

Part 10 Student Workbook

Use the built-in Control Hub IMU to turn right 90 degrees

TEACHER NOTE

MISSION: Configure the IMU, observe yaw, and explain how target, current heading, error, tolerance, timeout, and STOP work together.

Learning targets

- Identify the robot's agreed FRONT and describe the Control Hub logo and USB directions.
- Explain why the robot must be level, square, and still during IMU initialization and `resetYaw()`.
- Calculate signed heading error and predict the turn direction.
- Use tolerance, timeout, STOP, and an explicit final zero-power command as independent safeguards.

Before the video

Draw an arrow showing the robot's FRONT. Sketch the Control Hub and label which way the REV logo faces and which way the USB ports face.

Prediction: If target = -90 degrees and current = -70 degrees, what is the error? Should the robot continue clockwise or stop?

Guided Video Notes

Pause, discuss, and record code or visual evidence

PAUSE	QUESTION / MY EVIDENCE
0:10	What information does the IMU provide that drive encoders do not? _____
0:20	Where is the sensor used in this lesson? _____
0:31	Who defines the robot's FRONT? _____
0:43	Why must the Control Hub be rigidly mounted? _____
0:55	Which two directions describe the Hub installation? _____
1:05	Why must the robot remain still during initialization? _____
1:15	What does resetYaw() establish? _____
1:25	What yaw sign represents this right turn after verification? _____
1:37	Calculate target - current for -90 and -70. _____
1:47	Why reduce turn power near the target? _____
1:56	Why use a tolerance instead of exact equality? _____

IMU Setup and Error Practice

Complete the audit before a floor test

Physical orientation audit

CHECK	TEAM RECORD
Agreed robot FRONT	_____
REV logo direction	UP / DOWN / FORWARD / BACKWARD / LEFT / RIGHT
USB direction	UP / DOWN / FORWARD / BACKWARD / LEFT / RIGHT
Hub rigid and level?	YES / NO - evidence: _____
Code matches installation?	YES / NO - line: _____

Heading-error practice

TARGET	CURRENT	ERROR = TARGET - CURRENT	EXPECTED ACTION
-90	0	-90	Clockwise/right
-90	-70	-20	Continue clockwise
-90	-89	-1	Inside 2-degree tolerance: stop
-90	-95	+5	Correct counterclockwise
Student	_____	_____	_____

Code detective

- Circle the two Hub-orientation directions.
- Underline `resetYaw()`.
- Box the normalized heading-error calculation.
- Star the tolerance, timeout, `opModeIsActive()`, and final `stopDrive()` paths.

Safe Floor Test Record

Predict first; measure only after STOP and visible DISABLED

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.						

TRIAL	START YAW	TARGET	FINAL YAW	FINAL ERROR	EXIT REASON	MATCH?
1	_____	_____	_____	_____	Completed / Timeout / STOP	_____
2	_____	_____	_____	_____	Completed / Timeout / STOP	_____
3	_____	_____	_____	_____	Completed / Timeout / STOP	_____

Exit ticket

Use all five words - **target, current, error, tolerance, timeout** - to explain how the robot decides to keep turning, slow down, or stop.