

Part 11 Focus Guide

Build an accurate L-shaped path

TEACHER NOTE

The central idea is sensor teamwork: encoders estimate travel, the IMU holds heading, and physical measurement checks the result.

Prep

- StarterBot with verified encoder directions and rigid Control Hub
- StarterBotLPathAutonomous.java, Driver Station, charged battery
- Taped 36-inch by 24-inch L route with turn sweep, side buffers, and stopping space
- Tape measure, square, route sketch, student workbook, and POWERING ON poster

Planned pauses

TIME	ASK	LISTEN FOR
0:10	Complete route?	36 at 0, turn to -90, 24 at -90, stop
0:21	Distance sensor?	Encoders
0:32	Direction sensor?	IMU yaw
0:43	Why both?	Travel plus drift correction
1:05	Why target -90?	Measured absolute heading
1:28	Equal power = straight?	Not guaranteed
1:40	How correct drift?	Signed yaw error changes sides oppositely
1:57	When enter?	STOP, visible DISABLED, captain

Hands-on sequence

1. Mark the route, full chassis sweep, side buffers, and stopping area.
2. Trace the four top-level code calls using route cards.
3. Assign each observation to encoder, IMU, telemetry, or physical measurement.
4. Predict how a signed heading error changes left/right commands.
5. Run POWERING ON; complete one supervised trial with the operator ready at STOP.
6. Confirm DISABLED, measure, classify the miss, and choose one next check.

Part 11 Technical Notes

Keep route control and failure evidence visible

Control structure

Each straight segment converts inches to encoder counts, establishes RUN_TO_POSITION targets, and repeatedly compares target heading with IMU yaw. A clipped correction is added to one side and subtracted from the other. The turn segment reuses the signed yaw controller from Part 10.

Independent exits

- Encoder target reached
- Turn tolerance reached
- Segment timeout
- STOP / opModeIsActive false
- Teacher or safety captain calls abort
- Explicit stopDrive() after every segment and at final exit

Evidence hierarchy

EVIDENCE	WHAT IT SUPPORTS	WHAT IT DOES NOT PROVE ALONE
Encoder positions	Wheel rotation / estimated travel	Chassis followed a straight field line
IMU yaw	Robot orientation	Correct x/y endpoint
Telemetry	What code measured and commanded	Physical wheel traction
Tape/square	External route and endpoint	Which internal cause made the error

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.