

Compare Absolute and Relative Motion

Program the same geometric production path using absolute and relative motion, then recommend the better method.

Customer Precision Robotics Inc.	Department Controls Engineering	Difficulty Intermediate	Time 1 class period
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Production Goal: Select a reusable motion strategy for multiple workcells.

Background

Precision Robotics is creating reusable code for several similar workcells. Engineers disagree about whether the path should be programmed with absolute coordinates or relative increments. You must test both approaches using the same task.

Learning Objectives

- Distinguish absolute and relative robot movement
- Create equivalent programs using two motion strategies
- Compare readability, editability, and execution
- Support a programming recommendation with evidence

Equipment

- VEX CTE Workcell
- 6-Axis Arm with drawing tool or simulated points
- Python project
- Stopwatch
- Engineering notebook

Student Instructions

- 1 Choose a rectangular or stepped path with at least eight movements.
- 2 Sketch the path and label the starting coordinate and all dimensions.
- 3 Program Version A using absolute `move_to()` coordinates.
- 4 Program Version B using `move_inc()` for repeated or dimension-based moves.
- 5 Run each version three times and record execution time and positioning success.
- 6 Change the path width by 20 mm in both programs. Record how many lines or values had to change.
- 7 Compare code length, readability, reuse, and risk of accumulated error.
- 8 Write a recommendation for a factory that may move the fixture later.

Engineering Requirements

- Both programs must complete the same path
- Use at least eight motion commands
- Complete three successful trials per version
- Include comments that identify the coordinate strategy

Constraints & Safety

- Use identical speed settings for both versions

- Do not alter the physical workcell between trials
- Begin from the same Home position
- Keep the tool above the approved surface

Deliverables

- Absolute-motion program
- Relative-motion program
- Timing and editability comparison table
- Annotated path sketch
- Written recommendation

Reflection Questions

- 1 Which method was easier to understand?
- 2 Which method was easier to resize?
- 3 Where could relative error accumulate?
- 4 When would a hybrid approach be best?

Engineering Support

Engineering Tip

Absolute positions are useful for known fixtures; relative moves are useful for repeated patterns and reusable geometry.

Common Mistake

A relative program depends on the current position. Starting from the wrong point shifts every later move.

Stretch Goal

Create a hybrid program that uses absolute coordinates for setup and relative movement for the repeated pattern.

Career Connection

Robot programmers select coordinate strategies based on fixture stability, product variation, and maintainability.

Before You Submit

- Notebook evidence included
- Requirements checked
- Testing documented
- Reflection completed