

Engineering Training: Motion I

Duration: 6 days

Preparation: Allow sufficient time for preparation. This includes familiarizing yourself with the topics and reviewing the formal program materials. You may make any necessary changes to suit your individual training style or to communicate information most effectively to your audience.

Materials: All formal course materials can be found within the Engineering Training MS Team ([ET410](#), [ET441](#)). Trainees will already have all relevant training manuals as hard copies in their binders and access to digital copies. *Please note: Presentations are not to be distributed except in the case of trainee absence.*

Course Progression: All topics on the agenda below are necessary and required for development of the trainee's skillset. Relevant information and exercises may be added at your discretion if the group is progressing ahead of the timeline. Trainees who are finished with the current lesson are encouraged to explore referenced resources, delve deeper into the covered topics, and support their colleagues.

Day 1 AM

- Ensure trainees download and install the latest version of Motion upgrades.
- Demonstrate how to set up a single axis on the training set in a new project. Key points to elaborate on:
 - Each screen in *Drive Setup*
 - Drive node number in *Topology Overview*
 - Automatically added motion files (parameter table, error table, drive communication files)
 - Each quadrant of the *Commissioning* window
 - Powering on/off, autotuning, homing, and moving the axis
- Allow trainees to perform motion setup independently, using their notes from your lecture. Support as needed.
- Allow trainees to repeat motion setup tasks until sufficient comfort level is achieved (little to no reliance on notes).

Day 1 PM

- Demonstrate how to use the *AxisControl* function block to autotune, power on, home, move, stop, and reset errors on the axis using a new Ladder Logic program. Trainees should copy each step.
- Introduce and explain PLCopen motion chart using the Help file.
- Explain how *AxisControl* processes commands.
- Demonstrate how to use *AxisControl* to autotune, power on, home, move, stop, reset errors on the axis, and recover using a new Structured Text program. Trainees should copy each step.
- Allow trainees to repeat motion setup tasks until sufficient comfort level is achieved (little to no reliance on notes).

Day 2 AM

- Discuss units & period settings in the *AxisControl* configuration.

- Demonstrate how to integrate single-axis motion into trainees' latest copy of main project, including error handling and recovery.
- Trainees may create a simple visualization to accompany motion program.

Day 2 PM

- Demonstrate reading/writing operations on the drive.
- Discuss loading & saving configurations on the drive. Trainees can practice this using Ladder Logic.
- Demonstrate homing modes.
- Discuss best way to integrate a second axis into a project.
- Allow trainees to integrate a second axis into their main project, including error handling (using *Alarm* function block) and recovery.

Day 3 AM

- Use the “ET441TRN” presentation ([ET441](#)) to guide the discussion on Gearing & Phase Shift.
- Demonstrate:
 - Add a second Ladder Logic program to the motion project for a slave axis.
 - Add *AxisCoupling* function block and configure.
 - Demonstrate how gearing functions with master & slave axis.
- Allow trainees to construct your demo on their own and experiment with gear ratios and phase shifts.
- Use “ET441TRN” to guide the discussion on cam profiles.
- Demonstrate how to create a cam profile and configure using *AxisCoupling*.
- Allow trainees to construct your demo on their own and experiment with different profiles.

Day 3 PM

- Demonstrate how to integrate PLCopen function blocks with *AxisControl*.
- Allow trainees to construct your demo and experiment with it.
- Discuss requirements for Checkpoint 3.
- Any remaining time should be reserved for trainees to ask questions and prepare for Checkpoint 3.

Day 4-6

- Review and approve software designs, answer questions and support trainee work on Checkpoint 3.