



PRIMARY DEVELOPERS:

Glenn Wisniewski – Corporate Trainer, Henry Ford College
Wes Bye – Mechatronics SME, Pontiac Coil

MechapRACTICUM Outline

Controls and Motors

Topic: Controls and Motors

Estimated completion time: 12 hrs.

Purpose:

The purpose of this MechapRACTICUM is for the participant to demonstrate their ability to use and manipulate controls and motors.

Instructional Outcomes:

The participant will demonstrate the application of their skill and knowledge in the following topical areas:

- Controls and motors
- Basic electronics
- Safety

Instructions to Students

A standard Forward / Reverse motor starter is installed to control the rotation of a feed conveyer of a metal shear. The conveyer coasts when the motor is de-energized causing the load to be improperly positioned for the next operation.

The task is to add a braking system (dynamic, mechanical, plugging, DC) to the existing circuit to bring the conveyer to a stop and prevent the load from moving when power is removed from the motor starter. A red light will indicate when the braking system is active.

The Forward / Reverse circuit must include interlocking (pushbutton, relay contact, or mechanical) to prevent both the Forward and Reverse coils from being energized at the same time, and when the brake is applied. The braking circuit must include an interlock circuit (pushbutton, relay contact, or mechanical) to prevent the brake being applied when the motor is operation in forward or reverse.





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The Individual will:

Create a ladder Logic diagram with Rung, Line, Coil Reference numbers, and JIC / NEMA standard symbols. The Ladder Logic will meet the design requirements provided in the written documentation.

Proctor Sign Off:

- 1) Ladder Logic Diagram is drawn to JIC / NEEMA standard
 - a) Rung numbers are correct
 - b) Wire numbers are correct
 - c) Reference numbers are correct
 - d) Symbols are correct
 - e) Safety (Interlocks) are correctly applied

- 2) Ladder Logic diagram will provide the action listed in the specifications.

Redraw Ladder Logic Diagram to IEC standard

Safety

The student will demonstrate all safety practices learned in previous instruction.

Instructions to Evaluator:

The instructions for the evaluator are integrated with the instructions to the student.





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Rubrics:

Part 1

Proctor Sign Off:

- 1) Ladder Logic Diagram is drawn to IEC standard
 - a) Rung numbers are correct
 - b) Wire numbers are correct
 - c) Reference numbers are correct
 - d) Symbols are correct
 - e) Safety (Interlocks) are correctly applied
- 2) Ladder Logic diagram will provide the action listed in the specifications.

Use the provided Power Circuit Diagram and create a control wiring diagram, include wire numbers.

Proctor Sign Off:

- 1) Control wiring diagram is drawn to standard
 - a) Power flow from left to right and Top to Bottom
 - b) Wire numbers are shown for all control wiring

Construct the working control circuit and demonstrate the operation meets the specifications.

- 1) Components are properly positioned.
- 2) Wiring is neat and properly terminated.
- 3) The circuit operates as specified.
- 4) Follow correct safety procedures when working with the circuit.





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Proctor Sign Off:

Proctor will introduce a fault in the circuit, student will:

Operate the control circuit and record the observed operation. Compare the operation to the 'Cycle Graph' to determine fault location. Define a testing process to locate fault.

- 1) Correctly utilize the documentation, circuit diagrams to predict location of fault.
- 2) Correctly identify a testing process to locate and confirm circuit fault
- 3) Follow correct safety procedures when working with the circuit.

Proctor Sign Off:

Follow testing process to locate and correct fault. Operate circuit to demonstrate correction of fault.

- 1) Correctly locates the fault with minimum steps.
- 2) Correctly correct the fault and demonstrates correct operation of circuit
- 3) Follow correct safety procedures when working with the circuit

Final Proctor Sign Off:

- 1) All documents that are created and are Complete, Accurate, and Neat.

Part 2

- 1) Set up the Allen Bradley Flex drive to work with the given AC motor.
- 2) Establish remote control of the VFD – using a remote start-stop circuit and a variable potentiometer for speed adjustment. Set the starting speed for 3000 rpms max.
- 3) Set the acceleration and deceleration times for 10 seconds.

Proctor Sign off = _____

While the proctor is present, adjust:

- 1) Acceleration time to 7 seconds
- 2) Deceleration time to 5 seconds

Proctor Sign off = _____





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Motor Controls Mechapacticum

Student Name: _____ Date(s): _____

Instructor Name: _____

Scoring Guide: Maximum Points: 290

Highly Proficient – 10, Competent – 8, Developing – 6, Limited – 4 Scattered – 2, Unable to start - 0

| Skill Number | Skill Title | Skill Rating |
|--------------|--|--------------|
| 1 | Followed Safety Procedures without prompting | |
| 2 | Used Proper PPE | |
| 3 | Performed LOTO of energy sources when necessary | |
| 4 | Ladder Diagram is drawn to JIC/NEMA standards | |
| | a) Rung numbers are correct | |
| | b) Wire numbers are correct | |
| | c) Reference numbers are correct | |
| | d) Symbols are correct | |
| | e) Safety Interlocks are correctly applied. | |
| 5 | Ladder logic diagram appears to provide the action desired | |
| 6 | Ladder Diagram is drawn to IEC standards | |
| | a) Rung numbers are correct | |
| | b) Wire numbers are correct | |
| | c) Reference numbers are correct | |
| | d) Symbols are correct | |
| | e) Safety Interlocks are correctly applied. | |





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RELEASE DATE 12/17/2014

VERSION v 001

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| | | |
|----|--|--|
| 7 | Ladder logic diagram appears to provide the action desired | |
| 8 | Circuit constructed, debugged and verified to be operational as required | |
| 9 | Control wiring diagram is drawn to standard | |
| 10 | Cycle Graph is proper | |
| 11 | Construction of circuit and verification of operation | |
| 12 | Fault 1 Remediated | |
| 13 | Fault 2 remediated | |
| 14 | Assigned Documentation is complete, accurate and neat | |
| 15 | Efficient use of time | |
| 16 | Attention to Detail | |
| 17 | Work Attitude | |
| 18 | Work Procedure | |
| 19 | Professionalism | |
| 20 | Self Confidence | |
| 21 | Knowledge of Job | |
| 22 | Total Points | |





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