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

Mechapracticum Outline
PLC

Topic: PLC

Estimated completion time: 16 hours

Purpose:

The purpose of this Mechapracticum the demonstration by the participant of their ability to operate the PLC as prescribed in this document.

Instructional Outcomes:

You are being asked to demonstrate proficiency in the following areas:

- Communications (programming terminal to processor)
- Programming software usage, navigation and functionality
- Data organization and configuration
- Programming
- I/O configuration and wiring
- Troubleshooting

Instructions to Students:
Part 1

You will first have to configure the I/O and establish all Tags to support the following program.

Your exact I/O module information is on the white board.

Student assignment

- The circuit will have a start and stop pushbutton
- The start push button will have to be sealed
- Once the start PB is depressed, output one will initiate after a dwell of 5 seconds
- Once output one is activated, output 2 will activate after a dwell of 3 seconds
- All inputs have to be mapped in a unique subroutine
- All outputs have to be mapped in an unique subroutine
- The machine logic will be in an unique subroutine
- Assign descriptions to all program elements

Once you have wired the I/O on the trainer, entered and debugged the program, call your evaluator over to verify the proper operation.

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Part 2

When complete, you will be asked to leave the room while your instructor bugs the program and circuit.

When you return, debug the program and ask your evaluator to verify the proper operation of the program.

Part 3

When complete with the above, demonstrate to your evaluator how to do each action below.

- Search
- Toggle bits
- Apply and remove forces
- Change one of the dwell times through manipulation of the timers preset in the Tag area.

Part 4

You will be given a description of 2 proximity switches. Please select appropriate Input modules from the list provided to interface with these devices. You will have to search the internet for supporting documentation. Once you have selected the modules you want to use, then complete the following.

Draw the input wiring associated with sinking and sourcing proximities when given a selection of I/O modules and proximity switch data. This includes all supply connections and jumpers on the terminal blocks.

There will be an additional written exercise that you will receive from your instructor that will require the lap tops and logic analysis.

Submit this to your evaluators.

Part 5

Each student will be assessed on their work habits including Attitude, Procedure, Professionalism, Self-confidence, Knowledge, and Safety.

Part 6

Student assignment

LAB: RSLogix 5000 Application Program Exercise 2

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DESCRIPTION:

Create a program that simulates a Zone (accumulator) counter, where carriers are allowed to enter and exit the zone (accumulator), in the range of 0 – 20 carriers present at any given time.

ASSIGNMENT:

Zone (Accumulator) Counter - Design, wire, and debug an Up/Down Counter program that tracks carriers entering and exiting a zone (accumulator). Create routines, use JSR, COP, Counter, and Compare instructions, Map (copy) Inputs & Outputs, and create the tags necessary for logic design in the PLC project.

Parameters:

- DO NOT use Local address tags in machine logic routine. (Use mapped tags)
- Use NO PB 1 to increment counter whenever a carrier enters the zone.
- Use NO PB 2 to decrement counter whenever a carrier exits the zone.
- Zone counter cannot be allowed to count more than 20 carriers.
- Zone counter cannot be allowed to count below zero.
- Use lamp 1 on trainer to indicate Low Pre-alarm when zone is below 5 carriers.
- Use lamp 2 on trainer to indicate High Pre-alarm when zone is above 15 carriers.
- Low & High Pre-alarm lights will flash 5-times per second.
- Use lamp 3 on trainer to indicate an Alarm when zone is empty.
- Use lamp 4 on trainer to indicate an Alarm when zone is full.
- Empty and Full alarm lights are not allowed to flash. (On steady only)
- Zone low & high pre-alarms are to be reset when zone is completely empty or completely full. (Only one alarm light on at any given time)
- The zone counter can be reset by an additional push button.

Once you have wired the I/O on the trainer, entered and debugged the program, call your evaluator over to verify the proper operation.

Safety:

The student will demonstrate all safety practices learned previous instruction.

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Instructions to Evaluator:

Instructor/Evaluator Notes

- The outputs are not defined. At HFCC Pneumatic cylinders were used (available on our trainers). Use whatever is available.
- Start and stop pushbuttons are requested… Use the available inputs on your trainers.
- Students will have to connect programming terminals and initiate communications.
- We have pulled the batteries on the PLC trainers to force the students to configure the I/O
- Part 2 reflects that the instructor/evaluator will introduce bugs into the circuit. This can include: the insertion of a broken wire at an input or output, Move a wire on the trainers, Force an input or output, inhibit an I/O module, etc.
- Part 4 is a paper exercise to ensure that the students can demonstrate how an Input module could be wired to support a sourcing and sinking Proximity switch. The Input module specification is attached; as is the NPN and PNP Proximity switches. As is true with most schools, we actually don't want the students to wire and unwire the terminal blocks on the actual trainers.

Tools and Equipment:

- PLC trainer and programming terminal
- 4 Input switches
- 4 output lamps for part 6
- 2 output lamps or cylinders for part1

Rubrics:

The proctor will rank each of the Rubric criteria based on observations and accuracy of calculations and ability of the student to achieve the outcomes to a given standard.

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V3

Student Name: _____   Evaluator 1:
Dates: _____   Evaluator 2:
Evaluator 3:

Point assignment: 5 = Highly Proficient, 4 = Competent,
3 = Developing, 2 = Limited, 1 = Improvement required.

Note: Items 1g and 6g are used in lieu of 1 a through f and 6 a through f. If partial credit is to be given then a through f would apply and g not used.					
Part 1	**Circuit design and Build**	**PTS**	**Part 5**	**Work Habits**	**PTS**
1a	Using schematics prints and test equipment to troubleshoot a system		5a	Work Attitude	
1b	Circuit designed and entered into PLC		5b	Work Procedure	
1c	Establish communications between PLC and Laptop		5c	Professionalism	
1d	Tags configured		5d	Self-confidence	
1e	I/O Configured		5e	Knowledge of job	
1f	Trainer wired and Piped if applicable		5f	Use of Diagnostic Tools	
1g	Circuit functioning as required. This implies Proficiency in all of Part 1 requirements		**5g**	Safe Work Practices	
PART 2	**Demonstrated proficiency in Software utilization**	**PTS**	5h	Safety Attitude	
2a	Search Function		**Part 6**	**Circuit design and Build**	**PTS**

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2b	Toggle Function		6a	Using schematics prints and test equipment to troubleshoot a system	
2c	Apply and remove forces		6b	Circuit designed and entered into PLC	
2d	Manipulation of Presets in the Tag area		6c	Establish communications between PLC and Laptop	
PART 3	**Discovered and remediated fault**	**PTS**	6d	Tags configured	
3a	Fault 1		6e	I/O Configured	
3b	Fault 2		6f	Trainer wired and Piped if applicable	
3c	Fault 3		6g	Circuit functioning as required. This implies Proficiency in all of Part 1 requirements	
Part 4	**Will be assessed separately**				

Total Points: _____

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