Northwest State Community College  
Course Information Sheet

# Course Information

Title: PLC 2A

Course Number: PLC129

Credit Hours: 1

Pre-requisite: PLC128

# Description

This course is an in-depth study of the Allen Bradley CompactLogix system and how to use RSLogix5000 programming software to program, monitor, and troubleshoot a system. The primary focus will be on the processor memory structure, the intermediate instruction set, analog I/O modules, and using the RSLogix5000 software. Students will learn all the data structures used across most industrial PLCs, as well as a tag-based system versus an address-based system (SLC-500). Learning how the instructions work within a program will be an essential part of skills development for troubleshooting. A critical part of this course is learning how to search for objects in the L5000 project with RSLogix5000 as a method of increasing troubleshooting efficiency. Students will also learn of the different programming languages used for the ControlLogix platform (Ladder Logic, Structured Text, Sequential Function Charts).

# Learning Outcomes

Upon completion of this course the students will be able to:

1. Implement CompactLogix Comparison instructions
2. Implement CompactLogix Move/Logical instructions
3. Implement CompactLogix File/Misc. instructions
4. Implement CompactLogix Sequencer (SQO) instructions

# Required Material

**Text:**

Electrical Motor Controls for Integrates Systems Workbook, Rockis, Gary & Mazur, Glen A., 5th Edition, American Technical Publishers, ISBN: 978-0-8269-1226-8

**Supplies:**

VOM

# Module 1: AB ControlLogix/CompactLogix Comparison Instructions

In Module 1, the student will learn the functionality and operation of the various comparison instructions used in the Allen Bradley ControlLogix system.  The basic comparison instructions (EQU, NEQ, LES, LEQ, GRT, & GEQ) will be taught in the first part of the module, as well as the CMP (Compare) instruction.  The next portion of the module the student will learn the operation of the LIM (Limit Test) instruction.  These instructions will also be used in programs so the student can learn how they work together to form a comparative solution.  A very important part of this module is learning the various data types, and how they compare to each other.  Coupled with the data type is the data style (sometimes termed the data view, or in the PLC5/500 era, the Radix).  The student must know how to change the properties on a Tag, and to understand data style prefixes.

Upon completion of this module the student will be able to:

1. Explain what values would make a standard comparison instruction true.
2. Compare the various data types, and what types can be used in a comparison instruction.
3. Explain how to determine if a comparison instruction is true, when viewing Online.
4. Explain the different data view prefixes (ie. 2#, 16#, etc)
5. Compare the logic statement in a CMP instruction to a standard comparison instruction.
6. Determine which data types can be compared to each other in a comparison instruction.
7. Convert a decimal value to a hex value.

### Compare the execution time between a CMP instruction and a standard compare instruction. Module 1 Activites

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 Read Intro to ControlLogix PAC - Chapter 15 Comparison Instructions, pages 385-394

Text Book

 Read Logix5000 Controllers General Instruction Reference Manual - Chapter 5 Comparison Instructions, pages 283-325 Focus on just the Ladder Logic Instructions

Text Book

 Watch Video: Configuring a new RSLogix5000 project (19:10)

<https://www.youtube.com/watch?v=uaR48wNsuVA>

 Watch Video: Importing an RSLogix5000 L5K backup file (4:00)

<https://www.youtube.com/watch?v=NZOW48GT_0o>

 Watch Video: RSLogix Emulate5000 RSLinx Setup (7:52)

<https://www.youtube.com/watch?v=ZP0yxqsVLng>

 Watch Video: RSLogix Emulate5000 RSLogx5000 Setup (15:48)

<https://www.youtube.com/watch?v=1T7qduc4qCU>

 Watch Video: Backing up an RSLogix5000.ACD project file to L5K file (3:40)

<https://www.youtube.com/watch?v=9Oo-mzf9nm8>

 Watch Video: L5K file from Sakai to Virtual Machine (2:34)

<https://www.youtube.com/watch?v=jVP0ttTQ8Ic>

 Watch Video: Reconfigure Lab files for the RSLogix5000 Emulator (12:29)

<https://www.youtube.com/watch?v=pc4xNFQrBxM>

 Watch Video: Tag Styles in RSLogix5000 (5:43)

<https://www.youtube.com/watch?v=8g8MHMsxONA>

 Watch Video: PLC 129 Module 1 Video on MEQ (6:24)

<https://www.youtube.com/watch?v=X9B0M_nD5vI>

 Complete Quiz 129-1

See Quiz PLC129-1 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 129-1.0, 129-1.1 and, Lab 129-1.2

See Lab Documents

 Schedule and complete Hands-on Lab 129-1.0

See PLC129 1.0 Lab Document

 Schedule and complete Hands-on Lab 129-1.1

See PLC129 1.1 Lab Document

 Schedule and complete Hands-on Lab 129-1.2

See PLC129 1.2 Lab Document

# Module 2: AB ControlLogix/CompactLogix Move/Logical Instructions

In Module 2, the student will learn the functionality and operation of the logic instructions and move type instructions used in the Allen Bradley ControlLogix system.  The students will learn how the MOV and CLR instructions manipulate data values, as well as the various Atomic Data Types: SINT, INT, DINT, REAL & BOOL.  The students will also compare the advantages or disadvantages of using constants instead of Tag values in data transfer instructions.  The students will also learn about the Logic Instructions: AND, OR and XOR.  A very important part of this module is learning how masking data works, and how it is used within the Masked Move (MVM) instruction.  Configuring and learning the operation of the BTD instruction will also be part of this module

Upon completion of this module the student will be able to:

1. Explain the operation of a CLR instruction within a ControlLogix routine.
2. Determine if a MOV instruction is an input or an output type of instruction.
3. Explain if a Source and Destination values within a MOV can be a Tag or a Constant.
4. Explain the operation of an AND instruction with decimal and binary view data.
5. Determine if a rung of logic with multiple comparison instructions is true or not.
6. Explain the operation of an XOR instruction with decimal and binary view data.
7. Convert a decimal value to a hex value.
8. Determine the Destination value of a MVM, given the Source and Mask data.

### Module 2 Activities

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 Read Intro to ControlLogix PAC - Chapter 16 Data-Handling Instructions, pages 410-424 (focus on BTD page 365, AND page 372, OR page 396, XOR page 377)

Text Book

 Read Logix5000 Controllers General Instruction Reference Manual - Chapter 7 Move/Logical Instructions, Focus on just the Ladder Logic Instructions (BTD, AND, OR, XOR)

Text Book

 Watch Video: BTD Logical Instruction

<https://www.youtube.com/watch?v=lzPuUKNvQA8>

 Complete Quiz 129-2

See Quiz PLC129-2 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 129-2.1 and, Lab 129-2.2

See Lab Documents

 Schedule and complete Hands-on Lab 129-2.1

See PLC129 2.1 Lab Document

 Schedule and complete Hands-on Lab 129-2.2

See PLC129 2.2 Lab Document

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# Module 3:

# AB ControlLogix/CompactLogix File/Misc. Instructions

In Module 3, the student will learn the functionality and operation of the File Transfer type of instructions used in the Allen Bradley ControlLogix system.  The FAL instruction will be the first instruction the students will study. The students will have to configure the instruction and test that the data transfers between Tags.  The COP/CPS and FLL instructions will also be introduced to the student.  A very important portion of this module is learning how Data Arrays work, and how to configure them.  The student will learn how to setup and interpret 1, 2 and 3 dimensional arrays.

Upon completion of this module the student will be able to:

1. Explain the difference between a 1, 2 and 3 dimensional array tag.
2. Differentiate between an array Tag and a regular Tag.
3. Explain the operation of a COP instruction using array Tags.
4. Explain the operation of FLL instruction when using array Tags.
5. Explain the operation of a CPS instruction, and how it differs from a COP.
6. Explain the operation of a FAL when it is in the INC mode.
7. Explain the operation of a FAL when it is in the ALL mode
8. Explain the operation of a FAL when it is in the Numeric mode.

### Module 3 Activities

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 Read Intro to ControlLogix PAC - Chapter 16 Data-Handling Instructions, pages 424-428

Text Book

 Read Logix5000 Controllers General Instruction Reference Manual - Chapter 7 Move/Logical Instructions - focus on MOV and, MVM

Text Book

 Read Logix5000 Controllers General Instruction Reference Manual - Chapter 8 Array (File)/Miscellaneous Instructions - focus on COP/CPS, FAL, and FLL

Text Book

 Review PDF: Data Manipulation Instructions

See attached PDF file

 Watch Video: Data Manipulation Video

<https://www.youtube.com/watch?v=qapEKnocN_c>

 Complete Quiz 129-3

See Quiz PLC129-3 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 129-3.1, and Lab 129-3.2

See Lab Documents

 Schedule and complete Hands-on Lab 129-3.1

See PLC129 3.1 Lab Document

 Schedule and complete Hands-on Lab 129-3.2

See PLC129 3.2 Lab Document

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