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DUN # 829394449 (Veteran Owned Small Business)
A+ rating with the Better Business Bureau

5 Day - PLC Training MicroLogix1400 w/Digital Field Device Simulator

The curriculum is designed for adaptive delivery to electricians, technicians and engineers that have little or no experience with programmable logic controllers. It is also suitable for technical personnel with experience using controllers other than Allen Bradley, as well as those that need a refresher on PLCs. The course starts at the most fundamental level and progresses at the learner's level with each additional day.

The hardware platform used will be Micrologix1400 with Micro Starter (RSLogix500) programming software. For the sake of the maintenance of existing AB platforms found in most manufacturing facilities, PLC2, PLC3, PLC5, SLC500, 1771 racks of memory and I/O configurations will be discussed as well, if requested in advance.

The learner will take away a solid understanding of what a PLC is, how PLCs are implemented, and the necessary skills to analyze ladder logic diagrams for the use of troubleshooting the processes/machines controlled by a PLC. Attendees take home the project manuals.

In the photo above, the PLC is a Micrologix1400. There are very few differences (primarily in the I/O hardware only) between the Micrologix controllers and SLC500 controllers. Micrologix1400 are more current, support online editing and Ethernet communications.

Why we put such emphasis on "Hands-ON" learning...

Some of the lecture subjects and supporting lab projects with a real PLC:

Computer hardware and operating systems on the shop floor

What is a programmable logic controller?

What is machine control and what is process control?

Mastering RSLinx for the shop floor – *reducing downtime*

Using RSLogix500 as a troubleshooting tool – *reducing downtime*

Troubleshooting PLC Hardware – *reducing downtime*

Recognizing and troubleshooting the communication protocols and adapters

Troubleshooting manufacturing processes with RSLogix500 to *reduce downtime*

PLC2/3/5, the 1771 chassis and I/O modules discussion only – time permitting

SLC500, the 1746 chassis and I/O modules discussion only

Micrologix1000/1100/1200/1400/1500 processors and expansion modules

Certificate of Completion available for all attendees

I. Day One

A. Intros, Line-up and housekeeping

B. Evolution of Electrical Control Systems
1. Evolution of Machine/Process Control
2. Manual Control
3. Semi-Automatic Control
4. Automatic Control

C. Lab Session – RSLinx
1. Demonstration - RSLinx Overview
2. Lab Session
   a) *RS-232*
   b) *Ethernet*
3. Lab Lecture/Discussion

D. Basics of Industrial Controllers – P1
1. Programmable Logic Controllers
2. Relay Coils and Bits of Memory
3. Number Systems – Millions of bits, how to organize…
4. Memory Structure

E. Lunch Break

F. Lab Session – Creating a Project, adding I/O
1. LAB Intro Demo
2. Lab Project – Understanding how to navigate the software for troubleshooting
   a) *Create a project*
   b) *Saving a project*
   c) *Downloading a project*
   d) *Keyboard surfing the data table*
3. Lab/Lecture Discussion

G. Basics of Industrial Controllers – P2
1. Field Devices
2. States of Memory Locations
3. Memory Mapping
4. Photoelectric sensors, sinking and sourcing

H. Lab Session – Downloading and Keyboard Surfing
1. LAB Intro Demo
2. Lab Project
   a) *Going Offline/Online*
   b) *First rungs of logic*
3. Lab/Lecture discussion

I. **Practical Programming Example – Reading Ladder Logic Diagrams**
   1. LAB Intro Demo
   2. Lab Project
      a) *Industrial Garage Door Opener*
   3. Lab/Lecture Discussion

II. **Day Two**

A. **RSLogix500/Micro Starter**
   1. GUI layout
   2. Main Menu
   3. Sub Menus – Relevant Features only
   4. Context sensitive features
   5. Creating a new project
   6. The memory map for this processor
   7. Program files
   8. Data files
   9. File Types
   10. I/O Files
   11. Survey of the Instruction set
   12. Difference between Online and Offline
   13. Establishing communication with industrial controllers
   14. Identifying controller program files, online, offline and archived…
   15. Protecting the active program files in use and saving program files correctly

B. **Lab Session – Logic that Remembers - Troubleshooting LLD Types**
   1. Lab Intro
   2. Lab Project
      a) *Memory Locations - Tags, Pointers etc…*
      b) *Latch/Un-Latch*
      c) *Seal-In Logic*
      d) *Practical Examples*
   3. Lab Discussion

C. **Electrical control circuits and I/O Interfaces – Analyzing Ladder Logic**
   1. Electrical vs. Ladder Logic Diagrams
   2. Continuity versus True
   3. No Continuity versus False
   4. True Stop & False Start with True for seal-in.
   5. Field Device State versus True-If-ON and True-If-OFF instructions.
   6. Electrical control with sensors and relays
   7. Multiple device control
   8. PLC control with sensors and bits

D. Lunch

E. Lab Session Challenge #1 Pt1 & Pt2
1. Lab Intro/Demo
2. Lab Project
3. Lab Discussion/Lecture

F. Evolution of Computer Control, Optional
1. Single board computer control
2. Optical isolation with Opto-22
3. Expanding the limited I/O interface
4. Backplanes, data and control
5. PLC Input State Acquisition, Program Scan & Output State Update
6. A rack of memory- Chassis - I/O Modules
7. Memory layout
8. Timers, counters
9. Internal bits/words
10. Flexible memory mapping
11. Memory layout
12. Timers/Counters
13. Bits/Words
14. Program Files vs. Data Files
15. Field Circuits – I/O Module types
16. Input devices - Output devices

G. Lab Session One Shot Instruction – A Troubleshooters Best Friend
1. Lab Demo
2. Lab Session
   a) ONS
   b) *Practical Example*
3. Lab Discussion

III. Day Three

A. Lab Session – Timer Data Types
1. Lan Intro/Demo
   a) TON
   b) TOF
   c) RTO
   d) RES
2. Lab Discussion/Lecture

B. Lab Session – Practical Example – Timers/Troubleshooting Timers
1. Lab Demo
2. Lab Session
3. Lab Discussion

C. Lab Session – Free Running Timers
1. Lab Demo
2. Lab Session
3. Lab Discussion

D. Lab- Practical Application Programming Example – Troubleshooting LLD
1. Lab Intro
2. Lab Project
   a) Cylinder Monitoring
3. Lab Discussions

E. Lunch

F. Lab Session - Counter Data Types
1. Lab Demo
2. Lab Session
   a) CTU – CTD - RES
3. Lab Discussion

G. Lab Session – Practical Programming Example – Troubleshooting Counters
1. Lab Demo
2. Lab Session
   a) Carton Counting - Conveyors
3. Lab Discussion

H. Comparison Instructions

I. Lab Session – Troubleshooting Comparison Instructions
1. Lab Intro
2. Lab Projects
3. Lab Discussions

J. Math Instructions

K.   **Lab Session – Troubleshooting Math Instructions**
   1.   **Lab Project**
   2.   **Lab Discussions**

L.   **Word Copy (MOV) and MVM**

M.   **Lab Session – Troubleshooting MOV and MVM**
   1.   **Lab Project**
   2.   **Lab Discussion/Lecture**

N.   **Lecture - Bit Shifting – Optional**
   1.   **Lab Session – 40min.**
   2.   **Lab Project**
      a)   Bit Shift Left
      b)   Bit Shift Right
   3.   **Lab Discussion/Lecture**

IV.   Day Four

A.   **Sequencing with PLCs**

B.   **Lab Session – 60min.**
   1.   **Lab Demo**
   2.   **Lab Session**
      a)   Sequencing Part 1
   3.   **Lab Discussion/Lecture**

C.   **Lab Session – 45min.**
   1.   **Lab Demo**
   2.   **Lab Session**
      a)   Virtual Devices
   3.   **Lab Discussion/Lecture**

D.   **Lab Session – 60min.**
   1.   **Lab Demo**
   2.   **Lab Session**
      a)   Sequencing Part 1 – Latch/Un-Latching
   3.   **Lab Discussion/Lecture**

E.   **Lunch Break**

F.   **Lab Session – Troubleshooting Logic**
   1.   **Lab Demo**
   2.   **Lab Session**
      a)   Independent Logic
   3.   **Lab Discussion/Lecture**

    G.   **Lab Session – Troubleshooting Logic**
  1. **Lab Demo**
  2. **Lab Session**
     a)   Testing Seal-In Logic
  3. **Lab Discussion/Lecture**

    H.   **Lab Session – Troubleshooting Logic**
  1. **Lab Demo**
  2. **Lab Session**
     a)   Input/Output Routines
  3. **Lab Discussion/Lecture**

    I.   **Wrap Up**

V.   Time Permitting or Day Five

    A.   **Message Instructions**

    B.   **Lab Session – MSG**

    C.   **Loading, using and maintaining Rockwell Software revision**

    D.   **High Speed Counters, Pulse Width Modulation & Pulse Train Output**

    E.   **PWM/PTO Welder Lab Challenge**

VI.   Fill in activities or Day Five

    A.   **Plant Air Compressor Rotation Scheduling Lab Project**

    B.   **Challenge Results Discussion**

This is a basic outline of the sequence of activities, not a schedule. The delivery of content is continually adjusted for the mean learner…it goes as fast as the learners can assimilate the subject. The instructor has thousands of hours on the shop floor with the equipment and thousands of hours in the classroom. The instructor is a combat veteran with a disability rating from the VA that in no way interferes with the quality of the classroom delivery. The instructor is the author of the training manuals used in the classroom.