PRACTICAL TROUBLESHOOTING AND PROBLEM SOLVING OF
PLCS AND SCADA SYSTEMS

YOU WILL LEARN HOW TO:

- Quickly interpret, isolate and fix common hardware problems related to PLC input/outputs

- Troubleshoot PLC software (especially ladderlogic)

- Identify typical SCADA problems and fix them

- Safely make changes to a system without overriding machine safety or personnel safety programming

- Make temporary fixes to a program to test out new components or ideas

- Identify and fix electrical noise, earthing and power problems

- Identify and fix PLC/SCADA data communications problems

- Network with your peers on their automation troubleshooting

WHO SHOULD ATTEND:

- Operators

- Electricians

- Instrumentation technicians

- Trades staff working with PLCs

- Electrical, control and instrumentation engineers

- Design engineers

- Project engineers

- IT technicians and IT staff

- Plant engineers

And those who want to achieve a good proficiency in troubleshooting their PLC and SCADA systems.

IDC TECHNOLOGIES

Technology Training that Works

The Workshop

The objective of this workshop is to help you troubleshoot, and identify, prevent and fix common PLC and SCADA problems. The emphasis is on practical hard hitting information that goes beyond typical theory, focusing unerringly on providing you with the necessary skills to solve your problems whether it is a PLC, SCADA system, or indeed communications system linking the two together. The automation system on your plant underpins your entire operation. It is thus critical that you have the knowledge and tools to quickly identify and fix problems as they occur to ensure you have a safe, secure and productive system. No compromise is obviously possible here. This workshop distils all the tips and tricks learnt over many years.

If you have worked in industry, you are probably familiar with PLCs and SCADA systems and understand their basic operation. However, an increasing need today is to also understand how to troubleshoot the typical problems that occur from time to time with your PLC and SCADA based equipment. You want to be able to quickly diagnose problems using your PLC software; know how to connect to the right PLC processor online, make minor changes to get the machine running and have the know-how to test new ideas and hardware components. In addition, you want to be able to do troubleshooting and problem solving of your associated SCADA system.

The first step in PLC troubleshooting is to decide if the problem is internal to the processor or in the I/O system. Experience shows that more than 80% of all PLC malfunctions come back to problems with I/O modules or field equipment (or indeed wiring). Problems that can be traced back to an I/O module (and specific input) or usually external field components; whilst internal PLC problems often result in large scale failure or erratic behaviour on the part of the PLC.

This workshop is designed to benefit you with hard-hitting practical up-to-date information on the application of PLCs for the automation and process control of plants and factories. It aims to give practical advice from experts in the field, to assist you with your troubleshooting of your PLC and SCADA systems.

The content of the workshop brings everyone up to date by briefly reviewing PLC and SCADA systems and then examining in a logical step-by-step fashion with hands-on exercises (both PLCs and simulation software to get to the problems quickly) PLCs and SCADA systems. The key industrial communications problems are briefly covered.

The accompanying manual is detailed with contributions from a number of experts who have presented this course over many years and will become a valuable reference in your work.

Practical Sessions

This is a practical hands-on workshop enabling you to work through twelve (12) practical exercises which reinforce the concepts discussed.

The Program

DAY ONE

INTRODUCTION TO PLCS AND SCADA SYSTEMS
- PLC block diagram of components
- PLC processor module and memory organisation
- PLC input/output modules
- SCADA hardware
- Power supplies
- Good installation practice

Practical Session

FUNDAMENTALS OF PLC SOFTWARE
- Methods of representing logic
- Boolean algebra
- Instruction code
- Graphical representation: functional logic diagrams and ladderlogic
- Ladderlogic instruction set (coils and contacts/timers/counters)
- Advanced instructions (program flow/ arithmetic/data transfer and PID)
- Start-up/shutdown and fault routines
- Good programming habits
- Comparison of different manufacturers

Practical Session

SCADA SOFTWARE
- Communication architectures, HMI interface, SCADA software blocks, SCADA Alarm management

Practical Session

INDUSTRIAL DATA COMMUNICATIONS SYSTEM
- Roadmap of different standards, RS-232/ RS-485, Profibus and DeviceNet, industrial Ethernet, TCP/IP, Modbus

Practical Session

BASICS OF TROUBLESHOOTING AND DIAGNOSING EQUIPMENT
- Common symptoms, problems and solutions
- How to quickly identify likely causes
- Overall basic steps
- Communications issues
- Earthing, shielding and noise

Practical Session

PLC TROUBLESHOOTING ROAD MAP
- Review of the key PLC troubleshooting issues

Practical Session

PLCS POWER AND EARTH
- Visual inspection, measuring voltages, power supply test, AC ripple on DC power supplies, Batteries testing, EMI/RFI impacts, earthing and screening/shielding

Practical Session

TROUBLESHOOTING PLC INPUTS/ OUTPUTS
- Internal memory status against the field activity
- Digital input status
- Output modules and power supply
- Fuses
- Forcing outputs ON and OFF

- Leaky inputs and outputs
- Isolation problems
- You have located the problem - what to do now?
- Tracking down intermittent problems

Practical Session

TROUBLESHOOTING PLC ANALOG INPUT/OUTPUTS
- Isolated and non-isolated inputs
- Ranges of analog inputs
- Forcing analog output ranges
- Filtering and isolation issues

Practical Session

DAY TWO

MISCELLANEOUS HARDWARE ISSUES
- Processor problems
- What to do if you don't have the right replacement
- Are you sure you have the right problem?!
- Confirmation that the system is indeed operating correctly
- Other troubleshooting tips and tricks

Practical Session

PLC SOFTWARE ISSUES
- How to return the program to its original state
- Modifying an existing program
- Modifying a program to trap problems

Practical Session

SCADA TROUBLESHOOTING ROAD MAP
- Review of the key SCADA troubleshooting issues, SCADA system troubleshooting, PLC/SCADA interfacing problems

Practical Session

HUMAN MACHINE INTERFACE (HMI)
- Configuration of database points
- Troubleshooting I/O database

SCADA ALARM CONFIGURATION ISSUES
- Configuration of alarms

SCADA TO PLC INTERFACE ISSUES
- Drivers, protocols and throughput issues

KEY INDUSTRIAL DATA COMMUNICATIONS PROBLEMS AND TROUBLESHOOTING
- Cabling and hardware (switches/routers/ converters), fibre optics, noise and interference, RS-485 issues, industrial Ethernet, TCP/IP and Modbus

Practical Session

INSTALLATION AND COMMISSIONING
- Control room, MCC requirements, installation of equipment, loop testing

Practical Session

TOOLKIT SUMMARY OF KEY PROBLEMS TO LOOK FOR
- 23 common problems with PLCs and SCADA systems
- What to do and how to fix them