



## PLC FAULT FINDING

COURSE 520: 3 DAYS: Max 8 Candidates

Programmable logic controllers are commonplace in all areas of industry. Accordingly it becomes ever-more important that maintenance personnel should be able to carry out effective fault finding on these systems.

### PARTICIPANTS

This course will be invaluable to anyone involved in the maintenance of control systems which incorporate PLCs. Participants should ideally have an understanding of electrical principles.

### COURSE PRESENTATION

The emphasis throughout is on useful, practical skills and their application in the context of common industrial situations. Much of the course is given over to 'hands-on' experience and the maintenance skills that are required when working with PLCs. Comprehensive course notes are provided. The various main PLC manufacturers are represented on the course - Allen Bradley, Siemens, Mitsubishi and Omron. Candidates gain experience of each of these types, and this generic knowledge prepares them to deal with any type of PLC in the future (providing that sufficient help or further training is provided).

### COURSE OBJECTIVES

On completion of the course, participants will be able to

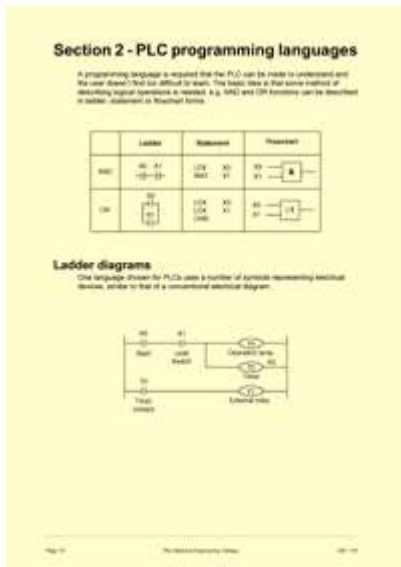
- understand the safety issues involved with PLCs and appreciate the need for safe working practices
- understand how PLCs are incorporated into modern industrial control systems, and the typical applications they are put to
- understand the logic functions performed by basic PLC instructions
- understand the methods of addressing inputs and outputs of PLCs
- understand the various methods of transmitting signals to and from PLCs
- identify the range of I/O modules available
- understand the use of battery back-up and ROM
- recognise ladder diagrams, statement lists and control system flowcharts
- use personal computers to interrogate PLCs
- monitor I/O lines to determine correct operation
- modify timers and counters
- safely use I/O forces as an aid to fault finding
- carry out fault finding on PLC-controlled systems
- back-up programs and restore them back to PLCs.

**Successful completion of the course leads to the award of the Technical Training Solutions Certificate of Competence 520: PLC Fault Finding.**

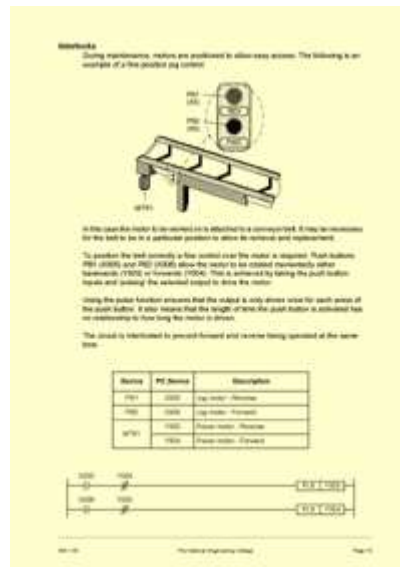
# What do candidates on the PLC training course actually do?

Candidates on the PLC Fault Finding course begin by learning about the programming languages used with PLCs and the typical applications they are put to. They then look at the various expansion modules, wiring and connections typically found. This is all done without getting involved in the internal PLC architecture, boolean logic principles or number system theories: We don't feel that these subjects are appropriate to candidates who are learning about maintenance of PLC systems.

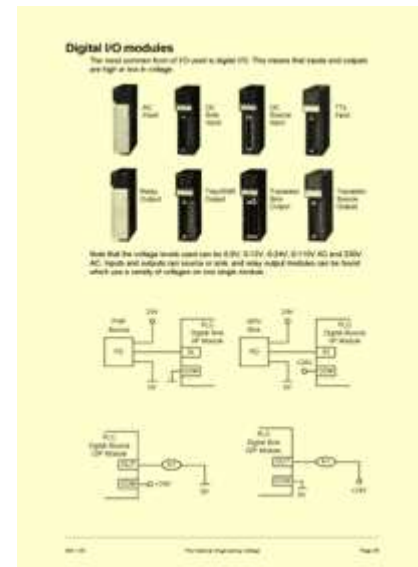
A few of the early pages from the course notes give an indication of this approach:



**Page 10 of the PLC training courses notes, describing the various languages used to communicate with PLCs**

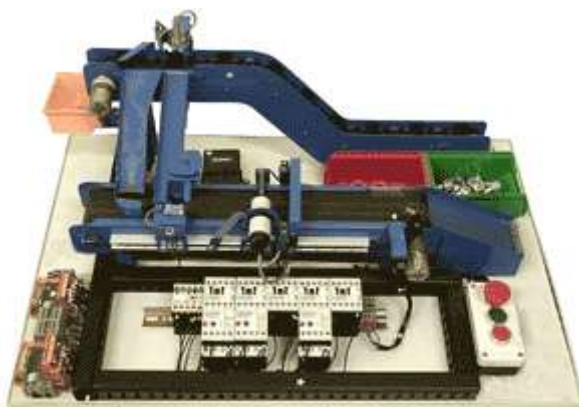


**Page 15 of the PLC training courses notes, one of the example applications explaining how PLCs are used in industrial control systems**

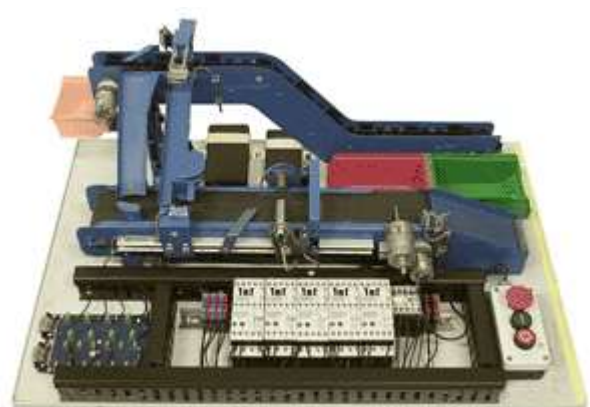


**Page 29 of the PLC training courses notes, providing examples of the input and output modules that industrial PLCs employ and how they would be connected**

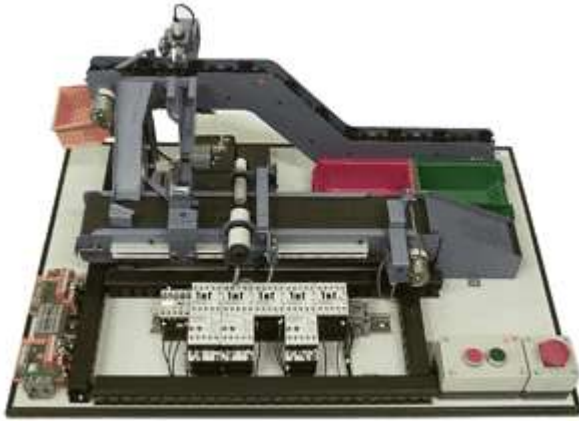
We then introduce our specially-designed industrial simulators which incorporate conveyors, motors, solenoids and industrial sensors to engage the candidates in the complex control issues dealt with by industrial PLCs:



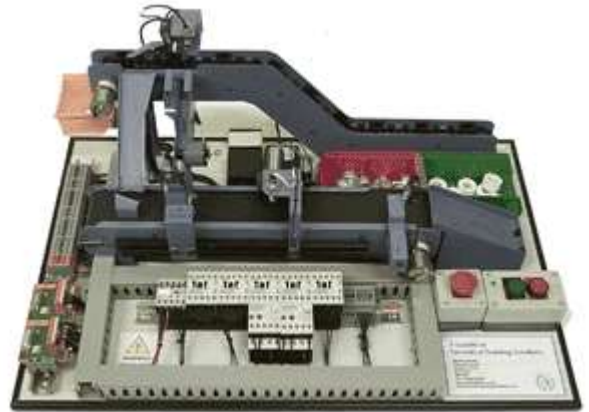
**One of the industrial simulators used on the PLC training courses, controlled by the Siemens S7 PLC**



**One of the industrial simulators used on the PLC training courses, controlled by the Mitsubishi FX0 PLC**



One of the industrial simulators used on the PLC training courses, controlled by the Omron Sysmac CP1E PLC

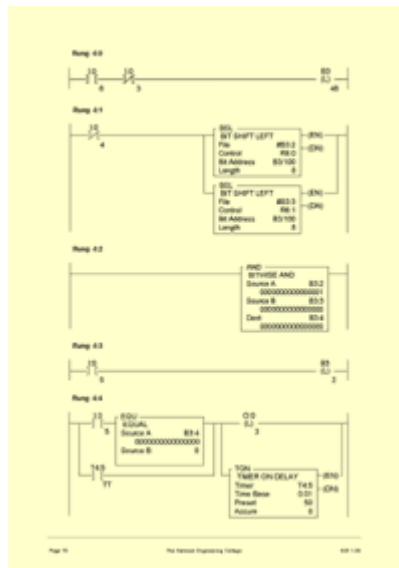


One of the industrial simulators used on the PLC training courses, controlled by the Allen Bradley SLC 500 PLC

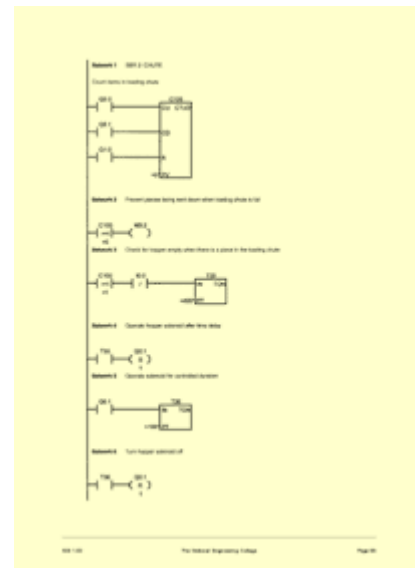
Candidates are then presented with a range of **pre-programmed** PLCs. These employ complex industrial-style programs. Examples of some of the programs are shown here, extracted from the plc course notes:



Page 60 of the PLC training courses notes, presenting the ready-written Mitsubishi PLC program



Page 70 of the PLC training courses notes, presenting the ready-written Allen Bradley PLC program



Page 83 of the PLC training courses notes, presenting the ready-written Siemens S7 PLC program

The PLCs used on the course are shown below:



**The Allen Bradley SLC500 PLC  
used on the PLC training courses**



**The Omron Sysmac CP1E PLC  
used on the PLC training courses**



**The Siemens S7 PLC  
used on the PLC training courses**



**The Mitsubishi FX0 PLC  
used on the PLC training courses**

Candidates then use PCs running real versions of each manufacturer's software to communicate with our PLCs.

We use a range of software:

- » Allen Bradley (Rockwell) RS-Logix
- » Mitsubishi FX-GP Win
- » Siemens Step 7
- » Omron CX1.

Candidates have to get familiar with at least three of these software packages during the course:



**The Mitsubishi FX-GP WIN PC-based software package used on the PLC training courses**



**The Omron CX1 PC-based software package used on the PLC training courses**



**The Allen Bradley RS Logix PC-based software package used on the PLC training courses**

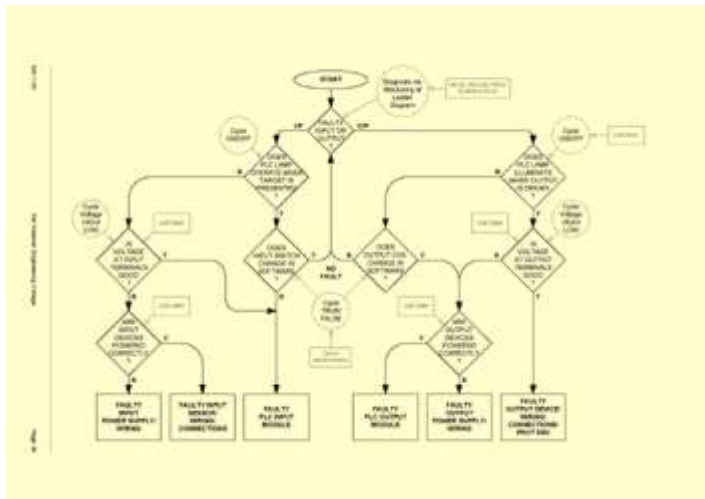


**The Siemens Step 7 PC-based software package used on the PLC training courses**

Some candidates and employers are interested in certain other PLC systems like the Siemens S5, The Mitsubishi Alpha or the Modicon TSX system and if required these can be integrated into the course.

Candidates can, of course, concentrate on using the PC software and handheld devices appropriate to them. We feel that experiencing various manufacturer's PLCs and software provides a much more holistic understanding of PLCs than a single-platform approach (using PLCs and software from only one manufacturer, for instance).

The course incorporates fault finding exercises, where we can simulate broken sensors, field wiring faults, power supply faults, PLC input module faults and PLC output module faults. Candidates are guided through a systematic method of fault finding on PLC-controlled systems, using our specially-designed fault finding flowchart:



**Page 39 of the PLC training courses notes, depicting the flowchart that we advocate for fault finding in PLC controlled systems**

Safety issues are, of course, paramount considerations, and the dangers of applying output forces, modifying the values of timers and counters, the dangers of electric shock whilst working 'live' and making measurements, as well as the physical dangers associated with unexpected movement of the controlled system are all covered on the course.

The clear distinction that this course is about fault finding and maintenance and not about programming also helps to make it clear to candidates that they should not be interfering with the program held inside the PLC - a major safety consideration in many industries.

Candidates who complete this course are in a good position to advance to the PLC programming course (if appropriate to them) or on to a more challenging manufacturer-specific course (if necessary).

**If you would like to see some of the equipment used on the PLC Fault Finding course for yourself, then please call us to arrange a visit to our offices in Kent. Alternatively, we can visit you anywhere in the British Isles.**

**CONTACT US**

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