Pearson BTEC Levels 4 Higher Nationals in Engineering (RQF)

Unit 15: Automation, Robotics and Programmable Logic Controllers (PLCs)

Unit Workbook 1

in a series of 4 for this unit

Learning Outcome 1

Design and Operational Characteristics of a PLC System

Contents

INTRODUCTION

Describe the design and operational characteristics of a PLC system

System operational characteristics:

Modular, unitary and rack mounted systems.

Characteristics, including speed, memory, scan time, voltage and current limits.

Input and output devices (digital, analogue).

Interface requirements.

Communication standards (RS-232, RS-422, RS-485, Ethernet).

Internal architecture.

Different types of programming languages (IEC 61131-3).

1.1 System Operational Characteristics

Unitary PLCs

This type of PLC exhibits all the features of a basic system within one compact unit. These may include …

- Power supply
- CPU (central processing unit)
- Outputs
- Inputs

Such compact unitary PLCs are commonly attached to the machine which they are intended to control.

ADVANTAGES

- Compactness
- A complete basic system
- Portability
- Cost effectiveness

DISADVANTAGES

- No scope for system expansion
- Failure often requires total replacement of the PLC
- Only basic functionality is available

Unitary PLCs are often used in applications such as;

- A small machine
- Overhead door control
- Car park access system
- Parts inspection system

Figure 1: *The unitary Micro820 PLC from Allen-Bradley*

Modular PLCs

This type of PLC exhibits more features than a basic system because modules may be slotted together. These modules may include …

- Power supply
- CPU (central processing unit)
- Outputs
- Inputs

Such modular PLCs are commonly expanded with modules to increase the number of inputs and/or outputs available.

ADVANTAGES

- Expansion
- Cost effective replacement of faulty modules

DISADVANTAGES

- More expensive than a typical unitary PLC

Modular PLCs are often used in applications where many inputs and outputs are required, such as process control in the manufacturing sector.

Figure 2: *Modular PLC units available from Siemens*

Rack-mounted PLCs

This type of PLC exhibits more features than both the unitary and modular types. They tend to be of a modular design, but these modules are usually supplied on cards which plug into slots on a rack, housed in a cabinet

ADVANTAGES

- Easy expansion
- Plentiful inputs and outputs
- Communication with other systems
- Direct replacement of faulty cards

DISADVANTAGES

- More expensive than a typical unitary or modular PLC
- Largest power consumption of the three types of PLC

Rack-mounted PLCs are often used in complex applications where many inputs and outputs are required, such as large process control systems in the manufacturing sector.

Figure 3: *Rack-mounted PLC system available from Unico*