Chapter 1

Chapter 1 Introduction to Programmable Controllers

Lesson 2

PRINCIPLES OF OPERATION

A programmable controller, as illustrated in Figure 1-5, consists of two basic sections:

1. The central processing unit
2. The input/output interface system

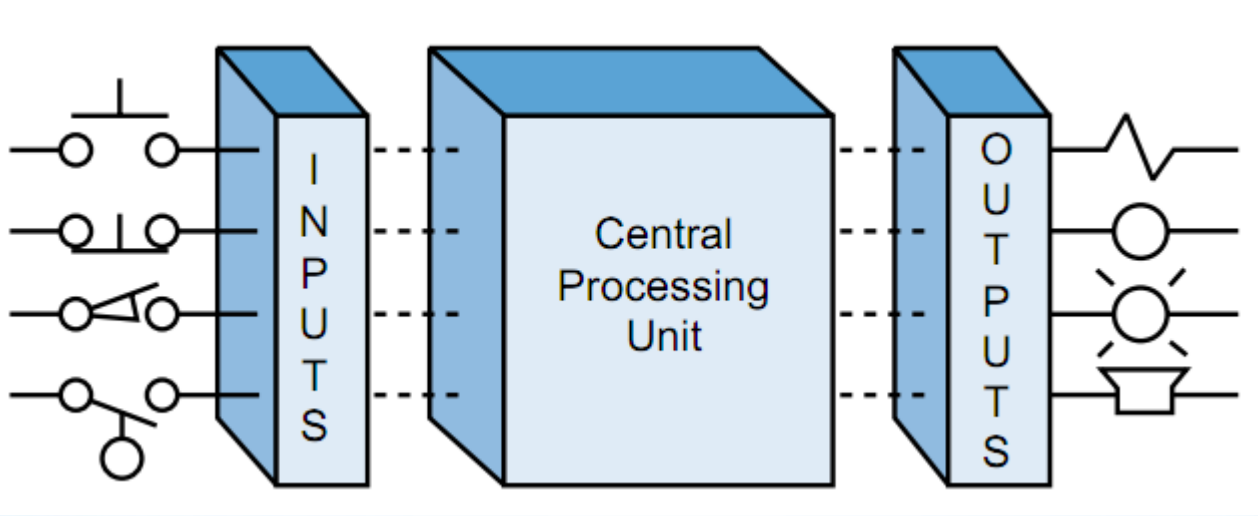


Figure Programmable controller block diagram

The central processing unit (CPU) governs all PLC activities.

The **Components** of CPU as shown in Figure:

1. The processor
2. The memory system
3. The system power supply

The **operation** of a programmable controller is relatively simple.

The input/output (I/O) system is physically connected to the field devices that are encountered in the machine or that are used in the control of a process.

These field devices may be discrete or analog input/output devices, such as *limit switches*, *pressure transducers*, *push buttons*, *motor starters*, *solenoids*, ….. Etcetera (etc).

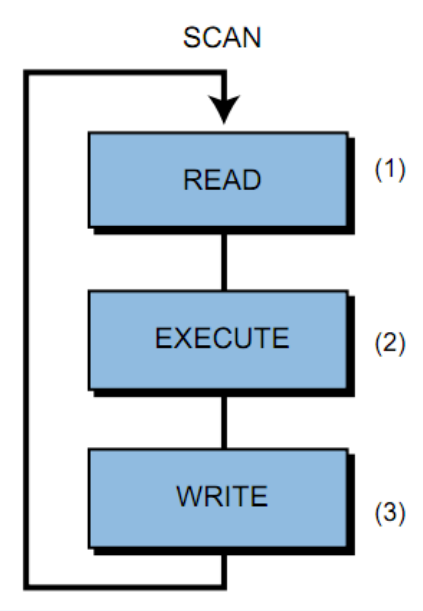
The I/O interfaces provide the connection between the CPU and the information providers (inputs) and controllable devices (outputs).

Scanning Operation or CPU operating cycle

During its operation, the CPU completes three processes:

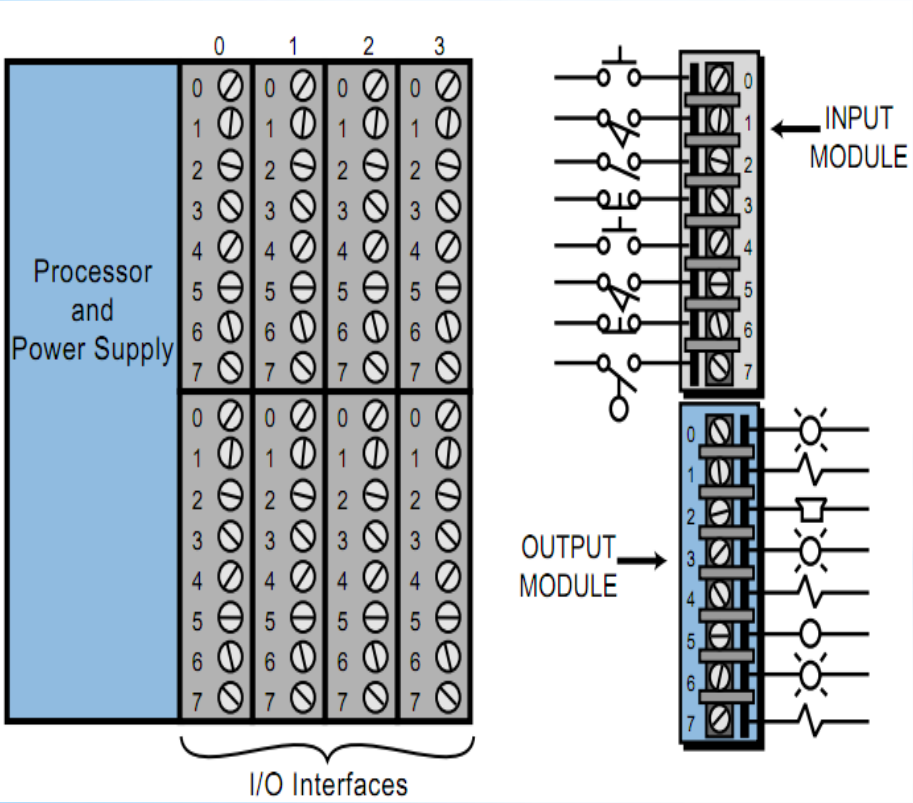
1. Reading or accepts, the input data from the field devices via the input interfaces
2. writes, or updates, the output devices via the output interfaces.

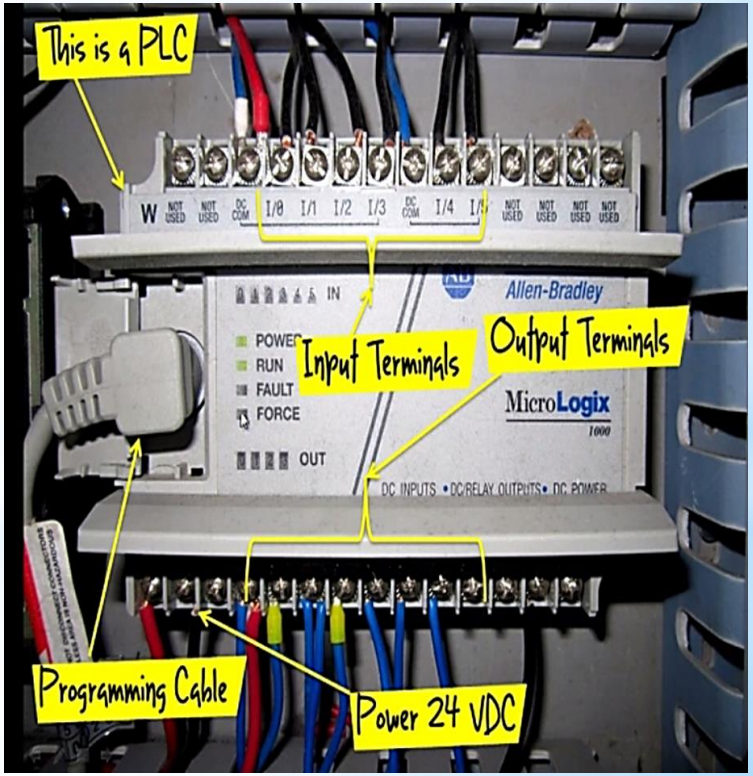
The process of sequentially reading the inputs, executing the program in memory and updating the outputs.



Input/output interface

The input/output system forms the interface by which field devices are connected to the controller (see Figure)





Benefits of Input/output interface

1. The interface is make sure the various signals received from or sent to external field devices.

2. Incoming signals from sensors (e.g., push buttons, limit switches, analog sensors, selector switches, and thumbwheel switches)

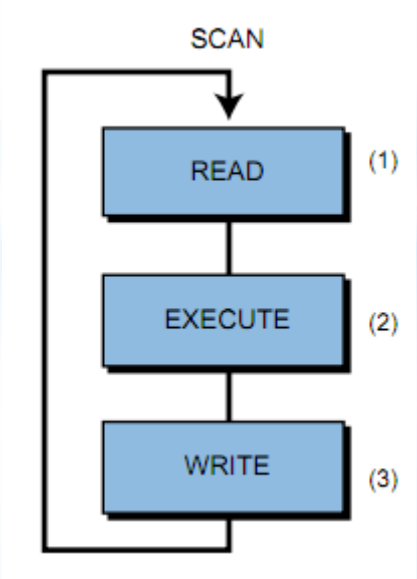
are wired to terminals on the input interfaces. Devices that will be controlled, like motor starters, solenoid valves, pilot lights, and position valves, are connected to
the terminals of the output interfaces.

The system power supply provides all the voltages required for the proper operation of the various central processing unit sections

The process of CPU for **PLC**

There are three process as list :

(1) It reads, or accepts, the input data from the field devices via the input interfaces.
(2) It executes, or performs, the control program stored in the memory system.
(3) It writes, or updates, the output devices via the output interfaces.



*How do I choose the right PLC?

In selecting a PLC, we need to consider the required input, output, and function of controller.

Types of controller : Rack , Mini, Micro, or software.

Need to consider the followings when choosing a controller;

-Num of logic input/output.

-Memory required, 1K or few bytes.

-Scan time, (price)

- software, Availabilityof programming.

-Comunications, serial or network.

PROCESS OF SELECTING A PLC

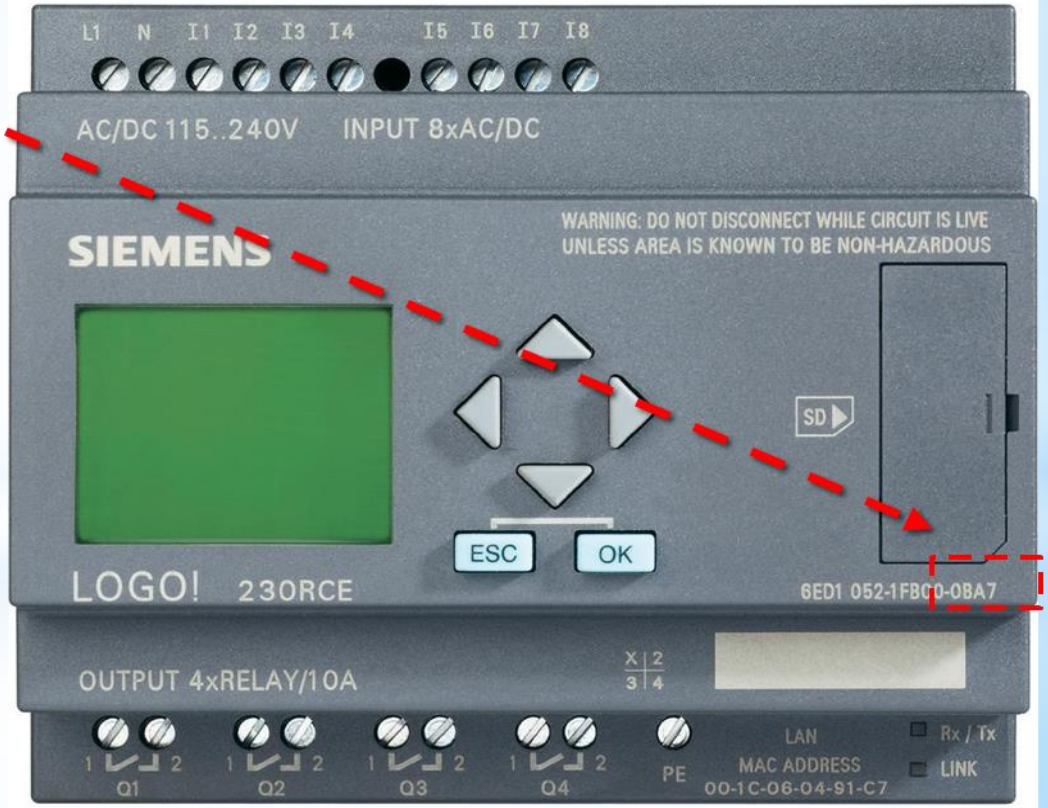
1. Understand the process to be controlled
   -num. of input/output
   -how the process is to be controlled?
   -special needs, such as distance between parts of the process.
2. If not already specified, a single vendor should be selected. Factors considered:-
   -manuals & documentation
   -training
   -the range of product available
   -shaping time for emergency replacement
3. Plan the ladder logic for the controls

4. Count the program instruction
5. Look for special program needs and check the PLC model
6. Estimate the cost for suitable hardware, programming software, cables, manuals, training , or ask a quote from vendor or etc.

In this course will considering LOGO's families

Siemens LOGO : Is the name of the family home to programmable controllers
There are many types of LOGO ! As shown list:

1. LOGO! 12/24 RC 0BA5
2. LOGO! 230 RC 0BA6
3. LOGO! 230 RCE 0BA7
4. LOGO! 12/24 RCE 0BA8



* PLC PRODUCT APPLICATION RANGES

*Figure 1-13 graphically illustrates programmable controller product ranges.

Market can be segmented into five groups:

1. micro PLCs
2. small PLCs
3. medium PLCs
4. large PLCs
5. very large PLCs

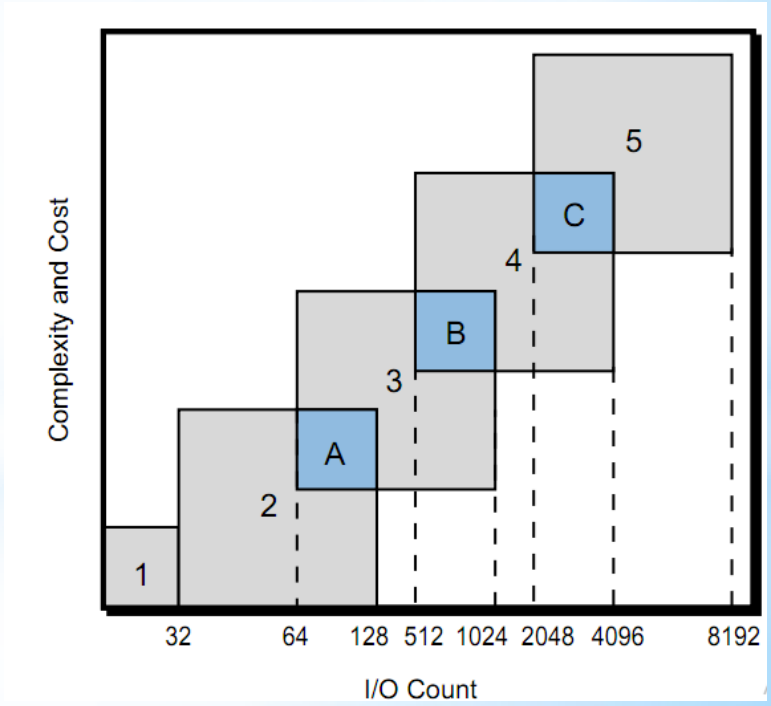


Figure. PLC product ranges