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BASIC STRUCTURE OF PLC

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Abstract:

This paper describes about the basic structure of PLC and gives the brief idea of plc components and their operations.In this project paper, ladder logic diagram of programming Logic Controller (PLC) is analyzed for input output module. As we know that in today's world automation is the future. So PLC helps in controlling and monitoring of different processes in industry. In this paper we will see the basic programming of PLC and its various components as well as their uses.

INTRODUCTION

PLC stands for (programmable logic control), they are used in the industries for the automation and various control process in the industries. PLC is a digital device. It uses a memory which can be program by an individual to store instructions and to use a particular function such as logical, arithmetical, timing, counting and sequence, operations to control equipment and process in the industries.

PLC is a cluster of solid state digital elements design to make analytical decisions and provide the operator desired outputs.

PLC is programmed interface between input sensors & output devices.

PLC TYPES

- Compact PLC – Inbuilt power supply, I/O modules, CPU, Communication Ports.
- Modular PLC – Chassis System, Separate power supply module, CPU module, I/O module
- Sidewise – Nano, micro, medium

PLC COMPONENTS

- Central Processing Unit
- Input Modules
- Output Modules
- Power Supply
- Bus System
- Rack(Rail)

CPU

CPU is the processing unit of the PLC. CPU module generally lives in the slot beside the power supply. These modules mainly consist of microprocessor, memory chip and other integrated circuits to control logic, monitoring and communications.

INPUT MODULE

These modules act as interface in between real-time status of sensors and the CPU. They are basically encoder to the CPU.

- Analog input module: Input to these modules is 4.0- 20 mA, 0-10 V.
- Digital input module: Input to these modules is 24.0 V DC, 115.0 V AC 230/223 V AC.

- Discrete input/ Digital Input – A discrete input, is an input that has two function ON or OFF that are attached to the PLC . In high condition it is referred to as logic 1 and in the low condition maybe referred to as logic 0.

OUTPUT MODULE

The output singleton act as bridge in between the output devices and processing unit.They are basically decoders.

- Analog output module: Output from these modules 4 – 20mA, 0-10V.
  Example: Control faucet, Speed trembling.
- Digital output module: Output from these modules is 24 V DC.
  Example: Solenoid faucet, alert light .

POWER SOURCE

The power source provides the required voltage level for electronic equipment the PLC from the line supply to the PLC.

BUS SYSTEM

It is track for the carrying of the signal between power source equipment and processing unit. The bus embrace of a variety single line i.e. cables or tracks.

VARIOUS COMPONENTS USED IN OUR PROJECT

- SMPS
- MCB
- Nexgenie PLC 1000
- Push button
- Toggle switch
- Limit switch
- Proximity sensor
- Foot switch
- PT100
- Thermocouple
- Led lamps

These components are connected with the PLC through various input   channel. These switches which are in our project are either discrete or analogue in nature. The switches carry the input signal from the user which is interpreting by the PLC program. We use ladder programming for the PLC. An example of ladder programming with all the component mention above is given below.

LADDER DIAGRAM OF VARIOUS INPUT-
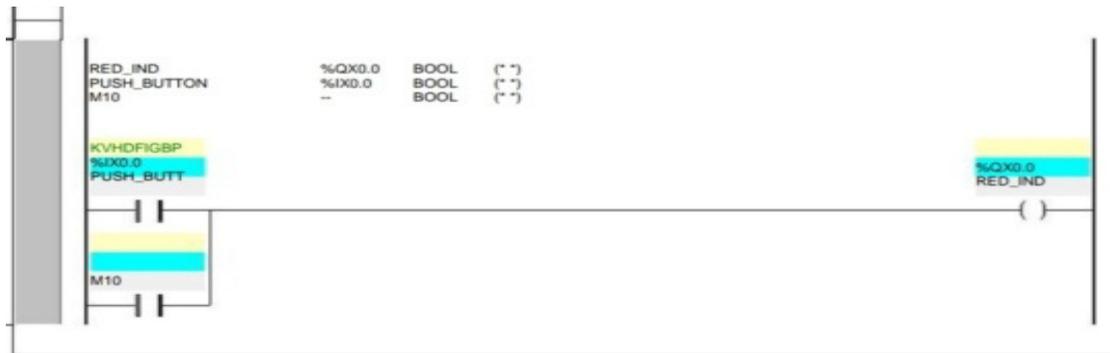
CODESYS

CODESYS stands for controller development system.It was founded in 1994 by a company situated in germany named smart software solution . The products of CoDeSys are CoDeSys Engineering, Motion +CNC and safety. CoDeSys is used in virtually all sectors of the automation Industries. CoDeSys is the name of the whole software family of IEC 61131-3 programming tools

It has an integrated visualization system which are very unique and convenient. International industrial standard are used for designing of software .By using the software it is made possible to draw a visual graph of the controller information and approach performance easily . There is no requirement of any other tools for this software. All the required information is there in the manual which comes along with the software and it has integrated visual program.

APPLICATION IN ENGINEERING

Codesys has all five programming language named as-

IL(instruction list)- it is an assembler.

ST(structured text)-C and pascal are used for designing the algorithm.

LD(ladder diagram)-relay and contactor are virtually connected using ladder logic.

FBD(function block diagram)-we can quickly program in Boolean and analogue statement respectively.

SFC(sequence function chart)-it's helpful in programming sequential process and flow.

ADVANTAGES OF CoDeSys

The main advantages of Codesys programming environment are as follows:

- It is quick and convenient object-oriented programming (OOP) as well as classical PLC programming.

- It has flexible visualization of a graphic user interface (GUI).

- It has simple configuration of communication interfaces

- It can combine a number of editors and program extensions in one integrated development system.

PROGRAMMING

We have done the programming in CoDeSys version 2.3. The program includes normally opened contacts & normally closed contacts and their respective outputs.

- When push button (X0) is pressed, Lamp 1 (Y0) is lit. If push button (X0) is released, Lamp 1 (Y0) remains lit.
- When toggle switch (X1) is toggled, Lamp 2 (Y1) is lit. If toggle switch (X1) is released, Lamp 2 (Y1) turns off.
- When foot switch (X2) is pressed, Lamp 3 (Y2) is lit. If foot switch is released, Lamp 3 (Y2) turns off.
- When limit switch is pressed, Lamp 4 (Y3) is lit. If limit switch is released, Lamp 4(Y3) turns off.
- When the proximity sensor detects the metallic object, Lamp 5(Y4) is lit. If proximity sensor doesn't detect the metallic object, lamp 5(Y4) turns off.
- When selector switch is turned right, Lamp 6 (Y5) is lit. If selector switch is turned left, Lamp 6 (Y5) turns off.

CONCLUSION

The above prose has gone through almost all the fundamental details plc. The plc is used in the controlling the large industry manufacturing as well as the assembly process. We have drawn the following conclusion from the project paper:-

- Automation helps in the production boom by reducing the machine failure .
- Due to automation the no. Of error decrease .
- The load parameter can be check by any unskilled man on the HMI screen.

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