

Web-based Application Development for Controlling and Monitoring PLC-based system over Intranet

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Abstract - In general, monitoring and controlling is an essential process to observe and improve the reliability and performance of a system. Programmable logic controllers (PLC) are an essential part of the system. But to control this PLC development of PC software in visual studio C# language communicated to PLC through Serial Modbus RTU to PLC controllers. Data can be exchanged from PLC to PC and the same application data can be dumped to My SQL server. For remotely monitoring this PC-based application from other locations but connected with intranet over the same network. Which can monitor all running status of the PLC system. Also, BLDC motor controlling and speed variation using the PLC application will be completed in this section. Also, vary the BLDC motor RPM with Software application through PLC analog output, and measure the accuracy of actual RPM coming PLC operation with Tachometer.

Key Words: PLC, VB, C#, Modbus RTU, Communication, PC- PLC,

1. INTRODUCTION

A programmable logic controller (PLC) is widely used in the modern industry field since it has the characteristics of high reliability and stabilization. It is easy to program and convenient for maintenance. PLC is used for process control, data acquisition, and status obtaining. For supervising control systems in real-time, the host computer is usually used for data analyses, computing, information storage, state displaying, and printing in the network. There are several modes of communication between PLC and computer such as serial communication, Controller Link protocol, Ethernet, Serial Communication, and RS485 Communication, so we can monitor and control PLC by Online program. If configuration software such as SCADA, Rockwell Software, Wonderware, Citect, GE/Fanuc, Siemens, National Instruments, or Indusoft, is used for supervision, and special interface modules or DDE Servers are used with PLC communicating with PLC, but it will be very costly. So it is a good solution for communication directly between computer PC-based software and PLC.

The Windows-based software application design can be achieved with Windows C# language. But the process of development is very difficult and complicated. Visual C# is a powerful tool for the development of macro or complicated systems. In this paper, the method of programming with VB C# for communication between PC and PLC is introduced by

using Delta PLC with Serial Modbus RTU communication. And Same VB PC-based application can monitor over the intranet from anywhere within the same network.

The BLDC motor RPM can be changed through the windows-based application.

2. PROBLEM STATEMENT

“PLC is mostly used in Industrial Automation due reliability and scan time, speed. But operating from PC applications like SCADA is very costly also using HMI is only operator oriented. So, to overcome this issue PC windows-based software implementation is very important which can easily communicate with PLC, and data can be exchanged and monitored by PC application.”

3. OBJECTIVES

- To Access the running system using PC based application, This PC-based application can control and monitor the complete system and is easy for troubleshooting or Maintenance.
- Reduced System Breakdown Time Production traceability and Machine running Status.
- Eliminate the cost of HMI which is a fixed type and only System operators can monitor it.
- Data Monitoring and controlling through also data logging, Historian.
- Change BLDC motor Speed from PC-based software and measure accuracy with tachometer.

4. PROPOSED METHODOLOGY

In this System, we are going to Provide PLC system monitoring and controlling using PC-based Software applications connected via Modbus RTU communication protocol.

This PC-based server software also can be monitored through client-side software which can monitor the defined system anywhere in the connected plant network over an intranet. And monitor server-side applications. Also, PLC based system will get monitored. PLC system is having Particular applications like BLDC motor operation in Auto and Manual mode and also controlling its RPM through PC-based software application. Running BLDC motor RPM can be measured with a Tacho meter.

5. IMPLEMENTATION SETUP

5.1 Components required

1. PLC Delta Make:12SA2, Analog Module: 06XA
2. BLDC Motor 0.41N, 130W, 24VDC, 7.1A, 3000RPM
3. BLDC Motor Drive
4. RELAY 24VDC 3 Nos
5. SMPS 24VDC
6. BUZZER 24 VDC
7. Desktop PC OR Laptop for Windows application
8. Ethernet Cable
9. PLC TO PC RS232 Communication Cable
10. RS 485 to USB converter for PLC program

5.2 Block Diagram

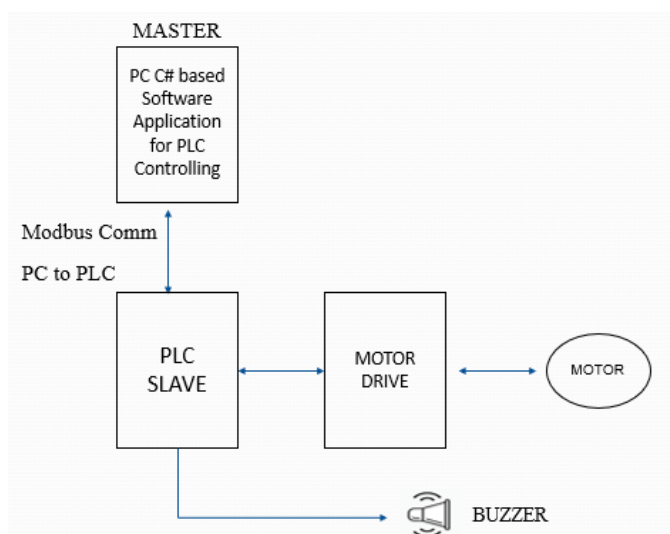


Fig 5.2.1 Block Diagram

5.3 Architecture

As the system is mainly based on PLC, Delta PLC is used with an analog output model for controlling BLDC motor speed through Analog output 0 to 3VDC. PLC is connected to the drive of the BLDC motor. And PC or Laptop through the serial port of the PC. Fig 5.3.1 shows the Architecture of the system. COM port no. 1 is assigned for Modbus RTU communication between PC and PLC. PLC Digital Output can be used for controlling BLDC motor driver for controlling enable and direction command. PLC also has an output for ON Buzzer. PLC is working as Slave and PC software is working as Master. PLC programming is done with the RS485 COM2. For PLC programming RS 485 to USB converter is required PLC is controlling and communicating with PC windows-based software which is written in Visual Studio C# language. A graphical Screen is also designed for operational activities.

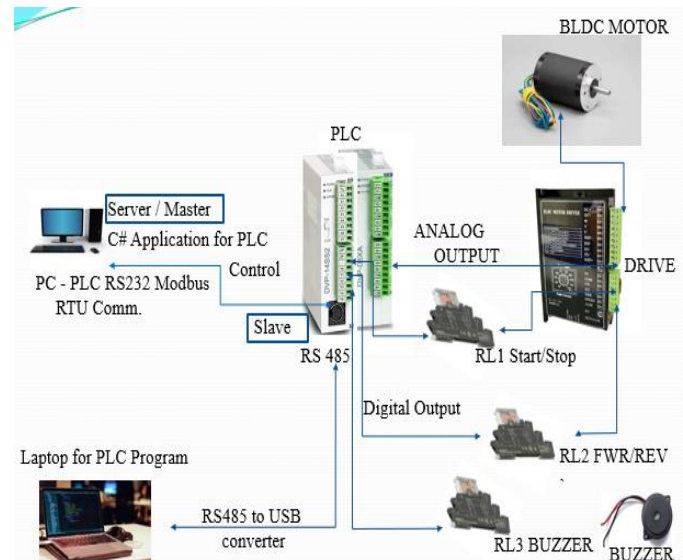


Fig 5.3.1 Architecture

6. WORKING SETUP

The below image Fig.6.1 represents the physical model of our system. PLC Communicating with PC Windows-based software on Modbus RTU communication.

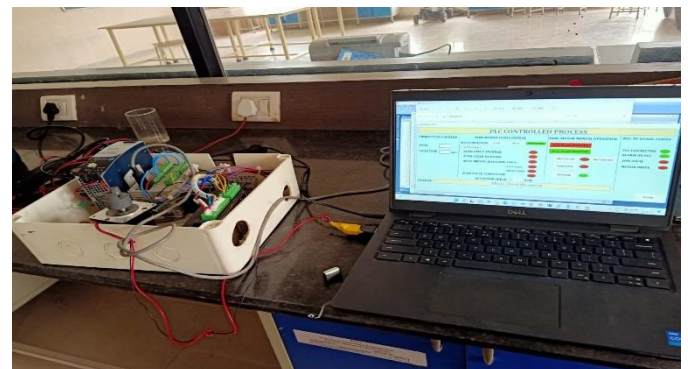


Fig 6.1.1 Image for Project Working Setup

The laptop is used instead of an industrial PC for a software application. PLC programming logic is written in Ladder logic language. Motor RPM can be varied through software applications with motor start-stop command operations.

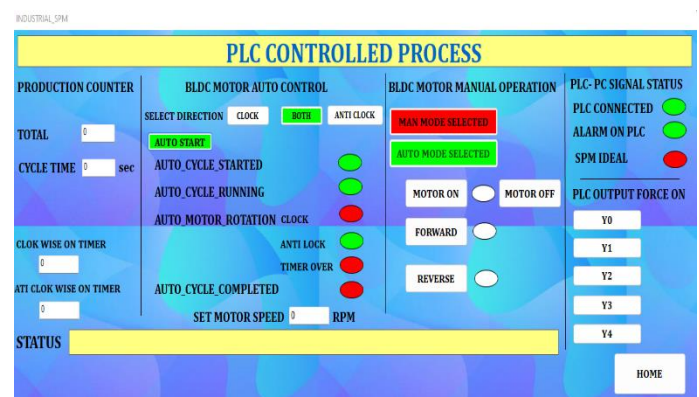


Fig 6.1.2 Image for windows-based Software application

6.2 Flow Chart for PLC Operation System

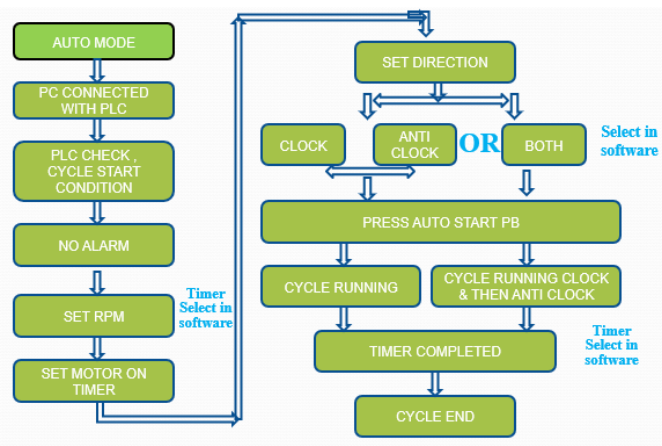


Fig 6.2.1 Flow Chart

7. APPLICATIONS

- Low-cost solution for industrial automation
- Industrial Application for accessing PLC data
- Automobile sector for receiving data from the local host server and sending to PLC
- All types of industries need this type of application in a different way like
The food industry, Aerospace, Transport, IIOT, Agriculture, Pharmaceutical, Automobile, and Health care industries.
- Production status logging
- Improve reliability, Productivity, and Safety
- Machine condition status send to server for interruption of production.
- Display Production counter shift wise.
- Maintenance breakdown reduction
- Breakdown analysis with a log while checking the root cause of the problem

8. FUTURE SCOPE

Using our model of industrial Automation System, various appliances can be controlled and, in the Process, industries will be used very extensively. Food processing plant, Process line automation, is having very much future for this application. Having cost-effective, low cost, and less hardware application for industrial use.

9. CONCLUSIONS

With rapid progress in technology, these systems have the potential to reduce human effort to an extent. It also helps in operating & securing the PLC-based system to directly communicate with the Server easily. The Windows PC-based software is developed for Controlling the PLC system. PLC is communicating with PC with the help of Modbus RTU master-slave communication. The PC software application will Fetch Real-time data is from PLC. Operating and controlling the same data as per the algorithm. also, PLC can vary BLDC motor speed as required with an analog signal. This type of application will work very wildly in industrial applications.

PLC status and data can be monitored and stored on the server for feature use in industries.

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