

Scada Power Distribution Monitoring System using PLC

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Abstract: - The system is based on PLC and configuration software, and the SCADA power distribution monitoring system is designed. The system uses PLC to collect various intelligent instruments on site and electrical parameters of devices. They will be uploaded to the monitoring system by the switch through the SCADA. Now a day only industries are use the PLC and SCADA system so we are trying to show here commercial buildings can also use this system and save power and get facilities using this system. In this project we are trying to make one simple model which helps the user to at a very ease. For all we are attempting to make the power management model for the almost comfort and maximum facilities to the user.

Keywords: - Scada, PLC, Rs-232, Smps, PC, Relay.

I. INTRODUCTION

SCADA provides several unique features that make it a particularly good choice for many control problems. The features are as follows:

- The computer control primary equipment's, record and store a very large amount of data from process.
- The operator can incorporate real data simulations into the system.
- The operator is assist by computer that recommends actions to keep the system safety.
- Many types of data can be collected from the RTUs (Remote Terminal Unit), this creates online the image of the system.

Supervisory Control and Data Acquisition (SCADA)[1] systems have been widely used in industry applications. Due to their application specific nature, most SCADA systems are heavily tailored to their specific applications. For example, a remote terminal unit (RTU)[2] that monitors and controls a production well in an oilfield is only connected with a few sensors at the well it resides. The RTU usually collects sensor data at pre-defined intervals, and only sends data back when being polled by a central data server[3]. A user can only access the data in one of the two ways: directly connecting to the RTU in the field or reading from the data server in the control room. A major

drawback of typical SCADA systems is their inflexible, static, and often centralized architecture, which largely limits their interoperability with other systems. For example, in a SCADA system developed for oil and gas fields, the RTUs are usually places at production wells and injection wells. However, there are many other places, such as pipeline, tanks, etc., that have valuable data but are too expensive (e.g., cable requirement) to deploy more RTUs. In such cases, sensor networks are a perfect solution to extend the sensing capability of the SCADA system. However, it is difficult to integrate sensor networks with current SCADA systems due to their limited interoperability. We identify that enabling such interoperability is an important task for future SCADA systems.

A. Research Issues

This section identifies major research issues to enable interoperability and extensibility of future SCADA systems. We roughly classify them in three categories:

- Flexible communication architecture,
- Open and interoperable protocols, and
- Smart remote terminal units.

1) Flexible Communication Architecture[4]:

Current SCADA systems are essentially a centralized communication system, where the data server polls each remote terminal unit (RTU) to collect data. There is no data sharing and forwarding between different RTUs. Usually these RTUs only communicate with the data server. This communication architecture is not flexible to interact with other systems, such as the embedded sensor networks and mobile users in the field. Designing flexible communication architecture is one of the key factors to enable interoperability and extensibility.

2) Open and Interoperable Protocols:

We suggest that SCADA systems should adopt the use of Internet technologies for networking, rather than proprietary or link-level approaches. Collect and manipulate different types of sensor data. It also includes how to discover and configure sensors. An open protocol should be extensible to support various types of sensors. These protocols

should also address what types of data should be transmitted and to whom. For example, raw data are only sent to data server for archival. Status summaries will be sent to managers and engineers, while emergency safety alarms should be broadcast to all field operators.

3) Smart Remote Terminal Units:

Remote terminal units play an important role in the new communication architecture we described above. They serve as bridge points to sensor networks as well as access points to mobile users in the field [5]. They respond to users queries and collect data from specific sensors. These RTUs should be smart enough to perform preliminary data processing. The first reason is to validate the data collected from different sensors. Sensors can give false values due to various reasons. It is important to validate them before use them to make important decisions. For example, in oilfield monitoring, a false sensor reading may result in a mistaken decision to shut in a well and lose production. The RTU is in a good position to validate sensor readings by cross checking from adjacent sensors.

B. Potential Benefits Of Scada

The benefits one can expect from adopting a SCADA system for the control of experimental physics facilities can be summarized as follows:

- A rich functionality and extensive development facilities. The amount of effort invested in SCADA product amounts to 50 to 100 p-years!
- The amount of specific development that needs to be performed by the end-user is limited, especially with suitable engineering.
- Reliability and robustness. These systems are used for mission critical industrial processes where reliability and performance are paramount. In addition, specific development is performed within a well-established framework that enhances reliability and robustness.
- Technical support and maintenance by the vendor.

C. SCADA Security

The majority of SCADA systems have useful lifetimes ranging from 15 to 30 years. In most instances the underlying protocols were designed without modern security requirements in mind. The rapid advance of technology and the changing business environment is driving change in SCADA network architecture, introducing new vulnerabilities to legacy systems [6][7].

The current push towards greater efficiency, consolidated production platforms and larger companies with smaller staffing levels is leading to changes in SCADA systems which are raising many questions about security.

In summary, these involve:

- An increasing reliance on public telecommunications networks to link previously separate SCADA systems.
- Increasing use of published open standards and protocols, in particular Internet technologies.
- The interconnection of SCADA systems to other business networks to enhance the amount, detail and timeliness of information available to management.

II. OUR WORK

Using powerful technologies, based on experience of qualified personal, SCADA (Supervisory Control and Data Acquisition) applications are created as a main tool for performing management, required by technical reengineering of an industrial company. In modern manufacturing and industrial processes, mining industries, public and private utilities, leisure and security industries, control systems are often needed to connect equipment and systems separated by large distances. These systems are used to send commands, programs and receive monitoring information from these remote locations [8]. SCADA refers to the combination of control systems and data acquisition. In the early days of data acquisition, relay logic was used to control production and plant systems. With the advent of the CPU (Central Process Unit) and other intelligent electronic devices, manufacturers incorporated digital electronics into relay logic equipment. The PLC (Programmable Logic Controller) is still one of the most widely used control systems in industry.

III. BLOCK DIAGRAM AND DESCRIPTION

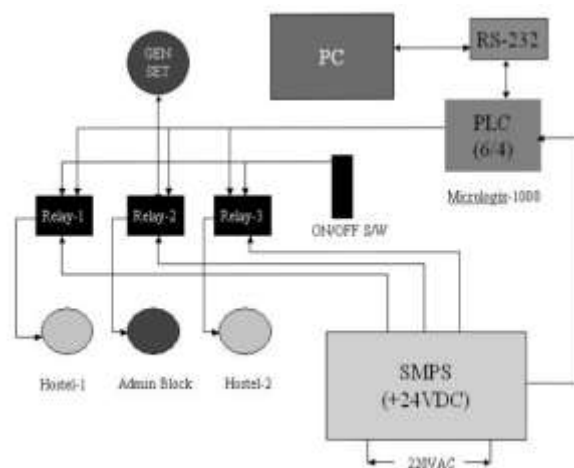
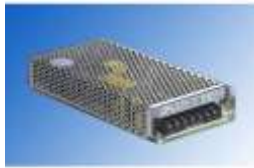


Fig.1 Block Diagram of the SCADA and PLC Based Control System.

MAIN COMPONENTS OF PROJECT ARE AS FOLLOW:

1. SMPS (+24 VDC)
2. RELAYS (24 VDC, 50/60Hz)
3. Serial Interface (RS-232)
4. PLC (6/4)
5. COMPUTER

A. Switch Mode Power Supply (Smpps)



The picture of SMPS used is shown and their features are as follows:

- High efficiency, high reliability,
- AC input range selected by switch
- 100% full load burn-in test.

Protections: Short circuit/ Over load/ Over voltage
Fixed switching frequency At 25 KHz.

Dimensions: 199*110*50mm

L*W*H

1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.
2. Ripple & noise are measured at 20MHz of bandwidth by using a 12"twisted pair-wire terminated with a 0.1 μ & 47 μ parallel capacitor.
3. Each output can within current range. But total output power can't exceed rated load [9].
4. The power supply is considered a component which will be installed into final equipment. The final equipment must be re-confirmed that it still meets EMC directives.

B. Power Relays

The coil of a relay passes a relatively large current, typically 7a for a 24V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

C. Serial Interface (Rs232)

1. RS232 Serial Cable Layout

Almost nothing in computer interfacing is more confusing than selecting the right RS232 serial cable [10]. These pages are intended to provide information about the most common serial RS232 cables in normal computer use, or in more common language "How do I connect devices and computers using RS232".

2. Rs232 Serial Connector Pin Assignment.

The RS232 connector was originally developed to use 25 pins. In this DB25 connector pin out provisions were made for a secondary serial RS232 communication channel.

In practice, only one serial communication channel with accompanying handshaking is present. Only very few computers have been manufactured where both serial RS232 channels are implemented.

Examples of this are the Sun Spare Station 10 and 20 models and the Dec Alpha Multia. Also on a number of Telebit modem models the secondary channel is present. It can be used to query the modem status while the modem is on-line and busy communicating. On personal computers, the smaller DB9 version is more commonly used today. The diagrams show the signals common to both connector types in black. The defined pins only present on the larger connector are shown in red. Note, that the protective ground is assigned to a pin at the large connector where the connector outside is used for that purpose with the DB9 connector version.

The pin out is also shown for the DEC modified modular jack. This type of connector has been used on systems built by Digital Equipment Corporation; in the early days one of the leaders in the mainframe world. Although this serial interface is differential (the receive and transmit have their own floating ground level which is not the case with regular RS232) it is possible to connect RS232 compatible devices with this interface because the voltage levels of the bit streams are in the same range

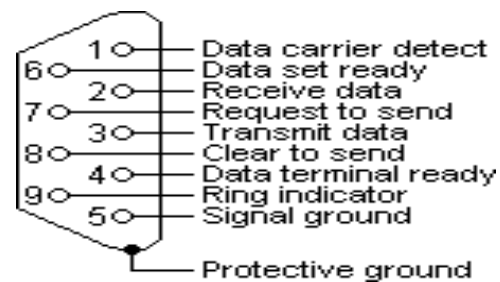


Figure 2 Serial Connector Pin Assignments.

D. Micrologix 1000 Programmable Controllers

The MicroLogix 1000 Programmable Controllers are designed to electronically control your application. The controllers are available in either 16 I/O points (10 inputs and 6 outputs) or 32 I/O points (20 inputs and 12 outputs) in 5 electrical configurations. The I/O options and electrical configurations make them ideal for almost any application.

Applications

- Water/Co2 Injection Well Scada Monitoring System.
- Pump jack/Screw pump Scada & Telemetry.
- Water Disposal High Tank Level Shutdown System
- Variable Frequency Drive (Vfd) Scada Communication
- Sewage Treatment Plant Inflow Telemetry.
- Municipal Water System - Tail End Data Extension & Wide Area Scada.
- Remote Valve Control
- Cellular Telemetry
- Water Reservoir Pump Control

IV. CONCLUSION

The trend in automated power systems is to use SCADA systems based on PLCs, advanced communication systems, and PC-based software. This project presents the basic knowledge needed to choose technology, design a system, and select a SCADA system. For power control SCADAs mostly used as designing, integrating, installing, and maintaining automated power systems as follows:

- Control system architecture, design, and specification generation.
- CAD-based layout and design of control enclosures and RTUs.
- Fabrication of control panels in a UL-certified shops.
- SCADA software programming from leading vendors like ROCKWELL.
- Integration of industrially-hardened PLC-based control systems.
- Field start-up, calibration, and training services.
- Support and maintenance services for existing systems.

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