MONITORING AND CONTROL REAL TIME ELECTRICAL PARAMETERS OF LONGER DISTANCE POWERED DEVICES ON RS485 BASED SCADA SYSTEM

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Abstract- This project aims at building an efficient and automatic power survey system, which is capable of monitoring and control the electrical parameters of high voltage devices, which are present in real time industrial environment. The system makes use of RS485 based communication which is suitable of transferring data over longer distances. The purpose of this project is to acquire the remote real time electrical parameters like voltage, current and frequency also temperature and send these real time values over PC using RS485 cable. The data is sense using various electrical sense and process by Microcontroller. The processed data is downloaded and display on to the computer for further processing. This project makes use of an onboard computer which is commonly termed as microcontroller. This onboard computer can efficiently communicate with the different sensors being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions.

Keywords- RS485, SCADA, PIC16F73, LM35.

I. INTRODUCTION

This project aims at building an efficient and automatic power survey system, which is capable of monitoring and control the electrical parameters of high voltage devices, which are present in real time industrial environment. The system makes use of RS485 based communication which is suitable of transferring data over longer distances.

The RS-485 is the recommend standard by the Electronic Industries Association (EIA) that specifies the electrical characteristics of generators and receivers that may be employed for the interchange of binary signals in multipoint interconnection of digital equipments.

When implemented within the guidelines, multiple generators and receivers may be attached to a common interconnecting cable. An interchange system includes one or more generators connected by a balanced interconnecting cable to one or more receivers and terminating resistors.

This project consists of Microcontroller based motherboards one dedicated with the sensors and the other at the PC end. This PC (terminal) unit is provided for the user interface to view the parameter levels. The data is transmitted from controller via Rs-485 cables to the PC (terminal software. The PC receives the data from the microcontroller and takes the responsibility to display the data onto the screen. Monitoring and control real time electrical parameters of longer distance powered devices on RS485 based SCADA system

The motherboard at the other end is provided with few sensors such as voltage sensor, current sensor and frequency sensor. These sensors monitor the load conditions of the device to which it connected and provides the same to the controller. The sensors, which we are employing, are meant to monitor very high voltage devices that we come across in industrial environment. There is a requirement for very sensitive interfacing between the sensors, controller and the high voltage devices. These interfacing protect the controller from damage. We also make use of the ADC module which available internally in a microcontroller to read the input from these sensors.

II. PLATFORM

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

The project “RS485 based SCADA system for longer distance powered devices” using PIC16F73 Microcontroller is an exclusive project that can control and monitor the devices according to the instructions given by the above said microcontroller. The project is SCADA based and embedded system.
III. BLOCK DIAGRAM

The circuit diagram is shown in above fig. The four sensors i.e. voltage, current, frequency and temperature sensors sense the parameters and send it to the microcontroller’s ADC channels to convert it into digital form. The data from the sensors are transmitted on pc via rs485 transreciever system. If the value of any parameter changes then the pc shows the changed value within 50msec. When the any parameter increased than set value microcontroller reads it and send command to relay to cut the supply of the equipment.

IV. CIRCUIT DIAGRAM

Industrial and instrumentation applications (I&I) require transmission of data between multiple systems often over very long distances. The RS-485 bus standard is one of the most widely used physical layer bus designs in I&I applications. The key features of RS-485 that make it ideal for use in I&I communications applications are

a. Long distance links—up to 4000 feet.
b. Bidirectional communications possible over a single pair of twisted cables.
c. Differential transmission increases noise immunity and decreases noise emissions.
d. Multiple drivers and receivers can be connected on the same bus.
e. Wide common-mode range allows for differences in ground potential between the driver and receiver.

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RS485 Specifications:

- Standard: EIA RS485
- Physical media: Twisted pair
- Network topology: Point-to-point, Multi-dropped, Multi-point
- Maximum devices: 32 - 256 devices
- Maximum distance: 1200 meters (4000 feet)
- Mode of operation: Differential signaling
- Maximum baud rate: 100 kbit/s - 10 Mbit/s
- Voltage levels: -7 V to +12 V
- Mark (1): Positive Voltages (B-A > +200 mV)
- Space (0): Negative voltages
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VII. LM35

CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC’s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

RESULT

The project “Monitoring and control real time electrical parameters of longer distance powered devices on RS485 based SCADA system” was designed an efficient and automatic power survey system which is capable of monitoring and controlling the electrical parameters i.e. voltage, current and frequency of high voltage devices, which are present in real time industrial environment. The system makes use of RS485 based communication which is suitable of transferring data over longer distances.

FUTURE SCOPE

Our project “Monitoring and control real time electrical parameters of longer distance powered devices on RS485 based SCADA system” is mainly intended to design a SCADA system using RS485 for devices which are at longer distance. The system has a temperature, current, voltage sensors and the LCD which is used to display the status on it.

This project consists of two Microcontroller based motherboards one dedicated with the sensors and the other at the display end. This display unit is provided for the user interface to view the parameter levels.
Both the controllers are connected using Rs-485 cables for transmitting the data from one to other. Monitoring and control real time electrical parameters of longer distance powered devices on RS485 based SCADA system. The motherboard at the other end is provided with few sensors such as voltage sensor, current sensor and frequency sensor. These sensors monitor the load conditions of the device to which it connected and provides the same to the controller. The sensors, which we are employing, are meant to monitor very high voltage devices that we come across in industrial environment. There is a requirement for very sensitive interfacing between the sensors, controller and the high voltage devices. These interfacings protect the controller from damage. We also make use of the ADC module which available internally in a microcontroller to read the input from these sensors. In future we can use this project in several applications by adding additional components to this project.

This project can be extended using GSM technology, which helps in sending the alerting SMS messages and also monitored parameters data to the user.

This project can be extended by using GPRS technology, which helps in sending the monitored and controlled data to any place in the world. The temperature controlling systems like coolant can also use in places where temperature level should be maintained.

By connecting wireless camera in industries, factories etc. we can see the entire equipments from our personal computer only by using GPRS and GPS technology. The monitoring and controlling of the devices can be done from the personal computer and we can use to handle so many situations.

REFERENCE


