GSM Based Tower Shelter Fault Monitoring System

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Abstract: **This project aim to develop low cost solution for monitoring health condition of remotely located of tower shelter using GSM technology to present premature failure of telecommunication system and improving reliability of services to the customers. An Embedded based hardware design is developed to acquire data from electrical sensing system. It consists of a sensing system, signal conditioning electronic circuits, advanced embedded hardware for middle level computing, a powerful computer network for further transmission of data to various places. A powerful GSM networking is designed to send data from a network to other network for proper corrective action at the earliest. Any change in parameters of transmission is sensed to protect the entire transmission and distribution. The performance of prototype model developed is tested at laboratory for monitoring various parameters like BTS over load, voltage fluctuations, over temperature, oil quality and level etc.**

Keywords: Global System For Mobile Communication (GSM), Special Protection System (SPS), Embedded Systems Base transceiver station (BTS) power management unit (PMU)

I. INTRODUCTION

In today's world mobile or cell phone plays very important role in communication. In mobile communication, for transmission and reception of signals there is a transceiver station known as cell site. Cell phone towers or mobile towers are installed to increase the network coverage of the GSM mobile network provider. Height of this tower varies from 50 feet to 200 feet. At the base of these cell phone towers there is a processing unit or electronic circuit

The aim of "Cell Phone Tower Base Station Safety System" is to design such a system which can monitor and control various alarms at mobile cell site. Intention of this project is to ensure the safety of this unit which is at the base of cell site. The main objective is to monitor various threats like fire detection, Smoke detection, to check the fuel level and to check if the door is left open. The door check is required since many times the maintenance workers forget to properly close the door of the base station unit. A typical cell site or mobile tower base station consists of various units including power management unit (PMU), BTS unit, battery unit and air-conditioners. These different units of cell site require frequent maintenance. For some type of base stations, it is daily and for some types it is weekly. These maintenances are quite expensive. With the use of "Cell Phone Tower Base Station Safety System", we

can reduce huge maintenance cost in order to increase the "intelligence" of a system. The border between both approaches shifts continuously, as more and more "intelligence" is cast into algorithmic, system-theoretic form.
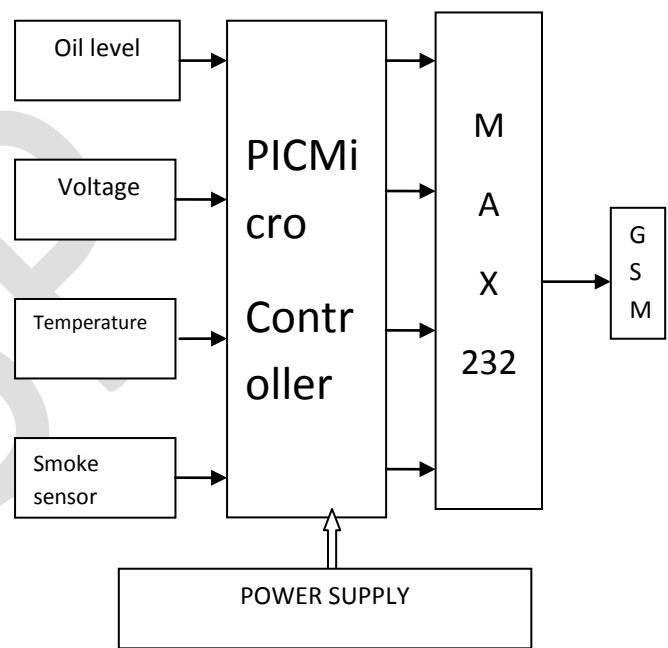
II. SYSTEM DESIGN

Fig: 1 Basic block diagram

III. PIC16F887 Microcontroller Device Overview

PIC16F877 belongs to a class of 8-bit microcontrollers of RISC architecture. It has 8kb flash memory for storing a written program. Since memory made in FLASH technology can be programmed and cleared more than once, it makes this microcontroller suitable for device development. IT has data memory that needs to be saved when there is no supply. It is usually used for storing important data that must not be lost if power supply suddenly stops. For instance, one such data is an assigned temperature in temperature regulators. If during a loss of power supply this data was lost, we would have to make the adjustment once again upon return of supply.

- RISC architecture
  - Only 35 instructions to learn
  - All single-cycle instructions except branches
- Operating frequency 0-20 MHz
- Precision internal oscillator
  - Factory calibrated
  - Software selectable frequency range of 8MHz to 31KHz
- Power supply voltage 2.0-5.5V
  - Consumption: 220uA (2.0V, 4MHz), 11uA (2.0 V, 32 KHz) 50nA (stand-by mode)
- Power-Saving Sleep Mode
- Brown-out Reset (BOR) with software control option
- 35 input/output pins
  - High current source/sink for direct LED drive
  - software and individually programmable *pull-up* resistor
  - Interrupt-on-Change pin
- 8K ROM memory in FLASH technology
  - Chip can be reprogrammed up to 100.000 times
- *In-Circuit Serial Programming* Option
  - Chip can be programmed even embedded in the target device

- 256 bytes EEPROM memory
  - Data can be written more than 1.000.000 times
- 368 bytes RAM memory
- A/D converter:
  - 14-channels
  - 10-bit resolution
- 3 independent timers/counters
- Watch-dog timer
- Analogue comparator module with
  - Two analogue comparators
  - Fixed voltage reference (0.6V)
  - Programmable on-chip voltage reference
- PWM output steering control
- Eight level deep hardware stack
- Power-on Reset (POR)
- Power-up Timer (PWRT) and
- Oscillator Start-up Timer (OST)
- Programmable code protection
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Direct, indirect and relative addressing modes
- Interrupt capability (up to 14 sources)
- Enhanced USART module
  - Supports RS-485, RS-232 and LIN2.0
  - Auto-Baud Detect

- Master Synchronous Serial Port (MSSP)
  - supports SPI and I2C mode
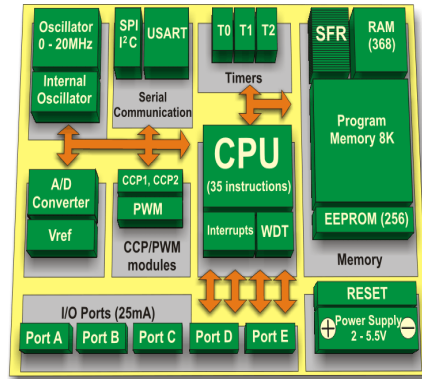
PIC16F887 Microcontroller block diagram:

Fig: Block diagram

GSM MODEM:-

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone

Fig : 2 GSM Modem

We are using the FARGO MAESTRO 20 GSM as shown in fig.

This is a powerful GSM/GPRS Terminal with compact and selfcontained unit. This has standard connector interfaces and has an

integral SIM card reader. The modem has a DB9 connector

through which a speaker and microphone can be connected a llowing audio calls being established, but this feature is not utilized in this project as only data transfer is needed.

Features & Specification

• Cellular frequency 900/1800MHz
• Easy to use
• Serial port DB9 connector
• Antenna length is 120mm

IV. PROTOTYPE MODEL DEVELOPMENT

As shown in the fig.6 microcontroller PIC16F877A is the main controlling element to which PT on input side, CT on load side, thermistor andfloat sensor are connected. The project is based on microcontroller programming. The program for microcontroller in embedded C language. Program written

Fig: 3 Model

burned into microcontroller and saved as Hex file. For PIC16F877A controller Atmel programmer is used. Program hex file is compiled in µcontroller flash compiler. This compiler converts program into machine language code as well as check program for error if any error found notifies and these errors are corrected manually. Then it successfully executed in compiler. After compiling program in µcontroller flash compiler, it is burned into PIC16F877A microcontroller with the help of universal program burner kit FP8903 programmer which is connected to computer. After successful program burning, microcontroller becomes ready for use

V. Application

The proposed methodology is based on Robust GSM technology meets safety reliability and fastest in operation. It consists of a sensing system, signal conditioning electronic circuits, advanced embedded hardware for middle level computing, a powerful computer network for further transmission of data to various places.
The Sub elements of proposed system are
❖ Power Grid
❖ Factories
❖ Industrial Area
❖ Home Automation.

VI. SCOPE FOR FUTURE ENHANCEMENTS

The scope for the future enhancement of the circuit is also shown in the block diagram. If an amplifier connected to the motor or various other equipment at the power grid is connected to the microcontroller circuit and suitable programming is done then along with the fault detection controlling of power grid can also be done by the use of GSM technology

VII. CONCLUSION

This paper shows that a GSM technique can be successfully apply to the earlier developed communication based special protection systems to increase its reliability during network interruptions. The GSM enhances speed of communication with distance independentancy. A suitable authenticated hardware is designed to meet the credibility of the networking. An Embedded based hardware is designed to acquire data from electrical sensing system, it sends from one network to other and change in parameters of transmission to be sensed to protect the entire transmission and distribution.

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