

GSM BASED CIRCUIT BREAKER

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Abstract— A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. When operated manually we see fatal electrical accidents to the line man are increasing during the electric line repair due to the lack of communication and coordination between the maintenance staff and the electric substation staff. In order to avoid such accidents, it is designed to solve this problem by design breaker such that only authorized person can operate it with a keyword by sending it to the GSM through mobile. The system is fully controlled by ATMEGA328P microcontroller. The global system for mobile (GSM) circuit enables remote control of the system from any place. This leads to address the problem of loss of life. Sometimes a certain line fault occurs where we can save time to operate the circuit breaker by being at the fault place itself.

Keywords- Arduino Uno a microcontroller based ATmega328p with relay and circuit breaker.

I. INTRODUCTION

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. When operated manually we see fatal electrical accidents to the line man are increasing during the electric line repair due to the lack of communication and coordination between the maintenance staff and the electric substation staff. In order to avoid such accidents, it is designed to solve this problem by designing a breaker such that only authorized person can operate it with a specified keyword. The system is fully controlled by ATMEGA328P microcontroller

Existing systems

1. password based circuit breaker with keypad

Disadvantage of Existing Systems

1. Difficult to maintain.

2. Need assistance with the controller.

Proposed System: The proposed system uses GSM module which enables us to switch on or off the circuit breaker with just a message and also the status of the circuit breaker is known through a message.

II. ARCHTECTURE OF THE SYSTEM

The architecture of the system mainly consists of three components the GSM MODEM and the interface circuit that include the relay and the circuit breaker. The function of the GSM MODEM is the remote communication between the user and the controller through the RS232 serial communication standard. The function of the controller is to continuously check the inputs coming from the relay and send message through the GSM network in case of we ask for the status. The microcontroller is connected to circuit breaker through relay. An interface circuit has been designed which switch on or of the circuit by a message. Then the programmed microcontroller has been

connected to the interface circuit and the GSM MODEM through the serial port of the GSM MODEM

III. DESIGN AND IMPLEMENTATION

The proposed system comprises of GSM modem, Microcontroller, relays, circuit breaker and LCD Display. If the user wants to control the system from a remote place, he/ she has to send the SMS command from his registered mobile indicating the operation of the device. The GSM modem embedded with Microcontroller receives the user’s command. According to the received message, the Microcontroller will switch ON/ OFF the relays (i.e. specific application) which switches the circuit breaker as of our need.

The block diagram of the GSM Based circuit breaker has shown in the below diagram. The system mainly consists of three components the GSM MODEM and the interface circuit that includes the relay and the circuit breaker.

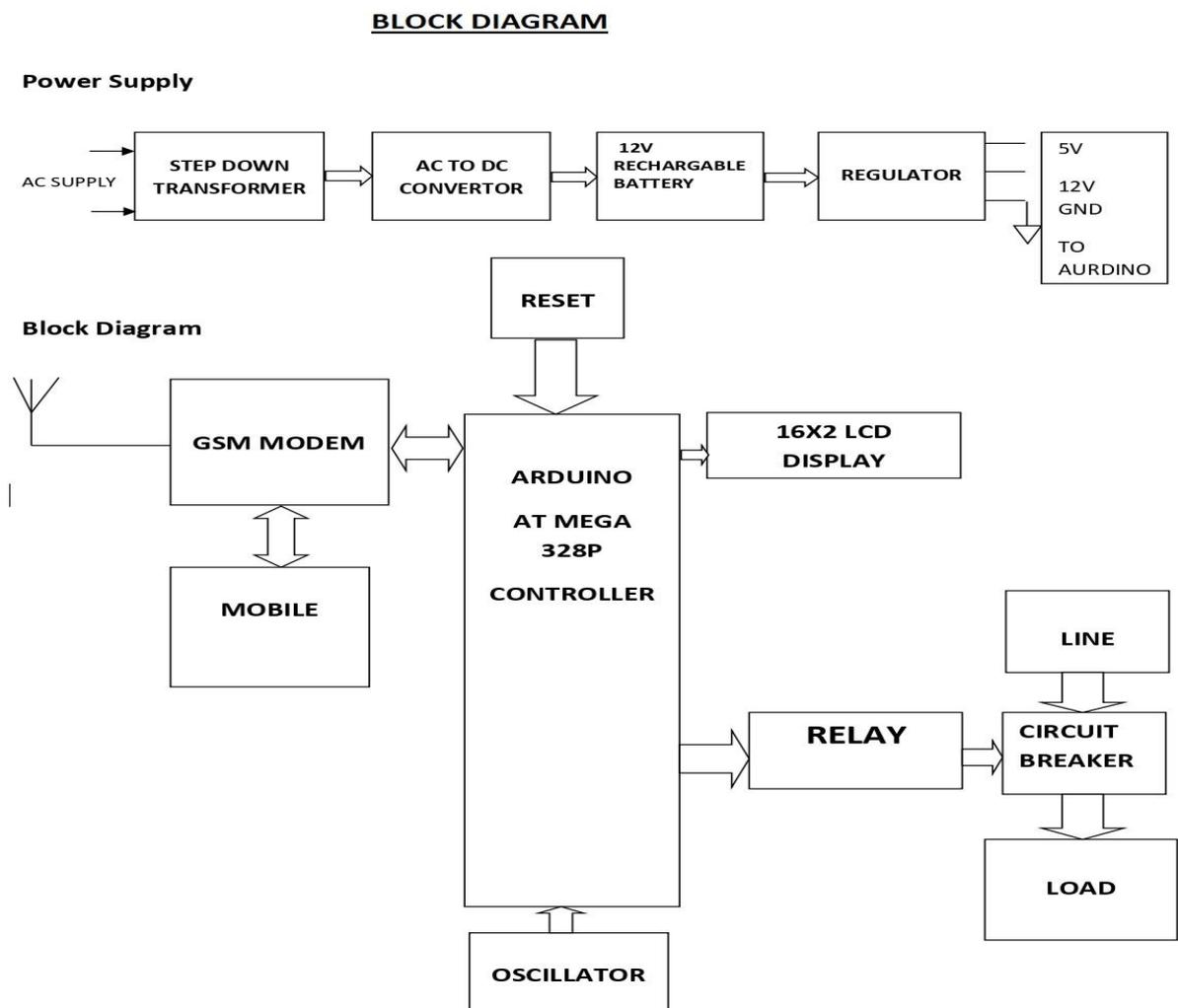


Fig 1. Block Diagram & Power Supply Circuit

IV.SENSING DEVICES

4.1 RELAY

Relays are **switches** that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. When the current is flown through the coil of the relay then the relay switches the normal open to normal close position as shown in the figure below.

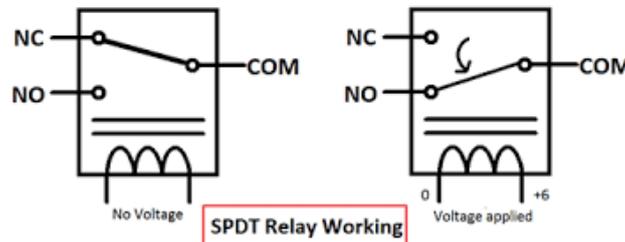


Fig.2. Relay

4.2 CIRCUIT BREAKER

A circuit breaker is an automatically operated electrical switch designed to protect an Electrical circuit from damage caused by excess current from an overload or short circuit. Circuit breakers are made in varying sizes, from small devices that protect low-current circuits or individual household appliance, up to large switchgear designed to protect high voltage circuits feeding an entire city. The generic function of a circuit breaker, RCD or a fuse, as an automatic means of removing power from a faulty system is often abbreviated as OCPD (Over Current Protection Device).

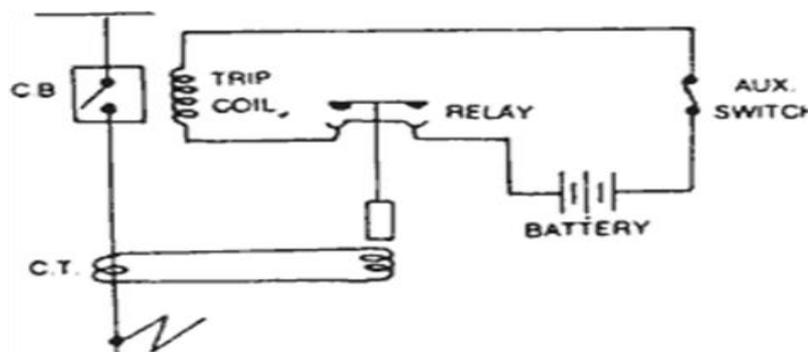


Fig.3. Circuit breaker

4.3 ATmega328

The **ATmega328** is a single-chip microcontroller created by Atmel in the megaAVR family. It has a modified Harvard architecture 8-bit RISC processor core. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

A common alternative to the ATmega328 is the "pico Power" ATmega328P. A comprehensive list of all other members of the mega AVR series can be found on the Atmel website.

- ATmega328
- ATmega328P and ATmega328P-AUTOMOTIVE
- ATmega328PB and ATmega328PB-AUTOMOTIVE (superset of ATmega328P)

As of 2013 the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

V. SERIAL COMMUNICATION–RS232

A popular way to transfer commands and data between a personal computer and a microcontroller is the use of standard interface, like the one described by protocols RS232(older) or USB (newer). This chapter is devoted to communication conforming to RS232protocol, the hardware for such interface is provided onboard. An example will be presented showing the processing of commands received through RS232 interface, and sending of a string of numbers using the same interface. The microcontroller includes up-to six hardware modules to deal with RS232 signals. Some of the modules additionally implement other communication protocols, like I2C, CAN, SPI; module named UART4 will be used in this experiment. Its detailed description can be found in RM0090, chapter 26. The voltage level translator is added on the test board, and is industry standard chip MAX3232. The Signals TX and RX are available at connector P580,pins3 and 2 respectively. The RS232 signals RX and TX are available as alternate functions replacing the regular port bits, and corresponding port pins Must be properly initialized software.

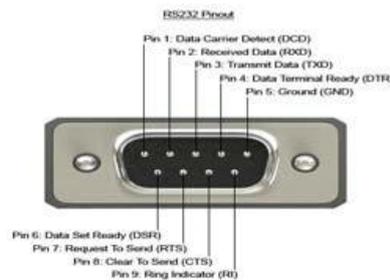


Fig.4. D-Connector

VI.SIM900-GSM/GPRS Module

GSM (Global system for mobile communication) is a cellular network. GSM network operate in four different frequency ranges. Most GSM network operates in 900 MHz or 1800 MHz bands. The transmission power in the handset is limited to a maximum of 2 watts GSM 850/900/300 and 1 watt in 1800/1900. The longest distance the GSM specification supports in practical use is 35Km (22 mi). In this paper we use SIM900a based GSM modem to receive and send short message to user and system



Fig.5 SIM 900A

VII.LCD DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven-segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD



Fig.6. LCD Display

VIII.RELAY DRIVER CIRCUIT

Relays are components which allow a low-power circuit to switch a relatively high current on and off, or to control signals that must be electrically isolated from the controlling circuit itself. New comers to electronics sometimes want to use a relay for this type of application, but are un sure about the details of doing so. Here is a quick run down. To make a relay operate, you have to pass a suitable ‘pull-in’ and ‘holding’ current(DC) through its energizing coil. And generally relay coils are designed to operate from a particular supply voltage often 12V or 5V, in the case of many of the small relays used for electronics work.

IX. CONTROL AND INTERFACE CIRCUITS

Nowadays, microcontrollers are so cheap and easily available that it is common to use them instead of simple logic circuits like counters for the sole purpose of gaining some design flexibility and saving some space. Some machines and robots will even rely on a multitude of microcontrollers, each one dedicated to a certain task. Most recent microcontrollers are „In System Programmable“ ,meaning that you can modify the program being executed, without removing the microcontroller from its place. In this paper aPHILIPS madeP89V51RD2 Microcontroller is used. It has 8-bitdata bus, 16-bit address bus, 32 general purpose registers each of 8 bits, 16 bit timers, 3 internal and 2 external interrupts, Bit as well as by addressable RAM area of 16 bytes. Four 8-bitports, (short models have two 8-bit ports). 16-bitprogram counter and data pointer, 64K Flash memory and UART for serial communication. The microcontroller is programmed by using Flash Magic Software. Control and interface Circuit

X.WORKING OF THE SYSTEM

The system is fully controlled by the microcontroller Whenever a fault occurs line man sends a message through his mobile with specific message to the design, where it differentiates circuit breaker with different passwords and follows the message whether to ON/OFF the circuit breaker and a LCD display is provided to indicate the substation staff the CB which is manually operating through GSM. we will preset a address to the circuit breaker for example as “P4909” with the circuit breaker number and the operation we need as “CB1ON/OFF” then the circuit breaker will get on or off as of we need. We can also get to know the status of the circuit breaker as it is in the position “ON/OFF” with a message “STATUS CB1” then the status is send through the sms to the authorized person as “CB1 STATUS ON/OFF”.

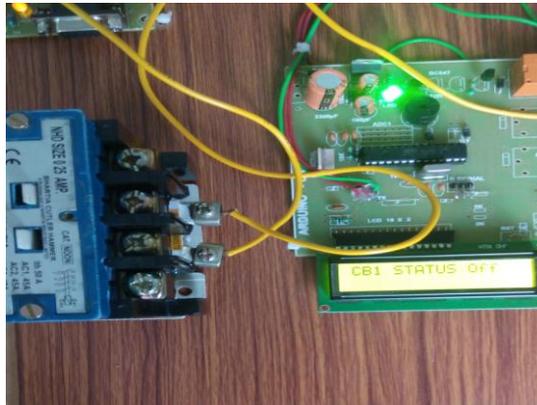


Fig.7. Working Model



Fig.8. GSM Module

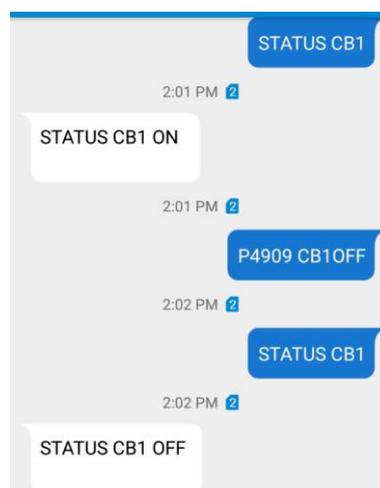


Fig.9. SMS Sent and Received

XI. CONCLUSION AND FUTURE WORK

On the successful implementation of the system, it displays whether the circuit is on or off. A GSM Based Circuit Breaker Control the Line Man's Safety. This system provides a solution, which can improve the safety of the project ,line man, as well as the time. It is designed to control a circuit breaker with the help of a GSM MODEM. In the future the whole system can be monitored by fixing a camera or can be operated manually via internet with the installation of a domain on the internet and Wi-Fi module to the Arduino.

REFERENCES

- 1 International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887 Volume 6 Issue IV, April 2018- Av.
- 2 Imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-4, 2017 ISSN: 2454-1362.
- 3 International Journal of Research,Ideas and Innovations in Technology ISSN: 2454-132X Impact factor: 4.295 (Volume3, Issue3).
- 4 Advanced Journal of Graduation Research ISSN: 2456-7108 Volume 1, Issue 1, pp. 35-39, January 2017.
- 5 ISSN: 2455-2631 July 2017 IJSDR | Volume 2, Issue 7.