Lineman protection by using Remote controlled Circuit Breaker

Sushmita Deb[1], Divya P N[2], Sindhu G[3], Kanthraj T S[4]

[1]Assistant Professor, [2,3,4]U.G. Students
Department of EEE,
SJMIT, Chitradurga, Karnataka, India

***Abstract*: A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition and interrupt current flow. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. 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, the breaker can be so designed such that only authorized person can operate it with a Remote. The system is fully controlled by the 8 bit microcontroller of 8051 family. Then the program is stored in an EEPROM, interfaced to the microcontroller and it can be changed any time unlike a fixed one burnt permanently on to the microcontroller. A keypad is used to operate the Remote and a relay to open or close circuit breaker, which is indicated by a lamp.

***Keywords*: Fuse, Circuit Breaker, Microcontroller, EEPROM, Lineman**

I.INTRODUCTION

Nowadays, electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. This project gives a solution to this problem to ensure line man safety. In this proposed system the control (ON/OFF) of the electrical lines lies with line man. This project is arranged in such a way that maintenance staff or line man has to enter the Remote operated to ON/OFF the electrical line. Now if there is any fault in electrical line then line man will switch off the power supply to the line by entering Remote operated and comfortably repair the electrical line, and after coming to the substation line man switch on the supply to the particular line by entering the Remote operated.

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. The main objective of this project is to save man life by making such a protective system controlled through sms In this proposed system if there is any fault in line the lineman sends the password due to which main line is switched off after that he works on online solution and after that sends sms and switch on the electrical line. Nowadays, electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. This project gives a solution to this problem to ensure line man safety. Its maintenance is a very low due to this it is very useful for the line man. Now a days there are various product which is available in the market but they are very costly and also they are very time consuming devices. Our devices reduce the time which is required for the line man for repairing. The parts which is required for our model is easily available in the market. The main concept of our project is to reduce the time of the line man.

II.BLOCKDIAGRAM

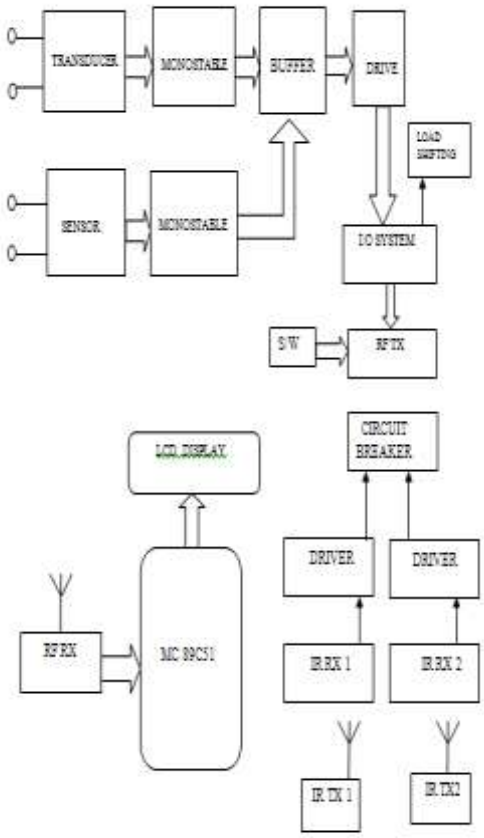

Fig. 2.1 Block diagram of remote controlled electric lineman protection system

III. PRINCIPLE OF OPERATION:

The basic block diagram of the system is shown in the above figure.2. OTP generation and OTP verification are the major steps that are performed by this system. Depending on the request from the user the system generates OTP and it will send to the user's phone. After enter this password using the keypad, it will compared with the generated password (which is stored in the ROM). If the passwords are same, the supply to the line will be made off. Similarly using another password the power to that line will be turned on. If the passwords are not matched up to or more than three times an alarm will be generate.

IV. COMPONENTS USED:

- **ATMEL 89C51:**

The general definition of a microcontroller is a single chip computer, which refers to the fact that they contain all of the functional sections (CPU, RAM, ROM, I/O, ports and timers) of a traditionally defined computer on a single integrated circuit. Some experts even describe them as special purpose computers with several qualifying distinctions that separate them from other computers.

Fig. 2.2: Microcontroller Module

The **ATMEL 89C51** is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The ATMEL 89C51 device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The ATMEL 89C51 provides the following standard features: 4K Bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry. In addition, the 89C51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The AT89C51 Power-down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

- **TRANSISTOR:**

A transistor consists of two pn junction formed by sand witching either p-type or n-type semiconductor between a pair of opposite type. Accordingly, there are two types of transistors namely: n-p-n transistor and p-n-p transistor

An n-p-n is composed of two n-type semiconductors separated a by thin section of p-type. However, a p-n-p is formed by two p-section separated by a thin section of n-type.

1) These are two pn junctions. Therefore, a transistor may be regarded as a combination of two diodes connected back to back.
2) There are 3 terminals, taken from each type of semiconductor.
3) The middle section is very thin layer. This is the most important factor in the functioning of a transistor.

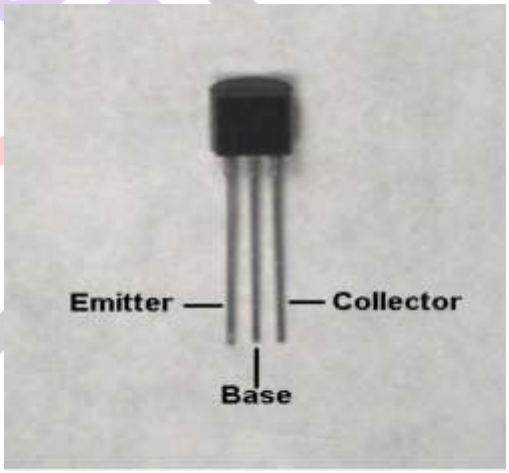

Fig. 2.3: Practical Transistor Module

- **LCD DISPLAY**:

For ease of interaction with the user, this system uses an electronic display module. Here a 16x2 LCD is used. This means in 2 lines it is possible to display 16 characters per line. A 5x8 pixel matrix is used for display one character. Two registers are associated with an LCD, such as data and command. These modules are preferred since it is easily programmable. For providing visual assistance to the lineman this module is unavoidable.

Fig. 2.4:LCD Display

- **POWER TRANSFORMER:**

The power supply, unsung hero of every electronic circuit, plays very important role in smooth running of the connected circuit. The main object of this 'power supply' is, as the name itself implies, to deliver the required amount of stabilized and pure power to the circuit. Every typical power supply contains one transformer which steps-down the main voltage, which is 230V AC, to the required level. The national standard for line frequency of the mains supply is 50 Hz.

The transformer simply transfers 230 Voltage Alternating Current from primary side to secondary side, without altering the voltage and frequency. The secondary voltage is depends on the number of turns in secondary winding. This turns ration of primary to secondary windings gives the rating of the transformer.

Fig 2.5 :Practical Power Transformer Module

- **IR TRANSMITTER AND RECEIVER:**

The Infra Red Transmitter is made very simple by employing the dedicated & commercially available IC1. Here the IC1 is used in flash mode by connecting Transmission Mode Pin 1 to +Vcc, and thus reduces average current consumption to 6.5 mA. In this mode minimum and maximum transmission times are 2.1 milliseconds and 3.6 milliseconds respectively and the duty cycle is 0.7%.

Since the Circuit is intended to send only one signal code, IC1 is configured for address one [refer the table in IC description] by making all the Address Input pins, Code pins to zero or ground. As soon the switch S1 is switched ON, the circuit gets its working voltage of 9 Volts through pin-20. Inside the IC, it creates the address 1 as a command code and sent to the output pin-19.

The IR Sensor Module has 3 terminals: signal input, supply pin and the ground pin. This module works on regulated +5Votls, and exceeding this limit may cause the damage of it. So, this Sensor is given V_{cc} through a biasing resistor R1 and grounded pin is given to negative terminal of the supply. Whenever the Infra Red rays falls on this Sensors eye [that black mole on Sensor] it produces varying signal voltages at output pin. This is given to amplifier stage built by an PNP transistor TR1 through an current limiting resistor R2. The output of this amplifier is fed to a buffer situated in IC2. This buffer or converter enhances the current capacity of the signal and send to driver stage. The signal output is monitored by observing the glowing indicator LED D4.

- **POWER SUPPLY SECTION:**

For the working of the system a power supply is needed. The micro controller needs only 5 volt DC for its working. Therefore the incoming AC will be rectified filtered and regulated by 7805 IC.

Fig 2.6 Voltage Regulator Voltage Levels

- **RELAY:**

It is basically a switch based on electromagnetic induction. Here uses a 12V DC SPDT relay. It is normally open and closes when the OTPS are the same.

Fig. 2.7: Relay

V. WORKING MODEL:

Fig. 2.8:Practical working modle

VI. ADVANTAGES:

- All the components required are easily available.
- It is accurate [Errors are nullified] & precise as it is Digital.
- Low power consumption.
- Less hardware involved and Cost Efficient.
- Automatically controlled & Easy to use.
- Unnecessary wastage of electricity can be controlled to a greater extend.
- Eliminate or at least minimize run off.
- By implementing this project we can safe guard the transformers.
- Without interrupting the operation we can deliver the power.
- By proper maintenance we can maintain the life to the maximum time.
- Easy for the line man to debug the issue at faster rate.

VII. DISADVANTAGES:

- In this project usage of relays leads to consume more power.
- One time investment.

FUTURE APPLICATIONS:

Using wireless communication this system can be operated from other areas besides the substation such as on the transformer. The SCADA is a system used in the communication channels to help easy troubleshoot to locate the fault location directly and the line man can easily rectify it.

CONCLUSION:

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.

By implementing this project we can avoid the human accidents and we can live update of the fault detection in the transformers or ant stations.

With moderrn technology it is possible to moniitor a large number of parameters of distributed transformer at a relatively high cost. The challenge is to balance the functions of the monitoring system and it's cost and reliability. In order to get effective transformer monitering system to a moderate cost,it is necessary to focus on a few key paraameters. Even this system is used to provide line man safetyin case of fault repair. After repairing this module activates the load if it receives commands from KEB and line man.

LIMITATIONS:

The network problems will affect the proper working of the system. Since it contain a GSM modem. There should be sufficient balance in the SIM also.

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BIOGRAPHY:

MRS. SUSHMITA DEB presently working as Assistant Professor in Dept. of EEE SJMIT, Chitradurga Karnataka, India. Previously worked as Assistant Professor in the Dept of EEE SMIT, Sikkim. Completed B.Tech (EEE) in the year 2006 from Sikkim Manipal Institute of Technology, Sikkim. Completed M.Tech (Power Electronics) in the year 2011 from Sikkim Manipal Institute of Technology, Sikkim India.

DIVYA P N
Student 8th Sem, E&E Dept SJMIT
Chitradurga, Karnataka

SINDHU G
Student 8th sem,E&E Dept, SJMIT
Chitradurga, Karnataka

KANTHRAJ T S
Student 8th sem E&E Dept, SJMIT
Chitradurga, Karnataka