

Underground Cable Fault Detection Using GSM Modem

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Abstract: This Project is required to discover the situation of fault in underground cable lines from the bottom station to the exact location in kilometer with the help of PIC Microcontroller (PIC18f877a). In the geographical area the line runs in underground rather than overhead lines. Whenever the fault occurs in underground cable it is hard to discover the exact location of the fault for repairing that cable. The projected system finds precise location of faults. This system uses PIC Microcontroller and regulated power supply. Here the present sensing circuits are created with a set of resistors unit interfaced to PIC Microcontroller in order to assist of the ADC to provide digital signals to the microcontroller representing the length of cable in kilometers. The occurrence of fault is made by using the set of resistors of 1kilo ohm. The relays are controlled by the relay driver IC (ULN2003A). A LCD display is connected to the microcontroller to display the Fault. In case of fault, the voltage across resistors changes accordingly and that change in voltage is fed to ADC to develop precise digital value from base station in kilometers. GSM SIM-800 is additionally connected to the PIC Microcontroller and it discovers the fault and send SMS on the user's mobile.

Key Word: Underground Power Cable; Sim 800 GSM Modem; PIC Microcontroller 18f877a; ADC; LCD.

I. Introduction

Power networks units are growing rapidly and their responsibility obtaining a lot of vital than ever. The quality of the total network contains various parts that may fail and interrupt the supply to the user. Underground high voltage cable units are not affected by the extreme weather conditions, heavy rain, storms, snow as well as pollution. A cable in fitness and put in properly will last a life of regarding thirty years. even if the Cable producing technology is up steadily; there are a unit still influences which can cause cable to fail throughout check and operation. However, cables will be simply broken by incorrect installation or poorly dead jointing. because of quick evolving technology of installation networks, analysis on transmission of power has reached to AN exceptional extent. With the ability loss baby-faced because of overhead transmission, transmission of power through underground cable (UG) has taken an exceptional position in installation analysis. Underground cables area unit most popular over overhead cables as a result of its lesser transmission losses and has the power absorb emergency power masses. In spite of getting higher installation price it's got a lower maintenance price. Underground cables area unit vulnerable to wide range of faults because of underground conditions, wear and tear, rodents etc. diagnosis fault supply is troublesome and whole cable ought to be taken out from the bottom to see and fix faults. This results in digging of the complete space to observe and properthe fault that causes wastage of money as well as manpower. Thus it is necessary to determine the exact location of faults in the underground cables.

Types of Fault in a 3 Phase Power Cable can be classified as follows:

1. **Open Circuit Fault:** - Open Circuit Fault occurs when one or more than one phase conductor breaks and the value of current in such fault become zero and load side gets isolated from the generation side.
2. **Short Circuit Fault:** - When Conductors of different phases get connected with each other than such fault occurs in the system.

II. Literature Survey

- 1] "GSM primarily based Underground Cable Fault Distance Locator" (IJSRD/Vol. 6/Issue 04/2018) Author's: - Kunal Yogesh Kumar Parikh, Brajesh Kumar, Vijay Raval The objective of this analysis paper is to see the gap of underground three-part cable fault from base station in kilometers by mistreatment PIC microcontroller & GSM. The tangency fault at a specific distance (1km, 2km, 3km, and 4km) in underground cable is found to rectify the fault with efficiency.
- 2] GSM primarily based Advance Security System by mistreatment Pic Microcontroller Authors: - Kunal Yogesh Kumar Parikh, Hiren Dave, Nitish Karelia, Brajesh Kumar, Vijay Raval R & D Engineer, Director, Department of analysis & Development, Greek deity Technologies PVT LTD, Gandhinagar, Gujarat, India. The fault occurring at a specific distance, the individual part beside the gap is displayed on the alphanumeric display. constant info is additionally sent to the involved authority transportable over GSM, interfaced to the PIC microcontroller.
- 3] PIC18FXX8 information Sheet 28/40-Pin superior, increased Flash Microcontrollers with will Module solely PIC18F4X8 devices implement the improved CCP module, analog comparators and therefore the Parallel Slave Port. From this paper we tend to get plan to use Pic18F458 microcontroller. As per higher than info, in our project we will use PIC18F458 Microcontroller.
- 4] "Automatic Fault Detection in Transmission Lines victimization GSM Technology". (IJIREICE/Vol.6/Issue4, April2018) Author's: -Prof. Vikram Singh R. Parihar, Shivani Jijankar, Anand Dhore, Arti Sanganwar, Kapil Chalkhure. GSM SIM800 module has created a beautiful choice for wireless communication applications. The GSM SIM800 network provides reliable communication quality with nationwide coverage. Short message service (SMS) has currently become the foremost wide used service primarily based upon GSM customary.
- 5] TOSHIBA Bipolar Digital computer circuit Si Monolithic ULN2003APG,ULN2003AFWG ULN2004APG,ULN2004AFWG The ULN2003APG/AFWG Series square measure square measure, high-current Darlington drivers comprised of seven NPN Darlington pairs. All units feature integral clamp diodes for change inductive masses. Applications embody relay, hammer, lamp and show (LED) drivers.

III. Working

This is projected model of underground cable fault locator by using PIC microcontroller as well as GSM Modem. It is classified into four main components named as –Power Supply, PIC Microcontroller, SIM 800 GSM Modem and LCD Display. DC power Supply consists of the transformer which step down step down the voltage, bridge rectifier converts ac signal to dc & regulator is employed to supply constant dc voltage. The cable part is represented by set of resistors along with the switches. Current sensing a part of cable represented as set of resistors & switches are used as fault creators to point the fault at every location. This half senses the amendment in current by sensing the dip. Next is dominant part-which contains analog to digital device that receives input from the current sensing circuit, converts this analog voltage is converted into the digital signal and is fed to the microcontroller. The microcontroller performs the necessary calculations. The microcontroller additionally drives a relay driver which successively controls the group of relays at every phase. The display part-consists of the LCD which is interfaced to the microcontroller that shows the status of the cable of every part and therefore the distance of the cable at the actual part, in case of any fault. The project uses the simple concept of ohm's law whenever the DC voltage is applied at the feeder finish through a series resistance. the present would vary relying upon the length of fault of the cable just in case there's a brief circuit. The series resistance dip changes consequently that is then fed to AN ADC to develop precise digital information that the programmed microcontroller would show a similar in metric weight unit meters. The project is assembled with a group of resistors representing linear unit in kilometre and fault creation is formed by a group of switches at each glorious kilometre to cross check the accuracy of a similar. The 230V AC offer is initial stepped down employing a transformer. this can be then regenerate to DC employing a bridge rectifier. The AC ripples are filtered out by employing an electrical device and given to the input pin of transformer. At output pin of this regulator, we have a tendency to get a relentless DC voltage that is employed by microcontroller and different ICs during this project. The feeder is fed through a resistance by a DC offer and as per the fault occurrence, the present through this resistance changes. currently relying upon this alteration in resistance the voltage across the resistance also changes. this alteration in voltage is fed to the microcontroller via ADC that

converts this voltage signal to a clear type to the microcontroller. The microcontroller is coded to scan numerous information given by ADC and provides the signal to alphanumeric display for displaying corresponding distances.

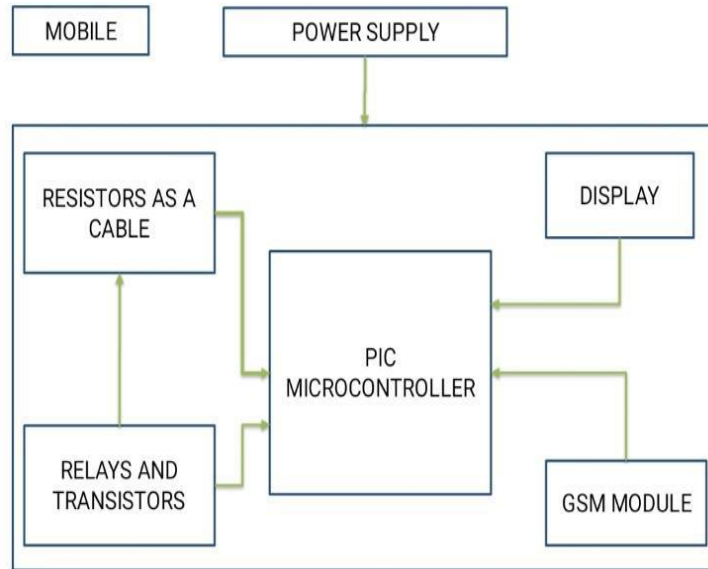


Figure no I Block Diagram

Circuit Requirements:

1. Microcontroller PIC18F877A: Associate in Nursing embedded system is usually a style that uses the ability of a tiny low microcontroller, just like the microchip PIC microcontroller (MCU) or PIC controller. PIC Microcontroller is the heart of project. PIC18F458 microcontroller is used to perform the required calculations so the accurate fault distance is displayed on the LCD Screen

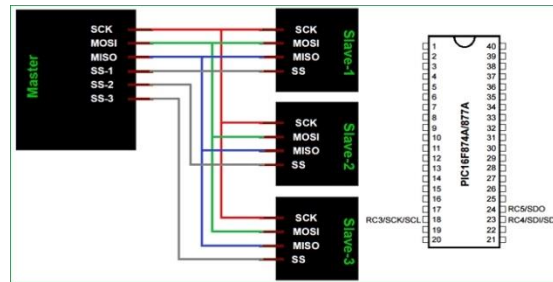


Figure no II Circuit Requirement Components

2. Voltage Regulator: In this project, power source of 5V and 12V unit is required, so as to get these voltage levels, voltage regulator IC's 7805 and 7812 are used.



Figure no III Voltage Regulator

3.GSM Module: SIM 800 GSM Modem is used for sending as well as receiving the information via AT commands. A GSM (Global System for Mobile Communications) electronic device that accepts a SIM card, and operates over a subscription just like our mobile phones. GSM is useful to send information concerning the fault to the user. Therefore, user can get update of the fault in metric linear unit from base station.



Figure no IV GSM Module

4. LCD: It shows area unit interfacing to PIC microcontroller. Most commonly LCD liquid crystal show LCD digital display alphanumeric display used area unit 16*2 & 20*2 display. Here we have used 16*2 LCD which suggests that number of columns are 16 whereas the number of rows are 2.



Module Size WxHxD (mm): 80x36x9

Viewing Area WxH (mm): 65x16

Figure no V LCD

5.Relay: Relay is sensing device that senses the fault and sends the signal to fuse in order to isolate the faulty section. Here, in this project, three Relays units are used for scanning three phases R – Y – B respectively one by one. If any faults occur in any of the sections then, it'll notice throughout scanning of that individual sections.



Figure no VI Relay

6.Current Sensing Circuit: the present detector may be a device that detects Associate in Nursing converts current to induce an output voltage, that is directly proportional to the present within the designed path. once current is passing through the circuit, a voltage drops across the trail wherever the present is flowing.

7.ADC: It is Analog to Digital converter and is used to converts Analog information into the digital information. The information is then send to the microcontroller for the further operation.

8.ULN2003 A Driver: it is used to drive the three relays. This Relays area used for scanning three phases (R – Y – B), one by one. If any faults occur in any of the section, it'll notice throughout scanning of that individual section.



Figure no VII ULN2003 A Driver IC

9.Power offer: It is used to give power supply to the various components used in the circuit. The ability offer circuit consists of stepdown electrical device that is 230v step all the way down to 12v.

10.Set of Resistors: Set of 1K ohm resistors are used to represent the length of power cable (R – Y - B). DC voltage is fed at one end and the fault is detected by sensing the change in voltage. For current sensing element – Switch is used.

11.MPLAB XIDE: In a software side, MPLAB XIDE is used to write program in Embedded C. This programs are dumped on Microcontroller by PIC kit 2 loader.

Advantages:

1. Fault can be identified Easily.
2. Fast repair to receive back the Power System.
3. No manual maintenance required.
4. Performance of the system gets improved.
5. Low Operating cost and reduction in time required by the crew.
6. Easy to detect the location of the fault in Bad Weather, Noisy Areaetc.

IV. Future scope

In this paper, we are detecting the exact location of short circuit fault in the underground cable in km by using pic18F877a microcontroller IC. In future, this project can be implemented by using either PIC 18f458 or IOT or either by using advanced versions of Raspberry pi to measure the open circuit fault.

V Result

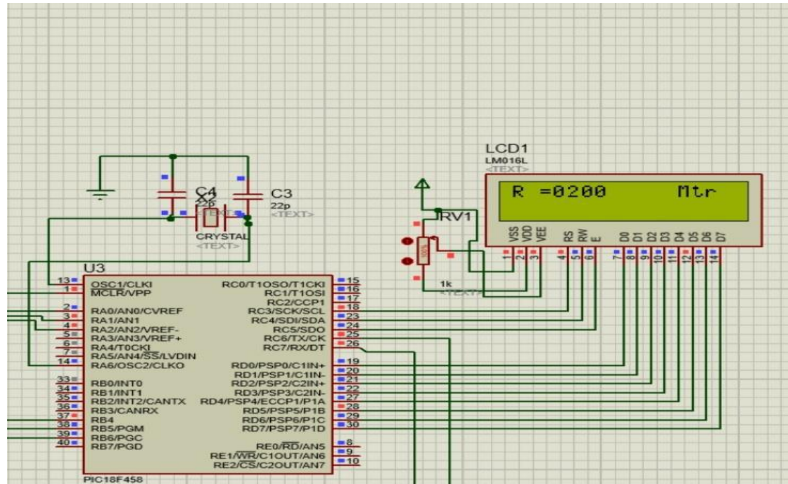


Figure no VIII Final Result

VI. Conclusion

The short circuit fault at a particular distance like 1 Km/2 Km/3 Kmin the underground cable is detected in order to identify the fault efficiently by using the switches and simple concept of Ohm's law. The occurrence of fault with distance displays on the LCD screen and the message is sent to User. The advantages of accurate fault locations are fast repair to revive back the power system; it improves the overall system performance and reduces the operating cost and the time to relocate the faults in the field.

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