IJIREEICE

ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

IOT Based Underground Wire Fault Detection Technique

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Abstract: This paper proposes fault location model for underground power cable using microcontroller and the thing which is based on the internet means the information will transfer through the internet access. The aim of this project is to determine the distance of underground cable fault from the base station in the kilometre and also find the exact location of that faulty place. This project uses the simple concept of ohm's law. When any fault like short circuit occurs, voltage drop will vary depending on length of fault in cable, since the current varies. A set of resistor are therefore used to represent the cable, since the current end and the fault is detected by detecting the change in the voltage using analog to voltage converter and a microcontroller is used to make the necessary calculation so that the fault distance is displayed on the LCD display. This fault details after send to any access point through the internet.

Keywords: Underground cable, fault location, fault detection, location methods, microcontroller.

I. INTRODUCTION

Till last decades cables were made to lay overhead& currently it is lay to underground cable which is superior to earlier method. Because the underground cable are not affected by any adverse weather condition such as storm,snow,heavy rainfall as well as pollution.But when any fault occur in cable,then it is difficult to locate fault. So we will move to find the exact location of fault. Now the world is become digitalized so the project is intended to detect the location of fault in digital way. The underground cable system is more common practice followed in many urban areas. While fault occurs for some reason, at that time the repairing process related to that particular cable is difficult due to not knowing the exact location of cable fault. Fault in cable is represented as:

- Any defect,
- Inconsistency,
- Weakness or non-homogeneity that affects performance of cable,
- Current is diverted from the intended path,

Fault in cable can be classified in two groups:

1) Open circuit fault: Open circuit faults are better than short circuit fault, because when this fault occurs current flows through cable becomes zero. This type of fault is caused by break in conducting path. Such faults occur when one or more phase conductors break.

2) Short circuit fault: Further short circuit fault can be categorized in two types:

a) Symmetricalfault: Three-phase fault is called symmetrical fault. In this all three phases are short circuited.

b) Unsymmetrical fault: In this fault magnitude of current is not equal&not displaced by 120 degree.

Fault location method:

Fault location methods can be classified as:

1) Online method: This method utilize process the sampled voltages& current to determine the fault points. Online method for underground cable is less than overhead lines.

2) Offline method: In this method special instrument is used to test out service of cable in the field. There are two offline methods as following

a) Tracer method: In this method fault point is detected by walking on the cable lines.Fault point is indicated from audible signal or electromagnetic signal .It is used to pinpoint fault location very accurately.

Example:
1) Tracing current method
2) Sheath coil method

b) Terminal method: It is a technique used to detect fault location of cable from one or both ends without tracing. This method use to locate general area of fault, to expedite tracing on buried cable.

Example:1) Murray loop method
2) Impulse current method

II. BLOCK DIAGRAM

The project uses the simple concept of OHMs law where a low DC voltage is applied at the feeder end through a series resistor. The current would vary depending upon the length of fault of the cable in case there is a short circuit of LL or 3L or LG etc. The series resistor voltage drop changes accordingly which is then fed to an ADC to develop precise digital data which the programmed microcontroller would display the same in Kilo meters. The project is assembled with a set of resistors representing cable length in KMs and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same.

This is proposed model of underground cable fault distance locator using microcontroller. It is classified in four parts –DC power supply part, cable part, controlling part, display part.

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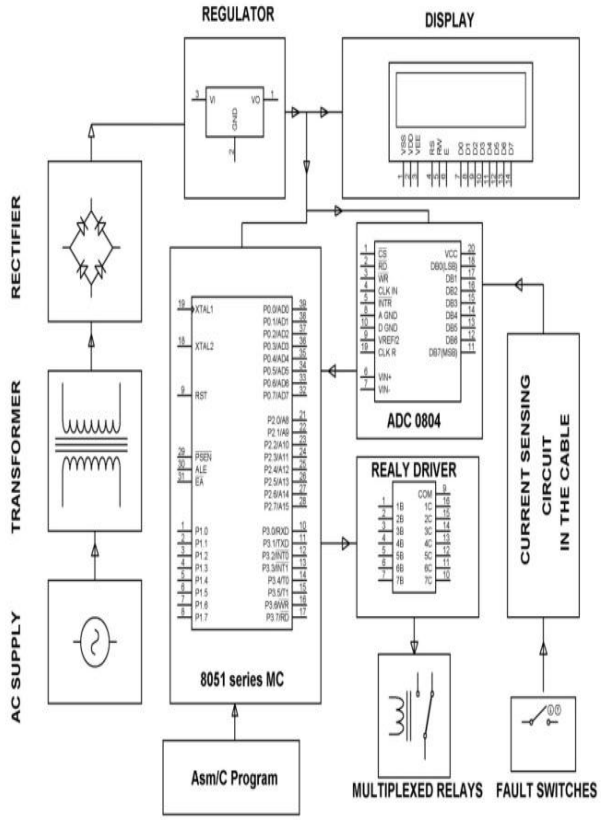


DC power supply part consist of ac supply of 230v is step-down using transformer, bridge rectifier converts ac signal to dc & regulator is used to produce constant dc voltage. The cable part is denoted by set of resistors along with switches.Current sensing part of cable represented as set of resistors &switches are used as fault creators to indicate the fault at each location.This part senses the change in current by sensing the voltage drop. Next is controlling part which consists of analog to digital convertor which receives input from the current sensing circuit, converts this voltage into digital signal and feeds the microcontroller with the signal. The microcontroller also forms part of the controlling unit and makes necessary calculations regarding the distance of the fault. The microcontroller also drives a relay driver which in turn controls the switching of a set of relays for proper connection of the cable at each phase. The display part consists of the LCD display interfaced to the microcontroller which shows the status of the cable of each phase and the distance of the cable at the particular phase, in case of any fault.

III.ALGORITHM AND FLOW CHART

Algorithm:

Step1: Initialize the ports, declare timer, ADC, LCD functions.

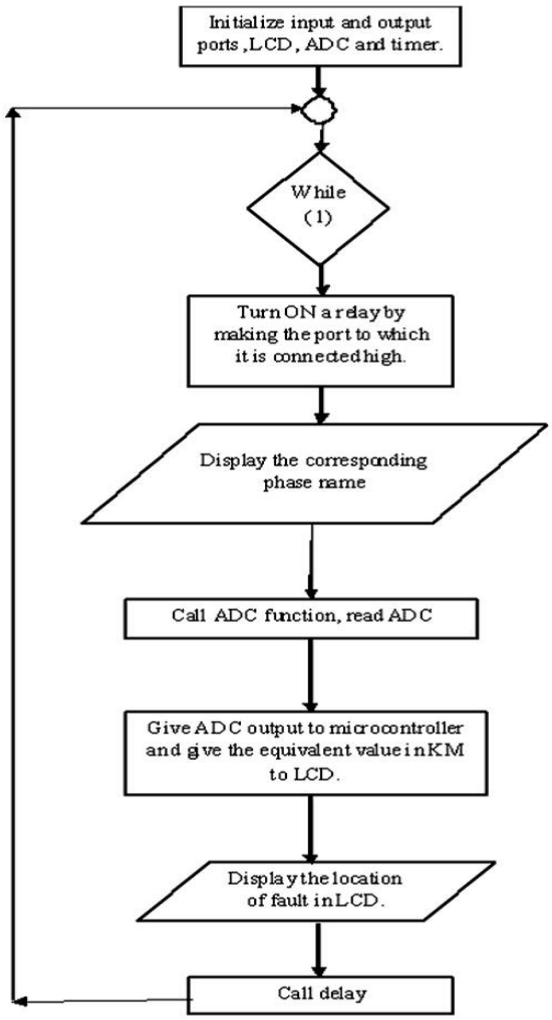
Step2: Begin an infinite loop; turn on relay 1 by making pin 0.0 high.

Step3: Display "R:" at the starting of first line in LCD.

Step4: Call ADC Function, depending upon ADC output, displays the fault position.

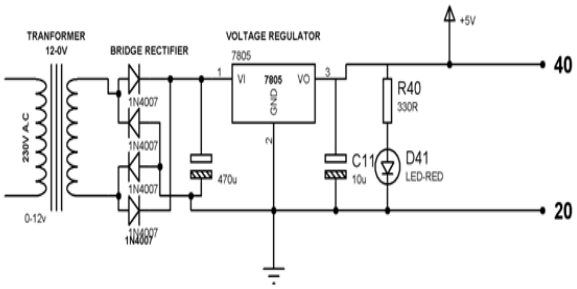
Step5: Call delay.

Step6: Repeat steps 3 to 5 for other two phases.



HARDWARE

The power supply circuit consists of step down transformer which is 230v step down to 12v.In this circuit 4diodes are used to form bridge rectifier which delivers pulsating dc voltage & then fed to capacitor filter the output voltage from rectifier is fed to filter to eliminate any a. c. components present even after rectification. The filtered DC voltage is given to regulator to produce 12v constant DC voltage.



Transformer is static device which transfer electrical energy from one circuit to other circuit with change i n voltage or current without change in frequency. In this step down transformer is used. Usually, DC voltage s are require d to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. Thus the a.c. input available at

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the mains supply i.e., 230V is to be brought owns the required voltage level. This is done by a transformer. Principle of transformer is according to faraday's law o electromagnetic induction.

MICROCONTROLLER

Microcontroller is on chip microcomputer. PIC16F877A is a most popular microchip in the market .It having external data memory and having specified type of program memory. It also has on chip facilities ADC, DAC, RAM, ROM, Timer, Counter, Serial communication port, I/O port. It operates on crystal frequency of 4MHZ.

RECTIFIER

The output of transformer is fed to rectifier. It converts A.C. into pulsating D.C. signal. Rectifier will be half wave or full wave rectifier. In this project a bridge is used because its merit likes good stability and full wave rectification.

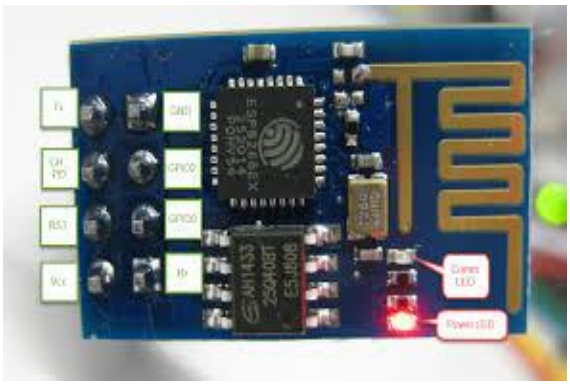
The bridge is a circuit which converts an a.c. voltage to d.c. voltage using both half cycle of input a.c. voltage. The circuits have four diode to form the bridge circuit. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

LCD DISPLAY

Liquid crystal displays are interfacing with the microcontroller LPC16F877A. Most commonly LCD used are 16*2 & 20*2 display. In 16*2 display 16 means

WI FI MODULE

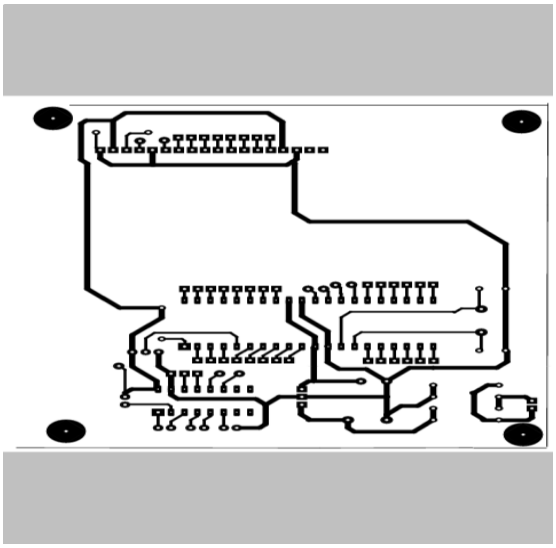
It is SPI type means serial peripheral type interface communication. Fast communication will be established by the WIFI interface.



GSM MODULE

GSM module used for mobile communication with the help of a gsm card which having a specified 10 digit number. Here we used SIM900 type gsm module.

PCB LAYOUT



IV. CONCLUSION

Through this project we simplified the actual problem of the detecting the fault in the underground area. We discover the position or location were the fault will be occur and also find the accurate distance of breaker point.

DOI 10.17148/IJIREEICE.2016.4431

By using software part we encrypt the and transfer at controlling section and actual action will be working out.

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