Under Ground Cable Fault Detection Over IOT

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***Abstract*: Underground cable system is a common practice followed in urban areas. While a fault occurs due to many reasons in the cable, at a time of removing or repairing process, there is difficulty in locating the exact location of the fault. The system proposed in this paper is used to find out the exact location of the fault and display it to the dedicated website over internet using wi-fi module, giving prior information to the authorized person at other end.**

Keywords:- ADC MCP 3204, Relay Driver ULN 2803 , ATMEL AT89s52 MSC-51, Wi-fi Module ESP-8266.

I. INTRODUCTION

For the real worldwide operated voltage distribution lines underground cables have been used from many years. In order to reduce the sensitivity of distribution networks to environmental influences underground voltage cables are highly used . Underground cables have been widely used in power distribution networks¬ due to the advantages of underground connection, more enhanced security than overhead lines in adverse weather condition, less liable to damage by storms or lightning. It is less costiy for larger distance, eco- friendly and low maintenance cost . But if any fault occur in cable, then it is difficult to locate fault and it's type . So this system is used to detect the location and type of fault in digital way. The requirement of locating the faulty point in an underground cable in order is to facilitate quicker repair, improve the system reliability and reduced outage period.

II.TYPES OF FAULTS & DETECTION

Programs uploaded in Microcontroller to detect various types of faults from the underground cables. When a fault occur in the underground cables, we can find out faults through microcontroller and LCD display which displays the faults in Kilometre.

The faults created are manually by using switches. Cable has many types. Every cables has different resistance which mainly depends upon the material. The value of the resistance is depends upon the length of the cable wire. If any changes occur in the resistance, the value of the voltage will be changed that particular point is called Fault. Faults has many types & are given below.

A.Short Circuit Fault

A short circuit fault occurs when there is an insulation failure between phase conductors or between phase conductor and earth or both. An insulation failure results into formation of a shortcircuit path that triggers a short-circuit conditions in the circuit.

B.Open Circuit Fault

An open-circuit fault occurs if a circuit is interrupted or interfered by any failure. If the circuit is not closed that is called open circuit fault.

C.Earth Fault

An earth fault is an inadvertent contact between an charged conductor and earth or equipment. The return path of the fault current is through the grounding system and any personnel or equipment that becomes part of that system.

III. BLOCK DIAGRAM DESCRIPTION

The proposed system detects underground cable fault distance from base station using ohms law, microcontroller and relay switches concept. It is classified in four parts as shown in Fig.1.

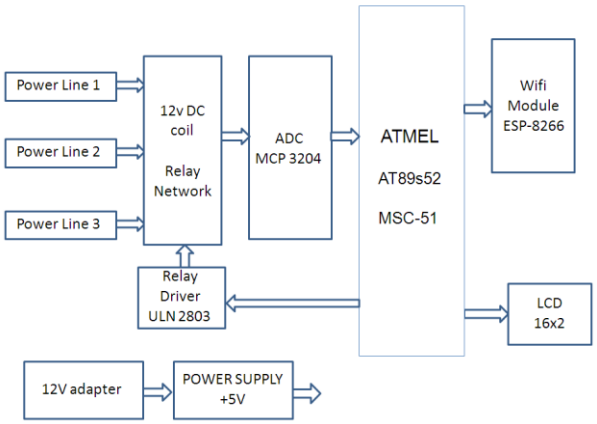

Fig.1. Block diagram of system

A. DC power supply

This part consist of AC supply of 230V is step-down using¬ step down transformer, full wave bridge rectifier converts AC signal to DC & regulator is used to produce constant DC voltage.

B. Cable fault detection

This part is denoted by set of resistors and three phase cable 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 due change in length of the resistor.

C. Controlling

Next is controlling part which consists of ADC which¬ receives input from the current sensing circuit as AC input, converts this voltage into digital signal and then it feeds the microcontroller with that signal. The microcontroller also a part of the controlling unit and makes necessary calculations regarding the distance of the fault according to our program.

D .Display part

This part consists of the LCD display which is interfaced to the microcontroller¬ which shows the status of the cable and the distance of the cable from the base station, in case of any fault.

The proposed system uses the simple concept of OHMs law where a low DC voltage is applied at the feeder end through a series resistor. In case there is a short circuit current would vary depending upon the length of fault of the cable. The voltage drop across series resistor changes accordingly which is then fed to an¬ ADC to develop digital data which the programmed microcontroller would display the same in Kilo meters. The system consist of few set of resistors representing cable length in KMs eg. 1kohm resistor for 1km cable.

IV. COMPONENTS

The system comprises of the following components:-

A. Step Down Transformer

The power supply section consists of step down transformer which is 230V step down to 12V. As we know that step down property of transformer depends upon the no. of turns in primary and secondary windings i.e N1:N2 ratio.

B. Rectifier

The output of the transformer is fed to the rectifier. It converts AC into pulsating DC. The rectifier may be a half wave or a full wave rectifier. In this system, a bridge rectifier is used because of its added advantage like good stability.The circuit has 4 diodes connected to form a bridge. A rectifier is an electrical component that converts alternating current, which periodically reverses direction, to direct current, which flows in only one direction. The process is known as rectification. Rectifiers have many uses, but are often found serving as device for DC supplies and high-voltage direct current power transmission systems. Rectification may serve in roles other than to generate DC for use as a source of power.

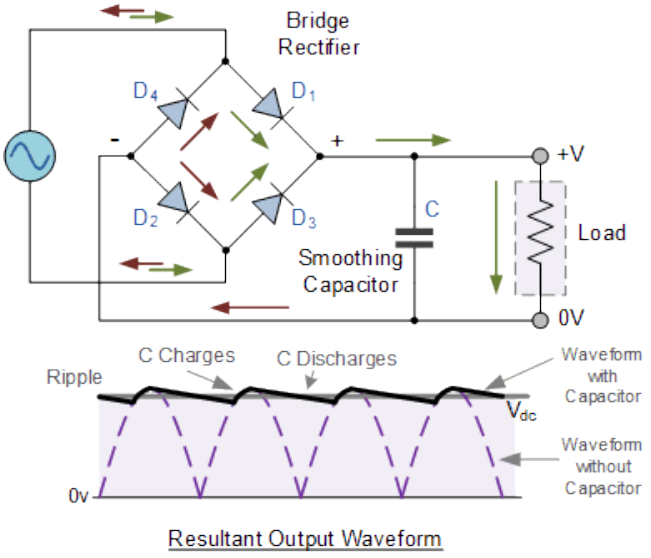

Fig.2. Circuit diagram of rectifier

C. Voltage Regulator

A voltage regulator is generally made up zener diode in which voltage regulation is achieved by operating this diode in reverse bias.In the proposed system, power supply of 5V and 12V are required. These voltage levels can be obtained by using 7805 and 7812 voltage regulators. The first number 78 represents positive supply and the numbers 05, 12 represent the required output voltage levels. The L78xx series of 3-terminal positive regulators is available.

D. ADC

The MCP3204 is 12-bit Analog-to-Digital Converter combines high performance and low power consumption in a small package, making it ideal for embedded control application system. The MCP3204 features a successive approximation register architecture and an industry-standard serial interface, allowing 12-bit ADC capability to be added to any microcontroller. The MCP3204 features 100k samples/second, hence used for low error output giving high resolution of the input analog signal.

E. Microcontroller

8051 microcontroller is an 8-bit family of microcontroller developed by Intel in 1981. This is one of the popular family of microcontroller being used in the world. This 8051 microcontroller was also referred as “system on the chip” because it has 128 bytes of RAM, 4Kb of ROM, 2 Timers, 1 Serial port, and 4 ports on a single chip. The CPU can work for only 8bits of data at time because 8051 is 8-bit processor. In case the data is more than 8 bits then it has to be broken into parts so that the CPU can process conveniently. Most manufacturers have put 4Kb of ROM even though the quantity of ROM can be exceeded up to 64 Kb.

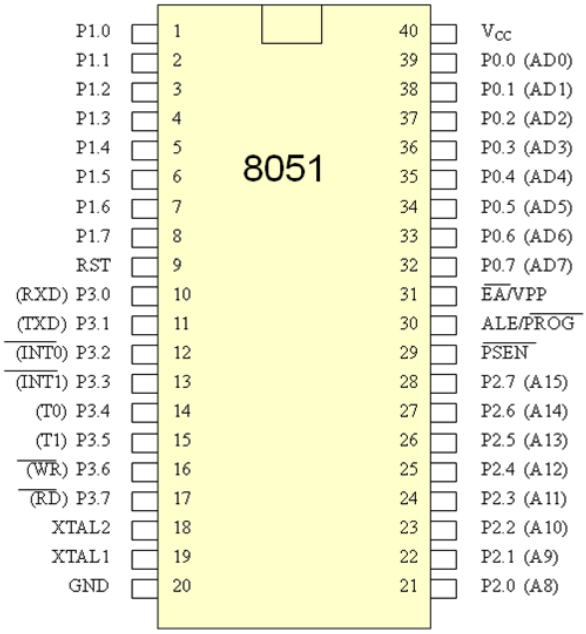

Fig.3. Pin diagram of microcontroller

F. LCD

Liquid crystal display (LCD) are interfacing to microcontroller.Most commonly LCD used are 16*2 & 20*2 display. In 16*2 displaY, 16 represents column & 2 represents rows. LCDs are available to display arbitrary images (as in a general-purpose display) or fixed images with low information, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in digital clock.

G.Wi-fi Module

The ESP8266 WiFi Module is an integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network and thus acts as host . The ESP8266 is capable of hosting an application data and updating over server address in particular interval. Each ESP8266 module is pre-programmed with an AT command set firmware, you can simply connect microcontroller and get about as much WiFi-ability as a WiFi Shield offers. The ESP8266 module is an highly cost effective board with a huge, and ever growing, community.

V. ALGORITHM AND FLOWCHART

A. 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.

B. FLOWCHART

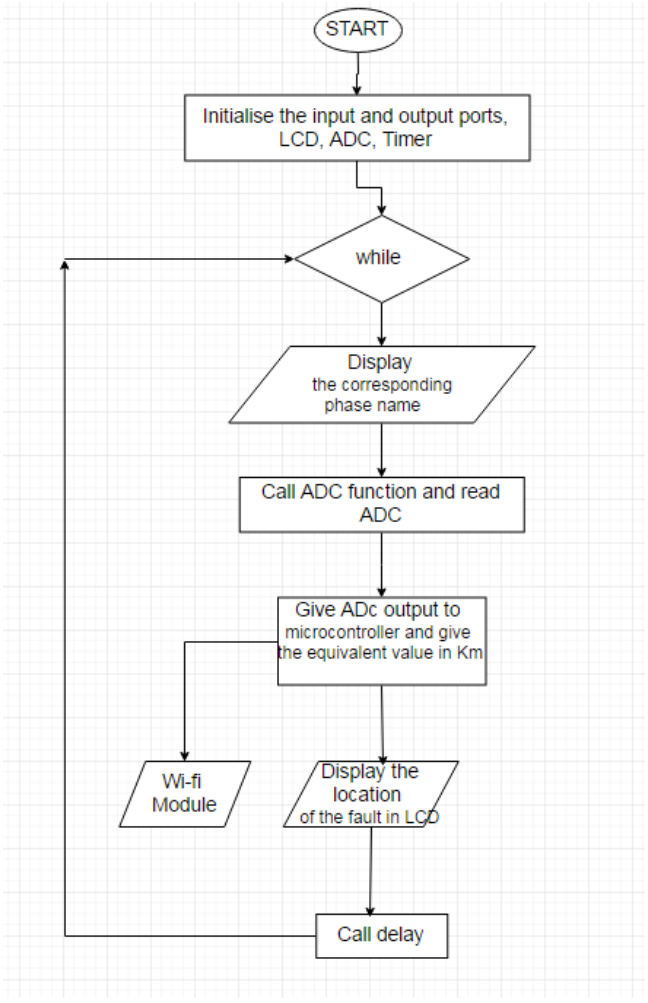

Fig.4. Flowchart of the system

VI. CONCLUSION

It's a difficult task to identify the Short Circuit faults in underground cables in an appropriate phase. By using Ohms law we can find out exact fault location in particular phase of wire. Once faults occur in the cable, with the help of micro¬ controller and the display unit displays the exact fault location that occurs in appropriate phase of the cable to a dedicated website with the help of IOT. Buzzer system is used to create an alerting signal which is¬ helpful to humans if there is an any failure in updation of data to dedicated website. Buzzer system create a alerting sound signal, once if the¬ fault occur in the underground cable which help us to solve the problem as earlier as possible.

VII. FUTURE SCOPE

The proposed system in this paper detect only the location of Short Circuit fault in underground cable line, and also detect the location of open circuit fault, to detect the open circuit fault capacitor is used in circuit which measure the change in resistance & calculate the distance of fault. For future research, the system would proceed with similar neural networks structure for different types fault section and fault location estimation.

VIII. REFERENCES

[1] Jitendra Pal Singh, Narendra Singh Pal, Sanjana Singh, Toshika Singh, Mohd. Shahrukh, "UNDERGROUND CABLE FAULT DISTANCE LOCATOR" International Journal of Scientific Research and Management Studies (IJSRMS) ISSN: 2349-3771 Volume 3 Issue 1, pg: 21-26

[2] Shunmugam.R, Divya., Janani.T.G, Megaladevi.P , Mownisha.P, "ARDUINO BASED UNDERGROUND CABLE FAULT DETECTOR" International Journal of Recent Trends in Engineering & Research (IJRTER) ,Volume 02, Issue 04; April - 2016 [ISSN: 2455-1457]

[3] Nikhil Kumar Sain, Rajesh Kajla, Mr.Vikas Kumar," Underground Cable Fault Distance Conveyed Over GSM" IOSR Journal of Electrical and Electronics Engineering (IOSRJEEE), Volume 11, Issue 2 Ver. III (Mar. – Apr. 2016), PP 06-10

[4] Dhivya Dharani.A, Sowmya.T "UNDER GROUND CABLE FAULT DETECTION " International Engineering Research Journal (IERJ) Volume 2 Issue 2 Page 417-419, 2016, ISSN 2395-1