



# IMPLEMENTATION OF IOT TO DETECT AND DISPLAY UNDERGROUND CABLE FAULT

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## ABSTRACT

This paper proposes the underground fault location module for the detection of fault using the internet of things (IOT) that means all the information can be transferred by means of internet. We know that in urban areas, the electrical cables can be run through underground instead of overhead lines. Underground cables are good compared to the overhead lines but whenever the fault occurs in underground cable it is very difficult to detect the exact location of the fault for the work of repairing that particular cable fault. So to overcome by this problem our project can hopefully be able to find out the exact location of the fault in kilometers by using the PIC16F877A microcontroller. The basic principle of this project is simple Ohm's law. When a low DC voltage is applied at the base station end through a series resistor (representation of cable lines in kit), then the current would vary depending upon the distance and location of the fault in the cable, as we know that the resistance is proportional to the distance. Then all the information can be displayed on LCD by using a Wi-Fi module it can be transferred to the base station by using IOT we can clear the fault quickly compare to other techniques.

**Key word:** IOT, microcontroller, Wi-Fi module

## 1. INTRODUCTION

With the development and modernization in technology, many things are changing in present days. As technology upgrades it makes all the works very easy and it also provides importance of technology in a wide range of areas for the implementation like in modern cities, the electrical power lines run underground cables instead of overhead lines, because it occupies less space and is the effective and efficient way of power transmission to the loads. But one of the major problems exists when there is any fault in the underground cable it is too difficult to detect the exact location of the fault. So we cannot do the process of repairing that particular cable fault quickly. As it is very difficult to find the exact location of the fault manually. At present many techniques and ideas have already been implemented in order to find out the exact fault location in the underground cable. But these existing methods we cannot find out the exact location of the fault and also information regarding to the fault in the cables because it is an underground cable system. In order to fill those requirements, we are presenting the new technique which detects the exact location of the fault and also time of fault occurrence through the means of IOT.

### 1.1 Types of Faults in Cables:

There are mainly 3 types of fault occur in the underground cables

#### 1. Open Circuit Fault

The break or opening in the conductor of the cable, it is called open circuit fault of the cable. In olden days the open circuit fault can be determined by using the megger. For this reason, the three conductors of the 3-core cable at the far end are shorted and earthed. Then resistance between the earth and each conductor is measured by means of megger device. When there is no fault occur in the cable the megger will indicate zero resistance. The megger will indicate infinite resistance in its circuit whenever the fault occurs in the cable.

#### 2. Short Circuit Fault

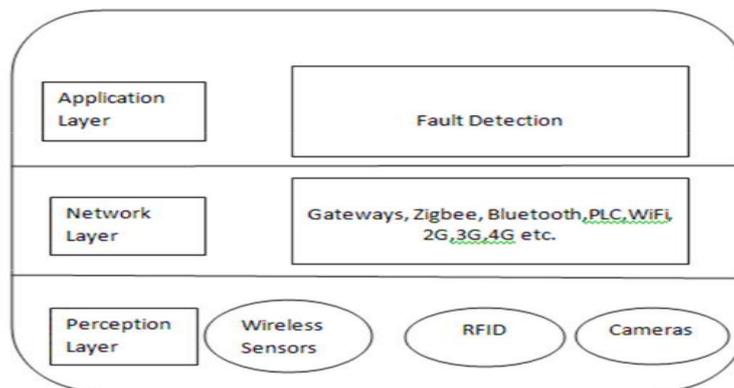
Short circuit fault occurs when two conductors of the cables can contact with each other due to the failure of the insulation of the cable then this type of the fault is called as short circuit fault. For finding these type of faults megger are used, the two terminals of the megger can be connected to the two cables then megger shows the zero reading there is a fault occur in the cable and vice versa.

#### 3. Earth Fault

The conductor of the cable comes in contact with earth, it is called earth fault. To identify earth or ground fault, Megger is used i.e one terminal of the megger is connected to the conductor and the other terminal connected to earth. When the megger connected to the conductor indicates zero then conductor is earthed and vice versa.

## 2. INTERNET OF THINGS:

IOT is the wireless technology to connect power industry assets and many works I e in offices, companies and other sectors for the purpose of minimizing the cost and fast work. The applications of IOT a wide range of applications such as energy systems, homes, industries, cities, logistics, health, agriculture and so on. The goal of IOT is not just only connecting things such as machines, devices and appliances, but also allowing the things to communicate, exchanging control data and other necessary information while executing applications. IOT system is consisting of three layers: the perception layer, the network layer, and the application layer as shown in Figure. The perception layer consisting of wireless sensors RFID cameras and Bluetooth these are all the internet enabled devices through which it can transfer the information to the other system through the internet. Network layer is the middle layer of the IOT that connects the perception and application layers of IOT system it can consisting of a 2G,3G,4G,PLC etc. for the transmission of the information to the upper layer.Application layer it is the upper layer of the IOT system that can displays the all the information regarding to the fault.



**Fig Architecture of IOT**

## 3. METHODOLOGY

The proposed system is an IOT enabled underground cable fault detection system. The basic principle behind the system is Ohms law. When fault occurs in the cable, the voltage varies which is used to calculate the fault distance. The system consists of Wi-Fi module, Microcontroller, and Real-Time Clock. The block diagram of the fault detection system is shown in the Figure. The power supply is provided using step-down transformer, rectifier, and regulator. The current sensing circuit of the cable provides the magnitude of voltage drop across the resistors to microcontroller and based on the voltage the fault distance is located.

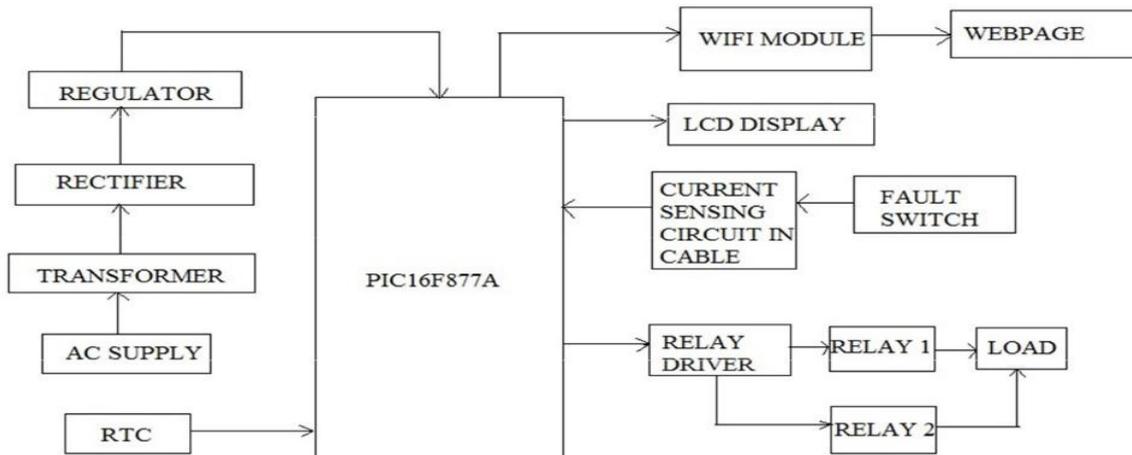
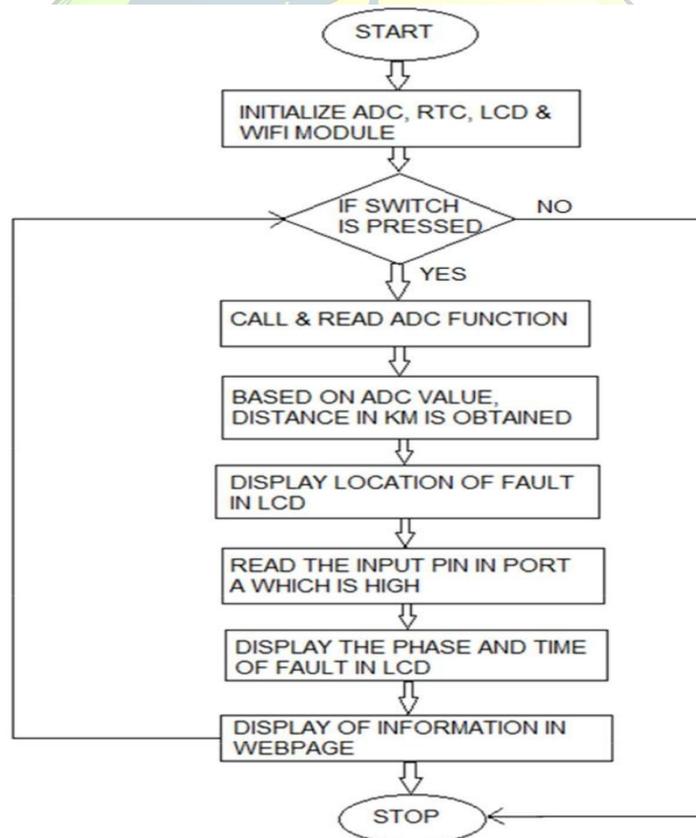


Figure 2 Block Diagram of Fault Detection system

3.1 FLOW CHART:



The flow chart of the logic behind the fault detecting system is given in Figure 3. The input and output ports of Microcontroller, LCD display, RTC and Wi-Fi module of the system are configured and initialized. When fault occurs (switch is pressed), the fault distance, time and phase are displayed corresponding to that fault. The above fault information will be displayed in the webpage using Wi-Fi module.

The above flow chart can clearly gives the working of our project, initially we start the system by pressing start button then all the components i e ADC,RTC,LCD and wi-fi module are turned on so by this initialization the system is ready to operation.



Whenever the fault occur in the underground cable fault alarm activated and gives the sound and fault signal given to the ADC function here analog signal of the fault can be converted into the digital data for the easy operation then based on the digital data of ADC the distance of the fault in km can be displayed in the LCD display. Here we considered the basic parameter to find the distance is resistance. Then distance of the fault and the exact time of fault occur can be displayed on the LCD. The exact time of fault occurrence can be find out by the RTC component.

Then all the information i e type of fault,time of fault occur can be transferred to the main station through IOT then these information can be displayed in the web page in controlling computer then we can take immediate action of clearing the fault because we know the exact location and time of fault occurrence so we can quickly repair the fault in underground cable.

#### 4. RESULT

As many researches came up with there ideas for the detection and location of the fault in underground cable but somewhere they are not able to find the exact location of the fault but some of the researches can find the location and fault in cable but it having a long algorithm procedure to find out the location so time requirement is more so by these it is not economical so implementation of our proposed system can be hopefully able to find out the fault and nearly exact location of the fault in underground cable by using IOT and also find the exact time fault occurrence by RTC i e real time clock.

#### 5. CONCLUSION

This proposed system can find the both short circuit and open circuit fault in the cable by the using we can find the exact location,type of fault,and the exact time of fault occurrence by using PIC16F877A microcontroller and ESP8266 wi-fi module for the displaying all the information on the web page so the benefits of our system is by knowing exact position so the repairing of fault is easy and also less cost so it can be very economical compare to other system.

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