# ARDUINO CABLE FAULT DETECTOR "A SURVEY"

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## ABSTRACT

The work is intended to compare and detect the location of fault in underground cable lines from the base station to exact location in kilometers using an Arduino micro controller kit. In the urban areas, the electrical cable runs in undergrounds instead of the overhead lines. Whenever the fault occurs in underground cable it is difficult to detect the exact location of the fault for process of repairing that the particular cable. The proposed system finds the exact location of the fault. This system uses an Arduino micro controller kit and a rectified power supply. Here the current sensing of circuits made with a combination of resistors are interfaced to Arduino micro controller kit to help of internal ADC device for providing the digital data to microcontroller representing cable length in kilometers. The fault creation is made by the set of switches. The relays are controlled by the relay driver. A 16x2 LCD display connected to the microcontroller to display the information. In case of short circuit the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed Arduino micro controller kit that further displays exact fault location from base station in kilometers. The project future can be implemented by using capacitor in AC circuit to measure the impedance which can even locate the open circuited cable. Whenever fault occurs in a cable the buzzer produce the alarm to alert and to take the immediate action by field workers.

## I. INTRODUCTION

Generally we used to overhead lines. We can easily identify the faults but in rushed places and familiar cities we could not use overhead lines. So, we are moving underground cables. Underground cables used largely in urban area instead of overhead lines. We can't easily identify the faults in underground cables. This work deals with microcontroller, buzzer and LCD. This proposes greatly reduces the time and operates effectively.the Underground cables have been widely implemented due to reliability and environmental concern. To improve the reliability of a distribution system, accurate identification of faulted segment is required in order to reduce the interruption time during the fault i.e., to restore services by determining faulted the segment in timely manner. In the conventional way of detecting a fault, an exhaustive search in the larger-scale distance has been conducted. This is time-consuming and inefficient. Not only that the manpower resource isn't utilized, but also the restoration time may vary depending on the reliability of the outage information. Such as, deriving efficient technique to locate the fault can improve system reliability. Use the underground power cable is expanding due to safety considerations and enhanced the reliability in the distribution and transmission systems in recent times. Due to safety reasons and high power requirements in the densely populated areas, use of the underground cable has seen sharp hike in recent times. Till the last decade's cables were made to lay overhead & currently it is lay to underground cable which is superior to earlier method. Because underground cable are not affected by any adverse weather condition such as to storm, snow, heavy rainfall as well as pollution. But when the any fault occur in the cable, then it is difficult to locate the fault. So we will move to find the exact location of a 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 the followed in many urban areas. While fault occurs for some reason, at that time the repairing process related to the particular cable is difficult due to not knowing the exact location of cable fault.

## II. LITERATURE SURVEY

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

Before making the decision regarding the choice of the major project, the brief research was conducted to find out the projects done previously on that related topic. There were only few previous projects that dealt with the speech synthesis processing we could find out.

We had to search the topics of the few website, YouTube and books.

## III. CABLE CHARACTERISTICS

### Good Cable Insulation

When voltage is printed across any insulation system, some current leaks during, through, and around the insulation. When testing with dc high voltage, capacitive charging current, insulation acceptance current, insulation the leakage current, and by-pass a current are all present to some degree. For the concern of this document on the cable fault locating, only leakage current throughout the insulation will be considered.

For shielded cable, insulation is used to limit the current leakage between the phase conductor and ground or between two conductors of differential potential. As long as the leakage current does not exceed the specific design limit, the cable is judged good and is able to deliver electrical energy to the load efficiently.

Cable insulation may be considered good when a leakage current is negligible but since there is no perfect insulator even good insulation allows some small amount the leakage current measured in a microamperes. See Figure 1

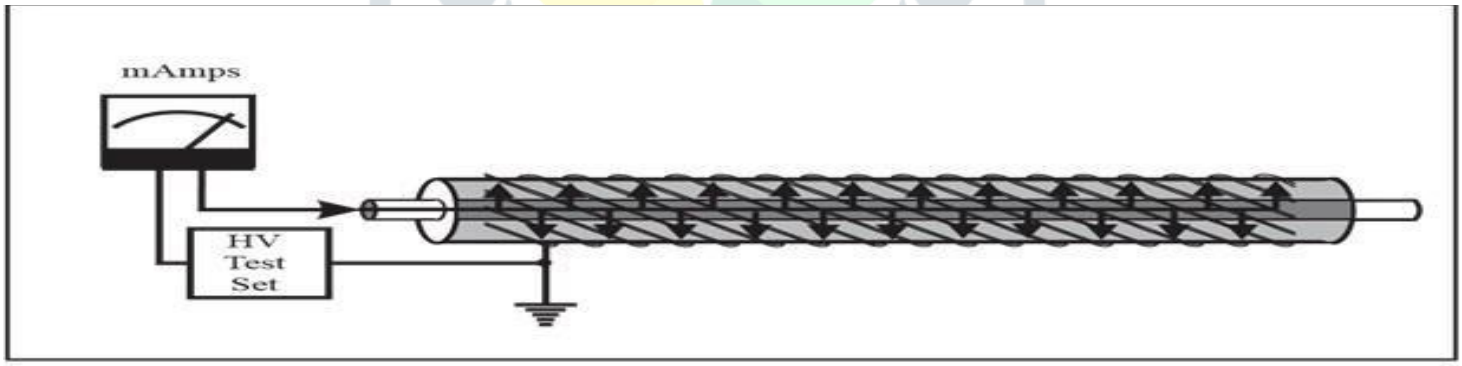



**Figure1. Good Cable Insulation**

### When Cable Insulation Is Bad

When the magnitude of the leakage current exceeds the design limit, the cable will shorter deliver energy efficiently See Figure 1.

### Why A Cable Becomes Bad

All insulation cable deteriorates naturally with age, especially when exposed to elevated the temperature due to high loading and even when it is not physically damaged. In this case, there is a distributed flow of the leakage current during the test or while energized. Many substances such as a water, oil and chemicals can contaminate and shorten the life of insulation and cause serious the problems. Cross-linked polyethylene (XLPE) insulation is subject to the condition termed treeing. It has been a found that the presence of moisture containing

contaminates, irregular surfaces or protrusions into the insulation plus electrical stress a provides the proper environment for inception and growth of these trees within the polyethylene material. Testing indicates that the ac breakdown strength of these treed the cables is dramatically reduced. Damage caused by lightning, fire, or overheating may require replacement of a cable to restore the service

## IV. RELATED WORK

Programs uploaded in the Arduino UNO kit to detect faults from the underground cables. When a fault occur in the underground cables, we can find out faults through the Arduino controller kit. LCD display which displays the faults in a kilometer . In this work of the project we created faults manually. Cable has many types. Every cables has different resistance which depends upon the material is used. The value of resistance is depends upon the length of the cable. In here resistance is leading role of the work project. If any deviation occur in the resistance, the value of the voltage will be changed that the particular point is called FAULT. We are find out those faults.

### TYPES OF FAULTS

Faults has many types. Frequently occurs the faults are given below

- Short Circuit Fault
- Open Circuit Fault
- Earth Fault

### Short Circuit Fault

A short circuit fault occurs when there is an insulation failure between phase conductors or between phase

conductor(s) and earth or both. An insulation failure results into formation of a short circuit path that triggers a short-circuit conditions in the circuit.

### Open Circuit Fault

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

### Earth Fault

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

## V. ARDUINO

### Defination of Arduino.

- The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market.
- The Arduino is open-source, which means hardware is reasonably priced and development software is free.

### History of Arduino

- Arduino started in 2005 as a project for students at theInteractionDesign Institute IvreainIvrea,Italy. At that time program students used a "BASIC Stamp" at a cost of $100, considered expensive for students.

Massimo Banzi, one of the founders, taught at Ivrea. The name "Arduino" comes from a bar in Ivrea, where some of the founders of the project used to meet. The bar, in turn, has been named after Arduino of Ivrea, who was the margrave of Ivrea and King of Italy from 1002 to 1014.

- Colombian student Hernando Barragán created the Wiring development platform which served as the basis for Arduino. Following the completion of the Wiring platform, its lighter, less expensive versions were created and made available to the open-source community; associated researchers, including David Cuartielles, promoted the idea. The Arduino's initial core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis.

## VI. CABLE ROUTE TRACERS/LOCATORS

Before attempting to locate the underground cable faults on direct buried primary cable, it is necessary to know where the cable is located and what a route it takes. If the fault is on secondary cable, knowing the exact route is even more the critical. Since it is extremely difficult to find a cable fault without knowing where the cable is, it makes sense to master the cable locating and tracing and to do acable trace before beginning the fault locating process.

Success in locating or tracing the route of electrical cable and metal pipe depends upon knowledge, skill, and perhaps, most of all,

- Is the cable shielded or unshielded?
- Is the cable direct buried or in conduit?
- Are there metal pipes or other underground structures under, over or near the target cable?
- Is the target cable connected to other cables or pipes through grounded neutrals?

It just as important to understand how the equipment works as it is to be thoroughly familiar with exact equipment being is used.

All popular locators/tracers consist of two basic modules:

The transmitter — an ac generator which supplies the signal current on the underground cable or pipe to be traced.

The receiver — detects the electromagnetic field produced by the transmitted ac current flow. See Figure

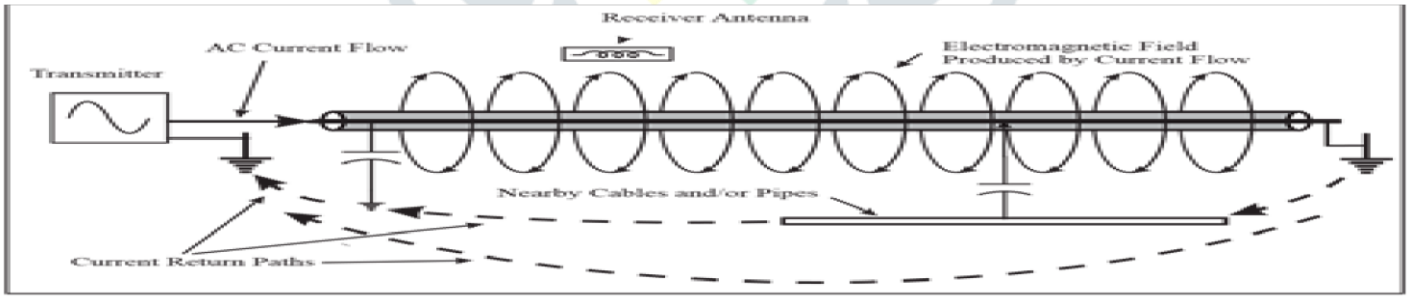
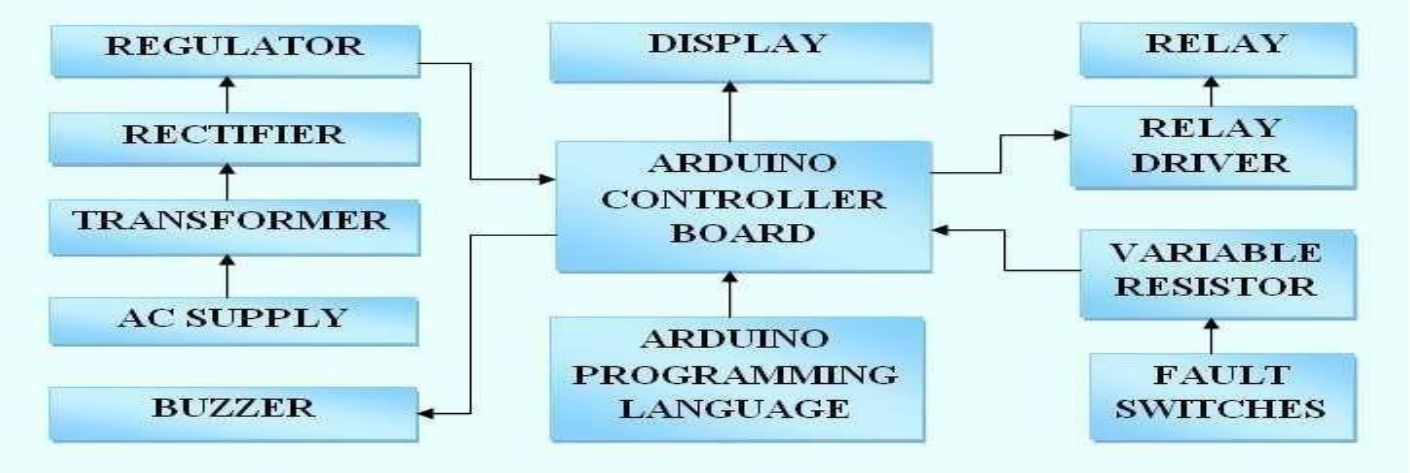



**Figure . How cable locator work**

## VII. PROPOSED SYSTEM

The underground fault detector deals with finding of the exact fault location from the base station itself. Cables have some resistance. We are mainly focusing that the resistance. Resistance can vary with respect to the length of the cable. If the length of the cable is increase, the value of the resistance will also increase. If any deviation occurs in the resistance value, we will call that is the fault point and finding that place through of the Arduino technology. That fault point is represent standard of distance (kilometer) from the base station. This value displayed by display unit.




## VIII. WORKING

Normally people have been using commercial voltage (230V). This voltage is step-down through step down of the transformer.Transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Generally, transformers are used to increase or decrease the voltages of alternating current in electric power applications. These stepdown voltage goes to rectifier unit.

Rectifier is nothing but electronic device which used to convert an AC supply into the DC supply. This project we were using bridge rectifier.12V AC supply is converts into 12V DC supply. These voltage moves to the regulator unit. Regulator is an electrical device which is used to maintain a constant voltage. Here we were using two voltage regulator. Namely voltage regulator 7812 and voltage regulator 7805.7812 voltage regulator maintains the 12V DC supply. These voltage is enough to operate relay unit and 7805 voltage regulator maintains the 5V DC supply. These voltage is used to handle the Arduino kit.

We uploaded the program in the kit. Program was written if any fault occur in the cable, immediately will open the relay terminal and disconnect that faulty line only. Rest of the other lines operates normally. Now a days embedded system changed metoricall. Arduino is the advanced version of embedded system. These Arduino has ample types but we selected Arduino UNO. These Arduino UNO helps to developed many advanced version of Arduino UNO creates user friendly environment.it easily to adopt other devices using serial port. Next we move the relay.

Relay is nothing but an electrical device here which acted as a switch if any fault occur in the line, will disconnect the line using relay. The connector of the relay moves from normally close conduct to the normally open conduct. we easily find the fault and disconnect the fault line. Display unit is connect the Arduino kit which is used to where the fault occurs and to display itself.

## IX. CONCLUSION

It's a difficult task to identify the faults in underground cables. By using Arduino controller we can find out exact the fault location. Once faults occur in the cable, the display unit displays the exact fault location that displays which phase is affected in the cable and how long it's affected and buzzer system is used to create an

alerting signal which is helpful to the humans. Buzzer system create a alerting sound signal, once if the fault occur to the underground cable

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