UNDERGROUND CABLE FAULT DETECTION SYSTEM

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Abstract—Theproject is intended to 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. This system uses an Arduino micro controller kit and a rectified power supply. Here the current sensing circuits made with a combination of resistors are interfaced to Arduino micro controller kit to help of the internal ADC device for providing digital data to the microcontroller representing the cable length in kilometers.

A 16x2 LCD display connected to the microcontroller to display the information. In case of open circuit the length of cable varies based on the location of cable cut (open). As the cable is open parallel wire capacitance gets reduced , 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 kilometres.

Keywords—Arduino, Impedance,16x2 LCD display, Underground power cables, Fault location, Frequency response, Astable circuit, Circuit fault.

I.INTRODUCTION

For most of the worldwide operated low voltage and medium voltage distribution lines underground cables have been used from many decades. To reduce the sensitivity of distribution networks to environmental influences underground high voltage cables are used more and more. Underground cables have been widely used in power distribution networks due to the advantages of underground connection, involving more security than overhead lines in bad weather, less liable to damage by storms or lightning.

Underground cables are less expensive for shorter distance, eco- friendly and it requires low maintenance. But if any fault occur in cable, then it is difficult to locate fault. So this project is used to detect the location 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. The underground cable system is very useful for distribution mainly in metropolitan cities, airport and defense services.

II. PROPOSED SYSTEM

A. OPEN CIRCUIT FAULT

Open Circuit can be detected by measuring the capacitance between two wires. Capacitance of cable changes according to the length. The length of cable varies based on the location of cable cut (open). As the cable is open parallel wire capacitance gets reduced based on this we can calculate the fault location.
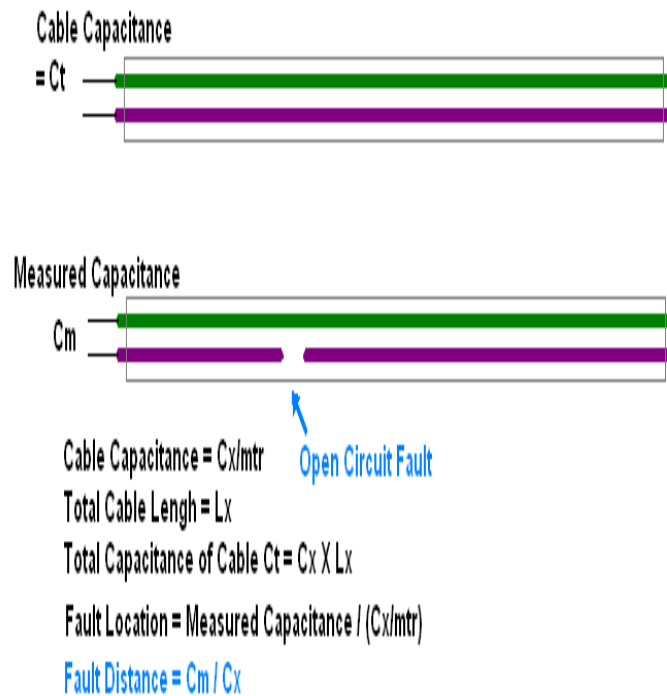
Fig .1 Cable Open Circuit Fault

The proposed system is to find the exact location of the fault. The project uses the standard concept of Ohms law i.e., when a low DC voltage is applied at the feeder end through a Cable lines, then current would vary depending upon the location of fault in the cable. In case there is a short circuit (Line to Ground), thevoltage across series resistors changesaccordingly,which is then fed to inbuilt ADC of Arduino board to develop precise digital data for display in Kilometres.

The project is assembled with a set of resistors representing cable length in KM's and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same. The fault occurring at a particular distance and the respective phase is displayed on a LCD interfaced to the Arduino board. Further this project enhanced by measuring capacitance of cable which can even locate the open circuited cable.

Capacitanceis defined as the ability of a body to store an electric charge. The SI unit of capacitance is the farad (symbol: F), named after the English physicist Michael Faraday.

A 1 farad capacitor, when charged with 1 coulomb of electrical charge, has a potential difference of 1 volt between its plates.

CAPACITANCE MEASUREMENT

Arduino capacitance meter relies on the same basic property of capacitors- the time constant. The time constant of a capacitor is defined as the time it takes for the voltage across the capacitor to reach 63.2% of its voltage when fully charged. Larger capacitors take longer to charge, and therefore have larger time constants. An Arduino can measure capacitance because the time a capacitor takes to charge is directly related to its capacitance by the equation:

TC = R x C
TC is the time constant of the capacitor (in seconds).
R is the resistance of the circuit (in Ohms).
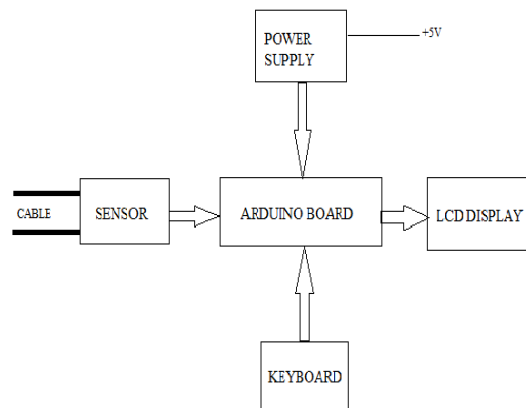C is the capacitance of the capacitor (in Farads).

B. BLOCK DIAGRAM

Fig.2 Block Diagram

C. APPLICATIONS

- Metropolitan cities
- Airport
- Defense services

D. ADVANTAGES

1) Less maintainance
2) It has higher efficiency
3) Less fault occur in underground cable
4)Underground cable fault location model are applicable to all types of cable ranging from 1kv to 500kv&other types of cable fault such as-Short circuit fault, cable cuts, Resistive Fault, Sheath faults, Water trees, Partial discharges.
5) Improved public safety.

III.RESULT

Underground cables have been widely used in power distribution networks due to the advantages of underground connection, involving more security than overhead lines in bad weather, less liable to damage by storms or lightning. It is less expensive for shorter distance, eco- friendly and it requires low maintenance. But if any fault occur in cable, then it is difficult to locate fault. So this project is used to detect the location of fault in digital way.

The fault has been detected using the basic equation of an astable circuit,

$$F = \frac{1,44}{(R1+2R2)C1}$$

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.

IV.CONCLUSION

In this project, we detect the exact location of short circuit fault in the underground cable from feeder end in km by using arduino. It's a difficult task to identify the faults in underground cables. By using Arduino controller we can find out exact 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 .Buzzer system create alerting sound signal, once if the fault occur in the underground cable.

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