



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume3, Issue2)

Underground Cable Fault Distance Locator

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Abstract: In this paper, a method to detect the fault and the distance at which the fault has occurred is calculated. The fault location in the underground cable is a bit cumbersome process so to deal with such problem a method is given in this project. To determine the location of fault a series resistor is used and the voltage across this resistor is measured and then is sent to the microprocessor to calculate the distance at which the fault has occurred. This is a safe and cheap method for obtaining the fault location in an underground cable. This method also does not have a high power requirement and is portable too.

Keywords: Underground Cable, Fault Detection, Fault Location, Microprocessor.

I. INTRODUCTION

Most of the transmission lines are laid using overhead line method but transmission line by underground method also finds its use and application over a large area. In areas like hospitals or colleges, underground cable is widely preferred to ensure safety. Underground cable installations are costly as compared to overhead cable but are more reliable and also the life of underground cable are more as compared to overhead lines.

Although underground cables are unaffected by adverse conditions like a storm, rainfall and the chances for fault in underground cables are less than that of overhead cables but when the fault happens at undergrounds cables its detection becomes difficult. So it becomes essential to calculate the distance of fault for an efficient way to employ underground cable method.

TYPES OF FAULT

Fault in a cable can be classified as:

- A.) Open circuit fault
- B.) Short circuit fault

Open circuit fault

This type of fault is caused by breaking in conducting path etc. Such fault happens when one or more phase conductor wire break. The value of current in such fault becomes zero and the load side gets isolated from the Generation side. This fault is less harmful as no current flows when short circuit fault occurs.

Short circuit fault

When conductors of different phases get connected with each other than such fault comes under short circuit fault. In this type of fault the value of current increases so it becomes harmful at the load ends.

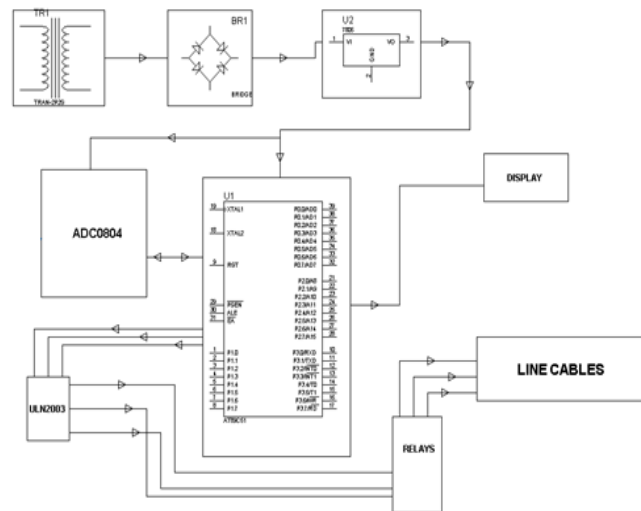
There are basically 2 types of short circuit fault:-

- i. Symmetrical Fault
- ii. Unsymmetrical Fault

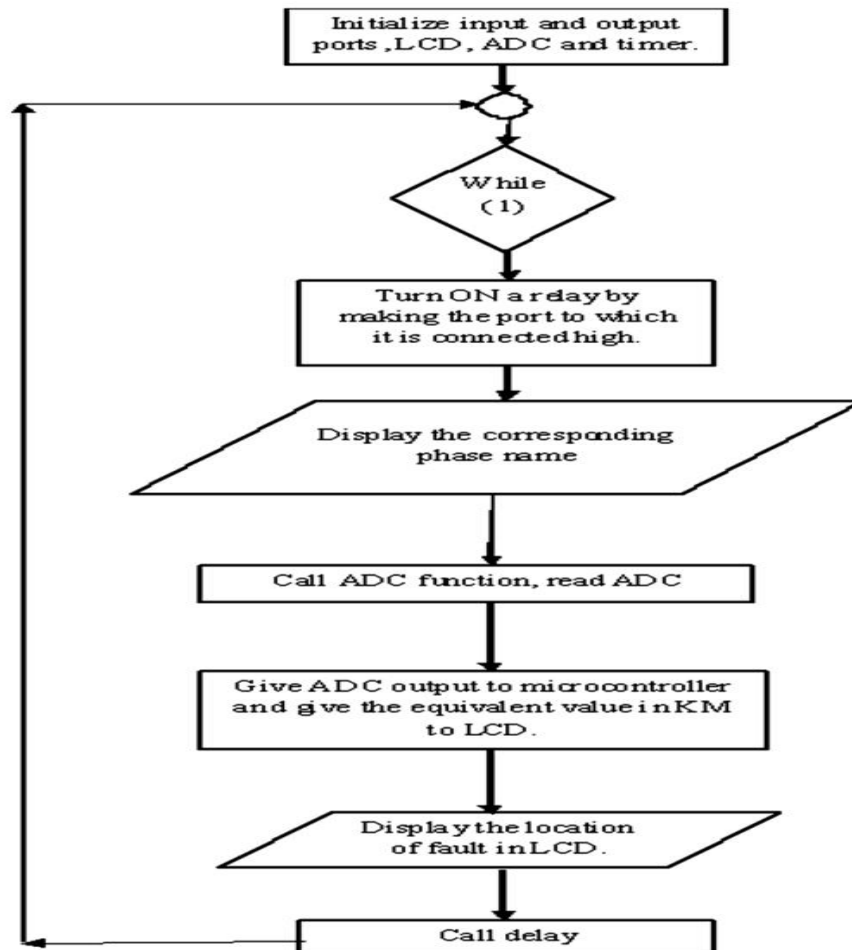
Symmetrical Fault: the 3-phase fault is called a symmetrical fault. In this, all 3-phases are short-circuited. In this fault the phase angles are unchanged but the magnitude of the current can vary.

Unsymmetrical Fault: In this fault magnitude of the current is not equal and also not displaced by 120-degree angle. The different phases are short-circuited with each other.

II. BLOCK DIAGRAM



III. FLOW CHART



IV. WORKING

The 230V AC supply is first stepped down to 12V AC using a step-down transformer. This is then converted to DC using a bridge rectifier. The AC ripples are filtered out by using a capacitor and given to the input pin of voltage regulator 7805. At output pin of this regulator, we get a constant 5V DC which is used for MC and other ICs in this project.

Working on this project employs ohm's law. The feeder is fed through a resistor by a DC supply and as per the fault occurrence, the current through this resistor changes. Now depending upon this change in resistance the voltage across the resistance also changes. This change in voltage is fed to the microcontroller via ADC which converts this voltage signal to a readable form to the microcontroller. The microcontroller is coded to read various data given by ADC and give the signal to LCD for displaying corresponding distances.

While any of the 12 switches are operated they impose conditions like the line to ground (LG), line to line (LL), and line to line to line (3L) fault as per the switch operation. Any NO point while driven to GND through the common contact point of the relay develops a current flow through R1 & any of the cables by the fault switch depending on the created fault. Thus the voltage drop at the analog to digital (ADC) pin varies depending on the current flow which is inversely proportional to the resistance value representing the length of cable in kilometers.

V. APPLICATION

Its main application is the detection of underground cable fault which is very hard to detect as it is not possible to see faults like line to line and other such faults which are quite possible in the case of overhead transmission line.

So for such cases our project is very helpful as the distance at which the fault has occurred can be calculated and then further action regarding the fault can be taken to overcome them.

CONCLUSION

In this project, the exact location of short circuit fault in the underground cable from feeder end is detected in km by using a microcontroller. For this, we use the concept of OHM's law to determine the distance at which fault is present. So that the faulty part can be removed from the line.

ACKNOWLEDGEMENT

It gives me immense pleasure to express my deepest sense of gratitude and sincere thanks to my highly respected and esteemed guide for their valuable guidance, encouragement, and help for completing this work. Their useful suggestions for this whole work and co-operative behavior are sincerely acknowledged.

I also wish to express my gratitude to Prof. Anshuman Tyagi HOD (Electrical & Electronics Engineering) for his kind-hearted support. I am grateful to my teachers for their constant support and guidance.

I also wish to express my indebtedness to my parents as well as my family member whose blessings and support always helped me to face the challenges ahead.

At the end, I would like to express my sincere thanks to all my friends and others who helped me directly or indirectly during this project work.

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