UNDERGROUND CABLE SHORT CIRCUIT FAULT DISTANCE LOCATOR

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Abstract: **The Project 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, the electrical cable runs in undergrounds instead of 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 particular cable. The proposed the system finds the exact location of the fault. This system uses an Arduino micro controller kit to help of the internal ADC device for providing digital data to the micro controller to display the information. In case of short circuit the voltage across seriece 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 an AC circuit to measure the impedance which can even locate the open circuited cable.**

Keywords: **Arduino UNO, LCD,Underground Cable.**

1.INTRODUCTION

Underground cable used largely in Urban areas instead of overhead lines.We can't simply determine the faults in the underground cables.This project deals with Arduino micro controller and LCD. This proposes greatly reduces the time and operates effectively.The underground cabling system is a common practice followed in many urban areas. Many time faults occur due to construction works and other reasons. At that time it is difficult to dig out cable due to not knowing the exact location of cable fault.

1.Open Circuit Fault:

This type of fault is caused by breaking in coducting path.Such fault happens when one or more phase conductor wire break. The value of current in this fault becomes zero.This fault is less harmful.

2.Short Circuit Fault:

When conductors of different phases are connected each other then such fault comes under short circuit fault.In this type of fault current increases so it is harmful at the load ends.

There are two types of short circuit fault-

i.Symmetrical Fault: In this all three phases are short circuited.Three phase fault is called symmetrical fault.

ii.Unsymmetrical Fault: In this fault magnitude of current is not equal and not displayed by 120 degree.

2. LITERATURE SURVEY

[1] "Principle of power system" By V. K. Mehta And Rohit Mehta, 4th Edition.

From this book we have taken the information about construction of cables, insulating materials of cables, different types of cables, various faults in cables, causes of this faults, effects of fault on cables. From this book we have also taken the information about methods for locating various types of faults in cables.

[2] "Underground Cable Fault Distance Locator" By Jitendra pal singh, Narendrasingh pal,Sanjana singh, Toshika Singh, Mohd. Shahrukh (ISSN:2349-3771) in IJSRMS , Vol. 3,Issue 1

From this IJSRM paper we have gathered information related to Simulation used in Proteus Software, this Proteus Software is generally used to develop the different simulation diagram. Hence this software is helpful to develop the simulation of underground cable fault detection technique.

[3] H. Shateri, S. Jamali "Impedance Based Fault Location Method For Phase To Phase And Three Phase Fault In Transmission Systems", IEEE 2010.

This method utilized the measured impedance by distance relay and the super imposed current factor to discriminate the fault location.This method is sensitive to the measured electrical phenomenon accuracy and super imposed current issue.

[4] In Abhishek Pande , Nicolas H. Younan (2010) 'Underground cable fault detection and identification via fourier analysis'-International Conference on High Voltage Engineering and Application , 11-14 Oct. 2010.

The methods of electrical resistance calculation via sending end voltage and differential voltage can be used for differentiating between the different types of cable defects from phase information.It need study to be conducted to find the best way of visualizing the results, especially the magnitude response.

3.BLOCK DIAGRAM

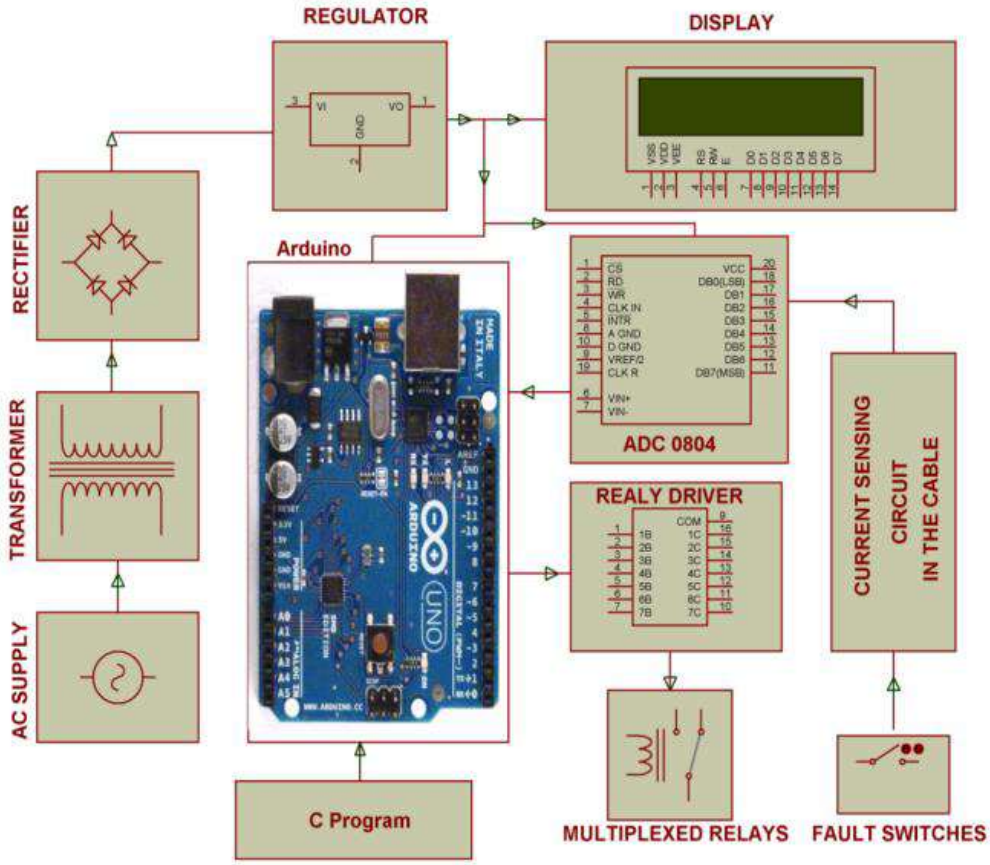

Fig.1 Block Diagram

Block Diagram Description

Block diagram consist of:

1) Arduino
2) Power Supply
3) Trasformer
4) Rectifier
5) Voltage Regulator
6) LCD
7) Relay
8) Resistor

The 230V AC supply is first stepped down to 12V AC using a 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 that converts this voltage signal to a readable type 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 groun(LG),lineto 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.

4.SIMULATION DIAGRAM

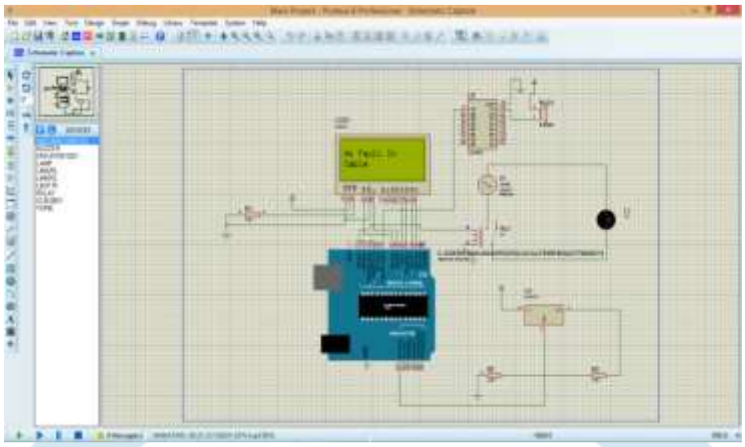

Fig.2 Simulation Diagram without fault

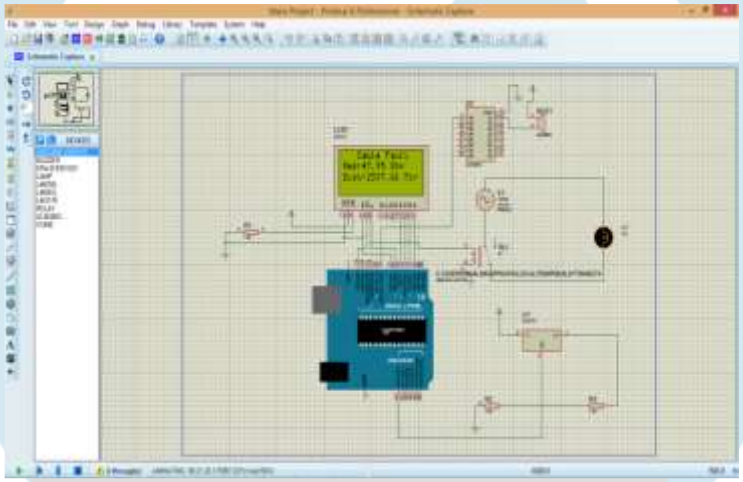

Fig.3 Simulation Diagram with fault

5.ALGORITHM

Step1: Initialize the ports, declare timer, ADC, LCD functions.
Step2: Begin an infinite loop; activate relay 1 by making pin 0.0 high.
Step3: Display -R at the starting of first line in LCD.
Step4: call ADC function, relying upon ADC output, displays the fault position.
Step5: Call delay.
Step6: Repeat steps 3 to 5 for other two phases

6.FLOWCHART

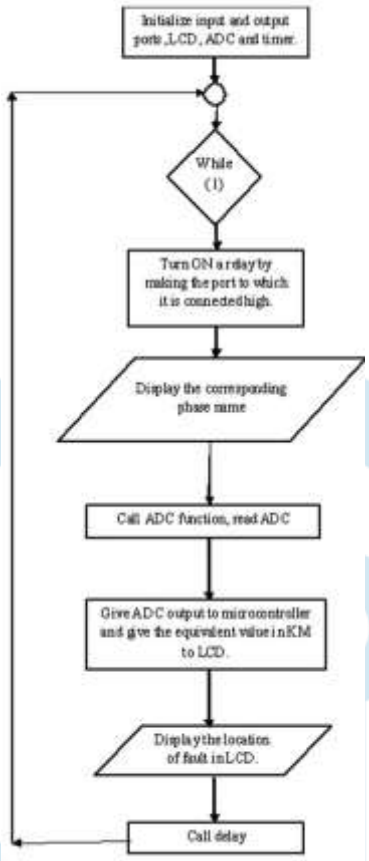

Fig.4 Flowchart

7.HARDWARE DESCRIPTION

Power Supply Unit:
The power supply circuit consists of step down transformer which is 230v step down to 12v.In this circuit 4diodes are used to type bridge rectifier which delivers pulsating dc voltage and then fed to capacitor filter the output voltage from rectifier is fed to filter to eliminate any a.c.components present even after rectification.The filtered DC voltage is given to regulator to produce 12v constant DC voltage.

Transformer:
The transformer below is the first part of the regulated power supply. To lower the sector 230V AC, we need a transformer down. Here is the main feature of the electronic transformer.
1. Power transformers are generally designed to operate from a low impedance source at a single frequency.
2. It is necessary to build with sufficient insulation of the necessary dielectric.
3. Notice transformers are in, volts. The volt amplifier of each of the winding or secondary windings is added to the secondary VA total. To this are added losses.
4. Raising the temperature of a transformer is decided on two well-known factors, namely unit losses provided by transformer dissipation and heat or cooling.

LCD Display:
Liquid crystal display are interfacing to microcontroller 8051.Most commonly LCD used are 16*2 and 20*2 display.In 16*2 display means 16 represents column and 2 represents rows. LCDs are available to arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Relay: Relay is sensing device which senses the fault and sends a trip signal to circuit breaker to isolate the faulty section. A relay is an automatic device by means of which an electrical circuit is indirectly controlled and is governed by change in the same or another electrical circuit.
There are various types of relay: Numerical relay, Static relay and electromagnetic relay. Relays are housed in panel in the control room. Here three mini power relay are used each for one of the three phases. The relays periodically scan the three phases and send the signal to the arduino controller. The rating of each of the relays is about 12V.

Voltage Regulator:
A voltage regulator is an electrical controller designed to automatically maintain a constant voltage level. In this project, a 5V and 12V power supply is required. To achieve these voltage levels, voltage regulators 7805 and 7812 must be used. The first number 78 represents a positive supply and the numbers 05, 12 represent the required output voltage levels. The L78xx series of three terminal positive regulators is available IC 7805 (Voltage Regulator IC.

8.ACKNOWLEDGEMENT
We would like to thank our guide Prof.S.N.Yadav of Electrical department for the valuable guidance and constructive suggestions,this helps us in making our project**.**

9.FUTURE SCOPE
In this we detect extra location of short circuit fault in the underground cable from feeder end in km by using arduino.In future , this project can be implemented to calculate the impedance by using a capacitor in an AC circuit and thus measure the open circuit fault.For future research, proceed with similar network structure for fault section and fault location estimation.

10.CONCULSION
It is difficult task to identify the faults in underground cable. By using Arduino controller we can find out exact fault location.
This circuit is assemble to detect open circuit fault,short circuit fault.Once fault occure in the cable we display unit displays the exact fault location that displays,which phase is affected in the cable and how long it is affected.

REFERENCES:
[1]"Principle of power system" By V. K. Mehta And Rohit Mehta, 4th Edition.
[2] "Underground Cable Fault Distance Locator" By Jitendra pal singh, Narendrasingh pal,Sanjana singh, Toshika Singh, Mohd. Shahrukh (ISSN:2349-3771) in IJSRMS , Vol. 3,Issue 1
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