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Defective Cable Recognition Beneath Ground

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Abstract- *The project is based on identifying the underground cable faults using an arduino micro controller kit. Still in many 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/proper location of the fault. The proposed system finds the exact location of the fault using relay circuit. This system uses an Arduino 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 signal to the microcontroller representing the cable length in kilometers. The fault creation is too made by the set of switches. The relays are controlled by the relay driver circuitry. A 16x2 LCD display is connected to 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 further displays exact fault location from base station in kilometers. Whenever a fault is seemed in a cable the buzzer produces the alarm to alert and to take* lines mainly in citie*an immediate action by field workers.*

Keywords- Arduino UNO, Fault Location, LCD, Ohm's law, Underground Power Cables.

I. INTRODUCTION

Generally we make use of overhead s thus we can easily identify the faults, but in rushed places or familiar cities we couldn't use overhead lines. So, instead of using upper connection there we use underground cables. But the problem is when a fault occurs it becomes difficult to detect. This leads to digging of the entire area to know where the fault is which in turn causes wastage of money and manpower. So it is necessary to know the exact location of faults in the underground cables.

In the paper, following system is to find the exact location of fault using Arduino Microcontroller Kit. The system uses the standard concept of Ohm's law that is when a low D.C. voltage is applied at the feeder end through a series resistors, then current would vary depending upon the location of fault in the cable in case of short circuit the voltage across series resistors changes accordingly which is then fed to inbuilt ADC of Arduino board then it is assembled with a set of resistors representing cable length in KM and fault creation is made by a set of switches at every known kilometer KM and occurred fault displayed on a LCD display which is interfaced to the Arduino Board.

Many time the fault occurs due to construction works and many other reasons. There are main two faults in cable that is short circuit and open circuit.

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II. DESIGN METHODOLOGY

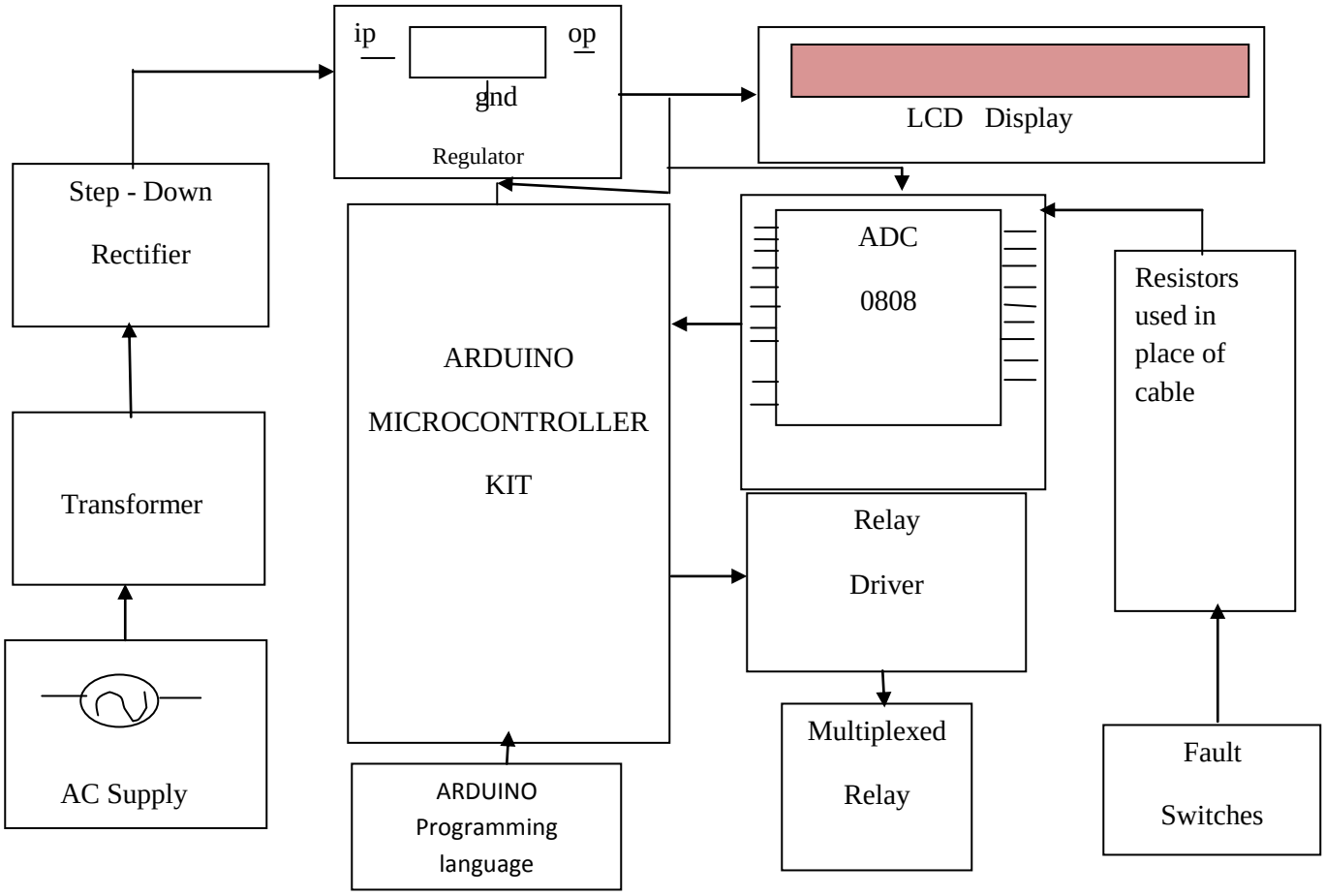

FIG. 1: Block Diagram

2.1 Description

There is one relay for each phase R, Y and B as three relays are used and the common points of the relays are grounded and the NO points are connected to the inputs of R17, R21 and R25 and being the three phase cable input.As supply needed for the relays is higher than that of the arduino, A Relay driver is used for boosting the supply and provide it to the relays. Power supply of 230V AC is applied to the transformer from where it is stepped down to 12V AC. From the transformer the alternating current gets converted into direct current when it pass through a Bridge wave rectifier. The 12V DC then goes to the voltage regulator where it gets converted from 12V DC to 5V DC. Voltage regulator is used also converts the variable Dc supply into constant DC supply. This 5V DC is used to supply power to the arduino and the LCD. Power supply to the LCD is given from a voltage regulator. When a fault is induced by operating any of the 12 switches (to F position), they impose conditions like LG,LL and LLG fault as per the switch operation. As a result of the fault, there is some change in voltage value. This voltage value measured

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across the resistance is fed to the ADC of the Arduino. Using this value, the arduino computes the distance. Finally the distance of the fault from the base station is displayed in terms of kilometers.

2.2 Working of project

This circuit consists of a power supply, 4 line display, Arduino and resistance measurement circuit. To introduce faults manually in the kit, fault switches are used. About 12 fault switches are used which are arranged in three rows with each row having 4 switches. These 3 rows represent the 3 phases namely R,Y and B. The fault switches have two positions-1.No fault position(NF) and 2.fault position(F).Main component of the underground cable fault detection circuit is 'low value resistance measurement'. It is constructed using a constant current source of 100mAmps. It can measure very low value resistance as the cables have around 0.01 Ohm/m resistance. For a 10m cable, resistance becomes 0.1 Ohm. This circuit can measure resistance up to 50 Ohm, Maximum cable length it can check approx. 4 kilometers. So starting from the reference point 4 sets of resistances are to be placed in series. These 4 sets of resistances represent the three phases and one neutral. Short circuit faults, Symmetrical and unsymmetrical faults can be determined using this method. The paper uses three set of resistances in series i.e.R10- R11-R12-R12,R17-R16-R14R21,R20-R19-R18-R25 One for each phase. Each series resistor represents the resistance of the underground cable for a particular distance and so four resistances in series represent 1-4kms.Value of each resistance is 10kΩ.

2.3 Short circuit Faults

Short circuit faults can be viewed as an abnormal connection of very low impedance between two points of different potential, whether made intentionally or accidentally. These are the most common and hazardous kind of faults, resulting in the flow of abnormal high currents through the equipment or transmission lines. If these faults are allowed to present there even for a short period, it leads to the extensive damage to the equipment. Short circuit faults are also called as shunt type faults. These type of faults are caused due to the insulation failure between phase conductors or between earth and phase conductors or both. The various possible short circuit fault conditions include three phase to earth, Phase to phase, Single phase to earth, two phase to earth and a phase to phase fault. In a single line to ground fault, fault occurs between any one of the three lines and the ground.

III. ADVANTAGES

1. Less maintenance

2. It has higher efficiency

3. Less fault occur in underground cable

4. This method is applicable to all types of cable ranging from 1kv to 500kv

5. It can detect other types of cable fault such as Short circuit fault, cable cuts, Resistive fault, Sheath faults, Water trees,

Partial discharge

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IV. RESULT

In the paper PCB layout of underground cable fault detection is designed using Eagle software where implementation of three phases along with one neutral line is done, which is shown below in fig.no-2.

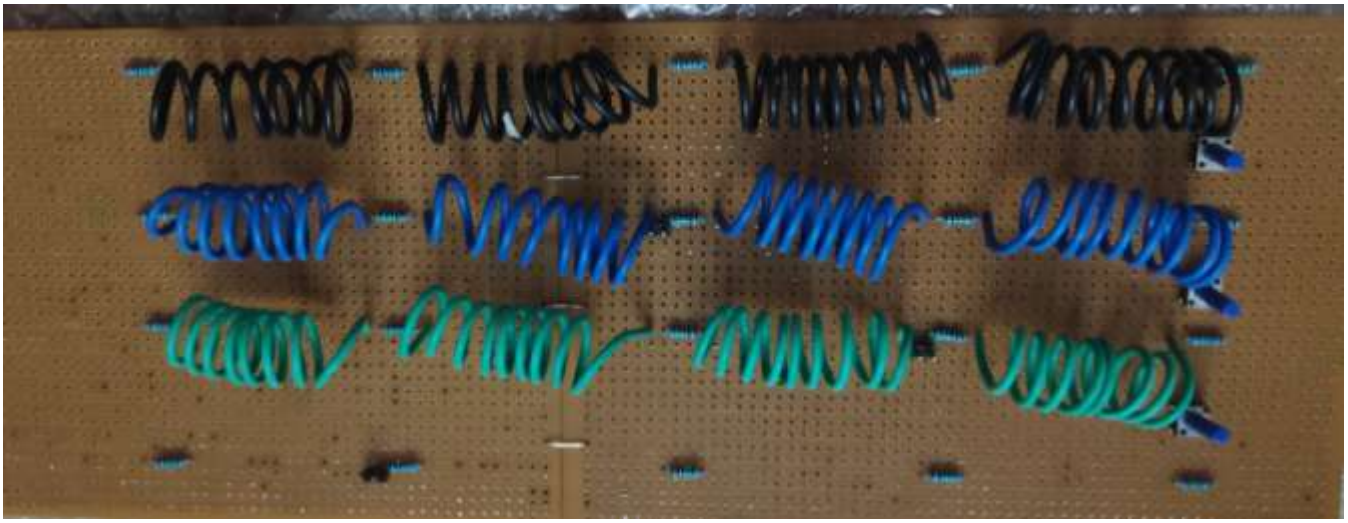

FIG. 2: PCB connection

V. CONCLUSION

Project on Defective Cable beneath Ground using Arduino is to be done and the distance of the fault from the base station in kilometers will be going to be displayed for three individual phases R, Y and B. Circuit can be tested with different resistor values to determine various fault conditions. In this mechanism faults up to a distance of 4km can be detected. When the fault switches are induced to fault condition then the phase corresponding to that particular switch is considered as the faulty phase. So this faulty section can easily be located.

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