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Underground Cable Fault Detector Using Smart Technology

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Abstract: Everywhere the electrical cable work is preferably underground because it is not easily damaged and also not affected by weather, therefore more reliable and has no risk of electrocution. Whenever a fault occurs within the underground cable, it is very difficult to find out the exact location of the fault for the exact cable. The main concept of this project is to find the distance of underground cable fault from the base station in kilometres. This project uses Ohms Law concept, when a low voltage DC is applied to the feeder end through a series resistor, then the current would differ based on the location of fault occurred in the cable. There are three types of cable fault like an open circuit fault, short circuit fault, ground fault or earth fault. All these types of faults are detected by the prototype of our project. The model uses Power supply , Arduino microcontroller , 16*2 liquid crystal display , GSM, Transformer, Rectifier, Voltage regulation, DC 0804,Relay, Relay driver, Fault Switches, Buzzer.

Keywords: Underground cable, Underground cable fault, Arduino.

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I. INTRODUCTION

Underground cable is that buried under the ground. This distributes electric power. Cable are made of one and many types of material with suitable insulation and a protective covers. Underground cables are usually classified according to their Voltage ratings.

1. Low tension cables which have a maximum voltage handling capacity of 1000V
2. High tension cables which have a maximum voltage handling capacity of 11kV
3. Super tension cables which have a maximum voltage handling capacity of 33kV
4. Extra high tension cables which have a maximum voltage handling capacity of 66kV
5. Extra super voltage cables which are used for applications with voltage requirement above 132kV.

A cable may have one or more than one core depending upon the type of service for which it is intended. It may be (a) Single-core (b) Two core (c) Three core (d) Four core etc. For a 3-phase service, either 3-phase-core cables or three-core cables can be used depending upon the operating voltage and load demand.

For the cables laid underground when fault occurs it is very difficult to detect the proper location of the fault and thus plan and repair the fault because conductors are not visible. The faults most likely to occur in underground cables due to wear, tear, moisture retention, etc . Open circuit fault, short circuit fault, earth fault are the major faults which occur.

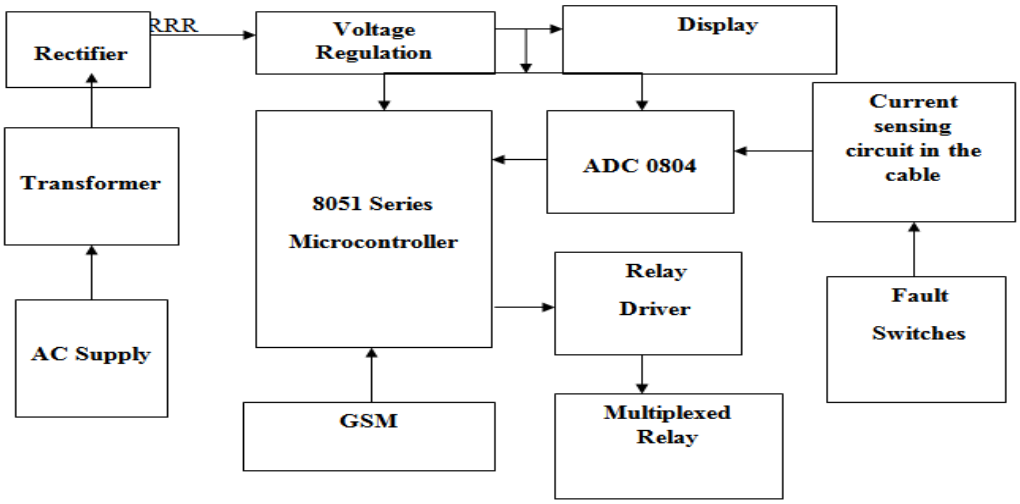
- Open circuit fault- when there is break in the conductor of a cable, it is called open circuit fault. When open circuit fault occurs then fault can be checked my megger. That's time three conductor of the core cable at the far end are shorted and earthed. Then megger is used to measure the resistance of each conductor.
- Short circuit fault- when two conductors of a multi core cable come in electrical contact with each other due to insulation fail, then its called short circuit fault.
- Earth fault- when the conductors come contact with the earth then its called earth fault or ground fault.

The above mentioned faults are very difficult to detect easily. The prototype of the detection kit easily detects the faults via arduino microcontroller, the power supply and rectifier core of the current detection circuit in combination with ADC drive to reset the k.m. This process is activated when it detects error in preset value and measured value. The action is only performed when the relays are controlled by a relay excitation IC. And the results shows the LCD display. GSM module works to inform the location of fault detected via massage.

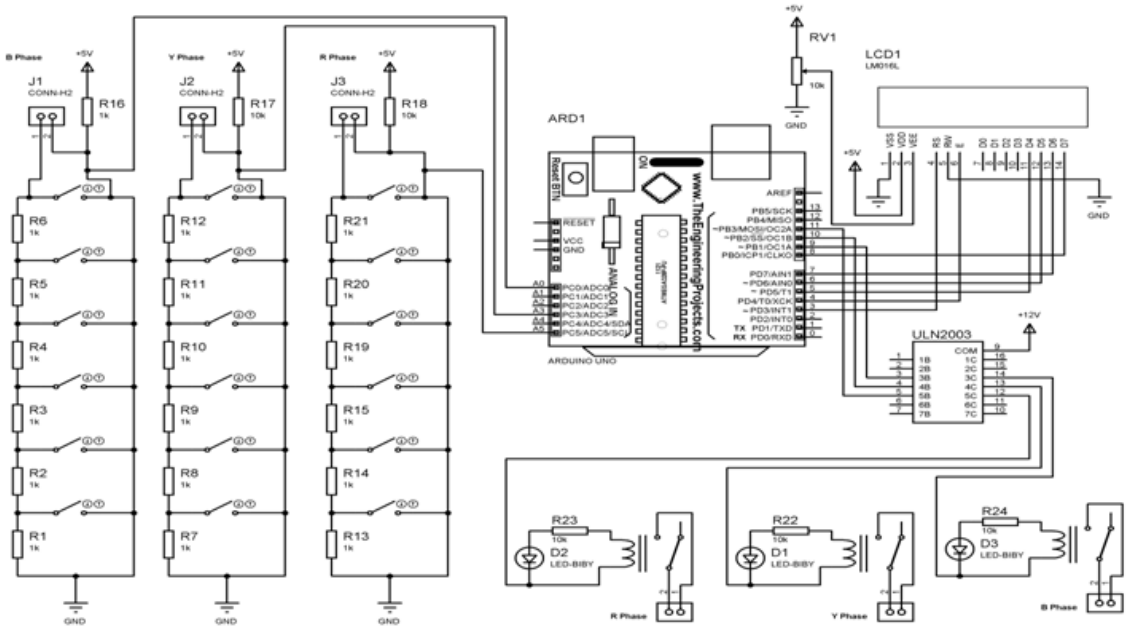
II. LIST OF REQUIRED COMPONENTS

SL NO	NAME OF THE ITEMS	QUANTITY	RATING
1	Arduino Microcontroller	1	150 200 mA.
2	Liquid Crystal Display	1	5v
3	GSM	1	3.3v-4.0v
4	Regulator	1	10v,5a
5	Transformer	1	1.5a
6	Buzzer	1	-
7	IC (Max 232)	1	3.3v
8	Analogue to Digital Converter (ADC 0805)	1	-
9	Fault Switch	6	-
10	Relay Driver Circuit	1	-
11	Bridge Rectifier	1	-
12	Relay	1	-
13	Current Sensing Circuit	1	-

III. BLOCK DIAGRAM



IV. CIRCUIT DIAGRAM



V. WORKING PRINCIPLE

The working of the prototype are divided into four main parts. (a) the DC power supply, (b) cable part, (c) controlling part and (d) display part. The main part of DC power supply consist of converting 230V AC to 12 V AC using step down transformer and then convert ac signal to dc signal using rectifier. Voltage rectifier is used to get constant dc voltage. Then the cable part is accessorised with the switches. The fault occurring in the cable is detected. Controlling part uses the ADC converters which supply to the microcontroller. The microcontroller calculates the distance of the fault using the program fed. The display then shows the result of the LCD.

VI. IMPORTANCE OF PROJECT IN PRESENT TECHNICAL SCENARIO

The result kit would give a portable and easy to install solution to the problem faced in detection of faults and also with the perfect distance at which it occurred. At present it is applicable for only overhead lines . Easy and fast detection of the fault and the informing through message facility makes it useful in the present technical scenario.

VII. CONCLUSION

The knowledge of the project cost estimation and manufacture of underground cable fault detector using smart technology is helpful for the technical people. It provides low cost solution to the underground fault detection problem.

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