

Underground Cable Fault Detection System

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ABSTRACT

This work Underground Cable Fault Detector is used for identifying faults in the underground cable. Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents etc. Diagnosing fault source is difficult and entire cable should be taken out from the ground to check and fix faults. The project work is intended to detect the location of fault in underground cable lines from the base station in km using a Arduino microcontroller. To locate a fault in the cable, the cable must be tested for faults. This prototype uses the concept of Ohms law. The current would vary depending upon the length of fault of the cable. In the urban areas, the electrical cable run in underground instead of overhead lines. Whenever the fault occurs in underground cable it is difficult to detect the exact location of the fault. The prototype is modelled with a set of wires representing cable length in km and fault creation is made by a set of switches at every known distance to cross check the accuracy of the same. In case of fault, the voltage across series wires changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed Arduino that further displays fault location in distance. The fault occurring distance is displayed on a 16X2 LCD interfaced with the microcontroller.

Keywords – Arduino Uno, Step Down Transformer, LCD.

I. INTRODUCTION

Till the last decade the cables were made to lay overhead and currently the scenario is to lay underground cable, which is superior to the earlier method. This is because the underground cables are not affected by the adverse weather conditions. Neither does the hot sunny day or rain influence it. But when the cable breaks due to some reasons it's

very difficult to locate where the fault is.

Right now, what is done is that, they locate the approximate area and uncover the cables from the location and check it physically to locate the specific point of discontinuity. Currently an Arduino, a microcontroller, is being developed which can be used to locate the break from an external point. When an underground cable is broken or short-circuited

then an Arduino will be connected to the circuit and locate the exact position of dis- continuity. Hence it is an advantage for repairing the fault. The other instruments that can be included are odometer, video cam, re- mote navigation etc.

II. OBJECTIVES

- The main objective of this project is to detect abnormalities occurring in underground cables using Arduino.
- Using this project, we can accurately find the exact location of the fault in the underground cables.
- This project can be done by using Arduino microcontroller coded with the program which is connected to LCD where the exact location of the fault will beshown

III. COMPONENTS

ARDUINO

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is If electronic devices are designed to have higher nominal power, transformers with high operating frequency are used (kHz-s). The transformers with higher nominal power value and 50/60 Hz nominal frequency would be too large and heavy. Also, the

daily used battery chargers use the step-down transformer in its design.

programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share- Alike 2.5 license and is available on the



Arduino website. Layout and production files for some versions of the hardware are also available.

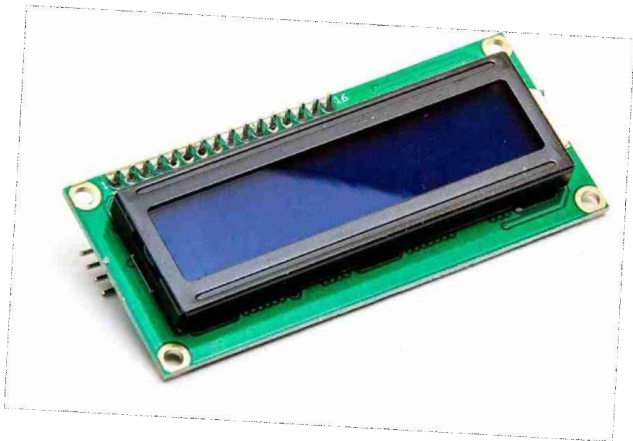
STEP DOWN TRANSFORMER

A step-down transformer is a type of transformer that converts the high voltage (HV) and low current from the primary side of the transformer to the low voltage (LV) and high current value on the secondary side of the transformer. The reverse of this is known as a step-up transformer. A transformer is a type of static electrical equipment that transforms electrical energy (from primary side windings) to magnetic energy (in transformer magnetic core) and again to the electrical energy (on the secondary transformer side). A step-down transformer is used to provide this low voltage value which is suitable for electronics supplying. It transforms home voltage (230/120 V) from primary to a low voltage on the secondary side which is used for electronic supplying.



LIQUID CRYSTAL DISPLAY (LCD)

The term LCD stands for Liquid Crystal Display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc



VOLTAGE REGULATOR

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. The regulators can be selected for operation with load

currents from hundreds of Mille amperes to tens of amperes, corresponding to power ratings. From Mille watts to tens of watts. A fixed three-terminal voltage regulator has an unregulated dc input voltage, V_i , applied to one input terminal, a regulated dc output voltage, V_o , from a second terminal, with the third terminal connected to ground.

The series 78xx regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79xx regulators provide fixed negative regulated voltages from 5 to 24 volts.

Advantages:

- 1) Provides Safety in the critical conditions.
- 2) Less maintenance, and higher efficiency
- 3) It can detect other types of cable fault such as short circuit fault, open circuit

Applications:

- 1) It can be used in almost all substation.
- 2) They can also be used in dangerous environments, where human penetration could be fatal.

IV. CONCLUSION

Thus, the project on Underground cable fault detection using Arduino was done and the distance of the fault was displayed on the LCD for the three lines R, Y and B. When the fault switches are operated to fault condition then the phase corresponding to that particular switch is considered as the faulty phase, and the distance of the fault will be shown in the liquid crystal display using Arduino microcontroller.

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