Underground Cable Fault Detection

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ABSTRACT

The fault in the electrical cables is characterized as an imperfection because of which the current is redirected from the proposed way. Faults are generally caused by mechanical failure, accidents, excessive internal or external stress. Significantly a stock line can be influenced by over voltage and over current. During the occasion of any shortcoming, the occasion goes unreported for quite a while. Manual reporting of the fault may lead to excess damage to the cable. The repairing process of cables become very difficult if the fault location is unknown. To conquer this issue, a framework is built up that will identify the adjustment in the voltage utilizing controller. The voltage is step down after a specific distance. According to the values of voltage at specific distances we can understand the fault location between two points. Also ESP32 with inbuilt WiFi module used to display the value on web page. By measuring the resistance between two points we can find the exact distance of the fault location.

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I. INTRODUCTION

Power cables that are placed underground are utilized to convey electrical force. Links are put in underground in request to stay away from superfluous obstruction. This makes it hard to locate the specific area where the flaw has happen. Underground transmission lines have lower visibility and less affected by weather therefore they are mostly used in urban areas. There are many electrical, telephone and other signal cables that are laid underground. Many time faults occur due to rainfall, snow, thunder, lightning, construction works and other reasons around then it is hard to uncover link because of not knowing the specific area of the link flaw. This requires links with unwavering quality, expanded wellbeing, roughness and more prominent help. So underground links are preferable. There are various methods to find the cable fault. Maintenance of the underground cable is also an important factor. The cost of the maintenance increases if the fault condition is not reported. In the off-line methods, in any event, when a deficiency is seen as present it is exceptionally hard to distinguish the specific area of the shortcoming. This prompts burrowing of the whole territory to identify and address the deficiency. In manual method, we need to approach the fault location to repair the fault. In this paper we can check the fault location online. Voltage is step down after specific distance to check the continuous flow of voltage which reduces the excess damage to cables. We get the approximate distance between two points. We can measure the resistance to get the exact distance of fault. Using the online method we can reduce the labour work.

II. RELATED WORK

Underground power cable fault location model utilizing voltage and current estimation at sending end has been proposed. Customary directing wire alongside resistors is utilized to speak to the force link. Switches and the resistors have been embedded after the specific interval on the wire this switches are used to create faults. Practically this system cannot be implemented because the model itself creates the fault [1]. There are three types of faults that occur in the underground cable. A short circuit fault occurs when two wires comes in contact with each other and creates a short circuit path. Insulation failure between the phase conductors leads to the short circuit fault. In open circuit fault the wire is interrupted

due to external conditions. The cause of the open circuit fault includes joint failure of cable and overhead lines. In the earth fault the cable is grounded, the arrival way of the shortcoming current is through the establishing system [2]. Partial discharge in the electric power cables can be located on line using PDL system. It provides a current pulse signal from terminal A to terminal B in order to obtain propagation time. If the signal do not reach the sensor placed at the both sides then it would be impossible to locate the partial discharge [3]. Information about online offline methods are given. In the tracer method we can detect the fault point by walking on the cable lines. Deficiency point is shown through discernible sign or electromagnetic signals. To measure the particular distance or location microcontroller is used along with the individual resistor and solid state relays are used as a sensing device and the fault is displayed on the LCD display. IOT based model which uses GSM which is used to get an SMS alert when the fault is detected. Advantage of the model is we get the notification when the fault occurs which makes it easy to reduce the fault [4].

III. LIMITATIONS

The model creates the fault itself but in practical the fault occurs due to external conditions. The sensor installed at the both ends of the cable, if signal do not reach the sensor placed at the both sides then it would be impossible to locate the partial discharge. GSM model is used for the SMS which is connected externally. Instead we can use the ESP32 which contains the inbuilt WIFI model. We can check the voltage continuity on web.

IV. SYSTEM DESIGN

ESP32

Fig 1. ESP32

This is a family of ESP32 based modules with some integrated key components, including a crystal oscillator and antenna matching circuit. The modules constitute ready-made solutions for integration into final products. USB to serial programming interface that provides power supply for board, pin headers. Push button for reset and activation of firmware download mode. ESP32 has inbuilt WiFi which enables a large physical range as well as direct connection to the internet via a WiFi router. This module supports data rates of up to 150 Mbps and 22dbm output power.

LCD

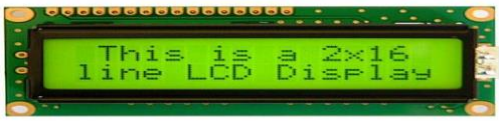

Fig 2. LCD

The operating voltage of LCD is 4.7v to 5.3v and current consumption is 1mA without backlight. IT consist of two rows and each row can print 16 characters where each character is built by 5x8 pixel box.

I2C

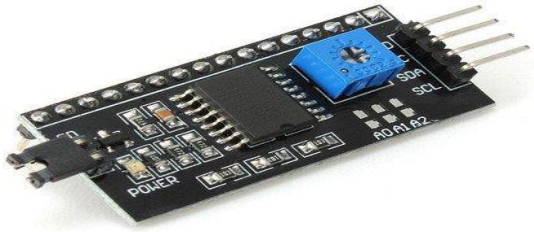

Fig 3.I2C Module

The I2C module has inbuilt I2C chip that converts I2C serial data to parallel data for LCD display. Operating voltage is 5v and it is compatible for 16x2 LCD.

V. BLOCK DIAGRAM

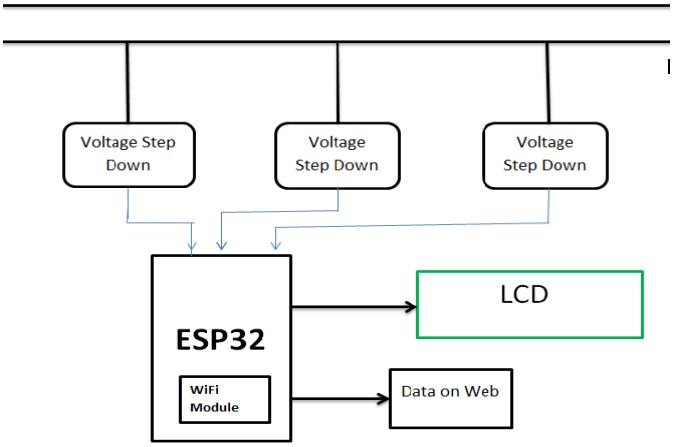

Fig .4. Block diagram

VI. PROPOSED SYSTEM

Underground cable fault detection deals with finding an exact Fault location. In this model online method for fault location is used. THE voltage is step down after a specific distance in the cable to get the continuous flow of voltage in the cable. This step down voltage is given to ESP32 controller which displays the voltage at every node. If any step down voltage shows the output zero which indicates there is a fault between two nodes. ESP32 contains inbuilt WiFi module, using this module we can check the voltage of each node on the web. As the voltage is step down after a specific kilometers so we have got the approximate fault distance as node1 or node2.

Now we can use resistance measurement method between these two nodes to get the exact fault location. Resistance measurement method is used to find the short circuit fault. Every cable has specific resistance per kilometer using which we can find the short circuit fault. The input voltage is known so the current source is used to give an input to the node. Using these two parameters we can find out the resistance. The basic ohm's law is used to find the resistance of the cable. To find the open circuit fault the capacitance measurement the technique is used.

VII. CONCLUSION

This paper is intended to detect the exact fault location using online method. ESP32 shows voltage of each node due to which it becomes easier to find the fault location. ESP32 contains the inbuilt WiFi module using which we can check the continuity of voltage on web. After getting fault location distance we can check the fault location precisely using the resistance and capacitance measurement method.

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