Display of Underground Cable Fault Distance over Internet (Iot) Of Things Using Gsm

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Abstract- **The objective of this project is to determine the distance of underground cable fault from the base station in kilometers and displayed over the internet. Underground cable system is a common practice followed in major urban areas. While a fault occurs for some reason, at that time the repairing process related to that particular cable is difficult due to exact unknown location of the fault in the cable. Proposed system is used to find out the exact location of the fault and to send data in graphical format to a dedicated website together with on board LCD display using a GSM module.**

Keywords: Fault diagnosis, Global system for mobile com- munication (GSM), Arduino UNO, Analog to digital converter (ADC), Liquid crystal display (LCD).

1. INTRODUCTION

The Underground system is efficiently used in practice nowadays than overhead transmission system as underground cables are not affected by weather conditions like wind and lightning damage having fewer interruptions of faults and can perform in urban/semi-urban areas un-noticed by society and pass along cross beneath rivers, safe landscape and transport links. Long period of power failure can create the power retailers and distributors an intense loss of revenue and distress of the people therefore automatic fault location is used to minimize the time to mend faults to make system reliable by figuring out the weak areas quickly which results into decreased restoration time and interruption so Arduino controller kit is used to locate fault in underground cables and display fault readings on LCD, are measured in kilometers by creating faults manually. The main advantage of this circuitry as compared to other protective devices available in the market is that it comprises of a UV detector which senses any kind of spark or excessive heat radiation in the atmosphere . The growing size of the power system has led to an extension in the complication of the system and our escalating reliance on it, has made the need to enlarge the reliability of the power system. Proper fault locating and detecting approaches are required for an improvement in reliability. Nowadays, detection and location of fault becomes a challenging task due to unreached underground cable and these approaches play a very significant role in increasing the reliability and thereby maintaining the system . Incidents of underground cable faults in the distribution and power trans- mission system is unpreventable due to several reasons thus a rapid rectification and diagnosis of the faults is a significant issue and is always the top priority for the power distributors. HIF (High Impedance Fault)s detection on distribution system has been one of the existing and troublesome problem facing the electric utility industry. Recent advancements in the digital technology through Arduino and GSM have enabled solutions of detection of these highly occurred faults. A method based upon fundamental circuit analysis principles to estimate fault currents, pre-fault and postfault phase voltages of various types is presented through venin matrix. Impedance based algorithms are usually used by utilities to locate faults in distribution system . The cable fault locating equipment currently being used is comparatively heavy. Moreover, in many cases, one method is not enough and accurate fault detection may require more than one method to be put together. However, organizing multiple tests with complicated equipment and to finally diagnose the fault is a time consuming task. Detecting the cable faults and pin-pointing the fault location makes task faster and easier for the field engineers through design and construction of a light weight portable machine . Underground system contributes potential advantages through minimized operations and main-tenance costs, less storm damage, reduced tree trimming costs and reduced loss of regular electricity sales for utility customers. An appropriate recognition of a faulty segment is required to diminish the intervention time fault. Fast and precise fault location plays a significant role in speeding up system renovation, diminishing great financial loss and operating cost thereby minimizing power loss time and most importantly ameliorating systemavailability and performance. Various fault locating methods like the sectionalizing methods, Murray loop methods and acoustic detection methods are not preferred much because they endure from many disadvantages. The sectionalizing method cannot be employed because examining of underground cable is not possible. The acoustic method may become catastrophic and hindering at rainy time. The Murray loop method is dependent upon the concept of Wheatstone and is highly inappropriate caused by distinct lead-resistances . Symbolic method for detection of open circuit conductor and short circuit fault in automated distribution system is employed which accurately identifies the section in which fault occurs . A single ended fault location scheme is also possible using just the transient fault currents on an EHV (Extra High Voltage) system and it is this scheme which is demonstrated on a distribution system

using one receiver as fault transient signals are high frequency signals superimposed on the steady state voltage and currents. The transient signals can then be extracted by applying a suitable high pass filter. It has been found, however, that the double ended method also provides an accurate fault location if the fault is located directly on the line of interest or it should indicate the location of the feeder circuit if the fault is on a feeder . Electric utilities often encounter the problem of detecting the accurate location of fault in underground cables. These faults occur at the worst time and cause the great amount of hindrance to utility consumers. The failures of the underground power cables represent a serious threat to the reliability of power infrastructure causing catastrophic break down of the cable. A dc voltage is applied to an arrangement of series resistors representing a cable depends upon the location of fault as the current varies, the potential drop also varies across the series resistors accordingly and this drop in potential helps to determine the location of fault. Current would vary relying on the cable fault location and voltage drop across resistors varies accordingly when a low DC voltage is given at the feeder end through cable lines (series resistors) in the matter of short circuit which is then fed to ADC to develop accurate digital data which the programmed Arduino families would display in kilometers. In this work, we have calculated accurately the location of a cable fault, eliminated the noise caused by arcing voltage, enhance the accuracy by interjecting pre-fault pulse signals occasionally into the cable, locate the open circuit and short circuit fault in underground cables using Global system for mobile communication (GSM) module

The project uses the standard theory of Ohms law, i.e., when a low DC voltage is applied at the feeder end through a series resistor(Cable lines),then the current would vary depending upon the location of the fault in the cable as the resistance is proportional to the distance. In case there is a short circuit (Line to Ground), the voltage across series resistors changes according to the resistance that changes with distance .This is then fed to an ADC to develop precise digital data which the programmed microcontroller of the 8051 family displays in kilometers.

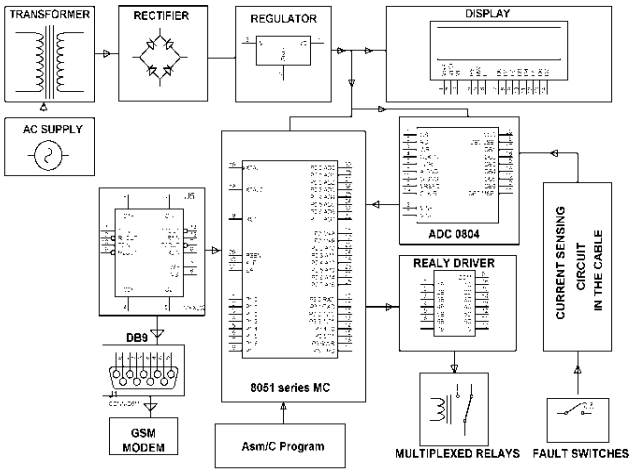
The project is assembled with a set of resistors representing the cable length in km and the fault creation is made by a set of switches at every known km to cross check the accuracy of the same. The fault occurring at a particular distance ,the respective phase along with the distance is displayed on the LCD. The same information is also sent to a dedicated website over internet activated SIM with GSM, interfaced to the microcontroller.

Furthermore, this project can be enhanced by using capacitor in an AC circuit to measure the impedance which can even locate the open circuited cable, unlike the short circuited fault that uses only resistors in DC circuit as followed in the above proposed project. Using programming language chosen strategy for control of a process as to be initially coded in accordance with requirements and fed to computers. This is no insignificant task and demands that programmer have clear picture of process and its related hardware.

COMPONENTS:

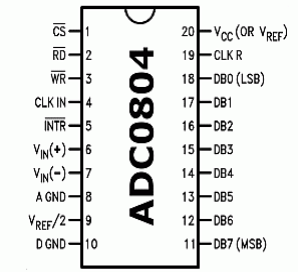
1. MICROCONTROLLER:

8K Bytes of In-Sy
stem Programmable (ISP) Flash Memory
4.0V to 5.5V Operating Range
Fully Static Operation: 0 Hz to 33 MHz
256 x 8-bit Internal RAM
32 Programmable I/O Lines
Three 16-bit Timer/Counters
Eight Interrupt Sources
Full Duplex UART Serial Channel
BLOCK DIGRAM:



2.ADC

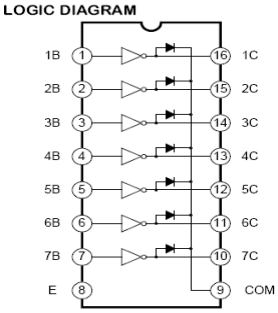
- ADC0804 is a very commonly used 8-bit analog to digital convertor It is a single channel IC, i.e.,
- it can take only one analog signal as input.



3 . Relay driver ULN2003:

- ULN is Relay driver application
- The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays.
- It consists of seven NPN Darlington pairs that features high-voltage outputs with common-cathode clamp diode for switching inductive loads.
- The collector-current rating of a single Darlington pair is 500mA.
- The Darlington pairs may be paralleled for higher current capability.
- The ULN functions as an inverter.

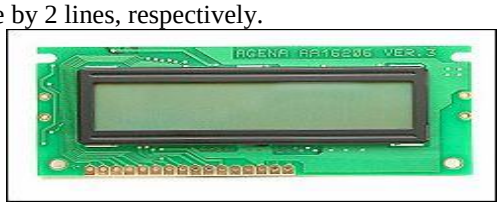
If the logic at input 1B is high then the output at its corresponding pin 1C will be low.



4.Liquid crystal display (lcd)

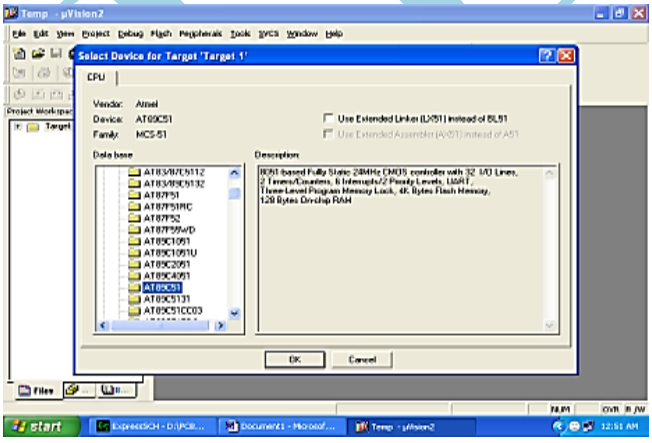
Most common LCDs connected to the microcontrollers are 16x2 and 20x2 displays.

This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.



Software requirements:

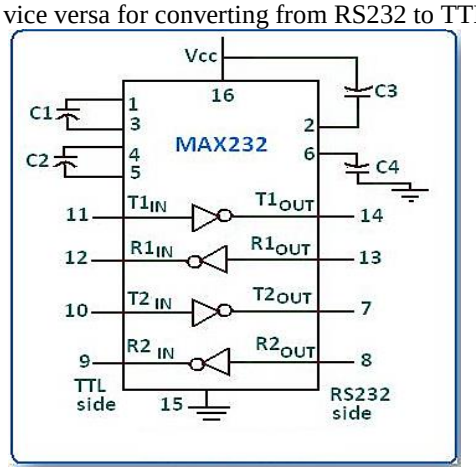
- Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.
- Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. i.e., the programs written in one of the HLL like ' C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer).
- For example compilers for Dos platform is different from the Compilers for Unix platform So if one wants to define a compiler then compiler is a program that translates source code into object code.



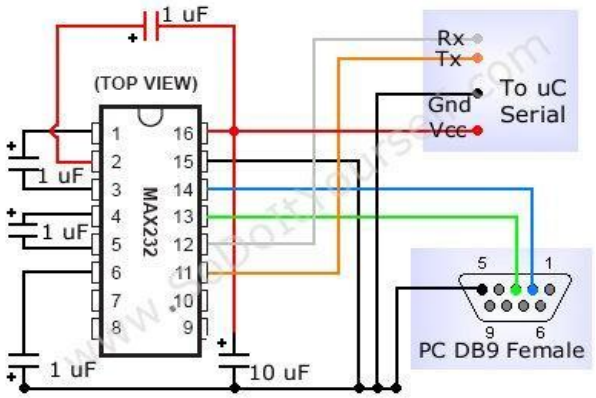
5.GSM COMMUNICATION:

- The term GSM usually means the GSM standard and protocols in the frequency spectrum around 900MHz.
- MS- Mobile Station:The MS is the physical equipment used by a subscriber, most often a normal hand-held cellular telephone. BTS- Base Transceiver Station:The BTS comprises the radio transmissionand reception devices, and also manages the signal processing related to the air interface.
- GSM MODEM: A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone
- From the mobile operator perspective, a GSM modem looks just like a mobile phone.
- When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.
- While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

- max232: The MAX232 is an integrated circuit that converts signals from an RS-232serial port to signals suitable for use in TTL compatible digital logic circuits.
- The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals .
- When a MAX232 IC receives a TTL level to convert, it changes a TTL Logic 0 to between +3 and +15V, and changes TTL Logic 1 to between -3 to -15V, and vice versa for converting from RS232 to TTL.



DB9 CONNECTOR: The DB9 (originally DE-9) connector is an analog 9-pin plug of the D-Sub miniature connector family.



WORKING:

The project uses a set of resistances in series i.e. R10,R11,R12,R13,and,R17,R16,R14,R21,R20,R19,R18,R25 ,R22 as shown in the circuit diagram, one set for each phase. Each series resistors represents the resistance of the underground cable for a specific distance thus 4 such resistances in series represent 1-4kms. 3 relays are used to common point of their contacts are grounded while the NO points are connected to the input of the R17, R21 & R25 being the 3 phase cable input. R10 is fed with a series resistor R1 to 5v supply. The common point of R10 & R1 is given to input pin of 6 of ADC0804 duely wired as explained above.

Fig. 11. Complete hardware model

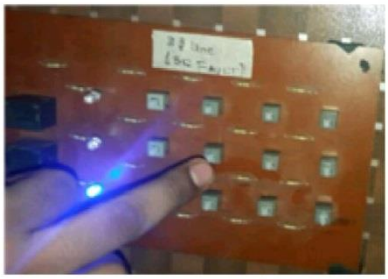


Fig. 5. Short circuit fault generated at 4km

ADVANTAGES

1.Easy to use, self-explanatory kit.
2.All-inclusive solution kit.
3.Exclusive audio – visuals available.
4.Branding – free material.
5.Pre-programmed Microcontroller.
6.Call/mail for Tech support from 10am-7pm.
7.Can be customized for Arduino ,Raspberry Pi ,PIC

II. CONCLUSION

In this paper detect the exact location of short circuit fault in the underground cable from feeder end in km by using microcontroller8051.For this used simple concept of OHM' s law so fault can be easily detected and repaired

FODT sensor used in fault detection of cable lines is Suitable to a low resistance grounded system, long distance line and multi-circuit line. The maximum detectable distance is 10 km with the accuracy of lm and the time needed is 15-30sec.a neural network-based fault identification system for underground transmission systems. Back propagation learning algorithm was used for training the system and the number of units in the hidden layer, learning Rate and momentum were found by brute-force trials for optimum parameters.

III. ACKNOWLEDGMENT

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REFERENCES:

1.Henao, C. O., Flrez, J. M., Londoo, S. P. (2012). A robust method for single phase fault location considering distributed generation and current compensation. Sixth IEEE/PES Transmission and Distribution: Latin America Conference and Exposition (TD-LA).

2. Wang, Q., Tang, C., Wu, G., Chen, G. (2014). Fault location in the outer sheath of power cables. Journal of Power Technologies, 94(4), 250.

3. Bawart, M., Marzinotto, M., Mazzanti, G. (2016). Diagnosis and lo- cation of faults in submarine power cables. IEEE Electrical Insulation Magazine, 32(4), 24-37.

4. Darvhankar, G. S., Gharpande, A. S., Bhope, S. D., Meshram, A. S., Bobade, J. A. (2015). Study Of 3-ph Underground Cable Fault Locator Using Acoustic Method. Development, 2(1).

5. M. R. Hans, S. C. Kor, A. S. Patil. (2017). Identification of underground cable fault location and development. International Conference on Data Management, Analytics and Innovation (ICDMAI), 5-8.

6. G. D. Ferreira, D. S. Gazzana, A. S. Bretas, A. S. Netto. (2012). A Unified Impedance-Based Fault Location Method for Generalized Distribution Systems. IEEE Power and Energy Society General Meeting, 1-8.

