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UNDERGROUND CABLE FAULT DETECTION SYSTEM USING AURDUINO, GPS &GSM MODULE

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ABSTRACT---This paper will useful for ***TAMILNADU ELECTRICITY BOARD (TNEB)&BSNL CO.*** for finding the exact location of fault in the underground cables. In case fault occur in a long distance distribution line,this system which helps to find the location of fault using the standard ***OHM'S LAW*** principle and convey the fault location to our mobile using gsm technology. This project is used for all the types of faults such as L-L, L-G & L-L-G faults. This method is also used for find the open circuit problem in the power lines.the basic ohm's law is used for find the fault in cable. . Whereas in Ohm's law method, when any fault occurs, voltage drop will vary depending on the length of fault in cable, since the current varies All the cables have the specific resistance depends upon their length so in this way, if fault occur in the cable , The voltage drop across the series resistor changes accordingly, this voltage drop is used in determination of fault location. a microcontroller is used to make the necessary calculations so that the fault distance is displayed on the LCD display

KEY WORDS---Fault detection& location, Open circuit, Short circuit, Aurduino, GPS, GSM

1.I NTRODUCTION :

This paper deals with how to arising the fault in the cable and how to find the exact location of fault using microcontroller. The various types of fault are arise in the power line but we can use one simple method using for find the fault in the cable .This project is fully automated fault detection system. The EMBEDDED technology is used for find the fault . we discuss the our project basic principle,methodology, components and circuit diagrams in given below

1.1.WHY WE USING EMBEDDED:

Now a days EMBEDDED system have a lot of growth in Automation &Internet of things technology. An EMBEDDED system is a programmed controlling and operating system with a dedicated function with a larger mechanical and electrical system A

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single chip microcontroller can do the all types of automation works . cost wise the EMBEDDED systems are low and the size of the project lit is also low. The accuracy of the calculation is high because the software is used for run the chip .The uses of EMBEDDED systems are virtually limitless, because every day new products are came based on the EMBEDDED system principle.

1.2.POSSIBLE REASON :

Processors have shrunk in size with increased performance Power consumption has drastically reduced. Cost of processors have come down to affordable level. There is a greater awareness now that rather than a totally hardwired electronic system, incorporation of a programmable processor in a circuit makes the design more robust with the reduction in the design time cycle. The concept of a development environment where you can prototype the system and do a simulation/emulation also reduces the design cycle and total development time. The latest model of the Ford car has more than 21 microcontrollers performing functions such as anti-lock breaking system.

2 . PROPOSED SYSTEM:

2 .1 BLOCK DIAGRAM:

In this project using ATMEGA 328 microcontroller. This microcontroller is a brain of this project. This microcontroller makes necessary calculations. The ATMEGA 328 is a very popular microcontroller chip produced by ATMEL . It is a 8 bit microcontroller that has 32k of flash memory .1k of EPROM , and 2k of internal SRAM. The power supply unit which is used to give the power to the components . The project is assembled with a set of resistors representing cable length in KMs and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same.

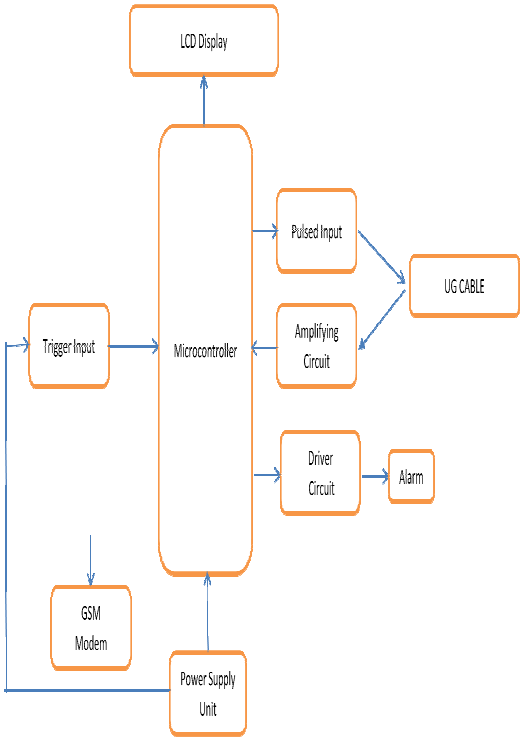

Fig. 1. Block diagram

2.2. CIRCUIT DIAGRAM:

This project circuit diagram is shown in given below. The main components of this

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project are microcontroller, LCD display, GPS tracker, GSM modem, relay circuit, trigger switch, power supply units. This is proposed model of underground cable fault distance locator using microcontroller. It is classified in four parts –DC power supply part , cable part ,controlling part, display part.DC power supply part consist of ac supply of 230v is step down using transformer, bridge rectifier converts ac signal to dc & regulator is used to produce constant dc voltage. The cable part is denoted by set of resistors along with switches .Current sensing part of cable represented as set of resistors &switches are used as fault creators to indicate the fault at each location. This part senses the change in current by sensing the voltage drop. Next is controlling part which consist of analog to digital convertor which receives input from the current sensing circuit, converts this voltage into digital signal and feeds the microcontroller with the signal. The microcontroller also forms part of the controlling unit and makes necessary calculations regarding the distance of the fault. The microcontroller also drives a relay driver which in turn controls the switching of a set of relays for proper connection of the cable at each phase. The display part consists of the LCD display interfaced to the microcontroller which shows the status of the cable of each phase and the distance of the cable at the particular phase, in case of any fault.

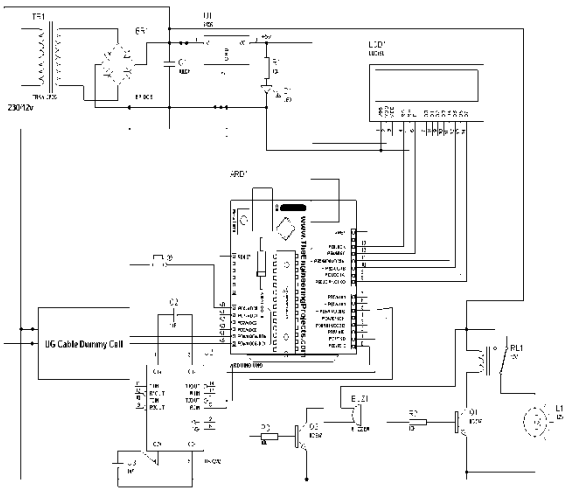

Fig.2. Circuit diagram

3. COMPONENTS:

3.1. POWER SUPPLY:

In first the step down transformer is used for convert the 230 V AC supply to the 12V AC supply. Next the bridge rectifier circuit is used to convert the 12V to the 12V dc supply. The capacitor C1 which is used to get the pure form of DC voltage. Next the regulator LM7805 which is used to regulate the voltage for get desired constant 5V DC supply.

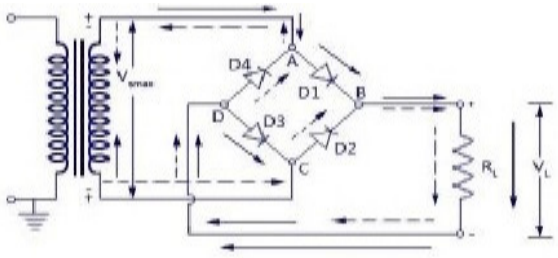

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Fig.3. Power supply unit

3.2. TRANSFORMER:

Transformer is a device which is used to transfer the electrical energy from one circuit to another circuit without changing in frequency. The transformer is a static generator. In generally two types transformer are available they are step down& step up transformer. In this project we are using 230V/ 12V AC transformer .this transformer gives the power supply to the whole board . The primary winding is connected to 230V AC source and the secondary winding is connected to the load side

Fig.4.Transformer

3.3.AURDUINO MICROCONTROLLER:

In this project we are selecting the ATMEGA328 series microcontroller. This microcontroller which is used to take the necessary calculations , controlling functions and other functions. The ATMEGA 328 is a single chip microcontroller created by ATMEL**.** It has a modified Harvard architecture 8-bit RISC processor core. It has 20 MHZ clock speed. It has available in two pin count they are 28pin &32 pin. It has 32kb flash memory,2 kb SRAM,1 kb EPROM**.** The basic C,C++ languages are used for program the microcontroller

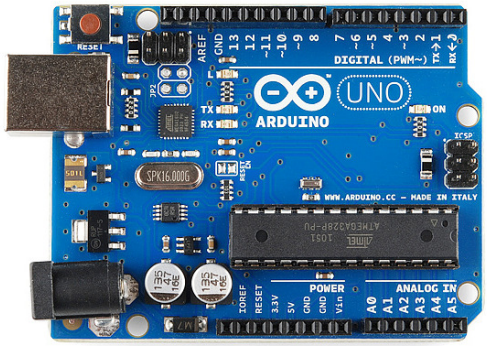

Fig.5.Microcontroller

3.4. LCD DISPLAY&ALARM CIRCUIT:

In this project we are using 16x2 cm LCD (LIQUID CRYSTEL DISPLAY) display for the purpose of show the fault location at the base station user. A 16x 2 means it can display 16 characters per line and there are 2 such lines. This display works on +5V(4.7V-5.3V). It has 16 pin . Current consumption is 1mA without backlight. It has available in Green and Blue Backlight. The alarm is used arise the beep sound when fault occur at the cable.

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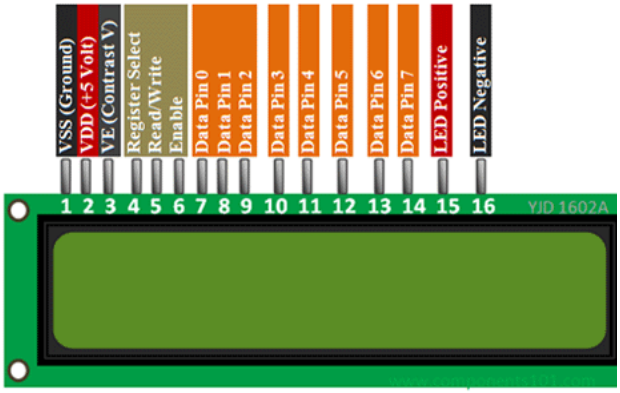

Fig.6.LCD display

3.5. RELAY CIRCUIT:

Relay is a device which is used to sense or detect the fault in the cable and send the trip signal to the circuit breaker for trip the faulty section from the healthy section. It is electrically operated switching device.In normal operation ,the current is normally flow in the circuit and there is no problem occur. If there are fault occur in a circuit, the current flowing through the relay coil creates the magnetic field and attract the contacts and isolate the fault circuit.

Fig.7. Relay circuit

3.6. GPS (GLOBAL POSITIONING SYSTEM):

In this project we are using GPS for the purpose of find the location of fault and send the exact location to the AURDUINO microcontroller. The GPS works on the basic principle of special theory of relativity. This GPS tracker device sense the location at the fault point and display the fault location at the LCD display. All GPS satellites broadcast on the same two frequencies. The primary signal is broadcast on what is referred to as L1 frequency which is 1,575.42 MHz.

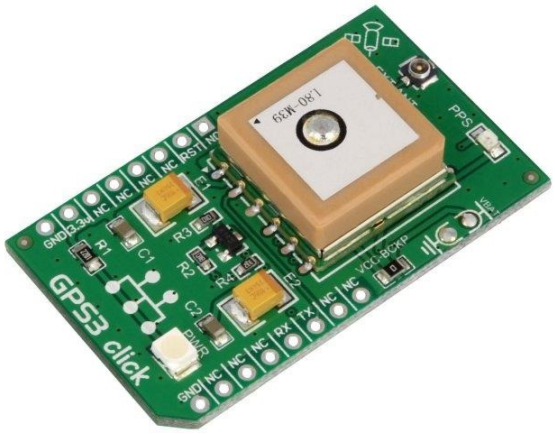

Fig.8. GPS tracker

3.7. GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION):

In this project we are using GSM module for communicate with user. The GSM is used for send the location of the fault to the mobile. GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead . In rare cases the 400 and 450 MHz

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frequency bands are assigned in some countries because they were previously used for first-generation systems.

Fig.9. GSM module

3.8. SOFTWARE USED:

The software is must for run the microcontroller. To assign the function of the microcontroller ,give the necessary ratings are given by the software. The software is a AURDUINO software. The ARDUINO IDE supports the languages C and C++ using special rules of code structuring. The ARDUINO IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program sub main() into an executable cyclic executive program with the GNU tool chain. also included with the IDE distribution. The ARDUINO IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the AURDUINO board by a loader program in the board's firm wares written in basic c& c++ languages.

4. ADVANTAGES:

1. Simple method
2. It is a automatic operation
3. By the implementation, in this project is also used for check insulation of the cable, EMF generation calculation.
4. This project is applicable for all types of voltage ranging like 11KV to 66KV for find the fault.
5. Improved public safety

5. DISADVANTAGE:

1. By implementation in real time may occur high cost.

6. APPLICATION:

1. Fault detection in underground power cable.
2. It is also used in fault detection in communication cable

7. CONCLUSION:

In this paper we discuss most of the content of my project. In this paper we detect the exact location of short circuit fault in the underground cable from feeder end in km by using AURDUINO microcontroller For this we use simple concept of OHM's law so fault can be easily detected and repaired. This circuit is fabricated to detect open circuit fault, short circuit fault and earth fault . Once faults occur in the cable, the display unit displays the exact fault location that displays which phase is affected in the cable and how long it is affected. A buzzer

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system is used to create an alerting signal which is helpful to humans. Buzzer system creates a alerting sound signal, once if the fault occur in the underground cable.

8. FUTURE SCOPE:

This prototype detects the exact location of various faults like earth short and open circuit fault in underground cables from feeder end. In future this project may be intended to detect even minute faults occurring in any region . Also this prototype can be extended to detect faults over large area. The future scope of this projects are find the insulation of the cable, EMF generation in the cable, check the power quality at instantly.

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