UNDERGROUND CABLE FAULT DETECTION USING MICRO-CONTROLLER

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ABSTRACT

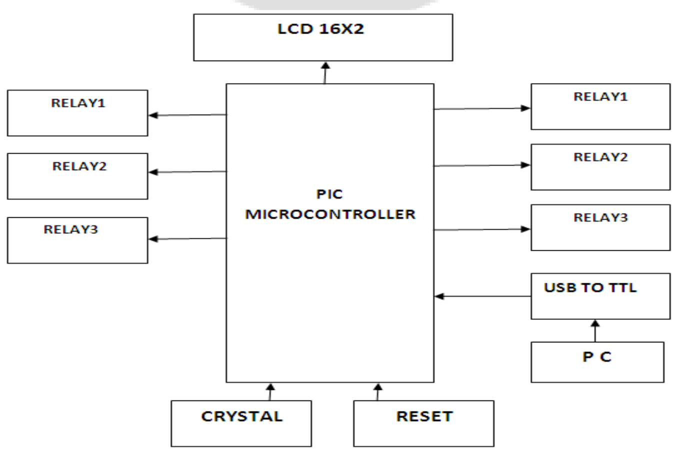
Cable faults are damage to cables which affects the resistance in the cable. If allowed to persist, this can lead to a voltage breakdown. To locate a fault in the cable, the cable must first be tested for faults. This prototype uses the simple concept of OHMs law. The current would vary depending upon the length of fault of the cable. This prototype is assembled with a set of resistors representing cable length in Kilo meters and fault creation is made by a set of switches at every known Kilo meters (km's) to cross check the accuracy of the same. The fault occurring at what distance and which phase is displayed on a 16X2 LCD interfaced with the microcontroller. The program is burned into ROM of microcontroller. The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

Keywords—cable; voltage break down; faults; prototy

1. INTRODUCTION

The main function of the electrical transmission and distribution systems is to transport electrical energy from the generation unit to the customers. Generally, when fault occurs on transmission lines, detecting fault is necessary for power system in order to clear fault before it increases the damage to the power system. Although the underground cable system provides higher reliability than the overhead line system, it is hard to seek out the fault location. The demand for reliable service has led to the development of technique of locating faults. During the course of recent years, the development of the fault diagnosis has been progressed with the applications of signal processing techniques and results in transient based techniques. It has been found that the wavelet transform is capable of investigating the transient signals generated in power system.

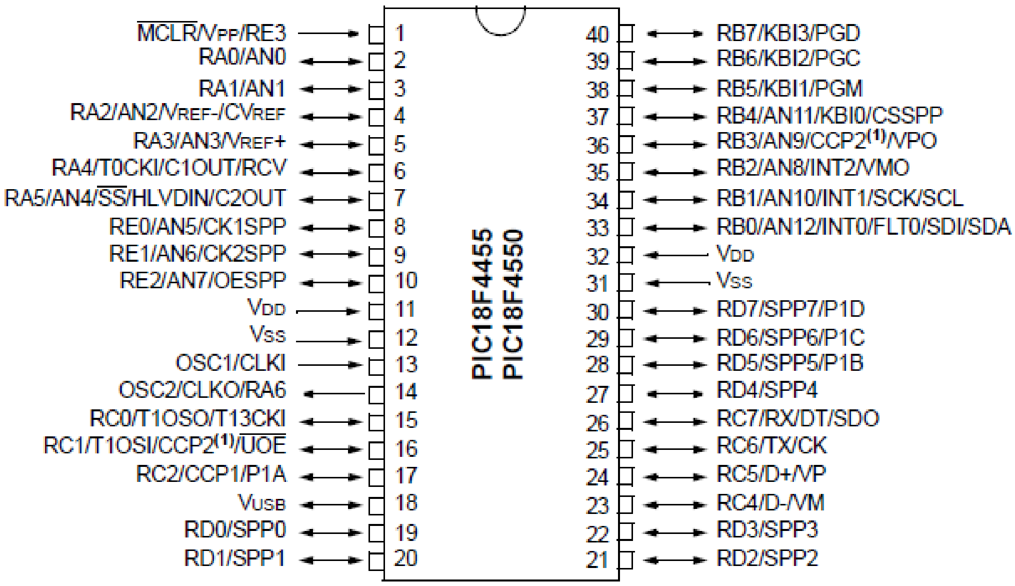
2. BLOCK DIAGRAM EXPLANATION:



There are two stages of implementation one is to measure voltage and spark in R, Y, B phase. And these are we can implement using RELAYS respectively. If voltage is crosses the threshold value of voltage in any phase among R, Y, B then relay will be tripped and message will be displayed on PC. If spark occurs in any phase among R, Y, B then relay will be tripped and message will be displayed on PC. The series resistor voltage drop changes accordingly which is then fed to an ADC to develop precise digital data which the programmed microcontroller would display the same in Kilo meters. The project is assembled with a set of wires representing cable length in KMs and fault creation is made by a set of wires at every known KM to cross check the accuracy of the same.

In the second stage we detect open circuit, short circuit, earth fault. To implement this we will be using connecting wires representing phases R, Y, B. In each phase there will be two wires interfaced to microcontroller. First wire in each phase is connected to Vcc. Second wire is pulled down to logic zero. The first wire when broken or cut will detect open circuit fault. When second wire attached to wire one used to detect short circuit fault. When both wires are grounded we can detect earth fault.

3. PIN DESCRIPTION:



4. RELAYS:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.
Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical.
The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Fig., Relay

4.1 Main Feature:

1. RW Series Relay covers switching capacity by 10A is spite of miniature size to comply with user 's wide selection.
2. RWH is approved C-UL & TÜV safety standard.
3. The employment of suitable plastic materials is applied under high temperature condition and various chemical solutions.
4. Complete protective construction is designed form dust and soldering flux. If required, plastic sealed type is available for washing procedure.
5. 12A at 120VAC for RW & 12A at 240VAC for RWH are UL approved.

4.2 Application:

Domestic Appliances, Office Machines, Audio Equipment, Coffee-Pots, Control units, etc.

5. POWER SUPPLY DESIGN:

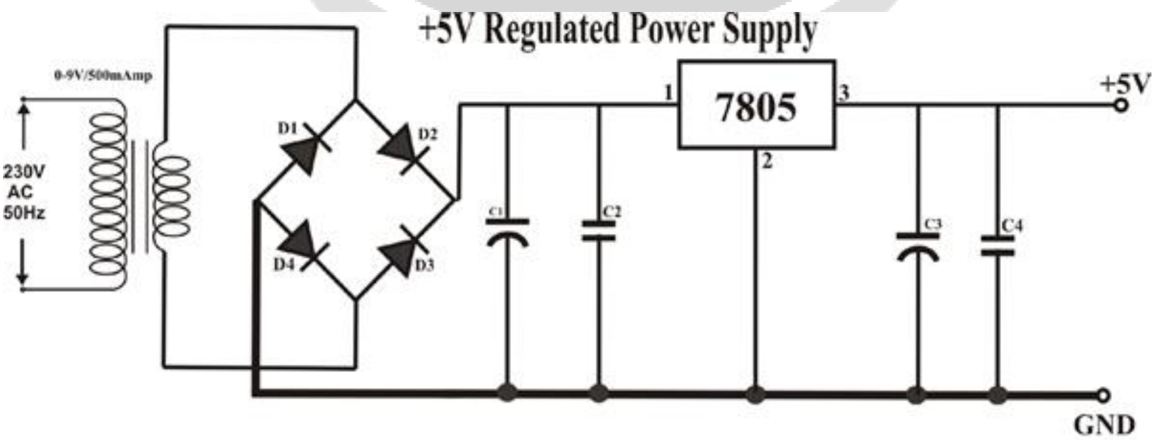


Fig. +5 V Regulated Power Supply

The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC contains all the circuitry needed to accept any input voltage from 8 to 18 volts and produce a steady +5 volt output, accurate to within 5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

The advantage of a bridge rectifier is you don’t need a centre tap on the secondary of the transformer. A further but significant advantage is that the ripple frequency at the output is twice the line frequency(i.e. 50Hz) and makes filtering somewhat easier.

The use of capacitor c1,c2,c3 and c4 is to make signal ripple free. The two capacitor used before the regulator is to make ac signal ripple free and then later which we are using is for safety, if incase there is a ripple left after regulating, then c3 and c4 will remove it.

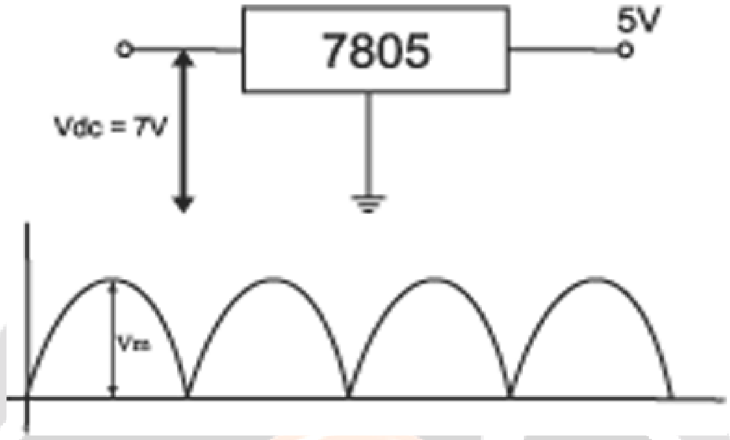


Fig. Power Supply Waveform

6. ADVANTAGES:

1. Low Cost
2. As internal ADC is used the Circuit becomes compact
3. Power consumption is less.
4. Cost effective and System life is durable
5. Can work in all climate conditions and in any environment.

7. CONCLUSION:

We have proposed a low-cost solution to enhance the remote monitoring capability of existing industrial system. It is secure, robust and low-power consuming.It can operate on multiple channels so as to avoid interference with other wireless devices or equipments in the industry.

8. REFERENCES:

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