

Protection of Distribution Line Assets- With Modern Microprocessor Based Relays

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Abstract – Distribution line to electric co-operative and municipal utilities submerged with simple protection schemes consisting of feeder circuit over current, recloser and transformer protection either with HRC fuses or differential over current protection. These devices provide more protection to personnel than that of equipment and unable to serve protection against open circuit faults (such as breaking of line due to natural climates). Arduino based system with CT, PT & RELAY used to protect distribution line assets when fault occurred at consumer end.

Key Words: Arduino, LCD, Relay, Current Transformer, Potential Transformer etc.

1. INTRODUCTION

The basic aim of this project model is to protect & detect the exact type of fault from distribution point using an Arduino board. Normally we use overhead lines for rural and agricultural needs. These lines are suffered from two types of faults mainly i.e. open circuit fault and short circuit fault. We can simply detect the short circuit faults by using HRC fuse at distribution transformer. But, when distribution line is deals with open circuit fault is remain unprotected due to HRC fuse. The HRC fuse only works when high inrush current flowing through the line. This open circuit fault are arrives in distribution line due to bad weather condition such as snowfall, heavy rainfall, storm and malfunctioning man made operation. These fault leads to accidents of human being & animals. So protection of distribution line is necessary and held immediately by tripping the circuit rather than wait for fuse element breakdown.

1.1 TYPES OF FAULTS

There are different type of faults, Normally occurring faults are given below:

☐☐ Short circuit fault

☐☐ Open circuit fault

1. Short circuit fault

When two or more conductors of the line come in

contact with each other, then this is called short circuit fault. A short circuit fault occurs when the insulation of the cable is damaged. In short circuit fault current bypasses the load.

2. Open circuit fault

As the name suggests, this fault include an open circuit in the conductors. When there is a break in the any conductor, it is called open circuit fault.

2. Block diagram

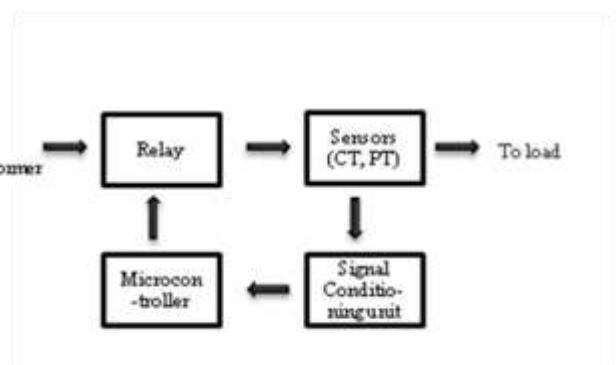


Fig.1. Block diagram

2.1 BLOCK DIAGRAM DESCRIPTION

The system is mainly comprises of CT, PT, Relay, Signal Conditioning Unit and Microcontroller. Whereas CT and PT are used as sensors. Normally current transformer are placed in series with line emerged from distribution transformer; PT are placed in between line and neutral in parallel. The signals from above sensors are given to the signal conditioning unit before fed to the microcontroller. Signal conditioning unit convert signal into specified value that usually understand by microcontroller. Microcontroller is the brain for our system. Which control the operation of relay circuit according to program burn into it. Program that burn into microcontroller are mainly showcased with short circuit fault, open circuit fault and over voltage fault condition. If in case any one of these condition is achieved by microcontroller then it gives signal to relay circuit for its tripping. Relay receives signal from microcontroller and trip the transformer connection from line. In absence of fault condition system will work as satisfactory.

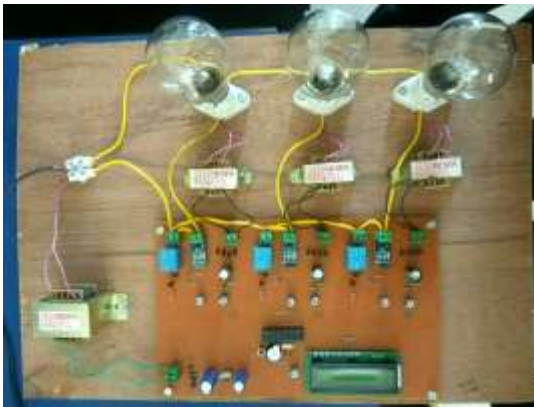


Fig.2. working hardware module

The result from hardware is send to the LCD display unit shown in figure



Fig.3. Result

2.2. SOFTAWRE DESCRIPTION

For programming of Arduino IDE software is use. Arduino Integrated development environment (IDE), which is across platform application written in the programming languages processing and wiring. It has a code editor with tool like a text cutting and pasting, searching and replacing text automatic indenting, brace matching, and syntax highlighting and provides very easy one click process to compile and upload programs to an Arduino board. It also includes a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. A program written with the IDE for Arduino is termed a sketch. Sketches are saved on the development computer as text file extension. .ino. The Arduino IDE supports the languages C and C++ using particular rules of code structuring. The Arduino IDE supplies a software library from the wiring projects, which provides many common input and output procedures.

3. FLOWCHART

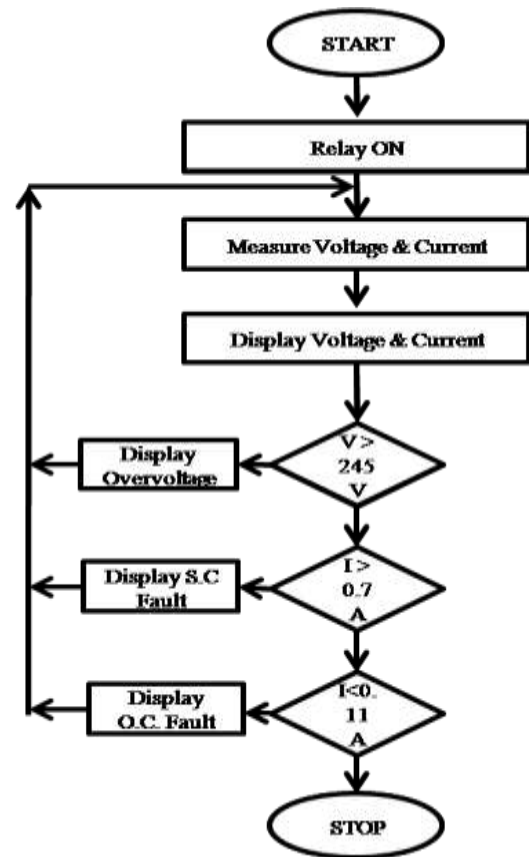


Fig.3. Flow chart

4. CONCLUSION

This is proposed model of protection and detection of fault on distribution line. Model is build with set of incandescent lamp for showing faulty condition in line. This condition shows the satisfactory operation of model after occurrence of fault.

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