

# Single phase fault analysis for temporary and permanent fault

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## ABSTRACT

This paper to develop an automatic tripping mechanism for the single phase supply system. The project output resets automatically after a brief interruption in the event temporary fault while it remains in tripped condition in case of permanent fault. There are some failures due to some faults which can be temporary or permanent. These faults lead to substantial damage to the power system equipment. It is common, the faults might be LG (Line to Ground) in the supply systems and these faults in single phase supply system can affect the power system. To overcome this problem a system is built, which can sense these faults and automatically disconnects the supply to avoid damage. This system is built using single phase transformers having input 230 volt and output at 12 volt. This concept low voltage testing of fault conditions is followed. A switch is used to create the LG fault in low voltage side, for activating the tripping mechanism. Short duration fault returns the supply to the load immediately called as temporary trip while long duration shall result in permanent trip. The idea in the future can be extended to developing a device to send message to

the authorities via SMS by interfacing a GSM modem.

**Keywords**— *Fault analysis, temporary fault, permanent fault, Automatic tripping.*

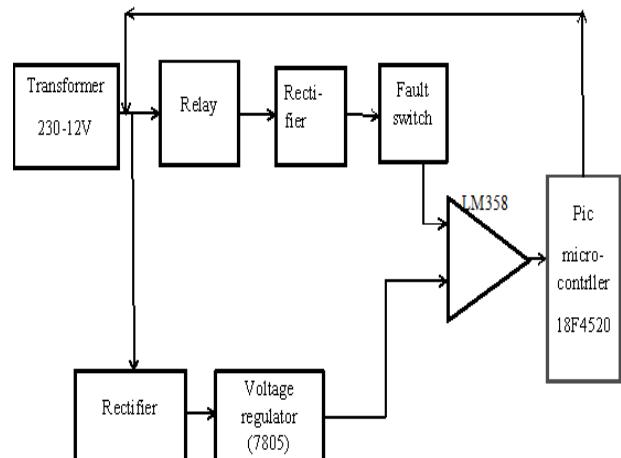
## 1. INTRODUCTION

Various studies have shown that anywhere from 70%, to as high as 90%, of faults on most overhead lines are transient. A transient fault, such as an insulator flashover, is a fault which is cleared by the isolator the fault, and which does not recur when the line is re-energized. Faults tend to be less transient (near the 80% range) at lower, distribution voltages and more transient (near the 90% range) at higher, sub transmission and transmission immediate tripping of one or more circuit breakers to voltages. Lightning is the most common cause of transient faults, partially resulting from insulator flashover from the high

transient voltages induced by the lightning. Other possible causes are swinging wires and temporary contact with foreign objects. Thus, transient faults can be cleared by momentarily de-energizing the line, in order to allow the fault to clear. Auto reclosing can then restore service to the line. The remaining 10-30% of faults are semi permanent or permanent in nature. A small branch falling onto the line can cause a semi-permanent fault. In this case, however, an immediate de-energizing of the line and subsequent auto reclosing does not clear the fault.

## 2 PROPOSED SYSTEM AND BLOCK DIAGRAM :-

The block diagram presenting plan arrangement of single phase fault analysis autoreset on temporary fault or permanent trip otherwise.



**Fig.1: block diagram of implemented scheme**

## 3 FAULT ANALYSES

Faults are classified into two parts, Active and Passive Fault.

**3.1 Active Fault:** - When current passing from one phase to another phase or phase to ground is known as Active fault. This fault must be cleared as quickly as possible otherwise its damages to the conductor or line or the equipment.

**3.2 Passive Fault:** - Passive faults are stressing the system beyond it's design and long duration fault which ultimately results in active fault.

**3.3 Transient Fault:** - Transient faults are didn't damage the insulation of wire and there are small in time duration and after that period circuit is re-energized. These

faults are occur on outdoor equipment because the air is main medium to take place the transient fault.

**3.4 Permanent Fault :-** Permanent fault as name suggest it is the permanent fault, which damage permanently to the insulation. In this period line will permanent de-energized and repaired.

**3.5 Symmetrical Fault:** - A symmetrical fault is a balanced fault which are occurred on three phase. These three phase has same value of fault current. Magnitude of all fault current is same. These faults are same in three line or three line to ground fault.

**3.6 Asymmetrical Fault:** - An asymmetrical fault has a d.c. offset, transient in nature and unbalanced fault. They are occur on single line, double line or single line to ground or double line to ground.

#### 4 Nature and Causes of Faults

Nature of a fault is simply defined as any abnormal condition, which causes a reduction in the basic insulation strength between phase conductors, or between phase conductors and earth or any earthed screens surrounding the conductors. In practice, a reduction is not regarded as a fault until it is detectable, that is until it results either in an excess current or in a reduction of the impedance between conductors, or between conductors and earth, to a value below that

of the lowest load impedance normal to the circuit.

#### 5. COMPONENT OF BLOCK DIAGRAM

**5.1 TRANSFORMER:** - Transformer is device used for increase and decrease the voltages. Here step down transformers are used for step down the voltage at 12volt from 220volt AC. Transformers are used at different location as well as transmission and distribution.



Fig .5.1.1 : Transformer

#### 5.2 RELAY :-

Figure shows the relay and relay contact.

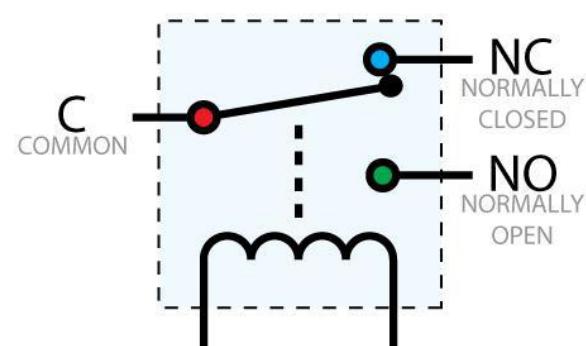
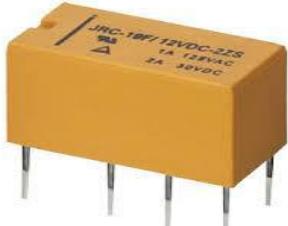


Fig-5.2.1: Relay Contact

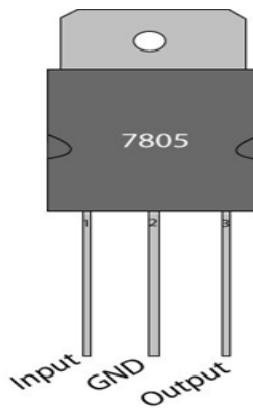
There are three terminal of the relay contact one is common for the supply and the other two or normally open and normally close. Relay is connected in circuit as we want as normally open or normally close by the operation of relay one signal is given to the circuit breaker and it's disconnect the circuit.



**Fig-5.2.2:** Relay

### 5.3. VOLTAGE REGULATOR

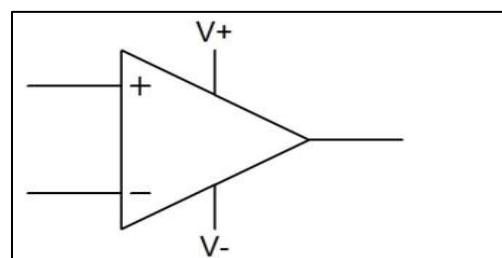
The LM78XX/LM78XXA series of three-terminal positive regulators are with several fixed output voltages, making them useful in a Wide range of applications. It has 3 pin, two is input and output and the other is ground. 7805 voltage regulator gives +5v supply.



**Fig 5.3.1:** Voltage Regulator.

### 5.4 COMPARATOR:-

Op amps and comparators look very comparable. An op amp amplifies the variance voltage between its two inputs – and is intended always to be used.



**Fig 5.4.1 :** Comparator

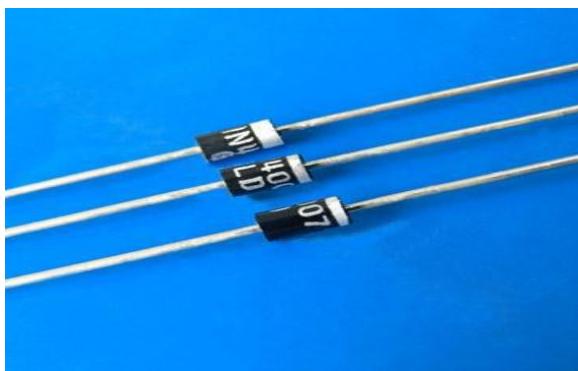
### 5.5 DIODE :-

Diodes are used to convert AC into DC. Three points must be kept in mind while using any type of diode.

1. Maximum forward current capacity
2. Maximum reverse voltage capacity

### 3. Maximum forward voltage capacity.

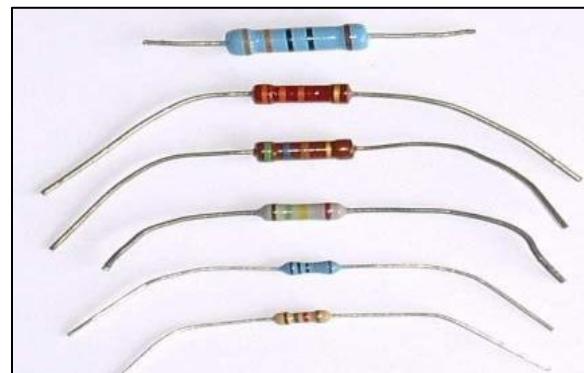
Diodes of number IN4001, IN4002, IN4003, IN4004, IN4005, IN4006 and IN4007 have maximum reverse bias voltage capacity of 50V and maximum forward current capacity of 1Amp.



**Fig 5.5.1: Diode**

## 5.6 RESISTOR

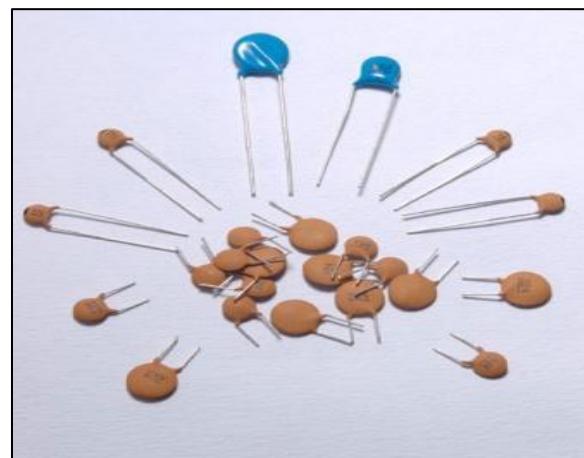
A resistor is a two-terminal electronic module intended to oppose an electric current by creating a voltage drop between its terminals in quantity to the current, that is in accordance with Ohm's law:  $V = IR$ . Resistors are used as part of electrical systems and electronic circuits.

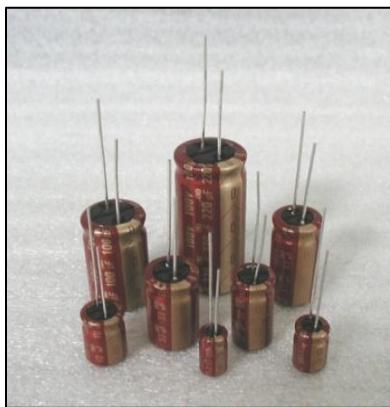


**Fig 5.6.1: Resistor**

## 5.7 CAPACITOR

When there is a potential difference (voltage) across the conductors, a static electric field develops in the dielectric that stores energy and produces a mechanical force between the conductors.

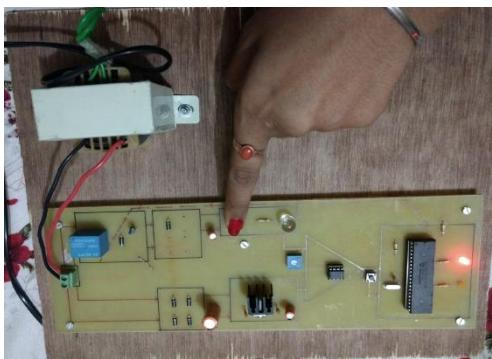




**Fig 5.7.1 Capacitor**

## 6. WORKING PRINCIPLE

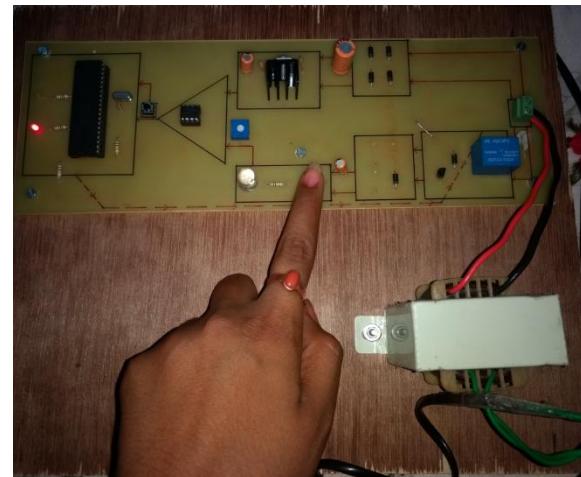
When the board is powered up then firstly initialize the port pin and then relay is in ON condition. If fault occurs in the system because we press the push button for a short duration i.e fault is temporary in nature, as shown in fig 6.1.



**Fig 6.1 Temporary fault**

Then the relay will turn off and delay for up to 3sec and incrementing the fault counter. Red light is on. And after 3 sec, it will get reset automatically & continuous supply will

obtain. If we press push button for long duration i.e fault is permanent in nature, relay will trip and it will check the condition for 3 times, as shown in fig 6.2, if fault is still remain in circuit then the relay will permanently tripped. At that time both LED's (Red and Yellow) are on. This fault is permanent fault as shown in fig.6.3. The process will shows in flow chart.



**Fig 6.2 Pressing the push buttons for long time.**



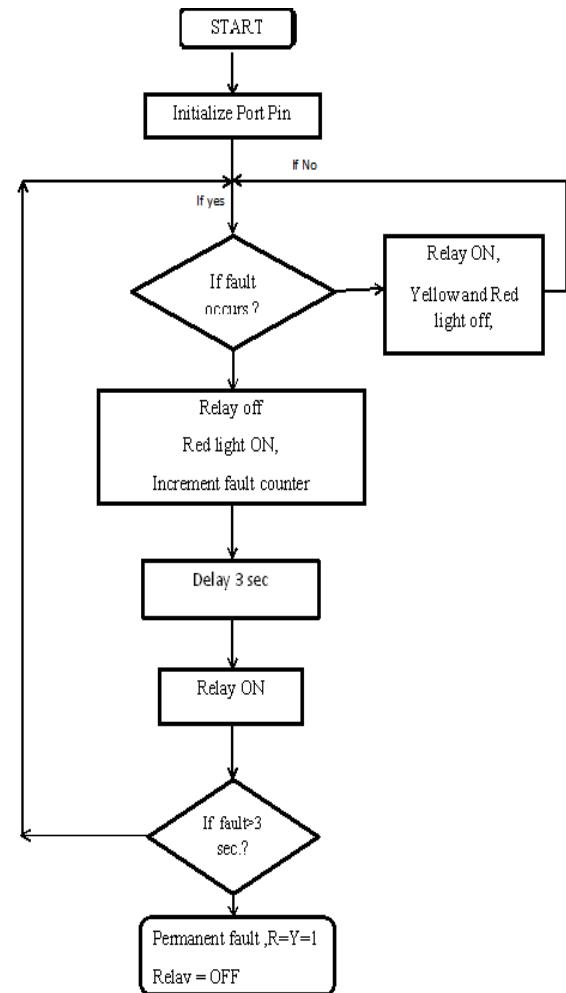
**Fig 6.3 Permanent fault**

## 10 CONCLUSION

Various types of faults are created to develop an auto tripping mechanism for the single phase supply system while temporary fault and permanent fault occur. Here microcontroller has been used with relay for the fault analysis; there are the short duration fault returns to the supply to the load immediately called a temporary fault while long duration shall result in permanent

trip. This system is more economical, cheaper in cost and automatic tripping.

## 7.FLOWCHART



## 8 ADVANTAGES

1. Safety
2. More Efficiency
3. More Reliable

4. Cheaper

## **9 APPLICATIONS**

1. Substation
2. Industrial and Commercial Sectors
3. Transmission line and Distribution system
4. Apartments

## **REFERENCE**

1. “Three Phase Fault Analysis with Auto Reset for Temporary Fault and Trip for Permanent Fault”, Sathish Bakanagari et al ,(2013) Int. Journal of Engineering Research and Applications .

2.“Fault Analysis on Three Phase Transmission Lines and its Detection” , Akshit Sharma, Ankit Nirwan, Ajay Singh Shekhawat Department of Electrical Engineering, Poornima College of Engineering, Jaipur (Rajasthan), India International Journal of Advance Research and Innovation volume 5 Issue 2 (2017) 229-233 ISSN 2347 – 3258.

3.“AUTO RESET ON TEMPORARY FAULT OTHERWISE PERMANENT TRIP IN THREE PHASE TRANSMISSION LINE”, Saqib

Momin, Rahul Killedar, Omkar Shinde, Abhijeet Desai, Sanjeevan Ranage, Students, Electrical, Sanjay Ghodawat Institute,Atigre,India. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 - 0056 Volume: 04 Issue: 03 | March-2017 p-ISSN: 2395-0072.

4.A Yadav, A Swetapadma. Fault Analysis in Three phase Transmission lines Using K-Nearest Neighbor Algorithm, AECC (ICAECC), 2014, 1-5.

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