International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 03 | March-2017 www.irjet.net p-ISSN: 2395-0072

AUTO RESET ON TEMPORARY FAULT OTHERWISE PERMANENT TRIP IN THREE PHASE TRANSMISSION LINE

Saqib Momin*1, Rahul Killedar*2, Omkar Shinde*3, Abhijeet Desai*4, Sanjeevan Ranage*5, Prof. Deepa Kerutagi*6

[12345]Students, Electrical, Sanjay Ghodawat Institute,Atigre,India
[6]Professor, Dept. of Electrical Engineering, Sanjay Ghodawat Institute,Maharashtra, India

---

Abstract- *Transmission line protection is an important issue in power system in electrical engineering. Transmission and distribution lines have good contribution in the generating unit and consumers to obtain the continuity of electric supply. It runs over hundreds of kilometers to supply electrical power to the consumers. As 85-87% of power system faults are occurring in transmission lines, it is a required to detect and locate the faults in the power system as early as possible. This paper describes an automatic tripping mechanism for the three phase supply system. In the event of temporary fault, the project output resets automatically after a brief interruption, while it remain in tripped condition in case of permanent fault. The faults that are LG, LL and 3L might be lead to damage to the power system equipment and may be affect the power system. This project is designed to understand about the basic operation of the relay and what are all the advanced techniques which are been used by the people to make the safety operation of the electrical appliance and protection.*

Keywords: **transmission line, tripping mechanism, LG, LL and 3L.**

1. INTRODUCTION

In different reviews it has been seen that blame happens are 70% to 90% is transient blame on overhead lines. A transient blame, for example, a separator flashover or short out is a blame which is cleared by the confine the blame, and which does not repeat when the line is re-invigorated. Shortcomings have a tendency to be less homeless people (close to the 80% territory) at lower, dissemination voltages and more transient (close to the 90% territory) at higher, sub transmission and transmission prompt stumbling of at least one circuit breakers to voltages. Lightning is the most widely recognized reason for transient issues, incompletely coming about because of separator flashover from the high transient voltages incited by the lightning. Other conceivable causes are swinging wires and impermanent contact with outside articles. Consequently, transient deficiencies can be cleared by quickly de-invigorating the line, keeping in mind the end goal to permit the blame to clear. Auto reclosing can then reestablish administration to the line. The rest of the 10 - 30% of shortcomings is semi perpetual or lasting in nature. A little branch falling onto the line can bring about a semi-lasting deficiency. For this situation, be that as it may, a quick de-empowering of the line and consequent auto reclosing does not clear the blame. Rather, an organized time-deferred excursion would permit the branch to be consumed with extreme heat without harm to the framework. Semi perpetual deficiencies of this sort are probably going to be most common in very lush territories and can be generously controlled by forceful line freedom programs. Lasting shortcomings are those that won't clear after stumbling and reclosing. A case of a perpetual blame on an overhead line is a broken wire bringing about a stage to open, or a broken shaft creating the stages to short together. Blames on underground links ought to be viewed as lasting. Link deficiencies ought to be cleared without auto reclosing and the harmed link repaired before administration is reestablished. There might be special cases to this, as on account of circuits made out of both underground links and overhead lines.

Despite the fact that auto reclosing achievement rates fluctuate starting with one organization then onto the next, plainly the lion's share of issues can be effectively cleared by the correct utilization of stumbling and auto reclosing. This de-empowers the line sufficiently long for the blame source to pass and the blame circular segment to de-stimulate, then naturally recloses the line to reestablish benefit. Along these lines, auto reclosing can fundamentally decrease the blackout time because of flaws and give a more elevated amount of administration

progression to the client. Moreover, effective fast reclosing auto reclosing. On transmission circuits can be a central point when endeavoring to keep up framework steadiness. For those deficiencies that are lasting, auto reclosing will reclose the circuit into a blame that has not been cleared, which may affect framework steadiness (especially at transmission levels). The elements are as per the following. 1. Confine the heap when there is increment in the heap current 2. Sorts of blame that it can detect: low voltage, high voltage, high current 3. On the off chance that the heap is segregated as a result of low voltage it will be exchanged on consequently when the voltage gets balanced out 4. Sign of kind of blame that has been happened on a 16x2 spot network lcd 5 Can change the present setting effortlessly. This is worked by utilizing an Atmega-8 microcontroller. Distinctive segments of the venture are outlined on partitioned pcb so that the venture can be exhibited effectively. The exhibit of the venture is exceptionally straightforward as by opening any one stage wire, which is only a low voltage, can be seen on the show. By chipping away at this venture one can see how to gauge the rms estimation of the sine wave by utilizing an ADC. The voltage and current sizes are ventured around utilizing a PT and CT. from that point the yield is associated with pinnacle indicator circuit which will give the yield dc voltage of greatness equivalent to the most extreme estimation of the sine wave. From that point the yield is given to an ADC which is interfaced to the microcontroller .the controller will work a transfer in the event that it finds any sudden change in the yield of the pinnacle locator segment, so that the heap is isolated frame the supply. All the required dc voltages are composed in the circuit itself by utilizing the voltage controller IC's. Control link blame area methods are utilized as a part of force framework for exact pinpointing of the blame positions. The advantages of precise area of blame are: 1. Quick repair to reestablish back the power framework. 2. Enhance the framework accessibility and execution. 3. Lessen working expense and spare the time required by the team looking in awful climate, boisterous range and extreme territories.

2. COMPONENTS

2.1. VOLTAGE REGULATOR 7805

Although designed primarily as fixed voltage controllers, these gadgets can be utilized with outer parts to get flexible voltages and streams. The LM78XX/LM78XXA arrangements of three-terminal positive controllers are accessible in the TO-220/D-PAK bundle and with a few settled yield voltages, making them valuable in a Wide scope of utilizations. Each sort utilizes inside current constraining, warm shutdown Fig.(b) Block graph of voltage controller 7805 and safe working range security, making

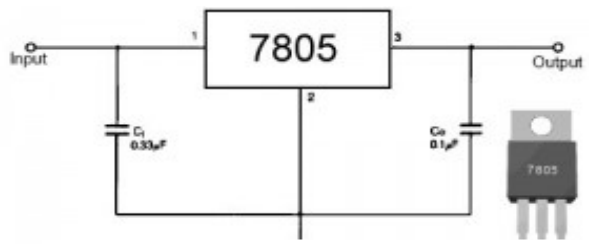


Fig.(a) Pin diagram of voltage regulator7805

it basically indestructible. On the off chance that satisfactory warmth sinking is given, they can convey more than 1A yield Current.

2.2 555 TIMER

Contingent upon the producer, the standard 555 bundle incorporates more than 20 transistors, 2 diodes and 15 resistors on a silicon chip introduced in a 8-stick smaller than usual double in-line bundle (DIP-8).[4] Variants accessible incorporate the 556 (a 14-stick DIP joining two 555s on one chip), and the 558 (a 16-stick DIP consolidating four somewhat altered 555s with DIS and THR associated inside, and TR falling edge delicate rather than level touchy).

Ultra-low power variants of the 555 are additionally accessible, for example, the 7555 and TLC555. The 7555 is intended to bring about less supply glitching than the exemplary 555 and the producer asserts that it ordinarily does not require a "control" capacitor and much of the time does not require a power supply sidestep capacitor.

The 555 has three operating modes:

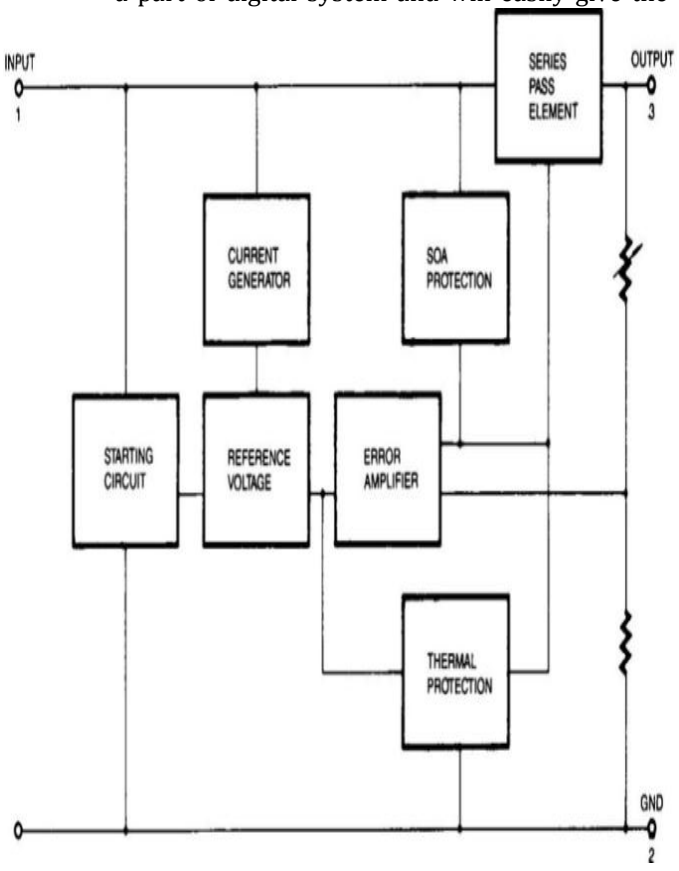
- Monostable mode: in this mode, the 555 capacities as a "one-shot". Applications include timers, missing pulse identification, bounce free switches, touch switches, frequency divider, capacitance measuring, pulse-width modulation (PWM) etc.
- Astable – free running mode: the 555 can work as an oscillator. Application includes LED and light flashers, pulse generation, logic clocks, tone generation, security alarms, pulse position modulation etc.
- Bistable mode or Schmitt trigger: the 555 can work as a flip-flop, if the DIS pin is not associated and no capacitor is used. Uses include bounce free latched switches, and so on.

2.3. LM358

The LM358 series consists of two independent, high gains; inside frequency compensated operational amplifiers which were planned particularly to work from a single power supply over a different range of voltages. Split power supplies can be possible and the low power supply current drain is independent of the value of the power supply voltage.

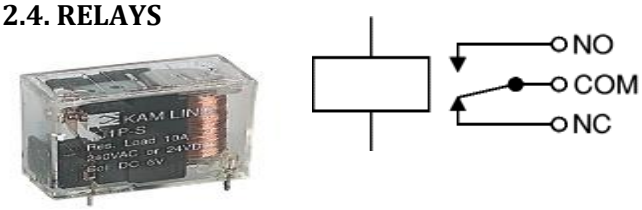
Application of it include transducer amplifiers, dc gain blocks and all the conventional operational amplifiers circuits which now can be all the more effectively actualized in single power supply system. For example, the LM358 series can be directly off of the standard +5V control supply voltage which is utilized as

a part of digital system and will easily give the



required interface electronics without requiring the extra ±15V power supplies.

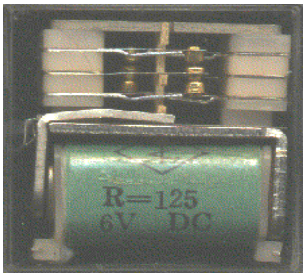
2.4. RELAYS



Fig(c).Common Relays

A relay is an electrically worked switch. Many relay utilize an electromagnet to work a switching mechanism mechanically, however other working principles are also used. Relays are utilized where it is important to control a circuit by a low-control motion (with complete electrical isolation among control and controlled circuits), or where a few circuits must be controlled by one signal. A relay is an electrically worked switch. Current passing through the coil of the relays make a magnetic field which attracts a lever and changes the switch. The current in a coil can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in figure. Relays permit one circuit to switch a second circuit which can be totally 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 any electrical connection inside the relay among between the two circuits; the link provides is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay; however, it can be as much as 100mA for relays designed to work from lower voltages. Most ICs (chips) can't give this current and a transistor is typically used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are normally SPDT or DPDT however they can have many more arrangements of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For additional data about switch contacts and the terms used to describe them please observe the page on switches.



Fig(d). Relay showing coil and switch contacts

Most relays are designed for PCB mounting yet you can patch wires straightforwardly to the pins providing you take care to avoid melting the plastic case of the relay.

2.5. DIODES

1. Diodes are used to change over AC into DC these are utilized as half wave rectifier or full wave rectifier. Three points must he remembered while utilizing any type of diode.

1. Maximum forward current limit
2. Maximum turn around voltage limit
3. Maximum forward voltage limit

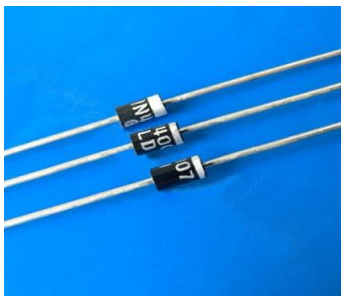


Fig (e). 1N4007 diodes

The number and voltage limit of a portion of the important diodes accessible in the market are as per the following:

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

- Diode of same capacities can be utilized as a part of place of each other. Other than this diode of more can be utilized as a part of place of diode of low capacity however diode of low capacity can't be utilized as a part of place of diode of high capacity. For example, in place of IN4002; IN4001 or IN4007 can be utilized but IN4001 or IN4002 can't be utilized as a part of place of IN4007. The diode BY125made by organization BEL is identical of diode from IN4001 to IN4003. BY 126 is identical to diodes IN4004 to 4006 and BY 127 is identical to diode IN4007.

2.6. RESISTORS

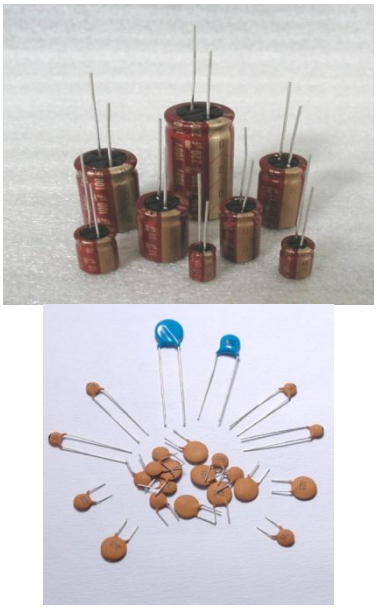
A resistor is a two-terminal electronic component designed for restricts an electric current by creating a voltage drop between its terminals in proportion to the current that is, as per Ohm's law:

$$V = IR$$

The essential qualities of resistors are their resistance and the power they can disperse. Different characteristics include temperature coefficient, noise, and inductance, critical resistance, the value below which power dissipation limits the maximum allowed current flow, and above which the limit is supplied voltage. Basic resistance depends upon the materials constituting the resistor and its physical measurements; it's determined by design.

2.7. CAPACITORS

A capacitor or condenser is an passive electronic component consisting of a couple of conductors isolated by a dielectric. At the point when a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This electrical field stores energy and produces a mechanical force in between two plates. The effect is greatest between wide, flat, parallel and narrowly separated of conductors.



Fig(f).Different capacitors

A perfect capacitor is described by a solitary steady esteem, capacitance, which is measured in farads. This is the proportion of the electric charge on every channel to the potential difference between them. In practice, the dielectric between the plates passes a little measure of leakage current. The conductors and leads present an equivalent series resistance and the dielectric has an electric field strength point of resulting about a breakdown voltage.

The properties of capacitors in a circuit may decide the resonant frequency and quality factor of a resonant circuit, power dissipation and operating frequency in a digital logic circuit, energy capacity in a high power system, and numerous other important aspects.

A capacitor (formerly known as condenser) is a device for storing electric charge. The types of useful capacitors fluctuate broadly, however all contain no less than two conductors isolated by a non-conductor. Capacitors utilized as parts of electrical system, for instance, comprise of metal foils isolated by a layer of protecting film.

Capacitors are broadly utilized as a part of electronic circuits for blocking direct current while permitting alternating current to pass, in filter networks, for smoothing the output of power supplies, in the full resonant circuit that tune radios to particular frequencies and for some different purposes.

A capacitor is a passive electronic component comprising of a couple of conductor isolated by a dielectric (insulator). At the point when there is a potential difference (voltage) over the conductors, a static electric field creates in the dielectric that stores vitality and produces a mechanical force between the conductors. A perfect capacitor is described by a single constant value, capacitance, measured in farads. This is the proportion of the electric charge on every conductor the potential difference between them.

The capacitance value of capacitor is greatest when there is a narrow separation between large areas of the conductor; hence capacitor conductors are called as "plates", referring to an early means of construction. In practice the dielectric between the plates passes a small value of leakage current and also has an electric field strength limit, resulting in a breakdown voltage, while the conductors and leads introduce an undesired inductance and resistance.

3. OPERATING PROCEDURE:

The project utilizes 6 numbers step down transformers for of the whole circuit under low voltage conditions of 12v just to test the 3 phase fault examination. The primary side of 3 transformers is associated with a 3 stage supply in star arrangement, while the secondary of the same is also associated in star arrangement. The other arrangement of 3 transformers with its primary associated in star to 3 phases has their secondary's associated in delta configuration. The output of all 6 transformers is rectified and filtered individually and is given to 6 relay coils. 6 push switches, one each connected across the relay coil is meant to make a fault condition either at star i.e. LL Fault or 3L Fault. The NC contacts of all the relay are made parallel while all the common points are grounded. The parallel connected point of NC is given to pin2 through a resistor R5 to a 555 timer i.e. wired in monostable mode. The output of a similar timer is connected to the reset pin 4 of another 555 timer in astable mode. LED'S are connected at their output to show their status either on or off. The output of the U3 555 timer from pin3 is given to an operational amplifier LM358 through wire 11 and d12 to the non altering input of pin3, while the inverting input is kept at a settled potential by a potential divider RV2. The potential at pin2 coming from the potential divider is held to the point that it is higher than the pin3 of the operational amplifier used as a comparator so that pin1 develops zero logic that fails to work the relay through the driver transistor Q1. This relay Q1 is "3CO" relay i.e. is meant for disconnecting the load to indicate fault conditions.

While any push catch over the relay is pressed it disconnects that relay and in the process in common contacts moves to the NC position to give a logic low at trigger pin of 555 timer to build up a output that brings the U3 555 timer, which is used as a part of astable mode for its reset pin to high such that the astable operation takes place at its output and which is shows appears by flashing D11 LED. In the fault is off temporary in nature i.e. if the push button pressed is released instantly the U1 monostable disables U3 the output of which goes to zero in case of any push button kept pressed for a longer duration the monostable output gives a longer duration active situation for U3 the astable timer the output of which charges capacitor C13 through R11 such that the output of the comparator goes to high that drives the relay to turn off three phase load.

The output of Op-amp stays high indefinitely through a positive feedback given for its pin1 to pin3 through a forward biased diode and a resistor in series. This outcomes in the relay for permanently switched to disengage the load connected at its NC contacts permanently off. In order to maintain or keep up flow of DC supply the star connected set DC'S are paralleled through D8, D9 and D10 for continuous supply to the circuit DC voltage of 12v and DC voltage of 5v derived out of voltage regulator IC 7805.

4. HARDWARE TESTING

4.1CONTINUITY TEST:

Test will be performed just after the hardware soldering and configuration has been completed. We use a multi meter to perform this test. This test aims at finding any electrical open paths in the circuit after the soldering.

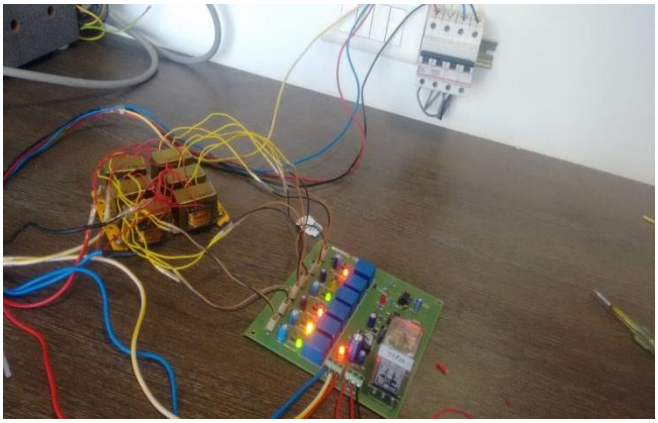
4.2POWER ON TEST:

This test is performed to analyze whether the voltage at various terminals is as per the necessity or not. This test will be performed without ICs. In this we can assure that the voltage at all the terminals is according to the requirement.

5. RESULT

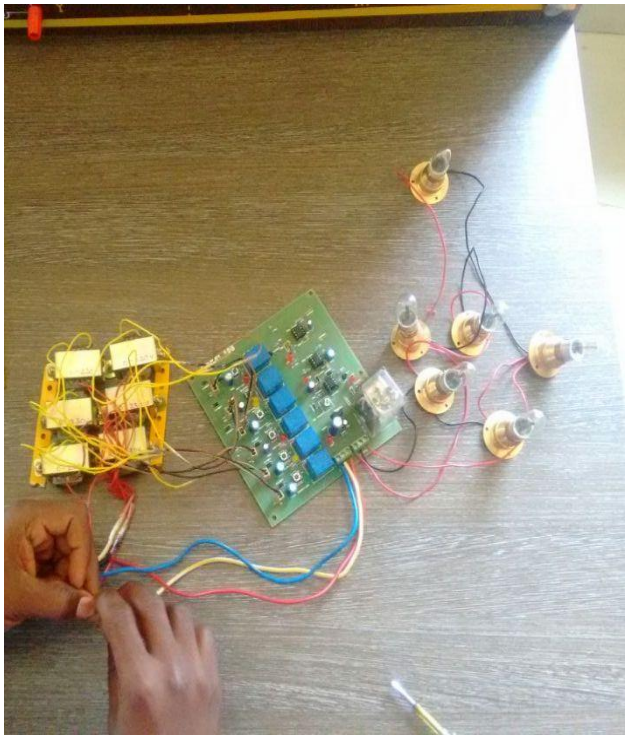
In this final stage, components assembled and connected all the circuit related connections of the respective transformers, pcb circuit and the load to notify the faults to be occurred by tripping through the push buttons.

Testing was performed on the circuits and were successfully executed for the respective continuity test and the power-on test.



Fig(g).Implementing connections

The transformers are connected to the pcb circuit whose input is 12v. the push buttons, LEDs glows and is executed by pressing push button. After successfully implementing the connection of transformers and load with pcb circuit, we gave three phase supply to transformer. We created fault by pressing push button and fault created successfully. The fault was cleared immediately within seconds notifying the occurrence of temporary fault. Following is successful execution of fault creating fault and correcting it.



Fig(h).Final execution

6. CONCLUSION

This project design in the form of hardware for six single phase transformer to 230v to 12v of output for to develop an automatic tripping mechanism for the three phase supply system while temporary fault and permanent fault occurs in system. During temporary fault it returns the supply to the load immediately, otherwise it results in permanent trip.

7. REFERENCES

[1] Kimbark, Edward Wilson, ScD; Power System Stability; John Wiley & Sons, Inc., N.Y., London

[2] HAVRAN, F.J. 1999. Fault investigation on power transmission system. ESKOM. Internal document: 38, 96- 99KELLER, P. 1998. Correct fault analysis. Eskom internal document Turan Gonen, "Electric Power Transmission System Engineering, Analysis and Design", Crc Press Taylor and Francis Group.

[3] Turan Gonen, "Electric Power Transmission System Engineering, Analysis and Design", Crc Press Taylor and Francis Group.

[4] Paul M. Anderson, "Analysis of Faulted Power Systems", The Institute of Electrical and Electronics Engineers, Inc., 1995.

[5] Miroslav D. Markovic, "Fault Analysis in Power Systems by Using the Fortescue Method", TESLA Institute, 2009.

[6] Jun Zhu. "Analysis Of Transmission System Faults the Phase Domain", Texas A&M University. Master Thesis, 2004.

[7] D. C. Yu, D. Chen, S. Ramasamy and D. G. Flinn, "A Windows Based Graphical Package for Symmetrical Components Analysis", IEEE Transactions on Power Systems, Vol. 10, No. 4, pp 1742-1749, November 1995.