

International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET) A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.

Available online at: www.jrrset.com UGC Approved Journal No: 45483 Volume 6, Issue10 Pages 51-55 ISSN (Print) : 2347-6729 ISSN (Online) : 2348-3105 JIR IF : 2.54 SJIF IF : 4.334 Cosmos: 5.395

OVERVOLTAGE AND UNDERVOLTAGE PROTECTION SYSTEM

Dr.P.K.Prakasha, KahkashanSharab, T.Ashok Kumar, MohdKhaja Ali

Department of Electrical and Electronics Engineering, Shadan College of Engineering and Technology HYD, T.S, INDIA

Abstract: The purpose of this project is trip the relay according to the variations in supply voltage for protecting electrical household as well as industrial equipment in case of overvoltage and under voltage. The electronic devices are very sensitive towards voltage variation, as voltage variation comes in supply the electronic equipment get easily damaged. In that condition it requires an additional protecting mechanism to protect the equipment as a load. According voltage comparator integrated circuits the decision of tripping of relay mechanism get performed, as voltage varies above or below the set value. The main advantage of this relay based mechanism is that it also protects three-phase appliances from single phasing and fluctuation of voltage in ac voltage waveform. In future their might be addition of earth fault detection and protection, automatic starting protection circuitry

Key Words:overvoltage and under voltage protection, voltage comparator circuitry, tripping mechanism of relay...

1. INTRODUCTION

The aim of this project is to develop a low voltage and high voltage tripping mechanism to protect the load from damage. The fluctuation in AC mains supply is frequent in homes and industries. The sensitive electronic devices in these conditions can get easily damaged. It is preferable to have a tripping mechanism to protect the load. This proposed system will trip the load in the event of the input voltage falling below/above a set value. Two 555 timers are used as window comparator. This delivers an error output if the input voltage to them crosses the range beyond the voltage window. A relay is then operated to cutoff the load for safety reasons. A lamp is used as load in this project. The concept in future can be extended by integrating an alarm, which sounds when voltage fluctuations occur. It can also be interfaced with a GSM modem to convey alertmessage to the user via SMS to take appropriate action. **1.1 SCHEMATIC DIAGRAM**

International Journal on Recent Researches in



Science, Engineering & Technology (IJRRSET) A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF. **Research Paper**

Available online at: www.jrrset.com UGC Approved Journal No: 45483

ISSN (Print) : 2347-6729 ISSN (Online) : 2348-3105 JIR IF: 2.54 SJIF IF : 4.334 Cosmos: 5.395



SCHEMATIC DIAGRAM

1.2 BLOCK DIAGRAM



BLOCK DIAGRAM

- **1.3 HARDWARE REQUIREMENTS:**555 Timers
- LED
- Voltage Regulator
- Resistors
- Potentiometer
- Capacitors
- Diodes
- Relay
- Lamp
- Transformer
- 2. 2.0 DESCRIPTION

2.1 CONNECTIONS:

In this project of OVER VOLTAGE OR UNDER VOLTAGE ALERT SYSTEM we are using one step down transformer from 230v 50hz to 12v. One bridge rectifierand voltage regulator of 7809 so that +9v can be obtained for the operation of the circuit. Here we are using two 555 timer known as U2 &U38th pin of which is connected to 3rd pin of voltage regulator where 4th pin is shorted to 8th pin. 2nd pin of U2 is connected to RV1which is used for low voltage LV and pin 2 of U3 is used for high voltage HV. Where 5th pin and 6th pin of both U2 & U3 are shorted and connected to ground through capacitor C3 of 10n where 7th pin is connected to filter circuit through LED D6 and resistor R2 of 220R 3rd pin is connected to base of transistorQ1 &Q2 (BC547) through R3 of 1k. Emitter is connected to VCC where Q2 is connected to relay where RL1 consist of LOAD lamp and ac supply.

2.2 WORKING:

In this project of over voltage or under voltage alert system, the following three conditions are explained: **2.2.1 FOR NORMAL OPERATION:**



International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)

A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.

Research Paper

Available online at: <u>www.jrrset.com</u> UGC Approved Journal No: 45483 ISSN (Print) : 2347-6729 ISSN (Online) : 2348-3105 JIR IF : 2.54 SJIF IF : 4.334 Cosmos: 5.395

Less than 1/3rd voltage i.e., 3V the The pin2 of U2 is connected to a pot fixed at some point say 3.1Vand at pin2 of U3 is fixed at some point say 2.9V. This presets are compared with 1/3rd voltage of supply 9V i.e., 3V at pin 5 of both 555 timers. In this condition the pin no.2 of U2 is high so the o/p at pin 3 of U2 is low. Therefore, the transistor Q1 is not conducting. The o/p of transistor is high, given to pin 4 of U3. So this timer is operating. Since the pin2 at U3 isoutput is high. Thus the transistor conducts and the output low. Hence the relay is ON, making the load turn ON.

2.2.2 FOR OVER VOLTAGE:

Whenever there is any increase in power supply, the voltage at pin 2 of U2 is above 3.1V i.e., high. Therefore the output is slow. The transistor Q1 is not conducting, due to which high is given to pin4 of u3.Since the voltage at pin2 of U3 is also increased due to change in input supply, the pin2 voltage goes above 2.9V (say 3.2V). Hence the output at pin3 of U3 will be low. Thus the relay is off and hence the load is over voltage condition.

2.2.3 FOR UNDER VOLTAGE:

This condition occurs if there is any decrease in input supply. So the voltage at pin2 of U2 will be less than 3.1V (say 2.8V) i.e., is low. Thus the output at pin3 of U2 is high. Now the transistor Q1 is conducting and load is given to pin4 of U3. Therefore the timer U3 is not operating and the output will be low. So the transistor Q2 is also not conducting. Now the relay is also OFF and the load is disconnected in case of under voltage in power supply.

3. LAYOUT DIAGRAM:



Layout Diagram

3.1 POWER ON TEST:

This test is performed to check whether the voltage at different terminals is according to the requirement or not. We take a multi meter and put it in voltage mode. Remember that this test is performed without ICs. Firstly, if we are using a transformer we check the output of the transformer; whether we get the required 12V AC voltage (depends on the transformer used in for the circuit). If we use a battery then we check if the battery is fully charged or not according to the specified voltage of the battery by using multi-meter.

Then we apply this voltage to the power supply circuit. Note that we do this test without ICs because if there is any excessive voltage, this may lead to damaging the ICs. If a circuit consists of voltage regulator then we check for the input to the voltage regulator (like 7805, 7809, 7815, 7915 etc) i.e., are we getting an input of 12V and a required output depending on the regulator used in the circuit.

EX: if we are using 7805 we get output of 5V and if using 7809 we get 9V at output pin and so on.

This output from the voltage regulator is given to the power supply pin of specific ICs. Hence we check for the voltage level at those pins whether we are getting required voltage. Similarly, we check for the other terminals for the required voltage. In this way we can assure that the voltage at all the terminals is as per the requirement.

3.2 Applications:

- Industrial machinery
- House hold items like TV



International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)

A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.

Research Paper

Available online at: <u>www.jrrset.com</u> UGC Approved Journal No: 45483 ISSN (Print) : 2347-6729 ISSN (Online) : 2348-3105 JIR IF : 2.54 SJIF IF : 4.334 Cosmos: 5.395

- Refrigerator
- Agriculture motors
- Water pumps
- Microwave oven
- 4. CONCLUSION:

This project was made with a aim to build a system that monitors voltage and provides a breakpoint based low and high voltage tripping mechanism that avoids any damage to the load.Various industrial and domestic systems consist of fluctuation in the AC mains supply, there's a chance of damaging electronic devices that are quite sensitive to these fluctuations. So there needs to be a tripping system that avoids any damage to these loads. Our system consists of a tripping mechanism that monitors the input voltage and trips according to limits provides.Here we use a quad comparator IC with two more comparators to be used as window comparators to it.

This project may be very useful in protecting electrical appliances from over and under voltage problems in an effective way, in both industrial and domestic use.

REFERENCE:

1. G. Yaleinkaya, M. H. J. Bollen and P.A. Crossley (1999), "Characterization of voltage sags in industrial distribution systems", IEEE transactions on industry applications, vol.34, no. 4, pp. 682-688, July/August.

2. "IEEE Recommended Practice for Monitoring – Electric Power Quality," IEEE Std. 1159-1995, June 1995.