

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

## Over Voltage and Under Voltage Protection

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**ABSTRACT:** This voltage protection circuit is designed to develop a low-voltage and high-voltage tripping mechanism to protect a load from any damage. In many of the homes and industries fluctuations in AC mains supply take place frequently. The electrical devices get easily damaged due to fluctuations.

To overcome this problem, we can implement a tripping mechanism of under / overvoltage protection circuit to protect the loads from the undue damage.- 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.

### I. INTRODUCTION

Two comparators used as a window comparator formed out of one quad comparator IC. This operation delivers an error in the output if the input voltage to the comparator crosses the limit beyond the voltage window.

In this circuit, an unregulated power supply is connected to both op-amps terminals, wherein each non-inverting terminal is connected through the two series resistors and a potentiometer arrangement. Similarly, the inverting terminal is also powered through Zener diode and resistance arrangements in the circuits.

### II. EXISTING SYSTEM & PROPOSED SYSTEM

#### 3. EXISTING SYSTEM

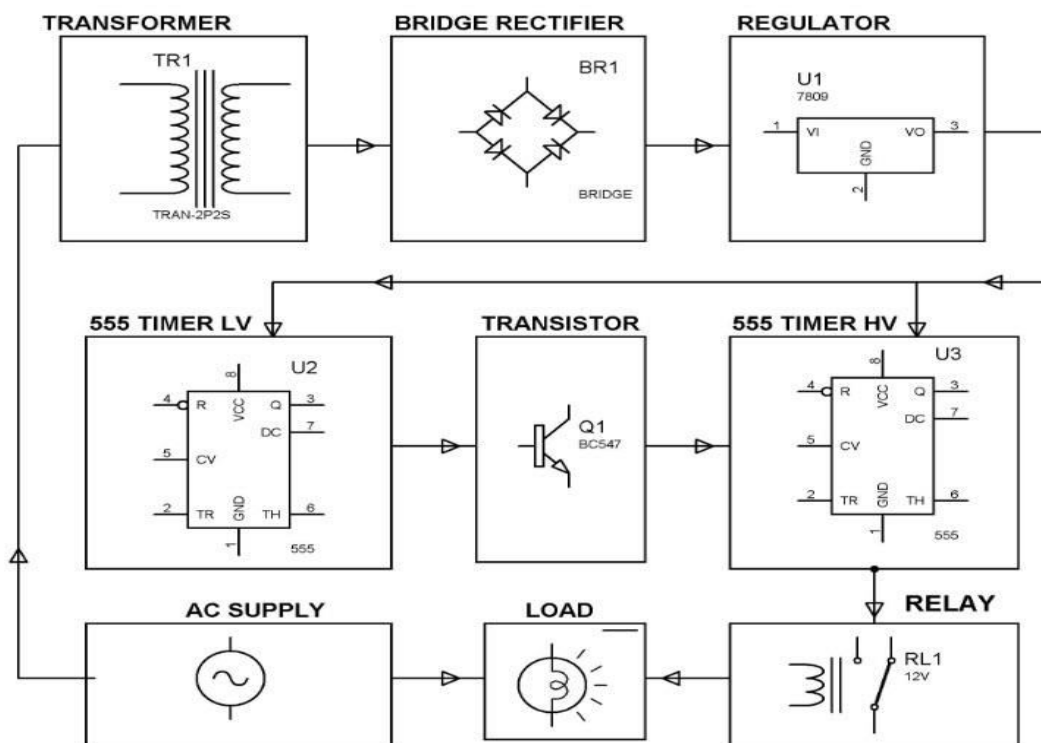
##### EXISTING SYSTEM

- The existing system of normal checking method.

#### 3.1 PROPOSED SYSTEM

This voltage protection circuit is designed to develop a low-voltage and high-voltage tripping mechanism to protect a load from any damage. In many of the homes and industries fluctuations in AC mains supply take place frequently. The electrical devices get easily damaged due to fluctuations.

**III. BLOCK DIAGRAM**



**BLOCK DISCRIPTION**

**POWER SUPPLY**

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others

**RELAY:**

Motor ON/OFF is controlled by a relay switch.

**IC 555**

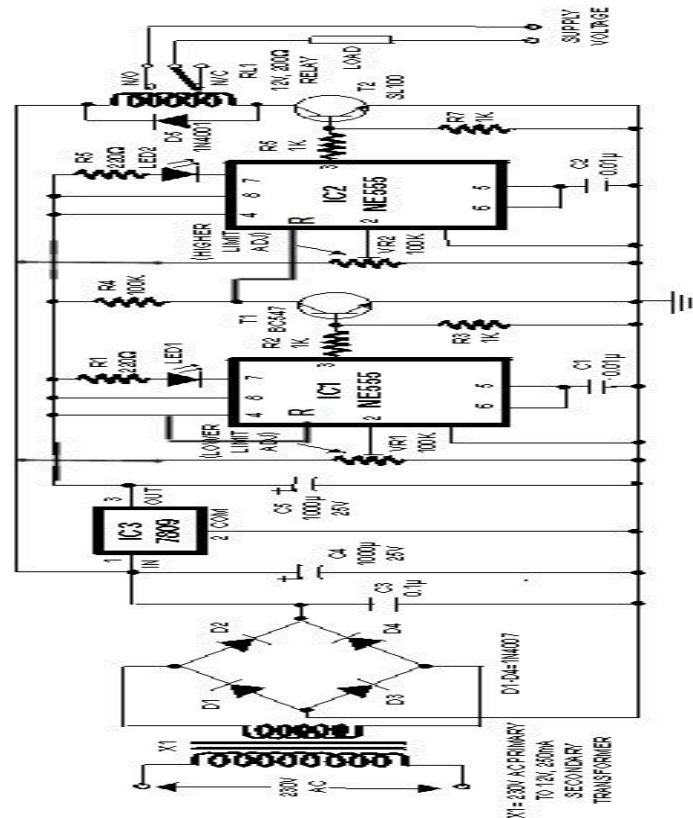
The LM555 is a highly stable device for generating accurate time delays or oscillation.

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## CIRCUIT DIAGRAM



## POWER SUPPLY

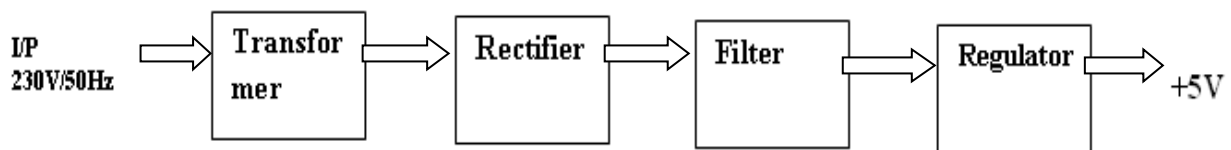


Figure: Power Supply

### Transformer

A **transformer** is a device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or *primary* winding creates a varying magnetic flux in the transformer's core, and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

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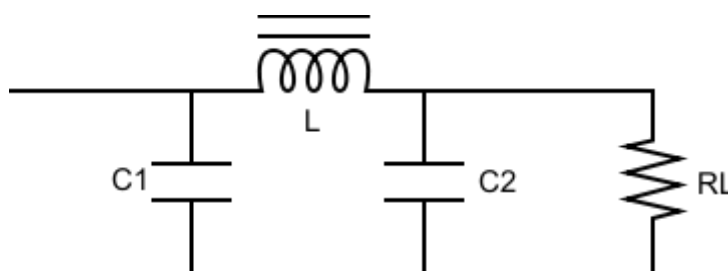
**Figure: Transformer Symbol**

### Rectifier

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as '**half-wave**' and '**full-wave**' rectifiers. Both use components called **diodes** to convert AC into DC.

### Capacitor Filter

The **capacitor-input filter**, also called "Pi" filter due to its shape that looks like the Greek letter pi, is a type of electronic filter. Filter circuits are used to remove unwanted or undesired frequencies from a signal.



**Figure: Capacitor Filter**

### Voltage Regulator

A **voltage regulator** is an electrical regulator designed to automatically maintain a constant voltage level. It may use an electromechanical mechanism, or passive or active electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. There are two types of regulator are they.

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

#### 78xx:

'78' indicate the positive series and 'xx' indicates the voltage rating. Suppose 7805 produces the maximum 5V. '05' indicates the regulator output is 5V.

#### 79xx:

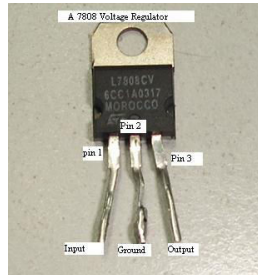
'78' indicate the negative series and 'xx' indicates the voltage rating. Suppose 7905 produces the maximum -5V. '05' indicates the regulator output is -5V.

These regulators consists the three pins there are

**Pin1:** It is used for input pin.

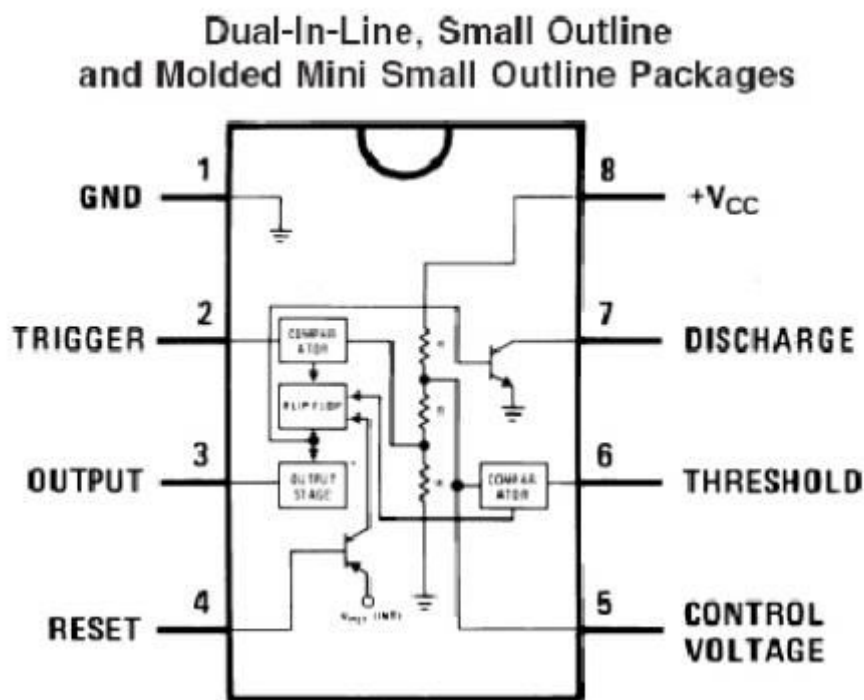
**Pin2:** This is ground pin for regulator

**Pin3:** It is used for output pin. Through this pin we get the output.



**Figure: Regulator**

**Pin Diagram**



**IV. WORKING OF ASTABLE MULTIVIBRATOR**

**WORKING OF ASTABLE MULTIVIBRATOR:**

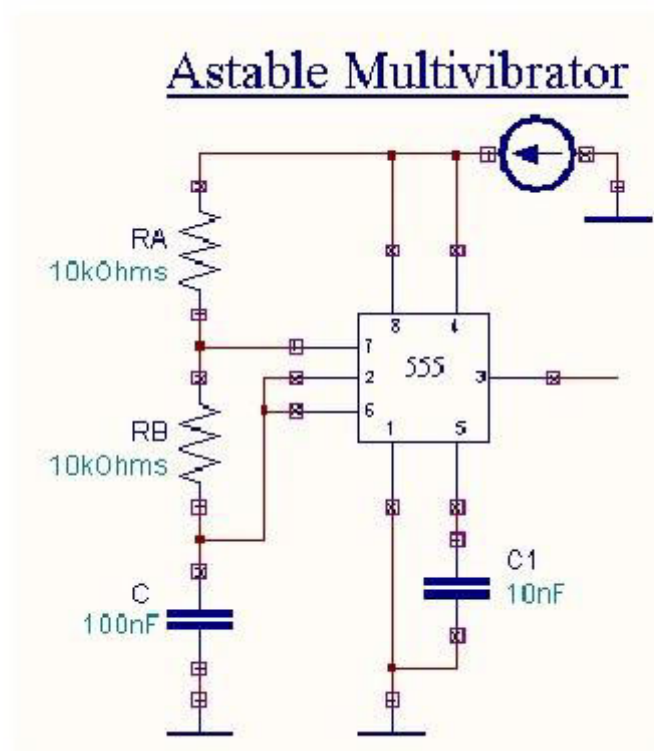
The circuit diagram for the astable multivibrator using IC 555 is shown here. The astable multivibrator generates a square wave, the period of which is determined by the circuit external to IC 555. The astable multivibrator does not require any external trigger to change the state of the output. Hence the name free running oscillator. The time during which the output is either high or low is determined by the two resistors and a capacitor which are externally connected to the 555 timer. The above figure shows the 555 timer connected as an astable multivibrator. Initially when the output is high capacitor C starts charging towards Vcc through RA and RB. However as soon as the voltage across the capacitor equals  $\frac{2}{3} V_{cc}$ , comparator 1 triggers the flip-flop and the output switches to low state. Now capacitor C discharges through RB and the transistor Q1. When voltage across C equals  $\frac{1}{3} V_{cc}$ , comparator 2's output triggers the flip-flop and the output goes high. Then the cycle repeats. The capacitor is periodically charged and discharged between  $\frac{2}{3} V_{cc}$  and  $\frac{1}{3} V_{cc}$  respectively. The time during which the capacitor charges from  $\frac{1}{3} V_{cc}$  to  $\frac{2}{3} V_{cc}$  is

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equal to the time the output remains high and is given by where  $R_A$  and  $R_B$  are in ohms and  $C$  is in Farads. Similarly the time during which the capacitor discharges from  $2/3 V_{cc}$  to  $1/3 V_{cc}$  is equal to the time the output is low



### V. PCB & SOLDRING DETAILS

#### SOLDERING

This is the operation of joining the components with PCB after this operation the circuit will be ready to use to avoid any damage or fault during this operation following care must be taken.

1. A longer duration contact between soldering iron bit & components lead can exceed the temperature rating of device & cause partial or total damage of the device. Hence before soldering we must carefully read the maximum soldering temperature & soldering time for device.
2. The wattage of soldering iron should be selected as minimum as permissible for that soldering place.
3. To protect the devices by leakage current of iron its bit should be earthed properly.
4. We should select the soldering wire with proper ratio of Pb & Tn to provide the suitable melting temperature.
5. Proper amount of good quality flux must be applied on the soldering point to avoid dry soldering.

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## ADVANTAGES

- Fully Automated Project, so there is no requirement for manual
- They require little maintenance as there are no rotating parts
- They can easily installed as they are light and require no foundation
- They can work under ordinary atmospheric conditions.

## APPLICATIONS

- It is very useful for Domestic and industrial application
- Industrial Machinery
- House Hold Items Like Tv , Refrigerator
- Agriculture Motors
- Water Pumps
- Microwave Oven

## VI. CONCLUSION

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.

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