

UNDERVOLTAGE AND OVERVOLTAGE PROTECTION OF ELECTRICAL EQUIPMENT

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Abstract - The motivation driving this task is trip the hand-off as appeared by the groupings in supply voltage for checking electrical family unit comparably as present day gear if there should rise an occasion of overvoltage and under voltage. The electronic contraptions are precarious towards voltage arrangement, as voltage collection comes in supply the electronic hardware get satisfactorily hurt. In that condition it requires an extra secures part to ensure the hardware as a heap. Agreeing voltage comparator encouraged circuits the choice of reeling of hand-off instrument get performed, as voltage changes above or underneath the set respect. The fundamental perfect position of this trade based system is that it additionally shields three-sort out machines from single organizing and flimsiness of voltage in cooling voltage waveform. In future their quality be augmentation of earth issue disclosure and affirmation, changed beginning security gear.

Watchwords: overvoltage and under voltage security, voltage comparator gear, reeling course of action of hand-off.

1. IINTRODUCTION

Advancing year one basic issue in industry comparatively as house hold is unforeseen over voltage or under voltage which results hurt the mechanical assembly. Electronic based weight develops very much arranged in family unit comparably as present day application and they are delicate to voltage combination. In this undertaking, center the ensured the gear if there should develop an occasion of over voltage or under voltage and the

examination of over voltage and under voltage, various power quality issues.

2. Power quality issues:

2.1 Overvoltage:

An overvoltage is an augmentation in the rms estimation of cooling voltage more noteworthy than 110 percent or 0.11pu at the power rehash for a range longer than 1 min. over voltages are typically the inevitable result of weight exchanging (e.g., slaughtering a colossal weight or connecting with a capacitor bank). The over voltages result in light of the way that either the structure is ridiculously slight for the ideal voltage guideline or voltage controls are deficient. Stirred up tap settings on transformers can in addition result in structure over voltages.

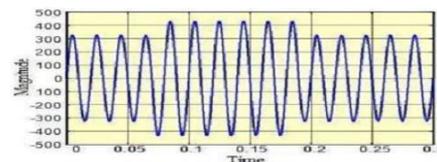


Fig-1: waveform for overvoltage

2.1.1 Causes of over voltages:

Overvoltage are less basic than under voltage yet they besides create in light of framework insufficiencies. Overvoltage can occur because of single line to ground deformity, which as such will raise the voltage of different stages. It can besides cause because of partition of huge current loads or exchanging on the capacitor banks. This is commonly due to ungrounded or floating ground delta frameworks, where a change in ground reference

would give voltage ascend to the ungrounded structure.

Purposes behind overvoltage are commonly an immediate aftereffect of fortifying of capacitor bank. It can in like way be made by sudden weight conclusion. In perspective on the unit of weight there is an unexpected decrease of current, which will give rise the voltage, where L is the inductance of the line. The impacts of overvoltage are consistently remarkable and unsafe. It might make the electrical hardware flop, because of overheating accomplished by high voltage. Besides electronic and other precarious contraption are inclined to breakdown.

As per IEEE 1159 Classification of overvoltage

Types of Voltage	Duration	Magnitude
Instantaneous	0.5 – 30 cycles	1.1 – 1.8 pu.
Momentary	30 cycles – 3 sec	1.1 – 1.4 pu.
Temporary	3 sec – 1 min	1.1 – 1.2 pu.

Table-1: Classification of overvoltage

2.1.2 Some more causes of Overvoltage are given below

- Loss of a Secondary Neutral (When the unprejudiced wire is broken by falling branches).
- Ferroresonance (is an extraordinary kind obviously of activity resounding between the polarizing reactance of a transformer and the structure capacitance (charging capacitors).

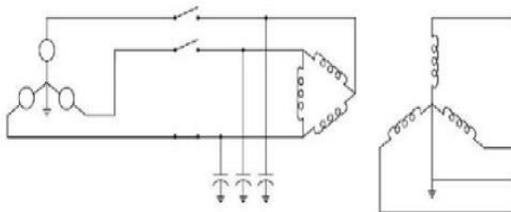


Fig-2:Cause of overvoltage

- Accidental Contact to High-Voltage Circuits
- Over voltages Due to Poor Voltage Regulation

2.2 Under voltage:

An under voltage is a decrease in the RMS respect cooling voltage to under 90 percent or 0.90pu at the power rehash for a timespan longer than 1 min. Under voltages are the consequence of exchanging occasions that are the regressive of the occasions that reason over voltage.

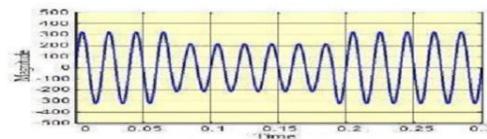


Fig-3:Waveform for under voltage

Under voltages are the most comprehensively seen power upsetting effect whose influence is extraordinary particularly in mechanical and wide business clients, for example, the evil of the affectability device's and loss of reliably indications and records. The events of the delicate mechanical assembly's are Programmable Logic Controller (PLC), Adjustable Speed Drive (ASD) and Chiller control. Under voltage at the apparatus terminal can be an immediate consequence of a short out deficiency a couple of kilometers away in the transmission framework

2.2.1 Causes of under voltages:

- Closing and Opening of Circuit Breakers
- Due to Fault
- Due to Motor Starting
- Due to Transformer Energizing
- Equipment Failure
- Bad Weather and Pollution (Lightning strikes, Flash over, and so forth.)
- Construction Activity(damage to underground
- Cables

3. Philosophy Used For Protection

The reason for our circuit is to confirm the store amidst under-voltage and over current conditions by controlling the hand-off amazing turn utilizing a LM324 comparator. The comparator will separate the supply voltage and required preset voltage and will trip the trade wind if the voltage dives under the ideal preset respect. The hand-off curve will in like way trip if the. The under voltage and over current ensuring contraption is appeared in the square design underneath

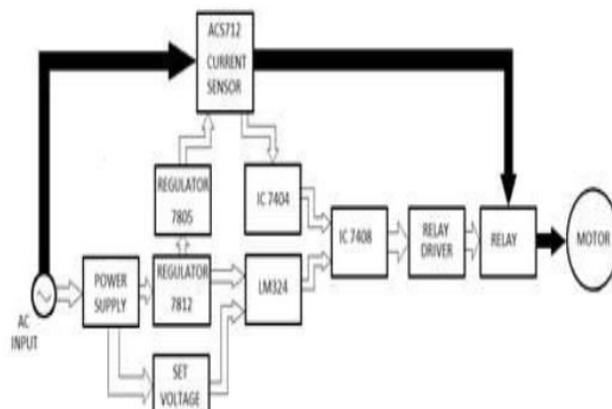


Fig-4: Method Used For Protection

4. Equipment use in Circuit:

- Transformer 12v
- Bridge wave rectifier
- Capacitors-480, 0.1micro farads
- Regulator IC 7812
- Potentiometer-50k
- Zener diode-6.8v, 6.0v
- Resistances -10k, 5k, 1k

- IC LM324
- Led
- Diode of IN4007
- Relay
- Load

5. Description of above equipment:

5.1 Transformer:

A 230 by 12 volt single stage transformer is used for power supply of voltage comparator circuit.

5.2 Bridge wave rectifier:

Full wave rectifier with the four diode with capacitor as channel is used for augmentation rectifier circuit.

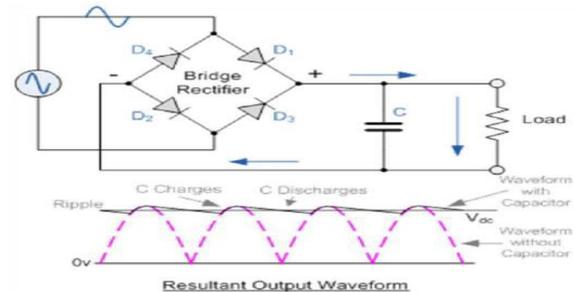


Fig-5: Bridge wave rectifier

Right when as supply given to it ,at positive half cycle D1 and D3 is in forward inclination and star conduction around then diode D2 and D4 are in reverse tendency and square supply through them anyway at negative half cycle the unequivocally transform movement occurs. Diode D1 and D3 moves in reverse tendency and square the conduction around then diode D2 and D4 are in forward inclination and start conduction.

5.3 Regulator IC 7812:

The voltage controller IC gives +12 volts, after the capacitor it is being used in power supply. In IC 7812, the 78 shows positive this is a 9V control supply which will work even on power disillusionment.

5.4 Potentiometer-50k:

Potentiometer is used as the variable voltage driver for changing the preset regard. It is class of variable resistor. We can vary voltage by using variable restriction pot moreover called as wiper. The basic part is a resistive strip inside it through which We can prepared to adjust the proportion of restriction/voltage to go in a circuit through it.

5.5 LM324:

LM324 is a 14 stick IC. Having four task amp in it, in this way furthermore called fourfold activity amp IC. Activity amps can be used as enhancers, comparators, oscillators, rectifiers, etc. The normal activity amp applications can be even more successfully executed

with LM324. Here task amps used as voltage comparator for comparing two voltage levels.

5.5.1 Pin Diagram

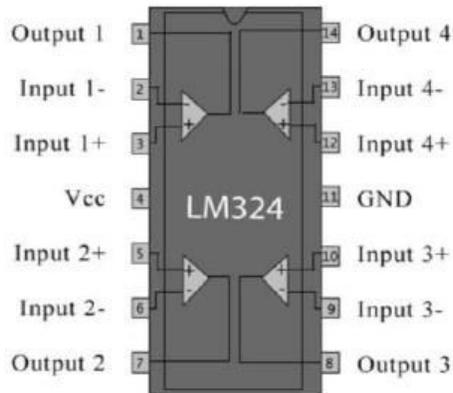


Fig -6: Pin Diagram

5.6 Relays:

An exchange is an electrically worked switch. Numerous exchanges use an electromagnet to work a trading instrument absolutely, yet other working principles are furthermore used. Exchanges are used where it is essential to control a circuit by a low-control movement (with complete electrical isolation among control and controlled circuits), or where a couple of circuits must be obliged by one banner

5.7 Zener diode:

Zener diode is the diode which can allow current stream both from its anode to its cathode and the other path around zener diode can in like manner its different area constantly. In this undertaking zener diode is used for take reliable voltage i.e DC fixed voltage as a preset regard.

6. Circuit diagram:

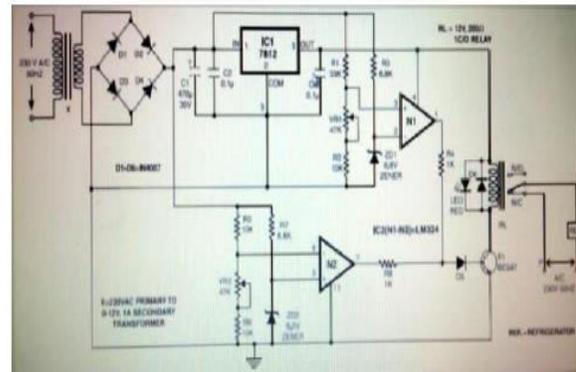


Fig -7: Circuit Diagram

7. Working:

In case 220VAC data is associated circuit adventure down transformer will diminish voltage to 12volt.Using Bridge rectifier IC 12volt DC yield is gotten.

Using IC LM7812 we get controller DC supply Regulator Input at stick 1 and 2 and from stick 3 and 4 yield is taken. IC LM324 fill in as heart of affirmation circuit. It has 4 comparator in it.4th stick is related with Vcc and eleventh stick is grounded. Two zener diode of 6volt and 6.8volt are used.6.8 volt zener diode is related with second stick of ICLM324 (comparator no.1).6 volt zener diode is related with fifth stick of ICLM324.

IC2/1 of comparator IC used for overvoltage Protection.IC2/2 of comparator IC used for under voltage security. Exactly when supply voltage raise past or fall assessed voltage Proportional DC voltage will change and hand-off driver IC will request to exchange driver to hand-off and hand-off will get staggered.

8. Possible additional circuits:

- └ Earth issue disclosure
- └ Automatic starting confirmation

9. Applications:

- └ Industrial equipment
- └ House hold things like TV , ice chest

- └ Agriculture motors
- └ Water siphons
- └ Microwave grill

10. Conclusion

From above talk it has cleared that of under voltage and overvoltage issue are incredibly typical and can make issue for client extraordinary and mechanical application. So structure should be guaranteed by certain confirmation plot. So here system showed using comparator and hand-off to separate supply when any overvoltage and under voltage issue occurs.

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