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# Over Voltage Under Voltage Load Protection with GSM Alert

*[1]Kunal Save, [2]Adarsh Monde, [3]Prof. Pranjali Kamble*

**[1][2] Student(EE) SSCET**

**[3] Asst. Professor(EE) SSCET**

**ABSTRACT−**

Automation is considered as the important aspect in current scenario. Automation of electrical distribution field can be helpful in enhancing of efficiency, increase in reliability and most important is the electric service quality. Automation helps in reduction of human efforts, enhance human operator capability and most important save lot of time. Insulation and damage of appliances due to Under and over voltage problem is typically seen in Indian scenario. This work is about the catastrophic condition due to under and over voltage problem. This problem can be economically reduced by the automation methodology. In this paper GSM Module with SMS alert system is designed and developed to automate the electric distribution system.

Keywords: Automation, over voltage and under voltage, GSM module

## Introduction:

Protection of line is very important for a secure and balanced system. Power system fault is an undesirable condition in power system like short circuit, over voltage, over current and etc. It occurs mostly due to increasing of voltage level or increasing load. This fault can result in permanent damage, which is highly undesirable.[1]This project aims 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 is 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. This system also includes 8051 microcontroller which finds out the voltage level which is displayed on the LCD screen. This microcontroller not only finds out the voltage.

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. Well the system delivers an error as soon as the input voltage falls out of the window range. This trigger then operates a relay that cuts off the load to avoid any damage to it. We here use a lamp to demonstrate as a load. Well the system is also configured with an alarm that goes on as soon as tripping takes place.

### *Overvoltage:*

An Overvoltage is defined as a rise within the r.m.s. value of the voltage up to tier between 1.1 pu to 1.8 pu at power frequency for periods starting from a half cycle to a second.Causes of overvoltage are mainly because of energization of capacitor bank. It also can be generated by sudden load deduction. it should cause the electrical equipment to fail, because of overheating caused by high voltage. Also electronic and other sensitive equipment are liable to malfunction.

### *Undervoltage :*

Under voltage is described as a surprising drop with inside the root imply square (r.m.s.) voltage and is commonly characterised via way of means of the remaining (retained) voltage. Undervoltage is thus, quick period discount in r.m.s. voltage, brought about especially via way of means of quick circuits, beginning of big cars and device failures.[4]

## Block Diagram
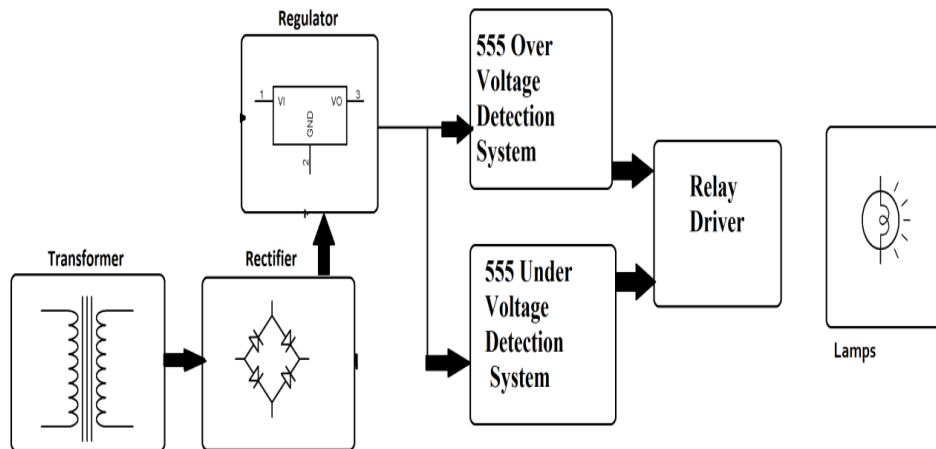


## Working:

The circuit consists of a transformer to step down the voltage from 220V to 12V. With the help of center tap diode bridge and a potential divider a voltage of 5V is fed to the microcontroller. Any fluctuation in the input to the transformer causes a fluctuation in the voltage fed to the microcontroller. The Atmega32 microcontroller compares this voltage with the reference value and if the voltage exceeds the specified limits, it sends a signal to the relay, the GSM module and the LCD. The LCD displays the input voltage under normal operation whereas it displays the status 'UnderVoltage' and 'OverVoltage' when the corresponding phenomenon occurs. To power microcontroller, GSM module and the LCD, a power supply is given separately. For this a voltage regulator is provided which gives a constant 5V output. Whenever the voltage becomes more or less than the required voltage, the microcontroller sends a signal to the relay to trip the circuit and disconnect the electrical load from the supply. At the same instance it sends a signal to the GSM module, which further sends a message to the specified mobile number.

### *Advantages*

- Highly sensitive
- Fit and Forget system
- Low cost and reliable circuit
- Complete elimination of manpower
- Can handle heavy loads up to 7A
- Auto switch OFF in abnormal conditions .
- Auto switch ON in safe conditions.

## Conclusion :

In this project, we have discussed about the problems caused by under voltage and over voltage in industrial applications as well as for consumer goods. We designed a system using a microcontroller and a GSM module to disconnect the load from the supply during the event of over voltage and under voltage and this system also sends a message about the same to a specified number. Along with this, if the user desires to know the supply voltage at any instance, a message could be sent and the value of the supply voltage is received by the user.

### *Future Scope:*

1. In our project, we have used 2 types of protection schemes together, namely-i) Under-voltage Protection and ii) Overcurrent Protection. Similarly, the protection circuit itself could include several other protection schemes, like- Overvoltage Protection-Just as we have set a reference voltage for lower voltage limit and the variable voltage resembles with the input voltage, similarly we could have set up the reference as upper voltage limit and the input as lower voltage limit, comparing it by a comparator and connecting it with a relay. Thus we could have Overvoltage protection in the same circuit.

 2. Microcontroller Based Protection-We could use a micro-controller like PIC16F877A in conjunction with a liquid crystal display which can control the circuit tripping more accurately and also can give out information about it. Moreover, it would increase the overall sophistication of the protection circuit.

3. Alarming circuit-In this circuit as alarm, we have provided 2 light emitting diodes. Though, some more advanced alarming can be done using a separate circuit which will generate an audio-visual warning signal, thus alerting everyone in the motors vicinity.

4. Protection of multiphase motors-Though we have created a protection circuit for only a single phase motor, 3 phase motor protection circuit could also be created. In those circuit, some schemes should also be considered i.e. single phasing.[11]

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