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Microcontroller Based High Voltage - Low Voltage Protection System

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ABSTRACT

This paper presents methods for estimation and autonomous control of voltage which is done by an unmanned microcontroller based protection system with thermistor. It used to check temperature along with voltage protection. The transformer used is copper cored and it works only on alternating current source. The thermistor is used to detect the temperature in case of overheating or fire problems.GPS module is also used to aware the owner of the system by sending the text message on phone in case of detection of any unusual activity. Such as low voltage, high voltage, high temperature. The main challenge is to make a sequence of codes for proper functioning.

KEYWORDS: *Microcontroller, Thermistor, Low Voltage, High Voltage, Arduino*

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INTRODUCTION

The irregularity in voltage is the major issue facing industry and home today and often times, is responsible for damaging valuable electrical equipment. Electrical Power System protection device is required for protection of both user and the system equipment from fault; hence electrical appliances are not allowed to operate without any protective device installed. Power System fault is defined as undesirable condition that occurs in the power system and the undesirable conditions are short circuit, current leakage, ground short, over current, under and over voltage. Technically speaking, an over/under voltage condition is reached when the voltage exceeds/lags the nominal voltage by10% for more than 1 minute. Short duration voltage events can also occur such as transients (both impulsive and oscillatory). Short duration intermittent supply failures can last anywhere from 0.5 cycles up to 1 minute and can be caused by a number of occurrences such as supply system faults, equipment failures, or malfunctions in control equipment. Under-voltage might result into brownout, distortion or permanent damage while overvoltage in the form of spikes and surges could cause distortion, burn-out, meltdown, fire and permanent damages.

FEATURES UNDER HIGH VOLTAGE AND LOW VOLTAGE PROTECTION

The electrical devices are designed in such a way that they can operate only in a specified voltage. For example, the devices which we used in our homes can operate only at 220 voltage. If the specified amount of voltage is increased or decreased by 20% then probably it cause damage to the device. These devices can only be protected by providing them a suitable high voltage and low voltage device.

The early methods which are used to protect devices only consist of relays. They are not provided with updated features which are going through the market in the present scenario. In older systems it only have fuses which burnt when it get higher voltage which are replaced later by the consumer only.

The early low voltage protection circuit is usually unable to detect temperature and are not able to inform the person about the fault.

- The latest protection system which comprises of all the protective features such as
- detection of high voltage and low voltage without compromising the fuse circuit, supplying voltage to the device only after getting stable supply as it can detect fluctuation also,
- detection of temperature with the help of thermistor.
- And all this done along with instant inform to the owner of the device by text message on phone using GSM module.

COMPONENTS USED

- Microcontroller
- Transformer
- Relay
- Voltage Regulator
- Voltmeter
- Arduino
- GSM Module
- Thermistor

OPERATION PRINCIPLE

Firstly we give the power supply to the system where voltage regulator & voltmeter are connected in parallel. Here the voltage regulator is used to regulate the voltage passed in the circuit so that it can be controlled, and we can check that if this project can really protect any system from a High or a Low voltage supply.

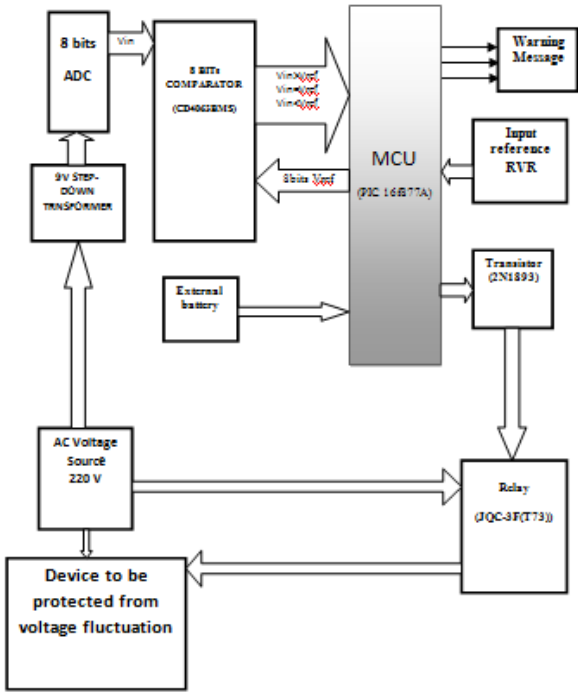
After the voltage regulator, a step down transformer is used in order to make the next circuits function properly as all the processes are in DC. But since just stepping down an AC supply will not make next circuit function, we install a full wave bridge rectifier. Its basic function is to convert an AC signal into a DC signal, but of course ripples will still remain in the signal. So to nullify it or reduce it we use a Capacitor to create a direct signal with as less ripple as possible.

After the full wave bridge rectifier, all the three circuit boards mainly used for Low Voltage trip circuit, High Voltage trip circuit & a Temperature sensor control circuit are connected in parallel which are further connected to their relays controlling& protecting the Main System connect-ed to this protection system.

We also connected an Arduino which is linked to a GSM module so that if the system gets overheated then it can send an SMS to the mobile number feed in the programming in Arduino

SYSTEM DESIGN

The system design of the latest voltage protection system is shown below.



RESULT

The final result of the efforts, we & our teachers put in this project over a course of around several months.

The designed protection system is examined professionally on different devices including claimed parameters. Different voltages were supplied to check its efficiency. When the voltage supplied is in the specified limit, the relays remain close and the connected device operate. The supplied voltage is measured and displayed on voltmeter. If any unwanted scenario take place, relay get energized and trip the supply for the device. The final result of the efforts, we & our teachers put in this project over a course of around several months.

A message will be received when power supply is cut due to either high voltage or low voltage or in case of over heating. Power supply of your system will get disconnected for it's safety and will be back online when the conditions become stable and operable

CONCLUSION

A microcontroller-circuit is designed to monitor the main voltage supply, and interrupt it if it falls below or above a required voltage range (RVR). If the voltage is disconnected, the microcontroller circuit will keep monitoring the voltage and only reconnect it back if it complies with the RVR and becomes stable. The design of the project was successful. The design is suitable for commercial as well as domestic use, given the fluctuations in main voltage supply worldwide, especially during summer and severe weather condition, and subsequent power-cuts. Voltage fluctuation leads to damage of electronic and electrical equipment connected to the main supply. This project used a range of RVR of 215- 230 volt as boundary of normal voltage; a keypad is recommended in the design to input the RVR by user. Keypad gives the

advantage of picking any voltage range (110 V supply for example). Embedded system technique, which based on microcontroller is intelligent system which in case of use it as voltage monitoring to protect home or office electric appliances will provide more and more of valuable devices so this technique is favorable and useful.

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