

Zero Voltage Switching to Extend the Life of Equipment

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Abstract- The project is designed to develop a device to increase the life of incandescent lamps. Incandescent lamps have a property of very low resistance in cold condition. Due to which lamp draws high current when switched is ON, this results in fast failure of lamps. Random switching of lamps may occur at any instant of the voltage/current waveform. Suppose it switches at the peak value supply voltage. When such switching of the load (Incandescent Lamp) occurs and as the lamp is having low resistance in cold condition, then the current further shoots up leading to premature failure of the lamp. The proposed project provides a solution by connecting a TRIAC in circuit such that the controlling the firing angle of the TRIAC by detecting the zero cross point of the waveform of supply voltage and after to switched ON the load. The project contains comparator here is ZVS (Zero Voltage Switching) which is given as reference interrupt to the microcontroller. A push button is used as a switch which is used to switch ON the load(Lamp) at zero voltage so the lamp draws current gradually from zero to full value.

Keywords: Arduino UNO, AC Voltage Regulator, Light Emitting Diode.

I. INTRODUCTION

Random voltage switching operates like it states, it energizes the output switch whenever the timing circuit signals it to do so, meaning that the external load can turn on at any point in the AC voltage waveform.

An AC circuit changes polarity frequently. In India it changes 50 times per second, and generally written as 50Hz or even 50 cps (cycles per seconds). This means that the voltage polarity changes from +/- to -/+ and back to +/- 50 times per second.

If switched is on at random instant suppose here at peak of voltage waveform the transients are created in the waveform which leads to formation of harmonics and leads to the damage of the equipment. To avoid this zero voltage circuit is developed. In the circuit the ZVS is used which is used to detect the zero crossing of the waveform and sends signal to the microcontroller. Microcontroller receives the signal and gives output signal to the opto-isolator.

II. IMPLEMENTATION SETUP COMPONENTS

2.1 Arduino Board:

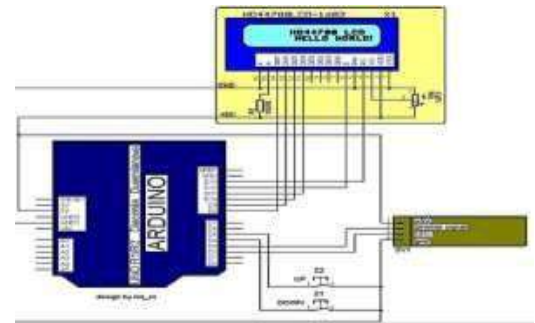
Arduino is a simple microcontroller board based on an open-source physical computing platform. The Arduino

Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the USB-to-serial driver chip.



Fig. Arduino Board

2.2 AC Voltage Regulator:



Circuit diagram

AC voltage regulator is also called as AC voltage controller. It is an electronic module. This electronic module is based on SCRs, TRIACs or IGBTs. These are used to convert a fixed voltage and fixed frequency of alternating current (AC). With this we get the variable output which is delivered to the load. The load in this project is resistive load. The working is in similar fashion of an autotransformer. AC voltage controller modules have high efficiency and low maintenance.