AUTOMATIC LOAD CONTROLLER USING MONSTABLE MULTIVIBRATOR

Mohammad Parvez Satter [1, a)], Rabeya Bosrin Rumi [1, a)], Refaya Binte Hamidur [1, a)], and Sadik Mahmud Fahim [1, a)]

AFFILIATIONS

[1] Department of electrical and electronic Engineering of Rajshahi University of Engineering and Technology

[a)] **Corresponding author:** 1601054@student.ruet.ac.bd, 1601052@student.ruet.ac.bd, 1601051@student.ruet.ac.bd, and 1601055@student.ruet.ac.bd

***Abstract* - Using 555 timer as a monostable multivibrator one can control the ON/OFF period of a load. Here a rectifier circuit is used to power up the 555 timer and the output of the timer control a relay connected to a load. Actually, by controlling the trigger of the 555 timer mainly control the load. When we get the high output at the output of the 555 timer the load goes OFF.**

***Keywords* – monostable multidirector, automatic load control**

1.0 INTRODUCTION

The automatic load controller is design to add or remove load steps to maintain an approximate target load on the generator to which the load bank is connected. The automatic load controller is intended for use with standby or emergency backup power systems. The controller is employed during a utility service power outage when the standby generator is supplying power to the building load.

The automatic load controller is designed with the 555 timer IC and is based on the operation principal of a monostable multivibrator. Here the timer input is directly coming from the 7812-voltage regulator output which is 12V, and using a AC-DC converter along with the timer IC. The overall circuit is formed and can control the load automatically.

This project aims to automatically switch ON/OFF different load at multiple number of times. And it can be used in divers' areas sums of the applications of this project can be in the refrigerator, traffic signal controller, in homes to switch ON/OFF different generator set.

2.0 THEORY

This project consists of 12V stepdown transformer, bridge rectifier, voltage regulator, LED, push button, 555 timer IC, relay, load(bulb), resistors, transistor, and capacitors. Once there is an AC supply to the 12V center tapped transformer, it passes the bridge rectifier which converts the AC voltage to DC voltage to 12V maximum and it supplies voltage to the timer and the relay. When the timer pin 2 gets negative triggering (0V) its output from the pin 3 is 'ON', that means the LED connected to pin 3 is going to be in 'ON' state. Then the PNP transistor is going to be 'OFF'. There will be no current flowing path for the relay circuit, so the bulb will be 'OFF'. But normally before triggering the timer output is 'OFF', so the LED is 'OFF' and also the current flows through the PNP transistor and this causes the relay to be 'ON' state and it makes the load(Bulb) 'ON'.

2.1 Waveshape for the circuit output

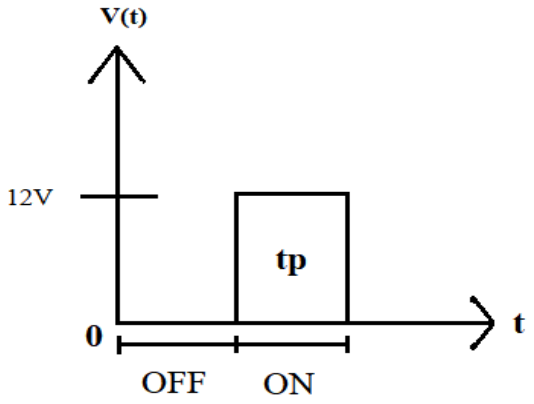

Fig 1: Waveshape of output of the 555 timer

We know for monostable operation:

$$tp = 1.1\ RC$$

Here we use a 220-ohm resistor for the safety as for the relay. And the output voltage is 12V theoretically but in practical it comes out nearly 10.8V.

3.0 CIRCUIT DIAGRAM

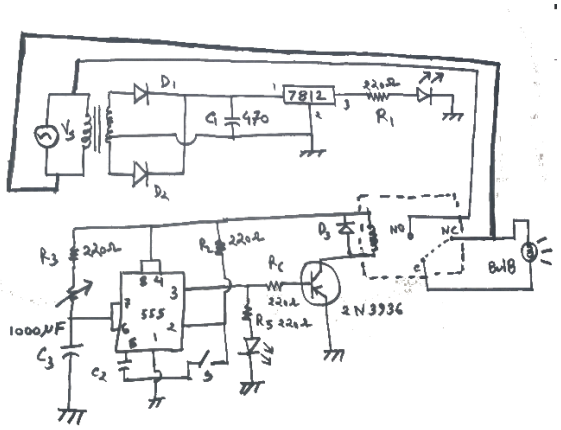

Fig 2: Circuit Diagram for the automatic load controller

4.0 DESIGN

TABLE 1: project cost

SN	Name	Specification	Quantity	Unit Price (BDT)	Total (BDT)
1	Resistor	220 ohm	5 Nos	0.2	1
2	Variable Resistor (pot)	10K ohm	1 No	10	10
3	Light Emitting Diode (LED)	Red	2 Nos	2.5	5
4	NE 555 IC	8 pin, Bipolar, Dual in line package (DIP)	1 No	10	10
5	Transistor PNP	2N3906	1 No	8	8
6	Voltage regulator	LM7812	1 No	15	15
7	Center tapped transformer	220V-50Hz, 1000mA, 12-0-12V	1 No	80	80
8	Diode	1N4007	3 Nos	1	3
9	Capacitor	470uF/16V 1000uF/16V Ceramic 104	1 No 1 No 1 No	3 3 1	7
10	Push button	2 Pin	1 No	3	3
11	IC base	8 pin DIP	1 No	5	5
12	Relay	9V	1 No	25	25
13	Connector screw	2 pin 3pin	2 Nos 1 No	4 6	8 6
14	PCB Board		1 No	150	150

TOTAL=336

4.1 Component Description

Power Supply Unit: power supply to this circuit is taken from the general power supply of PCB and is fed into the primary of a center tapped transformer within the power unit's circuit which is being rectified and filtered. The filtered output powers the system thereby enabling other operations.

555 Timer IC: The 555 timer IC is an integrated circuit (chip) used in a verity of timer, pulse generation and oscillator applications. It is used as a monostable multivibrator here.

Relay: This unit receive signal from the regular 230V ac input which controls the output automatically for load management.

Transistor: A PNP transistor is used to control the relay circuit.

Design Software: Express PCB software is used to design the PCB.

Fabrication & Testing: For soldering we use soldering iron, rosin core solder. We use lead alloy as soldering wire, and for good join we make sure that there must be the soldering iron, soldering wire and the leg of the components are on the circuit at the same time. As soldering is so important, it must be done carefully.

5.0 DISCUSSION & CONCLUSION

The project of automatic load controller which can work on the operating principal of monostable multivibrator and some other necessary circuit is very useful in household and many practical cases. So, it has great value and by doing the project successfully we learnt some practical knowledge on PCB design. In total it takes 336 BDT to complete this project.

For further research of this project, it can be noted that how to minimize the no of resistor and other components could be a great consideration. Also, to reduce the cost.