

# “Embedded Wireless Light Intensity Control Using DTMF”

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**Abstract:** The project aims in designing a system which is used for controlling the AC lamp intensity operation through Mobile phone using DTMF technology. This also aims at providing a wireless and continuous control over many household as well as industrial devices. The process of home automation works by making everything in the house automatically controlled using DTMF technology. In this project we can control any electrical lamp through mobile from any distance of the world. In this project one base unit is connected to the mobile phone. When we want to control lamp through outer phone then first we dial the receiver mobile number, bell is ringing and after few bell ringing phone is automatic going to self answering mode and switch on the base unit to operate. The controller device of the whole system is a Microcontroller 89C51. DTMF decoder decodes the signal and output fed to the controller unit to which has AC lamp is connected. When the users need control the lamp intensity user call the mobile phone which is present at receiver side in the self answering mode when the call is received, as the need of user press the keys of mobile phone assigned to intensity control the lamp operation of lamp.

**Keywords:** DTMF 8870, Microcontroller 89C51, TCA 785, SCR.

## I. INTRODUCTION

The aim of the proposed system is to develop a cost effective website. Solution that will provide controlling of intensity of lamp remotely. The system easily available due to development of a low cost system. Though devices connected as home and office appliances consume electrical power. This project should be controlled as well as turn on/off if required. Most of the times it was done manually. Now a day it is a necessity to control devices more effectively and efficiently at anytime from anywhere in the whole world. In this paper, we are going to develop a mobile phone based home/office appliance control. This system is designed for controlling various electronic devices; it includes a cell phone which is connecting to the system using head set. To active the cellular phone unit on the system a call is to be made and as the call is answered, in response the user would press the key to access the system to control the lamp intensity.

As the caller press the specific number, it results in control the required lamp intensity. The controlling of the lamp intensity is achieved by controlling the AC power. The underlying principle mainly relies up on the ability of DTMF (Dual Tone Multi Frequency) ICs to generate DTMF corresponding to a number or code in the number pad and to detect the same number or code from its corresponding DTMF. In detail, a DTMF generator generates two frequencies corresponding section which is simply low level frequency and high level frequency which is equivalent to a mobile set. In the receiver part, the DTMF decoder IC, These frequencies are decoded and given to the microcontroller. The microcontroller generates 8-bit code corresponding to the required firing angle to control using phase angle control (TCA 785) the SCR and hence control the AC power.

## II. BLOCK DIAGRAM EXPLANATION

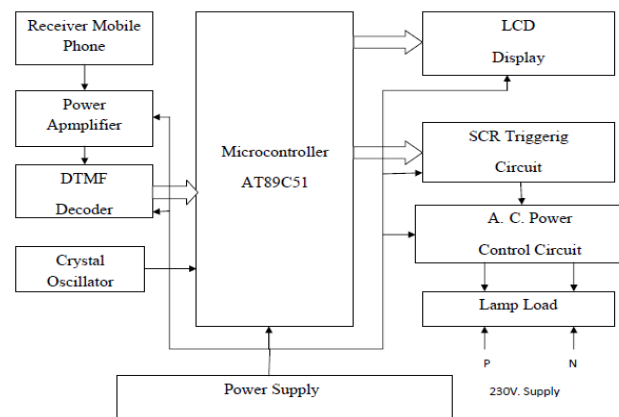
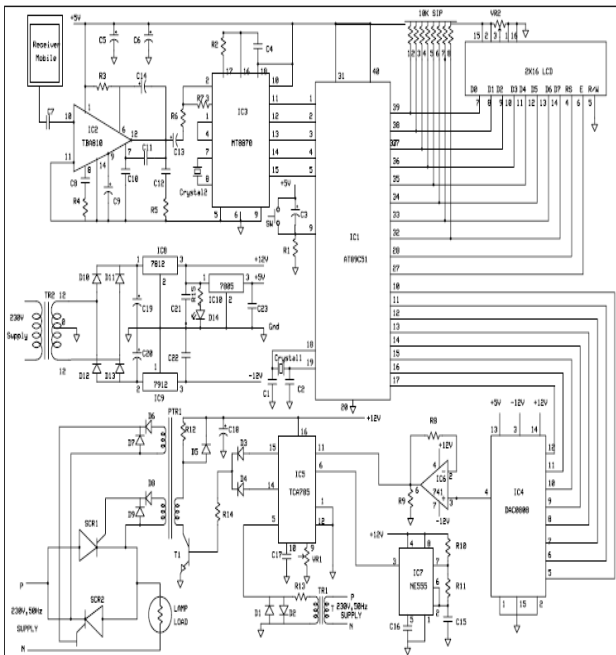


Fig 1. The basic block diagram of the system

The basic block diagram of the system is as shown in the fig. above. The controlling device of the whole system is a microcontroller. DTMF decoder used to decoding signal this system also employs the zero crossing detector for smooth operation of the lamp intensity. This project consists of the microcontroller that takes the input from the mobile phone and processes the request. Then it processes the data and takes necessary action and also updates the status of the LCD display. The whole system is powered by single supply. SCR connected in back to back to which AC lamp is connected are interfaces to the microcontroller. The user needs to call the mobile phone present in the system which will be in the auto answer mode. When the call get lifted, the user need to press the predefined intensity keys assigned to control the lamp dimming operation of the AC lamp. This system also has the LCD display which shows the intensity level of the

lamp. The microcontroller used in this project is programmed using Embedded C language.

**III. CIRCUIT DIAGRAM OF PROJECT**



**A. Circuit Diagram Explanation**

The basic circuit diagram of the system is as shown in the figure. The receiver mobile is used in the self answering mode. When a call is made on this mobile, it goes in to the self answering mode. Then if we press the number keys from caller mobile, the DTMF signal equivalent to the numbers are received by the receiver mobile. These numbers are in DTMF format i. e. for each number, two frequencies are received. These DTMF frequencies are amplified by an audio power amplifier designed with TBA810 (IC2) and amplified signals are given to the DTMF decoder MT8870 (IC3). MT 8870 is DTMF decoder which decodes the DTMF signal and gives the output in the form of binary numbers equivalent to the key under press at the caller mobile. This 4-bit binary data is interfaced to the microcontroller AT89C51 (IC1) at P1.0 – P1.3 and the number is read by the microcontroller.

As soon as the number is received by the microcontroller, the number is displayed on the LCD display. This number received is nothing but the percentage of light intensity of the lamp load. The light intensity is calibrated in terms of percentage. For 0% light intensity the number is 00 and for 100% light intensity the number is 100. To vary the light intensity, A. C. Power is controlled. For this two SCRs are connected in anti parallel and these SCRs are triggered as per the required light intensity For controlling the firing angle of the SCRs connected in anti parallel, phase angle control circuit is designed using TCA785 (IC5). This circuit generates the triggering pulses during the positive as well as negative half cycle of the line voltage and triggers one CSR during positive half cycle and another SCR during negative half cycle. Hence AC power is controlled.

Port P3 of the microcontroller is used to output the equivalent 8-bit code for the firing angle for the SCR. This 8-bit digital data is converted in to analogue using DAC0808 (IC4). The output of the DAC0808 is in the form of current. This current is converted in to voltage by current to voltage converter designed by an op-amp (IC6). The output of the current to voltage converter is in the range of 0 – 5V. This voltage is used as control voltage for TCA785 (IC5). The TCA785 also requires high frequency input. For this an astable multivibrator is designed with NE555 (IC7). The astable multivibrator generates high frequency pulses and provides to the TCA785. The firing pulses are amplified by the transistor (T1) and pulse transformer is used for the isolation of the power circuit from the triggering circuit. The pulse transformer is having two secondary windings. Hence two pulses are generated for two SCRs.

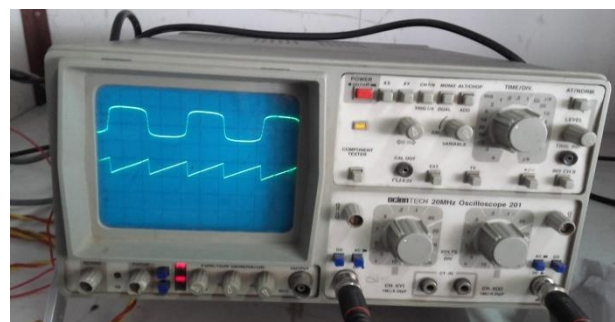
**B. Algorithm**

The program is developed for the micro controller as per the following algorithm.

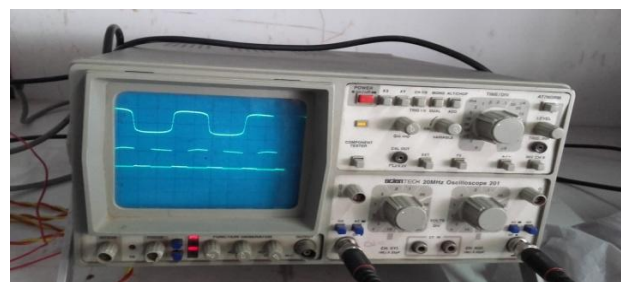
1. Start
2. Initialize the micro controller.
3. Initialize the LCD display.
4. Read P1.4.
5. Is P1.4 is high?
6. Read the DTMF inputs.
7. Display Intensity in percentage.
8. Output the equivalent code to DTMF value on Port-3.
9. Go to step 4.
10. Stop.

**IV. RESULT**

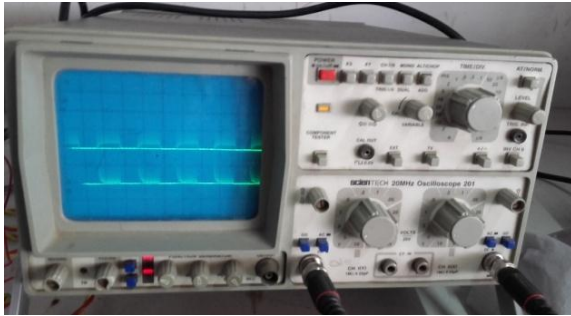
1. The control voltage is set to 5 volts and the ramp signal at pin no 10 of TCA 785



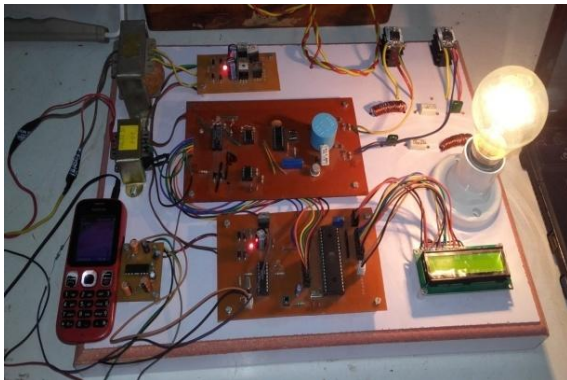
2. Continuous square w/f requires as a clock using A stable multivibrator at pin 6.



3. Input pulses for triggering SCR at pin no 14 and 15 of TCA 785



4. Total Circuit:



#### C. Advantages

1. Using this technology in homes, offices and industrial sector saves a lot of time and money.
2. Additional safety through appliance and lighting control.
3. Using this technology contributes toward the economics and it also improve quality of life.
4. Can be also control the system even when out of town.
5. It makes the control appliance easier for handicapped people also.

#### D. Future Scope

The system is designed for controlling the light intensity for one lamp load. The number of lamp loads can be increased with some modifications in the circuit diagram. The same design can be used for controlling the devices ON/OFF.

### V. CONCLUSION

The system designed controlling the light intensity is working properly. The DTMF technique is used for changing the intensity remotely. The system is controlling the light intensity by controlling the AC power. Hence the same system can be used to control the speed of 1-Ø induction motor.

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