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Infrared Based Home Appliance Remote Control

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Abstract: In this paper, we are discussing a kind of embedded system. The AT89S52 micro-controller is used in this system. The logic behind this project is to interface the IR receiver with the controller. The control codes are sent in serial format modulated to that 36 KHz, carrier frequency (usually by turning the carrier on and off). "IR" stands for infrared. Infrared light is invisible since its frequency is below that of visible range. Otherwise, it is like any other light source, operating under the same laws of physics.

Keywords: Infrared, LED, Frequency, Transceiver, Remote, Sensor, Radio.

I. OVERVIEW

It is an embedded controller circuit to switch on or off electrical appliances as required. This system will use normal TV remote control to send the control signal. The TV remote control sends different control signals as per the key pressed. This control can be used for decoding and select some of the out pin of the micro controller.

The TV remote control sends control signals in the form of IR rays to the receiving unit. The receiving unit receives the IR signals. The IR signal will be converted into digital signal with the help of an IR receiver. The received signals are decoded by the micro controller and changes its output with respect to the code received. The remote transmitter used in this project is a TV remote control used for Phillips TVs. It sends the control signals, which are in RC5 protocol modulated on a 40 kHz carrier signal.

In this device we also control the high temperature by the use of humidity sensor. When the temperature increase then it control the temperature of the room and fan speed is automatic slow and fast when temperature vary in the room.

The controller 8051 are attached with Surface Mounted Devices on which they work.

II. MICROCONTROLLER

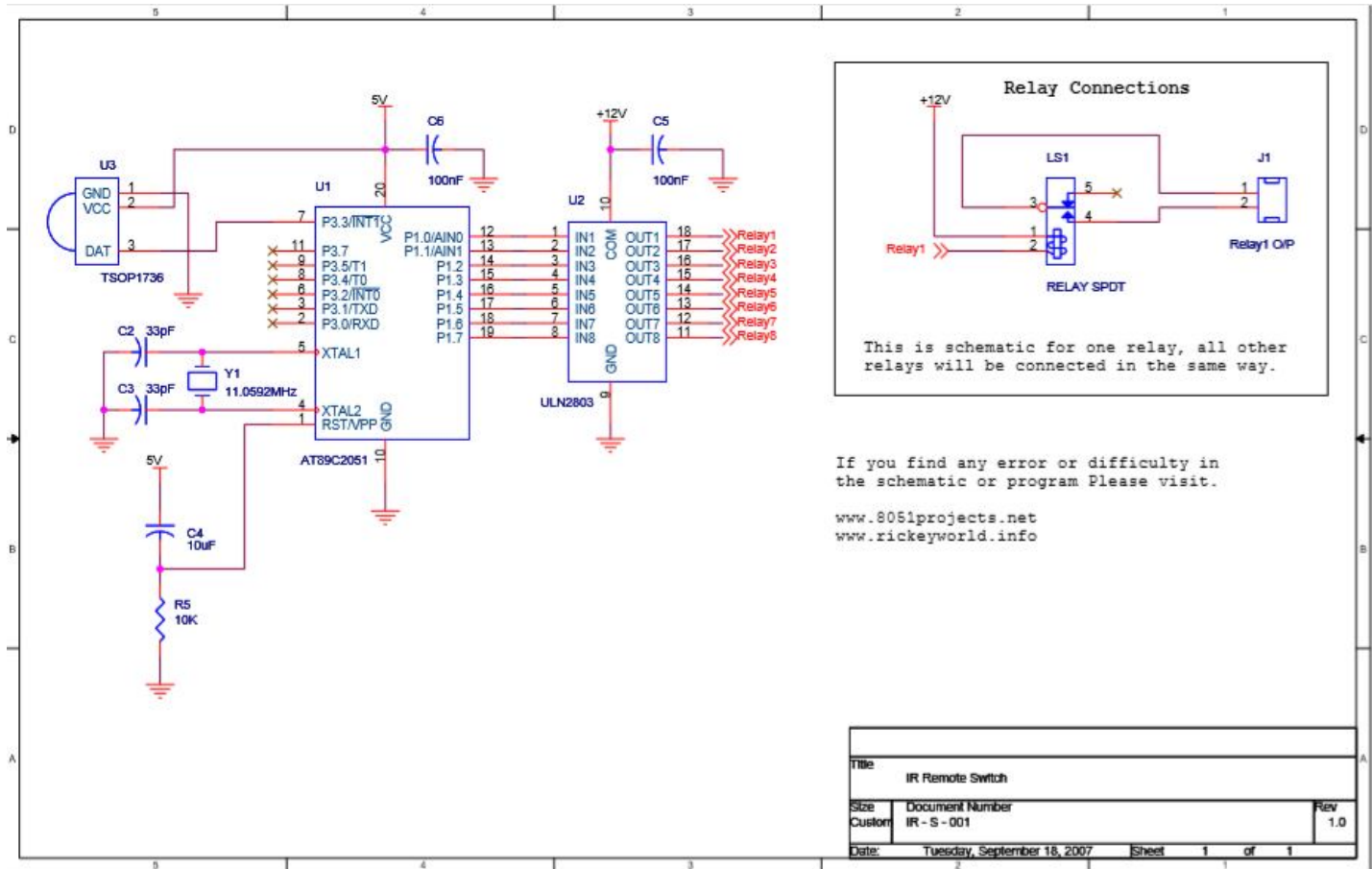
The 89C2051 micro controller is used in this project. It is in the family of Intel 8051. It is a CISC type processor and having 256 instructions. It has a 16-bit timer and UART. The controller receives the signals, which are in RC5 protocol. It decodes the control signals and changes the port status.

A. Why 89C2051?

Microcontrollers these days are silent workers in many apparatus, ranging from the washing machine to the video recorder. Nearly all of these controllers are mask programmed and therefore are of very little use for applications that require the programs to be changed during the course of execution.

The 89C2051, an 8 bit single chip microcontroller, 64K program memory address space, 64K data memory address space, 128 bytes of on chip RAM, 2K Bytes of Reprogrammable Flash Memory, two 16 bit timers/counters and an extensive interrupt structure.

B. Connection With Microcontroller 89c2051



C. MICRO CONTROLLER Programming for Remote Control Home Appliances

Coding....

```

VAR1 equ r7 ;Temporary Variable
TEMP equ 10H ;Temp variable
COUNT equ 11H ;Count
ADDR equ 12H ;Device address
CMD equ 13H ;Command
FLIP bit 00H ;Flip bit
TOG bit 01H ;Temp bit for flip
IR equ P3.3;IR Receiver connected to this pin
SW1 equ P1.0;Switch 1 connected here
SW2 equ P1.1;Switch 2 connected here
SW3 equ P1.2;Switch 3 connected here
SW4 equ P1.3;Switch 4 connected here
SW5 equ P1.4;Switch 5 connected here
SW6 equ P1.5;Switch 6 connected here
SW7 equ P1.6;Switch 7 connected here
SW8 equ P1.7;Switch 8 connected here
SWport equ P1 ;Port at which switches are connected
org 00H ;Start of prog
mov SWport,#00H ;switch all relays off!
mov sp,#50H ;Stack pointer initialization
clr TOG ;Clear temp bit
    
```



main:

```
jnb IR,$           ;Wait for first bit
mov VAR1,#255     ;3.024mS delay
djnz VAR1,$
mov VAR1,#25
djnz VAR1,$
mov VAR1,#25
djnz VAR1,$
mov VAR1,#25
djnz VAR1,$
mov VAR1,#25
djnz VAR1,$
mov VAR1,#255
djnz VAR1,$
mov VAR1,#100
djnz VAR1,$
movc,IR           ;Read Flip bit
movFLIP,c
clr A
;Count for address
```

fadd:

```
mov VAR1,#255     ;1.728mS delay for each bit
djnz VAR1,$
mov VAR1,#255
djnz VAR1,$
mov VAR1,#255
djnz VAR1,$
mov VAR1,#4
djnz VAR1,$
movc,IR
rlc a
djnzCOUNT,fadd
mov ADDR,A       ;Save the address
clr a
```

Count for Command

fcmd:

```
mov VAR1,#255     ;1.728mS Delay for each bit
djnz VAR1,$
mov VAR1,#255
djnz VAR1,$
mov VAR1,#255
djnz VAR1,$
mov VAR1,#4
djnz VAR1,$
movc,IR
rlc a
djnzCOUNT,fcmd
mov TEMP,CMD     ;Save the old command
movCMD,a        ;Save the new command
mova,ADDR       ;Check for valid address

cjne a,#00,nvalid
```



```
mova,TEMP
cjne,CMD,valid ;Check for valid command
nvalid
ljmp main
valid ;Key press check
clr a
movc,FLIP
rlc a
movTEMP,a
clr a
movc,TOG
cjne a,TEMP,valid1
sjmpnvalid
valid1
movc,FLIP
movTOG,c
mova,CMD
clr c
cjne a,#1,skip1 ;Check for SW1
jb SW1,isset1
setb SW1
ljmp main
isset1
clr SW1
ljmp main
skip1
cjne a,#2,skip2 ;Check for SW2
jb SW2,isset2
setb SW2
ljmp main
isset2
clr SW2
ljmp main
skip2
cjne a,#3,skip3 ;Check for SW3
jb SW3,isset3
setb SW3
ljmp main
isset3
clr SW3
ljmp main
skip3
cjne a,#4,skip4 ;Check for SW4
jb SW4,isset4
setb SW4
ljmp main
isset4
clr SW4
ljmp main
```

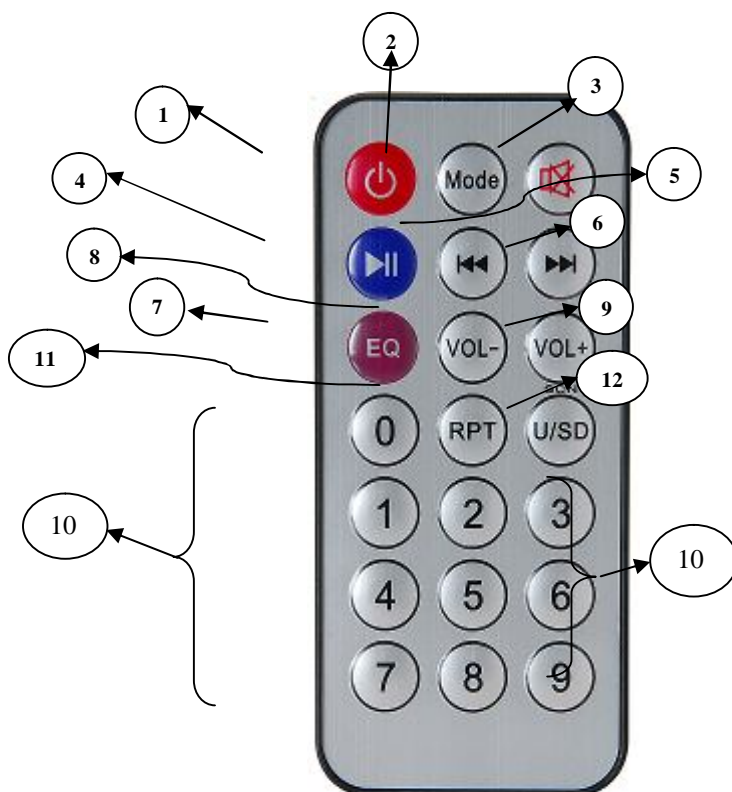


```
,skip5          ;Check for SW5
    jb SW5,isset5
    setb SW5
    ljmp main
isset5
    clr SW5
    ljmp main
skip5
    cjne a,#6,skip6          ;Check for SW6
    jb SW6,isset6
    setb SW6
    ljmp main
isset6:
    clr SW6
    ljmp main
skip6:
    cjne a,#7,skip7          ;Check for SW7
    jb SW7,isset7
    setb SW7
    ljmp main
isset7
    clr SW7
    ljmp main
skip7
    cjne a,#8,skip8          ;Check for SW8
    jb SW8,isset8
    setb SW8
    ljmp main
isset8
    clr SW8
    ljmp main
skip8:
    cjne a,#0CH,exit ;Check for all switches
    mov SWport,#00H
    ljmp main
exit:
    ljmp main
    END          ;End of program
```

D. Remote Configuration

III. IR BASED HOME AUTOMATION

A. IR Remote Layout



B. Remote Key Explanation

- 1) Key 1 (Power On/Off):N/A
- 2) Key 3 (Mute):N/A
- 3) Key 4 (Play/Pause):N/A
- 4) Key 5 (REW):To Decrease the speed of FAN_1.
- 5) Key 6 (FWD)To Increase the speed of FAN_1.
- 6) Key 8 (VOL+):To Increase the speed of FAN_2.
- 7) Key 9 (VOL-):To Decrease the speed of FAN_2.
- 8) Key 7 (EQ): NA
- 9) Key 11 (RPT): NA.
- 10) Key 12 (U/SD): NA.
- 11) Key 2 MODE: NA.
- 12) Key 10 (0-9 Key):
- 13) Numeric Key 1: To ON/OFF Relay1.
- a) Numeric Key 2: To ON/OFF Relay 2.
- b) Numeric Key 3: To ON/OFF Relay 3.
- c) Numeric Key 4: To ON/OFF Relay 4.
- d) Numeric Key 5-0 :N/A.

NOTE:Fan Speed up to 5 levels.

IV. REMOTE RECEIVING UNIT

The remote receiving unit receives the IR signals coming from the TV remote control unit. These signals are converted into electrical signals by the help of IR receiver. The TV remote control sends the control signals with RC5 protocol. The micro controller receives the signals and it decodes the control signals.

As per the control signals it changes the states of its port

A. Introduction

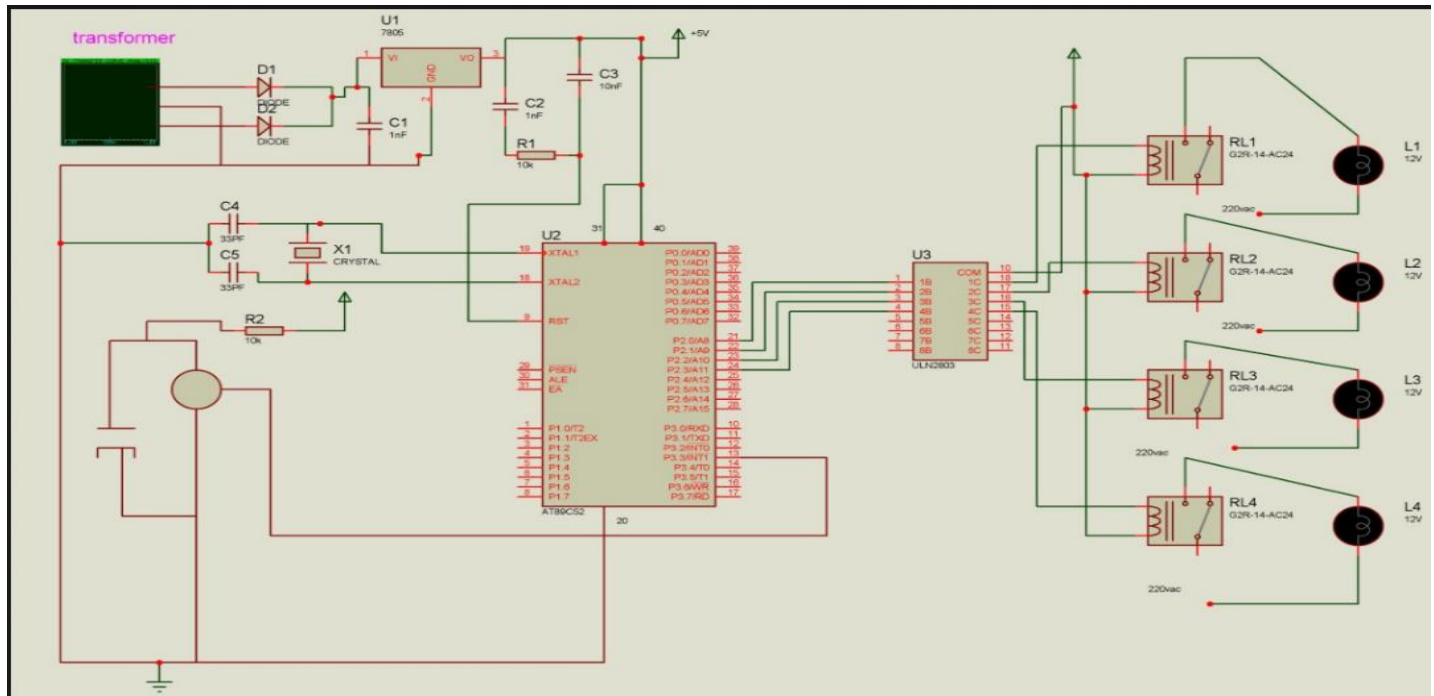
Infrared is actually a normal light with a particular colour. We can't see this color because its wavelength of 950nm is below from the visible spectrum. There are some IR system which uses other frequencies and other modulation. The cheapest way to remotely control a device within a visible range is via infrared light. Almost all audio and video equipment can be controlled by this way now-a-days. The IR remote is generally used in home theatres and is based on the principle of using infrared light as the medium of communication. Our infrared based home appliance remote control basically consists of a set of buttons and a circuit board. We perform a specific task by a specific buttons. Although we humans can't see the Infra-Red light emitted from a remote control doesn't mean we can't make it visible.

A video camera or digital photo camera can "see" the Infra-Red light as you can see in this picture. If you own a web cam you're in luck, point your remote to it, press any button and you'll see the Liquid Flow Through flicker. Unfortunately for us there are many more sources of Infra-Red light. The sun is the brightest source of all but there are many others, like: light bulbs, candles, central heating system, and even our body radiate infrared light.

B. Development

As we know that the first remote controllers were developed in the early 1990s. And in the starting remote were connected with wires to devices. But we can see that today remotes used infrared control and thus we are capable of controlling many task at a time as the working abilities of these remotes. In the starting only remote controllers were developed but after this infrared controls were developed in the 1970s. The 1970s remote use IR light and different light frequencies for different task but a now- a-days remote can control several appliances , equipment's AC ,TVs, Radios, video games etc.

C. Block Diagram of Project



D. Center Tapped Step Down Transformer

The center-tapped step-down transformer is used to step down the supply voltage of 230v ac from mains to lowervalues, as the various ICs used in this project require reduced voltages.

The outputs from the secondary coil which is center tapped are the ac values of 0v, 15v and -15v. The conversion of these ac values to dc values is done using the full wave rectifier unit.

E. Rectifier Unit

The rectifier circuit is used to convert the ac voltage into its corresponding dc voltage.

The most important and simple device used in rectifier circuit is the diode.

The simple function of the diode is to conduct when forward biased and not to conduct in reverse bias.

V. CONCLUSION & RESULT

This Project entitled "INFRARED REMOTE SWITCH USING MICROCONTROLLER" is used to switch on/off the Home Appliances by using a standard Remote control. The system is used to switch on/off up to six electrical devices simultaneously. All the above processes are controlled by the 8 bit Microcontroller AT89C2051. The Microcontroller receives the Infrared Signal from the receiver and it decodes and switch on/off the appropriate Device. The Range of the system is upto 10 meters. The system works on Phillips RC5 format. The device can switch on/off electrical devices of maximum load current of 5Amperes. High power loads can also be connected by changing the Relay. The Microcontroller is used to receive the Infrared signal from the Transmitter, the received signal is processed by the Microcontroller and according to the signal the corresponding device is switched ON/OFF.

VI. ACKNOWLEDGEMENT

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