

AUTOMATIC ROOM LIGHT CONTROLLER WITH BIDIRECTIONAL VISITOR COUNTER

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Abstract— This Project “Automatic Room Light Controller with Bidirectional Visitor Counter” is a reliable circuit that takes over the task of controlling the room lights as well as counting number of persons / visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one and the light in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light will be only switched OFF until all the persons in the room goes out. The total number of persons inside the room is also displayed on the seven segment displays. The microcontroller does the above job. It receives the signals from the sensors, and this signal is operated under the control of program which is stored in ROM. Microcontroller SST89E516RD continuously monitor the Infrared Receivers. When any object pass through the IR Receiver's then the IR Rays falling on the receivers are obstructed. This obstruction is sensed by the Microcontroller.

Keywords—microcontroller;ROM; IR;counter

I. INTRODUCTION

The objective of this project is to make a controller based model to count number of persons visiting particular room and accordingly light up the room. Here we can use sensor and can know present number of persons. In today's world, there is a continuous need for automatic appliances. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Also if at all one wants to know the number of people present in room so as not to have congestion, this circuit proves to be helpful. Automatic Room Light Controller with Bidirectional Visitor Counter” is a reliable circuit that takes over the task of controlling the room lights as well us counting number of persons/ visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one and the light in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light will be only switched OFF until all the persons in the room go out. The total number of persons inside the room is also displayed on the seven segment displays. The microcontroller does the above job. It receives the signals from the sensors, and this signal is operated under the control of program which is stored in ROM. Microcontroller SST89E516RD continuously monitor the Infrared Receivers. When any object pass through the IR Receiver's then the IR Rays falling on the receivers are obstructed. This obstruction is sensed by the Microcontroller.

II. BLOCK DIAGRAM

The basic block diagram of the bidirectional visitor counter with automatic light controller is shown in the above figure. Mainly this block diagram consists of the following essential blocks.

A. Power Supply

Here we have used +12V and +5V dc power supply. The main function of this block is to provide the required amount of voltage to essential circuits. +12V is given to relay driver. To get the +5V dc power supply we have used here IC 7805, which provides the +5V dc regulated power supply.

B. Transmitter Section

In this section we have used 555 Timer IC as Astable Multivibrator to generate 38 kHz square wave pulse for continuously blinking of IR LED as a transmitter circuit. We have used two transmitter circuits, one for Enter sensor & second for Exit sensor circuit. We can also use RC circuit with 555 Timer IC to generate 38 kHz square wave pulse for continuously blinking of IR LED as a transmitter circuit.

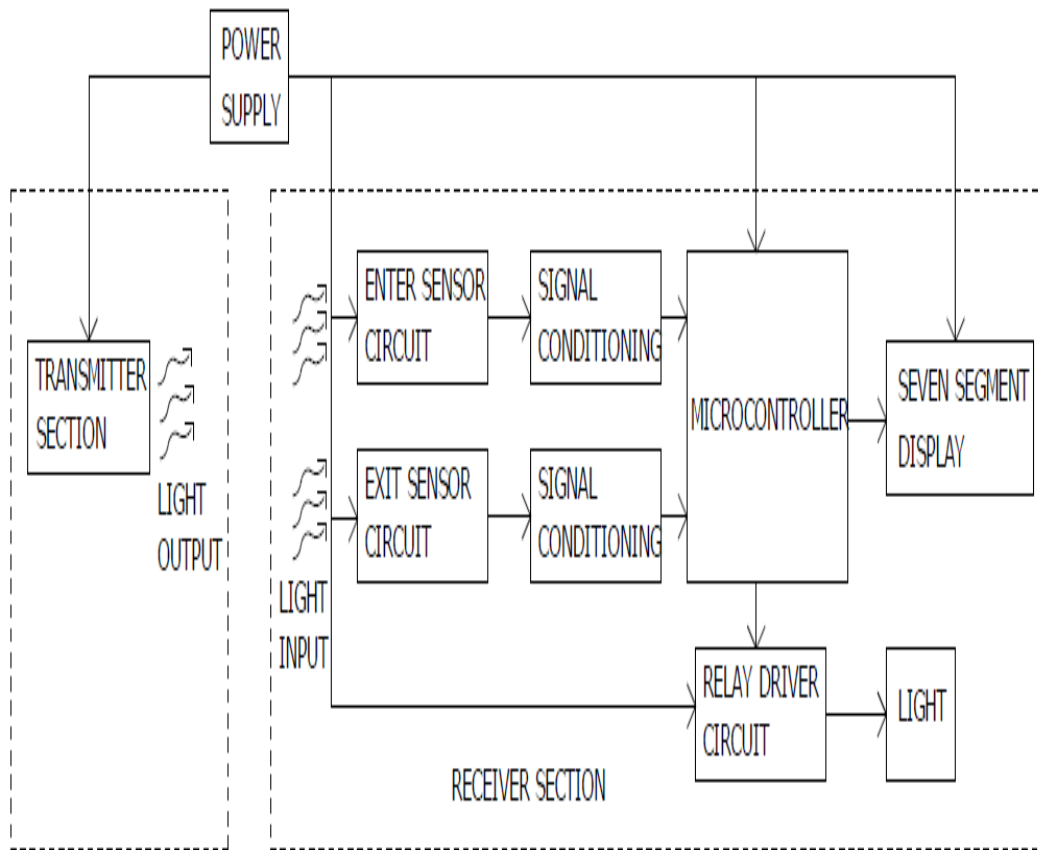


Fig.1: Block diagram of the system

C. Receiver Section

1. Enter & Exit Sensor Circuit

This is one of the main parts of our project. The main intention of this block is to sense the person. For sensing the person we are using a TSOP1738 sensor. By using this sensor and its related circuit diagram we can count the number of persons.

2. Microcontroller

The SST89E516RD is members of the Flash Flex family of 8-bit microcontroller products designed & manufactured by SST (Silicon Storage Technology, Inc.). Now SST was acquired by Microchip Technology, Inc. in April 2010. This device use the 8051 instruction set and is pin to pin compatible with standard 8051 microcontroller devices.

3. Seven Segment Display Circuit

In this section we have used two seven segment displays to display number of persons in the room. We have used transistor for display drive circuit.

4. Relay Driver Circuit

In this section we have used the transistor and the relays. Output signal from microcontroller is given to the base of the transistor, which energizes the particular relay, because of this, appropriate device is selected and which performs its allotted function.

III. FLOWCHART

Fig. 2 shows dataflow of the complete system.

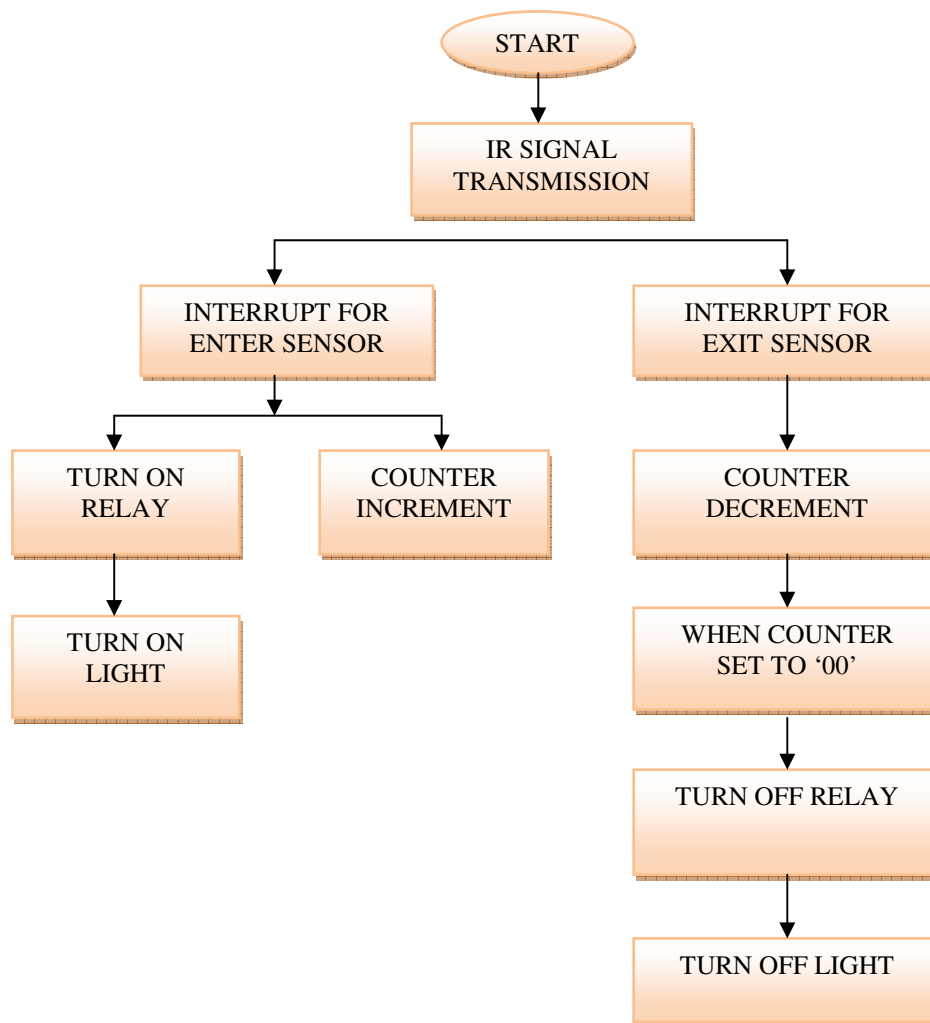


Fig. 2: Dataflow diagram

A. Microcontroller - SST89E516RD

The SST89E516RD is members of the FlashFlex family of 8-bit microcontroller products designed & manufactured by SST(Silicon Storage Technology,Inc).Now SST was acquired by Microchip Technology,Inc in April 2010.This device use the 8051 instruction set and is pin to pin compatible with standard 8051 microcontroller devices. [1] The Device come with 72 Kbyte of on chip flash EEPROM program memory which is partitioned into 2 independent program memory blocks. The primary block 0 occupys 64 Kbyte of internal program memory space & secondary block 1 occupys 8 Kbyte of internal program memory space. The 8 Kbytes secondary block can be mapped to the lowest location of the 64 Kbyteaddress space. In addition to the 72 Kbyte of EEPROM program memory on - chip and 1024 x 8 bits of on – chip RAM, the device can address up to 64 Kbyte of external program memory and up to 64 Kbyte of external RAM. The Flash memory blocks can be programmed via a standard 89s5x programmer.

B. Electronic circuit and its PCB layout

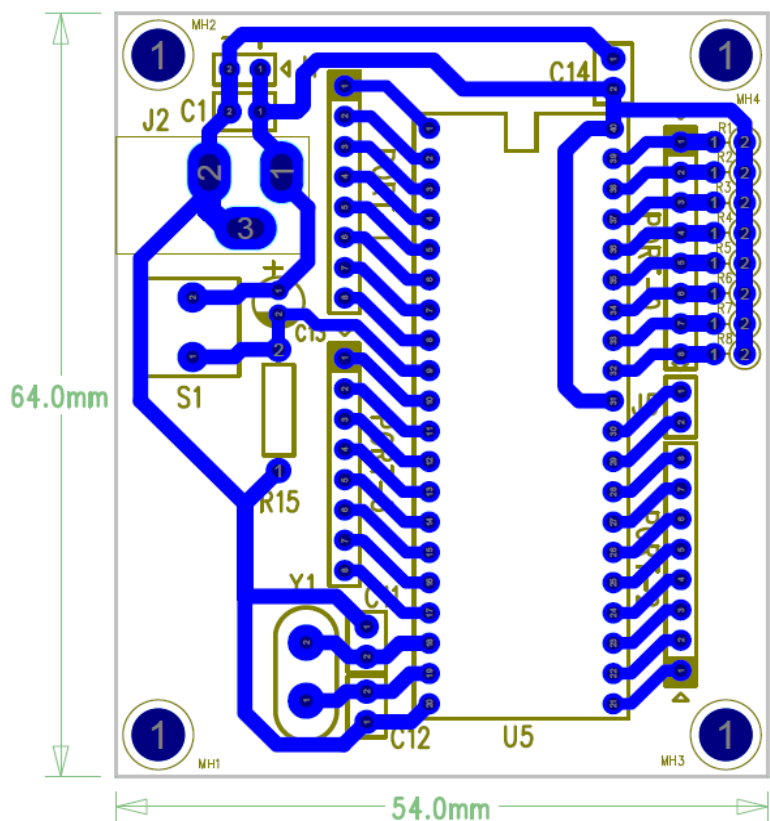
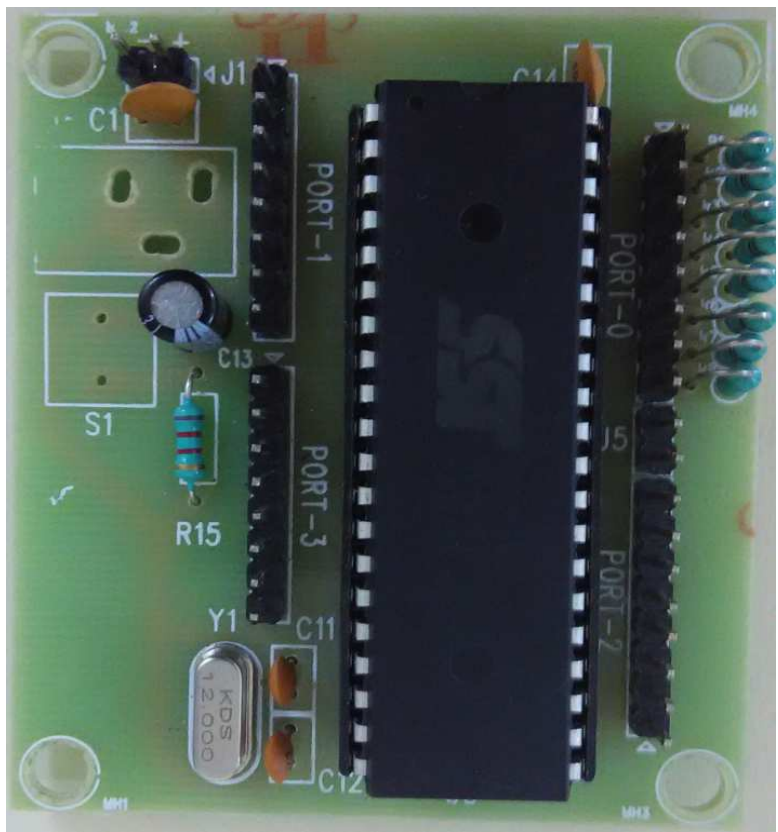


Fig.3: Snapshot of microcontroller with its circuitry

Fig. 4: PCB Layout

As per schematic we have provided 2.54mm pitch header for all port pins for flexibility purpose. So we can change input & output device connection as per our requirement. We have used SST89E516RD microcontroller. Output of enter sensor receiver circuit is connected to P3.2(pin 12) pin & exit sensor circuit is connected to P3.3(pin 13). We have connected seven segment display interface circuit with port 0 & their control signal is come from P1.7(pin 8)& P1.6(pin 7). Also we have connected relay interface circuit with P1.5 (pin 6).

C. Interfacing circuit

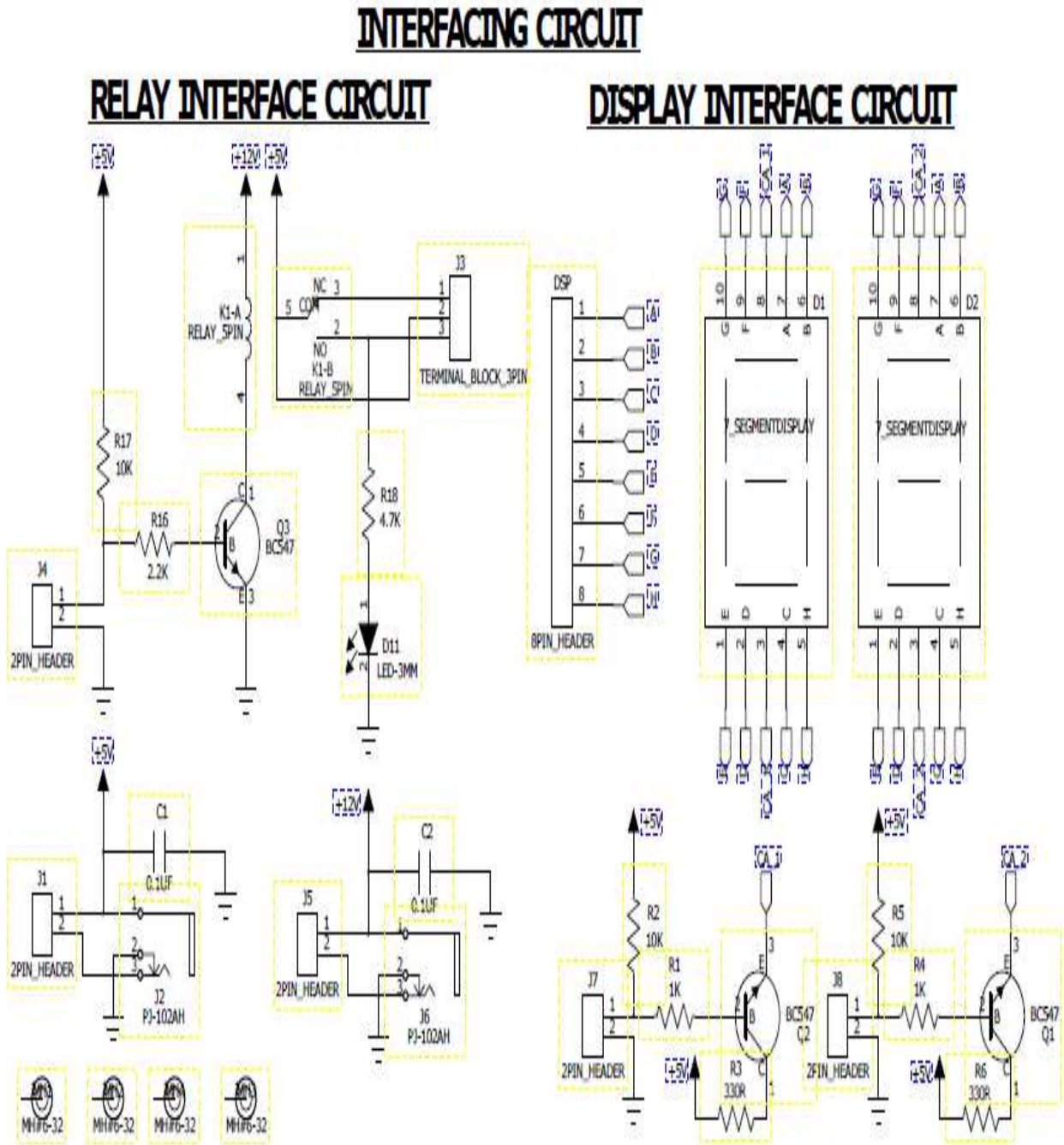


Fig. 5: Interfacing circuit

IV. TEST SETUP

In this project both IR transmitters continuously transmit 38 kHz IR signal to receiver. At receiver both enter & exit IR sensor TSOP1738 continuously receives this IR signal. Due to continuous IR signal falls on IR sensor, Output of IR sensor is continuously high. When any object pass through enter sensor interrupt is generated & output of IR sensor give low trigger on IC555 pin 2 & generate 110ms high pulse on output pin no 3 of IC555 which is inverted through NPN transistor & send to microcontroller P3.2 (pin 12). When P3.2 (pin 12) pin get low pulse counter on display increment by '1' & relay is on & light is on. When any object pass through exit sensor interrupt is generated & output of IR sensor give low trigger on IC555 pin 2 & generate 110ms high pulse on output pin no 3 of IC555 which is inverted through NPN transistor & send to microcontroller P3.3 (pin 13). When P3.3 (pin 13) pin get low pulse counter on display decrement by '1'. When counter is set to '00' then relay is OFF & light is OFF.



Fig. 6: Test setup

References

- [1] <http://ww1.microchip.com/downloads/en/DeviceDoc/25093B.pdf>
- [2] <http://www.ti.com/lit/ds/symlink/lm555.pdf>
- [3] <https://www.fairchildsemi.com/datasheets/BC/BC547.pdf>
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