DEEPAK GUPTA

Bidirectional Visitor Counter

Frontline Electronics, Pvt. Ltd., Salem

Digital visitor counter is a reliable circuit that takes over the task of counting number of Persons/ Visitors in the Room very accurately. When somebody enters into the Room then the Counter is Incremented by one. The total number of Persons inside the Room is displayed on the seven segment display module. The microcontroller does the above job it receives the signals from the sensors, and this signals operated under the control of software which is stored in ROM.

It can be used to count the number of persons entering a hall in the up mode at entrance gate. In the down mode, it can count the number of persons leaving the hall by decrementing the count at exit gate. It can also be used at gates of parking areas and other public places.

This circuit divided in three parts: sensor, controller and counter display. The sensor would observe an interruption and provide an input to the controller which would run the counter in up/down mode depending upon the selector setting. The same count is displayed on a set of 7-segment displays through the controller.

This project we will create counter system for apply. The total number of object is displayed on the seven segment display. The system is fully controlled by the 16 bit microcontroller 8051 which has a 4Kbytes of ROM for the program memory. It can also be used at gates of parking areas and other public places.

Working

In this circuit, two infrared (IR) sensor modules are used each for up and down counting, respectively. Whenever an interruption is observed by the first IR sensor, it increments the counter value. Similarly, when the second sensor detects an obstacle, the count is decremented. The count value is calculated depending upon the sensors' input and is displayed on a set of four seven segment displays by using the concept of multiplexing (for concept of multiplexing refer seven segment multiplexing). The data pins of each 7-segment display are connected to port P2 of the microcontroller AT89C51. The first four pins of port P1 (P1 ^ 0-P1 ^ 3) are connected to control pins to enable a particular 7-segment.

. P1 ^ 5 & P1 ^ 6 are configured as input pins at which the sensors are connected.

The sensor inputs are defined as up and down selector modes for the counter in the code. Each time the first sensor is blocked, it gives a high signal at P1 ^ 5 and the count value gets incremented. The value gets decremented when P1 ^ 6, connected to second sensor, gives high input. At each step, the value of the counter is sent to be displayed on the segments.

Component Used

89C51

89c51 is a low power ,high performance CMOS 8 bit controller with 8K of in system programmable Flash memory. By combining a versatile 8 bit CPU within system programmable flash on a monolithic chip, the atmel AT89c51 is a powerful computer which provides a high flexibility and cost effective solutions to many embedded control applications.It is based on an 8 bit central processing unit with an 8 bit Accumulator and another 8 bit B register as main processing blocks. Other portions of the architecture include few 8 bit and 16 bit registers and 8 bit memory locations. Each 8051 device has some amount of data RAM built in the device for internal processing. This area is used for stack operations and temporary storage of data. This base architecture is supported with on chip peripheral functions like I/O ports, timers/counters, versatile serial communication port. So it is clear that this 8051 architecture was designed to cater many real time The following list gives the features of the 8051 architecture:

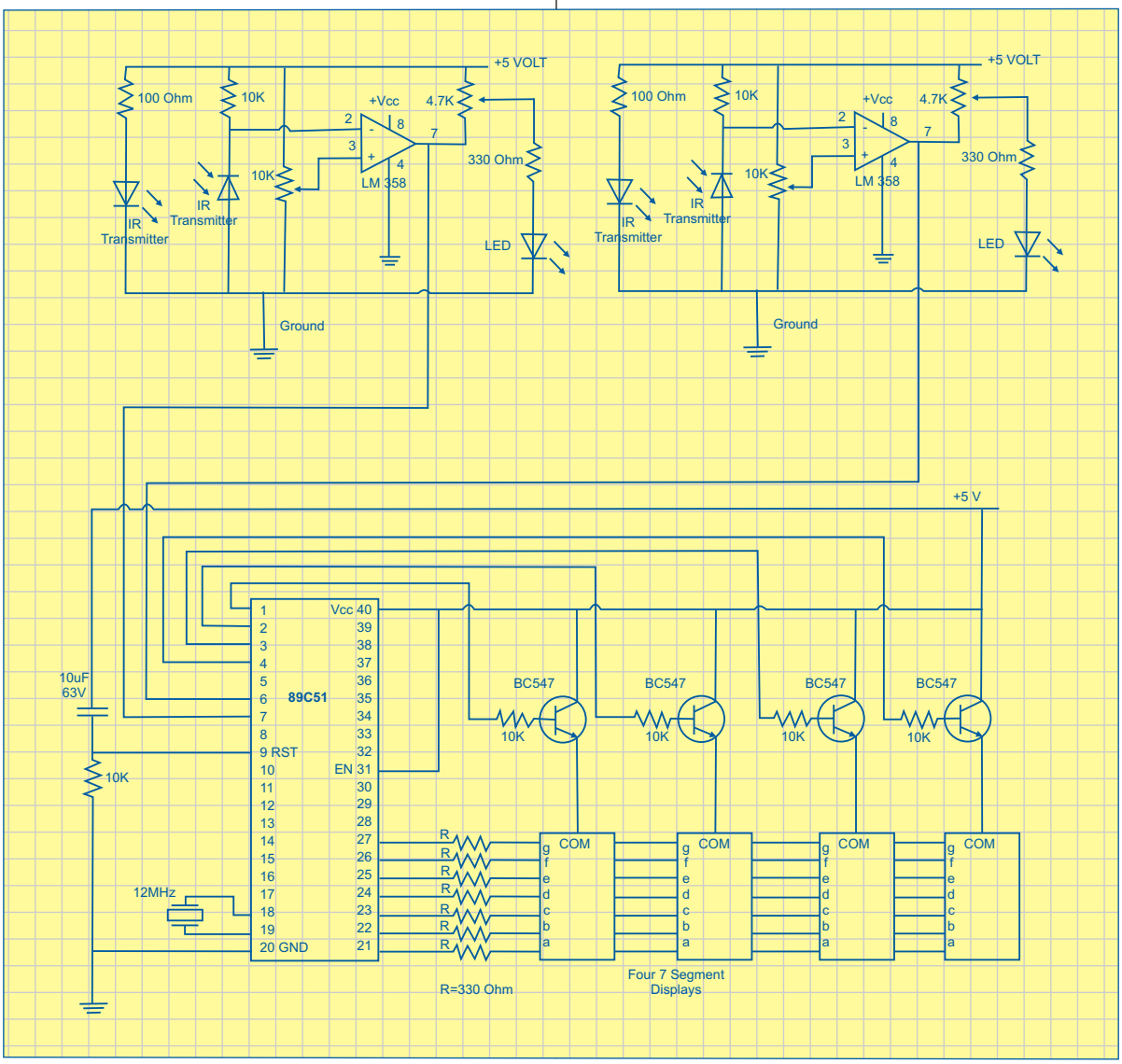
- Optimized 8 bit CPU for control applications.
- Extensive Boolean processing capabilities.

- 64K Program Memory address space.
- 64K Data Memory address space.
- 128 bytes of on chip Data Memory.
- 32 Bi directional and individually addressable I/O lines.
- Two 16 bit timer/counters.
- Full Duplex UART.
- 6 source / 5 vector interrupt structure with priority levels.
- On chip clock oscillator
- Light emitting diodes (LEDs)

Light emitting diodes (LEDs) are semiconductor light sources. The light emitted from LEDs varies from visible to infrared and ultraviolet regions. They operate on low voltage and power. LEDs are one of the most common electronic components and are mostly used as indicators in circuits. They are also used for luminance and optoelectronic applications.

Based on semiconductor diode, LEDs emit photons when electrons recombine with holes on forward biasing. The two terminals of LEDs are anode (+) and cathode (-) and can be identified by their size. The longer leg is the positive terminal or anode and shorter one is negative terminal. The forward voltage of LED (1.7V-2.2V) is lower than the voltage supplied (5V) to drive it in a circuit. Using an LED as such would burn it because a high current would destroy its p-n gate. Therefore a current limiting resistor is used in series with LED. Without this resistor, either low input voltage (equal to forward voltage) or PWM (pulse width modulation) is used to drive the LED.

- Infrared sensors



The TSOP17 series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor. TSOP17.. is the standard IR remote control receiver series, supporting all major transmission codes.

Features:

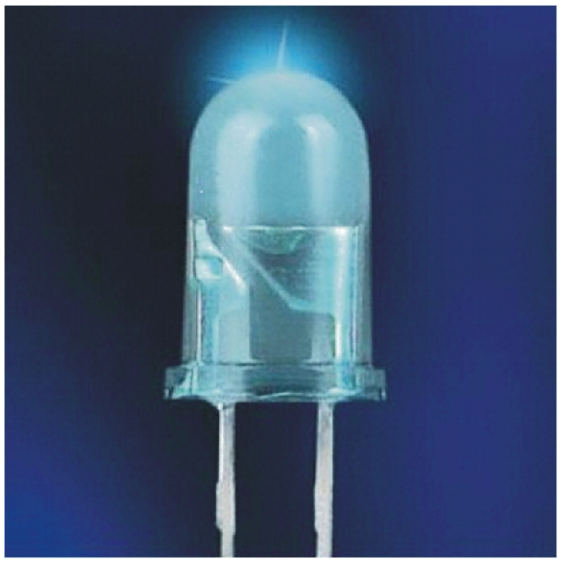
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Low power consumption
- High immunity against ambient light
- Continuous data transmission possible (up to 2400 bps)
- Suitable burst length 10 cycles/burst

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminium gallium arsenide. They, along with IR receivers, are commonly used as sensors.

The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED. To overcome this problem, the camera on a cellphone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit.

- Seven Segment Display One common requirement for many different digital devices is a visual numeric display. We've all seen seven-segment displays in a wide range of applications. Clocks, watches, digital instruments, and many household appliances already have such displays. A seven segment display is the most basic electronic display device that can display digits from 0-9. They find wide application in devices that display numeric information like digital clocks, radio, microwave ovens, electronic meters etc. The most common configuration has an array of eight LEDs arranged in a special pattern to display these digits. They are laid out as a squared-off figure '8'. Every LED is assigned a name from 'a' to 'h' and is identified by its name. Seven LEDs 'a' to 'g' are used to display the numerals while eighth LED 'h' is used to display the dot/decimal.

A seven segment is generally available in ten pin



package. While eight pins correspond to the eight LEDs, the remaining two pins (at middle) are common and internally shorted. These segments come in two configurations, namely, Common cathode (CC) and Common anode (CA). In CC configuration, the negative terminals of all LEDs are connected to the common pins. The common is connected to ground and a particular LED glows when its corresponding pin is given high. In CA arrangement, the common pin is given a high logic and the LED pins are given low to display a number. This requires just seven LEDs (plus an eighth one for the decimal point, if that is needed). A common technique is to use a shaped piece of translucent plastic to operate as a specialized optical fiber, to distribute the light from the LED evenly over a fixed bar shape. The seven bars are laid out as a squared-off figure "8". The result is known as a seven-segment LED.

- Transistor

Transistor is a device which transforms current flow from low resistance path to high resistance path. It is capable of performing many functions of the vacuum tube in electronic circuits, the transistor is the solid state device consisting of a tiny piece of semi conducting material, usually germanium or silicon, to which three or more electrical connections are made.

BC547 is an NPN bi-polar junction transistor. A transistor, stands for transfer of resistance, is commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals.

BC547 is mainly used for amplification and switching purposes. It has a maximum current gain

of 800. Its equivalent transistors are BC548 and BC549.The transistor terminals require a fixed DC voltage to operate in the desired region of its characteristic curves. This is known as the biasing. For amplification applications, the transistor is biased such that it is partly on for all input conditions. The input signal at base is amplified and taken at the emitter. BC547 is used in common emitter configuration for amplifiers. The voltage divider is the commonly used biasing mode. For switching applications, transistor is biased so that it remains fully on if there is a signal at its base. In the absence of base signal, it gets completely off.

Code

```
// Program to make a bidirectional visitor counter using IR sensor
#include <reg51.h>
#define msec 1
unsigned int num=0;
sbit dig_ctrl_4=P1^3;  //declare the control pins of seven segments
sbit dig_ctrl_3=P1^2;
sbit dig_ctrl_2=P1^1;
sbit dig_ctrl_1=P1^0;
unsigned digi_val[10]=
{0x40,0xF9,0x24,0x30,0x19,0x12,0x02,0xF8,0x00,0x10 };
unsigned int dig_1,dig_2,dig_3,dig_4,test=0;
unsigned char dig_disp=0;
sbit up=P3^5;  //up pin to make counter count up
sbit down=P3^6;  //down pin to make counter count down
void init()  // to initialize the output pins and Timer0
{
up=down=1;
dig_ctrl_4 = 0;
dig_ctrl_3 = 0;
dig_ctrl_2 = 0;
dig_ctrl_1 = 0;
TMOD=0x01;
TL0=0xf6;
TH0=0xFf;
IE=0x82;
TR0=1;
}
void delay()  //To provide a small time delay {
TMOD=0x01;
   TL0=0x36;
   TH0=0xF6;
   TR0=1;
   while(TF0==0);
   TR0=0;
   TF0=0;
}
void display() interrupt 1   // Function to display the digits on seven segment..
{
TL0=0x36;
   TH0=0xf6;
P2=0xFF;
dig_ctrl_1 = dig_ctrl_3 = dig_ctrl_2 = dig_ctrl_4 = 0;
dig_disp++;
dig_disp=dig_disp%4;
switch(dig_disp)
{
 case 0:
 P2= digi_val[dig_1];
 dig_ctrl_1 = 1;
 break;

 case 1:
 P2= digi_val[dig_2];
 dig_ctrl_2 = 1;
 break;
 case 2:
 P2= digi_val[dig_3];
 dig_ctrl_3 = 1;
 break;
 case 3:
 P2= digi_val[dig_4];
 dig_ctrl_4 = 1;
 break;
}
}

void main()
{
  init();
  while(1)
  {
 if(up==0&&down==1)  //check if up pin is pressed
    {
 test++;
    num=test;
    dig_4=num%10;
 num=num/10;
    dig_3=num%10;
 num=num/10;
    dig_2=num%10;
 dig_1=num/10;
 if(test==9999)
 test=0;
 }
   if(up==1&&down==0)  //check if down pin is pressed
   {
 test--;
    num=test;
    dig_4=num%10;
 num=num/10;
    dig_3=num%10;
 num=num/10;
    dig_2=num%10;
 dig_1=num/10;
 if(test==0)
 test=9999;
 }
}
}
```