**VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI-590018**



# **A MINI PROJECT REPORT ON**

# **“**INFRARED OBJECT COUNTER**”**

***Submitted in partial fulfilment of the Requirement of 3rd semester mini project in***

**ANALOG AND DIGITAL ELECTRONICS**

Submitted By

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## Department of Computer Science and Engineering



**CERTIFICATE**

This is to certify that **MOHAMMED SEYYED SAFWAN, MOHAMMED RISHAN HASSAN, MOHIDEEN NAZIM, SHIHAAB HASSAN** bearing USN **4PA19CS059, 4PA19CS058, 4PA19CS062, 4PA19CS091** and has successfully completed the project work entitled **“**INFRARED OBJECT COUNTER**” with MINI PROJECT [18CSL37]** as a partial fulfilment of the requirement of 3th semester mini project in **Computer Science & Engineering** of Visvesvaraya Technological University, Belagavi, during the year 2020-21.

**Signature of Staff In-Charge Signature of H.O.D.**

## EXTERNAL

**Name of the Examiners Signature with date**







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**By,**

**SAFWAN AND TEAM**

# INTRODUCTION

Infrared Object counters or product counters are important applications used in industries, shopping malls, etc. They count objects or products automatically and so reduce human efforts.  This infrared object counter can be installed at the entry gate to count the total number of people entering any venue. For example, it can be used at the railway stations or bus stands to count the people arriving per day or week.

The counter uses an infrared transmitter-receiver pair and a simple, low-cost calculator. It works even in the presence of normal light. The maximum detection range is about 10 meters. That means the transmitter and the receiver are to be installed (at the opposite pillars of the gate) not more than 10 meters apart. No focusing lens is required. If an 8-digit calculator is used the counter can count up to 99,999,999 easily, and if a 10-digit calculator is used the counter can count up to 9,999,999,999.

## COMPONENTS

* Transformer (230V to 9V 200mA)
* Transistor (BC547)
* Diode (1N4001) X4
* IC 555 Timer
* IC 7805
* IC MCT2E
* IR RX1 TSOP 1738
* IR LED X2
* 9V Battery
* ON/OFF Switch X2
* Resistor:

R1 = 4.7KΩ ; R2 = 10KΩ ; R3 = 33Ω ; R4 = 100Ω ; R5 = 470Ω ; R6 = 1KΩ ;

* Potentiometer – 10KΩ
* Capacitor :

C1 = 10µF(25V) ; C2 = 0.001µF ; C3 = 0.01µF ; C4 = 1000µF(25V) ; C5 = 0.1µF ; C6 = 47µF(25V) ;

* Simple Calculator
* Connecting wires

# COMPONENT DESCRIPTION

*IC 7805*

IC 7805 is a 5V Voltage Regulator that restricts the output voltage to 5V output for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is inexpensive, easily available and very much commonly used.

*IC MCT2E*

MCT2E is a phototransistor Optocoupler, as the name “phototransistor” suggests it has a transistor which is controlled based on light (photon). ... This IC is used to provide electrical isolation between two circuits, one part of the circuit is connected to the IR LED and the other to Photo-transistor.

*NE555 (IC 555)*

IC 555 is a precision timing IC that provides time delays or oscillations. 555 Timer IC has three modes of operation: Astable, Monostable and Bi-stable. In this project, we are going to use the IC 555 in Bi-stable mode.

*Transistor (BC547)*

BC547 is a general purpose BJT NPN transistor mostly used in electronics hobbyists and educational electronics projects. Besides these uses it can also be used in commercial circuits. It comes in TO-92 packaging and the maximum output current this transistor can handle is 100mA.

*IR LED*

An infrared light-emitting diode (IR LED) is a solid-state light-emitting (SSL) device that produces light in the infrared band or range of the electromagnetic radiation spectrum. ... IR LEDs are also useful in many types of electronics, such as remote controls for televisions and numerous other electronics.

*DIODE (1N4001)*

Often used for reverse voltage protection, a staple for many power, DC to DC step up, and breadboard projects. 1N4001 is rated for up to 1A/50V. A diode allows electrical current to flow in one direction -- from the anode to the cathode.

*TRANSFORMER (230V To 9V 200mA)*

Transformer has 230V primary winding and non-center tapped secondary winding. The transformer has flying colored insulated connecting leads ( Approx 100 mm long ). The Transformer act as step down transformer reducing AC - 230V to AC - 9V. The Transformer gives outputs of 9V and 0V.

*RESISTOR*

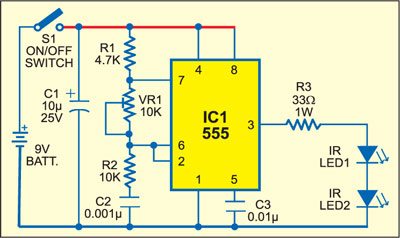
A resistor is a passive electrical component with the primary function to limit the flow of electric current.

CAPACITOR

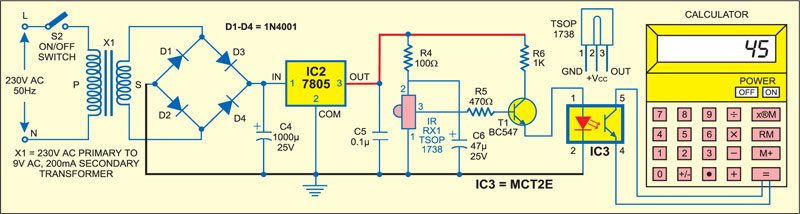
A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance.

# CIRCUIT DIAGRAM

*Fig. 1: Infrared Object Counter: Transmitter circuit*



*Fig. 2: Infrared Object Counter: Receiver-cum-counter circuit*



# WORKING OF THE PROJECT

When switch S1 is in ‘on’ position, the transmitter circuit activates to produce a square wave at its output pin 3. The two infrared LEDs (IR LED1 and IR LED2) connected at its output transmit modulated IR beams at the same frequency (38 kHz). The oscillator frequency can be adjusted using preset VR1.

In the receiver circuit, IR receiver module TSOP1738, which is commonly used in colour televisions for sensing the IR signals transmitted from the TV remote, is used as the sensor.

The IR beams transmitted by IR LED1 and LED2 fall on infrared receiver module IR RX1 of the receiver circuit to produce a low output at its pin 2. This keeps transistor T1 in non-conduction mode.

Now when anyone enters through the gate to interrupt the IR beam, the IR receiver module produces a high output pulse at its pin 3. As a result, transistor T1 conducts to activate IC3 and its internal transistor shorts key ‘=’ of the calculator to advance the count by one.

## CIRCUIT DESIGN

Both the transmitter and the receiver can be assembled on any general-purpose PCB. Place the transmitter and the receiver around one metre apart.

For calibration, press switches S1 and S2 followed by ‘on’ key of the calculator. Now press ‘1’ and ‘+’ keys sequentially to get ‘1’ on the screen of the calculator. Then, place a piece of cardboard between the transmitter and the receiver to interrupt the IR rays two times. If the calculator counts ‘2,’ the counter is working properly for that range. Repeat this procedure for higher ranges as well. If there is any problem, adjust VR1.

For installation, switch off the transmitter, receiver and calculator, and mount the transmitter and the receiver on the opposite pillars of the main entry gate such that they are properly orientated towards each other. Mount the calculator where you can read it easily. Connect pins 4 and 5 of IC3 across ‘=’ key connections on the PCB of the calculator.

Now switch on the transmitter and the receiver by pressing switches S1 and S2, respectively. Thereafter, switch on the calculator and press ‘1’ followed by ‘+’ key of the calculator to initialise it. Now your counter is ready to count.

The calculator reads ‘1’ after one interruption, ‘2’ after second interruption and so on.

# CONCLUSION

This **infrared object counter** can be installed at the entry gate to **count** the total number of people entering any venue. For example, it can be **used** at the railway stations or bus stands to count the people arriving per day or week.