
# Ahsanullah University of Science and Technology

## Department of EEE

## Measurement and Instrumentation

Group Project

# Object Counter Device

Submitted by:

Name: Navid Aziz ID: 20200205160

Name: Shakil Mahmud Arafat ID: 20200205112

Name: Tawsif Chowdhury ID: 20200205158

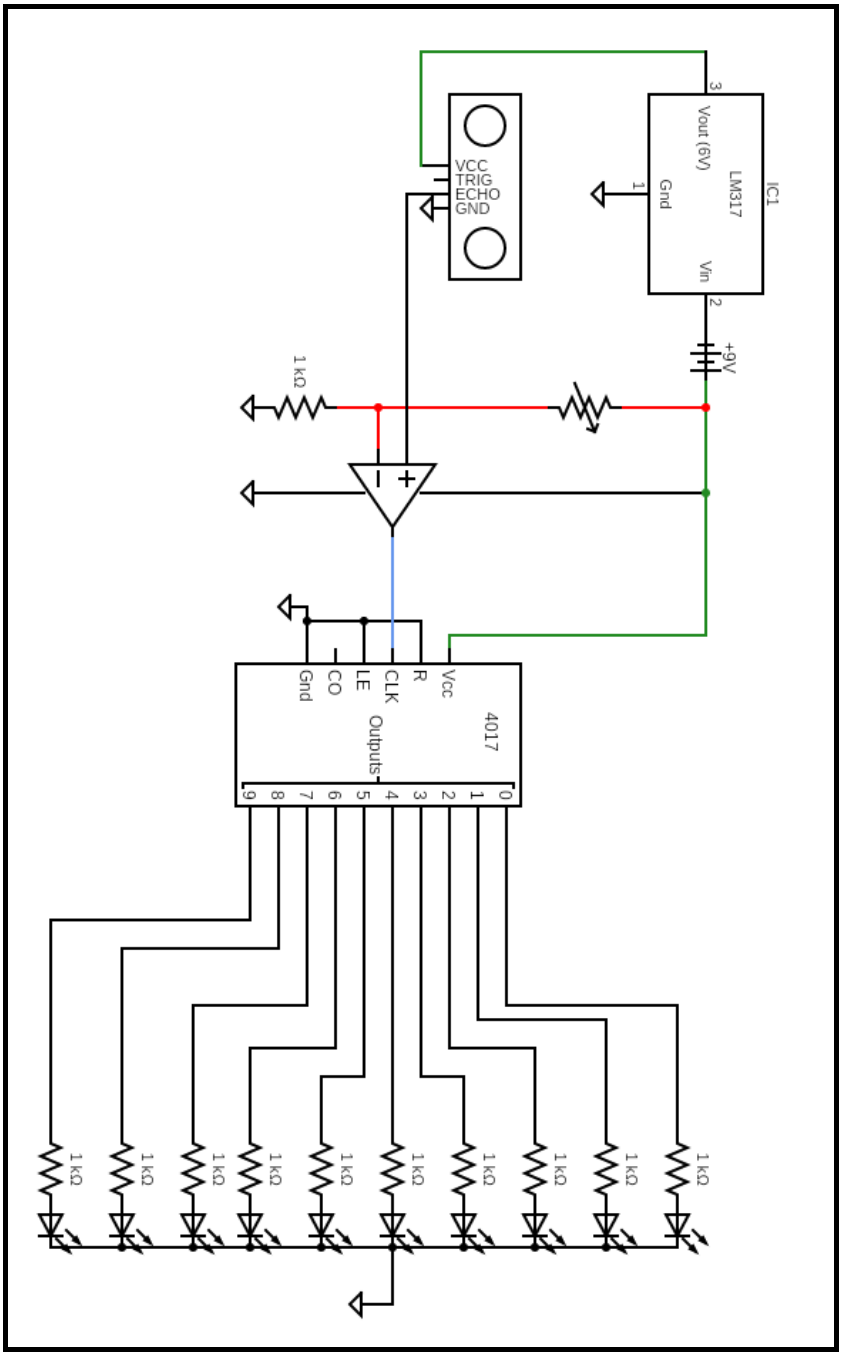
Name: Nasif Abdullah ID: 20200105074

Session: Fall2020

Subject code: EEE2212

# Object Counter Device

## Circuit Diagram:



## Working principle:

Overview:

We built a counter device that keeps track of objects that passes by the device. Some major components used are the uA741 operational amplifier, CD4017 Johnson decade Counter, and GP2Y0A02YK0F IR distance sensor.

When an object passes by the IR sensor within a range it detects the movement and outputs a voltage from 0V to ~3V. This voltage is fed to the positive pin to the Comparator circuit of uA741. The op-amp triggers a signal to the Counter IC which gives a fixed voltage to the output pins sequentially which we used to light up the LEDs one by one to keep track of the count.

Explanation:

We used a 9v battery as the power supply to feed power to the circuit, but as the GP2Y0A02YK0F sensor's operating range is 7v, we used a voltage controller to limit the voltage.

The GP2Y0A02YK0F IR sensor's output voltage range is from 0V to ~3V. This voltage is fed to the positive pin of the op-amp and in the negative pin, we have set 2V by adding two resistors connected to the 9V supply and ground. This was done to set a working range of the device. Using a voltage divider circuit, we can adjust the voltage by using a POT and a 1K resistor.

When the voltage of the positive pin gets higher than the negative pin, we get ~9V as the output from the op-amp as we set the positive biasing to 9V supply.

The output voltage is fed to the Clock input pin 14 of the Counter IC and it keeps track of the count using its working principle. We have grounded 8, 13, and 15 pins as per our requirements for the circuit and kept pin 12 open. The other 10 pins work as the output pin.

## New IC or sensor that were used:

### i. Sharp GP2Y0A21YK0F IR sensor:

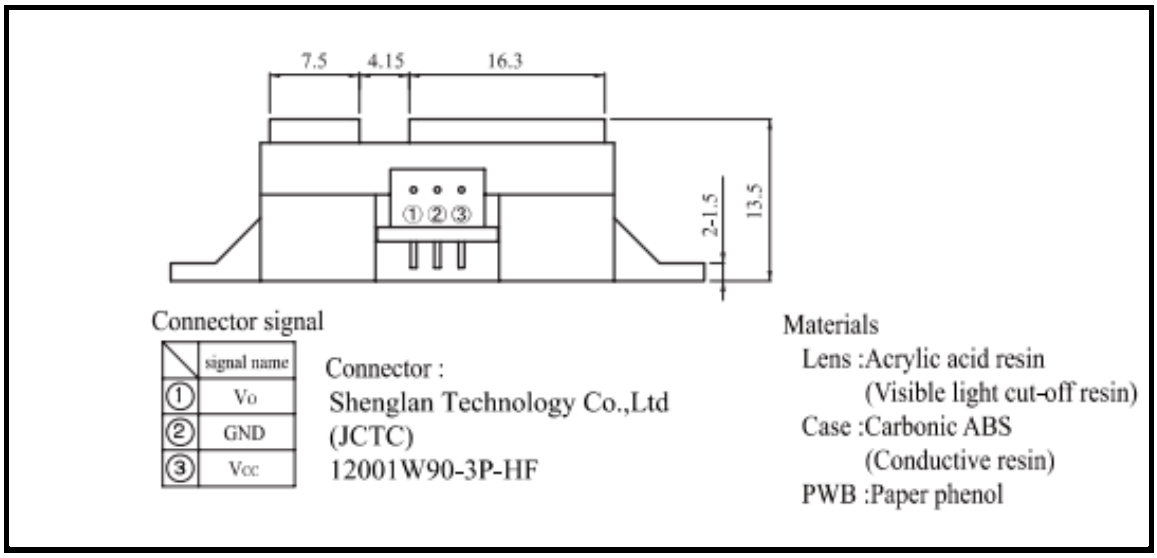
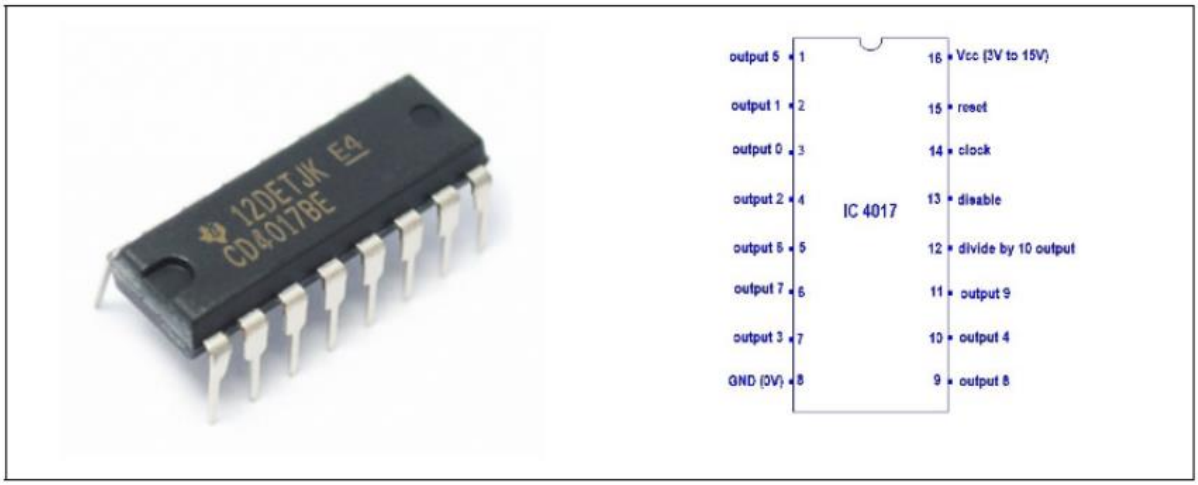



Fig: Data sheet with pin diagram of Sharp GP2Y0A21YK0F

### ii. 4017 Decade counter IC:



## Pin Overview

| Pin # | Name | Note |
|---|---|---|
| 1 | Q5 | DECODED OUTPUT - 5 |
| 2 | Q1 | DECODED OUTPUT - 1 |
| 3 | Q0 | DECODED OUTPUT - 0 |
| 4 | Q2 | DECODED OUTPUT - 2 |
| 5 | Q6 | DECODED OUTPUT - 6 |
| 6 | Q7 | DECODED OUTPUT - 7 |
| 7 | Q3 | DECODED OUTPUT - 3 |
| 8 | GND | Ground |
| 9 | Q8 | DECODED OUTPUT - 8 |
| 10 | Q4 | DECODED OUTPUT - 4 |
| 11 | Q9 | DECODED OUTPUT - 9 |
| 12 | **CO** | Carry Out |
| 13 | **EN** | Clock Inhibit/Enable |
| 14 | CLK | Clock (Input) |
| 15 | MR | Reset |
| 16 | VDD | Supply Voltage(+3 to +15V) |

## Real-life Applications:

One possible real-life application for this counter-circuit is in a people counting system. The GP2Y0A02YK0F sensor can detect when a person passes by, and the counter circuit can track how many people have entered or exited a room or building. This type of system could help track attendance at events, monitor the flow of traffic in public spaces, or manage capacity in a room with specific limits.

Another possible application could be in a production line where the counter circuit could keep track of the number of items produced. By measuring the distance between products on a conveyor belt using the infrared sensor, the counter circuit can accurately count the number of items that pass by and provide valuable information about production efficiency.

Overall, the application of this counter circuit depends on the system's specific requirements, but some potential applications include people counting, production line monitoring, and traffic flow analysis.

## Troubleshooting

There is initially some floating voltage in pin 6 of uA741 after biasing. But there should not be any voltage when the comparator circuit is in no detection mode. Because the counter IC gets turned on for the floating voltage and the first LED lit up instantly. So, we tried some different approaches to get rid of the voltage.

- Troubleshoot 1: Op-amp offset nullification. We added a pot between 1 and 5 pins and tried to nullify the floating voltage by varying the POT. But it didn't work.

- Troubleshoot 2: We added a pull-down resistance between pin 6 of the OP-AMP and ground so that the floating voltage gets supplied to the ground when there is no output. It didn't work either.

- Troubleshoot 3: The final approach we tried was to adjust the POT attached to pin 2 of the op-amp so that floating voltage gets minimized and cannot turn on the CD4017 counter IC. But it leaves some drawbacks for the circuit like its operating range.