Ahsanullah University of Science and Technology

Department of Electrical and Electronic Engineering

2nd Year 2nd Semester

Project Report

Course No **:** EEE-2212
Course Title **:** Measurement and Instrumentation Laboratory.

Project Name **: Analog RPM Counter [Tachometer].**

Date of Submission **: 07.09.2022**

Submitted By,

Name	**ID**
Md. Mamunar Rahoman	20200105196

Submitted To,

Aminur Rahman
Department of Electrical and Electronic Engineering
Ahsanullah University of Science and Technology

Objective **:** The objective of this project is to determine the approximate RPM[Revolutions Per Minute] of a perioding object.

Equipment List **:** There are 4 parts of this project :-

1. IP Sensor Module.
2. Frequency to voltage Converter.
3. Voltage Amplifier.
4. Voltage Level Indicator.

Equipment for IR sensor Module-

Component	Specification	Quantity
IR Transmitter		1
IR Receiver		1
Ceramic Capacitor	104	2
Resistor	0.5k	1
POT	100k	1
IC	LM358	1
LED	Green	1

Equipment for Frequency to Voltage Converter-

Component	Specification	Quantity
Resistor	5k,10k,68k,100k	1,3,1,1
Capacitor	474,104,10uF	1,1,1
IC	LM331	1
Digital Voltmeter		1

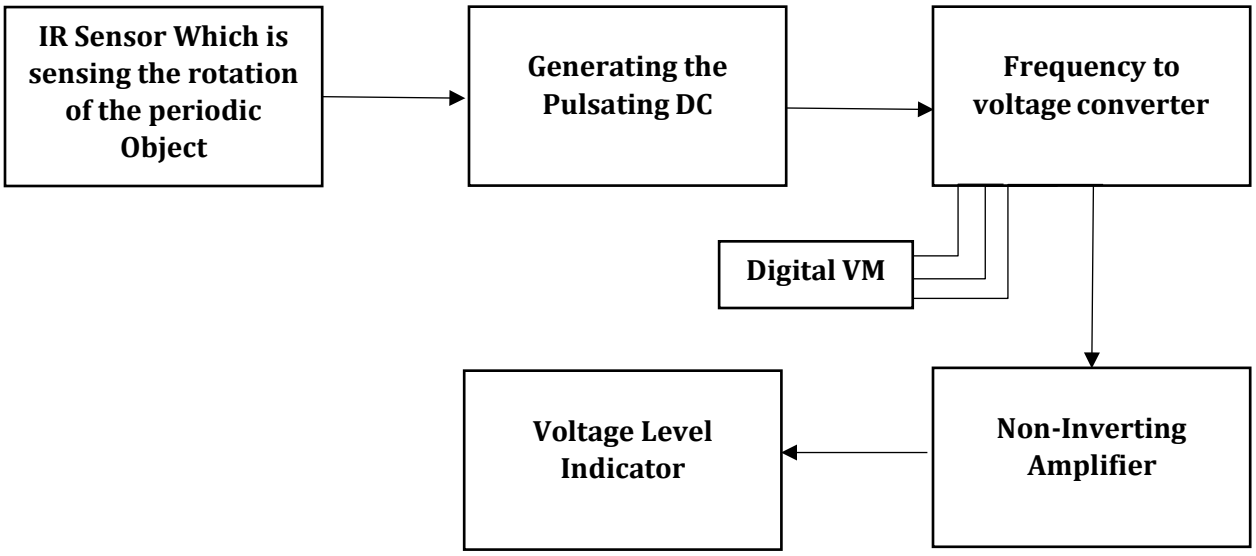
Equipment for Voltage Amplifier-

Component	Specification	Quantity
Resistor	1K,10k	1,1
IC	UA741	1
POT	20k	1

Equipment foe Voltage Level Indicator-

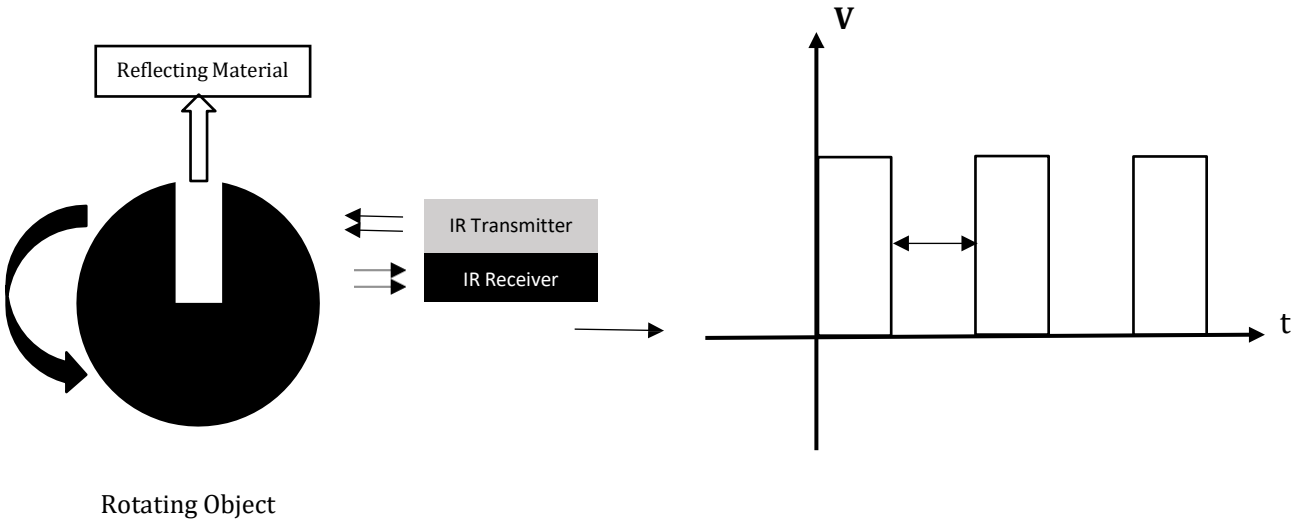
Component	Specification	Quantity
Resistor	5k,20k	1,1
POT	10k	1
IC	LM3914	1

Flow Chat of the RPM Counter Circuit :

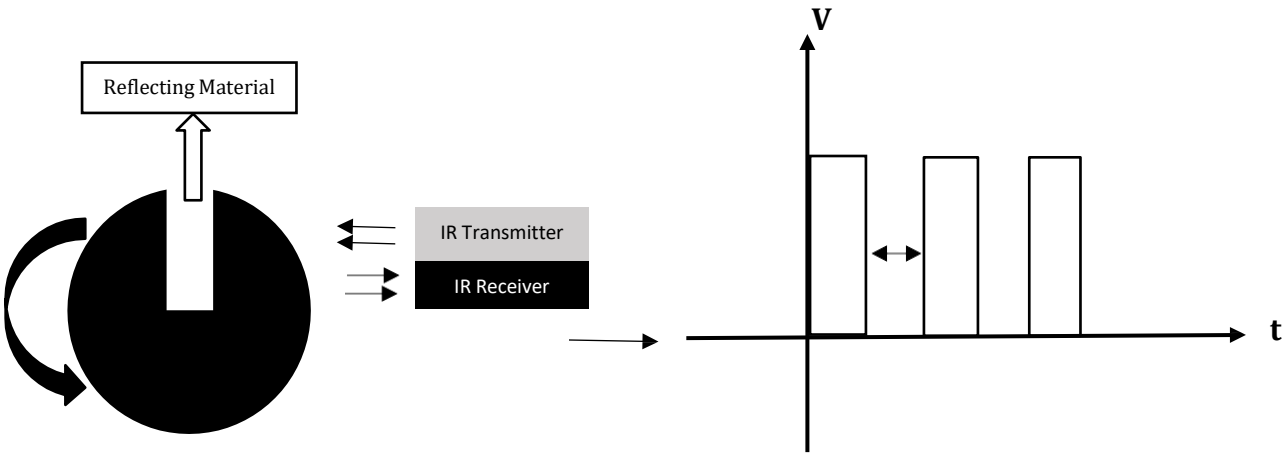


Schematic diagram of Analog RPM counter

Working Principle :



Frequency Generation for N1 RPM



Frequency Generation for N2 RPM

Here, N2>N1

IR Module :

Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. In our project the IR module is working as a pulsating DC creator.

Frequency to Voltage Converter:

Consider the circuit diagram, Here, the voltage at the output is proportional to the frequency at the input. KA331 is 8 pins IC. The source connects to pin 8 and supplies 9V. Pins 3 and 4 links to the ground. Pin 6 provides the input frequency and Pin 1 provides the output voltage. The input frequency differentiates by R7 and C3 and its resultant pulse goes to pin 6. The timer circuit triggers the built-in comparator circuit in the IC on the negative edge of the pulse.

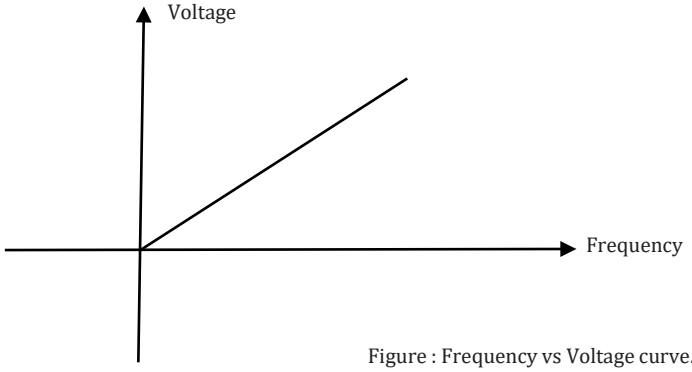


Figure : Frequency vs Voltage curve.

Voltage Amplifier :

Though the output voltage from the frequency to voltage converter is too small then the voltage is too small to indicate the level of voltage as output observation. So we need to amplify the output voltage so that we can use this voltage as output result. We used Non-inverting amplifier here.

Voltage Level Indicator :

The voltage level indicator circuit given here uses a comparator circuit to compare the input values to check whether the input is above or below the reference value. A **comparator** is a device that compares two inputs and produces an output that indicates which input is larger. The two inputs of the comparator are inverting (–) and non-inverting (+) inputs. The output of the comparator will be in a high state or positive saturation when the input voltage at the non-inverting terminal is larger than the voltage at the inverting terminal. And the output switches to a low state or negative saturation when the input voltage at the inverting terminal is larger than the non-inverting terminal. It simply checks the voltage between two inputs and gives an output either high or low irrespective of the magnitude of difference between them.

Discussion :

In this project our goal was to predict the approximate RPM of a periodic object which is partially satisfied in our project. Here the frequency to voltage converter is almost linear with the rotation of the periodic object so we can say that our project RPM Detector or Analog Tachometer is working properly but we can not measure the accurate RPM of the periodic object but we co-relate the RPM. Though our Project can determine the change of rotation with giving the changing voltage in output then we can predict the close to exact RPM with a Multiplication factor. Finally we can say that the project is working as our goal.