

STUDY OF SPEED MEASUREMENT TRAINER **(USING PHOTO ELECTRIC PICK – UP) (OPTO COUPLER),**

MODEL – SM – 11.

INTRODUCTION :

This trainer kit is specifically designed for speed measurement using Photo Electric pick – up.

This trainer kit consists of :

- (i) Photo Electric pick – up (Opto Coupler) fitted on a P.C.B. near to the slotted disc attached to the Motor.
- (ii) A D.C. Motor Fitted with slotted disc of 15 teeth to interrupt the light falling on the photo sensor.
- (iii) A D.C. power supply having :
 - (a) Variable power supply to change the speed of the motor.
 - (b) 5, Volt D.C. supply for photo sensor.
- (iv) 4 digit counter display to measure the R.P.M. of the Motor.
- (v) Electronic circuit with 1 Hz clock, wave shaper, a multiplier and necessary counter circuit.
- (vi) An analog output is also provided to measure the R.P.M. with a Multimeter.

POWER SUPPLY :

The kit is operated on 230 Volt, $\pm 10\%$, 50 Hz mains power supply.

Three terminals are provided to measure the wave shapes of the circuit at 1 Hz clock pulse, opto coupler output and multiplier output.

THEORY :

A slotted disk of 15 teeth is attached with the motor to generate 15 pulses for every revolution of the motor shaft, through an optical interruption.

These pulses after proper wave shaping are fed to a multiplier four ($15 \times 4 = 60$ pulses per revolution) to get 60 pulses per revolution.

These 60 pulses are then fed to a 4 digit (9999 counts) frequency counter to display the R.P.M. of the motor.

An analog output of 1 Volt corresponding to 1000 R.P.M. is provided through F to V circuit.

OBJECT :

To study the performance of a photo electric pick – up as a speed measurement device.

OTHER APPARATUS REQUIRED :

1. Dual Trace, Oscilloscope.
2. Digital Multimeter.

OPERATION :

1. Connect photo – electric sensor wire to the kit terminals :
Yellow Lead with yellow terminal. (+ 5 Volt)
Blue Lead with blue terminal. (Output)
Green lead with green terminal. (Ground)
2. Motor wire to the power supply terminals
Red wire with the red lead.
Green wire with green lead.
3. Connect the 3 pin mains plug of the kit to the mains socket (230 Volt, $\pm 10\%$, 50 Hz power supply).
4. Switch ON the kit, the display will show 0000 R.P.M.
5. Rotate the power supply knob clock wise to measure the speed of the motor.
6. Connect dual trace Oscilloscope at wave shaper output and multiplier output.
7. Note down the reading of the counter display, frequency of wave shaper output and multiplier output as shown in given table – I and compare the results.
8. Simultaneous are can measure the analog output with a multimeter.

TABLE – I

Sl. No.	Frequency wave Shaper output	Frequency of Multiplier Output.	Counter Reading.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			