

STUDY OF SPEED MEASUREMENT TRAINER
(USING ELECTRO MAGNETIC TRANSDUCER),
MODEL – SM – 11 A.

OBJECT :

To study the performance of a Electromagnetic Pickup as a Speed Measurement Device.

EQUIPMENT DESCRIPTION :

This Trainer Kit is designed for the students of Instrumentation course. It allows the students to understand the concept of Electromagnetic pickup (Proximity switch) with its application as speed measuring transducer.

This trainer kit consist of :

- (i) Electromagnetic pickup fitted near to the slotted disc attached to the motor.
- (ii) A D.C motor fitted with slotted disc having 15 slots to sense the magnetic portion passing through the switch.
- (iii) A D.C variable power supply to change the speed of the motor, and a 12 Volt fixed for Electromagnetic pickup.
- (iv) A 4-digit counter circuit to display to measured RPM and no. of pulses to measure the speed.
- (v) Electronic circuit with 1-Hz. Clock, wave shaper (converter), a multiplier and pulse counter.
- (vi) A reset switch is provided to reset the display, whenever, required.
- (vii) A push to on switch is provide to count the pulses
- (viii) A push to on switch is provided to count the pulses

The kit has number of IC regulated supplies which are permanently connected to all circuits.

No external D.C. supply should be connected to the unit.

Power Supply : 230V \pm 10%, 50 Hz Mains supply is required to operate the kit.

A toggle switch is provided to select the speed or rpm measurement.

Three terminals are provided to see the 1 – Hz. Clock pulse, wave shaper and multiplier output.

THEORY :

A disc having 15 slots in a revolution is attached with a small d.c. motor to generate 15 pulses for every revolution of the motor through an Electromagnetic pickup (Proximity switch).

These pulses after proper wave shaping is fed to a multiplier of 4 to get 60 pulses (15 x 4 = 60) in a revolution of the motor. These 60 pulse/rev. is fed to a 4-digit (9999 counts) digital frequency counter to display the RPM of the motor.

A pulse counter is, also, provided to measure the speed of the disc.

The Diameter of the disc is	=	85 mm
The C. F. of the disc will be	=	πD
	=	$85 \times \pi$
	=	267.14 mm
The number of holes in one revolution	=	15
i.e. in 15 counts the travel of disc	=	267.14 mm
Hence, in 1 count the travel of the disc	=	17.8 mm

$$\text{Therefore, Speed} = \frac{\text{Total nos. of counts}}{\text{Time taken in seconds}} \times 17.8 \text{ mm/sec.} \quad (1)$$

OPERATION :

1. Connect the Electromagnetic pickup (proximity switch) pickup and motor leads with the trainer kit terminals,

Red lead with red terminal
Black lead with black terminal
Blue lead with black terminal
Green lead with green terminal
Yellow lead with yellow terminal
2. Connect the 3 pin mains plug of the kit to the mains socket (230V \pm 10%, 50 Hz Power Supply).
3. Keep counter switch at RPM position.
4. Keep Power supply knob at minimum position.
5. Switch on the trainer kit, the display will light up, and will show 0000 reading.
6. Move the power supply knob clockwise to increase the speed of the motor.
7. Connect a dual trace CRO at wave shaper and multiplier outputs.

8. Note down the reading of counter display frequency of wave shaper and multiplier output as shown in the table and compare the results.

Table – 1

S. No.	Motor Voltage (in volts)	Wave Shaper Output (in Hz.)	Multiplier Output (in Hz.)	Display (in rpm)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Speed Measurement :

9. Keep counter switch at Speed position.
10. Press reset switch to reset display at 0000.
11. Now, Press push to count switch for some seconds (time can be measured with the help of a stop watch) and used eq. (1) to measure the speed at a particular R.P.M.

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Speed – 695
Second – 10 sec

$695/10 \times 17.8$
1.237 mm/sec
SM = 11A

RPM = 261
Speed = 695
Time = 10 sec

Volt = 2.90V.

Speed = Total no of count/Time in Second X 17.8mm/Sec

= 1.237 mm/sec.