

Department of Electrical Engineering

Instrumentation Lab

EE- 702

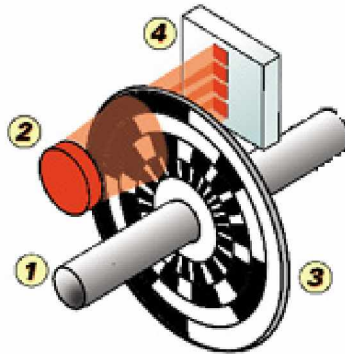
Experiment No.-2: Instrumentation of Speed.

Objective: Study of optical encoder based speed instrumentation trainer.
Obtain the operational and calibration characteristics.

Equipment / Apparatus required: Speed measurement tutor, CRO, digital tachometer.

Theory:

Speed of a rotating shaft can be sensed by a non contact method with the help of an optical encoder system. A circular disc is mounted on the shaft of motor. The disc has a large number of segments which are alternately transparent and opaque.



(1.Shaft 2.Ligth source 3.Disc 4.Photo sensor)

Figure 1: Configuration of optical encoder .

When the disc is rotated, the light from a source falling on it, is alternately allowed to pass or stopped. An optical sensor produces a pulsed signal at a frequency depending on the speed of rotating disc. The frequency of pulse signal obtained, can be calibrated to read the speed directly.

Alternately it can be converted into a voltage signal and calibrated for speed both rotational and linear (mm/sec)

Specifications :

Range	: 3000 mm/sec
Power source	: 230V, 50 Hz
Display	: 16 X 2 LCD

Diagram:

Identify the various stages of functional block diagram (figure2) from input to output from the panel diagram and circuit diagram attached (figure 3) and report .

Procedure:

1. Connect speed sensor unit by a 9 pin connector.
2. Switch on the unit, check : yellow LED
3. Rotate control knob fully (anticlockwise) so that display on LCD is zero RPM.
4. Observe the waveform of analog output on CRO and measure with multi meter. Use tachometer to measure speed.
5. Rotate the control knob to change speed in steps of 200 RPM (with help of tachometer). Observe the amplitude and frequency with CRO.
6. Record display of speed in RPM & mm / sec, analog output volts and frequency with multi-meter.

Observations :

S.No	Tachometer reading (RPM)	Display reading		Analog Voltage(V)	Frequency (Hz)
		(mm/sec)	RPM		
1		Zero speed	0.0	0.0	0.0
2		200			
3		400			
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16		3000			

Results:

Plot the graphs: Speed vs. Frequency,
Tachometer reading vs. Display (RPM)

Discussion:

1. Is there some correlation between displays of angular velocity(RPM) and linear velocity (mm/sec) ?
2. What could be advantage in industrial applications? Explain.
3. What could be the possible role of microcontroller in this set up?

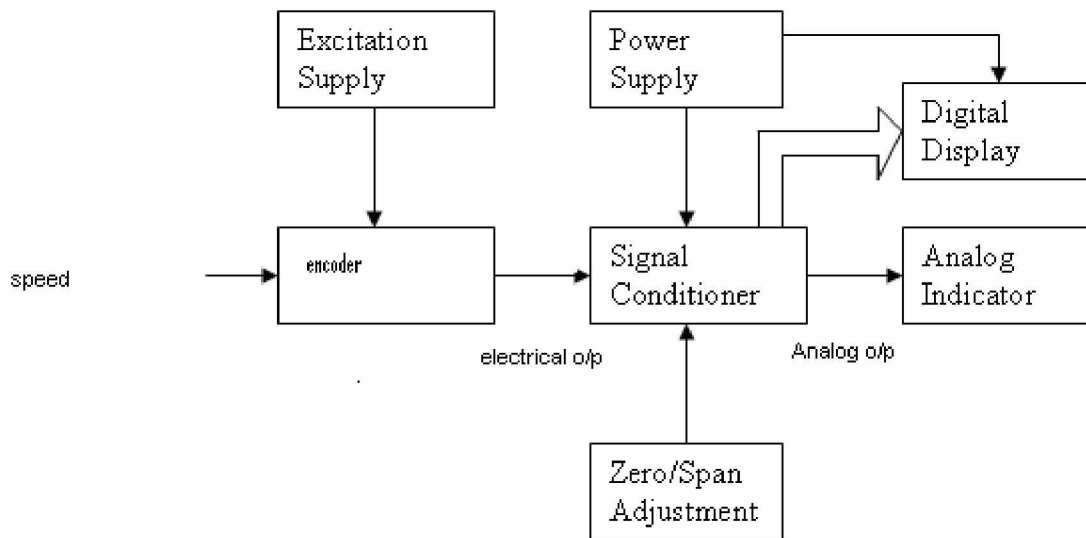


Figure 2: functional block diagram of Speed Measurement