

Experiment No. 03**Speed control of a DC. shunt motor**

OBJECTIVE: To study the speed control of a DC. shunt motor using

- (a) Field current control
- (b) Armature voltage control.

APPARATUS REQUIRED:

S.N.	Apparatus	Specification	Quantity
1	D.C. shunt motor	1.5 KW, 1500 RPM	1
2	Voltmeter	300 Volt	1
3	Ammeter	10 Amp	1
4	Rheostat	20 Ohm 10 amp and 300 Ohm 2 Amp	Each 1

Theory: The equation governing the speed of a DC shunt motor is

$$N = \frac{V - I_a R_a}{k\Phi}$$

Where

N = Speed of the machine

V = Armature voltage

I_a = Current through armature

R_a = Armature resistance

Φ = Field flux

k = constant

Out of the four parameters on the R.H.S. of the above equation R_a is constant. We can control the speed of the motor in two ways. First, by changing the field flux Φ and second, by changing the armature voltage. First of these alternatives is accomplished by introducing a rheostat in the field circuit of the machine. By varying the rheostat, we can get different values of field current or field flux Φ, and therefore, the different speeds of the motor. Similarly, the second alternative can be accomplished by introducing a rheostat in the armature circuit. This rheostat helps in changing the voltage across the armature of the machine. This gives us different speeds.

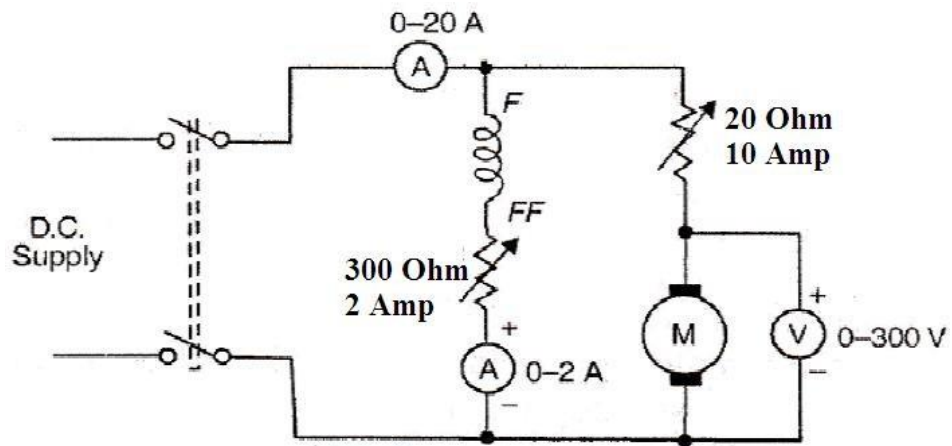


Fig. 1 Circuit for Study of Speed Control of D.C. Shunt Motor

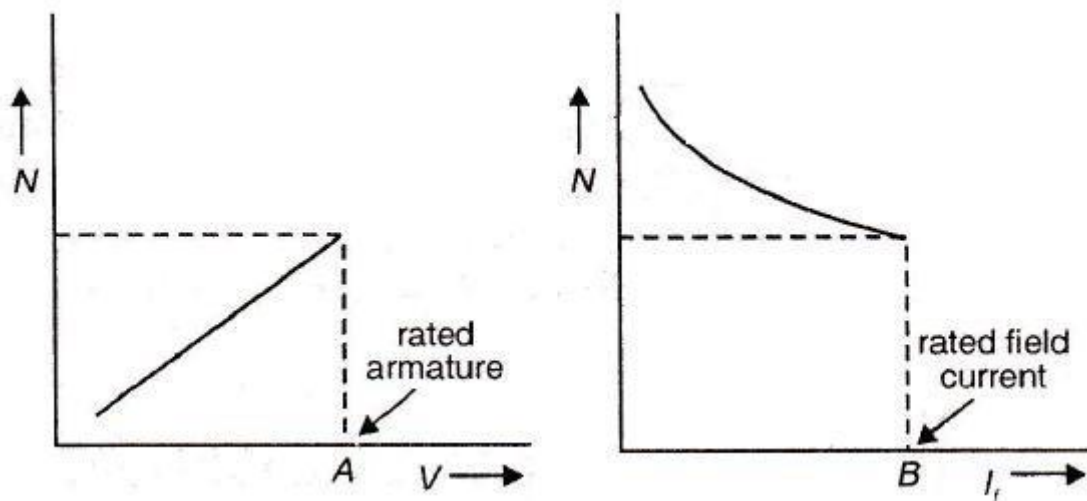


Fig. 2 Speed Control of D.C. Shunt Motor
(A) Armature Control Method and (B) Field Control Method.

PROCEDURE: The experiment to study the speed control of d.c. shunt motor should be conducted by adopting the following steps:

1. Connect the circuit as shown in Fig. 1.
2. Keep the armature rheostat to its maximum value and the field rheostat to its minimum value.
3. Switch-ON supply. The motor will start, and it will run at a slow speed.
4. Note down the speed, field current and armature voltage.
5. For various positions of armature rheostat repeat the step no. 4, till the armature rheostat reaches its minimum value. The field current should remain constant.
6. This completes the speed control by armature control. Draw a graph N vs. V .

7. Next, keep the armature rheostat at its minimum value. Increase the field rheostat in steps and note down the readings as mentioned in step 4, till field rheostat is at its maximum value.

8. This completes the speed control by field control. Draw a graph N vs I_f .

9. Bring the armature rheostat to its maximum value and switch-OFF the d.c. supply.

OBSERVATIONS: The observations should be recorded as per Table 1. given below:

Table (1) Observations for speed control of DC shunt motor

S. No.	Flux Control method		Armature Control Method	
	N (r.p.m.)	I_f (A)	N (r.p.m.)	V (Volts)
1.				
2.				
3.				
4.				
5.				

RESULTS: The graph for speed control of the DC shunt motor by armature control method is as shown in Fig. 2 (a). The graph for speed control of the DC shunt motor by the field control method is as shown in Fig. 2 (b).

PRECAUTIONS: Following precautions should be observed while performing this experiment:

1. All the connections should be tight and clean.
2. When starting the motor, the field rheostat should be at minimum position and the armature rheostat should be at maximum position.
3. Before switching-off the supply, the armature rheostat should be moved to its maximum position.
4. The range of instruments should be carefully selected.
5. The zero settings of the instruments should be checked in the beginning.

CALCULATIONS & RESULTS: