KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE-462 ELECTRICAL MACHINES

Term: 012

Experiment # 10
SPLIT PHASE MOTOR-STARTING, LOAD, AND TORQUE CHARACTERISTICS

OBJECTIVE

- To determine the starting torque and starting current of a split-phase motor.
- To study the load characteristics of the split-phase motor.
- To study the torque-load characteristics of the motor.

APPARATUS REQUIRED

1	SPM-100 Split Phase Motor
1	PB-l00 Prony Brake
1	0 to 150 Volt AC Voltmeter
3	0 to l0 Amp AC Ammeters
1	0 to 140 Volt AC Power Supply
2	0 to 750 Watt AC Wattmeters (115 V-10 A)
1	115 Volt DC Power Supply
I	DCG-l00 DC Generator
1	HT-100 Tachometer
1	RL-100 Resistance Load
1	0 to *2.5* Amp DC Ammeter
1	0 to 150 Volt DC Voltmeter

PROCEDURE

1. Couple the Split-Phase Motor to the Prony Brake and make the connections shown in figure 1. Adjust the belt of the brake tight against the pulley so that the motor will not rotate when switched on. Adjust the AC supply voltage to 30 Volts.
2. Let the instructor check your connections and brake hookup.
3. Measure the reduced voltage starting torque and currents respectively on the brake and ammeters by switching the motor on momentarily. The motor should not be left on more than 3 seconds. Allow approximately two minutes between starting tests. If the motor rotates, the brake's belt should be tightened further. Maintain the AC supply voltage at 30 volts. Record all data in table 1.
4. Assuming that the starting current is directly proportional to the applied voltage, predict the starting current at full line voltage.
5. Assuming that the starting torque varies directly with the square of the applied voltage (i.e., $T = KV^2$), predict the starting torque at full line voltage.
6. Couple the Split-Phase Motor to the Prony Brake and make the connections as shown in figure 2. Adjust the variable AC supply to 60 volts. Adjust the Pronv Brake belt so that it is slack.

7. Let the instructor check your machine and motor connections.
8. Start the motor and adjust the AC supply to maintain 60 volt. AC.
9. Perform a load test on the motor from no load to approximately 250 in-ozs load. Record in table 2 the motor's current, voltage, wattage, and speed for each value of load torque.
10. Calculate the output horse power using the following formula: $HP = \frac{9.93\, T_{(in\ oz)} N_{in\ RPM}}{10^7}$.
11. Couple the Split-Phase Motor to the DC Generator and make the connections as shown in figure 3. Adjust the Generator's rheostat to its maximum resistance, fully CW position. Adjust the variable AC supply to 60 volts.
12. Let the instructor check your machine and meter connections.
13. Start the motor and adjust the output of the DC generator to 125 volts DC by means of its field rheostat.
14. Perform a load test on the motor from no load to approximately 2 Amps load on the generator. As each load step is applied, it will be necessary to: (i) adjust the AC supply to maintain a 60 volt input, (ii) adjust the generator's rheostat to maintain a 125 volt DC output.

Record in table 3 the motor's Volts, Amps, Watts, and speed and the generator's Armature volts and amps.

15. Calculate the motor's Voltampere input and power factor for each load step. Enter the data in table 3.
16. Calculate the generator's output wattage for each load step. Enter the data in table 3.

SUGGESTIONS FOR CONCLUSION

1. On the basis of the motor's 1/3 HP rating, calculate its full-load torque rating. At what percentage are the starting torque and current you calculated from the full-load rated values? Draw a phasor diagram showing the line volts and amps, the starting winding amps, and the running winding amps.

2. Plot the motor's Watts, speed, and output horse power as ordinates versus the output torque as abscissa. Compare your curves to those that would be expected considering the theory involved. Explain any sources of error.

3. Plot the motor's Amps, Watts, Power factor, and speed versus the output power as abscissa. Compare your curves to those that would be expected considering the theory involved. Explain any sources of error.

QUESTIONS

1. How is it possible to control the speed of a Split phase Motor?
2. Why is it desirable to disconnect the auxiliary winding in a split-phase motor after the rotor reaches about 75% of rated speed?

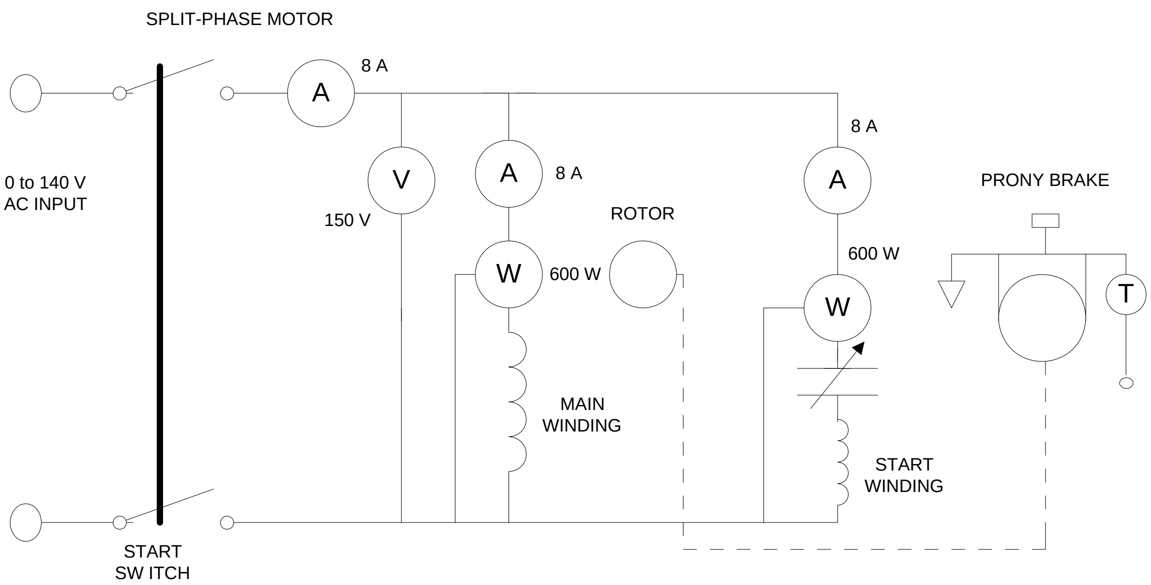

Figure 1. SPLIT-PHASE Motor coupled with prony brake

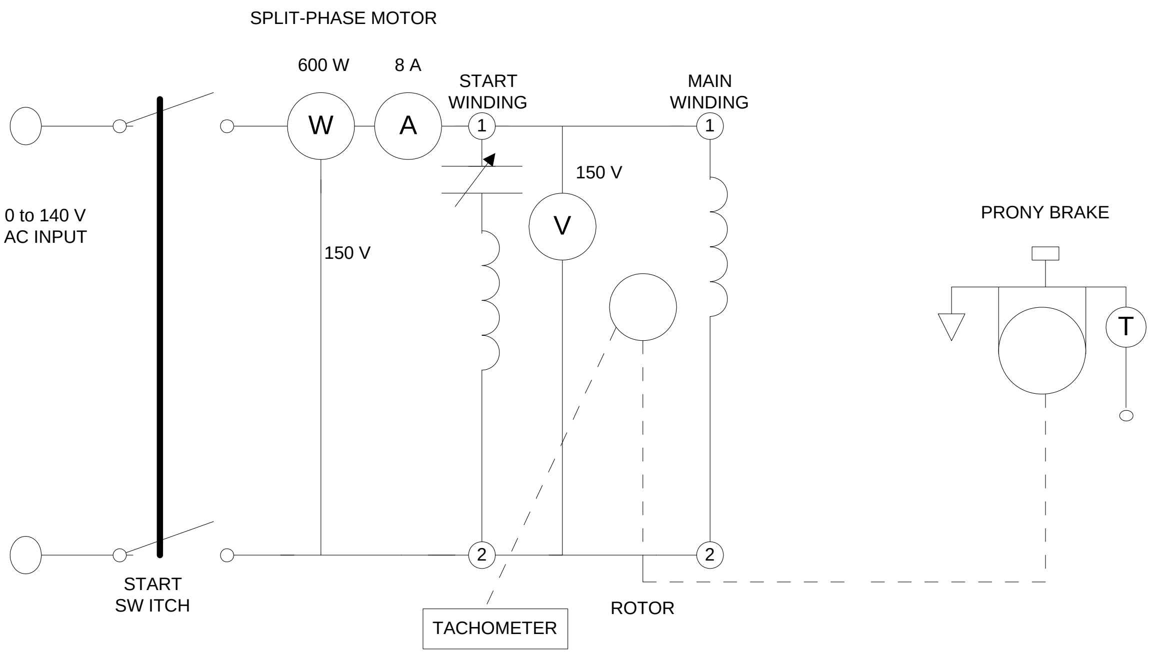

Figure 2

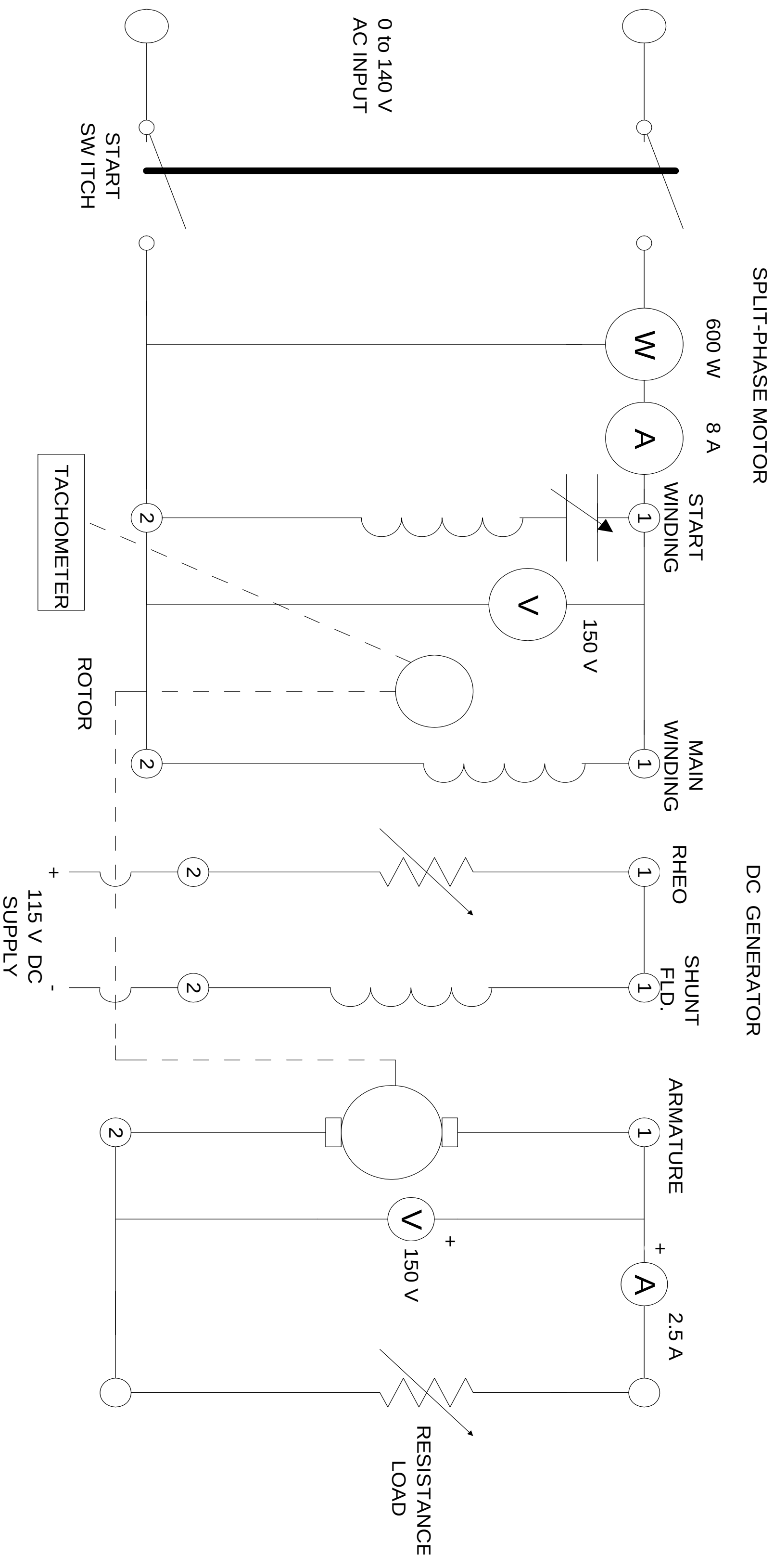

Figure 3. Split-phase motor coupled with DC generator