EET2233 - LABORATORY

Experiment #9

DC MOTORS

The purpose of this experiment is:

To examine the behavior of DC Shunt and Compound Motors under load.

PROCEDURE:

1. A DC generator is used to provide a dynamic, variable load on the shaft of the DC motor in the dynamometer cradle. Connect the DC-generator as shown in figure 1.

2. Connect the DC-Shunt motor as shown in figure 2. Start the motor with the motor field rheostat all the way to the left. Adjust the motor field rheostat to give 1800 RPM with the generator unloaded. At the same time, adjust the generator field supply to obtain a terminal voltage of 120 volts at no load. Take measurements of motor speed (in RPM), motor terminal voltage, motor line current and the dynamometer scale reading (in lbs) and record in the data sheet as the generator load is varied. (**Note:** The best curve will be constructed if you take a measurement after adding only a single load at a time.) Do not exceed 27 Amps of motor current. Remove the load from the generator and shut off the motor.

3. Connect the DC-compound motor as shown in figure 3. Take measurements of motor speed (in RPM), motor terminal voltage, motor line current and the dynamometer scale reading (in lbs) and record in the data sheet as the generator load is varied. Again, do not exceed 27 Amps of motor current. Remove the load from the generator and shut off the motor.

CALCULATIONS & PLOTS:

1. Plot the speed vs motor current curves for both the Shunt and Compound Motors on the same graph and label them. (Motor current on the X-axis)

2. Plot the torque vs motor current curves for both the Shunt and Compound Motors on the same graph and label them. (Motor current on the X-axis)

3. Calculate and plot the efficiency of both motors vs the load current on the same graph. (Motor current on the X-axis) Attach one sample set of calculations to the final report.

4. Briefly explain the differences between the speed vs motor current curves and the torque vs motor current curves for DC-Shunt and Compound motors.

5. Also, explain how would you reverse the direction of rotation of the Shunt Motor.

Torque = dynamometer scale reading x length of radius arm
(units are in lb-ft as the length of the radius arm of the dynomometer is 1 foot)

$$\text{Percent Efficiency} = \frac{HP \times 746 \times 100\%}{P_{in}} \qquad HP = \frac{2\pi \times RPM \times T}{33{,}000} \qquad P_{in} = I_L \times V_L$$

DATA SHEET

EET2233 - EXPERIMENT #9

DC - MOTORS

Lab Section _____ Name _____

Date _____ Lab Partners _____

Bench # _____ _____

Name plate data:

a) DC motor (dynamometer):

b) DC generator:

1. DC Shunt Motor:

SPEED (RPM)	V_t (Volts)	I_L (Amps)	Scale Reading (lbs)

2. DC Compound Motor:

SPEED (RPM)	V_t (Volts)	I_L (Amps)	Scale Reading (lbs)

1. DC-Shunt Motor

Speed (Rpm)	Torque lb-ft	HP	I_L (A)	V_t (V)	P_{in} (W)	% Eff. η

2. DC-Compound Motor

Speed (Rpm)	Torque lb-ft	HP	I_L (A)	V_t (V)	P_{in} (W)	% Eff. η

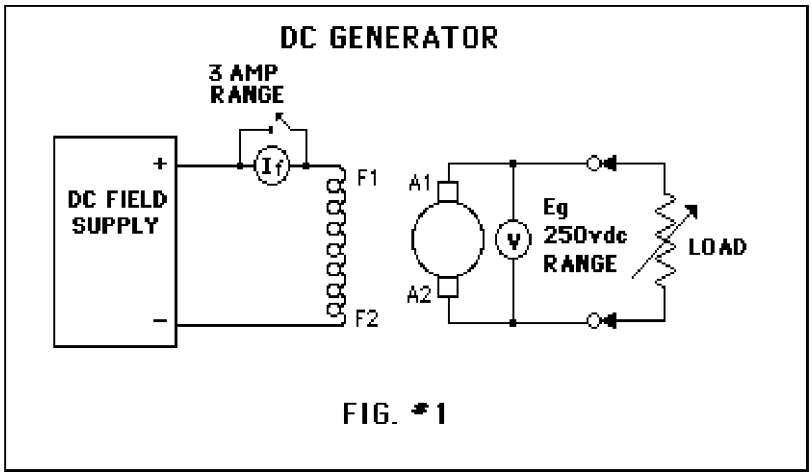


FIG. #1

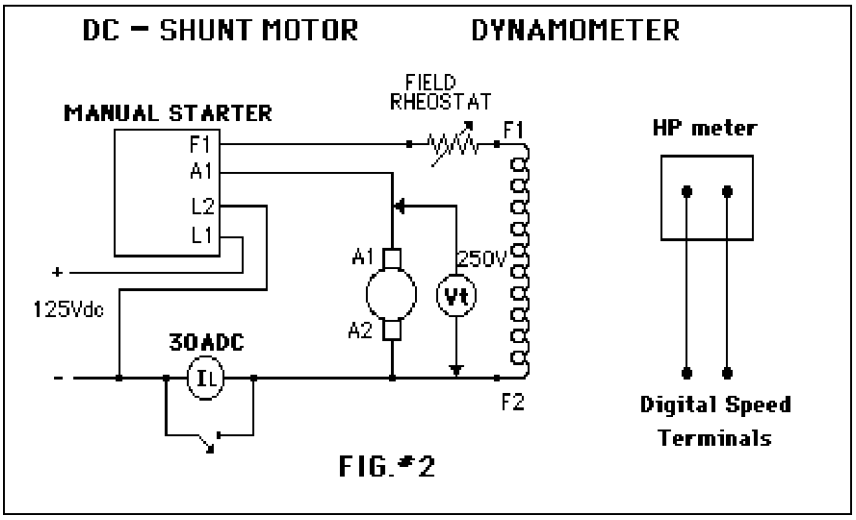


FIG.#2

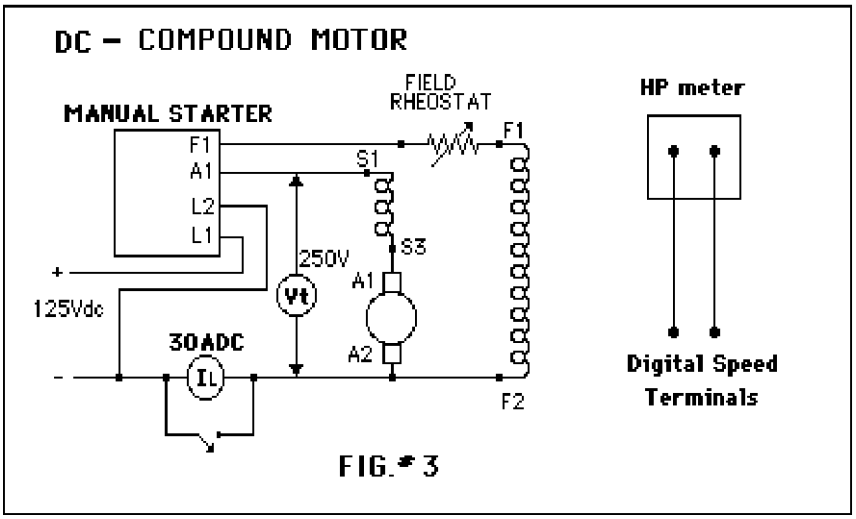
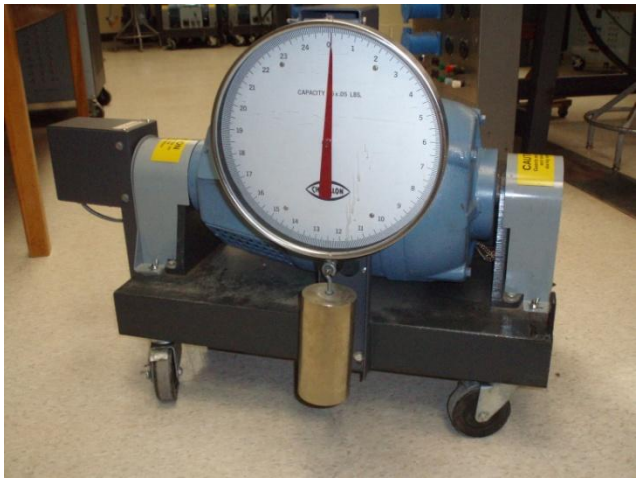
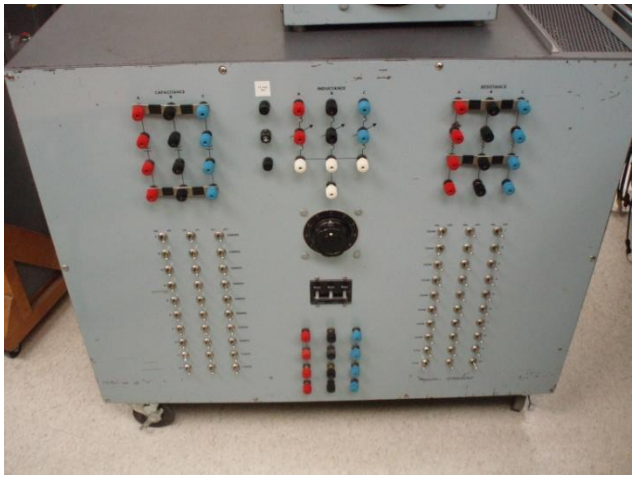
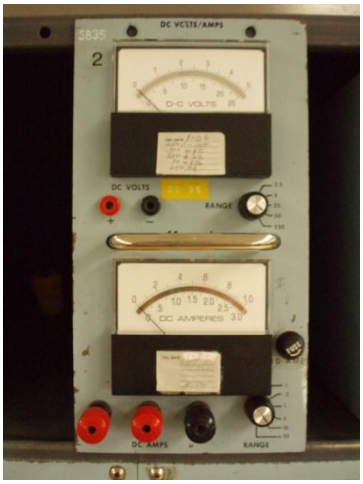


FIG.# 3


SAMPLE RATE
RESET
000,000
K
Hz
C
HOLD
5300A MEASURING SYSTEM
HEWLETT · PACKARD
SENSITIVITY
TIME BASE
FUNCTION
SENSITIVITY
FREQ
A
B
AUTO
A 50 MHz
B 10 MHz
PER AVG B
CHECK
5302A 50 MHz UNIVERSAL COUNTER
OPEN/CLOSE
SUPPLY

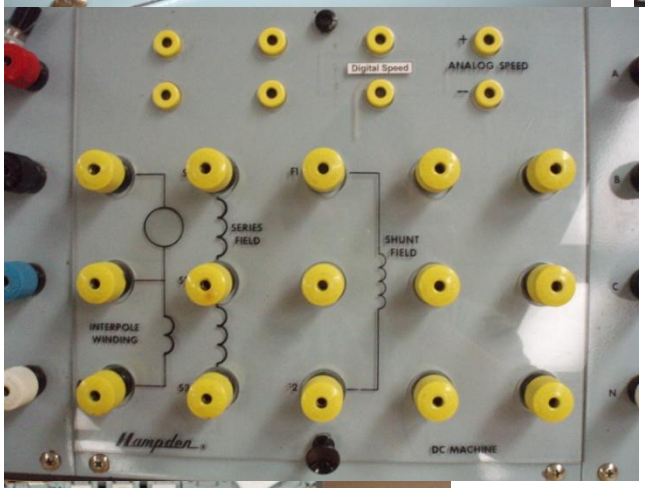


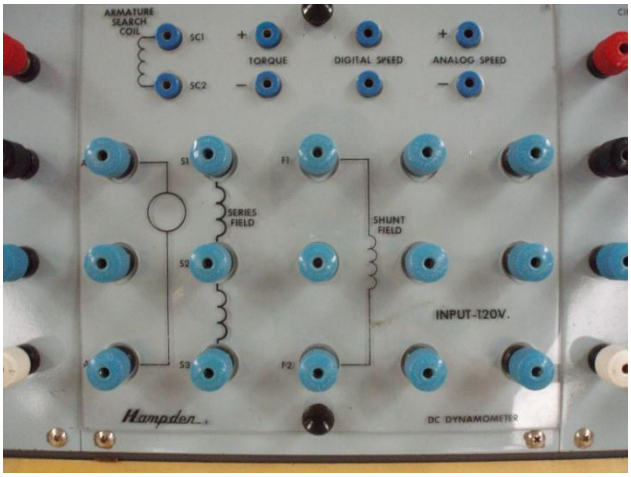


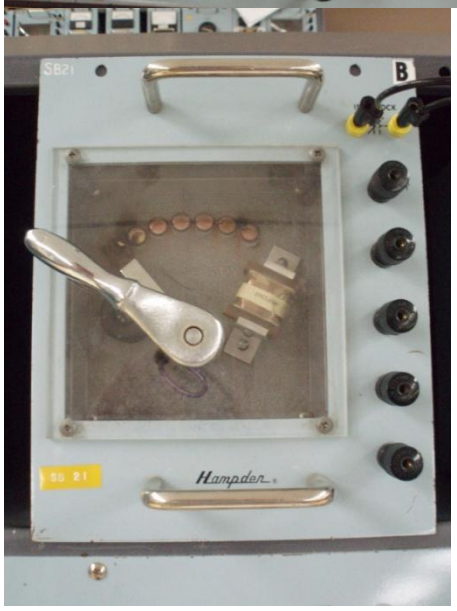

DC VOLTS/AMPS
D-C VOLTS
DC VOLTS
RANGE
DC AMPERES
DC AMPS
RANGE


RANGE
FUNCTION
Simpson
DIGITAL MULTIMETER
model 460 SERIES 3
10A
mA
COMMON
POWER
WOUND ROTOR CONTROL


5
SB35
250 OHM MAX
INCREASE
OHMITE
2 AMP
Hampden


Digital Speed
ANALOG SPEED
SERIES
FIELD
SHUNT
FIELD
INTERPOLE
WINDING
Hampden
DC MACHINE


ARMATURE
SEARCH
COIL
SC1
SC2
TORQUE
DIGITAL SPEED
ANALOG SPEED
SERIES
FIELD
SHUNT
FIELD
INPUT-120V.
Hampden
DC DYNAMOMETER


SB21
B
Hampden


1
SB35
VOLTAGE CONTROL
INCREASE
POLARITY
ON
0-175V.DC-2A MAX.
RESET
Hampden