

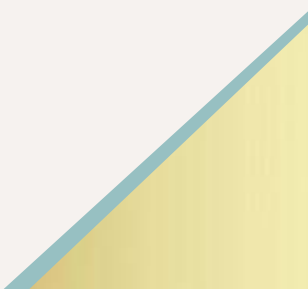


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Power Lab Motor Design and Experiment



# Mission

- Design a variable frequency power generation system that can provide power for various experiments within the lab
  - To come up with several experiments
  - For example: comparing the performance of the synchronous machine with the doubly fed induction machine
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# Plan of Completion

- Understand the project
- Get Familiar with the machines
- Doing the experiments
- Meets the specification >>>>>>> Writing the reports

# Measurement Requirements

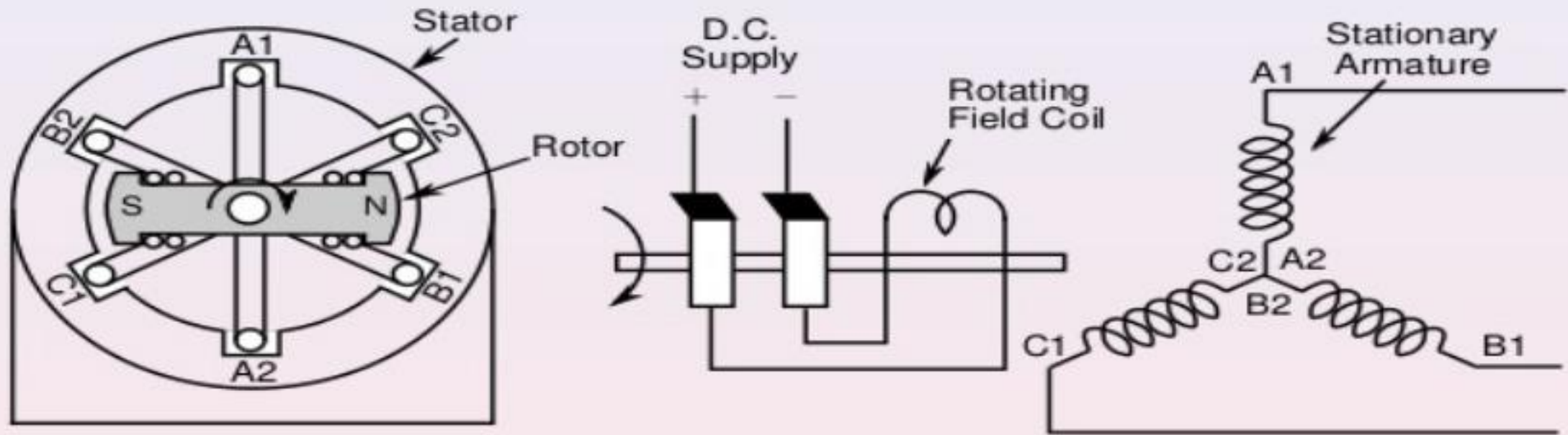
1 • Speed and Frequency

2 Field Voltage and Current

3 Torque and Power

4 Voltage per hertz

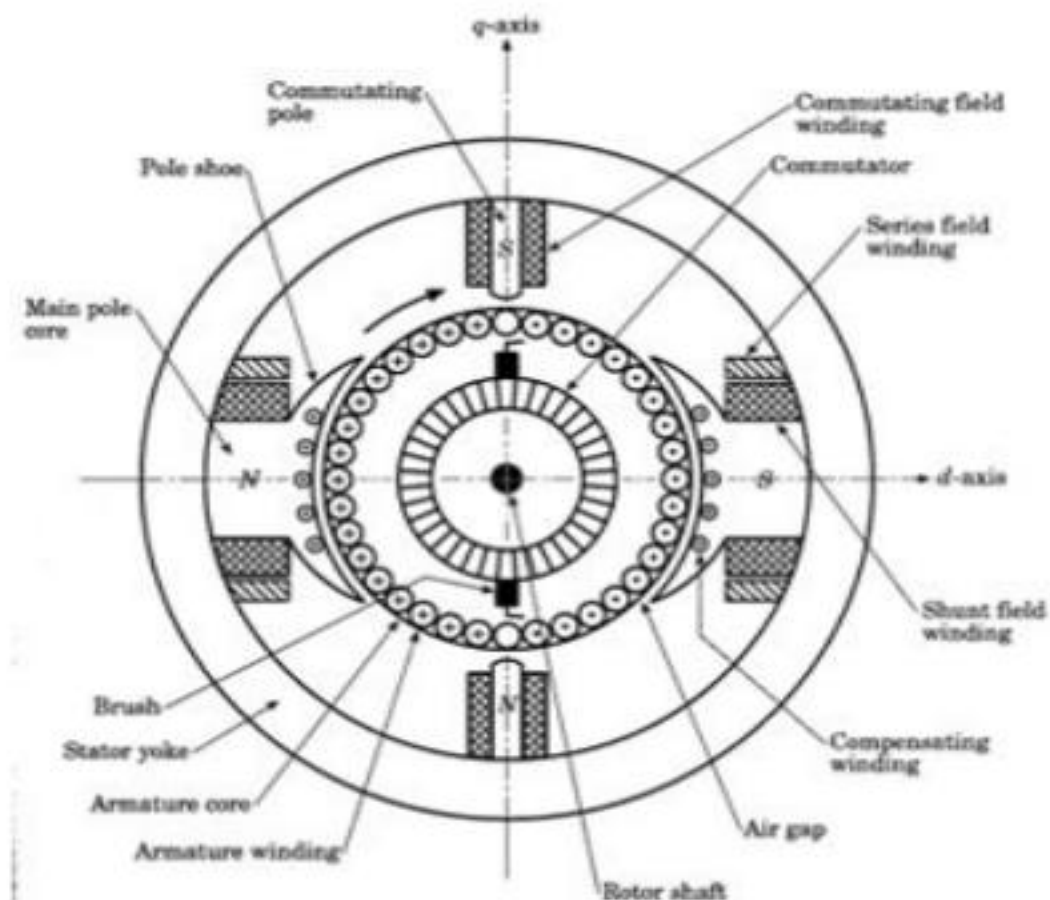
# Principle of Operation of Synchronous Generator



When the poles on the rotor, driven by prime mover, move past the stator conductors, due to the relative motion of conductors with respect to the poles, the magnetic flux lines are cut by the conductors and voltage is induced in them.

# DC Machines

- The stator of the dc motor has poles, which are excited by dc current to produce magnetic fields.
- In the neutral zone, in the middle between the poles, commutating poles are placed to reduce sparking of the commutator. The commutating poles are supplied by dc current.
- **Compensating windings are mounted on the main poles. These short-circuited windings damp rotor oscillations.**





# DC machine experiments


## Generator side

- i) Connect the 120V single phase resistive load bank to Terminals 1 and 2 on the output of the generator test table (right hand side). The generator armature current  $I_{agen}$  will flow through the generator test table to the resistive load bank.
- ii) Connect Terminal 1 on the left-hand side of the generator test table to A1 output of the generator panel. Similarly, connect Terminal 2 to A2
- iii) Connect the field of the generator to the output of the DC Power Supply. This will be used to supply the generator field current,  $I_{fgen}$ .
- iv) Use a multimeter on the output of the voltage reversing switch to measure the armature voltage of the DC generator,  $V_{agen}$ . Be sure to protect the multimeter by opening the voltage circuit breaker switch before power is applied.
- v) Connect the tachometer to the generator shaft. Adjust the height so the tachometer cable is level with the shaft. Note the direction of the arrow on the top of the generator. The way the arrow is pointing will indicate the positive lead on the tachometer.



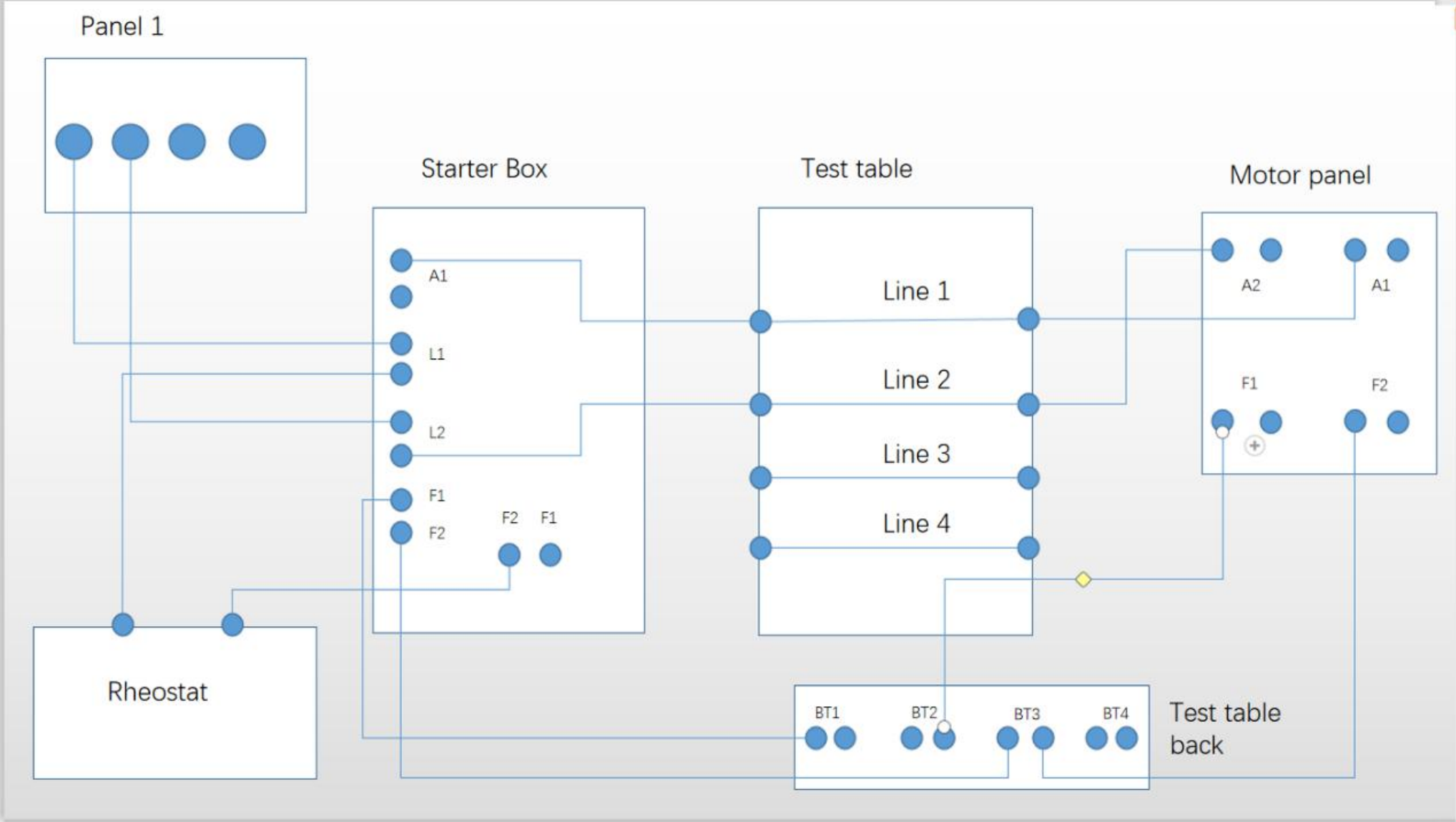
## Motor side

Shunt Excited Motor Connection: Use the diagram in Figure 2 to connect the other side of the DC motor-generator set as a shunt excited motor.

- 1) Use 120v DC from distribution panel and then connect it to the starter box as it's shown in the diagram.
  - 2) Use the Rheostat that will vary the motor field current and connect to the starter box as it's shown in the diagram.
  - 3) connect the starter box to the test table.
  - 4) connect the test table to the A1 and A2 as shown in the diagram.
  - 5) connect the field to the back of the test table as shown in the diagram.
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# Generator side



# Motor side

