

DC Motor Instruction Manual

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1.) Check on receipt

Please check the following items on receipt:

- 1.1) Check if the motors is damaged or dirty and make sure there are no parts or accessories missing.
- 1.2) Carefully read and study the information on all the nameplates, connection diagrams and attachments, such as this manual.
- 1.3) Check if the drive shaft is locked for transport, if locked, unlock the drive shaft. Rotate the shaft manually to check if the roller bearings are damaged.
- 1.4) Check if the brushes are making good contact to the commutator and are not damaged
- 1.5) Check the tachometer generator and for damage.
- 1.6) Open the junction box and megger the insulation resistance to the motor ground terminal. Do not exceed 500 volts and not less than 1M ohm.

If you find any problems, please contact Electric Regulator Corp., or your dealer.

2.) Installation environment

Careful consideration must given to the operating environment of DC motors. An improper environment will significantly reduce the longevity of DC motors.

- 2.1) The temperature must be between -15 °C and 40 °C.
- 2.2) The altitude should be less than 1000 meters above sea level. If it is above 1000 meters, contact Electric Regulator Corp., or your dealer.
- 2.3) Make sure the blower motor rotates in the direction of the indicator arrow.
- 2.4) The air ventilation inlet and outlets or inlet air duct must be clear of blockage or any impedance of the air flow. Any restriction of ventilation will result in abnormal temperature rise. The air filter should be inspected, cleaned or changed regularly. The air filter must me completely dry before being used.
- 2.5) Warning, the motor should not be in a **hazardous environment**, such as gasses or air born materials that are **corrosive** or **flammable**. Example: Extruding PVC plastic emits ammonia gas that will corrode the motor's commutator very quickly. We recommend cooling the motor by installing an air duct to bring in clean outside air.
- 2.6) The mounting foundation must be hard, solid and free of vibration. We recommend the motor or the motor bed be bolted to a concrete floor for stability.
- 2.7) The drive shaft coupling or the belt pulley must be properly installed and aliened. Belt pulley should be balanced with half key. **Warning**, don't damage the drive shaft, avoid impacts to the drive shaft and bearings.

3. Wire Size.

The voltage should be stable and the electrical power line voltage drop should be kept to the minimum under load conditions.

3.1) Make sure the power lines are large enough to avoid significant voltage drop under load, see the table below.

3.2) Warning, connect the motor according to the connection diagram. Make sure the motor is well grounded.

500V DC Armature Full Load Amps	Minimum Wire Size for 40ft length
12	12 AWG
15	10 AWG
30	8 AWG
38	6 AWG
45	4 AWG
60	3 AWG
75	2 AWG
90	1 AWG
110	00 AWG
148	0000 AWG
185	300 MCM
218	(2) 000 AWG
295	(2) 250 MCM
408	(2) 350 MCM

300V DC Field Full Load Amps	Minimum Wire Size for 40ft length
7	12 AWG
9	10 AWG
18	8 AWG

3.1) DC Motor Electrical Connections

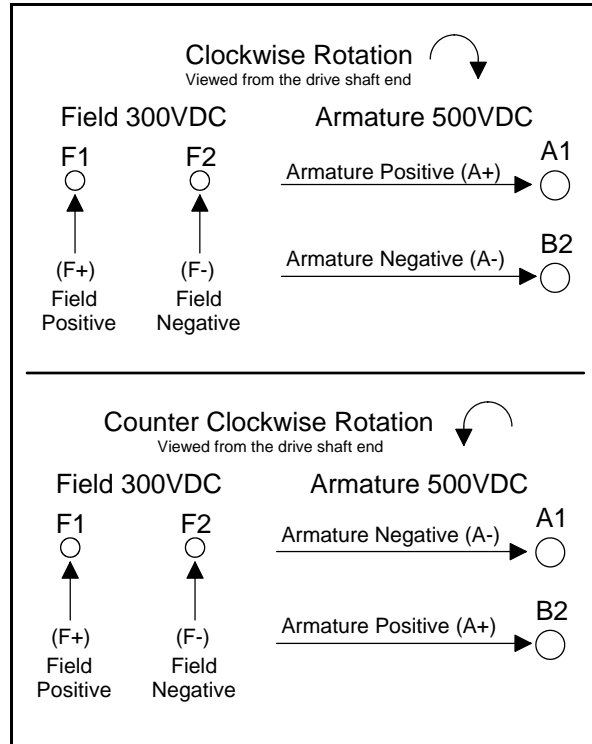
The DC motor has a terminal board in the junction box that makes the electrical connections simple and easy.

The field is prewired for 300 volts, simply connect the field positive power (F+) to terminal F1 and field negative power (F-) to terminal F2.

Clockwise and counter clockwise is viewed from the drive shaft pointing towards you.

For clockwise rotation, connect the armature positive (A+) to A1 and armature negative (A-) to B2.

For counter clockwise rotation, connect the armature negative (A-) to A1 and armature positive (A+) to B2.

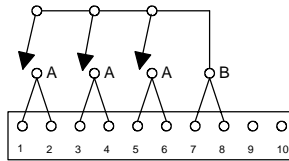


3.2) Thermostat Connections

Thermostat Relay Nomenclature

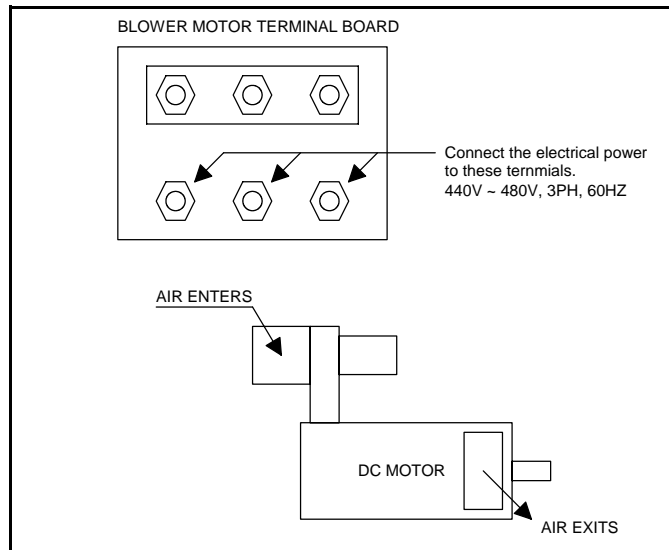
A = Commutating Pole (Normally Open)

B = Main Pole



3.3) Blower Motor Electrical Connections

The blower motor has a terminal board in the junction box that makes the electrical connections simple and easy. It is prewired for 440V to 480V, 3 phase, 60 Hz, power. Simply connect the power to the three bottom terminals, see diagram below. Test run the motor to determine if the blower is rotating in the correct direction. The air should enter through the air filter and exit the DC motor. If the air flow is the wrong direction, this will seriously damage the DC motor.



Warning

Incorrect air flow direction will severely damage the motor.

3.4.) Air Filter

Periodically inspect and/or clean the air filter to ensure cooling. After cleaning the filter should be completely dry before using.

4.) Running the motor

The blower motor should be running before applying voltage to the field. **The field power must be on before applying voltage to the armature**, then gradually apply voltage to the armature.

Warning, don't apply full DC voltage directly from the line.

Warning, never apply power to the armature without power to the field.

4.1) First, start the blower motor.

4.2) Second, switch on the power to the field. Most DC drives have ampere regulator for the field. When ampere regulator is used, when the field is cold the field voltage will be well below 300 volts. Eventually the field will warm up to somewhere about 40°C to 50°C, the voltage will rise to somewhere about 300 volts.

4.3) Third, gradually apply voltage to the armature. Avoid dwelling at high amperage at speeds below five percent of base speed.

4.4) Check for abnormalities, such as abnormal noise, sparking and overheating of the bearings or motor. If anything abnormal is detected, stop the motor immediately, remove or repair the fault.

4.5) Field weakening should begin after the motor has reached base speed. The motor should have full field when it is started. When the motor has reached base speed then field weakening should begin. Don't exceed the motors maximum speed rating, this is the mechanical limit of the motor.

5.) Commutator maintenance

Warning, inspection and cleaning of DC motors should be performed when the motor is stopped and the electric power off.

Note: The commutator should always be free of dust and oil.

5.1) New DC motors are ready for operation. No preparation of the commutator surface is require.

5.2) The commutator surface will eventually wear. Note: operation in a very dirty enviroment under low load will accelerate commutator surface wear. When the commutator surface requires refinishing, lift or remove the brushes and use a silicon carbide abrasives (stone).

Warning, don't use emery cloth and all commutator surfacing work should be done when the motor is cold.

5.3) If the commutator is out of round, this may cause sparking during operation. The commutator should be cut by a diamond lathe tool. When fluting the mica between the commutator segments, ensure that the concavity is 1.0 mm to 1.5 mm, remove burrs and wipe off the dust.

5.4) Checking comutator wear, if the brush track depths are greater than 0.25 mm (0.010") deep, the commutator should be stoned. If the brush track depths are 1.00 mm (0.040") or greater. The commutator should be refaced on a lathe with a diamond bit. Flute (undercut) the mica between the commutator segments, ensure that the concavity is 1.0 mm to 1.5 mm, remove burrs and wipe off the dust.

6.) Brush maintenance.

Note: If the motor is operated under overload conditions for a long period of time. The brushes will wear out quickly and commutation will deteriorate.

Note: If the motor is operated under very low load for a long time. The brushes will develop nicks in them causing uneven wear of the commutator surface and the brushes will wear out quickly.

6.1 Check the brushes and the surface of the commutator periodically.

6.2) **Brush pressure** should be 2 to 3 pounds.

6.3) Replacing brushes,

When the brush wears down so that the top is even with the top of the brush holder it is time to change brushes. If the brushes are too short it will not have enough contact pressure resulting in chattering and excessive comutator wear and heat. All the brushes in the motor should be replaced at one time. All the brushes should be the same brand and types (don't mix brushes).

6.4) Seating the brushes

Seating the brushes should be done by and experience technician.

6.5) Brush rockers

Adjustment of the brush rockers should be done by and experience technician.

6.6) Brush replacements

Motor	HP	Base Speed	Brush Part Number	Qty
2511AT	30	1750	DCMB-32-25-12.5	8
2811AT	50	1750	DCMB-32-25-12.5	8
3212AT	100	1750	DCMB-40-25-12.5	12
3611AT	150	1750	DCMB-40-25-16	12
4012AT	200	1750	DCMB-40-25-16	16

Motor	HP	Base Speed	Brush Part Number	Qty
4014AT	300	1750	DCMB-40-25-16	20
4411AT	300	1750	DCMB-40-25-20	20
5014AT	500	1750	DCMB-40-25-20	28

7.) Roller Bearings

Lubrication is the most important consideration in roller bearing maintenance. The estimated bearing life is 20,000 hours under the motors rated load. The motors is shipped from the factory with the bearings lubricated and ready to run. Depending on operating conditions, periodic lubrication is required.

Note: the bearing grease should always be clean. **Warning: the bearing temperature should not exceed 90°C.**

7.1) Roller Bearing Grease

The motor is shipped from the factory lubricated with #2 Lithium grease.

If you change to an alternate grease, first remove all of the Lithium grease, a recommended alternative is Mobil Polydex EM grease