

D.C. PERMANENT MAGNET MOTOR
SERVICE BULLETIN

TROUBLE SHOOTING
DISASSEMBLY
REASSEMBLY
BRUSH REPLACEMENT



30 PAINT FORK ROAD
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The permanent magnet motor differs from conventional DC motors in that the field winding has been replaced with ceramic magnet pole pieces. **Do not impact, drop or squeeze the motors as this can cause damage to the ceramic pole pieces and will affect warranty considerations.** Care must be taken when the permanent magnet motor is disassembled, since the magnet pole pieces will attract ferrous metals. This fact dictates motors should be disassembled in an area free of ferrous metal chips

PRE-DISASSEMBLY TROUBLE SHOOTING:

1. Read the nameplate to become familiar with the motor, especially the rated voltage.
2. Try to turn the shaft by hand. Keep motor leads separated while doing this. If the shaft turns freely go to item (4). If the shaft won't turn, proceed to item (3)
3. The shaft could be tight for several reasons. This check is to determine if the tightness is of a temporary nature only. Obtain a power supply to produce the nameplate voltage. **Do not make a permanent connection.** First touch the motor leads quickly to the power supply just long enough to observe if the shaft turns. If it does turn, then hold the motor leads on the power supply for a longer time. If the motor sounds normal, go to item (4). If the motor sounds noisy, it should be taken apart as described in this bulletin.
4. If the motor turned freely, connect an ammeter in the circuit as shown in Figure 1. With rated voltage applied and the shaft running free, the ammeter should read less than 20% of the nameplate full load current. If the motor meets the above conditions then it can be assumed the original problem is external to the motor.

DISASSEMBLY:

1. Before removing the drive end cover, **take a sharpie and make a mark connecting both the drive end cover and the comm end cover to the motors shell.**
2. Remove thru bolts.
3. Remove drive end cover. **Take note of which cover has the bearing spring/shims.**
4. Pull the armature out of the assembly in one swift motion. **It is important that the pulling motion on the armature be continuous. Do not pull part way out and release.** If this is done, the magnets will pull the armature back into the stator and cause severe damage.
5. Remove commutator end cover.

NOTE: DO NOT PLACE THE STATOR RING IN ANY MECHANICAL HOLDING DEVICE DURING THE DISASSEMBLY OR ASSEMBLY OPERATION. PERMANENT DISTORTION OR OTHER DAMAGE WILL RESULT.

POST DISASSEMBLY TROUBLE SHOOTING:

Once the motor has been disassembled, go through the following check list steps to determine where the problem lies.

1. BEARINGS – Should spin smoothly and easily and have ample lubrication and be free of corrosion. If bad see **REASSEMBLY STOP 4**
2. ARMATURE – Check for grounds and shorted turns. Refinish commutator surface if pitted or excessively worn.
3. BRUSHES – Check brushes for wear and to ensure that they are free in the brush holders. Note: Observe how brushes are assembled in brush holders and position of brush lead. New brushes must be installed in same manner. Brushes should be removed as follows:
 - a. Unwind the brush spring from its final position with pliers.
 - b. Lift brush assembly from brush holder.
 - c. Disconnect brush assembly lead.
 - d. New brush assembly to be installed by reversing above procedure.
 - e. **NOTE:** Inspect wire harness and all connections for signs of damage due to overheating.
4. STATOR – Check magnets to see if they are securely mounted, and no that there are no chips/cracks in the magnet.

REASSEMBLY:

1. Install new brushes and be sure they slide free in the holder. Install brush with the lead wires positioned as when received. Raise all brushes to the locked position. (see Figure)
2. Place commutator cover on a work bench with brush assembly facing upward.
3. Place the bearing spring/shims into the bearing bore.
4. Take a complete armature assembly, including bearings, and insert commutator end bearing into the bearing bore. Note: Do not re-use bearings which have been removed from armature shaft. Keep assembly in a vertical position. Use extreme care not to damage armature with bearing pullers. New bearings should be installed by pressing inner race of bearing onto proper position on armature shaft.
5. Set the brushes to final position as shown in Figure 2.
6. The next step is to place the complete stator assembly down over the vertical armature, an into position on the commutator cover. **Caution – Care must be exercised at this point. There is a strong magnetic attraction between the stator assembly and the armature, which tends to pull the stator assembly rapidly downward. It is important to have a firm grasp on the stator assembly and be sure fingers are free from the space between stator assembly and commutator cover (see Figure 3).**
7. The stator assembly must be placed in a definite relationship with the commutator covers in order to obtain a neutral brush setting. There is a

match-mark on both items. ***These two marks must line up exactly. Rotate until they do.***

8. Assemble the drive end cover in the proper relationship (aligning the marks you made). Insert mounting bolts and tighten alternately to ensure a good mechanical alignment.
9. Spin the shaft by hand to see if it is free. Be sure motor leads (if used) are not touching together. If the leads are touching, a generator action will give the effect of friction in the motor. a no-load test can now be performed. At rated voltage, observe the no-load current. It should be less than 20% of the nameplate full load current. Anything higher indicates:
 - a. Brushes are not on neutral setting (check match-marks for exact alignment).
 - b. Faulty armature.
 - c. Bearings not pressed in the correct location

BRUSH REPLACEMENT:

WITHOUT BRUSH INSPECTION COVER:

DISASSEMBLY

1. Remove thru bolts.
2. Before removing the drive end cover, ***take a sharpie and make a mark connecting the drive end cover and the comm drive end of the motors shell.***
3. Remove drive end cover. ***Take note of which cover has the bearing spring/shims.***
4. Pull the armature out of the assembly in one swift motion. ***It is important that the pulling motion on the armature be continuous. Do not pull part way out and release.*** If this is done, the magnets will pull the armature back into the stator and cause severe damage.
5. Remove commutator end cover.

NOTE: DO NOT PLACE THE STATOR RING IN ANY MECHANICAL HOLDING DEVICE DURING THE DISASSEMBLY OR ASSEMBLY OPERATION. PERMANENT DISTORTION OR OTHER DAMAGE WILL RESULT.

REPLACEMENT: ONLY REMOVE ONE BRUSH AT A TIME

1. Remove/loosen the screw holding the brush shunt to the brush ring. **FIG. 5**
2. Hold the spring back just far enough to remove the old brush, take the new brush (making sure that the orientation matches the old brush) and insert it back into the brush holder.
3. Referring to **FIG. 2** put all brushes in the raised position and the springs in the locked position. Once that's done refer to **REASSEMBLY on PAGE. 3 STEPS 6-9**

WITH BRUSH INSPECTION COVER

1. Loosen the screw holding the brush inspection cover to the motor, removing the brush inspection cover. **FIG. 4**
2. With the motor in a vertical position with the comm drive end toward the ground, **ONE AT A TIME** remove the screw holding the brush shut to the brush ring. **FIG. 6 IF YOU LOSE ANYTHING INSIDE THE MOTOR YOU MUST DISASSEMBLE THE MOTOR!**
3. Hold the spring back just far enough to remove the old brush, take the new brush (making sure that the orientation matches the old brush) and insert it back into the brush holder. Repeat until all brushes have been replaced
4. After you make sure there is not any foreign objects inside the motor, take the brush inspection cover put it into the correct place and tighten the screw.

FIGURES

FIGURE 1

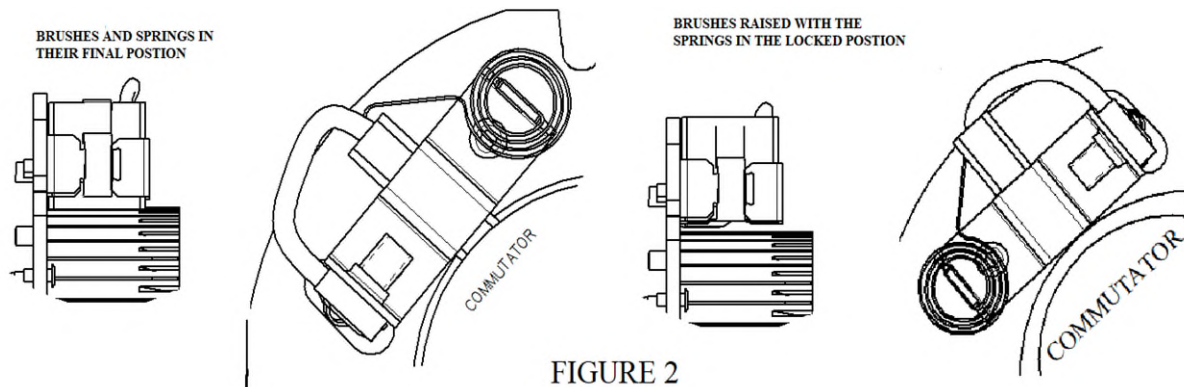
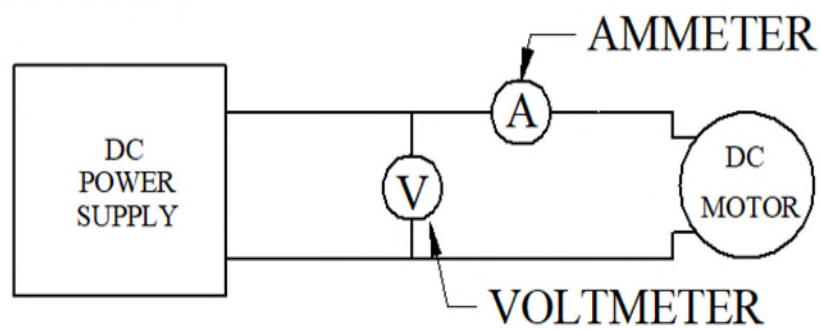


FIGURE 2

FIGURE 3

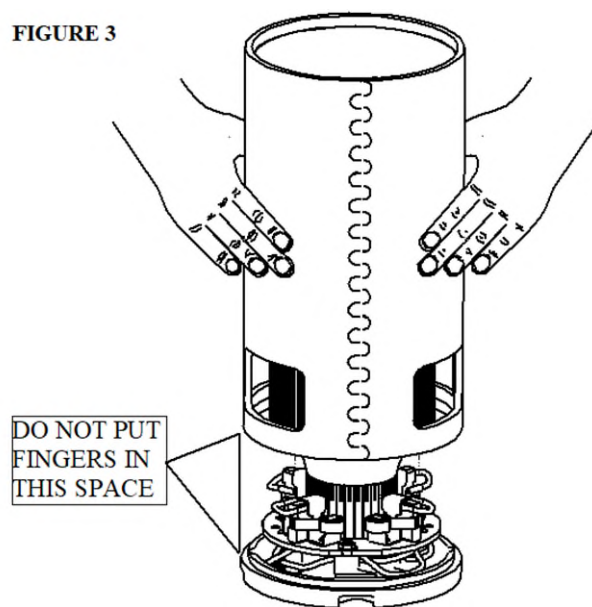


FIGURE 4

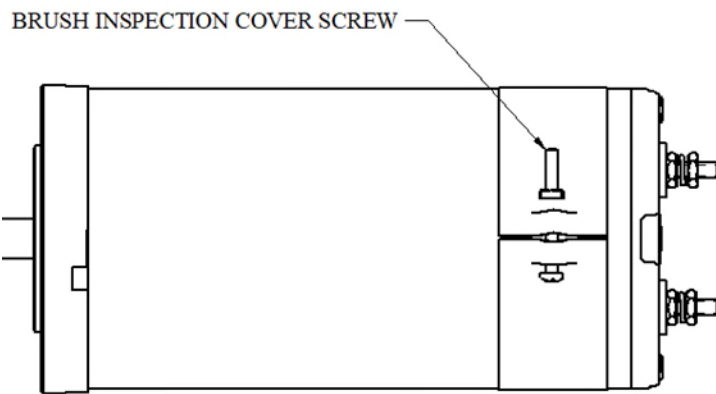


FIGURE 5

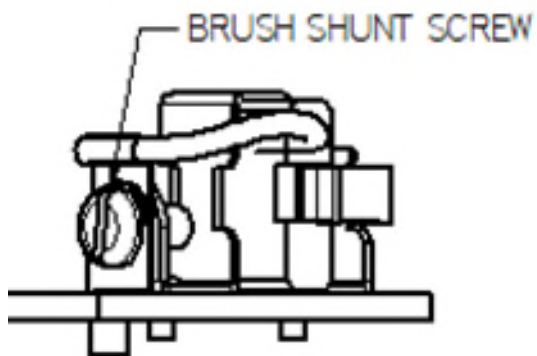


FIGURE 6

