ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT
MAINTENANCE INSTRUCTION

DYNAMIC BRAKE GRID FAN AND MOTOR

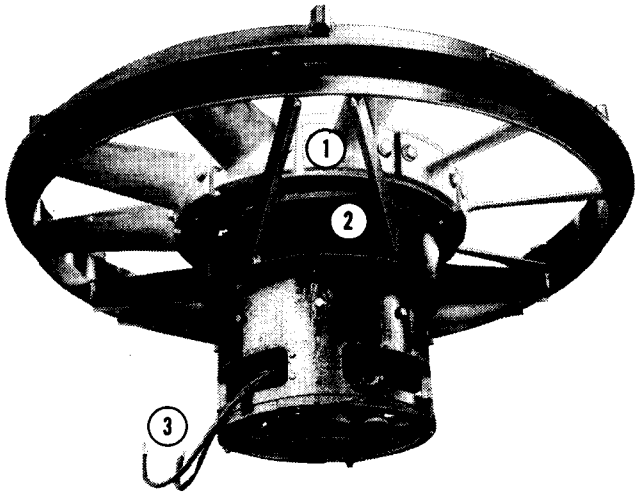
DESCRIPTION

The dynamic brake grid cooling fan assemblies consist of a fan powered by a direct current series motor. Differences in assemblies arise from various combinations of fan and motor sizes.

Fan and motor assemblies consist of five major components:

1. Armature assembly
2. Frame and field coil assembly
3. End frame and brush rigging assembly
4. End frame and stator assembly
5. Fan rotor assembly

The current design motors, Figs. 1 and 2, are identifiable by the position of the brush leads which extend through the brush holder window opening. Figs. 3 and 4 show earlier design motors with leads through the end frame.



1. Fan Rotor Assembly
2. End Frame-Stator Assembly
3. Brush Leads

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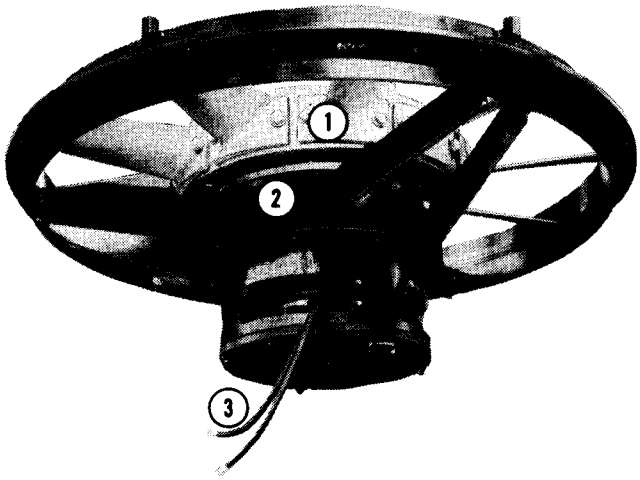
Fig. 1 – Current Grid Fan And Motor Assembly - 1.22 m (48") Fan



1. Fan Rotor Assembly
2. End Frame-Stator Assembly
3. Brush Leads

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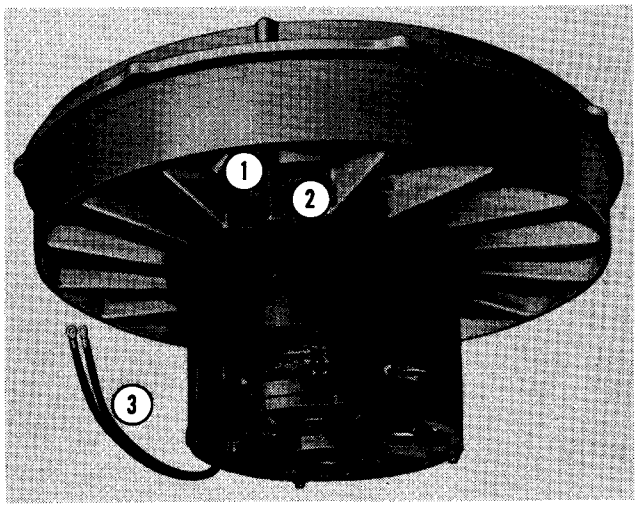
Fig. 2 – Current Grid Fan And Motor Assembly - 0.914 m (36") Fan



1. Fan Rotor Assembly
2. End Frame-Stator Assembly
3. Brush Leads

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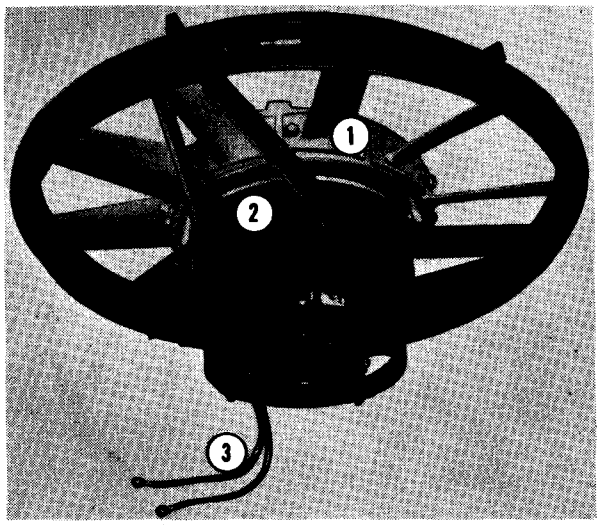
Fig. 3 – Previous Design Grid Fan And Motor Assembly - 1.22 m (48") Fan

The grid fan motor is insulated with Class A and B insulation. It is arranged for ceiling mounting in the grid hatch assembly and has the fan rotor assembly bolted to the fan mounting hub.

*This bulletin is revised and supersedes previous issues of this number.



1. Fan Rotor Assembly
2. End Frame-Stator Assembly
3. Brush Leads

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Fig. 4 - Previous Design Grid Fan And Motor Assembly - 0.914 m (36") Fan

OPERATION

When the locomotive is operating in dynamic braking, the traction motors operate as generators. The electrical power generated by the traction motors is converted into heat in the braking grids. This heat is dissipated into the atmosphere by the dynamic brake grid fan and motor assembly.

The dynamic brake grid motor is powered by a portion of the electricity generated by the traction motors during dynamic braking operation.

MAINTENANCE

DISASSEMBLY OF FAN AND MOTOR ASSEMBLY

The fan and motor assembly should be disassembled in the order outlined below. Fig. 5, shows a cross-sectional view of fan and motor assembly.

NOTE: As previously mentioned, fan and motor assemblies are identical with the exception of changes in the fan rotor and end frame-stator assemblies. For all practical purposes, the procedure for disassembly is the same for all fan and motor assemblies.

Before setting the fan and motor assembly in the vertical position (fan end up), remove the four bearing housings to end frame cap screws from the commutator end.

Raise the fan and motor assembly to the vertical position (fan end up).

CAUTION: Ensure proper support of assembly to prevent lead damage of earlier design assemblies having leads coming through the bottom plate of commutator end frame.

With the fan and motor assembly resting in the vertical position, refer to Fig. 5, and proceed with disassembly as follows:

1. Remove the brushes from the holders. If brushes are to be reused, identify them so they will be returned to original holders.

2. Tape heavy fish paper over commutator to prevent damage during disassembly.

3. Remove the fan rotor mounting bolts and shaft end cover. Lift out fan rotor.

4. Remove the hub mounting locknut and washer. Remove the rotor hub by tapping the hub flange with a non-metallic mallet.

5. Mark the relative position of the end frames to the main frame with a prick punch.

6. Remove bearing housing cap screws and remove end frame mounting bolts from fan end of motor.

7. With the aid of a hoist, lift end frame from stator assembly.

8. Apply an eyebolt to fan end of shaft and lift out the armature assembly. Place armature in a saddle prior to removal of bearing assembly.

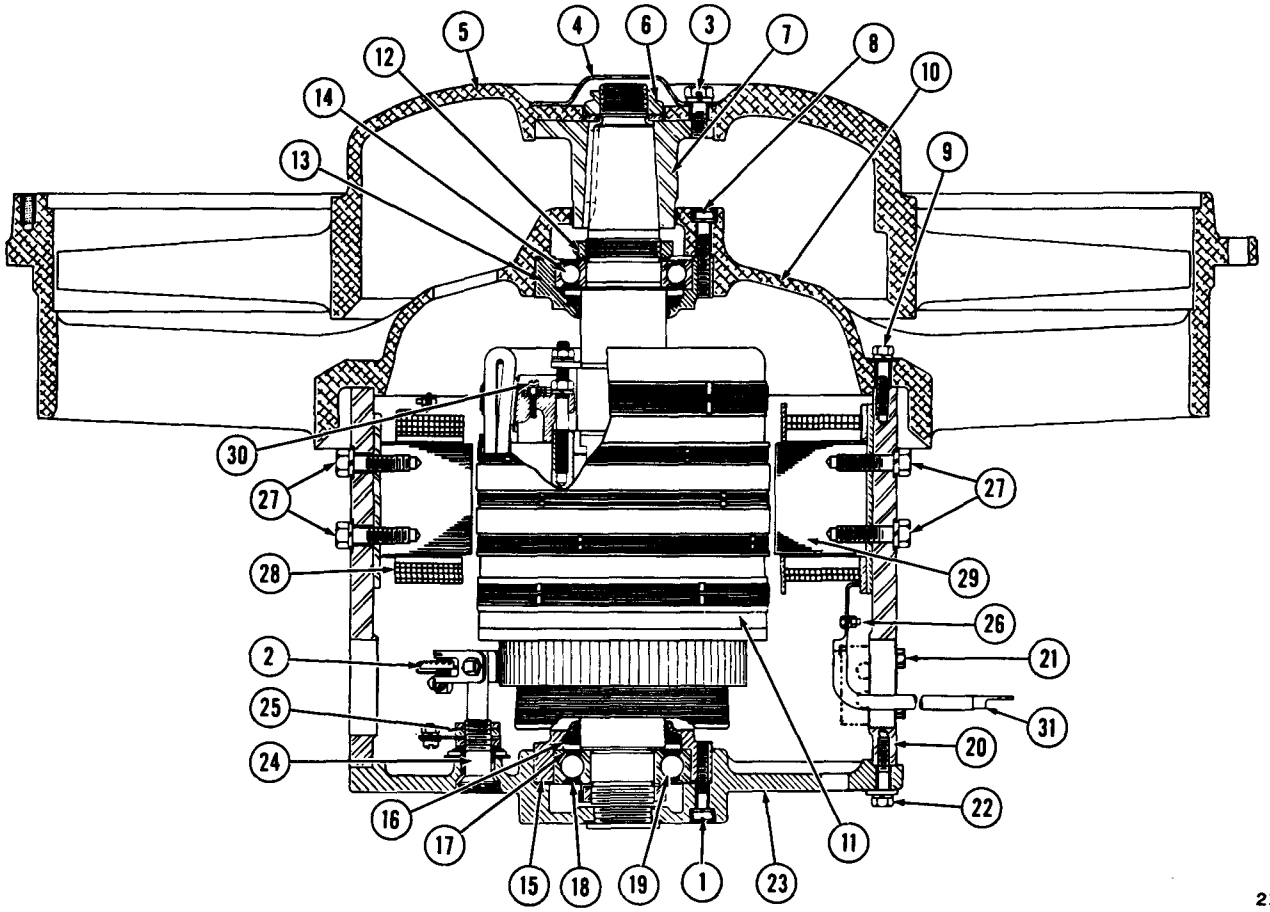
9. Remove the bearing locknut and lockwasher from fan end of shaft.

10. Engage jaws of bearing puller behind shoulder of bearing housing and withdraw the bearing and housing from the shaft.

11. Remove bearing and housing from commutator end of shaft as described in operations 9 and 10.

12. Remove the line lead clamp assembly, and disconnect the leads from the field coil to the brush rigging. Identify leads with markers.

NOTE: On previous design motors, it is necessary to invert the frame prior to performing the above procedure.



1. Bearing Housing Cap Screw
2. Brush Holder Assembly
3. Fan Rotor Mounting Bolts
4. Shaft Cover
5. Fan Rotor
6. Hub Locknut
7. Rotor Hub
8. Bearing Housing Cap Screws
9. End Frame Mounting Bolts
10. End Frame And Stator Assembly
11. Armature Assembly
12. Bearing Locknut
13. Fan End Bearing Housing
14. Fan End Ball Bearing
15. Commutator End Bearing Housing
16. Grease Cavity
17. Slotted Shield
18. "Viton" Shield
19. Commutator End Ball Bearing
20. Frame And Coil Assembly
21. Line Lead Clamp
22. End Frame Mounting Bolts
23. End Frame And Brush Rigging
24. Brush Holder Studs
25. Brush Holder Stud Locknut
26. Field Coil Connector Bolts
27. Pole Assembly Mounting Bolts
28. Series Coil
29. Interpole Coil And Pole Piece Assembly
30. Balance Weights Fan End
31. Brush Leads

Fig. 5 - Cross-Section Of Fan And Motor Assembly

- 13. Remove end frame mounting bolts and remove end frame and brush rigging assembly.

- 14. Remove brush holders by loosening the locknuts and clamp screws.

- 15. Remove brush holder studs by removing the locknuts and tapping the studs out of end frame.

NOTE: When replacing the brush holder studs and brush holders, align the studs and brush holders as shown in Fig. 10.

- 16. Unsolder and remove field coil connector bolts.

- 17. Remove the pole piece mounting bolts and lift the pole pieces out of frame.

NOTE: Series coils may be replaced individually. Interpole coils are serviceable only in assembly with the pole piece.

Check polarity of coils after connecting.

- These operations should not be performed unless part replacement is necessary.

CLEANING

It is essential that the motor be kept clean at all times. A clean motor runs cooler. Inspect and clean as required by blowing out motor interior with clean, dry, compressed air. A large volume

of air at reasonably low pressure should be used. If high pressure from a nozzle is used, there is danger of loosening insulation and protective coating on the various parts. Brush holders and insulated washers should be wiped with a clean dry cloth.

If deposits of dirt are allowed to collect, they may become caked and difficult to remove. If this condition exists, it is necessary to clean the motor using a solvent saturated cloth. Allow sufficient time for solvent to evaporate. No electrical test should be attempted immediately after cleaning. Keep solvents off the commutator surface.

CAUTION: Practice standard safety precautions applicable to inflammable fluids. Provide adequate ventilation when using solvent.

INSPECTION

The motor should be inspected at regular intervals to prevent failures in service, and replaced at intervals specified in the applicable Scheduled Maintenance Program. Inspection should include the examination of items which appear under the respective headings.

LUBRICATION

FAN END BEARING

The fan end bearing is a double "Viton" shielded, prelubricated, grease type. Inner and outer seals protect the bearing which is factory packed and sealed with Chevron SRI-2 grease, Fig. 5. No additional lubrication is required during operation. On overhaul, remove and replace with new factory packed bearing. Refer to the applicable Scheduled Maintenance Program for overhaul period.

COMMUTATOR END BEARING

The commutator end bearing is designed specifically for operation within a critical temperature environment. It is equipped with one "Viton" shield at the bottom and one slotted metal shield at the top which faces an enlarged grease cavity in the housing, Fig. 5, ensuring adequate grease flow into bearing as required. Only Standard Supermil M-125 grease should be used as a lubricant in the commutator end bearing assembly.

CAUTION: Both the fan and commutator end bearings have the same outer dimensions but are not interchangeable. Care must be exercised during installation to ensure against application of either bearing to the wrong end. Also, the fan end bearing may be applied with either side up or down. It is imperative the commutator end bearing be applied with the metal shield facing grease cavity, Fig. 5. Improper orientation will result in premature bearing failure.

BRUSH HOLDERS AND BRUSHES

The four-shunt dual-wafer brushes, Fig. 6, should move freely in the holders and not be stuck with dirt or other foreign substances. Lift the springs, and raise and lower the brushes in the brush holder to release accumulated dirt. Care should be taken not to snap the spring. This may result in a chipped brush. Replace brushes that have been chipped or worn. (Refer to Service Data.)

Fig. 6 - Four-Shunt Dual-Wafer Brush

"SANDING-IN" NEW BRUSHES

When new brushes are installed, they should be "sanded-in" Fig. 7, by placing a piece of No. 00 grade sandpaper under the brush with the sand side contacting the brush and moving the sandpaper in the direction of rotation. Lift the brush when moving the paper back, and keep the paper close to the commutator to avoid rounding the edges of the brush.

CAUTION: Do not use carborundum, emery cloth, or emery paper for "sanding-in" brushes.

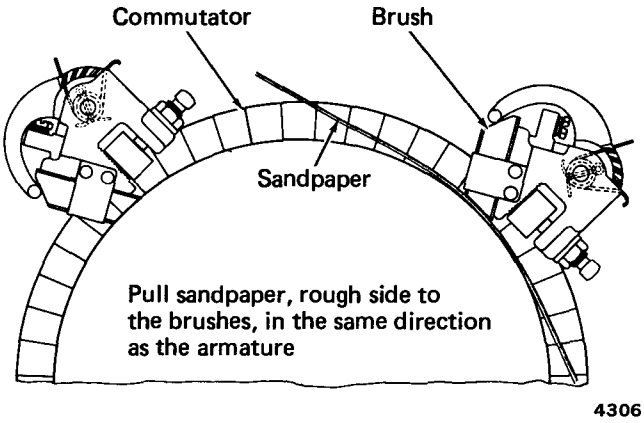


Fig. 7 – Fitting and "Sanding-In" Brushes To Commutator

MEASURING BRUSH PRESSURE

Proper brush pressure should be maintained as specified under "Service Data" at the end of this Instruction. Unequal brush pressure will cause unequal current distribution of the brushes. The current distribution will be inversely proportional to the contact resistance. Refer to Fig. 8 for method of measuring brush pressure.

Maintain 3.18 mm (1/8") clearance between the bottom of each brush holder and the commutator. The brush holder assembly is arranged in such a way that the brush holder may be moved toward the commutator by loosening the check nut and the set screw on the brush arm. Brush holders should be bolted rigidly in place.

BRUSH HOLDER STUD REPLACEMENT (FIG. 9)

Disassembly

1. Disconnect brush holder and spring assembly (9) from stud shaft (16).
2. Remove jam nut (8), terminal clip (7), and jam nut (11).
3. Remove three steel spring washers (12).
4. Remove three insulation washers (14), (6), and (5).
5. Remove stud (16), brush stud disc (3), insulating compound (4), and expansion plug (2) from brush stud insulating sleeve (1), by carefully tapping out stud from brush holder and spring assembly side (9).

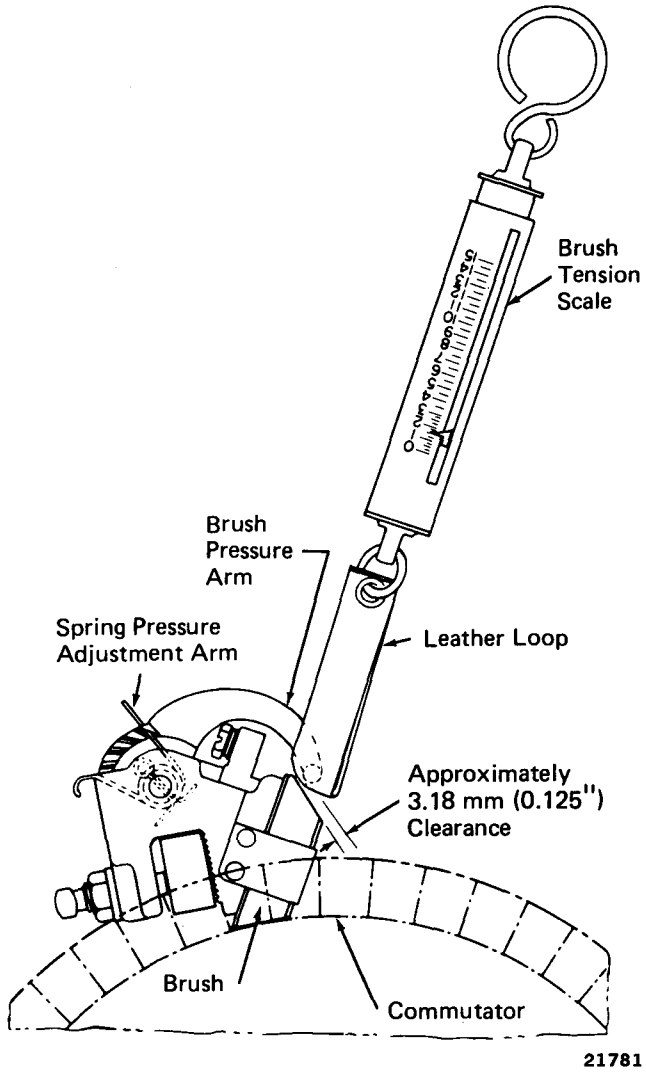


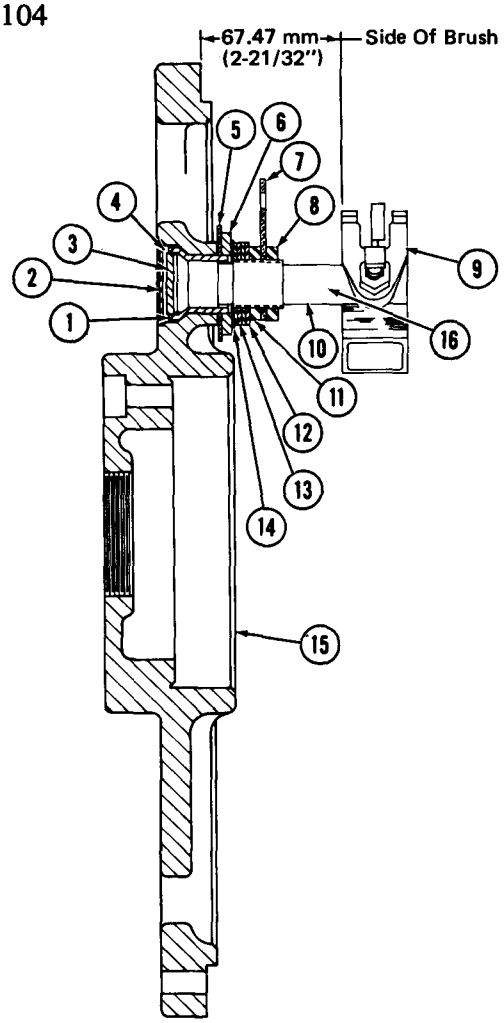
Fig. 8 – Measuring Brush Pressure

Reassembly

1. Insert stud (16) into insulating sleeve (1).
2. Apply brush stud disc (3), insulating compound (4), and expansion plug (2) to head of stud.
3. Apply insulation washers (5), (6), and (14) IN THAT ORDER.
4. Apply three steel spring washers (12) with FLAT SIDE towards brush holder and spring assembly.
5. Apply jam nut (11), terminal clip (7), and jam nut (8) IN THAT ORDER.

NOTE: Tighten jam nuts to 89 to 95 N·m (65 to 70 ft-lbs) torque.

6. Apply brush holder and spring assembly (9) to stud shaft (16).



1. Brush Stud Insulating Sleeve
2. Expansion Plug
3. Brush Stud Disc
4. Insulating Compound
5. Insulation Washer
6. Insulation Washer
7. Terminal Clip
8. Jam Nut
9. Brush Holder And Spring Assembly
10. Brush Holder Stud
11. Jam Nut
12. Steel Spring Washer
13. Steel Washer
14. Insulation Washer
15. End Frame
16. Stud Shaft

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Fig. 9 – Brush Holder Stud Replacement

NOTE: When replacing brush holder studs and brush holders, align as shown in Fig. 10. The carbon brush shunts should be arranged to clear the parts of the frame at ground potential.

ARMATURE

Test the insulation resistance of the armature by using a 500 volt DC megger. The minimum reading allowed is 1 megohm. If a megger reading of 1 megohm cannot be obtained, armature may have to be dried by placing it in an oven for 4 hours with the oven set at 120° C (245° F).

If after drying, the megger reading is still less than 1 megohm, the armature will have to be electrically tested to determine cause of low reading.

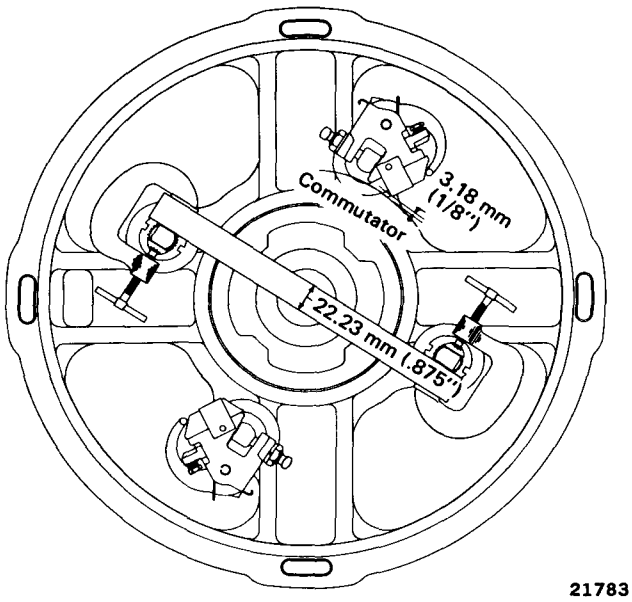

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Fig. 10 – Brush Holder Stud Alignment

Armature bands should be tight and secure. Soldering on the bands and to the commutator risers should be intact.

Armature band wire diameter is 1.02 mm (0.040") and has a tension of 68 kg (150 pounds). Armature bands should be tight and secure. If solder was thrown off, cause should be determined, corrected, and band replaced. When applying new bands, duplicate the banding originally on the armature. Do not change the diameter of the banding wire, the band position, or the width of the band. Deviating from the original band may cause heavy currents capable of overheating and melting the solder.

The coil insulation should be checked for blisters, flakes, or cracked insulating varnish surfaces. When any of these conditions exist, the armature should be given a varnish treatment.

After cleaning and checking the armature, it may be varnish treated as outlined below.

VARNISH TREATMENT

When the armature is ready for varnishing, determine applicability, and perform one of the two treatments below.

Rewound Armature (Double Dip)

1. Preheat armature in a convection oven set at 160° C (320° F) until core temperature reaches 130° ± 10° C (266° ± 50° F). This will take approximately 5 hours.

2. Remove from oven and dip in varnish thinned with a solvent blend of 80% Rule 66 Mineral Spirits and 20% Butyl Acetate. Allow to soak in varnish, commutator end up, for 10 minutes.

3. Remove from varnish and allow to drain for 5 minutes. Next, place in oven having a maximum temperature of 160° C (320° F), and bake for 30 minutes.

4. Remove from oven, and while hot, again dip in varnish. Allow to soak for 5 minutes.

5. Remove from varnish and allow to drain for 5 minutes.

6. Clean varnish from all machined surfaces using a solvent saturated cloth.

7. Bake armature for 5 hours in an oven set not to exceed 160° C (320° F).

8. After baking, remove from oven. While still hot, 50° ± 5° C (122° ± 41° F), perform a hi-pot test to ground. Check commutator bolts for tightness. Apply 40.7 N·m (360 in.-lbs) torque to test bolts. (Refer to Service Data for voltage and time.)

Not Rewound (Single Dip)

1. Perform Steps 1, 2, 5, 6, 7, and 8 above.

BALANCING ARMATURE

Dynamically balance the armature after any of the following operations:

1. Armature rewound, or coils repaired.

2. Armature rebanded.

3. Armature impregnated and baked.

4. Repairs to commutator, other than tightening and turning.

The brake blower motor armature must be in dynamic balance within 0.004 N·m (1/2 inch-ounce).

BALANCING COMMUTATOR END OF ARMATURE

An unbalanced armature at the commutator end is balanced by applying weights to the commutator spider and securing the weights with special cap screws. Refer to Parts Catalog for numbers of weights and special cap screws for securing weights.

BALANCING FAN END OF ARMATURE

An unbalanced armature at the fan end is balanced by applying weights to the coil support. Refer to Parts Catalog for numbers of weights, screws, and washers.

BALANCING OF FAN ROTORS

If any of the blades of the fan rotor are removed or replaced, it will be necessary to dynamically balance the reassembled rotor. Weight is added in the form of washers stacked on the blade mounting bolts.

A small washer must be used against the hub, adjacent to the nut with the larger washers sandwiched between them. No more than four large washers may be used on any one bolt. At least two full threads of the bolt must protrude beyond the end of the nut. A third small washer must be used between the bolt head and blade casting.

Torque the bolts to 128.8-149.1 N·m (95-110 ft-lbs). If additional weight is required, drill an 11.12 mm (7/16") hole in the hub at a radius of 228.6 mm (9") from the center. Place a bolt and small washer through the hole, threaded portion down. Add weight washers, a small washer, and the nut. Refer to Parts Catalog for numbers of special bolts and washers to be used for balancing the fan assembly, Fig. 11.

COMMUTATOR

The commutator should present a polished surface and be entirely free from pitting. In the event the commutator becomes pitted, it should be cleaned.

CAUTION: Do not use carborundum, emery cloth, or emery paper on the commutator.

When cleaning the commutator, extreme caution must be taken to keep copper dust from the windings. After the commutator has been cleaned, the windings should be blown out carefully with clean dry compressed air, at reduced pressure.

CAUTION: Do not apply lubricant to the commutator. If commutator is not kept clean and free from grease and oil, carbon dust will collect in the slots between the segments, and will tend to cause a short circuit.

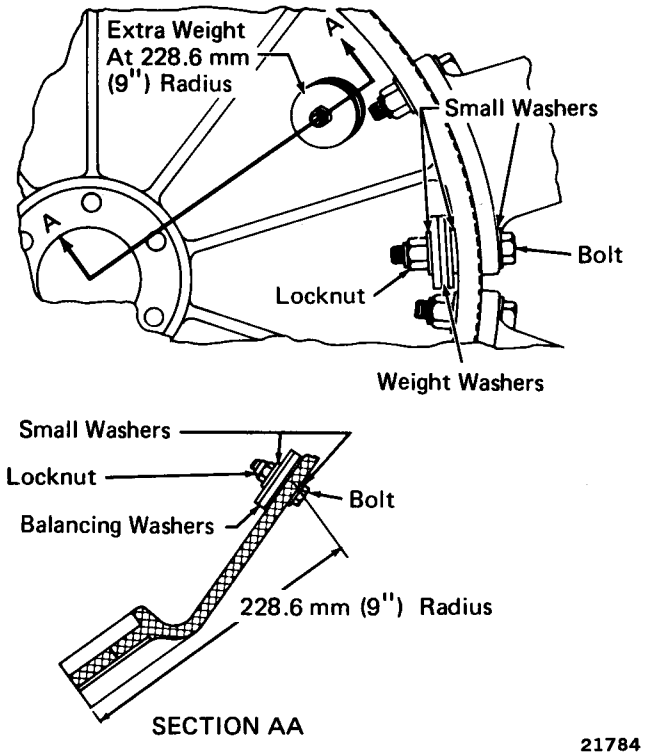

Fig. 11 - Fan Balancing Details

If the commutator is badly worn or burned, it should be turned just enough to give a uniform surface. Before turning the commutator, a suitable head covering should be placed over the end windings to prevent chips from working into the armature. While turning, the peripheral speed of the commutator surface should be 91.5 m (300 ft) per minute. Round off the ends of the commutator segments with a file, to at least 1.58 mm (1/16") radius.

Check outside diameter and neck of commutator surface. Condemning limit is when the commutator diameter has reached 180.97 mm (7-1/8") or the neck width is less than 4.77 mm (3/16").

Check commutator for eccentricity. Maximum eccentricity is 0.03 mm (.001") total dial indicator reading.

After the commutator has been turned, the mica should be undercut. Undercut of mica must be uniform all the way around the commutator, 0.794 mm (1/32") to 1.191 mm (3/64") deep. The sharp edges of the bars should be removed with a hand scraper. Remove all mica cuttings and inspect to see that no copper chips remain. Final polishing with crocus cloth is recommended. The width of mica insulation between commutator segments is 0.76 mm (0.030"), and the width of the mica undercutting saw is to be 0.64 mm (0.025").

TIGHTENING COMMUTATOR

After last baking and while armature is hot, check commutator nuts for tightness. Apply 40.7 N·m (360 in.-lbs) torque to commutator nuts to test for tightness.

COMMUTATOR CREEPAGE SURFACE

Shorts, grounds, and flashovers are likely to occur when the creepage surfaces between the end of the bars and the steel V-ring or the riser area become coated with dirt, grease, and carbon dust. This condition is as critical for the blower motor as it is for larger machines as traction motors and main generators. Therefore, it is imperative that these surfaces be kept clean. Refer to Service Data for the numbers of relevant Maintenance Instructions.

FIELD POLES AND COILS

Inspect insulation on field coils and investigate any unusual condition. Keep oil and dirt off coil insulation. Whenever indications of coil insulation charring are observed the cause should be determined, and the fan motor removed for repairs.

Clean the frame assembly with clean, dry, compressed air. (Refer to "Cleaning" and "Inspection.")

Examine field coil insulation and cables. If tight and in good condition but varnish treatment is necessary, proceed as outlined under "Armature."

When field coils and pole pieces are to be removed, keep each pole piece, coil assembly, and accompanying shims, if any, together. When reassembling, the assemblies should be installed in their original position.

To remove a field coil, remove the coil connector bolts, the bolts which hold the pole to the frame, and the pole assembly through the end of the frame. The series coil can readily be slipped off the pole. The interpole coils, however, should not be removed from the pole piece.

Use new lock washers when reassembling field coil pole piece bolts.

After coils are reassembled, care should be taken to ensure cables are properly reconnected. Refer to connection diagram, Fig. 12.

Carefully check the coil polarity. Contact surfaces should be clean, and the bolts should be drawn up tightly.

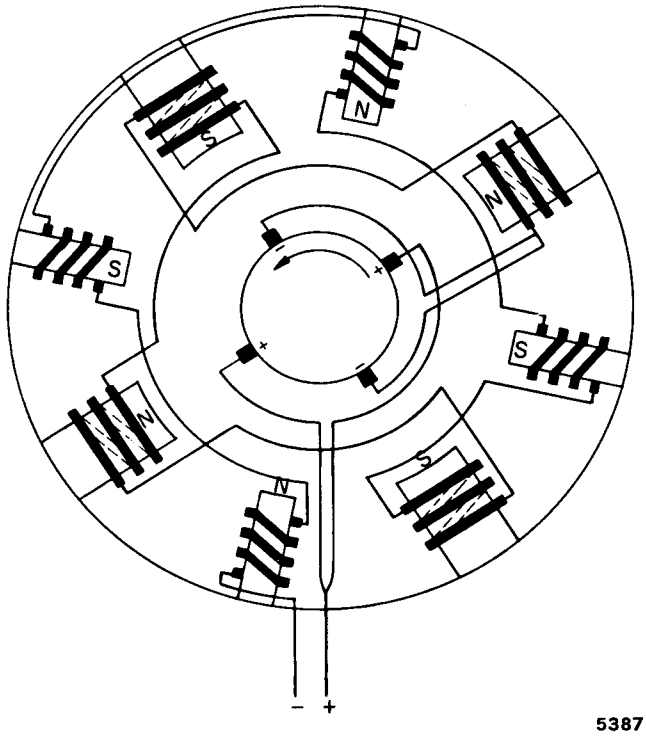

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Fig. 12 – Connection Diagram Viewing Commutator End

CONNECTIONS

Connections and leads to coils should be examined to determine if they are mechanically and electrically satisfactory. Field coils, leads, and cable connections must be secured and taping intact.

Any connections found loose or loosened for any reason should have the contact surfaces cleaned and properly bolted together to ensure a good electrical connection.

When soldering connectors to cables, flux leads with "Nokorode" solder flux and solder with pure tin solder.

Tape all field connections with asbestos tape, and coat with black air drying varnish.

INSULATION TEST AFTER OVERHAUL

All high potential tests MUST be made by placing electrodes on circuit under test before closing switch. Dangerous overvoltage surges may result when electrodes touch the circuit under test if they are already energized.

This is a low voltage motor connected in a high voltage circuit. For insulation test purposes, this motor falls in the same class as the locomotive high voltage tests.

See Service Data for voltages and times used when performing hi-pot tests.

ARMATURE BEARING AND FINAL FAN AND MOTOR REASSEMBLY

1. Clean out the grease cavities in the bearing housings and in the end frames surrounding the bearings.

2. Check seal and shield in the bearing housing.

NOTE: Ensure felt washer (fan end only) is in good condition. If defective, remove old washer and replace with new assembly saturated with oil.

3. Apply additional Chevron SRI-2 grease in the cavity surrounding the fan end bearing. Fill the commutator end bearing housing cavity with Supermil M-125. Refer to Service Data for quantities involved.

NOTE: The Supermil M-125 grease is used ONLY in the commutator end bearing.

4. Place the bearing housings on the shaft. Ensure fan end bearing housing and commutator end bearing housing are not interchanged.

5. Discard (scrap) the previously removed old bearings and replace with new factory packed bearings. The bearings are not interchangeable. DO NOT install a commutator end bearing in the fan end housing or a fan end bearing in the commutator end housing. Caution must be exercised in this application since the outside dimensions are the same and either bearing will fit into either housing. Also ensure the commutator end bearing is properly installed in its housing with the metal shield facing the filled grease cavity.

NOTE: Improper orientation of commutator end bearing in housing will result in excessive grease purging and premature bearing failure.

With the aid of locknuts and new lockwashers, move the bearing assemblies solidly against shoulders of shaft. Tighten locknuts against the bearings and ensure locknuts and lockwashers are in place on both bearing assemblies.

6. Tape heavy fish paper over commutator to prevent damage during reassembly.

7. Apply two 3/8"-15 x 6" studs to commutator housing to pilot bearing housing into the end frame.

8. Apply a new gasket to the commutator end bearing housing.

9. Apply a new gasket to the fan end bearing housing. Assemble end frame and stator assembly over the bearing housing. Bolt end frame to the bearing housing.

10. Apply commutator end frame and brush rigging assembly to main frame assembly. Line up the prick punch marks on end frame and main frame which were made during disassembly of the fan motor.

11. To prevent damage to the external leads during heat shield application and handling, longer external leads clamped inside the stator extending out through the brush holder window opening, Figs. 1, 2, and 5, are now used. Measure leads from inside of window, straight out to center line hole in lug.

    To accomplish lead relocation on rebuilt fan motors, drill and tap two 1/4" x 20 holes in the frame, Fig. 13. Relocate the cable cleat mounted inside the motor, and reposition the motor upon reinstallation into the unit.

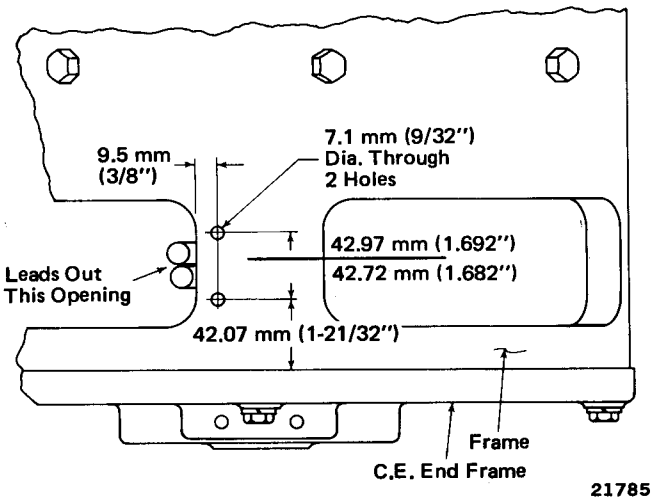

Fig. 13 - Dynamic Brake Fan Motor New Lead Clamp Hole And Cable Cleat Location

NOTE: When a motor and fan assembly is reinstalled in the number one position (short hood end) of a -2 type locomotive, rotate assembly one hole spacing (45°) in a counterclockwise direction to ensure against motor cables wrapping around sharp edge of stator.

The leads will leave the motor at approximately 1 o'clock (looking down from above the unit) assuming 6 and 12 o'clock are on the centerline of the locomotive with 12 o'clock closest to the long hood.

Repositioning of fan assembly may require extending carbody leads to reach motor leads. Equivalent cable should be used for this purpose. DO NOT eliminate one or more cleats.

12. Tie leads in place with nylon cord if necessary.

13. Tuck leads into brush holder window openings to protect them.

NOTE On motors with the leads extending from the end frame, it is necessary to place main frame assembly in vertical position and rest assembly on commutator end frame. Block under the end frame to prevent damage.

14. Apply an eyebolt to fan end of the shaft and install the armature assembly into main frame assembly. Guide commutator end housing pilot studs into the end frame.

15. Line up end frame and fan stator assembly with punch marks on the main frame, and bolt assemblies together. Tighten to 16-19 N·m (12-14 ft-lbs) torque.

16. Insert the hub locking key to the shaft.

17. Mount rotor hub on shaft. Apply washer and hub mounting locknut to fan end of the shaft and draw up tightly.

18. Mount fan rotor assembly to hub. Tighten bolts to 74.5-81.5 N·m (55-60 ft-lbs) torque. Clean shaft end cover and apply liquid Neoprene to the cover. While still wet, bolt cover and fan rotor to mounting hub.

NOTE: The paint on cover is used for sealing purposes.

19. Remove pilot studs from commutator end housing and apply bearing housing retaining cap screws.

20. Apply brushes to the brush holder. Secure fan motor line leads to brush rigging assembly. Blow out carbon dust.

BRUSH SETTING (KICK NEUTRAL METHOD)

Determination of proper brush location with respect to electrical neutral may be accomplished by performing the following procedure:

1. Using the commutator as a scale, check brush holder angular spacing. Holders should be equally spaced around the commutator to within 0.4 mm (1/64").
2. Count the number of commutator bars and the number of main field poles. Divide the number of commutator bars by the number of main field poles.

EXAMPLE: 147 bars divided by 4 poles equals 36-3/4. Use the nearest whole number which is 37. One to 37, in this case, will be considered the span.

3. Choose and mark one commutator bar – this is the number one bar in the span. Facing the commutator (counting counterclockwise), count out the number of bars found in Step 2 above. Mark the center of last bar in span.
4. Rotate armature until center of first bar in span is near the center of the top right brush holder as viewed from the commutator end. The last bar in the span should now be near the center of the top left brush holder.
5. Connect a 6 volt storage battery and a switch in series with the main field.
6. Isolate all brushes from the commutator.
7. Connect a zero center reading 50 millivolt ammeter across the first and last commutator bars in the span.
8. Read the armature kick voltage when the switch connected in series with the field circuit is opened and closed. Wait several seconds once the switch is closed to allow field current build up.
9. Excite the field; open the circuit. Note deflection on meter. Rotate armature approximately one commutator bar distance and repeat. If second reading is greater than the first, and of the same polarity, armature was rotated in wrong direction.

   If second reading is opposite polarity of first, the neutral point has been passed. Repeat above pattern of slightly rotating the armature until meter reading is zero or as near zero as possible.
10. Once neutral is found, check if the upper right and left brushes are located on the first and last bars of the span as shown in Fig. 14. If not, rotate commutator end frame while the armature remains in electrical neutral position, to bring brushes to within 0.4 mm (1/64") of locating setting.
11. Recheck setting after adjustment is complete.

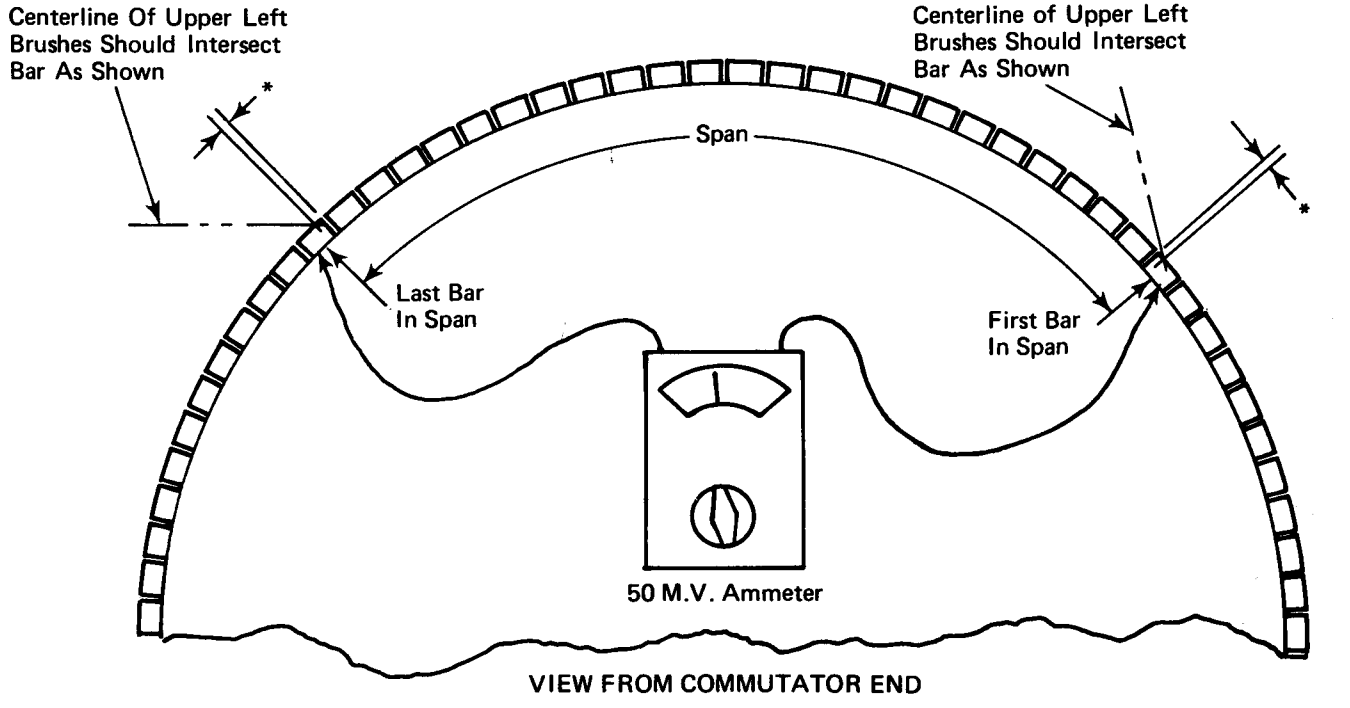

Fig. 14 – Brush Setting (Kick Neutral Method)

SERVICE DATA

FAN ASSEMBLY	8324324 1.22m (48") 36 H.P.	8324128 *8388765 1.22m (48") 18 H.P.	5547900 0.914m (36") 16 H.P.
COMMUTATORS			
Min. Commutator Dia.	180.98 mm (7-1/8")	180.98 mm (7-1/8")	180.98 mm (7-1/8")
Min. Neck Thickness	6.35 mm (1/4")	4.77 mm (3/16")	4.77 mm (3/16")
Undercutting Depth	1.2 mm (3/64")	1.2 mm (3/64")	1.2 mm (3/64")
Undercutting Width	0.64 mm (.025")	0.64 mm (.025")	0.64 mm (.025")
Eccentricity TIR - Cold	0.03 mm (.001")	0.03 mm (.001")	0.03 mm (.001")
- Hot	0.05 mm (.002")	0.05 mm (.002")	0.05 mm (.002")
BRUSHES			
Part Number	4997085	4997085	4997085
Type	Four-shunt dual-wafer	Four-shunt dual-wafer	Four-shunt dual-wafer
Minimum length	25.4 mm (1")	25.4 mm (1")	25.4 mm (1")
Pressure	0.68-1.13 kg (1-1/2 - 2-1/2 lb.)	0.68-1.13 kg (1-1/2 - 2-1/2 lb.)	0.68-1.13 kg (1-1/2 - 2-1/2 lb.)
RESISTANCES @	75° C (167° F)	75° C (167° F)	Values in ohms
Series field	.0619-.0695	.0326-.0360	.0326-.0360
Interpole field	.0302-.0333	.0262-.0289	.0262-.0289
Armature	.0521-.0575	.0397-.0437	.0397-.0437
Armature (1-10)	.0238-.0264	.0173-.0191	.0173-.0191
GREASE			
To fan end bearing cavity	85 g (3 oz.)	29 g (2 oz.)	29 g (2 oz.)
To commutator end bearing cavity	Fill	Fill	Fill
HI-POT TO GROUND (Cold And Dry)			
Armature	1800 V, 1 min.	1800 V, 1 min.	1800 V, 1 min.
Stator	1800 V, 1 min.	1800 V, 1 min.	1800 V, 1 min.
FAN ASSEMBLY			
Maximum unbalance	2160 mg·m (3 in. oz.)	2160 mg·m (3 in. oz.)	180 mg·m (1/4 in. oz.)

*Special Low Profile

MISCELLANEOUS

0.453 6 kg (1 lb.) Supermil M-125	9318549
3.6 kg (8 lb.) Chevron SRI-2 grease	8490018
Fan end bearing (Chevron SRI-2 packed)	907831
Commutator end bearing (Supermil M-125 packed)	908198
Commutator end bearing housing	4987641
Felt seal for bearing housing	1079145
Gaskets for bearing housings	5357547

*Varnish, Electrical Insulating - Modified Polyester Y-432 -200 Litres (55 Gal.) - Sterling Varnish Co.
Varnish mixture to have viscosity at 250-325 seconds using Ford Cup No. 4 at 21.1° C (70° F).
Thinner Solvent For Above Varnish
Chevron No. 1300 Solvent
Thompson - Hayward Chemical Company No. 2026 Solvent
**Xylol Thinner

An alternate thinner solvent may be blended using the following materials:
Mineral Spirits (Rule 66 Type Thinner) 80%
Butyl Acetate - Technical Grade 20%

NOTE: The above blend is required because the varnish sets up in the tank when mineral spirits thinner is used alone. Butyl acetate prevents this.

*To be used where compliance with pollution control regulations is required.
**Xylol may be used as a substitute thinner, however, Xylol DOES NOT comply with pollution control regulations.

Black air drying varnish	8122357
Liquid Neoprene, 3.8 litres (1 gal.)	8213281
Solder	8107868

REFERENCE

M.I. 1743 Scheduled Maintenance Program - Turbocharged Export Locomotives (645 Engines)
M.I. 1744 Scheduled Maintenance Program - Blower-Type Export Locomotives (645 Engines)
M.I. 3302 Main Generator - Types D32, D22 And D12
M.I. 3900 General Maintenance - Models D37, D47, D57, D67, D75 And D77 Traction Motors
M.I. 3904 General Maintenance - Export Type Traction Motors

} For Commutator Creepage Surface Maintenance

Litho in U.S.A.