



M AINTENANCE I NSTRUCTION

TRACTION MOTOR BLOWER MOTOR MODEL I-435

DESCRIPTION

Traction motor blower motor, Model I-435, Fig. 1, is basically a 5 HP, 149 volt AC, 4-pole, 3-phase, 106-2/3 cycle, 3150 RPM (at 800 RPM Diesel engine speed), squirrel cage type induction motor.

A squirrel cage induction motor consists essentially of a stator (the stationary part) and a rotor (the rotating part) and has no commutator, slip ring or brushes.

These alternating current motors receive electrical energy from the alternator and operate continuously as long as the engine is running and the field excitation to the alternator is applied.

These blower motors are used on locomotives having individual blowers for each traction motor. Each motor has a fan, or blower wheel, mounted on its rotor shaft to provide the cooling air.

On all locomotives, except the GP7 and GP9, the rotation of the blower wheel is clockwise when viewed from the fan end. On the GP7 and GP9 locomotives phases 1 and 3 of the locomotive wiring are reversed to give the blower motors counterclockwise rotation.

A 15 inch diameter fan wheel is used in the latest blower and fan motor assemblies in place of the 14 inch diameter fan wheel used on F2, F3 and BL2 locomotives. The 14 inch diameter fan wheel should only be used on BL2, F2 and F3 locomotives which have not been converted to higher tonnage ratings. The 15 inch diameter wheel must then be used. For

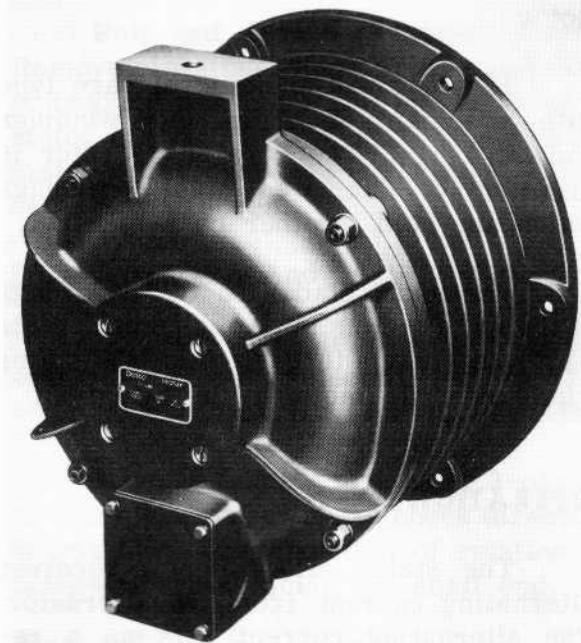


Fig. 1 - Traction Motor Blower Motor

interchangeability of blowers, see Master Parts Catalog No. 90, Book Two (2), Parts List 4103.

There are two 15 inch diameter blower wheel assemblies available, one for blower motors rotating clockwise and the other for blower motors rotating in a counterclockwise direction.

Stator

The stator consists of phase windings placed in slots of the core assembly. The core assembly consists of laminated steel punchings which are held together in a frame. The purpose of the frame is to support the stator core, prevent the core from turning and support the

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rotor bearing assembly. On the outside of the frame are a series of fins cast with the frame to aid in the cooling of the stator. The stator frame is cast aluminum.

The stator leads are connected directly to the alternator terminal board and circuits are not fused.

Rotor

The rotor is of squirrel cage type with aluminum die cast rotor windings and end rings. The core of the rotor is made up of laminated steel punchings which are held together by a lock nut.

The short blades on the end rings of the rotor act as fans and circulate air within the frame to cool rotor and stator windings while motor is in operation.

OPERATION

The stator of the motor receives alternating current from the alternator. The alternating current sets up a revolving magnetic field in the stator, and as this revolving field moves across the aluminum bars of the rotor a voltage is induced in the bars. The reaction between the rotating field set up by the stator and the field set up by the induced voltage in the rotor produces a turning force, or motor torque.

Speed Of Motor

Since the number of pairs of poles of the alternator and the number of pairs of poles of the blower motor stator are fixed, the speed of the motor will vary with the frequency of the generated alternating current voltage. An increase in the frequency increases the speed of the rotating field and therefore the speed of the rotor is increased.

The frequency will vary with engine speed, therefore the blower motor speed will vary in proportion to the engine speed.

ROUTINE MAINTENANCE

Cleaning

These motors are of the enclosed type, Fig. 2, therefore no internal cleaning is required.

The exterior of the motor should be kept free from dirt, water, oil and grease, for best heat transfer from motor to atmosphere.

Lubrication

The ball bearings used on the blower motor are of the double shielded pre-lubricated grease type. The bearings protected by inner and outer seals are now packed with Calol (OHT) grease (8190451 for 5 lbs.) and are designed to operate without further lubrication. On overhaul, the bearings should be removed and replaced with new factory grease packed bearings. For overhaul period, refer to Scheduled Maintenance Program, Maintenance Instruction 1704.

NOTE: Earlier bearing, 5382611, was packed with an Andok type grease. When installing bearings 5382611, apply Andok "BR" grease to the bearing cavities, refer to Step 2 in section entitled, "Assembling Rotor Bearings." When installing the new Calol (OHT) grease packed bearings 954386 or 954824, apply Calol (OHT) grease to the bearing cavities. Bearings containing the Calol (OHT) grease have the EMD part number stamped on the carton.

OVERHAUL MAINTENANCE

Inspection Before Teardown

When blower motor is removed from the locomotive unit the following inspection should be made to determine the extent of repairs required:

1. Set motor in a suitable fixture or stand. Do not damage the external

cooling fins on motor frame in handling the assembly.

2. Check electrical circuit to ground with a megohmmeter. Windings should have a minimum of one (1) megohm above ground when dry. If below even after drying, strip and rewind the stator.
3. If electrical condition of blower motor is unknown, run motor from a 85 volt, 3-phase, 60 cycle source, or from a 149 volt, 3-phase, 106-2/3 cycle source.

When motor is running, the current in each line should be measured. These line currents should be equal, or balanced within 10%. If the line currents are not within 10%, it may be assumed that there are turn to turn shorts in the stator coil which must be eliminated.

DISASSEMBLY PROCEDURE

To Remove Rotor Assembly From Stator Assembly

A study of Fig. 2 prior to disassembling motor is recommended as the cross-section drawing clearly illustrates why the sequence in the disassembly procedure given here is of utmost importance.

1. Remove locknut, blower wheel assembly and key from rotor shaft.

NOTE: On some blower and motor assemblies, the blower wheel assembly must be removed from the rotor shaft before the blower motor can be removed from the blower housing. Remove locknut; keep rotor shaft from turning by inserting an "L" shaped cold rolled steel

rod into one of the holes in the hub of the blower wheel to remove locknut. To remove blower wheel assembly from shaft use grip puller and apply puller to the holes in the rotor hub. After removing blower wheel assembly, the blower motor may then be removed from the unit to the shop.

2. Place motor in a vertical position, shaft end down, on a suitable fixture and bolt tight.
3. Remove the four (4) cap screws and lockwashers from end frame.
4. Remove the four (4) cap screws, lockwashers and cover from the terminal box. Remove block and plate from inside of terminal box and free motor leads.
5. Remove the four (4) bolts and washers from each bearing housing.
6. Bolt suitable lifting plate to end frame using the bearing housing cap screw holes.
7. With the aid of a crane, remove the end frame, bearing assemblies, and rotor assembly. The end frame may have to be loosened from stator

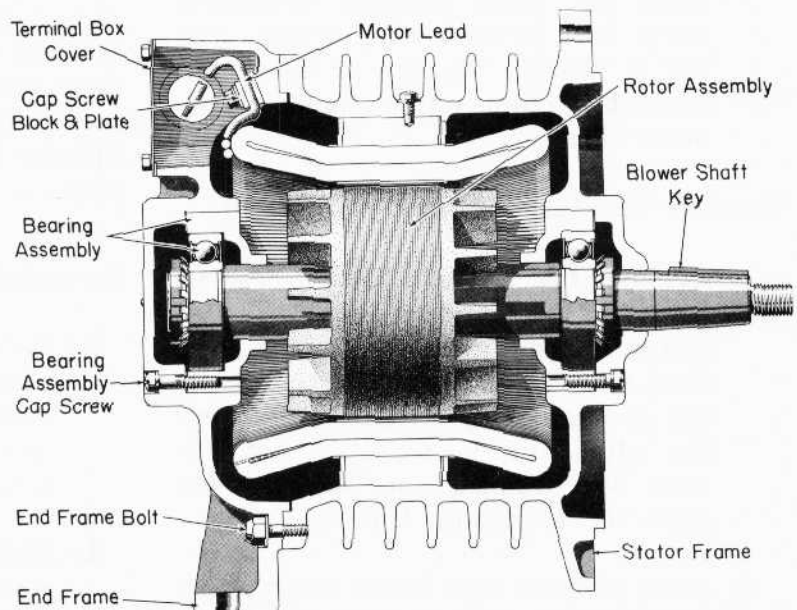


Fig. 2 - Cross-Section Drawing Of Traction Motor Blower Motor

frame by tapping on projecting bosses using a rawhide or lead hammer. Slack should be taken up with the crane.

CAUTION: Care should be exercised when tapping on end frame as it is cast aluminum.

8. Remove rotor assembly and place rotor in a wooden cradle. Care must be exercised not to injure the laminations and windings during handling.

Removing Rotor Bearing Assembly

1. Remove lifting fixture from end frame. The end frame may now be removed by slipping it off the bearing housing.
2. Remove the locknut from both bearing assemblies.
3. Apply the puller studs and the puller to bearing housings. Pull off the bearing and the housing simultaneously from the shaft. After removing the bearings from the shaft, discard (scrap) bearings.

Wrap the other bearing assembly parts in a protective covering and tag to identify the end of the rotor assembly from which these parts were taken.

Varnish Treatment (Stator Assembly)

1. Remove the three (3) bolts holding the core to the housing. Place the stator assembly in a convection type oven set at 160° C. Leave the assembly in oven long enough to expand the aluminum housing so that the core and winding can be removed from the aluminum housing.
2. Apply friction tape to the main leads and terminal lugs to prevent varnish accumulation on leads during varnish treatment of stator assembly.

3. Preheat stator sub-assembly for (2) hours in oven set at 155°-160° C.

4. Dip stator sub-assembly while hot in clear baking varnish type R-851-F (8160879 for 55 gal.) for 6 minutes. Varnish should have a viscosity of 40-55 seconds at 21.1° C. as measured with a Ford cup #4 orifice. Varnish temperature should be maintained between 20° and 50° C. The thinner used is "Xylol."

5. Bake stator assembly (5) hours in oven set at 155°-160° C.

6. Remove protective covering from main leads applied before varnish treatment. Clean off excessive varnish from outside of the lamination core.

Assembly Of Stator Winding In Stator Housing

Place the aluminum stator housing in a convection type oven and heat for (4) hours at 160° C.

Remove the stator housing from oven and set on a suitable stand with the large end up. Place the stator core and coil assembly into the aluminum housing with the lead end up. Align the three holes in the core with the holes in the housing. Apply the three dog-pointed fillister head screws and lockwashers to hold the core assembly in the housing.

Assembling Rotor Bearings

1. Clean all parts and cavities surrounding bearings thoroughly before starting to assemble. Carefully inspect all parts for wear, burrs and nicks.
2. Coat each side of the new bearings and cavities surrounding the bearings with 2 ounces of the type grease recommended, refer to the section entitled, "Lubrication."

3. Install new factory pre-lubricated bearings in each bearing housing.
4. Place bearing and housing assemblies on rotor shaft. The fit of the bearing to the shaft should be a press fit. Press on inner race only when installing bearing on shaft.
5. Apply a small amount of grease on the lock washers and place on rotor shaft next to bearings. Run locknut down until bearing inner race bottoms on shaft. Lock the nut in place.
6. Place locating studs in bearing housings, both ends. The locating studs in the shaft end bearing housing should be long enough to guide the rotor through the small air gap in the stator frame.
7. Apply new gaskets to both bearing housings.
8. Slide endframe over bearing housing, remove locating studs, and fasten end frame to bearing housing with the four fillister head cap screws.

Assembly Of Rotor In Stator Frame

Place stator in a vertical position, open end of stator up.

Apply anti-seize compound, white lead, and oil to the pilot between motor housing and end frame to prevent corrosion of parts at this point. Apply lifting fixture to rotor assembly. Pick up rotor assembly with hoist and enter rotor into stator frame. Guide rotor with locating studs, also guide the three main leads into terminal box.

Bolt end frame to stator frame. Remove locating studs from shaft end of bearing assembly and bolt bearing to stator frame. Secure main motor leads inside of terminal box with clamp, block, bolts and washers.

Final Inspection And Test

Give the complete blower motor assembly a high potential test of 1200 volts RMS, 60 cycles, for 10 seconds.

Make a running test using 3-phase, 85 volts RMS, 60 cycle to check direction of rotation. The direction of rotation is clockwise when facing the shaft end.

Assembly Of Blower Wheel On Shaft

On most blower and motor assemblies, the blower wheel assembly can be mounted on the shaft before bolting the

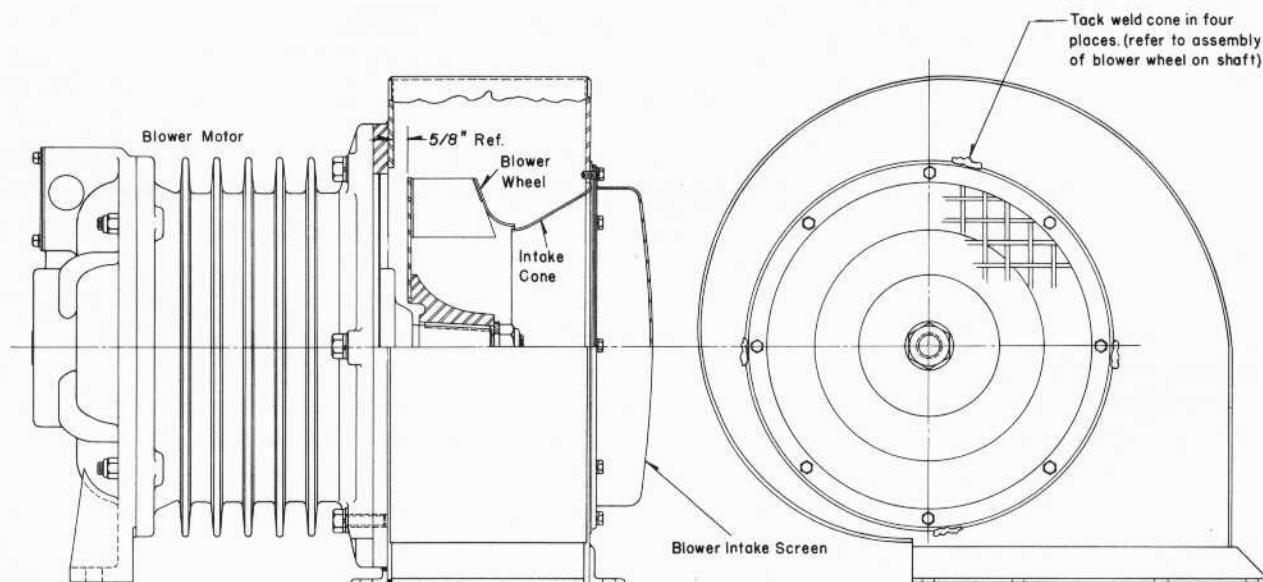


Fig. 3 - Traction Motor Blower Motor And Assembly

blower motor to the blower housing; however, on some blower and motor assemblies, the blower motor has to be bolted to the housing before the wheel is on the motor shaft and the wheel put on the shaft through the 15-1/4" hole in the inlet side of the housing. The blower housing intake cone is bolted to the housing after mounting the wheel and should be centered with the inlet ring and the wheel to keep the two from rubbing.

When replacing air intake cone on the blower housing, care should be taken to locate the intake cone to clear the blower wheel at assembly and then secured in place on the blower housing by bolts (where used) and tack welds, Fig. 3. Do not tack weld intake cone to housing

if the blower motor and wheel assembly cannot be removed from rear end opening of housing. The nominal clearance between blower wheel and intake cone is approximately 3/32" with the old style 9-5/16" diameter intake cone and 1/8" with the new style 9-1/4" diameter intake cone. The intake cone can be centered by using a feeler gauge between the cone and blower wheel.

Stator Connection Diagram

The connection diagram shown in Fig. 4, is for blower motors which have a 2/3 pitch stator winding. Earlier motors had a 5/6 pitch stator winding. When the winding of a stator with a 5/6 pitch fails, the stator is rewound with a 2/3 pitch winding.

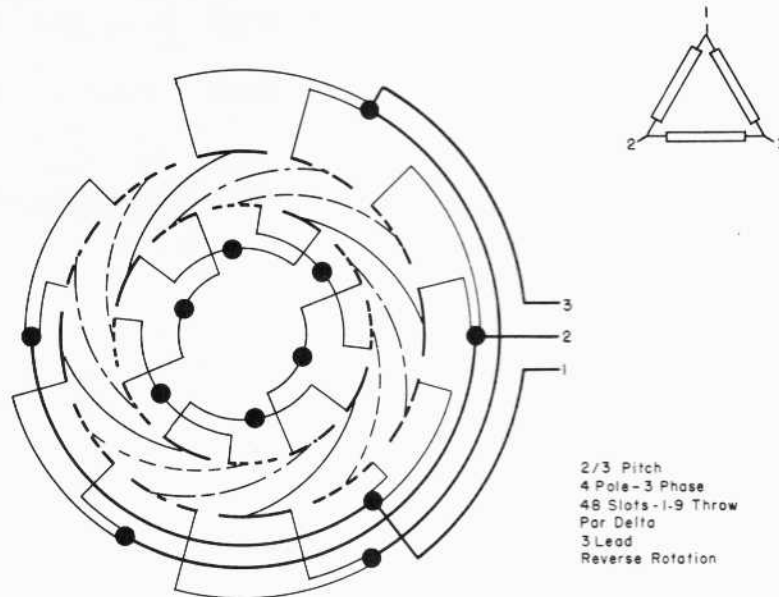


Fig. 4 - Line Diagram Connection Of Traction Motor Blower Motor