ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

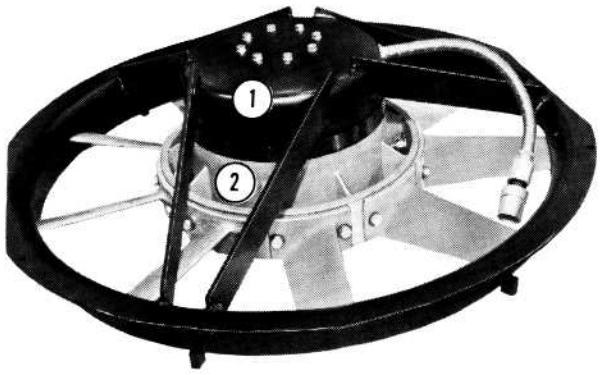
MAINTENANCE INSTRUCTION

48" AC MOTOR DRIVEN COOLING FAN

DESCRIPTION

Three configurations (6, 8, and 9 blade) of AC motor driven cooling fans are used in current production locomotives. The application and assembly part numbers of these fans will be found in the Maintenance Data.

The AC motor driven cooling fan, Fig. 1, basically consists of an inverted squirrel-cage type induction motor. The motor differs in construction from conventional squirrel-cage motors by having the rotor located outside of the stator and rotating with the fan.



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1. Frame and Sator Assembly
2. Fan and Rotor Assembly

Fig. 1 — Nine Blade Cooling Fan Assembly

OPERATION

During circulation through the diesel engine and air compressor, the cooling system water picks up heat. This heat is dissipated and the water temperature controlled by means of a radiator assembly and AC motor driven cooling fans. Two or more fans are used depending upon the locomotive model, engine size, and cooling requirements.

The fans are mounted in a hatch located in the roof of the locomotive above the engine cooling system. When operating, the fans draw air through the radiator assemblies removing heat from the circulating water. The heated air is discharged through the roof of the locomotive. The fans, which operate independently, are controlled automatically by thermostatic switches and contactors which function with changes in the cooling system temperature.

Motor and fan speed is directly proportional to the AC frequency which in turn depends on the engine (and alternator) speed. The cooling fans would run at approximately 600 RPM at engine speed of 315 RPM and approximately 1700 RPM at full engine speed of 900 RPM. Rotation is clockwise when looking down at the fan.

For further information concerning cooling system operation, refer to applicable Locomotive Service Manual.

MAINTENANCE

For maintenance required, inspection intervals, and overhaul period, refer to the applicable Scheduled Maintenance Program.

*NOTE: Information contained herein is applicable to equipment being produced as of the date of publication.

LUBRICATION

Ball bearings used on cooling fans are the double shielded prelubricated type. The bearings, protected by inner and outer seals are packed and sealed at the factory with Chevron BRB-2 grease and are designed to operate without further lubrication. On overhaul the bearings should be removed and replaced with new factory packed bearings.

OPERATING INSPECTION

Periodic inspection of the cooling fans should be made as follows:

1. Inspect to see that the fan is securely fastened to the locomotive hatch and that guard is in place.
2. Make sure that there are no restrictions to fan rotation or air flow.
3. With the engine running, complete a circuit through thermostat switch to cause the fan to operate. Listen for unusual noises that could indicate possible internal or external trouble. Check for vibration or other signs of unbalance.

WARNING: Before doing any work on the fan make sure it is disconnected from power source or that engine is shut down. This will prevent fan from being inadvertently started.

COOLING FAN RECONDITIONING

When the cooling fan is removed from the locomotive for reconditioning, the following preliminary inspection should be performed before disassembly.

PRELIMINARY INSPECTION

1. Place fan and motor on a suitable stand with the fan end up. Be careful not to damage flexible conduit or connection plug.
2. Slowly rotate fan manually to check freedom of rotation.
3. Test stator winding insulation resistance using a 500 volt DC megger. The allowable minimum indication is 1 megohm. If a megger indication of 1 megohm cannot be obtained, stator may have to be dried by placing in a 120° C. oven for 4 to 6 hours.

   After drying, if the megger indication is still less than 1 megohm, further testing should be made after disassembly.
4. Mount motor in a fixture designed to prevent air flow through the fan during running test.
5. Connect motor leads to an 85 volt AC, 3 phase, 60 cycle power source or to the locomotive alternator providing 149 volts at 106-2/3 cycles.
6. With the motor running, check the voltage in each phase with an ammeter. The voltage in each phase should be equal within 10%. If a greater difference exists, it may be assumed that the stator coils are shorted between turns (turn-to-turn shorts).

DISASSEMBLY

With the fan and motor positioned with the fan end up, refer to Fig. 2 and disassemble as follows:

1. Remove the cap screws from the fan hub and remove the cover plate.
2. Remove fan and rotor assembly from shaft hub. If necessary, lightly tap center of shaft hub to loosen fan pilot from shaft hub.
3. Separate the sections of the 3 pole male plug to expose terminal connections of leads. Remove terminals from leads and remove plug.

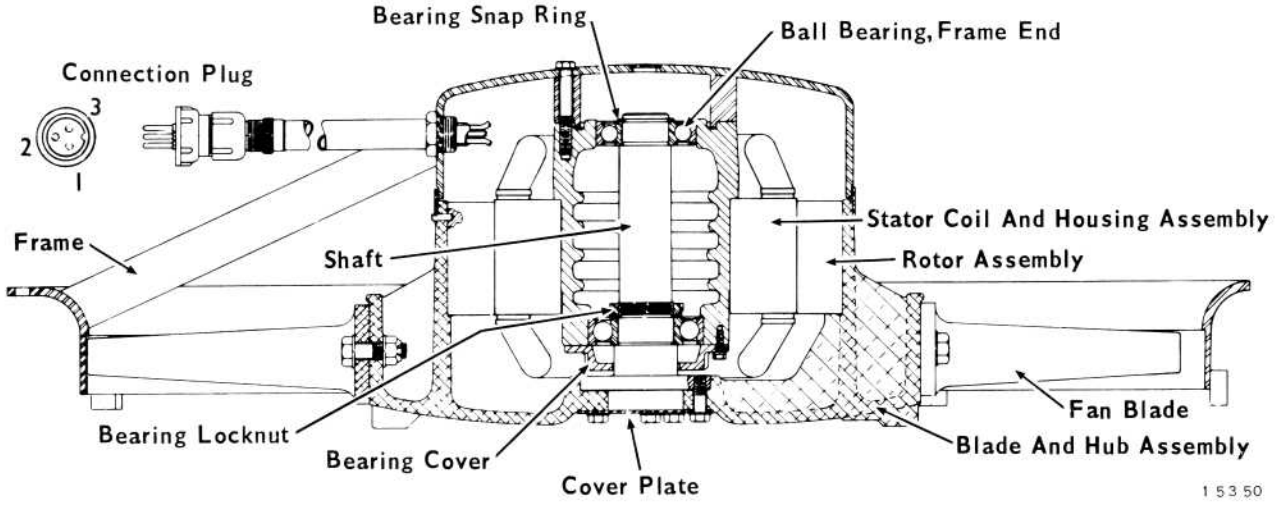

Fig. 2 — Cross-Section Of Cooling Fan Assembly

4. Loosen conduit fastener from the frame and remove fastener and flexible conduit from the leads. If the leads are not colored, refer to Fig. 3 and tag each lead.

5. Turn stator and frame assembly upside down, blocking under shaft to support stator winding assembly.

6. Remove cap screws from frame to

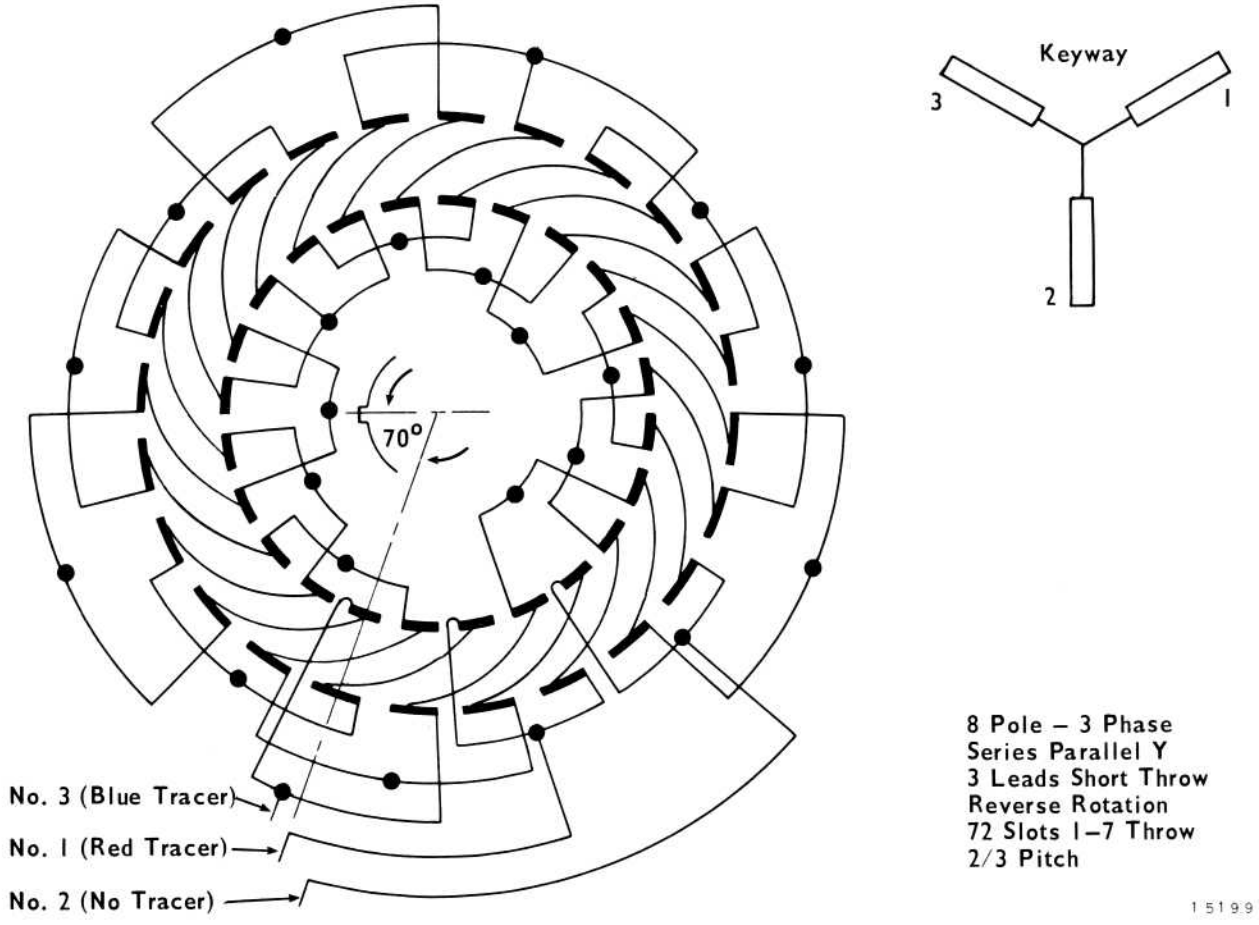

Fig. 3 — Fan Motor Connection Diagram

stator winding assembly. Remove frame from bearing housing and stator assembly.

7. Remove stator assembly and mount on a clean work bench in preparation for removal of bearing assembly.

REMOVAL OF BEARING ASSEMBLY FROM SHAFT

1. Remove the cap screws holding bearing cover to housing. Removal of bearing assembly is to be made from hub end of shaft.

2. Remove bearing assembly and shaft from housing by tapping with a soft mallet on the small end of the shaft.

3. After removal of bearing assembly and shaft from housing in stator assembly, remove snap ring from small bearing end of shaft and remove bearing by applying pressure to the inner race.

4. Remove bearing lock washer and nut from shaft and remove bearing cover and large bearing simultaneously from shaft. Discard (scrap) bearings removed.

CLEANING OF STATOR ASSEMBLY

The stator assembly should be cleaned of all dirt and grease prior to varnish treatment which follows. The stator should be blown out with clean dry compressed air at a reasonably low pressure. If high pressure is used, there is a danger of loosening insulation or protective coating on various parts.

If deposits of dirt are caked or difficult to remove, it may be necessary to clean stator with a cloth dampened with a solvent. Most solvents require some time to evaporate, so no electrical test or varnish treatment should be attempted immediately after cleaning.

WARNING: Use the usual safety precautions that apply to inflammable fluids. Provide adequate ventilation when any type of solvent is being used.

VARNISH TREATMENT OF STATOR ASSEMBLY

When stator is ready for varnishing, it should be treated as follows:

1. Mask off machined surface of bearing housing and apply protective covering to the main leads to prevent varnish from getting on leads.

2. Preheat stator two hours at 155° to 160° C. in a convection type oven.

3. Remove stator from oven and while still hot, dip in clear baking varnish thinned with Xylol and mixed according to instructions given in Maintenance Data. Allow to soak in varnish for five minutes.

4. Bake stator assembly for five hours at 155° to 160° C.

NOTE: If an additional dip and bake varnish treatment is needed, the first baking time can be reduced to one hour and the stator dipped while hot a second time. The final baking time should remain at five hours.

CLEANING AND PAINTING OF STATOR ASSEMBLY

1. Remove protective material from main leads and machined surface of bearing housing. If necessary, clean varnish

from machined surface using a cloth saturated with Xylol.

2. Clean off excess varnish from outside of stator laminations. This cleaning can be accomplished with a power driven wire brush being careful not to damage the windings.

3. Tap out the threaded holes.

4. Paint bearing housing with red air drying enamel and paint outside of laminations with black air drying varnish. Refer to Maintenance Data for part numbers.

5. Allow painted areas to dry thoroughly.

SHAFT AND BEARING ASSEMBLY

1. Make sure that shaft and housing bore are clean and free of burrs.

2. Apply additional grease to the cavity in the bearing cover and install cover on shaft, small diameter of bearing cover toward shaft flange. Refer to Maintenance Data for type and quantity of grease.

3. Press a new fan and bearing assembly on shaft. Apply pressure to face of inner race and drive solidly up against the shaft shoulder. Apply lock plate and nut. Tighten nut and bend up lip of lock plate into nut slot to lock nut in place.

4. Install the small bearing assembly on the shaft. Apply pressure directly (straight and square) to face of inner race and drive bearing solidly up against the shaft shoulder. Apply snap ring in groove of shaft to hold the bearing in place.

5. Apply additional grease to the side of the bearing facing the fan end bearing. Refer to Maintenance Data for type and quantity of grease.

FINAL ASSEMBLY OF MOTOR

1. Apply a thin film of grease to the fits between frame and bearing housing. Install stator winding assembly in frame so that the leads will be in line with the conduit hole in the frame. Pull leads through hole as stator winding assembly is being slid into frame.

2. Apply lock washers and cap screws to fasten the frame to stator winding assembly. Tighten cap screws evenly to 70-75 ft-lbs.

3. Arrange stator leads evenly and slide the flexible conduit and conduit fastener over leads. Tighten conduit fastener to frame.

4. Slide bottom half of plug over cable. Crimp terminals (male contacts) to leads. Complete assembly of plug. Refer to Fig. 3 for terminal arrangement. Refer to Maintenance Data for part number of terminals and die size of crimping tool.

5. Check tightness of balance weights on fan and rotor.

6. Mount the fan and rotor assembly on shaft hub. Use two pilot bolts in hub holes to guide fan assembly onto shaft hub.

7. Clean the cover plate and apply red insulating enamel to the cover. While paint is still wet, apply cover plate over pilot bolts. Remove pilot bolts.

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

8. Apply lock washers and cap screws to fasten the cover plate to fan assembly.

Tighten cap screws evenly to 70-75 ft.-lbs.

Perform a half hour running test as specified in Preliminary Inspection paragraph, Steps 4, 5, and 6. During running test, fan should run smoothly without noticeable vibration. Refer to Maintenance Data for maximum allowable unbalance. If vibration is excessive, the fan and rotor assembly should be removed and dynamically balanced. Balancing is accomplished by adding washers as necessary to the fan blade mounting bolts (4 washers per bolt maximum) in conjunction with longer bolts so that at least two full threads protrude beyond the end of the nut.

FINAL INSPECTION AND TEST

Give the complete motor a high potential test. Refer to Maintenance Data for voltages and times to be used.

MAINTENANCE DATA

FAN ASSEMBLY

Fan Assembly Part No.	No. of Blades	Application
8311479	6	GP38, SD38
8310416	8	GP40, SD40, SDP40
8379212	9	SD45, FP45, F45, SD39

Maximum unbalance ..... 5 in. oz. at 750 RPM

BLADE ASSEMBLY

Torque Blade Mounting Bolts ..... 95-110 ft-lbs.

STATOR ASSEMBLY

Hy-Pot test ..... 120 volts to ground, 10 seconds

PLUG ASSEMBLY

Plug 8323955
Terminals (male contacts) ..... 8327717 (size 125/24)
Crimping tool size ..... T & B #33

BEARING ASSEMBLY

Fan end bearing 907786
Frame end bearing 907931

GREASE

Chevron BRB-2 8398924
To be added to bearing cavity ..... 3 oz.

MISCELLANEOUS

Clear baking varnish (55 gallons) 8136692
Xylol, thinner (5 gallons) 8089758
Varnish-Xylol mixture to have viscosity of 120-125 seconds Ford Cup #4 at 21.1° C.
Black air drying varnish 8122357
Red insulating enamel 8061130

Litho in U.S.A.