

MAINTENANCE INSTRUCTION

FAN SHAFT BEARINGS

INTRODUCTION

The cooling fan on most switcher locomotives is powered mechanically by the air compressor which is directly coupled to the diesel engine with a drive shaft. The fan is turned indirectly (with "V" belts) by a sheave on the air compressor stub shaft. Refer to Fig. 1. This arrangement is necessary because of the difference in height between the cooling fan axial centerline and the crankshaft centerline of the diesel engine. The compressor drives the lower sheave which is connected to the upper sheave through multiple "V" belts. The upper sheave turns the fan drive

shaft which is connected to the cooling fan. The fan drive shaft is supported on each end by a ball or roller bearing. These bearings must withstand the loading forces involved as well as support the weight of the cooling fan assembly. This publication illustrates the assembly of the fan shaft bearings. The bearings are sometimes referred to as pedestal bearings because the bearings are used to support the fan drive shaft on top of the fan pedestal structure.

HISTORY

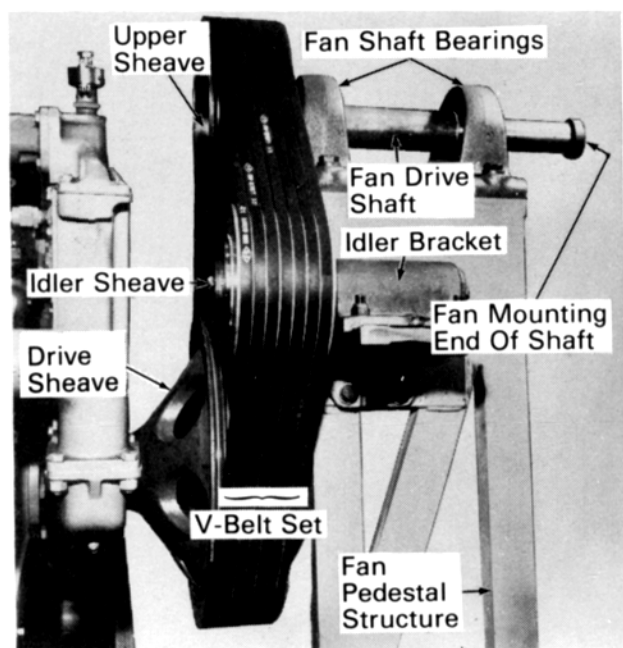
As the switcher locomotive is constantly being improved and modernized, different fan shaft bearings have been used to increase the reliability of the system. Other changes have been made to provide overall compatibility of system components. This publication deals with all of the various bearing arrangements currently found on switcher locomotives.

All bearing modifications can be classified into one of three arrangements depending upon the date of manufacture of the locomotive.

1. Switcher locomotives made before October 1973 - SW1000, 1001, 1500, 1504.
2. Switcher locomotives made after October 1973 - SW1000, 1001, 1500.

NOTE: Units made before October 1973 could be converted (conversion kit 8498237) to the same configuration as those made after October 1973.

3. 1500 HP switcher locomotives made after March 1974 - MP15.



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Fig. 1 - Fan Pedestal And "V" Belt Assembly

ASSEMBLY

The principal differences between the three classifications of fan shaft bearing assemblies are the

type of bearings – ball or roller, the lubrication interval – permanent or periodic lubrication, and the height adjustment of the bearings relative to the pedestal assembly. Refer to Fig. 2.

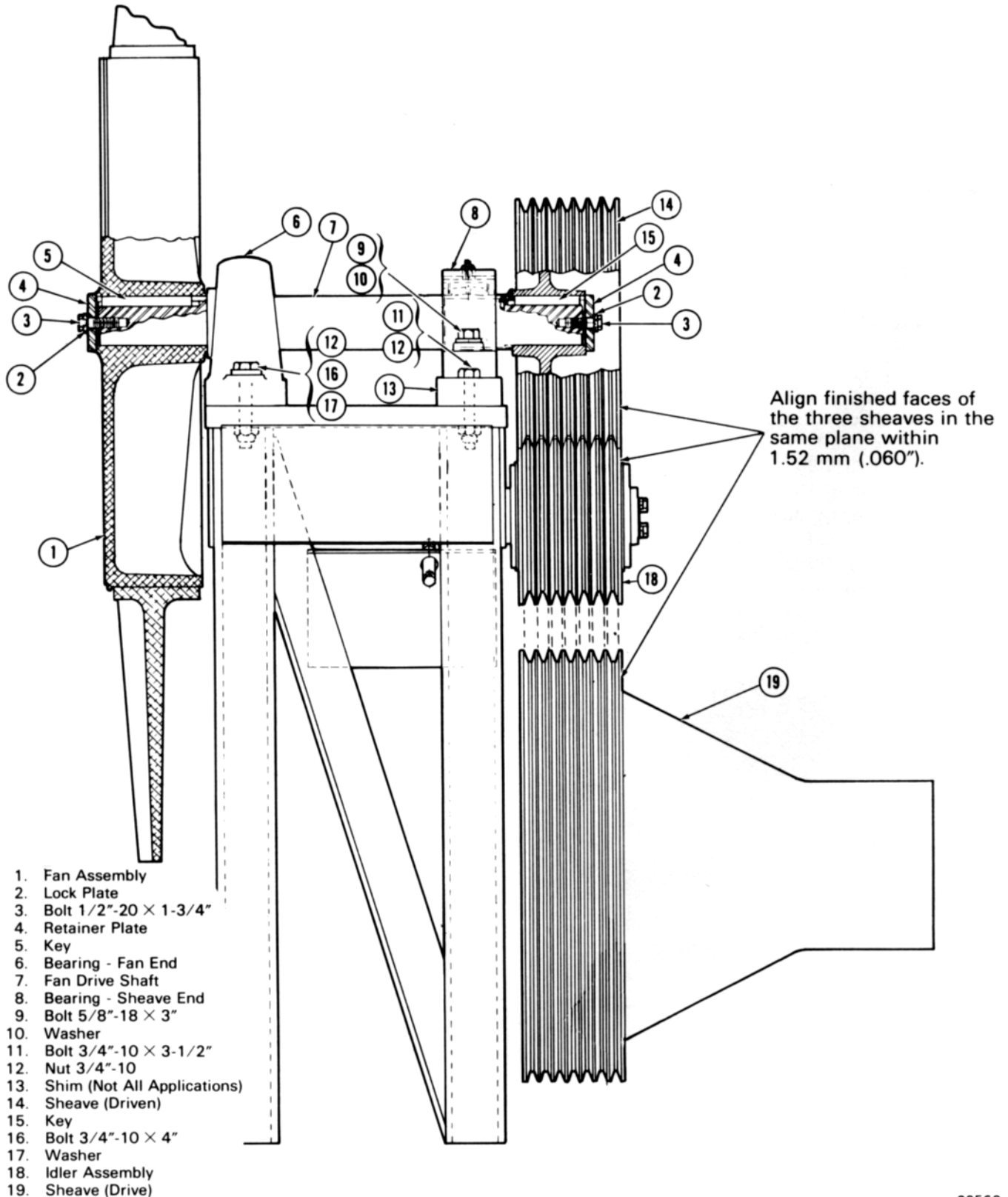


Fig. 2 – Fan Pedestal Assembly

NOTE: In the confined location of the fan pedestal assembly, the cooling fan itself restricts any attempt to work in that area. In order to provide some working space while the fan shaft bearings are being installed, a spacer is applied instead of the fan. When the servicing is completed, the spacer is replaced by the fan. Refer to Fig. 3.

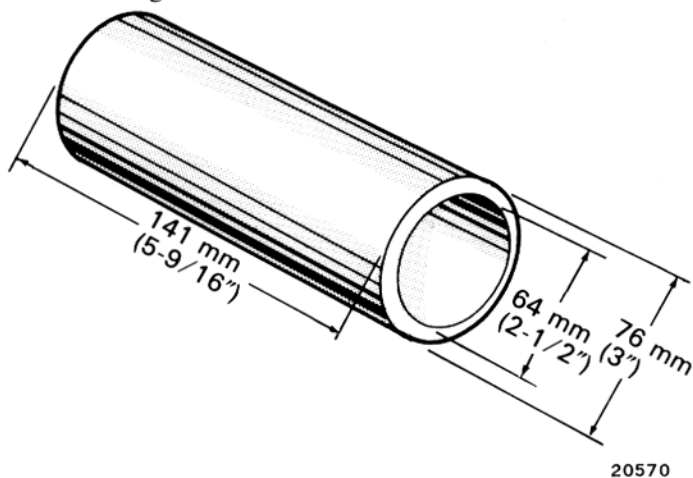


Fig. 3 - Spacer To Replace Fan
During Bearing Assembly

**SWITCHER LOCOMOTIVES MADE BEFORE
OCTOBER 1973 -- SW1000, 1001, 1500, 1504
(A Ball Bearing At Sheave End
And a Ball Bearing At Fan End)**

1. Press bearing assemblies onto shaft and against shoulder of shaft with loose bearing collars outboard. Remove set screws in bearing collars and rotate collars on bearings from counterclockwise to clockwise, noting free traverse. Position collar midway between this traverse.
2. Apply "V" belt sheave, drive key, retaining washer and tighten retaining bolts (300 M bolts) to 122 N·m (90 ft-lbs) torque.
3. Apply tubular spacer 141.3 mm (5-9/16") long (in place of fan), drive key, and retaining washer and tighten retaining bolts (300 M bolts) to 122 N·m (90 ft-lbs) torque. Mark position of collar on bearing before removing spacer.
4. Mount shaft, bearings, shim, sheave, and spacer assembly to fabricated pedestal, and align fan sheave and idler sheave so that faces are in same plane (horizontally and vertically) within 1.52 mm (.060"). Torque retaining bolts of bearings to 305 N·m (225 ft-lbs).

5. Make certain that shaft assembly rotates freely. Total lateral movement between inner and outer races of ball bearings should be more than .127 mm (.005").
6. Inspect pedestal assembly on deck of locomotive to ensure that fan sheave and idler sheave are in same plane with drive sheave on air compressor within 1.52 mm (.060").
7. Apply fan drive belts and adjust tension per M.I. 1216.
8. If assembly has been made without fan, remove spacer and install fan, retaining washer and torque retaining bolts (300 M bolts) to 122 N·m (90 ft-lbs). Position collar on bearing to marked position before torquing. Lock bolts by bending up tabs on lock plate.
9. Recheck tightness of retaining bolts at sheave end of shaft and lock bolts by bending up tabs on lock plate.
10. Apply shutter and screen assemblies.

NOTE: Both the fan end bearing and the sheave end bearing are permanently lubricated and require no further maintenance.

**SWITCHER LOCOMOTIVES MADE AFTER
OCTOBER 1973 AND OLDER UNITS
CONVERTED TO THIS CONFIGURATION --
SW1000, 1001, 1500, 1504
(A Roller Bearing At Sheave End
And A Ball Bearing At Fan End)**

1. Press bearing assembly 9425296 onto fan end of drive shaft and against shoulder of shaft with loose bearing collar outboard. Remove and discard set screw from locking collar and rotate collar on bearing from clockwise to counterclockwise noting free traverse. Position collar midway between this traverse.
2. Press bearing assembly 9436196 onto sheave end of drive shaft and against shoulder of shaft with inner race extension outboard. A shim is necessary to adapt the new roller bearing to the shaft height determined by the fan end bearing. Apply adapter shim to bearing housing using 280-M bolts only. Torque bolts to 203 N·m (150 ft-lbs).
3. Apply fan shaft sheave key, retainer plate, lock plate, and sheave retainer bolts.

**1500 HP SWITCHER LOCOMOTIVES MADE
AFTER MARCH 1974 -- MP15
(A Roller Bearing At Sheave End
And A Roller Bearing At Fan End)**

4. Tighten retaining bolts (300 M bolts) to 122 N·m (90 ft-lbs) torque as follows: Initially torque each bolt in sequence to 68 N·m (50 ft-lbs). Repeat torquing of each bolt in sequence to 122 N·m (90 ft-lbs) until no further rotation is noted.
 5. In place of fan and key apply 141 mm (5-9/16") long tubular spacer (refer to Fig. 3), retainer plate, lock plate, and fan retainer bolts. Tighten bolts (300 M bolts) to 122 N·m (90 ft-lbs).
 6. Mount spacer, shaft, bearings, and sheave assembly to fabricated pedestal. Install bolts in fan end bearing housing and pedestal.
 7. Align fan shaft sheave with idler sheave, and with drive sheave on air compressor so that all three sheaves are in the same plane (horizontally and vertically) within 1.52 mm (.060"). Torque bolts to 305 N·m (225 ft-lbs).
 8. In like manner install bolts in sheave end bearing housing, shim, and pedestal.
 9. Position sheave end bearing housing in center of 9.5 mm (3/8") axial float. Torque bolts to 319 N·m (235 ft-lbs).
 10. Check shaft assembly for freeness to rotate.
 11. Apply fan drive belts and adjust tension per M.I. 1216.
 12. Recheck tightness of sheave retaining bolts. Lock bolts by bending up tabs on lock plate.
 13. Remove fan retainer bolts, lock plate, retainer plate, and tubular spacer. Apply fan, key, retainer plate, lock plate, and fan retainer bolts. Tighten bolts (300 M bolts) to 122 N·m (90 ft-lbs). Lock bolts by bending up tabs on lock plate.
 14. Apply shutter and screen assemblies.
- NOTE: The fan end bearing is permanently lubricated but the sheave end bearing requires periodic lubrication. Refer to LUBRICATION REQUIREMENTS.
1. With inner race extensions outboard, press bearing assembly onto shaft and against shaft shoulder. Bearing assembly with axial free play is located at sheave end of shaft, and neither bearing has a locking collar. No shim is necessary as the pedestal height has been raised in this application.
 2. Apply "V" belt sheave, drive key, retaining washer and tighten retaining bolts (300 M bolts) to 122 N·m (90 ft-lbs) torque as follows: Initially torque each bolt in sequence to 68 N·m (50 ft-lbs). Repeat torquing of each bolt in sequence to 122 N·m (90 ft-lbs) until no further rotation is noted.
 3. Assemble tubular spacer 141 mm (5-9/16") long (in place of fan), drive key, and retainer plate to shaft. When spacer is applied, tighten retaining bolts to 122 N·m (90 ft-lbs).
 4. Mount shaft with bearings, sheave and spacer to fabricated pedestal assembly. Align fan sheave and idler sheave so the faces are in same plane (horizontally and vertically) within 1.52 mm (.060"). After aligning sheaves, torque retaining bolts of bearing next to fan to 278 N·m (205 ft-lbs).
 5. Position housing of bearing next to sheave in center of 9.5 mm (3/8") axial free play between housing and bearing. Torque retaining bolts of bearing assembly next to sheave to 278 N·m (205 ft-lbs). Check shaft assembly for freeness to rotate.
- Inspect pedestal assembly on deck of locomotive to ensure that fan sheave and idler sheave are in same plane with drive sheave on air compressor, within 1.52 mm (.060").
6. Apply fan drive belts and adjust tension per M.I. 1216.

7. After assembly has been made, remove spacer, lock plate, retainer plate and bolts. Install fan, drive key, lock plate, retainer plate and bolts. Torque retaining bolts to 122 N·m (90 ft-lbs) following procedure outlined in Step 2.
8. Recheck tightness of retaining bolts at sheave end of shaft. Retorque, if necessary, to 122 N·m (90 ft-lbs) following procedure outlined in Step 2. Lock bolts by bending up tabs on lock plate. Apply shutter and screen assemblies.

NOTE: Both fan end bearing and sheave end bearing require periodic lubrication. Refer to LUBRICATION REQUIREMENTS.

ALIGNMENT

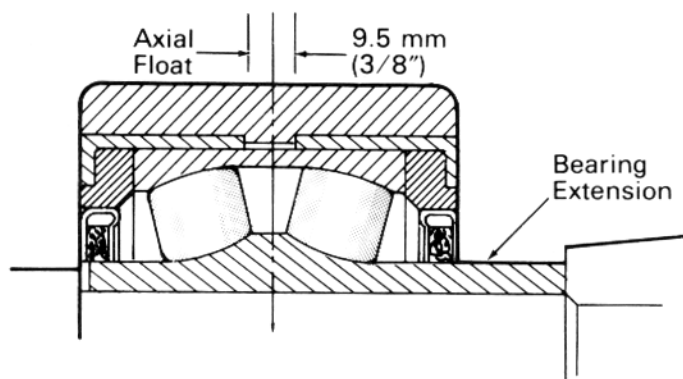
Alignment of "V" belt sheaves as well as shaft and pedestal base orientation are critical to the long term reliability of the bearings. Specified tolerances should be strictly observed.

1. Align fan end bearing housing with drive shaft so that bearing housing is square with shaft to within 1.52 mm (.060").
2. Fan shaft sheave must align with idler sheave and with drive sheave on air compressor so that all three sheaves are in the same plane (horizontally and vertically) within 1.52 mm (.060"), i.e. maximum misalignment between any two sheaves cannot exceed 1.52 mm (.060").
3. Sheave end bearing housing must align with drive shaft so that bearing housing is square with shaft to within 1.52 mm (.060").

NOTE: If bearing housing and/or bearing housing shim mounting holes in the pedestal assembly prevent proper alignment of any item in the above sections, then it will be necessary to reposition the pedestal assembly in order to accomplish the proper alignments. During repositioning be certain to maintain the fan drive shaft square with and on the centerline of the engine.

4. On all switcher locomotives made after October 1973, align sheave end bearing housing in center of 9.5 mm (3/8") axial float. Refer to Fig. 4.

Housing to be square with shaft to within 1.52 mm (.060").



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Fig. 4 - Sheave End Roller Bearing Alignment

LUBRICATION REQUIREMENTS

Fan shaft bearings that require periodic lubrication should be regreased at 6 month intervals with Shell NLG1 No. 2 EP lithium base or Texaco Marfax multi-purpose No. 2 lithium base grease or equivalent. It is recommended that grease be applied to the bearings until it purges from the bearing seals. Grease is available in 429 cc (14-1/2 oz) tubes 8413019.

MODIFICATIONS

To eliminate outer ring rotation of the fan end bearing, all new switcher locomotives that previously used roller bearing 9436601 on the fan end of the fan shaft have this bearing replaced by roller bearing 9437515. This modification should be applied to all switcher locomotives using the 9436601 bearing at the next scheduled bearing replacement. The new bearing has the same lubrication requirements as 9436601.

If it is preferable to periodically grease the permanently lubricated 9425296 ball bearing, then the pipe plug in the bearing housing should be replaced with lube fitting 9411010. In this instance, it is recommended that the amount of grease applied be limited to 4 strokes with a portable grease gun.

• • • • **A Service Department Publication** • • • •

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