



SERVICE DEPARTMENT

ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION

# MAINTENANCE INSTRUCTION

## SPEED INCREASER, COOLING FAN, AND BLOWER DRIVE ASSEMBLIES

### DESCRIPTION

The speed increaser and fan drive assembly forces air at high velocity through the engine cooling system radiators to maintain water temperatures within recommended limits, and on most assemblies also provides a drive for a traction motor blower.

Two basic assemblies similar to those shown in Fig. 1 are used for all applications. Assembly 8310133 is similar to 8253685. Assemblies similar to 8209671 are: 8189200, 8257375, 8306828, 8310134, 8322051, 8373131, 8379144, 8389330, 8391271, and 8491663. Variations occur in fan and blower sizes and drives, and in the presence or absence of a fan clutch or blower drive. An application chart is included in the Service Data at the back of this instruction.

As shown in the cross-sectional views of these assemblies, Fig. 2, 3A, and 3B, the gear box houses a set of right angle bevel gears for the vertical fan drive, and it also houses the gear

takeoff for a traction motor blower (when applicable). Power is received from the engine through a drive shaft provided with flexible couplings at each end. This provides a positive drive for the traction motor blower and fan. When an air clutch element, (10) Fig. 2, is used, it provides a positive control for the fan drive.

### OPERATION

Since the drive, Fig. 1, is directly connected to the engine, this portion of the assembly, which includes the traction motor blower, is in operation all the time the engine is running. On units equipped with a clutch assembly, the fan operates only when the engine cooling water temperature reaches the control switch setting.

The clutch element, (10) Fig. 2 and Fig. 3, connects the fan to the vertical drive shaft when air is admitted to the tube assembly of the air clutch. Air admission is controlled by the temperature of the engine cooling water.

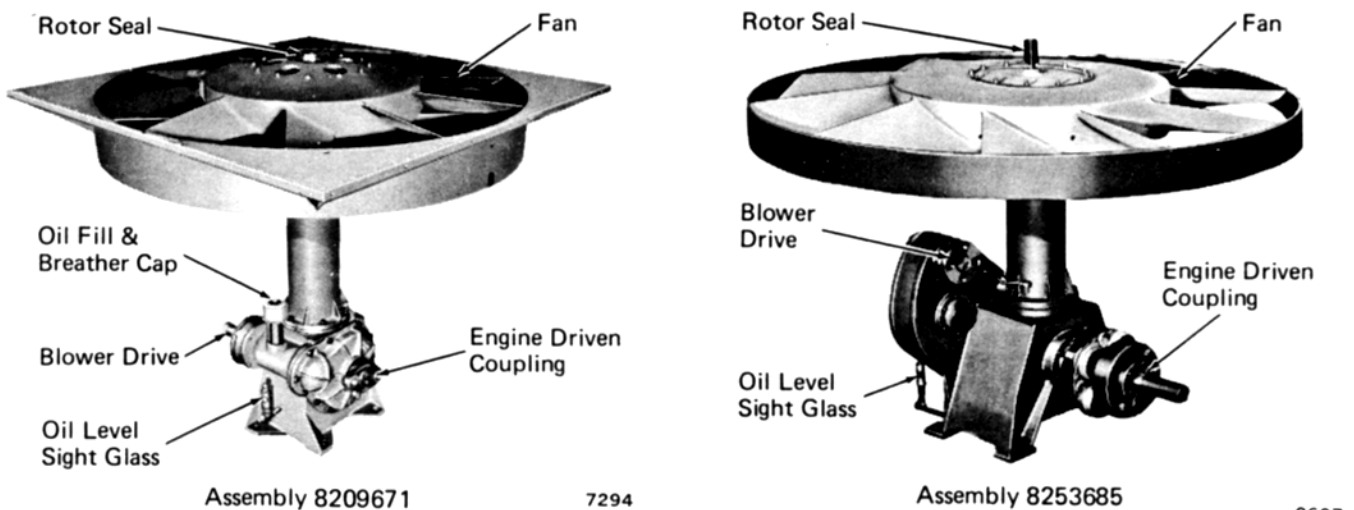
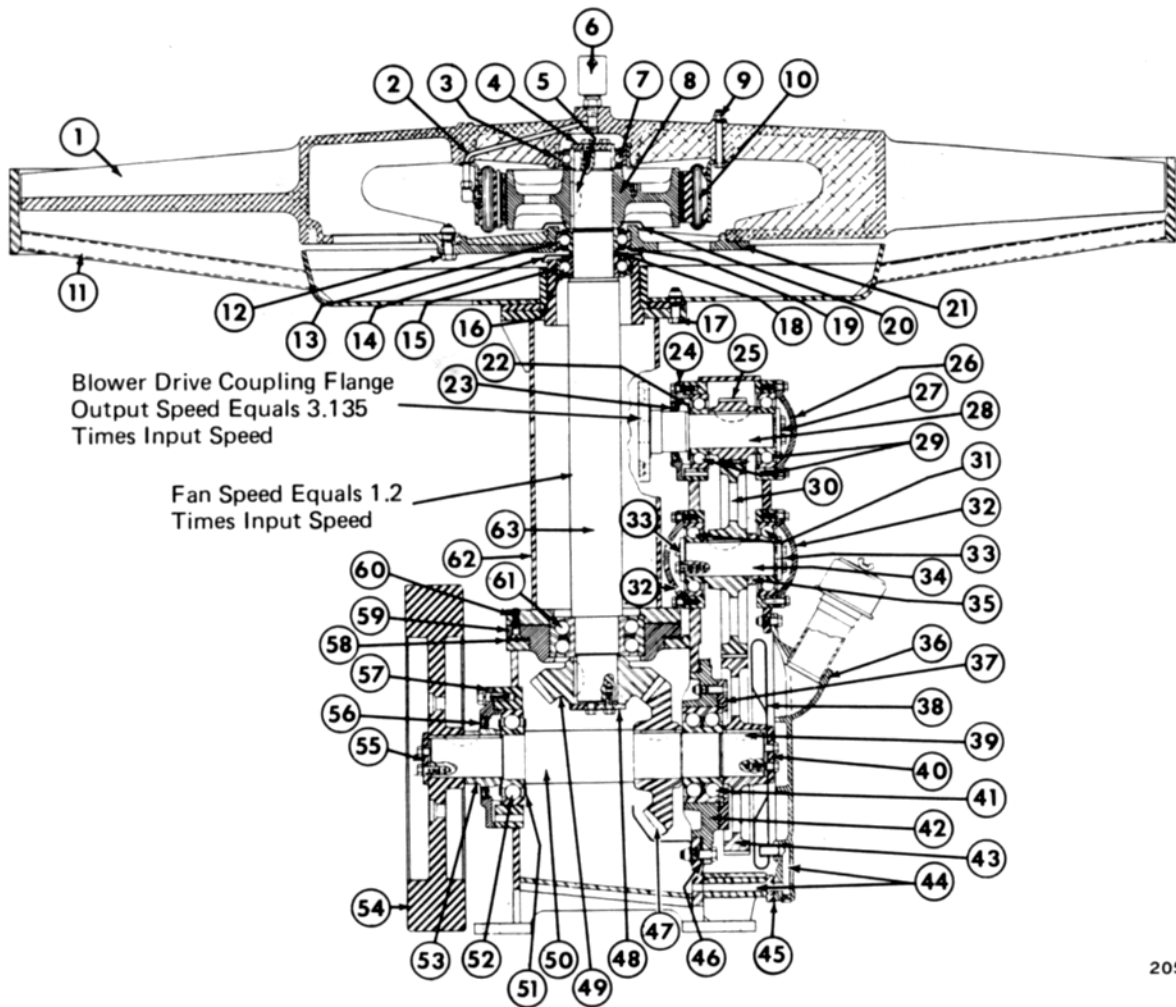


Fig. 1 - Speed Increaser Assemblies

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



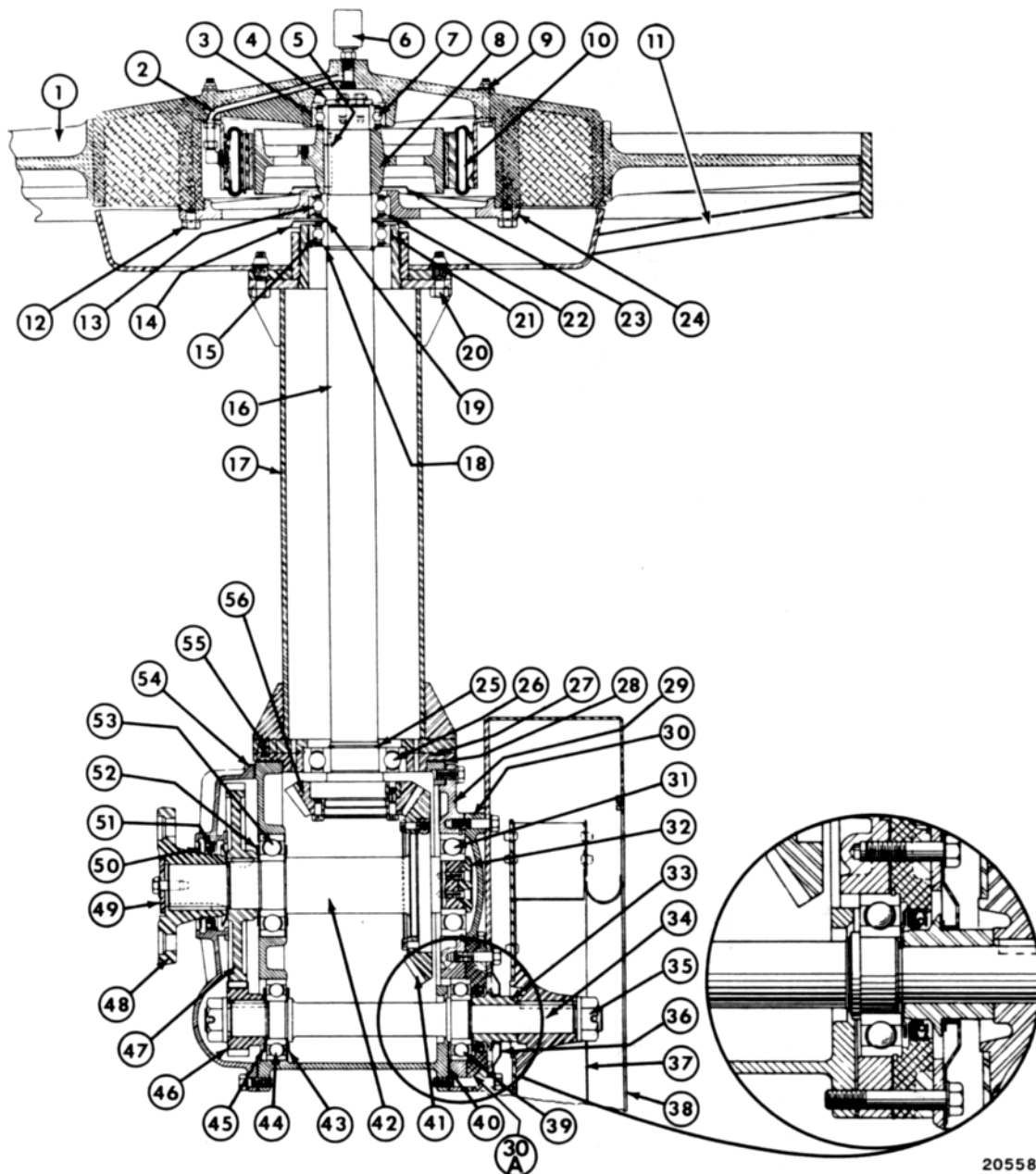
Blower Drive Coupling Flange  
Output Speed Equals 3.135  
Times Input Speed

Fan Speed Equals 1.2  
Times Input Speed

20557

- |                                       |   |  |
|---------------------------------------|---|--|
| 1. Cooling Fan                        | 23. Oil Seal                              | 43. Drive Gear                         |
| 2. Air Supply Line                    | 24. Oil Seal Housing                      | 44. Oil Passage                        |
| 3. Insert, Upper Pilot Bearing        | 25. Gear, Blower Drive Shaft              | 45. Cover Gasket                       |
| 4. Retainer Plate                     | 26. Cover - Blower Drive Shaft Bearing    | 46. Shim Set - Gear Adjustment         |
| 5. Key - Driving Wheel                | 27. Retainer Plate                        | 47. Main Drive Gear                    |
| 6. Rotor Seal                         | 28. Shaft - Blower Drive                  | 48. Retainer Plate                     |
| 7. Bearing, Upper Pilot               | 29. Bearing, Blower Drive Shaft           | 49. Drive Gear, Vertical Shaft         |
| 8. Driving Wheel                      | 30. Gear, Idler                           | 50. Main Drive Shaft                   |
| 9. Bolt, Clutch Assembly-To-Fan       | 31. Bearings, Idler Gear Drive Shaft      | 51. Oil Slinger                        |
| 10. Clutch Element Assembly           | 32. Cover, Idler Gear Drive Shaft Bearing | 52. Bearing, Main Drive Shaft (Single) |
| 11. Air Straightener Assembly         | 33. Retainer Plate                        | 53. Sleeve - Main Drive Shaft          |
| 12. Bolts, Hub-To-Fan                 | 34. Shaft, Idler Gear                     | 54. Flywheel                           |
| 13. Bearing, Cooling Fan              | 35. Spacer, Idler Gear                    | 55. Retainer Plate                     |
| 14. Slinger, Upper Vertical Drive     | 36. Cover And Oil Filler Assembly         | 56. Oil Seal                           |
| 15. Tolerance Ring                    | 37. Bearing Retainer Plate                | 57. Oil Seal Housing                   |
| 16. Bearing, Upper Vertical Drive     | 38. Oil Slinger                           | 58. Shim Set, Gear Adjustment          |
| 17. Bolt, Fan Support-To-Straightener | 39. Drive Gear Key                        | 59. Bearing Housing Plate              |
| 18. Spacer, Fan                       | 40. Retainer Plate                        | 60. Screw, Bearing Housing Plate       |
| 19. Snap Ring                         | 41. Bearing, Main Drive Shaft (Double)    | 61. Bearing, Lower Vertical Drive      |
| 20. Slinger, Upper Bearing            | 42. Bearing Housing Plate                 | 62. Fan Support Assembly               |
| 21. Hub, Cooling Fan                  |   | 63. Fan Drive Shaft                    |
| 22. Oil Slinger                       |   |  |

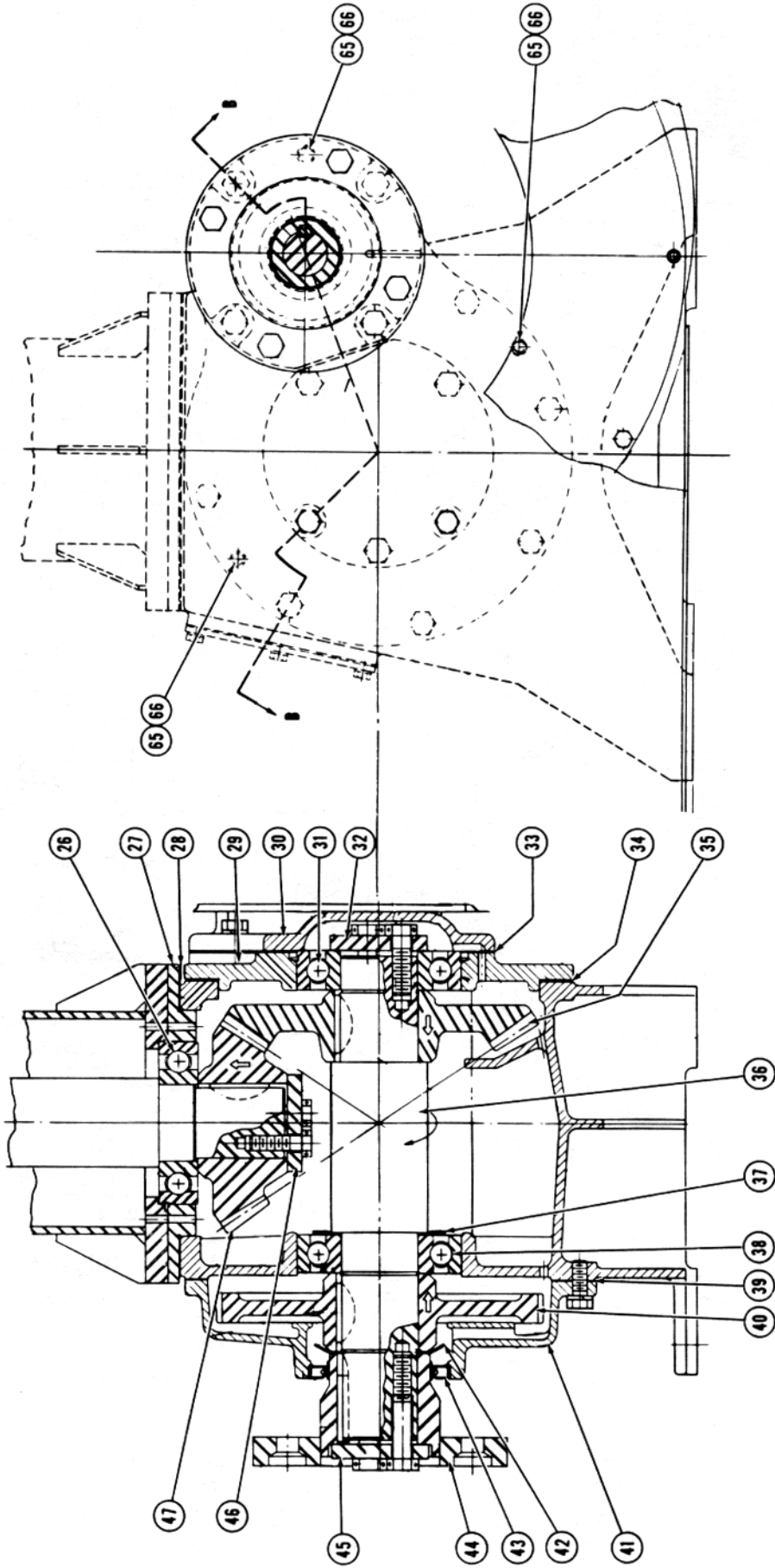
Fig. 2 - Cross-Section View Of Speed Increaser, Fan, And Blower Assembly 8253685

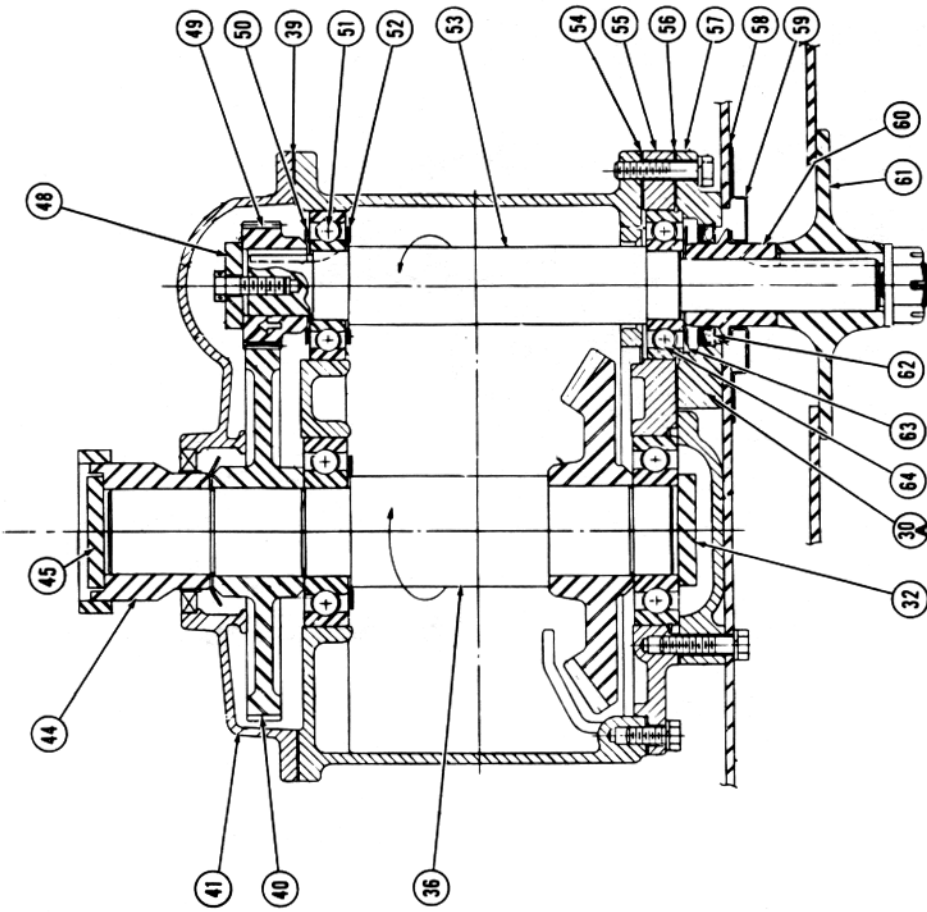


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- |                                   |                                       |                                  |
|-----------------------------------|---------------------------------------|----------------------------------|
| 1. Cooling Fan                    | 20. Bolt, Fan Support-To-Straightener | 37. Blower Wheel                 |
| 2. Air Supply Line                | 21. Tolerance Ring                    | 38. Blower Housing               |
| 3. Insert, Upper Pilot Bearing    | 22. Snap Ring                         | 39. Bearing, Blower Drive Shaft  |
| 4. Retainer Plate                 | 23. Slinger, Upper Bearing            | 40. Shim Plate, Gear Adjustment  |
| 5. Key, Driving Wheel             | 24. Hub, Cooling Fan                  | 41. Main Drive Gear              |
| 6. Rotor Seal                     | 25. Snap Ring                         | 42. Main Drive Shaft             |
| 7. Bearing, Upper Pilot           | 26. Bearing, Lower Vertical Drive     | 43. Oil Slinger                  |
| 8. Driving Wheel                  | 27. Bearing Housing Plate             | 44. Bearing, Blower Drive Shaft  |
| 9. Bolts, Clutch Assembly-To-Fan  | 28. Shim Set, Gear Adjustment         | 45. Oil Slinger                  |
| 10. Clutch Element Assembly       | 29. Bearing Plate                     | 46. Gear, Blower Drive Shaft     |
| 11. Air Straightener Assembly     | 30. Bearing Cover                     | 47. Drive Gear                   |
| 12. Bolts Hub-To-Fan              | 30A. Bearing Plate Cover              | 48. Coupling Drive Flange        |
| 13. Bearing, Cooling Fan          | 31. Bearing, Main Drive Shaft         | 49. Retainer Plate               |
| 14. Slinger, Upper Vertical Drive | 32. Retainer Plate                    | 50. Oil Slinger                  |
| 15. Bearing, Upper Vertical Drive | 33. Blower Spacer                     | 51. Seal                         |
| 16. Fan Drive Shaft               | 34. Blower Drive Shaft                | 52. Oil Slinger                  |
| 17. Fan Support Assembly          | 35. Nut, Blower Drive Shaft           | 53. Bearing, Main Drive Shaft    |
| 18. Snap Ring                     | 36. Oil Trap                          | 54. Cover, Speed Increaser       |
| 19. Spacer, Fan                   |                                       | 55. Screw, Bearing Housing Plate |
|                                   |                                       | 56. Drive Gear, Vertical Shaft   |

Fig. 3A – Cross-Section View Of Speed Increaser, Fan,  
And Blower Assembly 8189200





20559

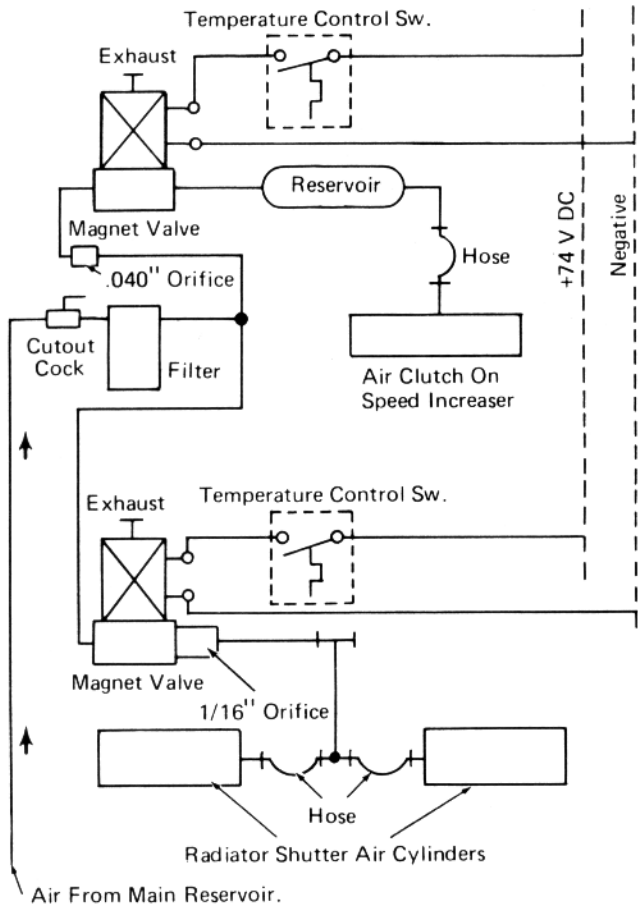
Section B-B

1. Thru 25. See Fig. 3A

- 26. Bearing - Lower Vertical Drive
- 27. Bearing Housing Plate
- 28. Shim Set
- 29. Bearing Cover
- 30. Bearing Cover
- 30A. Bearing Plate Cover
- 31. Bearing - Main Drive Shaft
- 32. Retainer Plate
- 33. Cover Gasket
- 34. Shim
- 35. Main Drive Gear
- 36. Main Drive Shaft
- 37. Oil Slinger
- 38. Bearing, Main Drive Shaft
- 39. Gasket
- 40. Drive Gear
- 41. Speed Increaser Cover
- 42. Oil Slinger
- 43. Seal
- 44. Drive Flange Coupling
- 45. Retainer Plate
- 46. Retainer Plate
- 47. Drive Gear, Vertical Shaft
- 48. Retainer Plate
- 49. Blower Drive Gear
- 50. Oil Slinger
- 51. Bearing, Blower Drive Shaft
- 52. Oil Slinger
- 53. Blower Drive Shaft
- 54. Shim Plate
- 55. Bearing Plate
- 56. Cover Gasket
- 57. Bearing Plate Cover
- 58. Gasket
- 59. Oil Trap
- 60. Blower Spacer
- 61. Blower Wheel Assembly
- 62. Seal
- 63. Oil Slinger
- 64. Bearing
- 65. Dowels
- 66. Snap Rings

Fig. 3B - Cross-Section View Of Speed Increaser And Blower Assembly 8389330

As shown in Fig. 4, magnet valves control the operation of the fan clutch and the radiator shutter operating cylinders. When the engine water temperature reaches the setting of the temperature control switch, a circuit is completed to energize the magnet valves. Air from the main reservoir is admitted through an orifice and reservoir to the tube of the air clutch. The fan is then driven by the vertical shaft of the speed increaser. The orifice and reservoir in the air line to the clutch provides a slow buildup of pressure on the



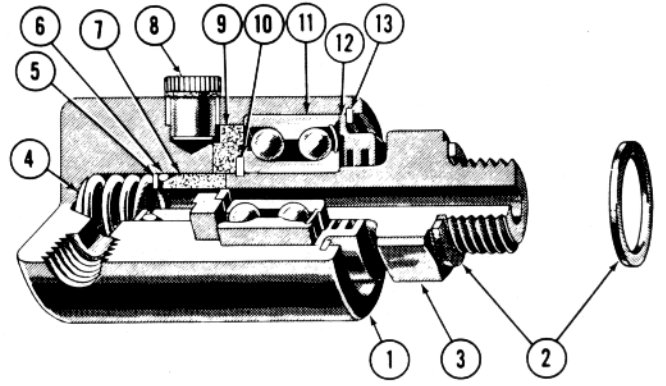
NOTE: Temperature control switch pickup and dropout values are shown on the switch plate.

20560

Fig. 4 - Schematic Diagram, Speed Increaser Wiring And Air Piping

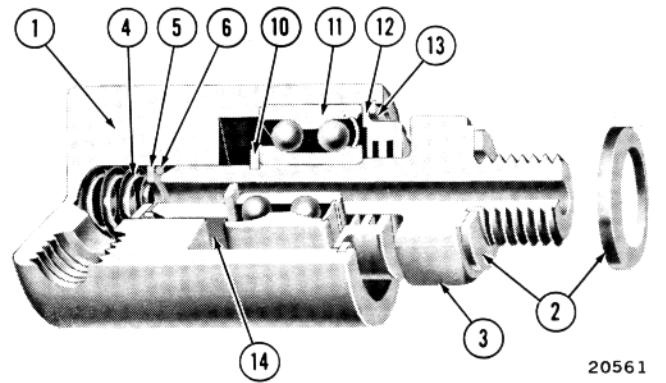
clutch to avoid shock loading. Release of the air is more rapid through the exhaust port in the magnet valve when the valve is de-energized by the proper reduction in cooling water temperature.

The rotor seal assembly, Fig. 5, is screwed into the center of the fan casting. This permits the air connection to be stationary while the fan is rotating.



Oil Lubricated Type

7544



Grease Lubricated Type

20561

- |                  |                      |
|------------------|----------------------|
| 1. Housing       | 8. Oiler             |
| 2. Copper Gasket | 9. Packing Ring      |
| 3. Shaft         | 10. Snap Ring        |
| 4. Spring        | 11. Bearing          |
| 5. Spring Stop   | 12. Labyrinth Collar |
| 6. Grommet       | 13. Snap Ring        |
| 7. Seal          | 14. Grease Cavity    |

Fig. 5 - Rotor Seal Assembly

## ROUTINE MAINTENANCE

### LUBRICATION SYSTEMS

The upper vertical shaft bearings in all assemblies are the sealed grease type. The lower vertical shaft bearings are oil lubricated, either by splash from the main drive gear or by oil draining from the blower drive gear assembly.

In assemblies such as 8253685 shown in Fig. 2, the blower drive gear train requires use of a pressure-type lubricating system. Oil is conducted from the bevel gear box to the traction motor blower drive gear train through tubes, (44) Fig. 2, and a drilled passage. The oil flows into the oil slinger (38) applied at the end of the main drive shaft adjacent to the drive gear. The slinger propels the oil into the nozzle of an oil tube positioned in the slinger groove, Fig. 6. The end of this tube must be sharp and free of nicks or oil will not enter the tube.

Oil is conducted through the tube to discharge between the upper two gears in the blower gear train. Oil throw-off from this delivery is directed into a slotted tube, (7) Fig. 6, by a baffle. This oil is then gravity fed to the lower bearings of the vertical drive shaft. After lubricating these bearings and flowing over the main drive gears, the oil returns to the bottom of the gear housing for recirculation. All oil passages must be kept clean and free of obstructions such as poorly indexed gaskets.

In assemblies such as 8189200 and 8389330, Figs. 3A and 3B, lubrication is by a splash-type system. The gears and lower bearings are lubricated by oil thrown up by the main drive gears. The same oil is recommended for all speed increasers and should conform to the specifications given in Service Data.

Oil level in the speed increasers should be maintained within the lower third of the sight glass when the engine is running, and within the middle to upper third of the sight glass with the engine shut down. The vent passage in the special plug, Fig. 7, at the top of the sight glass must be kept open to ensure a correct oil level reading. Oil is added to the housing through the fill pipe after removing the breather cap. Gaskets and seals should be maintained in good condition to prevent oil leaks.

Oil in the speed increasers should be changed at the intervals specified in the applicable Scheduled Maintenance Program. Oil is drained by removing the pipe plug at the sight glass tee connection, Fig. 7.

### ROTOR SEAL

The rotor seal, Fig. 5, is located at the top center of the cooling fan. It is necessary to remove a side panel on the carbody above the fan to provide access to the assembly when the speed increaser is installed. At intervals given in the applicable Scheduled Maintenance Program, a few drops of light oil should be applied to the rotor seal through the opening covered by the small screw plug provided on early models of the rotor seal. Current rotor seals are a grease-lubricated type which require no periodic lubrication.

### OIL FILTER BREATHER CAP

At intervals specified in the applicable Scheduled Maintenance Program, the filter element in the breather cap, Fig. 7, should be removed from the oil filler pipe breather and cleaned with a petroleum solvent. Before assembly, the cap and element support should be thoroughly cleaned and wiped dry.

## OVERHAUL MAINTENANCE

The speed increasers should be reconditioned at intervals given in the applicable Scheduled Maintenance Program, and any defective parts replaced.

Since the disassembly of these units is similar, the same instructions apply to all models. Care must be taken in the disassembly that shims used to position the main bevel drive gears are not damaged, and are identified as to their location on an assembled unit. If a new set of drive gears is installed, it may be necessary to vary the shim thickness to properly position the gears as outlined in the instructions for the gear housing assembly.

NOTE: Numbers in parentheses in the following procedures refer to items in Fig. 2, 3A, or 3B. When more than one number appears, the first will apply to Fig. 2, the second to Fig. 3A, and the third to Fig. 3B.

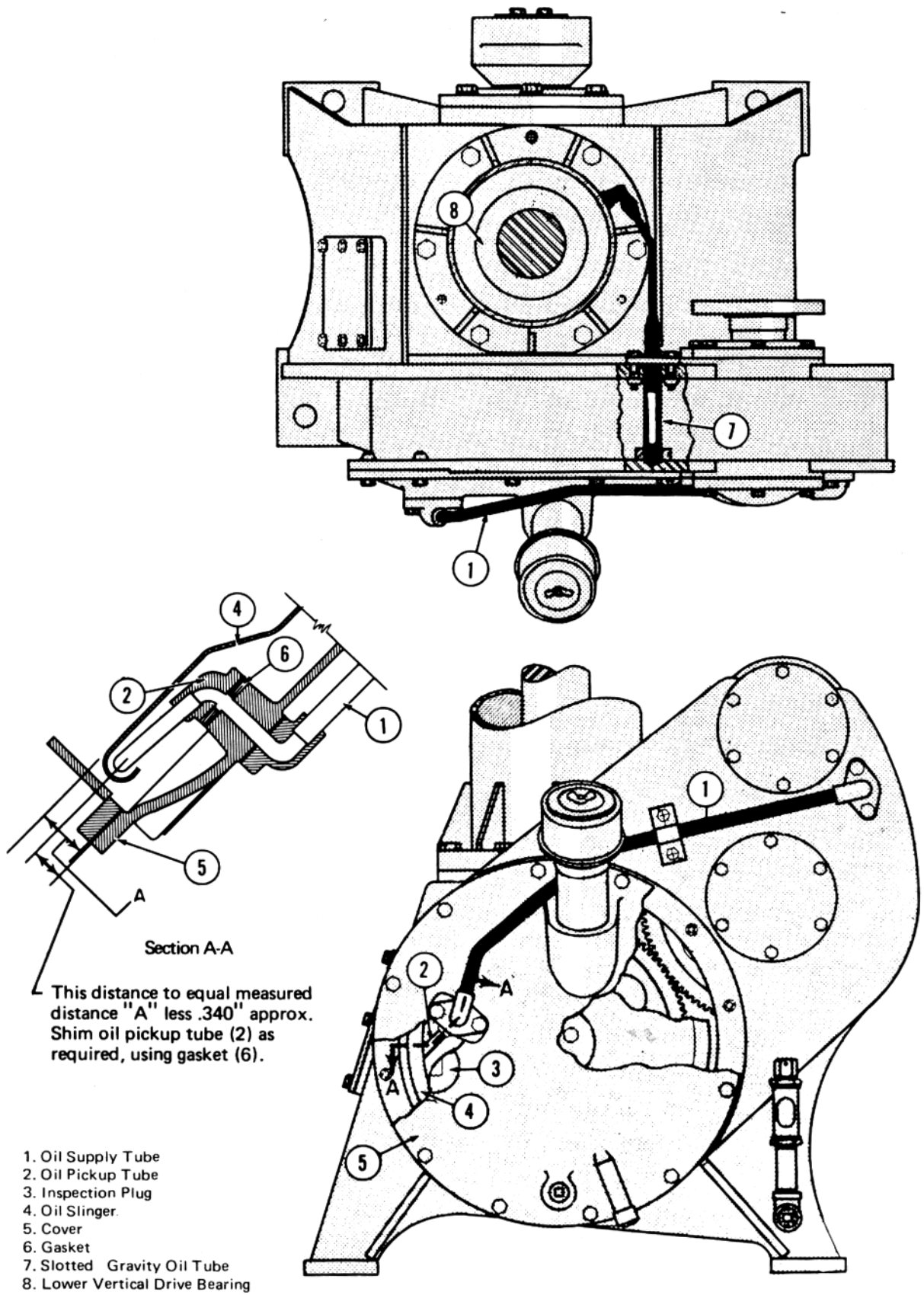


Fig. 6 – Oil Tube Application, Pressure-Type Lubrication System

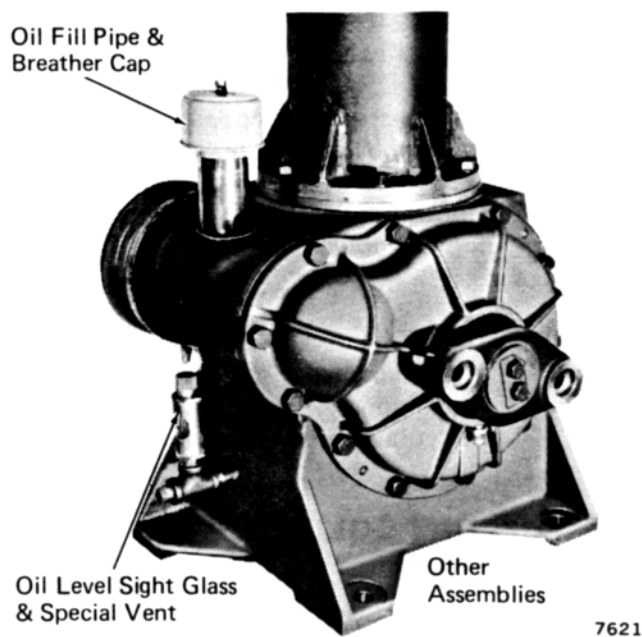
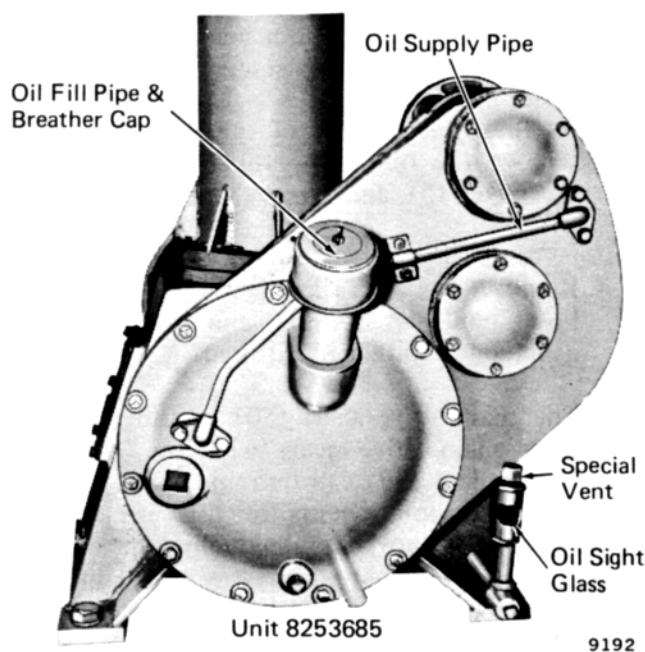


Fig. 7 – Oil Fill Pipe And Oil Level Sight Glass Locations

The speed increaser, cooling fan, and blower drive assembly may be removed from the locomotive as an assembly after removal of the radiator hatch, or the components may be removed independently. In either case it will be necessary to remove the carbody inspection side panels on either side of the speed increaser assembly and to disconnect the rotor seal air line at the top of the fan. If the components are to be removed independently, it will be necessary to remove any closing plates between the air straightener (11) and the radiator hatch. Also, the cooling fan support column may be removed as an assembly, or components may be removed independently.

### COOLING FAN REMOVAL

The cooling fan subassembly consists of the fan and air clutch element assembly (when so equipped) and is removed as follows:

1. Remove rotor seal (6) from the top of the fan.
2. Remove the hub-to-fan bolts (12).
3. Remove the fan from the upper pilot bearing (7) by lightly tapping around the inside hub of the fan with a rawhide mallet.
4. On models which do not have an air clutch, the cooling fan is removed by first removing the fan retainer plate bolts and retainer plate, and then removing the cooling fan assembly.

### CLUTCH ELEMENT REMOVAL

After the fan assembly has been removed, take off the clutch element (10) by removing the clutch assembly-to-fan bolts (9).

### DRIVING WHEEL REMOVAL

Remove the upper pilot bearing retaining bolts and retainer plate (4). Puller holes are provided in the driving wheel (8) so that a pulling tool can be used against the top of the vertical drive shaft. Remove the driving wheel and the upper pilot bearing (7).

### COOLING FAN HUB REMOVAL

The cooling fan hub, (21) Fig. 2, or (24) Fig. 3, is removed by using a gear puller applied against the end of the drive shaft and pulling on the hub.

### AIR STRAIGHTENER REMOVAL

Remove the fan support-to-air straightener bolts (17) or (20). Using a suitable hoist, lift the air straightener off the fan support.

### FAN SUPPORT COLUMN REMOVAL

1. Provide lifting arrangement using a suitable hoist at the top of the fan support column.

2. Remove the bolts securing the column assembly to the gear case.
3. Using jack bolts in the tapped holes provided in the column base, slowly jack the column up to clear the lower bearing retainer from the gear housing bore and to free the drive gear. The assembly can then be lifted from the gear case.

**CAUTION:** Use care in column removal to prevent damaging the gear adjustment shims located between the flange of the column and the gear case.

### **FAN SUPPORT COLUMN DISASSEMBLY**

1. Remove the drive gear (49), (56), or (47).
2. Remove the bearing housing plate (59) or (27). The shaft may then be pressed or driven from the column.
3. The shaft bearings may be removed on an arbor press. Whenever possible, a soft steel sleeve should be used to apply or remove bearings. Force should be applied at the pressure area; that is, if the bearing is tight on the shaft, force should be applied at the inner race. If the bearing is tight at the outside diameter, force should be applied there. The sleeve should be slightly larger than the inner race diameter or slightly smaller than the outer race diameter, depending upon the location where force will be applied.

### **MAIN GEAR HOUSING DISASSEMBLY**

Basically two different types of gear housing assemblies are used in speed increaser assemblies. The gear housing used in speed increaser assemblies 8253685 and 8310133 will be covered separately from the gear housing used in the other speed increaser assemblies.

**NOTE:** These procedures are applicable to speed increaser assemblies 8253685 and 8310133.

1. Remove the 3/8" bolts securing the retainer plate, (55) Fig. 2, and if necessary, use a puller to remove flywheel (54).

2. Remove the oil seal housing (57) and the oil seal (56) from the housing.
3. At the opposite side of the housing carefully remove the oil supply tube, (1) Fig. 6, from the cover (5), and remove the cover bolts and cover.
4. Remove the oil slinger retainer plate, (40) Fig. 2, oil slinger (38), and drive gear (43), using a gear puller if required.
5. The main drive shaft (50), bearings (41) and (52), main drive gear (47), and bearing retainer plate (37) can be removed as an assembly. The components of this assembly can then be removed individually on an arbor press. Carefully remove the gear adjustment shims (46) so they will be kept intact and not damaged.
6. Remove bearing covers (32) and bolts from retainer plates (33) to permit the idler gear shaft (34) to be driven from the bearings (31), spacer (35), and idler gear (30). Remove the idler gear through the lower opening of the gear housing. The remaining parts may then be removed.
7. To remove the blower drive shaft gear (25), remove the cover (26), oil seal housing (24), bolts and retainer plate (27). The drive shaft may then be driven out and the gear removed.

**NOTE:** These procedures are applicable to all speed increaser assemblies EXCEPT 8253685 and 8310133.

The primary difference between the speed increasers covered in these procedures is the size of the fan.

1. Remove the cotter pin from the blower drive shaft nut, (35) Fig. 3A. Remove nut and the blower wheel (37). This will provide access to the bolts securing the oil trap (36) and the blower housing (38) to enable these parts to be removed, as well as the blower spacer (33).
2. At the coupling drive flange (48) side of the gear case, remove the bolts securing retainer plate (49) and remove retainer plate and the coupling drive flange. Next remove the speed increaser cover (54), the oil slinger, and (using a gear puller) the drive gear (47).

3. Using a soft metal drift at the end of the blower drive shaft (34), tap the end of the shaft opposite the blower drive shaft gear (46) to free the shaft from bearing (39). Continue tapping the shaft to release the bearing at the gear end so that the shaft, gear, and bearing are removed as an assembly. Parts then can be removed individually from the shaft.

4. Remove the bolts securing the bearing plate (29). Then using a soft metal drift at the coupling end of the main shaft, remove shaft with bearings, gear, and bearing plate from the main housing as an assembly. After removal of the cover (30) and retainer plate (32), remove the individual parts with an arbor press.

## QUALIFICATION OF COMPONENTS PRIOR TO ASSEMBLY

Wash all components thoroughly in petroleum solvent and perform a visual inspection for surface defects.

It is felt that under normal use the speed increaser housing and fan drive shaft should last the life of the locomotive.

It is recommended that the bearings and gears be replaced with new ones and the fan drive shaft magnaflux inspected when the components are removed for reconditioning as specified in the Scheduled Maintenance Program.

If the clutch assembly has been slipping due to worn friction shoes, the complete clutch assembly should be replaced. It is important to replace the complete assembly rather than individual friction shoes because, after continued use, the rubber boot portion of the clutch may stretch, creating a smaller friction shoe diameter and causing new friction shoes to drag.

## FAN SUPPORT COLUMN ASSEMBLY

The fan support column subassembly consists of the fan drive shaft upper and lower bearings, bearing housing plates, (59) Fig. 2 or (27) Figs. 3A and 3B, drive gears, (47) Figs. 2 and 3B, or (56) Fig. 3A and the column housing.

The fan support column is assembled as follows:

1. Inspect the drive shaft to make sure it is clean and that the bearing surfaces are smooth.
2. Place the new bearing to be used in a convection type oven and heat sufficiently to enable the bearing to be easily applied to the shaft. If an oven is not available the bearing may be applied with an arbor press.

**CAUTION:** Do not heat the bearing over 300° F, as the hardness of the bearing may be affected.

3. Apply the lower vertical drive shaft bearing (61) or (26) to the shaft as follows:
  - a. On the assembly shown in Fig. 2 and 3B, the lower vertical drive shaft bearing (61) or (26) is installed from the lower end to make positive contact at the flange of the shaft.
  - b. On the assembly shown in Fig. 3A, apply the lower vertical drive shaft bearing (26) by placing it over the top of the shaft with its retainer ring upward, and lowering until it seats on the flange at the lower end of the shaft. After the lower bearing is in place, apply the snap rings (18) and (25) to the upper and lower ends of the shaft.
4. Before assembly of the bearing housing plate (59) or (27) place it on top of the gear housing and line up the mounting holes. Mark the housing plate and gear housing. By prelocating the bearing housing plate, the heavy fan support column can be easily placed in position after the bearing housing plate is assembled to the drive shaft.
5. Assemble the upper vertical drive shaft and bearings in the fan support column before applying the drive gear and housing plate to avoid a possible cocked shaft. Place a clean square of cardboard on the floor and place the shaft in a vertical position, resting on the cardboard.

Clean the inside area of the support column, making sure there is no foreign material which could fall out on the lower bearing when the assembly is placed over the vertical drive shaft. Using a suitable lifting device, raise the column to a vertical position. Using dry air at low pressure, blow out the interior, and check the bottom counterbore of the

support column for cleanliness so the bearing and retainer will enter squarely and not be misaligned.

Place the column over the vertical shaft as shown in Fig. 8, making sure the lower bearing, (61) Fig. 2 or (26) Fig. 3, enters satisfactorily.

Compress the tolerance ring (15) or (21) by hand and press into the groove in the upper collar of the fan support column. Apply a

light coat of lubricant 8196884 to the upper vertical drive shaft bearing area on the shaft. Place the upper bearing (16) or (15) squarely on the shaft. Use a soft steel tube having an inside diameter slightly larger than the bearing inside bore diameter, and drive the bearing in place.

6. Lay the support column on a clean workbench and apply the bearing housing plate (59) or (27).
7. Check the angular alignment of the shaft in the column with a dial indicator. Attach the base of the dial indicator to the gear seat or to the end of the shaft, with the button against the outer race of the lower bearing. The maximum total runout of the shaft must not exceed .012".

8. Apply the vertical shaft drive gear.

- a. On the keyed shaft design apply the gear, (49) Fig. 2 or (47) Fig. 3B, to the drive shaft. Fit the key to the shaft and gear to check for snug fit, and apply the retainer plate (48), 3/8"-24 bolts and lock plate, or drilled bolts. Torque the bolts to 120 ft-lbs. Bend locking tabs or install lockwire as applicable.

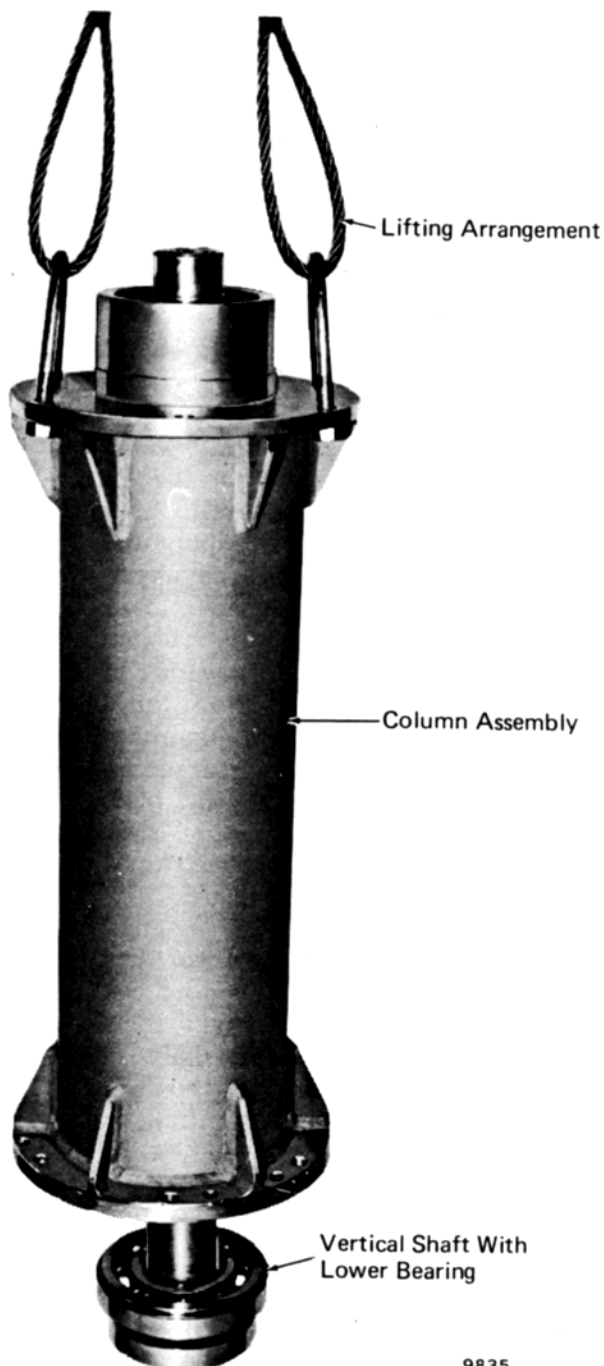
- b. On the flanged shaft design, apply the drive gear, (56) Fig. 3A, and 3/8"-20 mounting bolts. Torque the bolts to 30 ft-lbs and lockwire.

## GEAR HOUSING ASSEMBLY

These procedures are applicable to speed increaser assemblies 8253685 and 8310133. Before assembly, clean the gear case and all parts thoroughly. Replace all seals and other parts which are defective. Check freedom and alignment of parts during assembly and protect all metal parts against rust after assembly.

1. Install the intermediate idler gear, (30) Fig. 2, before application of the main drive shaft, as with the main drive shaft installed there is not room enough to install the gear. Insert the gear in place and temporarily wire it up out of the way in the gear housing.

2. Fit the main drive gear key to the gear (47) and shaft (50) so that it fits snugly. Apply a small quantity of lubricant 8196884 to the shaft in the gear area. Press the gear sufficiently to apply it to the shaft with its key.



9835

Fig. 8 - Installing Column Housing Over Vertical Shaft

3. Position the bearing housing plate (42) in the gear housing to see that it fits properly, and remove it. Apply a small quantity of lubricant 8196884 to the housing plate bearing bore and install the bearing (41) so that its snap ring rests against the top of the housing. Apply the bearing retainer plate (37) to hold the bearing housing in place. Press the bearing and housing assembly on the shaft (50) after coating the shaft with lubricant 8196884.
4. Install the oil slinger (38) at the end of the main drive shaft opposite the gear and apply bearing (52) and the outer slinger.
5. Inspect the completed shaft assembly to see that it is clean and properly assembled as shown in Fig. 2. Check the gear housing to see that it is clean and that the flange surface for the shaft assembly is clean, smooth, and free of any nicks. This is particularly important at the flange where the gear adjustment shims are applied, as any foreign material or raised areas on the flange will affect drive gear alignment. Mating teeth on the main drive gear (47) and the vertical shaft drive gear (49) are marked with an "X." So these teeth may be seen easily at assembly, mark each gear with bright chalk.
6. Check the shim set (46) to see that the laminated shim pack is intact, clean, and smooth. Place the shims on the bearing housing plate (42), inserting several bolts to hold them in place. Install the completed shaft assembly in place in the gear case as indicated in Fig. 2. Position the gear so that the mating teeth are at the top.
7. Apply a new seal (56) to the oil seal housing (57) and install the completed assembly to the gear housing.
8. Check the fan support assembly (62) bore in the gear housing to see that it is clean and smooth. Apply the shim set (58) previously removed, if in good condition, or replace with a set made to the same thickness.
9. Using a suitable hoist, raise the previously assembled fan support assembly in preparation for installation. Carefully lower the fan support assembly so that upon entering the gear housing, the marked teeth of the gears mesh. Apply the mounting bolts.
10. The main drive gear backlash should be checked before any further assembly is made,

since it may be necessary to vary the thickness of shim sets (46) and (58) to maintain correct gear backlash. The gear backlash should be held within the limits etched on the gear set, which is within  $.006'' - .010''$ . Correct assembly of gears will result in heel of gear teeth being flush at point of engagement and rolling contact being in the center of the teeth which can be checked with a film of red lead. At the time of checking backlash, the vertical shaft should be held stationary. Since the fan assembly is not installed, the weight must be simulated by downward pressure on the vertical shaft. One means of accomplishing this is the collar arrangement shown in Fig. 9. The collar fits

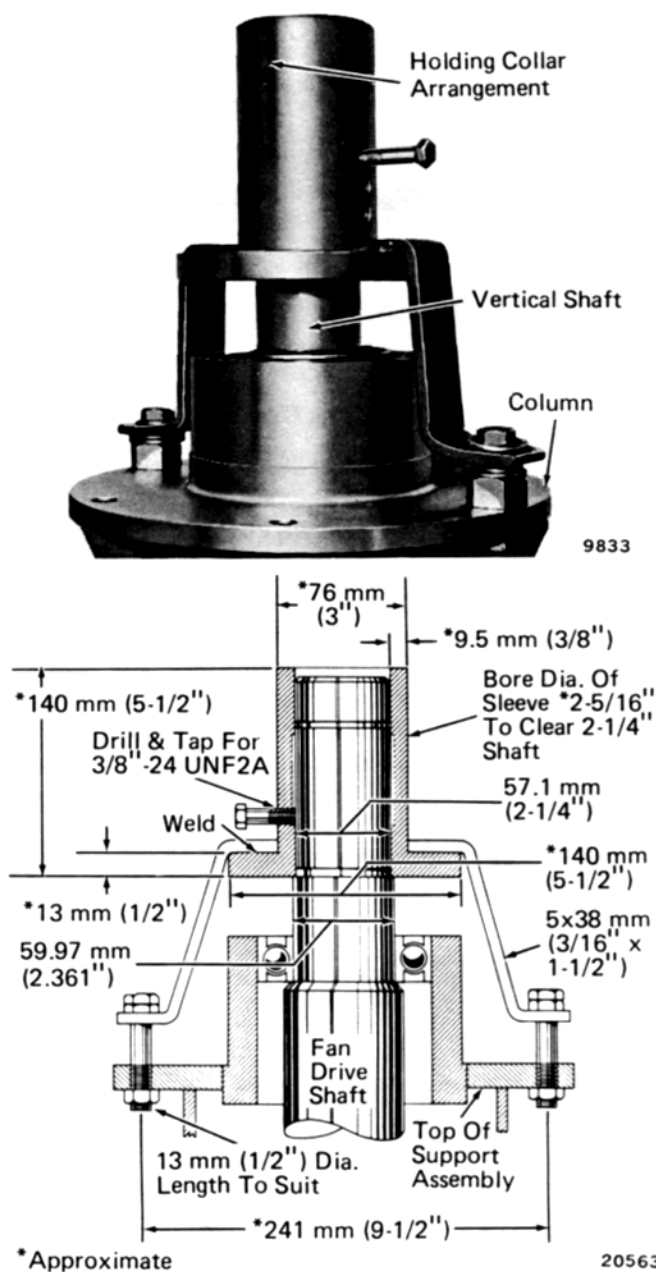


Fig. 9 - Fan Drive Shaft Collar Arrangement

on the shoulder of the vertical shaft, and the arms extend above the fan support flange sufficiently to enable application of two bolts to the flange to draw down the vertical shaft. Tightening the bolt in the side of the collar, prevents the shaft from turning. Attach a dial indicator, Fig. 10, so that the button rests against the center of the main drive gear tooth. With the vertical shaft held stationary, move the main gear to check backlash. After checking backlash, remove the holding collar, if applied.

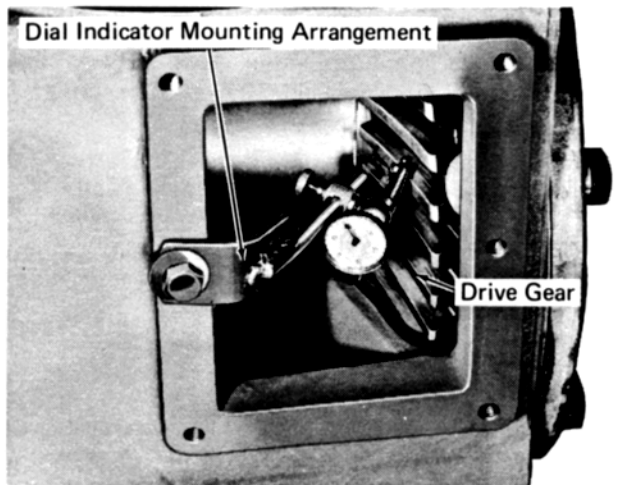
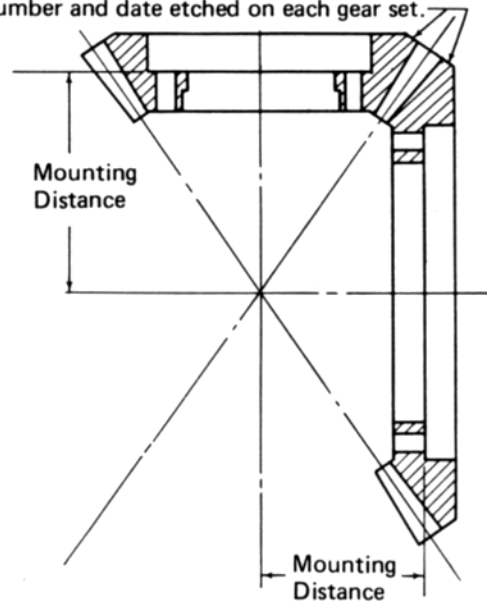


Fig. 10 – Checking Gear Backlash

NOTE: If anything is done to interfere with the gear mounting distance, the adjustment shim sets, (46) or (58) Fig. 2, may require changing to maintain the gear backlash within limits. Mounting distance of the gears is shown in Fig. 11, and is the distance from the mounting base surface of the gears to the apex of projected lines drawn through the pitch diameter of the gear teeth. It is held within limits attained at the time the gear set is originally hobbled and ground. The mounting distance is etched on each gear, as indicated in Fig. 11, along with the backlash, serial number, part number, and date of grinding.

If a new gear set is used, which has a different mounting distance, or if other new parts are used which bring the gears closer together or farther apart, it is necessary to compensate by a change in shim thickness. For example, if the replacement main drive gear has a mounting distance .010" greater than the previous gear, it is necessary to increase the shim set, (46) Fig. 2, thickness

Part number, mounting distance, backlash limits, serial number and date etched on each gear set.



Part number, mounting distance, backlash limits, serial number and date etched on each gear set.

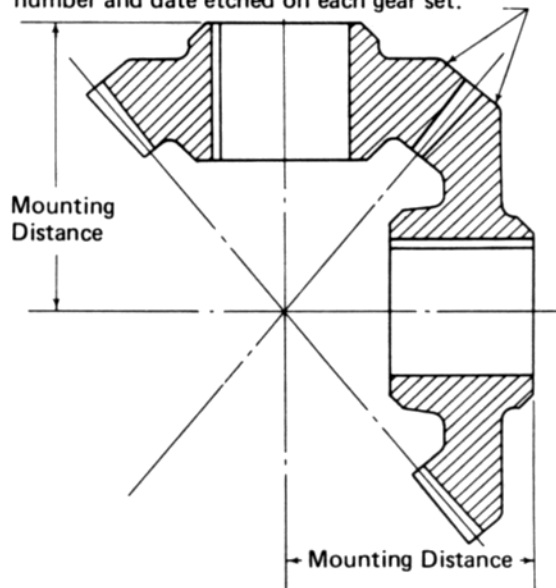


Fig. 11 – Gear Mounting Distances

by .010" to give proper gear matching, provided the vertical gear mounting distance remained the same as the previous gear. If not, shims affecting the upper gear would also have to be changed. If a new bearing housing plate, (42) Fig. 2, is used which has a .010" thinner flange thickness than the replaced housing, a .010" increase in shim thickness has to be made.

The shim sets used in these speed increasers are the laminated type. A solid shim of .0232" is used and the remainder of the set

up to .094" thickness is made up of .002" laminations. It is advisable when using a new shim set, to check the solid shim for solder deposit which, if allowed to remain, would cause misalignment. Laminations are peeled off separately, using a sharp edged blade, making sure the remaining surface is smooth and of equal thickness.

After the main drive gear and vertical shaft installation, the gear backlash adjustment, and the shim set application is made, the rest of the assembly is installed.

11. Apply the key to the drive gear (43) and the main drive shaft (50) to fit snugly. Coat the shaft lightly with lubricant 8196884 and apply the drive gear (43), oil slinger (38), retainer plate (40), and the 5/8"-11 socket head retainer plate capscrews and torque to 210 ft-lbs.
12. Fit the key to the flywheel (54) and the main drive shaft (50). Apply lubricant 8196884 lightly to the shaft and apply the flywheel and key to the shaft, using care not to damage the oil seal (56). Apply retainer plate (55), 5/8"-11 socket head retainer plate capscrews and torque to 210 ft-lbs.
13. Make up subassembly of idler gear shaft (34), bearing retainer plate (33), 3/8"-24 bolts and lock plate. Torque bolts to 30 ft-lbs and secure with the lock plate. Fit the key to the shaft (34) and insert the shaft in the gear (30) and idler gear spacer (35). Apply bearing (31) to the shaft (34) and apply retainer plate (33). Apply the 3/8" bolts and lock plate, torque bolts to 30 ft-lbs and secure with the lock plate. Apply bearing covers (32) using new gaskets. The bearing cover near the vertical fan drive should contact the fan drive flange, and the cover on the opposite side should contact the bearing. This will leave a space between this cover and the flange. Measure this distance and add sufficient gasket shims to provide .010" - .015" clearance to allow end play for the bearing.
14. Apply the key to the blower drive shaft (28) and gear (25) to fit snugly. Install a new seal in the oil seal housing (24).

Assemble the blower drive shaft, oil seal housing, seal gasket, oil slinger, bearing, blower drive shaft gear, and key. Install this

subassembly to the housing, meshing blower drive shaft gear (25) and idler gear (30). Apply the remaining bearing (29) to the shaft end. Tighten the 5/16"-18 oil seal housing-to-flange bolts to a torque of 13 ft-lbs.

Apply bearing retainer plate (27), 3/8"-24 retainer bolts, and lock plate. Torque to 30 ft-lbs and secure with lock plate.

Apply bearing cover gasket and bearing cover (26). Using a thickness gauge, measure the space between the bearing cover (26) and face of housing. Remove the bearing cover and apply gasket shims to provide a bearing end play of .010" - .015".

15. Before the gear box cover, (5) Fig. 6, is applied, it is necessary to correctly position the oil pickup tube (2), as shown in Section AA. The distance "A" is measured from the gear housing cover face to the inside surface of the oil slinger. Gaskets (6) are applied at the oil pickup tube flange to maintain the dimensions shown. Apply the cover (5) to the gear case, with the inspection plug removed. Check to see that the end of the oil pickup tube is below the tip of the oil slinger (4). After proper adjustment of the oil pickup tube, tighten the cover bolts. Apply lubricant 8196884 to the inspection plug, and install the plug in the cover.

The following procedures are applicable to all speed increaser assemblies except 8253685, and 8310133.

Before assembly, thoroughly clean the gear case and all parts. Replace all seals and other parts which are defective. The surfaces of all metal parts should be protected against rust after assembly. Check freedom and alignment of parts during assembly.

1. Assemble a main drive shaft subassembly, as shown in Fig. 12. Check the main drive gear and the gear flange or hub for fit on the drive shaft before applying the drive gear to the shaft. Torque the gear-to-flange bolts to 30 ft-lbs and lockwire.

**CAUTION:** Do not heat bearings above 300° F or they may be damaged. Apply both bearings to the shaft and apply the retainer plate, (32) Figs. 3A and 3B. Apply retainer plate bolts as follows:

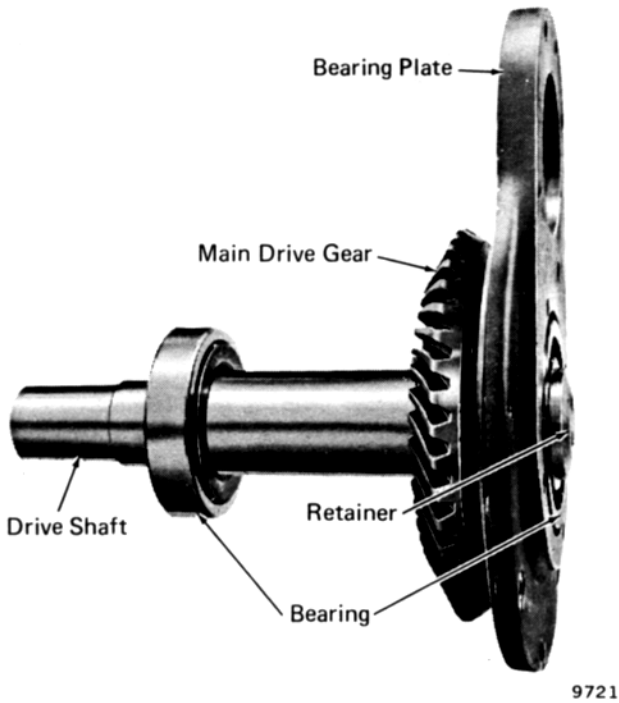


Fig. 12 - Main Drive Shaft Subassembly

- a. On assemblies using retainer 8192906, apply 3/8"-24 socket head capscrews and torque to 75 ft-lbs. Lock each capscrew by staking the retainer plate in two places with a center punch.
- b. On assembly 8373131, using retainer 8389186, apply 1/2"-20 drilled bolts, torque to 120 ft-lbs and lockwire. On other assemblies using retainer 8389186, apply 5/8"-18 drilled bolts, torque to 240 ft-lbs, and lockwire.

If the bearings were heated, allow them to cool, then remove the snap ring from the bearing adjacent to the drive gear. Apply some lubricant 8196884 to the bearing plate bearing bore and place the bearing plate (29) over the bearing, and replace the bearing snap ring.

2. Check the gear housing bore for the bearing plate (29) and the flange of the bearing plate. Apply the snap rings, (66) Fig. 3B, to the gear housing dowels (65) and install the dowels in the gear housing.
3. Inspect the shims which were removed during disassembly. If they are in good condition, place them on the bearing plate flange. (If the shims have been damaged in any way, measure the thickness of the oil shim set and replace it with a new set of the same thickness.) This

shim set thickness is very important to maintain main drive gear alignment.

4. Insert the main drive shaft subassembly in the gear housing, and apply the bearing plate-to-gear case bolts. Temporarily apply two bearing cover bolts and wide washers 180° from each other as shown in Fig. 13. Turn the main drive gear (41) (35) Fig. 3, so the tooth marked "X" is at the top. Mark the tooth with a bright chalk so it can be easily seen when the fan support assembly and the mating vertical shaft drive gear (56) (47) are applied. Check angular alignment of the main shaft by placing dial indicator on coupling seat with the button on outer race of bearing, (53) (38). The maximum total runout of the shaft must not exceed .012".

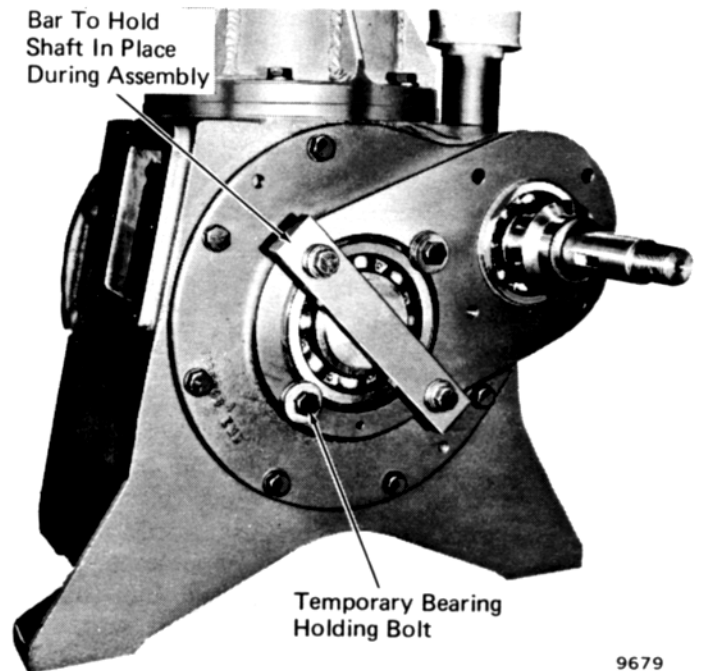


Fig. 13 - Temporary Bearing Holding Bolts

5. Check the fan support assembly (17) bore in the gear case to see that it is clean and smooth. Apply the shim set previously removed, if in good condition, or replace with a set made to the same thickness.
6. Using a suitable hoist, raise the previously assembled fan support assembly. Mark the gear tooth having "X" with bright chalk so that it may be easily seen for mating with the main drive gear (41) (35). Being careful of the shim set, carefully lower the fan support so that upon entering the gear housing, the marked teeth of the gears mesh. Apply the mounting bolts.

7. The main drive gear backlash should be checked before any further assembly is made, since it may be necessary to vary the thickness of shim set (28) to maintain correct gear backlash. The gear backlash should be held within the limits etched on the gear set, which is within .004" - .010". Correct assembly of gears will result in heel of gear teeth being flush at point of engagement and rolling contact being in the center of the teeth, which can be checked with a film of red lead. At the time of checking backlash, the vertical shaft should be held stationary. Since the fan assembly is not installed, the weight must be simulated by downward pressure on the vertical shaft. One means of accomplishing this is the collar arrangement shown in Fig. 9. The collar fits on the shoulder of the vertical shaft, and the arms extend above the fan support flange sufficiently to enable application of two bolts to the flange to draw down the vertical shaft. Tightening the bolt in the side of the collar prevents the shaft from turning.

Attach a dial indicator, Fig. 10, so that the button rests against the center of the main drive gear tooth. With the vertical shaft held stationary, move the main gear to check backlash. After checking backlash, remove the holding collar, if applied.

NOTE: If anything is done to interfere with the gear mounting distance, the adjustment shim set, (28) Fig. 3, may require changing to maintain the gear backlash within limits. Mounting distance of the gears is shown in Fig. 11, and is the distance from the mounting base surface of the gears to the apex of projected lines drawn through the pitch diameter of the gear teeth. It is held within limits attained at the time the gear set is originally hobbled and ground. The mounting distance is etched on each gear, as indicated in Fig. 11, along with the backlash, serial number, part number, and date of grinding.

If a new gear set is used, which has a different mounting distance, or if other new parts are used which bring the gears closer together or farther apart, it is necessary to compensate by a change in shim thickness. For example, if the replacement main drive gear has a mounting distance .010" greater than the previous gear, it is necessary to increase the shim set, (28) Fig. 3, thickness

by .010" to give proper gear matching, provided the vertical gear mounting distance remained the same as the previous gear. If not, shims affecting the upper gear would also have to be changed. If a new bearing plate (29) is used which has a .010" thinner flange thickness than the replaced plate, a .010" increase in shim thickness has to be made.

The shim sets used in these speed increasers are the laminated type. A solid shim of .032" is used and the remainder of the setup to .094" thickness is made up of .002" laminations. It is advisable when using a new shim set, to check the solid shim for solder deposit which, if allowed to remain, would cause misalignment. Laminations are peeled off separately using a sharp edged blade, making sure the remaining surface is smooth and of equal thickness.

After the main drive gear and vertical shaft installation, the gear backlash adjustment, and the shim set application is made, the rest of the assembly is installed.

8. Make up a subassembly at the gear end of the blower drive shaft (34) (53). Apply the inside oil slinger (43) (52) to the shoulder of the shaft, followed by the bearing (44) (51), the outside oil slinger (45) (50), and the blower drive shaft gear and key. The key should fit snugly to the gear and shaft.

a. On units equipped with a special gear retaining nut, apply the washer and nut and torque to between 360 and 395 ft-lbs (nominally 375). Insert cotter pin to prevent turning of the nut. Do not bend the pin over the end of the shaft, as it may interfere with the speed increaser cover (54) (41).

b. On units equipped with a gear retainer plate, (48) Fig. 3B, apply the plate and 1/2"-20 drilled bolts. Torque to 120 ft-lbs and lockwire.

Install the completed subassembly in the gear housing. After installation, apply the blower drive shaft bearing (39) (31) to the blower end of the shaft, backing up the shaft at the gear end. Check alignment of the blower drive shaft by placing a dial indicator on the shaft seat for spacer (33) (60) and the button on the outer race of the bearing (39) (31). The maximum total runout of the shaft must not exceed .012".

9. If applicable, apply the bearing oil slinger, (52) Fig. 3A, adjacent to the bearing (53) at the coupling end of the main drive shaft, (42) Fig. 3A, (36) Fig. 3B. Fit the drive gear, (47) Fig. 3A or (40) Fig. 3B, and key to the shaft. Install a back-up bar, Fig. 13, at the opposite end of the main drive shaft so that the shaft will not be forced out of the bearing.
10. Check the speed increaser cover, (54) Fig. 3A and (41) Fig. 3B, to see that it is clean and in satisfactory condition. Apply a new oil seal (51) (43) to the cover, with the spring of the seal facing toward the coupling.
11. Before applying the speed increaser cover (54) (41), fit the coupling drive flange (48) (44) and key to the main drive shaft, then remove the cover from the shaft and place the oil slinger adjacent to the blower drive gear (47) (40) as shown in Figs. 3A and 3B.
12. Apply the cover to the gear case, using a new gasket and 1/2"-13 bolts with lockwashers. Install the previously fitted coupling drive flange (48) (44) and key on the main drive shaft. Apply coupling retainer plates as follows:
  - a. On assemblies using a four-hole retainer plate and no locking plate, install retainer plate and four 1/2"-20 socket head cap-screws and torque to 120 ft-lbs. On assemblies using a locking plate (units with no blower drive) install retainer and two 1/2"-20 hex head bolts and torque to 30 ft-lbs. Bend locking tabs to keep the bolts from turning.
  - b. On assemblies equipped with a three hole retainer plate and shallow bolt holes in the drive shaft, apply the retainer plate and three 1/2"-20 x 1-1/4" long hex head bolts. Torque to 120 ft-lbs.
  - c. On assemblies equipped with a three hole retainer plate and deep bolt holes in the main drive shaft, apply the retainer plate and three 5/8"-18 x 3-1/2" long drilled bolts. Torque to 240 ft-lbs and lockwire.
13. Remove the temporary back-up bar used to hold the bearing at the blower end.
14. Clean the bearing plate cover (30A), particularly at the seal counterbore, and install a new oil seal with the edge facing out. Insert

the blower spacer (33) (60) into the seal bore. Apply the oil slinger (63) adjacent to the blower drive shaft bearing (39) (64). The bearing cover (30A), blower spacer (33) (60) and oil trap (36) (59) may be applied over the shaft. The bearing cover bolts other than those for the blower housing, may be tightened.

15. Check and fit the blower wheel (37) (61) and its key to the blower shaft before application of the blower housing (38). Then remove the blower wheel from its shaft.
16. Apply the blower housing (38) to the gear housing.
17. Apply the previously fitted blower wheel and key to the blower shaft. Apply the special 1-1/4"-12 blower shaft nut (35) and cotter pin. Torque the nut to 375 ft-lbs.

## **SPEED INCREASER INSTALLATION**

If the components are installed individually in the locomotive the speed increaser main gear housing assembly should first be secured in place. Then use the following installation procedure.

## **FAN SUPPORT COLUMN INSTALLATION**

Installation of the fan support column to the main gear housing was described previously under "Main Gear Housing Assembly."

## **AIR STRAIGHTENER INSTALLATION**

To install the air straightener, position the air straightener on the fan support and secure with the fan support-to-air straightener bolts, (17) Fig. 2 or (20) Fig. 3.

## **COOLING FAN HUB INSTALLATION**

1. Before installing the cooling fan hub, the cooling fan bearing (13) must be applied.
  - a. Clean the bearing housing and apply lubricant 8196884 lightly to the walls of the housing.

- b. Invert the housing, placing it on a flat surface to protect the lip which holds the bearing.
  - c. Carefully position the bearing in the housing and, using a rawhide mallet, drive the bearing all the way in place in the housing.
  - d. After the bearing is installed, apply the bearing retaining snap ring.
2. Apply the upper vertical drive bearing slinger (14) above the upper vertical drive bearing (16) or (15) and install the fan spacer (18) or (19) above the slinger.
  3. Lightly coat the drive shaft with lubricant 8196884 and place the hub assembly over the fan drive shaft with the snap ring side down. Using a rawhide mallet and a soft steel tube section contacting the inner race of the bearing, drive the hub assembly down until the bearing contacts the spacer.

## DRIVING WHEEL INSTALLATION

Before applying the driving wheel, the following checks should be made:

1. Select the driving wheel key (5) to be used. Lightly file or break the edges of the key. Provide a slight lead (narrowing) at the end to act as an entrance guide and form a slight radius to conform to any radius in the drive shaft keyway.
2. Fit the key into both the shaft and wheel keyways to check for a snug fit. Lightly file the keyways to remove any nicks or roughness.
3. Apply the key to the drive shaft keyway, centering the key. Then apply a thin coat of lubricant 8196884 to the key and shaft.
4. Inspect the wheel to see that the contact surface is not glazed, and that the upper bearing, (16) Fig. 2 or (15) Fig. 3, is satisfactory. If necessary, apply a new slinger to the wheel.
5. Apply the driving wheel to the shaft, lining up the keyway with the key in the shaft. Using a rawhide mallet, drive the wheel all the way down until solid contact of the hub end is made with the bearing directly under it.

## CLUTCH ELEMENT INSTALLATION

Upon reapplication of the clutch element assembly, Fig. 14, mark the clutch at the air inlet to aid in locating. Use a new washer in the clutch element air inlet counterbore, as any air leakage would likely result in a slipping clutch and excessive wear of the friction shoes.

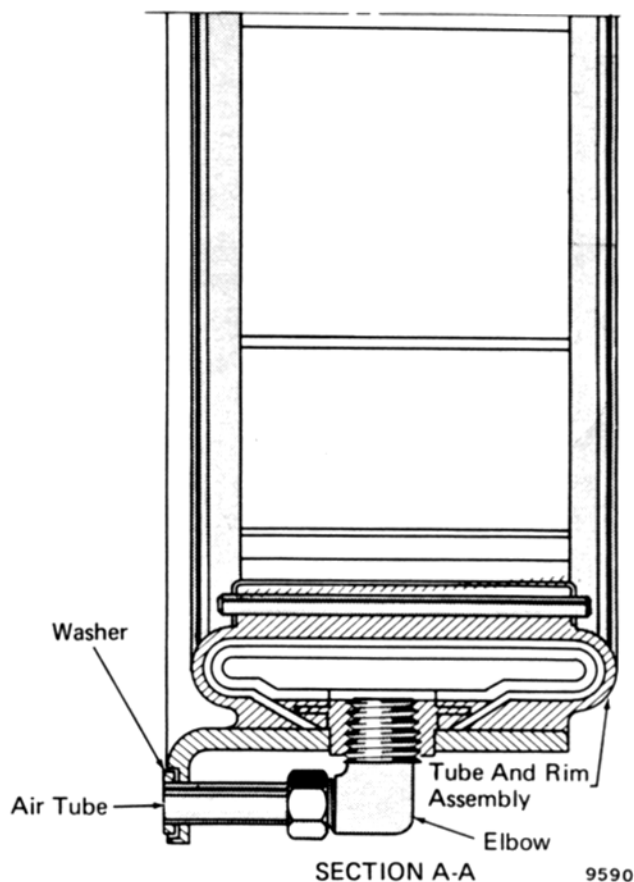
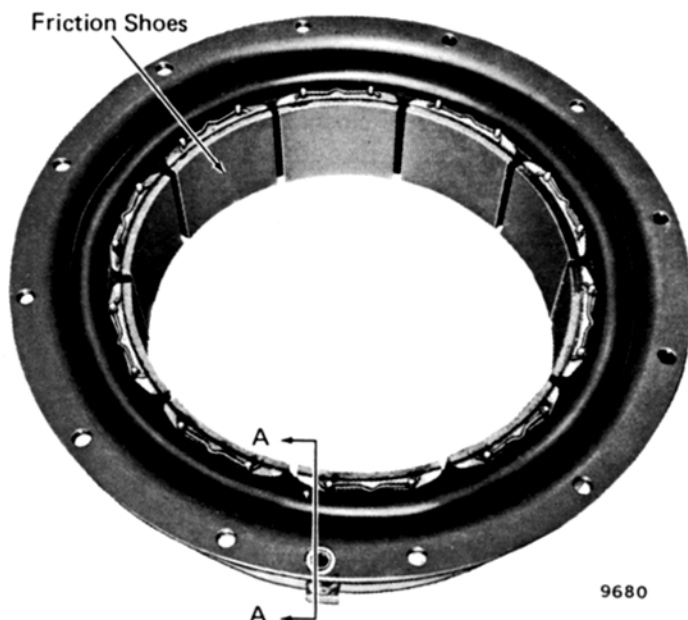


Fig. 14 -- Clutch Element Assembly

Position the clutch element assembly, (10) Fig. 3, and apply the clutch assembly-to-fan bolts and nuts (9).

## COOLING FAN INSTALLATION

The following procedure may be used to install the cooling fan assembly on the vertical drive shaft.

1. Check the upper pilot bearing insert, (3) Fig. 3, to be sure it is clean and free of nicks or scuffs. Early model cooling fans that are not equipped with the upper pilot bearing insert should have this insert applied as shown in Fig. 15. The cooling fan housing must be bored to 106.25 mm (4.183") to 106.27 mm (4.184") diameter and insert 8307555 installed. Use the insert as a template to drill and tap the five 1/4"-20 thread UNC-2B bolt holes being sure the insert is aligned so the holes are centered over the cooling fan webs. Bolt the insert to the housing, torque to 6 ft-lbs, and lockwire. Bore the insert to the required dimensions shown in Fig. 15.

2. Check the fan clutch element, (10) Fig. 2 and Fig. 3, to ensure that the air lines are clean and that the tube responds to applied air pressure. Temporarily apply an air line to the air connection on top of the fan. When alternately applying and shutting off the air supply, the tube should inflate and deflate.
3. Check all friction shoes to see that they are securely in place.
4. Inspect the driving wheel on the vertical shaft to see that the surface is not scuffed or glazed. A wheel that is scuffed or glazed should be replaced.
5. Inspect the upper pilot bearing (7) for satisfactory condition and check that the retainer plate (4) is not deformed. Apply the retainer plate, 1/2"-20 bolts, and lock plate, and torque bolts to 120 ft-lbs.
6. Using a suitable hoist and slings under the fan blades, lift the fan assembly and rest it so the upper pilot bearing is started in the fan housing.

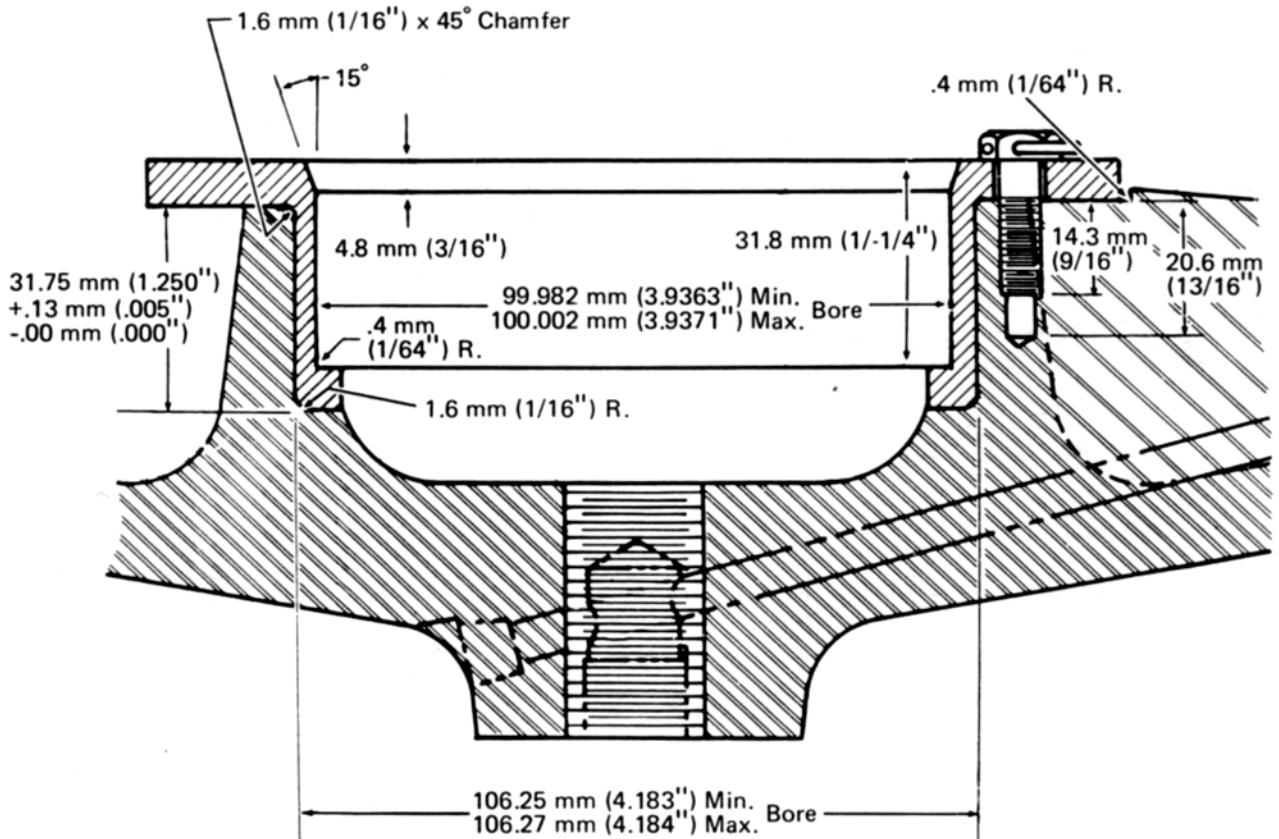


Fig. 15 -- Installing Cooling Fan Pilot Bearing Insert

7. Models without an air clutch do not have an upper pilot bearing. To install this type of cooling fan, be sure the cooling fan bearing (13) and upper vertical drive slinger (14) are in good condition and properly located, then set the cooling fan in place over the fan drive shaft, (63) Fig. 2 or (16) Fig. 3. Install the cooling fan key in its keyway. Apply the retainer plate, 1/2"-20 bolts, lock plate, and torque bolts to 120 ft-lbs.
8. On models having an air clutch, rotate the fan assembly to locate the hub-to-fan bolts (12). Start the 1/2"-13 hub-to-fan bolts, then drive the fan assembly down over the pilot bearing with a rawhide mallet. Drive at the center of the fan until the pilot bearing is seated in the fan, then apply the hub-to-fan bolts and torque to 120 ft-lbs.
9. Complete the assembly by applying the rotor seal to the top of the fan. Connect the air line to the rotor seal at the top of the fan, and check for leaks.

Install closing plates between the air straightener and the radiator hatch, as applicable, and install the carbody inspection panels on each side of the speed increaser assembly. Before the speed increaser is put into service, be sure it has been properly lubricated as recommended.

## ALIGNMENT

After the speed increaser is installed in the locomotive and the drive shaft is coupled up, the couplings must be aligned.

The shaft must be located in the taper bushing of the shaft coupling flange so the coupling flexing elements are neither stretched nor compressed. The distance between the face of the shaft coupling flange and the face of the speed increaser drive flange, or flywheel, must be 77.8 mm (3-1/16") to 81.0 mm (3-3/16") at the 3 and 9 o'clock positions on the coupling. Align drive flanges on either side of flexible coupling to within 1.27 mm (.050") total indicator reading.

# SERVICE DATA

## REFERENCES

Scheduled Maintenance Program . . . . . M.I. 1744

## SPECIFICATIONS

Lube oil (all speed increasers) . . . . . \*SAE No. 30 Air Compressor Oil  
 \*Dura 600 or equivalent

Low Flow, High Melt Grease - 1 Lb. (Aero Lubriplate) . . . . . 8196884

## TORQUE VALUES

DESCRIPTION	SIZE	TORQUE (Ft-Lbs)
Insert To Housing Bolts . . . . .	1/4"-20	6
Upper Pilot Bearing		
Retainer Plate Bolts . . . . .	1/2"-20	120
Hub-To-Fan Bolts . . . . .	1/2"-13	58
Drive Gear Retainer		
Plate Bolts . . . . .	3/8"-20	120
Drive Gear Mounting Bolts . . . . .	3/8"-20	30
Drive Gear Retainer		
Plate Socket Head Capscrews . . . . .	5/8"-11	210
Flywheel Retainer Plate		
Socket Head Capscrews . . . . .	5/8"-11	210
Idler Gear Shaft Bolts . . . . .	3/8"-24	30
Oil Seal Housing To		
Flange Bolts . . . . .	5/16"-18	13
Bearing Retainer Plate Bolts . . . . .	3/8"-24	30
Bearing Retainer Plate		
Socket Head Screws . . . . .	3/8"-24	75
Retainer Plate Bolts . . . . .	5/8"-18	240
Retainer Bolts . . . . .	5/8"-18	240
Coupling Retainer Plate		
Socket Head Screws . . . . .	1/2"-20	240
Special Blower Shaft Nut . . . . .	1-1/4"-12	375

## SERVICE DATA (Cont'd)

## APPLICATION CHART

Assembly Number	Locomotive Model	Fan Clutch	Fan Size	Fan Drive Gear Ratio	Blower Drive Gear Ratio
8189200	B, G12	Yes	54"	1.5:1	3.0:1
8209671	G8	Yes	**54"	1.5:1	3.0:1
8257375	GR12W	Yes	54"	1.5:1	3.0:1
8253685	G16W, G16U	Yes	66"	1.2:1	3.135:1
8306828	GA12C, GA12N	No Clutch	54"	1.5:1	No Blower Drive
8310133	G16 (Egypt)	No Clutch	66"	1.2:1	3.135:1
8310134	G12 (Egypt)	No Clutch	54"	1.5:1	3.0:1
8322051	J18W	No Clutch	54"	1.5:1	3.0:1
8373131	GL26MC	Yes	66"	1.2:1	No Blower Drive
8379144	JL18W	Yes	54"	1.5:1	3.0:1
8389330	G22, G22C	Yes*	54"	1.5:1	3.0:1
8391271	G26C	Yes*	66"	1.2:1	3.0:1
8491663	GT18MC	Yes	54"	1.2:1	No Blower Drive

\*Fan Clutch deleted on special order.

\*\*50" Fan on some early models.