ELECTRO-MOTIVE

M.I. 1250
*Rev. B

MAINTENANCE INSTRUCTION

GENERATOR DRIVE TRANSMISSION ASSEMBLY 8221394

DESCRIPTION

On Model SR8 drilling rig power units, the transmission of power from the diesel engine to the two generators is accomplished by means of the gear box shown in Fig. 1. The power input shaft from the engine is splined to fit the main drive shaft on which a 100-tooth drive gear is mounted. This gear drives a 66-tooth gear on each of the two power output shafts to the generators, providing the desired 1:1-1/2 speed increase.

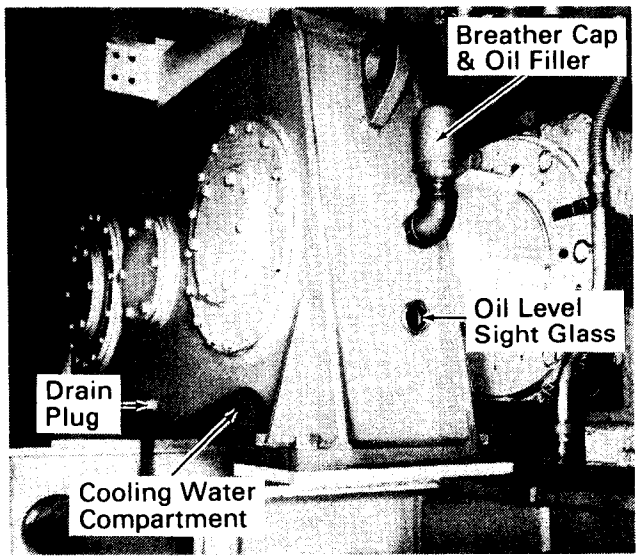


Fig.1 - Generator Drive Transmission

The gears are mounted on fixed centers provided by ball bearing assemblies in the gear case, Fig. 2. Lubrication to the gears and bearings is provided by splash oil from a segment-shaped trough that surrounds the bottom of the input gear. Oil splash is also channeled at the top of the case and piped through a jumper line to lubricate the spline of the power input drive shaft. Gear box lubricant is cooled by circulating engine water through a jacketing arrangement in the bottom of the case.

MAINTENANCE

Due to the design of the generator drive transmission, routine maintenance is limited to periodic oil level inspections and oil changes. Gear box oil level should be checked during normal shutdown periods for servicing. Oil level should be maintained at the center of the sight glass (while engine is not running).

The gear box should be disassembled at intervals specified in the Scheduled Maintenance Program. Bearings, oil seals, and gaskets should be replaced at time of overhaul. All other parts should be carefully cleaned and inspected to qualify them for continued service.

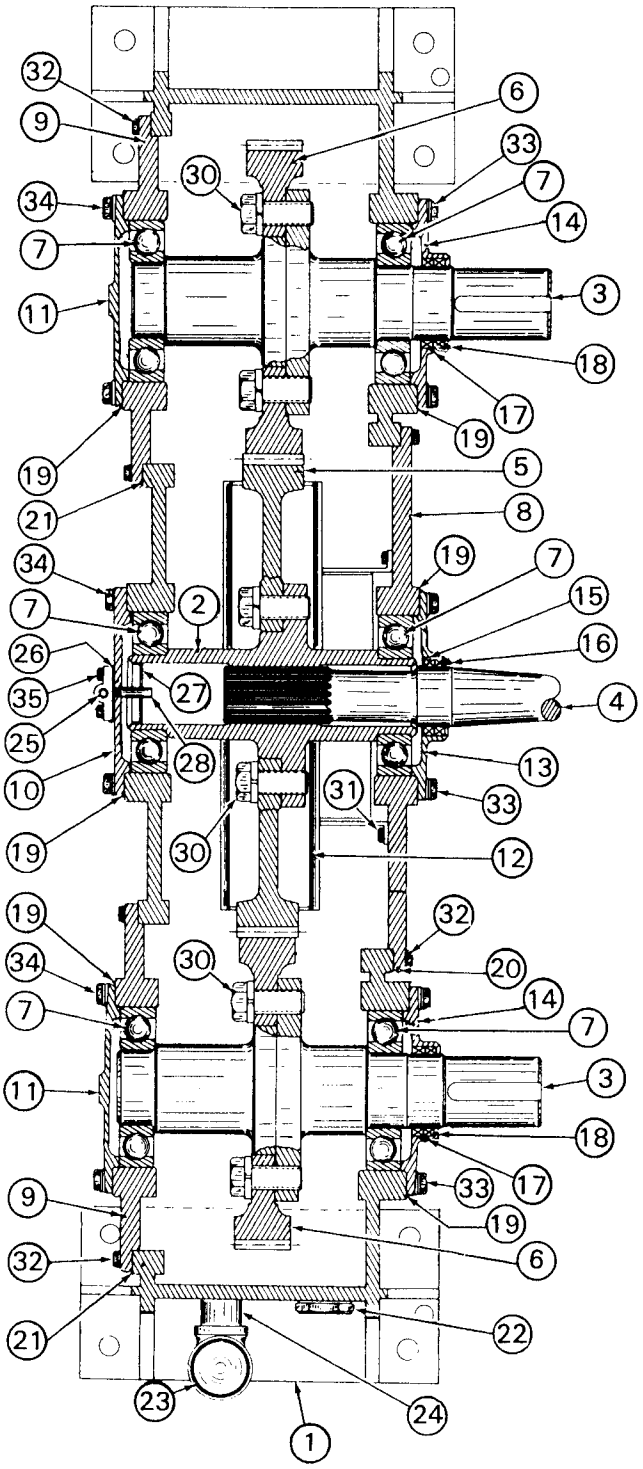
OIL CHANGE PROCEDURE

1. Remove drain plug from gear case and allow oil to drain completely.
2. Remove oil breather filter cap from filler pipe.
3. Refill gear box through oil filler pipe with SAE-30 (non-deep-crankcase-type) air compressor oil, or SAE-40 oil suitable for engine use, until level reaches the center of the oil sight glass.
4. Clean oil breather filter media by soaking in solvent and letting air dry. Reinstall breather cap on filler pipe.

DISASSEMBLY

1. Drain oil from gear case and disconnect water lines to cooling compartment to drain water.

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



1. Gear Case
2. Main Drive Shaft
3. Output Shaft
4. Input Shaft
5. 100-Tooth Main Drive Gear
6. 66-Tooth Driven Gear
7. Ball Bearing
8. Main Drive Shaft Bearing Retainer
9. Output Shaft Bearing Retainer
10. Main Drive Shaft Bearing Cover
11. Output Shaft Bearing Cover
12. Oil Sump (Trough)
13. Main Drive Shaft Oil Seal Retainer
14. Output Shaft Oil Seal Retainer
15. Main Drive Shaft Inner Oil Seal
16. Main Drive Shaft Outer Oil Seal
17. Output Shaft Inner Oil Seal
18. Output Shaft Outer Oil Seal
19. Bearing Cover/Oil Seal Retainer Gasket
20. Main Drive Shaft Bearing Retainer Gasket
21. Output Shaft Bearing Retainer Gasket
22. Oil Sight Glass
23. Oil Breather-Filter Cap
24. Oil Filler Pipe Assembly
25. Oil Transfer Tube Assembly
26. Oil Transfer Tube Gasket
27. Oil Baffle
28. Pipe Nipple
29. Oil Drain Plug (Not Shown)
30. 1-1/4"-12 x 3" Gear To Shaft Bolts & 1-1/4" Lockwashers
31. 3/8"-24 x 5/8" Sump Mounting Bolts & 3/8" Lockwashers
32. 1/2"-20 x 1-1/4" Bearing Retainer Mounting Bolts & 1/2" Lockwashers
33. 5/8"-18 x 1-1/4" Oil Seal Retainer Mounting Bolts & 5/8" Lockwashers
34. 5/8"-18 x 1-3/8" Bearing Cover Mounting Bolts & 5/8" Lockwashers
35. 3/8"-24 x 1" Transfer Tube Mounting Bolts & 3/8" Lockwashers

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Fig.2 - Generator Drive Gear Box

2. Remove oil transfer tube assembly between main drive shaft bearing cover and gear case.

3. Unbolt input shaft seal retainer. Slide retainer back on shaft away from gear box.

4. Apply blocking to support input shaft. Remove mounting bolts and move gear box away from generators.

5. Place gear box in a horizontal position (shafts up) and remove twenty 1/2"-20 bolts and lockwashers securing bearing retainer to gear case.

6. Remove main drive shaft, gear, bearings, and bearing retainer as one assembly. The main drive shaft must be removed with the retainer because of the oil sump that is attached to the

retainer which encases the lower segment of the gear. Three tapped holes are provided in the bearing retainer for application of lifting bolts (eyebolts) to aid handling.

7. Unbolt and remove oil sump from retainer. Remove bearing retainer from main drive shaft.

8. Remove front and rear bearings from main drive shaft. Remove oil baffle (slinger) from bearing cover end of main drive shaft.

9. Place gear box on blocking (approximately six inches high) with output shafts in the downward position.

10. Remove sixteen 1/2"-20 bolts and lockwashers securing each bearing retainer to gear case.

11. Remove both output shafts complete with gears, bearings, and retainers from gear case.

12. Return gear case to a vertical position.

13. Unbolt and remove seal retainers and seals from both output shafts as well as main drive shaft bearing cover.

14. Remove bearings and gears from output shafts and gear from main drive shaft.

INSPECTION AND REWORK

GEARS

1. Check gear to shaft mating surfaces for burrs, nicks, or other imperfections. Surfaces should be stoned, if necessary, to provide proper contact between gears and shafts.

2. The face of each gear under the lockwashers must be flat and free from upsets or gouges.

3. Check output (driven) gear condemning limits for the 7/8" and 2-1/8" dimensions, Fig. 3, which are 29/32" and 2-5/32" respectively. Limits for the main drive gear 1" and 2-1/4" dimensions, Fig. 4, are 1-1/32" and 2-9/32" respectively.

4. Inspect gear teeth for chips or fretting. Clean up where necessary.

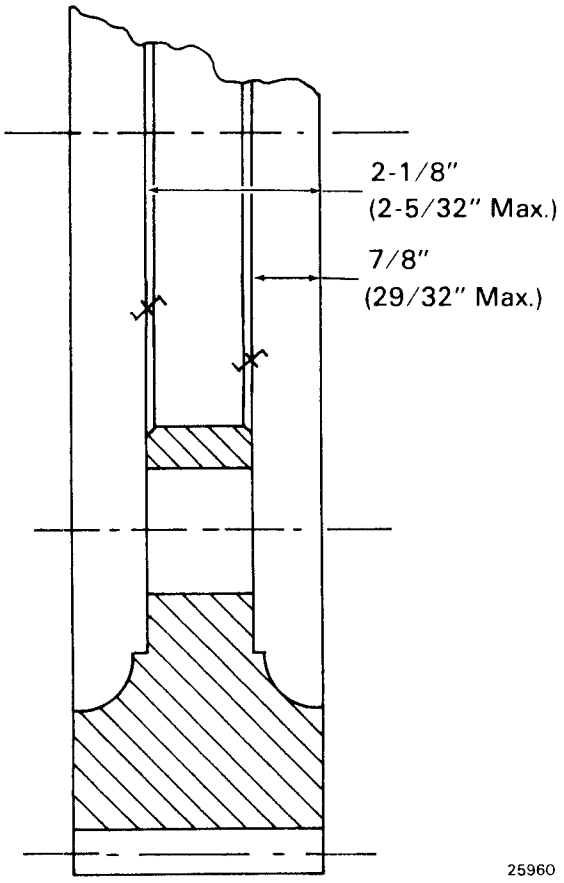

Fig.3 – Output (Driven) Gear Condemning Limits

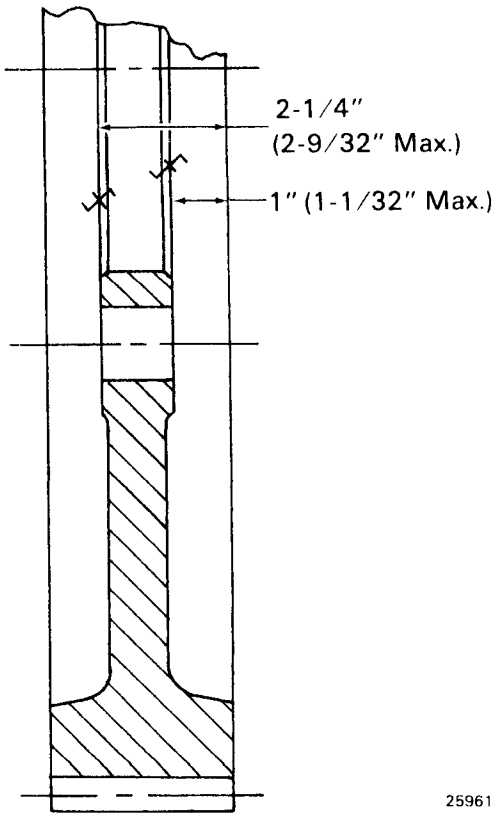

Fig.4 – Main Drive Gear Condemning Limits

SHAFTS

1. Check shaft bearing seats and seal surfaces for damage and undersize, Fig. 5 and 6. If necessary, shafts may be ground down to remove damaged spots, then chrome-plated and re-ground to proper size. Maximum thickness of chrome after re-grind is 0.050". Shaft seal surfaces can be ground undersize and used without plating if diameter is not less than 3.865". All shaft bearing seats should be reworked to accept tolerance ring (Roller Bearing Co. of America #BN100 x 24).

NOTE

It is not necessary to have chrome plate in the bottom of the tolerance ring groove.

2. Condemning limit for output (driven) shaft 4.812" ± .005" dimension, Fig. 5, is 4.797". Limit for main drive shaft 5.062" ± .005" dimension, Fig. 6, is 5.047".

3. Tapped hole(s) in shaft end(s) should be cleaned up with a 1"-14 tap. Shafts with tapped hole in one end only should be reworked to provide the 1"-14 hole in both ends.

BEARINGS

1. Bearing seat and bore diameters in gear case and bearing retainers, Fig. 7, must be within the drawing tolerance of 8.4644" + .0014" - .0000" at four diameters approximately 45° apart for the full width of the bearing seat or bore. Oversize or damaged bores in the retainers or case should be built up by welding, and then re-bored to proper size.

2. Check parallelism of outer edge of bearing retainer to outer edge of bearing cover mounting surface of both input and output bores. Out-of-parallel surfaces should be corrected by machining. Condemning limit for the 14.500" ± .005" dimension in the gear case, Fig. 7, is 14.485". The limit for the 14.375" ± .005" dimension is 14.360".

3. Test fit input and output shaft bearings in gear case and retainer bores. Bearings must fit into the case and retainers without interference and be free to move by hand.

NOTE

Bearings may be tight in bores that are within tolerance because of small high spots that are not detected by the dial bore gauge. These

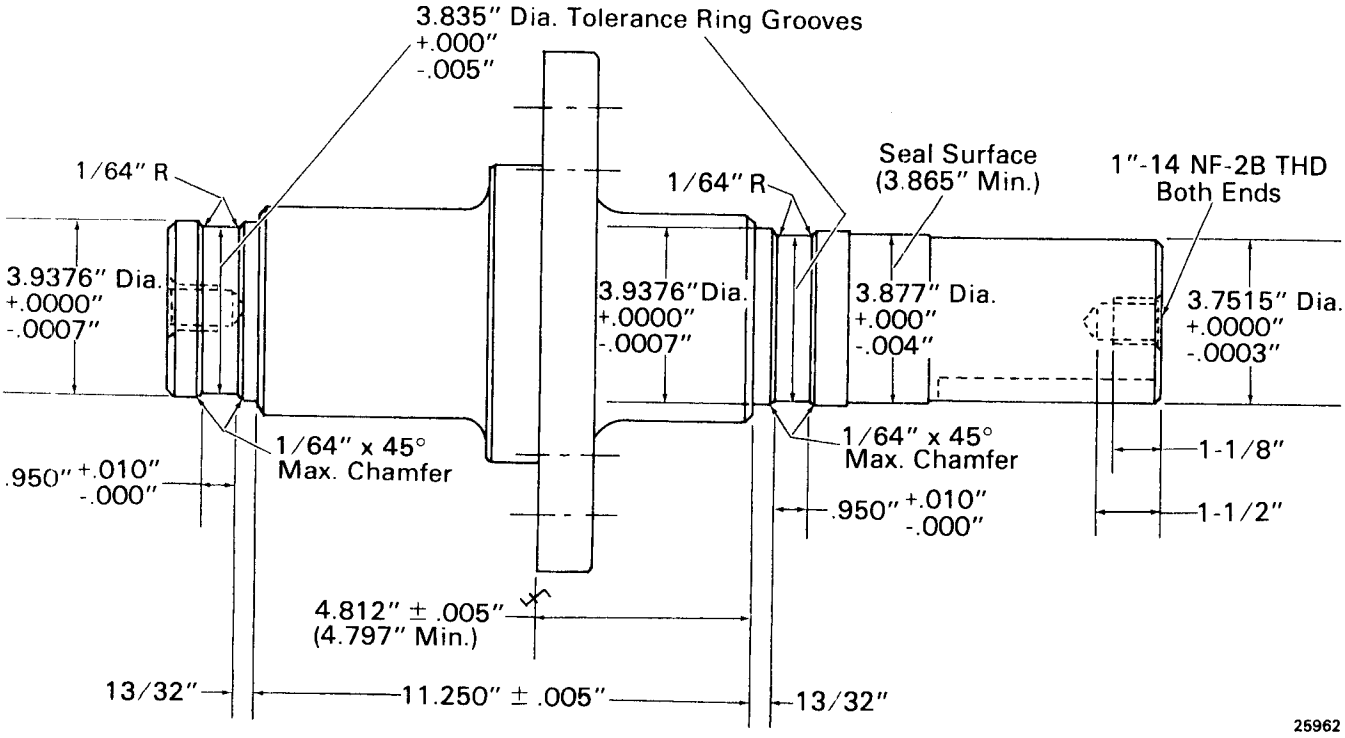

Fig.5 - Typical Output (Driven) Shaft Rework Limits

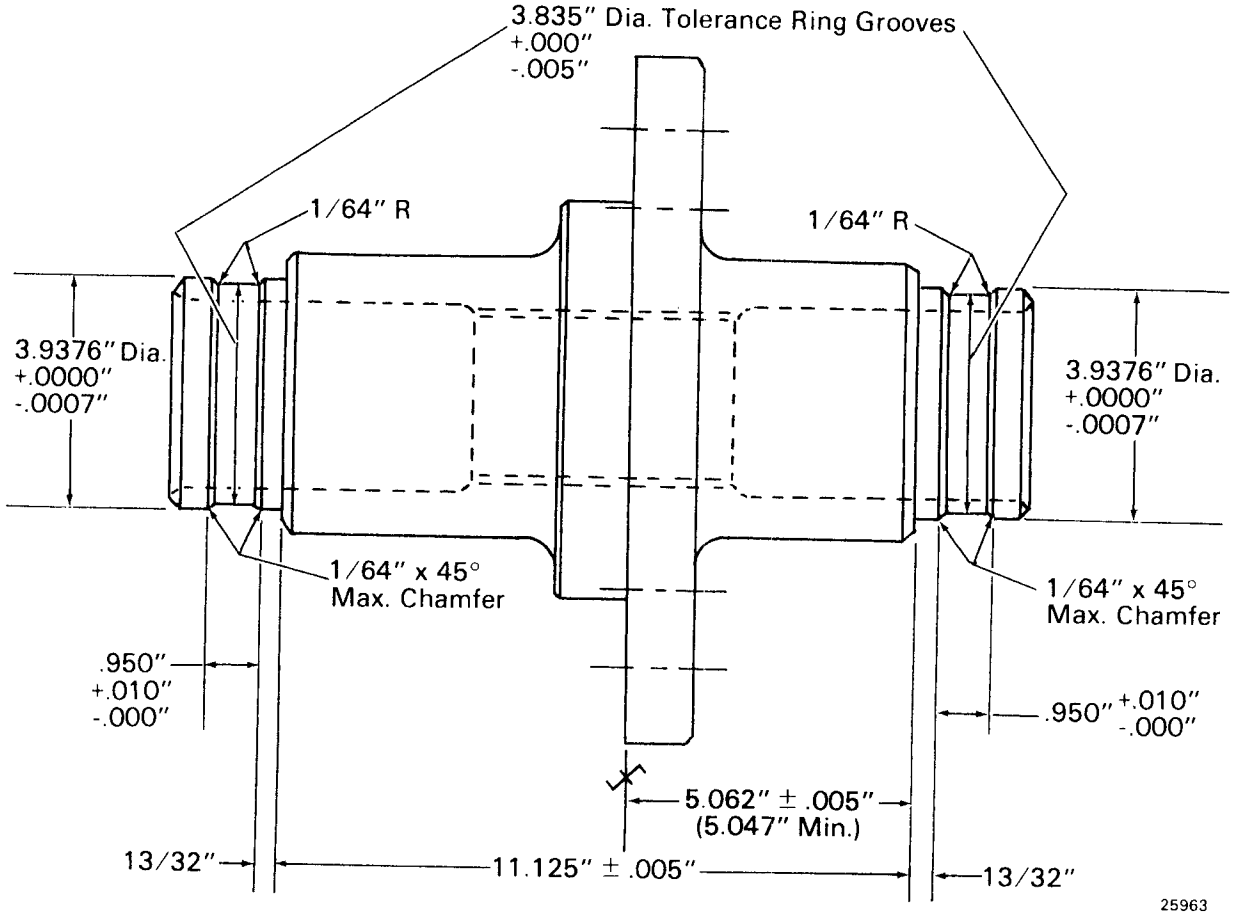

Fig.6 - Main Drive Shaft Rework Limits

spots will be indicated as bright areas after the bearing is pushed through the bore and must be polished out until the bearing moves freely.

ASSEMBLY

1. Apply Texaco Threadtex No. 2303 to threads of gear mounting bolts.

2. Secure input and output gears to shafts with mounting bolts and lockwashers. Torque bolts to 1 288 N·m (950 ft-lbs).

3. Apply tolerance ring inserts to grooves in shaft bearing seats.

4. Press bearings on main drive and output shafts until bearings seat tight against shaft shoulders. With tolerance ring inserts in place, a hydraulic pressure of 68 948 kPa (10,000 psi) to 137 895 kPa (20,000 psi) will be required to install (or remove) the bearings.

NOTE

Bearings must have interference to shaft fit of not less than 0.0002" or more than 0.0009".

5. Place bearing retainer on main drive shaft bearing, and secure temporarily with seal retainer (without seals).

6. Assemble oil sump to bearing retainer with mounting bolts. Torque bolts to 34 N·m (25 ft-lbs.). Lockwire heads of oil sump bolts.

7. Temporarily install input bearing cover to gear box.

8. Place gear box in the horizontal (shafts up) position and install main drive shaft retainer gasket.

9. Lower main drive shaft, bearings and retainer into gear case.

10. Install retainer bolts and lockwashers. Torque bolts to 88 N·m (65 ft-lbs).

11. Temporarily apply output shaft seal retainers (without seals) to gear case.

12. Place gear case on blocks (approximately six inches high) with seal retainer side (front of gear case) facing down.

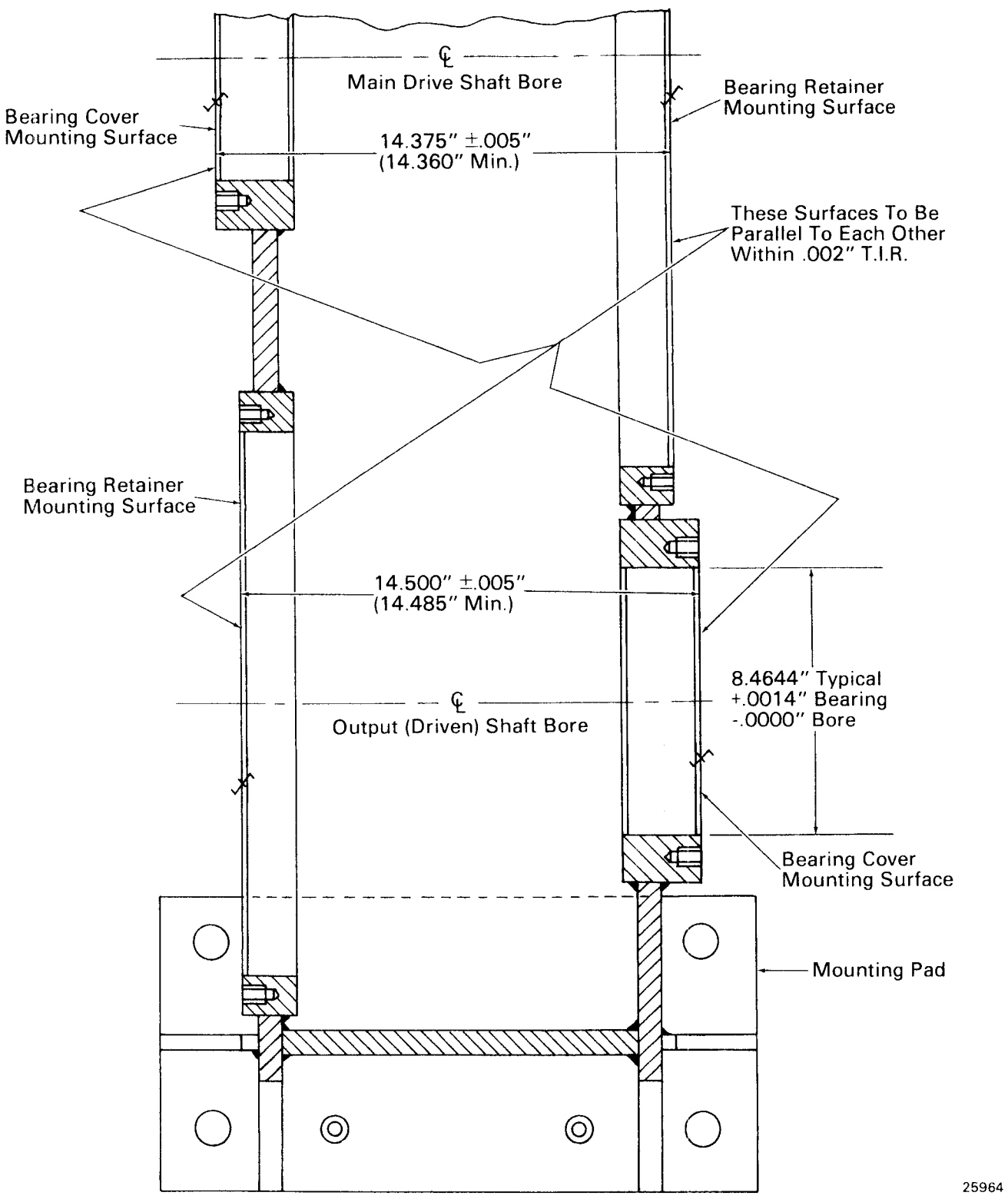

Fig.7 – Typical Gear Case Cross Section

13. Lower right hand output shaft with gear and bearings into gear case with stubshaft pointing down.

14. Place retainer-to-gear case gasket on gear case.

15. Place bearing retainer over rear bearing and secure retainer to gear case with mounting bolts and lockwashers. Torque bolts to 88 N·m (65 ft-lbs.).

16. Install bearing cover gasket and bearing cover. Secure cover to bearing retainer with mounting bolts and lockwashers. Torque bolts to 176 N·m (130 ft-lbs.).

17. Install left hand output shaft assembly in same manner as right hand assembly.

18. Remove main drive shaft bearing cover and seal retainer.

19. Check gear lash as follows:

    a. Place steel or hardwood blocks approximately four to five inches in diameter, 3/4" to 1" thick, on each end of the main drive shaft under the bearing cover and oil seal retainer.

    b. Tighten only two of the 5/8" cap screws (180° apart) in each bearing cover until the center shaft is locked.

    c. Attach radius arm to end of each output shaft and check gear lash at 8.25" radius (gear pitch diameter is 16.50"). Gear lash must be between 0.010" and 0.040".

NOTE

If these limits cannot be held, major rebuilding of the gear case assembly is required.

20. Remove bearing cover and oil seal retainer from main drive shaft, and remove blocks.

21. Install oil baffle (slinger) in bearing cover end of main drive shaft. Press baffle into shaft end (rolled end first) until edge of baffle is flush with inside of internal chamfer.

22. Apply pipe nipple to inside of main drive shaft bearing cover (if removed) wrench tight. Install bearing cover and gasket. Secure to case with bolts and lockwashers.

23. Remove oil seal retainers from output shafts.

24. Determine bearing laterals as follows:

    a. Move main drive and output shafts so rear bearings are against their bearing covers.

    b. Measure the height of the pilot on the seal retainer without the gasket.

    c. Measure the distance from the bearing retainer gasket surface to the outer race of the front bearing.

    d. The difference in the two dimensions is the minimum clearance between the cover pilot and the bearing outer race, and is the bearing lateral.

    The bearing lateral must not be less than 0.010" on any of the three shafts.

25. Soak felt and leather oil seals in SAE No. 10 oil for twenty minutes prior to application.

26. Install oil seals in seal retainers with the felt seal first, then the leather seal with the lip edge toward the bearing.

27. Install oil seal retainers and gaskets and secure with mounting bolts and lockwashers. Torque bolts to 176 N·m (130 ft-lbs.).

28. Apply oil transfer tube between main drive bearing cover and gear case. Torque bolts to 34 N·m (25 ft-lbs.).

29. Install gear case oil drain plug, oil filler assembly, and sight glass (if removed).

30. Fill gear case oil sump to mid-point of sight glass.

NOTE

Assembly may be test run to check for excessive gear or bearing noise using a motor coupled to one shaft. Shaft speed should be limited to no more than 1000 RPM during test.

SERVICE DATA

REFERENCE

Lubricant specifications (gear case oil) . . . . . M.I. 1756

SPECIFICATIONS

Output (driven) gear to mounting face - Max.	2-5/32″
Output (driven) gear to shaft mating surface - Max.	29/32″
Main drive gear to mounting face - Max.	2-9/32″
Main drive gear to shaft mating surface - Max.	1-1/32″
Output (driven) shaft to gear mating surface - Min.	4.797″
Output (driven) shaft seal surface diameter - Min.	3.865″
Main drive shaft to gear mating surface - Min.	5.047″
Bearing bore in bearing retainer or gear case	8.4644″-8.4658″
Out-of-parallel (bearing retainer to bearing cover mounting surface) - Min.	
Input bore	14.485″
Output bore	14.360″

MATERIAL

Thread lubricant, Texaco Threadtex No. 2303 (approx. 18.93 litre [5 gal.]) 8307731

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Electro-Motive Division Of General Motors La Grange, Illinois 60525

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