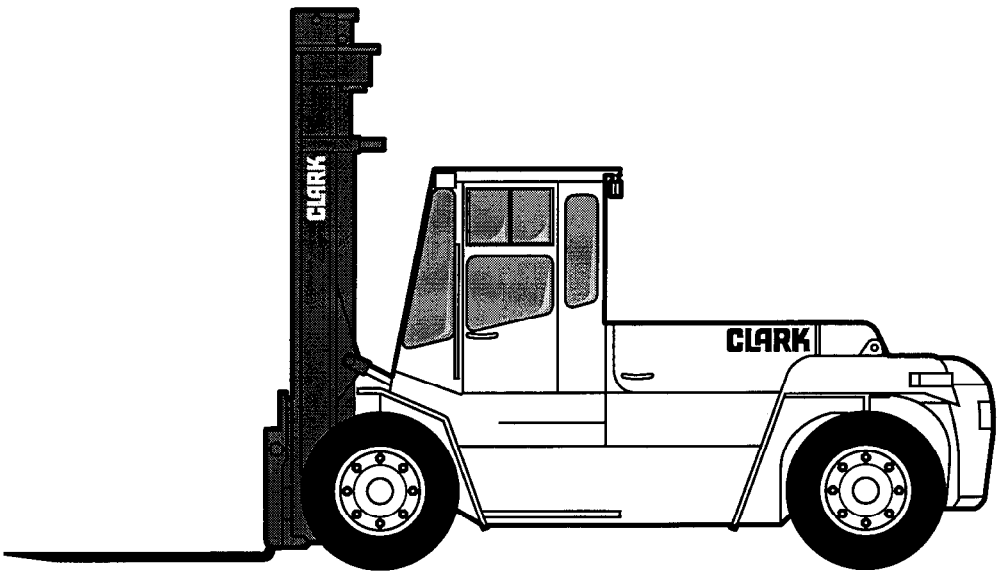
Main Table of Contents

SM 622
CDP 100/164
Service Manual



ISO 9001 CERTIFIED CLARK

CLARK Technical Publications Lexington, KY 40508

250 Hour Service Check list

1. Visually inspect machine for obvious damage.
2. Raise bonnet to give access to engine bay.
3. Check engine oil. Add oil to full mark on engine dipstick.
4. Check the coolant level.
5. Check the fuel level and condition of screen located under fuel filler cap.
6. Lower the upright and check the hydraulic fluid level. When necessary, add *BP Super TOU*, or equivalent, to the proper level. Check condition of hydraulic tank cap and torque tank cap base securing bolts.
7. Check the transmission fluid level with the engine at idle. The fluid level is checked by removing a level plug at the side of the transmission. Add oil until off flows from plug hose. For transmission oil specification, see lubrication guide.
8. Check the seat mounting for security and the seat adjuster for proper forward and back operation.
9. Start the engine and listen for unusual engine noise. Report any unusual noises immediately.
10. Check drive tire inside turning diameters which should be about equal in forward left and right turns. While driving, listen for unusual drive train noise.
11. Make a visual check of the truck. Look for signs of obvious leaks.
12. Inspect the sheet metal. Any damage should be noted on the P.M. check sheet.
13. Check the hydraulic control levers for security and freedom of movement.
14. Jack up the machine and check for loose wheel bearings by trying to rock the wheels vertically. Rocking wheels horizontally may indicate wear in steering linkage.
15. Turn the steering wheel left and right with engine idling and truck not moving. Steer wheels should respond immediately. The engine should not lug down.
16. Check hydraulic lines and cylinders for leaks.
17. Using a two foot extension on the air hose, blow through the radiator from the counterweight side and blow off the engine. Then blow through the radiator from the engine side.

⚠ WARNING

Do not use air pressure greater than 30 PSI.

18. Also, blow off the transmission, the differential, and surrounding areas.
19. Check the alternator mounting bolts to make sure they are secure.
20. Adjust the drive belt for proper tension. If tension is low, belt will slip, if to high, bearing and seal damage can occur in alternator and water pump.
21. Check the fan blades for looseness and damage. Make sure the fan is properly installed. Check for correct fan blade to radiator cowling clearance.
22. Pressure test the radiator cap, replacing it if necessary. Pressure requirement is 7 PSI.
23. Pressure test the cooling system, eliminating any leaks which are found. Check for operation of low water level sensor. Check for leaks at all hose fittings.
24. While the oil drains, clean and lubricate all grease fittings. See lubrication section for details..
25. Refill engine with engine oil. Recheck level.
26. Check linkages, lubricating all connections. In dirty, abrasive operations, use a dry type lubricant.
27. Check the fuel control linkage for security and mounting.
28. Replace all filters at specified intervals. See Preventative Maintenance schedule for details.
29. Engine oil filter is located on left hand side of engine. Change as per the preventative maintenance program.
30. Water corrosion filter is located on left hand side of engine. Shut off taps are located both sides of the filter. Change as per the preventative maintenance program.

IMPORTANT

To prevent intercooler damage, air caught in water system must be bled after changing this filter. Bleed points are located behind oil cooler filter mount, top of ????

31. Check tires for excessive wear and cuts. Remove any objects which could damage the tires. Also check wheel lug nuts for tightness and make sure none are missing. Re-torque wheel lug bolts two or three times during the first three initial work days. Torque to required specifications (see Critical Torque Areas).
32. Differential: Check lubricant level after each 250 hours of operation. Always maintain lubricant level to bottom of filler plug hole. Drain oil every 1,000 operating hours.
33. Check axle and lubricant level, and if necessary, fill to the required level.
34. Clean the upright and chains.
35. Check wear patterns in the rails. A wear pattern like this indicates that chain adjustment is correct.
36. A wear pattern like this means. that the chains are too long and must be adjusted to correct length. See upright section for adjustment procedures.
37. Check the condition of the load rollers and the corresponding area on the carriage.
38. Check chain adjustment by making sure the chains are under equal tension. See upright section for adjustments.
39. Make sure chains are properly mounted on rollers. Check rollers for damage.
40. Use an approved safety platform, raised by another lift truck, to perform these checks in the raised positions. Refer to Section 14 for adjustment procedures.
41. Check to see that the lift cylinders are securely bolted to the upright.
42. Check the chain anchors and cotter pins. Make sure they are secure and in good condition.

Wet Disc Brakes
There is no adjustment for the sealed wet disc brake unit. The operator should inspect the wet disc brake area for any oil leaks. If any leaks are found, they should be reported and repaired. Generally a delay in braking can indicate that brake plates are nearing the plate wear limit, (the limit before the brake discs need replacement). Minimum thickness of brake disc is 5.22mm (nominal 6.2mm) therefore free motion of the brake piston increases from 2.5mm to 8.5mm. For any further information consult your service manual. This hydraulic system is filled with an accumulator which requires servicing as per the following pages and the Preventative Maintenance Schedule.

Hydraulic Tank
Check the hydraulic tank oil level. Correct fluid level is important for proper system operation. Low oil level can cause pump damage. Overfilling can cause loss of oil or lift system malfunction.

Hydraulic fluid expands as its temperature rises. Therefore, it is preferable to check the fluid level at operating temperature (after approximately 30 minutes of truck operation). To check the fluid level, first park the truck on a level surface and apply the parking brake. Raise the upright to the full stroke and lower the fork carriage fully. Pull the dipstick out, (attached to the sump breather) wipe it with a clean wiper and re-insert it. Remove dipstick and check oil level. Keep the oil level above the LOW mark on the dipstick by adding recommended hydraulic fluid only, as required. DO NOT OVERFILL.

Check the condition of the hydraulic oil (age, color or clarity, contamination and additives). Hydraulic Oil and Filter Change Drain and replace the hydraulic oil every 1000 operating hours. (Severe service or adverse conditions may require more frequent fluid change). Replace the hydraulic oil filter element at every oil change. Remove and inspect suction strainers screens and repair as required. Remove magnetic drain plug and inspect for any ferrous particles. Wipe clean and monitor. A programmed oil sampling system can assist in monitoring for any unexpected failures. Check for leaks after installation of the filters. Also, check that the hydraulic line connections are tightened correctly.

Hydraulic Tank Breather Maintenance and Inspection
Remove the hydraulic tank fill cap/breather and inspect for excessive (obvious) contamination and damage. Clean or replace the fill cap/breather, as required by operating conditions.

Hydraulic System
The filling of an accumulator is an option for the hydraulic lift circuit, for applications where the operating surface is rough or unsealed, it is recommended. Note, this system is standard for all Clark container handling trucks. The accumulator requires maintenance as per following page and the Preventative Maintenance Schedule.

ACCUMULATORS

Check Precharge

⚠ DANGER

If working on accumulators or accumulated hydraulic circuits, ensure hydraulic pressure is released. These systems contain high pressure that can cause injury even death.

When a new accumulator has been in service for a short period, the precharge should be checked to ensure there is no leakage.

Subsequent checks need only be at 250hrs interval or 6 months which ever comes first.

When checking the precharge of an accumulator installed in a system, the accumulator must be isolated from the system pressure and the fluid removed by bleeding the hydraulic pressure down through the charging set bleed valve and collecting the fluid in a suitable container or release the fluid back to tank.

Fit charging set without the charging hose fitted, ensuring the bleed valve is closed and charging connection sealing cap is fitted. Turn handwheel clockwise and check precharge. Replenish if required.

If you are not sure or do not have the equipment to carry out precharge testing, contact your local Clark dealer or a specialized hydraulics company.

IMPORTANT

A. Use nitrogen gas only.
B. Check model number of accumulator on label for working pressure.
C. Always use a nitrogen pressure regulator.
D. If unit has been rebuilt, ensure bladder has been lubricated with system fluid before commencing precharge.

Transmission Fluid Check
Before making check, run engine until unit is at operating temperature. This is important as transmission oil temperature should be 90°C (200°F) and the engine waterjacket should be at operating temperature. Apply parking brake. With the engine operating at idle and the transmission in NEUTRAL, check the fluid on the dipstick. Fill if necessary to the FULL mark on the dipstick, using *"C-3 Mono Grade"* oil. *(See lubrication sheet for specifications).*

Differential Oil and Breather Check
Check the differential breather to be sure it is free of obstruction.

SECTION 1.

TROUBLESHOOTING

CONDITION	POSSIBLE CAUSE	SUGGESTED CORRECTION
Excessive engine noise.	1. Drive belt slipping.	1. Check operation of belt tensioner. If defective, replace. Check condition of drive belt. If worn or damaged, replace.
	2. Intake air or exhaust system leaks.	2. Check and repair intake air or exhaust system.
	3. Excessive valve lash.	3. Adjust valves. Check for bent push rods or worn rocker levers. Replace any defective components.
	4. Turbocharger defective.	4. Check turbocharger for evidence of impeller and/or shaft and wheel to housing contact. Repair turbocharger.
	5. Excessive front gear backlash.	5. Check and measure gear backlash. Adjust backlash. Check and replace gears as required.
	6. Rod and/or main bearings worn or damaged.	6. Replace rod and/or main bearings.

Replace the thermostat if even a slight opening of the valve at normal temperature is found or if its appearance shows any breakage. If the sensing part is damaged, the thermostat valve will remain closed.

COOLING SYSTEM DRAIN AND REFILL

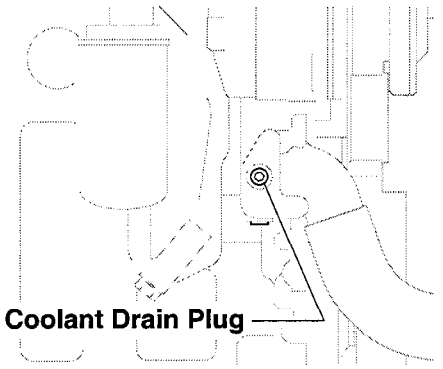
Draining the Radiator and Cooling System

Place a large drain pan under the radiator and engine and remove radiator cap.

⚠ WARNING

!! STEAM !!

Do not remove radiator cap when the radiator is hot. Steam from the radiator will cause severe burns.



Remove the coolant drain plug from the engine block as shown and open drain cock on radiator.

Inspect the coolant hoses and clamps to determine if they need to be replaced.

Flushing the Cooling System

If the condition of the used coolant indicates severe contamination, rust deposits, scale or oil in the cooling system, it may be necessary to clean and flush the cooling system with a commercial cleaner. Choose a product from a reliable manufacturer and follow the manufacturer's recommendations in its use.

Reinstall the engine coolant drain plug and close the radiator drain cock.

Fill the cooling system and perform the cleaning and flushing operation in accordance with the manufacturer's recommended procedure.

Again drain the cooling system by removing the engine coolant drain plug and opening the radiator drain cock. Reinstall the engine coolant drain plug, close the radiator cock and remove the drain pan. Dispose of both used coolant and flushing fluid in the proscribed manner.

Fill the radiator to the bottom of the filler neck opening with the recommended coolant mixture.

Start the engine and allow it to run for 2-3 minutes to circulate coolant through the cooling system. Accelerate the engine to a moderate speed several times for brief periods. Then, stop engine.

Check the coolant level and add coolant as required to the correct fill level.

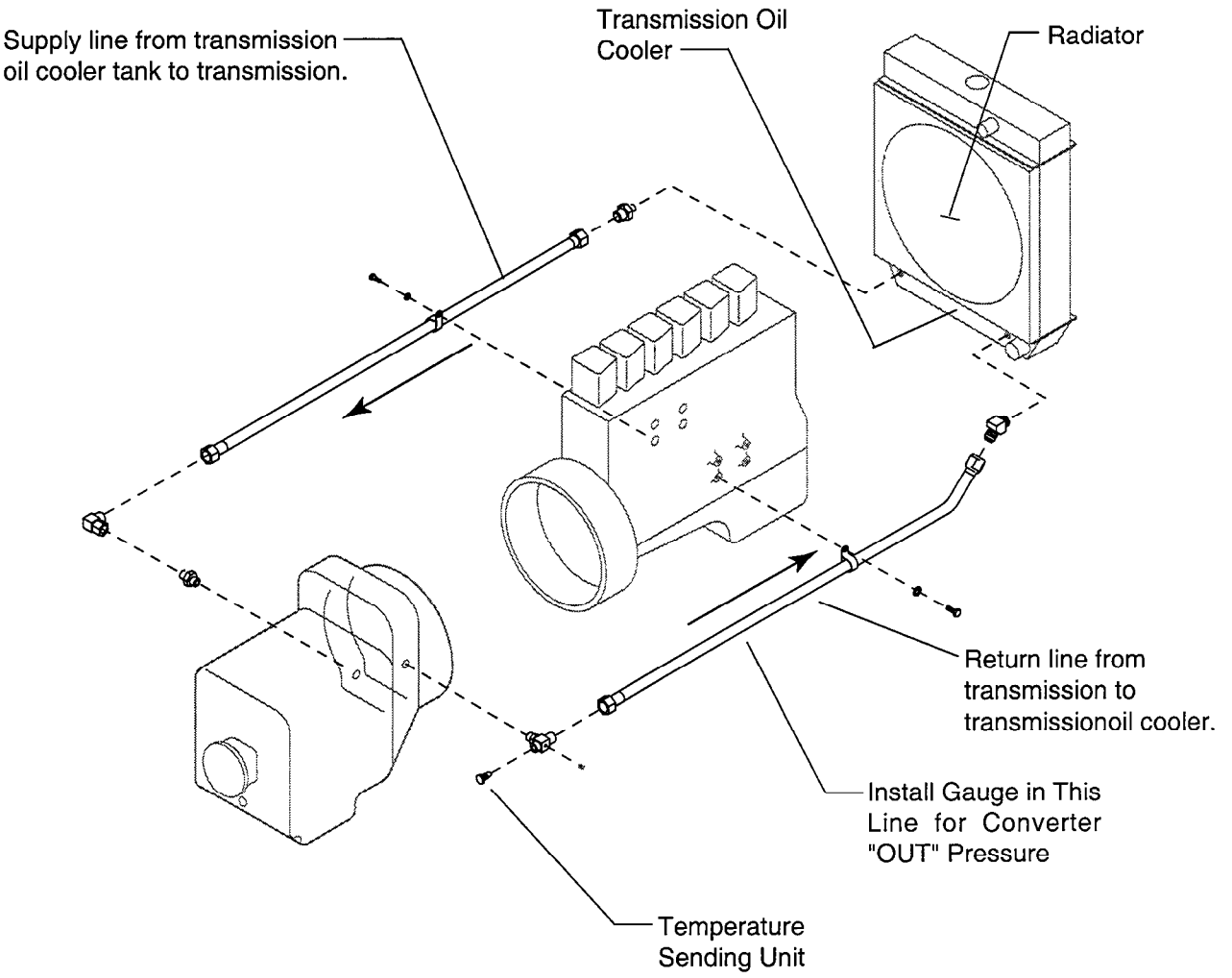
Reinstall radiator cap and again start engine. Run at fast idle and observe temperature gauge until operating temperature has been reached and the thermostat has opened. Shut engine down and allow to cool.

Using shop cloth as shown, remove radiator cap. Turn cap only to the first stop and allow any residual steam to escape. Then remove cap and top off coolant as necessary with recommended coolant mixture.

Again inspect cooling system hoses, connections and components for any leaks that may have developed when system was pressurized.

SECTION 3

TRANSMISSION COOLING



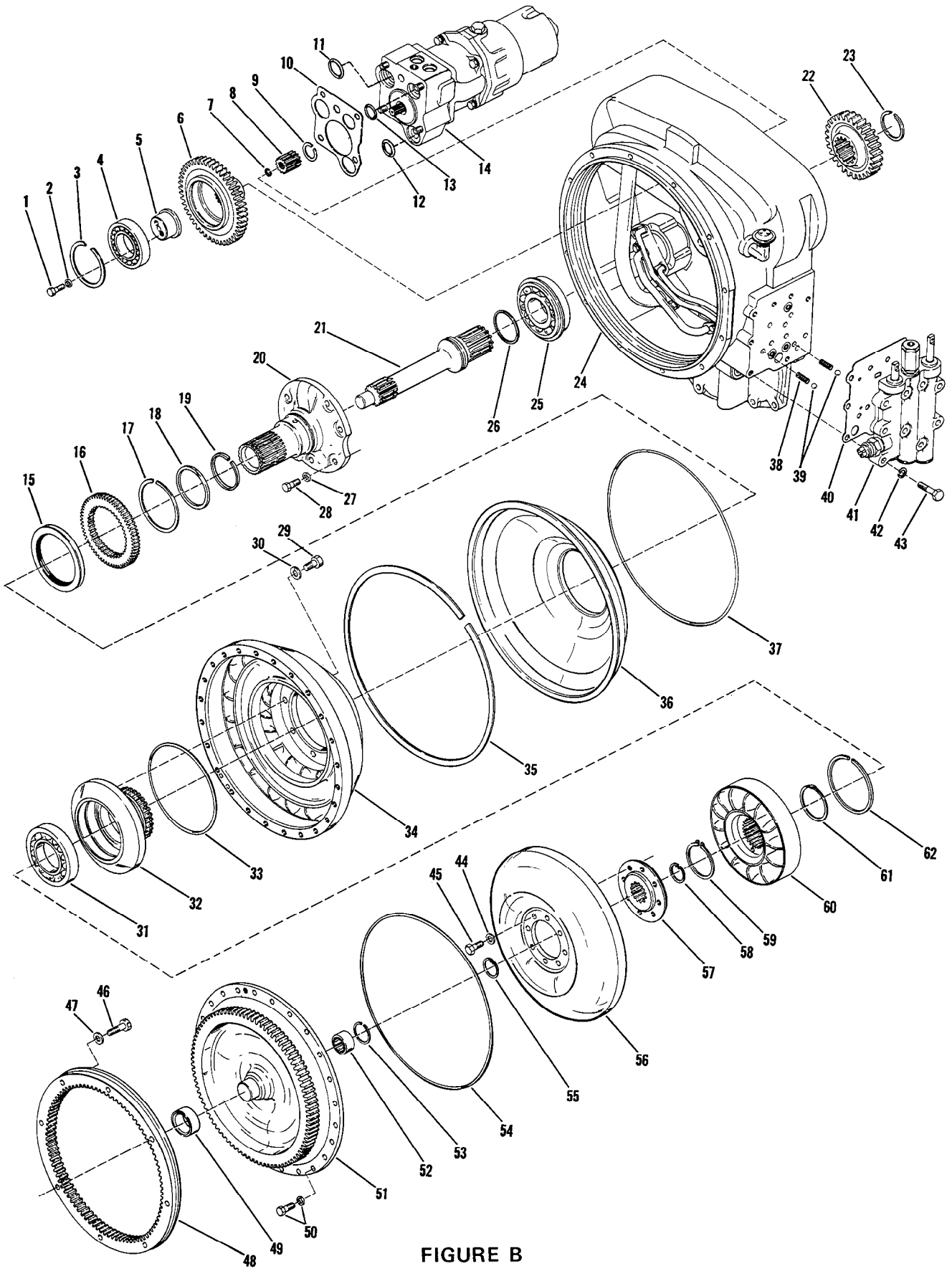

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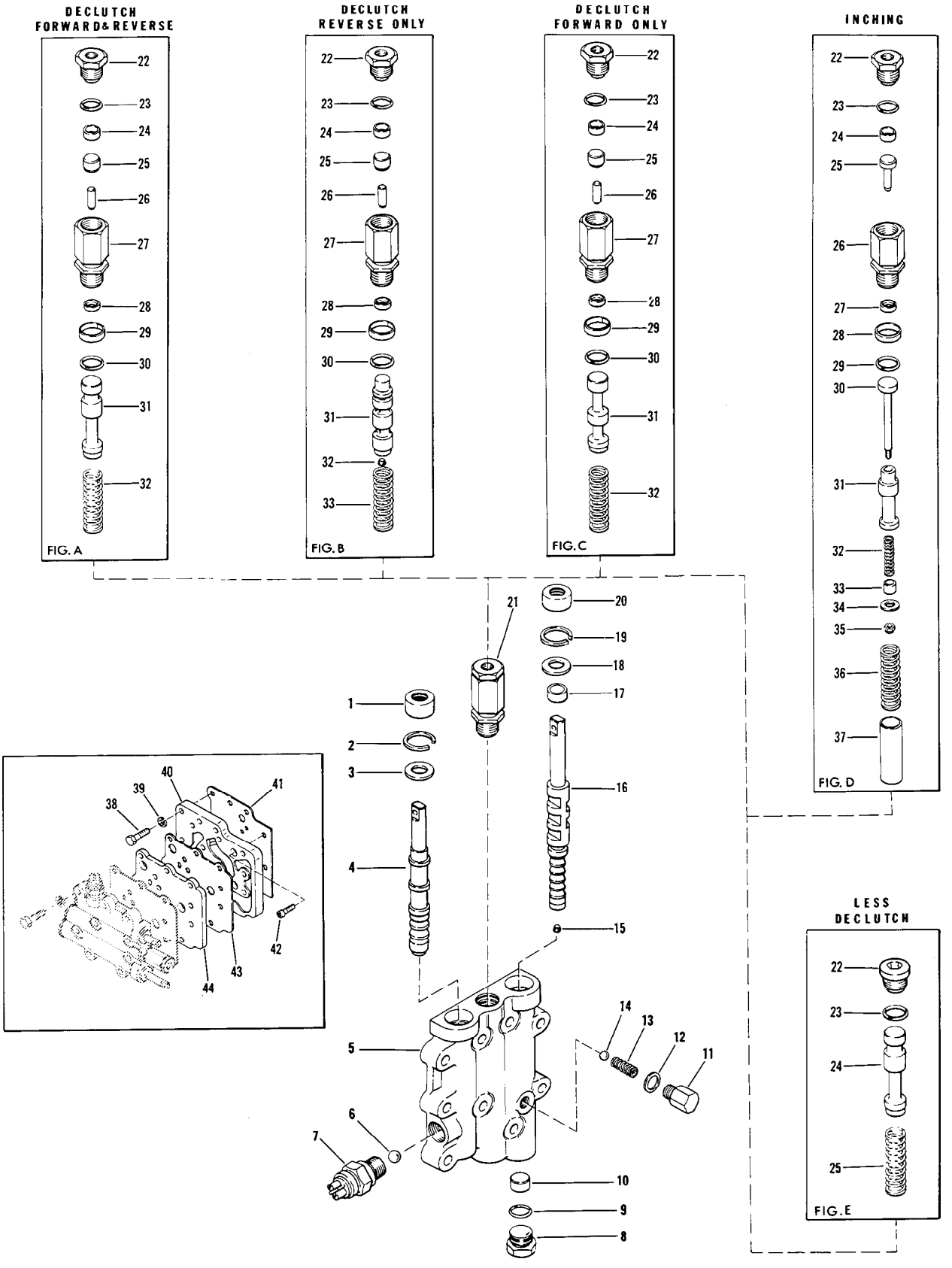
FIGURE B



HYDRAULICALLY OPERATED CONTROL VALVE

FIGURE G

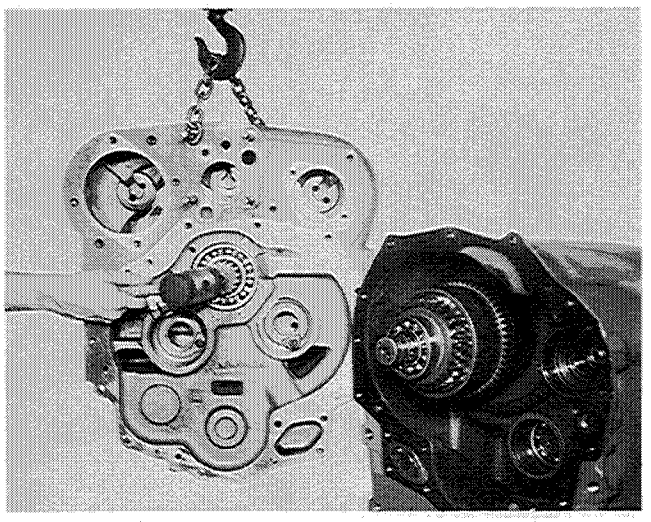


Figure 29
From rear of converter housing tap turbine shaft and bearing from housing.

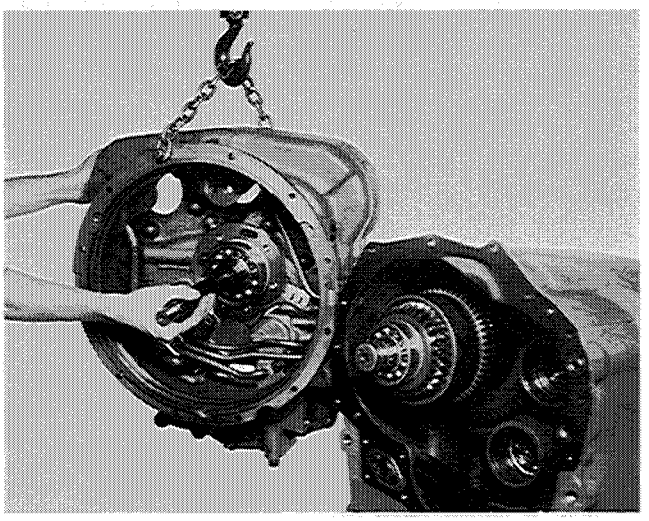


Figure 30
Remove turbine shaft and bearing from converter housing.

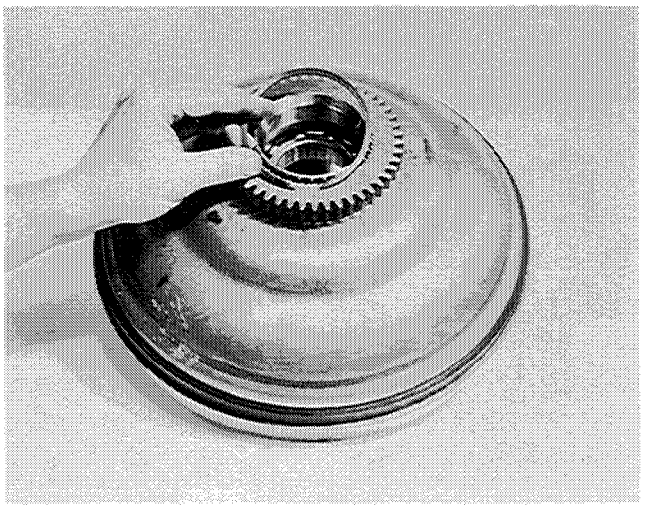


Figure 31
Remove impeller hub gear retainer ring.

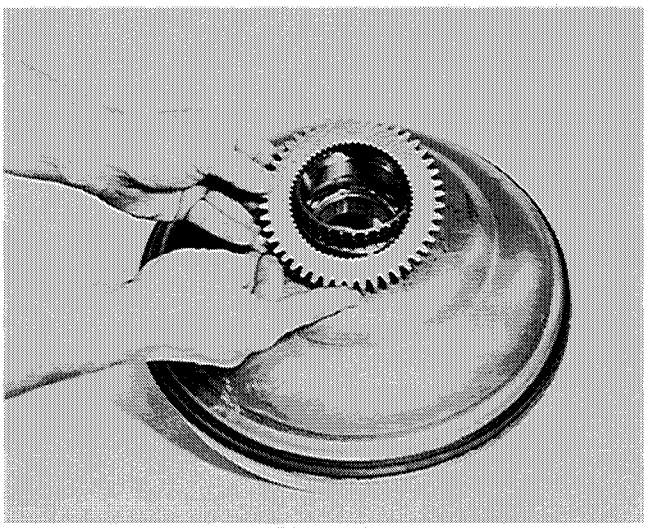


Figure 32
Remove impeller hub gear.

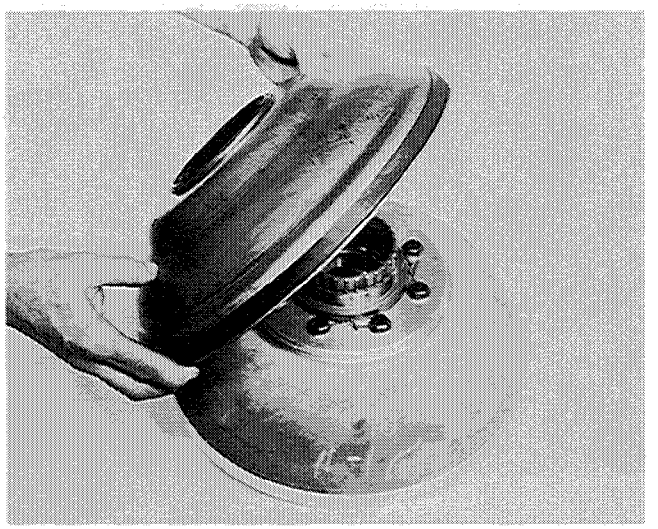


Figure 33
Lift oil baffle and oil seal assembly from impeller.

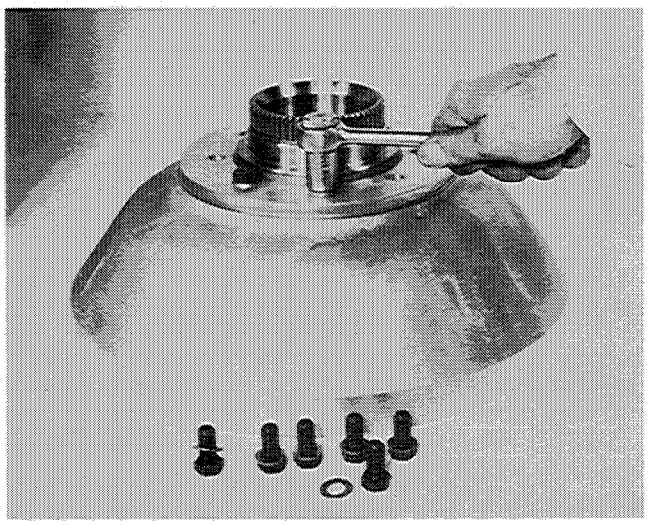


Figure 34
Remove impeller to hub bolts.

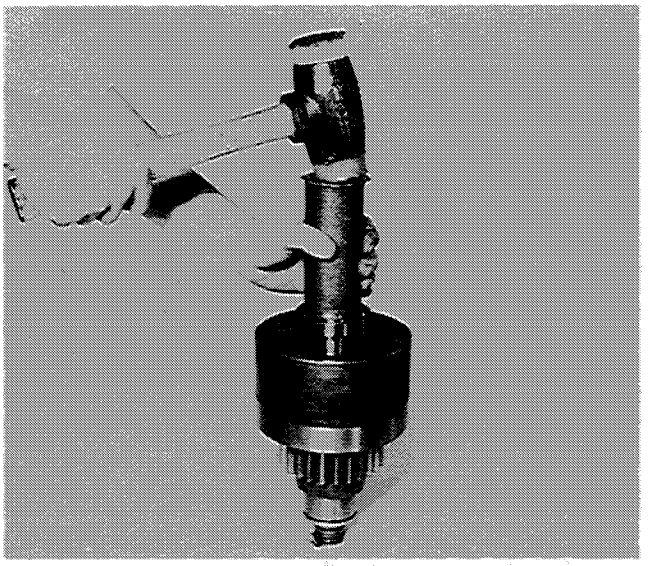


Figure 84
Install low gear inner bearing.

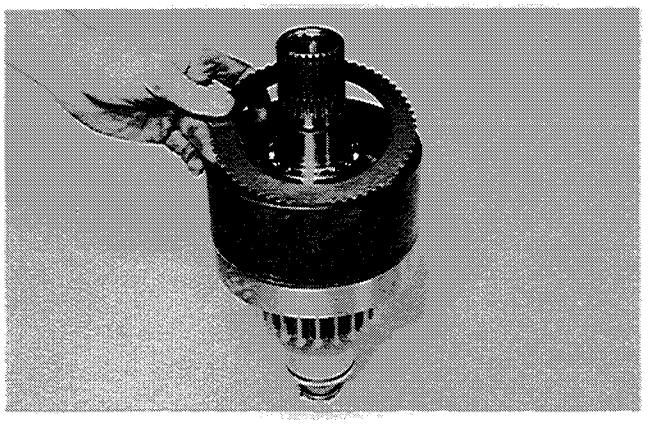


Figure 85
Install one steel disc.

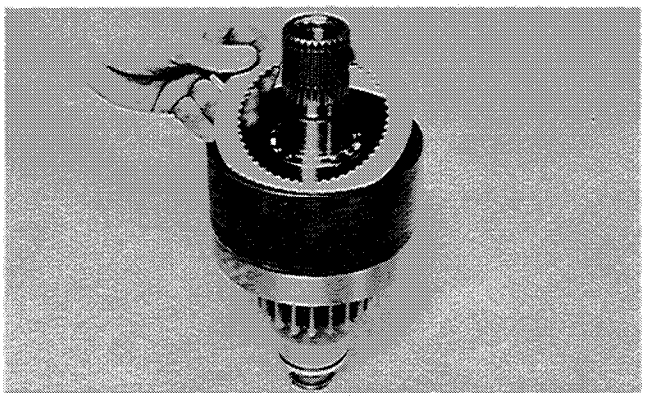


Figure 86
Install one friction disc.

NOTE: The friction discs in the low clutch has a higher co-efficient rating than the friction discs in the other clutches, therefore the discs must not be mixed. Alternate steel and friction discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is friction.

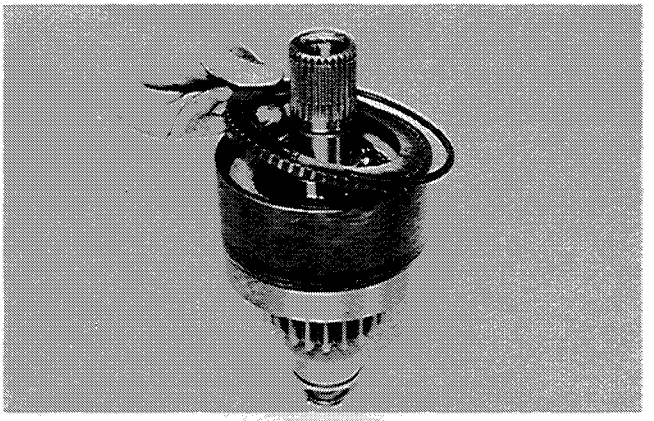


Figure 87
Install end plate and retainer ring.

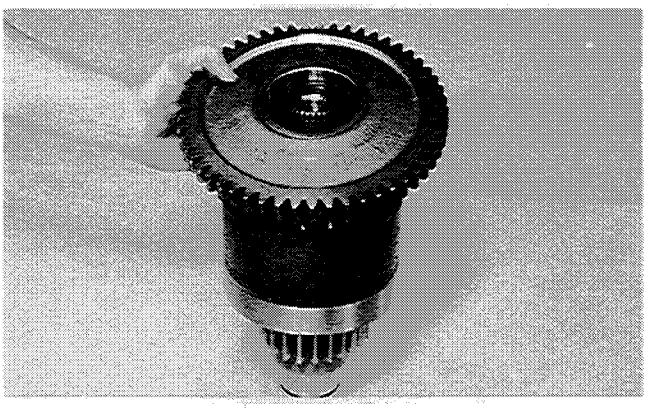


Figure 88
Install low gear into clutch drum. Align splines on low gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

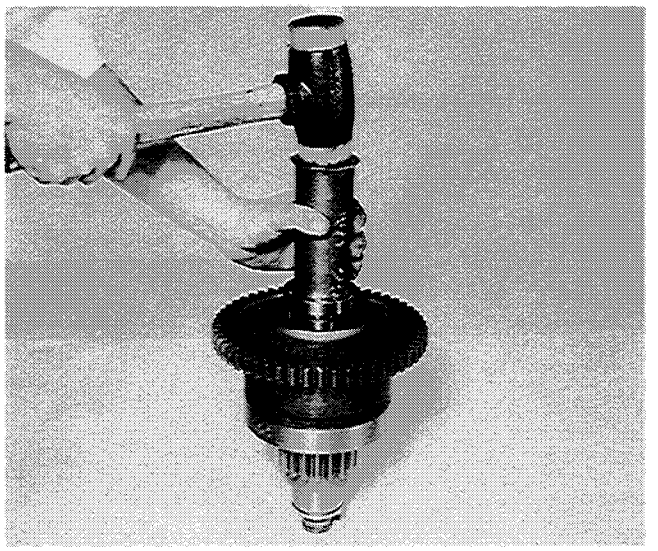


Figure 89
Install low gear outer bearing.

NOTE: When installing the 3rd gear in the 3rd speed clutch a bearing spacer is used between the inner and outer 3rd gear bearing.

SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the drive line between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other; therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered completed.

After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1. Drain entire system thoroughly.

2. Disconnect and clean all hydraulic lines. Where feasible, hydraulic lines should be removed from machine for cleaning.

3. Replace oil filter elements, cleaning out filter cases thoroughly.

4. The oil cooler must be thoroughly cleaned. The cooler should be "back flushed" with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from machine for cleaning, using oil, compressed air and steam cleaner for that purpose. **DO NOT** use flushing compounds for cleaning purposes.

5. On remote mounted torque converters remove drain plug from torque converter and inspect interior of converter housing, gears, etc. If presence of considerable foreign material is noted, it will be necessary that converter be removed, disassembled and cleaned thoroughly. It is realized this entails extra labor; however, such labor is a minor cost compared to cost of difficulties which can result from presence of such foreign material in the system.

6. Reassemble all components and use only type oil recommended in lubrication section. Fill transmission through filler opening until fluid comes up to **LOW** mark on transmission dipstick. **NOTE:** If the dipstick is not accessible oil level check plugs are provided.

   Remove **LOWER** check plug, fill until oil runs from **LOWER** oil hole. Replace filler and level plug.

   Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle (500-600 RPM).

   Add quantity necessary to bring fluid level to **LOW** mark on dipstick or runs freely from **LOWER** oil level check plug hole. Install oil level plug or dipstick. Recheck with hot oil (180-200° F.) [82, 2-93, 3° C].

   Bring oil level to **FULL** mark on dipstick or runs freely from **UPPER** oil level plug.

7. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.

TORQUE IN (LBS.—FT.)
BOLTS, CAPSCREWS, STUDS AND NUTS

Grade 5 Identification, 3 Radial
Dashes 120° Apart on Head of Bolt

Grade 8 Identification, 6 Radial
Dashes 60° Apart on Head of Bolt

Torque Specification for Lubricated or Plated Screw Threads

NOM. SIZE	Grade 5 FINE THREAD LB-FT	Grade 5 FINE THREAD [N·m]	Grade 5 COARSE THREAD LB-FT	Grade 5 COARSE THREAD [N·m]	Grade 8 FINE THREAD LB-FT	Grade 8 FINE THREAD [N·m]	Grade 8 COARSE THREAD LB-FT	Grade 8 COARSE THREAD [N·m]
.2500	9 - 11	[12,3 - 14,9]	8 - 10	[10,9 - 13,5]	11 - 13	[15,0 - 17,6]	9 - 11	[12,3 - 14,9]
.3125	16 - 20	[21,7 - 27,1]	12 - 16	[16,3 - 21,6]	28 - 32	[38,0 - 43,3]	26 - 30	[35,3 - 40,6]
.3750	26 - 29	[35,3 - 39,3]	23 - 25	[31,2 - 33,8]	37 - 41	[50,2 - 55,5]	33 - 36	[44,8 - 48,8]
.4375	41 - 45	[55,6 - 61,0]	37 - 41	[50,2 - 55,5]	58 - 64	[78,7 - 86,7]	52 - 57	[70,6 - 77,2]
.5000	64 - 70	[86,8 - 94,9]	57 - 63	[77,3 - 85,4]	90 - 99	[122,1 - 134,2]	80 - 88	[108,5 - 119,3]
.5625	91 - 100	[123,4 - 135,5]	82 - 90	[111,2 - 122,0]	128 - 141	[173,6 - 191,1]	115 - 127	[156,0 - 172,2]
.6250	128 - 141	[173,5 - 191,2]	113 - 124	[153,2 - 168,1]	180 - 198	[224,0 - 268,5]	159 - 175	[215,6 - 237,3]
.7500	223 - 245	[302,3 - 332,2]	200 - 220	[271,2 - 298,3]	315 - 347	[427,1 - 470,5]	282 - 310	[382,3 - 420,3]

32 SCREW RING GEAR INSTALLATION PROCEDURE
(Non-Asbestos Ring Gear)

1. Remove all burrs from flywheel mounting face and pilot bores. Clean the torque converter ring gear flywheel mounting surface and the ring gear screw tapped holes with solvent. Dry thoroughly, being certain ring gear screw holes are dry and clean.

2. Check engine flywheel and housing or housing adaptor for conformance to standard S.A.E. No. 3 — SAE J927 and J1033 tolerance specifications for pilot bores size, pilot bores eccentricities and mounting face deviations. Measure and record engine crankshaft end play.

3. Install torque converter ring gear as shown.

   NOTE: Assembly of the ring gear must be completed within a fifteen minute period from start of screw installation. The screws are prepared with an epoxy coating which begins to harden after installation in the flywheel mounting holes. If not tightened to proper torque within the fifteen minute period insufficient screw clamping tension will result.

4. Install backing ring and thirty-two (32) special screws to approximately .06 inch [1,5 mm] of seated position. It is permissible to use a power wrench for this installation phase. With a calibrated torque wrench tighten screws 23 to 25 pounds feet of torque [31,2 - 33,8 N.m].

   To obtain maximum effectiveness of the special screw's locking feature, a minimum time period after screw installation of twelve (12) hours is suggested before engine start-up.

   The special screw is to be used for **ONE** installation only. If the screw is removed for any reason it **MUST BE REPLACED.** It is recommended that the epoxy left in the flywheel hole be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a **NEW** screw for re-installation.

5. Assemble torque converter to engine flywheel by sliding converter into position by hand before fastening housing attachment screws. This may require more than one trial to match the drive gear teeth. Pulling the converter into position with housing attachment bolts is not recommended.

6. Measure engine crankshaft end play after assembly of torque converter. This value must be within one thousandth (.001) of an inch [0,0254mm] of end play recorded (in Paragraph #2) before assembly of torque converter.

802544 — 1.5 INCH [38,1] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	243970	Ring Gear Screw 1.5 Inch [38,1]
1	802550	Installation Instruction Sheet

802545 — 1.75 INCH [44,4] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	244903	Ring Gear Screw 1.75 Inch [44,4]
1	802550	Installation Instruction Sheet

802546 — 2.0 INCH [50,8] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	240318	Ring Gear Screw 2.0 Inch [50,8]
1	802550	Installation Instruction Sheet

802547 — 2.5 INCH [63,5] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	237153	Ring Gear Screw 2.5 Inch [63,5]
1	802550	Installation Instruction Sheet

802548 — 3.0 INCH [76,2] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	236938	Ring Gear Screw 3.0 Inch [76,2]
1	802550	Installation Instruction Sheet

802549 — M8-32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	4200097	Ring Gear Screw [M8 x 1.25]
1	802550	Installation Instruction Sheet

236937 Backing Ring Not Included in Ring Gear Kit. Must be Ordered Separately.

NOTE: The initial installation drive gear mounting kit includes a converter air breather. This breather is used on C & CL 270/C & CL 320 converters only and is not required for the HR & LHR 28000/HR & LHR 32000 applications.

SEE PAGE 37 FOR INSTALLATION ILLUSTRATIONS

CLARK-HURTH COMPONENTS

TECHNICAL SERVICE BULLETIN

No. U.S.A - 259 E | Mo - Year 9-96

SUBJECT: SDC NON-ASBESTOS THIRTY TWO (32) BOLT TORQUE CONVERTER DRIVE RING GEAR

REASON FOR BULLETIN: Proper Parts Ordering and Service Procedure

MODELS EFFECTED: C & CL 270, C & CL 320 Torque Converters HR & LHR 28000 and HR & LHR 32000 Transmissions

A STABLE DRIVE CONNECTION CONVERTER DRIVE RING GEAR HAS BEEN RELEASED FOR PRODUCTION AND SERVICE. THE DURABILITY OF THIS GEAR HAS BEEN IMPROVED AND THE WEAR CONDITION WITH THE MATING IMPELLER COVER GEAR TEETH HAS BEEN ADDRESSED.

Refer to installation instructions forms 802563, 802655 and Technical Service Bulletin USA-256E for proper installation procedure.

		WAS		NEW	
Bolt Length Inches	Thread	Drive Gear	Drive Gear Kit	SDC Drive Gear	SDC Drive Gear Kit
1.50	5/16-18 UNC	249265	802544	249473	802649
1.75	5/16-18 UNC	249265	802545	249473	802650
2.00	5/16-18 UNC	249265	802546	249473	802651
2.50	5/16-18 UNC	249265	802547	249473	802652
3.00	5/16-8 UNC	249265	802548	249473	802653
2.36	M8 X 1.25	249265	802549	249473	802654

The 236937 Backing Ring must be ordered separately, it is not included in the Ring Gear Kit.

Additional copies of this bulletin available upon request. Phone Clark-Hurth Components : (704) 878-5858 (U.S.A) - (39) 464-532666 (Italy) - (32) 50-402442 (Belgium)

CLARK-HURTH
COMPONENTS

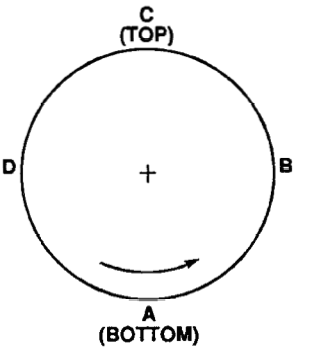
Eccentricity - Drive Gear to Nose Pilot

Converter Drive Gear Pilot Diameter

Indicator Set Up per Fig. 2 Sheet 4

Dial Indicator Reading _____ **Difference Of**	A_____ C(-)_____ I_{A-C}_____	B_____ D(-)_____ I_{B-D}_____

Mark Flywheel As Shown



Important- Record if Indictaor Value is (+) Larger or (-) Smaller than "Set" Value.

Converter Nose Support Diameter

Indicator Set Up per Fig. 3 Sheet 4

Dial Indicator Reading _____ **Difference Of**	A_____ C(-)_____ II_{A-C}_____	B_____ D(-)_____ II_{B-D}_____

Eccentricity: Drive Gear Pilot Diameter To Nose Support Pilot Diameter.

Eccentricity A-C:

I_{A-C}

$II_{A-C(-)}$_____

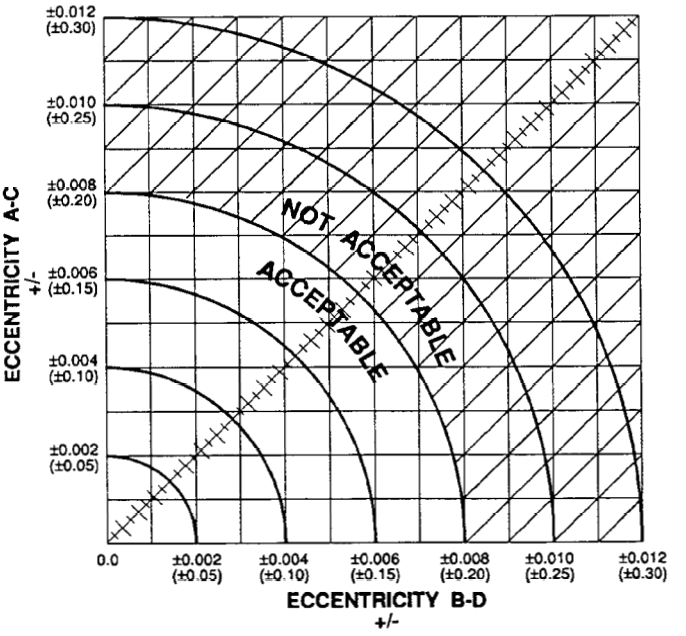
A-C Plot On Chart _____

Eccentricity B-D:

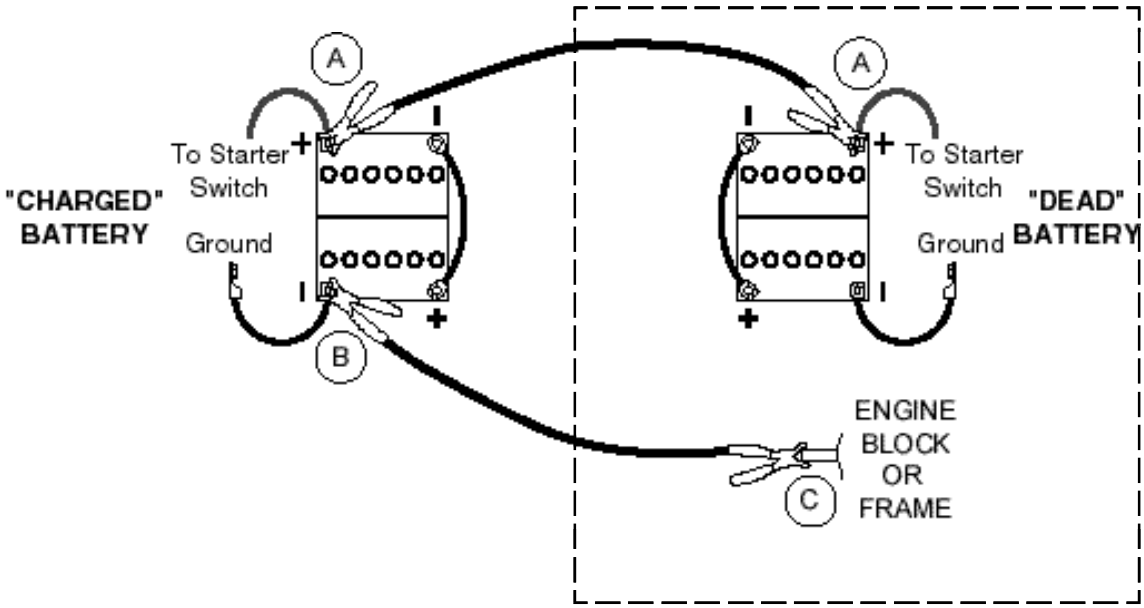
I_{B-D}

$II_{B-D(-)}$_____

B-D Plot On Chart_____



NOTE: "Eccentricity" refers to total indicator readings. Actual eccentricity is equal to one-half this value.



Typical 24 Volt System

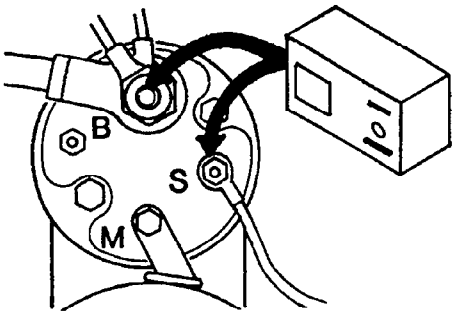
5. Connect the jumper cables in the following sequence:
   a. Connect a jumper cable from the positive (+; red) terminal on one battery to the positive (+; red) terminal on the other battery.

   CAUTION

   Never connect positive (+; red) to negative (-; black) or negative to positive.

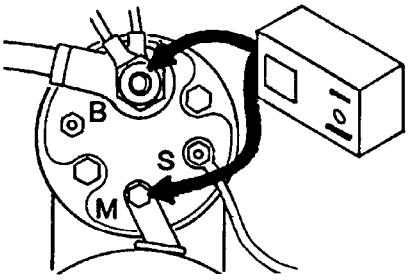
   b. Connect one end of the second cable to the grounded negative (-; black) terminal of the "Jumper Vehicle" battery.

   c. Connect the other end of the second cable to a stationary, solid metallic point **on the engine** of the "Stalled Vehicle," **not to the negative** (-; black) **terminal** of its battery. Make this connection at a point at least 18 inches (450 mm) away from the battery, if possible. Do not connect it to pulleys, fans or other parts that move. Do not touch hot manifolds that can cause severe burns.
6. Start the engine on the "Jumper Vehicle" and run the engine at a moderate speed for a minimum of five minutes.
7. Start the engine on the "Stalled Vehicle." Follow the starting instructions in Section 5, "Starting and Operating Procedures" in this manual. Be sure that the engine is at idle speed before disconnecting the jumper cables.
8. Remove the jumper cables by reversing the installation sequence exactly. Start by removing the last jumper cable from the stalled vehicle first. Remove the cable end from the engine block first, then the other end of the negative (-; black) cable.
9. Remove both ends of the positive (+; red) cable.



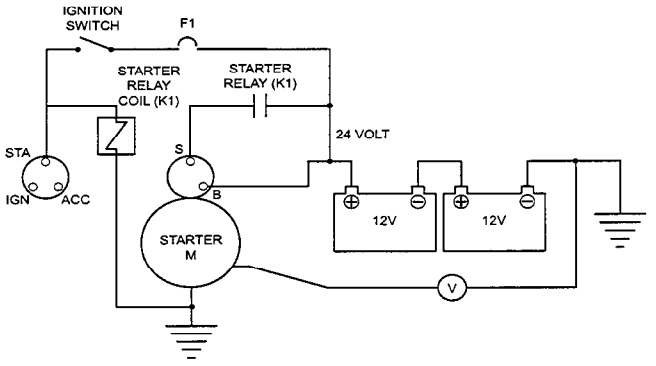
4. Check the starter solenoid disc contact.

   Connect a voltmeter across the solenoid "Battery" terminal and the solenoid motor terminal. With the engine cranking, a voltage reading of less than 0.3 volts should be measured. A reading higher than 0.3 volts indicates excessive resistance within the solenoid. Check the solenoid contact disc and terminals.



5. Check starter ground circuit.

   Connect a voltmeter from the frame (body) of the starter motor, to either a point on the engine flywheel housing or the bolt that mounts the battery negative cable to the ground connection on the engine or frame. While cranking the engine, a reading higher than 0.3 volts indicates excessive resistance. Clean the starter mounting bolts and flange.



Alternate Method. Connect the voltmeter from the frame of the starter motor, to the battery negative terminal post. While cranking, a reading higher than 0.4-0.6 volts indicates excessive resistance. Clean starter mounting flange and bolts, check battery negative cable for damage, clean and tighten battery cable connections.

TROUBLESHOOTING

Trouble in the charging system will normally be indicated by one of the following:

- Indicator light "on" with engine running.
- Indicator light "off" with key on, engine not running.
- Undercharged or overcharged battery.
- Short life of light bulbs or other electric equipment caused by abnormally high system voltage.
- System voltmeter readings outside normal range.

Diagnose system as follows (refer to Figs. 8 and 9):

A. ALL CHARGING SYSTEMS -

TEST EQUIPMENT NEEDED:

- Belt Tension Gage
- Battery State-of-Charge Indicator

1. Check electrical system wiring and battery terminals for poor connections or other obvious conditions that might result in shorts, opens, grounds, or high resistance. Correct as necessary.
2. Check generator drive belt for proper tension. Adjust to manufacturer's specifications.
3. Check battery for state-of-charge. If low, recharge according to manufacturer's specifications and load test to establish serviceability. Further diagnostic tests require a known good, fully-charged battery for accurate results.

B. SYSTEMS WITH INDICATOR LIGHT -

TEST EQUIPMENT NEEDED:

- Jumper Lead with 5-Amp Fuse

1. If indicator light is on with engine running:

   Stop engine. Turn key switch to "run" position. Indicator light should be on. If not, go to step 3.

   Disconnect indicator light lead at generator. For one-wire systems, this will be the "I" terminal connector. For 3-wire systems, disconnect the regulator terminal connector (terminals 1 and 2).

   If indicator light remains on, locate and correct shorted or grounded condition in indicator light circuit between the light and the generator.

   If indicator light goes out, light is working properly. Proceed to "C." for check of system with indicator light working properly.

2. If indicator light does not come on with the key switch in the "run" position with the engine stopped ("bulb check" mode):

   Leave key in "run" position with engine stopped. Disconnect indicator light lead from generator. For one-wire systems, this will be at the "I" terminal. For 3-wire systems, disconnect the regulator terminal connector (terminals 1 and 2) and determine which is the indicator lamp circuit by locating the terminal that connects to the #1 terminal on the regulator. Use fused (5-amp) jumper lead to ground indicator lamp circuit in harness connector to generator housing.

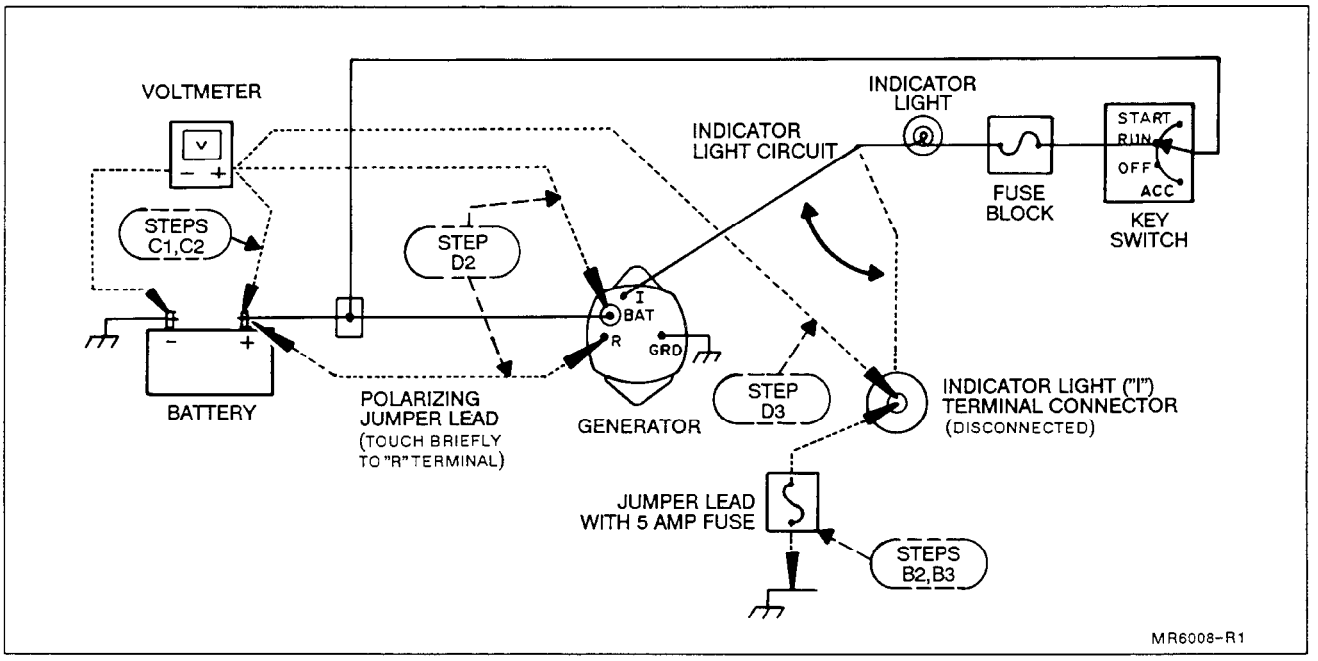


Figure 8. Troubleshooting a One-Wire System

18. For some 3-wire systems (Fig. 30), regulator stud connector onto threaded stud on regulator, positioning other end over brush holder mounting hole. Regulator nut to threaded stud on regulator (finger tighten).

    NOTE: Later regulator designs do not have a threaded stud and the connector is not used. The earlier and later designs are interchangeable. If replacing regulator having stud by new regulator without stud, omit connector and nut; if replacing regulator that does not have stud by regulator having stud, add connector and nut.

19. Second insulated regulator attaching screw to mounting hole in brush holder, passing through diode trio connector and regulator stud connector. Finger tighten.

20. Secure SRE component fasteners in following order (Fig. 31):

Tighten

(1) Inside output terminal nut to 5.5 N·m (50 lb. in.).

(2) Rectifier bridge attaching screws (2 places) to 3.0 N·m (25 lb. in.).

(3) Insulated capacitor attaching screw to 2.5 N·m (22 lb. in.).

(4) "R" and/or "I" terminal (2 places, if used) inside nuts to 2.5 N·m (22 lb. in.). It may be necessary to hold terminal on outside while tightening.

(5) Regulator mounting screw (grounding) to 2.0 N·m (20 lb. in.).

(6) Insulated regulator attaching screws (2 places) to 2.0 N·m (20 lb. in.).

(7) Regulator nut (if used) to 2.5 N·m (22 lb. in.).

(8) Brush holder attaching screw (pivot) to 2.0 N·m (20 lb. in.).

Install or Connect

21. Debris shield mounting stud (if used) with inside washer to "I" terminal hole in SRE housing. Outside washer, lockwasher, and nut to mounting stud on outside. Tighten nut to 5.5 N·m (50 lb. in.).

22. Stator to SRE housing assembly, placing 3 phase leads over 3 threaded studs on rectifier bridge (Fig. 32). Be sure stator is seated in register around edge of SRE housing.

23. Rectifier bridge nuts to 3 threaded studs on rectifier bridge (Fig. 32).

Tighten

Rectifier bridge nuts (3 places) to 2.5 N·m (22 lb. in.).

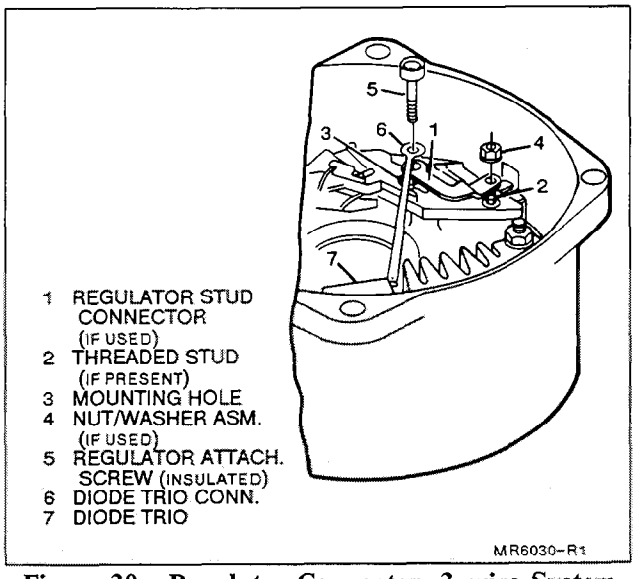


Figure 30. Regulator Connector, 3-wire System

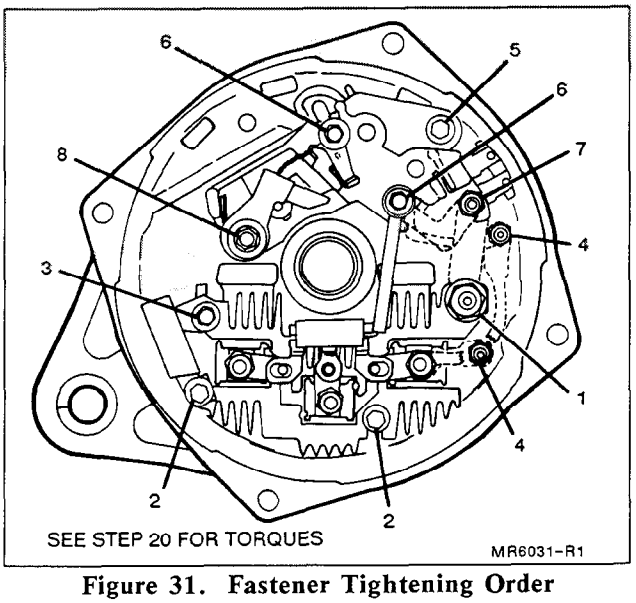


Figure 31. Fastener Tightening Order

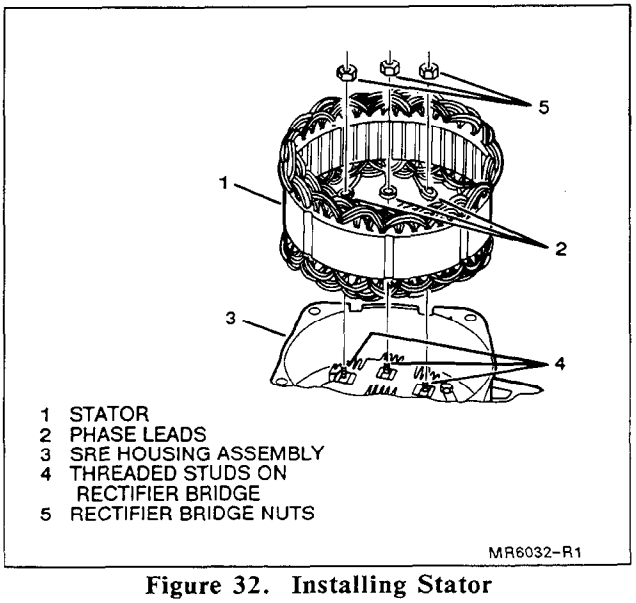


Figure 32. Installing Stator

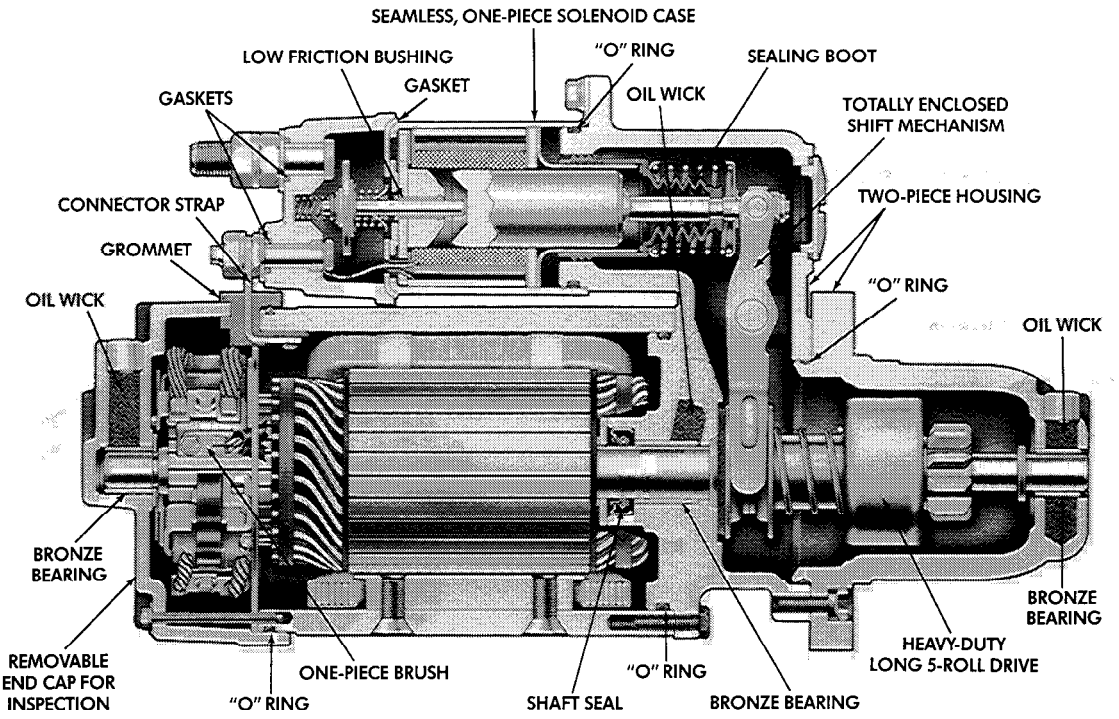


Figure 2—Cross-sectional view, typical 37-MT motor.

Reference should be made to the vehicle manufacturer's wiring diagram for the complete cranking circuit.

A basic circuit of a 37-MT is shown in Figure 4, and a 42-MT circuit is shown in Figure 5. In Figure 5A is shown a 42-MT with a thermostat.

A typical thermostat is shown in Figure 5B. The built-in thermostat protects against damage due to overcranking for excessively long periods of time.

A wiring adapter is needed to connect the thermostat to the wiring harness when installing a 42-MT on a vehicle wired for a 40-MT, and when a 40-MT replaces a 42-MT. These two adapters are available through AC-Delco outlets.

For all circuits, when the start switch is closed, the magnetic switch contacts close, and the solenoid windings are connected to the battery.

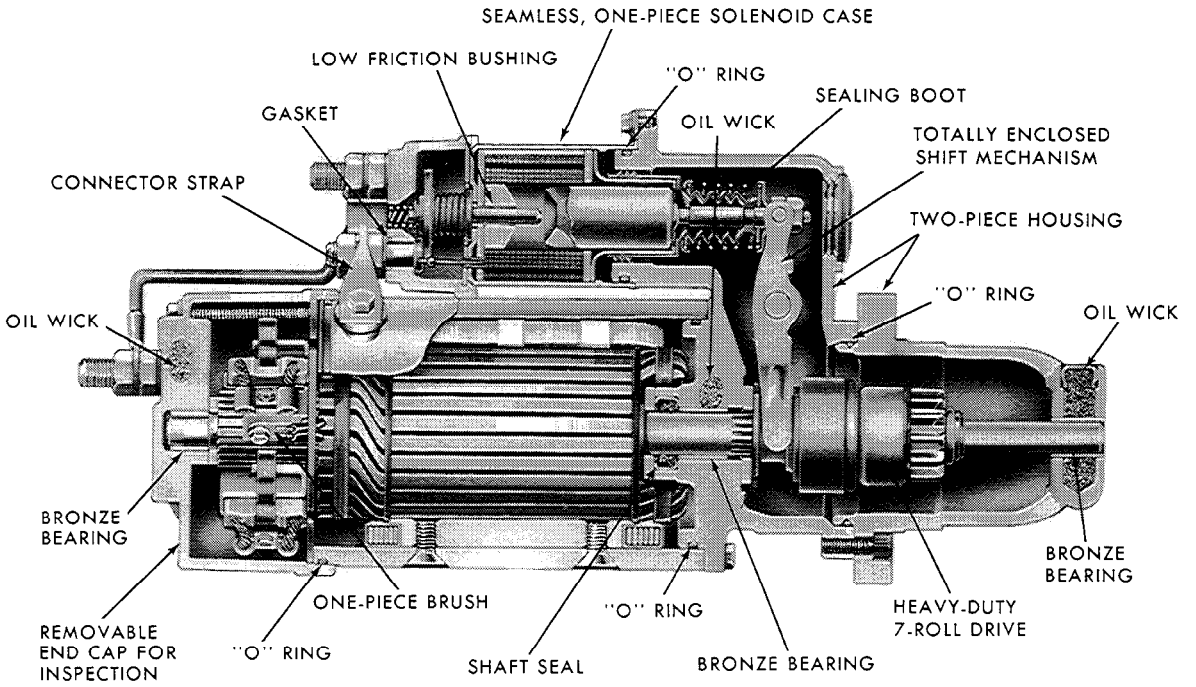
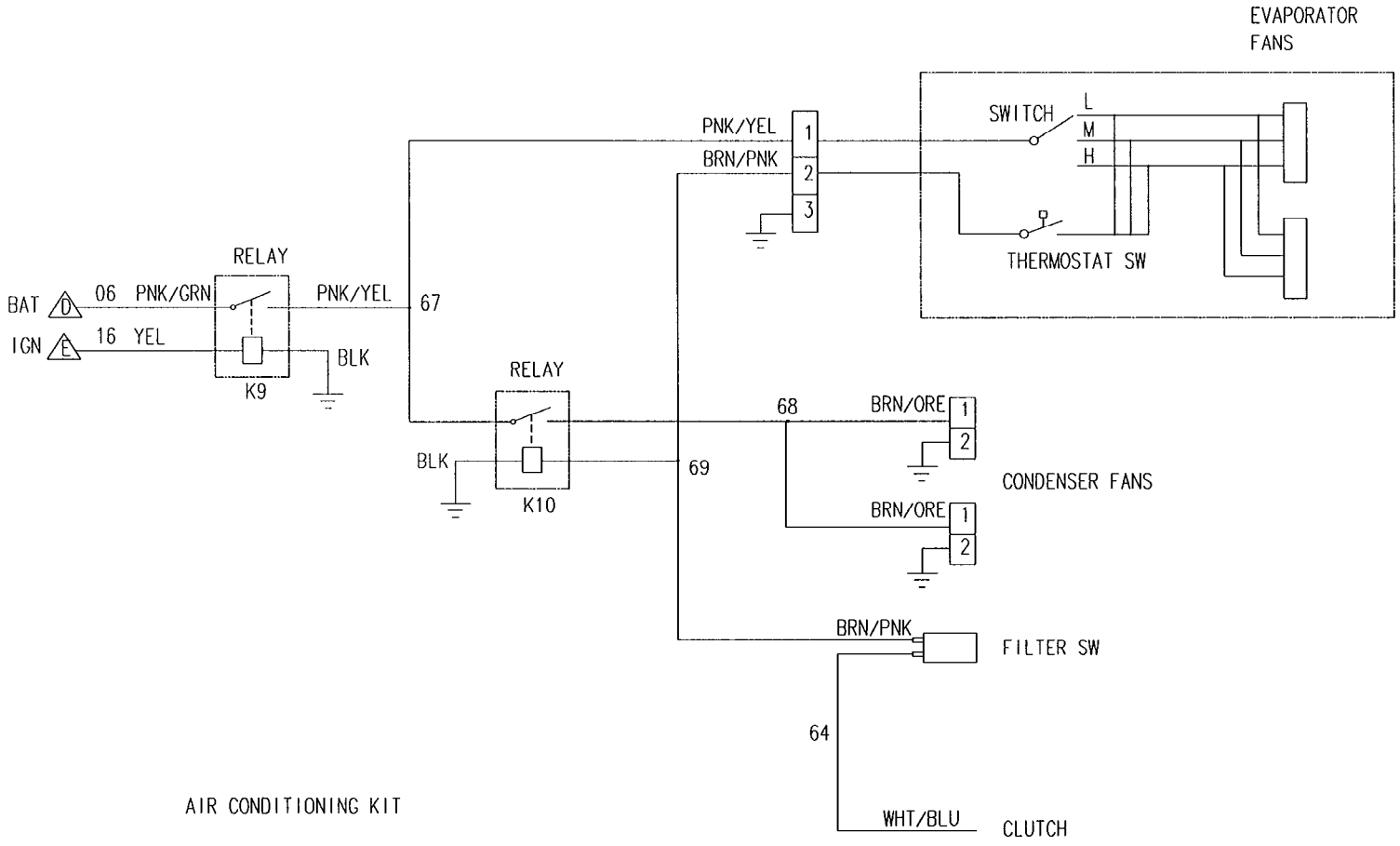


Figure 3—Cross-sectional view, typical 42-MT motor.



DWG NO:3661096

REV	DESCRIPTION	CHG NOTICE	DATE	APPROVAL	SHEET
DRN	CC		3.9.97		
CHK					
REL	97-361		3.9.97		

OMEGA HEAVY LIFT TRUCK DIVISION
CLARK EQUIPMENT AUSTRALIA PTY LTD

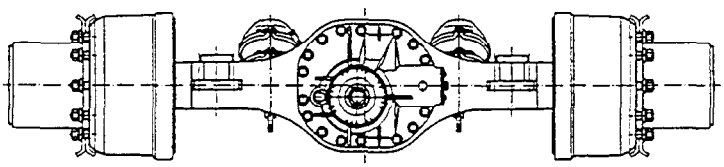
TITLE: ELECTRICAL DIAGRAM (WITH LOW EMISSION ENG)

SIZE: A0 — DWG NO: 3661096 — SCALE NTS — SHEET 2 OF 15 — REV E

EXCEPT AS NOTED:DIMENSIONS ARE IN MM:UNITS ARE ISO METRIC © CAD DRAWING © PRINTED IN AUSTRALIA

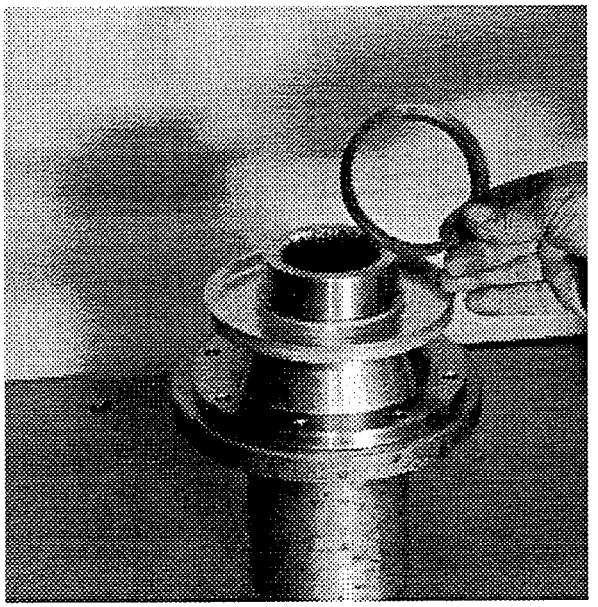
AXLE DESIGN

The axle casing is rectangular shaped and pressed of steel sheet material.
The primary reduction takes place in hypoid gear unit and secondary reduction in planetary gears, which are located in the wheel hubs.



General view of Sisu BTH Industrial axle

Then install the seal and fill space under it by grease; install the pinion flange with seal protection ring and V-seal, screw the pinion nut finger tight.



Picture 22. Seal protection plate installed onto the flange. V-seal ready for installation.

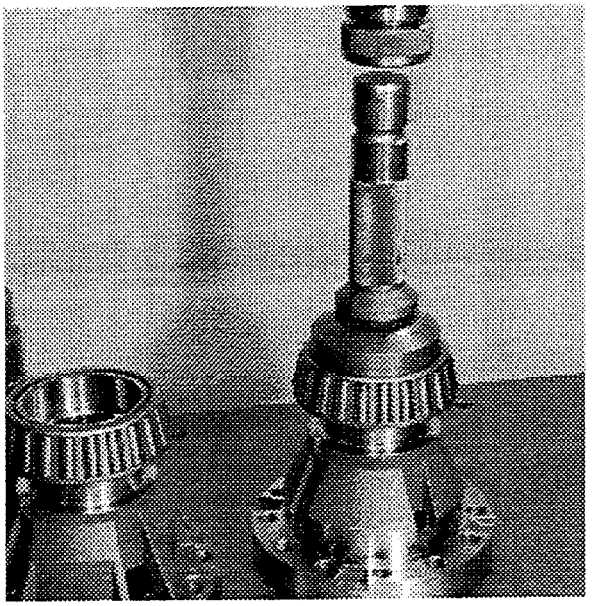
If a workshop press in not available for assembly, adjustment can be performed as follows:
Assembly usually, but instead of pressing use the flange and the nut, tighten the nut to 1300 Nm torque. After this do measure and adjust bearing rolling torque as previously described.
When rolling torque is correctly adjusted, install the pinion flange with seals.

Finally tighten the pinion nut to 1300 Nm torque and secure the nut by a cotter pin.

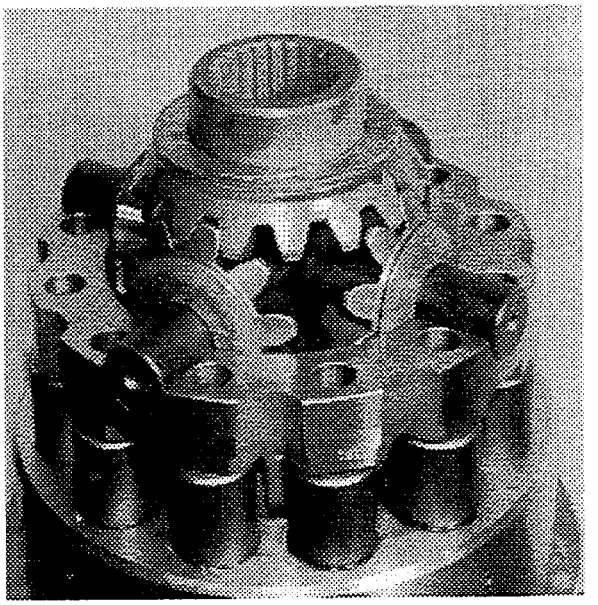
DIFFERENTIAL

Assembly

Prior the assembly inspect all parts carefully and assure that all to be reused parts are in good condition.
Start assembly by pressing the conical outer bearings onto housing halves if they are replaced.
Then place crown wheel side housing half on the crown wheel and place differential side gear with the thrust washer into the housing half. Place then planetary gears with their thrust washers inserted onto spider onto the side gear in the housing half.
If differential if fitted with the lock, side gear with lock splines have to be installed first in the bottom.



Picture 23. Pressing of a conical roller bearing to a differential casing half.



Picture 24. Differential components installed in the casing half

Place other side gear with its thrust washer on the top of planetary gears. See picture 24.

Then fit the upper casing half according to markings and insert screws and fit nuts. Use Loctite locking liquid and tighten nuts to 320 Nm torque. (Nuts have to be replaced always when undone).

GROUP 22

TIRE AND WHEEL SAFETY

SECTIONS

⚠ WARNING

Remove all jewelry before working on truck and or componenets.

⚠ WARNING

Always wear safety glasses.

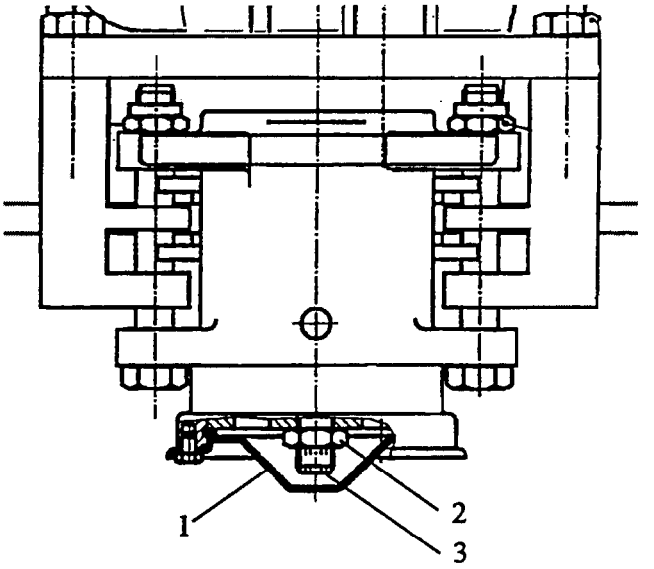
⚠ WARNING

Tire changing can be dangerous, and should be done by trained personnel using proper tools and procedures.

Failure to comply with these procedures may result in faulty positioning of the tire and/or rim, and cause the assembly to burst with explosive force, sufficient to cause serious physical injury or death. Never mount or use damaged tires or rims.

Method of manually releasing the park brake to enable towing. The parking brake may be manually disengaged by physically removing the spring pressure on the park brake caliper. This is done through the following steps:

1. Find the parking brake. It is located between the prop shaft and the drive axle.
2. Remove the protective cone-shaped cover (1 in the drawing) by removing three screws using a 10mm wrench
3. Loosen the locking nut (2 in the drawing) using a 24 mm wrench.
4. Turn the adjustment screw (3 in picture) counter-clockwise until the caliper no longer grabs the bake disc.
5. Now the vehicle can be towed.
6. Reverse the procedure as described in Section 24, page 17 of the Wet-Disc Brake Maintenance Manual.



Brake Cover/Piston Inspections
Start by carefully cleaning all brake parts and dry them by pressurised air.

Inspect all parts and discard all defective and worn parts. Both O-Rings *(in Figure 13)* always have to be replaced when the brake piston is dismantled. Use only original spare parts.

IMPORTANT
Brake engagement fluid in WDB brakes is regular hydraulic oil. All seal materials must withstand mineral oils.

IMPORTANT
Never use brake fluids when installing brake seals and O-rings. Use regular grease, such as Mobil Grease MP, for seal lubrication.

Inspect the surfaces of the brake piston *(Figure 10)* and the mating surfaces of the brake cover very carefully. Small scratches can be removed using fine crocus cloth but if marks of seizing or pitting are found the piston and/or brake cover must be replaced.

Brake Drum Dismantling
Remove the brake plates from the brake drum. Remove bottom steel spacer plate.

Inspect all plates and note any unusual coloring or other signs of over heating.

The steel plates must be in good condition and straight. Any plates that are not straight must be replaced. Check that the external teeth of the steel plates are in good condition and fit properly into the brake drum splines.

The friction plates with internal teeth must be in good condition and straight. Any plates that are not straight must be replaced. Inspect the internal teeth of these friction plates and check that they fit onto the brake hub splines.

The spacer plate must also be in sound condition

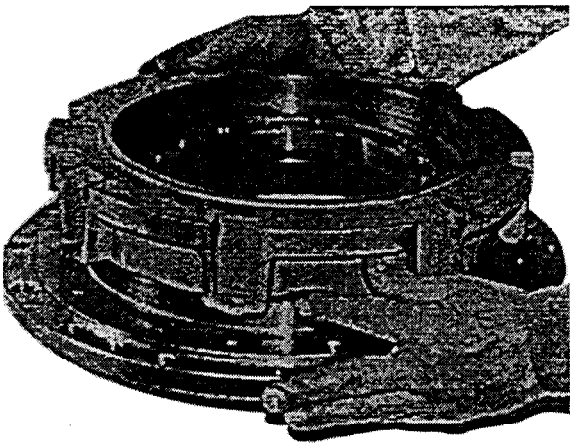


Figure 9. Removing the Brake Piston

Figure 10.Inspecting the Brake Piston

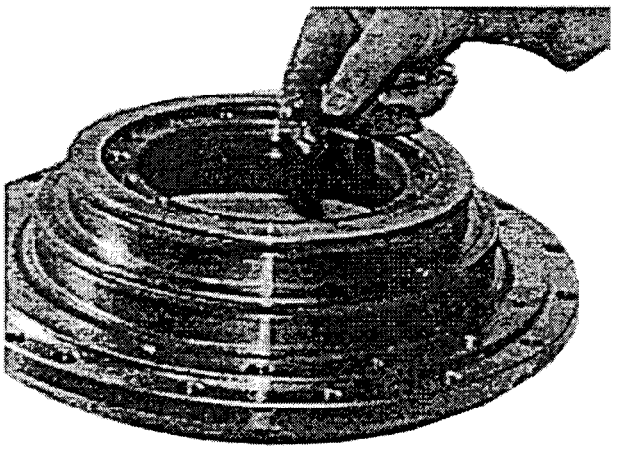
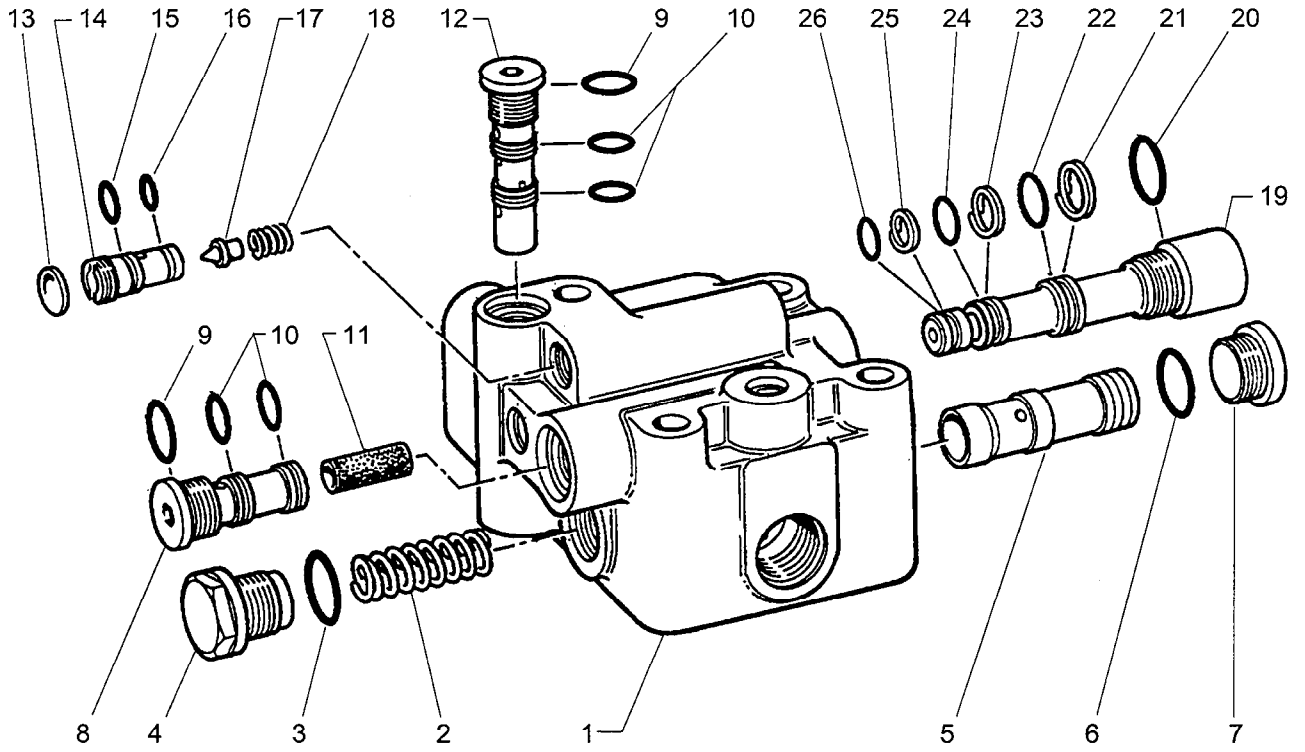


Figure 11. Lubricating the Brake Cover



1. STAC body
2. Spring
3. 'O'-Ring
4. Plug
5. Spool
6. 'O'-Ring
7. Plug
8. Check Valve Assembly
9. 'O'-Ring
10. 'O'-Ring
11. Filter
12. Shuttle Assembly
13. Core Plug Cap
14. Core Plug
15. 'O'-Ring
16. 'O'-Ring
17. Poppet
18. Spring
19. Unloading Capsule
20. 22, 24, 26 'O'-Ring
21. 23, 25 Anti-extrusion rings

REPLACING, ADDING OR REMOVING WORK SECTION ASSEMBLIES. FOR MODEL V50

NOTE

For clarification, the side containing the inlet cover (the cover containing the main relief valve) will be called the left end of the valve assembly. Refer to Figure 3-4

1. Before disassembly, it is suggested that each work section be marked numerically to avoid incorrect reassembly.
2. Remove four hex nuts from the right end of the valve assembly using a 5/8" socket wrench.
3. Remove the outlet cover and each section by sliding from the valve assembly studs.
4. If work sections are to be added or subtracted from the valve assembly, the four studs must be removed from the inlet cover and replaced with studs of proper length.

ASSEMBLY STUDS

No. of Work Sections	Assembly Stud Kit No.
1	K-1 2515-A
2	K-12516-A
3	K-12517-A
4	K-12518-A
5	K-12519-A
6	K-1 2520-A
7	K-1 2521
8	K-12522
9	K-12523
10	K-12524

NOTE

No lock washers required! Studs are of special material and should be replaced only with original equipment replacement parts.

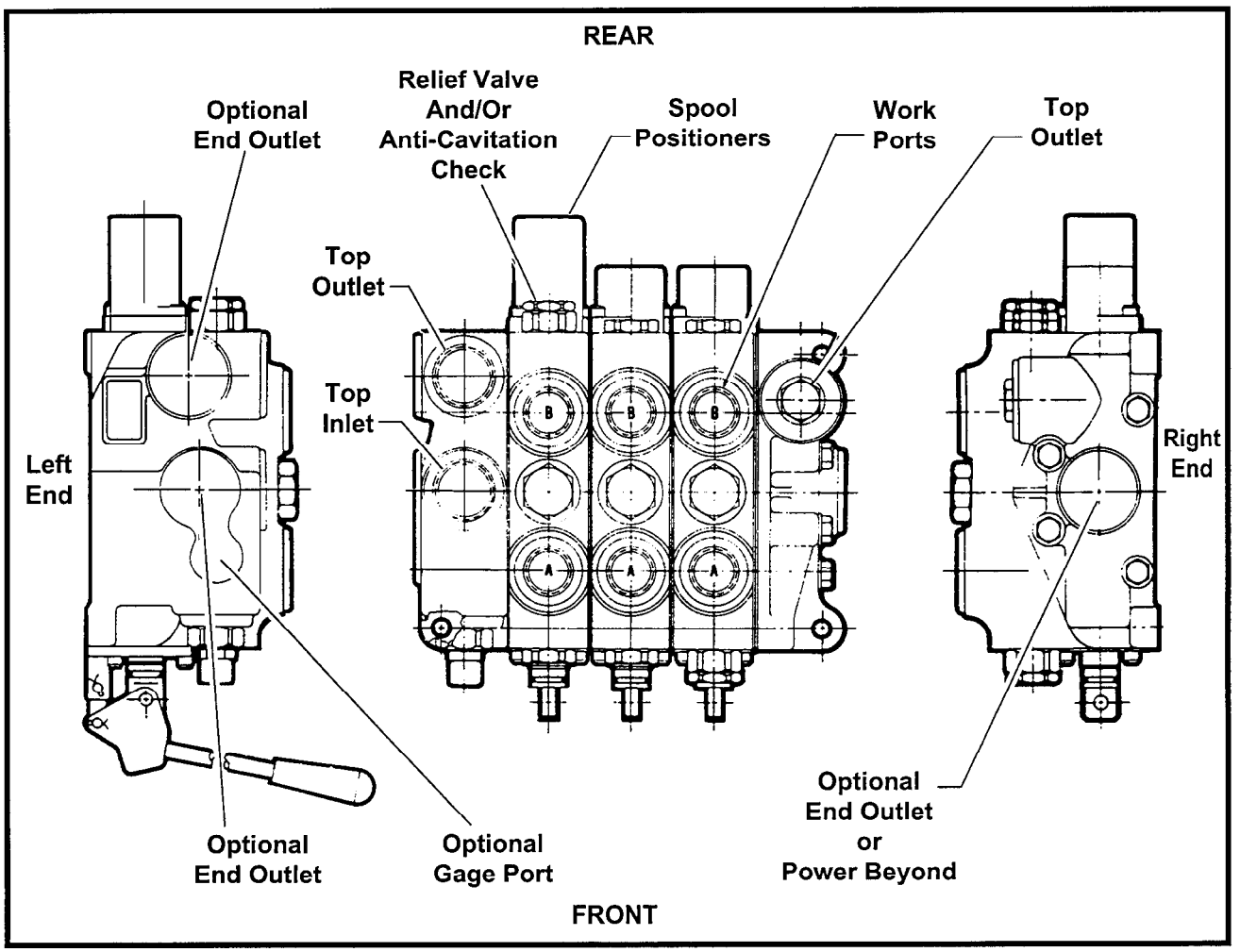
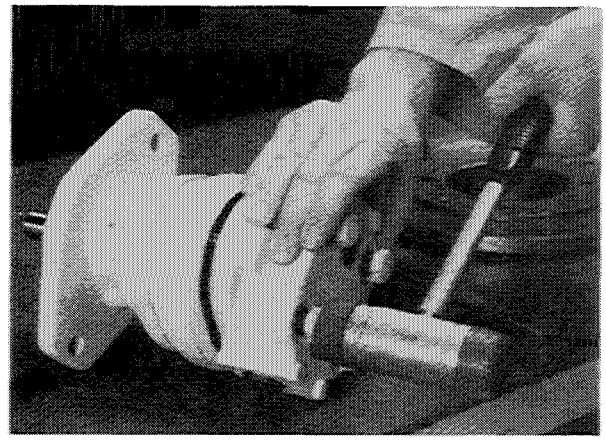
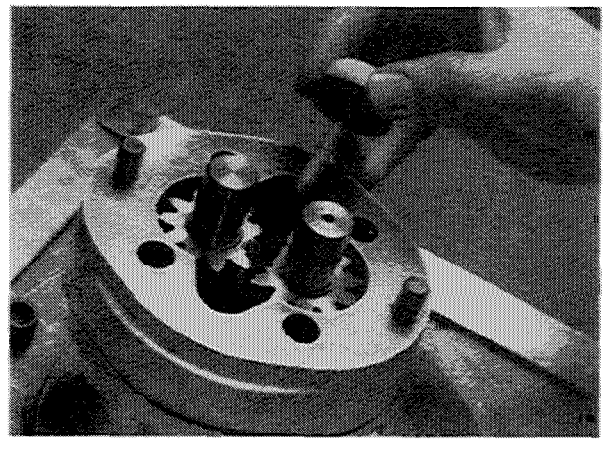


Figure 3-3. Schematic view of a typical Model V50 Control Valve Assembly

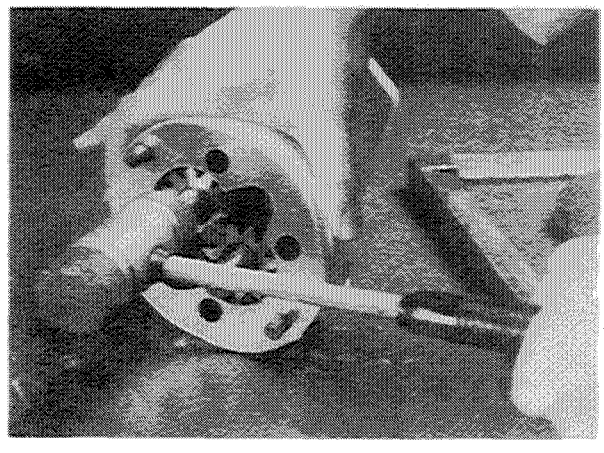
Another way to do this is to reinstall the bolts a couple of turns and then tap on the bolt heads with a soft head hammer.



IMPORTANT: Keep the gears meshed together until they have been marked to ensure replacement in the same position.



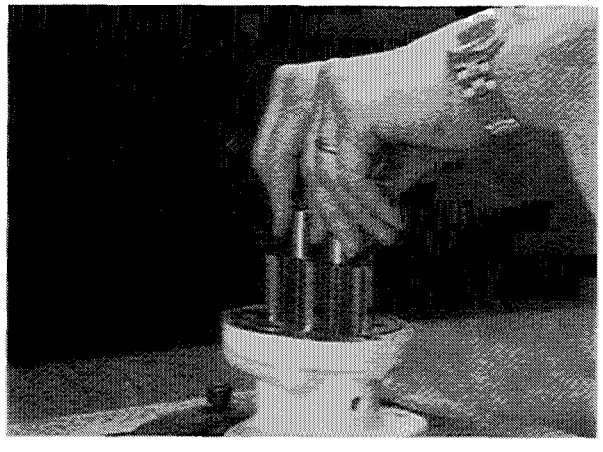
3. **Remove the center housing (25) from adapter (7).** Lay the pump on its side while holding onto the housing. Use a soft head hammer to tap on the ends of the drive and driven shafts (the ends that were in the cover). Do not use a screw driver or wedge to pry apart the separate sections. This will damage the machined sealing surfaces.



For pumps with shaft numbers 49 and below

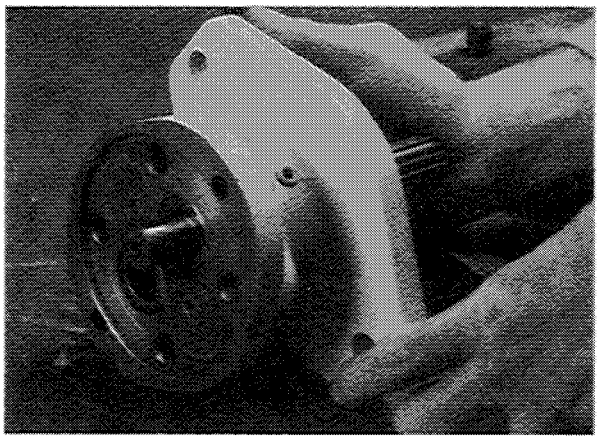
4. **Remove gear assemblies (21) and (23)** by first removing key (16, 17, 18 or 19) from drive shaft (21). The gears will pull straight up out of the adapter.

   On shaft number 7 only the snap ring (1) and coupling (2) must also be removed before the gears can be pulled out.

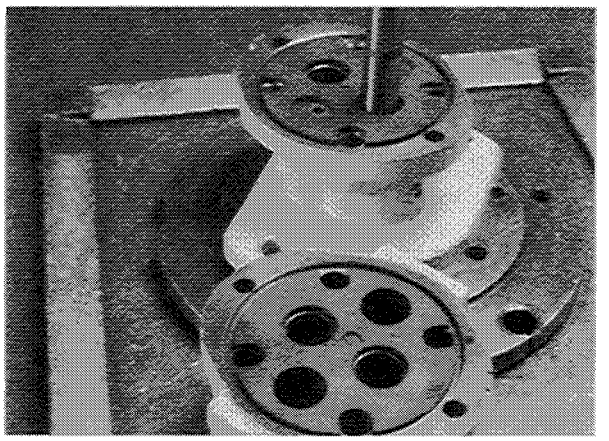


For pumps with shaft numbers 50 through 54

8. Slide the drive shaft (21A) through the adapter (7) from the pilot side. Be careful not to damage the seal. After the shaft is fully engaged in the adapter, place the adapter up so that the shaft will stay engaged while you put one snap ring (22A) on the shaft closest to the adapter.

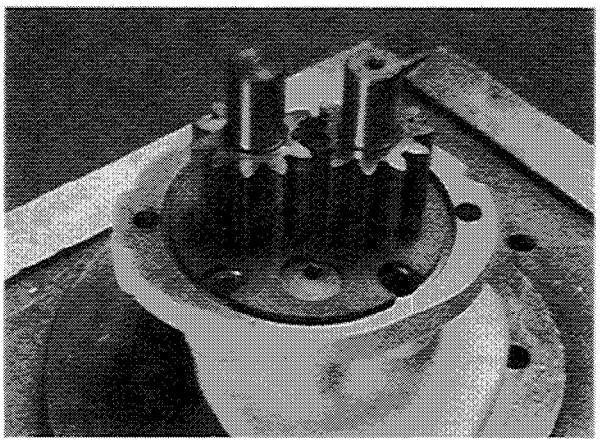


9. **Put wear plates (15)** in the adapter (7) and cover (29). High pressure pockets on wear plates must face gears. **IMPORTANT: The high pressure pocket in the cover will have to be 180° opposite the high pressure pocket in the adapter when the pump is finally assembled.**



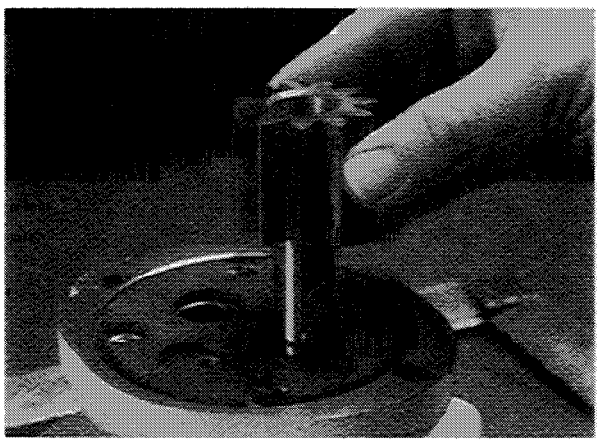
For pumps with shaft numbers 49 and below

10. Install drive gear assembly (21) and the driven gear assembly (23) in the adapter (7). If using original gears, make sure to align marks made during disassembly.



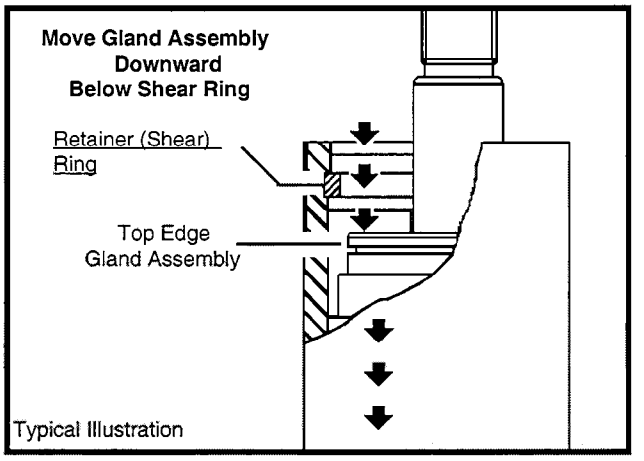
For pumps with shaft numbers 50 through 54

10. **Insert the dowel pin (22)** in the groove on drive shaft. Place drive gear (21B) on shaft flat side down (side with champfer towards rear of pump). Slide the gear (21B) down the shaft until it clears the second snap ring groove.



Remove Retainer (Shear) Ring

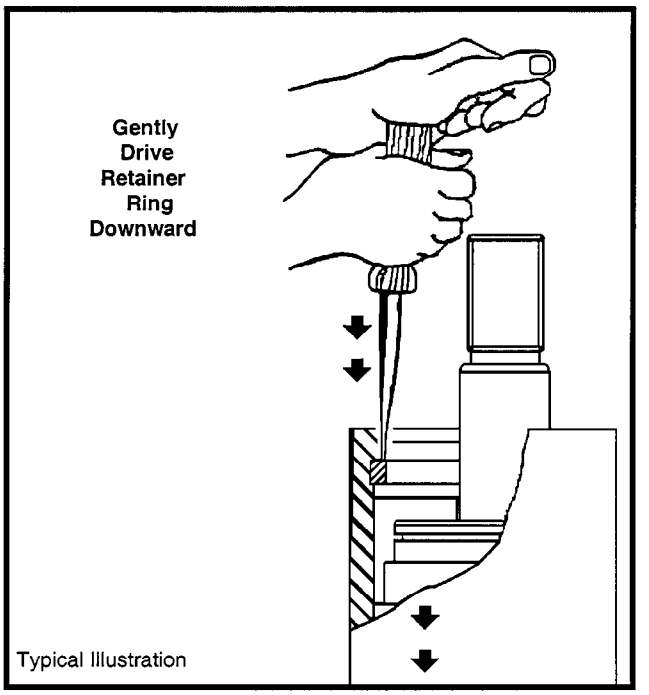
- Carefully drive gland assembly downward until the top edge of the gland is just below the retainer ring as shown here.



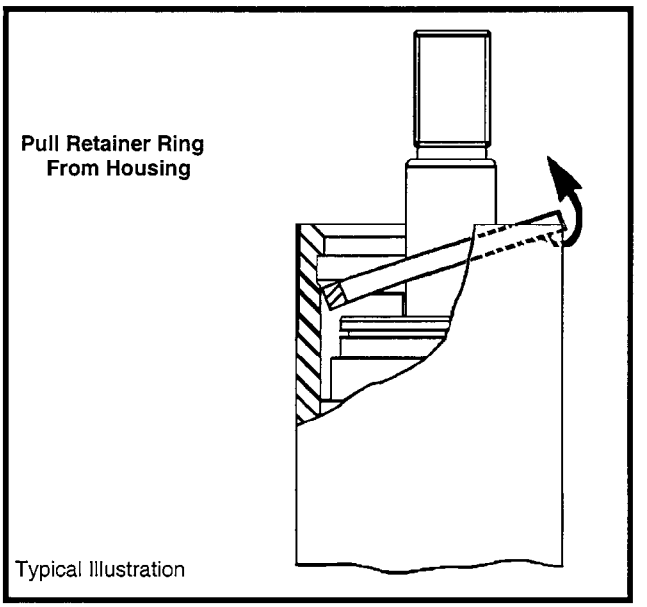
- Drive the retainer ring downward (180° opposite ring grove) using a screwdriver and heel of your hand.

⚠ CAUTION

Be careful not to scratch, nick or damage inside diameter of housing wall.



- Remove retainer ring from housing.



GENERAL DESCRIPTION

Clark CDP 100/164 series masts feature all roller, interlocking "I" beam and channel construction, reinforced with optimum section tie bars, located for ideal visibility. Upright construction uses variable retainment upright rollers with four carriage load rollers. Four side thrust rollers are used on carriages and integral attachments to resist deflection due to off center loading. Self aligning lift and tilt cylinder mounts minimize side loading on cylinder rods, seals and packings. Tilt cylinders are locked to yokes.

For positive adjustment, uprights are mounted on hardened steel bushes with trunnion style mounting, allowing simple removal.

High capacity leaf type chain is used on all CDP 100/164 mast assemblies. Twin cylinder, hi visibility construction ensures optimum forward visibility for operators. Upright lift heights are available from 3175 mm maximum fork height (MFH) to 9150 mm. Alternate upright styles, including hi-lo and non-telescopic, are also offered for applications with overhead clearance restrictions. Certain capacity restrictions apply to various mast options. Chrome plated lift and tilt cylinders are utilized.

The lift circuit incorporates a two speed lift system for increased unloaded and part loaded lift speeds. A lowering control valve is used to, regulate lowering speed in relation to load weight. The tilt function features a tilt lock valve for safe operation. High mounted tilt cylinders aid in forward visibility of fork tips and loads at ground level, as supporting structures are removed from operator's field of vision and mast structure is simplified.

CDP 100/164 forks are upset forged and heat treated. Roller mounting of forks allows independent hydraulic fork positioning and side shift capabilities with load. Forks are readily removed for the fitting of alternate carriage mounted attachments.

SAFETY PRECAUTIONS

Before working on the upright:

1. Remove all attachments and forks
2. Drive machine onto a flat level surface
3. Set parking brake and block drive wheels
4. Attach hoist slings to upper corners of carriage
5. It is possible to remove carriage from top of upright by following the procedure listed on the next page. We recommend to work on carriage, that the upright and carriage be removed in one operation and any work on carriage be done with upright off the truck.

NOTE

It is not possible to remove carriage through the top of the upright.

Chain Lubrication

Like all bearing surfaces, the precision-manufactured, hardened-steel, joint-wearing surfaces of leaf chain require a film of oil between all mating parts to prevent accelerated wear.

Maintaining a lubricant film on all chain surfaces will:

- Minimize joint wear.
- Improve corrosion resistance.
- Reduce the possibility of pin turning.
- Minimize tight joints.
- Promote smooth, quiet chain action.
- Lower chain tension by reducing internal friction in the chain system.

Laboratory wear tests show #40 oil to have greater ability to prevent wear than #10 oil. Generally, the heaviest (highest viscosity) oil that will penetrate the joint is best.

Whatever method is used, the oil must penetrate the chain joint to prevent wear. Applying oil to external surfaces will prevent rust, but oil must flow into the live bearing surfaces for maximum wear life.

To prepare the chain for oiling, the leaf chain plates should be brushed with a stiff brush or wire brush to clear the space between the plates so that oil may penetrate the live bearing area.

Oil may be applied with a narrow paint brush or directly poured on. Chain should be well flooded to be sure the oil penetrates the joint.

In locations difficult to reach, it may be necessary to use a good quality oil under pressure such as an aerosol can or pump pressure spray.

Other Chain Service Notes

- Use lengths of factory assembled chain. Do not build lengths from individual components.
- Do not attempt to rework damaged chains by replacing only the components obviously faulty. The entire chain may be compromised and should be discarded.
- Never electroplate assembled leaf chain or its components. Plating will result in failure from hydrogen embrittlement. Plated chains are assembled from modified, individually plated components.
- Welding should not be performed on any chain or component. Welding spatter should never be allowed to come in contact with chain or components.
- Leaf chains are manufactured exclusively from heat treated steels and therefore must not be annealed. If heating a chain with a cutting torch is absolutely necessary for removal, the chain should not be reused.