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Ingersoll

**TWO-SPEED TRANSAXLE
Service Manual 9-99585**

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INTRODUCTION

This manual covers service procedures for the hydraulically driven two-speed transmission used on:

200 and 400 series compact tractors
3000 and 4000 series compact tractors
3100 and 4100 series compact tractors
600 and 6000 series compact loaders



This safety alert symbol indicates important safety messages in this manual. When you see this symbol, carefully read the message that follows and be alert to the possibility of personal injury or death.

REMOVAL

NOTE: REFERENCE NUMBERS REFER TO THE FIGURE ON PAGE 5.

Models
220, 222, 442 and 444 Prior to S/N 9646800

1. Remove drain plug (7a) to drain the transmission oil. Replace the plug when the oil has completed draining.
2. Remove the four bolts holding the seat support assembly to the frame. Remove the seat support assembly while keeping the fuel tank in its original position.
3. Loosen lug bolts on rear wheels, raise and securely block the tractor frame (NOT transmission case) and remove the rear wheels.
4. Set the range lever in neutral and remove the four cap screws which connect the oil line manifold to the hydraulic motor. For Model 442, S/N 9632452 and after, and all Model 444, remove the two valve to motor port tubes.
5. Set the fuel tank ahead of the transmission mounting bolts.
6. Place a portable hoist or other suitable support under the transmission and remove the four frame mounting bolts.

CAUTION: THE TRANSMISSION ASSEMBLY IS HEAVY. AVOID INJURY BY OBTAINING HELP WHEN REMOVING OR INSTALLING THE TRANSMISSION.

7. Move the transmission to the left to clear the brake drum (40) from the brake band and slide it back and away from the tractor frame.

IMPORTANT: COVER THE EXPOSED OIL LINE MANIFOLD AND HYDRAULIC MOTOR PORTS TO INSURE AGAINST DIRT ENTRY.

Models 220, 222, 442 and 444
S/N 9646800 and after
All 224, 226, 446 and 448
All 3000 & 4000 series
All 3100 & 4100 series
All 600 and 6000 series

1. Remove drain plug (7A) to drain the transmission oil. Replace the plug when the oil has completed draining.
2. Remove the fenders and the rear seat support panel. Loosen fuel tank mounting straps, if equipped. Remove fuel hose at tank outlet elbow and drain fuel tank into a clean, approved, container. Remove the fuel tank, front seat support panel and seat.

CAUTION: DRAIN GASOLINE INTO AN APPROVED CONTAINER ONLY. DO NOT SMOKE OR EXPOSE GASOLINE TO OPEN FLAMES.



3. Loosen lug bolts on rear wheels, raise and securely block the tractor frame (NOT transmission case) and remove the rear wheels.
4. Set range lever in neutral and disconnect the valve to motor port tubes at the hydraulic motor. For Models 220 Prior to S/N 9649062, 222 Prior to 9647203, remove the four cap screws which connect the oil line manifold to the hydraulic motor.

5. Place a portable hoist or other suitable support under the transmission and remove the four frame mounting bolts.

CAUTION: THE TRANSMISSION ASSEMBLY IS HEAVY. AVOID INJURY BY OBTAINING HELP WHEN REMOVING OR INSTALLING THE TRANSMISSION.



6. Move the transmission to the left to clear the brake drum (40) from the brake band and slide it back and away from the tractor frame.

IMPORTANT: COVER EXPOSED HYDRAULIC LINES AND MOTOR PORTS TO IN-

3. Remove snap rings (15), near axles (11 and 13), differential assembly, washers (36), seals (4), and bushings (2 and 3). (Later style transmissions use flanged bushings (2) for inner, and outer axles bushings).
4. Disassemble the complete differential assembly by removing the four special bolts (34) and locknuts (35). See inset A.

NOTE: LATER STYLE DIFFERENTIAL ASSEMBLIES USE SPECIAL BOLTS AND GEAR (26) HAS TAPPED HOLES.

5. Remove the four cap screws which attach the hydraulic motor to the transmission case and remove the motor and input shaft (16) as an assembly. If necessary, remove bearing (9).

**Model 220 S/N 9649062 and after
Model 222 S/N 9647203 and after
Model 442 S/N 9632450 and after
All 224, 226, 444, 446 and 448 models
All 3000 and 4000 series
All 3100 and 4100 series
All 600 and 6000 series**

Refer to inset B. Shims (48 and 49), thrust washers (20), bearing (18) are not used. The input shaft is an integral part of the hydraulic motor and cannot be removed unless the motor is disassembled.

7. Remove snap rings (23), yoke (21), shifting shaft (22) and seal (8). If necessary remove plug (10). (Later style transmissions do not have a shifting shaft plug (10).)

INSPECTION

1. Thoroughly clean and wipe dry all parts before inspection.
2. Inspect all gears and shafts for burrs, nicks, or excessive wear both to the teeth and to the splines. Light burrs and nicks may be removed with a hone or crocus cloth.
3. Inspect bearings for worn or pitted rollers. There should be no pits or other visible damage. If damaged, replace with new parts.
4. Inspect the differential housings and transmission case for cracks, burrs or nicks.
5. Inspect axles for nicks, cracks and stripped or damaged splines.
6. Inspect bushings for score marks, nicks or excessive wear and replace if necessary.
7. Replace all oil seals each time the unit is disassembled.

ASSEMBLY

**Model 220 Prior to S/N 9649062
Model 222 Prior to S/N 9647203
Model 442 Prior to S/N 9632450**

NOTE: ASSEMBLY FOR ALL OTHER MODELS BEGINS ON PAGE 7.

1. Press in new brake shaft bushings (5 and 6) until flush with their seats. Ream the inner bushing if necessary to 1.004" - 1.005" (25.50mm - 25.52mm). Ream the outer bushing if necessary to 1.192" - 1.193" (30.28mm - 30.30mm).

2. Install new axle bushings (2 and 3). Press the flange bushings (2) in until seated, and the straight bushings (3) (if so equipped) in until flush with oil seal shoulder. Ream bushings if necessary after assembly to 1.1876" - 1.1877" (30.165mm - 30.167mm) inside diameter.

IMPORTANT: INSTALL THE FLANGE BUSHINGS (2) WITH THE OIL GROOVE DOWNWARD.

CAUTION:

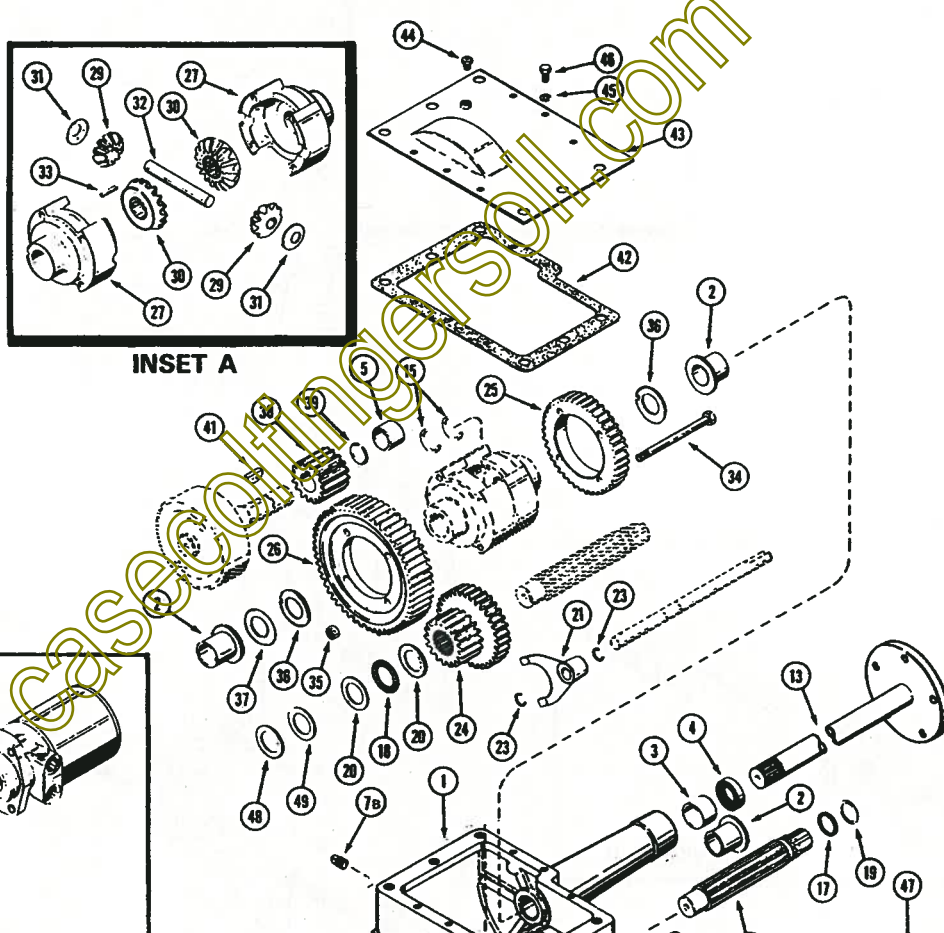
IF ANY BUSHINGS REQUIRED REAMING, CLEAN ALL SHAVINGS AND DEBRIS FROM BUSHINGS AND TRANSMISSION CASE.

3. Install needle bearing (9) flush with the inside of transmission case.
4. Re-install shifting shaft plug (10) if previously removed.
5. Install new shifting shaft oil seal (8).
6. Install new brake shaft oil seal (4).
7. Install new axle shaft oil seals (4) lip side first.

IMPORTANT: BE SURE THE SEAL LIP IS NOT IN CONTACT WITH THE OUTER AXLE BUSHING.

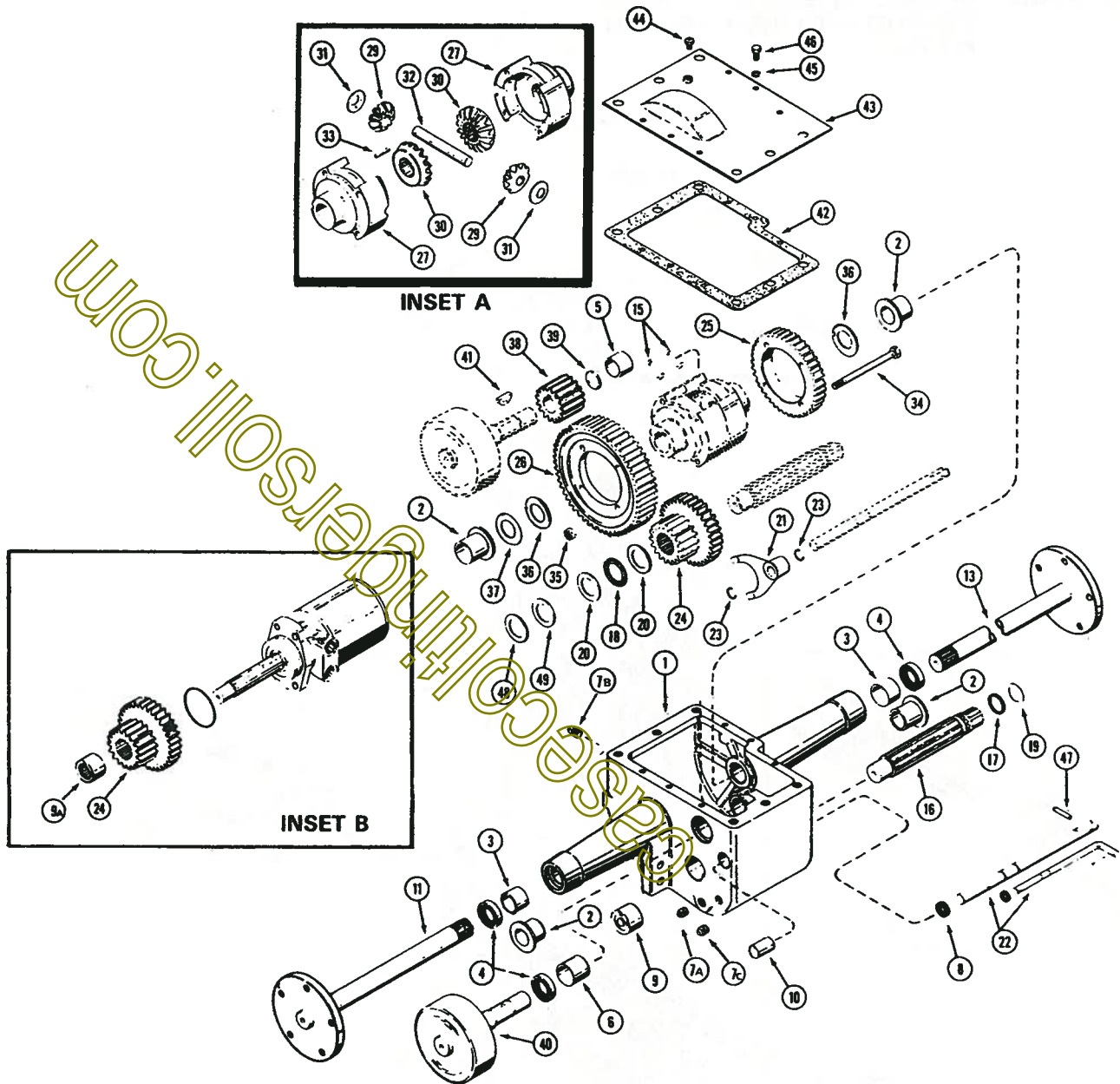
8. Carefully install a new o-ring (17) and back up washer (19) on the input shaft (16). The o-ring must be installed first and be located to the inside of the back up washer. Check the o-ring for installation damage and carefully insert the shaft into the hydraulic motor until it bottoms. If necessary, tap the end of the shaft lightly with a plastic hammer. Install a new o-ring on the face of the hydraulic motor flange.

NOTE: BEFORE INSTALLING HYDRAULIC MOTOR ASSEMBLY, CHECK MOUNTING SURFACE AND O-RING CHAMFER FOR NICKS OR BURRS. APPLY GREASE TO O-RING CHAMFER AND INSIDE WALL TO GUARD AGAINST O-RING DAMAGE.



bearing.

as a replacement service part. Torque to 50 foot pounds (67 Nm).



13. Place the differential assembly in the transmission case with washer stop grooves facing up.
14. Grease the axle shafts (11 and 13) thoroughly and carefully install them through the seals, bearings and into the differential assembly, being sure that stop washers (36), and shim washers (37), if required, are in place.

IMPORTANT: MAXIMUM END PLAY ON THE DIFFERENTIAL ASSEMBLY IS .030" (.76MM). MINIMUM END PLAY IS .005" (.13MM). USE .015" (.38MM) SHIM WASHERS (37) AS REQUIRED. A COATING OF GREASE ON THE SHIM WASHERS WILL HELP TO HOLD THEM IN POSITION WHILE INSERTING THE AXLE. SECURE THE AXLE SHAFTS WITH NEW SNAP RINGS (15).

15. Place a new wire retainer (39) into brake gear (38). Install woodruff key (41) in brake shaft (40). Carefully insert brake shaft (40) through the case and into brake gear. When the inside end of the shaft is in contact with the wire retainer, rap the outside end sharply with a leather or dead blow mallet to seat the retainer.
16. Fill the transmission to level plug (7B) using approximately 3 quarts (2.8 l) of clean 20W-40 motor oil or No. 80 or 90 EP gear lubricant. Install a new cover gasket (42) and replace cover (43) with six bolts (46) and lock washers (45). Check to see that breather plug (44) is functional.

Model 220 S/N 9649062 and after
Model 222 S/N 9647203 and after
Model 442 S/N 9632450 and after
All 224, 226, 444, 446 and 448 Models
All 3000 and 4000 series
All 3100 and 4100 series
All 600 and 6000 series

1. Press in new brake shaft bushings (5 and 6) until flush with their seats. Ream the inner bushing if necessary to 1.004" - 1.005" (25.50mm - 25.52mm). Ream the outer bushing if necessary to 1.192" - 1.193" (30.28mm - 30.30mm).
2. Install new axle bushings (2 and 3). Press the

CAUTION: IF ANY BUSHINGS REQUIRED REAMING, CLEAN ALL SHAVINGS AND DEBRIS FROM BUSHINGS AND TRANSMISSION CASE.



3. Install needle bearing (9a) flush with the inside of transmission case. (Bearing is shown in inset "B". Later style cases do not have a through hole.
4. Install new shifting shaft oil seal (8).
5. Install new brake shaft oil seal (4).
6. Install new axle shaft oil seals (4) lip side first.

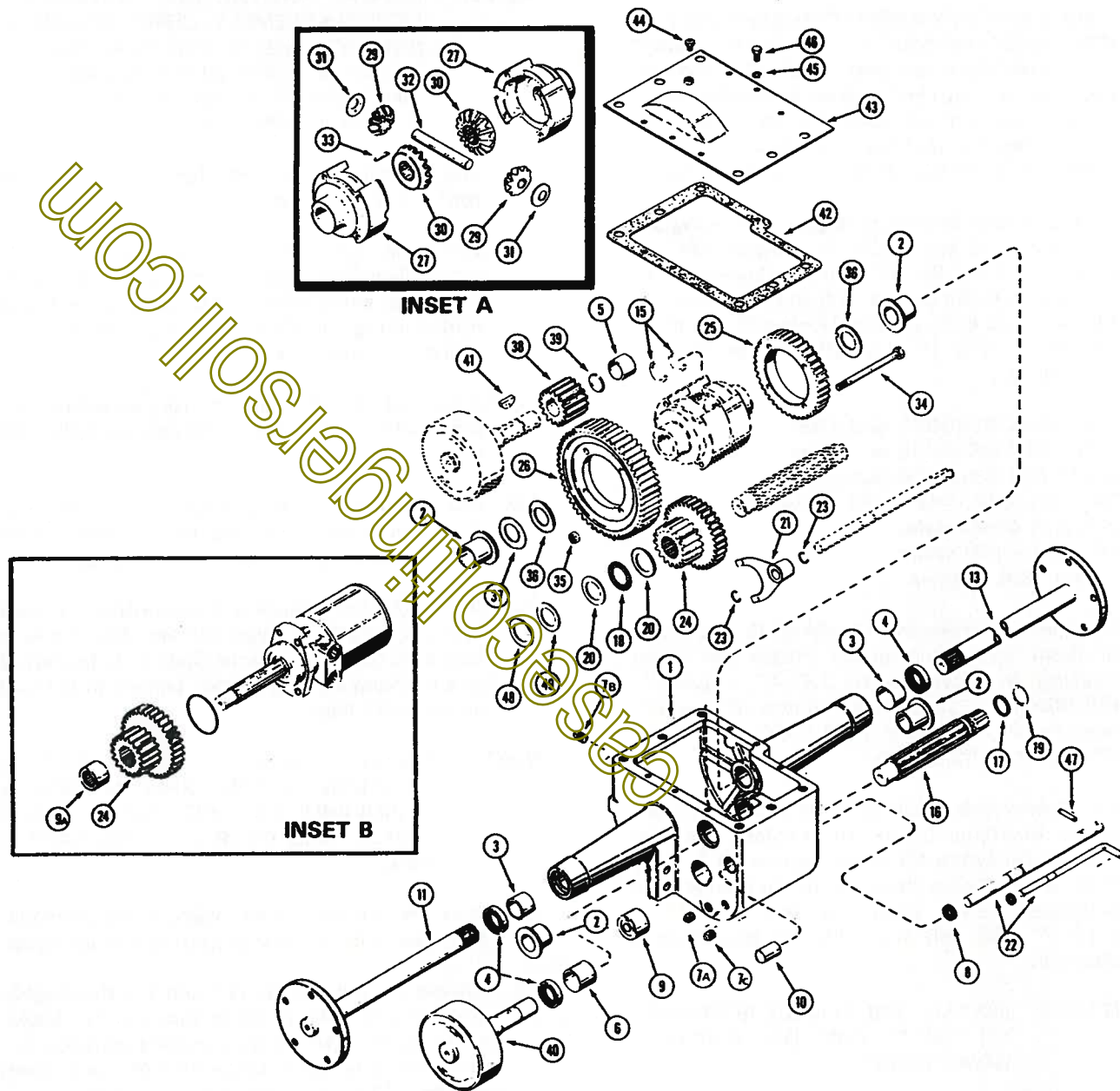
IMPORTANT: BE SURE THE SEAL LIP IS NOT IN CONTACT WITH THE OUTER AXLE BUSHING.

NOTE: BEFORE INSTALLING HYDRAULIC MOTOR ASSEMBLY, CHECK MOUNTING SURFACE AND O-RING CHAMFER FOR NICKS OR BURRS. APPLY GREASE TO O-RING CHAMFER AND INSIDE WALL TO GUARD AGAINST O-RING DAMAGE.

7. Install a new o-ring on the face of the hydraulic motor flange. (Inset "B").
8. Start the hydraulic motor assembly into the case. Slide drive gear (24) on input shaft. Slide the input shaft into needle bearing (9a) until motor flange is flush and tight against the machined face of case.
9. Install the four hydraulic motor cap screws using locktite and torque to 80 foot pounds (108 Nm).
10. Place shifting yoke (21) on groove between drive cluster gear (24) and install shifting shaft (22). Secure in place with new snap rings (23).
11. Assemble the differential according to inset "A" and install ring gears (25 and 26). Use new lock nuts (35) and special bolts (34) (available as a kit from service parts). Torque to 50 foot pounds (67 Nm).

NOTE: LATER STYLE DIFFERENTIAL ASSEMBLIES USE SPECIAL BOLTS (AVAILABLE AS A KIT FROM SERVICE

14. Place a new wire retainer (39) into brake gear (38). Install woodruff key (41) in brake shaft (40). Carefully insert brake shaft (40) through the case and into brake gear. When the inside end of the shaft is in contact with the wire retainer, rap the outside end sharply with a leather or dead blow mallet to seat the retainer.



INSTALLATION

1. Position the transmission under the tractor frame and place the brake drum into the brake band.
2. Secure the transmission to the frame with the four bolts and lockwashers.

NOTE: CHECK AND MAKE SURE THE TWO RIGHT FRAME CHANNEL SPACERS ARE IN PLACE BETWEEN THE MOUNTING HOLES.

- 3A. **Model 220 Prior to S/N 9649062**
Model 222 Prior to S/N 9647203
Model 442 Prior to S/N 9632450

Make sure the new o-rings are in place on the hydraulic motor ports. Secure the oil line manifold to the hydraulic motor with the original four cap screws and tighten to 24-28 foot pounds (33-37 Nm).

- 3B. **Model 220 S/N 9649062 and after**
Model 222 S/N 9647203 and after
Model 442 S/N 9632450 and after
All 224, 226, 444, 446 and 448 models
All 3000 and 4000 series
All 3100 and 4100 series
All 600 and 6000 series

Connect the two valve to motor port tubes.

4. Return the fuel tank to its normal location and install the seat support with the original bolts.

NOTE: BEFORE INSTALLING THE SEAT SUPPORT MOUNTING BOLTS, PLACE THE SLOTTED END OF THE SHIFT LEVER OVER THE ROLL PIN ON THE TRANSMISSION SHIFT ROD.

5. Install the rear wheels and remove the blocks from the tractor frame. Torque lug bolts according to Specification Chart.

AXLE AND AXLE SEAL REPLACEMENT ONLY

It is not required to remove or completely disassemble the two-speed transaxle to replace an axle or axle seal. The following procedure should be followed.

1. Follow steps one and two "Removal" section of this manual on page 3.
2. Loosen the wheel lug bolts on the axle to be removed.
3. Place a jack stand under the axle housing on the side to be removed.
4. Remove the wheel and tire.
5. Remove the four frame mounting bolts and transmission case cover screws.
6. Lift frame slightly and slide transmission cover from between frame and transmission case. (On 644 and 646) loaders, the cover is on top of the frame and lifting of the frame is not

7. Remove the snap ring from the axle. The snap ring may be retrieved from the bottom of the transmission case by inserting a flexible handled magnet around in front of the differential.
8. Place a magnet over the differential thrust washer and shims (36 and 37) and slide the axle shaft out.
9. Remove old seal.
10. Install new seal (4) being sure the seal lip is not in contact with the outer axle bushing (3).
11. Inspect axle shaft for nicks, burrs or rough spots and polish if necessary.
12. Grease axle shaft thoroughly and carefully insert through seal.
13. Reassemble in the reverse order of

LISTED ABOVE, THE TRANSMISSION MUST BE OPENED TO REMOVE THE HYDRAULIC MOTOR. REFER TO THE "REMOVAL " AND "DISASSEMBLY" SECTIONS OF THIS MANUAL.

1. Remove the drain plug (7A) to drain the transmission oil. Replace the plug when the oil has completed draining.
2. Remove the two valve to motor port hydraulic tubes.

assembly from the transmission case. The high-low cluster gear (24) will remain inside the case.

7. Reassemble in the reverse order of disassembly.
8. Torque mounting bolts to 80 foot pounds. (108 Nm).

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