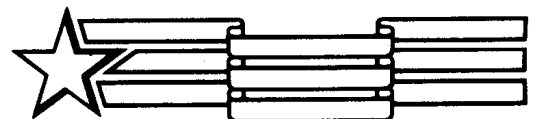




Ingersoll

**TWO-SPEED TRANSAXLE
Service Manual 9-99584**



QUALITY IN THE AMERICAN TRADITION

Ingersoll Equipment Co., Inc.

Winneconne, Wisconsin 54986-9576

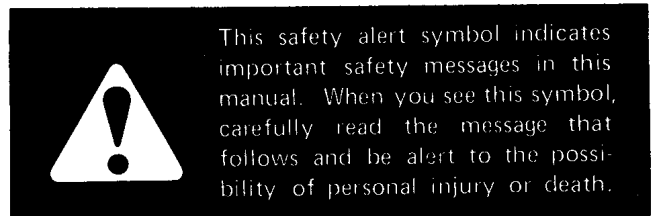
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INTRODUCTION

This manual covers service procedures for the hydraulically driven two-speed transmission used on Models 220, 222, 224, 226, 442, 446, 448 compact tractors and 644, 646, and 648 compact loaders.



REMOVAL

NOTE: Reference numbers refer to the Figure on Page 5.

A. 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.

B. Models 220, 222, 224, 226, 442, 444, 446, 448 S/N 9646800 and After and All Model 644, 646 and 648 Loaders.

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. 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 insure against dirt entry.

DISASSEMBLY

1. Remove transmission cover plate screws (46), lock-washers (45), cover plate and gasket.
2. Place a large drift pin against the inside end of the brake drum shaft (40) and rap sharply with a hammer. This will dislodge the retainer which holds the brake drum shaft to the brake gear (38). Remove the brake drum (40), key (41), gear (38), retainer (39), seal (4), and bushings (5 and 6).
3. Remove snap rings (15), rear axles (11 and 13), differential assembly, washers (36), seals (4), and bushings (2 and 3).
4. Disassemble the complete differential assembly by removing the four special bolts (34) and locknuts (35). See inset A.
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).
- 6a. Model 220 Prior to S/N 9649062
Model 222 Prior to S/N 9647203
Model 442 Prior to S/N 9632450

When the input shaft is part way removed, slide off shims (48 and 49), thrust washers (20), bearing (18), and the drive gear (24) to prevent them from dropping. Pull out or gently tap the input shaft (16) from the hydraulic motor.
- 6b. 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, 448, 644, 646 and 648

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).

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 threads.
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

1. Install new seal (8) and reassemble shifting shaft (22) and yoke (21). Secure in place with snap rings (23). Replace plug (10) if previously removed.
2. Install needle bearing (9) flush with the inside of the transmission case.
- 3a. Model 220 Prior to S/N 9649062
Model 222 Prior to S/N 9647203
Model 442 Prior to S/N 9632450

(1.) 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.
- (2.) Start the assembled input shaft (16) into the case. Slide the drive gear (24), thrust bearing and washers (18 and 20), and shims (48 and 49) on the input shaft and place the yoke (21) between the gears. The thicker shim should be used next to the bearing (9).
- (3.) Slide the input shaft (16) into the needle bearing (9) until the hydraulic motor flange is flush and tight against the machined face of the case. Check the clearance between thrust washer (20) and shim (48). Clearance must not be less than .001" (.02mm) and not more than .015" (.38mm). If necessary, adjust the shim stack keeping a .030" (.76mm) shim next to the needle bearing.
- (4.) Install the four hydraulic motor cap screws using locktite and torque to 110-125 foot pounds (149-168 Nm). Install new o-rings on the hydraulic motor ports.

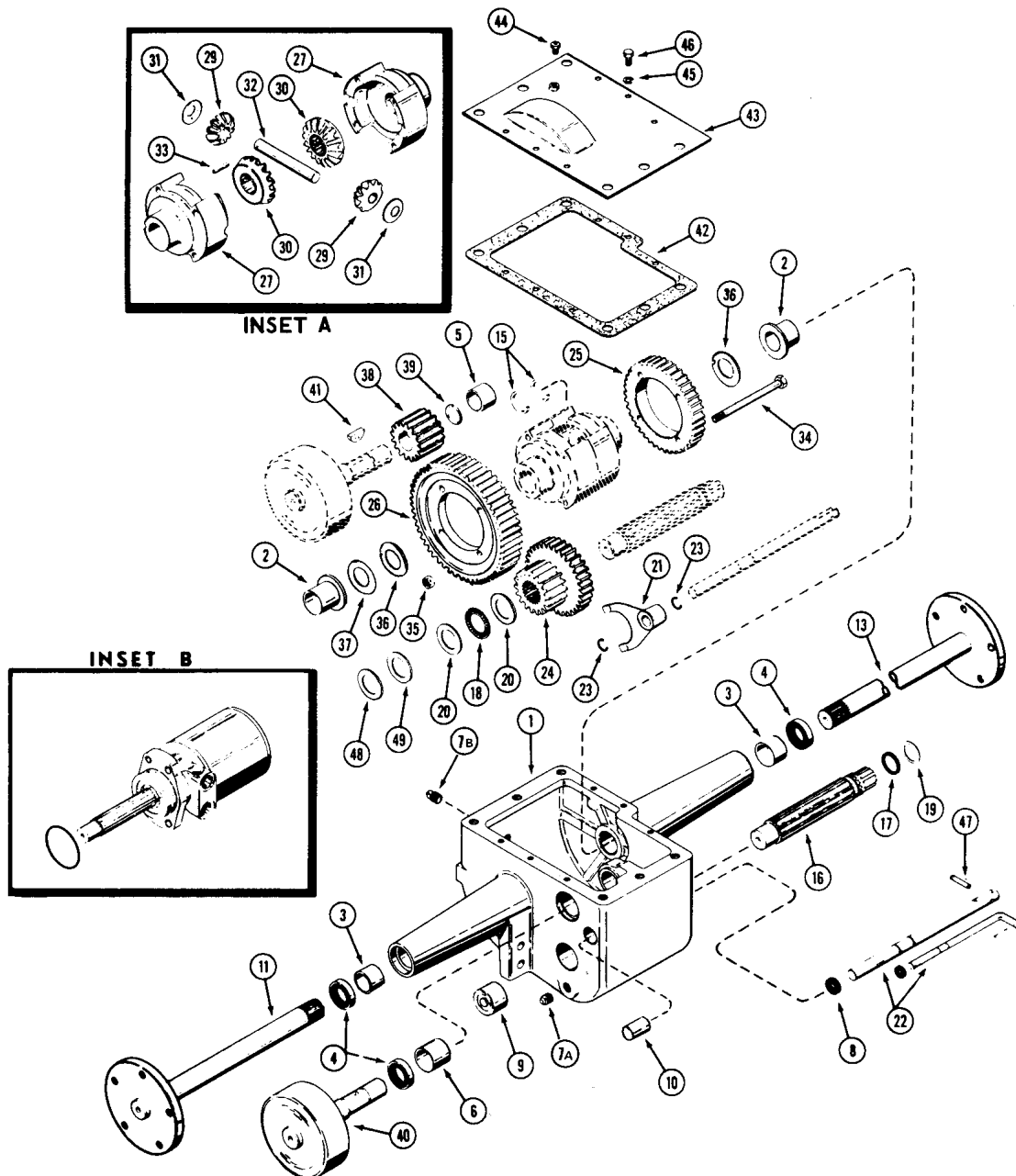
3b. Model 220 S/N 9649062 and after
 Model 222 S/N 9647203 and after
 Model 442 S/N 9632450 and after
 All 224, 226, 444, 446, 448, 644, 646 and 648

- (1.) Start the hydraulic motor and input shaft assembly (inset B) into the case. Slide the drive gear (24) on the input shaft and place the yoke (21) between the gears.
 - (2.) Install the four hydraulic motor cap screws using lockite and torque to 110-125 foot pounds (149-168 Nm).
4. Assemble the differential according to inset "A" and install the ring gears (25 and 26). Use new locknuts on the special bolts (34) and torque to 50 foot pounds (67 Nm).

5. If the axle bushings (2 and 3) were removed, press in new bushings.

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

6. Install new oil seals lip side first being sure the seal lip is not in contact with the outer axle bushing.
7. 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.

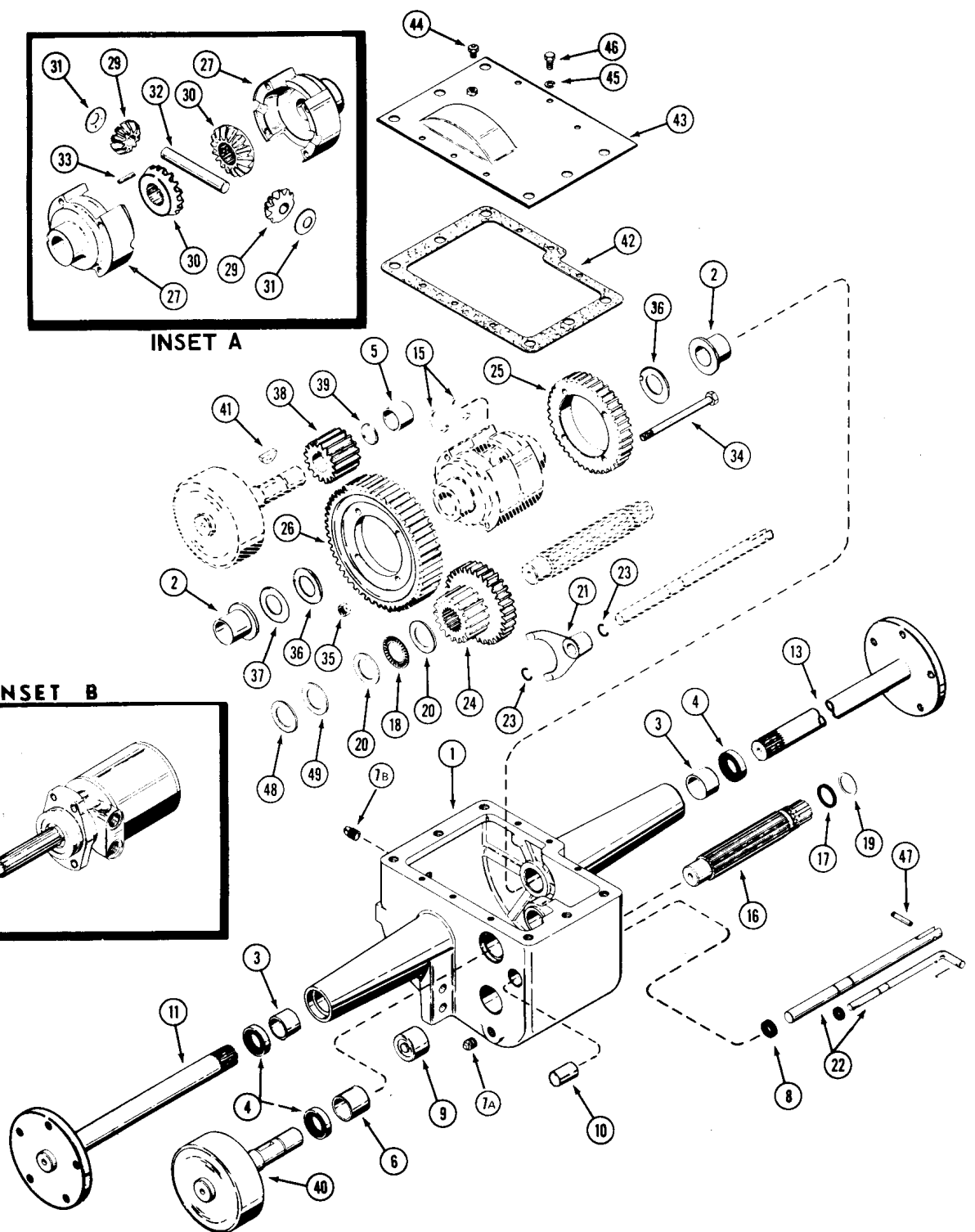
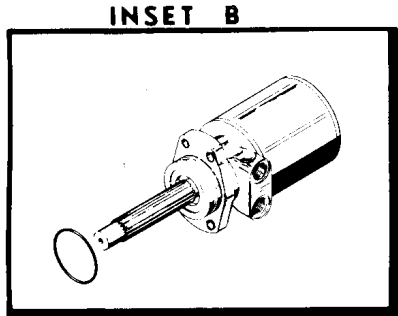
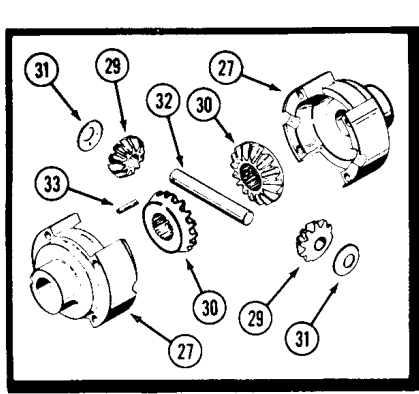


NOTE: Maximum end play on the differential assembly is .030" (.76 mm). Minimum end play is .005" (.13 mm). Use .015" (.38 mm) shim washers (37) as required. A coating of grease on the shim washers will help to hold them in position while inserting the axle. Secure the axle shafts with snap rings (15).

8. If the brake shaft bushings (5 and 6) were removed, press in new bushings until flush with their seats. Ream the inner bushing if necessary to 1.004" - 1.005" (25.50 mm - 25.52 mm). Ream the outer bushing if necessary to 1.192" - 1.193" (30.28 mm - 30.30 mm). Install a new seal (4).

9. Install a new wire retainer (39) to the brake gear (38). With the Woodruff key (41) in place, insert the brake shaft (40) through the case and into the brake gear. When the inside end of the shaft is in contact with the wire retainer, rap the outside end sharply with a leather mallet to seat the retainer.

10. 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 lockwashers (45). Check to see that the breather plug (44) is functional.



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 pound (33-37 newton-metre).

- 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, 448, 644, 646 and 648

Connect the two valve to motor 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 of Section A or B in the "Removal" section of this manual.
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 required).

IMPORTANT: Do not lift frame excessively as distortion of the hydraulic motor tubes might result.

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 disassembly.

HYDRAULIC MOTOR REPLACEMENT ONLY

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, 448, 644, 646 and 648

NOTE: For all models prior to those 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.
3. Place the transmission in low range.
4. Place a jack stand under the left axle housing and remove the left rear tire and wheel.
5. Remove the four cap screws that hold the hydraulic motor.
6. Slide the hydraulic motor and input shaft assembly from the transmission case. The high-low cluster gear (24) will remain inside the case.
7. Reassemble in the reverse order of disassembly.

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