

SHOP MANUAL

CASE/INTERNATIONAL

MODELS

2090	2290	2390	2590
2094	2294	2394	2594

IDENTIFICATION

Tractor model number and identification serial number are located on a plate on right fender of tractors not equipped with a cab, or on a plate on upper right of cab interior on tractors so equipped. Cab serial number is located on a plate on upper right of cab interior. Engine serial number is located on a plate on right rear of cylinder block. Transmission serial number is on right side of transmission housing. On models so equipped, front-wheel drive serial number is located on a plate on rear of front drive axle housing.

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DUAL DIMENSIONS

This service manual provides specifications in both the U.S. Customary and Metric (SI) system of measurements. The first specification is given in the measuring system used during manufacture, while the second specification (given in parenthesis) is the converted measurement. For instance, a specification of "0.011 inch (0.279 mm)" would indicate that the equipment was manufactured using the U.S. system of measurement and the metric equivalent of 0.011 inch is 0.279 mm.

FRONT AXLE (TWO WHEEL DRIVE)

FRONT WHEEL BEARINGS

All Models

1. Refer to Fig. 1 for typical wheel hub and bearing assembly.

The tapered inner and outer roller bearings are not interchangeable. Clean and inspect bearing cups and cones and renew as necessary. Install inner seal (9) with lip facing spindle flange. Install outer seal (10) with lip facing away from bearing (11). Fill hub cavity and pack bearings with No. 2 lithium grease. Coat surface of seal lips with grease.

When adjusting wheel bearings, tighten nut (7) until drag on hub is felt, then back nut off ¼ turn or until next pin hole lines up. Bearings should have zero end play. Install cotter pin.

SPINDLES

All Models

2. **R&R SPINDLES.** To remove spindle, lift and support front of tractor and remove wheel. Disconnect tie rod ball joint from steering arm (3—Fig. 2). Remove bolt (1) and washer (2) from arm (3). Note index punch marks on arm and shaft indicating location of tapered splines for left or right steering arm, then remove steering arm. Support spindle and remove snap ring (4) and shims (5), then remove spindle (10) from axle extension (7).

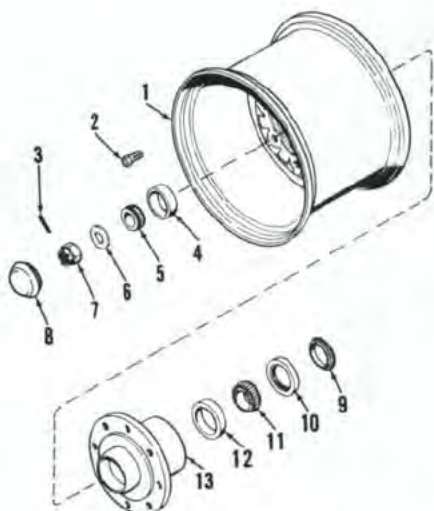


Fig. 1—Exploded view of wheel hub and bearing assembly used on all models.

- | | |
|-----------------|------------------|
| 1. Wheel | 8. Cap |
| 2. Bolt | 9. Seal (inner) |
| 3. Cotter pin | 10. Seal (outer) |
| 4. Bearing cup | 11. Bearing cone |
| 5. Bearing cone | 12. Bearing cup |
| 6. Washer | 13. Hub |
| 7. Nut | |

3. **SPINDLE BUSHINGS.** With spindles removed, spindle bushings (6 and 9—Fig. 2) can be removed using a suitable drift punch. New bushings are presized and should not require reaming if carefully installed. Press new bushings into axle ends until bushing flange seats against surface of axle ends.

Assembly by reversing disassembly procedure making sure punch marks on shaft and steering arm align. Tighten bolt (1) to 200-250 ft.-lbs. (271-339 N·m) torque. Lubricate through grease fitting (8) with No. 2 lithium grease. Tighten tie rod slotted nut to 100-125 ft.-lbs. (136-169 N·m) torque and install new cotter pin.

4. TIE RODS AND TOE-IN.

Disassembly of tie rod assembly is obvious after examination of unit and reference to Fig. 3. However, upon reassembly make sure clamp bolt (9) for left side drag link (3) is installed in same number hole as left side axle extension outer bolt; and that right side drag link bolt (11) is installed in one less number hole of drag link (2) than outer mount-

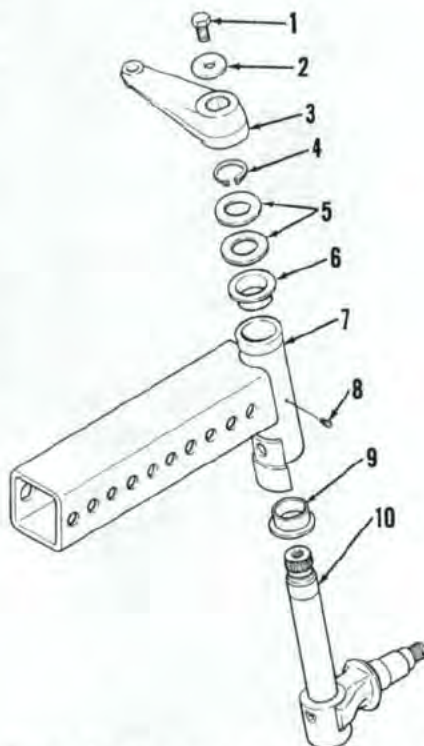


Fig. 2—Exploded view of steering spindle assembly typical of all models.

- | | |
|--------------------|--------------------|
| 1. Bolt | 7. Axle extension |
| 2. Washer | 8. Grease fitting |
| 3. Steering arm | 9. Bushing (lower) |
| 4. Snap ring | 10. Spindle |
| 5. Shims | |
| 6. Bushing (upper) | |

ing bolt of right axle extension. Tighten tie rod ball joint slotted nuts to 100-125 ft.-lbs. (136-169 N·m) torque. Install new cotter pins. Tighten drag link clamp bolt nuts to 45-54 ft.-lbs. (61-73 N·m) torque.

Front wheel toe-in must be 1/8 to 1/2 inch (3.2-12.7 mm). To adjust toe-in, remove clamp bolt (9—Fig. 3) on left drag link. Loosen jam nut (4), then turn drag link (3) in or out until desired toe-in is obtained. Install clamp bolt and tighten nut on clamp bolt to 45-54 ft.-lbs. (61-73 N·m) torque. Tighten jam nut (4) against drag link.

AXLE MAIN MEMBER AND PIVOT PIN

Models 2090 and 2290 (S/N prior to 9905953)

5. To remove axle main member, first raise and support tractor under engine side rails with suitable jack stands. Disconnect tie rods from steering arms, then refer to Fig. 3 and disconnect power steering cylinder (13) from axle main member and tie rod lug. Secure steering cylinder up and out of the way. Be careful not to damage hydraulic lines to cylinder.

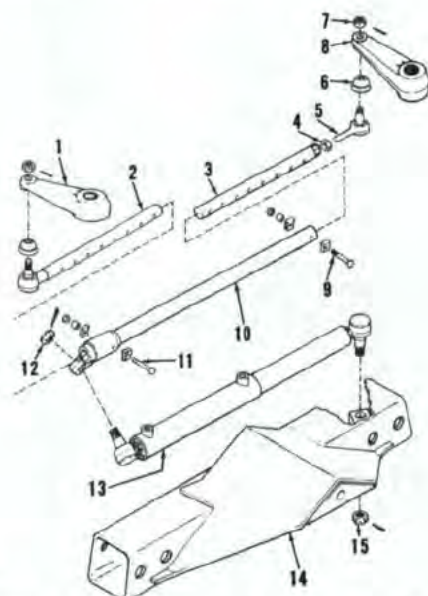


Fig. 3—Exploded view of steering tie rod, cylinder, and arms typical of all models. (Standard wheel base axle shown.)

- | | |
|------------------------|-----------------------|
| 1. Steering arm (R.H.) | 9. Clamp bolt (L.H.) |
| 2. Drag link (R.H.) | 10. Tie rod tube |
| 3. Drag link (L.H.) | 11. Clamp bolt (R.H.) |
| 4. Jam nut | 12. Slotted nut |
| 5. Ball joint | 13. Steering cylinder |
| 6. Dust cover | 14. Axle main member |
| 7. Slotted nut | 15. Slotted nut |
| 8. Steering arm (L.H.) | |

between torque tube and transmission as outlined in paragraph 106. Remove rear cab or platform mounts. With transmission suitably supported, remove wheels. Remove axle housings and final drive assemblies as outlined in paragraph 166. Remove pto housing assembly as outlined in paragraph 202. Remove brake assemblies as outlined in paragraph 192.

Disconnect differential lock oil fitting on right side of transmission then remove oil tube. Remove rear pto drive shaft. Disconnect hitch cable and remove oil tube from rear of transmission frame.

Support differential with wood blocks. Remove differential bearing carriers from both sides of transmission. Remove both differential bearing cones, shims and inner halves of brake cylinders from both sides of transmission. Attach a suitable chain or sling and hoist to differential assembly and remove from transmission.

Remove four speed transmission shift control cable bracket from top of transmission. Remove hitch cable upper mount bolts from top of rear transmission access cover, then remove cover. Remove front side transmission access cover.

Remove front bushing from pto shaft, pull shaft out approximately four inches, remove snap ring from rear of pto shaft, then withdraw pto shaft from input shaft.

Remove roll pins (13 and 17—Fig. 107) from both shifting forks. Remove detent balls and springs. Engage park lock and drive shift rail roll pin (6) out. Remove shift rail from rear of transmission. Remove shift forks.

Bend retainer nut (1—Fig. 108) lip from notch in countershaft and remove nut and thrust washer (2). Remove snap ring (6) from shaft. Using a brass drift, drive countershaft rearward approximately 1/4 inch (6.35 mm) and install a suitable puller and remove front countershaft bearing cone (3). Push countershaft assembly rearward until out of park lock gear (8) and remove Woodruff key (7) (on models equipped with transmission S/N 10237494 and below) from countershaft. Push countershaft rearward while removing items (9 through 18) out top of access opening. Park lock gear cannot be removed until fourth, third and second gears are removed. Remove park lock gear (8) then remove remainder of items (19 through 23) out top of access opening and withdraw countershaft from rear of transmission.

Remove snap ring (5) from behind front bearing cup and drive out cup. Drive out rear bearing cup (25). Press rear bearing cone from countershaft.

116. Clean and inspect all parts for damage or excessive wear and renew as necessary. Check bearings for free smooth action and renew any bearing having a loose fit or rough action. Bearing (26—Fig. 108) may be heated to 250° F (120° C) for ease of assembly.

REASSEMBLY

117. COUNTERSHAFT. Assemble countershaft as follows: If rear pinion bearing cone (26—Fig. 108) was removed, heat and install bearing cone on countershaft with large side toward pinion gear. With countershaft standing vertical with pinion gear down assemble shaft components as follows: Install 1/8 inch (3.18 mm) thick thrust washer from thrust bearing (23), then install needle bearing and cup washer, cup side down. Install first gear (22), hub gear end up. Install pinion shaft hub (19) with 1/4 inch (6.35 mm) recessed spline side down, then install shift collar (20). Install thrust bearing (18), cup side down; second gear (17), hub gear end down. Install thrust bearing (16), cup side down, then third gear (15), hub gear end up.

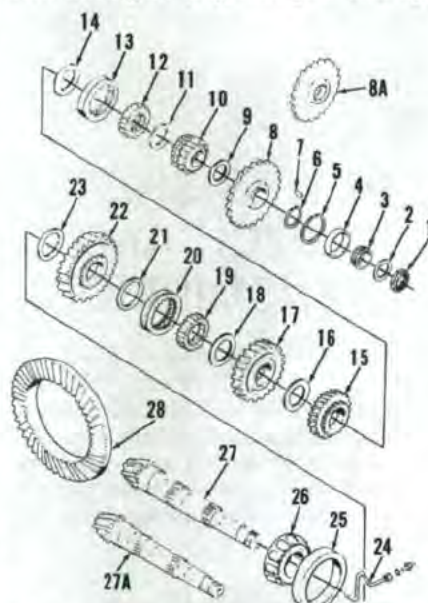


Fig. 108—Exploded view of four-speed gear countershaft used on all Model 2090 and 2290 tractors.

- | | |
|--|---|
| 1. Locknut | 14. Thrust washer |
| 2. Washer | 15. Gear (3rd driven) |
| 3. Bearing cone | 16. Thrust washer |
| 4. Bearing cup | 17. Gear (2nd driven) |
| 5. Snap ring | 18. Thrust washer |
| 6. Snap ring | 19. Hub (1st & 2nd) |
| 7. Woodruff key (transmission S/N 10237494 & before) | 20. Shift collar |
| 8. Park lock gear (transmission S/N 10237494 & before) | 21. Thrust washer |
| 9. Thrust washer | 22. Gear (1st driven) |
| 10. Gear (4th driven) | 23. Thrust washer |
| 11. Thrust washer | 24. Lube tube |
| 12. Hub (3rd & 4th) | 25. Bearing cup |
| 13. Shift collar | 26. Bearing cone |
| | 27. Pinion shaft (transmission S/N 10237494 & before) |
| | 27A. Pinion shaft (transmission after S/N 10237494) |
| | 28. Ring gear |



Fig. 109—Hydraulic inlet screen must be removed to remove shifter shafts.

Install thrust bearing (14), cup side up. Install pinion hub (12) with 1/4 inch (6.35 mm) recessed spline side down, then install shift collar (13). Install thrust bearing (11) with 1/8 inch (3.18 mm) thrust washer first and remainder of assembly, cup side down. Install fourth gear (10) with hub gear end down. Install thrust bearing (9) with cup side up. Install park lock gear (8) and key (7) (on models equipped with transmission S/N 10237494 and below) on shaft. Tap park lock gear with hammer to make sure there is no clearance between assembled parts. Install a shim type snap ring (6) and measure clearance between snap ring and park lock gear. Install appropriate thickness snap ring until 0.003-0.011 inch (0.076-0.279 mm) clearance is obtained. Snap rings (6) are available in thicknesses of 0.078, 0.088, 0.098, 0.108, 0.118, 0.128 and 0.138 inch (1.98, 2.24, 2.49, 2.74, 3.0, 3.25 and 3.5 mm). See Fig. 110 for cross-sectional view of assembled countershaft. Remove all parts from countershaft for assembly into transmission.

If front bearing cup was removed, install snap ring (5—Fig. 108) and press cup (4) into bore against snap ring. Install countershaft through rear of transmission case assembling parts in order outlined previously in this paragraph and shown in Fig. 110. Install a bar and bolt as shown in Fig. 111 to hold countershaft rigid and in correct position for installation of front bearing. Heat front bearing cone (3—Fig. 108) and install on front of countershaft, then install thrust washer (2) and retainer nut (1).

118. COUNTERSHAFT BEARING PRELOAD. Remove bar and bolt shown in Fig. 111. Tighten countershaft retainer nut, while rotating countershaft to remove clearance between countershaft bearing cones and cups. With transmission in neutral, measure rolling torque with a torque wrench. Tighten retainer nut until an additional 25-35 in.-lbs. (2.8-3.9 N·m) rolling torque for new bearings or 15-25 in.-lbs. (1.7-2.8 N·m) additional rolling torque for

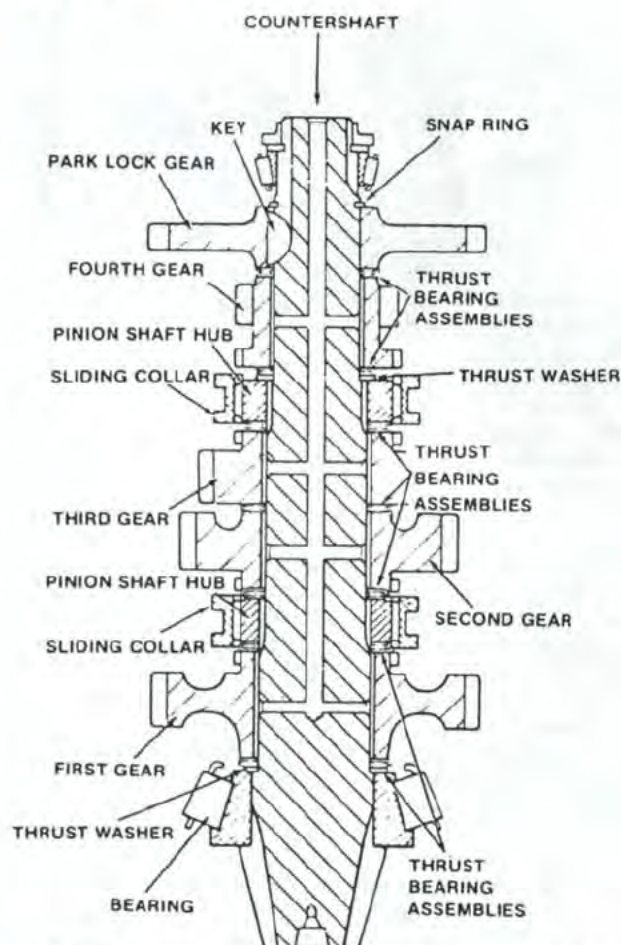


Fig. 110—Cross-sectional view of assembled countershaft and related parts.



Fig. 111—With differential removed, install jackbolt and bar to support countershaft for reassembly.

original bearings is added to the original measurement. After correct preload is obtained, bend edge of retainer nut into groove in countershaft.

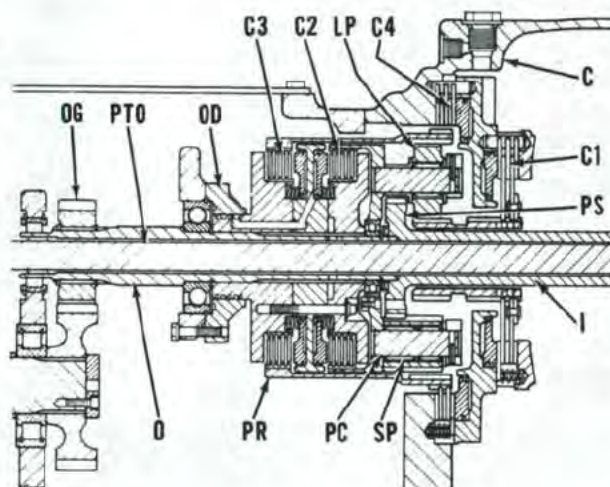
119. Reassemble tractor by reversing disassembly procedure. Adjust differential bearing preload and ring gear and pinion backlash as outlined in paragraph 170. Coat all mating surfaces of access covers, axle housings and transmission halves with Loctite 504 or equivalent prior to assembly. Fill transmission to proper level with new Hy-Tran Plus fluid. Bleed brakes as outlined in paragraph 185. Adjust hitch control and sensing cables as outlined in paragraph 267. Adjust shift linkage as outlined in paragraphs 102, 103 and 104.

POWER SHIFT CLUTCH AND TRANSMISSION

Some Model 2090 and 2290, all Model 2390, 2590, 2094 and 2294, and some Model 2394 and 2594 tractors are equipped with a hydraulically controlled power shift clutch and planetary drive unit which provides three forward speeds without stopping tractor or in-

Fig. 112—Cross section of typical three-speed power shift clutch unit. Output shaft (O) is gear transmission input shaft.

- C. Carrier
- C1. Clutch 1
- C2. Clutch 2
- C3. Clutch 3
- C4. Clutch 4
- I. Input shaft
- LP. Large planet pinion
- O. Output shaft
- PC. Planet carrier
- PTO. Pto & pump drive shaft
- PR. Planetary ring gear
- PS. Planetary sun gear
- SP. Small planet pinion
- OD. Oil distributor
- OG. Output gear



interrupting power flow. Some Model 2394 and 2594 tractors are equipped with a power shift High/Low unit in front of the three-speed power shift resulting in six power shift speeds. The power shift transmission is coupled to a sliding gear transmission which can be shifted only when tractor is at a standstill. Reverse gears cannot be engaged while tractor is moving. The four-speed gearbox and three-speed power shift clutch provides a total of 12 forward and three reverse gear ranges. On Models 2394 and 2594 so equipped, the six-speed power shift and four-speed gearbox provides 24 forward and three reverse gear ranges. Reverse cannot be operated in fourth gear.

OPERATION

Power Shift Models 2090, 2290, 2390 and 2590

120. POWER TRAIN. The power shift clutch is a manually controlled, hydraulically actuated planetary gear unit shown in Fig. 112.

Control units consist of four clutches which are hydraulically actuated and released by spring pressure when hydraulic flow to clutch is blocked.

Power enters the clutch through input shaft (I—Fig. 112), which is splined to torque limiter disc (or discs) on flywheel. Input shaft is also primary sun gear (PS) in the clutch. Primary sun gear (PS) drives the three small planet pinions (SP) which in turn drive the large planet pinions (LP). The speed of output shaft (O) depends on which clutch units are engaged.

Power to pto clutch and hydraulic pumps is transmitted through two long shafts which pass through center of drive train. The front shaft is splined to flywheel by a drive sleeve. The two shafts couple at the hydraulic pump drive. Rear shaft drives pto clutch.