

FORD

SHOP MANUAL

MODELS 8000—8600—8700—9000—9600—9700—TW-10—TW-20—TW-30

These Ford tractors are equipped with a six-cylinder diesel engine. The 9000 series, TW-20 and TW-30 models engines are equipped with a turbocharger and due to increased power output, several components on these models have been strengthened in comparison to the 8000 series and TW-10 models. An eight-speed gear type transmission and disc type clutch is standard on all models. A Dual Power planetary gear assembly which provides under-drive ratios in all transmission speeds is standard on TW-30 models and available for all other models.

Identification numbers pertaining to Models 8000, 8600, 9000 and 9600 are located on a plate inside the tool box cover.

Numbers pertaining to Models 8700 and 9700 are located on a plate mounted on the underside of the radiator filler cap access door.

Numbers pertaining to Models TW-10 and TW-20 are on a plate located above the right front corner of the radiator and are accessible after removing the right front grill panel.

Numbers pertaining to Model TW-30 are on a plate located between the radiator and front fuel tank; they are accessible by sliding the right front grill panel forward.

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CONDENSED SERVICE DATA

GENERAL	8000	9000	TW-10	TW-20	TW-30
	8600, 8700	9600, 9700			
Torque Recommendations	See End of Shop Manual				
Engine make	Own	Own	Own	Own	Own
No. of Cylinders	6	6	6	6	6
Bore, Inches	4.4	4.4	4.4	4.4	4.4
Stroke, Inches	4.4	4.4	4.4	4.4	4.4
Displacement, Cubic Inches	401	401	401	401	401
Compression Ratio	16.5:1	16.5:1	16.3:1	15.6:1	15.6:1
Pistons Removed From	Above	Above	Above	Above	Above
Main Bearings, Number of	7	7	7	7	7
Cylinder Sleeves	None	None	None	None	None
Generator Make	Own	Own
Alternator Make	Own	Own	Motorola	Own	Own
Turbocharger Make	See Paragraph 134				
Injection Pump Make	Simms	Simms	Minimec	Minimec	Minimec
Forward Speeds	8	8	8	8
With Dual Power	16	16	16	16	16
Reverse Speeds	2	2	2	2
With Dual Power	4	4	4	4	4

CONDENSED SERVICE DATA CONT.

TUNE-UP	8000, 8600, 8700	9000, 9600, 9700	TW-10	TW-20, TW-30
Firing Order			1-5-3-6-2-4	
Compression, Gage Lbs. at Cranking Speed of 200 Rpm	380-480	380-480	300-400	275-375
Maximum Allowable Variation Between Cylinders, Psi	20	20	20	20
Valve Tappet Gap, Intake, Hot			0.014-0.016 inch	
Valve Tappet Gap, Exhaust, Hot			0.017-0.019 inch	
Engine Low Idle Rpm	700-800	700-800	700-800	700-800
Engine High Idle Rpm	2530-2580	2420-2470	2530-2580	2420-2470
Engine Rpm at Rated Load	2300	2200	2300	2300
Engine Rpm for 540 Pto Rpm	1900	*1900	1873	*1873
Engine Rpm for 1000 Pto Rpm	1935	1935	1918	1918
Injection Timing			23° BTDC	
Battery Terminal Grounded			Neg.	

*540 rpm pto shaft not available on 9000, TW-30 and some 9600 models.

**SIZES—CAPACITIES—
CLEARANCES [INCHES]**

Crankshaft Journal Diameter			See Paragraph 98	
Crankpin Diameter			See Paragraph 97	
Camshaft Journal Diameter			2.3895-2.3905	
Piston Pin Diameter	1.4997-1.5000	1.6246-1.6251	1.4997-1.5000	1.6246-1.6251
Valve Stem Diameter, Intake			0.3711-0.3718	
Valve Stem Diameter, Exhaust			0.3701-0.3708	
Main Bearing Running Clearance			0.002-0.0045	
Rod Bearing Running Clearance, Aluminum Bearings			0.0025-0.0046	
Copper-Lead Bearings			0.0017-0.0038	
Camshaft Bearing Running Clearance			0.001-0.003	
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Camshaft End Play			0.001-0.007	
Piston Skirt Clearance			See Paragraph 95	
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Fuel, Gallons	43	43	58	**100
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**FRONT SYSTEM AND STEERING
MODELS 8000—8600—9000—9600**
**WIDE ADJUSTABLE
FRONT AXLE**

Exploded view of row crop axle is shown in Fig. 1; all purpose type is similar except center (main) member is reversed. All parts except center steering arm (13) and inner tie rod ends (12)

are interchangeable between row crop and all purpose types. Refer to Figs. 2 and 3 for center steering arm and tie rod installation.

1. R&R FRONT AXLE ASSEMBLY.
To remove either the row crop or all purpose type front axle, proceed as

follows: Straighten tabs of locking plates and unbolt center steering arm (13—Fig. 1) from steering motor shaft. Support front end of tractor, unbolt front pivot pin support (21) from front support and roll axle assembly forward. Unbolt and remove rear pivot pin support (16).

Reinstall front axle by reversing

removal procedure, making sure a thrust washer (17) is placed on each pivot pin. Tighten pivot pin support and center steering arm cap screws to a torque of 180-220 ft.-lbs., then bend locking plates against steering arm cap screw heads.

2. SPINDLE BUSHINGS. To renew spindle bushings, support front of tractor and remove front wheels. Remove steering arm clamp bolts on models so equipped, pull arms from spindles and remove Woodruff keys (8—Fig. 1). On models equipped with spindles having splined end is shown in Fig. 1, remove retaining nut (24) and pull steering arm from spindle. Withdraw spindles downward out of axle extensions. Remove seals (7) and thrust bearing (3). Remove thrust bearing spacers (2) if worn or damaged. Drive bushings from axle extensions and install new bushings using piloted drift or driver; bushings are pre-sized and should not require reaming if carefully installed. Be sure grease holes are aligned. Pack thrust bearings with grease.

NOTE: Upper ends of early spindles with a key were 1½ inches in diameter

whereas late spindles with a key are approximately 1-5/8 inches. Only the large diameter spindle is available. If renewing small spindle, a new large diameter steering arm must also be installed. Be sure correct size spindle seal is installed. Tighten steering arm clamp bolts on models equipped with keyed spindles to a torque of 135-165 ft.-lbs. On models with splined spindles, tighten retaining nuts (24—Fig. 1) to a torque of 200-250 ft.-lbs. Stake spindle threads to nut.

3. AXLE CENTER MEMBER, PIVOT PINS AND BUSHINGS. To remove axle center member (20—Fig. 1), support front of tractor, remove clamp bolts from tie rods and unbolt axle extensions from center member. Withdraw axle extensions with spindles and wheels from center member and tie rod sleeves. Unbolt and remove center steering arm with tie rods. Support center member and unbolt front pivot pin support. Move center member and front pivot forward until clear of rear pivot pin and lower to floor. Unbolt and remove rear pivot pin and support.

Pivot pins are integral parts of pivot pin supports; renew the pin and sup-

port assembly if pin is excessively worn. Renew bushings (18) in center member if member is otherwise serviceable; bushings are pre-sized and should not require reaming if carefully installed. Be sure grease holes are aligned and install plug (19) in bore through axle tube. Renew thrust washers (17) if worn.

Reinstall by reversing removal procedure. Tighten pivot pin support and center steering arm cap screws to a torque of 180-220 ft.-lbs., then bend locking plates against steering arm cap screw heads. Tighten tie rod clamp bolts to a torque of 25-35 ft.-lbs. and check toe-in as outlined in paragraph 4.

4. TIE RODS AND TOE-IN. Tie rod ends are of the non-adjustable automotive type and procedure for renewing same is evident. Tighten clamp bolts on outer tie rod ends to a torque of 25-35 ft.-lbs. and tighten jam nut at inner end of tie rods to a torque of 100-125 ft.-lbs.

Toe-in on both row crop and all purpose models should be ¼- to ½-inch. Position center steering arm at center line of tractor as shown in Fig. 2 or Fig. 3 before checking toe-in at spindle height. If toe-in is not correct, remove

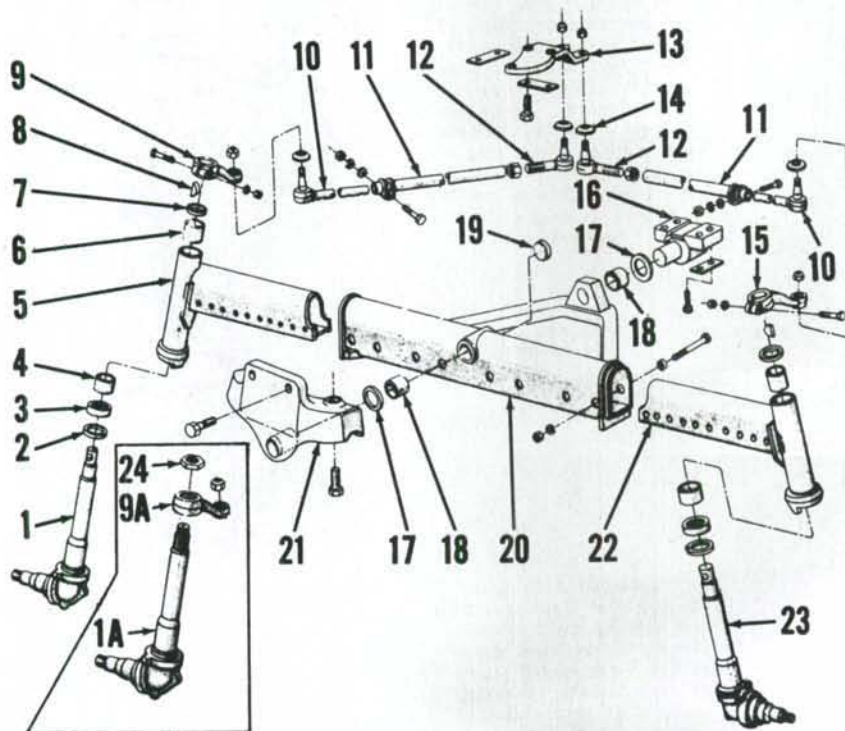


Fig. 1—Exploded view of row crop type wide adjustable front axle. All purpose type front axle is similar except that center member (20) is reversed to provide shorter wheelbase. Note that later models are equipped with spindles (1A) and steering arms are retained by a nut as shown in inset. All parts except center steering arm (13) and inner tie-rod ends (12) are interchangeable between row crop and all purpose types. Refer to Figs. 2 and 3 for center steering arm views.

- | | | | |
|-------------------------|--------------------------|------------------------------|-------------------------------|
| 1. & 1A. Spindle, R.H. | 8. Woodruff key | 14. Dust seals | 19. Plug |
| 2. Thrust spacer | 9. & 9A. Steering arm | 15. Steering arm, L.H. | 20. Axle center member |
| 3. Thrust bearing | 10. Tie rod ends, outer | 16. Rear pivot pin & support | 21. Front pivot pin & support |
| 4. Lower bushing | 11. Tie rod tube | 17. Thrust washers | 22. Axle extension, L.H. |
| 5. Axle extension, R.H. | 12. Tie rod ends, inner | 18. Pivot pin bushings | 23. Spindle, L.H. |
| 6. Upper bushing | 13. Steering arm, center | 24. Nut | |
| 7. Seal | | | |

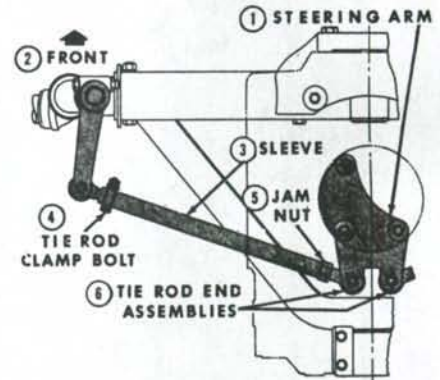


Fig. 2—When checking toe-in on row crop wide adjustable axle, be sure steering arm is centered as shown. View is from top. When installing center steering arm, be sure steering motor is centered and install arm as shown.

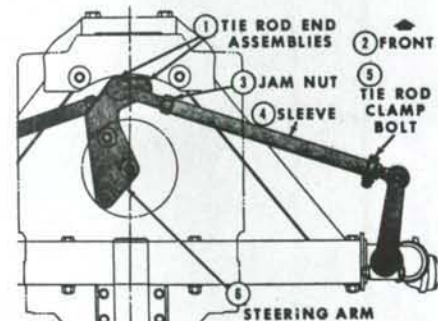


Fig. 3—View showing position of all purpose type center steering arm for checking toe-in. Note that center arm (6) and tie rod inner ends are different than those used on row crop front end. View is from top.

clamp bolts and loosen jam nuts on both tie rods, then turn each tie rod sleeve an equal amount as necessary. Refer to preceding paragraph for tightening torques.

TRICYCLE FRONT SPINDLE

5. The dual wheel tricycle spindle is bolted directly to the power steering motor shaft; procedure for removing and installing spindle is obvious. Tighten spindle to steering motor shaft cap screws to a torque of 209-231 ft.-lbs. Spindle can be installed on steering motor shaft in one position only due to offset bolt holes.

FRONT SUPPORT (PEDESTAL)

6. To remove front support, first

remove steering motor assembly as outlined in paragraph 22. Remove wide front axle assembly as outlined in paragraph 1. Unbolt and remove side plates from front support and transmission. Attach hoist to front support, then unbolt front support from engine cylinder block and oil pan; be careful not to lose shims on the two oil pan bolts and label shims for reinstallation, if same pedestal, oil pan and cylinder block are to be reinstalled.

If front support, oil pan, and/or engine cylinder block have been renewed, it will be necessary to select shim thickness for installing front support as follows: Install the three bolts and one cap screw retaining front support to cylinder block and tighten to a torque of 180-220 ft.-lbs. Install the two cap screws retaining front support

to oil pan, tighten them to a torque of 180-220 ft.-lbs., then measure gap between front support and oil pan at the two bolting points using a feeler gage. Remove the two front axle support to oil pan cap screws, then reinstall with shims equal to measured gap and tighten cap screws to a torque of 270-330 ft.-lbs. Shims are available in thicknesses of 0.015, 0.018, 0.021, 0.024 and 0.027 inch.

If front support is being reinstalled with same engine cylinder block and oil pan, reinstall shims as removed on the two front support to oil pan cap screws. Tighten the front support to cylinder block bolts and cap screws to a torque of 180-220 ft.-lbs., then tighten the two front support to oil pan cap screws to a torque of 270-330 ft.-lbs.

HYDROSTATIC POWER STEERING SYSTEM

CAUTION: The maintenance of absolute cleanliness is necessary when servicing the hydrostatic power steering

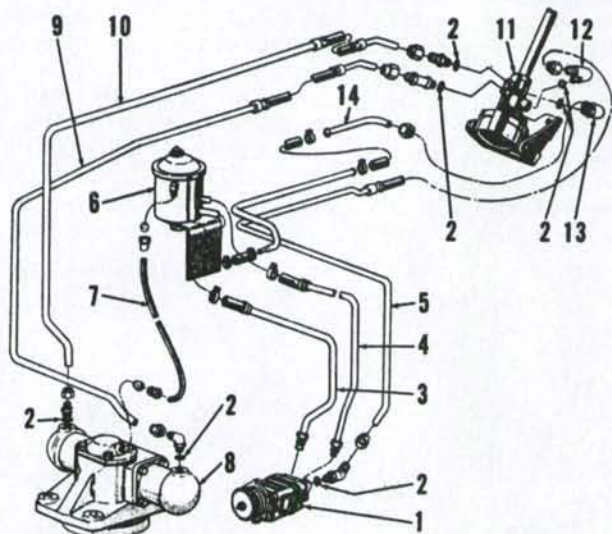


Fig. 4—View showing hydrostatic power steering system used on 8000 and 9000 models and early 8600 and 9600 models. Note that tube (9) from left end of steering motor (8) is connected to lower port on front side of Hydramotor steering unit (11) and is connected by long fitting to offset connecting nuts. Pressure tube (5) from pump is connected to left side port of Hydramotor unit by elbow (12); elbow (13) is fitted in rear port of Hydramotor unit and connects to return tube (14) to reservoir. Refer to Fig. 5 for later system.

- 1. Pump assy.
- 2. "O" rings
- 3. Pump inlet tube
- 4. By-pass tube
- 5. Pressure tube
- 6. Reservoir assy.
- 7. Return tube
- 8. Steering motor
- 9. Left cylinder tube
- 10. Right cylinder tube
- 11. Hydramotor steering unit
- 12. Elbow connector
- 13. Elbow connector
- 14. Return tube

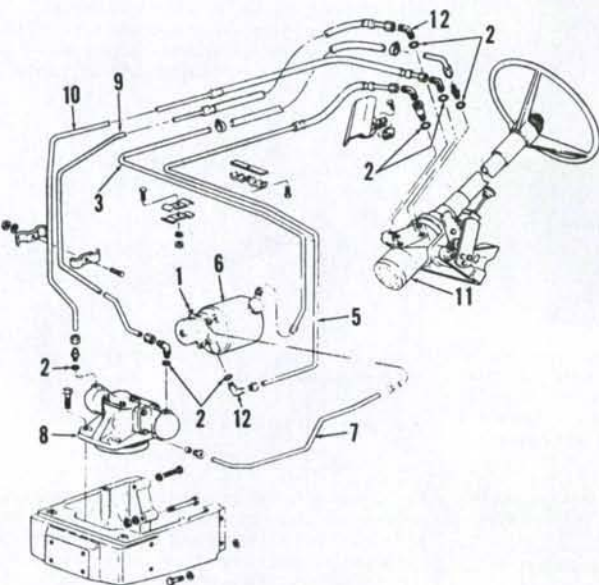


Fig. 5—8600-9600 hydrostatic power steering system with integral hydraulic pump and reservoir. Refer to Fig. 4 for identification of components. Steering motor (11) is pressurized from tube (5) to lower port. Upper port returns unused fluid through tube (3) to reservoir (6). Tubes (9) and (10) are routed to front steering motor (8) from side ports.

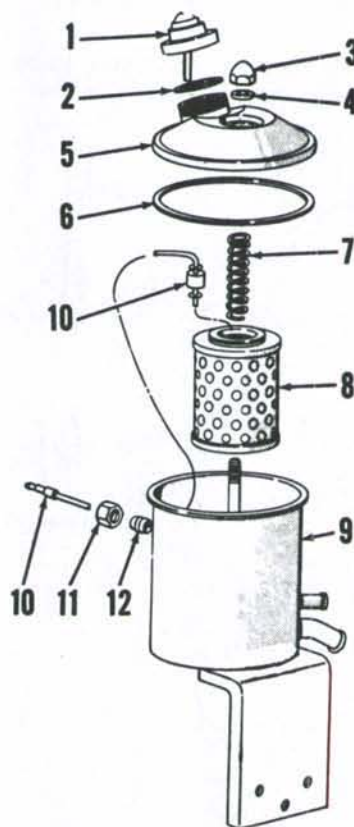


Fig. 6—Exploded view of power steering system reservoir used on 8000 and 9000 models and early 8600 and 9600 models. Oil level switch (10) is connected to warning light on instrument panel. Filter element (8) and oil in reservoir should be renewed after each 600 hours of use.

- 1. Dipstick & filter cap
- 2. Gasket
- 3. Acorn nut
- 4. Sealing washer
- 5. Cover
- 6. Gasket
- 7. Element retainer spring
- 8. Filter element
- 9. Reservoir
- 10. Warning light switch
- 11. Nut
- 12. Ferrule

system. Avoid use of shop towels or rags in wiping internal parts as any lint can cause malfunction of the system.

All 8000 and 9000 models and early 8600 and 9600 models were equipped with a remote power steering oil reservoir, a Saginaw Hydramotor power steering motor and a power steering pump with a flow control valve. The relief valve on pump is accessible from the outside.

Late 8600 and 9600 models were equipped with a Ross power steering motor which uses a spool to control flow. Steering pumps on these models have the reservoir as an integral part of pump. It is necessary to remove this type pump from engine to change filter or relief pressure.

7. FLUID, BLEEDING AND SYSTEM RESERVOIR. Recommended power steering fluid is Ford M-2C-41 oil. Maintain fluid level to full mark on dipstick. A low oil level switch assembly (10—Fig. 6) is used on models with remote fluid reservoir and is connected to a warning light on instrument panel. The light (located in Proof-Meter dial) should be on when starter switch is turned to "ON" position and go out when engine is started. If light remains on after engine is started, check for low oil level or malfunction in warning light system.

After each 600 hours of use, renew filter element. On models with remote reservoir, remove all oil from reservoir with suction gun, install new element and refill reservoir with new oil. On models with integral reservoir, remove pump from engine, drain reservoir, remove bolt (1—Fig. 8) and renew filter and "O" rings.

On all models the power steering system is self-bleeding. When any unit has been removed or disconnected, refill reservoir, start engine and cycle system by turning steering wheel from lock to lock. System is fully bled when front wheels respond directly to steering wheel movement and oil stays at level mark. Check fluid level and add oil as required to maintain full reservoir when cycling system.

8. CHECKING SYSTEM PRESSURE. On models with remote reservoir the power steering pump assembly incorporates a pressure relief valve and a flow control valve. System relief pressure should be 1450-1550 psi. On later models with integral pump and reservoir, pressure should be 1550-1650 psi.

To check system relief pressure, disconnect fitting and remove elbow in pressure line (5—Fig. 4 or Fig. 5) and connect a 0-2000 psi gage to pump, using

an "O" ring on fitting to pump. With the engine running, gage reading should be as stated above. On models with remote reservoir, if pressure is not as specified, remove the pressure relief valve cap (7—Fig. 7) and add or remove shims (6) as required. If adding shims under the pressure relief valve cap will not increase system pressure, clean flow control spool in pump. If pressure is still low remove and overhaul power steering pump as outlined in paragraph 11.

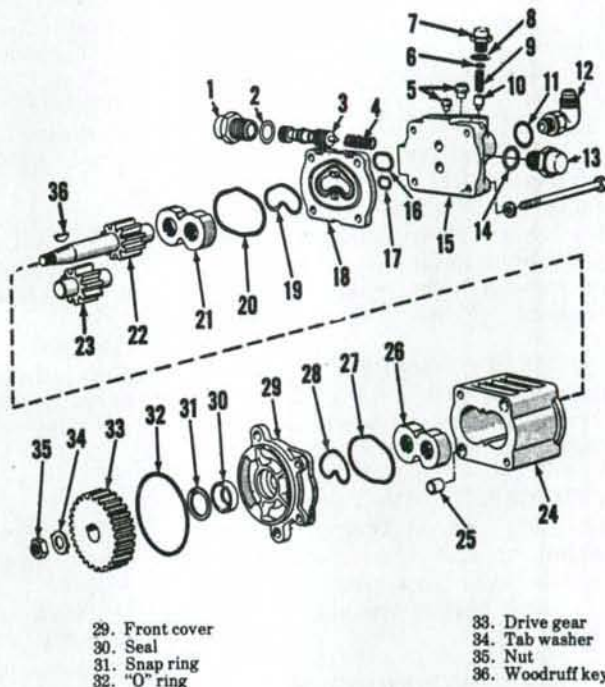
CAUTION: When checking system relief pressure, run engine only long enough to observe gage reading; pump may be damaged if engine is allowed to run for an excessive length of time.

On 8600 and 9600 models, with pump and reservoir as an integral unit, if pressure is not as specified, pump must be removed from engine. Drain reservoir and refer to Fig. 8. Remove reservoir (2) and filter (3). Remove relief valve body (24), shims (25) and spring (26). Shims are available in 0.010, 0.015 and 0.060 inch thicknesses. Each shim will change the pressure by the following approximate values: 0.010 inch—70 psi, 0.015 inch—105 psi, 0.060 inch—420 psi. Tighten relief valve to 30-40 ft.-lbs. torque.

9. STEERING SYSTEM TROUBLESHOOTING [Models with remote reser-

Fig. 7—Exploded view of power steering pump used with remote reservoir. Note position of flow control valve spring (4) and that small tip on valve (3) is towards spring.

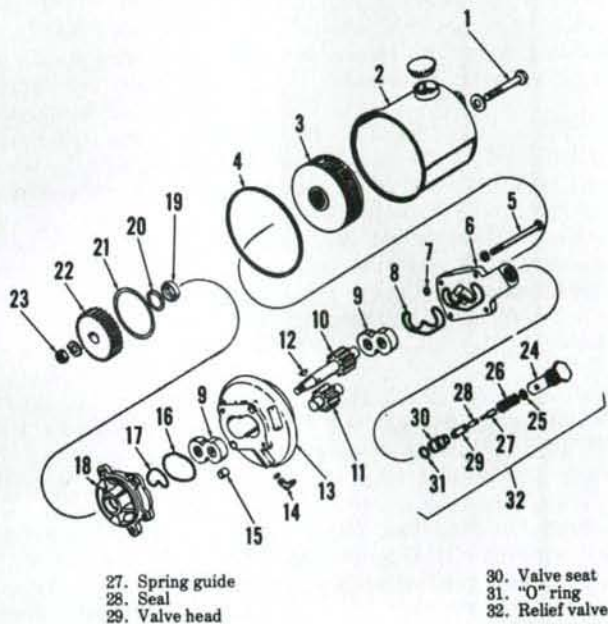
1. Cap plug
2. "O" ring
3. Flow control valve
4. Spring
5. Tubing seats
6. Shims
7. Cap plug
8. "O" ring
9. Spring
10. Pressure relief valve
11. Seal ring
12. Outlet elbow
13. Cap plug
14. "O" ring
15. Rear cover
16. "O" ring
17. "O" ring
18. Rear plate
19. Inner seal ring
20. Outer seal ring
21. Bearing block
22. Drive gear & shaft
23. Driven gear & shaft
24. Pump body
25. Dowel rings (2)
26. Bearing block
27. Outer seal ring
28. Inner seal ring



29. Front cover
30. Seal
31. Snap ring
32. "O" ring
33. Drive gear
34. Tab washer
35. Nut
36. Woodruff key

Fig. 8—Exploded view of power steering pump with integral reservoir used on late 8600 and 9600 models.

1. Bolt
2. Reservoir
3. Filter
4. Gasket
5. Through-bolt
6. Cover
7. "O" ring
8. Seal ring
9. Bearing block
10. Driven gear
11. Follow gear
12. Woodruff key
13. Body
14. Outlet elbow
15. Ring dowel
16. Seal ring
17. Seal ring
18. Flange housing
19. Oil seal
20. Snap ring
21. "O" ring
22. Drive gear
23. Shaft nut
24. Valve body
25. Shim pack
26. Spring
27. Spring guide
28. Seal
29. Valve head
30. Valve seat
31. "O" ring
32. Relief valve



voir). Refer to the following paragraphs for checking causes of steering system malfunction:

HARD STEERING. Check column bearings and bearings in Hydramotor unit; renew if rough or damaged. Check ring, rotor and vanes for wear and renew the assembly if necessary. Check for sticking control valve spool or blocking spool in Hydramotor; clean valves or renew Hydramotor parts as required.

EXCESSIVE WHEEL DRIFT. Check blocking spool spring and guide assembly and renew if spring is broken. Check for leakage past blocking valve; if excessive, renew valve body housing assembly. Check seals on steering cylinder pistons and renew pistons and/or cylinders as required.

STEERING WHEEL TURNING UNAIDED. Check the Hydramotor unit for sticking control valve spool, broken valve spool spring, actuator shaft binding or torque shaft (inside actuator shaft) broken. Clean spool and bore or renew valve body housing assembly as required.

STEERING WHEEL SLIPPAGE. Hydramotor control valve spool scored (renew valve body housing assembly) or rotor seals leaking (renew seals).

EXCESSIVE NOISE. Hydraulic lines vibrating against tractor frame or broken control valve spool spring; insulate lines from tractor or renew valve body housing assembly if spring is broken.

ERRATIC MOVEMENT OF FRONT WHEELS. Check Hydramotor ring, rotor or vanes for scoring, wear or binding condition; renew the ring and rotor assembly if necessary.

WILL NOT STEER IN EITHER DIRECTION. The manual steer check ball between pump return and pressure passages in Hydramotor unit may not be seating. Disassemble unit and clean passage with solvent and dry with compressed air. Renew pressure plate assembly if check ball cannot be made to seat.

FRONT WHEELS JERK OR TURN WITHOUT MOVING STEERING WHEEL. Check for sticking rotor vanes, rotor springs out of place or broken, scored pressure plate, scored rotor ring, scored housing, ball check valves in pressure plate leaking, improper assembly causing gap between rotor components. Disassemble the Hydramotor

unit, carefully clean and inspect all parts and renew components as necessary.

10. STEERING SYSTEM TROUBLESHOOTING. (Models with integral pump and reservoir). Refer to the following paragraphs for checking causes of steering system malfunction:

HARD STEERING. Check column bearings and bearings in steering motor; renew if rough or damaged. Check rotor and stator assembly for wear or damage and renew assembly if necessary. Check for leaks from damaged valve spool; renew steering motor if spool is damaged. Check for binding at all pivot points in steering; free up and lubricate as necessary. Check for jammed valve spool; if unable to free up, renew steering motor assembly.

EXCESSIVE WHEEL DRIFT. Check for leakage past valve spool; if spool is worn or damaged, renew spool assembly.

EXCESSIVE NOISE. Hydraulic lines vibrating against tractor frame. Insulate lines from tractor.

ERRATIC WHEEL MOTION. Rotor vanes sticking or damaged. Check vanes, rotor and stator for free movement; renew if necessary.

WHEELS JERK FROM STOP-TO-STOP. Rotor vane springs jammed; check for proper seating of vane springs, renew complete assembly if damaged.

11. R&R AND OVERHAUL PUMP. (REMOTE RESERVOIR). Thoroughly clean pump, lines and surrounding area. Disconnect lines from pump and allow fluid to drain. Cap all openings to prevent dirt from entering pump or lines, then unbolt and remove pump assembly from engine front plate. When reinstalling pump, use new sealing "O" ring and tighten retaining bolts to a torque of 23-30 ft.-lbs. Reconnect lines, fill and bleed system as in paragraph 7.

Refer to exploded view of remote reservoir model pump in Fig. 7 and disassemble pump as follows: Scribe an assembly mark across pump covers and body. Straighten tab on washer (34) and remove nut (35). Pull drive gear (33) from pump shaft and remove key (36). Remove the four through-bolts and separate rear cover assembly (15), plate (18), body (24) and front cover (29). Remove bearing blocks (21 and 26) and gears (22 and 23) from pump as a unit. Remove caps (1, 7 and 13) from rear cover (15) and withdraw flow control valve (3), pressure relief valve (10) and related parts. Remove locating

snap ring (31) and the oil seal (30) from front cover. Clean all parts in a suitable solvent, air dry, then lightly oil all machined surfaces.

Inspect bearing blocks (21 and 26) for signs of seizure or scoring on face of journals. (When disassembling bearing block and gear unit, keep parts in relative position to facilitate reassembly). Light score marks on faces of bearing blocks can be removed by lapping bearing block on a surface plate using grade "O" emery paper and kerosene. Examine body for wear in gear running track. If track is worn deeper than 0.0025 inch on inlet side, body must be renewed. Examine pump for excessive wear or damage on journals, journal bores in bearing blocks or teeth. Runout across the gear face to gear tooth edge should not exceed 0.001 inch. If necessary, the gear journals may be lightly polished with grade "O" emery paper to remove wear marks. The gear faces may be polished by sandwiching grade "O" emery paper between gear and face of scrap bearing block, then rotating the gear. New gears are available in matched sets only. If flow control valve (3) or rear cover (15) are scored or damaged, they must be renewed as a matched set only.

When reassembling pump, install all new seals, "O" rings and sealing rings. Insert new drive shaft oil seal (30) in front plate and install locating snap ring. Install flow control valve (3), spring (4) and plugs (1 and 13) with new "O" rings (2 and 14). Install pressure relief valve (10), spring (9) and plug (7), being sure that all shims (6) are in plug and using new "O" ring (8). Assemble pump gears to bearing blocks and insert the unit into pump body. Be sure the two bolt rings (hollow dowels) are in place in pump body, then position the front cover on body. Place the rear plate (18) at rear of body and install rear cover. Tighten the four cap screws (through-bolts) to a torque of 13-17 ft.-lbs. Install the pump drive gear key, drive gear, tab washer and nut. Tighten the nut to a torque of 55-60 ft.-lbs. and bend tab of washer against flat on nut.

12. R&R AND OVERHAUL INTEGRAL RESERVOIR PUMP. For exploded view of parts used on models with integral pump and reservoir refer to Fig. 8. Clean pump and surrounding area and disconnect pump pressure and return lines. Remove the two cap screws securing pump to engine front cover and lift off pump and reservoir as a unit. Drain the reservoir and remove through-bolt (1), reservoir (2) and filter (3).

Relief valve cartridge (32) can now be removed if service is indicated. For ac-

cess to shims (25) grasp seat (30) lightly in a protected vise and unscrew body (24). Shims (25) are available in thicknesses of 0.010, 0.015 and 0.060 inch. Starting with the removed shim pack substitute shims, thus varying total pack thickness, to adjust opening pressure. Available shims permit thickness adjustment in increments of 0.005 inch and each 0.005 inch in shim pack thickness will change opening pressure about 35 psi. If parts are renewed, the correct thickness can only be determined by trial and error, using the removed shim pack as a guide.

To disassemble the pump, bend back tab washer and remove shaft nut (23), drive gear (22) and key (12). Mark or note relative positions of flange housing (18), pump body (13) and cover (6); then remove pump through bolts (5). Keep parts in their proper relative position when disassembling pump unit. Pump gears (10 and 11) are available in a matched set only. Bearing blocks (9) are available separately but should be renewed in pairs if renewal is because of wear. Bearing blocks should also be renewed with gear set if any shaft or bore wear is evident. Examine body (13) for wear in gear running track. If track is worn deeper than 0.025 inch on inlet side, body must be renewed. Renew all "O" rings and seals.

When reassembling the pump, tighten through bolts (5) to a torque of 25 ft.-lbs. and drive gear nut (23) and relief valve body (24) to a torque of 30-40 ft.-lbs.

13. SAGINAW HYDRAMOTOR STEERING UNIT. Refer to the following paragraphs 14 through 18 for information on removal, overhaul and installation of the Saginaw Hydramotor steering unit which is used on 8000 and 9000 models and early 8600 and 9600 models. If parts are not available for repair of Hydramotor unit, a conversion kit is available to install the later Ross unit on early tractors. Refer to paragraph 9 for troubleshooting information. For the Ross unit used on 8600 and 9600 models, refer to paragraphs 19, 20 and 21.

14. R&R HYDRAMOTOR UNIT. To remove Hydramotor, first remove hood top, right and left side panels, then proceed as follows:

Remove cap (1)—Fig. 9 from adjuster knob (4) and remove nut (2) and washer (3). Knob can then be removed from locking rod in shaft (11), then remove steering wheel (7) and shaft (8) as an assembly. Disconnect the four tubes from Hydramotor unit, then cap or plug all openings. Loosen both jam nuts (24) and unscrew the pivot studs (23) from support (21). Then remove steering unit from below the instrument panel.

NOTE: Remove intake manifold air tube if necessary for clearance.

To reinstall, position unit in support with tilt quadrant engaged in lock plunger and turn pivot studs in to support unit. Reconnect the four tubes and reinstall steering wheel and adjuster knob. With steering shaft shortened to full extent and steering wheel in lowered position, attach pull scale to steering wheel rim and release quadrant latch. Tighten pivot studs until a pull of 18-22 pounds will lift steering wheel from lowered position, then tighten jam nuts to a torque of 180-220 ft.-lbs. and recheck pivot stud adjustment.

NOTE: Do not attempt to position steering wheel on shaft as slippage in unit will not allow wheel to remain in any relative position to front wheel movement.

R&R STEERING COLUMN JACKET AND SHAFT ASSEMBLIES (Hydramotor Models). With Hydramotor unit removed as outlined in paragraph 14, proceed as follows:

Loosen clamp (15)—Fig. 9 and pull column jacket assembly (10) from control valve housing (16). Unscrew the hex nut (14) until it nearly contacts control valve

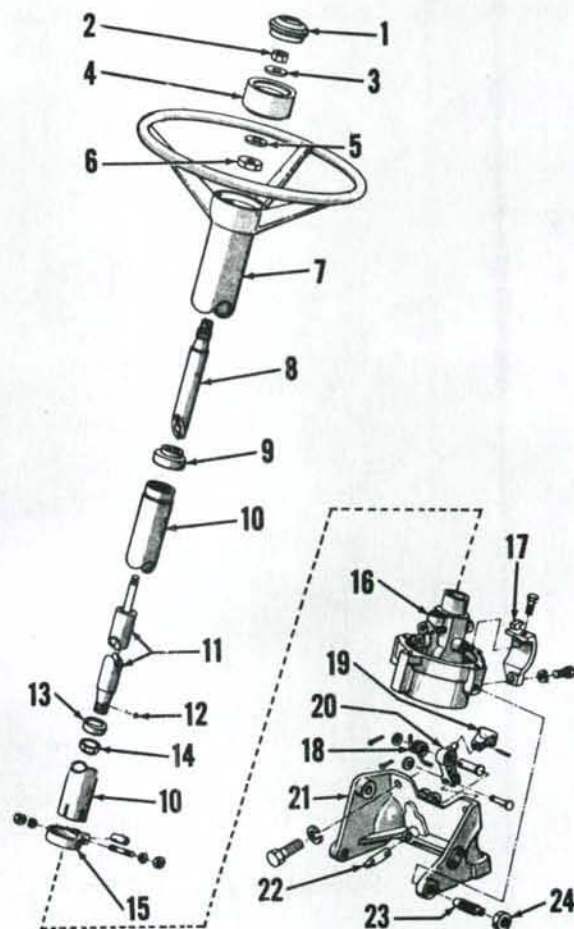
housing. Nut was staked when assembled and will turn hard. Drive the tapered collar (13) towards nut until collar is loose, then turn collar until hole in collar is over locking ball hole in outer shaft (11) and shake the ball (12) out of hole. The outer shaft, tapered collar and hex nut can then be removed from the Hydramotor actuator shaft.

Reassemble the unit before reinstalling on actuator shaft as follows: Install tapered ring (13) on outer shaft (11), with large I.D. first. Install a new nut (14) just far enough to catch one or two threads of outer shaft. Engage splines of outer shaft on splines of actuator shaft. Align hole in tapered ring, hole in outer shaft and groove around the actuator shaft, then drop locking ball in hole and groove and turn tapered collar ¼-turn. Tighten the hex nut to a torque of 40-50 ft.-lbs. and stake nut into slot in outer shaft as shown in Fig. 11.

16. R&R BLOCKING SPOOL (RE-ACTION) VALVE (Hydramotor Models). The blocking spool valve and related parts can be removed and reinstalled after the Hydramotor steering unit has been removed as outlined in paragraph 14. Refer to Fig. 12 and proceed as follows:

Fig. 9—View showing adjustable length steering shaft and variable position Hydramotor steering unit bracket on 8000 and 9000 models and early 8600 and 9600 models. Lock plunger (22) engages one of eight notches in quadrant (17) to hold steering wheel at desired tilt position. Adjusting knob (4) tightens tapered end of steering shaft (8) against tapered end of lower shaft to lock steering wheel at desired height.

1. Cap
2. Nut
3. Flat washer
4. Adjusting knob
5. Flat washer
6. Nut
7. Steering wheel & outer tube
8. Steering wheel shaft
9. Shaft scraper & seal
10. Steering column jacket
11. Hydramotor outer shaft
12. Steel ball (11/64-inch)
13. Taper ring
14. Nut
15. Clamp
16. Hydramotor unit
17. Tilt quadrant
18. Spring
19. Tilt knob
20. Tilt pivot
21. Support
22. Tilt lock plunger
23. Pivot studs
24. Jam nut



Remove the lockout adjuster nut (1). Plug (3) and spool valve (4) may now be removed by pushing the plug into bore against spring pressure with screwdriver, then quickly releasing the plug to allow spring to pop it out of bore. Remove plug and, if spool sticks in bore, invert the unit and tap housing (12) with soft faced mallet to jar spool out. Invert unit and allow spring (5) and spring and guide assembly (6) to drop from bore.

Spool is not serviced separately, but is available in a complete housing kit, which includes necessary parts to rebuild housing assembly.

NOTE: On some Hydramotor housings, oil leakage around blocking valve adjuster (1) may be due to mismatch of counterbore in valve spool bore and position of "O" ring (2) on plug (3). To stop oil leakage, install plug with part No. C9NN-3R675-A. Note difference in plugs shown in Fig. 14. Later models will all be equipped with the later design plug.

To reassemble, install parts in bore of housing (12—Fig. 12) as shown in exploded view, renewing the "O" ring (2) on plug (3) and tightening adjuster nut to a torque of 10-15 ft.-lbs.

NOTE: The adjuster (1) is not accessible after tractor is fully assembled; thus, the adjuster must be in the down,

or closed position when unit is being reinstalled.

17. R&R COVER RETAINING SNAP RING (Hydramotor Models). To remove snap ring (7—Fig. 10) used to retain cover (30) to housing (12) proceed as follows:

With unit removed from tractor as outlined in paragraph 14, check to see that end gap of snap ring is near hole in cover as shown in Fig. 13; if not, bump snap ring into this position with hammer and punch. Insert a pin punch into hole and drive punch inward to dislodge snap ring from groove. Hold punch under snap ring and pry ring from cover with screwdriver. Usually, the coil spring (27—Fig. 10) will push housing from cover; if not, bump cover loose by tapping around edge with mallet.

To reinstall the cover retaining snap ring, housing must be held in cover, against spring pressure. It is recommended that the unit be placed in an arbor press and the housing be pushed into cover with a sleeve as shown in Fig. 15.

CAUTION: Do not push against end of shaft (14—Fig. 10).

Place snap ring over housing before placing unit in press. Carefully apply force on housing with sleeve until flange on housing is below snap ring groove in

cover. Note that lug on housing which prevents rotation must enter slot in cover. If housing binds in cover, do not apply heavy pressure; remove unit from press and bump cover loose with mallet.

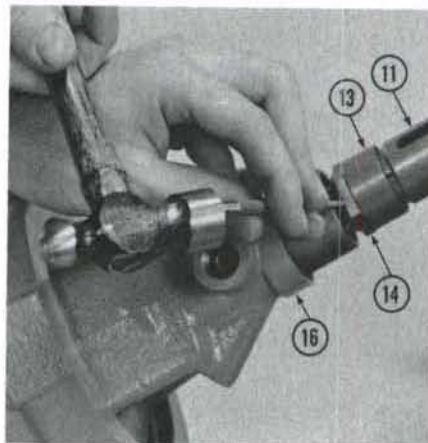


Fig. 11—After installing steering shaft on Hydramotor actuator shaft, stake hex nut to slot in steering (11) with center punch.

- 11. Outer shaft
- 13. Tapered ring
- 14. Hex nut
- 16. Housing

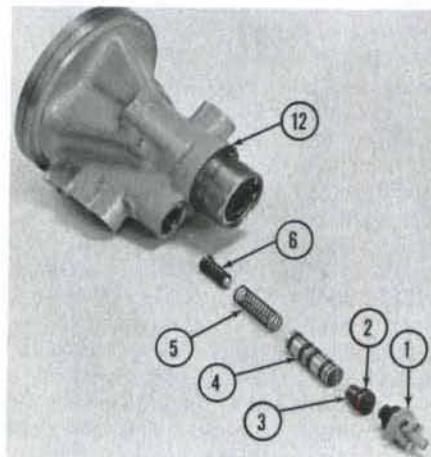


Fig. 12—Exploded view of Hydramotor housing and blocking valve components. Blocking valve can be removed without disassembly of Hydramotor.

- 1. Lockout
- 2. "O" ring
- 3. Plug
- 4. Blocking valve
- 5. Spring
- 6. Spring & guide assy.
- 12. Housing

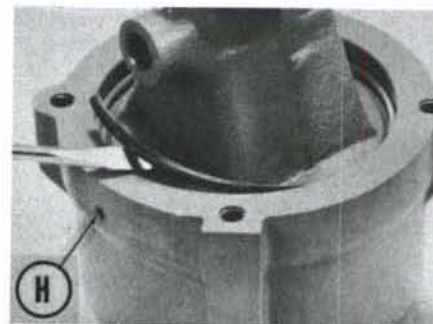


Fig. 13—To remove cover retaining snap ring, drive pin punch through hole (H) in cover to disengage snap ring from groove.

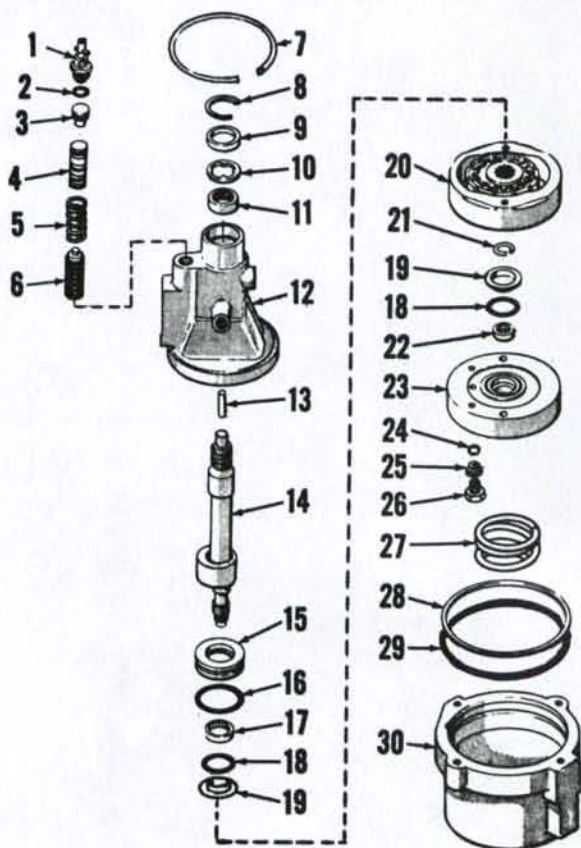


Fig. 10—Exploded view of the Saginaw Hydramotor steering unit. Also refer to Figs. 11 to 27 for photos showing disassembly and reassembly techniques.

- 1. Blocking valve lockout
- 2. "O" ring
- 3. Plug
- 4. Block valve
- 5. Spring
- 6. Spring & guide assy.
- 7. Snap ring
- 8. Snap ring
- 9. Dust seal
- 10. Oil seal
- 11. Needle bearing
- 12. Housing
- 13. Dowel pins (2)
- 14. Actuator shaft & control valve spool
- 15. Bearing support
- 16. "O" ring
- 17. Needle bearing
- 18. "O" ring
- 19. Rotor seal ring
- 20. Ring, rotor & vane assy.
- 21. Snap ring
- 22. Needle bearing
- 23. Pressure plate assy.
- 24. Check valve balls (2)
- 25. Check valve springs (2)
- 26. Retaining plugs (2)
- 27. Pressure plate spring
- 28. Back-up ring
- 29. "O" ring
- 30. Cover