

# SHOP MANUAL

# MASSEY-FERGUSON

## MODELS 1010 AND 1020

The tractor serial number is located on a plate on the steering column below the dash (1—Fig. 1). The tractor model is located on plate at (2). The engine serial number is located on the right side of engine block (3—Fig. 2) and the chassis serial number is stamped into the rear axle center housing (4—Fig. 3).

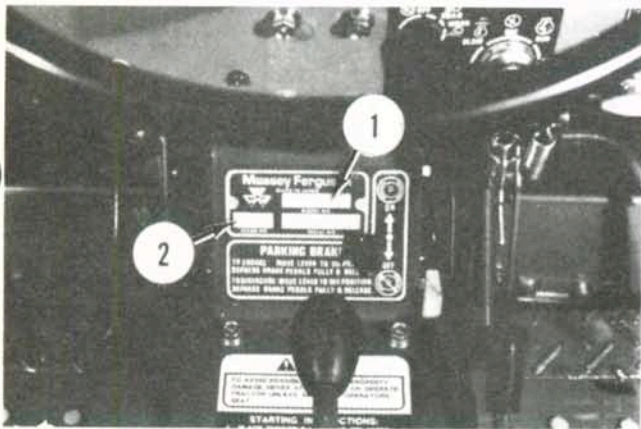


Fig. 1—The tractor serial number plate is located on the steering column below dash.

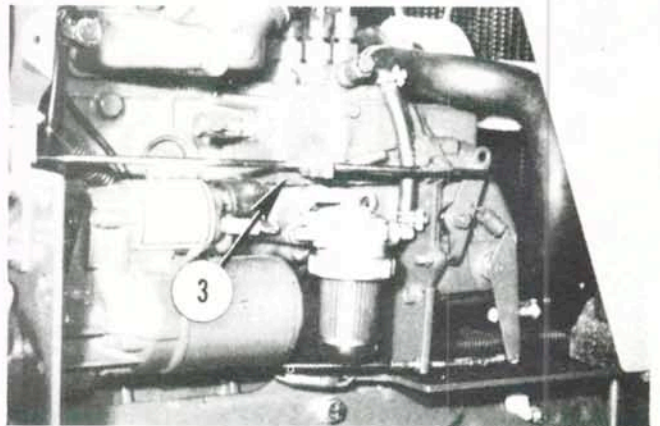


Fig. 2—Engine serial number is stamped on right side of engine.

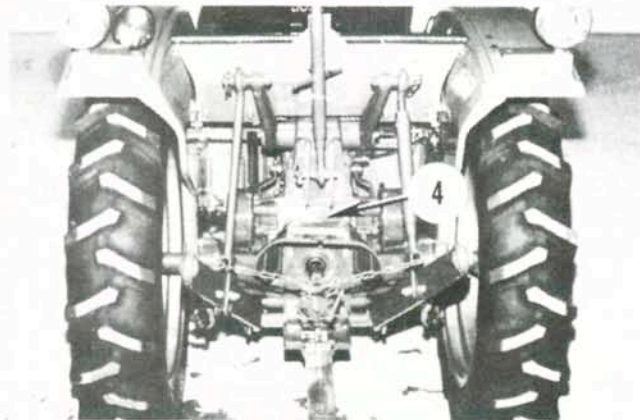


Fig. 3—The chassis serial number is stamped on rear axle center housing.

# INDEX (By Starting Paragraph)

	Models 1010 and 1020	Models 1010 and 1020
<b>BRAKES</b>		
Adjust . . . . .	144	
R & R and Overhaul . . . . .	145	
<b>CLUTCH</b>		
Adjustment . . . . .	55	
Clutch Shaft and Release Bearing . . . . .	58	
R & R and Overhaul . . . . .	56	
<b>COOLING SYSTEM</b>		
Radiator . . . . .	48	
Thermostat . . . . .	49	
Water Pump . . . . .	50	
<b>DIESEL FUEL SYSTEM</b>		
Fuel Filters and Lines . . . . .	37	
Glow Plugs . . . . .	47	
Governor and Injection Pump Camshaft . . . . .	41	
Injector Nozzles . . . . .	43	
Injection Pump . . . . .	39	
<b>ELECTRICAL SYSTEM</b>		
Alternator and Regulator . . . . .	51	
Circuit Description . . . . .	54	
Safety Switches . . . . .	53	
Starter . . . . .	52	
<b>ENGINE AND COMPONENTS</b>		
Cam Followers . . . . .	23	
Camshaft . . . . .	27	
Connecting Rod and Bearings . . . . .	31	
Crankshaft and Main Bearings . . . . .	32	
Crankshaft Rear Oil Seal . . . . .	33	
Cylinder Head . . . . .	18	
Flywheel . . . . .	34	
Front End/Engine Split . . . . .	16	
Oil Pan . . . . .	35	
Oil Pump . . . . .	36	
Piston Pin . . . . .	30	
Piston, Rings and Cylinder . . . . .	29	
R & R Engine . . . . .	17	
Rocker Arms . . . . .	22	
Rod and Piston Units . . . . .	28	
Timing Gear Housing . . . . .	25	
Timing Gears . . . . .	26	
Valve Clearance . . . . .	19	
Valve Springs . . . . .	21	
Valve Timing . . . . .	24	
Valves, Guides and Seats . . . . .	20	
<b>FINAL DRIVE AND AXLES</b> . . . . .		142
<b>FRONT AXLE SYSTEM (FOUR-WHEEL DRIVE)</b>		
Axle Housing, King Pin, Axle Shafts and Universal Joints . . . . .		13
Differential . . . . .		15
Front Axle Assembly . . . . .		11
Front Axle Assembly and Steering Linkage . . . . .		10
Front Final Drive . . . . .		12
<b>FRONT AXLE SYSTEM (TWO-WHEEL DRIVE)</b> . . . . .		1
<b>HYDRAULIC LIFT SYSTEM</b>		
Control Valve . . . . .		170
Fluid and Filters . . . . .		163
Hydraulic Pump . . . . .		164
Lift Cover . . . . .		168
Relief Valve		
1010 Hydro and All 1020 Models . . . . .		167
1010 Standard Models . . . . .		166
<b>POWER TAKE-OFF</b>		
Front Pto . . . . .		161
Mid Pto . . . . .		158
Rear Pto		
1010 Hydro Models . . . . .		147
1010 Standard Models . . . . .		146
1020 Hydro Models . . . . .		153
1020 Standard Models . . . . .		152
<b>REAR AXLE CENTER HOUSING AND DIFFERENTIAL</b>		
Axle Center Housing		
1010 Hydro Models . . . . .		122
1010 Standard Models . . . . .		120
1020 Hydro Models . . . . .		126
1020 Standard Models . . . . .		124
Differential and Bevel Gears		
1010 Hydro Models . . . . .		132
1010 Standard Models . . . . .		128
1020 Hydro Models . . . . .		139
1020 Standard Models . . . . .		136
<b>STEERING SYSTEM</b>		
Power Assist . . . . .		8
Steering Gear . . . . .		6
<b>TRANSMISSION</b>		
<b>1010 HYDRO</b>		
Front-Wheel-Drive Idler . . . . .		84
Hydrostatic Unit . . . . .		76

	Models 1010 and 1020
<b>TRANSMISSION 1010 HYDRO (Cont.)</b>	
Lubrication . . . . .	69
Overhaul . . . . .	78
Range Transmission . . . . .	80
Spacer Housing Assembly . . . . .	79
Tests and Adjustments . . . . .	71
Troubleshooting . . . . .	70

<b>TRANSMISSION 1010 STANDARD</b>	
Inspection . . . . .	59
Lubrication . . . . .	60
Overhaul . . . . .	62
Remove and Reinstall . . . . .	61

<b>TRANSMISSION 1020 HYDRO</b>	
Front-Drive Output Shaft . . . . .	118

	Models 1010 and 1020
<b>TRANSMISSION 1020 HYDRO (Cont.)</b>	
Hydrostatic Unit . . . . .	109
Lubrication . . . . .	102
Overhaul . . . . .	111
Range Transmission . . . . .	113
Spacer . . . . .	112
Tests and Adjustments . . . . .	104
Troubleshooting . . . . .	103

<b>TRANSMISSION 1020 STANDARD</b>	
Creeper (Mode) Transmission . . . . .	97
Front-Wheel Drive . . . . .	100
Inspection . . . . .	86
Lubrication . . . . .	87
Main and Range Transmission . . . . .	89
Shifter Cover . . . . .	88

## DUAL DIMENSIONS

This service manual provides specifications in both U.S. Customary and Metric (SI) systems of measurement. The first specification is given in the measuring system perceived by us to be the preferred system when servicing a particular component, while the second specification (given in parenthesis) is the converted measurement. For instance, a specification of 0.011 inch (0.28 mm) would indicate that we feel the preferred measurement in this instance is the U.S. Customary system of measurement and the Metric equivalent of 0.011 inch is 0.28 mm.

## CONDENSED SERVICE DATA

	Models			
	1010 Standard	1010 Hydro	1020 Standard	1020 Hydro
<b>GENERAL</b>				
Engine Make . . . . .	Hinomoto			
Model . . . . .	CS86		CS112	
Number of Cylinders . . . . .	3			
Bore . . . . .	70 mm (2.756 in.)		75 mm (2.953 in.)	
Stroke . . . . .	75 mm (2.953 in.)		85 mm (3.347 in.)	
Displacement . . . . .	865 cc (52.8 cu. in.)		1126 cc (68.7 cu. in.)	

# CONDENSED SERVICE DATA (Cont.)

	Models			
	1010 Standard	1010 Hydro	1020 Standard	1020 Hydro
<b>GENERAL (Cont.)</b>				
Compression Ratio.....	23:1			
Firing Order.....	1-3-2			
Valve Clearance (Cold) -				
Inlet.....	0.30 mm (0.012 in.)			
Exhaust.....	0.35 mm (0.014 in.)			
Valve Face and Seat Angle -				
Inlet and Exhaust.....	45°			
Injection Timing - BTDC				
Static.....	25°			
Fuel Pump				
Make.....	Diesel Kiki			
Engine Low Idle, rpm.....	850-900			
Engine High Idle, rpm.....	2650-2700	2650-2700	2500-2550	2650-2700
Engine Rated Speed, rpm.....	2500	2500	2350	2500
Battery Terminal Grounded.....	Negative			
Transmission, Speeds.....	3F-1R × 2	Hydrostatic Variable × 2	3F-1R × 2 × 2	Hydrostatic Variable × 3
<b>SIZES</b>				
Crankshaft Main Journal Diameter.....	59.960-59.985 mm (2.3606-2.3614 in.)			
Crankshaft Crankpin Diameter.....	47.960-46.980 mm (1.8882-1.8890 in.)			
Camshaft Journal Diameter -				
Front.....	45.910-45.925 mm (1.8075-1.8081 in.)			
Piston Pin Diameter.....	23.990-23.996 mm (0.9445-0.9447 in.)	24.989-24.999 mm (0.9839-0.9841 in.)		
Valve Stem Diameter -				
Inlet.....	7.945-7.960 mm (0.3128-0.3134 in.)	7.945-7.960 mm (0.3128-0.3134 in.)		
Exhaust.....	7.920-9.935 mm (0.3118-0.3124 in.)	7.910-9.925 mm (0.3114-0.3120 in.)		
<b>CLEARANCES</b>				
Main Bearing Diametral Clearance.....	0.03-0.095 mm (0.0012-0.0037 in.)			
Rod Bearing Diametral Clearance.....	0.03-0.095 mm (0.0012-0.0037 in.)			
Camshaft Bearing				
Diametral Clearance.....	0.021-0.092 mm (0.0008-0.0036 in.)			
Crankshaft End Play.....	0.1-0.3 mm (0.0039-0.0118 in.)			
Piston Skirt to				
Cylinder Clearance.....	0.07-0.109 mm (0.0027-0.0043 in.)			
<b>CAPACITIES</b>				
Cooling System.....	3.0 L (3.17 qt.)	4.0 L (4.4 qt.)		

# CONDENSED SERVICE DATA (Cont.)

	Models			
	1010 Standard	1010 Hydro	1020 Standard	1020 Hydro
<b>CAPACITIES (Cont.)</b>				
Crankcase With Filter . . . . .	2.5 L* (2.64 qt.*)	3.0 L (3.2 qt.)	3.7 L (4.0 qt.)	
Transmission . . . . .	17 L (4.5 gal.)		23 L (6.08 gal.)	26 L (6.9 gal.)
Front Drive Axle Hubs (Each Side) . . . . .		0.4 L (0.42 qt.)		
Front Drive Axle Housing . . . . .		1.5 L (1.6 qt.)		

\* Later models with two drain plugs - 3.0 L (3.2 qt.).

# FRONT AXLE SYSTEM (TWO-WHEEL DRIVE)

## FRONT AXLE ASSEMBLY AND STEERING LINKAGE

### Two-Wheel-Drive Models

**1. WHEELS AND BEARINGS.** Front wheel bearings should be removed, cleaned, inspected and renewed or repacked every 400 hours of operation. To remove front wheel hub and bearings, raise and support the front axle extension, then unbolt and remove the tire and wheel assembly. Remove cap (8—Fig. 4 or Fig. 5), cotter pin, castellated nut (10), washer and cone of outer bearing (12). Slide the hub assembly from spindle axle shaft. Remove seal (15) and cone for inner bearing (14). Drive cups for bearings (12 and 14) from hub if renewal is required. Inner seal (9) can be removed from spindle (16) if renewal is required.

Pack wheel bearings liberally with a suitable wheel bearing grease. Reassemble by reversing disassembly procedure. Tighten castellated nut (10) to a torque

of 29.4 N·m (22 ft.-lbs.), loosen nut, then tighten nut to 9.8-14.7 N·m (7.2-11.0 ft.-lbs.) torque and install new cotter pin. Be sure to install cap (8), using new gasket or sealer, and tighten retaining screws securely. Bolts attaching front wheel to hub should be tightened to 88 N·m (65 ft.-lbs.) torque.

**2. TIE ROD AND TOE-IN.** A single tie rod connects the left and right steering arms (22 and 23—Fig. 4 or Fig. 5) which are attached to the steering spindles (16). The automotive type tie rod ends are not adjustable for wear and should be renewed if worn. Rod end threaded into right end of tie rod is used to adjust the distance between ends to establish front wheel toe-in. Recommended toe-in is 3-10 mm ( $\frac{1}{8}$ - $\frac{3}{8}$  in.) and should be measured between the wheel rims on centerline of axle, parallel to ground. Rotate wheels and re-measure to be sure that wheels are not bent, giving incorrect reading. Tighten rod end jam nut after toe-in is correctly set.

**3. SPINDLES, AXLE EXTENSIONS AND BUSHINGS.** To remove spindle (16—Fig. 4 or Fig. 5), first remove the wheel and hub. Disconnect rod end from steering arm (22 or 23), remove clamp screw from steering arm, then remove steering arm. Remove key (21) and seal (if used) from top of spindle, then lower spindle out of axle (5). Clean and inspect

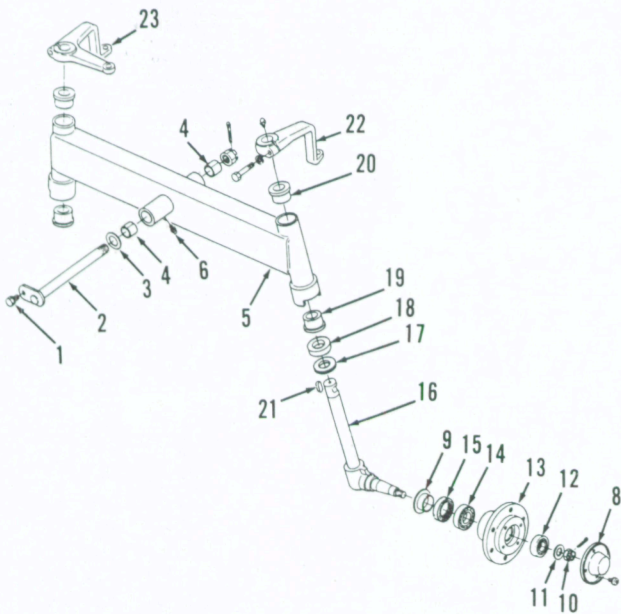


Fig. 4—Exploded view of axle and wheel hub of two-wheel-drive 1010 models.

- |                     |                        |
|---------------------|------------------------|
| 1. Screw            | 13. Wheel hub          |
| 2. Axle pivot pin   | 14. Inner bearing      |
| 3. Shims            | 15. Seal               |
| 4. Bushings         | 16. Spindle            |
| 5. Axle main member | 17. Seal               |
| 6. Grease fitting   | 18. Thrust bearing     |
| 8. Bearing cap      | 19. Bushing            |
| 9. Inner seal       | 20. Bushing            |
| 10. Castellated nut | 21. Key                |
| 11. Washer          | 22. Left steering arm  |
| 12. Outer bearing   | 23. Right steering arm |

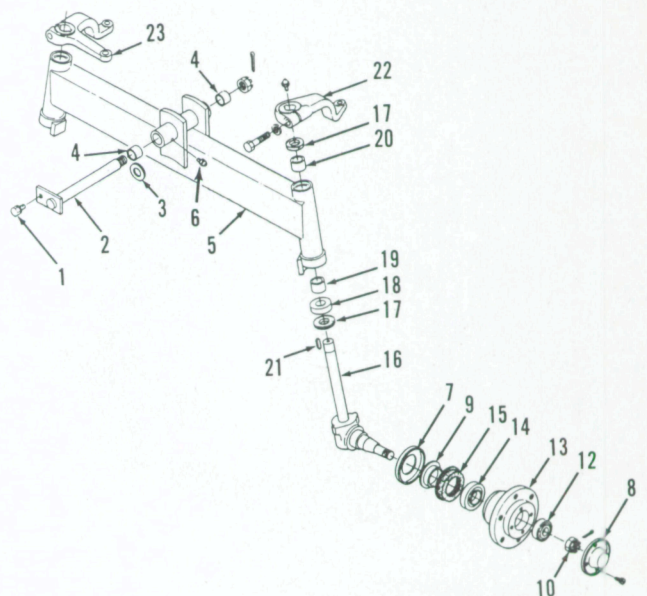


Fig. 5—Exploded view of front axle used on two-wheel-drive 1020 models. Refer to Fig. 4 for legend except shield (7).

parts for wear or other damage and renew as necessary.

Spindle bushings (19 and 20) should not require reaming after pressing into position in axle (5). Be sure that hole in spindle for grease fitting is clean and open before assembling.

When reassembling, install thrust bearing (18) so that numbered side of bearing is facing upward. Install seal (17) and insert spindle through axle. Install upper seal (if so equipped) and key (21), then locate steering arm on top of spindle. Tighten steering arm retaining clamp screw to 88 N·m (65 ft.-lbs.) torque. Bolts attaching front wheel to hub should be tightened to 88 N·m (65 ft.-lbs.) torque. Balance of reassembly is the reverse of disassembly. Refer to paragraph 2 for toe-in adjustment.

**4. AXLE CENTER MEMBER, PIVOT PIN AND BUSHINGS.** To remove front axle assembly, first remove any front mounted equipment, guards, weights and weight frame. Raise front of tractor in such a way that it will not interfere with the removal of the axle. Remove the front wheels. Disconnect steering hoses if equipped with power steering and cover openings to prevent the entry of dirt. On all models, disconnect drag link from right steering arm. Support the axle with a suitable jack to prevent tipping while permitting the axle to be lowered and moved safely. Remove axle pivot pin (2—Fig. 4 or Fig. 5), carefully lower the axle assembly and roll axle from under tractor.

Check axle pivot bushings (4) and renew if necessary. Bushings are pressed into bore of axle and should be installed flush with bore. Split in bushing should be 45° from top of axle bore. It should not be necessary to ream bushings after installation.

Reverse removal procedure when assembling. Axle end play should be 0-0.3 mm (0-0.012 in.) for 1010 models; 0-0.4 mm (0-0.016 in.) for 1020 models. Push the axle toward rear on pivot pin, then measure axle end play with a feeler gauge. Shims (3) are available in various thicknesses for adjusting end play. Make sure that pin retaining screw (1) at front is tight and that pin retaining nut at rear is snug, but not over-tightened. Install cotter pin through pin and castelated nut. Refer to paragraphs 2 and 3 for additional torque values and assembly notes.

**5. FRONT SUPPORT.** The front axle and radiator must be removed before unbolting the front axle support from engine. The front axle, the front support and the remainder of the tractor must each be supported separately while removing, while separated and while assembling. Be sure that sufficient equipment is available before beginning.

Remove any front mounted equipment, guards, weights and weight frame. Unplug lights, then remove hood and grille assembly. Remove the battery, drain cooling system, disconnect radiator hoses and remove radiator assembly. Refer to paragraph 4 and remove axle assembly. Remove the front pto, if so equipped. On all models, attach a hoist or other supporting device to front support, then remove the five retaining screws from each side and separate the front support from engine.

Reattach front support to engine by reversing the removal procedure. Apply "Loctite 271" or equivalent to the ten screws attaching front support and frame to sides of engine. Complete assembly by reversing the removal procedure.

# STEERING SYSTEM

## STEERING GEAR

### All Models

6. A cross section drawing of the manual steering gear assembly is shown in Fig 6. Note that the steering gears are contained within a cavity in the top of the clutch housing and that the steering shaft extends through the clutch housing. The steering ratio is 10:1 for all 1010 models and 13:1 for all 1020 models. Some differences will be noticed, including the number of teeth on gears (12 and 15—Fig. 7) and shaft (17) may be straight on some models.

7. **R&R AND OVERHAUL.** To service steering gear, it is necessary to remove the steering wheel, instrument panel cover and fuel tank. Disconnect brake and clutch rods from pedals and pedal cross

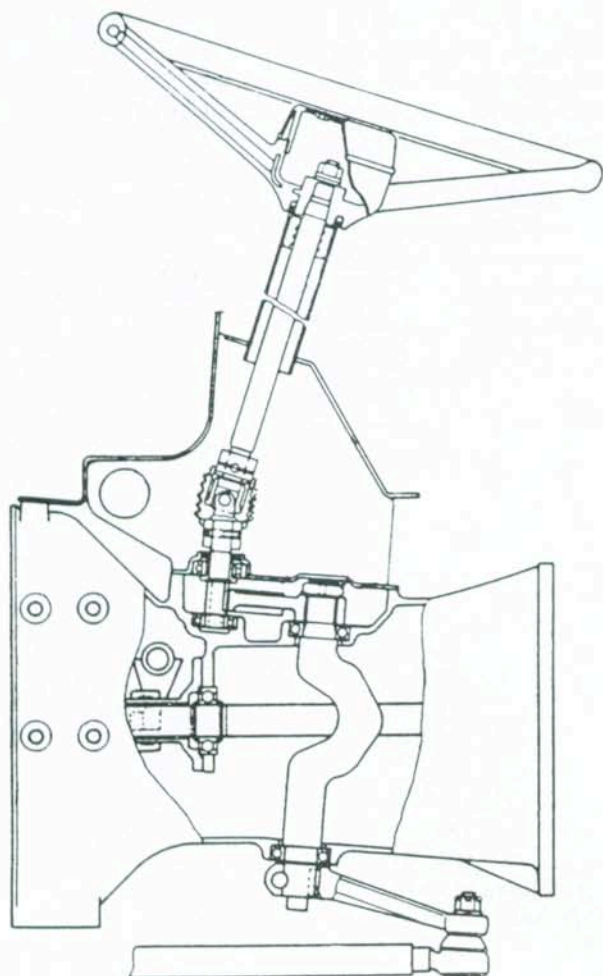


Fig. 6—Cross section drawing of steering gear typical of all models. Refer to Fig. 7 for exploded view.

shaft, then unbolt and remove the steering wheel shaft support (24—Fig. 7). Remove clamp rings (7) and slide boot (8) up to uncover universal joint. Remove lower retaining ring (4) and use a punch to drive lower pin (6) from universal joint, then separate universal joint (5) from pinion shaft (12). Notice that pins (6) are stepped and must be removed toward larger end. Remove screws attaching cover (9) to transmission housing, then remove cover, leaving pinion shaft (12) in transmission housing. Pinion shaft (12) and quadrant gear (15) can be removed together after removing retaining nut (14). Steering arm shaft (17) can be removed after splitting tractor between engine and clutch housing, then removing the engine clutch shaft.

When reassembling, front wheels must be straight ahead and steering pinion (12) must be in center of teeth on quadrant gear (15). Tighten nut (14) to 59-78 N·m (43-58 ft.-lbs.) torque. If tab lockwasher is installed under nut (14), flat side of nut should be toward top and tab of washer should be bent up to lock retaining nut. Some models may be equipped with self-locking nut or two special nuts. Fill gear cavity half full with multi-purpose lithium base grease. Nut for clamp bolt (22) retaining steering arm (21) to lower end of shaft should be tightened to 78-90 N·m (57-68 ft.-lbs.) torque. The steering arm (21) of some models is retained with a nut threaded to shaft similar to the type (14) at upper end. The larger retaining nut should be tightened to 98-117 N·m (72-87 ft.-lbs.) torque.

## POWER ASSIST

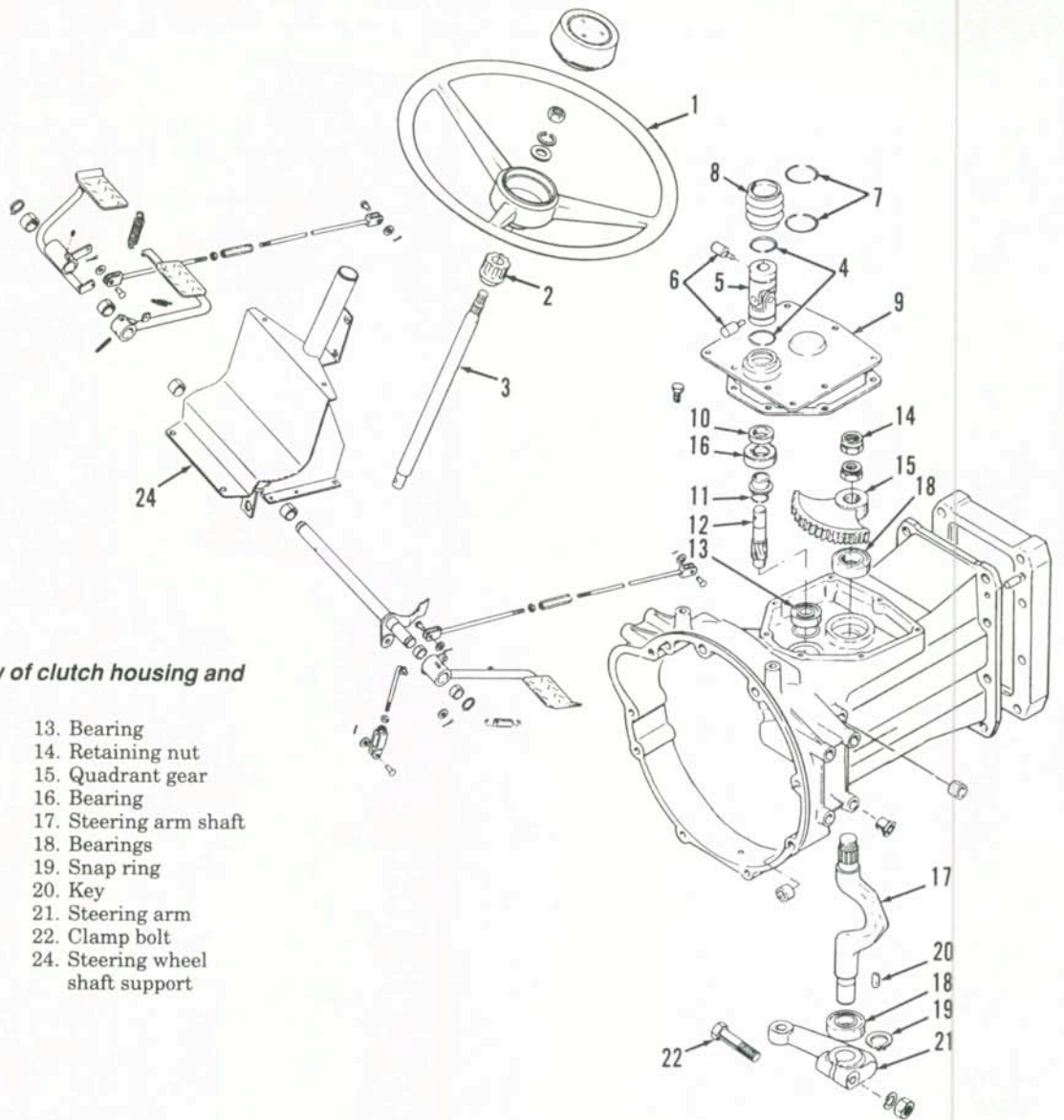
### Models So Equipped

8. Power assisted steering is available and may be installed on any model. Refer to Fig. 8 for view of flow divider valve (1), steering valve and steering assist cylinder assembly (3), connecting hydraulic lines and attaching brackets. Most service will consist of removal, disassembly, cleaning and reassembly using new seals. Refer to Fig. 9 for exploded view of cylinder and valve unit.

To remove the power steering unit, raise front of tractor so that weight is removed from the front wheels. Disconnect hydraulic lines (2 and 8—Fig. 8), then turn steering wheel from lock to lock to discharge oil from steering cylinder. Disconnect steering unit from anchor bracket (4), steering arm (5) and drag link (7).

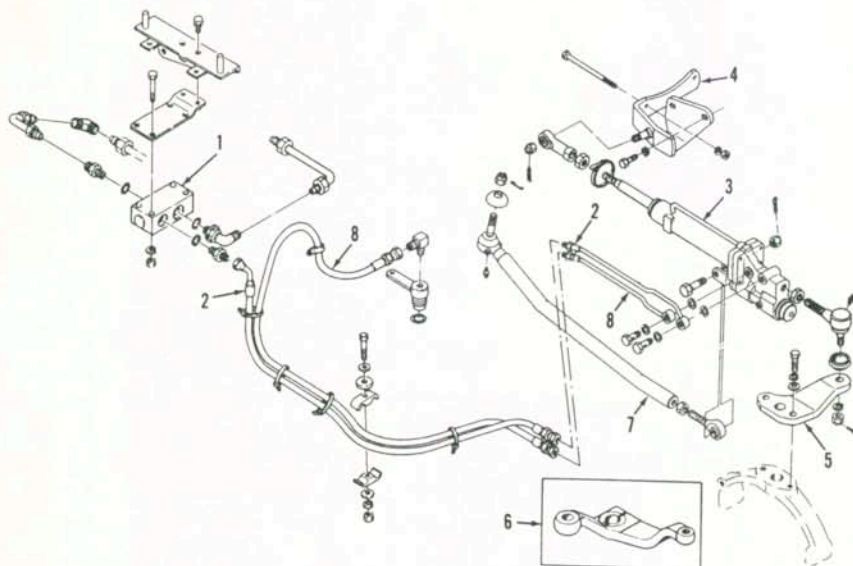
To renew steering cylinder seals, remove ball joint end from cylinder rod (41—Fig. 9). Flatten the locking groove on the cylinder, then unscrew cap and bearing assembly (43) from cylinder (36). Withdraw cylinder





**Fig. 7—Exploded view of clutch housing and typical steering gear.**

- |                        |                                  |
|------------------------|----------------------------------|
| 1. Steering wheel      | 13. Bearing                      |
| 2. Bushing             | 14. Retaining nut                |
| 3. Steering shaft      | 15. Quadrant gear                |
| 4. Retaining rings     | 16. Bearing                      |
| 5. Universal joint     | 17. Steering arm shaft           |
| 6. Pins                | 18. Bearings                     |
| 7. Clamp rings         | 19. Snap ring                    |
| 8. Boot                | 20. Key                          |
| 9. Steering gear cover | 21. Steering arm                 |
| 10. Oil seal           | 22. Clamp bolt                   |
| 11. Snap ring          | 24. Steering wheel shaft support |
| 12. Steering pinion    |                                  |



**Fig. 8—Power assist (booster) steering is installed on some models. Refer to Fig. 9 for exploded view of cylinder and valve unit.**

- |                            |                       |
|----------------------------|-----------------------|
| 1. Flow divider            | 5. Steering arm (4WD) |
| 2. Pressure lines          | 6. Steering arm (2WD) |
| 3. Cylinder and valve unit | 7. Drag link          |
| 4. Bracket                 | 8. Return lines       |

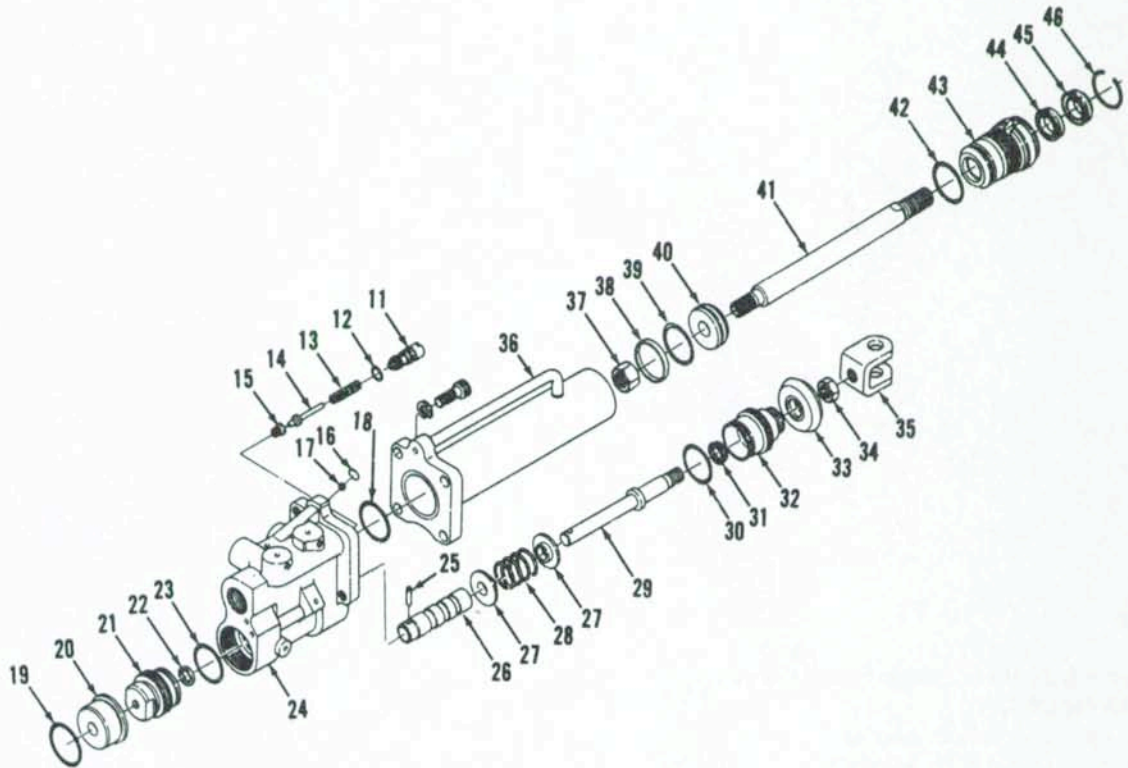


Fig. 9—Exploded view of steering assist cylinder and valve unit.

- |                   |                   |                |                   |
|-------------------|-------------------|----------------|-------------------|
| 11. Adjuster      | 20. Dust cover    | 29. Spool rod  | 38. Seal ring     |
| 12. "O" ring      | 21. Plug          | 30. "O" ring   | 39. "O" ring      |
| 13. Spring        | 22. Washer        | 31. Seal ring  | 40. Piston        |
| 14. Valve plunger | 23. "O" ring      | 32. Plug       | 41. Rod           |
| 15. Seat          | 24. Valve housing | 33. Dust cover | 42. "O" ring      |
| 16. "O" ring      | 25. Pin           | 34. Nut        | 43. Cap & bearing |
| 17. Orifice       | 26. Valve spool   | 35. Yoke       | 44. Oil seal      |
| 18. "O" ring      | 27. Spring seat   | 36. Cylinder   | 45. Dust seal     |
| 19. "O" ring      | 28. Spring        | 37. Nut        | 46. Snap ring     |

rod, cap and piston (40) from cylinder. Slide the cap off the rod. Remove retaining ring (46), then drive dust seal (45) and oil seal (44) from the cap. Remove seal ring (38) and "O" ring (39) from piston. Unbolt and remove cylinder (36) from valve housing (24) if renewal of "O" ring (18) is necessary. When installing

new seals note that lip of oil seal (44) faces inward and lip of dust seal (45) faces outward.

After installing power steering unit on the tractor, start the engine and turn steering wheel from lock to lock several times to bleed air from the cylinder and lines.

## FRONT AXLE SYSTEM (FOUR-WHEEL DRIVE)

9. A mechanical front-wheel drive is available on these models. There are some differences between the front-wheel-drive systems used on these models that will be referred to in the servicing instructions which follow.

### FRONT AXLE ASSEMBLY AND STEERING LINKAGE

#### Four-Wheel-Drive Models

10. **TIE ROD AND TOE-IN.** A single tie rod connects the left and right king pin housings. The automotive type tie rod ends are not adjustable for wear and should be renewed if worn. Rod end threaded into right end of tie rod is used to adjust the distance between ends to establish front wheel alignment. Recommended alignment is when wheels toe-in less than 5 mm ( $\frac{3}{16}$  in.) or toe-out no more than 5 mm ( $\frac{3}{16}$  in.). To check alignment, measure between the wheel rims on centerline of axle, parallel to ground. Rotate wheels and re-measure to be sure that wheels are not bent, giving incorrect reading. Tighten tie rod end jam nut after wheel alignment is correctly set.

### FRONT AXLE ASSEMBLY

#### Four-Wheel-Drive Models

11. **REMOVE AND REINSTALL.** The front axle assembly includes the differential and axle pivot, drive shaft, axle housings, and final drive. Refer to

appropriate paragraphs for disassembly and service to individual units.

To remove the complete front drive axle assembly, first support tractor behind axle and remove both front wheels. Disconnect drag link from steering arm and, if unit is to be disassembled, drain oil from final drive and differential housings. Loosen clamp from drive shaft cover and slide front half of cover toward rear. Remove the three screws attaching rear of drive shaft cover to rear housing, lift snap rings from grooves in drive shaft and relocate snap rings toward center of drive shaft. Move drive shaft couplings toward center of drive shaft, then remove drive shaft and cover. Support axle level with floor to prevent tipping, then remove the two screws (S—Fig. 10) attaching rear pivot bracket and the four screws attaching the front pivot bracket. Carefully lower the front axle assembly and pivot brackets away from front support frame.

When installing, be sure that ring gear is on correct side of tractor (pinion) and that differential drain plug is toward bottom. Be sure to install new "O" rings around differential pivots against pivot brackets. Shims are available to limit clearance of differential between pivot brackets to 0.2 mm (0.008 in.). Tighten pivot bracket retaining screws to 88 N·m (65 ft.-lbs.) torque. Remainder of installation is reverse of removal procedure. Tighten wheel retaining nuts to 87 N·m (64 ft.-lbs.) torque.

### FRONT FINAL DRIVE

#### Four-Wheel-Drive Models

12. **R&R AND OVERHAUL.** Each front final drive can be disassembled without disturbing other parts of the drive system. Support weight of tractor front end and remove front wheel. Remove drain plug (13—Fig. 11), then unbolt cover (3) from housing (15). Carefully bump cover from studs and bearing (6) from inner bore, then withdraw cover, stub axle, and reduction gear from housing. Remove cotter pin then remove nut (8) and washer (7) from inner end of stub axle (1). Bump inner end of axle with a soft hammer while supporting cover (3) to remove bearing (6), gear (5), bearing (4) and cover (3) from axle (1). Oil seal (2) and bearings (4 and 9) can be removed from cover if renewal is required. Drive gear (11) can be removed from 1010 models after removing snap ring (10). Outer collar (42) must be removed before removing pinion and shaft (41) from 1020 models.

Be sure that inner part of seal (2) is removed from stub axle (1) and outer part of seal (2) is removed from

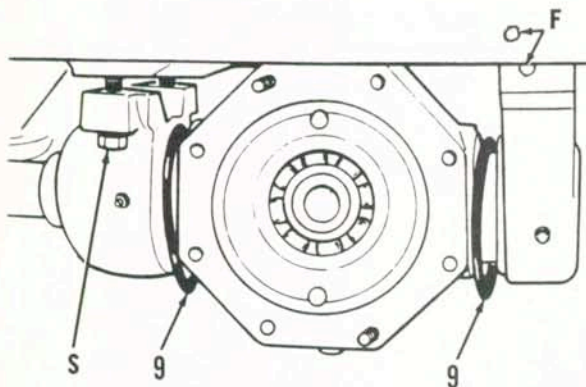


Fig. 10—The differential must be lowered 10 mm ( $\frac{3}{8}$  in.) by loosening screws (S) to have enough clearance to remove axle housing from models with standard transmissions. Screws may come out and differential may fall if standard screws are loosened more than 15 mm ( $\frac{9}{16}$  in.). Front pivot bracket is retained in front support by four screws entering from the side (F).

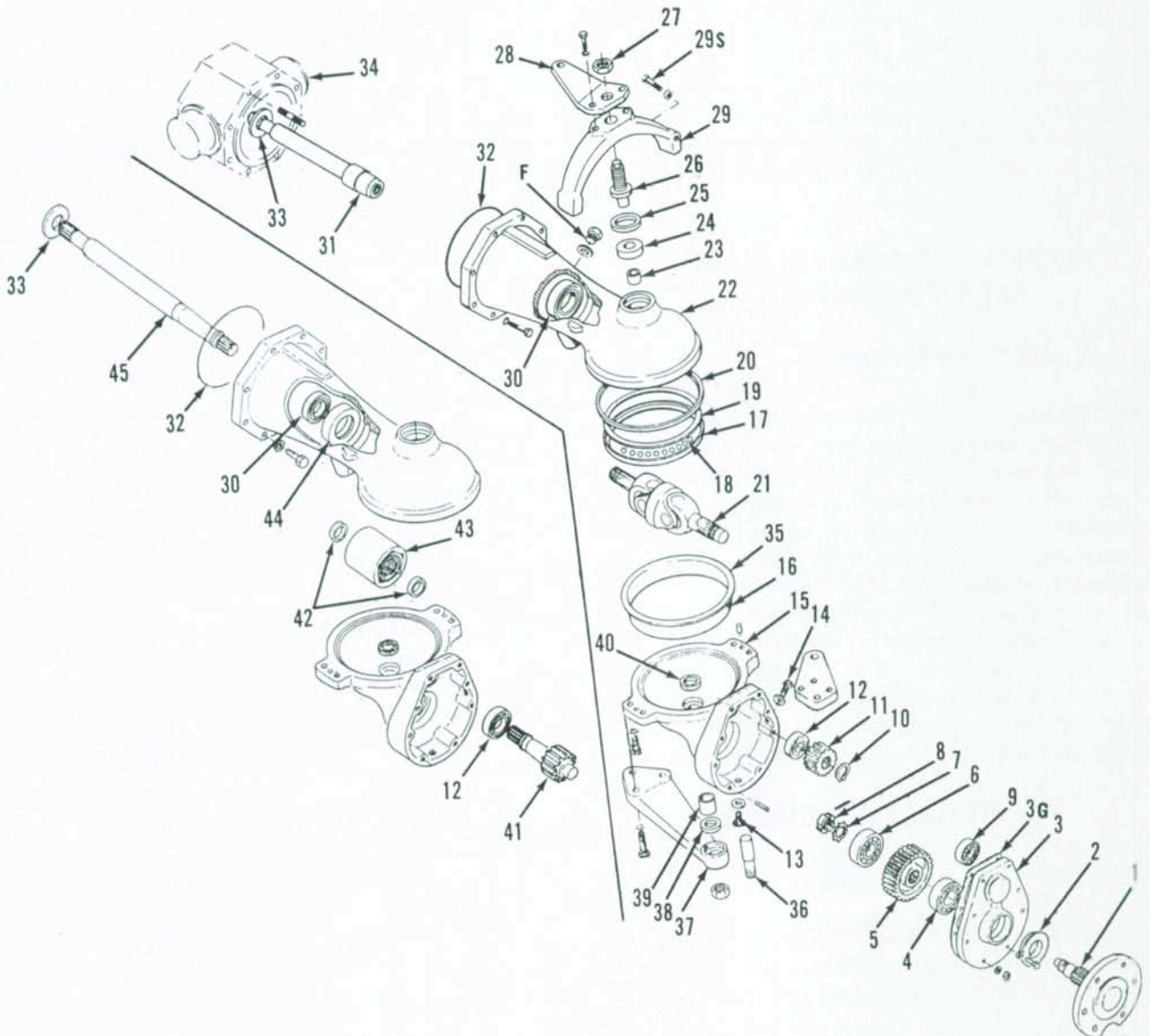


Fig. 11—Exploded view of front-wheel-drive housing and related parts used on 1010 models. Inset shows different drive shaft and universal joint parts (41-45) used on 1020 models.

- |               |                                       |                     |                              |
|---------------|---------------------------------------|---------------------|------------------------------|
| 1. Axle       | 13. Drain plug                        | 23. Bushing         | 34. Differential housing     |
| 2. Oil seal   | 14. Fill plug                         | 24. Bearing         | 35. Ring sleeve              |
| 3. Cover      | 15. King pin housing                  | 25. Seal            | 36. Lower arm pin            |
| 3G. Gasket    | 16. "O" ring                          | 26. Adjusting screw | 37. Lower support arm        |
| 4. Bearing    | 17. Bearing race                      | 27. Nut             | 38. Dust seal                |
| 5. Gear       | 18. Bearing balls<br>(89 each race)   | 28. Steering arm    | 39. Bushing                  |
| 6. Bearing    | 19. Bearing race                      | 29. Support         | 40. Oil seal                 |
| 7. Washer     | 20. Seal                              | 29S. Stop screw     | 41. Pinion gear<br>and shaft |
| 8. Nut        | 21. Universal joint<br>& pinion shaft | 30. Bearing         | 42. Bearing collar           |
| 9. Bearing    | 22. Housing                           | 31. Drive shaft     | 43. Constant velocity joint  |
| 10. Snap ring |                                       | 32. "O" ring        | 44. Spacer                   |
| 11. Gear      |                                       | 33. Thrust washer   | 45. Drive shaft              |
| 12. Bearing   |                                       |                     |                              |

cover (3). Pack grease between lip of oil seal before installing and coat axle shaft seal surface with oil before inserting into seal. Install gear (5) so that protruding boss is toward inside. Install washer (7) and tighten nut (8) to 78 N·m (58 ft.-lbs.) torque, then

install cotter pin. **DO NOT** loosen nut to install cotter pin. Make sure all gasket surfaces are clean and install gasket (3G). Tighten fasteners attaching cover (3) to 27 N·m (20 ft.-lbs.) torque. Tighten wheel retaining nuts to 87 N·m (64 ft.-lbs.) torque. Each gear

housing should contain approximately 0.4 L (0.42 qt.) of "Massey-Ferguson Permatran III," SAE 80 GL-3, SAE 80 GL-4 oil or equivalent. Fill through opening for plug (14).

## AXLE HOUSING, KING PIN, AXLE SHAFTS AND UNIVERSAL JOINTS

### Four-Wheel-Drive Models

**13. REMOVE AND REINSTALL.** The differential housing can remain installed on tractor while removing and installing axle housing. To remove one axle housing and associated parts from one side, raise tractor and remove wheel. Remove drain plug (13—Fig. 11) and allow oil to drain. Support the axle that will remain installed so that the axle to be removed is lower. On models with standard transmission (not Hydro models), it is also necessary to lower the differential housing for additional clearance. Refer to paragraph 11 to remove Front Final Drive if so desired. The king pin housing (15) can be removed if desired, leaving housing (22) attached to differential housing (34).

To remove, detach tie rod, drag link and any other interfering connections. On models with standard transmission (not Hydro models), it is necessary to loosen drive shaft cover and lower the differential housing 10 mm ( $\frac{3}{8}$  in.). Remove the three screws attaching drive shaft cover to rear housing, then loosen (but do not remove) the two screws (S—Fig. 10) attaching axle rear carrier (pivot bracket) to the front support, which will allow differential to lower the correct amount. If screws are loosened too much, screws will come out and differential will fall. If not loosened, there will not be enough room to remove axle housing. On all models, support axle housing safely, then unbolt housing from differential housing (34—Fig. 11). Carefully move the axle (31) and housing (22) away from differential and from under tractor.

**NOTE:** The screws and stud nuts attaching axle housing to one side of differential housing also attach the differential housing cover. Be careful to separate between axle housing and cover. The cover is located between left axle housing and left side of differential housing on 1010 Hydro models. Cover is located between right axle housing and right side of differential housing of other 1010 and 1020 models. Cover should stay with differential housing and does not need to be removed; however, reinstall using a new sealing "O" ring, if cover is removed.

Carefully slide axle shaft (31—Fig. 11) out together with housing (22) unless king pin is to be disassembled. If axle (31) pulls out of bearing (30), it may be

necessary to remove king pin housing (15) so that shaft (31 or 45) can be installed in bearing (30) and universal joint (21 or 43) can be installed on end of shaft (31 or 45).

To reinstall, be sure that opposite axle is raised to permit more room on side to be installed. Install new "O" ring (32) on differential housing, be sure that thrust washer (33) is positioned on axle shaft (31 or 45), then carefully slide axle assembly onto differential housing. Coat threads of screws and stud nuts attaching axle housing to differential housing with "Loctite 271" or equivalent, then tighten to 55 N·m (41 ft.-lbs.) torque. Tighten screws attaching differential pivot brackets (S—Fig. 10) to 88 N·m (65 ft.-lbs.) torque. Tighten wheel retaining nuts to 87 N·m (64 ft.-lbs.) torque. Each outer final drive gear housing should contain approximately 0.4 L (0.42 qt.) of "Massey-Ferguson Permatran III," SAE 80 GL-3, SAE 80 GL-4 oil or equivalent. Fill through opening for plug (14). The axle housings and differential housing contain approximately 1.5 L (1.6 qt.) of the same fluid and are filled through opening for plug (F).

**14. OVERHAUL.** Service to king pins, bearings and universal joints can be accomplished without separating axle housing from differential housing; however, removal is required for service to bearing (30—Fig. 11) and axle shaft (31 or 45).

Refer to paragraph 12 and remove the front final drive (1 through 9). On 1010 models, gear (11) can also be removed after removing snap ring (10). On all models, detach tie rod and drag link, then loosen or remove locknut (27) and make sure that adjusting screw (26) is free to turn. Unbolt upper support (29) from king pin housing (15) and carefully remove upper support from dowels. Lower support (37) should hold king pin housing in place. If necessary, clean and lubricate threads of adjusting screw (26) to facilitate adjustment while reassembling. Support king pin housing (15) and remove the three screws attaching lower support (37) to axle housing (22). Lower king pin housing and related parts away from axle housing and make sure that all 89 bearing balls (18) are located. The 5.5563 mm (0.219 in.) diameter bearing balls can cause extensive damage if caught between gear teeth or left out. Seal (20), bearing races (17 and 19), balls (18), "O" ring (16) and ring sleeve (35) should be renewed when disassembled if at all questionable.

Clean all parts thoroughly and make sure that all 89 bearing balls (18) are accounted for. Carefully press upper race (19) and seal (20) in axle housing and pack lip of seal with grease. Coat inner race (17) with grease and carefully stick all 89 loose bearing balls to the race with the grease. Position inner race with bearing balls into the installed upper outer race and make sure that it is held firmly in place. The seal wear ring (35) should be bonded to the lower (king pin) housing (15) with "Loctite 277" or equivalent. All

old adhesive must be removed and surface should be free of scratches, dirt and oil. Apply adhesive evenly only when ready to assemble king pin housing to axle housing, because it begins to cure in five minutes. Adhesive will stabilize after about 24 hours.

Lubricate adjusting screw (26) and lip of seal (25) with grease. Make sure that adjusting screw is free to turn easily. Install bearing (30) with sealed side toward outside (universal joint side). Position "O" ring (16) in groove of housing (15) and bearing (12) in bore of housing. On 1020 models, install pinion gear and shaft (41) and constant velocity universal joint (43). On 1010 models, install universal joint (21) through bearing (12), then install gear (11) and snap ring (10). On all models, position shaft (31 or 45) in bearing (30), then locate king pin housing (15) against axle housing (22) with splines of universal joint meshing with splines of shaft (31 or 45). Hold axle housing and king pin housing in proper position, then install support (29). Make sure that adjusting screw is not binding and tighten support retaining screws to 70 N·m (51 ft.-lbs.) torque. After support retaining screws are properly tightened, loosen adjusting screw (26) to make sure that screw is not binding, then tighten to 9.8 N·m (7.2 ft.-lbs.) torque and install locknut (27). Install lower support arm (37) after upper support is installed and adjusted. Refer to

paragraph 13 for attaching axle housing to differential housing and to paragraph 12 for installing final reduction gears and cover.

## DIFFERENTIAL

### Four-Wheel-Drive Models

**15. R&R AND OVERHAUL.** Refer to paragraph 11 and remove both axles and differential as an assembly, then refer to paragraph 13 and separate the axle housings from the differential housing. Refer to Fig. 12 and bump bearings (23), differential carrier (31), ring gear (24) and side cover (33) out of housing (18). Be careful not to mix, damage or lose shims (22L and 22R) behind both bearings (23).

The pinion nut (10) is staked in position and is secured with "Loctite." Hold pinion shaft and remove nut (10). Be careful to notice position of shims (15 and 15M) between bearings (13) and behind teeth of pinion gear (17). Shims (15) adjust preload of bearings (13), and shims (15M) control mesh position of pinion (17). Bump pinion (17) inward to remove. Drive pin (25) out, then remove shaft (26) and parts (27, 28, 29 and 30). Bearings (13), spacer (16), seal collar (12), seal (11) and associated parts can be removed for inspection or renewal.

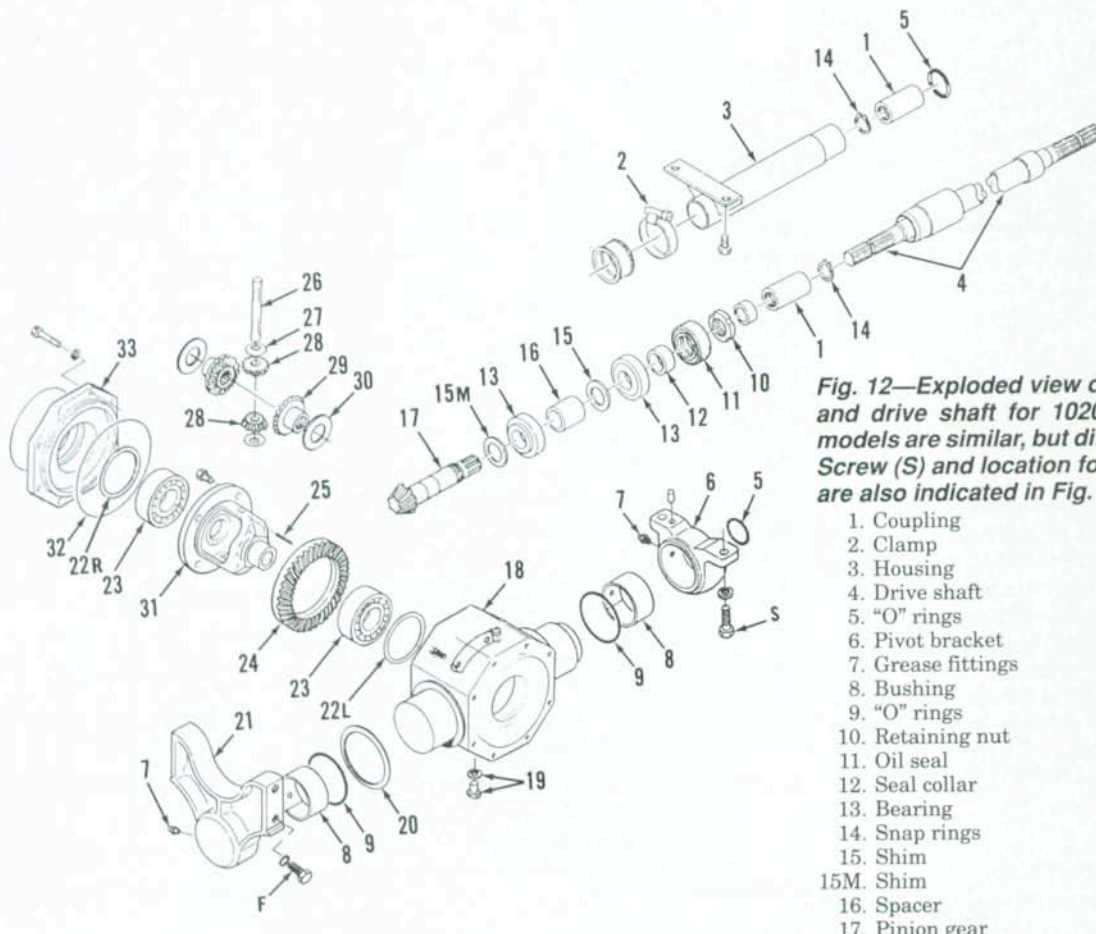


Fig. 12—Exploded view of front axle differential and drive shaft for 1020 Hydro tractor. Other models are similar, but differences will be noted. Screw (S) and location for one of the screws (F) are also indicated in Fig. 10.

- |                    |                          |
|--------------------|--------------------------|
| 1. Coupling        | 18. Housing              |
| 2. Clamp           | 19. Drain plug           |
| 3. Housing         | 20. Shim                 |
| 4. Drive shaft     | 21. Front pivot bracket  |
| 5. "O" rings       | 22L. Shims               |
| 6. Pivot bracket   | 22R. Shims               |
| 7. Grease fittings | 23. Bearings             |
| 8. Bushing         | 24. Ring gear            |
| 9. "O" rings       | 25. Pin                  |
| 10. Retaining nut  | 26. Shaft                |
| 11. Oil seal       | 27. Thrust washer        |
| 12. Seal collar    | 28. Pinions              |
| 13. Bearing        | 29. Side gears           |
| 14. Snap rings     | 30. Thrust washer        |
| 15. Shim           | 31. Differential carrier |
| 15M. Shim          | 32. "O" ring             |
| 16. Spacer         | 33. Cover                |
| 17. Pinion gear    |                          |

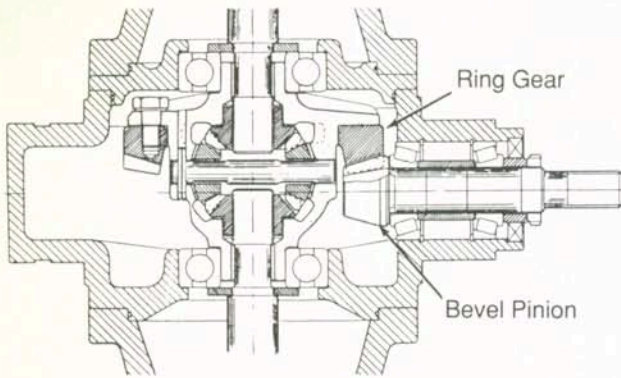


Fig. 13—Cross section of typical front drive differential assembly.

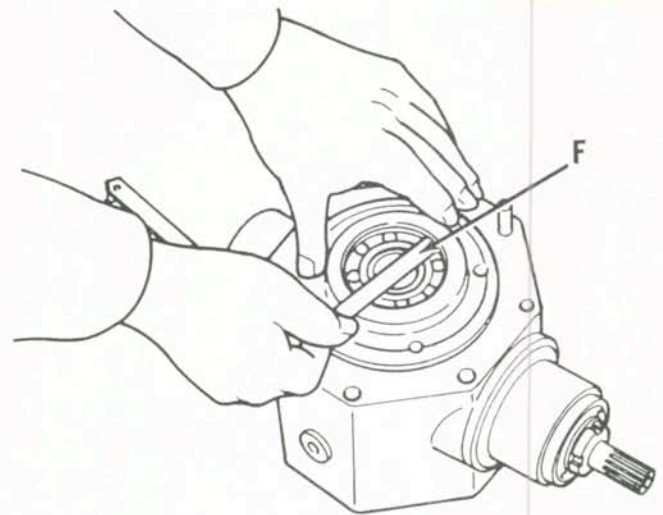


Fig. 15—Determine correct total thickness of shims by measuring clearance with feeler gauge (F) as shown.

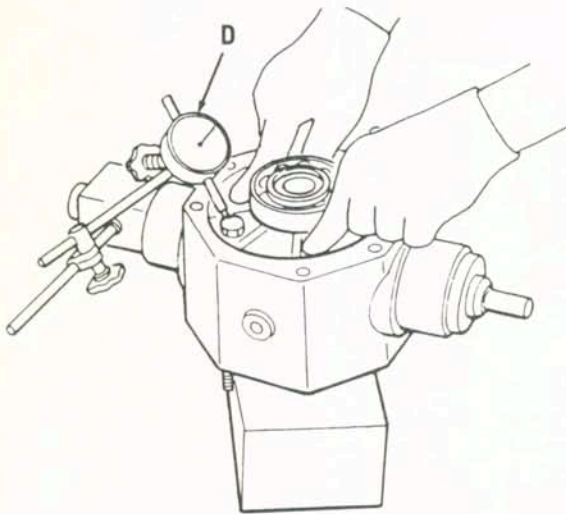


Fig. 14—Check gear backlash using a dial indicator (D) positioned as shown.

**NOTE:** On 1010 Hydro tractors, the ring gear (24) and cover (33) are located on left side of pinion. The ring gear and cover of all other models are located on the right as shown in Fig. 12 and Fig. 13.

Observe the following when assembling differential on all models. Ring gear (24—Fig. 12) and pinion (17) are available only as a matched set. Threads of screws which attach ring gear (24) to carrier (31) should be coated with “Loctite 271” or equivalent before tightening to 50 N·m (37 ft.-lbs.) torque.

Assemble pinion (17) and associated parts (12 through 16) in housing (18) using shims (15) that were removed. Seal (11) should be omitted when checking bearing adjustment and gear mesh and should only be installed upon final assembly. Tighten nut (10) to 59-79 N·m (44-58 ft.-lbs.) torque, then check torque required to turn pinion shaft in bearings (13). If rolling torque is not within range of 0.59-0.98 N·m (5.2-8.6 in.-lbs.), add or decrease thickness of shims (15) between bearings (13) as required. Re-check rolling torque after changing shims and tight-

ening nut (10) to 59-79 N·m (44-58 ft.-lbs.) torque. Shims (15M) between pinion gear and front bearing are the same as shims (15); however, shims at location (15M) adjust gear mesh position.

Press carrier bearings (23) firmly onto differential carrier (31), then install carrier and bearing assembly into differential housing using shims (22L) that were originally installed. Make sure that inner bearing is firmly seated against shims in housing (18), then check backlash between pinion and ring gear with a dial indicator mounted as shown in Fig. 14. Correct backlash is 0.13-0.18 mm (0.005-0.007 in.). Backlash is increased by adding shims (22L) between inner bearing (23) and housing (18). Install cover (33) using at least three evenly spaced screws, omitting “O” ring (32). Flat washers will be necessary if original long screws are used to hold cover on while checking. Tighten cover retaining screws, then measure clearance between bearing outer race and bore in cover as shown in Fig. 15. Remove cover (33—Fig. 12) and install shims (22R) equal to the clearance measured (Fig. 15). Shims (22L and 22R—Fig. 12) are alike.

Mesh position of pinion and ring gear can be checked using appropriate die or red lead on gear teeth. Typical gear mesh patterns are shown in Fig. 16. Shims (15M—Fig. 12) are the same as shims (15); however, shims at location (15M) adjust gear mesh position and shims at (15) adjust bearings (13). Mesh pattern (B—Fig. 16) indicates that ring gear is too far away from pinion and can usually be corrected by moving shims (22L—Fig. 12) from inside housing (18) to location (22R) in cover. Mesh pattern (C—Fig. 16) is caused by too little backlash (ring gear too close to pinion). Condition (C) can be corrected by moving shims (22R—Fig. 12) from cover (33) to location (22L) in housing (18). Mesh pattern (D—Fig. 16) is caused

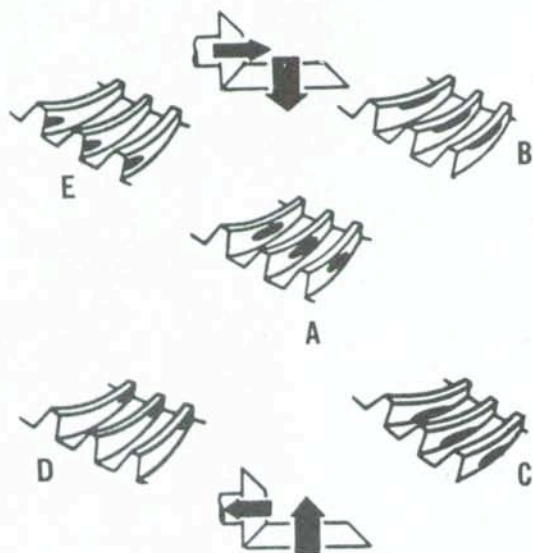


Fig. 16—Correct mesh position of pinion and ring gear will be indicated by a pattern centered on gear teeth as shown at (A). Refer to text for corrective action if mesh is not as shown at (A).

by pinion (17—Fig. 12) too far from center of ring gear and is corrected by adding shims at (15M). Mesh pattern (E—Fig. 16) is caused by ring gear too far into ring gear and can be corrected by removing some

shims (15M—Fig. 12). If mesh position of pinion is changed by adding or removing shims (15M), it will be necessary to recheck backlash and change position of shims at (22L and 22R).

## ENGINE AND COMPONENTS

### FRONT END/ENGINE SPLIT

#### All Models

16. To separate the front axle and support from front of engine, remove any front mounted equipment, guards, weights and weight frame. Unplug lights, thread wires through retaining clips and lay on top of engine, then remove hood and grille assembly. Disconnect battery cables, drain cooling system, disconnect radiator hoses and remove air cleaner hose (if necessary). Disconnect steering drag link and detach steering cylinder and hoses if equipped with power assisted steering. Remove the front pto, if so equipped. Remove the drive shaft from Hydro models with four-wheel drive. Detach drive shaft cover from other four-wheel-drive models and be prepared to remove drive shaft and cover as the front assembly is moved forward. On all models, wedge between axle and front support frame to prevent tipping. Support engine and rear of tractor securely and safely so that front support and frame can be unbolted and removed. Support the front axle, front support, battery and radiator to prevent uncontrolled movement, then remove the five screws that attach frame to each side of engine. Carefully move the front axle, front support, battery and radiator assembly forward away from engine.

Attach front support to engine by reversing the removal procedure. Apply "Loctite 271" or equivalent to the ten screws attaching front support and frame to sides of engine. Complete assembly by reversing the removal procedure.

### R & R ENGINE

#### All Models

17. To remove the engine, first refer to paragraph 16 and split tractor between front support and front of engine. Be sure that rear wheels are blocked properly so that engine can be removed and reinstalled safely. Disconnect wires from engine temperature warning gauge sender, oil warning light switch, alternator, starting glow plugs and starter motor. Thread wires through retaining clips and position out of the way. Detach tachometer cable from drive on engine, throttle rod from pump lever and engine stop cable from pump stop lever. Shut fuel off at tank, disconnect fuel lines from pump and fuel filters, then remove the fuel filter assembly from engine. Lower three-point hitch, drain transmission, then remove hydraulic pressure line between pump and hydraulic lift cover. Remove hydraulic suction line from filter to hydraulic pump. Cover all fuel system and hydraulic system



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