

# FORD

## MODELS

FORDSON MAJOR DIESEL (FMD)

FORDSON POWER MAJOR (FPM)

FORDSON SUPER MAJOR (FSM)

NEW PERFORMANCE FORDSON SUPER MAJOR (New FSM)

FORD 5000 SUPER MAJOR (Same As New FSM)

This manual provides service procedures and specifications on the Fordson Major series of tractors manufactured in England and imported to the United States, beginning with approximately tractor Serial No. 1260402.

On early tractors the serial (engine) number is stamped on the flange of the fly-wheel housing near the starter mounting.

Effective with tractor (engine) Serial No. 1380939, the serial number is located on a pad at the front right hand side of the engine cylinder block.

In November, 1961, the serial number designation was changed from a 7 digit number to a six digit number with prefix and suffix. (Note: When this new numbering system was introduced, only the six digit number was stamped on the tractor; later a "Z" was stamped in front of the prefix, but was deleted after a short time.)

As the Fordson Major Tractor Parts List indicates parts usage by month and year of tractor production instead of serial number or model range, the following list indicating month and year of production by serial numbers is presented below:

### FORDSON MAJOR TRACTOR SERIES SERIAL NUMBERS

The following list of serial numbers for the Fordson Major series of tractors represents the serial number of the first tractor built on the first working day of each month from beginning of production in January, 1952, to end of production in October, 1964.

Month/Year	Starting Serial No.	Month/Year	Starting Serial No.
1/52	1217101	1/57	1412409
2/52	1217854	2/57	1416126
3/52	1219501	3/57	1420047
4/52	1222168	4/57	1424724
5/52	1225184	5/57	1429067
6/52	1228560	6/57	1434128
7/52	1231013	7/57	1438156
8/52	1232538	8/57	1441861
9/52	1235064	9/57	1444787
10/52	1239010	10/57	1448456
11/52	1242232	11/57	1452136
12/52	1244823	12/57	1455496
		1/58	1458381
1/53	1247381	2/58	1461911
2/53	1249734	2/58	1461811
3/53	1252374	3/58	1464968
4/53	1255494	4/58	1468222
5/53	1257474	5/58	1471551
6/53	1259074	6/58	1475102
7/53	1260753	7/58	1478284
8/53	1262438	8/58	1481013
9/53	1264418	9/58	1483139
10/53	1267672	10/58	1485781
11/53	1271038	11/58	1488927
12/53	1273713	12/58	1491814
		1/59	1494448
1/54	1276857	2/59	1497684
2/54	1280461	3/59	1501006
3/54	1284114	4/59	1504869
4/54	1288616	5/59	1509598
5/54	1292616	6/59	1512807
6/54	1296979	7/59	1517042
7/54	1301371	8/59	1520046
8/54	1304721	9/59	1522832
9/54	1308341	10/59	1526968
10/54	1312911	11/59	1531041
11/54	1316276	12/59	1534587
12/54	1319466		
1/55	1322525		
2/55	1326304		
3/55	1330197		
4/55	1335206		
5/55	1339093		
6/55	1343610		
7/55	1348338		
8/55	1351565		
9/55	1355435		
10/55	1359668		
11/55	1363538		
12/55	1367817		
1/56	1371418		
2/56	1375378		
3/56	1379563		
4/56	1384154		
5/56	1388054		
6/56	1392039		
7/56	1395222		
8/56	1398262		
9/56	1400956		
10/56	1403907		
11/56	1406790		
12/56	1409843		



Month/Year	Starting Serial No.				
1/60	1538065	10/61	1619437	4/63	08C-952584-D
2/60	1541957	11/61	08A-300001-M	5/63	08C-956290-E
3/60	1545719	12/61	08A-302578-N	6/63	08C-960302-F
4/60	1550185			7/63	08C-964121-G
5/60	1554240	1/62	08B-741001-A	8/63	08C-967835-H
6/60	1558530	2/62	08B-744763-B	9/63	08C-970815-K
7/60	1562473	3/62	08B-748538-C	10/63	08C-974950-L
8/60	1565448	4/62	08B-752790-D	11/63	08C-979533-M
9/60	1569090	5/62	08B-756397-E	12/63	08C-982803-N
10/60	1573528	6/62	08B-760604-F		
11/60	1576812	7/62	08B-763854-G	1/64	08D-940000-A
12/60	1580199	8/62	08B-765817-H	2/64	08D-950495-B
1/61	1583906	9/62	08B-769002-K	3/64	08D-954150-C
2/61	1588413	10/62	08B-771608-L	4/64	08D-957597-D
3/61	1592205	11/62	08B-775046-M	5/64	08D-961347-E
4/61	1596773	12/62	08B-778355-N	6/64	08D-964662-F
5/61	1601150			7/64	08D-967990-G
6/61	1605704	1/63	08C-781470-A	8/64	08D-970624-H
7/61	1609222	2/63	08C-945000-B	9/64	08D-973017-K
8/61	1613013	3/63	08C-948667-C	10/64	08D-975956-L
9/61	1615674				

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### GENERAL

Engine Make .....	Own
No. Cylinders .....	4
Bore, Inches .....	3.937-3.938
Stroke, Inches .....	4.524-4.528
Displacement, Cubic Inches .....	220.35
Compression Ratio .....	16:1
Pistons Removed From: .....	Above
No. Main Bearings .....	5
Cylinder Sleeves, Type .....	Wet
Forward Speeds .....	6
Reverse Speeds .....	2
Starter & Generator Make .....	Lucas
Injection Pump & Injector Make .....	Simms

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Valve Gap Intake .....	0.015-H
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After Serial No. 1425096 .....	1.375
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# FRONT SYSTEM, AXLE TYPE

## WHEEL ASSEMBLY

**1. BEARING ADJUSTMENT.** Wheel bearings should be adjusted with clamp bolt (3—Fig. 1) removed from nut (2). Tighten nut while rotating wheel until a drag is noticeable. Then, back off until wheel turns free, insert cotter pin through nut and spindle and install and tighten the clamp bolt.

## SPINDLES

**2. R&R SPINDLES.** To renew spindle, proceed as follows: Support front end of tractor and remove wheel, hub and bearing cones. Remove clamp bolt from steering arm (16 or 26—Fig. 1) and remove arm. Withdraw spindle from axle extension.

Install new thrust bearing (11) if worn or rough. Renew spindle bushings as outlined in paragraph 3 if

spindle to bushing clearance exceeds 0.013. Insert spindle in axle extension, install dust seal (15) and steering arm. While holding all end play from spindle, adjust clearance between steering arm and axle extension to 0.002-0.007 if a felt dust seal is used, or to 0.025-0.035 if late type rubber seal is installed. (Felt and rubber dust seals are interchangeable.) Note: It may be necessary to grind a wider bolt slot in steering spindle to obtain the specified clearance. Install steering arm clamp bolt and tighten securely. Reinstall wheel, hub and bearings assembly using a new felt seal (9). Adjust wheel bearings as outlined in paragraph 1.

**3. SPINDLE BUSHINGS.** Spindle bushings can be renewed after removing spindle as outlined in paragraph 2. Remove old bushings with

cape chisel and install new bushings with OTC T-810 Bushing Driver and 815 Driving Mandrel or equivalent tools. After installing bushings, ream to 1.500 with standard 1½ inch adjustable reamer. NOTE: Upper and lower bushings are not alike; install upper bushing with blind end of lubrication groove up.

Spindle diameter (new) is 1.498-1.499 providing 0.001-0.003 clearance in the 1.500-1.501 diameter bushings. Maximum allowable spindle to bushing clearance is 0.013.

## AXLE EXTENSIONS

**4. Axle extension (13 or 27—Fig. 1)** can be renewed after removing spindle as outlined in paragraph 2. When installing extension, be sure that one retaining bolt is placed in the outer hole in center member and the other two bolts at each side of the radius rod bolt.

## AXLE CENTER MEMBER, PIVOT PIN AND BUSHING

**5. To renew the axle center member (beam) or pivot pin (trunnion) bushing,** support tractor under front end of transmission housing and proceed as follows: Remove bolts from tie rod clamps (24—Fig. 1), unbolt axle extensions from center member and remove wheels, axle extensions, steering arms and tie rod ends as units. Remove radius rod (refer to paragraph 7), then remove pivot pin (29) and lower axle center member from front support (cross member).

On "FMD" and "FPM" models, pivot pin (29) is retained by a cotter pin at each end and thrust washers are used at front and rear of axle center member. On "FSM" models, the pivot pin is of larger diameter, no thrust washers are used and pivot pin is retained in front support by two roll pins (see Fig. 2) or by a ½-inch diameter clevis pin and cotter pin. When reinstalling pivot pin with ⅜-inch hole, be sure to install roll pins as shown in Fig. 2. Only the latest type pivot pin with ½-inch hole will be serviced; to install this pin in early "FSM," enlarge retaining pin hole in front support to ½-inch and retain with clevis pin and cotter pin.

To renew pivot pin bushing (30—Fig. 1), remove old bushing with cape chisel and drive new bushing in flush with axle center member. Bushing should not require reaming if carefully installed. Bushing is not interchangeable between "FSM" and earlier models.

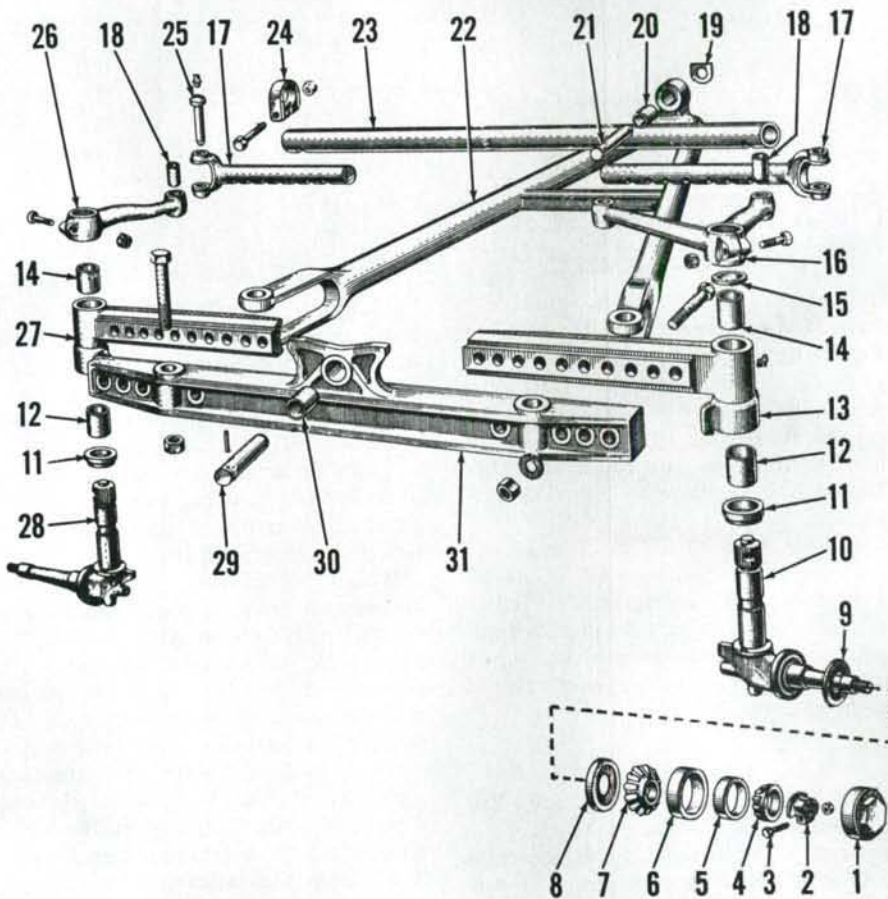


Fig. 1—Exploded view of adjustable front axle, radius rod, tie rod and steering arms for models "FSM" and "New FSM". Front axle assembly for earlier models "FMD" and "FPM" is similar except thrust washers are used on trunnion (29) at each side of axle center member (31) and thrust washer (19) is not used on radius rod pivot pin (21).

- |                 |                          |                        |                          |
|-----------------|--------------------------|------------------------|--------------------------|
| 1. Hub cap      | 8. Seal retainer         | 15. Dust seal          | 22. Radius rod           |
| 2. Nut          | 9. Felt seal             | 16. Steering arm, L.H. | 24. End clamps           |
| 3. Clamp bolt   | 10. Spindle, L.H.        | 17. Tie rod ends       | 25. End pins             |
| 4. Bearing cone | 11. Thrust bearing       | 18. Bushings           | 26. Steering arm R.H.    |
| 5. Bearing cup  | 12. Bushing, lower       | 19. Thrust washer      | 27. Axle extension, R.H. |
| 6. Bearing cup  | 13. Axle extension, L.H. | 20. Bushing            | 28. Spindle, R.H.        |
| 7. Bearing cone | 14. Bushing, upper       | 21. Pivot pin          |                          |



**TIE ROD AND TOE-IN**

**All Models**

6. The tie rod assembly, except for tread width adjustment, is non-adjustable. Toe-in should be correct at each tread width adjustment unless tie rod or steering arms are bent or excessive wear has occurred. Zero toe-in (no toe-in or toe-out) is specified.

Pins (25) are a press fit in the tie rod ends (17) and bushings (18) are a press fit in the steering arms (16 and 26).

**RADIUS ROD, REAR PIVOT PIN AND BUSHING**

7. The radius rod (22—Fig. 1) pivots on a pin (21) retained in bosses on the bottom of engine oil pan (sump). Radius rod is fitted with a renewable, pre-sized steel bushing (20).

Due to increased diameter of pivot pin, radius rod, bushing, pivot pin and engine oil sump are not interchangeable between the "FSM" models and earlier models.

To remove radius rod, remove pivot pin and the bolts through radius rod and front axle center member. Slide radius rod to either side of tractor until clear of oil sump, then remove from tractor. Remove bushing with

cape chisel and drive new bushing in until flush. Reinstall rear pivot retaining roll pins, if so equipped, as shown in Fig. 2.

**FRONT SUPPORT**

8. To renew the front support (cross member), first drain radiator, then proceed as follows:

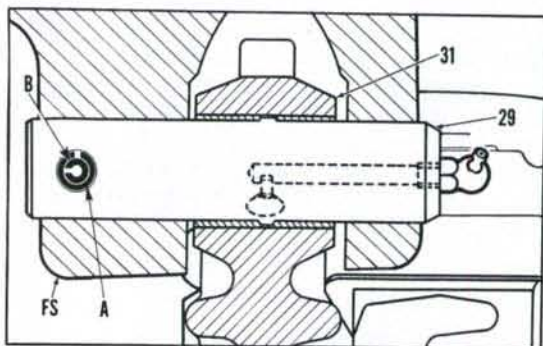
Remove engine hood, disconnect headlight wiring and remove radiator shell from front support. Disconnect both radiator hoses and remove radiator from front support. Support tractor under front end of transmission and remove front axle pivot pin (trun-

nion). Unbolt and remove side rail from right side of tractor. Unbolt front support from left engine side rail, move support to right until clear of channel, then lift front support from tractor. Install new front support by reversing removal procedure.

Due to increased diameter of front axle pivot pin (trunnion), front support is not interchangeable between "FSM" models and earlier models.

NOTE: Due to change in radiator mounting, it may be necessary to relocate radiator mounting holes in new front support; refer to paragraph 134 and Fig. 88 in COOLING SYSTEM section.

Fig 2—Cross-sectional drawing showing front pivot pin (29) installation on model "FSM" wide front axle. Note proper installation of inner (B) and outer (A) retaining roll pins. Front support is (FS), axle center member is (31).



**FRONT SYSTEM, TRICYCLE**

**LUBRICATION**

9. Oil level should be maintained at bottom of cover plate opening in front support (cross member) as shown in Fig. 3. Capacity is 4½ pints of SAE 90 gear lubricant. When refilling, remove bleed plug from upper front side of pintle housing (12) and add oil until oil flows from plug opening. Then reinstall plug and fill to proper level.

**ADJUSTMENTS**

10. **PINTLE BEARINGS.** Pintle shaft tapered roller bearings (11 & 14—Fig. 3) are adjusted by tightening nuts at top end of pintle (13). Straighten tap of washer located between the two nuts and loosen top nut. Adjust lower nut to remove all end play from pintle shaft without causing binding. Then, while holding lower nut from turning, securely tighten top nut and bend tabs of washer against flats on nuts.

11. **BEVEL GEAR BACKLASH.** With pintle bearings properly adjusted as outlined in paragraph 10, vary number of shims (10—Fig. 3) located between cross shaft bearing (5) and front support (23) to remove all possible backlash between the bevel gears (3 and 4) without binding at any point in turning range of gears.

**WHEEL ASSEMBLY**

12. To remove wheel hub from axle, follow conventional procedure except unbolt seal retainer (20) from hub (21) before pulling hub from axle. Seal and retainer can be removed from axle after removing inner bearing cone and roller assembly. Reinstall by reversing removal procedure.

Adjust front wheel bearings on tricycle models as outlined for adjustable axle models in paragraph 1. Lubricate wheel bearings with pressure gun and multi-purpose grease; fill wheel hub with grease until grease appears from seal retainer.

**AXLE SHAFT**

13. To renew axle shaft (17—Fig. 3), support front end of tractor and remove front wheels, hubs, bearings and seals. Remove cotter pin and castellated nut from lower end of pintle (13) and pull axle from pintle. Renew key (18) if damaged. Install new axle and tighten retaining nut securely, then install cotter pin. Check for any end play or binding condition of pintle shaft and, if necessary, adjust pintle shaft bearings as outlined in paragraph 10.

**PINTLE AND HOUSING**

14. **R&R ASSEMBLY.** To remove pintle and housing with front wheels as an assembly, support front end of tractor and proceed as follows:

Remove bleed plug from upper front side of pintle housing and drain as much oil as possible. Reinstall plug, unbolt pintle housing from front support (cross member) and remove assembly from tractor.

When reinstalling, renew pintle housing to front support gasket and be sure that side of gear (3—Fig. 3) having the two punch marked teeth is to left side of tractor. Single punch marked tooth on cross shaft gear (4) must mesh between the two punch marked teeth on gear (3). Steering arm (9) should be nearly vertical when gears are properly meshed and wheels are in a straight ahead position. Refer to paragraph 9 for lubrication information.

15. **OVERHAUL PINTLE AND HOUSING UNIT.** Support front end of tractor and remove front wheels then, remove pintle, pintle housing and axle assembly as a unit following procedures outlined in paragraph 14. Turn unit upside down to drain oil from pintle housing.



Straighten tabs of washer located between the two nuts at top end of pintle and remove the nuts, washer and bevel gear (3—Fig. 3). Remove pintle housing from pintle and withdraw upper bearing cone and roller assembly from housing. Remove cotter pin and castellated nut from lower end of pintle and remove pintle from axle shaft (17). Remove key (18) from pintle, then remove pintle housing cover (16), seal (15) and lower bearing cone and roller assembly. Remove upper and lower bearing cups from housing (12) if renewal of bearings is indicated.

Renew oil seal (15) and other parts as necessary. Reassemble by reversing disassembly procedure. Align the two punch marked teeth of gear (3) with punch marked spline on pintle (13). If mark on spline is not visible, install gear with punch marked teeth 90 degrees to left of key (18). Securely tighten castellated nut and install cotter pin at bottom end of pintle, then tighten nuts at top of pintle to properly adjust pintle bearings as outlined in paragraph 10. Reinstall the assembly as outlined in paragraph 14.

**CROSS SHAFT AND FRONT SUPPORT**

**16. RENEW CROSS SHAFT BEARING AND/OR SEAL.** Remove bleed plug from upper front side of pintle shaft housing and drain oil level down below the cross shaft bearing. Remove

clamp bolt from steering arm and remove arm from cross shaft, leaving arm attached to steering drag link. Remove oil seal retainer (7—Fig. 3) and bearing (5), taking care not to lose or damage shims (10) located between bearing and front support. Remove old seal from bearing and install new seal with lip to inside. Using the removed shim pack or one of equal thickness, carefully install bearing (5) to avoid damage to seal (6). Reinstall seal retainer and steering arm. Check and readjust bevel gear backlash as outlined in paragraph 11.

**17. RENEW CROSS SHAFT AND/OR FRONT SUPPORT.** Drain radiator and proceed as follows: Remove pintle shaft, housing, axle and front wheels assembly as outlined in paragraph 14. Remove engine hood, radiator shell and radiator. Disconnect steering arm from cross shaft and unbolt and remove front support from engine side rails. Remove top cover plate. Remove seal retainer and "O" ring from around crank extension shaft at front of support (cross member). Remove cotter pin from crank extension shaft inside the front support and withdraw the shaft from rear of support. Unbolt and withdraw the cross shaft bearing as outlined in paragraph 16, then remove cross shaft from front support. If front support casting is to be renewed, remove the mud guard from old casting and install on new part.

Reassemble by reversing disassembly procedure. Renew cover plate gasket, crank extension shaft "O" ring and cross shaft seal. Be sure that the punch marked tooth on cross shaft gear meshes between the two punch marked teeth on pintle shaft gear.

**STEERING GEAR**

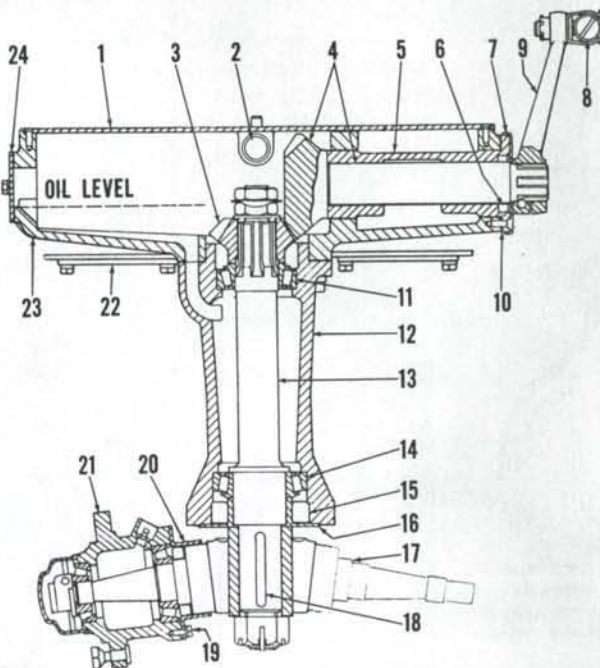
**All Models**

**18. ADJUSTMENT.** Steering gear adjustment is usually not required unless necessary to renew steering gear component parts. When overhauling steering gear assembly, adjust steering shaft and rocker shaft during reassembly as outlined in following paragraphs 19 and 20.

**19. STEERING SHAFT.** Steering gear adjustment is correct when, with steering retaining nuts tightened, steering shaft turns freely without binding and there is no noticeable end play in shaft.

To adjust steering shaft, refer to Fig. 4 and add or remove shims (20) as required to obtain proper adjustment. A gasket (19) should be placed on each side of shim stack. Be sure that holes (H) in gaskets and shims are aligned with oil holes in steering column and gear housing.

**20. ROCKER SHAFT.** Rocker shaft adjustment is correct when, with cover retaining bolts tightened, there is no noticeable end play in rocker shaft in mid (straight ahead) position. There will be some end play in rocker



1. Top cover plate
2. Cranking extension shaft
3. Bevel gear
4. Cross-shaft
5. Cross-shaft bearing
6. Cross-shaft seal
7. Seal cover
8. Drag link
9. Steering arm
10. Shims
11. Upper pintle bearing
12. Pintle housing
13. Pintle
14. Lower pintle bearing
15. Pintle seal
16. Pintle housing cover
17. Axle
18. Key
19. Cap screws
20. Seal retainer
21. Wheel hub
22. Mud guard
23. Cross-member
24. Cover plate

Fig. 3—Drawing showing cross-sectional view of tricycle front pedestal (cross-member and pintle). Oil level is checked by removing plate (24). Wheel bearing detail is similar to that shown for adjustable front axle in Fig. 1, except that seal retainer (20) is secured to inner side of hub (21) by cap screws (19).

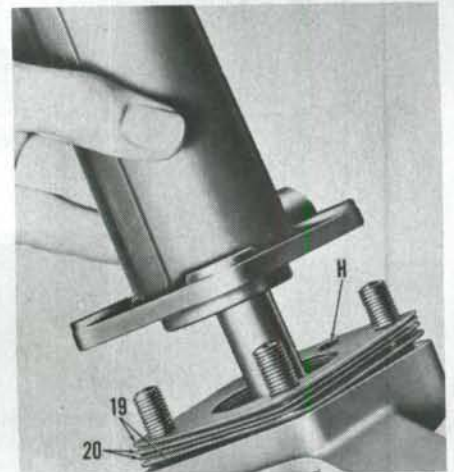


Fig. 4—Shims are used between steering column and gear housing to adjust worm-shaft bearings. A gasket (19) should be placed each side of shim stack (20). Be sure oil holes (H) in shims and gaskets are aligned with oil holes in housings.



shaft when at either side of mid position.

To adjust rocker shaft, refer to Fig. 6, be sure shaft (4) is in mid-position and that roller (6) is in place, then install cover (1) with shims as required to eliminate shaft end play. A gasket (3) should be on each side of shim stack. Note that roller (6) engages slot (S) in cover.

**21. R&R STEERING GEAR UNIT.**

To remove the steering gear unit, first turn front wheels to mid (straight ahead) position, remove engine hood and steering wheel, then proceed as follows:

On models "FPM" and "FSM", disconnect battery ground cable and drain cooling system. Remove temperature gage bulb from engine and disconnect wiring to instrument panel at connectors on wiring harness. Remove pin or clamping screw from throttle control lever and remove the lever. Remove screws retaining instrument panel and remove the panel, disconnecting proofmeter (tachometer) cable as panel is lifted from fuel tank. On all models shut-off fuel supply valve and disconnect fuel supply and excess fuel return lines, unbolt fuel

tank from supports and lift fuel tank from supports and steering column.

Remove the nut retaining steering (drop) arm to steering gear rocker shaft and using gear pullers, remove arm from shaft. Then, unbolt and remove steering gear assembly from transmission.

When reinstalling steering gear assembly, be sure gasket surfaces are clean and apply thin coat of gasket sealer to gear housing and transmission mating surfaces. Install new gasket on top of transmission, then reinstall steering gear assembly. Turn gear unit to mid position and reinstall steering arm to rocker shaft. Complete the reassembly of tractor by reversing disassembly procedure and bleed the diesel fuel system as outlined in paragraph 107.

**22. OVERHAUL STEERING GEAR UNIT.** With steering gear unit removed as outlined in paragraph 21, drain lubricant from gear housing and proceed as follows:

Remove the side cover plate (1—Fig. 6) and roller (6), then withdraw rocker shaft (4) from housing. Retain shims (2) for reassembly. The rocker shaft seal can be renewed at this time. On early models, refer to Fig.

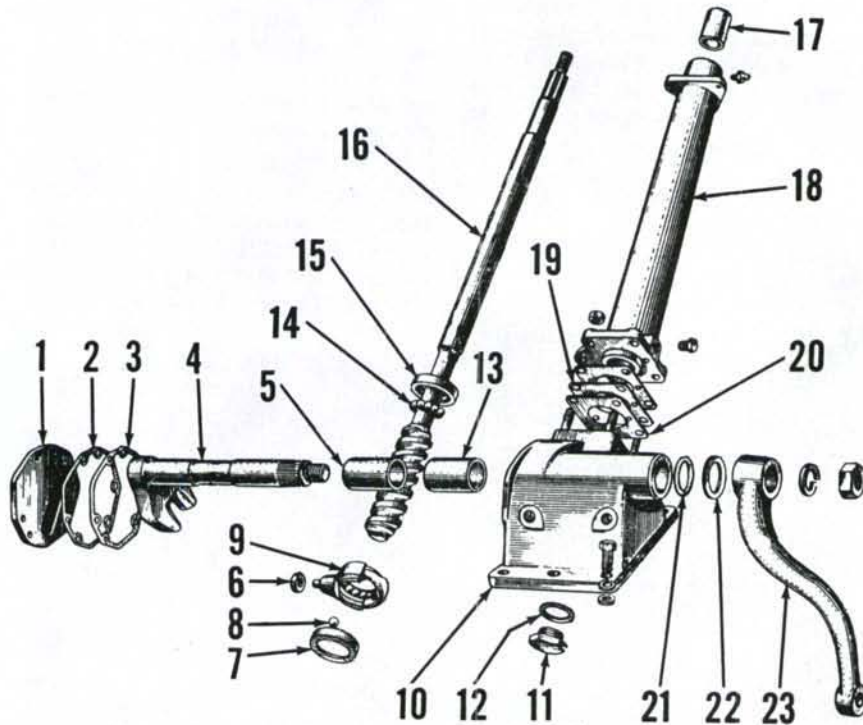


Fig. 5—Exploded view of typical steering gear assembly for adjustable front axle models. Tricycle steering gear is same as that shown except that a different drag link is used. Steering column (18) for "FMD" models does not have instrument panel support and different wormshaft (16) is required. Late production oil seal (21) does not require retaining ring (22).

- |                 |                   |                  |                     |
|-----------------|-------------------|------------------|---------------------|
| 1. Cover        | 7. Bearing race   | 12. Seal ring    | 18. Steering column |
| 2. Shims        | 8. Steel balls    | 13. Bushing      | 19. Gaskets         |
| 3. Gasket       | 9. Main nut assy. | 14. Steel balls  | 20. Shims           |
| 4. Rocker shaft | 10. Housing       | 15. Bearing race | 21. Oil seal        |
| 5. Bushing      | 11. Plug          | 16. Wormshaft    | 22. Retainer        |
| 6. Roller       |                   | 17. Bushing      | 23. Steering arm    |

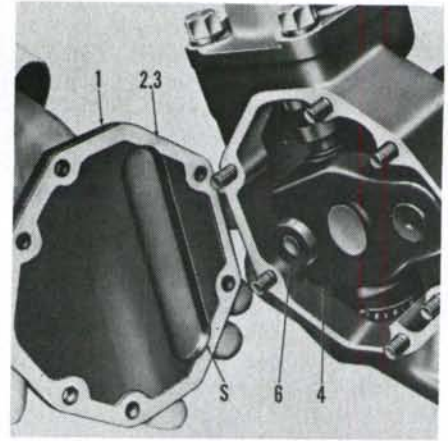


Fig. 6—Slot (S) in cover plate (1) guides roller (6) and ball nut in straight line parallel with wormshaft. Vary shims (2) as required to eliminate end play of rocker shaft (4).

7 and pry the seal (21) out of groove between bushing (13) and retainer (22). On later models, pry the lip type seal from shaft bore.

Refer to Fig. 4, and unbolt and remove steering column from gear housing and steering shaft. Lift steering shaft up far enough to remove upper bearing race (15—Fig. 5) and the ten loose steel balls (14). Remove steering shaft and ball nut assembly from side opening in housing and remove the ten loose steel balls of lower bearing from housing. If necessary to renew lower bearing race, remove plug (11) and drive race upward. Unscrew ball nut (9) from worm on steering shaft and remove the 14 recirculating balls.

Inspect rocker shaft journals and bushings. If necessary to renew bushings on early models, refer to Fig. 7 and carefully remove the staking and seal retainer (22). On all models,

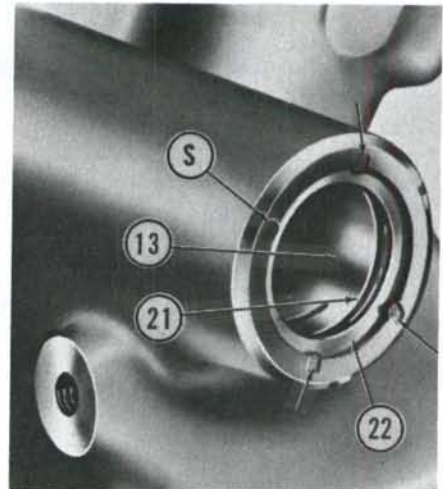


Fig. 7—Seal retainer (22) (not used on late models) is retained in gear housing by staking (S) as shown. Oil seal (21) can be renewed without removing retainer.



drive or press bushings from housing. When installing outer bushing (13) be sure open end of oil groove is to inside of housing. Bushings are pre-sized and should not require reaming if carefully installed. On early models, install oil seal retainer and carefully stake in position, then insert "O" ring in groove between bushing and retainer. On late models, drive seal into housing with lip to inside.

Renew steering shaft and ball nut assembly if shaft or nut are damaged.

To reinstall shaft and ball nut assembly, stick the 14 steel balls in nut with heavy grease and thread nut onto shaft. Install new lower race if necessary and stick ten steel balls into race. Insert shaft up through side opening and seat into lower bearing assembly. Stick ten steel balls into upper race, invert the bearing and install over steering shaft. Install new bushing (17—Fig. 5) in upper end of steering column, then install column over steering shaft with two gaskets

and proper number of shims as outlined in paragraph 19. Lubricate rocker shaft and seal, then carefully install shaft through bushings and seal. Place roller (6) on ball nut, then install side cover with two new gaskets and proper number of shims as outlined in paragraph 20. Refill steering gear housing to filler plug opening with SAE 90 gear lubricant and lubricate steering column bushing with pressure grease gun.

## POWER STEERING

The power steering system consists of a belt driven hydraulic pump which furnishes pressurized oil, through flexible hoses, to a combined power cylinder and control valve assembly. The system utilizes the standard steering gear assembly which allows the operator to steer the tractor manually should the loss of power occur.

With the exception of the power cylinder, the component parts of the power steering system used on four wheel adjustable axle tractors and tricycle tractors remain the same. Since the power requirement of the tricycle models is less than that of four wheel tractors, the bore of the power cylinder for tricycle tractors is 1 3/4 inches compared to 2 inches for four wheel tractors.

### FLUID AND BLEEDING

#### All Models

23. To bleed the system, turn front wheels to the right against stop. Fill reservoir to "full" mark on dip stick (see Fig. 9) with good quality SAE 10W oil. Note: If temperature is consistently below 10 degrees F. use

S.A.E. 5W oil. Start engine and run at a fast idle; then, turn front wheels full left and full right and observe return oil for bubbles and turbulence. Continue until the returning oil is free of bubbles and turbulence, then turn front wheels to the straight ahead position and refill reservoir to the "full" mark on dip stick.

### SYSTEM OPERATING PRESSURE

#### All Models

24. A pressure test of the power steering circuit will disclose whether the pump, relief valve or some other unit in the system is malfunctioning; proceed as follows:

Connect a pressure test gage and shut-off valve in series with the pump pressure line and be sure that the pressure gage is connected in the circuit between the shut-off valve and the pump. Open the shut-off valve and run the engine at slow idle speed until the working fluid is warmed to normal operating temperature. Advance the engine speed to high idle rpm, close the shut-off valve and remain in the closed position only long

enough to observe the gage reading.

NOTE: Pump may be seriously damaged if valve is left in closed position for more than a few seconds. If the gage reading is 720-800 psi, with the shut-off valve closed, the pump and relief valve are O.K. and any trouble is located in the control valve, power cylinder and/or connections.

If the gage pressure is more than 800 psi, the relief valve is probably stuck in the closed position. If the gage pressure is less than 720 psi, renew the relief valve spring (25—Fig. 10) and recheck the pressure reading. If the gage pressure is still too low, it will be necessary to overhaul the pump as outlined in paragraph 26.

### PUMP AND RESERVOIR

#### All Models

25. REMOVE AND REINSTALL. To remove the power steering pump proceed as follows: Remove the reservoir cover and withdraw as much oil as possible from the reservoir with a suction gun. Disconnect hoses from pump pressure and return line fittings and secure the hoses in a raised position to prevent oil drainage. Loosen

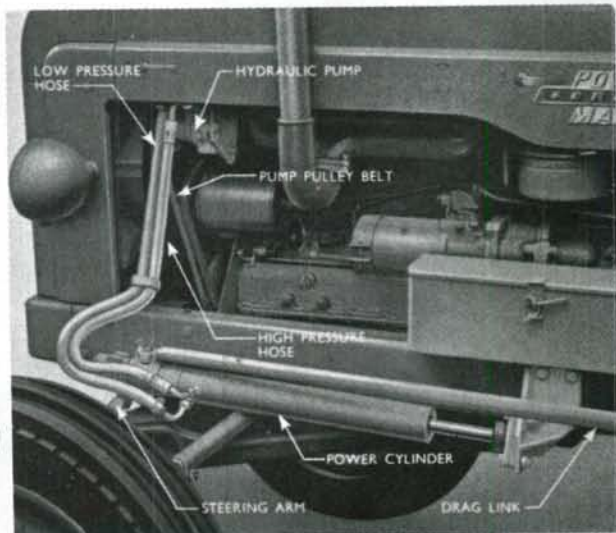


Fig. 8 — View showing power steering components on model "FPM" with wide adjustable front axle. Power steering systems for other models (including tricycle front end) are similar.

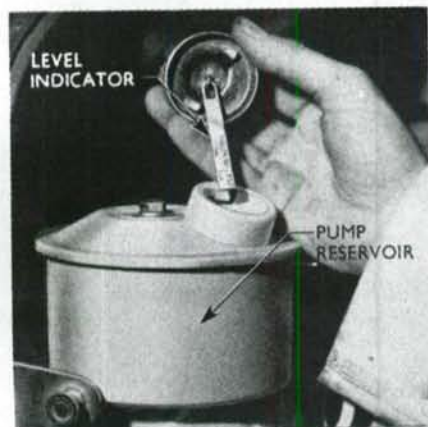


Fig. 9—Maintain fluid level to full mark on level indicator (dipstick) attached to pump reservoir filler cap.

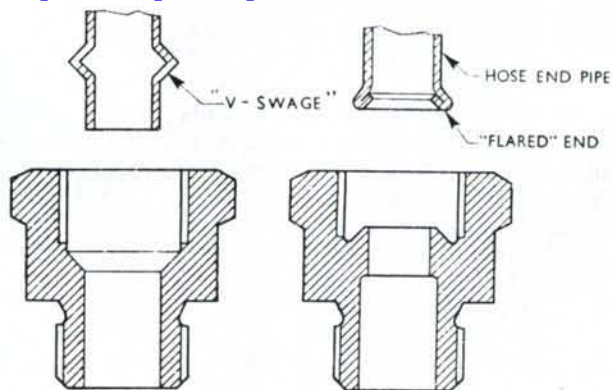


the pump drive belt adjusting bolts and remove belt. Withdraw bolts and lift pump from tractor.

After pump is reinstalled, fill and bleed the system as in paragraph 23.

26. **OVERHAUL.** With pump removed from tractor as outlined in paragraph 25, refer to Fig. 10 and proceed as follows: Remove the reservoir spring and filter assembly, then clean the pump assembly. Remove the reservoir retaining cap screws and the reservoir stud (11), then lift reservoir and reservoir retaining plate (13) from pump body. Remove and discard the two "O" rings which are between reservoir and pump body. Remove the nut and lockwasher retaining pulley to pump shaft and using a suitable puller, remove pulley. Remove the four cap screws which retain pump cover (33) and separate pump cover and pump body (28). Remove and discard the two "O" rings from their grooves in pump body. Remove the pump rotors (23) and rotor drive key from pump shaft. Remove snap ring (16) retaining rotor shaft

Fig. 10A—View showing early "V" swage hose end, late flared end hose fitting and related adaptors.



bearing in pump body and press bearing and shaft assembly from pump body. Bearing (18) can be removed from shaft after removing snap ring (17).

Remove the pump outlet adaptor (38) from pump body. Remove flow control valve spring (37) and flow control valve (24). If necessary, use a piece of hooked wire to pull flow control valve from housing. Remove the snap ring retaining the pressure

relief valve (35) in the flow control valve and remove the pressure relief valve and spring (25).

27. Wash all parts EXCEPT the rotor shaft bearing in a suitable solvent and inspect. If the bushing and/or pump cover is worn, renew the cover and bushing assembly. If the bushing and/or the pump body is worn, renew the pump body and rotor sub-assembly. (Bushings are not available separately.) If the drive or driven rotors show evidence of wear or damage, renew the pump body and rotor assembly.

Check clearances as follows: Insert rotor shaft and bearing into housing until bearing is in position. Install key, drive rotor and driven rotor and check clearance at tooth ends as

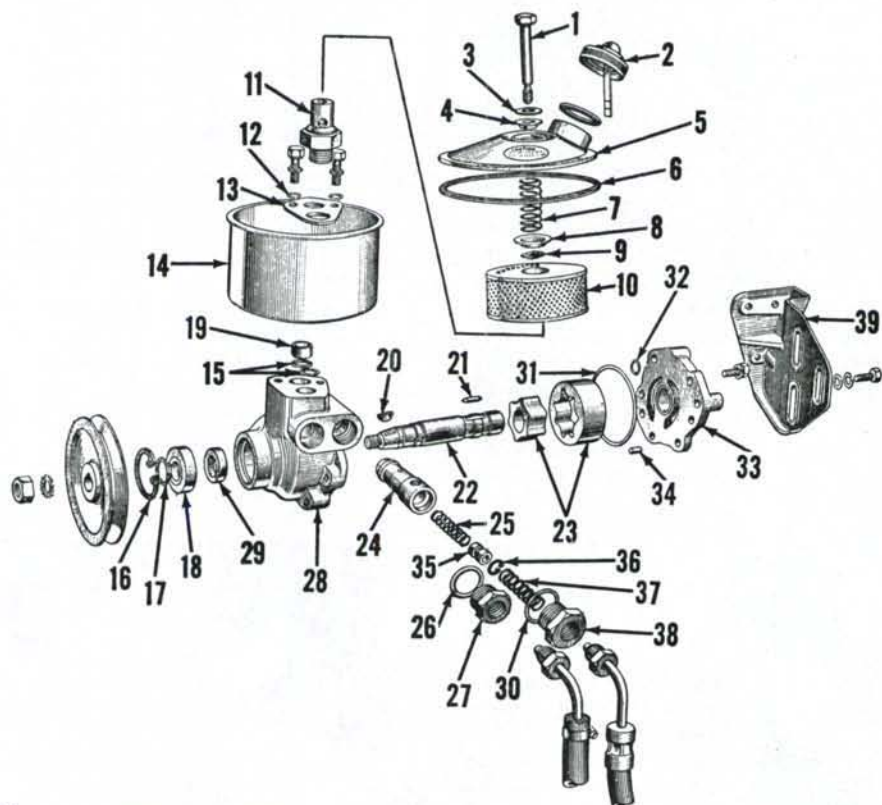


Fig. 10—Exploded view of the power steering pump and reservoir assembly. Pump bracket (39) for early models is different than shown.

- |               |                   |                         |                               |
|---------------|-------------------|-------------------------|-------------------------------|
| 1. Cover bolt | 11. Stud          | 21. Rotor key           | 29. Oil seal                  |
| 2. Filler cap | 12. "O" rings     | 22. Pump shaft          | 30. Seal                      |
| 3. Washer     | 13. Reinforcement | 23. Rotor set           | 31. "O" ring                  |
| 4. Gasket     | 14. Reservoir     | 24. Flow control valve  | 32. "O" ring                  |
| 5. Cover      | 15. "O" rings     | 25. Relief valve spring | 33. Pump cover                |
| 6. Gasket     | 16. Snap ring     | 26. Seal                | 34. Dowel pin                 |
| 7. Spring     | 17. Snap ring     | 27. Adaptor             | 35. Relief valve              |
| 8. Retainer   | 18. Bearing       | 28. Pump body           | 36. Snap ring                 |
| 9. Clip       | 19. Retainer      |                         | 37. Flow control valve spring |
| 10. Filter    | 20. Woodruff key  |                         | 38. Adaptor                   |

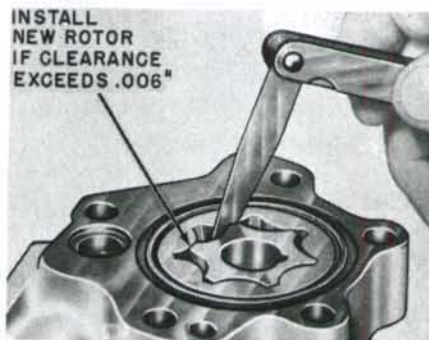


Fig. 11—Measuring drive rotor to driven rotor tooth clearance. Renew rotor set if clearance exceeds 0.006.

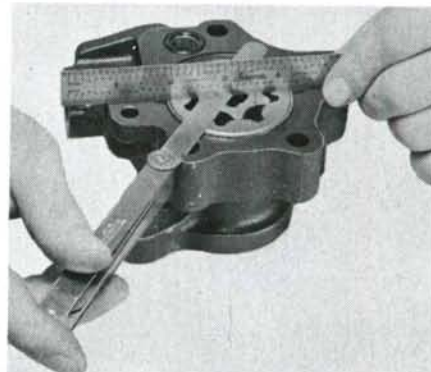


Fig. 12—Measuring rotor end clearance with straight edge and feeler gage. Maximum allowable clearance is 0.0025.