



# KUBOTA

Models ■ B5100D ■ B5100E ■ B6100D ■ B6100E  
■ B6100HST-D ■ B6100HST-E ■ B7100D  
■ B7100HST-D ■ B7100HST-E

Previously contained in Intertec's I&T Shop Service Manual No. K-2



# SHOP MANUAL

# KUBOTA

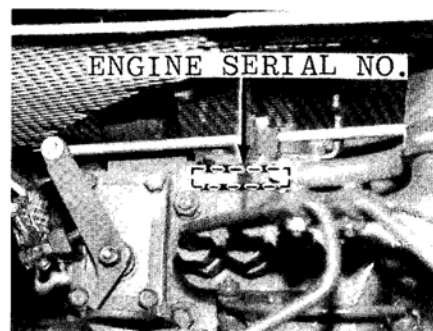
## MODELS

**B5100D – B5100E – B6100D – B6100E – B6100HST-D –  
B6100HST-E – B7100D – B7100HST-D – B7100HST-E**

On Models B5100D, B5100E, B6100D, B6100E and B7100D, tractor serial number is located on left side of clutch housing case as shown below.

On Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E, tractor serial number is located on left side of clutch housing case as shown below.

On all models, engine serial number is located on right side of engine crankcase as shown below.



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## DUAL DIMENSIONS

This service manual provides specifications in both the 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 "0.28 mm (0.011 inch)" would indicate that we feel the preferred measurement, in this instance, is the metric system of measurement and the U.S. system equivalent of 0.28 mm is 0.011 inch.

## CONDENSED SERVICE DATA

MODELS	B5100D B5100E	B6100D B6100E	B6100HST-D B6100HST-E	B7100D	B7100HST-D B7100HST-E
<b>GENERAL</b>					
Engine Make.....	Own	Own	Own	Own	Own
Engine Model.....	Z500-1A	D650-A	D650-AH	D750-A	D750-AH
Number of Cylinders.....	2	3	3	3	3
Bore (mm).....	68	64	64	68	68
(Inches).....	2-5/8	2-1/2	2-1/2	2-5/8	2-5/8
Stroke (mm).....	70	70	70	70	70
(Inches).....	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4
Displacement (cc).....	508	675	675	762	762
(Cubic Inches).....	31	41.2	41.2	46.5	46.5
Compression Ratio.....	22:1	22:1	22:1	22:1	22:1
<b>TUNE-UP</b>					
Valve Tappet Gap (Cold) (mm).....	0.15-0.20	0.15-0.20	0.15-0.20	0.15-0.20	0.15-0.20
(Inch).....	0.006-0.008	0.006-0.008	0.006-0.008	0.006-0.008	0.006-0.008
Injection Timing (BTDC).....	25°	25°	25°	25°	25°
Timing Mark Location.....	Flywheel	Flywheel	Flywheel	Flywheel	Flywheel
Injection Pressure (MPa).....	13.7	13.7	13.7	13.7	13.7
(Psi).....	1988	1988	1988	1988	1988
Battery -					
Volts.....	12	12	12	12	12
Capacity Amp/hr.....	35	45	45	45	45
Ground Polarity.....	Negative	Negative	Negative	Negative	Negative
Slow Idle Speed (RPM).....	750-800	750-800	750-800	750-800	750-800
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# CONDENSED SERVICE DATA (CONT.)

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(PSI) . . . . .	1710	1710	1710	1710	1710
Rated Delivery (Liters/min) . . . . .	11.78	11.78	11.78	11.78	11.78
(GPM) . . . . .	3.1	3.1	3.1	3.1	3.1
<b>SIZES—CLEARANCES</b>					
Crankshaft Main Journal—					
Diameter (mm) . . . . .	43.934-43.950	43.934-43.950	43.934-43.950	43.934-43.950	43.934-43.950
(Inches) . . . . .	1.7297-1.7303	1.7297-1.7303	1.7297-1.7303	1.7297-1.7303	1.7297-1.7303
Bearing Clearance (mm) . . . . .	0.034-0.106	0.034-0.106	0.034-0.106	0.034-0.106	0.034-0.106
(Inch) . . . . .	0.0013-0.0042	0.0013-0.0042	0.0013-0.0042	0.0013-0.0042	0.0013-0.0042
Crankshaft Crankpin Journal—					
Diameter (mm) . . . . .	36.959-36.975	36.959-36.975	36.959-36.975	36.959-36.975	36.959-36.975
(Inches) . . . . .	1.4551-1.4557	1.4551-1.4557	1.4551-1.4557	1.4551-1.4557	1.4551-1.4557
Bearing Clearance (mm) . . . . .	0.029-0.087	0.029-0.087	0.029-0.087	0.029-0.087	0.029-0.087
(Inch) . . . . .	0.0011-0.0034	0.0011-0.0034	0.0011-0.0034	0.0011-0.0034	0.0011-0.0034
Side Clearance (mm) . . . . .	0.2-0.4	0.2-0.4	0.2-0.4	0.2-0.4	0.2-0.4
(Inch) . . . . .	0.008-0.016	0.008-0.016	0.008-0.016	0.008-0.016	0.008-0.016
Crankshaft End Play (mm) . . . . .	0.15-0.3	0.15-0.3	0.15-0.3	0.15-0.3	0.15-0.3
(Inch) . . . . .	0.006-0.012	0.006-0.012	0.006-0.012	0.006-0.012	0.006-0.012
Camshaft Journal—					
Diameter (mm) . . . . .	32.934-32.950	32.934-32.950	32.934-32.950	32.934-32.950	32.934-32.950
(Inches) . . . . .	1.2966-1.2972	1.2966-1.2972	1.2966-1.2972	1.2966-1.2972	1.2966-1.2972
Bearing Clearance (mm) . . . . .	0.050-0.091	0.050-0.091	0.050-0.091	0.050-0.091	0.050-0.091
(Inch) . . . . .	0.0020-0.0036	0.0020-0.0036	0.0020-0.0036	0.0020-0.0036	0.0020-0.0036
Camshaft Side Clearance (mm) . . . . .	0.07-0.22	0.07-0.22	0.07-0.22	0.07-0.22	0.07-0.22
(Inch) . . . . .	0.0028-0.0087	0.0028-0.0087	0.0028-0.0087	0.0028-0.0087	0.0028-0.0087
Valve Stem Diameter—					
Intake and Exhaust (mm) . . . . .	6.960-6.975	6.960-6.975	6.960-6.975	6.960-6.975	6.960-6.975
(Inch) . . . . .	0.2740-0.2746	0.2740-0.2746	0.2740-0.2746	0.2740-0.2746	0.2740-0.2746
Valve Face Angle . . . . .	45°	45°	45°	45°	45°
Valve Seat Angle . . . . .	45°	45°	45°	45°	45°
Piston Pin—					
Diameter (mm) . . . . .	20.002-20.011	20.002-20.011	20.002-20.011	20.002-20.011	20.002-20.011
(Inch) . . . . .	0.7875-0.7878	0.7875-0.7878	0.7875-0.7878	0.7875-0.7878	0.7875-0.7878
Clearance (mm) . . . . .	0.015-0.04	0.015-0.04	0.015-0.04	0.015-0.04	0.015-0.04
(Inch) . . . . .	0.0006-0.0015	0.0006-0.0015	0.0006-0.0015	0.0006-0.0015	0.0006-0.0015
Piston Skirt-to-Cylinder					
Clearance (mm) . . . . .	0.076-0.102	0.076-0.102	0.076-0.102	0.076-0.102	0.076-0.102
(Inch) . . . . .	0.003-0.004	0.003-0.004	0.003-0.004	0.003-0.004	0.003-0.004
<b>CAPACITIES</b>					
Crankcase (Liters) . . . . .					
(U.S. Quarts) . . . . .	2.3	3.9	3.9	3.9	3.9
Lubricant Type . . . . .	2.4	4.1	4.1	4.1	4.1
Cooling System (Liters) . . . . .					
(U.S. Gallons) . . . . .	CC or CD	CC or CD	CC or CD	CC or CD	CC or CD
Transmission/Hydraulic System—					
(Liters) . . . . .	3	4.6	4.6	4.6	4.6
(U.S. Gallons) . . . . .	0.78	1.20	1.20	1.20	1.20
Front Axle Differential Case—					
(Liters) . . . . .	8.5	11.5	13.5	11.5	13.5
(U.S. Gallons) . . . . .	2.21	3	3.6	3	3.6
Lubricant Type . . . . .	See Para. 90	See Para. 90	See Para. 90	See Para. 90	See Para. 90
Front Axle Gear Case—					
(Liters) . . . . .	0.5	0.5	0.5	0.7	1.5
(U.S. Quarts) . . . . .	0.53	0.53	0.53	0.74	1.6
Fluid Type . . . . .	SAE 80	SAE 80	SAE 80	SAE 80	SAE 80
Front Axle Gear Case—					
(Liters) . . . . .	Gear Lube	Gear Lube	Gear Lube	Gear Lube	Gear Lube
(U.S. Quarts) . . . . .	0.15	0.15	0.15	0.15	0.5
Fluid Type . . . . .	0.15	0.15	0.15	0.15	0.5
Front Axle Gear Case—					
(Liters) . . . . .	SAE 80	SAE 80	SAE 80	SAE 80	SAE 80
(U.S. Quarts) . . . . .	Gear Lube	Gear Lube	Gear Lube	Gear Lube	Gear Lube
Fluid Type . . . . .	Gear Lube	Gear Lube	Gear Lube	Gear Lube	Gear Lube

# FRONT AXLE AND STEERING SYSTEM

Front axle is a fixed tread type. Camber angle, caster angle and king pin inclination are non-adjustable.

Front axle assembly and support frame are hinged together by a single pivot pin. Pivot pin removal can only be accomplished after removing front axle assembly and support frame as a unit as outlined in paragraph 2.

## TIE RODS AND TOE-IN

### All Models

1. Tie rod and drag link ends are automotive type. Steering drag link is non-adjustable and must be renewed as an assembly. Tie rod assembly is renewable as separate components. Adjust toe-in to 0-5 mm (0-0.2 inch) by shortening or lengthening tie rod.

## FRONT AXLE

### Two-Wheel Drive Models

**2. REMOVE AND REINSTALL.** Disconnect headlight wiring, then remove hood assembly. Open radiator drain cock and allow coolant to drain into a suitable container. Disconnect negative battery cable terminal from battery post. Remove air cleaner assembly, muffler and left and right side covers. Disconnect radiator hoses. Remove oil cooler lines at cooler as needed. Detach drag link (13-Fig. 1) from steering arm (17). Support tractor behind front axle, then support front axle level with floor to prevent tipping. Remove cap screws securing front axle support to engine block. Carefully move front axle assembly, support frame and radiator forward until clear of tractor. To complete disassembly, attach a suitable hoist or holding fixture to support frame, then remove set spring (12), castle nut (11) and washer (10). Withdraw pivot pin (7), then separate front axle assembly from support frame.

Installation is reverse of removal. Tighten castle nut (11) to 9.8 N·m (7 ft.-lbs.) torque. Tighten cap screws securing support frame to engine block to 48-56 N·m (35-41 ft.-lbs.) torque. Tighten drag link nut to 29-49 N·m (22-36 ft.-lbs.) torque. Replenish cooling system and transmission hydraulic fluids as needed.

### Models B5100D - B6100D - B6100HST-D - B7100D

**3. REMOVE AND REINSTALL.** Disconnect headlight wiring, then remove hood assembly. Open radiator drain cock and allow coolant to drain in-

to a suitable container. Disconnect negative battery cable terminal from battery post. Remove air cleaner assembly, muffler and left and right side covers. Disconnect radiator hoses. Remove oil cooler lines at cooler as needed. Detach drag link from steering arm (26-Fig. 3). Support tractor behind front axle, then support front axle level with floor to prevent tipping. Loosen drive shaft protective cover band at joint case (89-Fig. 3 or 4) and remove drive

shaft from joint case. Remove cap screws securing front axle support to engine block. Carefully move front axle assembly, support frame and radiator forward until clear of tractor unit. To complete disassembly, attach a suitable hoist or holding fixture to support frame, then remove set spring (9-Fig. 3), castle nut (8) and flat washer (7). Withdraw pivot pin (3), then separate front axle assembly from support frame. Installation is reverse of removal.

Fig. 1—Exploded view of front axle, spindle and hub assembly and steering linkage used on two-wheel drive models.

1. Front axle
2. Steering arm
3. Tie rod end
4. Grease fitting
5. Locknut
6. Tie rod
7. Pivot pin
8. "O" ring
9. Grease seal
10. Washer
11. Castle nut
12. Set spring
13. Drag link
14. Washer
15. Castle nut
16. Cotter key
17. Steering arm
18. Bolt
19. Lockwasher
20. Nut
21. Shim
22. Spacer
23. "O" ring
24. Bushings
25. Bearing
26. Collar
27. Grease seal
28. Key
29. Spindle
30. Grease seal
31. Bearing
32. Spacer
33. Hub

34. Bearing
35. Washer
36. Castle nut

37. Cotter key
38. Gasket
39. Cap

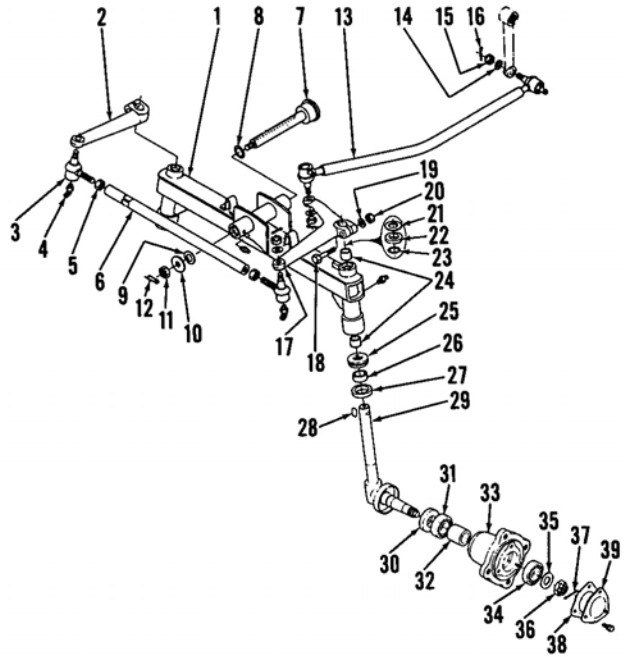
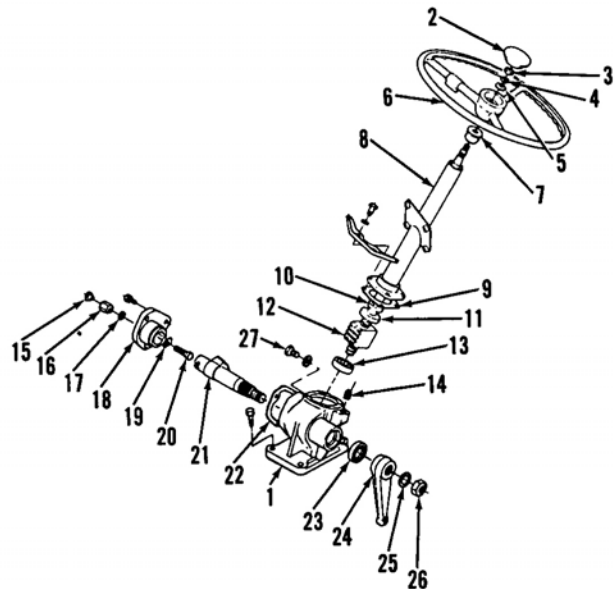


Fig. 2—Exploded view of recirculating ball nut steering gear used on all models.

1. Housing
2. Cap
3. Nut
4. Lockwasher
5. Flat washer
6. Steering wheel
7. Bushing
8. Column
9. Shim
10. Seal
11. Bearing
12. Worm gear & shaft
13. Bearing
14. Plug
15. Plug
16. Nut
17. Gasket
18. Cover
19. Shim
20. Adjusting screw
21. Sector shaft
22. Gasket
23. Seal
24. Pitman arm
25. Lockwasher
26. Nut
27. Drain plug



Tighten castle nut (8) to 9.8 N·m (7 ft.-lbs.) torque. Tighten cap screws securing support frame to engine block to 48-56 N·m (35-41 ft.-lbs.) torque. Tighten drag link nut to 29-49 N·m (22-36 ft.-lbs.) torque. Replenish cooling system and transmission/hydraulic fluid as needed.

### Model B7100HST-D

**4. REMOVE AND REINSTALL.** Disconnect headlight wiring, then remove hood assembly. Open radiator drain cock and allow coolant to drain into a suitable container. Disconnect negative battery cable terminal from battery post. Remove air cleaner assembly, muffler and left and right side covers. Disconnect radiator hoses. Remove oil cooler lines at cooler. Detach drag link from steering arm (26 - Fig. 5). Support tractor behind front axle, then support front axle level with floor to prevent tipping. Loosen drive shaft protective cover band at joint case (89) and remove drive shaft from joint case. Remove cap screws securing front axle support to engine block. Carefully move front axle assembly, support frame and radiator forward until clear of tractor. To complete disassembly, attach a suitable hoist or holding fixture to support frame, then remove set spring (9), castle nut (8) and flat washer (7). Withdraw pivot pin (3), then separate front axle assembly from support frame.

Installation is reverse of removal. Tighten castle nut (8) to 9.8 N·m (7 ft.-lbs.) torque. Tighten cap screws securing support frame to engine block to 48-56 N·m (35-41 ft.-lbs.) torque. Tighten drag link nut to 29-49 N·m (22-36 ft.-lbs.) torque. Replenish cooling system and transmission/hydraulic fluid as needed.

## SPINDLES AND BUSHINGS

### Two-Wheel Drive Models

5. Spindle shaft (29 - Fig. 1) outside diameter should be 19.948-19.980 mm (0.7854-0.7866 inch). Front axle spindle shaft bushings (24) should have an inside diameter of 20-20.051 mm (0.7874-0.7894 inch). Clearance between spindle shaft (29) and front axle spindle shaft bushings (24) should be 0.020-0.103 mm (0.0008-0.0041 inch). Spindle shaft should have no end play.

Renew all parts as needed.

If upper spindle shaft bushing (24) is renewed, press bushing below top surface of axle to provide sufficient room for "O" ring (23). Press seal (27) into position with lip of seal towards top.

Tighten castle nut (36) to 82-86 N·m (61-64 ft.-lbs.) torque.

## KING PINS AND BUSHINGS

### Models B5100D - B6100D - B6100HST-D - B7100D

**6. R&R AND OVERHAUL.** Bend lock tab (54 - Fig. 3) away from screw head, then remove screw (53). Withdraw lower king pin (56). Unbolt and remove steering arm (26), then withdraw upper king pin (46). Separate outer drive assembly and axle shaft from front axle.

Standard king pin bushing inner diameter is 20.020-20.053 mm (0.7882-0.7895 inch). Standard king pin outside diameter is 19.979-20.000 mm (0.7866-0.7874 inch). Recommended clearance between king pin and bushing is 0.020-0.074 mm (0.0008-0.0029 inch).

Reassembly is reverse order of disassembly. Lubricate king pins with a good quality, multi-purpose, lithium base grease, then slide into position.

**NOTE: King pins should slide freely into bushing bores with just hand pressure, DO NOT drive king pins in with a hammer.**

Tighten steering arm retaining screws to 39-49 N·m (29-36 ft.-lbs.).

### Model B7100HST-D

**7. R&R AND OVERHAUL.** Upper support (king pin) and bushing are accessible after removing steering arm (26 - Fig. 5). Outside diameter of support (44) end should be 25.000-25.033 mm (0.9843-0.9856 inch). Bushing (42) inside diameter should be 25.050-25.085 mm (0.9862-0.9876 inch). Clearance between bushing (42) and king pin (44) should be 0.017-0.085 mm (0.0007-0.0033 inch).

The lower end of the outer drive housing is supported by support cover (72) and rotates around bearing (69). Refer to outer drive housing service section in paragraph 13 if bearing must be renewed as gear backlash may be affected.

## PIVOT PIN AND BUSHINGS

### All Models

**8. R&R AND OVERHAUL.** Remove front axle as previously outlined and refer to Fig. 1, 3 or 5.

Pivot pin (7 - Fig. 1 or 3 - Fig. 3 or 5) outside diameter should be 19.88-20.03 mm (0.7827-0.7886 inch). Front axle pivot pin bushings should have an inside diameter of 20.10-20.15 mm (0.7913-0.7933 inch). Clearance between pivot pin and front axle pivot pin bushings should be 0.07-0.27 mm (0.0028-0.0106 inch). Front axle-to-frame end play should be 0.02 mm (0.0008 inch).

## STEERING GEAR

### All Models

**9. R&R AND OVERHAUL.** Raise hood, then disconnect negative battery cable terminal from battery post. Disconnect electrical connector under instrument panel. On hydrostatic drive models so equipped, remove Speed Set knob, cover retaining cap screws and cover. Remove steering wheel cap (2 - Fig. 2), then remove nut (3), lockwasher (4) and flat washer (5). Using a suitable puller, withdraw steering wheel (6). Remove four cap screws securing instrument panel, then lift panel clear from column. Remove pitman arm securing nut (26) and lockwasher (25). Place a suitable alignment mark on sector shaft end (21) and pitman arm (24) to ensure correct repositioning during reassembly. Using a suitable puller, withdraw pitman arm (24) from sector shaft end (21). On hydrostatic drive models so equipped, remove upper rod from Speed Set cam. Remove four bolts and nuts securing steering gear assembly to tractor unit, then lift clear.

To disassemble, first remove drain plug (27) and allow oil to drain into a suitable container. Remove any existing paint, rust or burrs from pitman arm end of sector shaft. Disassemble steering gear assembly with reference to Fig. 2.

Inspect and renew any components that are excessively worn or damaged. Worm gear and shaft (12 - Fig. 2) are available only as an assembled unit and disassembly is not recommended.

End clearance of adjusting screw (20) in slot of sector shaft (21) is controlled by shim (19) which is available in five thicknesses. Install thickest possible shim when unit is assembled.

Reassembly is reverse order of disassembly. Make sure center tooth on sector shaft (21) enters center tooth space on worm gear (12). After reassembly, fill steering gear through plug hole (14) with 0.2 liter (0.2 quart) of SAE 80 gear lube, then install and tighten plug (14).

Installation of steering gear is reverse of removal. Install pitman arm (24) on sector shaft (21) while aligning marked splines. Install lockwasher (25) and nut (26); tighten nut (26) to 118-157 N·m (87-116 ft.-lbs.) torque. Reinstall instrument panel. Install steering wheel (6), flat washer (5), lockwasher (4) and nut (3). Tighten nut (3) to 29-49 N·m (22-36 ft.-lbs.) torque. With worm gear and sector shaft gear at center position, remove plug (15), loosen locknut (16) and turn adjusting screw (20) until steering wheel free movement is 10-30 mm (25/64 - 1-3/16 inches). Complete reassembly by reversing disassembly procedure.

# FRONT-WHEEL DRIVE SYSTEM

## (Models B5100D – B6100D – B6100HST-D – B7100D)

Front-wheel drive assembly includes drive shaft, housing, differential, axle shafts and axle hub assemblies. Front-wheel drive power is supplied through transmission assembly and controlled by manually engaging or disengaging FWD select lever.

Camber angle, caster angle and king pin inclination are non-adjustable. Rolling angle adjuster screw (1 – Fig. 3) should be adjusted to a height of 25 mm (0.9843 inch) measured from axle case (34) to top of screw head. Front wheel steering angle adjuster screw (47) (front and rear) should

be adjusted to a length of 22 mm (0.8661 inch) measured from outer drive housing (49) to top of screw head.

### OUTER DRIVE ASSEMBLY

#### Models B5100D – B6100D – B6100HST-D – B7100D

**10. R&R AND OVERHAUL.** To disassemble outer drive assembly, first remove wheel from side to be serviced. Remove drain plug (51–Fig. 3) and allow lubricant to drain into a suitable container. Remove cap screws securing outer cover (68) to outer drive housing (49), then withdraw cover with components (63, 64, 65, 66, 69 and 70).

**NOTE:** During removal, if gear (64) catches on bearing (61), use suitable tools and carefully drive against gear (64) forcing bearing (63) inward until approximately halfway off wheel axle (70).

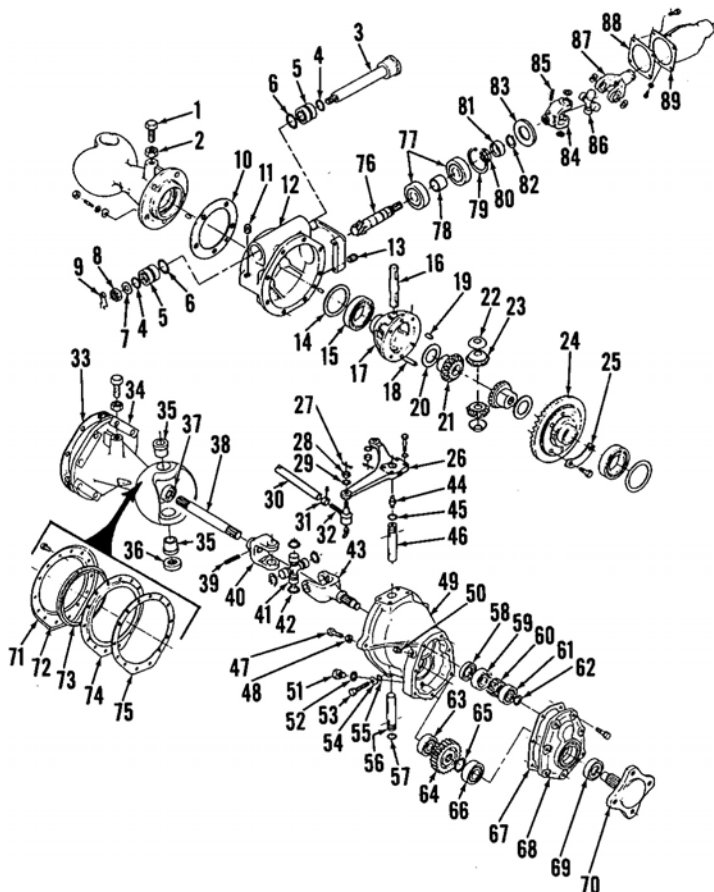
Remove bearing (63), gear (64) and snap ring (65) from wheel axle (70), then separate remaining components.

Examine components for damage and excessive wear.

Reassembly is reverse order of disassembly.

**NOTE:** To ease installation of outer cover assembly, press bearing (63) onto wheel axle (70) only halfway. After installation, lightly tap wheel axle (70) to force bearing against shoulder.

Tighten cap screws securing outer drive cover (68) to outer drive housing (49) to 18-21 N·m (6-7 ft.-lbs.) torque. Remove plug (50) and fill axle gearcase with 0.15 liter (0.15 U.S. quart) of SAE 80 gear lube. Install and tighten plug (50). Reinstall wheel and tighten lug nuts to 63-73 N·m (46-54 ft.-lbs.) torque.



**Fig. 3—Exploded view of front-wheel drive axle used on Model B5100D. Front-wheel drive axle used on Models B6100D, B6100HST-D and B7100D is similar except for pinion gear assembly and location of differential drain plug (see Fig. 4).**

- |                       |                     |                         |                      |
|-----------------------|---------------------|-------------------------|----------------------|
| 1. Adjuster screw     | 24. Bevel ring gear | 46. King pin            | 68. Outer cover      |
| 2. Locknut            | 25. Lock plate      | 47. Adjuster screw      | 69. Oil seal         |
| 3. Pivot pin          | 26. Steering arm    | 48. Locknut             | 70. Wheel axle       |
| 4. "O" ring           | 27. Cotter key      | 49. Outer drive housing | 71. Dust cover       |
| 5. Bushing            | 28. Castle nut      | 50. Fill plug           | 72. Felt seal        |
| 6. "O" ring           | 29. Washer          | 51. Drain plug          | 73. Dust seal        |
| 7. Flat washer        | 30. Tie rod         | 52. Gasket              | 74. Dust seal holder |
| 8. Castle nut         | 31. Locknut         | 53. Retainer screw      | 75. Gasket           |
| 9. Set spring         | 32. Tie rod end     | 54. Lock tab            | 76. Bevel pinion     |
| 10. Gasket            | 33. Gasket          | 55. Gasket              | 77. Bearings         |
| 11. Fill plug         | 34. Axle case       | 56. King pin            | 78. Spacer           |
| 12. Center case       | 35. Bushing         | 57. "O" ring            | 79. Snap ring        |
| 13. Drain plug        | 36. Bearing         | 58. Oil seal            | 80. Collar           |
| 14. Shim              | 37. Oil seal        | 59. Bearing             | 81. Bushing          |
| 15. Bearing           | 38. Axle shaft      | 60. Gear                | 82. Snap ring        |
| 16. Cross-shaft       | 39. Pin             | 61. Bearing             | 83. Oil seal         |
| 17. Differential case | 40. Yoke            | 62. Snap ring           | 84. Yoke             |
| 18. Pin               | 41. Universal joint | 63. Bearing             | 85. Pin              |
| 19. Pin               | 42. Clip            | 64. Gear                | 86. Universal joint  |
| 20. Thrust washer     | 43. Yoke shaft      | 65. Snap ring           | 87. Yoke             |
| 21. Side gear         | 44. Grease fitting  | 66. Bearing             | 88. Gasket           |
| 22. Thrust washer     | 45. "O" ring        | 67. Gasket              | 89. Joint case       |
| 23. Spider gear       |                     |                         |                      |

### OUTER DRIVE HOUSING, AXLE SHAFTS AND AXLE CASE

#### Models B5100D – B6100D – B6100HST-D – B7100D

**11. R&R AND OVERHAUL.** Remove outer drive assembly as outlined in paragraph 10. Remove drain plug (13–Fig. 3) on Model B5100D and plug (95–Fig. 4) on all other models and allow lubricant to drain into a suitable container. Detach tie rod end (32–Fig. 3) from steering arm (26). Remove cap screws securing dust cover (71), felt seal (72), dust seal (73), dust seal holder (74)



and gasket (75), then slide components toward center. Remove snap ring (62), then slide bearing (61) and gear (60) from yoke shaft (43). Bend lock tab (54) away from head of retainer screw (53) and remove screw (53) with lock tab (54) and gasket (55). Withdraw king pin (56). Unbolt and remove steering arm (26), then withdraw king pin (46). Lift outer drive housing (49) from axle case (34). Slide components (71 through 75) off axle case. Withdraw axle shaft assembly (38 through 43). Remove cap screws securing axle case (34) to center case (12) and separate components. Use care not to allow differential assembly to fall free from center case.

Inspect all components for damage and excessive wear. Inspect universal joint (41) for binding, roughness, excessive wear or any other damage. Renew all parts as needed.

Reassembly is reverse of disassembly. Tighten cap screws securing right side axle case to center case to 48-56 N·m (35-41 ft.-lbs.) torque. Tighten cap screws securing left side axle case to center case to 24-27 N·m (17-20 ft.-lbs.) torque. Tighten cap screws retaining steering arm (26) to 39-49 N·m (29-36 ft.-lbs.) torque. Tighten tie rod end nut to 29.5-49.2 N·m (22-36 ft.-lbs.) torque. Complete reassembly as outlined in paragraph 10. Remove plug (11) and refill differential case with 0.5 liter (0.53 U.S. quart) of SAE 80 gear lube on Models B5100D, B6100D and B6100HST-D and 0.7 liter (0.74 U.S. quart) of SAE 80 gear lube on Model B7100D. Install and tighten plug (11).

**DIFFERENTIAL AND BEVEL GEAR ASSEMBLY**

**Models B5100D – B6100D – B6100HST-D – B7100D**

**12. R&R AND OVERHAUL.**

Remove outer drive housing, king pins, axle shafts and left axle case as outlined in paragraph 11. Lift differential and bevel ring gear assembly (14 through 25–Fig. 3) from center case (12). Loosen drive shaft protective cover band at joint case (89–Fig. 3 or 4) and remove drive shaft from joint case. Use a suitable punch and hammer to drive pin (85) from yoke (84). Withdraw yokes (84 and 87) with universal joint (86) as a unit. On Model B5100D, remove joint case (89–Fig. 3), gasket (88), seal (83) and snap ring (79), then withdraw bevel pinion assembly. On Models B6100D, B6100HST-D and B7100D, remove cap screws securing joint case (89–Fig. 4) and retaining plate (91), then withdraw bevel pinion assembly.

To disassemble bevel pinion assembly on Model B5100D, remove snap ring (82–Fig. 3), then complete disassembly

with reference to Fig. 3. To disassemble bevel pinion assembly on Models B6100D, B6100HST-D and B7100D, place bevel pinion (76–Fig. 4) in a suitable holding fixture, then remove nut (94) from pinion shaft. Complete disassembly with reference to Fig. 4.

Inspect components for damage and excessive wear. Renew all parts as needed. Bevel pinion (76–Fig. 3 and 4) and bevel ring gear (24–Fig. 3) must be renewed as a matched set.

Reassembly is reverse order of disassembly. On Models B6100D, B6100HST-D and B7100D, tighten nut (94–Fig. 4) to 98-147 N·m (72-108 ft.-lbs.) torque.

To separate differential and bevel ring gear assembly, first bend tabs of lock plate (25–Fig. 3) away from screw heads, then remove cap screws securing bevel ring gear (24) to differential case (17). Use a suitable mallet and tap bevel ring gear (24) from differential case (17). Withdraw keys (18 and 19) and cross-shaft (16) from differential case (17), then separate components (20 through 23) from case (17). Use a suitable puller and associated tools to withdraw bearings (15) from differential case (17).

Inspect components for damage and excessive wear. Renew all components as needed. Bevel ring gear (24) and bevel pinion (76–Fig. 3 and 4) must be renewed as a matched set.

Reassembly is reverse order of disassembly. Lubricate components with a light film of SAE 80 gear lube prior to installation. Tighten cap screws securing bevel ring (24) to differential case (17) to 29-34 N·m (22-25 ft.-lbs.), then bend tabs of lock plate (25) over to secure screws.

Shims (14–Fig. 3) are used to adjust backlash between bevel ring gear and bevel pinion gear. Recommended backlash is 0.1-0.2 mm (0.004-0.008

inch). Shims (14) are available in thicknesses of 0.2, 0.3 and 0.5 mm (0.008, 0.012 and 0.020 inch). Recommended pinion shaft end play is zero. Shims are available for Models B6100D, B6100HST-D and B7100D to adjust mesh position. After adjustment, add shims behind retainer plate (91–Fig. 4) until zero end play is attained.

Reassemble outer drive housing, king pins, axle shafts and left axle case as outlined in paragraph 11.

**FRONT-WHEEL DRIVE SYSTEM (Model B7100HST-D)**

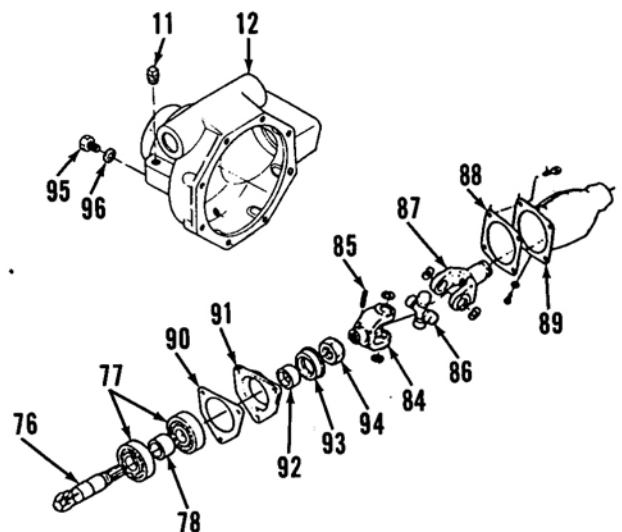
Front-wheel drive assembly includes drive shaft, housing, differential, axle shafts and axle hub assembly. Front-wheel drive power is supplied through transmission assembly and controlled by manually engaging or disengaging FWD select lever. Camber angle, caster angle and king pin inclination are non-adjustable. Rolling angle adjuster screw (1–Fig. 5) should be adjusted to a height of 25 mm (0.98 inch) measured from axle case (35) to top of screw head. Front wheel steering angle adjuster screw (56) (front and rear) should be adjusted to a length of 22 mm (0.86 inch) measured from outer drive housing (58) to top of screw head.

**OUTER COVER, OUTER DRIVE HOUSING, GEARCASE AND DRIVE COMPONENTS**

**13. R&R AND OVERHAUL.** Remove wheel from side to be serviced. Remove drain plug (62–Fig. 6) and

Fig. 4—Exploded view of bevel pinion gear assembly and differential case of the type used on Models B6100D, B6100HST-D and B7100D. Refer to Fig. 3 for identification of parts except for the following.

- 90. Gasket
- 91. Retaining plate
- 92. Bushing
- 93. Seal
- 94. Nut
- 95. Drain plug
- 96. Gasket



allow lubricant to drain into a suitable container. Detach tie rod end (32—Fig. 5) from steering arm (26). Remove cap screws securing gearcase (48) to axle case (34 or 35). Place a suitable drain pan under end of axle case, then lift complete outer drive assembly from axle case and place on a suitable work bench to complete disassembly. Note shims (47) located between axle case and gear-

case. Extract axle shaft (96) with components (38, 39 and 40).

Remove cap screws retaining steering arm (26) to outer drive housing (58), then separate arm from support end (44). Remove cap screws securing support (44) to gearcase (48) and separate. Remove cap screws securing lower support cover (72) to outer drive housing (58), then withdraw cover along with

gear (68) and bearing (69). Note shims (70). Using a suitable mallet, tap shaft (55) from bottom side to separate outer drive housing (58) from gearcase (48). Remove cap screws securing outer cover (82) to outer drive housing (58), then withdraw outer cover (82) assembly. Complete disassembly of components with reference to Fig. 5.

Reassembly is reverse order of disassembly. Install new "O" rings and gasket (81). Be sure to install seal (54—Fig. 7) with lip facing towards top and seal (65) with lip facing towards bottom.

Tighten cap screws securing outer cover (82—Fig. 5) to outer drive housing (58) to 48-56 N·m (35-41 ft.-lbs.) torque. Tighten cap screws securing support cover (72) to outer drive housing (58) to 24-27 N·m (17-20 ft.-lbs.) torque. Tighten cap screws securing support (44) to gearcase (48) to 24-27 N·m (17-20 ft.-lbs.) torque. Tighten cap screws securing gearcase (48) to axle case (34 or 35) to 77-90 N·m (57-67 ft.-lbs.) torque.

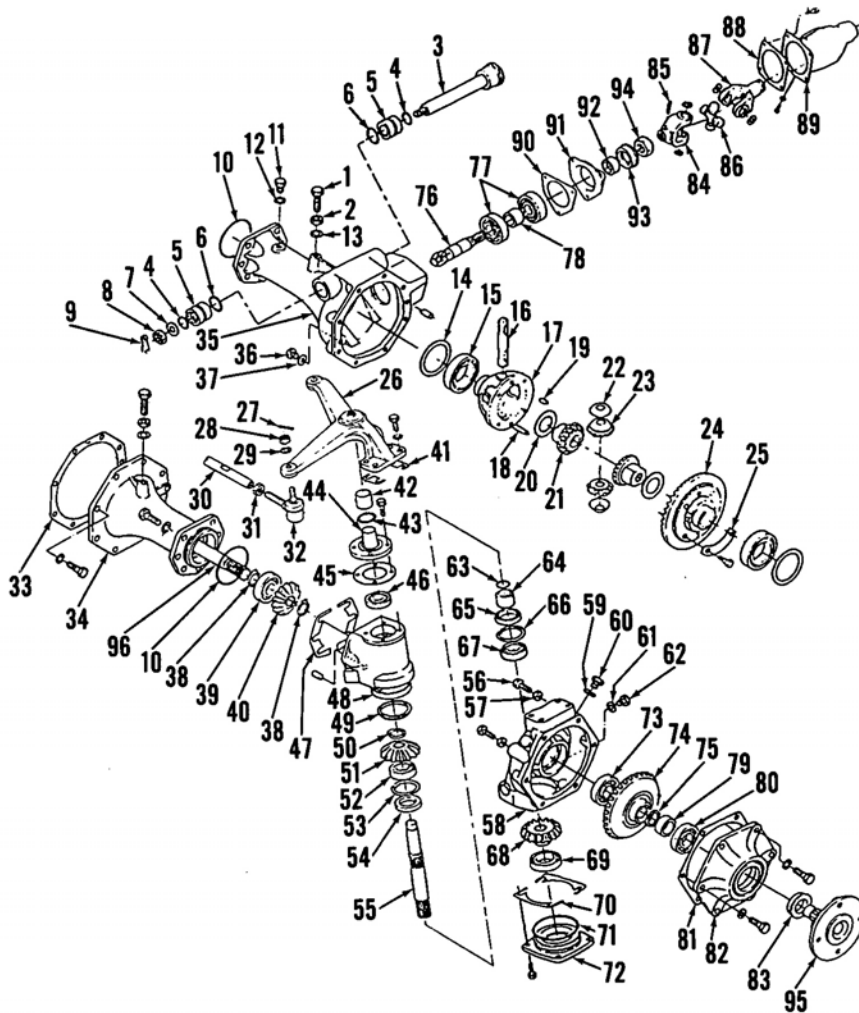


Fig. 5—Exploded view of front-wheel drive axle used on Model B7100HST-D.

- |                       |                     |                         |                     |
|-----------------------|---------------------|-------------------------|---------------------|
| 1. Adjuster screw     | 25. Lock plate      | 49. Dust seal           | 73. Bearing         |
| 2. Locknut            | 26. Steering arm    | 50. Snap ring           | 74. Gear            |
| 3. Pivot pin          | 27. Cotter key      | 51. Gear                | 75. Collar          |
| 4. "O" ring           | 28. Castle nut      | 52. Bearing             | 76. Bevel pinion    |
| 5. Bushing            | 29. Washer          | 53. Snap ring           | 77. Bearings        |
| 6. "O" ring           | 30. Tie rod         | 54. Seal                | 78. Spacer          |
| 7. Flat washer        | 31. Locknut         | 55. Shaft               | 79. Spacer          |
| 8. Castle nut         | 32. Tie rod end     | 56. Adjuster screw      | 80. Bearing         |
| 9. Set spring         | 33. Gasket          | 57. Locknut             | 81. Gasket          |
| 10. "O" ring          | 34. Left axle case  | 58. Outer drive housing | 82. Outer cover     |
| 11. Fill plug         | 35. Right axle case | 59. Gasket              | 83. Seal            |
| 12. Gasket            | 36. Drain plug      | 60. Fill plug           | 84. Yoke            |
| 13. Lockwasher        | 37. Gasket          | 61. Gasket              | 85. Pin             |
| 14. Shim              | 38. Snap ring       | 62. Drain plug          | 86. Universal joint |
| 15. Bearing           | 39. Bearing         | 63. "O" ring            | 87. Yoke            |
| 16. Cross-shaft       | 40. Gear            | 64. Sleeve              | 88. Gasket          |
| 17. Differential case | 41. Shim            | 65. Seal                | 89. Joint case      |
| 18. Pin               | 42. Bushing         | 66. Snap ring           | 90. Gasket          |
| 19. Pin               | 43. "O" ring        | 67. Bearing             | 91. Retaining plate |
| 20. Shim              | 44. Support         | 68. Gear                | 92. Bushing         |
| 21. Side gear         | 45. Gasket          | 69. Bearing             | 93. Seal            |
| 22. Thrust washer     | 46. Bearing         | 70. Shim                | 94. Nut             |
| 23. Spider gear       | 47. Shim            | 71. "O" ring            | 95. Wheel axle      |
| 24. Bevel ring gear   | 48. Gearcase        | 72. Support cover       | 96. Axle shaft      |

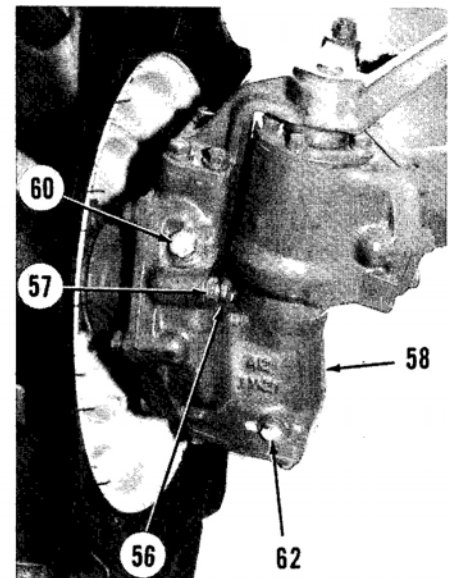


Fig. 6—View showing fill plug (60), drain plug (62), steering angle adjuster screw (56) and locknut (57) located in outer drive housing (58) on Model B7100HST-D.

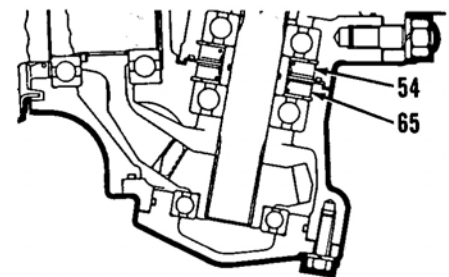


Fig. 7—Install seals (54 and 65) with lips facing as shown.

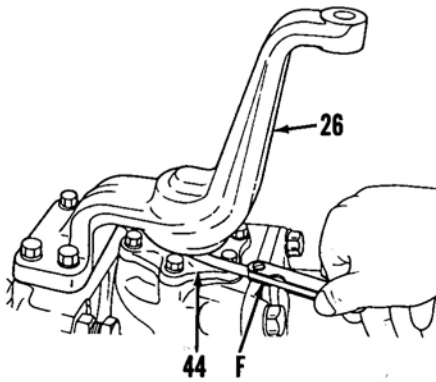


Fig. 8 - View showing procedure for measuring clearance between steering arm (26) and support (44) using feeler gage (F). Refer to text.

Backlash between gears (40 and 51) and (68 and 74) should be 0.10-0.30 mm (0.004-0.012 inch). Adjustment shims (47 or 70) are available in thicknesses of 0.2, 0.3 and 0.5 mm (0.008, 0.012 and 0.020 inch). Clearance between steering arm (26) and support (44) should be 0-0.2 mm (0-0.008 inch) measured as shown in Fig. 8. Adjustment shims (41 - Fig. 5) are available in thicknesses of 0.2, 0.3 and 0.5 mm (0.008, 0.012 and 0.020 inch).

Replenish lubricant in front axle differential case as needed. Remove fill plug (60 - Fig. 6) and fill front axle gearcase with 0.5 liter (0.5 U.S. quart) of SAE 80 gear lube, then reinstall and tighten plug (60).

**DIFFERENTIAL AND BEVEL GEAR ASSEMBLY**

**14. R&R AND OVERHAUL.** Remove outer cover, outer drive housing, gearcase and drive components as outlined in paragraph 13. Remove drain plug (36 - Fig. 9) and allow lubricant to drain into a suitable container. Remove cap screws securing left axle case (34 - Fig. 5), then separate axle cases (34 ar. 35). Use care not to allow differential assembly to fall free when axle cases are separated. Lift differential and bevel ring gear assembly (14 through 25) from

axle case (35). Remove cap screws securing joint case (89) and retaining plate (91), then withdraw bevel pinion assembly.

To separate bevel pinion assembly, place bevel pinion (76) in a suitable holding fixture, then remove nut (94) from pinion shaft. Complete disassembly with reference to Fig. 5.

Inspect components for excessive wear and damage.

Renew defective parts. Bevel pinion (76) and bevel ring gear (24) must be renewed as a matched set.

Reassembly is reverse order of disassembly. Renew oil seal (93). Tighten nut (94) to 98-147 N·m (72-108 ft.-lbs.) torque.

To separate differential and bevel ring gear assembly, first bend tabs of lock plate (25) away from screw heads, then remove cap screws securing bevel ring gear (24) to differential case (17). Use a suitable mallet and tap bevel ring gear (24) from differential case (17). Withdraw keys (18 and 19) and cross-shaft (16) from differential case (17), then separate components (20 through 23) from case (17).

Use a suitable puller and associated tools to withdraw bearings (15) from differential case (17). Inspect components for excessive wear and damage.

Measure outside diameter of side gear (21) and inside diameter of differential case (17). Clearance should be 0.025-0.066 mm (0.0010-0.0026 inch). Measure outside diameter of cross-shaft (16) and inside diameter of spider gear (23). Clearance should be 0.016-0.052 mm (0.0006-0.0020 inch).

Renew all components as needed. Bevel ring gear (24 - Fig. 5) and bevel pinion (76) must be renewed as a matched set.

Reassembly is reverse order of disassembly. Lubricate components with a light film of SAE 80 gear lube prior to installation. Tighten cap screws securing bevel ring gear (24 - Fig. 5) to differential case (17) to 29-34 N·m (22-25 ft.-lbs.), then bend tabs of lock plate (25) over to secure screws. Tighten

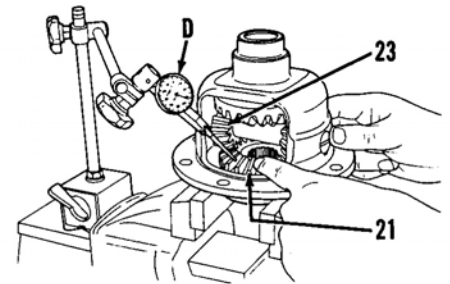


Fig. 12 - View showing procedure for checking backlash between side gear (21) and spider gear (23) using dial indicator (D). Refer to text.

cap screws securing left axle case (34) to right axle case (35) to 48-56 N·m (35-41 ft.-lbs.) torque.

Shim (20 - Fig. 5) is used to adjust backlash between side gear (21) and spider gear (23). Mount differential assembly in a suitable holding fixture and measure backlash as shown in Fig. 12. Recommended backlash is 0.20-0.25 mm (0.0079-0.0098 inch). Shims (20 - Fig. 5) are available in thicknesses of 0.8, 1.0 and 1.2 mm (0.031, 0.039 and 0.047 inch). Shims (14) are used to adjust backlash between bevel pinion gear. Recommended backlash is 0.1-0.2 mm (0.004-0.008 inch). Shims (14) are available in thicknesses of 0.2, 0.3 and 0.5 mm (0.008, 0.012 and 0.020 inch). Recommended pinion shaft end play is zero. Shims are available to adjust mesh position. After adjustment, add shims under retainer plate until zero end play is attained.

Reassemble outer cover, outer drive housing, gearcase and drive components as outlined in paragraph 13. Remove plug (11 - Fig. 9) and refill differential case with 1.5 liters (1.6 U.S. quarts) of SAE 80 gear lube. Reinstall and tighten plug (11).

**ENGINE**

**All Models**

**18. REMOVE AND REINSTALL.** Drain engine oil and transmission/hydraulic system fluid into suitable containers. Remove front axle assembly as outlined in paragraph 2 for all two-wheel drive models, paragraph 3 for Models B5100D, B6100D, B6100HST-D and B7100D and paragraph 4 for Model B7100HST-D. Detach electrical wiring at engine starter, oil pressure sending unit, glow plugs and alternator. Remove starter. Disconnect fuel leak-off line from rear injector, close fuel shut-off valve at fuel filter, then disconnect fuel supply line from fuel pump. Remove line connecting fuel tank to fuel filter at

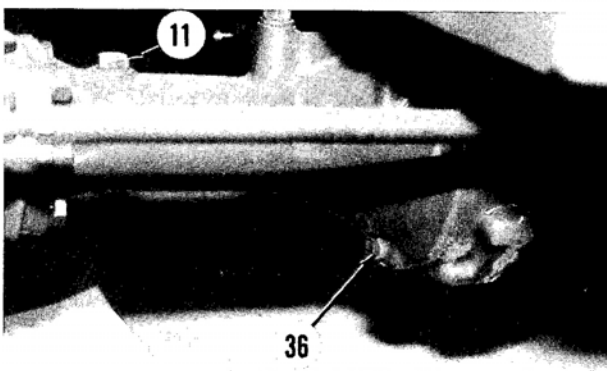


Fig. 9 - Note location of front-axle drain plug (36) and fill plug (11) used on Model B7100HST-D.

filter port and plug openings to prevent fuel spillage. Remove fuel filter assembly and fuel tank. Disconnect throttle linkage and compression release cable. Remove heat insulator plate located at rear of engine. Remove hydraulic fluid supply lines; note copper washers and "O" rings when disassembling. Attach a suitable hoist or holding fixture to engine assembly and support rear of tractor with a suitable jack. Remove the eight cap screws connecting engine to clutch housing. Pull engine along with clutch assembly straight forward to separate engine from clutch housing.

Reassembly is reverse order of disassembly. Tighten the eight cap screws securing engine to clutch housing to 19.7-29.5 N·m (15-22 ft.-lbs.) torque. Reinstall front axle assembly as outlined in appropriate paragraph. Replenish engine oil and transmission/hydraulic fluid with quantity and grade of lubri-

cant as noted in CONDENSED SERVICE DATA TABLE. Bleed fuel system as outlined in paragraph 36.

**COMPRESSION PRESSURE**

**All Models**

19. Compression pressure should be 2.7-3.1 MPa (398-454 psi). Allowable minimum pressure is 2.4 MPa (341 psi).

**VALVE TAPPET GAP**

**All Models**

20. **ADJUSTMENT.** Valve tappet gap should be adjusted with engine cold and piston at top dead center on compression stroke. Remove rocker cover and turn rocker arm adjusting screws so valve gap for both valves is 0.15-0.20 mm (0.006-0.008 inch).

**COMPRESSION RELEASE**

**All Models**

21. **ADJUSTMENT.** All models are equipped with a compression release. The compression release holds the exhaust valves open slightly when compression release lever (9—Fig. 13) is rotated to applied position by actuator cable.

To adjust compression release, rotate engine crankshaft so piston in cylinder being adjusted is at top dead center on compression stroke. Remove cover (3), loosen locknut (6) and back out adjusting screw (7). Pull out actuator knob to rotate compression release lever to engaged position. Turn adjusting screw (7) in until it contacts exhaust rocker arm, then turn screw an additional 1½ turns. Tighten locknut and adjust remaining cylinders. Check operation of

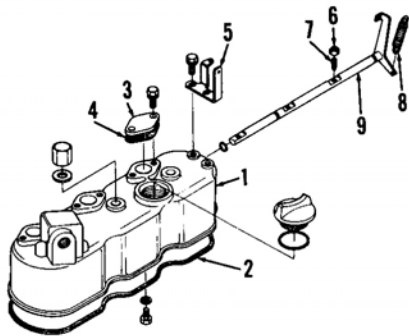


Fig. 13—View of valve cover and compression release components.

- 1. Valve cover
- 2. Gasket
- 3. Cover
- 4. Gasket
- 5. Bracket
- 6. Locknut
- 7. Compression release screw
- 8. Spring
- 9. Compression release shaft

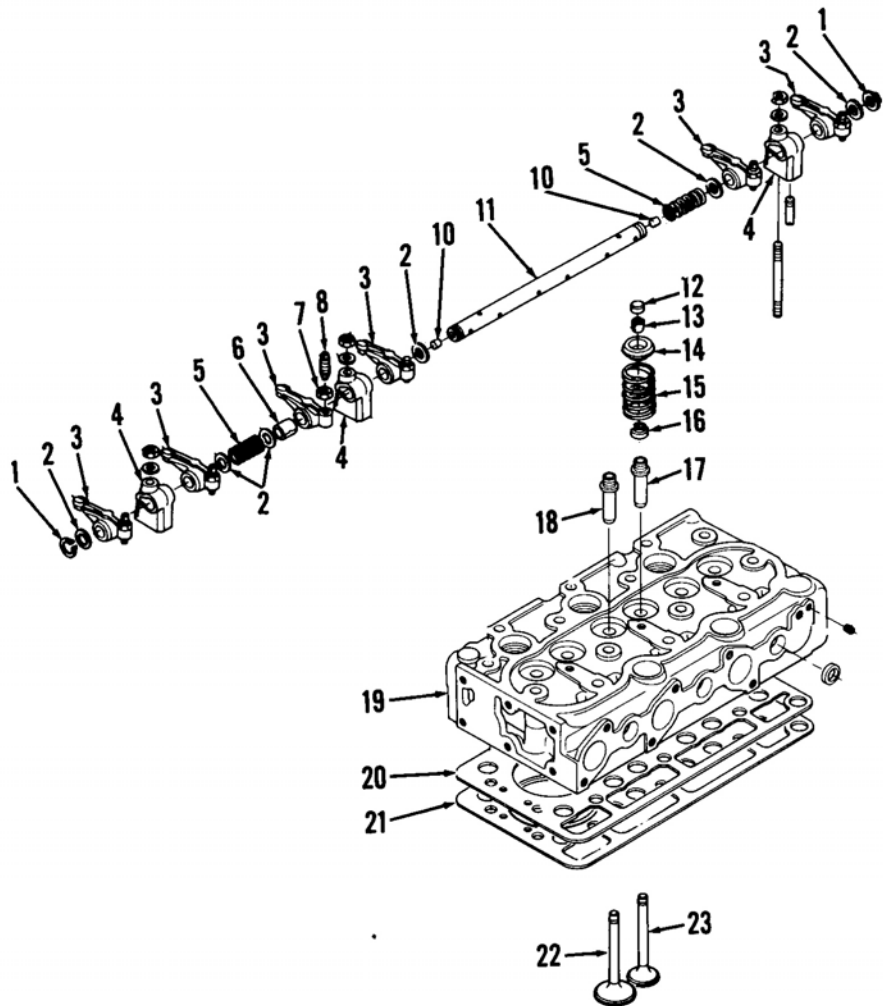


Fig. 15—Exploded view of cylinder head and valve train.

- 1. Snap ring
- 2. Washer
- 3. Rocker arm
- 4. Shaft stand
- 5. Spring
- 6. Bushing
- 7. Locknut
- 8. Adjusting screw
- 10. Set screw
- 11. Rocker shaft
- 12. Valve cap
- 13. Retainer keys
- 14. Retainer
- 15. Spring
- 16. Seal
- 17. Exhaust valve guide
- 18. Intake valve guide
- 19. Cylinder head
- 20. Shim
- 21. Gasket
- 22. Intake valve
- 23. Exhaust valve

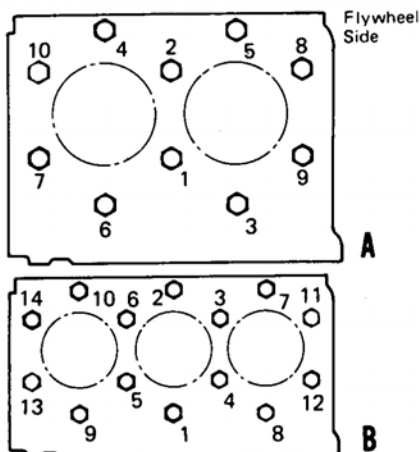


Fig. 14—Follow sequence in diagram A when tightening cylinder head fasteners on two-cylinder models or diagram B on three-cylinder models.

compression release being sure exhaust valves do not contact pistons.

**CYLINDER HEAD**

**All Models**

**22. R&R AND OVERHAUL.** To remove cylinder head, drain coolant from radiator and cylinder block. Disconnect battery ground wire. Disconnect electrical wiring at glow plugs, alternator and any other location that will obstruct cylinder head removal. Remove radiator hose from cylinder head water outlet. Remove air cleaner and exhaust manifold. Disconnect compression release cable. Remove fan belt. Remove high pressure fuel lines to all injector nozzles, disconnect fuel leak-off line from rear injector, then remove injectors. Be sure to cover all openings in fuel lines and fuel passages to prevent entrance of dirt. Remove rocker arm cover. Unbolt rocker arm assemblies, then withdraw rocker arms, stands and push rods. Loosen cylinder head retaining screws evenly one-half turn at a time to prevent warpage, then remove screws and lift cylinder head from block.

Check flatness of head surface using a straightedge placed along sides and across mating surface. Insert a feeler gage between straightedge and surface. Maximum allowable distortion is 0.05 mm (0.002 inch) per 100 mm (4 inches). If distortion is beyond limit, then head must be resurfaced. If head is resurfaced, check valve-to-piston clearance as outlined in following paragraph.

To check valve-to-piston clearance, install head and gasket with valves and springs installed but with injectors removed. Tighten head fasteners to 42-47 N·m (31-35 ft.-lbs.) torque following sequence shown in Fig. 14. Using a suitable measuring gage such as soft solder or Plastigage, insert gage between each valve and piston crown while rotating crankshaft through top dead center. Minimum allowable valve-to-piston clearance is 0.6 mm (0.024 inch). Clearance may be increased by installing a shim gasket (20—Fig. 15) between cylinder head (19) and head gasket (21). Shim gasket thickness is 0.2 mm (0.0079 inch).

Reverse removal procedure to reinstall cylinder head. Refer to Fig. 14 for cylinder head tightening sequence.

Tighten cylinder head securing cap screws to 42-47 N·m (31-35 ft.-lbs.) torque. Tighten rocker arm stands to 16.7-20.6 N·m (12-15 ft.-lbs.) torque. Tighten injector nozzle nut to 29.4-49.0 N·m (22-36 ft.-lbs.) torque. Adjust valve tappet gap as outlined in paragraph 20. Adjust compression release as outlined in paragraph 21.

**VALVE SYSTEM**

**All Models**

**23.** Both valves ride directly in cylinder head. Maximum allowable clearance between valve stem and valve guide is 0.035-0.065 mm (0.0014-0.0026 inch). Valve guide diameter should be 7.010-7.025 mm (0.2760-0.2766 inch) while valve stem diameter should be 6.960-6.975 mm (0.2740-0.2746 inch).

Valves seat directly in head. Valve seat and face angles are 45 degrees. Valve seat width should be 2.1 mm (0.083 inch). When depth of valve head from cylinder head surface exceeds 1.1 mm (0.043 inch), then head surface should be machined.

Valve springs are interchangeable. Valve spring free length should be 35.1-35.6 mm (1.382-1.402 inches) while installed height is 31 mm (1.22 inches). Valve spring pressure at installed height should be 74 Newtons (16.5 lbs.) with a minimum allowable pressure of 63 Newtons (14 lbs.).

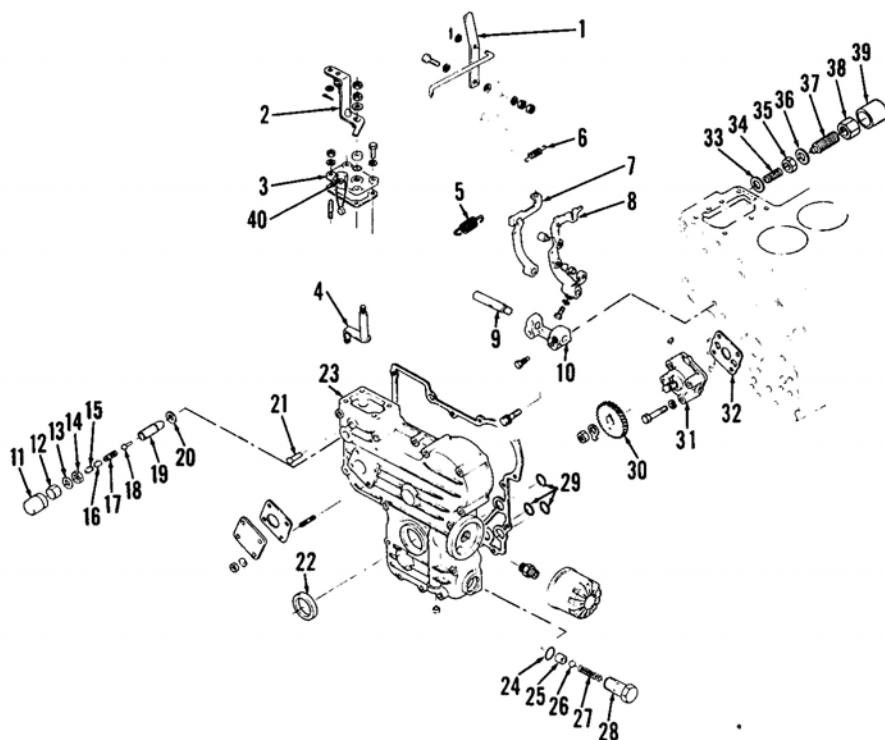
Rocker arm bushings (6—Fig. 15) are renewable. Bushing ID should be 10.997-11.038 mm (0.4330-0.4346 inch). Rocker shaft OD should be 10.973-10.984 mm (0.4320-0.4324 inch). Maximum allowable clearance between shaft and rocker arm bushing is 0.12 mm (0.0047 inch).

**TIMING GEARS AND COVER**

**All Models**

**24. REMOVE AND REINSTALL.** To remove timing gear cover, remove cover just below injection pump and detach governor spring (5—Fig. 16) from governor arm (7). Detach control linkage to control lever (2). If radiator obstructs crankshaft pulley removal, then drain coolant and relocate radiator. Remove fan belt and fan, then unscrew crankshaft pulley nut and using a suitable puller, remove crankshaft pulley. Unscrew and remove timing gear cover.

Refer to Fig. 17 for proper alignment of timing marks on crankshaft, idler, camshaft and injection pump camshaft gears. Backlash between any two gears should be 0.04-0.12 mm (0.002-0.005 inch). Refer to appropriate sections for gear service.



**Fig. 16—Exploded view of timing gear cover and associated components. Be sure "O" rings (29) are in place when installing cover (23).**

- |                     |                                 |                                    |                           |
|---------------------|---------------------------------|------------------------------------|---------------------------|
| 1. Speed control    | 12. Cap nut                     | 21. Start spring pin               | 31. Oil pump              |
| 2. Control lever    | 13. Gasket                      | 22. Seal                           | 32. Gasket                |
| 3. Plate            | 14. Locknut                     | 23. Timing gear cover              | 33. Gasket                |
| 4. Control arm      | 15. Maximum fuel limiting screw | 24. "O" ring                       | 34. Spring                |
| 5. Governor spring  | 16. Spacer                      | 25. Oil pressure relief valve seat | 35. Locknut               |
| 6. Start spring     | 17. Spring                      | 26. Relief valve ball              | 36. Gasket                |
| 7. Governor arm     | 18. Pin                         | 27. Spring                         | 37. Low idle speed screw  |
| 8. Pump control arm | 19. Maximum fuel limiting body  | 28. Valve body                     | 38. Cap nut               |
| 9. Pivot pin        | 20. Gasket                      | 29. "O" rings                      | 39. Cap                   |
| 10. Pivot block     |                                 | 30. Pump gear                      | 40. High idle speed screw |
| 11. Cap             |                                 |                                    |                           |

When installing timing gear cover, be sure the three "O" rings (29 - Fig. 16) are in place. Tighten timing cover screws to 9.8-11.3 N·m (7-8 ft.-lbs.) torque. Tighten crankshaft pulley nut to 137.3-156.9 N·m (101-115 ft.-lbs.) torque.

**PISTON AND ROD UNITS**

**All Models**

**25. REMOVE AND REINSTALL.** Piston and connecting rod are removed as a unit after removing oil pan, oil pickup and cylinder head. Unscrew rod cap retaining screws, detach rod cap and extract piston and rod.

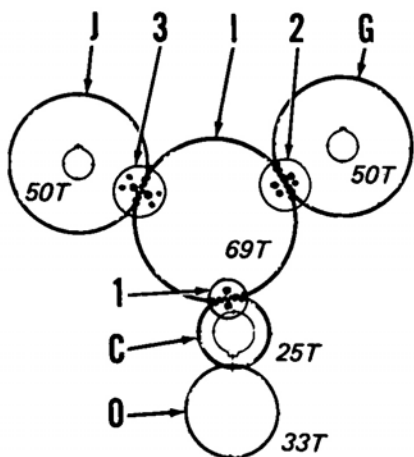
Note that numbers are stamped on sides of rod and cap and should be on same side when assembled. Install piston and rod units so numbers on rod and cap are toward fuel injection pump side of engine. Tighten rod screws to 26-30 N·m (20-22 ft.-lbs.) torque.

**PISTON AND RINGS**

**All Models**

**26.** All models are equipped with two compression rings and an oil control ring surrounding an aluminum, cam-ground piston. Piston and rings are available in 0.5 mm (0.02 inch) oversize.

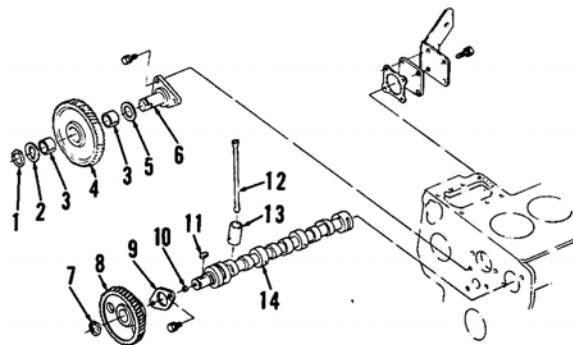
Standard piston diameter measured at skirt perpendicular to piston pin is 64 mm (2.52 inches) on Models B6100D, B6100E, B6100HST-D and B6100HST-E and 68 mm (2.68 inches) on Models B5100D, B5100E, B7100D, B7100HST-D and B7100HST-E. Piston-to-cylinder clearance should be 0.069-0.089 mm (0.0027-0.0035 inch) on Models B6100D,



**Fig. 17 - Diagram of drive gears showing proper alignment of timing marks. Note three marks (3) on injection pump gear (J) and idler gear (I); two marks (2) on camshaft gear (G) and idler gear (I); single marks on crankshaft gear (C) and idler gear (I). No marks are used on oil pump gear (O).**

**Fig. 18 - Exploded view of camshaft and idler gear assemblies.**

1. Snap ring
2. Slotted washer
3. Bushing
4. Idler gear
5. Washer
6. Idler shaft
7. Snap ring
8. Gear
9. Retainer
10. Plug
11. Key
12. Push rod
13. Tappet
14. Camshaft



B6100E, B6100HST-D and B6100HST-E and 0.055-0.094 mm (0.0022-0.0037 inch) on Models B5100D, B5100E, B7100D, B7100HST-D and B7100HST-E.

Piston pin boss inner diameter should be 20.000-20.013 mm (0.7874-0.7879 inch) for all models with wear limit of 20.04 mm (0.789 inch).

Piston ring end gap is 0.25-0.40 mm (0.0098-0.0158 inch) for compression rings and 0.20-0.40 mm (0.0078-0.0158 inch) for oil control ring on all models. Maximum wear limit for any ring is 1.25 mm (0.0492 inch). The top compression ring is a keystone type and side clearance is not measured. Side clearance for second compression ring should be 0.085-0.112 mm (0.0033-0.0044 inch) and for oil control ring should be 0.020-0.052 mm (0.0008-0.0020 inch).

**PISTON PIN**

**All Models**

**27.** A full floating piston pin is used on all models. Piston pin OD should be 20.002-20.011 mm (0.7875-0.7878 inch). Clearance between pin and piston bosses should be 0.011 mm (0.0004 inch) interference to 0.011 mm (0.0004 inch) loose. Clearance between pin and connecting rod bushing should be 0.014-0.038 mm (0.0006-0.0015 inch).

**CONNECTING ROD AND BEARINGS**

**All Models**

**28.** Connecting rods are equipped with a renewable bushing in the small end and insert type bearings in the big end. Inner diameter of big end bearing should be 37.004-37.046 mm (1.4568-1.4585 inches) while clearance between bearing and crankpin should be 0.029-0.087 mm (0.0011-0.0034 inch). Bearings are available in 0.25 mm (0.0098 inch) undersize.

Small end bushing inner diameter is 20.025-20.040 mm (0.788-0.789 inch). Clearance between piston pin and bush-

ing is 0.014-0.038 mm (0.0006-0.0015 inch).

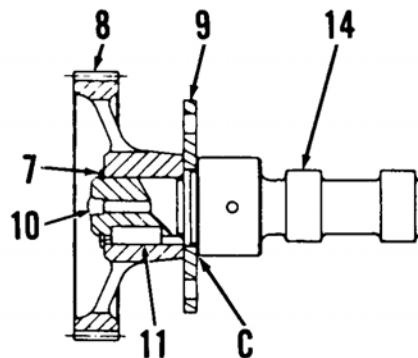
Tighten connecting rod cap screws to 26-30 N·m (20-22 ft.-lbs.) torque.

**CAMSHAFT**

**All Models**

**29. R&R AND OVERHAUL.** To remove camshaft, remove cylinder head as outlined in paragraph 22 and timing gear cover as outlined in paragraph 24, then remove tappets. Unscrew camshaft retainer plate (9 - Fig. 18) and withdraw camshaft from cylinder block. If necessary, press camshaft gear (8) off camshaft (14).

Camshaft lobe height should be 26.88 mm (1.0583 inches) with a wear limit of 26.83 mm (1.0563 inches). Camshaft bearing journal diameter should be 32.934-32.950 mm (1.2966-1.2972 inches) while inner diameter of renewable camshaft bearings is 33.000-33.025 mm (1.2992-1.3002 inches). Clearance between camshaft journal bearing should be 0.050-0.091 mm (0.0020-0.0036 inch). With camshaft supported in V-blocks at outer bearing journals, maximum allowable runout measured at either center bearing journal is 0.08 mm (0.0031 inch).



**Fig. 19 - Install gear (8) on camshaft (14) so there is 0.07-0.22 mm (0.0028-0.0087 inch) clearance (C) between retainer (9) and side of front camshaft journal. Refer to legend in Fig. 18 for identification of remaining components.**

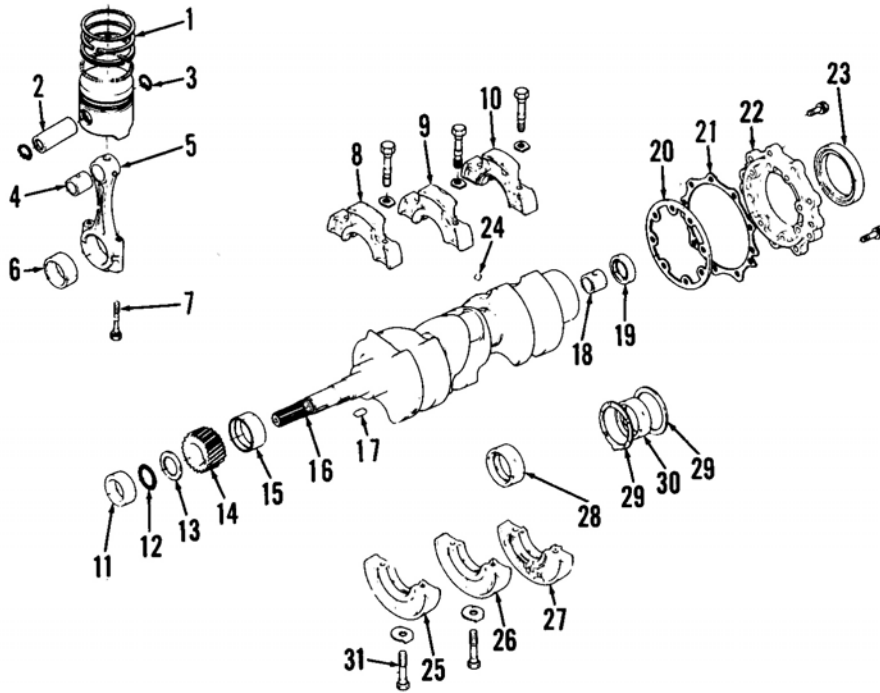


Fig. 20—Exploded view of piston, rod and crankshaft assembly.

- |                                       |                  |  |
|---------------------------------------|------------------|--|
| 1. Piston rings                       | 11. Spacer       | 23. Seal                               |
| 2. Piston pin                         | 12. "O" ring     | 24. Plug                               |
| 3. Retainer                           | 13. Oil slinger  | 25. Lower bearing carrier half, front  |
| 4. Bushing                            | 14. Gear         | 26. Lower bearing carrier half, middle |
| 5. Connecting rod                     | 15. Bearing      | 27. Lower bearing carrier half, rear   |
| 6. Bearing                            | 16. Crankshaft   | 28. Main bearing                       |
| 7. Screw                              | 17. Key          | 29. Thrust washers                     |
| 8. Upper bearing carrier half, front  | 18. Bushing      | 30. Rear main bearing                  |
| 9. Upper bearing carrier half, middle | 19. Seal         | 31. Locator screw                      |
| 10. Upper bearing carrier half, rear  | 20. Gasket       |  |
|                                       | 21. Gasket       |  |
|                                       | 22. Seal carrier |  |

When installing camshaft gear on camshaft, first install retainer (9). Heat camshaft gear to approximately 80°C (176°F) and push gear onto camshaft until there is 0.07-0.22 mm (0.0028-0.0087 inch) clearance between retainer and side of camshaft journal as shown in Fig. 19. Refer to paragraph 24 to properly align camshaft gear timing marks during installation.

**CRANKSHAFT AND BEARINGS**

**All Models**

**30. R&R AND OVERHAUL.** Remove engine as outlined in paragraph 18. To remove crankshaft, remove pistons and rods, timing gear cover, crankshaft gear, flywheel and seal carrier (22—Fig. 20). Free bearing carriers (25, 26 and 27) by unscrewing locating screws (31—Fig. 20 or 21). Carefully withdraw crankshaft and bearing carrier assembly out rear of cylinder block. Note that bearing carriers are a tight fit in cylinder block to prevent oil loss between oil passages in block and bearing carriers. Remove screws securing bearing carrier halves and separate halves from crankshaft. Note that main

bearing carriers are not interchangeable.

Standard main journal diameter is 43.934-43.950 mm (1.7297-1.7303 inches). Main bearing clearance for front bearing (15—Fig. 20) should be 0.034-0.106 mm (0.0013-0.0042 inch) while clearance for all other bearings should be 0.34-0.92 mm (0.0013-0.0036 inch). Main bearings are offered in 0.20 and 0.40 mm (0.0079 and 0.0157 inch) undersizes.

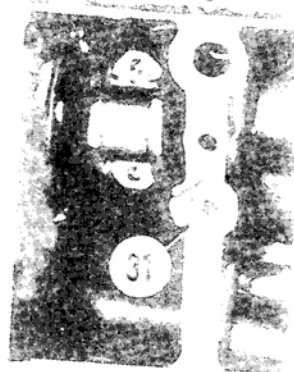


Fig. 21—View showing location of locating screw (31) which secures bearing carrier to block.

Crankshaft end play should be 0.15-0.31 mm (0.0059-0.0122 inch) and is controlled by thrust washers (29) which are available in 0.20 and 0.40 mm (0.0079 and 0.0157 inch) oversizes. Install thrust washers so grooved side is away from bearing carrier.

Standard size of crankpin journals is 36.959-36.975 mm (1.4551-1.4557 inches). Rod bearings are offered in 0.20 and 0.40 mm (0.0079 and 0.0157 inch) under-size.

To reinstall crankshaft, reverse removal procedure. Tighten rear bearing carrier screws to 19.6-23.5 N·m (15-18 ft.-lbs.) torque and screws of center bearing carriers to 29.4-34.3 N·m (21-26 ft.-lbs.) torque. Tighten carrier locating screws (31) to 29.4-34.3 N·m (21-26 ft.-lbs.) torque. Install seal carrier so top mark is towards head surface and tighten screws in a diagonal pattern to 9.8-11.8 N·m (7-9 ft.-lbs.) torque.

Reassembly is reverse order of removal. Reinstall piston and rod units as outlined in paragraph 25. Tighten timing cover screws to 9.8-11.3 N·m (7-8 ft.-lbs.). Tighten flywheel cap screws as outlined in paragraph 33. With reference to paragraph 18, reinstall engine in reverse order of removal.

**CYLINDER LINER**

**All Models**

**31. REMOVE AND REINSTALL.** All models are equipped with dry type cylinder liners. Use suitable removal and installation tools to renew defective liners. Install cylinder liner so distance from top of liner to cylinder block head surface is plus or minus 0.025 mm (0.001 inch).

Standard inner diameter of cylinder liner is 64.000-64.019 mm (2.5197-2.5204 inches) on Models B6100D, B6100E, B6100HST-D and B6100HST-E and 68.000-68.019 mm (2.6772-2.6779 inches) on Models B5100D, B5100E, B7100D, B7100HST-D and B7100HST-E. The cylinder liner may be bored for 0.5 mm (0.02 inch) oversize piston installation.

**OIL PUMP**

**All Models**

**32. R&R AND OVERHAUL.** To remove oil pump, first remove timing gear cover as outlined in paragraph 24, then unscrew and remove pump.

Clearance between inner and outer rotor measured as shown in Fig. 22 should be 0.11-0.15 mm (0.0043-0.0059 inch) with an allowable limit of 0.20 mm (0.0079 inch). Clearance between outer

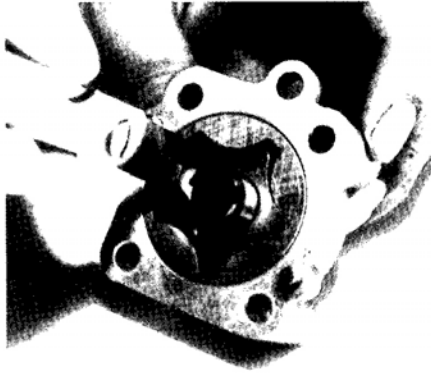


Fig. 22—Measure clearance between inner and outer oil pump rotors as shown. Desired clearance is 0.11-0.15 mm (0.0043-0.0059 inch).

rotor and pump body measured as shown in Fig. 23 should be 0.07-0.15 mm (0.0028-0.0059 inch) with an allowable limit of 0.25 mm (0.0098 inch). Individual pump components are not available; pump must be serviced as a complete unit.

Oil pressure relief ball (26—Fig. 16) and spring (27) are located in timing gear cover. Oil pump unrestricted delivery pressure should be 200-400 kPa (28-64 psi). Relief valve opening pressure is 290-340 kPa (43-50 psi) and is non-adjustable. Tighten screws securing pump to 9.8-11.8 N·m (7-9 ft.-lbs.) torque.

**FLYWHEEL**

**All Models**

**33. REMOVE AND REINSTALL.** Separate engine from clutch housing as outlined in paragraph 52. Remove cap screws securing flywheel to rear of crankshaft.

Retaining cap screws should be tightened to 53.9-58.8 N·m (40-43 ft.-lbs.) torque. Flywheel runout and wobble should not exceed the limit of

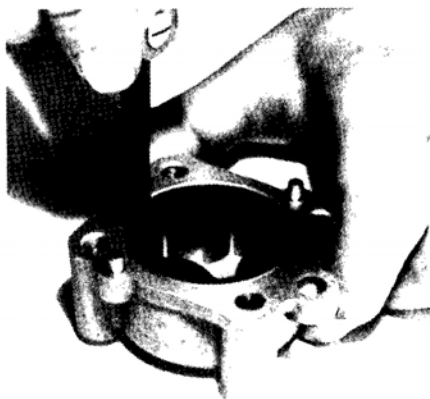
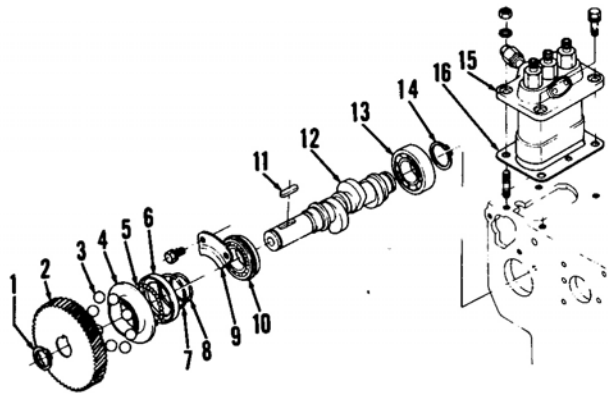


Fig. 23—Measure clearance between outer rotor and oil pump body as shown. Desired clearance is 0.07-0.15 mm (0.0028-0.0059 inch).

Fig. 24—Exploded view of injection pump camshaft and governor components.

1. Snap ring
2. Gear
3. Large governor balls (8)
4. Sleeve
5. Small governor balls (30)
6. Governor case
7. Retainer ring
8. Retainer ring
9. Bearing retainer
10. Bearing
11. Key
12. Injection pump camshaft
13. Bearing
14. Snap ring
15. Injection pump
16. Shim gasket



0.15 mm (0.0059 inch). Readjust flywheel position if measured reading is beyond limit. With reference to paragraph 52, reinstall engine to clutch housing in reverse order of removal.

**GOVERNOR**

**All Models**

**34. R&R AND OVERHAUL.** All models are equipped with a flyball type governor mounted on front end of fuel injection pump camshaft. Refer to Figures 16 and 24 for exploded views of governor mechanism. Ball movement against governor sleeve (4—Fig. 24) actuates control arm (8—Fig. 16) which is connected to fuel injection control rack. Flyball movement is balanced by governor spring (5).

Governor components are accessible after removing timing gear cover as outlined in paragraph 24. Inspect components and renew any which are excessively worn or damaged.

Low idle speed for all models is 750-800 rpm and is adjusted by turning idle speed screw (37—Fig. 16). High idle speed and maximum fuel limiting screws are sealed and should be adjusted by qualified personnel only. High idle speed should be 3000 rpm on Models B5100D and B5100E and 2800 rpm for all other models. Turn high idle speed screw (40) for adjustment.

Maximum fuel limiting stop should be set to prevent excessive smoke level at slight overload. To make adjustment, remove seal cap, loosen jam nut and turn spring housing (19) in to lower smoke level or out to raise smoke level.

**DIESEL FUEL SYSTEM**

Because of extremely close tolerances and precise requirements of all diesel components, it is of utmost importance that only clean fuel is used and careful maintenance be practiced at all times. Unless necessary special tools are available, service on injectors and injection pumps should be limited to removal, installation and exchange of complete assemblies. It is impossible to recalibrate an injection pump or reset an injector without proper specifications, equipment and training.

**FUEL FILTERS AND LINES**

**All Models**

**35. OPERATION AND MAINTENANCE.** Filter life depends upon careful maintenance as well as hours of operation and condition of operation. Necessity for careful filling with **CLEAN** No. 2 diesel fuel (No. 1 diesel fuel may be used when conditions are -10°C (15°F) or below) cannot be overstressed. To minimize contamination of

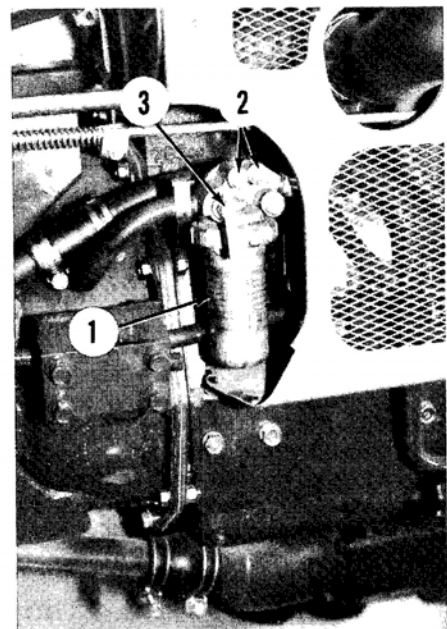


Fig. 25—View showing fuel filter pot (1), bleeding screws (2) and fuel shut-off valve (3).



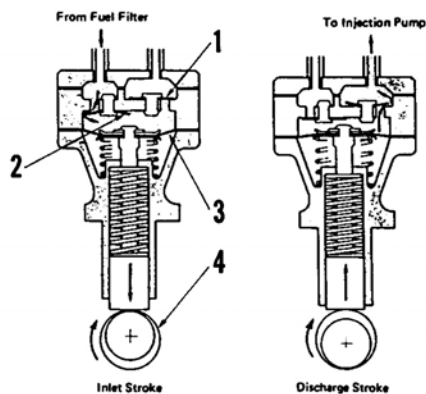


Fig. 25A—Cross-sectional views of fuel pump showing operation on inlet and discharge stroke.

- 1. Outlet reed valve
- 2. Inlet reed valve
- 3. Diaphragm
- 4. Fuel camshaft

diesel fuel system, the following precautions are recommended.

Fill fuel tank after use and before storage, to eliminate presence of humid air in tank and reduce contamination due to condensation.

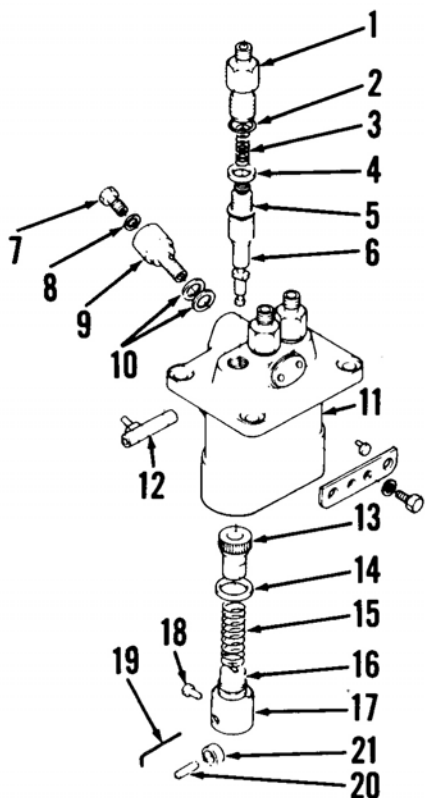


Fig. 26—Exploded view of fuel injection pump.

- 1. Delivery valve holder
- 2. "O" ring
- 3. Spring
- 4. Shim
- 5. Delivery valve assy.
- 6. Plunger
- 7. Air bleed screw
- 8. Gasket
- 9. Adapter
- 10. Gaskets
- 11. Pump body
- 12. Control rack
- 13. Control sleeve
- 14. Washer
- 15. Spring
- 16. Spring seat
- 17. Tappet
- 18. Guide pin
- 19. Pin
- 20. Pin
- 21. Roller

Remove filter pot (1—Fig. 25) and drain off any water at least every 100 hours (more often if trouble is suspected). Rinse out inside of pot and filter element with kerosene.

**NOTE: If filter element is severely contaminated, renewal is suggested.**

Check fuel lines for aging or leaks. Tighten all clamps periodically. Fuel lines should be renewed at least every two years unless damage is noted earlier.

**36. BLEED FUEL SYSTEM.** The fuel system should be bled if fuel tank is allowed to run dry, if fuel lines, filter or other components within the system have been disconnected or removed, or if engine has not operated for a long period of time. If engine fails to start or if it starts, then stops, the cause could be air in the system, which should be removed by bleeding.

To bleed fuel system, make sure fuel tank has a sufficient amount of fuel, then open fuel shut-off valve (3—Fig. 25). Unscrew bleeding screws (2) two to three turns. Allow fuel to drain from bleed screw until air-free fuel appears, then tighten bleed screws. Open air bleed screw (7—Fig. 26) and place throttle lever in fully closed position. Turn engine over for approximately 10 seconds, then close screw (7) when air bubbles disappear from fuel. Disconnect high pressure fuel lines from injectors. Rotate engine, then reconnect fuel lines when air-free fuel flows from fuel lines.

**FUEL PUMP**

**All Models**

36A. Fuel pump mounts to right side of engine beneath injection pump assembly. Fuel pump is driven by a cam on the fuel camshaft. A diaphragm and two reed valves are used to draw fuel into pump chamber on the downward stroke and discharged on the upward stroke. Valves allow fuel to flow only in one direction. A cross-sectional view of pump operation is shown in Fig. 25A. Pump normal operating pressure is 20 kPa (2.8 psi).

**INJECTION PUMP**

**All Models**

**37. INJECTION PUMP TIMING.** Start of injection should occur at 25° BTDC, or when "FI" flywheel timing mark aligns with end plate timing mark as shown in Fig. 27.

To check timing, disconnect fuel pressure lines from injection pump. Make sure fuel system is properly bled.

Move throttle control to full open position. Pull decompressor knob out and turn engine slowly until wetness appears at one of the disconnected fittings. Look through inspection window, timing marks should be aligned.

To adjust ignition timing, remove injection pump as outlined in following paragraph and add or delete shims (16—Fig. 24). Each shim alters timing approximately 1½ crankshaft degrees. Add shims to retard timing or delete shims to advance timing.

**38. REMOVE AND REINSTALL.**

While noting position of each screw, remove the four injection pump cover securing screws. Lightly tap cover with a suitable mallet to remove. Use a pair of pliers and unhook governor spring from lever arm leaving spring in housing. Remove cap screws and nuts retaining injection pump. Withdraw injection pump, care must be used when control rod is separated from control arm.

The injection pump should be tested and overhauled by a shop qualified in diesel injection pump repair.

The injection pump tappets are actuated by lobes on injection pump camshaft (12—Fig. 24). Inspect camshaft each time injection pump is removed.

Installation is reverse order of removal. Tighten pump retaining cap screws and nuts to 24-27 N·m (17-20 ft.-lbs.) and refer to previous section to adjust injection pump timing.

**INJECTOR**

**All Models**

**WARNING: Fuel emerges from injector with sufficient force to penetrate the skin. When testing injector, keep yourself clear of nozzle spray.**

**39. REMOVE AND REINSTALL.** Before removing an injector, or loosening injector lines, thoroughly clean inje-

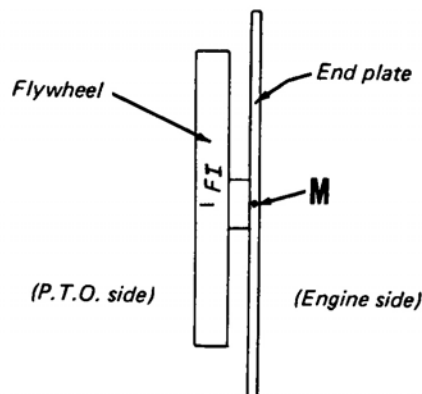


Fig. 27—View of "FI" injection timing mark on flywheel and timing mark (M) on end plate. Refer to text.

tor, lines and surrounding area using compressed air and a suitable solvent.

To remove injector unit, first remove high pressure line leading from injection pump to injector. Disconnect bleed line by removing nut and banjo fitting, or by pulling line(s) from banjo nipple fitting (2—Fig. 28). With pressure and bleed-back lines removed, unscrew injector from its mounting position on cylinder head.

When installing injector, make sure that machined seating surface in cylinder head is completely clean and free from carbon build-up. Use a new copper washer underneath injector nozzle and tighten injector carefully to 29-49 N·m (22-36 ft.-lbs.) torque.

**40. TESTING.** A complete job of testing and adjusting the injector requires use of special test equipment. Only clean, approved testing oil should be used in tester tank. Nozzle should be tested for opening pressure, seat leakage and spray pattern. When tested,

nozzle should open with a high-pitched buzzing sound, and cut off quickly at end of injection with a minimum of seat leakage and a controlled amount of back leakage.

Before conducting test, operate tester lever until fuel flows, then attach injector. Close valve to tester gage and pump tester lever for a few quick strokes to be sure nozzle valve is not stuck, and that possibilities are good that injector can be returned to service without disassembly.

**41. OPENING PRESSURE.** Open valve to tester gage and operate tester slowly while observing gage reading. Opening pressure should be 13.7 MPa (1988 psi).

Opening pressure is adjusted by adding or removing shims in shim pack (5—Fig. 28). Adding or removing one 0.1 mm (0.004 inch) thickness shim will change opening pressure approximately 980 kPa (142 psi).

**42. SEAT LEAKAGE.** Nozzle tip should not leak at a pressure less than 12.7 MPa (1846 psi). To check for leakage, actuate tester lever slowly and as gage needle approaches suggested test pressure, observe nozzle tip. Hold pressure for 10 seconds; if drops appear or nozzle tip becomes wet, valve is not seating and injector must be disassembled and overhauled as outlined in paragraph 44.

**NOTE: Leakage of tester valve or connections will cause a false reading, showing up in this test as fast leakback. If a series of injectors fail to pass this test, the tester rather than injector units should be suspected.**

**43. SPRAY PATTERN.** Spray pattern should be well atomized and slightly conical, emerging in a straight axis from nozzle tip. If pattern is wet, ragged or intermittent, nozzle must be overhauled or renewed.

**44. OVERHAUL.** Hard or sharp tools, emery cloth, grinding compound or other than approved solvents or lapping compounds must never be used. An approved nozzle cleaning kit is available through a number of specialized sources.

Wipe all dirt and loose carbon from exterior of nozzle and holder assembly. Refer to Fig. 28 for exploded view and proceed as follows:

Secure pressure fitting (4) in a soft-jawed vise or holding fixture and remove nozzle nut (10). Place all parts in clean calibrating oil or diesel fuel as they are removed, using a compartmented pan and using extra care to keep parts from each injector together and separate from other units.

Clean exterior surfaces with a brass wire brush, soaking in an approved carbon solvent, if necessary, to loosen hard carbon deposits. Rinse parts in clean diesel fuel or calibrating oil immediately

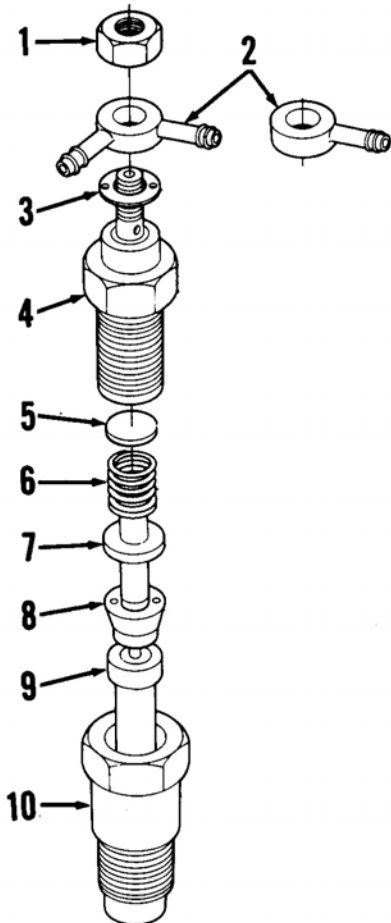


Fig. 28—Exploded view of injector.

- |                     |                   |
|---------------------|-------------------|
| 1. Nut              | 6. Spring         |
| 2. By-pass fitting  | 7. Pressure pin   |
| 3. Washer           | 8. Spacer         |
| 4. Pressure fitting | 9. Nozzle & valve |
| 5. Shim             | 10. Nozzle nut    |

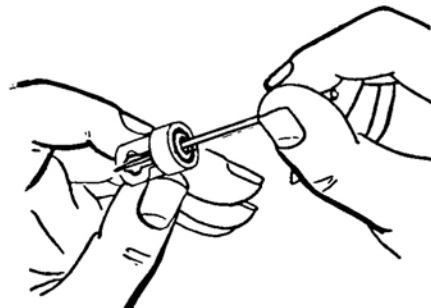


Fig. 29—Use a pointed hardwood stick to clean spray hole as shown.

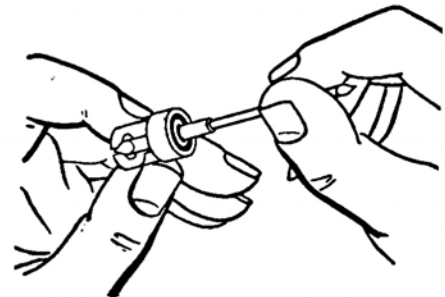


Fig. 31—Clean valve seat using brass scraper as shown.

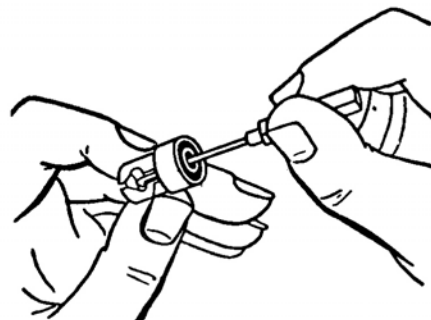


Fig. 30—Use hooked scraper to clean carbon from pressure chamber.

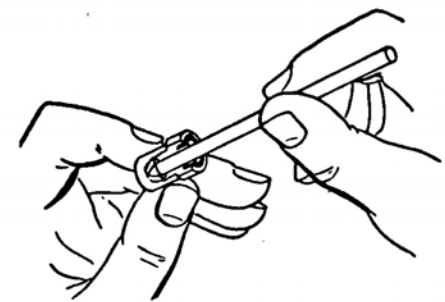


Fig. 32—Polish seat using polishing stick and mutton tallow.

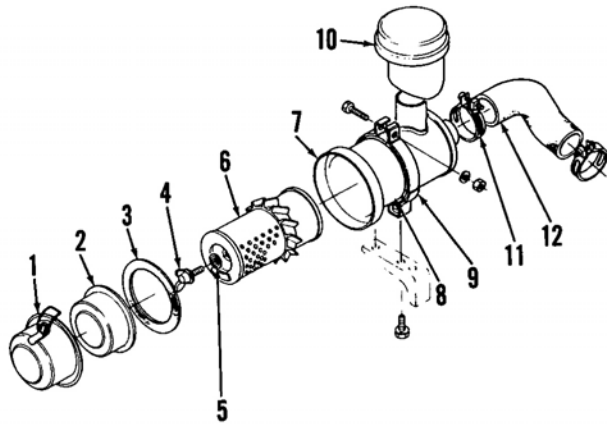


Fig. 33—Exploded view of a typical air filter assembly.

1. Cover
2. Baffle
3. Gasket
4. Wing screw
5. Gasket
6. Element
7. Housing
8. Cushion
9. Band
10. Cap
11. Clamp
12. Inlet hose

after cleaning to neutralize the solvent and prevent etching of polished surfaces.

Clean nozzle spray hole from inside using a pointed hardwood stick or wood splinter as shown in Fig. 29. Scrape all carbon from pressure chamber using hooked scraper as shown in Fig. 30. Clean valve seat using brass scraper as shown in Fig. 31, then polish seat using wood polishing stick and mutton tallow as in Fig. 32.

Back flush nozzle using reverse flusher adapter. Reclean all parts by rinsing thoroughly in clean diesel fuel or calibrating oil and assemble while parts are wet. Make sure adjusting shim pack is intact. Tighten nozzle retaining nut (10—Fig. 28) to a torque of 58.8-78.4 N·m (43-58 ft.-lbs.). Do not overtighten, distortion may cause valve to stick and

no amount of overtightening can stop a leak caused by scratches or dirt. Retest assembled injector as previously outlined.

### GLOW PLUGS

#### All Models

45. Glow plugs are parallel connected with each individual glow plug grounding through mounting threads like a spark plug. Turn key switch to preheat position. Indicator light will glow after about 10 seconds if unit is operating satisfactorily and will fail to glow if circuit is open. It will take at least 20 seconds until the preheating coil in the combustion chamber is fully heated.

Glow plugs are rated at 10 volt, 20 ampere capacity. If indicator light fails

### AIR FILTER

#### All Models

46. **INSPECTION.** All models are equipped with a dry type renewable air filter element as shown in Fig. 33. Manufacturer recommends blowing out filter after every 100 hours of operation and renewing filter every year or after six cleanings.

## COOLING SYSTEM

#### All Models

47. All engines are liquid cooled and use a thermo-siphon type cooling system. Note that cooling fan (1—Fig. 34) is mounted on alternator (2). Recommended pressure rating for radiator cap is 88.25 kPa (13 psi).

Recommended fan belt deflection under a load of 98 N (22 lbs.) applied at mid-point between fan pulley and tension pulley should be 10 mm (25/64-inch). Relocate tension pulley (10) to obtain desired belt tension.

## ELECTRICAL SYSTEM

### ALTERNATOR

#### All Models

48. Alternator is mounted on water outlet and drives cooling fan. Refer to Fig. 35 for an exploded view of alternator assembly.

Alternator should produce 14 volts maximum with a minimum charging current of 8½ amperes at alternator speed of 4250 rpm.

### ELECTRIC STARTER

#### All Models

49. Refer to Fig. 36 for an exploded view of Nippon Denso electric starter used on all models. Minimum brush

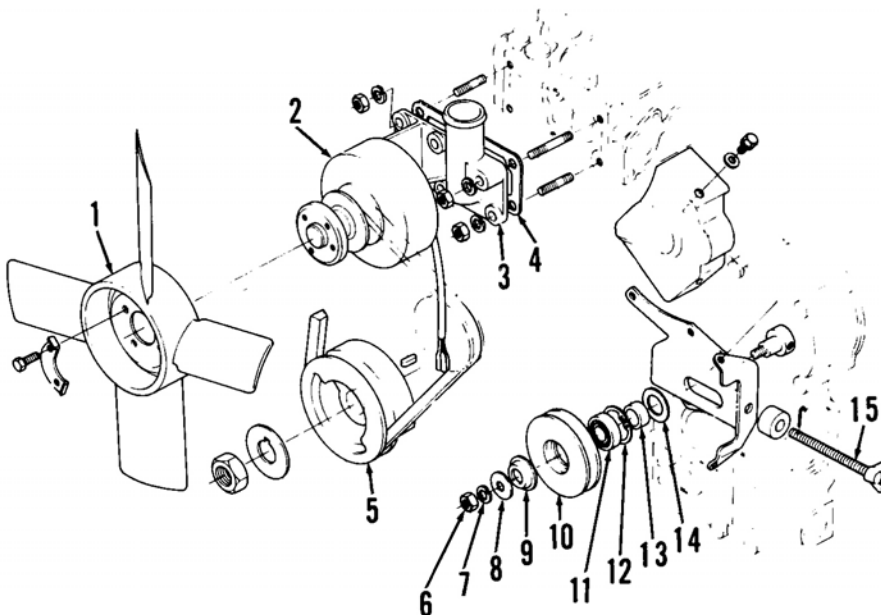


Fig. 34—View of alternator and tensioner pulley.

- |                 |                      |                      |                                  |
|-----------------|----------------------|----------------------|----------------------------------|
| 1. Fan          | 5. Crankshaft pulley | 9. Collar            | 13. Sleeve                       |
| 2. Alternator   | 6. Nut               | 10. Tensioner pulley | 14. Washer                       |
| 3. Water outlet | 7. Lockwasher        | 11. Bearing          | 15. Belt tension adjusting screw |
| 4. Gasket       | 8. Washer            | 12. Snap ring        |                                  |

length is 10.7 mm (0.4213 inch) while wear limit of commutator is 29.7 mm (1.1693 inches) diameter. With no load imposed on starter and using an 11 volt source, the starter shaft should rotate at 5000 rpm or more while drawing 50 or less amperes current.

Pinion engagement depth is adjusted by turning hook (H—Fig. 36). With starter pinion in engaged position, distance between collar (8) and pinion should be 0.1-0.4 mm (0.0039-0.0157 inch). Turn hook (H) so pinion engagement depth is correct.

## ENGINE CLUTCH

### LINKAGE

#### All Models

51. **ADJUSTMENT.** Clutch pedal free play should be 2-4 mm (5/64-5/32 inch). Clutch pedal travel should not exceed 8 mm (5/16-inch). Safety switch (1—Fig. 39) should not be engaged until clutch pedal is depressed past the recommended free play setting, placing clutch in disengaged position.

If clutch pedal free play is too little, then shorten intermediate rod (7). If

clutch is difficult to disengage, then lengthen intermediate rod (7). To adjust intermediate rod (7) length, unhook spring (8), remove cotter key (3), withdraw pin (4), loosen locknut (6) and turn clevis (5) until desired setting is attained, then retighten locknut (6). Reassemble using a new cotter key (3).

Adjust clutch pedal travel by loosening locknut (9—Fig. 40) and turning adjusting screw (10) until correct travel distance is attained, then retighten locknut.

Safety switch (1—Fig. 39) is adjusted on some models by loosening locknuts (11), then screwing switch in or out of mounting bracket. On other models, an adjusting screw positioned in lever arm is used.

## ENGINE/CLUTCH HOUSING SPLIT

#### All Models

52. Drain engine oil and transmission/hydraulic system fluid into suitable containers. Detach negative battery terminal from battery post. Remove air cleaner assembly, muffler and left and right side covers. Detach drag link from steering arm. Disconnect positive battery terminal from battery post. Discon-

nect electrical wiring at engine starter, oil pressure sending unit, headlights, glow plugs, alternator and safety switch. If needed, loosen front-wheel drive shaft protective cover band at joint case, then withdraw drive shaft from joint case. Disconnect throttle linkage and compression release cable. Disconnect fuel leak-off line from rear injector. Remove heat insulator plate located at rear of engine. Close fuel shut-off valve at fuel filter, then disconnect fuel supply line from fuel pump. Remove line con-

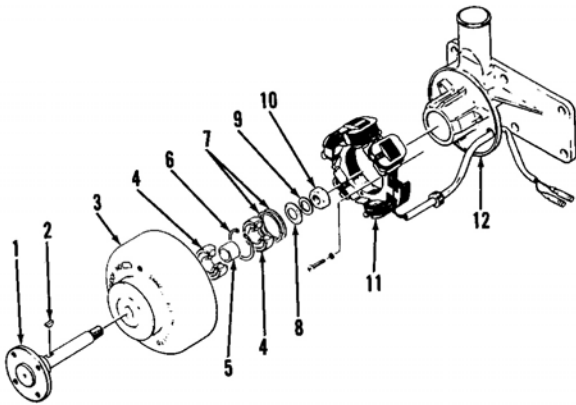


Fig. 35—Exploded view of alternator assembly.

1. Fan shaft
2. Key
3. Rotor
4. Bearing
5. Spacer
6. Snap ring
7. Shim(s)
8. Washer
9. Lockwasher
10. Nut
11. Stator
12. Water outlet & mounting base

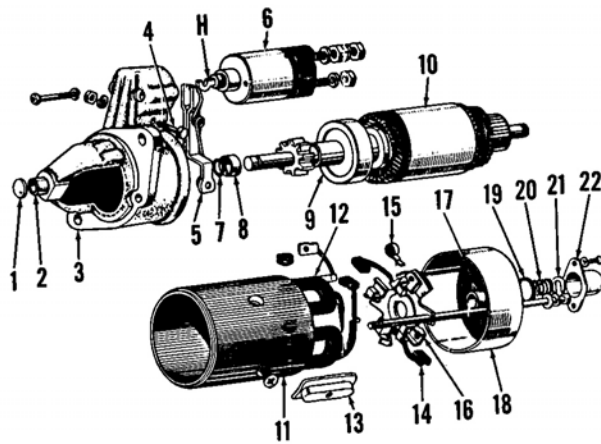


Fig. 36—Exploded view of electric starter.

1. Cap
2. Bushing
3. Drive housing
4. Pivot bolt
5. Fork
6. Solenoid
7. Snap ring
8. Collar
9. Starter drive
10. Armature
11. Frame
12. Field coils
13. Field magnets
14. Brush
15. Brush spring
16. Brush plate
17. Bushing
18. End frame
19. Packing
20. Spring
21. Spring retainer
22. Cap

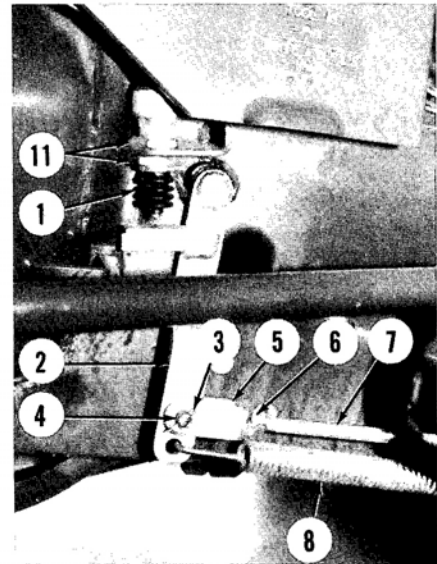


Fig. 39—View of clutch linkage used on Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E. Other models are similar.

1. Safety switch
2. Lever
3. Cotter key
4. Pin
5. Clevis
6. Locknut
7. Intermediate rod
8. Spring
11. Locknuts

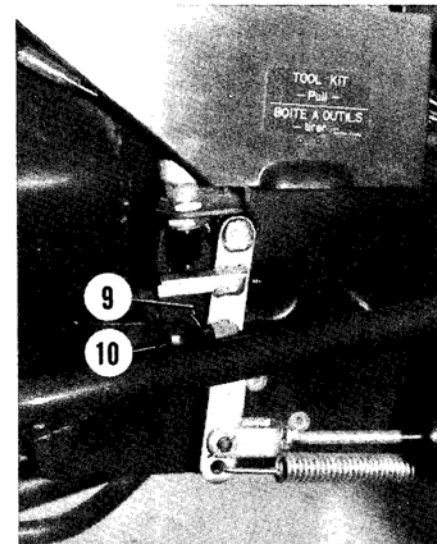


Fig. 40—View of locknut (9) and adjusting screw (10), used for adjusting clutch pedal travel.

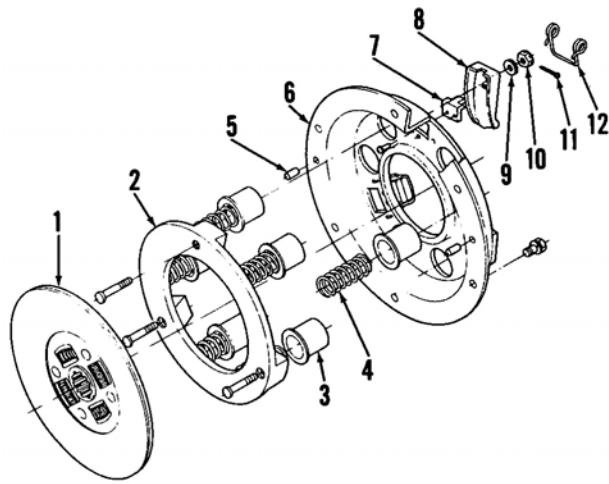


Fig. 41—Exploded view of clutch assembly used on all models.

1. Clutch disc
2. Pressure plate
3. Cap
4. Spring
5. Pin
6. Cover
7. Lever seat
8. Release lever
9. Washer
10. Castle nut
11. Cotter key
12. Return spring

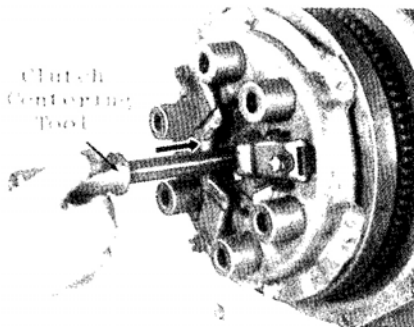


Fig. 42—Install clutch centering tool as shown.

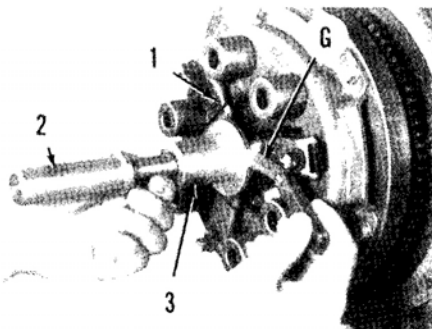


Fig. 43—To check release lever (1) height, install clutch centering tool (2) with measuring tool (3), then measure clearance between release lever (1) and measuring tool (3) with feeler gage (G). Refer to text.

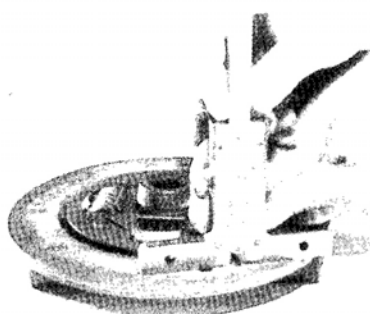


Fig. 44—View showing procedure for measuring clutch disc wear. Refer to text.

necting fuel tank to fuel filter at filter port and plug openings to prevent fuel spillage. Remove fuel filter assembly and fuel tank. Remove hydraulic fluid supply lines. Note copper washers and "O" rings when disassembling. Attach a suitable hoist or holding fixture to engine assembly and support rear of tractor with a suitable jack. Remove the eight cap screws connecting engine to clutch housing. Pull engine and front end assembly along with clutch assembly straight forward to separate engine from clutch housing.

Reinstall in reverse order of removal. Tighten the eight cap screws securing engine to clutch housing to 19.7-29.5 N·m (15-22 ft.-lbs.) torque. Replenish engine oil and transmission/hydraulic fluid with quantity and grade of lubricant as noted in CONDENSED SERVICE DATA TABLE. Bleed fuel system as outlined in paragraph 36.

**CLUTCH**

All Models

**53. REMOVE AND REINSTALL.** To remove clutch assembly for service, first split tractor between engine and clutch housing as outlined in paragraph 52. Insert clutch centering tool into clutch disc as shown in Fig. 42. Remove cap screws securing cover (6—Fig. 41) and pressure plate (2) assembly to flywheel, then withdraw pressure plate assembly. Remove clutch centering tool along with clutch disc (1).

Reinstall clutch assembly in reverse order of removal. Align clutch disc to engine crankshaft pilot bearing hole using clutch centering tool as shown in Fig. 42, then securely tighten cap screws mounting pressure plate assembly to flywheel.

Height of release levers should be 44.8-46.2 mm (1.764-1.819 inches) measured from flywheel to surface.

Allowable difference between release lever heights is 0-0.3 mm (0-0.012 inch). Check lever heights by installing clutch centering tool (2—Fig. 43) along with measuring tool (3), then using feeler gage (G), measure clearance between release lever (1) and measuring tool (3). Adjust release lever height by removing cotter key (11—Fig. 41) and turning castle nut (10).

**54. OVERHAUL.** Remove clutch assembly as outlined in paragraph 53. Remove cotter keys (11—Fig. 41), then exercising caution, remove castle nuts (10). Complete disassembly with reference to Fig. 41. Cover (6) and pressure plate (2) are renewable only as parts of the complete assembly.

Measure clutch disc wear using a suitable depth gage as shown in Fig. 44. Renew clutch disc if distance from clutch disc surface to top of rivet head is not at least 0.1 mm (0.004 inch). Inspect pressure plate (2—Fig. 41) surface for cracks, scoring, heat discoloration and excessive wear. Surface grind or renew as needed. Inspect springs (4) for cracks, weakness, warpage and any other damage. Inspect all other parts for excessive wear or any other damage. Renew all parts as needed.

Reassembly is reverse order of disassembly.

**RELEASE BEARING**

All Models

**55.** Release bearing may be serviced after separation of engine from clutch housing as outlined in paragraph 52. Renew bearing if outer race does not turn smoothly without noise or excessive play is noticed when outer race is tilted forward or backward.

Extract release bearing from holder to renew.

**HYDROSTATIC TRANSMISSION**

Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E are equipped with a hydrostatic transmission and a range transmission. Refer to RANGE TRANSMISSION section for service on that unit.

**OPERATION**

All Models So Equipped

**56.** Hydrostatic transmission consists of variable displacement piston pump, fixed displacement piston motor, charge trochoid pump and valve system. Two

types of hydrostatic transmissions are used, TYPE I and TYPE II. Refer to the following chart for tractor model and hydrostatic transmission match up.

**TYPE I**

Model	(Prior to Serial No.)
B6100HST-D	50127
B6100HST-E	11140
B7100HST-D	51742
B7100HST-E	11906

**TYPE II**

Model	(Serial No. and Later)
B6100HST-D	50127
B6100HST-E	11140
B7100HST-D	51742
B7100HST-E	11906

Engine power is transferred to the input shaft (7—Fig. 45 or 46) which drives the trochoid rotor assembly (5) and variable displacement piston pump (24). Trochoid rotor assembly (5) is located in charge pump case (6) and is used to supply low pressure oil to the charge system. Cylinder block (27) within the variable displacement piston pump (24) is rotated against variable swashplate (29) surface. If the swashplate is moved in the forward or reverse direction, oil will be pumped to the fixed displacement piston motor (21) to turn the output shaft (19). The higher the volume of oil the faster the output shaft will turn. Volume of oil is controlled by the variable swashplate degree of tilt. Fluid direction and pressure regulation is governed by valves contained within the circuits.

**PRESSURE TEST**

**All Models So Equipped**

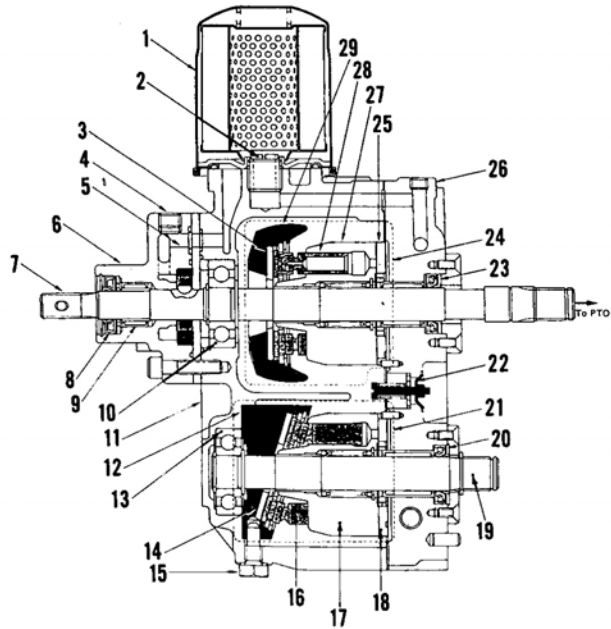
57. Pressure tests may be performed after removing hydrostatic transmission protective cover as follows: Remove speed control knob, left and right hood latch, front and rear mounting cap screws, then withdraw cover.

Refer to the following paragraphs for case pressure, charge pressure, high relief pressure (forward and reverse) and vacuum test procedures.

58. **CASE PRESSURE.** Remove plug from port (B—Fig. 47) and install a low pressure gage. Position high-low gear shift and speed control pedal in neutral. Engage parking brake, then run engine at 2800 rpm. Recommended reading is 165.6-220.8 kPa (24-32 psi) with an allowable limit of 144.9-248.4 kPa (21-36 psi). Low case pressure could cause transmission overheating,

**Fig. 45—Cross-sectional view of Type I hydrostatic transmission.**

1. Filter
2. Joint
3. Thrust plate
4. Charge pressure check port
5. Trochoid rotor assy.
6. Charge pump case
7. Input shaft
8. Oil seal
9. Needle bearing
10. Ball bearing
11. Case
12. Fixed swashplate
13. Ball bearing
14. Thrust plate
15. Stop bolt
16. Piston
17. Cylinder block
18. Valve plate
19. Output shaft
20. Oil seal
21. Fixed displacement piston motor
22. Case relief valve
23. Oil seal
24. Variable displacement piston pump
25. Valve plate
26. Port block
27. Cylinder block
28. Piston
29. Variable swashplate



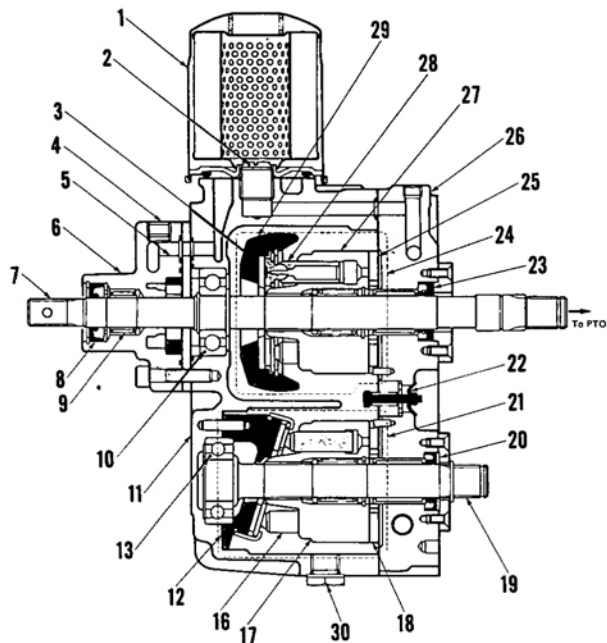
resulting from oil not being circulated to oil cooler. A high pressure reading could indicate that the pipe to the oil cooler or the oil cooler itself is clogged, which could cause oil seal damage.

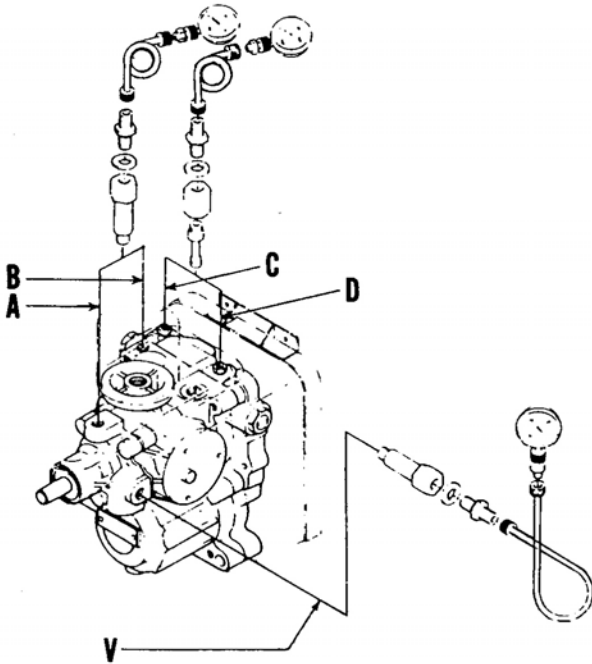
59. **CHARGE PRESSURE.** Prior to charge pressure testing, check case pressure as outlined in previous section. To check charge pressure, remove plug from port (A—Fig. 47) and install a low pressure gage. Position high-low gear shift and speed control pedal in neutral. Engage parking brake, then run engine at 2800 rpm. To calculate correct charge pressure, deduct case pressure reading (paragraph 58) from measured charge

pressure. Recommended reading is 441.6-579.6 kPa (64-84 psi) with an allowable limit of 414-607.2 kPa (60-88 psi). Low pressure could cause a lack of power or noise and vibration.

60. **HIGH RELIEF PRESSURE. (Forward or Reverse).** Remove plug from port (D—Fig. 47) to test forward circuit or port (C) to test reverse circuit. Install a high pressure gage that will read at least 27.6 MPa (4000 psi). Start engine and allow transmission fluid to warm up to operating temperature. Engage parking brake, then set engine speed at 2800 rpm. Depress speed control pedal approximately 10 mm

**Fig. 46—Cross-sectional view of Type II hydrostatic transmission. Refer to legend in Fig. 45 for parts identification except for drain plug (30).**





**Fig. 47—View showing locations for pressure testing hydrostatic transmission.**

- A. Charge pressure
- B. Case pressure
- C. High relief pressure (Reverse)
- D. High relief pressure (Forward)
- V. Vacuum

(25/64-inch) in direction of circuit being tested (forward or reverse). Record gage reading as quickly as possible.

**NOTE:** Depressing speed control pedal more than 10 mm (25/64-inch) will give an incorrect high reading. DO NOT hold speed control pedal down longer than 10 seconds.

Recommended high relief pressure is 21.6-25.5 MPa (3130-3700 psi).

**61. VACUUM.** Remove plug from port (V—Fig. 47) and install a vacuum gage with maximum capability of 762 mm Hg (30 in. Hg). Engage parking brake, then run engine at 2800 rpm. Recommended maximum vacuum gage

readings are as follows; readings will vary according to oil temperature:

Oil Temperature	Gage Reading
30°C (86°F)	120 mm Hg (4.7 in. Hg)
50°C (122°F)	60 mm Hg (2.4 in. Hg)
80°C (176°F)	35 mm Hg (1.4 in. Hg)

A high vacuum reading indicates incorrect oil type or a clogged strainer. A fluctuating reading indicates a faulty or loose connection on the suction side.

**LINKAGE**

**All Models So Equipped**

**62. OPERATION.** View of linkage is shown in Fig. 48. Neutral holder (5—Fig. 48) is connected to transmission

trunnion shaft which controls the angle of variable swashplate. Neutral holder (5) is connected to rod guide (3) via speed control rod (4). Depressing pedal (9) causes rod guide (3) to rotate. Forward travel speed may be set by engaging speed control linkage (1, 2 and 11 through 15). Speed control linkage must be disengaged manually. Neutral adjuster (6) is used to correctly position needle bearing (7) in center position of neutral holder (5) when pedal (9) or speed control linkage is released, thus placing transmission in neutral position. Spring (25) is used to return neutral holder arm (8). Damper (10) slows pedal return rate to prevent tractor from stopping too quickly and to prevent transmission damage due to fast pedal direction changeover.

**63. ADJUSTMENT.** Before performing adjustments, be sure mechanism moves freely without binding. Dirt, grit or other foreign material may cause false adjustment settings.

To adjust neutral position proceed as follows: Place selector lever in two-wheel drive, raise rear wheels off the ground, then start engine and set engine speed at low idle.

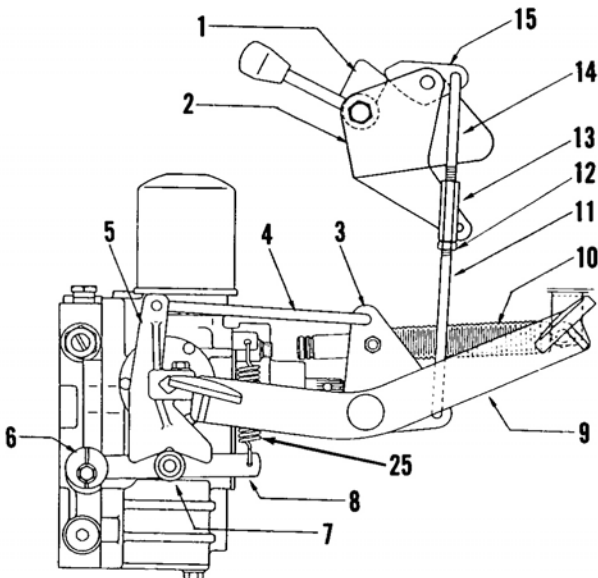
Loosen cap screw (16—Fig. 49) and turn slot (18) counterclockwise so the rear wheels rotate in forward direction. Turn slot (18) clockwise until the rear wheels completely stop. Mark position (X) of slot (18) on clutch housing (17) where rear wheel rotation stopped.

Continue to turn slot (18) clockwise until the rear wheels rotate in the reverse direction, then turn slot (18) in counterclockwise direction until rear wheels completely stop. Mark position (Y) of slot (18) on clutch housing (17) where rear wheel rotation stopped.

Position neutral adjuster (6) so slot (18) is centered between marks X and Y, then tighten cap screw (16) to 19-32 N·m (14-24 ft.-lbs.) torque while securely holding slot (18) in position.

After lowering rear wheels, check that wheels stop automatically after forward-reverse pedal is released from either direction. If the wheels continue to turn in the forward direction, turn slot (18) clockwise in small increments. If the wheels continue to turn in the reverse direction, turn slot (18) counterclockwise in small increments. Continue adjustment procedure until neutral position is obtained when pedal is released from both directions.

If true neutral position cannot be found by adjustment procedure, move neutral holder arm (8—Fig. 48) by hand to determine if true neutral position can be obtained. If neutral cannot be found, problem may be located in the neutral valve.



**Fig. 48—View showing hydrostatic transmission control linkage.**

- 1. Lever
- 2. Lever support
- 3. Rod guide
- 4. Speed control rod
- 5. Neutral holder
- 6. Neutral adjuster
- 7. Needle bearing
- 8. Neutral holder arm
- 9. Speed control pedal
- 10. Damper
- 11. Lower rod
- 12. Locknut
- 13. Turnbuckle
- 14. Upper rod
- 15. Cam
- 25. Spring

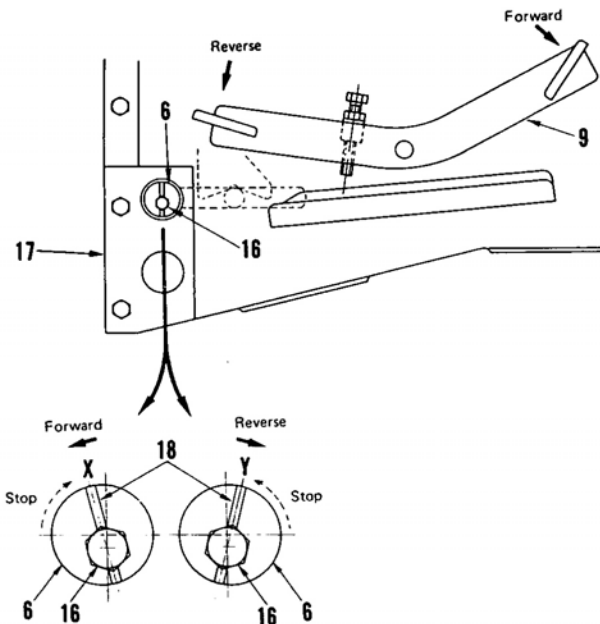


Fig. 49—View showing procedure for adjusting neutral position. Refer to text.

- 6. Neutral adjuster
- 9. Speed control pedal
- 16. Cap screw
- 17. Clutch housing
- 18. Slot

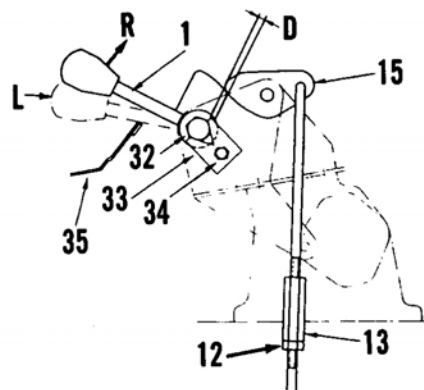


Fig. 50—Side view of forward speed control components. Refer to text.

- 1. Lever
- 12. Locknut
- 13. Turnbuckle
- 15. Cam
- 32. Bolt
- 33. Retainer plate
- 34. Cap screw
- 35. Cover

To adjust forward speed control components proceed as follows: Loosen locknut (12—Fig. 50) and turn turnbuckle (13) until dimension (D) is 6-8 mm (15/64-5/16 inch), then retighten locknut (12). Loosen locknut (37—Fig. 51) and turn adjuster nut (39) to adjust tension on spring (38) until force required to operate lever (1—Fig. 50) in “R” direction is 25-30 N (5.5-6.6 lbs.), then retighten locknut (37—Fig. 51).

If excessive play is noted in lever

(1—Fig. 50), adjust as follows: Loosen screw (34) and reposition retainer plate (33) until play is reduced and head of bolt (32) does not rotate when lever (1) is operated.

After installing cover (35), place lever (1) in position “L”, then depress reverse side of speed control pedal. Observe linkage to make sure that cam (15) does not contact lever (1).

64. **OVERHAUL.** Overhaul of neutral position linkage components is evident after referral to Fig. 52. During reassembly, apply a thin coat of suitable grease around surface of bushing (24—Fig. 52). After reassembly, refer to paragraph 63 for adjustment of linkage.

**CLUTCH HOUSING/  
TRANSMISSION CASE SPLIT**

**All Models So Equipped**

65. Drain transmission/hydraulic system fluid into a suitable container. Remove hydrostatic transmission protective cover as follows: Remove speed control knob, left and right hood latch, front and rear mounting cap screws, then withdraw cover. Remove hydrostatic transmission oil filter and joint. Raise hood and disconnect negative battery cable from battery post. Detach hydraulic lines as needed. Disconnect speed control rod (4—Fig. 48) from rod guide (3). Remove right and left brake pedal rods. Remove differential lock shaft. On four-wheel drive models,

Fig. 52—Exploded view of neutral holder assembly and charge pump inlet hose.

- 4. Speed control rod
- 5. Neutral holder
- 6. Neutral adjuster
- 7. Needle bearing
- 8. Neutral holder arm
- 16. Cap screw
- 19. Cotter key
- 20. Washer
- 21. Cap screw
- 22. Snap ring
- 23. Washer
- 24. Bushing
- 25. Spring
- 26. Spring holder
- 27. Cap screw
- 28. “O” ring
- 29. Nipple fitting
- 30. Clamp
- 31. Hose

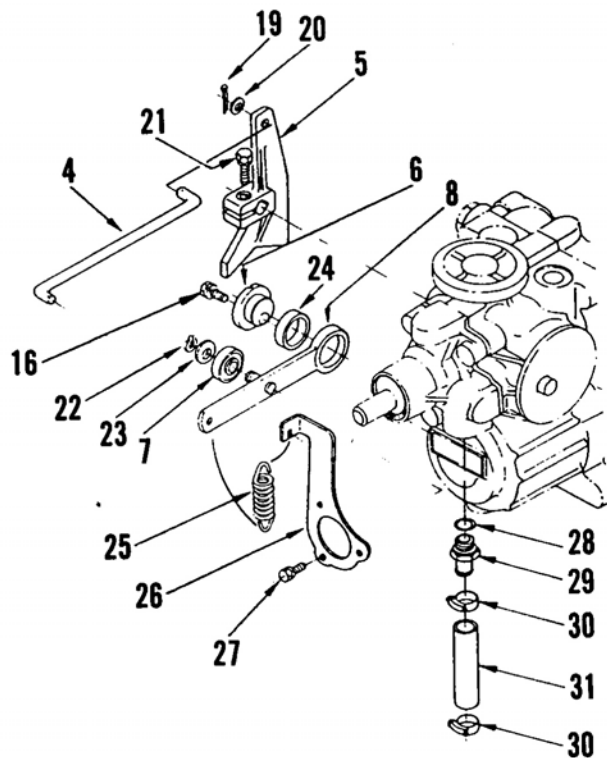
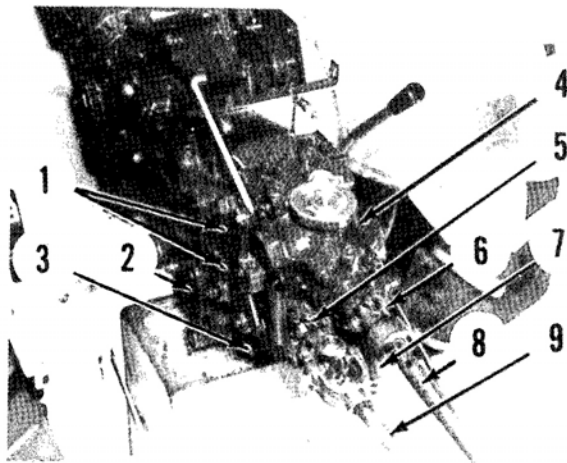


Fig. 51—Rear view of forward speed control components. Refer to text.

- 1. Lever
- 32. Bolt
- 33. Retainer plate
- 34. Cap screw
- 36. Plates
- 37. Locknut
- 38. Spring
- 39. Adjuster nut





**Fig. 53—Refer to text for removal of components shown in view.**

1. Nuts
2. Transmission case
3. Cap screw
4. Hydrostatic transmission
5. Pin (4WD Models)
6. Pin
7. Hose
8. Propeller shaft
9. Drive shaft (4WD Models)

loosen drive shaft protective cover band at joint case, then withdraw drive shaft from joint case. Remove bolts and nuts securing step plates to fenders. Remove clutch housing and transmission case connecting plate from underneath side. Support rear of tractor. Attach a hoist with suitable holding fixtures to clutch housing. Remove bolts and nuts securing clutch housing to transmission case, then separate components.

Reassembly is reverse order of splitting procedure. Tighten bolts and nuts securing clutch housing to transmission case to 61-107 N·m (45-79 ft.-lbs.) torque. Refill transmission/hydraulic system with 13.5 liters (3.6 U.S. gallons) of the following hydrostatic transmission fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56.

**REMOVE AND REINSTALL**

**All Models So Equipped**

66. Split clutch housing from transmission case as outlined in paragraph 65. Remove pin (6—Fig. 53), then separate propeller shaft (8) from transmission. On models equipped with

front-wheel drive, remove pin (5), then separate drive shaft (9) from transmission. Remove nuts (1) and cap screw (3) from each side of hydrostatic transmission, then separate hydrostatic transmission from range transmission case.

Installation procedure is reverse order of removal. Tighten nuts (1) and cap screw (3) to 48-56 N·m (35-41 ft.-lbs.) torque.

**OVERHAUL**

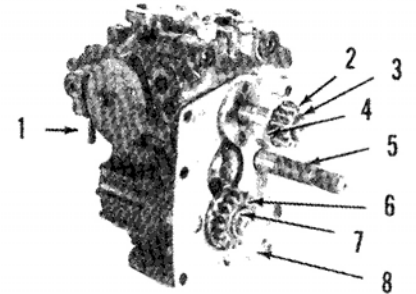
**All Models So Equipped**

Before disassembly, plug all port openings, then thoroughly clean outside of transmission case. Make sure that a clean work bench or table is used. Construct a work table as shown in Fig. 54 if no suitable work bench is available. All parts should be cleaned separately in clean solvent and blown dry with clean compressed air to avoid nicks and burrs. Caution must be used to avoid damage to components; do not force parts.

67. Disassemble neutral holder assembly shown in Fig. 52. Place alignment marks on neutral adjuster (6) and neutral holder arm (8), so neutral posi-

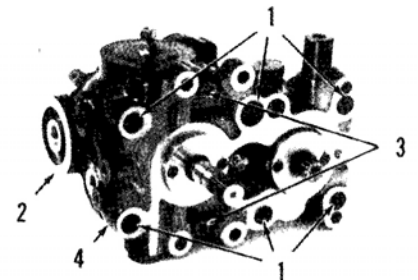
tion can be determined after reassembly. Remove snap ring (3—Fig. 55), then withdraw gear (2) and bearing (4). Remove snap ring (7), then withdraw gear (6). On models so equipped, extract front-wheel drive shaft (5) out front of transmission. Remove nipple fitting (1) and gasket (8).

Remove screws (1 and 3—Fig. 56) from port block (4), then separate port block (4) from case (2). Note that valve plates (7 and 8—Fig. 57) may remain with port block (4) during separation, be

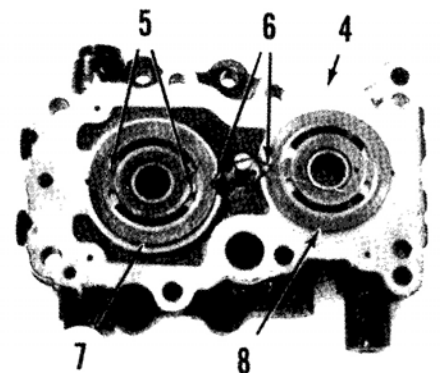


**Fig. 55—Rear view of hydrostatic transmission.**

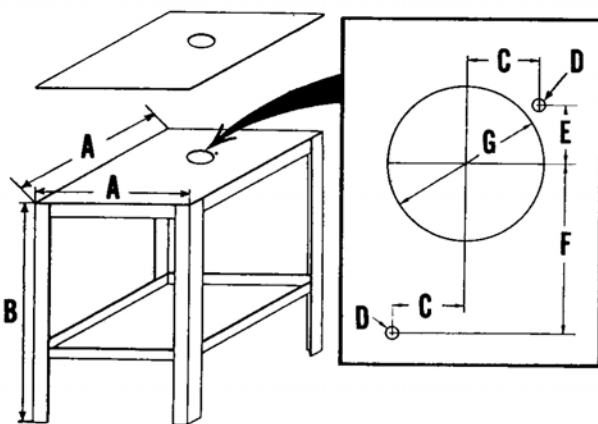
1. Nipple fitting
2. Pto gear
3. Snap ring
4. Bearing
5. Front-wheel drive shaft (models so equipped)
6. Output shaft gear
7. Snap ring
8. Gasket



**Fig. 56—Remove screws (1 and 3) to separate port block (4) from transmission case (2).**



**Fig. 57—View showing pump side valve plate (7) and motor side valve plate (8) located in port block (4). Valve plate (7) with two notches (5) is assembled on pump side. Note anchor pins (6).**



**Fig. 54—View showing dimensions for constructing a work table to facilitate hydrostatic transmission disassembly and reassembly.**

- A. 500 mm (20 inches)
- B. 1000 mm (40 inches)
- C. 55 mm (2-11/64 inch)
- D. 10 mm (25/64 inch)
- E. 45 mm (1-49/64 inches)
- F. 130 mm (5-1/8 inches)
- G. 120 mm (4-23/32 inches)

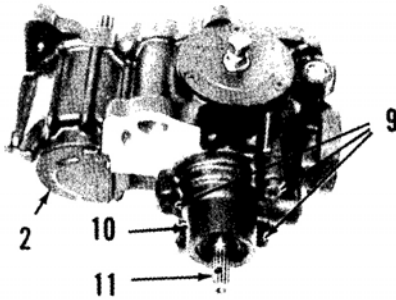


Fig. 58— Remove screws (9) and tap on rear of input shaft (11) with a suitable mallet to separate charge pump case (10) from transmission case (2).

careful not to allow plates to fall free. Remove valve plates (7 and 8). Note that valve plate (7) with two notches (5) is located on pump side, while valve plate (8) with no notches is located on motor side. Remove screws (9—Fig. 58) securing charge pump case (10) to transmission case. Tap on rear of input shaft (11) with a suitable mallet to break charge pump case (10) loose from transmission case, then withdraw charge pump assembly along with the two dowel pins. Withdraw pump cylinder block (13—Fig. 59) from case (2). Remove circlip (18), then extract pistons (15) and retainer plate (17). Remove thrust plate which is

attached to variable swashplate (16). Remove stop bolt (19) (Type I transmission only), hold output shaft (14) and tap case (2) with a soft mallet to extract motor cylinder block assembly (12). Remove screws securing left and right trunnion shaft covers and remove covers, then remove variable swashplate.

Separate input shaft from charge pump case, then inspect shaft for excessive wear and any other damage. Check pistons for smooth movement through cylinder block bores. Examine piston barrel (21—Fig. 61) and cylinder block bores for scratches, burrs, excessive wear and any other damage. Inspect slipper (22) for excessive wear; minimum allowable thickness is 2.90 mm (0.114 inch).

**NOTE: Pistons and cylinder blocks are matched sets and must be renewed as such. Components are identified as follows: Marked with X, group X; No mark, group Y; Marked with Z, group Z.**

If clogged, blow lubricant hole (23) clear with compressed air. Inspect polished face of cylinder block (12 and 13—Fig. 59) for scratches and any other damage. Examine internal spring of cylinder block for cracks and broken coils. Inspect valve plates (7 and 8—Fig. 57) for scratches, corrosion, excessive wear and any other damage. Inspect charge pump case (10—Fig. 62) and trochoid rotor assembly (24) for scrat-

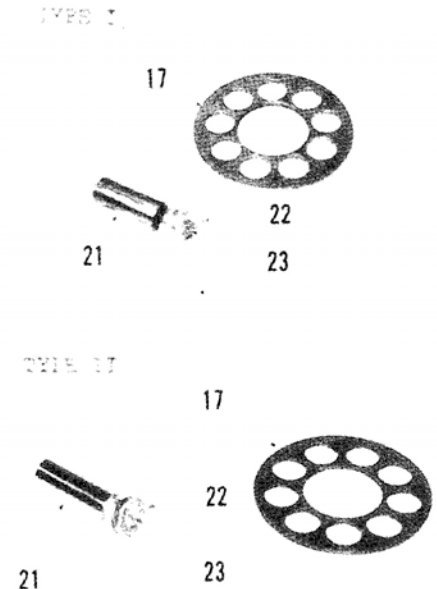


Fig. 61— View showing Type I and Type II piston barrel (21), slipper (22), lubricant hole (23) and retainer plate (17).

ches, excessive wear and any other damage. Examine needle bearing (25) for cracked and missing rollers, excessive wear and any other damage.

**NOTE: Except for seals, charge pump must be renewed as a complete unit.**

Recommended side clearance (C—Fig. 63) between trochoid rotor (24) and straightedge (S) measured as shown should be 0.030-0.045 mm (0.0012-0.0018 inch).

Remove forward and reverse neutral and check valves as shown in Fig. 64. Be sure that check valve (31—Fig. 64) moves unrestricted along valve body (33). Inspect all components for heavy scratches, burrs, corrosion, excessive wear and any other damage. If clogged, blow passages of neutral valve (34) and valve body (33) clear with compressed air. Inspect springs (32 and 35) for any deformities and broken coils.

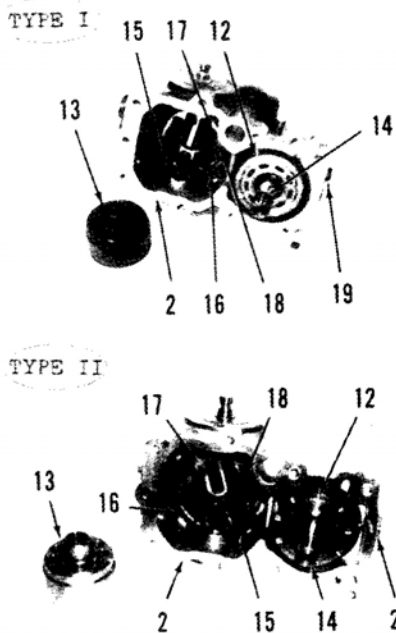


Fig. 59—View showing rear of hydrostatic transmission with port block removed.

- 2. Case
- 12. Motor cylinder block
- 13. Pump cylinder block
- 14. Output shaft
- 15. Pistons
- 16. Variable swashplate
- 17. Retainer plate
- 18. Circlip
- 19. Stop bolt (Type I only)
- 20. Drain plug (Type II only)

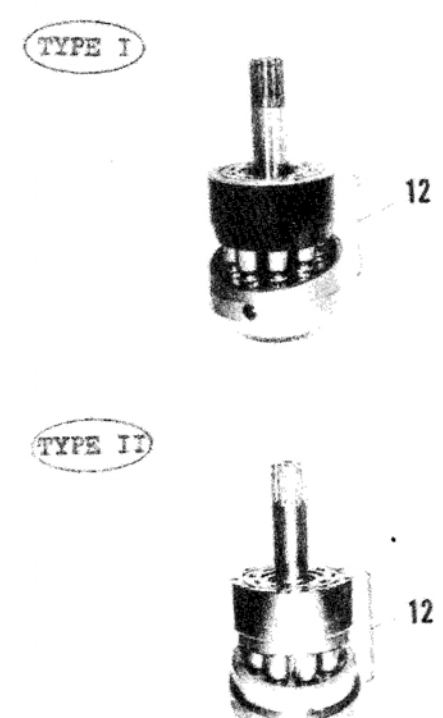


Fig. 60—View showing Type I and Type II motor cylinder block assembly (12).

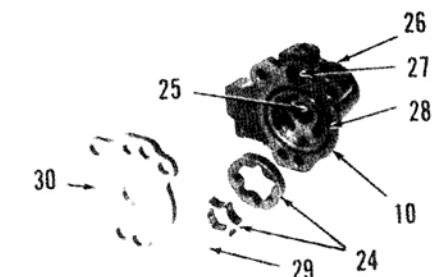
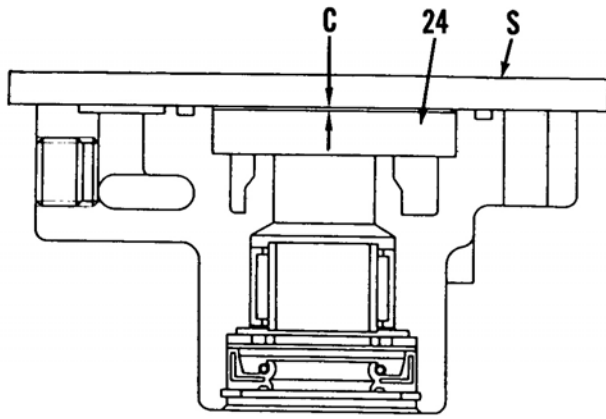
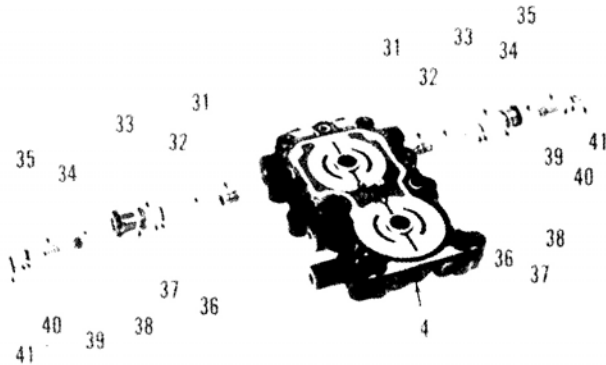


Fig. 62—View showing charge pump assembly.

- 10. Case
- 24. Trochoid rotor assy.
- 25. Needle bearing
- 26. Oil seal
- 27. "O" ring
- 28. "O" ring
- 29. Woodruff key
- 30. End plate

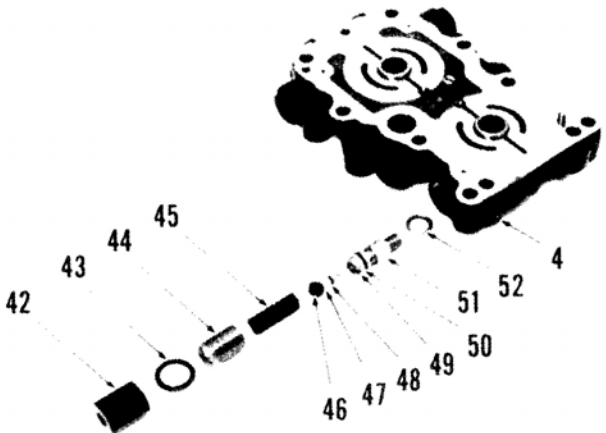


**Fig. 63**—View showing procedure for measuring side clearance (C) between trochoid rotor (24) and straightedge (S). Refer to text.



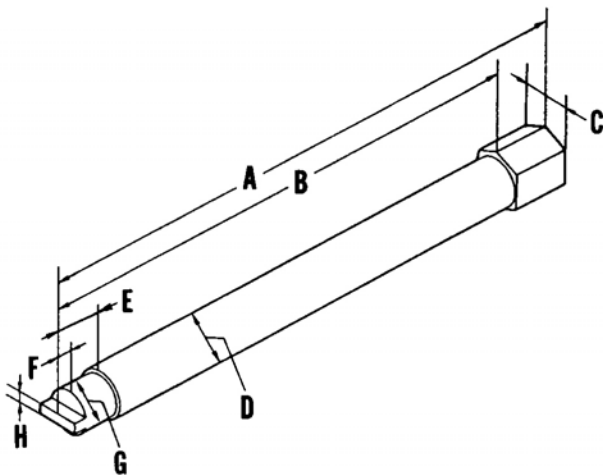
**Fig. 64**—Exploded view showing neutral and check valve assemblies (forward and reverse) located in port block (4).

- 31. Check valves
- 32. Springs
- 33. Valve bodies
- 34. Neutral valves
- 35. Springs
- 36. "O" rings
- 37. Backup ring
- 38. Seals
- 39. "O" rings
- 40. Caps
- 41. Pins



**Fig. 65**—Exploded view showing high pressure relief valve located in port block (4).

- 42. Cap nut
- 43. Seal
- 44. Plug
- 45. Spring
- 46. Poppet valve
- 47. Backup ring
- 48. "O" ring
- 49. Backup ring
- 50. "O" ring
- 51. Valve seat
- 52. Gasket



**Fig. 66**—View showing dimensions needed for constructing special valve seat (51 - Fig. 65) removal tool.

- A. 160 mm (6.3 inches)
- B. 144 mm (5.7 inches)
- C. 16.75-17.00 mm (0.659-0.669 inch)
- D. 16.8-17.0 mm (0.661-0.669 inch)
- E. 14 mm (0.55 inch)
- F. 4 mm (0.16 inch)
- G. 15.3-15.5 mm (0.602-0.610 inch)
- H. 2.9-3.0 mm (0.114-0.118 inch)

Remove high pressure relief valve shown in Fig. 65. Note that to maintain set pressure of relief valve, height of plug (44) must be measured and alignment marks placed on plug (44) and port block (4) before plug (44) is removed. To remove seat (51), Kubota special tool 07916-60841 or a suitable equivalent must be used. Tool may be constructed using dimensions shown in Fig. 66. Inspect all components for heavy scratches, burrs, corrosion, excessive wear and any other damage. If clogged, blow valve passages clear with compressed air. Inspect spring (45 - Fig. 65) for any deformities and broken coils.

Remove charge relief valve shown in Fig. 67. Inspect valve (53 - Fig. 67) for heavy scratches, burrs, corrosion, excessive wear and any other damage. Inspect spring (54) for any deformities and broken coils.

Inspect trunnion shaft covers and bushings for excessive wear and any other damage. Inspect pump side needle bearing (59 - Fig. 68) and motor side needle bearing (60) located in port block (4) for cracked or missing rollers, excessive wear and any other damage.

Renew all parts as needed. Renew all seals, gaskets and "O" rings. Oil seals must be installed using suitable tools to prevent seal damage and ensure proper seating. Lubricate all working components with the following hydrostatic transmission fluid or a suitable equivalent during reassembly: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56.

Reassembly is reverse order of disassembly. Observe the following during reassembly. Needle bearings (59 and 60 - Fig. 69) should be installed with marked side protruding 3.5 mm (9/64 inch) above port block (4) machined surface as shown.

Install pump side oil seal in port block (4 - Fig. 68) so top of seal surface is 3 mm (1/8-inch) below machined surface. Install motor side oil seal in port block (4) so top of seal surface is 0.5 mm (1/64-inch) above machined surface. Apply a thin coat of suitable grease to lip surface of oil seals.

Install trunnion shaft oil seal in cover so top of seal surface is 1 mm (3/64-inch) below outside surface. Apply a thin coat of suitable grease to lip surface of oil seal.

Install snap ring (57 - Fig. 67) with its square edge (opposite edge is rounded) facing out.

Cap nut (42 - Fig. 65) should be tightened to 59-69 N·m (43-51 ft.-lbs.) torque. Tighten screws securing trunnion shaft covers to 2-2.5 N·m (17-23 in.-lbs.) torque.

Install charge pump oil seal (26 - Fig.

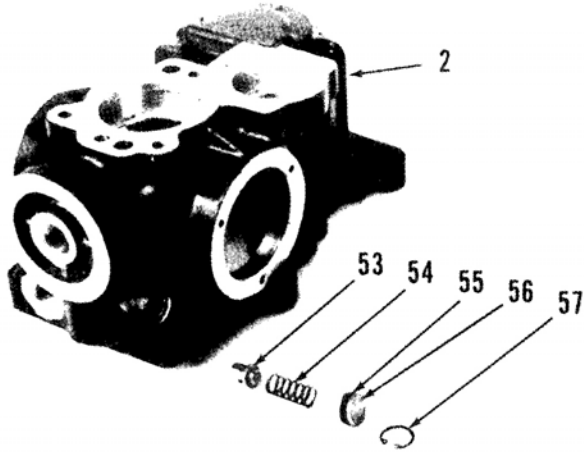


Fig. 67—Exploded view showing charge relief valve located in transmission case (2).

- 53. Valve
- 54. Spring
- 55. "O" ring
- 56. Plug
- 57. Snap ring

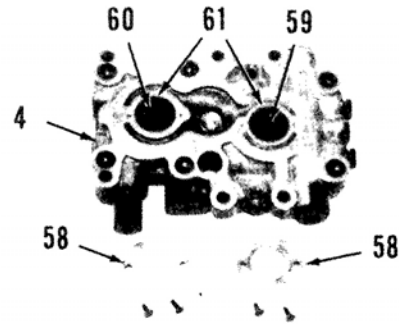


Fig. 68—View showing port block (4) with flange covers (58) removed. Note pump side needle bearing (59), motor side needle bearing (60) and oil seals (61).

62) in case (10) so end of seal is 4 mm (5/32-inch) below outside surface. Install snap ring retaining oil seal (26) so square edge of snap ring faces out. Tighten screws securing case (10) to 11-14 N·m (8-10 ft.-lbs.) torque.

Cylinder block and pistons are assembled in reverse order of disassembly. Be sure to lubricate entire unit with clean hydrostatic fluid. Pump side circlip (18—Fig. 59) is installed with flat side or undistorted side towards retainer plate (17).

Observe the following during installation of output shaft and motor cylinder block assembly in case (2). On Type I models, be sure stop bolt hole in fixed swashplate aligns with hole in case (2). Install stop bolt (19) and tighten to 16-21 N·m (12-15 ft.-lbs.) torque. On Type II models, align hole of fixed swashplate with dowel pin in case (2).

Install pump side valve plate and motor side valve plate as shown in Fig. 57. During assembly of case components to port block assembly a protective cover should be used over input shaft and output shaft to protect seal lips. Note that port block floats over case assembly and should separate from case when holding hand pressure is released. Tighten screws securing port block to case to 23-27 N·m (17-20 ft.-lbs.) torque. Be sure input shaft and output shaft rotate smoothly.

Note that square edge of snap rings securing gears and/or bearings should face towards the component it is retaining.

### OPERATION

#### All Models So Equipped

68. All models are equipped with a range shift lever for high-low speed selection. Models B6100HST-D and B7100HST-D are equipped with a front-wheel drive select lever for engagement and disengagement of front-wheel drive unit.

In high range position, shift lever (2—Fig. 70) is pushed completely down. Power is transmitted from hydrostatic transmission output shaft and gear to gear (14—Fig. 71 and 72), to shaft and gear assembly (22), to gear (2), to shaft (7), to high range gear (8), to smaller side of gear (27) and then to bevel pinion (34).

In low range position, shift lever (2) is pulled completely up. Power is transmitted from hydrostatic transmission output shaft and gear assembly (22) to gear (2), to shaft (7), to low range gear (5), to

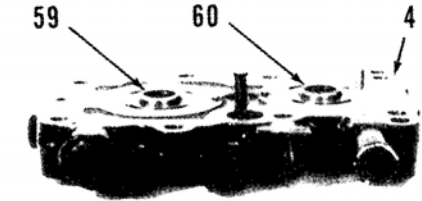


Fig. 69—Install pump side needle bearing (59) and motor side needle bearing (60) with marked side protruding 35 mm (9/64 inch) above port block (4) machined surface.

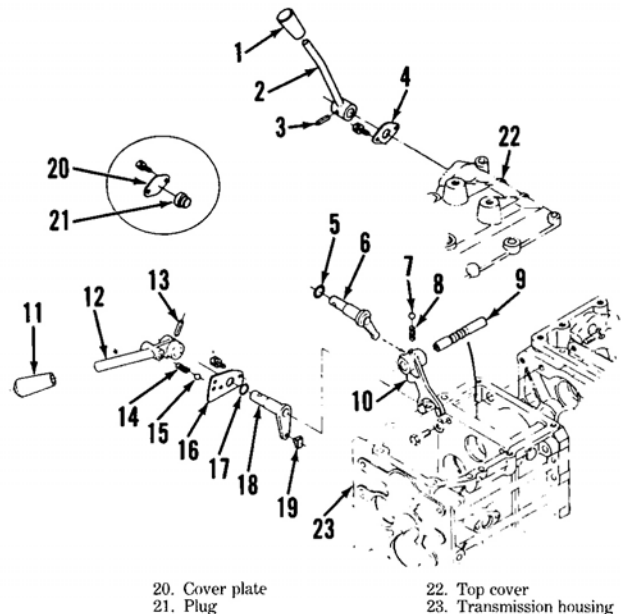
larger side of gear (27) and then to bevel pinion (34).

Neutral position is located mid-way between high and low position. Gear (27) is positioned in between low range gear (5) and high range gear (8), so no power is transmitted to bevel pinion (34).

On Models B6100HST-D and B7100HST-D, front-wheel drive select lever (12—Fig. 70) is used to mesh gear (54—Fig. 72) with gear (57) to engage front-wheel drive unit or to slide gear (54) away from gear (57) to disengage front-wheel drive unit.

Fig. 70—View showing high-low range shift lever and shift linkage used on all hydrostatic drive models. Front-wheel drive select lever and linkage used on Models B6100HST-D and B7100HST-D. Inset shows cover plate (20) and plug (21) used on Models B6100HST-E and B7100HST-E.

- 1. Grip
- 2. Range shift lever
- 3. Pin
- 4. Plate
- 5. "O" ring
- 6. Arm
- 7. Ball
- 8. Spring
- 9. Rail
- 10. Fork
- 11. Grip
- 12. Front-wheel drive select lever
- 13. Pin
- 14. Spring
- 15. Ball
- 16. Plate
- 17. "O" ring
- 18. Arm
- 19. Shoe



- 20. Cover plate
- 21. Plug

- 22. Top cover
- 23. Transmission housing

## RANGE TRANSMISSION

Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E are equipped with a two-speed range transmission. On Models B6100HST-D and B7100HST-D, power for the front-wheel drive system is derived from the range transmission.

**REMOVE AND REINSTALL**

**All Models So Equipped**

69. Remove hydrostatic transmission unit from front of gear transmission assembly as outlined in paragraph 66. Remove top cover (22-Fig. 70). Remove hydraulic lift cover as outlined in paragraph 99. Remove cap screws and nuts securing range transmission case to center housing. Separate assemblies, then withdraw transmission assembly while being careful not to allow any components to fall free.

Installation is reverse order of removal. Install a new gasket between center housing and transmission case.

Tighten securing cap screws to 19-32 N·m (14-24 ft.-lbs.) torque and nuts to 25-39 N·m (18-29 ft.-lbs.) torque. Install top cover (22-Fig. 70) and securely tighten retaining cap screws. Refer to paragraphs 99 and 66 to complete reassembly.

**OVERHAUL**

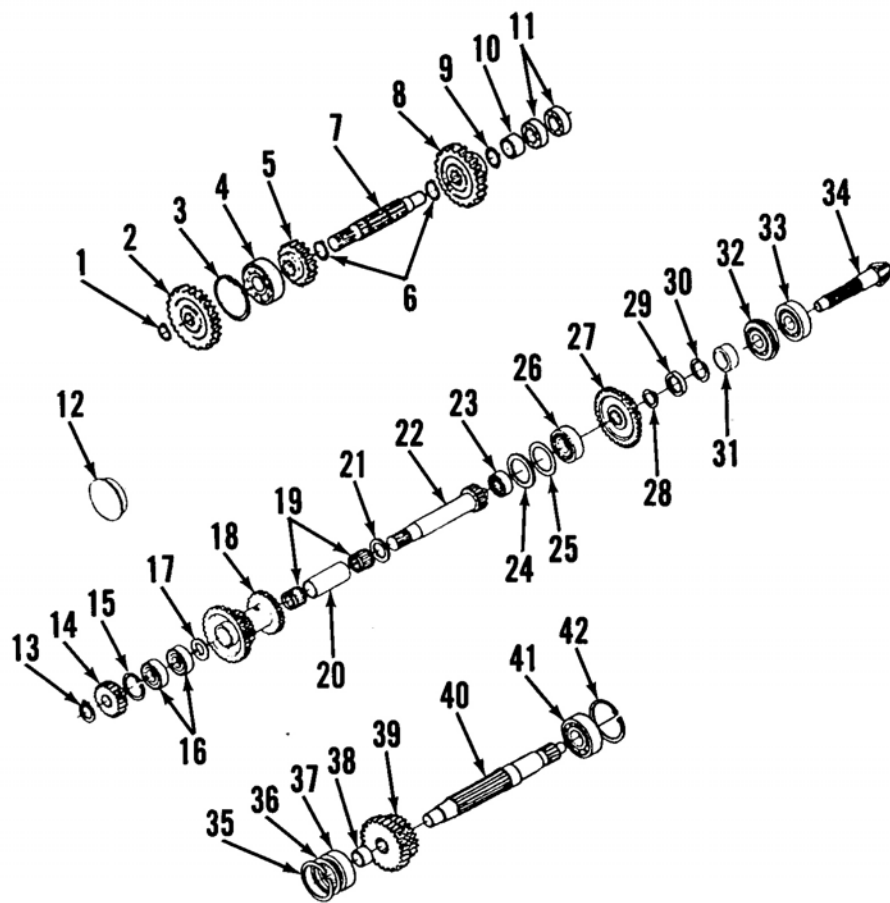
**All Models So Equipped**

70. Disassembly is evident after reference to Fig. 70 and Fig. 71 or 72. Inspect all components for damage and excessive wear.

Shift fork (10-Fig. 70) width should be 6.8-6.9 mm (0.268-0.272 inch). Shift groove width in gear (27-Fig. 71 or 72)

should be 7.0-7.1 mm (0.276-0.280 inch). Side clearance between shift fork (10-Fig. 70) and groove width in gear (27-Fig. 71 or 72) should be 0.1-0.3 mm (0.004-0.012 inch) with an acceptable limit of 0.6 mm (0.024 inch). Spring (8-Fig. 70) free length should be 22 mm (0.866 inch) with an acceptable minimum length of 20 mm (0.787 inch). Renew all parts as needed.

Reassembly is reverse order of disassembly. Gear backlash should be 0.1-0.2 mm (0.004-0.008 inch) with an acceptable limit of 0.4 mm (0.016 inch). Backlash between gear splines and shaft splines should be 0.030-0.078 mm (0.0012-0.0031 inch) with an acceptable limit of 0.2 mm (0.008 inch).



**Fig. 71—Exploded view of transmission gears and shafts used on Models B6100HST-E and B7100HST-E.**

- |                       |                        |                  |
|-----------------------|------------------------|------------------|
| 1. Snap ring          | 15. Snap ring          | 29. Spacer       |
| 2. Gear               | 16. Bearings           | 30. Stop collar  |
| 3. Snap ring          | 17. Spacer             | 31. Spacer       |
| 4. Bearing            | 18. Pto cluster gear   | 32. Bearing      |
| 5. Low range gear     | 19. Needle bearings    | 33. Bearing      |
| 6. Snap rings         | 20. Spacer             | 34. Bevel pinion |
| 7. Shaft              | 21. Spacer             | 35. Snap ring    |
| 8. High range gear    | 22. Shaft & gear assy. | 36. Shim         |
| 9. Shim (As equipped) | 23. Bearing            | 37. Bearing      |
| 10. Spacer            | 24. Spacer             | 38. Spacer       |
| 11. Bearings          | 25. Shim               | 39. Pto gear     |
| 12. Cap               | 26. Bearing            | 40. Pto shaft    |
| 13. Snap ring         | 27. Gear               | 41. Bearing      |
| 14. Gear              | 28. Snap ring          | 42. Snap ring    |

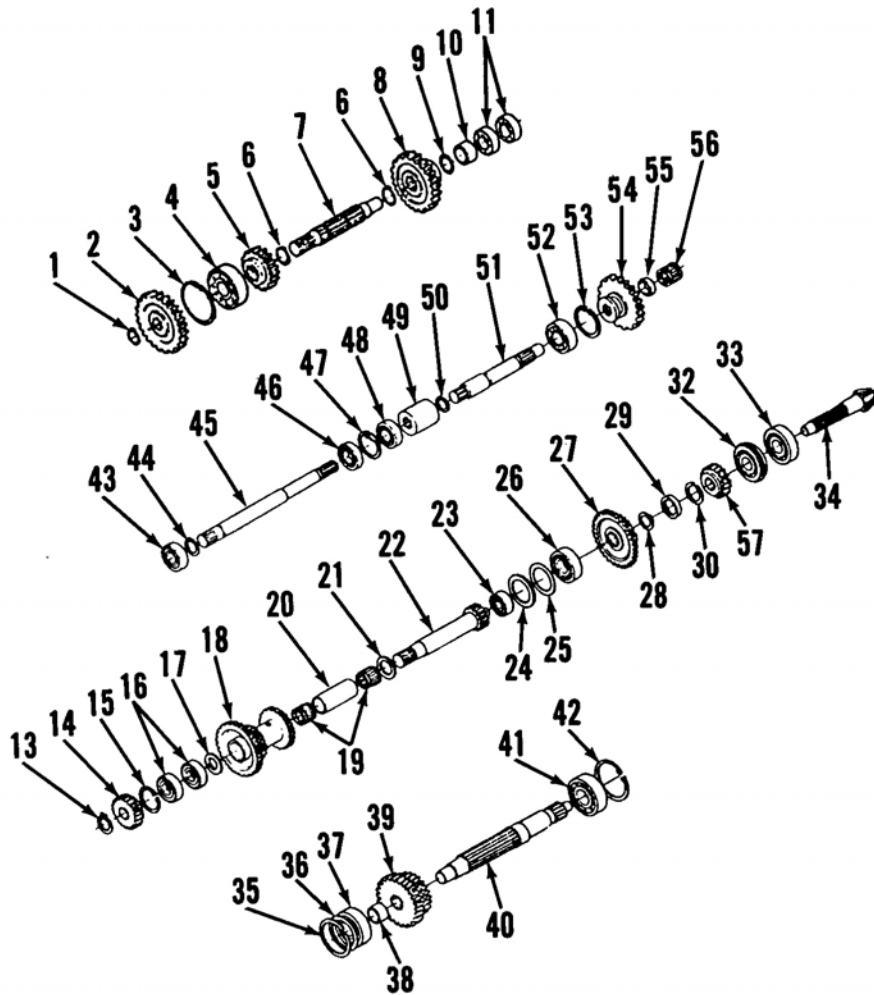


Fig. 72—Exploded view of transmission gears and shafts used on Models B6100HST-D and B7100HST-D. Refer to legend in Fig. 71 for identification of parts except for the following.

- |               |               |                    |
|---------------|---------------|--------------------|
| 43. Bearing   | 48. Bearing   | 53. Snap ring      |
| 44. Snap ring | 49. Coupler   | 54. Gear           |
| 45. Shaft     | 50. Snap ring | 55. Spacer         |
| 46. Bearing   | 51. Shaft     | 56. Needle bearing |
| 47. Snap ring | 52. Bearing   | 57. Drive gear     |

## SIX-SPEED TRANSMISSION

### OPERATION

#### All Models So Equipped

71. Main shift lever (2—Fig. 73 or Fig. 74) selects gear positions through an H-pattern as shown in Fig. 75. When range shift lever (33—Fig. 73 or 74) is placed in the low range position (up position), reverse one and forward one, two and three are attainable. When range shift lever (33) is placed in the high range position (down position), reverse two and forward four, five and six are attainable.

### CLUTCH HOUSING/ TRANSMISSION CASE SPLIT

#### All Models So Equipped

72. Drain transmission/hydraulic system fluid into a suitable container. Raise hood and disconnect battery cable from negative battery post. Remove air cleaner assembly and right side cover. Disconnect throttle linkage. Close fuel shut-off valve at fuel filter, then disconnect fuel supply line from fuel pump. Remove line connecting fuel tank to fuel filter at filter port and plug openings to prevent fuel spillage. Remove fuel filter assembly. Detach hydraulic lines as needed. Remove bolts and nuts connecting step plates to fenders. Detach brake

pedal rod and differential lock rod from under step plate. If so equipped, disconnect flasher lamp wiring at rear fenders. Support rear of tractor. Attach a hoist with suitable holding fixtures to clutch housing. Remove nuts securing clutch housing to transmission case, then separate components.

Reassembly is reverse order of splitting procedure. Tighten nuts securing clutch housing to transmission case to 61-107 N·m (45-79 ft.-lbs.) torque. Capacity of transmission/hydraulic system is 8.5 liters (2.21 U.S. gallons) on Models B5100D and B5100E and 11.5 liters (3 U.S. gallons) on Models B6100D, B6100E and B7100D. Refill with the following transmission/hydraulic fluid or a suitable equivalent: Kubota

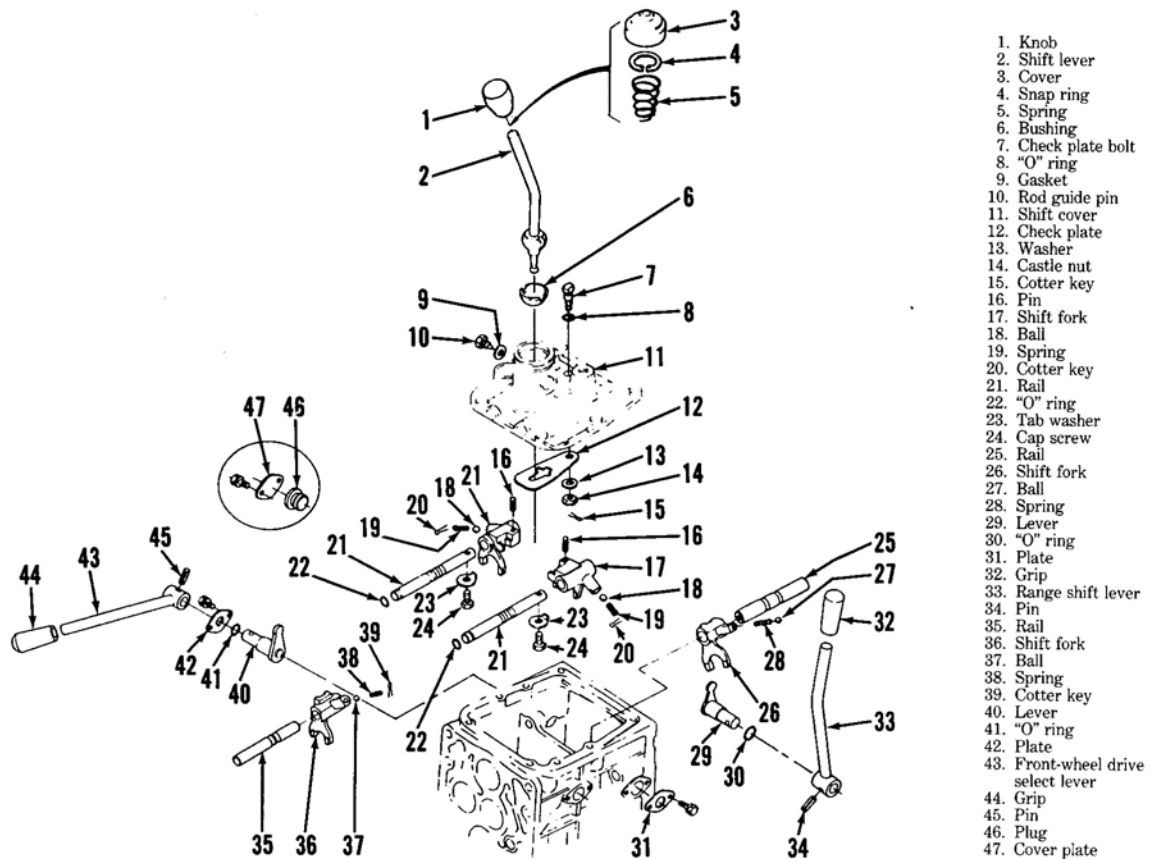


Fig. 73—Exploded view of shifter mechanism used on Models B5100D and B5100E. Components 35 through 44 are used on Model B5100D and components 46 and 47 are used on Model B5100E.

UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56. Bleed fuel system as outlined in paragraph 36.

**REMOVE AND REINSTALL**

**All Models**

73. Split clutch housing from transmission case as outlined in paragraph 72. Remove shift cover (11—Fig. 73 or Fig. 74) as an assembly with shift components. Remove hydraulic lift covers as outlined in paragraph 99. Remove cap screws and nuts securing gear transmission case to center housing. Separate assemblies, then withdraw transmission assembly while being careful not to allow any component to fall free.

Installation is reverse order of removal. Tighten cap screws and nuts securing transmission to center housing to 39-43 N·m (29-32 ft.-lbs.) torque. Install shift cover assembly. Refer to paragraphs 99 and 72 to complete reassembly.

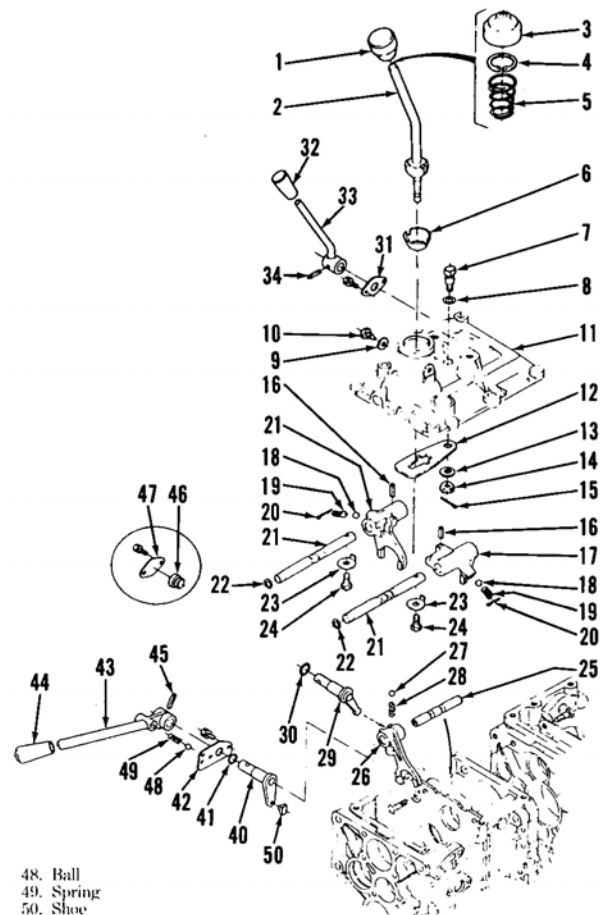
**OVERHAUL**

**All Models**

74. Disassembly is evident after reference to Figs. 73 and 77 for Model B5100D, Figs. 73 and 76 for Model

Fig. 74—Exploded view of shifter mechanism used on Models B6100D, B6100E and B7100D. Components (40 through 50) are used on Models B6100D and B7100D and components (46 and 47) are used on Model B6100E.

1. Knob
2. Shift lever
3. Cover
4. Snap ring
5. Spring
6. Bushing
7. Check plate bolt
8. "O" ring
9. Gasket
10. Rod guide pin
11. Shift cover
12. Check plate
13. Washer
14. Castle nut
15. Cotter key
16. Pin
17. Shift fork
18. Ball
19. Spring
20. Cotter key
21. Rail
22. "O" ring
23. Tab washer
24. Cap screw
25. Rail
26. Shift fork
27. Ball
28. Spring
29. Lever
30. "O" ring
31. Plate
32. Grip
33. Range shift lever
34. Pin
40. Lever
41. "O" ring
42. Plate
43. Front-wheel drive select lever
44. Grip
45. Pin
46. Plug
47. Cover plate



48. Ball
49. Spring
50. Shoe

B5100E, Figs. 74 and 79 for Models B6100D and B7100D and Figs. 74 and 78 for Model B6100E.

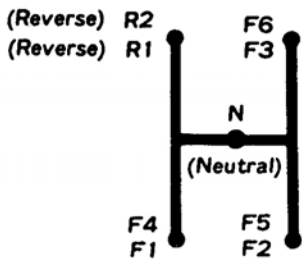


Fig. 75 — View showing main shift lever (2 — Fig. 73 or Fig. 74) shift pattern.

Inspect all components for excessive wear and damage. On Models B6100D, B6100E and B7100D, inside diameter of bushing (70 — Fig. 78 or Fig. 79) should be 20.00-20.02 mm (0.7874-0.8661 inch). Diameter of third shaft (74) at bushing running area should be 19.97-20.02 mm (0.7862-0.8661 inch). Clearance between shaft and bushing should be 0.02-0.06 mm (0.0008-0.0024 inch). Renew all parts as needed.

Reassembly is reverse order of disassembly. Recommended gear backlash is 0.1-0.2 mm (0.004-0.008 inch) with an acceptable limit of 0.4 mm (0.016 inch). Apply a thin coating of a suitable lubricant to all working components during reassembly.

# REAR AXLE DIFFERENTIAL AND BEVEL GEARS

## All Models

**75. REMOVE & REINSTALL.** Drain transmission/hydraulic system fluid into a suitable container. Raise hood and disconnect battery cable from negative battery post. Raise rear wheels off the ground, then detach and remove both rear wheels. Remove both rear fender assemblies. Remove seat from

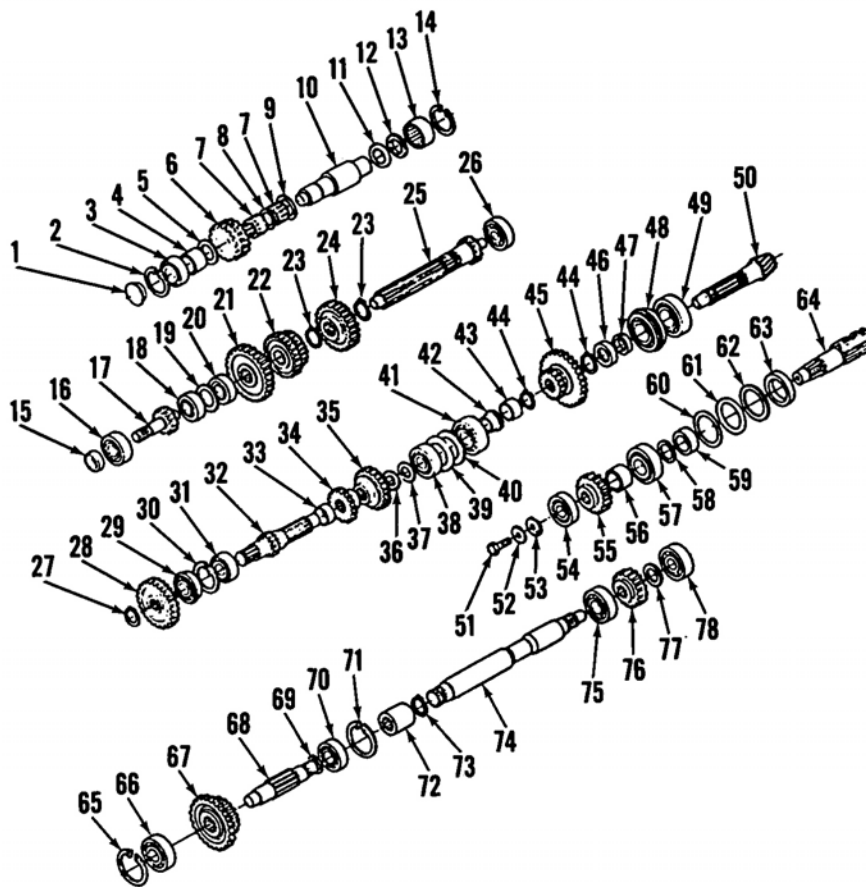


Fig. 76 — Exploded view of transmission gears, shafts and other components showing relative installed position used on Model B5100E.

- |                    |                   |                       |                     |
|--------------------|-------------------|-----------------------|---------------------|
| 1. Cap             | 21. Gear          | 40. Spacer            | 59. Bushing         |
| 2. Snap ring       | 22. Gear          | 41. Bearing           | 60. Shim            |
| 3. Bearing         | 23. Snap ring     | 42. Bushing           | 61. Shim            |
| 4. Bushing         | 24. Gear          | 43. Spacer            | 62. Spacer          |
| 5. Thrust washer   | 25. Fourth shaft  | 44. Snap ring         | 63. Oil seal        |
| 6. Gear            | 26. Bearing       | 45. Gear              | 64. Pto shaft       |
| 7. Needle bearings | 27. Snap ring     | 46. Spacer            | 65. Snap ring       |
| 8. Spacer          | 28. Gear          | 47. Stop collar       | 66. Bearing         |
| 9. Thrust washer   | 29. Bearing       | 48. Bearing           | 67. Gear            |
| 10. Reverse shaft  | 30. Snap ring     | 49. Bearing           | 68. Third shaft     |
| 11. Shim           | 31. Bearing       | 50. Bevel pinion gear | 69. Thrust washer   |
| 12. Thrust washer  | 32. Second shaft  | 51. Cap screw         | 70. Bearing         |
| 13. Needle bearing | 33. Spacer        | 52. Washer            | 71. Snap ring       |
| 14. Snap ring      | 34. Gear          | 53. Washer            | 72. Coupling        |
| 15. Oil seal       | 35. Gear          | 54. Bearing           | 73. Snap ring       |
| 16. Bearing        | 36. Shim          | 55. Pto gear          | 74. Pto drive shaft |
| 17. Input shaft    | 37. Thrust washer | 56. Spacer            | 75. Bearing         |
| 18. Bearing        | 38. Bearing       | 57. Bearing           | 76. Gear            |
| 19. Spacer         | 39. Shim          | 58. Spacer            | 77. Snap ring       |
| 20. Bearing        |                   |                       | 78. Bearing         |



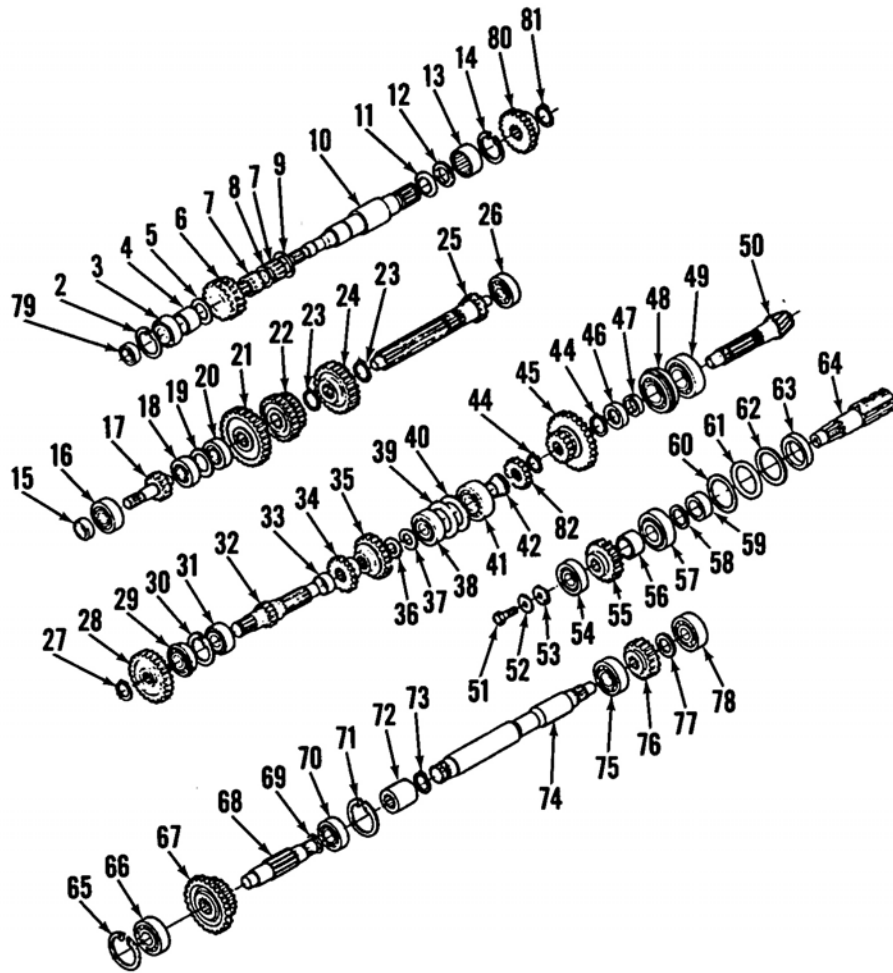


Fig. 77—Exploded view of transmission gears, shafts and other components showing relative installed position used on Model B5100D. For identification of parts, refer to legend in Fig. 75 except for the following front-wheel drive components.

- 79. Oil seal
- 80. Driven gear
- 81. Snap ring
- 82. Drive gear

lift cover. Disconnect and remove differential lock and brake rods. Remove control rod from control valve actuating lever. Remove three cap screws retaining control valve to lift cover, then separate components being careful not to drop the two "O" rings. Remove bracket mounted to lift cover cylinder head. Remove top link bracket at rear of lift cover. Remove the nine cap screws securing lift cover to center housing, then tap lift cover upwards using a suitable mallet. Note that lift cover must be lifted upward because of dowel pins located in center housing. Remove the ten cap screws retaining left and right axle case assemblies to center housing. Tap axle shaft with a suitable mallet to break components apart, then carefully extract assemblies. Remove left (18—Fig. 81) and right (17) differential bearing holders and withdraw shims (4 and 5—Fig. 80). Lift out differential and bevel ring gear assembly from center housing.

Installation is reverse order of removal. Renew all gaskets and "O" rings. Backlash between bevel ring gear and bevel pinion should be 0.1-0.2 mm (0.004-0.008 inch) with an allowable limit of 0.4 mm (0.016 inch). Adjust by varying thickness of shim (4 or 5—Fig. 80) until recommended backlash is attained. Tighten cap screws securing left and right axle case to center housing to 48-56 N·m (35-41 ft.-lbs.) torque for M10 cap screws and 77-90 N·m (57-67 ft.-lbs.) torque for M12 cap screws. Tighten cap screws securing lift cover to center housing to 25-29 N·m (19-22 ft.-lbs.) torque. Tighten cap screws mounting top link bracket to lift cover to 41-47 N·m (30-35 ft.-lbs.) torque.

Capacity of transmission/hydraulic system is 13.5 liters (3.6 U.S. gallons) for Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E and 8.5 liters (2.21 U.S. gallons) for Models B5100D and B5100E and 11.5 liters (3 U.S. gallons) on Models B6100D,

B6100E and B7100D. Use only the following transmission/hydraulic fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56. Add fluid as needed until lubricant level is at full mark on inspection dipstick.

Adjust differential lock control rod as outlined in paragraph 77. Adjust brake pedal free play as outlined in paragraph 80.

**76. OVERHAUL.** Use a suitable bearing puller and push plate to withdraw left and right case bearings (3—Fig. 80). Bend ears of lock plate (6), then remove the four cap screws securing bevel ring gear (2) to differential case (1). Tap components with a suitable mallet to break apart, then complete separation. Extract retaining pin (8), then slide cross-shaft (9) from differential case. Complete disassembly with reference to Fig. 80.

Clean all parts in a suitable cleaning solvent and blow dry with clean compressed air. Inspect components for excessive wear and damage.

Outside diameter of cross-shaft (9) should be 13.973-13.984 mm (0.5502-0.5506 inch). Inside diameter of spider gears (14) should be 14.000-14.018 mm (0.5512-0.5519 inch). Clearance between shaft outside diameter and bushing inside diameter should be 0.016-0.045 mm (0.0006-0.0018 inch) with an allowable

limit of 0.25 mm (0.01 inch). Outside diameter of side gears (10) should be 31.959-31.975 mm (1.2582-1.2589 inches). Inside diameter of bushing in differential case (1) and bevel ring gear (2) should be 32.000-32.025 mm (1.2598-1.2608 inches). Clearance between side gear outside diameter and bushing inside diameter should be 0.025-0.066 mm (0.0010-0.0026 inch) with an allowable limit of 0.25 mm (0.01 inch). Renew all parts as needed.

Reassembly is reverse order of disassembly. Coat all parts with a thin film of a suitable lubricant during reassembly. Tighten cap screws securing bevel ring gear (2) to differential case (1) to 30-35 N·m (22-26 ft.-lbs.) torque. After reassembly, check backlash between spider gears (14) and side gears (10) using a dial indicator as shown in Fig. 82. Backlash should be 0.15-0.30 mm (0.006-0.012 inch) with an allowable limit of 0.4 mm (0.016 inch). If backlash is

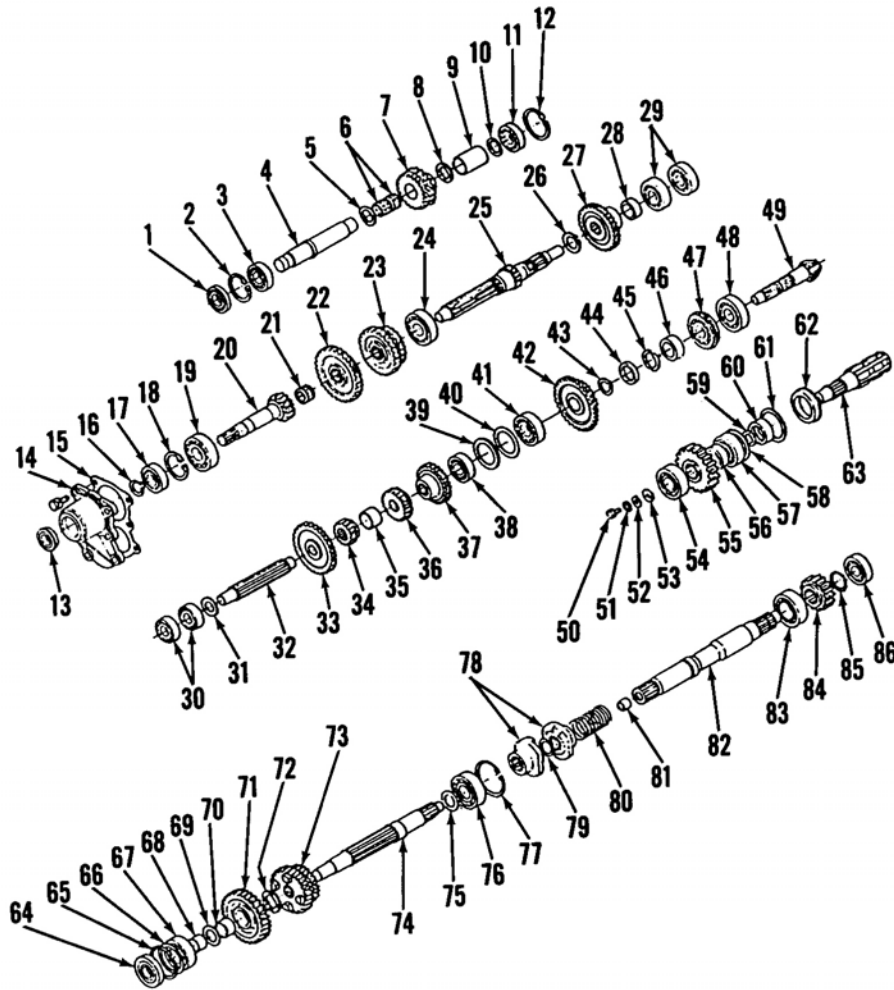


Fig. 78 — Exploded view of transmission gears, shafts and other components used on Model B6100E.

- |                    |                   |                       |                    |
|--------------------|-------------------|-----------------------|--------------------|
| 1. Oil seal        | 23. Gear          | 44. Spacer            | 65. Snap ring      |
| 2. Snap ring       | 24. Bearing       | 45. Stop collar       | 66. Shim           |
| 3. Bearing         | 25. Fourth shaft  | 46. Spacer            | 67. Bearing        |
| 4. Reverse shaft   | 26. Snap ring     | 47. Bearing           | 68. Spacer         |
| 5. Thrust washer   | 27. Gear          | 48. Bearing           | 69. Thrust washer  |
| 6. Needle bearings | 28. Spacer        | 49. Bevel pinion gear | 70. Bushing        |
| 7. Gear            | 29. Bearings      | 50. Cap screw         | 71. Gear           |
| 8. Thrust washer   | 30. Bearings      | 51. Washer            | 72. Thrust washer  |
| 9. Spacer          | 31. Thrust washer | 52. Washer            | 73. Gear           |
| 10. Thrust washer  | 32. Second shaft  | 53. Washer            | 74. Third shaft    |
| 11. Bearing        | 33. Gear          | 54. Bearing           | 75. Shim           |
| 12. Snap ring      | 34. Gear          | 55. Pto gear          | 76. Bearing        |
| 13. Oil seal       | 35. Spacer        | 56. Spacer            | 77. Snap ring      |
| 14. Front cover    | 36. Gear          | 57. Bearing           | 78. One-way clutch |
| 15. Gasket         | 37. Gear          | 58. Spacer            | 79. Snap ring      |
| 16. Snap ring      | 38. Bearing       | 59. Spacer            | 80. Spring         |
| 17. Bearing        | 39. Spacer        | 60. Bushing           | 81. Bushing        |
| 18. Snap ring      | 40. Shim          | 61. Shim              | 82. Fifth shaft    |
| 19. Bearing        | 41. Bearing       | 62. Oil seal          | 83. Bearing        |
| 20. Input shaft    | 42. Gear          | 63. Pto shaft         | 84. Gear           |
| 21. Needle bearing | 43. Snap ring     | 64. Oil seal          | 85. Snap ring      |
| 22. Gear           |                   |                       | 86. Bearing        |

beyond limits adjust by varying thickness of thrust washer (12—Fig. 80). Thrust washer (12) is available in thicknesses of 0.7-0.8 mm (0.0276-0.0315 inch), 0.9-1.0 mm (0.0367-0.0394 inch) and 1.1-1.2 mm (0.0433-0.0472 inch). Correct thickness of thrust washer (13) is 0.9-1.0 mm (0.0367-0.0394 inch).

## DIFFERENTIAL LOCK

### All Models

77. Differential lock assembly mounts in right axle case housing. To service differential lock components, remove right

axle case assembly as outlined in paragraph 78. Separate differential lock components as shown in Fig. 84.

Inspect all components for excessive wear and damage. Make sure engagement teeth on cam (3—Fig. 83) and differential case (2) engage properly and are not chipped, cracked or damaged in any other way. Measure free length of differential lock spring (5), reference value is 40 mm (1.5748 inches). Renew all parts as needed.

Reassembly is reverse order of disassembly. Refer to paragraph 78 to reinstall right axle case assembly. Adjust differential lock pedal travel to a length of 28 mm (1.1024 inches) on Models B5100D and B5100E, 23 mm (0.9055 inch) on Models B6100D, B6100E and B7100D and 4-8 mm (5/32-5/16 inch) on all other models.

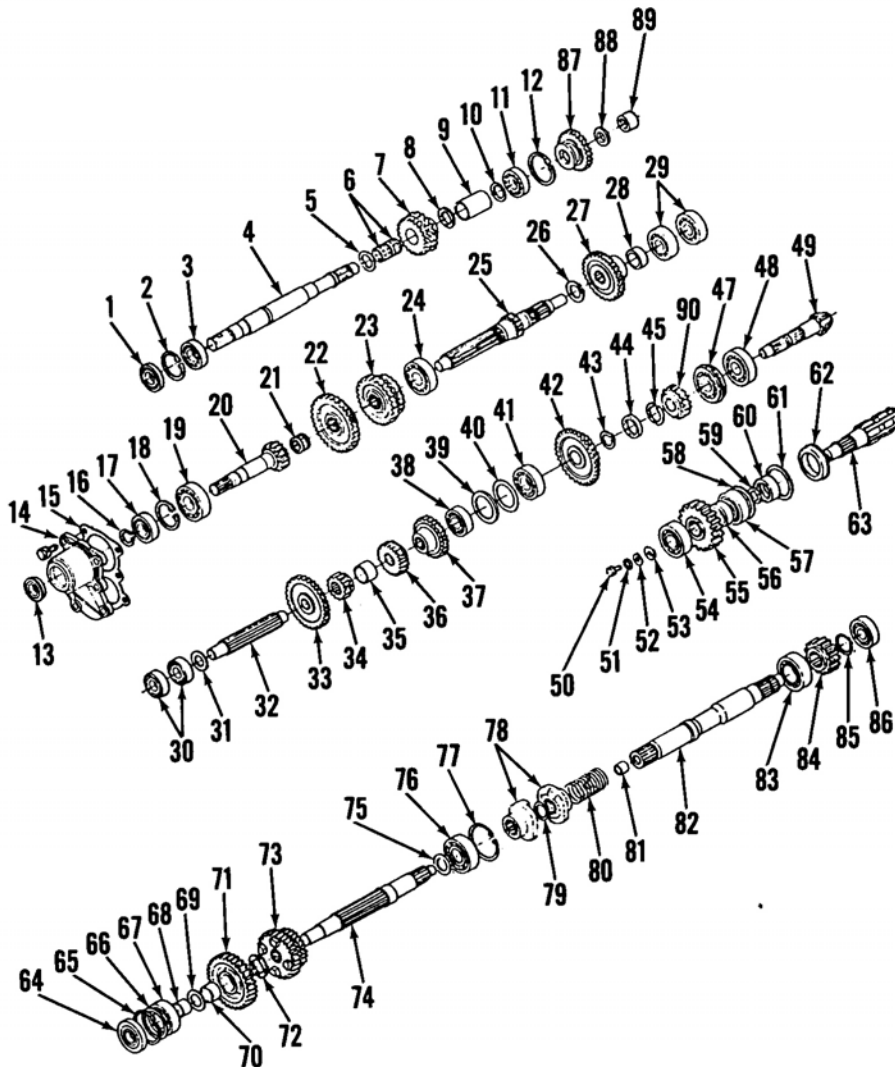


Fig. 79—Exploded view of transmission gears, shafts and other components used on Models B6100D and B7100D. For identification of parts, refer to legend in Fig. 77 except for the following front-wheel drive components.

- 87. Driven gear
- 88. Thrust washer
- 89. Needle bearing
- 90. Drive gear

## FINAL DRIVE

### All Models

78. REMOVE AND REINSTALL. Drain transmission/hydraulic system fluid into a suitable container. Raise rear wheel of the side to be serviced off the ground, then detach and remove rear

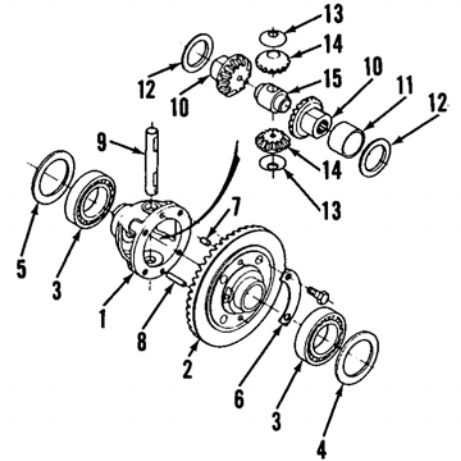


Fig. 80—Exploded view of rear axle differential and bevel ring gear typical of all models.

- 1. Differential case
- 2. Bevel ring gear
- 3. Bearing
- 4. Shim (left)
- 5. Shim (right)
- 6. Lock plate
- 7. Knock pin
- 8. Retaining pin
- 9. Cross-shaft
- 10. Side gear
- 11. Bushing
- 12. Thrust washer
- 13. Thrust washer
- 14. Spider gear
- 15. Thrust collar

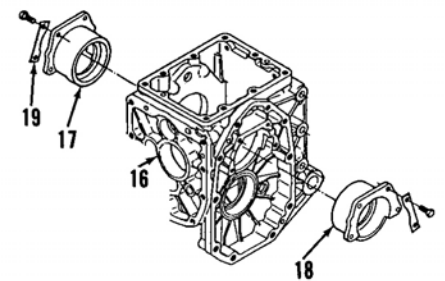


Fig. 81—Left differential bearing holder (18) and right differential bearing holder (17) mount to center housing (16). Retaining cap screws are secured by lock plate (19).

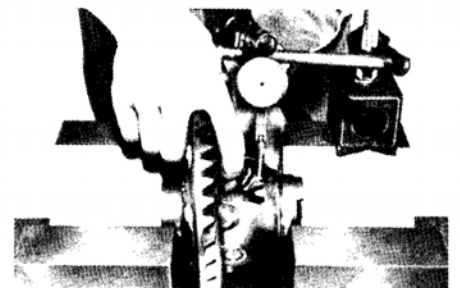


Fig. 82—Check backlash between spider gear and side gear using a dial indicator as shown. Refer to text.

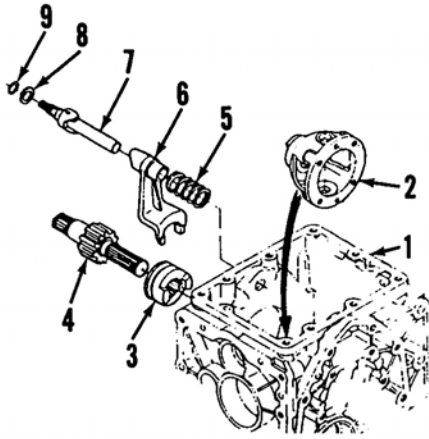


Fig. 83—Exploded view of differential lock assembly typical of the type used on all models.

- 1. Center housing
- 2. Differential case
- 3. Differential lock cam
- 4. Bull pinion gear
- 5. Spring
- 6. Fork
- 7. Engagement rod
- 8. Shim
- 9. "O" ring

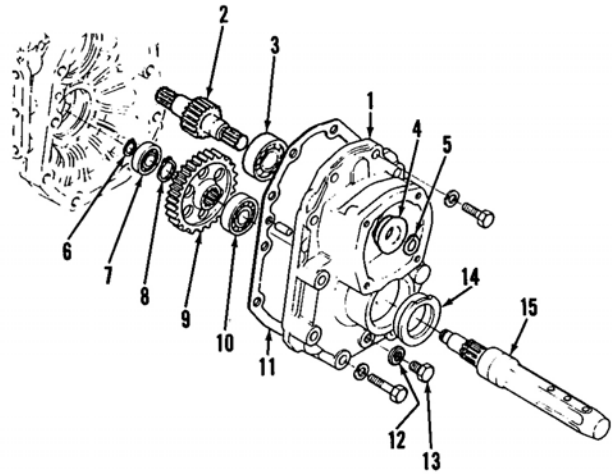
wheel. Remove fender assembly. Disconnect and remove differential lock rod (right side only) and brake rod. Remove the ten cap screws retaining axle case assembly to center housing. Tap axle shaft with a suitable mallet to break components apart, then carefully extract assembly.

Installation is reverse order of removal. Tighten cap screws securing axle case to center housing to 48-56 N·m (35-41 ft.-lbs.) torque for M10 cap screws and 77-90 N·m (57-67 ft.-lbs.) torque for M12 cap screws.

Capacity of transmission/hydraulic system is 13.5 liters (3.6 U.S. gallons) on Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E, 8.5 liters (2.21 U.S. gallons) on Models B5100D and B5100E and 11.5 liters (3 U.S. gallons) on Models B6100D, B6100E and B7100D. Use only the following transmission/hydraulic fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exx-

Fig. 85—Exploded view showing final drive assembly used on Models B5100D and B5100E.

- 1. Rear axle case
- 2. Bull pinion shaft
- 3. Bearing
- 4. Oil seal
- 5. Snap ring
- 6. Snap ring
- 7. Bearing
- 8. Snap ring
- 9. Bull gear
- 10. Bearing
- 11. Gasket
- 12. Gasket
- 13. Drain plug
- 14. Oil seal
- 15. Axle shaft



on Torque Fluid 56. Add fluid as needed until lubricant level is at full mark on inspection dipstick.

Adjust differential lock control rod as outlined in paragraph 77. Adjust brake pedal free play as outlined in paragraph 80.

**79. OVERHAUL.** Before disassembly, check end play of axle shaft (15—Fig. 85 or 86). Recommended end play of axle shaft (15) is 2 mm (0.079 inch). Renewal of axle shaft bearing is required if end play is beyond limit.

Remove brake components as outlined in paragraph 81. If removing right final drive, remove differential lock components. On Models B5100D and B5100E remove snap ring (6—Fig. 85), then extract bearing (7) using a suitable puller. Remove snap ring (8) and withdraw bull gear (9). Using a suitable mallet, tap axle shaft (15) from axle case (1). Remove oil seal (14). Extract bearing (10) from shaft (15) if needed. Remove snap ring (5), then tap pinion shaft (2) from axle case (1). Extract bearing (3) from pinion shaft (2) if needed.

On all other models, remove snap ring

(6—Fig. 86), then extract bearing (7) using a suitable puller. Withdraw bull gear (9) and spacer (16). Remove oil seal (14) and snap ring (8). Using a suitable mallet, tap axle shaft (15) from axle case (1). Extract bearing (10) from shaft (15) if needed. Tap pinion shaft (2) from axle case (1). Extract bearing (3) from pinion shaft (2) if needed.

Examine components for excessive wear and damage. Renew all parts as needed.

Reassembly is reverse order of disassembly. Renew oil seals (4 and 14—Fig. 85 or 86) and gasket (11) during reassembly. Backlash between pinion gear (2) and bull gear (9) should be 0.1-0.2 mm (0.004-0.008 inch) with an allowable limit of 0.5 mm (0.02 inch).

## BRAKE

### All Models

**80. ADJUSTMENT.** Disengage brake lock plate so free travel of right and left brake pedal can be measured in-

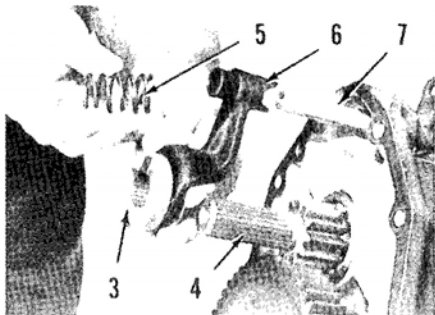
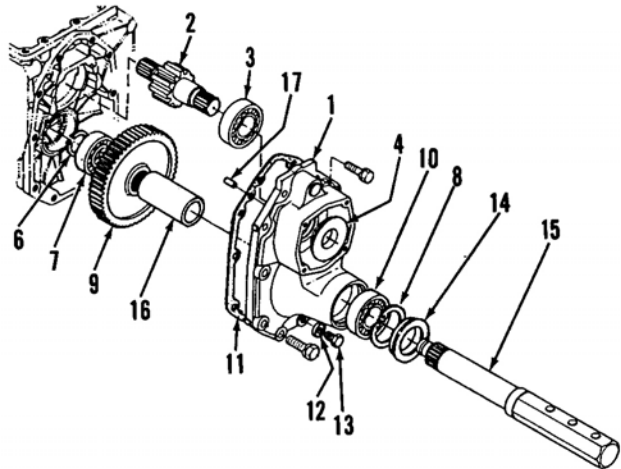


Fig. 84—After removal of right axle case assembly, remove differential lock components as shown. For identification of parts refer to legend in Fig. 83.

Fig. 86—Exploded view showing final drive assembly used on all models except Models B5100D and B5100E. Refer to legend in Fig. 85 for identification of parts except for spacer (16) and dowel pin (17).

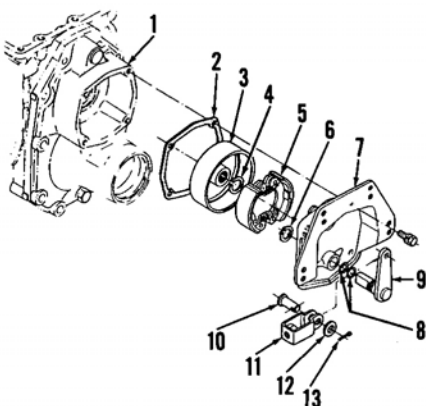


dividually. Applying a load of 39-59 N (9-13 lbs.), push down on each brake pedal until beginning of brake actuation is felt. Use a suitable scale and measure this distance. Free travel distance should be 10-30 mm (25/64-1-3/16 inches) with an allowable limit of 40 mm (1-37/64 inches). Difference between right and left brake pedal free travel should not exceed 4 mm (0.16 inch).

**81. REMOVE AND REINSTALL.**

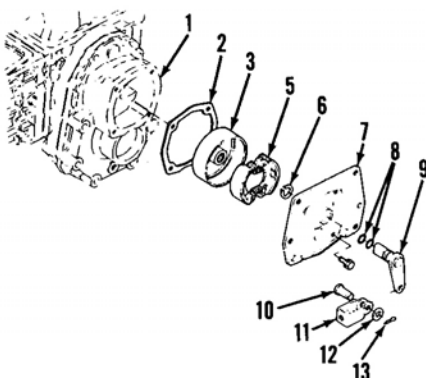
Raise rear wheel of the side to be serviced off the ground, then detach and remove rear wheel. Remove fender assembly. Disconnect and remove brake rod. Remove the four cap screws securing brake cover (7—Fig. 87 or Fig. 87A) to axle case, then separate cover assembly from axle case. On all models except B5100D and B5100E, remove snap ring (4) before separating brake drum (3) from bull pinion shaft.

Installation is reverse order of



**Fig. 87—Exploded view of brake assembly used on Models B6100D, B6100E, B6100HST-D, B6100HST-E, B7100D, B7100HST-D and B7100HST-E.**

- |                |                 |
|----------------|-----------------|
| 1. Axle case   | 8. "O" ring     |
| 2. Gasket      | 9. Actuator cam |
| 3. Brake drum  | 10. Pin         |
| 4. Snap ring   | 11. Bracket     |
| 5. Brake shoes | 12. Washer      |
| 6. Snap ring   | 13. Cotter key  |
| 7. Cover       |                 |



**Fig. 87A—Exploded view of brake assembly used on Models B5100D and B5100E. Refer to legend in Fig. 87 for identification of parts.**

disassembly. Do not allow oil to touch brake shoe lining or brake drum inner surface. Renew gasket (2) and attach cover (7) assembly to axle case (1). Adjust brake pedal free play as outlined in paragraph 80.

**82. OVERHAUL.** Inspect linings of brake shoes (5—Fig. 87) for stains from excessive amounts of oil, cracks, excessive wear or any other damage. Measure brake lining thickness,

minimum allowable thickness is 2.5 mm (0.098 inch). Inspect brake drum (3) inner surface for scoring, discoloration from excessive heat, cracks, excessive wear or any other damage. Inside diameter of brake drum should be 95.0-95.1 mm (3.740-3.744 inches) with an allowable limit of 97 mm (3.819 inches). Examine all other components for excessive wear and damage. Renew all parts as needed.

Reassembly is reverse order of disassembly.

## POWER TAKE-OFF (Models B6100HST-D—B6100HST-E— B7100HST-D—B7100HST-E)

**83. Two rear pto speeds and one mid-pto speed are available by altering the gear combinations through positioning of pto select lever. When pto select lever is placed in low speed range, power is transmitted to rear pto. Rear pto shaft will rotate at a speed of 540 rpm when engine speed is set at 2800 rpm. When pto select lever is placed in high speed range, power is transmitted to rear pto and mid-pto. Rear pto shaft will rotate at a speed of 850 rpm and mid-pto shaft will rotate at a speed of 2450 rpm when engine speed is set at 2800 rpm. A one-way clutch is used to prohibit reverse drive when rear pto speed exceeds engine speed.**

### REAR PTO

#### Models B6100HST-D—B6100HST-E—B7100HST-D—B7100HST-E

**84. R&R AND OVERHAUL.** Drain transmission/hydraulic system fluid into a suitable container. Raise hood and disconnect battery cable from negative battery post. To remove pto components located in center housing, first remove the six cap screws securing rear cover (54—Fig. 88) to center housing (2). Using a suitable mallet, lightly tap rear cover (54) to separate components, then withdraw rear cover with components (43 through 57). Using a suitable puller, extract bearing (42) from shaft end (38). Remove snap ring (41), then withdraw gear (40). To service one-way clutch (34) or extract pto drive shaft (38), first remove hydraulic lift cover as outlined in paragraph 99. Remove all components as needed that will obstruct in center housing and transmission case split. Using suitable holding fixtures, support center housing and transmission case, then split units apart. Remove snap ring (35) and withdraw one-way clutch half (34) and spring (36). Lightly tap front end of shaft (38) to break bearing (39)

loose from center housing bore, then extract shaft.

Inspect all components for damage and excessive wear. Renew all components as needed. Renew seal and gaskets during reassembly.

Installation is reverse of removal. Tighten cap screws securing center housing to transmission case to 19-32 N·m (14-24 ft.-lbs.) torque and nuts to 25-39 N·m (18-29 ft.-lbs.) torque. Reinstall hydraulic lift cover as outlined in paragraph 99. Refill transmission/hydraulic system with 13.5 liters (3.6 U.S. gallons) of the following hydrostatic transmission fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56.

### RANGE TRANSMISSION COMPONENTS

#### Models B6100HST-D—B6100HST-E—B7100HST-D—B7100HST-E

**85. R&R AND OVERHAUL.** Service to pto components located in range transmission is outlined in paragraphs 69 and 70. Pto select linkage components are serviced with reference to Fig. 88 after removal of needed range transmission components to allow access to shift components.

### MID-PTO

#### Models B6100HST-D—B6100HST-E—B7100HST-D—B7100HST-E

**86. R&R AND OVERHAUL.** Drain transmission/hydraulic system fluid into a suitable container. Raise hood and disconnect battery cable from negative battery post. Remove the four cap screws securing case (23—Fig. 88) to bottom side of transmission case (1),

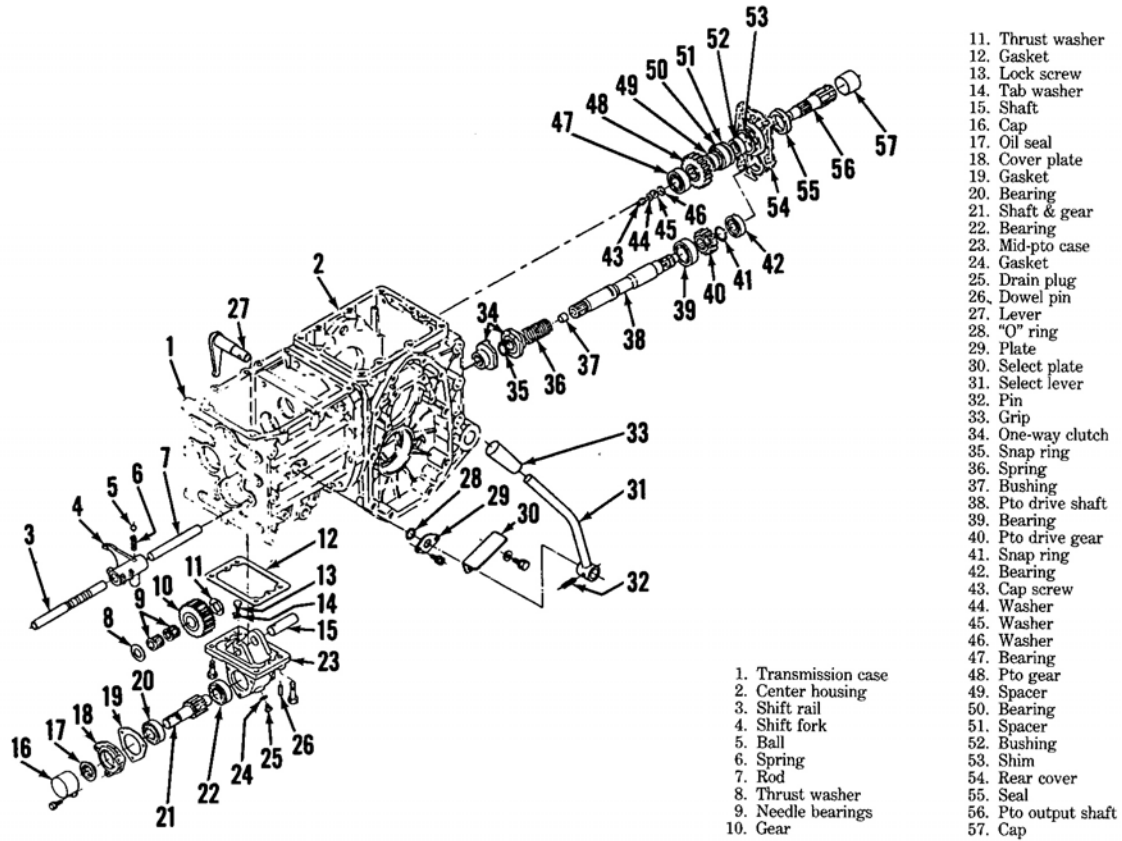


Fig. 88— Exploded view of pto components used on Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E. Refer to text.

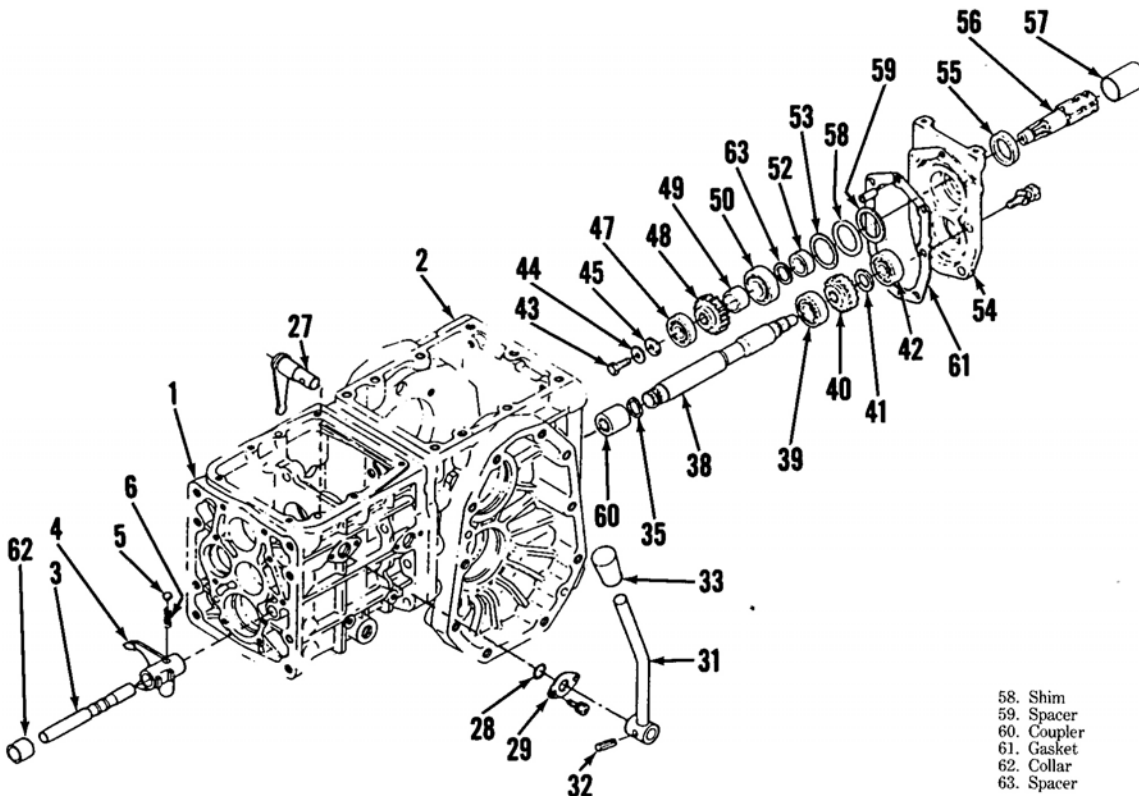


Fig. 89— Exploded view of pto components used on Models B5100D and B5100E. For identification of parts, refer to legend in Fig. 88 except for the following.

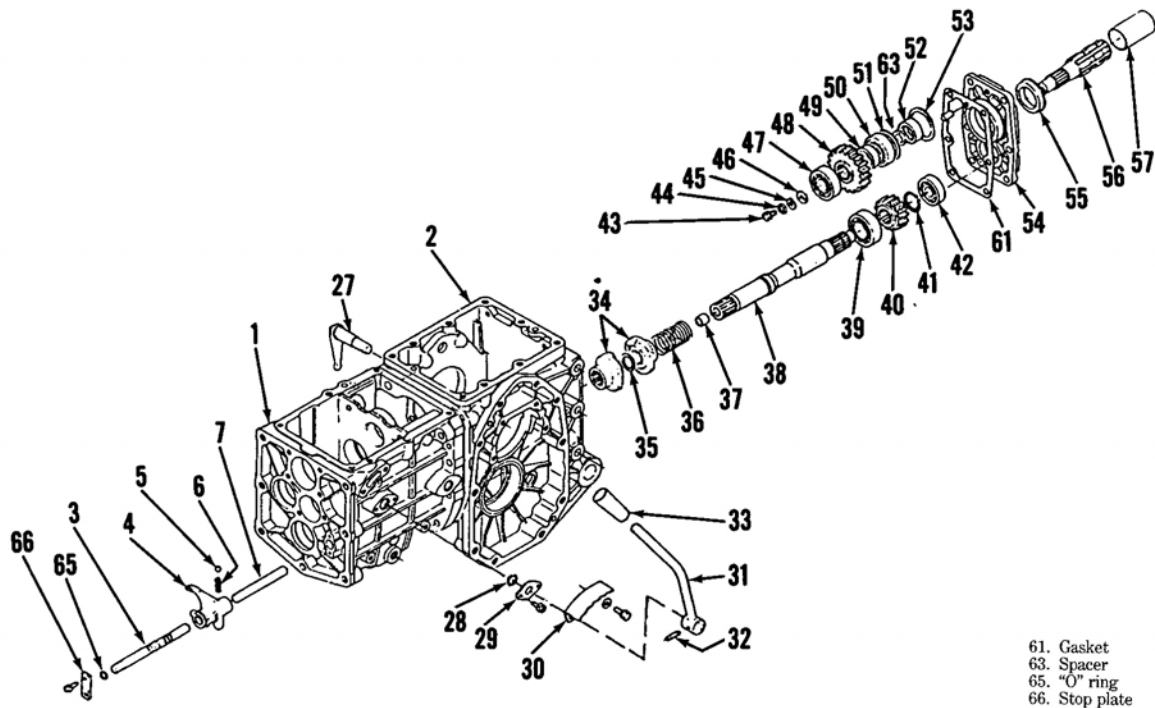


Fig. 90 — Exploded view of pto components used on Models B6100D, B6100E and B7100D. For identification of parts, refer to legend in Fig. 88 except for the following.

61. Gasket  
63. Spacer  
65. "O" ring  
66. Stop plate

then withdraw mid-pt. unit.

Disassembly of unit is evident after referral to Fig. 88. Inspect components and renew any which are damaged or excessively worn.

Installation is reverse order of

removal. Install new gasket (12). Tighten cap screws securing case (23) to transmission case (1) to 48-56 N·m (35-41 ft.-lbs.) torque. Refill transmission/hydraulic system with quantity and grade of fluid as noted in paragraph 84.

## POWER TAKE-OFF (Models B5100D — B5100E — B6100D — B6100E — B7100D)

87. Two rear pto speeds are available on Models B5100D and B5100E and three rear pto speeds are available on Models B6100D, B6100E and B7100D.

**NOTE:** Pto second and third speed ranges should never be used except when following the implement instructions.

On Models B5100D and B5100E, when pto select lever is placed in first speed range, rear pto shaft will rotate at a speed of 603 rpm when engine speed is set at 3000 rpm. When pto select lever is placed in second speed range, rear pto shaft will rotate at a speed of 963 rpm when engine speed is set at 3000 rpm.

On Models B6100D, B6100E and B7100D, when pto select lever is placed in first speed range, rear pto shaft will rotate at a speed of 514 rpm when engine speed is set at 2800 rpm. To place pto select lever in second speed range, loosen cap

screw securing lever restrictor plate to transmission case and slide plate forward. When pto select lever is placed in second speed range, rear pto shaft will rotate at a speed of 876 rpm when engine speed is set at 2800 rpm. To place pto select lever in third speed range, remove lever restrictor plate. When pto select lever is placed in third speed range, rear pto shaft will rotate at a speed of 1498 rpm when engine is set at 2800 rpm. After using second or third pto speed, reinstall restrictor plate and securely tighten retaining cap screw.

### REAR PTO

#### Models B5100D — B5100E — B6100D — B6100E — B7100D

88. R&R AND OVERHAUL. Drain transmission/hydraulic system fluid into

a suitable container. Raise hood and disconnect battery cable from negative battery post. To remove pto components located in center housing, first remove the six cap screws securing rear cover (2) to center housing (1). Using a suitable mallet, lightly tap rear cover (54) to separate components, then withdraw rear cover assembly. Using a suitable puller, extract bearing (42) from shaft end (38). Remove snap ring (41), then withdraw gear (40).

To remove shaft (38) on Model B5100D or B5100E, remove hydraulic lift cover as outlined in paragraph 99. Using a suitable mallet, lightly tap shaft rearward to break bearing (39) loose from center housing bore, then extract shaft. Note coupler (60).

On Models B6100D, B6100E and B7100D, to service one-way clutch (34—Fig. 90) or extract pto drive shaft (38), first remove hydraulic lift cover as outlined in paragraph 99. Remove all components as needed that will obstruct in center housing and transmission case split. Using suitable holding fixtures, support center housing and transmission case, then split units apart. Remove snap ring (35) and withdraw one-way clutch half (34) and spring (36). Lightly tap front end of shaft (38) to dislodge bearing (39) from center housing bore, then extract shaft.

Inspect components and renew any which are damaged or excessively worn.

Installation is reverse of removal.

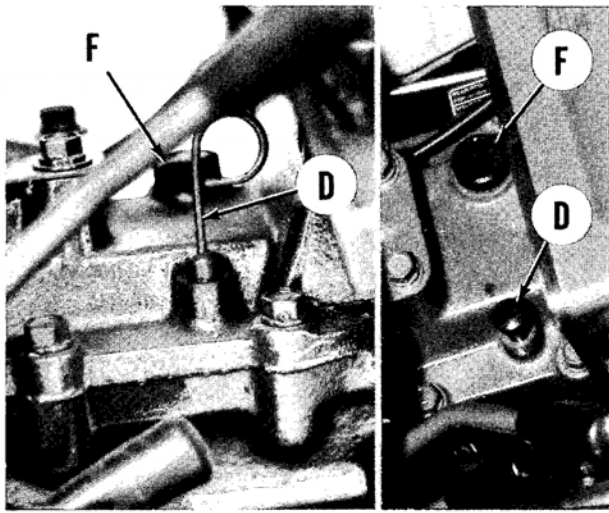


Fig. 91—View shows transmission top cover with two different type of dipsticks (D). Maintain lubricant level at full mark on both models. Add lubricant through fill hole by removing fill cap (F).



Fig. 92—View showing transmission/hydraulic system drain plugs located at bottom of left and right rear axle housings and in bottom of mid-pto housing on models so equipped.

Tighten cap screws securing center housing to transmission case to 19-32 N·m (14-24 ft.-lbs.) torque and nuts to 25-39 N·m (18-29 ft.-lbs.) torque. Reinstall hydraulic lift cover as outlined in paragraph 99. Refill transmission/hydraulic system with 8.5 liters (2.21 U.S. gallons) on Models B5100D and B5100E and 11.5 liters (3 U.S. gallons) on Models B6100D, B6100E and B7100D. Manufacturer recommends the following hydrostatic transmission fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobil Fluid 350, Exxon Torque Fluid 56.

**GEAR TRANSMISSION COMPONENTS**

**Models B5100D – B5100E – B6100D – B6100E – B7100D**

89. **R&R AND OVERHAUL.** Service to pto components located in gear transmission is outlined in paragraphs 73 and 74. Pto select linkage components are serviced with reference to Fig. 89 on Models B5100D and B5100E and Fig. 90 on Models B6100D, B6100E and B7100D after removal of needed gear transmission components to allow access to shift components.

**HYDRAULIC LIFT SYSTEM**

**FLUID AND FILTERS**

**All Models**

90. The hydrostatic transmission (models so equipped), gear or range transmission, differential and hydraulic system share a common sump. Lubricant should be maintained at full level

mark on dipstick (D—Fig. 91). Add lubricant through fill hole under fill cap (F). Fluid should be drained and filled every 200 hours of operation. The hydraulic system strainer (16—Fig. 96) should be cleaned after 200 hours of operation, and on models equipped with hydrostatic drive, transmission oil filter cartridge should be renewed every 200 hours of operation.

Capacity of transmission/hydraulic system is 13.5 liters (3.6 U.S. gallons) on Models B6100HST-D, B6100HST-E, B7100HST-D and B7100HST-E, 8.5 liters (2.21 U.S. gallons) on Models B5100D and B5100E and 11.5 liters (3 U.S. gallons) on Models B6100D, B6100E and B7100D. Use only the following transmission/hydraulic fluid or a suitable equivalent: Kubota UDT hydrostatic transmission fluid, Shell Donax-TD or TM, Mobile Fluid 350, Exxon Torque Fluid 56.

Drain plugs (Fig. 92) are located at bottom of left and right rear axle housings and in bottom of mid-pto housing on models so equipped.

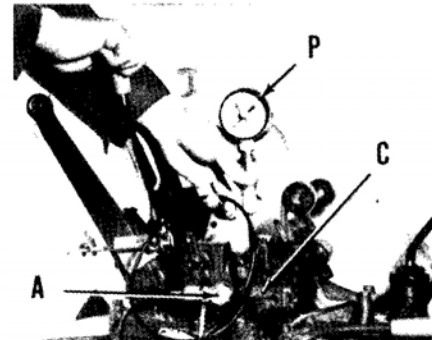


Fig. 93—View showing special Kubota adapter (A) and pressure gage (P) (Tool kit 07916-50041) installed in control valve (C) pressure line inlet. Refer to text.

**TESTS AND ADJUSTMENTS**

**All Models**

91. **RELIEF PRESSURE.** Install special Kubota adapter (A—Fig. 93) and pressure gage (P) (Tool kit 07916-50041) or suitable equivalents. Start engine and allow fluid to warm up to 49°C (120°F) (warm to the touch), then move control lever to full up position while observing the pressure gage. Pressure reading should be 10.8-11.8 MPa (1570-1710 psi). Adjust pressure by varying shims (24—Fig. 101). Adding one 0.3 mm

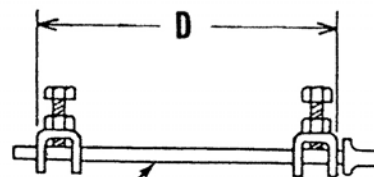
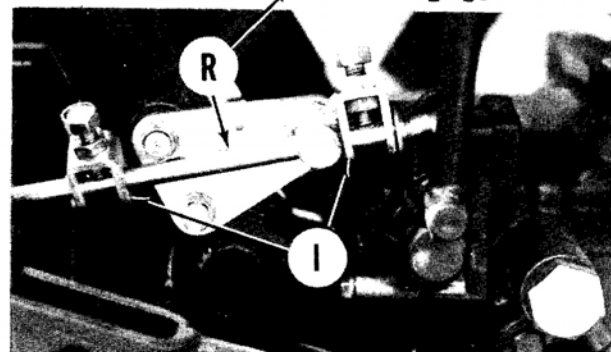


Fig. 94—View showing procedure for measuring distance (D) stops (I) are apart on control rod (R). Refer to text.





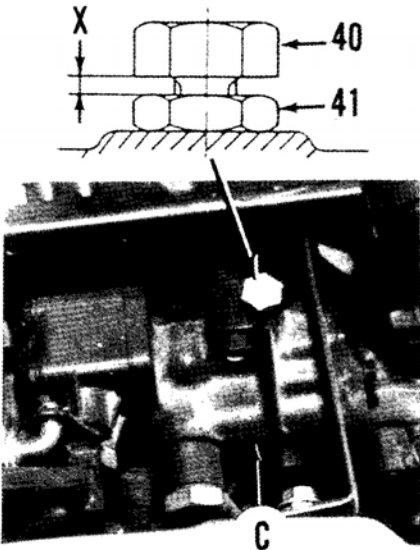


Fig. 95 - View showing adjuster screw (40) and locknut (41) located in control valve (C). Clearance (X) is adjusted to control implement lowering speed. Refer to text.

(0.0118 inch) shim will increase the relief valve set pressure 780-980 kPa (110-140 psi).

**92. CONTROL ROD ADJUSTMENT.** Position front stop (I - Fig. 94) completely forward, then measure distance (D) between stops (I) on control rod (R). Distance (D) should be 124 mm (4.89 inch) on Models B5100D and B5100E and 131 mm (5.16 inch) on all other models. Distance (D) will vary according to type of work. Tilt rear stop at a 60-degree angle away from lift arm as shown in Fig. 94 so interlock and lift arm will clear each other during operation.

**NOTE:** When using rear pto to drive a three-point mounted tiller or mower, make sure control rod interlock is adjusted so angle of pto shaft universal joint cannot exceed 30 degrees or pto drive shaft damage could occur.

**93. IMPLEMENT LOWERING SPEED ADJUSTMENT.** Adjuster screw (40 - Fig. 95) is located in top of control valve assembly (C). Measure clearance (X) between top of locknut (41) and bottom of adjuster screw (40) head. Clearance (X) should be 3 mm (1/8-inch). Screw (40) should be adjusted to allow an implement to lower from full up position to completely down in 3.8-4.2 seconds when atmosphere temperature is 15°C (59°F). Reducing the clearance slows down the lowering speed while increasing the clearance accelerates the lowering speed. Retighten locknut (41) after completing adjustment.

**HYDRAULIC LINES**

**All Models**

94. Shown in Fig. 96 are hydraulic lines located between hydraulic gear pump (G - Fig. 96) and control valve assembly (C). On some models a hydraulic block (Fig. 97) is located in pressure line (20 - Fig. 96) and is used as an option to operate external hydraulic attachments. Note that hydraulic block must only be used when simultaneous three-point hitch operation is needed. External attachment control valve must be equipped with a pressure relief valve which limits maximum pressure to 11.8 MPa (1710 psi). Relief pressure beyond limit could cause hydraulic system damage.

**HYDRAULIC PUMP**

**All Models**

**95. REMOVE AND REINSTALL.** Drain transmission/hydraulic system fluid into a suitable container. Raise hood and disconnect negative battery cable. Remove air cleaner assembly, right side cover and throttle linkage. Close fuel shut-off valve at fuel filter, then disconnect fuel supply line from pump. Remove line connecting fuel tank

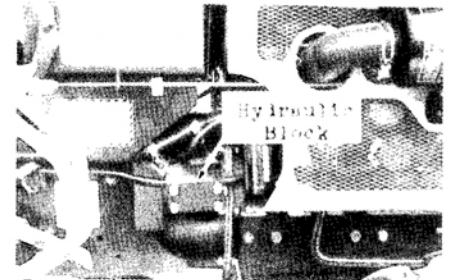


Fig. 97 - View showing hydraulic block located in pressure line (20 - Fig. 96) used on some models. Block is used as an option to operate external hydraulic attachments when simultaneous three-point hitch operation is needed.

to fuel filter at filter port and plug openings to prevent fuel spillage. Remove fuel filter assembly. Remove fitting screws (14 and 18 - Fig. 96), clamp (19) and fitting screw and strainer (16). Remove hydraulic fluid supply lines (12 and 20). Note copper washers (17) and "O" rings (13 and 15) when disassembling. Remove three cap screws and one nut securing hydraulic pump and withdraw pump.

Installation is reverse of removal. Clean hydraulic system strainer (16) if needed. Renew all "O" rings (13 and 15) and copper washers (17) as needed, then securely tighten fitting screws (14, 16 and 18). Replenish transmission/hydraulic system fluid with quantity and grade of lubricant as noted in paragraph 90. Bleed fuel system as outlined in paragraph 36.

**96. OVERHAUL.** Remove the six screws securing end cover (10 - Fig. 98), then separate end cover (10) from pump body (1). Remove "O" rings (2, 8 and 9). Extract outer bushings (7). Remove idler gear (6) and drive gear (5) by lightly tapping shaft end of drive gear (5) with a suitable mallet.

Remove inner bushings (4 - Fig. 98) and "O" rings (3). Remove oil seal (11).

Measure inside diameter of bushings

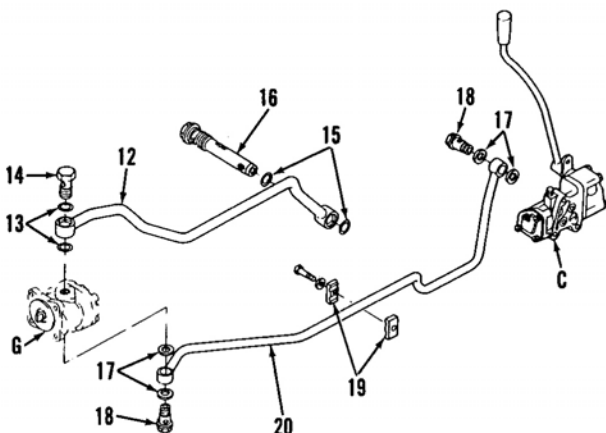


Fig. 96 - View showing hydraulic lines located between hydraulic gear pump (G) and control valve assembly (C). Some models are equipped with a hydraulic block (Fig. 97) located in pressure line (20).

- 12. Suction line
- 13. "O" rings
- 14. Fitting screw
- 15. "O" rings
- 16. Fitting screw & strainer
- 17. Copper washers
- 18. Fitting screw
- 19. Clamp assy.
- 20. Pressure line

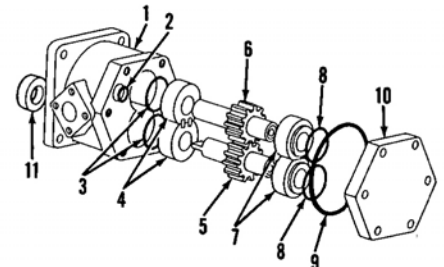


Fig. 98 - Exploded view of hydraulic gear pump.

- 1. Pump body
- 2. "O" ring
- 3. "O" rings
- 4. Inner bushings
- 5. Drive gear & shaft
- 6. Idler gear
- 7. Outer bushings
- 8. "O" rings
- 9. "O" ring
- 10. End cover
- 11. Oil seal

(4 and 7). Diameter should be 14.00-14.02 mm (0.5512-0.5520 inch). Measure outside diameter of drive gear (5) and idler gear (6) shafts where they contact their respective bushings. Diameter should be 13.95-13.98 mm (0.5492-0.5504 inch). Clearance between gear shaft and bushing should be 0.02-0.07 mm (0.0008-0.0028 inch) with an allowable limit of 0.15 mm (0.006 inch). If clearance exceeds allowable limit, renew pump assembly. Measure length of bushings (4 and 7). Length should be 14 mm (0.551 inch). Measure clearance between gears (5 and 6) and pump body (1). Clearance should be 0.02 mm (0.0008 inch) with an allowable limit of 0.05 mm (0.0020 inch). If clearance exceeds allowable limit, renew pump assembly.

Examine all components for scratches, roughness, excessive wear or any other damage. Oil seal and "O" rings only are available as individual components, otherwise pump assembly must be renewed as a complete unit.

Reassembly is reverse order of disassembly. Refer to Fig. 99 for correct assembled direction and position of inner bushings (4), outer bushings (7) and idler gear (6). Install oil seal (11) with number on seal facing outward. Coat all working components, "O" rings and oil seal with a thin film of suitable lubricant during reassembly.

**CONTROL VALVE**

**All Models**

**97. REMOVE AND REINSTALL.** Drain transmission/hydraulic system fluid into a suitable container. Detach control rod (81-Fig. 100) from lever (48). Remove fitting screw (18) while noting copper washers (17-Fig. 96). If needed, remove control valve hydraulic supply line. Remove any other components that will obstruct control valve assembly removal. Remove the three cap screws (S-Fig. 100) securing control valve assembly to lift cover, then remove control valve. Note the two "O" rings (32-Fig. 101) located between control valve and lift cover.

Installation is reverse order of removal. Renew "O" rings (32) and tighten cap screws (S-Fig. 100) to

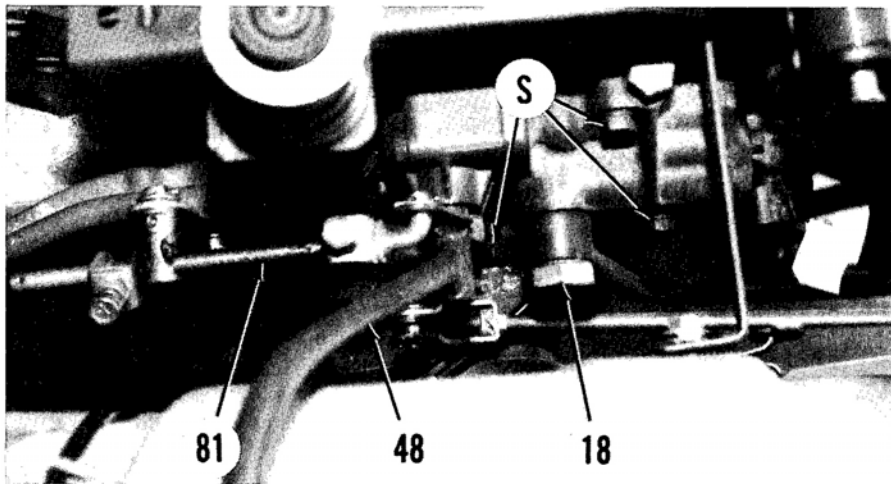


Fig. 100 - Top view of control valve and related components.

- S. Cap screws      18. Fitting screw      48. Control valve lever      81. Control rod

17.7-20.4 N·m (13-15 ft.-lbs.) torque. Renew copper washers (17-Fig. 96) if needed. Replenish transmission/hydraulic system fluid with quantity and grade of lubricant as noted in paragraph 90.

**98. OVERHAUL.** Remove spring holder (43-Fig. 101), gasket (44), spring (45) and ball (46). Remove cap screws retaining valve cover (36) to control valve body (50), then separate components. Bend tab washer (38) clear of cap screw head (37). Remove cap screw (37) and tab washer (38). Extract lever (48), then lift cam (39) from valve cover (36). Withdraw spool (34) from control valve body

(50). Remove cap screws retaining cover plate (21), then separate plate from control valve body (50). Measure and record the distance adjuster screw (23) protrudes from control valve body surface, then remove adjuster screw (23) and remaining relief valve components (24 through 31).

Clean all components with a suitable cleaning solvent, then blow dry with clean compressed air or dry with a clean lint-free cloth. Inspect spool (34) and valve body bore for heavy scratches, excessive wear or any other damage. If heavy scratches are noted, run your fingernail over the suspected surface, if

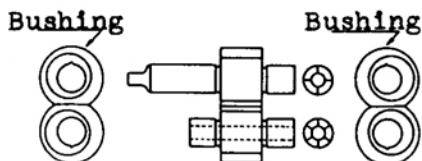
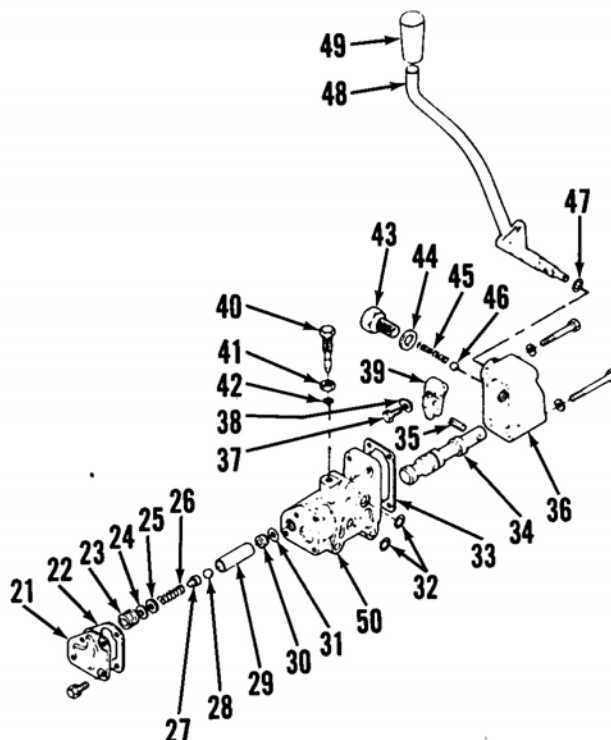
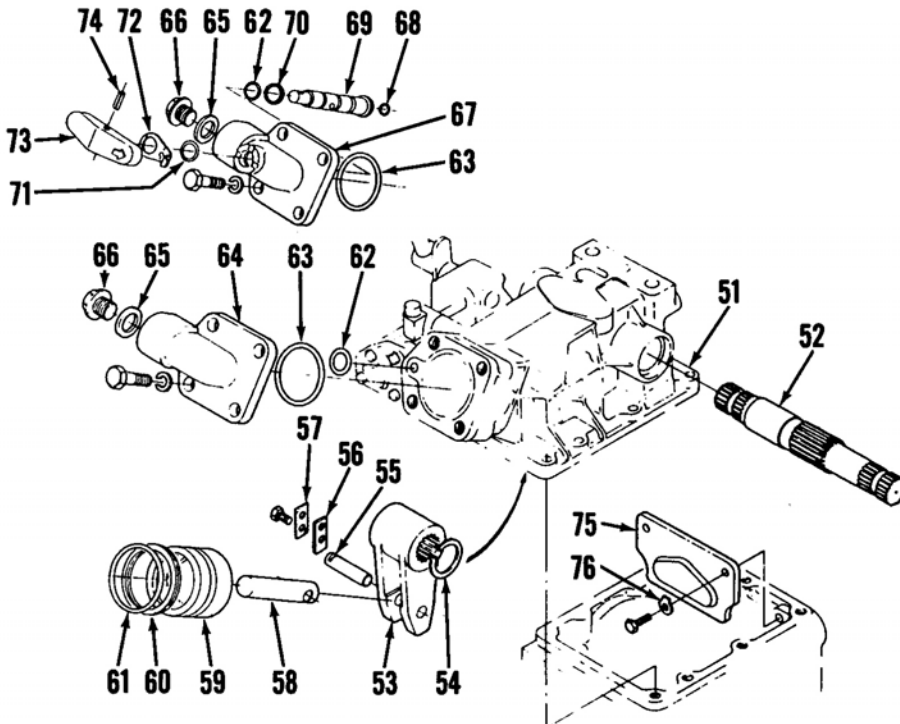


Fig. 99 - View showing correct assembled direction and position of hydraulic pump bushings and gears.

Fig. 101 - Exploded view of control valve assembly.

- 21. Cover plate
- 22. Gasket
- 23. Adjuster screw
- 24. Shim
- 25. Washer
- 26. Spring
- 27. Spring holder
- 28. Ball
- 29. Sleeve
- 30. Seat
- 31. "O" ring
- 32. "O" rings
- 33. Gasket
- 34. Spool
- 35. Pin
- 36. Valve cover
- 37. Cap screw
- 38. Tab washer
- 39. Cam
- 40. Adjuster screw
- 41. Locknut
- 42. "O" ring
- 43. Spring holder
- 44. Gasket
- 45. Spring
- 46. Ball
- 47. "O" ring
- 48. Control valve lever
- 49. Grip
- 50. Control valve body





**Fig. 102—Exploded view of hydraulic cylinder components typical of all models. Diverter valve used on some models is shown at top. On early models, piston (59) is only fitted with "O" ring (61). On later models, piston (59) is fitted with both seal ring (60) and "O" ring (61).**

- |                  |   |                                     |
|------------------|---|-------------------------------------|
| 51. Lift cover   | 61. "O" ring                              | 68. "O" ring                        |
| 52. Rocker shaft | 62. "O" ring                              | 69. Diverter valve spool            |
| 53. Arm          | 63. "O" ring                              | 70. Washer                          |
| 54. Snap ring    | 64. Cylinder head                         | 71. "O" ring                        |
| 55. Shaft        | 65. Gasket                                | 72. Spring plate                    |
| 56. Washer plate | 66. Plug                                  | 73. Control handle                  |
| 57. Lock plate   | 67. Cylinder head (diverter valve models) | 74. Pin                             |
| 58. Rod          |   | 75. Plate                           |
| 59. Piston       |   | 76. Tab washer (models so equipped) |
| 60. Seal ring    |   |                                     |

your nail catches then component must be renewed. It is recommended that both the control valve body (50) and spool (34) be renewed if either is defective. Inspect ball (28) and contact area of seat (30) for excessive wear, suspected oil leakage or any other damage. It is recommended that both ball (28) and

seat (30) be renewed if either is defective. Examine spring (26) for squareness and correct length. Length of spring (26) should be 37.7-38.3 mm (1.484-1.508 inches). Examine all other components for excessive wear or any other damage. Renew all components as needed.

Reassembly is reverse order of

disassembly. Renew all gaskets and "O" rings. Use a suitable lubricant and coat all working components with a thin film of oil during reassembly. Tighten cap screw (37) to 9.8-17.7 N·m (7-13 ft.-lbs.) torque. During reassembly, be sure that pin (35) engages slot in cam (39).

**LIFT COVER**

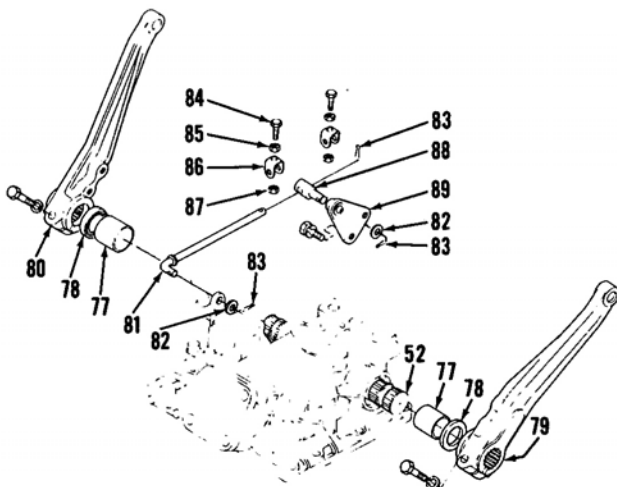
**All Models**

**99. REMOVE AND REINSTALL.** Lower lift arms to complete down position. Remove seat. Remove control valve assembly as outlined in paragraph 97. Remove bracket mounted on lift cover cylinder head. Remove top link bracket at rear of lift cover. Remove nine cap screws securing lift cover, then with a suitable mallet tap lift cover upward to separate from center housing. Note that lift cover must be lifted straight up because of locating dowel pins.

Installation is reverse order of removal. Tighten cap screws securing lift cover to center housing to 39-45 N·m (29-33 ft.-lbs.) torque. Complete reassembly with reference to paragraph 97. Install seat.

**100. OVERHAUL.** Remove seat mounting brackets. Remove four cap screws securing cylinder head (64 or 67—Fig. 102) to lift cover (51), then separate components. Extract piston (59) from cylinder bore. Place suitable alignment marks on lift arms (79 and 80—Fig. 103) and rocker shaft (52) to ensure correct positioning during reassembly. Remove cap screws securing left and right lift arms (79 and 80) on rocker shaft (52), then withdraw left lift arm (79) and right lift arm (80) with control rod assembly (81 through 89). Place a suitable alignment mark on rocker shaft (52—Fig. 102) and arm (53) to ensure correct positioning during reassembly. Hold snap ring (54) open and lightly tap rocker shaft (52) against small diameter end to drive rocker shaft (52) from arm (53). Remove oil seals (78—Fig. 103). On models equipped with diverter valve cylinder head (67), disassembly is evident after referral to Fig. 102.

Clean all components with a suitable cleaning solvent, then blow dry with clean compressed air. Inside diameter of cylinder bore should be 60.06-60.10 mm (2.365-2.366 inch) with an allowable limit of 60.15 mm (2.368 inches). Cylinder bore should not taper more than 0.05 mm (0.002 inch). Measure vertical and horizontal inside diameter of lift cover bushings (77—Fig. 103). Right side bushing (large end) diameter should be 31.97-32.04 mm (1.2587-1.2614 inches) with an allowable limit of 32.4 mm



**Fig. 103—Exploded view showing rocker shaft, lift arms and control rod assembly typical of all models.**

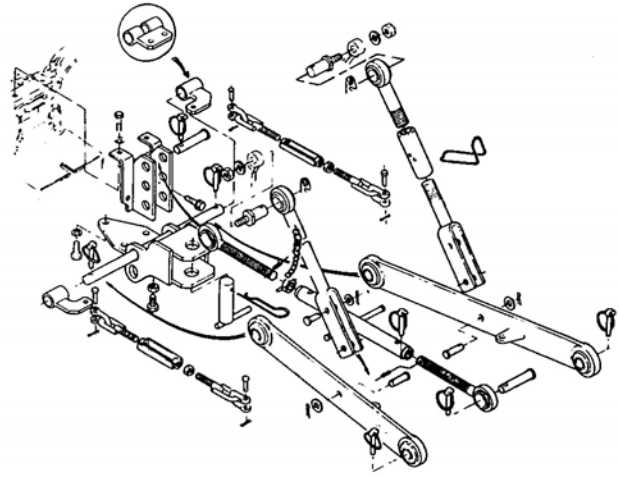
- |                    |                    |
|--------------------|--------------------|
| 52. Rocker shaft   | 83. Spring clip    |
| 77. Bushing        | 84. Adjuster screw |
| 78. Oil seal       | 85. Locknut        |
| 79. Left lift arm  | 86. Stop clevis    |
| 80. Right lift arm | 87. Nut            |
| 81. Control rod    | 88. Actuator pin   |
| 82. Washer         | 89. Bracket        |

(1.276 inches). Left side bushing (small end) diameter should be 27.97-28.04 mm (1.1012-1.1039 inches) with an allowable limit of 28.4 mm (1.118 inches). Measure outside diameter of rocker shaft (52) where bushings (77) contact shaft (52). Right side (large end) diameter should be 31.92-31.95 mm (1.2567-1.2579 inches). Left side (small end) diameter should be 27.94-27.96 mm (1.100-1.1079 inches). Clearance between rocker shaft (52) and bushings (77) should be 0.01-0.09 mm (0.0004-0.0035 inch) with an allowable limit of 0.5 mm (0.020 inch).

Examine piston (59—Fig. 102) and cylinder bore for heavy scratches. Inspect all other components for excessive wear or any other damage. Renew all components as needed.

Reassembly is reverse order of disassembly. Renew gasket, seals and "O" rings as needed. Use a suitable lubri-

**Fig. 104—Exploded view of three-point hitch assembly typical of all models.**



cant and coat all seals and "O" rings with a thin film of oil prior to reassembly. Be sure rocker shaft (52—Fig. 103) align-

ment marks are correctly positioned with lift arms (79 and 80) and arm (53—Fig. 102) during reassembly.

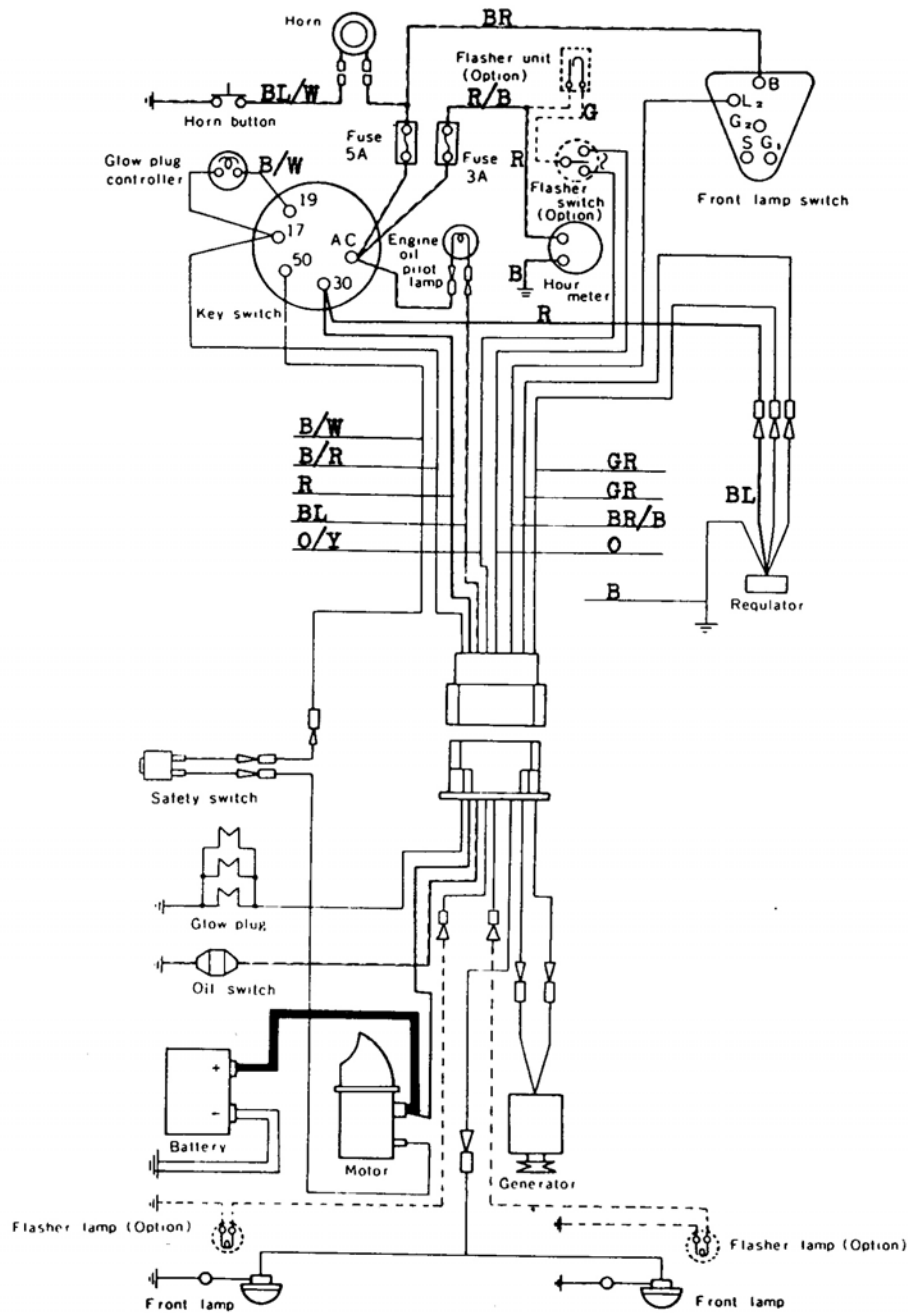


Fig. 105— Typical wiring schematic for Models B5100D, B5100E, B6100D and B6100E.

- |                   |                    |
|-------------------|--------------------|
| B. Black          | G. Green           |
| BL. Blue          | GR. Gray           |
| BR. Brown         | O. Orange          |
| B/R. Black/red    | O/Y. Orange/yellow |
| B/W. Black/white  | R. Red             |
| BL/W. Blue/white  | R/B. Red/black     |
| BR/B. Brown/black | R/W. Red/white     |

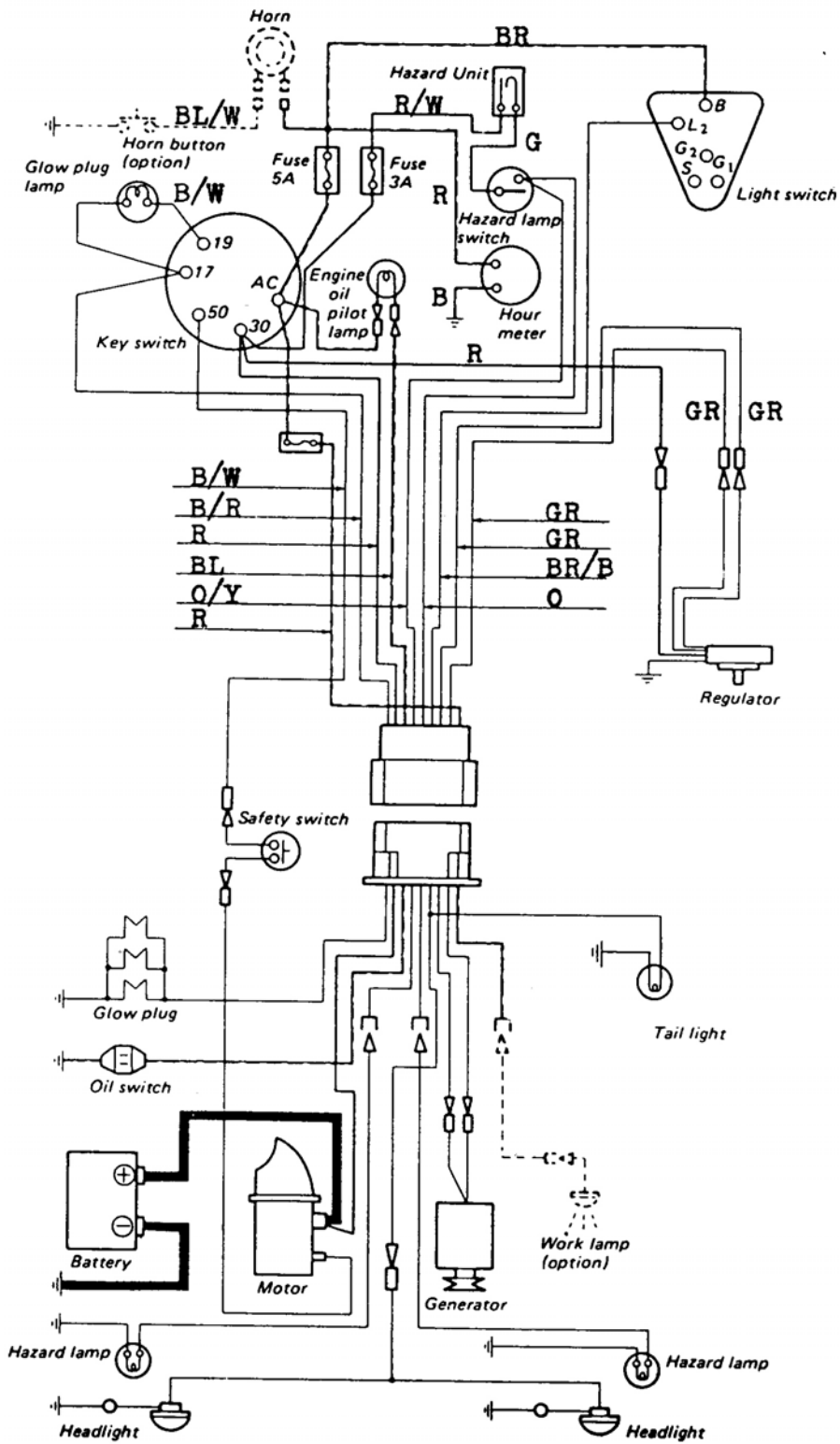


Fig. 106— Typical wiring schematic for Models B6100HST-D, B6100HST-E, B7100D, B7100HST-D and B7100HST-E. Refer to legend in Fig. 105 for wire identification.