SHOP MANUAL

KOMATSU

GD530A, AW SERIES
GD650A, AW SERIES
GD670A, AW SERIES

MACHINE MODEL	SERIAL NUMBER
GD530A-1	200840 THRU 202000
GD530A-1E	201404
GD530A-2A	202002 & Up
GD530A-2B	202002 & Up
GD530A-2E	202002 & Up
GD530A-2C	
GD530AW-1	200840 THRU 202000
GD530AW-2A	202002 & Up
GD530AW-2B	202002 & Up
GD530AW-2E	202002 & Up
GD530AW-2C	
GD650A-1	200840 THRU 202000
GD650A-2	202001
GD650A-2A	202002 & Up
GD650A-2B	202002 & Up
GD650A-2E	202002 & Up

MACHINE MODEL	SERIAL NUMBER
GD650A-2C	
GD650AW-1	200840 THRU 202000
GD650AW-2A	202002 & Up
GD650AW-2B	202002 & Up
GD650AW-2E	202002 & Up
GD650AW-2C	
GD670A-1	200840 THRU 202000
GD670A-2A	202002 & Up
GD670A-2B	202002 & Up
GD670A-2E	202002 & Up
GD-670A-2C	
GD670AW-1	200840 THRU 202000
GD670AW-2A	202002 & Up
GD670AW-2B	202002 & Up
GD670AW-2E	202002 & Up
GD-670AW-2C	

This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Material and specifications are subject to change without notice.

GD530A, AW Series mount the KDC610T / S6D102-1 / S6D102E-1 engine.
GD650A, AW Series mount the KDC614T / S6D114-1 / S6D114E-1 engine.
GD670A, AW Series mount the KDC614T / S6D114-1 / S6D114E-1 engine.

For details of the engines, see the appropriate engine manual sets.
APR 96

19. Remove four bolts, lock washers, plain washers (1, Figure 13) and hose clamps (2).

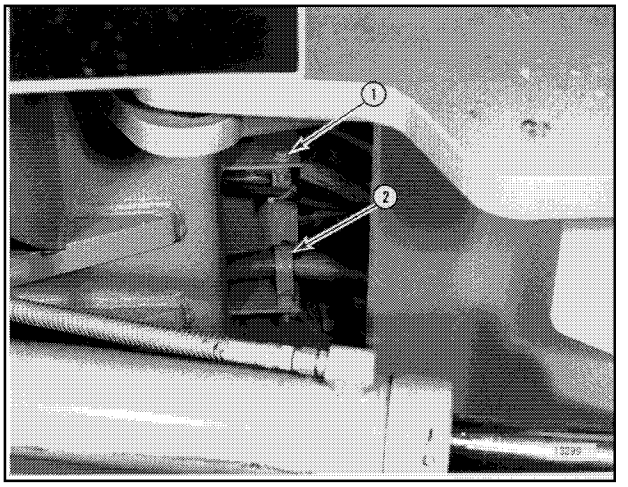

Figure 13

20. Remove two bolts, lock washers and retainer plate (top [1] & bottom [2], Figure 14).

21. Remove plates with shims from top articulation joint.

    NOTE: *Repeat for bottom articulation joint.*

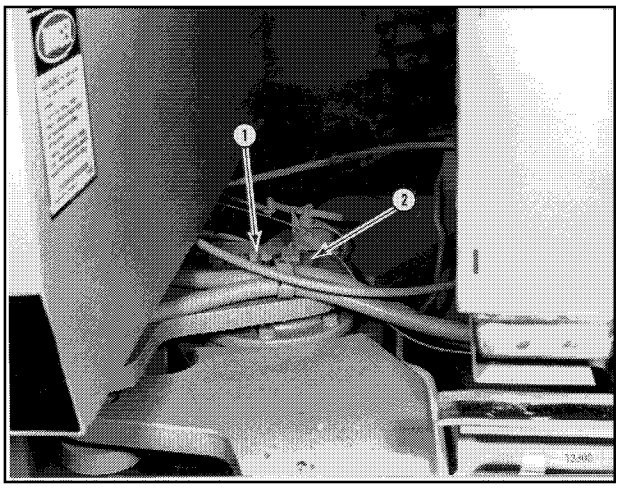

Figure 14

22. Place suitable ten ton jacks (1, Figure 15) under front module for support.

23. Using another hydraulic jack (2, Figure 15), remove bottom hinge pin.

24. With hydraulic jack installed between remaining top articulation assembly and top of bottom hinge pin assembly: remove top hinge pin.

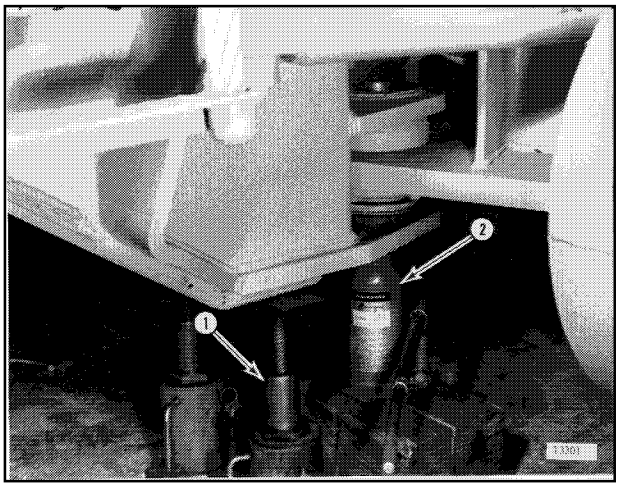

Figure 15

12. Support hood side (1, Figure 27) and install gas spring door prop (2) between hood side and rear cowl (3).

    NOTE: *The gas spring door prop extends further than the locking support, and should be installed first.*

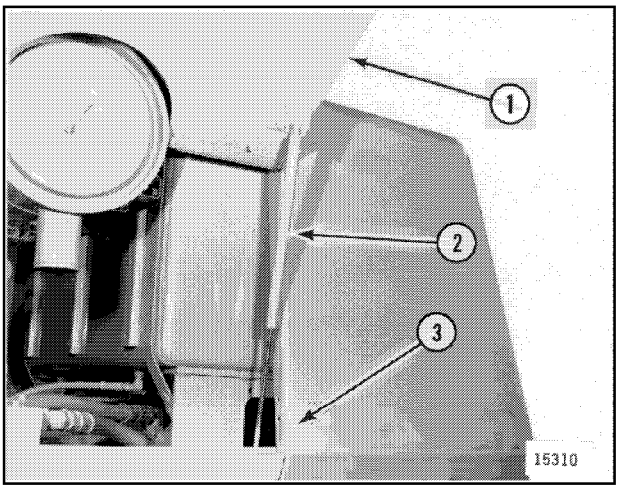

Figure 27

13. With hood side (1, Figure 28) still supported, install locking support (2) between hood side and front cowl (3).

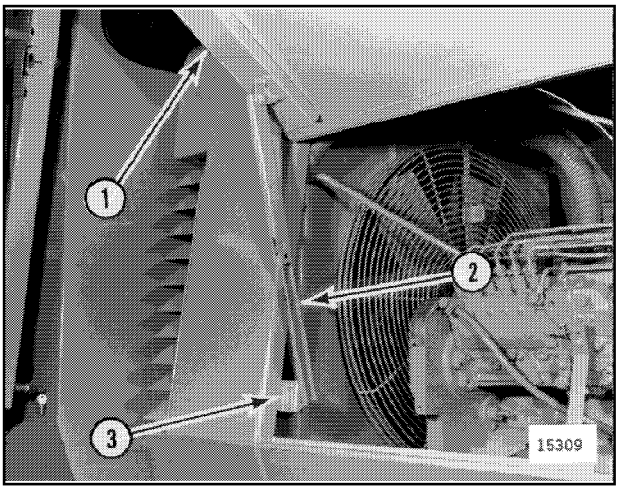

Figure 28

14. Secure air intake cap (2, Figure 29) to air intake tube (3) with clamp (1).

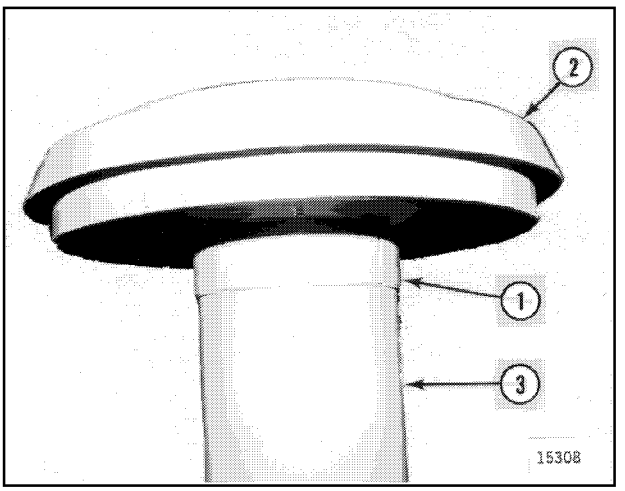

Figure 29

9. Position housing as shown, use clean wood block to protect housing end from vise rail.

10. Remove retaining ring (1, Figure 9) from housing (2).

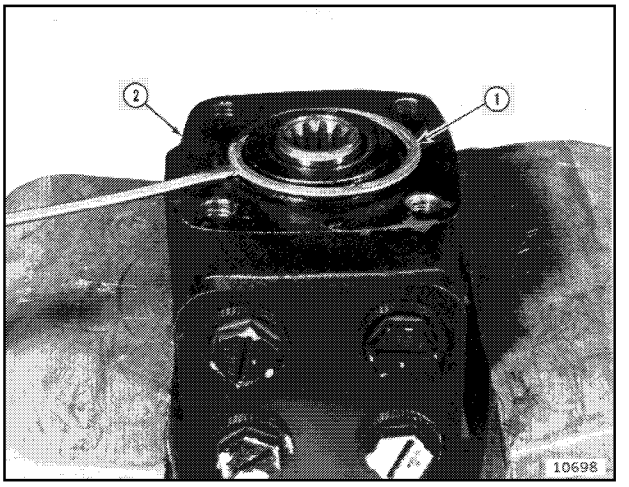

Figure 9

11. Pry seal gland bushing (1, Figure 10) from housing (2).

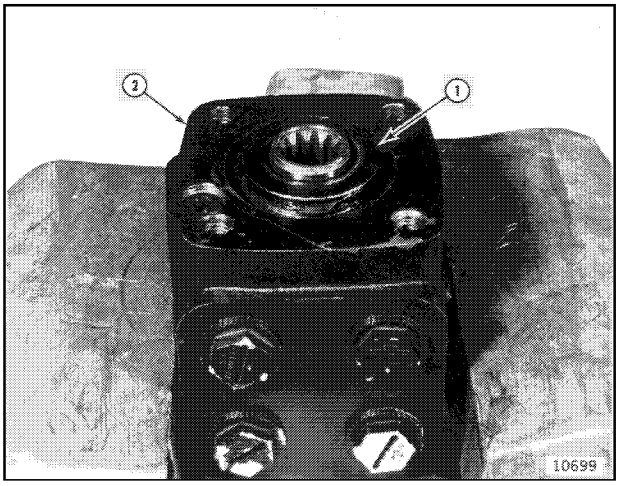

Figure 10

12. Remove upper seal (1, Figure 11) and lower quad ring seal (2) from seal gland bushing (3), refer to cleaning and inspection section for appropriate service.

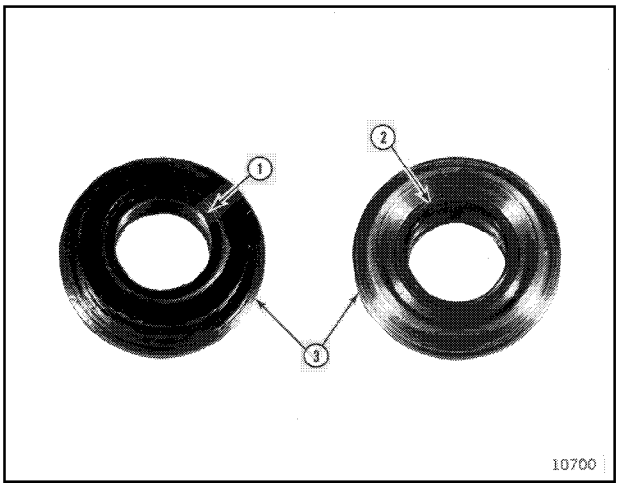

Figure 11

15. Set spacer (2, Figure 31) on drive shaft, install star gear (1) on drive spline.

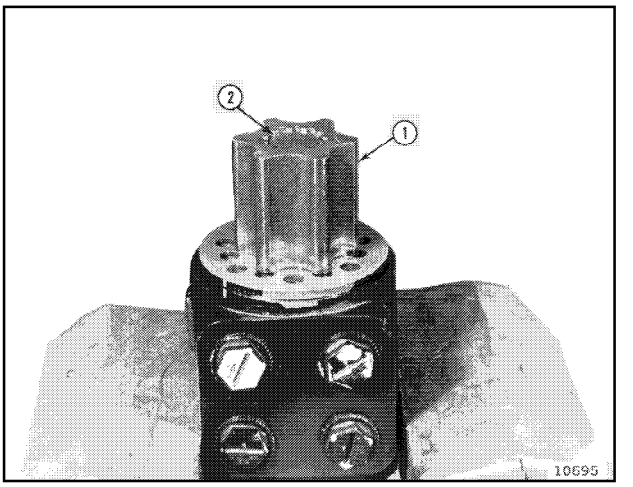

Figure 31

16. Replace O-ring (1, Figure 32) on gerotor (2).

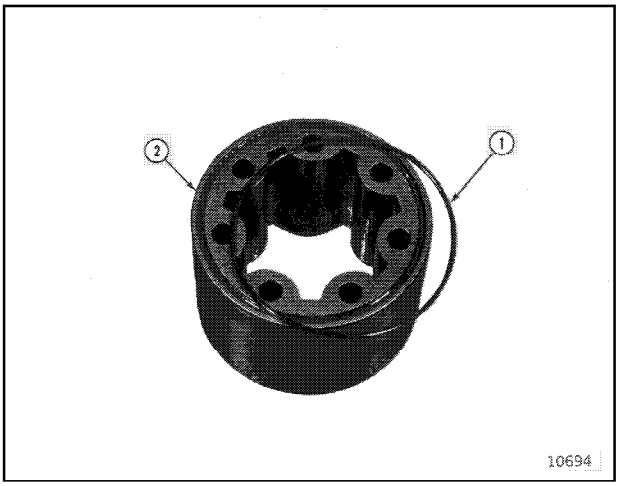

Figure 32

17. Align match marks and install gerotor (1, Figure 33) with O-ring down, over star gear (2).

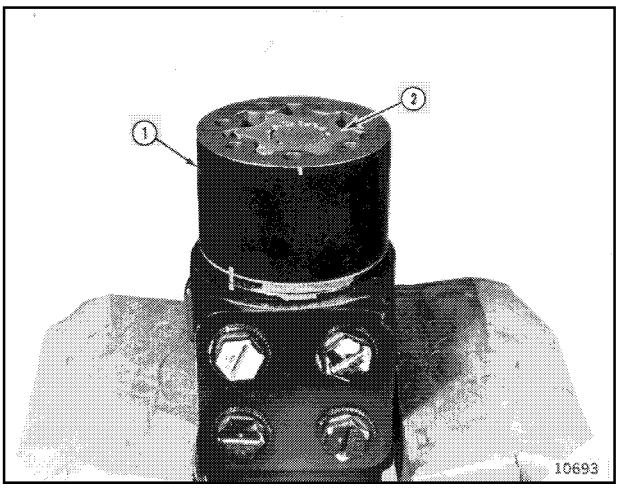

Figure 33

5. If the oil temperature gauge, which is the converter oil out temperature, rises to 250°F (121°C) or the warning light comes on, stop the vehicle immediately. Shift to neutral and run the engine at 1000 - 1200 RPM. The temperature should drop rapidly to the engine water temperature, or if an air to oil exchanger is used, the temperature should drop rapidly to ambient air temperature across the heat exchanger. If the temperature does not drop, trouble is indicated. The trouble should be determined before the vehicle is operated again. Overheating generally occurs due to working in too high of a gear ratio.

6. Do not shut off the engine when the unit is overheating, if the cooling system is known to be in working order.

SERVICE

1. When servicing the unit for the first time after vehicle installation and/or after repair, the unit is filled as follows:

   A. Fill the unit with 4 U.S. Gallons (15.1 ℓ) of the recommended lubricant.

   B. Start the engine and run at idle speed to let the converter and oil lines fill.

WARNING! Assure that transmission has been shifted to "NEUTRAL," parking brake has been applied, and moldboard is resting on ground. Do not risk severe personal injury or death.

   C. With the engine at idle speed, finish filling the unit to the full level. The amount needed will vary with each application.

NOTE: *The oil level is always checked with the engine running at idle speed, the transmission in neutral, and transmission oil temperature 160° - 200°F (71° - 93°C). In some applications that use an air to oil heat exchanger, the transmission temperature will be below the temperature recommended for checking oil level. Due to the expansion of oil as it heats up, it is important that the oil level be checked at the recommended temperature.*

WARNING! Do not overfill the transmission.

2. Lubrication Recommendations:

Recommended Oils: COMMERCIAL POWERSHIFT TRANSMISSION

Prevailing Ambient Temperature	Oil Specifications
Above - -10°F (-23°C)	Hydraulic Transmission Fluid Type C-3 or C-4 (except Grade 30).
Below - -10°F (-23°C)	Hydraulic Transmission Fluid Type C-3 or C-4 (except Grade 30). Auxiliary preheat required to raise temperature in the sump to above -10°F (-23°C).
Above - 32°F (0°C)	Hydraulic Transmission Fluid Type C-3 or C-3 Grade 30.

WARNING! Funk Manufacturing does not recommend the use of any hydraulic transmission fluid that uses an "EP" (Extreme Pressure) additive.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Clutch selected pressure does not return to normal.	Contaminated solenoid valve spool.	Clean valve and replace oil and filter.
	Accumulator spring too strong.	Replace spring.
	Primary pump defective.	Replace primary pump.
	Excessive internal leakage to clutch.	Inspect seal ring, piston seals and all sealing surfaces. (See assembly section of this manual Item 1, ?.)
Excessive noise.	Charge pump defective.	Replace pump.
	Excessive backlash in gear.	Replace bearings and inspect for defective gears.
	Auxiliary drive pump bad.	Remove pump and check for noise.
Blows oil out of breather or dipstick.	Transmission overfilled with oil.	Establish proper oil level. (Check front seal on auxiliary driven hydraulic pump if installed.)
	Converter seal ring broken.	Remove transmission and install new seal ring on converter hub.
Transmission overheating.	Converter stalling.	Shift to lower gear.
	Oil level to high.	Establish proper oil level. (Check front seal on auxiliary driven hydraulic pump if installed.)
	Engine overheating.	Check engine coolant.
	Water line defective on heat exchanger.	Replace lines.
	Heat exchanger dirty.	Clean heat exchanger.
	Clutch slipping.	Check clutch pressure.

11. Using a suitable lifting device, sling hood top (1, Figure 19) in opposite corners as shown. Remove hood top from grader.

    NOTE: *Set hood top on front frame member in front of lift cylinders. This will help prevent the sheet metal and hood sides from becoming sprung.*

    NOTE: *If unit is equipped with an air restriction indicator (2,* Figure 19*), be sure to disconnect the plastic tube leading to it located inside the hood top lip by L.H. hood side.*

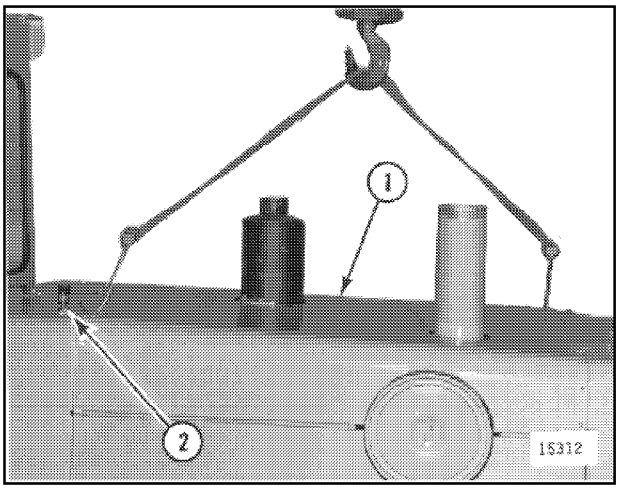

Figure 19

12. Remove three bolts, lock washers and flat washers (1, Figure 20) that secure rear cowl (2) to frame (3) on each side. Remove two bolts, lock washers and flat washers that secure rear cowl to battery tray (4).

13. Remove two bolts, lock washers and flat washers that secure rear cowl to engine panel on other side.

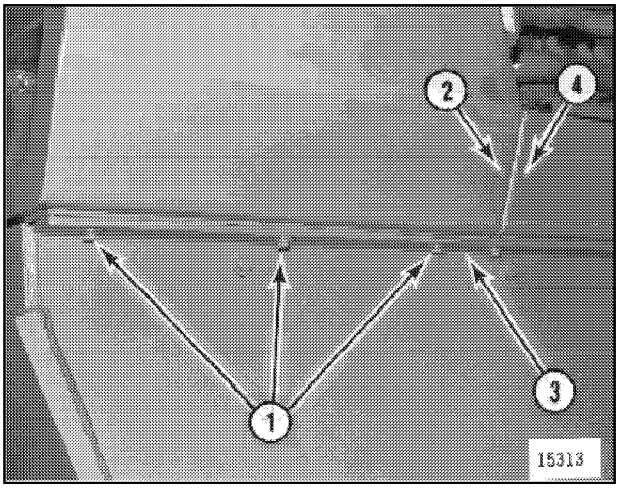

Figure 20

14. Using a suitable lifting device, sling rear cowl (1, Figure 21) through fuel tank and hydraulic oil tank access cover holes.

15. Disconnect electrical connector (2, Figure 21) leading to tail lights, fuel tank sending unit, hydraulic oil filter and hydraulic oil temperature sensor (and other accessories if applicable).

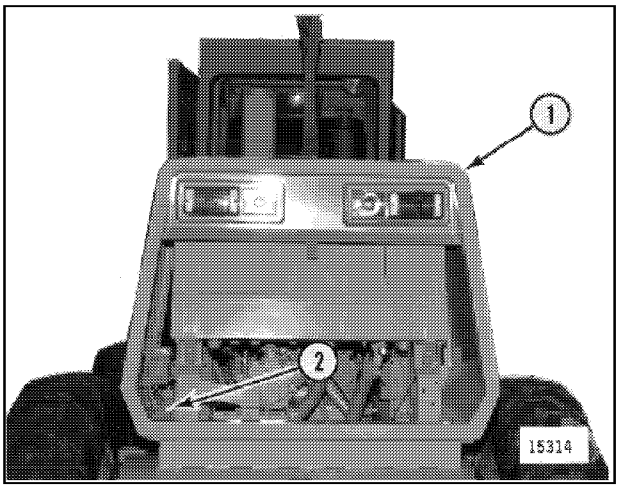

Figure 21

1. Remove seven bolts (1, Figure 39), bearing retainer (2) with oil seal (3), plastic strip gasket (4) and bearing (5) from front cover (6).

2. Remove three bolts mounting bearing retainer (7, Figure 39) to rear of front cover.

3. Remove impeller hub gear (28, Figure 39) and thrust washer (29) from stator support hub splines.

4. Remove six bolts (8, Figure 39), cover plate (9) and stator support tube (10).

5. With soft-face hammer, drive input shaft (11, Figure 39) through housing from front to back side. Remove ball bearing (12), retaining ring (13) and seal ring (14).

6. Remove cover (15, Figure 39) with O-ring (16), bolt, retaining washer, roll pin, idler shaft (17), bearing (18), retaining ring (19), auxiliary pump gear (20), bearing (21) and retaining ring (22).

7. Remove lube tube (30, Figure 39) and elbow (31) from front cover (6), if necessary.

8. Remove three bolts, oil passage cover (23, Figure 39) and ring seal (24).

9. Remove pipe plug (25, Figure 39), converter relief valve assembly (26) and breather (27).

10. Remove three outer clutch pack bearing races and sleeves (32, Figure 39) from front cover (6), if replacement is necessary.

    NOTE: *When removing sleeves notice where in the lip the tag aligns with the index notch.*

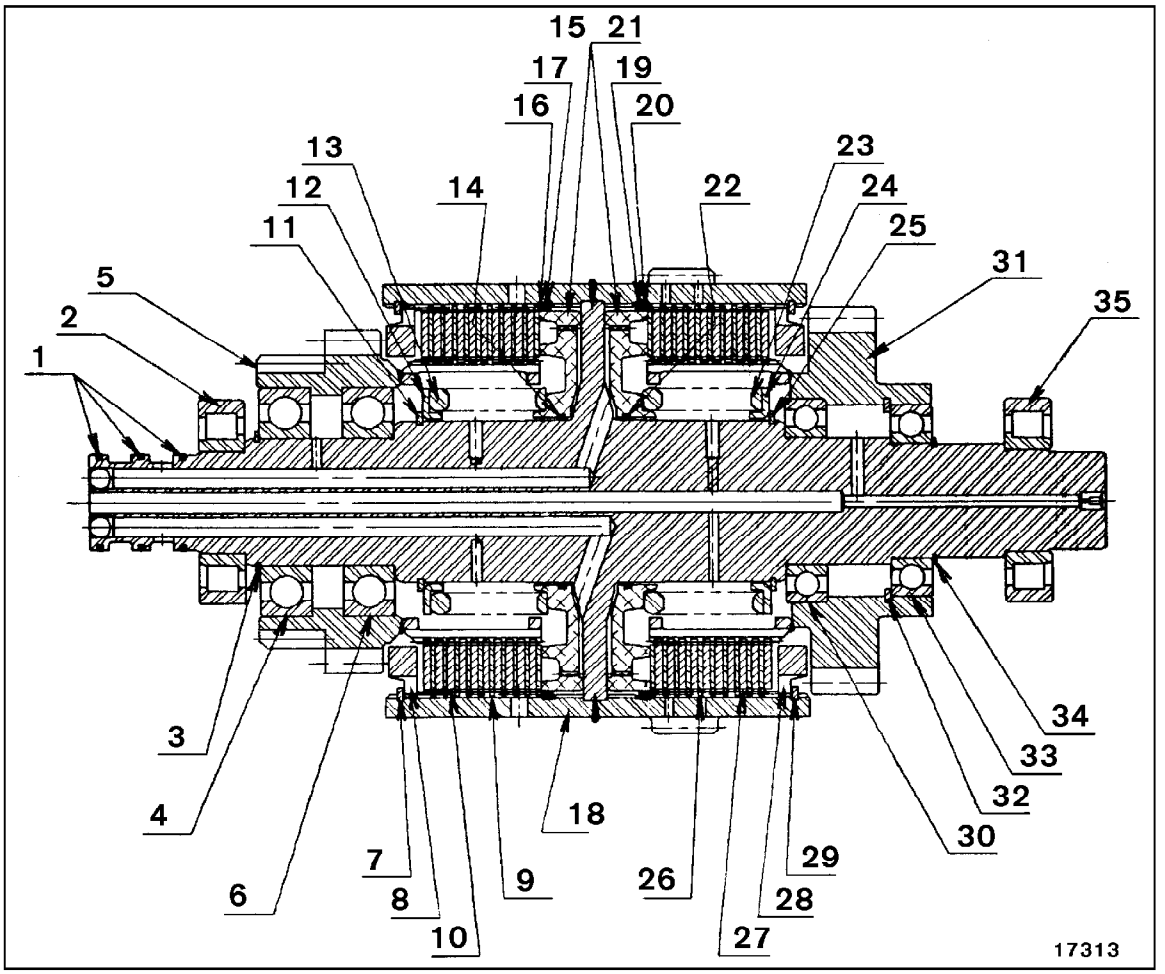

Figure 46

1. Disassemble fifth clutch pack as follows;

   A. Remove three seal rings (1, Figure 45) from shaft of clutch pack housing (18).

   B. Remove inner bearing race (2, Figure 45) from shaft of clutch pack housing (18).

   C. Remove retaining ring (3, Figure 45) and gear and hub assembly (5) from clutch pack housing (18). Bearing (4) will be removed with gear and hub assembly.

      NOTE: *Bearing (6) may stay in hub or on shaft of clutch pack housing (18).*

   D. Using a suitable puller, remove bearings (4 and 6, Figure 45) from gear and hub assembly (5).

   E. Remove retaining ring (7, Figure 45) and retainer (8) from clutch pack housing (18).

   F. Remove separator plates (9) and clutch plates (10) alternately until ten of each are removed from clutch pack housing (18).

1. Before removal, match mark coil and receptacle assemblies (1, Figure 51) in their appropriate locations.

2. Remove six flanged nuts (2, Figure 51) and assemblies.

3. Remove core assembly (3, Figure 51) with O-ring (4) consisting of spool (5), retaining ring (6), roll pin (7), plunger (8) and solenoid spring (9).

4. Remove plug (10, Figure 51) with O-ring (11) and regulator spool assembly (12) and flat washer (13).

5. Remove dump valve plug (14, Figure 51) with O-ring (15), dump valve spring (16), dump valve (17), accumulator piston (18) with dowel pin accumulator spring (19) and regulator cap (20).

1. Install seal ring (23, Figure 56) and O-ring (22) onto impeller hub (21). Secure hub to impeller (5) with twelve seal washers (20) and bolts (19). Tighten bolts to 23 ±2 lbf ft (3.2 ±0.3 kg•m)

   NOTE: *Apply Loctite 262 to threads of bolts.*

2. Install thrust washer (18, Figure 56), needle thrust bearing (17) and thrust washer (16) on impeller hub (21) inside impeller (5).

3. Install free-wheeling stator hub components (14, Figure 56) in stator (11).

   A. Position stator (11, Figure 56) so that front of stator is facing up. A letter "F" is cast into the front side of the stator.

   B. Install internal retaining ring (15, Figure 56) in stator (11).

   C. Install one clutch retainer (14A, Figure 57) in stator (11, Figure 56).

   D. Assemble inner clutch race (14B, Figure 57), sprag clutch (14C), and outer clutch race (14D). Install sprag clutch assembly into stator (11, Figure 56). Sprag cage flanges must be towards "F" side of stator (11).

   E. Install second clutch retainer (14E, Figure 57) in stator (11, Figure 56).

   F. Install remaining internal retaining ring (12, Figure 56) to finish securing free-wheeling stator hub components (14) in stator. Position stator and hub assembly in impeller (5) on thrust bearing assembly (Items 18, 17 and 16).

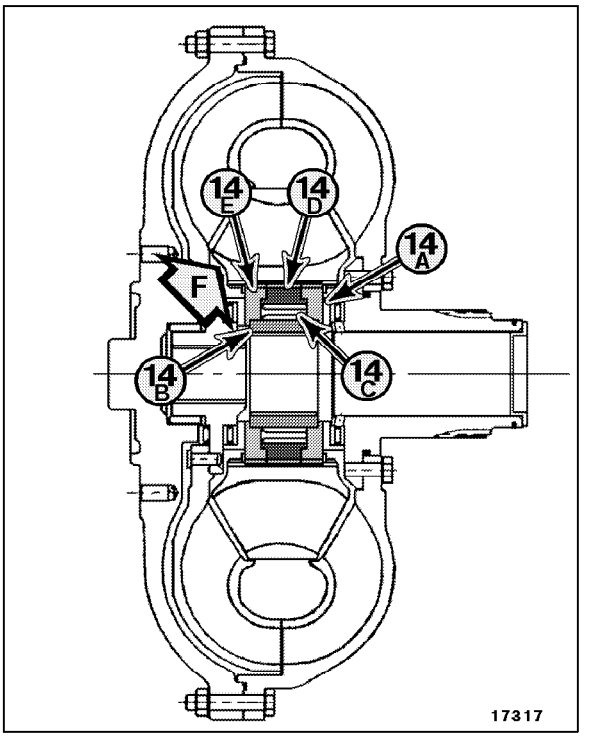

Figure 57 FREE-WHEELING STATOR HUB COMPONENTS

   NOTE: *Make sure that the "F" stamped into stator case is toward front cover and not impeller.*

4. Install thrust washer (10, Figure 56), thrust washer bearing (9) and thrust washer (13) in free-wheeling stator hub (14). Carefully position turbine (8) on thrust bearing assembly in impeller (5).

5. Install thrust bearing (7, Figure 56), thrust washer (6) on turbine (8).

   NOTE: *There is only one thrust washer used at this location.*

6. Press needle bearing (4, Figure 56) on front cover (3).

   NOTE: *End of bearing must be installed 0.100 In. (2.540 mm) above flush with face of front cover.*

7. Position O-ring (3, Figure 56) on impeller (5).

8. Position front cover (3, Figure 56) in place into impeller (5). Install twenty-four bolts (1) and lock nuts (2). Tighten bolts to 26 ±2 lbf ft (3.6 ±0.3 kg•m).

O. Using a suitable adaptor, press inner bearing race (2, Figure 63) on shaft of clutch pack (20).

NOTE: *Make sure that lip side on bearing race is pressed against the bearing seat, as shown in Figure 65. If not the clutch pack can not be properly installed into the main case.*

P. Install three seal rings (1, Figure 63) on shaft of clutch pack housing (18).

NOTE: *Form seal onto the shaft diameter and fit the ring seal into the grove. Caution must be exercised not to deform the rings any more than necessary. After the seal ring is fitted into the groove, apply finger pressure to assure seal ring is formed into the grove. Seal ring must be lubricated with oil before installation.*

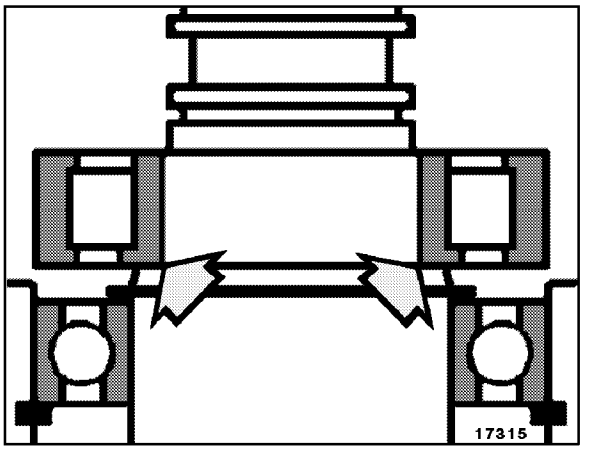

Figure 65

1. Position tube clamp (5, Figure 71) on tube (6). Apply Loctite 601 to bore of transmission case (3) mounting hole and O.D. of end of tube. Swage tube in mounting bore. Tube must be flush to 0.060 In. (1.524 mm) below outside surface of case. Check tube after swaging process. Tube must not rotate with any hand pressure.

2. Apply Loctite 262 to threads of bolt (4, Figure 71). Install bolt (4) to secure tube (6) to transmission case (3).

3. Install suction screen gasket (2, Figure 71) and suction screen (1) in transmission case (3). Make sure that screen is properly seated on tube (6).

INSTALLATION

1. Prior to installing the transmission in the grader, the engine crankshaft endplay and flywheel runout must be checked. Refer to appropriate engine service manual for your unit.

   NOTE: *A locating dowel or 3.000 In. (76.200 mm) long stud should be placed in a transmission drive plate assembly hole. Align dowel or stud with one engine flywheel mounting hole and engine flywheel housing access hole when lowering into position. This will aid installation of bolts into drive plate assembly once transmission is bolted up. The flywheel must be turned to align flywheel mounting hole with access hole.*

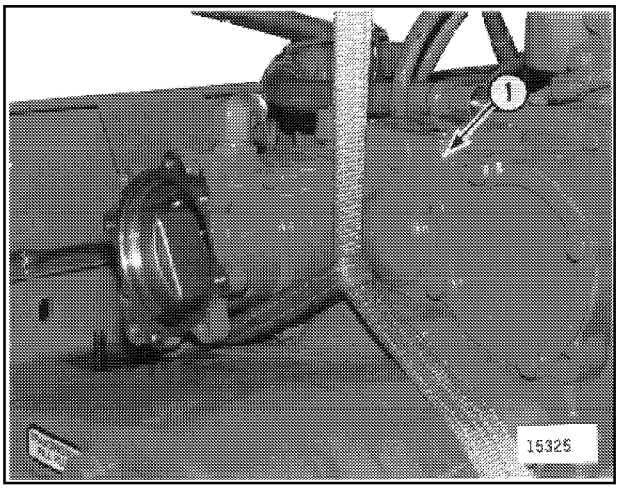

Figure 76

2. With nylon straps/chains around transmission (1, Figure 76) and suitable lifting device, lower the transmission into position so that it can be positioned directly in line with the engine crankshaft and engine flywheel housing. Align the pilot sleeve with the flywheel pilot bore, and align the 3.000 In. (76.200 mm) stud with one of the thru holes in the flywheel.

3. Push transmission up against engine.

   WARNING! If transmission does not seat up against flywheel and flywheel housing, DO NOT PROCEED. Forcing the transmission against engine with the assembly bolts could preload engine crankshaft and cause engine and/or transmission problems later. Remove transmission and check previous assembly steps to determine where the problem is and take corrective action before proceeding.

4. Install one bolt through the L.H. forward transmission/engine mounting hole while lowering because it will be difficult to install after transmission is in place.

5. Install eleven bolts and lock washers around transmission housing. Tighten bolts to 41 lbf ft (5.7 kg•m).

   NOTE: *Install battery ground strap and electrical harness clamp under two of top bolts. Secure transmission dipstick to flywheel housing and transmission.*

48. Secure rear grill (3, Figure 100) to rear cowl (4) with two flat washers and hex nuts (2) and one flat washer and bolt (1).

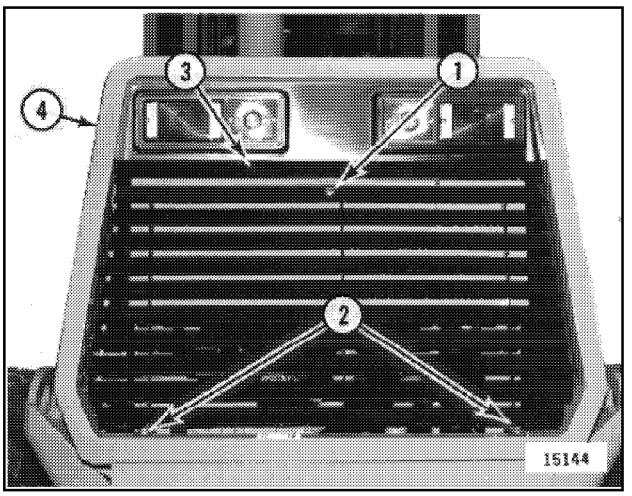

Figure 100

LEGEND FOR ROTARY GROUP

1. MECHANICAL STOP RING
2. SPRING RING
3. RETAINING RING
4. O-RING
5. FRONT COVER
6. OIL SEAL
7. RETAINING RING
8. SUPPORTING RING
9. SPACER
10. SHIMS
11. SUPPORTING DISC
12. SHIMS
13. SHIMS
14. ROLLER BEARING
15. DRIVE SHAFT
16. O-RING
17. BEARING FLANGE
18. CAGE
19. CAGE ROLLER
20. SLIDING PIECE
21. CRADLE WITH PIN
22. WIRE
23. PIN
24. MECHANICAL STOP
25. COUNTERSUNK SCREW
26. PISTON
27. RETAINING PLATE
28. RETAINING BALL
29. CUP SPRING
30. SHIMS
31. CYLINDER WITH BUSHING
32. CONTROL LENS
33. ROLLER BEARING
34. SPRING RING
35. CLUTCH HUB

CHARGE PUMP (IN WARRANTY SERVICE)

Disassembly

1. Before removing bolts, mark the position of the charge pump housing (1, Figure 12) and separator plate (2) in relation to the port block (3).

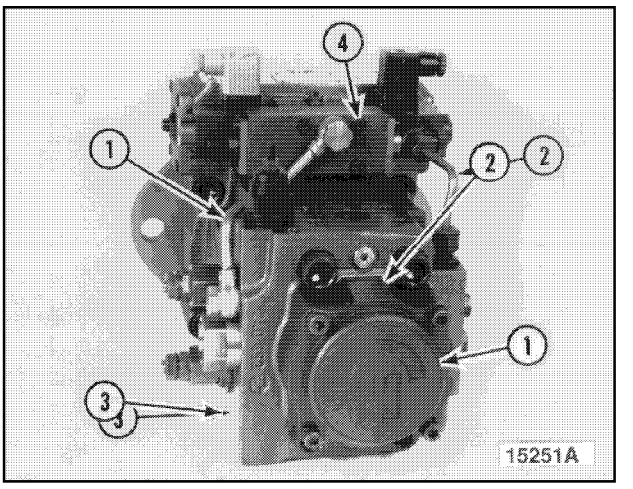

Figure 12

2. Remove four screws (1, Figure 13).

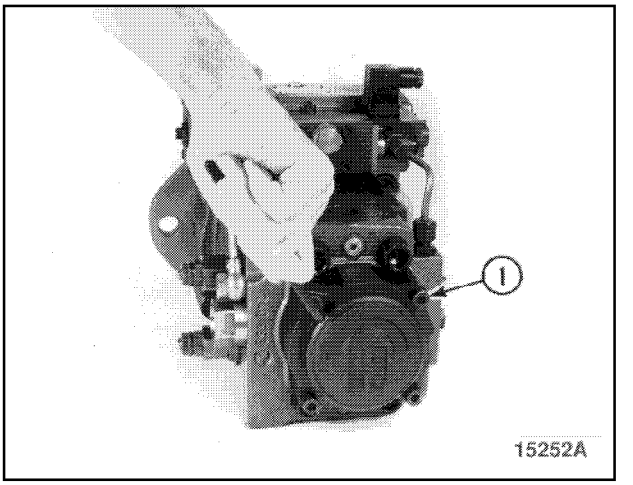

Figure 13

3. Remove charge pump housing (1, Figure 14) and separator plate (2).

4. Inspect internal components of charge pump (1) for wear or damage.

5. Remove and discard O-ring (3).

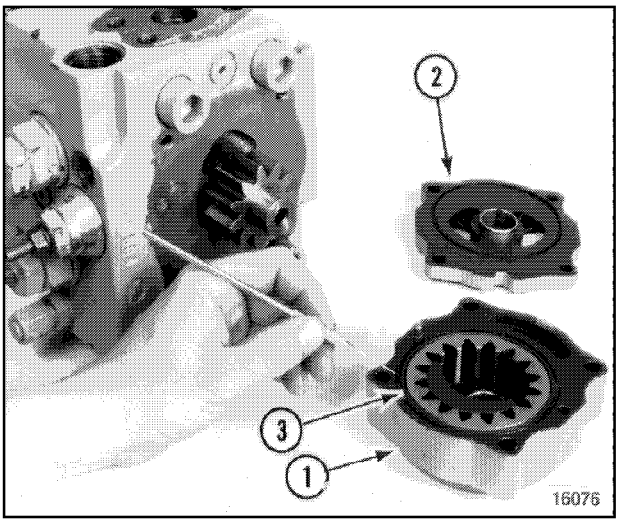

Figure 14

43. Remove four screws (1, Figure 40) and remove control unit (2) from spindle housing (3).

44. Look into spindle housing (3) through hole that control unit (2) was removed from, and through large opening in pump housing. Note shape and orientation of grooves in center of spindle for aid in reassembly.

45. Single flat groove faces inside of pump housing. Stepped groove faces control unit opening.

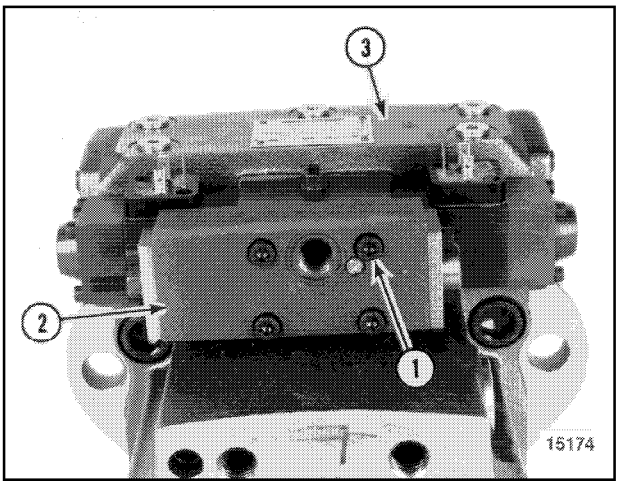

Figure 40

46. Note position of seals (1 and 2, Figure 41) in relation to cover (3) and control unit (4).

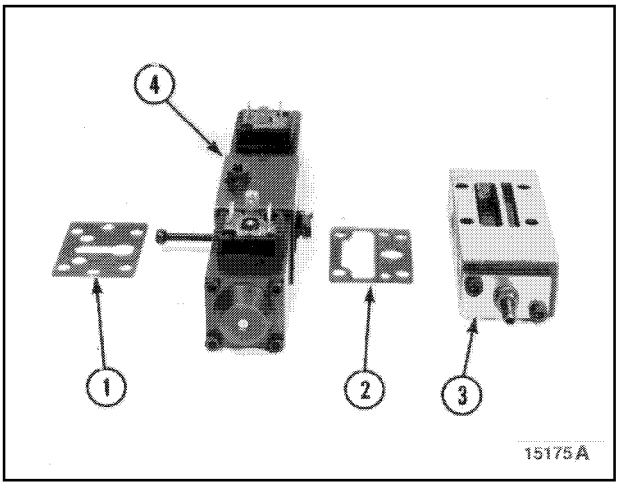

Figure 41

47. Scribe match marks across control unit (1, Figure 42) and solenoids (2 and 3). Remove four screws (4) and remove solenoid (2) from control unit (1).

48. Remove O-ring (5) from solenoid (2).

49. Repeat for second solenoid (3).

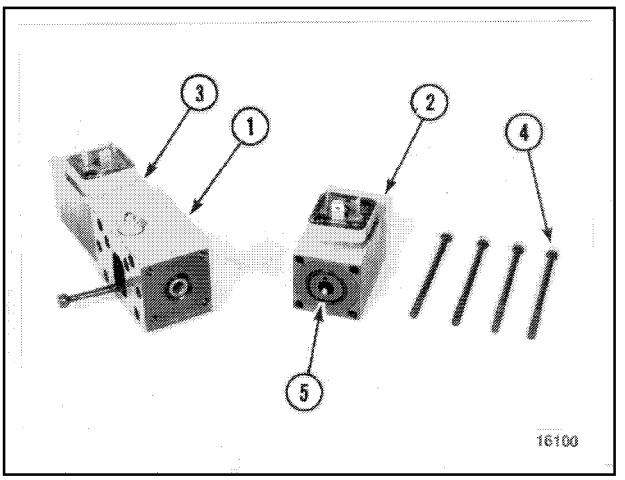

Figure 42

36. Install new O-rings (1, Figure 63) on connection plate (2).

37. Coat surface of port plate (4) with clean hydraulic oil.

38. Make sure notch (3) is facing proper direction as noted during disassembly.

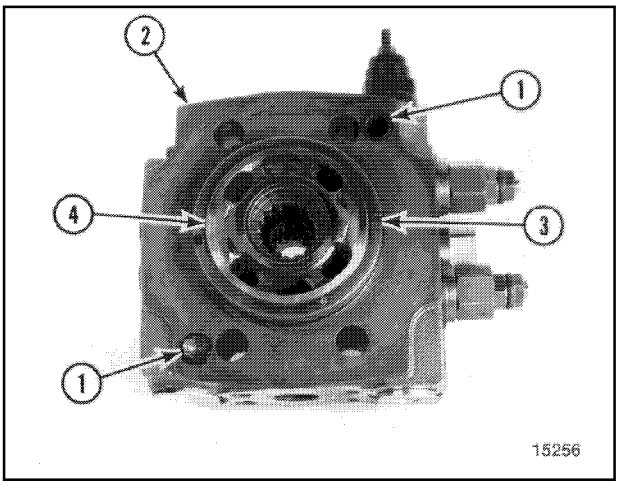

Figure 63

39. Back off screw (2, Figure 64) so that it does not protrude into the pump housing.

40. Using match marks for correct positioning, install connection plate (1) on pump housing (3).

    NOTE: *Before installing screws (4), measure the distance between connection plate (1) and pump housing (3) with a feeler gauge. This distance must be 0.090 In. (2.286 mm) - 0.104 In. (2.642 mm). To adjust this distance, add or subtract shims (2, Figure 55).*

41. Install four screws (4, Figure 64) and tighten to 138 lbf ft (19.1 kg•m).

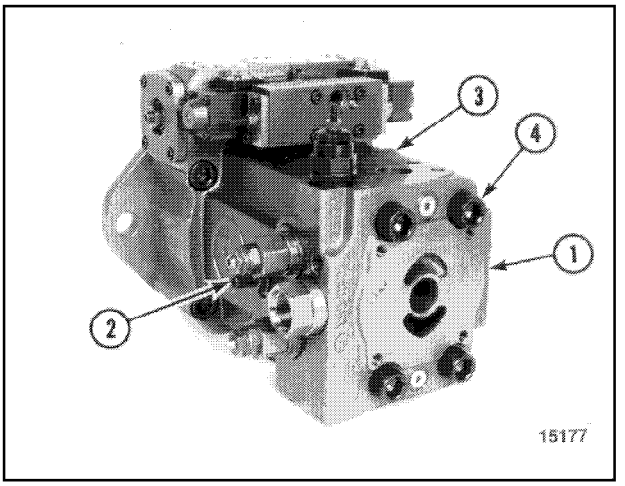

Figure 64

42. Remove nut (1, ?) and turn screw (2) in or out as necessary to achieve a distance of 0.91 In. (23.114 mm) as shown in Figure 65.

43. When this distance has been achieved, turn screw (2, ?) the smallest distance needed to align the slot in the screw with the match mark scribed on the housing during disassembly.

44. While holding screw (2) with a hex wrench so as not to disturb the adjustment, install and tighten nut (1) against the housing.

    NOTE: *If the screw becomes tight, or if the proper distance can not be achieved, do not force the screw. Remove the connection plate and adjust the position of the port plate until the notch in the port plate will receive the adjusting screw.*

LEGEND FOR CIRCLE REVERSE GEAR CASE MOTOR

The exploded view shown on the previous page and legend shown here are to help identify parts and their orientation to each other while servicing the circle reverse gear case motor. Some components mentioned during service procedure may only be shown in this illustration.

1 HYDRAULIC MOTOR
2 BOLT
3 FLAT WASHER
4 GASKET
5 BOLT
6 WASHER
7 MOUNTING PLATE
8 GASKET
9 COUPLING
10 CIRCLE REVERSE GEAR CASE ASSEMBLY

E. If available, use magna-flux or similar process for checking for cracks that are not visible to the eye. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. Replace all gears showing cracks or spots where case hardening has worn through. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they have not been sprung, bent, or splines twisted, and that shafts are true.

NOTE: *Spline wear is not considered detrimental except where it affects tightness of splined parts.*

Inspect thrust washers for distortion, scores, burs, and wear. Replace thrust washer if defective or worn.

F. Inspect bores and bearing surfaces of cast parts and machined surfaces for scratches, wear, grooves and dirt. Remove any scratches and burrs with crocus cloth. Remove foreign matter. Replace any parts that are deeply grooved or scratched which would affect their operation.

GENERAL TORQUE VALUES

Refer to "General Torque Values" shop manual section when **SPECIFIC TORQUES** are not given in this shop manual section. All values listed throughout this manual are lubricated (WET) unless stated otherwise.

METRIC CONVERSIONS

Refer to "Metric Conversions" shop manual section for metric conversion of U.S. Measurements.

CLEANING AND INSPECTION

Some of the following information may not apply to the particular component that you are servicing.

All parts must be clean to permit an effective inspection. During assembly, it is very important that no dirt or foreign material enters unit being assembled. Even minute particles can cause malfunction of close fitting parts such as thrust bearing, matched parts, etc.

1. Clean all metal parts thoroughly using a suitable cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all oils, lubricants, and/or foreign materials are dissolved and parts are thoroughly clean.

WARNING! Care should be exercised to avoid inhalation of vapors, exposure to skin and creating fire hazards when using solvent type cleaners.

2. For bearings that can be removed, soak them in a suitable cleaning fluid for a minute or two, then remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. To dry bearings, use moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning bearings that are not lubricated. DO NOT SPIN BEARINGS WHEN DRYING; bearings may be rotated slowly by hand to facilitate drying process.

3. Carefully inspect all bearing rollers, cages and cups for wear, chipping or nicks to determine condition. Do not replace a bearing cone or cup individually without replacing mating cup or cone at the same time. After inspection, dip bearings in light weight oil and wrap in clean lintless cloth or paper to protect them until installation.

   For those bearings that are to be inspected in place; inspect bearings for roughness of rotation, scoring, pitting, cracked or chipped races. If any of these defects are found, replace bearings. Also inspect defective bearing housing and/or shaft for grooved, galled or burred conditions that indicate bearing has been turning in its housing or on its shaft.

4. It is more economical to replace oil seals, O-rings, sealing rings, gaskets and snap rings when unit is disassembled than waiting for premature failures; refer to latest Micro Fiche and/or Parts Book for replacement items. Be extremely careful when installing sealing members, to avoid cutting or scratching. Curling under of any seal lip will seriously impair its efficiency. Apply a thin coat of Loctite #120 to outer diameter, of metal casing, on oil seals to assure an oil tight fit into retainer. Use extreme care not to get Loctite on lips of oil seals. If this happens, that portion of the seal will become brittle and allow leakage.

   When replacing lip type seals, make sure spring loaded side is towards oil to be sealed.

LOCATION ON MACHINE

The steering and brake pump is located on L.H. side of the engine and is mounted to the front gear housing.

DESCRIPTION

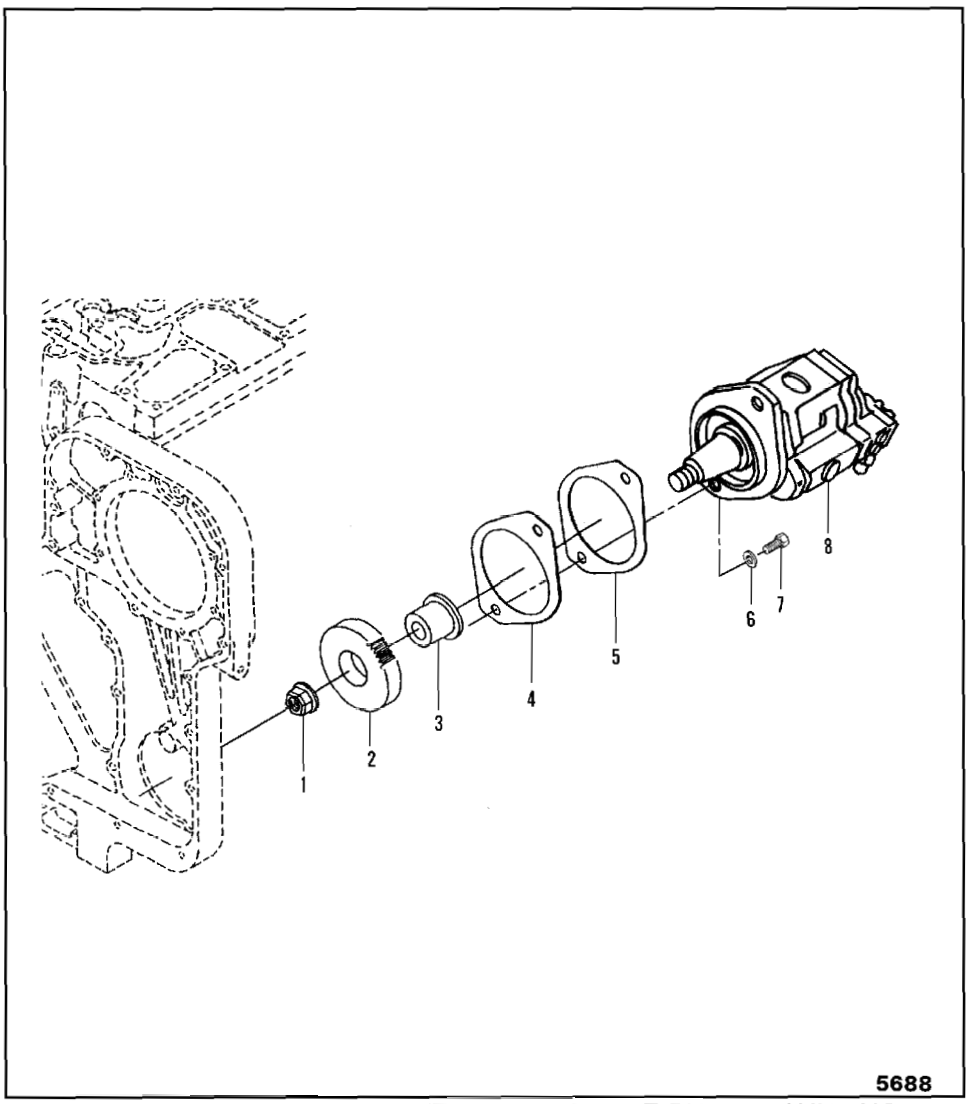

Figure 1 EXPLODED VIEW OF STEERING & BRAKE PUMP MOUNTING

DISASSEMBLY

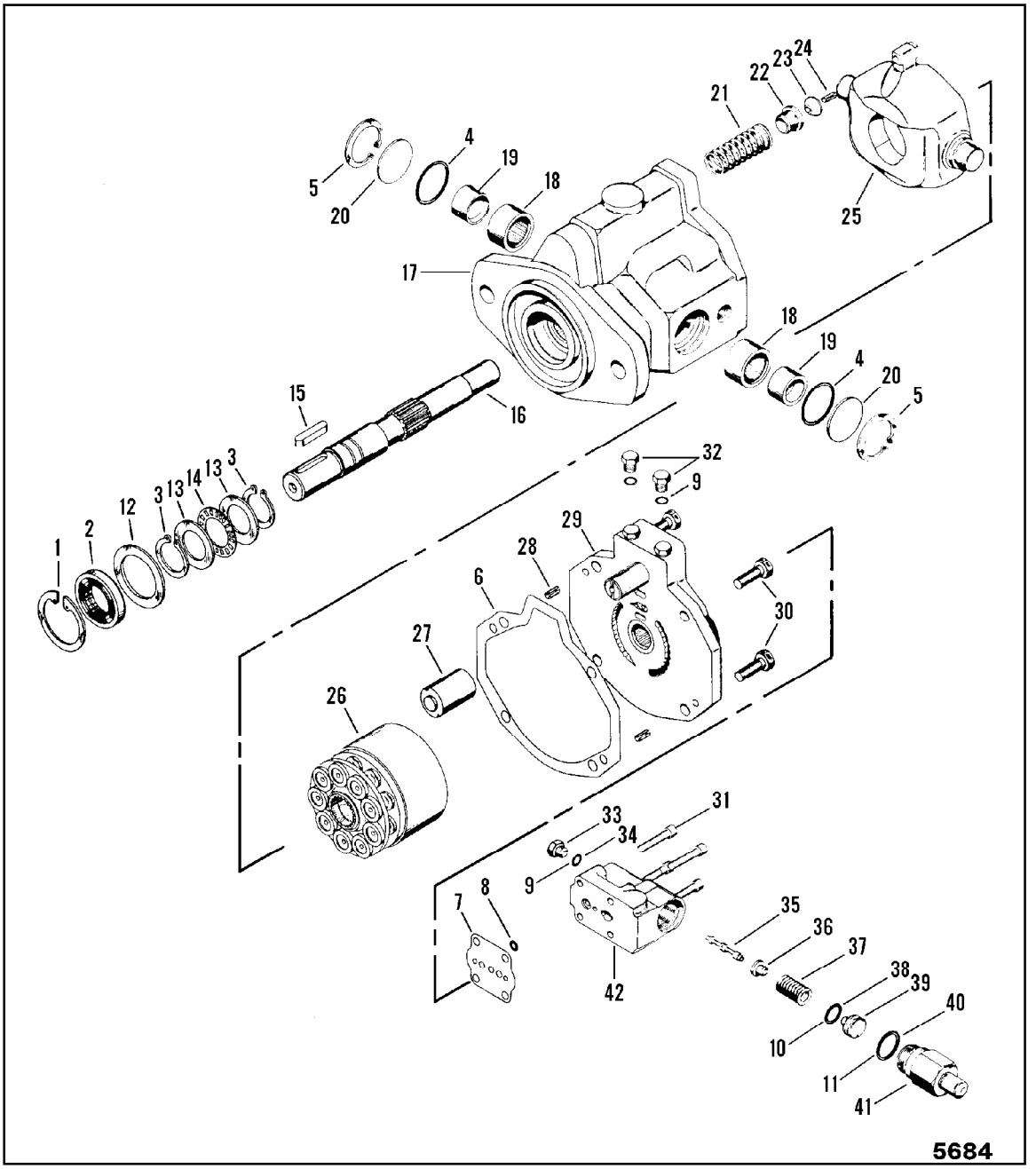

Figure 4 EXPLODED VIEW OF STEERING & BRAKE PUMP

NOTE: *Removal of adjusting screw covers from cap may void warranty on this assembly.*

1. Clamp end of drive shaft in a protected jaw vise with body of pump up and remove four allen head screws (31, Figure 4) holding compensator (42).

2. Remove compensator assembly (42, Figure 4), O-ring (8), and gasket (7).

3. Remove four bolts (30, Figure 4) from backplate of pump.

GENERAL TORQUE VALUES

Refer to "General Torque Values" shop manual section when **SPECIFIC TORQUES** are not given in this shop manual section. All values listed throughout this manual are lubricated (WET) unless stated otherwise.

METRIC CONVERSIONS

Refer to "Metric Conversions" shop manual section for metric conversion of U.S. Measurements.

10. Place plain washer (1, Figure 8) under head of long bolt (2), and insert threaded end through center of cylinder block (3). Be sure bolt extends approximately 1.500 In. (38.100 mm) beyond edges of cylinder block and has enough threads to allow for approximately 1.000 In. (25.400 mm) of spring (4) expansion when retaining ring (15, Figure 1) is removed. Plain washer (5, Figure 8) and nut (6) on threaded end of bolt and tighten nut until spring is depressed enough to allow removal of retaining ring (15, Figure 1). Slowly loosen nut (6, Figure 8) to relief tension on spring. Remove nut from bolt and remove washer (16, Figure 1), spring (17, Figure 1) and thrust washer (18, Figure 1).

11. Remove retainer ring (23, Figure 1).

12. Using an arbor press, remove shaft seal (24, Figure 1) out of housing (3). Use short piece of 1.500 In. (38.100 mm) heavy wall tubing as a press tool.

13. Alignment pins (7 and 9, Figure 1) need not be removed unless damaged.

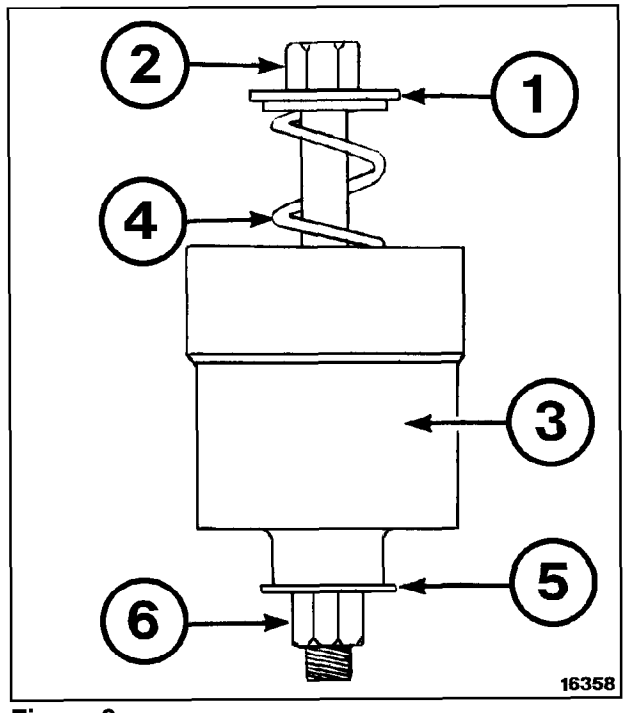

Figure 8

The following steps may not be necessary after an inspection of components is made.

14. If it is found that the drive shaft bearing (5, Figure 1) is defective, remove bearing race from valve block (Figure 9).

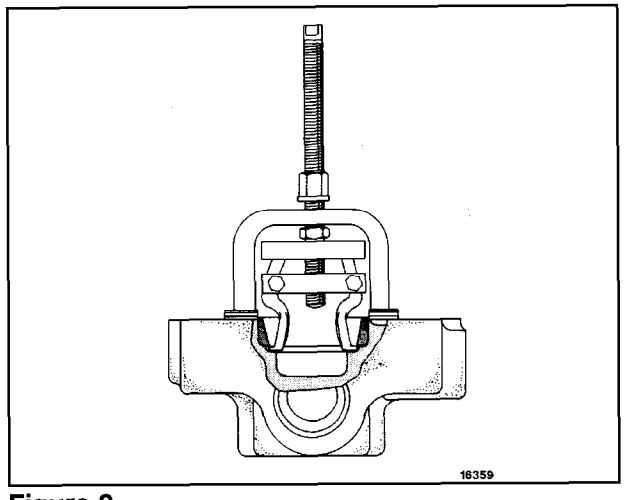

Figure 9

SHOP MANUAL E-30.40K

HYDRAULIC OIL SWIVEL BLOCK (FOUR-WAY)

APPLICABLE MODELS	SERIAL NUMBERS
GD530A-1	200417 & Up
GD530AW-1	200417 & Up
GD650A-1	200417 & Up
GD650AW-1	200417 & Up
GD670A-1	200417 & Up
GD670AW-1	200417 & Up

CAUTION

ALL	COMPONENTS MUST BE PROPERLY SUPPORTED DURING DISASSEMBLY AND REASSEMBLY.
ALL	JACKING, HOISTING AND GENERAL WORKSHOP EQUIPMENT REQUIRED FOR THIS OPERATION MUST BE IN GOOD WORKING ORDER.
EXTREME	CAUTION TO BE OBSERVED AT ALL TIMES TO PREVENT INJURY.
SAFE	WORKSHOP PRACTICES ARE A MUST.

FOR TABLE OF CONTENTS SEE PAGE 2

KOMATSU DRESSER COMPANY 850 SOUTH STREET GALION, OH 44833

0194

TESTING AND ADJUSTMENTS

After the installation of either the two-way or four-way swivel block is completed on your unit, follow the steps listed below:

1. Check oil in the hydraulic oil tank to be sure that the oil level is between the "ADD" and "FULL" marks.

2. Start grader.

3. Raise moldboard off blocking.

4. Operate side shift lever to check that the moldboard shifts in the proper direction (this step applies to both types of swivel blocks). If unit does not function correctly check all hoses and lines for proper locations.

5. With the four-way swivel block you have the powertilt for the moldboard, Operate powertilt lever to see if blade tilts in proper direction. If unit does not function correctly check all hoses and lines for proper location.

NOTE: *When performing steps 4 and 5 the operation may be sluggish untill the air is expelled from swivel block, lines and hoses. Full cycling of cylinders will help expel air.*

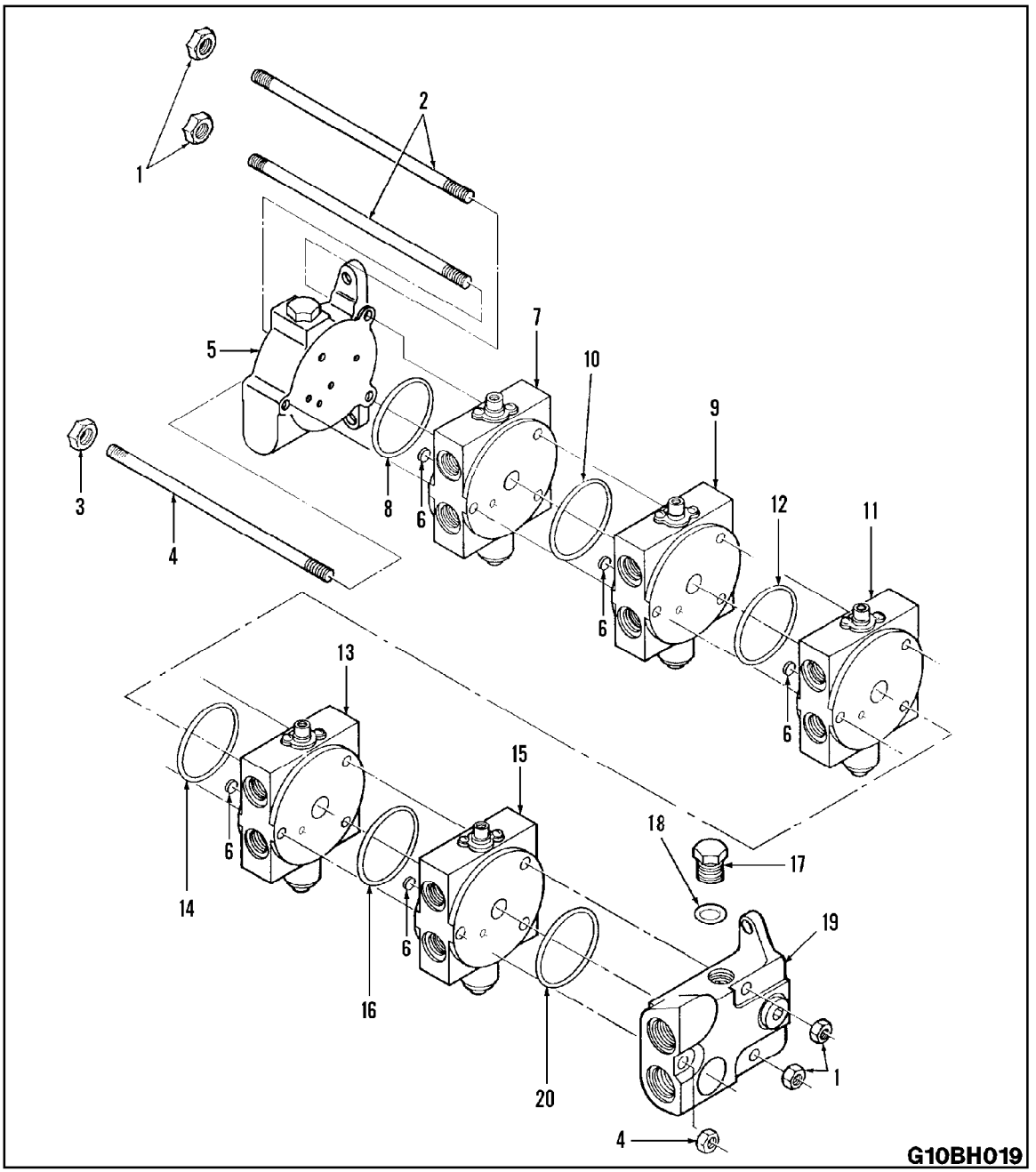

Figure 4 EXPLODED VIEW OF CONTROL VALVE - L.H. BANK

4. Remove eight bolts and flat washers (1, Figure 8) securing cover assembly (2) to cab deck.

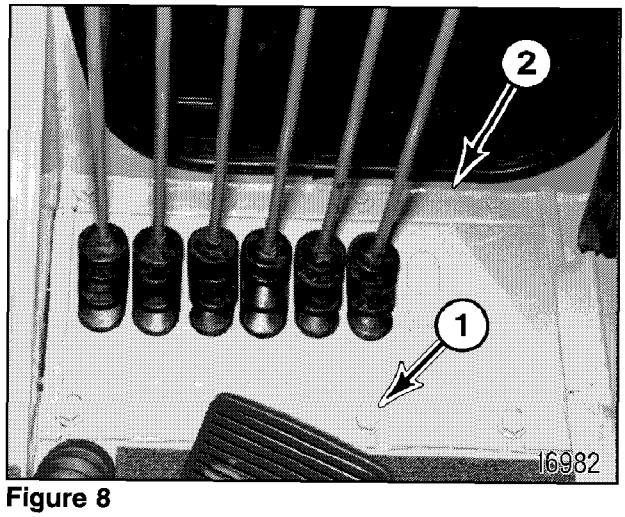

Figure 8

5. Slide cover assembly (1, Figure 9) up control lever rods (2). Use locking pliers to prevent cover assembly from falling.

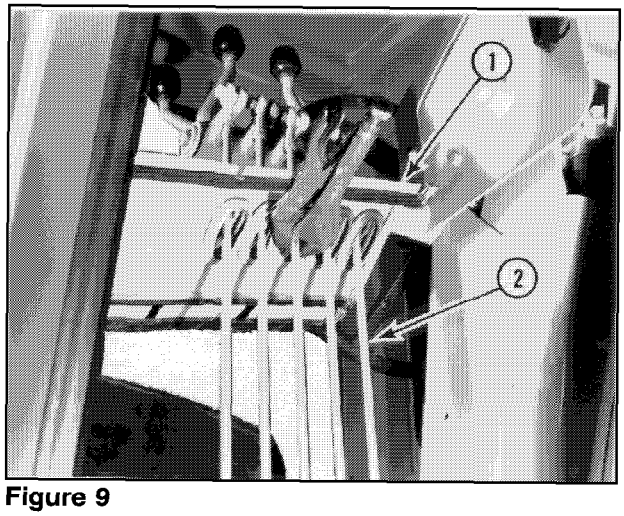

Figure 9

6. Loosen jam nut (1, Figure 10) and unscrew swivel adaptor (2) from control lever rod (3). Repeat procedure for remaining control lever rods.

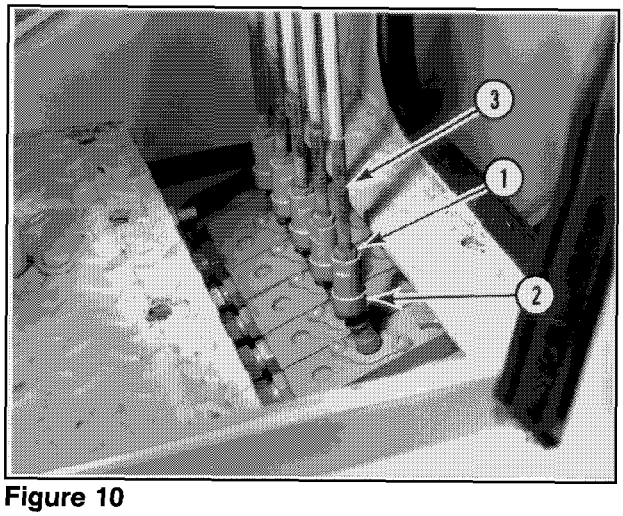

Figure 10

Reassembly of Control Valve Bank

1. Install O-ring (21, Figure 16) and O-ring (23) in inlet section (20).
2. Aline control valves matching scribe marks made in disassembly.
3. Install shuttle (9, Figure 16) in each valve section.
4. Install O-rings (8, 11, 13, 15 and 17, Figure 16).
5. Install two tie rods (2, Figure 16) and one tie rod (4) and secure with nuts (1 and 3) and washers (2).

   NOTE: *Tighten two tie rods (3, Figure 16) to 17.5 ±1.5 lbf ft (2.4 ±0.2 kg•m) and one tie rod (5) to 33 ±3 lbf ft (4.6 ±0.4 kg•m).*
6. Install O-ring (6, Figure 16) and shut-off plug (5).
7. Install O-rings (20 and 21, Figure 16) on main relief valve cartridge (19).
8. Install main relief valve cartridge (19, Figure 16) in outlet section (18).

LEGEND FOR MAIN SYSTEM PUMP

The exploded view shown on the previous page and legend show here are to help identify parts and their orientation to each other while servicing the pump. Some components mentioned during service procedure may only be shown in this illustration.

1 RETAINING RING
2 SHAFT SEAL
3 WASHER
4 RETAINING RING
5 THRUST RACE
6 THRUST BEARING
7 KEY
8 DRIVE SHAFT
9 HOUSING ASSEMBLY
10 NEEDLE BEARING
11 INNER RACE
12 O-RING
13 TRUNNION COVER
15 CAMPLATE CONTROL SPRING
16 SPRING COLLAR
17 PIVOT BUTTON
18 ROLL PIN
19 CAMPLATE
20 PISTON ASSEMBLY
21 SPIDER
22 SPIDER PIVOT
23 PISTON BLOCK
24 PIN KEEPER
25 PIN
26 WASHER
27 SPRING
28 RETAINING RING
29 ROTATING KIT ASSEMBLY
30 CONTROL PISTON
31 GASKET
32 DOWEL PIN
33 BACKPLATE ASSEMBLY
34 CAP SCREW
34A CAP SCREW
35 GASKET, COMPENSATOR
36 O-RING
37 COMPENSATOR ASSY., PRESSURE-FLOW
38 ALLEN HEAD CAP SCREW
39 COMPENSATOR ASSEMBLY, PRESSURE
40 PLUG ASSEMBLY
41 O-RING
42 COMPENSATOR HOUSING, PRESSURE-FLOW
43 SPOOL, PRESSURE COMPENSATOR
44 SPRING PIVOT CAP
45 SPRING, PRESSURE COMPENSATOR
46 O-RING
47 PRESSURE ROD
48 O-RING
49 ADJUSTMENT CAP, PRESSURE
50 SPOOL, FLOW COMPENSATOR
51 SPRING PIVOT
51A SPRING PIVOT
52 SPRING, FLOW COMPENSATOR
53 O-RING
54 PRESSURE ROD
55 O-RING
56 ADJUSTMENT CAP, FLOW
57 COMPENSATOR HOUSING, PRESSURE

31. Remove shaft seal (1, Figure 17) and washer (2) from drive shaft (3).

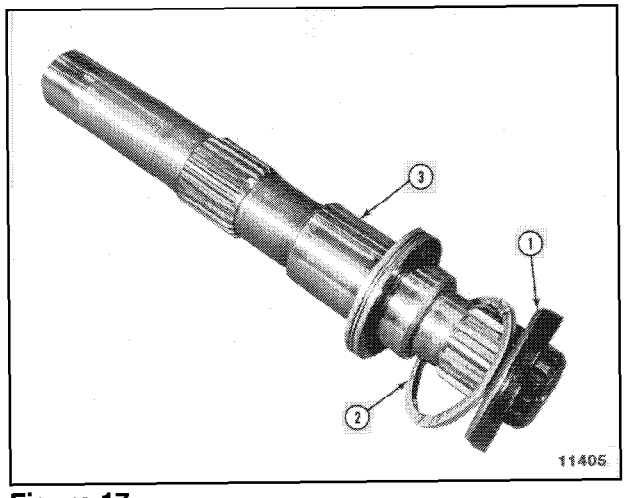

Figure 17

32. Remove retaining ring (1, Figure 18) from drive shaft (2).

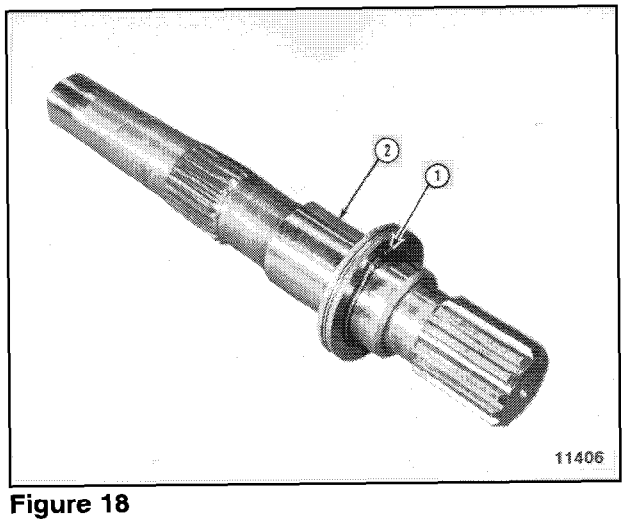

Figure 18

33. Remove two thrust bearing races (1, Figure 19), thrust bearing (2) and retaining ring (3) from drive shaft (4).

NOTE: *Make sure that bearing surface of thrust bearing races are kept towards thrust bearing. Wear patterns must match at reassembly.*

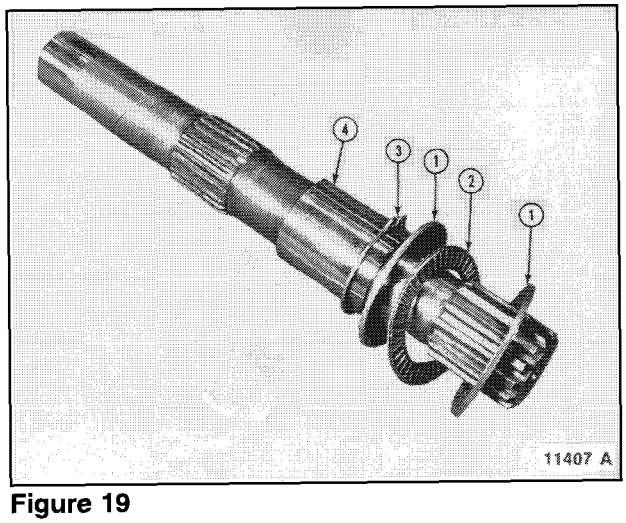

Figure 19

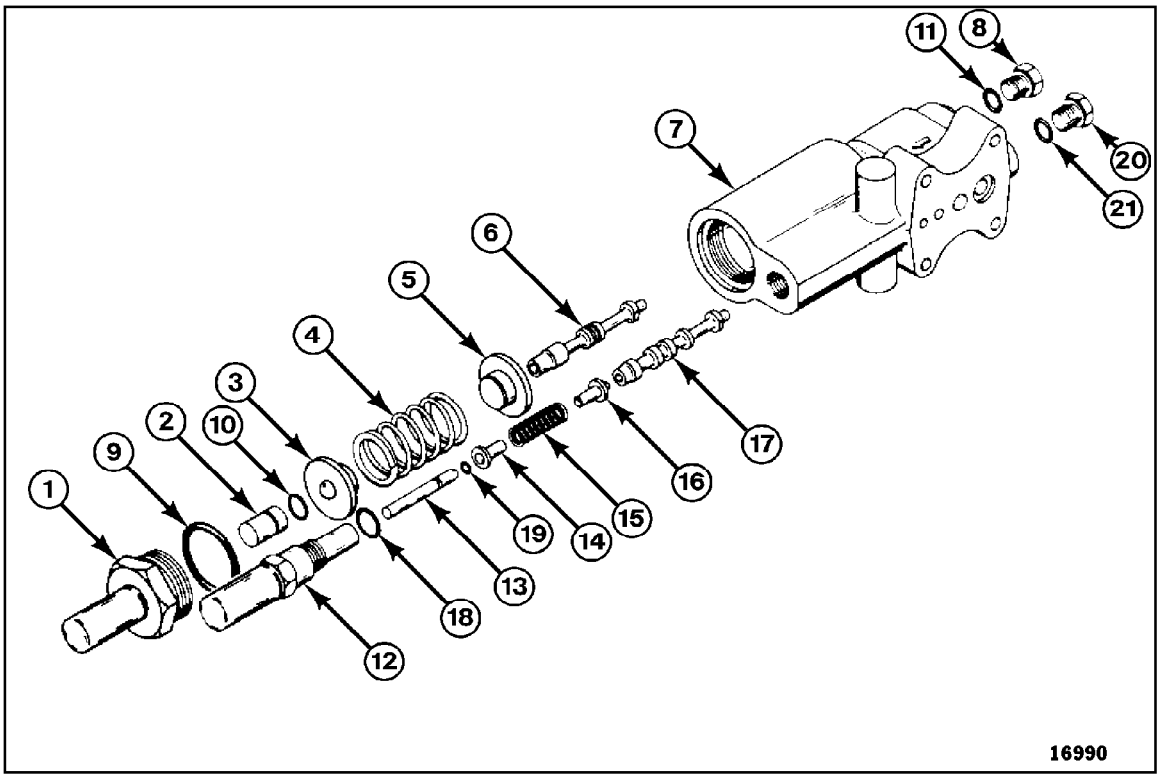

Figure 42

26. Install O-ring (21, Figure 42) on plug (8).

27. Install plug (20, Figure 42) in compensator housing (7). Tighten plug from 6 - 8 lbf ft (0.8 - 1.1 kg•m).

28. Install O-ring (19, Figure 42) on pressure rod (2).

29. Install O-ring (18, Figure 42) on flow adjustment cap (1).

30. Install pressure compensator spool (17, Figure 42), spring pivot cap (16), flow compensator spring (15), spring pivot cap (14), pressure rod (13), and flow adjustment cap (1) in compensator housing (7). Tighten flow adjustment cap from 10 - 12 lbf ft (1.4 - 1.7 kg•m).

    NOTE: *Use extreme care not to disturb the adjustment screw and jam nut on adjustment cap (1).*

31. Install O-ring (11, Figure 42) on plug (8).

32. Install plug (8, Figure 42) in compensator housing (7). Tighten plug from 6 - 8 lbf ft (0.8 - 1.1 kg•m).

33. Install O-ring (10, Figure 42) on pressure rod (2).

34. Install O-ring (9, Figure 42) on pressure adjustment cap (1).

35. Remove pressure compensator spool (6, Figure 42), spring pivot cap (5), pressure compensator spring (4), spring pivot cap (3), pressure rod (2), and pressure adjustment cap (1) in compensator housing (7). Tighten pressure adjustment cap from 60 - 70 lbf ft (8.3 - 9.7 kg•m).

    NOTE: *Use extreme care not to disturb the adjustment screw and jam nut on adjustment cap (1).*

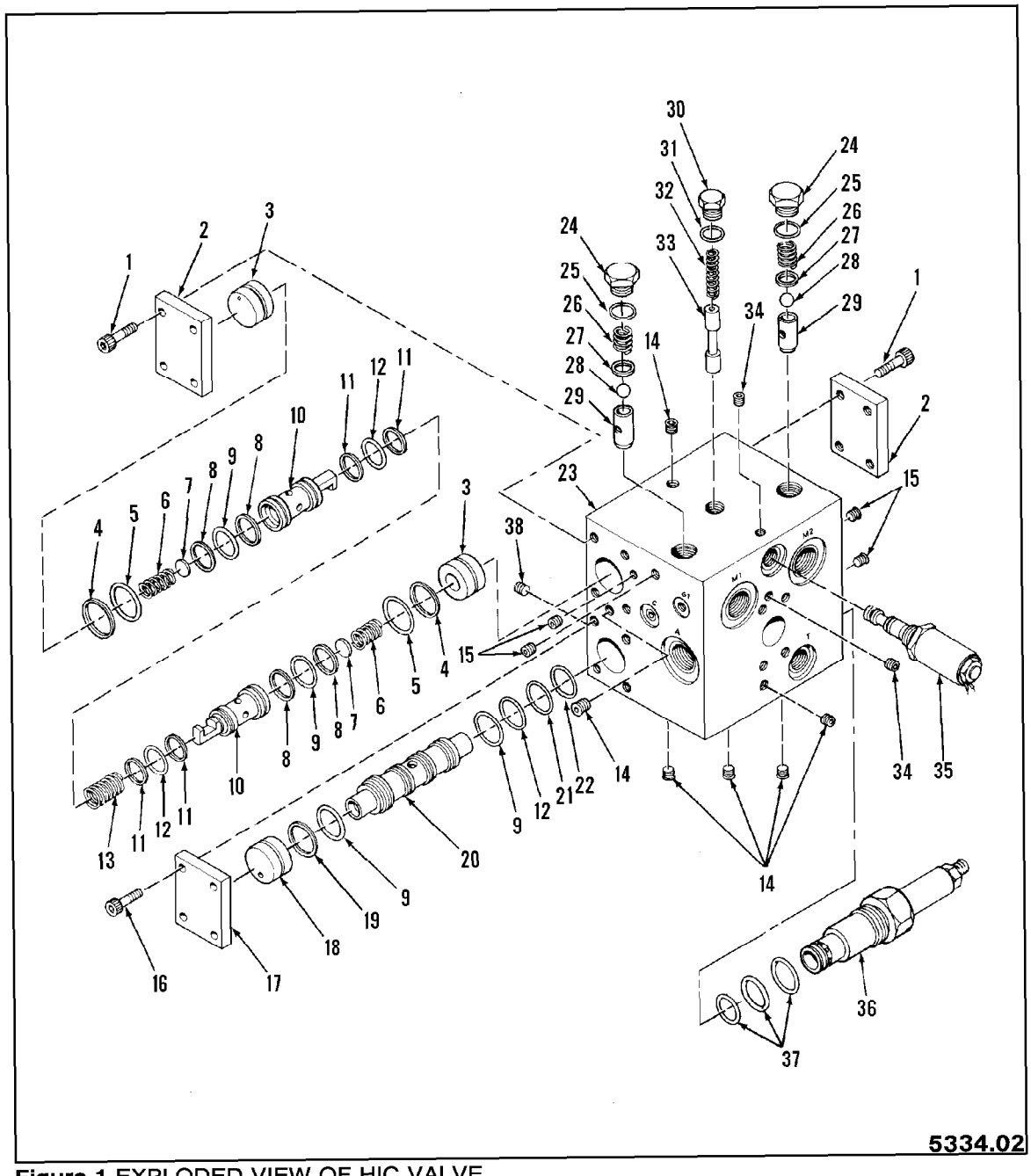

Figure 1 EXPLODED VIEW OF HIC VALVE

5. If available, use magna-flux or similar process for checking for cracks that are not visible to the eye. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. Replace all gears showing cracks or spots where case hardening has worn through. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they have not been sprung, bent, or splines twisted, and that shafts are true.

   NOTE: *Spline wear is not considered detrimental except where it affects tightness of splined parts.*

   Inspect thrust washers for distortion, scores, burs, and wear. Replace thrust washer if defective or worn.

6. Inspect bores and bearing surfaces of cast parts and machined surfaces for scratches, wear, grooves and dirt. Remove any scratches and burrs with crocus cloth. Remove foreign matter. Replace any parts that are deeply grooved or scratched which would affect their operation.

SPECIAL TORQUES

The following is a comprehensive listing of special torques used during overhaul of this component.

CYLINDER NAME & PART NUMBER(S)	PISTON ROD NUT TORQUE VALUE	CYLINDER TEST PRESSURE
Steering:		
163318	180 lbf ft (24.9 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Leaning Wheel:		
153693	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Moldboard Tilt:		
141365	180 lbf ft (24.9 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
1278352H91	180 lbf ft (24.9 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Moldboard Side Shift:		
141350	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
1285483h91	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Drawbar Side Shift:		
159963 (R.H. Bias)	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
153694 (R.H. & L.H.)	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Drawbar Lift:		
140009 (R.H. & L.H.)	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
159965 R.H. (R.H. Bias)	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
159971 L.H. (R.H. Bias)	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Scarifier:		
136277 L.H.	285 lbf ft (39.4 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
136276 R.H.	285 lbf ft (39.4 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Lock Pin:		
140022	None	3000 PSI (210.9 kg/cm^2)
Articulation Cylinder:		
159273	400 lbf ft (55.3 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)
Ripper:		
153866	500 lbf ft (69.2 kg•m) (Wet)	3000 PSI (210.9 kg/cm^2)

Installation

1. Position cylinder (7, Figure 10) and spacers (6) in axle weldment (8). Secure in place with bolt and self-locking nut (5). Tighten self-locking nut to 129 lbf ft (17.8 kg•m).

2. Install fittings (3 and 4) in cylinder (7). Connect hose (1) and tee (2) to fittings.

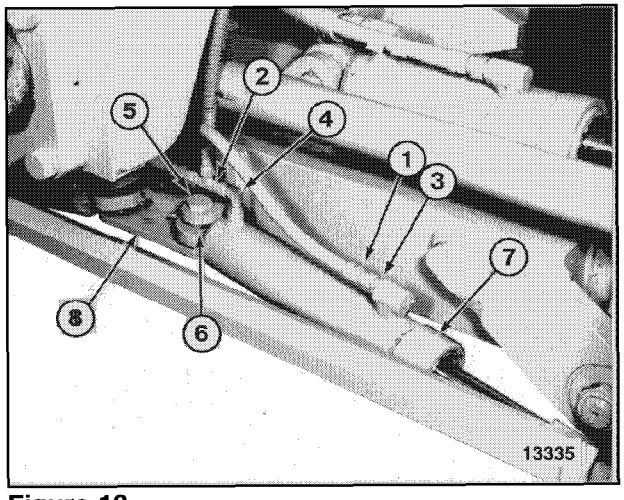

Figure 10

3. Screw rod end (2, Figure 11) with jam nut (1) into piston rod (5).

   NOTE: *When jam nut is tightened, be sure the amount of exposed thread equals that measured at disassembly.*

4. Position rod end (2) in axle (4) and tighten ball socket assembly. Install plain washer and slotted nut (3) to 170 lbf ft (23.5 kg•m). If necessary, increase torque on nut to install cotter pin.

5. Recheck exposed threads and tighten jam nut (1).

   NOTE: *The turning radius and wheel alignment must be checked. Refer to "Front Wheel Alignment & Turning Radius Adjustment" section of this manual.*

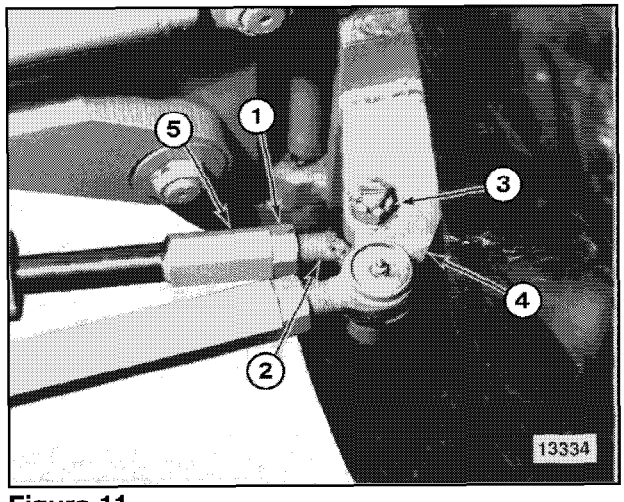

Figure 11

5. Disconnect hose (1, Figure 22) from fitting (2). Remove fitting from base end cylinder port (3). Plug hose and cylinder port.

   NOTE: *If cylinder could not be retracted manually, push it in before plugging ports in steps 4 and 5.*

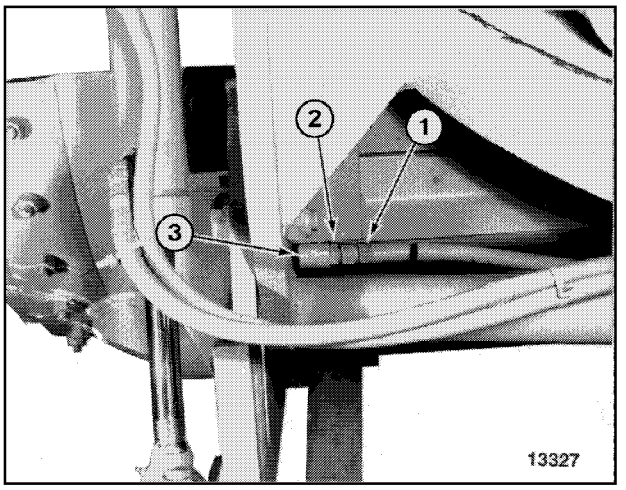

Figure 22

6. Remove self-locking nut and bolt (1, Figure 23) from base end of cylinder (2) and moldboard (3). Remove cylinder from circle assembly.

   NOTE: *For units S/N 200000 & Up, remove cylinder guard, two cotter pins and pin that secures base end of cylinder to L.H. bracket weldment.*

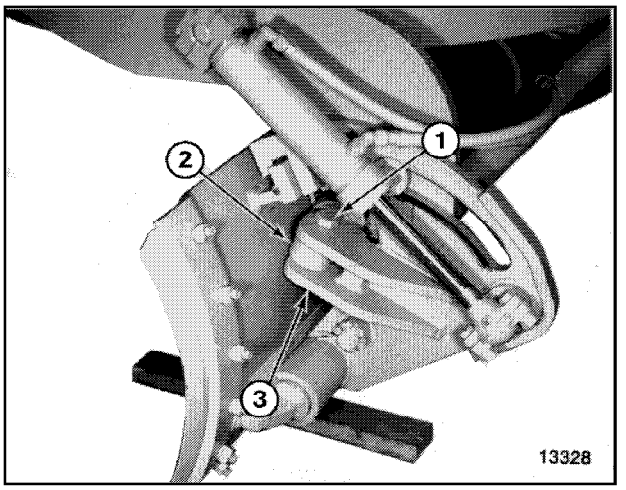

Figure 23

Disassembly

1. Remove plugs from cylinder ports and drain cylinder of oil.
2. Using a spanner wrench, remove clamp ring (12, Figure 35) from cylinder weldment (1).

   NOTE: *Clamp ring will not slip off piston rod assembly at this time.*
3. Remove piston rod assembly (14) with cylinder head (8) from cylinder weldment (1).

WARNING! Remove piston straight from cylinder weldment. Avoid scratching or binding piston.

WARNING! Use care not to scratch piston rod with clamp ring.

4. Remove self-locking nut (2), piston (6), cylinder head (8) from piston rod (14). Remove clamp ring (12).
5. Remove rod wiper (13), back-up ring (11), and O-ring (10) from cylinder head (8).
6. Remove O-ring (7), piston ring (5), O-ring (4) and wear ring (3) from piston (6).
7. Remove retainer ring (15), and rod seal (9) from cylinder head (16).

Cleaning and Inspection

See Page 10, for "Cleaning and Inspection" procedures.

Reassembly

1. Using a adaptor and arbor press, install rod seal (9, Figure 35) in cylinder head (8).
2. Install wear ring (3) piston ring (5), O-ring (4) and O-ring (7) in piston (6).
3. Install O-ring (10), back-up ring (11) and rod wiper (13) in cylinder head (8).

   NOTE: *When installing back-up ring, be sure that cupped side of ring is against O-ring.*

   NOTE: *Install rod wiper with cup side facing out.*
4. Install clamp ring (12), cylinder head (8), piston (6) and self-locking nut (2) on rod (14).

   NOTE: *Refer to "Special Torques" section of this manual for self-locking nut torque.*
5. Coat outside of piston (6) and cylinder head (8) with hydraulic oil. Slide piston rod assembly (14) into cylinder weldment (1). Using a spanner wrench, secure cylinder head in place with clamp ring (12).

WARNING! Install piston straight into cylinder weldment. Avoid scratching or binding piston.

4. Using a suitable lifting device, sling cylinder (1, Figure 46) as shown.

5. Disconnect hose and/or fitting (2) from base end port connector. Remove connector from port, if replacement is necessary.

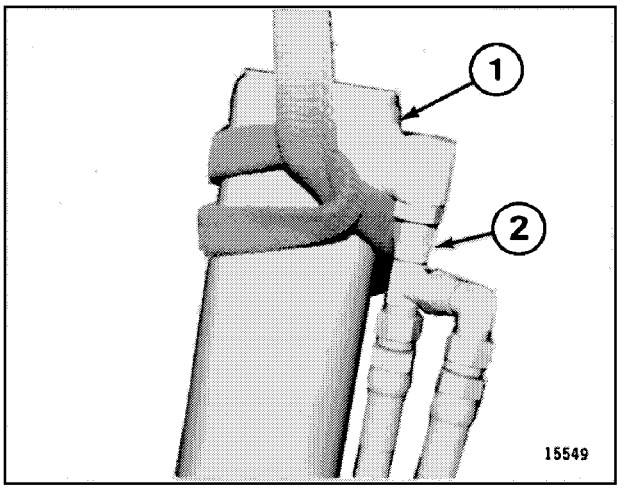

Figure 46

6. Remove two hex nuts, lock washers, and bolts (1, Figure 47), ball cap (2) and shims from piston rod.

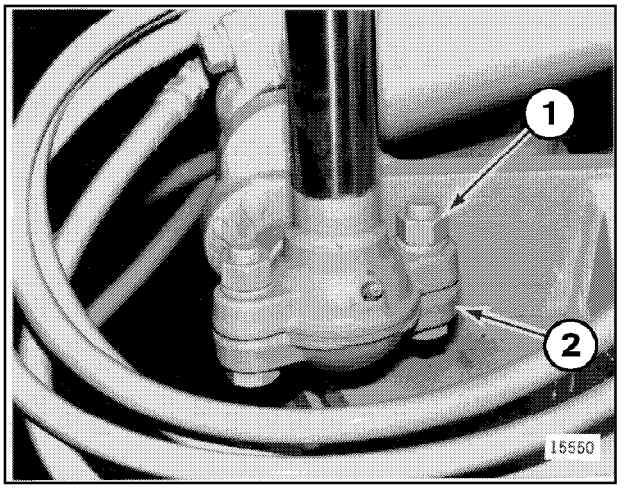

Figure 47

7. Remove four bolts and lock washers (1, Figure 48), two trunnion caps (2), and cylinder (3) from yoke (4).

8. Remove two trunnion bearings (5) from cylinder trunnion pivots.

   NOTE: *Remove grease fitting(s) from bearing(s) if replacement is necessary.*

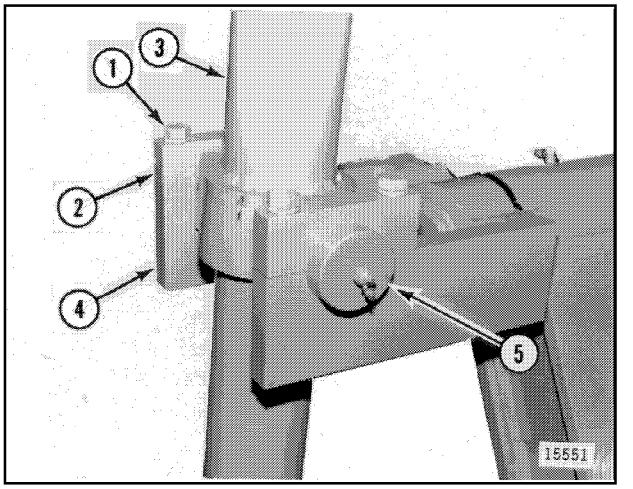

Figure 48

LOCK PIN CYLINDER (R.H. & L.H. BIAS BLADE SUSPENSION ONLY)

Removal

WARNING! Before disconnecting hoses from lock pin cylinder, be sure to relieve pressure in circuit created by the accumulator that is connected to the circuit.

1. Position moldboard on ground to relieve weight on lock pin cylinder (1, Figure 62).

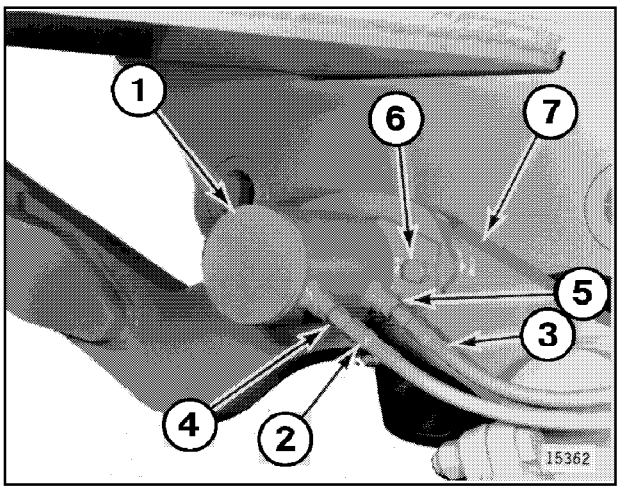

Figure 62

2. On units with S/N 200000 & Up, relieve pressure in lock pin circuit in the following manner;

   A. Shutdown engine.

   B. Tag and disconnect brake hose (1, Figure 63) from fitting (2) on each side of final drive (3).

   WARNING! ACCUMULATOR in brake system. Do not depress the foot brake when the brake hose is disconnected.

   C. Attach a 3 Ft. (0.91 m) length of hose to each brake hose. Place open end of hoses in a 1 U.S. Gallons (3.8 ℓ) container.

   D. With hoses in container depress foot brake pedal several times. This will release hydraulic fluid from each accumulator.

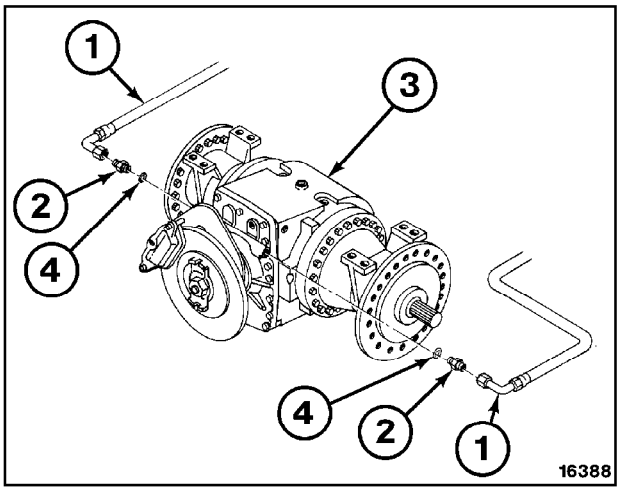

Figure 63

   E. Reconnect hose (1, Figure 63) to fitting (2) on each side of final drive (3). Refer to appropriate "Final Drive Assembly" shop manual section for brake bleeding procedure when cylinder installation is completed.

3. Tag and disconnect hoses (2 and 3, Figure 62) from fittings (4 and 5). Remove fittings from cylinder.

4. Remove two bolts and plain washers (6, Figure 62) and cylinder from link weldment (7).

LOCATION ON MACHINE

BRAKE SYSTEM ACCUMULATORS

The hydraulic accumulator(s) is located between the under side of cab and frame.

DRAWBAR LIFT AND DRAWBAR SIDE SHIFT ACCUMULATORS

A piston type hydraulic accumulator is available as an accessory on graders to help protect the moldboard assembly and related components from impact loading in severe working conditions or areas where extremely hard material many be encountered.

When this accessory packaged is installed on a unit the accumulators will be installed as follows:

1. Two accumulators will be mounted to the top of the moldboard assembly to protect the circle shift cylinder. One will be plumbed into the rod end supply line and the other will be connected to the base end supply line. The circle shift cylinder is subjected to impact loading from both directions.

2. Two accumulators will be mounted to the main frame (one on each side) in front of the moldboard suspension group. The right hand accumulator is plumbed into the base end of the R.H. lift cylinder, and the L.H. accumulator is connected to the base end of the L.H. lift cylinder. The lift cylinders only require protection from impacts that would cause the cylinders to retract.

5. Tag and disconnect hoses (1, Figure 9) from fittings (2). Plug and cap hoses and fittings to prevent contamination from entering hydraulic system and accumulators (4 and 6).

6. Loosen clamps (5 and 7, Figure 9) and slide accumulators (4 and 6) out.

7. Remove fittings (2, Figure 9) and O-rings (3) from end of accumulators (4 and 6), if replacement is necessary.

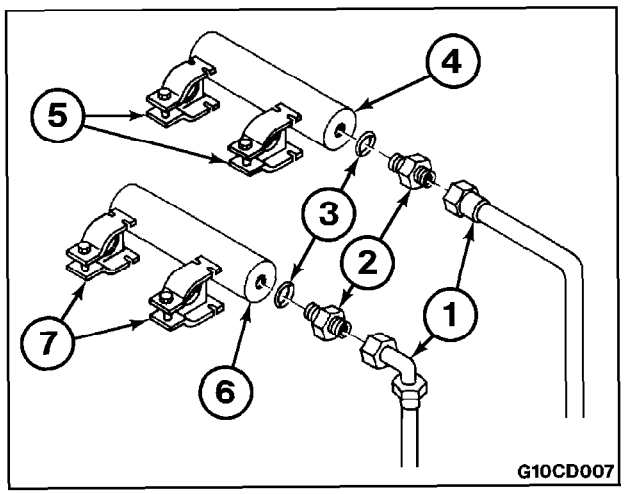

Figure 9

REMOVAL (DRAWBAR LIFT AND DRAWBAR SIDE SHIFT)

WARNING! Prior to disconnecting hoses and lines from hydraulic (wet) brake system, be sure to relieve pressure in circuit created by the accumulator that is connected to the circuit.

1. Park grader on a level surface and lower all mounted equipment. Make sure there is not excessive unit down pressure on the implement to serviced. Down pressure will create as static pressurization in the hydraulic lines.

2. Place blocking in front of and behind each tire.

3. Shutdown engine.

4. Operate the appropriate control lever for the function being serviced

5. Tag and disconnect hoses (1, Figure 10) from fittings (2). Plug and cap hoses and fittings to prevent contamination from entering hydraulic system and accumulators (4 and 6).

6. Loosen clamps (5 and 7, Figure 10) and slide accumulators (4 and 6) out.

7. Remove fittings (2, Figure 10) and O-rings (3) from end of accumulators (4 and 6), if replacement is necessary.

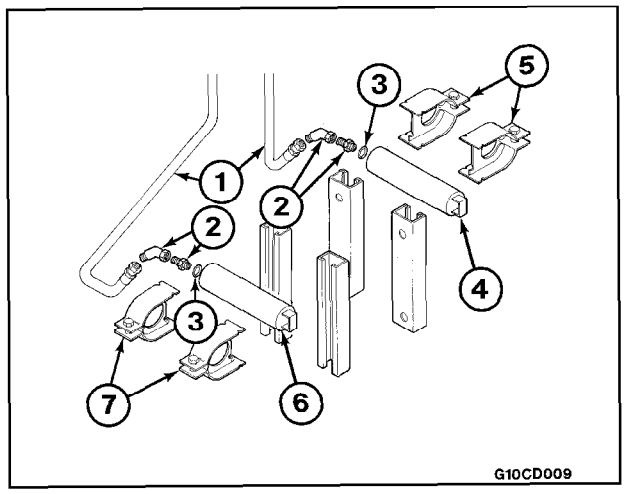

Figure 10

INTRODUCTION

This manual covers troubleshooting for basic hydraulic circuits of the graders.

Figure 3, on the following page shows a flow chart of how this manual is organized.

Information is arranged from general-to-specific troubleshooting. It starts with sections on general diagnosis procedures, hydraulic test port connections and a hydraulic system overview. The hydraulic system overview section contains the following information:

a) A quick reference pressure chart.
b) Hydraulic schematics used with both configurations of graders.
c) A block flow diagram with a brief description of each circuit for each configuration of grader.

There are then detailed hydraulic sections, covering individual hydraulic circuits mentioned during the overview portion.

Use the six-step approach in "General Diagnosis Procedure" for troubleshooting while referring to specific troubleshooting information in each later section.

Make a copy of this section to kept in the service file for each unit. The test values that will be recorded within can be helpful in future servicing.

When possible, always test with all fluids and components at operating temperatures. Pressures will be higher if oil is cold.

Certain abbreviations are contained in this section which may be unfamiliar to the reader. They are:

AWD	=	All Wheel Drive	POV	=	Pressure Override Valve
β	=	Beta	PSI	=	Pounds Per Square Inch
CCW	=	Counterclockwise	PSID	=	Pounds Per Square Inch Differential - The difference between two pressure gauge readings.
CW	=	Clockwise			
HIC	=	Hydraulic Integrated Circuit			
L.H.	=	Left Hand	R.H.	=	Right Hand
L.S.	=	Load Sense	kPa	=	Kilopascal - Metric equivalent for PSI

A copy of the Operator's Manual must be available for use with this section.

Actual desired pressure values to be recorded in this manual, may vary slightly to those values shown in hydraulic schematics. When a system is discussed, schematic values will be used. When a system is tested the actual desired values will be used. The difference in values is due to inherent restrictions in the system caused by hose lengths, fittings, etc.

SETTING RELIEF VALVES

The following pressure check procedures, involve the adjustment of relief valves. To help maintain clarity in the procedures, all relief valves can be adjusted this way, unless otherwise specified.

1. Cut lock wire, or remove cap and sealing washer, or remove tamper proof cap, from relief valve cartridge.

   NOTE: *On some relief valves this cap also acts as locking nut or collar.*

2. Loosen locking nut or collar.

Figure 8, shows that the standard grader consists of two separate hydraulic circuits.

1. The main hydraulic circuit. See page 17.
2. The steering and brake circuit (includes lock pin circuit). See page 48.

MAIN HYDRAULIC CIRCUIT

Figure 8, shows that the main system pump is driven by the transmission.

The main system pump draws oil from the hydraulic oil tank through a 100 mesh strainer located in the bottom of the tank. It is a flow demand pump, controlled by a load sensing compensator. The compensator sensor line is connected to the two control valve banks. The sensor lines are used to sense system pressure and control the swash plate angle of the main system pump by means of the compensator assembly.

When demanded by a control function (ie. moldboard tilt, lift cylinder, etc.) the main system pump flow is directed to the control valve banks. It then can be directed by mechanically controlled valve spools to various functions. These functions will be discussed later in their own sections.

Return oil from the control valve banks is routed through a junction block. The oil from the junction block is routed next to the hydraulic oil filter and then to the hydraulic oil tank.

NOTE: *Some control valve functions have independent drain lines which are also connected to the junction block.*

This description by no means describes the main hydraulic circuit. It is only intended to show the basic functional order of components in the system. Refer to the appropriate section of this manual for a complete description and troubleshooting.

STEERING AND BRAKE HYDRAULIC CIRCUIT (INCLUDES LOCK PIN)

Figure 8, shows that the steering and brake pump is driven by the engine.

The steering and brake pump is a flow compensated pump which responds to a drop in system pressure when flow is created by the actuation of a function in the circuit. The pump draws oil from the hydraulic oil tank through a 100 mesh strainer located in the bottom of the tank. This oil is then routed to either the orbitrol steering unit or the double brake check valve.

When the steering wheel is turned a demand for oil is created (by a drop in pressure) and the pump strokes up to maintain pressure. The orbitrol unit directs the flow of oil to the steering cylinder. Return oil from the cylinders, first passes back through the orbitrol unit, then is routed to a 150 PSI (10.5 kg/cm^2) relief valve located at the junction block. This relief valve maintains oil in the return line circuit.

NOTE: *Emergency steering is made possible by the 150 PSI (10.5 kg/cm^2) relief valve. In an emergency, the steering wheel can be turned manually, and steering cylinder oil is then used to steer the unit. The relief valve blocks the flow of oil from returning to tank.*

Oil from the pump directed to the double brake check valve is used to supply the normal wet brakes (located in rear axle), parking/emergency brake, and lock pin cylinder (if equipped). The double brake check valve splits the oil into two circuits. Each of these circuits contains an accumulator to supply emergency operating fluid and pressure. One circuit supplies the L.H. rear axle brake (controlled by the brake valve). The other circuit supplies oil to the R.H. brake circuit, plus oil to the parking/emergency brake solenoid valve and lock pin solenoid valve (if equipped) located at the junction block.

"PULLED" (PRESSURIZED "B" PORT)

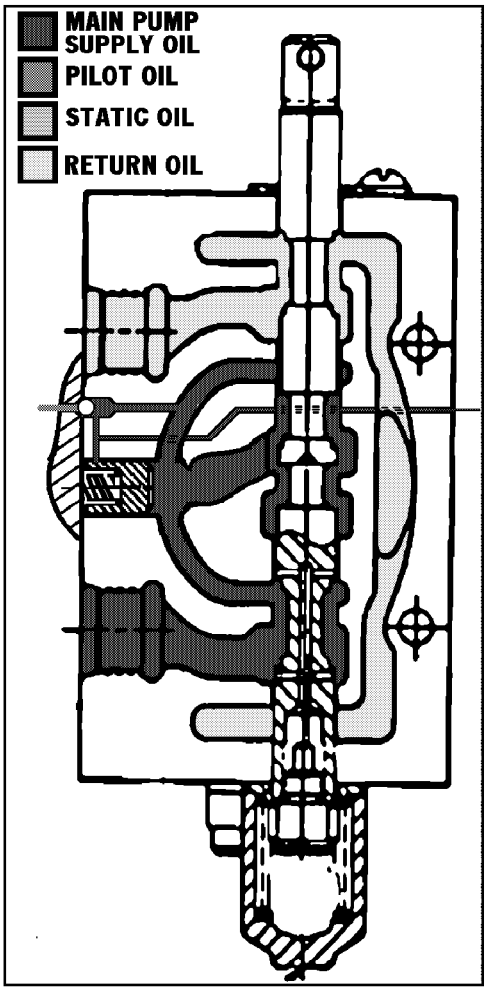

Figure 19 CROSS SECTION OF VALVE SHOWING FLOW CONTROL VALVE PULLED

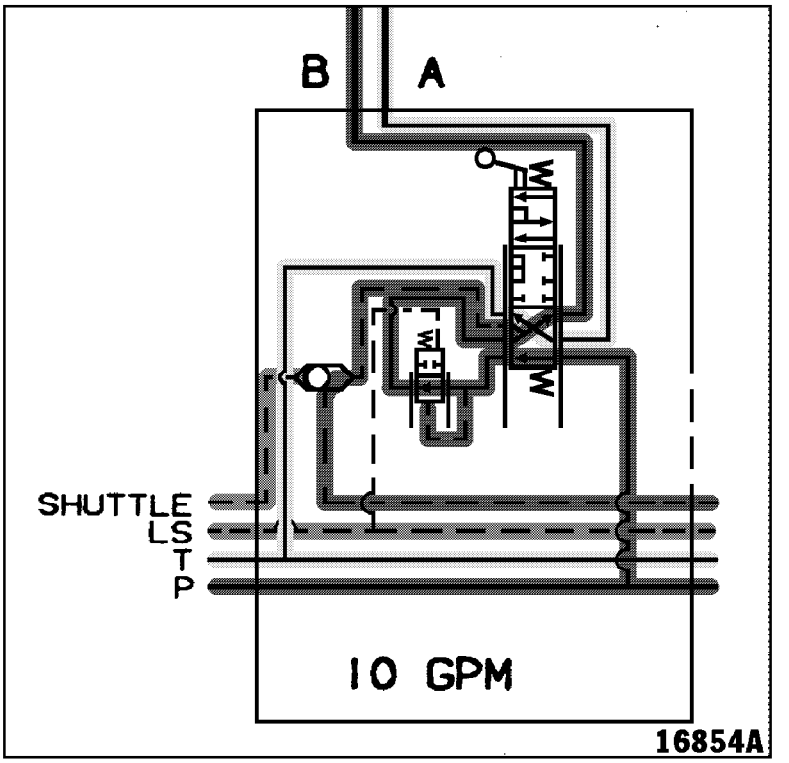

Figure 20

When the control lever is pulled, oil flow from the pump is allowed to pass through the (now opened) center portion of the valve section and open the compensator. With the compensator opened oil passes through the bridge and is then allowed to flow out the (now opened) "B" port.

At the same time that the compensator opens the pressurized oil is allowed to shift the load sense shuttle. When the load shift shuttle is shifted, the 140 PSI (9.8 kg/cm^2) load sense line pressure is blocked off from all control valve down stream from the shuttle. System pressure is in turn sensed by these shuttles.

Return oil from the control function is allowed to enter port "A" and pass over the (now opened) valve spool and return to tank.

NOTE: *Remember that when a valve section is in the R.H. bank that the flow is out the opposite "A" port and return oil enter the "B" port.*

Main System Control Valve Functions

Scarifier Cylinders

The optional scarifier control uses the 20 GPM (75.7 ℓ/min) control valve. Also, a double pilot check valve with crossline relief is used to protect the rod ends of the cylinders from damaging impacts when control valve is in neutral.

NOTE: *Refer to Figure 16, for operational detail of control valve.*

Double Pilot Check Valve Function

When the scarifier control lever is "PUSHED," oil flow is routed to port "VH" of the double pilot check valve with crossline relief. Oil is allowed to pass freely over the pilot check valve between ports "VH" and "CH." A pilot line from port "VH" opens the pilot check valve located between ports "CR" and "VR." This allows the rod end oil being exhausted to pass over this pilot check valve. When the control lever is returned to neutral, springs close the pilot check valve poppets and the oil is trapped, preventing the cylinders from drifting.

When the scarifier control lever is "PULLED," oil flow is routed to port "VR" of the double pilot check valve with crossline relief. Oil is allowed to pass freely over the pilot check valve between ports "VR" and "CR." A pilot line from port "VR" opens the pilot check valve located between ports "CH" and "VH" and allows the base end oil being exhausted to pass over this pilot check valve. When the control lever is returned to neutral, springs close the pilot check valve poppets and the oil is trapped, preventing the cylinders from drifting.

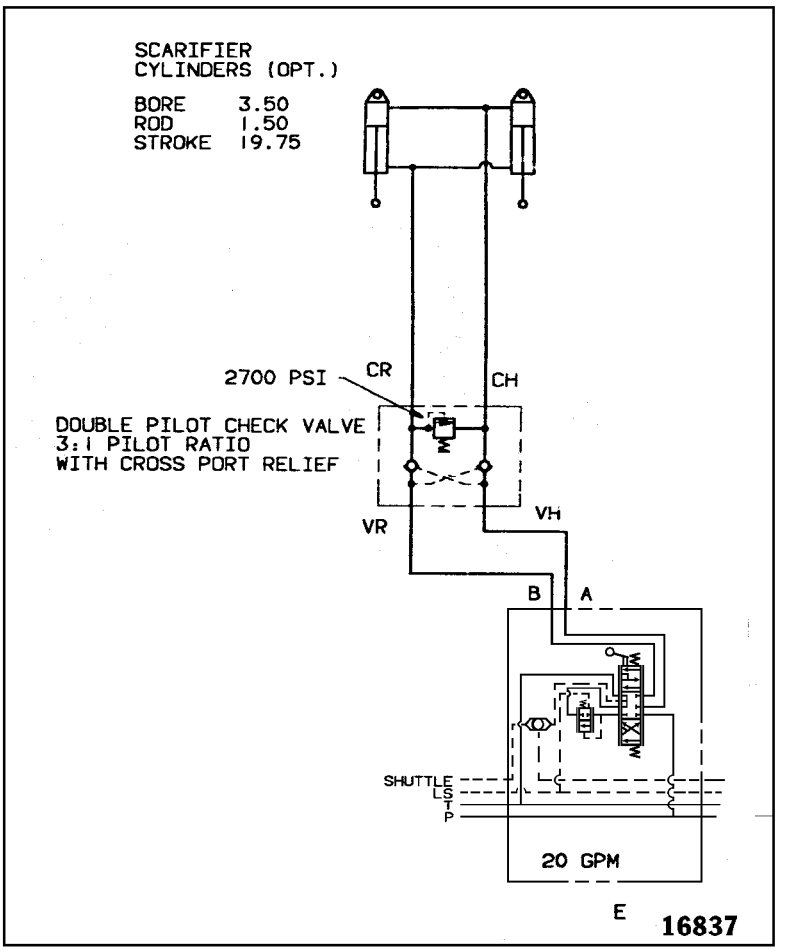

Figure 26 SCARIFIER CIRCUIT

The two pilot check valves operate at a 3:1 ratio. This means that pilot pressure required to open the check valve must be at least 1/3 of the pressure being exerted by the exhaust oil against the check valve poppet that is trying to kept it closed. This causes a controlled flow and movement of the cylinders, preventing a free falling of them.

LEGEND FOR (Figure 36)

A) FLOATING BODY
B) CHECK POPPET ASSEMBLY
C) CHECK SEAT AND VALVE SPOOL ASSEMBLY
D) CHECK SPRING
E) MAJOR BIAS SPRING
F) PILOT PASSAGE

Figure 36, shows a cutaway view of one of the counterbalance valves.

NOTE: *For descriptive purposes the action of the valve will be discussed for a L.H. turn.*

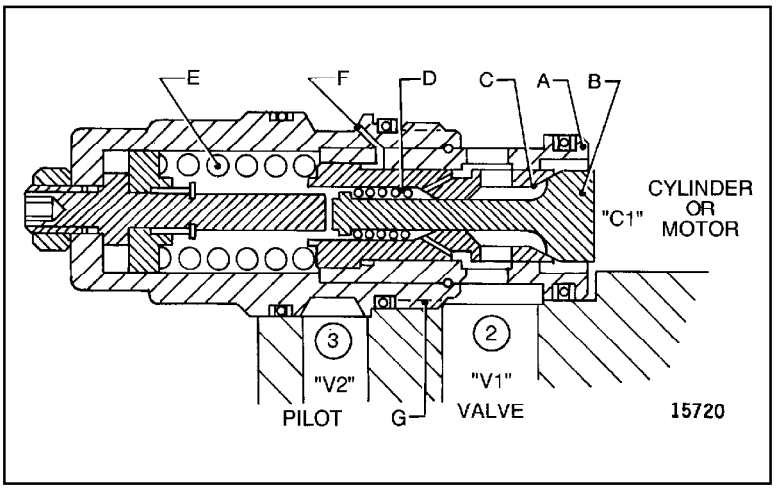

Figure 36 CUTAWAY VIEW OF COUNTERBALANCE VALVE

Positive internal piloting pressure from supply line "V2," opposite the controlled (counterbalanced) line "C1" is utilized with the load induced pressure from line "C1" (Figure 36) pushing against the check valve seat end of the spool, to open the valve. With the pilot assist feature, internal pilot pressure from supply line "V2" (Figure 36) effectively reduces the pressure setting of the valve by allowing pilot pressure through pilot passage (F). This forces the check seat and valve spool assembly (C) to the left against the major bias spring (E). The loaded machine member is restrained until pressure is available from the opposite cylinder line "C1." That means the actuator cannot move faster than the speed resulting from the pressurized supply (pump) fluid in line "V2." This action permits smooth, positive control of overrunning loads and cushioned deceleration. This positive control of overrunning loads occurs due to the drop in pressure that takes place during the overrun condition in the supply pilot line "V2." This allows the major bias spring (E) to move the valve spool assembly to the right closing the valve.

ALL WHEEL DRIVE CIRCUIT

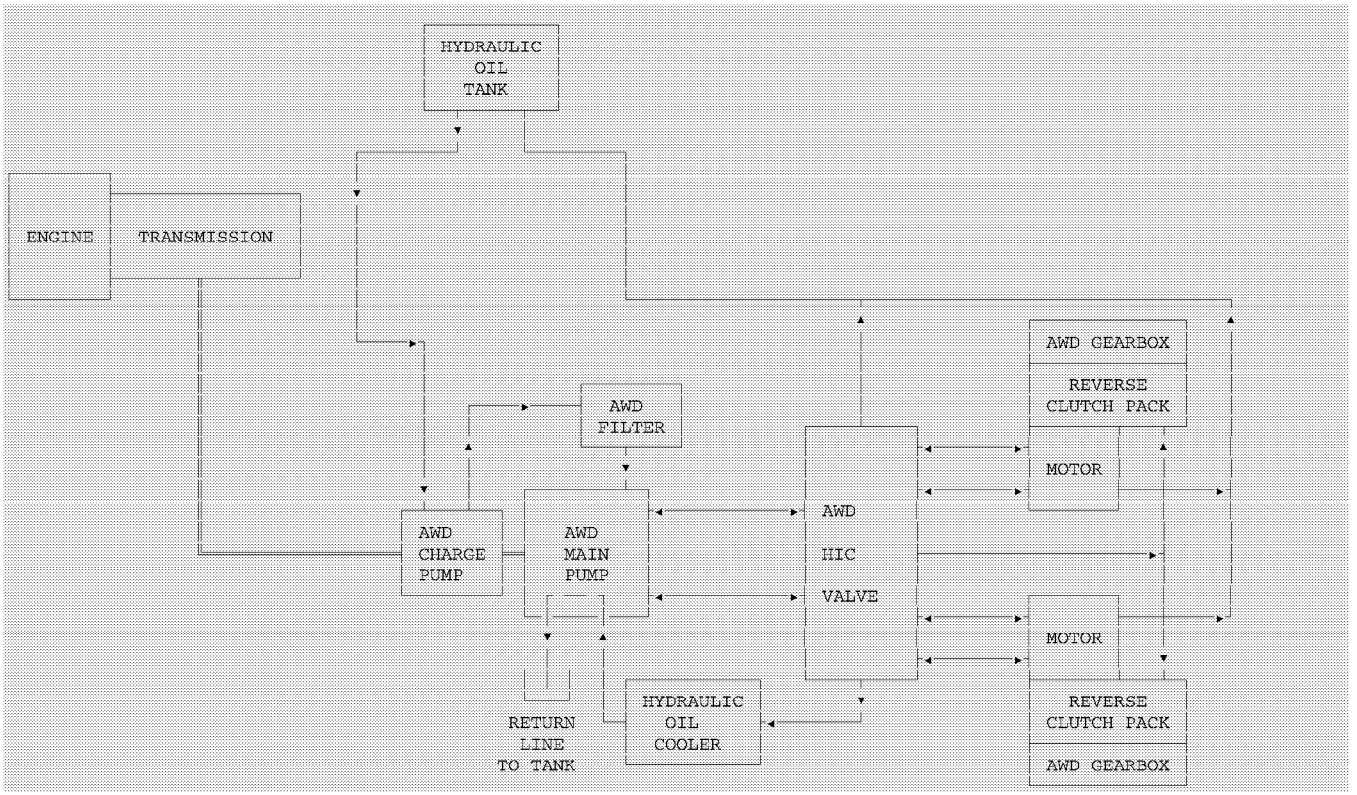

Figure 47 ALL WHEEL DRIVE CIRCUIT PORTION OF THE OVERVIEW DIAGRAM

Introduction

All Wheel Drive, or "AWD" for short, is the term we've given to the front wheel assist drive system of the graders. When it's switched on, all six wheels are powered. That sounds like an easy job to do but it takes a well coordinated and balanced system to do it right.

This system uses a hydraulic pump and two motors to deliver engine power to special low profile gearboxes in the front wheels. The electrical system controls many combinations of factors. Some factors are engine speed, travel speed, gear selection, and direction of travel, to leave the operator free to concentrate on grading.

The reason for All Wheel Drive is that the Grader's productivity is increased to that of a larger size machine by increasing tractive effort. It also improves front end stability. You get all this without increasing fuel consumption.

It's simple to use, too. The operator uses a three position switch on the shift console to select "OFF," "NORMAL MODE," or "AGGRESSIVE MODE." Select either mode, any time, in any gear, forward or reverse. Touch the foot brake and the system turns "OFF." Take your foot "OFF" the brake and the AWD system resumes its assistance automatically. It also responds in this manner when the inching pedal is used. Touch the inching and the system turns "OFF." Take your foot "OFF" the inching pedal and the AWD system resumes its assistance.

It automatically shuts "OFF" when the transmission is shifted to "NEUTRAL," or when the parking/emergency brake is "APPLIED." If the parking brake has not been "APPLIED" the "AWD" resumes operation when the gear shift lever is placed into gear. If the parking was "APPLIED" an interlock system requires that the gear shift lever be returned to "NEUTRAL" before the parking/emergency brake can again be "RELEASED," and then shift into gear to resume "AWD" operation.

This provides a power path around the Sprague clutch. When a forward gear is selected, the HIC solenoid valve must be energized. This solenoid prevents the two pilot-to-close poppet valves in the HIC from opening. Bypassing oil at the poppet valves would cause a loss of forward power. The front wheels can be driven in the forward direction only if this solenoid is energized.

A disconnect signal is supplied to the controller, on wire "10 AWD." Wire "10 AWD" is connected to the AWD disable relay. The disable relay can be activated by the foot brake, inching pedal or parking brake switch. Any voltage on wire "10 AWD" will signal the controller to cancel the drive signal to the pump. The AWD system will appear to shutoff when any of the previous functions are applied.

The controller also receives a reset signal on wire "12 AWD" from the shifter when neutral is selected. This signal clears all speed data from the controller when in neutral. In neutral, power will be removed from both pump solenoids due to logic in the transmission adapter harness. The neutral signal to the controller will assure that no drive signal is present when changing from Neutral to Forward or Neutral to Reverse.

Each speed sensor requires a three conductor shielded cable. This cable carries a common ground wire "4 AWD," at least 8.5 VDC for sensor power on wire "5 AWD," and a signal to the controller on wire "7 AWD" from the front, and wire "8 AWD" from the rear. The cable shield is grounded *only* at the controller.

Care must be taken to ensure that voltage polarity is not reversed or the sensor can be damaged. Consequently, DO NOT conduct a continuity check of the sensor to determine if it is working. Follow the testing procedures in the troubleshooting section.

3. Unplug connector (Figure 62) containing wire "10 AWD" from relay located just in front of the AWD controller. This must be done for the test so the brakes can be applied without shutting off power to the AWD system.

   NOTE: *Remove the AWD controller access cover to disconnect connector containing wire "10 AWD" from relay. This connector also includes wire "68/O." Only unplug the one connector from the relay, leave the other one connected.*

   WARNING! The system develops full force during this test. Keep clear of the area in front of and behind the machine.

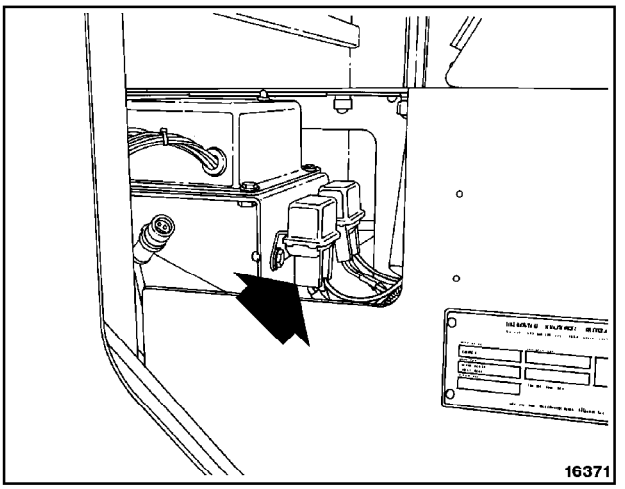

Figure 62 RELAY CONNECTOR CONTAINING WIRE "10 AWD" (LOCATED JUST IN FRONT OF AWD CONTROLLER)

4. "APPLY" foot brake, "RELEASE" parking brake, and move AWD system switch to the "OFF" position. Start engine and set engine speed control at 1000 ±25 RPM.

   NOTE: *The pump has a Pressure Override Valve (POV) which varies the swash plate angle to limit the maximum pressure. This valve prevents continuous dumping of excessive flow, at maximum pressure, through the system relief valves in the pump. This eliminates unnecessary heating of the oil and protects the pump when the wheels stall.*

5. Move the AWD system switch to "NORMAL MODE," shift transmission to "SIXTH GEAR FORWARD," and push test button (1, Figure 60) on controller.

   A. The right hand gauge should show override pressure (from 4200 - 4600 PSI (295.3 - 323.4 kg/cm^2) @ 1000 ±25 RPM). Have other person, record override pressure reading.

      _____ PSI Forward override pressure @ 1000 ±25 RPM.

   B. The left hand gauge should show charge pressure (about 250 - 290 PSI (17.6 - 20.4 kg/cm^2) @ 1000 ±25 RPM). Have other person, record charge pump reading.

      _____ PSI Charge pump pressure @ 1000 ±25 RPM.

6. Shift to "THIRD GEAR REVERSE" and push test button (1, Figure 60).

   A. The right hand gauge should show charge pressure (about 250 - 290 PSI (17.6 - 20.4 kg/cm^2) @ 1000 ±25 RPM). Have other person, record charge pump reading.

      _____ PSI Charge pump pressure @ 1000 ±25 RPM.

   B. The left hand gauge should show override pressure (from 4200 - 4600 PSI (295.3 - 323.4 kg/cm^2) @ 1000 ±25 RPM). Have other person, record override pressure reading.

      _____ PSI Reverse override pressure @ 1000 ±25 RPM.

7. Shutdown engine and "APPLY" parking/emergency brake.

8. Plug in connector on relay that was disconnected in Step 3 above before returning machine to service.

2. All Wheel Drive Front Sensor:

   A. In R.H. wheel assemblies reinstall sensor assembly (Figure 65). With feeler gauge obtain a 0.045 In. (1.143 mm) gap between the gear teeth and the sensor pickup. DO NOT tighten the lock nut more than 36 lbf in (0.4 kg•m).

   B. Remove the gearbox breather hose and fitting from the gearbox to measure gap.

      NOTE: *The front sensor uses 3/8" - 24 UNF threads. When the sensor is turned one full turn it moves 0.042 In. (1.067 mm).*

   C. Once the front sensor is installed it may have to be adjusted inward to reduce the gap to prevent front wheel creep. Perform the "AWD System Functional Test" to determine if additional adjustment is required ("AWD System Functional Test," Steps 5.F, 6.F).

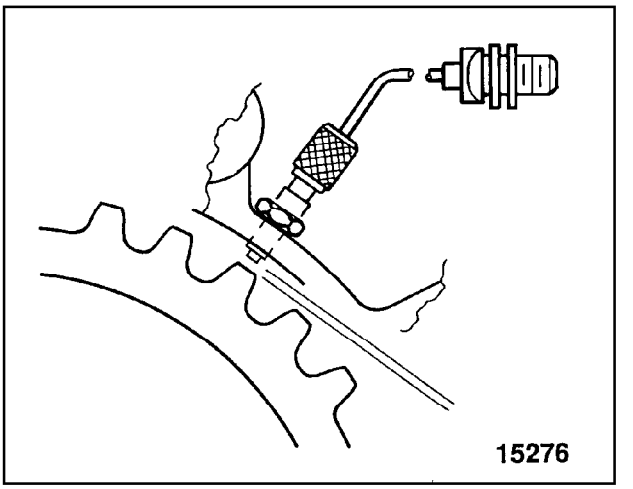

Figure 65

2. Using two split flange plugs (P/N 603 517 C1) and two O-rings (P/N 343 906 R1), block the flow of oil in the high pressure tubes leading to the HIC valve. The split flange connections are located just in front of the forward and reverse test ports (Figure 69).

   NOTE: *Blocking the high pressure tubes will eliminate the flushing valve from affecting the charge pressure reading.*

3. Connect a two calibrated 600 PSI (42.2 kg/cm^2) gauges to pressure test ports "MA" and "MB" (Figure 68).

4. Start engine and set engine speed control lever to 2500 ±25 RPM.

5. Record charge pressure reading. Charge pressure must be 330 - 370 PSI (23.2 - 26.0 kg/cm^2) @ 1770 ±25 RPM.

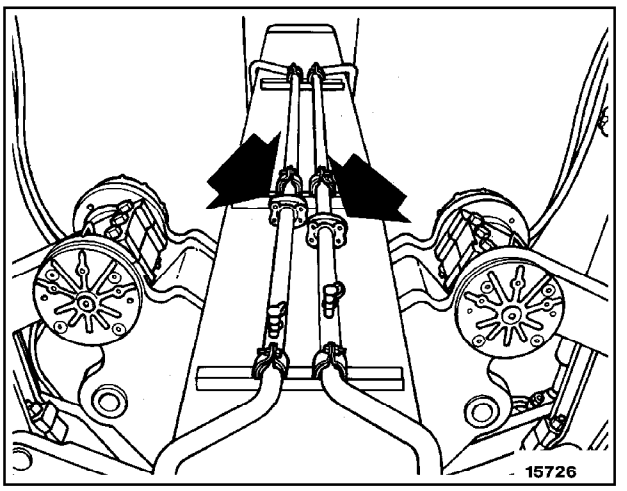

Figure 69 SPLIT FLANGE CONNECTIONS ON HIGH PRESSURE TUBES LEADING TO H.I.C. VALVE

_____ PSI @ Charge pressure at test port "MA."

_____ PSI @ Charge pressure at test port "MB."

6. If readings are not correct, shutdown the engine and adjust charge pressure relief valve (Figure 68). Then restart the engine and check pressures again.

   NOTE: *If pressure readings are not within 5 PSI (0.4 kg/cm^2) of each other, the "Hydraulic Centering Procedure" must be performed.*

7. Shutdown engine.

8. Turn the forward and reverse high pressure relief valve adjustment screws (Figure 68) "OUT" (CCW) until the spring tension is completely relieved. Then turn both screws in one full turn CW.

9. Turn the Pressure Override Valve (POV) adjusting screw (Figure 68) "IN" (CW) until firm resistance is encountered.

WARNING! Do not force the POV adjustment screw beyond the firm resistance point. To do so could result in damage to the valve.

NOTE: *Turning the POV adjustment screw all the way in will set it to a higher pressure than that of the forward and reverse high pressure relief valves.*

TABLE OF CONTENTS

1. Install two needle bearing (4, Figure 6) in front housing (11).
2. Install ball bearing (13, Figure 6) on drive shaft (7). Hold bearing in place with two retaining rings (12).
3. Press bearing (13, Figure 6) with shaft (7) into front housing (11).
4. Install spacer (14, Figure 6), oil seal (15) and retaining ring (16) in front housing (11).
5. Install woodruff key (8, Figure 6) and drive gear (5) on drive shaft (7).
6. Assemble idler gear drive shaft (6, Figure 6). Shaft assembly is comprised of a drive gear, idler shaft, drive pin and retaining ring.
7. Install two needle bearings (4, Figure 6) in rear housing (1).
8. Aligning match marks, position proper colored gasket (10, Figure 6) and rear housing (1) on front housing (11). Install eight bolts (2). Tighten bolts from 9.5 - 12.5 lbf ft (1.3 - 1.7 kg•m).

   NOTE: *New gasket must be same color as one removed during disassembly.*

SERVICING

The following is only one method of obtaining a removal, disassembly, cleaning and inspection, reassembly, and installation of the circle reverse slip clutch.

Thoroughly clean the component to be repaired and the surrounding area. This will help prevent contamination from entering the component or system being repaired.

REMOVAL

1. Before removal of circle slip clutch from grader, the circle shoes must be loosened and the circle moved away from the pinion gear. There is a small lip by the root of the pinion gear that will prevent it from being removed unless the circle is moved.

2. Position a floor jack under circle slip clutch assembly to prevent it from falling.

3. Remove six bolts and lock washers (1, Figure 4), bearing retainer (2) and shims from circle reverse gear case cover (3).

   NOTE: *Keep shim pack together for reassembly.*

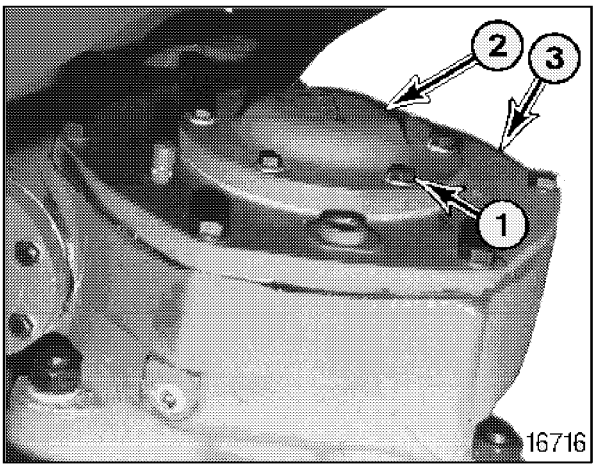

Figure 4

4. Remove lock nut and washer (1, Figure 5) from pinion shaft (2).

5. Slowly lower floor jack and remove circle slip clutch assembly out of circle reverse gear case.

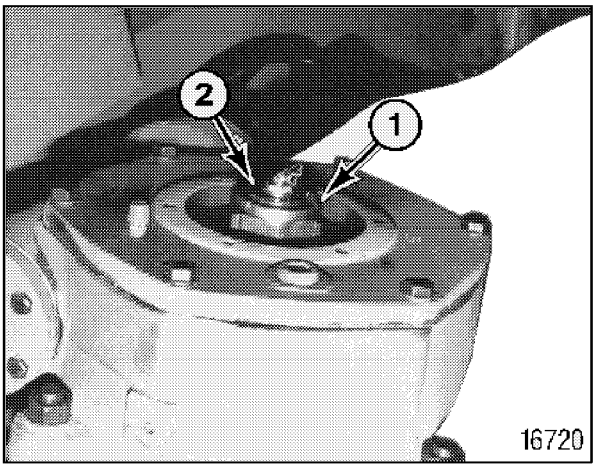

Figure 5

16. Using a feeler gauge (1, Figure 22), measure gap between cover (2) and housing (3) beside each bolt (4).

17. Average the four readings together.

18. Make a shim pack that is within ±.002 In. (0.051 mm) of the average reading.

19. Remove four bolts (4, Figure 22) and clutch housing cover (2) from clutch housing (3).

20. Remove "Circle Slip Clutch Gauge Tool" (1, Figure 19) from clutch housing (3, Figure 22).

WARNING! Do not leave "Circle Slip Clutch Gauge Tool" in clutch pack assembly.

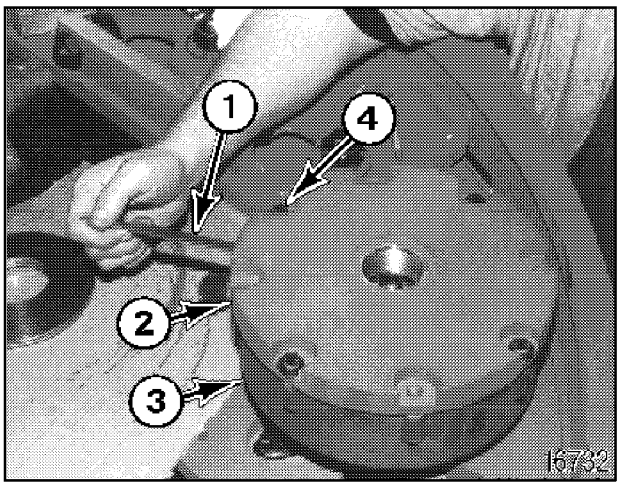

Figure 22

21. Coat new O-ring (1, Figure 23) with clean oil, and position it in O-ring groove of clutch housing cover (2).

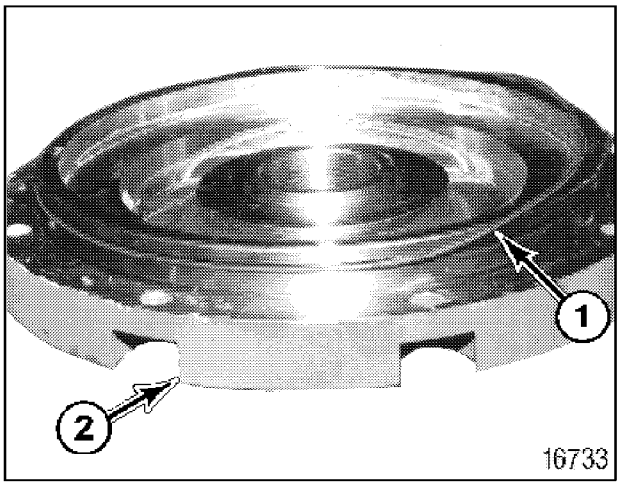

Figure 23

22. With "Circle Slip Clutch Gauge Tool" (1, Figure 19) removed, install two belleville springs (1, Figure 24) on backing plate (2).

NOTE: *Coat belleville springs and mating surface of backing plate with 3% molybdenum disulfide grease.*

WARNING! O.D. of belleville springs must be in contact with backing plate.

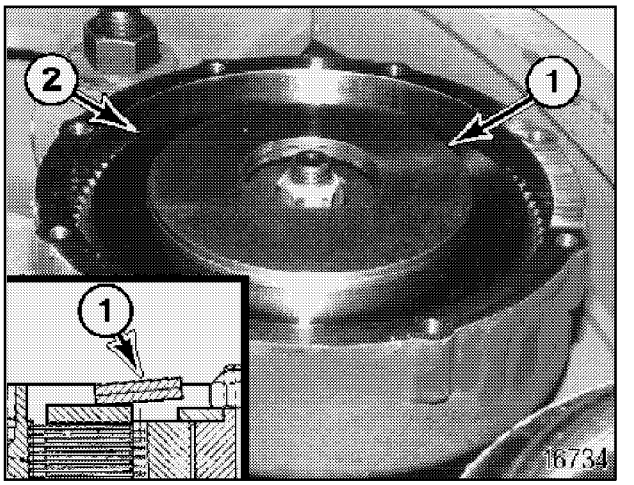

Figure 24

Engine and Transmission Gear Range Test

WARNING! Use extreme caution when performing this test.

WARNING! Make sure that all equipment being used to conduct test is in good condition.

WARNING! All equipment must be capable of handling a load of at least 25,000 Lbs. (11,337.5 kg).

After the slip clutch is installed on the grader, the following test can be made to check operation.

1. Position circle (1, Figure 40) so that the centerline of the circle is on the centerline of the frame (2).
2. Rotate blade (3, Figure 40) so that it is at 90° to the centerline of the circle (1) and frame (2).
3. Sideshift the blade (3, Figure 40) so that the end of it is more than 8 Ft. (2.44 m) from the centerline of the circle (1) and frame (2).
4. At 8 Ft. (2.44 m) ("X"), position the blade against a solid object that can withstand a load of 25,000 Lbs. (11,337.5 kg), and a surface capable of obtaining traction in third and forth gears without slipping the wheels.
5. Use a calibrated tachometer to obtain proper engine speed (RPM).

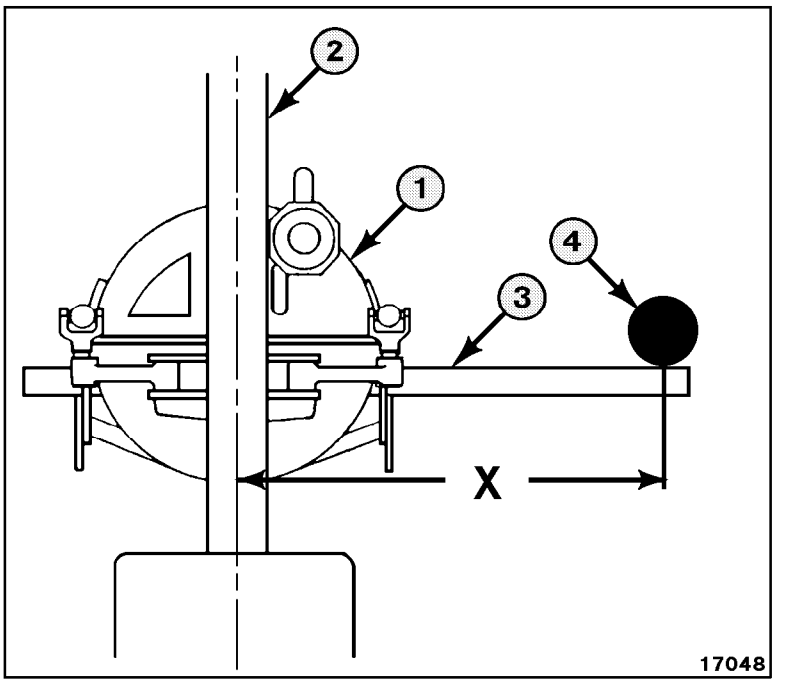

Figure 40

5. Remove fill plug (1, Figure 5) on top of gear case (2).

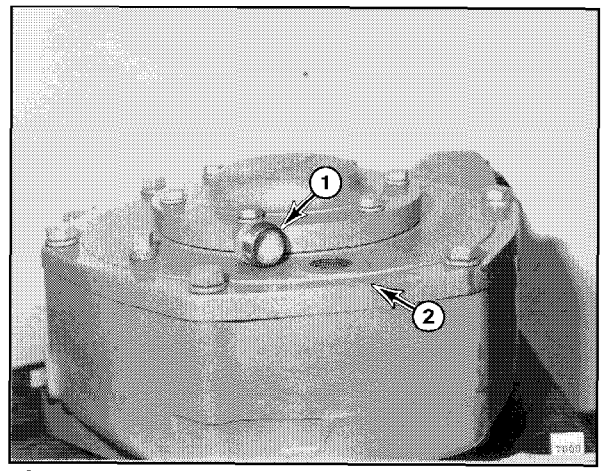

Figure 5

6. Remove check level plug (1, Figure 6) at side of gear case (2).

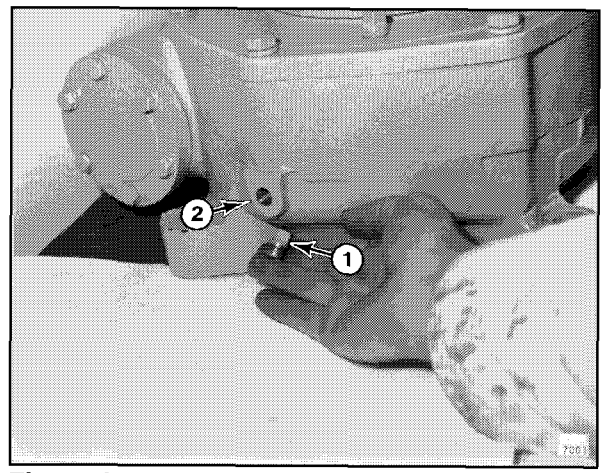

Figure 6

7. To aid in the reassembly of gear case, center punch caps, cover and gear case to mark their locations, as shown in Figure 7.

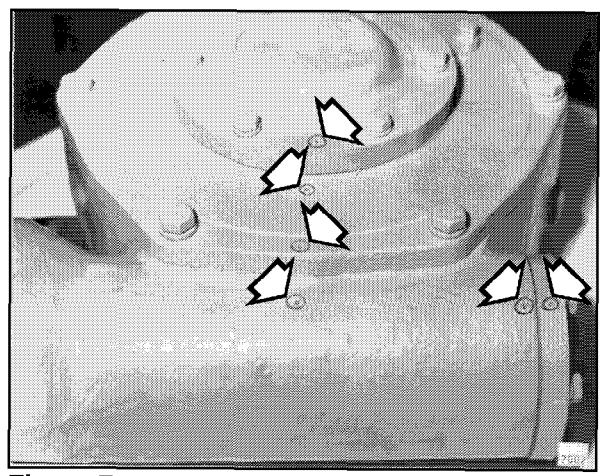

Figure 7

G. Remove two bolts (3, Figure 27) and end cap (1, Figure 28) from circle reverse case (2).

H. Place shim pack in position.

I. Install end cap (1, Figure 28) and six bolts with washers (2). Tighten bolts to 32 lbf ft (4.4 kg•m).

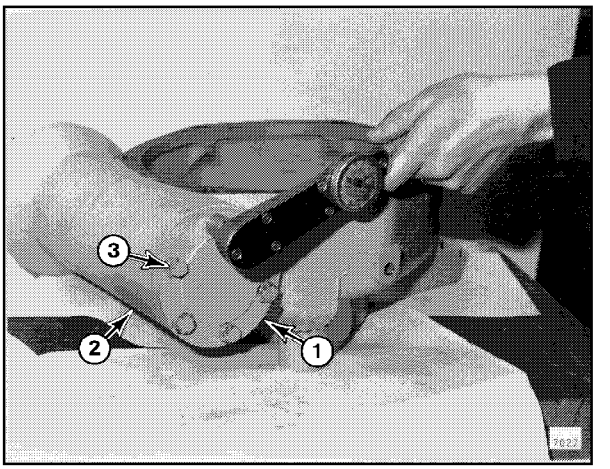

Figure 28

8. Using an arbor press and suitable adaptor, press bearing cones (2 and 3, Figure 29) on circle reverse gear (1).

   NOTE: *Make sure that bearing cones are fully seated.*

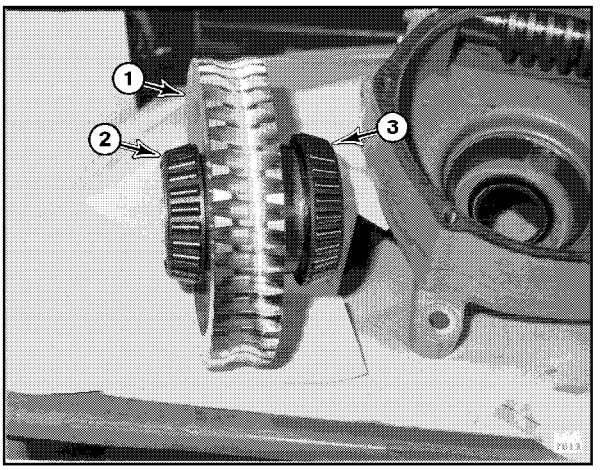

Figure 29

9. Insert circle reverse gear (1, Figure 30) in circle reverse case (2) with longer shoulder to the bottom of case. (Bearing cone (3, Figure 29) is mounted on long shoulder.)

   NOTE: *Circle reverse gear should be engaged with circle reverse worm as it is inserted in circle reverse case.*

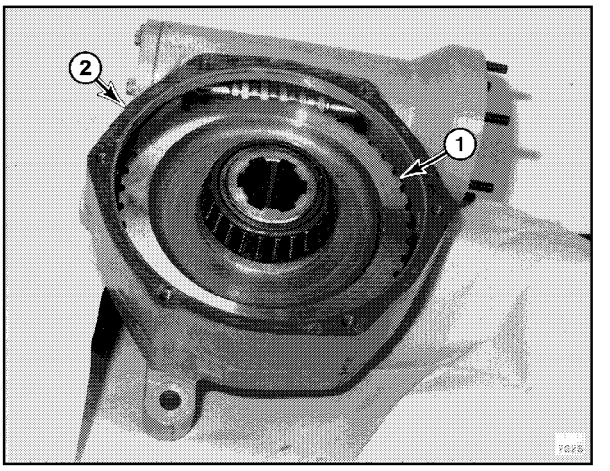

Figure 30

LEGEND FOR TANDEM DRIVE CASE WITHOUT PLANETARY FINAL DRIVE

The exploded view shown on the previous page and legend shown here are to help identify parts and their orientation to each other while servicing the tandem drive case. Some components mentioned during service procedure may only be shown in this illustration.

1. NUT, AXLE
2. WASHER, LOCKING
3. WASHER
4. WHEEL
5. KEY
6. BOLT
7. WASHER, FLAT
8. RETAINER, BEARING
9. SHIM - 0.030 In. (0.762 mm) - CORAL
   SHIM - 0.015 In. (0.381 mm) - PINK
   SHIM - 0.005 In. (0.127 mm) - BLUE
   SHIM - 0.003 In. (0.076 mm) - GREEN
   SHIM - 0.002 In. (0.051 mm) - RED
10. SEAL, OIL
11. BOLT
12. WASHER, FLAT
13. HOUSING, TANDEM
14. GASKET, LIQUID - 300ML CARTRIDGE
15. CUP, BEARING
16. CONE, BEARING
17. SHAFT WELDMENT - REAR
18. SHAFT WELDMENT - FRONT
19. CHAIN - DOUBLE STRAND
20. .LINK, CONNECTING
    .LINK, ROLLER
21. COVER, ACCESS
22. WASHER, FLAT
23. BOLT
24. BOLT
25. WASHER, FLAT
26. COVER, ACCESS
27. BREATHER VALVE ASSEMBLY
28. BUSHING, REDUCER
29. ADAPTER, PIPE
30. PLUG, MAGNETIC
31. CASE, TANDEM - L.H.
    CASE, TANDEM - R.H.
32. .STEP - R.H. ONLY
33. .STEP - R.H. ONLY

SPREADER BAR AND CHAINS

Shown here are manufacturing details for the spreader used to hold chains apart while removing and installing axle assembly.

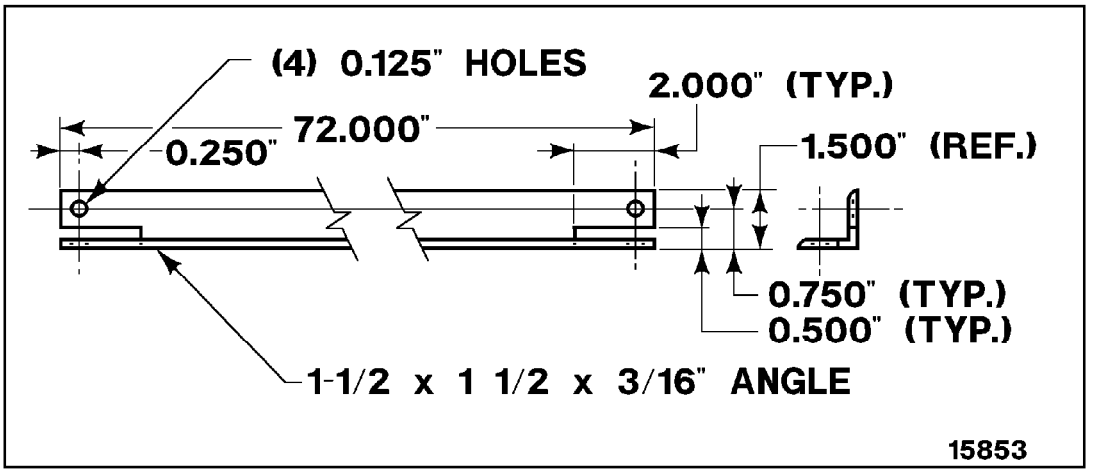

Figure 13 MANUFACTURING DETAILS FOR SPREADER BAR

Figure 14, shows how the spreader bar should be attached between chains.

Two chains 17 Ft. (5.18 m) long with 0.375 In. (9.525 mm) links are required.

NOTE: *Spreader bar should be notched to receive 0.375 In. (9.525 mm) chain link. Both ends of spreader must be moused (locked) to chain, 6 Ft. (1.83 m) from lifting eye(s). Chains must have a lifting capacity of not less than 2 Tons (1.81 Mg).*

A piece of wire passed through the two drilled holes and twisted will hold chain in position in spreader bar.

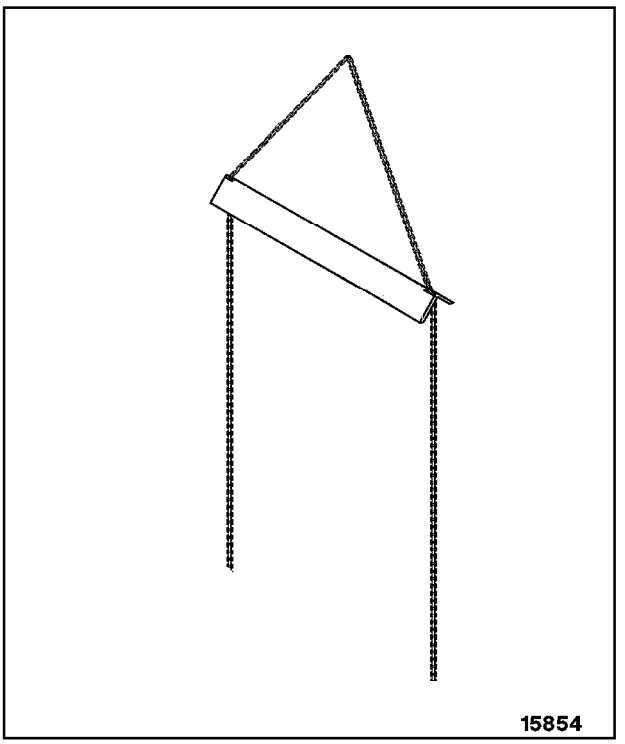

Figure 14 SPREADER BAR AND CHAIN ARRANGEMENT

4. Prime and coat mating surfaces of tandem housing (13) and tandem case weldment (31) with Loctite Grade 518. Secure housing to case with twelve hardened washers (12) and prevailing-torque bolts (11). Torque to 70 lbf ft (9.7 kg•m).

   NOTE: *Thoroughly clean surface to be sealed with degreasing solvent. Apply primer "N" (spray can-accelerator) liberally to one surface to shorten curing time. Apply gasket-sealant as required to other surface. Assemble without excessive lateral movement.*

5. Install outer bearing cup (15) in tandem housing (13), if removed at disassembly.

6. To obtain proper preload of bearings, position a 0.060 In. (1.524 mm) thick shim pack, and wheel bearing retainer (8) (without oil seal), on tandem housing (13). Install three hardened washers (7) and bolts (6) 120° apart and torque evenly to 70 lbf ft (9.7 kg•m), while turning axle and sprocket in both directions to be sure bearings are seated properly.

   NOTE: *Shims come in 0.030 In. (0.762 mm) (CORAL), 0.015 In. (0.381 mm) (PINK), 0.005 In. (0.127 mm) (BLUE), 0.003 In. (0.076 mm) (GREEN), and 0.002 In. (0.051 mm) (RED) sizes. If combination of these shims do not match the desired thickness, go to the closest, higher combination.*

7. Install axle rolling torque tool on end of axle shaft. Then using a dial indicator torque wrench measure the rolling torque. Rolling torque must be 20 - 40 lbf ft (2.8 - 5.5 kg•m).

   NOTE: *Do not use a clicker type torque wrench.*

   NOTE: *See "Special Tools" for manufacturing details of axle sprocket rolling torque tool.*

8. If rolling torque is not with in limits, add or subtract shims to shim pack to obtain proper rolling torque.

9. Remove two bolts (6), hardened washers (7) and retainer (8) from housing (13) after shim pack value is determined.

10. Coat O.D. of oil seal (10) with Permatex #2 or equivalent. Press oil seal into bearing retainer (8).

11. Position shim pack (9) (Determined in Step ?) and wheel bearing retainer (8) on tandem housing (13). Install six hardened washers (7) and bolts (6). Torque bolts to 70 lbf ft (9.7 kg•m).

12. Install pipe adapter (29), reducer bushing (28) and breather (29) in each tandem case weldment (31). Coat threads of pipe adapter engaging tandem case weldment with Loctite Grade 592.

Remove any oil film, dust or other foreign matter from the toric rubber rings (2, Figure 3), and from the tramps (4 and 7) and lips (3 and 8) of both the rings (1) and housings (6). Use tri-chloroethane, and clean cloth or paper towels for wiping.

IMPORTANT: *Never permit oil to get on the toric rings or ramps before both seal rings are put together in their final assembled position.*

WARNING! Contains tri-chloroethane. Avoid prolonged skin contact. Avoid breathing vapors in enclosed areas without adequate ventilation. Do not use open flame, welding operations or other heated surfaces exceeding 900°F (482.2°C).

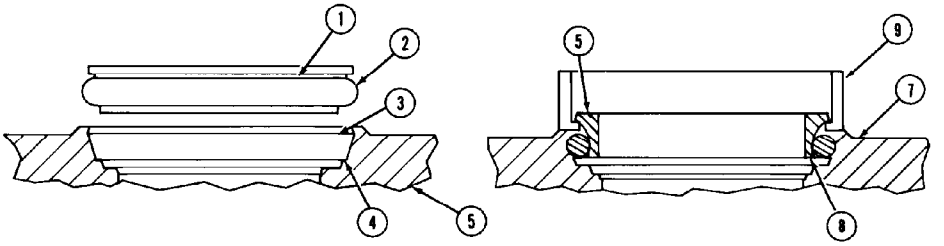

Figure 3

Put toric ring (2 Figure 4) on seal ring (1), at the bottom of seal ring ramp (7) and against lip (8).

NOTE: *Make sure that toric ring (2) is straight on seal ring (1) and is not twisted. Be careful when you work on the rubber toric ring. Nicks, cuts and scratches can cause leaks.*

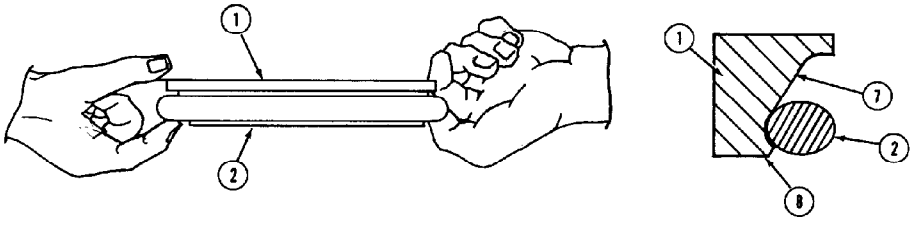

Figure 4

8. Remove cotter pins (1, Figure 22), slotted nuts (2) and flat washers from tie rod (3) and steering cylinder rod end (4).

   NOTE: *On some axle assemblies, there may not be a flat washer under the slotted nuts.*

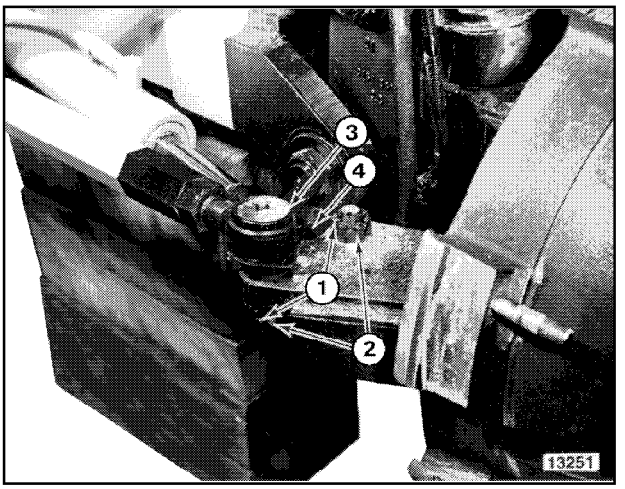

Figure 22

9. Remove retaining ring (1, Figure 23) and cover plate (2), from top and bottom of spindle assembly.

   NOTE: *Remove grease fitting from cover plate, if necessary.*

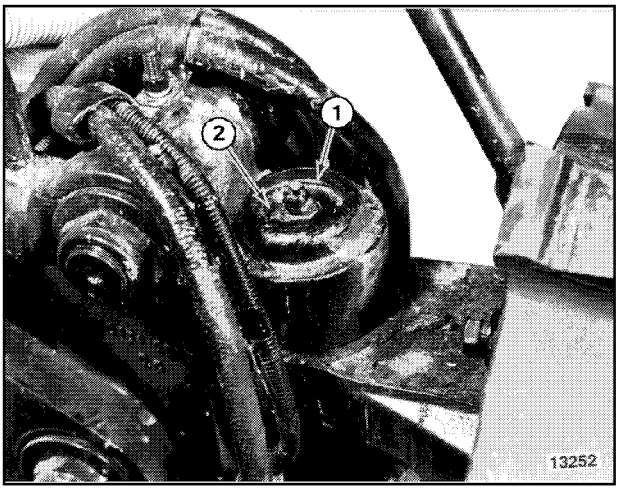

Figure 23

10. Drive roll pin (1, Figure 24) into center pin (2) until pin can be felt bottoming against arm (3).

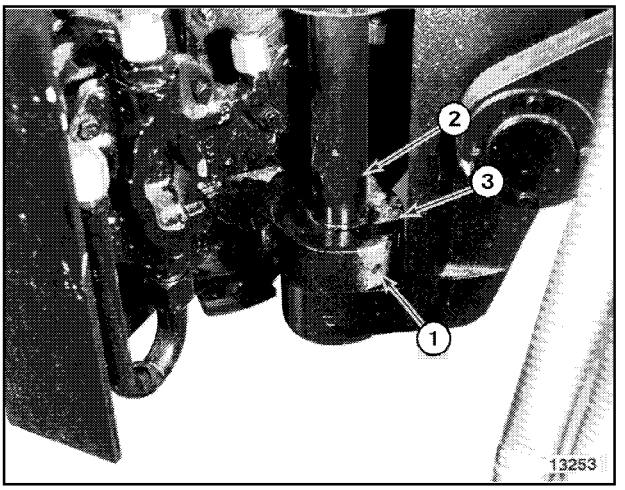

Figure 24

F. Remove six socket head bolts (1, Figure 52) securing bull gear (2) to clutch housing.

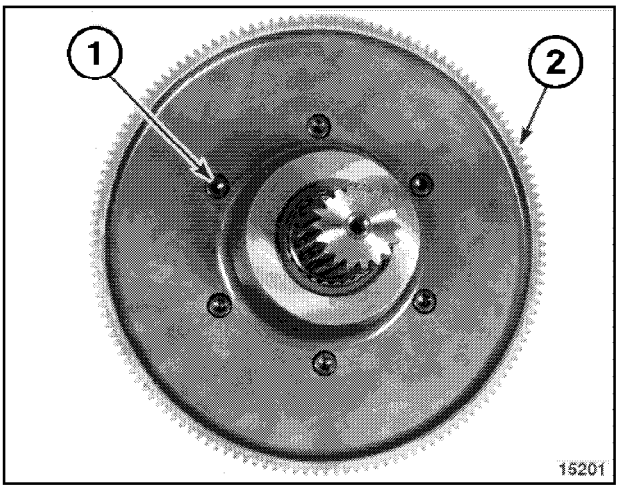

Figure 52

G. Remove reverse clutch housing (1, Figure 53) from bull gear (2).

NOTE: *It may be necessary to leave two bolts (1, Figure 52) in housing 180° apart and tap off reverse clutch housing.*

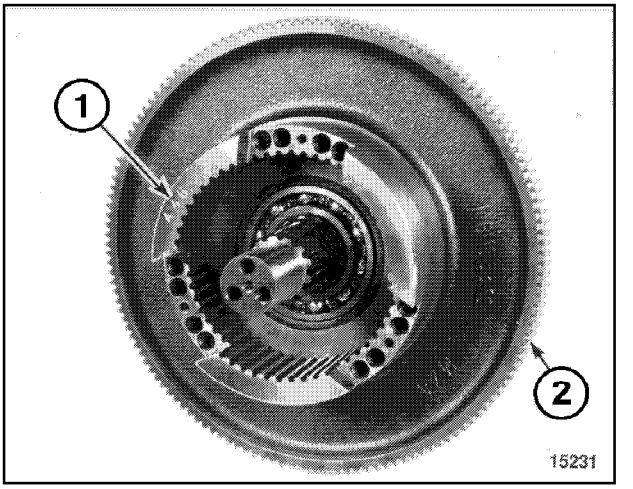

Figure 53

H. Invert assembly and remove retaining ring. Press sun gear shaft (1, Figure 54) from bull gear (2).

NOTE: *Arrow points in direction that sun gear shaft must be pressed from bull gear.*

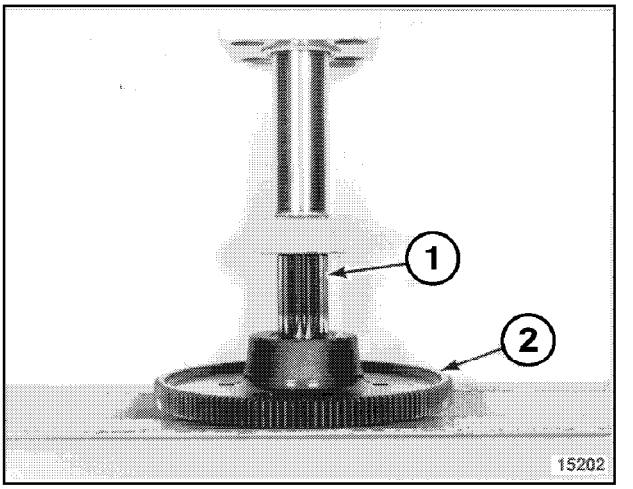

Figure 54

J. Install gear case housing (1, Figure 73) over gasket, using alignment dowel pins for proper alignment. Install four bolts and lock washers (2).

K. Tighten bolts to 115 lbf ft (15.9 kg•m).

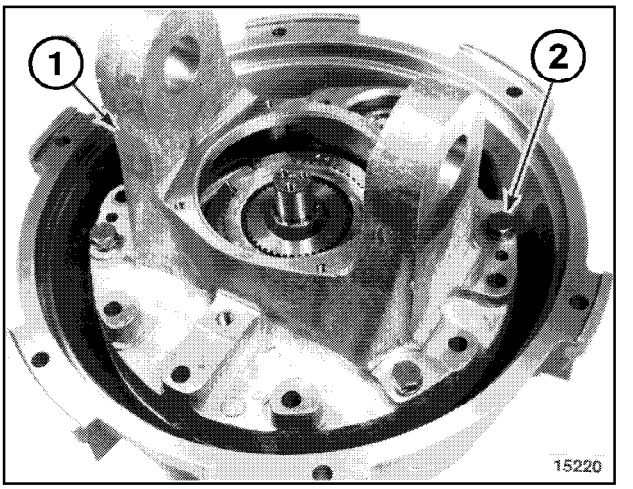

Figure 73

L. Press bearing (1, Figure 74) on pinion (2) and into gear housing (3) at same time.

M. Install retaining ring (4).

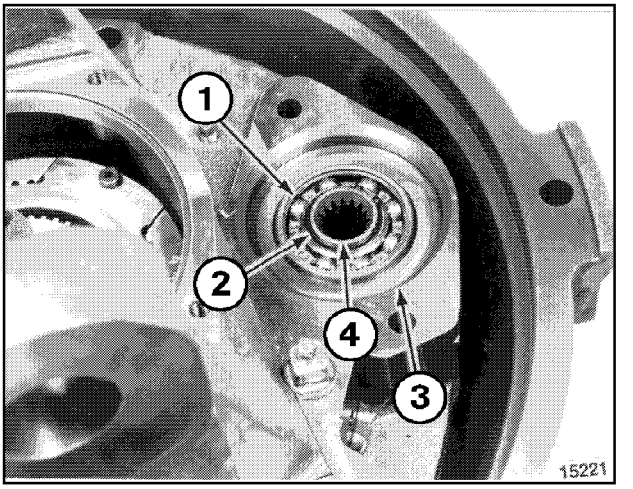

Figure 74

N. Install disc spring (1, Figure 75) over pinion assembly (2).

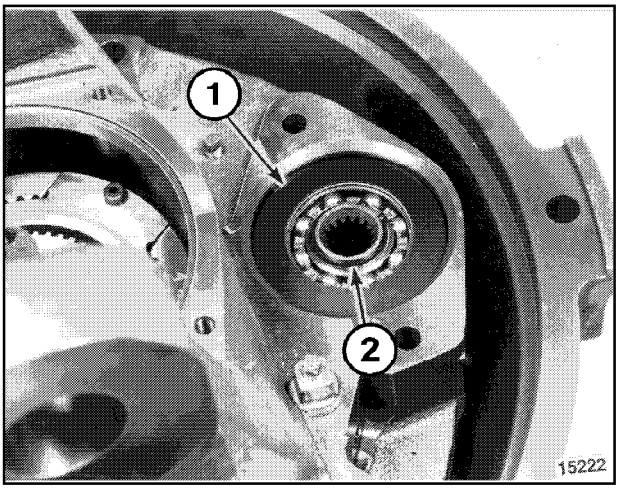

Figure 75

SHOP MANUAL G-01.15K

FRONT AXLE ASSEMBLY

APPLICABLE MODELS	SERIAL NUMBERS
GD530A-1	200417 & Up
GD530AW-1	200417 & Up
GD650A-1	200417 & Up
GD650AW-1	200417 & Up
GD670A-1	200417 & Up
GD670AW-1	200417 & Up

CAUTION

ALL	COMPONENTS MUST BE PROPERLY SUPPORTED DURING DISASSEMBLY AND REASSEMBLY.
ALL	JACKING HOISTING AND GENERAL WORKSHOP EQUIPMENT REQUIRED FOR THIS OPERATION MUST BE IN GOOD WORKING ORDER.
EXTREME	CAUTION TO BE OBSERVED AT ALL TIMES TO PREVENT INJURY.
SAFE	WORKSHOP PRACTICES ARE A MUST.

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KOMATSU DRESSER COMPANY 850 SOUTH STREET GALION, OHIO 44833

0194

3. Check and adjust front wheel "Toe In," if necessary.

   All Wheel Drive - 0.0 In. (0.000 mm)
   Non-All Wheel Drive - 0.125 In. (3.175 mm)

   A. Measure the distance between the wheels of the grader on the same horizontal centerline as the spindle axle. These measurements must be taken at both the front and rear of the wheels (Figure 11).

      NOTE: *Do not measure on tires or tire rims. Due to variances in tires, inaccurate measurements can result.*

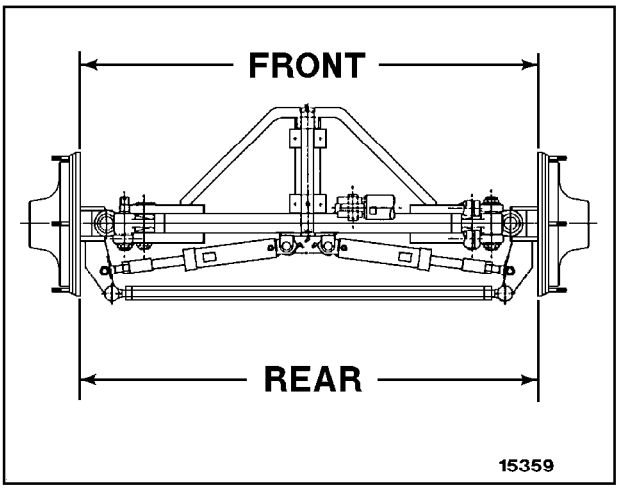


Figure 11

   B. NON-ALL WHEEL DRIVE AXLE ONLY: The measurement at the rear of the wheels should be approximately 1/8" (0.12" ±0.03") (3.048 ±0.762 mm) more than the front. If not, the tie rod will have to be adjusted to obtain proper toe-in.

   C. ALL WHEEL DRIVE AXLE ONLY: On All Wheel Drive (AWD) front axles, there MUST BE ZERO TOE-IN. Front and rear measurements MUST EQUAL.

   D. If front wheels need alignment, loosen jam nut (1, Figure 12) on both ends of the tie rod (2), at the ball socket assembly (3).

   E. The tie rod has R.H. threads on the R.H. end, and L.H. threads on the L.H. end. This thread combination allows the wheel alignment to be adjusted by turning the tie rod.

   F. Once the proper alignment is obtained, tighten the jam nuts (1).

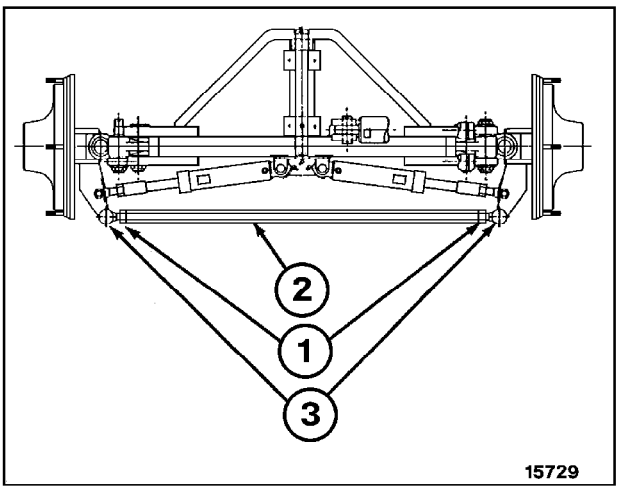


Figure 12

21. Tag and remove hoses (1, Figure 34) from steering cylinders (2). Remove lock nut (3), stud (4) and two spacers (5) from base end of each steering cylinder. Remove steering cylinders.

    NOTE: *Refer to cross section shown in Figure 35.*

22. Remove two retaining rings (6, Figure 34), grease zerks (7) and cover plates (8).

23. Drive pivot pin (9, Figure 34) from weldment (10), remove two thrust washers (11).

    NOTE: *Do not damage grease zerk tapped hole in pivot pin.*

24. Remove two bushings (not shown) from axle weldment, if replacement is necessary.

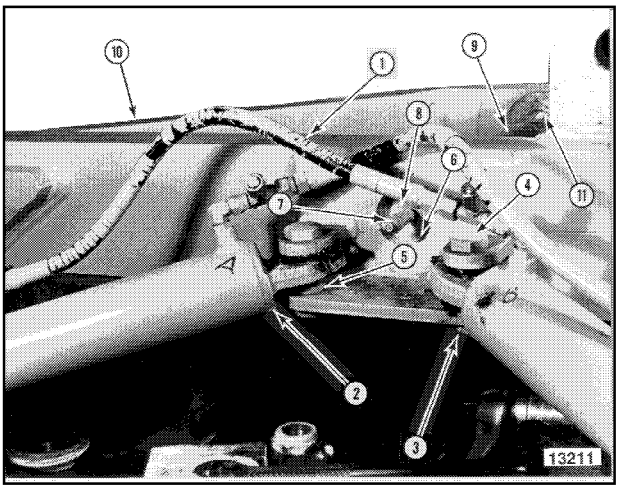


Figure 34

NOTE: *When removing bushing pay attention to which side of the bushing is worn so that when new bushing is installed the split can be located properly.*

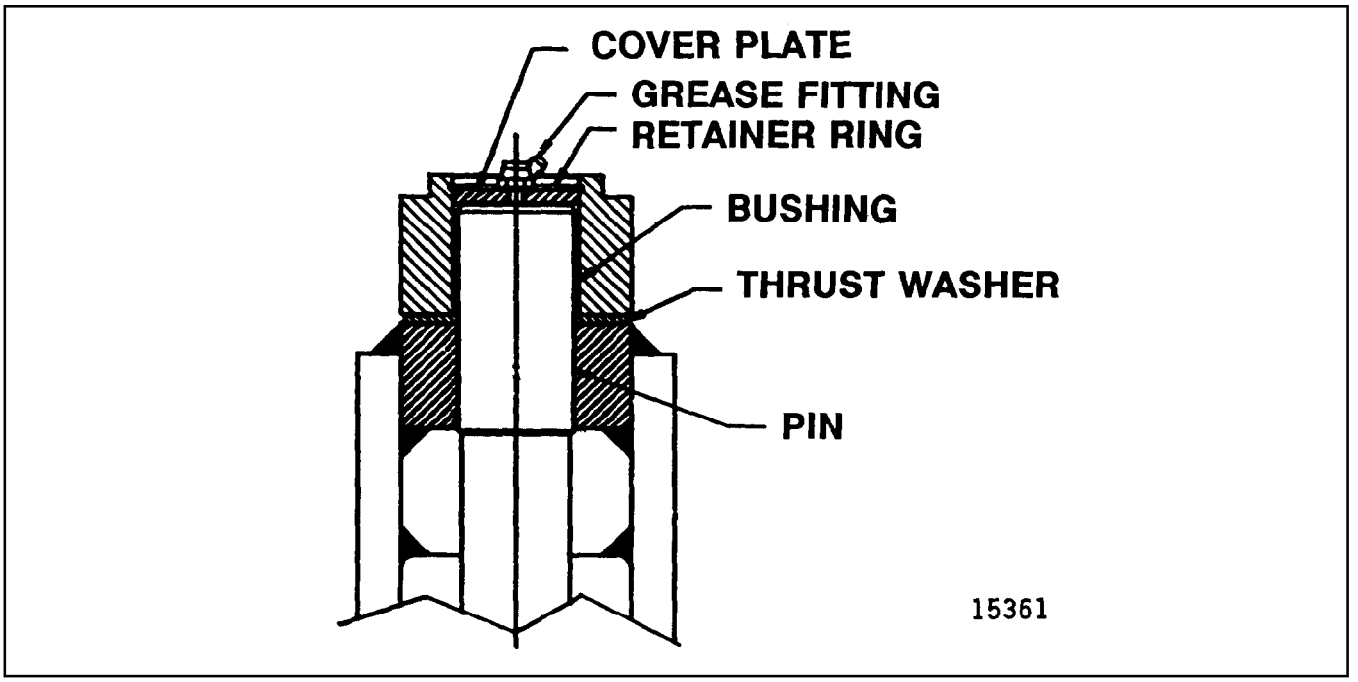


Figure 35 CROSS SECTION OF FRONT END OF PIVOT PIN ASSEMBLY

INSTALLATION

1. Sling front axle assembly (1, Figure 53) with chains and overhead hoist and lift into place under grader frame.

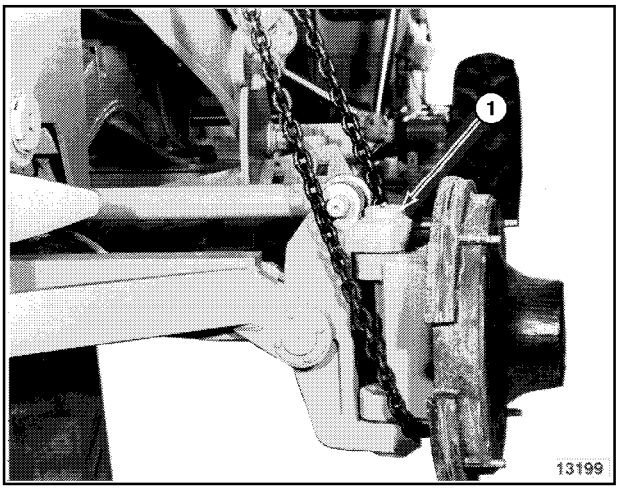


Figure 53

2. Install locating pin (not shown), and front and rear pivot caps (2, Figure 54) with eight bolts and flat washers (1).

   NOTE: *Rear cap has hole for locating pin and front cap does not. Make sure they are installed this way. Align locating pin with hole in pivot pin and rear pivot cap.*

3. Tighten bolts as specified in "Front Axle Torque Values" section of this manual.

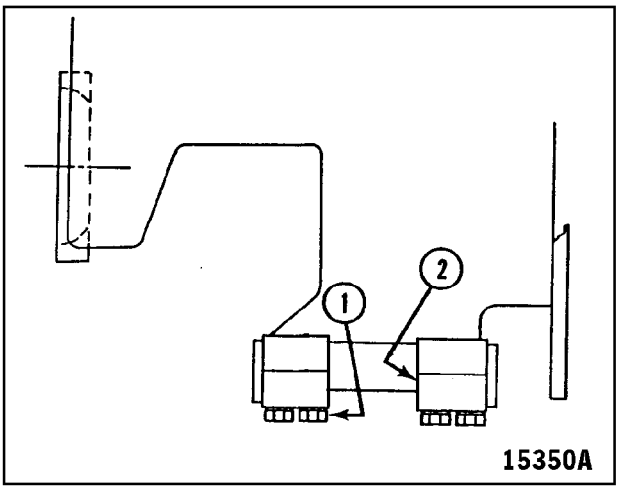


Figure 54

4. Install hoses (1, Figure 55) to leaning wheel cylinder (2) according to tags made as removal.

5. ALL WHEEL DRIVE AXLE ONLY: Refer to appropriate Shop Manual Section for the All Wheel Drive Gearbox Assembly. This manual will show additional hoses and sensors that must be connected and installed as tagged during removal.

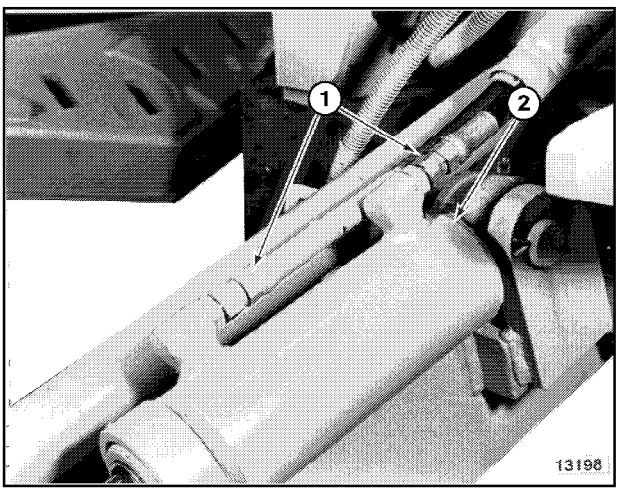


Figure 55

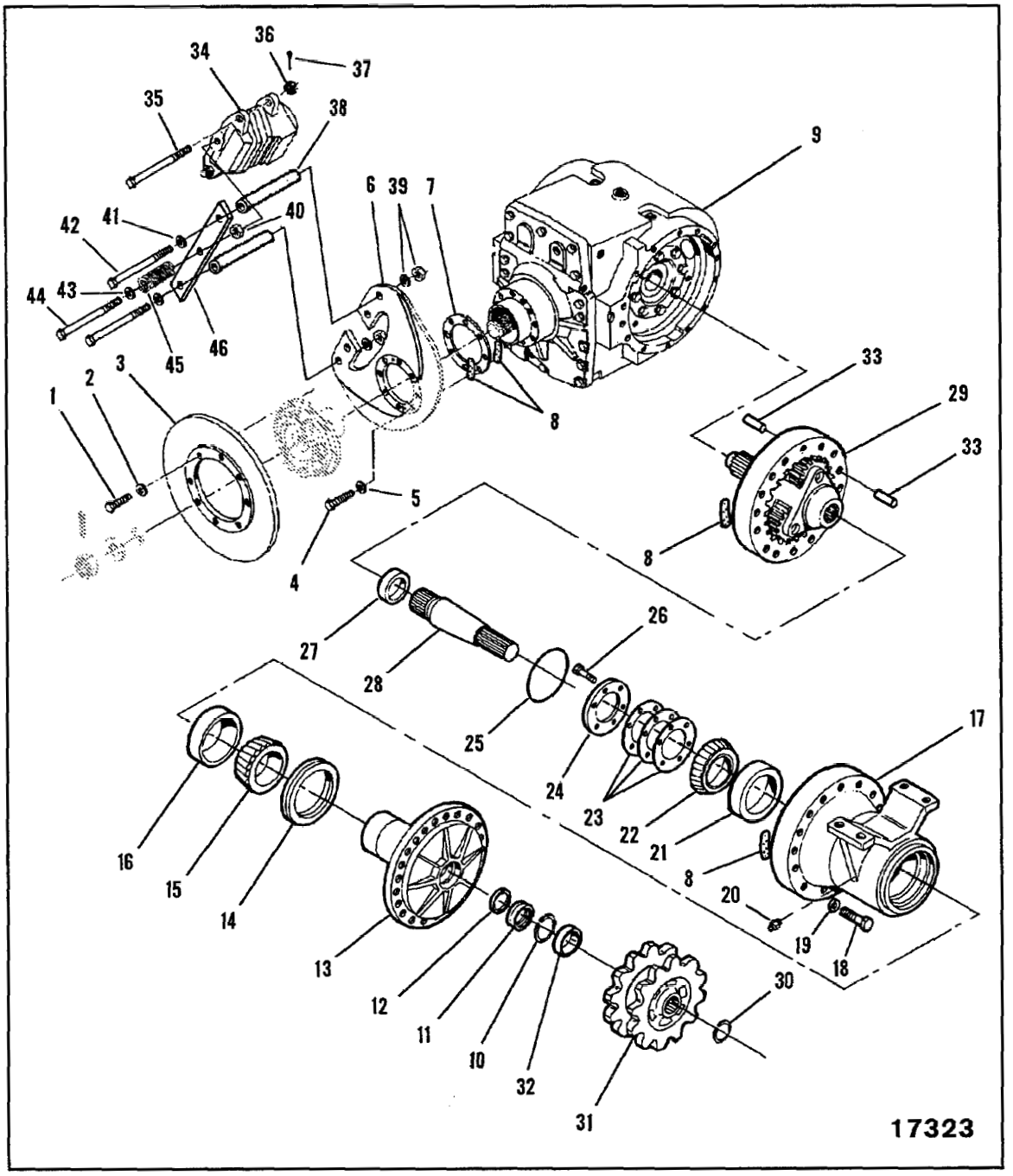


Figure 2 EXPLODED VIEW OF FINAL DRIVE WITH PLANETARY REDUCTION AND PERROT PARKING BRAKE (FOR MICO PARKING BRAKE SEE PARTS MANUAL)

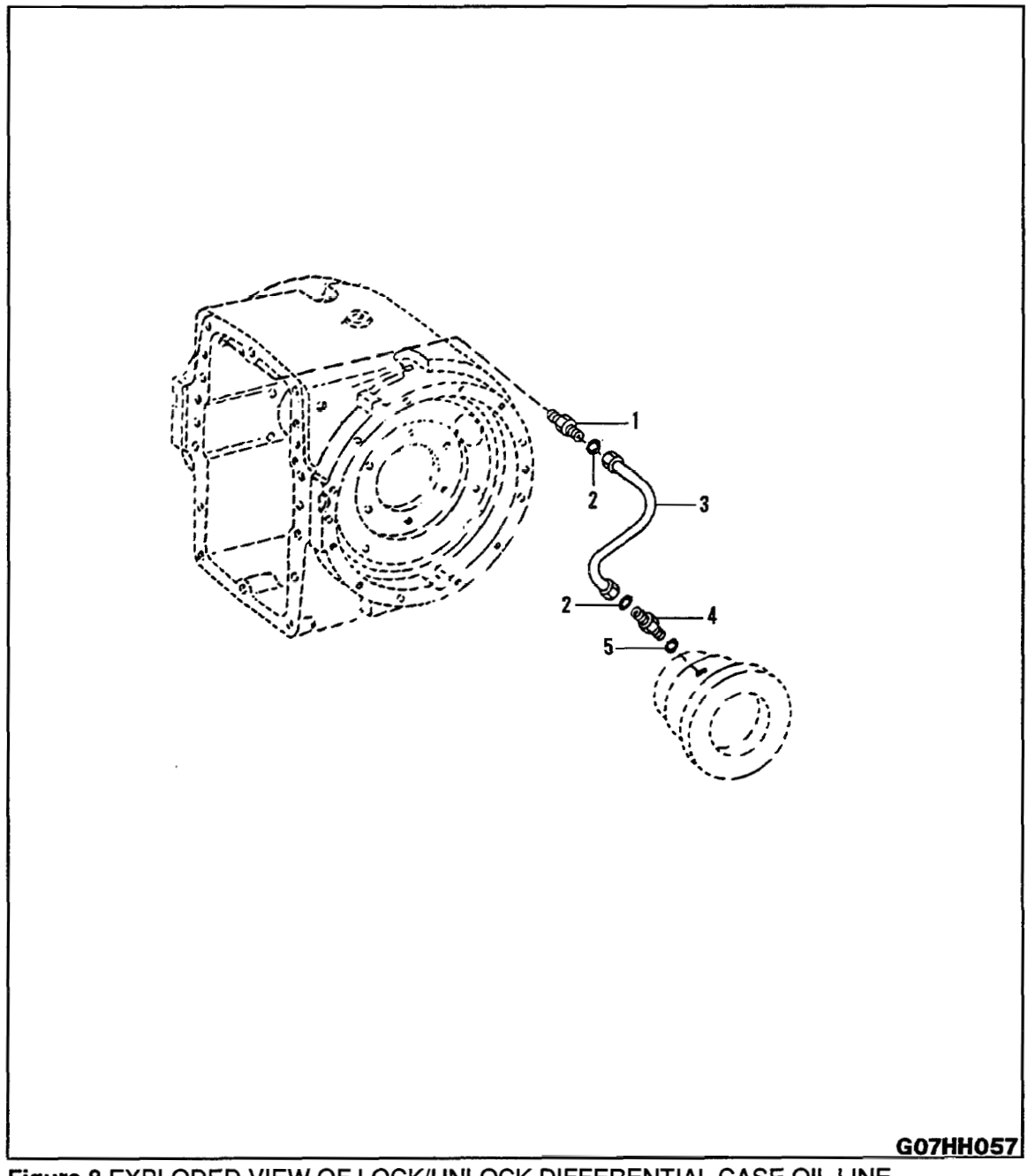


Figure 8 EXPLODED VIEW OF LOCK/UNLOCK DIFFERENTIAL CASE OIL LINE

LEGEND FOR LOCK/UNLOCK DIFFERENTIAL CASE OIL LINE DIFFERENTIAL

The exploded view and legend shown here are to help identify parts and their orientation to each other while servicing lock/unlock differential case oil line. Some components mentioned during service procedure may only be shown in this illustration.

1. ADAPTOR
2. O-RING
3. OIL LINE
4. ADAPTOR
5. O-RING

SERVICE/SPECIAL TOOLS

SPREADER BAR AND CHAINS

Shown here are manufacturing details for the spreader used to hold chains apart while removing and installing axle assembly.

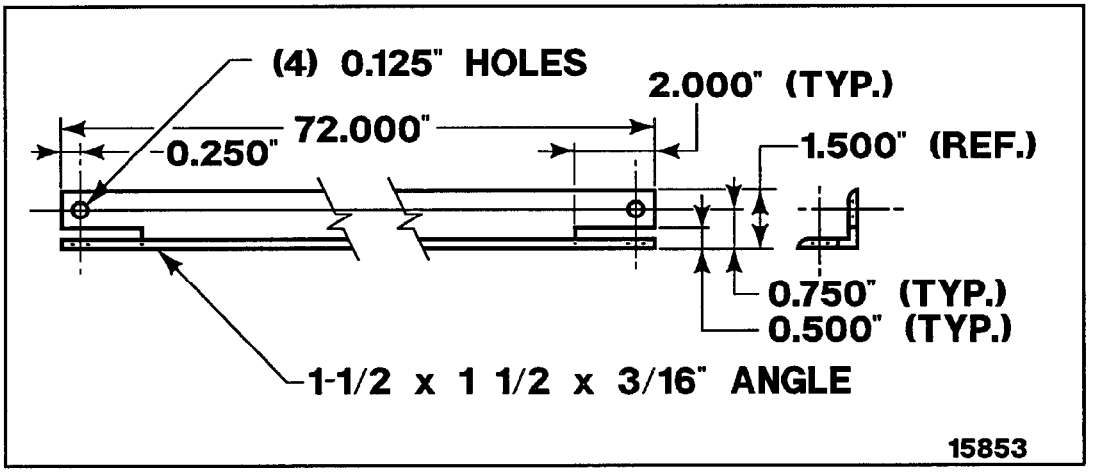


Figure 15 MANUFACTURING DETAILS FOR SPREADER BAR

Figure 16, shows how the spreader bar should be attached between chains.

Two chains 17 Ft. (5.18 m) long with 0.375 In. (9.525 mm) links are required.

NOTE: *Spreader bar should be notched to receive 0.375 In. (9.525 mm) chain link. Both ends of spreader must be moused (locked) to chain, 6 Ft. (1.83 m) from lifting eye(s). Chains must have a lifting capacity of not less than 2 Tons (1.81 Mg).*

A piece of wire passed through the two drilled holes and twisted will hold chain in position in spreader bar.

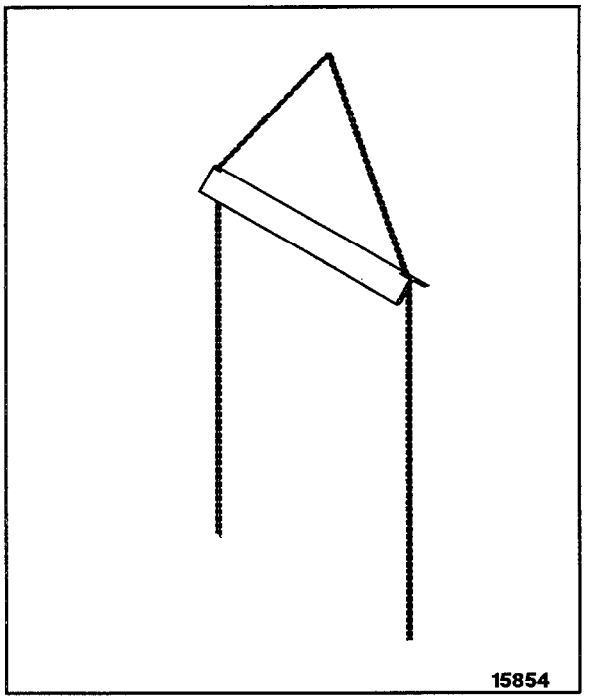


Figure 16 SPREADER BAR AND CHAIN ARRANGEMENT

15. Position two jacks under tandem case (1, Figure 32) so it will remain level.

16. Using a 2 ton (1,814 kg) lifting device, sling tandem case (1, Figure 32) as shown.

17. Remove twenty-four bolts and washers that secure tandem case (1, Figure 32) to final drive.

    NOTE: *The seven bolts at top of final drive can not be removed until tandem case is separated from final drive.*

18. Repeat preceding steps for remaining tandem case.

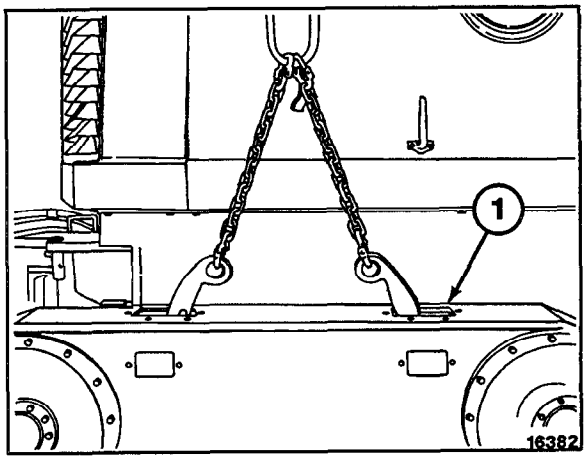


Figure 32

19. If not previously done, remove drain plug from final drive assembly (1, Figure 33) and discard old oil. Reinstall drain plug.

    NOTE: *Refer to "Operation and Maintenance Manual" for oil capacity of final drive assembly.*

20. Using a suitable lifting device and spreader, sling final drive assembly (1, Figure 33) as shown. Position a jack under brake disc (2) to prevent tipping of final drive as it is lowered away from frame (3).

    NOTE: *See "Special Tools" for manufacturing details of spreader bar and chains.*

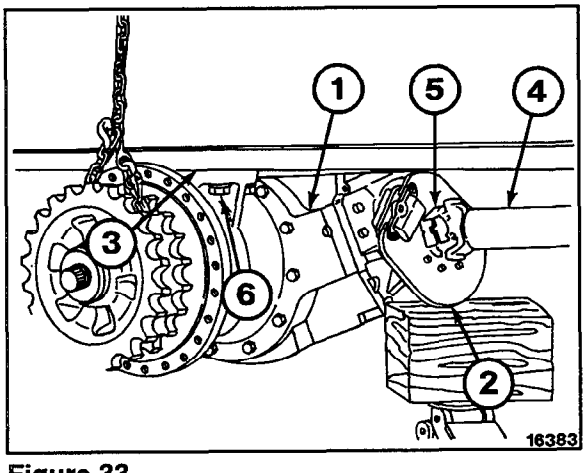


Figure 33

21. Disconnect drive shaft (4, Figure 33) from input yoke (5).

22. Remove eight bolts and washers (6, Figure 33) that secure final drive to frame. Lower final drive to ground and slide it out from under unit.

14. Remove oil seal (1, Figure 59) from tandem mounting sleeve (2).

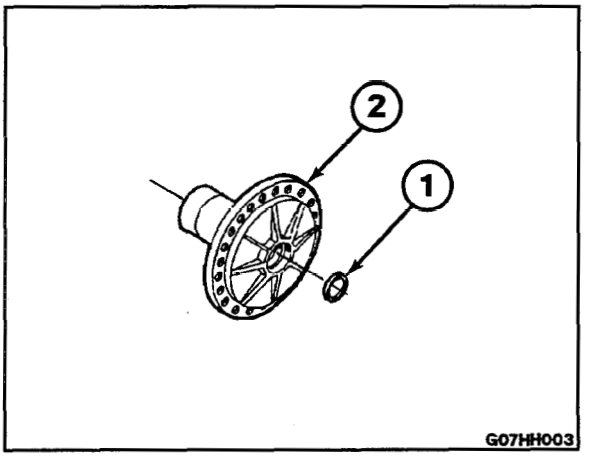


Figure 59

15. Remove bearing cup (5, Figure 60) from inboard end of final drive housing (4).

16. Remove grease seal (3, Figure 60), bearing cone (2) and bearing cup (1) from outboard end of final drive housing (4).

17. Remove grease fitting (6, Figure 60) from final drive housing (4), if replacement is necessary.

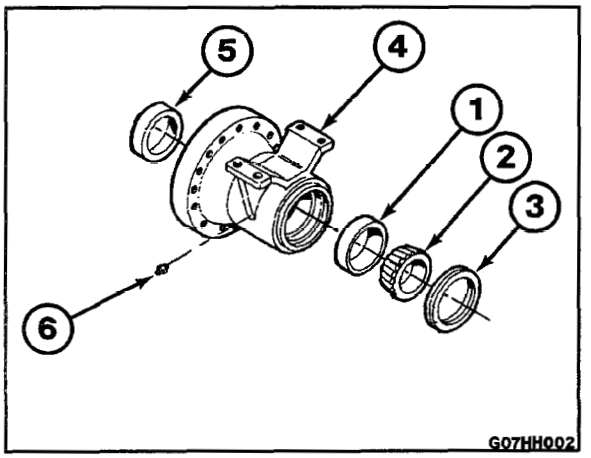


Figure 60

16. Remove seals (1 and 2, Figure 77) from piston bore.

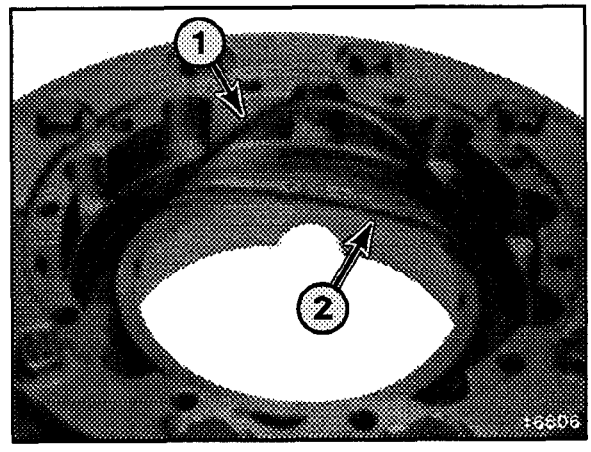


Figure 77

17. Using a suitable puller, remove bearing cone (1, Figure 78) from housing (2).

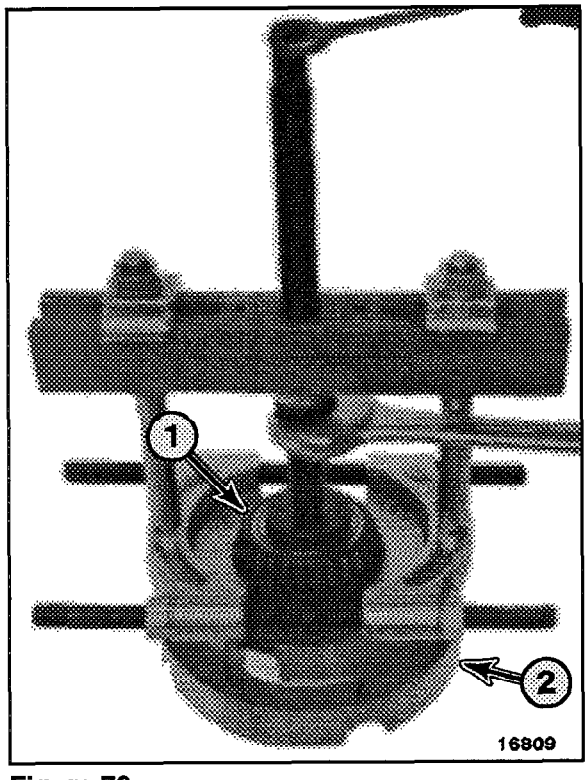


Figure 78

REASSEMBLY OF DIFFERENTIAL CASE WITH LOCK/UNLOCK DIFFERENTIAL

Reassembly of Lock/Unlock Differential Miscellaneous Items

1. Install alignment dowels (9, Figure 3) in differential case (20), if removed during disassembly.
2. Install plugs (1, 6, 15, 21, and 28, Figure 3) with new O-rings in differential case (20) and cover (7).
3. Install reducer (30, Figure 3) and breather (31) in differential case (20).
4. Install new O-ring (19, Figure 3), bleeder bushing (18) and bleeder screw (17), in differential case (20)

Reassembly of Ring Gear and Lock/Unlock Differential

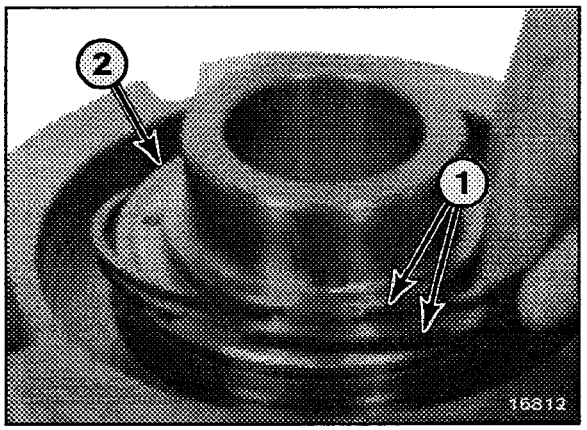


Figure 90

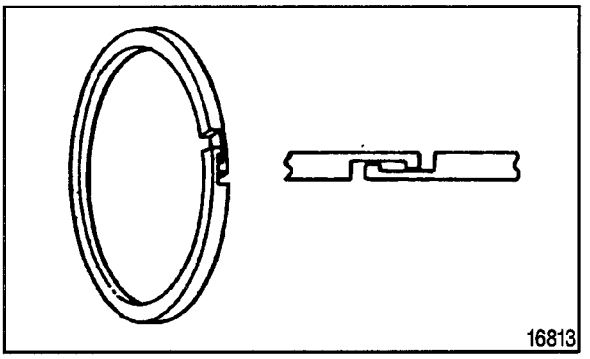


Figure 91

1. Install two sealing rings (1, Figure 90) on differential housing (2). Open rings slightly to install. Make sure rings are locked once in grooves.

   NOTE: *Be sure a gap is between locks on ends of sealing rings. Install new rings if not gap is present. Check new rings for gap.*

2. Using a suitable adaptor, press bearing cone (1, Figure 92) onto differential housing (2).

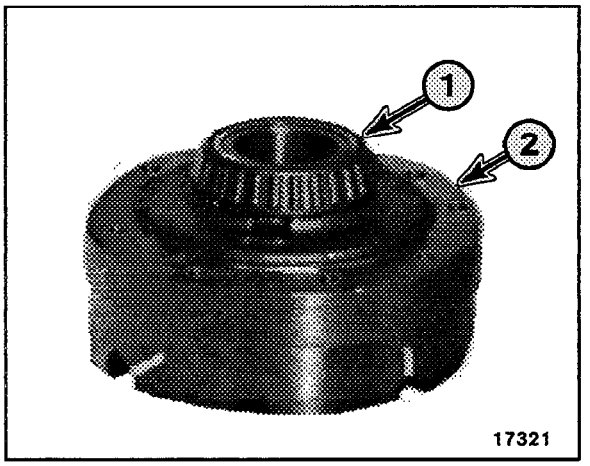


Figure 92

3. Using a suitable adaptor and arbor press, install bearing cone (23, Figure 109) on pinion gear (10).

> **- IMPORTANT -**
>
> The cone point adjustment procedure presented here is based upon the precision machining of component parts. No complicated formulas are required.

4. Subtract number (Figure 112) etched on end of pinion gear from 8.331 In. (211.607 mm). This will determine required cone point shim pack thickness to obtain a proper cone point adjustment.

   NOTE: *Number etched on end of pinion is in inches.*

	8.331 In.	1400 Series Constant
-	_____	Number Etched on Pinion Gear
=	_____	Required Cone Point Shim Pack

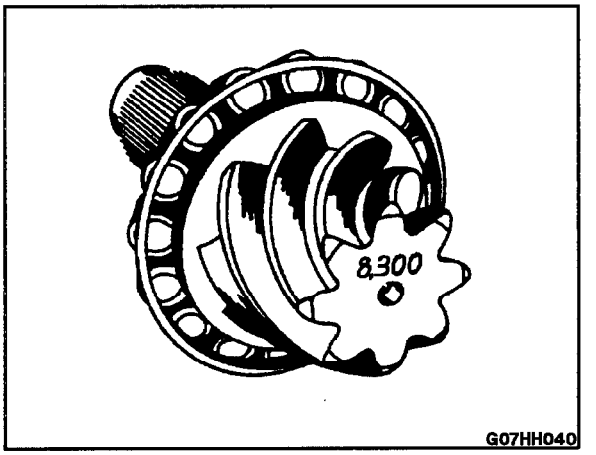
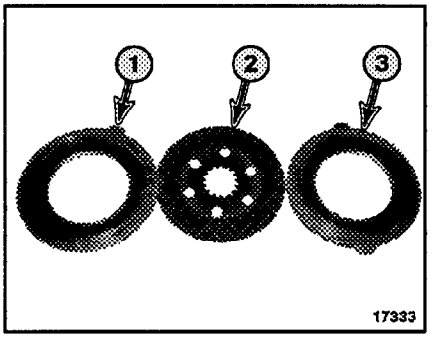
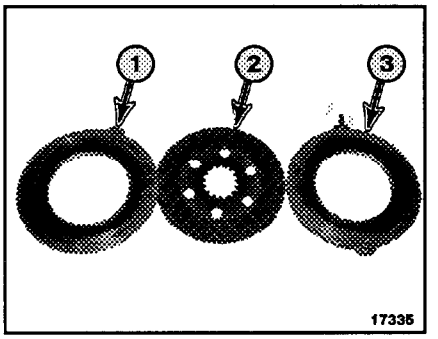


Figure 112

5. Install required cone point shim pack (21, Figure 109), bearing cup (22), and pinion gear (10) with bearing cone (23) in differential case cover (14).

VERSION OF INTERNAL WET BRAKE	AXLE PART NUMBER		BRAKE PISTON, DISK AND BACKING PLATE
	NON-PLANETARY	PLANETARY	
VERSION #3 **NOTE:** *Version #1 and #2 parts **can not** be used to service version #3 and #4.* *Version #3 and #4 use lugs on the circumference of the piston and backing plate to prevent them from rotating.*	1431781H91 & H92	1431782H91 & H92	 The brake piston (1) has one lug. The brake disk (2) has no slots. The backing plate (3) has two lugs on the circumference with no dowel pins.
	1432004H91 & H92	1432005H91 & H92	
VERSION #4 **NOTE:** *Version #1 and #2 parts **can not** be used to service version #3 and #4.* *Version #3 and #4 use lugs on the circumference of the piston and backing plate to prevent them from rotating.*	1431781H93, H94 & UP	1431782H93, H94 & UP	 The brake piston (1) has one lug. The brake disk (2) has no slots. The backing plate (3) has two lugs on the circumference with two dowel pins
	1432004H93, H94 & UP	1432005H93, H94 & UP	

7. Install parking brake caliper now.

   A. Perrot parking brake caliper installation.

      1) Slide caliper (5, Figure 156) over parking brake disc and align mounting holes with parking brake bracket (11). Install a bolt (14), nut (13) and cotter pin (12), in each end of caliper.

WARNING! Do not place fingers between caliper brake pads.

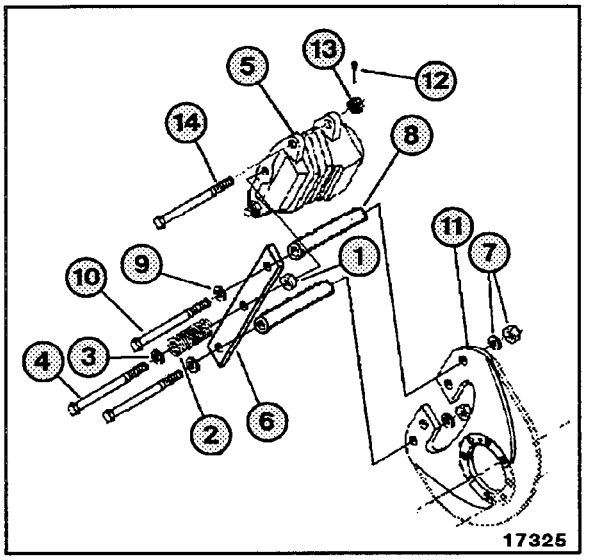


Figure 156

      2) Refer to "Parking Brake Adjustment" section of this manual for proper adjustment procedure.

         NOTE: *If hose leading to parking brake caliper was disconnected, the caliper will have to be bleed. See "Parking Brake Bleeding" section of this manual.*

      3) Slide washer (9, Figure 156) on bolt (10). Repeat for other bolt. Slide a bolt in each end of support bar (6). Slide one spacer (8) on each bolt. Position bolts in mounting bracket (11). Install flat washer and nut (7) on each bolt. Only finger tighten nuts at this time.

      4) Install bolt (4, Figure 156) in center hole of support bar (6), far enough to install jam nut (1) on bolt, half way up threads. Screw bolt into threaded hole in caliper (5), until jam nut makes contact. Tighten jam nut. Align support bar and tighten its mounting hardware so bolt (4) passes freely through center hole of bar. Tighten two bolts (10) to 45 lbf ft (6.2 kg•m).

      5) Loosen jam nut (1, Figure 156) and remove bolt (4) from caliper (5). Remove jam nut from bolt and remove bolt from support bar (6). Slide washer (3) and spring (2) on bolt. Place bolt back into center hole of support bar. Install jam nut on bolt, positioning it at top of threads. Install bolt in threaded hole in caliper.

      6) Turn bolt (4, Figure 156) in until washer (3) and spring (2) just touches support bar (6) and bolt head. Spring should be at its free length (no compression). Then turn bolt in three more revolutions and lock jam nut.

PINION ADJUSTMENT

Set moldboard crosswise under grader.

Rotate circle slightly until pinion gear is in the position shown.

With pinion in this position the tooth backlash should be 0.125 In. (3.175 mm) throughout 360° rotation.

NOTE: *The circle may have to be rotated slightly to obtain proper pinion gear alignment. At no time should the pinion tooth top land touch in the bottom land between any two teeth of the circle or vice versa.*

NOTE: *Due to manufacturing processes the chordal thickness of circle teeth may vary. When adjusting backlash allow for this variance.*

Make adjustment as follows:

1. Loosen vertical shoe mounting bolts.
2. Back out jack bolts on shoes #3 & #4.
3. Tighten jack bolts on shoes #1 & #2. Increase backlash and clearance beyond 0.125 In. (3.175 mm), then back out jack bolts.
4. Have one person hold two 0.125 In. (3.175 mm) diameter rods between top and bottom lands and 0.125 In. (3.175 mm) backlash spacer, between faces of teeth.
5. Tighten jack bolts on shoes #3 & #4 until spacer and rods are pinched between pinion gear and circle. Then loosen jack bolts one turn.
6. Tighten jack bolts on shoes #1 & #2 until spacer and rods are free.

   NOTE: *Tightening jack bolts on shoe #2 will tend to increase top and bottom land clearance, while shoe #1 will tend to increase backlash.*
7. Tighten jack bolts on shoes #3 & #4.
8. Once circle is positioned tighten all vertical mounting bolts.
9. Recheck pinion clearance after vertical bolts are tightened. Torque bolts to values listed here.

   580 lbf ft (80.2 kg•m) S/N 100476 & BELOW
   455 lbf ft (62.9 kg•m) S/N 100477 & UP
10. Perform vertical adjustment on one shoe at a time.

    NOTE: *When tightening jack bolts and jam nuts, make certain that the edge of the shoe against the vertical shoe of the circle is making equal contact.*
11. Have one person observe pinion clearances while another rotates the moldboard 360° in both directions. Make any necessary corrections.

SERVICE DIAGNOSIS

PROBLEM	POSSIBLE CAUSE	CORRECTION
Parking/emergency brake does not release.	Parking/emergency brake release valve (1, Figure 6) was left closed, preventing hydraulic oil pressure from "RELEASING" brake.	Open parking/emergency brake release valve (1, Figure 6).
	Malfunctioning brake solenoid valve.	Check for electrical power to brake solenoid valve (located in junction block). **NOTE:** *If no power to solenoid valve is detected, check switch in shift console and shifter.*
		Check that solenoid valve is not stuck. Remove and clean. **WARNING! Relieve pressure in accumulators.**
		Check seals, and replace if necessary. **WARNING! Relieve pressure in accumulators.**
	Seals in parking/emergency brake caliper are leaking. This is indicated by hydraulic oil on caliper.	Remove caliper and replace seals.
	Air in system.	Bleed circuit. See "Parking/Emergency Brake Bleeding" section of this manual.
	Steering and brake system not developing sufficient pressure. **NOTE:** *This will also result in loss of steering and/or sluggish steering and insufficient normal service brakes.*	Check steering and brake system pressure. See "Hydraulic Troubleshooting" section for test procedure.

GENERAL TORQUE VALUES

Refer to "General Torque Values" shop manual section when **SPECIFIC TORQUES** are not given in this shop manual section. All values listed throughout this manual are lubricated (WET) unless stated otherwise.

METRIC CONVERSIONS

Refer to "Metric Conversions" shop manual section for metric conversion of U.S. Measurements.

B. **Method Two** - Use this removal procedure when, engine is inoperative, and parking/emergency brake caliper is able to be hydraulically released by using a port-a-power and/or some other auxiliary pump.

1) Parking/emergency brake must be set.

2) Place blocks in front of and behind each tire to prevent movement of grader when parking/emergency brake is "RELEASED."

3) Turn parking/emergency brake release valve (1, Figure 4) fully CW to close it.

4) Attach a port-a-power of other auxiliary pumping device, to quick connect fitting (2, Figure 4). Pump hydraulic fluid into system through quick connect fitting until caliper releases. Once caliper is released remove port-a-power or pumping device.

C. **Method Three** - Use this removal procedure when caliper is unable to be hydraulically released.

1) Parking/emergency brake must be set.

2) Place blocks in front of and behind each tire to prevent movement of grader when parking/emergency brake is "RELEASED."

3) Loosen hex nut (1, Figure 5) and turn adjustment set screw (2) counterclockwise ("OUT") until brake pads (3 and 4) are clear of brake disc.

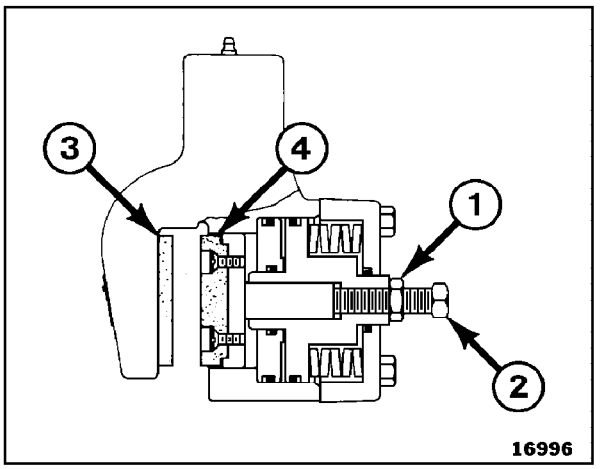


Figure 5 MANUAL RELEASE OF BRAKE CALIPER

4. Remove four hex nuts, eight flat washers and four bolts (1, Figure 6) securing caliper mount assembly (2) to parking brake bracket (3).

WARNING! Do not place fingers between caliper brake pads.

5. With caliper mount assembly (2, Figure 6) and caliper (4) removed from parking brake bracket (3), turn parking/emergency brake release valve (1, Figure 4) fully CCW to open it, and allow the caliper return to the "APPLIED" position. This should relieve all hydraulic oil pressure.

6. Disconnect hose from fitting (5, Figure 6). Plug hose to prevent contamination from entering hydraulic oil system.

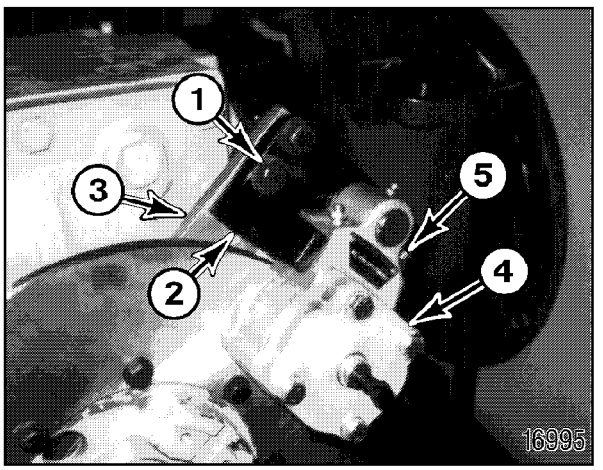


Figure 6

7. Remove fitting (5, Figure 6) and O-ring from caliper (4). Plug port in caliper to prevent contamination from entering it.

PARKING/EMERGENCY BRAKE ADJUSTMENT

WARNING! For safe operation, it is imperative that the parking/emergency brake always be kept correctly adjusted and in proper working order.

The parking/emergency brake assembly is mounted to the rear axle assembly. The parking/emergency brake is a spring applied hydraulically released mechanism. Under normal conditions, no periodic service adjustment is required. When brake is released, a 0.012 In. (0.305 mm) gap is acceptable.

However if brake should need adjustment, use the following procedure:

1. Park grader on a level surface. Rest moldboard and all accessories solidly on ground.
2. Place blocking in front of and behind each tire.
3. Switch parking/emergency brake switch to "RELEASED" position.

   NOTE: *Parking/emergency brake caliper is spring applied and hydraulically released.*

4. With one person in cab, have another person, loosen hex nut (1, Figure 14) and turn adjustment set screw (2) clockwise ("IN") until both brake pads (3 and 4) are in solid contact with brake disc.
5. With both brake pads (3 and 4, Figure 14) in contact with disc, turn adjustment set screw (2) "OUT" until 0.012 In. (0.305 mm) clearance is obtained. Then tighten hex nut (1) to hold it in position.

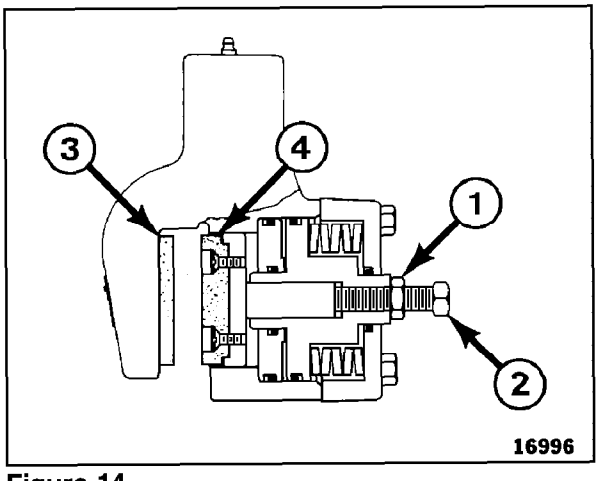


Figure 14

SPECIAL TORQUES

The following is a comprehensive listing of special torques used during overhaul of this component.

Brake Valve Body Connecting Bolts . . . . . 17 lbf ft (2.4 kg•m)
Brake Pedal Adjustment Jam Nut and Self-locking . . . . . 115 lbf ft (15.9 kg•m)

TESTS AND ADJUSTMENTS

BRAKE PEDAL ADJUSTMENT

Service Brakes Must Be Adjusted To Ensure That:

1. Brake discs are never dragging once pedal is released.
2. Full brake line pressure is achieved when pedal is pushed to floorboard.
3. Excess force is **never** applied to a bottomed piston in brake valve.

Three (3) Areas Are Involved In Proper Brake Adjustment:

1. Free pedal clearance.
2. Pedal floorboard stop.
3. Full brake valve stroke.

See references "A" and "B" in Figure 6.

Free pedal clearance;

Reference "A" adjustment is to make sure that brake valve (1, Figure 6) is not applied when pedal (3) is released.

With brake pedal released, gap clearance between brake lever and brake valve piston (A, Figure 6) must be 0.010 - 0.030 In. (0.254 - 0.762 mm). To increase gap clearance, screw in bolt (2). To reduce gap, screw out bolt (2). Tighten jam nut on bolt (2).

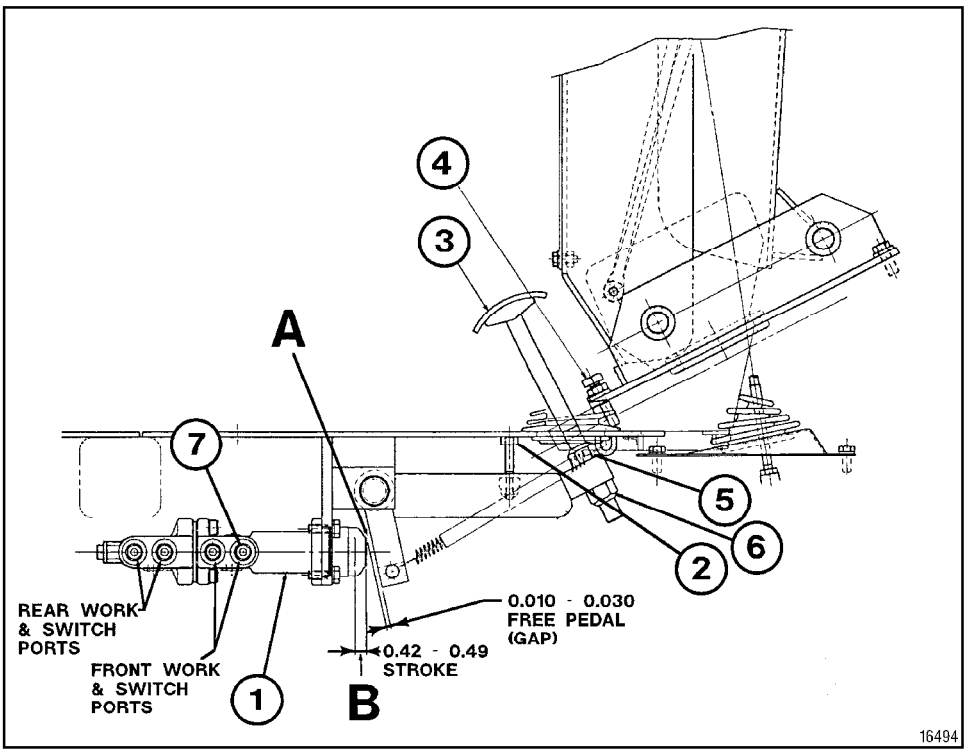


Figure 6 BRAKE PEDAL FREE PEDAL

DESCRIPTION

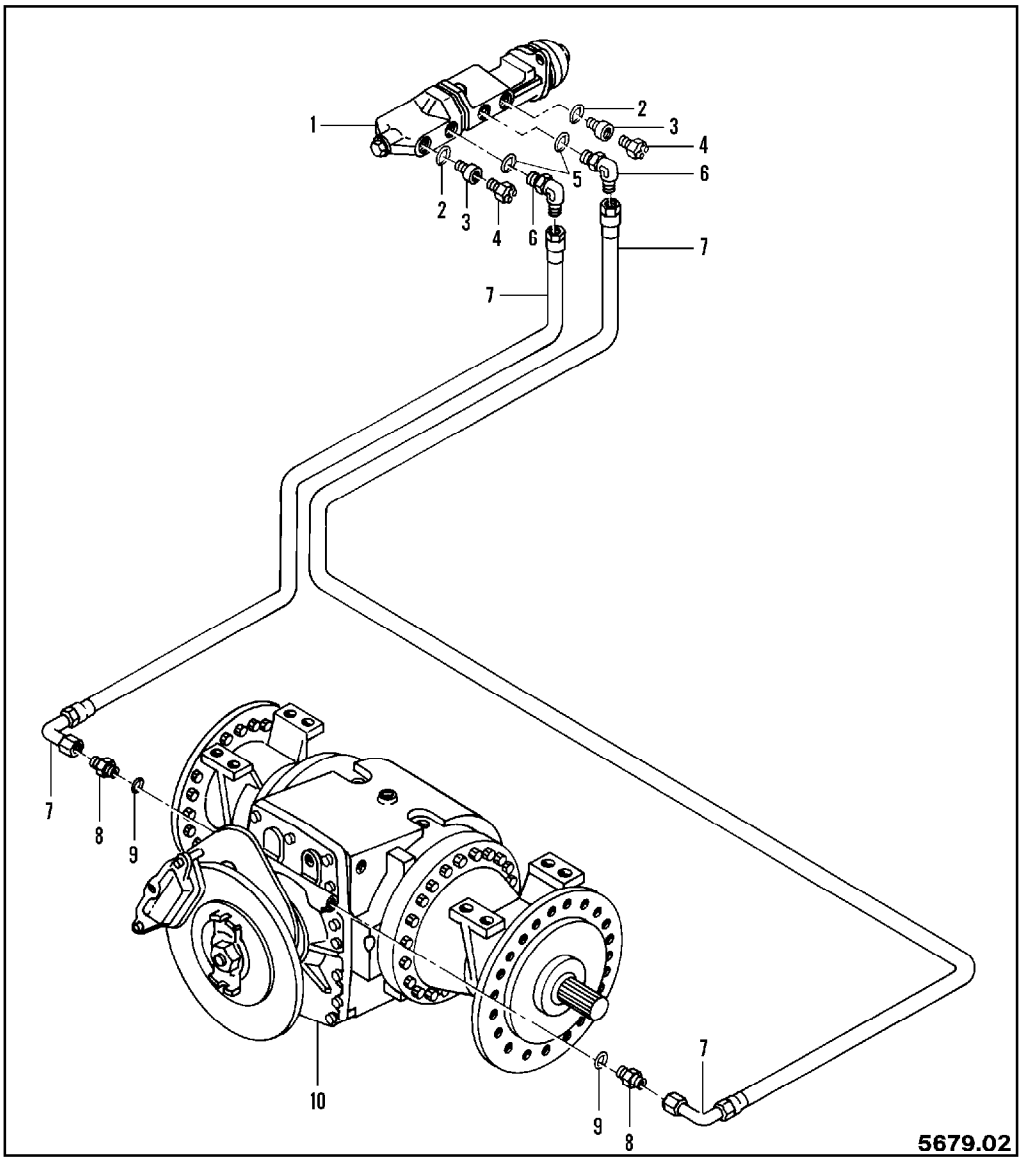


Figure 1 EXPLODED VIEW OF HYDRAULIC BRAKE LINES

LEGEND FOR HYDRAULIC BRAKE LINES

The exploded view shown in Figure 1 and the legend shown here, are to help identify parts and their orientation to each other while servicing the hydraulic brake lines. Some components mentioned during service procedure may only be shown in this illustration.

1. VALVE, BRAKE
2. O-RING
3. ADAPTOR
4. SWITCH, BRAKE PRESSURE
5. O-RING
6. ELBOW - 90°
7. HOSE
8. CONNECTOR
9. O-RING
10. AXLE, REAR

6. Using a piece of plumbers strap (1, Figure 10), secure internal parts of brake as shown, until brake valve is ready to be mounted on the unit.

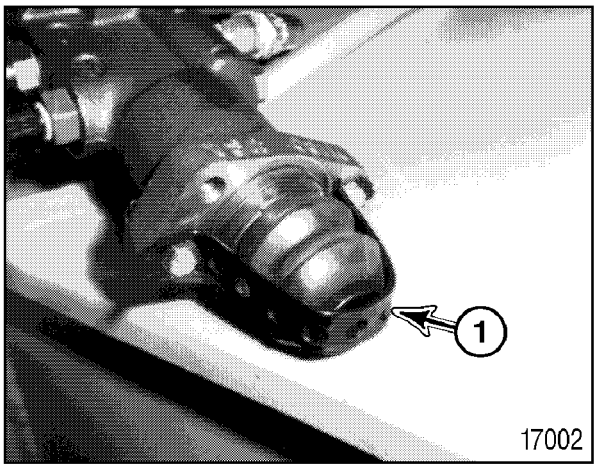


Figure 10

INSTALLATION

1. Install fittings, brake pressure switches and tubes on brake valve.

2. Securing brake valve (2, ?) to mounting bracket with two flat washers (4) and bolts (3).

3. Connect all hoses (3, Figure 11) to brake valve (4) as tagged during removal.

4. Connect electrical leads (1, Figure 11) to brake pressure switch (2) as tagged during removal.

   NOTE: *Units equipped with All Wheel Drive have two pressure switches.*

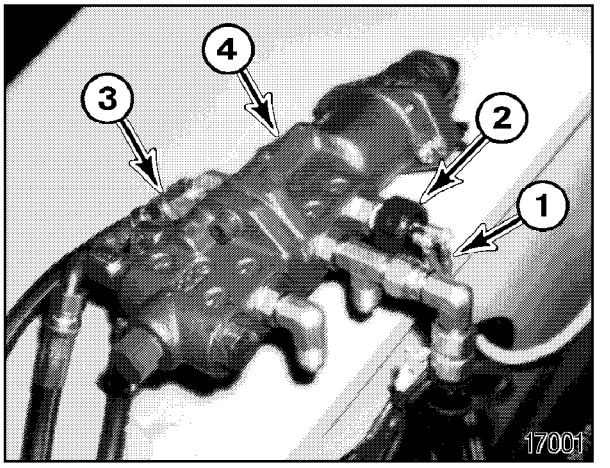


Figure 11

5. Install R.H. step (1, Figure 12) that was removed to aid access to brake valve (2).

6. Connect negative (-) battery cables to batteries.

7. Once the brake valve is installed the brake system should be bleed. See "Final Drive Brake Bleeding" section of this manual.

8. The brake pedal linkage should be adjusted. See "Brake Pedal Adjustment" section of this manual.

9. Remove blocking from in front of and behind each tire.

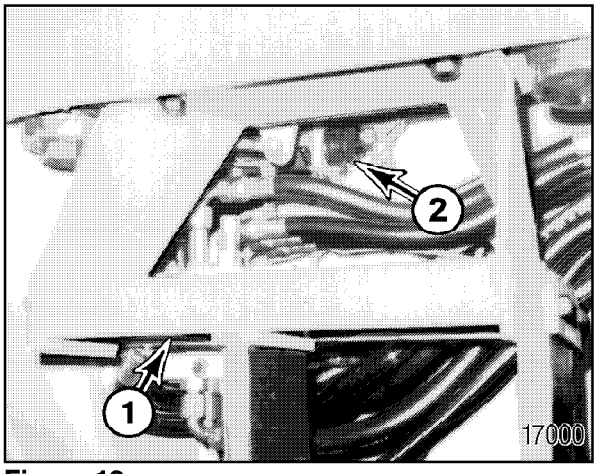
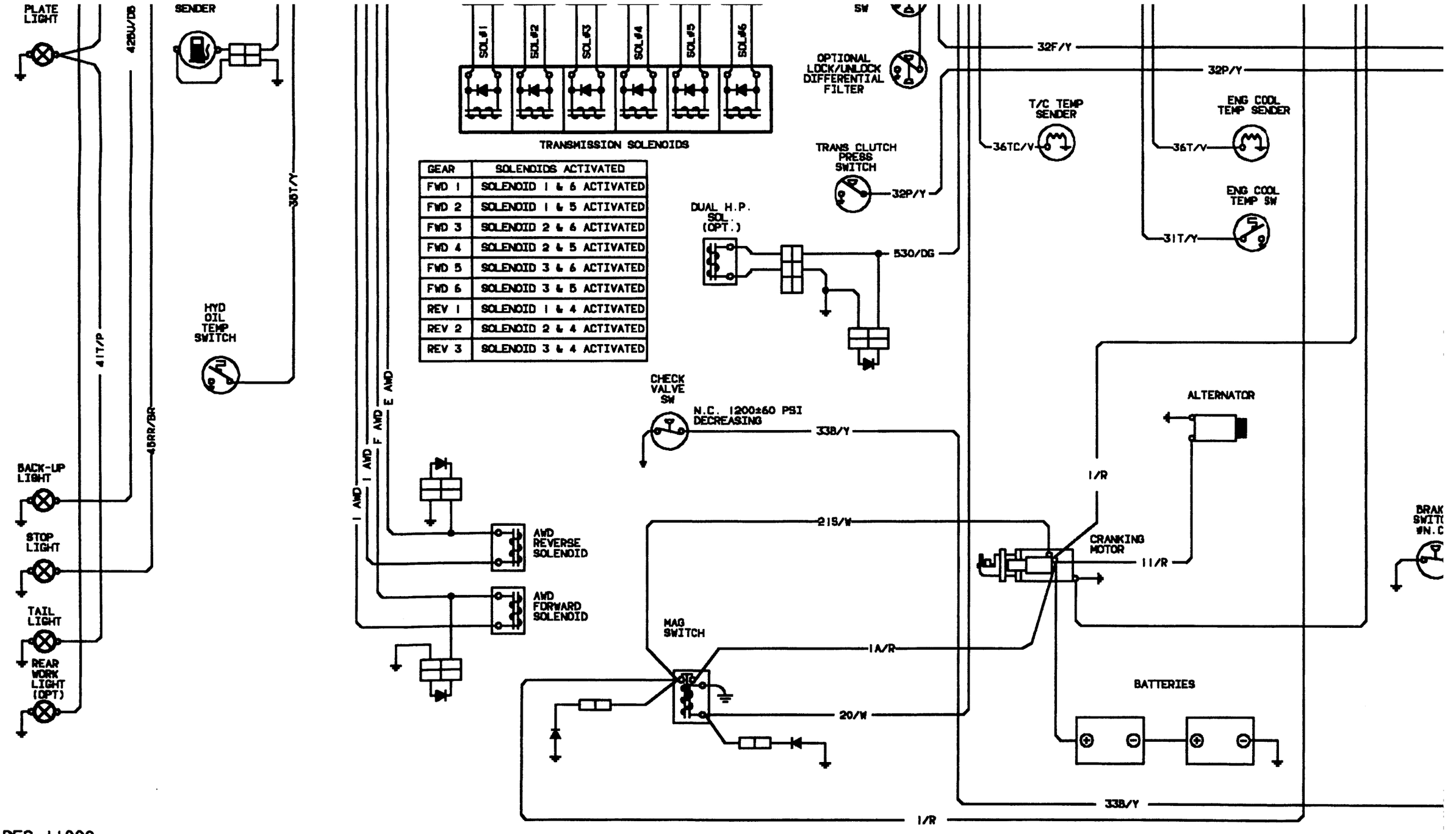


Figure 12



GEAR	SOLENOIDS ACTIVATED
FWD 1	SOLENOID 1 & 6 ACTIVATED
FWD 2	SOLENOID 1 & 5 ACTIVATED
FWD 3	SOLENOID 2 & 6 ACTIVATED
FWD 4	SOLENOID 2 & 5 ACTIVATED
FWD 5	SOLENOID 3 & 6 ACTIVATED
FWD 6	SOLENOID 3 & 5 ACTIVATED
REV 1	SOLENOID 1 & 4 ACTIVATED
REV 2	SOLENOID 2 & 4 ACTIVATED
REV 3	SOLENOID 3 & 4 ACTIVATED

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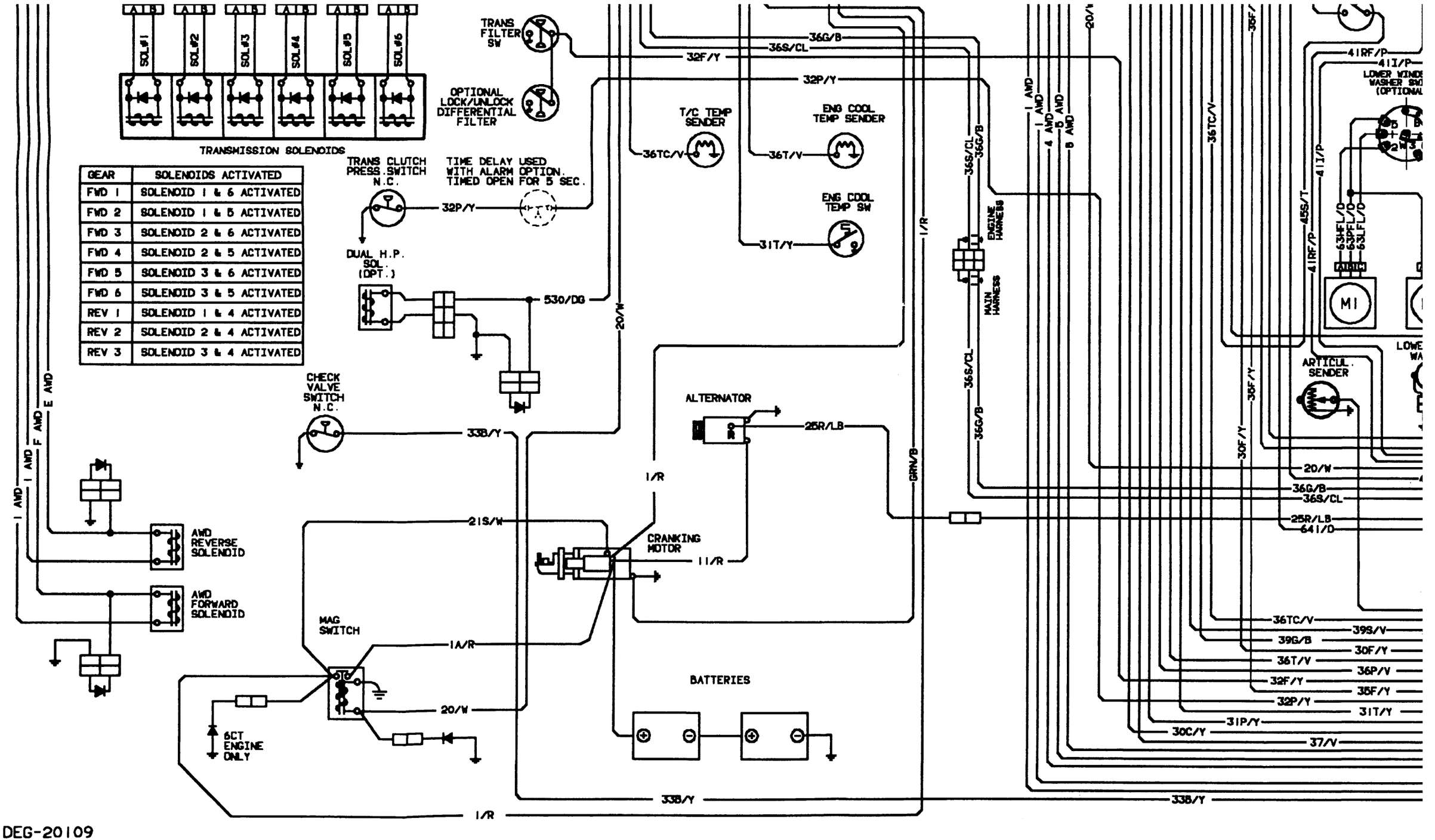
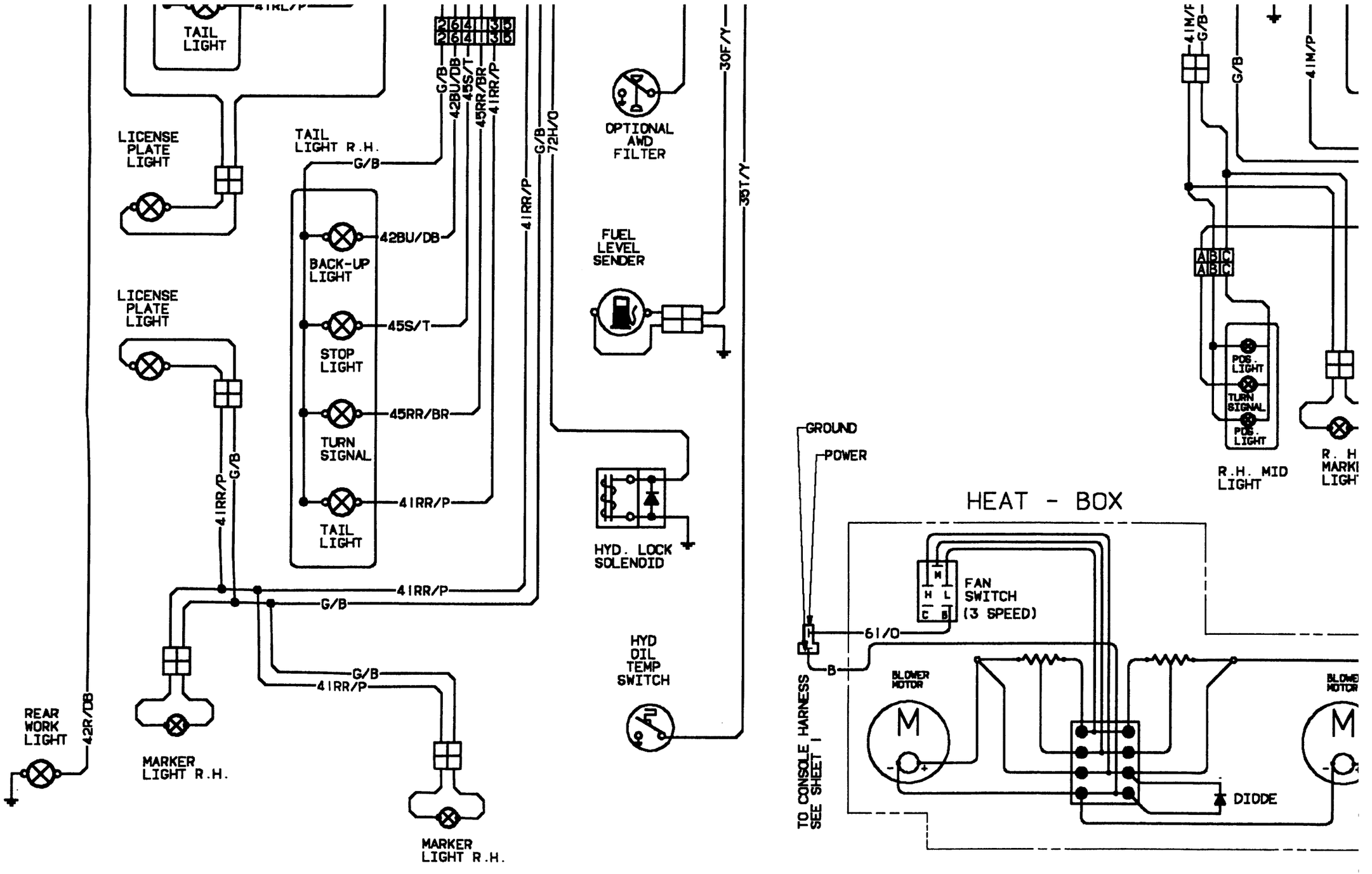
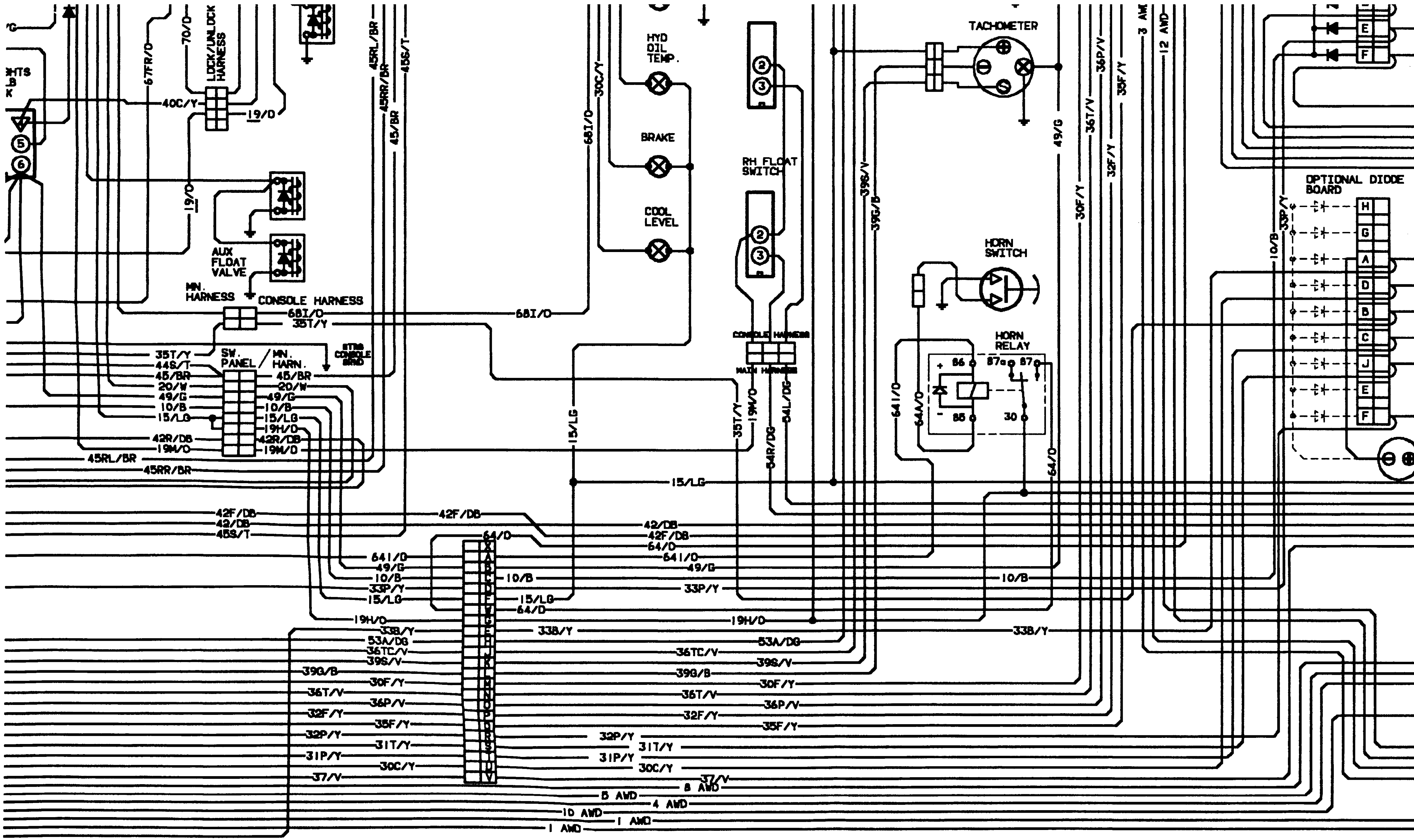


GEAR	SOLENOIDS ACTIVATED
FWD 1	SOLENOID 1 & 6 ACTIVATED
FWD 2	SOLENOID 1 & 5 ACTIVATED
FWD 3	SOLENOID 2 & 6 ACTIVATED
FWD 4	SOLENOID 2 & 5 ACTIVATED
FWD 5	SOLENOID 3 & 6 ACTIVATED
FWD 6	SOLENOID 3 & 5 ACTIVATED
REV 1	SOLENOID 1 & 4 ACTIVATED
REV 2	SOLENOID 2 & 4 ACTIVATED
REV 3	SOLENOID 3 & 4 ACTIVATED

DEG-20109


TAIL LIGHT
LICENSE PLATE LIGHT
TAIL LIGHT R.H.
G/B
42BU/DB
45S/T
45RR/BR
41RR/P
BACK-UP LIGHT
STOP LIGHT
TURN SIGNAL
TAIL LIGHT
LICENSE PLATE LIGHT
41RR/P
G/B
REAR WORK LIGHT
42R/DB
MARKER LIGHT R.H.
MARKER LIGHT R.H.
OPTIONAL AWD FILTER
72H/O
30F/Y
35T/Y
FUEL LEVEL SENDER
HYD. LOCK SOLENOID
HYD OIL TEMP SWITCH
41M/P
R.H. MID LIGHT
POS. LIGHT
TURN SIGNAL
POS. LIGHT
GROUND
POWER
HEAT - BOX
FAN SWITCH (3 SPEED)
61/O
B
BLOWER MOTOR
DIODE
TO CONSOLE HARNESS SEE SHEET 1



TACHOMETER
HYD OIL TEMP.
BRAKE
COOL LEVEL
RH FLOAT SWITCH
HORN SWITCH
HORN RELAY
OPTIONAL DIODE BOARD
LOCK/UNLOCK HARNESS
AUX FLOAT VALVE
MN. HARNESS
CONSOLE HARNESS
SW. PANEL / MN. HARN.
STRG CONSOLE GRND
CONSOLE HARNESS
MAIN HARNESS
40C/Y
19/D
67FR/O
70/O
45RL/BR
45RR/BR
45S/T
45/BR
68I/O
30C/Y
35T/Y
44S/T
20/W
49/G
10/B
15/LG
19H/O
42R/DB
19M/O
15/LG
19M/O
54R/DG
54L/DG
39S/V
39G/B
64I/O
64A/O
64/O
30F/Y
36T/V
36P/V
35F/Y
32F/Y
3 AWD
12 AWD
33P/Y
42F/DB
42/DB
33B/Y
53A/DG
36TC/V
32P/Y
31T/Y
31P/Y
37/V
8 AWD
4 AWD
10 AWD
1 AWD

DEG-20158

TORQUE VALUES FOR STANDARD METRIC FASTENERS

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Manual for the machine involved. **DO NOT SUBSTITUTE**. Original equipment standard hardware is defined as coarse thread metric class 10.9 bolts and class 10.0 nuts and thru hardened flat washers (Rockwell "C" 38-45), all phosphate coated and assembled without supplemental lubrication (as received) condition.

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

Markings on bolt heads or nuts indicated material class ONLY and are NOT to be used to determine required torque.

NOMINAL THREAD DIAMETER	STANDARD TORQUE ± 10%	
MILLIMETERS	KILOGRAM METER (kg•m)	FOOT POUNDS (Ft. Lbs.)
6	1.0	7
7	1.7	12
8	2.4	17
10	4.7	34
12	8.3	60
14	12.4	90
16	20.7	150
18	27.7	200
20	40.1	290
22	53.9	390
24	69.2	500
27	101.0	730
30	136.9	990
33	183.9	1330
36	239.3	1730
39	309.8	2240

ARTICULATION JOINT
(8) 5/8"-11 GRADE 8
140 lbf ft (19.4 kg•m)

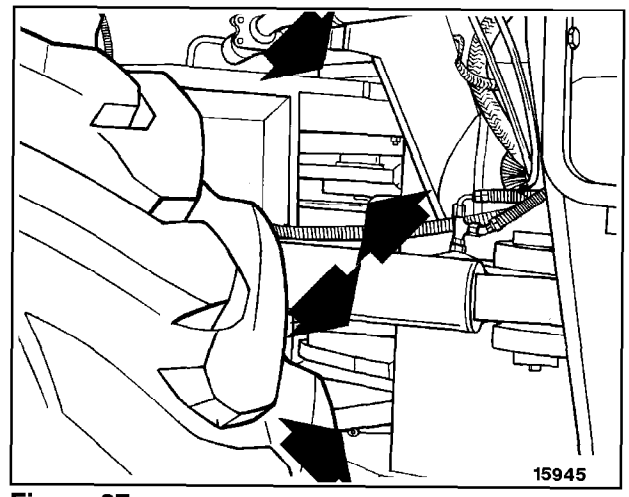


Figure 37

CAB MOUNTS
FRONT (1 EACH SIDE)
(2) 3/4"-10 GRADE 8
200 lbf ft (27.7 kg•m)
REAR (2 EACH SIDE)
(4) 1"-8 GRADE 8
200 lbf ft (27.7 kg•m)

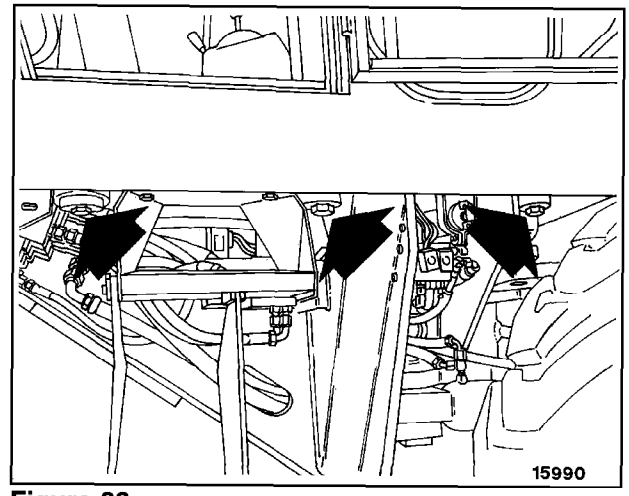


Figure 38

REAR AXLE TO FRAME
(8) 1"-8 GRADE 8
580 lbf ft (80.2 kg•m)

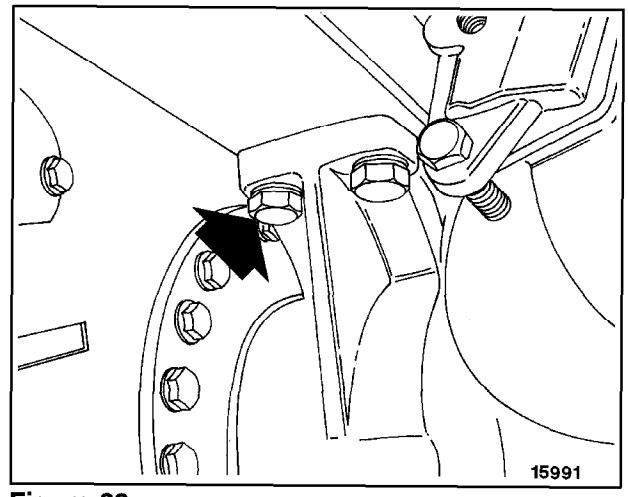


Figure 39

ENGINE SPEEDS

ENGINE SPEED TABLE

ALL checks must be made with hydraulic oil at operating temperature, 160°F (71°C). All controls must be in "NEUTRAL." The All Wheel Drive (AWD) feature must be "OFF." Parking brake must be set. Moldboard must be ON and IN the ground. Should the RPM recorded on the tachometer NOT READ per specifications, correct RPM by adjusting throttle linkage. DO NOT ATTEMPT TO ADJUST ENGINE FUEL PUMP. (See Engine Service Manual).

NOTE: *If unit is equipped with Air Conditioning (AC), the AC must be turned "ON" and set for "MAXIMUM" cooling.*

GD530A-1 / GD530AW-1 WITH KDC 610T (SINGLE HORSEPOWER)

	Minimum	Maximum	Actual	
Low Idle	800 RPM	900 RPM	_____	RPM
Low Idle (AWD)	900 RPM	950 RPM	_____	RPM
High Idle	2600 RPM	2750 RPM	_____	RPM
Stall Speed	1648 RPM	1803 RPM	_____	RPM
Stall Speed (AWD)	1598 RPM	1756 RPM	_____	RPM

GD650A-1 / GD650AW-1 WITH KDC 614T (SINGLE HORSEPOWER)

	Minimum	Maximum	Actual	
Low Idle	810 RPM	910 RPM	_____	RPM
Low Idle (AWD)	900 RPM	950 RPM	_____	RPM
High Idle	2580 RPM	2700 RPM	_____	RPM
Stall Speed	1775 RPM	1929 RPM	_____	RPM
Stall Speed (AWD)	1782 RPM	1889 RPM	_____	RPM

GD650A-1 / GD650AW-1 WITH KDC 614T (DUAL HORSEPOWER)

	Minimum	Maximum	Actual	
Low Idle	810 RPM	910 RPM	_____	RPM
Low Idle (AWD)	--- RPM	--- RPM		
High Idle	2600 RPM	2830 RPM	_____	RPM
Stall Speed	1873 RPM	2024 RPM	_____	RPM
Stall Speed (AWD)	1835 RPM	1989 RPM	_____	RPM

GD670A-1 / GD670AW-1 WITH KDC 614T (SINGLE HORSEPOWER)

	Minimum	Maximum	Actual	
Low Idle	810 RPM	910 RPM	_____	RPM
Low Idle (AWD)	900 RPM	960 RPM	_____	RPM
High Idle	2690 RPM	2750 RPM	_____	RPM
Stall Speed	1932 RPM	2084 RPM	_____	RPM
Stall Speed (AWD)	1897 RPM	2051 RPM	_____	RPM

WARNING! Never remain in stall condition for more than thirty seconds at a time. Allow engine to run at no load for five minutes before making any further tests.