CEBM003100

SHOP MANUAL

KOMATSU

D32E-1,P-1
D38E-1,P-1
D39E-1,P-1

CRAWLER TRACTOR

SERIAL NUMBERS	D32E-1,P-1	P075718 and up
	D38E-1,P-1	P085799 and up
	D39E-1,P-1	P095872 and up

NOV 98

the parking brake. Turn off the electrical system master switch. Remove the key.

Read and know your OPERATION & MAINTENANCE MANUAL and SHOP MANUAL before performing any work on the machine. Read ALL product graphics and safety precautions. Never work beneath the blade without proper blocking and/or a safety bar properly installed. Improper blocking could result in serious injuries.

Do not attempt to make repairs that you do not understand. Consult your distributor. Use only approved parts for repairs and maintenance. Failure to do so could compromise your personal safety and machine performance and reliability. The rollover protective structure (ROPS) provides operator protection in the event of machine rollover or upset. This structure is designed to bend during a rollover to protect the operator from sudden impact loads. Do not attempt to repair a protective structure after an accident.

Repaired structures do not provide the original strength and protection. Contact your distributor for information on structure replacement. Do not operate the machine again until the ROPS has been replaced. Use only replacement parts shown in your PARTS BOOK.

Do not cut, grind, weld, drill or tap holes in the ROPS. This could weaken the structure, or affect the overall energy absorption capabilities.

Do not smoke when refueling or servicing the machine. A fire could result. Never place gasoline or diesel fuel in an open pan. Never remove the fuel tank filler cap or refill the fuel tank while the engine is operating or hot or when the machine is indoors. The fumes are dangerous and a spark or flame could result in a fire or explosion.

Loosen the radiator cap slowly to relieve all pressure in the system and use caution when removing the caps. Loosen the filler cap slowly to relieve reservoir pressure to prevent possible injury. Always vent the hydraulic system before working on any hydraulic component. Have all equipment resting on the ground or blocked before removing any component.

When service or maintenance requires access to areas that cannot be reached from the ground, use a ladder or platform. If such ladders or platforms are not available, use the machine hand holds and steps provided. Perform all service or maintenance carefully.

Never align holes with fingers or hands. Use a proper aligning tool. Be sure all tools are in good condition. Do not use tools which are worn, bent or have mushroomed heads. Use the proper tool for the job. Remove sharp edges and burrs from reworked parts.

Before working on the machine, tag and lock the electrical system master switch so no one will start it unexpectedly.

For field service, move machine to level ground if possible and block the tracks. If work is absolutely necessary on an incline, block the machine and its attachments securely. Move the machine to level ground as soon as possible.

Do not carry loose objects in pockets that might catch on the machine or fall unnoticed into open compartments.

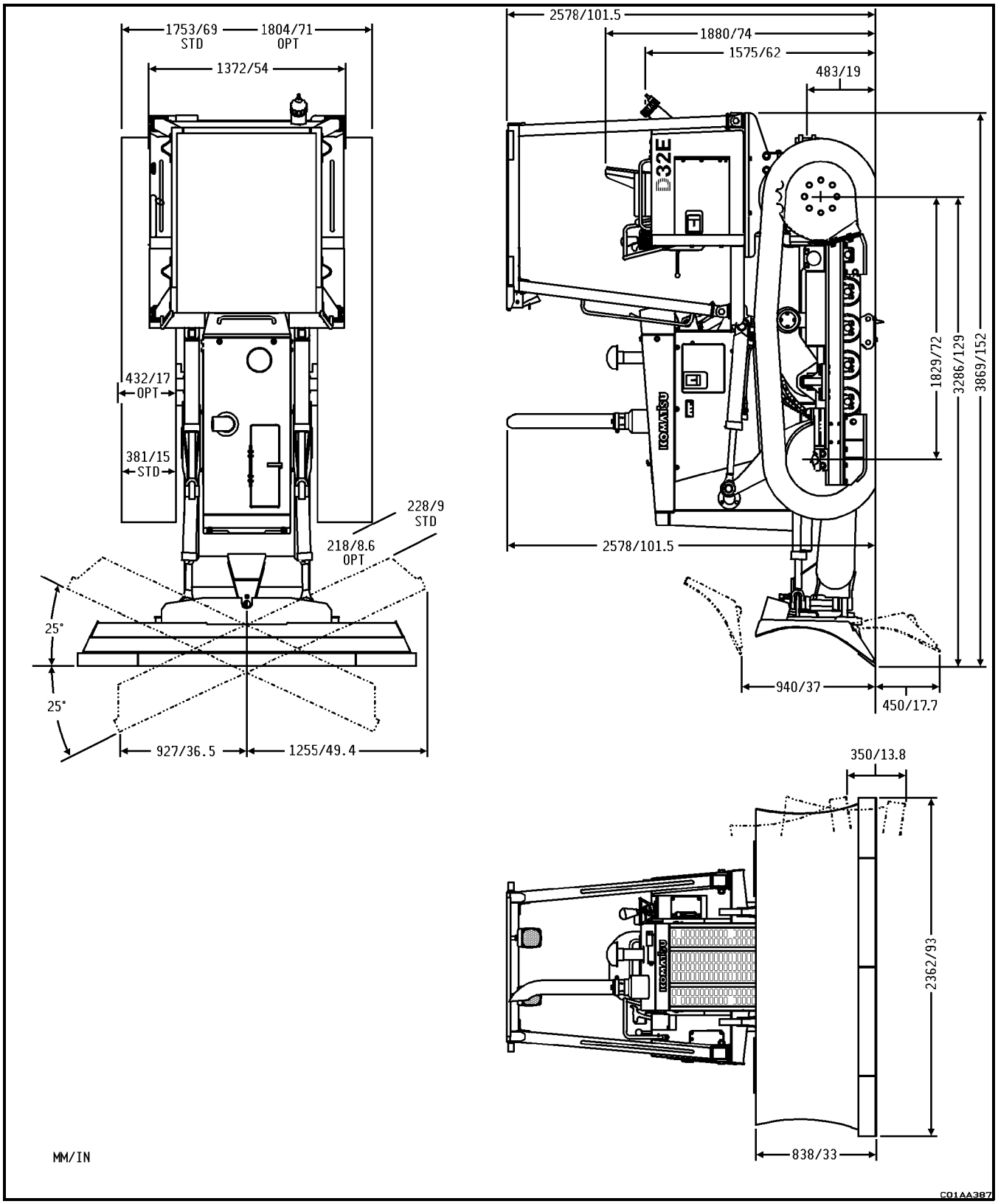
Before working on any part of the engine or electrical system, disconnect the battery ground cable. Tag the cable and all controls to alert personnel that work is in progress.

When it is necessary to make any checks or adjustments with the engine operating, always use two people. One trained person must be in the operator's seat to safeguard the second person making the checks or adjustment. As an added precaution, when making checks or adjustments with the engine operating, make sure the transmission shift lever is locked in neutral (N).

Never stand on the tracks or near the blade while engine is operating. If the engine is running and the side doors are open or removed be careful of rotating parts such as the fan and belts that can cause serious injury. Never run the engine when cleaning or lubricating the machine. Serious injury could result from contacting moving parts.

Use a non toxic, nonflammable commercial solvent for cleaning parts, unless otherwise specified. Never use gasoline, diesel fuel, kerosene or other flammable solvents for cleaning parts. Excessive or repeated skin contact with sealants or solvents may cause skin irritation. In case of skin contact, remove sealant or solvent promptly by washing with soap and water. Follow the manufacturer's advise whenever cleaning agents or other chemicals are used.

D32E-1 DIMENSIONS



HDTF Komatsu heavy duty transmission fluid or equivalent fluid meeting C-4 or TO-4 and must NOT contain viscosity index improver.

EO1 Komatsu engine oil or multigrade diesel engine oil or engine oil API CF/CC or MIL-L-2104 with sulphated ash of 1.65%.

EO2 (For service only) Komatsu hydraulic fluid or engine oil API CD/CC, CD or MIL-L-2104 and passing TO-2 and C-3 test with 0.10% minimum zinc.

MPL Komatsu gear lube or multi-purpose gear lube API GL-5 or MIL-L-2105.

MPG Komatsu super grease or multi-purpose grease 251 HEPM or NLGI grade #2 multi-purpose lithium grease with 3% MoS_2 (molybdenum disulfide).

HTF (For service only) Komatsu hydraulic transmission fluid.

DF Diesel fuel per ASTM D975, Grade 1 or 2 depending on ambient temperature.

SAE: Society of Automotive Engineers

API: American Petroleum Institute

NLGI: National Lubricating Grease Institute

ASTM: American Society of Testing and Materials

DESCRIPTION

These machines are equipped with a disc and pad type brake system which can be applied manually or hydraulically. The brake and decelerator pedal manually actuates the brakes and the secondary brake pedal control the hydraulic system. This section covers the external portion of the pedal systems only with the hydraulic and internal portions covered in Section 7E. Complete brake system adjustment is also covered in Section 7E.

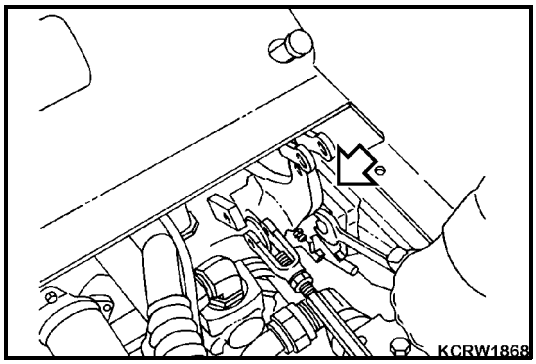
SPECIFICATIONS

Brake Pad Tension Spring:
- Free Length . . . . . 3.243 in (82.610 mm)
- Test Length . . . . . 2 in (50.8 mm)
- Work Length . . . . . 1.8 to 2.125 in (45.72 to 53.98 mm)
- Test Load . . . . . 21.5 to 24.5 lbf (95.3 to 108.7 N)
- Number of Coils 17

Brake Pad Return Spring:
- Free Length . . . . . 5 in (127 mm)
- Test Length . . . . . 8.85 in (224.79 mm)
- Work Length . . . . . 8.85 to 9.89 in (224.79 to 251.21 mm)
- Test Load . . . . . 26.1 lbf (116.1 N)
- Number of Coils 42

Brake and Decelerator Pedal Effort:
- To Start . . . . . 3.34 lbf (14.85 N)
- Finish (At Dash) . . . . . 4.38 lbf (19.48 N)

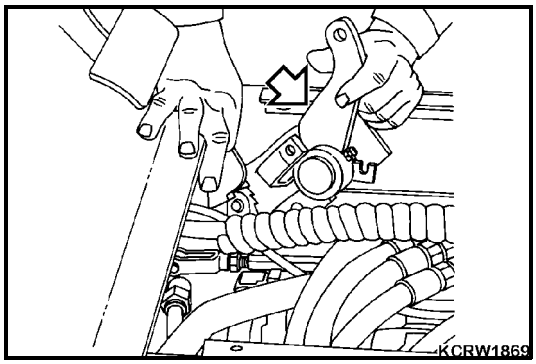
5. Remove brake pad mounting hardware.



6. Remove brake pad from machine.

7. If brake release rod assembly warrants repair, proceed as follows:

Compress return spring (13) and drive out roll pin (12). Pull out release rod (10) and remove remaining parts (11 and 13).



⚠ WARNING

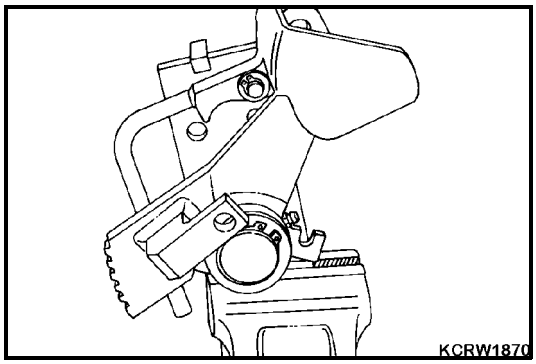
Spring loaded assembly. Assembly must be held to remove spring. Use extreme care when disassembling.

SERVICE

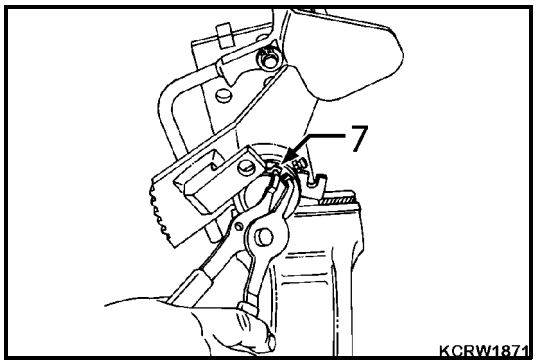
REMARK

Callouts from exploded and flat views correspond with callouts in following steps.

1. Position assembly in vise.



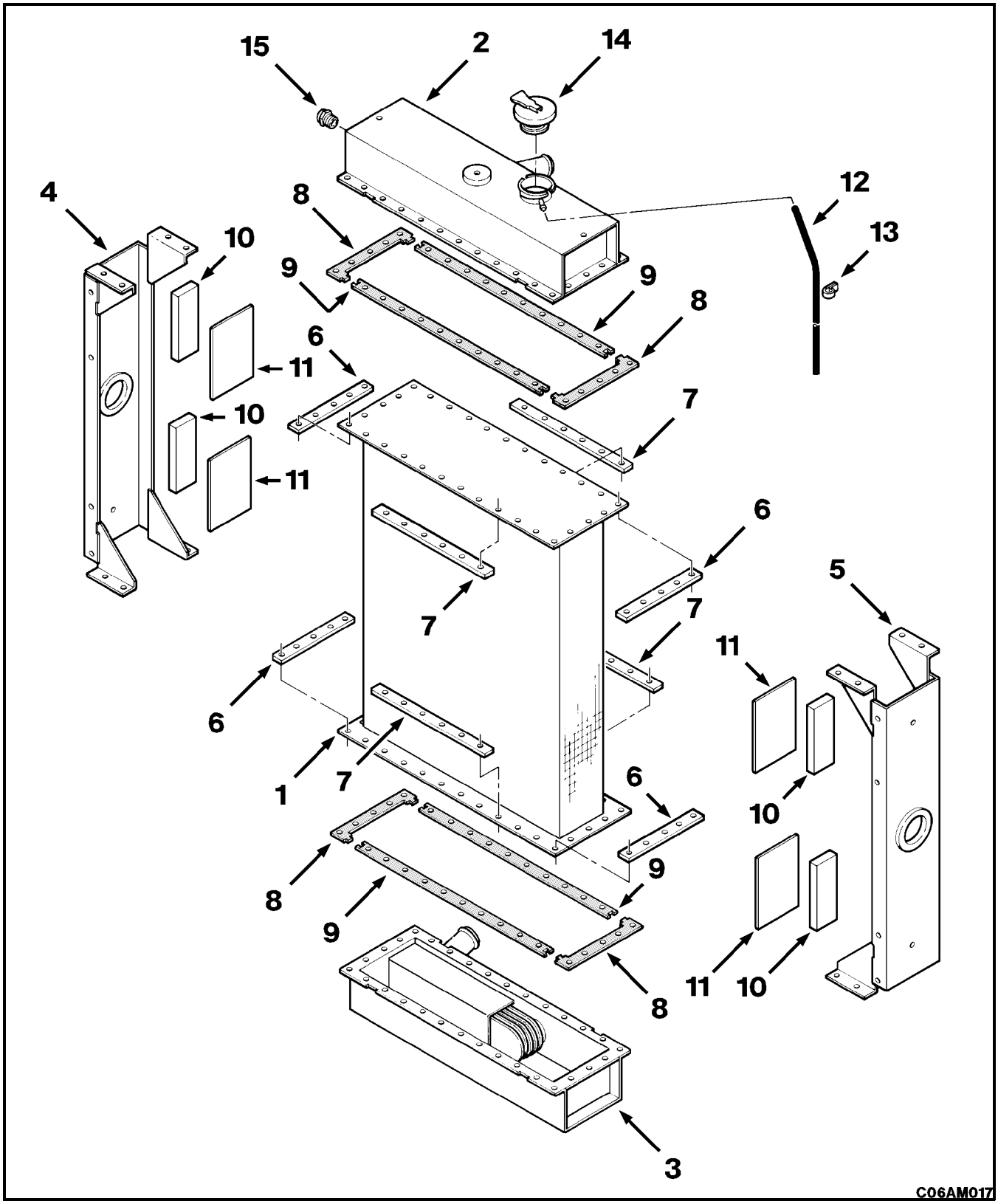
2. Remove large retaining ring (7).



SECTION 6

⚠ WARNING

Refer to, read and follow all safety precautions in SECTION 1. Failure to do so may result in serious injury or death.



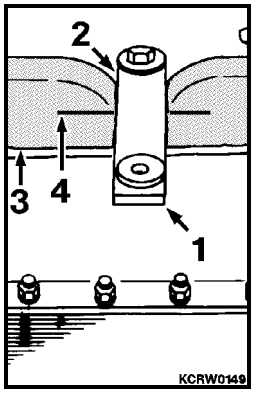
EXPLODED VIEW OF RADIATOR

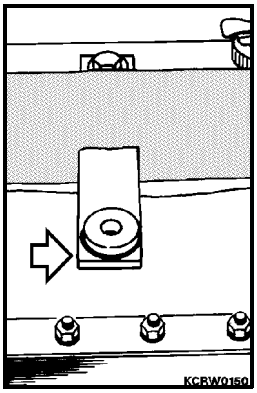
1. Core and Header
2. Top Tank
3. Bottom Tank
4. Right Side Bracket
5. Left Side Bracket
6. Bolting Bar
7. Bolting Bar
8. End Gasket
9. Gasket Strip
10. Core Support
11. Core Side
12. Overflow Hose
13. Hose Clip
14. Radiator Cap
15. Sight Glass

DISASSEMBLY **REMARK**

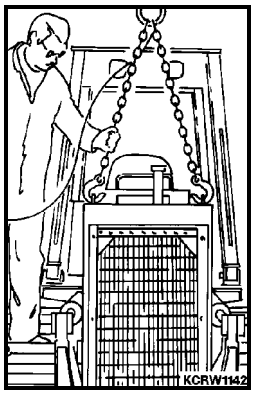
7. Install stabilizing link (1) to radiator (2) over foam strip (3). Mark (4) foam at bottom of link. Remove link and cut slit in foam.

8. Install link and check it for fit up. Adjust as necessary. Remove link.

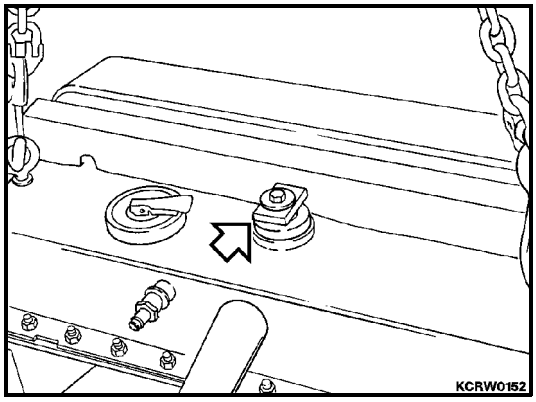




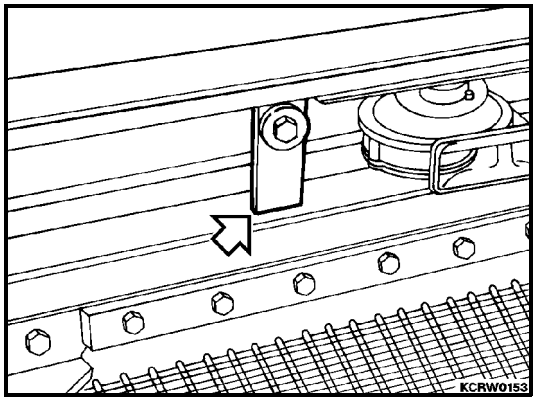
9. Using hoist, lower radiator into frame being careful not to damage bottom strip and horn harness.



10. Install stabilizing link and connect to radiator. Torque bolt to 38 N•m (28 lbf ft) ±10%.



11. Connect stabilizing link to front frame. Torque bolt to 38 N•m (28 lbf ft) ±10%.

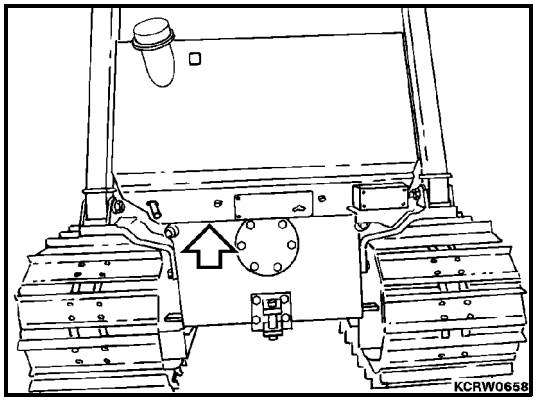


Again, the charge pump flow is teed off the outlet elbow of the pressure filter and directed to the left brake pedal valve which releases the brake cylinder in the rear main frame. For a complete description of components, refer to Section 7E.
Main pressure oil is directed out the F or R port and also out the 1 or 2 port of the transmission/steering valve. When directed out these ports, main pressure oil is routed by hoses to the range selector valve to shift the spools. For a complete description of these valves, refer to Section 7C. Main pressurized oil from the main pressure regulator valve is directed to the rate of rise valve and the range selector valve. For a complete description of the rate of rise valve, refer to Section 7C.

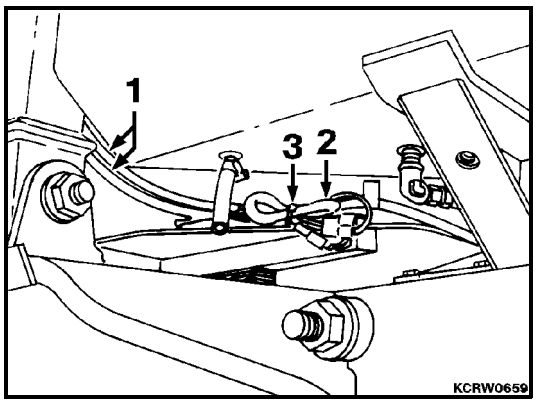
Converter pressurized oil from the C port of the main pressure regulator valve is directed by hose to the inlet port of the torque converter. After pressurized oil is used for torque multiplication, it exits the torque converter at the outlet port and is directed by hose to the inlet port of the oil cooler, which is located in the radiator bottom tank. For a more complete description and operation of the torque converter, refer to Section 7B.

Cooled oil from the outlet port of the oil cooler is regulated by the lubrication spool in the main pressure regulator valve and directed to the transmission for lubrication purposes. Oil from the transmission housing is scavenged by hose through an in-line oil strainer and through the rear element of double pump. From the pump outlet, oil is delivered back to the rear main frame.

12. Remove rear cover.



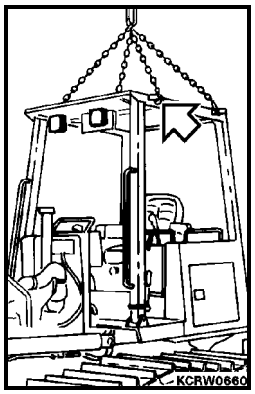
13. Disconnect front and rear light harness (1) from main harness (2). Cut tie strap (3) and remove from clip.



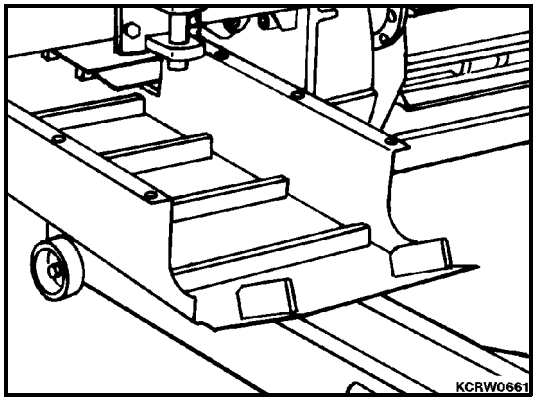
14. Attach four leg chain and hoist to ROPS lifting brackets. Remove mounting hardware and lift ROPS from machine.

REMARK

For a machine equipped with a cab, see Section 13 for cab removal.

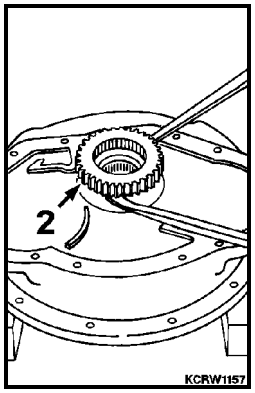


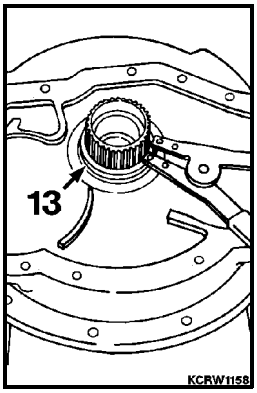
15. Using a rolling floor jack, remove transmission guard from under machine.



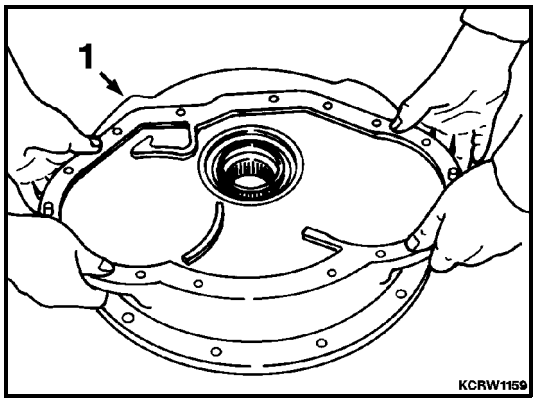
15. Carefully pry pump drive gear (2) from converter assembly.

16. Remove front retaining ring (13).

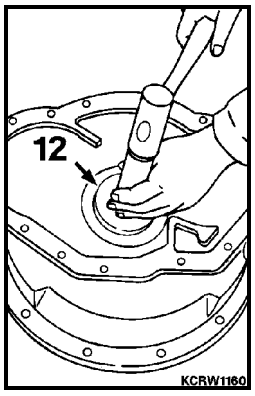




17. Lift housing (1) off from converter assembly.



18. Drive oil seal (12) from housing (1) and discard.



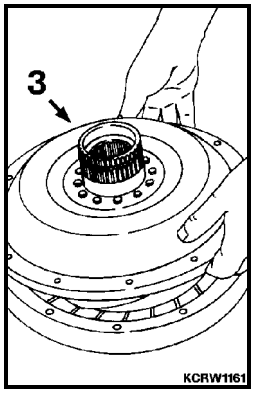
CONVERTER ASSEMBLY

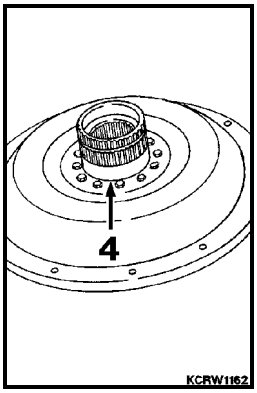
1. Remove mounting hardware and impeller (3) from assembly.

2. Check condition of oil seal sleeve (4). If replacement is necessary remove as follows: Using a low heat source, break Loctite bond between oil seal sleeve and impeller hub. Cold chisel at four spots on sleeve, inset of splines, and remove from hub.

REMARK

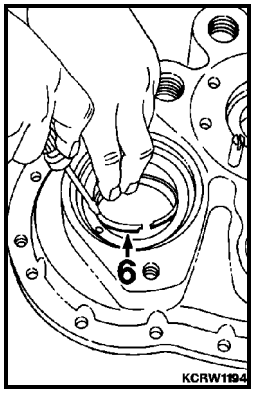
Oil seal sleeve is press fit on impeller hub and retained with Loctite #609.

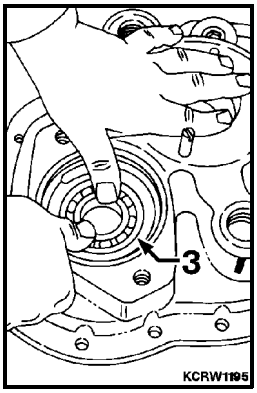




13. Install retaining ring (6) into housing at other pump mounting area.

14. Finger press outer bearing (3) into housing up against retaining ring.

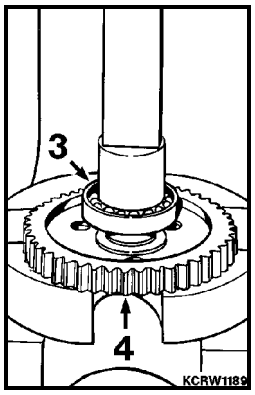


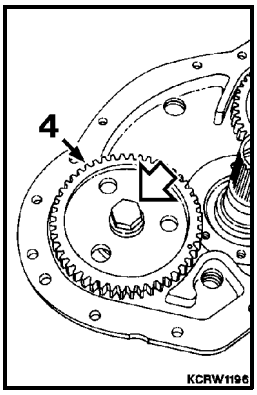


15. Position pump gear (4) in press. Press inner bearing (3) onto gear until it bottoms.

16. From under side of housing position pump gear (4) with bolt and washer from, DR04-719 through bearing.

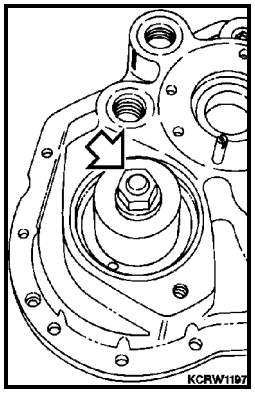
REMARK
Rear housing rotated 180° for clarity.

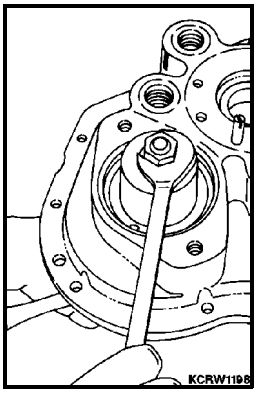




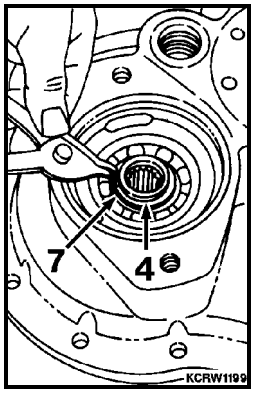
17. Position driver DR04-719 on bearing inner race and secure with washer and nut.

18. Tighten installing tool until inner bearing bottoms against large retaining ring.



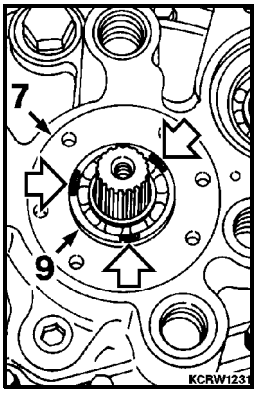


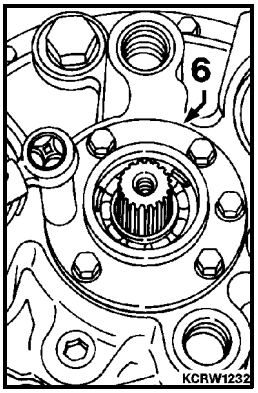
19. Install retaining ring (7) to pump gear (4).



15. Install gasket (7) to housing. Position solder at three equidistant spots on bearing (9) outer race.

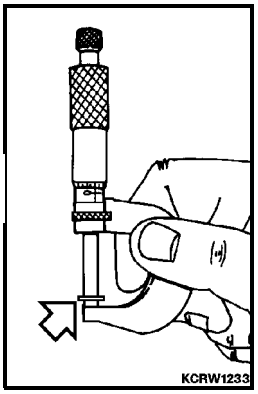
16. Install bearing retainer (6) being careful not to dislodge solder from bearing race. Torque bolts to 49 to 58 N•m (36 to 43 lbf ft). Remove bolts and bearing retainer.

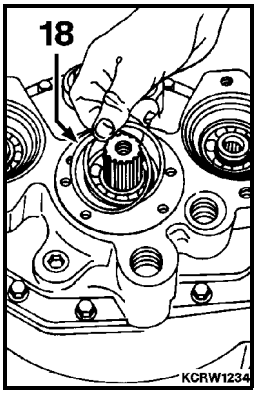




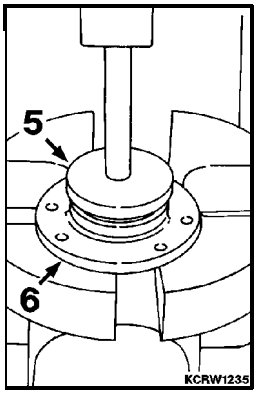
17. Measure each solder thickness, average readings. Elect a shim pack equal to averaged readings. Shims are available in thickness increments of 0.127, 0.254 and 0.508 mm (0.005, 0.010 and 0.020 in).

18. Install required shim pack (18) on outer race of bearing.

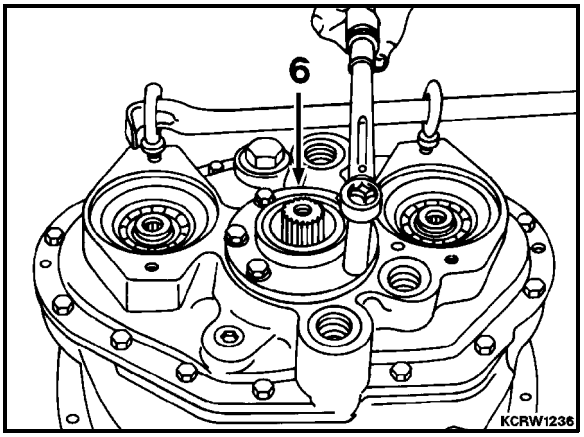


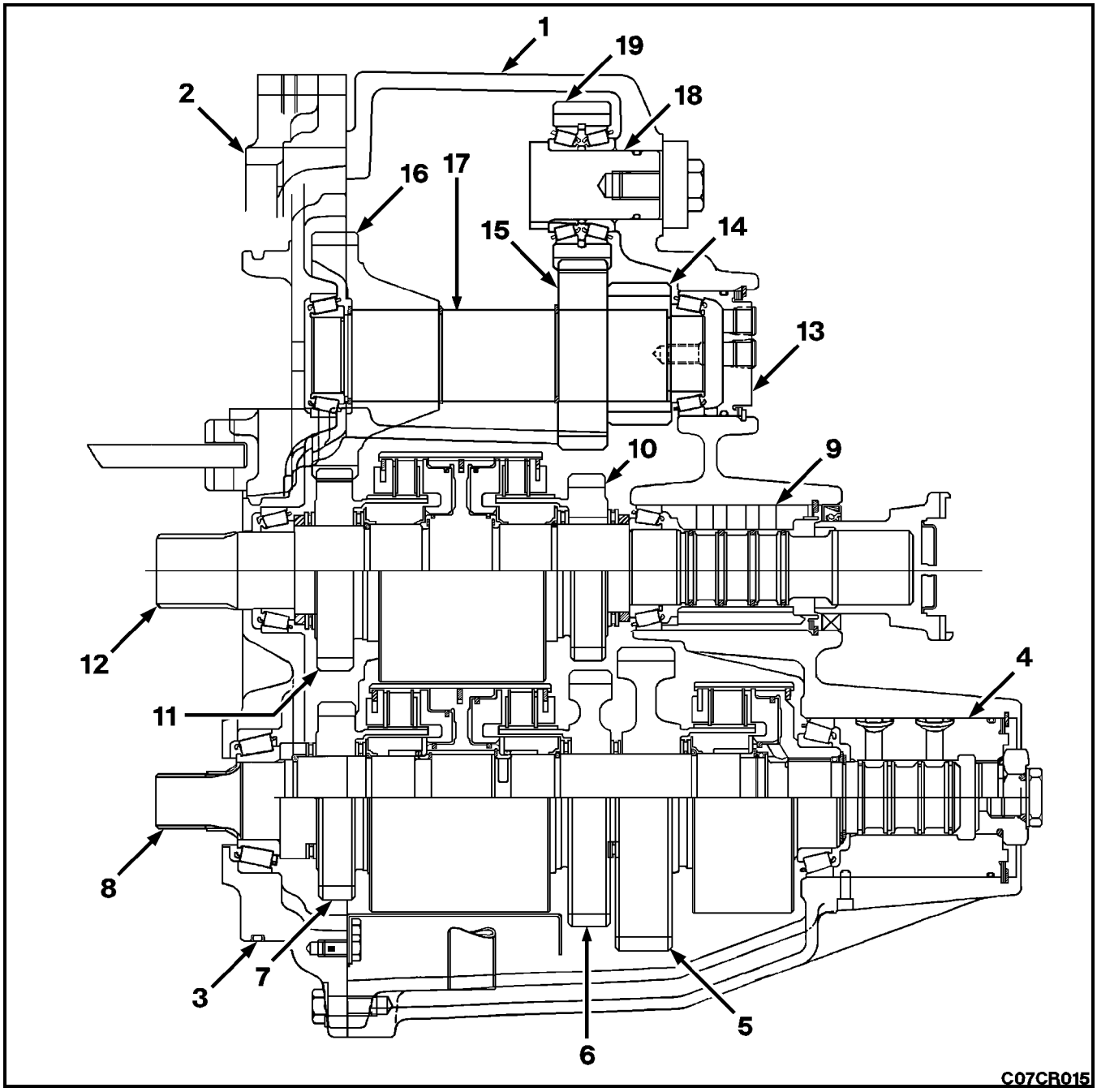


19. Position bearing retainer (6) in press and install oil seal (5) flush with edge.



20. Install bearing retainer (6) with hardware and torque to 49 to 58 N•m (36 to 43 lbf ft).





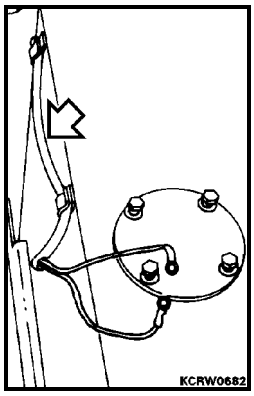
CROSS SECTION VIEW OF TRANSMISSION

1. Transmission Case
2. Transmission Cover
3. Mounting O-Ring
4. Output Shaft Manifold
5. 1st Speed Driven Gear
6. 2nd Speed Driven Gear
7. 3rd Speed Driven Gear
8. Output Shaft
9. Directional Clutch Manifold
10. Reverse Gear
11. Forward Gear
12. Input Shaft
13. Countershaft Cover
14. 1st Speed Gear
15. 2nd Speed Gear
16. 3rd Speed Gear
17. Countershaft
18. Idler Shaft
19. Reverse Idler Gear

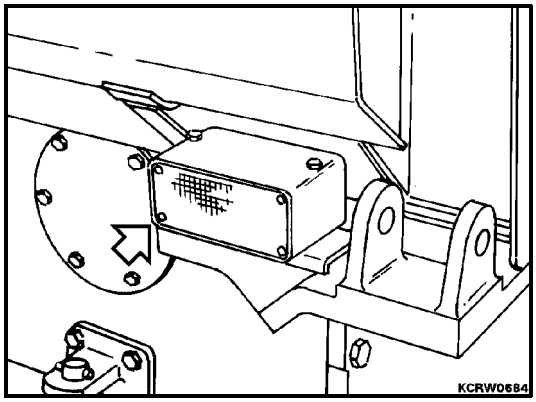
REMARK

Unless otherwise notated, all reference callouts refer to cross section view of transmission.

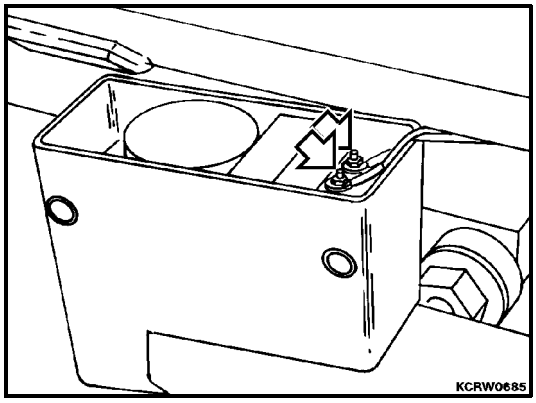
35. Replace cover and unclip harness from fuel tank.



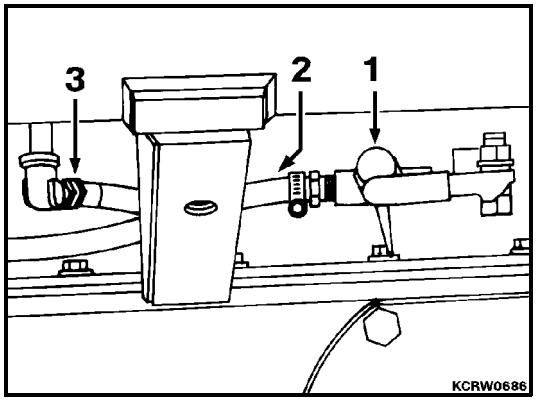
36. Remove back up alarm mounting hardware.

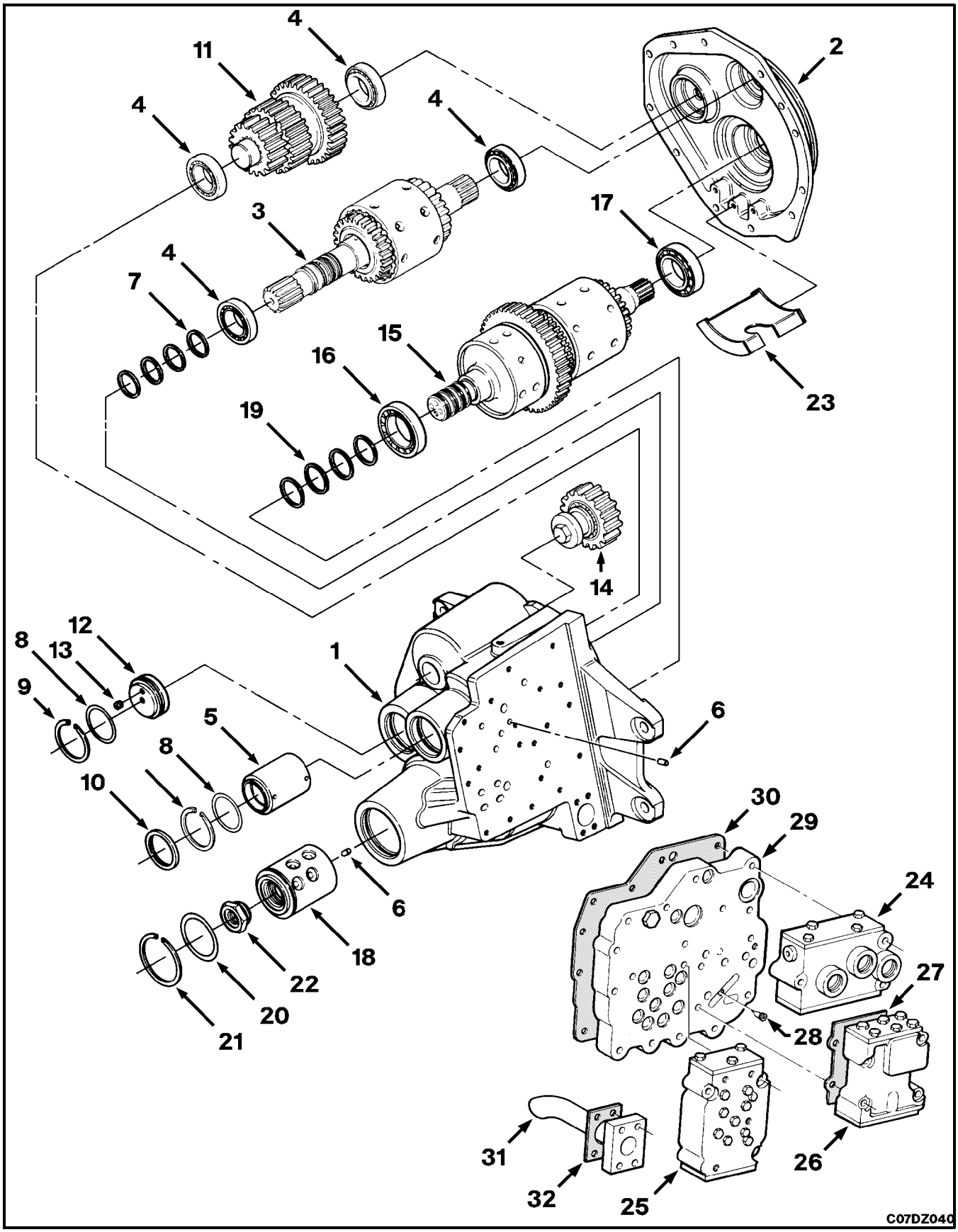


37. Flip over alarm and remove wire leads.



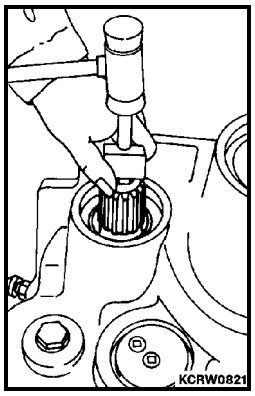
38. Close fuel shut off valve (1). Disconnect and cap hose (2). Disconnect and cap fuel return hose (3).



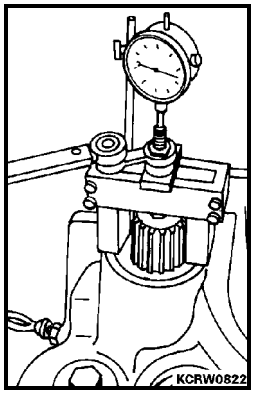


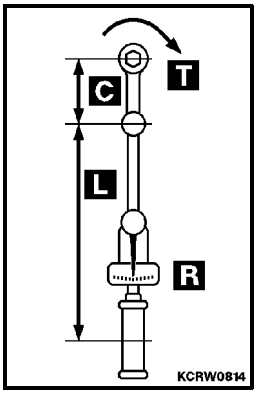
EXPLODED VIEW OF COMPLETE ASSEMBLY

29. Remove bridge tool. Lightly tap down on directional (input) shaft to attempt to achieve zero end play.



30. Refit bridge tool to directional (input) shaft. Install extension adapter on torque wrench. Position dial indicator on threaded rod of tool and set to zero. Pull up on directional (input) shaft with 58 N•m (43 lbf ft) and read and record indicator movement.



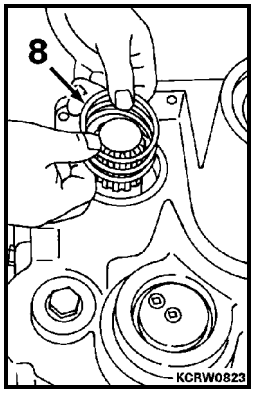


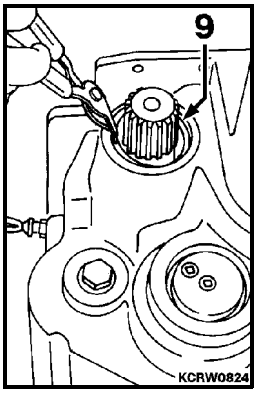
R = T x L ÷ (L + C)	
T- Torque Required	58 N•m (43 lbf ft)
MULTIPLIED BY (x)	
L - Wrench Length	mm (in)
DIVIDED BY (÷)	
L - Wrench Length	mm (in)
PLUS (+)	
C- Extension Length	mm (in)
EQUALS (=)	
R - Reading on Scale	N•m (lbf ft)

31. Determine shim pack (8) as follows;

    Subtract 0.178 to 0.508 mm (0.007 to 0.012 in) from indicator reading recorded in Step 30. This thickness is directional (input) shaft shim pack. Shim pack must include at least one 0.762 mm (0.030 in) shim to be placed against retaining ring. Remove retaining ring and install shim pack.

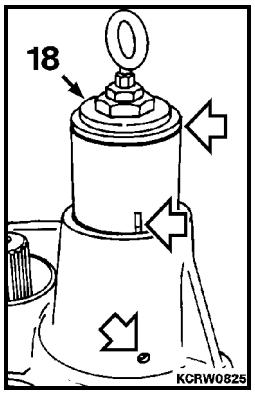
32. Install retaining ring (9) up against 0.762 mm (0.030 in) shim into groove in housing.

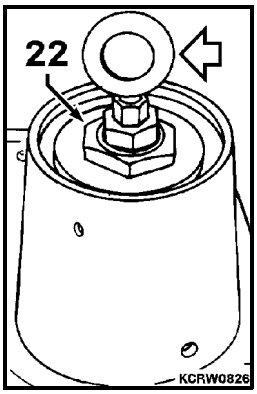




33. Install new o-ring to range (output) shaft manifold (18). Install manifold, indexing slot with dowel pin, into trans housing. Be careful not to cut, twist or distort seal rings on shaft.

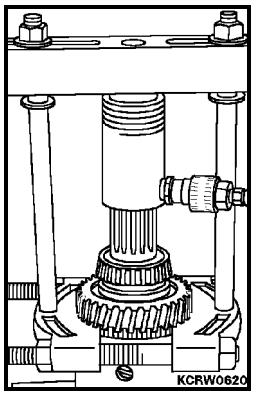
34. Remove lifting eye and adapter fitting (22).

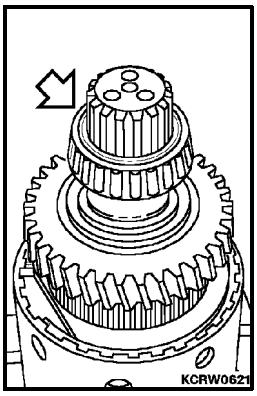




15. Turn assembly over in stand and support with metal bars. Install bearing puller arrangement on forward gear and hub. Activate ram to unseat bearing press fit. Remove puller arrangement after press fit is unseated.

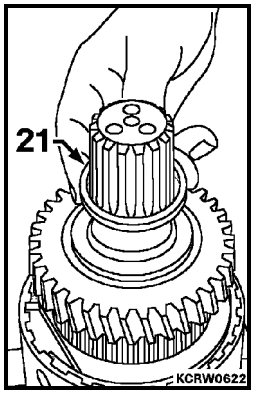
16. Remove bearing cone from directional (input) shaft.

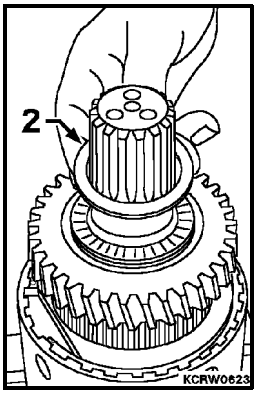




17. Remove bearing spacer (21) from directional (input) shaft.

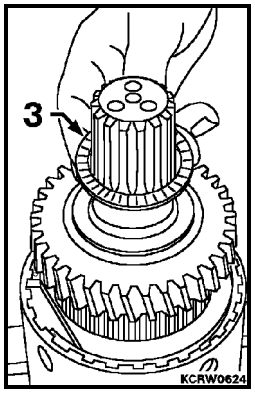
18. Remove outer thrust race (2).

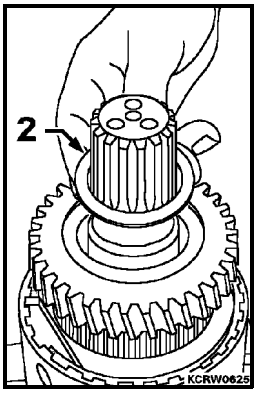




19. Remove thrust bearing (3).

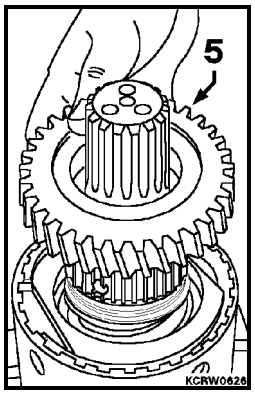
20. Remove inner thrust race (2).

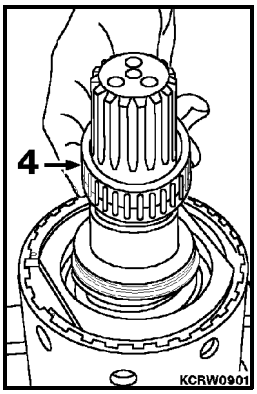




21. Remove forward gear and hub (5) from directional (input) shaft.

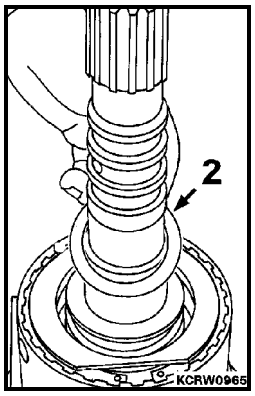
22. Remove needle bearing (4).

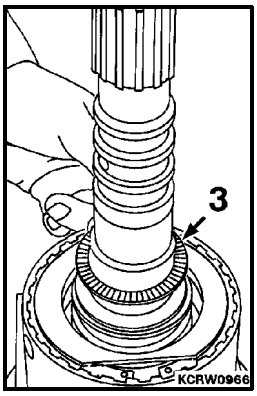




45. Install inner thrust race (2).

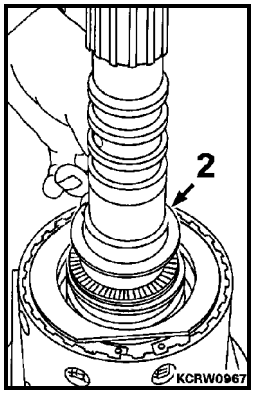
46. Install thrust bearing (3) to race. Coat bearing needles with clean oil.

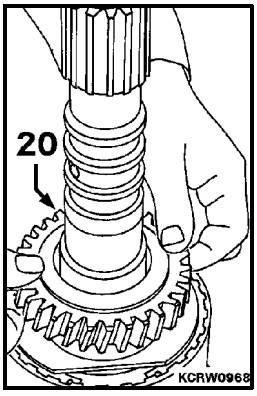




47. Install outer thrust race (2).

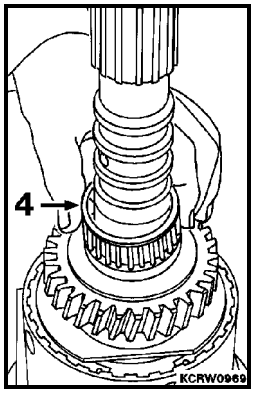
48. Install reverse gear and hub (20) aligning all six friction discs.

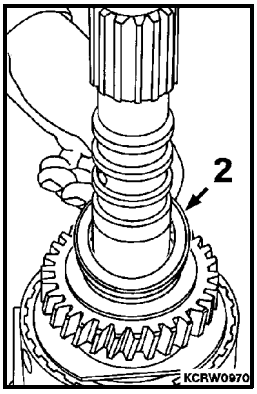




49. Install gear needle bearing (4). Coat bearing needles with clean oil.

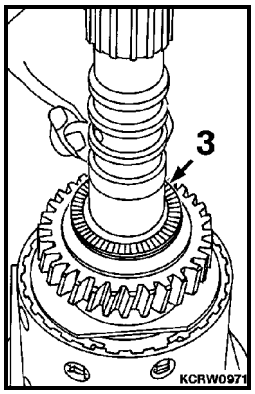
50. Install inner thrust race (2).

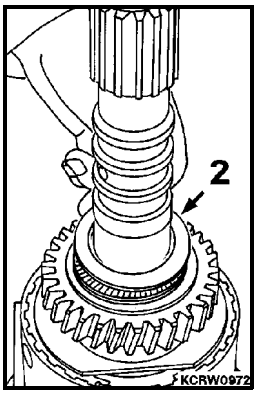




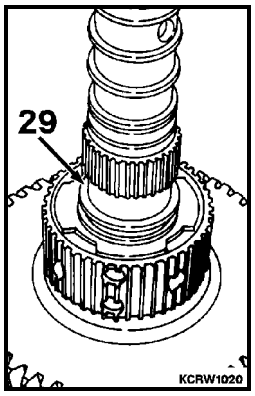
51. Install thrust bearing (3). Coat bearing needles with clean oil.

52. Install outer thrust race (2).

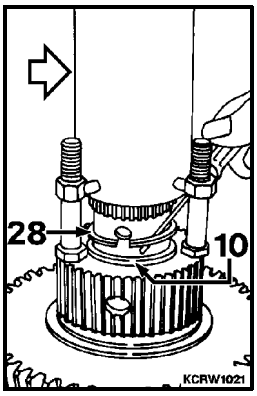




21. Remove seal ring (29) from groove in shaft.



22. Position assembly in press and install spring compressor tool DR04-721-6 on lube sleeve (10). Activate press to move retainer below retaining ring (28). Move ring out of groove and up on shaft. Slowly let off press until spring fully decompresses. Remove tool and retaining ring from shaft.

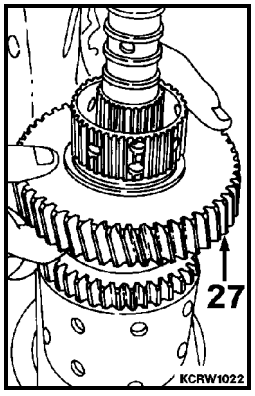


⚠ WARNING

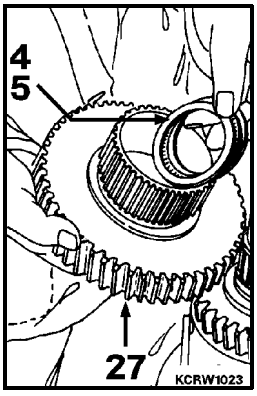
Spring loaded assembly. Assembly must be held to relieve spring pressure. Use extreme care when disassembling.

Remove lube sleeve (10), spring (9), spring retainer (8) and retaining ring (3) from assembly.

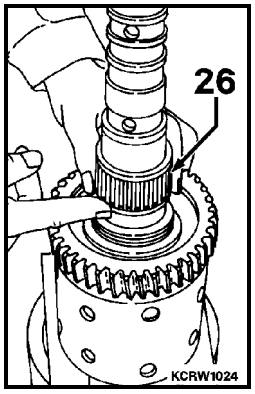
23. Remove 1st speed gear and hub (27).



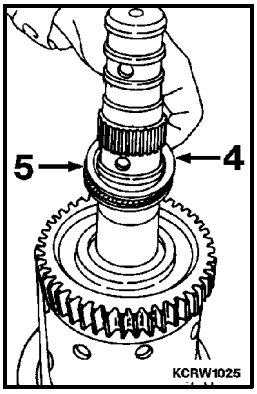
24. Remove thrust races (4) and bearing (5) from inside 1st speed gear and hub (27).



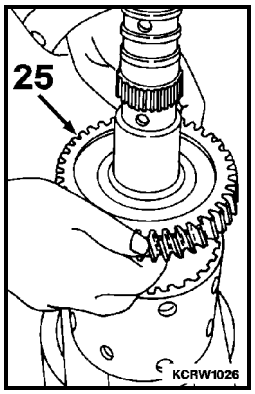
25. Remove needle bearing (26).



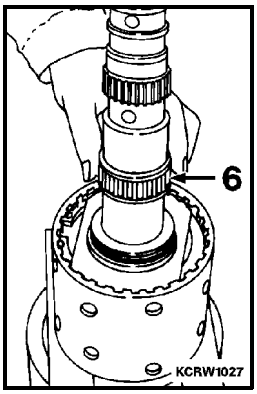
26. Remove thrust races (4) and bearing (5).



27. Remove 2nd speed gear and hub (25).

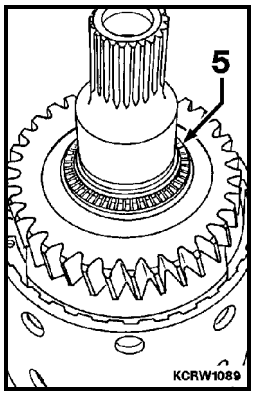


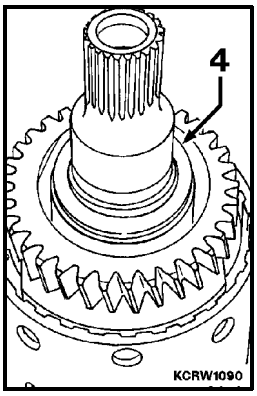
28. Remove needle bearing (6).



40. Install thrust bearing (5) to race. Coat bearing needles with clean oil.

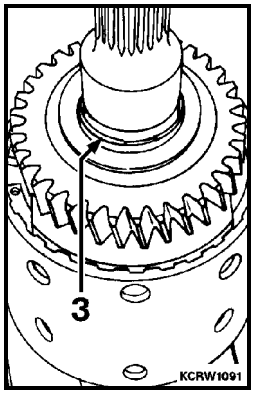
41. Install outer thrust race (4).

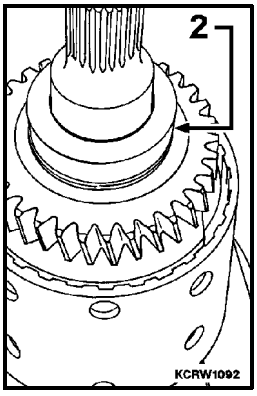




42. Install retaining ring (3) up against step on output shaft.

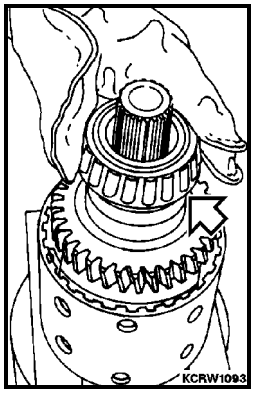
43. Seat bearing spacer (2) on outer thrust race against retaining ring.

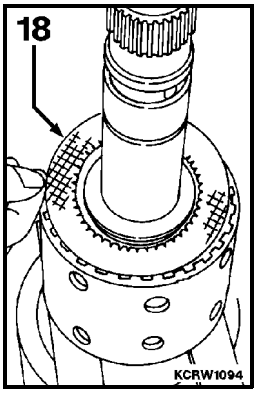




44. Heat bearing cone to 135°C (275°F) for 45 minutes. Install on shaft and bottom. To insure cone is seated, keep pressure against cone until it cools. After bearing has cooled turn assembly over in clutch stand.

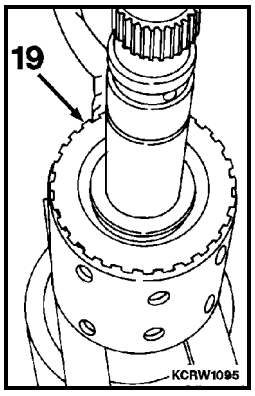
45. Coat friction disc (18) lightly with clean oil and install into assembly.

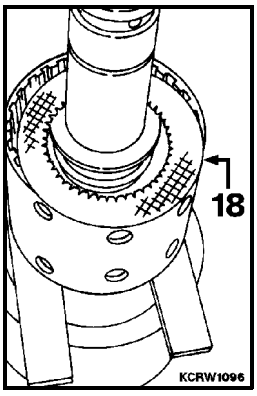




46. Install separator plate (19).

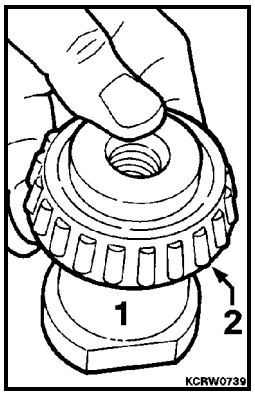
47. Alternately install friction disc and separator plates ending with friction disc (18). A total of seven friction discs and six separator plates are to be used.

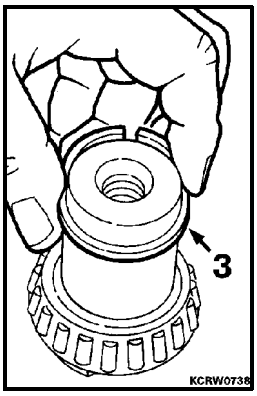




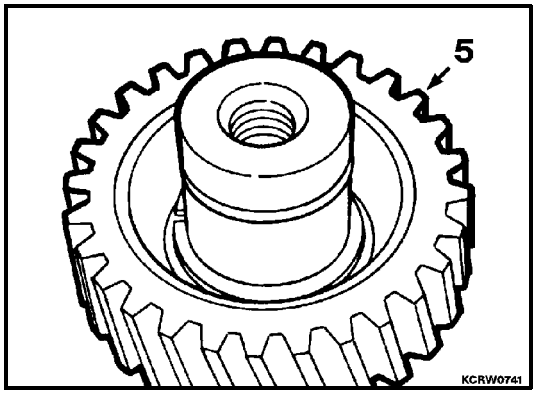
2. Install inner tapered roller bearing (2) on reverse idler shaft (1) and bottom against step.

3. Install bearing cone spacer (3).



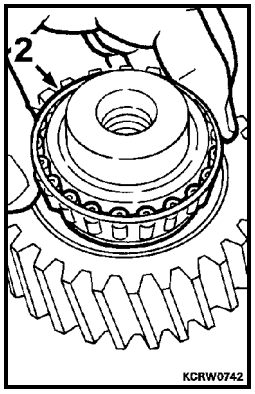


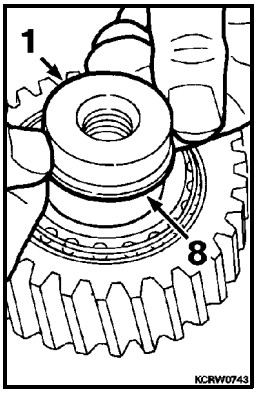
4. Install reverse idler gear (5) on inner tapered roller bearing cone.

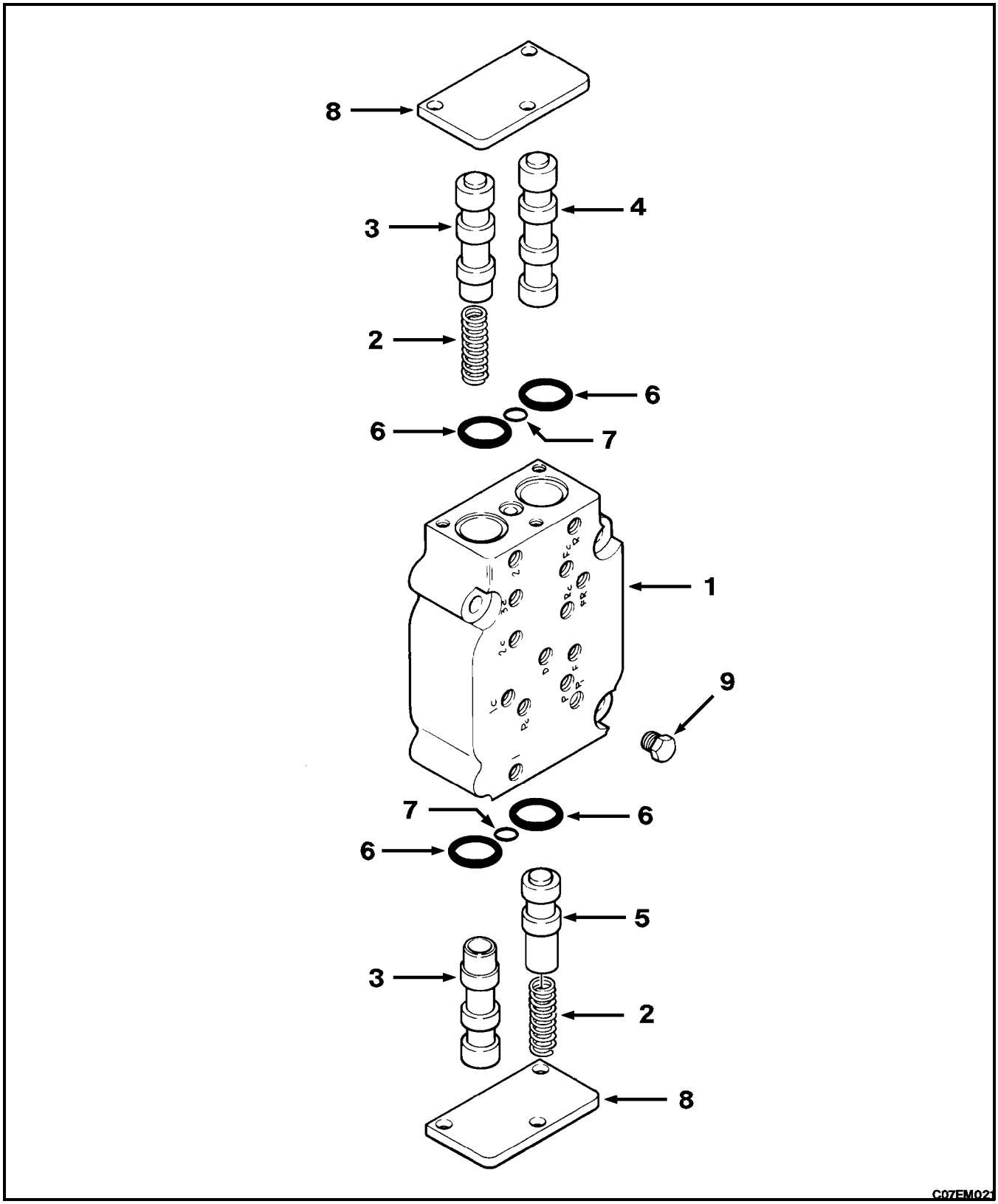


5. Install outer tapered roller bearing (2) cone.

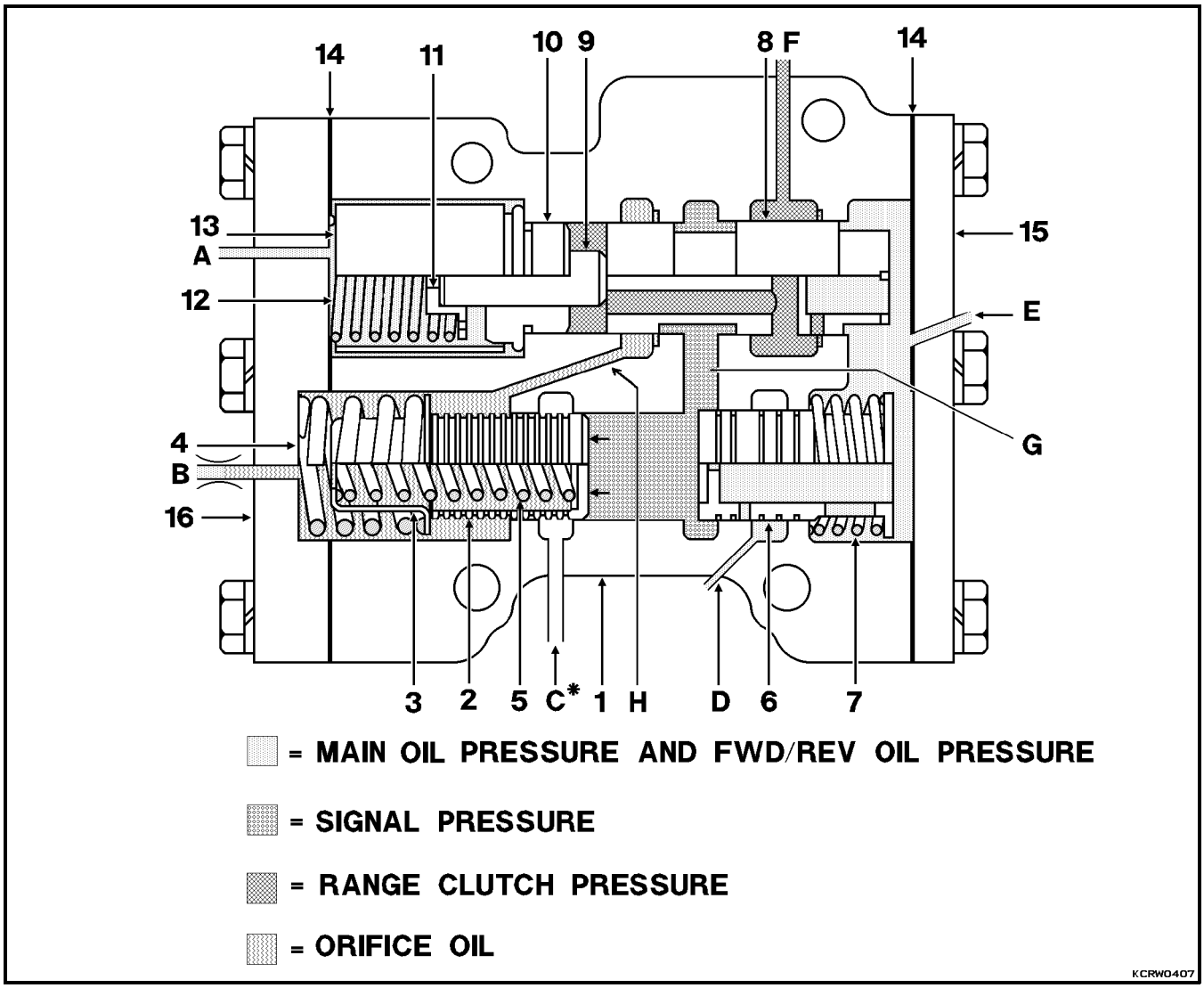
6. Install new seal ring (8) to groove on reverse idler shaft (1).







EXPLODED VIEW OF RANGE SELECTOR VALVE

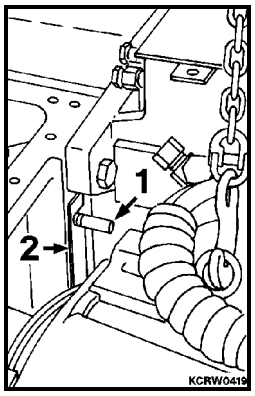


SEQUENCE SPOOL SHIFTED, MODULATING PISTON SHIFTED TO LEFT

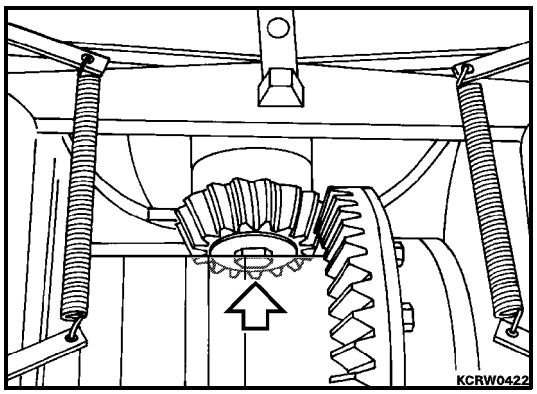
A. Main Pressure Oil
B. Orificed Main Pressure Oil
C. Drain Port
D. Main Pressure Oil from Short Directional Spool
E. Main Oil Pressure to Directional Spool
F. Main Oil Pressure to Range Spools
G. Internal Passage
H. Internal Passage

1. Valve Housing
2. Modulating Piston
3. Piston Spring Retainer
4. Outer Piston Spring
5. Inner Piston Spring
6. Reducing Spool
7. Reducing Spool Spring
8. Sequence Spool
9. Dowel Pin
10. Sequence Spool Spacer
11. Sequence Spool Disc
12. Sequence Spool Spring
13. Tube Spacer
14. End Cover Gasket
15/16. End Cover

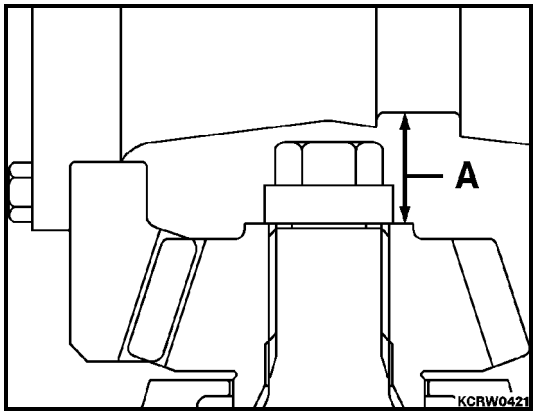
9. Install aligning studs (1), DR04-721-8, to top transmission mounting bolt holes. Position five 0.5 mm (0.020 in) mounting shims (2) on each stud. On pinion gear notate and record dimension etched on face of gear. Coat new mounting o-ring with liberal amount of amber grease. Using hoist position transmission in place and work into rear main frame engaging pinion gear with ring gear. Install mounting bolts and torque to 130 N•m (100 lbf ft).



10. Measure and record distance (A) between face of pinion gear to ring gear carrier machined groove. Add or subtract mounting shims to bring pinion gear within dimension etched on face, recorded in Step 9, within 0.025 mm (0.001 in). Torque transmission mounting bolts to 352 to 406 N•m (260 to 300 lbf ft).

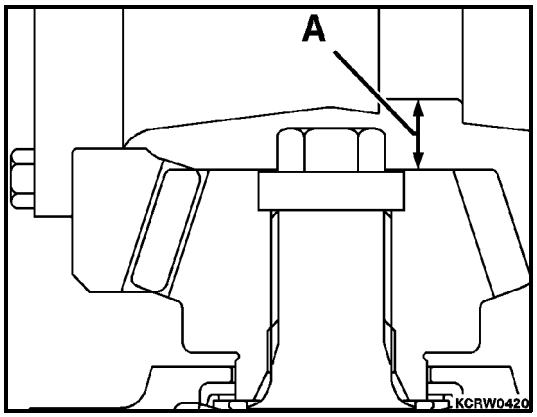


11. D32E-1, D32P-1, D38E-1 or D38P-1

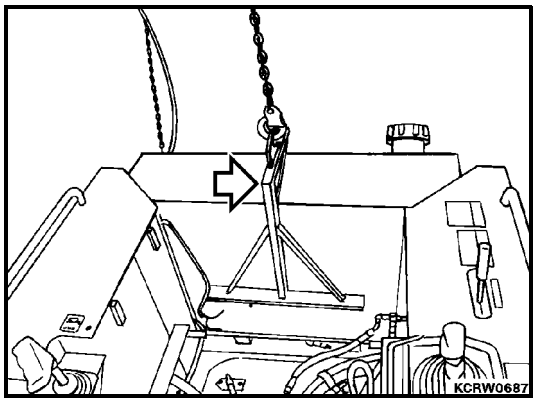


12. D39E-1 or D39P-1

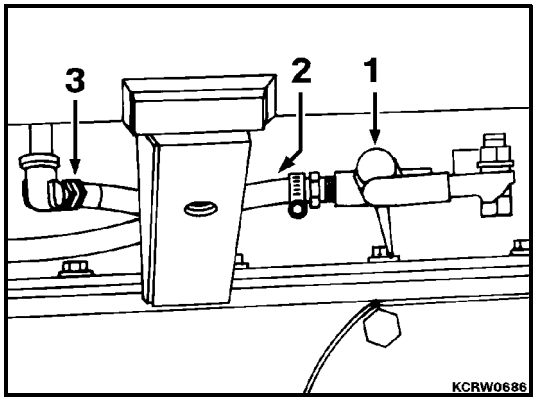
.



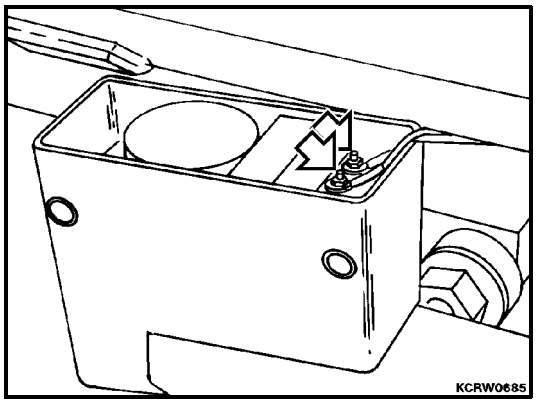
62. Remove lifting bracket from front of fuel tank.



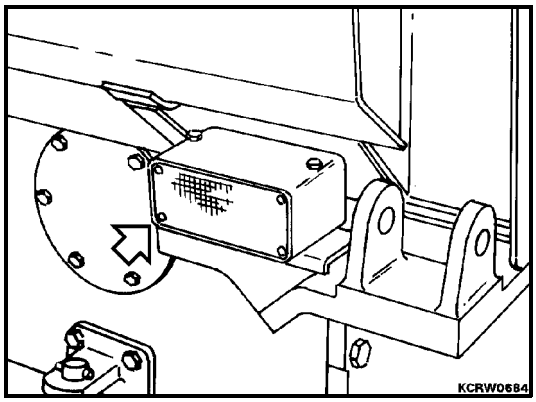
63. Connect fuel return hose (3) to fitting at tank. Connect fuel supply hose (2) to shut off valve (1). Open valve.



64. Apply electrical sealing grease, Grafo 112-X to wire leads and connect at back of alarm. Torque nuts to 1.8 N•m (16 lbf in) ±10%.



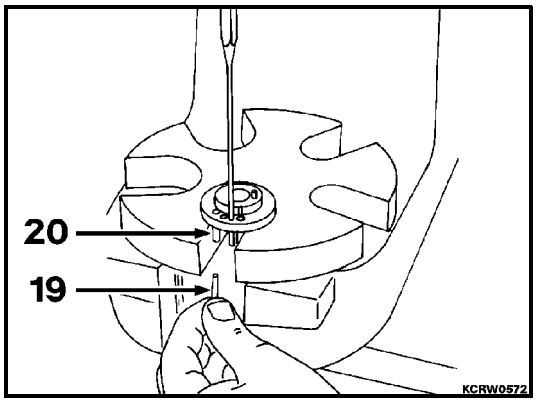
65. Position back up alarm and secure with hardware. Torque bolts to 38 N•m (28 lbf ft) ±10%.



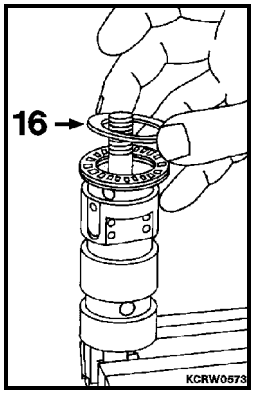
SPECIFICATIONS

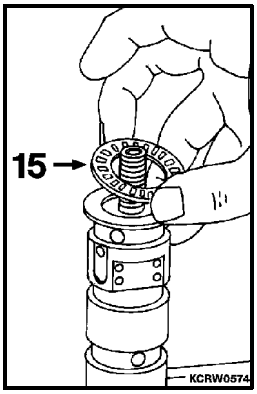
Steering Spool Inner Spring (6)	
Free Length	67.6 mm (2.66 in)
Test Length	38.6 mm (1.52 in)
Work Length	25.4 to 38.6 mm (1 to 1.52 in)
Test Load	51.2 ±4.45 N (11.5 ±1 lbf)
Number of Working Coils	15.5
Steering Spool Outer Spring (7)	
Free Length	65.5 mm (2.58 in)
Test Length	32.9 mm (1.29 in)
Work Length	23.1 to 32.9 mm (0.91 to 1.29 in)
Test Load	31.2 ±3.34 N (7 ±0.75 lbf)
Number of Working Coils	10
Forward Reverse Spool Spring (10)	
Free Length	40.4 mm (1.59 in)
Test Length	23.6 mm (0.93 in)
Work Length	17.3 to 23.6 mm (0.68 to 0.93 in)
Test Load	120.6 ±6.67 N (27 ±1.5 lbf)
Number of Working Coils	5.5
Range Detent Spring (36)	
Free Length	24.4 mm (0.96 in)
Test Length	19.9 mm (0.78 in)
Work Length	19.0 to 19.9 mm (0.75 to 0.785 in)
Test Load	73.4 ±6.67 N (16.5 ±1.5 lbf)
Number of Working Coils	6
Torques:	
Directional Spool Retainer Nut (11)	22 N•m (16 lbf ft)
Rocker End Jam Nut (13)	38 N•m (28 lbf ft)
Range Cam Retainer Nut (18)	54 N•m (40 lbf ft)
Bottom Cover (22) Bolts	38 N•m (28 lbf ft)
Orifice Plug (24)	3 N•m (2 lbf ft)
Bearing Housing (27) Bolts	11 N•m (8 lbf ft)
Detent Guide Plug (38)	20 N•m (15 lbf ft)
Sealant:	
Directional Spool Retainer Nut (11)	Loctite # 242
Range Cam Retainer Nut (18)	Loctite # 242
Cam Ring (28) Working System (Generous Amount)	KOMATSU Super Grease - 1400120H91
Universal Joint (31) (Liberal Amount in Joint Area)	KOMATSU Super Grease - 1400120H91
Magnet Brass Screw (42)	Loctite #242
Switch Arm (40) Locking Bolt (43)	Loctite #242

35. If necessary, remove dowel pin(s) (19 and/or 20).

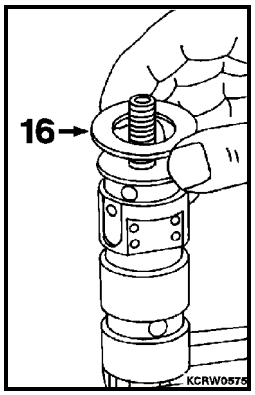


36. Remove top thrust washer (16).
37. Remove thrust bearing (15).

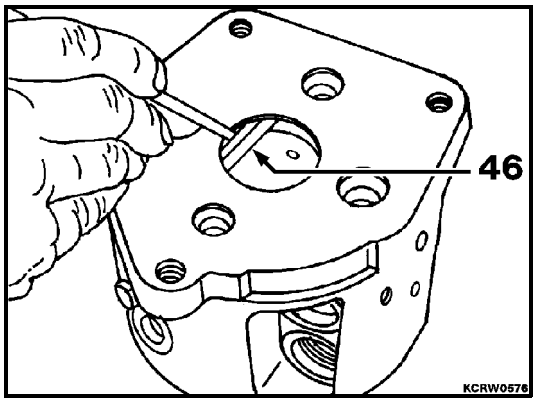




38. Remove bottom thrust washer (16).

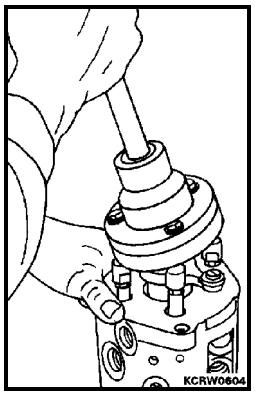


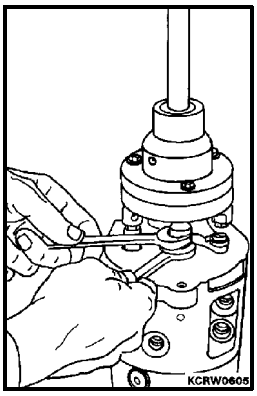
39. Remove and discard range selector wiper seal (46) from valve body.



3. Move motion lever fully in all directions to seat range selector spool against needle bearing. Recheck for free play between cam ring and rocker ends and correct as necessary.

4. Tighten jam nuts to spool rocker ends.

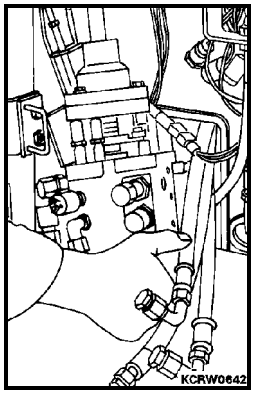


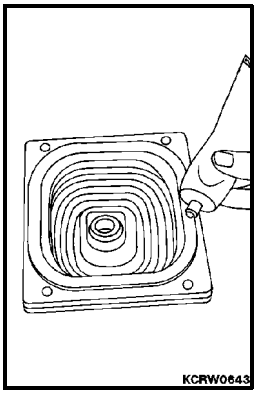


INSTALLATION

1. Apply Loctite #515 to valve mounting surface. Using large flat washer on valve lever, lift valve, tilting forward to clear reed switch magnet, into position and secure with mounting hardware.

2. Apply clear RTV sealant to underside boot all around to fashion a water tight joint.



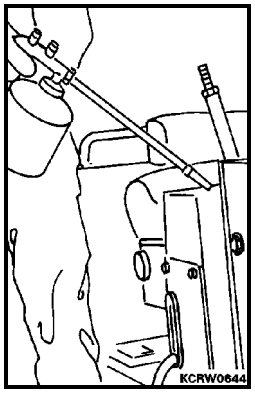


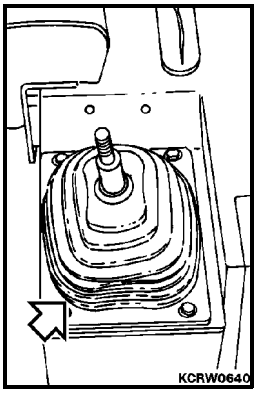
3. Apply corrosion inhibiter to inside of valve mounting cavity.

4. Install boot with clamp and plate and secure with hardware.

REMARK

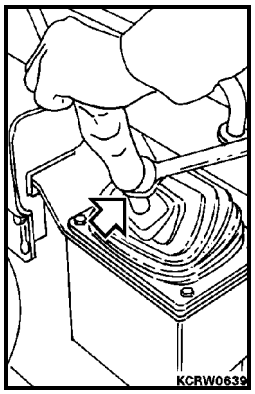
Lever portion of boot incorporates an o-ring, be careful not to cut or damage during installation.

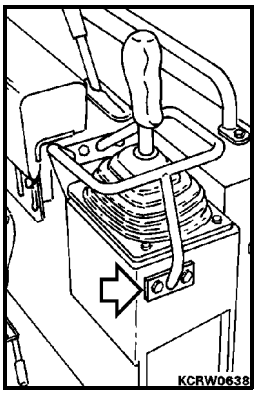




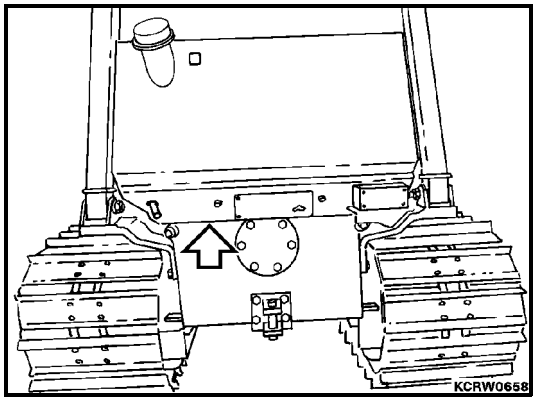
5. Install handle to desired position and secure with jam nut.

6. Install feathering handle and secure with hardware.

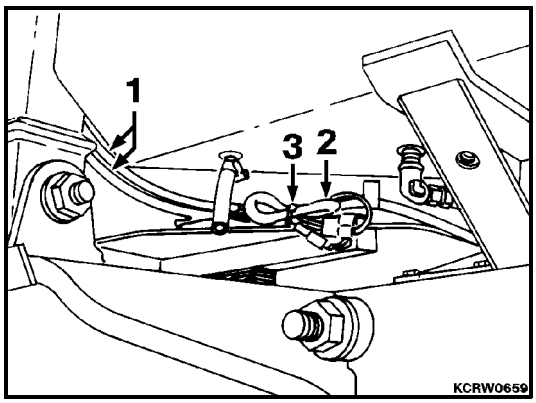




6. Remove rear cover.



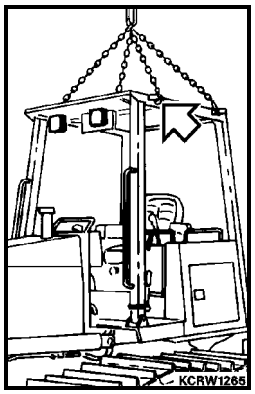
7. Disconnect front and rear light harness (1) from main harness (2). Cut tie strap (3) and remove from clip.



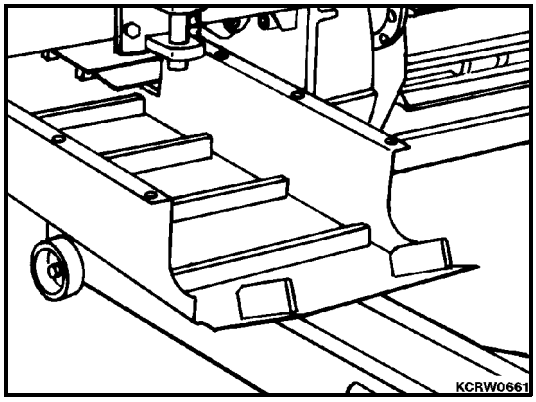
8. Attach four leg chain and hoist to ROPS lifting brackets. Remove mounting hardware and lift ROPS from machine.

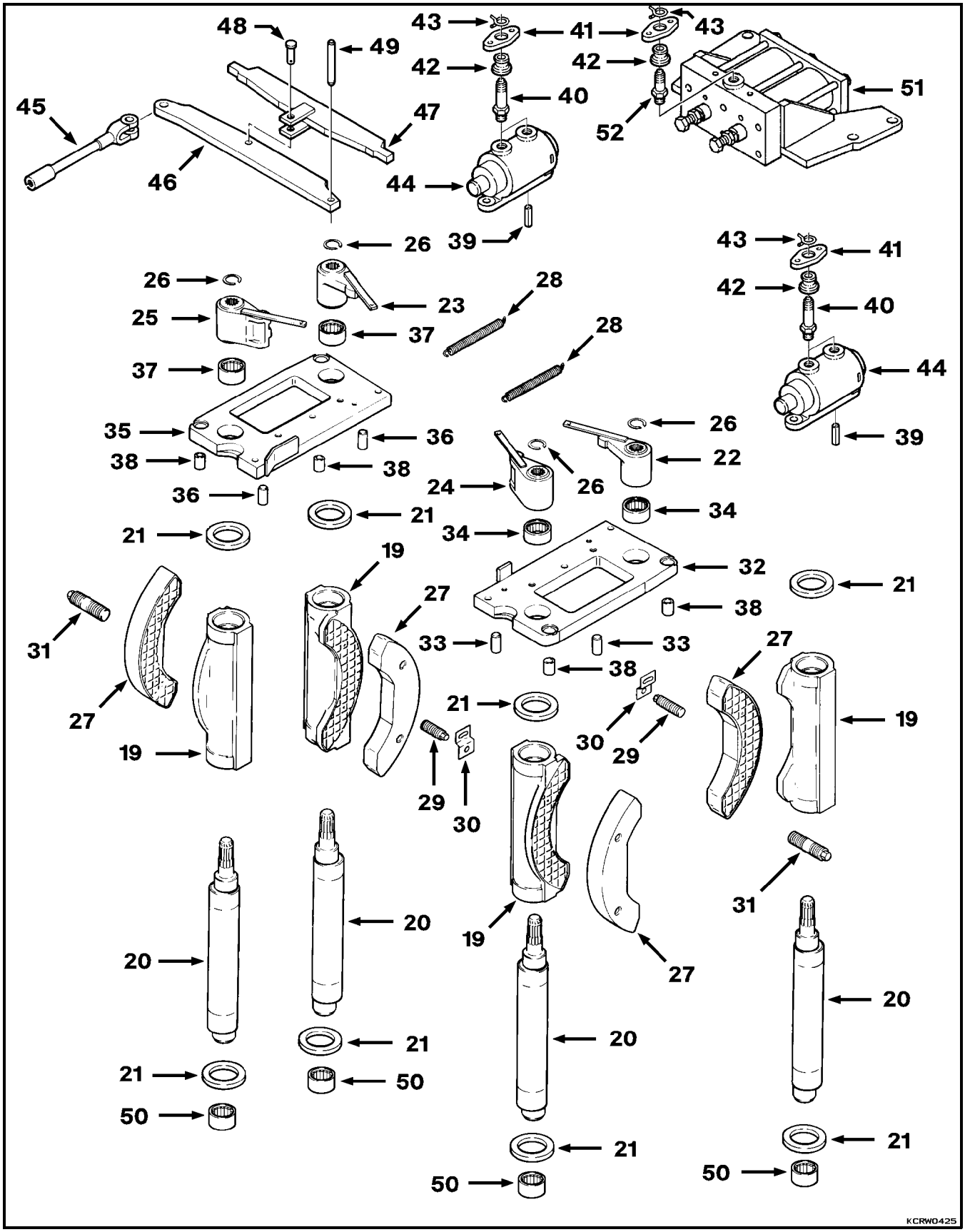
REMARK

For a machine equipped with a cab, see Section 13 for cab removal.

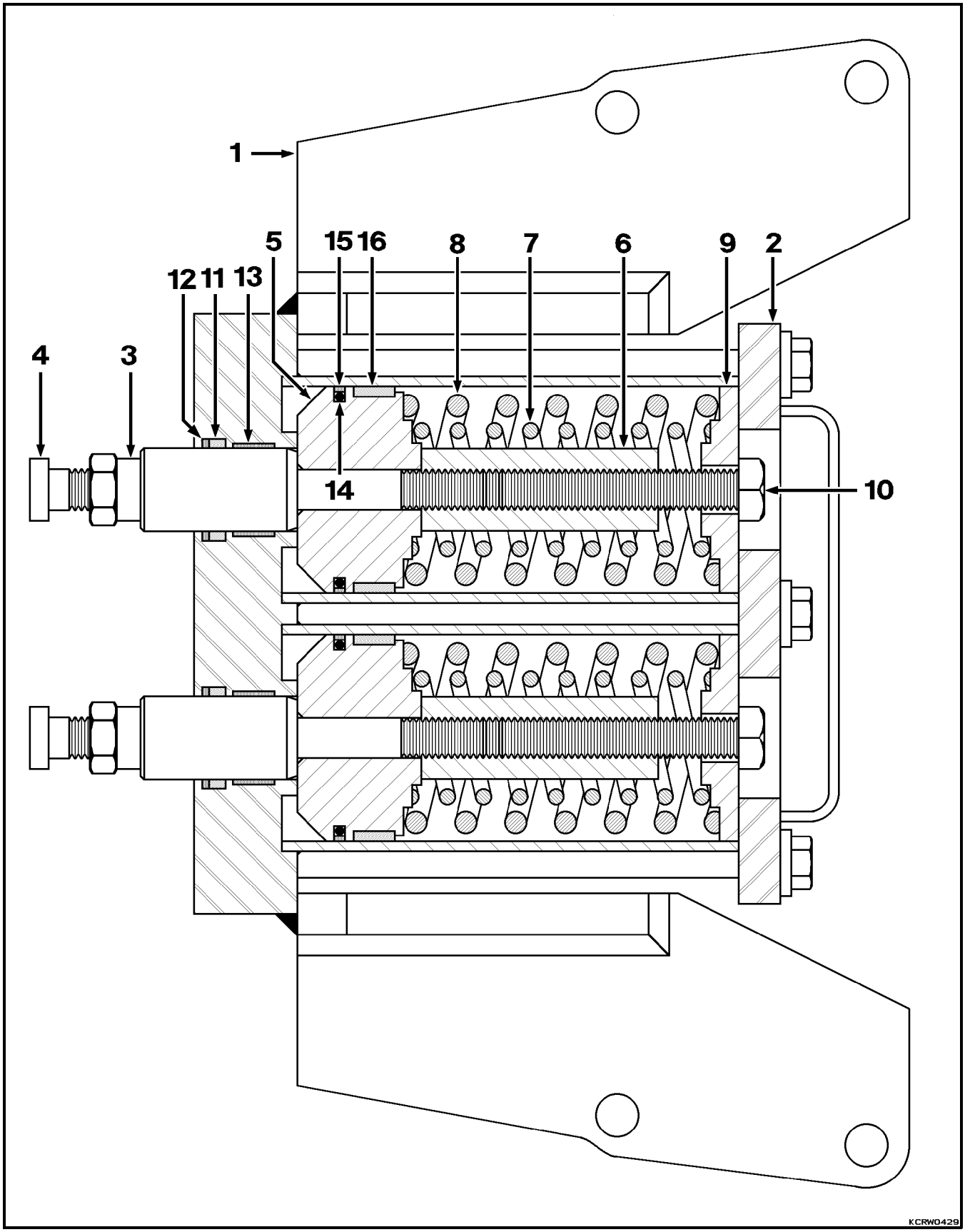


9. Using a rolling floor jack, remove transmission guard from under machine

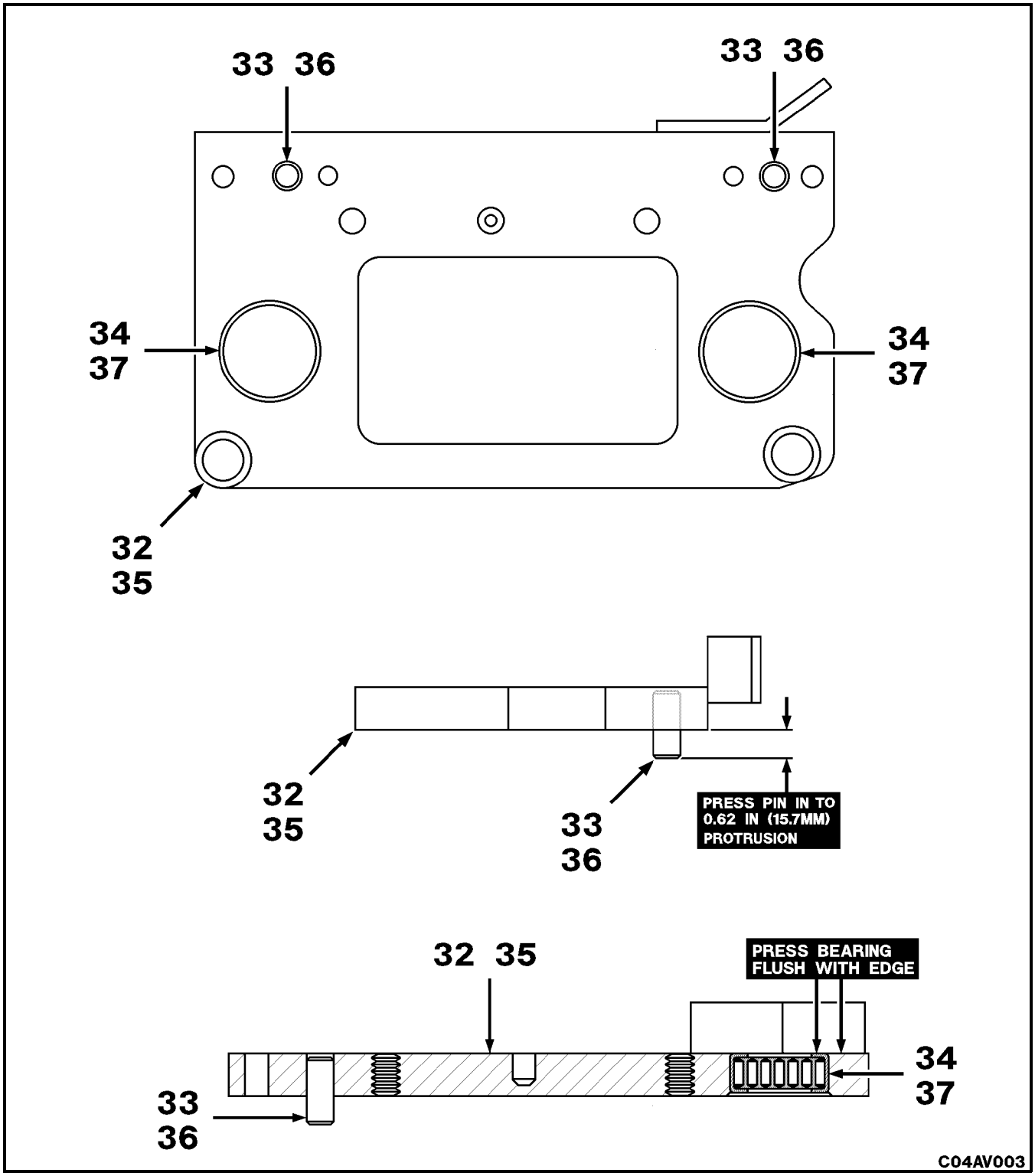




EXPLODED VIEW OF STEERING DRIVE SHOES AND LEVERS



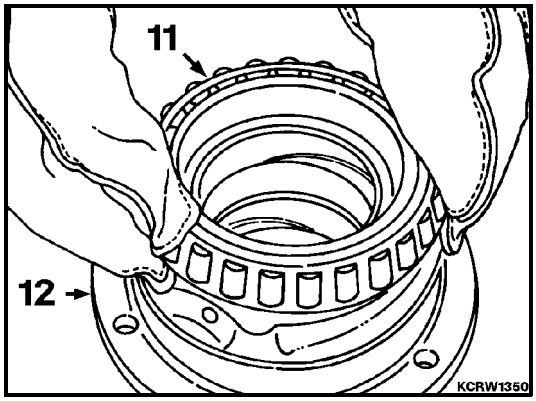
CROSS SECTION VIEW OF BRAKE CYLINDER



SECTION VIEW OF CYLINDER PLATE

32. Left Mounting Plate
33. Dowel Pin
34. Needle Bearing
35. Right Mounting Plate
36. Dowel Pin
37. Needle Bearing

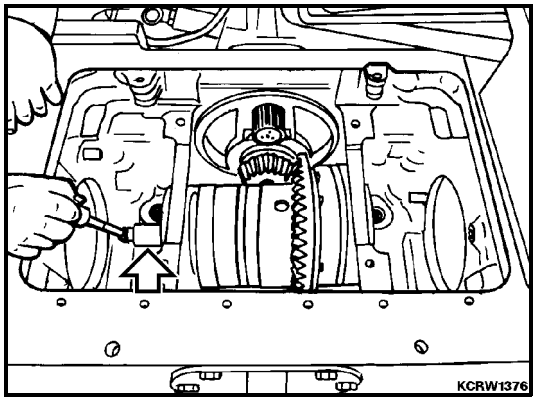
8. Heat bearing cone (11) to 135°C (275°F) for 45 minutes. Install on bearing carrier (12) and bottom. To insure cone is seated, keep pressure against cone until it cools.



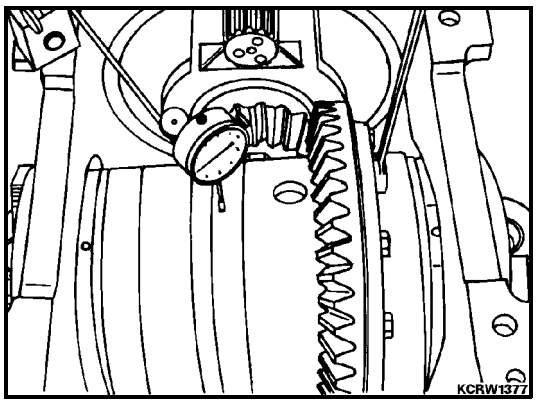
REMARK

For installation of brake carrier, refer to REASSEMBLY and follow steps from brake carrier installation to end.

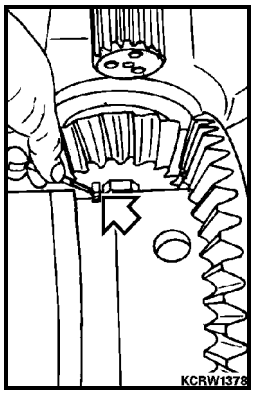
19. From left side, preload carrier bearings by torquing mounting fixture to 34 N•m (25 lbf ft). Let off loading fixture mounting bolts (two each side). Remove hoist and sling.



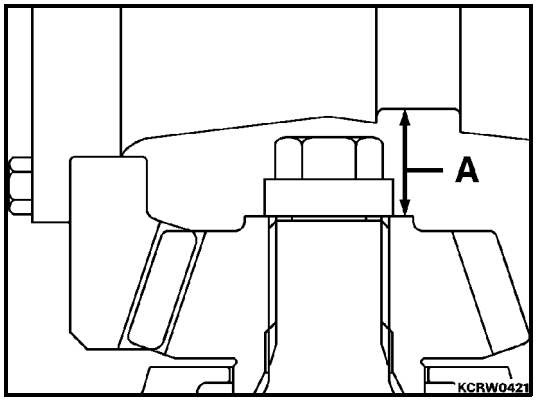
20. Position dial indicator on machined bevel gear carrier surface and determine distance between extremes of eccentricity. Maximum permissible 0.254 mm (0.010 in) TIR (total indicator run out).



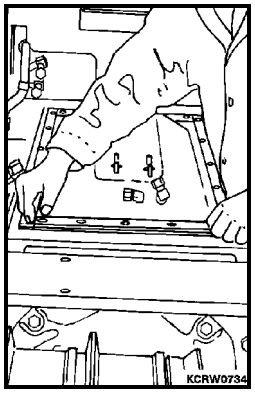
21. Measure and record distance between face of pinion gear to ring gear carrier machined groove. Add or subtract mounting shims to bring pinion gear within dimension etched on face, recorded in Step 14, within 0.025 mm (0.001 in). Torque trans mounting bolts to 352 to 406 N•m (260 to 300 lbf ft).

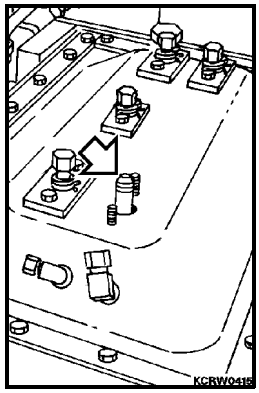


D32E-1, D32P-1, D38E-1 or D38P-1



72. Install front, back and side stiffeners and secure with hardware. Remove aligning studs and install remaining hardware. Torque bolts to 55 N•m (41 lbf ft).

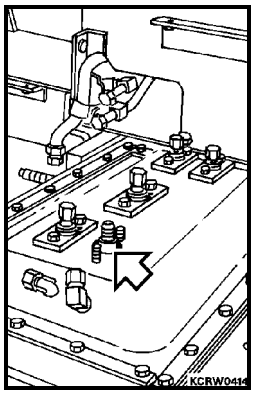


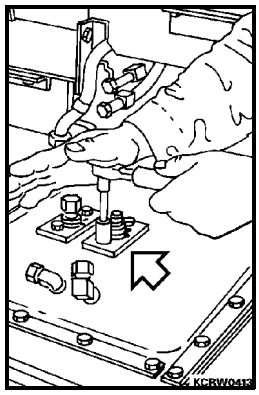


73. Install long connector, with new o-ring, to cylinder port.

74. Install boot down over connector against cover.

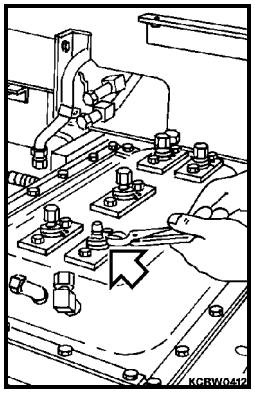
75. Install seal flange and secure with hardware. Torque lock nut to 16 to 20 N•m (12 to 15 lbf ft).



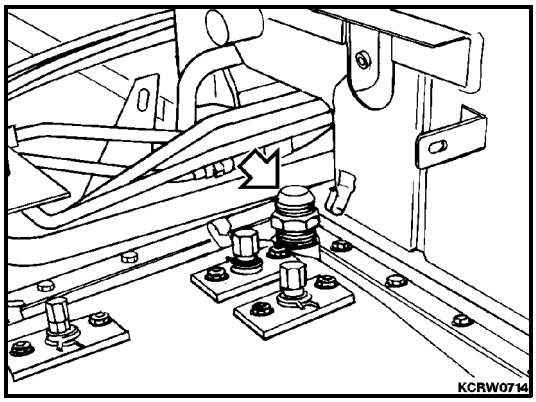


76. Using lock ring pliers, install ring over boot and under lip.

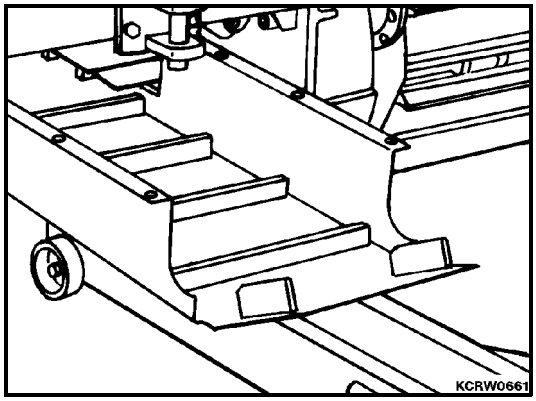
    Repeat at four remaining spots.



77. Install lower filler tube.



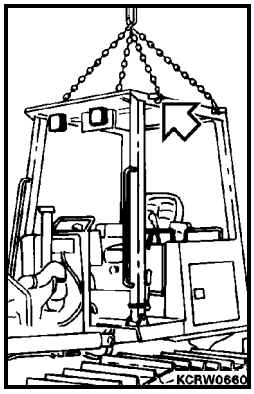
42. Using a rolling floor jack, install transmission guard to machine and secure with hardware. Torque bolts to 92 N•m (70 lbf ft) ±10%.



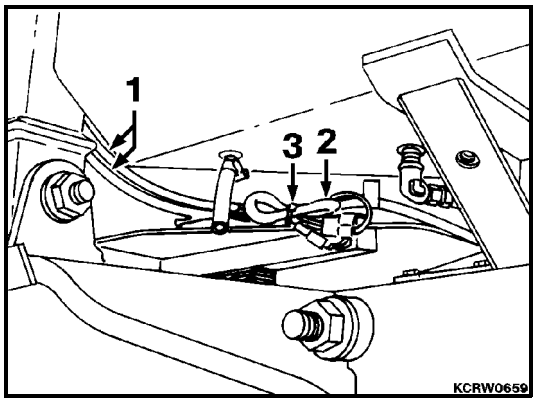
43. Using hoist, install ROPS on machine securing with hardware (nuts inward) and torque to 822 ±47 N•m (605 ±35 lbf ft).

REMARK

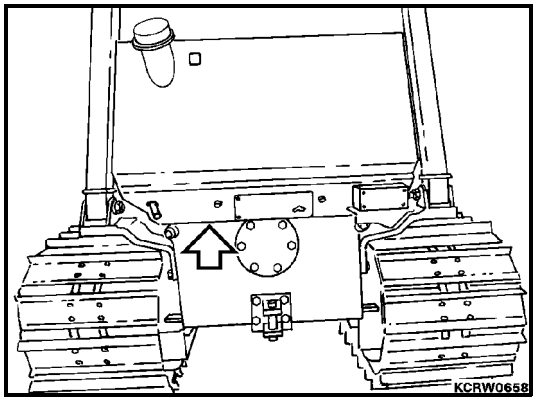
For a machine equipped with a cab, see Section 13 for cab reassembly.



44. Connect front and rear light harness (1) to main harness (2). Tie strap (3) and insert in clip.



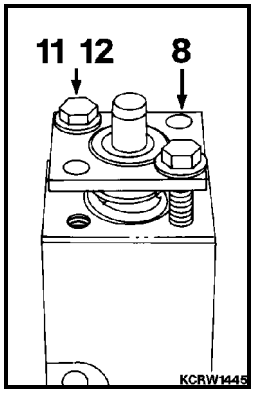
45. Position rear cover in place and secure with hardware. Torque bolts to 92 N•m (70 lbf ft) ±10%.

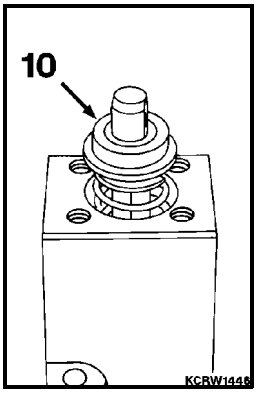


DISASSEMBLY

REMARK
Callouts from exploded and cross section views correspond with callouts in following steps.

1. Remove two end cover bolts (11) and washers (12) across from each other. Install longer bolts in place. Remove remaining two end cover bolts. Slowly loosen two longer bolts until all spring tension is relieved. Remove end cover (8).



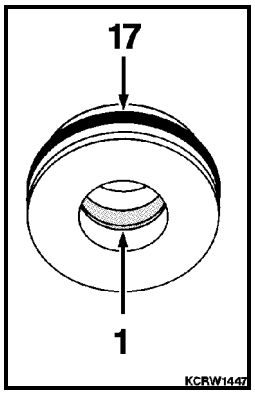


⚠ WARNING

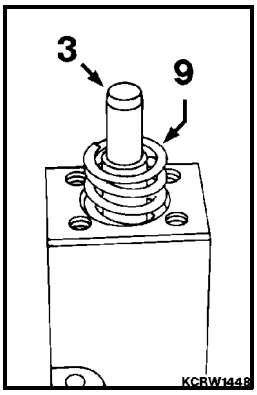
Spring loaded assembly. Use extreme caution when disassembling.

2. Remove seal retainer (10) from spool.

3. Remove spool wiper (1) and o-ring (17) from retainer (10) and discard.

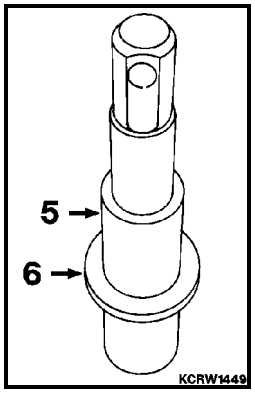


4. Remove return spring (9) and spool (3) from valve body.

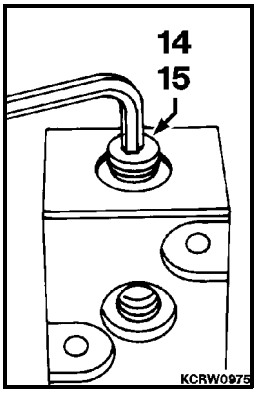


REMARK
Check spring for damage and fatigue against those values listed in SPECIFICATIONS.

5. Remove spool stop (5) and retainer washer (6) from spool.

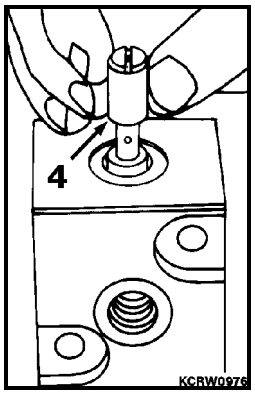


6. Remove end plug (14) and o-ring (15) from valve body.



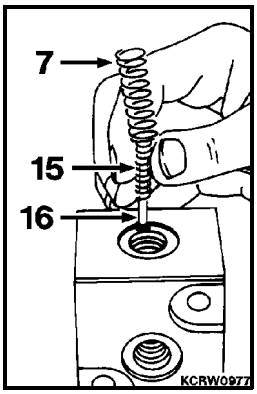
7. Remove metering spool (4) from valve housing.

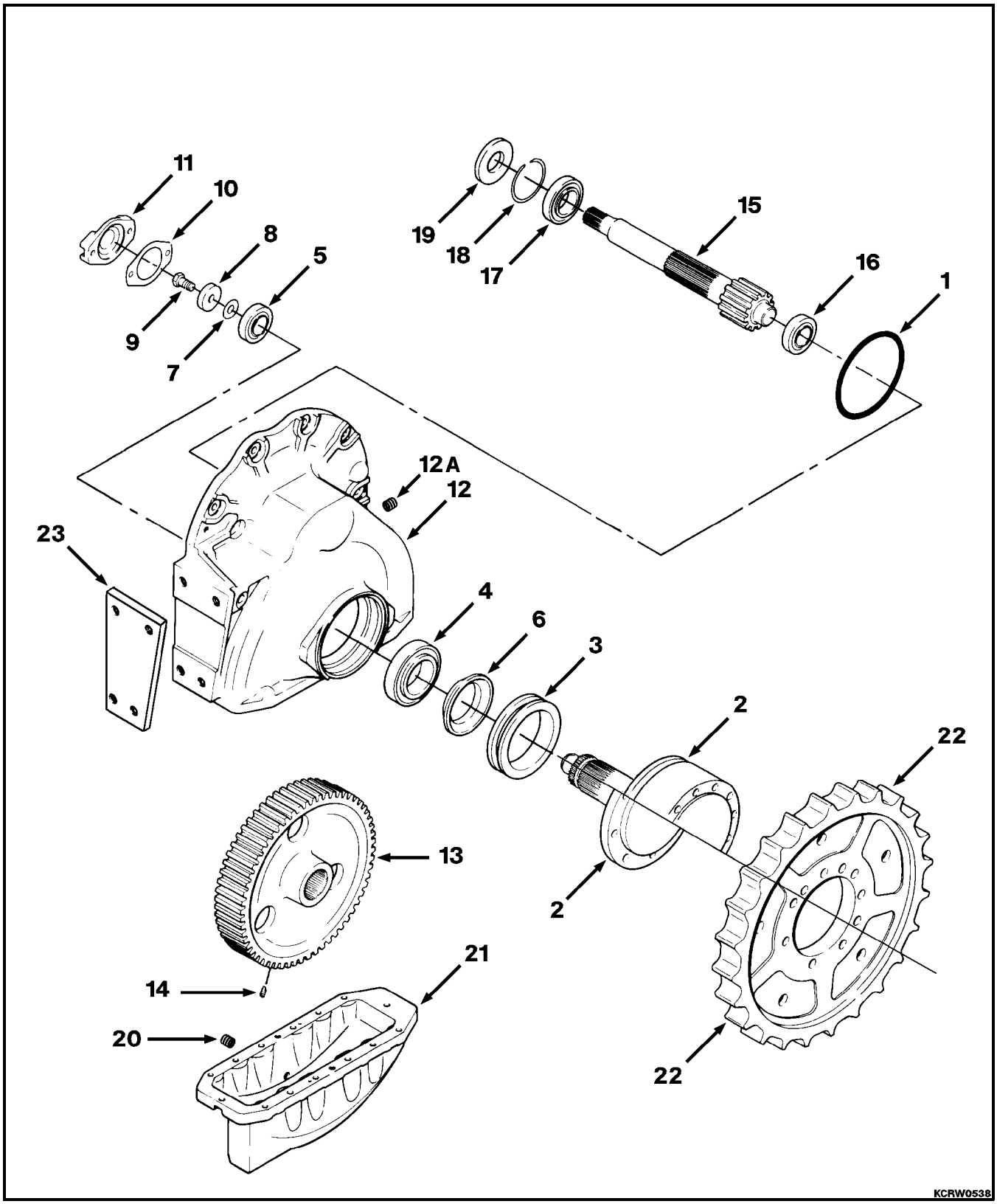
8. Remove inner (15), outer (7) metering springs and spring guide (16) from valve housing.



REMARK
Check spring for damage and fatigue against those values listed in SPECIFICATIONS.

9. If not already done, discard all o-rings and seal and replace with new. Clean all parts in solvent and dry thoroughly with compressed air. Inspect valve body wall, and spool for wear, scoring, scratches or grooves that may cause seal kit failure. Very slight scratches can be polished out with a fine emery cloth and oil so a smooth surface is presented to new seals. Inspect all parts for cracks and breakage and replace as necessary.





EXPLODED VIEW OF FINAL DRIVE

1. O-Ring
2. Carrier Shaft
3. Seal
4. Outer Bearing
5. Inner Bearing
6. Spacer
7. Shim
8. Washer
9. Bolt
10. Gasket
11. Cover
12. Housing
12a Filler Plug
13. Drive Gear
14. Screw
15. Pinion
16. Outer Bearing
17. Inner Bearing
18. Retaining Ring
19. Oil Seal
20. Drain Plug
21. Bottom Cover
22. Sprocket
23. Spacer Plate
D32E&P D38E&P

D32E-1, D32P-1, D38E-1 OR D38P-1

REMARK

Callouts from exploded view correspond with callouts in following steps

1. Block final drive housing in a horizontal position with rear main frame mating face up. Check height of two mounting studs for 65 mm (2.56 in) dimension. If necessary to install new studs, use Loctite #568 or Plastic Gasket.

2. Assemble studs to housing and set to 65 mm (2.56 in) dimension. If necessary, assemble drive pinion outer bearing cup (16) into housing. Using a driver, tap to seat in housing.

3. Heat drive pinion inner bearing (17) to 135°C (275°F) for 45 minutes and assemble to shaft (15). Tap to seat against shoulder of shaft.

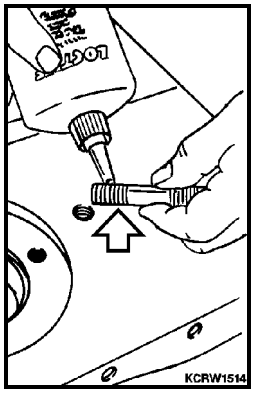
4. Heat drive pinion outer bearing (16) to 135°C (275°F) for 45 minutes and assemble to shaft (15). Tap to seat against shoulder of shaft.

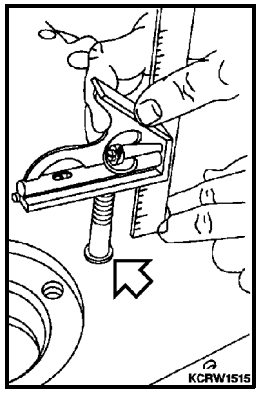
5. Prelube drive pinion bearings and set shaft (15) into outer bearing cone.

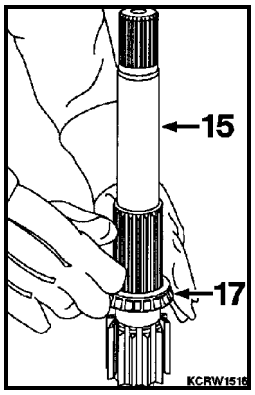
6. Using driver, install inner bearing cup until a slight resistance to rotation is felt.

7. Attempt to insert 2.769 mm (0.109 in) retaining ring (18). If possible to insert ring, bump cup back against ring with slide hammer. If shaft rotates freely assembly is complete.

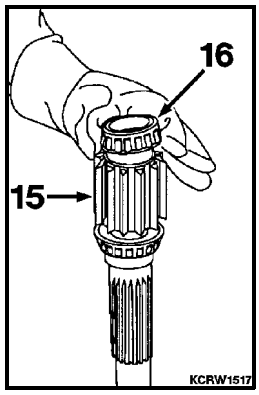
8. Position indicator against hose clamp assembled to shaft. Set to zero. Insert pry bar between housing and shaft. Pry shaft upward from within housing to determine end play. Observe and record reading. Repeat two or three times and average readings. Required end play is 0 to 0.229 mm (0 to 0.009 in). If end play should exceed 0.229 mm (0.009 in) with 2.769 mm (0.109 in) retaining ring, install 2.972 mm (0.117 in) ring and bump cup back against ring. If 2.769 mm (0.109 in) retaining ring will not fit, or shaft will not rotate freely, install 2.565 mm (0.101 in) retaining ring and bump cup back against retaining ring.


KCRW1514

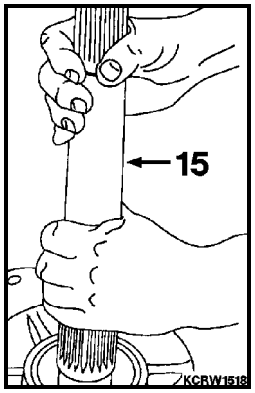

KCRW1515



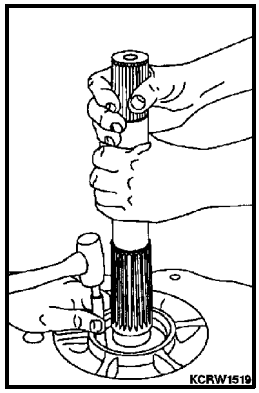
KCRW1516

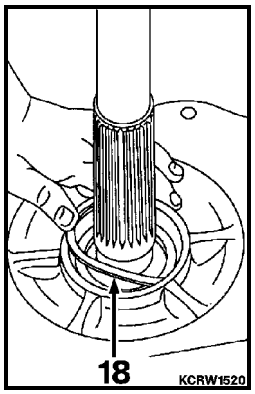


KCRW1517

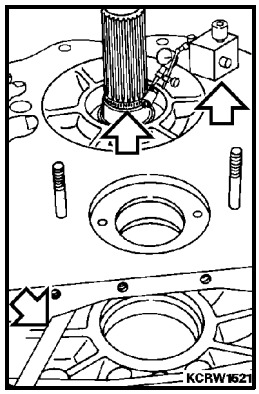


KCRW1518

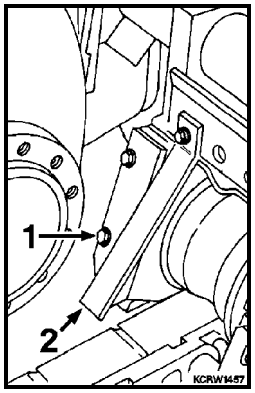

KCRW1519



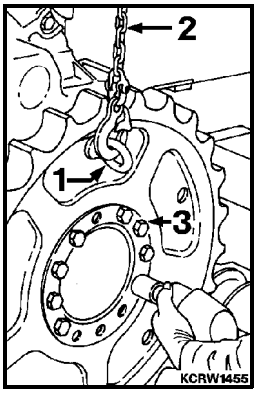
KCRW1520


KCRW1521

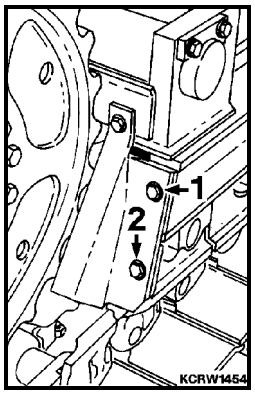
9. Install inner rock deflector (2) and bolts (1) and torque to 267 N•m (195 lbf ft).



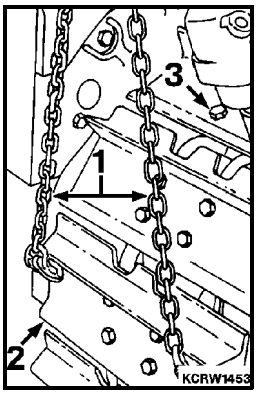
10. Attach eye bolt (1) to hole in sprocket, attach hoist (2) and install sprocket to carrier. Install bolts (3) and torque to 455 N•m (335 lbf ft). Remove eye bolt.



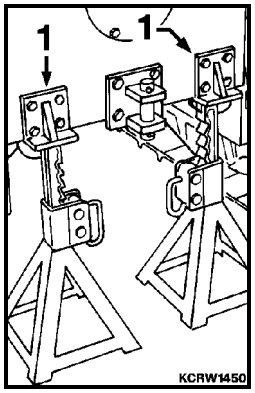
11. Install outer rock deflector (2) and bolts (1) and torque to 267 N•m (195 lbf ft).



12. Attach hoist (1) to front section of track chain, pull chain to rear and position split link over sprocket. At least two links should contact sprocket. Reattach hoist to other section of chain, raise chain to engage and align split link. Install track shoe (2) and bolts (3). Liberally lubricate bolts with engine oil or chassis grease. Torque bolts to value given in SECTION 15.



13. Raise machine to clear blocking, remove, and lower machine to ground. Fill final drive with oil and adjust track chain, refer to OPERATION & MAINTENANCE MANUAL.



Cylinder Drift Test

The problem of cylinder drift can be traced to two main causes, internal or external leakage. External leakage is not detailed here, since it can be visually located. Internal leakage is not always readily pin pointed to its source and may require a series of tests to isolate the problem.

There are two places that might be a source of internal leakage; the cylinders might have leakage past the piston packing and the control valve could leak at the spool.

Following is a series of tests developed to trace the source of internal leakage. Oil must be at operating temperature.

1. Fully raise the blade, move the blade lift lever to the lower position releasing it to hold before the blade drops to the ground. Check for cylinder drift. The piston rod should not travel out of the cylinder at more than 16 mm (0.625 in) per minute.

   REMARK
   The 16 mm (0.625 in) per minute figure represents accumulative allowable loss of control valve and cylinders combined.

2. If the cylinder drift is less than 8 mm (0.3125 in) per minute, proceed to CYLINDER TIME CYCLE.

3. If the cylinder drift is more than 8 mm (0.3125 in) per minute, proceed with step 4.

4. Lower the blade and install a shut off valve at the raise port of both cylinders. Fully raise the blade, close the shut off valves and check for drift.

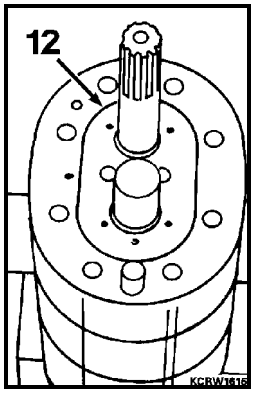
   A. If the cylinder drift is more than 3.2 mm (0.125 in) per minute, the cylinder is at fault.

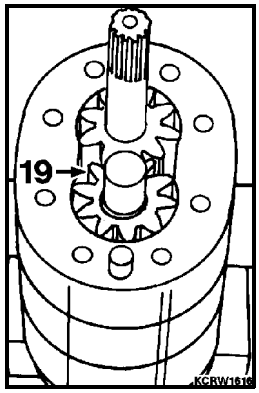
   B. If the cylinder drift is less than 3.2 mm (0.125 in) per minute, the control valve is at fault.

5. When the preceding tests are completed, remove the shut off valves. Vent the hydraulic system and add oil as necessary. Refer to the OPERATION & MAINTENANCE MANUAL. Visually check for oil leakage.

16. Remove front diaphragm (12).

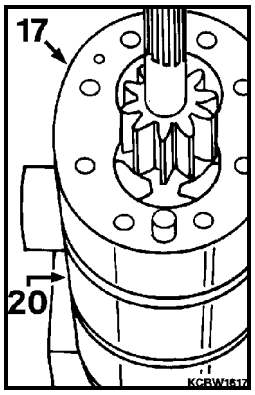
17. Remove idler gear and shaft (19).

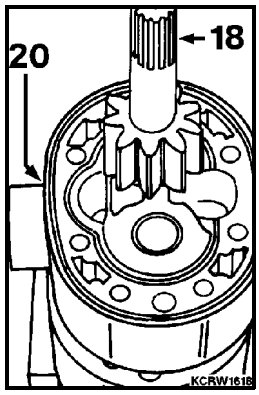




18. Tap on front housing (17) and center housing (20) to loosen from dowel pins. Remove front housing.

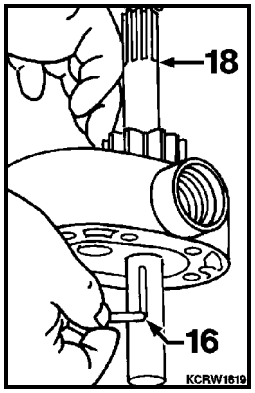
19. Remove center housing (20) with drive gear and shaft (18). Keyed rear gear will most likely stay with assembly.

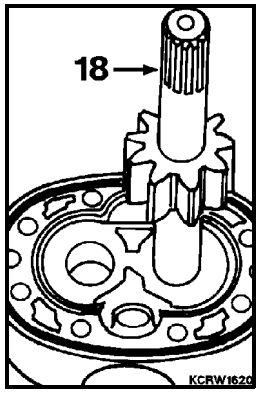




20. Remove key (16) from drive gear and shaft (18).

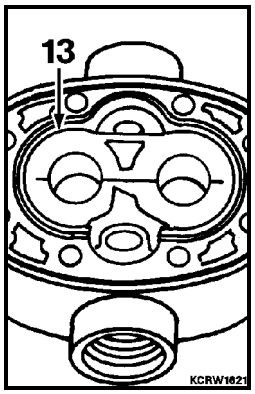
21. Remove drive gear and shaft (18) from center housing.

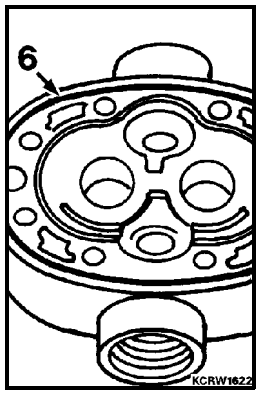




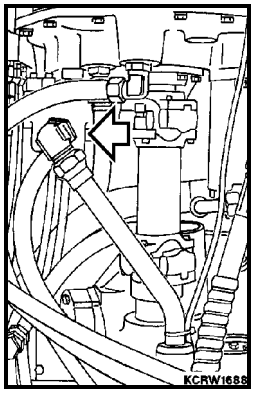
22. Remove thrust plate (13) from center housing.

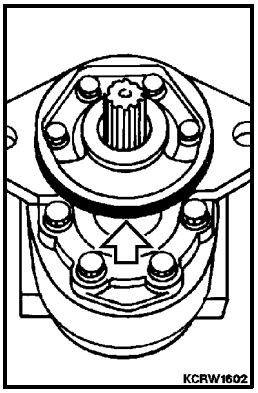
23. Remove section o-ring (6).





6. Disconnect and cap lines at top and bottom of pump and allow pump to drain into suitable container. Remove hardware and lift pump out of machine.





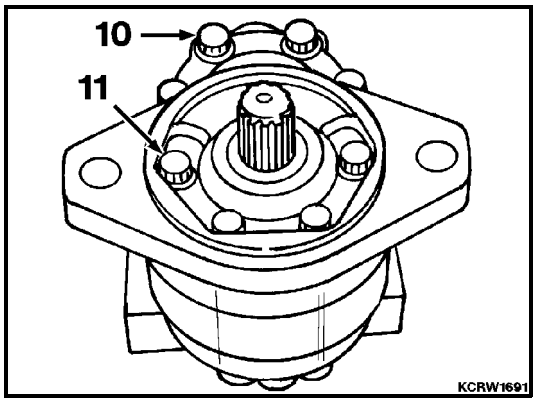
DISASSEMBLY

REMARK

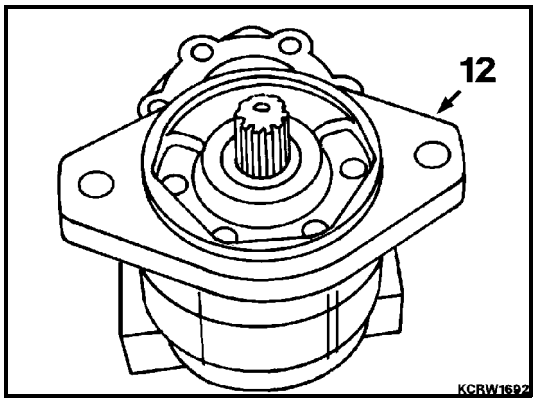
Callouts from exploded and cross section views correspond with callouts in following steps.

1. Remove and discard mounting o-ring and replace with new.

2. Thoroughly clean pump before disassembly. Match mark sections of pump as shown. Remove mounting bolts (10 and 11).

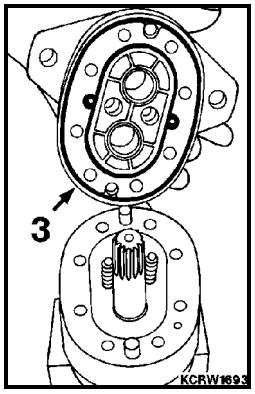


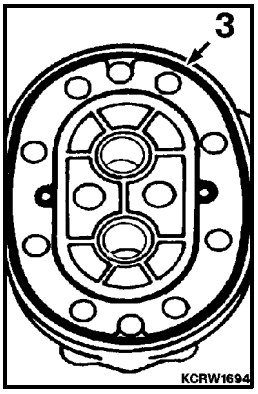
3. Tap on front plate (12) to loosen from dowel pins.



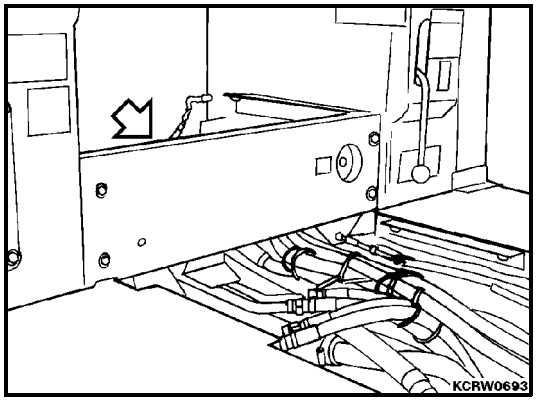
4. Remove front plate (12) from assembly.

5. Remove section o-ring (3) from front plate.



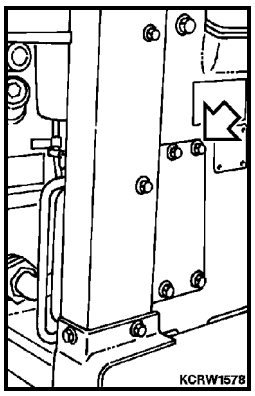


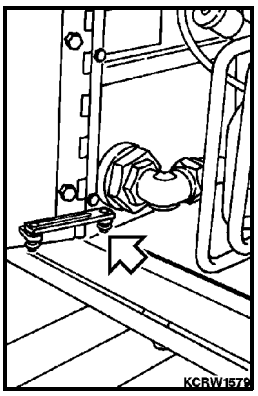
15. Remove hardware and seat support from machine.



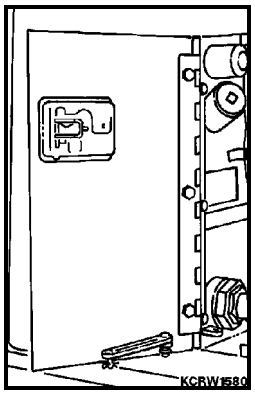
16. Remove right front access cover.

17. Open reservoir door. Disconnect door lock from inside cavity.

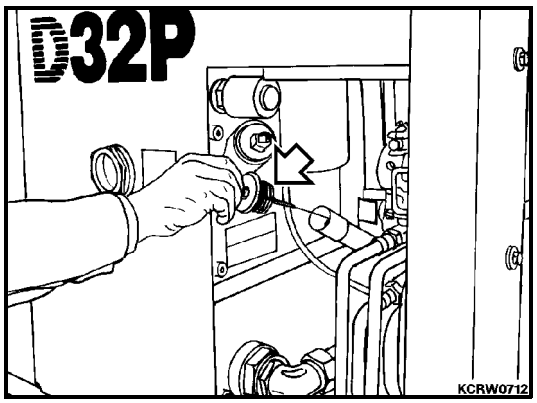


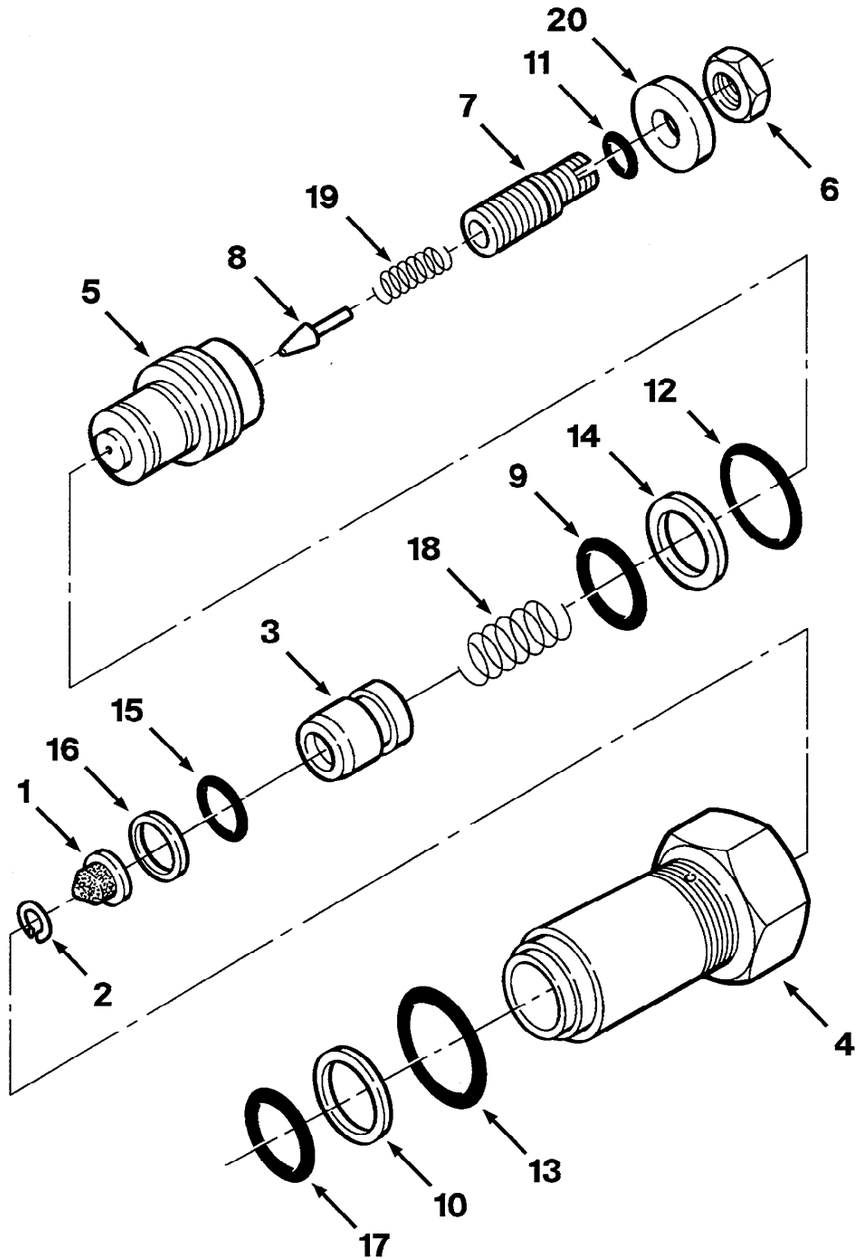


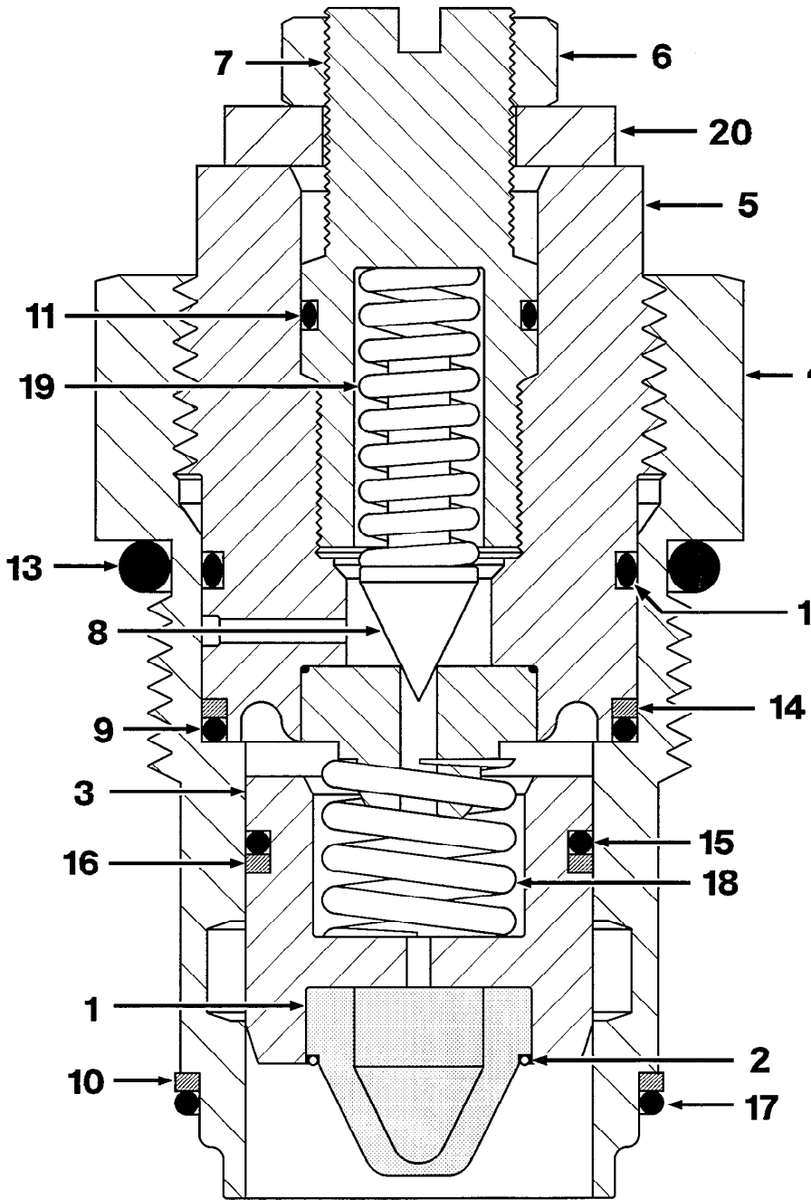
18. Remove door hinge inside mounting hardware and lift door from machine.



19. Remove drive train dipstick.

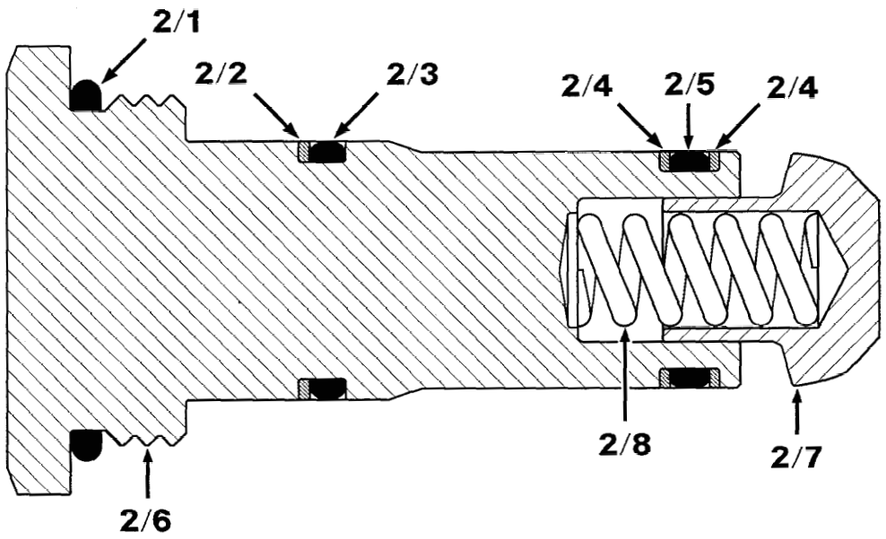


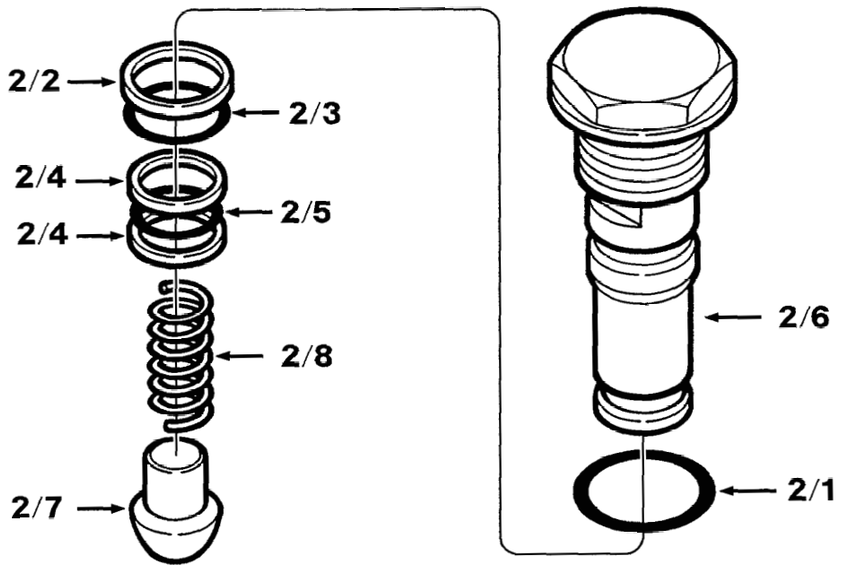


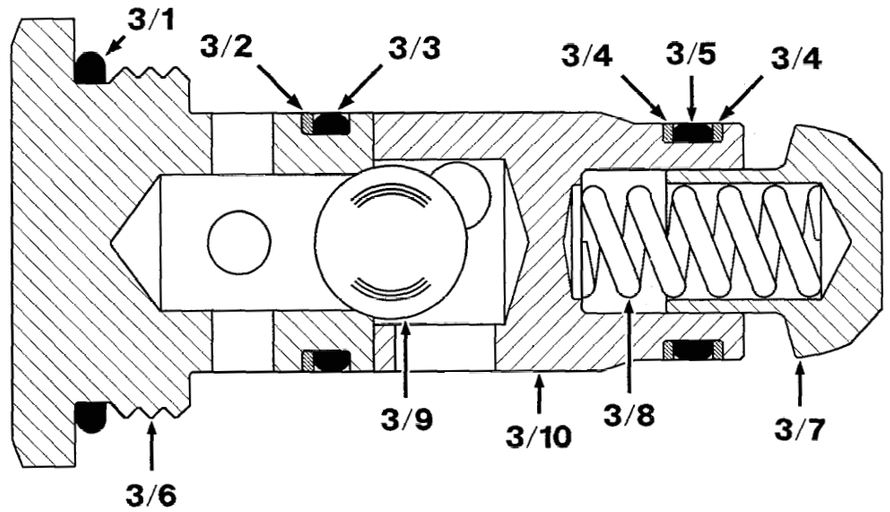


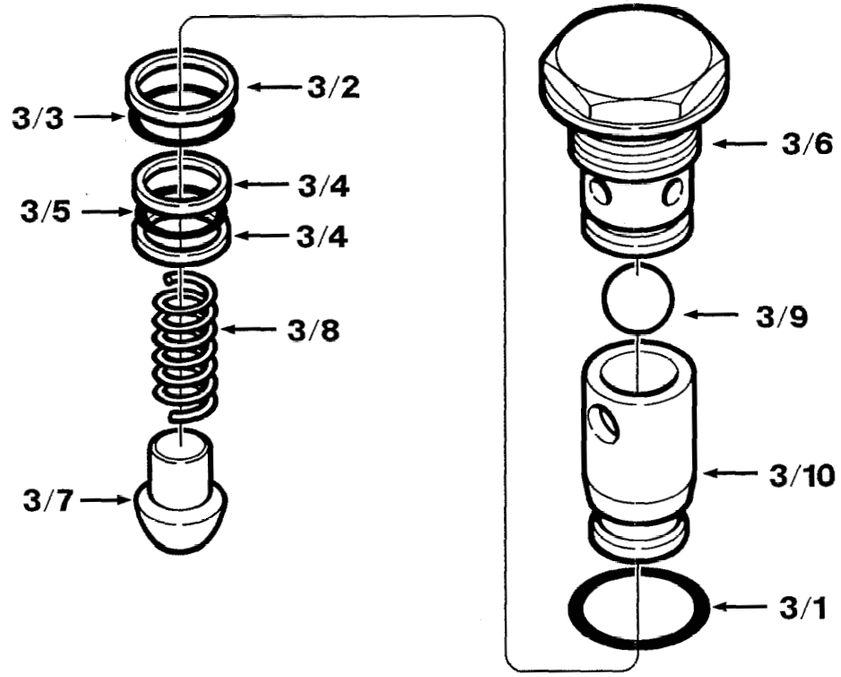
1. Filter Screen
2. Retaining Ring
3. Main Poppet
4. Valve Body
5. End Cap
6. Jam Nut
7. Adjusting Screw
8. Pilot Poppet
9. O-ring
10. Back Up Ring
11. O-ring
12. O-ring
13. O-ring
14. Back Up Ring
15. Back Up Ring
16. O-ring
17. O-ring
18. Main Poppet Spring
19. Pilot Poppet Spring
20. Flat Washer

KCRW1826









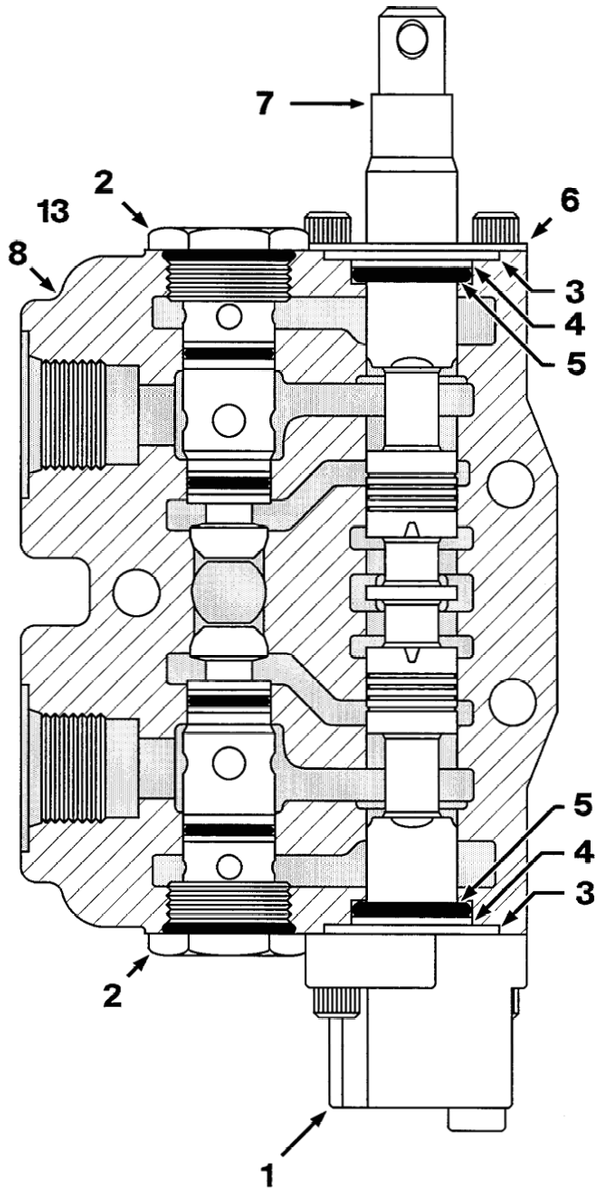
LOAD CHECK VALVE

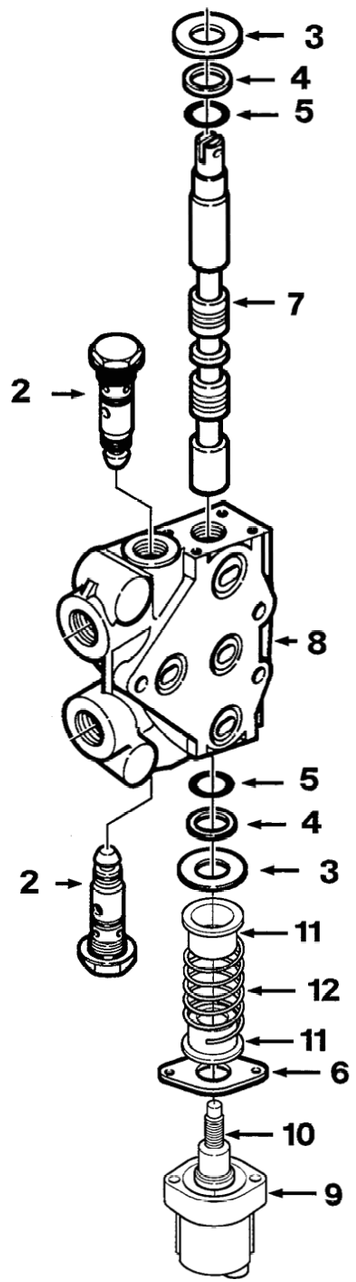
2/1. O-ring Seal
2/2. Back Up Ring
2/3. O-ring Seal
2/4. Back Up Ring
2/5. O-ring Seal
2/6. Valve Ball Body
2/7. Check Poppet
2/8. Poppet Spring

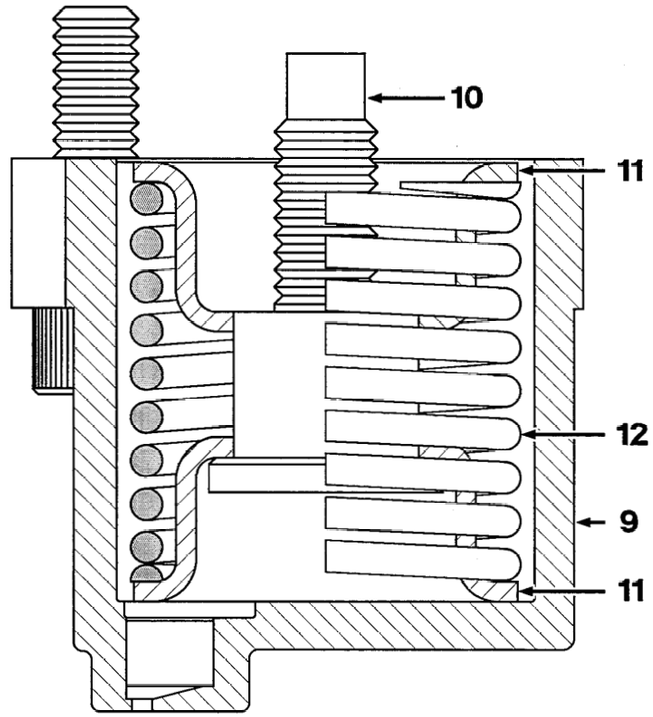
ANTI-CAV VALVE

3/1. O-ring Seal
3/2. Back Up Ring
3/3. O-ring Seal
3/4. Back Up Ring
3/5. O-ring Seal
3/6. Check Ball Body
3/7. Check Poppet
3/8. Poppet Spring
3/9. Check Ball
3/10. Ball Retainer

KCRW1828





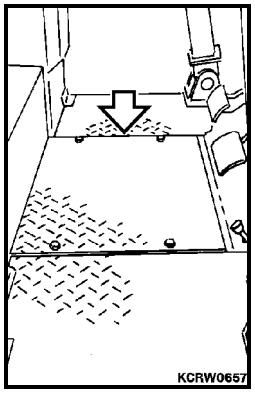


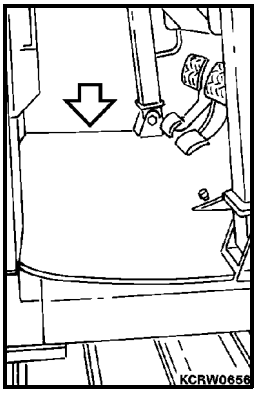
1. Spool Positioner
2. Anti- Cav Valve
3. Seal Retainer
4. Back Up Ring
5. O-ring Seal
6. Retainer Plate
7. Section Spool
8. Valve Body
9. Spool Housing
10. Spool Collar
11. Spring Retainer
12. Centering Spring
13. Orifice Vent

KCRW1830

47. Install operators compartment floor plate. Torque bolts to 38 N•m (28 lbf ft) ±10%.

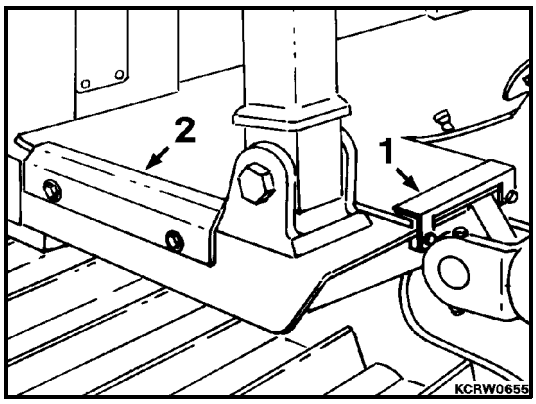
48. Install floor mat.





49. Install front (1) and side (2) floor mat retainer angles at each side of machine. Torque bolts to 38 N•m (28 lbf ft) ±10%.

50. Fill hydraulic reservoir, refer to OPERATION & MAINTENANCE MANUAL. Adjust system relief valve per SECTION 10.

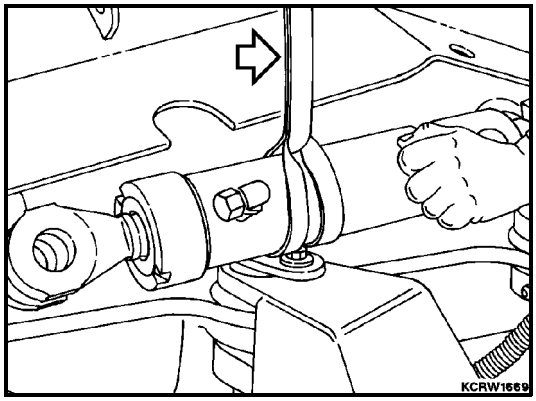


INSTALLATION

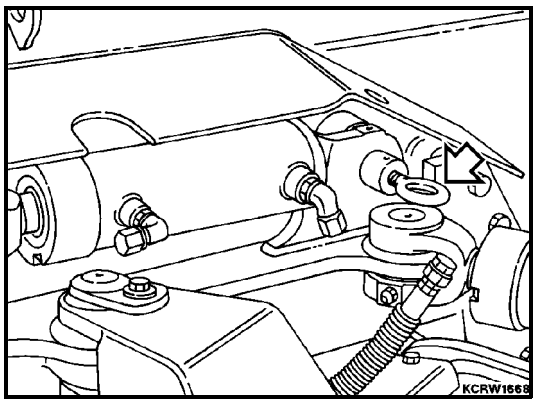
REMARK

Installation of cylinders are similar with tilt cylinder shown.

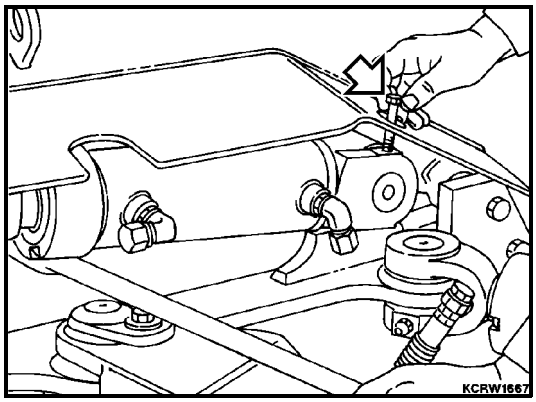
1. Using hoist and sling, position cylinder in place on machine.



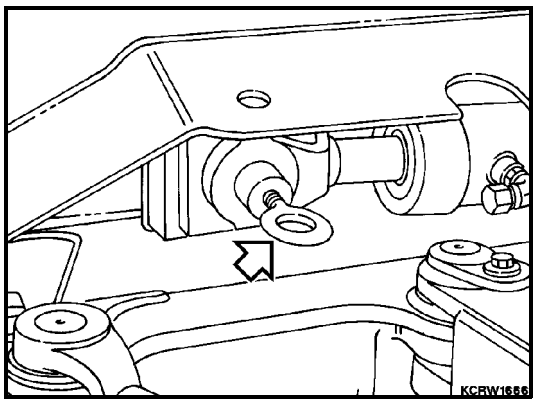
2. Install mounting pin using eye bolt to align anchor bolt mounting holes.



3. Install anchor bolt and secure with nut. Torque bolt to 60 N•m (45 lbf ft) ±10%.



4. Install mounting pin using eye bolt to align anchor bolt mounting holes.



SECTION 12

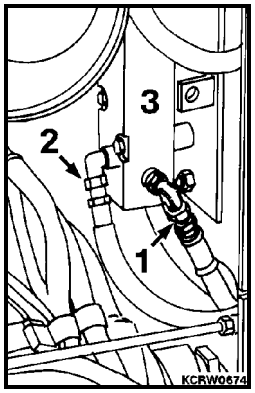
WARNING

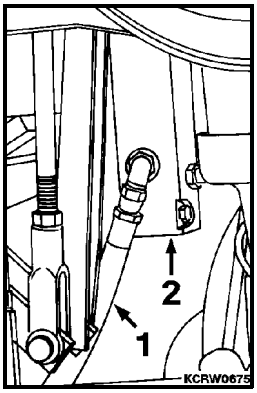
Refer to, read and follow all safety precautions in SECTION 1. Failure to do so may result in serious injury or death.

REMARK
Tag, cap and plug all disconnected hoses, tubing and fittings.

32. At left side, disconnect two hoses (1 and 2) at foot brake valve (3).

33. At right side, disconnect remaining hose (1) at foot brake valve (2).

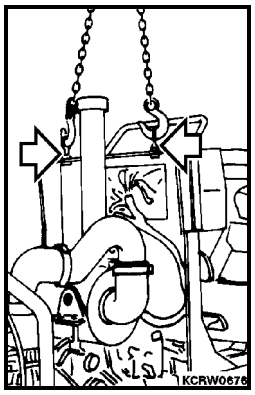


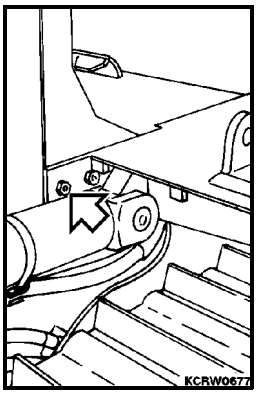


34. Install two ½NC eye bolts to dashboard and attach chain and hoist.

35. Remove three mounting bolts from each side and lift dashboard from machine.

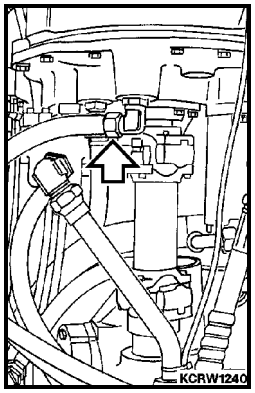
REMARK
On some models there will be shims between dashboard and main frame. Keep shims with sides they were removed from.

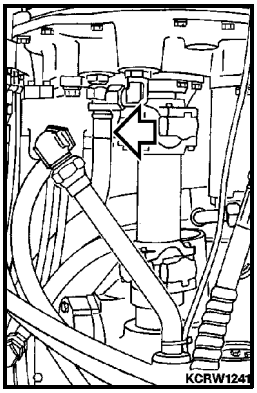




36. Disconnect, cap and plug converter inlet hose at torque converter.

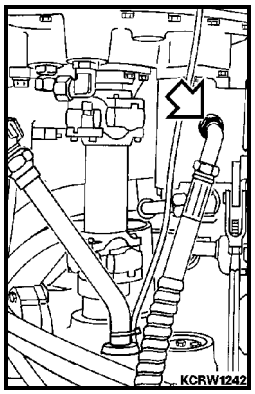
37. Disconnect, cap and plug converter drain hose at torque converter.

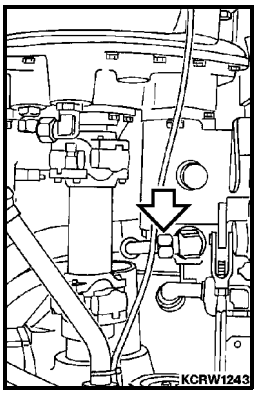




38. Disconnect, cap and plug pump to filter hose at front port of charge and scavenge pump.

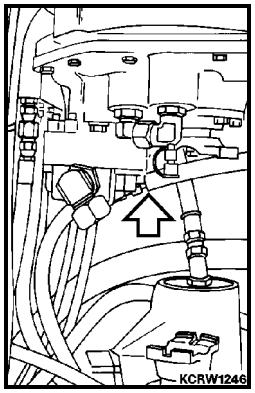
39. Disconnect, cap and plug pump to rear main frame hose at rear port of charge and scavenge pump.

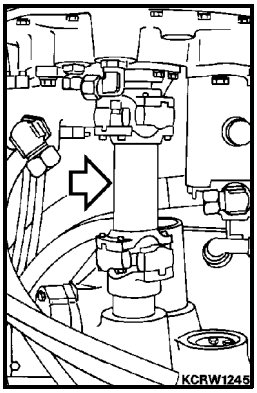




20. Connect pump to equipment valve hose to bottom port of equipment pump.

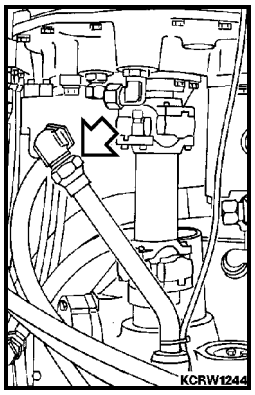
21. Install drive shaft with mounting hardware. Torque D32E-1, D32P-1, D38E-1 or D38P-1 bolts to 33 N•m (24 lbf ft). Torque D39E-1 or D39P-1 bolts to 57 N•m (42 lbf ft).

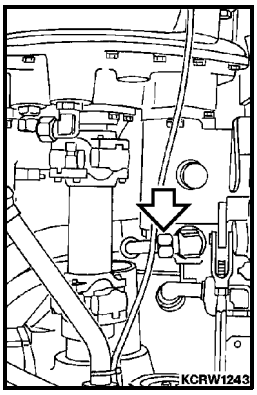




22. Connect front half of reservoir to pump hose to top port of equipment pump.

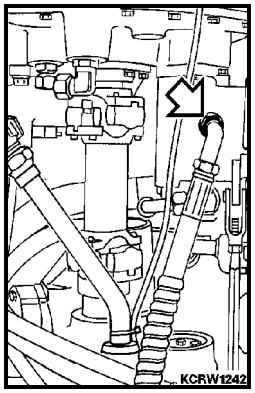
23. Connect pump to rear main frame hose to rear port of charge and scavenge pump.

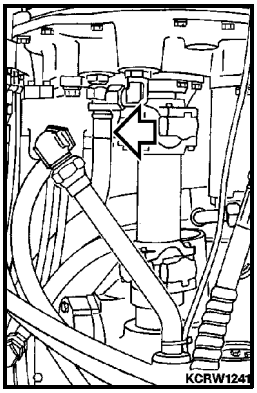




24. Connect pump to filter hose at front port of charge and scavenge pump.

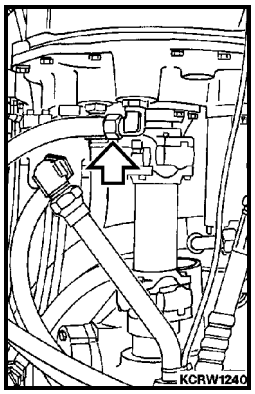
25. Connect converter drain hose at torque converter.

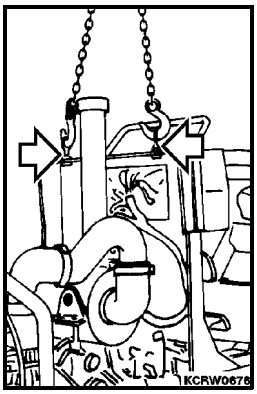




26. Connect converter inlet hose at torque converter.

27. Position dashboard in place. Coat hardware (3 each side) with Loctite #262 and secure with shims. Torque bolts to 92 N•m (70 lbf ft) ±10%.



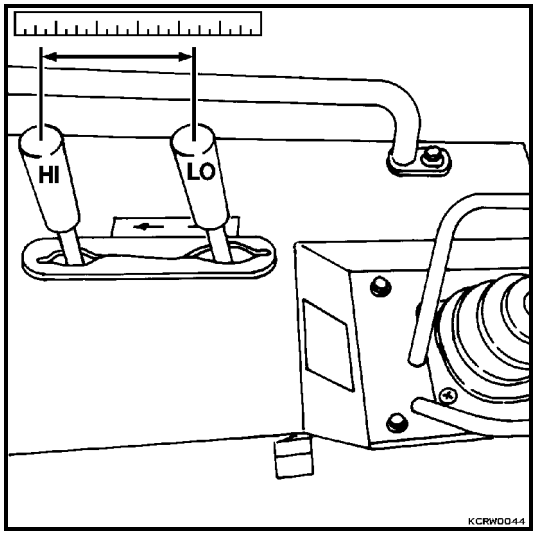


FUEL CONTROL LINKAGE

★ **Measurement Conditions**
- ♦ Engine stopped
- ♦ Safety lock lever in the locked (down) position
- ♦ Mounted equipment lowered to the ground

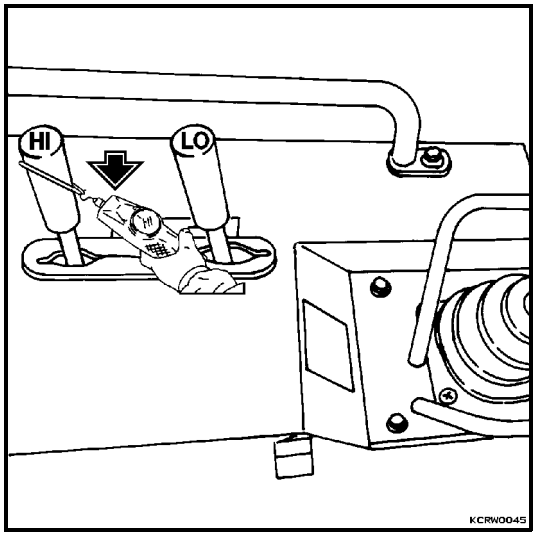
Lever Travel

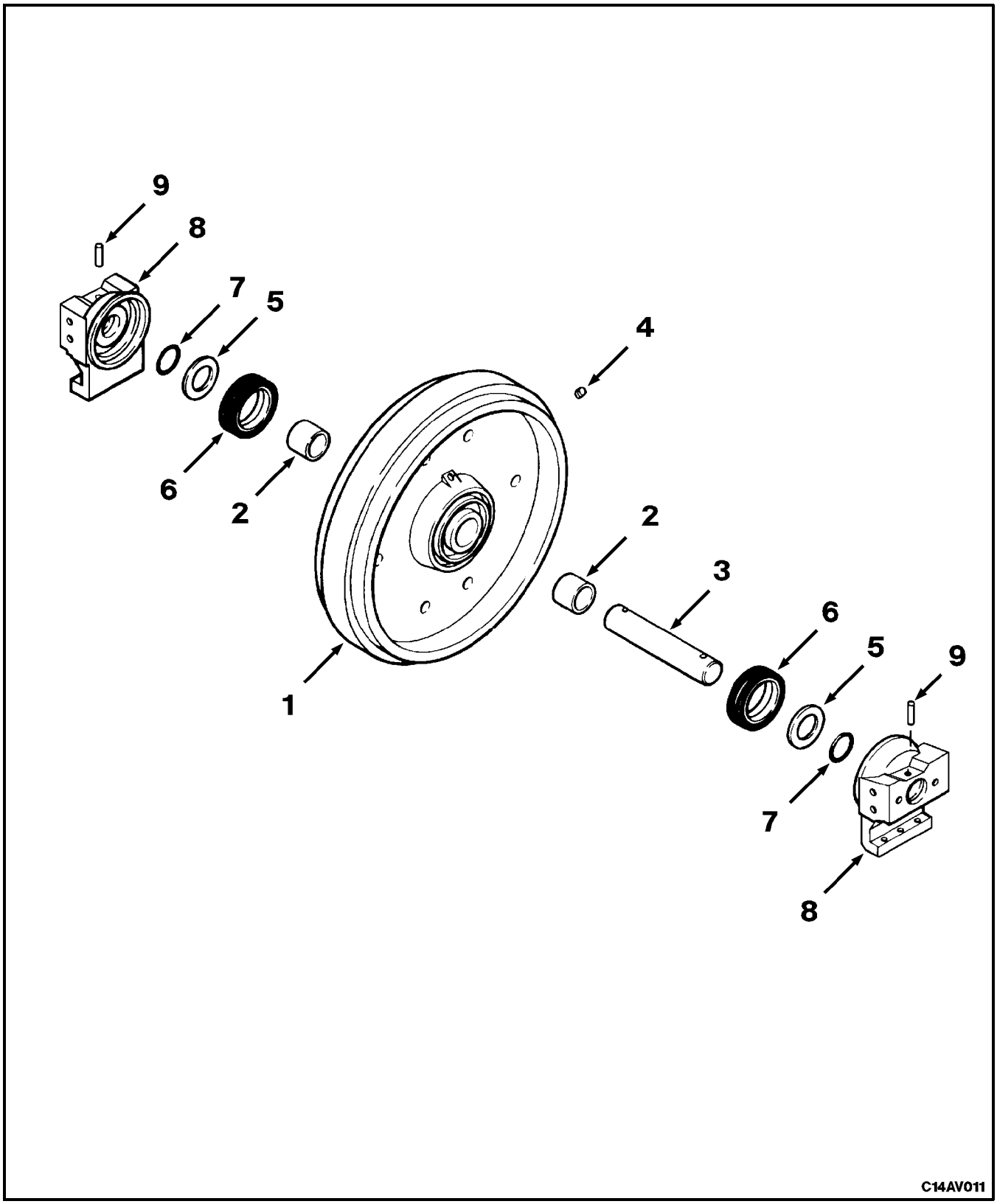
Measure travel distance with scale from low idle to high idle at the center tip of the lever knob.



Lever Effort

Using the push pull scale measure the maximum effort required when moving the lever from low to high idle and high to low idle.



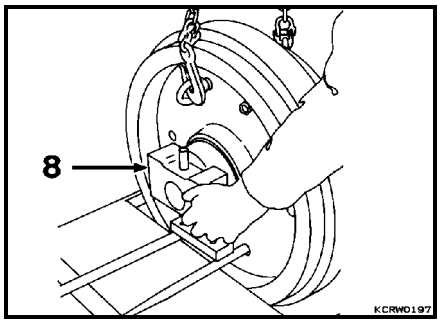


EXPLODED VIEW OF FRONT IDLER

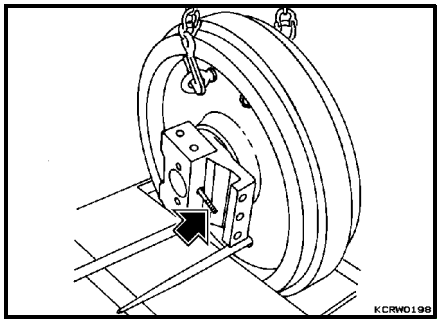
LEGEND FOR EXPLODED AND CROSS SECTION VIEWS

1. Front Idler
2. Bushing
3. Idler Shaft
4. Port Plug
5. Thrust Washer
6. Seal Kit
7. O-Ring
8. Mounting Support
9. Roll Pin

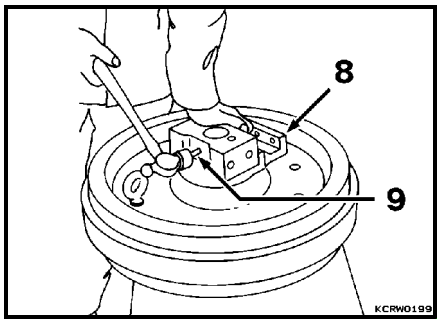
11. Install support (8) onto shaft.



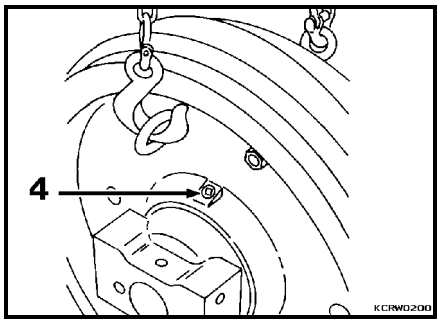
12. Reposition support to shaft and temporarily secure with aligning dowel.



13. Reposition idler as shown. Remove aligning dowel. Press down on support (8) while driving in roll pin (9). This will energize each seal.

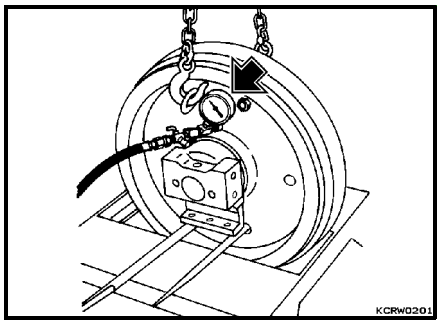


14. Remove filler plug (4).

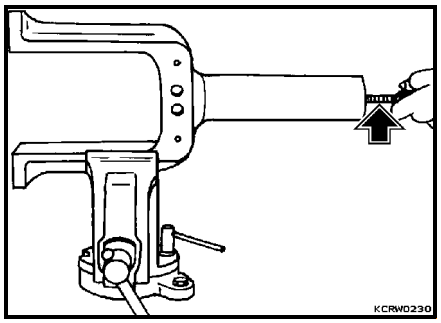


15. Fabricate an air pressure tester and connect to idler at fill plug hole.

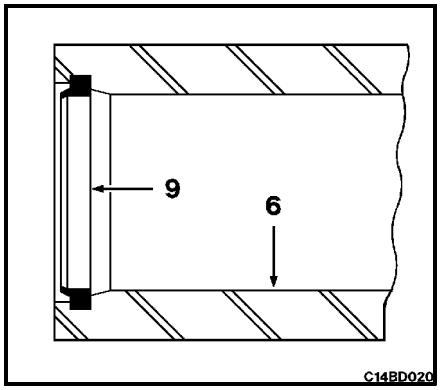
    Slowly apply 21 to 34 kPa (3 to 5 psi) of air pressure to idler. Assembly must maintain this pressure for 10 to 20 seconds with no drop in pressure.



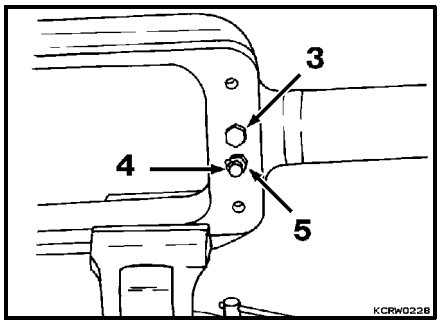
10. Coat piston ring and bore of fork with clean grease. Install a ½NC threaded rod into piston and insert into fork being careful not to cut or slice piston ring on wiper ring groove.



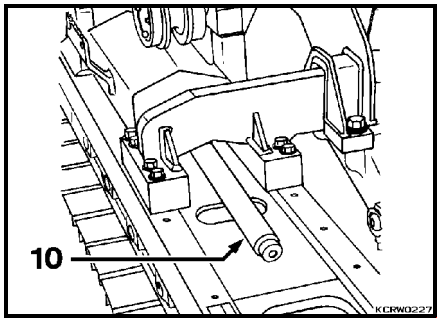
11. Install wiper seal (9) into groove in fork (6) with lips facing out.



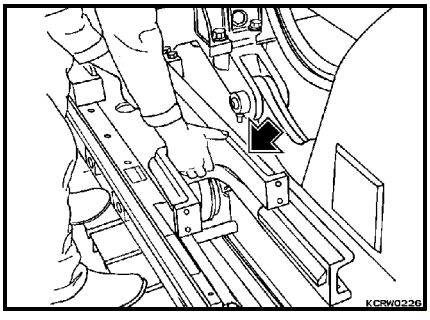
12. Install bleeder plug (3) and check valve (5) with lube fitting (4) to fork. Torque each to 68 N•m (50 lbf ft).



13. Position rod (10) in spring retainer and rest on track frame.

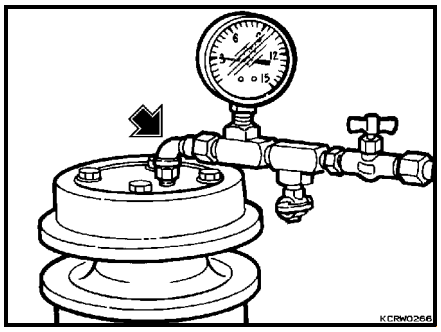


14. Position fork (6) and slide down on adjuster rod being careful not to cut or slice wiper ring.

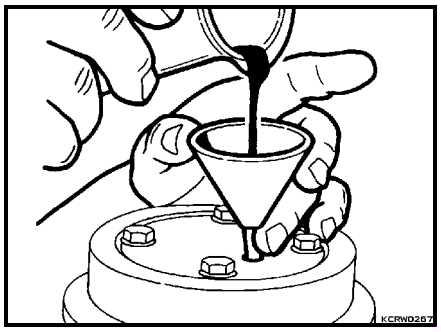


13. Fabricate an air pressure tester and connect to top idler at fill plug hole.

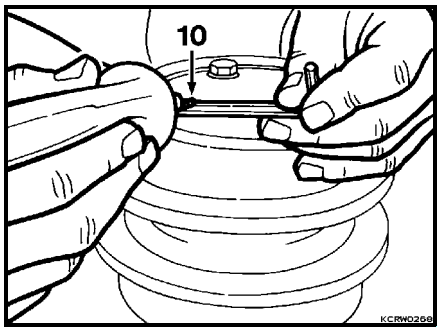
    Slowly apply 21 to 34 kPa (3 to 5 psi) of air pressure to idler. Assembly must maintain this pressure for 10 to 20 seconds with no drop in pressure.



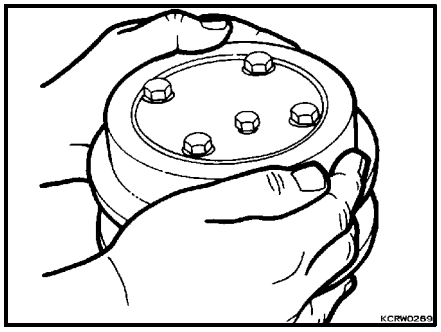
14. Fill top idler with recommended type and quantity of lubricant. Refer to OPERATION & MAINTENANCE MANUAL.



15. Apply Loctite #592 to fill plug (10) and install. Torque plug to 20 to 61 N•m (15 to 45 lbf ft).

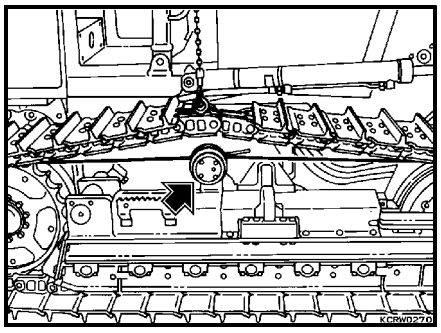


16. Rotate idler 5 to 10 revolutions to distribute lubricant.

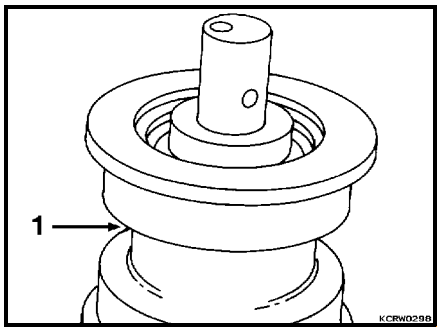


INSTALLATION

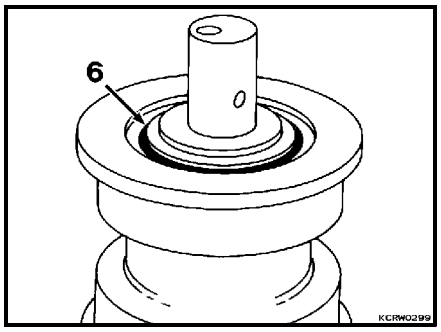
1. Install top idler into support. Run a string between center of front idler and center of sprocket.



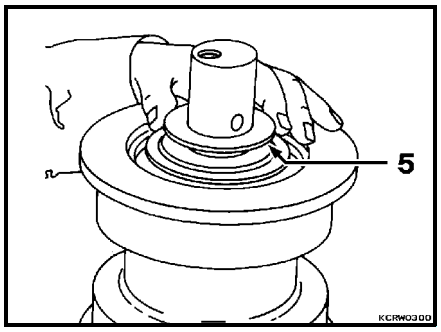
6. Install roller (1) over shaft.



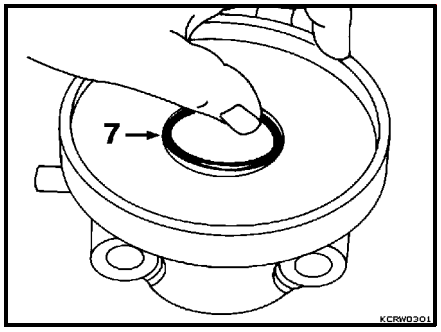
7. Install one half of metal type face seal (6) into roller body. Refer to METAL TYPE FACE SEAL .



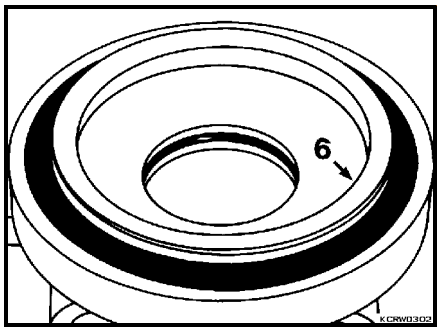
8. Install thrust washer (5) against idler body.



9. Install new o-ring (7) into bracket. Apply a thin coat of #2 MPG to o-ring to aid in installation.



10. Install one half of metal type face seal (6) into mounting bracket. Refer to METAL TYPE FACE SEAL .

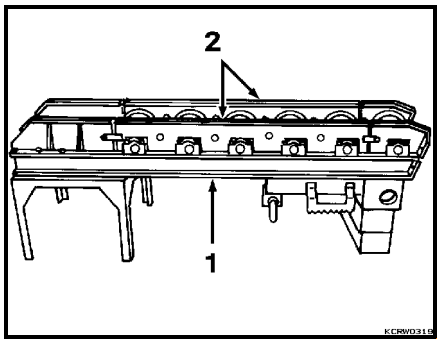


REPLACEMENT

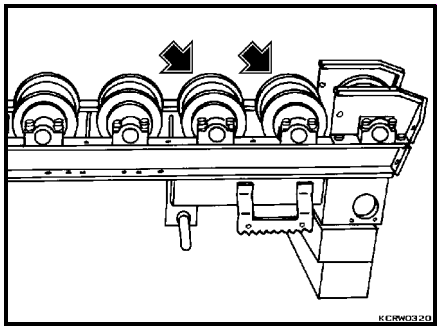
WARNING

Please observe all safety and precautionary standards as dictated by environment and work conditions under which equipment will be inspected, reworked and repaired. Consult SECTION 1 and your Komatsu distributor on any and all questions regarding safety.

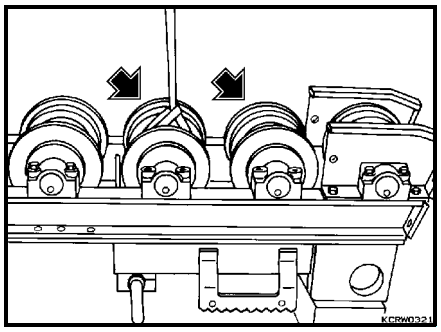
1. Remove track frame from machine as described in this section. Position frame (1) on suitable blocking as shown. Remove track roller shields (2).



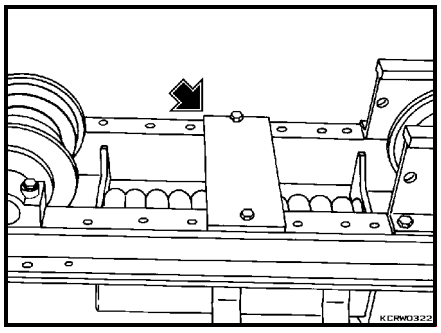
2. Remove hardware from 2nd and 3rd rear track roller.



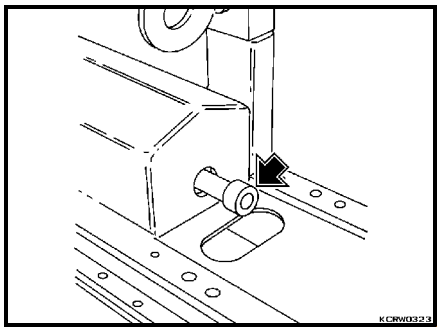
3. Attach hoist and sling to rollers and remove.



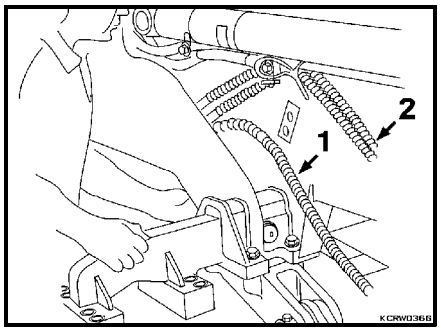
4. Install containment plate, DR11-713-1, between track roller mounting surfaces.



5. Insert spring bolt, DR11-713-2, through housing and spring.

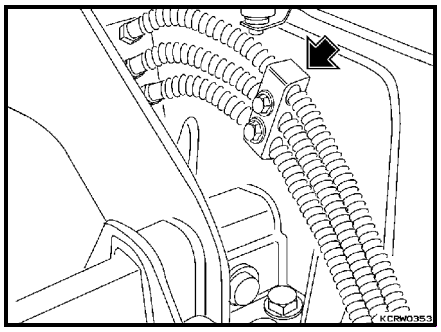


7. On each side of machine, reconnect bottom hose (1) to manifold. Cut loose upper hoses (2).



8. If equipped, on each side of machine, install hose bracket and secure with hardware. Torque bolts to 92 N•m (70 lbf ft) ±10%.

9. On each side of machine, install track frame. Refer to TRACK FRAME in this section.



DESCRIPTION

The interlocking type track chain consists of drop forged heat treated steel links (6 and 7) and drop forged heat treated split links (1, 2, 8 and 9) which are held together by bushings (3) and pins (4) to form a continuous chain. The bushings and pins are press fitted to the links, with the pins pivoting inside of the bushings. The pin has a hollow center which is used as a hydraulic reservoir. A cross drilled passage permits the oil to enter the bushings for lubrication of the pins, bushings and oil seals. The plug (10) retains the oil in the pin. Oil seal (11) seals against lubricant loss and prevents the entrance of contaminants.

The track shoes are mounted to the track links, and are held in place with heat treated dome head bolts with integral washers. The split links are bolted together with longer track shoe bolts to form a continuous chain.

MAINTENANCE

The track links have only one wearing surface which contacts the track rollers, front idler and track idlers. However, it usually becomes necessary to replace pins and bushings before the links wear out, and it is a matter of judgement then whether the links are good enough to justify a new set of pins and bushings. Only the wear on the outside of the bushings is visible. Wear on the pins and interior of the bushings is indicated by track stretch (forward adjustment of the front idler). The amount of wear can be determined by measuring the pitch length of the track (distance between centers of pins) under tension and comparing it with new and maximum allowable pitch lengths listed in SECTION 14. Sprocket wear must also be considered in conjunction with track chain wear.

Wear of the sprocket teeth decreases the pitch length of the sprocket, while wear of pins and bushings increases the pitch length of the track. The results are that the pitch lengths of the sprocket and track becomes more and more out of phase, and the bushings ride higher on the sprocket teeth. Combined wear of sprocket and track should never be allowed to reach this point. Whenever new or rebuilt track chains are installed, the sprocket should also be replaced or interchanged to present the better side of teeth to the bushings. Never remove one link to bring a stretched track to within the range of proper track adjustment. A track that is worn badly enough to take up the length of one link, will be so far out of pitch that the increased wear on the sprocket will far more than offset the saving obtained by the removal of one link in the track chain.