

SERVICE MANUAL

JCB Transmission

EN - 9813/4750 - ISSUE 2 - 12/2017

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Foreword

The Operator's Manual



You and others can be killed or seriously injured if you operate or maintain the machine without first studying the Operator's Manual. You must understand and follow the instructions in the Operator's Manual. If you do not understand anything, ask your employer or JCB dealer to explain it.

Do not operate the machine without an Operator's Manual, or if there is anything on the machine you do not understand.

Treat the Operator's Manual as part of the machine. Keep it clean and in good condition. Replace the Operator's Manual immediately if it is lost, damaged or becomes unreadable.

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01 - Machine

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Electrical Power Cables

You could be electrocuted or badly burned if you get the machine or its attachments too close to electrical power cables.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near electric power lines.

Before you start using the machine, check with your electricity supplier if there are any buried power cables on the site.

There is a minimum clearance required for working beneath overhead power cables. You must obtain details from your local electricity supplier.

Working Platform

Using the machine as a working platform is hazardous. You can fall off and be killed or injured. Never use the machine as a working platform unless with approved man-basket or man-crate (if applicable).

Machine Safety

Stop work at once if a fault develops. Abnormal sounds and smells can be signs of trouble. Examine and repair before resuming work.

Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

Travelling at High Speeds

Travelling at high speeds can cause accidents. Always travel at a safe speed to suit working conditions.

Hillsides

Operating the machine on hillsides can be dangerous if the correct precautions are not taken. Ground conditions can be changed by rain, snow, ice etc. Check the site carefully. When applicable, keep all attachments low to the ground.

Visibility

Accidents can be caused by working in poor visibility. Use your lights to improve visibility. Keep the road lights, windows, mirrors and cameras clean (when fitted).

Do not operate the machine if you cannot see clearly.

Modification of the machine's configuration by the user (e.g. the fitting of large and non-approved attachments) may result in a restriction of the machine visibility.

Hands and Feet

Keep your hands and feet inside the machine.

When using the machine, keep your hands and feet clear of moving parts. Keep your hands and feet within the operator compartment while the vehicle is in motion.

Controls

You or others can be killed or seriously injured if you operate the control levers from outside the machine. Operate the control levers only when you are correctly seated.

Passengers

Passengers in or on the machine can cause accidents. Do not carry passengers.

Fires

If your machine is equipped with a fire extinguisher, make sure it is checked regularly. Keep it in the correct machine location until you need to use it.

Do not use water to put out a machine fire, you could spread an oil fire or get a shock from an electrical fire. Use carbon dioxide, dry chemical or foam extinguishers. Contact your nearest fire department as quickly as possible.

Roll Over Protection

If the machine starts to roll over, you can be crushed if you try to leave the cab. If the machine starts to roll over, do not try and jump from the cab. Stay in the cab, with your seat belt fastened.

Confined Areas

Pay extra attention to proximity hazards when operating in confined areas. Proximity hazards include buildings, traffic and bystanders.

Safe Working Loads

Overloading the machine can damage it and make it unstable. Study the specifications in the Operator's Manual before using the machine.

Lightning

If you are inside the machine during a lightning storm stay in the machine until the storm has passed. If you are outside of the machine during a lightning storm stay away from the machine until the storm has passed. Do not attempt to mount or enter the machine.

If the machine is struck by lightning do not use the machine until it has been checked for damage and malfunction by trained personnel.



00 - General

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Introduction

For: HS750 Page 24-3

Otherwise Page 24-3

(For: HS750)

The park brake also called the hand brake is a latching brake usually used to keep the vehicle stationary. It is also used to prevent a vehicle from rolling when there is no operator in the cab.

The park brake system consists of an actuator cylinder which is operated hydraulically to release the park brake. The cylinder moves the actuator rod which turns the actuator lever. The actuator lever on the calliper withdraws the brake pads from the disc mounted on the output of the gearbox allowing drive to be restored to the propshaft and axles.

For details of disc procedures refer to (PIL 24-18-21).

For details of actuator and calliper procedures refer to (PIL 24-18-48).

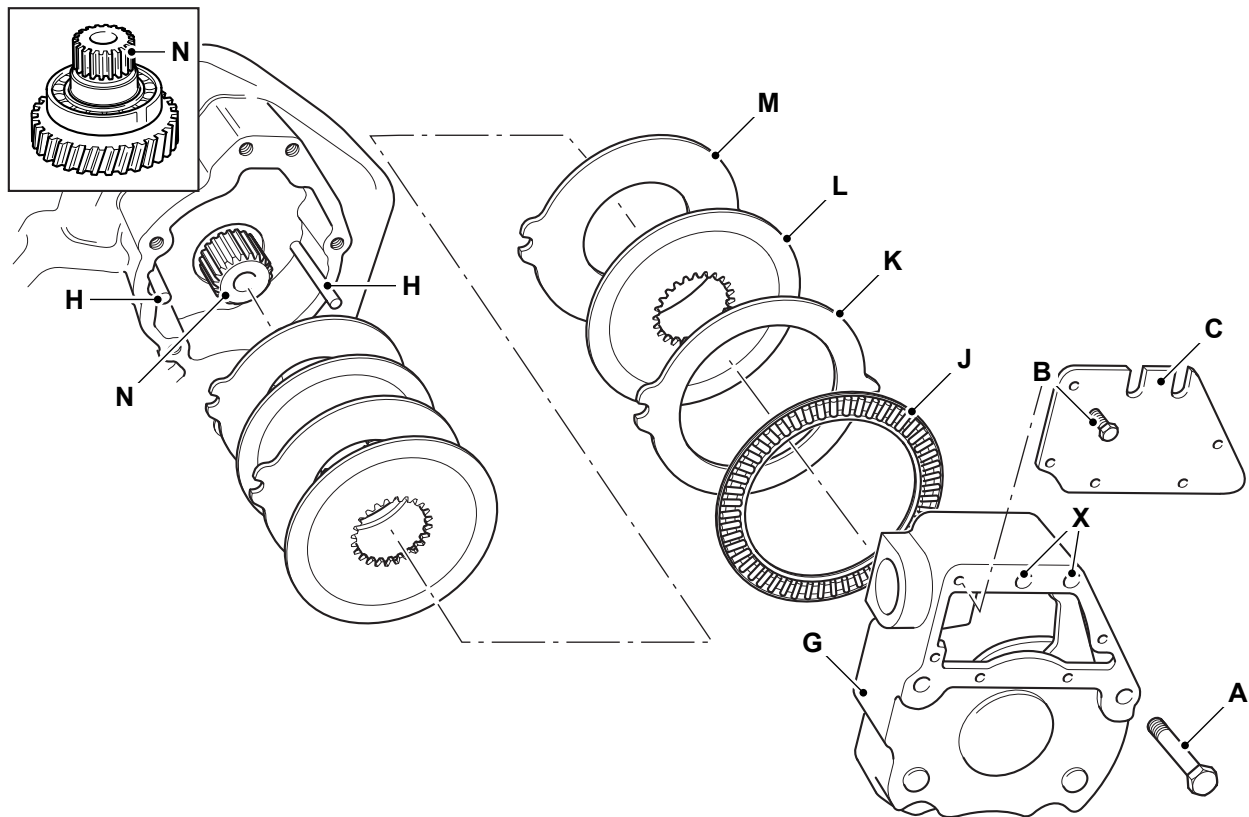
(Otherwise)

The park brake also called the hand brake is a latching brake usually used to keep the vehicle stationary. It is also used to prevent a vehicle from rolling when the operator needs both feet to operate the clutch and throttle pedals.

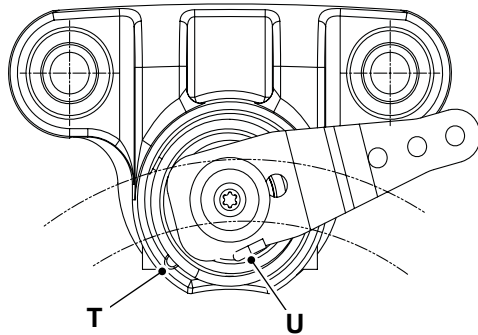
The park brake usually consists of a cable directly connected to the brake mechanism on one end, and to a hand-operated lever, on the floor at the side of the driver.

3. Remove the remaining bolts (x4) and carefully remove the cover, keep it parallel to the mating face of the drop-box case.
 - 3.1. If the cover does not get loosen easily, one or more reaction pins will have remained in the cover. Use a pair of long nosed pliers to push the pins back into the drop-box case. Make sure that you do not damage the surface of the pins.
4. Remove the components that follow:
 - 4.1. Needle roller thrust bearing.
 - 4.2. Thrust plate.
 - 4.3. Friction plates.
 - 4.4. Counter plates.
5. Disassemble the brake actuator.
6. Inspect the friction plate pack for damage.
7. Inspect the brake actuator for damage.

Figure 21.



- | | |
|--|---|
| <p>A Bolt (x6)</p> <p>C Cover plate</p> <p>H Reaction pins</p> <p>K Thrust plate</p> <p>M Counter plate</p> <p>X Location 1 and Location 2 for bolt installation</p> | <p>B Capscrew (5)</p> <p>G Cover</p> <p>J Needle roller thrust bearing</p> <p>L Friction plate</p> <p>N Hydraulic motor drive gear</p> |
|--|---|

Figure 30.


- T** Spring hole
- U** Lever outside edge

9. Locate the small diameter end of spring around the outside edge of lever. Refer to Figure 30.
10. Install the lever and align the lever to the mark made at the time of disassembly.
11. Hold the lever against the tension of the spring and install the washer 1 and washer 2.
12. Install the screw and tighten the screw to the correct torque value.
13. Install the brake pads.
14. Apply silicon grease to the dust seals and the bushes.
15. Install the dust seals to the housing and put mounting bushes.
16. Make sure that the dust seals locate in their location grooves on the bushes and housing.
17. Lubricate and install new O-rings. Wipe off any excess grease.
18. Before you install the caliper, make sure that the lever rotates smoothly and that the lever side pad returns to the off position when the lever is released.
19. Install the brake caliper.
20. Install and adjust the park brake actuator.

Table 14. Torque table

Item	Torque value
Screw	13–16N·m

Table 53. SS740 4WD Drop gears

4WD Disconnect	26/32	24/34	26/33	23/34		
Clutch type (Spring On)	Yes	Yes		Yes		
Clutch type (Pressure On)	Yes	Yes	Yes			
Permanent engage (No Clutch)		Yes		Yes		

Table 54. SS700 Drop gears

	17/38 Low Ratio	19/36 Standard Ratio
26/32	1:1.816	1:1.539
24/34	1:1.578	1:1.337
26/33	1:1.761	1:1.493
27/31	1:1.947	1:1.650
23/34	1:1.512	1:1.282

Table 56.

Gear Ratios	Standard Ratio	Low Ratio
1st	5.56:1	6.55:1
2nd	3.45:1	4.06:1
3rd	1.83:1	1.89:1
4th	1.00:1	1.00:1

Table 55.

Number Of Teeth	Standard Ratio	Low Ratio
Transfer gear	19	17
Layshaft	36	38

Table 57. Torque Converter

Torque converter diameter	310mm	
Torque converter identification	04/600580	04/600581
Torque multiplication at stall	2.52:1	3.01:1

Table 59.

	Pressure
Converter inlet relief valve pressure (maximum)	6.5bar (94.2psi)

Table 58.

Converter Pressures (In Neutral)		Pressure
Converter in at 50°C (121.9°F)	1000 RPM	1.5–2.5bar (21.7–36.2psi)
	2000 RPM	5.3–6.7bar (76.8–97.1psi)
Converter in at 100°C (211.9°F)	1000 RPM	0.5–1.3bar (7.2–18.8psi)
	2000 RPM	4.1–4.9bar (59.4–71.0psi)
Converter out at 50°C (121.9°F)	1000 RPM	0.8–1.6bar (11.6–23.2psi)
	2000 RPM	3–4bar (43.5–58.0psi)
Converter out at 100°C (211.9°F)	1000 RPM	0.3–0.9bar (4.3–13.0psi)
	2000 RPM	2.1–2.9bar (30.4–42.0psi)

Table 60.

Lubrication Pressures (In Neutral)		Pressure
At 50°C (121.9°F)	1000 RPM	0.3–0.9bar (4.3–13.0psi)
	2000 RPM	1.8–2.4bar (26.1–34.8psi)
At 100°C (211.9°F)	1000 RPM	0.1–0.3bar (1.4–4.3psi)
	2000 RPM	1.3–2.1bar (18.8–30.4psi)

Main Component Identification

Figure 40. SS700 Synchro Shuttle

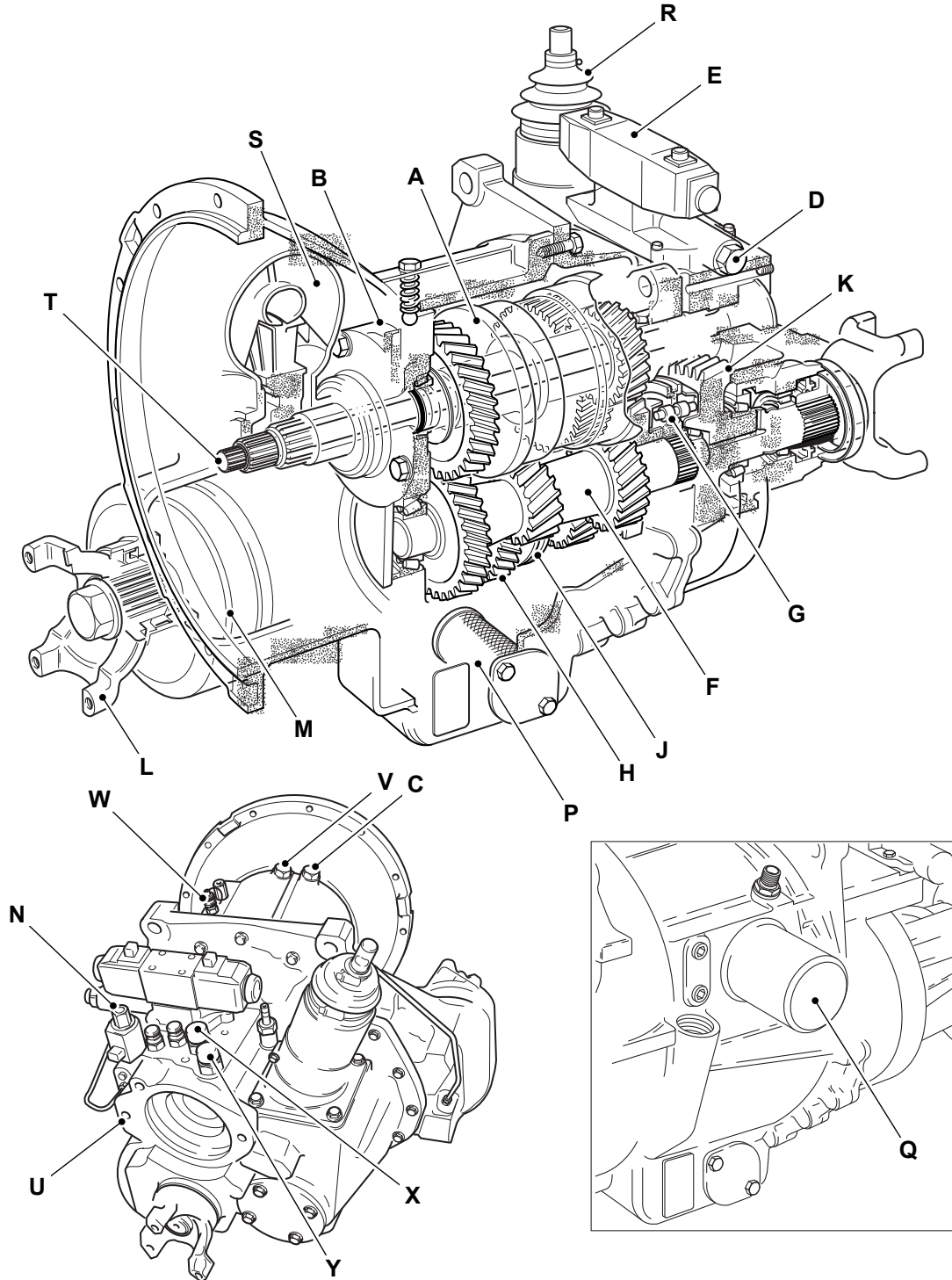


Table 71.

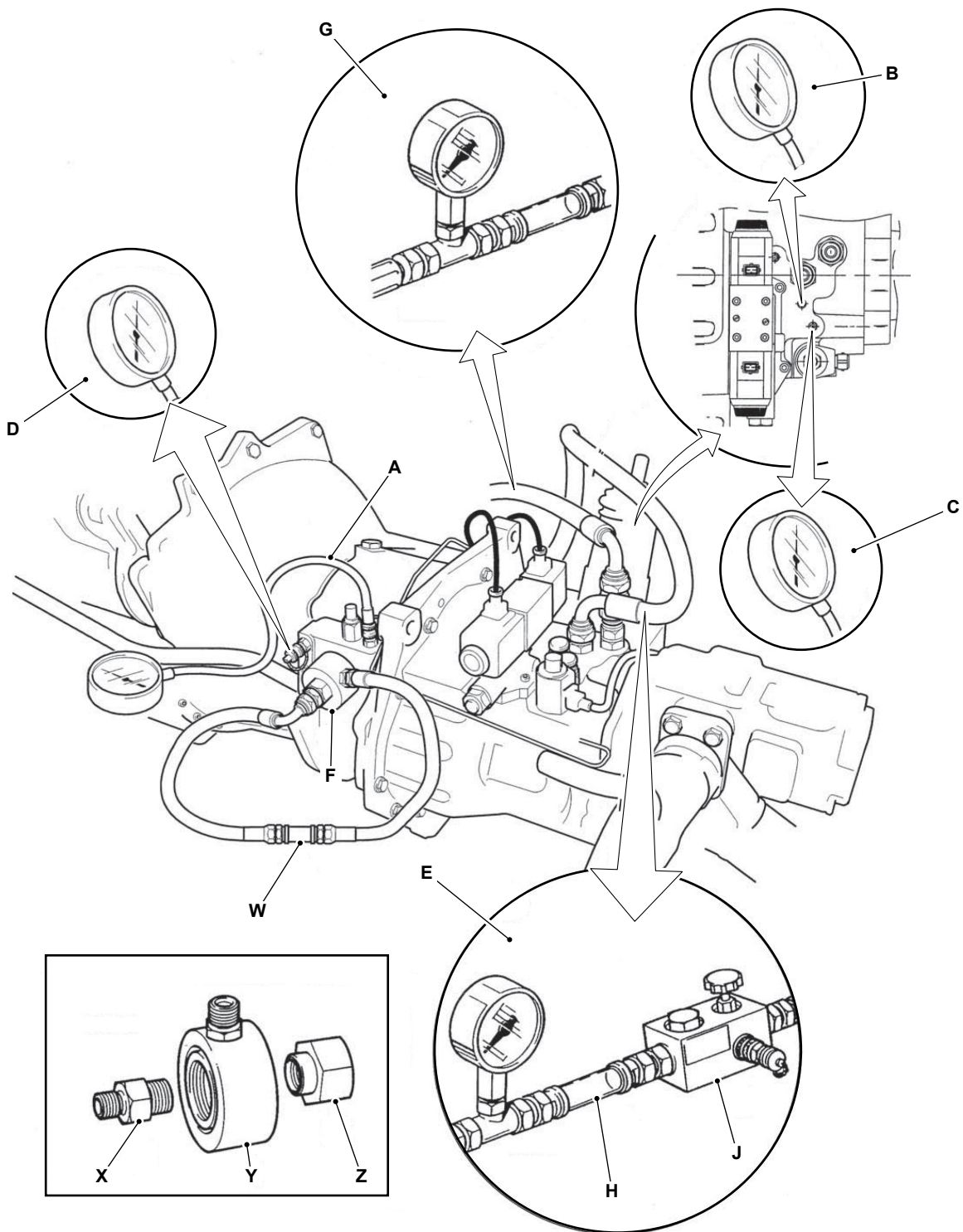
Item	Description
1	Selector fork 1 (3rd and 4th gears)
2	Selector fork 2 (1st and 2nd gears)
3	Input shaft clutch assembly (forward and reverse clutches)
4	Selector rod 1 (1st and 2nd gears)
5	Selector rod 2 (3rd and 4th gears)
6	2WD4WD clutch assembly
7	Layshaft
8	Park brake multi plate pack
9	Idler gear
10	Synchromesh unit 1 (3rd and 4th gears)
11	Synchromesh unit 2 (1st and 2nd gears)
12	Suction strainer
13	Main shaft

Check			Action
31	Are the selector rods worn or damaged?	Yes	Replace as necessary.
		No	Check 32.
32	Are the selector fork pads out of position?	Yes	Reposition the selector fork pads. Replace as necessary.
		No	Check 33.
33	Is there excessive end float in gears or shafts?	Yes	Adjust the end float.
		No	Check the thrust washers and mating faces.
34	Is the synchroniser bronze worn?	Yes	Replace the synchro pack.
		No	Check 35.
35	Are steel chips embedded in the bronze?	Yes	Continue using, chips will either embed below bronze or be rejected.
		No	Check 36.
36	Are the synchroniser components damaged?	Yes	Replace as necessary.
		No	Check the free running gears for seizure or damage.
37	Are the sliding gears tight on the splines?	Yes	Replace as necessary.
		No	Check 38.
38	Are chips wedged between splines of shaft or gear?	Yes	Remove the chips.
		No	Make sure that the clutch is disengaged when dump pedal is pressed.
39	Are steel chips embedded in the bronze?	Yes	Continue using, chips will either embed below bronze or be rejected.
		No	Check 40.
40	Are the synchroniser spring pins damaged?	Yes	Replace the synchro pack.
		No	Check 41.
41	Is the synchroniser bronze worn?	Yes	Replace the synchro pack.
		No	Check the blocker pins.

Table 74. The transmission will not pull

Check			Action
1	Is the transmission not pulling in one direction only?	Yes	Check 5.
		No	Check 2.
2	Is the transmission not pulling in both forward and reverse?	Yes	Stall test the machine. Check 3.
		No	Check 5.
3	Is the converter in pressure is as specified?	Yes	Check 4.
		No	Inspect the converter relief valve for damage.
4	Is pump being driven by converter?	Yes	Check the pump pressure.
		No	Replace the damaged components.
5	Are clutch sealing rings damaged?	Yes	Tap the pressure gauge into clutch feed lines to monitor pressure.
		No	Check the clutch plates for damage.
6	Is there drive in one direction only?	Yes	Check 8.
		No	Check 7.
7	Is the start switch in the run position and supplying current to the neutral start relay?	Yes	Check 8.
		No	Repair as necessary.
8	Is the fault only when the transmission is hot?	Yes	Disassemble the solenoid. Check the condition of the components.
		No	Check the condition of the microswitches, relay and wiring loom.

Figure 66.

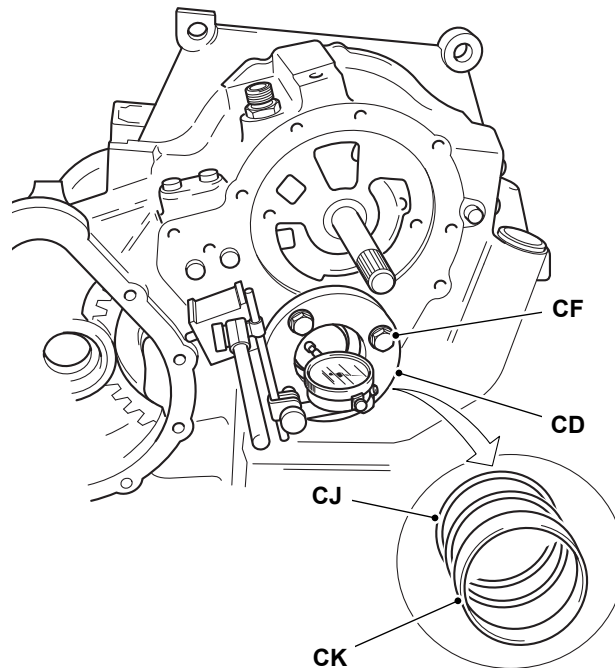


- | | |
|--|--|
| <p>A Main line pressure
 C Reverse clutch pressure
 E Converter outlet pressure
 G Lubrication pressure

 J Load valve</p> | <p>B Forward clutch pressure
 D Converter inlet / Converter relief valve pressure
 F Pump flow (remove filter and install adaptors)
 H Cooler flow (flow meter in line from transmission to cooler)
 W Flow meter</p> |
|--|--|

4. Measure the main shaft end float and it should be within the specified limit.
 Dimension: 0.03–0.08mm

Figure 76.



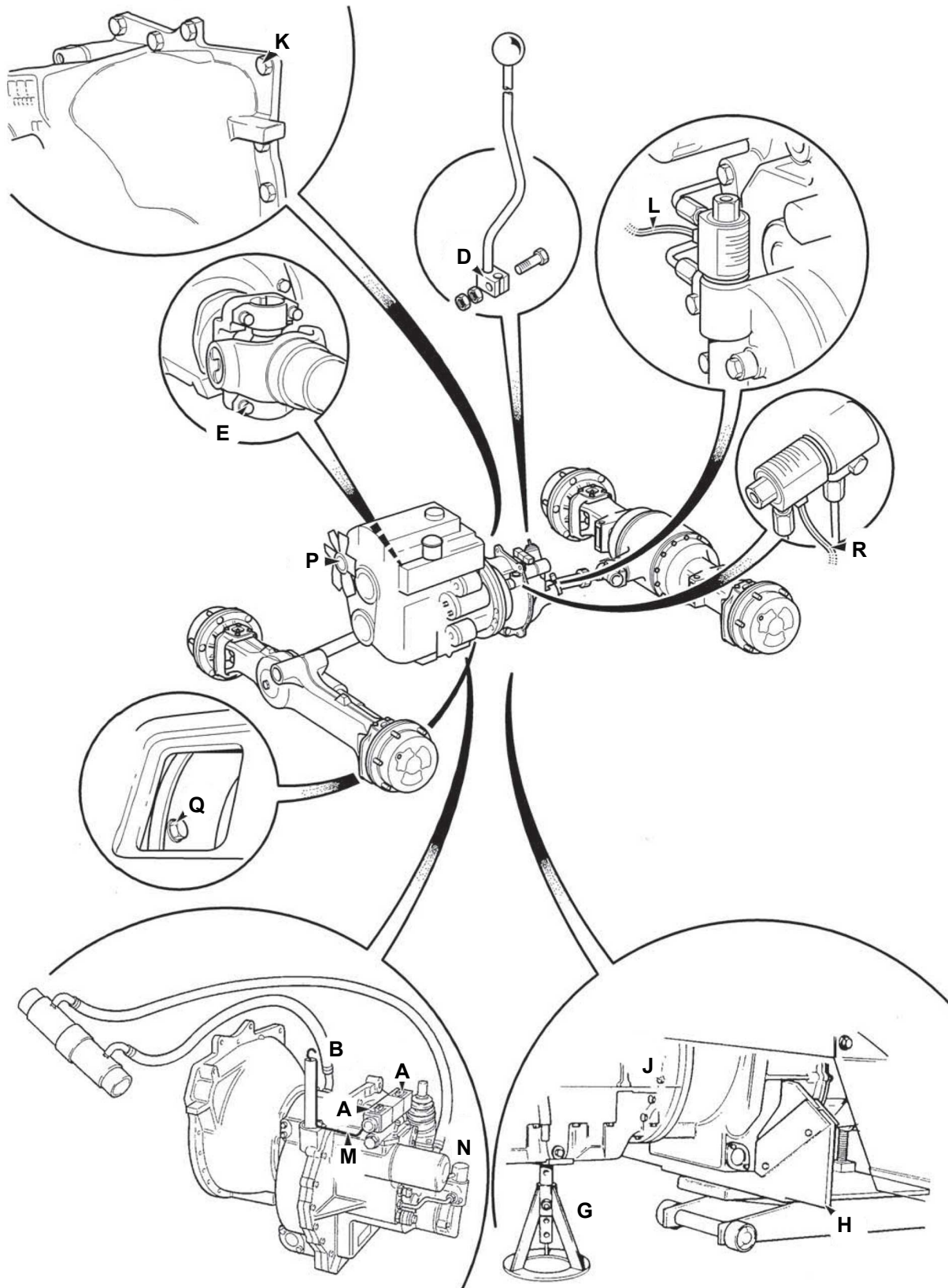
5. Rotate the main shaft when you take the measurement to install the bearings fully.
6. Calculate the correct seam thickness. Remove the end float setting tool and put the shims between the bearing outer cup and the spacer.
Special Tool: Shim Kit (Qty.: 1)
7. Calculate the correct seam thickness. Remove the end float setting tool and put the shims between the bearing outer cup and the spacer. Refer step 4

8. Remove the end float setting tool.

End float adjustment - Forward and reverse shaft

1. To check the end float it is necessary to temporarily assemble the front and rear cases of the gearbox.
2. Make sure that the forward reverse shaft rear bearing outer cup and shims are installed to the rear cover.

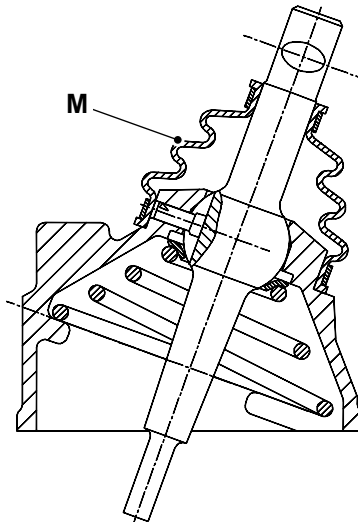
Figure 96.



12. Remove the bolt 3 and then remove the gear lever turret. Refer to Figure 108.
13. The gearbox can be installed with different types of gear lever turret assemblies.

- 13.1. The short single lever type must not be disassembled, the only replaceable component is the rubber gaiter. Refer to Figure 109.

Figure 109.



M Rubber gaiter

- 13.2. The larger two-piece gear lever turrets can be disassembled. Push the bottom lever and remove the circlip. You must be

careful about the spring pressure, behind the lever and circlip. Refer to Figure 110.

Figure 110.

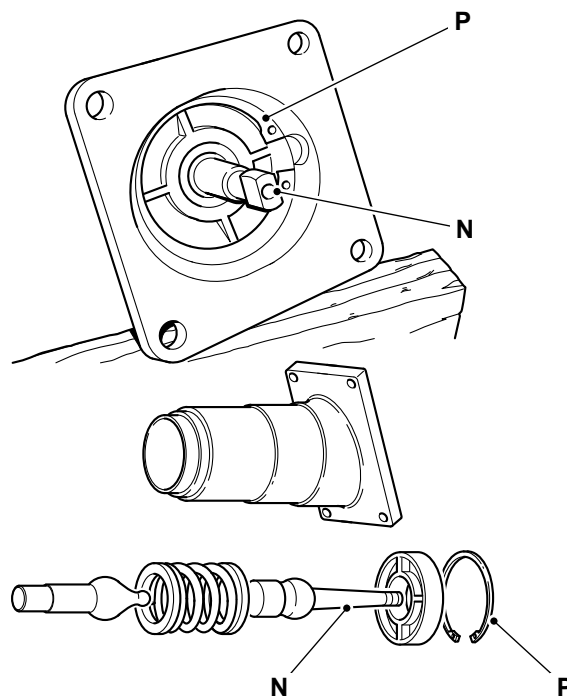
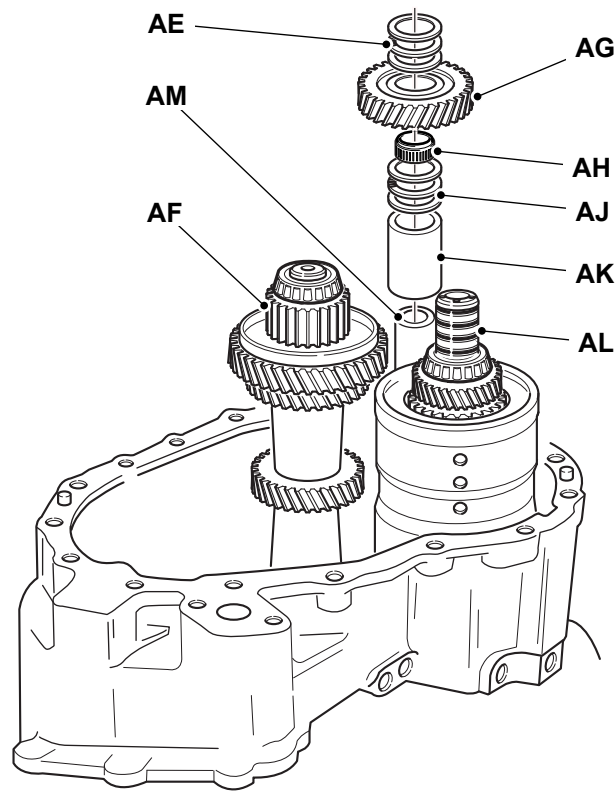


Figure 127.



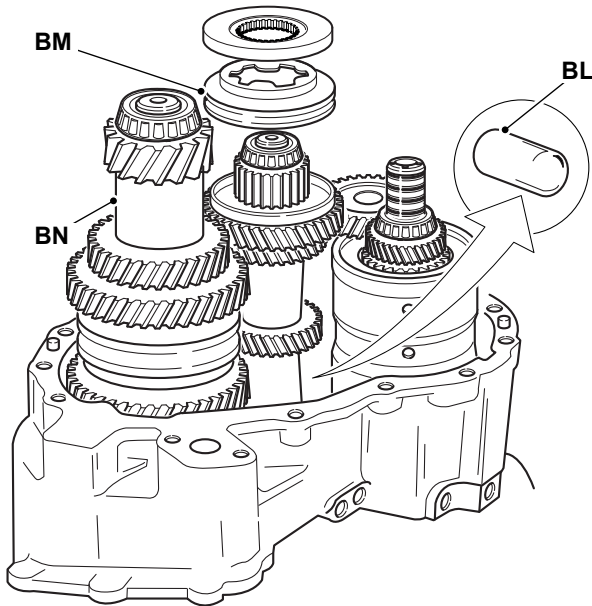
- AE** Upper thrust washers and bearing assembly
- AG** Idler gear
- AJ** Lower thrust washers and bearing assembly
- AL** Forward and reverse clutch

- AF** Main shaft
- AH** Needle roller bearing
- AK** Idler gear spacer
- AM** Idler gear spindle

25. Install the upper thrust washers and bearing assembly. Refer to Figure 127.
26. Lubricate the front end bearing of the layshaft. Then carefully lower then layshaft into the correct position. Refer to Figure 128.

27. Install the remaining synchronising components to the main shaft. Make sure that you install all of the synchronising components into there original location. Refer to Figure 128.

Figure 151. Blocking pin type synchro

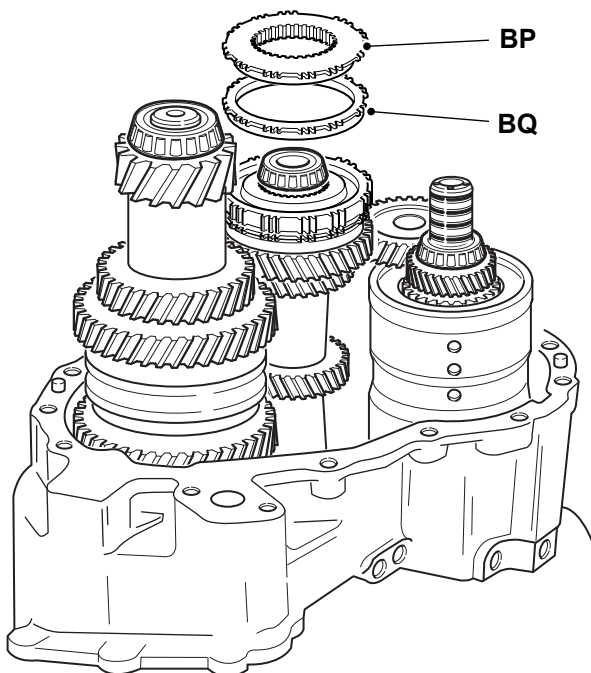


BL Interlock plunger
BM 3rd and 4th synchro hub
BN Layshaft

33. Ring and cone type synchro. Refer to Figure 152.

33.1. Lift off the outer cone and ring from the synchroniser. Mark the positions of the cone and the ring to make sure that they are installed correctly on the synchroniser at the time of assembly.

Figure 152. Ring and cone type synchro



BP Outer cone
BQ Ring

33.2. Be careful not to lose any synchroniser components at the time of removal.

33.3. Do not remove the outer sleeve.

34. Remove the layshaft assembly. Refer to Figure 151.

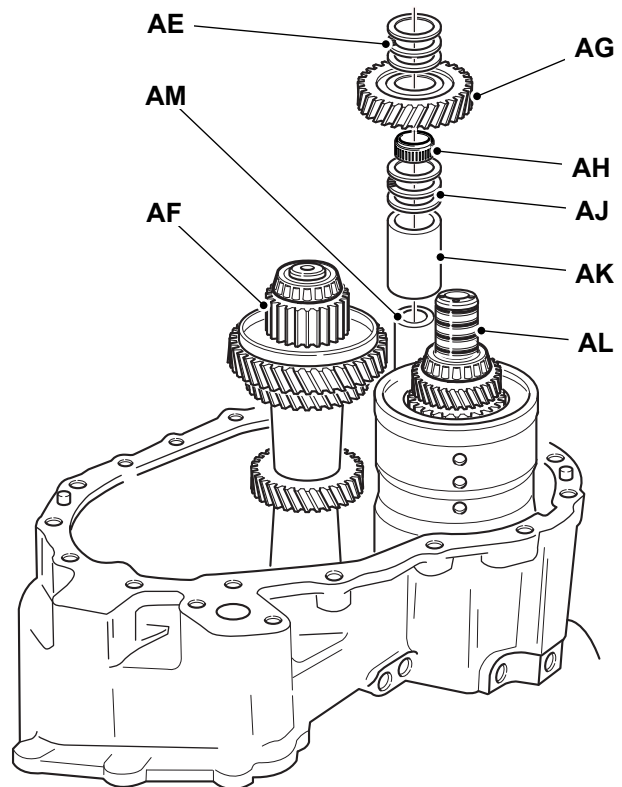
35. Remove the idler gear upper thrust washers and bearing. Keep the thrust washers and bearing together. Refer to Figure 153.

36. Tilt the main shaft to one side and remove the idler gear together with the needle roller bearing. Refer to Figure 153.

37. Remove the idler gear lower thrust washers and bearing. Keep the thrust washers and bearing together. Refer to Figure 153.

38. Remove the idler gear spacer. Refer to Figure 153.

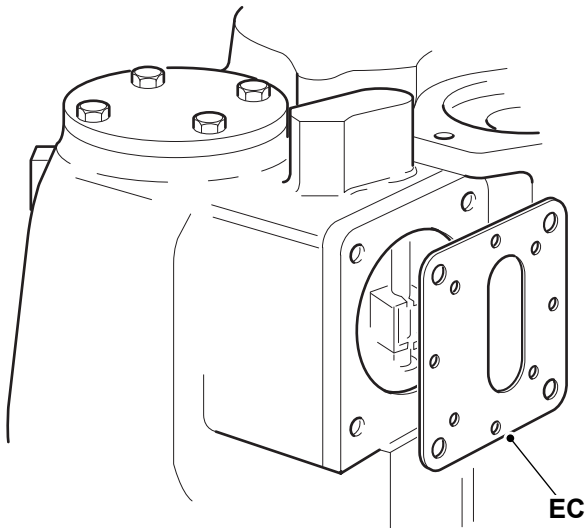
Figure 153.



AE Upper thrust washer and bearing
AF Main shaft
AG Idler gear
AH Needle roller bearing
AJ Lower thrust washer and bearing
AK Idler gear spacer
AL Reverse clutch
AM Idler gear spindle

39. Tilt the main shaft to one side and remove the forward and reverse clutch. Discard the sealing rings. Refer to Figure 153.

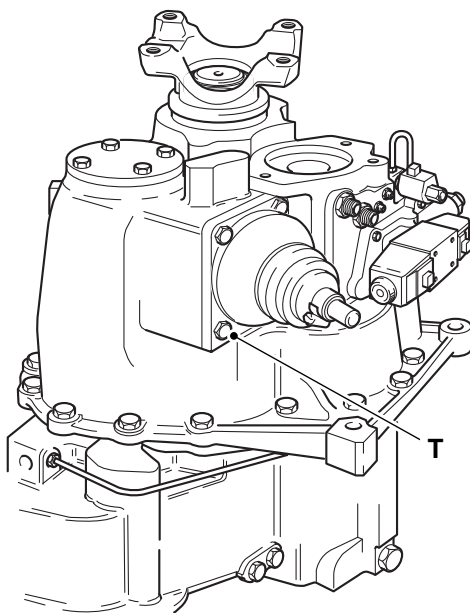
Figure 184.



EC Gear lever turret baffle plate

89. Put a second gasket and then install the gear lever turret assembly. Refer to Figure 185.

Figure 185.

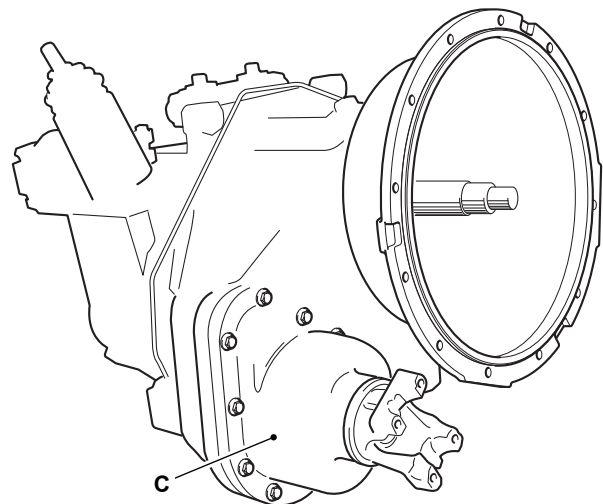


T Bolt 4

- 90. Apply sealant to the bolt 4 and secure the turret assembly with the bolt 4. Refer to Figure 185.
- 91. Tighten the bolt 4 to the correct torque value. Refer to Figure 185.
- 92. Check the gear selection. Refer to Figure 185.
- 93. It is recommended that a 75 micron (0.075mm) service suction strainer is installed to clean the system after a major overhaul.

- 94. After the first 100 hours of operation remove the service strainer and install a production stainer.
- 95. Put a new gasket and install the suction strainer. Refer to Manual Gearbox, Suction Strainer-Remove and Install (PIL 27-03-04).
- 96. Install a new filter. Refer to Manual Gearbox, Filter- Remove and Install (PIL 27-03-03).
- 97. Install the dipstick or oil filler tube (not shown).
 - 97.1. Install the nut to the tube followed by the seal.
 - 97.2. Insert the tube fully down the bore in the case. Engage the nut and tighten down loosely onto the seal.
 - 97.3. Tighten the nut fully after the tube has been correctly routed.
- 98. If applicable then install the 2WD and 4WD clutch assembly.

Figure 186.



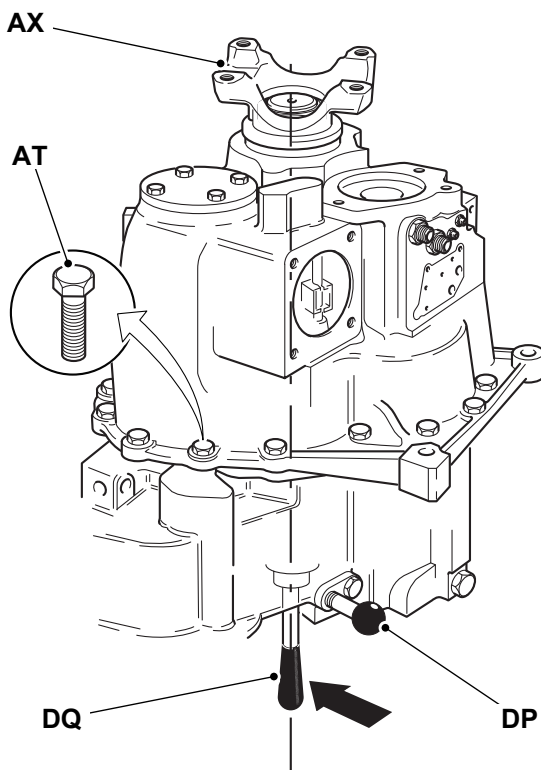
C 2WD and 4WD clutch unit

- 99. Install a new sealing ring on the pump 1 driveshaft. Refer to Figure 187.
- 100. Install the pump 1 driveshaft followed by the bearing and circlip 1. Refer to Figure 187.

engages with the case first, followed by 3rd and 4th gear selector rod. Refer to Figure 214.

48. Make sure that the main shaft locates with the output shaft. Refer to Figure 214.
49. It is necessary to push the shaft adjuster tool to keep the shaft correctly aligned. Refer to Figure 214.
50. Rotate the output shaft back and forth to engage the gears on the layshaft. Refer to Figure 214.

Figure 214.



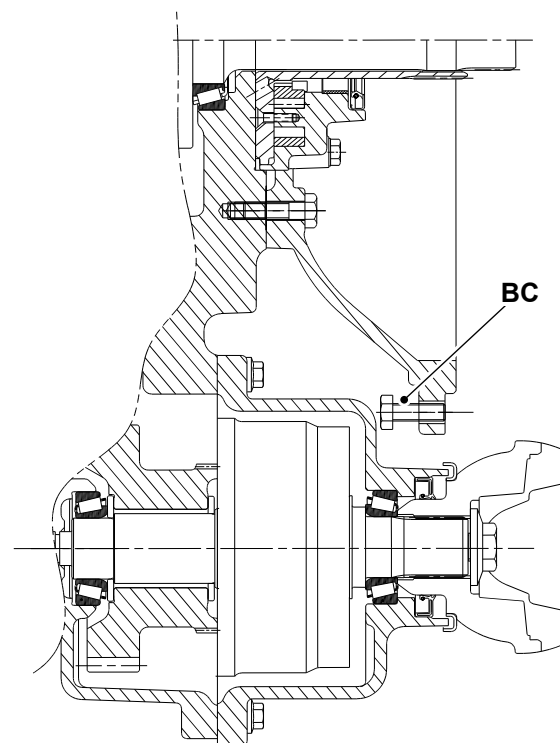
- AT** Bolt 6
- AX** Yoke
- DP** Selector shaft lock screw
- DQ** Main shaft adjuster

51. Do not give excessive force when installing the output end case. Refer to Figure 214.
 52. Apply sealant to all the bolt 6 and tighten the bolt 6 to the correct torque value. Refer to Figure 214.
- Consumable: JCB Threadlocker and Sealer (Medium Strength)**
53. Remove the shaft lock screw and install the selector detent ball and spring 5 at the same position. Refer to Figure 214.
 54. Apply sealant and install the selector detent plug. Refer to Figure 214.

Consumable: JCB Threadlocker and Sealer (Medium Strength)

55. Tighten the selector detent plug correctly. Refer to Figure 214.
56. End float check- forward and reverse unit.
57. End float check- main shaft unit.
58. End float check- layshaft.
59. Install the 2WD / 4WD unit.
60. Before you install the SAE (Society of Automotive Engineers) type housing, install the bolt 8 (M10*30). It is not possible to install the bolt 8 after the housing is attached with the gearbox. Refer to Figure 215.

Figure 215.



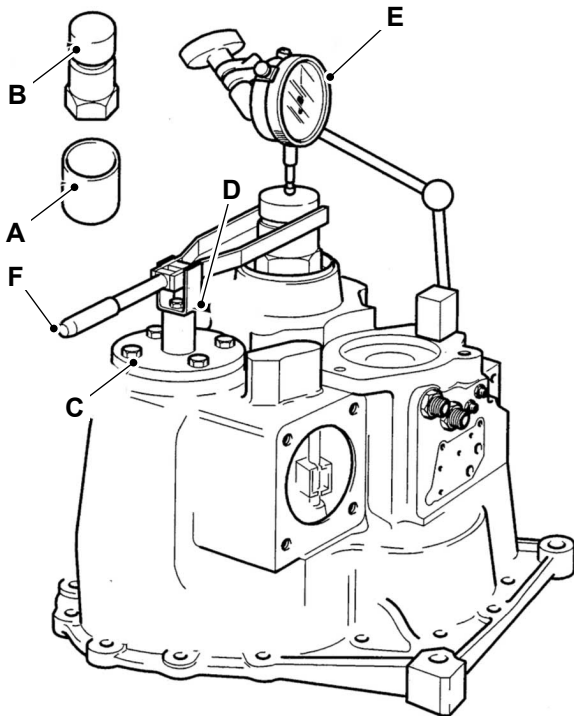
- BC** Bolt 8 (M10x30mm)

61. Apply a bead of JCB Multi-gasket to the mating face of the gearbox cover. Refer to Figure 216.

Consumable: JCB Multi-Gasket

- 11.1. If the rolling torque exceeds 1.5 Nm, check that the output shaft has been assembled correctly.
12. If the rolling torque measured is too high, install the next larger size spacer. If there is end float, install the next smaller size spacer.

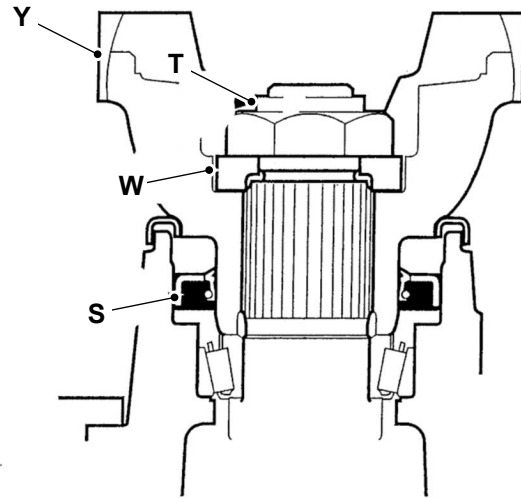
Figure 247.



- A Sleeve
- B Nut
- E DTI
- F Torque wrench

13. Remove nut and sleeve. Install new oil seal, grease between seal lips before installing.
 - 13.1. Note that the seal does not fix to the back of the housing - use the service tool to locate the seal. Install the output yoke.
14. Install the stepped washer the correct way around with the plain face uppermost.
15. Install a new retaining nut and progressively tighten to correct torque value 300 Nm. Provided the correct size spacer has been selected, the rolling torque should be 2.0 Nm when the nut is fully torque tightened.
16. Important: If the rolling torque measured is too high, install the next larger size spacer. If the rolling torque is too low, install the next smaller size spacer.
17. Finally, carefully stake nut into slot using a square-ended staking tool.

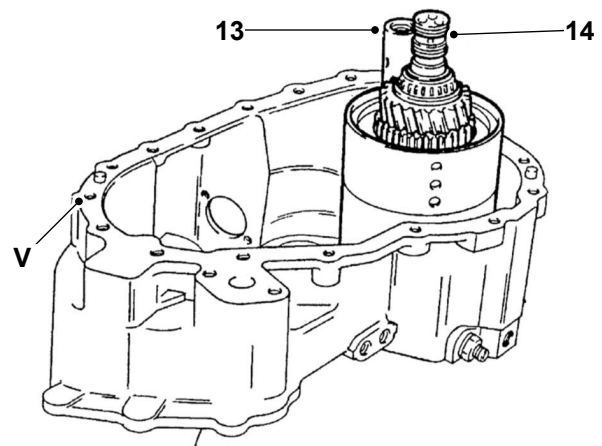
Figure 248.



- S Oil seal
- Y Output yoke
- W Washer
- T Retaining nut

18. Press the idler gear spindle into front casing.
19. Important: Before proceeding further, make sure that the 3 shaft front bearing outer cups are correctly located inside the casing.
20. Grease forward/ reverse shaft front bearing, then carefully lower the reverser unit into casing. Install the shaft sealing rings and smear with grease.

Figure 249.



- V Casing
- 13 Sealing rings
- 14 Smear

21. Smear main shaft output end bearing grease and place main shaft in position, alongside the reverser unit assembly.
22. Install the idler gear spacer.

Check (Condition)

For: SS500, SS600, SS700 MK1, SS700
MK2 Page 27-191
For: SS750 Page 27-191

(For: SS500, SS600, SS700 MK1, SS700
MK2)

Carry out a visual inspection of the friction and counter plates:

Counter plates

1. Light scoring or polishing is permissible, plates that are not flat, worn or heavily marked or scored must be replaced with a new set.

Friction plates

1. The cross hatching should be clearly visible, plates that are not flat, have friction material damage or scoring must be replaced with a new set.
2. DO NOT mix old and new plates, if a plate is damaged or worn install a complete new set.
3. Needle roller bearings should slide into position freely, do not bend or distort the cage to install. If the cage has been distorted install new bearings.
4. Take care when handling disc springs to avoid marking or damage, which could result in stress cracking. If in doubt install a new disc spring

(For: SS750)

Check (Condition)

Before you assemble the clutch assembly, carry out a visual inspection of the friction and counter plates:

Counter plates

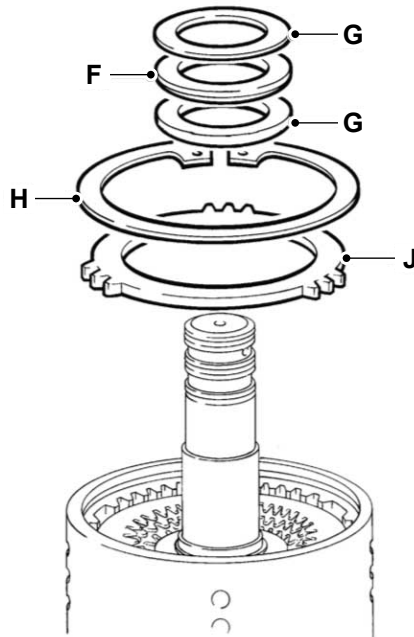
1. Counter plates- light scoring or polishing is permissible, plates that are not flat, worn or heavily marked or scored must be replaced with a new one.

Friction plates

1. The cross hatching should be clearly visible, plates that are not flat, have friction material damage or scoring must be replaced with a new one.
2. DO NOT mix old and new plates, if a plate is damaged or worn install a complete new set.

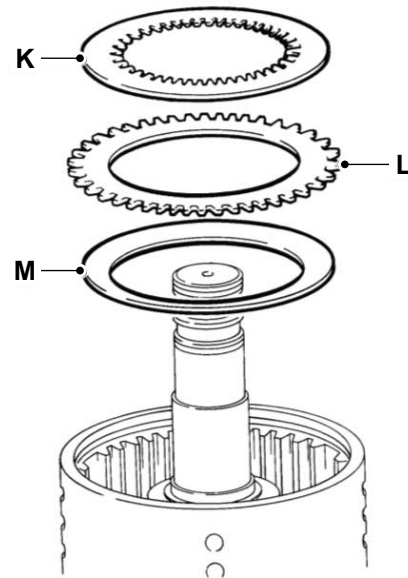
3. Needle roller bearings should slide into position freely, do not bend or distort the cage to install. If the cage has been distorted install new bearings.
4. Take care when handling disc springs to avoid marking or damage, which could result in stress cracking. If in doubt install a new disc spring.
5. The piston consist of a small check valve. Visually check the piston to make sure that the ball is in place and that the seat is free from contamination. If necessary clean the valve by blowing through with an air line. Do not use a wire rod (or screwdriver) as it can damage the valve seat.

5. Remove the gear and the splined hub assembly with the needle roller bearing and the spacer. Refer to Figure 305.
6. Make sure that you have note the location of the spacer for its correct assembly. Refer to Figure 305.
7. Remove the thrust bearing 2 and the thrust washer 2. Refer to Figure 306.

Figure 306.


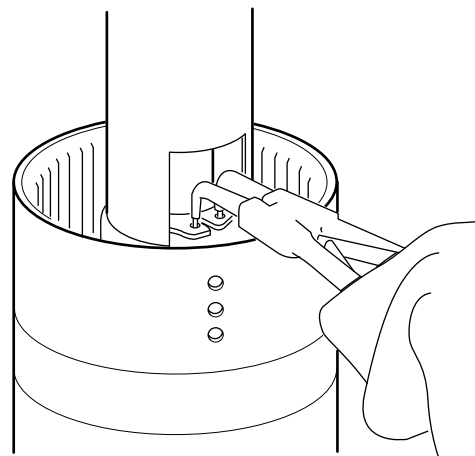
- F** Thrust bearing 2
- G** Thrust washer 2
- H** Friction and counter plates retaining circlip
- J** Pressure end plate

8. Remove the friction and counter plate retaining circlip. Refer to Figure 306.
9. Remove the pressure end plate. Refer to Figure 306.
10. Remove the friction plates and the counter plates. Keep them together in set. Refer to Figure 307.
11. Do not mix the plates with those from other clutches assemblies. Refer to Figure 307.

Figure 307.


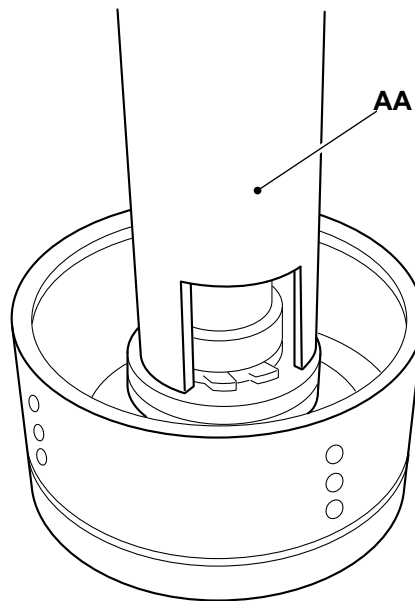
- K** Friction plate
- L** Counter plate
- M** Disc spring

12. Remove the disc spring. Refer to Figure 307.
13. Put the clutch assembly in a suitable press to compress the piston spring then remove the circlip. Refer to Figure 308.

Figure 308.


14. Lift off the spring retaining plate. Refer to Figure 309.
15. Remove the spring. Refer to Figure 309.

Figure 325.



AA Cut away tube

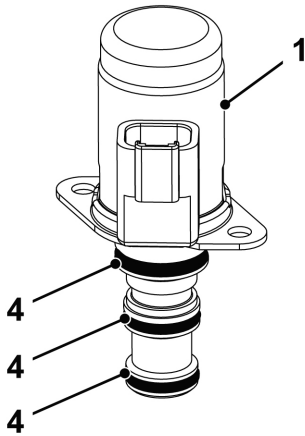
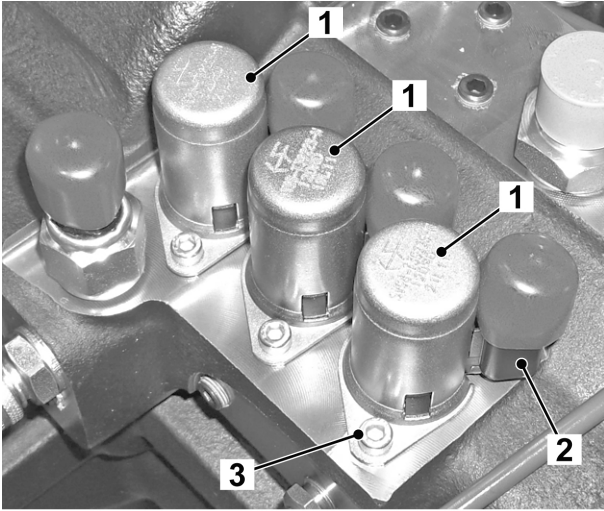
18. Remove the spring retainer plate, spring and the oil baffle.
19. Remove the piston and then remove and discard both the O-ring and O-ring 1.

The piston housing cannot be separated from the shaft, as on some other types of 2WD and 4WD clutches.

Before assembly inspect the 2WD and 4WD clutch.

Note: All bearings must be lightly oiled before assembly. Make sure that all components are thoroughly clean and replace all O-rings.

Figure 342.



- 1 Solenoid valve
- 2 Solenoid coil
- 3 Screws
- 4 O-ring seals

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following work.
2. Inspect the gauze filters and O-ring seals for damage. Refer to Check Condition (PIL 27-03-15).
3. Put some clean gearbox oil on the O-ring seals.
[Consumable: JCB Transmission Fluid EP SAE 30](#)
4. Tighten the screws to the correct torque value.

Table 95. Torque Values

Item	Nm
3	6

Disassemble and Assemble

(For: SS500, SS600, SS700 MK1)

Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

It is not normally recommended to remove the spool from the valve body. None of the component parts of the valve assembly can be renewed individually. The extent of permissible servicing is cleaning and the consequential renewal of O-ring seals. Refer to Check Condition.

Disassemble

1. Remove the surface mounted O-rings 1.
2. Unscrew the knurled nut and remove O-ring 3, withdraw the solenoid and O-ring 5.
3. Hold the solenoid valve body in a vice, using the spanner flats, remove spindle and O-ring 8.
4. Pull out the actuating pin, spring, spring retainer and spool.
5. Dismantle the opposite solenoid in the same sequence as described above.
6. Inspect the spool and spool bore for signs of wear, nicks scratches etc.



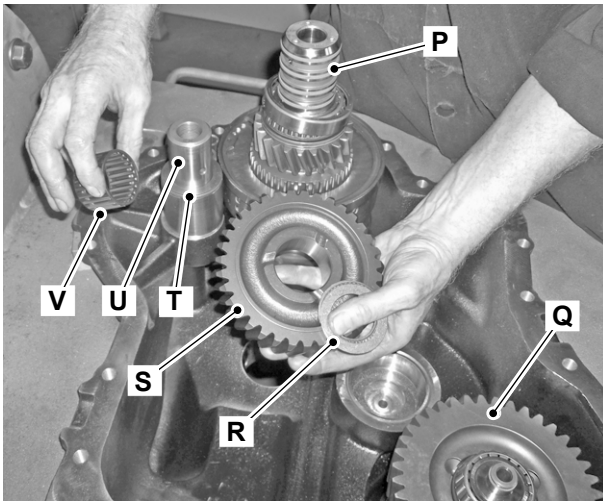
39 - Filter

[Introduction](#) 27-247
[Remove and Install](#) 27-248

Introduction

The transmission filter is designed to filter all the contamination that is generated through use to the required level of cleanliness. The filter must be serviced to the requirements of the machine maintenance schedules.

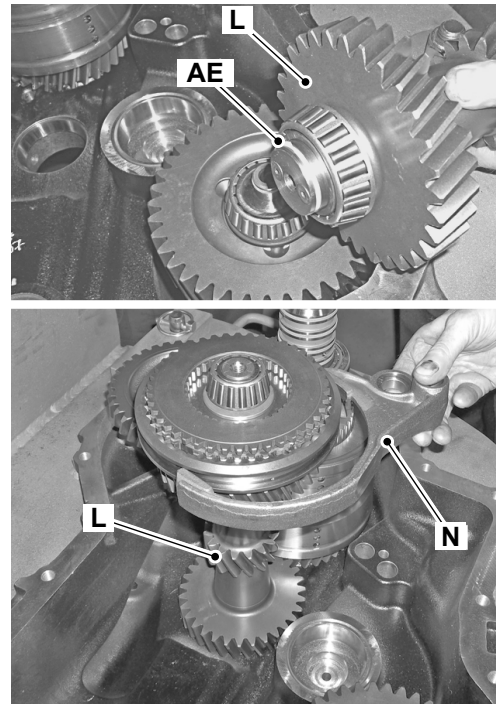
Figure 365.



- P** Input shaft
- Q** 2WD/4WD clutch shaft
- R** Needle roller thrust bearing 1 and washer 1
- S** Idler gear
- T** Needle roller thrust bearing 2 and washer 2
- U** Idler shaft
- V** Needle roller bearing

6. Install the needle roller bearing. Refer to Figure 365.
7. Install the idler gear. Refer to Figure 365.
8. Install the needle roller thrust bearing 1 and the washer 1 on the idler shaft. Put some oil on the bearing. Refer to Figure 365.
9. Make sure that the piston ring seal 1 is installed correctly. Refer to Figure 366.

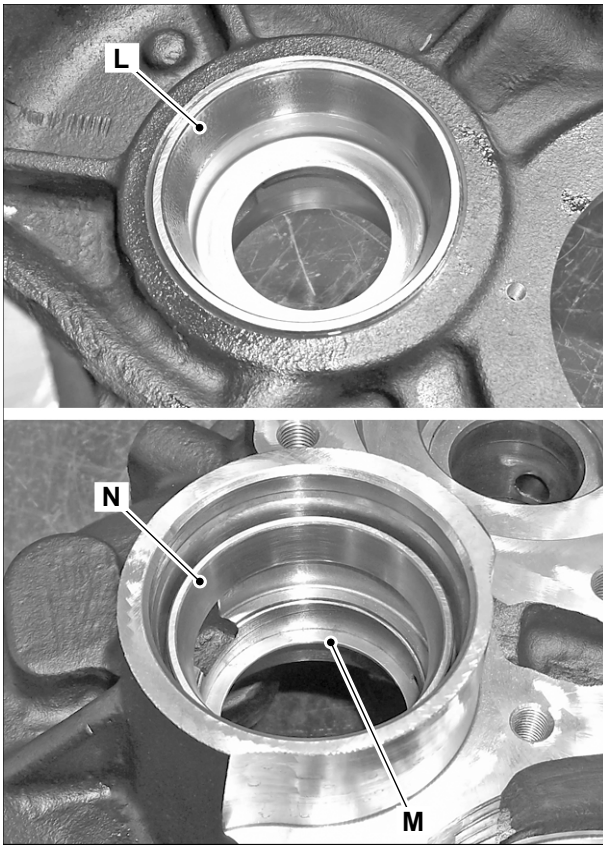
Figure 366.



- L** Main shaft
- N** Selector fork
- AE** Piston ring seal 1

10. Install the main shaft in the front gear case. Make sure that the piston ring seal 1 is not damaged. Refer to Figure 366.
11. Locate the selector fork. Refer to Figure 366.
12. Make sure that the piston ring seal 2 is installed correctly. Refer to Figure 367.

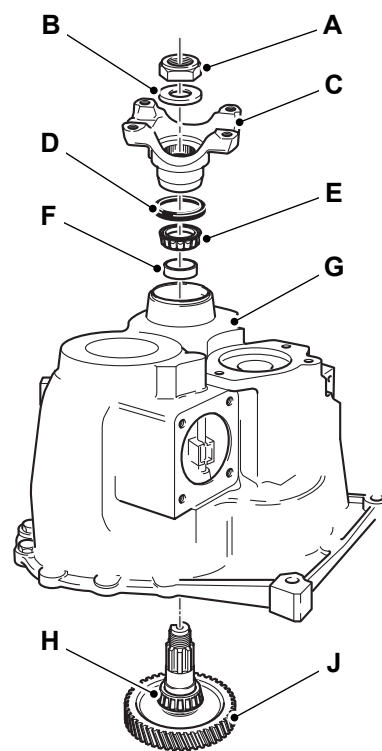
Figure 384.



- L** Inner bearing cup
- M** Oil baffle
- N** Outer bearing cup

3. Lubricate the output shaft inner bearing. Refer to Figure 385.
4. Install the inner bearing on the output shaft. Refer to Figure 385.
5. Locate the output shaft in the rear gear case. Refer to Figure 385.
6. Install the service spacer (921/52627) in the place of the original spacer. Refer to Figure 385.
Special Tool: Spacer Kit (Qty.: 1)
7. Lightly oil the outer bearing and temporarily install it. Refer to Figure 385.
8. Make sure that you do not install the oil seal at this stage. Refer to Figure 385.

Figure 385.



- A** Retaining nut
- B** Stepped washer
- C** Output yoke
- D** Oil seal
- E** Outer bearing
- F** Spacer
- G** Rear gear case
- H** Bearing
- J** Output shaft

9. Temporarily install the output yoke. Refer to Figure 386.
10. Temporarily install the stepped washer in correct orientation, facing the retaining nut. Refer to Figure 386.
11. Temporarily install the retaining nut. Refer to Figure 386.

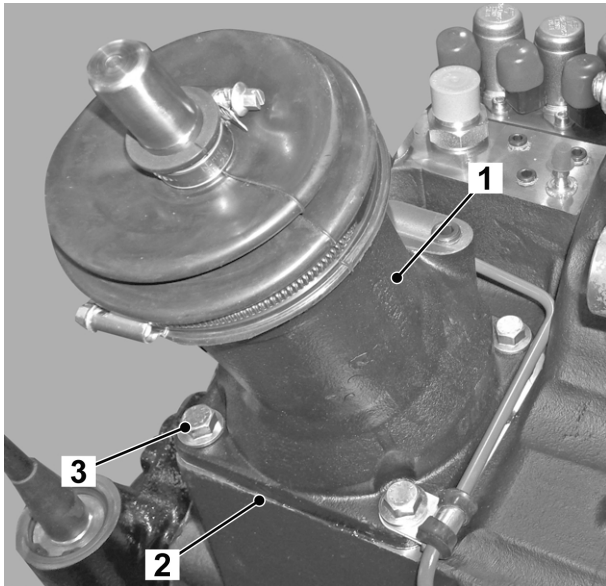
Remove and Install

(For: SS750)

Remove

1. Clean off all debris, dirt and grit from around the gear lever turret. Do not allow particles of grit to fall into the gearbox.
2. Remove the four bolts and their associated washers.
3. Remove the gearbox turret assembly from the gearbox. Remove the gasket.

Figure 399.



- 1 Gear lever turret
- 2 Gasket
- 3 Bolts (x4)

Replacement is the opposite of the removal procedure. During the replacement procedure do the following work:

Install

1. Install a new gasket.
2. Tighten the bolts to the correct torque value.

Table 106. Torque Values

Item	Nm
3	56



Check (Condition)

Refer to Front Case - Check Condition (PIL 27-03-90).

Remove and Install

Refer to Front Case - Remove and Install (PIL 27-03-90).

Figure 420. Dual Tech Variable Transmission

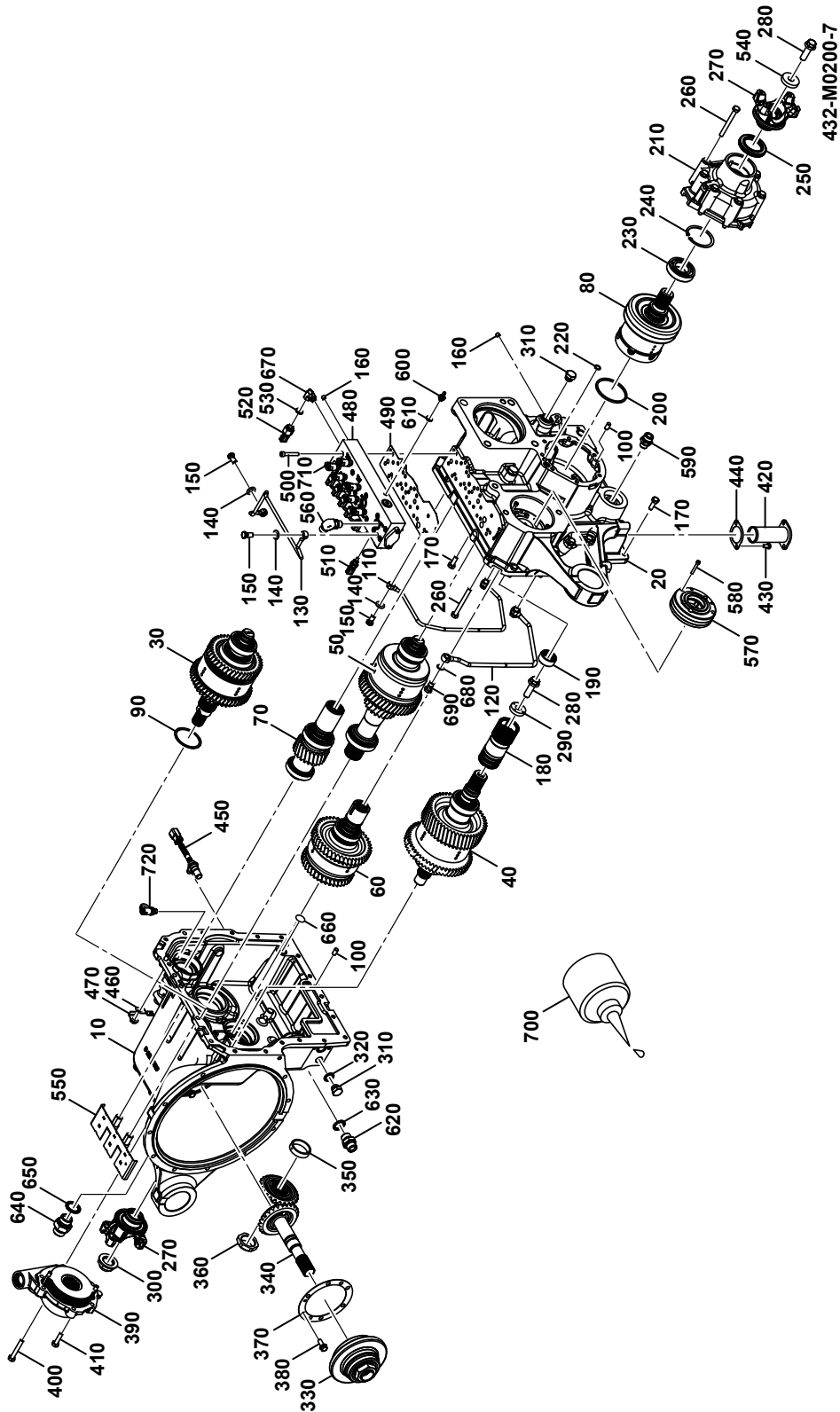
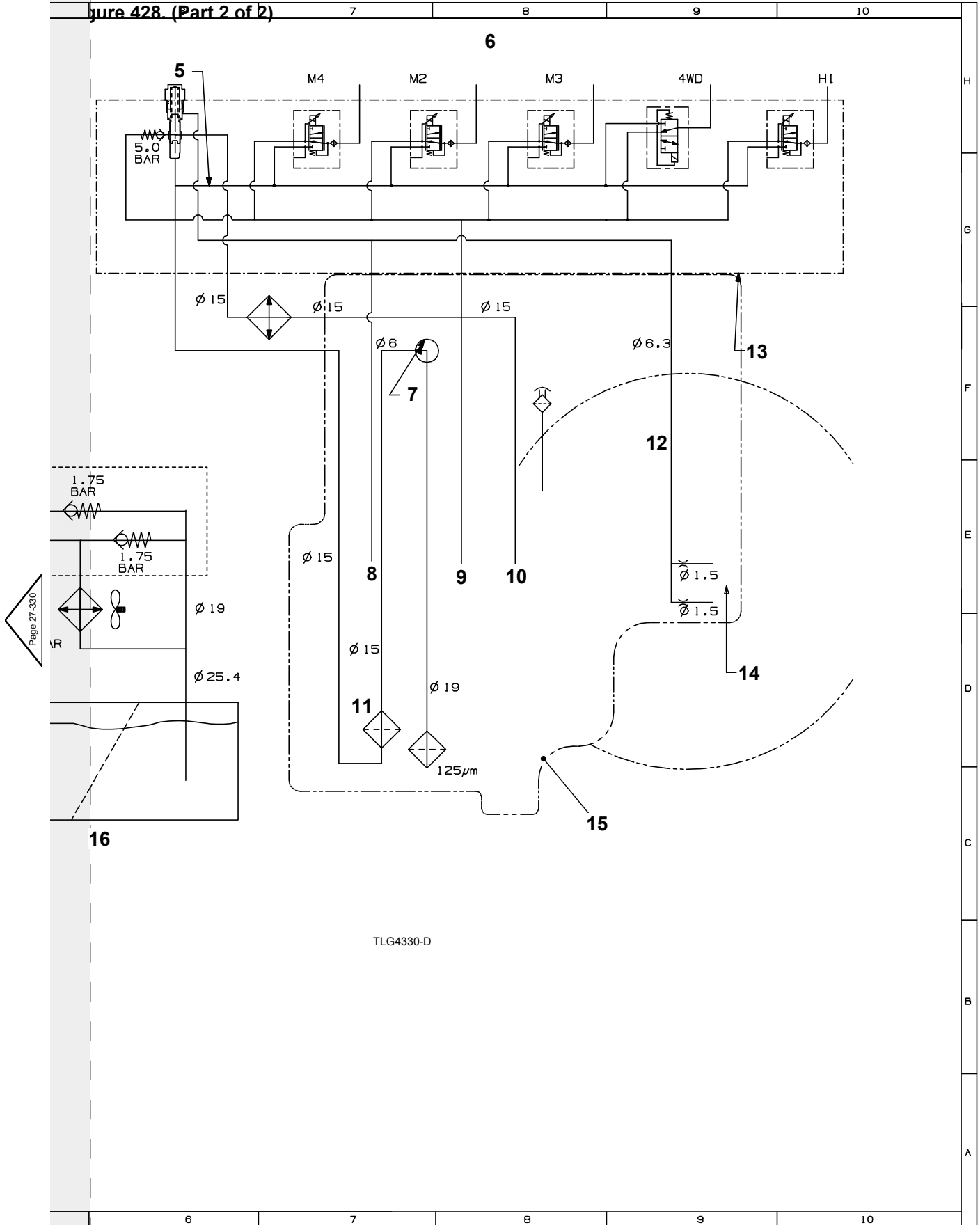


Figure 428. (Part 2 of 2)



TLG4330-D

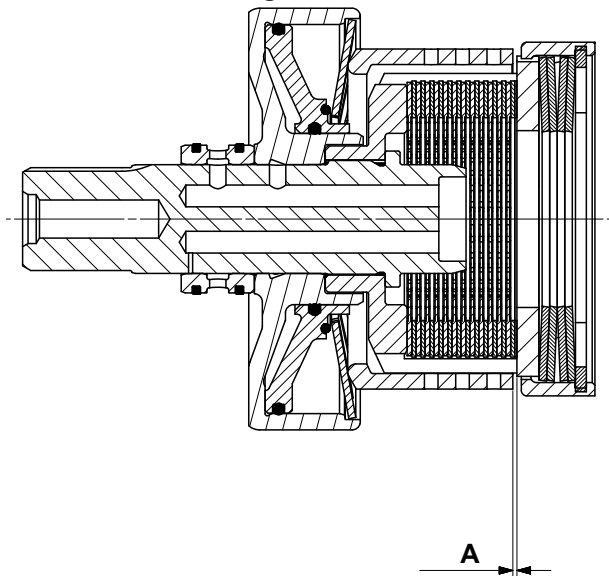
Adjust

Refer to driveline, hydrostatic gearbox, clutch 2WD/4WD, disassemble and assemble. (PIL 27-05-07).

1. Install a single shim plate if required to achieve the specified dimension.

Length/Dimension/Distance: 0.75–1.5mm

Figure 431.



A Specified dimension

Disassemble and Assemble

▲ CAUTION The spring (or springs) apply considerable force. Make sure you take care to avoid damage or injury.

Refer to Driveline, Hydrostatic gearbox, Clutch 2WD (Two Wheel Drive)/4WD (Four Wheel Drive), (PIL 27-05-07).

Make a note of the fitted orientation of all the components to assist in installation.

Discard all o-rings and seals.

1. Remove bolt, washer and coupling yolk (If not already removed).
2. Remove the oil feed sleeve.
3. Remove the piston housing.
4. Remove the circlip and remove the clutch pressure, friction and counter plates in their installed order.
5. Different clutches may have different specification plates depending on the application. Make sure that the plates are not mixed up with plates from other clutches. You may not be able to distinguish the difference if the plates have been used.

Assemble

1. The assembly procedure is the opposite of the disassembly procedure. Additionally do the following steps.
2. Make sure all components are clean.
3. Install new seals and O-rings
4. Make sure all seals and O-rings are lubricated but do not lubricate anything with grease. Make sure you use transmission oil only, unless otherwise stated in the procedure. Refer to (PIL 75).
5. Lightly lubricate all bearings and components with the correct oil. Make sure you use transmission oil only unless otherwise stated in the procedure. Refer to (PIL 75).
6. Take care not to damage seals or o-rings during assembly.
7. Install the first friction plate up against the clutch drum.
8. On assembly of the splines, the friction plate groove pattern is to be aligned.

Remove and Install

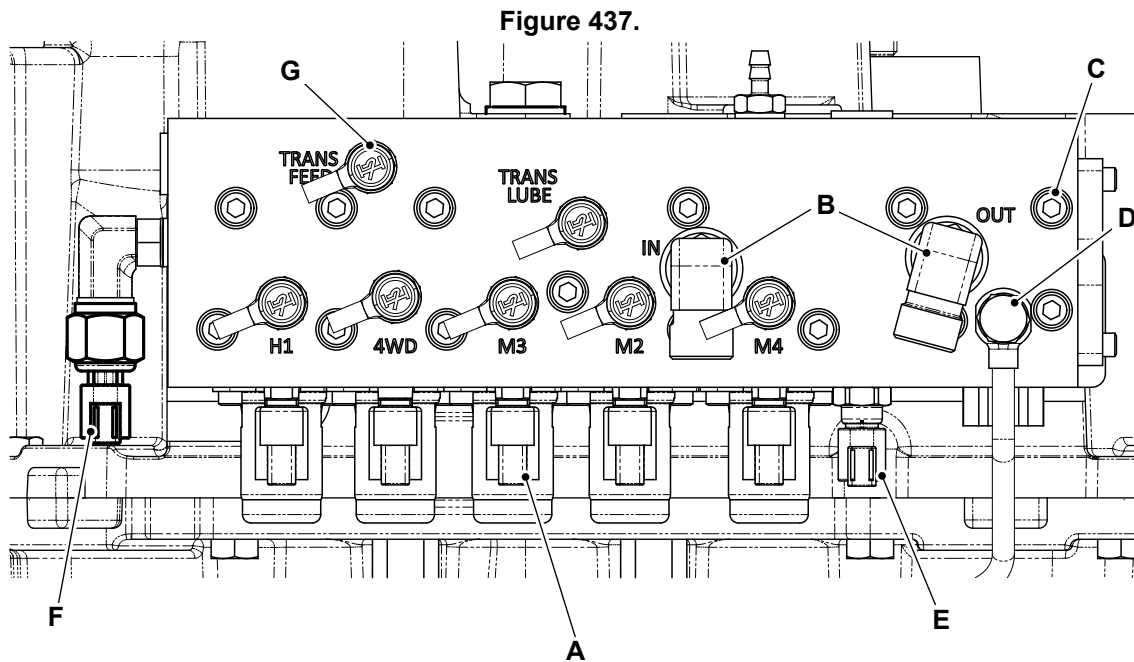
Remove

Before you start the removal procedure, pressure wash all dirt and debris from the external case of the gearbox. Make sure that the electrical and hydraulic connections are protected from any chemicals used in the wash equipment.

1. Disconnect the wiring connectors from each of the solenoid valves.
2. Disconnect the hydraulic hose, plug the hose and cap the adaptor.
3. The illustration shows self seal pressure test points positioned on the valve, on some machines they may be replaced with microbore

hoses and the pressure test points are remotely located.

4. Mark for correct replacement, remove the hoses from the pressure points, plug the hoses and cap the adaptors to prevent ingress of dirt.
5. When you remove the capscrews, slacken progressively and in a logical opposing sequence to prevent distortion of the aluminium valve block.
6. Remove and discard the gasket between the valve block and the gearbox case.
7. Lift and remove the valve block.
8. Prevent ingress of debris to the mating face on the transmission.



- A** Solenoid valve connections (x5)
- C** Capscrews (x14)
- E** Oil pressure sender
- G** Pressure test points (x7)

- B** Hydraulic hose connections (x2)
- D** Banjo bolt
- F** Temperature sender



27 - Speed Sensor

Technical Data 27-373
Component Identification 27-374
Remove and Install 27-374

Technical Data

Table 126.

Type	Magnetic gear tooth sensor
Air gap	1.03–2.03mm
Output frequency	0–5Hz



45 - Piston Ring Seal

Introduction	27-387
Remove and Install	27-388

Introduction

A piston ring is a split ring that fits into a groove on the outer diameter of a piston

Check (Pressure)

Special Tools

Description	Part No.	Qty.
Hand Pump Pressure Test	892/00223	1
Pressure Test Adaptor	993/59300	1

1. Assemble the 2 and 4 wheel drive clutch. Refer to the relevant Clutch- Disassemble and Assemble procedure (PIL 27-06).
2. Check the clutch pack end float and adjust as required. Refer to the relevant Clutch - Disassemble and Assemble procedure (PIL 27-06).

3. Use the service tool (993/59300), insert the adaptor into the oil gallery in the end of the 2 and 4 wheel drive clutch shaft as shown. Hold the adaptor in position with clamp.

Special Tool: Pressure Test Adaptor (Qty.: 1)

4. Use the hand pump (892/00223) to pressurise the clutch assembly until the gear can be turned by hand. Note the pressure gauge reading. Do not exceed the given value.

Pressure: 13.8bar (200.0psi)

Special Tool: Hand Pump Pressure Test (Qty.: 1)

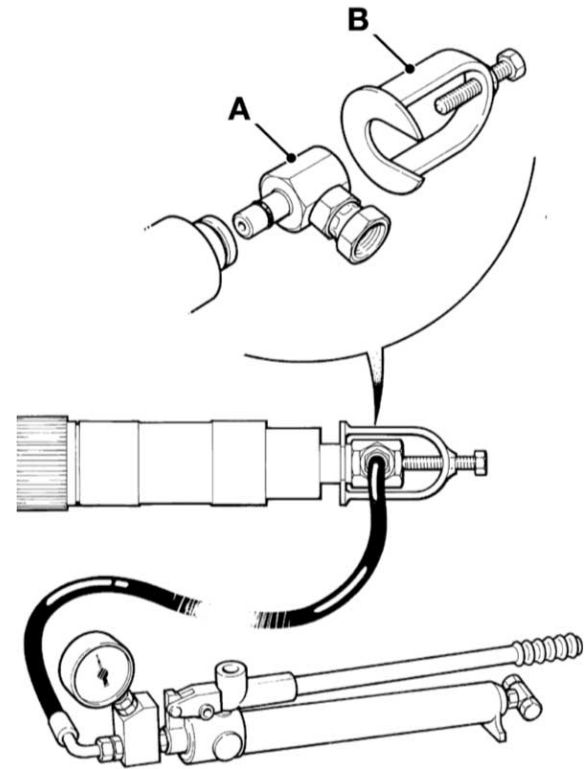
5. If the pressure gauge reading is between the given values, then the clutch is operating correctly and can be installed in the gearbox.

Pressure: 8.6–9.3bar (124.6–134.8psi)

6. If the pressure gauge reading is above the given value, then check the clutch for assembly defects, especially the clutch pack end float (the shim may not be to the correct thickness). Re-test after checking and rectify assembly defects.

Pressure: 9.3bar (134.8psi)

Figure 457.



A Adaptor (Part of 993/59300)

B Clamp (Part of 993/59300)



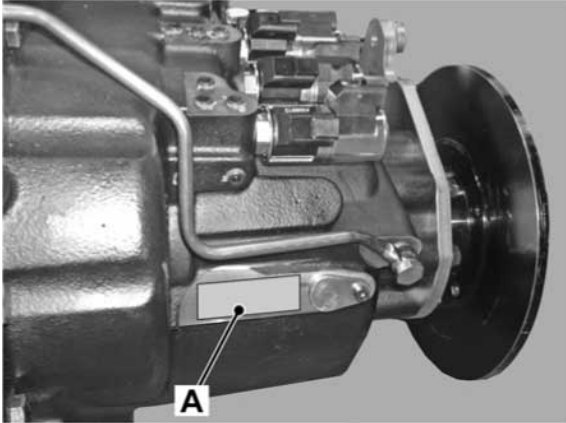
95 - Coupling Yoke

Introduction	27-415
Remove and Install	27-416

Introduction

The drive yoke is an important component of a driveshaft assembly. The drive yoke assembly allows a driveshaft or PTO to flex or slip with their given application. The drive yoke is also essential for allowing u-joints to rotate properly with the driveshaft.

Figure 472.



A Identification plate



Table 157.

Item	Description
1	Wet clutch case
2	Rear case
3	Intermediate case
4	Front case
5	Range box case
6	Front PTO (Power Take-Off) assembly
7	Rear PTO assembly
8	Park brake disc and rear axle driveshaft coupling
9	Charge pump

Item	Description
10	Solenoid control valve block
11	PTO ratio position sensor
12	Front axle driveshaft coupling
13	External hydraulic feed pipe
14	Speed sensors
15	Range box selector position sensors
16	Range box selector solenoid control valves
17	Pump drive interface

Fault-Finding

For: HS750 Page 27-457 (For: HS750)

For: P/Tronic 6x4 Smoothshift, PS700,
PS750 MK2, PS750 MK3, PS750 MK4,
PS760, PS764, PS766 Page 27-461

Fault

Machine drives but lacks power in all gears. Gearbox oil may also be overheating.	Table 169.	Page 27-457
Machine does not drive in any gear.	Table 170.	Page 27-458
Some gears fail to engage or lack power.	Table 171.	Page 27-458
Gearbox oil overheating.	Table 172.	Page 27-459
Noisy operation.	Table 173.	Page 27-459
Cannot engage 4WD (Four Wheel Drive) (Spring ON clutch).	Table 174.	Page 27-460
Cannot engage 2WD (Spring ON clutch).	Table 175.	Page 27-460
Gearbox oil contaminated with water.	Table 176.	Page 27-460
Consequential Faults (Gearbox faults caused typically by water contamination and other factors related to the gearbox oil.)- Pressurisation of gearbox casing. Dipstick blows out and oil escapes from dipstick tube.	Table 177.	Page 27-461
Consequential Faults (Gearbox faults caused typically by water contamination and other factors related to the gearbox oil.)- Clutch failure due to friction lining separation.	Table 178.	Page 27-461
Consequential Faults (Gearbox faults caused typically by water contamination and other factors related to the gearbox oil.)- Badly worn or noisy bearings.	Table 179.	Page 27-461
Gear shifts fail to function normally or shifts occur at the incorrect road speed.	Table 180.	Page 27-461

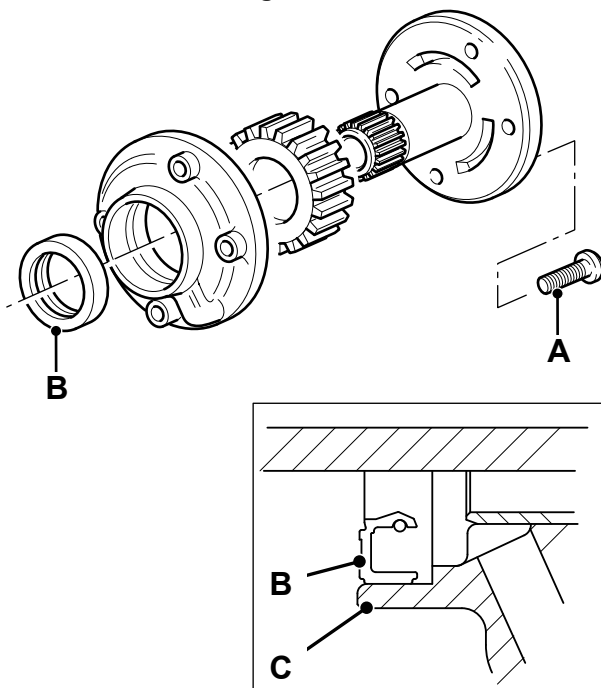
Table 169. Machine drives but lacks power in all gears. Gearbox oil may also be overheating.

Cause	Remedy
Gearbox oil level low.	Check for leaks and top up oil level as required.
Gearbox oil contaminated or wrong grade.	Investigate the reason for the contamination and rectify as required. Drain the oil and flush the gearbox. Refer to driveline- semi automatic gearbox, refer to (PIL 27-06).
Suction strainer restricted or blocked.	Remove the suction strainer and clean or install new as applicable. Refer to driveline- semi-automatic gearbox, refer to (PIL 27-06).
Pressure maintenance valve defective.	Carry out oil pressure and flow tests. Refer to driveline- semi-automatic gearbox, refer to (PIL 27-06).
	Remove the pressure maintenance valve and inspect for signs of damage or excessive wear. Clean or install new as applicable.
Oil cooler lines restricted or blocked. Internal blockage within the oil cooler matrix due to contamination.	Carry out oil pressure and flow tests. Refer to driveline- semi-automatic gearbox, refer to (PIL 27-06).
	Clear the restriction. Inspect the hose routing and install new the hoses or oil cooler matrix as applicable.

mating faces for signs of wear and damage, (If either is evident, the pump must be renewed).

- 5.2. Carefully remove and discard the oil seal. Take care not to damage the seal housing.
- 5.3. Install a new seal. Install the seal the correct way around. Push the seal flush with the front of the housing.
- 5.4. Re-assemble the pump.

Figure 500.



- A** Security screw
- B** Oil seal
- C** Housing

6. Cases:

- 6.1. If the gearbox cases are to be renewed, be sure to install blanking plugs and adaptors as required. Inspect the original cases and identify the blanking plug and adaptor positions. Transfer the plugs and adaptors to the new cases. Apply JCB Threadlocker and Sealer to the threads. Note that new plugs may be supplied with a sealant patch, in which case sealant need not be applied.

Consumable: JCB Threadlocker and Sealer (Medium Strength)

(For: HS750)

Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

Before assembling the gearbox, make sure that a thorough inspection of all components is carried out. Remember that although a failed component may be easy to identify, the cause of that failure may be less easy to trace. It is also possible that a failed component may have caused damage to other areas of the gearbox.

1. Cleaning: Refer to Semi-Automatic Gearbox - Clean, refer to (PIL 27-06).
2. General Inspection:
 - 2.1. Carefully inspect all gears, bearings and shafts for signs of excessive wear or damage. If wear or damage is evident, the components must be renewed.
 - 2.2. Make sure that all oil way cross drillings are clear and free from debris. Blocked oil ways are a common cause of bearing failure. If necessary use an air line to blow through the oil ways.
3. Clutch Units:
 - 3.1. If a clutch failure is suspected see the relevant clutch dismantling and assembly procedure, refer to (PIL 27-06).
4. Remote Gearbox Oil Pump-Renew:
 - 4.1. If tests have shown the pump performance to be unacceptable, the pump must be renewed as a complete unit.
5. Cases:
 - 5.1. If the gearbox cases are to be renewed, be sure to install blanking plugs and adaptors as required. Inspect the original cases and identify the blanking plug and adaptor positions. Transfer the plugs and adaptors to the new cases. Apply JCB Threadlocker and Sealer to the threads. Note that new plugs may be supplied with a sealant patch, in which case sealant need not be applied.

Consumable: JCB Threadlocker and Sealer (Medium Strength)



Figure 507. Transmission Technical Data Checklist

Transmission Technical Data Checklist

Please refer to the relevant section of Transmission Service Manual for reference data.

Company	Contact Name
Transmission Serial Number.....	E-mail address &
	Tel Number
Machine Make/Model	Installation Date
M/C Serial	Machine Hours
Oil Used	Oil Sample Available Yes/No

1. Stall Test results

Stall Test Results	RPM	
	Forward	Reverse
Gear		
1st		
2 nd		
3rd		
4 th		

2. Pressures (in neutral) at 50°C

	1000rpm	2000rpm
Converter In		
Converter Out		
Lubrication		
Mainline		
Forward High Clutch		
Forward Low Clutch **		
Reverse High Clutch		
Reverse Low Clutch **		
Layshaft Clutch **		
Mainshaft Clutch **		
5 th or 6 th Spd Clutch ##		
2/4 wd Clutch		
Converter Inlet Relief Valve		

** not applicable to synchromesh transmissions
only applicable to PS750 5spd or PS760 6spd

3. Flow Rates (in neutral) @ 50°C

	1000rpm	2000rpm
Cooler		
Pump		

4. Summary of symptoms / fault / previous history

.....

.....

.....

.....

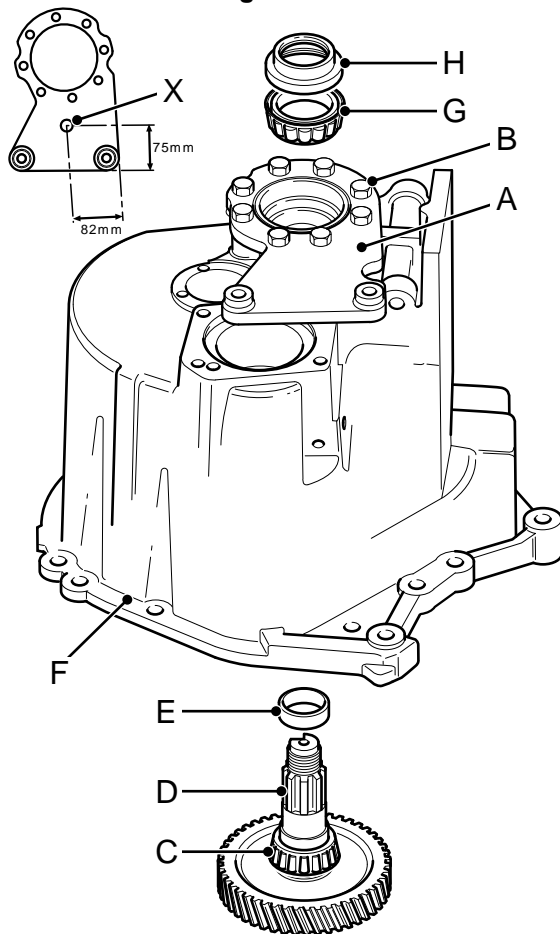
Signature Date

- 2.1. Lightly oil the inner bearing and cup and install to the output shaft.
- 2.2. Install the service spacer (13.70 mm thick, part number 921/52620) onto output shaft and assemble the shaft into case.

Special Tool: Spacer Kit (Qty.: 1)

- 2.3. Lightly oil the outer bearing and cup and install onto the output shaft, do not install the oil seal at this stage.

Figure 535.



- A** Parking brake bracket
- B** Bolts (166Nm)
- C** Inner bearing
- D** Output shaft
- E** Service spacer
- F** Case
- G** Outer bearing
- H** Oil seal
- X** 12.5mm diameter hole

3. Check the output shaft assembly end float. Refer to Gearbox - Calibrate (PIL 27-06).

4. Output gear shaft final assembly.

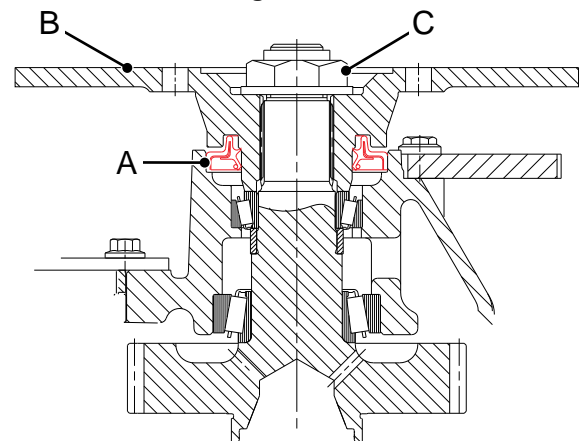
- 4.1. Install a new oil seal (lubricate between the seal lips before installing). Make sure that the seal is pushed in square to the housing.

- 4.2. Install the brake disc using the alignment marks made during dismantling. Note: Do not excessively hammer the disc during assembly or damage to the shaft bearings could occur. If necessary, press install the parts. Fully support the shaft during assembly.

- 4.3. Install the new retaining nut and washer and progressively tighten to the correct torque value. Provided the correct size spacer has been selected the combined seal and bearing rolling torque should not exceed a maximum of 2.0 Nm when fully tightened. Note: If the rolling torque measured is too high, install the next largest size spacer. If the rolling torque is too low, install the next smallest size spacer.

- 4.4. Finally stake the nut into the slot in the shaft.

Figure 536.

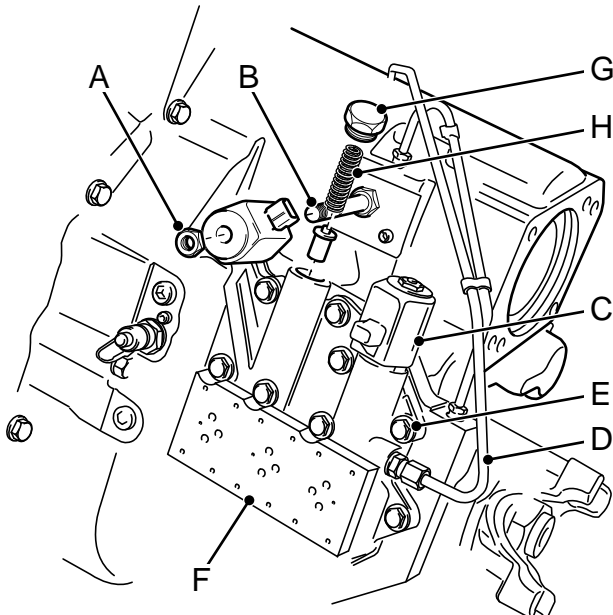


- A** Oil seal
- B** Brake disc
- C** Nut and washer (300Nm)

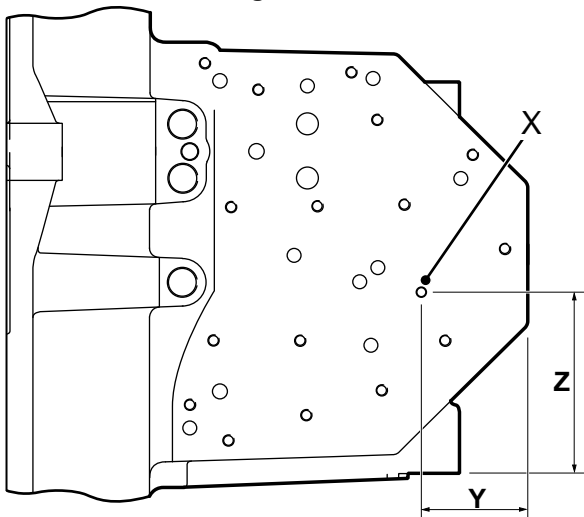
5. Check the output and reverse clutch shaft end floats.

- 5.1. Position the gearbox vertically on wooden blocks to give clearance to the input shaft.

- 5.2. Lubricate the taper roller bearings, then carefully lower the input clutch assembly and reverse clutch assembly into the case. Note: To prevent damaging the input shaft piston ring seals, it is permissible to remove the seals prior to assembling the case halves. However, this is applicable only whilst measuring the shaft end float. Make sure you install the seals before final assembly.

Figure 567.


- A Nut (7Nm)
- B Valve spindle
- C 4WD clutch solenoid
- D 4WD clutch oil feed pipe
- E Bolts (x16) (25-28Nm)
- F Valve manifold block
- G Plug
- H Spring

Figure 568.


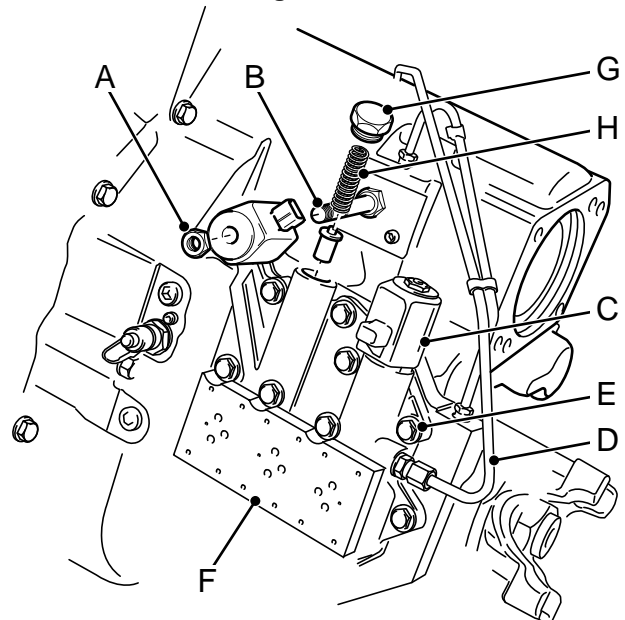
- X Oilway blanking plug
- Y 65mm
- Z 122mm

- 21.3. Assemble the pressure maintenance valve spool and spring into the manifold block. Install and tighten the plug. Do not overtighten as damage to the aluminium housing could result.
- 21.4. Renew the O-ring and install the 4WD clutch valve. (if applicable). Lubricate the

spindle thread, install the retaining nut and tighten to the correct torque value. Do not overtighten as damage to the valve could result.

- 21.5. Install the 4WD clutch assembly oil feed pipe (if applicable), (support the bracket not shown). Make sure that the pipe is not twisted or strained before tightening the nuts to the correct torque value. Note: A pipe guard is available as a service install option. The guard is installed using two bolts as shown. Use JCB Threadlocker and Sealer on the bolts and tighten to the correct torque value.

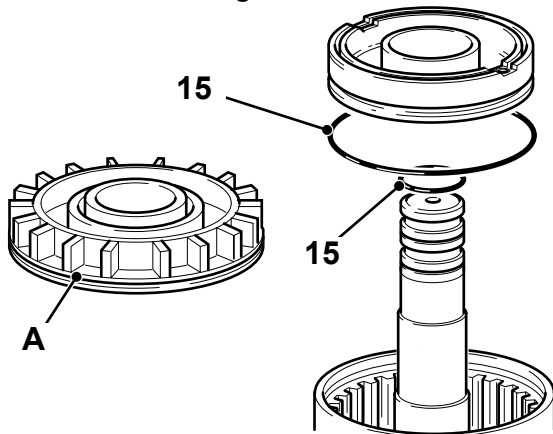
Consumable: JCB Threadlocker and Sealer (Medium Strength)

Figure 569.


- A Nut (7Nm)
- B Valve spindle
- C 4WD clutch solenoid
- D 4WD clutch oil feed pipe
- E Bolts (x16) (25-28Nm)
- F Valve manifold block
- G Plug
- H Spring

22. Install the solenoid control valves:

- 22.1. Renew the surface mounted O-ring seals in each valve body.
- 22.2. Mount the forward high/low clutch solenoid valve onto the manifold block. Install the capscrews and tighten to the correct torque value.
- 22.3. Mount the main shaft/layshaft clutch solenoid valve which may be a single coil or double coil.

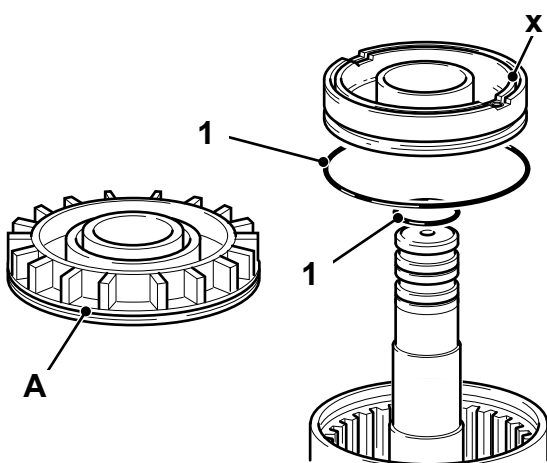
Figure 585.


- 15 O-rings
 A Plastic type piston

16. Repeat steps 2 to 15 to dismantle the opposite clutch.

Assemble

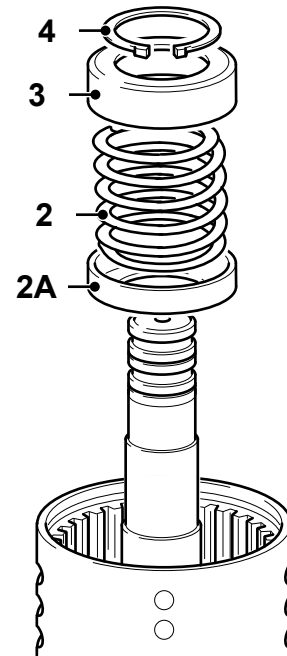
1. Install the new O-rings onto the piston and shaft, lubricate with oil then press the piston fully into the bore of the housing. Make sure that the outer O-ring seal is correctly seated in its groove. Check that the ball valve is seated correctly. Note: It is recommended that the plastic type piston is replaced with an aluminium type, particularly if water ingress has occurred. The oil baffle plate will also be required.

Figure 586.


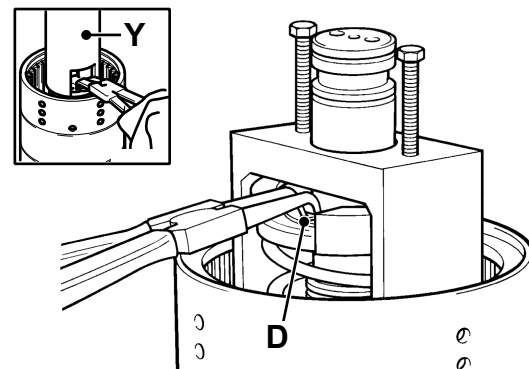
- 1 O-rings
 A Plastic type piston
 X Ball valve

2. Install the oil baffle and piston spring, make sure the spring seats in the piston.
 3. Install the spring retaining plate.

4. Position the clutch assembly in a press, with a cutaway tube, compress the piston spring then install the circlip.

Figure 587.


- 2 Piston spring
 2A Oil baffle plate
 3 Spring retaining plate
 4 Circlip

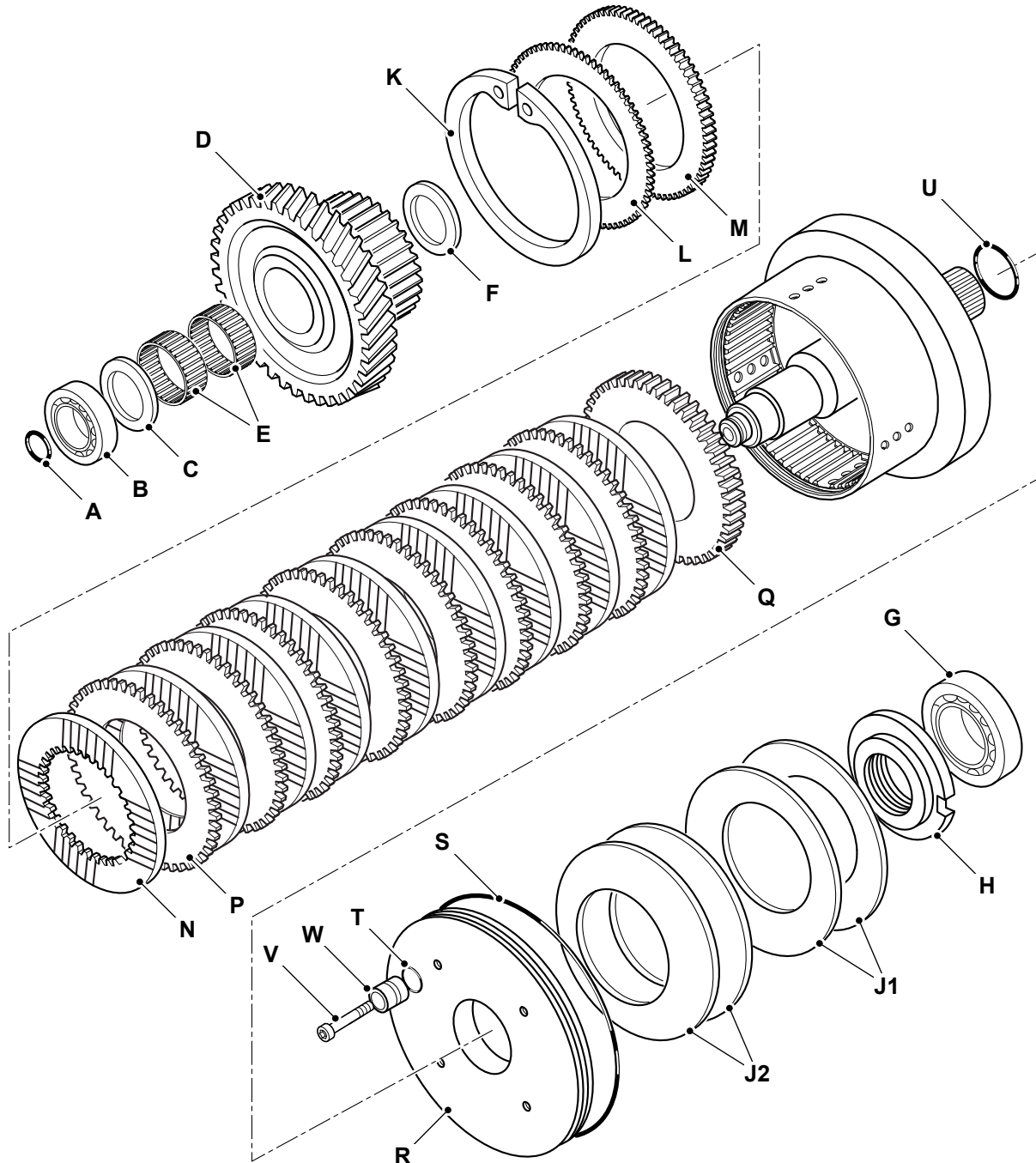
Figure 588.


- D Circlip
 Y Press with cutaway tube

5. Inspect the disc spring for signs of contact at X, with piston or plate support carrier or loosening in the crimped housing. If there is contact, or the housing is damaged renew the disc spring assembly. Install the disc spring assembly, make sure it is installed the right way round as shown. Note: The disc spring is assembled within a crimped housing (not shown) to protect the hub support spline.
 6. Firstly, install one counter plate.

(For: PS764, PS766)

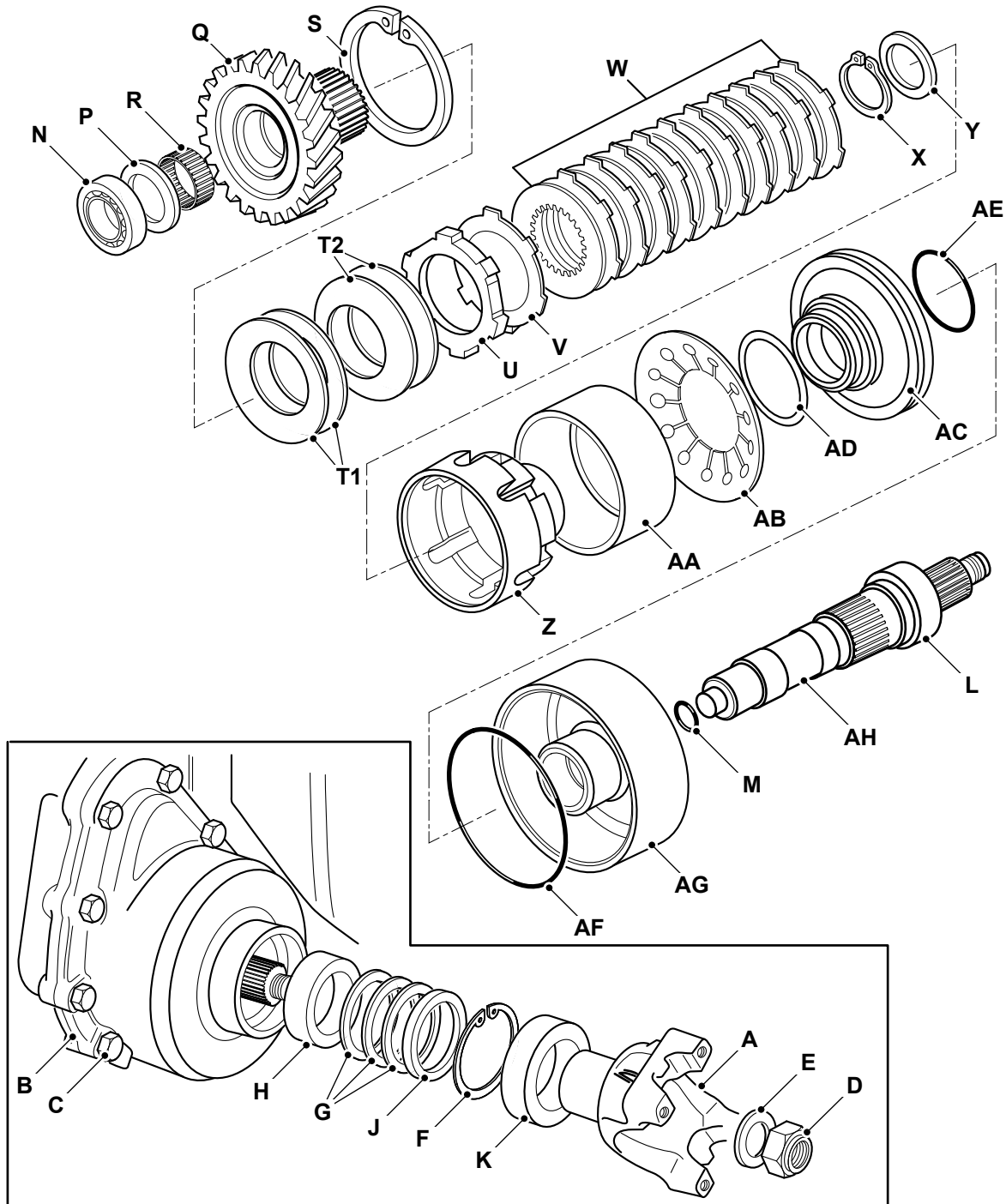
Figure 603. S1 - 4WD Spring ON



- | | | | |
|-----------|---|-----------|------------------------|
| A | Piston ring seal | B | Taper roller bearing 1 |
| C | Thrust washer 1 | D | Gear and splined hub |
| E | Needle roller bearings | F | Thick thrust washer |
| G | Taper roller bearing 2 | H | Locknut |
| J1 | Disc spring | J2 | Disc spring |
| K | Friction and counter plates retaining circlip | L | Shims |
| M | Pressure end plate | N | Friction plates |
| P | Counter plates | Q | Pressure end plate |

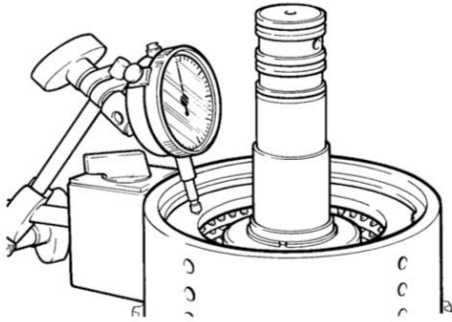
Disassembly

Figure 619.



- | | | | |
|---|-----------|---|----------------------|
| A | Yoke | B | Gasket |
| C | Bolt | D | Nut |
| E | Washer | F | Circlip 1 |
| G | Shims 1 | H | Bearing 1 outer race |
| J | Spacer | K | Oil seal |
| L | Bearing 1 | M | Piston ring seal |

Figure 637.



13. If it is necessary to adjust the end float to bring it within tolerance, there is a choice of installing a 6.0mm (0.23in) or 6.5mm (0.25in) thick pressure end plate, with either a shim or an extra counter plate between the retaining circlip 1 and the pressure end plate.
14. Use an air line to check the operation of the clutch.
15. Install the thrust washer 2.
16. Carefully align the teeth of the clutch plates with a thin rod (or screwdriver) and install the 4WD gear and splined hub, needle roller bearings and thrust washer 1.
17. Apply gearbox oil on the clutch end bearing 2 and press the bearing onto the shaft to seat on the thrust washer 1.
18. Install the new piston ring seals.



08 - Clutch - Layshaft

Introduction	27-583
Component Identification	27-584
Check (Condition)	27-591
Calibrate	27-592
Remove and Install	27-595
Disassemble and Assemble	27-596

Introduction

A clutch is a mechanical device that engages and disengages drive, from driving shaft to driven shaft.

Each gear on the gearbox has an associated clutch which is operated using the applicable solenoid.

When the solenoid is engaged fluid is applied to the clutch to move it into position. When in position the clutch connects the selected gear with the driven shaft.

A combination of clutches is often used within the gearbox to allow different gears to be engaged.

Figure 660.

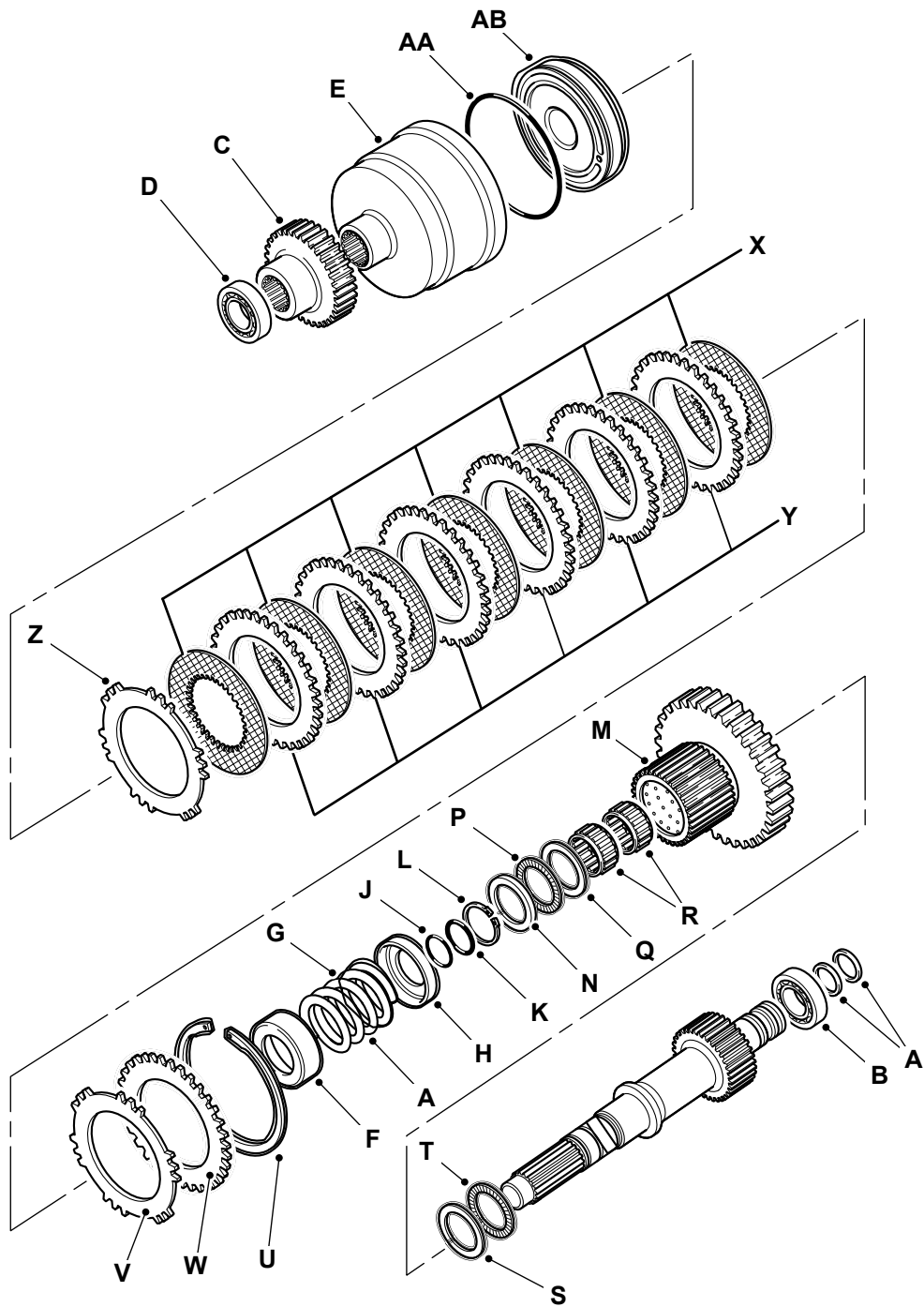


Table 210.

Item	Description
A	Piston ring seals.
B	Taper roller bearing 1
C	4 wheel drive transfer gear
D	Taper roller bearing 2

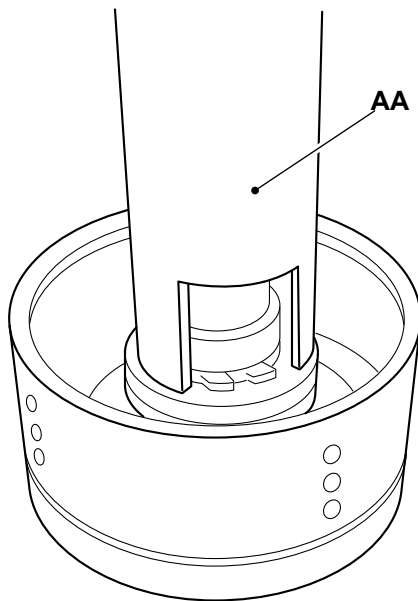
Item	Description
E	Piston housing
F	Spring retaining plate
G	Spring
H	Oil baffle
J	O-ring 1
K	O-ring 2



Table 212.

Item	Description
A	Piston ring seals
B	Taper roller bearing 1
C	Taper roller bearing 2
D	Circlip 1
E	Pressure plate
F	Shim (if installed)
G	Friction plates

Item	Description
H	Counter plates
J	Circlip 2
K	Spring retaining plate
L	Spring
M	Oil baffle
N	Piston
P	O-ring 1 (Piston)
Q	O-ring 2 (Shaft)

Figure 683.


AA Cut away tube

6. Turn the shaft and place it in the press so that the gear welded to the shaft is supported by the press frame.

- 6.1. Put a tube with cut-out aligned with the circlip ears over the spring retaining cup or an assembly tool and compress the spring.
Special Tool: Circlip Assembly Tool (Qty.: 1)
- 6.2. Loosen the circlip 1 from its groove and slowly release the spring compression.
- 6.3. Remove the circlip 2, spring cup 1, spring and the spring cup 2.
7. To remove the piston apply compressed air through the pressure port located between the top two seal grooves of the shaft. This will displace the piston from its housing.
8. Remove and discard the O-ring 1 seal from the piston.
9. Remove and discard the O-ring 2 seal from the shaft.
10. If necessary, remove and discard the taper roller bearing 2 with its associated cup retained in the case from the shaft.
11. Check the clutch drum and if necessary replace.
 - 11.1. Remove all the capscrews through the drive gear welded to the shaft.
 - 11.2. Lift out the clutch drum.

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(For: PS700)

Figure 690.

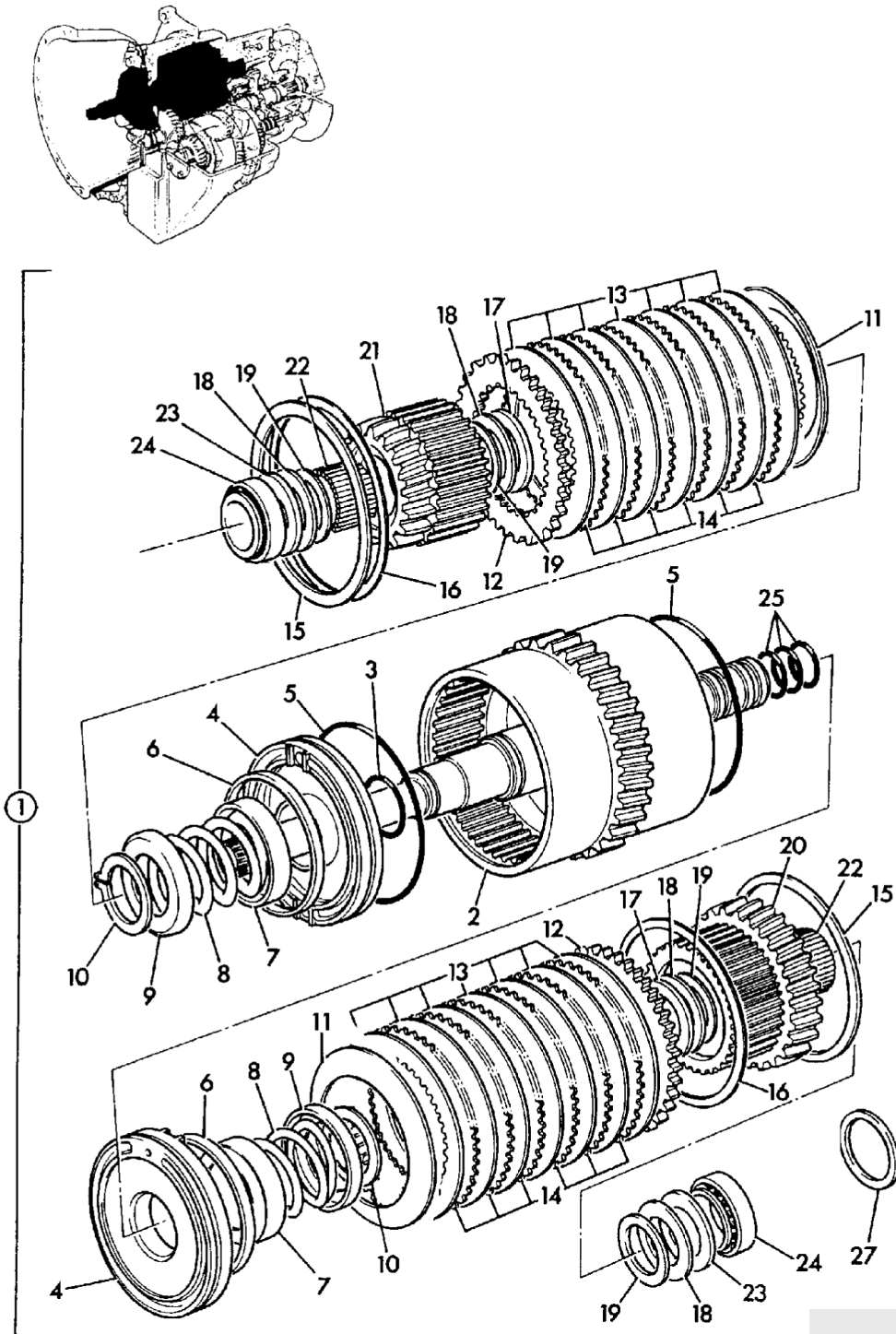
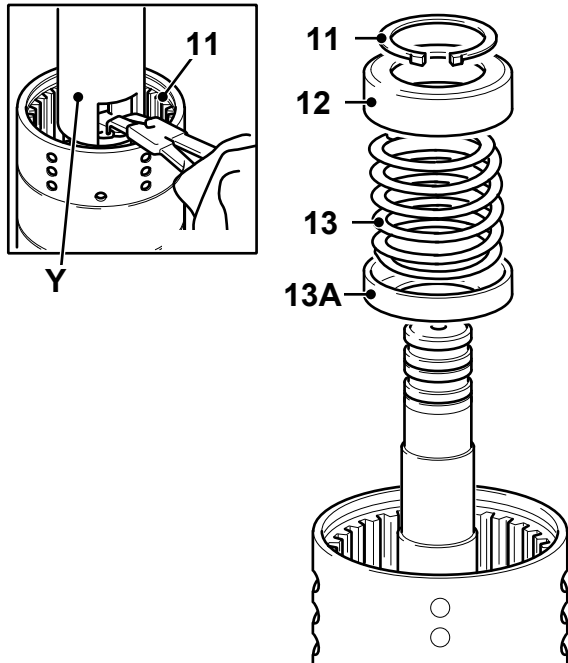
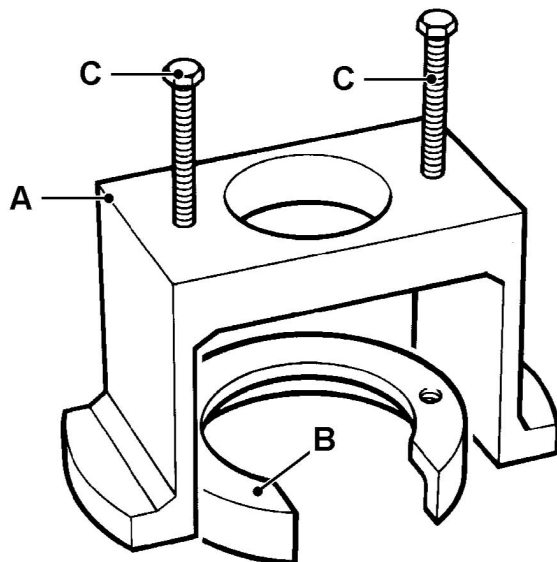


Figure 700.



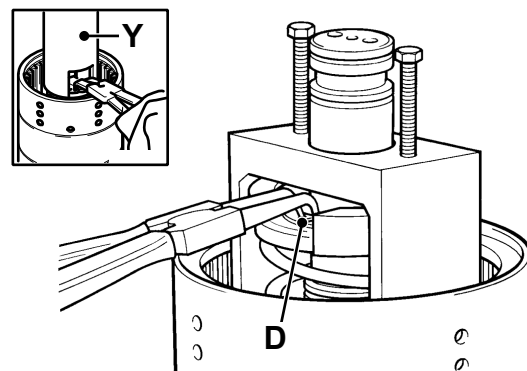
- 11 Circlip
- 12 Spring retaining plate
- 13 Piston spring
- 13A Oil baffle plate
- Y Press with cutaway tube

Figure 701.



- A Spring compressor tool
- B C-plate
- C Bolts (x2)

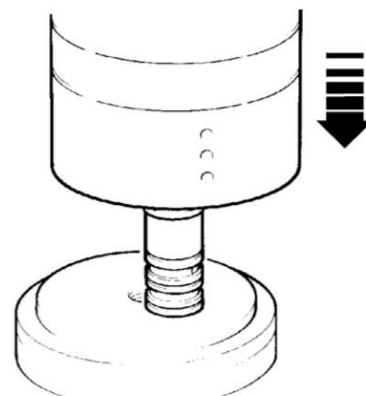
Figure 702.



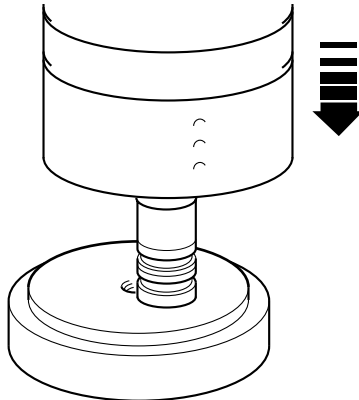
- D Circlip
- Y Press with cutaway tube

14. Knock the clutch shaft on a piece of aluminium (or wood) to remove the piston. If the piston does not loosen when the clutch shaft is knocked on the aluminium, then hand pump air down the shaft of the oil inlet hole.

Figure 703.



15. Remove and discard the piston and shaft O-rings. Make sure that the piston liner is secure. The liner must be a tight fit on the piston (not shown). Note: The plastic type piston is shown.

Figure 726.


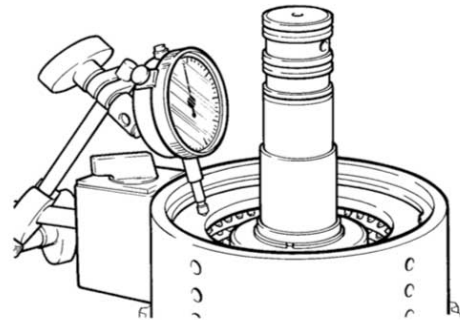
14. Remove the piston.
15. Remove and discard the piston O-ring 1.
16. Remove and discard the shaft O-ring 2.
17. To disassemble the opposite clutch, carefully remove the piston ring seals 2.
18. Remove the bearing 2 with a suitable puller.
19. Remove the thrust bearing 3, thick thrust washer 2 and thin thrust washer 3.
20. Remove the gear and splined hub 2 assembly with the needle roller bearing 2.
21. Do the steps 5 to 16 to disassemble the clutch assembly.

Assemble

1. Install the new O-ring 1 onto the piston.
2. Install the new O-ring 2 onto the shaft.
3. Lubricate the piston with oil and press fully into the bore of the clutch housing.
4. Install the oil baffle and piston spring. Make sure that the spring is positioned properly in the piston.
5. Install the spring retaining plate.

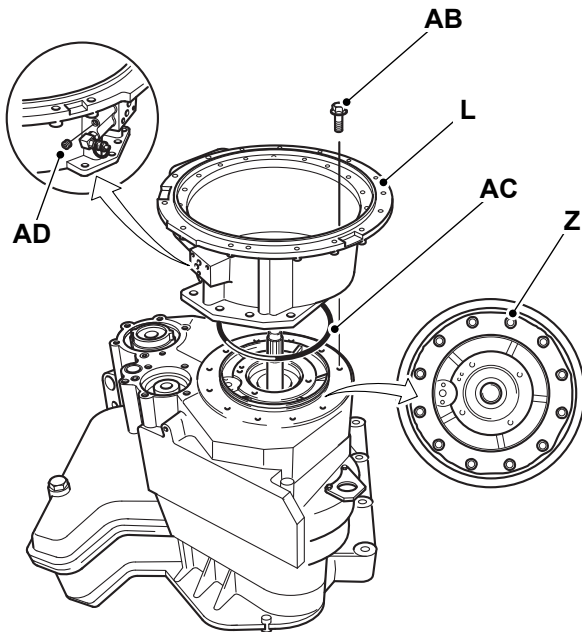
CAUTION! *The spring (or springs) apply considerable force. Make sure you take care to avoid damage or injury.*
6. Compress the spring with a cut away tube and install the circlip 2.
7. Install the disc spring assembly.
 - 7.1. Make sure that the disc spring is installed with the teeth towards the clutch pack.
 - 7.2. Make sure that the teeth are not aligned with the lubrication slots in the housing.

8. Install one counter plate followed by one friction plate.
 - 8.1. Continue to install alternate counter and friction plates, finishing with a friction plate.
9. Install the pressure end plate. Make sure the chamfered face of the pressure end plate faces the clutch pack.
10. Make sure that the teeth are not aligned with the lubrication slots in the housing.
11. Do not install the shim at this stage.
12. Install the friction and counter plate retaining circlip 1.
13. Use a DTI to measure the end float of the pressure end plate. The value should be within the specified range.
 Length/Dimension/Distance: 1.9–2.5mm

Figure 727.


14. If it is necessary to adjust the end float to bring it within tolerance, there is a choice of installing a 6.0mm (0.23in) or 6.5mm (0.25in) thick pressure end plate, with either a shim or an extra counter plate between the retaining circlip 1 and the pressure end plate.
15. Use an airline to check the operation of the clutch.
16. Install the thick washer 1, thin washer 2, and the thrust bearing 2.
17. Carefully align the teeth of the clutch plates using a thin rod (or screwdriver) and install the gear and splined hub 1.
18. Install the needle roller bearing 1.
19. Install the thrust bearing 1 and thin thrust washer 1.
20. Apply gearbox oil on the clutch end bearing 1 and install the gear and bearing 1 onto the shaft.
21. Install the new piston ring seals 1.

Figure 741.



- L** Housing
- Z** JCB multigasket
- AB** Verbus-ripp bolts (x12)
- AC** O-ring2
- AD** Cross drilling blanking plug2

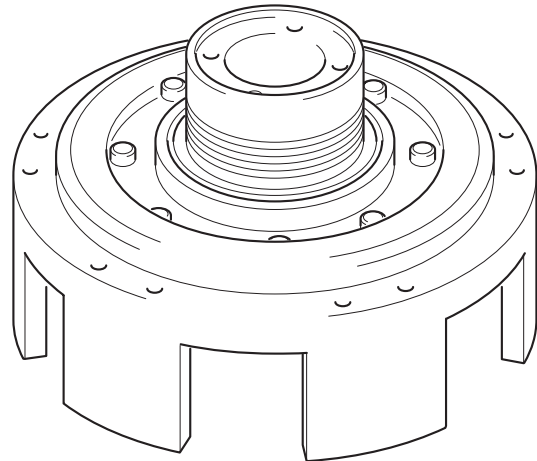
28. The clutch house removal.

- 28.1. Remove and discard all the Verbus-ripp bolts.
- 28.2. Use a soft faced hammer to separate the housing from the PTO/splitter gearbox.
- 28.3. Remove the clutch housing.

29. After you remove the clutch from the housing there will be three main sub assemblies.

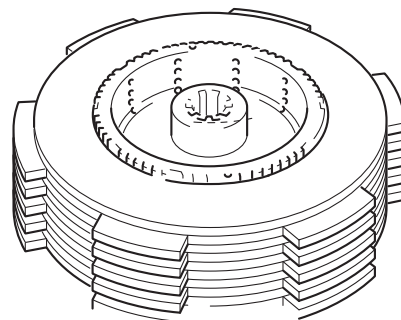
- 29.1. Remove the Clutch drum, hub and pressure plate sub-assembly. Refer to Figure 742.

Figure 742.



29.2. Remove the clutch plates and plate carrier sub-assembly. Refer to Figure 743.

Figure 743.



29.3. Remove the clutch drum carrier and input gear PTO sub-assembly.



14 - Clutch - 5 Speed

Introduction	27-695
Component Identification	27-696
Disassemble and Assemble	27-698

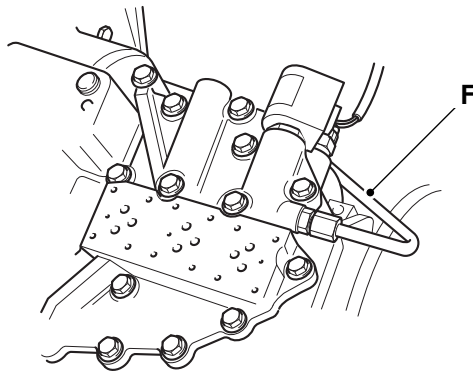
Introduction

A clutch is a mechanical device that engages and disengages drive, from driving shaft to driven shaft.

Each gear on the gearbox has an associated clutch which is operated using the applicable solenoid.

When the solenoid is engaged fluid is applied to the clutch to move it into position. When in position the clutch connects the selected gear with the driven shaft.

A combination of clutches is often used within the gearbox to allow different gears to be engaged.

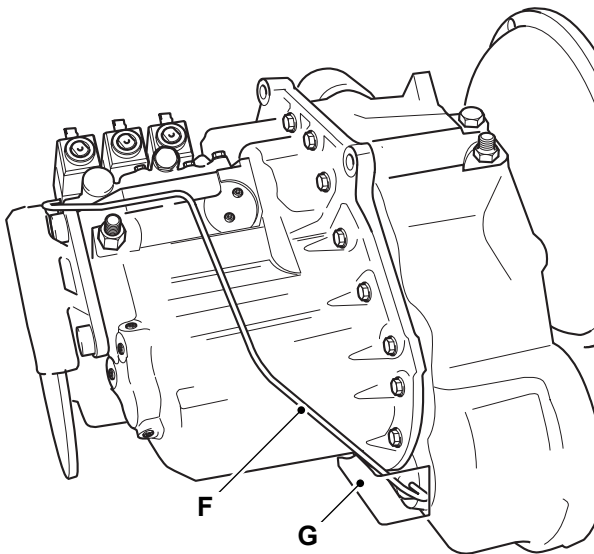
Figure 777.


F 4WD oil feed pipe

5. A pipe guard is available as a service option. The guard is installed using two bolts. Refer to Figure 778.
6. Apply sealant to the threads of the bolts and tighten to the correct torque value.

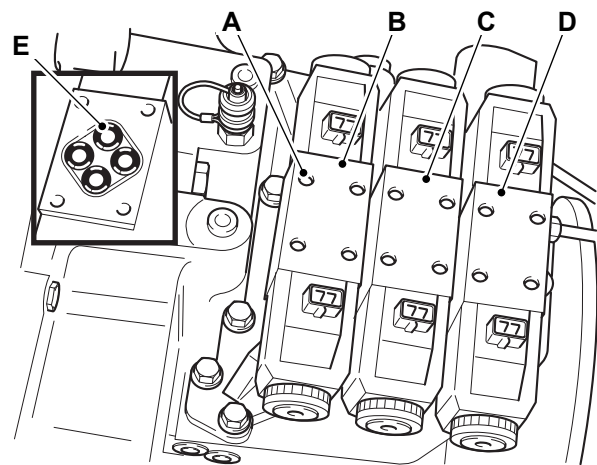
Torque: 56N·m

Consumable: [JCB Threadlocker and Sealer \(Medium Strength\)](#)

Figure 778.


F 4WD oil feed pipe
G Pipe guard

7. Install the solenoid control valves as follows: Refer to Figure 779.

Figure 779.


A Screws
B Reverse high-low clutch solenoid valve
C Main shaft-layshaft clutch solenoid valve
D High-low clutch solenoid valve

- 7.1. Replace the surface mounted o-rings in each valve body.
- 7.2. Put the forward high-low clutch solenoid valve in position against the manifold block.
- 7.3. Attach the forward high-low clutch solenoid valve with the screws.
- 7.4. Tighten the screws to the correct torque value.
- 7.5. Do the steps 7.2 to 7.4 main shaft-layshaft clutch solenoid valve and reverse high-low clutch solenoid valve.
- 7.6. After assembly, make sure that the plastic sealing plugs are inserted into the mounting screw counter-bores to prevent the ingress of water and dirt. This will prevent corrosion of the screw heads and avoid problems removing the screws in the future.

Table 238. Torque Values

Item	Nm
A	5
F	56
H	7
N	27

(For: P/Tronic 6x4 Smoothshift)

The following procedure is for one solenoid control valve. Repeat the same procedure for all the remaining solenoid control valves.

25 - Charge Pump

Remove and Install 27-723
Disassemble and Assemble 27-724

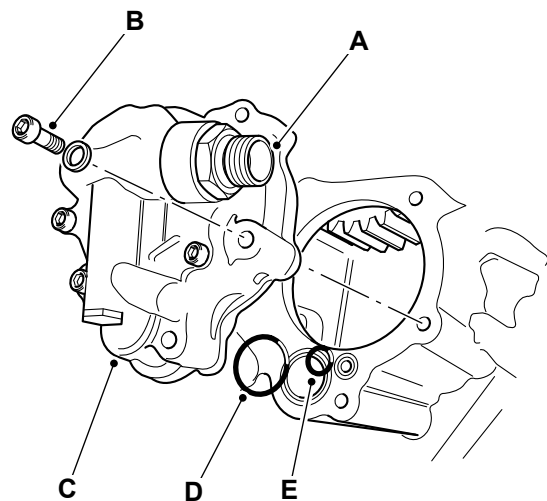
Remove and Install

Remove

The gearbox pump may be removed with the gearbox in the machine.

1. Drain the oil from the gearbox.
2. If the gearbox is removed from the machine, make sure that it is securely mounted on a manipulator.
3. Disconnect the pressure feed hose from the pump adaptor, plug the hose and the cap adaptor to prevent ingress of dirt.
4. Remove the capscrews that secure the pump to the gearbox case.
5. Remove the pump.
6. Remove and discard the O-ring seal 1.
7. If installed, remove and discard the O-ring seal 2.

Figure 787.



- A** Pressure feed hose
- B** Capscrews
- C** Pump
- D** O-ring seal 1
- E** O-ring seal 2

Install

1. Installation is the opposite of the removal procedure. At the time of installation do the following steps.
2. Install new O-ring seals.

Remove and Install

Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

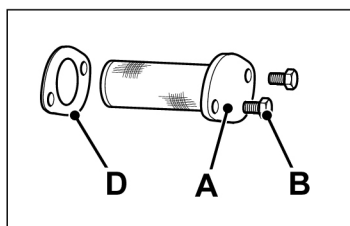
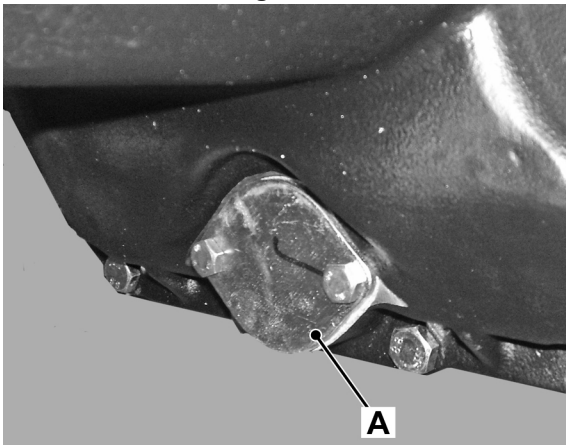
Table 247. Torque Values

Item	Nm
B	12

Remove

1. Clean the area around the strainer. Do not allow particles of grit to fall into the gearbox.
2. Place a container, of suitable size beneath the suction strainer. Remove the bolts. Remove the strainer and the gasket. Allow the oil to drain into the container. Be aware that the oil may be hot. Refer to Gearbox, Drain and Fill (PIL 27-06).
3. Clean the strainer with a suitable solvent. Follow the solvent manufacturer's instructions on safety.

Figure 795.



- A** Strainer
- B** Bolts
- D** Gasket

Install

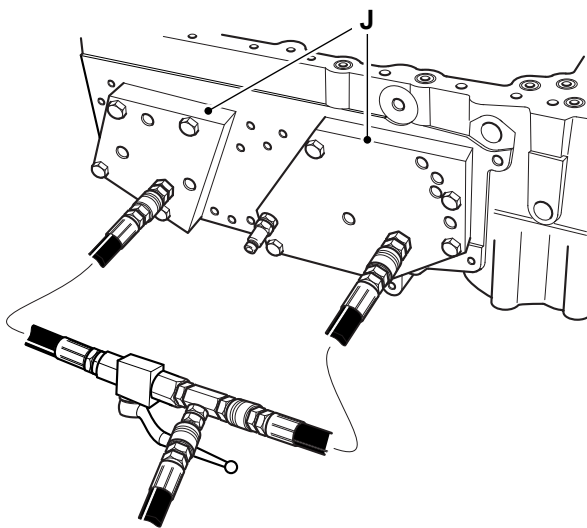
1. Install the strainer and a new gasket.
2. Apply JCB Threadlocker and Sealer to the threads of the bolts. Tighten the bolts to the correct torque value.

Consumable: JCB Threadlocker and Sealer (Medium Strength)

6. Remove the tool.
7. Install new o-rings. Make sure the correct O-rings are used. Refer to Figure 806.
8. Lubricate the O-rings. Make sure they stay in their positions when the intermediate case is installed.
9. Apply a continuous bead of JCB black plastic gasket B574 around the joint faces of the gearbox case. Refer to Figure 807.
10. Make sure that the black gasket does not come into contact with the O-ring seals.
11. Install the special adaptor plates to the transmission selector valve mounting face as shown. Refer to Figure 808.
- 11.1. This is to make sure that the clutch pack friction plates do not get misaligned when the intermediate cover is installed.

Special Tool: Adaptor Plates (Qty.: 1)

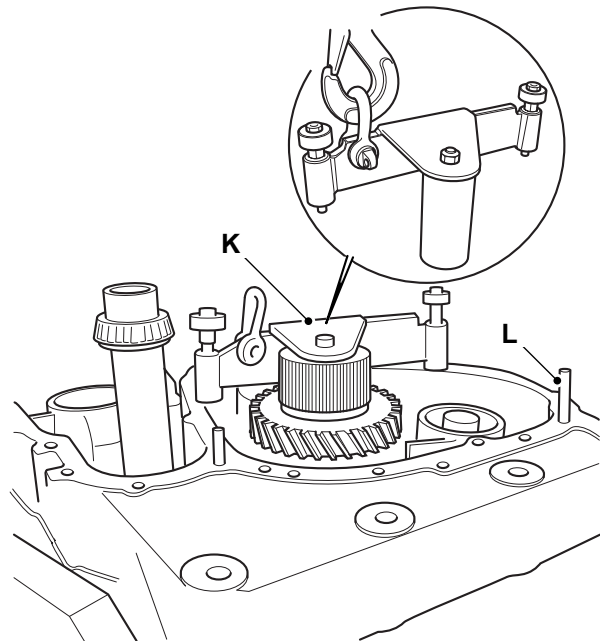
Figure 808.



K Adaptor plates

12. To lock the clutch connect compressed air lines to the quick disconnect couplings that are installed into the adapter plates.
13. Use the special lifting bar to safely support the intermediate case and lower over the guide studs. Refer to Figure 809.

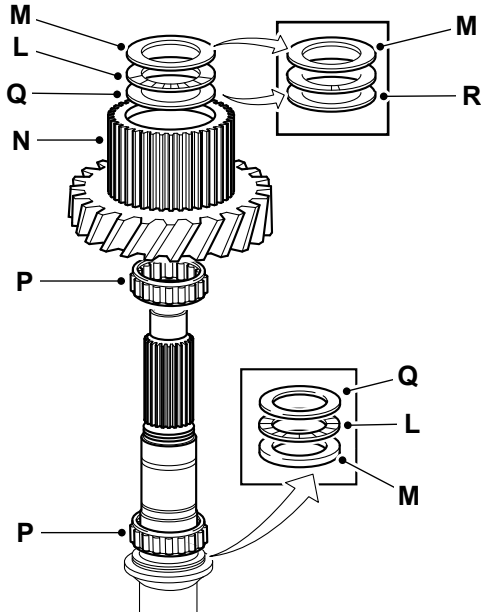
Figure 809.



K Lifting bar
L Studs

14. Gently rotate the centre bearing shaft back and forth to make sure that the splines fully engage with the main shaft clutch plates.
15. Remove the guide studs.
16. Install the fixing screws that attach the intermediate case.
17. Tighten the screws to the correct torque value.
 Torque: 56N·m
18. Measure the end float of the main shaft.

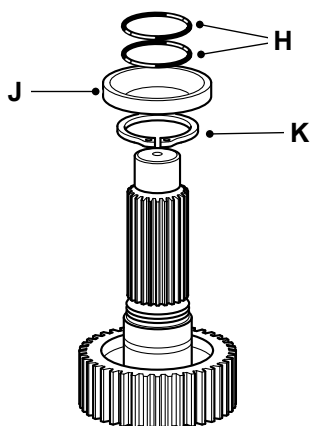
Figure 836.



- L Needle roller thrust bearing
- M Thrust washer 1
- N Gear and splined hub
- P Needle roller bearings (x2)
- Q Thin steel thrust washer
- R Nylon thrust washer

22. Install the gear and splined hub.
23. Install the thrust washer, then a needle roller thrust bearing and a thin thrust washer at the top.
24. Install the external circlip.
25. Install the spring retaining plate.

Figure 837.

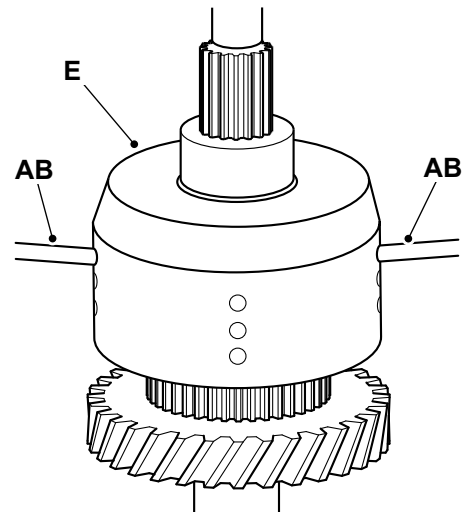


- H O-rings 1
- J Spring retaining plate
- K External circlip

26. Install two new O-rings 1 on to the layshaft.

27. Position the clutch assembly on the layshaft splined hub to align the clutch friction or counter plates.

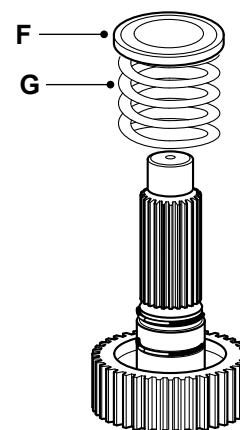
Figure 838.



- E Clutch assembly
- AB Small rounded screwdrivers

28. To wedge the plates together, install two small rounded screwdrivers through the bottom holes at the side of the clutch housing.
29. Remove the wedged clutch assembly.
30. Install the spring and the oil baffle plate.

Figure 839.



- F Oil baffle plate
- G Spring

31. Install the wedged clutch assembly.

Description	Part No.	Qty.
Bearing Assembly Tool	892/01084	1

Before Removal

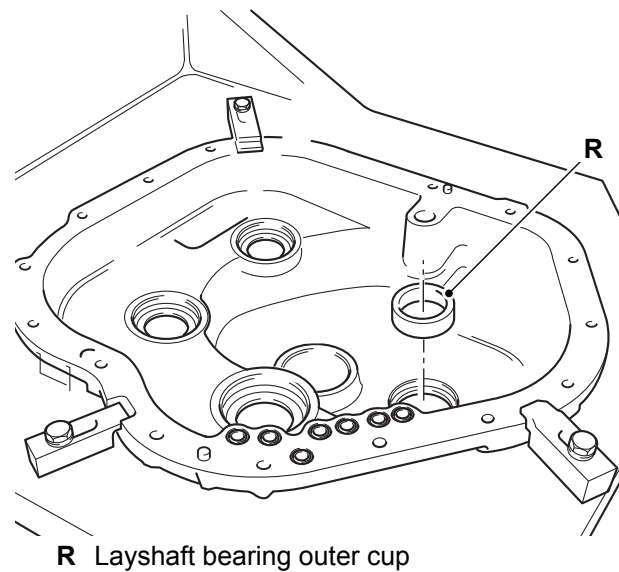
1. Remove the front case and the clutch shafts.

Remove

1. Remove the pressure maintenance valve as follows:
 - 1.1. Remove the plug.
 - 1.2. Remove the spring and valve spool from the rear case.
2. If required, remove the speed sensor as follows:
 - 2.1. Remove the bolt 1.
 - 2.2. Remove the sensor and its O-ring from the rear case.
3. Hold the output yoke with the service tool.
Special Tool: Drive Coupling Spanner (Qty.: 1)
4. Remove the bolt 2 and the thick washer.
 - 4.1. The bolt is very tight, the help of an assistant will be required.
5. Remove the yoke.
6. Remove and discard the oil seal. Make sure that you do not damage the seal housing.
7. Support the transfer gear shaft assembly and remove the gear from inside the rear case.
8. The gear assembly will come down along with the following components:
 - 8.1. Inner taper roller bearing.
 - 8.2. Inner taper bearing outer cup.
 - 8.3. Solid spacer.
9. Remove the outer taper rolling bearing and the outer bearing outer cup.
 - 9.1. Note: If the inner and outer taper roller bearings are to be used again, keep the bearings together with their respective outer cups in their original relationships.
 - 9.2. Put tags on the bearings to make sure that assembly of them in their original positions.
 - 9.3. If any of the two bearings is worn or damaged, both the bearings must be replaced and a new solid spacer be selected and installed.

10. Remove the layshaft bearing outer cup from the rear case.

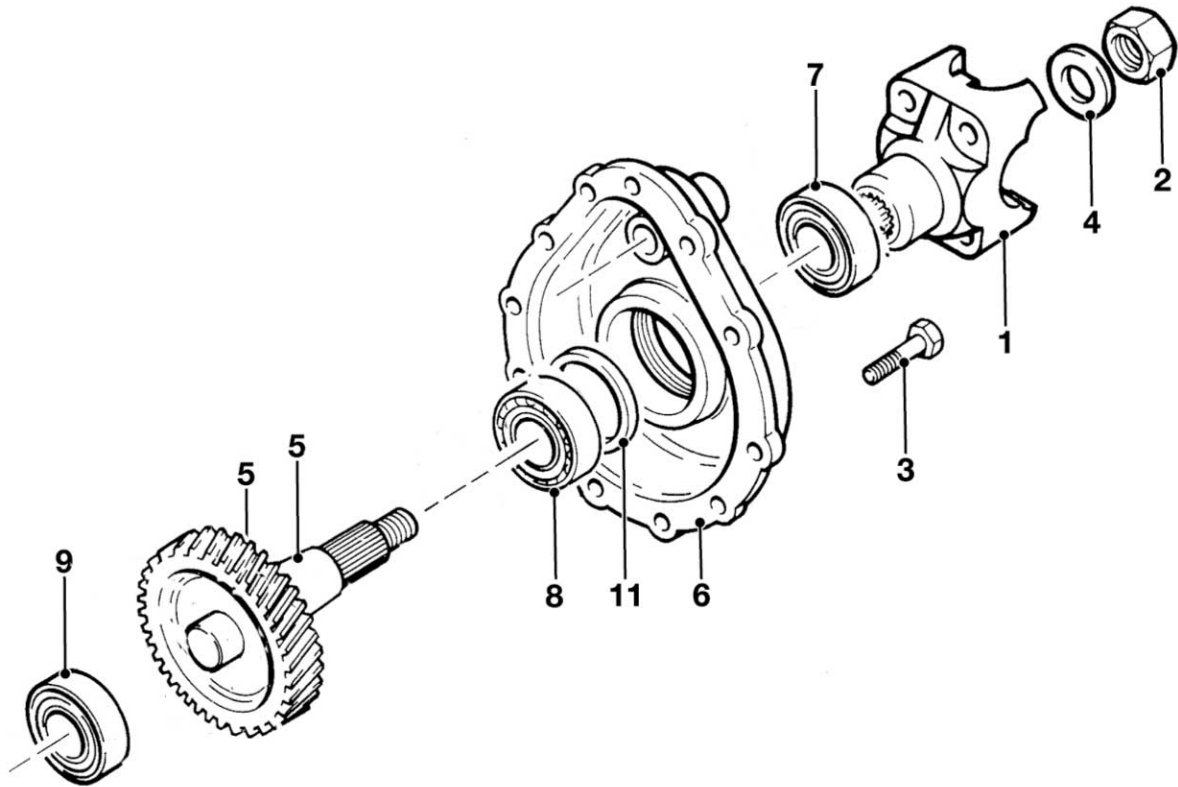
Figure 857.



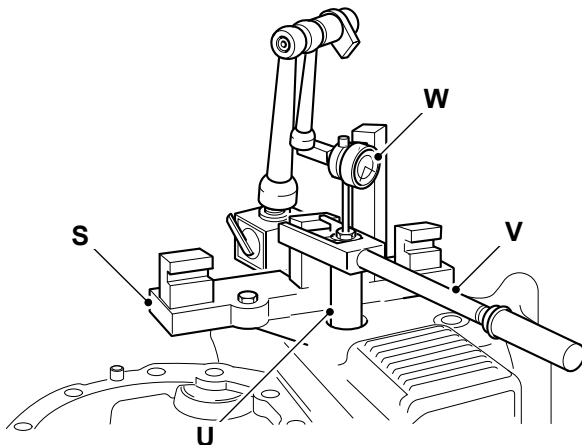
R Layshaft bearing outer cup

Component Identification

Figure 874.



- | | | | |
|---|---------------|----|---------------|
| 1 | Output yoke | 2 | Retaining nut |
| 3 | Housing bolts | 4 | Washer |
| 5 | Shaft | 6 | Housing |
| 7 | Oil seal | 8 | Bearing |
| 9 | Bearing | 11 | Spacer |

Figure 891.


- S** Base plate
- U** Adaptor
- V** Torque wrench
- W** DTI

- 6.1. Assemble the adaptor to the end of the shaft.
- 6.2. Install the base plate to the gearbox with a bolt.
- 6.3. Assemble the DTI and the torque wrench.
- 6.4. Set the DTI to zero and the torque wrench to the specified torque value.

Torque: 35N·m

- 6.5. Gain access through the 4WD cover to rotate the main shaft. For 2WD (Two Wheel Drive) transmissions use an airline and the adaptor tool.
- 6.6. Rotate the main shaft back and forth to seat the bearings, and lift and depress the torque wrench.

- 6.7. Record the reading on the DTI.

- 6.8. The end float must be within the range specified.

Length/Dimension/Distance: 0.02–0.18mm

7. Install the 4WD clutch assembly or output shaft assembly (permanent 4WD variant) (if applicable).

8. Install the gearbox oil pump.

9. Install the torque converter housing as follows:

- 9.1. Apply liquid gasket to the mating face of the torque converter housing.

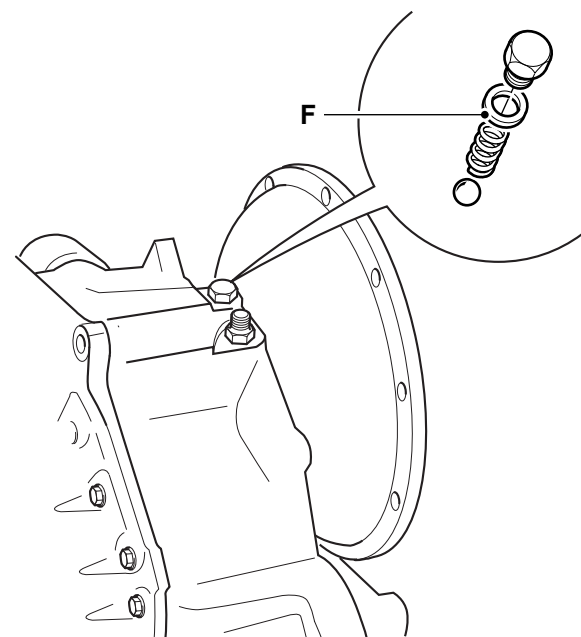
Consumable: JCB Multi-Gasket

- 9.2. Put the torque converter in position against the front case. Make sure that the dowels are engaged with the torque converter housing.

- 9.3. Apply sealant to the threads of the bolts that attach the torque converter.

Consumable: JCB Threadlocker and Sealer (Medium Strength)

- 9.4. Tighten the bolts to the correct torque value.
- 9.5. Install the torque converter relief valve ball and tapered spring. Refer to Figure 892.
- 9.6. Make sure that the larger diameter of the tapered spring is located securely over the spigot on the plug.
- 9.7. Use a new sealing washer, then install and tighten plug.

Figure 892.

F Torque converter relief valve

10. Install the solenoid valve manifold block and the solenoid valves.

11. Install the suction strainer.

12. Install the drain plug with a new sealing washer.

13. Tighten the drain plug to the correct torque value.

Torque: 203N·m

14. Install the main line pressure switch and pressure test point assembly with a new sealing washer.

15. Tighten the locknut to the correct torque value.

16. Install a new oil filter.

17. Install the main shaft lubrication oil pipe at the gearbox case and torque converter housing.

18. If removed, install the speed sensor.

Remove and Install

For: PS700, PS750 MK2 Page 27-821
 For: PS750 MK3 Page 27-821
 For: HS750, PS750 MK4 Page 27-821
 For: P/Tronic 6x4 Smoothshift
 Page 27-821

(For: PS700, PS750 MK2)

The front and rear case are separated at the same time. Refer to the removal procedure of the front case.

(For: PS750 MK3)

The front and rear case are separated at the same time. Refer to the removal procedure of the front case.

(For: HS750, PS750 MK4)

The front and rear case are separated at the same time. Refer to the removal procedure of the front case. Refer to (PIL 27-05-90).

(For: P/Tronic 6x4 Smoothshift)

Special Tools

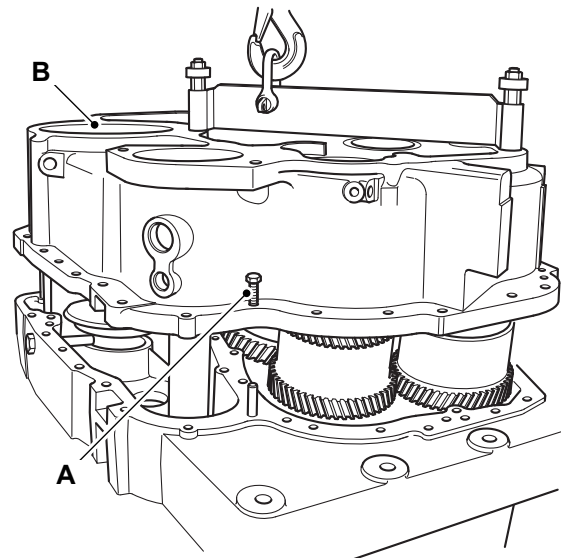
Description	Part No.	Qty.
Torque Wrench (10-100Nm)	993/70111	1
Reaction Plate Rear Case	998/11337	1
Push Pull Adaptor	998/11384	1
Air Feed Adaptor - Output Shaft	998/11386	1
Push Pull Adaptor	998/11387	1
Dolly Main Gear Bearing	998/11390	1
Clutch Plate Alignment Tool	998/M0034	1

▲ CAUTION This component is heavy. It must only be removed or handled using a suitable lifting method and device.

Removal

1. Remove the screws that attach the rear case. Refer to Figure 917.

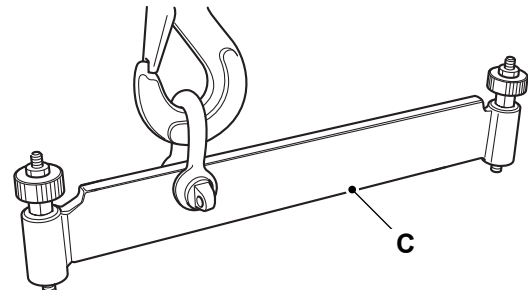
Figure 917.



A Screw
B Rear case

2. Install a spreader bar across the case for accurate balance and a horizontal lift. Refer to Figure 918.

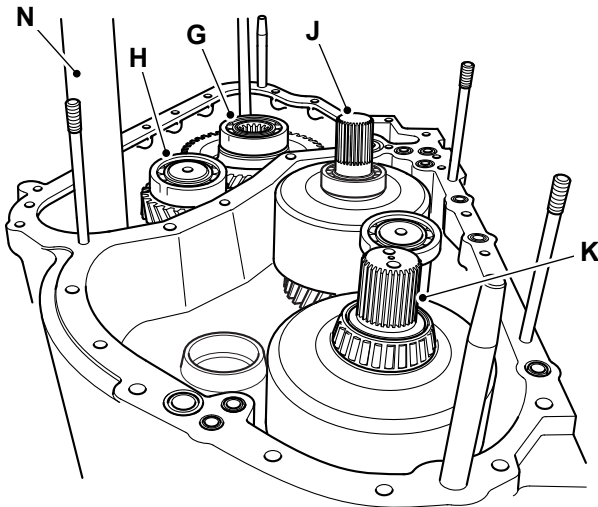
Figure 918.



C Spreader bar

3. Disengage and lift the cases apart. Use a large plastic mallet to break the sealing bond caused by the gasket compound used on assembly.
4. Install lifting eyes and shackles to the shafts to lift the shafts out of the case.
5. Remove the flange O-ring seals. Discard the seals.
6. The main shaft clutch can be lifted clear of its drive hub with suitable lifting equipment. Refer to Figure 919.
- 6.1. Make sure that no side load is applied on the drive hub when the main shaft gears are lifted out of mesh with their mating gears on the layshaft.

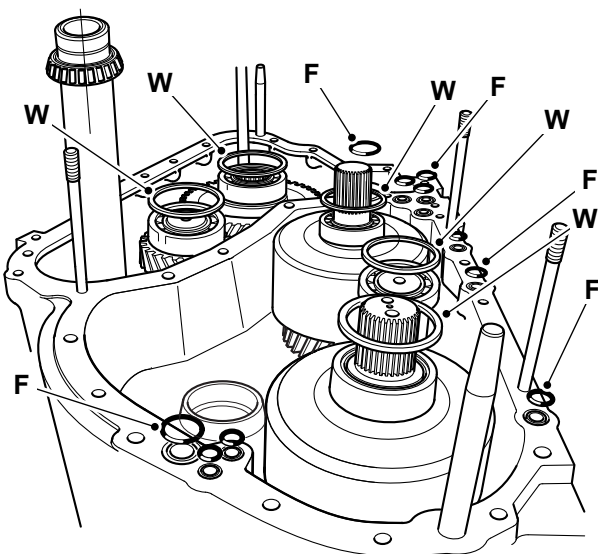
Figure 937.



- G** PTO Ratio selector shaft
- H** PTO Idler drive shaft
- J** Ratio clutch shaft 1
- K** Ratio clutch Shaft 2
- N** Pump drive shaft

2. Make sure that the joint flanges of the case are clean and free from oil and old sealant.
3. Thread three or four guide studs into the tapped holes around the flange. These will help align the intermediate cover as it is lowered into place.
4. Put the nominal shims on the top of the bearing cups which are positioned on their matched shaft bearings, ready for end float measurement.

Figure 938.

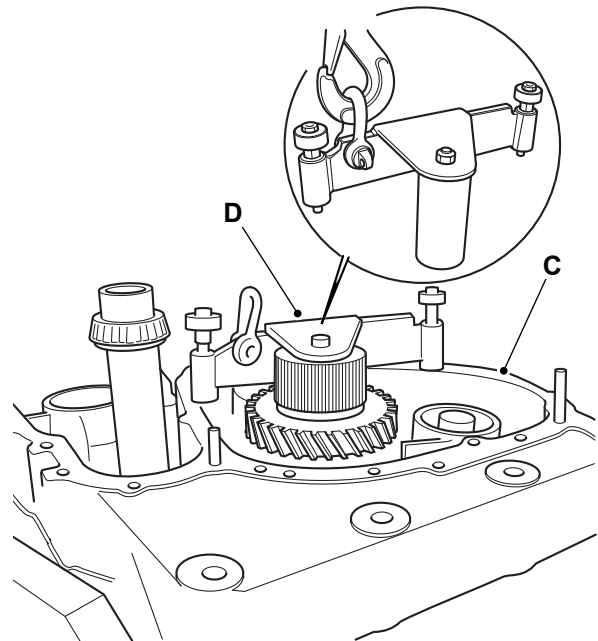


- F** O-rings
- W** Shims

5. Use the special lifting spreader bar to replace the intermediate case.

- 5.1. Secure the case with 17mm fixing screws.

Figure 939.



- C** Intermediate case
- D** Spreader bar

- 5.2. Tighten the fixing screws to the specified torque value.

Torque: 56N·m

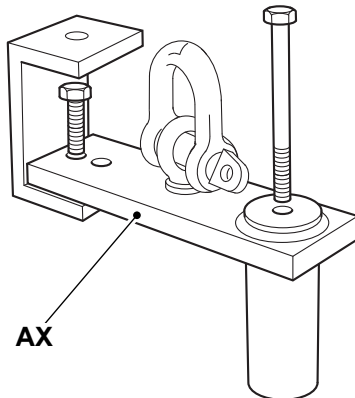
6. Add nuts to the studs, which are already installed.

- 6.1. Spacers may be required over the studs to make sure that there is sufficient threads to allow the nuts to be tightened.

- 6.2. Tighten the nuts to the specified torque value.

Torque: 56N·m

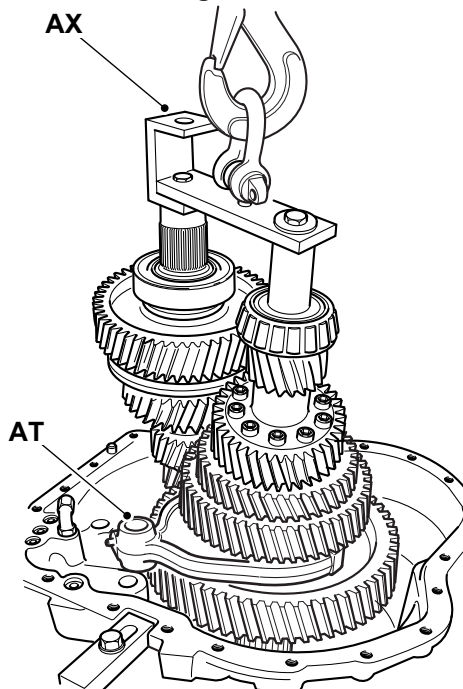
Figure 956.



AX Lifting Frame Range Box Shafts

50. When the special bracket is securely bolted to both shafts, position the lifting eye and shackle centrally as shown. Refer to Figure 957.
51. Both the shafts will be locked together and may be lifted vertically from the case. Refer to Figure 957.

Figure 957.



AX Lifting Frame Range Box Shafts
AT Selector fork 2

52. Remove the selector fork 2 from the output shaft. Refer to Figure 957.
53. If the three range box shafts are to be reassembled with new bearings, remove the old bearing cups from the case and discard them.

If necessary, before assembly refer to the following procedures.

- Range Box- Internal pipework and seals. Refer to: [PIL 27-11](#).
- Range Box- Selector rail pistons. Refer to: [PIL 27-11](#).
- Range Box- Main shaft. Refer to: [PIL 27-11](#).
- Range Box- Output Shaft. Refer to: [PIL 27-11](#).
- Range Box- 4WD clutch. Refer to: [PIL 27-11](#).

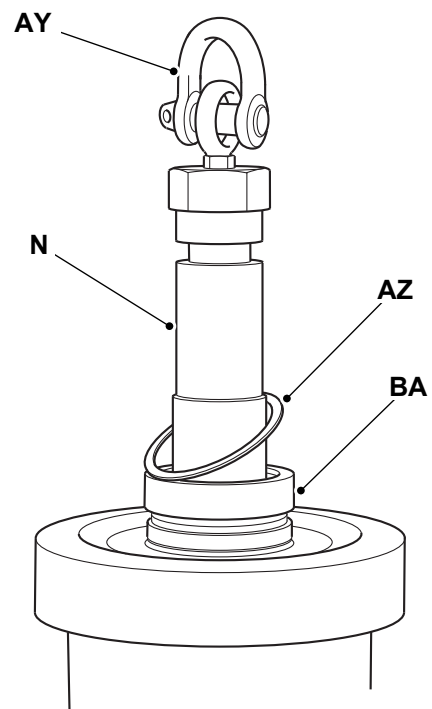
Assembly

4WD clutch assembly

1. When the case is tightly attached to the manipulator and positioned horizontally, install a new matched 4WD clutch bearing cup to the case. Refer to Figure 958.
2. Assemble the end float adaptor with its spacer ring. Refer to Figure 958.

Special Tool: Push Pull Adaptor (Qty.: 1)
 Special Tool: Spacer (Qty.: 1)

Figure 958.



N Push pull adaptor
AY Shackles
AZ End float spacer shim
BA Bearing cup

3. Attach the lifting eye and shackle to the taper hole in the end of the adaptor. Refer to Figure 958.

Assembly

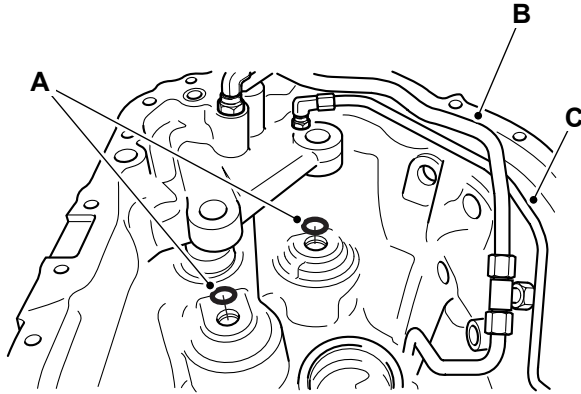
1. Assembly is the reversal of the disassembly procedure.

Disassemble and Assemble

Disassembly

1. O-ring seals must be removed and discarded.

Figure 993.



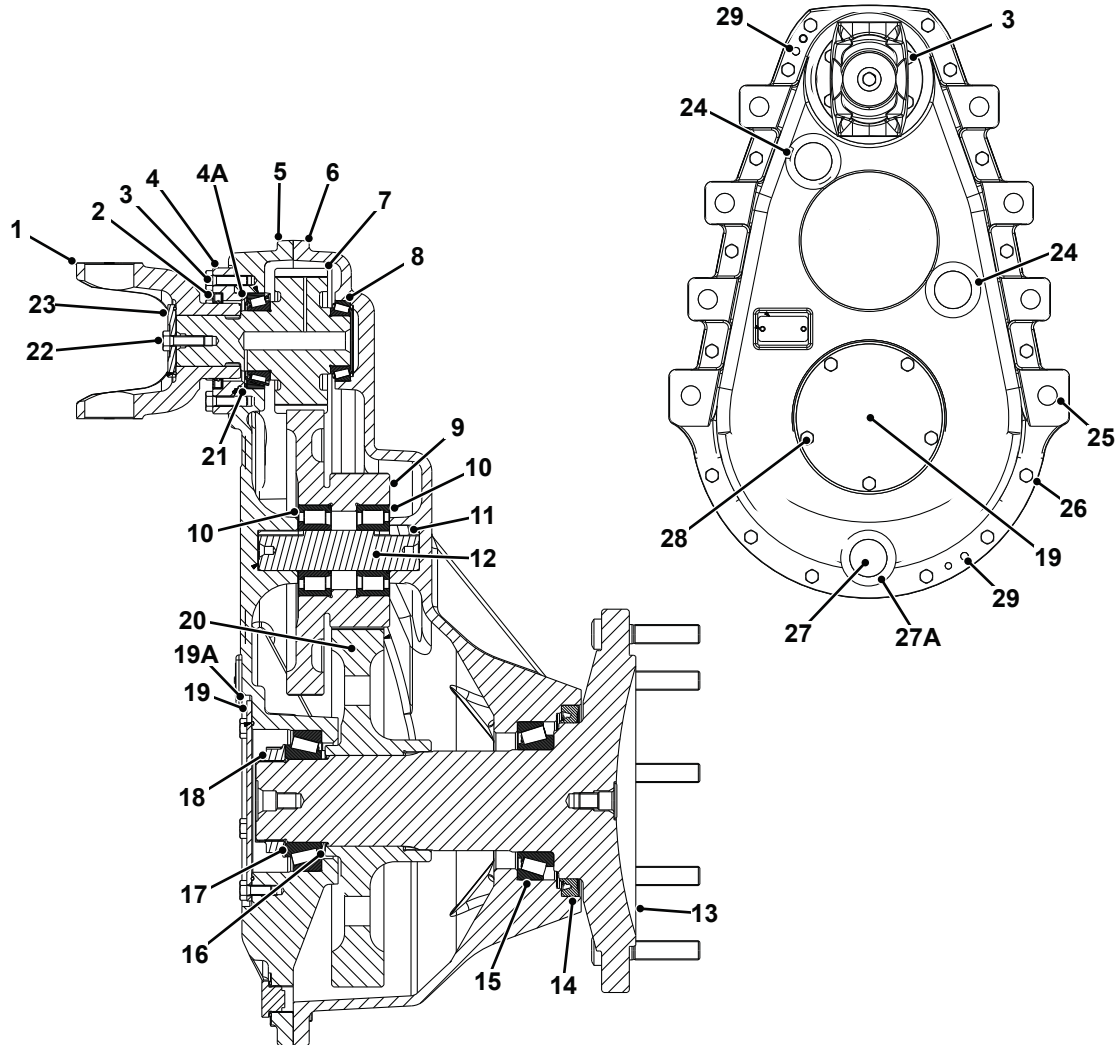
- A** O-ring seals
- B** Lubrication pipes
- C** Pressure feed pipes

Assembly

1. Securely install the case to a suitable manipulator, it is necessary to rotate the box for further advancement of the assembly process.
2. Clean all the components before you start assembly.
[Refer to: PIL 27-11-95.](#)
3. Install new O-ring seals to the selector rail piston housings.
4. Check and if necessary replace the lubrication and the pressure feed pipes.

Main Component Identification

Figure 1004. Early Design



1	Yoke	2	Seal 1
3	Setscrew 1	4	Input shaft cover
4A	O-ring 1	5	Front case
6	Rear case	7	Input shaft
8	Taper roller bearing 1	9	Intermediate gear
10	Straight needle roller bearing	11	Dowel 1
12	Intermediate shaft	13	Output shaft
14	Seal 2	15	Taper roller bearing 3
16	Spacer kit 1	17	Taper roller bearing 4
18	Stake Nut	19	Output shaft cover
19A	O-ring 2	20	Output gear
21	Spacer kit 2	22	Setscrew 2
23	Washer 2	24	Filler plug
25	Mounting bolts	26	Setscrew 3
27	Drain plug	27A	Bonded washer
28	Setscrew 4	29	Dowel 2

- 1.11. Put a suitable drift through the two holes in the pinion gear and then remove the bearing 2 from the gear.
2. Remove the bevel gear assembly.
 - 2.1. Remove the bolts 2 that attach the bevel gear assembly to the gearbox housing.
 - 2.2. If necessary, use a jacking bolt in the tapped extraction holes on the bevel gear housing.
 - 2.3. Remove the shim set 2 and put a label as 'for use with the bevel gear assembly.'
 - 2.4. Use a reaction block to hold the gear assembly in a vice.

Special Tool: Reaction Block Fixture (Qty.: 1)
 - 2.5. With a heavy duty socket of the specified value, remove the stake nut 2.

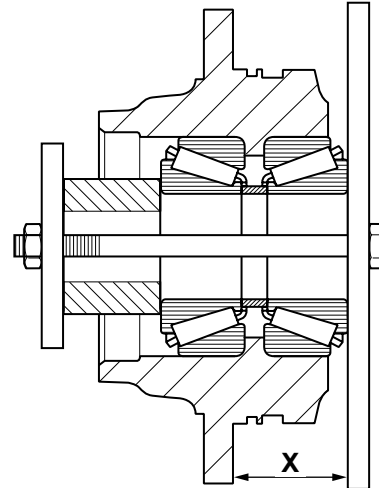
Dimension: 46mm

Special Tool: Heavy Duty Socket 46mm A/ F (Qty.: 1)
 - 2.6. Remove the washer, drive flange 1, and the O-ring 3.
 - 2.7. Remove the bevel gear. Make sure you also remove the bearing 3 and spacer 3.
 - 2.8. Remove the triple-lip seal 2 and the O-ring 4.
 - 2.9. Important: If the bearings or the gear assembly is to be replaced, measure and

record the dimension as shown below. Make sure you use suitable measuring equipment with an accuracy of the specified value.

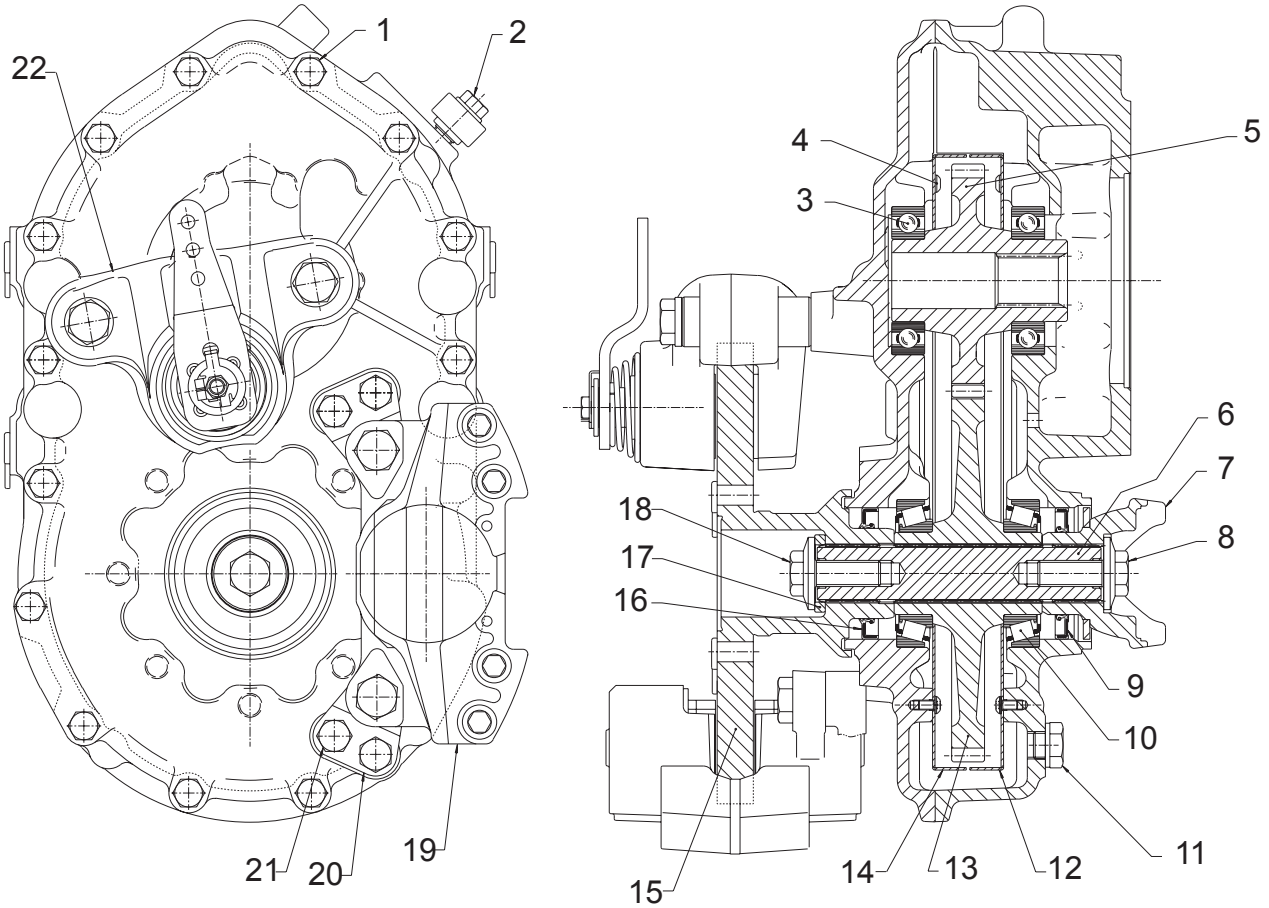
Dimension: 0.01mm

Figure 1019.



- 2.10. Remove the bearing cups from the bevel gear housing.
- 2.11. Put a suitable drift through the two holes in the pinion gear and then remove the bearing 4 from the gear.

Figure 1038.



- | | | | |
|-----------|----------------------------------|-----------|-------------------------------|
| 1 | Bolt (M10 x 40mm) | 2 | Breather |
| 3 | Ball bearing | 4 | Button head screw (M6 x 10mm) |
| 5 | Input gear | 6 | Output shaft |
| 7 | Coupling yoke | 8 | Setscrew 1 (M16 x 40mm) |
| 9 | Dual lip seal | 10 | Taper roller bearing |
| 11 | 3/8in BSP plug and bonded washer | 12 | Oil baffle 1 |
| 13 | Output gear | 14 | Oil baffle 2 |
| 15 | Drive flange | 16 | Pinion seal |
| 17 | Abutment ring | 18 | Setscrew 2 (M16 x 40mm) |
| 19 | Service brake calliper | 20 | Brake mounting bracket |
| 21 | Setscrew 3 (M12 x 35mm) | 22 | Park brake calliper |

Disassemble

1. Remove the service brake, park brake callipers and transmission motor.
2. Remove the setscrew. Refer to Figure 1039.
[Special Tool: Drive Coupling Spanner \(Qty.: 1\)](#)



00 - General

Introduction	27-933
Health and Safety	27-934
Disassemble and Assemble	27-934

Introduction

Power take-off (PTO) is a method for taking power from a power source, such as an engine, and transmitting it to an application such as an attachment or a separate machine.

It usually comprises a splined output shaft on a machine, designed so that a PTO shaft, a type of driveshaft, can be easily connected and disconnected, and a corresponding input shaft on the application end.

Item	Description
L	Upper spring cup
M	Spring
N	Lower spring cup
P	Piston
Q	O-ring seal 1
R	O-ring seal 2

Assembly

Assembly is a reverse of the disassembly procedure with the following precautions.

1. Install a new O-ring seal 1 to the piston.
2. Install a new O-ring seal 2 to the shaft groove.
3. Lubricate the new seals and push the piston by hand into the clutch drum.
4. Put the lower spring cup over the centre spigot of the piston.
 - 4.1. Replace the spring and the top spring cup with new ones.
 - 4.2. Keep the circlip 2 on the top spring cup for installation.
5. Use a tube with a cutout to compress the spring.
 - 5.1. Locate the cutout to give access to the circlip 2.
 - 5.2. Install the circlip 2 make sure that it is correctly seated in the groove.
6. Before assembly the clutch friction plate should be soaked in transmission oil.
7. Install the first counter plate to the clutch drum followed by the friction plate.
 - 7.1. Alternately install the plates until all of the twenty four plates are installed.
 - 7.2. Use a scrap splined drive hub to align the splines of the friction plates.
8. Install the thick counter plate to the top of the plate pack followed by the large snap ring.
9. Check the end float measurement of the clutch pack plates. It should be within the specified limit.
Dimension: 3–3.5mm
10. Install three new PTFE ring seals.

(For: P/Tronic 6x4 Smoothshift, Rear)

Refer to PTO (Power Take-Off) (Front), Clutch, Disassembly and Assembly procedure.

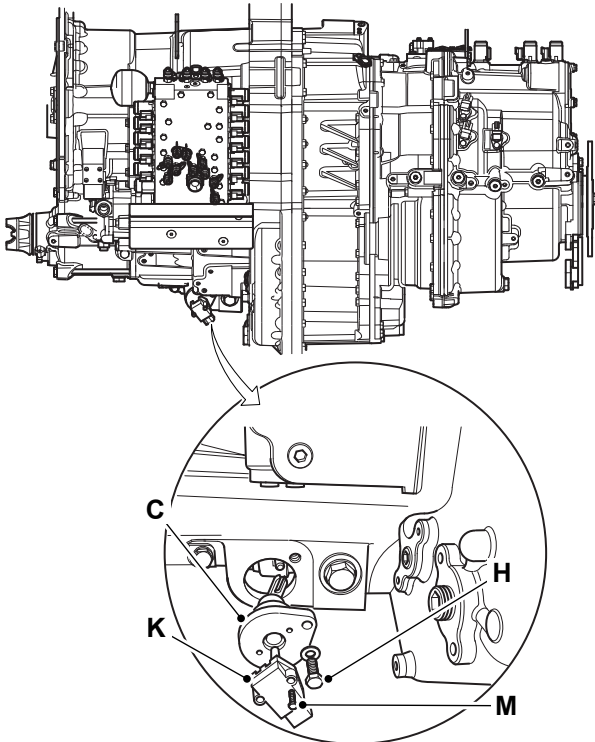
Remove and Install

Remove

If position sensors are replaced then a full recalibration must be performed on the transmission.

1. Remove the screws 1.
2. Remove the sensor body from the housing.

Figure 1088.



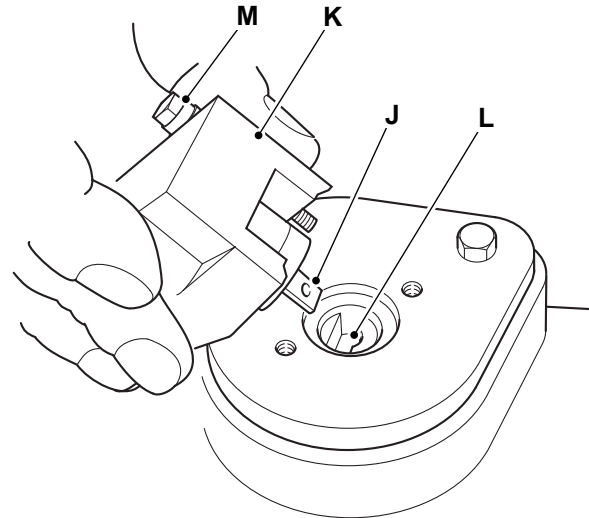
- C** Housing
- H** Screw 2
- K** Sensor body
- M** Screws 1

3. Remove the screw 2.
4. Remove the housing from the gearbox.

Install

1. Install the housing onto the gearbox and secure it with the screw 2.
2. Put the electric sensor body into the housing of the selector sensor.

Figure 1089.



- J** Flat of the drive spindle
- K** Sensor body
- L** Semi-circular slot of selector sensor shank
- M** Screws 1

3. To make sure the correct timing of the electric sensor position the flat of the drive spindle towards the semi-circular slot of the selector fork shank.
4. Secure the electric sensor body with the Screws 1.

Item	Description
8	Brake piston housing
9	Controlled piston back off spring assembly ⁽¹⁾
A	Positive piston back off spring assembly ⁽²⁾
10	Drive head housing

(1) Controlled piston back off maintains the same piston retraction distance as the friction plates wear.

This type of piston back off is installed for servo brake applications.

(2) Positive piston back off retracts the piston to the same position. As the friction plates wear the retraction distance will increase. This type of piston back off is installed for hydraulic power brake applications.

Sectional Drawing

Figure 1098.

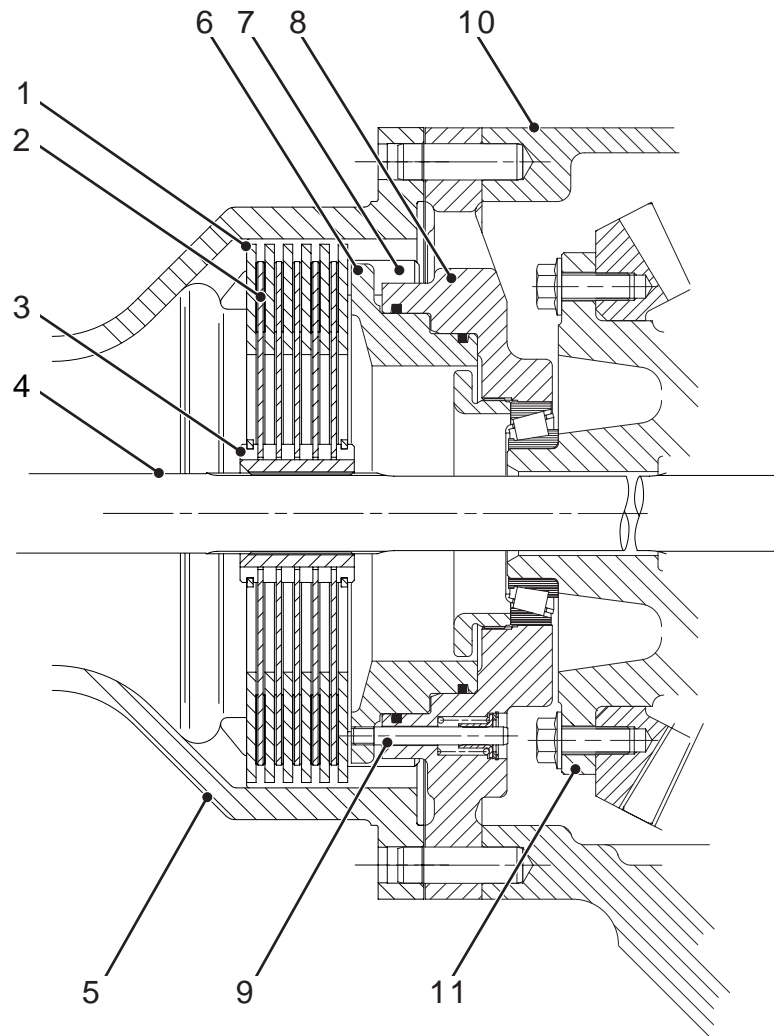
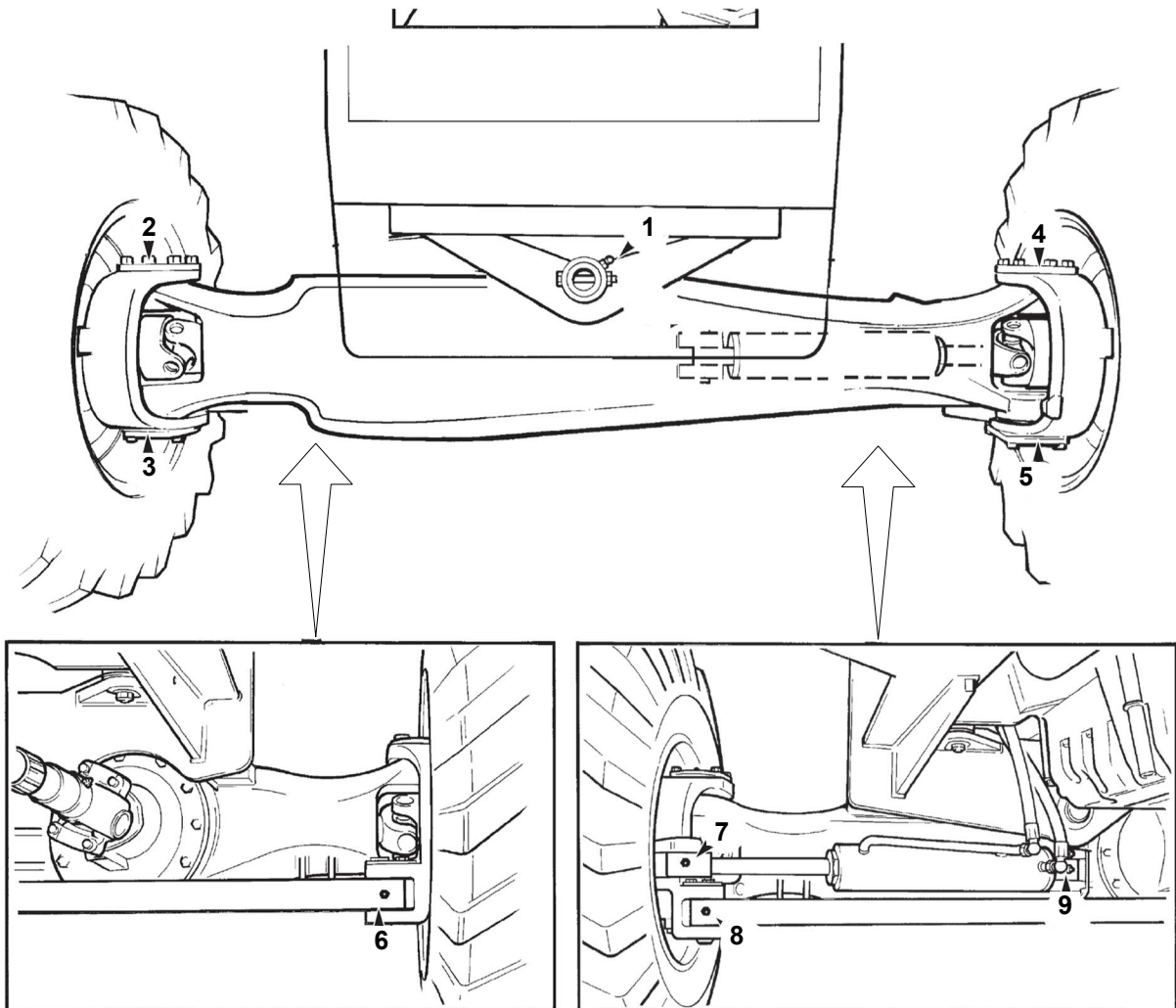


Table 316.

Item	Description
1	Counter plates
2	Friction plates

Item	Description
3	Brake carrier
4	Driveshaft
5	Stub axle arm

Figure 1118.



- 1 Grease point
- 3 Grease point
- 5 Grease point
- 7 Grease point
- 9 Grease point

- 2 Grease point
- 4 Grease point
- 6 Grease point
- 8 Grease point

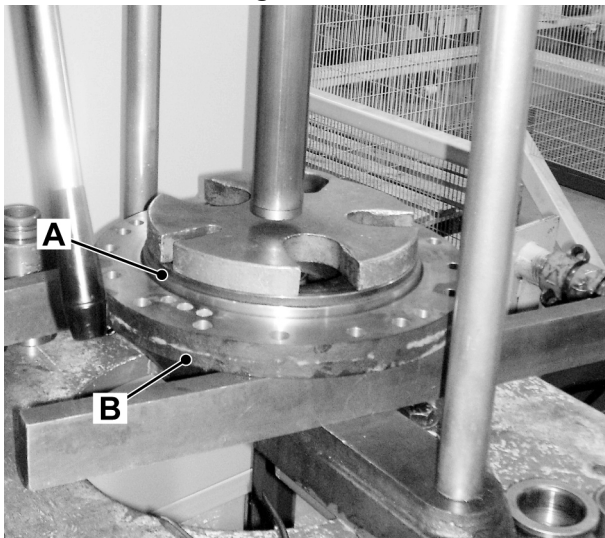
- 1 Axle arm
- 3 Drivehead
- 5 Disc springs
- 7 Brake pack
- 9 Brake pack hub
- 11 Friction plate
- 13 Seal
- 15 Brake piston
- A Cross Hatching

- 2 Bolts
- 4 Brake piston housing
- 6 Pressure plate
- 8 Circlip
- 10 Counter plate
- 12 Seal
- 14 Reaction pin
- 16 Dowels
- B Oil flow holes

Assemble

1. Install new brake piston seals 12 and 13. Make sure that the seals are lubricated with the correct clean hydraulic oil before assembly. Make sure they sit squarely in their grooves. Assemble the brake piston to the brake piston housing using the correct tools.

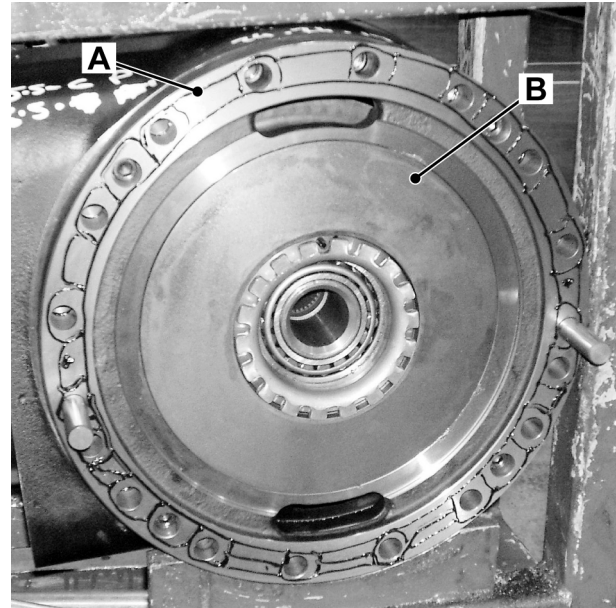
Figure 1125.



- A Brake piston
- B Brake piston housing

2. Remove all traces of the old sealant from the mating faces of the drivehead and the brake piston housing. Make sure that the faces are clean and undamaged.
3. Install the inner brake disc spring to the differential bearing carrier on the drivehead. Make sure it is the correct way around.

Figure 1126.



- A Drivehead
- B Brake disc spring

4. Apply JCB Multigasket to the drivehead mating face.

[Consumable: JCB Multi-Gasket](#)

5. Locate the brake piston housing on the dowels and at the same time install the outer brake disc spring. Make sure that the disc spring is the correct way around.
6. Assemble the five friction plates and the four counter plates to the hub. Install the circlip 8. If the original brake pack is to be reused, return the plates to their original positions. Soak the new friction plates in JCB Special Gear Oil before assembly. Note: On assembly of the brake packs, the oil flow holes must be aligned with each other when being installed to the brake pack carrier. Make sure that the plate lugs are aligned with the reaction pins.

[Consumable: JCB Gear Oil OP](#)

7. Install the three reaction pins to the axle arm brake housing.
8. Install a counter plate to the axle arm brake housing. Locate the plate on the reaction pins.

Main Component Identification

Figure 1139.

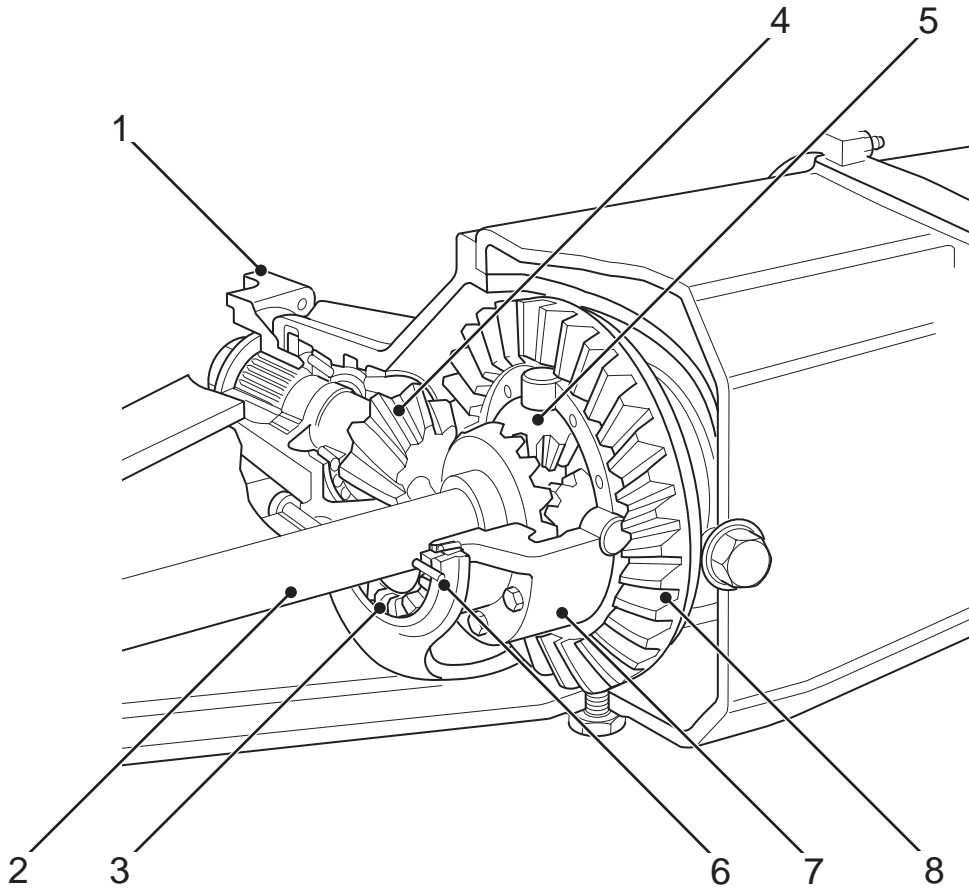


Table 331.

Item	Description
1	Coupling yoke
2	Driveshaft
3	Side nut
4	Pinion

Item	Description
5	Bevel gears
6	Side nut locking pin
7	Differential housing
8	Crownwheel

Table 335. Torque Values

Item	Description	Nm
G	Differential case half bolt	28
S	Verbus-ripp bolt	94
A	Drive head carrier screw	56

(For: 40 Series (3 Piece Axle and Dropbox))

Special Tools

Description	Part No.	Qty.
Drive Coupling Spanner	892/00812	1
Setting Tool Kit	892/00918	1
Support Bracket	892/01075	1
Park Brake Lockup Tool	892/01237	1
Shim Kit	921/01900	1
Spacer Kit	921/52600	1
Spacer Kit	921/53400	1
Torque Wrench (10-100Nm)	993/70111	1

Consumables

Description	Part No.	Size
Cleaner/Degreaser - General purpose solvent based parts cleaner	4104/1557	0.4L
JCB Multi-Gasket	4102/1212	0.05L
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

Lifting Equipment

You can be injured if you use incorrect or faulty lifting equipment. You must identify the weight of the item to be lifted then choose lifting equipment that is strong enough and suitable for the job. Make sure that lifting equipment is in good condition and complies with all local regulations.

Disassembly

When the drivehead is installed on the machine it cannot be disassembled. It is recommended that you remove the complete axle. Make sure that the axle is removed completely with the transmission hydraulic motor. Refer also to Hubs (PIL 27-27), Axles (PIL 27-20) and Driveshafts (PIL 27-51).

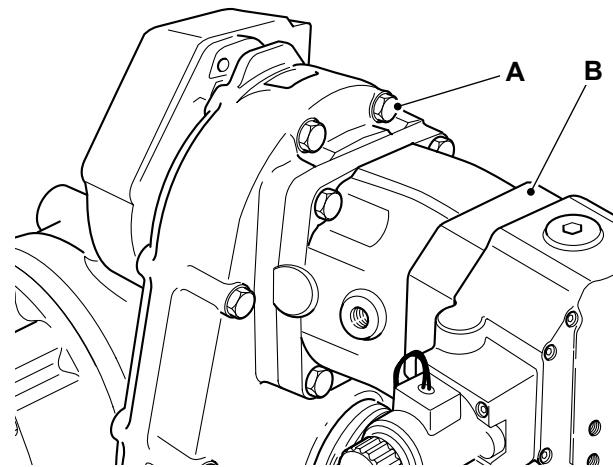
The drivehead consists of the drop-box, pinion shaft assembly, integral park brake and the differential unit. A separate disassembly procedure is given for each sub assembly.

The crownwheel and the pinion are matched and should be replaced as a pair, if either of them is damaged or excessively worn.

The two differential case halves are also matched as are the differential side gears and planet gears, do not use unmatched halves or gears.

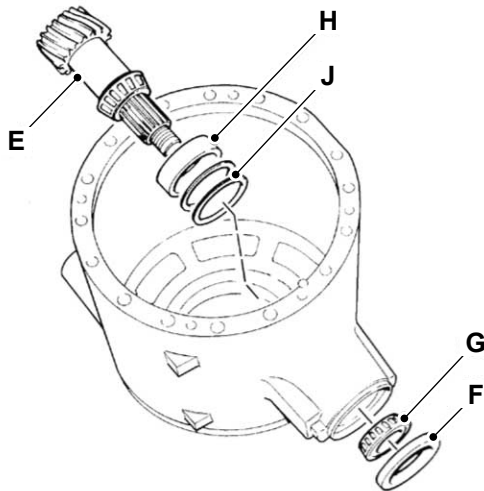
Hydraulic motor removal

1. Support the weight of the hydraulic motor with suitable lifting equipment, then remove the four securing bolts. Refer to Figure 1152.

Figure 1152.


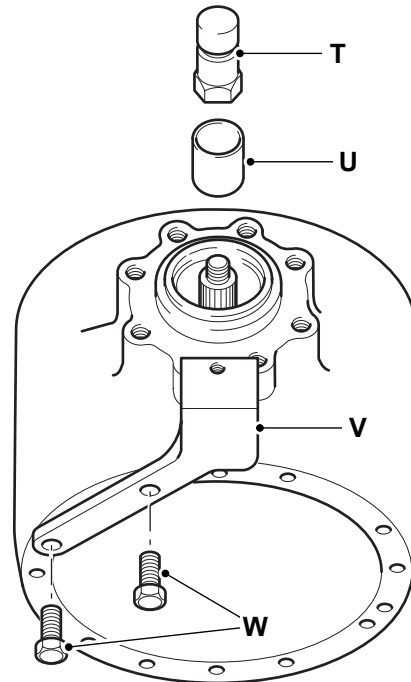
- A** Hydraulic motor securing bolt
- B** Hydraulic motor

2. Before you remove the hydraulic motor, make sure that the park brake lock-up tool is installed.
Special Tool: Park Brake Lockup Tool (Qty.: 1)
3. If the park brake tool is not installed, the park brake friction plates inside the axle drop-box will move from the correct orientation and then it will be impossible to install the motor without a disassemble of the park brake.
4. Remove the access cover. Refer to Figure 1153.
5. Remove the park brake cable. Refer to the applicable machine service manual for the correct procedure. Refer to Figure 1153.
6. Install the park brake lock up tool. Refer to Figure 1153.
Special Tool: Park Brake Lockup Tool (Qty.: 1)
7. Connect the fork end to the brake actuator with the original screw.

Figure 1185.


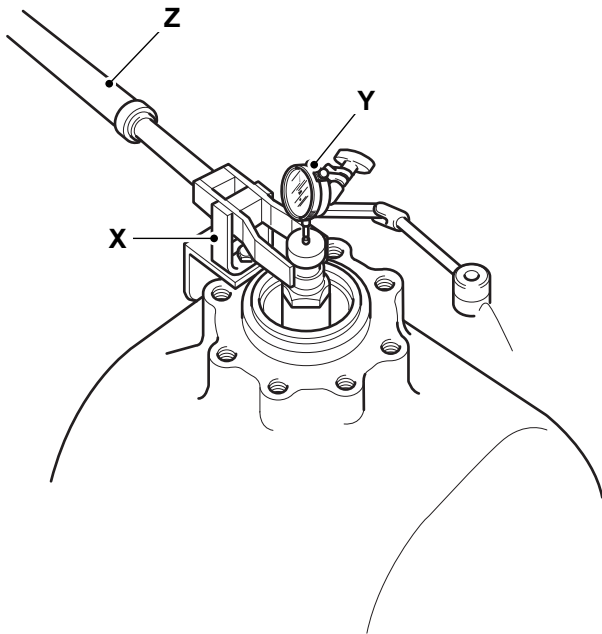
- E** Pinion
- F** Pinion seal
- G** Outer bearing cone
- H** Inner bearing cup
- J** Shim

17. Before you put the pinion into the bore, make sure that it is matched with the crownwheel. Refer to Figure 1185.
18. The code numbers etched on the pinion end face and the crownwheel perimeter should be the same. Refer to Figure 1185.
19. Install the pinion outer bearing cone. Refer to Figure 1185.
20. Do not install the oil seal at this stage. Refer to Figure 1185.
21. Install the special tool sleeve and the special pinion shaft adaptor. Refer to Figure 1186.
Special Tool: Setting Tool Kit (Qty.: 1)
22. Tighten the adaptor to the correct torque value. Refer to Figure 1186.
23. Make sure that the pinion is free to rotate and there is end float. Refer to Figure 1186.
24. End float will prevent the bearing from damage. Refer to Figure 1186.

Figure 1186.


- T** Pinion shaft adaptor
- U** Special tool sleeve
- V** Special bracket
- W** Bolt (M10x30)

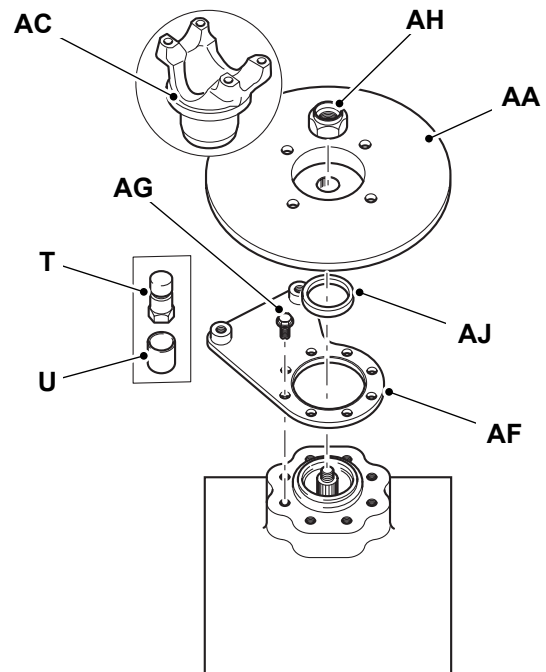
25. If the pinion is not free to rotate or there is no end float at this stage check the bearing is installed correctly. Refer to Figure 1186.
26. Make sure that the correct size spacer is installed. Refer to Figure 1186.
27. Use two bolts (M10x30) to install the special bracket to the drivehead housing. Refer to Figure 1186.
Special Tool: Support Bracket (Qty.: 1)
28. Install the special tool support pillar to the bracket so that the fork end engages in adaptor. Refer to Figure 1186.
29. Make sure that the fork is centrally located on the adaptor. Refer to Figure 1186.
30. If necessary, align the bracket again. Refer to Figure 1186.
31. Install a DTI. Refer to Figure 1187.
32. Make sure that the DTI is installed on the drivehead not on the bracket. Refer to Figure 1187.

Figure 1209.


- X** Support pillar
- Y** DTI
- Z** Torque wrench

30. Install a DTI. Refer to Figure 1209.
31. Make sure that the DTI is installed on the drivehead not on the bracket. Refer to Figure 1209.
32. Set the torque wrench to the specified value and measure the end float while you rotate the shaft. Refer to Figure 1209.
Torque: 35N·m
Special Tool: Torque Wrench (10-100Nm) (Qty.: 1)
33. Correct size solid spacer selection. Refer to Figure 1209.
 - 33.1. To select the correct size spacer, subtract the end float obtained at step 32 from the solid spacer size (14.20 mm).
 - 33.2. Also subtract 0.04 mm to allow for theoretical bearing tolerance and pre-load.
 - 33.3. The result is the size of spacer to be installed from the solid spacer kit.
 - 33.4. If there is no spacer of this size, install the next nearest size spacer from the spacer kit.
Special Tool: Spacer Kit (Qty.: 1)
34. Remove the sleeve and the temporary spacer. Refer to Figure 1210.

35. When you remove the temporary spacer make sure that the outer bearing is not damaged. Refer to Figure 1210.
36. Install the correct size spacer from the solid spacer setting kit. Refer to Figure 1210.
37. Install the sleeve. Refer to Figure 1210.
38. Tighten the adaptor to the specified value, to protect against bearing damage while spacer selection is verified and make sure that the pinion is free to rotate. Refer to Figure 1210.
Torque: 50N·m
39. Check there is no end float and the pinion is free to turn smoothly by hand. Refer to Figure 1210.
40. Remove the adaptor and install the stake nut. Refer to Figure 1210.

Figure 1210.


- T** Pinion shaft adaptor
- U** Special tool sleeve
- AA** Park brake disc
- AC** Coupling yoke
- AF** Brake caliper bracket
- AG** Brake caliper bracket mounting bolt
- AH** Stake nut
- AJ** Oil seal

41. Check that rolling torque is less than 2.0 Nm. If the rolling torque exceeds 2.0 Nm, check that the shaft is assembled correctly. Refer to Figure 1210.

- 11.1. To select the correct size spacer, subtract the end float obtained at step 10 from the solid spacer size (14.20 mm).
- 11.2. Also subtract 0.04 mm to allow for theoretical bearing tolerance and pre-load.
- 11.3. The result is the size of spacer to be installed from the solid spacer kit.
- 11.4. If there is no spacer of this size, install the next nearest size spacer from the spacer kit.

Special Tool: Spacer Kit (Qty.: 1)

12. Remove the sleeve and the temporary spacer. Refer to Figure 1244.

- 12.1. Install the correct size spacer from the spacer kit.
- 12.2. When you remove the temporary spacer make sure that the outer bearing is not damaged.
- 12.3. Install the sleeve. Refer to Figure 1244.
- 12.4. Tighten the adaptor to the specified value, to protect against bearing damage while spacer selection is verified and make sure that the pinion is free to rotate. Refer to Figure 1244.

Torque: 50N·m

- 12.5. Make sure that there is no end float and the pinion is free to turn smoothly by hand.
- 12.6. Remove the adaptor and install the stake nut. Refer to Figure 1244.

13. Measure the rolling torque. The rolling torque should be less than the value specified.

Torque: 2N·m

- 13.1. If the rolling torque exceeds the specified value, make sure that the shaft is assembled correctly.

14. If the pinion is not free to rotate then check the correct size spacer is installed.

15. If the rolling torque measured at step 13 is too high then install the next largest size spacer. If the rolling torque is too low then install the next smallest size spacer.

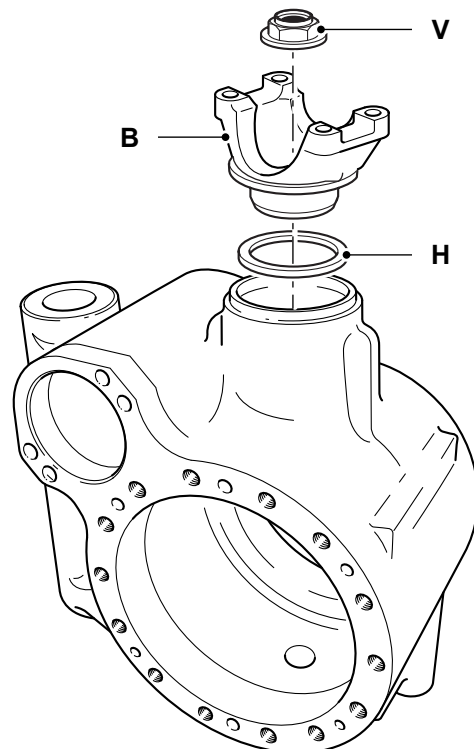
16. If a correct spacer is not available from the range, check that the drivehead is assembled correctly.

17. Remove the stake nut and the sleeve. Refer to Figure 1244.

18. Lubricate the seal lips and then install the new oil seal. Refer to Figure 1245.

19. Install the coupling yoke and the new stake nut. Refer to Figure 1245.

Figure 1245.



B Coupling yoke

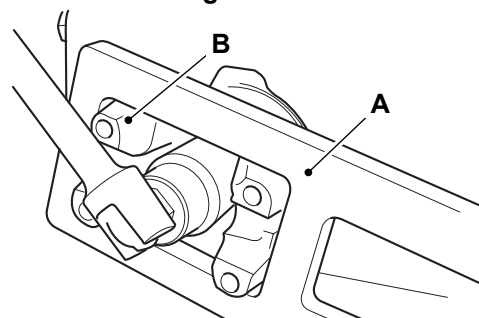
H Oil seal

V Stake nut

20. With a drive coupling spanner gradually tighten the stake nut to the correct torque value, occasionally rotate the coupling yoke. Refer to Figure 1246.

Torque: 280N·m

Figure 1246.



A Drive coupling spanner

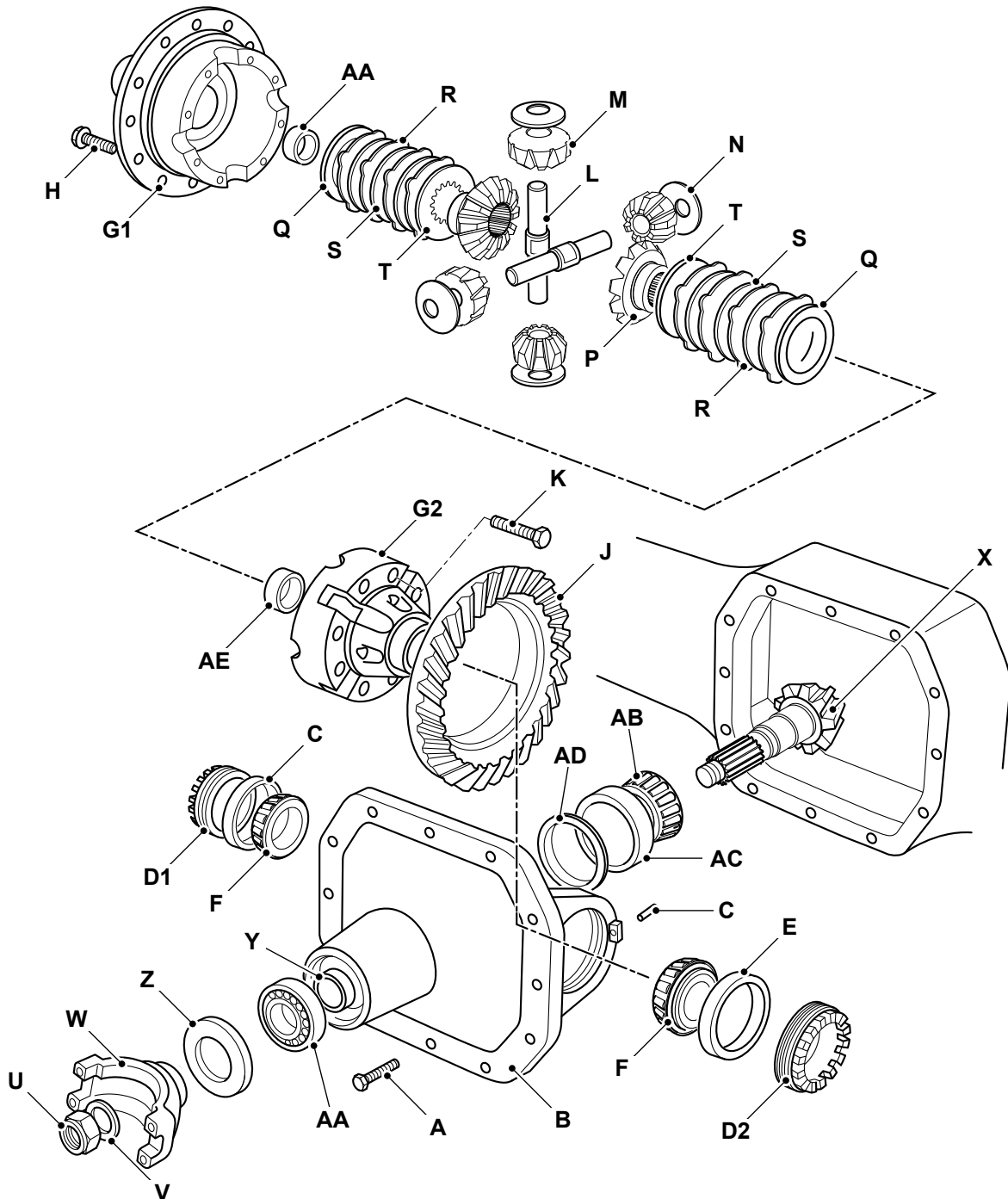
B Coupling yoke

21. If the correct size spacer is selected, the rolling torque should be within the specified torque value including the seal drag.

Torque: 0.5–3.5N·m

(For: 40 Series (1 Piece Axle), Limited Slip Differential (LSD))

Figure 1260.



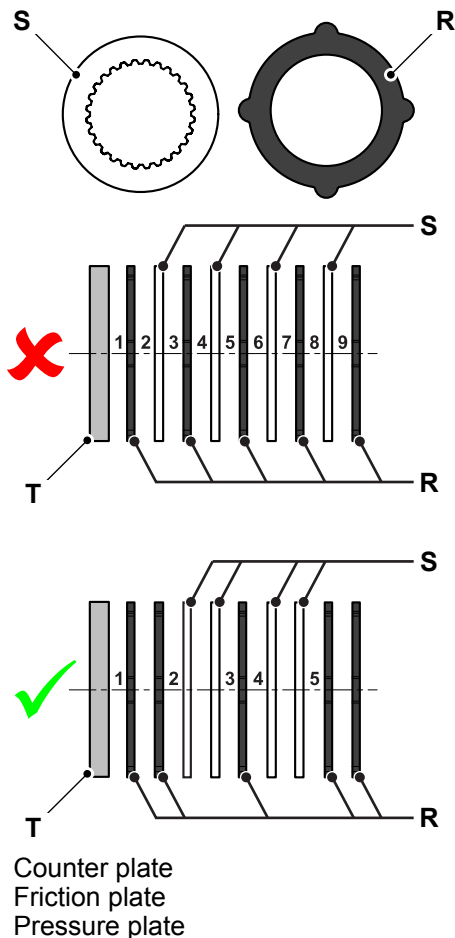
- | | |
|----------------------------------|----------------------------------|
| A Bolt 1 | B Drivehead carrier |
| C Roll pin | D1 Castellated nut 1 |
| D2 Castellated nut 2 | E Bearing cup |
| F Bearing cone | G1 Differential case half |
| G2 Differential case half | H Verbus-ripp bolt |
| J Crownwheel | K Bolt 2 |

Assemble

Make sure all bearings are lightly oiled before installation and setting. Make sure that the bearings are rotated when they are being set.

1. Install the following components into the crownwheel half of the differential assembly:
 - 1.1. Trunnion pins.
 - 1.2. Side gears with pressure plates.
 - 1.3. Counter plates.
 - 1.4. Friction plates.
 - 1.5. Planet gears.
 - 1.6. Thrust washers.
2. The counter plates and friction plates should be installed alternatively, as shown. However, some axles which incorporate differential assemblies containing 9-friction faces require a unique configuration. Before assembling these parts, identify the correct configuration for your machine.

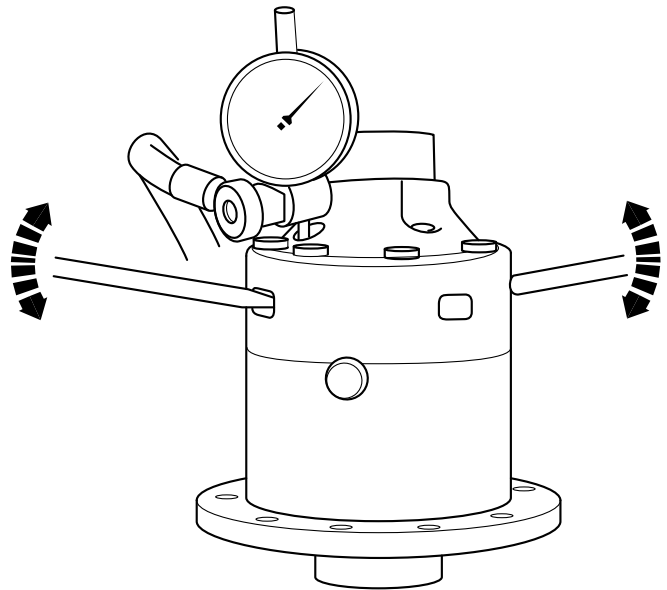
Figure 1269.



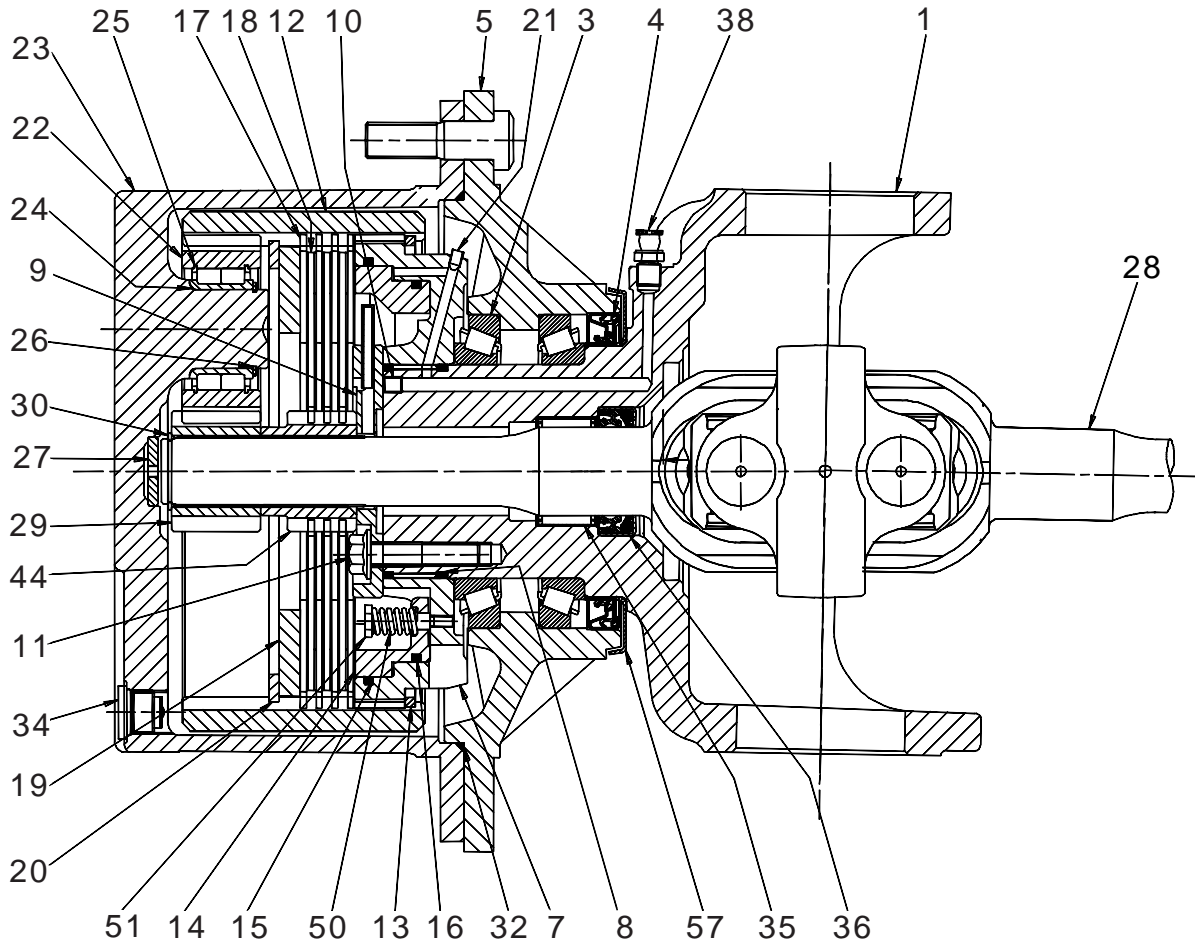
3. Do not install the shims 1 at this stage.

4. Attach the two halves of the differential assembly with the bolts 2. Make sure the marks made during disassembly are aligned.
5. Use a DTI (or feeler gauges), with two screwdrivers or suitable levers, gently apply pressure to prise the side gear away from the trunnion pins.

Figure 1270.

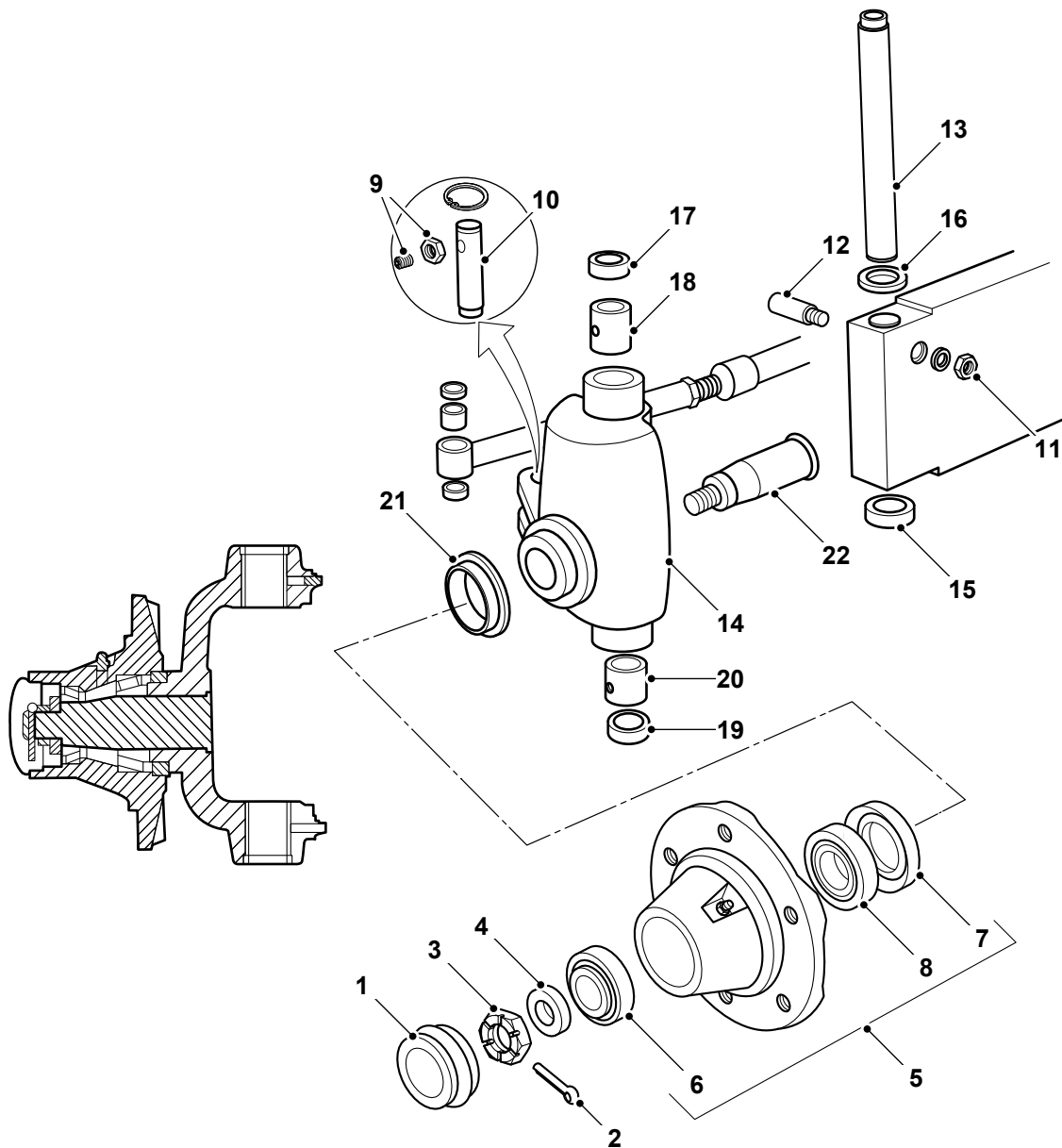


6. Measure and record the end float of the side gear.
7. Turn the differential assembly over and do the steps 5 and 6 for the second side gear.
8. Disassemble the differential assembly.
9. Add shims to give an end float between the specified range.
 - 9.1. For new plates.
Dimension: 0.1–0.2mm
 - 9.2. For old plates.
Dimension: 0.2–0.5mm
10. Do the steps 5 to 7 again.
11. If the end float is correct, tighten the bolts to the correct torque value.
12. Install the crownwheel with new verbus-ripp bolts.
13. Tighten the verbus-ripp bolts to the correct torque value.
14. Measure the pinion depth setting.

Sectional Drawing
Figure 1286.

Table 365.

Item	Description
1	Swivel hub
3	Bearing (taper roller)
4	Oil seal
5	Bearing carrier
7	Annulus carrier
8	O-ring
9	Retaining plate
10	Grub screw
11	Bolt Verbus-ripp
12	Annulus ring
13	Circlip (internal)
14	Brake piston

Item	Description
15	Seal
16	Seal
17	Counter plate
18	Friction plate
19	Pressure plate
20	Circlip (internal)
21	Grub screw
22	Planet gear
23	Planetary hub carrier
24	Bearing
25	Circlip (L-shaped)
26	Circlip (external)
27	Thrust pad

Figure 1303.


- 1 Grease cap
- 3 Castle nut
- 5 Hub
- 7 Oil seal
- 9 Bolt
- 11 Nut
- 13 King pin
- 15 Bearing 3
- 17 Seal
- 19 Seal
- 21 Sleeve

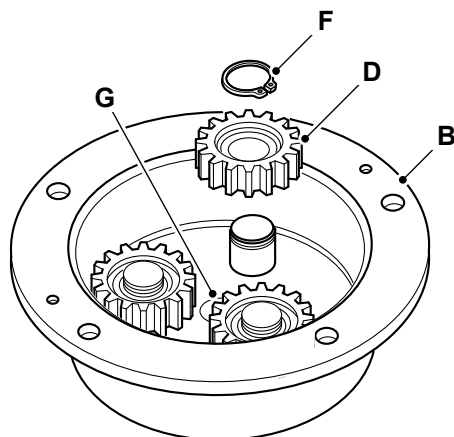
- 2 Split pin
- 4 Thrust washer
- 6 Bearing 1
- 8 Bearing 2
- 10 Pivot pin
- 12 Pin
- 14 Stub axle carrier
- 16 Shim
- 18 Bush 1
- 20 Bush 2
- 22 Stub axle

Disconnect the battery, to prevent the machine being started while you are beneath it.

The illustrations in this procedure show the axle removed from the machine but the hubs can be disassembled without removing the axle. Refer to Figure 1341.

1. Drain the oil from the hub.
2. Remove the screws.
3. Remove the planet gear carrier from the bearing carrier.
4. Remove and discard the O-ring.
5. Remove the planet gears only if they are damaged, Note: Planet gears can only be replaced as an assembly which contains the gear, the bearing, and two L-shaped circlips. Refer to Figure 1337.

Figure 1337.



- B** Planet gear carrier
- D** Planet gear
- G** Driveshaft thrust pad
- F** External circlip 1

- 5.1. Remove the external circlip 1.
- 5.2. Remove the planet gear.
- 5.3. The driveshaft thrust pad is drilled and tapped for removal purposes.
6. Remove the external circlip 2 and remove the sun gear from the driveshaft.
7. Remove the verbus-ripp bolts with a heavy duty socket.

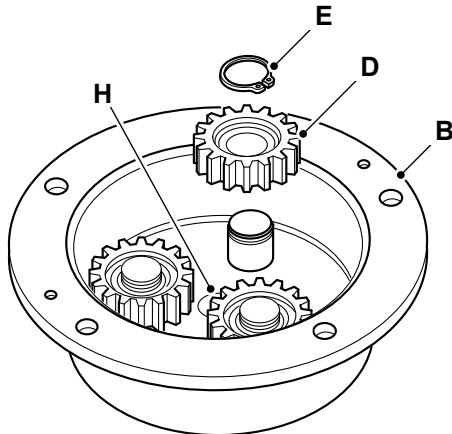
Special Tool: Heavy Duty Socket 19mm A/F x 3/4 in Drive (Qty.: 1)

- 7.1. Note: the verbus-ripp bolts are very tight and care must be taken not to distort the bolt heads. Use an extension bar as short

as possible. Discard the verbus-ripp bolts after removal.

8. Remove the retaining plate.
9. Put marks on the stub shaft, annulus carrier and annulus ring to identify their relative angular position during installation.
10. Remove the annulus carrier with the annulus ring from the axle stub shaft.
 - 10.1. Note: It is normal for fretting to occur on the mating surfaces between the axle stub shaft and annulus carrier. Do not attempt to repair it.
11. Remove the internal circlip to separate the annulus ring from the annulus carrier.
12. Remove the outer wheel bearing and the bearing carrier as follows:
 - 12.1. Attach the legs of the bearing puller onto two diametrically opposite wheel studs and put the reaction tube over the driveshaft. Refer to Figure 1338.

Special Tool: Wheel Hub Service Kit (Qty.: 1)
 - 12.2. The reaction tube must be used otherwise damage to the driveshaft and driveshaft bearings will occur.
 - 12.3. On five wheel stud axles, the modified wheels studs from the Wheel Hub Service Kit must be used. Bolt to two diametrically opposite holes provided on the bearing carrier.
 - 12.4. Slowly turn the screw until the bearing carrier and the outer wheel bearing are released from the axle stub shaft.
 - 12.5. If the wheel hub starts to rotate use a suitable bar to prevent further rotation.
 - 12.6. If the screw becomes hard to turn, tap the back of the bearing carrier with a soft faced mallet to help release the bearing.

Figure 1367.


- B** Planet gear carrier
- D** Planet gear
- E** External circlip 1
- H** Driveshaft thrust pad

45. Install the sun gear onto the driveshaft and secure with the external circlip 2.

45.1. The sun gear must be installed with the 1.5 mm x 45° chamfer inboard.

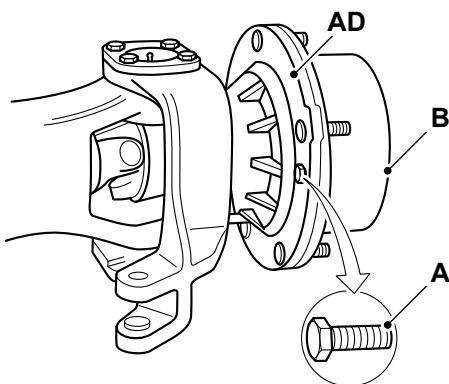
46. Install a new O-ring.

47. Install the planet gear carrier onto the bearing carrier. Make sure that the two tapped holes are in line with those on the bearing carrier.

48. Do not strike the centre of the planet gear carrier during installation as this may dislodge the driveshaft thrust pad.

49. Apply sealant to the threads of the screws. Refer to Figure 1368.

Consumable: [JCB Threadlocker and Sealer \(Medium Strength\)](#)

Figure 1368.


- A** Screw
- B** Planet gear carrier
- AD** Bearing carrier

50. Install the screw to attach the planet gear carrier.

51. Tighten the screws to the correct torque value.

52. Fill the hub with the correct grade oil.

Table 375. Torque Values

Item	Nm
A	56
R	166

(For: PD85)

Special Tools

Description	Part No.	Qty.
Heavy Duty Socket 19mm A/F x 3/4 in Drive	892/00333	1
Wheel Hub Service Kit	892/01092	1
Reaction Plate M14 Studs	998/M1374	1
Reaction Plate	998/M1375	1

Consumables

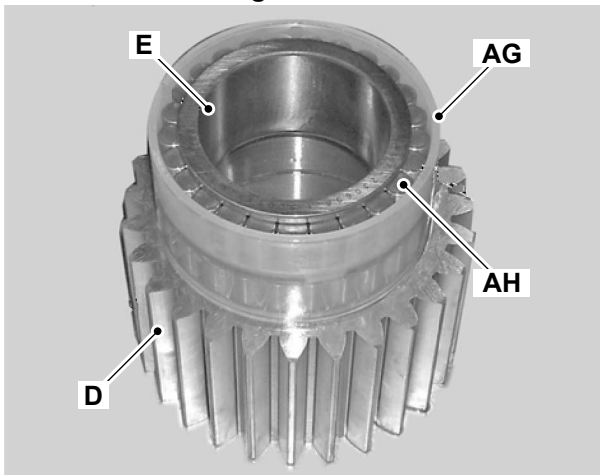
Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

Disassemble

▲ WARNING A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it. Disconnect the battery, to prevent the machine being started while you are beneath it.

The following illustrations show the axle removed from the machine but the hubs may be dismantled without removing the axle.

29. Press the driveshaft thrust pad (chamfered side faces downwards) into the recess in the planet gear carrier.
30. Install the driveshaft/sun gear into the axle arm and drivehead.
31. If applicable assemble new planet gears and bearings as follows: Refer to Figure 1399.

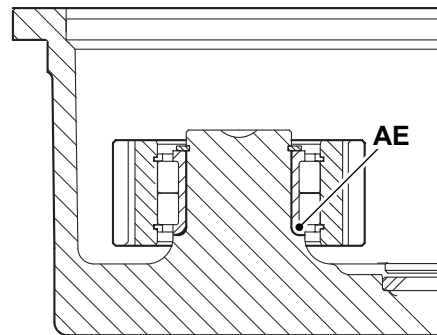
Figure 1399.


- D** Planet gear
- E** Roller bearing
- AG** Protective sleeve
- AH** Bearing rollers

- 31.1. Do not remove the protective outer sleeve from the bearing.
- 31.2. Push the bearing into the planet gear and at the same time allow the sleeve to slide off the bearing.
- 31.3. Note: Keep the protective sleeve pressed against the planet gear to prevent the loss of rollers from the bearing during assembly.
- 31.4. Push the bearing inside until the bearing snap ring engages with the locating groove in the gear.
- 31.5. Discard the protective outer sleeve.
- 31.6. The bearing and gear are correctly assembled when the bearing is retained inside the gear.

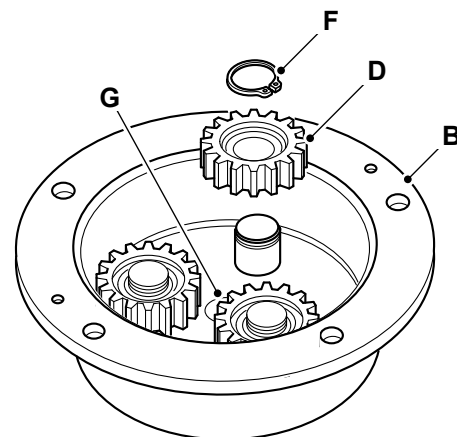
32. Install the new planet gears in the position of any that were removed during disassembly. Refer to Figure 1401.

- 32.1. Important: Make sure that you install the planet gears in the correct orientation. The large radius end of the bearing should face the planet gear carrier. Refer to Figure 1400.

Figure 1400.


- AE** Large radius end

- 32.2. Secure the planet gears with an external circlip.

Figure 1401.


- B** Planet gear carrier
- D** Planet gear
- G** Driveshaft thrust pad
- F** External circlip

33. Clean the sealing face of the wheel bearing carrier and install the O-ring. Refer to Figure 1402.
34. Install the planet gear carrier onto the bearing carrier. Make sure that the four tapped holes are in line with those on the bearing carrier.
 - 34.1. When you install replacement wheel studs align them correctly with the rear face of the wheel bearing carrier as shown.



00 - General

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Disassemble and Assemble	27-1194

Introduction

The driveshaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of the driveline that cannot be connected directly because of distance or the need to allow for relative movement between them.



E Driveshaft
G Circlip

F Sun gear

Fault

Lack of Power	Table 398.	Page 30-5
Low Mainline Pressure (In Neutral)	Table 399.	Page 30-5
High Stall Speeds (Forward and Reverse Clutches)	Table 400.	Page 30-6
Low Stall Speeds (Forward and Reverse Clutches)	Table 401.	Page 30-6
Low Pump Flow	Table 402.	Page 30-6
High Converter Out Pressure	Table 403.	Page 30-6
Low Lubrication Pressure	Table 404.	Page 30-6
Low Clutch Pressure and/or Clutch Slipping	Table 405.	Page 30-6
Low Cooler Flow	Table 406.	Page 30-7
Overheating	Table 407.	Page 30-7

Table 398. Lack of Power

Cause	Remedy
Poor engine condition.	Check and repair the engine if necessary.
Low oil level.	Top up the system.
Worn pump.	Check the flow and if necessary repair or install a new pump.
Torque converter damage.	Check and if necessary repair or install a new torque converter.
Low mainline pressure.	Refer to the fault 'Low mainline pressure'. See Also: Table 399. Low Mainline Pressure (In Neutral)
Clutches slipping.	Refer to the fault 'Low clutch pressure'. See Also: Table 405. Low Clutch Pressure and/or Clutch Slipping
Internal leakage.	Check internal cored galleries and casting for porosity. Check the condition of seals.
High stall speeds.	Refer to the fault 'High stall speeds'. See Also: Table 400. High Stall Speeds (Forward and Reverse Clutches)
Low stall speeds.	Refer to the fault 'Low stall speeds'. See Also: Table 401. Low Stall Speeds (Forward and Reverse Clutches)
Overheating.	Refer to the fault 'Overheating'. See Also: Table 407. Overheating

Table 399. Low Mainline Pressure (In Neutral)

Cause	Remedy
Worn pump.	Check the flow and if necessary repair or install a new pump.
Blocked suction strainer.	Clean the suction strainer.
Pressure maintaining valve sticking/leaking.	Free off or install a new valve.
Oil aerated (foaming).	Internal leakage (cored galleries)- inspect/repair transmission. Dirty suction strainer- clean strainer. High oil level- drain to proper level. Incorrect grade of oil- drain then refill with correct oil.
Oil leak through parking brake on/off circuit. (Gearboxes with internal parking brake only)	Check external pipework for parking brake circuit. Check parking brake (pressure) circuit. Disconnect the parking brake and re-check.

Table 410. No Or Insufficient Pressure

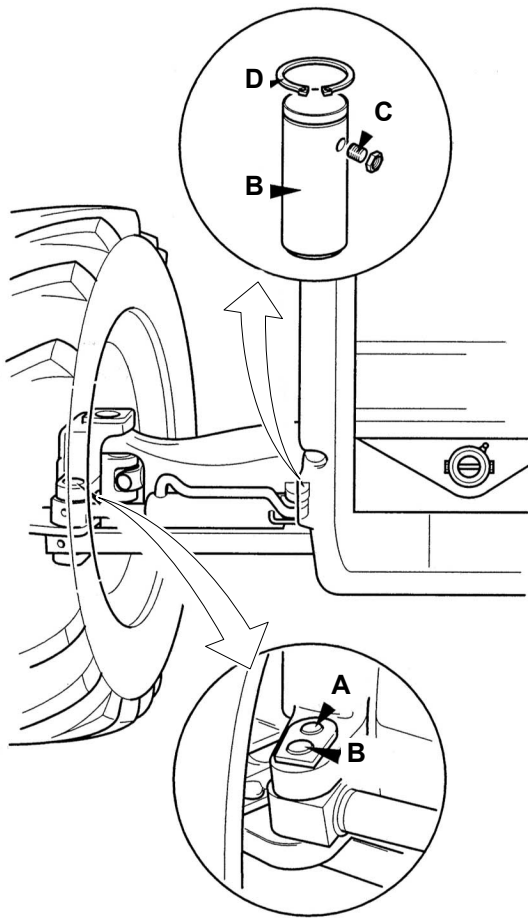
Cause	Remedy
Faulty mechanical drive (e.g. defective coupling).	Contact machine or system manufacturer.
Drive power too low.	Contact machine or system manufacturer.
Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Contact machine or system manufacturer. (e.g. optimize inlet conditions, use suitable hydraulic fluid).
	Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
	Remove contaminants from the suction line.
Hydraulic fluid not in optimum viscosity range.	Use suitable hydraulic fluid Contact machine or system manufacturer.
External control of the control device defective.	Check external control Contact machine or system manufacturer.
Insufficient pilot pressure.	Check pilot pressure. Contact machine or system manufacturer.
Malfunction of the control device or controller of the axial piston unit.	Contact machine or system manufacturer.
Wear of axial piston unit.	Exchange axial piston unit. Contact machine or system manufacturer.
Mechanical damage to the axial piston unit.	Exchange axial piston unit. Contact machine or system manufacturer.
Output unit defective (e.g. hydraulic motor or cylinder).	Contact machine or system manufacturer.

Table 411. Pressure / Flow Fluctuations

Cause	Remedy
Axial piston unit not or insufficiently air bled.	Completely air bleed axial piston unit.
Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Contact machine or system manufacturer. (e.g. optimize inlet conditions, use suitable hydraulic fluid).
	Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
	Remove contaminants from the suction line.

Table 412. Pump Hydraulic Fluid Temperature Too High

Cause	Remedy
Excessive inlet temperature at the axial piston unit.	Contact machine or system manufacturer. Inspect system, e.g malfunction of the cooler, insufficient hydraulic fluid in the tank.
Malfunction of the pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure control).	Contact machine or system manufacturer.
Malfunction of the flushing valve.	Contact machine or system manufacturer.
Wear of axial piston unit.	Exchange axial piston unit. Contact machine or system manufacturer.

Figure 1431.


- A** Bolt
- B** Pivot pin
- C** Pin
- D** Ring

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Apply anti-seize paste to the pivot pins, to facilitate subsequent removal.
3. After connecting the hoses, check the hydraulic fluid level.
 - 3.1. If necessary, top up as required.

Check (Condition)

Hydraulic Hoses

▲ **WARNING** Damaged hoses can cause fatal accidents. Examine the hoses regularly. Do not use the machine if a hose or hose fixture is damaged.

WARNING Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear personal protective equipment. Hold a piece of cardboard close to suspected leaks and then examine the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

Examine the hoses for:

- Damaged hose ends
- Worn outer covers
- Ballooned outer covers
- Kinked or crushed hoses
- Exposed armouring in the outer covers
- Displaced hose end fittings.
- Worn cover sheathing or hose burst protection covering

Replace a damaged hose before you use the machine again.

The replacement hoses must be of the same size, standard and pressure rating. If necessary, for more information contact your JCB dealer.

Remove and Install

(For: HM560 Variable Transmission)

▲ **CAUTION** Make sure the hose is restrained sufficiently during this procedure. If the hose clamps are released without sufficiently restraining the hose, personal injury may occur due to hose whip.

Removal

1. This procedure assumes the transmission is already removed from the machine. Refer to
2. Make sure the transmission is correctly restrained on a suitable work bench.
3. Label the hoses and ports to make sure they are installed correctly later.
4. Make sure the areas around the hose and the hose itself are clean and free of debris.
5. Position a suitable oil container and remove clamp 1 on hose 1.
6. Using an assistant hold hose 1 very firmly whilst removing clamp 2.
7. Carefully allow the hose to relax to its uninstalled shape.
8. Plug the hose and ports.
9. Remove the clamps from the pump end of the hose.
10. Plug the hose and ports and store the hose correctly.
11. Repeat steps 5 to 10 for hose 2 and clamps 3 and 4.



00 - General

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Introduction

The electrical circuits are protected by fuses. If a fuse blows, find out why and rectify the fault before installing a new one.

A full up to date list of fuses and relays and their locations can be found in the relevant operator manual, maintenance section.

4. The speed sensor may be damaged or fail to operate correctly if it is not at the correct distance inside the housing.
5. Install the screw 2.
6. Tighten the screw 2 to the correct torque value.

(For: PS700, PS750 MK2, PS750 MK3)

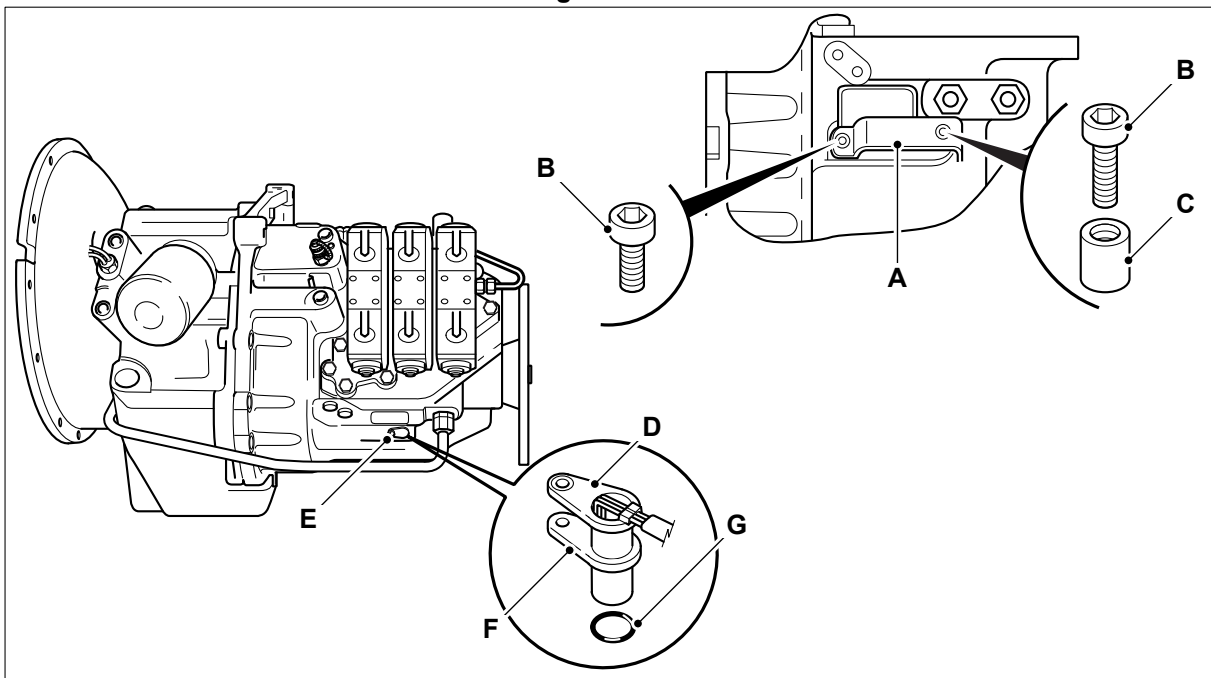
Remove

1. If installed remove the sensor guard as follows:
 - 1.1. Remove the capscrews 1 (x2).
 - 1.2. Remove the spacer 1.
 - 1.3. Remove the sensor guard.
2. Remove the capscrew 2.
3. Remove the speed sensor.
4. Remove the spacer 2
5. Remove and discard the O-ring.

Table 422. Torque Values

Item	Description	Nm
C	Screw 1	28
E	Screw 2	12

Figure 1454.



- A Sensor guard
- C Spacer 1
- E Capscrew 2
- G O-ring

- B Capscrew 1 (x2)
- D Sensor
- F Spacer 2

00 - General

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Introduction

Use the torque setting tables (Technical Data) only where no torque setting is specified in the text. Note: Dacromet fasteners are lubricated as part of the plating process, do not lubricate. Torque settings are given for the following conditions:

Table 428. Up to September 2017

Type	Condition 1	Condition 2
no coating	Unlubricated fasteners	Zinc flake silver (Dacromet) fasteners.
2 (obsolete from September 2017).	Zinc fasteners	Lubricated zinc and yellow plated fasteners.
3, 4 (obsolete from September 2017).	Yellow plated fasteners	Where there is a natural lubrication. For example, cast iron components.

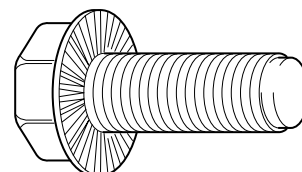
Table 429. From September 2017

Type	Condition 1	Condition 2
no coating	Unlubricated fasteners	Dacromet) fasteners.
1	Zinc flake - silver	Zinc flake silver (Dacromet) fasteners.
5	Zinc and heavy trivalent with seal	
7	Zinc nickel - silver	
8	Zinc nickel - black	
9	Zinc flake - black	

Verbus-Ripp Bolts

Torque settings for these bolts are determined by the application. Refer to the relevant procedure for the required settings.

Figure 1458.



00 - General

Introduction

It is most important that you read and understand this information and the publications referred to. Make sure all your colleagues who are concerned with lubricants read it too.

Hygiene

JCB lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following.

Storage

Always keep lubricants out of the reach of children. Never store lubricants in open or unlabelled containers.

Waste Disposal

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil should be in accordance with any local regulations. Never pour used engine oil into sewers, drains or on the ground.



75 - Consumable Products

15 - Adhesive
00 - General

Subsec-tion	Commer-cial name	Product Number	Colour	Shelf life	Technical data	Comments
Direct glazing	Terostat 8900 LV	4103/4200	Black	365d in car-tridges 180d in sausage pack. 180d in hob-bocks and drums	80bar (1,159.4psi) tensile strength	One component, pumpable adhesive/sealant based on polyurethane, which cures by reaction with moisture to an elastic rubber. The skin formation and curing time are dependent on humidity, temperature and depth of joint. High temperature and high moisture reduces curing time. Sag resistant, temperature range of -40°C (103.9°F) to 90°C (193.9°F) short exposure (up to 1h) of 130°C (265.8°F).
Direct glazing	Sika 295 UV	4103/4300	Black, white	365d	-	Direct glazing adhesive for plastic glazing panels. One component polyurethane adhesive of paste like consistency. 60min tack free time, 1d cure time (4mm at 23°C (73.4°F)). Good UV, fresh water and sea-water resistance. Do not apply below temperatures of 10°C (50.0°F) or above 35°C (95.0°F).

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