

TO READER

This manual has been printed for a skilful engineer to supply necessary technical information to carry out service operations on this machine.

Read carefully this manual to collect correct information relevant to repair procedures.

For any question or remark, or in case of any error relevant the contents of this manual, please contact:

NEW HOLLAND KOBELCO CONSTRUCTION MACHINERY S.p.A.

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REFERENCE

Beyond this Service Manual, also refer to documents hereunder listed:

- Operator's Manual
- Parts Catalogue

COMPLETE HANDBOOK FOR INSTRUCTIONS AND REPAIRS

The complete Service Manual consists of two volumes:

- LB90.B - LB95.B - LB110.B - LB115.B
Service Manual "LOADER BACKHOE"
- LB90.B - LB95.B - LB110.B - LB115.B
Service Manual "Engine"

The Service Manuals for "Loader backhoe" and "Engine" contain the necessary technical information to carry out service and repair on machine and on engine, necessary tools to carry out those operations and information on service standard, on procedures for connection, disconnection, disassembly and assembly of parts.

The complete Service Manual which covers the loader backhoe models LB90.B - LB95.B - LB110.B - LB115.B consists of the following volumes, which can be identified through their print number as stated below:

VOLUME	MACHINE TYPE	PRINT NUMBER
Service Manual - "Loader backhoe"	LB90.B - LB95.B - LB110.B - LB115.B	604.13.547
Service Manual - "Engine"	LB90.B - LB95.B - LB110.B - LB115.B	604.13.612

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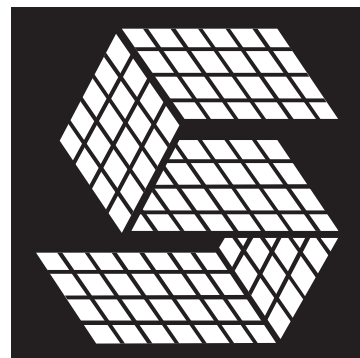
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LB90.B
LB95.B
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SECTION 00 - SAFETY PRECAUTIONS

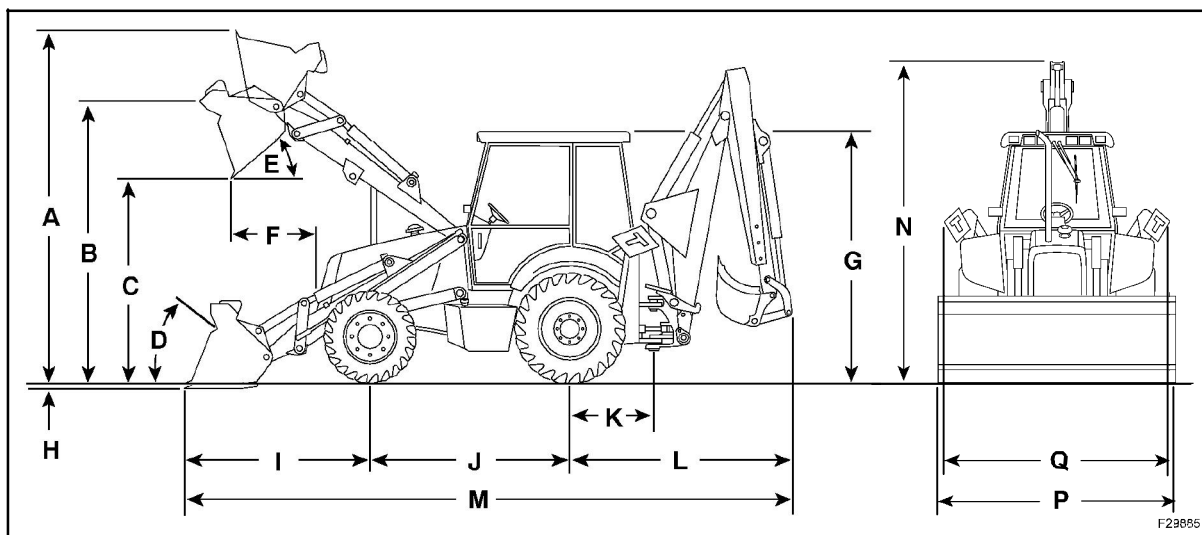
LB90.B
LB95.B
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LB115.B



SECTION 02 - TECHNICAL SPECIFICATIONS

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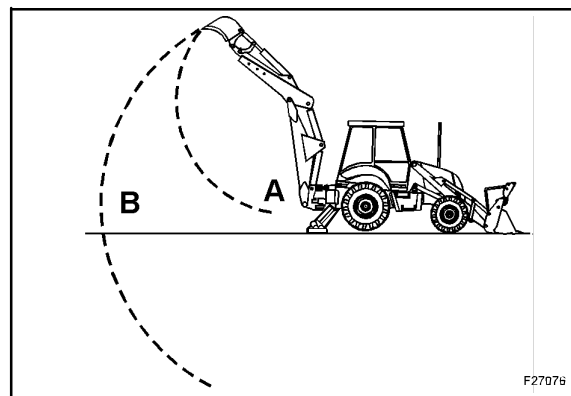
LB110.B (CENTRE PIVOT VERSION)



TYRES	FRONT	REAR
2WD	11L-16F	19.5L-24R4
4WD	12-16.5	19.5L-24R4

Dimensions	2WD	4WD
A	4270 mm	4284 mm
B	3442 mm	3456 mm
C	2694 mm	2710 mm
D	40°	40°
E	45°	45°
F	800 mm	795 mm
G	2885 mm	2885 mm
H	146 mm	130 mm
I	2007 mm	1997 mm
J	2175 mm	2175 mm
K	1120 mm	1120 mm
L	2934 mm	2934 mm
M	7040 mm	7040 mm
N	3973 mm	3973 mm
P	2250 mm	2250 mm
Q	2230 mm	2230 mm
Performance	2WD	4WD
Lift capacity at maximum height	3530 kg	3560 kg
Breakout force	6203 daN	6430 daN

LB110.B (CENTRE PIVOT VERSION)



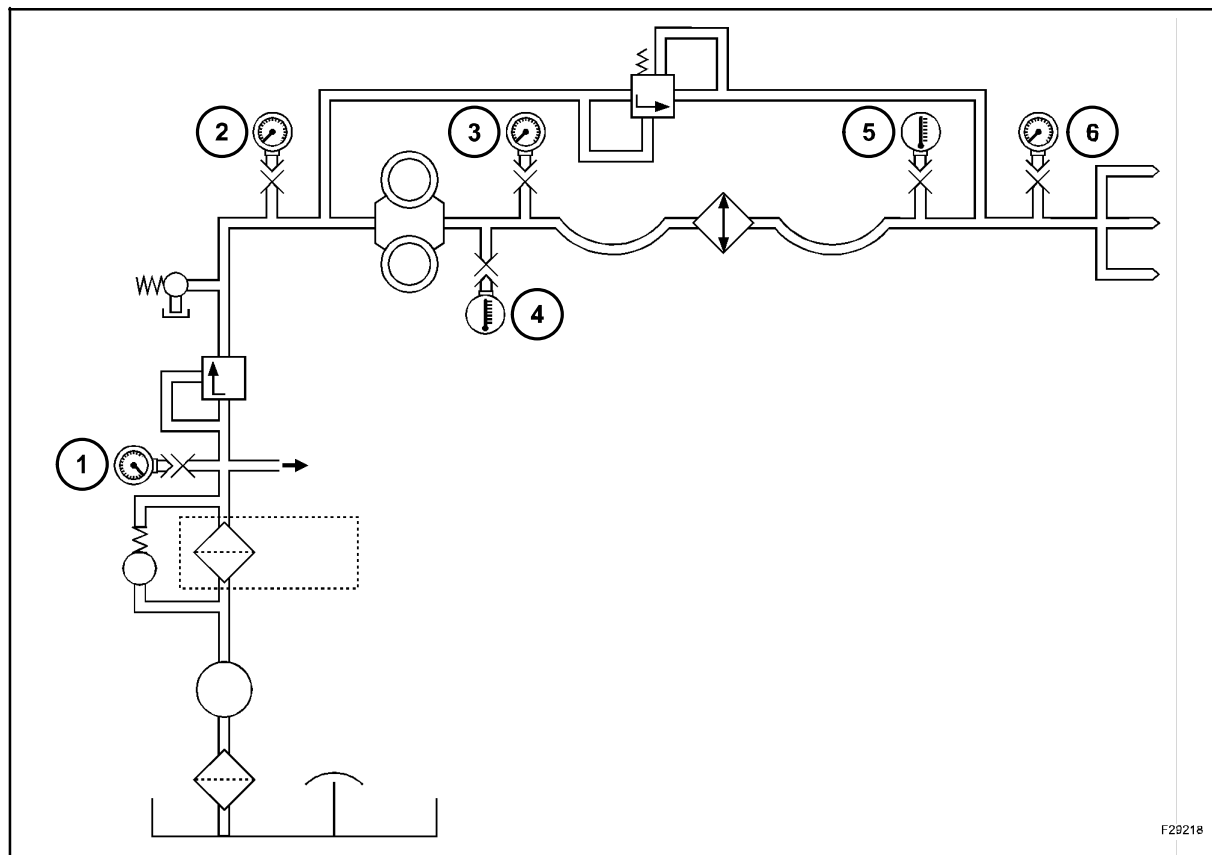
Standard dipper		Telescopic dipper (retracted)		Telescopic dipper (extended)		Height/Depth
Dipper - A	Boom - B	Dipper - A	Boom - B	Dipper - A	Boom - B	m
					590	+5.4
	1160		1085		880	+4.9
	1545		1445	1510	1015	+4.3
2640	1665	2585	1555	1605	1080	+3.6
2615	1695	2505	1575	1655	1110	+3.0
2665	1680	2550	1560	1680	1125	+2.4
2915	1660	2790	1530	1755	1125	+1.8
3700	1630	3555	1495	1850	1125	+1.2
6080	1600	5910	1460	2075	1120	+0.6
	1570		1430	3235	1115	0 (ground)
	1545		1400	5787	1110	-0.6
	1530		1380		1110	-1.2
	1525		1370		1115	-1.8
	1540		1380		1125	-2.4
	1610		1435		1150	-3.0
	1920		1710		1210	-3.6
					1350	-4.2
					1990	-4.8

2. POWERSHIFT TORQUE CONVERTER

2.1 DESCRIPTION AND OPERATION

Engine power is transmitted from the engine flywheel to the impeller through the impeller cover. This element is the pump portion of the torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump in that it picks up fluid at its centre and discharges at its outer diameter. The torque converter turbine is mounted opposite the impeller and is connected to the turbine shaft or clutch shaft. This element receives fluid at its outer diameter and discharges at its centre. The stator of the torque converter is located between and at the centre of the inner diameters of the impeller and turbine elements. Its function is to take the fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element. This recirculation will make the converter to multiply torque. The torque multiplication in function of following elements, impeller, turbine and stator, and the converter output speed (turbine speed). The converter will multiply engine torque to its designed maximum multiplication ratio when the turbine shaft is at zero RPM (stall). Therefore we can say that as the turbine shaft is decreasing in speed, the torque multiplication is increasing. In the impeller cover a splined shaft is fitted which runs inside and through the turbine shaft to drive a hydraulic pump which is fitted at the back of the transmission. Since the shaft is connected to the centre of the impeller cover, the pump speed will be the same as engine speed. The rear side of the impeller cover has a tanged drive which drives the transmission charging pump located in the converter housing. The transmission charging pump speed is also the same as the engine speed.

TORQUE CONVERTER AND LUBRICATION PRESSURE TEST PORTS



- | | |
|------------------------------|---------------------------------------|
| 1. System pressure port | 4. Oil temperature converter out port |
| 2. Torque converter in port | 5. Oil temperature cooler out port |
| 3. Torque converter out port | 6. Lubrication pressure port |

(See section "TRANSMISSION" chapter "PRESSURE SPECIFICATIONS AND CHECK POINTS" at page 106)

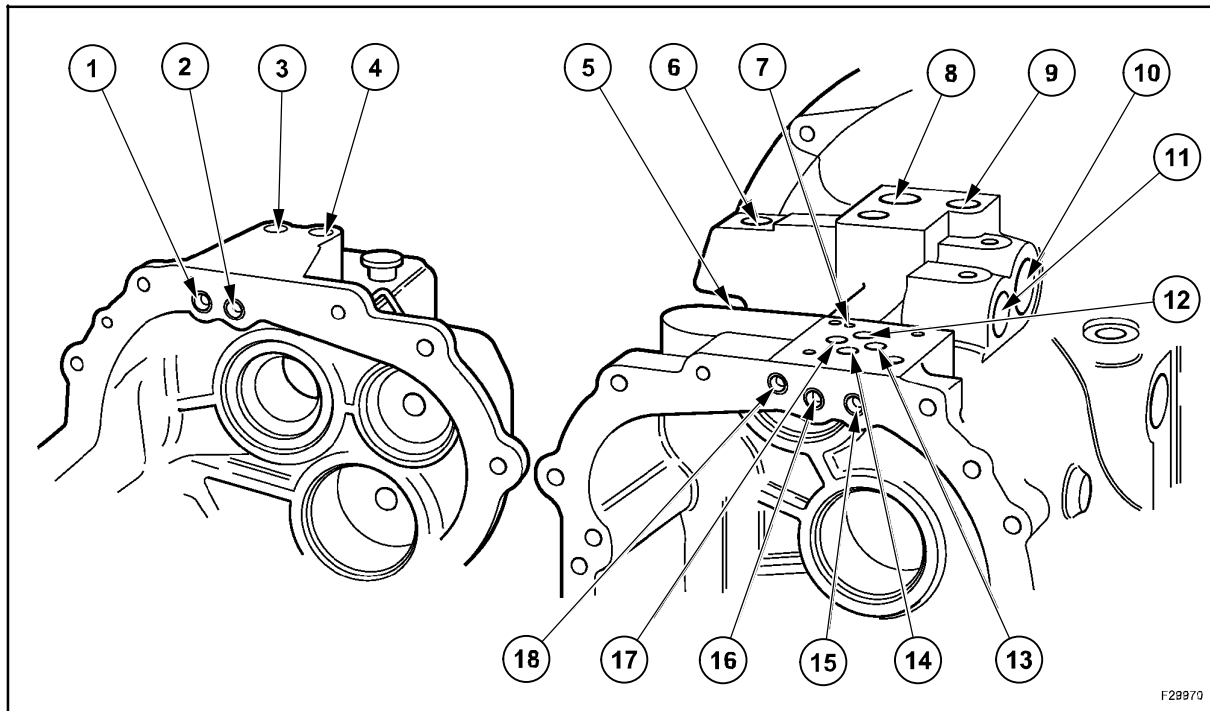
1.2 TIGHTENING TORQUES

Strainer bolts.....	18 to 31 Nm
Pump retaining bolts	18 to 31 Nm
Output Yoke bolts	68 to 88 Nm
Pressure test plugs	41 to 54 Nm
Main transmission case bolts.....	45 to 64 Nm
Shift detent plug	41 to 54 Nm
Shift fork screws.....	18 to 25 Nm
Shift lever assembly screws.....	16 to 24 Nm
Drain plugs.....	34 to 54 Nm
Relief valve	23 to 30 Nm
Pressure regulator valve	46 to 60 Nm
Cold start valve	46 to 60 Nm
4WD solenoid valve spool.....	20 to 27 Nm
4WD Solenoid coil retaining nut.....	5.4 Nm
Control valve retaining screws.....	6.8 to 8.5 Nm
4WD hydraulic pipe connections.....	6.8 to 10.2 Nm
Filter housing bolts.....	45 to 64 Nm
Oil filter	7 to 10 Nm
Temperature sender	20 to 27 Nm

RECOMMENDED SEALANTS

Transmission case joint	Loctite 5203
4WD Output gear	Loctite 649
4WD gear (Permanent 4WD assy)	Loctite 649
4WD clutch supply pipe	Loctite 542
Gear lever housing.....	Loctite 5900 RTV
Shimming access plug	Loctite 649

TRANSMISSION OIL SUPPLY PORT

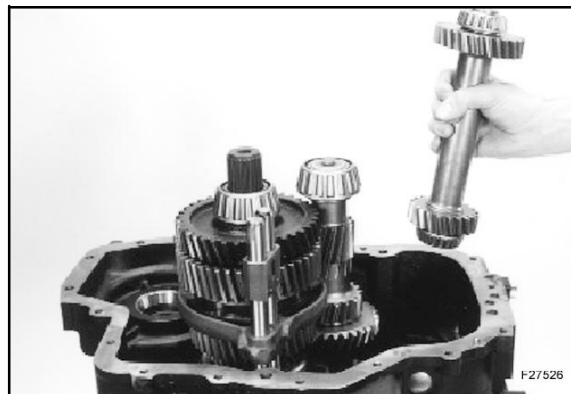


Viewed From Front and Rear Housings

- | | |
|---|---|
| <p>1. Oil supply port to Reverse clutch pack, rear casing.</p> <p>2. Oil supply port to forward clutch pack, rear casing.</p> <p>3. Oil supply port to pressure test reverse clutch pack.</p> <p>4. Oil supply port too pressure test forward clutch pack.</p> <p>5. Front Wheel Drive Solenoid.</p> <p>6. System pressure test point, connected to test block.</p> <p>7. Locating Dowel</p> <p>8. Cold start oil pressure protection valve.</p> <p>9. Torque converter pressure test point, connected to test block.</p> | <p>10. System pressure sequencing valve.</p> <p>11. Torque converter pressure regulating valve.</p> <p>12. Oil supply from pump to solenoid valve pack.</p> <p>13. Oil supply port to Reverse clutch pack, front casing.</p> <p>14. Oil port to tank (dump) from solenoid.</p> <p>15. Oil supply port to Reverse clutch pack, front casing.</p> <p>16. Oil supply port to forward clutch pack, front casing.</p> <p>17. Oil supply port to forward clutch pack, front casing.</p> <p>18. Manufacturing drilling only.</p> |
| | <p>19. Forward oil supply port (front casing)</p> <p>20. Forward oil supply port (rear casing)</p> |

1. Front gear case assembly
2. Rear gear case assembly
3. Plug and O-ring
4. Cold start spring housing
5. Bolt
6. Sealing cap
7. Bolt
8. Reverse shift hub sleeve
9. Synchronizer assembly
10. Sealing ring
11. Copper washer
12. Thrust bearing
14. Thrust washer
17. Ball
18. Cold start spring
19. O-ring
20. Plug
21. Oil filter housing
22. Flywheel housing
23. Washer
24. Filter housing gasket
25. Bolt
26. Cover plate
27. Setscrew
28. 4th gear output shaft
29. 3rd gear output shaft
30. 2nd gear output shaft
31. 1st gear output shaft
32. Spacer
33. Bearing
34. 1st gear bearing spacer
35. 1st gear bearing sleeve
36. Circlip
37. Expansion plug
38. Directional valve
40. O-ring
43. 4th gear thrust washer
44. Bearing spacer
45. Shim
50. Shim
51. Bearing
52. Output shaft
53. Bearing
54. Bearing spacer
55. Shim
58. Shim
59. Support washer
60. Bearing
61. Bearing
62. Thrust washer
63. Countershaft
64. Reverse idler gear
65. Input shaft assembly
66. Forward primary gear
67. Reverse primary gear
68. Clutch pack retaining clip
69. Clutch pack retaining plate
70. Clutch plate
71. Clutch plate (friction)
72. Circlip
73. Spring retainer
74. Piston return spring
75. Piston
76. Piston sealing ring outer
77. O-ring
78. Piston sealing ring inner
79. O-ring
80. Breather plug
81. Capscrew
82. Breather
83. Needle bearing spacer
84. Bolt
85. Needle bearing
86. Temperature sender
87. Output yoke washer
88. O-ring
89. Screw
90. O-ring
91. End yoke assembly
92. Pump assembly
93. Pump sealing ring
94. O-ring
95. Detent ball
96. Detent spring
97. 1st/2nd shift fork
98. 3rd/4th shift fork
99. 1st/2nd shift rod
100. 3rd/4th shift rod
101. Shift fork screw
102. Gear shift lever
103. Bolt
104. Gear lever seating
105. Pin
106. Rubber boot
107. O-ring
108. Suction strainer
109. Pressure regulator valve
110. Plastic clip
111. Plastic clip
112. Plug
113. Converter relief valve
114. Setscrew
115. Oil seal
116. Oil filter
117. Oil filter adapter
118. Drain plug
120. Dowel
121. Strainer cover plate
127. Plug

Remove the reverse idler shaft assembly.



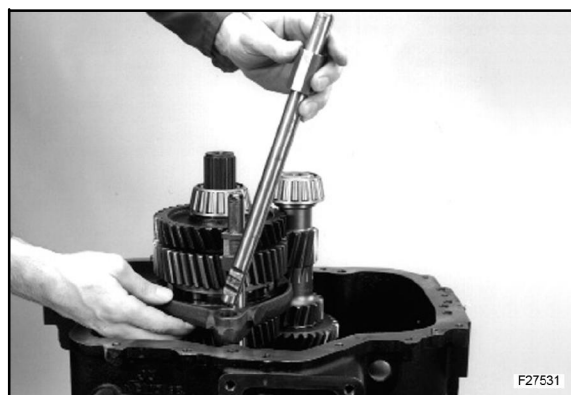
Remove the outer detent plug, spring and ball.



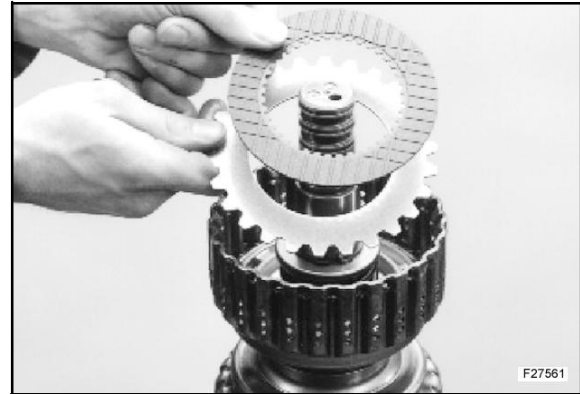
Ensure both synchronizers are in the neutral position then remove the 1st/2nd shift fork screw.



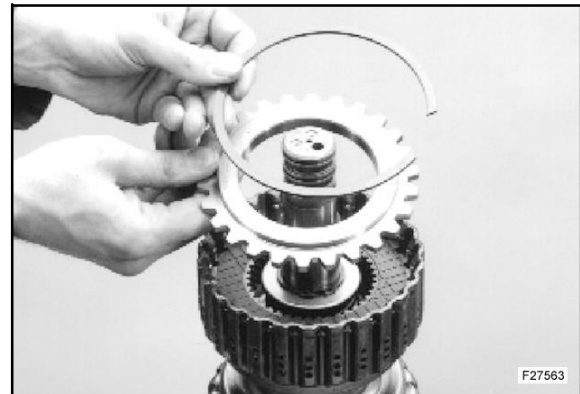
Withdraw the 1st/2nd shift rod from the housing. Then using a magnetic probe remove the interlock ball from the detent, bore.



Replace an externally splined (plain) disc and then an internally splined (friction) disc alternately until six of each have been replaced.



Replace the clutch pack retaining plate and refit the retaining clip.

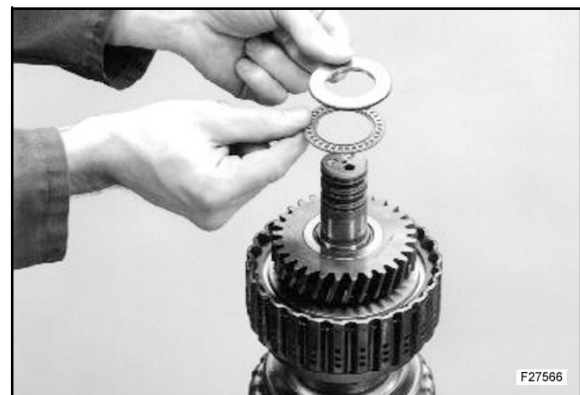


Replace the thrust washer, bearing, spacer and bearing.



Line up the clutch plate splines and replace the primary gear. Then replace the needle bearing and thrust washer as shown.

NOTE: the needle bearing should be fitted with the closed side of its cage against the gear.



Refit the 3rd/4th synchronizer assembly.



Refit the 4th gear and thrust washer as shown.



Using an appropriately sized tube replace the front bearing.



Remove the 4WD gear.



Remove the needle bearings and spacer.



Remove the needle bearing and thrust washer.



Remove the clutch pack retaining clip.



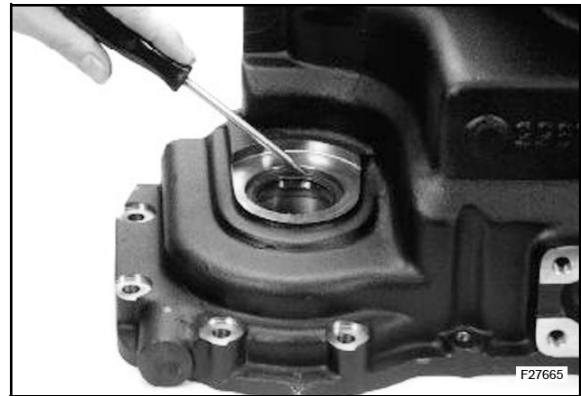
TRANSMISSION ASSEMBLY

All nylon patch bolts may be re-used 5 to 6 times provided a prevailing thread torque of 20 to 25 Nm is recorded.

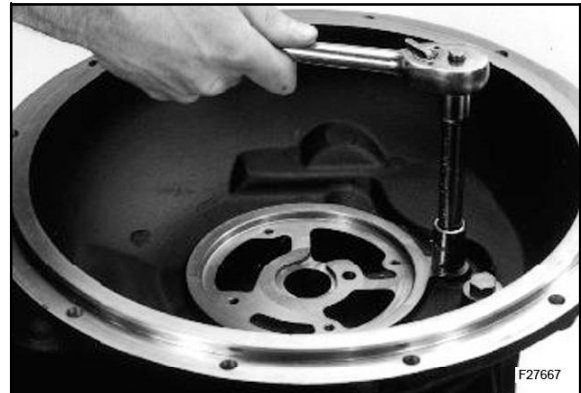
All shafts and bearings should be lubricated with transmission fluid prior to assembly.

To prevent possible contamination of hydraulic parts lint or cotton rags should not be used.

Position the front case as shown and using a suitably sized tube fit a new 4 wheel drive output shaft oil seal to a depth of 6 mm below the housing face. Fill the seal lip with light grease. (Not fitted on 2WD model).

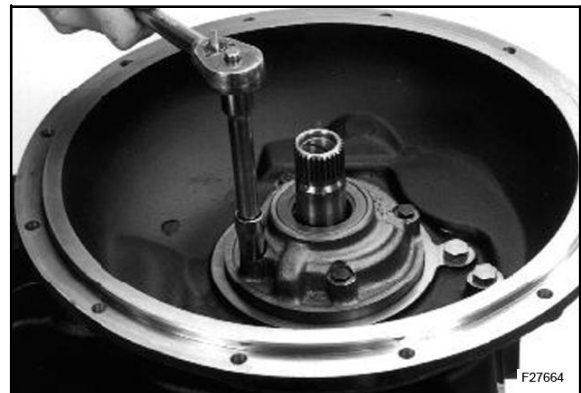


If previously removed, replace the two plug and O-ring assemblies and tighten to a torque of 41-54 Nm.

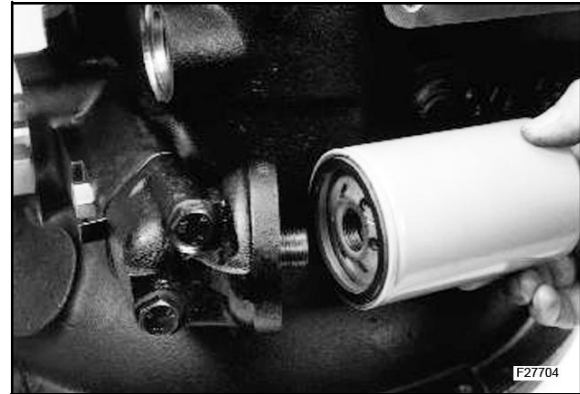


Refit the oil pump assembly and sealing ring. Tighten 4 bolts to a torque of 18-31 Nm.

New copper washers must be fitted under the bolt heads. Finally check for free rotation of pump rotor.



Lubricate the seal with a light grease and screw on a new oil filter. Tighten to a torque of 7 to 10 Nm, or a half to three quarters of a turn after initial seal contact.



Lubricate the seals with a light grease and refit the 4 wheel drive solenoid spool. Tighten to a torque of 20-27 Nm. (Not fitted on 2WD).



Refit the 4 wheel drive solenoid coil and nut. Tighten to a torque of 5.4 Nm maximum. (Not fitted on 2WD).

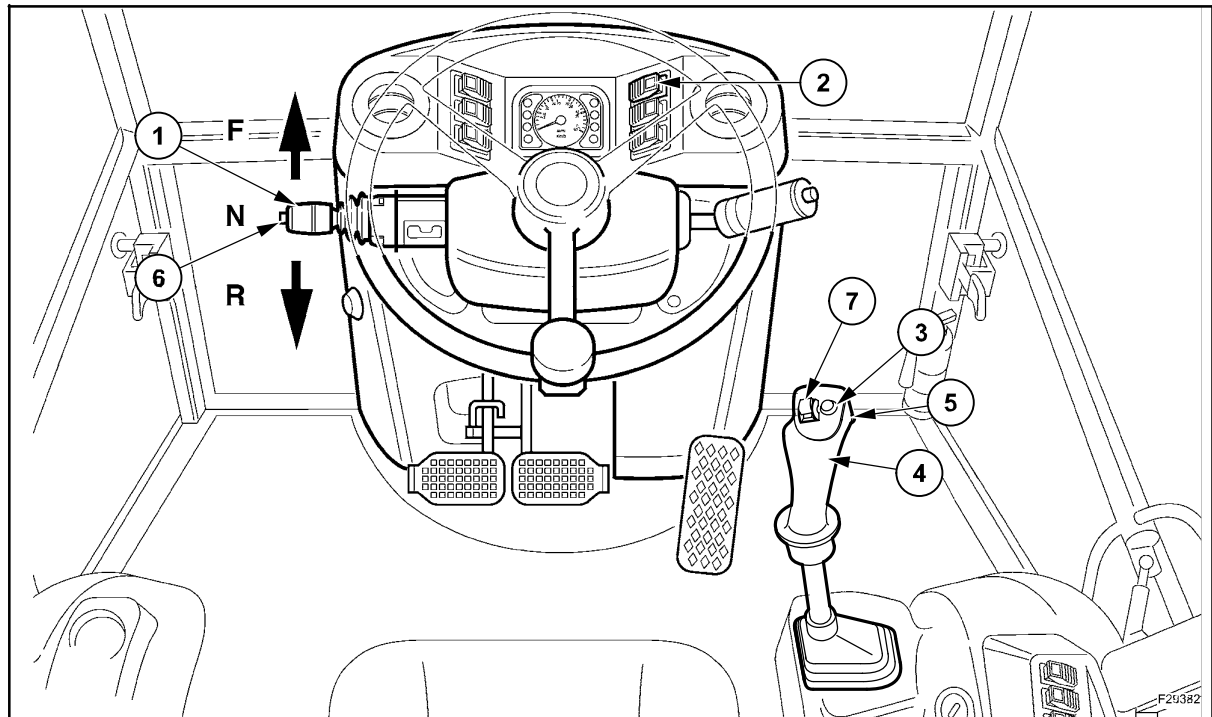


If previously removed refit the 4 wheel drive clutch supply pipe, apply sealant (Loctite 542) to threads and tighten nuts to a torque of 6.8-10.2 Nm. (Not fitted on 2WD).



2.2 TRANSMISSION CONTROLS

4X2 POWERSHIFT TRANSMISSION CONTROL



1. TRANSMISSION POWERSHIFT DIRECTION LEVER: four gears are selectable for the required ground speed in forward and 2 two gears for reverse travel.

IMPORTANT: the gear changes and direction of travel are governed by the micro processor to maintain smooth and safe changes, irrespective of gear selected. Therefore upshifting, downshifting or direction of travel through the gears will only occur when the monitored machine speed is safe to do so.

2. DIFFERENTIAL LOCK SELECTION SWITCH: depressing the spring loaded switch will lock both rear wheels together giving equal drive and will disengage when wheel torque equalizes or the foot brakes are applied.
3. WARNING HORN BUTTON
4. LOADER ATTACHMENT CONTROL LEVER
5. TRANSMISSION DISCONNECT BUTTON
6. KICKDOWN SWITCH: if the machine is in 2nd gear and 1st is required for loader work engaging kick down instantly lowers the gear from 2nd to 1st. When reverse is selected the transmission reverts to 2nd gear.

4X2 POWERSHIFT TRANSMISSION

The transmission fitted to this machine is designed to Powershift gear changes supplying drive to the machine wheels depending upon the gear and direction selected. The transmission is controlled by a microprocessor in the Powershift lever unit (1). The Powershift lever (1) with electronic speed selection actuates the Powershift transmission with four forward speeds, two reverse speeds.

7. ROLLER FOR THE PROPORTIONAL CONTROL OF LOADER BUCKET 4X1

2.3 LUBRICATION

Oil capacity 14 litres

Suggested oil Ambra Hydrodex 3 NH 530 B

Daily

Check oil level daily with engine running at idle (600 rpm) and oil at 82 - 93 °C.

Maintain oil level at full mark.

Normal drain period

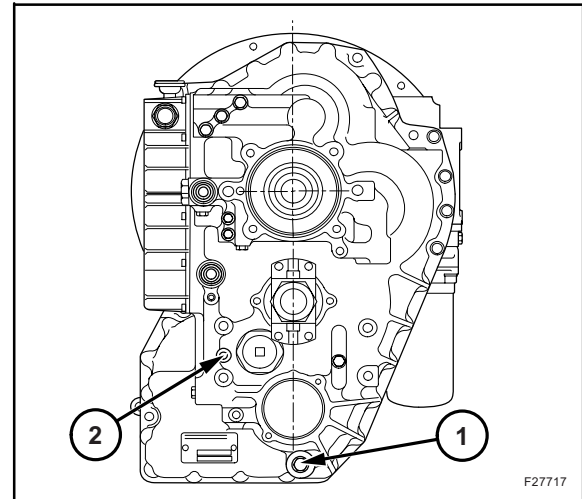
Normal drain period and oil filter change are for average environment and duty cycle condition.

Severe or sustained high operating temperature or very dusty atmospheric conditions will cause accelerated deterioration and contamination.

For extreme conditions judgement must be used to determine the required change intervals.

- Every 1000 hours change oil filter.
- Every 1000 hours drain and refill system as follows:
 - drain with oil at 65 - 93°C.
 - Drain transmission.
 - Oil filter, remove and discard, install new filter.
 - Refill transmission (14 litres).
 - Run engine at idle (600 rpm) to prime converter and lines.
 - When oil temperature is at 82 - 93 °C adjust oil level to full mark.

NOTE: it is recommended that oil filter be changed after 100 hours of operation on new, rebuilt or repaired unit.



1. Drain plug
2. Oil level plug

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THE TRANSMISSION CONTROLS

The transmission is controlled by an electronic gear selector (EGS). This unit has a microprocessor which receives certain inputs (gear selector position, speed sensor...) which are processed and will give output signals to the control valve.

The control valve has 6 solenoid, 6 shift spools, a pressure reducer, an electronic controlled modulation valve, an accumulator, a pressure booster and a speed sensor.

Operation of the valve is as follows:

Regulated pressure 20 bar is directed to the shift spools, pressure booster and pressure reducer.

In the pressure reducer, regulated pressure is reduced to 5,5 bar. This reduced pressure is used as supply for the solenoid and electronic controlled modulation valve.

When activated, the electronic controlled modulation valve will give an output pressure curve from 0 to 5 bar.

This pressure curve is multiplied in the booster so that a curve from 0 to 20 bar is available for the directional clutches.

Between the electronic modulation valve and the booster is an accumulator to damper any hydraulic vibration.

When forward is selected the electronic modulation valve and the forward solenoid are activated.

The pilot pressure of the forward solenoid will move the shift spool so that a forward clutch can be fed with modulated pressure.

If the high/low solenoid is not activated the forward high clutch is engaged, if it is activated the forward low clutch is engaged.

When reverse is selected the electronic modulation valve and the reverse solenoid are activated, the pilot pressure of the reverse solenoid will move the shift spool so that the reverse clutch can be fed with modulated pressure.

The shift spools from forward and reverse are located against each other with a return spring in between; this is to make sure that only one direction can be selected.

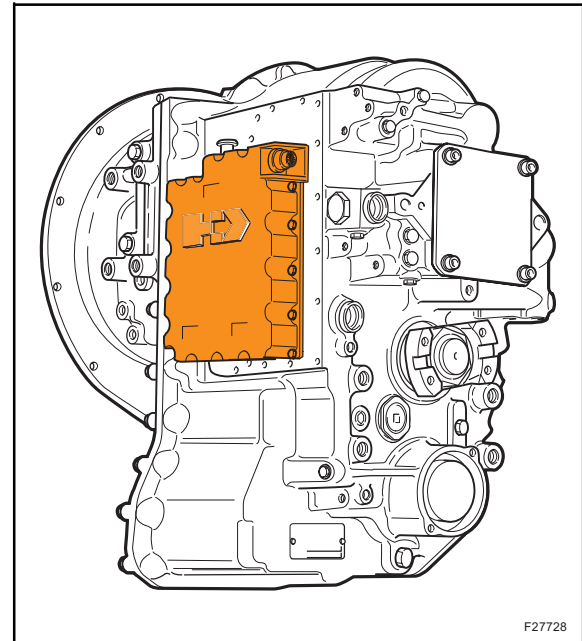
Range is selected as follows:

if the range solenoid (2nd/1st) is not activated, regulated pressure is fed through the modulation shift spool and through the 2nd/1st shift spool to the 2nd clutch.

If the range solenoid (2nd/1st) is activated, the pilot pressure will move the shift spool so that 1st clutch is fed.

The range clutches also have modulation which operates as follows:

When the range is changed, oil will flow through the modulation shift spool to the chosen range clutch momentarily until the friction discs are closed against the dished plate. At that moment the range modulation solenoid is activated.



The transmission controls

CONTROL VALVE OPERATION FORWARD, SECOND GEAR WITH FOUR WHEEL DRIVE ENGAGED

Pressure oil from the system regulating valve flows to the pressure reducing valve.

The pressure lowers to 5.5 bar. This oil flows to the 6 solenoids.

Oil also supplies the modulation valve.

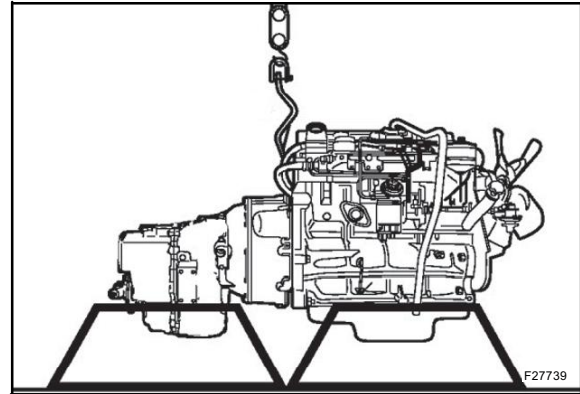
When the powershift lever is moved forward and twisted anti clock wise a electrical signal is sent to:

- Oil flows from the system pressure regulating valve at 20 bar through the four wheel drive spool to engage the 4WD clutch.
- System pressure also flows through the range modulation valve, then through the 1st 2nd spool to engage the 2nd gear clutch.
- The high low solenoid which energizes allowing pilot oil to flow to the shift spool. This will allow oil to flow to the low clutch.
- The neutral forward solenoid which energizes allows pilot pressure to flow to the shift spool this will allow oil to flow on to the forward low shift spool.
- The modulation valve has a reducing current from the microprocessor, pilot pressure gradually increases acting on the boost valve and it multiplies pilot pressure.
- The oil from the boost valve is modulated allowing a steady increase of pressure to act on the forward low clutch pack which gradually takes up drive until clutch pressure reaches 20 bar.

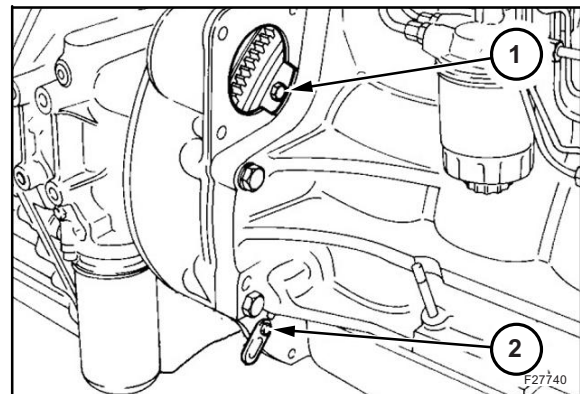
1. Transmission sump
2. Transmission breather
3. Suction strainer
4. Gerotor oil pump
5. Pressure oil filter
6. Filter by-pass valve 4.3 bar
7. System pressure test port 20 bar
8. System pressure regulating valve 20 bar
9. Oil to converter circuit
10. Pressure reducing valve 5.5 bar
11. 2nd / 1st Solenoid
12. 2nd / 1st shift spool
13. 2nd gear clutch
14. 1st gear clutch
15. Range modulation solenoid
16. Range modulation spool
17. Range modulation restriction
18. Four wheel drive solenoid
19. Four wheel drive shift spool
20. Four wheel drive clutch
21. High / low solenoid
22. High / low shift spool
23. Forward high clutch
24. Forward low clutch
25. Neutral reverse solenoid
26. Neutral reverse shift spool
27. Reverse clutch
28. Neutral forward solenoid
29. Neutral forward shift spool
30. Electronic modulation valve 0-5.5 bar
31. Accumulator
32. Pressure booster 0-20 bar

SEPARATING ENGINE FROM TRANSMISSION

1. Place the engine/transmission assembly on a suitable splitting stand.
2. Remove the starter motor assembly.



3. Unscrew and remove the torque converter attaching bolts accessed through the starter motor aperture (1).
4. Remove the engine timing tab (2).
5. Unscrew and remove the bell housing bolts.
6. Gently slide the transmission with the torque converter from the engine.

**INSTALLATION**

Place a stud in one tang of the flexi plate and as the transmission is assembled up to the engine guide the stud through a bolt hole of the flywheel, remove the stud and refit a bolt.

Refit the attaching bolts which couple the transmission to engine.

Turn the engine crankshaft using a torque bar to expose in turn each attaching bolt hole of the flywheel through the flexi plate and refit all of the bolts.

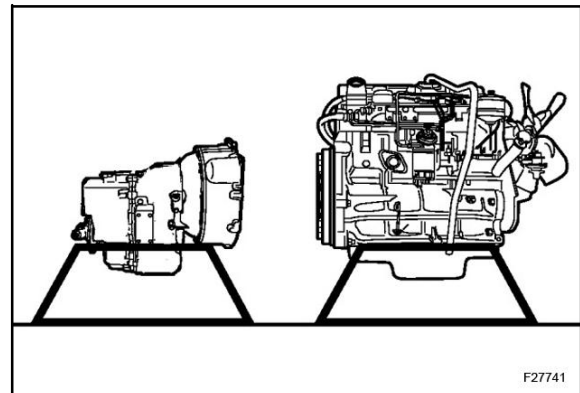
Hoist the engine / transmission assembly back into the vehicle and centralize in the machine using a measure between the chassis and centre line of the crankshaft pulley. This ensures the engine is centrally positioned before torque up of the engine / transmission to chassis bolts.

Reconnect all ancillary equipment as previously described.

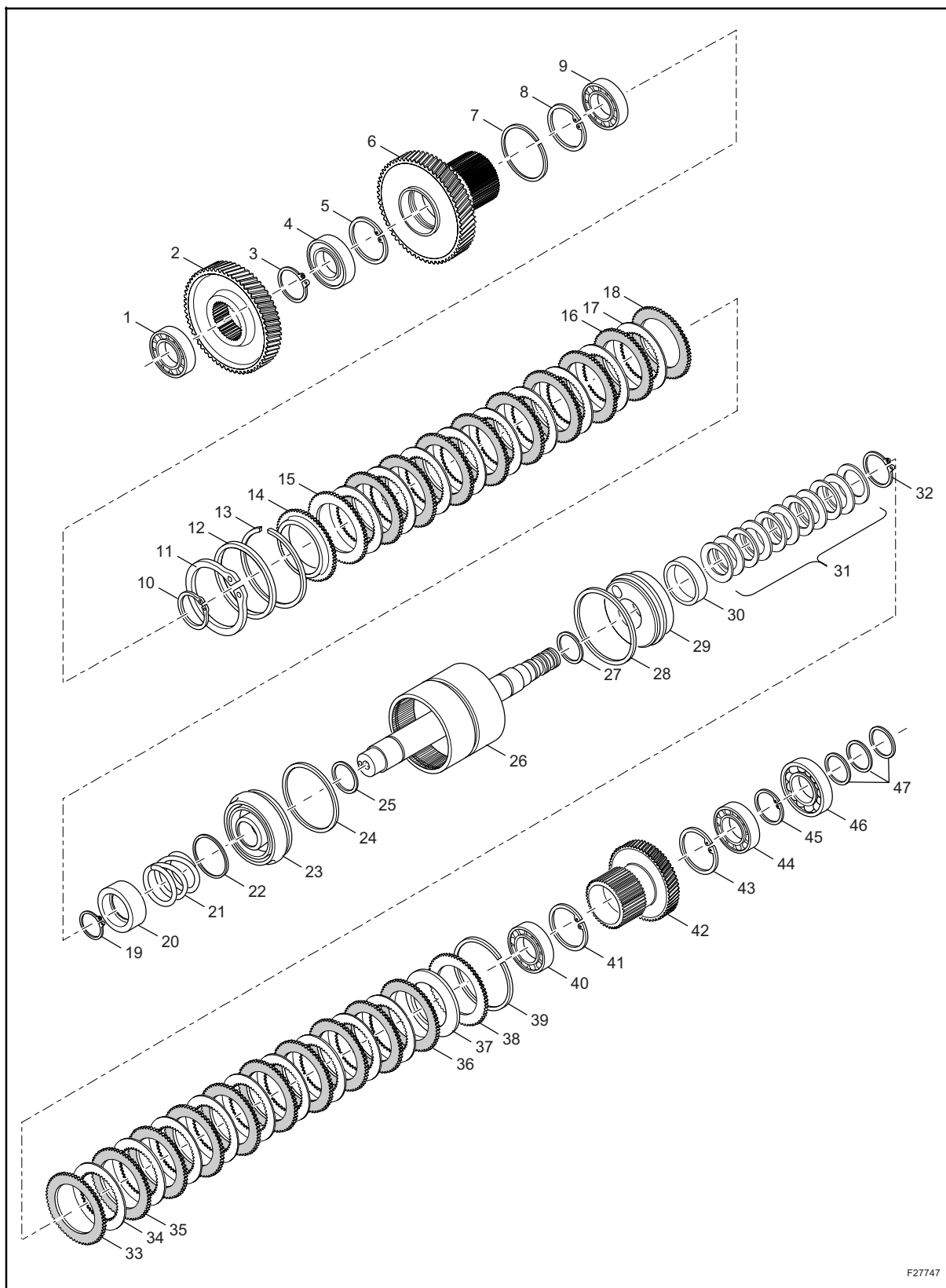
Ensure all attaching hardware is tightened to the correct torque value as detailed in the specifications. Ensure after installation that all fluid levels are correct prior to start up.

Start and run the engine until correct operating temperature is achieved to purge air from cooling system.

Stop engine, check for leaks, rectify as required and recheck fluid levels.

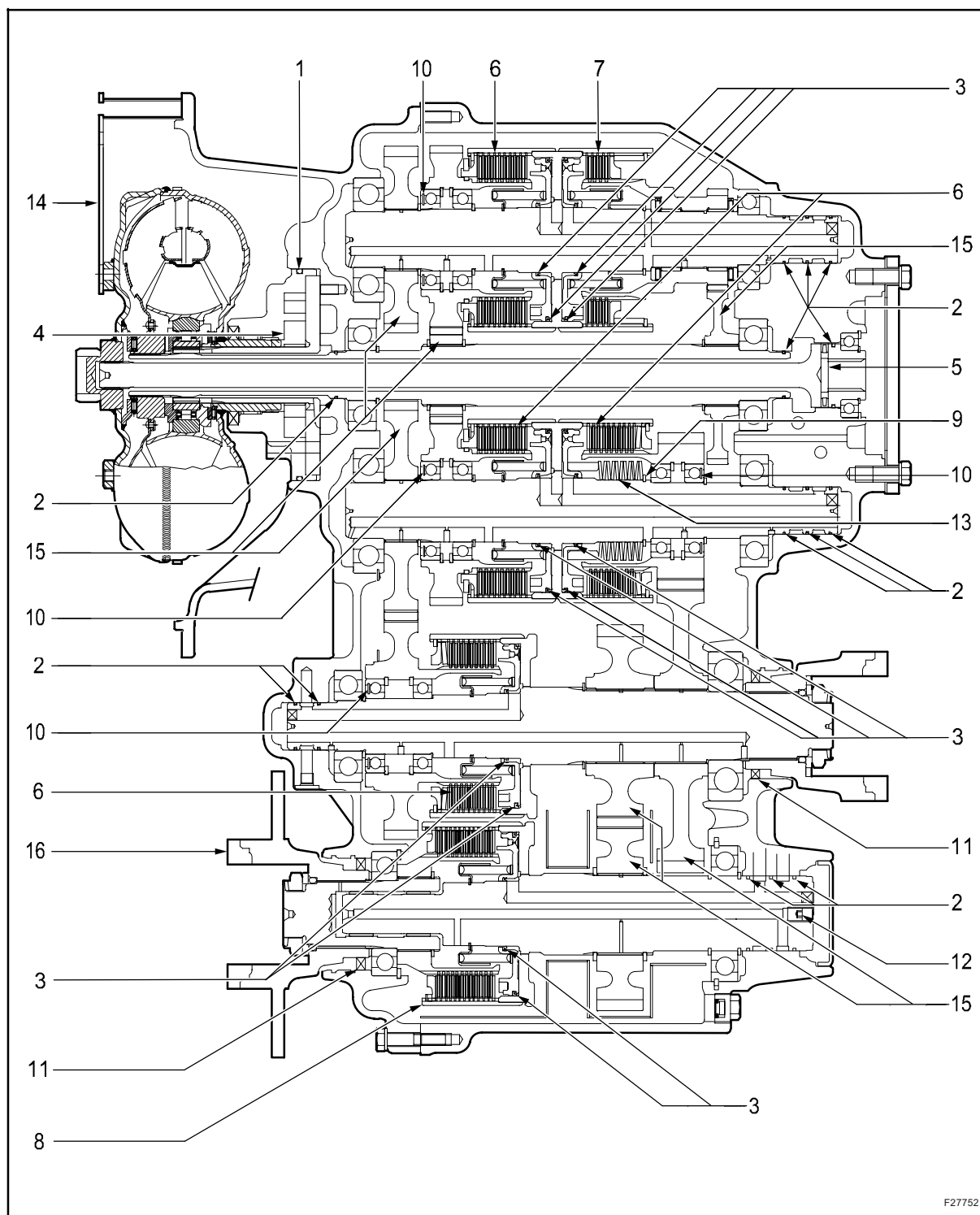


REVERSE / 1ST SHAFT AND GEARS



2.12 DISASSEMBLY AND ASSEMBLY

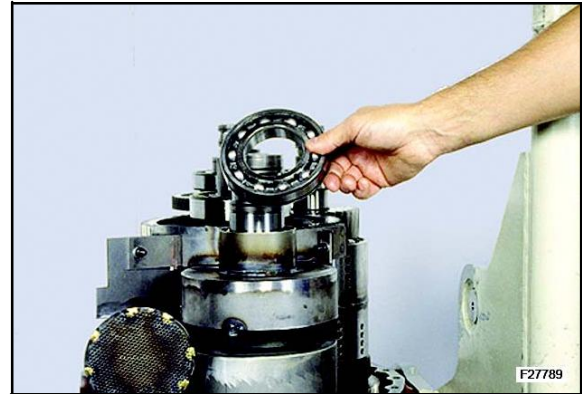
ASSEMBLY INSTRUCTIONS



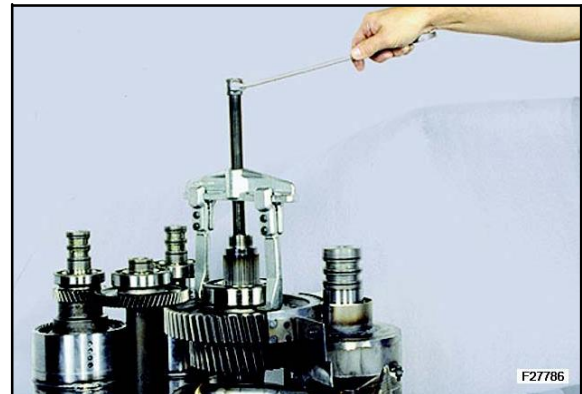
F27752

1. Add some grease to O-ring before assembly.
2. Add some grease to piston rings before assembly slots of piston rings are not allowed to pass bores in housings.

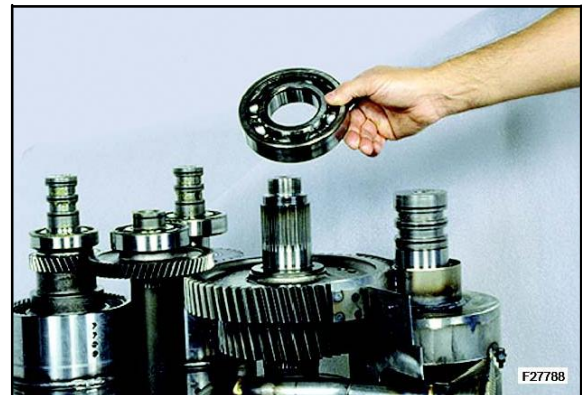
Output shaft rear bearing removed.



Using bearing puller to remove 2nd shaft rear bearing.



2nd shaft rear bearing removed.



Using bearing puller to remove input shaft rear bearing.



Compress spring to remove spring retainer snap ring.



Remove spring retainer snap ring.



Remove clutch spring spacer.



Remove clutch piston spring retainer.



Install one steel disc.
Alternate friction and steel discs until the proper
amount of discs are installed.
First and last discs are steel.



Install one outer half disc with friction material down.



Install backing plate.



Install backing plate snap ring.



Remove backing plate retainer ring.



Remove backing plate.



Remove modulation spring.



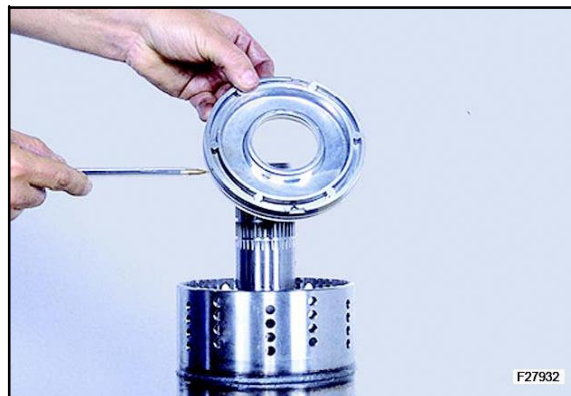
Use bearing puller to remove clutch gear inner bearing.



REVERSE CLUTCH ASSEMBLY

Install clutch piston outer seal.

NOTE: ring must be sized before installing in clutch drum. Sizing is best accomplished by rotating piston while holding a round object against the new sealing ring. Rotate piston until sealing ring is flush with outer diameter of piston.



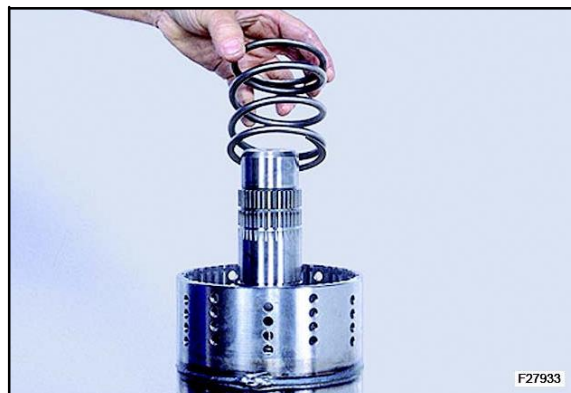
Install clutch piston inner seal. Install clutch piston in clutch drum, use caution as not to damage sealing rings.



Install piston wear plate on piston.



Install clutch piston spring.



Tap outer bearing into clutch hub.



Install outer bearing retaining ring.



Install clutch shaft sealing rings.



Install backing plate retainer ring.



Install clutch hub inner bearing.



Tap clutch gear inner bearing into place.



Install clutch hub bearing locating rings. Install clutch gear in clutch drum. Align splines on clutch gear with internal teeth of steel discs. Do not force this operation.

Gear splines must be in full position with internal teeth of all steel discs.



Install one half disc with friction material down.



Install backing plate.



Install backing plate spacer.



Install backing plate snap ring.



Use bearing puller to remove input shaft front bearing.



Remove input shaft front bearing.



Remove input shaft front bearing retaining ring.

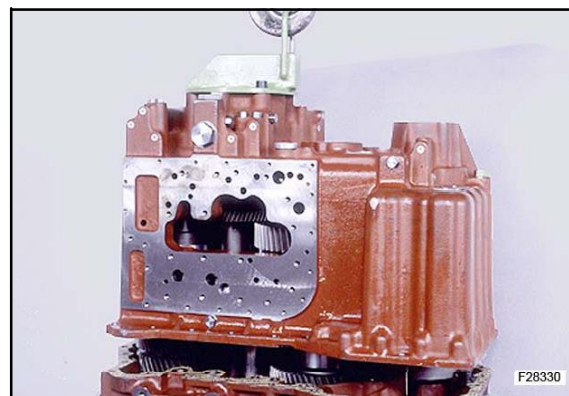


Remove forward low gear retaining ring.

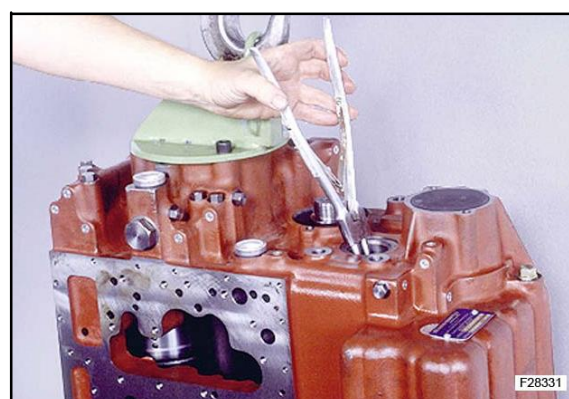


TRANSMISSION ASSEMBLY

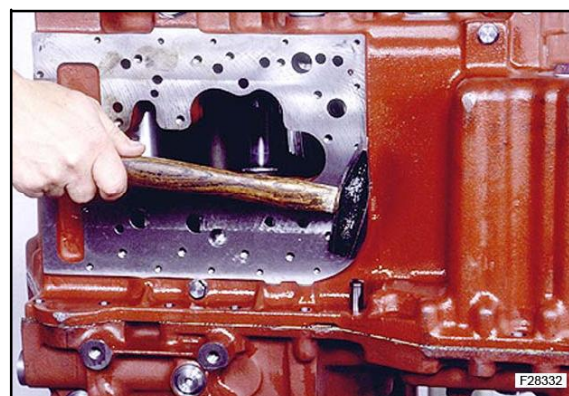
Remove lower output bore plug. Position transmission case on converter housing (using lifting bracket).



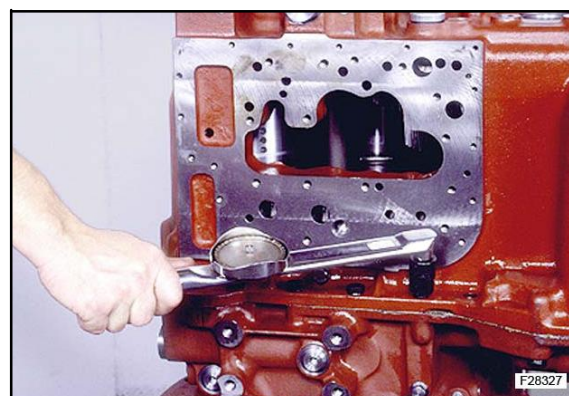
Using spreading type snap ring pliers, spread ears on output shaft rear bearing retaining ring. Holding snap ring open. Tap transmission case into place.



Tap dowel pin in transmission case and converter housing.



Install transmission case to converter housing mounting screws and lock washers. Tighten mounting screws to specified torque.



2.14 FAULT FINDING

STALL TEST

Use a stall test to identify transmission, converter, or engine problems.

TRANSMISSION PRESSURE CHECKS

Transmission problems can be isolated by the use of pressure tests. When the stall test indicates slipping clutches, then measure clutch pack pressure to determine if the slippage is due to low pressure or clutch plate friction material failure.

In addition, converter charging pressure and transmission lubrication pressure may also be measured.

MECHANICAL AND ELECTRICAL CHECKS

Prior to checking any part of the system for hydraulic function (pressure testing), the following mechanical and electrical checks should be made:

- Check the parking brake for correct adjustment.
- Be sure all lever linkage is properly connected and adjusted in each segment and at all connecting points.
- The controls are actuated electrically. Check the wiring and electrical components.
- Be sure that all components of the cooling system are in good condition and operating correctly. The radiator must be clean to maintain the proper cooling and operating temperatures for the engine and transmission. Air clean the radiator, if necessary.
- The engine must be operating correctly. Be sure that it is correctly tuned and adjusted to the correct idle and maximum no-load governed speed specifications.

HYDRAULIC CHECK

Also, before checking the transmission clutches, torque converter, charging pump, and hydraulic circuit for pressure and rate of oil flow, it is important to make the following transmission fluid check:

Check oil level in the transmission. The transmission fluid must be at the correct (full level). All clutches and the converter and its fluid circuit lines must be fully charged (filled) at all times. See note below.

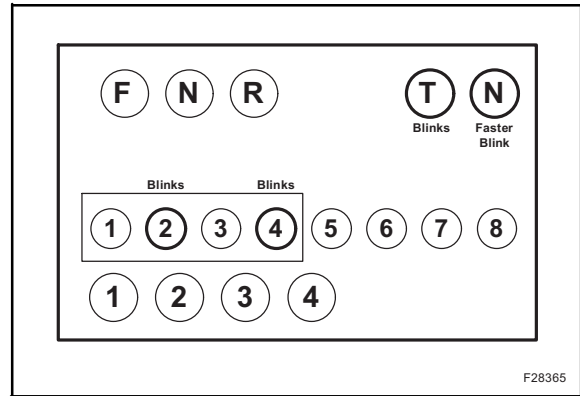
NOTE: the transmission fluid must be at operating temperature of 82 - 93 °C to obtain correct fluid level and pressure readings. Do not attempt to make these checks with cold oil.

To raise the oil temperature to this specification it is necessary to either operate (work) the vehicle or run the engine with converter at "stall". (Refer to converter stall procedure).

FAULT CODE F5 AND F6 / OPEN CIRCUIT DIRECTION OUTPUTS

Direction selection related outputs (E06-Pin P, E07-Pin N):

A short to plus is considered as a critical fault. Shorts to plus usually result in being blocked in either Forward or Reverse. If both are on simultaneously, the transmission Behaviour depends on the state of a mechanical interlock inside the transmission.

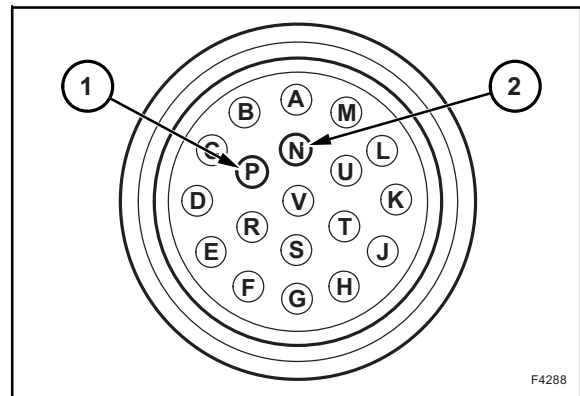


In this case the Microprocessor normally turns on the pressure modulator (E03-Pin T). This results in immediate selection of neutral regardless of the origin of the fault. Indeed even in case the short to plus is applied externally, this response effectively blocks the transmission in neutral.

If however at the time the fault was detected a fault was also present on the pressure modulator, the microprocessor reverts to shutdown mode and remains this way until power is removed. Shutdown mode is a state in which power is removed from the microprocessor outputs by opening the internal redundant shutdown path.

This only helps if the fault was caused by the microprocessor internally.

Additionally, during program execution, critical variables are continuously checked for contents integrity.



Gear Shifts

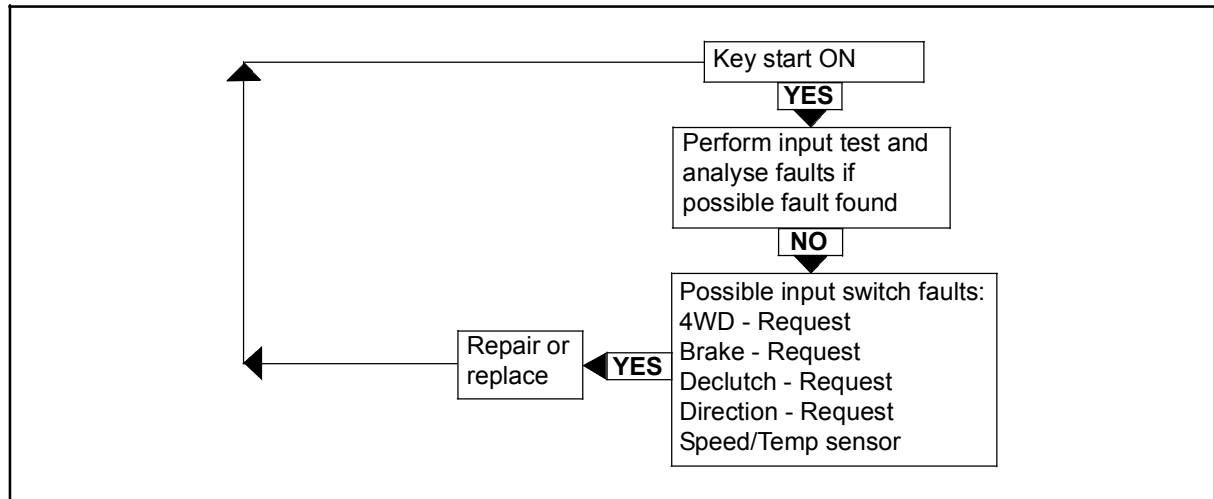
low/high solenoid:

inactive = forward high is selected

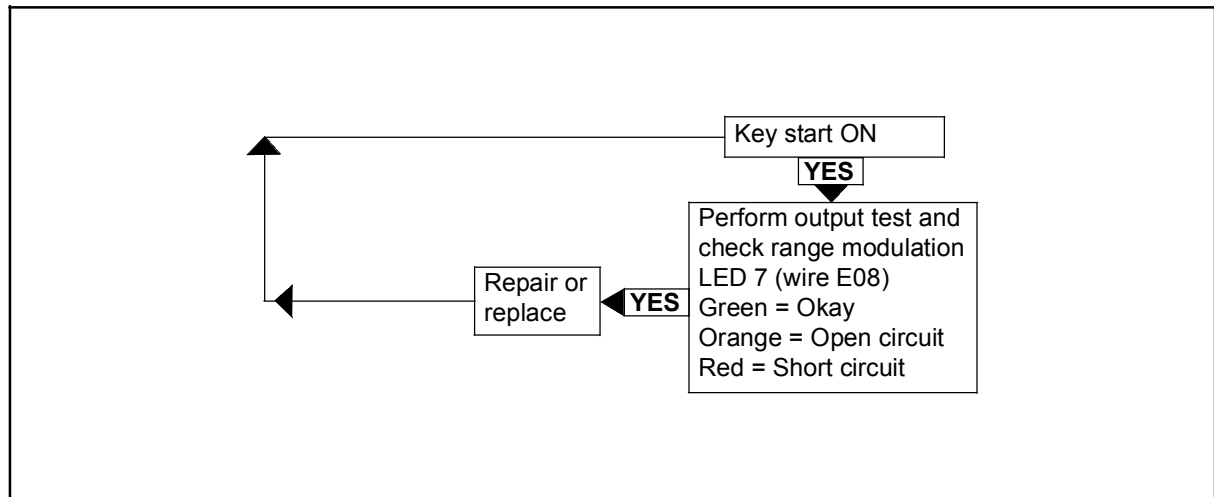
active = forward low is selected

SHIFT DIAGRAM - SOLENOIDS	FORWARD				REVERSE	
	1	2	3	4	1	2
reverse/n					X	X
forward/n						
low/high	X	X	X	X		
1st/2nd	X		X		X	

F12



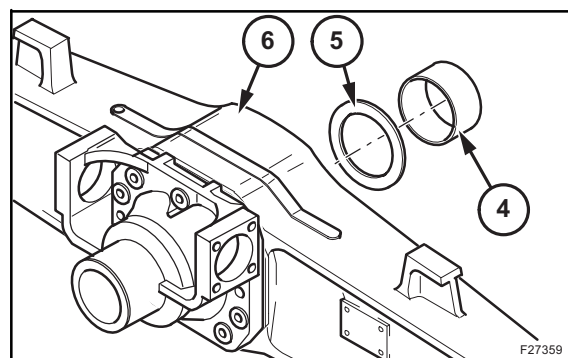
F13



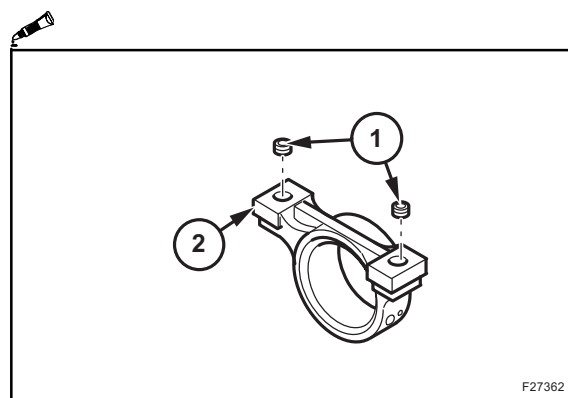
Insert the thrust washer (5) into the front support seat.

Heat the bush (4) at 110÷120 °C then assemble it to the axle housing (6).

NOTE: if necessary assemble the bush (4) with a pad and a hammer.



Apply sealant on bushes (1) contact surface.
Assemble the bushes (1) to the front support (2) with a pad and a hammer.

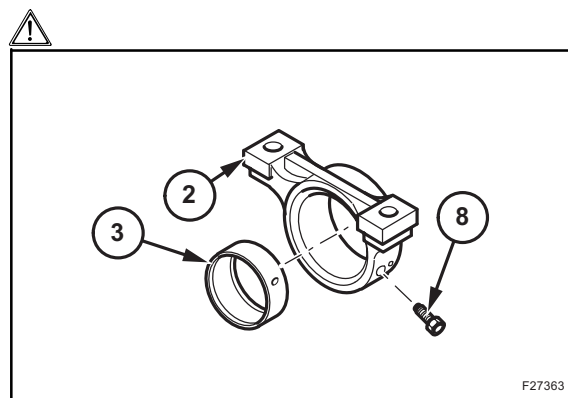


Assemble the bush (3) into the front support (2) with a suitable driver and a hammer.

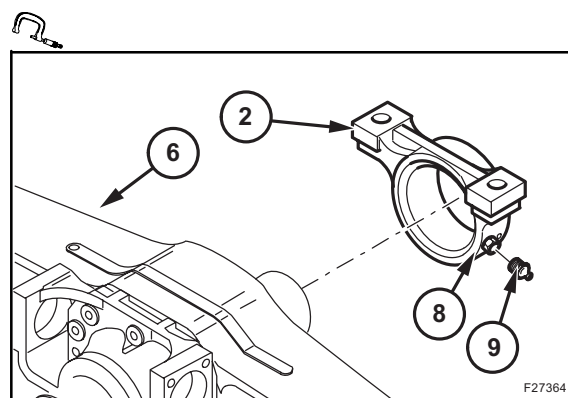
⚠ WARNING

Align the bush hole with the bolt (8) hole.

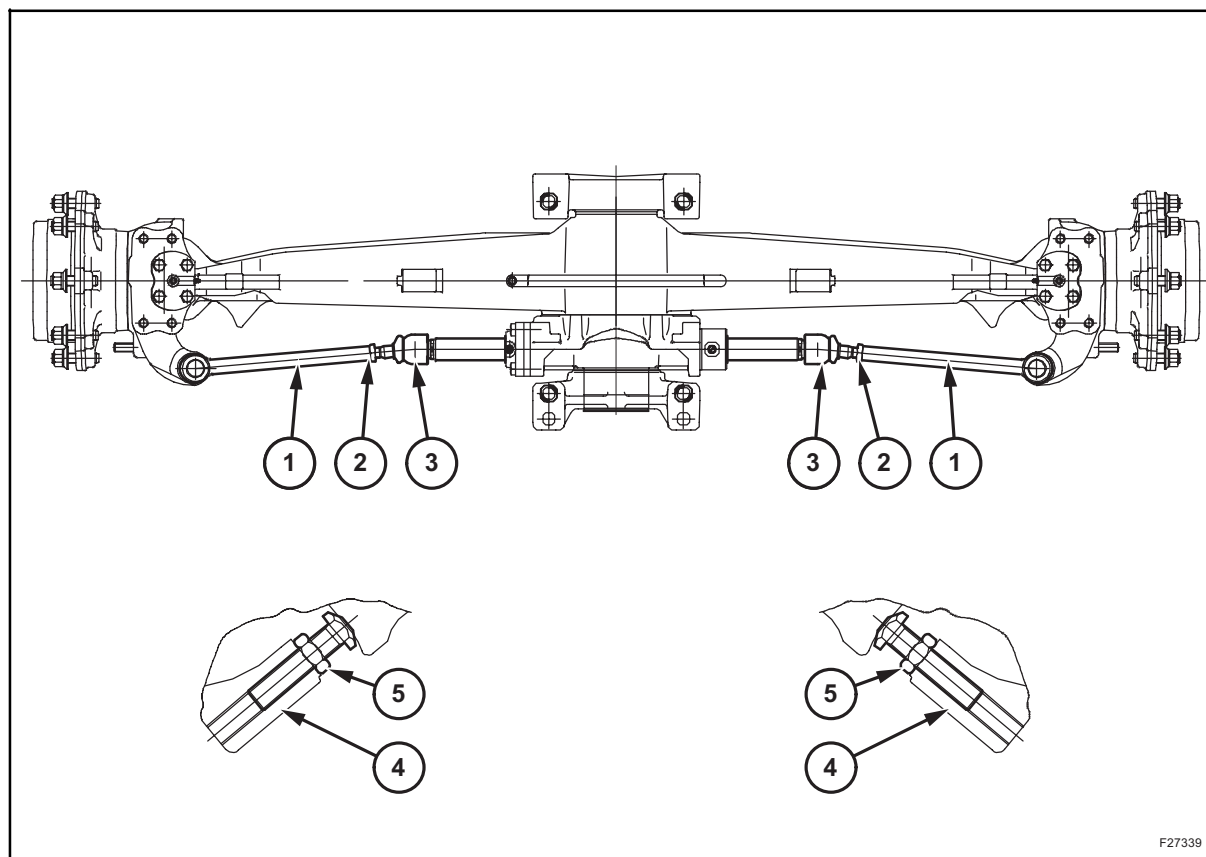
Assemble the bolt (8).



Insert the front support (2) on the axle housing (6).
Tighten the bolt (8) to the request torque and tighten the lube nibble (9).



TOE-IN / STEERING ANGLE



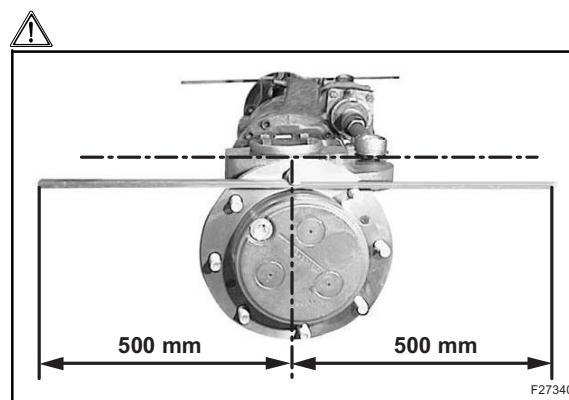
F27339

Toe-in

Put two equal one-metre-long linear bars on the wheel sides and lock them with two nuts on the wheel hub stud bolt.

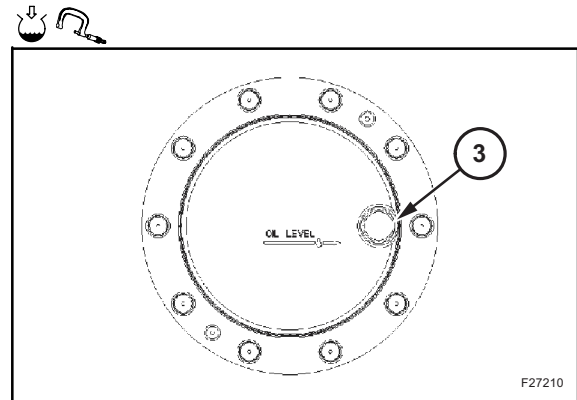
⚠ WARNING

The two bars should be fixed on their middle so that they are perpendicular to the supporting surface and parallel to the pinion shaft axis; align the two bars.



F27340

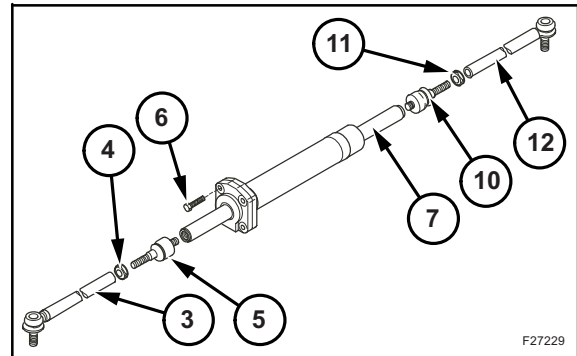
Rotate the wheel end so that the hole (3) is in the position shown in figure.
Fill to the bottom of the fill plug hole with specified oil.
Tighten the plug (3) to the requested torque.



Remove the tie rods (3) and (12) by loosening the nuts (4) and (11) with a suitable wrench, then check the conditions.

Unscrew the fastening screws (6) and take the steering cylinder (7) out of its housing, if necessary use a rubber hammer.

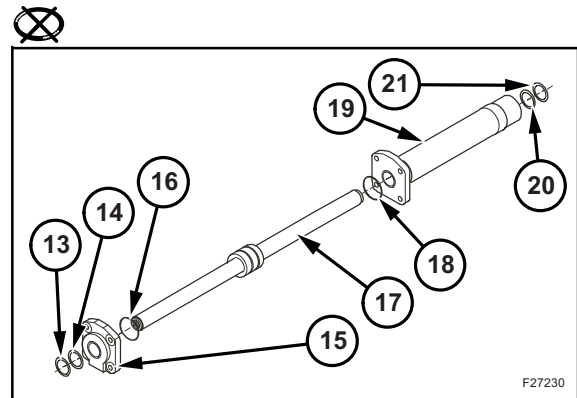
Remove only parts that need to be overhauled and/or replaced.



Remove the cylinder head (15) from the cylinder body (19) and remove it from the rod (17).

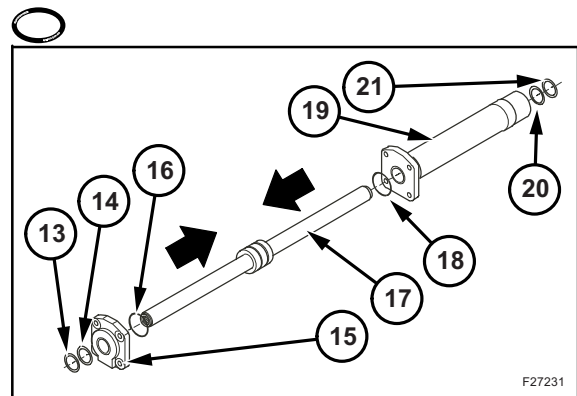
Remove the rod (17) from the cylinder body (19).

Remove all the seals and O-rings (13, 14, 16, 18, 20 and 21) from the cylinder body (19), the cylinder head (15), and the rod (17).

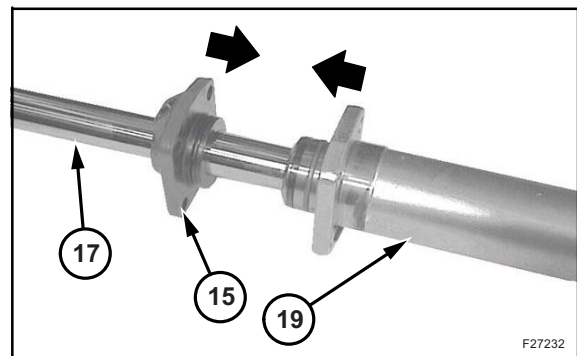


Assembly

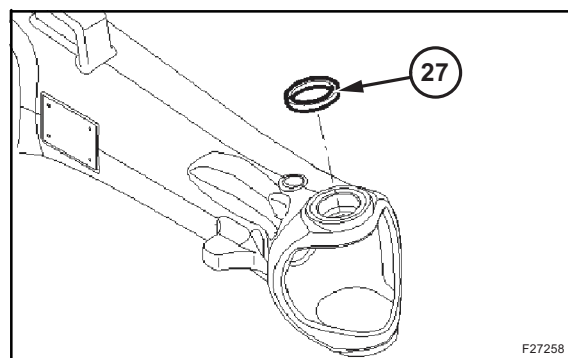
Assemble new seals and O-rings (13, 14, 16, 18, 20 and 21) on the cylinder head (15), on the rod piston (17) and on the cylinder body (19).



Assemble the cylinder head (15) on the rod (17). Slide the pre-assembled rod (17) into the cylinder body (19).



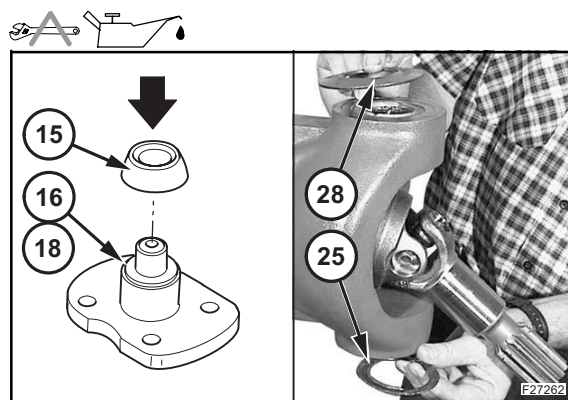
Assemble the spacer (27) in the upper king pin housing.



If the cone (15) of the spherical joint has been previously removed, reassemble it to the lower king pin (16) using the special tool **380002662** under a press.

Grease carefully the seats of king pin (16) and (18) with specific grease.

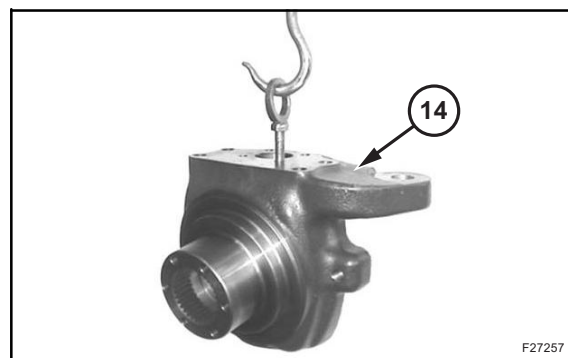
Position the belleville washers (25) and (28) on the king pin (16) and (18) housings.



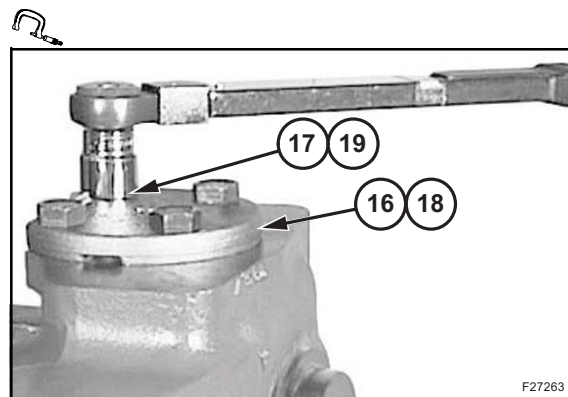
Secure the swivel housing (14) with a belt or a rope to a hoist or any other supporting device.

Protect the splined end of the axle shaft by winding it with an adhesive tape to avoid damage to the seal ring.

Assemble the swivel housing (14) on the axle beam.



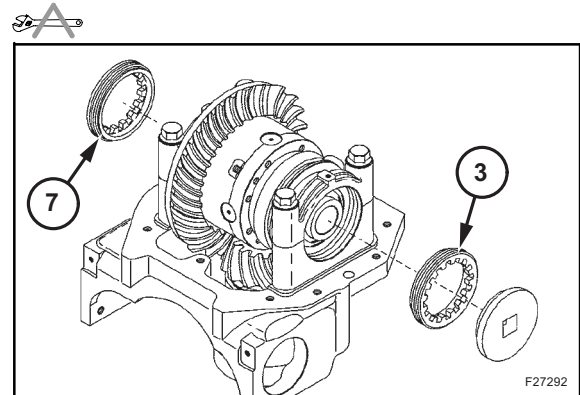
Assemble the king pins, the lower (16) and the upper (18), and tighten the retaining screws (17) and (19) to the requested torque.



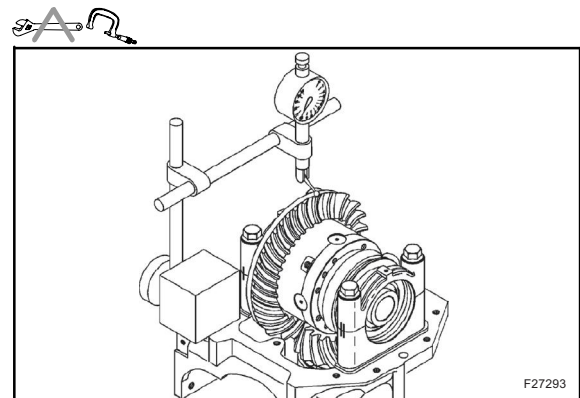
Assemble the adjuster ring nuts (3) and (7) to the differential support.

Tighten both ring nuts (3) and (7) with special tool **380000406**, till the backlash is eliminated and the differential bearings are slightly preloaded.

Check that the differential bearings are well settled; if necessary, knock slightly with a soft hammer, in order to properly set the bearings in position.



Position a magnetic-base dial gauge on the differential support, so that the feeler stylus touches the surface of one tooth of the crown gear with a 90° angle.



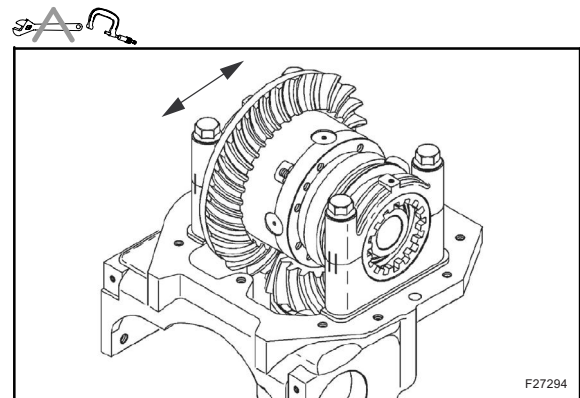
Lock the pinion and move the crown gear alternatively and note the pinion-ring gear backlash, measured with the comparator.

Repeat the operation on 2 or more points (teeth), rotating the crown gear, so that to obtain an average value.

Check if the measured backlash value is within the requested range:

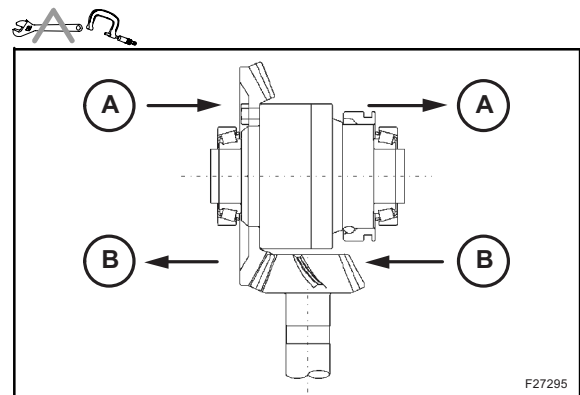
$$0.18 \pm 0.25 \text{ mm}$$

Carry out the adjustment by operating on the ring nuts with the appropriate tool **380000406**.



Adjust the ring nuts (3) and (7), remembering that:
(A)- if the measured backlash is greater than the given tolerance range, unscrew the adjuster ring nut (3) and screw in the adjuster ring nut (7) by the same measure.

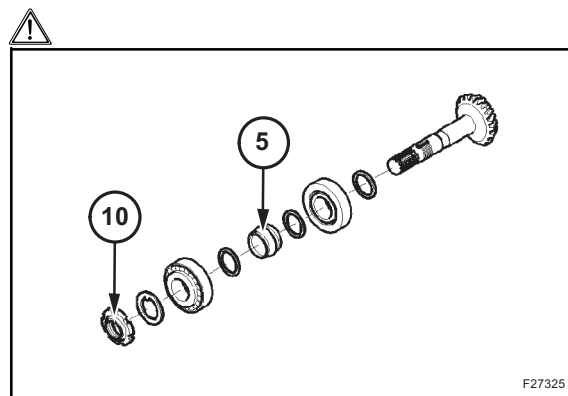
(B)- if the measured backlash is less than the given tolerance range, unscrew the adjuster ring nut (7) and screw in the adjuster ring nut (3) by the same measure.



Check all pinion components for wear.

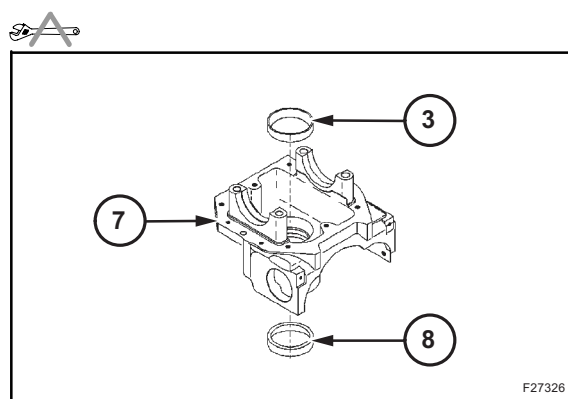
⚠ WARNING

The ring nut (10) and the collapsible spacer (5) must be replaced when reassembling the unit.

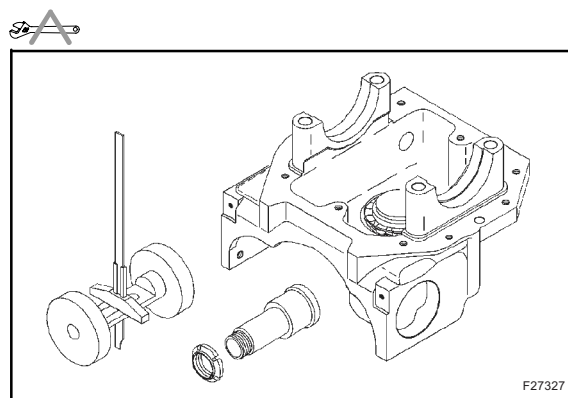


Assembly

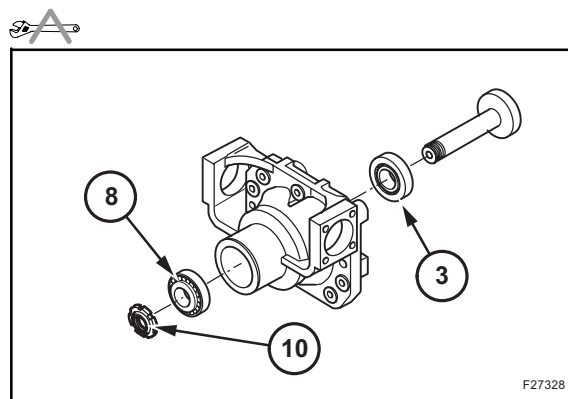
Place the differential support (7) on a workbench. Fit the bearing cups (3) and (8) using the special drifts and a hammer.



Prepare the kit consisting of the special tools called "false pinion" **380002219** and "false differential box" **380000407 + 380000440** and a depth gauge.



Insert the bearing cones (3) and (8) in their housings. Assemble the "false pinion" **380002219** and its ring nut (10). Tighten without exceeding the ring nut, till the backlash is eliminated.

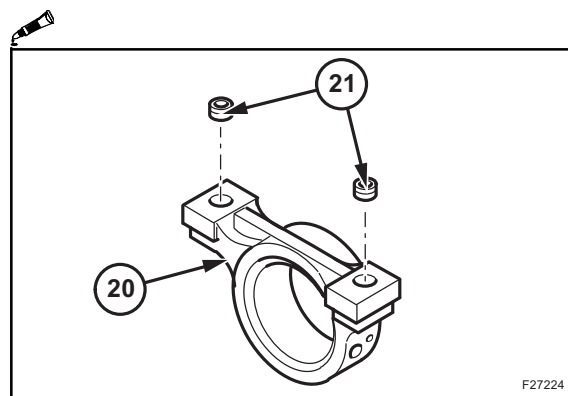


SECTION 25 - FRONT AXLES

79

Side gear spline worn out Replace all scratched washers (Excessive backlash)	Excessive use	Replace differential gear group. Replace half shaft if required.
Thrust washer surface worn out or scratched	Insufficient lubrication Incorrect lubrication Contaminated oil	Use correct lubrication and fill up to right level. Replace at intervals recommended. Replace all scratched washers and those with 0,1 mm thickness lower than the new ones.
Inner diameter of tapered roller bearing worn out	Excessive use Excessive pinion axial backlash Insufficient lubrication Contaminated oil	Replace bearing. Check pinion axial backlash. Use proper lubrication, fill up to right level and replace at recommended intervals.
Bent or broken half shaft	Vehicle intensively operated or overloaded	Replace.
Half shaft broken at wheel side	Wheel support loose Beam body bent	Replace. Check that wheel support is not worn out or wrongly adjusted.

Apply sealant on bushes (21) contact surface.
Assemble the bushes (21) to the front support (20) with a pad and a hammer.

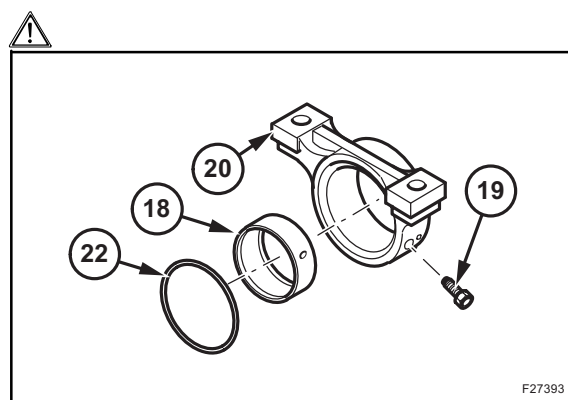


Assemble the bush (18) into the front support (20) with a suitable driver and a hammer.

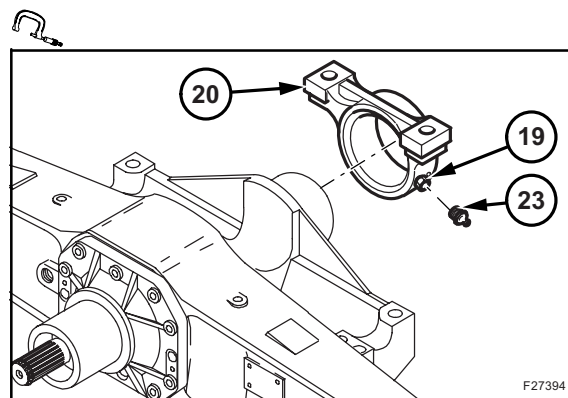
⚠ WARNING

Align the bush hole with the bolt (19) hole.

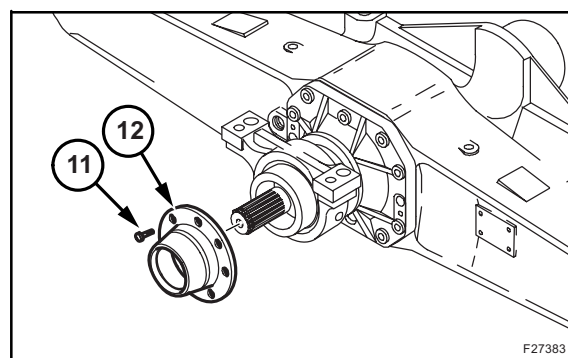
Mount the bolt (19).
Assemble O-ring (22).



Insert the front support (20) on the axle beam.
Tighten the bolt (19) to the requested torque.
Assemble the lube nibble (23).

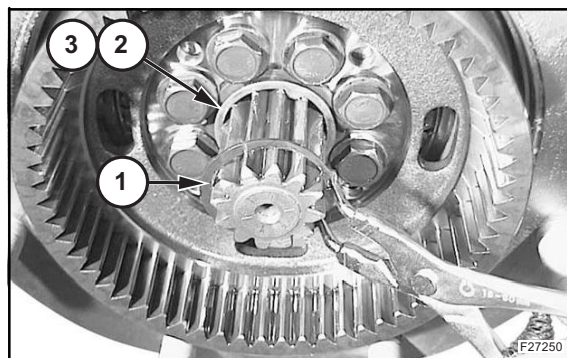


Assemble the flange (12) and fasten by tightening the screws (11).

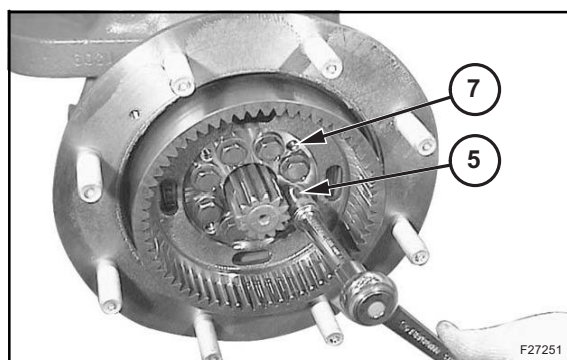


Remove the lock ring (1) from the double U-Joint shaft.

Collect the double U-Joint shaft washers (2) and (3).

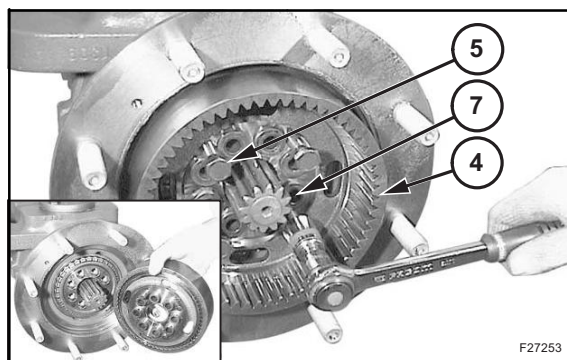


Unscrew and remove the fastening screws (5) from the wheel carrier (7).



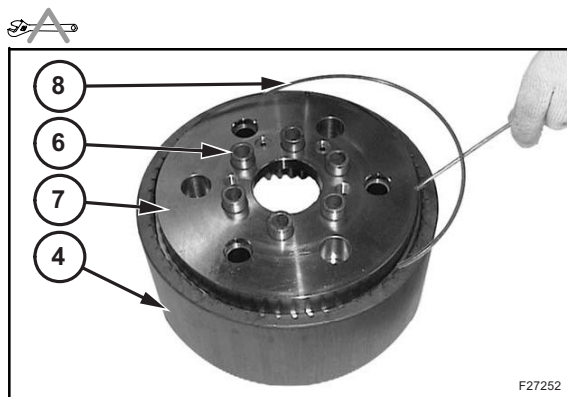
In order to remove the wheel carrier group from its housing, screw two of the just removed screws (5) in the threaded extraction holes.

Extract and remove the wheel carrier (7) together with the epicyclic ring gear (4).



Remove the steel lock ring (8) and disjoin the wheel carrier (7) from the epicyclic ring gear (4).

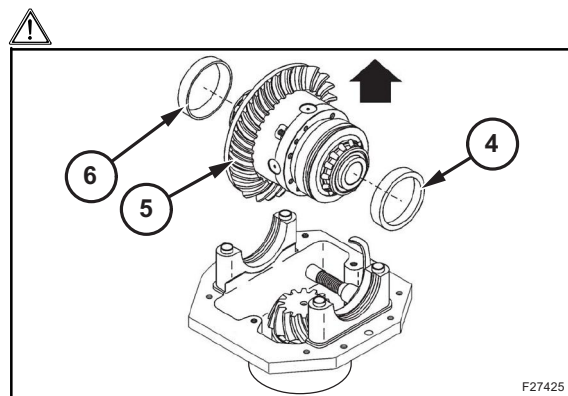
Only if necessary, remove the centering bushes (6) from the wheel carrier with a hammer and the special tool **380002667**.



Remove the differential housing (5).
The bearing cones (4) and (6) are removed together with the differential housing.

⚠ WARNING

Do not invert the bearing cone if the bearings are not replaced.

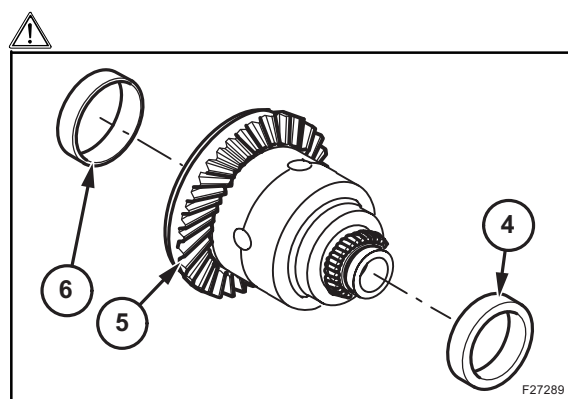


Assembly

Assemble the bearing cone (4) and (6) on the differential housing (5).

⚠ WARNING

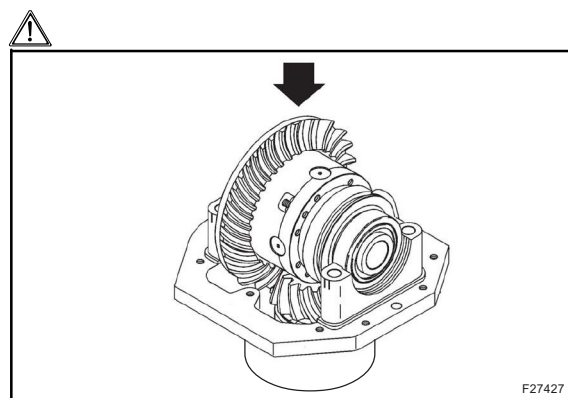
Do not invert the bearing cones if the bearings are not replaced.



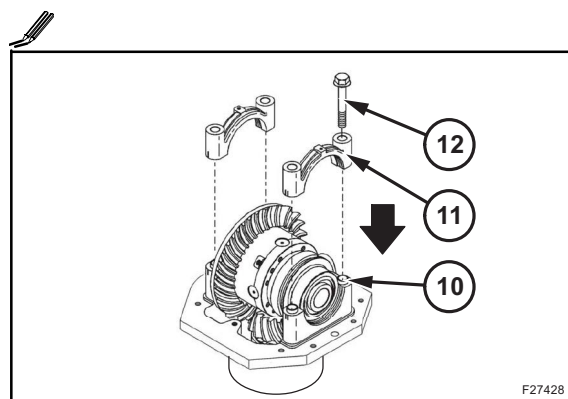
Position the complete differential box with bearings on the differential carrier.

⚠ WARNING

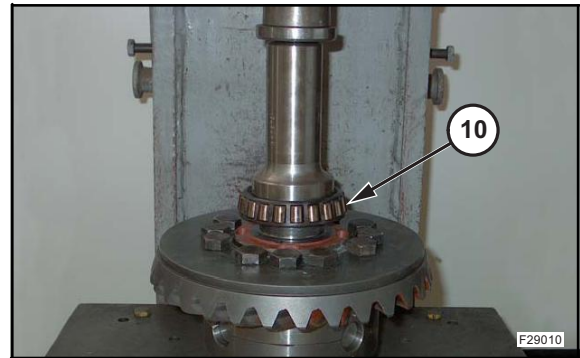
Check the right side of the bevel crown assembly.



Move the differential group so to place the bevel crown gear on the pinion.
Check that all bushes (10) are in their housings and position both half collars (11) on their seats using the previously traced reference marks.
Lock both collars with their fastening bolts (12).



Press bearing (10) or assemble after preheating.



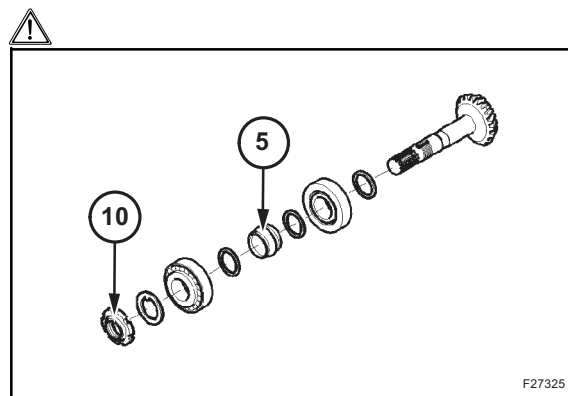
Press bearing (2).



Check all pinion components for wear.

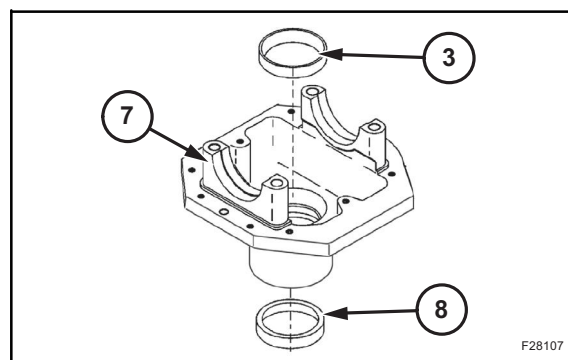
⚠ WARNING

The ring nut (10) and the collapsible spacer (5) must be replaced when reassembling the unit.

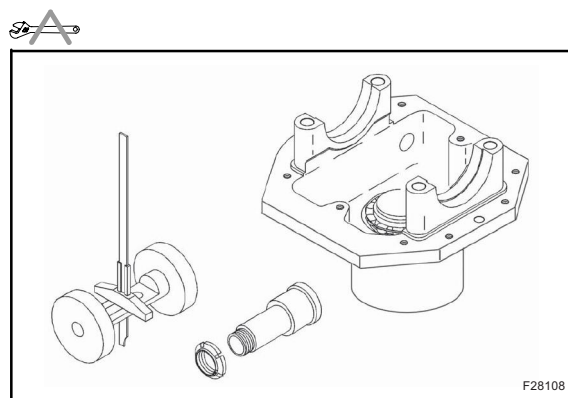


Assembly

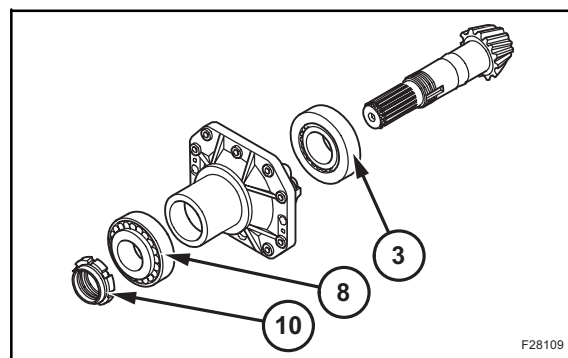
Place the differential support (7) on a workbench. Fit the bearing cups (3) and (8) using the special drifts and a hammer.



Prepare the kit consisting of the special tools called "false pinion" **380002219** and "false differential box" **380000407 + 380000440** and a depth gauge.



Insert the bearing cones (3) and (8) in their housings. Assemble the "false pinion" **380002219** and its ring nut (10). Tighten without exceeding the ring nut, till the backlash is eliminated.



SECTION 25 - FRONT AXLES

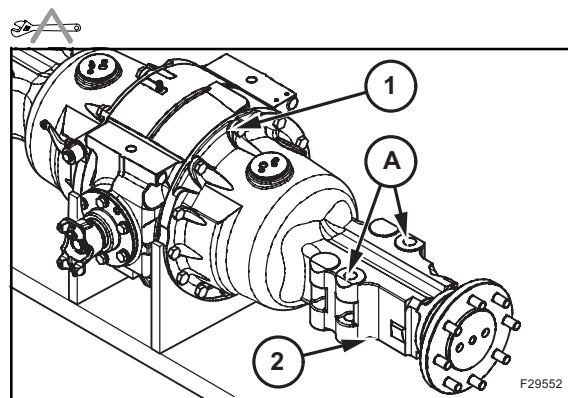
139

Side gear spline worn out Replace all scratched washers (Excessive backlash)	Excessive use	Replace differential gear group. Replace half shaft if required.
Thrust washer surface worn out or scratched	Insufficient lubrication Incorrect lubrication Contaminated oil	Use correct lubrication and fill up to right level. Replace at intervals recommended. Replace all scratched washers and those with 0,1 mm thickness lower than the new ones.
Inner diameter of tapered roller bearing worn out	Excessive use Excessive pinion axial backlash Insufficient lubrication Contaminated oil	Replace bearing. Check pinion axial backlash. Use proper lubrication, fill up to right level and replace at recommended intervals.
Bent or broken half shaft	Vehicle intensively operated or overloaded	Replace.
Half shaft broken at wheel side	Wheel support loose Beam body bent	Replace. Check that wheel support is not worn out or wrongly adjusted.

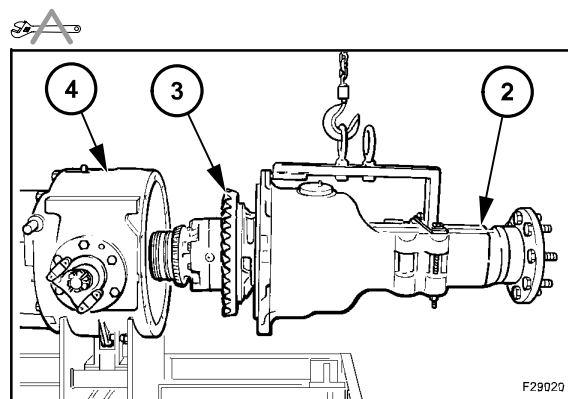
DIFFERENTIAL REMOVAL

Unscrew the upper screw (1). Use the hole of this screw and holes (A) to install tool **380000990** for the lifting of half-beam housing (2).

Unscrew and remove remaining screws (1).

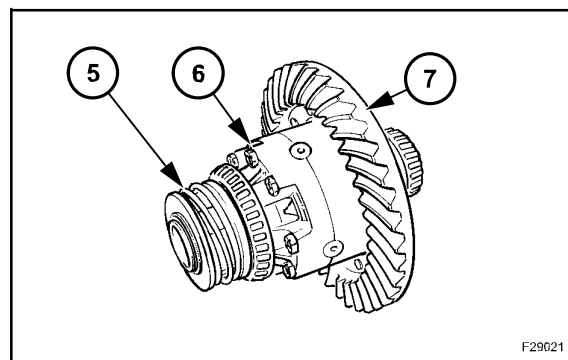


Remove left housing of half-beam (2) with differential (3) using tool **380000990**, from axle central body (4).



At this point it is possible to remove from the left housing of the half-beam the differential group assy.

- The differential consists of:
- differential lock spring (5);
 - differential housing (6);
 - crown wheel (7).



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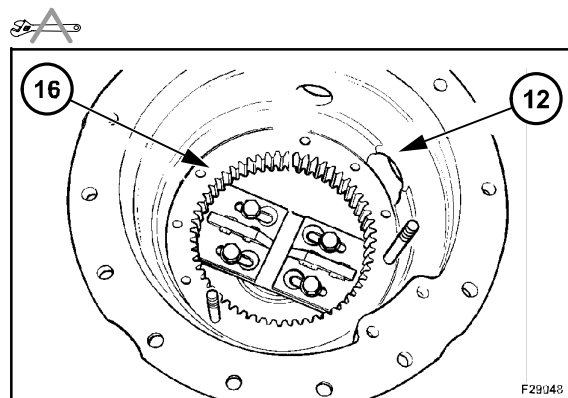
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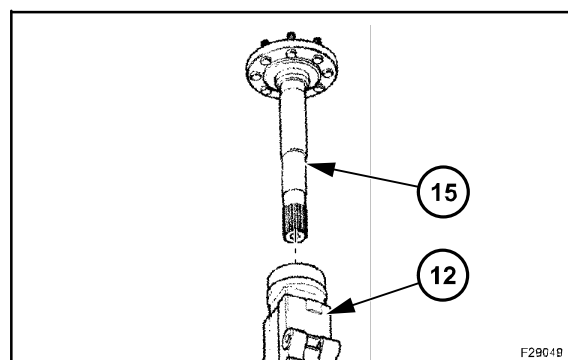
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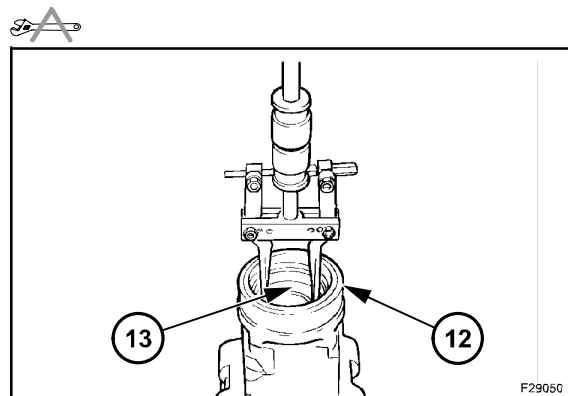
The planetary ring gear (16) can be removed from the axle (12) with the aid of tool **380000816**. Position the tool beneath the ring gear, expand the plates and tighten the screws. Invert the axle and press out the gear from the wheel hub side. Inspect the gear for wear, scoring or damage and repair or replace.



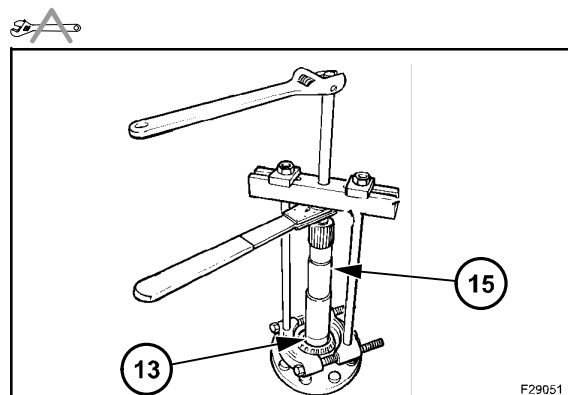
Position the axle housing (12) to allow removal of the shaft with wheel hub (15).



Using the puller tool **380000986** and the slide hammer **380000987**, remove the bearing cups (13) from the axle housing (12).

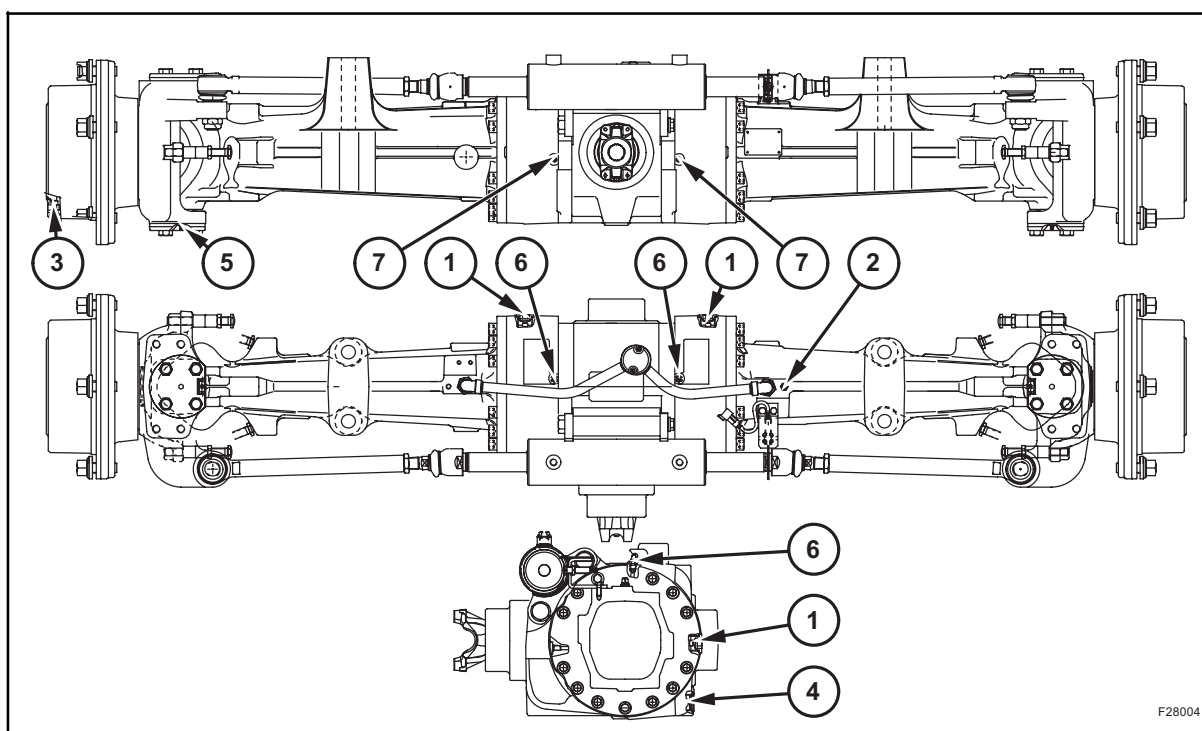


By means of extractor **380002676** remove the bearing (13) from the axle shaft (15). Applying gradual pressure to the tool, the bearing will separate from the half axle. Inspect the bearing for wear, scoring or damage and replace if in any doubt.



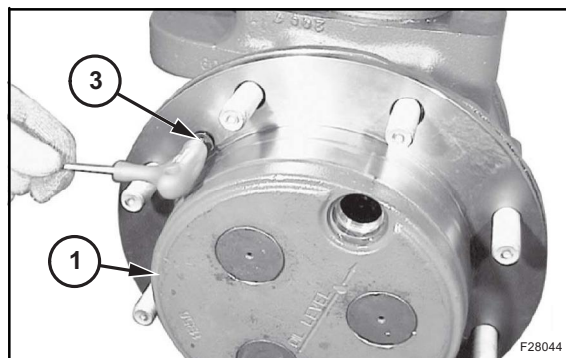
LUBRICATION AND GREASING

Differential oil capacity	11 litres
Epicyclic reduction gear oil capacity each side	1.3 litres
Oil specification: use recommended oil enriched in additives Note: do not use synthetic or vegetable oil without consent of the axle manufacturer	Ambra Multi G NH 410 B
Grease specification	TECNOLUBE SEAL POLYMER 400/L (DIN = KHER1R ISO-I-XMR-XM2)
Use on king pin only	AGIP MU/EP2

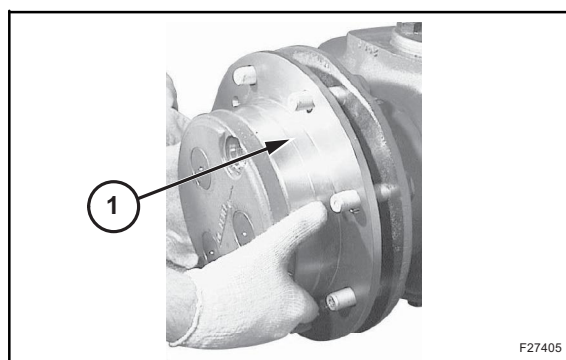


DESCRIPTION	POSITION
Differential oil filling and level plug	1
Oil breather	2
Fill / drain and level plug of epicyclic reduction gear oil	3
Differential oil drain plug	4
Greasing points	5
Brake bleed plug	6
Service brake oil port	7

Unscrew and remove both fastening screws (3) of the planetary carrier (1).

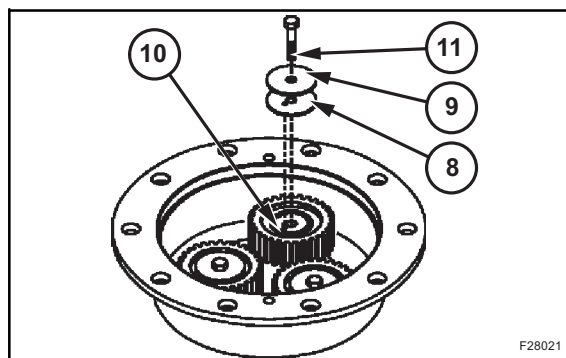


Remove the planetary carrier (1) from the wheel hub.
Position the planetary carrier (1) on a workbench and check its wear conditions.

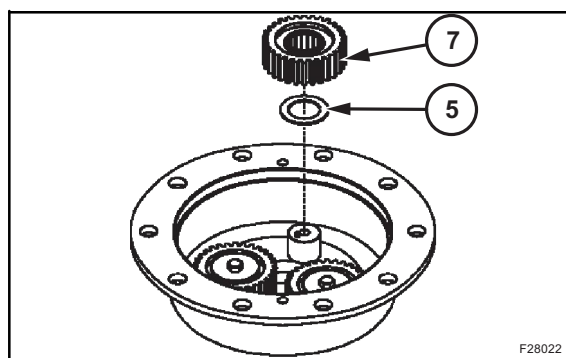


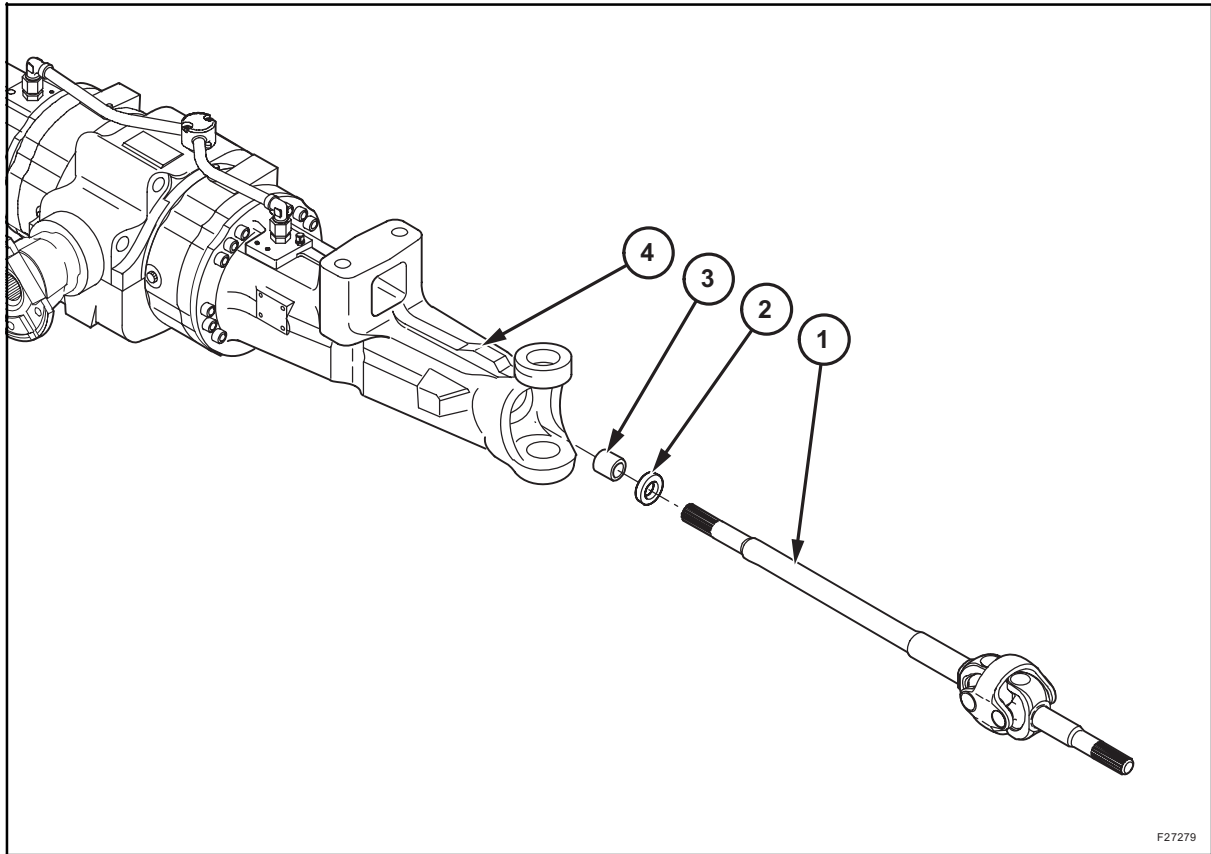
To replace the epicyclic gears, if necessary, remove the screw (11) and relevant washers (8) and (9).

NOTE: treat the pin (10) with care.

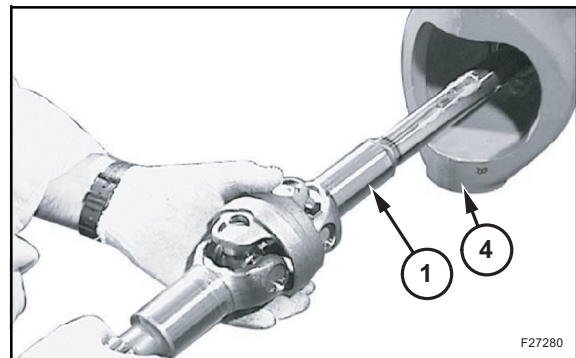


Remove the epicyclic gear (7) from its seat, taking care not to lose the rollers inside it.
Remove the shim (5).



DOUBLE U-JOINTS**Disassembly**

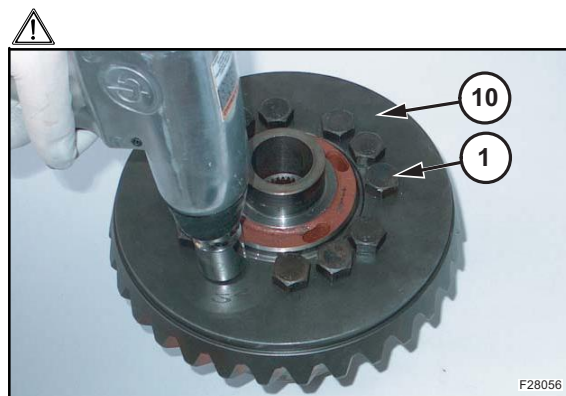
Remove the two double U-Joints (1) from the axle beam (4).



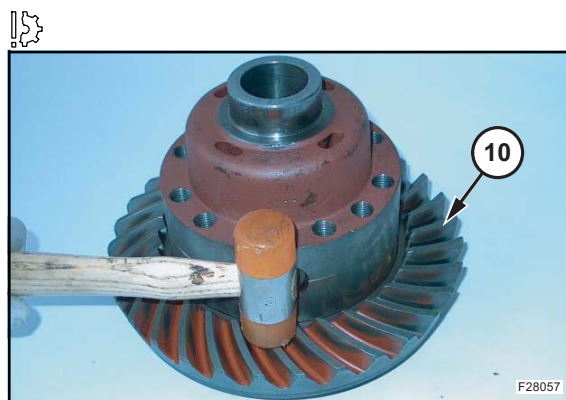
Unscrew all fastening screws (1) of bevel gear crown (10).

⚠ WARNING

This operation makes both differential half boxes free, so take care not to lower the inner components.



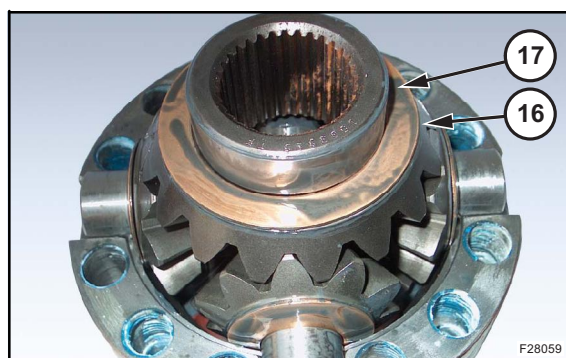
Remove the bevel gear crown (10) by means of a mallet.



Check marking points (8) and (9) that will be useful during the assemblage.



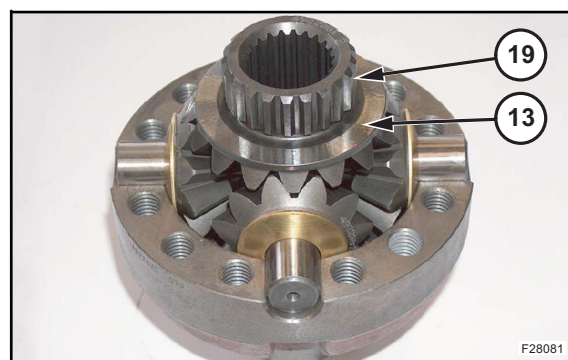
Remove planetary gear (16) and shim (17).



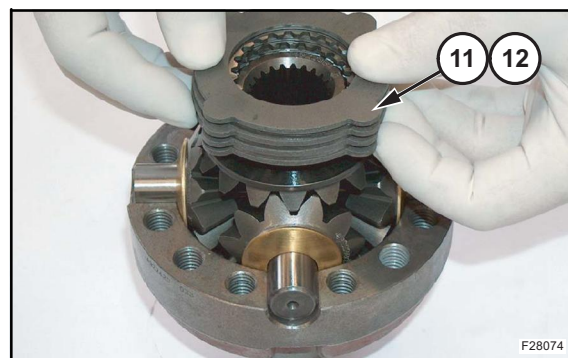
Assemble the differential unit pin (17) and planetary gears (16) and washers (15).



Assemble planetary gear (19) with shim (13).



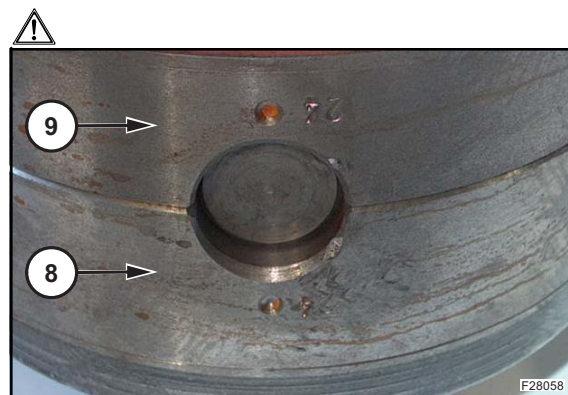
Assemble discs (11) and (12).



Assemble the two half housings of differential unit (8) and (9).

⚠ WARNING

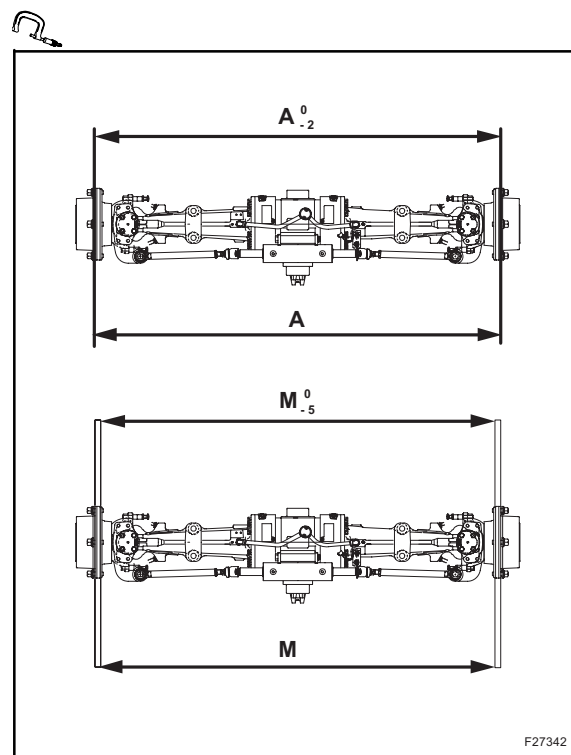
Carefully check that the marks of both differential half housings coincide.



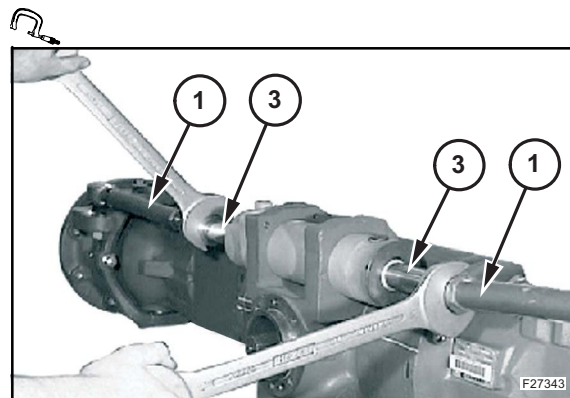
Check that the difference of the measurements between the wheel hubs diameters ends is within the requested tolerance range.

The nominal toe-in value (A) is referred to the external diameter of the wheel hubs flange, therefore the measured value (M) at the bars ends must be related to the ratio between length of the bar and flange diameter

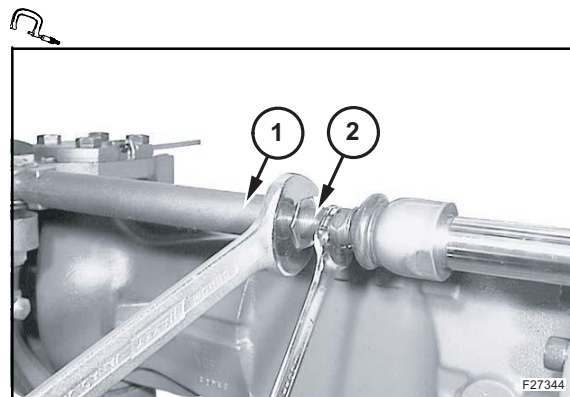
nominal toe-in= A_{-2} → measured toe-in= M_{-5}



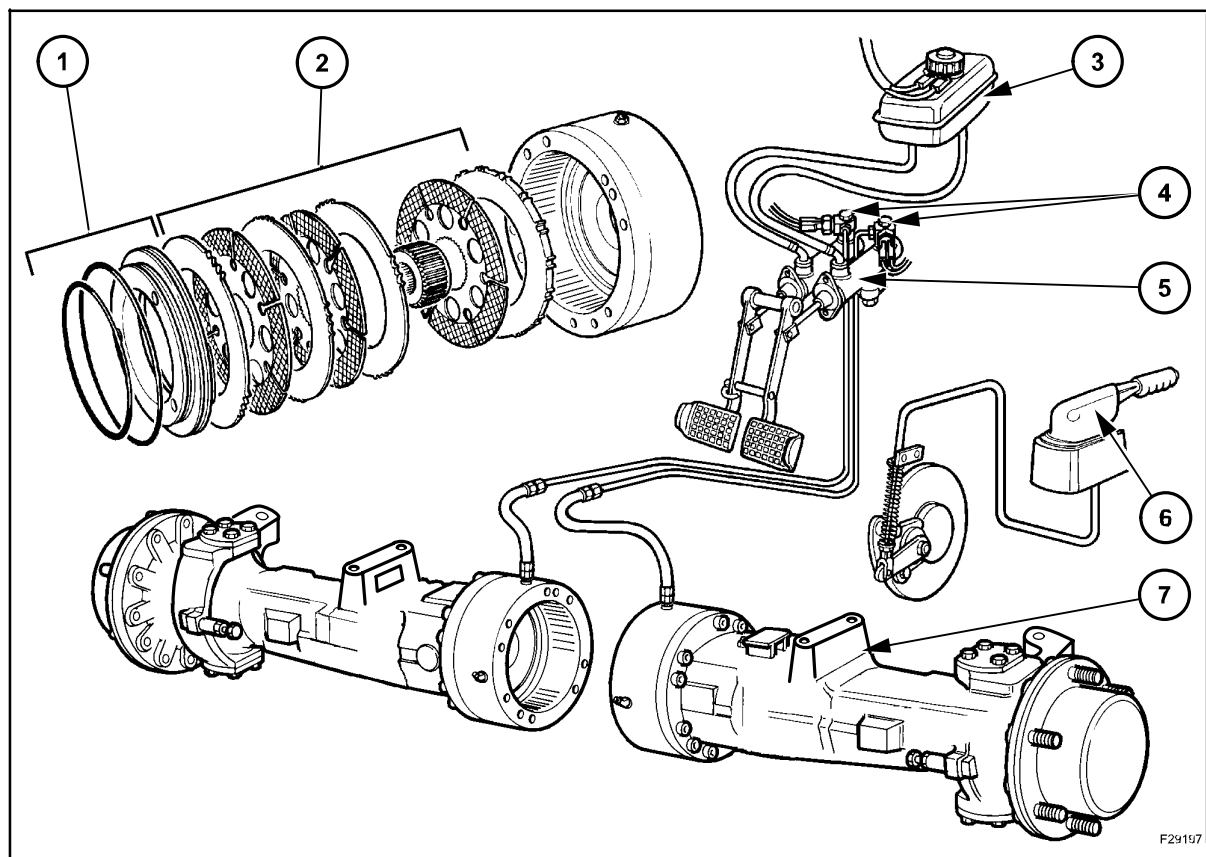
If toe-in is incorrect, operate with two wrenches on the guide rods (1) screwing in and out the two joint tie rods (3) equally till the toe-in is within the requested tolerance.



After adjusting, screw in the locknuts (2) of the guide rods (1) to the requested torque.



BRAKE SYSTEM LAYOUT (4WS)

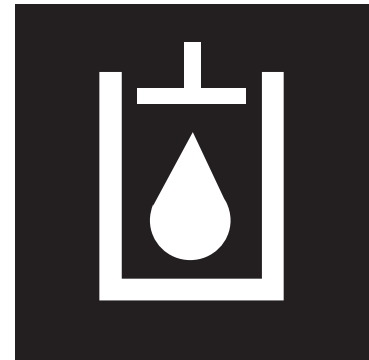


1. Brake piston assembly
2. Brake discs
3. Brake tank
4. Pressure switch

5. Master cylinders
6. Hand brake
7. Axle shaft

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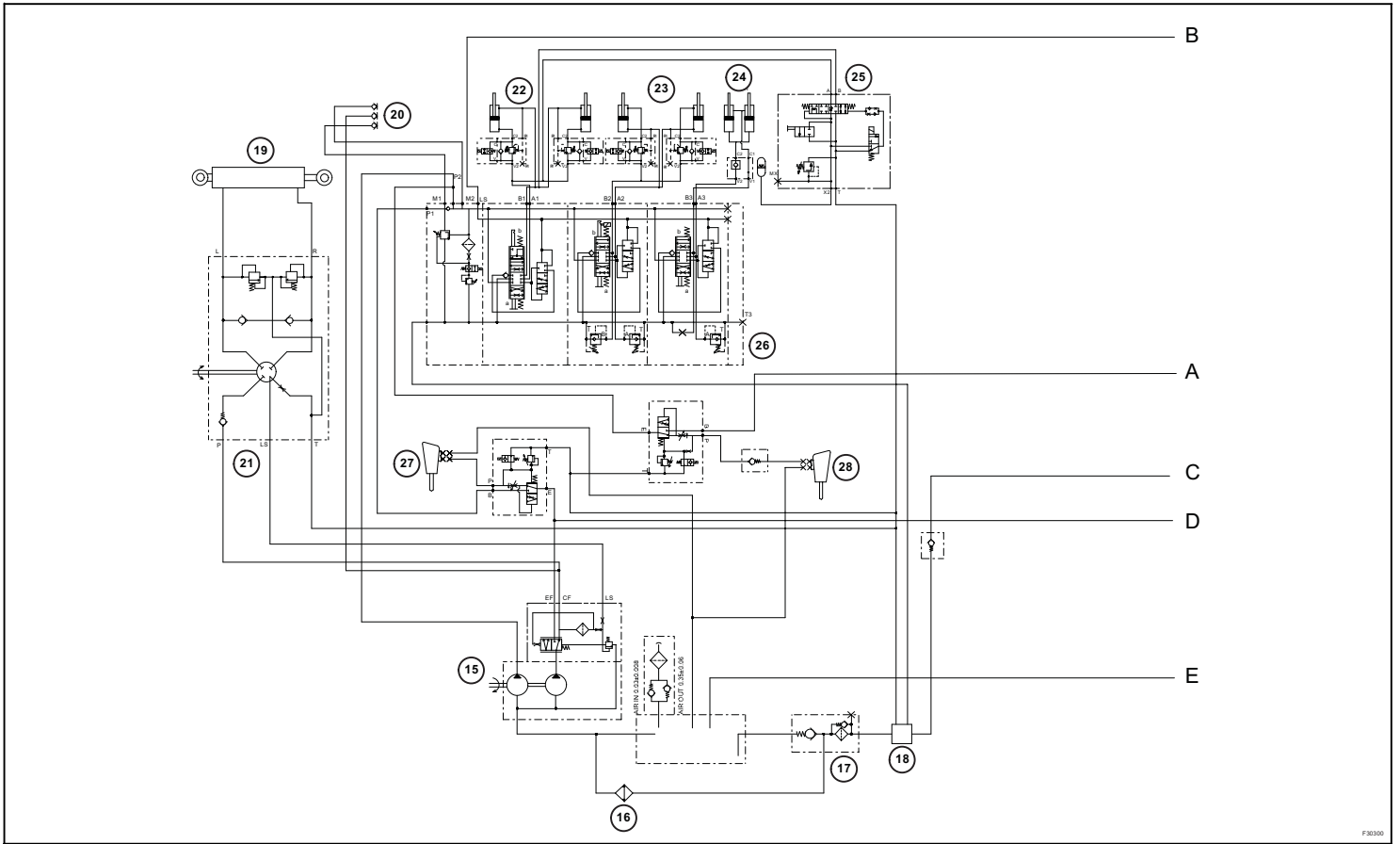
LB90.B
LB95.B
LB110.B
LB115.B



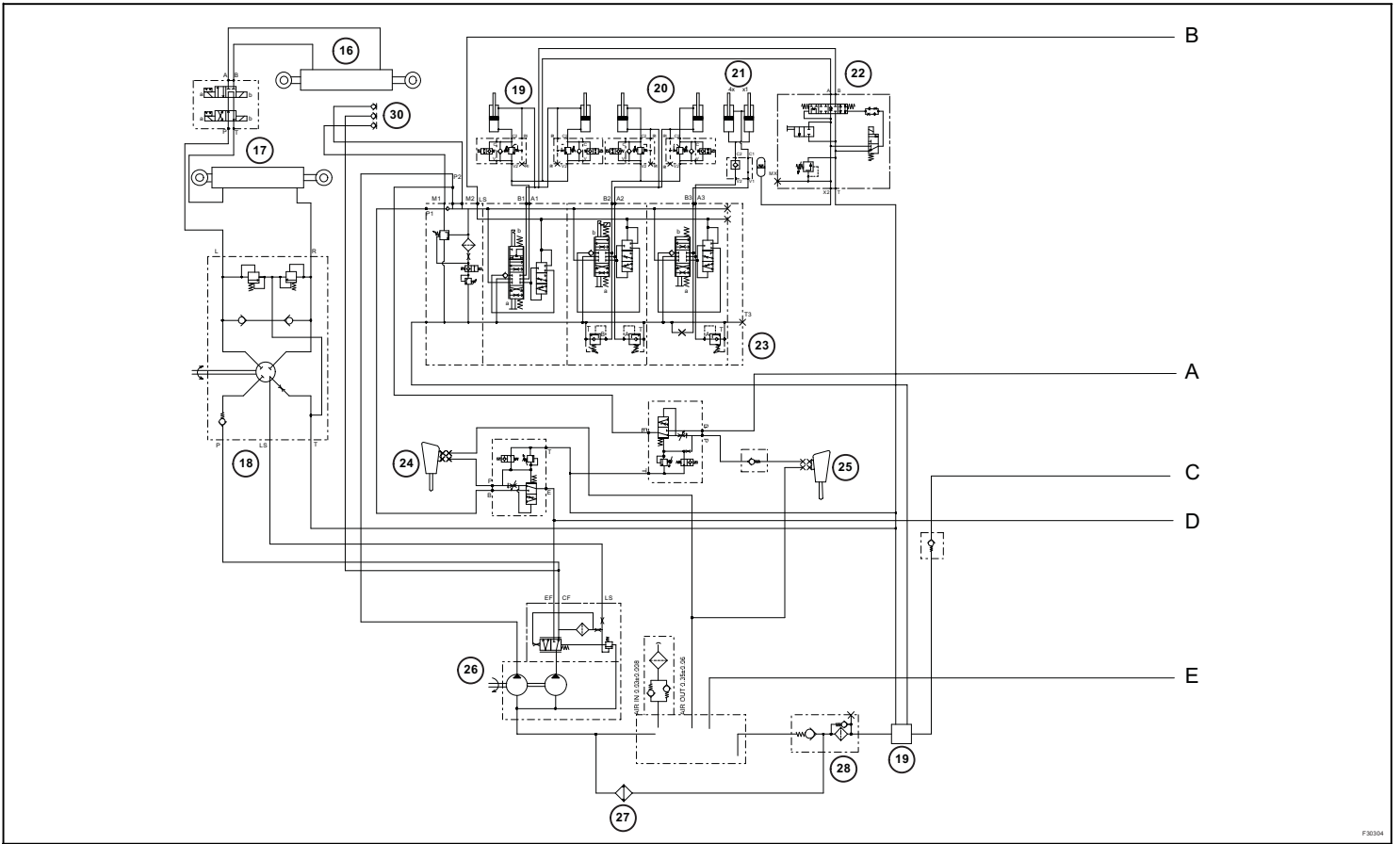
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SECTION 35 - HYDRAULIC SYSTEM

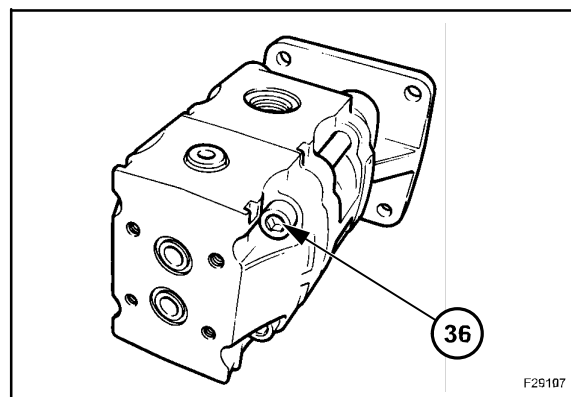


SECTION 35 - HYDRAULIC SYSTEM

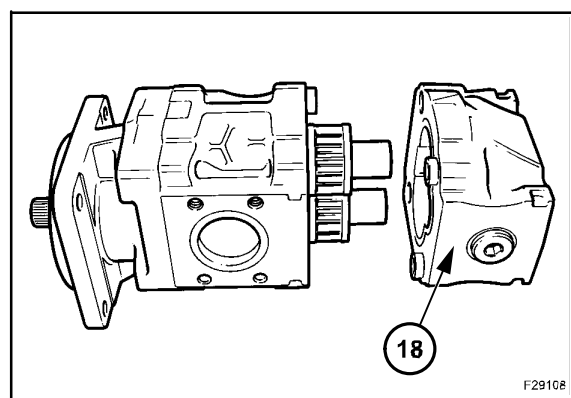


DISASSEMBLE REAR PUMP

Remove the screws (36).



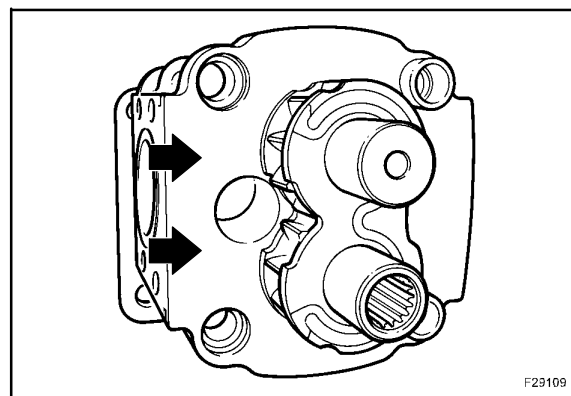
Remove the rear pump assembly (18).



IMPORTANT: prior to disassembly and to ensure correct reassembly identify the position of each bearing block in the pump body as described below.

Scribe an identifying letter "A" and "B", "C" and "D" on the pump housing and in the channel of each bearing block.

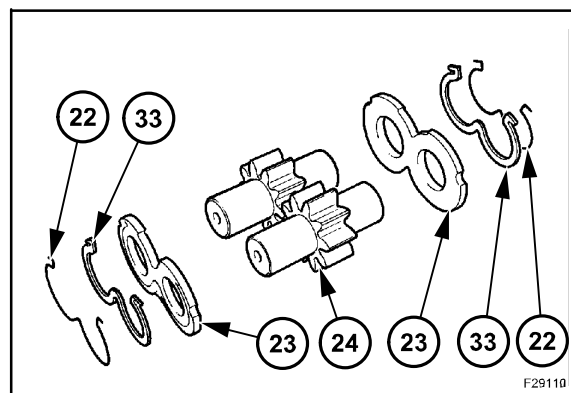
NOTE: orientation of bearing block seals relative to oil port.

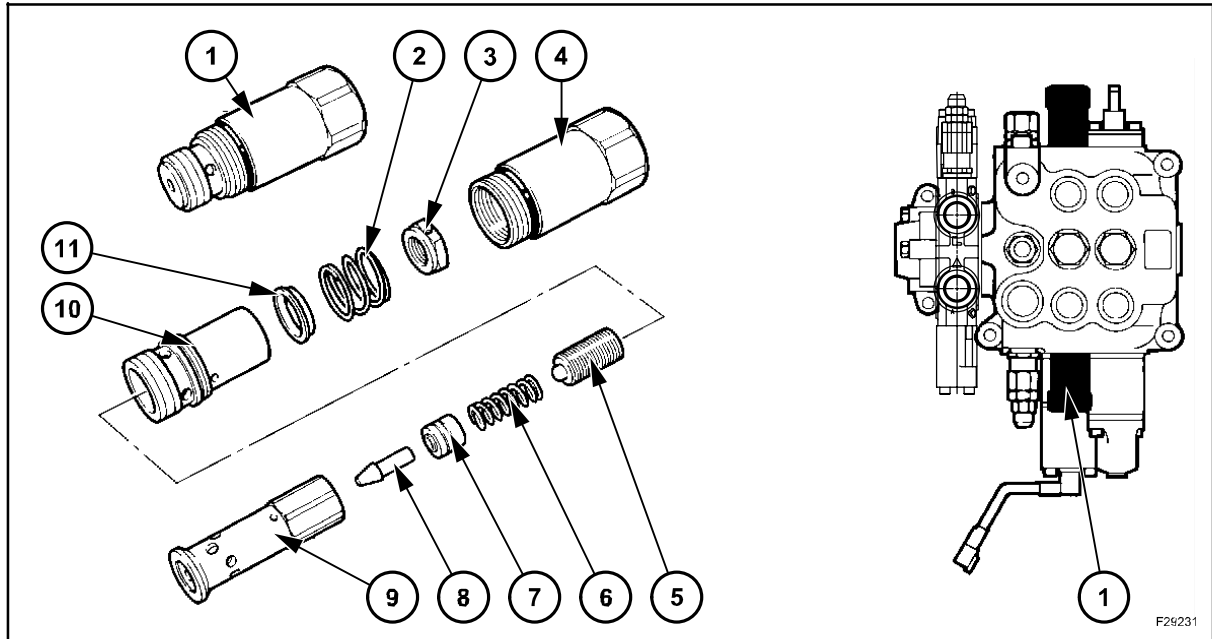


If scribe is not available take care to keep bearing blocks in pairs.

Disassemble gears (24), seals (22) and (33) and bearings (23).

Wash all components in approved degreasant.





- | | |
|--------------------------|----------------------|
| 1. Relief valve assembly | 7. Guide |
| 2. Spring | 8. Poppet |
| 3. Locknut | 9. Sleeve |
| 4. Valve body | 10. Valve body inner |
| 5. Adjuster | 11. Spring seat |
| 6. Spring | |

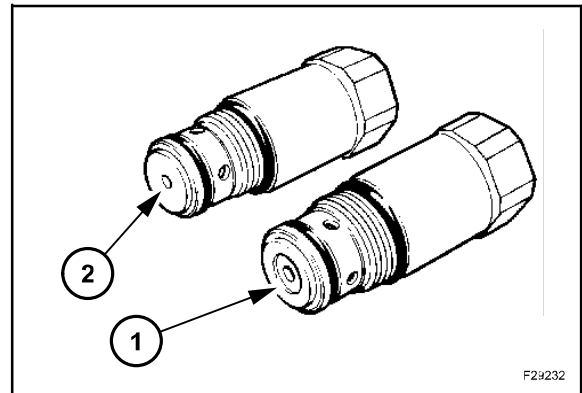
The piston and rod end loader bucket circuit relief valves are similar in operation but the end faces of some internal components are different.

Each relief valve can be identified by the size of hole in the centre of the plunger assembly.

The bucket rod end relief valve (1) has the small hole and is set to a pressure of 227 bar.

The bucket piston end relief valve (2) has the larger hole and can also be identified by the recess on the face of the plunger assembly item. This valve is set to a pressure of 160 bar.

For further details on the operation, overhaul and adjustment of circuit relief valves used in the loader backhoe hydraulic system, refer to circuit relief valves principle of operation, overhaul and adjustment.



Telescopic dipper valve section

The telescopic dipper valve section is different from that of the stabilizer valves and contains a built in check valve to prevent the back flow of oil into the parallel gallery.

These valves are not required in the stabilizer valve sections due to the external pilot operated "Fail Safe" lock valves used in the stabilizer circuit.

Control valve section in neutral

When a control valve is in neutral the oil in a cylinder is trapped by the spool and pump oil is allowed to flow through the staggered open centre gallery.

The pressure in the parallel gallery is at pump pressure, however the oil is static as the gallery terminates at the outlet end cover.

The return to tank oil in the control valve exhaust gallery is static.

Oil to either end of the cylinder is trapped by the spool. Oil is also trapped in the "D" shaped gallery behind the check valve.

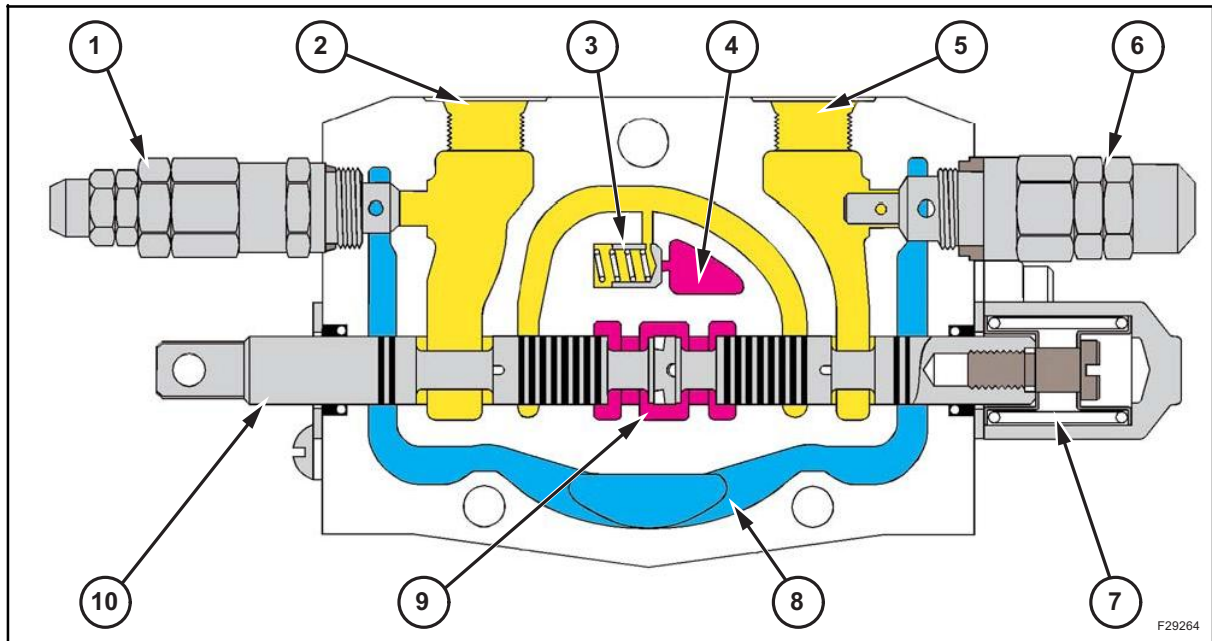
Control valve section operating

When the valve spool is moved either left or right to extend or retract a cylinder, flow through the staggered open centre gallery is blocked.

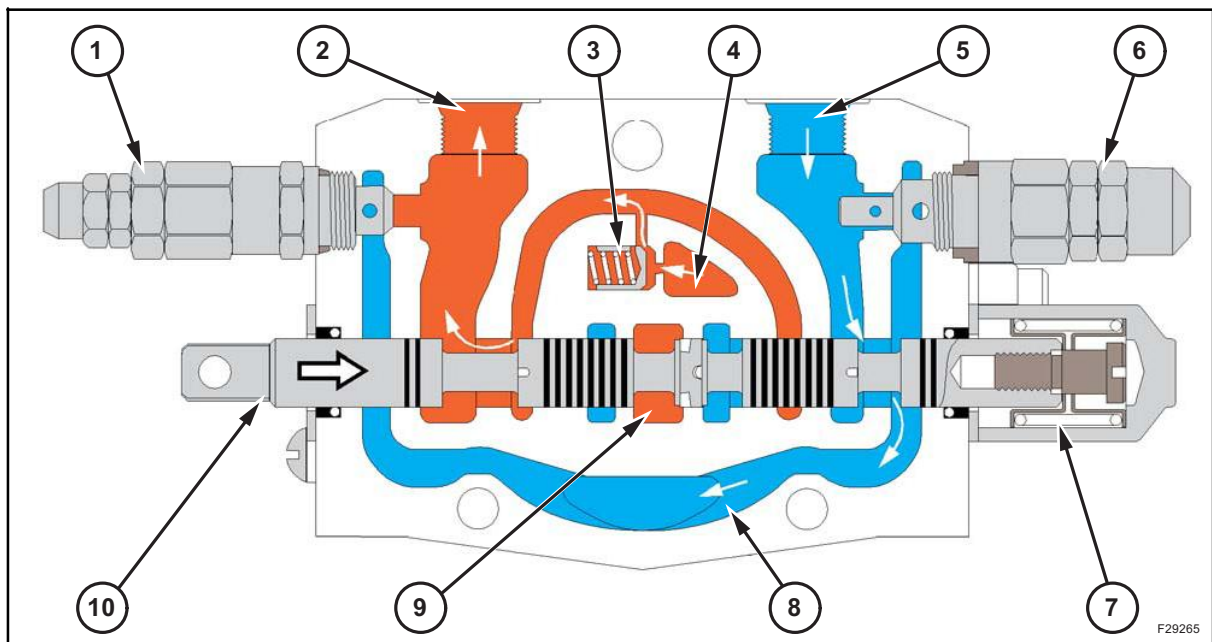
Pump pressure in the staggered and parallel galleries will rise.

Moving the spool joins one cylinder port to tank and the other to the "D" shaped gallery behind the check valve. As pump pressure rises in the parallel gallery the check valve will open and oil will flow through the "D" shaped gallery to the cylinder port.

Exhaust oil from the cylinder flows into the cylinder exhaust port and returns to tank.



Backhoe section - Neutral position



Backhoe section - Operating position

- Pump pressure oil
- Trapped oil
- Return to tank

1. Circuit relief valve
2. Cylinder port
3. Check valve
4. Parallel gallery
5. Cylinder port

6. Circuit relief valve
7. Centering spring
8. Exhaust gallery
9. Staggered open centre gallery
10. Spool

3.2 CONTROL VALVES “REXROTH” (MECHANICAL MODELS)

The hydraulic circuit is a load sensing flow sharing system working in conjunction with a fixed displacement gear type hydraulic pump.

This system has the advantage that at any time the distribution of flow to the services being operated is in proportion to the openings of the control valve spools.

The flow distribution to the backhoe and loader control valves is independent of the load and it is therefore possible to operate two or more spools satisfactorily at the same time.

The principal components of the load sensing flow sharing system are the pressure compensator valves in each control valve section, together with the load sense line which connects all the spool sections in both the loader and backhoe control valve assemblies.

Because the hydraulic pump is a fixed displacement gear type pump it should be noted that the load sense line only connects the loader and backhoe control valve assemblies and does not have any connection to the hydraulic pump.

The hydraulic pump draws oil from the tank and flow from the front pump is directed to the centre galleries of the loader and backhoe control valves assemblies.

Flow from the rear section of the pump passes through the load sensing flow divider valve mounted on the pump and gives priority flow to the steering circuit with remaining flow directed to supplement the flow from the front pump for the loader and backhoe circuits.

The centre gallery of both the loader and backhoe control valves are blocked by the end plate.

Pressure in the supply circuit is controlled by the pump flow balancer valve in accordance with the pressure in the load sense line.

Consequently the higher the load sense pressure the less flow is returned to tank with corresponding increase in flow/pressure to the hydraulic circuits.

Maximum system pressure is limited by the load sense pressure relief valve which relieves pressure in the load sense line when it reaches 210 bar.

Because the pump flow balancer valve is influenced by load sense pressure the valve diverts sufficient flow back to tank to maintain the maximum system pressure of 210 bar.

Loader control valve

The loader control valve is mounted on the right hand side of the machine adjacent to the pump.

The valve assembly consists of a maximum of three spool operated sections and provides oil flow to the loader boom, bucket and auxiliary services where fitted.

Backhoe control valve

The backhoe control valve is located at the rear of the chassis.

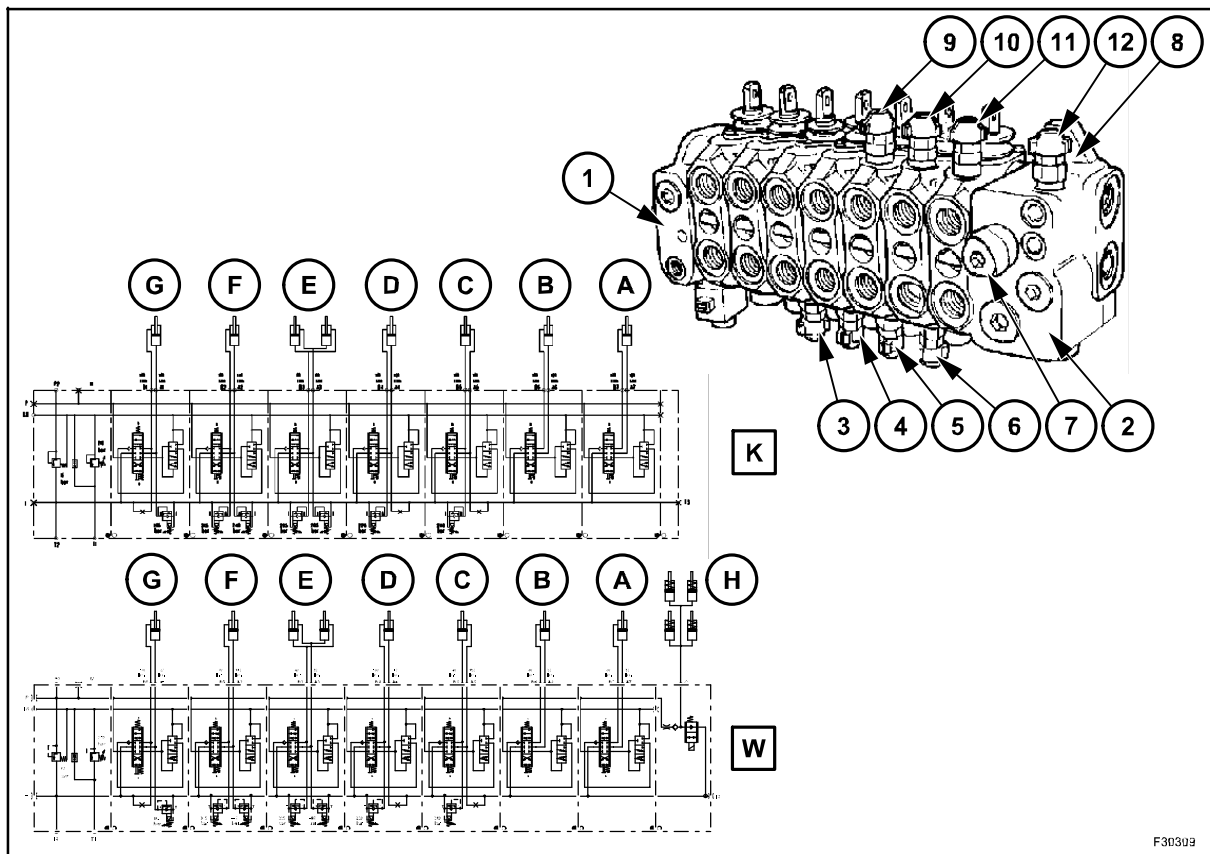
The control valve consists of a maximum of seven sections of spool control valves and provides the oil flow for operating the lifting, the digging, the bucket, the stabilizers, the swing and telescopic arm (optional).

BACKHOE CONTROL VALVE (WITH MECHANICAL CONTROL)

The backhoe control valve assembly is located on the rear of the tractor. It consists of six or seven valve sections together with an inlet and outlet end cover.

Valve sections are:

- Stabilizer right
- Stabilizer left
- Lifting
- Dipper
- Slew
- Bucket
- Telescopic (optional)



F30309

K. Hydraulic diagram for centre pivot models

W. Hydraulic diagram for sideshift models

A. Right stabilizer section

B. Left stabilizer section

C. Dipper section

D. Bucket section

E. Swing section

F. Lifting section

G. Telescopic dipper section

H. Sideshift clamps valve

1. End cover

2. Inlet section

3. Dipper circuit relief valve (piston end) - 240 bar

4. Bucket circuit relief valve (piston end) - 220 bar

5. Swing circuit relief valve (piston end) - 205 bar

6. Lifting circuit relief valve (piston end) - 315 bar

7. Pump flow balancer - 15 bar

8. Load sensing return to tank

9. Swing circuit relief valve (rod end) - 205 bar

10. Boom circuit relief valve (rod end) - 240 bar

11. Telescopic circuit relief valve (rod end) - 205 bar

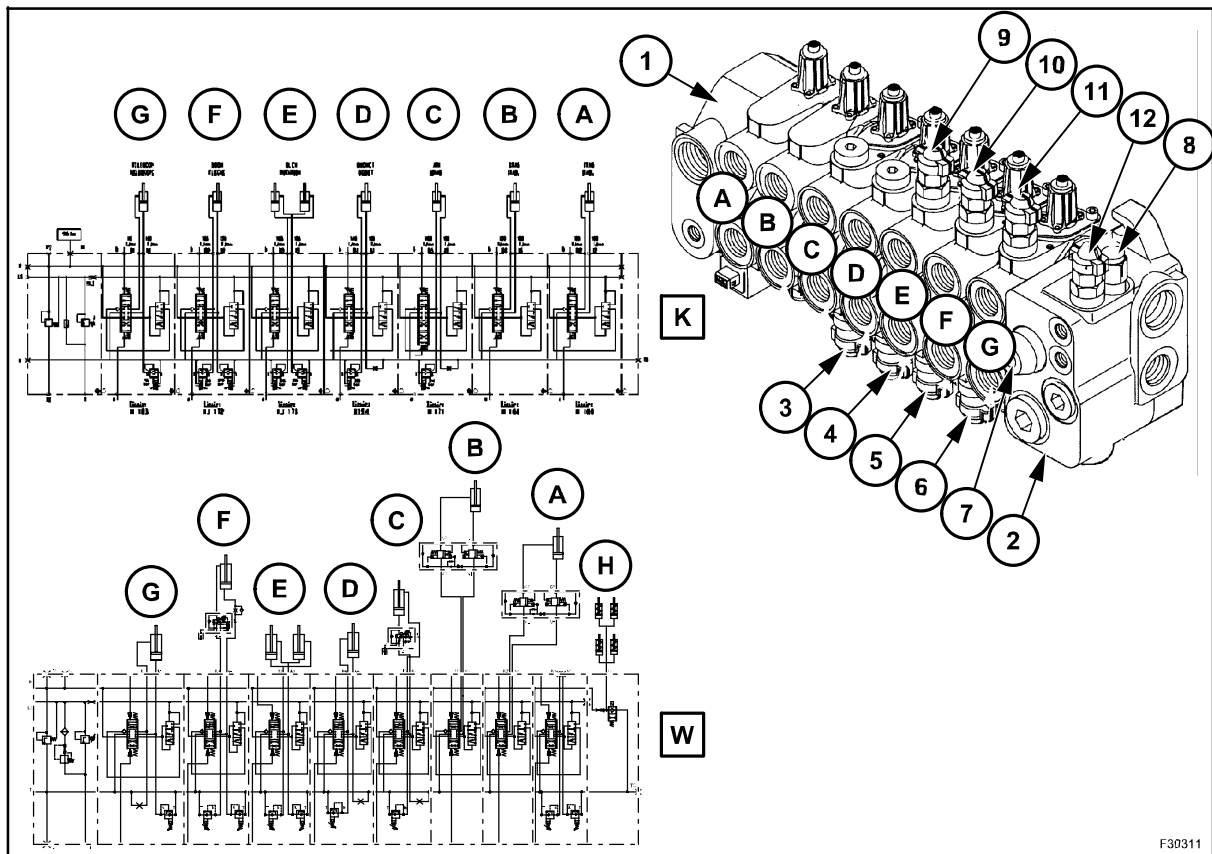
12. Load sensing relief valve - 210 bar

BACKHOE CONTROL VALVE (WITH HYDRAULIC CONTROL)

The backhoe control valve assembly is located at the rear of the tractor. It consists of six or seven valve sections together with an inlet and outlet end cover.

Valve sections are:

- Stabilizer right
- Stabilizer left
- Lifting
- Dipper
- Slew
- Bucket
- Telescopic (optional)



K. Hydraulic diagram for centre pivot

W. Sideshift

A. Right stabilizer section

B. Left stabilizer section

C. Dipper section

D. Bucket section

E. Swing section

F. Lifting section

G. Telescopic dipper section

H. Sideshift clamps

1. End cover

2. Inlet section

3. Dipper circuit relief valve (piston end) - 240 bar

4. Bucket circuit relief valve (piston end) - 220 bar

5. Swing circuit relief valve (piston end) - 205 bar

6. Lifting circuit relief valve (piston end) - 315 bar

7. Pump flow balancer valve - 15 bar

8. Load sensing return to tank

9. Swing circuit relief valve (rod end) - 205 bar

10. Lifting circuit relief valve (rod end) - 240 bar

11. Telescopic circuit relief valve (rod end) - 205 bar

12. Load sensing relief valve - 210 bar

F30311

Nitrogen Pressure p_0 is Correct

- Screw the handwheel (A) anti-clockwise to close the accumulator gas valve.
- Slacken the bleed valve (B) to release pressure in the UCA.
- Unscrew the UCA from the adapter.
- Unscrew the adapters from the accumulator gas valve.

Nitrogen Pressure p_0 is Too High

- Slacken the bleed valve (B) to vent nitrogen from the accumulator until, after stabilization, the desired pressure p_0 is registered. Nitrogen vents into the air.
- Tighten the bleed valve (B) once the desired filling pressure is reached.
- Screw the handwheel (A) anti-clockwise to close the accumulator gas valve.
- Slacken the bleed valve (B) to release pressure in the UCA.
- Unscrew the UCA from the adapter.
- Unscrew the adapters from the accumulator gas valve.

Nitrogen Pressure p_0 is Too Low

- Close the inflation valve (A) by screwing the handwheel anti-clockwise.
- Remove the cap (8).
- Connect the end of the hose (9) to the valve (10).
- Connect the other end of the hose to the nitrogen source.
- Progressively open the valve on the nitrogen source.
- Screw the handwheel (A) clockwise to admit the pressurized gas, taking particular care if the accumulator has a small capacity.
- When pressure p_0 is reached, close the valve on the nitrogen source. To allow for the effects of temperature transfer, the accumulator should be allowed to stand for a minimum of 15 minutes to allow the temperature to stabilize before a final reading of the precharge pressure is taken.
- Screw the handwheel (A) anti-clockwise to close the accumulator gas valve.
- Slacken the bleed valve (B) to release pressure in the UCA.
- Remove the hose carefully, to release internal pressure.
- Refit the cap (8) on the valve (10).
- Unscrew the UCA from the adapter(s).
- Unscrew the adapters from the accumulator gas valve. After removing the UCA and adapter(s), make sure that the accumulator gas valve (13) is sealing effectively. Refit the gas valve dust cap (12) and replace the protective cover (11).

4. HYDRAULIC SWING SYSTEM

4.1 DESCRIPTION AND OPERATION

The hydraulic swing system has two versions:

- it can shift laterally with the backhoe attachment because installed directly on the sideshift carriage performing the shifting. This is possible only on the loaders backhoes with sideshift version.
- it is fixed because it is installed directly on the chassis. This is possible only on loader backhoes with centre pivot version.

The backhoe boom and digging elements can be moved in an arc about the main chassis of 180 degrees.

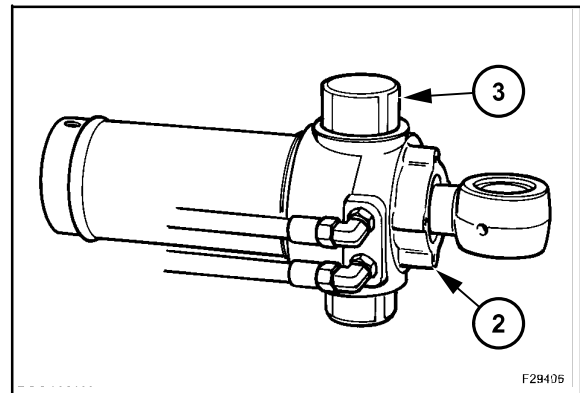
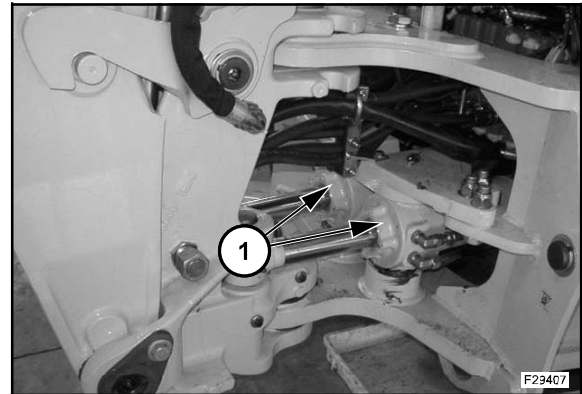
This movement is obtained by the use of two hydraulic cylinders (1) coupled between the main chassis and swing post.

The cylinders act directly on the swing post, without the use of any connecting links or bell cranks.

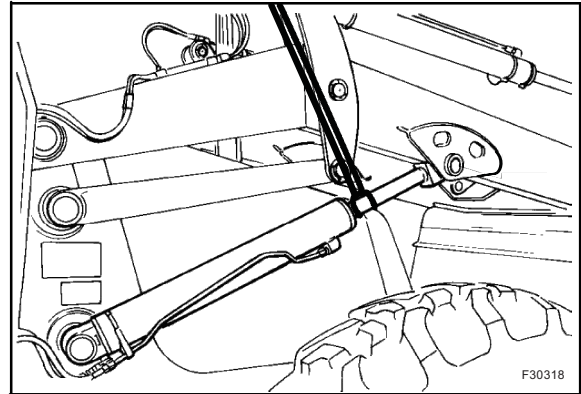
Each cylinder is free to rotate, around two pivots (3), while the stem comes out or retracts inside of the cylinder body (2).

As each cylinder extends or retracts and the swing post rotates, the cylinders turn in a horizontal plate, pivoting on the headstocks within the carriage.

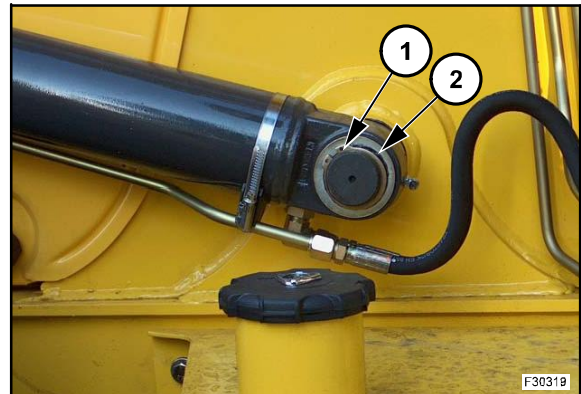
Each cylinder is double acting and as hydraulic oil is fed to a cylinder to turn the swing post, one cylinder pushes and the other cylinder pulls to perform the swing cycle.



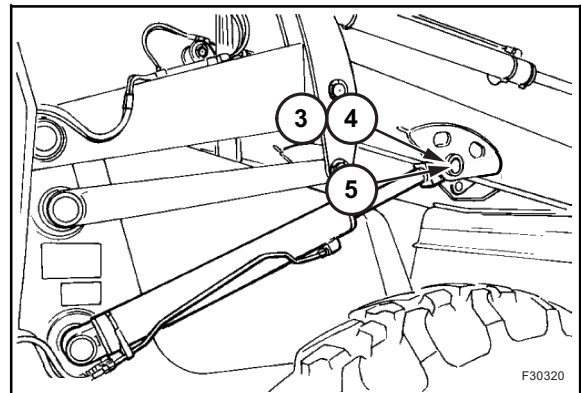
Support the cylinder using sling and suitable hoist.
Disconnect the hydraulic hoses. Cap or plug all
exposed openings.



Disconnect the hydraulic hoses.
Remove the snap ring (1) and the spacer (2).



Remove the ring (3) and the pin (4).
Use a hammer to slide out the rod pin (5).

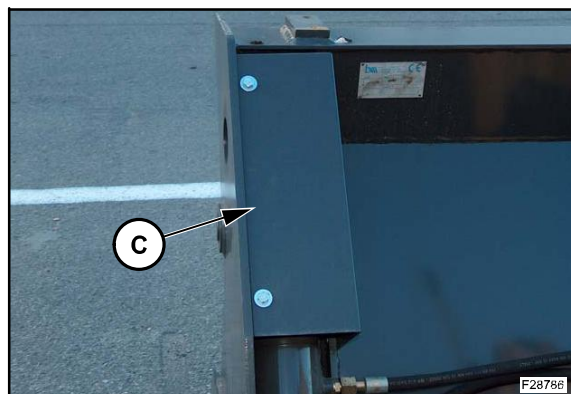


Remove the loader cylinder.

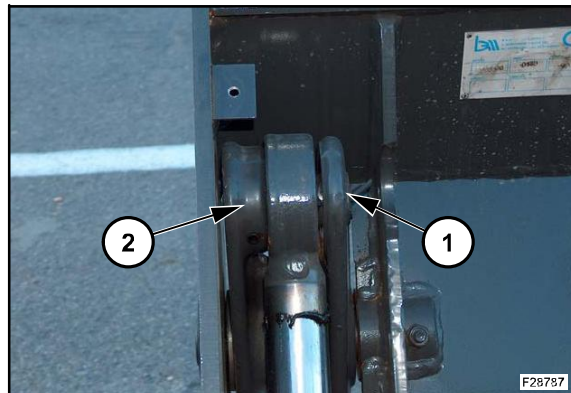
Disconnect hydraulic hoses.



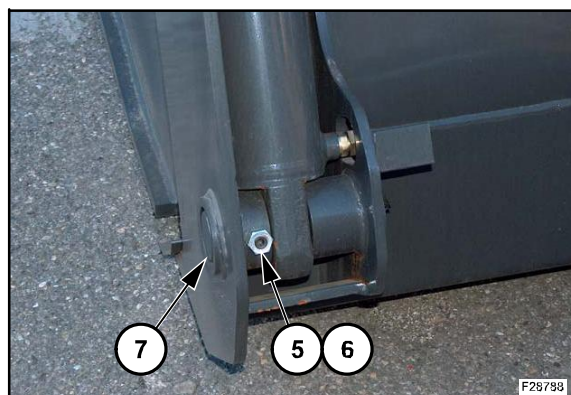
Unscrew and remove the clamping screws of cover (C). Remove the cover (C).



Remove the pin (2). Slide out the pin (1) with an hammer.

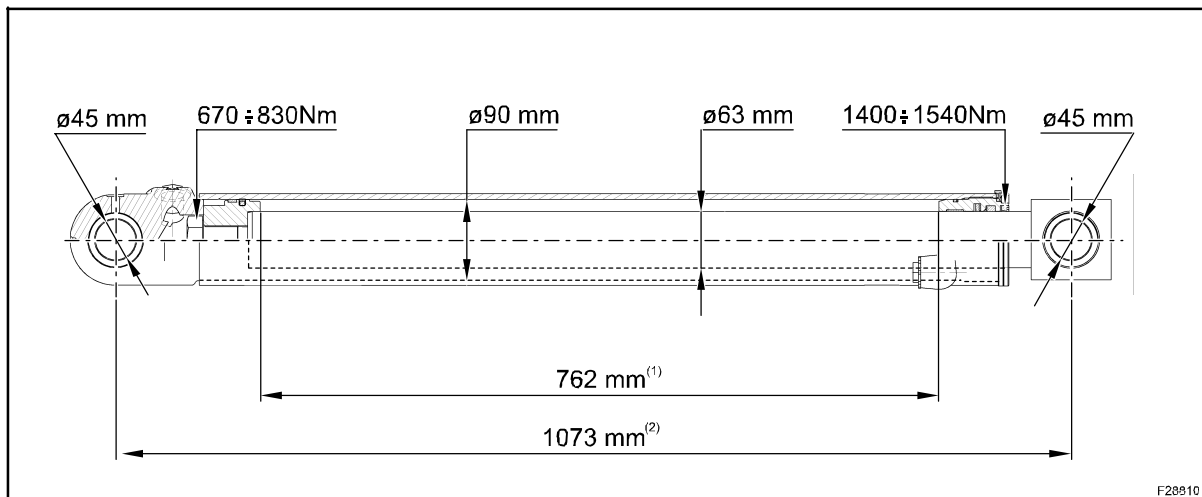


Unscrew and remove the nut (6) and the dowel (5). Slide out the lower pin (7) with an hammer.



Remove the 4x1 bucket cylinder.

5.6 BACKHOE BUCKET CYLINDER



(1) Stroke

(2) Completely retracted

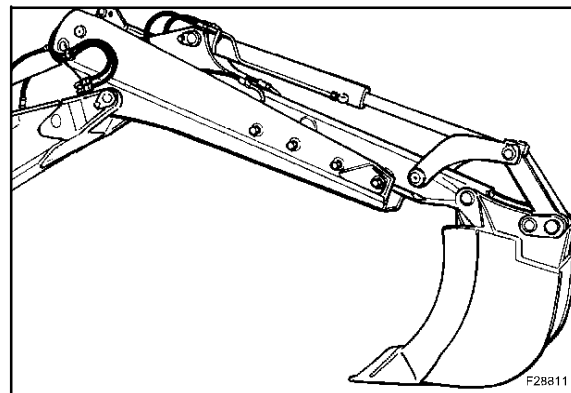
BACKHOE BUCKET CYLINDER REMOVAL

Park the machine on a flat surface. Lay the backhoe bucket firmly on the ground.

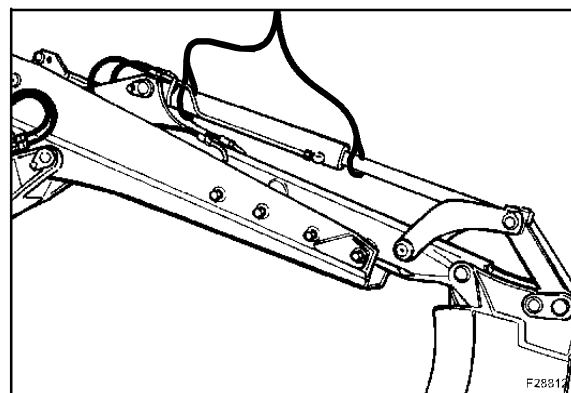
⚠ WARNING

Always support the structural members so that they will be stable and safe to work around.

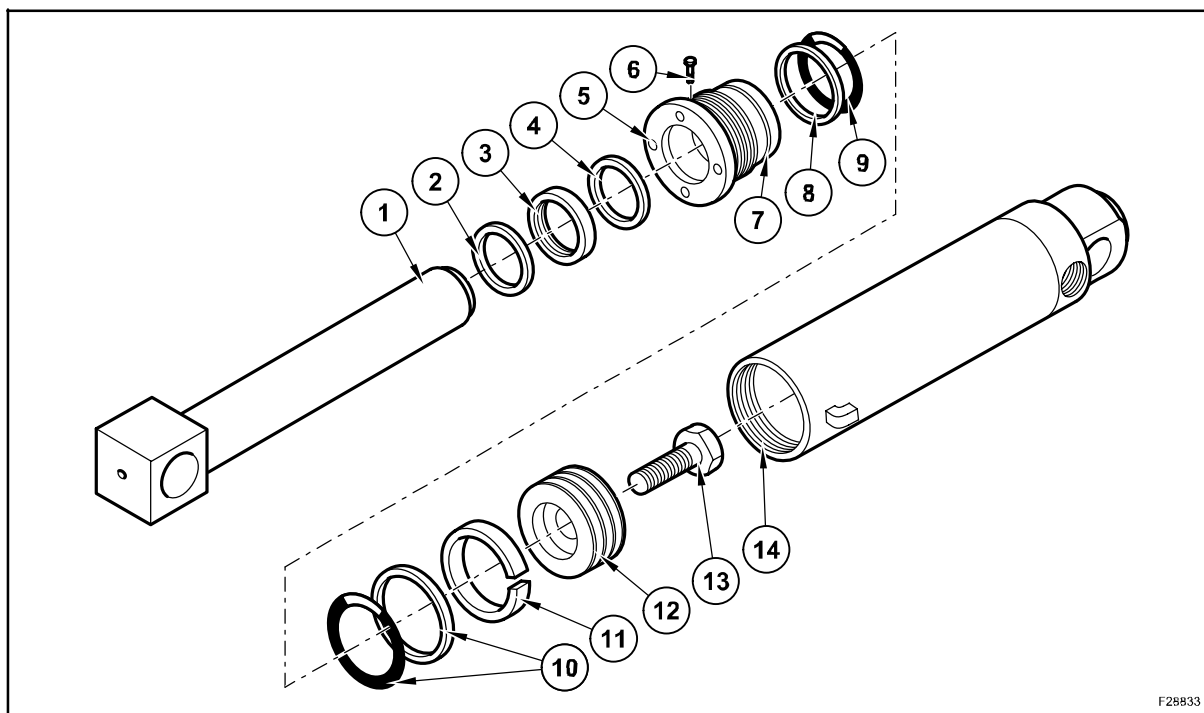
Stop the engine and move the backhoe control levers through all operating positions to relieve all residual pressures in the system.



Position a sling or other suitable lifting equipment around the cylinder.



DISASSEMBLY STABILIZER CYLINDER (CENTRE PIVOT)



1. Rod
2. Wiper ring
3. Seal
4. Seal
5. Guide bush
6. Screw
7. Cylinder head

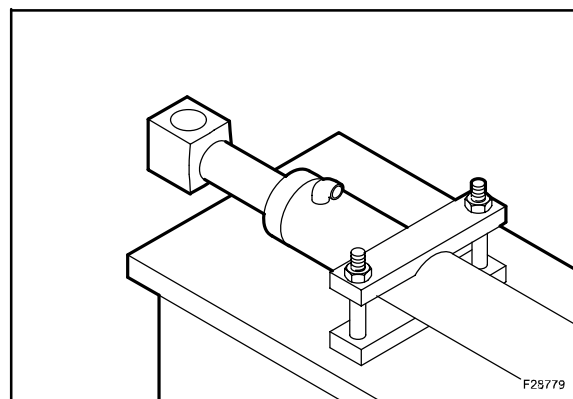
8. Back-up ring
9. O-ring
10. Piston gasket
11. Piston ring guide
12. Piston
13. Screw
14. Cylinder tube

The disassembly procedure that follows takes into consideration the hydraulic piping already disassembled.

⚠ WARNING

Cylinder weight: 43.5 kg

Lift and place the cylinder on a workbench and secure it. Be sure that the cylinder is placed horizontally. Drain hydraulic oil from cylinder.

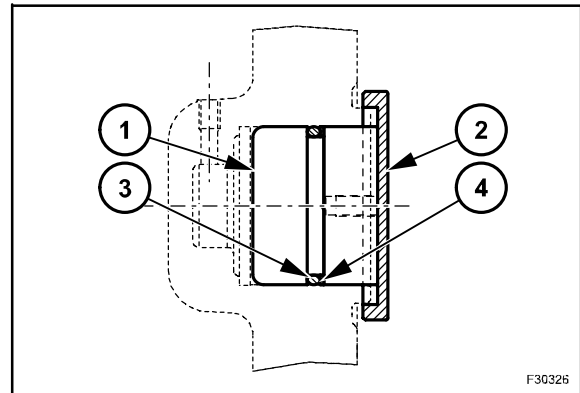


5.11 BACKHOE SIDESHIFT LOCKING CYLINDER (SIDESHIFT)

They are installed on the loader backhoe n. 4 sideshift locking cylinders. Their function is to lock the carriage once the backhoe attachment is ready in the digging position.

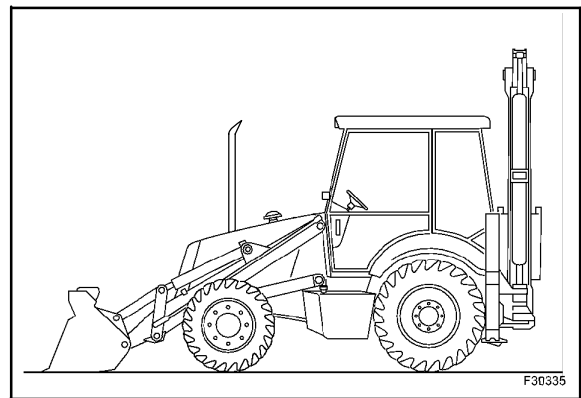
The cylinder consists of:

1. Piston
2. Plate
3. O-ring
4. Back-up ring



CYLINDER REMOVAL

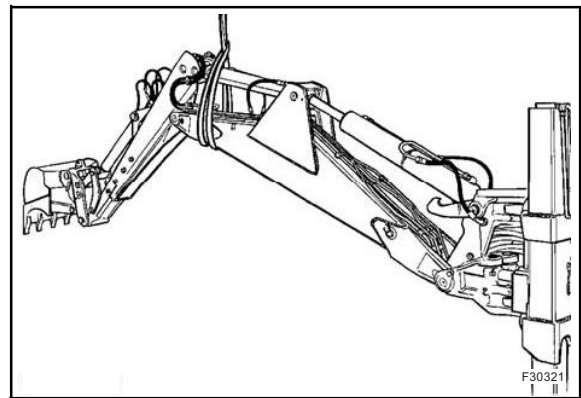
Park machine on a flat surface and position the bucket on the ground.



Position the backhoe support in the centre of the machine and lower the backhoe on the ground. Support the backhoe elements using a suitable stand and hoist capable of carrying 1500 kg.

⚠ WARNING

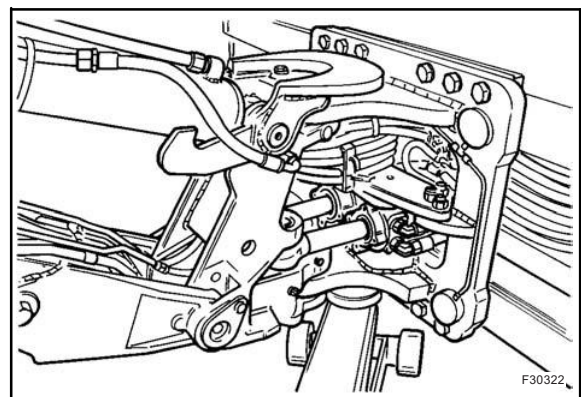
Always support the structural members so that they will be stable and safe to work around.

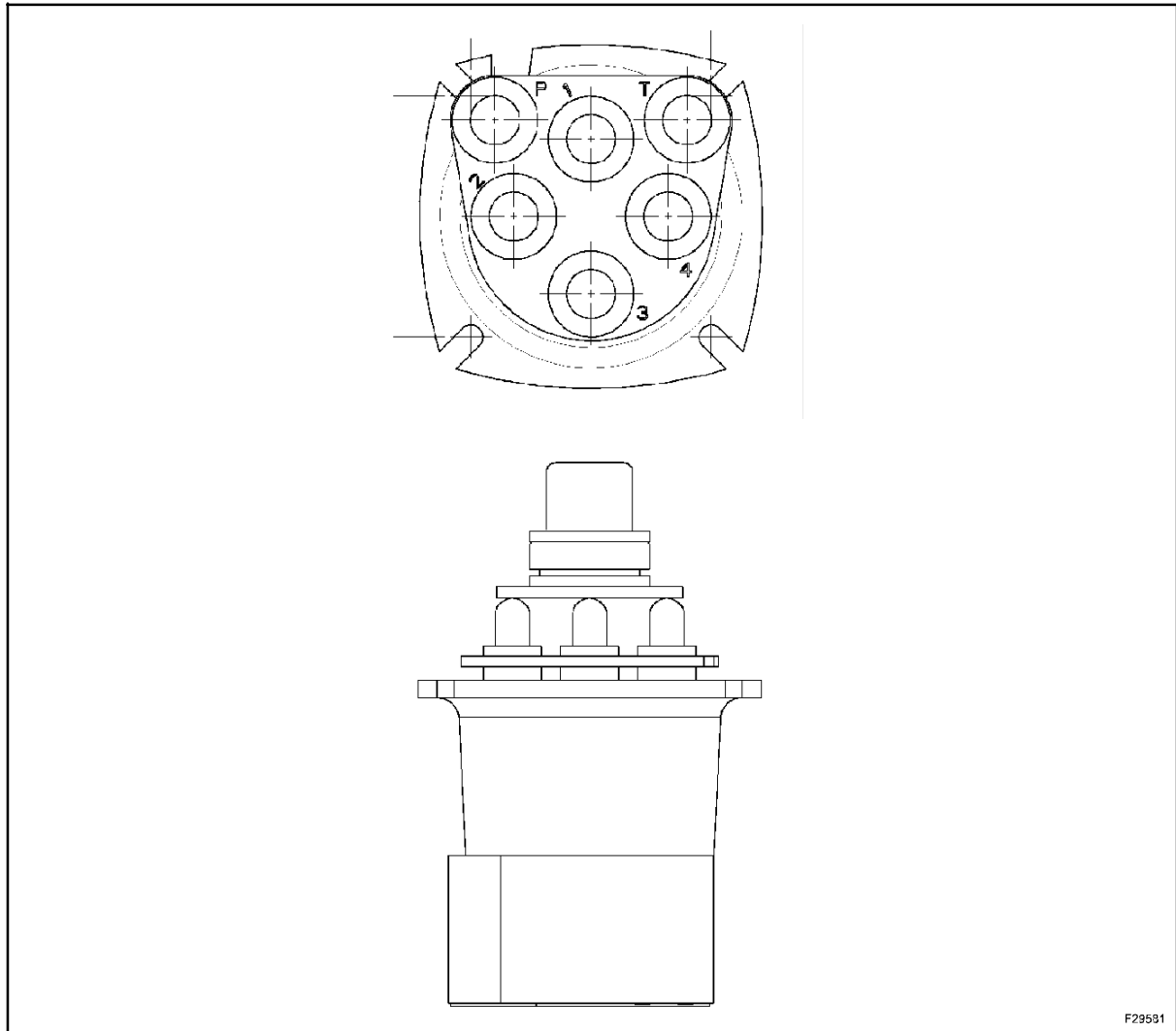


Lower the stabilizers to the ground.

Relieve the residual pressure in the system by moving the loader control lever through all operating positions.

Position a trolley jack beneath the backhoe support. Disconnect all hydraulic pipes that link the backhoe attachment to the machine.



6.4 CONTROL LEVER VALVE

P. Supply
T. Tank return

Right valve (dipper/bucket)

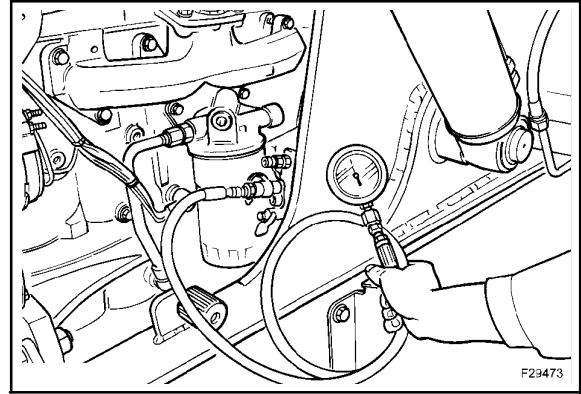
1. Retracting the dipper
2. Opening the backhoe bucket
3. Extending the dipper
4. Closing the backhoe bucket

Left valve (backhoe/swing)

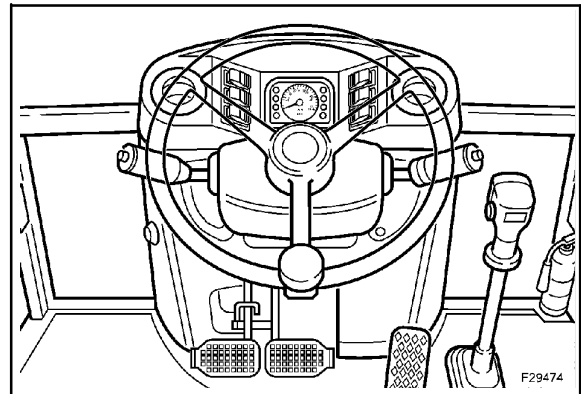
1. Lifting
2. Right swinging
3. Lowering
4. Left swinging

Steering standby

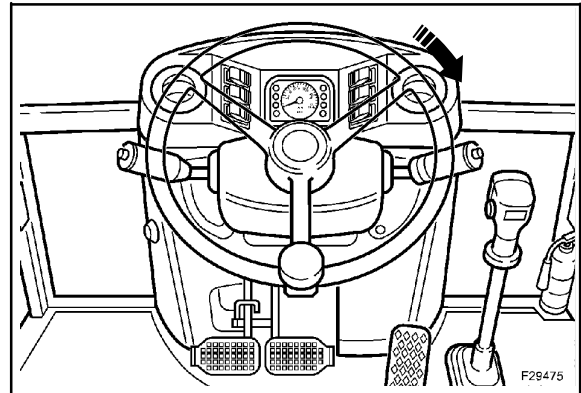
Install 0 - 200 bar pressure gauge in middle test port on left hand side of machine.
Set engine speed to 1000 rev/min.



Ensure no turning force is being applied to the steering wheel and observe pressure on gauge. The pressure gauge should read approximately 7 bar and is the steering standby pressure.
If pressure incorrect remove and examine flow divider spool on end of pump.

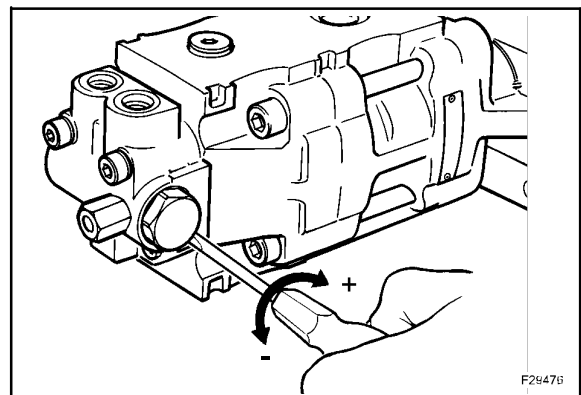
**Steering circuit relief valve**

Set engine speed to 2000 rev/min and fully turn and hold steering on either full left or right hand turn and observe pressure gauge. The gauge reading should rise to 140 bar and is the steering circuit relief valve setting.



If reading is not to specification stop engine, remove blanking plug on pump flow divider and using screwdriver turn relief valve adjusting screw to increase or decrease setting.

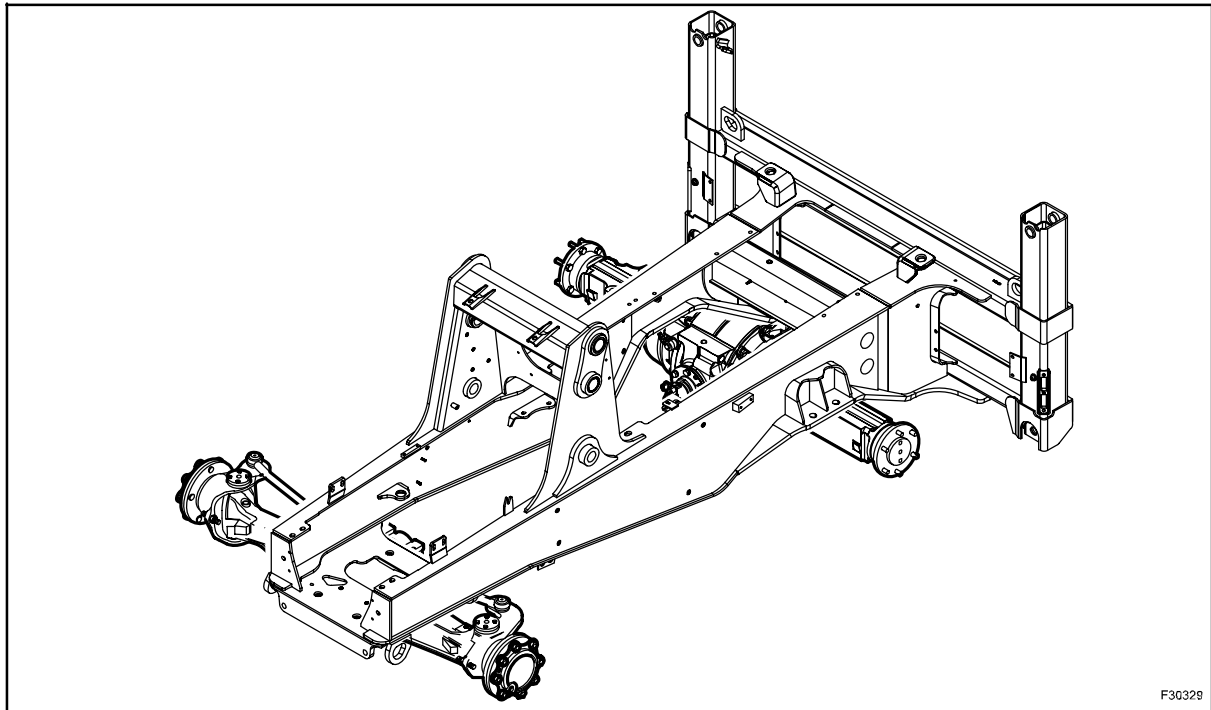
Retest steering and when pressure correct peen end of adjuster to prevent movement and reinstall blanking plug.



HYDRAULIC PUMP

PROBLEM	CAUSE	ACTION
System noisy	<p>Worn or damaged pump gears or pressure plates</p> <p>Aeration: air entering the systems at: suction tube, pump shaft, fittings, or cylinder glands</p> <p>Cavitation: restrictions in the system at the suction line or at the suction screen in the tank</p> <p>Water in the system</p> <p>System relief valve chatter</p> <p>Tubing vibration</p> <p>Cold hydraulic oil</p> <p>Wrong type oil being used</p>	<p>Hydraulic pump performance test.</p> <p>Hydraulic pump performance test.</p> <p>Visual and/or hydraulic pump performance test.</p> <p>Visual.</p> <p>Check system relief valve, adjust/overhaul as necessary.</p> <p>Visual.</p> <p>Check hydraulic oil operating temperature.</p> <p>Investigate/drain and refill.</p>
Hydraulic oil exhausts from breather at the tank	<p>Tank overfilled</p> <p>Aeration: air entering the system at: suction tube, pump shaft, fittings, or cylinder glands</p> <p>Cavitation: Restriction in the system at the suction screen in the tank</p>	<p>Check hydraulic oil level.</p> <p>Hydraulic pump performance test.</p> <p>Visual and/or hydraulic pump performance test.</p>
Oil heating	<p>Oil supply low</p> <p>Contaminated oil</p> <p>Setting of relief valve too high or too low</p> <p>Oil in system too light</p> <p>Oil cooler fins blocked</p>	<p>Fill tank.</p> <p>Drain tank and refill with clean oil.</p> <p>Drain tank and refill with clean oil. Test relief valves.</p> <p>Drain tank and refill with correct viscosity oil.</p> <p>Clean oil cooler.</p>
Shaft seal oil leakage	<p>Worn shaft seal</p>	<p>Replace shaft seal and inspect pump.</p>
Foaming oil	<p>Low oil level</p> <p>Air drawn into suction line</p> <p>Wrong oil grade</p>	<p>Fill tank.</p> <p>Check/tighten suction line.</p> <p>Drain and refill with correct oil.</p>

2.2 COMPONENTS BELOW THE CHASSIS



FRONT AXLE

The front axle is attached to the underside of the chassis by 6 through screws (2WS) or 4 through screws (4WS).

To remove front axle from the machine:

- Park the machine on a flat ground.
- Stop the engine, remove the key and relieve residual pressure in the backhoe and loader circuits by moving the loader and backhoe control levers through all operating position.
- Lower the stabilizers on the ground.
- Lower the loader bucket on the ground.
- Using the loader bucket raise the front of the machine, high enough to remove the front wheels.
- Place stands under the chassis, supporting appropriately the machine.
Place under the axle the appropriate supporting/removing tool.
- Remove the nuts on the wheels and then remove them.
- Disconnect the steering cylinder hoses.
- Remove the axle swivel pin attaching bolts (4WD).
- Disconnect the spider coupling (4WD).
- Remove the axle bolts.
- Remove the front axle.

REAR AXLE

The rear axle is attached to the frame at the rear of the machine by 4 through bolts.

To remove rear axle from the machine:

- Park the machine on a flat ground.
Stop the engine, remove the key and relieve residual pressure in the backhoe and loader circuits by moving the loader and backhoe control levers through all operating position.
- Lower the stabilizers on the ground.
- Lower the loader bucket on the ground.
- Using the stabilizers, raise the rear of the machine, high enough to remove the rear wheels.
- Place stands under the chassis, supporting appropriately the machine.
- Remove the nuts from the wheels and then remove them.
- Disconnect the steering cylinder hoses (4WS).
- Disconnect the brake circuit hoses.
- Disconnect the connector of harness of the differential lock (electrically controlled version).
- Remove the precision swing assy if installed (see Section 35).
- Remove axle swivel pin attaching bolts.
- Disconnect spider coupling.
- Remove the axle bolts.
- Remove the rear axle.

The steering system shows these features:

- double acting, type steering cylinder on both 2 and 4WD axles;
- common hydraulic tank with the main hydraulic system;
- a tandem gear pump located on the rear of the transmission; both pumps are driven by a shaft running directly off the flywheel.

Oil is drawn through the common inlet port into both pumping elements.

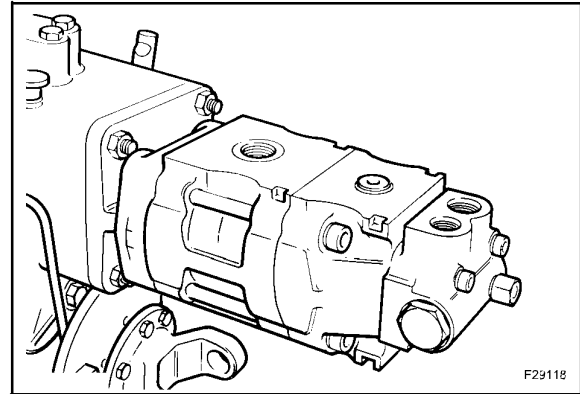
The front pump flow is directed to the loader and backhoe control valves and side shift clamping system.

Rear pump flow passes through the flow divider valve which maintains priority oil flow to the steering system with remaining flow directed for stabilizers, loader and backhoe elements.

The flow divider, located on the rear of the pump, comprises a load sensing valve and steering system pressure relief valve.

The valve ensures a priority oil flow to the steering system while the steering is operated, with the remaining flow directed to the stabilizer, loader and backhoe circuits;

- load sensing power steering.



3.1 TECHNICAL SPECIFICATIONS

Type	Sensibility to hydro-static load
Displacement (2WS)	125 cc/rev
Displacement (4WS)	160 cc/rev
Adjustment shock valves (2WS)	200 ÷ 220 bar
Adjustment shock valves (4WS)	240 ÷ 260 bar

TIGHTENING TORQUES

COMPONENT	MAXIMUM TIGHTENING TORQUE Nm
3/4 - 16 UNF	60
7/16 - 20 UNF	20
Steering wheel nut	55
Steering motor to steering column bracket	23
Power steering end cover	30
Power steering pipe connection	45
Power steering pipe adaptors	55
Check valve bolt	30
Shock valve (4WS)	30

Assemble spool and sleeve.

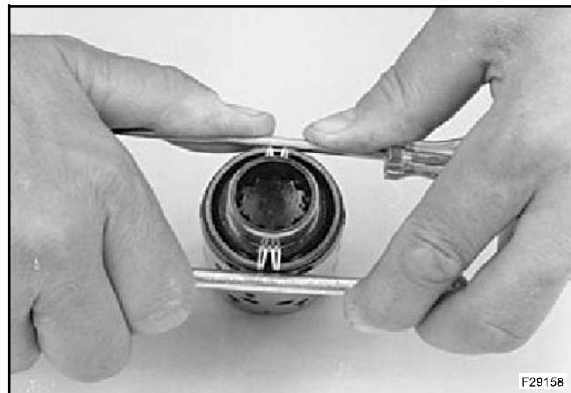
When assembling spool and sleeve only one of two possible ways of positioning the spring slots is correct. There are three slots in the spool and three holes in the sleeve in the end of the spool/sleeve opposite to the end with spring slots. Place the slots and holes opposite each other so that parts of the holes in the sleeve are visible through the slots in the spool.



Press the springs together and push the neutral position springs into place in the sleeve.

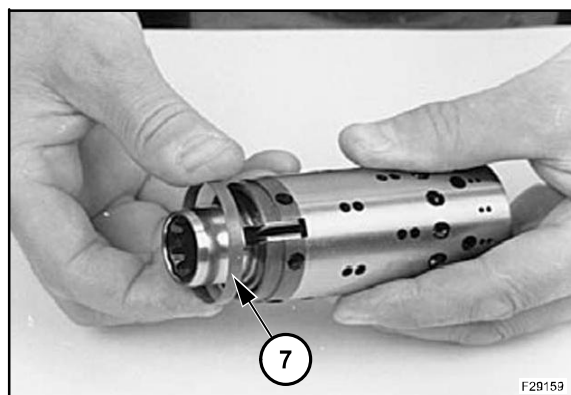


Line up the springs and centre them.



Guide the ring (7) down over the sleeve.

NOTE: the ring should be able to move - free of springs.



3.4 SPECIAL TOOLS

P/N CNH	DESCRIPTION
380000281	Assembly tool for lip seal.
380002677	Assembly tool for dust seal.
380002679	Assembly tool for cardan shaft.
380002680	Assembly tool for O-ring and Roto-Glyd.

3.5 FAULT FINDING

PROBLEM	CAUSE	ACTION
No steering or excessive effort required to steer	<p>Incorrect oil level in tank</p> <p>Air in system</p> <p>Pump relief valve faulty</p> <p>Worn pump</p> <p>Leaking power cylinder</p> <p>Damaged valve spool</p> <p>Broken or damaged steering column</p> <p>Damaged or worn metering element</p>	<p>Fill with the correct grade and quantity of oil.</p> <p>Check for loose connections or damaged tubing. Purge system of air.</p> <p>Check system pressure.</p> <p>Inspect and repair.</p> <p>Inspect and repair.</p> <p>Inspect and replace.</p> <p>Inspect and replace.</p> <p>Inspect and replace.</p>
Steering wanders	<p>Excessive play in steering linkage ball joints</p> <p>Leaking power cylinder</p> <p>Control valve spool sticking or worn</p> <p>Damaged or worn metering element</p>	<p>Inspect and replace.</p> <p>Inspect and repair.</p> <p>Inspect and replace.</p> <p>Inspect and replace.</p>
Front wheels surge when steering	<p>Leaking power cylinder</p> <p>Control valve spool sticking</p> <p>Damaged or worn metering element</p>	<p>Inspect and repair.</p> <p>Inspect and repair.</p> <p>Inspect and replace.</p>
Noisy pump	<p>Incorrect oil level in tank</p> <p>Air in system</p> <p>Water in oil</p> <p>Worn pump</p>	<p>Fill with the correct grade and quantity of oil.</p> <p>Check for loose connections or damaged tubing. Purge system of oil.</p> <p>Drain and replace the oil.</p> <p>Replace pump.</p>

FAULT FINDING - GENERAL

Items that may cause a concern are suggested in the fault finding chart but as a general rule apply the following steps:

Ensure water flow to the heater radiator is steady and all air has been removed from the system.

Hoses are unrestricted and not leaking.

Check the electrical connections are good and the blower motor is operational.

The operating cable to the heater valve and valve is operational.

FAULT FINDING

PROBLEM	CAUSE	ACTION
Dust enters the cab	Improper seal around filter element	Check seal condition.
	Blocked filter	Clean or replace filter.
	Defective filter	Replace filter.
	Excessive air leak (s) around doors and windows	Repair and Seal air leak(s).
Blower motor air flow low	Blocked filter or recirculation filter	Clean or replace filter(s).
	Heater radiator core blocked	Clean radiator core thoroughly.
Blower motor not working	Fuse blown	Replace fuse.
Cab does not heat up	Engine not reaching operating temperature. Thermostat stuck open	Replace thermostat.
	Heater hose from engine to cab radiator, kinked or blocked	Ensure water flow to heater radiator is adequate and not restricted.
Cab does not cool	Heater control turned on	Turn temperature control knob fully counterclockwise for maximum cooling.
	Heater control valve stuck in open position	Free up valve or change as required.
Temperature not stable	Low engine coolant	Top up coolant recovery tank.

COMPRESSOR

The air conditioning compressor is mounted on the left hand side of the engine and is belt driven from the crankshaft pulley.

The compressor separates the low and high pressure sides of the system and has two functions:

1. To raise the refrigerant temperature by compression to a higher degree of temperature than the ambient (outside air) temperature.
2. To circulate the required volume of refrigerant through the system.

The refrigerant compressor is a seven cylinder wobble plate unit housed in a die cast aluminium housing.

Drive to the wobble plate is from the pulley, through the electro-magnetic clutch to the main driveshaft.

Attached to the driveshaft is a cam rotor which oscillates the wobble plate. The wobble plate is prevented from rotating by a static gear engaging with teeth formed in the face of the plate. The seven pistons are connected to the wobble plate by rods located in ball sockets.

Refrigerant is drawn in on the downward stroke of a piston through the reed valves located either end of the cylinder assembly. Refrigerant enters the cylinder assembly through a gallery in the outer circumference of the cylinder assembly.

The upwards stroke of the piston compresses the refrigerant and expels it through another reed valve into an inner gallery in the cylinder assembly and out into the refrigerant circuit.

The compressor is lubricated with a Polyalkylene Glycol (PAG) oil Type SP20. This oil is miscible with the refrigerant and is carried around the refrigerant circuit.

The compressor is activated by an electro-magnetic clutch which functions to engage or disengage the compressor as required in the operation of the air conditioning system.

The clutch is primarily activated by the:

- Temperature control
- Low pressure cut-out switch



PERFORMANCE TEST DIAGNOSIS CHART

**Gauge Readings: Low Pressure - High
High Pressure - High**

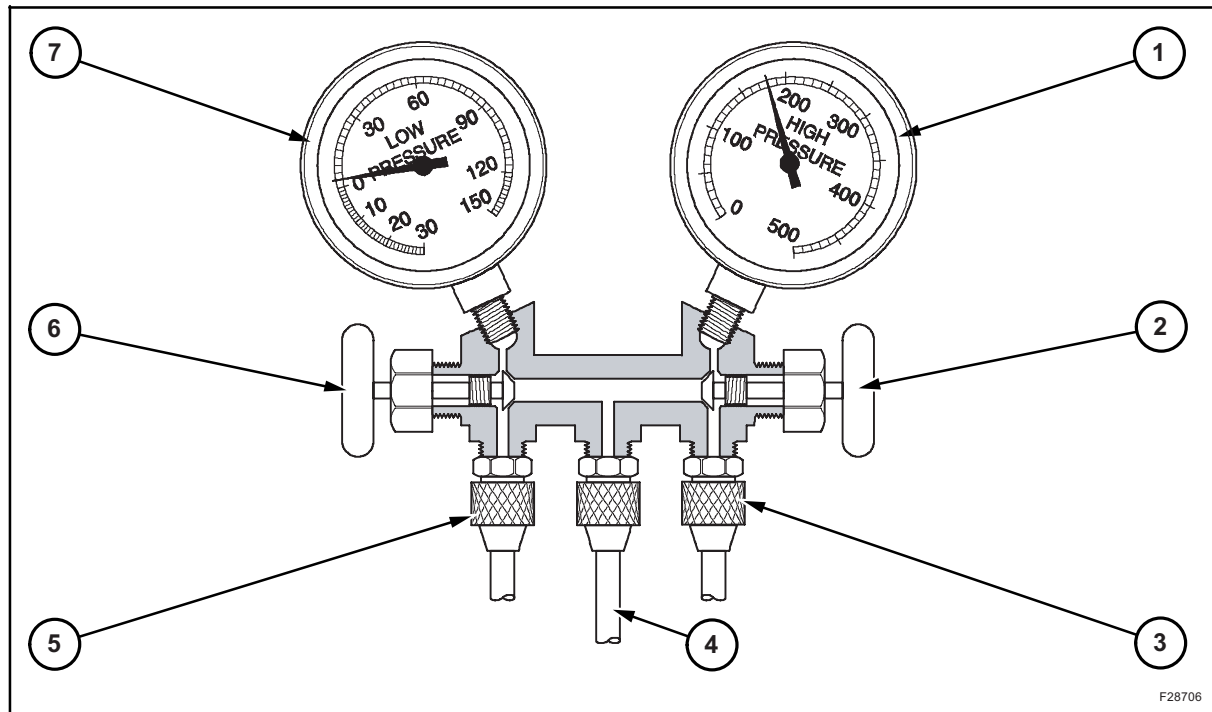
PROBLEM	POSSIBLE CAUSE	CORRECTION
Evaporator air warm Liquid line hot (condenser outlet to expansion valve tube)	Improper operation of condenser	Inspect for dirty condenser restricting air flow and cooling. Check operation of condenser cooling fans. Repair or replace as needed.
High pressure switch cutting out	Overcharged with refrigerant Air in system	Check for overcharge as follows: Stop the engine. Recover and recycle the charge using correct recovery equipment. Recharge the system with the correct quantity of refrigerant, replacing any lost lubricant. Recheck performance of air conditioning system.
Evaporator air not cold	Expansion valve allowing too much refrigerant to flow through the evaporator	Check expansion valve as follows: Set for maximum cooling. Low pressure gauge should lower slowly. If expansion valve is defective: Discharge System. Replace Expansion Valve. Evacuate System. Charge System. Re-test.

PERFORMANCE TEST DIAGNOSIS CHART

**Gauge Readings: Low Pressure - Low
High Pressure - High**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Insufficient cooling	Restriction in liquid line	Discharge the system. Replace the receiver/drier. Inspect all lines and tubing from compressor outlet to expansion valve. Replace if needed. Evacuate the system. Charge the system. Re-test.

PERFORMANCE TEST EXAMPLE 9



Performance Test Example 9

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. High side low 2. High side hand valve closed 3. High side hose connected to high side service connector 4. Not used | <ol style="list-style-type: none"> 5. Low side hose connected to low side service connector 6. Low side hand valve closed 7. Low side low |
|---|--|

PROBLEM

Insufficient or no cooling.

CAUSE

Restriction in high side of system.

CONDITIONS*

Low side pressure too low. Gauge should read 1-2 bar.

High side pressure too low. Gauge should read 13.3-14.8 bar.

NOTE: a normal or high reading of the high side pressure gauge under these conditions indicates the system is overcharged or the condenser or receiver/dryer is too small.

Evaporator only slightly cool.

Liquid line and receiver/dryer are cool to touch and show frost or considerable moisture.

CORRECTIVE PROCEDURES

1. Check for sticking expansion valve as follows: Operate the system at maximum cooling. Check the low side gauge. The pressure should lower slowly.
2. If the test indicates that the expansion valve is defective, proceed as follows: Discharge and recover the refrigerant from the system. Replace the expansion valve. Evacuate the system. Charge the system. Performance test the system.

DIAGNOSIS

Thermostatic expansion valve is allowing too much refrigerant to flow through the evaporator coils. Valve may be stuck open.

NOTE: * test procedure based upon ambient temperature of 35 °C.

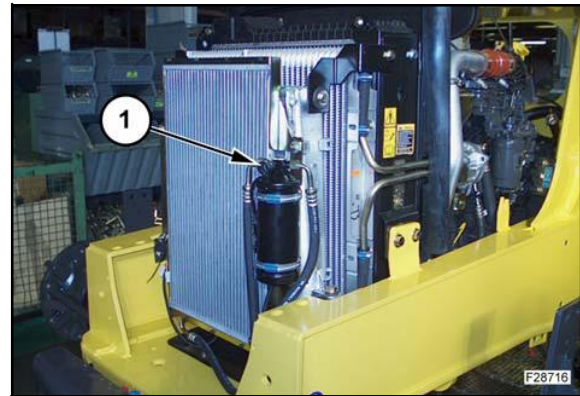
For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.

LOW PRESSURE CUT-OUT SWITCH

1. With the engine "OFF" check continuity across the switch contacts. If the switch (1) shows "Open Circuit" replace as detailed below.

IMPORTANT: the pressure switch can not be replaced without discharging the system.

2. Remove switch by unscrewing from self sealing Schrader valve.
3. Replace with new switch and connect to harness.



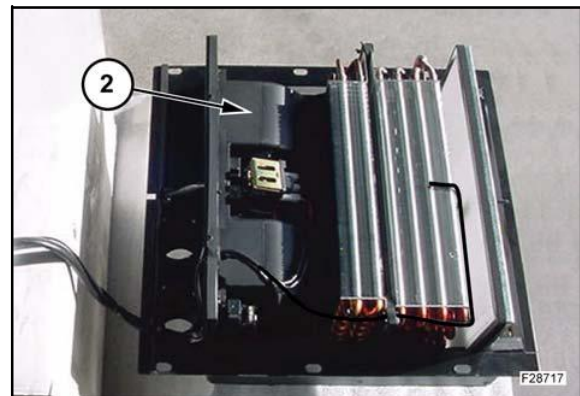
BLOWER MOTOR ASSEMBLY

The blower motor (2) can if required be removed without discharging the system as follows:

1. Remove the cab seat mounting plate.

NOTE: take care not to damage hoses during this operation. If the cab heater hoses restrict movement of the housing drain the heater assembly and disconnect the hoses.

2. Disconnect the motor wiring connector block.
3. Remove the remaining motor securing screws and withdraw motor.
4. Re-assembly follows the disassembly procedure in reverse.

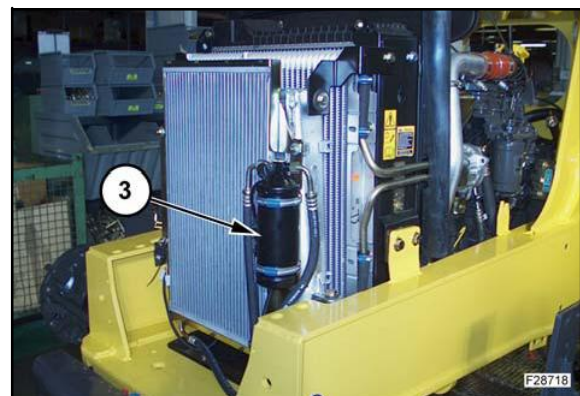


RECEIVER DRYER

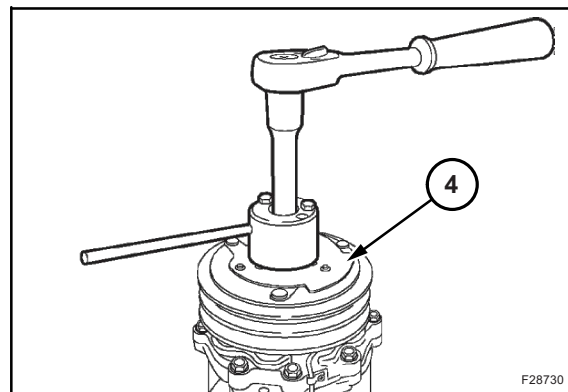
The receiver/dryer (3) cannot be overhauled and must be replaced as an assembly. The receiver/dryer assembly should be replaced if it is suspected that moisture is in the system.

The receiver dryer must also be replaced if the system has been discharged and the air conditioning joints disconnected.

1. Discharge and reclaim refrigerant gas using certified recovery systems.
2. Disconnect the hoses and switch and remove the dryer from the tractor.
3. Drain the refrigerant oil from the receiver dryer into a clean calibrated container. Measure the quantity of oil obtained and add the same quantity of new refrigerant oil directly into the new item.
4. Cap and plug all fittings to prevent any dirt entering the system.
5. Install a new receiver dryer.

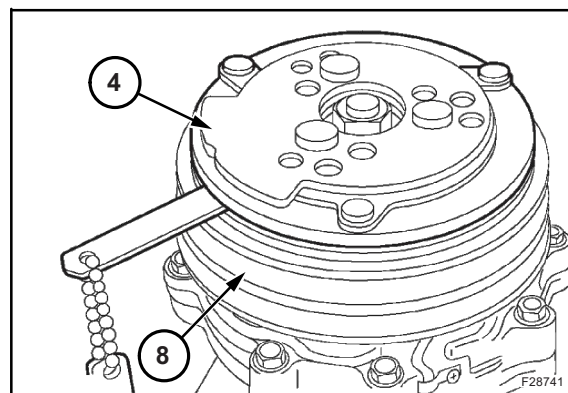


Replace the plate (4) and retaining nut and tighten to a torque of 18 Nm.



Check the clearance between the plate (4) and rotor (8). This should be consistent around the circumference and be between 0.4-0.8 mm.

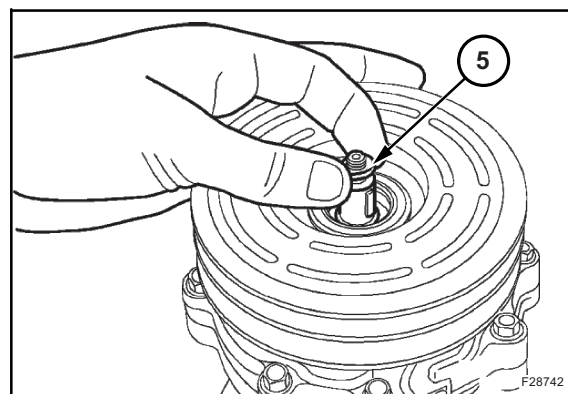
NOTE: if the air gap is not consistent, lightly pry up on the counter weighted front plate at the low spots or lightly tap down at the high spots.



If the clearance is not within specification the shims (5) under the front plate should be added to or subtracted from, until the correct clearance is obtained.

NOTE: new shims are available in sizes 1.00, 0.50 and 0.13 mm.

Replace dust cover (2) if present and torque 3 on 6 bolts (1) as specified into Tightening torques.



1. GENERALITIES

1.1 TEMPORARY WIRING HARNESS REPAIR

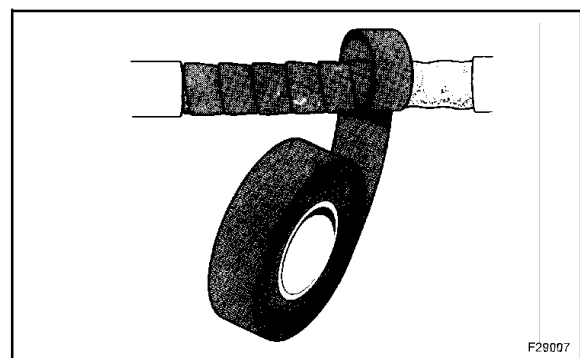
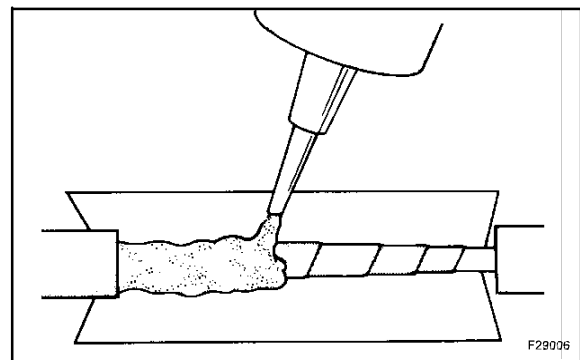
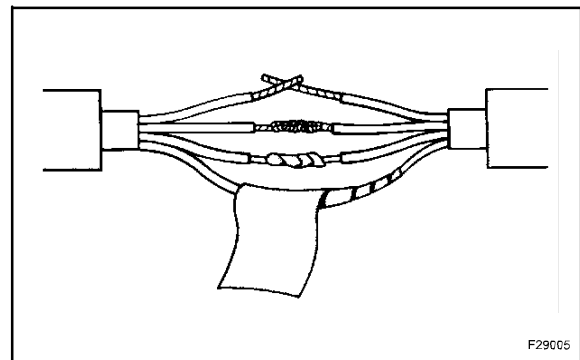
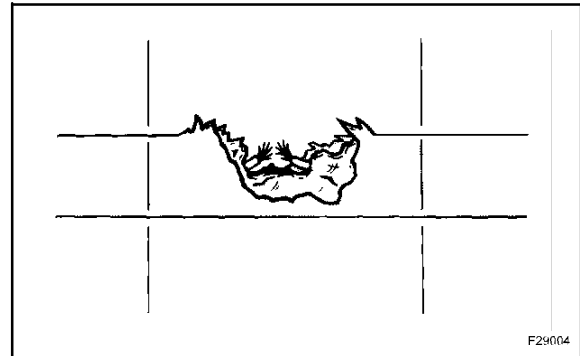
The following method to repair wiring is a temporary expedient only. Wiring should be replaced as soon as possible. Replacement of temporary repaired cables with new is particularly important if the tractor is to be used for spraying as chemicals can enter the repaired area, travel up the cable and damage electrical components. Do not attempt to repair the wire on any system sensors as these are sealed and should only be replaced with a new component.

NOTE: when conducting a cable repair it is important that only RESIN CORED SOLDER is used. Use of other types of solder may result in further cable damage.

To carry out a temporary repair, proceed as follows:

- Locate damaged portion of cable then cut away outer protective cover on both sides of the damaged area.
- Peel back the cable from both ends of the damaged area and carefully cut away the inner cable cover at the damaged area and strip about 13 mm (1/2 inch) of insulation from the wires. Do not cut away any wire strands.
- Using a suitable solvent, clean about 2 inches (50 mm) from each cover end. Clean the grey cable cover and the individual leads.
- Twist two bare leads together for each damaged lead, being careful to match wire colours, then solder the leads using resin cored solder. Tape each repaired lead with vinyl insulation tape.
- Wind a layer of vinyl insulation tape up to the grey cable cover at each end of the repair section. Make a paper trough, then apply silicon rubber compound (non hardening sealant) over the repaired section up to the cover ends. Sufficient sealant must be used to fill the ends of the cut away area.
- Allow the compound to cure then cover the area with insulating tape taking the tape well over each end of the repair. An overlap of at least 2 inches (50 mm) of tape at each end is necessary.
- Check to ensure the repair is satisfactory and secure the repaired cable so that repeat damage is avoided.

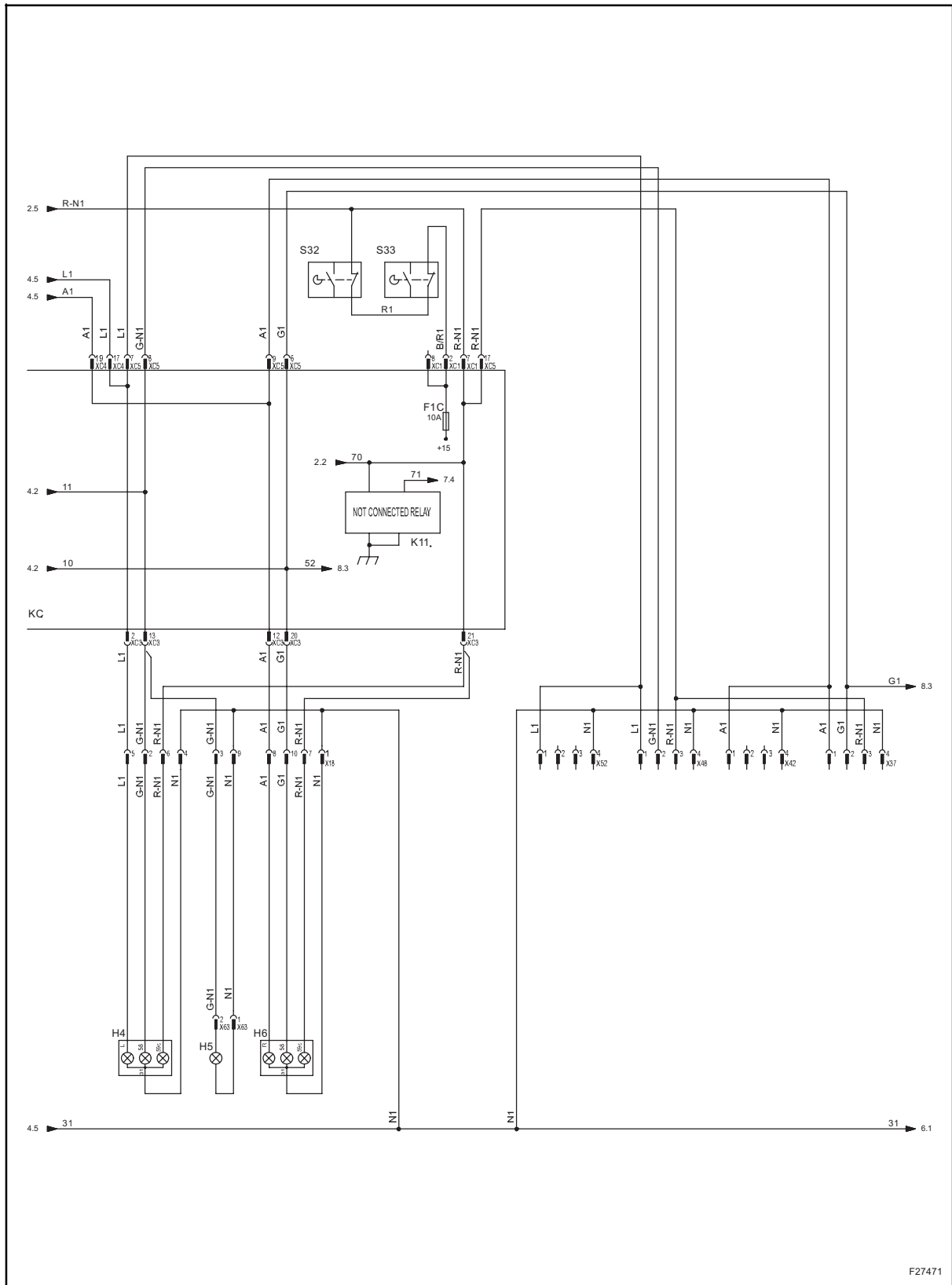
NOTE: this is a temporary repair only. Ensure the damaged cable is replaced as soon as possible to prevent ingress of water or chemicals.



SECTION 55 - ELECTRICAL SYSTEM

NAME	DESCRIPTION
K1	Safety relay
S1	Pilot on/off switch 8 way connector
S2	Pattern change switch 8 way connector
X1	Pattern valve "1" 2 way connector
X2	Pattern valve "2" 2 way connector
X4	Left joystick 2 way connector
X11	Left stabilizer pressure switch 2 way connector
X12	Right stabilizer pressure switch 2 way connector
X13	Right tower line 5 way connector
X14	Right joystick 6 way connector
X17	Manifold power 2 way connector
X20	LVC unit 23 way connector
X23	Safety switch 2 way connector
X24	Left stabilizer joystick 6 way connector
X27	Horn jumper connection 2 way connector
X72	Pilot control cable 1 way connector
XL	Left stabilizer joystick 3 way connector
XR	Right stabilizer joystick 3 way connector
YP3	Plug 3 left down 2 way connector
YP4	Plug 4 left up 2 way connector
YP5	Plug 5 right down 2 way connector
YP6	Plug 6 right up 2 way connector
YP7	Plug 7 extend 2 way connector
YP8	Plug 8 retract 2 way connector
YP9	Plug 9 reverse speed aux 2 way connector
YP10	Plug 10 forward 2 way connector

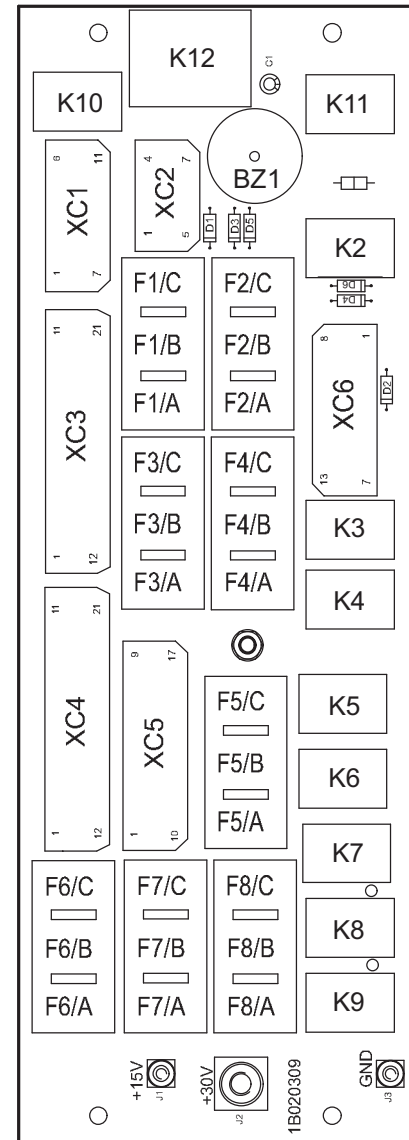
REAR LIGHTS LINE



2.3 ELECTRICAL DIAGRAMS - 4WS

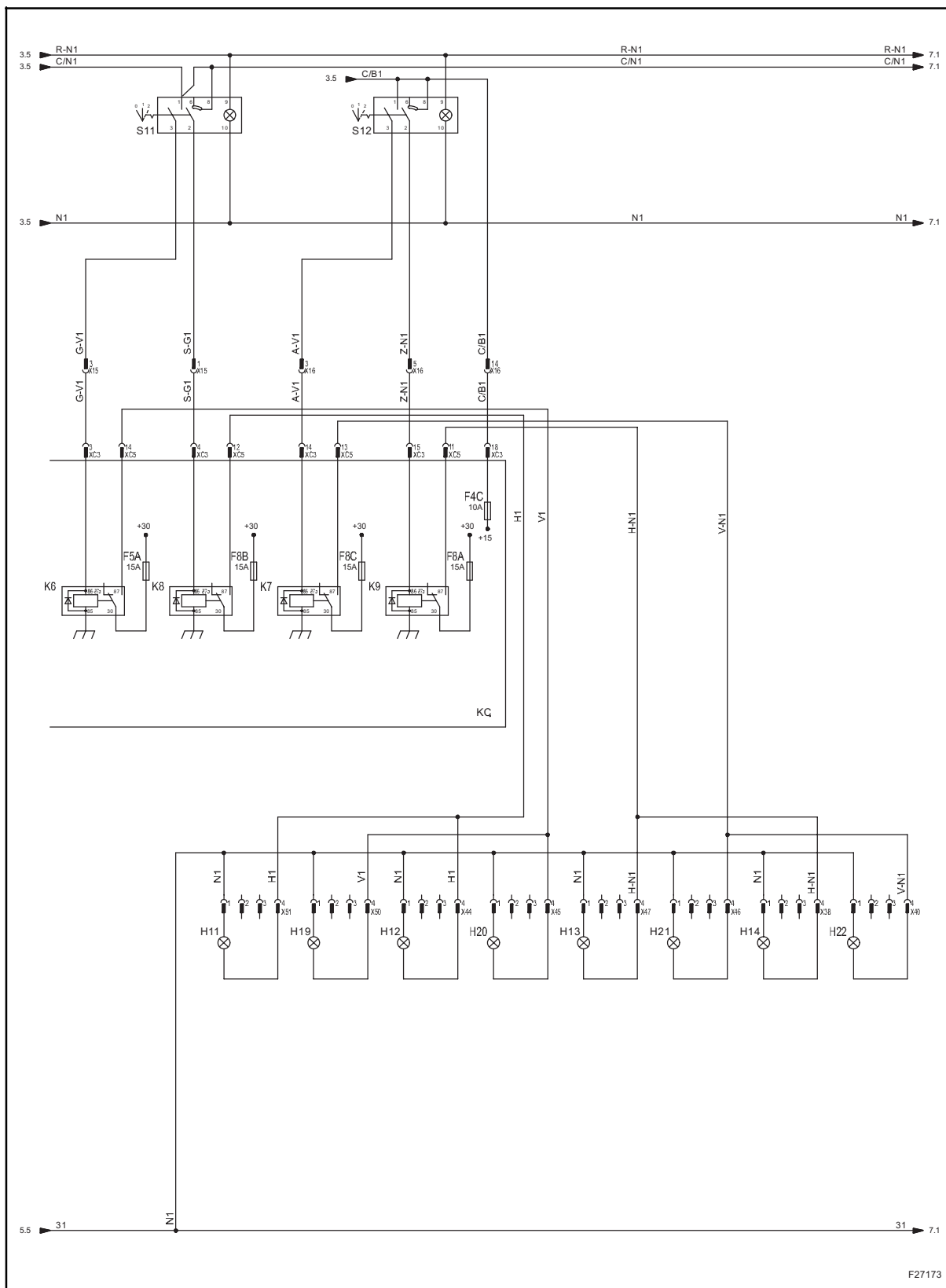
FUSES AND RELAYS DESCRIPTION

NAME	DESCRIPTION
F1A	Rear windshield wiper and rear windshield washer (15 A)
F1B	Fuel shut off, antitheft power supply, grid heater (7.5 A)
F1C	Steering unit, steering switch (10 A)
F2A	Instruments power supply, switches lamps, brake oil level sensor, seat, buzzer, stop lights switch (15 A)
F2B	Conditioner (15 A)
F2C	Pilot control (15 A)
F3A	Rear right/front left side lights, instruments illumination, conditioner switch illumination (3 A)
F3B	Rear left/front right side lights, number plate light (3 A)
F3C	Front work light, Glide Ride control, double delivery, 4x1 grab switches (10 A)
F4A	EGS power supply, clutch shut off button, 4WD switches (7.5 A)
F4B	Rear hammer button, grab level valve and sensor (10 A)
F4C	Rear excavator lock, rear translation lock, rear work light (10 A)
F5A	Front inner work lights (15 A)
F5B	Traffic lights (10 A)
F5C	Main beam (15 A)
F6A	Beacon lamp (7.5 A)
F6B	(+15) Flasher (7.5 A)
F6C	Hand hammer (7.5 A)
F7A	(+30) Warning, horn (10 A)
F7B	Current intake, radio, roof lamp (10 A)
F7C	Front windshield wiper (6 A)
F8A	Outer rear work lights (15 A)
F8B	Outer front work lights (15 A)
F8C	Inner rear work lights (15 A)



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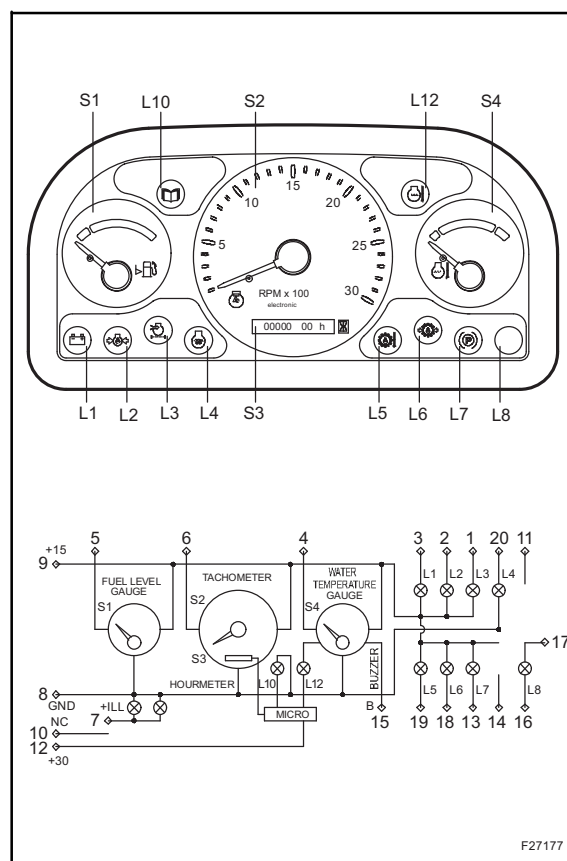
WORK LIGHTS LINE



K10	Reverse speed relay
K11	Forward speed relay
K12	Flasher

SIDE INSTRUMENT

POS.	PIN No.	FUNCTION	SIGNAL
L3	1	Air cleaner lamp	-
L2	2	Engine oil pressure lamp	-
L1	3	Generator lamp	-
S4	4	Water temperature gauge	ohm
S1	5	Fuel level gauge	ohm
S2	6	Tachometer	Hz
• ILL	7	Backlighting (•)	• Lights
GND	8	Ground	
• 15	9	Positive (• Key)	
	10	NC	
L10		Service lamp	Int.
	11	NC	
• 30	12	Permanent supply volt (• Battery)	
L7	13	Hand brake lamp	
	14	NC	
B	15	External buzzer driving (-)	
L8	16	Neutral red lamp	+/-
L8	17	Neutral red lamp	+/-
L6	18	Transmission oil pressure lamp	-
L5	19	Transmission oil pressure lamp	-
L4	20	Engine preheating lamp	-
L12		High water temperature lamp	Int.

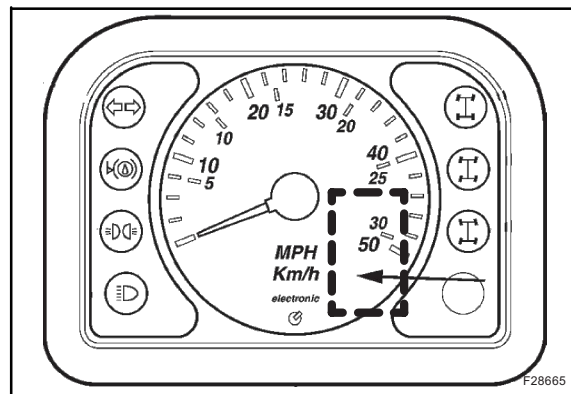


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3.4 CALIBRATION OF SPEEDOMETER

Dependent upon the model and tyres fitted it may be a requirement to set the calibration of the front console.

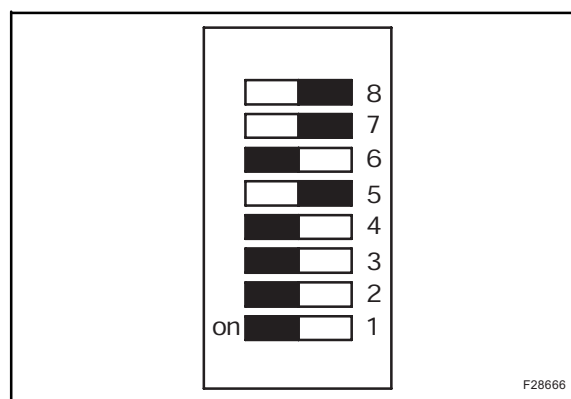
This setting is required if fitting a new instrument or a change of tyres takes place, and can be performed by adjusting the settings of the switch block, mounted at the rear of the console.



Each switch numbered 1 to 8 mounted in the block should be turned ON = or OFF as shown in the opposite example, to suit the requirement and as shown in the following tables.

Switch positions:

- 1 = ON
- 0 = OFF



POWERSHUTTLE

AXLE RATIO	TYRE - ROLLING CIRCUMFERENCE	FREQUENCY AT 50 Km/hr	SWITCH POSITIONS 1-2-3-4-5-6-7-8
18.5	4065 - 4335	2055	1-1-1-1-0-1-0-0
18.5	3810 - 3911	2245	1-1-1-0-1-0-1-0
20.8	4065 - 4335	2310	1-1-1-0-1-1-1-0
20.8	3810 - 3911	2522	1-1-0-0-0-0-0-1

POWERSHIFT

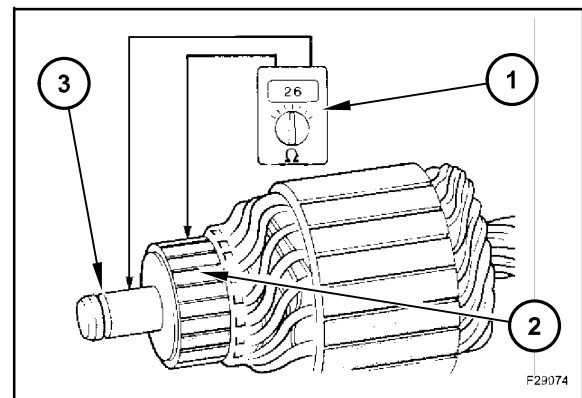
EGS FREQUENCY	TYRE - ROLLING CIRCUMFERENCE	FREQUENCY AT 50 Km/hr	SWITCH POSITIONS 1-2-3-4-5-6-7-8
6.53 - 6.12	4065 - 4335	315 Hz	0-0-0-0-0-0-0-0
6.97 - 6.79	3810 - 3911	345 Hz	0-1-0-0-0-1-0-0

Armature

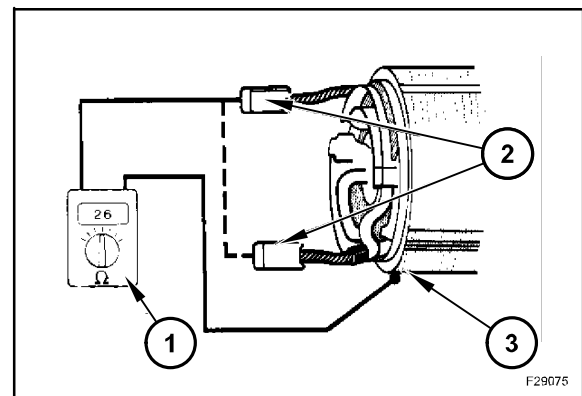
- The surface of the commutator must be clean and without traces of burns. If necessary, remove traces of burns using fine sandpaper. Do not use emery cloth. Then, clean the commutator with a cloth soaked in gasoline.
- After rectifying the commutator, polish it with fine sandpaper, then wipe it with a cloth soaked in gasoline.

NOTE: make sure not to graze the metal of the commutator during rectification of insulating notches.

- The resistance of the armature insulation may be checked by connecting an ohmmeter (1) between the blades of the commutator (2) and the armature shaft (3). The resistance must be infinite (no continuity).
- To check that the armature is not short-circuited, a special device for armatures must be used. The other solution is to replace the armature.
- If the circumference of the armature has come into contact with the starter pole shoes, the bearings of the armature are probably excessively worn out. First check that the starter pole shoes have been tightened and that the armature rotates without any concentric defect. If necessary, replace the armature bearings.

**Field coils**

- To check the resistance of the field coil insulation, connect an ohmmeter (1) between the brushes of each induction coil (2) and a clean unpainted area of the body (3). The resistance must be infinite (no continuity).
- To check the continuity of the field coils, connect an ohmmeter between the brushes of each induction coil and the main supply terminal (the thickest braided wire). The resistance must be equal to 1 MW.
- If the field coils are defective, the entire assembly consisting of the body and the field coils must be replaced.

**Drive pinion**

- The drive pinion must only rotate clockwise. If the pinion is seized or turns in both directions or if its teeth are damaged, change the complete drive assembly.

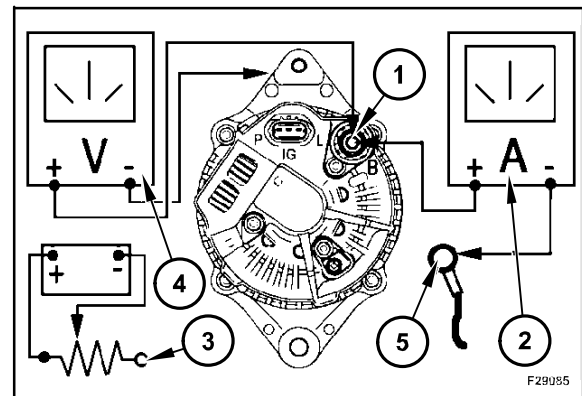
NOTE: if the teeth of the drive pinion are damaged, also check the teeth of the engine flywheel ring gear.

CHECKING THE MAXIMUM OUTPUT OF THE ALTERNATOR

- Make sure that the ignition is turned off (key on "off").
- Disconnect the negative cable from the battery and disconnect cable B+ (5) from the alternator.
- Connect an ammeter (2) between terminal B+ (1) of the alternator and the disconnected cable B+ (negative side towards the cable).
- Connect a voltmeter (4) between terminal B+ of the alternator and the ground.
- Reconnect the battery, start the motor and increase its speed to 2000 rpm.
- Gradually reduce the resistance (3) until the ammeter shows 90 A.
- Observe the voltmeter, which must not indicate a value that is less than 14.2 V.

If the value lowers below 14.2 V, an alternator component is defective.

Carry out the operations described in the "Checking the alternator components".



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