SERVICE MANUAL

B90B / B95B / B95BLR / B95BTC / B110B / B115B

Backhoe Loaders

Print No. 84428670B

NEW HOLLAND CONSTRUCTION

72 kW - 97 HP ENGINE (B95B - B95BTC)

Specifications (ISO 14396)	72 kW - 97 HP @ 2200 rpm
Model	F4HE0484G*J102
Type	diesel, electronic
No. of cylinders	4
Valves per cylinder	4
Bore	104 mm (4 in)
Stroke	132 mm (5.2 in)
Displacement	4485 cm^3 (237.69 in^3)
Compression ratio	17.5:1
Maximum torque (EC)	453 Nm (334 lbf·ft) @ 1400 rpm
Low idle speed at no load	1000 ± 50 rpm
High idle speed at no load (engine not installed)	2430 ± 50 rpm
High idle speed at no load (engine not installed on the vehicle)	2380 ± 60 rpm
Maximum speed at full load	2200 rpm
Air intake	TAA (turbocharged with aftercooler)

Supply

Type	high-pressure, common rail
Injection pump	CP3 high-pressure pump
Control unit	EDC7
Injection sequence	1-3-4-2
Cold-start device	“Grid heater” (optional)

Cooling

Pump type	H_2O pump
Pump drive	belt drive
Temperature switch (opening start)	81 ± 2 °C (177.8 ± 35.6 °F)

Front tyres	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	12-16.5 L5
Rear tyres	19.5L-24 R4	16.9-24 R4	17.5L-24 R4	16.9-28 R4	21L-24 R4	19.5L-24 L4
A	4235 (166.73)	4238 (166.85)	4247 (167.20)	4218 (166.06)	4225 (166.34)	4250 (167.32)
B	3408 (134.17)	3410 (134.25)	3420 (134.64)	3391 (133.50)	3397 (133.74)	3422 (134.72)
C	2671 (105.16)	2675 (105.31)	2690 (105.90)	2644 (104.09)	2654 (104.49)	2687 (105.78)
D	175 (6.89)	172 (6.77)	160 (6.29)	196 (7.71)	189 (7.44)	160 (6.29)
E	801 (31.53)	795 (31.29)	771 (30.35)	842 (33.15)	827 (32.56)	797 (31.38)
F	1461 (57.52)	1459 (57.44)	1453 (57.20)	1471 (57.91)	1467 (57.75)	1453 (57.20)
G	1411 (55.55)	1413 (55.63)	1420 (55.90)	1398 (57.20)	1402 (55.19)	1412 (55.59)
H	1539 (60.59)	1538 (60.55)	1534 (60.39)	1546 (60.87)	1544 (60.79)	1530 (60.23)
α	41°	41.1°	41.4°	40.5°	40.7°	40.7°
β	49.4°	49.6°	50.3°	48.2°	48.7°	49.5°
χ	43.9°	43.7°	43.1°	45.1°	44.7°	43.8°

mm (in)

Front tyres	12-16.5 R4	12-16.5 R4	12-16.5 R4	14-17.5	14-17.5 R4	14-17.5 R4
Rear tyres	19.5L-24 R4	17.5L-24 R4	16.9-24 R4	19.5L-24 R4	16.9-28 R4	21L-24 R4
A	4253 (166.73)	4265 (167.91)	4256 (167.56)	4293 (169.01)	4296 (169.13)	4302 (169.37)
B	3425 (134.84)	3437 (135.31)	3428 (134.96)	3465 (136.42)	3468 (136.53)	3474 (136.77)
C	2691 (105.94)	2711 (106.73)	2696 (106.14)	2737 (107.75)	2734 (107.64)	2743 (107.99)
D	156 (6.14)	140 (5.51)	153 (6.02)	113 (4.45)	114 (4.49)	106 (4.17)
E	789 (31.06)	758 (29.84)	783 (30.82)	762 (30)	790 (31.10)	775 (30.51)
F	1451 (57.12)	1444 (56.85)	1450 (57.08)	1431 (56.34)	1430 (56.29)	1427 (56.18)
G	1414 (55.67)	1423 (56.02)	1416 (55.75)	1422 (55.98)	1414 (55.67)	1418 (55.82)
H	1529 (60.19)	1524 (60.00)	1528 (60.15)	1505 (59.25)	1499 (59.01)	1497 (58.93)
α	40.8°	41.2°	40.9°	40.3°	39.6°	39.8°
β	49.8°	50.6°	49.9°	50.5°	49.7°	50.1°
χ	43.6°	42.7°	43.4°	42.8°	43.6°	43.2°

mm (in)

Front tyres	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	12-16.5 L5
Rear tyres	19.5L-24 R4	16.9-24 R4	17.5L-24 R4	16.9-28 R4	21L-24 R4	19.5L-24 L4
A (standard bucket)	3133 (123.34)	3137 (123.50)	3149 (123.97)	3111 (122.48)	3120 (122.83)	3149 (123.97)
A (6x1 bucket)	3296 (129.76)	3299 (129.88)	3310 (130.31)	3277 (129.01)	3284 (129.29)	3311 (130.35)
B (standard bucket)	2695 (106.10)	2698 (106.22)	2711 (106.73)	2673 (105.23)	2681 (105.55)	2710 (106.69)
B (6x1 bucket)	2899 (114.13)	2902 (114.25)	2912 (114.64)	2879 (113.34)	2887 (113.66)	2914 (114.72)
C (standard bucket)	479 (18.86)					
C (6x1 bucket)	437 (17.20)					
D (standard bucket)	2485 (97.83)	2477 (97.52)	2447 (96.34)	2535 (99.80)	2517 (99.09)	2479 (97.59)
D (6x1 bucket)	2328 (91.65)	2320 (91.34)	2288 (90.08)	2382 (93.78)	2362 (92.99)	2322 (91.42)
E (standard bucket)	2757 (108.54)	2755 (108.46)	2750 (108.27)	2767 (108.94)	2764 (108.82)	2749 (108.23)
E (6x1 bucket)	2719 (107.04)	2717 (106.97)	2711 (106.73)	2728 (107.40)	2725 (107.28)	2711 (106.73)

mm (in)

Front tyres	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	12-16.5 L5
Rear tyres	19.5L-24 R4	16.9-24 R4	17.5L-24 R4	16.9-28 R4	21L-24 R4	19.5L-24 L4
A (standard bucket)	3153 (124.13)	3168 (124.72)	3156 (124.25)	3195 (125.79)	3195 (125.79)	3203 (126.10)
A (6x1 bucket)	3315 (130.51)	3328 (131.02)	3317 (130.59)	3355 (132.08)	3357 (132.16)	3364 (132.44)
B (standard bucket)	2714 (106.85)	2730 (107.48)	2717 (106.97)	2757 (108.54)	2757 (108.54)	2764 (108.82)
B (6x1 bucket)	2917 (114.84)	2931 (115.39)	2920 (114.96)	2958 (116.45)	2960 (116.53)	2966 (116.77)
C (standard bucket)	479 (18.86)					
C (6x1 bucket)	437 (17.20)					
D (standard bucket)	2470 (97.24)	2432 (95.75)	2462 (96.93)	2437 (95.94)	2471 (97.28)	2453 (96.57)
D (6x1 bucket)	2312 (91.02)	2272 (89.45)	2304 (90.71)	2277 (89.64)	2314 (91.10)	2294 (90.31)
E (standard bucket)	2748 (108.19)	2740 (107.87)	2746 (108.11)	2727 (107.36)	2726 (107.32)	2722 (107.16)
E (6x1 bucket)	2709 (106.65)	2702 (106.38)	2707 (106.57)	2687 (105.78)	2686 (105.75)	2683 (105.63)

mm (in)

“Heavy Duty” or “Extra Heavy Duty” backhoe bucket

RETRACTED DIPPER						
Front tyres	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	12-16.5 L5
Rear tyres	19.5L-24 R4	16.9-24 R4	17.5L-24 R4	16.9-28 R4	21L-24 R4	19.5L-24 L4
A	5645 (222.24)	5628 (221.57)	5552 (218.58)	5766 (227.01)	5728 (225.51)	5636 (221.88)
B	3790 (149.21)	3774 (148.58)	3699 (145.63)	3911 (153.98)	3873 (152.48)	3782 (148.90)
C	4415 (173.81)	4431 (174.44)	4503 (177.28)	4297 (169.17)	4335 (170.66)	4423 (174.13)
D	4039 (159.01)	4054 (159.60)	4124 (162.36)	3925 (154.52)	3962 (155.98)	4046 (159.29)
E	1803 (70.98)	1818 (71.57)	1887 (74.29)	1691 (66.57)	1727 (67.99)	1824 (71.81)
F	1313 (51.69)	1323 (52.09)	1368 (53.86)	1241 (48.86)	1264 (49.76)	1327 (52.24)
G	5312 (209.13)	5314 (209.21)	5319 (209.40)	5301 (208.70)	5305 (208.85)	5312 (209.13)
α	203.8°					

mm (in)

RETRACTED DIPPER						
Front tyres	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	11L-16 F3	12-16.5 L5
Rear tyres	19.5L-24 R4	16.9-24 R4	17.5L-24 R4	16.9-28 R4	21L-24 R4	19.5L-24 L4
A	5619 (221.22)	5526 (217.56)	5603 (220.59)	5570 (219.29)	5676 (223.46)	5637 (221.93)
B	3766 (148.26)	3673 (144.60)	3749 (147.60)	3717 (146.34)	3822 (150.47)	3783 (148.94)
C	4439 (174.76)	4526 (178.18)	4454 (175.35)	4482 (176.45)	4382 (172.51)	4420 (174.01)
D	4061 (159.88)	4146 (163.22)	4076 (160.47)	4103 (161.53)	4005 (157.67)	4042 (159.13)
E	1841 (72.48)	1924 (75.74)	1856 (73.07)	1913 (75.31)	1828 (71.97)	1864 (73.39)
F	1338 (52.68)	1392 (54.80)	1348 (53.07)	1385 (54.53)	1330 (52.36)	1353 (53.27)
G	5314 (209.21)	5321 (209.48)	5315 (209.25)	5316 (209.29)	5307 (208.93)	5310 (209.05)
α	203.8°					

mm (in)

BACKHOE ATTACHMENT LIFTING CAPACITY

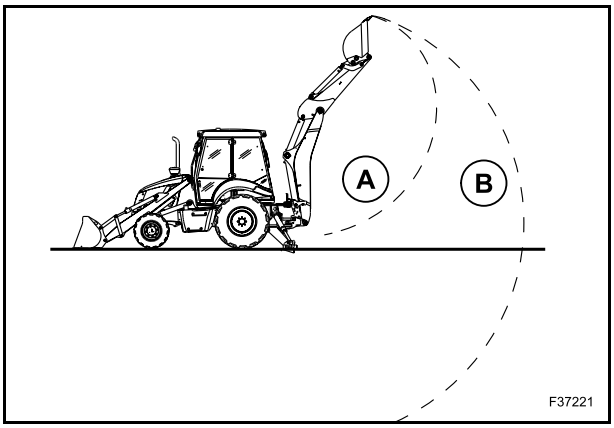
LIFTING CAPACITY - MODELS B90B, B95B AND B95BLR

Lifting capacity in normal operating mode - SAE rated

The following table reports the lifting capacities of the dipper (A) and the boom (B).

NOTE: *the capacities indicated may slightly vary from one machine to another, according to the accessories mounted, the pressure settings and the market requirements.*

Lifting capacities are given in kg (lb) for a standard dipper and a telescopic dipper.



1

Dipper		Telescopic dipper (retracted)		Telescopic dipper (extended)		Height/Depth
Dipper A	**Boom B**	**Dipper A**	**Boom B**	**Dipper A**	**Boom B**	**m (ft)**
					590 (1300)	+5.4 (18)
	1160 (2560)		1085 (2390)		880 (1945)	+4.9 (16)
	1545 (3405)		1445 (3185)	1510 (3330)	1015 (2235)	+4.3 (14)
2640 (5820)	1665 (3675)	2585 (5705)	1555 (3430)	1605 (3540)	1080 (2380)	+3.6 (12)
2615 (5770)	1695 (3735)	2505 (5520)	1575 (3470)	1655 (3655)	1110 (2450)	+3.0 (10)
2665 (5880)	1680 (3710)	2550 (5625)	1560 (3440)	1680 (3705)	1125 (2475)	+2.4 (8)
2915 (6425)	1660 (3665)	2790 (6155)	1530 (3375)	1755 (3865)	1125 (2480)	+1.8 (6)
3700 (8155)	1630 (3590)	3555 (7840)	1495 (3300)	1850 (4080)	1125 (2480)	+1.2 (4)
6080 (13410)	1600 (3525)	5910 (13030)	1460 (3225)	2075 (4575)	1120 (2470)	+0.6 (2)
	1570 (3460)		1430 (3155)	3235 (7135)	1115 (2455)	0 (ground)
	1545 (3410)		1400 (3090)	5787 (12755)	1110 (2450)	-0.6 (2)
	1530 (3370)		1380 (3045)		1110 (2450)	-1.2 (4)
	1525 (3360)		1370 (3025)		1115 (2455)	-1.8 (6)
	1540 (3400)		1380 (3045)		1125 (2480)	-2.4 (8)
	1610 (3550)		1435 (3170)		1150 (2540)	-3.0 (10)
	1920 (4230)		1710 (3770)		1210 (2670)	-3.6 (12)
					1350 (2985)	-4.2 (14)
					1990 (4390)	-4.8 (16)

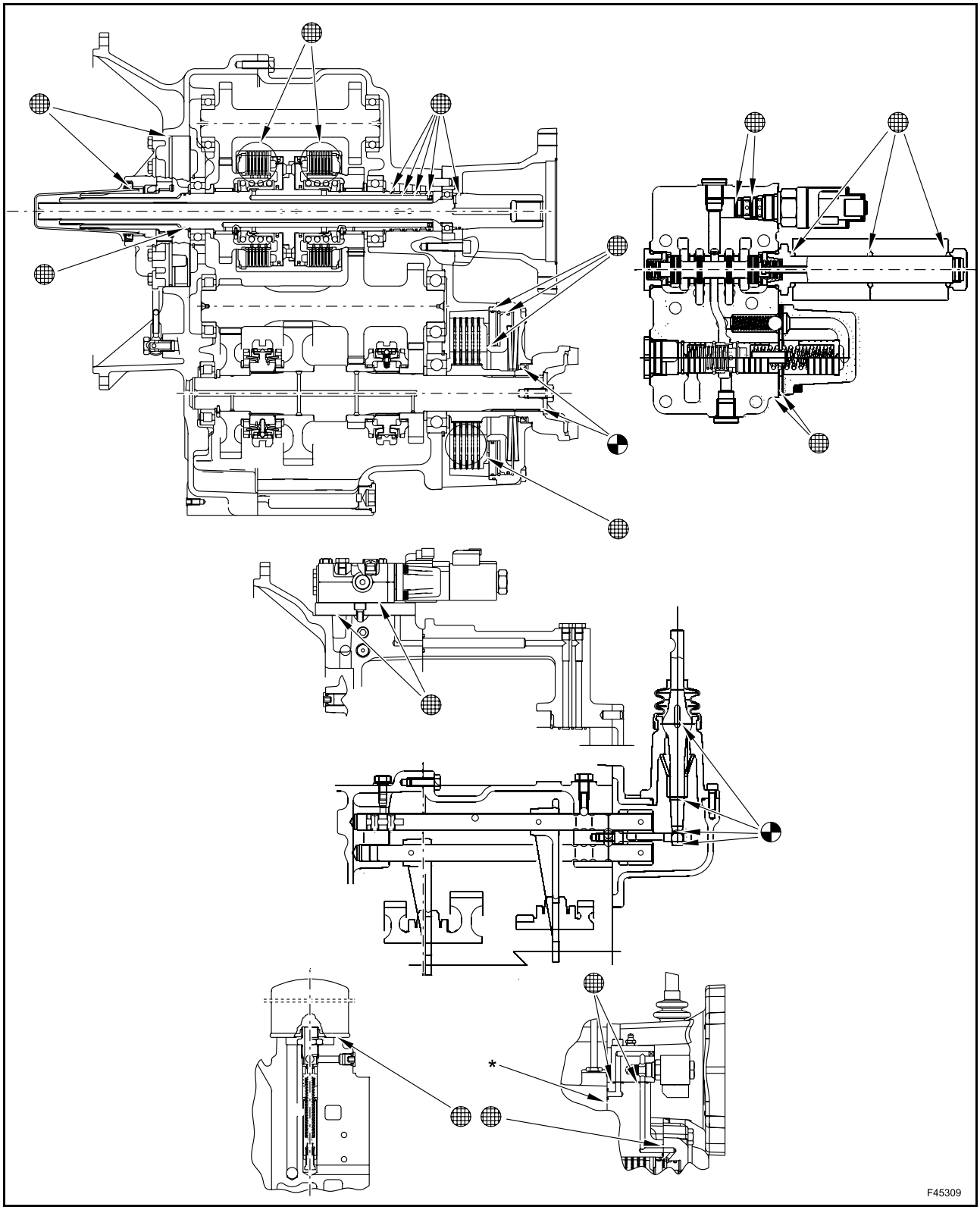
REF.	DESCRIPTION	NOTES
1	Suction filter	250 micron
2	Pump	36 cm^3/rev (2.19 in^3/rev)
3	Filter	10 micron
4	Pressure regulator	
5	Oil filter relief valve	23 bar (334 psi)
6	Parking brake valve	
7	Parking brake clutch	
8	Torque converter relief valve	3.5 ÷ 5.5 bar (51 ÷ 80 psi)
9	Torque converter	
10	Oil cooler	
11	Temperature thermostat port	
12	Flow divider	
13	Forward/reverse travel modulation valve	
14	Modulation relief valve	
15	Forward/reverse travel selector valve	
16	Forward gear clutch	
17	Reverse gear clutch	
18	Forward/reverse travel shaft lubrication	
19	1st, 2nd, 3rd, 4th gear shaft lubrication	
20	Pressure check port of torque converter	
21	Pressure check port of lubrication return from cooler	
22	Forward/reverse gear main pressure check port	
23	Forward gear pressure check port	
24	Reverse gear pressure check port	
25	Differential lock engagement/release	
26	Hydraulic differential lock valve	
27	Main pressure port	
28	Air breather	

GREASING

Tecnolube POLYMER 400 grease

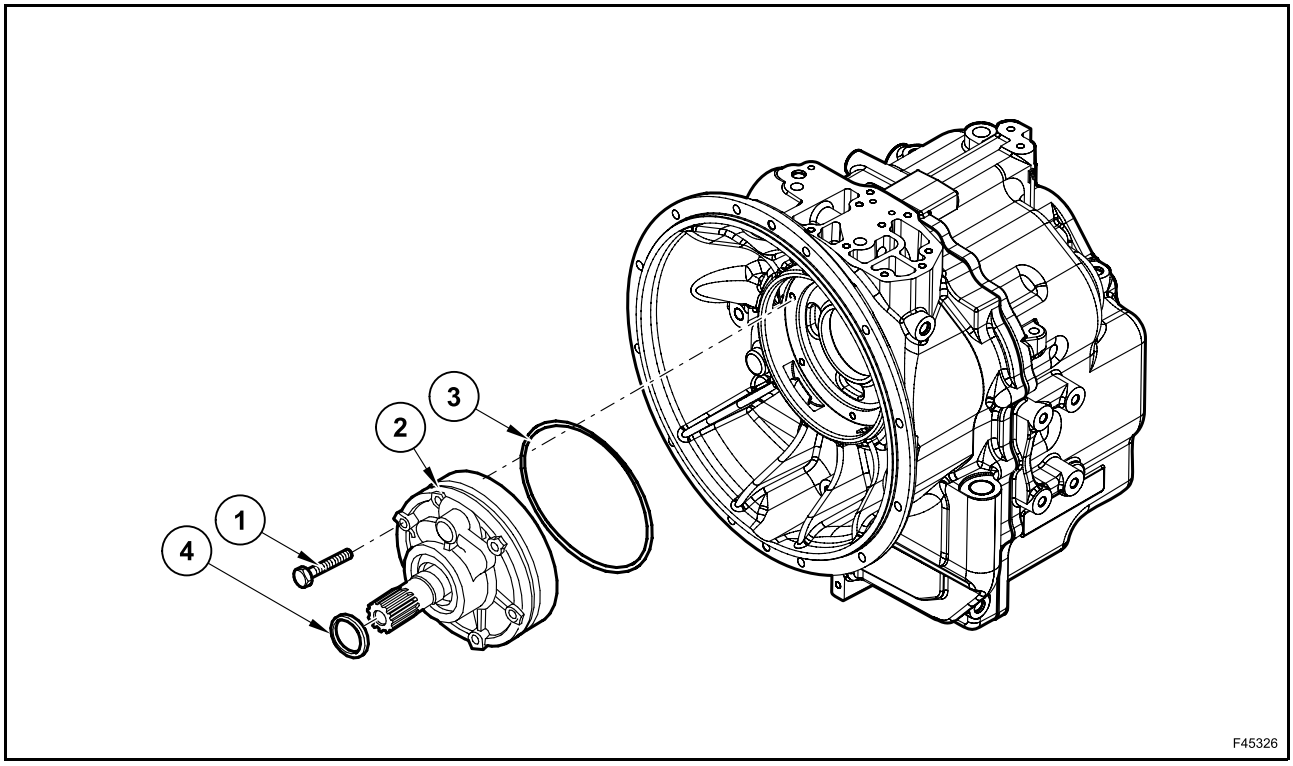
Transmission oil

2WD - 4WD



*: no grease, no oil

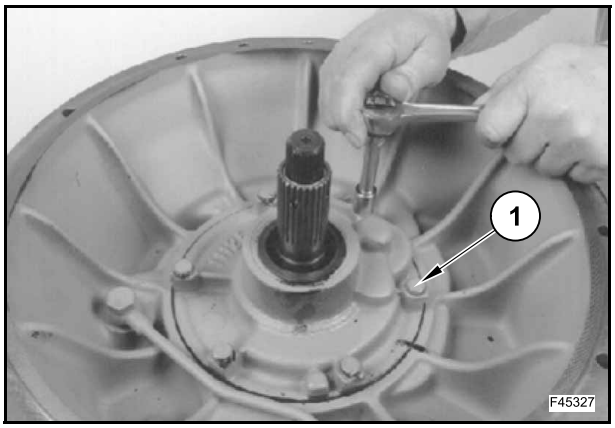
OIL PUMP



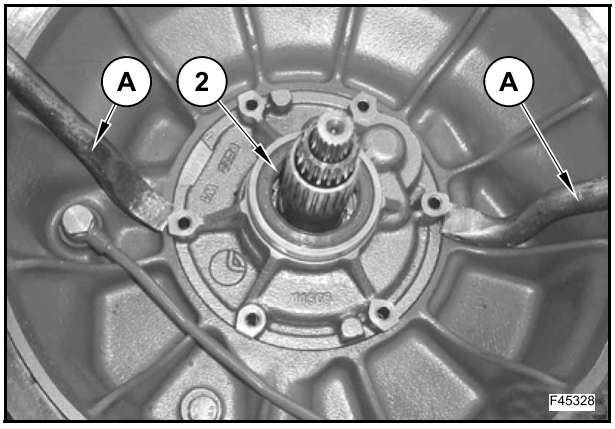
Disassembly

Loosen and remove the screws (1).

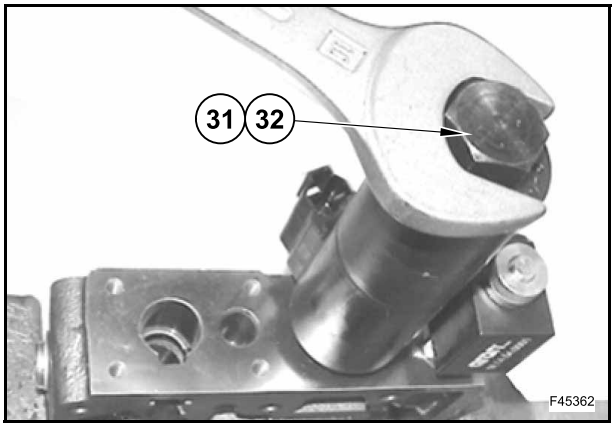
Mark the oil pump position with respect to the bell housing before loosening the screws.



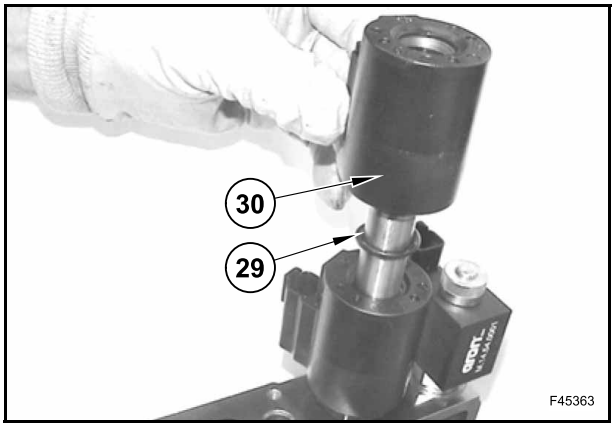
Use two levers (A) to pull out the oil pump (2).



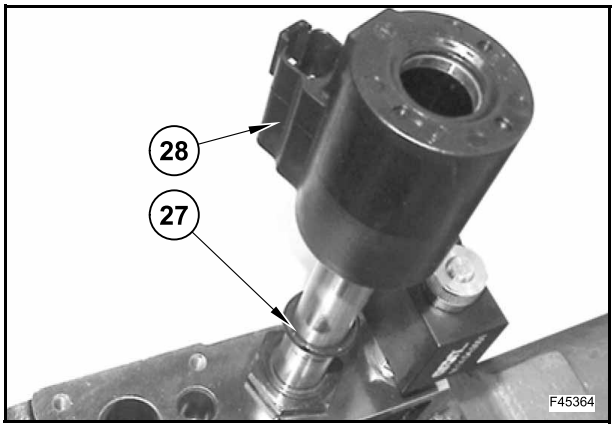
Remove the plug (32) and the O-ring (31).



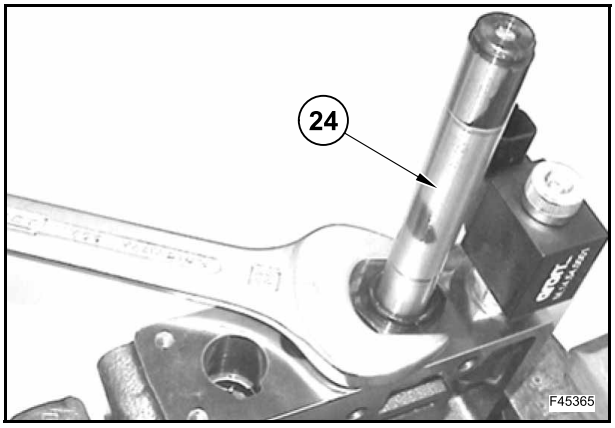
Remove the solenoid valve coil (30) and the O-ring (29).



Remove the solenoid valve coil (28) and the O-ring (27).

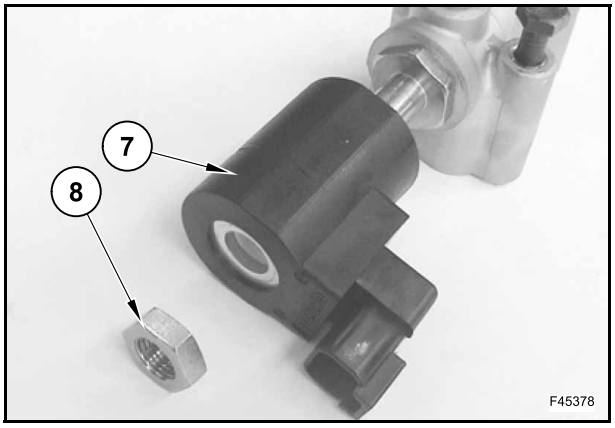


Unscrew the solenoid tube (24).



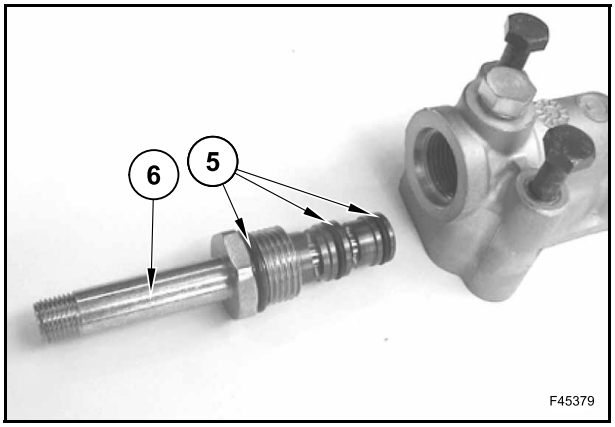
Remove the nut (8).

Remove the solenoid valve coil (7).

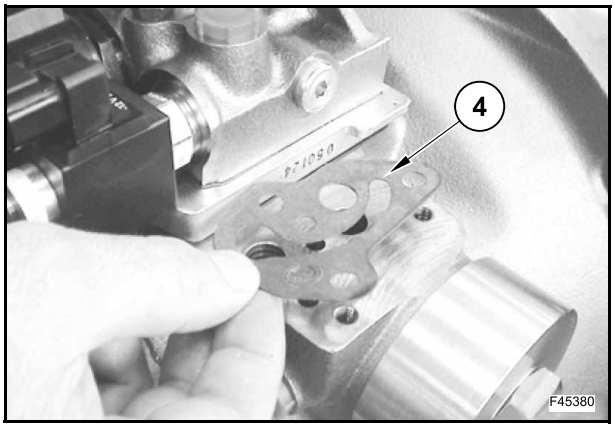


Remove the shaft (6).

Remove the O-rings (5).



Remove the gasket (4).

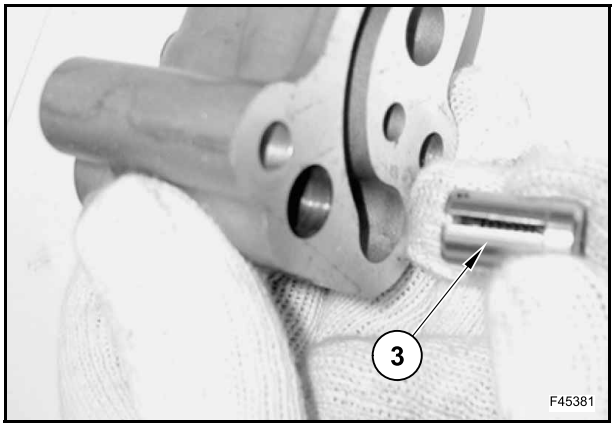


If necessary, remove the valve (3).

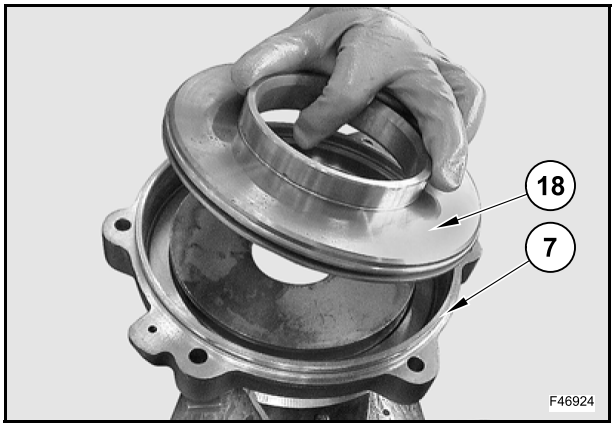
Do not disassemble the valve (3).

There are no serviceable parts.

If there is a problem, use a new valve.

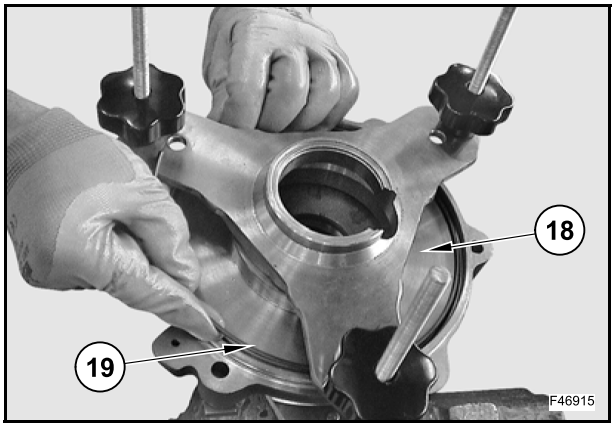


Assemble the piston assembly (18) in the cover (7).

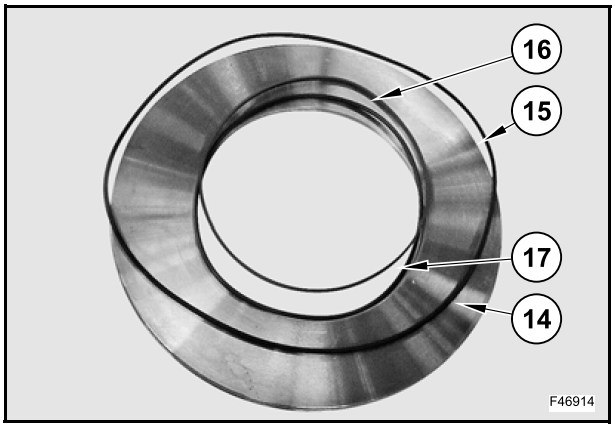


Press the piston (18) as much as possible to mount the snap ring (19) by means of the tool 380200215.

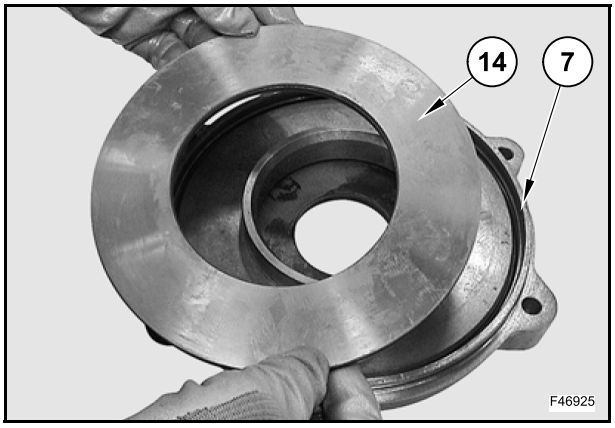
Assemble the snap ring (19).



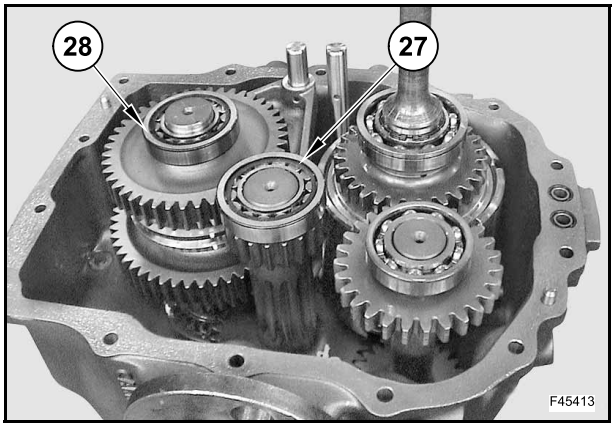
Assemble the O-ring (15), the O-ring (17) and the seal ring (16) on the retaining plate (14).



Assemble the retaining plate (14) in the cover (7).

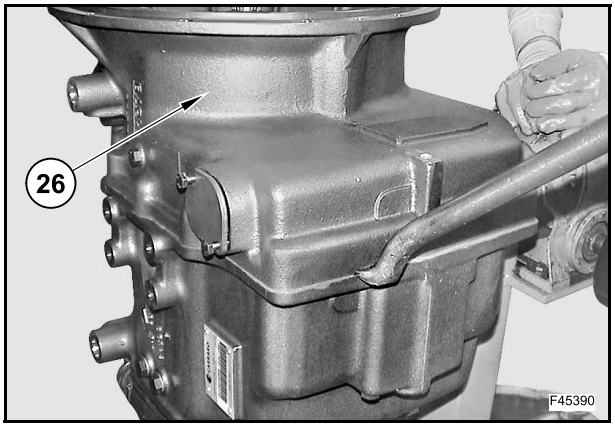


Lubricate and assemble the bearings (27) and (28).

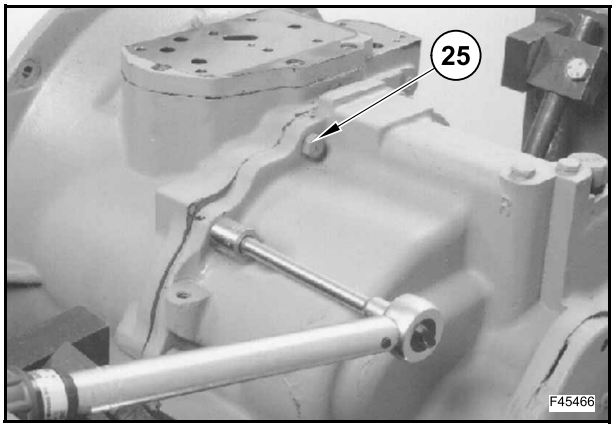


Assemble the front half box (26).

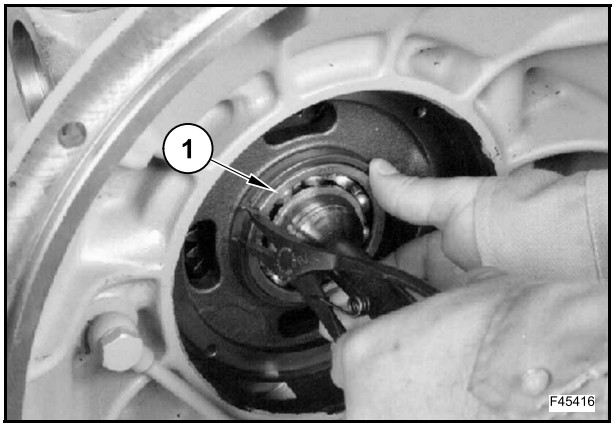
Make sure that the bearings of the shafts go straight into the bores in the front box.



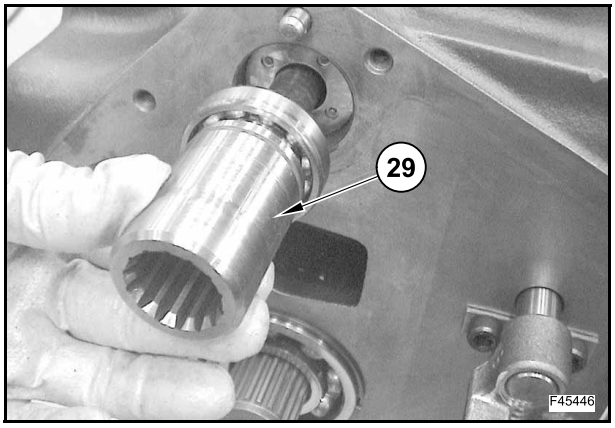
Screw in and tighten the screws (25) to a tightening torque of 50 Nm (37 lbf·ft).



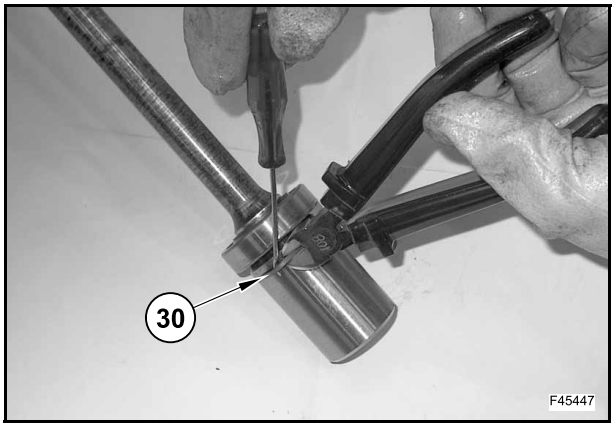
Assemble the snap ring (1).



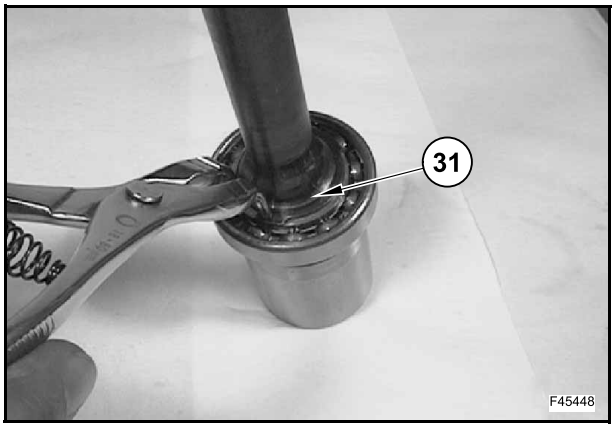
Remove transmission shaft PTO (29) by pushing lightly on the opposite side.



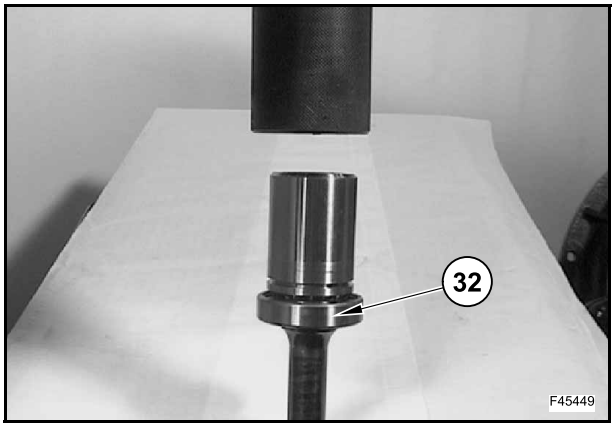
If necessary, replace the seal ring (30) by cutting it.



Remove the snap ring (31).

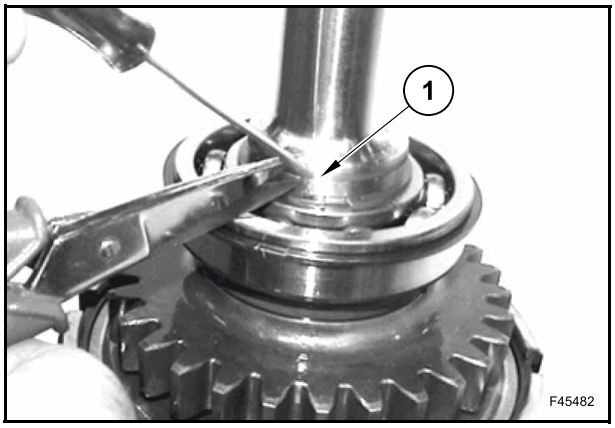


Take out the bearing (32) by means of tool 380200190.

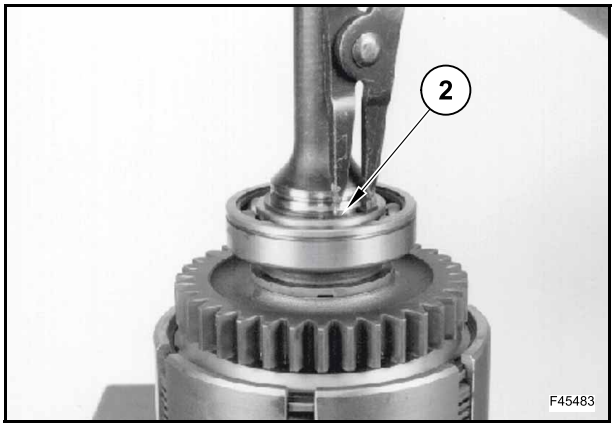


Shaft (A)

If necessary, remove the seal ring (1).



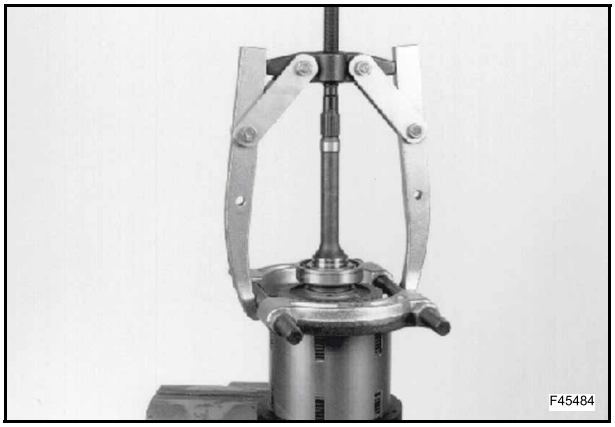
Remove the snap ring (2).



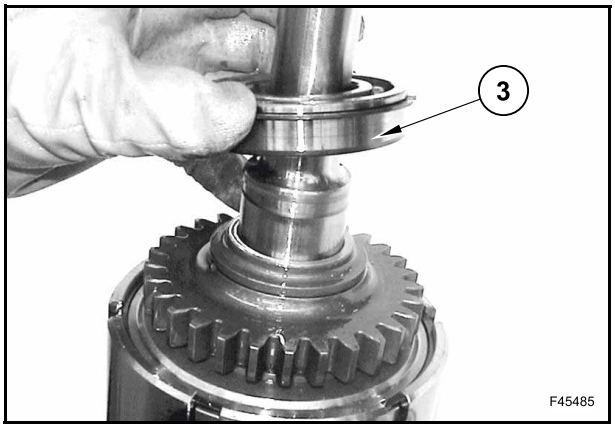
Assemble a bearing separator under the gear (do not assemble the bearing separator between the gear and the bearing).

Use a puller on the bearing separator and insert a shaft protector between the puller and the end of the input shaft.

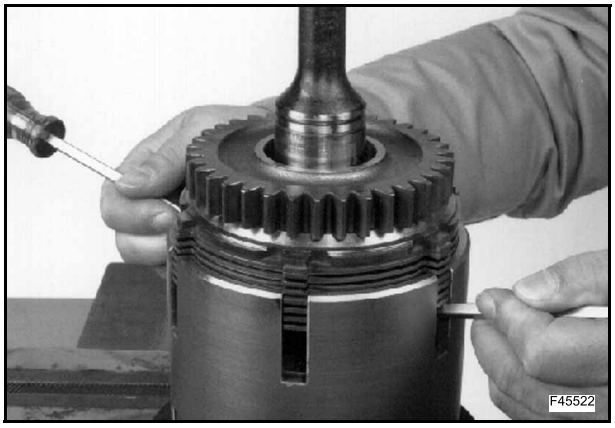
By means of puller which operates between separator and shaft protection, pull only until the bearing is free, otherwise the parts can be damaged.



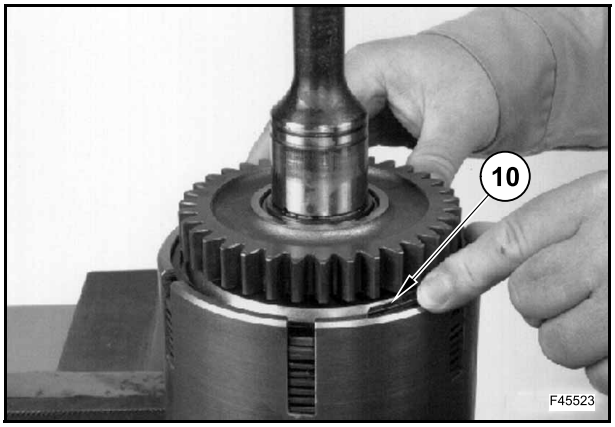
Remove the bearing (3).



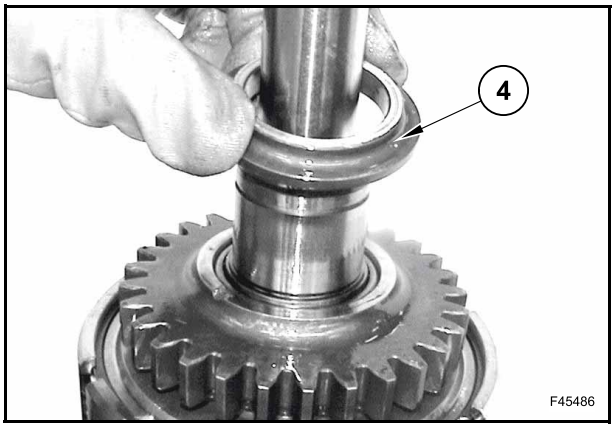
Use 2 screwdrivers to position the disc kit.



Assemble the snap ring (10).

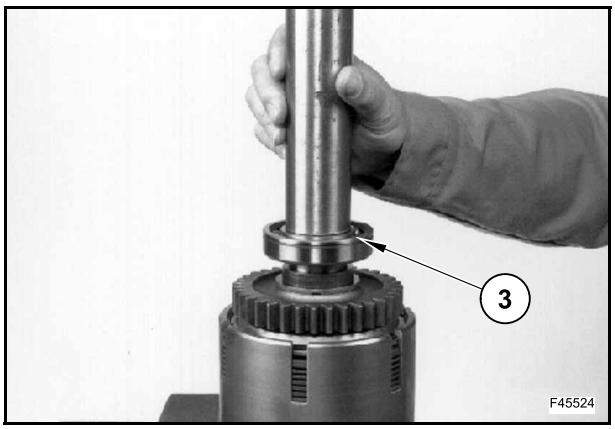


Assemble the spacer (4).



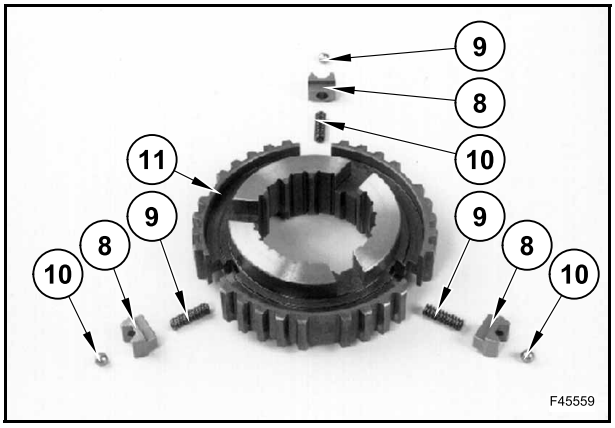
Heat the bearing (3) to 80 ÷ 100 °C (176 ÷ 212 °F).

Assemble the bearing (3) by means of tool 380200190.

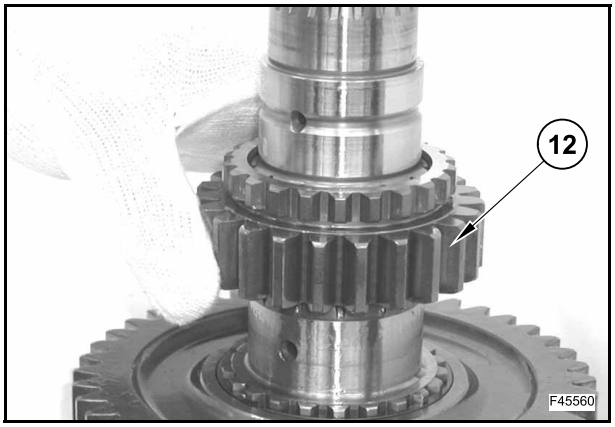


Remove the blocks (8), the balls (9), the springs (10) and the synchronizer hub (11).

The synchronizer hub contains 3 blocks (8), 3 balls (9) and 3 springs (10).

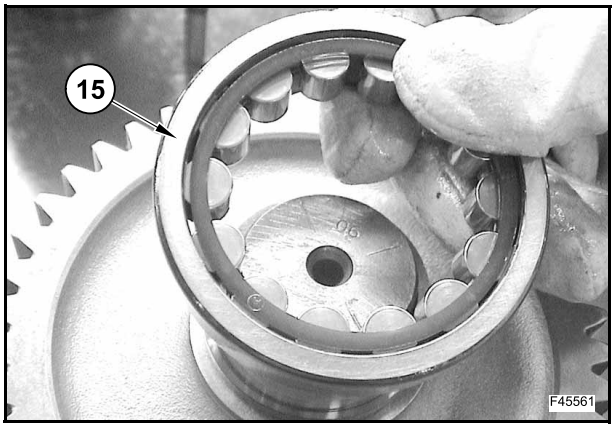


Remove the 4th speed gear (12).



Turn the shaft.

Remove outer ring of bearing (15).



Use a puller to remove inner ring of bearing (15).

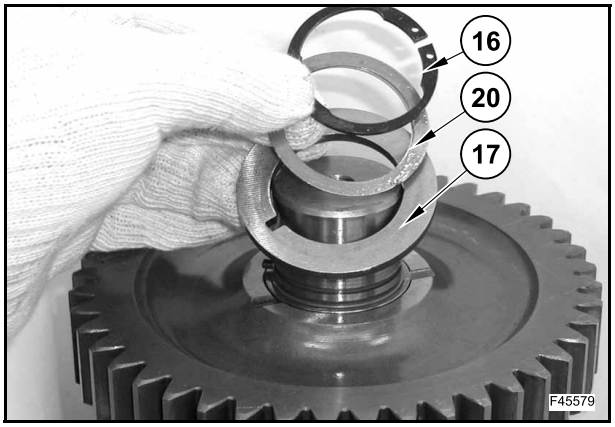
NOTE: *do not try to remove the bearing by pulling the gear since it is locked by snap ring (16).*

Use a thickness gauge.

If backlash “X” is more than the prescribed value, remove the snap ring and the thrust washer from their seats and, using the shims shown in the chart, reach the prescribed value.

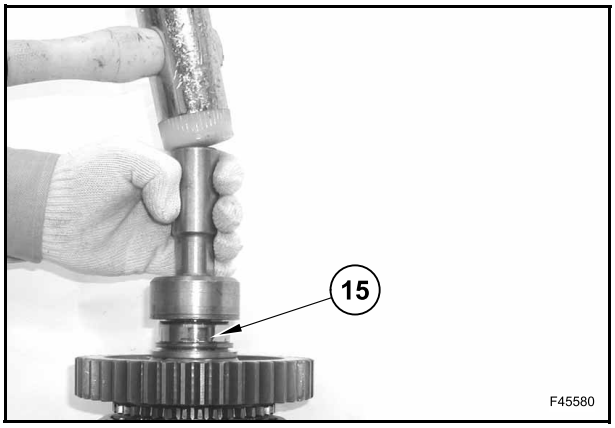
Correctly assemble the shims (20) between the thrust washer (17) and the snap ring (16).

SHIM RANGE				
Shims mm (in)	0.05 (0.002)	0.1 (0.004)	0.3 (0.012)	0.5 (0.02)

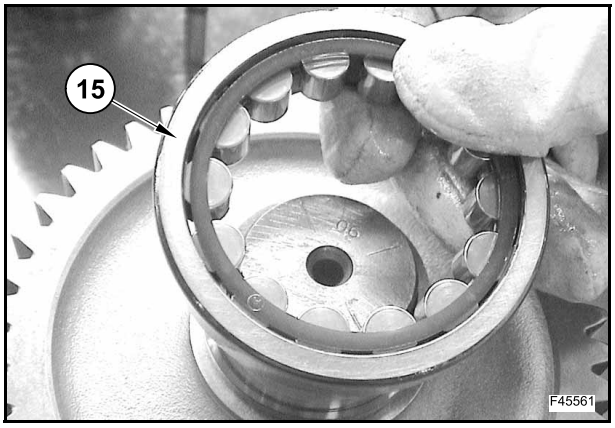


Heat the inner ring of the bearing (15) to 80 ÷ 100 °C (176 ÷ 212 °F).

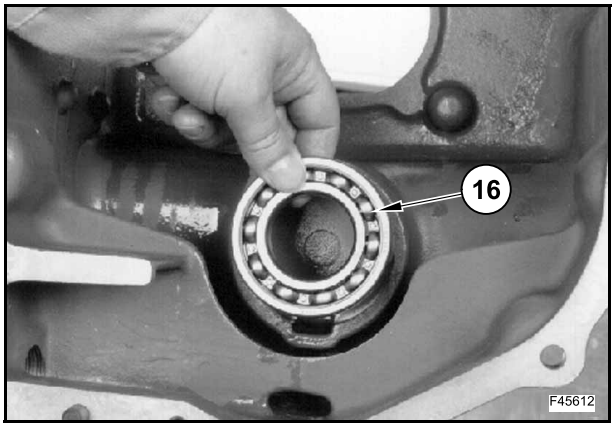
Assemble the inner ring of the bearing (15) by means of tool 380200203.



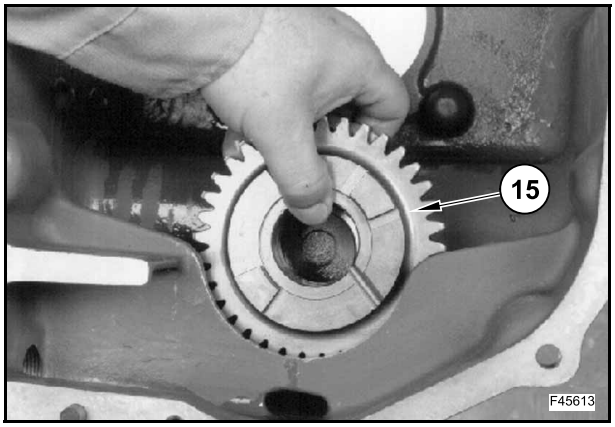
Assemble the outer ring of bearing (15).



Assemble the bearing (11).

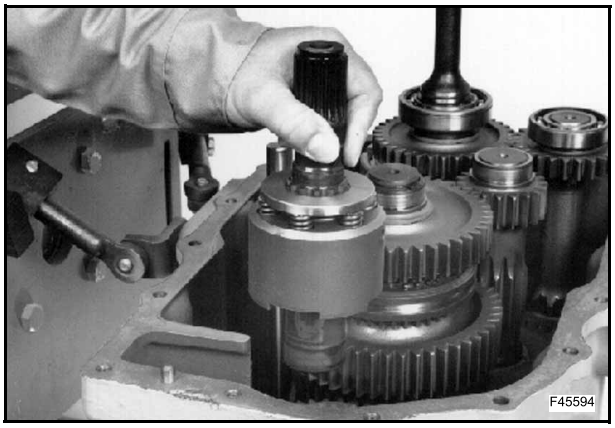


Assemble the gear (10).



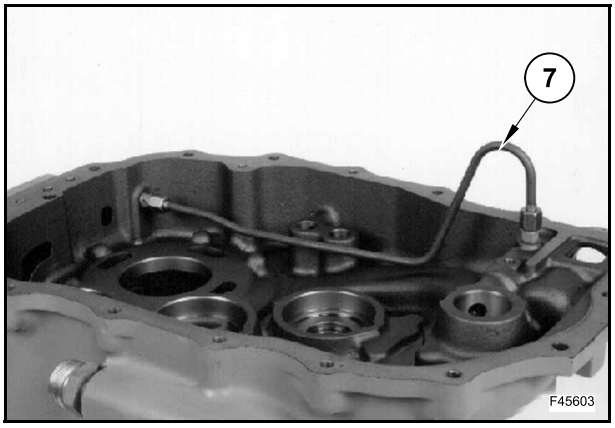
Assemble the shafts (B) and (C).

Assemble shaft (E).



Reassemble the 4WD clutch tube (7), if previously removed from the front box.

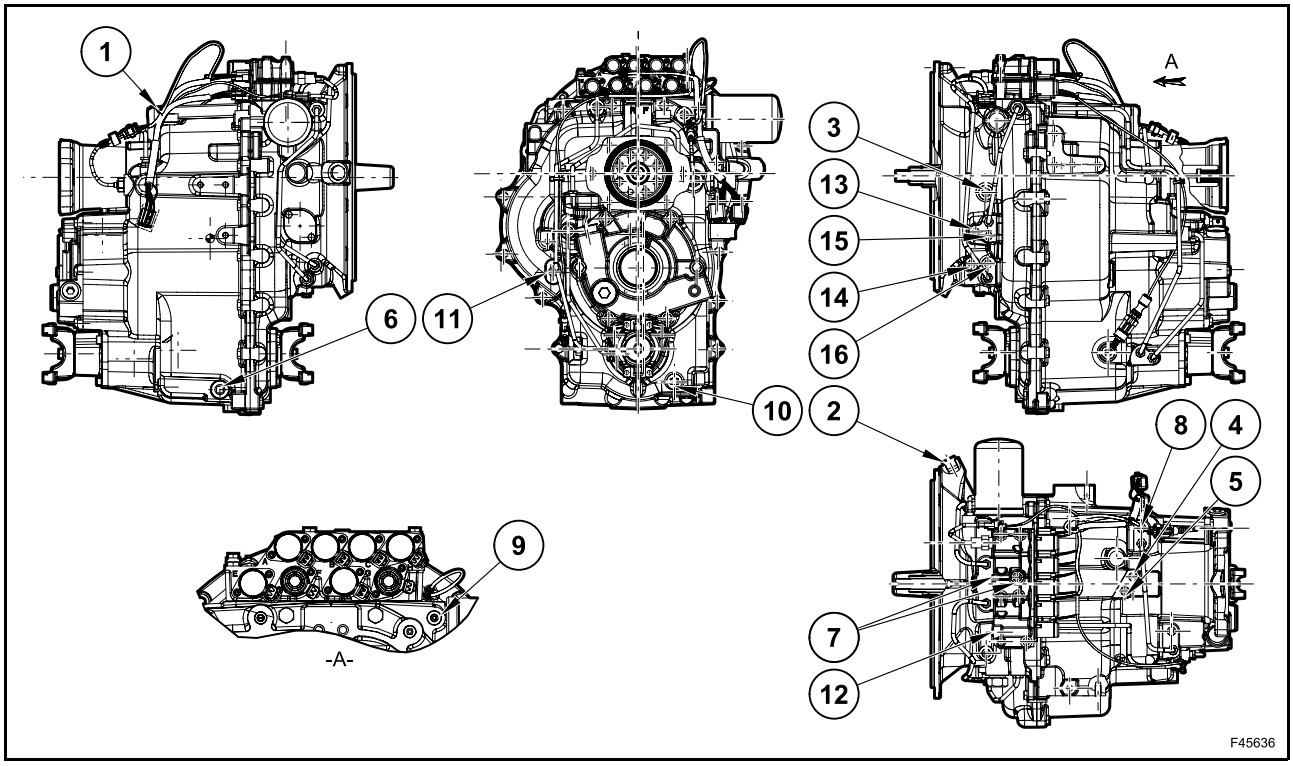
Assemble the front half box on the rear half box.



SPECIAL TOOLS

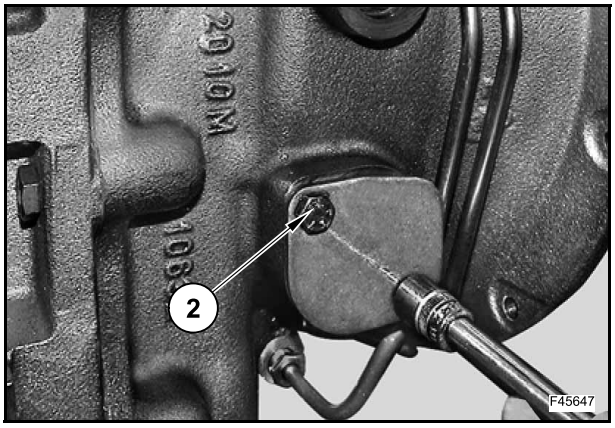
PN CNH	DESCRIPTION	USE	2WD	4WD
380002211	Handle	To be used with the various pushers and buffers	•	•
380200190	Buffer	Assembly / disassembly of several bearings	•	•
380200197	Buffer	Assembly of shaft A bearings	•	•
380200203	Buffer	Assembly of B and C shaft bearings	•	•
380200207	Protection	Assembly of 4WD shaft seal ring	/	•
380200208	Protection	Assembly of 4WD shaft seal ring	/	•
380200213	Protection	Assembly of 4WD shaft cover seal ring	/	•
380200214	Calibrator	Assembly of seal ring on PTO shaft and 4WD shaft	•	•
380200215	Attachment	Disassembly / assembly of clutch	•	•
380200218	Buffer	Assembly of oil pump seal ring	•	•
380200224	Cover and shims	Assembly of seal ring on shaft A	•	•
380200225	Plunger	Assembly of seal ring on PTO shaft and 4WD shaft	•	•
380001926	Protection	Clutch piston assembly	•	•
380200226	Buffer	Assembly of SAHR seal ring for parking brake	•	•
380200230	Buffer	Assembly of D shaft bearings	•	•
380001933	Cover and shims	Assembly of seal ring on shaft A	•	•
380001927	Calibrator	Assembly of seal ring on shaft A	•	•
380001928	Plunger	Assembly of seal ring on shaft A	•	•
380200246	Hook	Lifting of shafts B and C and of gear control yokes	•	•
380200257	Protection	Assembly of seal ring on PTO shaft	•	•
380200258	Tool	Disassembly / Assembly of snap ring on 4WD shaft	/	•

4WS



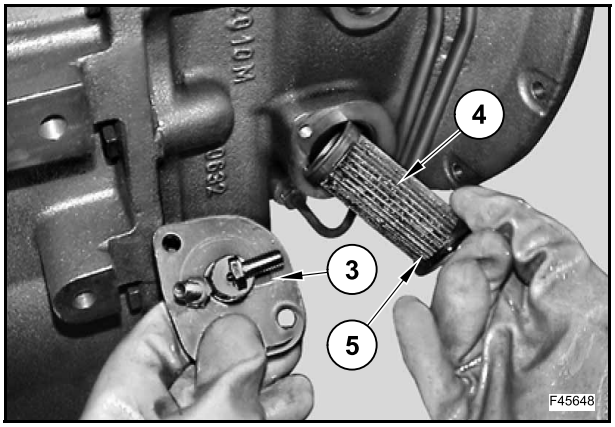
REF.	DIMENSION	USE	NOTES - MISCELLANEOUS
1	7/8” - 14 UNF	Oil inlet from cooler	
2	7/8” - 14 UNF	Oil outlet to cooler	
3	9/16” - 18 UNF	Check port for torque converter input pressure	3 ÷ 9 bar (43.5 ÷ 130 psi)
4	9/16” - 18 UNF	Forward gear pressure check port	13.5 ÷ 16.5 bar (196 ÷ 239 psi) 0.3 bar (4.3 psi) = maximum pressure in neutral position
5	9/16” - 18 UNF	Reverse gear pressure check port	13.5 ÷ 16.5 bar (196 ÷ 239 psi) 0.3 bar (4.3 psi) = maximum pressure in neutral position
6		Oil drain plug	
7	9/16” - 18 UNF	Oil pressure delivery to differential lock	14 ÷ 17 bar (203 ÷ 246 psi)
8	9/16” - 18 UNF	Lubrication pressure check port (from cooler) Oil outlet to brake tank	1 ÷ 5 bar (14.5 ÷ 72.5 psi) forward/reverse gear 1 ÷ 5 bar (14.5 ÷ 72.5 psi) neutral position
9	9/16” - 18 UNF	Brake oil pressure delivery	14 ÷ 17 bar (203 ÷ 246 psi)
10	9/16” - 18 UNF	Oil return	
11	9/16” - 18 UNF	Oil level check port	
12	9/16” - 18 UNF	Oil main pressure check port	14 ÷ 17 bar (203 ÷ 246 psi)
13	1/8” - BSP	Lubrication check port	
14	1/8” - BSP	Check port of 1st gear	
15	1/8” - BSP	Check port of 2nd gear	
16	1/8” - BSP	Check port of 4th gear	

Loosen and remove the 2 screws (1).



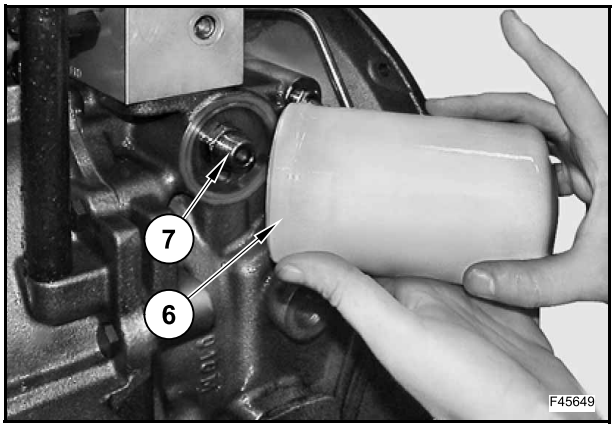
Remove cover (3).

Remove the oil filter (4) and the O-ring (5).

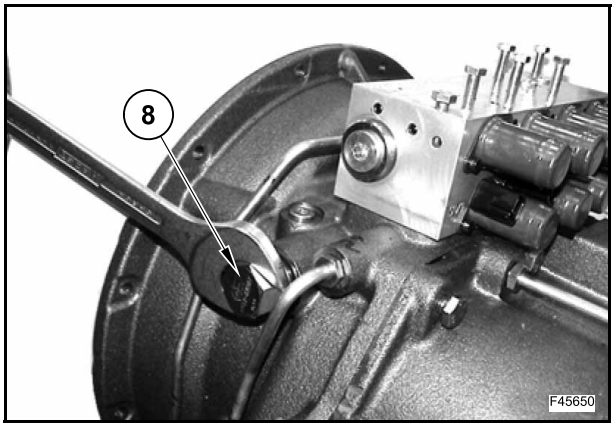


Unscrew and remove the oil filter (6).

If necessary, remove the fitting (7).

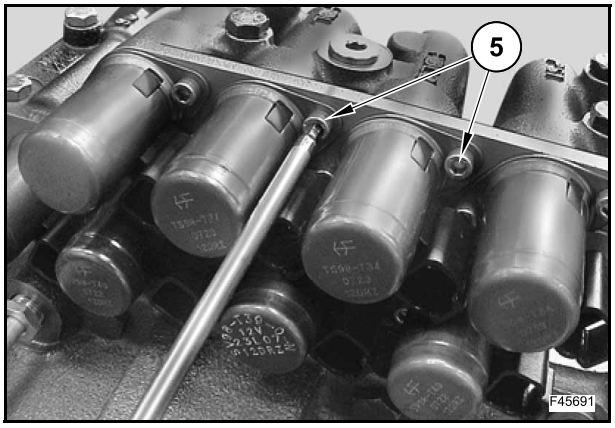


Loosen and remove the valve (8).

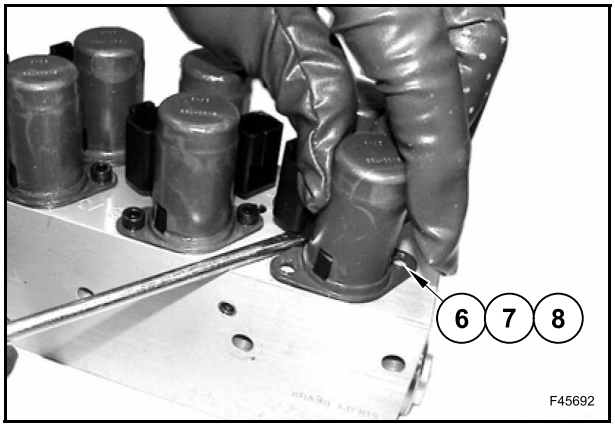


Place the control valve on a workbench.

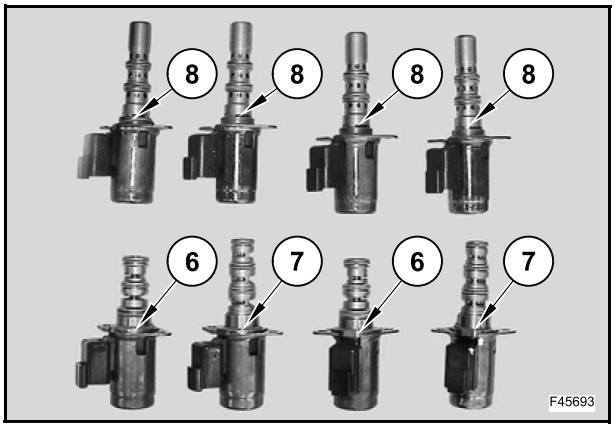
Loosen and remove the screws (5) of the valves.



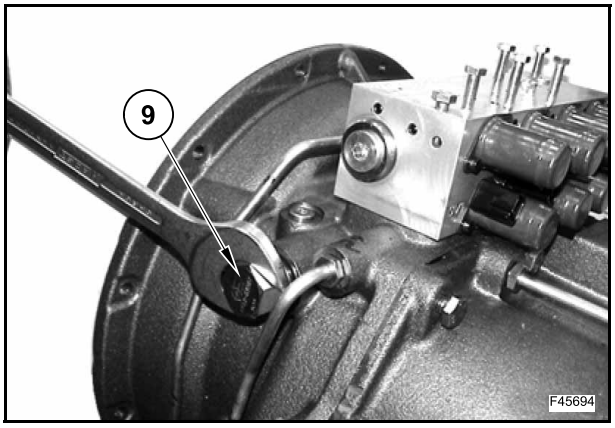
Pull out the valves (6), (7) and (8) with a screwdriver.



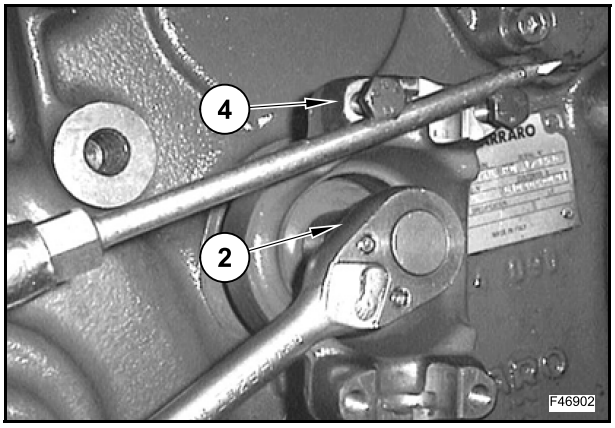
Check the valves (6), (7) and (8).



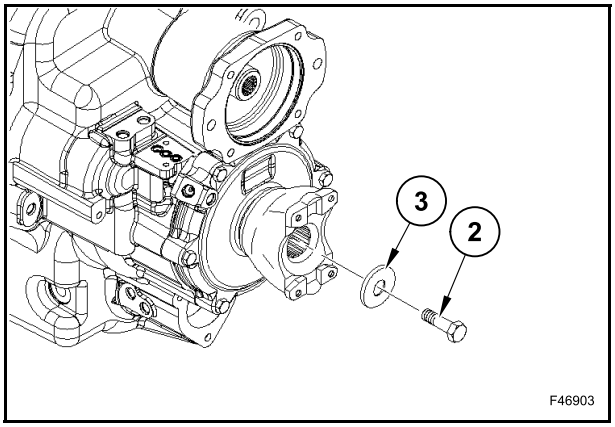
Loosen and remove the valve (9).



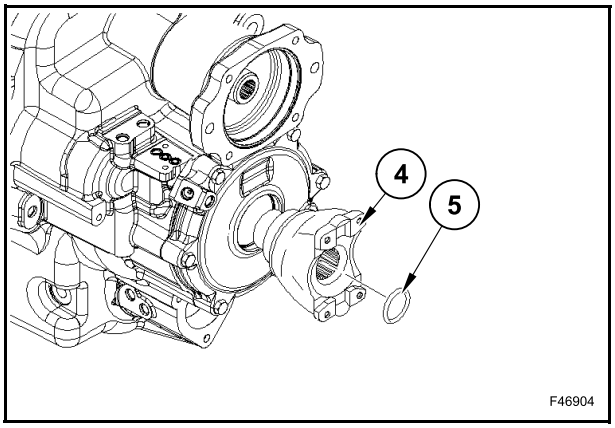
Unscrew the screw (2) of the flange (4).



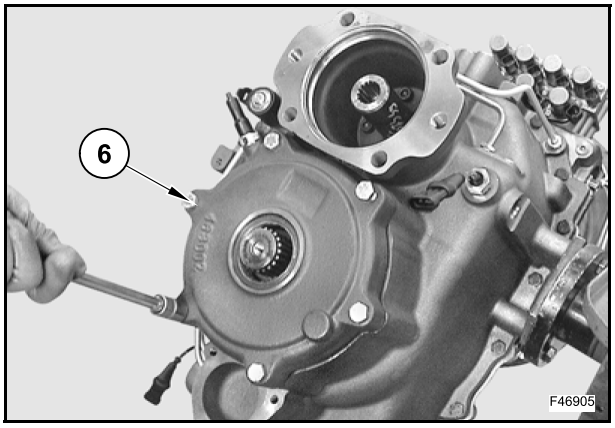
Loosen the screw (2) and the washer (3).



Remove the flange (4) and the O-ring (5).



Loosen and remove the screws (6) using the procedure below.

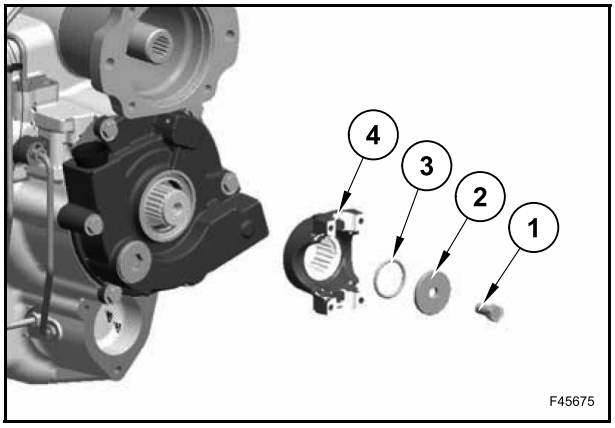


Unscrew the screw (1).

Use a screwdriver and 2 screws to lock the flange.

Remove the screw (1) and the washer (2).

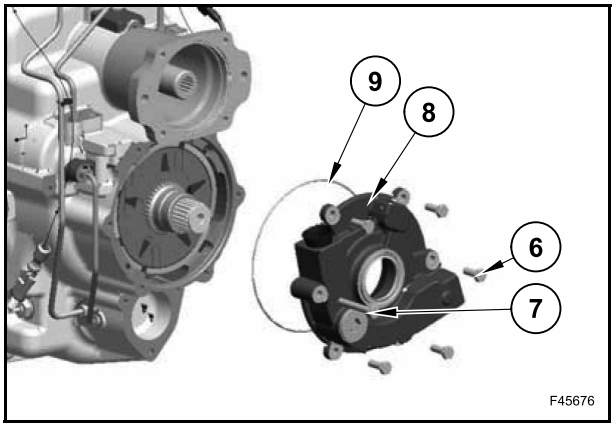
Remove the flange (4) and the O-ring (3).



Loosen and remove the screws (6) and (7).

Remove the brake (8) assembly.

Remove the O-ring (9) from the brake (8).

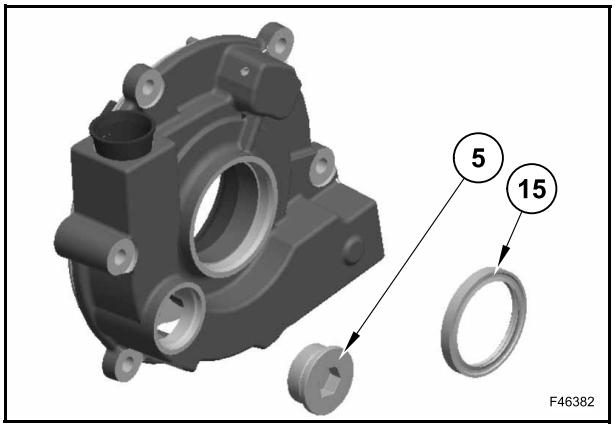


Remove the seal ring (15).

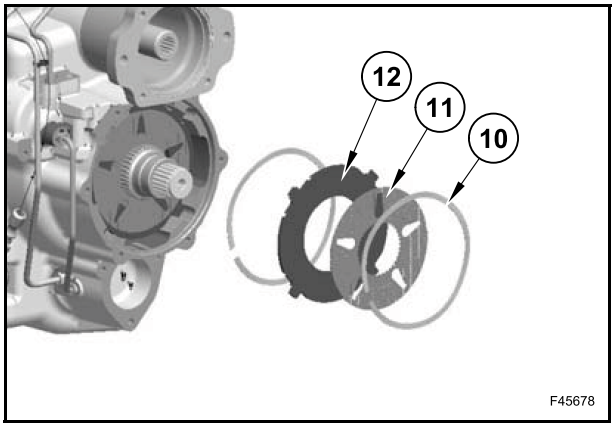
⚠ WARNING ⚠

The seal ring can be damaged.

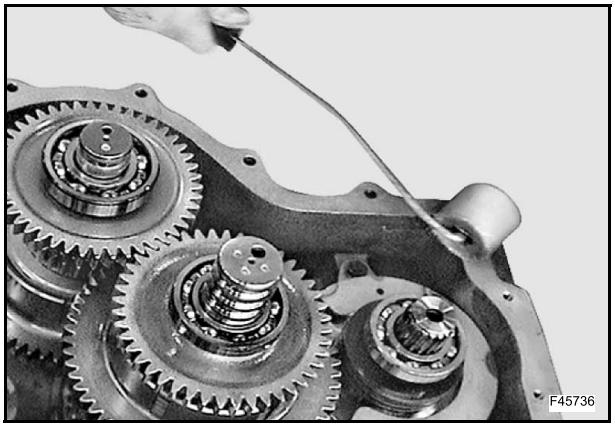
Remove the plug (5).



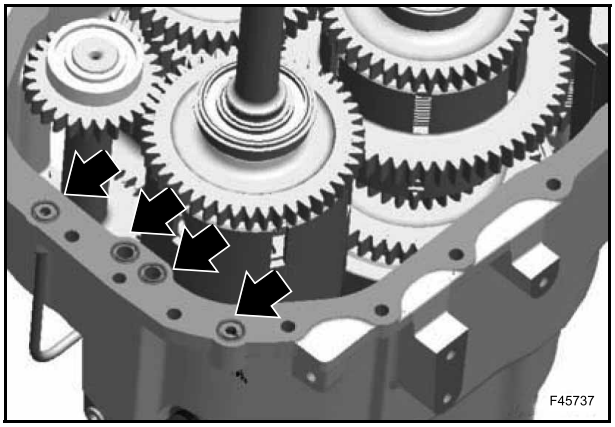
Remove the rings (10), the 5 brake discs (11) and the 5 counterdiscs (12).



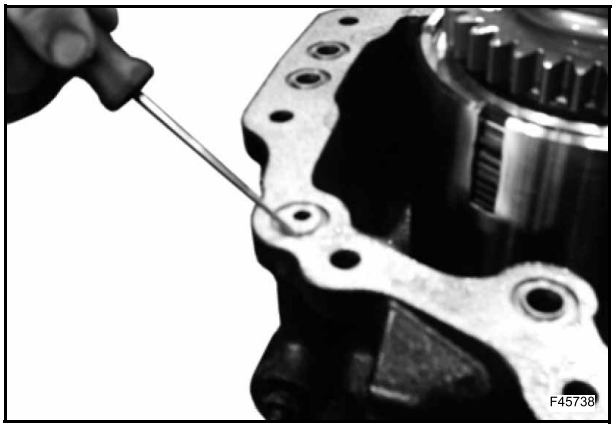
Spread the sealant uniformly.



Prevent the penetration of the sealant in the O-ring seats.

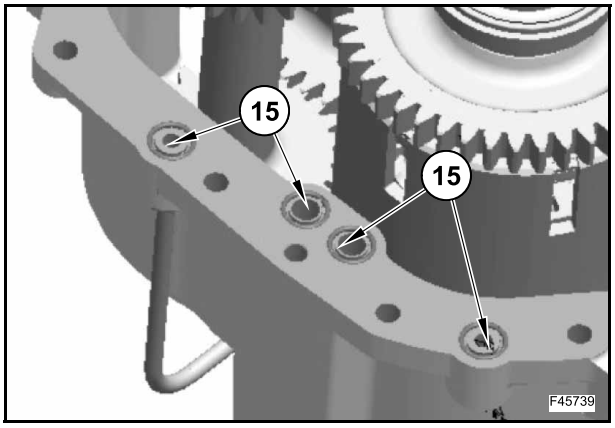


Carefully clean the O-ring seats.

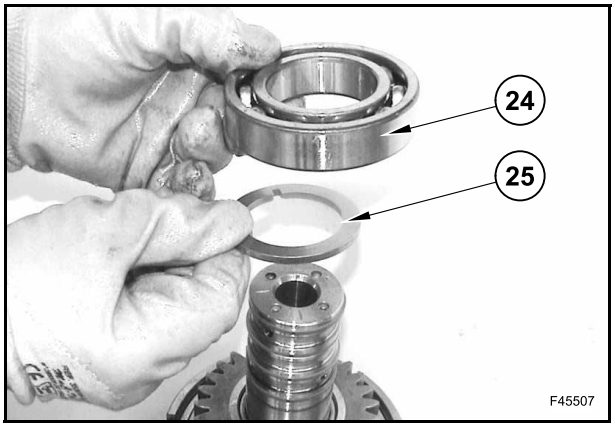


Assemble the O-rings (15).

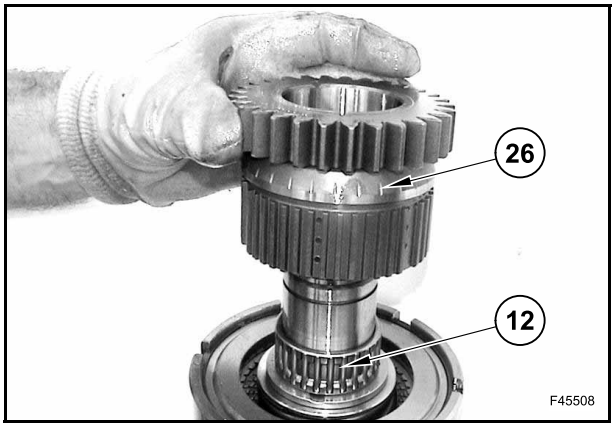
Do not lubricate the O-rings.



Remove the bearing (24) and the thrust washer (25).



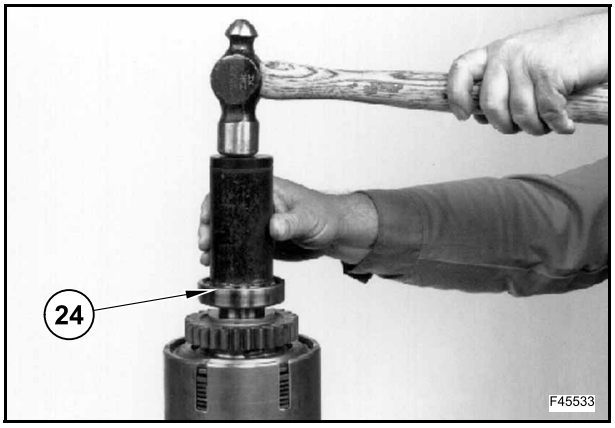
Remove the gear (26) and the roller retainer (12).



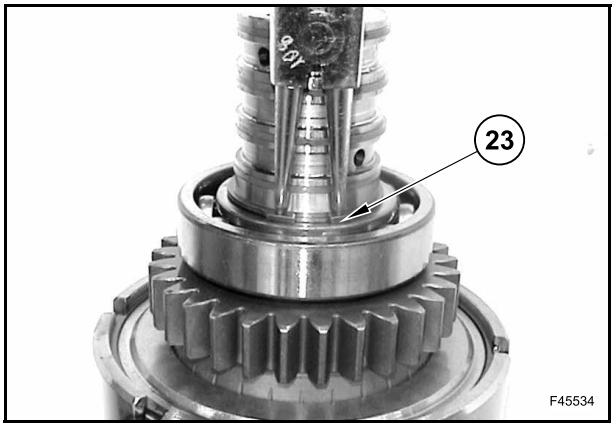
For the disassembly of other parts, repeat the operations described previously.

Heat the bearing (24) to 80 ÷ 100 °C (176 ÷ 212 °F).

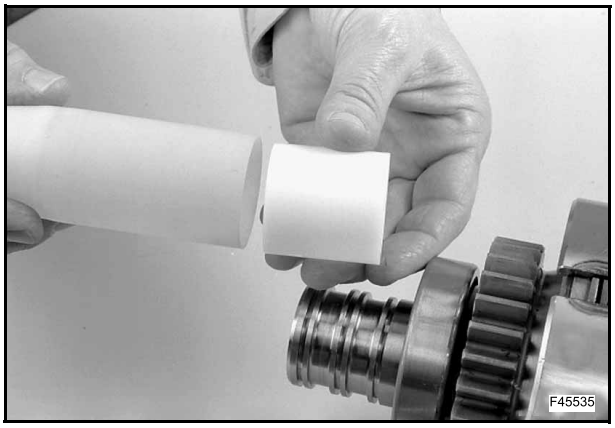
By means of tool 380200197 place the bearing (24) onto the input shaft until it makes contact with the thrust washer.



Assemble the snap ring (23).

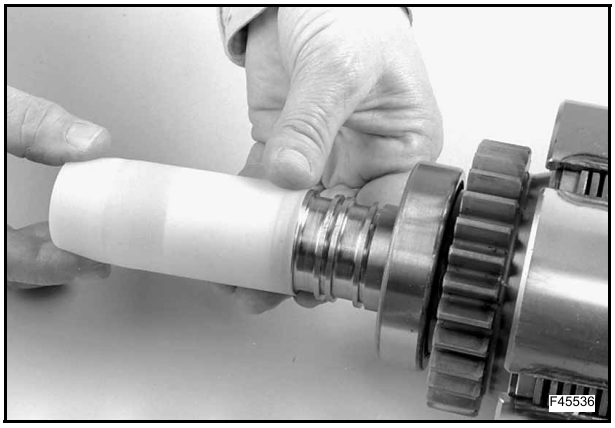


Assemble the snap rings and place the spacer in the protection (tool 380001933).

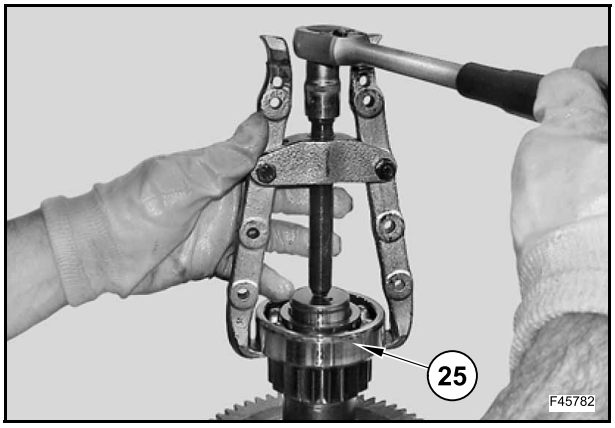


Place tool 380001933 on the shaft.

The tool will stop in the correct position to install the seal ring in the groove.



Remove the bearing (25) by means of a puller.



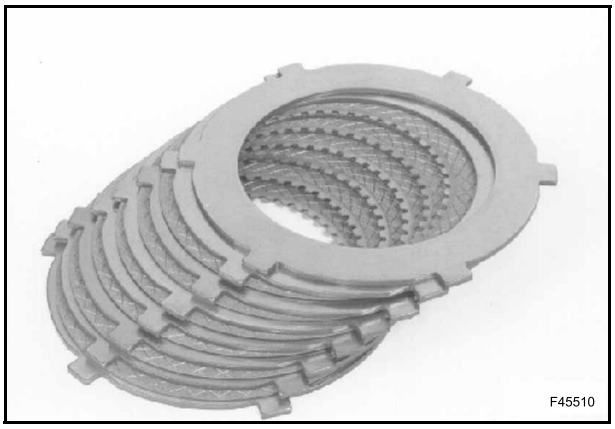
Check the seal ring grooves (large and small) for wear or damage.

Check if the output shaft is worn or damaged.

Check oil passages in the output shaft to be sure that they are open and free of foreign material.

Check the ball bearings and the needle bearings for flat areas, pitting or other damage.

If you are to re-use the clutch discs, observe the assembly order.



At each disassembly check with a gauge that the total thickness of the clutch disc kit remains within the wear limits; otherwise replace the clutch disc kit (11) with a new one.

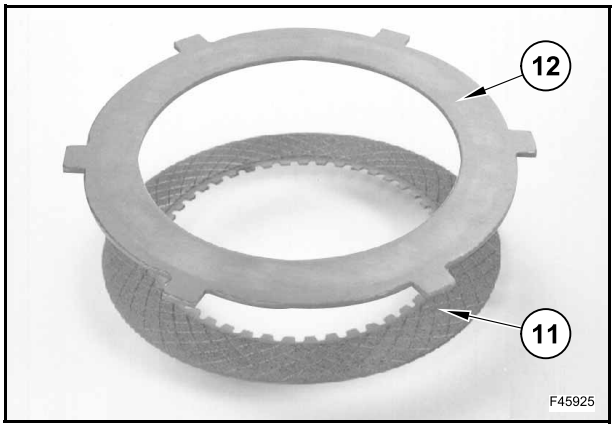
Verify that all clutch discs are free from burns, that the friction surfaces are not damaged and that the grooves of the friction surfaces are well outlined.

Moreover, verify that the counterdiscs (12) are perfectly flat, without scrapes or pittings.

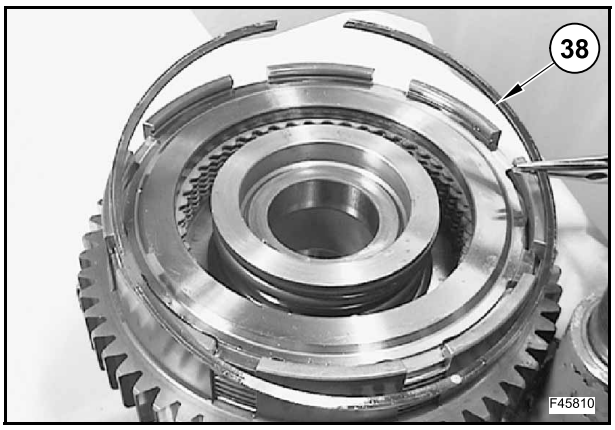
In case any of the discs shows even just one of the above-mentioned faults, replace the clutch disc kit with a new one.

If you are to use a new kit of clutch discs, let it soak into a bath of oil for at least one hour before its use.

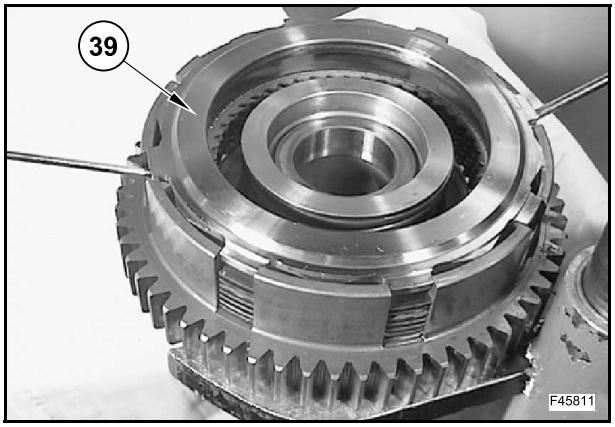
In any case, prior to assembling the clutch disc kit, lubricate the contact surfaces of the counterdiscs with oil.



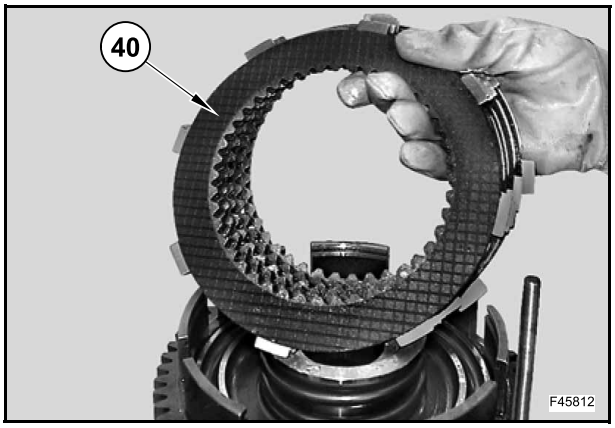
Remove the snap ring (38).



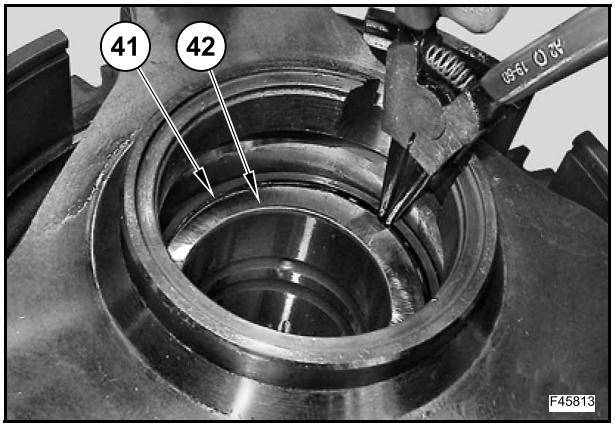
Remove the thrust washer (39) by means of 2 screwdrivers.



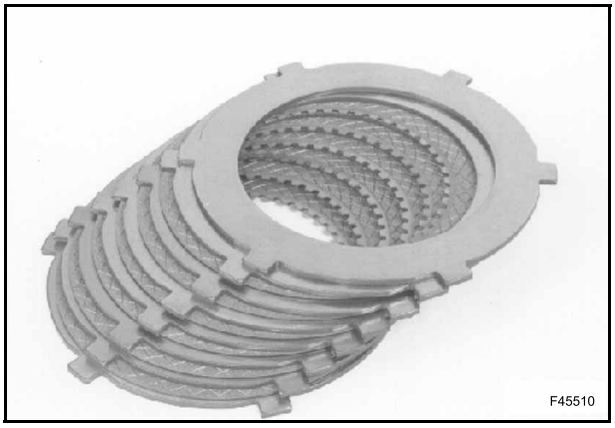
Remove the disc kit (40).



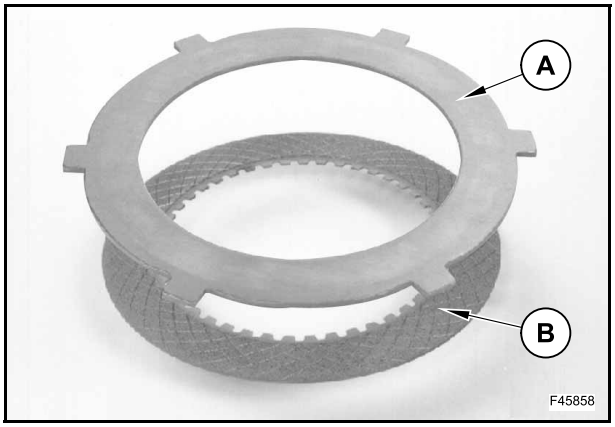
Lower the cover (42) so as to allow the extraction of the snap ring (41) by means of tool 380200215.



If you are to re-use the clutch discs, observe the assembly order.



At each disassembly check with a gauge that the total thickness of the clutch discs remains in the wear limits; otherwise replace the clutch disc kit (B) with a new one.



Verify that all clutch discs are free from burns, that the friction surfaces are not damaged and that the grooves of the friction surfaces are well outlined.

Moreover, verify that the counterdiscs (A) are perfectly flat, without scrapes or pittings.

In case any of the discs shows even just one of the above-mentioned faults, replace the clutch disc kit with a new one.

If you are to use a new kit of clutch discs, let it soak into a bath of oil for at least one hour before its use.

In any case, prior to assembling the clutch disc kit, lubricate the contact surfaces of the counterdiscs with oil.

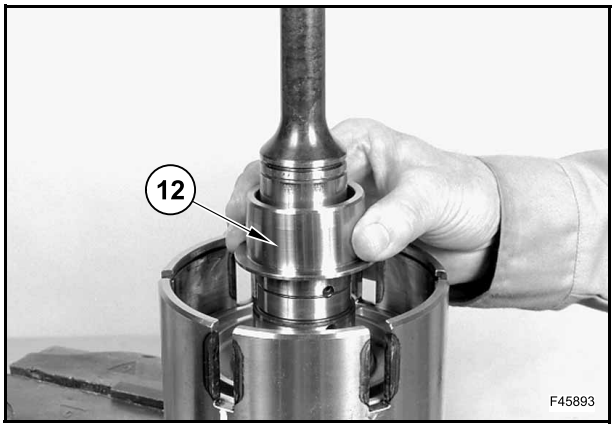
Check that the hole of the input shaft on the rear half box does not show damages that could cause leaks when the clutch is assembled.

Check that the grooves of the input shaft are not damaged by the steel discs.

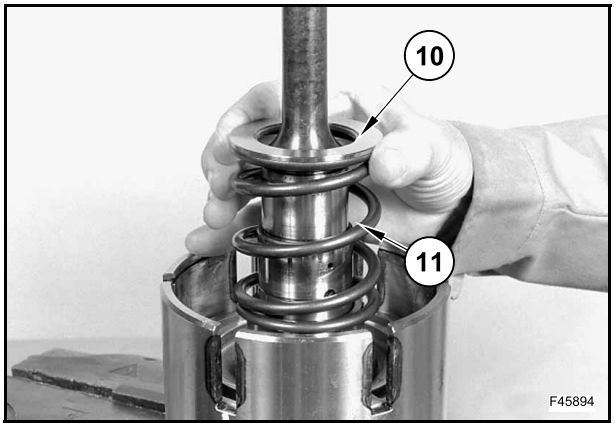
Apply a thin film of oil on the seal rings recently fitted.

Insert the piston (13) by means of tool 380001926 to protect the seal rings.

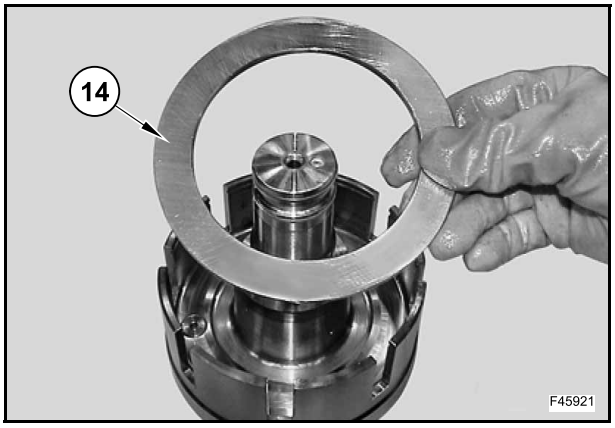
Assemble the sleeve (12).



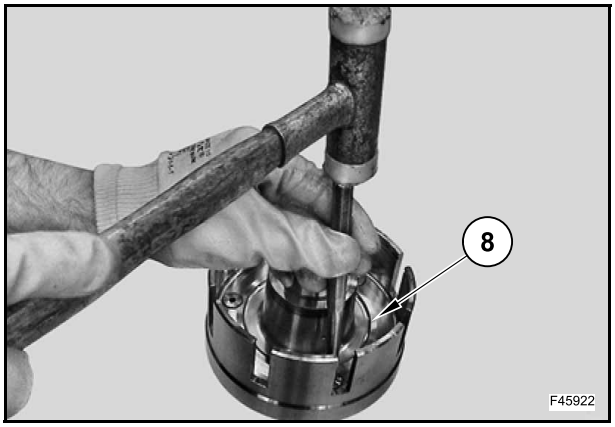
Assemble the spring (11) and the cover (10).



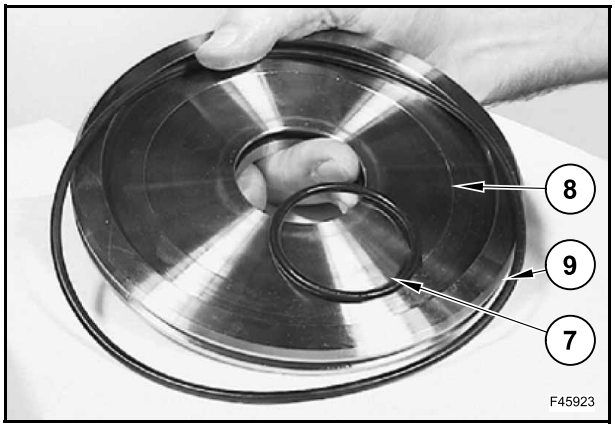
Remove the counterdisc (14).



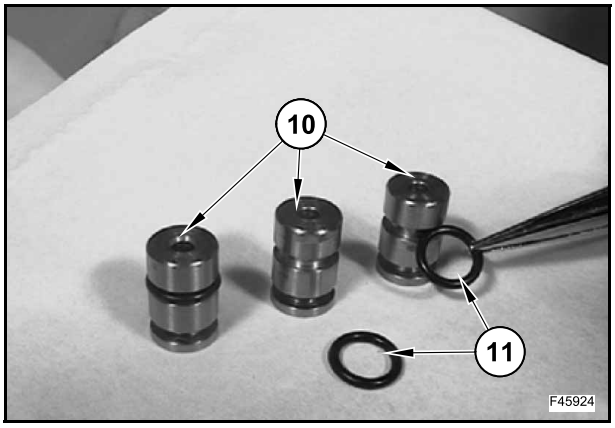
Take out the piston (8).



Remove the inner (7) and outer O-ring (9) from the piston (8).

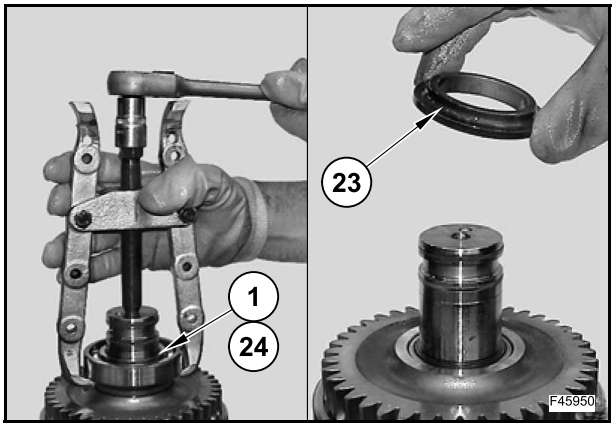


Remove the pins (10) and the O-rings (11).

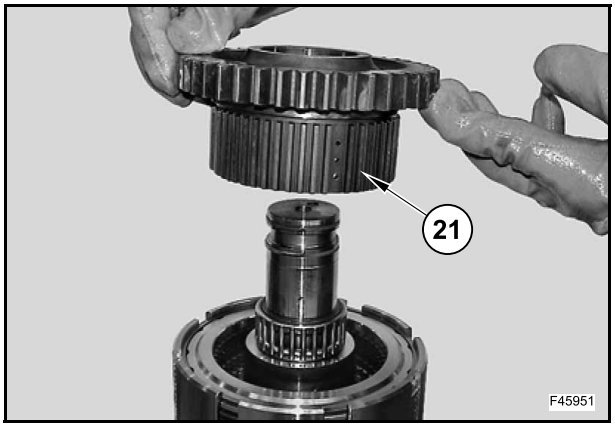


Remove the bearings (1) and (24) by means of a puller.

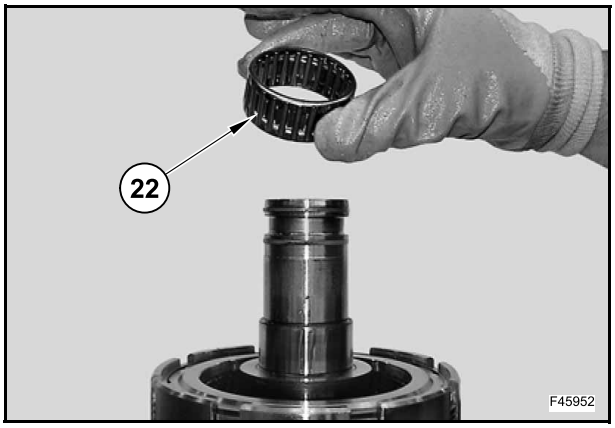
Remove the spacer (23).



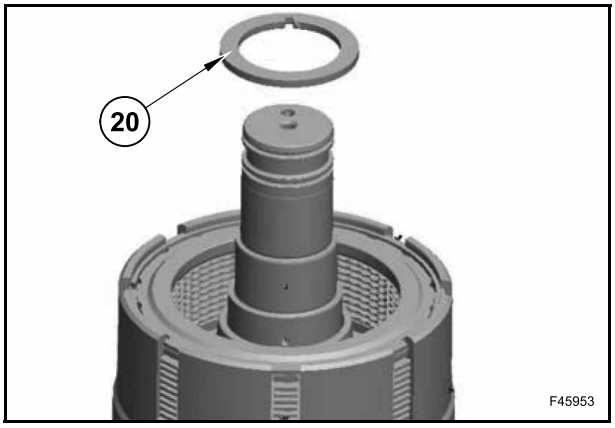
Remove the gear (21).



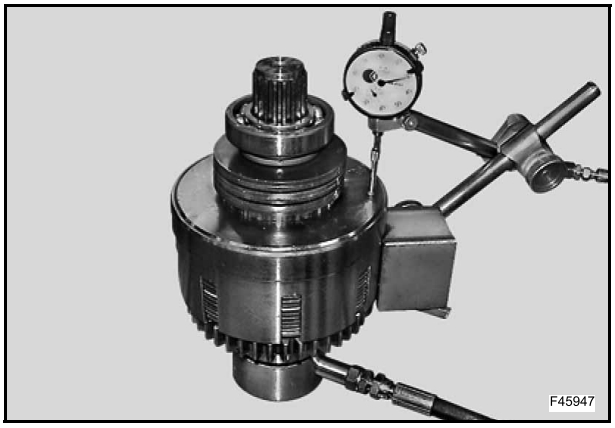
Remove the roller retainer (22).

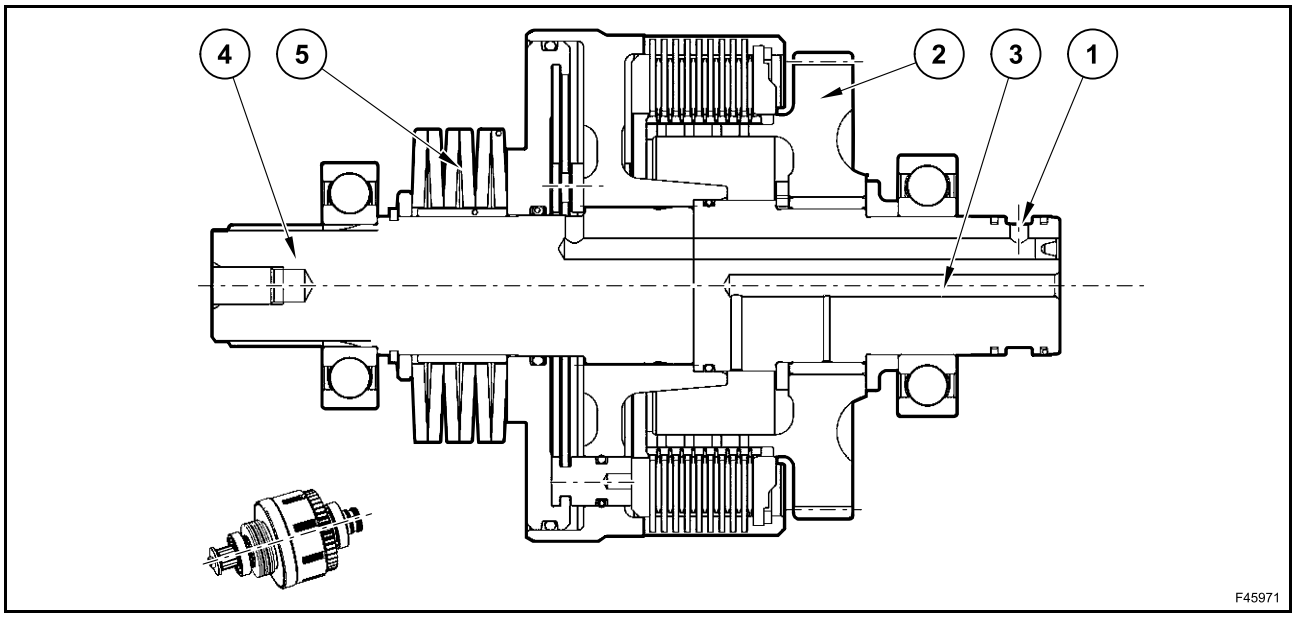


Remove the thrust washer (20).



In order to check the sealing of the rings, put the piston chamber under pressure with oil at 10 bar (145 psi) and verify with a dial gauge that the actual stroke is 1.70 ÷ 1.90 mm (0.067 ÷ 0.075 in).





1. 4WD oil passage
2. 4WD gear
3. 4WD lubricant oil passage
4. Shaft
5. Belleville washers

Apply compressed oil pressure of approximately 10 bar (145 psi) to the 4WD clutch passage.

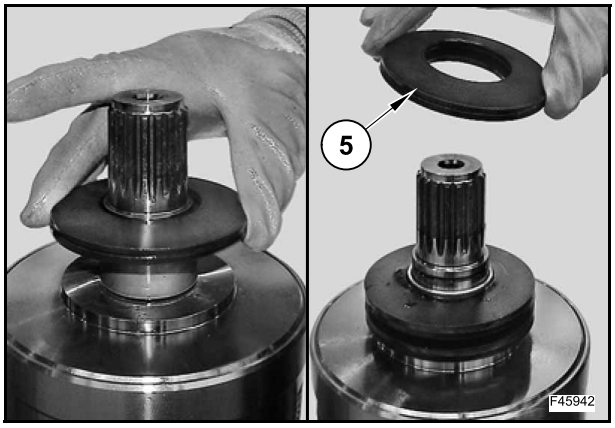
Listen for the piston to move and to unlock the related clutch disc kit.

The Belleville washers compress themselves. Try to shift the 4WD gear.

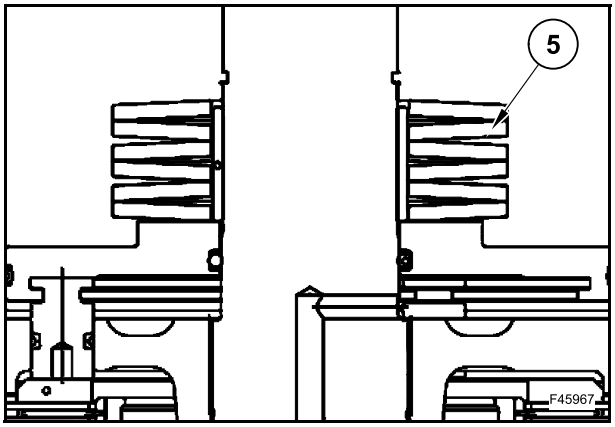
It must turn freely on the 4WD shaft.

If the clutches do not work correctly, disassemble them to find the problem.

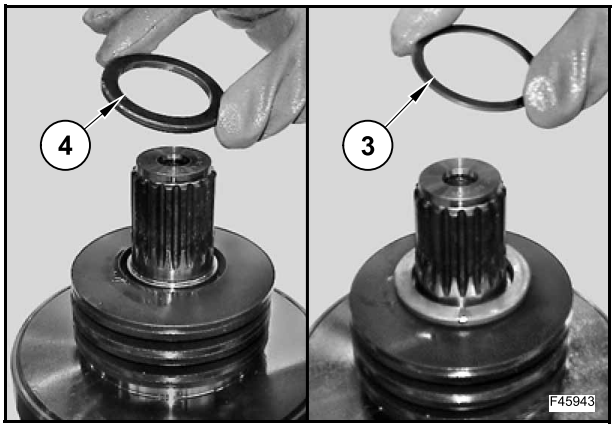
Insert the Belleville washers (5).



Check the proper orientation of the Belleville washers (5).

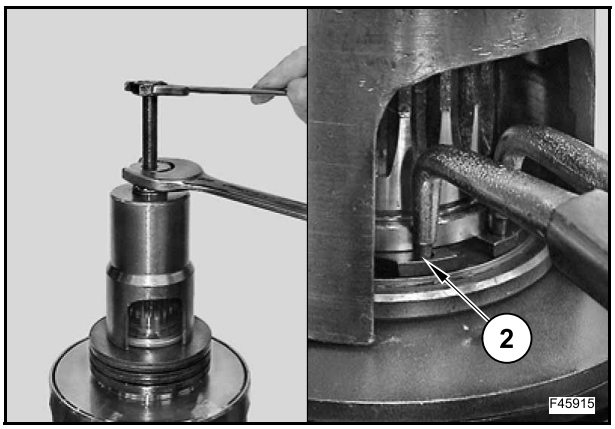


Assemble the thrust washer (4) and the shims (3) with size “S” previously calculated.



Press the Belleville washers and fit the snap ring (2) by means of tool 380200275.

The springs can cause damages to persons if the snap ring is not assembled correctly.



DISASSEMBLY AND ASSEMBLY

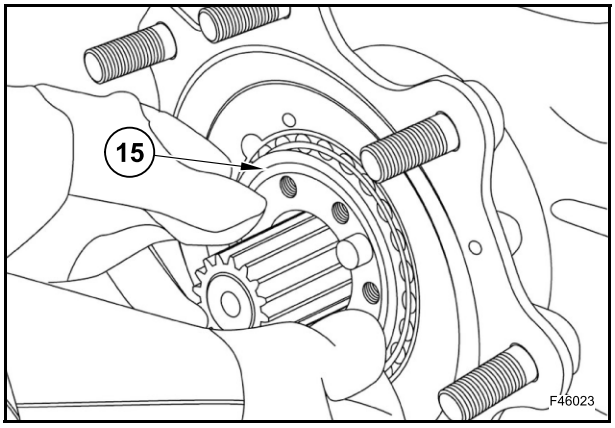
NOTE: *The 2WD and 4WD axles are identical, with the following exceptions: the 2WD axle has pressed steel plugs in the bores, while the 4WD has internal gears and shafts.*
The 2WD axle reduction gear has no planetary carrier.

MOUNTING SCREW TORQUE

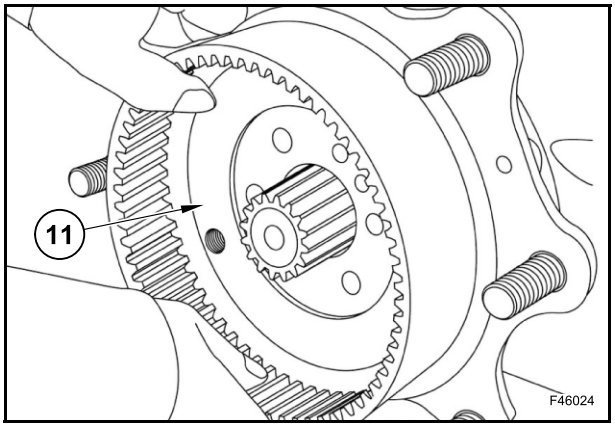
Tie rod nut, standard	111 ÷ 137 Nm (82 ÷ 101 lbf·ft)
Tie rod nut, HD	213 ÷ 263 Nm (157 ÷ 194 lbf·ft)
Tie rod ball joint nut, standard	129 ÷ 160 Nm (95 ÷ 118 lbf·ft)
Ball joint nut, HD	162 ÷ 200 Nm (119 ÷ 147 lbf·ft)
Tie rod ball joint nut, standard	255 ÷ 315 Nm (188 ÷ 232 lbf·ft)
Breather	11 ÷ 14 Nm (8 ÷ 10 lbf·ft)
Oil drain plug	54 ÷ 66 Nm (40 ÷ 49 lbf·ft)
Lubrication fitting, king pin	20 ÷ 30 Nm (15 ÷ 22 lbf·ft)
Planet carrier retention screw	21 ÷ 26 Nm (15.5 ÷ 19 lbf·ft)
King pin screw	154 ÷ 188 Nm (114 ÷ 139 lbf·ft)
Differential cover screw	96 ÷ 118 Nm (71 ÷ 87 lbf·ft)
Steering cylinder screw	358 ÷ 442 Nm (264 ÷ 326 lbf·ft)
Steering stop nut	200 ÷ 244 Nm (148 ÷ 178 lbf·ft)
Shaft retaining nut	358 ÷ 442 Nm (264 ÷ 326 lbf·ft)
Ring gear support screw, standard	88 ÷ 108 Nm (65 ÷ 80 lbf·ft)
Ring gear support screw, HD	96 ÷ 118 Nm (71 ÷ 87 lbf·ft)
Gear pin screw	95 ÷ 105 Nm (70 ÷ 77 lbf·ft)
Oil drain plug	72 ÷ 88 Nm (53 ÷ 65 lbf·ft)
Bearing cup screw	96 ÷ 118 Nm (71 ÷ 87 lbf·ft)
Ring nut retainer screw	21 ÷ 26 Nm (15.5 ÷ 19 lbf·ft)
Ring gear screw	96 ÷ 118 Nm (71 ÷ 87 lbf·ft)
Pinion	1.7 ÷ 2.2 Nm (1.2 ÷ 1.6 lbf·ft)
Differential	1.5 ÷ 2.5 Nm (1.1 ÷ 1.8 lbf·ft)
Wheel bearing with seal, standard	8 ÷ 25 Nm (6 ÷ 18 lbf·ft)
Wheel bearing with seal, HD	12 ÷ 25 Nm (9 ÷ 18 lbf·ft)
Standard differential	0 ÷ 1 Nm (0 ÷ 0.7 lbf·ft)
Limited slip differential	1 ÷ 5 Nm (0.7 ÷ 4 lbf·ft)

Install the outer bearing (15).

Installation will be easier if you heat the bearing slightly.
Do not heat the wheel bearing more than 149 °C (300 °F).

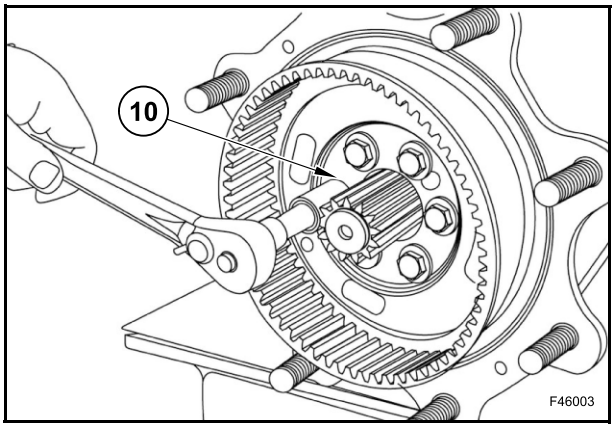


Align the holes in the ring gear carrier (11) with the holes in the swivel housing and install the ring gear carrier.

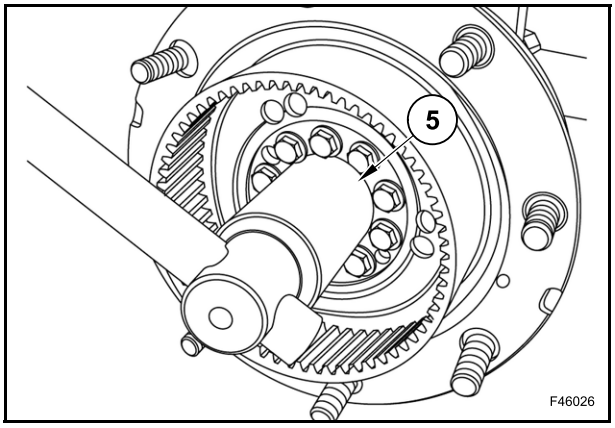


Install and tighten the screws (10) evenly to pull the hub against the swivel housing.

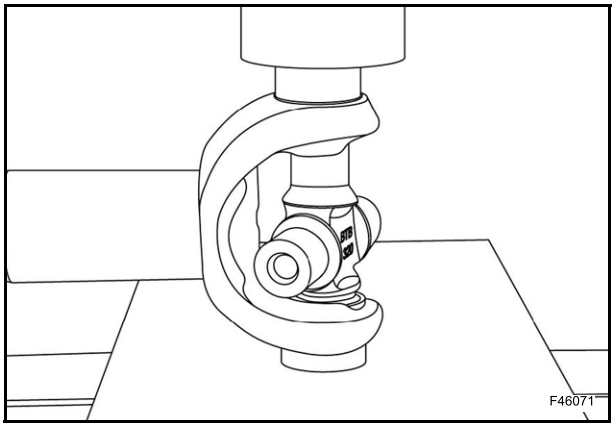
Tighten the screws (10) to a tightening torque of 358 ÷ 442 Nm (264 ÷ 326 lbf·ft).



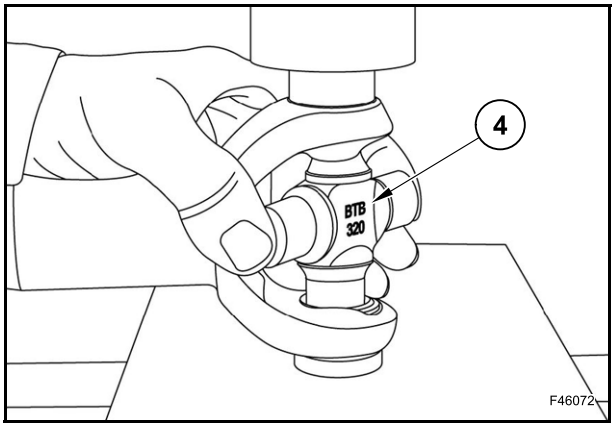
Tighten the ring nut (5) by means of tool 380000468, to a tightening torque of 358 ÷ 442 Nm (264 ÷ 326 lbf·ft).



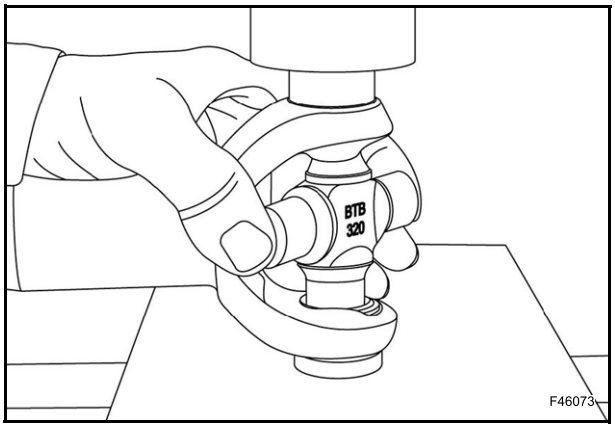
Press the other bearing cup into the yoke until the top of the bearing cup is 9 mm (0.35 in) above the top of the yoke.



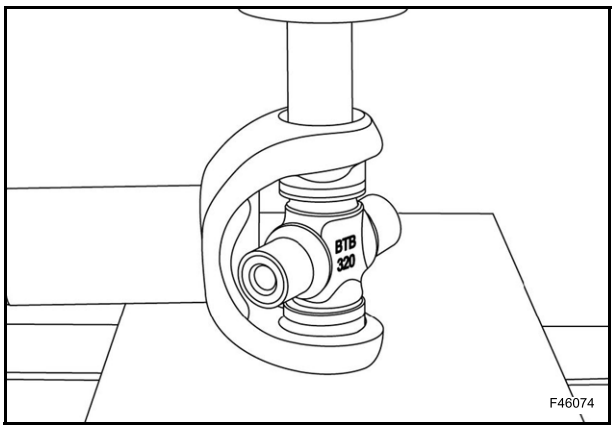
Carefully remove the cross (4) from the bearing cup so that the cross is in both bearing cups.



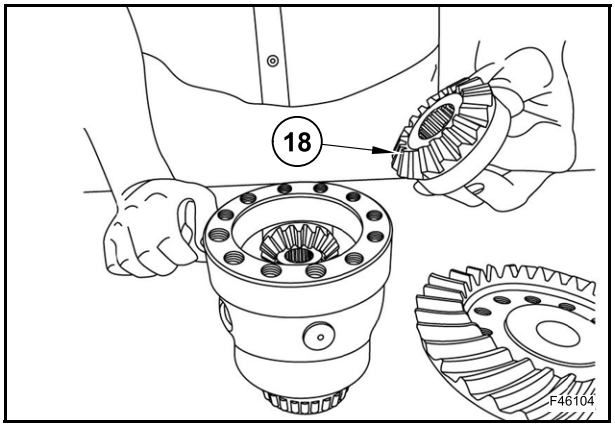
Hold the cross and press the bearing cups into the yoke.



Press a bearing cup into the yoke so that a snap ring can be installed.

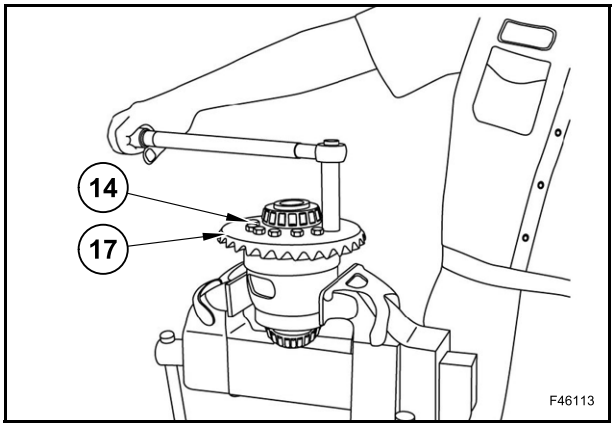


Assemble the gear (18).



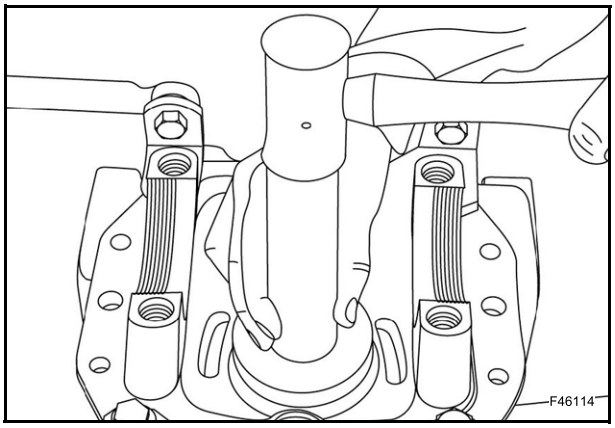
Make sure that the mounting surfaces of the ring gear (17) are clean and install the ring gear.

Screw in and tighten the screws (14) to a tightening torque of 96 ÷ 118 Nm (71 ÷ 87 lbf·ft).



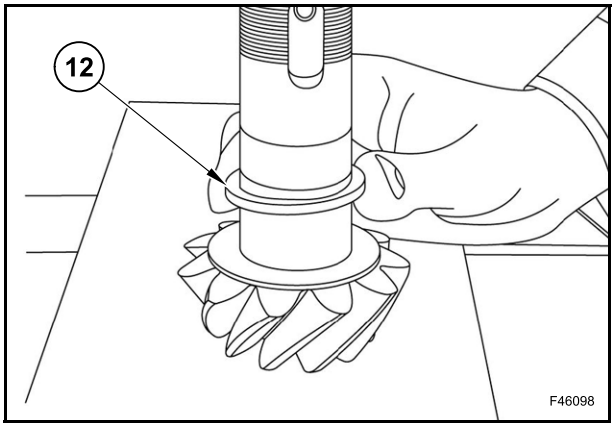
Assemble the bearing cup(s) into the differential carrier.

Use a feeler to ensure cups are fully seated.



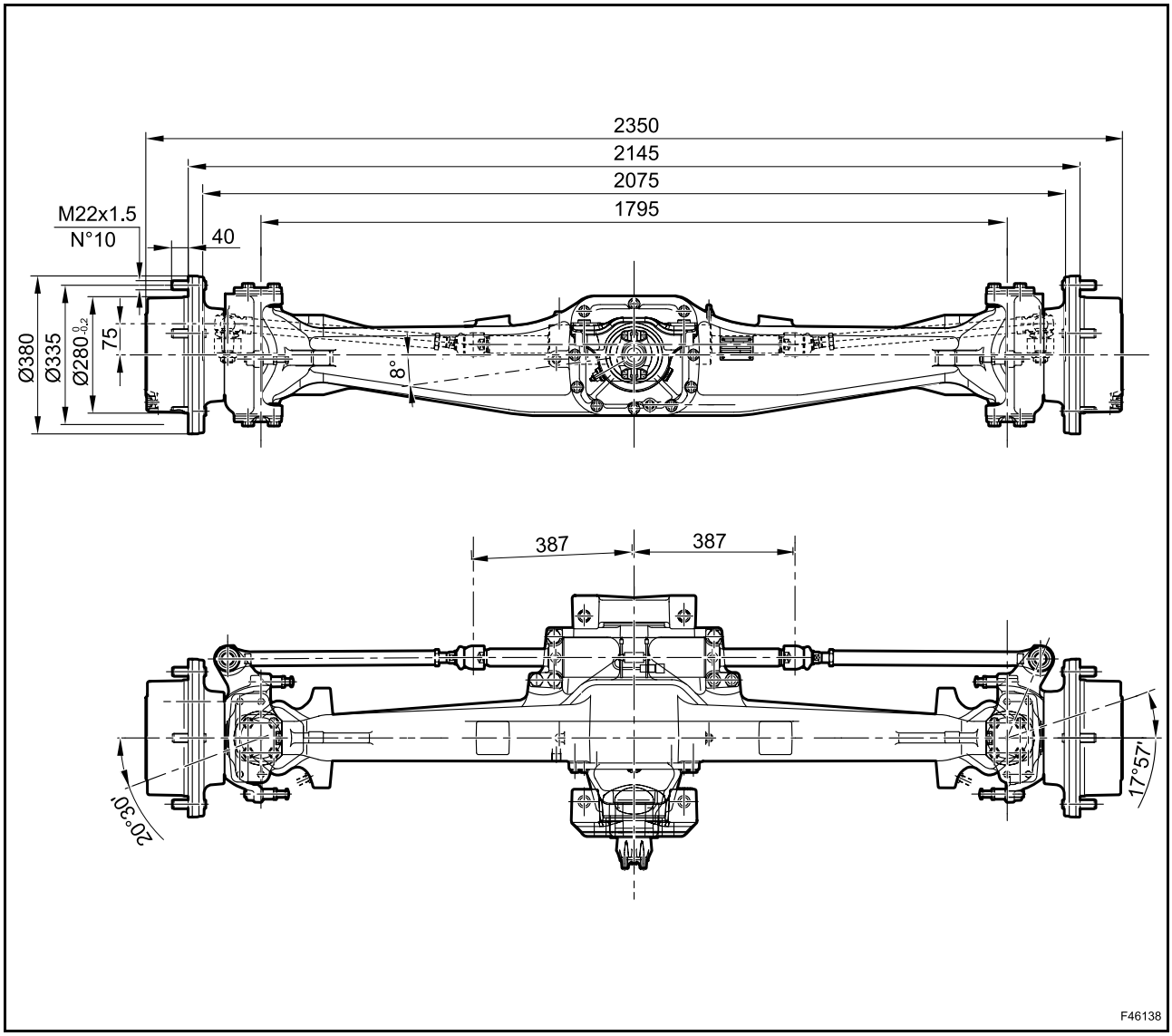
Install the shim (12).

The chamfer of the shim must be towards the pinion.



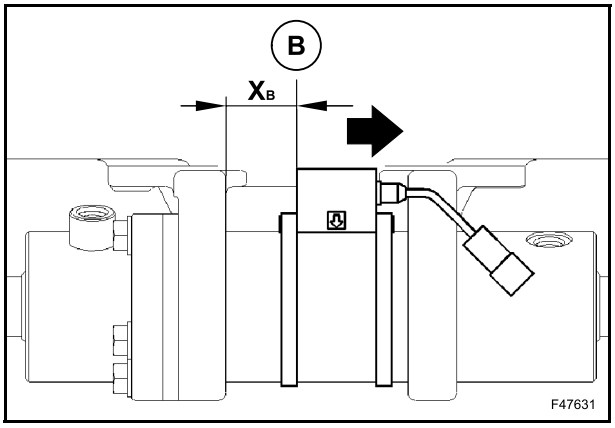
4WS FRONT AXLE

TECHNICAL SPECIFICATIONS

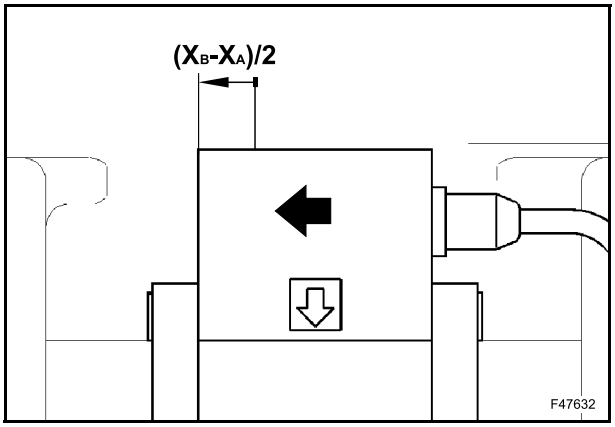


Manufacturer	CARRARO
Model	26.32
Differential ratio	2.75
Planetary hub ratio	6.92
Total reduction ratio	19.04
Lubrication angle	35° maximum (front and rear) - 35° maximum (from side to side)

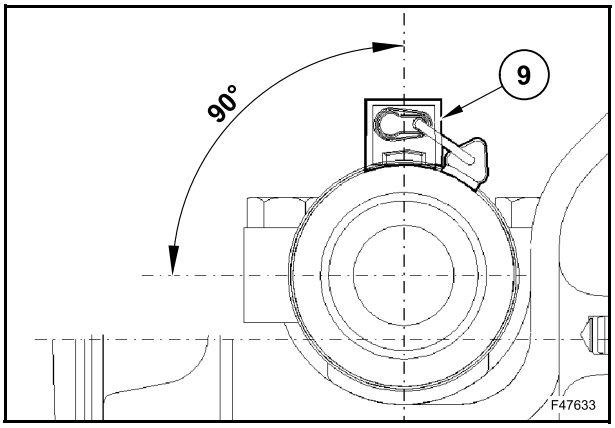
Horizontally slowly slide the sensor on the cylinder until the led turns off (position “B”) and measure the XB dimension, between the differential support and the rear part of the sensor.



Move the sensor backwards by a distance of (X_B-X_A)/2 (maximum tolerance ± 1.0 mm (0.039 in)).

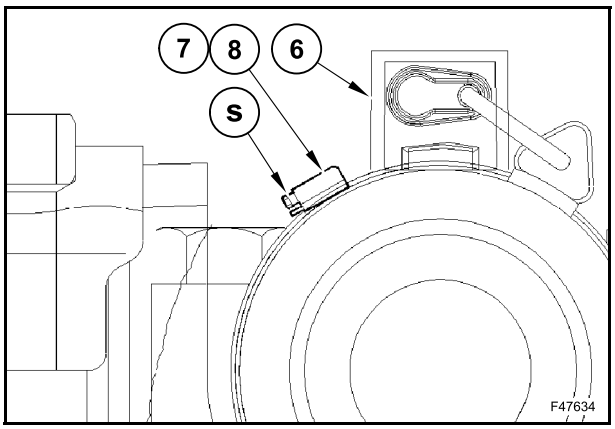


Before tightening the clamps, check the right position of the sensor (9) in the appropriate seat fastened to the steering cylinder.

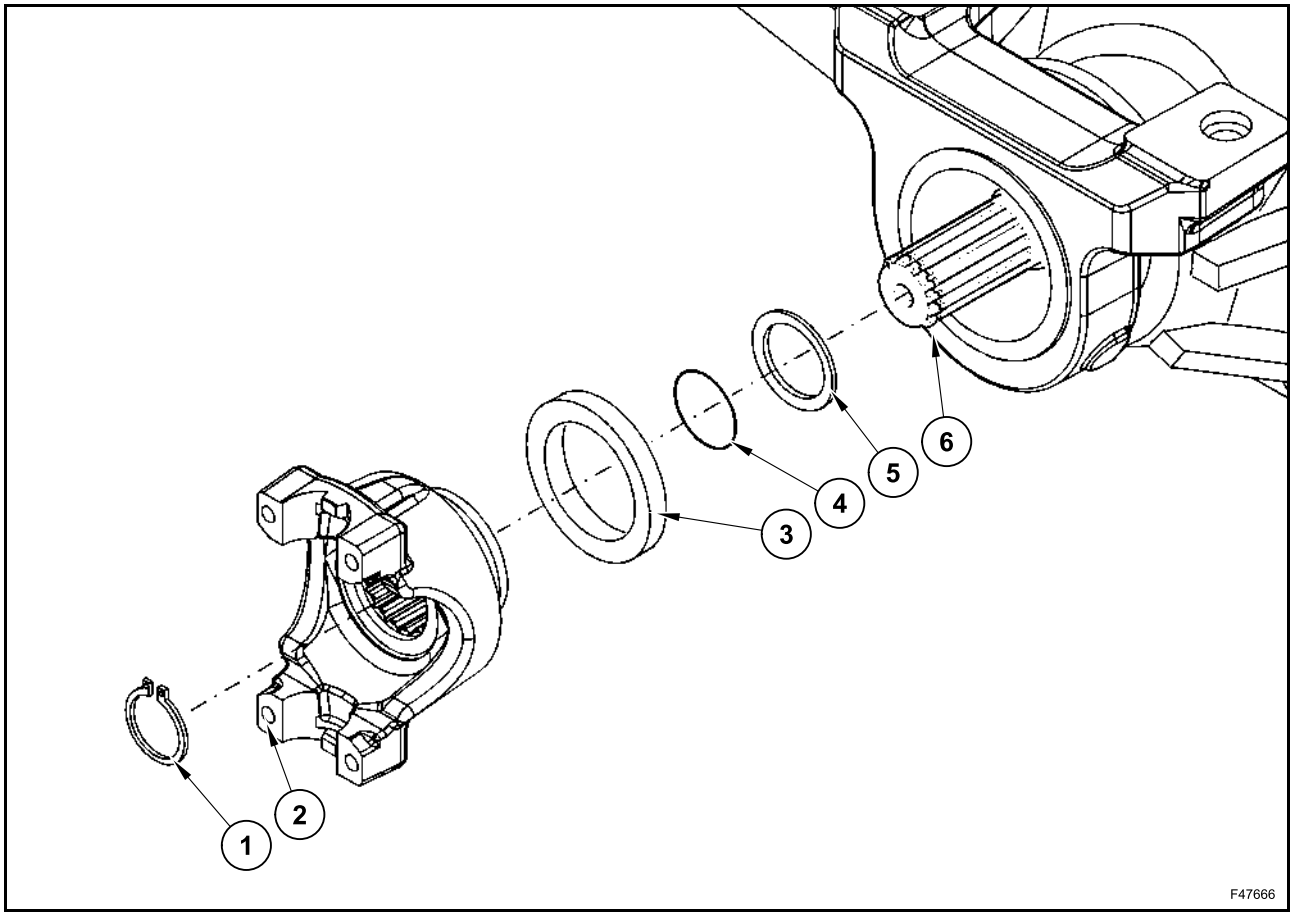


Place the fastening screws (S) of the two clamps (7) and (8) in the shown position.

Tighten the fastening screws (S) to lock the sensor (9).

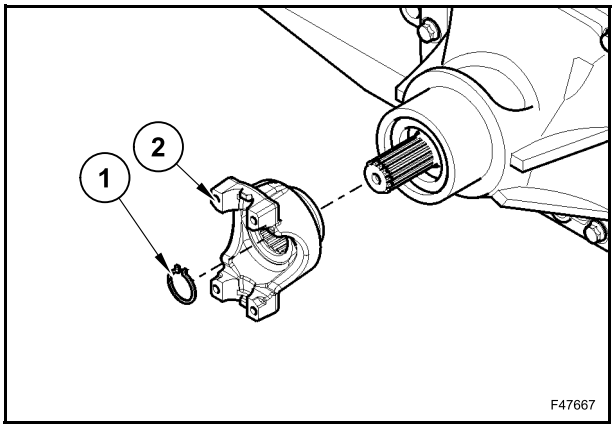


FLANGE



Disassembly

Remove the snap ring (1) and extract the flange (2).

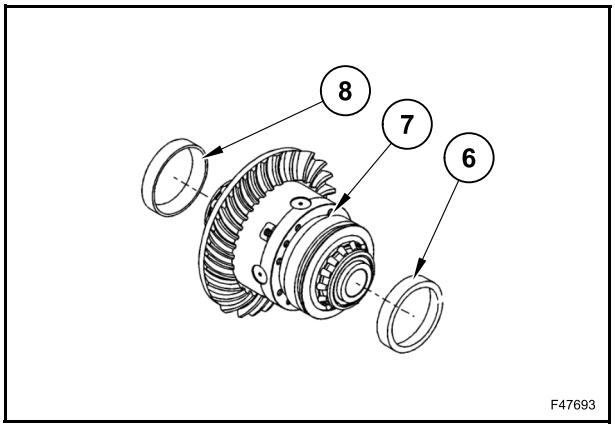


Assembly

Assemble the bearings (6) and (8) on the differential assy (7).

⚠ WARNING ⚠

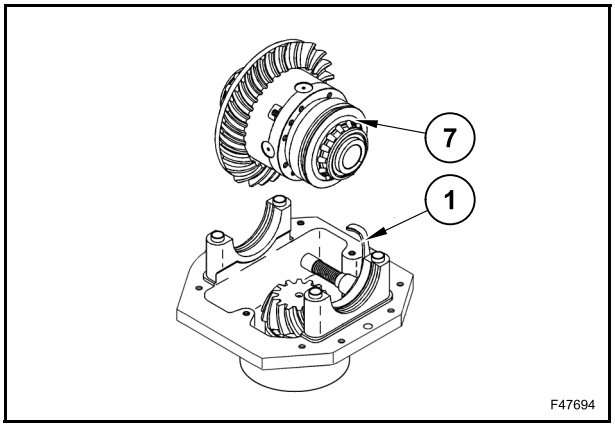
Do not exchange the bearings in case they are replaced.



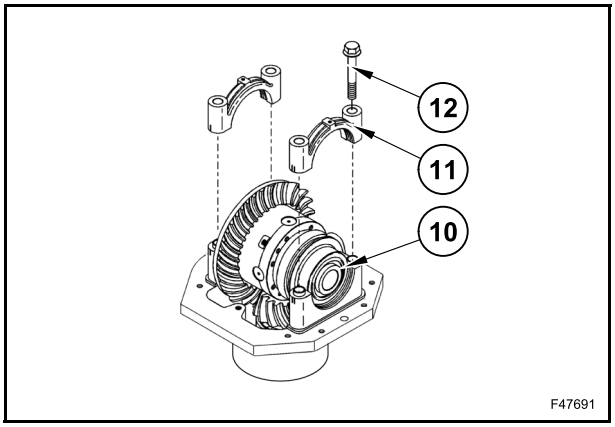
Assemble the differential assy (7) with bearings onto the differential support (1).

⚠ WARNING ⚠

Check the correct assembly side of the ring gear.

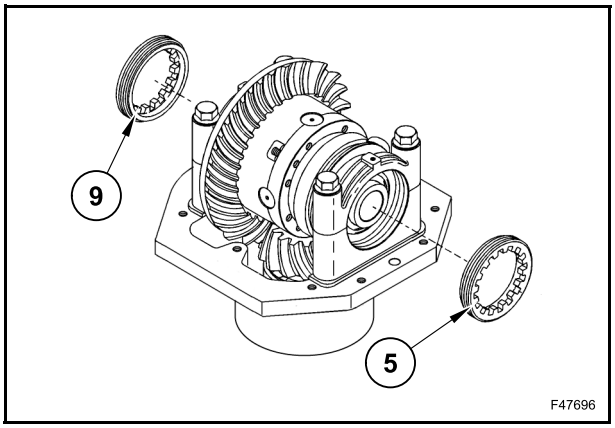


Move the differential assy so that the ring gear is placed against the pinion.
Check that all bushings (10) are in their housings and position both half-supports (11) in their seats, using the previously traced reference marks.
Lock both half-supports (11) with the fastening screws (12).

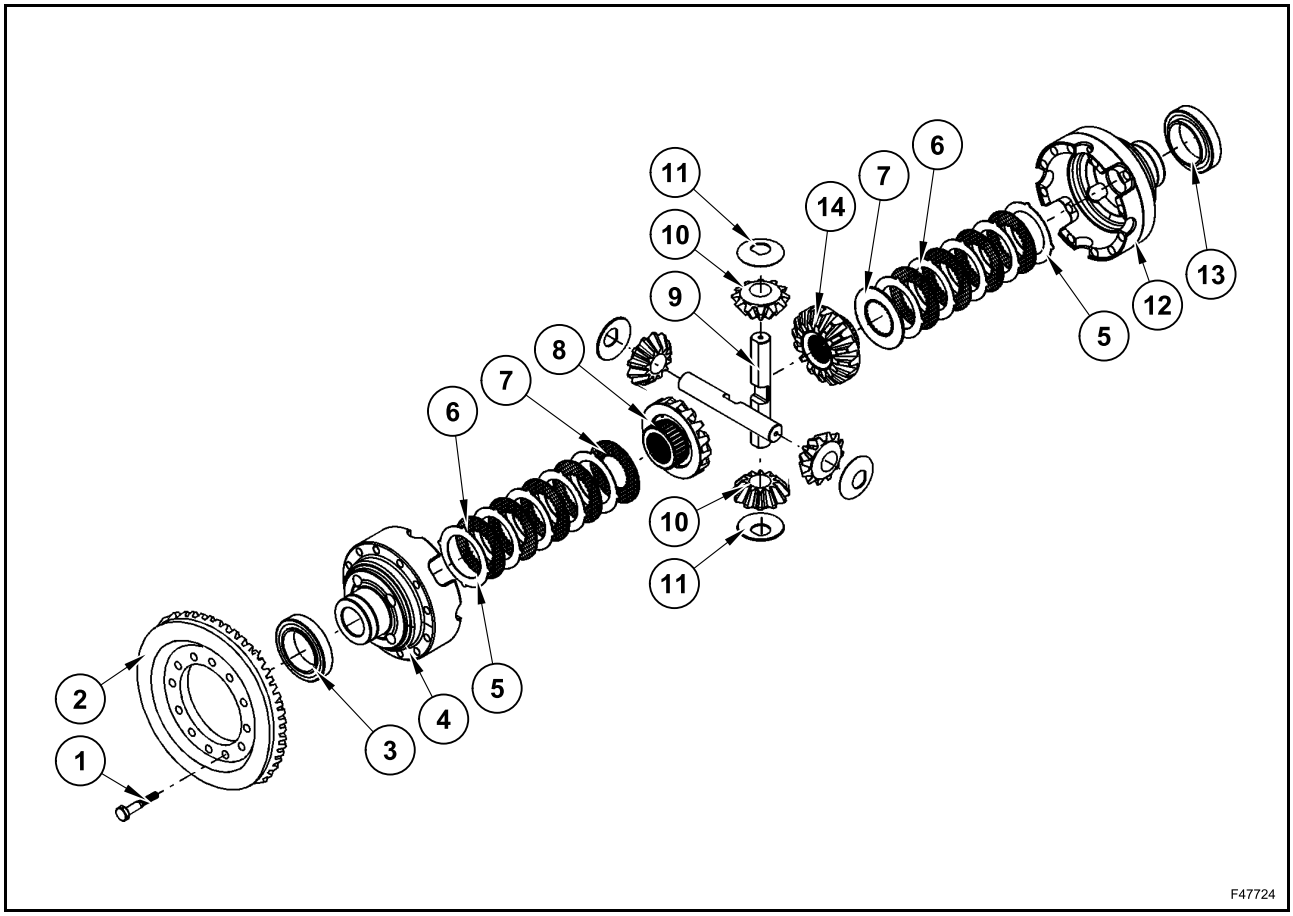


Assemble the adjustment ring nuts (5) and (9) to the differential support.
Tighten both ring nuts (5) and (9) with special tool **380000406**, till the backlash is eliminated and the differential bearings are slightly preloaded.
Check that the differential bearings are correctly seated.

If necessary, slightly knock with a rubber hammer.

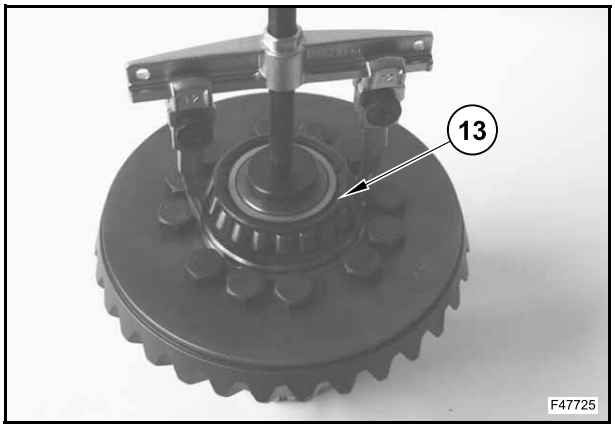


SELF-LOCKING DIFFERENTIAL GROUP



Disassembly

Use an extractor to remove bearing (13).



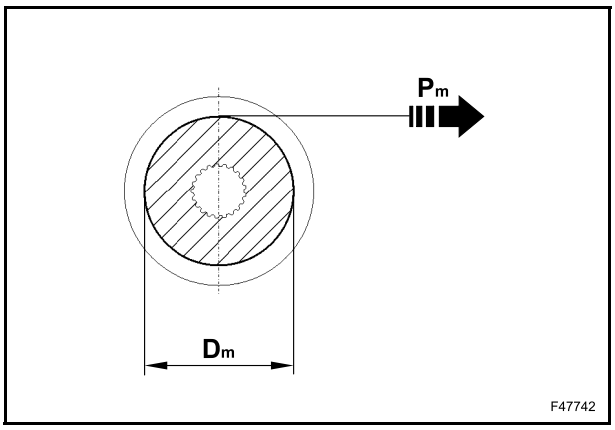
The actual preload F_{Pm} is measured on the tool (gauge diameter D_m = 104.4 mm (4.11 in)).

The measured value should be within the following range:

F_{Pm} = 30.7 ÷ 46,0 N (6.90 ÷ 10.34 lbf)

⚠ WARNING ⚠

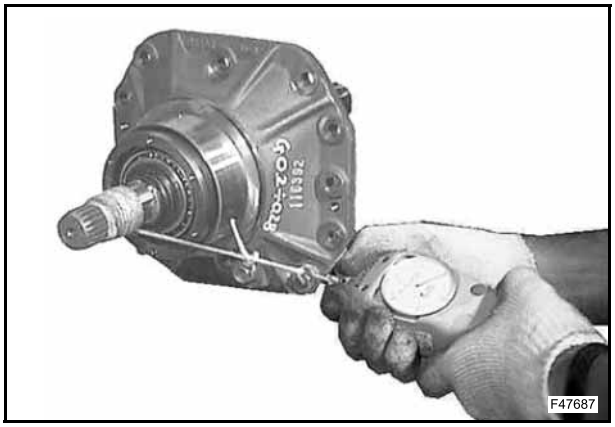
Values for new bearings.



In case you do not use the prescribed tool to measure the preload, the reference diameter is the diameter of pinion shaft splined end.

The measured value should be within the following range:

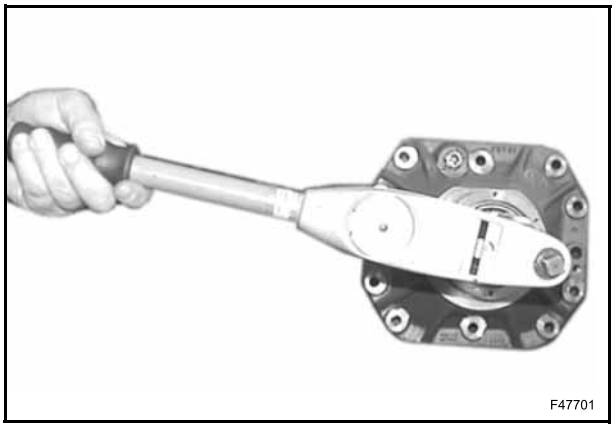
F_{Pm} = 92 ÷ 137 N



As an alternative, it is possible to measure the pinion bearings' rolling torque M_{Pm} with a torque meter

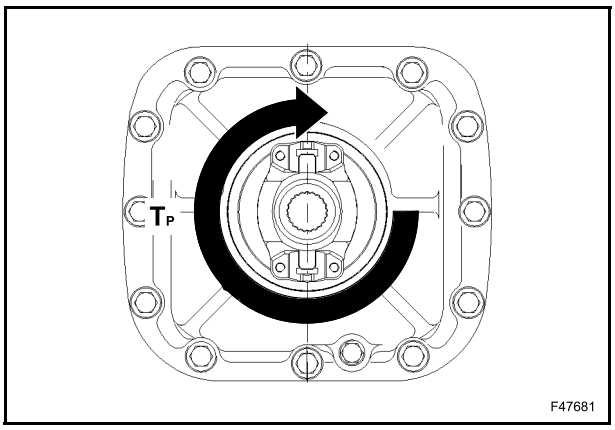
⚠ WARNING ⚠

All preloads must be measured without seal ring.



The measured value M_{Pm} should be within the following range:

M_{Pm} = 1.6 ÷ 2.4 Nm (1.18 ÷ 1.77 lbf·ft)



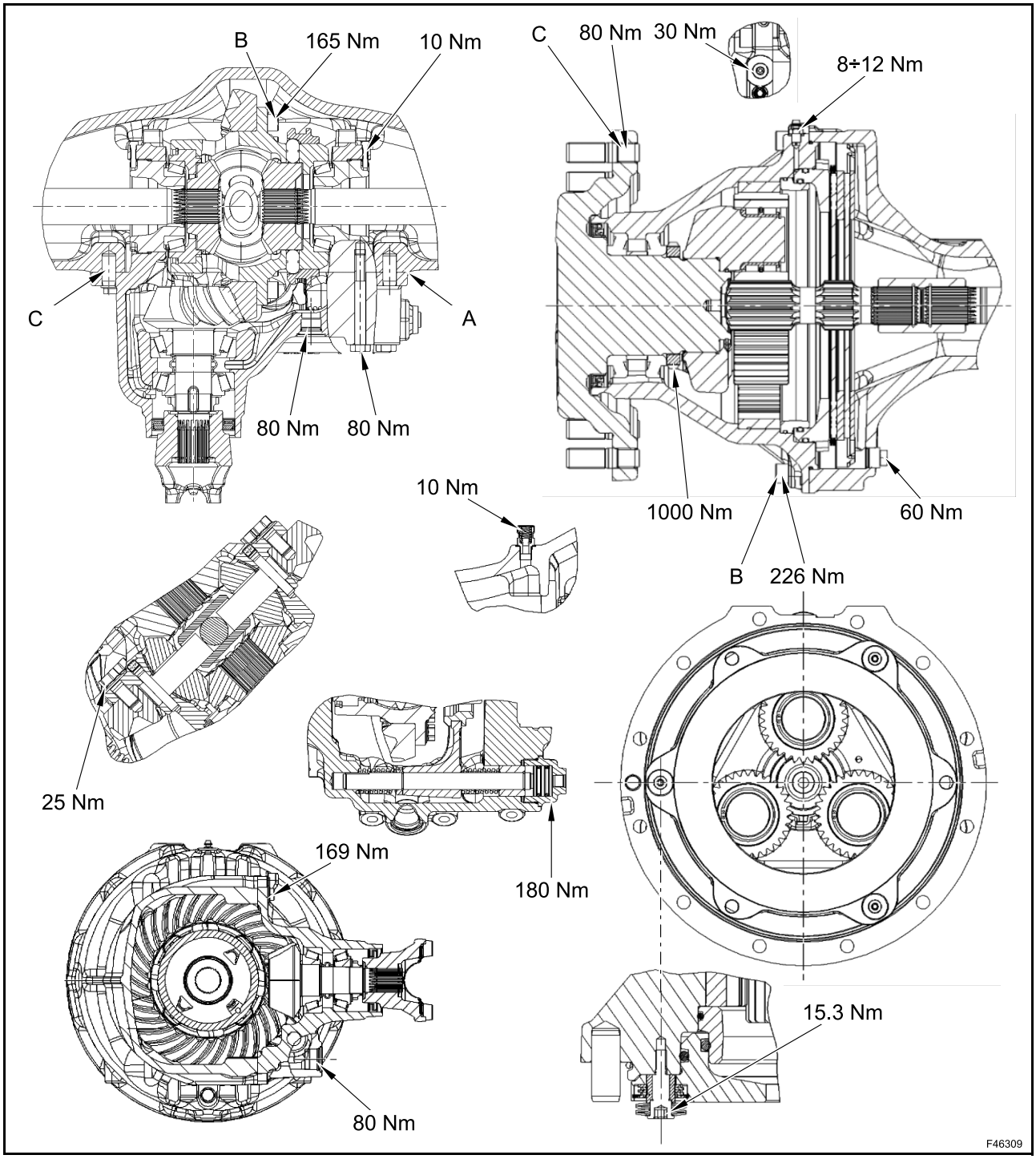
TROUBLE	POSSIBLE CAUSE	ACTION
Gaskets leak oil.	Prolonged operation at excessive oil temperature. Oil gasket wrongly installed. Gasket edge cut or scored. Contaminated lubricant.	Replace the gasket and matching surface if damaged. Use proper lubricant, fill up to right level and replace at recommended intervals.
Excessive wear of input flange spline.	Intense use. Pinion nut loose. Pinion axial backlash.	Replace the flange. Check that the pinion spline is not excessively worn out. Replace bevel gear, if necessary.
Pinion gear tooth fatigue break. Check if the fracture line is wavy or clearly delineated (stop line).	Intense use. Continuous overload.	Replace bevel gear.
Break of pinion and ring gear teeth.	Crash load of differential components.	Check and/or replace other differential components.
Splines of planetary gear worn (excessive backlash).	Intense use.	Replace differential gear assy. Replace axle beam, if necessary.
Worn or scored surfaces of the scraper thrust washer.	Insufficient lubrication. Lubrication wrong. Contaminated lubricant.	Replace all scratched washers and those with a 0.1 mm (0.0039 in) thickness lower than the new ones. Use proper lubricant, fill up to right level and replace at recommended intervals.
Inner diameter of pinion tapered roller bearing worn out.	Intense use. Excessive pinion end play. Unsuitable lubrication. Contaminated lubricant.	Replace bearing. Check pinion axial backlash. Use proper lubricant, fill up to right level and replace at recommended intervals.
Broken or bent axle beam.	Intense vehicle operation, overload.	Replace the axle beam.

DISASSEMBLY AND ASSEMBLY

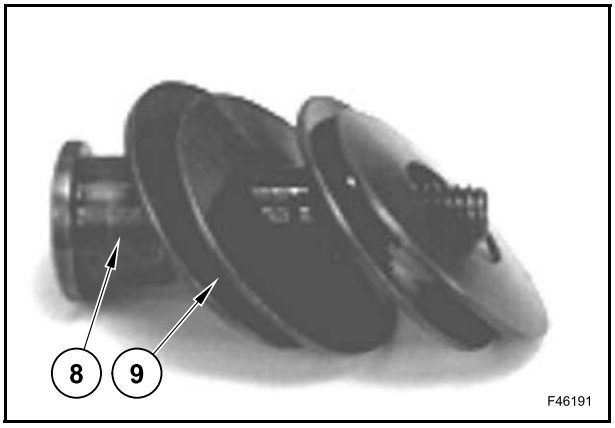
Some of the following pictures could not exactly show your axle, but the procedure is correct.

TIGHTENING TORQUES AND APPLICATION OF SEALANTS / ADHESIVES

A. Loctite 510
B. Loctite 270
C. Loctite 638



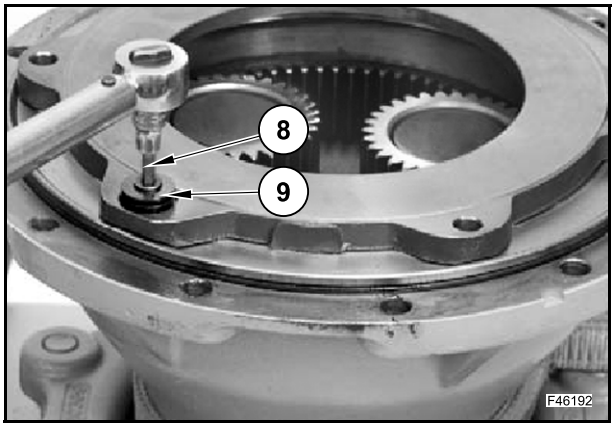
Assemble the Belleville washers (9) on the screws (8) paying attention to orientate them correctly.



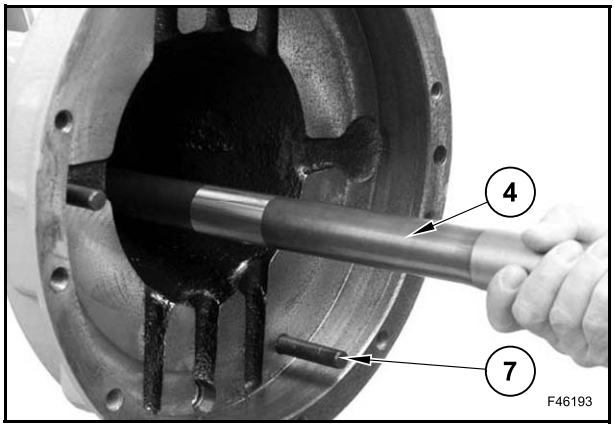
Assemble the screws (8) and the Belleville washers (9).

Tighten the screws (8) to a tightening torque of 15.3 Nm (11 lbf·ft).

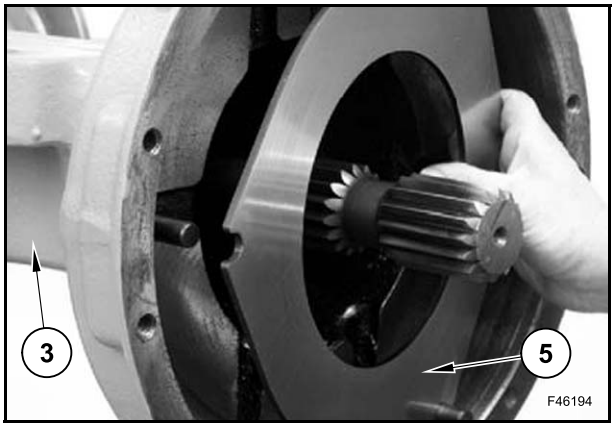
Make sure that the 4 Belleville washers are correctly aligned before tightening the screws.



Assemble half shaft (4) and the dowel pins (7).

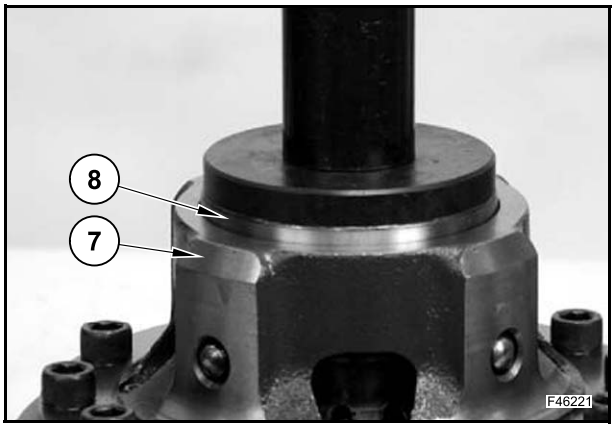


Using the reference mark made during disassembly, assemble the counterdisc (5) paying attention to direct it with the mark towards the axle body (3).

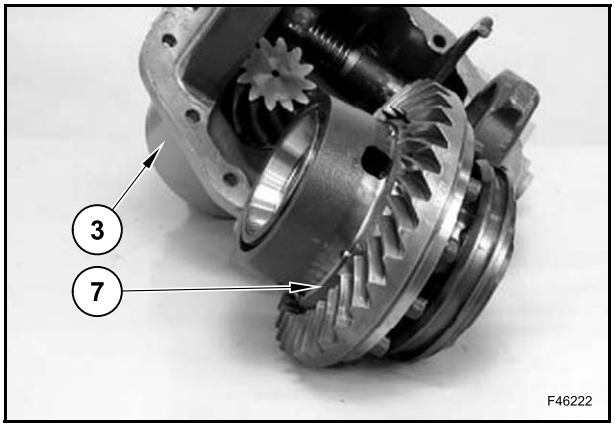


Assembly

Assemble the bearing cups (8) and (9) on the differential box (7) by means of drift 380200218.

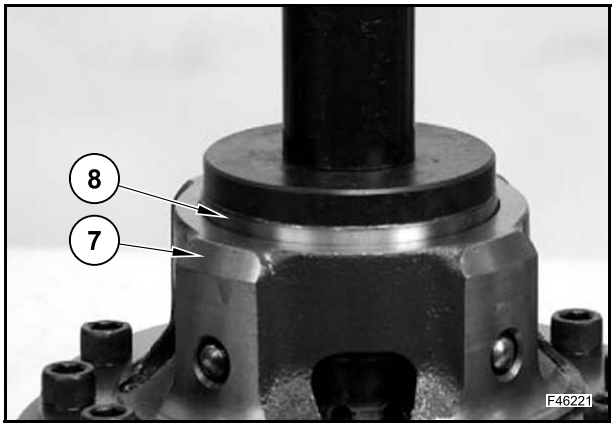


Assemble the differential box (7) with bearings onto the differential support (3).

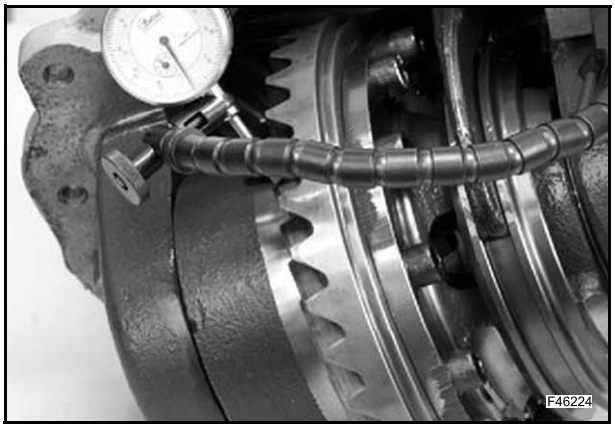


Tighten both ring nuts (5) and (6) by means of tool 380200243, till the backlash is eliminated and the bearings are slightly preloaded.

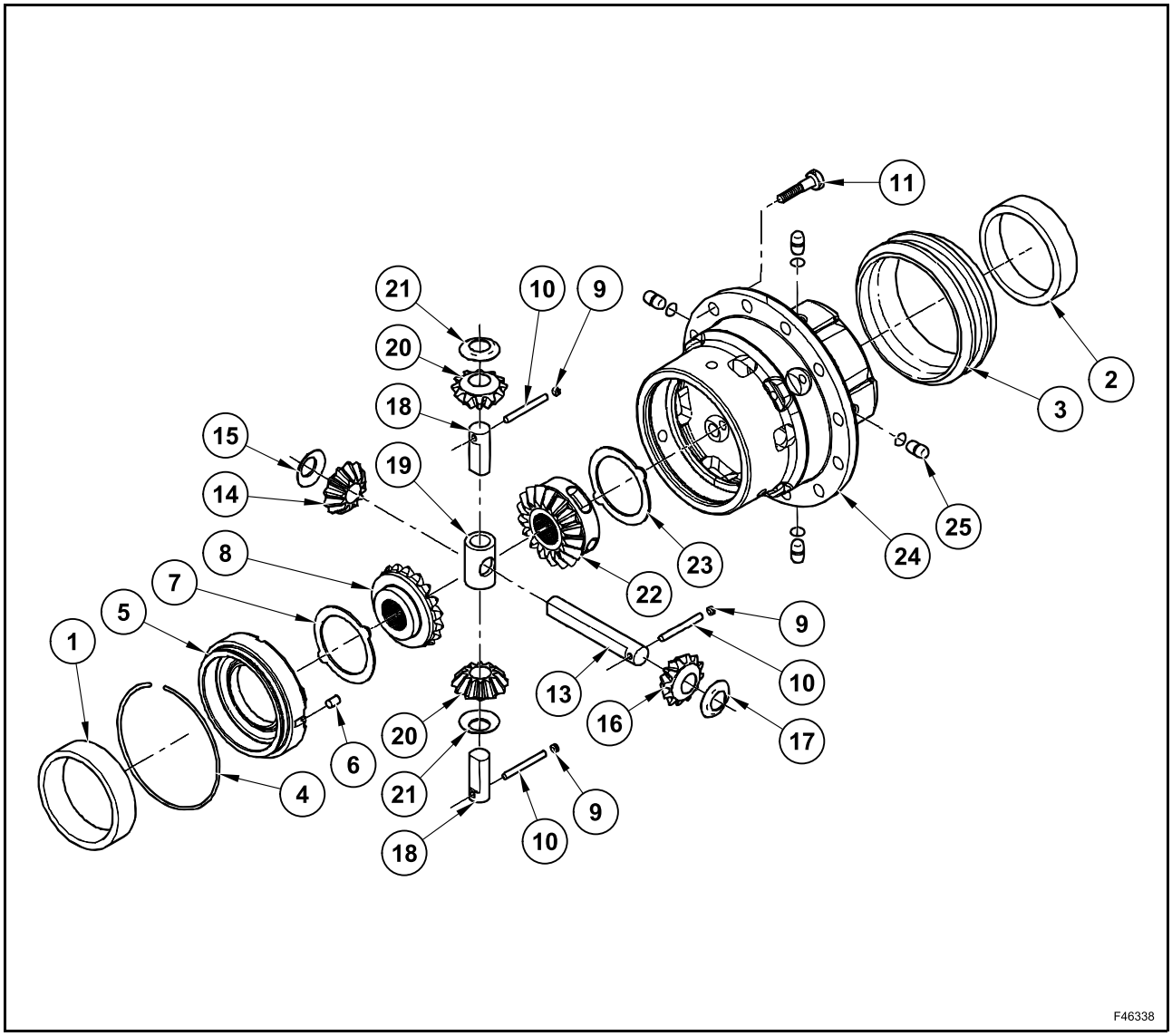
Check that the bearings are correctly seated.



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



DIFFERENTIAL



Disassembly

If differential bearings must be replaced, remove the bearing cups (1) and (2).

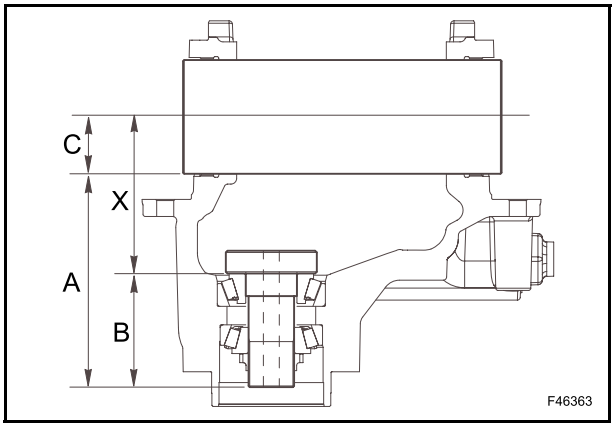
Remove the sleeve (3).

To adjust the bevel gear measure the distance “A” with a depth gauge.

Determine the value “X” as follows:

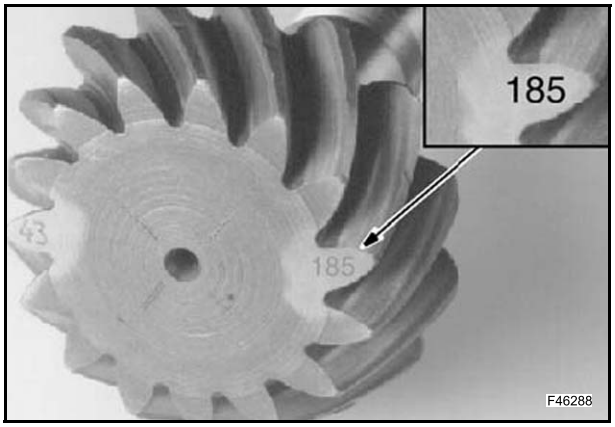
X = (A + C) - B mm (in)

where “B” and “C” are known values.



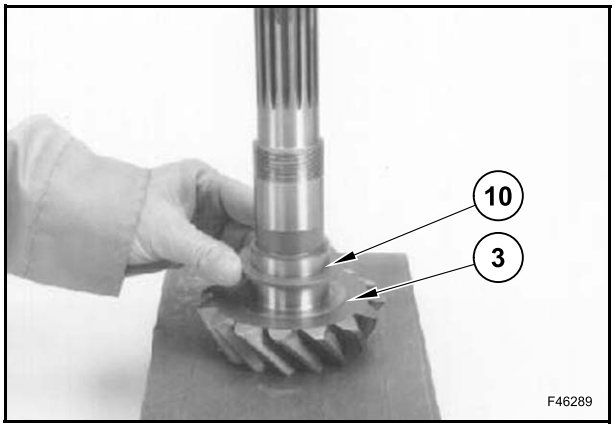
In order to determine the value (S) of the shim to be placed between pinion and bearing, subtract from the measured value (X) the value (V) engraved on pinion head (V = prescribed distance).

S = (X - V) mm (in)



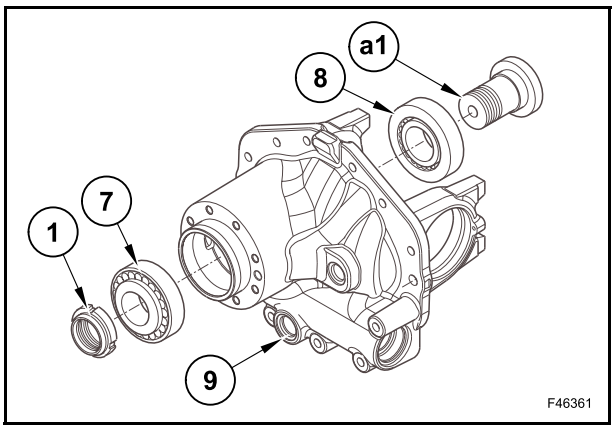
Select the shim (10) with value (S) from the range of available shims, and fit it onto the shaft end under the pinion head.

SHIM RANGE										
Shims mm (in)	2.5 (0.098)	2.6 (0.102)	2.7 (0.106)	2.8 (0.110)	2.9 (0.114)	3.0 (0.118)	3.1 (0.122)	3.2 (0.126)	3.3 (0.130)	3.4 (0.134)
Q.ty	-	-	-	-	-	-	-	-	-	-



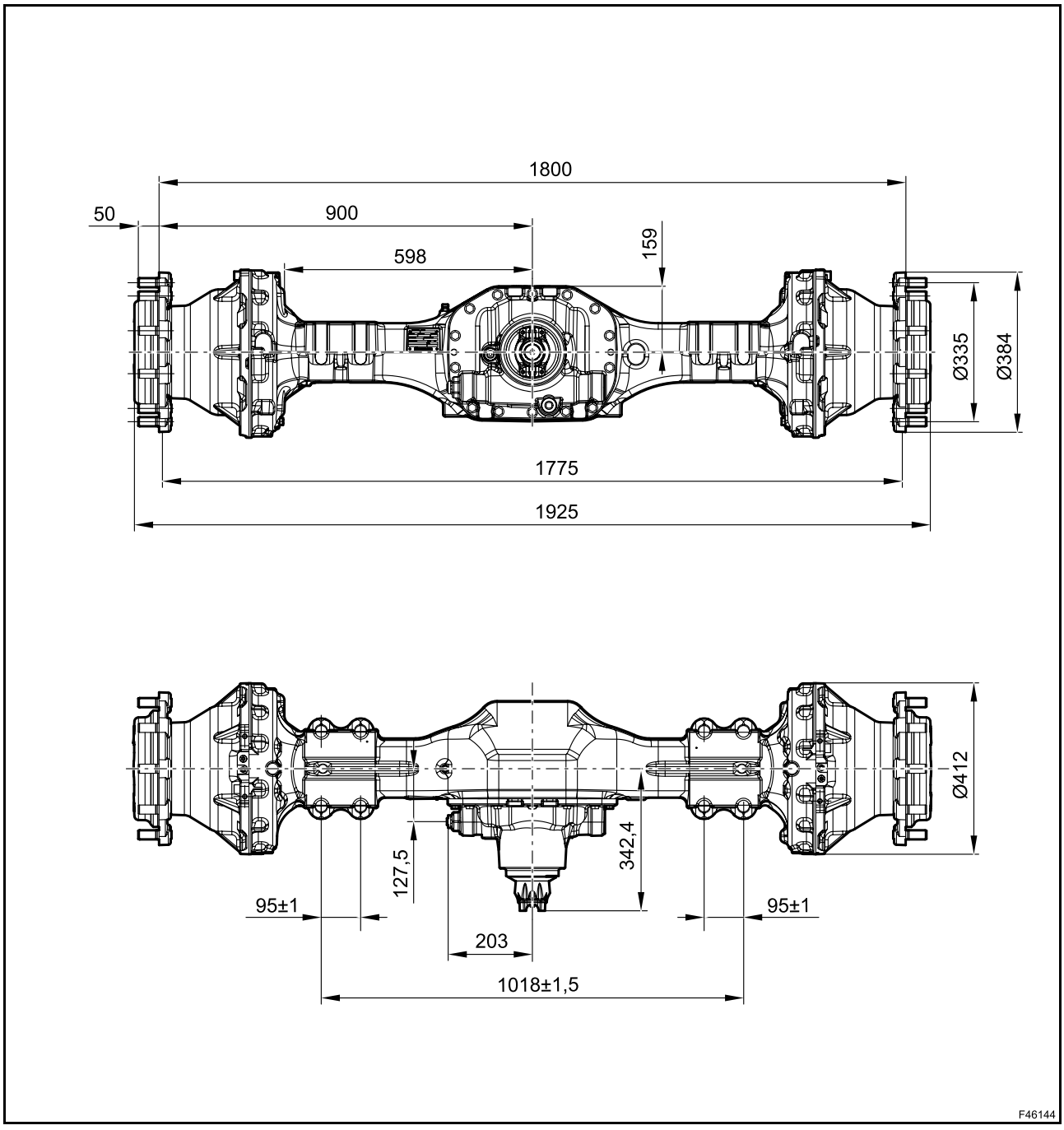
Remove tool 380200187 from the seats (9) of the differential box.

Disassemble the ring nut (10), the false pinion 380200202 (a1) and the bearings (7) and (8).

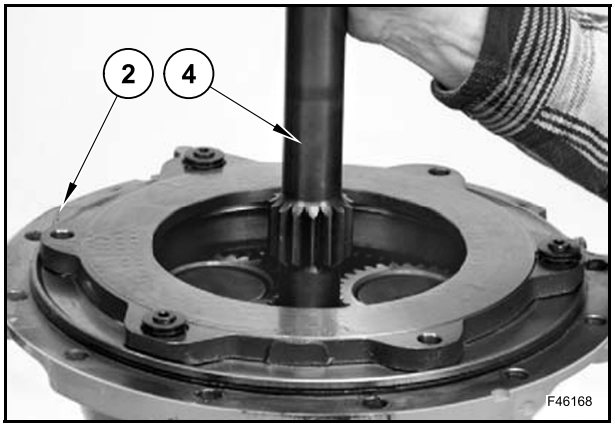


2WS REAR AXLE
(B110B)

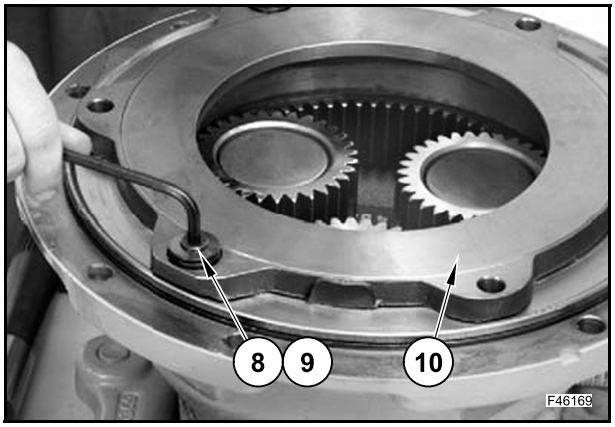
TECHNICAL SPECIFICATIONS



Remove the half axle (4) from the wheel hub assy (2).

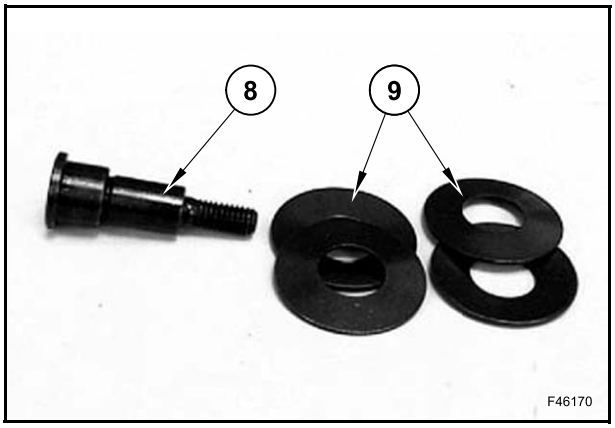


Remove the screws (8) and the Belleville washers (9) from the brake cylinder (10).

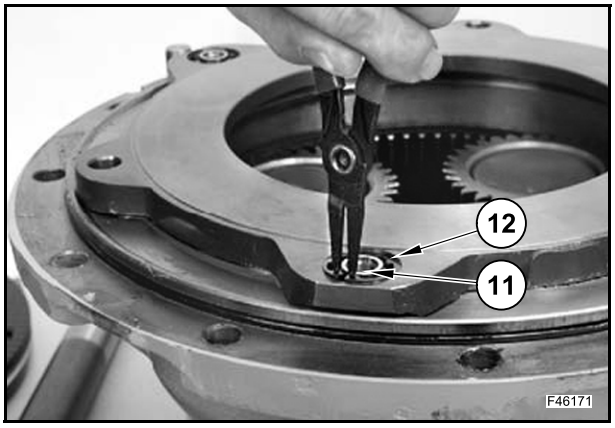


Check screws (8) and Belleville washers (9) for damage.

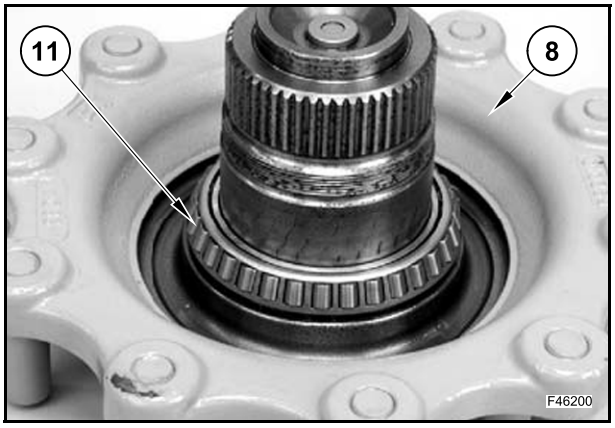
NOTE: *if brake discs are replaced, also replace screws and springs.*



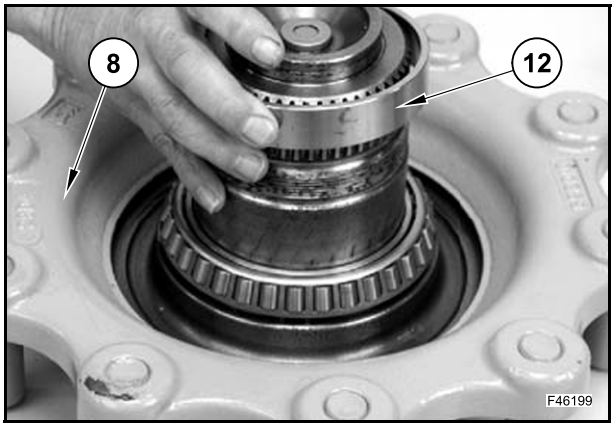
Remove the snap ring (11) and the self adjust kit assy (12).



Assemble the bearing (11) onto wheel flange (8) with a press.



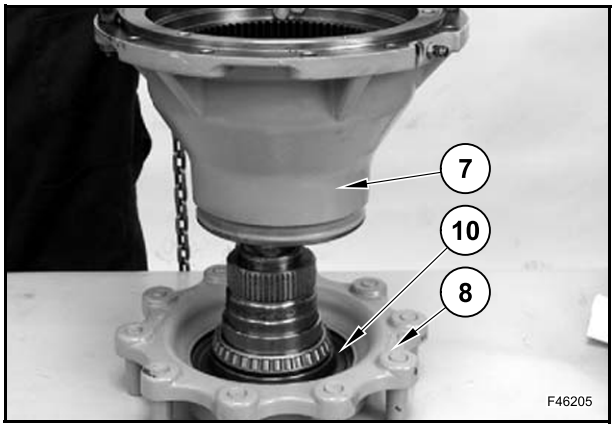
Place the spacer (12) on the wheel flange (8).



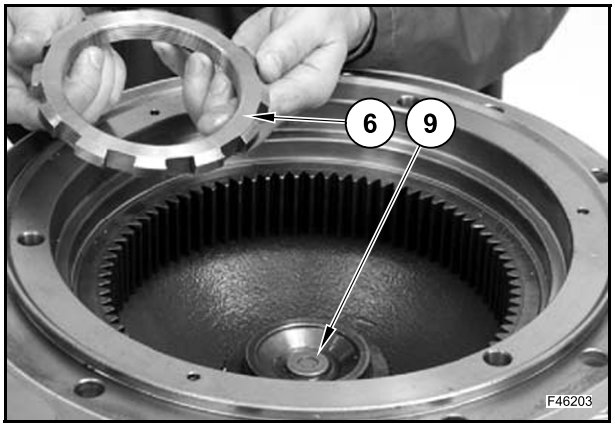
Connect the wheel hub (7) to a lifting device and place it on the wheel flange (8).

Clean the sealing surface of the flange.

Pay attention not to damage the seal ring (10).

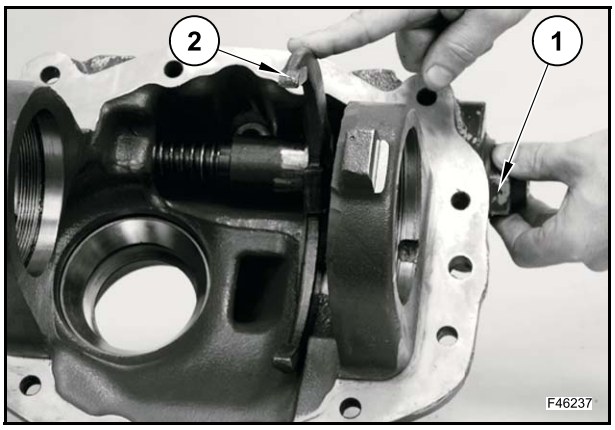


Assemble the bearing (9) and the ring nut (6).

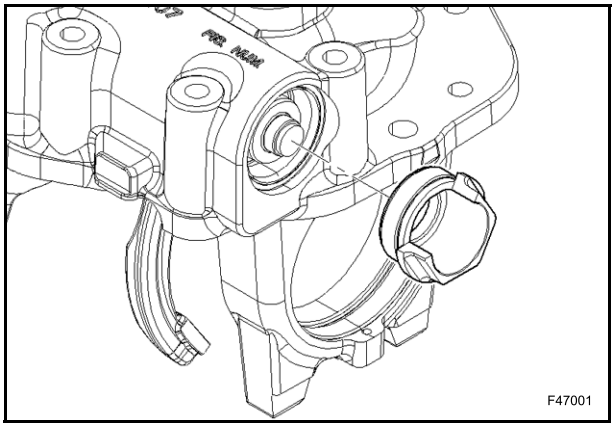


Push the yoke (2) downwards using the differential support as a retainer.

Remove the plug (1).

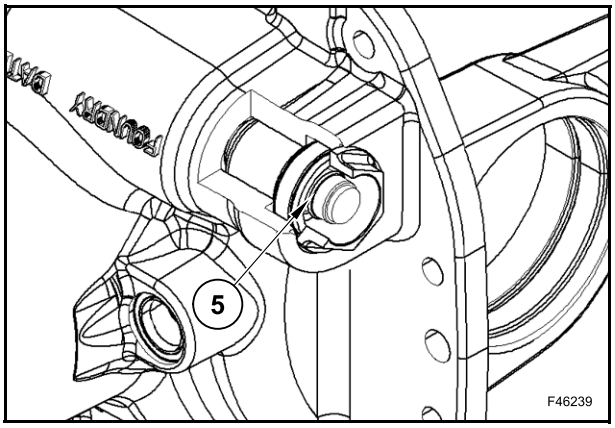


Insert the tool 380200259.

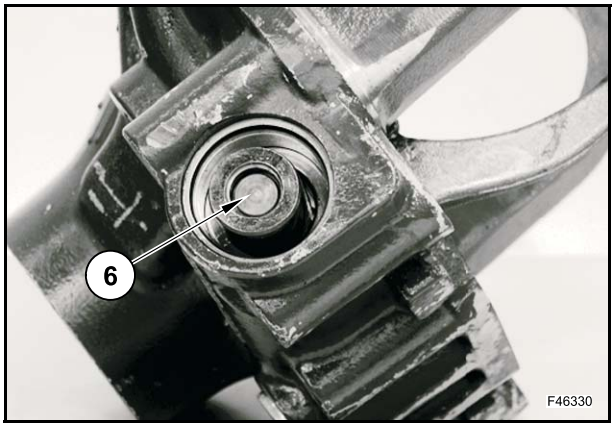


Remove the snap ring (5).

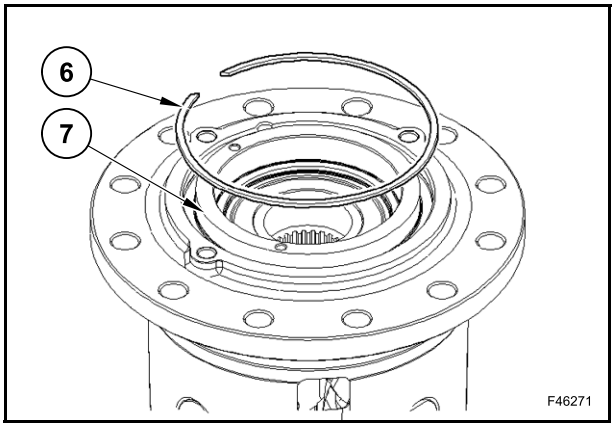
Remove the tool 380200259.



Remove the bushing (6).

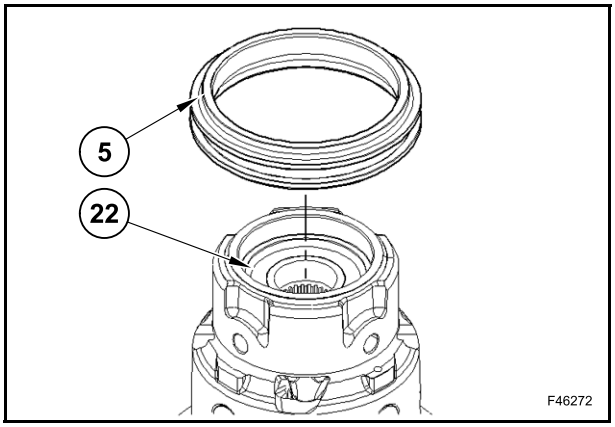


Lock the cover (7) with the snap ring (6).



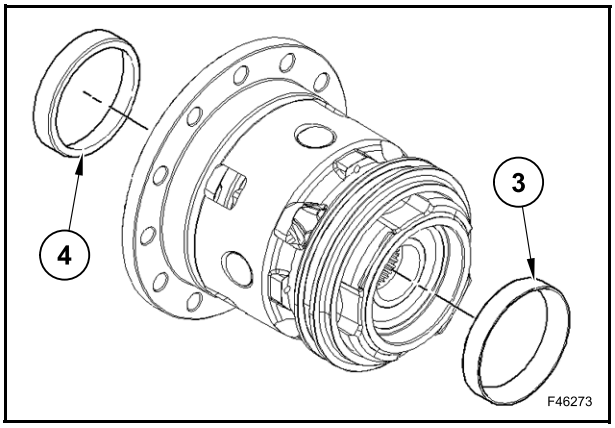
Assemble the sleeve (5) and make sure that it seats correctly.

NOTE: *to ease the fitting, turn the gear (22).*



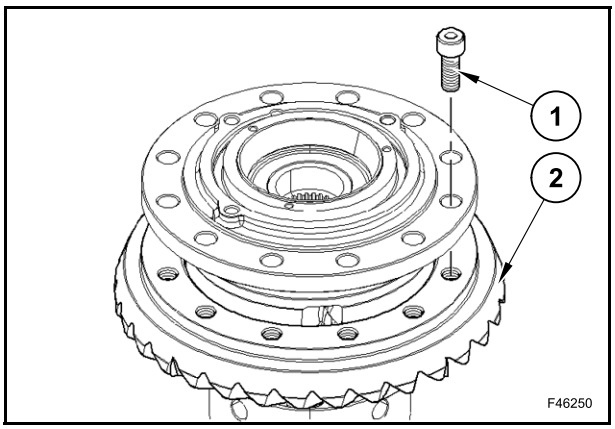
Assemble the bearing cups (3) and (4) by means of drift 380200218.

Take care not to mix the bearing cups.

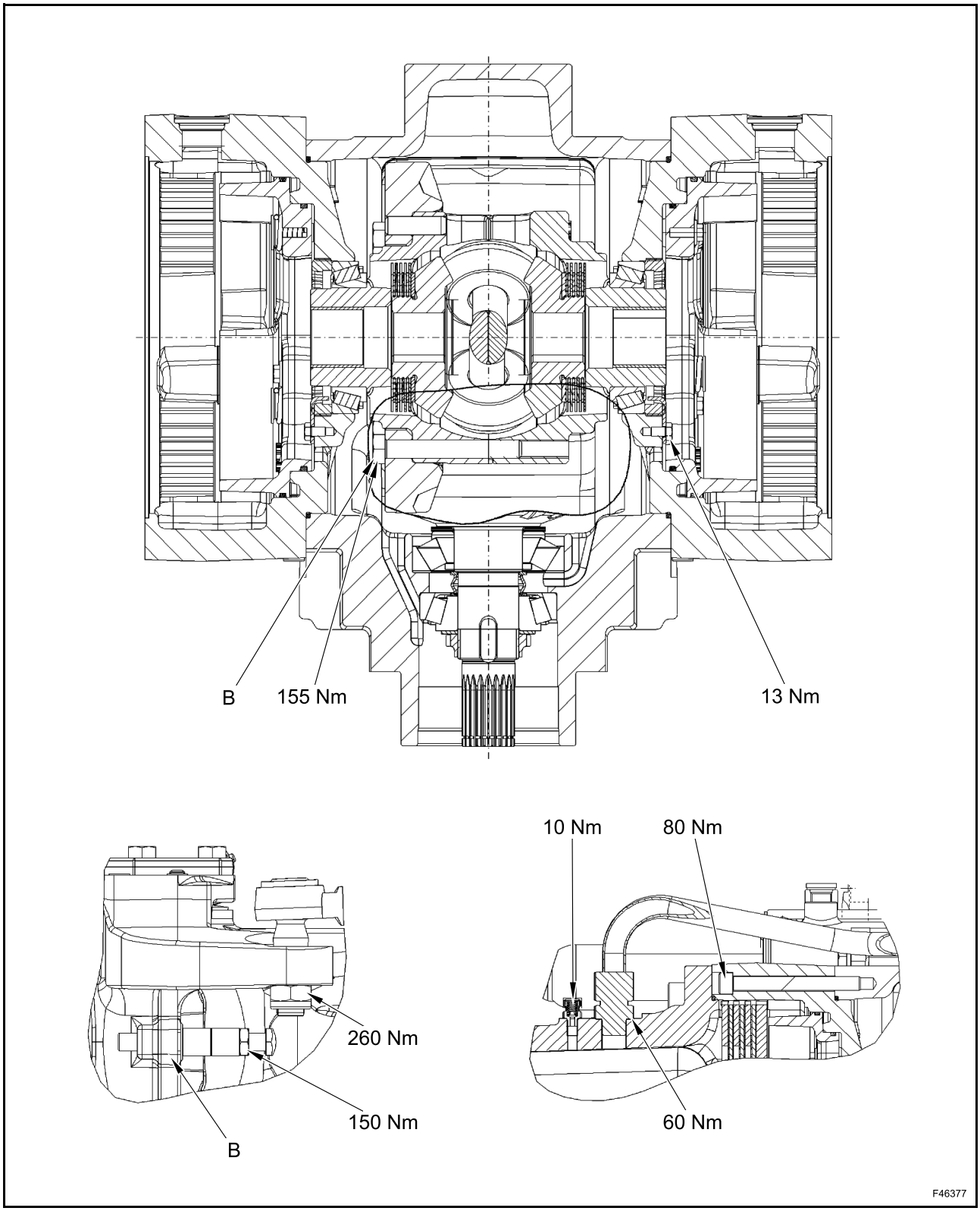


Assemble the ring gear (2).

Apply some sealant and tighten the screws (1) to the prescribed torque of 190 Nm (140 lbf·ft).

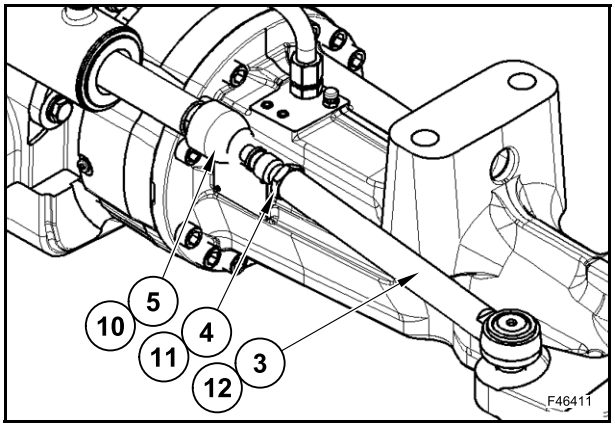


FAULT	POSSIBLE CAUSE	ACTION
Outer tip of ring gear tooth is broken.	Excessive gear load compared to the one expected. Gear adjustment wrong (excessive backlash). Pinion nut loose.	Replace bevel gear. Follow carefully recommended adjustment operations of ring gear and pinion backlash and of tooth marks detection.
Inner tip of ring gear tooth is broken.	Crash load. Gear adjustment wrong (insufficient backlash). Pinion nut loose.	Replace bevel gear. Follow carefully recommended adjustment operations of ring gear and pinion backlash and of tooth marks detection.
Ring gear teeth or pinion teeth damaged or scored.	Insufficient lubrication. Contaminated lubricant. Incorrect lubrication or poor additives. Worn out pinion bearings that cause an incorrect pinion axle backlash and wrong contact between pinion and ring gear.	Replace bevel gear. Replace worn out pinion bearings that cause an incorrect pinion axle backlash and wrong contact between pinion and ring gear. Use proper lubricant, fill up to right level and replace at recommended intervals.
Ring gear teeth or pinion teeth overheated. Check if gear teeth have faded.	Prolonged operation at high temperature. Unsuitable lubricant. Oil level low. Contaminated lubricant.	Replace bevel gear. Use proper lubricant, fill up to right level and replace at recommended intervals.
Drive pinion teeth pitted.	Extremely intense use Insufficient lubrication	Replace bevel gear. Use proper lubricant, fill up to right level and replace at recommended intervals.
Bent axle beam body.	Machine overloaded. Damaged vehicle. Crash load.	Replace the axle beam body.
Bearings worn or pitted.	Insufficient lubrication. Contaminated lubricant. Extremely intense use. Normal wear. Pinion nut loose.	Replace the bearings. Use proper lubricant, fill up to right level and replace at recommended intervals.


B
155 Nm
13 Nm
10 Nm
80 Nm
260 Nm
150 Nm
B
60 Nm
F46377

Screw in the ball joints (5) and (10) to the ends of the rod to the prescribed torque of 300 Nm (221 lbf·ft).

Screw in the nuts (4) and (11) and the tie rods (3) and (12) to the ball joints (5) and (10).

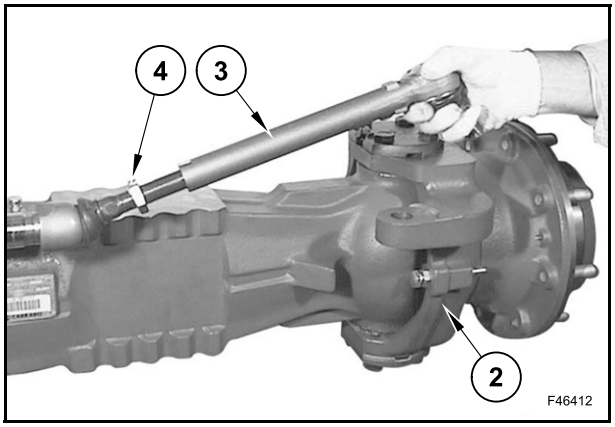


Align the swivel housing (2) with the axle.

Screw the tie rod (3) so that its ball joint can be inserted into the swivel housing (2) arm.

It is important to unscrew the nut (4) to carry out this operation.

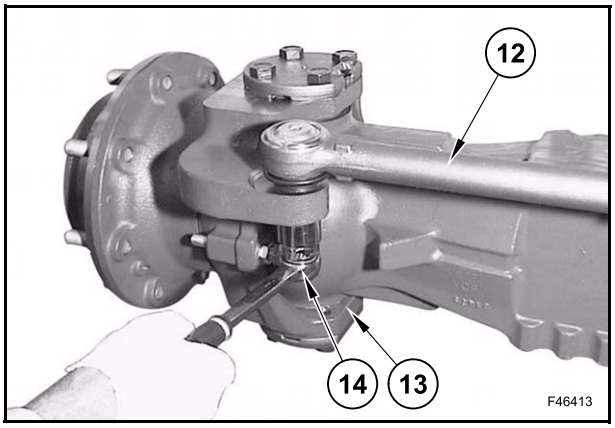
Repeat the mentioned operations on the other side.



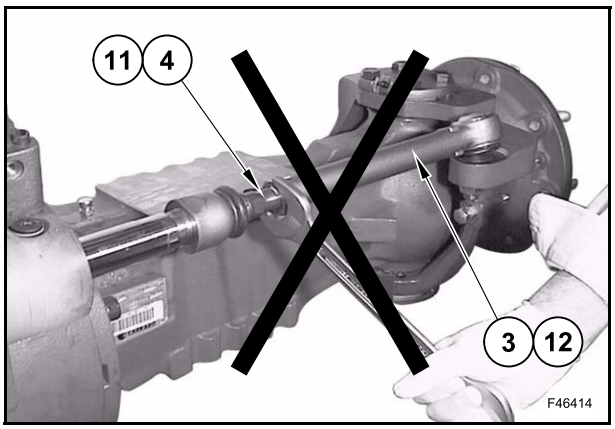
Insert the ball joint of the tie rod (12) into its seat on the swivel housing (13).

Screw in and tighten the nut (14) to a tightening torque of 260 Nm (192 lbf·ft).

Repeat the mentioned operations on the other side.



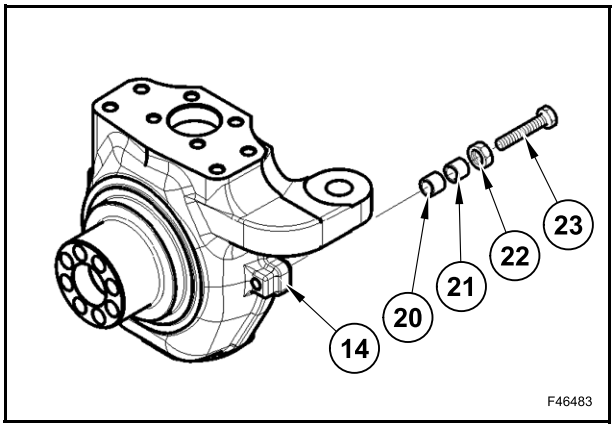
Screw in the nuts (4) and (11) of the tie rods (3) and (12) only after the toe-in adjustment has been carried out.



Assembly

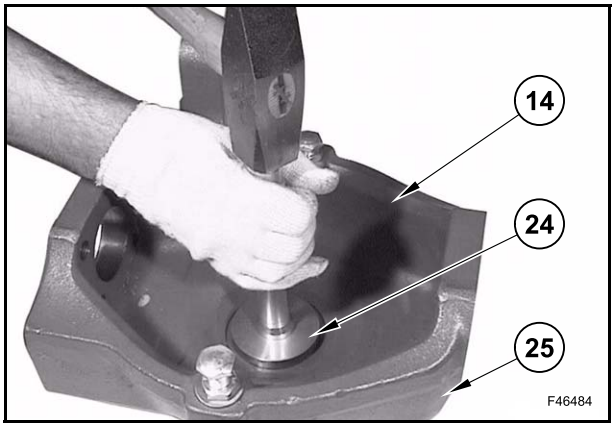
If previously removed, assemble the steering stop screw (23), the nut (22) and the bushings (20) and (21).

Do not tighten the nut (22) until the steering angle adjustment has been carried out.



Insert the bronze bushing (24) into the swivel housing (14) by means of tool 380000024 and a hammer.

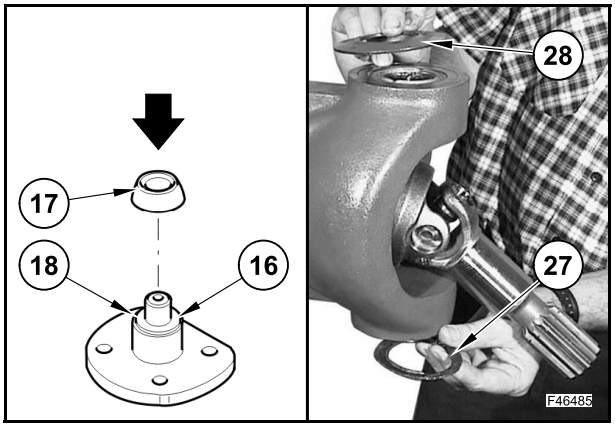
Assemble the new seal ring (25) into the swivel housing (14) by means of tool 380200266 and a hammer.



If the ball bearing (17) has been previously removed, reassemble it to the lower king pin (18) by means of tool 380200195 under a press.

Grease the king pin seats (16) and (18).

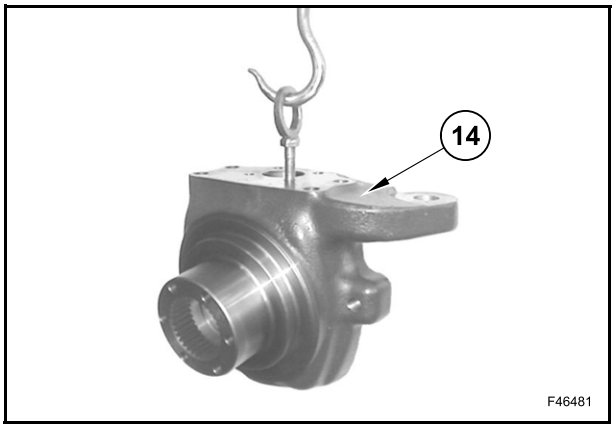
Position the Belleville washers (27) and (28) on the king pin seats (16) and (18).



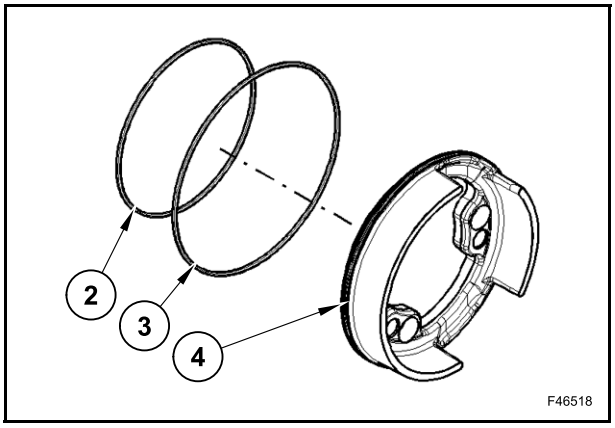
Secure the swivel housing (14) with a rope to a hoist or any other supporting device.

Protect the splined end of the axle shaft by winding it with protective tape, to avoid damaging the seal ring.

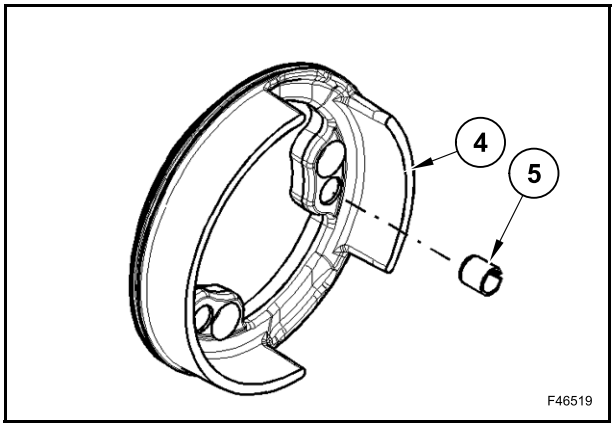
Assemble the swivel housing (14) to the axle and, after assembly, completely remove the protective tape.



Remove the O-rings (2) and (3) from the piston (4).



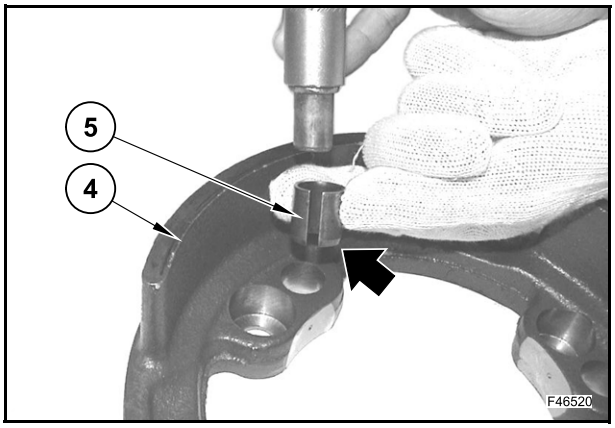
If necessary, remove the bushings (5) of the self-adjust kit from the piston (4), by means of tool 380200194 and a hammer.



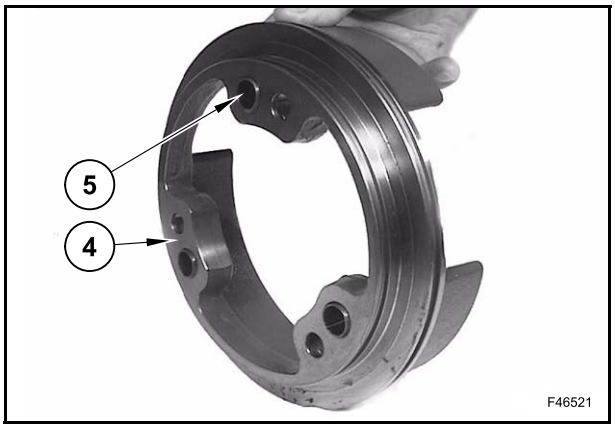
Assembly

Collect the piston (4).

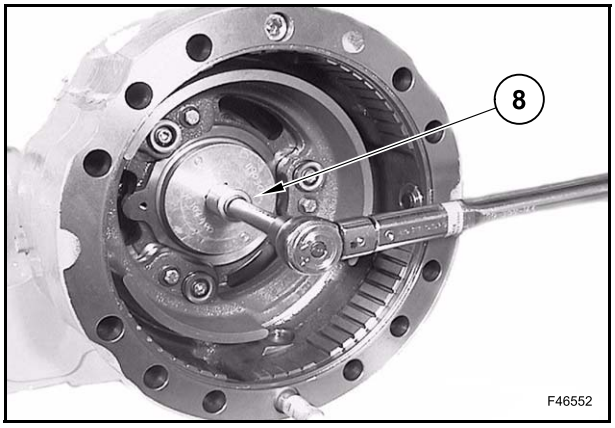
Push the washers (5) into the self-adjust seats by means of tool 380200194 and a hammer, till they are aligned with the piston supporting inner surface.



The bushings (5) must be aligned with the inner supporting surface of the piston (4).

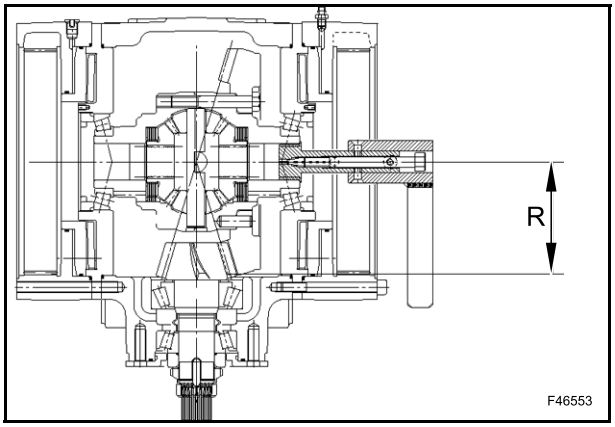


Tighten both ring nuts (8) by means of tool 380200209, till the backlash is eliminated and slightly preload the differential bearings.



Assemble the tool 380200222 on the hole of the differential box.

Place a dial gauge and a feeler in contact and to 90° with respect to the surface of the tool and in correspondence of value R.



Shift manually and alternately the tool 380200222 bracket installed on the hole of the differential box.

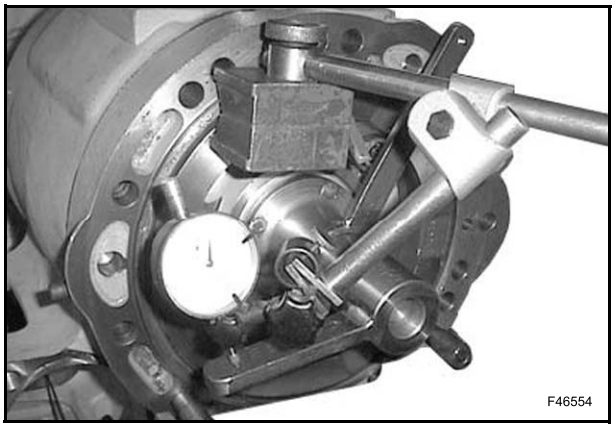
Determine and note the backlash between pinion and ring gear.

Turn the ring gear 1/4 of turn, determine and note the backlash between pinion and ring gear.

Repeat this operation to get several values of the backlash.

Check if the average backlash is within the requested range:

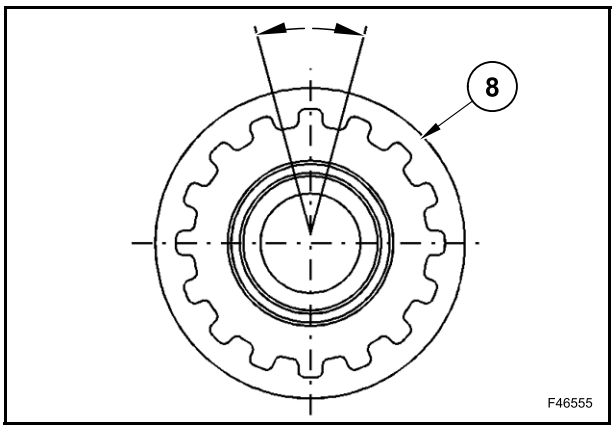
0.15 ÷ 0.30 mm (0.006 ÷ 0.012 in)



If the backlash is not within the requested range, carry out adjustment as follows.

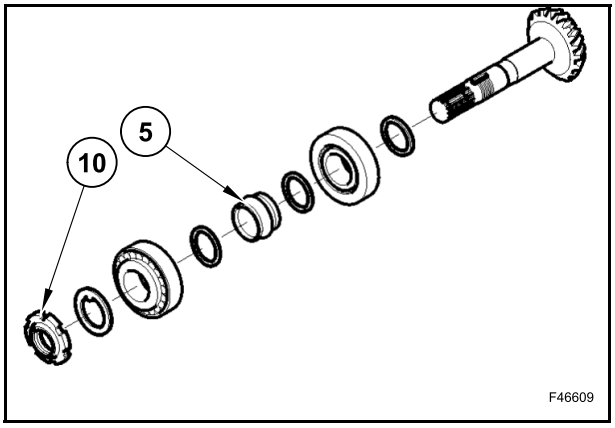
Adjust the ring nuts (8) by means of tool 380200209.

Unscrew and tighten both ring nuts of about 30° each, then check the backlash.



Check the conditions of all parts.

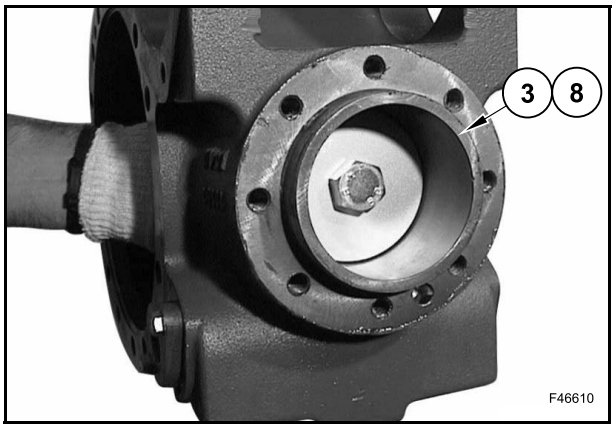
The ring nut (10) and the spacer (5) must be replaced during reassembly.



Assembly

Position the axle central body onto a workbench.

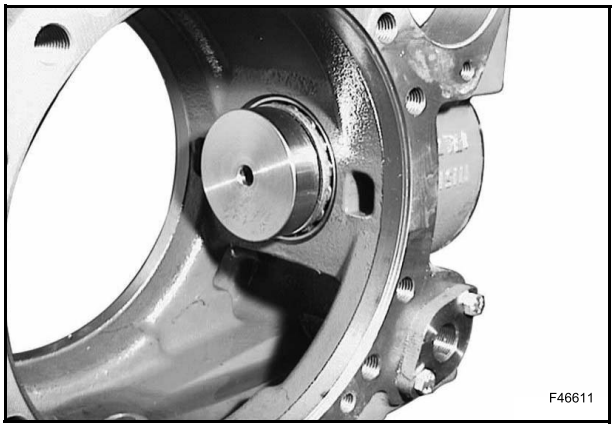
Insert the bearing cups (3) and (8) into their seats using kit 380200216.



Use the false pinion 380200202 and false differential box 380200217.

Insert the bearing and the false pinion into the seats.

Tighten the ring nut, until the backlash is eliminated.

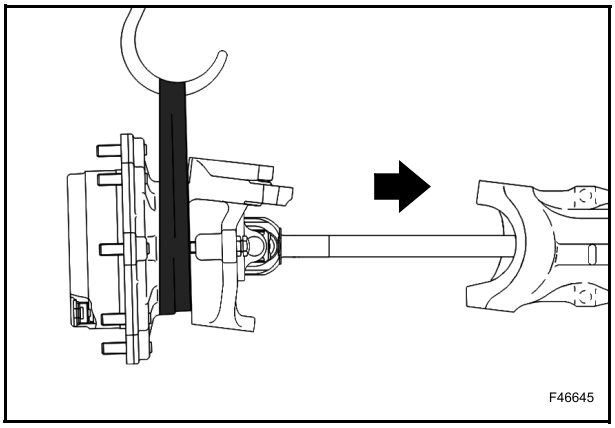


Check the correct place of the differential box supports at the right and left side, using the reference marks applied on the same and on the central body.

Assemble the 2 brake cylinders, fastening them with the relevant screws.

Assembly of wheel assy and double joint

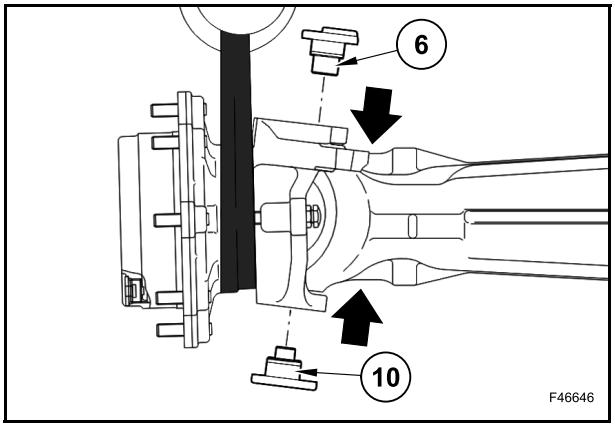
Assemble the wheel hub assy.



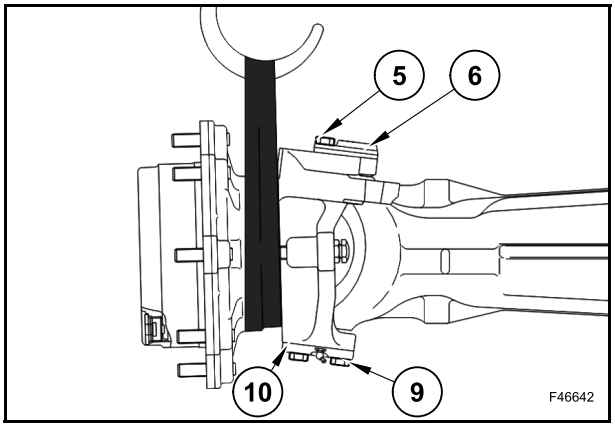
Grease the king pin seats (6) and (10).

Position the Belleville washers on the king pin seats.

Assemble the lower (10) and the upper (6) king pins.

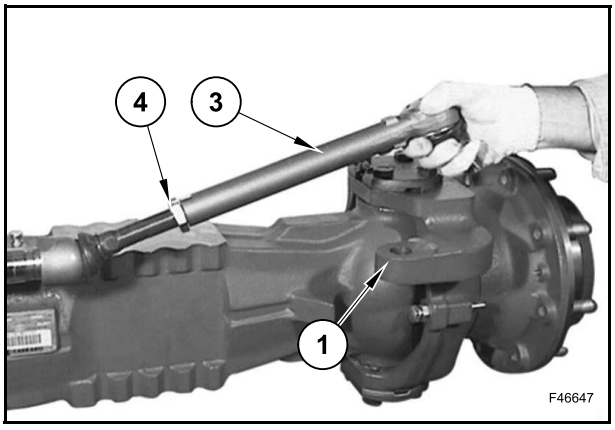


Assemble the upper (6) and lower (10) and king pins by fastening the screws (9) and (5) to the prescribed torque of 300 Nm (221 lbf·ft).



Insert the ball joint of the tie rod (3) into its seat on the swivel housing (1) by turning the swivel housing as much as necessary.

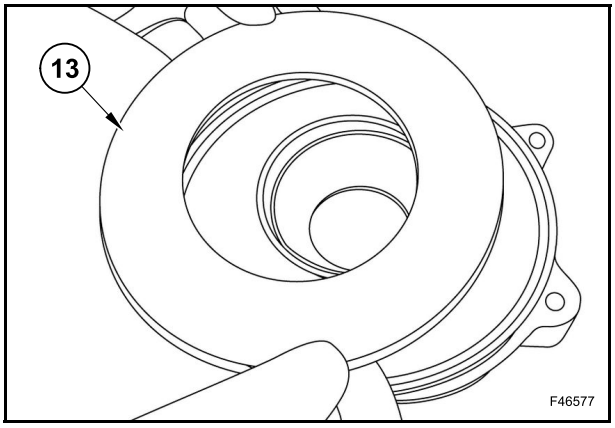
Do not unscrew the tie rod (3) and the relevant nut (4) so as not to impair the wheel toe-in.



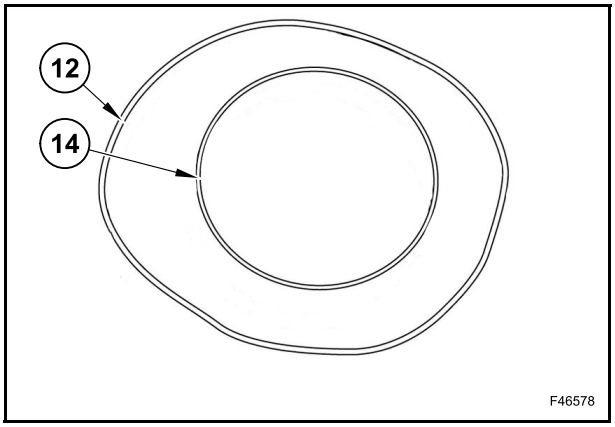
SPECIAL TOOLS

PN CNH	DESCRIPTION	USE
380002211	Handle	To be used with the various pushers and buffers
380000021	Wrench	Screw / unscrew the pinion ring nut
380200188	Buffer	Assembly of bearing cups into the differential box
380200190	Buffer	Assembly of pinion bearing cups
380000020	Wrench	Measure of pinion rolling torque
380200192	Buffer	Assembly / disassembly of bushings in the ring gear carrier hub
380200194	Buffer	Assembly / disassembly of self-adjust kit
380200195	Buffer	Ball bearing assembly of the lower king pin
380200196	Buffer	Ball bearing assembly of the upper king pin
380000024	Buffer	Bushing assembly into the swivel housing
380200202	False pinion	Differential and pinion assembly
380200205	Buffer	Assembly of bushings into the differential box
380200209	Wrench	Tighten / loosen the brake cylinder ring nut
380200210	Buffer	Wheel hub seal ring assembly
380200211	Buffer	Assembly of bearing cups into the wheel hub
380200216	Kit	Assembly of pinion bearing cups
380200217	False differential box	Differential and pinion assembly
380200218	Buffer	Assembly of bearing cup into the brake cylinder
380200222	Tool	Backlash measure between pinion and ring gear
380200227	Buffer	Assembly of bushing in the half-beam
380002226	Buffer	Assembly of seal ring in the half-beam
380200237	Tool	Preload measure
380200238	Buffer	Brake piston assembly
380200266	Buffer	Seal ring assembly into the swivel housing
380200267	Buffer	Pinion seal ring assembly

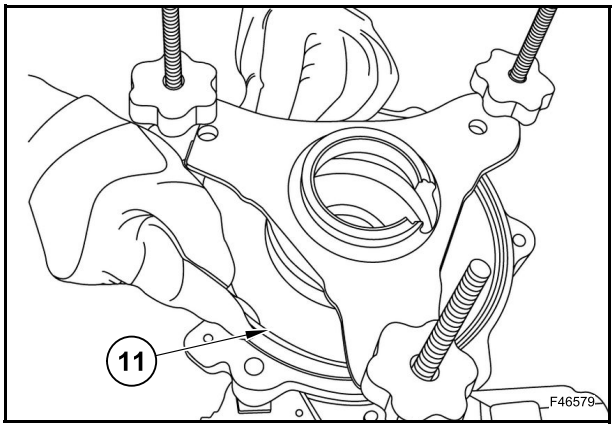
Remove the retaining plate (13).



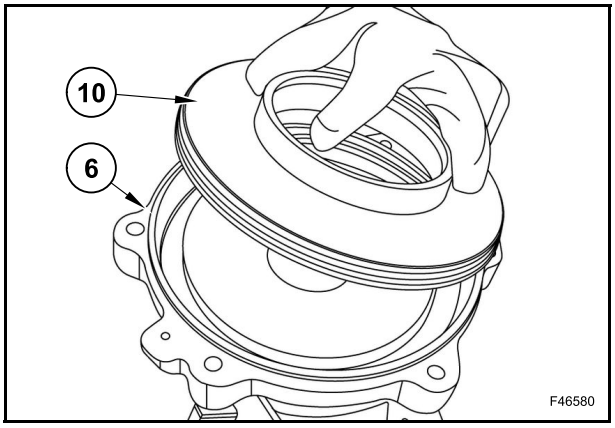
Remove the O-rings (12) and (14) from the retaining plate.



Compress the Belleville washers, to remove the snap ring (11).



Remove the piston (10) from the brake cover (6).



1. Front axle steering cylinder
2. Steering control valve
3. 4x1 bucket cylinders
4. Dipper cylinders
5. Boom cylinder
6. Ride control valve (optional)
7. Ride control accumulator (optional)
8. Loader control valve
9. Hand hammer control valve (optional)
10. Backhoe hammer control valve (optional)
11. Hand hammer (optional)
12. Backhoe hammer (optional)
13. Hydraulic pump
14. Priority valve
15. Hydraulic oil cooler
16. Hydraulic oil tank
17. Air filter
18. Hydraulic filter manifold
19. Backhoe control valve
20. Telescopic cylinder
21. Bucket cylinder
22. Dipper cylinder
23. Stabilizers right cylinder

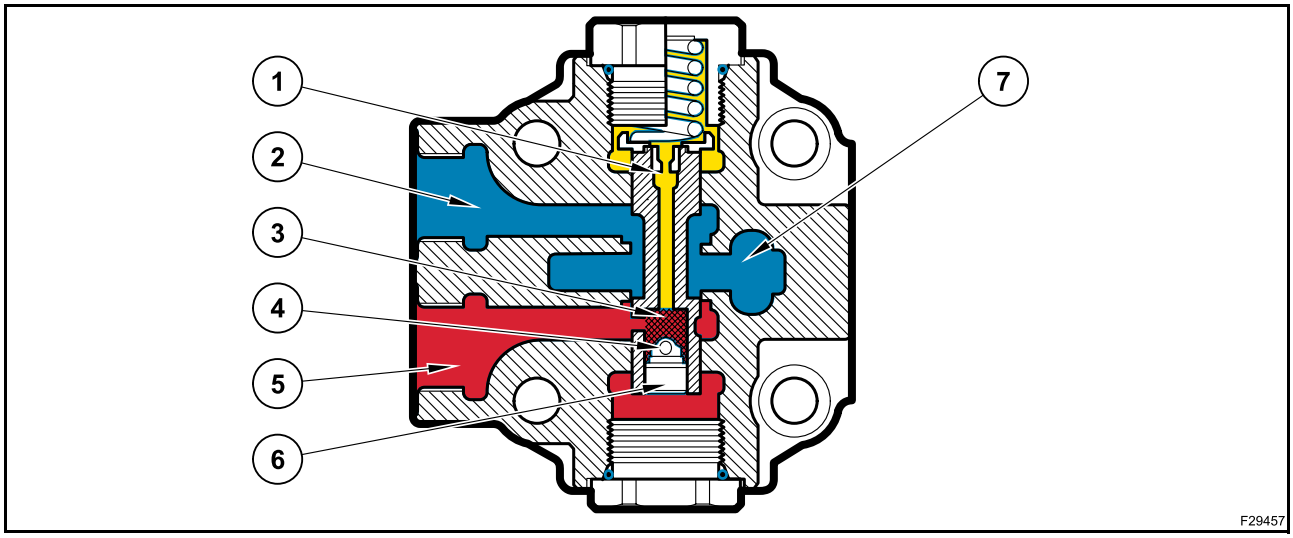
23A. Check valve

24. Stabilizers left cylinder

24A. Check valve

25. Boom cylinder
26. Swing cylinders

26A. Swing valve

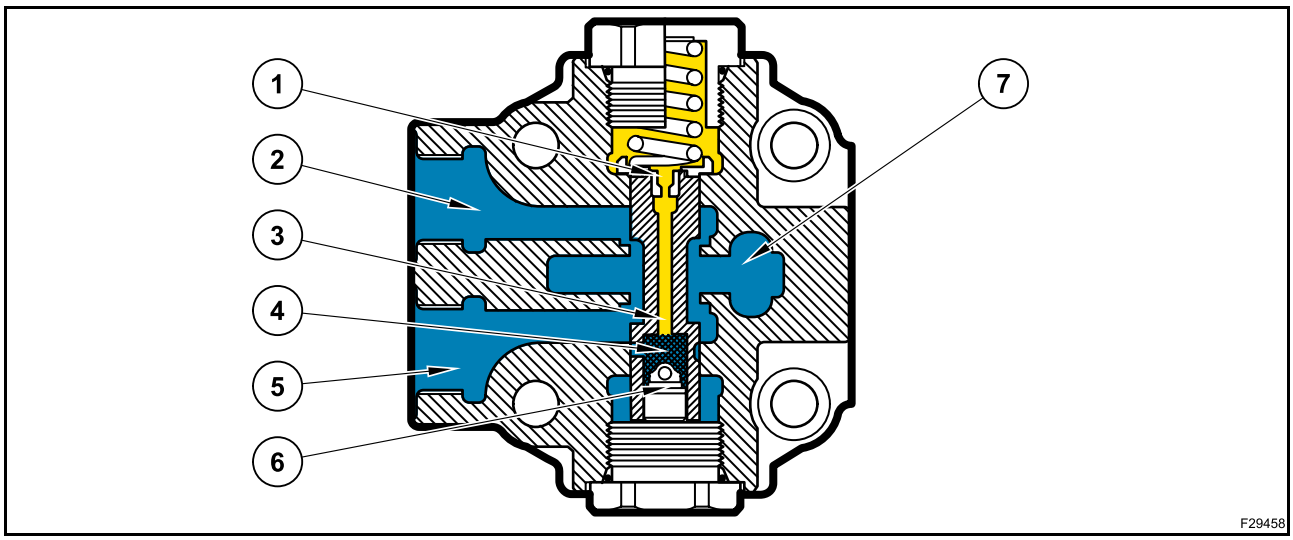


Load sensing valve with pump running - Steering in neutral

Return to oil tank
Trapped oil
Pressure oil

1. Orifice
2. Rear systems (EF)
3. Filter
4. Spool
5. To steering priority flow (CF)
6. Orifice
7. Inlet port (from rear port)

The pressure on (CF) increases until the pressure value (stand-by pressure) is sufficient to move the spool valve in a way to divert the flow toward (EF).



Load sensing valve with pump running - Steering working

Trapped oil
Return to oil tank

1. Orifice
2. Rear systems (EF)
3. Filter
4. Spool
5. To steering priority flow (CF)
6. Orifice
7. Inlet port (from rear port)

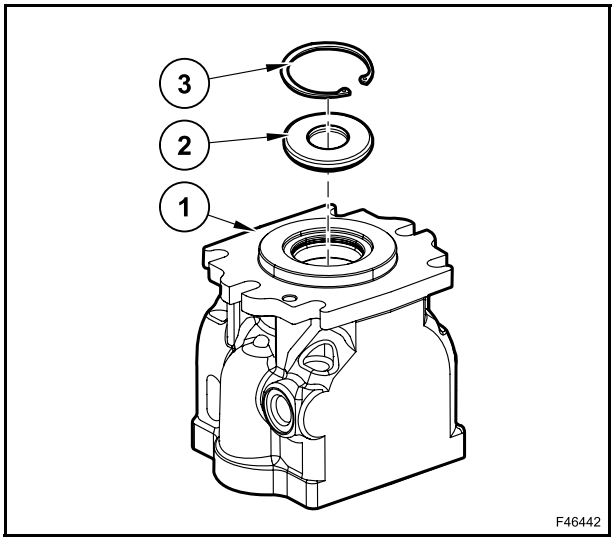
During steering two actions are performed:
1. The fluid moves to the steering through (CF).
2. The (LS) signal is in communication to the steering.

Orientate the pump body (3) with the flange facing up.

Remove the snap ring (1).

Carefully pry out the seal ring (2).

In case it is not possible to extract the seal sing (2), try to push the seal out by going through the inside of the pump body (3).



Disassembly of the load-sensing control valve (29)

Remove the 4 plugs (40), (43), (48), (54) and their O-rings (41), (44), (47), (55).

Remove the 2 screws (62).

Remove the spools (42), (45). Note which bore each spool came out of.

Also note the orientation of each spool for reinsertion.

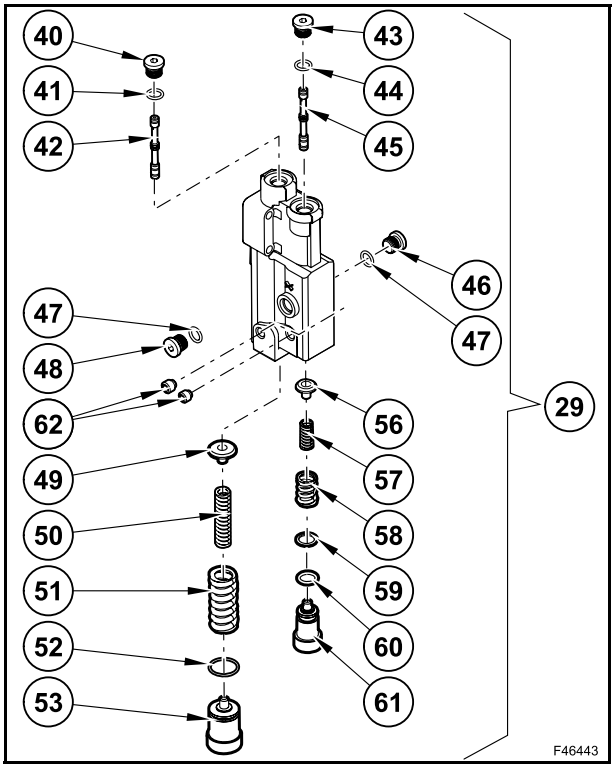
There may be differences in reinserting into the same bore.

Remove the adjusting screw (53) and the O-ring (52).

Remove the springs (51), (50) and the spring guide (49).

Remove the adjusting screw (61), the O-ring (60) and the back-up ring (59).

Remove the springs (57), (58) and the spring guide (56).



Loader unload valve operation

An unload valve with sensing is installed to dump the rear pump flow when operating the loader, to provide more power to the transmission.

The front pump is not affected, so the loader will have the same power, but will momentarily be slower.

The operator may not notice the reduced speed, for as soon as the pressure lowers below the preset limit, the rear pump flow is directed back to the loader.

System pressure below 170 bar (2465 psi)

Oil flow from the front pump enters the loader valve housing at port P1.

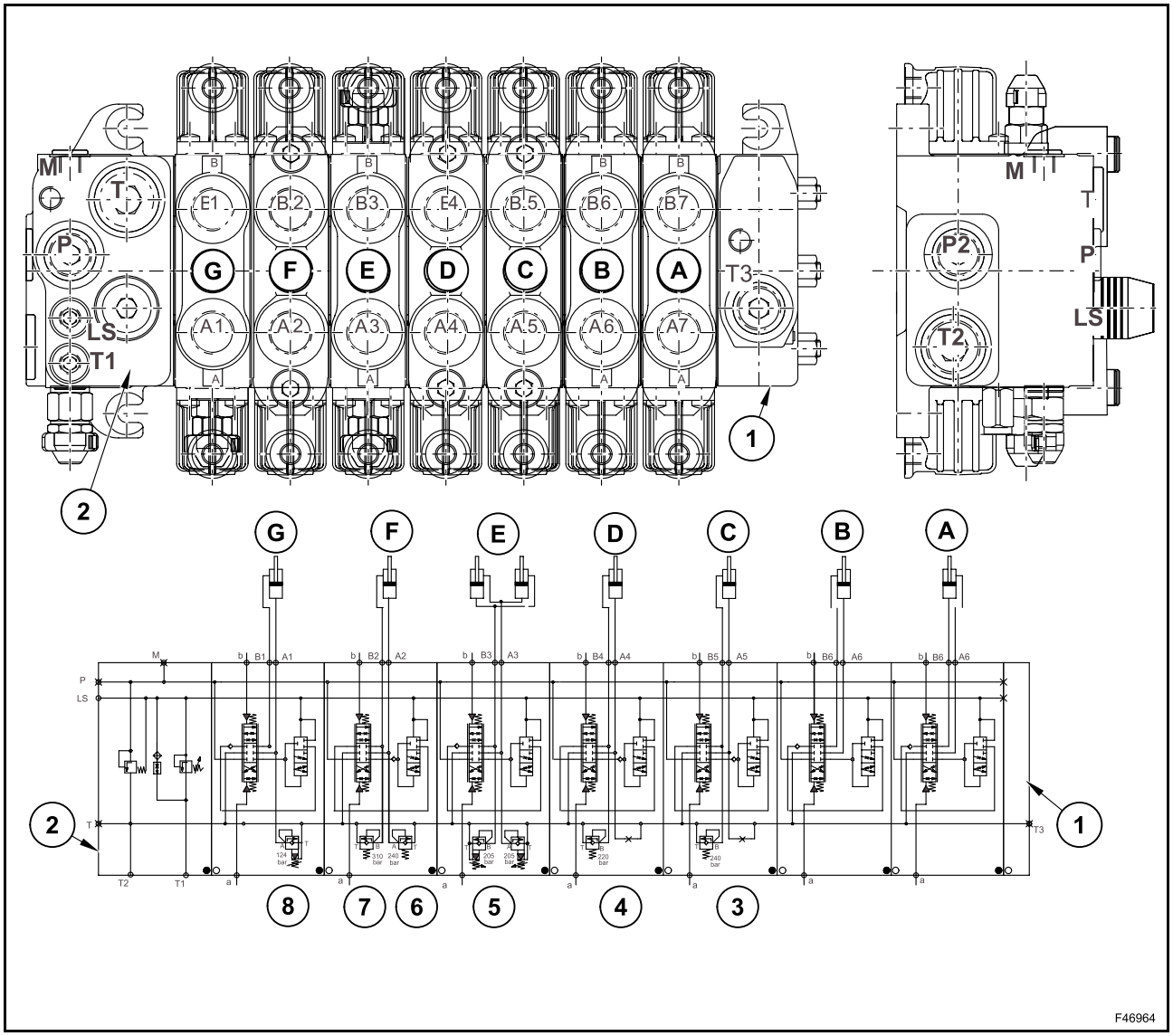
Oil flow from the rear pump enters the loader valve at port P2.

When system pressure is less than 170 bar (2465 psi), the rear pump flow passes through the load check valve and merges with the flow from the front pump.

System pressure above 170 bar (2465 psi)

When system pressure rises to 170 bar (2465 psi), the rear pump flow back to tank through port T.

This reduced flow through the loader and backhoe control valves now allows a more precise control of the loader and backhoe elements.



A. Right stabilizer section
B. Left stabilizer section
C. Dipper section
D. Bucket section
E. Swing section
F. Boom section
G. Telescopic dipper section

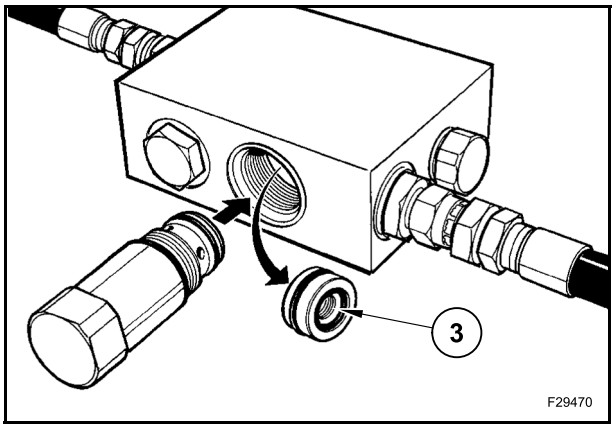
1. End cover
2. Inlet section
3. Dipper relief valve - 240 bar (3481 psi)
4. Bucket relief valve - 220 bar (3191 psi)
5. Swing relief valves - 205 bar (2973 psi)
6. Boom relief valve (rod side) - 240 bar (3481 psi)
7. Boom relief valve (piston side) - 310 bar (4496 psi)
8. Telescopic dipper relief valve - 124 bar (1798 psi)

Reassemble the valve and install it on the test block.

Operate hand pump and recheck pressure.

If pressure is now lower than that recorded with the insert installed it is an indication that the anti-cavitation feature of the valve is leaking and the valve requires overhaul or replacement.

The insert isolates the anti-cavitation feature of the valve. When reassembling the insert into the test block ensure it is installed correctly. When correctly installed the O-ring (3) on the face of the insert should be visible.



PRECISION SWING VALVE FAULT FINDING

Measurement of swing drift

On horizontal ground, tilt unit approximately 10° with stabilizers. Extend the boom, dipper, and bucket so they are horizontal. Warm unit up to approximately 49 °C (120 °F) (valve will be warm to the touch).

Center boom, lower to the ground, and make a mark with the bucket (or line up an object with a bucket tooth). Raise bucket to approximately 6'.

Turn unit off and wait 5 minutes. Lower boom (no swing!) to the ground.

Measure the difference between mark (or reference object) and bucket tooth.

This distance should be approximately 5" for a B95.

Delay check leaks

Symptom:

The backhoe linkage would likely swing slowly to one side during roading / loading of the backhoe.

Verification method:

Switch swing port relief valves. If the drifting switches to the opposite side, the problem is with the relief valve.

Perform swing drift test measurement. If the check is leaking, the measured distance will increase significantly.

Performing the swing drift test with a cross-over orifice plugged would eliminate the cross-over spool as a cause of the leakage.

Shuttle valve leaks

Symptom:

The backhoe linkage would likely swing slowly to one or both sides during roading / loading of the backhoe.

Verification method:

See "Delay Check Leaks" above.

Cross-over spool leaks

Symptom:

The backhoe linkage would likely swing slowly to both sides during roading / loading of the backhoe. The swing may drift slowly after almost stopping when the unit is tilted.

Verification method:

Perform the swing drift test and then repeat the test with a cross-over orifice plugged.

This would determine if the cross-over spool is the cause of the leakage.

Bypass orifice contaminated

Symptom:

The backhoe linkage would likely drift slowly to one side after the swinging motion is stopped and the unit is tilted slightly.

Verification method:

Repeat the motion, so that the drift occurs again, and then add tilt to the unit. Repeat the motion several times to verify that drift is not reproducible at higher angles.

Delay orifice or delay screen contaminated

Symptom:

The backhoe boom takes longer than normal to stop from a swinging motion in both directions.

Verification method:

Perform the swing drift test with a cross-over orifice plugged. If the symptom stops, this would indicate that the delay orifice is contaminated.

Thermal bypass fails

Symptom:

The backhoe boom takes longer than normal to stop from a swinging motion in both directions when starting in cold weather or the system may not actuate after oil is warmed up.

Verification:

In cold weather, remove the cross-over spool assembly, and with snap ring pliers, remove all internal components. Reinstall the crossover spool in the valve and verify that the backhoe boom stops quickly and with some oscillations.

If the system is not activating after the oil is warmed up, remove the cross-over spool assembly. Push the back of the thermal actuator and verify that it easily strokes approximately ¼". With snap ring pliers, remove all internal components. Visually inspect the thermal actuator for evidence of damage.

7 or 0.34 bar (100 or 5 psi) main flow check fails

Symptom:

Anti-rebound valve works well in one direction, but doesn't work in the other direction.

Verification method:

Remove the swing anti-rebound valve. Switch the check valves from one side to the other side. Make sure that the black (100 psi) check valves are inserted closest to the mounting surface, and that the direction of good performance is noted before the swap.

LOADER BUCKET CYLINDER REMOVAL (B95BTC - B115B)

Move the machine to a level and firm ground.

Place the bucket firmly on the ground.

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

Support the cylinder using a sling and a suitable support.

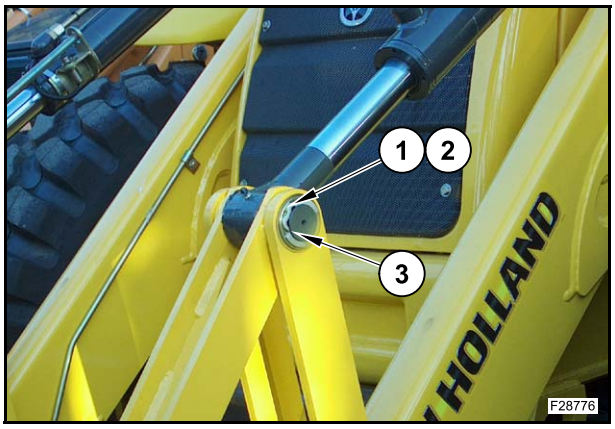
Disconnect the hoses.

Cap or plug all exposed openings.

Support the bucket linkage and rods.

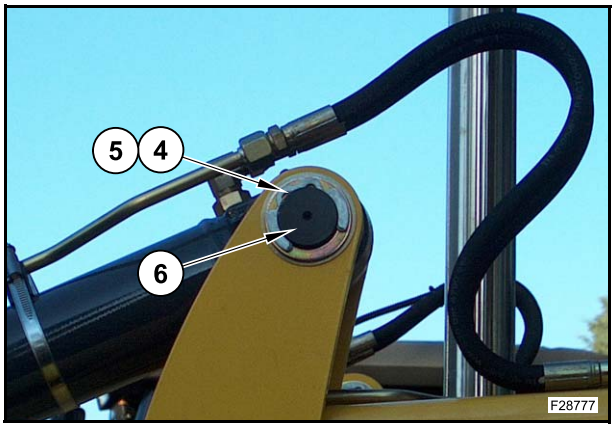
Remove the snap ring (1) and the spacer (2).

Hammer to slide out the pin (3).



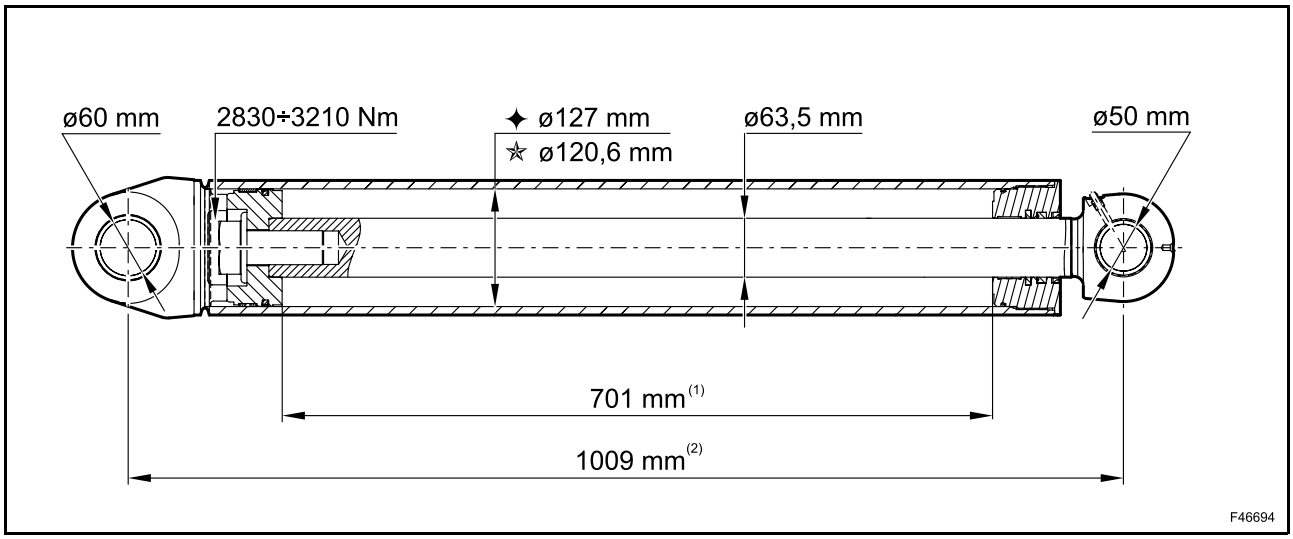
Remove the stop ring (4) and the shim (5).

Hammer to slide out the pin (6).



Remove the loader bucket cylinder.

BACKHOE ATTACHMENT DIPPER CYLINDER



1. Stroke
2. Completely retracted

✦ with long dipper
(B95BLR - B110B - B115B)

✯ with short dipper
(B90B - B95B - B95BTC)

BACKHOE ATTACHMENT DIPPER CYLINDER REMOVAL

Move the machine to a level and firm ground.

Place the bucket firmly on the ground.

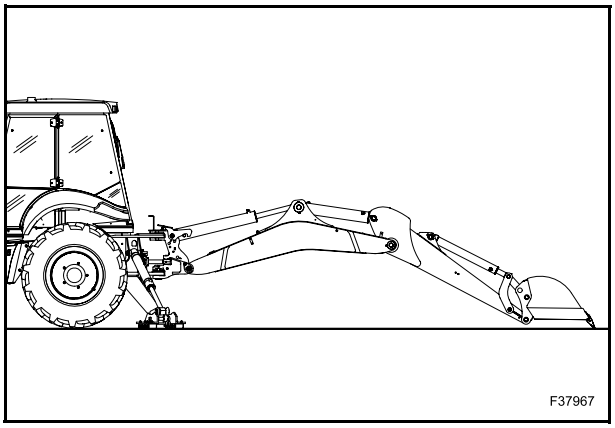
Support the backhoe attachment elements for cylinder removal using a suitable support.

⚠ WARNING ⚠

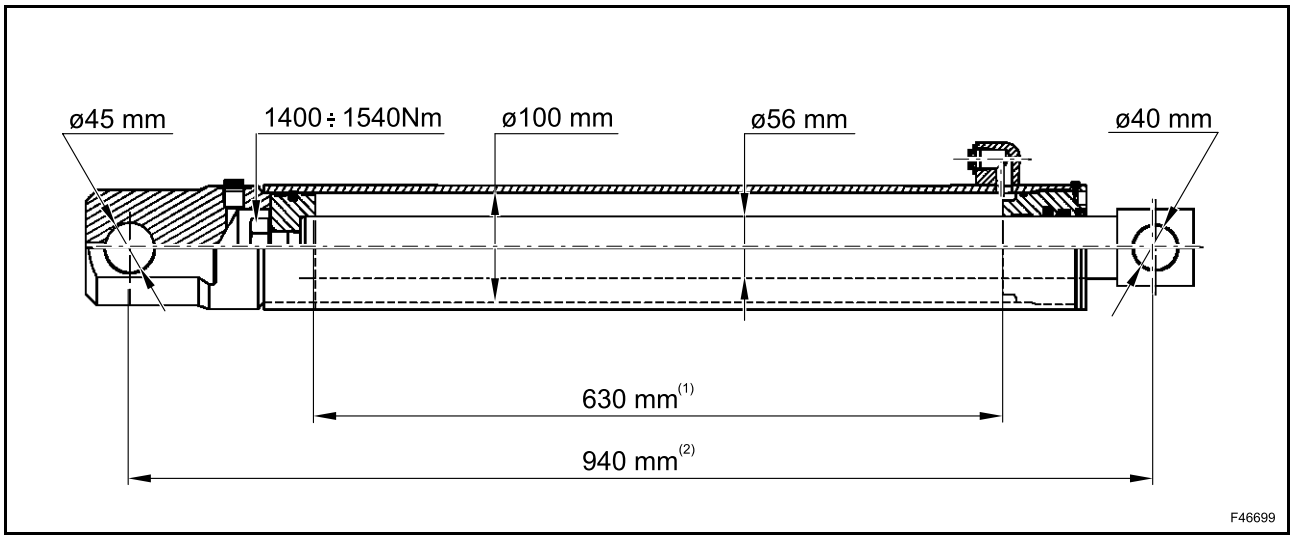
Always support the structural members so that they will be stable and safe to work around.

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

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



STABILIZER CYLINDER



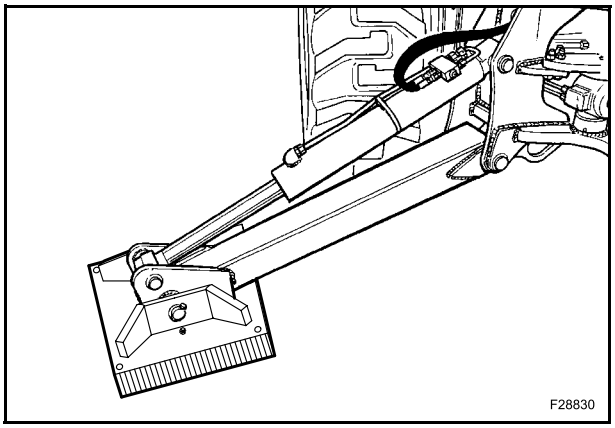
(1) Stroke

(2) Completely retracted

STABILIZER CYLINDER REMOVAL - CENTER PIVOT

Make sure that the backhoe loader is locked in the transfer position or parked in a safety work position.

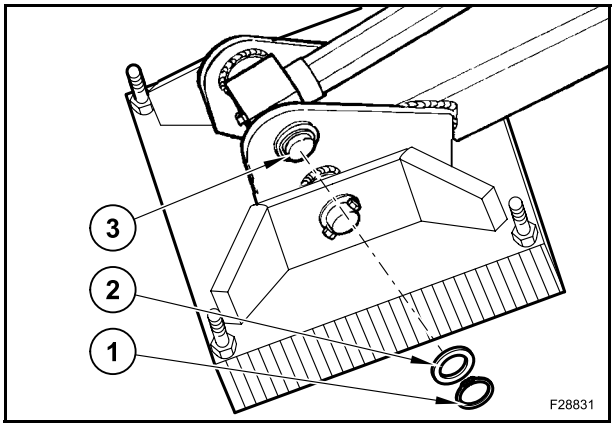
Lower the stabilizers to the ground.



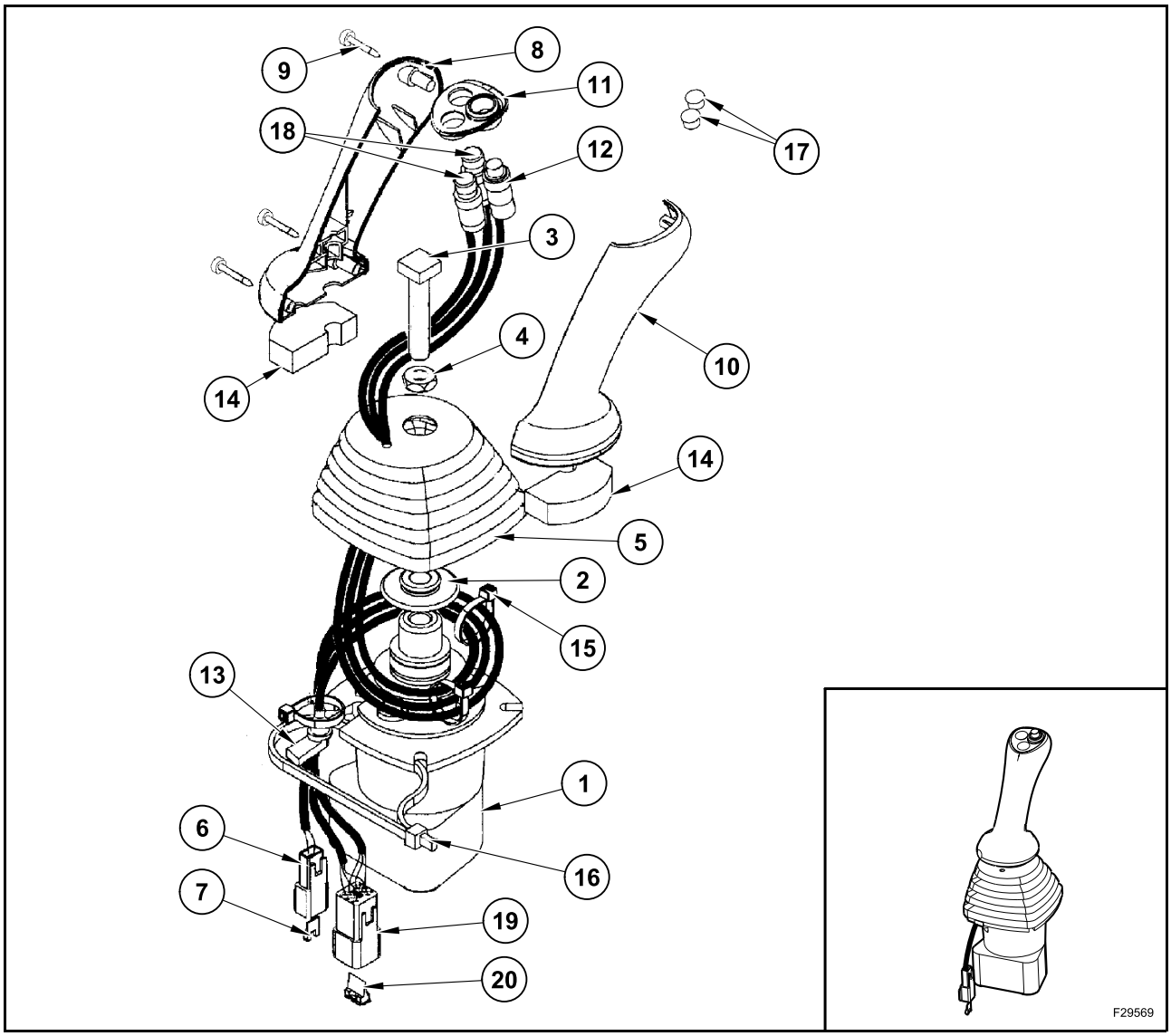
Support the cylinder safely with suitable belt and hoist.

Remove the snap ring (1) and the shim (2).

Extract the pin (3) with a hammer. Using the hydraulic power, retract the cylinder very slowly.



LEFT HAND CONTROL LEVER



1. Valve
2. Plate
3. Screw
4. Nut
5. Boot
6. Connector
7. Wedge
8. Half handle
9. Screw
10. Half handle
11. Cover
12. Switch push button (horn)
13. Washer
14. Spacer
15. Clip
16. Clip
17. Plugs [if the switches (18) are not fitted]
18. Switch push buttons (auxiliary bidirectional)
19. Connector
20. Wedge

HYDRAULIC PUMP

TROUBLE	CAUSE	ACTION
System noisy.	Worn or damaged pump gears or pressure plates.	Make a hydraulic pump performance test.
	Aeration: air entering the systems at: suction tube, pump shaft, fittings or cylinder ring nuts.	Make a hydraulic pump performance test.
	Cavitation: system restrictions in the suction line or in the tank filter.	Make a visual check and/or a hydraulic pump performance test.
	Water in the system.	Visual check.
	The system relief valve vibrates.	Check system relief valve, adjust/ overhaul as necessary.
	Vibrations in the lines.	Visual check.
	Cold hydraulic oil.	Check the hydraulic oil operating temperature.
	Wrong oil type.	Investigate/drain and top up.
Hydraulic oil drain through tank breather.	Tank overfilled.	Check hydraulic oil level.
	Aeration: air entering the system at: suction tube, pump shaft, fittings or cylinder ring nuts.	Make a hydraulic pump performance test.
	Cavitation: Restriction of the suction filter in the tank.	Make a visual check and/or a hydraulic pump performance test.
Oil heating.	Low oil quantity.	Fill the tank.
	Contaminated oil.	Drain the tank and refill with clean oil.
	Too high/low setting of the relief valve.	Drain the tank and refill with clean oil. Test relief valves.
	Oil in system too light.	Drain the tank and refill with oil with the correct viscosity.
	Oil cooler fins obstructed.	Clean the oil cooler.
Oil leaks through the shaft seal.	Worn shaft seal.	Replace shaft seal and inspect pump.
Foamy oil.	Low oil level.	Fill the tank.
	Air in the suction system.	Check/tighten suction line.
	Wrong oil type.	Drain and refill with correct oil.

The cab frame is a one-piece unit, mounted on top of the chassis.

To remove the cab it is necessary to carry out different operations, listed below.

Remove the cab skirts (S) all around the cab.

Disconnect the two electric connectors from the main harness and engine harness.

Remove the two front fixing screws (7) between the cab floor and the cab support (13) (detail A).

Remove the two rear fixing screws (7) between the cab floor and the rear supports (10) on the main frame (1) (detail B).

Disconnect the two steering cylinder hoses (left side).

Disconnect the pump - power steering valve hose.

Disconnect the power steering valve - oil tank hose.

Disconnect the load sensing valve hose.

Disconnect the stabilizers cables (mechanical version).

Disconnect the parking brake cable.

Disconnect the water - heater hoses (after water discharge).

Disconnect the air conditioning hoses (after coolant drain).

Disconnect the transport lock cable (mechanical version).

Disconnect the telescopic dipper control pedal (mechanical version).

Turn the knobs and the boots of the various levers (front and rear)

Lift the cab with the crane after its anchorage to lifting hook.

IMPORTANT: *when lifting the cab ensure the hydraulic brake tanks are not caught and damaged on the loader support frame.*

2WS (mechanical models)

Model ..... EATON P/N 403-8754-58

Displacement ..... 160 cm^3/rev (9.76 in^3/rev)

Shock valve ..... no

Load-sensing pressure relief valve adjustment ..... no

2WS (pilot models)

Model ..... EATON P/N 403-8754-52

Displacement ..... 160 cm^3/rev (9.76 in^3/rev)

Shock valve ..... no

Load-sensing pressure relief valve adjustment ..... 175 bar (2538 psi)

4WS

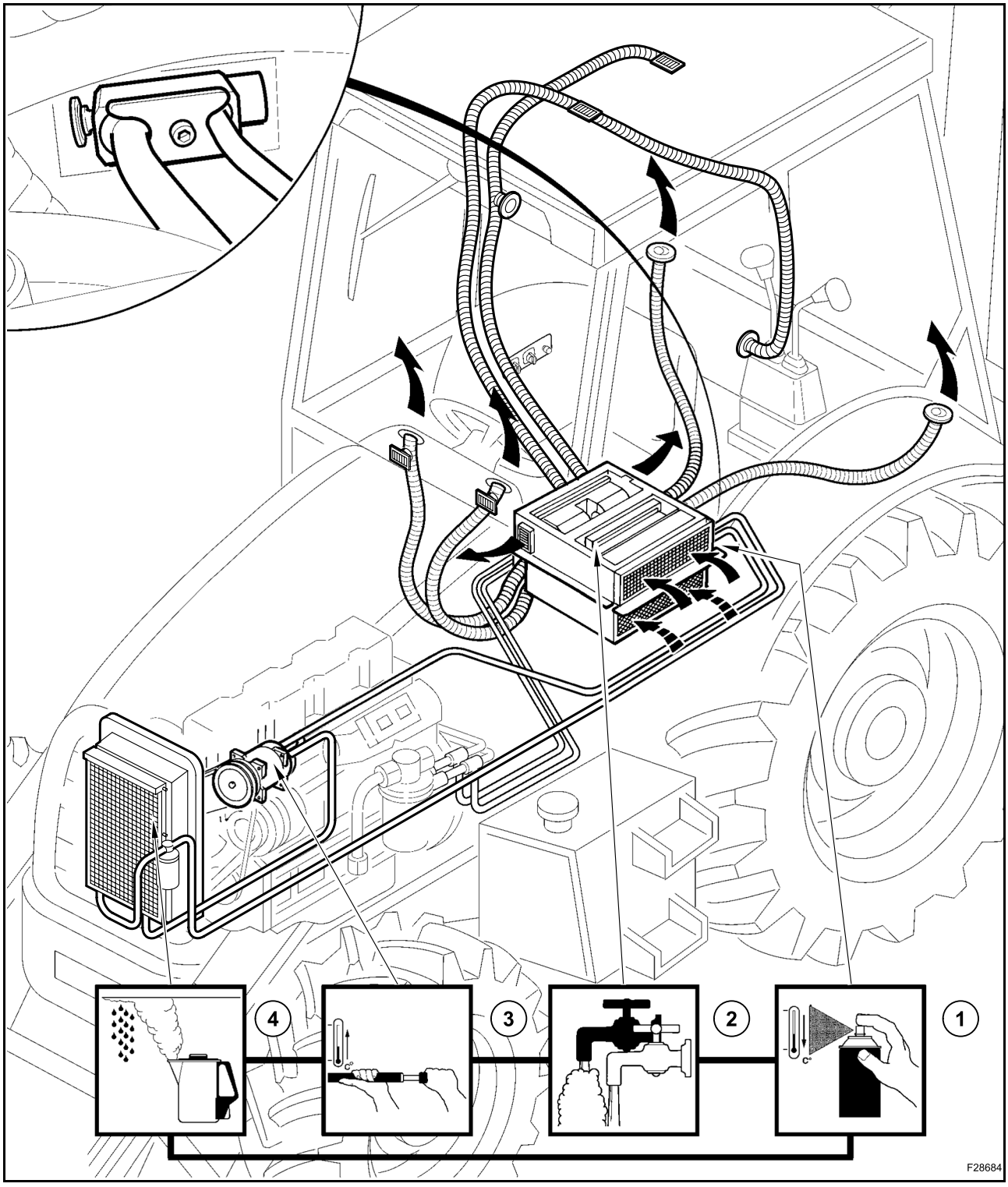
Model ..... EATON P/N 403-7754-04

Displacement ..... 160 cm^3/rev (9.76 in^3/rev)

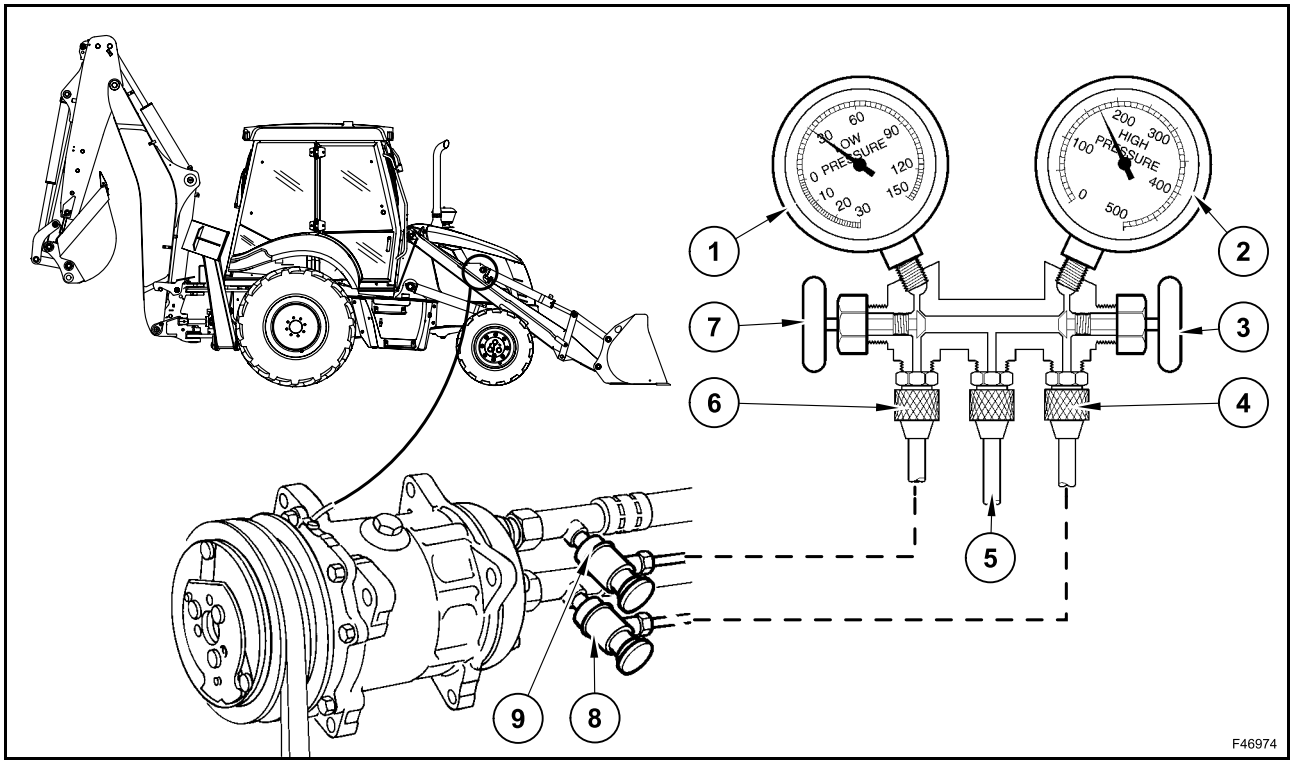
Shock valve adjustment ..... 235 bar (3408 psi)

Load-sensing pressure relief valve adjustment ..... 175 bar (2538 psi)

OPERATING DIAGRAM



1. Expansion valve-atomizes liquid coolant before passing to evaporator
2. Evaporator-absorbs heat from air in cab
3. Compressor-compresses and raises temperature of coolant gas
4. Condenser and receiver dryer-converts coolant from gas to a liquid



1. Low side gauge
2. High side gauge
3. Shut-off valve
4. Test hose to high side service connector
5. Centre hose (not used)
6. Test hose to low side service connector
7. Shut-off valve
8. Low pressure (suction) side service valve
9. High pressure (discharge) side service valve

Performance testing the air conditioning system

The manifold gauge set is the most important tool used in testing and servicing the air conditioning system.

NOTE: *for Dealers who posses the latest design level of coolant recovery, recycling and recharging station, these gauges are an integral part of the machine.*

The following instructions for performance testing the air conditioning system is based on the use of the gauge set shown. The principal of operation is however similar when testing the system using a recovery and recharging station with integral gauges.

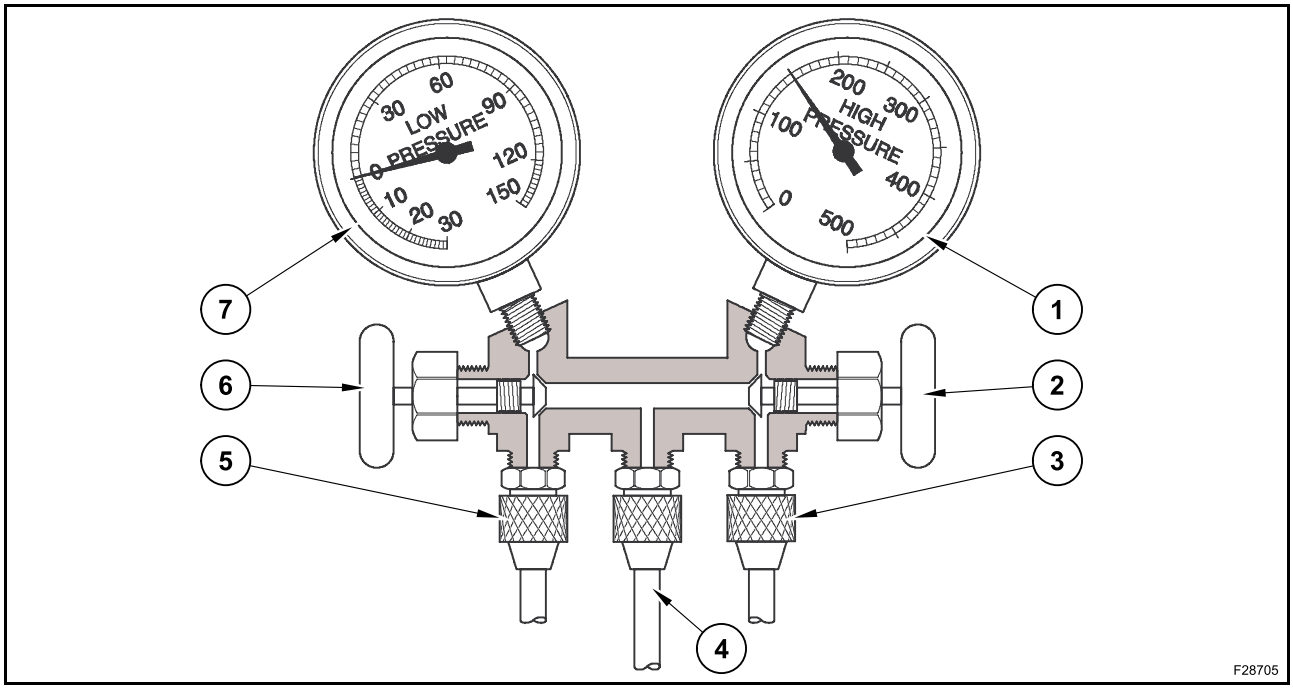
When using this type of equipment **always** consult the manufacturers operating instructions.

Operating precautions

IMPORTANT: *always ensure the shut-off valves are **closed** (turn clockwise until seated) during all test operations.*
In the closed position, coolant circulates around the valve stems to the gauges. Therefore, when the manifold gauge set is connected into a system, pressure is registered on both gauges.

- **NEVER** open the HIGH SIDE shut off valve when the system is operating.
- **ALWAYS** open the LOW SIDE shut off valve when adding coolant.

Performance test example 8



1. High side low
2. High side hand valve closed
3. High side hose connected to high side service connector
4. Not used
5. Low side hose connected to low side service connector
6. Low side hand valve closed
7. Low-pressure side low

Problem

Insufficient cooling.

Cause

Improper operation of thermostatic expansion valve (stuck open).

Conditions*

Low side pressure too low (zero or vacuum). The gauge should read 1 ÷ 2 bar (14.5 ÷ 29 psi).

High side pressure low. The gauge should read 13.3 ÷ 14.8 bar (193 - 215 psi).

Evaporator air cool, but not sufficiently cold.

Evaporator inlet pipe surface shows considerable moisture or frost.

Low pressure switch cutting out.

Corrective procedures

Place finger on expansion valve to evaporator tube. If too cold to touch, proceed as follows:

- operate the system at maximum cooling;
- check the low-pressure side gauge. The pressure should lower slowly.

If the previous procedure indicates that the expansion valve is defective, proceed as follows:

- discharge the system;
- replace the expansion valve;
- drain the system;
- charge the system;
- carry out the performance test of the system.

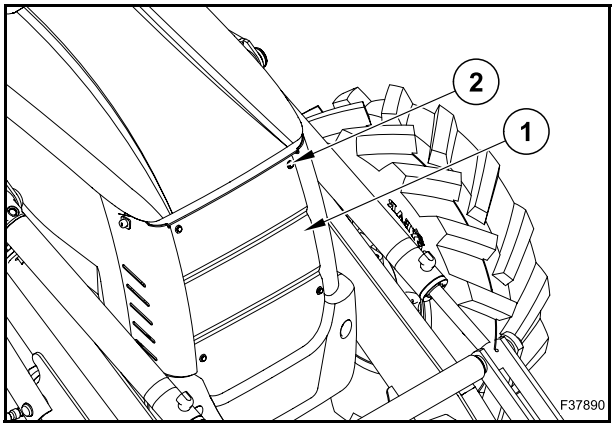
Diagnostic

Expansion valve is not permitting a sufficient flow of coolant. May be caused by valve stuck in restricted or closed position.

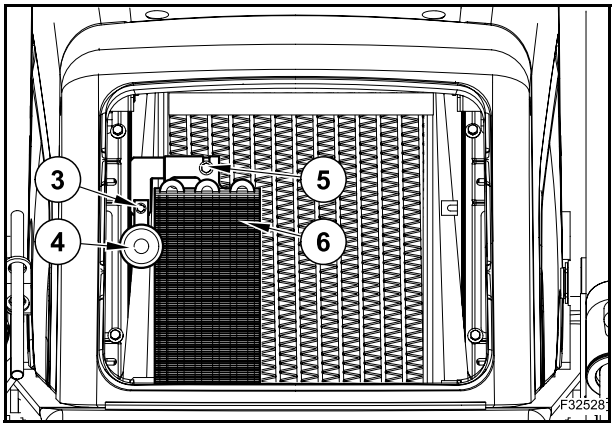
***NOTE:** * test procedure based upon ambient temperature of 35 °C (95 °F).*
For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.

CONDENSER

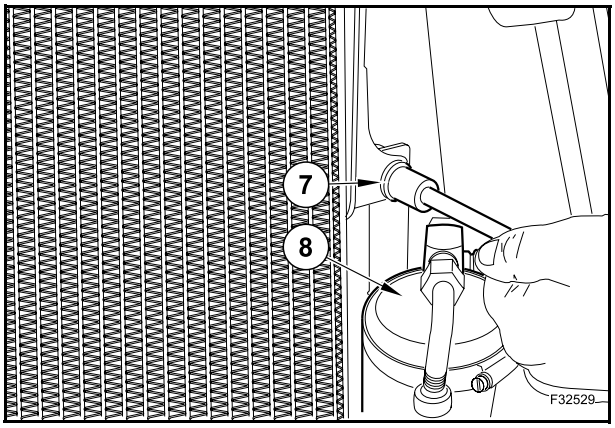
Loosen and remove the fixing screws (2). Remove the front grill (1).



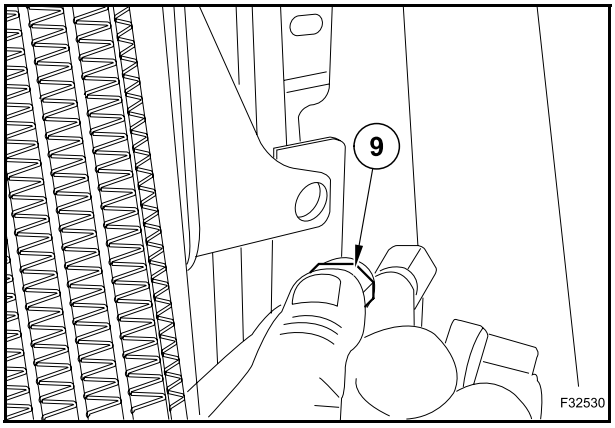
Unscrew and remove the nut (3). Remove the horn (4). Unscrew and remove the nut (5). Remove the fuel cooler (6).



Unscrew and remove the fixing upper nut (7) and loosen the fixing lower nut. Move the dryer filter (8) to the right side.



Unscrew and remove the nuts (9).



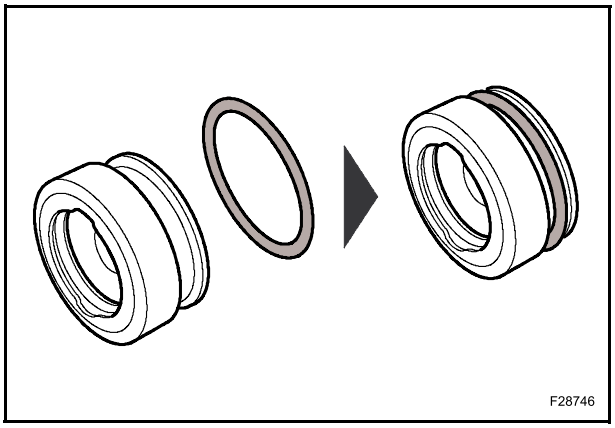
Assembly

Thoroughly clean the seal cavity in the hub.

Use “lint free” cloth only.

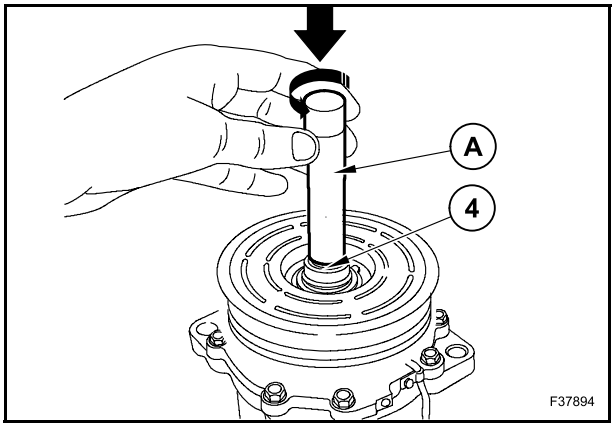
Ensure the new shaft seal O-ring is installed onto the seal assembly.

Dip the new seal assembly in clean coolant oil and attach to the seal remover/installer tool.



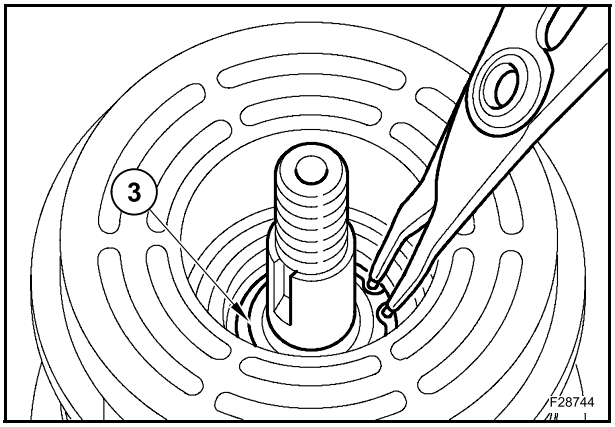
Completely insert the new seal (4).

NOTE: *if remover/installer tool (A) is not available, position the seal squarely in the hub and tap gently until fully seated.*

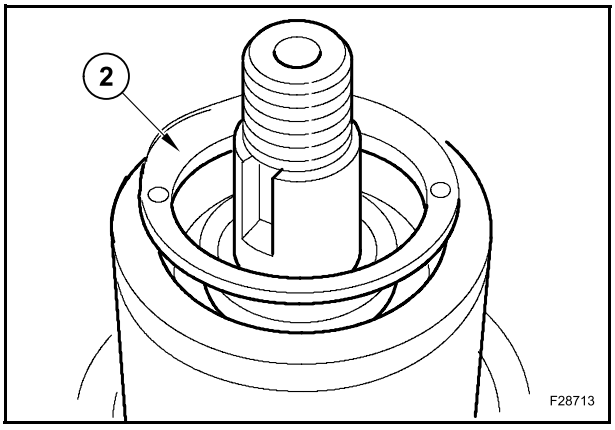


Install the snap ring (3).

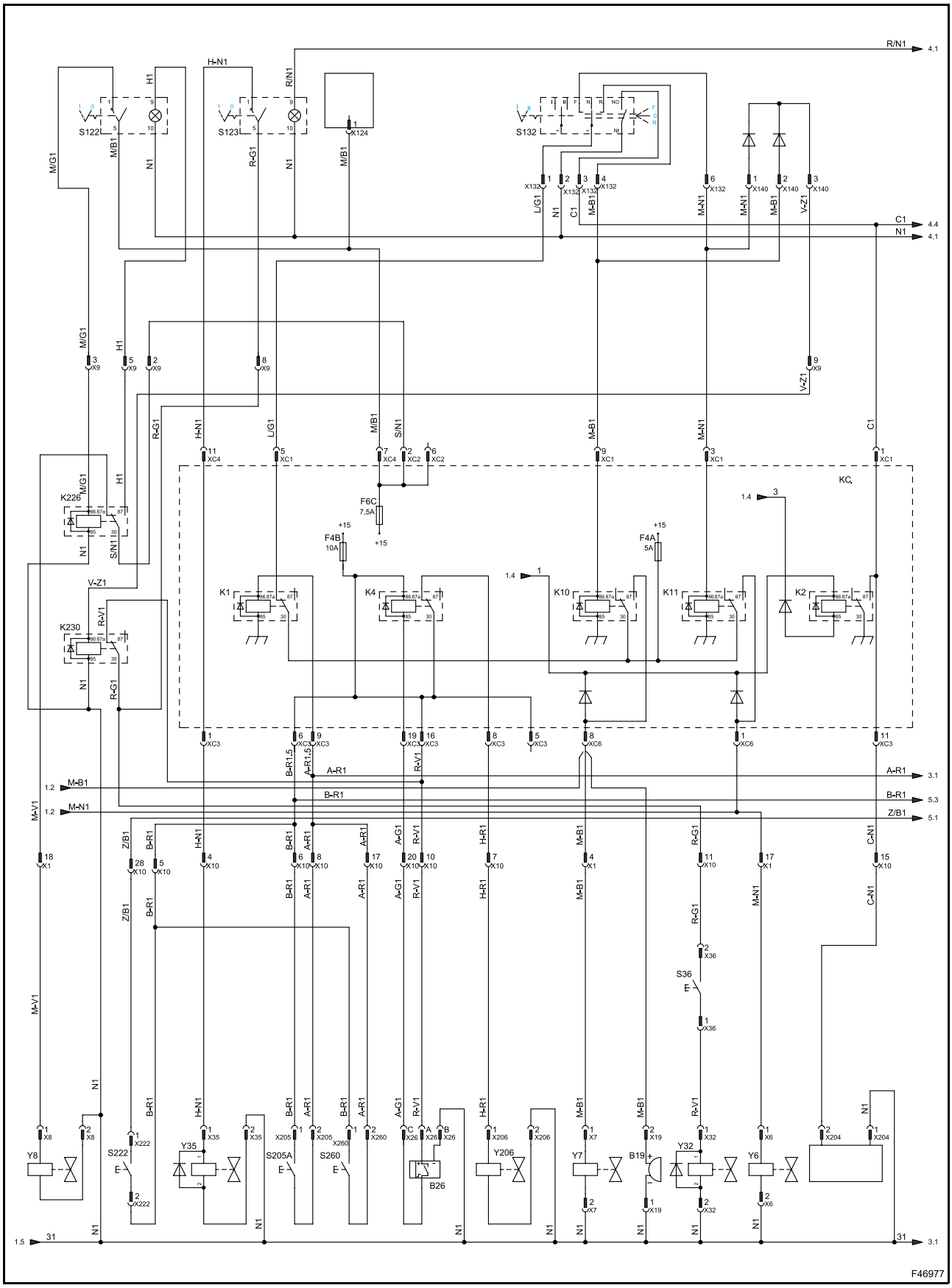
If the snap ring has a bevelled edge, this should face outwards.



Install the new ring (2) and push into position.



SOLENOID VALVE LINE DIAGRAM



COMPONENTS

NAME	DESCRIPTION
A14	Antitheft unit
A106	Engine control unit
A131	Flasher control unit
B4	Air filter pressure switch
B5	Fuel level sensor
B24	Hand throttle
B25	Foot throttle
B26	Bucket sensor
B33	Engine rpm sensor
B66	Transmission oil temperature switch
B69	Air conditioning pressure switch
B107	Water in fuel sensor
B134	Stop light switch
B159	Stop light switch
B211	Parking brake pressure switch
E16	Rotating beacon
E17	Lamp for socket
E37	Rear right light
E38	Rear right work light
E40	Rear right work light (optional)
E42	Front right indicator
E44	Front right work light
E46	Rear left work light (optional)
E45	Front right work light (optional)
E47	Rear left work light
E48	Rear left light
E51	Front left work light
E52	Front left indicator
E144	Lamp switch block (optional)
F1	Main fuse
F402	ECU main fuse
F403	+30 Electric fan fuse
F31	Diagnostic fuse
F208	Air conditioning fuse 10 A

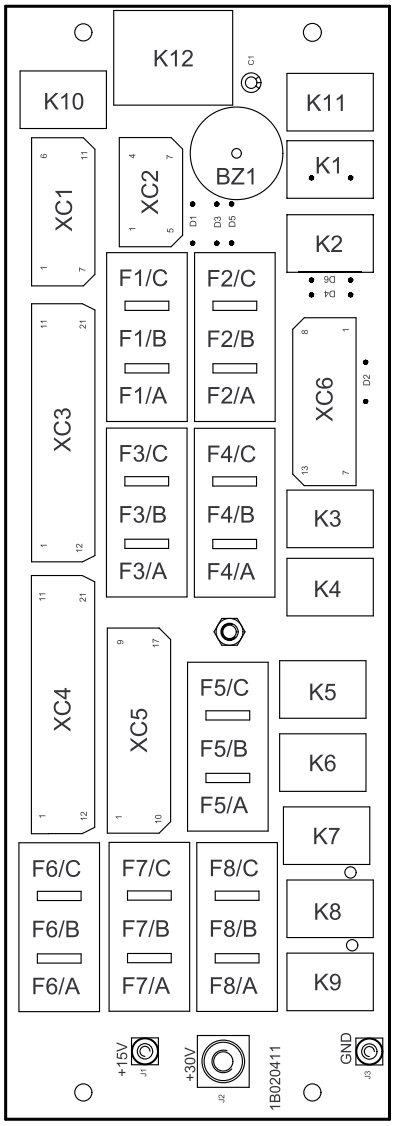
NAME	DESCRIPTION
F112	Air conditioning fuse
F113	Water in fuel fuse
G1	Battery
G67	Alternator
H7	Reverse travel alarm
H26	Block control lamp
H32	Buzzer (optional)
H121	Horn
K102	Start control relay
K103	Start consent relay
K104	Engine start relay
K105	Air conditioning relay
K224	Differential lock relay
K225	Parking brake relay
K226	4WD relay
K227	Additional relay
K230	Hand hammer relay
M1	Starter motor
M64	Air conditioning motor
M207	Starter motor
P1	Side instrument
P125	Front instrument cluster
R2	Grid heater resistor
S15	Starting switch
S36	Rear hammer button (optional)
S120	Warning switch
S122	4WD switch
S123	Hand hammer switch
S126	Light switch
S127	Rotating beacon switch
S130	Indicator light switch
S132	Gearshift lever switch
S135	Backhoe attachment travel lock switch (optional)

ELECTRIC DIAGRAMS - POWERSHUTTLE CAB (B90B)

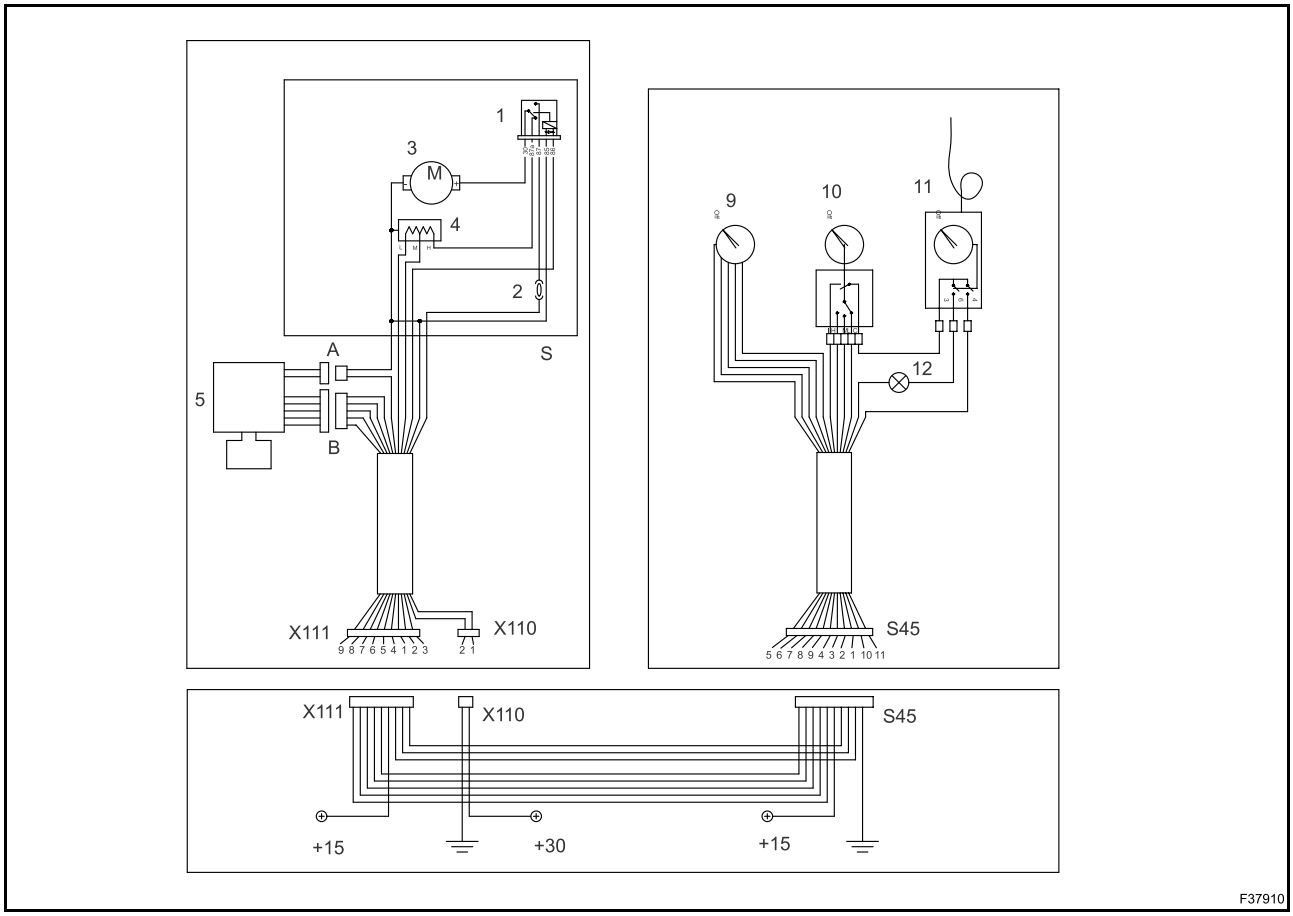
FUSES AND RELAYS

Fuse No.	Rating	Function
F1A	15 A	Rear windshield wiper and washer
F1B	7.5 A	Engine stop, (+15) anti-theft device, “grid heater”
F1C	10 A	Stop light switch
F2A	15 A	Instrument power supply, switch control lamps, pneumo-electric seat, buzzer
F2B	15 A	Air conditioning
F2C	15 A	Pilot control
F3A	3 A	Rear right/front left-side lights, instrument backlighting, air conditioning switch
F3B	3 A	Rear left/front right side lights, number plate light
F3C	10 A	Front work light switch, ride control, 4x1 bucket
F4A	5 A	Forward travel, reverse travel, reverse travel alarm, gearshift control
F4B	10 A	Rear hammer button, sensor + bucket level solenoid valve, clutch disconnecting buttons and differential lock
F4C	10 A	Backhoe attachment lock, backhoe attachment travel lock, rear work light switch
F5A	15 A	Inner front work lights
F5B	10 A	Low beams
F5C	15 A	Main beams
F6A	7.5 A	Rotating beacon
F6B	7.5 A	(+15) hazard warning light power supply
F6C	7.5 A	Hand hammer, 4WD
F7A	10 A	(+30) power supply for hazard warning lights, horn
F7B	10 A	Electric socket, radio, cab lighting
F7C	6 A	Front windshield wiper
F8A	15 A	Outer rear work lights
F8B	15 A	Outer front work lights
F8C	15 A	Inner rear work lights

K1	Forward-reverse travel control relay
K2	Gear engaged + parking brake activated relay
K3	Starting relay
K4	Bucket level solenoid valve relay
K5	Low and main beam relay
K6	Inner front work light relay
K7	Inner rear work light relay
K8	Outer front work light relay
K9	Outer rear work light relay
K10	Reverse travel relay
K11	Forward travel relay
K12	Hazard warning lights



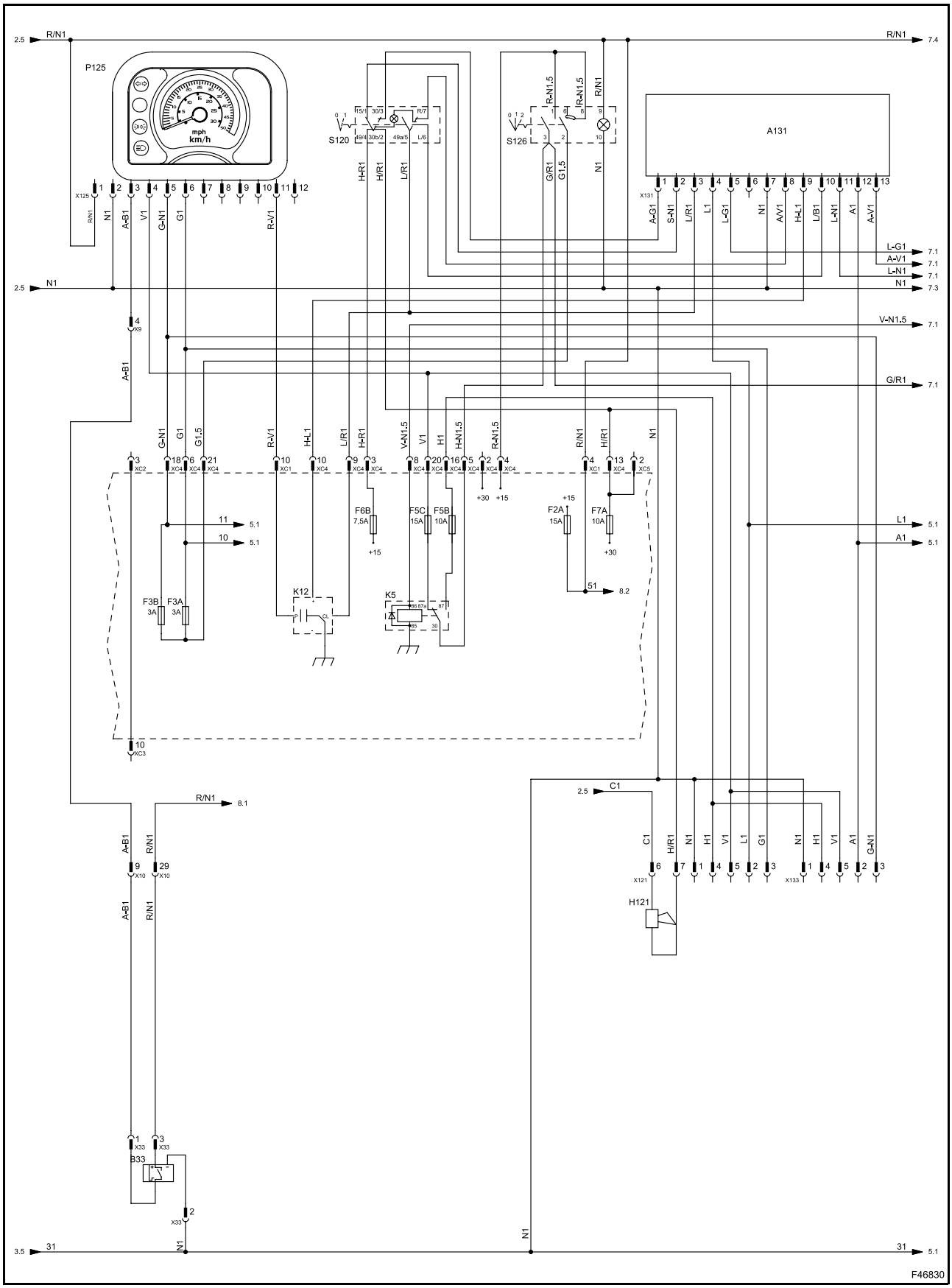
AIR CONDITIONER SCHEMATIC



S	Evaporator box
1	3rd speed relay
2	Fuse 25 A
3	Blower motor
4	1 and 2 speed resistor
5	Electric cock
X111	9-way connector
X110	2-way power connector

S45	11-way connector
9	Potentiometer
10	Speed switch
11	Temperature switch
12	12 V light
A	2-way waterproof connection
B	5-way waterproof connection

LIGHT LINE DIAGRAM

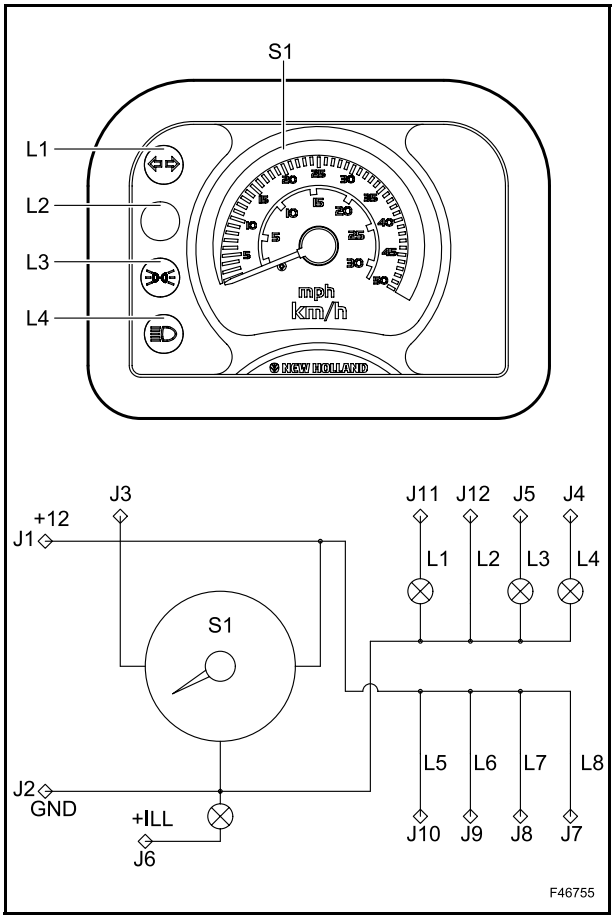


NAME	DESCRIPTION
X23	General line - front instrument panel line interface connector
X24	Hand hammer connector
X25	Foot accelerator connector
X26	Bucket sensor connector
X27	Number plate light connector
X28	Rear left light connector
X29	Rear right light connector
X31	Flasher control unit connector
X32	Alarm connector (optional)
X35	Hand hammer connector
X36	Backhoe attachment hammer button connector
X37	Right rear light connector
X38	Work light connector
X39	Rear windshield wiper motor connector
X40	Work light connector
X41	Blower motor connector
X42	Front right direction indicator connector
X43	Rotating beacon connector
X44	Work light connector
X45	Work light connector
X46	Work light connector
X47	Work light connector
X48	Rear left light connector
X49	Front windshield wiper connector
X50	Work light connector
X51	Work light connector
X52	Front left direction indicator connector
X53	Radio connector
X54	Radio connector
X55	Current intake
X56	Front windshield wiper motor connector
X57	Rear windshield wiper motor connector
X64	Air conditioning compressor connector

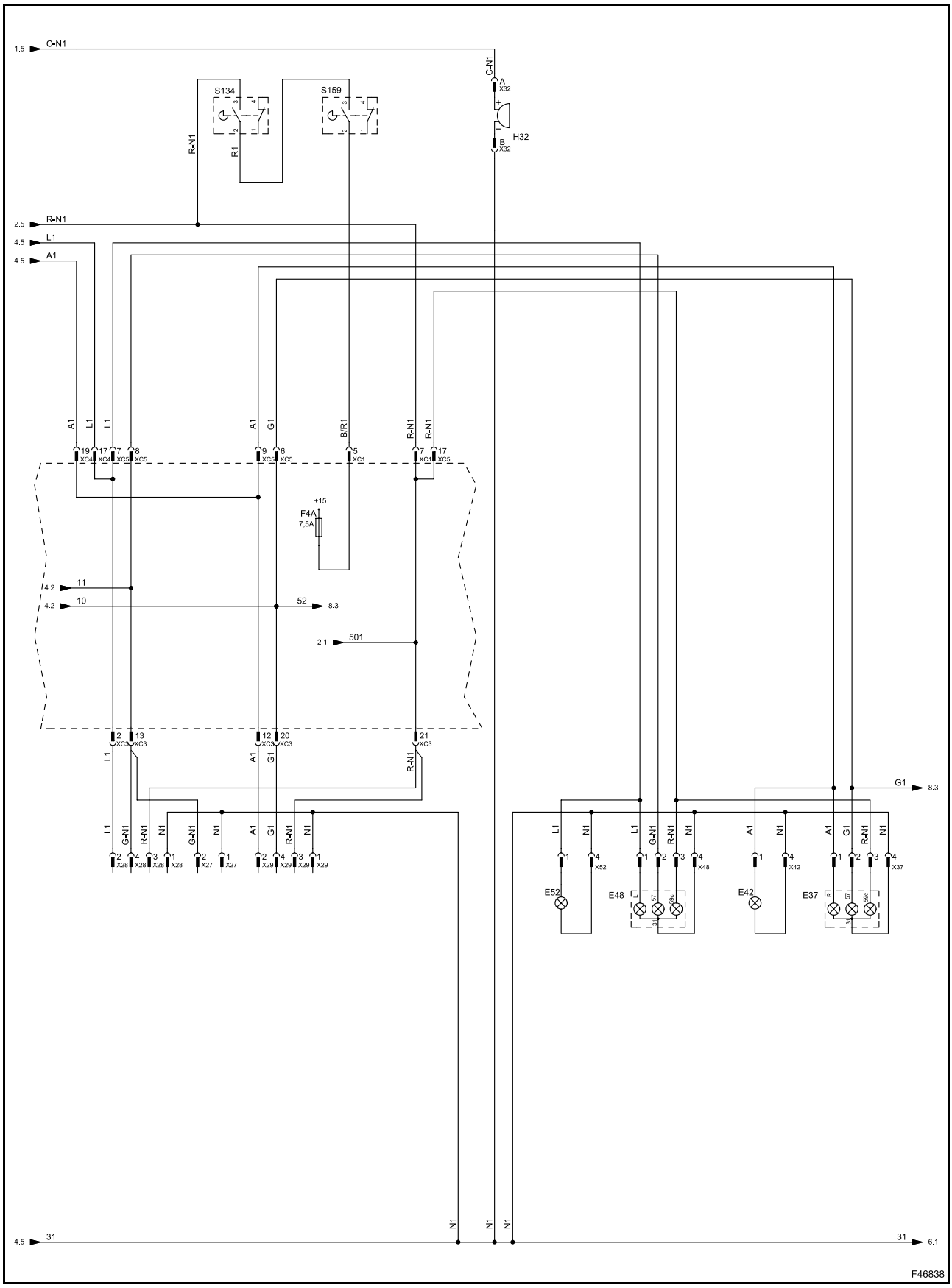
NAME	DESCRIPTION
X66	Transmission oil temperature sensor connector
X67	Alternator connector
X69	Air conditioning pressure switch connector
X72	Pilot control interface connectors
X87	General line - left side instrument cluster line interface connector
X88	General line - left side instrument cluster line interface connector
X101	“Carraro” line solenoid valve connector
X102	“Carraro” line solenoid valve connector
X103	“Carraro” line solenoid valve connector
X104	“Carraro” line solenoid valve connector
X105	“Carraro” line solenoid valve connector
X106	Engine control unit connector
X107	Water in fuel connector
X108	“Carraro” line transmission temperature sensor connector
X109	“Carraro” line pressure switch connector
X110	Air conditioning connector
X111	Air conditioning connector
X112	“Carraro” line engine rpm sensor connector
X113	“Carraro” line solenoid valve connector
X114	“Carraro” line solenoid valve connector
X121	Front instrument panel line / left light line / horn interface connector
X125	Front instrument connector
X128	Optional connector
X130	Light / windshield wiper control lever connector
X133	Front instrument panel line - right light line interface connector
X134	Stop connector
X159	Stop connector
X201	Manual accelerator knob connector

FRONT INSTRUMENT

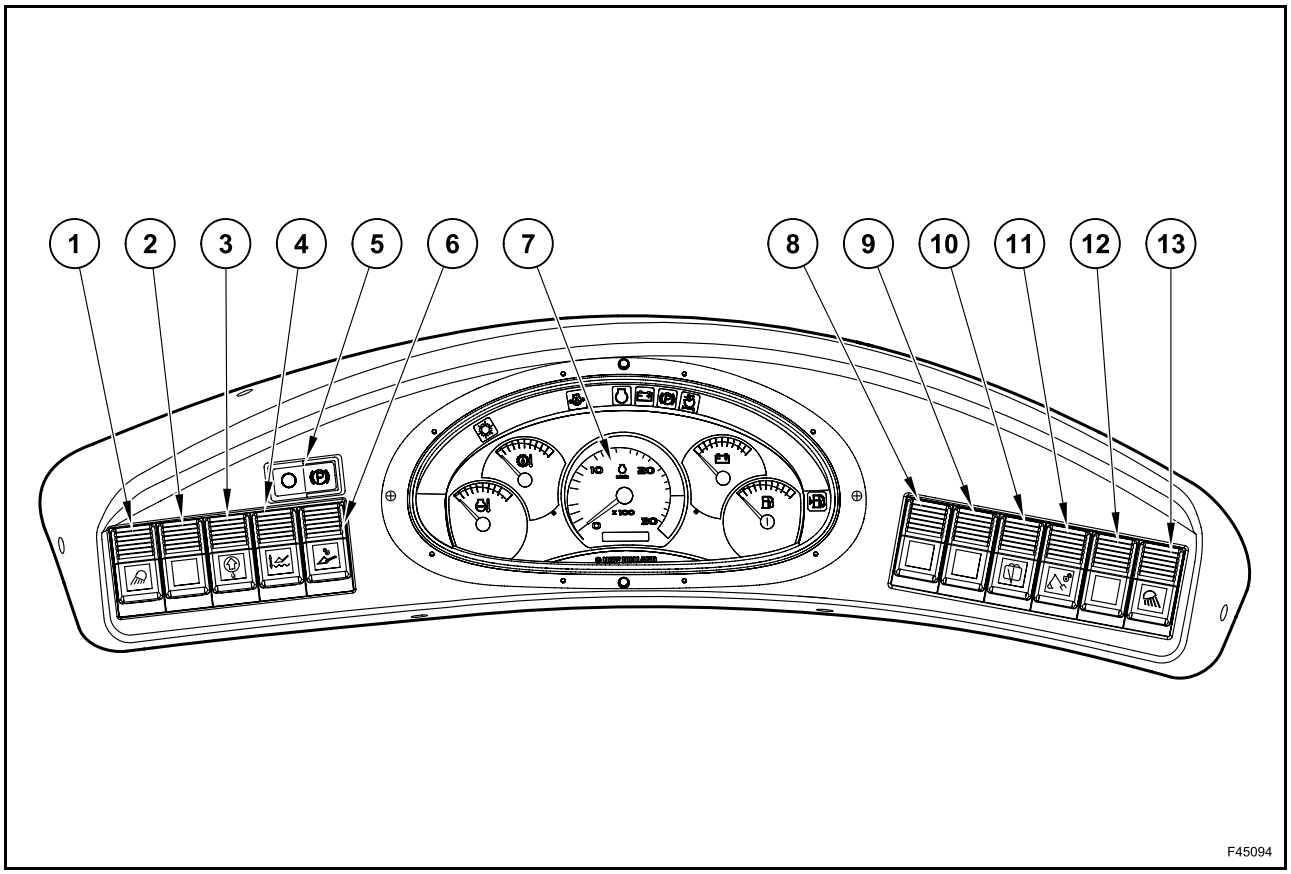
REF.	PIN	FUNCTION	SIGNAL
+12	J1	Positive (+12 V)	
GND	J2	Ground - Negative	
S1	J3	Speedometer	Sensor
L4	J4	Main beam lamp (blue)	Positive
L3	J5	Side light lamp (green)	Positive
+ILL	J6	Backlighting (+)	+ Light
L8	J7	Not used	
L7	J8	Not used	
L6	J9	Not used	
L5	J10	Not used	
L1	J11	Direction lamp (green)	Positive
L2	J12	Not used	



REAR WORK LIGHT LINE DIAGRAM



SIDE INSTRUMENT CLUSTER PANEL (B90B)

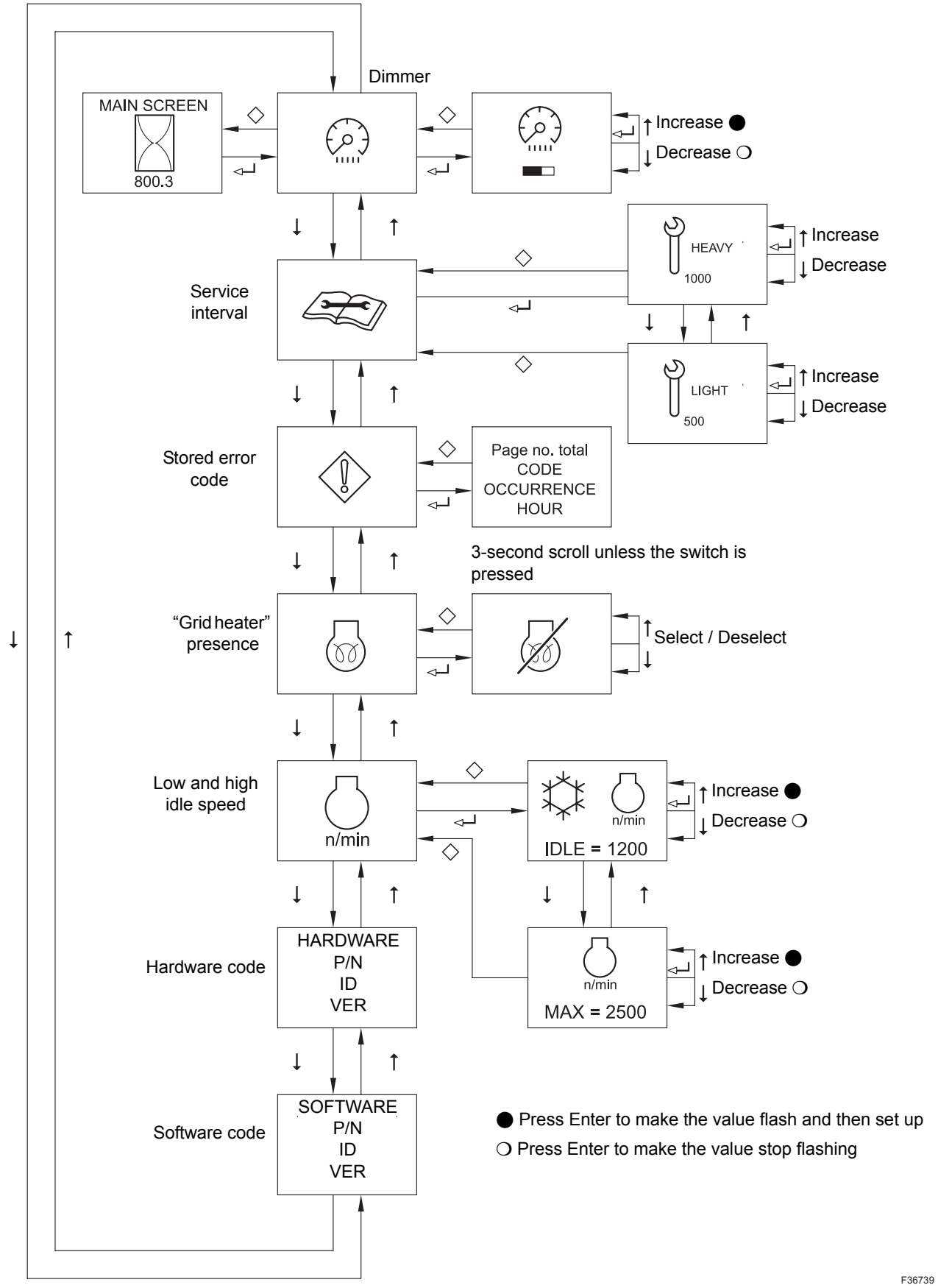


1. FRONT WORK LIGHT SWITCH
   This switch has three positions:
   - The first position is OFF (lamp off).
   - Second position, by pressing the symbol side (first click), the outer front work lights are turned on (lamp on).
   - Third position, by pressing the symbol side again (second click), the inner front work lights are turned on too (lamp on).
2. LOADER ATTACHMENT SWITCH (Available)
3. ROLL-OVER PROTECTION SWITCH (Optional)
   This switch is used to engage or disengage the roll-over protection device. When the operator is about to start working with the backhoe attachment in conditions which could cause the machine to roll over, he/she must activate the roll-over protection device by pressing the switch (ON position and lamp turned on).
   In this condition, the audible alarm will sound by means of the buzzer when the pressure switch, installed on the backhoe attachment boom cylinder, detects a pressure exceeding the following values:
   2WS = 116 bar (17 psi)
   4WS = 126.5 bar (18 psi)
4. "GLIDE RIDE" SWITCH (Optional)
   The "glide ride" system control improves the machine comfort during travel, regardless of the type of terrain and with the loader bucket full or empty. It reduces forward and rearward pitching when moving to the rear or forwards and when carrying loads, at the same time increasing productivity and operator comfort. It also reduces impact forces to the machine during operation. Do not use this system while operating the loader attachment.

⚠ WARNING ⚠

Never operate the "glide ride" system control when the loader arm and loader bucket are maintaining the front of the machine raised off the ground. The machine could fall and cause serious or fatal injury.

SETUP MENU


Dimmer
MAIN SCREEN
800.3
Increase ●
Decrease ❍
Service interval
HEAVY
1000
Increase
Decrease
LIGHT
500
Increase
Decrease
Stored error code
Page no. total
CODE
OCCURRENCE
HOUR
3-second scroll unless the switch is pressed
"Grid heater" presence
Select / Deselect
Low and high idle speed
n/min
IDLE = 1200
Increase ●
Decrease ❍
MAX = 2500
Hardware code
HARDWARE
P/N
ID
VER
Software code
SOFTWARE
P/N
ID
VER
● Press Enter to make the value flash and then set up
❍ Press Enter to make the value stop flashing
F36739