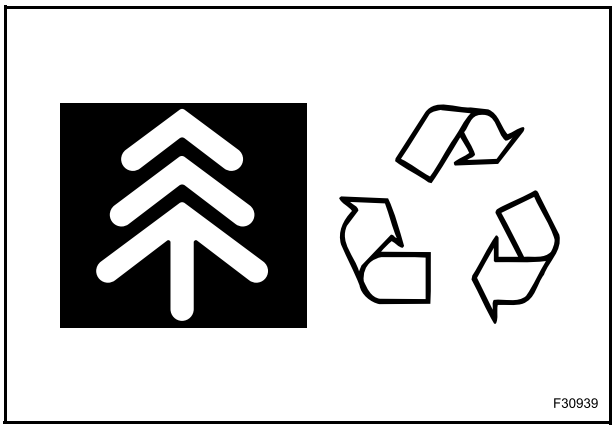
SERVICE MANUAL

B95C / B95CTC / B95CLR / B110C
Tier 4
Loader Backhoe

Part number 84596886A
1st edition English
May 2012

NEW HOLLAND CONSTRUCTION

PRECAUTIONS FOR WASTE DISPOSAL



Improperly disposing of waste can threaten the environment.

Each country has its own Regulations on this subject. It is therefore advisable to prepare suitable containers to collect and store momentarily all solid and fluid materials that must not be scattered in the environment to avoid pollution.

At preset intervals these products will be delivered to disposal stations legally recognized and present in this Country.

Here below is a list of the products in the machine which require disposal:

- hydraulic oil;
- brake system oil;
- coolant mixture, condensation residue and pure anti-freeze;
- diesel oil;
- oil and diesel oil filter elements;
- engine and air conditioning air filter elements;
- battery.

Also polluting rags, paper, sawdust and gloves must be disposed in compliance with the same procedures.

Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning coolant escaping into the air can damage the Earth’s atmosphere.

Government regulations may require a certified air conditioning service centre to recover and recycle used air conditioning coolant.

Obtain information on the proper way to recycle or dispose of waste from your local environmental or recycling centre, or from your Dealer.

TYRES

TYRE TYPES

Tyres - 2WS

	Front tyres	Rear tyres
4WD	12-16.5 R4 10PR	19.5L-24 L4 14PR
		19.5L-24 R4 10PR
		17.5L-24 R4 10PR
		16.9-24 R4 10PR
	14-17.5 R4 10PR	16.9-28 R4 10PR
		21L-24 R4 12PR
		19.5L-24 R4 10PR

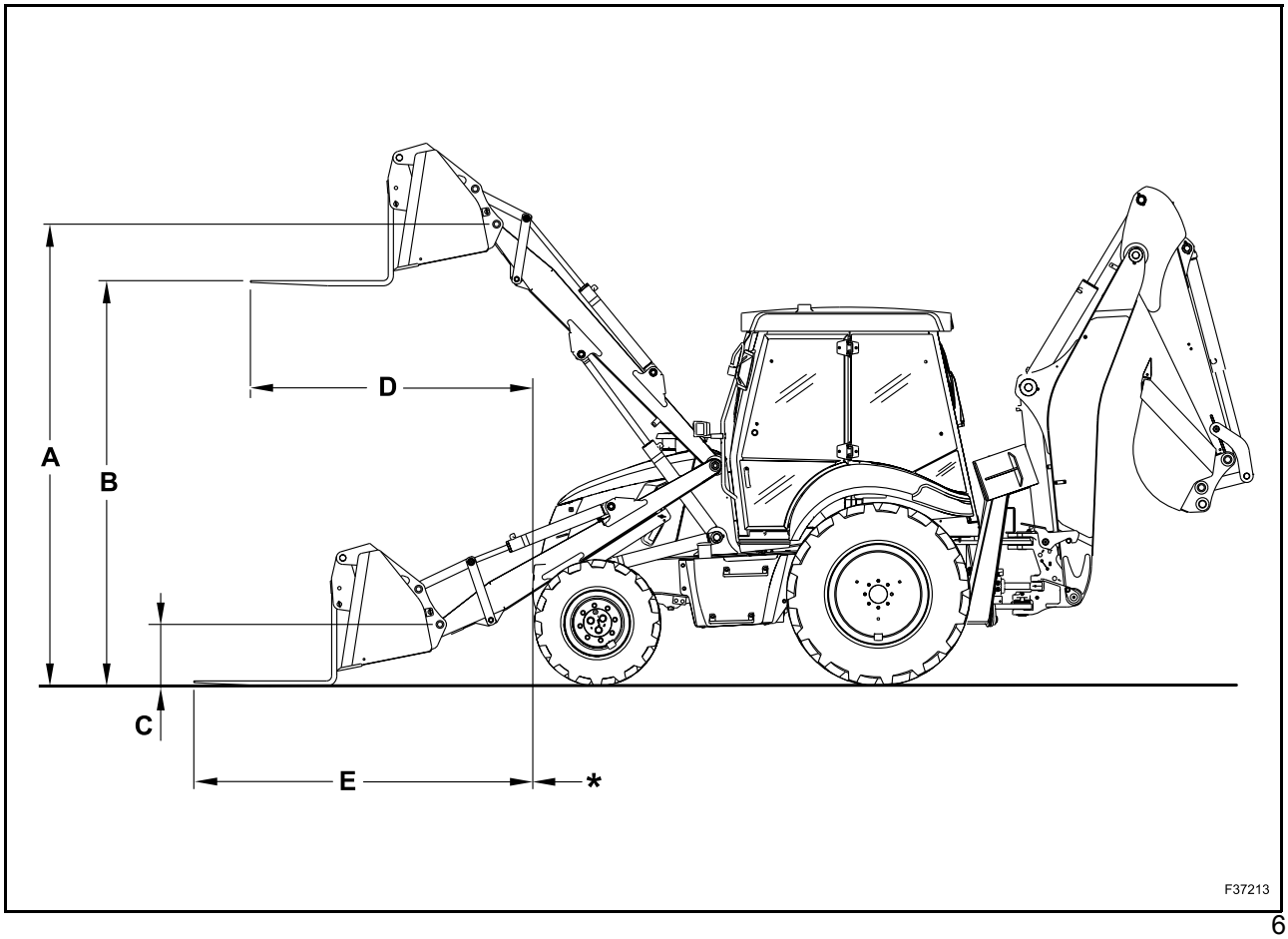
NUT TORQUES

Front nuts (2WS)..... 330 Nm (243 lbf·ft)

Rear nuts (2WS) ..... 540 Nm (398 lbf·ft)

PERFORMANCE OF LOADER ATTACHMENT WITH FORKS

B95C AND B110C



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* Front counterweight
A. Maximum height of loader bucket pin/pivot with lifted forks
B. Fork maximum height
C. Height of loader bucket pin/pivot with lowered forks
D. Fork reach when raised
E. Fork reach when lowered

Front tyres	12.5-18 SLR4
Rear tyres	18.4-28 SLR4
A (6 x 1 bucket)	3537 mm (139.2 in)
B (6 x 1 bucket)	3143 mm (123.7 in)
C (6 x 1 bucket)	433 mm (17.0 in)
D (6 x 1 bucket)	2136 mm (84.1 in)
E (6 x 1 bucket)	2577 mm (101.5 in)

SUPPLY SUMMARY TABLE

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RECOMMENDED FLUIDS AND APPLICATION	NEW HOLLAND Specifications	INTERNATIONAL Specifications	MODELS		Q.TY	
					Litres	Gal
ENGINE - OIL Unitek CJ-4	MAT 3521	API CJ-4, ACEA E9, 15W - 40	2WS - with filter		8	2.11
COOLING SYSTEM Ambra Agriflu antifreeze 50% water 50%	NH 900 A MAT 3620	ASTM D 6210	ALL		24	6.30
HYDRAULIC SYSTEM Ambra Multi G	NH 410 C	API GL4 ISO VG 46, 10W-30	ALL		118	31.10
Ambra Multi BIO-S biodegradable For cold weather operation, consult your Dealer	NH 646 BS	ISO VG 46 DIN 51524 - PART II	ALL		118	31.10
POWERSHUTTLE TRANSMISSION (complete with torque converter and pipe) Ambra Mastertran	MAT3505		4WD		20.8	4.57
POWERSHIFT TRANSMISSION (complete with torque converter and pipe) Ambra Mastertran			ALL		20.8	4.57
FRONT AXLE (2WS) Ambra TRX 80W - 140			4WD	Differential	6.5	1.70
				Wheel reduction gear (each)	0.7	0.20
REAR AXLE (2WS) Ambra TRX 80W - 140			Differential	B95C-B95CTC	15.5	3.41
				B110C	17	3.74
FUEL Decanted and filtered diesel fuel			ALL		135	35.50
VARIOUS JOINTS Ambra MG2 grease	NH 585/GR	NLGI 2	ALL		As required	
TELESCOPIC DIPPER Ambra Grease GR EXP	NH 587/GR	NLGI 2	ALL		As required	
AIR CONDITIONING COMPRESSOR PAG SP 20 oil			ALL		As required	

Disconnect the exhaust gas pipe.

TBR00016

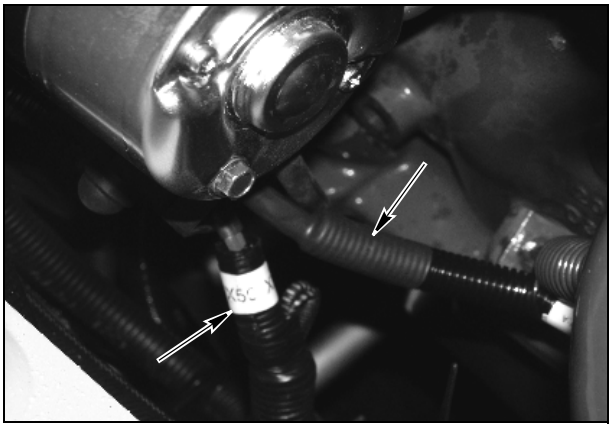
Remove the four screws that secure the top cover of the engine hood to the frame of the machine.

TBR00017

Remove the top cover of the engine hood from the machine.

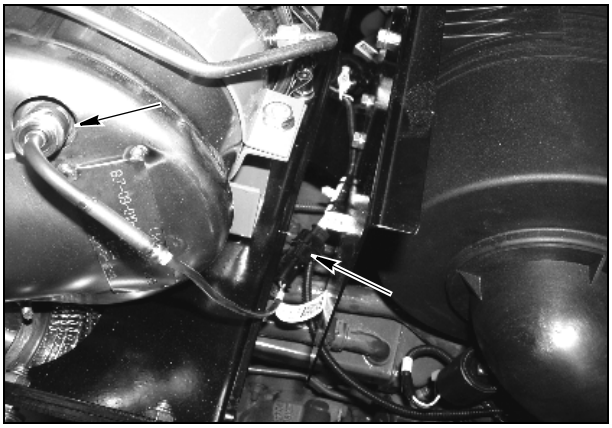
TBR00018

Disconnect the electrical connection X508 from starter motor and the ignition connection.



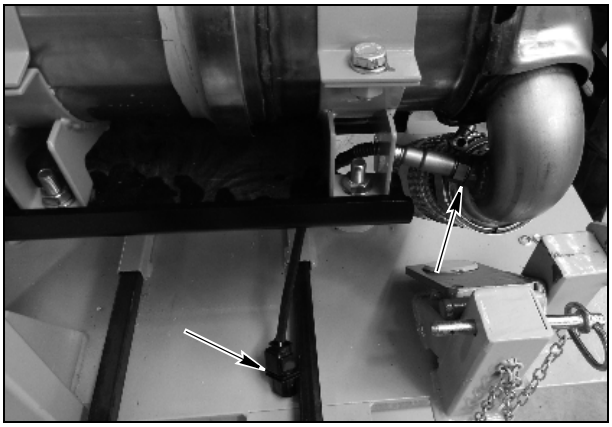
TBR00053

Remove the connection X476 from temperature sensor DPF.



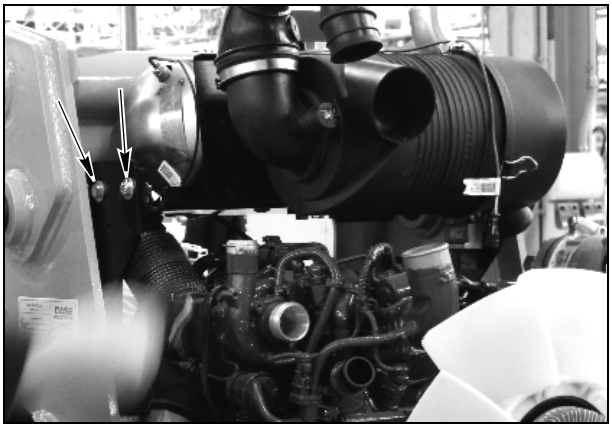
TBR00054

Remove the connection from heated Lambda sensor.



TBR00058

Attach the aircleaner/DPF a lifting device suitable and remove the screws (q.ty 4, two on each side).

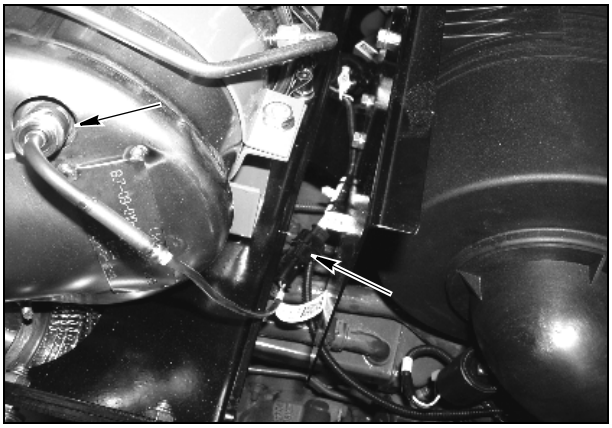


TBR00055

Connect the heated Lambda sensor connection.

TBR00058

Connect the connection X476 of temperature sensor DPF.



TBR00054

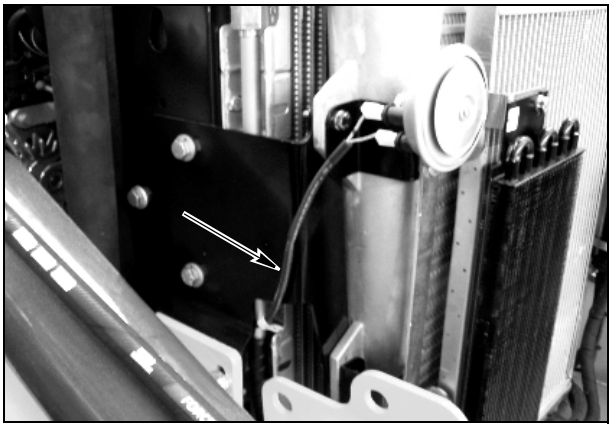
Connect the connection X477 of temperature sensor DPF.

TBR00051

Connect the hoses right and left on delta pressure sensor and connect the electrical connection X475.

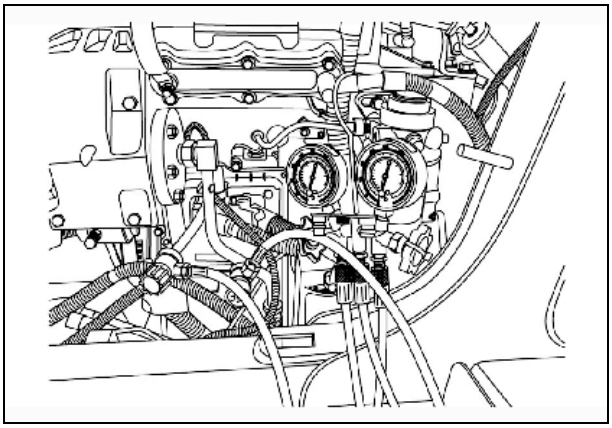
TBR00042

Connect the electrical connection X2 on the horn.



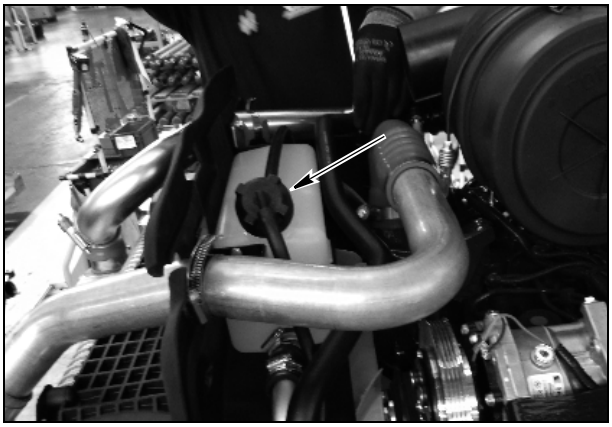
TBR00044

Recharge the A/C system.



TBR00020

Refill the system with coolant.



TBR00068

CODE	SHORT FAILURE DESCRIPTION	AMBER WARNING One second alarm upon activation for key cycle	RED STOP
3256	ADC Monitoring - Queue Error.	X	
3258	High Side Power – Short circuit to Battery.	X	
3259	High Side Power – Short circuit to Ground.	X	
3260	Low Side Power - Open Load.	X	
3261	Low Side Power – Short circuit to Battery of Excess Temperature.	X	
3262	Low Side Power – Short circuit to Ground.	X	
3265	Overrun Monitoring - Injection Time Too Long.		X
3266	Redundant Engine Speed in Overrun Monitoring - Speed Signal Not Plausible.		X
3278	ECM Internal Supply Voltage Too High - CJ940 Above Limit.		X
3279	ECM Internal Supply Voltage Too Low - CJ940 Below Limit.		X
3280	Sensor Supply Voltage 1 – High.	X	
3281	Sensor Supply Voltage 1 – Low.	X	
3283	Sensor Supply Voltage 2 – High.	X	
3284	Sensor Supply Voltage 2 – Low.	X	
3285	Sensor Supply Voltage 3 – High.	X	
3286	Sensor Supply Voltage 3 - Low.	X	
3334	Timeout of CAN message TSC1-PE Torque.	See note below	X
3339	Timeout of CAN message TSC1-VE Speed.	See note below	X
3363	Atmospheric Pressure Sensor - Processed via ADC (no CAN Plausibility Performed).	X	
3856	Coolant Temperature signal test failure.	X	
3998	Unknown error code with amber lamp from ECU.	X	
3999	Possible unknown error code with red lamp from ECU.		X

Note: 3334, 3339 initial visualize as amber due to ECU coding in DM1 message. Message then turns to red based on rules above.

IMPORTANT: *the powershuttle lever is equipped with a neutral lock to prevent an accidental engagement of the transmission. With this design, the powershuttle lever moves through a "T" slot to the forward or reverse positions.*

IMPORTANT: *when operating at low environmental temperatures with cold transmission oil, allow the oil to warm up before attempting to shift the powershuttle lever. The transmission can be shifted normally after the oil warms up.*

IMPORTANT: *the horn will sound if the powershuttle lever is operated with the parking brake engaged.*

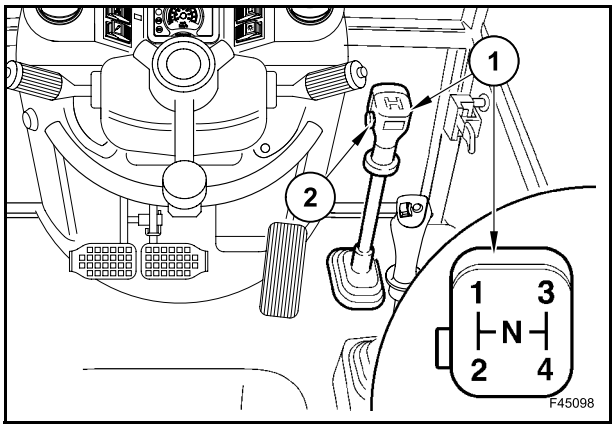
IMPORTANT: *the powershuttle lever can be shifted at any engine speed; however, as a safety and precautionary measure, the engine must run at approximately 1200 rpm.*
This action is easily controlled by means of the foot accelerator to control engine and ground speed.

TRANSMISSION DISCONNECTION

The 4x4 transmission provides for easy upward and downward gear ratio changes on the move.

However, as a clutch is not used between the engine and transmission, the power flow from the engine to the transmission must be interrupted to shift from one gear ratio to another. This is accomplished by means of a transmission disconnect (dump) button.

The finger operated button (2) on the main gearshift lever knob (1) is easy to operate.



⚠ WARNING ⚠

To avoid personal injury do not use the disconnect switch control to coast down hill. Excessive speed may cause loss of control, personal injury to a bystander or failure of the transmission.

To make upward gear ratio changes simply depress and hold the button (2) on the gearshift lever (1), while moving the lever from one gear ratio to another.

When the desired gear ratio has been selected release the button and allow the unit to gain engine speed and ground speed.

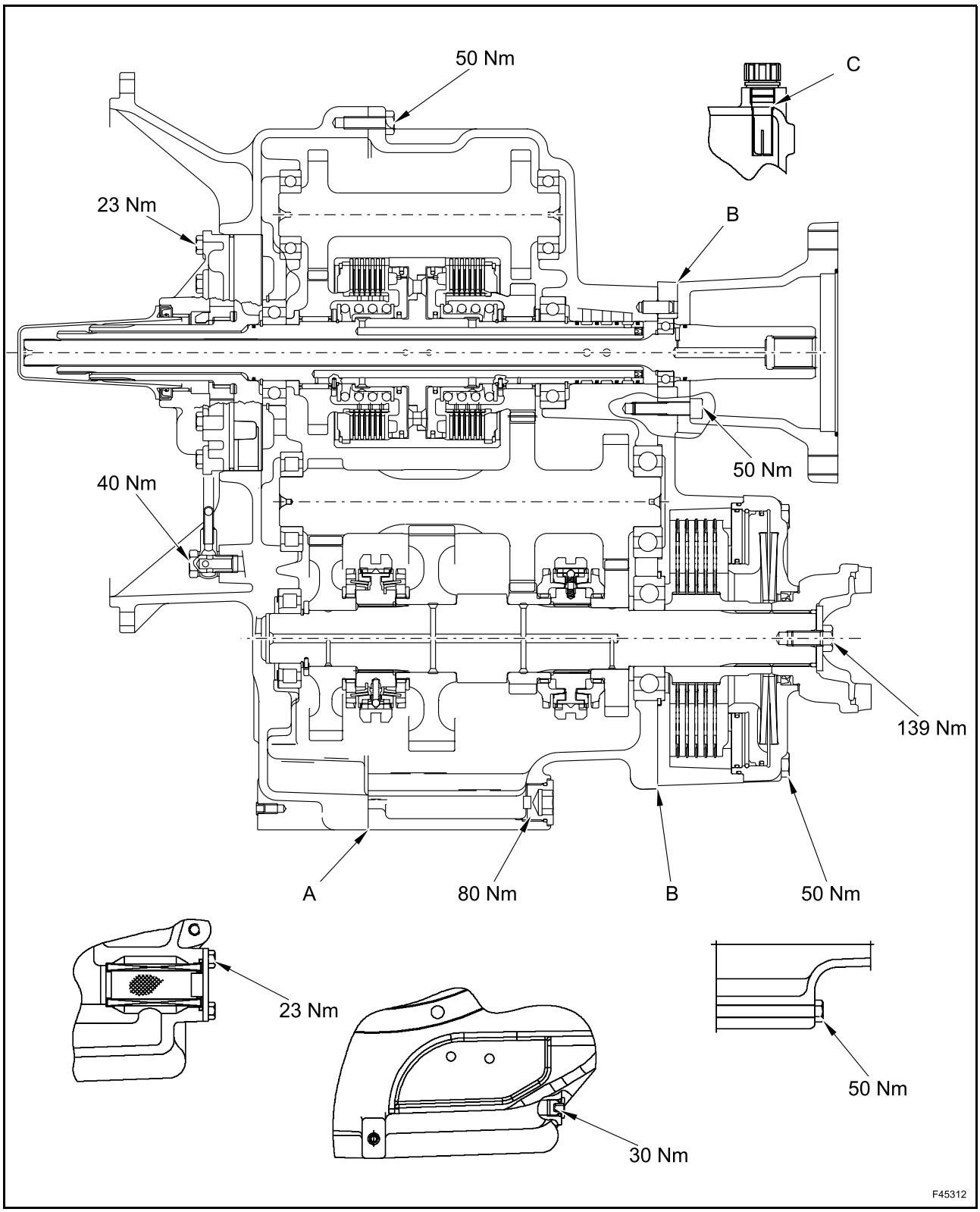
If another higher ratio is required repeat the procedure.

DISASSEMBLY AND ASSEMBLY

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

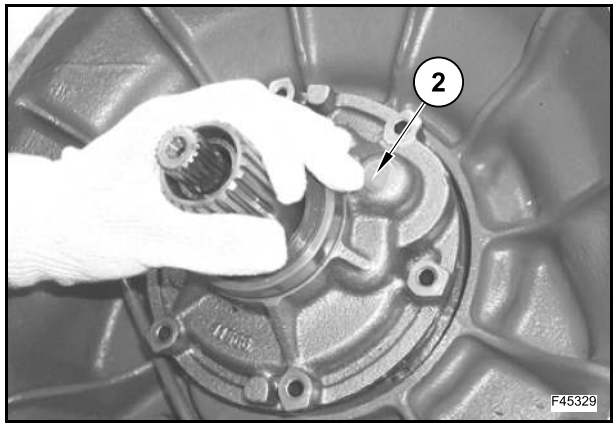
TIGHTENING TORQUES AND APPLICATION OF SEALANTS / ADHESIVES

A. Loctite 510
B. Loctite 518
C. Loctite 638
D. Loctite 542



Remove the oil pump (2).

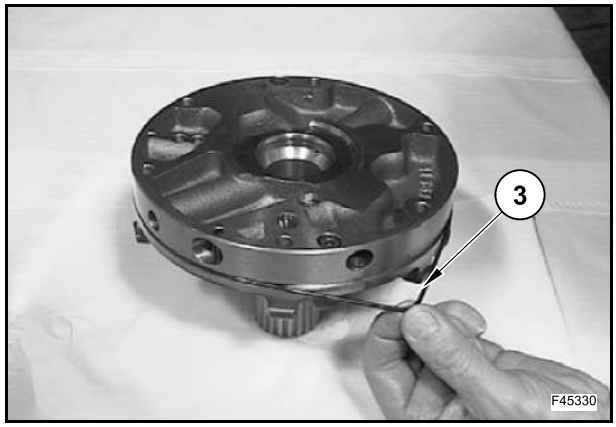
The pump seal ring can be damaged during this operation.



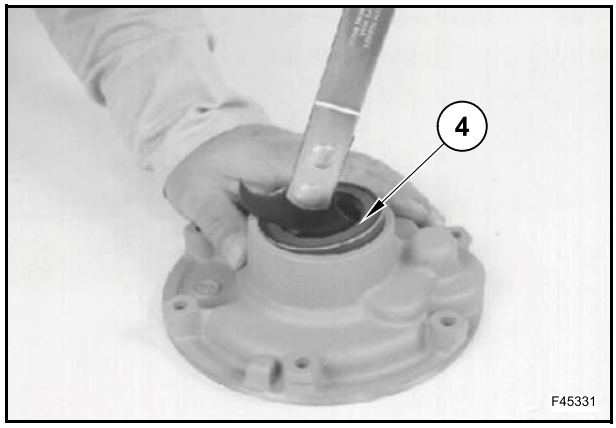
If necessary, remove the O-ring (3).

⚠ WARNING ⚠

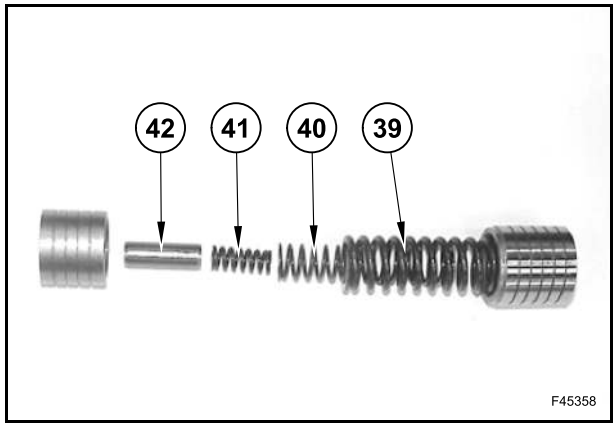
Do not disassemble the pump or its operation may be compromised.



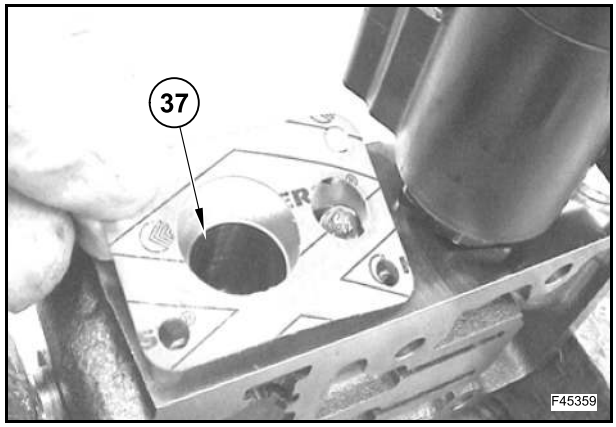
If necessary, remove the seal ring (4).



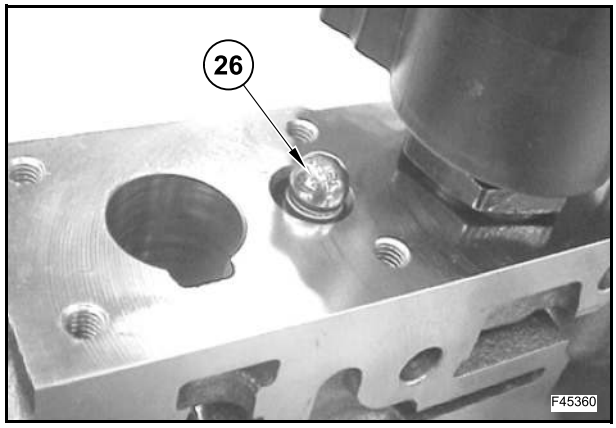
Verify the wear condition of the springs (39), (40) and (41) and of the pin (42).



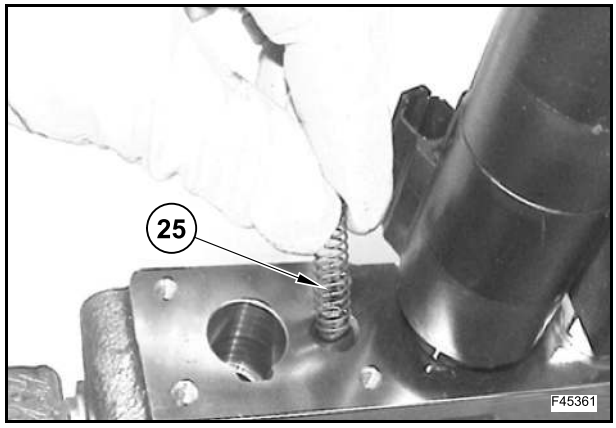
Remove the gasket (37).



Remove the ball (26).

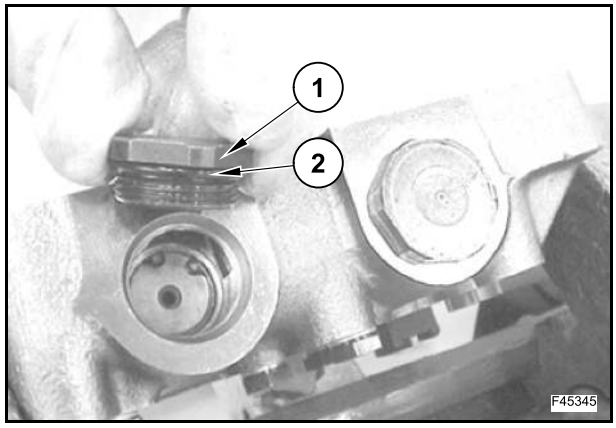


Remove the spring (25).

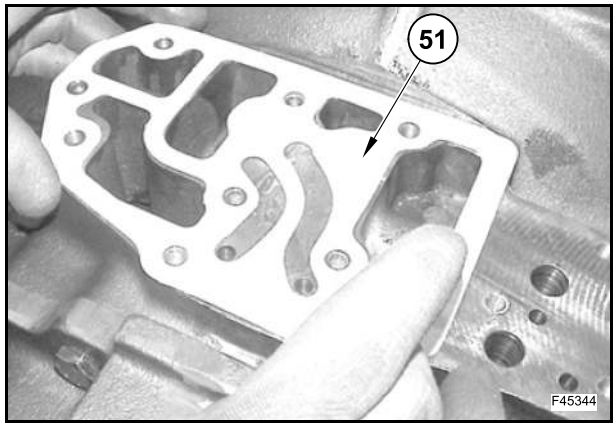


Assemble the O-ring (2) on the plug (1).

Screw in and tighten the plug (1) to the tightening torque of 80 Nm (59 lbf·ft).

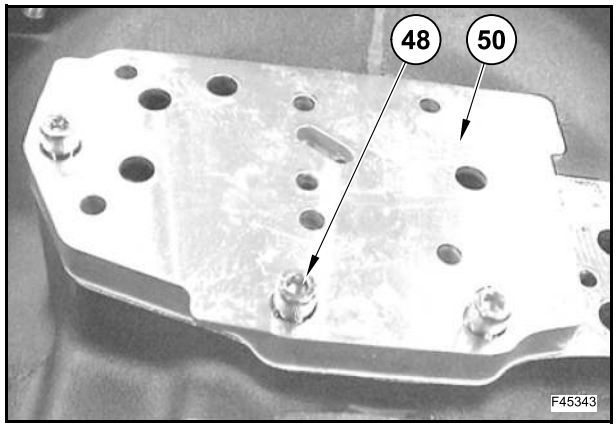


Position and lubricate the gasket (51).



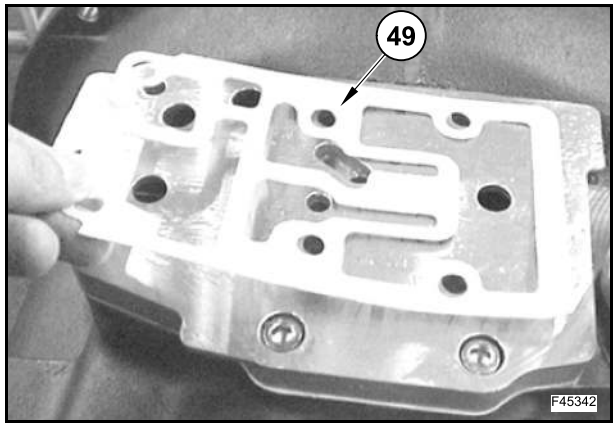
Assemble the plate (50).

Screw in and tighten the screws (40) to a tightening torque of 50 Nm (37 lbf·ft).

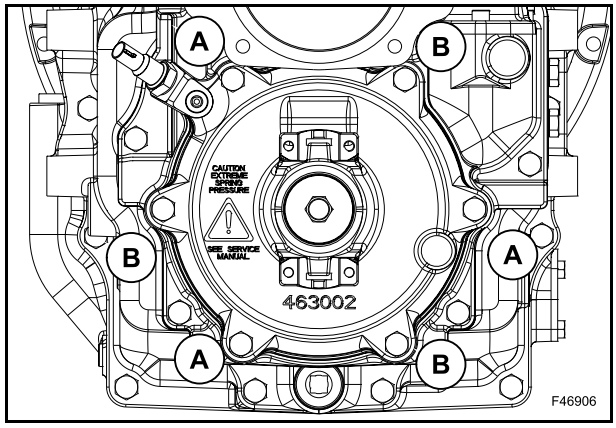


Position and lubricate the gasket (49).

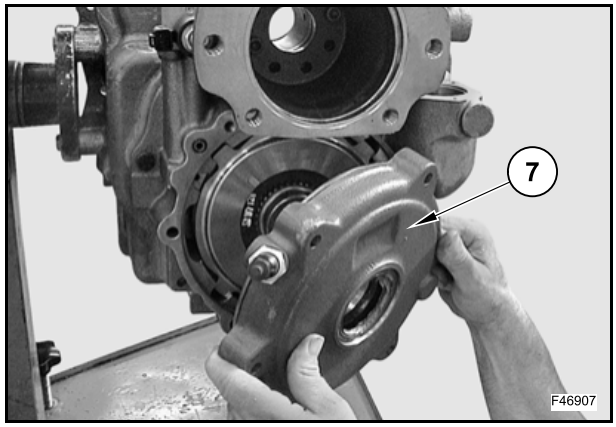
Lubricate the gasket (49).



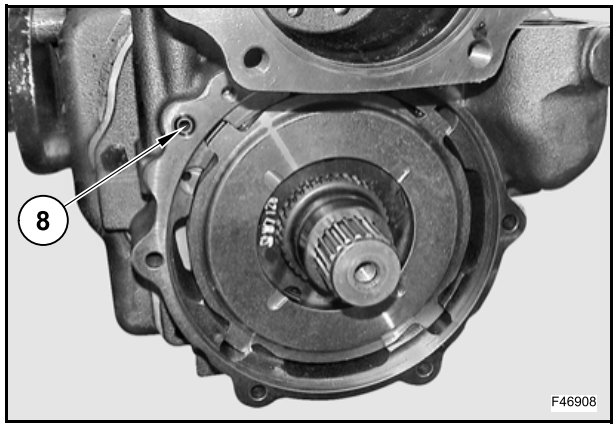
Remove the screws (A) and slowly and alternatively unscrew screws (B) in order to release the load of Belleville washer.



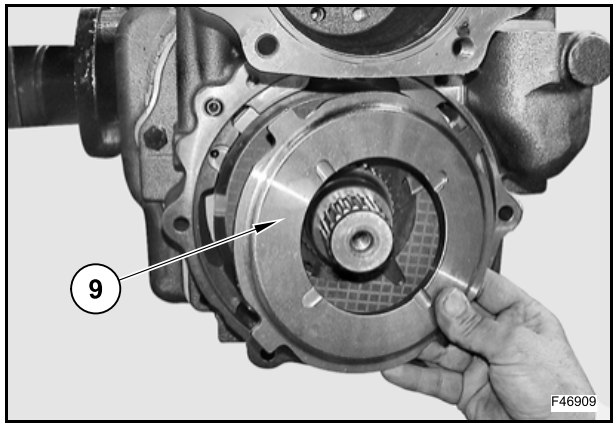
Remove the brake cover assembly (7).



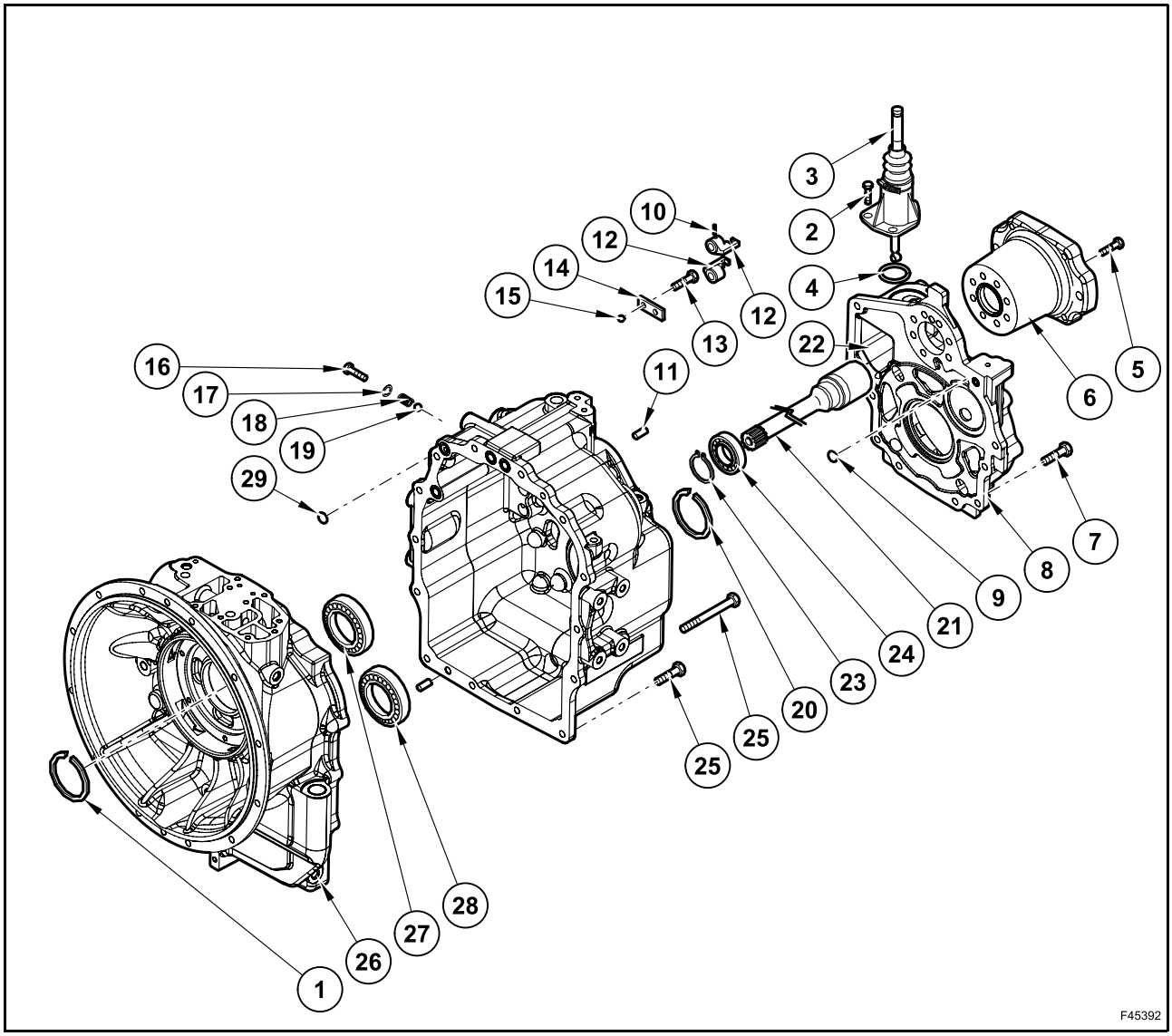
Remove the O-ring (8).



Remove the counterplate (9).

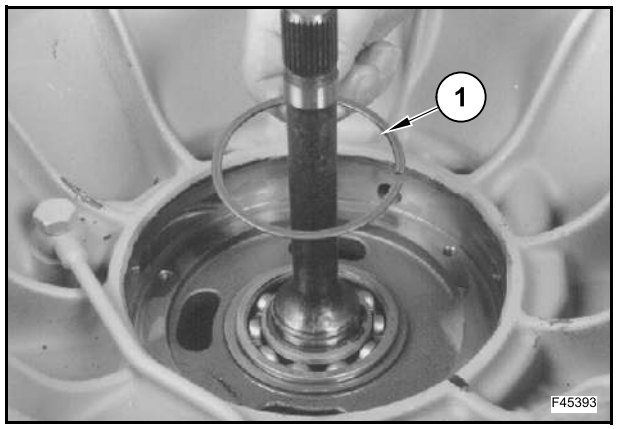


2WD - TRANSMISSION BOX



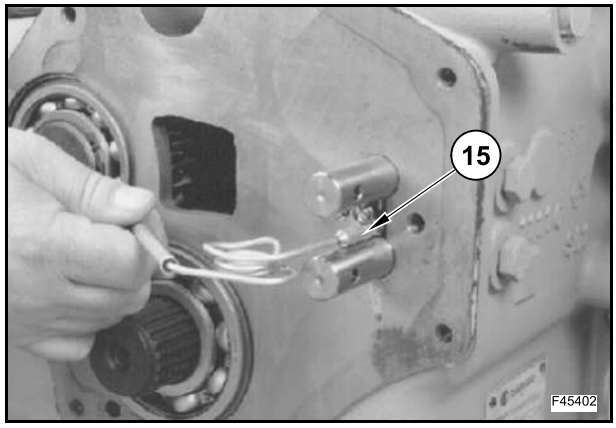
Disassembly

Remove the snap ring (1).

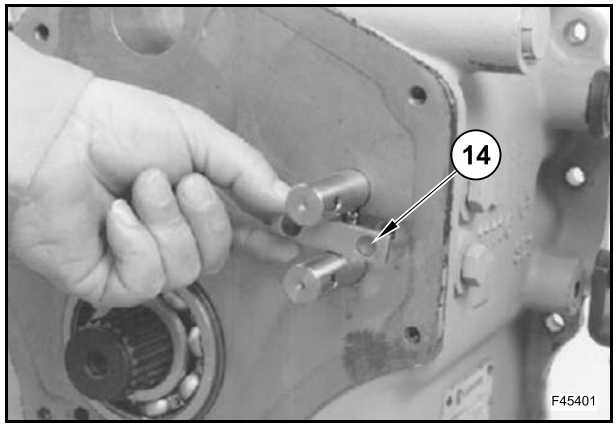


Grease the balls.

Insert the 2 balls (15).

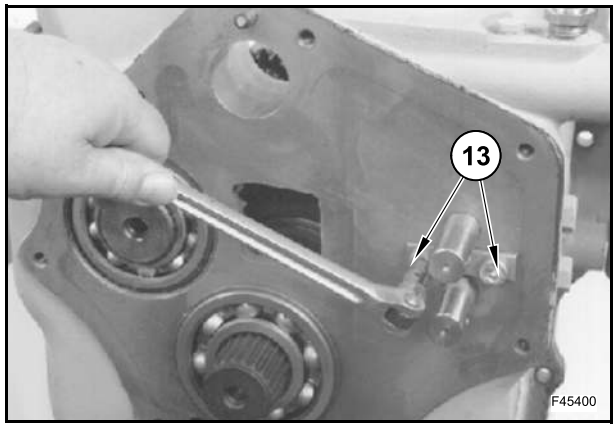


Assemble the plate (14).

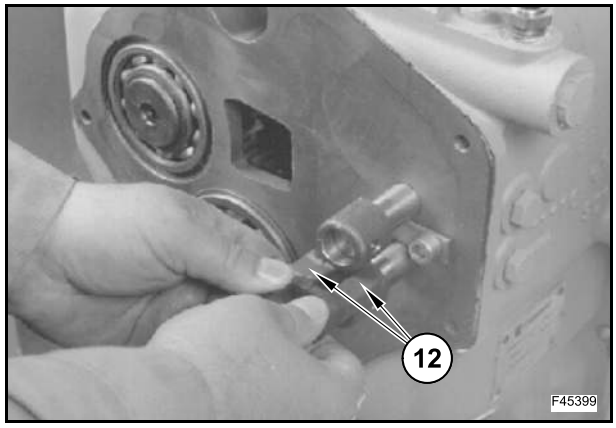


Apply sealant on the threads of the 2 screws.

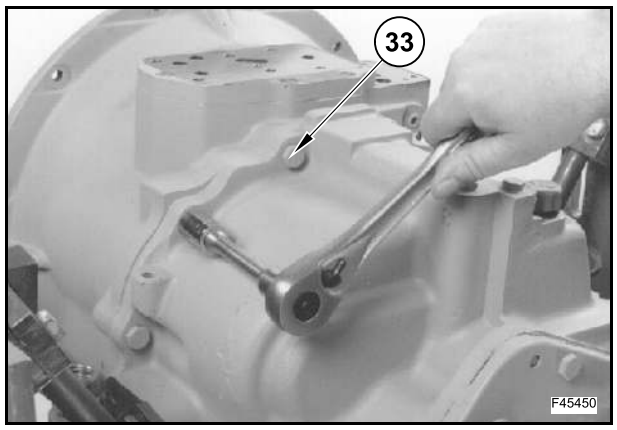
Screw in the 2 screws (13) to fasten the plate correctly and tighten them to the prescribed torque of 50 Nm (37 lbf·ft).



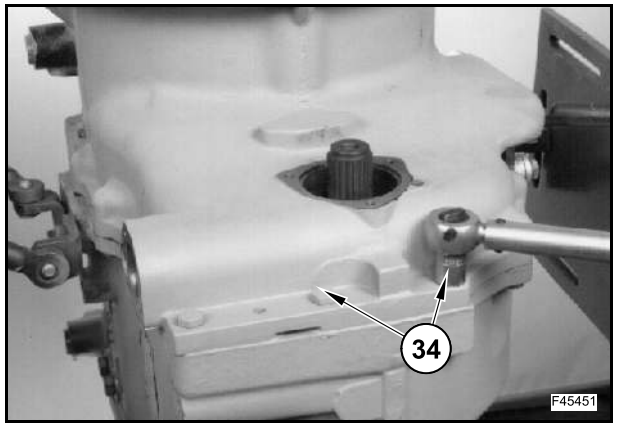
Assemble the retainers (12) on the gearbox pins.



Loosen and remove the screws (33).

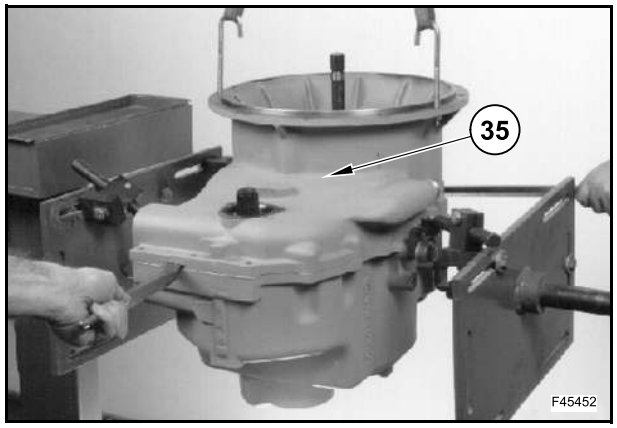


Loosen and remove the screws (34).



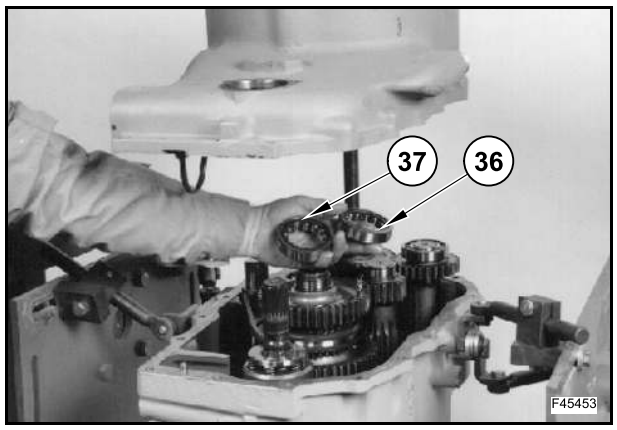
Use a lever to remove the front half box (35).

Raise the front half box.

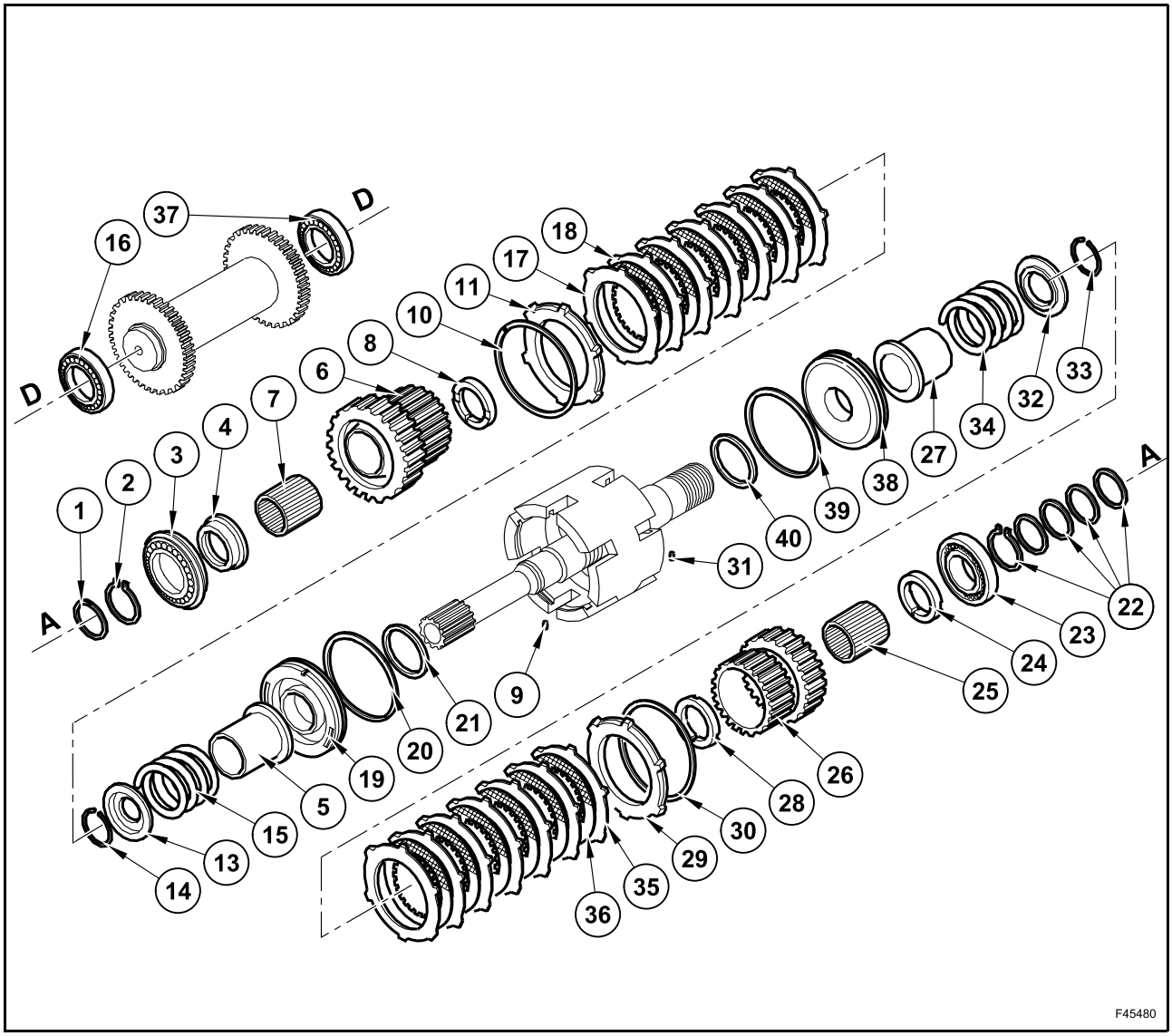


The outer rings of the bearings on the primary shaft (36) and on the secondary shaft (37) can either stay on the shafts or on the front box seat.

Remove the 2 bearings (36) and (37).

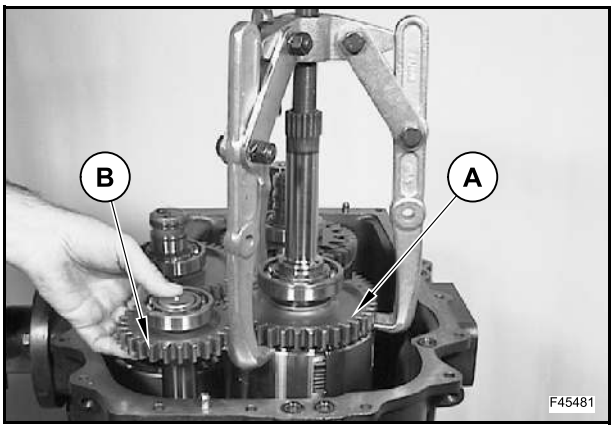


A, D SHAFTS



Disassembly

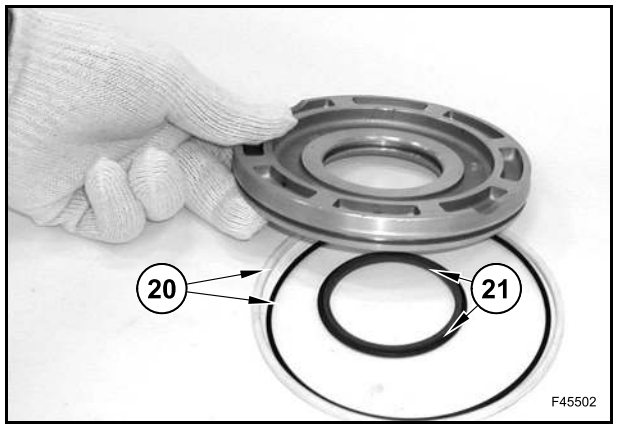
Grab the shaft with the (A) pliers and pull out the shaft assy (D).



Assembly

Shaft (A)

Assemble the seal ring (20) with the relevant O-ring and the seal ring (21) with the relevant inner O-ring, respectively in the outer and inner seat of the piston.



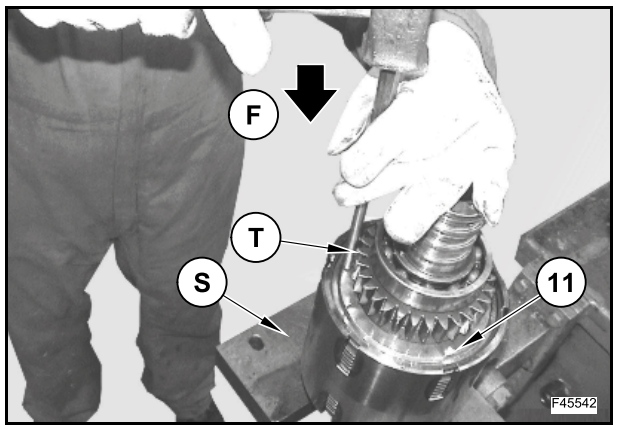
Apply a thin film of oil on the seal rings.

Insert the piston (19) by means of tool (T) 380001926.

Carry out the check procedure of the clutch disc kit play on both sides of the clutch.

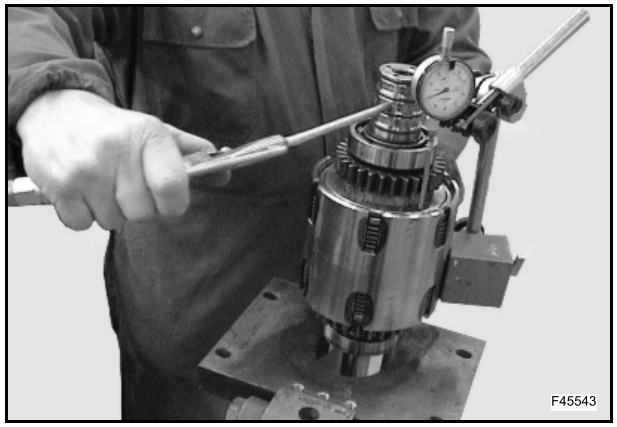
Position the shaft on a suitable support (S) and apply load **F** on the counterdisc (11) surface by means of a proper buffer (T), as shown.

This operation clears any possible play.



To check the backlash, supply the piston chamber with compressed air at 6 bar (87 psi) and verify the actual stroke “X” with a dial indicator.

Determine clearance “X”.



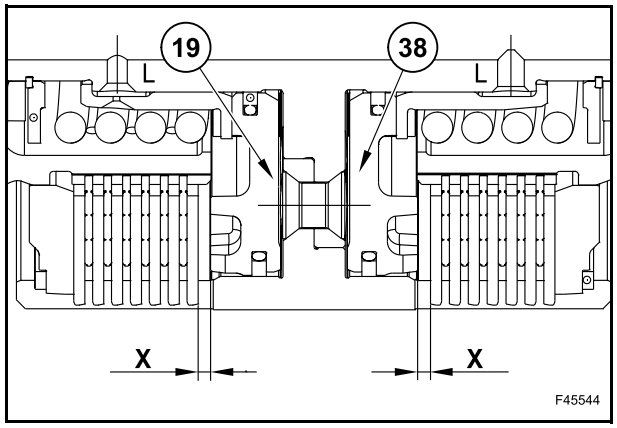
The piston stroke (19) and (38) must be such to ensure a play corresponding to (according to the clutch disc kit)

X = 2.15 ÷ 4.10 mm (0.08 ÷ 0.16 in)

X = 1.60 ÷ 2.45 mm (0.06 ÷ 0.10 in)

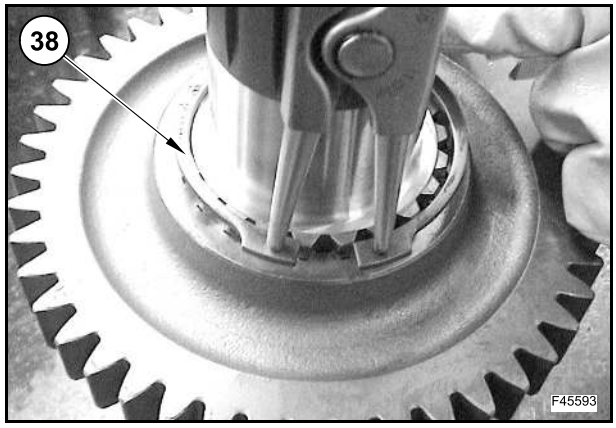
If the distance is not within specification, the clutch is probably wrongly installed.

Turn the clutch shaft upside down and repeat the operation for the other clutch disc kit.



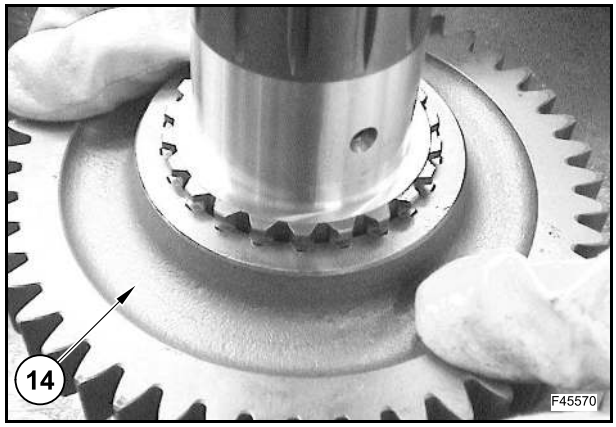
Only with 4WD models

Remove the snap ring (38).



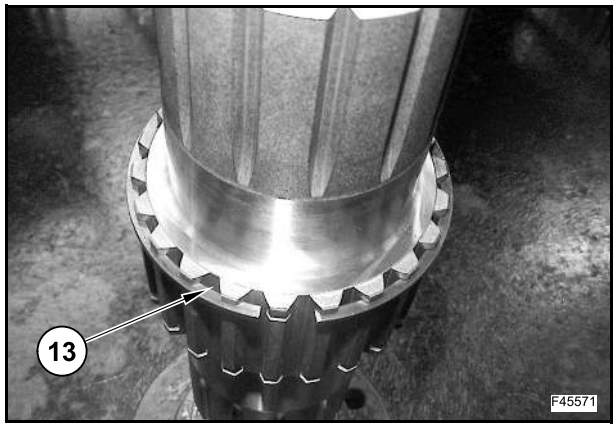
Only with 4WD models

Remove the 4WD gear (14).



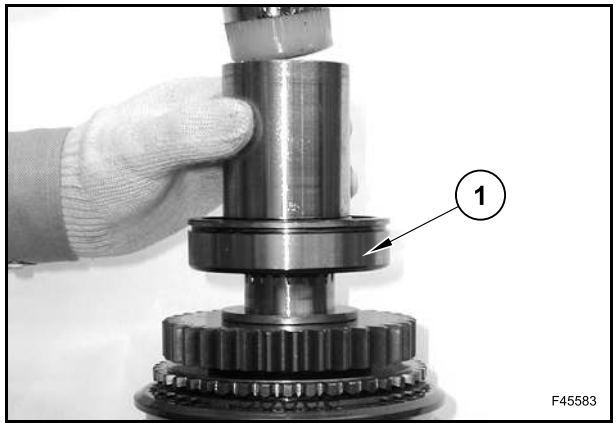
Only with 4WD models

Remove the snap ring (13).



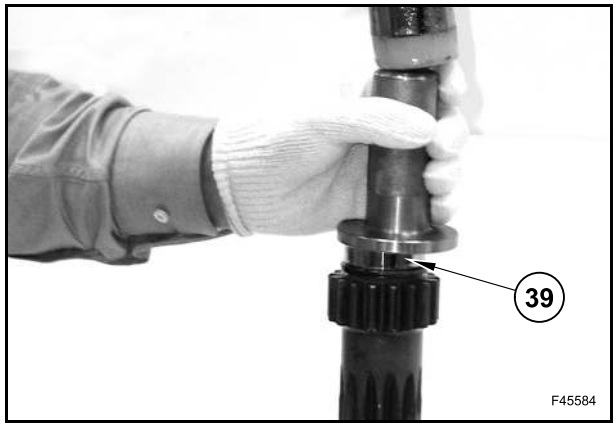
Heat the bearing (1) to 80 ÷ 100 °C (176 ÷ 212 °F).

Assemble the bearing (1) by means of tool 380200190.



Heat the inner ring of the bearing (39) to 80 ÷ 100 °C (176 ÷ 212 °F).

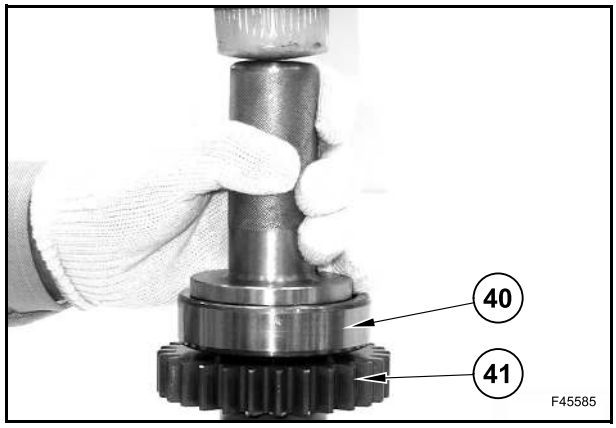
Assemble the inner ring of the bearing (39) by means of tool 380200203.



Turn the shaft (41).

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

Assemble the bearing (40) by means of tool 380200190.



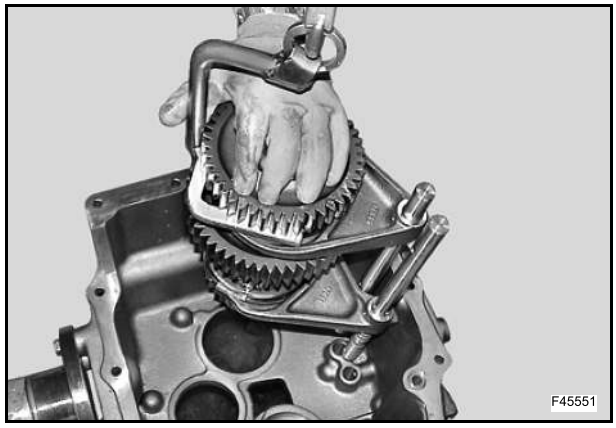
Re-position the shaft assemblies (B) and (C) into the half box.

Use tool 380200246.

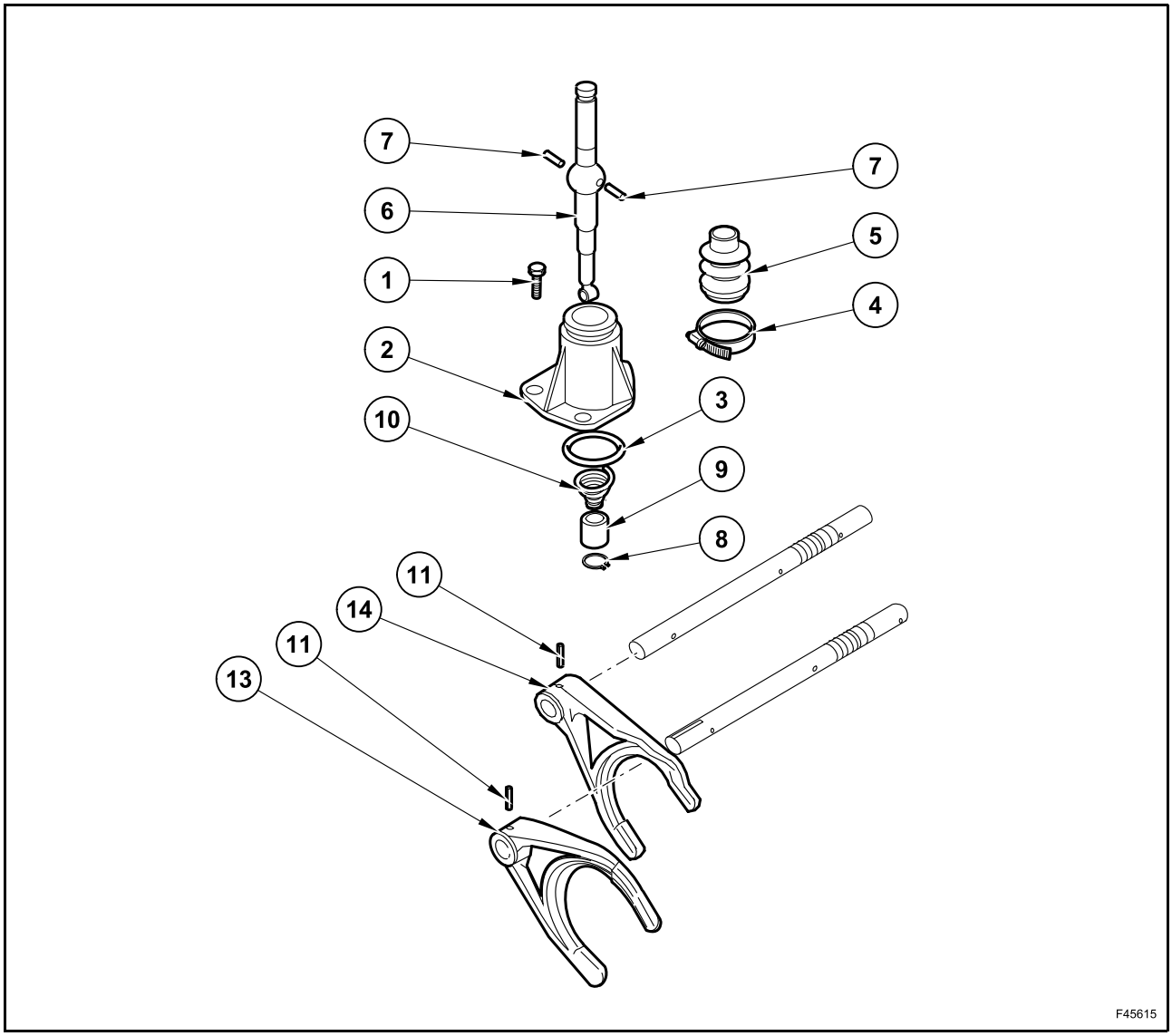
⚠ WARNING ⚠

The shaft assemblies must be inserted with pins and yokes.

Insert the pre-fitted yokes for 3rd and 4th speed and for 1st and 2nd speed as shown.



SPEED CONTROLS

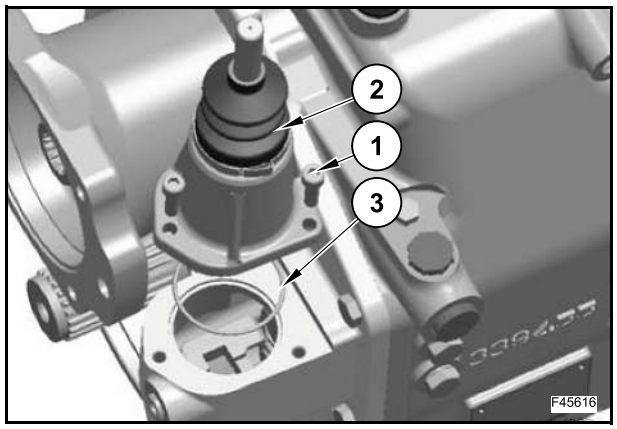


Disassembly

Loosen and remove the screws (1).

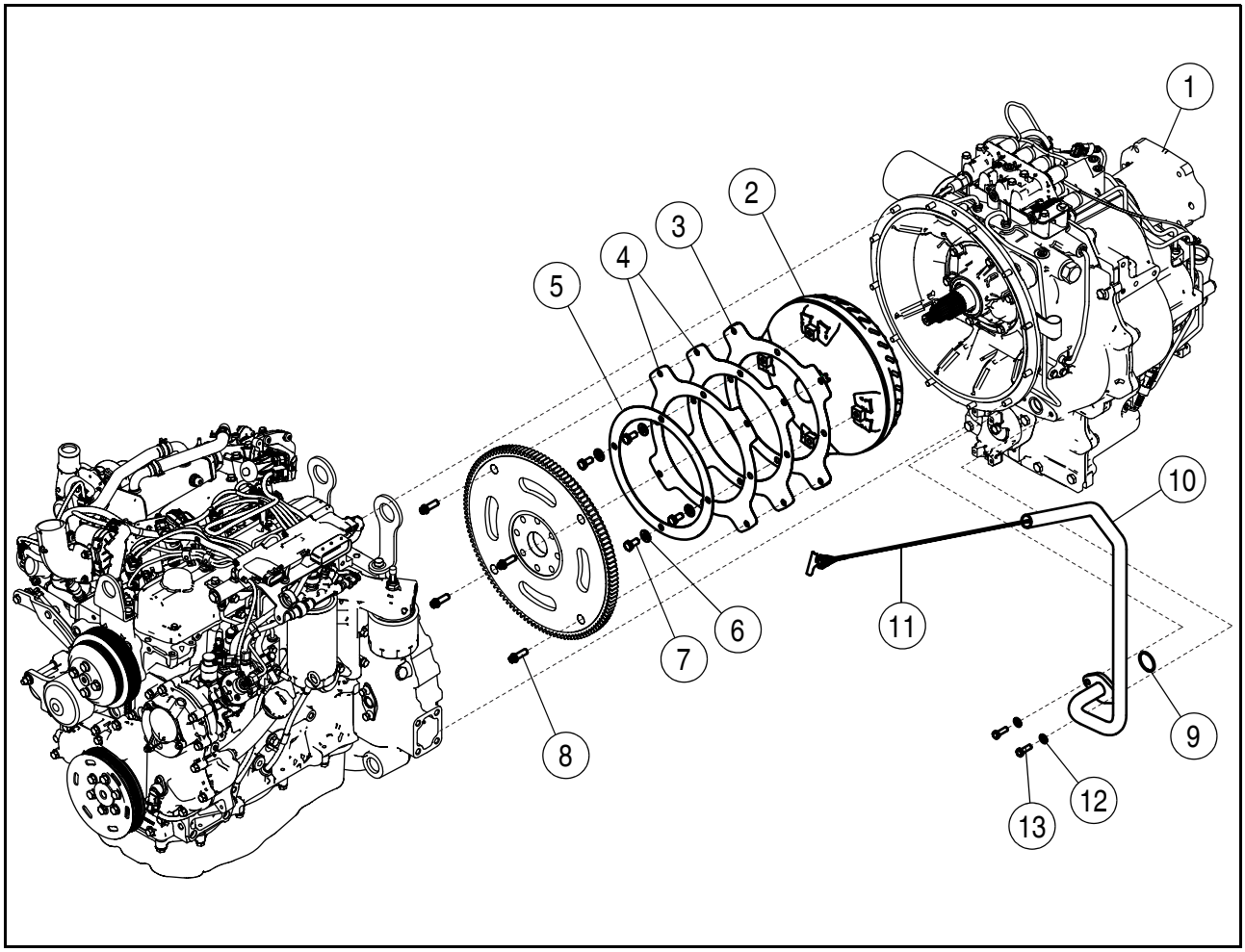
For the disassembly of the two half boxes it is necessary to remove the gearshift control assy.

Remove the gearshift control assy (2) and the O-ring (3).



TRANSMISSION ERROR CODES

CODE	DESCRIPTION	Amber Telltale LED	Red Telltale LED
4000	Power supply (pin 2), forward FWD drive (pin 3), or RVS (pin 4) drive shorted to ground.		X
4002	Power supply for digital outputs (pin 8) does not have power.	X	
4004	Battery voltage (Pin 34) voltage below 10 volts for 2.5 seconds with engine speed above 900 rpm.	X	
4005	Downshift delayed due to possible engine overspeed condition.	X	
4006	FWD input (Pin 12) feedback circuit is reading too much current with command. (>1.1 A for 1ms).		X
4007	FWD input (Pin 12) current is less than 0.05 A with more than 0.1 A commanded for more than 250 ms.		X
4008	FWD solenoid is drawing more current than commanded.		X
4009	FWD solenoid is drawing less current than commanded.		X
4011	RVS input (pin 40) feedback circuit is reading too much current with command. (>1.1 A for 1ms).		X
4012	RVS input (pin 40) current is less than 0.05 A with more than 0.1 A commanded for more than 250 ms.		X
4013	RVS solenoid is drawing more current than commanded (Error=20% of command or more).		X
4014	RVS solenoid is drawing less current than commanded (Error=20% of command or more).		X
4028	Differential lock or 4 wheel drive solenoid shorted to ground.	X	
4029	Shift lever improperly connected, no power to pin 16, pin 18, or pin 46 for more than 3 seconds.		X
4030	Shift lever malfunction; transmission in neutral receives forward and neutral together more than 5 seconds.		X
4031	Shift lever malfunction; transmission in neutral receives reverse and neutral together more than 5 seconds.		X
4032	Shift lever malfunction; transmission in forward receives forward and reverse together more than 5 seconds.		X
4033	Shift lever malfunction; transmission in reverse receives forward and reverse together more than 5.		X



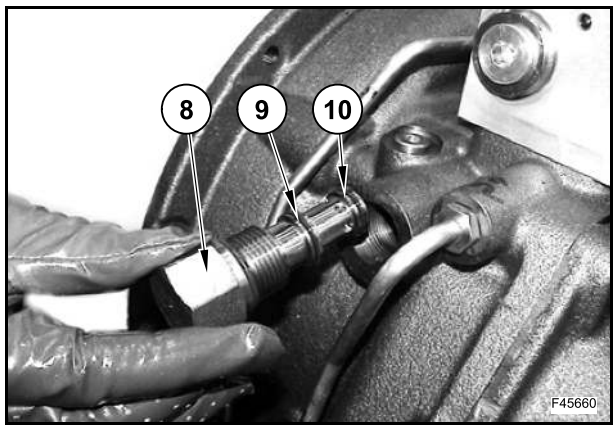
TBR00075

TABLE 2

1. Transmission
2. Torque converter
3. Plate
4. Plate
5. Snap ring
6. Washer
7. M10x20 hex screw
   [tightening torque 52÷57 Nm (38÷42 lbf·ft)]
8. M10x30 hex screw
   [tightening torque 52÷57 Nm (38÷42 lbf·ft)]
9. O-Ring
10. Dipstick tube
11. Dipstick
12. Washer
13. M8x25 hex screw
    [tightening torque 26÷31 Nm (19÷23 lbf·ft)]

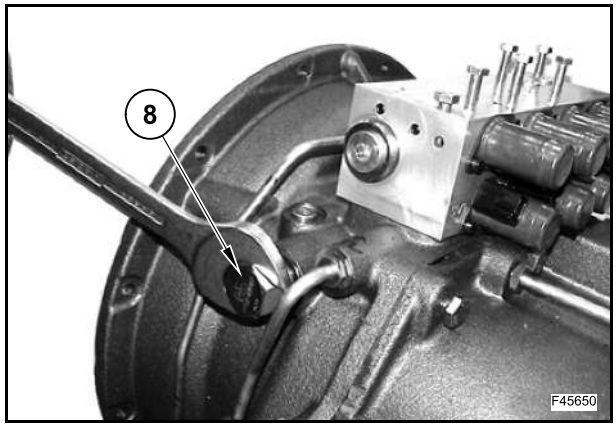
Clean the valve (8).

Assemble the O-rings (9) and (10) onto the valve (8).



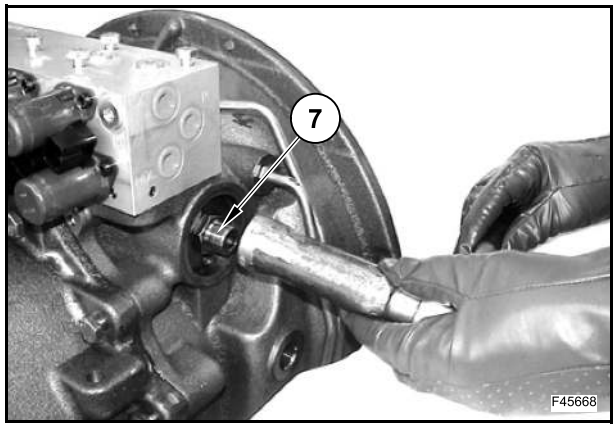
Assemble valve (8).

Tighten to the prescribed torque of 28 Nm (21 lbf·ft).



Assemble fitting (7).

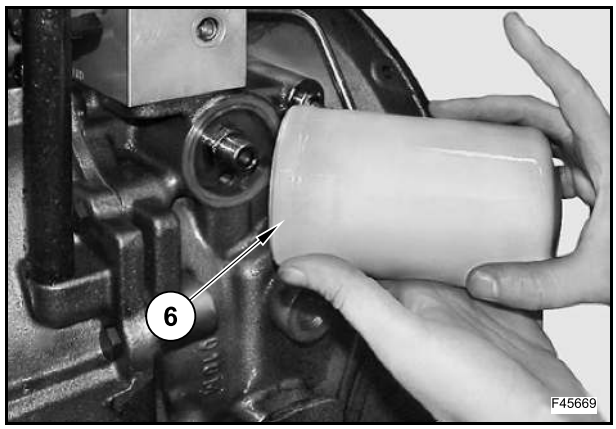
Tighten to the prescribed torque of 50 Nm (37 lbf·ft).



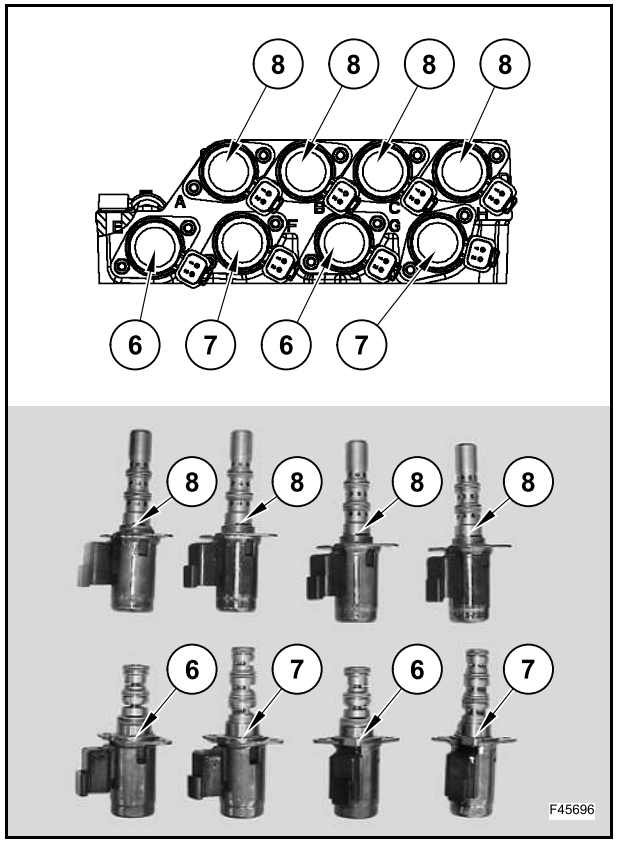
Assemble the oil filter (6).

Lubricate the gasket.

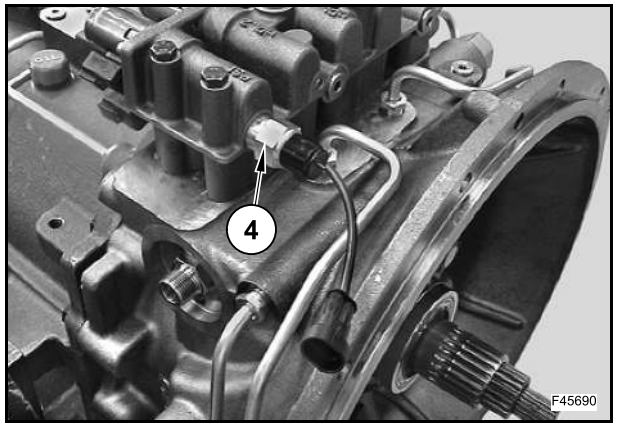
Tighten clockwise until the gasket makes contact with its seat, then tighten further 2/3 of a turn.



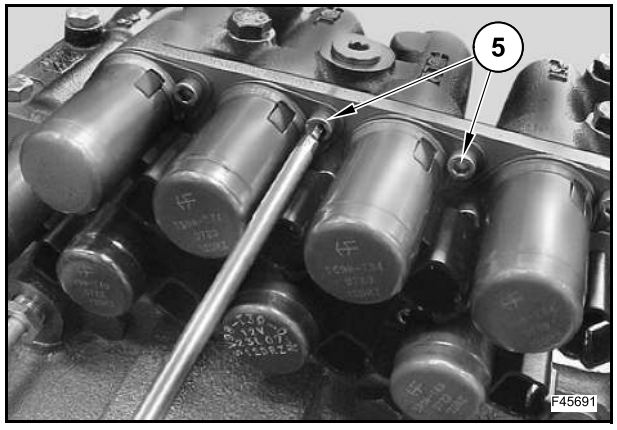
Assemble the valves ON/OFF (6) and (7) and the proportional valves (8) by observing the shown positions.



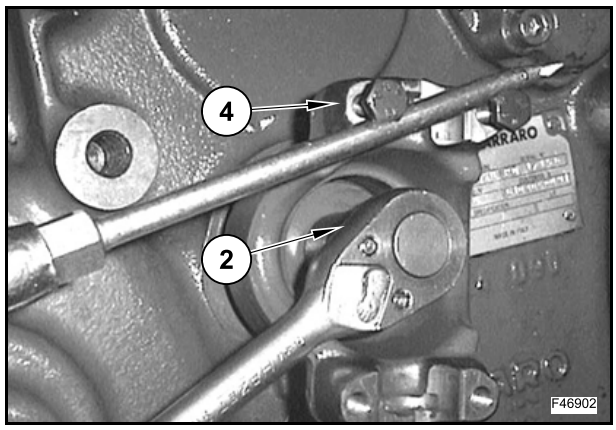
Assemble the pressure switch (4).



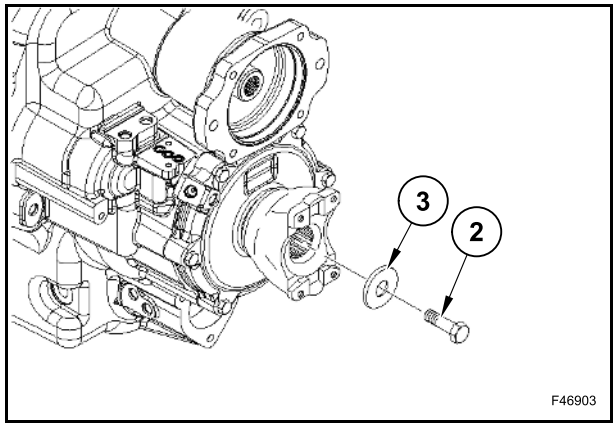
Screw in and tighten the screws (5) to a tightening torque of 3 ÷ 4 Nm (2 ÷ 3 lbf·ft).



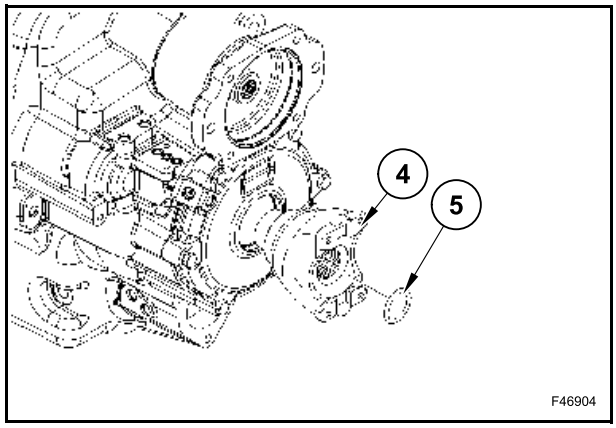
Unscrew the screw (2) of the flange (4).



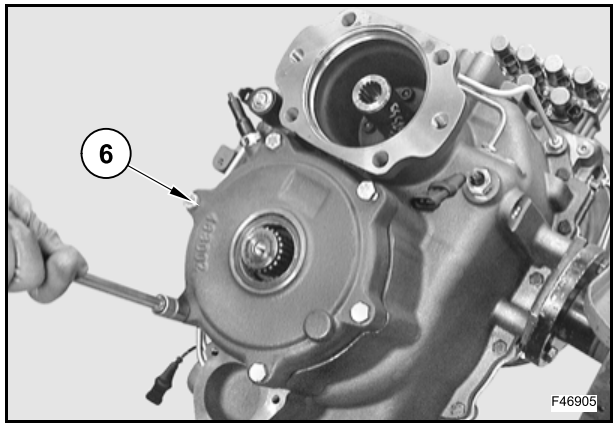
Loosen the screw (2) and the washer (3).



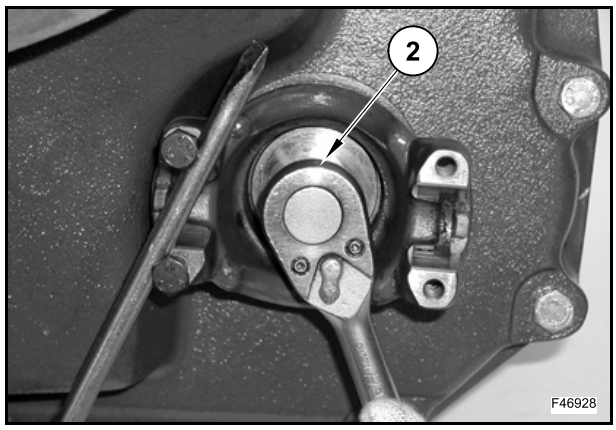
Remove the flange (4) and the O-ring (5).



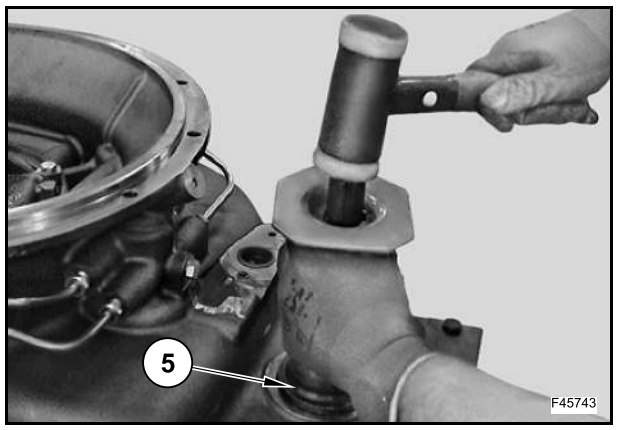
Loosen and remove the screws (6) using the procedure below.



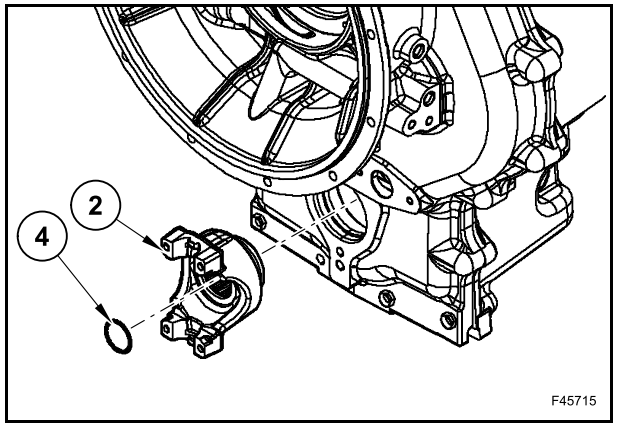
Tighten the screw (2) to the tightening torque of 139 Nm (102.5 lbf·ft).



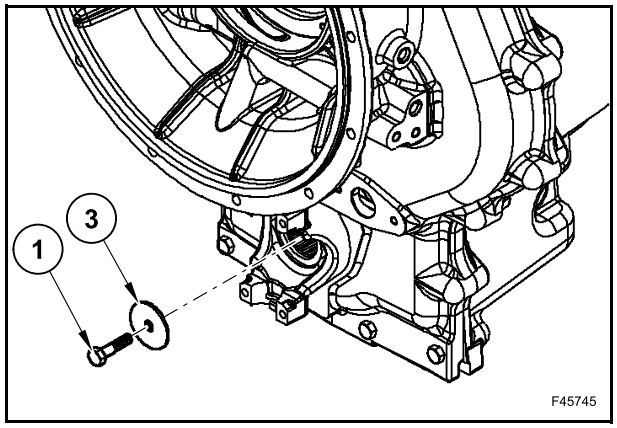
Assemble the seal ring (5) on the output of the front shaft by means of tool 380200226.



Assemble the flange (2) and a new O-ring (4).

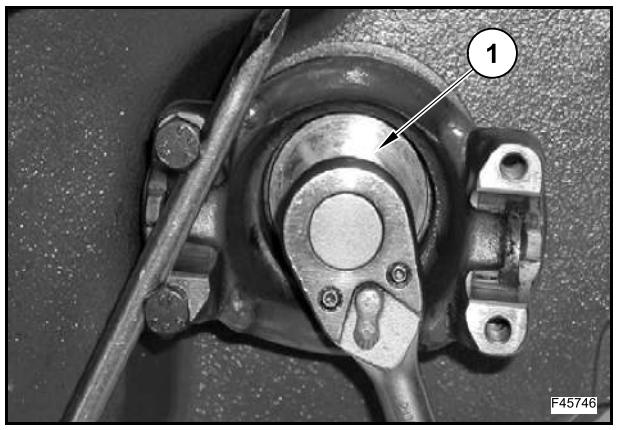


Assemble the washer (3) and tighten the screw (1).

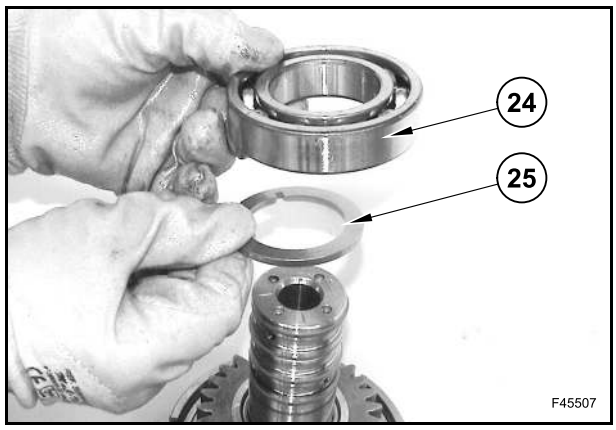


Tighten the screw (1) to a tightening torque of 139 Nm (102.5 lbf·ft).

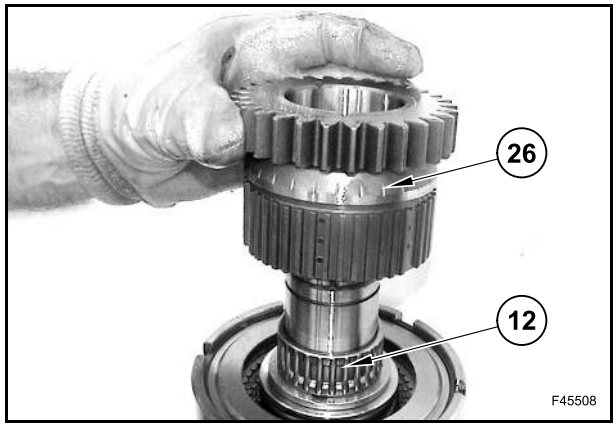
Use a screwdriver and 2 screws to lock the flange.



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.

Assemble the 380200225 tool over the 380200224 tool and slide the seal ring until it reaches the groove in the shaft.

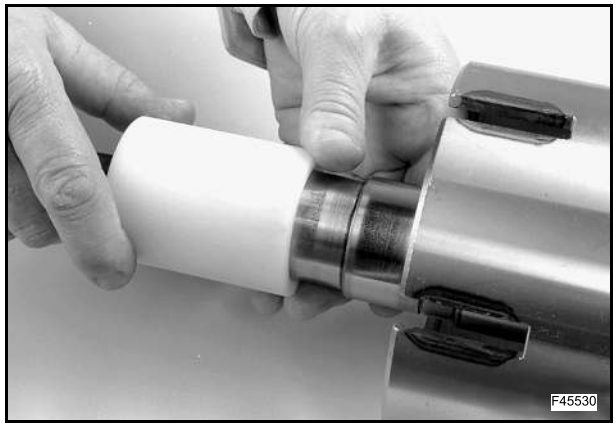
Remove the tools 380200224 and 380200225, the expander/protector and the spacer from the shaft.

Assemble the end of the 380200214 seal compressor with the deep chamfer onto the shaft and over the seal ring.

Use a back and forth twisting motion to allow the seal compressor to slip over the top of the seal ring and seat this latter into the groove.

Be careful not to damage the seal ring.

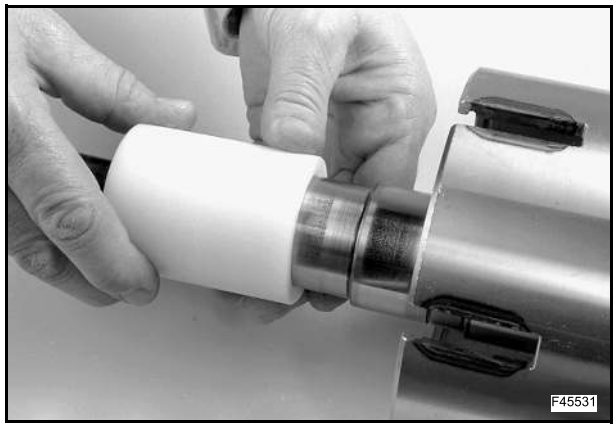
After the seal ring is seated in the groove, remove the seal compressor from the shaft.



Turn the seal compressor around and slide the end with the narrow chamfer over the shaft and over the seal ring.

Leave the seal compressor in place for 15 minutes until the seal ring has cooled and is properly seated in the groove.

After the seal ring has cooled, remove the seal compressor from the shaft.

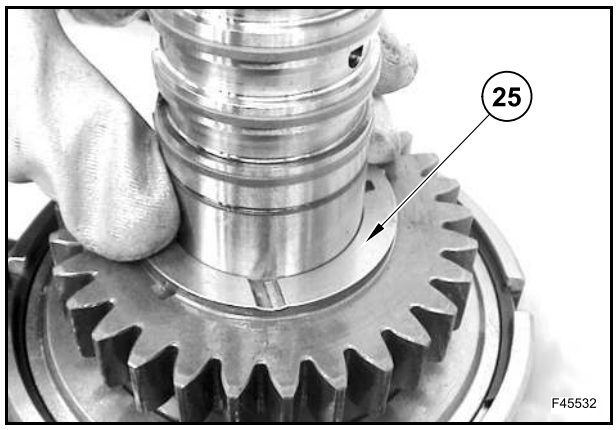


Turn the shaft upside down to carry out the operations described previously.

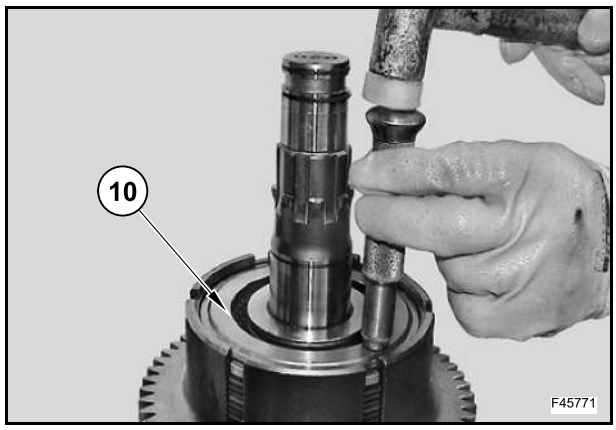
Lubricate the thrust washer (25).

Assemble the thrust washer so that the notch in the inner edge fits over the pin.

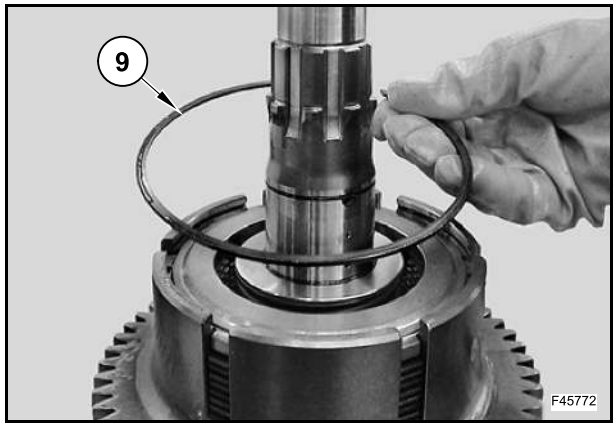
Make sure that the side with the oil grooves is down.



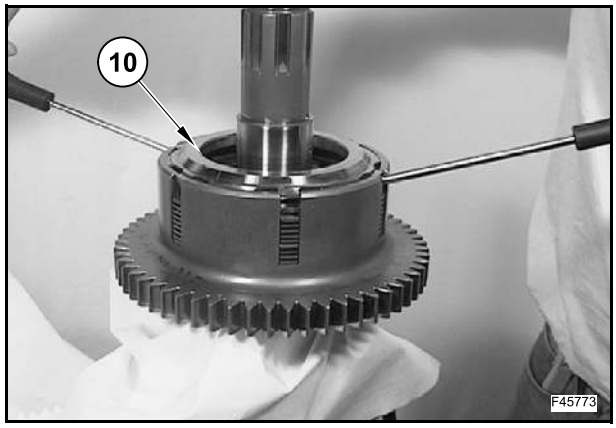
Push the thrust washer (10) slightly.



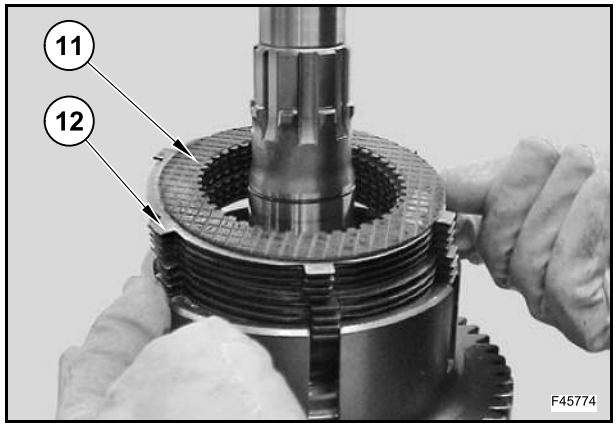
Remove the snap ring (9).

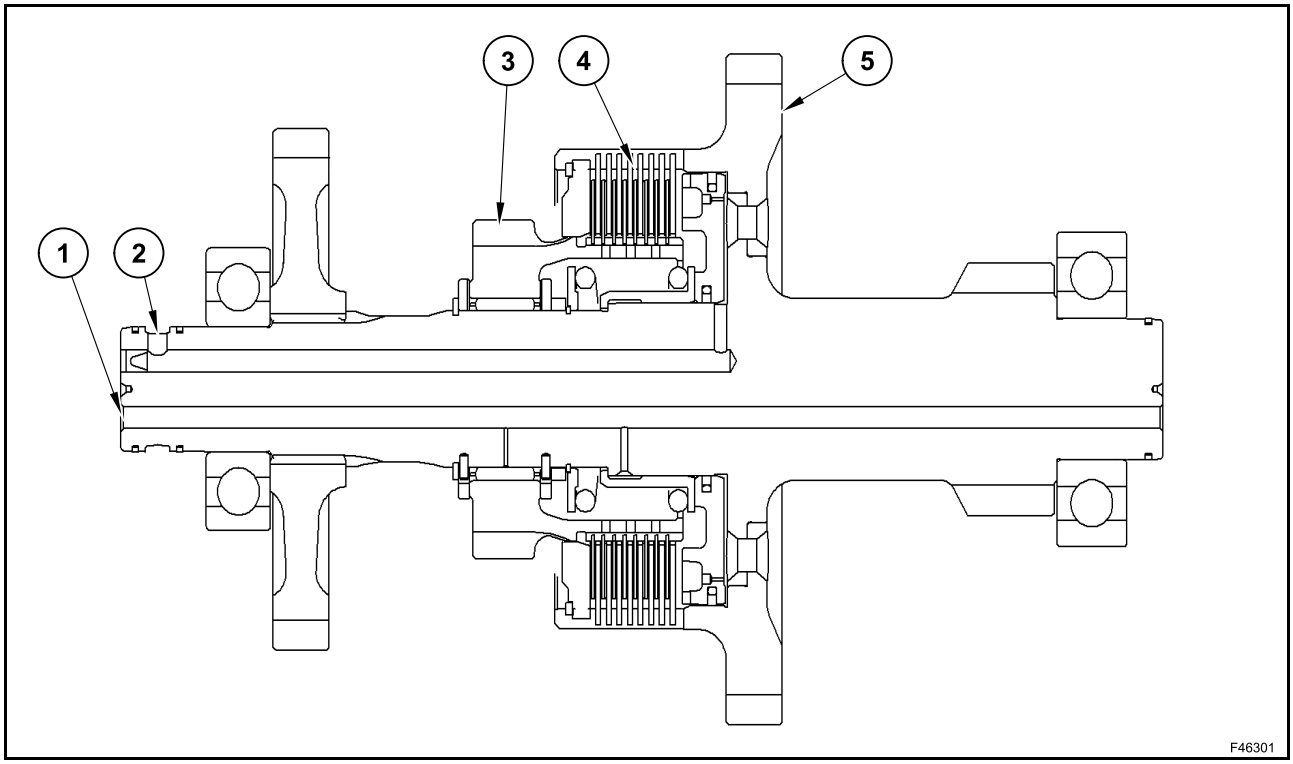


Remove the thrust washer (10) by means of 2 screwdrivers.



Remove the discs (11) and the counterdiscs (12).





1. Lubrication oil passage
2. 2nd gear clutch oil passage
3. 2nd gear
4. 2nd gear clutch disc kit
5. Input shaft

Try to turn the 2nd travel gear. It must turn on the input shaft.

Apply compressed air at approximately 6 bar (87 psi) to the 2nd gear clutch passage.

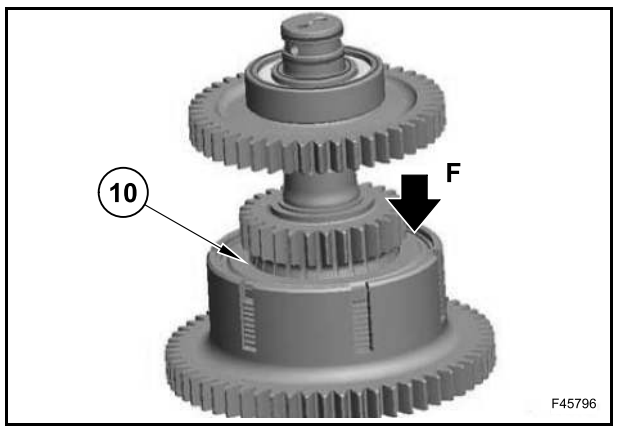
Listen for the 2nd gear piston to move and to lock the related clutch disc kit.

Try to shift the 2nd travel gear. It must not turn on the input shaft.

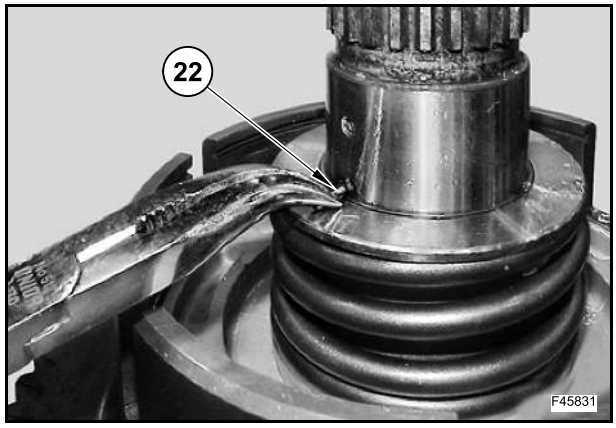
If the clutch does not work correctly, disassemble it to find the problem.

Carry out the check procedure of the clutch disc kit backlash on both sides of the FWD-REV-clutch. Position the shaft on a suitable support and apply load **F** on the counterdisc (10) surface by means of a proper buffer.

This operation clears any possible play.

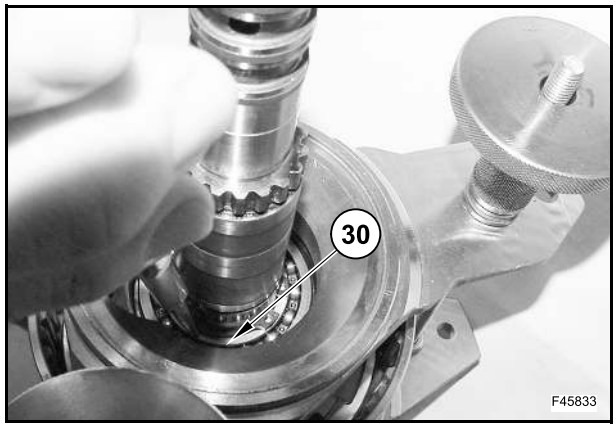


Remove the pin (22).



Lower the cover (29) by means of tool 380200215.

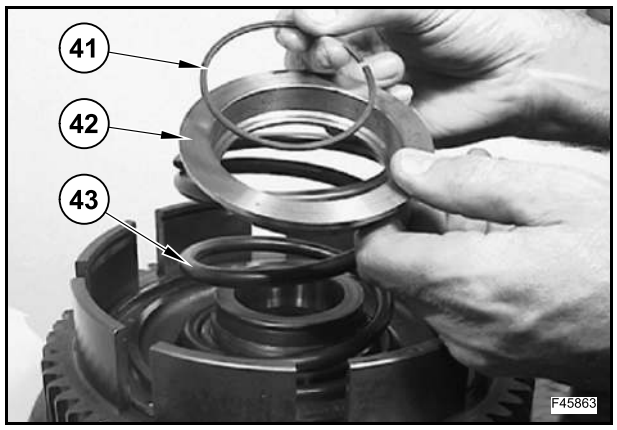
Remove the snap ring (30).



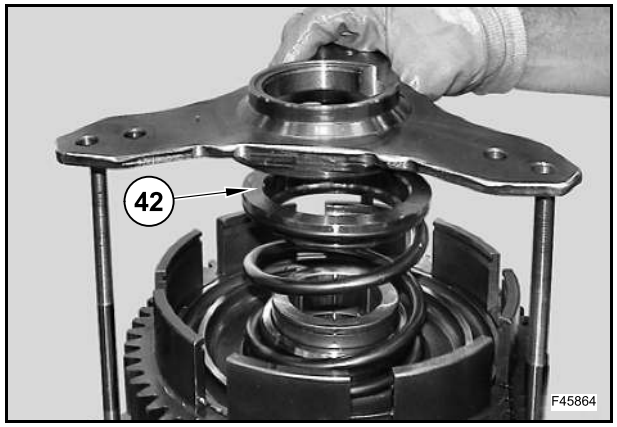
Loosen the knobs of the threaded bars to clear the spring tension.

Remove the upper part of tool 380200215.

Insert the spring (43), the cover (42) and the snap ring (41).

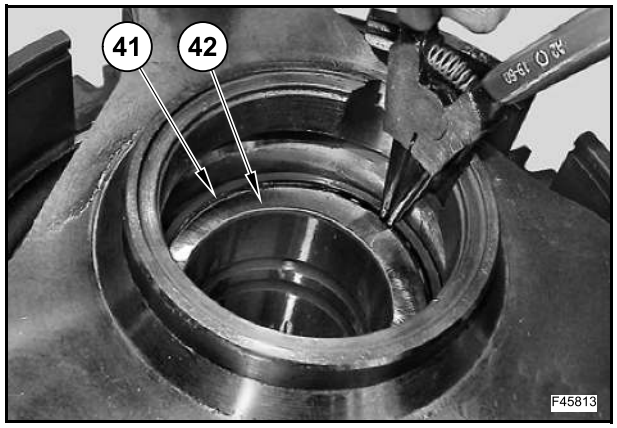


Lower the cover (42) by means of tool 380200215.



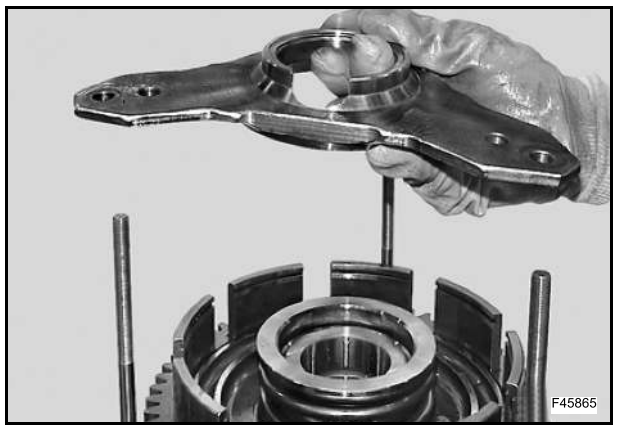
Insert the snap ring (41).

Make sure that the snap ring (41) is correctly fitted into its seat.



Loosen the knobs of the threaded bars to clear the spring tension.

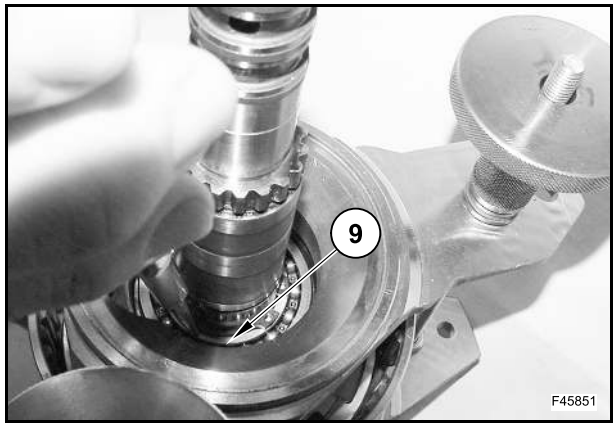
Remove the upper part of tool 380200215.



Lower the cover (10) by means of tool 380200215.

Insert the snap ring (9).

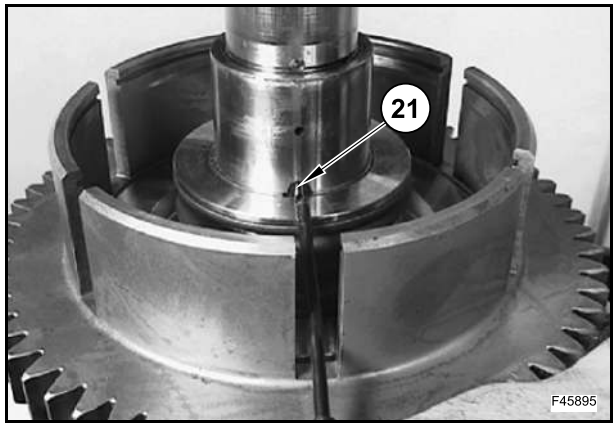
Make sure that the snap ring (9) is correctly fitted into its seat.



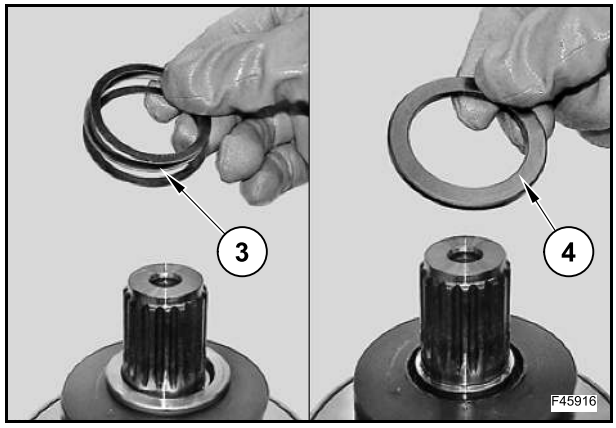
Loosen the knobs of the threaded bars to clear the spring tension.

Remove the upper part of tool 380200215.

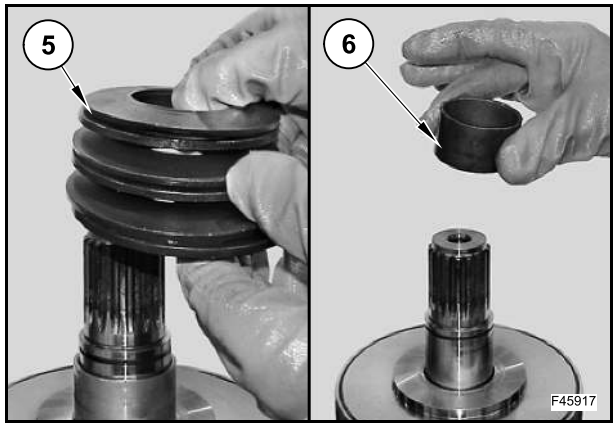
Assemble the pin (21).



Remove the shims (3) and the thrust washer (4).

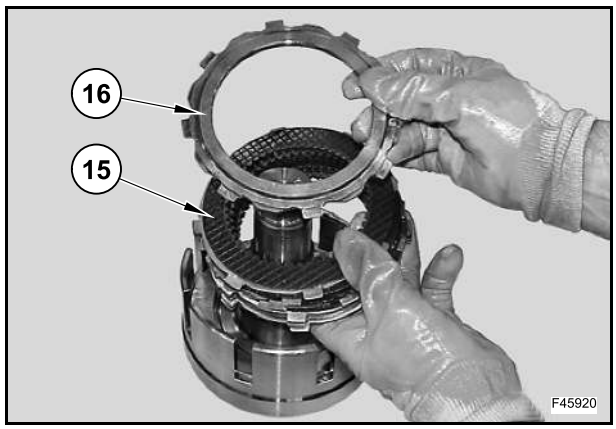


Remove the Belleville washers (5) and the spacer (6).



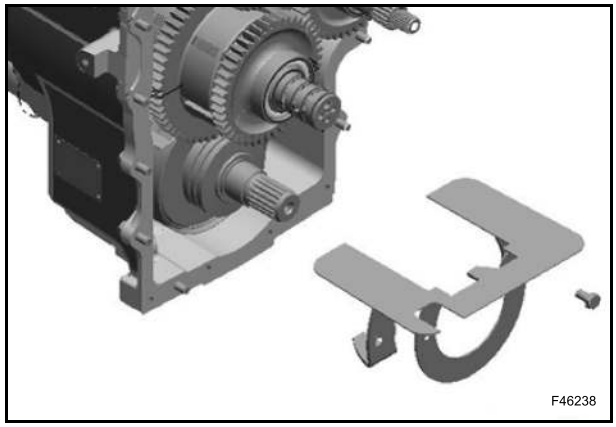
Remove the snap ring (17).

Remove the thrust washer (16) and the disc and counterdisc kit (15).

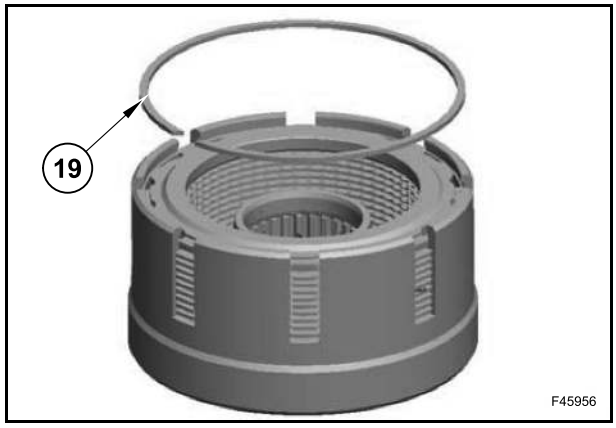


Lift the 3 shafts (B), (C) and (E) at the same time and insert the assy into the half box by means of tool 380200239.

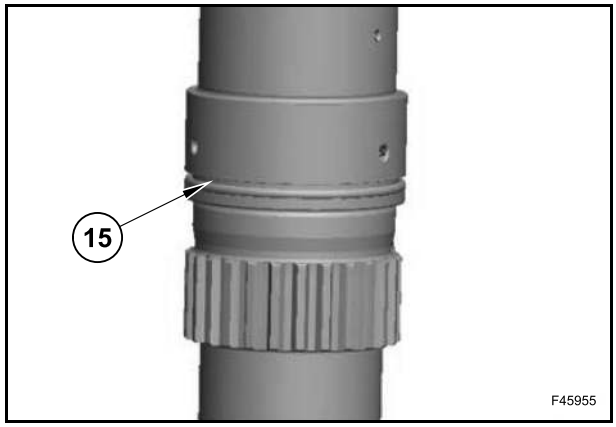
Assemble the bulkhead and tighten the screws.



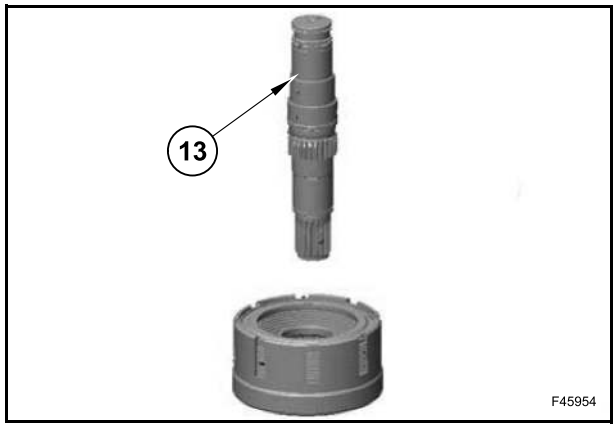
Assemble the snap ring (17).



Assemble the O-ring (15).

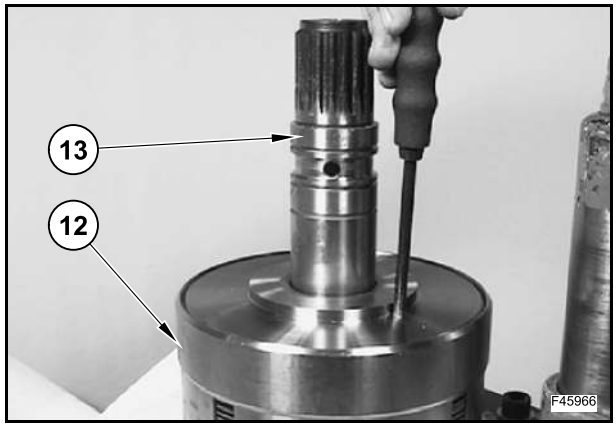


Assemble the shaft (13).



Turn the shaft (13) and the bell housing (12).

Make sure that the disc and counterdisc kit and the piston are correctly seated.

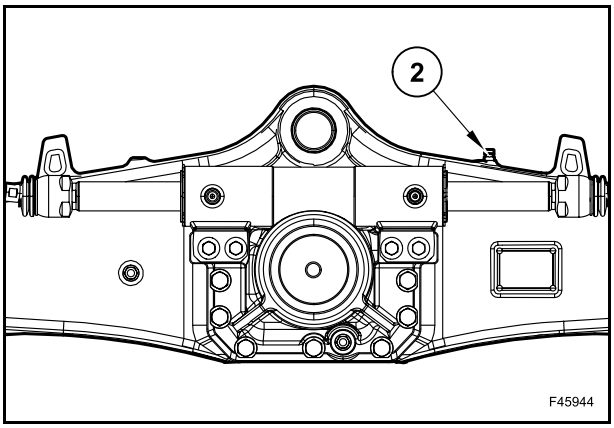


FAULT	POSSIBLE CAUSE	ACTION
	The brake does not release.	Check the general pressure of transmission. Check voltage. Check the operation of the solenoid valve. Check the mounting of the brake solenoid valve block after operating on the brake. After the above-described verifications, disassemble the brake cover and check the condition of the parts for unlocking/locking the brake (seal rings, Belleville washers, brake disc deformation, etc.).
The vehicle has a reduced power transmission.	Incorrect oil temperature.	Wait for the operating temperature to be reached (stall test).
	Transmission oil overheating.	Restore acceptable temperature values.
	Incorrect operating pressures.	Check the hydraulic circuit and replace (oil pump, filters, control valve).
	Damaged converter.	Replace the converter.
	Incorrect oil level.	Restore the oil level.
	Worn-out clutch assembly.	Replace/repair.
	4WD fails to engage.	Repair/replace the 4WD shaft assy.
	Overheated solenoids/solenoid valves.	Replace.
	Damaged connections of transmission and vehicle wiring harness.	Repair and, if necessary, replace the wiring harness.
	Software of EGM/ECU gearshift electronic control faulty.	Replace EGM/ECU.
	Damage to sensors.	Replace sensors.
Overheating.	Damaged cooling system.	Repair the cooling system.
	Dirty heat exchanger.	Clean the heat exchanger.
	Unintentionally activated parking brake.	Deactivate the parking brake.
	Excessive soil deposit on axle wheel hubs.	Clean the axle wheel hubs.

Before draining the oil from the axle body, use the breather (2) to release any possible internal pressure.

⚠ WARNING ⚠

Risk of violent oil ejection.



To drain the oil from the central body remove the level plug (1) and the drain plug (4).

⚠ WARNING ⚠

Risk of violent oil ejection.

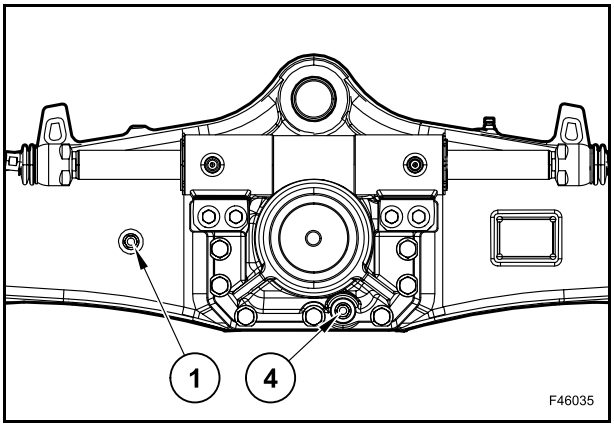
Drain all oil.

Clean, screw in and tighten the drain plug (4).

Fill through the hole of the plug (1).

Check the level and, if necessary, top up.

Clean, screw and tighten the plug (1).



Before draining the oil from the reduction gear, rotate it so that the plug (3) is in the highest position (position A) and partially unscrew the plug to release any possible internal pressure.

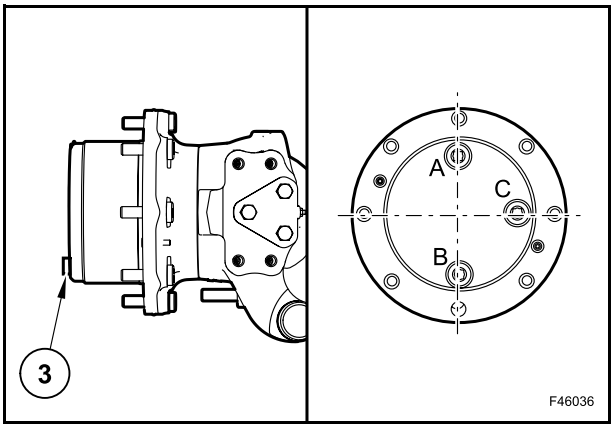
Turn and bring the plug to the lowest position (position B).

Remove the plug and drain the oil.

Now turn again and bring the hole of the plug (3) to check and oil filling position (position C).

Carry out the filling.

Clean, screw and tighten the plug (3).



Checks

Clean all parts in cleaning solvent.

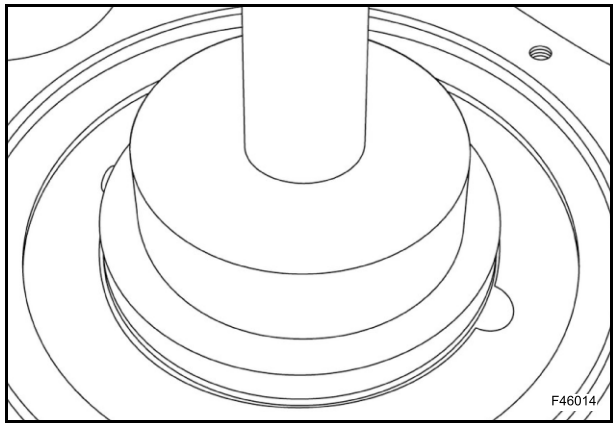
Inspect the bearing cup and the rollers in the bearings for flat areas, pitting, scoring, and other damage. Also check the inner race for damage. If any of these defects are found, new bearings and new bearing cups must be installed.

Inspect the pins for wear and damage.

Inspect the teeth of the gears and of the ring gear for wear, pitting, scoring or other damage.
Use new parts as required.

Assembly

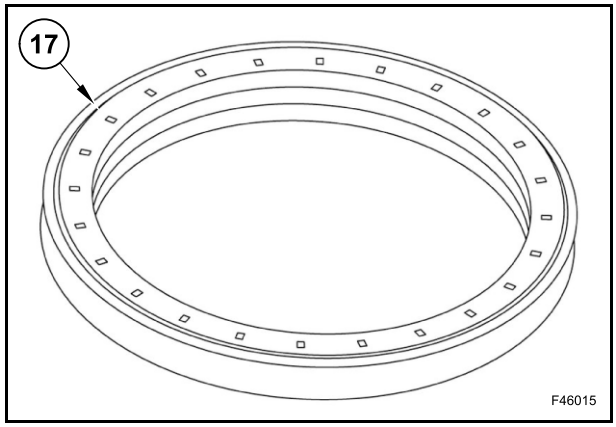
If bearing cups were removed, use an acceptable driver to press new bearing cups into the wheel hub.



The word “OUTSIDE” on the seal ring (17) must be facing up.

Use tool DMT100004 to insert the new seal ring into the wheel hub.

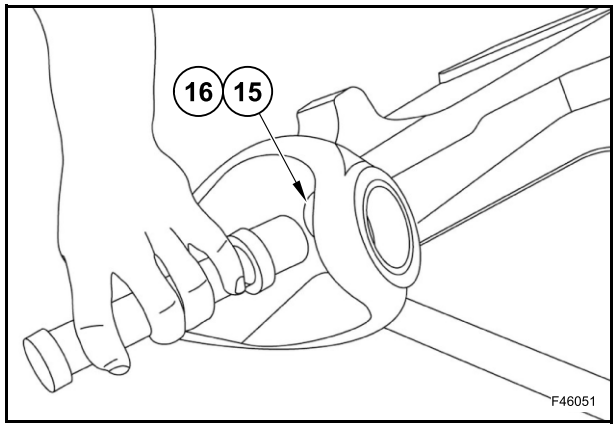
Do not damage the seal ring.



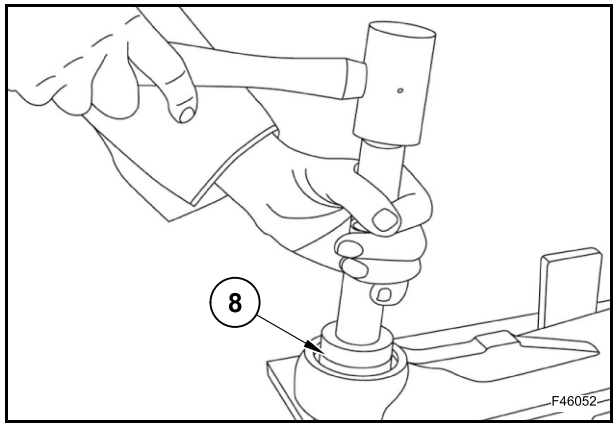
Assembly

Install the bushing (16) by means of tool DMT100005.

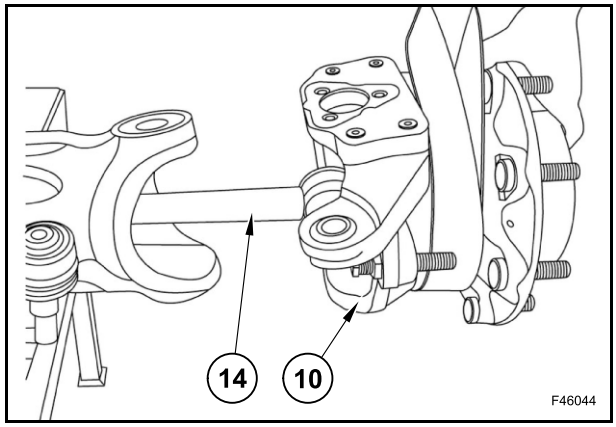
Install the seal (15) by means of tool DMT100006.



Assemble the bearing (8).

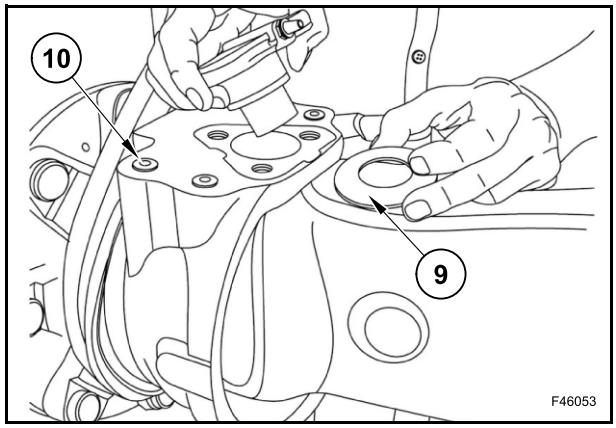


Assemble the swivel housing (10) together with the cardan joint (14).

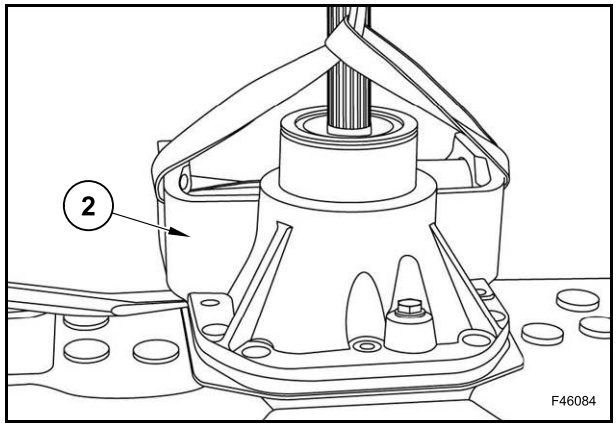


Assemble the Belleville washers (9).

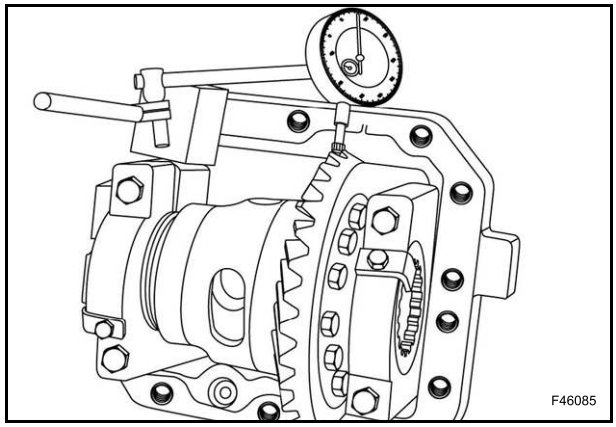
Fasten the swivel housing (10).



Remove the differential carrier (2) by means of a suitable lifting device.



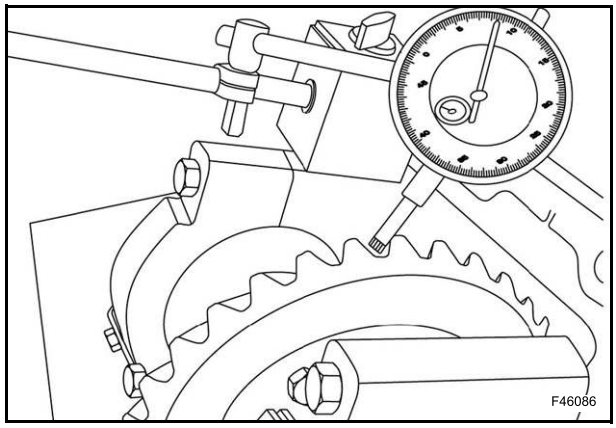
Place the differential on an approved working area.



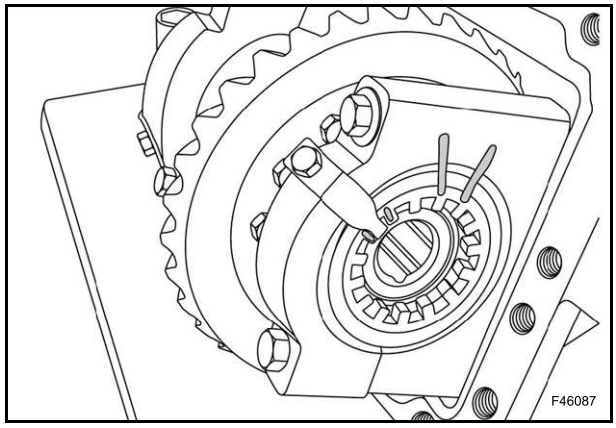
Prevent the pinion from turning.

Measure the backlash of the ring gear.

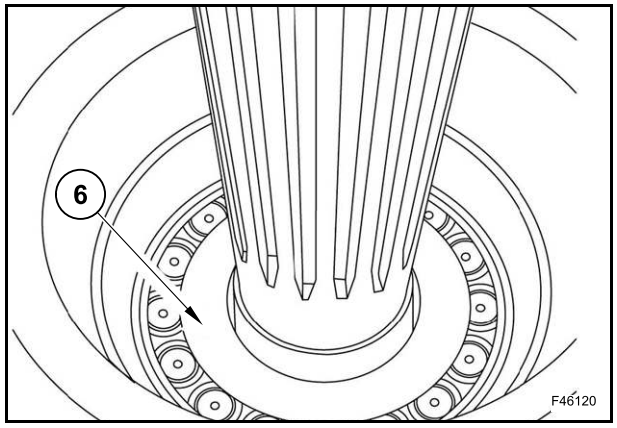
Record the reading.



Make an identification mark on the supports and ring nut on one side of the differential carrier.

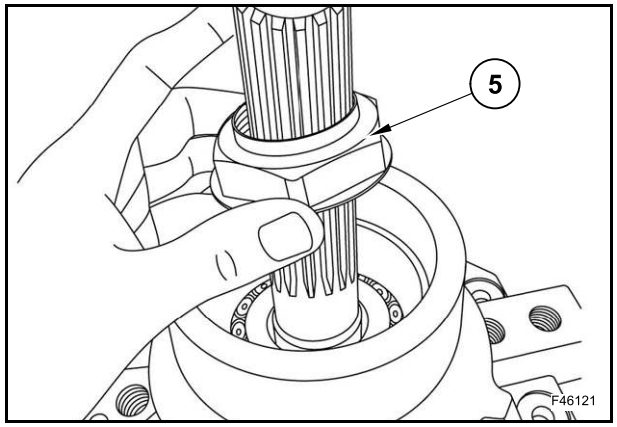


Assemble the washer (6).



Install a new nut (5).

Use a yoke and the wrench 380000468 to tighten the nut.



The pinion and bearings will still be loose.

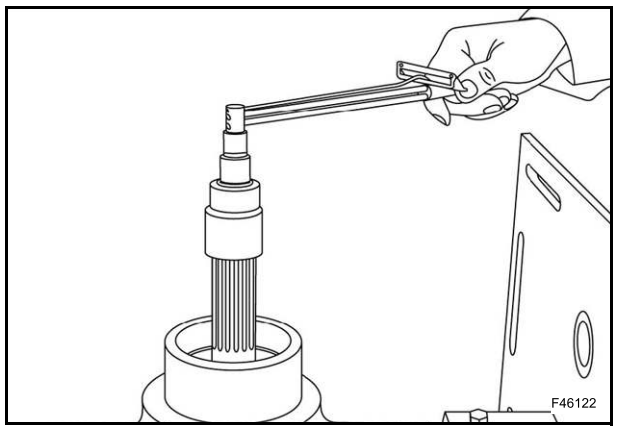
Progressively tighten the nut until the bearings become seated.

NOTE: *If the nut is tightened too much (rotating torque higher than specified), the pinion must be removed and a new spacer must be installed on the pinion.*

Use tool 380100102 and a torque wrench to check the rotating torque of the pinion.

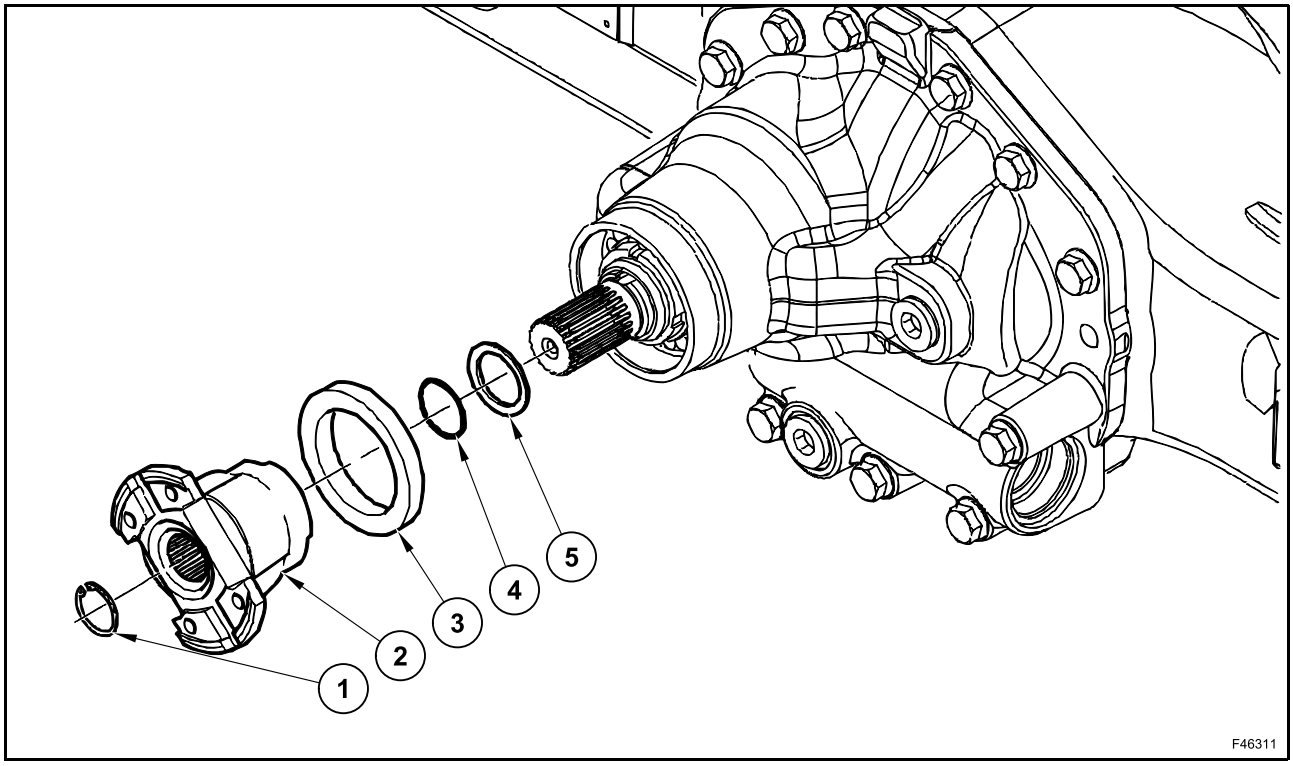
It must be rotated while tightening the nut. Final reading to be verified after 3 complete revolutions. The rotating torque must be 1.7 ÷ 2.2 Nm (1.2 ÷ 1.6 lbf·ft).

If the rotating torque is lower than specified, further tighten the nut and check the rotating torque again.



NOTES:

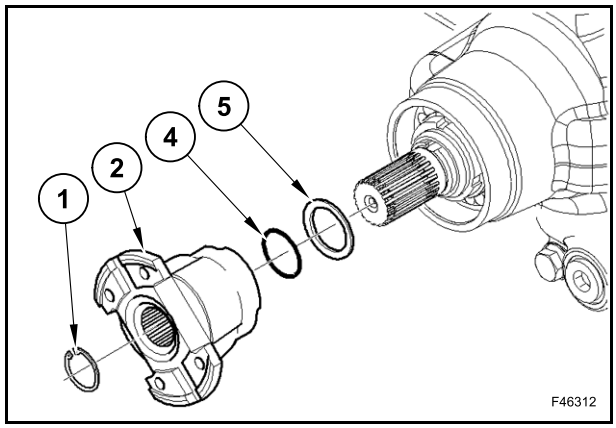
FRONT FLANGE



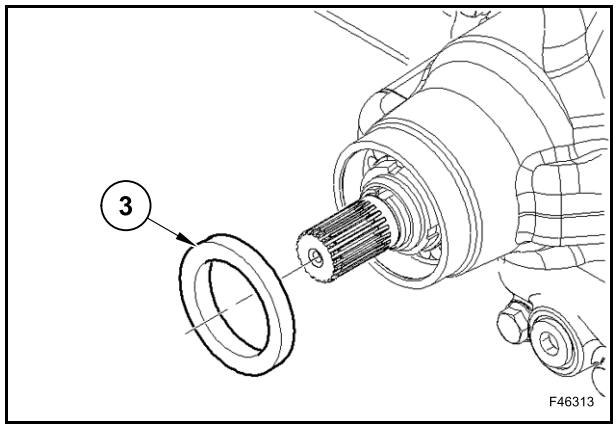
Disassembly

Remove the stop ring (1) and the front flange (2).

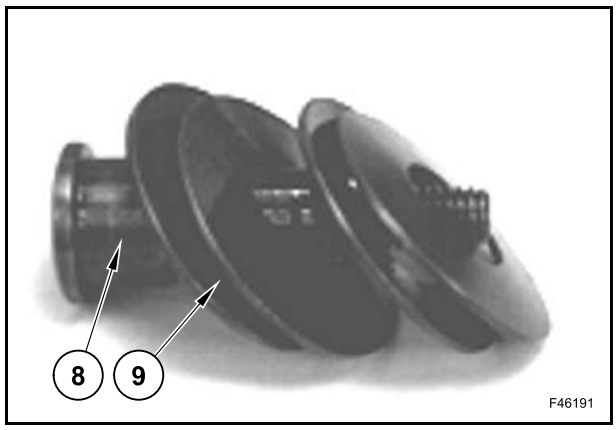
Remove the O-ring (4) and the shim (5).



Remove the seal ring (3).



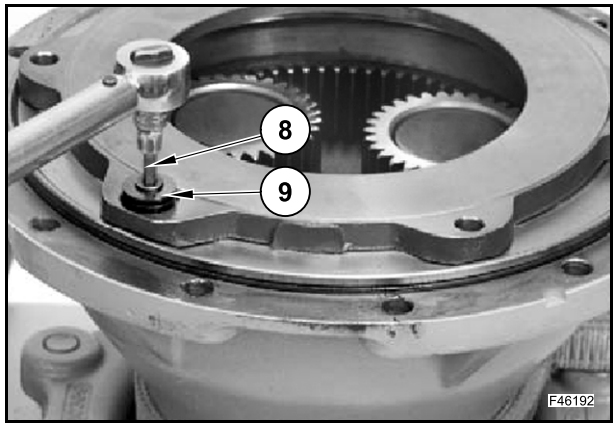
Assemble the Belleville washers (9) on the screws (8) paying attention to orientate them correctly.



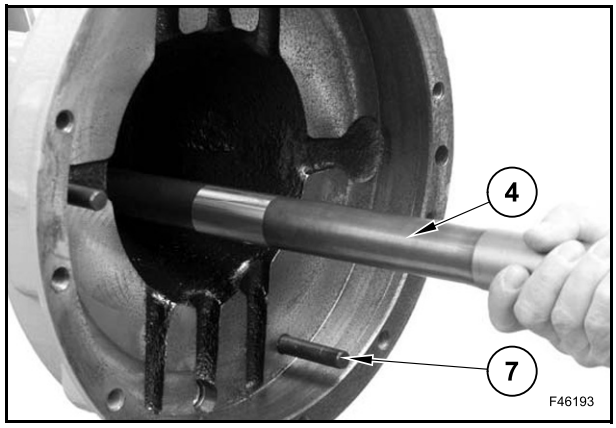
Assemble the screws (8) and the Belleville washers (9).

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

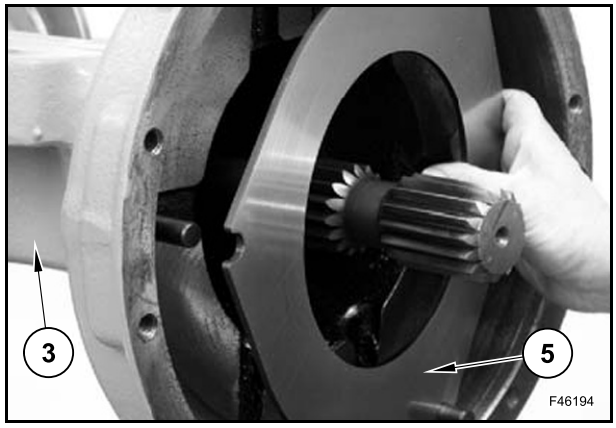
Make sure that the 4 Belleville washers are correctly aligned before tightening the screws.



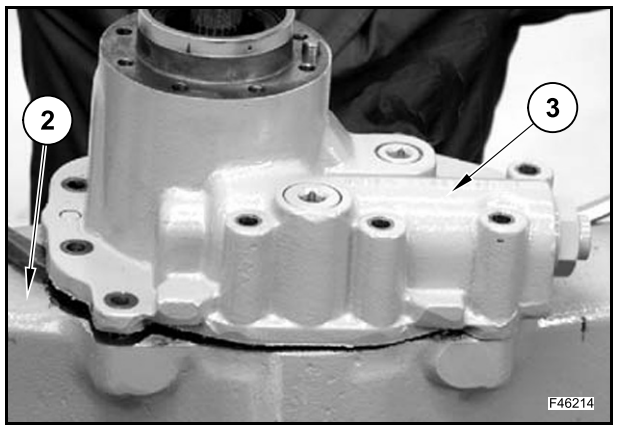
Assemble half shaft (4) and the dowel pins (7).



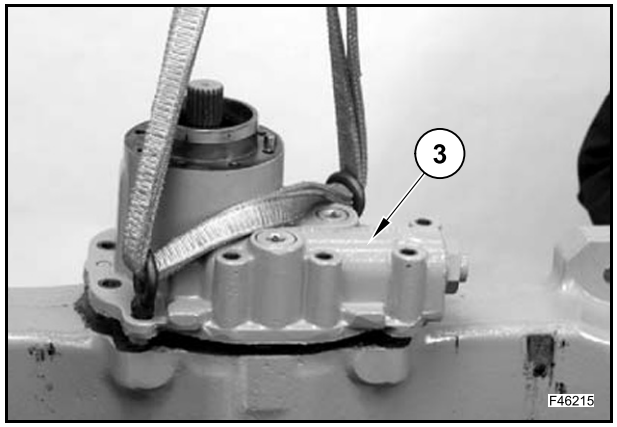
Using the reference mark made during disassembly, assemble the counterdisc (5) paying attention to direct it with the mark towards the axle body (3).



Separate the axle support (3) from the axle body (2) using pry bars in slots.



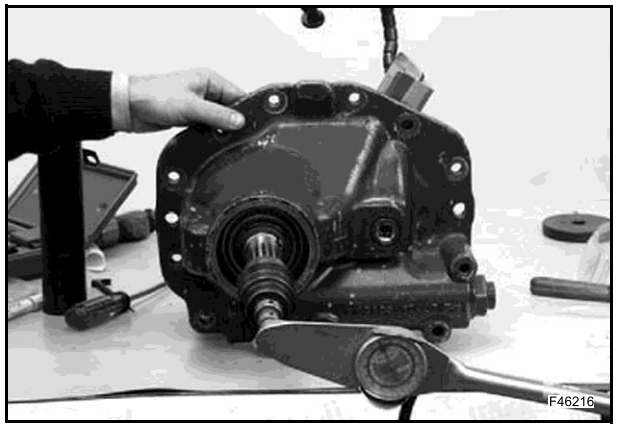
Connect the differential support (3) to a lifting device to remove it.



Measure the rolling torque M_{T0} of the bearings (pinion-ring gear system), by means of wrench 380200269.

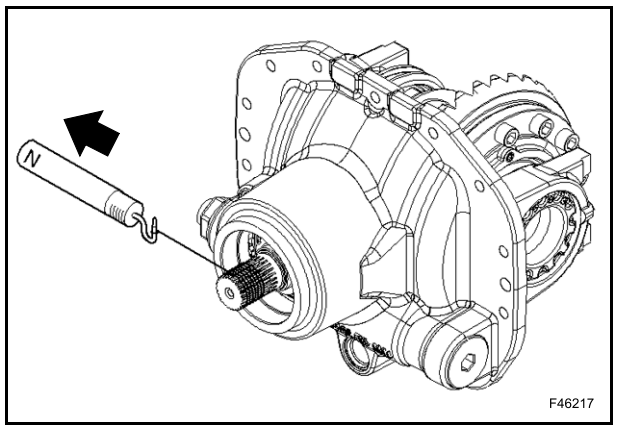
Note value M_{T0} that is necessary for assembling the bearings.

NOTE: *the total rolling torque must be determined without the pinion seal ring.*

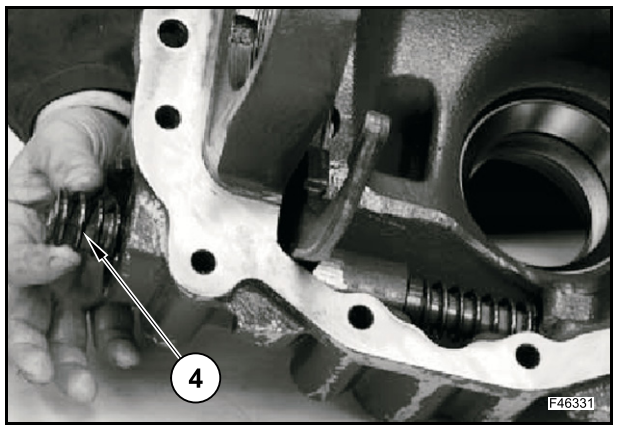


It is possible to measure the total starting preload F_{T0} of the bearings (pinion-ring gear system) using a dynamometer whose cord is wound on the end of the pinion shaft.

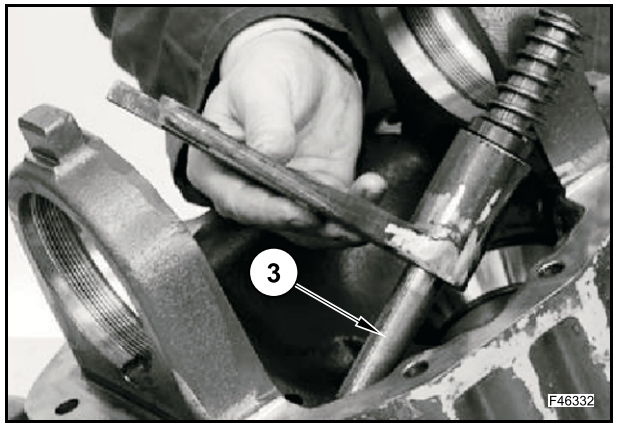
Note value F_{T0} that is necessary for assembling the bearings.



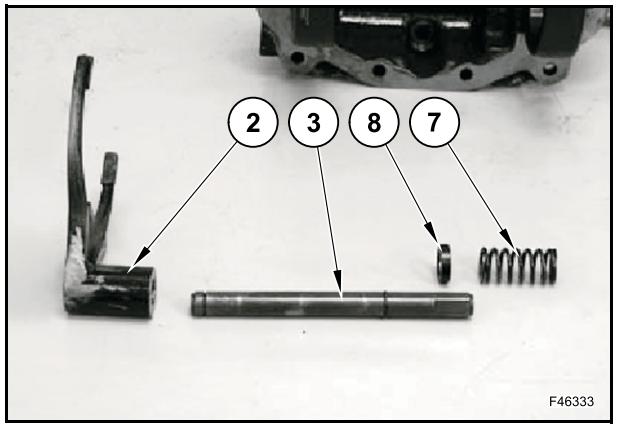
Remove the spring (4).



Extract the rod assy (3) from the differential support.

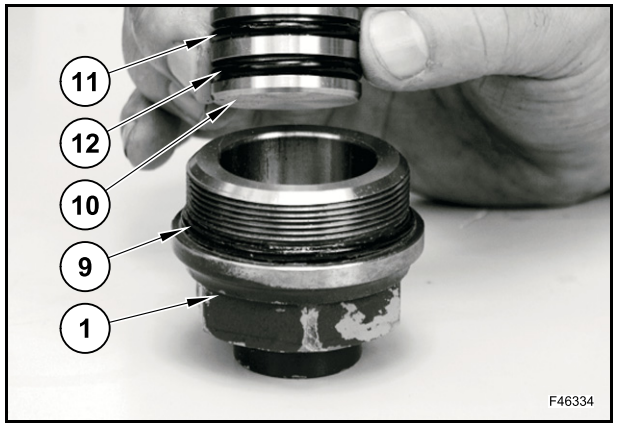


Remove the yoke (2), the spring (7) and the spacer (8) from the rod (3).

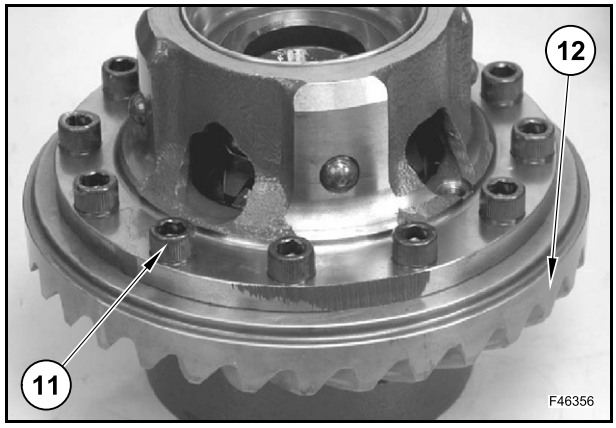


Remove the O-ring (9) from the plug (1).

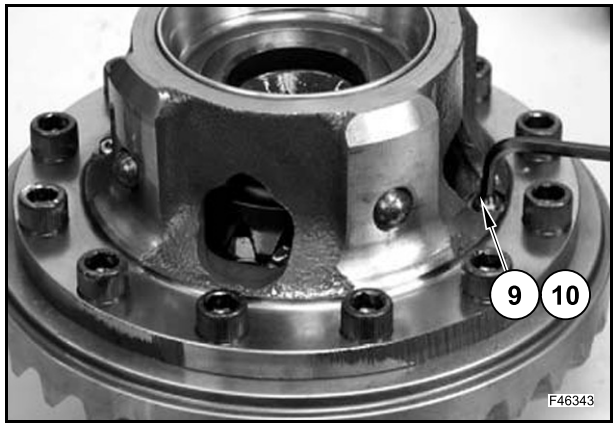
Remove the O-rings (11) and (12) from the piston (10).



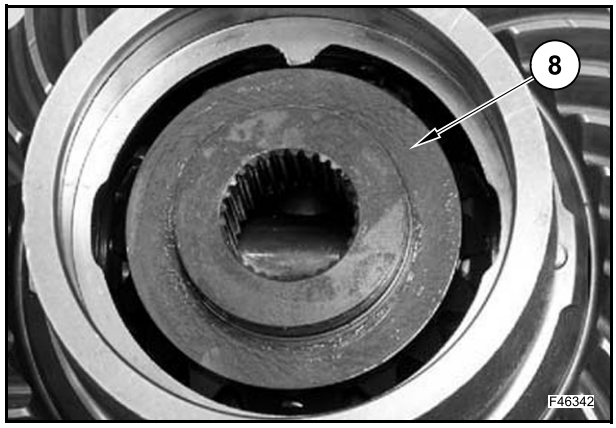
Assemble the ring gear (12), apply some sealant and tighten the screws (11) to a tightening torque of 165 Nm (122 lbf·ft).



Insert the pins (10) and tighten the plugs (9) to the prescribed torque.

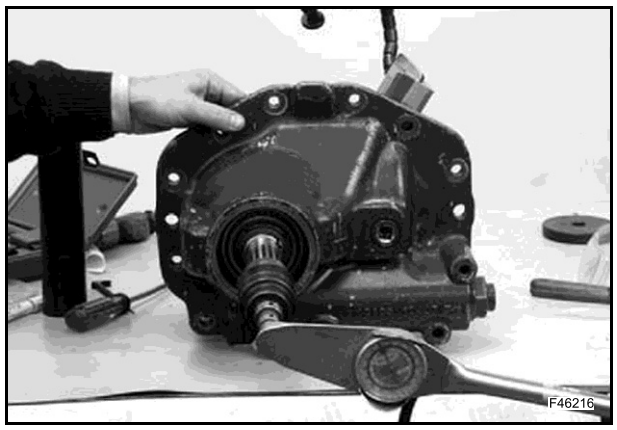


Assemble the gear (8).



Apply a thin film of grease on the cover (5) and assemble the ring (7).

If the bearings are new, measure the rolling torque M_{Pm} of the pinion shaft bearings with a torque meter and the wrench 380000020.



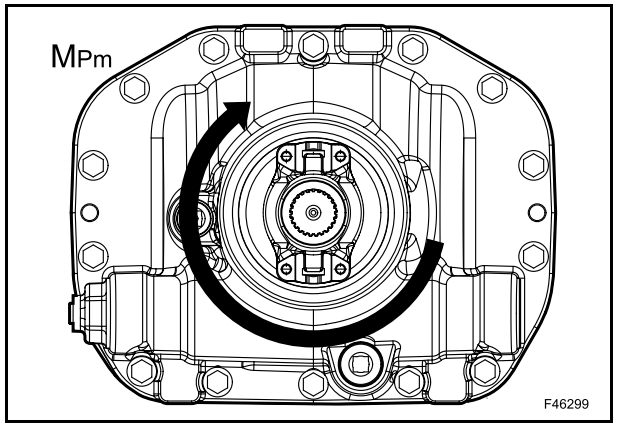
⚠ WARNING ⚠

All preloads must be measured without seal rings.

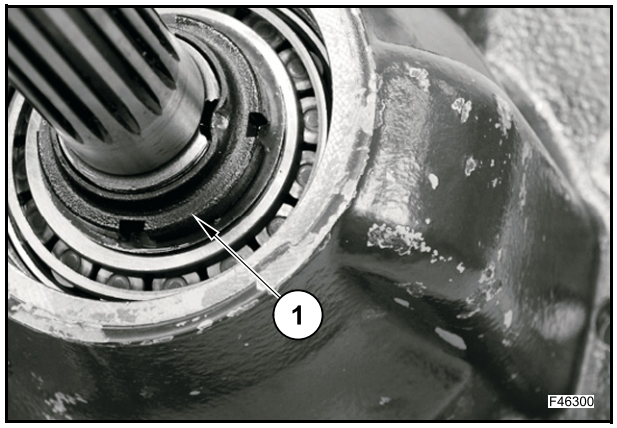
The measured value M_{Pm} should be within the following range:

M_{Pm} = 2.0 ÷ 2.4 Nm

[M_{Pm} = 1.47 ÷ 1.77 lbf·ft]

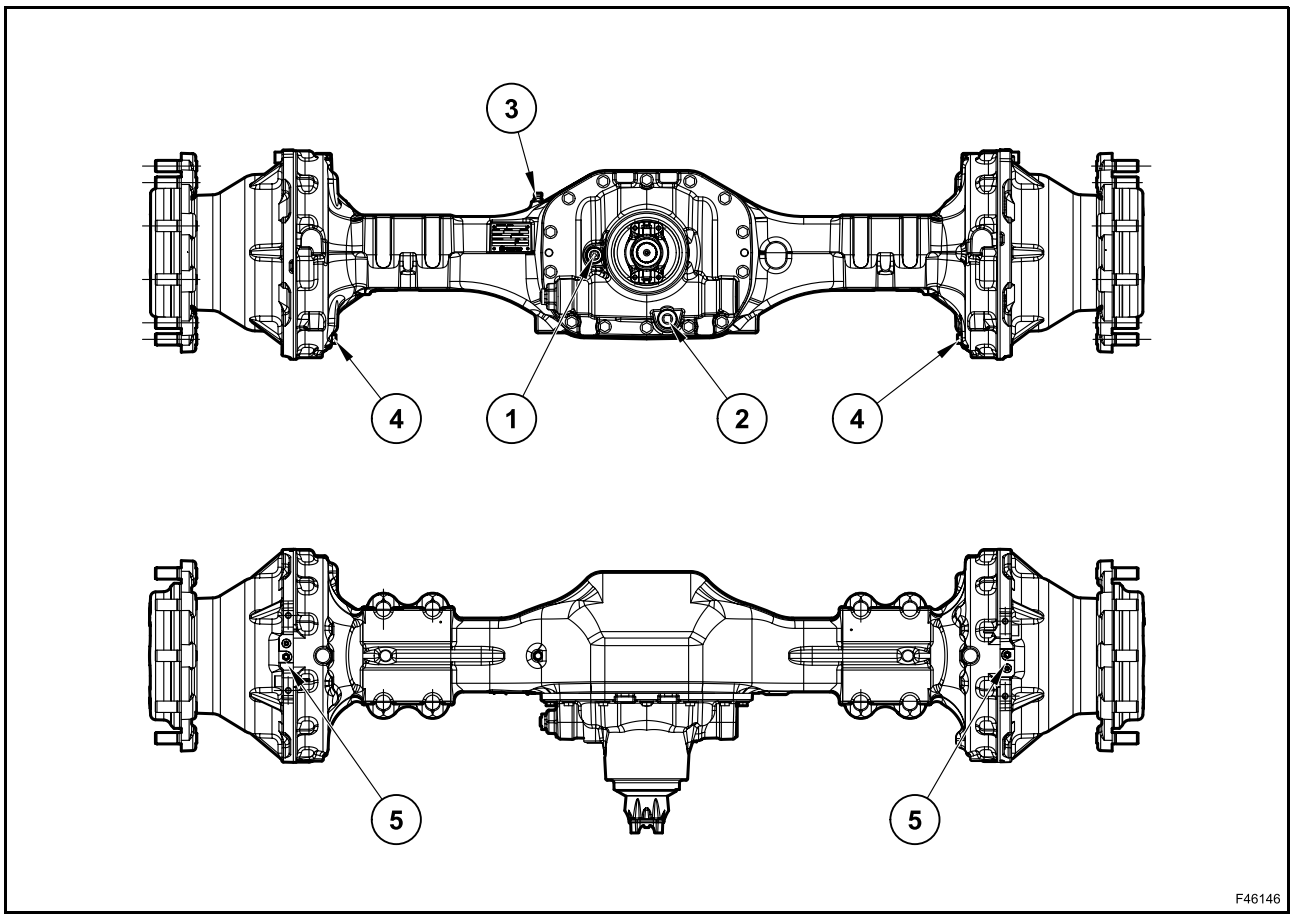


Once the prescribed preload value is achieved, caulk the ring nut (1) using a hammer and a punch.



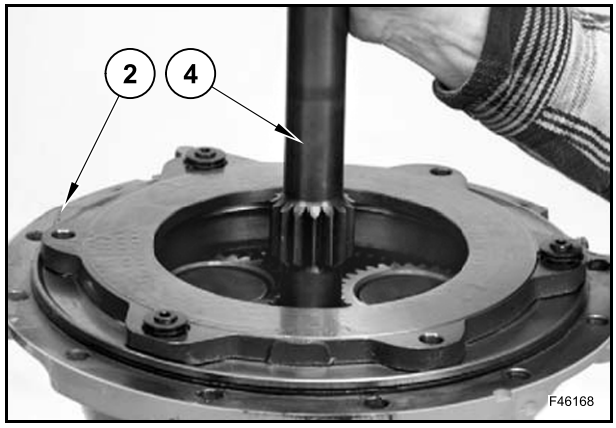
LUBRICATION AND GREASING

Oil capacity (differential)	15.5 litres (3.41 gal)
Oil type	Ambra TRX 80W -140 NH600 / TR

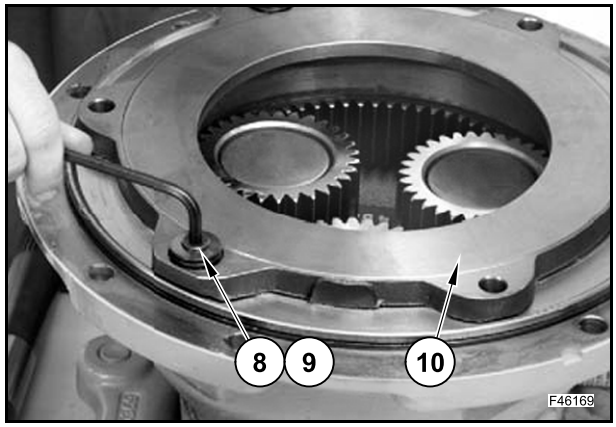


1. Level and fill plug for differential oil
2. Differential oil drain plug
3. Oil breather
4. Oil drain plug
5. Brake breather

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

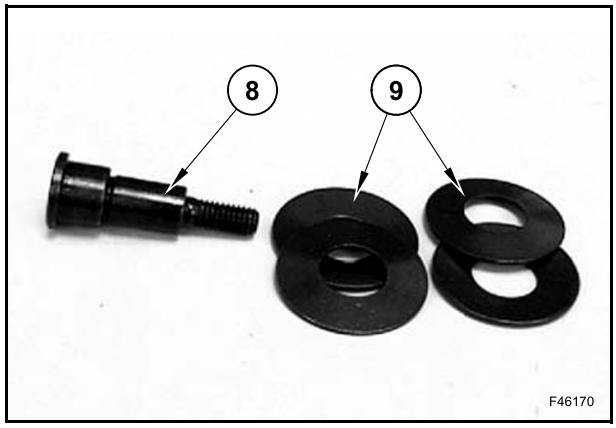


Remove the screws (8) and the Belleville washers (9) from the brake cylinder (10).

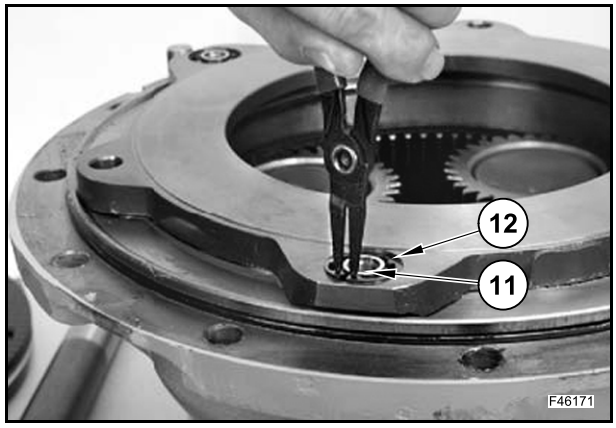


Check screws (8) and Belleville washers (9) for damage.

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

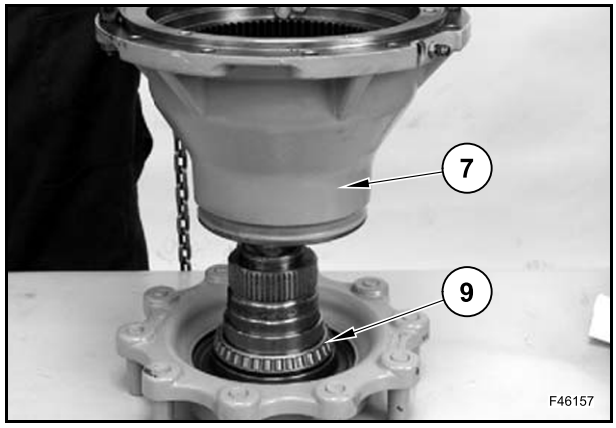


Remove the snap ring (11) and the self adjust kit assy (12).



Connect the hub (7) to a hoisting tool to remove it.

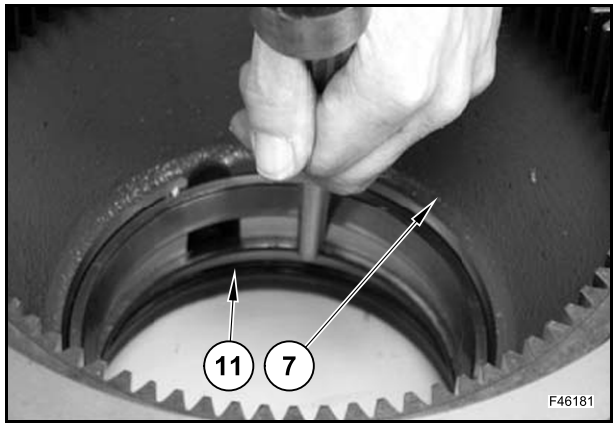
Collect the bearing (9).



Remove the bearing cup (9) from the wheel hub (7).

Remove the seal ring (10) from the wheel hub (7).

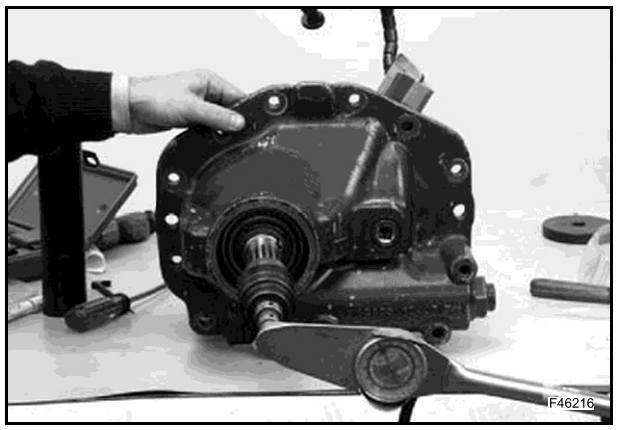
Remove the bearing cup (11) from the wheel hub (7).



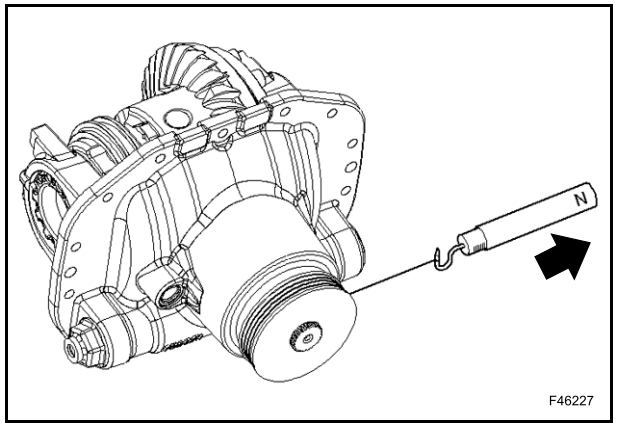
Once the pinion-ring gear backlash has been adjusted, if the bearings have not been replaced, measure the total rolling torque M_{Tm} of the bearings (pinion-ring gear system) with a torque meter and the wrench 380200269.

The measured value M_{Tm} should be the same of the starting:

$$M_{Tm} = M_{T0}$$



If the bearings have been replaced, measure the total preload F_{Tm} of the bearings (pinion-ring gear system), using a dynamometer whose cord is wound on tool 380200272 inserted on the pinion splined end.



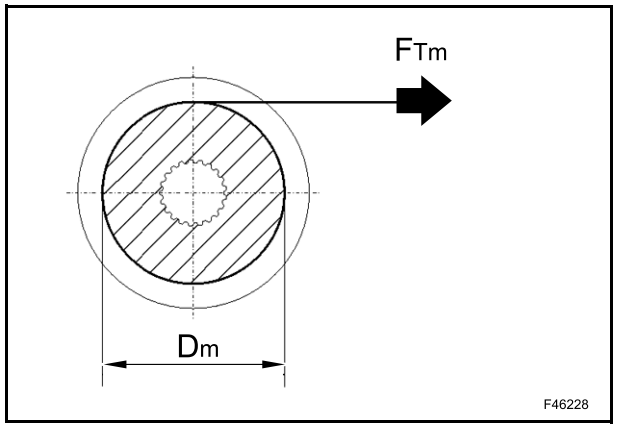
The total preload F_{Tm} is measured by means of tool 380200272.

The measured value should be within the following range:

$$F_{Tm} = (F_{Pm} + 9.2) \div (F_{Pm} + 13.8)\ N$$

$$[F_{Tm} = (F_{Pm} + 2.07) \div (F_{Pm} + 3.10)\ lbf]$$

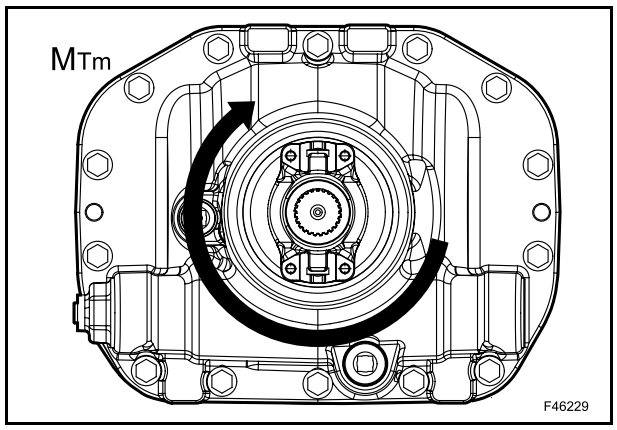
where F_{Pm} is the actual preload measured on tool 380200272 [gauge diameter Dm = 119.1 mm (4.69 in)].



Once the pinion-ring gear backlash has been adjusted, if the bearings have been replaced, measure the total rolling torque M_{Tm} of the bearings (pinion-ring gear system) with a torque meter and the wrench 380200269.

⚠ WARNING ⚠

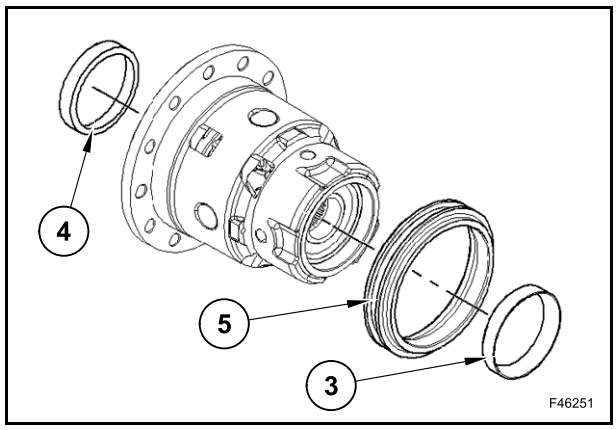
All preloads must be measured without seal rings.



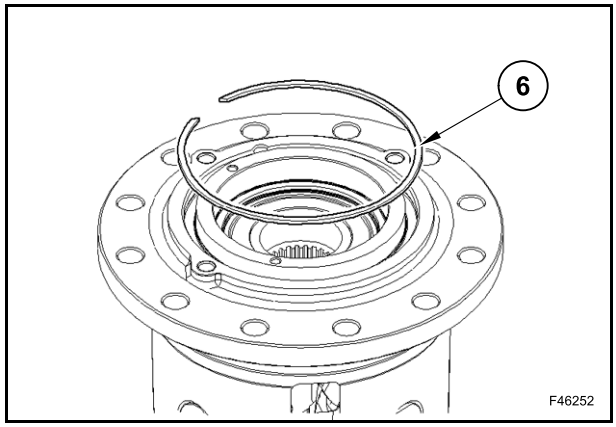
If necessary, replace the differential bearings.

Remove the bearing cups (3) and (4).

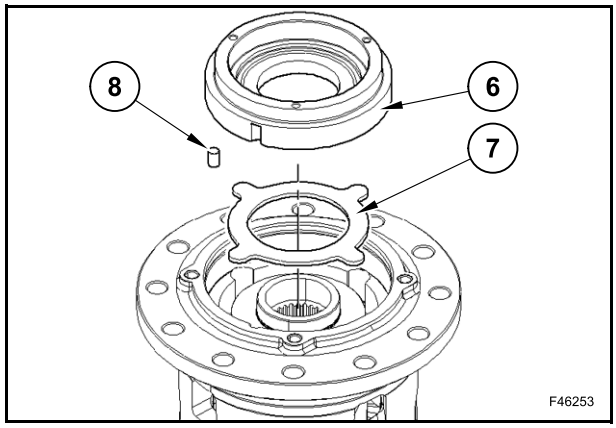
Remove the sleeve (5).



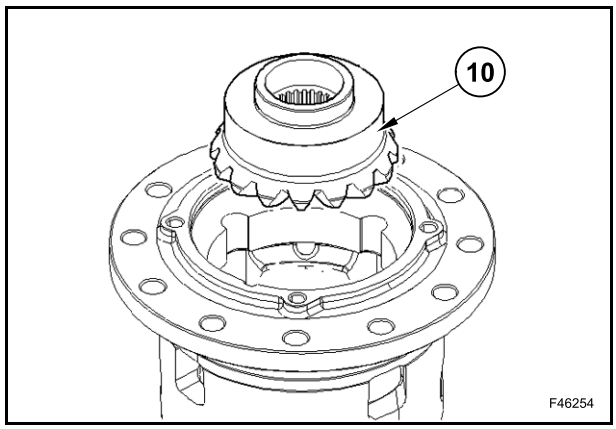
Remove the snap ring (6).



Take out the cover (7) and collect the anti-rotation pin (8) and the ring (9).



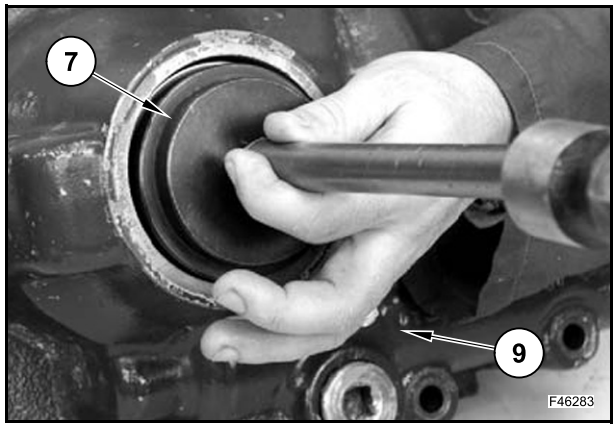
Remove the gear (10).



Assembly

Place the differential support (9) on a workbench.

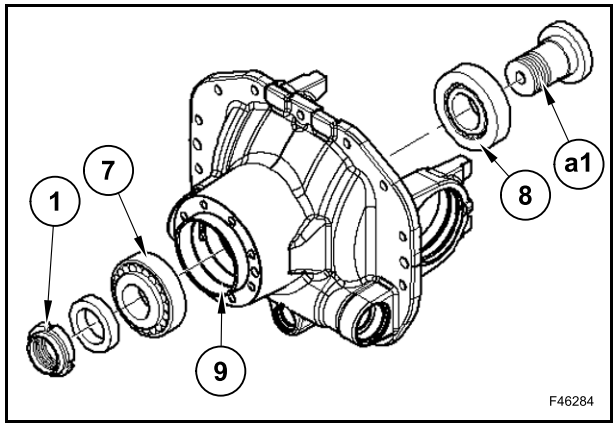
Insert the bearing cups (7) and (8) by means of the buffer 380200274 and a hammer.



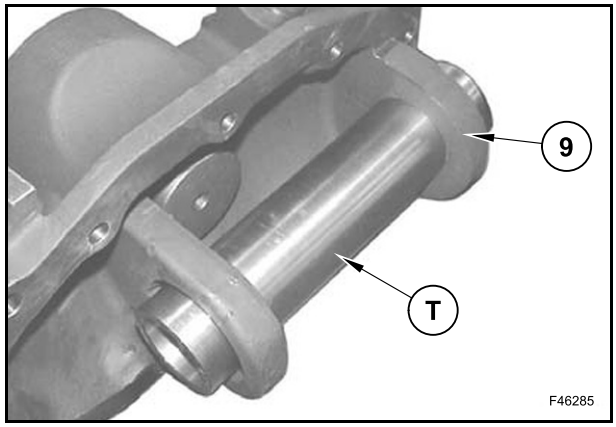
Insert the bearings (7) and (8) into the relevant seats.

Assemble the false pinion kit 380200273 (a1) and the ring nut (1).

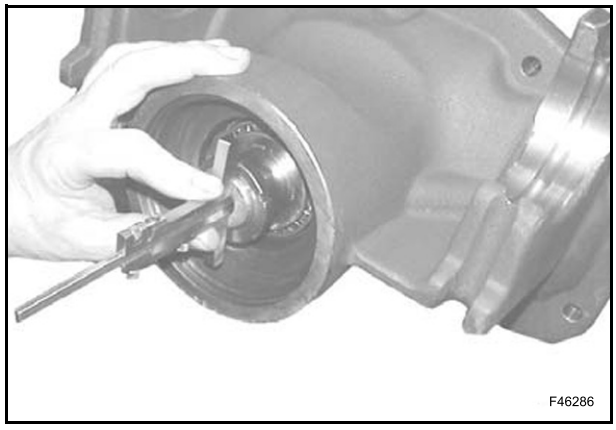
Tighten without exceeding the ring nut, until the backlash is eliminated.



Assemble tool 380200187 (T) on the differential box seats (9).



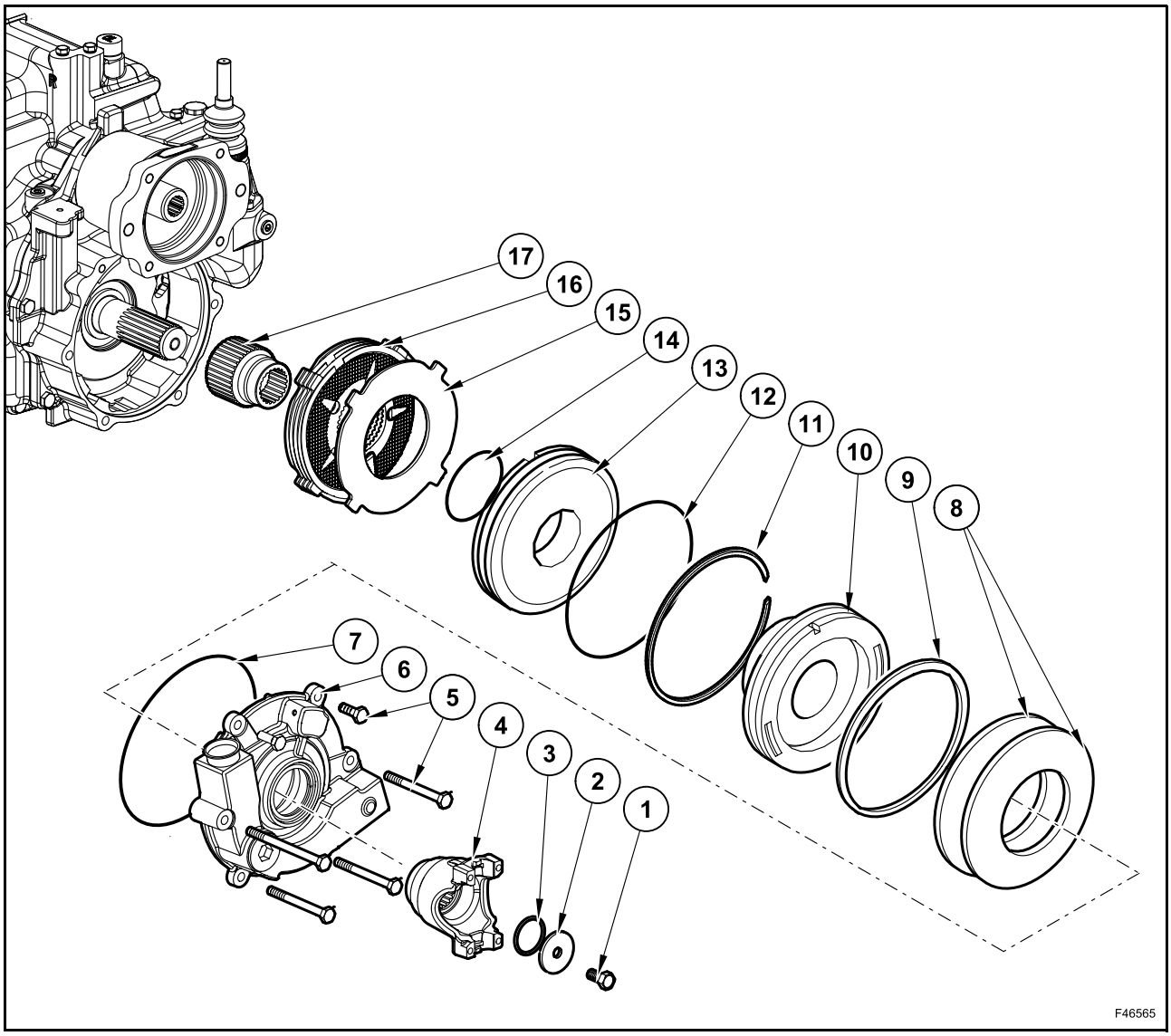
Use a depth gauge to measure dimension “X” (distance between bearing axis of differential box and leaning point of pinion head or bearing base).



FAULT	POSSIBLE CAUSE	ACTION
Noise during travel.	Excessive backlash between ring gear and pinion.	Adjust the backlash between the ring gear and the pinion.
	Pinion and ring gear worn.	Replace pinion and ring gear.
	Worn-out pinion bearings	Replace pinion bearings.
	Loose pinion bearings.	Adjust pinion bearings.
	Excessive pinion end play.	Adjust the axial play of the pinion.
	Differential bearings worn out.	Replace differential bearings.
	Loose differential bearings.	Adjust the bearings.
	Ring gear excessively off-set.	Replace the ring gear.
	Low lubricant level.	Restore the level.
	Poor or wrong lubricant grade.	Change lubricant.
	Axle beam bent.	Replace the axle beam.
Noise during idling.	Noises emitted by the axle when the vehicle is moving are usually heard during idling, even though they are not too loud.	Adjust the backlash between the ring gear and the pinion or replace pinion and ring gear.
	Wrong backlash between pinion and ring gear (the noise heard while decelerating disappears when speed is increased).	Adjust the play between the pinion and the ring gear.
	Pinion spline or input flange worn.	Replace the pinion.
Intermittent noise.	Damaged ring gear.	Replace bevel gear.
	Differential box screws loose.	Tighten the screws to torque.
Constant noise.	Ring gear teeth or pinion teeth damaged.	Replace bevel gear.
	Worn bearings.	Replace the bearings.
	Pinion splines worn.	Replace the pinion.
	Axle beam bent.	Replace the axle beam.
Noise while bending.	Differential planetary gears damaged.	Replace the planetary gears.
	Differential box and/or pins worn.	Replace the differential box.
	Worn differential thrust washers.	Replace the thrust washers.
	Worn-out axle beam splines	Replace the axle beam.

DISASSEMBLY AND ASSEMBLY

These procedures deal with the parking brake section and leave off the control lever and the relevant connection cable.

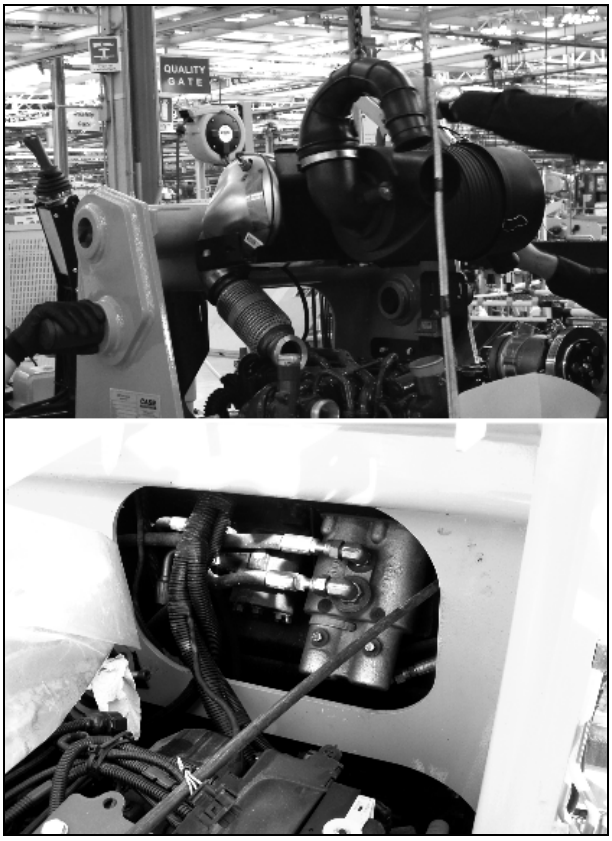


1. Screw
2. Washer
3. O-ring
4. Flange
5. Screw
6. Brake cover
7. O-ring
8. Belleville washer
9. O-ring
10. Piston
11. Snap ring
12. O-ring
13. Stop plate
14. O-ring
15. Disc
16. Brake discs
17. Hub

BRAKE PUMP - Remove

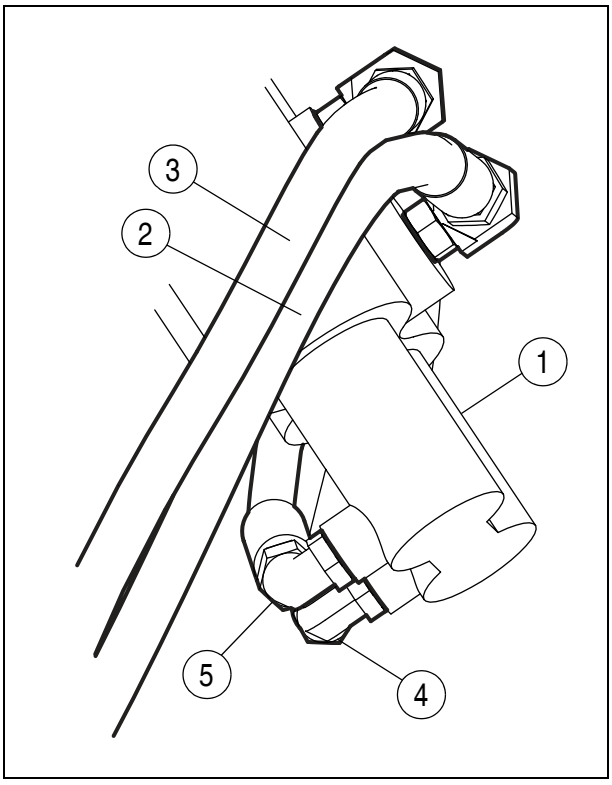
Park the machine on a level surface. Raise the loader and lock the support strut to hold the loader.

Open the engine hood and remove the DPF system from the machine following the procedure described in section 10, Engine Remove.



TBR00094

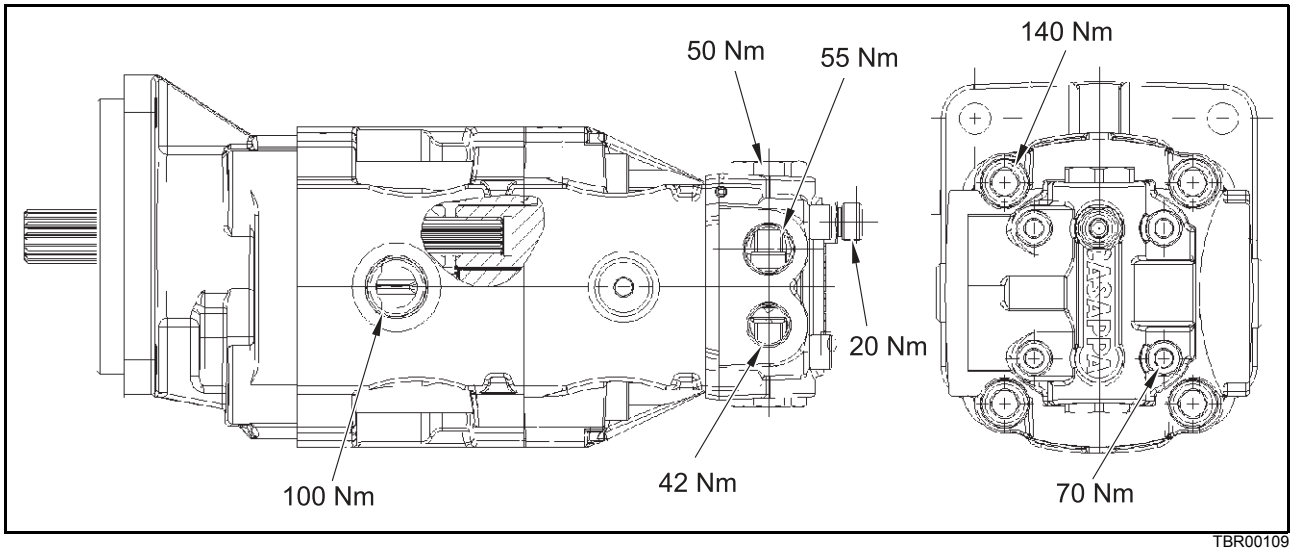
Tag and disconnect from brakes pump (1) the hydraulic hoses in (2), and (3), the hydraulic hoses brake right (4) and left (5).



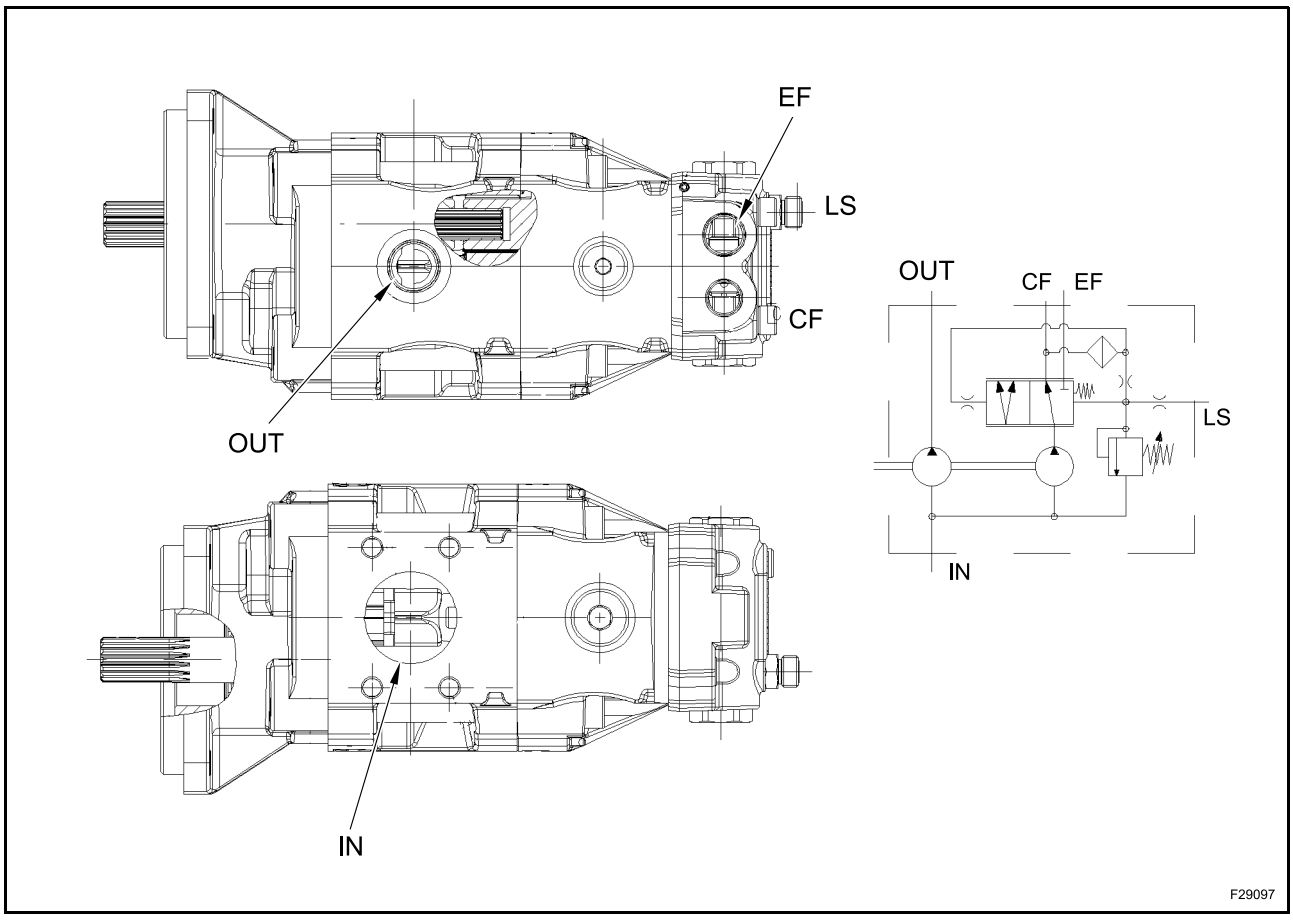
TBR00093

1. Front axle steering cylinder
2. Steering control valve
3. 4x1 bucket cylinders
3A. 4x1 bucket control valve
4. Loader bucket 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

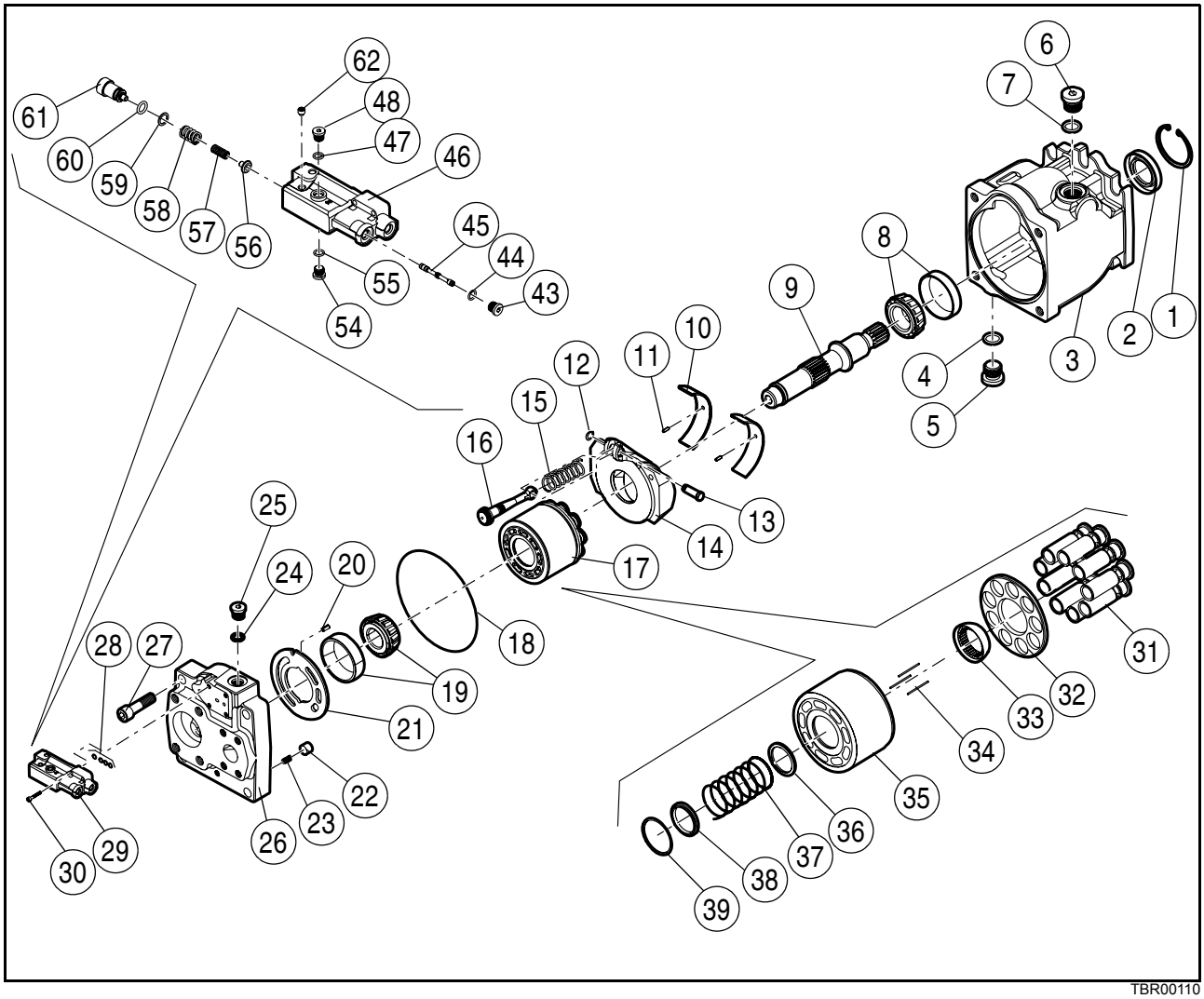
Tightening torques



Hydraulic diagram



COMPONENTS



Assembly

Coat the cradle bearings (10) with oil and install them into the pump body (3).

Insert the pins (11) a minimum of 0.5 mm (0.02 in) below the bearing surface.

If the bearings (10) are reused, reinstall them in their original position.

Install the bearing (8).

Before replacing the spring (15), coat the contact surface of the swashplate (14) with oil.

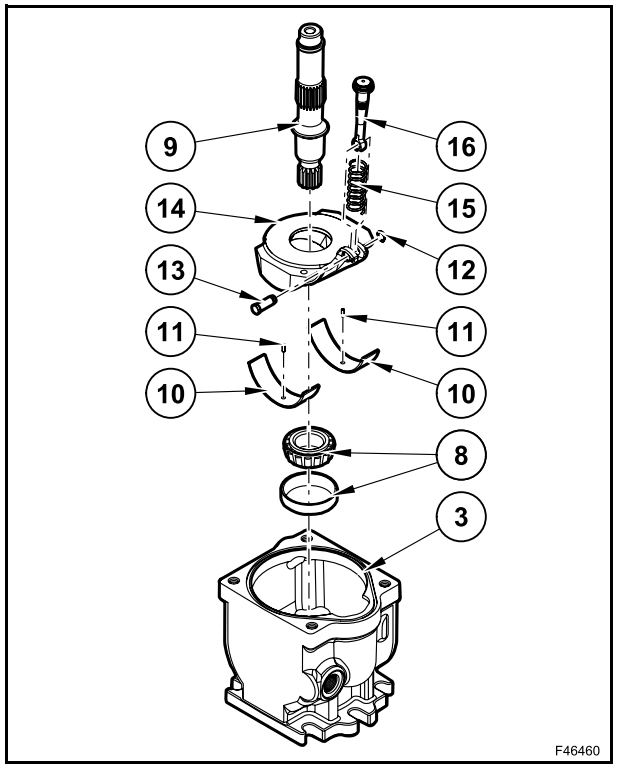
Assemble the swashplate (14), and the piston (16) and the spring (15) into the pump body (3).

Rotate the piston (16) perpendicularly to the swashplate (14) and, at the same time, compress the spring (15) to fit it into the pump body (3).

Liberally lubricate all sides of the piston (16) and its relevant bore and also the flat face of the swashplate to prevent premature wear during start-up.

Insert the shaft (9) through the bearing in the body.

Push on the piston to rotate the swashplate in order to put the shaft in properly.



Lubricate components before assembly.

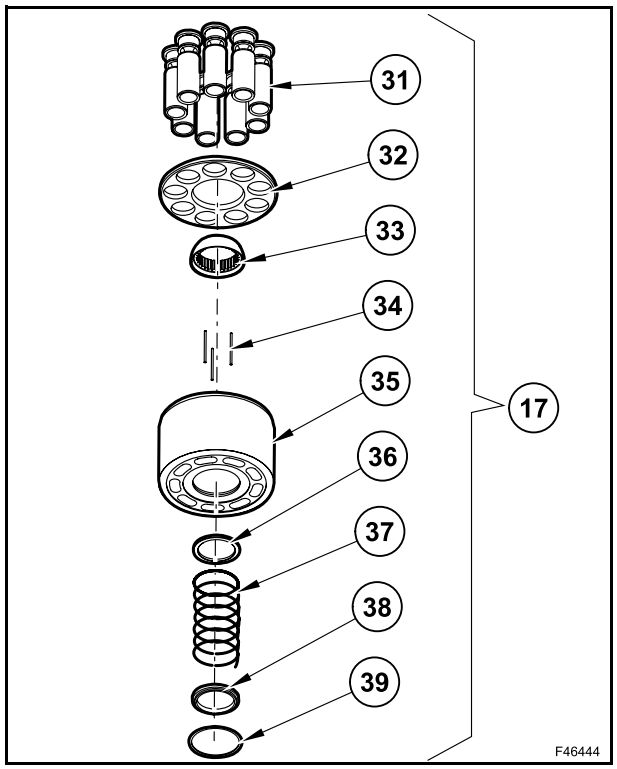
Install the inner washer (36), the spring (37) and the outer washer (38) into the cylinder (35). Compress the spring enough to insert the ring (39).

⚠ WARNING ⚠

Compressing the spring (37) requires about 350 ÷ 400 N (79 ÷ 90 lbf). Use a press sufficient to maintain this force.

Ensure that the spring is secure before attempting to assemble the ring (39).

Release the pressure slowly after the ring (39) has been installed.



Turn the cylinder over and assemble the pins (34) and the ball guide (33) into the cylinder (35).

Assemble the pistons (31) on the piston disc (32).

Install the piston/disc assy into the cylinder (35).

Ensure the concave surface of the disc seats correctly in the ball guide. If reusing the pistons, install them to the original cylinder bores.

Lubricate the pistons (31), the piston disc (32) and the ball guide (33) before assembly.

IMPORTANT: *make sure to install the piston disc (32) so that it mates correctly with the articulation (33), the concave side of the disc against the convex side of the ball guide.*

LOADER CONTROL VALVE REMOVAL FROM MACHINE

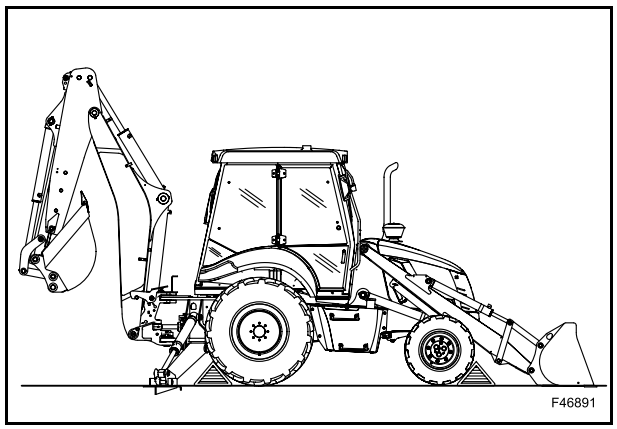
Move the machine to a level and firm ground, away from any soft ground, excavations and poorly shored cavity.

Lower the loader attachment to the ground.

Place the direction-of-travel lever and gearshift lever in neutral position.

Immobilize the machine by means of the parking brake.

Lower the stabilizers to the ground.



Stop the engine and remove the starter key.

Release the hydraulic pressure by operating the control levers in all directions.

On hydraulically controlled machines, turn the key to ON and release the pressure by moving the hydraulic control levers in all directions.

Place some wedges under the wheels so as to prevent the machine from moving.

Disconnect the electric system by disconnecting the battery master switch.

Drain oil from the hydraulic system.

Disconnect the battery.

Clean the area around the control valve.

Identify and disconnect the articulations, cables and hoses and plug the hose ends.

A drip tray will be required to catch oil draining from inside the hoses.

Loosen and remove the fastening screws.

Remove the control valve assembly from the machine.

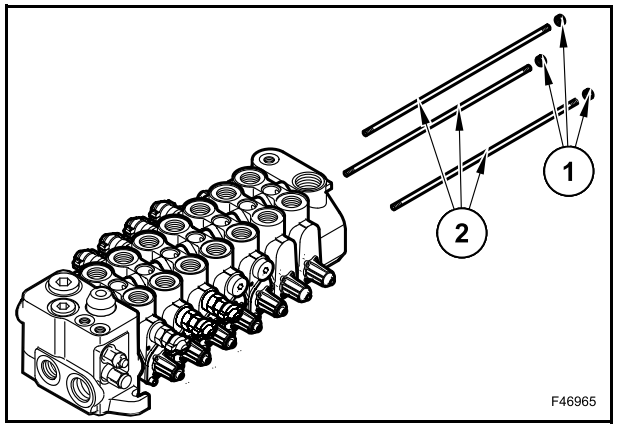
For installation, follow the removal procedure in reverse order.

DISASSEMBLY AND ASSEMBLY

Loosen and remove the 3 nuts (1).

[Tightening torque = 27.2 Nm (20.06 lbf·ft)]

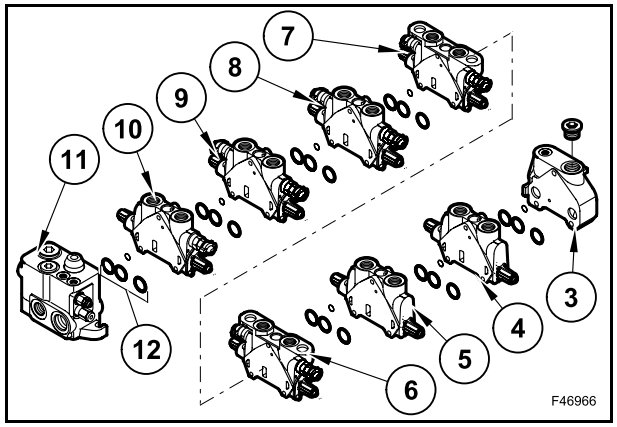
Extract the 3 tie rods (2).



Remove the end cover (3).

Disassemble the sections of the control valve (4), (5), (6), (7), (8), (9) and (10) and the inlet section (11).

Check and, if necessary, replace the O-rings (12) located between the different sections of the control valve.



Inlet section disassembly

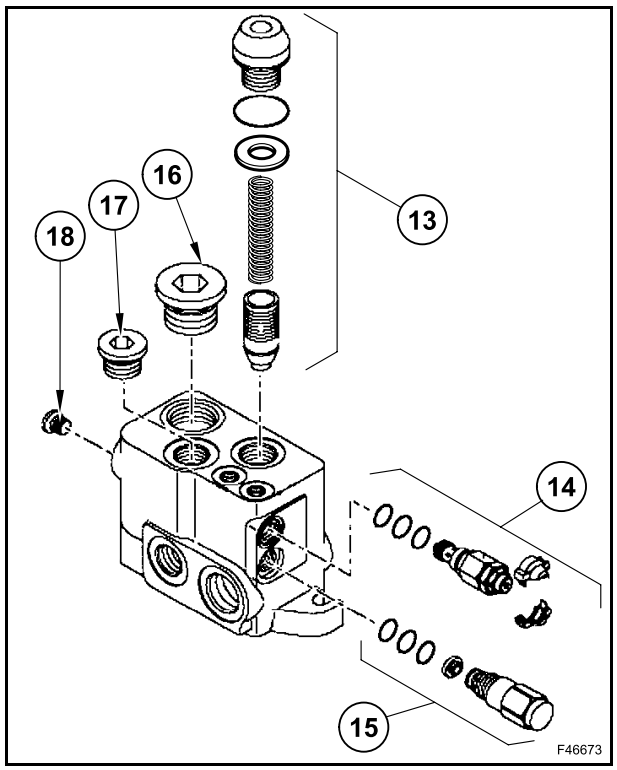
Remove the flow balancer valve (13).
[Tightening torque = 100 Nm (73.76 lbf·ft)]

Remove the load-sensing relief valve (14).
[Tightening torque = 45 Nm (33.19 lbf·ft)]

Remove the load sensing bleed valve (15).

Unscrew and remove the plugs (16) and (17).

Unscrew and remove the plug (18).
[Tightening torque = 20 Nm (15 lbf·ft)]

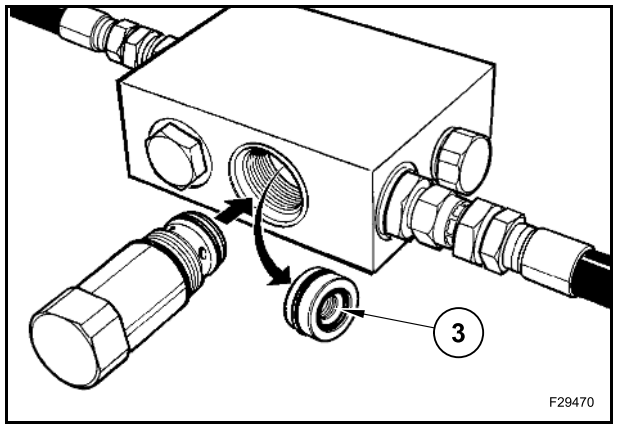


Reassemble the valve and install it on the test block.

Operate hand pump and recheck pressure.

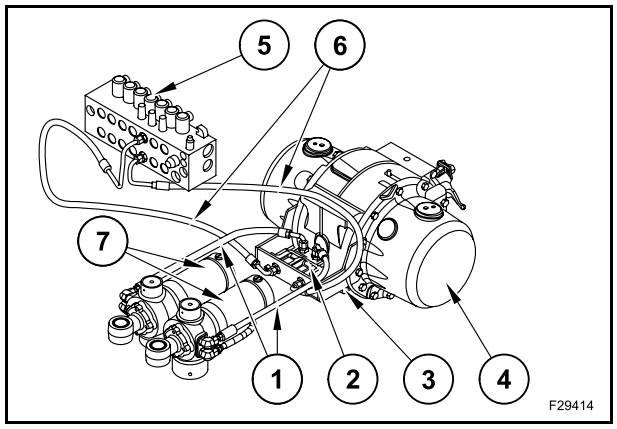
If pressure is now lower than that recorded with the insert installed it is an indication that the anti-cavitation feature of the valve is leaking and the valve requires overhaul or replacement.

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 CONTROL

Each of this assy consists of a valve (2) fitted on a bracket (3) that is on its turn installed on rear axle (4) and of some hydraulic lines (6) connecting the valves with the swing cylinders (7) and the backhoe control valve (5).



OPERATION

Backhoe swing system without precision swing control

When the backhoe is being swung from side to side and the control valve spool is returned to the neutral position, the pressure generated by the inertia of the backhoe structure will cause the cylinders to continue to stroke as oil is forced over the system relief valve. The high pressure induced by this inertia in the return system and corresponding low pressure in the supply side of the system, provides the force difference which causes the backhoe to move in the opposite direction (rebound). This condition can occur multiple times and give the appearance of loose or worn pins.

Backhoe swing system with precision swing control

The anti-rebound valve monitors conditions in the swing system as it speeds up, slows down, moves at a steady speed or is stopped. When stopped, speeding up or moving at a steady speed, the system is inactive. Neither swing speed, power or internal leakage is affected.

When the swinging boom is brought to a stop the anti-rebound valve is designed to meter oil from one side of the swing cylinder system to the other. The system is activated only when the control valve spool is in the neutral position and the cylinder return oil passes over the port relief. At that point, the return side of the system becomes the high-pressure side with the oil passing through the 100 psi check (A). This 100 psi pressure differential across the check shifts a throttling spool (B) that allows a restricted “cross over” flow between the two swing cylinders. This restricted flow allows the swing cylinders to de-accelerate to a smooth stop. When the swing has stopped the pressure differential decreases and the throttling spool closes.

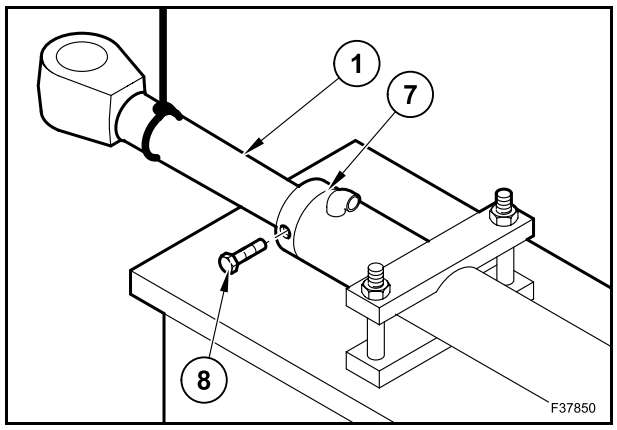
If the oil temperature in the swing system is not above approximately 80 degrees F, a thermal compensating feature prevents the spool from overcoming the spring force holding it closed. Below this actuation temperature the system performs as if the feature were not installed.

Support the cylinder rod (1).

Unscrew and remove the safety screw (8).

Use the wrench 380000725 to loose the cylinder gland (7).

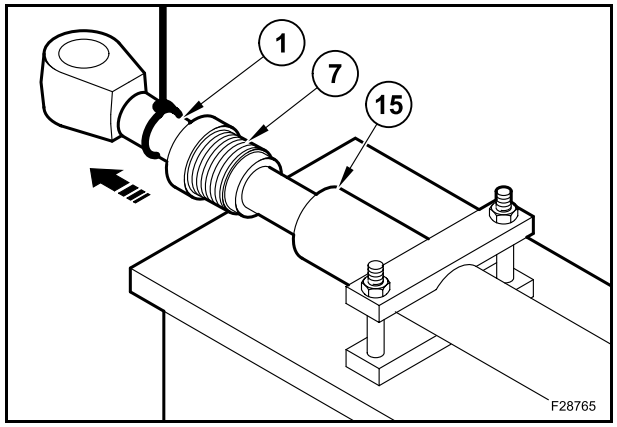
If necessary gently heat the gland carrier to soften the thread sealant applied during manufacture.



Remove the cylinder gland (7) from the cylinder barrel (15) using a plastic hammer.

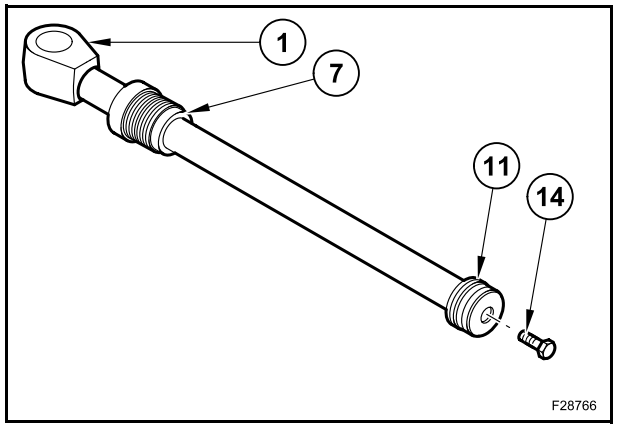
Remove the cylinder rod (1) and the cylinder gland (7).

IMPORTANT: *be sure to pull the cylinder rod (1) straight so as not to damage the sliding surfaces.*



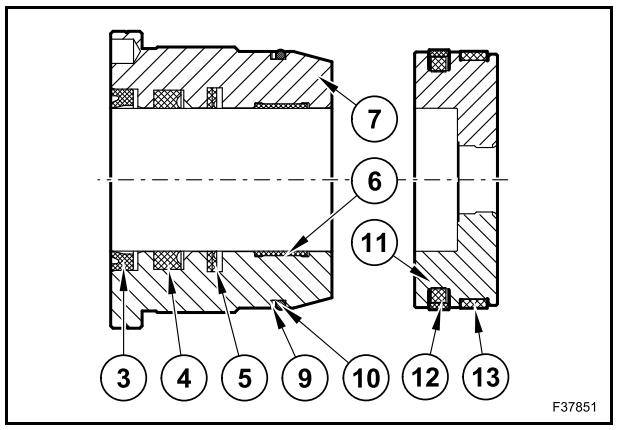
Loosen and remove the screw (14).

Extract the piston (11) and the cylinder gland (7) from the cylinder rod (1).



Only if necessary:

- remove the wiper ring (3), the seal ring (4), the ring (5), the guide bush (6) and the back-up ring (9) with the O-ring (10) from the cylinder gland (7);
- remove the piston seal (12) and the piston guide rings (13) from the piston (11).

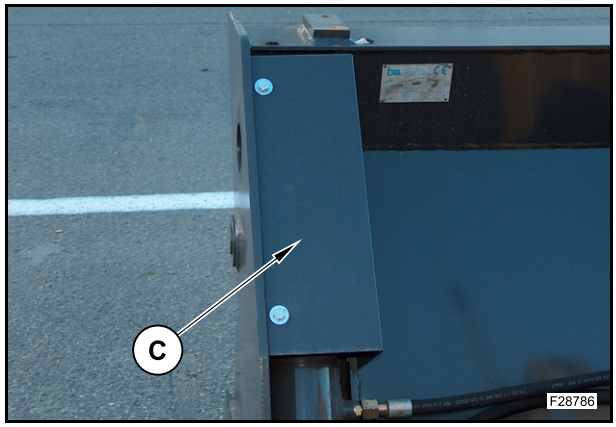


Disconnect the hoses.

Cap or plug all exposed openings.

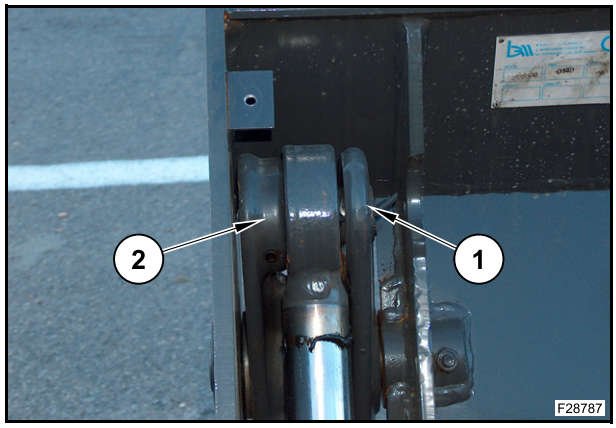
Unscrew and remove the clamping screws of the cover (C).

Remove the cover (C).



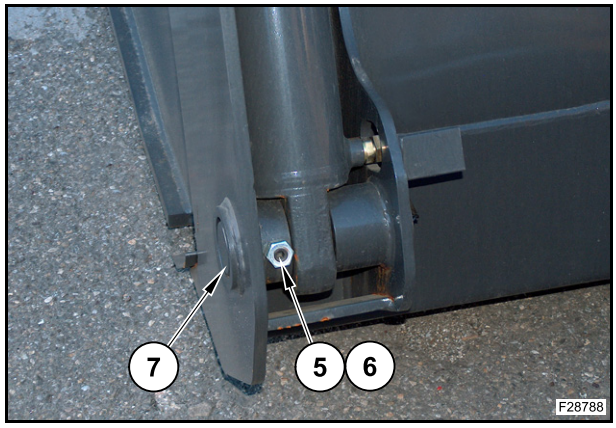
Remove the pin (2).

Slide out the rod pin (1) with an hammer.



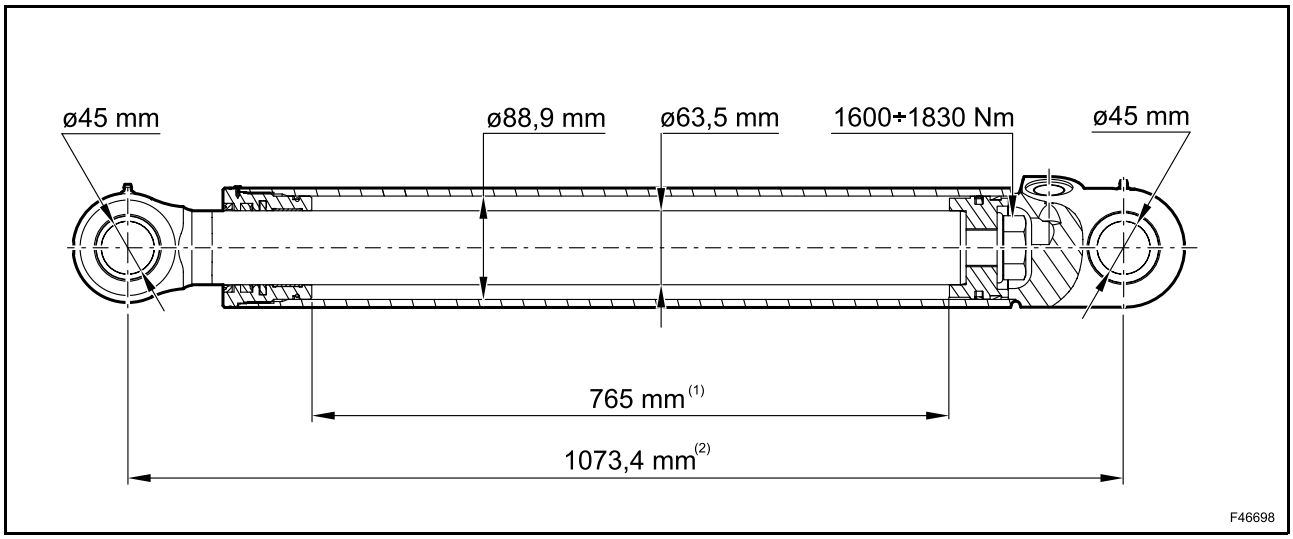
Unscrew and remove the nut (6) and the dowel (5).

Slide out the lower pin (7) with an hammer.



Remove the 4x1 bucket cylinder.

BACKHOE BUCKET CYLINDER



1. Stroke
2. Completely retracted

BACKHOE BUCKET CYLINDER REMOVAL

Move the machine to a level and firm ground.

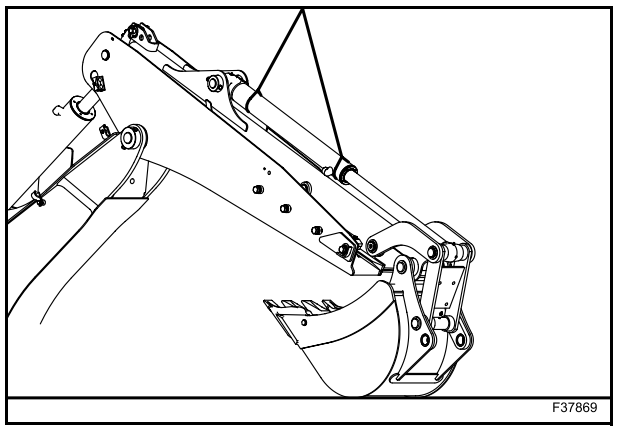
Place the bucket firmly on the ground.

⚠ WARNING ⚠

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

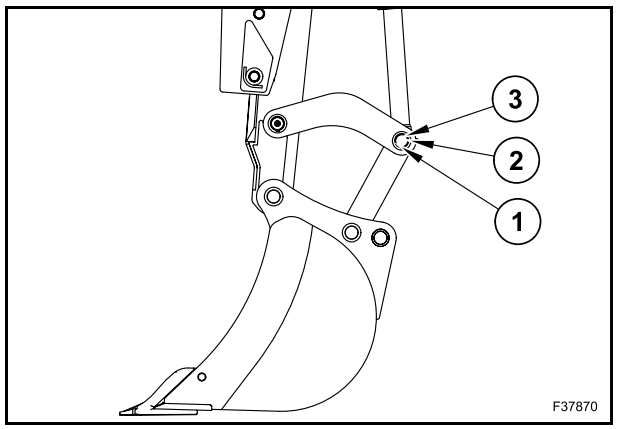
Stop the engine and move the backhoe attachment control levers through all operating positions to relieve any residual pressures in the system.

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

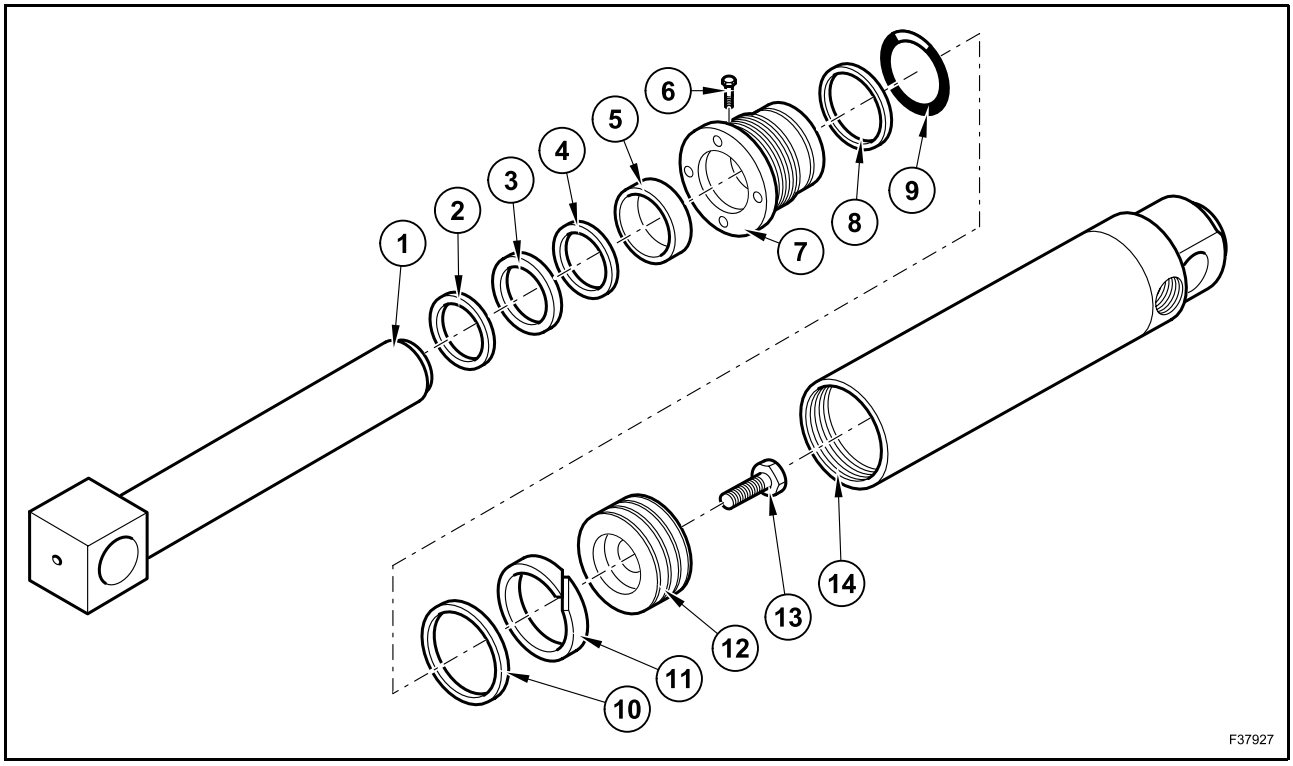


Remove the stop ring (1) and the shim (2). Slide out the pin (3) with an hammer and pay attention to levers.

If necessary use hydraulic power to very slowly retract the cylinder.



STABILIZER CYLINDER DISASSEMBLY



1. Cylinder rod
2. Wiper ring
3. Ring
4. Seal ring
5. Guide bush
6. Safety screw
7. Cylinder gland
8. Back-up ring
9. O-ring
10. Piston gasket
11. Piston guide
12. Piston
13. Screw
14. Cylinder tube

The disassembly procedure described below is based on the premise that the hydraulic hoses have already been disconnected.

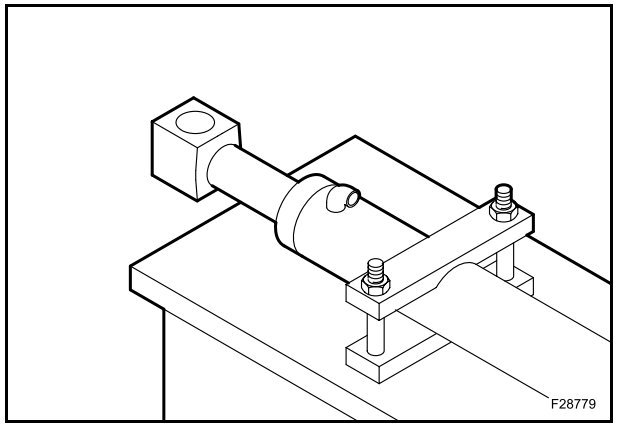
⚠ WARNING ⚠

Cylinder weight: 43 kg (94.80 lb).

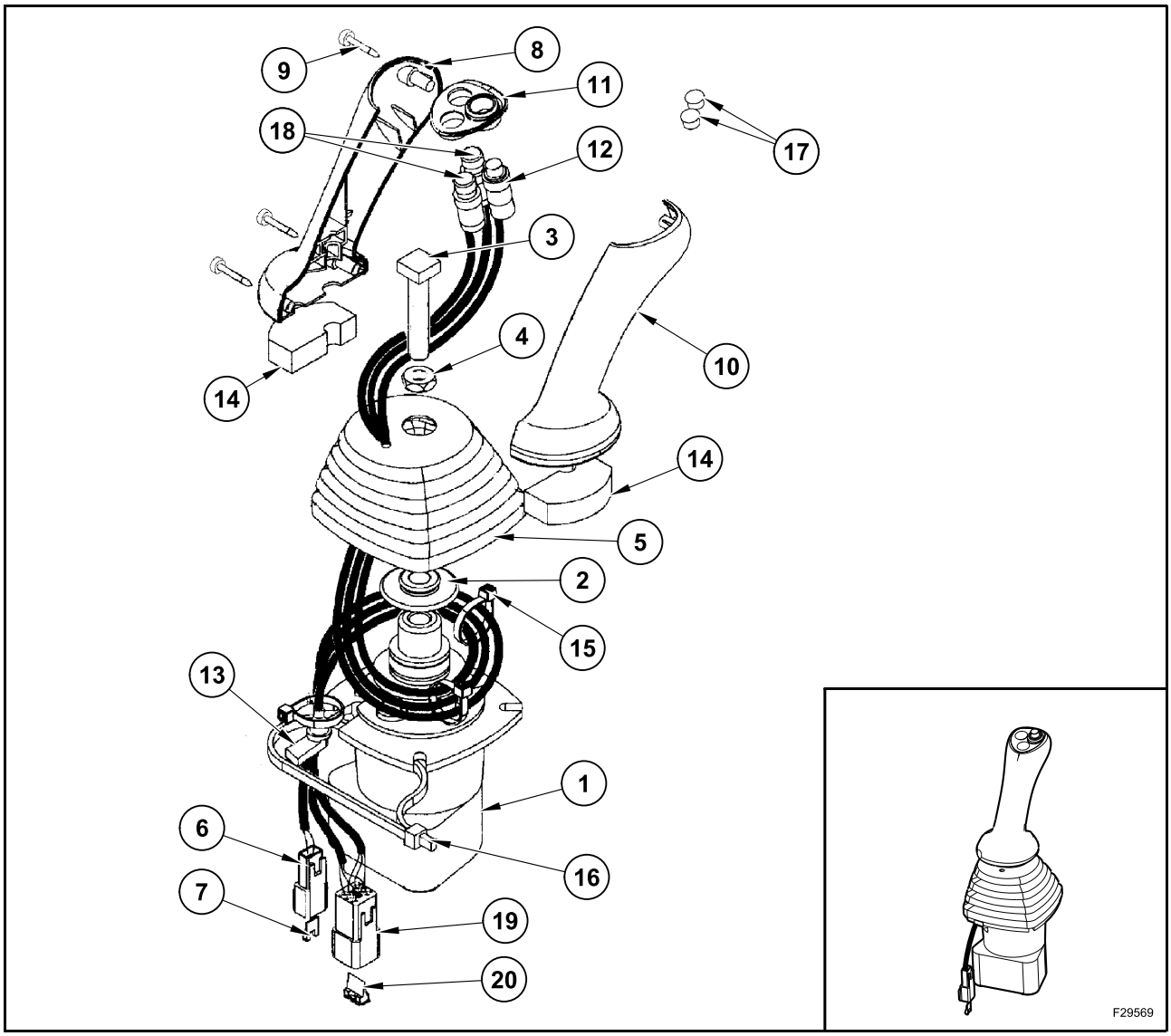
Lift and securely place the cylinder on a workbench.

Be sure that the cylinder is placed horizontally.

Drain hydraulic oil from the cylinder.



LEFT HAND CONTROL LEVER



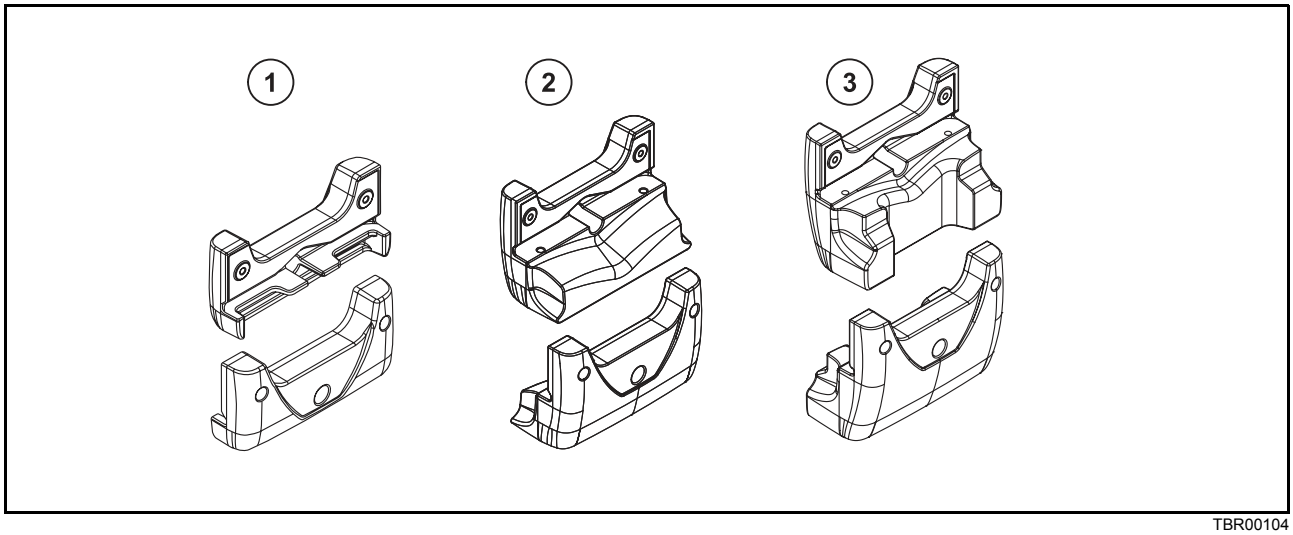
1. Valve
2. Plate
3. Screw
4. Nut
5. Boot
6. Connector
7. Wedge
8. Half handle
9. Screw
10. Half handle
11. Cover
12. Switch push button (horn)
13. Washer
14. Spacer
15. Clip
16. Clip
17. Plugs [if the switches (18) are not fitted]
18. Switch push buttons (auxiliary bidirectional)
19. Connector
20. Wedge

BACKHOE

Refer to the following backhoe fault finding chart after first considering the preceding charts. The backhoe chart should only be referred to if the supply system is performing normally, thereby confirming that the pump and hydraulic supply systems are functioning to specification. See also “Fault finding hydraulic pump”.

TROUBLE	CAUSE	ACTION
Lift fails to operate, is slow, has loss of power or is not holding.	Lift system relief valve stuck open, set too low or seat is leaking.	Pressure test lift system relief valve.
	Valve spool leakage.	Examine lift section of backhoe control valve assembly for wear and scoring.
	Piston seal leaking or cylinder barrel damaged.	Examine/reseal piston and gland.
Crowd fails to operate, is slow, has loss of power.	Crowd system relief valve (piston end) stuck open, set too low or seat is leaking.	Pressure test crowd system relief valve.
	Valve spool leakage.	Examine crowd section of backhoe control valve assembly for wear and scoring.
	Piston seal leaking or cylinder barrel damaged.	Examine/reseal piston and gland.
Bucket fails to operate, is slow, has loss of power.	Bucket system relief valve (rod end) stuck open, set too low, or seat is leaking.	Pressure test bucket system relief valve.
	Valve spool leakage.	Examine bucket section of backhoe control valve assembly for wear and scoring.
	Piston seal leaking or cylinder barrel damaged.	Examine/reseal piston and gland.
Telescopic dipper (HED) fails to operate, is slow, has loss of power or is not holding.	Refer to telescopic dipper (HED) fault finding chart.	
All backhoe systems fail to operate, are slow or have loss of power.	Regenerative check valve in control valve outlet end cover stuck open or seat is leaking.	Examine regenerative check valve.

COUNTERWEIGHT



TBR00104

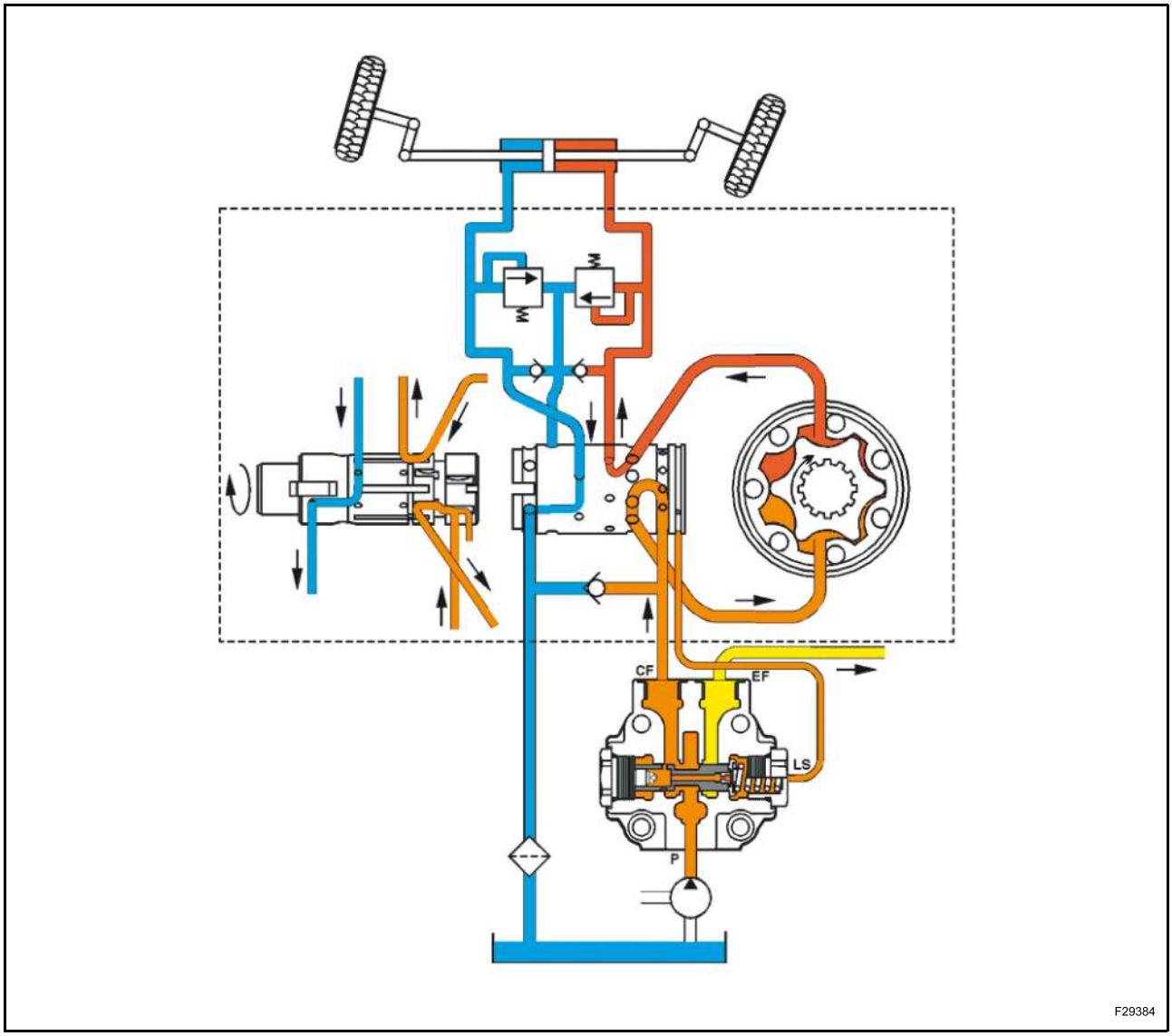
It is installed under the chassis in the front section of the machine with two screws.

There are different types of counterweights:

2WS:

1. Standard counterweight ..... 127.3 kg (281 lb)
2. Medium counterweight..... 370 kg (816 lb)
3. Big counterweight ..... 483.7 kg (1066 lb)

Power steering - Turning right



Pump pressure

Metered pressure

Trapped oil

Return to oil tank

When the steering wheel is turned, the movement of the power steering spool forms a series of passages.

During right turn, oil flows through the spool along a groove and into a passage in the housing which leads to the metering unit. A gallery is also lined up to allow pressure oil to flow down the sensing line to the priority flow divider.

As the metering unit is turned by the drive shaft, it directs a measured quantity of oil along another set of passages in the spool then from these to the steering cylinder.

Return oil from the other side of the cylinder is directed through the spool to a return passage in the housing.

ASSEMBLY

Check all mating surfaces.

If any parts have scratches or burrs, the power steering must be replaced.

The use of parts with scratches or burrs can cause leakage and is therefore not recommended.

Clean all metal parts in clean solvent.

Blow dry with air.

Do not wipe dry with cloth or paper towel because lint or other matter can get into the hydraulic system and cause damage.

Do not use grit paper or file or grind these parts.

Lubricate all seals, replace all old seals with new seals and do not use an excessive quantity of lubricant on the seals of the rotor / stator gear.

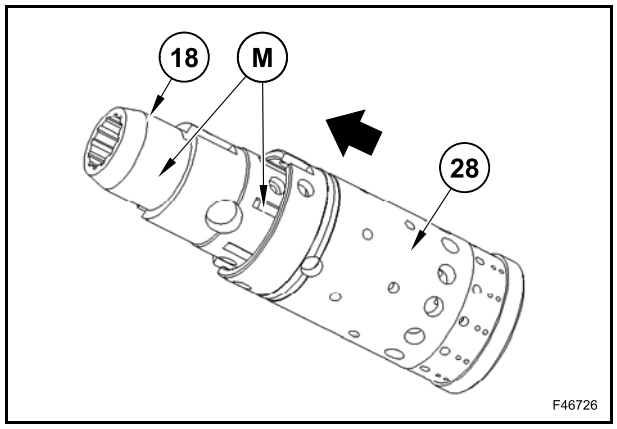
Carefully assemble the spool (18) and the sleeve (28) so that spring slots line up correctly. Rotate spool while sliding parts together.

M = marks

Test for free rotation.

The spool should rotate smoothly in the sleeve with finger tip force applied to its end.

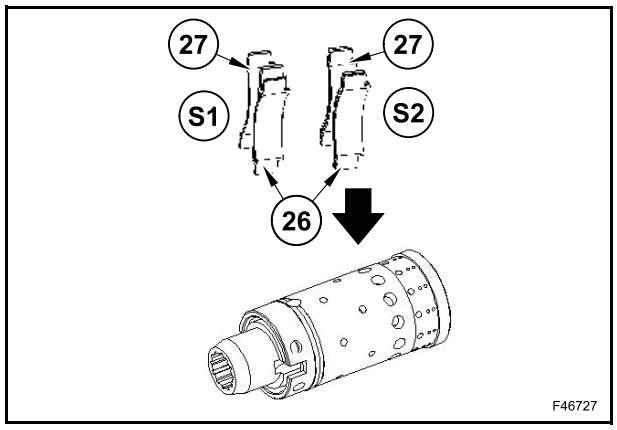
Align the spool and the sleeve making reference to the relevant marks (M).



The centering springs (26) for power steering with low input torque (S1) have four arched springs with two flat spacers (27) in the center.

The centering springs (26) for power steering with standard input torque (S2) have six arched springs.

Position centering springs so that the notches line up, and arched center sections are nested together. Next, with spring notches facing sleeve, insert one end of entire spring set into spring installation tool.



OPERATION

CAB AIR FILTER

Before servicing the air filter situated under the operator's seat, switch off the blower and close all windows and one door.

Forcibly close the other door.

The resulting back pressure will dislodge loose dirt from the underside of the filters.

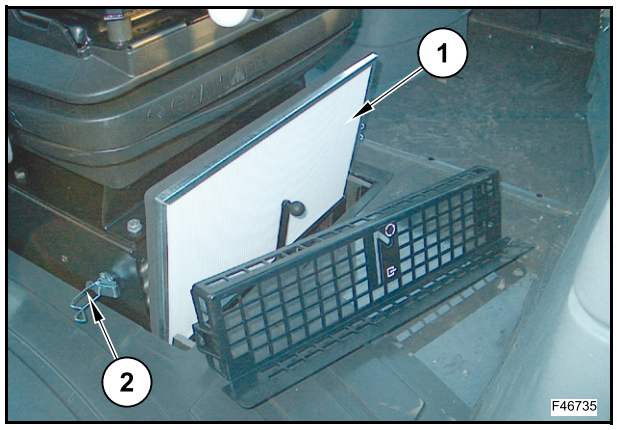
To remove the filter (1), release the retaining straps (2) and remove the filter element.

Ensure the element, and sealing faces are not damaged on removal.

IMPORTANT: *in humid conditions, such as occur on most early mornings, do not switch on the blower prior to servicing the filters. Damp particles drawn into the filter may solidify and prove difficult to remove without washing.*

The filter element is made of specially treated paper with a sealing strip bonded to the outer face.

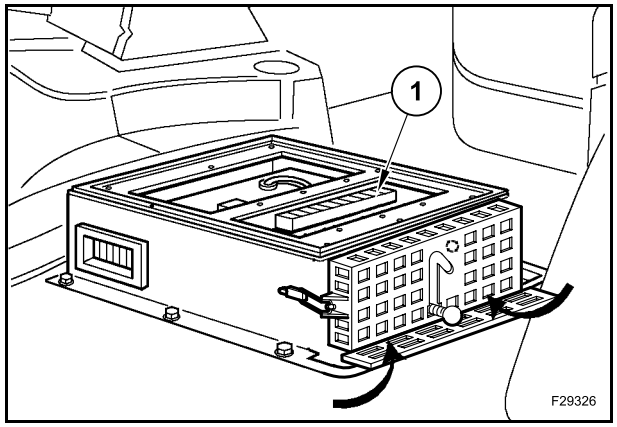
Clean this element by blowing with compressed air from the clean side through to the dirty side. The compressed air should not exceed 2 bar (29 psi) and the air line nozzle should be at least 300 mm (11.8 in) from the element.



HEATER RADIATOR

The heater radiator (1) is fitted in a housing under the cab seat to guarantee a uniform distribution of warm or cold air flow.

IMPORTANT: *to ensure a good flow of air through the heater radiator the filter should be cleaned more frequently when operating in extremely dusty conditions.*



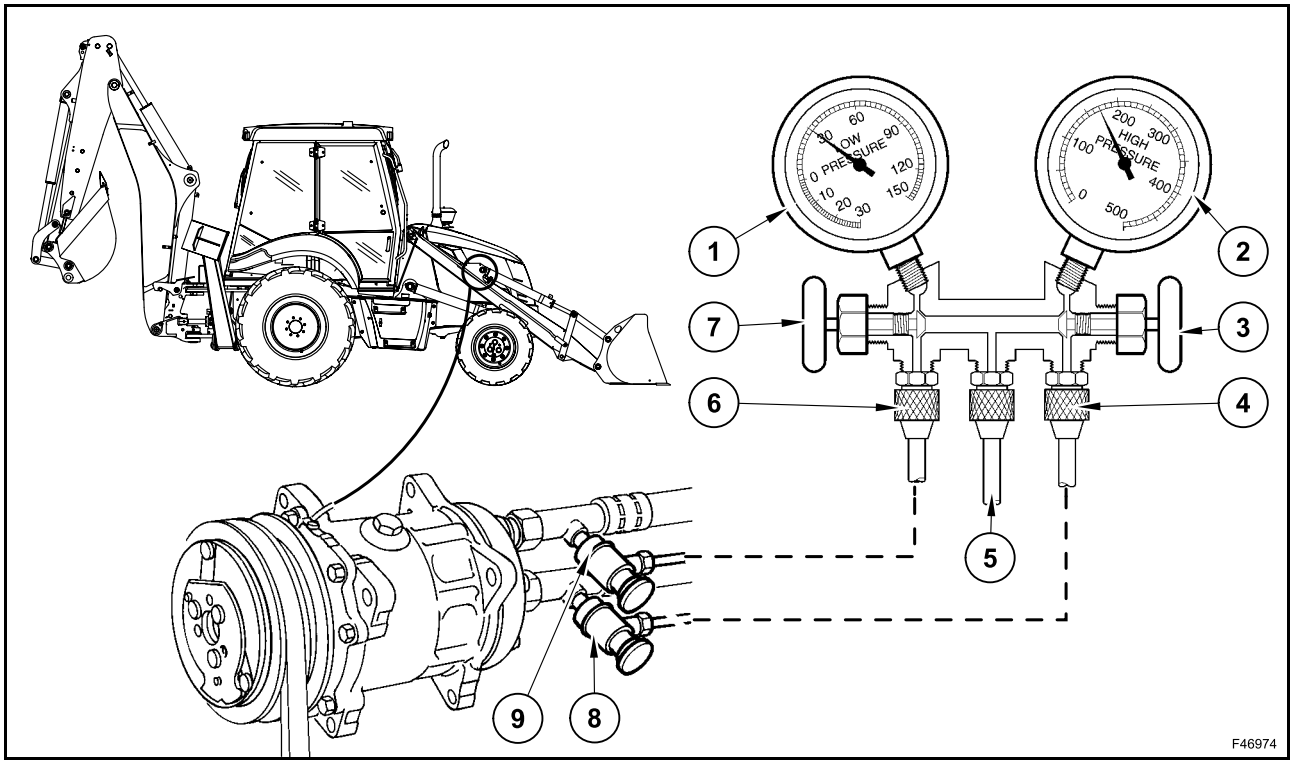
By giving off heat to the outside air, the vapour is condensed to a liquid which moves under high pressure to the receiver dryer where it is stored until released to the evaporator by the temperature sensing expansion valve.

As liquid coolant passes through the metered orifice in the expansion valve the coolant changes from a high pressure liquid to a low pressure atomized liquid with a lower temperature.

This low pressure, low temperature, atomized liquid enters the evaporator coils and absorbs heat from the cab warm air blown across the coils and fins by the cab blower motor.

The coolant now changes from a cold low pressure atomized liquid to a warm low pressure vapour and leaves the evaporator outlet, moving to the suction (low pressure) side of the compressor to repeat the cycle.

As this heat loss is taking place, moisture (humidity) in the cab air will condense on the outside of the evaporator and drain off as water through the drain hoses attached to the evaporator drain pan, thereby reducing the humidity level of the cab.



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.

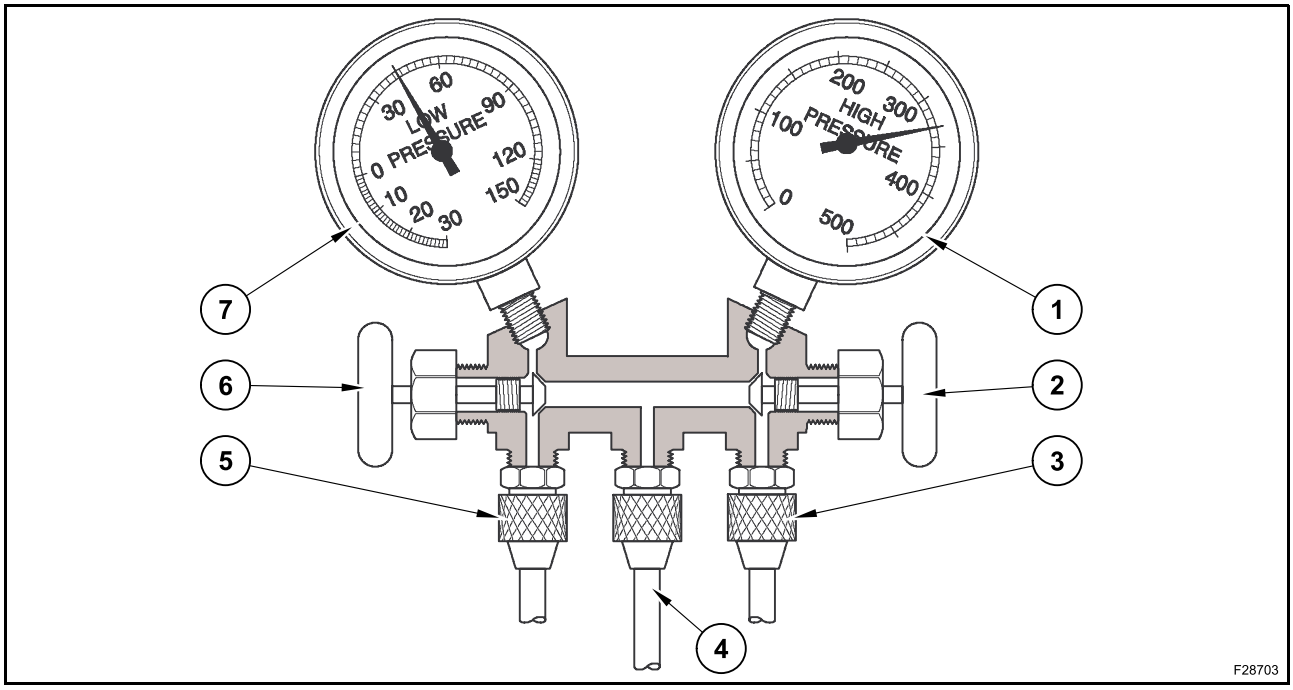
When using this type of equipment **always** consult the manufacturers operating instructions.

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 6



1. High side normal
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 normal

Problem

Little or no cooling.

Cause

Large amount of air in system.

Conditions*

Low side pressure too high. The gauge should read 1 ÷ 2 bar (14.5 ÷ 29 psi).

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

Evaporator air not cold.

Corrective procedures

Discharge and recover the coolant from the system.

Replace receiver/drier.

Drain the system.

Charge the system.

Performance test the system.

Diagnostic

Air in the system. Air and humidity contained in it contaminate the system: therefore, it will operate incorrectly.

***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.

CHARGING THE SYSTEM

IMPORTANT: *make sure that there are no leaks in the system and that the system has been fully drained. Observe all safety recommendations when handling coolant HFC 134a, see "Precautions when Handling coolant HFC 134a" in this Section.*
Ensure the charging unit is correctly connected to the loader backhoe air conditioning system in accordance with the manufacturers instructions.

If a charging unit, in conjunction with the manifold gauge set is used, open the high and low side hand valves on the manifold.

Charge the system with 1.35 kg (2.97 lb) of coolant as per the manufacturers instructions.

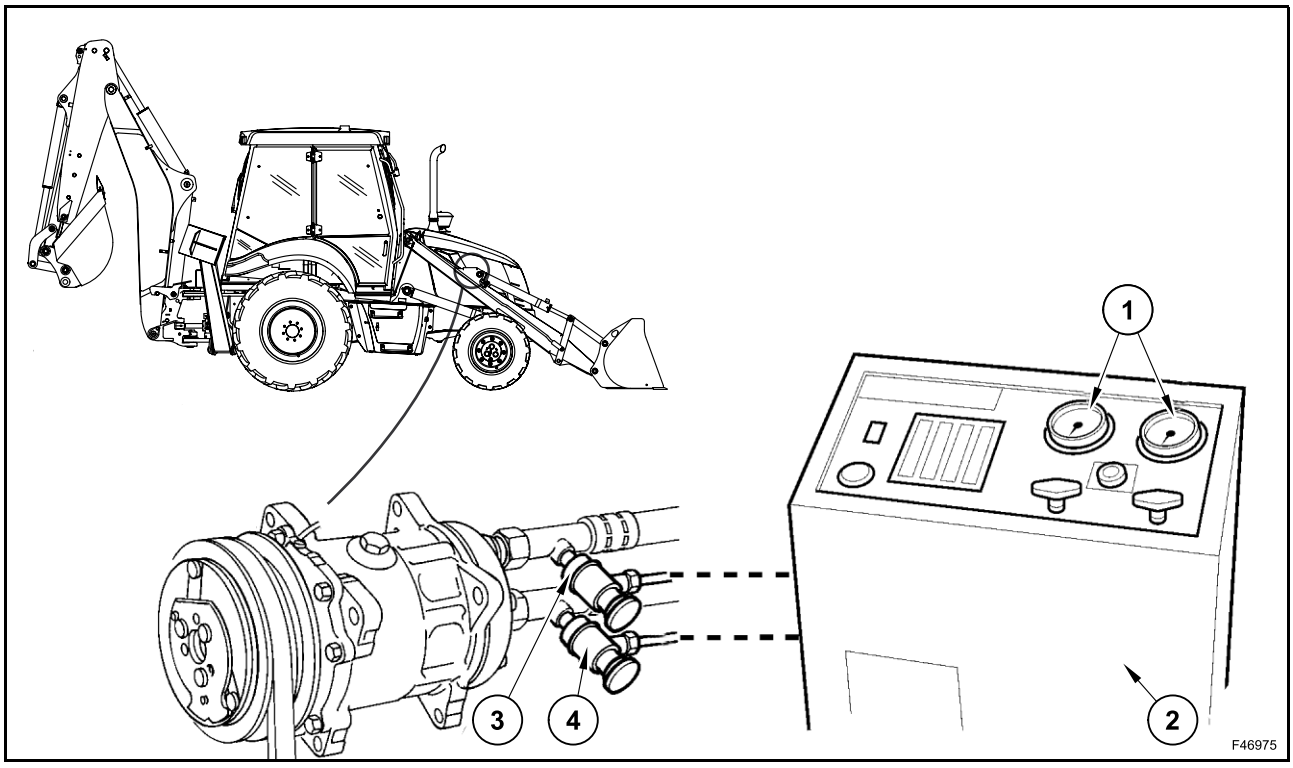
If the charging rate becomes very slow **close the high side valve carefully,** start the loader backhoe and set engine speed to idle. Turn ON the air conditioning so that the compressor can pull the remainder of the coolant into the system.

If the coolant charge will not completely transfer to the air conditioning system, recover and recharge the system.

Close the high and low side valves on the unit control panel, or on the gauge assy if being used, and test the air conditioning as described in the paragraph relevant to the performance test of the air conditioning system.

NOTE: *after charging a system use the following start up procedure to ensure the lubricating oil is properly dispersed around the system.*

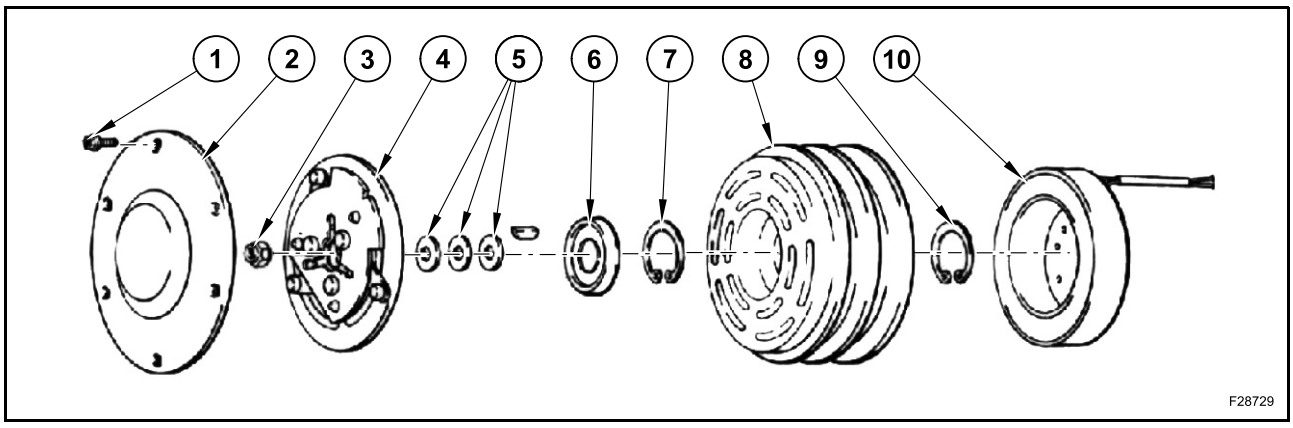
- Ensure air conditioning is switched OFF.
- Start the engine and bring speed down to idle.
- Turn the air conditioning ON and allow system to operate for at least one minute before increasing engine speed.



1. Built in manifold gauge set
2. Recovery/recharging unit
3. Low side (suction) service valve (blue hose)
4. High side (discharge) service valve (red hose)

DISASSEMBLY AND ASSEMBLY

CLUTCH



1. Screw
2. Dust cover
3. Nut
4. Plate
5. Shims
6. Cover
7. Snap ring
8. Rotor
9. Snap ring
10. Coil

Disassembly

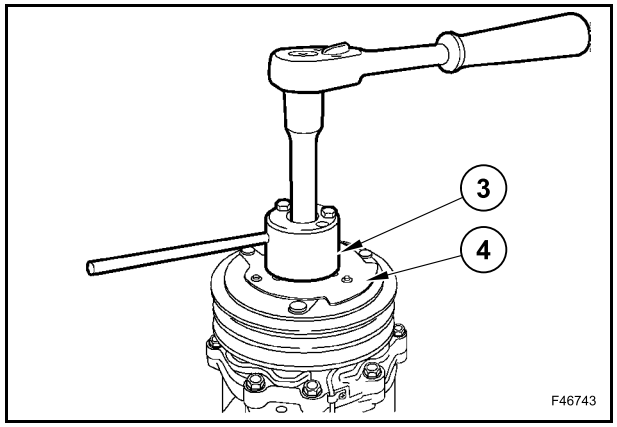
All clutch servicing should be done with the compressor removed from the vehicle. Support the compressor. If using a vice, do not hold on to the housing.

If a dust cover (2) is present, remove the 3 or 6 screws (1) holding it in place and remove the cover.

If auxiliary sheet metal pulley is present, remove the screws holding it in place.

Then remove pulley.

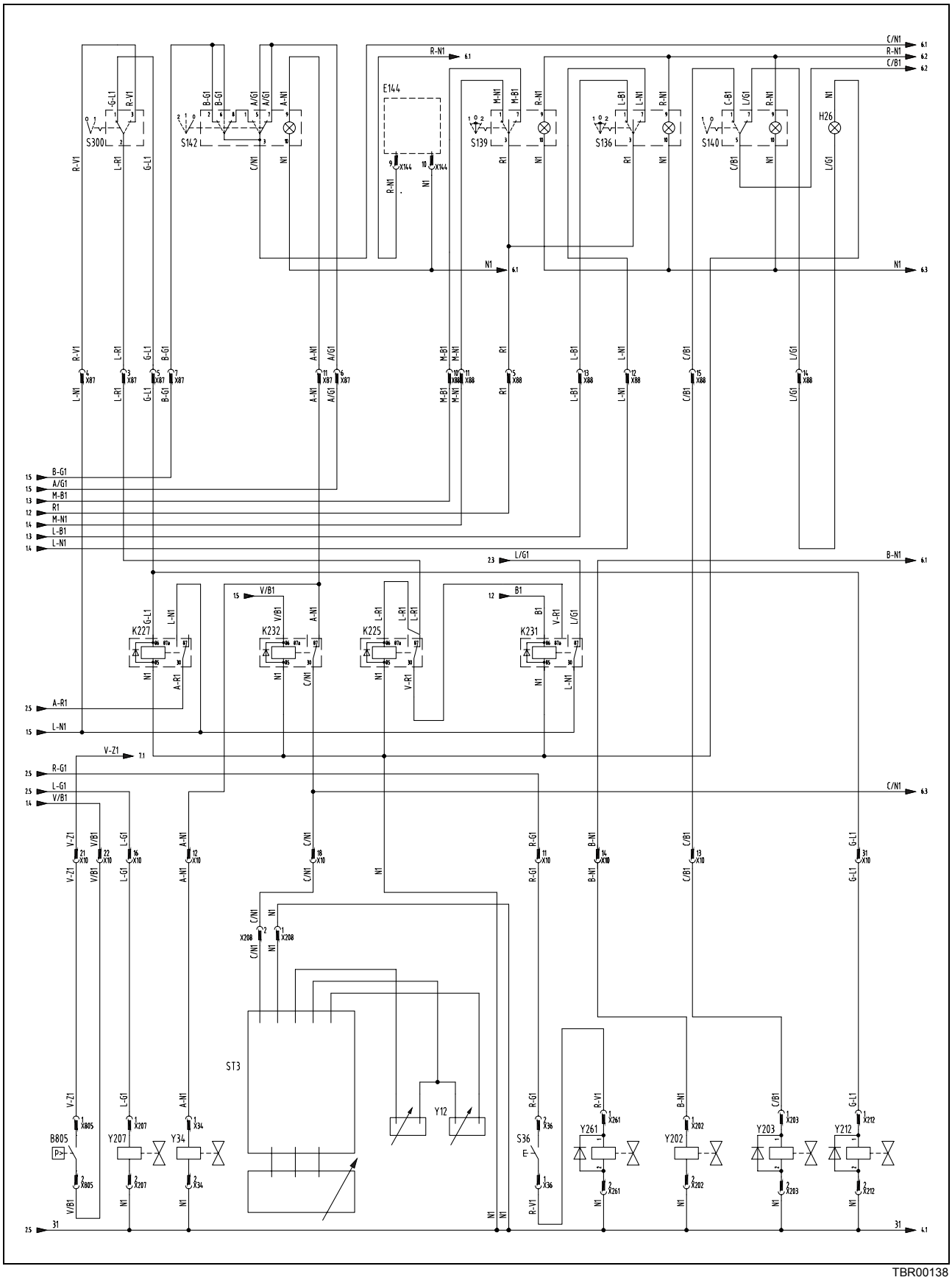
Attach the tool to the cover in front of the clutch disc and remove the nut (3) using a wrench.



NOTES:

SOLENOID VALVE LINE DIAGRAM

(table 2)



TBR00138

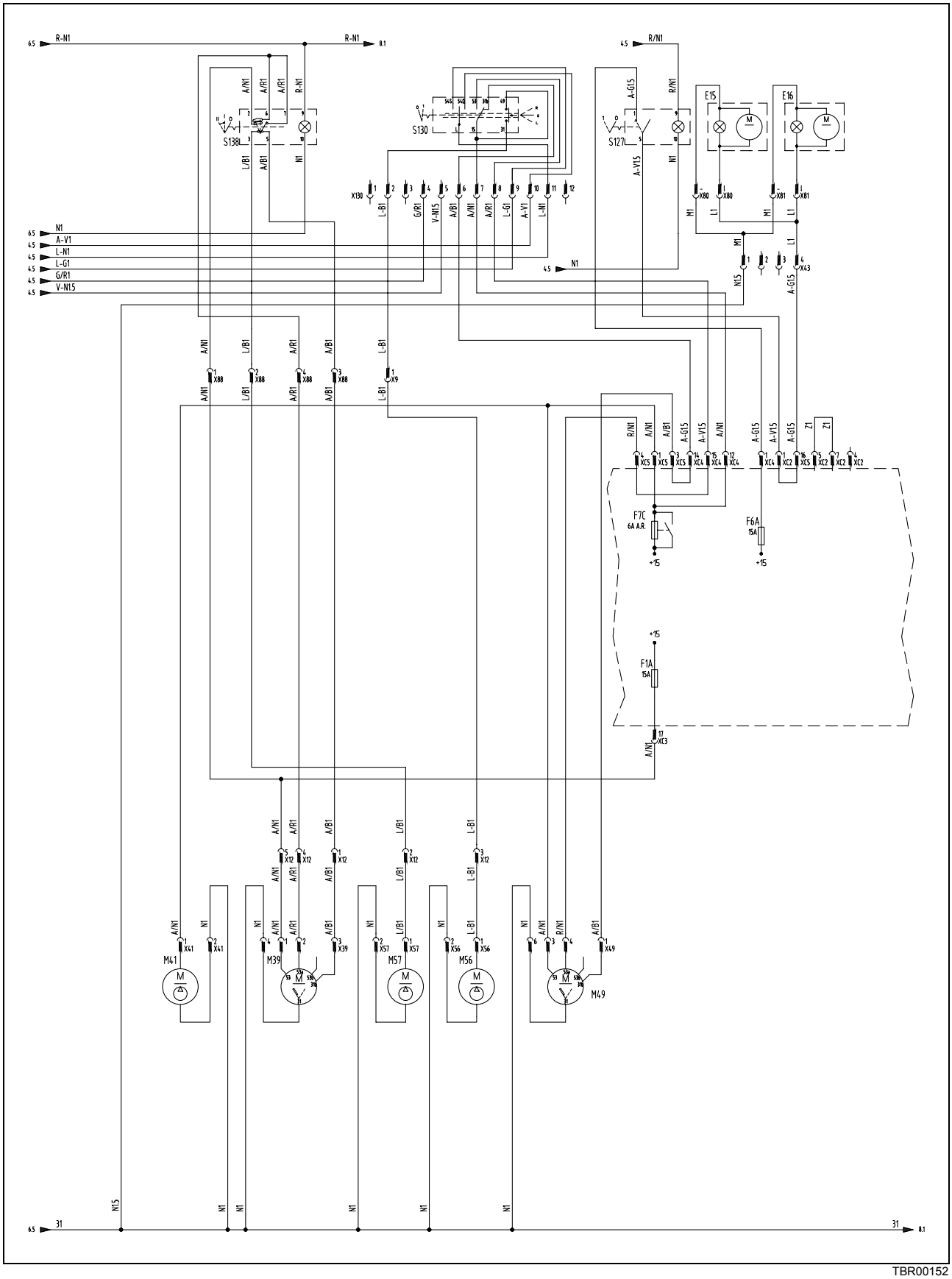
NAME	DESCRIPTION
K464	Main relay
M1	Starter motor
M39	Rear windshield wiper-washer pump motor
M41	Blower motor (optional)
M49	Front windshield wiper-washer motor
M56	Front windshield wiper-washer pump
M57	Rear windshield wiper-washer pump
M473	A/C clutch
P1	Side instrument cluster panel
P125	Front instrument panel
S15	Start switch
S36	Rear hammer button (optional)
S120	Warning switch
S122	4WD switch
S123	Hand hammer switch
S126	Lights switch
S127	Rotating beacon switch
S130	Light-windshield wiper control lever
S132	Gearshift lever
S135	Rear travel lock switch (optional)
S136	Menu scroll switch
S137	Rear work light switch
S138	Rear pump switch
S139	Display enter switch
S140	Backhoe attachment travel lock switch (optional)
S141	Front work light switch
S142	Ride control switch (optional)
S204	Rear horn button
S205	Clutch disconnect button
S222	Differential lock switch
S260	Clutch disconnect button
S300	Parking brake switch
SB1	Battery master switch
ST3	4x1 bucket control lever
X55	12 V socket
Y6	Forward travel solenoid valve
Y8	4WD solenoid

NAME	DESCRIPTION
Y12	Proportional solenoid valves
Y34	Ride control solenoid valve
Y35	Hand hammer solenoid valve
Y74	Differential lock solenoid valve
Y200	Reverse travel solenoid valve
Y202	Backhoe attachment travel solenoid valve
Y203	Backhoe attachment travel lock solenoid valve
Y206	Bucket level solenoid valve
Y207	Delivery doubling solenoid valve
Y212	Parking brake solenoid valve
Y261	Hand hammer solenoid valve

CONNECTORS

NAME	DESCRIPTION
X1	General line - engine line interface connector
X5	Fuel level sensor connector
X6	Forward travel solenoid valve connector
X7	Reverse travel alarm connector
X8	4WD solenoid valve connector
X9	General line - front line interface connector
X10	General line - solenoid valve line interface connector
X12	General line - cab interface connector
X14	Antitheft connector
X15.1	Start switch connector
X15.2	Start switch connector
X17	Seat connector (optional)
X18	Cabin light connector
X21	Diagnostic connector
X24	Accelerator knob connector
X25	Foot accelerator connector
X26	Loader attachment sensor connector
X27	Number plate light connector
X28	Rear left light connector
X29	Rear right light connector
X31	Diagnostic fuse connector
X32	Optional buzzer connector

WINDSHIELD WIPER AND WASHER LINE DIAGRAM

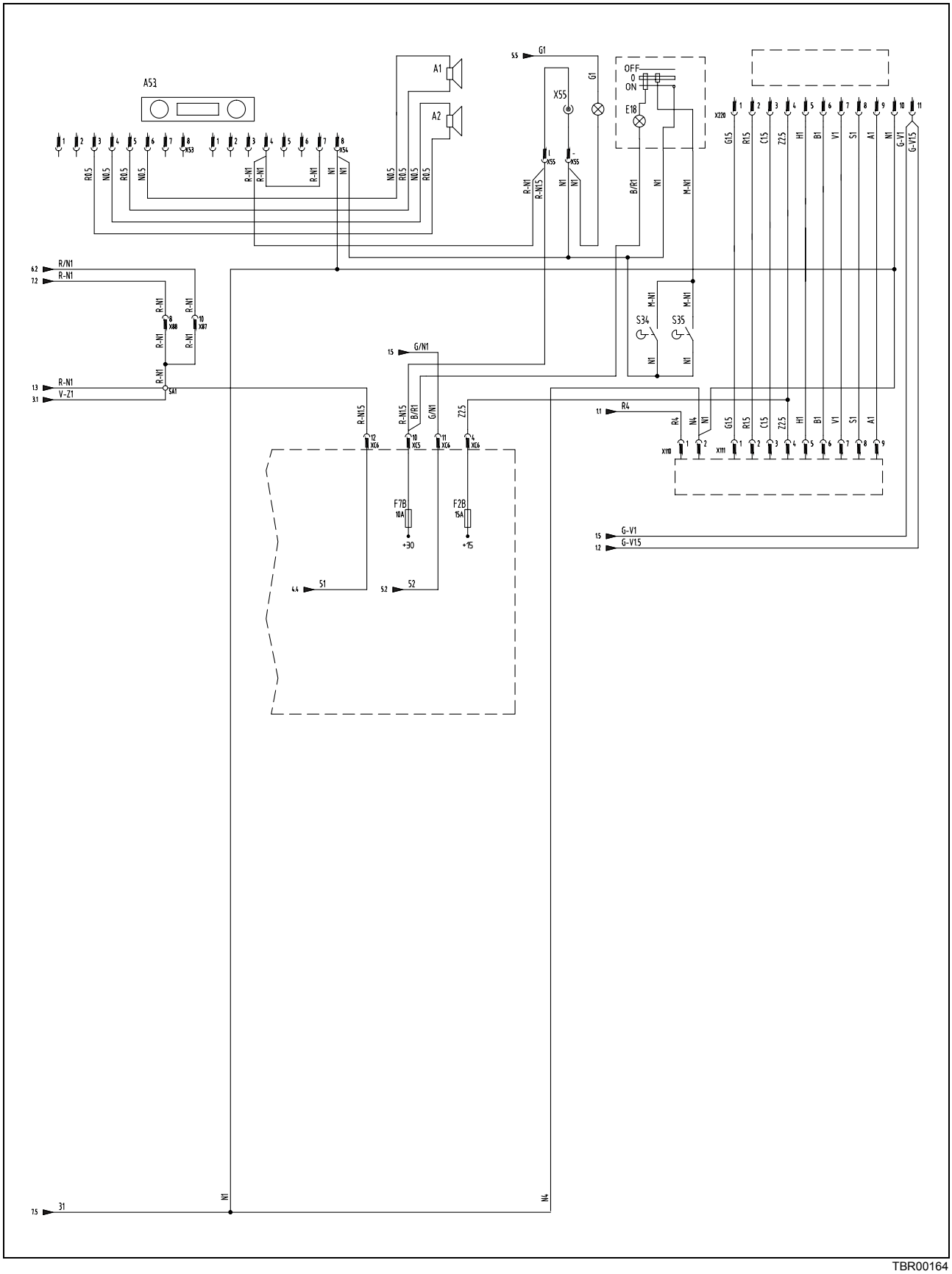


TBR00152

NAME	DESCRIPTION
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
X108	“Carraro” line transmission temperature sensor connector
X109	“Carraro” line pressure switch connector
X110	Air conditioning 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
X130	Light / windshield wiper control lever connector
X133	Front instrument panel line - right light line interface connector
X201	Manual accelerator knob connector
X202	Backhoe attachment travel connector
X203	Backhoe attachment lock connector
X204	Horn button connector
X205	Transmission disconnect connector and horn button
X206	Bucket levelling connector
X207	Delivery doubling connector
X208	Quick coupler connector
X211	Parking brake pressure switch connector
X212	Parking brake solenoid valve connector
X220	Air conditioning connector
X301	Differential lock button connector

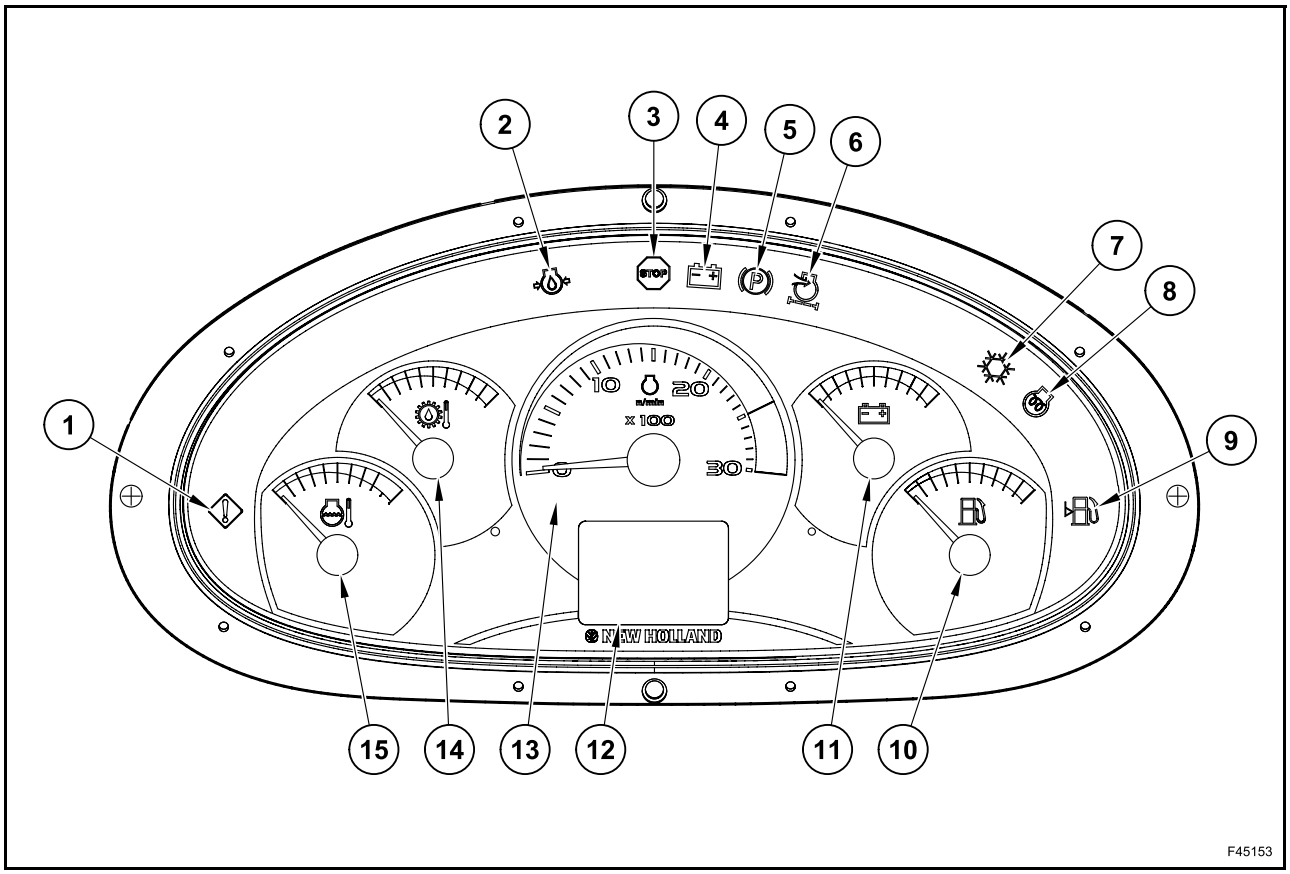
NAME	DESCRIPTION
X400	Gearshift lever connector
X401	Transmission control unit connector
X402	Transmission solenoid valve line - transmission line interface connector
X403	Transmission solenoid valve line - transmission line interface connector
X404	Front instrument panel line - transmission line interface connector
X405	Front instrument panel line - transmission line interface connector
X406	Diode interface connector
X407	Quick coupler connector
X408	Front instrument panel line - general line interface connector
X409	Front instrument panel line - transmission line interface connector
X461	Engine control unit connector
X603	Blower fuse connector
XC1	Fuse and relay control unit interface connector
XC2	Fuse and relay control unit interface connector
XC3	Fuse and relay control unit connector
XC4	Fuse and relay control unit interface connector
XC5	Fuse and relay control unit connector
XC6	Fuse and relay control unit interface connector
XST1	Side instrument connector
XST2	Side instrument connector
XX	Diode interface connector

HEATER AND RADIO LINE DIAGRAM



TBR00164

SIDE INSTRUMENT CLUSTER (B95C - B95CTC - B110C)



1. CAUTION MASTER LAMP
   This lamp signals a not critical caution.
   When this caution is active, it is necessary to change the operating mode, plan a down time to carry out maintenance or, if the fault continues, consult your dealer.
   This lamp turns on at the same time of lamps (2), (4), (6) and (8).
2. ENGINE OIL PRESSURE WARNING LAMP
   This warning lamp turns on and the audible warning device sounds when the engine oil pressure is too low.
3. STOP MASTER LAMP
   The stop master lamp signals a critical caution.
   When this lamp turns on, stop the machine immediately and shut off the engine.
   If this is not the case, the machine can get damaged or accidents may occur.
4. BATTERY CHARGE WARNING LAMP
   This warning lamp turns on when the alternator/ fan belt is broken or when the alternator is not charging the battery.
5. PARKING BRAKE INDICATOR LAMP
   This indicator lamp turns on when the parking brake lever is in the raised position (wheels braked).
6. AIR FILTER RESTRICTION LAMP
   This warning lamp turns on when the air filter element needs to be cleaned or replaced.
7. AIR CONDITIONER INDICATOR LAMP (Optional)
   This lamp turns on when the air conditioner is working.
8. “GRID HEATER” LAMP (Optional)
   If the machine is equipped with a “grid heater”, wait for the indicator lamp to turn off before starting the engine.

WORK HOURS

In order to allow service or the customer to view vehicle hours of operation, it will not be necessary to have the key.

By pressing the menu enter/display scroll switch, with the key turned to OFF, the instrument cluster panel will activate and display the service hours for 10 seconds.

The hourmeter increments when the engine is running (rpm> 600). The hours are displayed starting from 0.0 until 210,554,060.7 using an interval of 6 minutes.

In case of battery disconnection, the cluster can lose 0.1 hour or 6 minutes max.

WORK HOURS SETTING

In order to allow service to install a new Vehicle Control Module (VCM) on an old vehicle, it is possible to increase (no decrease will be allowed) the hour to the same setting as the original.

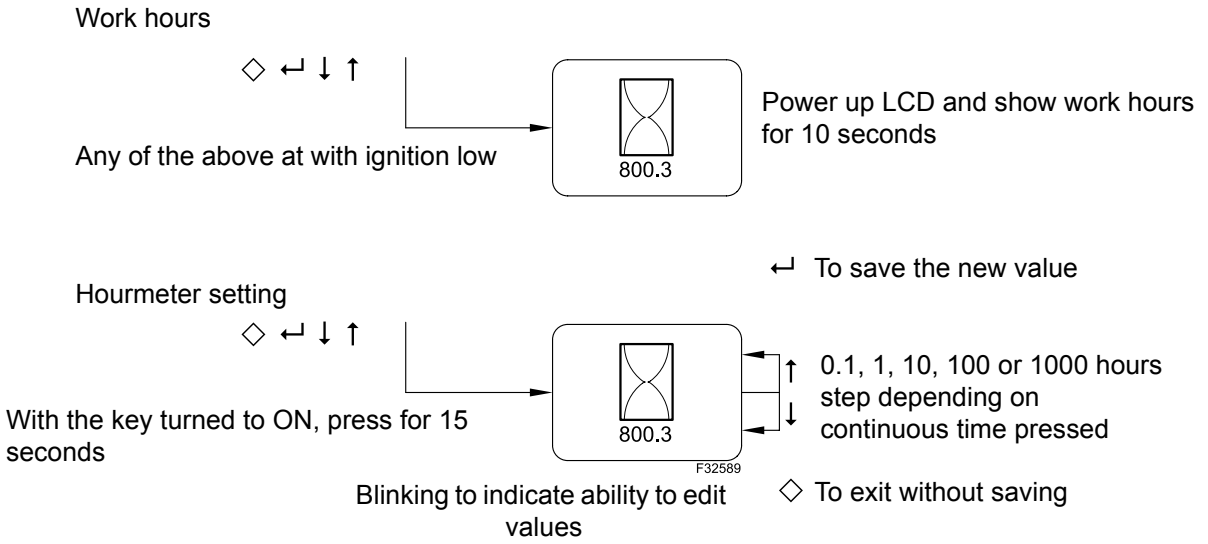
To modify the hourmeter value, execute the following procedure:

- select the hourmeter function on the display;
- press and hold depressed for 15 seconds “arrow UP” and “display” until the value shown on display starts to blink (1 Hz, duty 50%);
- once in the adjustment mode the meaning of the arrow UP switch is “increase hourmeter value”, and the meaning of arrow DOWN switch is “decrease hourmeter value”. Single switch pressure will increase or decrease the value of one unit (6 min). Continuous switch pressure will increase or decrease the value continuously (1 every 300 milliseconds): when the value reaches a multiple of 10, the increment/decrement rate is 10 units every 300 ms; when the value reaches a multiple of 100, the rate is 100 units every 300 ms; when the value reaches a multiple of 1000, the rate is 1000 units every 300 ms.

During continuous setting the value stops flashing.

Once the operator has reached the desired value press and hold down the arrow UP and display switches for 15 seconds to end setting procedure.

It is not possible to set a value lower than the current one, and the procedure can be repeated three times in the cluster life.



Value may only increase for the hourmeter. While setting the value it can be decreased due to operator overshoot, but the value can not be stored if it is below the current stored value. Pressing DISPLAY will exit without saving. ENTER must be pressed to store the modified value in protected memory.

Function	Lamp	Alarm	Lamp	Display lamp	Condition	DTC	SA	Description	Priority	Colour
Accelerator knob signal out of range		One second alarm every 30 seconds			Accelerator above 9 V for 5 seconds	1038	VCM	Accelerator knob sensor - shorted high to Vbat	2	Amber
Accelerator knob signal out of range		One second alarm every 30 seconds			Accelerator under 0.5 V for 5 seconds	1039	VCM	Accelerator knob sensor - shorted low to ground	2	Amber
5 V accelerator knob power supply		One second alarm every 30 seconds			Accelerator above 5.1 V for 5 seconds	1031	VCM	Accelerator knob supply voltage too high	2	Amber
5 V accelerator knob power supply		One second alarm every 30 seconds			Accelerator under 4.9 V for 5 seconds	1032	VCM	Accelerator knob supply voltage too low	2	Amber
5 V accelerator knob power supply		One second alarm every 30 seconds			Accelerator above 9 V for 5 seconds	1033	VCM	Accelerator knob supply voltage shorted high	2	Amber
5 V accelerator knob power supply		One second alarm every 30 seconds			Accelerator under 0.5 V for 5 seconds	1034	VCM	Accelerator knob supply voltage shorted low	2	Amber
Seat not in driving position		Continuous			Switch closed to ground with vehicle in gear and no parking brake	N/A	VCM	This must have a debounce time of less then 500 ms	2	Amber
Boost air temperature too high		One second alarm every 30 seconds			Boost temperature over 88 °C (1276 °F) for 5 seconds	1018	VCM	Engine over operating boost air temperature	3	Amber
Engine coolant temperature too high		One second alarm every 30 seconds			Coolant above 106 °C (223 °F) for 5 seconds	1019	VCM	Engine over operating coolant temperature		Amber
Engine coolant temperature too high		One second alarm every 30 seconds				3007	ECU	Coolant temperature signal high	3	Amber

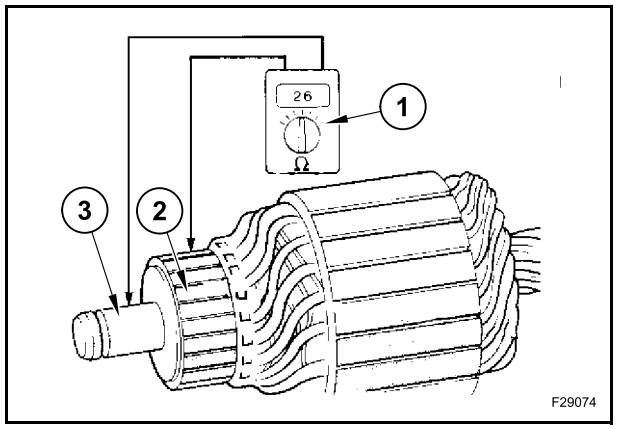
Armature

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

After rectifying the commutator, polish it with fine sandpaper, then wipe it with a cloth soaked in gasoline.

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

The resistance of the armature insulation may be checked by connecting an ohmmeter (1) between the blades of the commutator (2) and the armature shaft (3). The resistance must be infinite (no continuity).

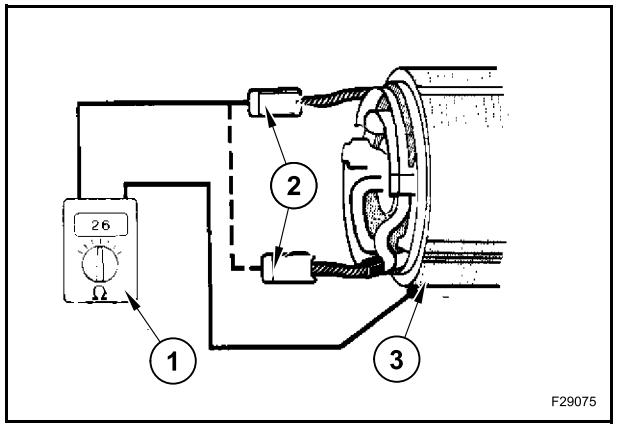


To check that the armature is not short-circuited, a special device for armatures must be used. The other solution is to replace the armature.

If the circumference of the armature has come into contact with the starter pole shoes, the bearings of the armature are probably excessively worn out. First check that the starter pole shoes have been tightened and that the armature rotates without any concentric defect. If necessary, replace the armature bearings.

Field coils

To check the resistance of the field coil insulation, connect an ohmmeter (1) between the brushes of each induction coil (2) and a clean unpainted area of the body (3). The resistance must be infinite (no continuity).



To check the continuity of the field coils, connect an ohmmeter between the brushes of each induction coil and the main supply terminal (the thickest braided wire). The resistance must be equal to 1 MW.

If the field coils are defective, the entire assembly consisting of the body and the field coils must be replaced.

Drive pinion

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

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