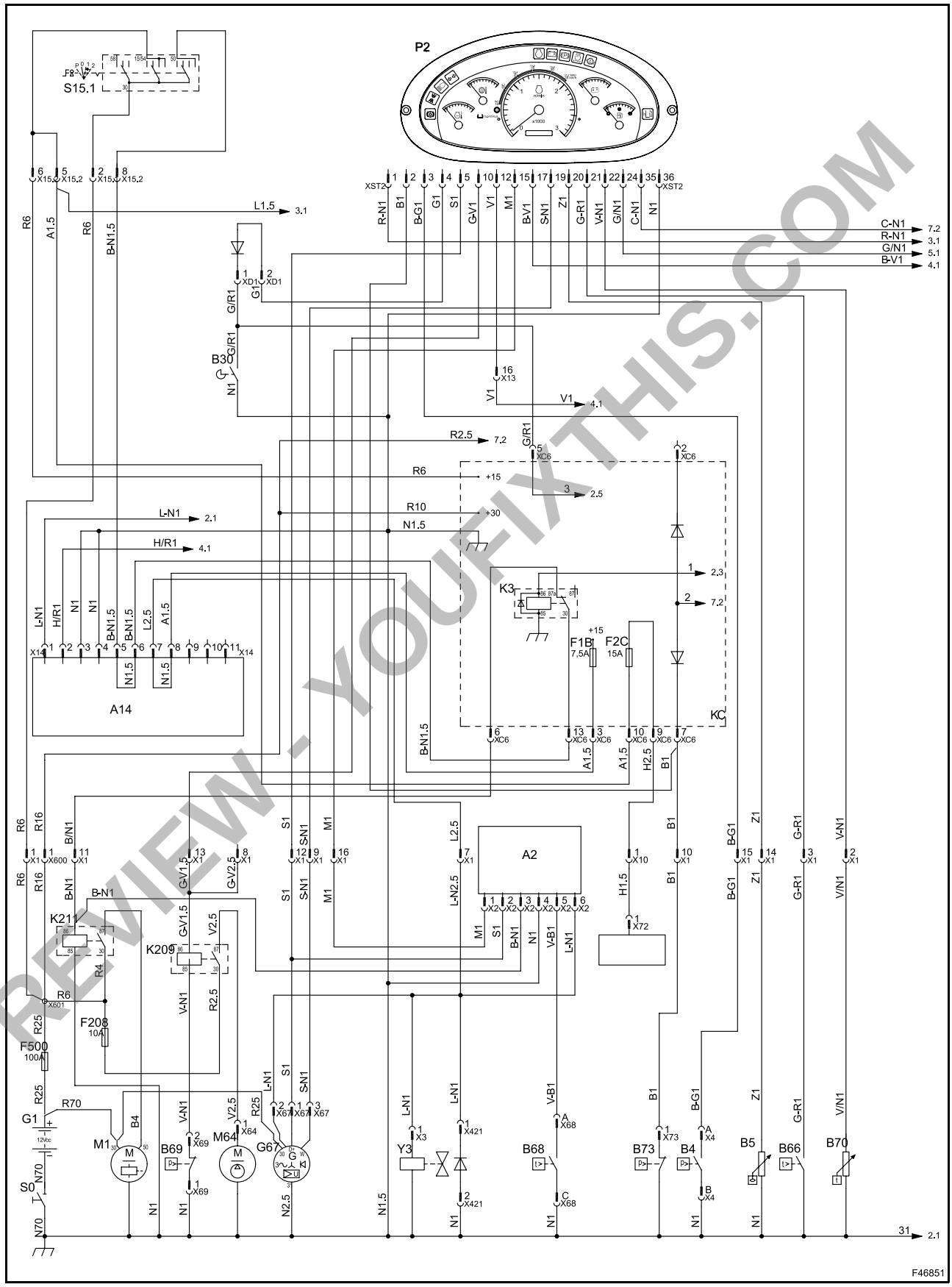
ENGINE LINE DIAGRAM



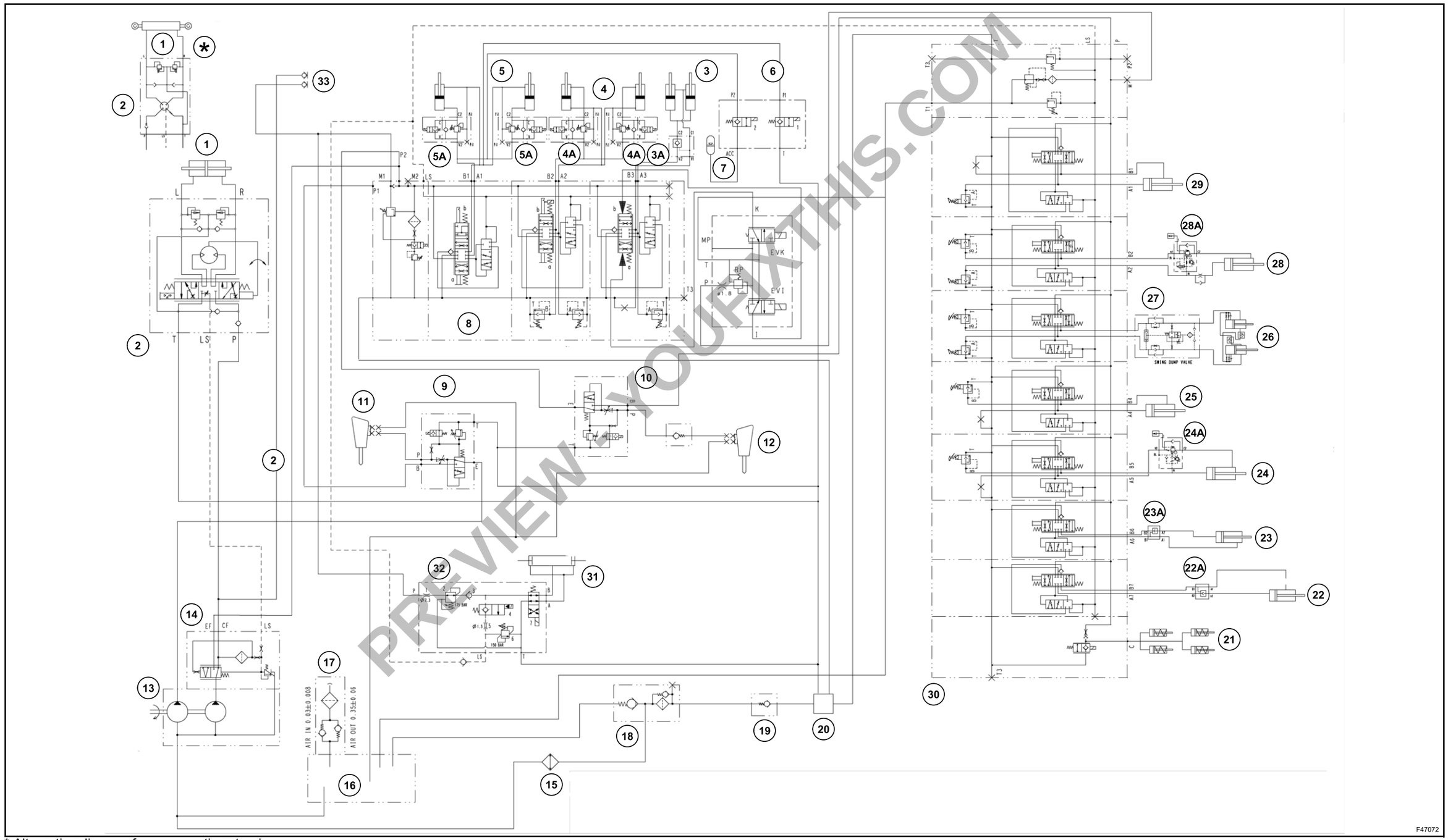
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HYDRAULIC DIAGRAMS

HYDRAULIC DIAGRAM - 2WS SIDESHIFT MECHANICAL MODELS

WITH FIXED-FLOW-RATE GEAR PUMP



* Alternative diagram for non-reactive steering

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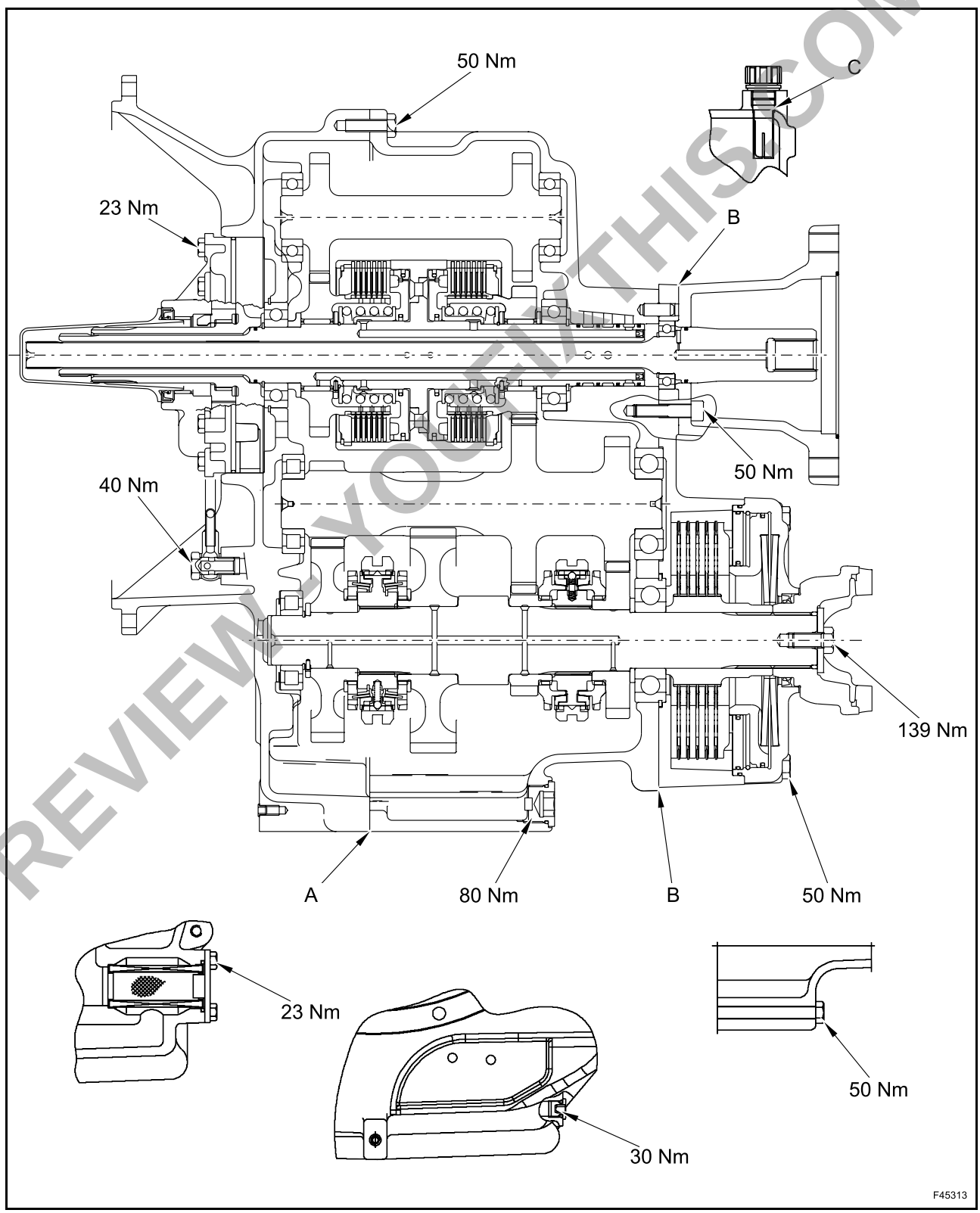
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DISASSEMBLY AND ASSEMBLY

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



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TECHNICAL SPECIFICATIONS

DIESEL ENGINE

72 kW - 97 HP ENGINE (580T)

Specifications (EEC 88/195) ..... 72 kW - 97 HP @ 2200 rpm
Model F4GE9484C*601
Type ..... diesel, mechanical
No. of cylinders 4
Valves per cylinder 2
Bore ..... 104 mm (4 in)
Stroke ..... 132 mm (5.2 in)
Displacement ..... 4485 cm^3 (237.69 in^3)
Compression ratio 17.5:1
Maximum torque (EC) ..... 420 Nm (309 lbf·ft) @ 1250 rpm
Low idle speed at no load ..... 1000 ± 50 rpm
High idle speed at no load (engine not installed) ..... 2430 ± 50 rpm
High idle speed at no load (engine not installed on the vehicle) ..... 2380 ± 60 rpm
Maximum speed at full load ..... 2200 rpm
Air intake ..... TAA (turbocharged with aftercooler)

Supply

Type ..... direct injection
Injection pump ..... BOSCH ROTARY VE 4/12 F1100L
Injection sequence 1-3-4-2
Cold-start device ..... “grid heater” (optional)

Cooling

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

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TROUBLESHOOTING

FAULT	POSSIBLE CAUSE	ACTION
The vehicle does not move.	Control valve supply problem.	Check and, if necessary, replace the control valves.
	Damaged connections of transmission and vehicle wiring harness.	Repair and, if necessary, replace the wiring harness.
	Oxidation in the contacts of the electric cables of the wiring harness.	Clean the contacts.
	Interruption of the electric cable.	Replace the electric cable.
	Damage to the solenoids/solenoid valves.	Replace the solenoids.
	Damage to sensors.	Replace sensors.
	Short circuits or bad contact.	Check and, if necessary, replace the fuses.
	Incorrect oil level.	Restore the oil level.
	Check for possible oil leaks.	Eliminate the leaks and restore the oil level.
	Suction strainer restriction.	Clean the suction strainer.
	Damaged oil pump.	Replace the oil pump.
	Damaged oil pump pressure relief valve.	Replace the oil pump.
	Damaged/restricted filter.	Replace the filter.
	Damaged / stuck control valve.	Replace the control valve.
	Damaged converter.	Replace the converter.
	Oil temperature below 0 °C (32 °F).	Wait for the operating temperature to be reached (stall test).
	Damaged rotary seal rings.	Replace the rotary seal rings.
	Synchronizers damaged.	Replace the synchronizers.
	Stuck shuttle lever.	Repair the shuttle lever.
	Excessively worn-out clutch assembly.	Repair and, if necessary, replace the clutch disc kit.
	Lack of motion transmission (broken gears, shafts, bearings, etc.).	Check, repair and, if necessary, replace.

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SUPPLY SUMMARY TABLE

RECOMMENDED FLUIDS AND APPLICATION	CASE Specifications	INTERNATIONAL Specifications	MODELS		QUANTITY	
					Litres	Gal
ENGINE - OIL Akcela No 1 Engine oil	MS 1121	API CH-4, ACEA E5, 15W40	2WS - with filter 4WS - with filter		11.7 11.5	3.09 3.04
COOLING SYSTEM Akcela Premium Anti-freeze antifreeze 50% water 50%	MS 1710	ASTM D6210	ALL		24	6.30
HYDRAULIC SYSTEM Akcela Nexplore	MAT 3525	API GL4 ISO VG 32/ 46 10W-30	2WS 4WS		140 118	36.90 31.10
Akcela Hydraulic Excavator Fluid Bio	MS 1230	ISO VG 46 DIN 51524 - part II	2WS 4WS		140 118	36.90 31.10
POWERSHUTTLE TRANSMISSION Akcela Hy-tran Ultra	MS1209	API GL4, 80W - 140	2WD 4WD		18.5 20.8	4.07 4.57
POWERSHIFT TRANSMISSION Akcela Hy-tran Ultra			ALL		20.8	4.57
FRONT AXLE (2WS) Akcela Transaxle fluid 80W -140	MS1317		2WD		0.8	0.21
			4WD	Differential	8.6	2.27
				Wheel reduction gear (each)	1	0.26
FRONT AXLE (4WS) Akcela Transaxle fluid 80W -140			Differential		10.5	2.80
			Wheel reduction gear (each)		1.3	0.34
REAR AXLE (2WS) Akcela Transaxle fluid 80W -140			Differential	580T-580ST	15.5	3.41
				590ST	17	3.74
REAR AXLE (4WS) Akcela Transaxle fluid 80W -140			Differential		11	2.90
			Wheel reduction gear (each)		1.3	0.34
FUEL Decanted and filtered diesel fuel			2WS 4WS		145 124	38.20 32.70
VARIOUS JOINTS Akcela Multi-purpose grease	251H EP	NLGI 2	ALL		As required	
TELESCOPIC DIPPER Akcela Moly Grease	251 H EP-M	NLGI 2	ALL		As required	
AIR CONDITIONING COMPRESSOR PAG SP 20 oil			ALL		240 cm^3	14.6 in^3

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SUPPLY SUMMARY TABLE 29

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REF.	DESCRIPTION	NOTES
1	Suction filter	250 micron
2	Pump	36 cm^3/rev (2.19 in^3/rev)
3	Filter	15 micron
4	Pressure regulator	
5	Oil filter relief valve	23 bar (333.58 psi)
6	Valve for 4WD engagement/release	
7	“Easy” 4WD engagement/release	
8	Torque converter relief valve	3.5 ÷ 5.5 bar (50.76 + 79.77 psi)
9	Torque converter	
10	Oil cooler	
11	Temperature thermostat port	
12	Flow divider	
13	Forward/reverse travel modulation valve	
14	Modulation relief valve	
15	Forward/reverse travel selector valve	
16	Forward gear clutch	
17	Reverse gear clutch	
18	Forward/reverse travel shaft lubrication	
19	1st, 2nd, 3rd, 4th gear shaft lubrication	
20	4WD pressure check port	
21	Check port for torque converter pressure	
22	Pressure check port of lubrication return from cooler	
23	Forward/reverse/HDL gear main pressure check port	
24	Forward gear pressure check port	
25	Reverse gear pressure check port	
26	Hydraulic differential lock engagement/release	
27	Hydraulic differential lock valve	

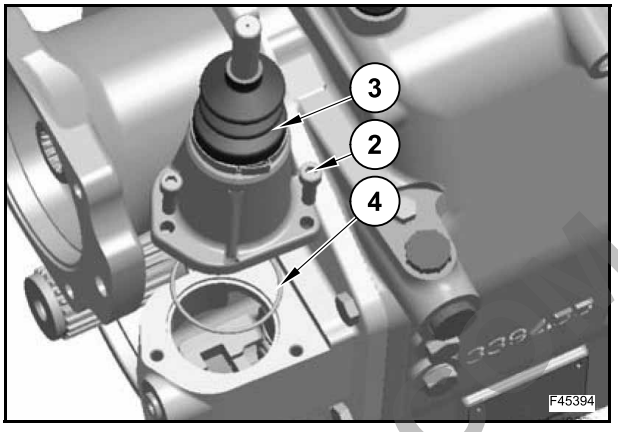
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Assemble a new O-ring (4) on the gearshift control assy (3).

Use clean oil to lubricate the ring and assembly it on the rear box.

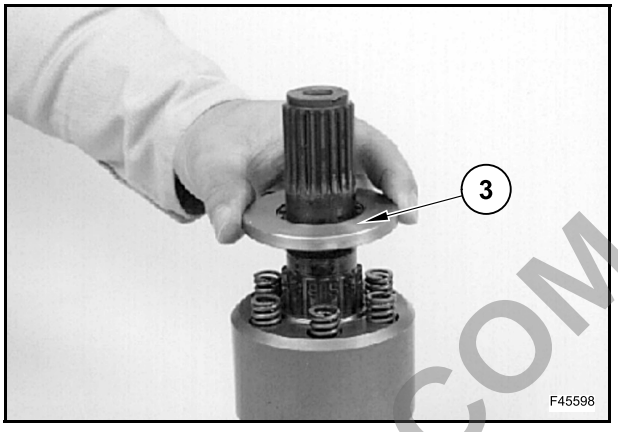
Screw in the 3 screws (2) fastening the gearshift control assy to the rear cover and tighten to the prescribed torque of 23 Nm (17 lbf·ft).



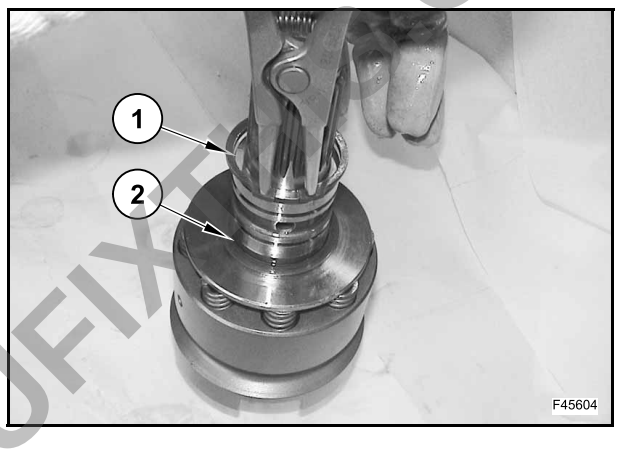
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Assemble the spacer (3).



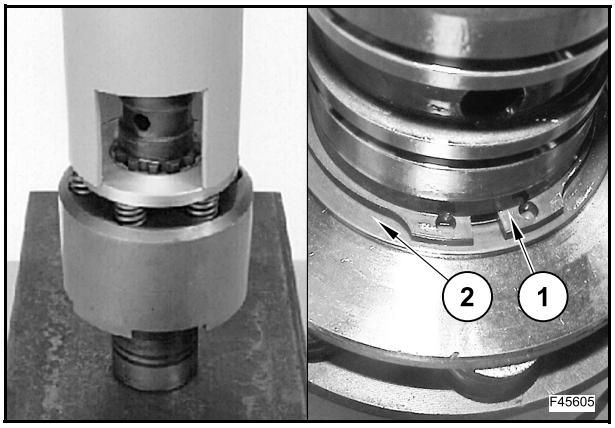
Position the washer (2) and the snap ring (1).



Use tool 380200258 to press the spring retainer down until you have access to the snap ring. Assemble the snap ring (1).

Release the tension and remove the tool.

Make sure that the snap ring (1) is seated correctly in the recess of the spring retainer.

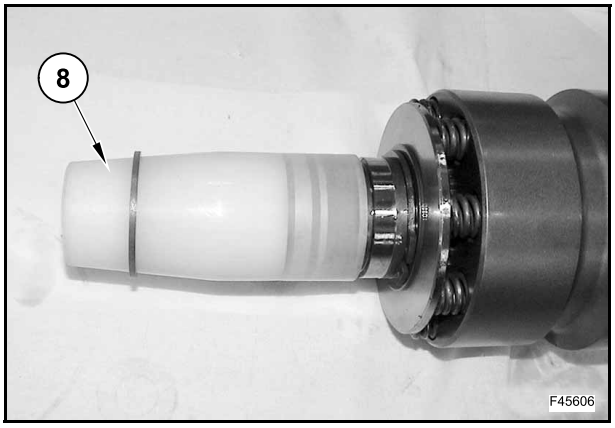


Place tool 380200207 on the shaft.

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

Heat the seal ring (8) to 60 ÷ 80 °C (140 ÷ 176 °F).

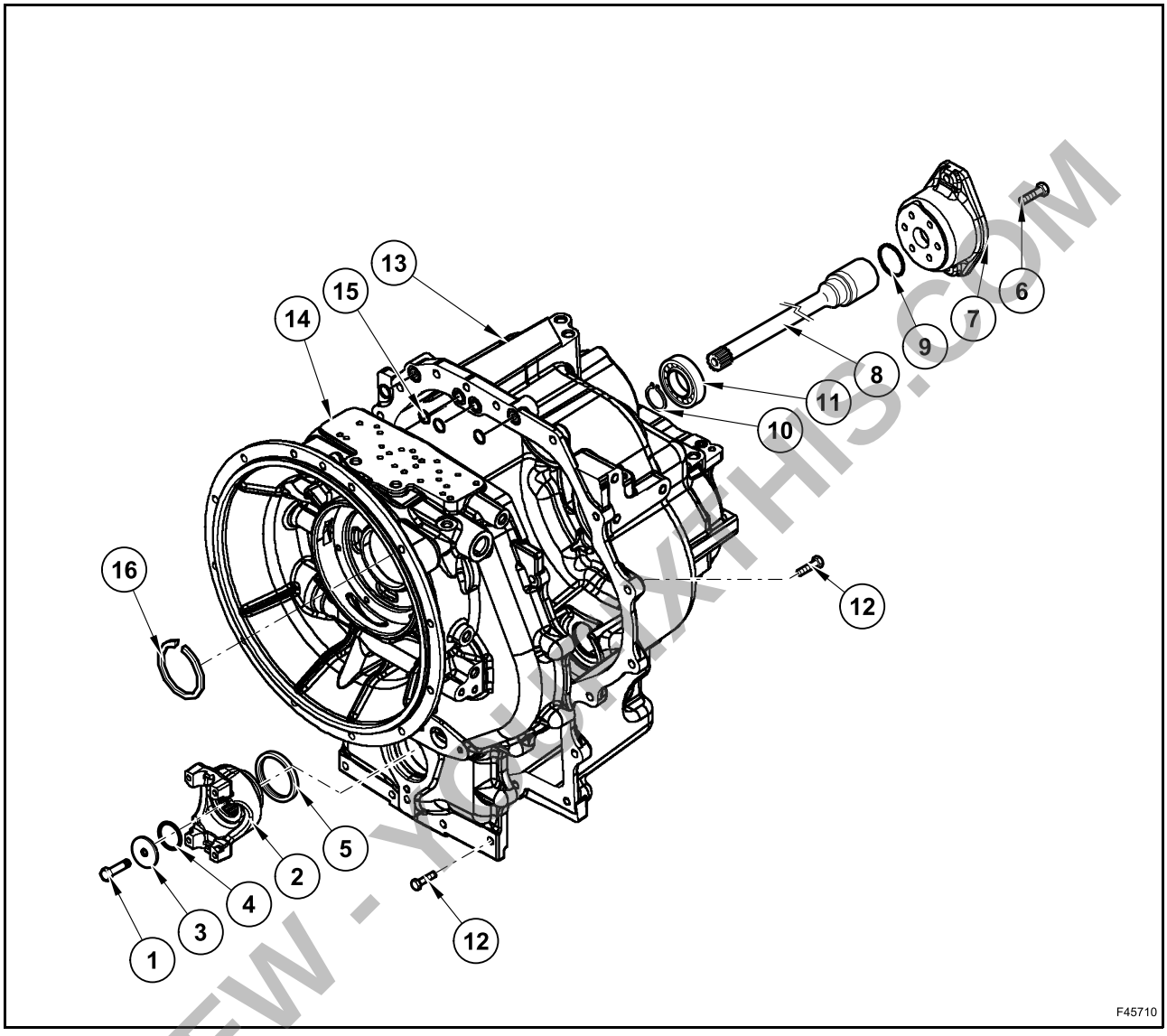
Assemble the seal ring on the tool.



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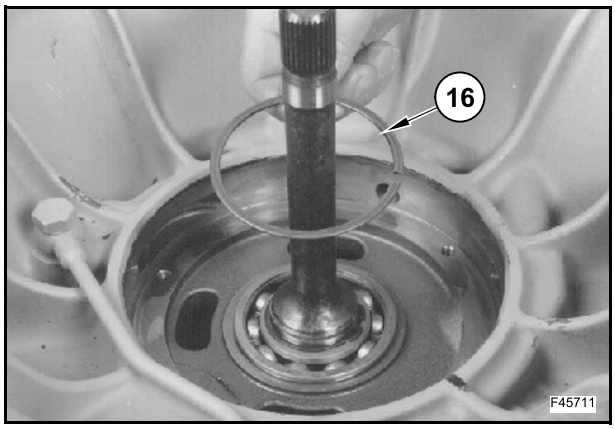
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TRANSMISSION BOX



Disassembly

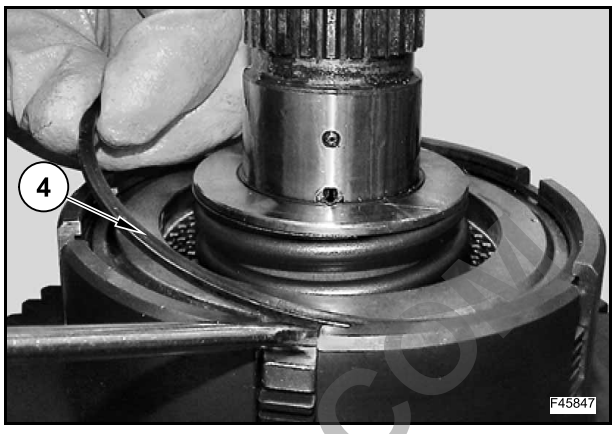
Remove the snap ring (16).



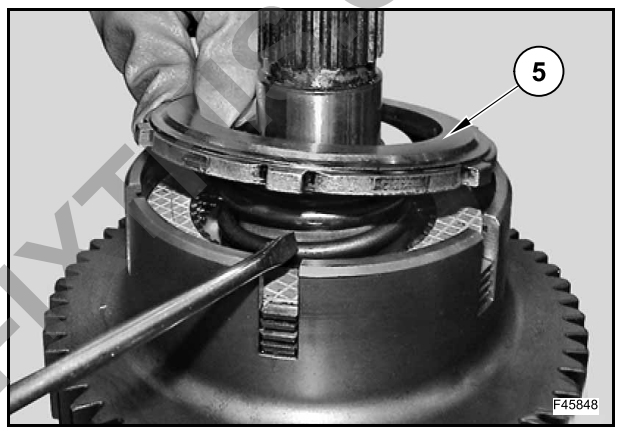
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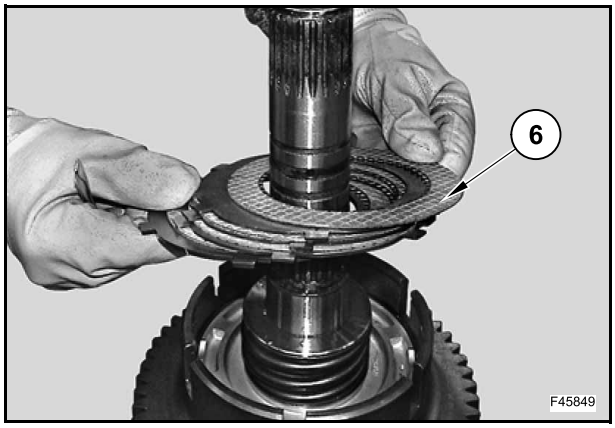
Remove the snap ring (4).



Remove the thrust washer (5) by means of 2 screwdrivers.



Remove the disc kit (6).



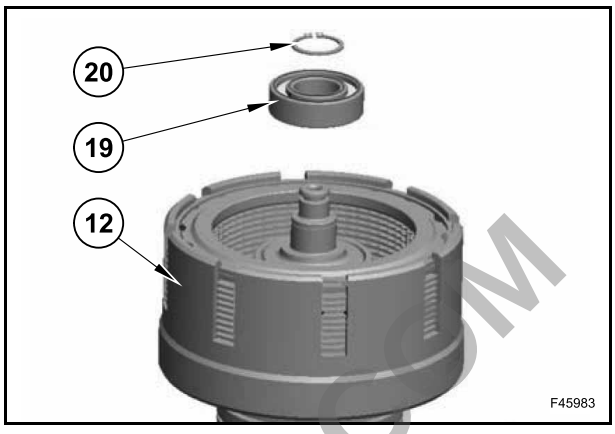
Lower the cover (10) by means of tool 380200215.



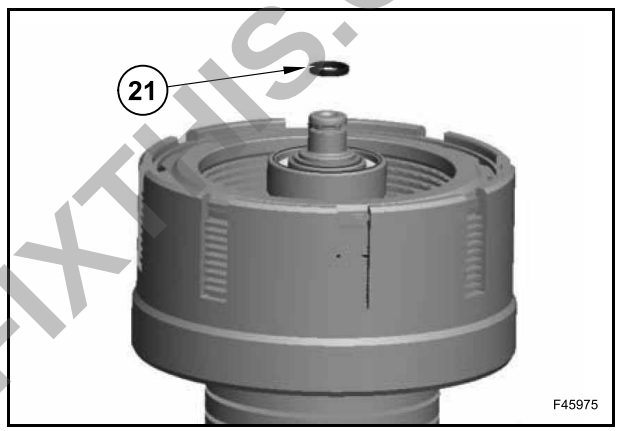
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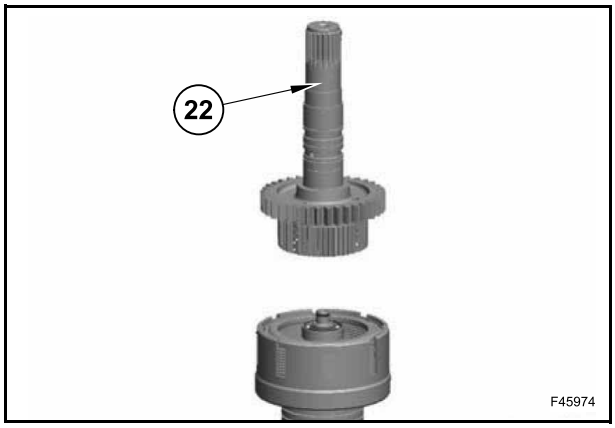
Turn the shaft (17) and the bell housing (12).
Assemble the bearing (19) with tool 380200229.
Assemble the snap ring (20).



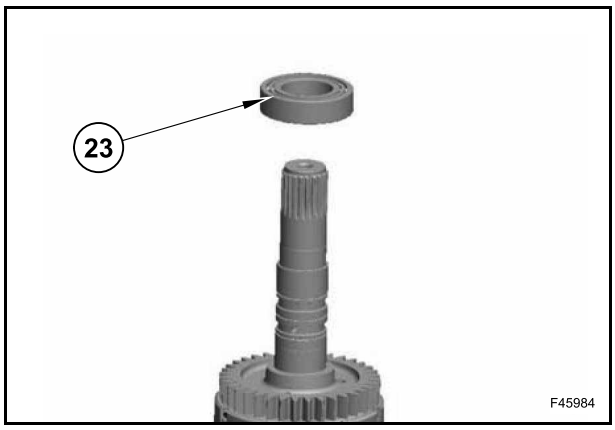
Assemble the O-ring (21).



Assemble the gear (22).



Assemble the bearing (24) with tool 380200220.



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Make the final adjustments of the ring nuts to align locking devices and confirm the rolling torque.

Apply the yellow compound on the bevel set in 3 places, 120° apart, on 3 teeth each.

Rotate bevel set enough to see pattern in yellow compound.

Pattern should be per chart above.

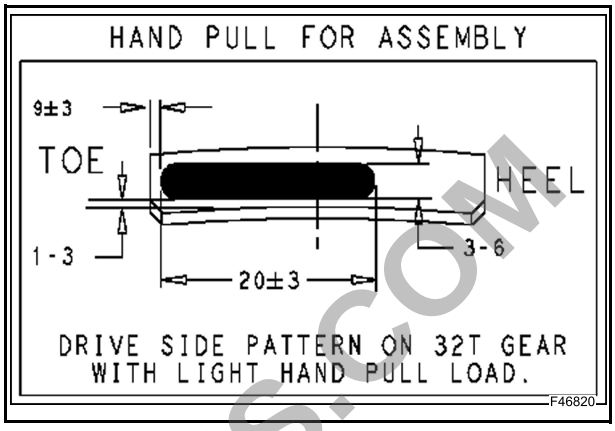
Normal wear will flatten (elongate) the contact pattern.

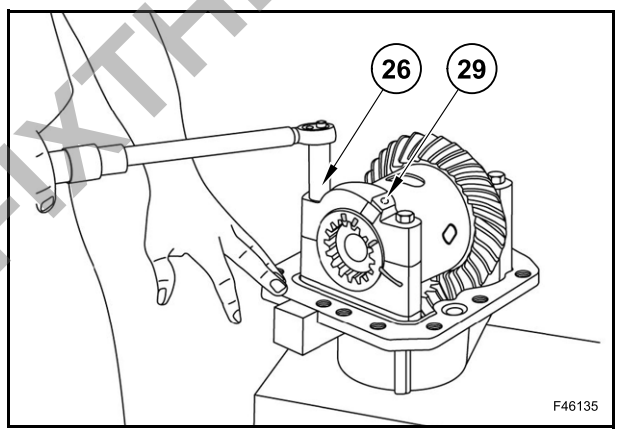
NOTE: *this is a non-adjustable bevel set. If pattern is significantly different from specifications, then replace bevel set.*

If the original ring gear and pinion gear are being used, the backlash must be equal to the measurement made during disassembly.

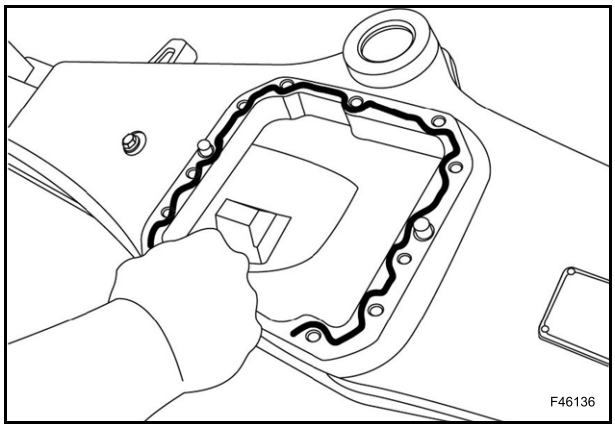
Tighten the screws (26) to the prescribed torque of 266 Nm (196 lbf·ft).

Screw in the lock screw (29) which blocks the ring gear and tighten to a tightening torque of 162 ÷ 200 Nm (119 ÷ 147 lbf·ft).





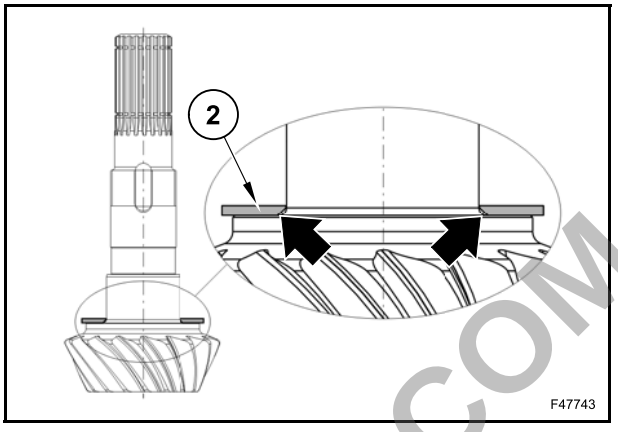
Apply some sealant.



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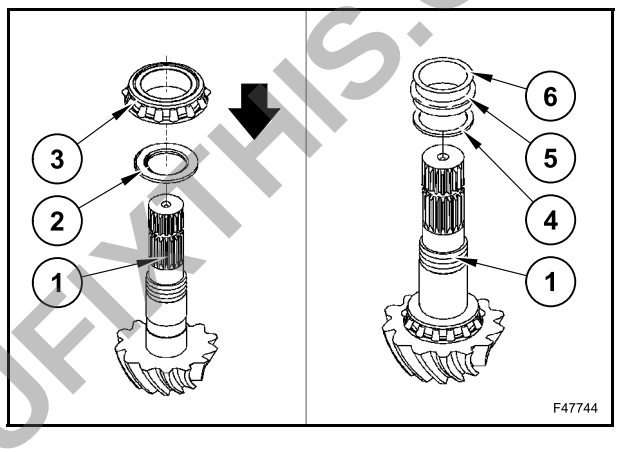
Once you have chosen the suitable shim (2), insert it on the pinion shaft with the chamfer against the pinion head.



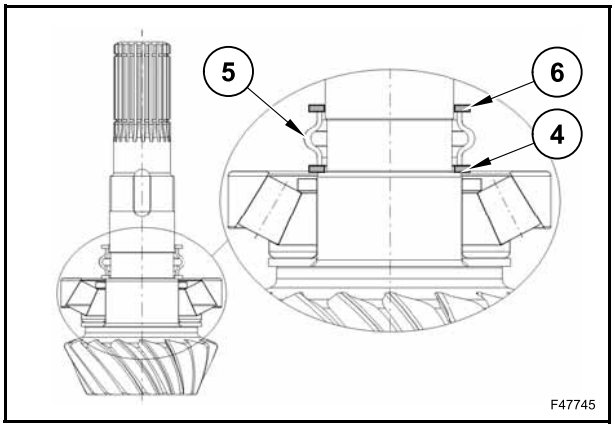
Force the bearing (3) into the pinion (1) using a vice with the special tool **380002224**, making sure it is well set.

Insert the shims (4) and (6) and a new spacer (5).

NOTE: *always use a new spacer (5).*



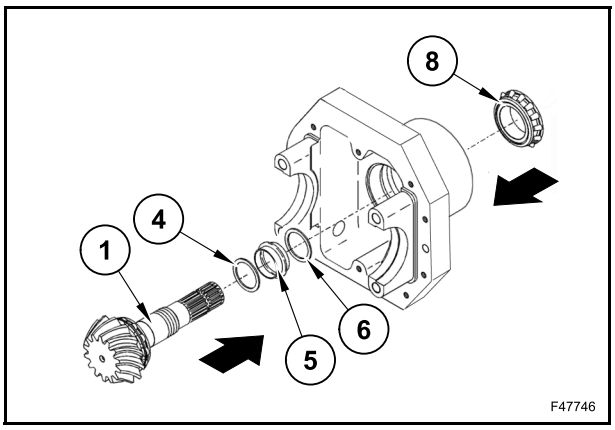
Check the correct assembly sequence of shims (4) and (6) and of the spacer (5).



Insert the pinion assy (1) into the differential support housing (7) and the bearing (8).

In order to force the bearing (8) into position, use the special tool **380002224** and a hammer.

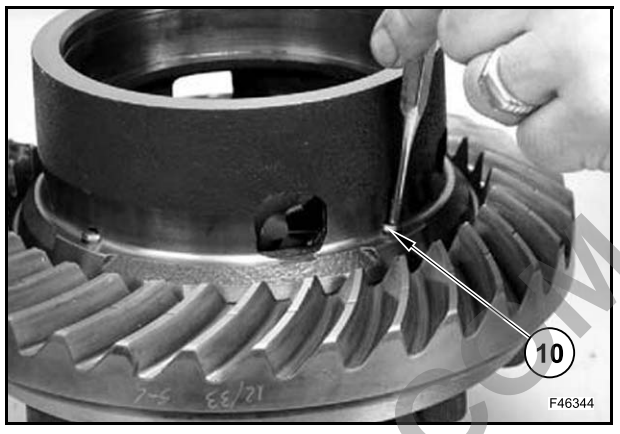
It is advisable to offer resistance, for example a sledge, to the beating force.



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Take out the pins (10).

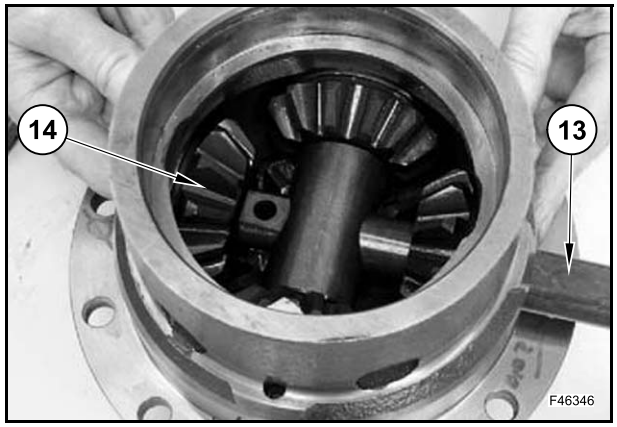


Unscrew and remove the screws (11) and the ring gear (12).

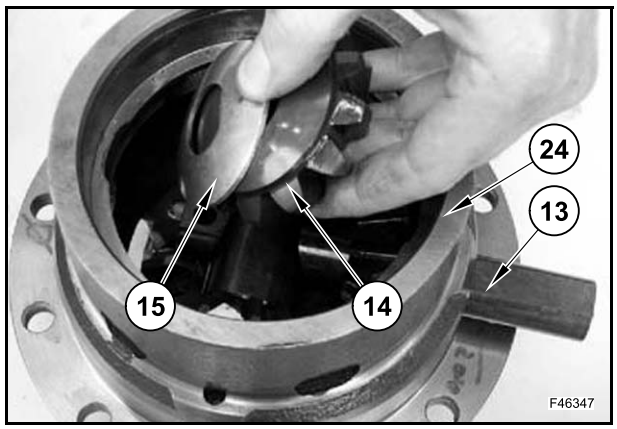


Slip off pin (13) until the gear is free (14).

NOTE: *the pin can be slipped off only in one direction.*



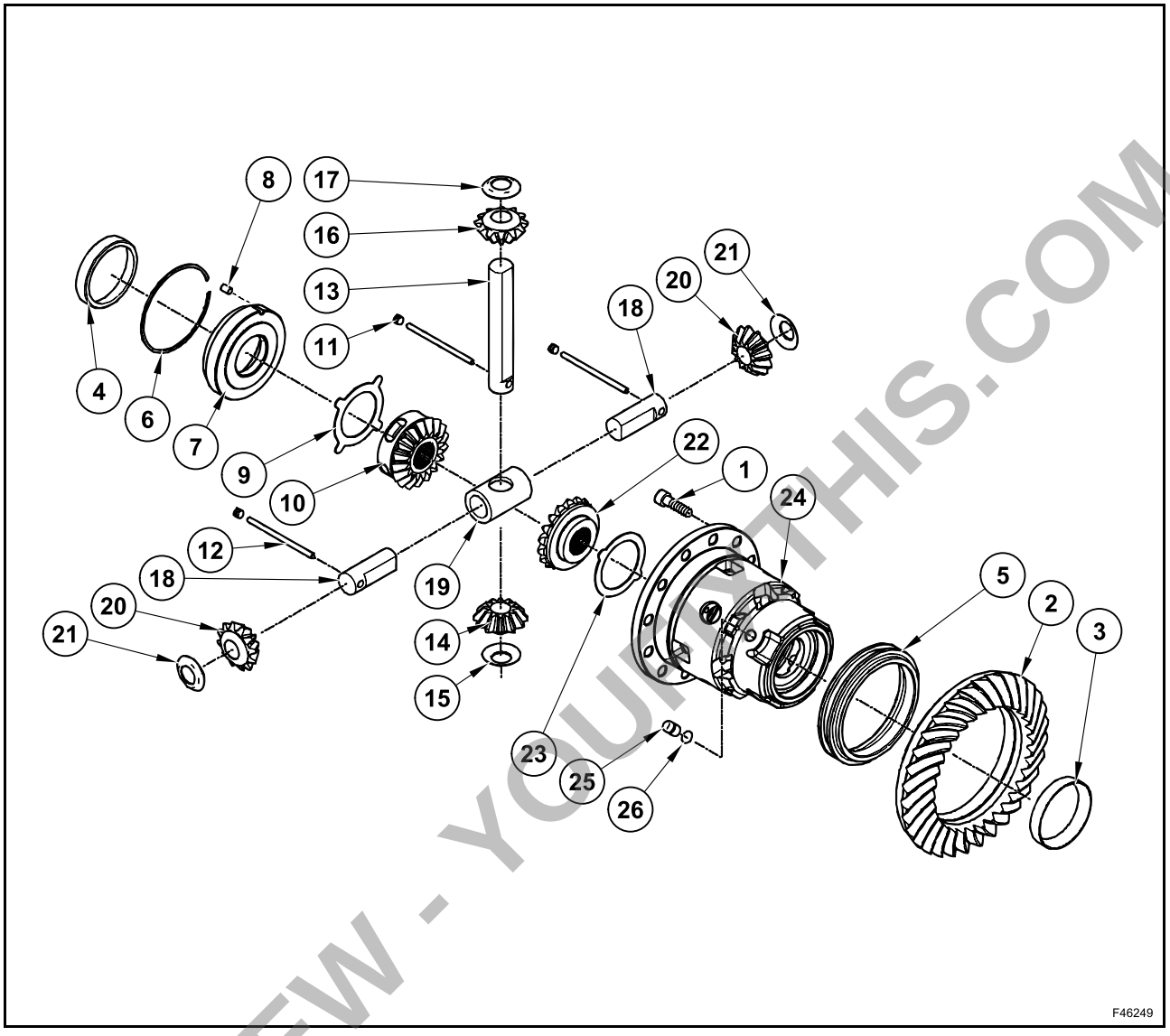
Assemble the planetary gear (14) and the relevant shoulder ring (15).



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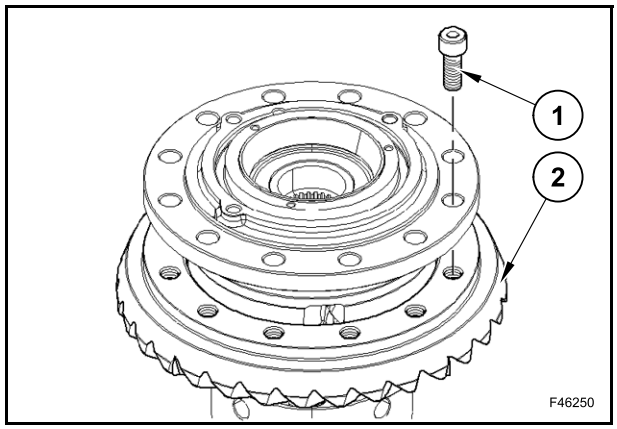
DIFFERENTIAL



Disassembly

Loosen and remove the screws (1).

Remove the ring gear (2).

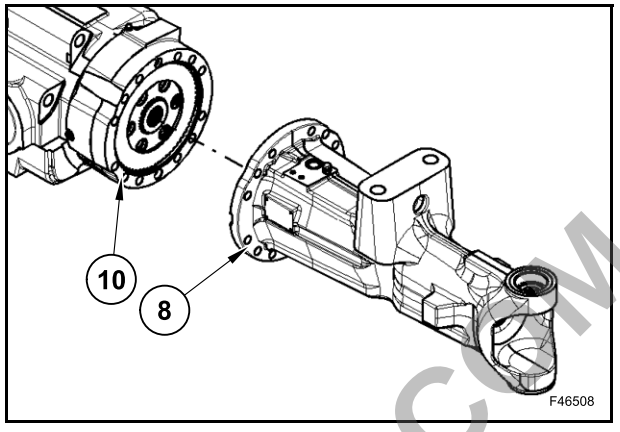


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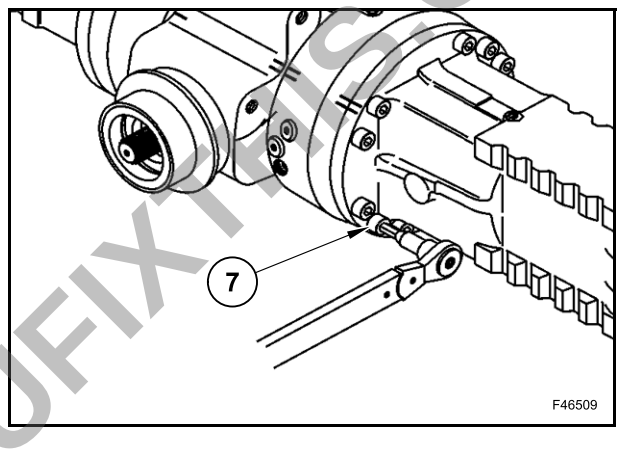
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Support the assemblies properly as already pointed out for disassembly phase.

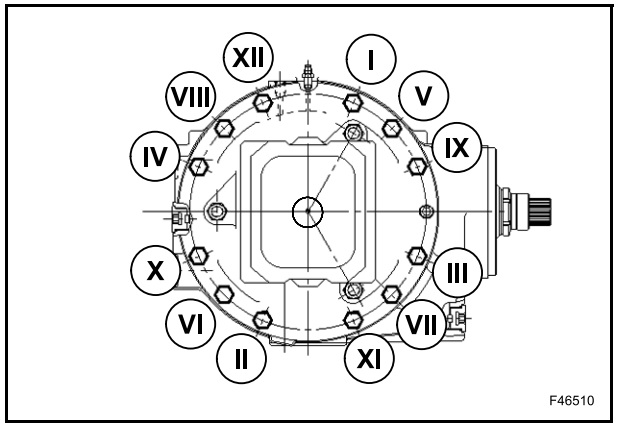
Assemble the beam (8) on the central axle body (10) respecting the reference marks applied during disassembly.



Screw in and tighten the screws (7) to a tightening torque of 320 Nm (236 lbf·ft).

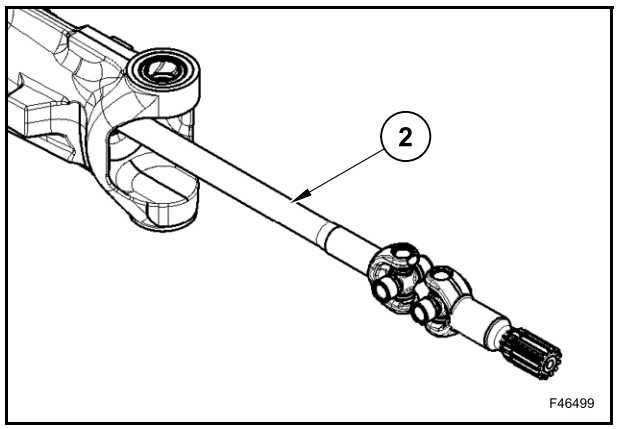


Tighten the screw (7) respecting the sequence shown.



Insert the double joint (2).

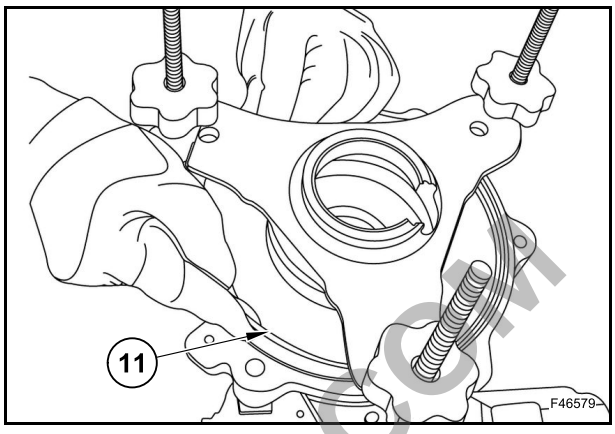
Be careful not to damage the seal ring.



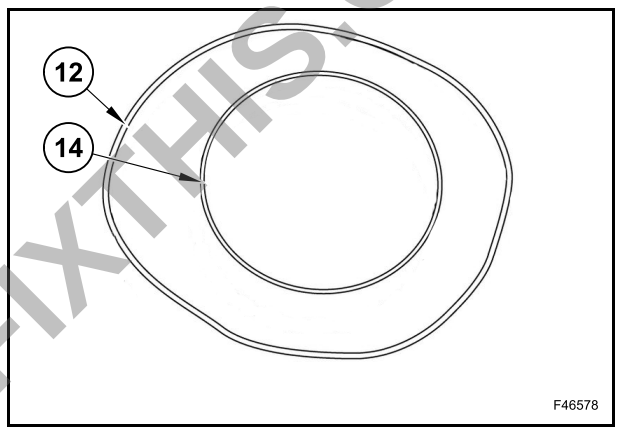
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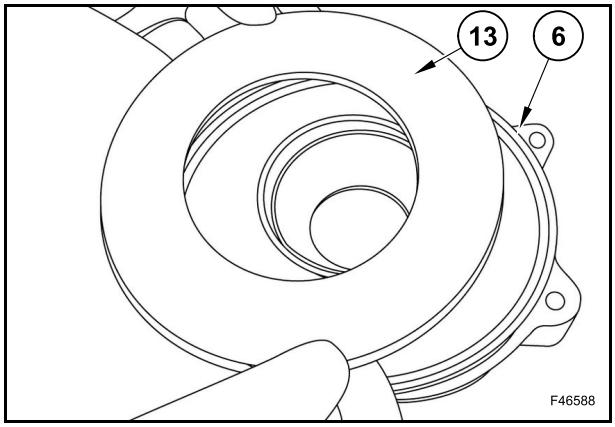
Compress the belleville washers, to assemble the snap ring (11).



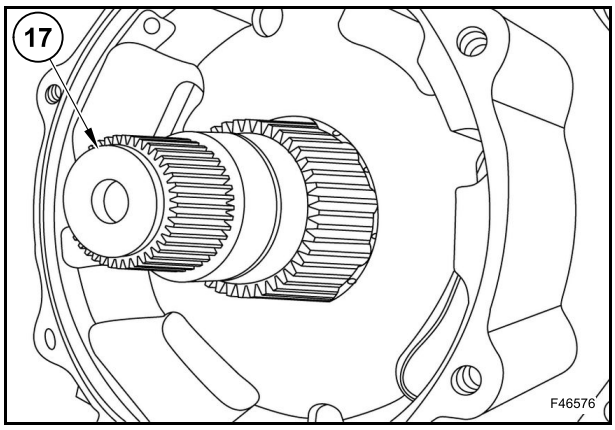
Assemble new O-rings (12) and (14) onto the retaining plate.



Lubricate and install the retaining plate (13) into the brake cover (6).



Assemble the hub (17).



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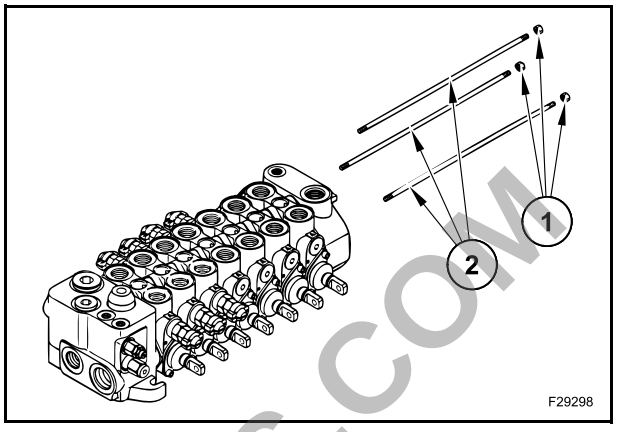
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DISASSEMBLY AND ASSEMBLY

Loosen and remove the 3 nuts (1).

[Tightening torque = 42 Nm ± 10% (30.97 lbf·ft)]

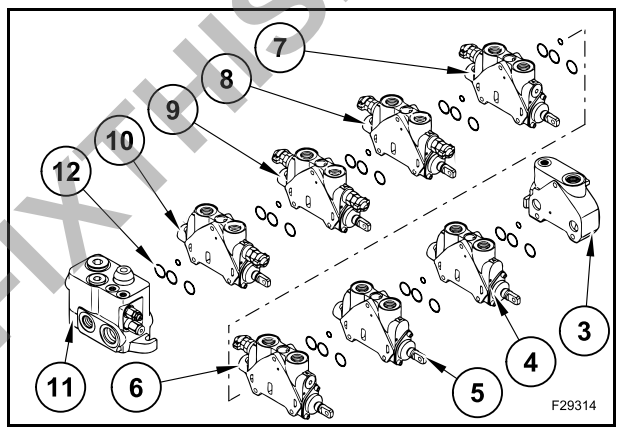
Extract the 3 tie rods (2).



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

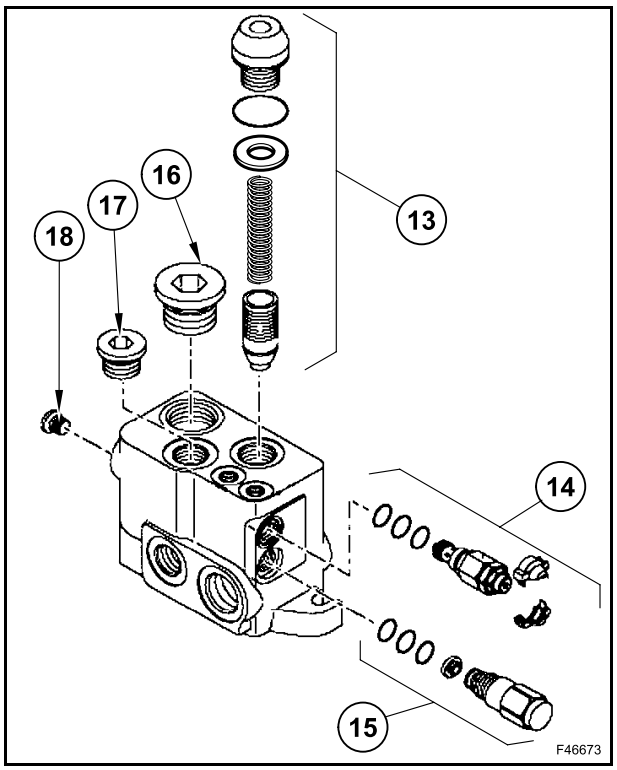
Remove the flow balancer valve (13).
[Tightening torque = 100 Nm (73.76 lbf·ft)]

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

Remove the pressure relief valve (15).

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

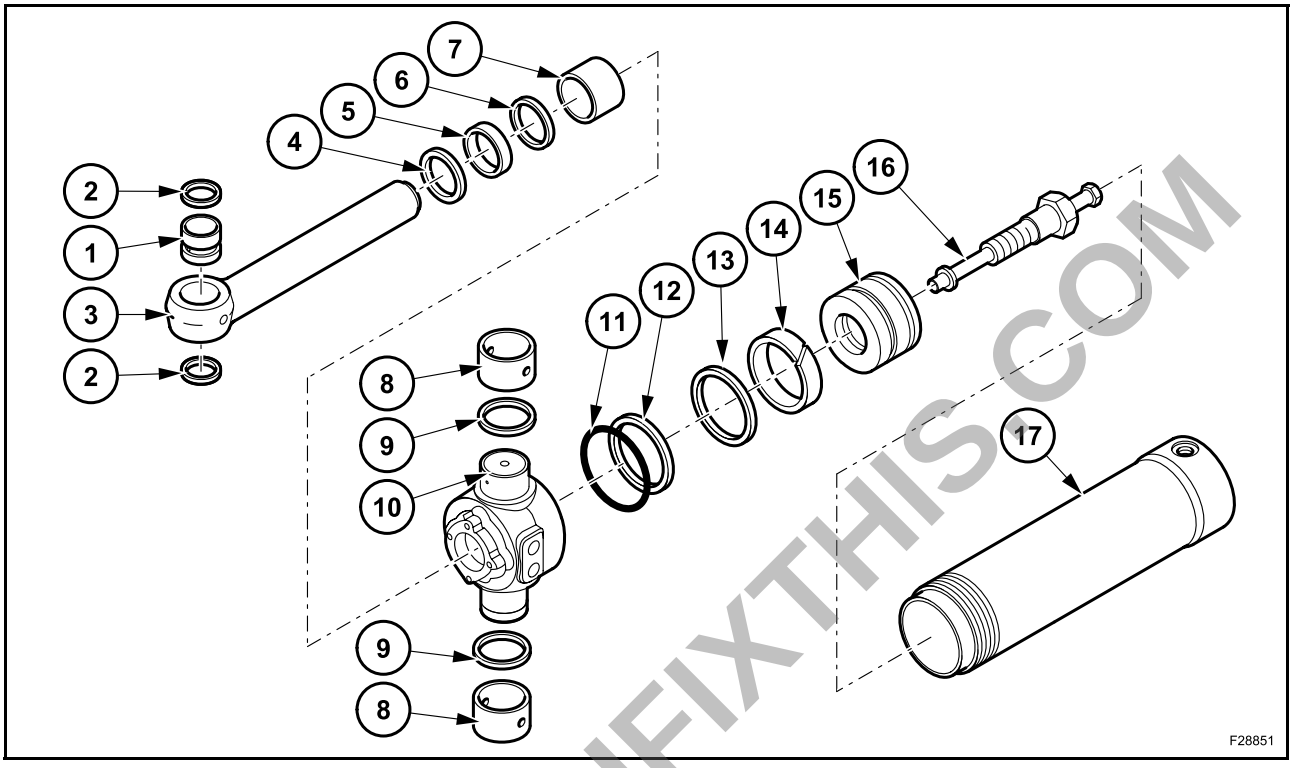
Unscrew and remove the plug (18).
[Tightening torque = 20 Nm (15 lbf·ft)]



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SWING CYLINDER DISASSEMBLY



1. Bushing
2. Wiper ring
3. Cylinder rod
4. Wiper ring
5. Seal ring
6. Ring
7. Guide bush
8. Bushing
9. Seal ring
10. King pin
11. O-ring
12. Back-up ring
13. Piston gasket
14. Piston guide
15. Piston
16. Lock retaining piston
17. Cylinder tube

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

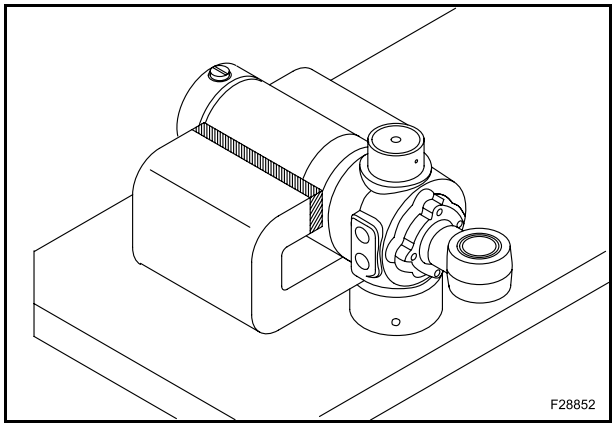
⚠ WARNING ⚠

Cylinder weight: 31 kg (68.34 lb).

Lift and place the cylinder on a workbench and secure it to a vice.

Be sure that the cylinder is placed horizontally.

Drain hydraulic oil from the cylinder.



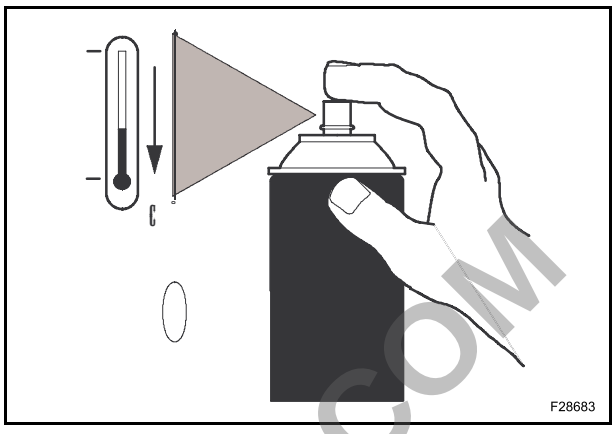
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When a liquid is atomized through an orifice, the temperature of the resultant vapour will lower.

The low temperature of the atomized liquid will then absorb heat from its surrounding.

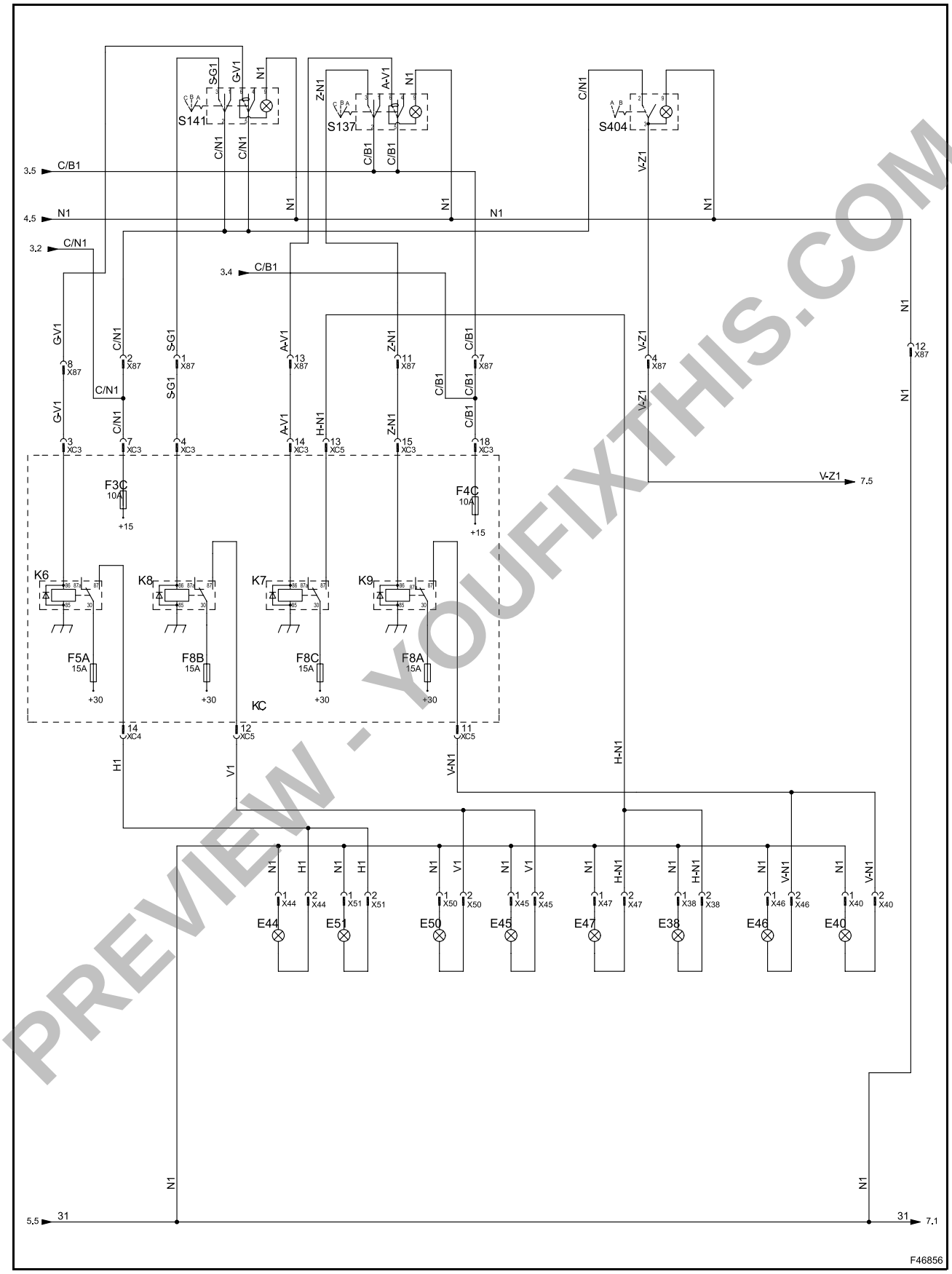
On air conditioning systems, coolant is atomized using an expansion valve.



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WORK LIGHT LINE DIAGRAM



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CONNECTORS

NAME	DESCRIPTION
X1	18-way general line - engine line connector
X2	6-way cold start connector
X4	2-way air filter connector
X5	Fuel level indicator connector
X7	2-way reverse travel buzzer connector
X10	31-way solenoid valve line - general line connector
X12	9-way general line - upper cab line connector
X13	17-way general line - front instrument panel connector
X14	11-way antitheft connector
X15.1	Starting panel connector
X15.2	Starting panel connector
X17	4-way pneumo-electric seat connector
X21	7-way left light - horn connector
X22	5-way right light connector
X23	Front instrument panel line - general line interface connector
X24	Lock valve interface connector
X25	Foot accelerator connector
X26	3-way bucket sensor connector
X27	2-way number plate light connector
X28	4-way rear right light connector
X29	4-way rear left light connector
X31	General line fuse box connector
X34	2-way ride control solenoid valve connector
X35	2-way hand hammer solenoid valve connector
X36	2-way backhoe hammer button connector
X38	2-way rear right work light connector
X39	4-way rear windshield wiper connector
X40	2-way rear right work light connector (optional)

NAME	DESCRIPTION
X41	2-way blower connector (optional)
X43	6-way rotating beacon connector
X44	2-way front right work light connector
X45	2-way front right work light connector (optional)
X46	2-way rear left work light connector (optional)
X47	2-way rear left work light connector
X49	6-way front windshield wiper connector
X50	2-way front left work light connector (optional)
X51	2-way front left work light connector
X53	8-way radio connector (brown)
X54	8-way radio connector (black)
X55	2-way electric socket connector
X56	2-way front windshield washer connector
X57	2-way rear windshield washer connector
X64	1-way air conditioning compressor connector
X67	3-way alternator connector
X69	2-way air conditioning pressure switch connector
X72	1-way pilot control line connector
X87	13-way general line - left side instrument cluster line connector
X88	9-way general line - right side instrument cluster line connector

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REPLACEMENT

Move the machine to a level and firm ground.

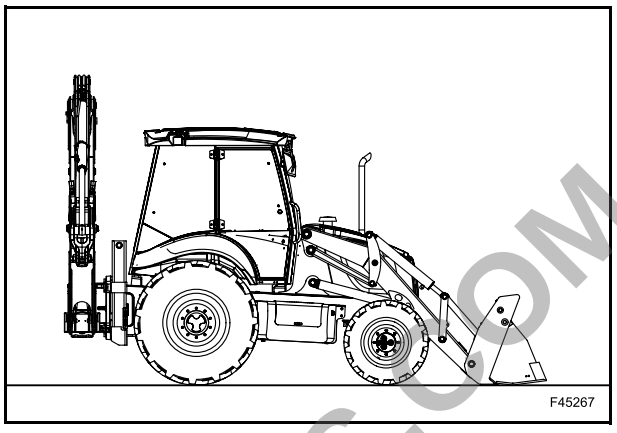
Lower the loader attachment to the ground.

Place the backhoe attachment in the road travel position.

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

Immobilize the machine by means of the parking brake.

Stop the engine and remove the starter key.



⚠ WARNING ⚠

Never reverse the battery terminals. Connect the positive cable to the positive terminal (+) and the negative cable to the negative terminal (-).

When disconnecting the battery cables, always disconnect the negative cable (-) first.

When reconnecting the battery cables, always connect the negative (-) cable last.

Never short-circuit the battery terminals with metal objects.

Never touch the battery terminals with your hands. This could generate an electrolysis inside the human body and damage the body's vital organs.

Place the battery switch in the OFF position.

Remove the battery master switch support (6) without disconnect the battery cables.

Remove the terminal covers and disconnect the cables, first from the negative terminal (1) then the positive terminal (2).

Remove the nuts and washers (3), the clamping bar (4) and the brackets (5) and remove the old battery.

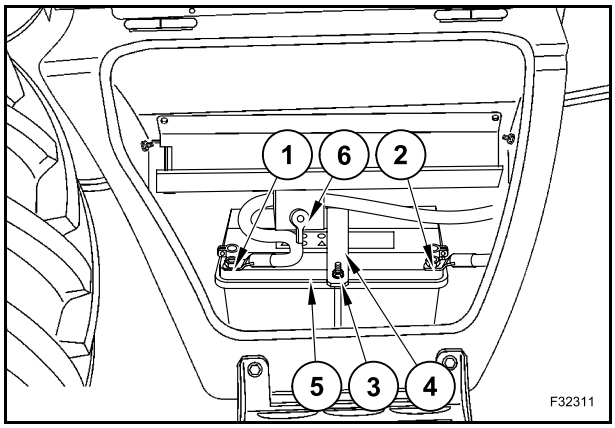
Install the new battery.

Install the brackets (5), the clamping bar (4) and the washers and nuts (3).

Clean the cables and the connecting terminals and coat them with grease.

Connect the cables, first to the positive terminal (2), then the negative terminal (1) and install the terminal covers.

Reassemble the battery master switch support (6).



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