

# SHOP MANUAL

---

---

---

# WB93R-5E0

**BACKHOE-LOADER**

SERIAL NUMBER

**WB93R-5E0 F60003** and up

**KOMATSU**  
*Utility*

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

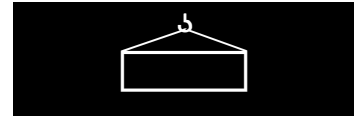
- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below




- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

# HOISTING INSTRUCTIONS



**⚠** Heavy parts (25 kg or more) must be lifted with a hoist etc. In the Disassembly and Assembly section, every part weighing 25 kg or more is clearly indicated with the symbol 

- If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
  - Check for removal of all bolts fastening the part to the relative parts.
  - Check for any part causing interference with the part to be removed.

## 2. Wire ropes

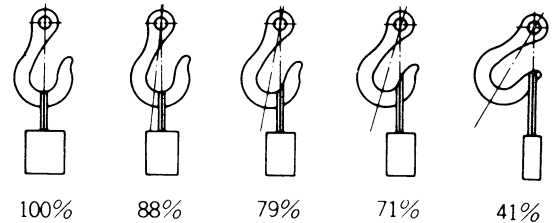
- Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

WIRE ROPES (Standard «S» or «Z» twist ropes without galvanizing)	
Rope diameter (mm)	Allowable load (tons)
10.0	1.0
11.2	1.4
12.5	1.6
14.0	2.2
16.0	2.8
18.0	3.6
20.0	4.4
22.4	5.6
30.0	10.0
40.0	18.0
50.0	28.0
60.0	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

- Sling wire ropes from the middle portion of the hook. Slings near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result.

Hooks have maximum strength at the middle portion.



- Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

**⚠** Slings with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can cause dangerous accidents.

- Do not sling a heavy load with ropes forming a wide hanging angle from the hook.

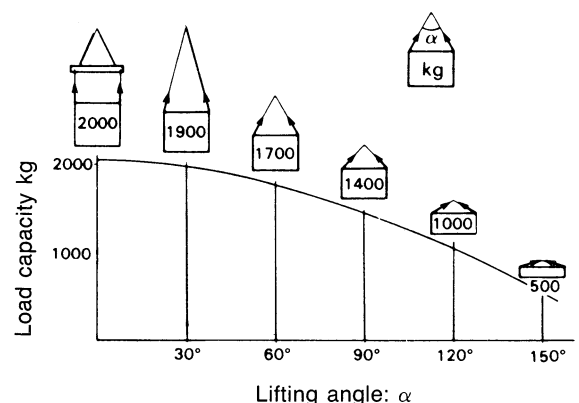
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles.

The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles.

When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended.

This weight becomes 1000 kg when two ropes make a 120° hanging angle.

On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



**From liter to U.S. Gall.**

1 ℓ = 0.2642 U.S. Gall.

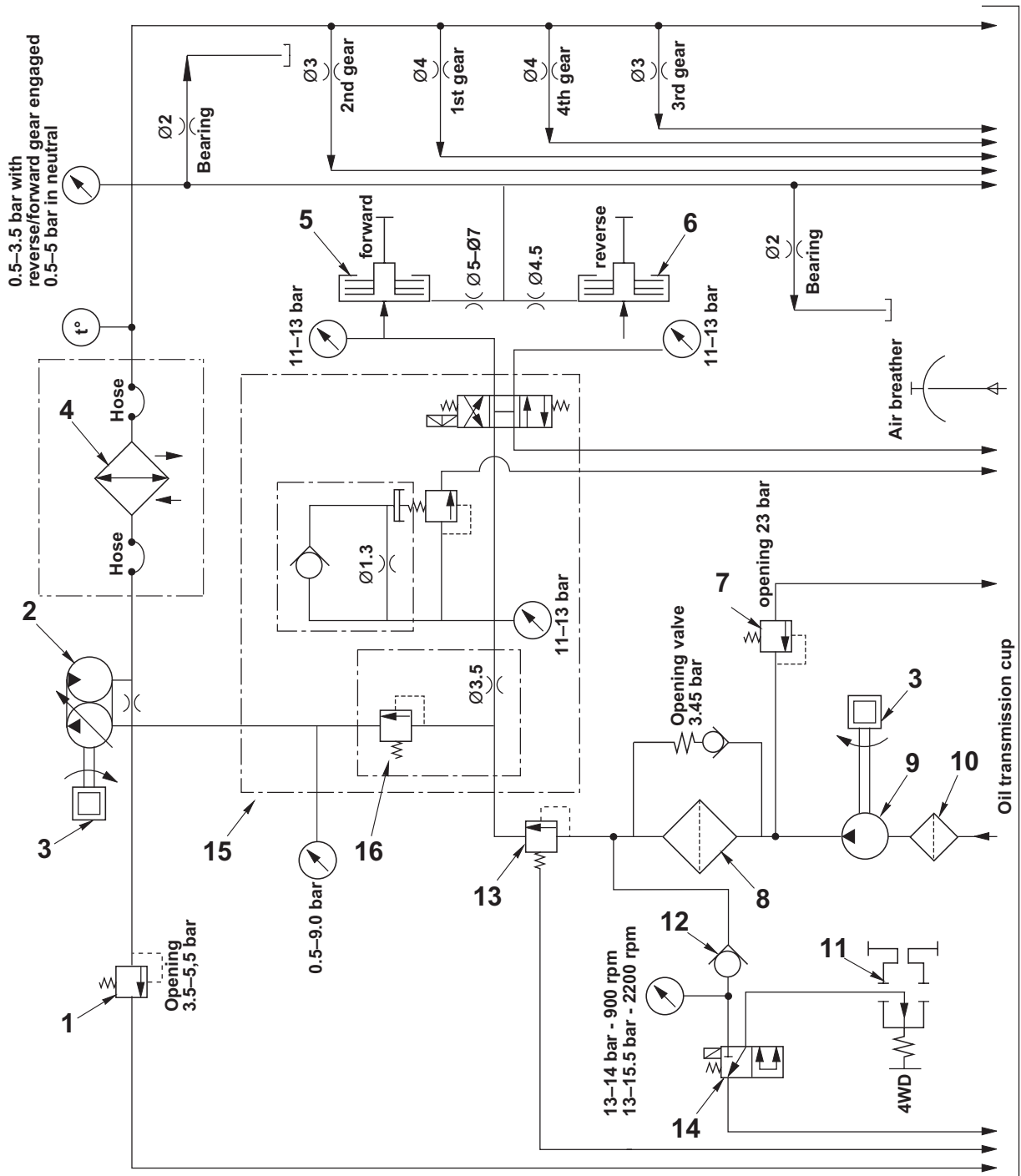
	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

**From liter to U.K. Gall.**

1 ℓ = 0.21997 U.K. Gall.

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.699	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	12.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

Hydraulic converter-transmission circuit diagram

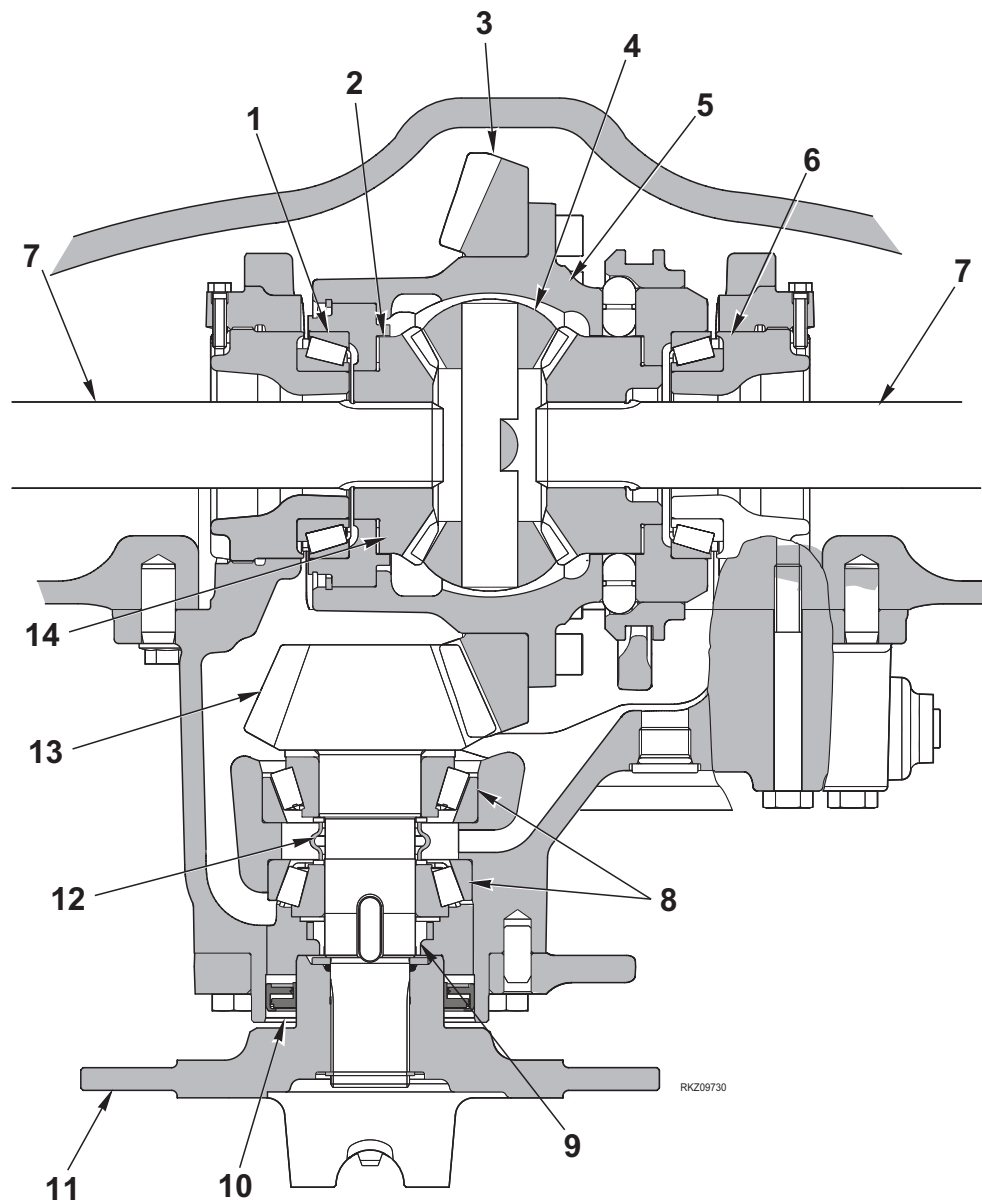


RKZ09630

- |                                       |   |
|---------------------------------------|---|
| 1. Converter pressurization valve     | 9. Pump                                       |
| 2. Converter                          | 10. Suction filter (250 µm)                   |
| 3. Diesel engine                      | 11. 4WD engagement device                     |
| 4. Oil cooler                         | 12. Check valve                               |
| 5. Forward clutch                     | 13. Pressure control                          |
| 6. Reverse clutch                     | 14. 4WD engagement solenoid                   |
| 7. Max. pressure valve: calib. 23 bar | 15. Control valve group                       |
| 8. Spin-on filter (10 µm)             | 16. Oil flow divider/pressure regulator valve |

## REAR AXLE

## Differential

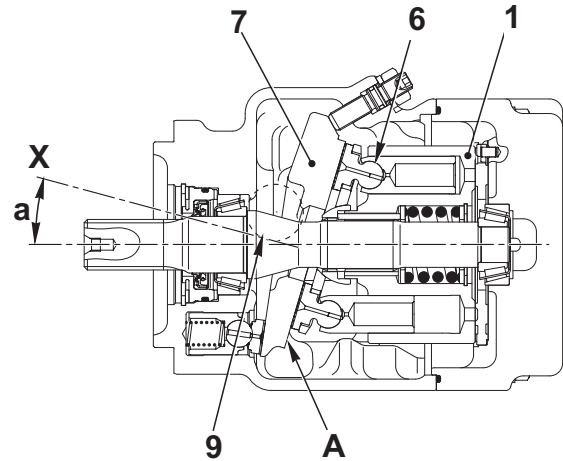


- |                         |                          |
|-------------------------|--------------------------|
| 1. Bearing              | 8. Bearing               |
| 2. Planetary gear       | 9. Ring nut              |
| 3. Ring gear (Z=32)     | 10. Gasket               |
| 4. Planetary gear       | 11. Flange               |
| 5. Differential housing | 12. Spacer               |
| 6. Ring nut             | 13. Bevel pinion (Z=13)  |
| 7. Half-axle            | 14. Differential housing |

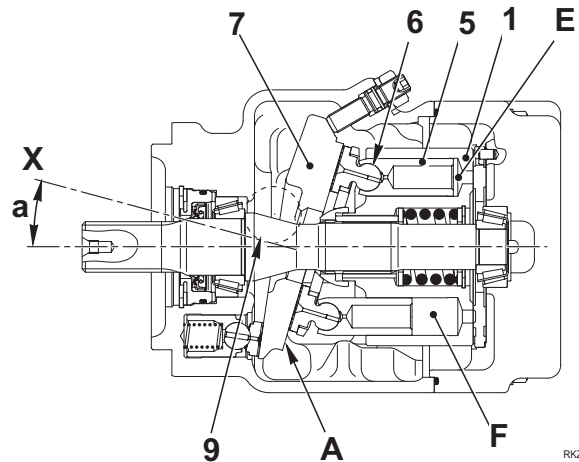
**OPERATION**

**1. Pump operation**

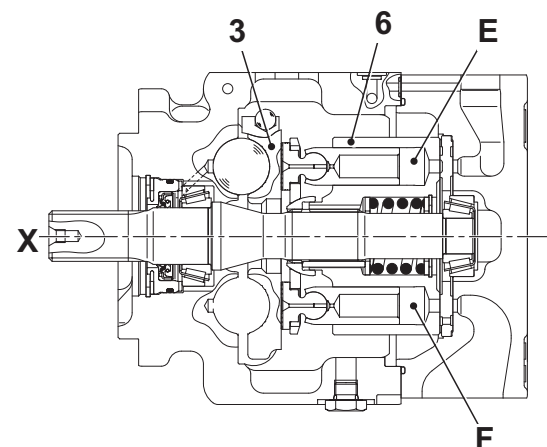
- 1 - The cylinder block (1) rotates with the shaft (2), and the shoe (6) slides on the flat surface **A**.  
When this happens, the swash plate (7) rotates on the ball (9), and the angle **a** between the axis of the cylinder block (1) and the axis **X** of the swash plate (3) changes. The angle **a** is known as the swash plate angle.
- 2 - When the axis **X** of the swash plate (7) retains the angle **a** in relation to the axis of the cylinder block (1), flat surface **A** acts as a cam for the shoe (6). This is why the piston (5) slides inside the cylinder block (1), creating a difference between volumes **E** and **F** and therefore causing the suction and delivery of oil in a quantity that is equivalent to the difference between those volumes ( $F-E = \text{delivery}$ ).  
In other words, when cylinder block (1) rotates, chamber **F** decreases in volume causing oil to be delivered to the circuits, while chamber **E** increases in volume causing oil to be suctioned. (The illustration shows the state of the pump when suction at chamber **F** and delivery at chamber **E** are complete).
- 3 - When the center line **X** of the swash plate (7) and the center line of the cylinder block (1) are perfectly aligned (the swash plate angle  $a = 0$ ), the difference between the volumes **E'** and **F'** within the cylinder block (1) becomes 0 and the pump does not take in or deliver any oil.
- 4 - In brief, the angle of the swash plate **a** is proportional to pump delivery.



RKZ09530

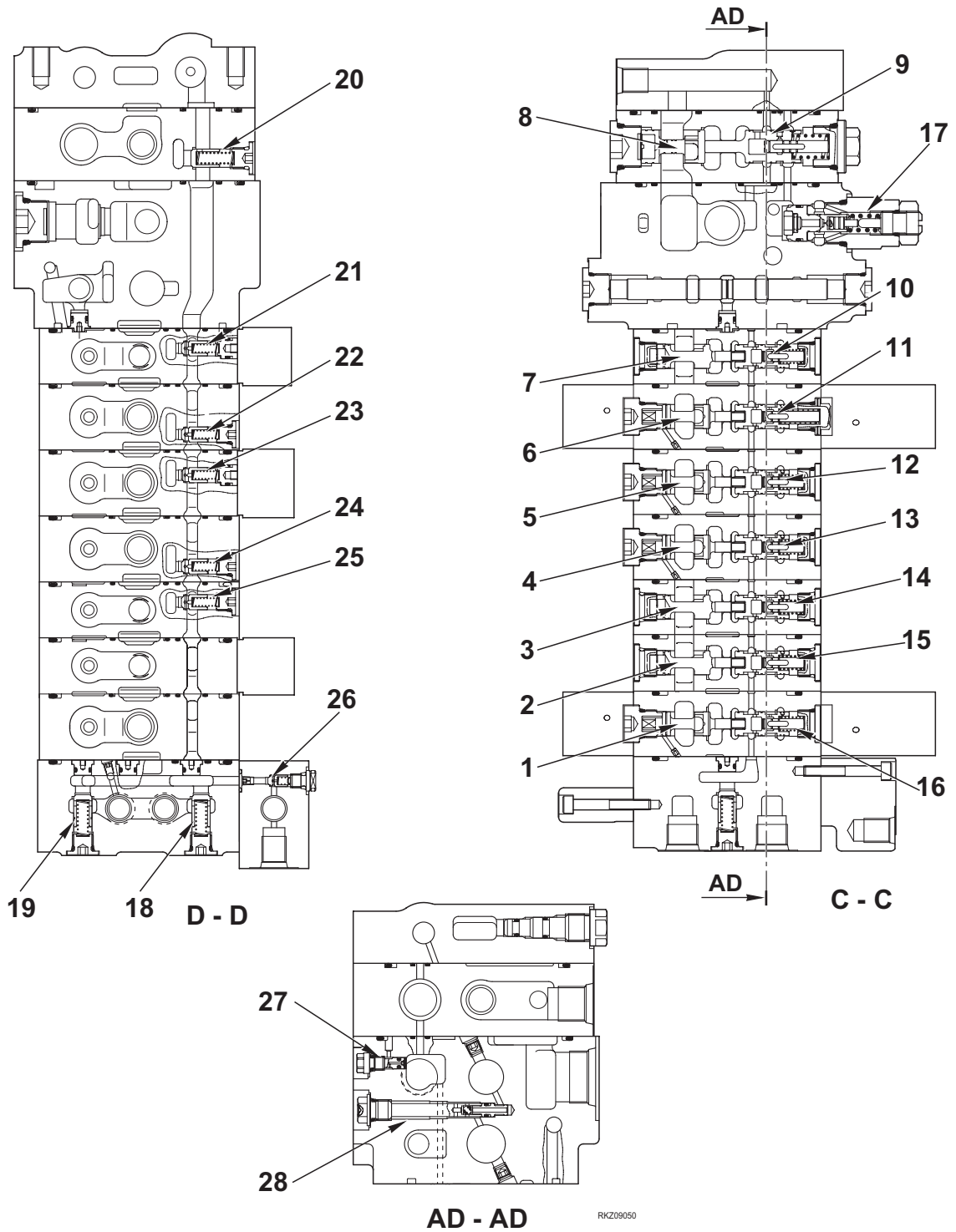


RKZ09540



RKZ09550

**PAGE INTENTIONALLY  
LEFT BLANK**



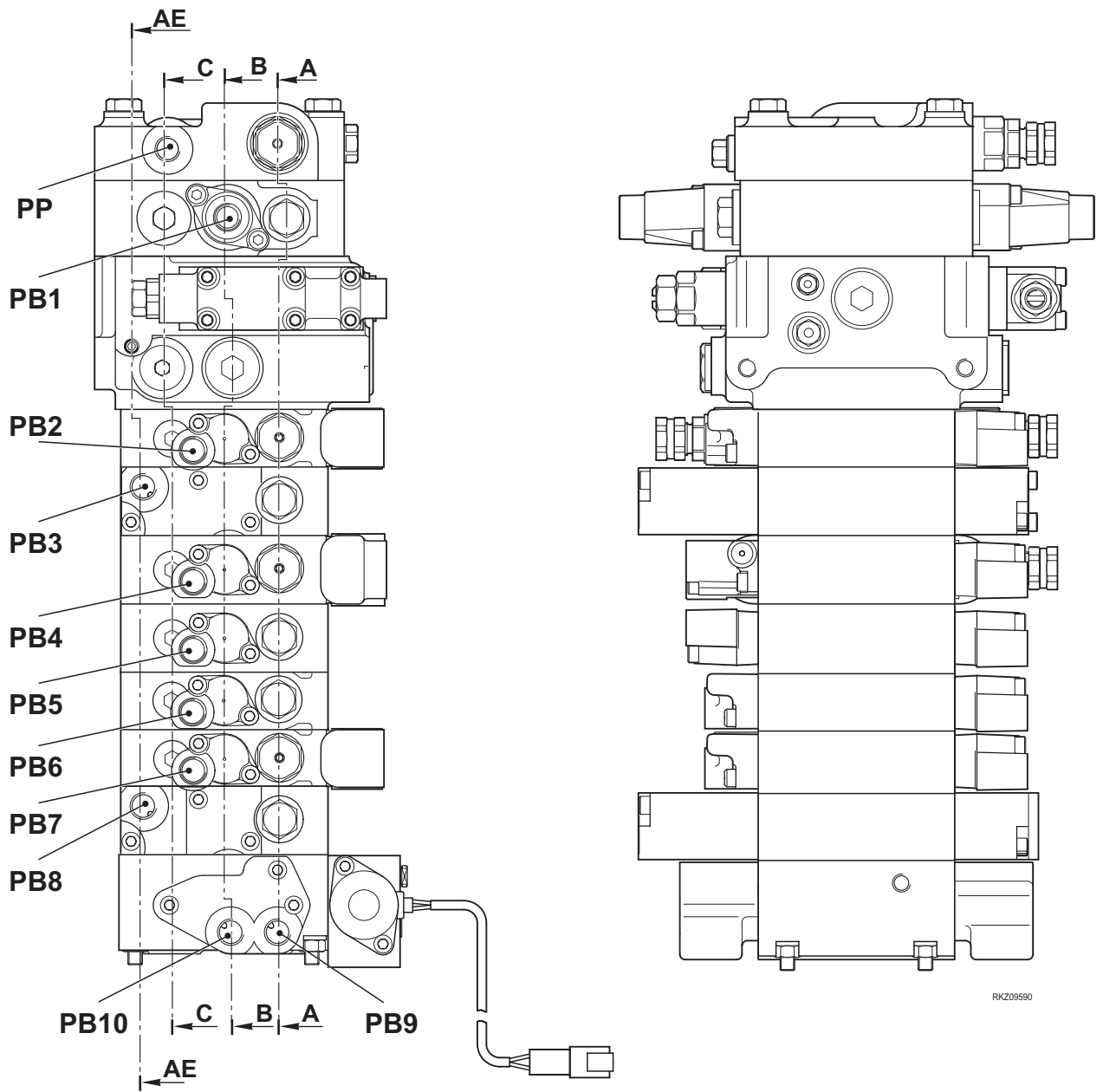
**PRESSURE REDUCING VALVE**

- 1. Shovel arm
- 2. Jig arm
- 3. 4 in 1 bucket
- 4. Backhoe bucket
- 5. Boom
- 6. Front bucket
- 7. Boom swing
- 8. Arm

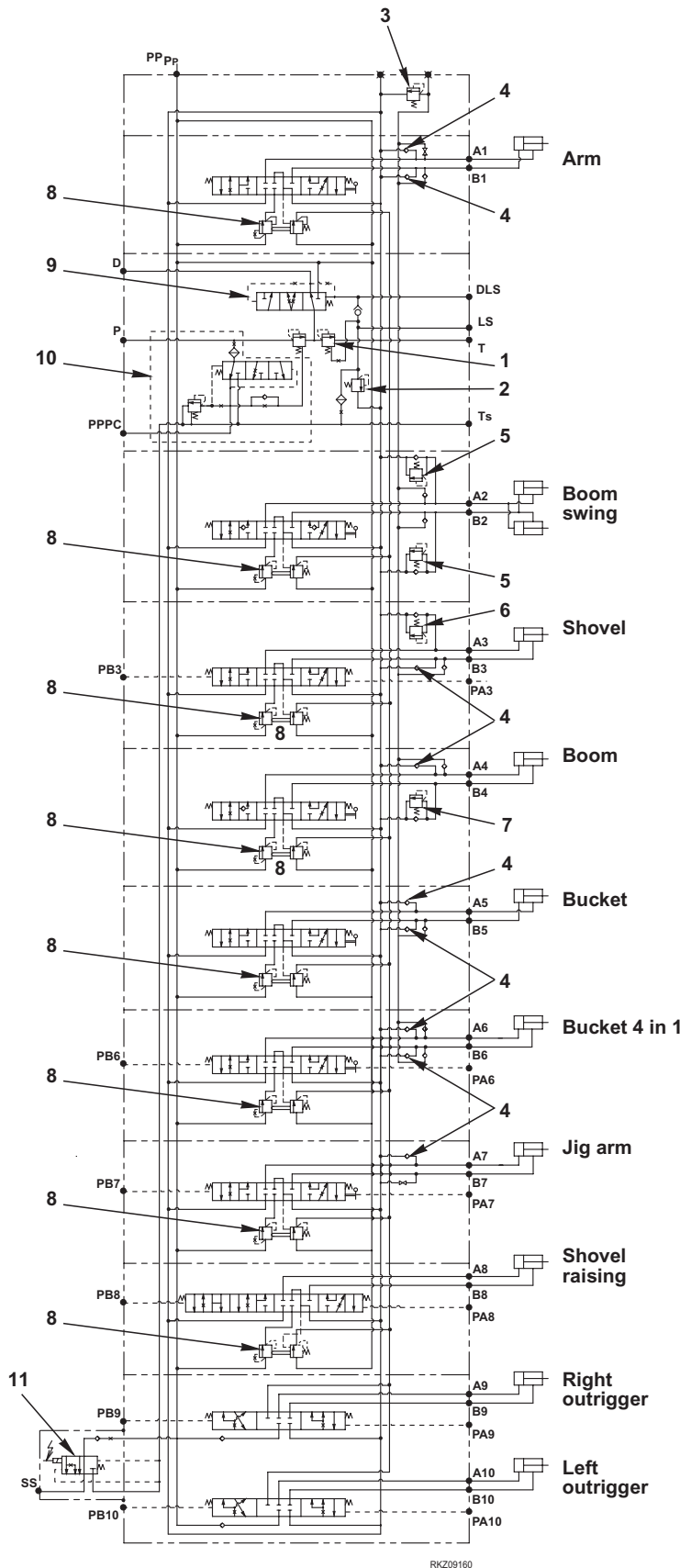
**DELIVERY CONTROL VALVE**

- 9. Arm
- 10. Boom swing
- 11. Front bucket
- 12. Boom
- 13. Backhoe bucket
- 14. 4 in 1 bucket
- 15. Jig arm
- 16. Shovel arm
- 17. Max. pressure valve
- 18. Check valve

- 19. Check valve
- 20. Check valve
- 21. Check valve
- 22. Check valve
- 23. Check valve
- 24. Check valve
- 25. Check valve
- 26. Check valve
- 27. LS, DLS pressure check valve
- 28. LS by-pass plug



3.1.1 10-spool mechanical control valve (with mechanical control)

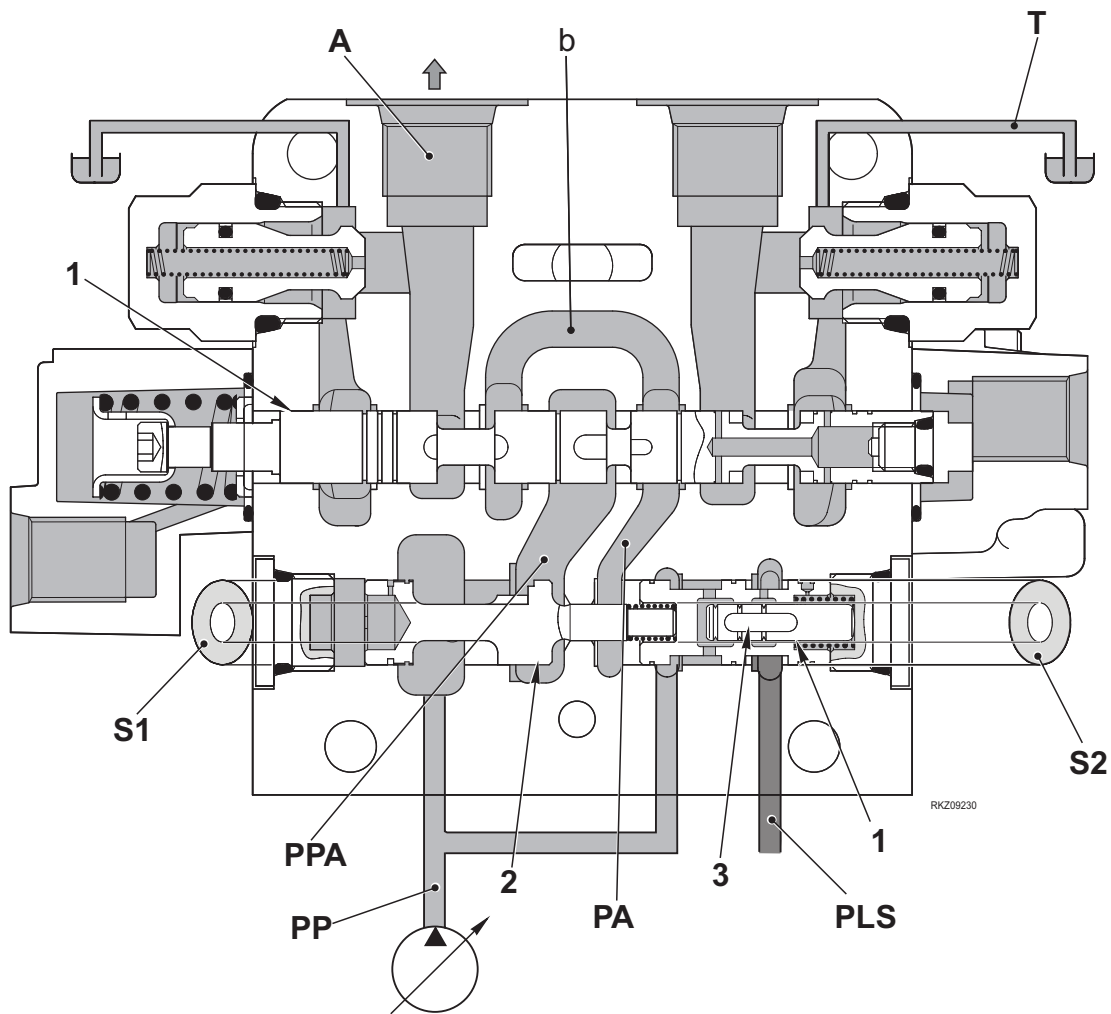


1. Unloading valve:  
pressure LS + 27.5 bar
2. Max. pressure valve: 218 bar
3. Safety valve: 270 bar
4. Check valve
5. Anti-shock/anticavitation valve: 215 bar
6. Anti-shock/anticavitation valve: 220 bar
7. Anti-shock/anticavitation valve: 350 bar
8. Pressure compensation valves
9. Priority valve
10. Servocontrols reducing valve
11. Backhoe plate lock valve

## 3.6 PRESSURE COMPENSATION VALVE SURFACE/SURFACE RATIO

## Function

- In order to equalize the characteristics of each actuator, the pressure compensation valve will determine the compensation characteristics by performing a micrometer adjustment of the surface ratio  $S1/S2$ . This is the ratio of area  $S1$  (delivery control valve (2) end) to area  $S2$  (pressure reducing valve (1) end).  
 $S1$  = surface of the delivery control valve (2) – Surface of piston (3).  
 $S2$  = surface of pressure reducing valve (1) – Surface of piston (3).

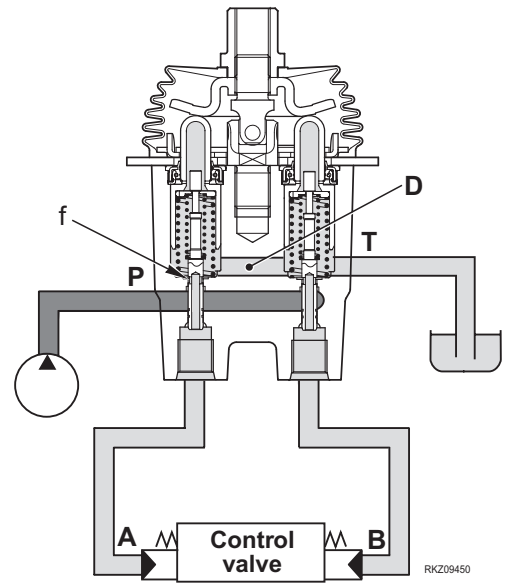
Surface ratio ( $S1:S2$ ) and compensation characteristics

- When the ratio is 1.00 :  
 $[ \text{Pump pressure } PP - \text{Pressure } PPA \text{ upstream of spool} ] \approx [ \text{Load Sensing } PLS \text{ pressure} - \text{Actuator } PA \text{ pressure} (= A) ]$   
 Delivery is distributed proportionally to the opening surfaces of the spool.
- When the ratio is greater than 1.00:  $PP - PPA > PLS - PA (= A)$   
 Delivery distribution is lower than the proportion of the opening surfaces of the spool.
- When the ratio is lower than 1.00:  $PP - PPA < PLS - PA (= A)$   
 Delivery distribution is higher than the proportion of the opening surfaces of the spool.

**OPERATION**

**1. Control lever in neutral position**

Control valve ducts **A** and **B** and PPC valve ducts **P1** and **P2** are connected to discharge chamber **D** by means of the calibrated hole **f** in spool (1).



**2. During fine control (NEUTRAL → Actuator)**

When the disk (5) starts pushing down on the piston (4), the retainer (9) moves as a result. This movement will compress the spring (2) which will in turn act on the spool (1) and push it downwards. As a result of this action, the calibrated hole **f** will be isolated from the discharge chamber **D** and at almost at the same time it will be put in connection with the **PP** chamber, which is directly connected to the servocontrols circuit.

Pressure in the servocontrols circuit will flow through the calibrated hole **f** and into the circuit thereby increasing the pressure in duct **P1-A**.

When pressure **P1** increases, spool (1) is pushed upwards, and calibrated hole **f** is connected back to discharge chamber **D** thereby compressing the spring (2).

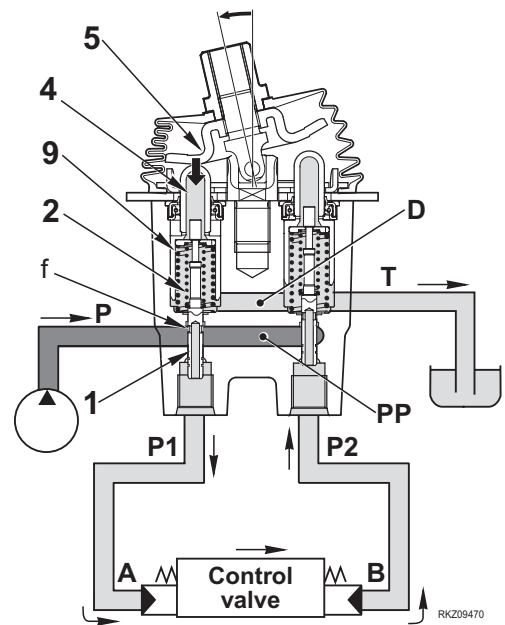
The floating of the spool (1) will continue until calibrated hole **f** is halfway between discharge chamber **D** and pressure chamber **PP**, in other words until the pressure in duct **P1** – the pressure acting on the section of stem (1) – offsets the force applied by the spring (2).

The spring (2) is compressed proportionally to the movement of the disk (5) and therefore, pressure at **P1** increases in proportion to the travel of the disk (5).

The equilibrium position is then kept until the position of piston (4) is changed, i.e.:

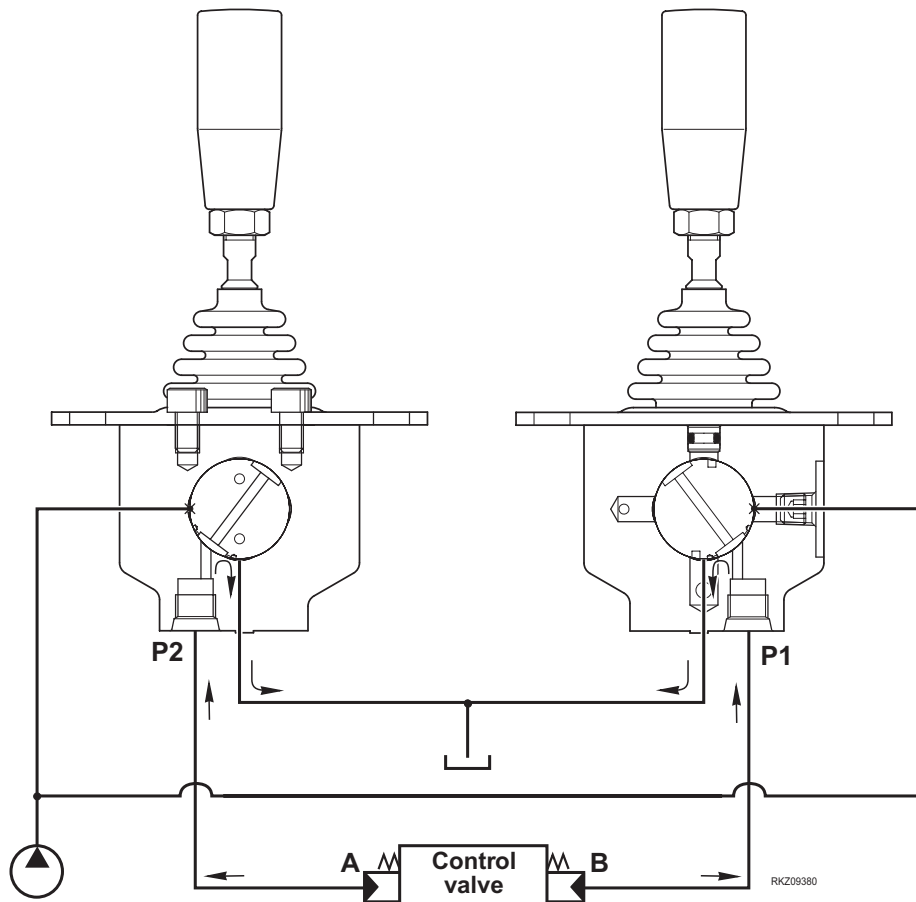
- a) as long as pressures at ports **A** and **P1** are perfectly balanced;
- b) until pressure in section **A-P1** – i.e. the pressure acting on stem (1) – is enough to counteract the force of the spring (2).

This ensures proportionality between control lever position, **A-P1** circuit pressure, and main control valve stem displacement.



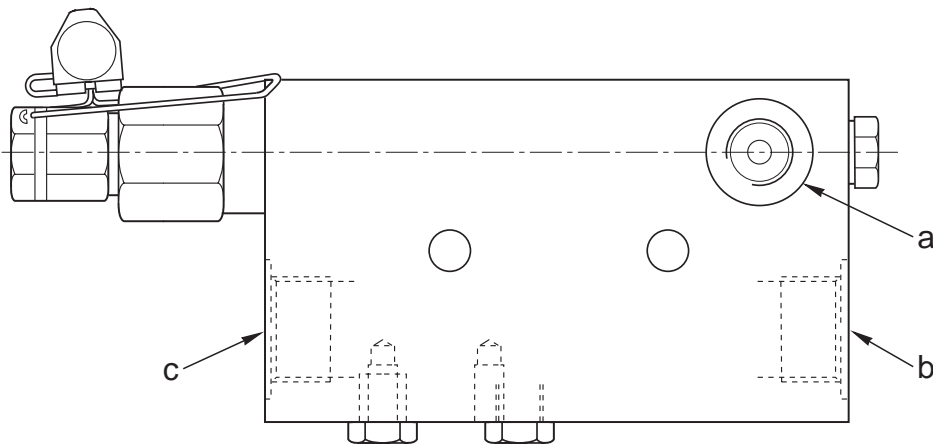
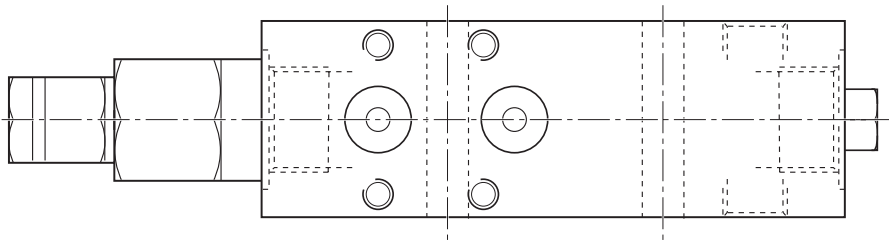
## OPERATION

## 1. Control lever in neutral position

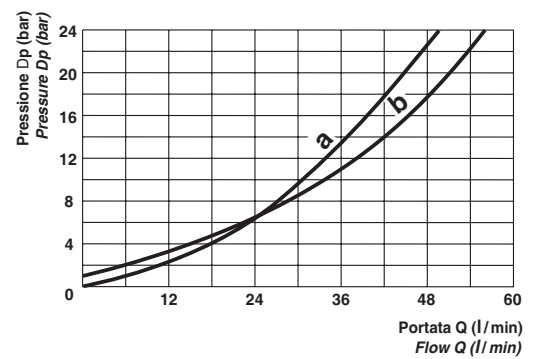


- Ports **A** and **B** of control valve and ports **P1** and **P2** of PPC valves are connected to the tank circuit.
- Hence, the spool is in neutral position.

SHOVEL DUMP



RKZ08060



RKZ08070

- a. Port PiL - To the dump cylinder (Bottom side)
- b. Port C2 - To the dump cylinder (Head side)
- b. Port V2 - From control valve (8-spool) (B3 port)

**CHARACTERISTICS**

Safety valve calibration: 220 ± 10 bar

## HOW THE AIR-CONDITIONING UNIT FUNCTIONS

The compressor (1) is driven directly by the engine shaft by means of a belt, and made to rotate by a pulley fitted with an electromagnetically-engaged clutch (1a).

A thermostatic sensor (7) controls the engagement and disengagement of the clutch. It disengages the clutch when the evaporator reaches the lower temperature limit and engages the clutch when the evaporator reaches the upper temperature limit.

The coolant fluid (in gaseous phase) is drawn into the compressor where it is subjected to compression and an intense heating process. In these conditions the fluid is then sent into the condenser (2) where, due to the heat extracted by ambient temperature air flowing over fins, it reaches condensation temperature, and passes into a high-pressure liquid state.

Subsequently the coolant passes into the drying-filter group (3) which performs three functions: it filters out impurities, absorbs any moisture present in the circuit and, finally, also functions as a reserve tank.

The coolant in its liquid state is then transferred to the evaporator (6), first passing through an expansion valve (5). The task of this valve is the constant metering of the quantity of fluid in order to maintain optimum evaporation.

In the evaporator the coolant fluid is subjected to expansion, bringing it up to the critical evaporation point at a temperature of approximately  $-8^{\circ}\text{C}$ .

The flow of air generated by centrifugal fan (8) which passes through the evaporator (6) at ambient temperature is considerably warmer than  $-8^{\circ}\text{C}$ . For this reason it yields heat to the coolant fluid, bringing it up to boiling point and complete evaporation.

On leaving the evaporator (6) the coolant is drawn once more into the compressor (1) and a new cycle commences.

The yielding of heat from the atmosphere in which the evaporator is positioned leads to the condensation of the water suspended in the air, and hence to dehumidification. The condensate is deposited on the evaporator fins where, if a temperature higher than  $0^{\circ}\text{C}$  is not maintained, it freezes and inhibits the functioning of the evaporator.

The task of keeping the temperature of the evaporator above  $0^{\circ}\text{C}$  (and thus within the optimum limits for heat exchange) is entrusted to a thermostatic sensor (7).

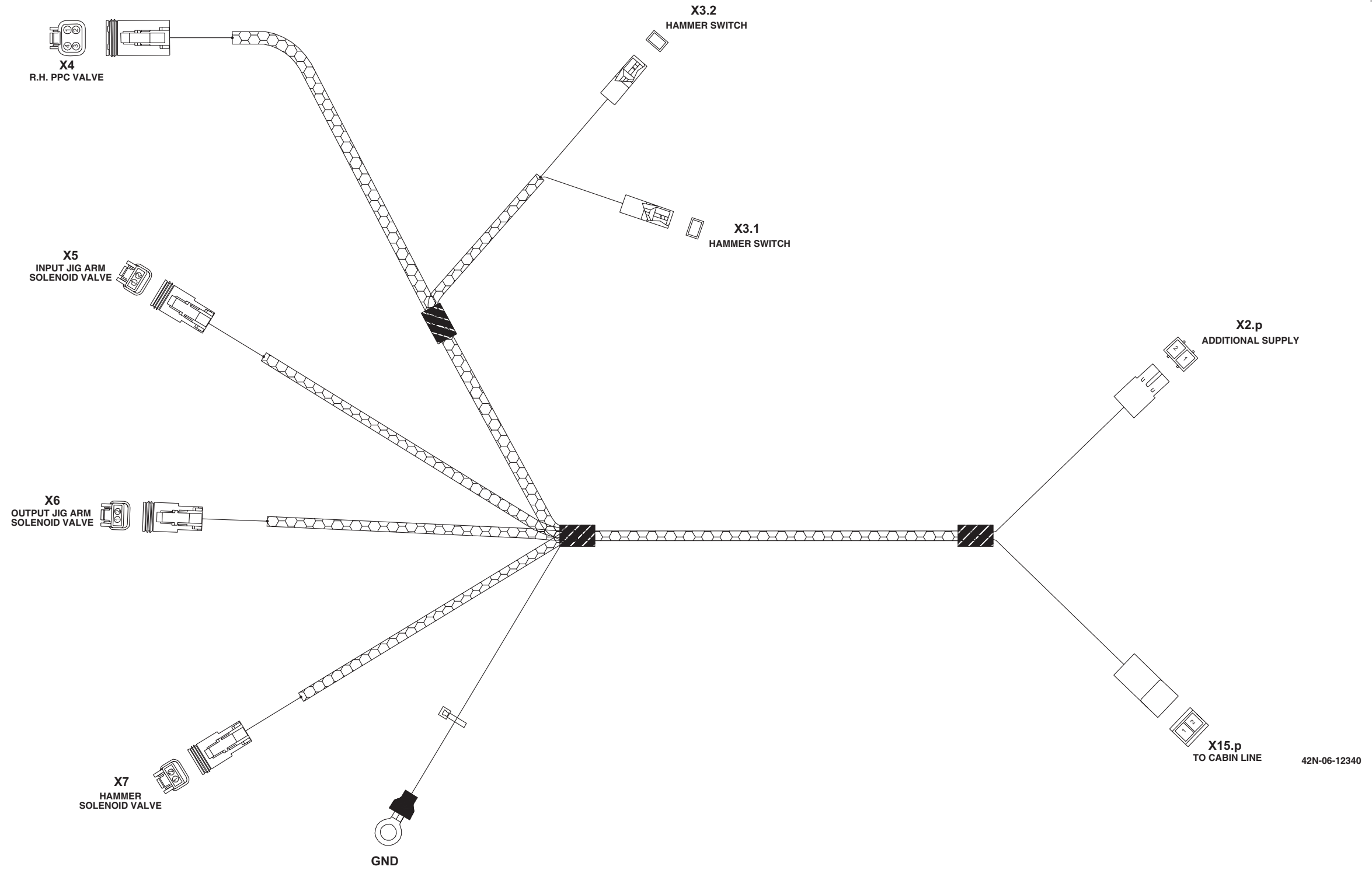
The condensate that forms on the evaporator fins (6) also contains dust, pollens and particles suspended in the air. Continual condensation therefore effectively purifies the air, and the droplets of condensate are discharged to the exterior.

A fixed quantity of anti-freeze oil is also introduced into the circuit, with the function of lubricating all the mechanical parts of the unit. A percentage of this oil circulates constantly throughout the unit in nebulized form, lubricating the compressor (pistons and bearings) and the expansion valve.

A pressure switch (4) has been inserted in the electrical control circuit to protect the unit in the case of a lack of coolant fluid or if the quantity becomes insufficient due to leakages. This switch will inhibit the engagement of the electromagnetic clutch and hence the functioning of the air-conditioning unit.

# JIG ARM WIRING

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----



★ The technical data of follow table are referred to a machine with max. 500 kg shovel, 600 mm (max. 160 kg) backhoe bucket and standard arm (or jig arm) closed.

**MACHINE WITH BACKHOE MECHANICAL CONTROLS**

Machine model				WB93R-5E0		
Classification	Check item	Test conditions	Unit	Standard value	Normal value	
Hydraulic drift working equipment	Backhoe	Measuring posture: see Fig. F <ul style="list-style-type: none"> <li>Oil temperature: 45–55 °C</li> <li>Backhoe balanced on the guides bucket in transport condition.</li> <li>Fully retract arm and bucket cylinder Lift the bucket fulcrum pin 1 m off the ground and swing boom to bottom of stroke in either direction.</li> <li>Move the machine on a slope of 15° and apply the parking brake.</li> <li>Stop the engine and, after 1 minute, check the inner cylinder feed back opposite to the boom every 5 min. for a total of 15 minutes.</li> <li>Perform the above test on both swing directions.</li> </ul>	mm	15	15	
		Measuring posture: see Fig. G <ul style="list-style-type: none"> <li>Oil temperature: 45–55 °C</li> <li>Backhoe balanced.</li> <li>Boom and arm cylinders in, bucket cylinder out</li> <li>Outriggers at maximum extension.</li> <li>Engine stopped</li> <li>Check the frame lowering for each side every 5 min. for a total of 15 minutes.</li> </ul>		7	15	
Cylinder leaking	Shovel	Boom	<ul style="list-style-type: none"> <li>Engine: Max. speed</li> <li>Oil temperature: 45–55 °C</li> <li>Leaking check: on the cylinder opposite side to the pressure one.</li> <li>Check 1 cylinder at a time.</li> <li>For arm shovel, shovel and for swing, check the two cylinders separately.</li> </ul>	cm <sup>3</sup> /min	2,0 (each cylinder)	Max. 8,0
		Shovel			1,6 (each cylinder)	Max. 6,0
	Backhoe	Boom			3,3	Max. 13,5
		Arm			3,0	Max. 12,0
		Bucket			2,4	Max. 9,5
		Boom swing			3,2	Max. 13,0
		Outriggers			3,3	Max. 13,5
		Side digging boom			2,0	Max. 8,0
		Jig arm			1,6	Max. 6,0

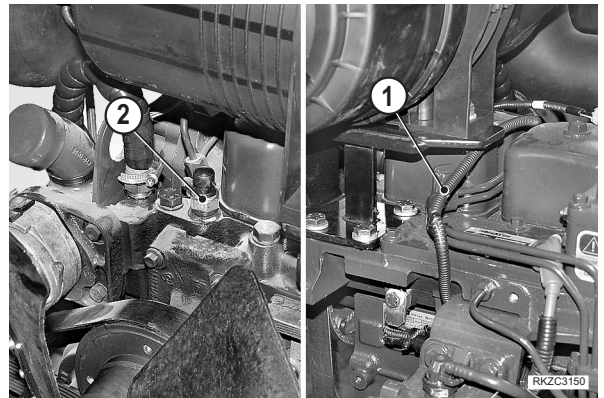
★ The technical data of follow table are referred to a machine with max. 500 kg shovel, 600 mm (max. 160 kg) backhoe bucket and standard arm (or jig arm) closed.

VEHICLE WITH SERVOCONTROLS

Machine model				WB93R-5E0		
Classification	Check item	Test conditions	Unit	Standard value	Normal value	
Work equipment speed	Shovel	Arm shovel Cylinders fully out ⇕ Shovel at the ground	Lifting	3,6	3,1–4,1	
			Lowering	2,6	2,2–3,0	
		shovel Cylinders fully out ⇕ Cylinders fully in	Curl	2,3	2,0–2,6	
			Dump	2,8	2,4–3,2	
		Backhoe	Boom Cylinders fully in ⇕ Teeth bucket on level ground	Lifting ●	2,7	2,3–3,1
				Lowering	2,0	1,7–2,3
	Arm Cylinders fully in ⇕ Cylinders fully out		Opening	3,8	3,2–4,3	
			Closing ●	4,4	3,7–5,1	
	Bucket Cylinders fully in ⇕ Cylinders fully out		Dump	2,4	2,0–2,8	
			Curl	3,1	2,6–3,6	

## VALVE CLEARANCE ADJUSTING

- 1 -Park the machine on solid, level ground, apply the parking brake, and remove the ignition key.
- 2 -Remove the intake filter and muffler.  
(For details see "30 REMOVAL AND INSTALLATION").
- 3 -Release from straps and disconnect the wiring harness (1) of the coolant liquid temperature sensor (2).
- 4 -Adjust valve clearance according to the instructions provided in the engine shop manual (code WEBMNEF001).



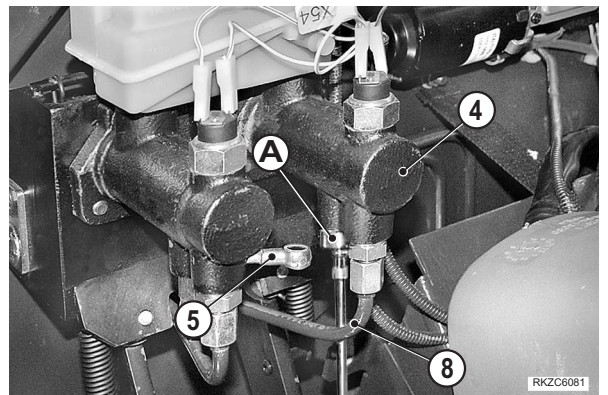
• **Checking individual pumps**

1 -Remove the front lining (3).

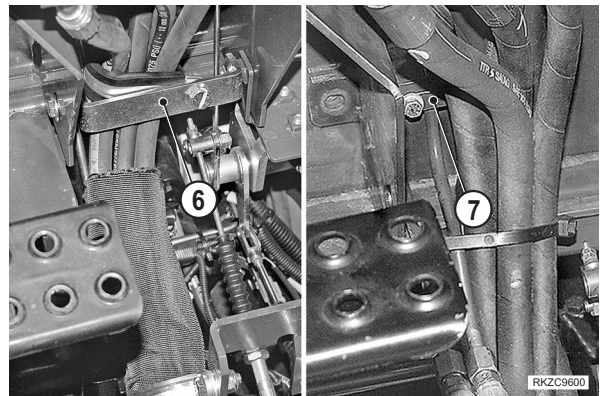


2 -Disconnect the pressure equalizer hose (5) from the brake circuit pump (4) that is being inspected.

3 -Seal the hole of the equalizer (plug "A").



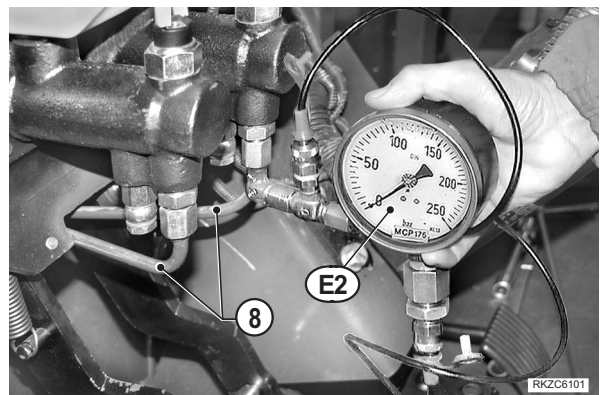
4 -Remove the bracket (6) and the clamp (7).



5 -Disconnect the delivery hoses (8) from the pump that is being tested. Connect a pressure gauge E2 (250 bar) to the pump during the inspection.

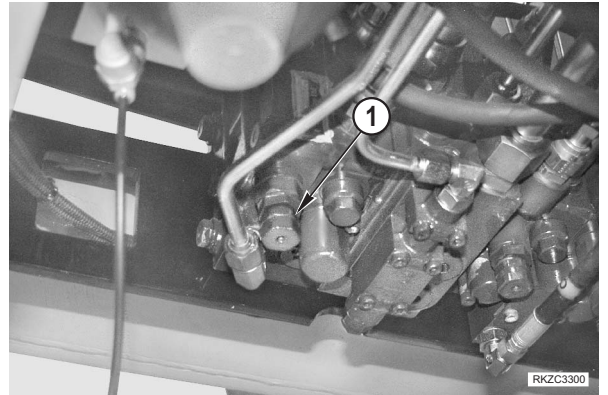
6 -Apply the brake pedal corresponding to the pump and pressurize the circuit to approx. 120 bar.

★ Do not exceed maximum permitted pressure (150±5 bar).



- **Adjusting secondary valves (for boom swing, shovel dump, hammer, and boom raise movements)**


1 -Loosen nut (1)

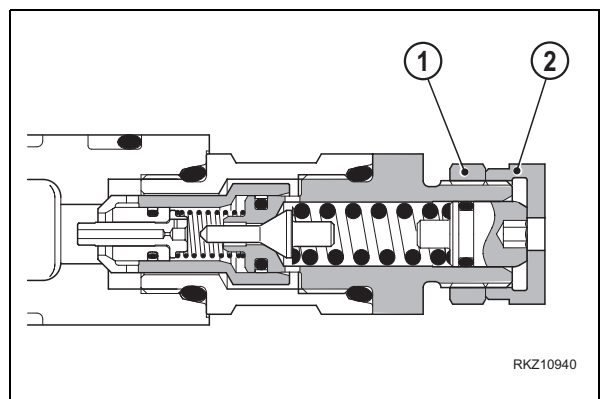


2 -Adjust the pressure using the nut (2).

- To INCREASE pressure turn in CLOCKWISE direction.
- To DECREASE pressure turn in COUNTERCLOCKWISE direction.

3 -Tighten nut (1) while holding nut (2).

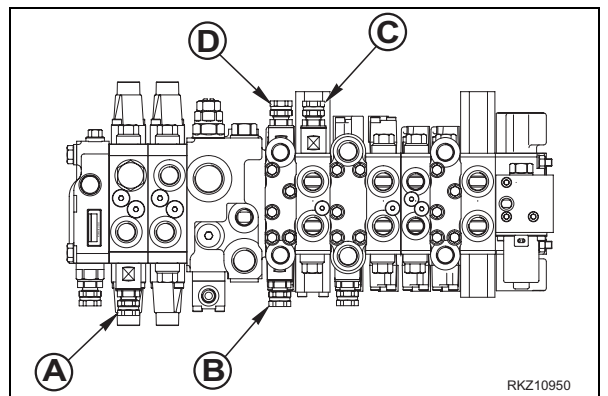
 Nut (1): 39-49 Nm



- **Adjusting the secondary valve (for arm in, shovel loading, backhoe bucket loading, boom raise, and 4-in-1 bucket movements)**

1 -Loosen nut (1).


- A** = hammer secondary valve
- B** = LH swing secondary valve
- C** = shovel dump secondary valve
- D** = RH swing secondary valve

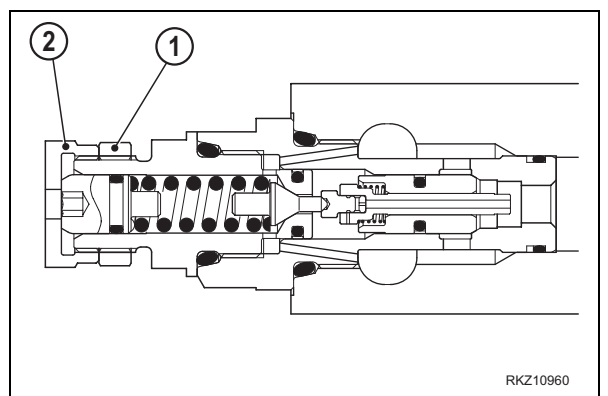


2 -Adjust the pressure using the nut (2).

- To INCREASE pressure turn in CLOCKWISE direction.
- To DECREASE pressure turn in COUNTERCLOCKWISE direction.

3 -Tighten nut (1) while holding nut (2).

 Nut (1): 39-49 Nm

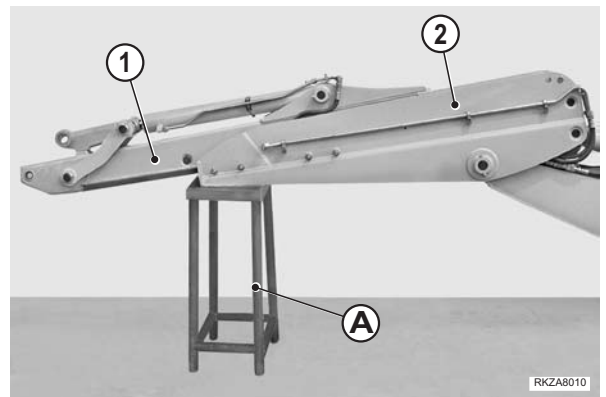


## JIG ARM CLEARANCE ADJUSTMENT

**⚠** Use the procedure described below at each replacement of the lower guide shoes.

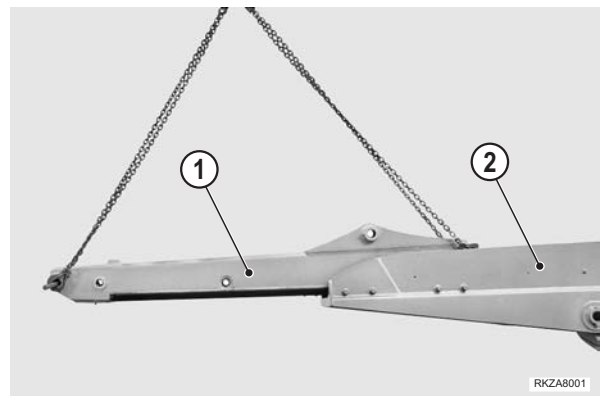
★ Conditions for the adjustment:

- Working equipment removed.
- Arm on stand "A" (height: 80 cm).
- Jig arm sliding cylinder engaged with the 2nd arm.
- Guides lubricated with NLG11 grease

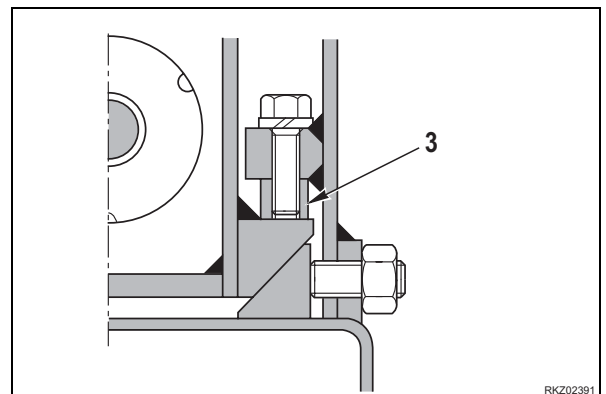


### • Guide adjustment

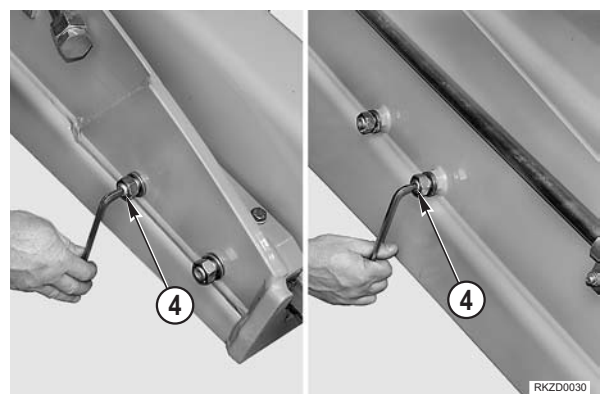
1 - Connect the 2nd arm (1) to some hoisting tackle; introduce the 2nd arm into the fixed arm (2) and push it down to the end of back travel.



2 - Raise the arm (1) until it contacts the upper guide shoes (3).



3 - Tighten or loosen the adjusting dowels (4) on both sides of the arm to centre the 2nd arm (1) in relation to the fixed arm (2).



**2. Checking the unit**

Check the unit after the point 1., 2., 3., 4. and 6. of the precedent paragraph.

A diagnosis of faults in the unit is based on the working pressures.

When the pressures do not fall within the values given in the following table, the causes must be sought by checking the high-pressure (H.P.) and low pressure (L.P.) pressure gauges.

Outside Temperature (°C)	Unit with R134a			
	L.P. (kg/cm <sup>2</sup> )		H.P. (kg/cm <sup>2</sup> )	
	Min.	Max.	Min.	Max.
20	1,2	2,5	6,0	9,0
25	1,0	2,5	7,5	10,5
30	1,1	2,4	9,5	13,0
35	1,3	2,4	12,0	15,5
40	1,5	1,8	18,0	18,8
45	1,8	1,9	21,5	22,0

The following conditions may be found:

Conditions	Causes - Faults
<b>L.P. high - H.P. normal or low</b>	<ul style="list-style-type: none"> <li>• Electromagnetic pulley that slips or does not engage correctly</li> <li>• Expansion valve blocked in open position</li> <li>• Compressor damaged</li> </ul>
<b>L.P. low - A.P. high or normal</b>	<ul style="list-style-type: none"> <li>• Expansion valve blocked in closed position or obstructed</li> <li>• Filter saturated with moisture</li> <li>• Obstruction in the L.P. line or in the H.P. line between the filter and the evaporator L.P.</li> </ul>
<b>L.P.normal - H.P. normal</b>	<ul style="list-style-type: none"> <li>• Infiltration of hot air into the evaporator group, the pipes or the cab</li> <li>• Hot air circulating in the heating group</li> <li>• Formation of ice on the evaporator</li> </ul>
<b>L.P. high - H.P. high</b>	<ul style="list-style-type: none"> <li>• Normal condition with very high ambient temperature (higher than 43°C)</li> <li>• Excess coolant (30÷35% more)</li> <li>• Overheating of condenser</li> <li>• Air present in the unit</li> <li>• Obstruction in the H.P. line between the compressor and the condenser-filter tube, behind the measurement point of the H.P</li> </ul>
<b>L.P. normal or low - H.P. low</b>	<ul style="list-style-type: none"> <li>• Normal condition with very low temperature (lower than 5°C)</li> <li>• Lack of coolant (70 - 75% less) (probable leakages)</li> <li>• Obstruction in the H.P. line between the compressor and the condenser-filter tube, before the measurement point of the H.P.</li> <li>• Compressor damaged</li> </ul>
<b>L.P. roughly equal to H.P.</b>	<ul style="list-style-type: none"> <li>• Compressor belt missing</li> <li>• Electromagnetic pulley that slips or does not engage</li> <li>• Compressor damaged</li> </ul>

**REAR AXLE CHECKING AND TROUBLESHOOTING**

<b>Ring gear tooth broken at the outer side</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Excessive gear load compared to the one foreseen	Replace bevel gear set Adjust bevel gear set freebacklash
Incorrect gear adjustment (excessive backlash)	
Pinion nut loosened	
<b>Ring gear tooth broken side</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Load bump	Replace bevel gear set Adjust bevel gear set freebacklash
Incorrect gear adjustment (insufficient backlash)	
Pinion nut loosened	
<b>Pinion or ring gear teeth or worn</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Insufficient lubrication; contaminated oil; incorrect lubrication or depleted additives	Replace bevel gear set. Use correct lubrication, fill up to the right level and substitute at recommended intervals Use correct lubricants, fill up to the right levels and replace according to the recommended program.
Worn out pinion bearings	
<b>Overheated ring and pinion teeth</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Prolong ed functioning at high temperatures	Replace bevel gear set. Use correct lubrication, fill up to the right level and substitute at recommended intervals
Insufficient lubrication; contaminated oil; incorrect lubrication	
<b>Pinion teeth pitting</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Excessive use axial pinion	Replace bevel gear set. Use correct lubrication, fill up to the right level and substitute at recommended intervals
Insufficient lubrication	
<b>Axle beam body bent</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Vehicle over loaded	Replace axle beam body
Vehicle's accident	
Load bump	
<b>Worn out or pitted bearings</b>	
<b>CAUSES</b>	<b>REMEDY</b>
Insufficient lubrication; contaminated oil	Replace bearings. Use correct lubrication, fill up to the right level and substitute at recommended intervals
Excessive use axial pinion	
Normal wear out	
Pinion nut loosened	

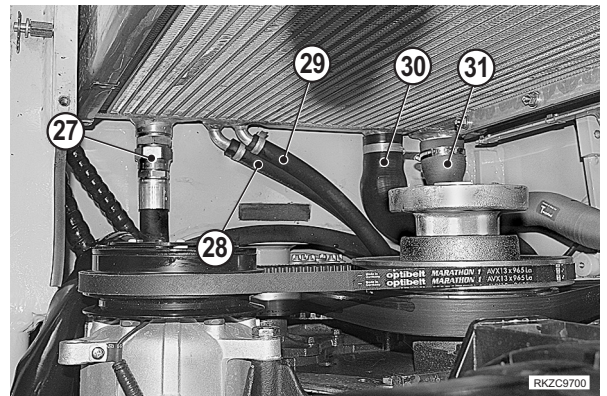
## SPECIAL TOOLS

Nature of work	Symbol	Code	Name	Q.ty	
Removal of piston pump	B	1	Pump support tool	1	
Removal of transmission		2	Transmission support tool	1	
Disassembly - assembly front axle	D	1	CA715655	Plunger	1
		2	CA119097	Plunger	1
		3	CA715360	Plunger	1
		4	CA715035	Plunger	1
		5	CA715026	Plunger	1
		6	CA715077	Plunger	1
		7	CA715034	Plunger	1
		8	CA715163	Plunger	1
		9	CA119043	Plunger	1
		10	CA715779	Plunger	1
		11	CA715164	Plunger	1
		12	CA119030	Ring nut spanner wrench	1
		13	CA119230	Plunger	1
		14	CA119099	Closed end wrench	1
		15	CA715170	Closed end wrench	1
		16	CA119225	Plunger	1
		17	CA715023	False pinion	1
		18	CA119182	False differential box	1
		19	CA119206	False differential box	1
		20	CA715179	Plunger	1
		21	CA715701	Plunger	1


16 -Disconnect following pipes:

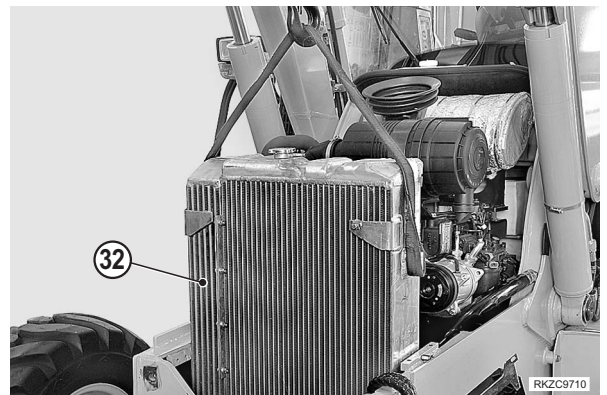
- (27) - hydraulic oil inlet
- (28) - transmission oil outlet
- (29) - transmission oil inlet
- (30) - coolant inlet
- (31) - air inlet (from turbocharger)

- ★ Mark the position of pipes (28) and (29) connect.
- ★ Plug pipes, hoses and holes immediately to prevent contamination and leak of oils.



17 -Connect the radiators group (32) to some hoisting equipment and remove it. [\*2] [\*3]

 Radiator group assy.: 37 kg [\*4]



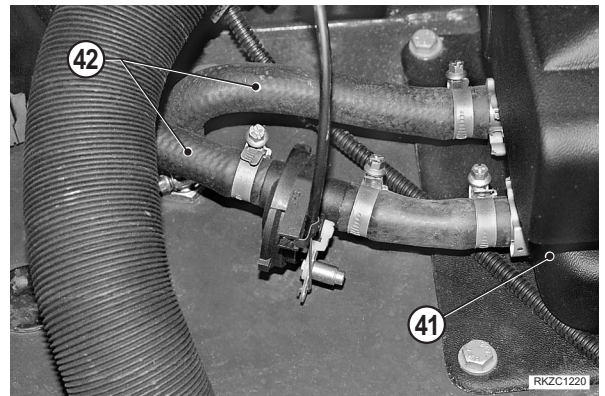
- 5 -Remove the muffler (10)  
(For details see "MUFFLER").
- 6 -Remove the turbocharger according to the instructions provided in the engine manual (manual code WEBMNEF001).



### Installation

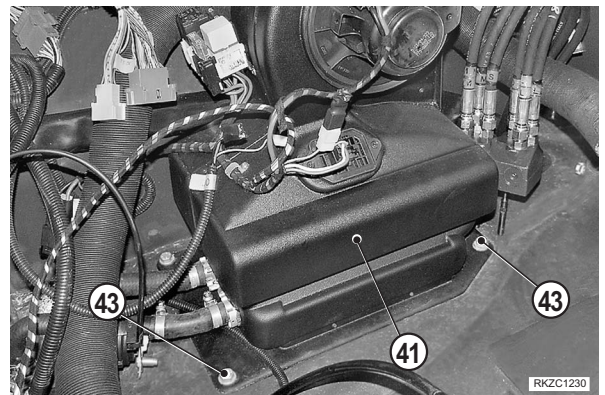
- To install, reverse removal procedure.

- 31 -Disconnect the heating system liquid inlet and outlet pipes (42) from the oil cooler (41).



### OIL COOLER GROUP

- 32 -Loosen and remove the four screws (43) and remove the group.



### Installation

- 1 - Refill the coolant liquid.



Coolant liquid: approx. 14 l

- 2 -Drain and refill the air-conditioning unit.



Quantity of fluid (R134a): 2250 ±150 g  
Quantity of oil: see the amount recovered.

- 3 -Start the engine and use a leak detector to check the leaktightness of the air-conditioning unit.
- 4 -Complete installation by reversing the removal procedure.

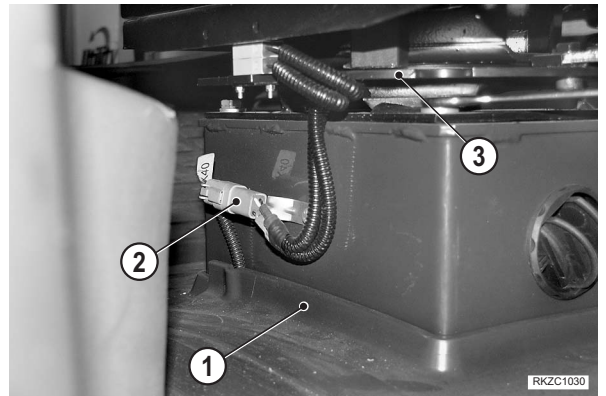
## STEERING UNIT

### Removal

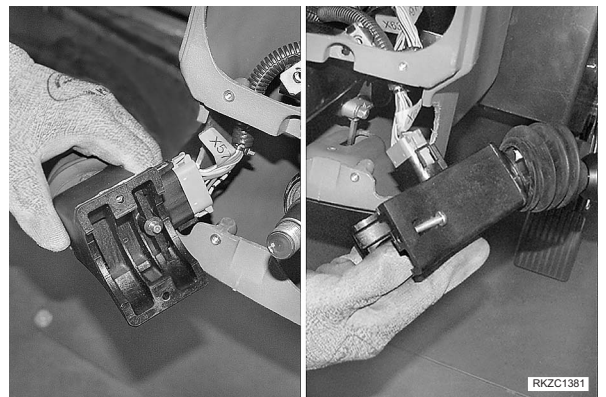
- ⚠** Lower the working equipment completely until it rests on the ground.  
Engage the parking brake, stop the engine and remove the ignition key.
- ⚠** Eliminate residual pressure from all circuits by moving all control levers in all directions.

1 -Remove the front mat (1).

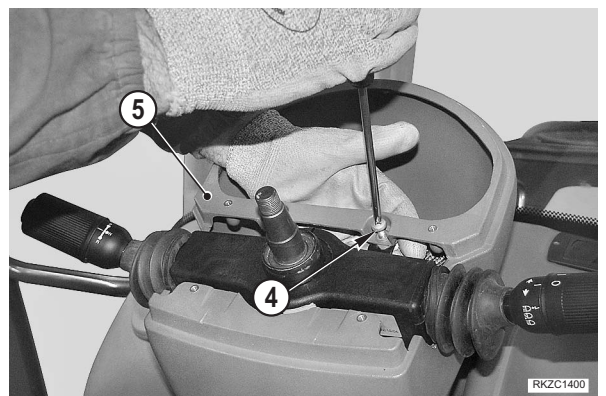
2 -Disconnect the connector (2) and remove the seat (3).



3 -Remove the steering wheel and the direction indicator, transmission reverse and headlight dipper beam control groups  
(For details, see "STEERING WHEEL AND TRANSMISSION-REVERSE, DIRECTION INDICATOR AND HEADLIGHT DIPPER BEAM CONTROL GROUP").

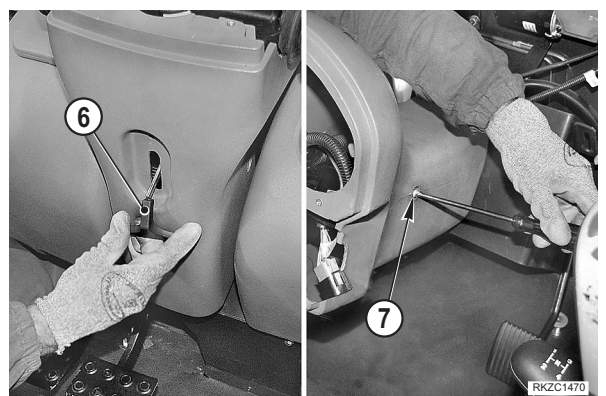


4 -Loosen and remove the upper screws (4) retaining the instrument panel holder (5).



5 -Remove the steering column lock knob (6).

6 -Remove the screws (7) retaining the side of the instrument panel holder.




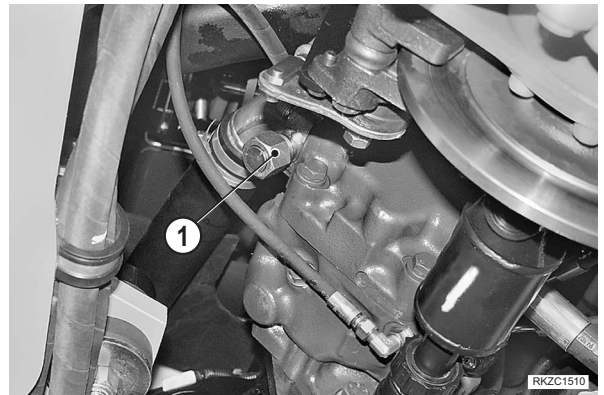
## HYDRAULIC OIL TANK

### Removal

- ⚠** Lower the working equipment completely until it rests on the ground.  
Engage the parking brake, stop the engine and remove the ignition key.
- ⚠** Eliminate residual pressure from all circuits by moving all control levers in all directions.
- ⚠** Disconnect the cable from battery negative terminal (-).  
(For details, see "BATTERY").

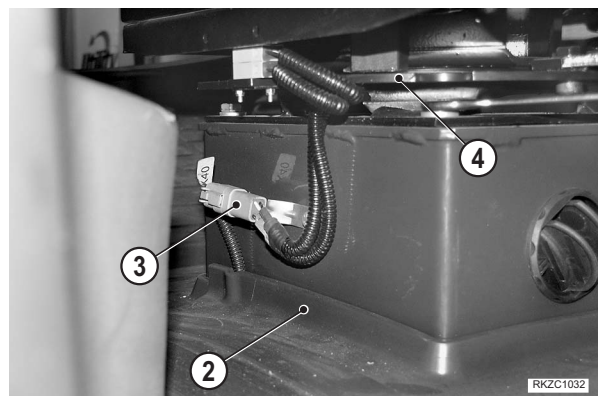
1 -Remove the plug (1) and drain the hydraulic oil.

 Hydraulic oil: approx. 40 ℓ

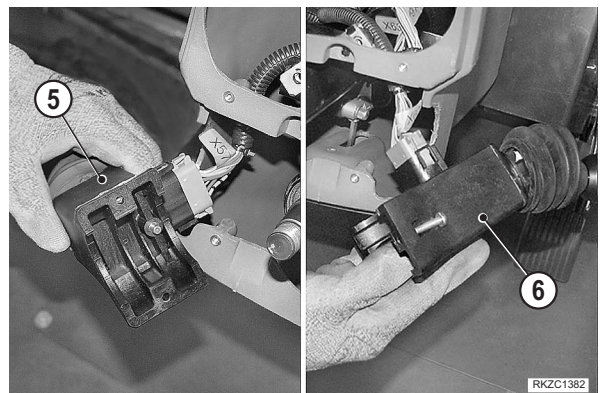


2 -Remove the front mat (2).

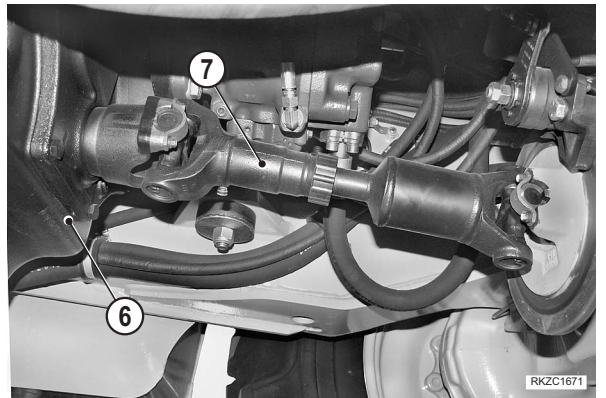
3 -Disconnect the connector (3) and remove the seat (4).



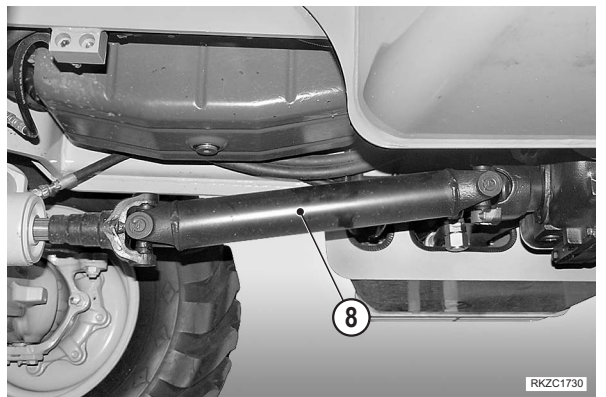
4 -Remove the steering wheel and remove the transmission reverse control group (5) and the direction indicator and headlight dipper beam control group (6) (For details, see "STEERING WHEEL AND TRANSMISSION-REVERSE, DIRECTION INDICATOR AND HEADLIGHT DIPPER BEAM CONTROL GROUP").



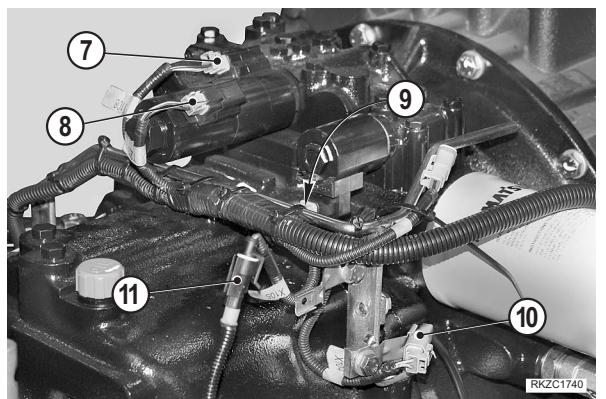
4 - Disconnect rear cardan shaft (7) from transmission (6).  
[\*4]



5 - Remove front cardan shaft (8). [\*4]

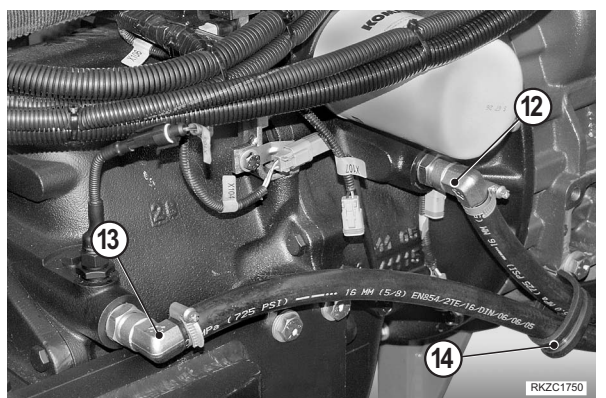


6 - Disconnect solenoid valve connectors (7), (8), (9), 4<sup>th</sup> gear sensor connector (10), and gearbox oil temperature sensor connector (11) from gearbox (6).



7 - Disconnect delivery hose (12) to oil cooler and return hose (13) from gearbox (6).

8 - Remove the clamp (14).



CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below

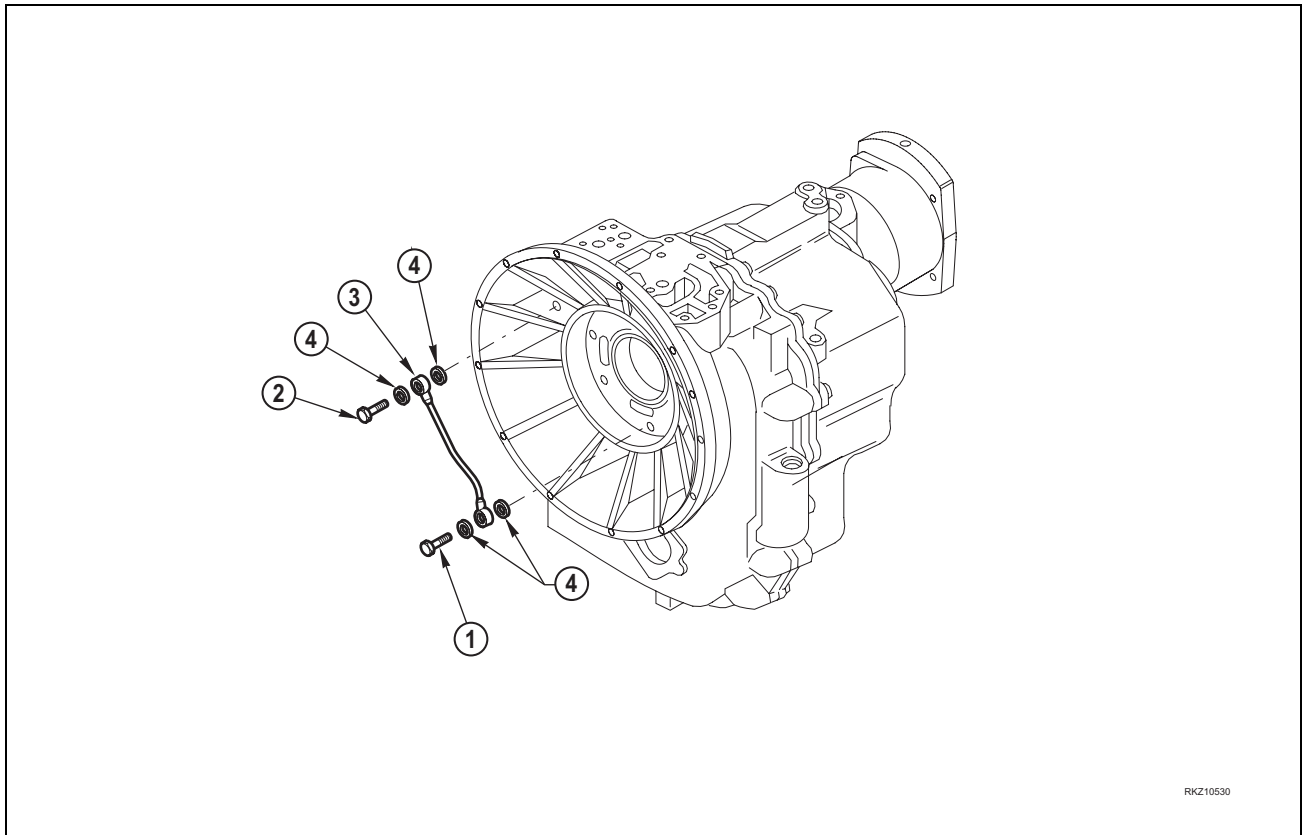


- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

## 2. OIL PUMP

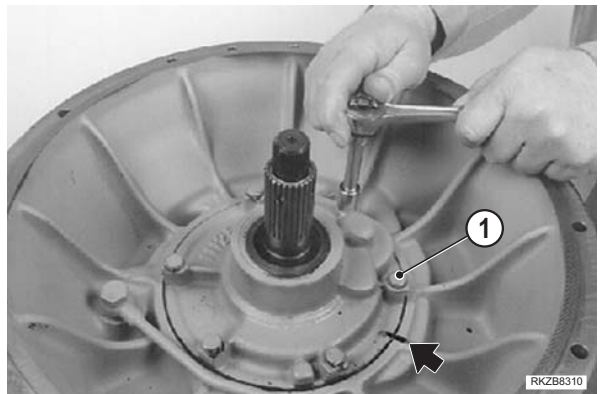
### 2.1 Disassembly



1 -Remove the drain plug (1) and drain the oil from the transmission.

2 -Remove the screws (1).

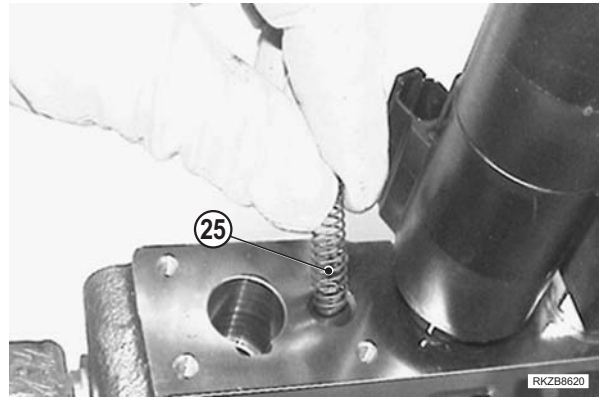
- ★ Make reference mark on the pump and bell housing before untightening the screws.



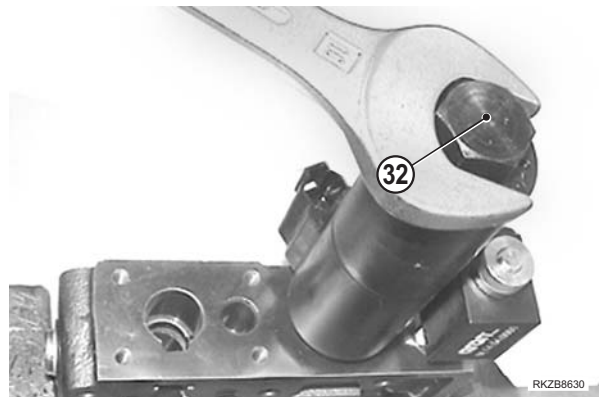
3 -Remove the pump (2) by means of two levers.



19 -Remove the spring (25).



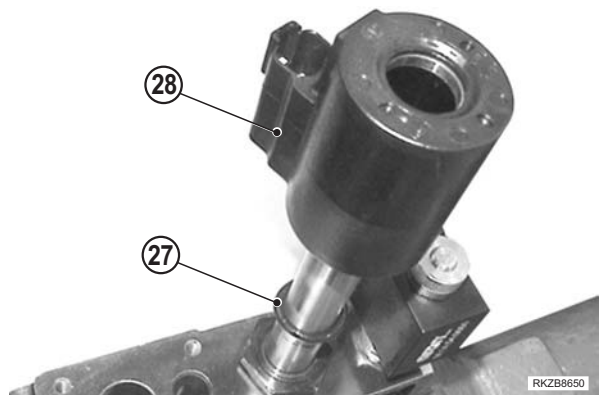
20 -Remove the nut (32) and the O-ring (31);



21 -Remove the solenoid (30) and remove the O-Ring (29);

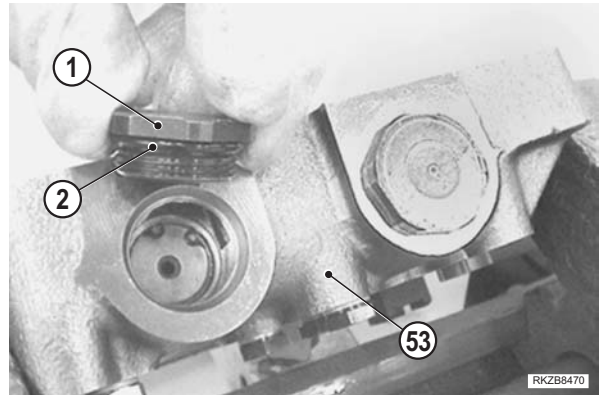


22 -Remove the solenoid (28) and remove the O-Ring (27);

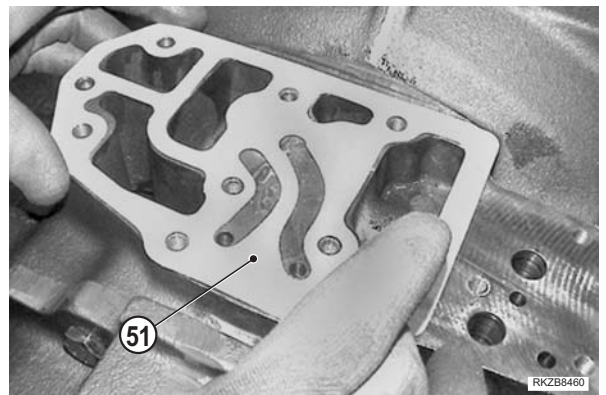


28 -Assemble the O-ring (2) on the plug.


29 -Assemble the plug (1).

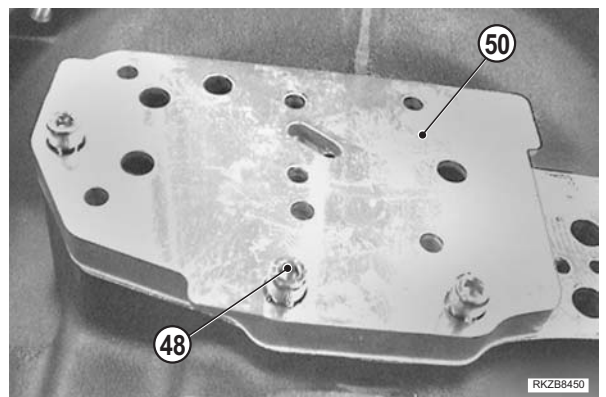


30 -Assemble the gasket (51) on the transmission (52).

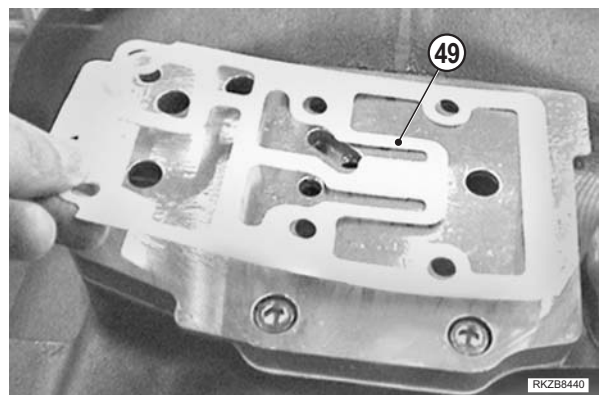


31 -Assemble the plate (50) and the screws (48).

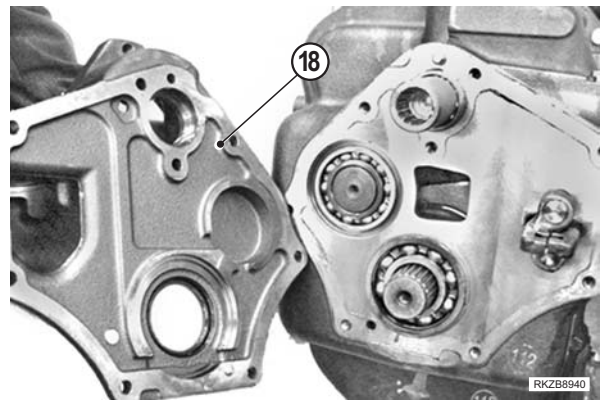
 Screw: 23Nm



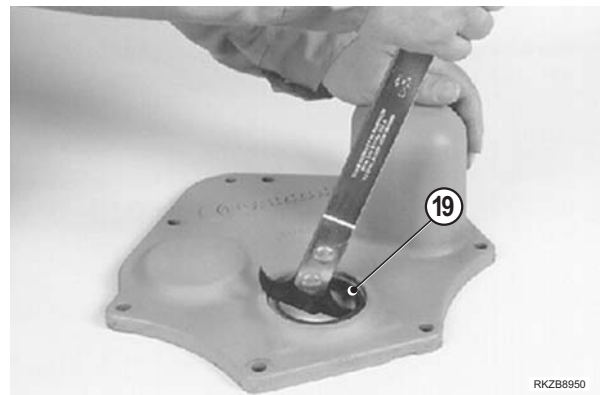
32 -Mount the gasket (49).



19 -Use a prybar to separate the rear cover from the housing.  
Remove the rear cover (18).

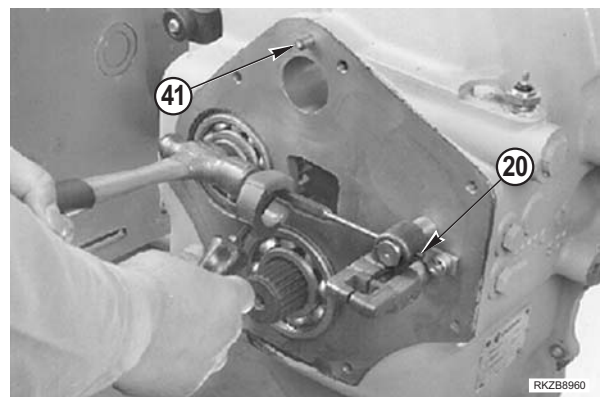


20 -Remove the seal (19) from the rear cover.



21 -Use a punch to remove the pins (20) which fasten the shift collars to the shift rods.

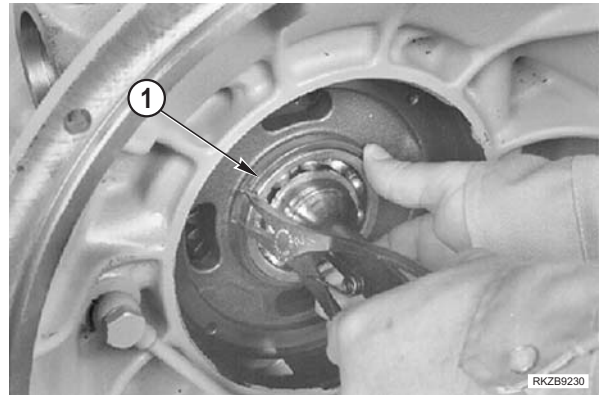
22 -Remove the centering pins (41).



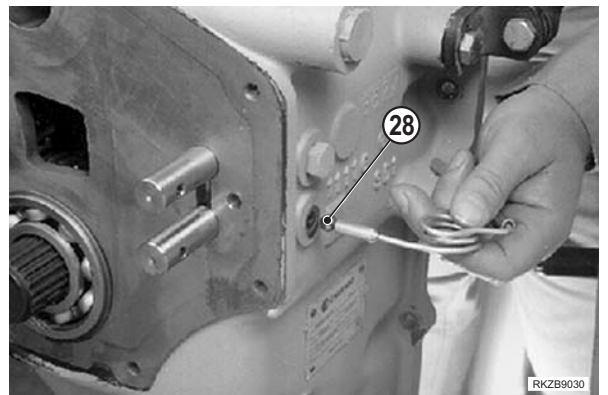
23 -Remove the shift collars (21).



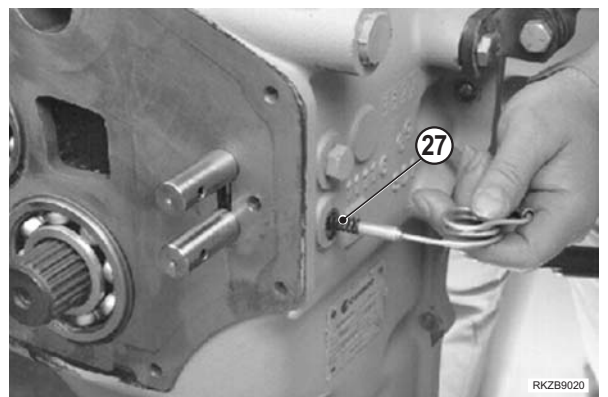
19 -Assemble snap ring (1).




20 -Install the ball (28).

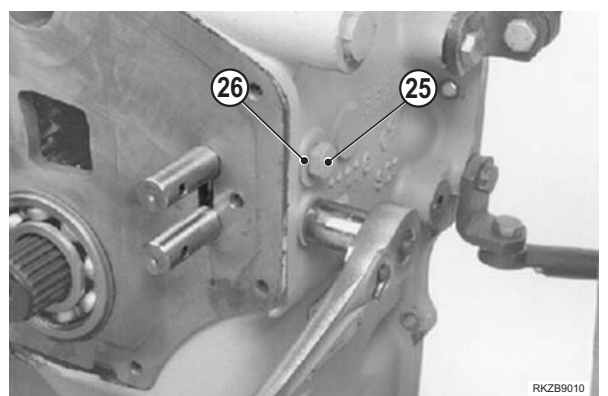


21 -Mount the spring (27).



22 -Mount the washer (26) and the screw (25).

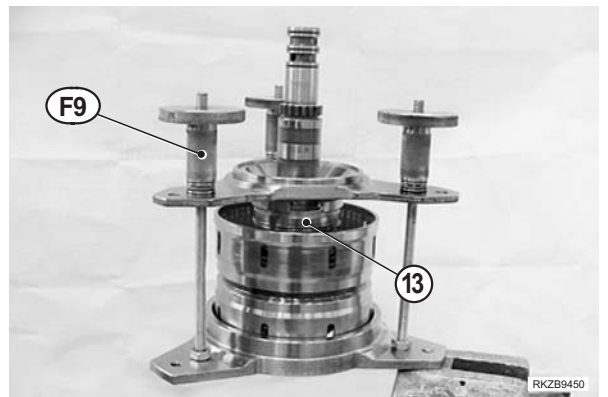
 Screw: 80 Nm



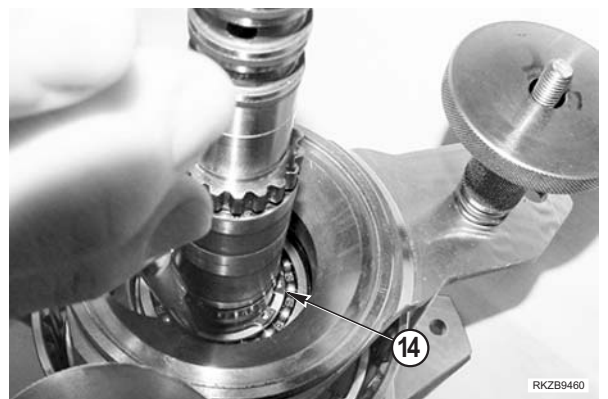
14 -Place a mark on each clutch plate lock ring (11), clutch plate (18) and clutch drive plate (17).  
 These marks will be used for reference during the reassembly procedure.



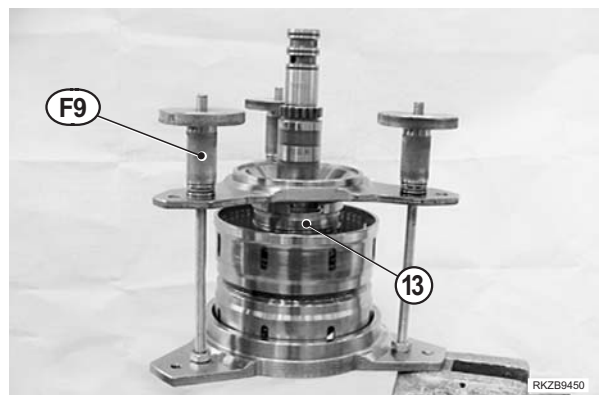
15 -Use the tool **F9** lower lock spring cover (13).



16 -Remove snap ring (14).



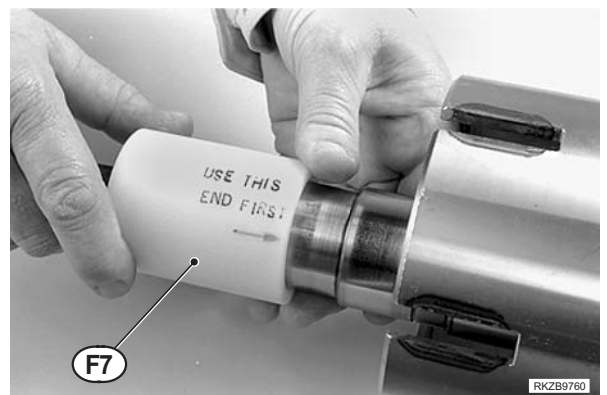
17 -Loosen the handles of the threaded rods to release the tension from the spring.  
 Remove the top piece of the F9 special tool.



- 21 - Install the **F6** pusher over the expander/protector and slide the seal ring until it reaches the groove in the shaft. Remove the pusher, expander/protector, and spacer from the shaft.



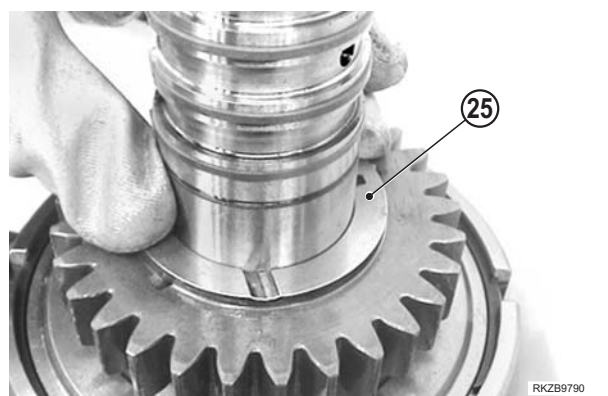
- 22 - Install the end of the **F7** seal compressor with the deep chamfer onto the shaft and over the sealing ring. Use a back and forth twisting motion to allow the seal compressor to slip over the top of the sealing ring and seat the sealing ring into the groove. Be careful not to damage the seal ring. After the sealing ring is seated in the groove, remove the seal compressor from the shaft.



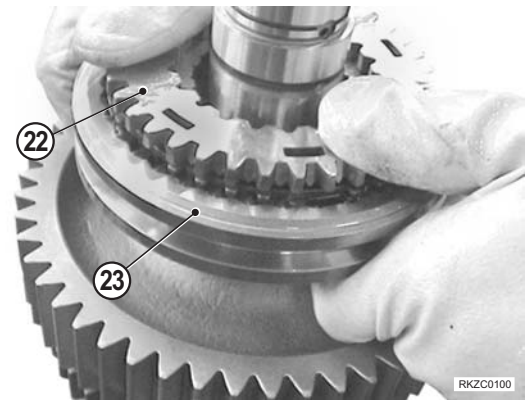
- 23 - Turn the seal compressor around and slide the end with the narrow chamfer over the shaft and over the seal ring. Leave the seal compressor in place for 15 minutes until the sealing ring has cooled and is properly sized and seated in the groove. After the seal ring has cooled, remove the seal compressor from the shaft.



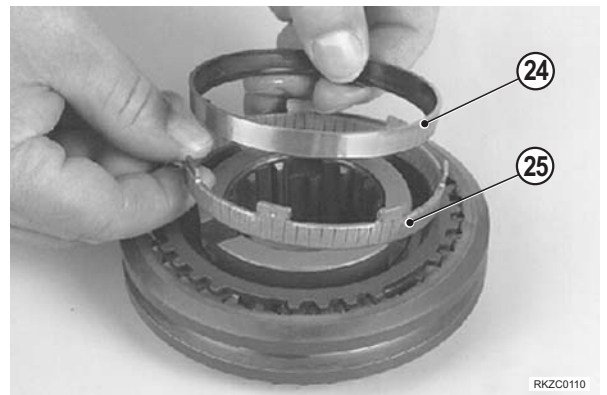
- 24 - Turn the shaft around and carry out steps 1 - 10 for the other clutch. Lubricate the ring (25) with transmission oil. Install the ring (25) so the notch on the inside rim goes onto the pin. Make sure that the side with the oil grooves is down.



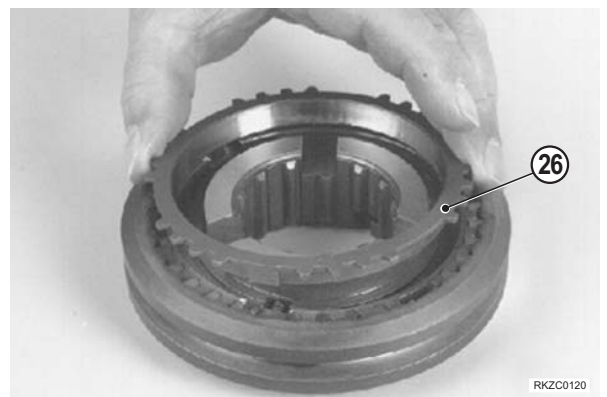
- 17 -Remove the first/second speed synchronizer assembly (23).  
Remove synchronizer ring (22).



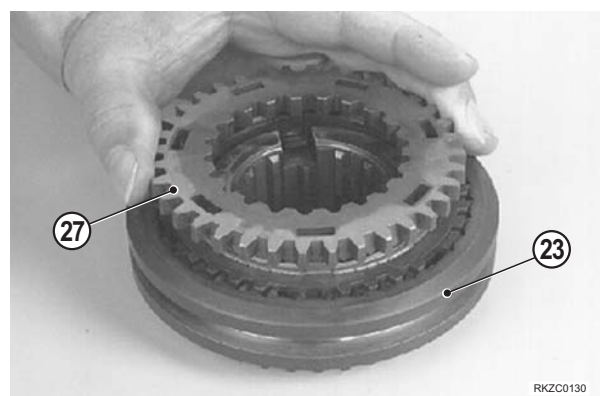
- 18 -Remove the steel ring (24) and the sintered ring (25).



- 19 -Remove the tapered friction ring (26).



- 20 -Turn the synchronizer assembly (23) over and remove the synchronizer ring (27) from the other side.



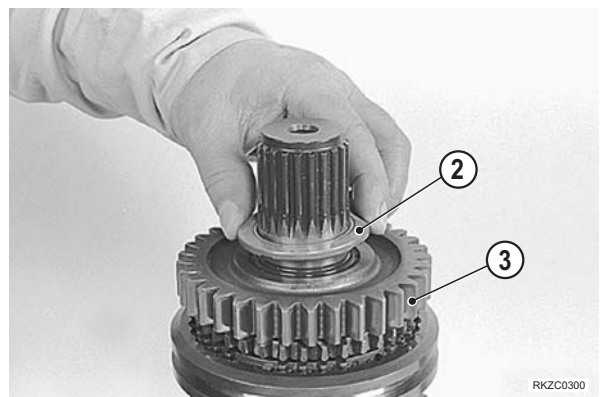
28 -Lubricate clutch ring (5) with transmission oil and install to each side of the synchronizer assembly.



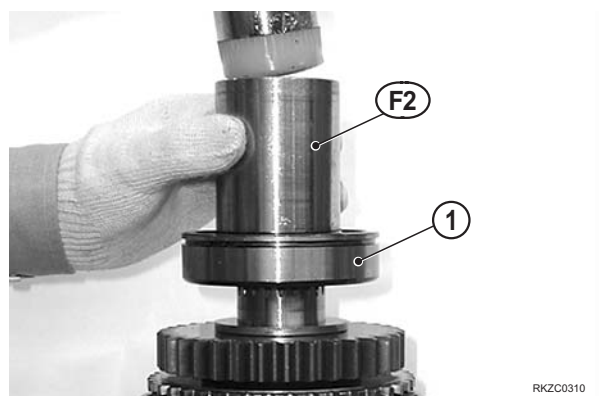
29 -Install the third/fourth speed synchronizer assembly (4) onto the shaft.



30 -Use clean transmission oil to lubricate the thrust washer (2). Assemble third speed gear (3) and the thrust washer (2) onto the shaft.



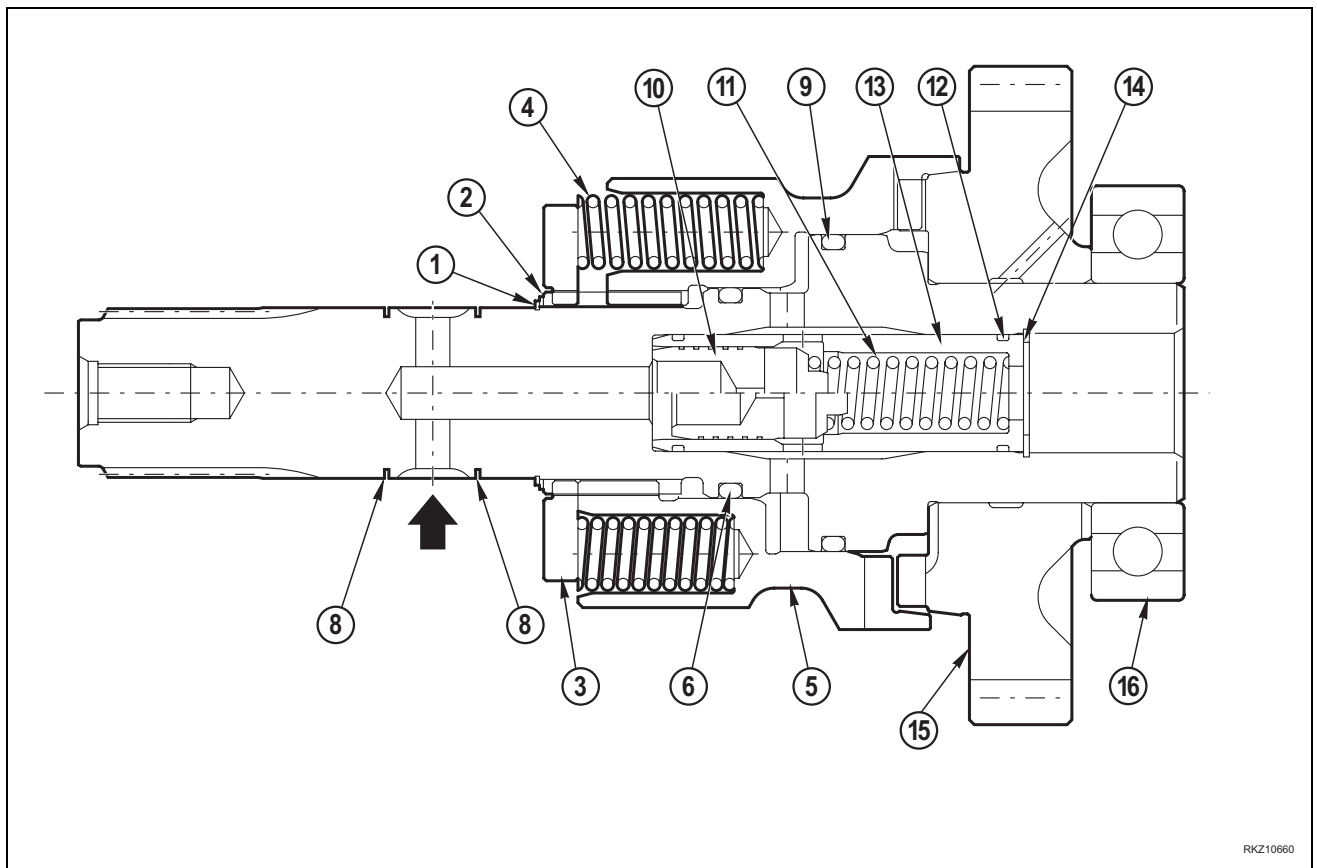
31 -Heat the bearing (1) to 80÷100°C (176°÷212°F). Use the tool F2 assemble bearing (1)



16 -Apply air compressed at about 6 bar to 4WD clutch oil passage (see arrow) by plugging the opposite hole with a finger. The sleeve (5) should be moving when compressing the springs (4).

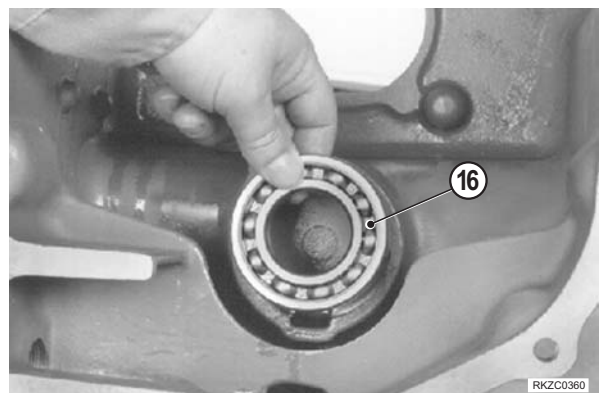
The 4WD gear (15) should move freely on 4WD shaft. Valve (10), if operating correctly reaches the end of stroke making a noise.

If the operation is incorrect, dismantle to find the problem.



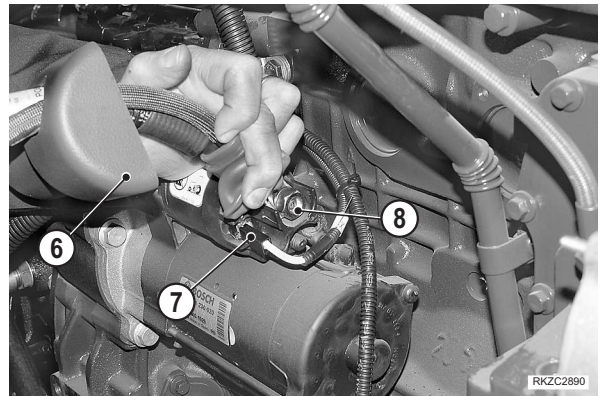
RKZ10660

17 -Install bearing (16).



RKZC0360

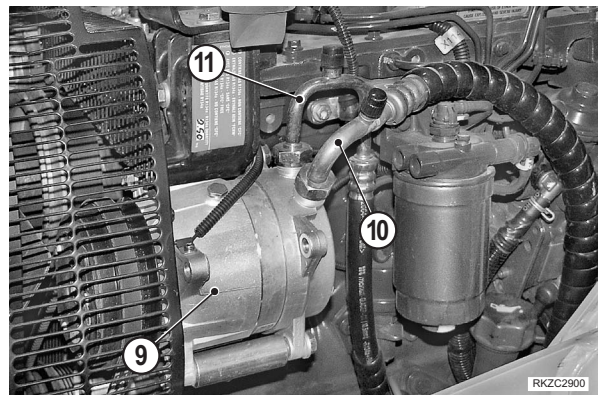
- 5 -Lift the cover (6) and disconnect wiring harnesses (7) and (8) from starter.



**Only if equipped**

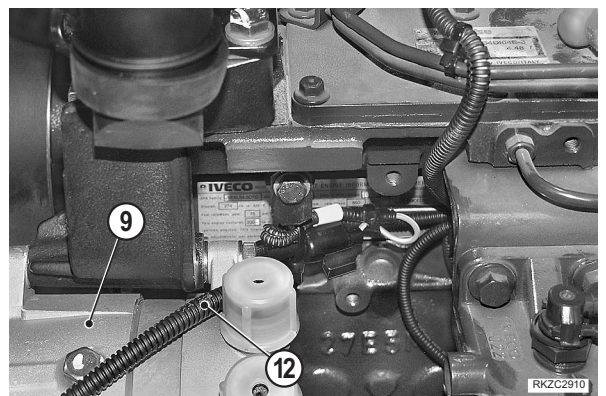
- 6 -Disconnect suction and delivery hoses (10) and (11) from air-conditioning group compressor (9).

★ Cap the hoses and holes to prevent contamination.

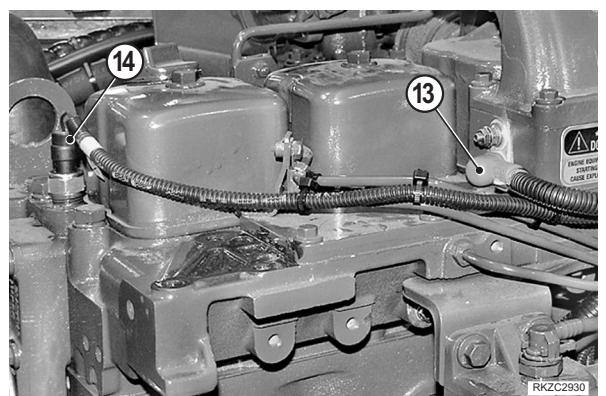


**Only if equipped**

- 7 -Release the wiring harness (12) to the compressor (9) from the tie straps and disconnect.



- 8 -Disconnect wiring harness (13) from thermal starter and disconnect connector (14) from the coolant liquid temperature sensor.



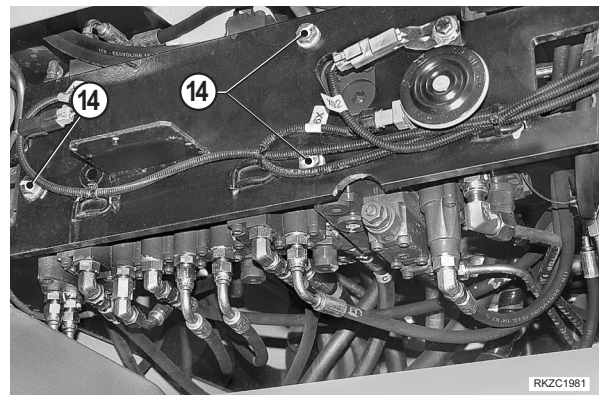
11 -Support control valve (13) by means of two ropes connected to a lift arm to be introduced through the cab opening.

Apply a slight tension to the ropes.


- ★ Pay special attention to rope routing to prevent damaging the unions.



12 -Loosen and remove the four screws (14) (n° 3) and the relative washers.



13 -Lower the control valve (13) onto a lift. [ \*1 ]

 8-spool control valve: approx. 42 kg

 10-spool control valve: approx. 47 kg



## Installation

- To install, reverse removal procedure.

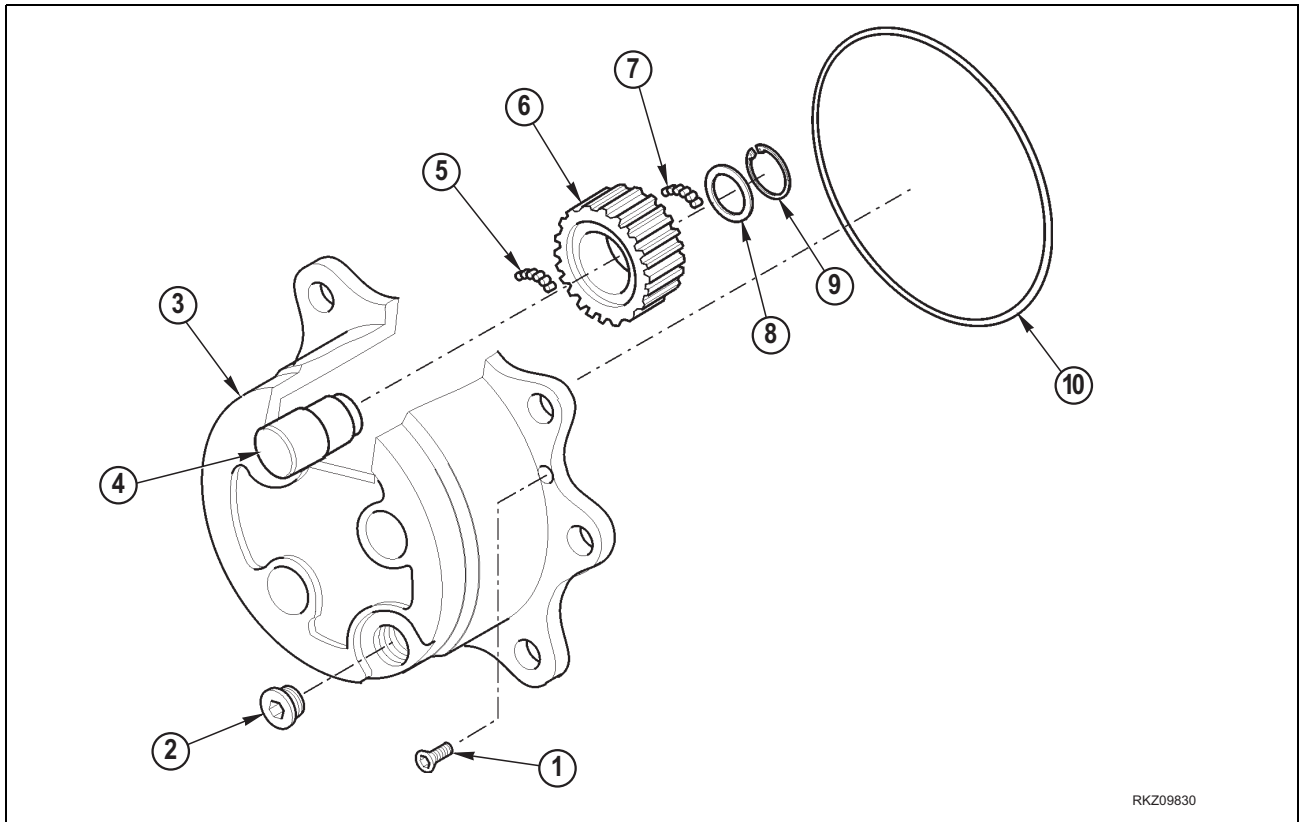
[ \*1 ]

- ★ Install control valve from top.

- 1 -Start the machine to circulate the oil; check to ensure that there are no leaks.
- 2 -Bleed the air from the working equipment circuits.  
(For details see "20 TESTING AND ADJUSTMENTS").
- 3 -Stop the engine, check the hydraulic oil level and top up as necessary.

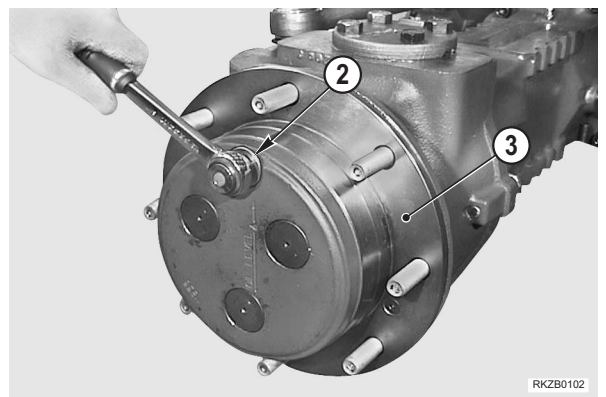
2. EPICYCLIC REDUCTION GEAR

2.1 Disassembly



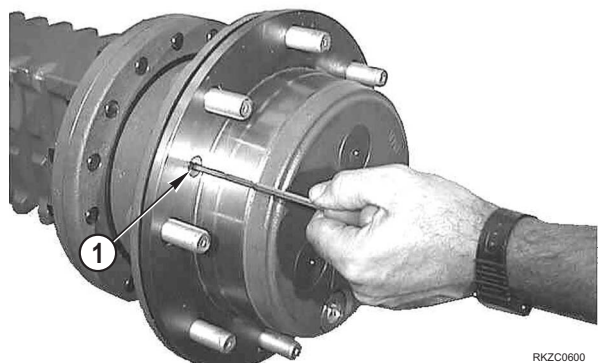
RKZ09830

**!** Before draining the oil, position the epicyclic reduction gear (3) with the plug (2) on the upper part and loosen it of some turns in order to eliminate any possible inner pressure, then remove it completely. Turn the hub upside-down till the hole is in the lowest point. Drain the oil completely.



RKZB0102

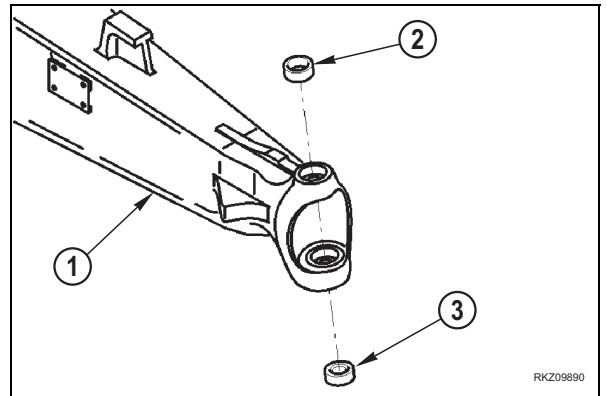
1 -Remove the fastening screws (1).



RKZC0600

4 -Extract the upper bushings (2) and cup (3) from the king pin housings.

- ★ Examine the bushing and housing before removal and replace depending on wear conditions.

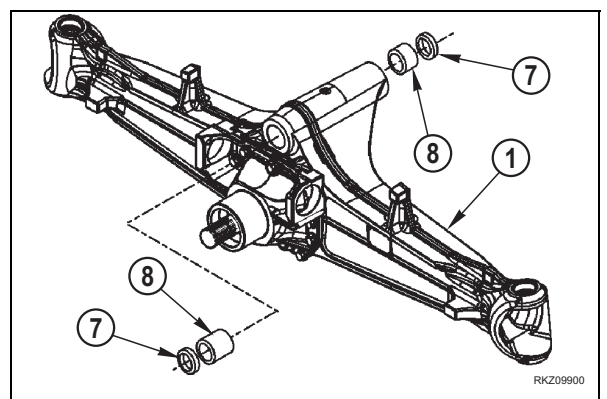


5 -Take the seal ring (7) out of the axle (1) beam with a suitable tool.

- ★ This is a destructive operation for the seal rings.

Only if necessary, remove the bushings with a standard three-gripping point extractor or a suitable driver and a hammer.

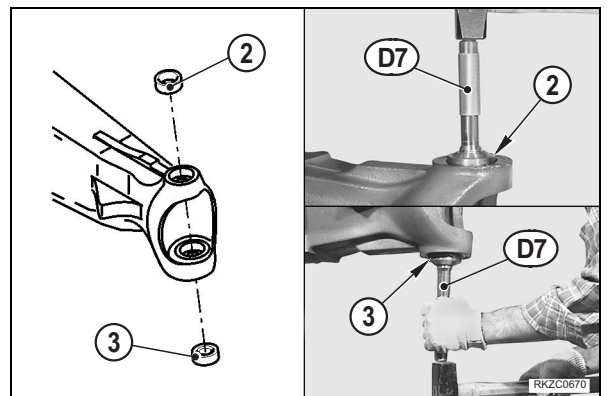
- ★ Do not damage the bushing housing.



**4.2 Assembly**

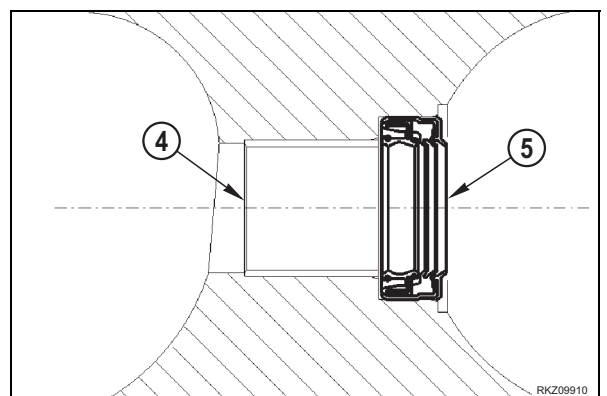
1 -Using tool **D7** and a hammer, install bushing (2) and cup (3).

- ★ To make installation easier, allow the bushings and cups to cool in liquid nitrogen at less than -100°C (-148°F)

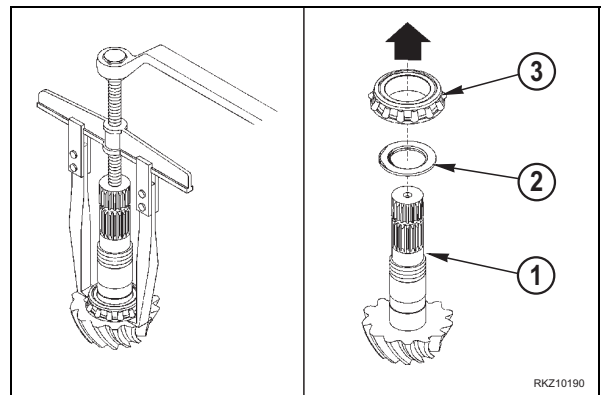


2 -Assemble the bush (4) on the axle beam with the special tool **D9** and a hammer.

3 -Assemble the seal ring (5) on the beam with the special tool **D10** and a hammer.  
Fill 3/4 of the seal ring cavity with grease ASL800050.

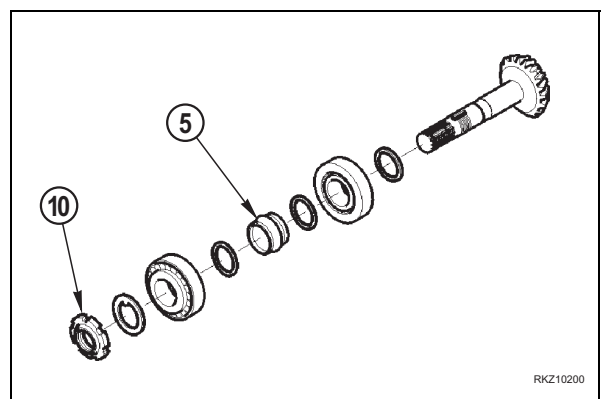


7 -To remove bearing inner ring (3) from bevel pinion (1), use a commercially available grip puller. Recover bearing inner ring (3) and the shim (2) under it.



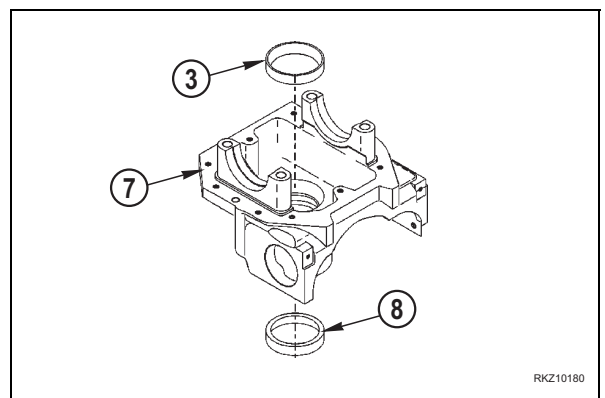
8 -Check all pinion components for wear.

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

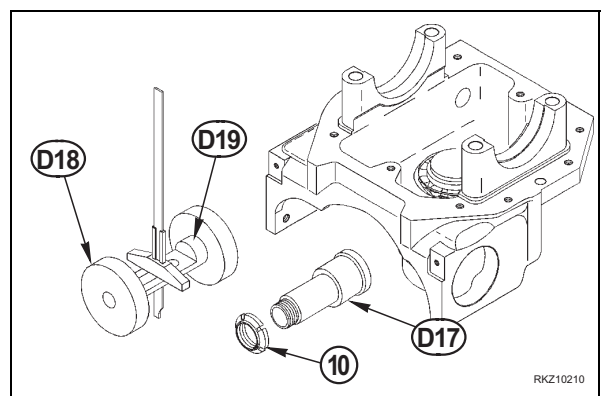


**6.2 Assembly**

1 -Place differential support (7) on a work bench. Force bearing outer rings (3) and (8) into it using special tool **D16** and a hammer.

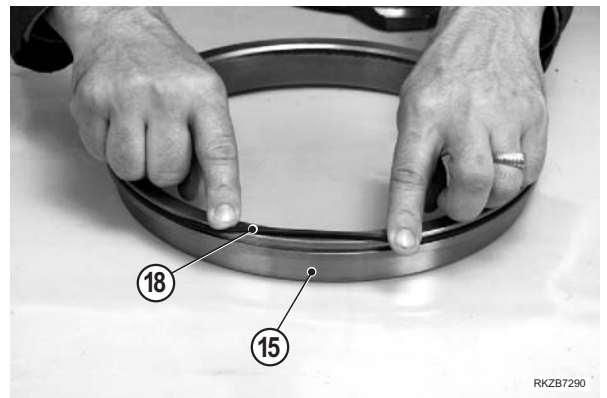


2 -Use the kit consisting of the special tools called “false pinion” **D17** and “false differential box **D18** and **D19** and a deep gauge.






2 - Install O-ring (18) onto inner cylinder (15).

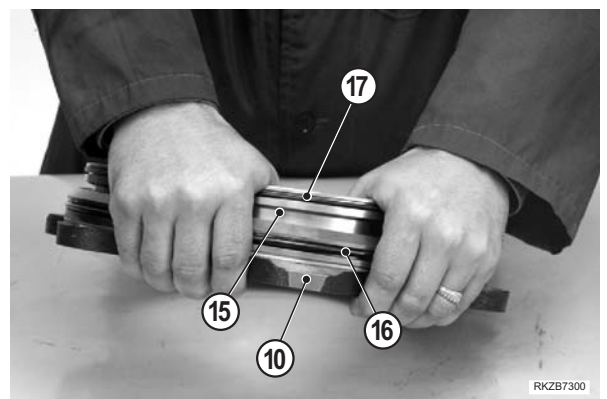


3 - Install O-rings (16) and (17) onto brake piston (10).




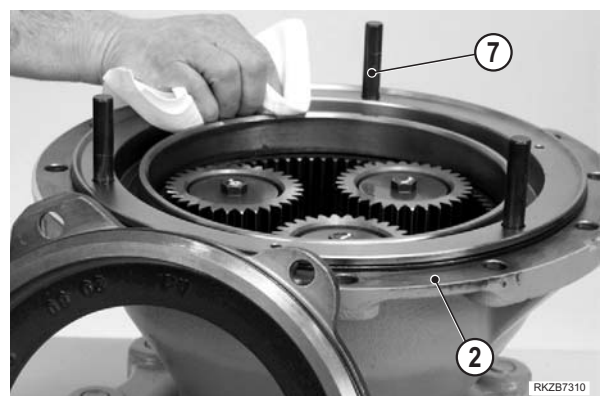
4 - Lubricate O-rings (16), (17) and (18), and install complete piston (15) to brake cylinder (10)

 O-ring: ASL800050



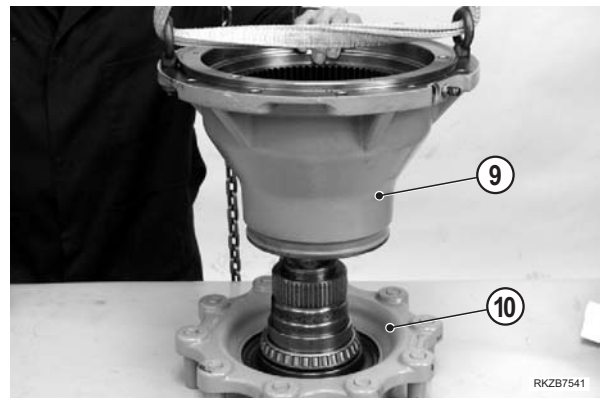
5 - Use hydraulic oil to lubricate the brake cavity of the hub housing (2) and mount pins (7).

 Cylinder cavity: ASL800050

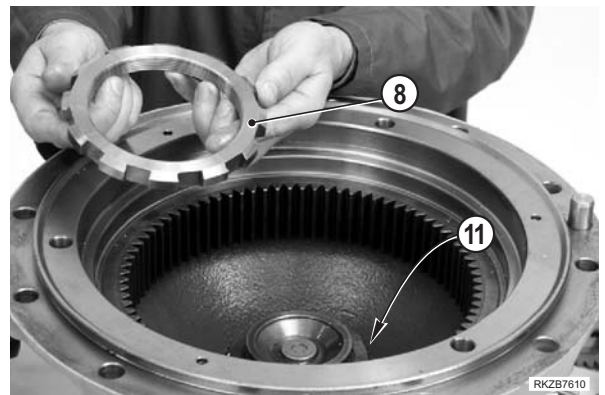


4 -Attach lifting equipment to hub (9) and carefully install onto wheel flange (10).


- ★ Clean accurately all sealing surfaces.
- ★ Take care not to damage the hub seal (12).

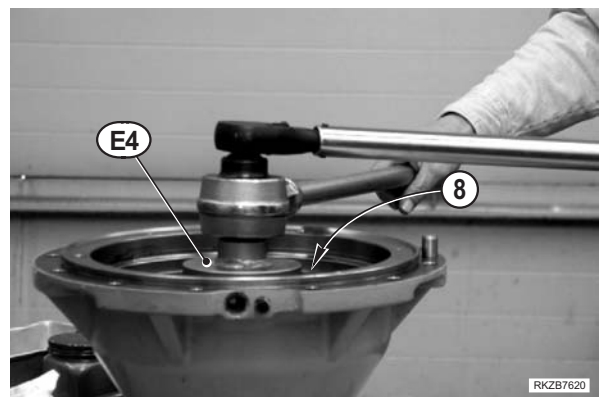


5 -Install bearing inner race (11) using a suitable driver and a hammer.  
Install ring nut (8).




6 -Using spanner **E4**, tighten ring nut (8) to the required torque.

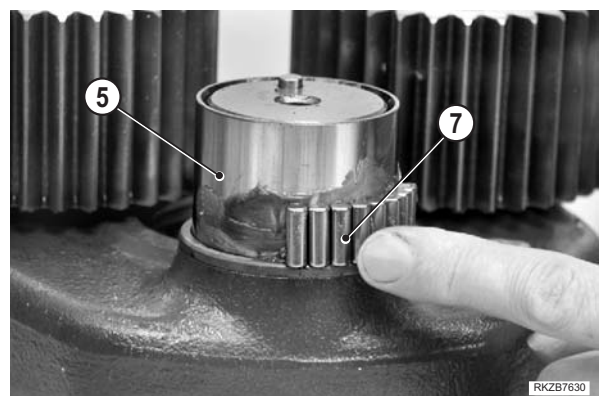
 Ring nut: 1000 Nm



7 -Apply a light coat of Lithium based grease to the planetary carrier (5) stud to hold the needle bearings (7) (n° 33) in place.

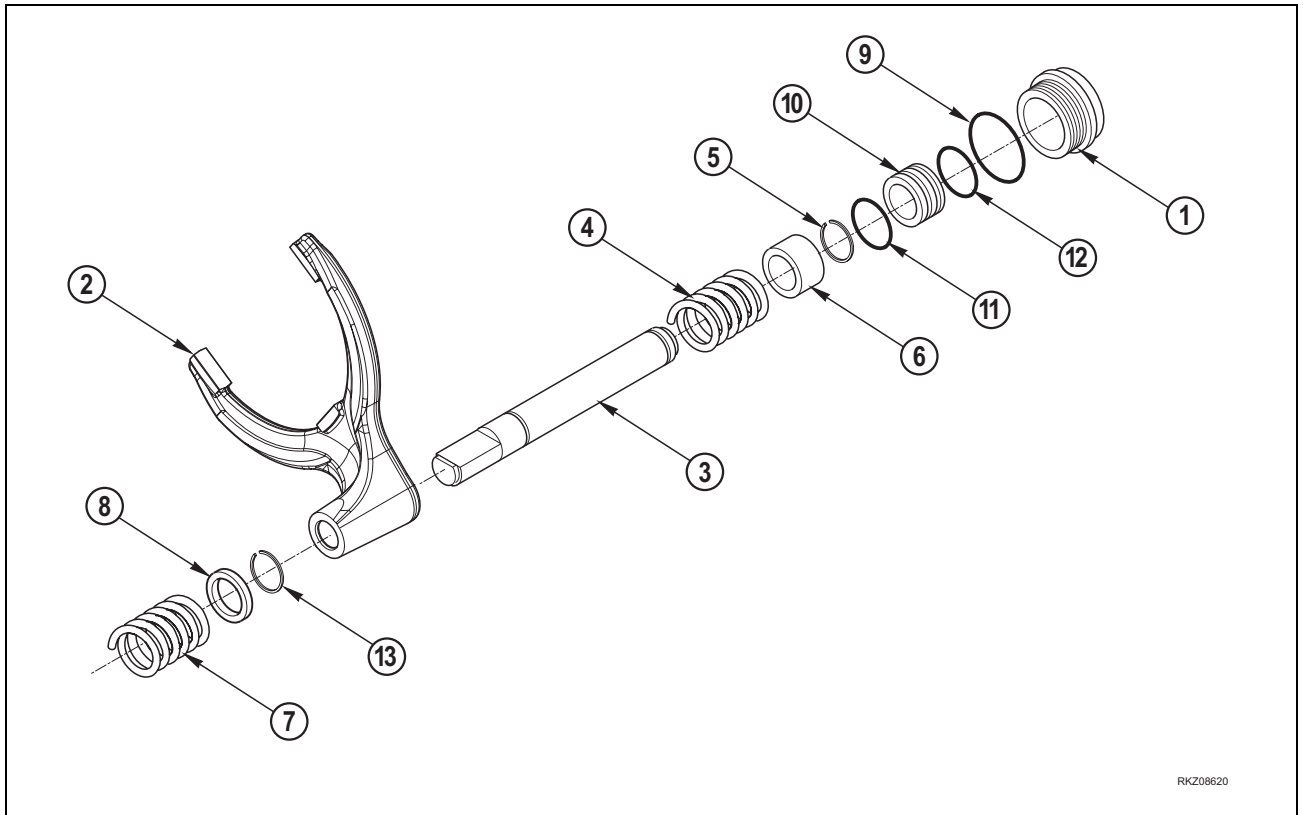
 Grease: ASL 800050

- ★ Use all the components corresponding to the marks made during disassembly.

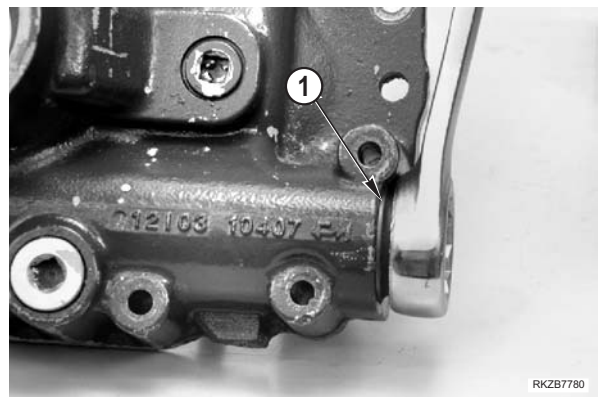


5. DIFFERENTIAL LOCKING GROUP

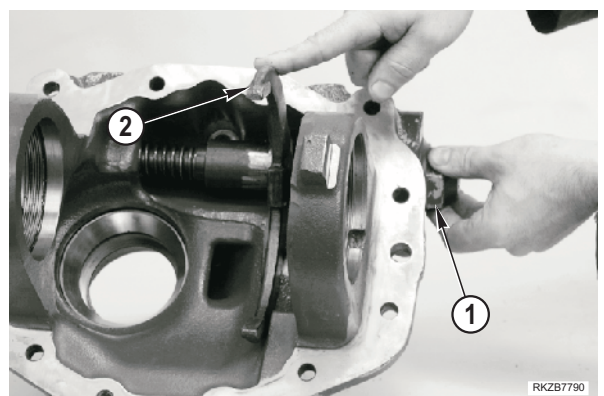
5.1 Disassembly



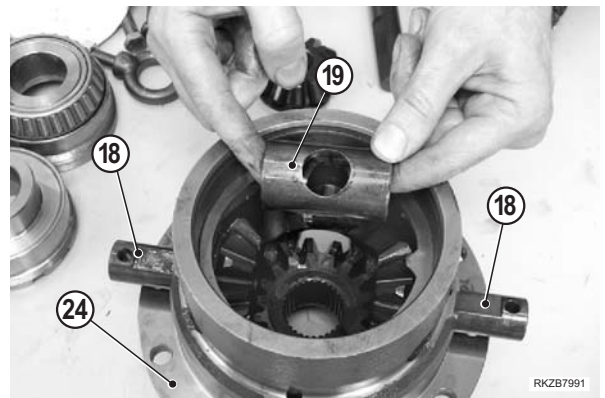
1 -Loose plug (1) but do not remove it.



2 -Hold the differential lock fork (2) down to catch a block inside of the housing, remove the plug (1).




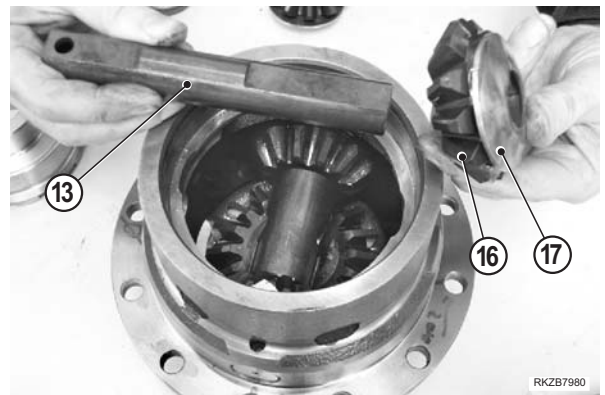
- 5 - Install spacer (19) and introduce pins (18), taking care to align the holes with those on the differential housing (24).




- 6 - Lubricate and install the sun gear (16) and thrust washer (17).  
Introduce the pin (13) as far as it will go.

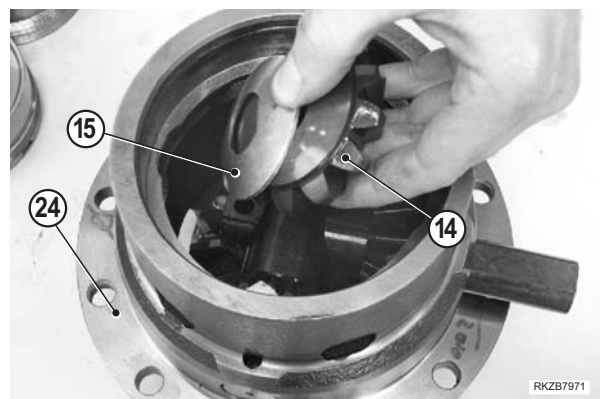
★ Orient pin (13) with the flats on the pin facing up.

 Gear and pin: differential oil



- 7 - Lubricate and install the planetary gear (14) and thrust washer (15) and introduce the pin (13). Orient the hole so as to align with the hole on the differential housing (24).

 Gear and thrust washer: differential oil



- 8 - Install the differential ring gear (12), apply sealant and tighten screws (11) to the required torque.

 Screw: Loctite 270

 Screw: 155 Nm



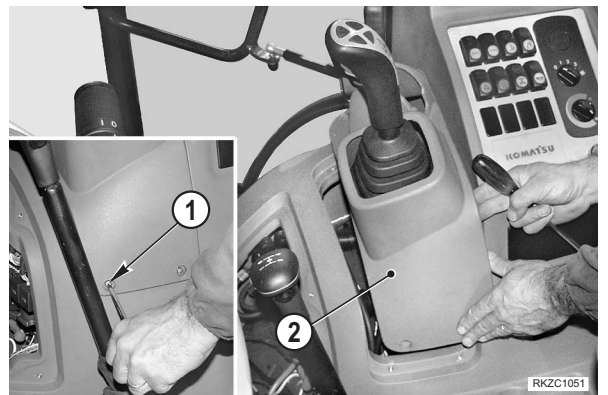
## SHOVEL PPC VALVE

### Removal

- ⚠ Lower the working equipment completely until it rests on the ground; engage the parking brake, stop the engine and remove the ignition key.
- ⚠ Release all residual pressure from all circuits.  
(For details, see "20 TESTING AND ADJUSTMENTS").

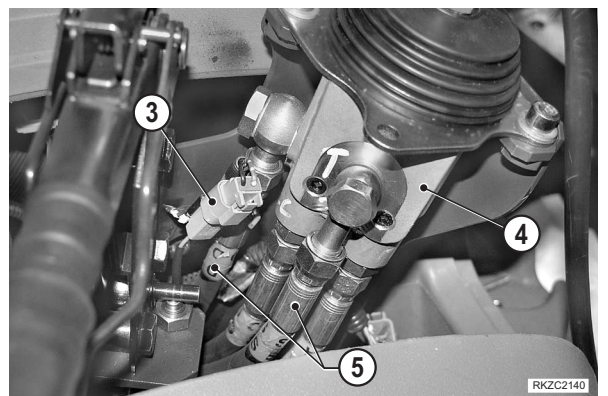


- 1 - Remove four screws (1) and remove PPC valve and parking brake casing (2).

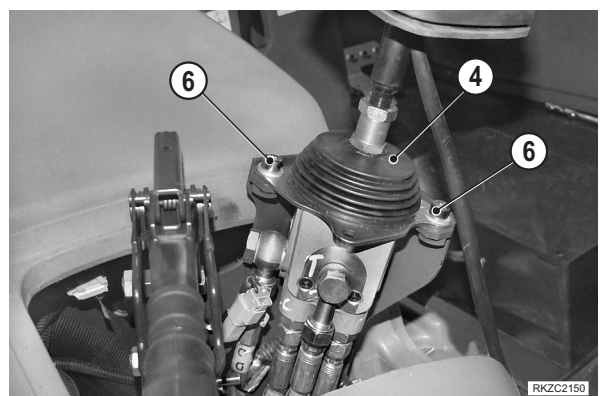


- 2 - Disconnect the connector (3).
- 3 - Disconnect five hoses (5) from PPC valve (4).

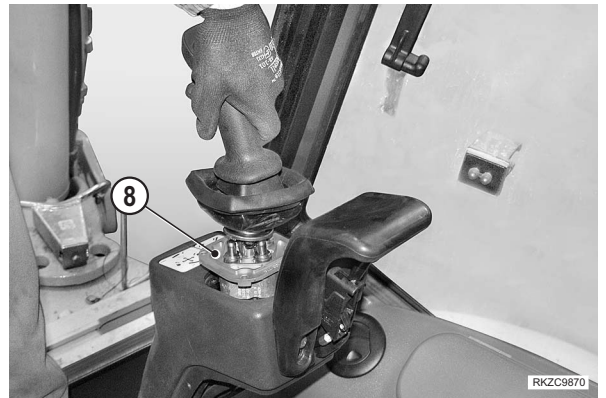
- ★ Check to ensure that hoses are marked; scribble match marks if necessary. [\*1]
- ★ Cap the hoses and holes to prevent contamination.



- 4 - Loosen and remove screws (6) and remove the complete PPC valve (4).



9 -Remove the PPC valve (8).



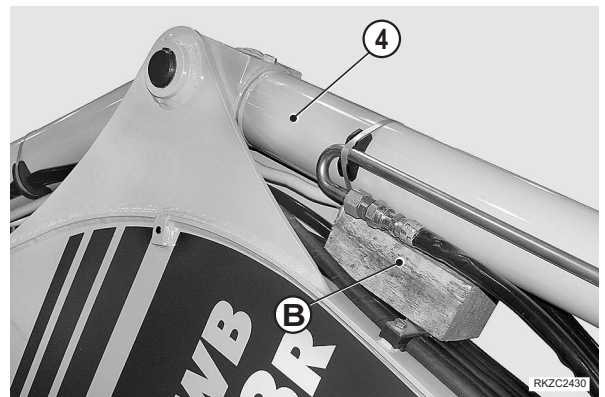
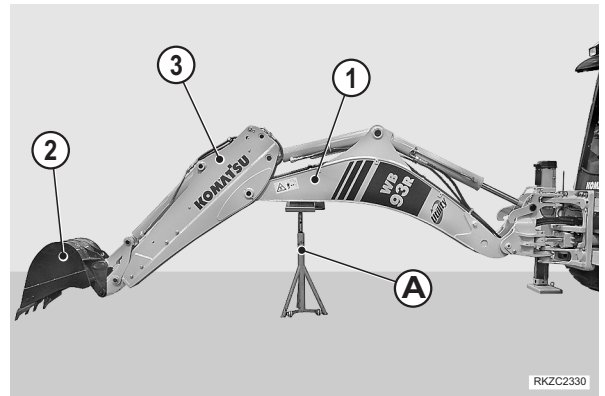
### Installation

- To install, reverse removal procedure.
  - ★ Carefully inspect the hoses for the proper position when connecting them.  
(For details, see "10 STRUCTURE AND FUNCTION").

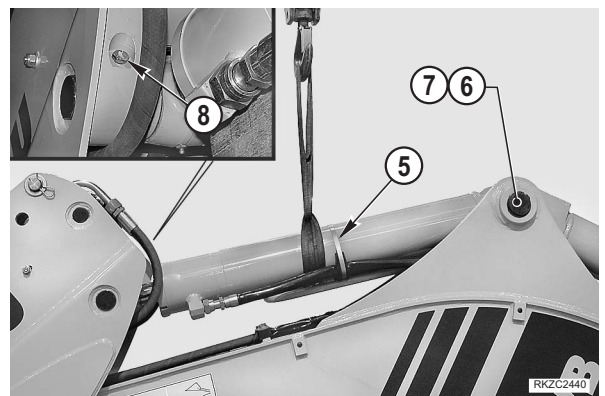
## ARM CYLINDER

### Removal

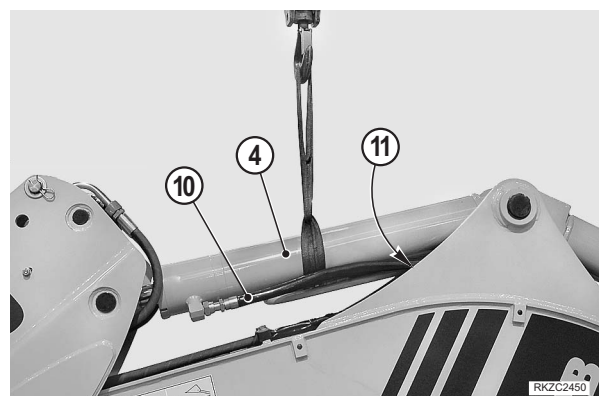
- 1 -Fully extend the arm (1) and fully open the bucket (2).  
Manoeuvre the boom until the outer end of the boom is in a level position.
  - 2 -Place and force a jack stand "A" and a non-slip block under the boom.
  - 3 -Lower arm (3) until bucket teeth touch the ground.
  - 4 -Lower the outriggers to the ground, apply the parking brake, and stop the engine.
- ⚠** Release residual pressure from all circuits by operating all hydraulic controls in all directions.
- 5 -Force a block "B" under the boom cylinder (4).



- 6 -Remove the strap (5) retaining the hoses.
  - 7 -Sling the cylinder (4) in a band and connect it to a hoisting device; apply a slight tension.
- ★ Do not engage the hoses with the band.
- 8 -Remove the snap ring (6) retaining the cylinder fulcrum pin (7) and the screw (8) retaining the piston pin (9).



- 9 -Disconnect hoses (10) and (11) from cylinder (4).
- ★ Cap pipes, hoses and holes to prevent contamination.

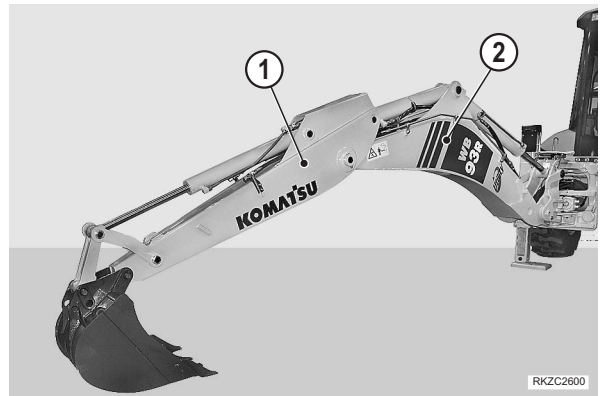


## BACKHOE BOOM SAFETY CYLINDER

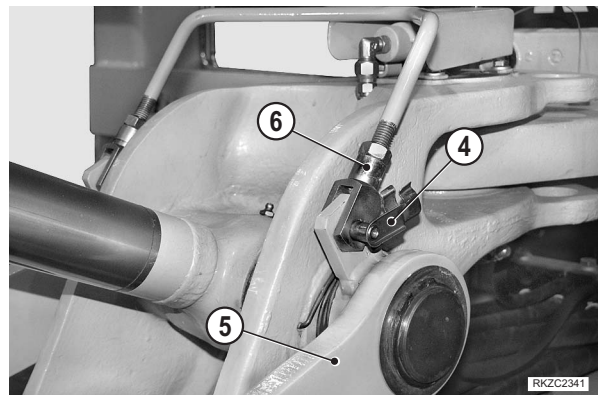
### Removal

- 1 -Extend the arm (1).
- 2 -Operate the boom (2) and bucket (3) until bottom of bucket sits level.
- 3 -Lower the outriggers to the ground, apply the parking brake, and stop the engine.

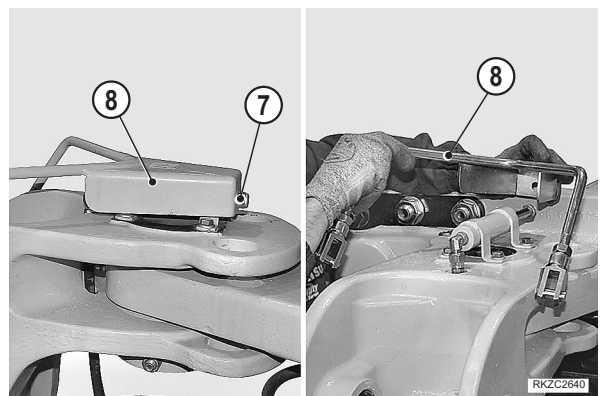
**!** Release residual pressure from all circuits by operating the control levers in all directions.



- 4 -Remove pins (4) and disconnect yokes (6) from boom retaining levers (5).



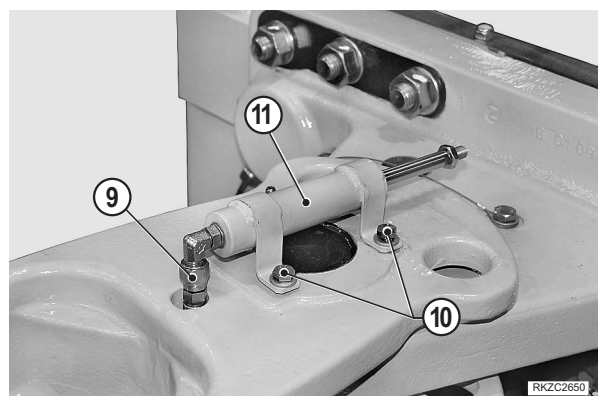
- 5 -Loosen and remove nut (7) and remove tie rod (8).



- 6 -Disconnect feed hose (9).

★ Cap the hose and hole to prevent contamination.

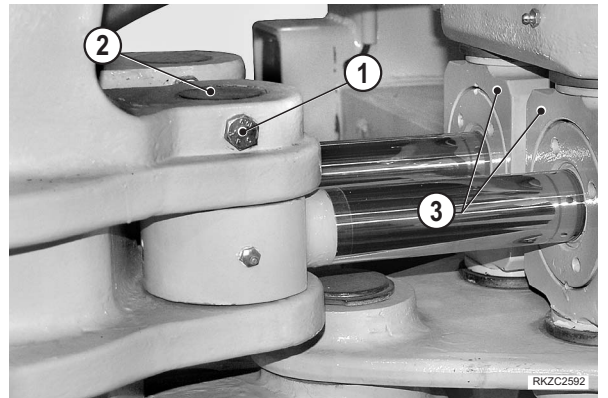
- 7 -Loosen and remove the screws (10) and the cylinder (11).



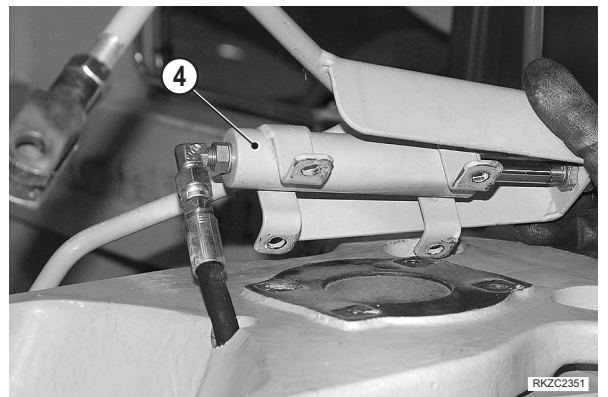
# BACKHOE SWING BRACKET


## Removal

- 1 -Remove the equipment.  
(For details see "BACKHOE WORKING EQUIPMENT").
- 2 -Take out the screws (1) and remove the pins (2) that connect the swing cylinders (3). [\*1] [\*2]
- 3 -Remove boom safety cylinder (4).  
(For details see "BACKHOE BOOM SAFETY CYLINDER").



- 4 -Sling the swing bracket (5)
- 5 -Take out screws (6) and (7) and remove pins (8) and (9) from swing bracket. [\*1] [\*2]
- 6 -Remove swing bracket (5) and shims (10) and slide the hoses off. [\*3]




 Bracket: 162,5 kg


## Installation

- To install, reverse removal procedure.

[\*1]

 When aligning the positions between the hole and the pin, turn the engine over at low idling speed. Do not insert fingers into the holes to check alignment.

[\*2]

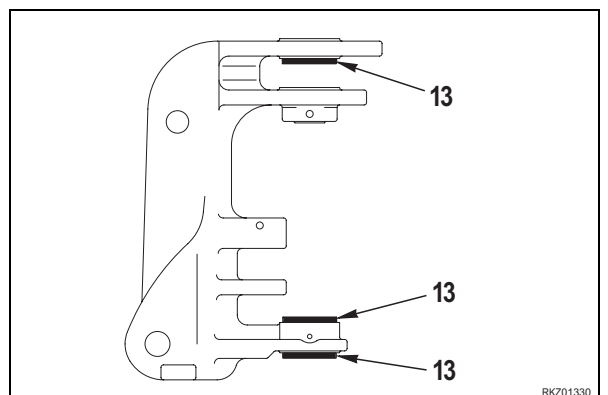
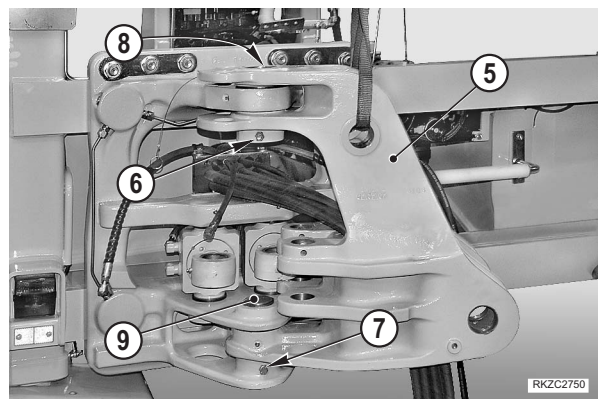
 Internal bushing: ASL800050

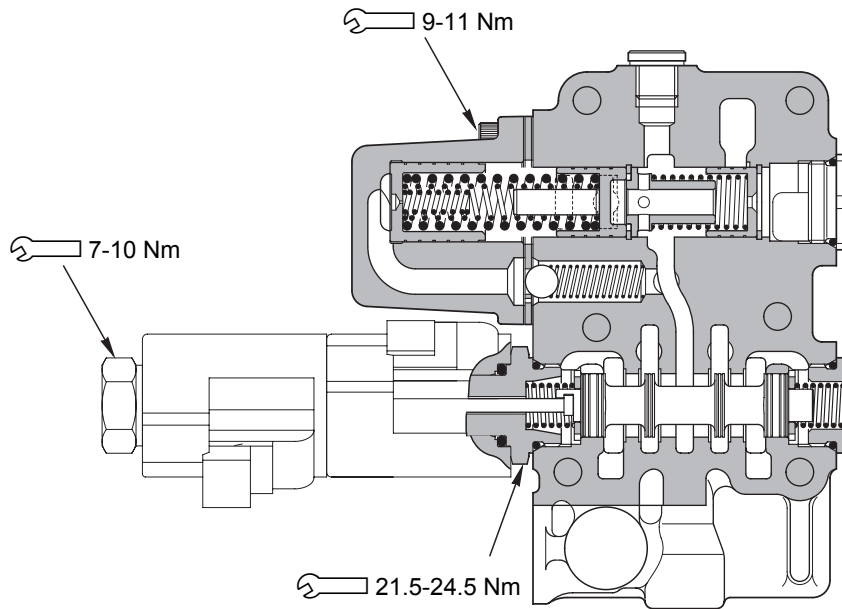
[\*3]

- ★ Insert the shims.

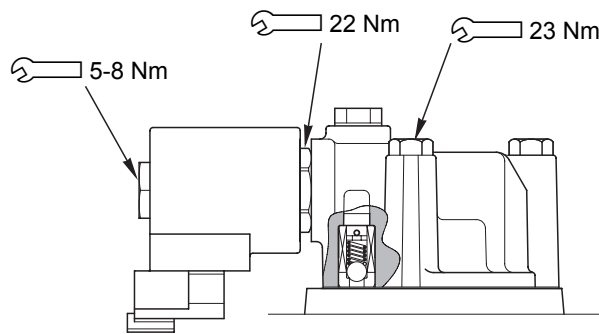
- 1 -Start the engine and bleed the air from the cylinders.  
(For details, see "20 TESTING AND ADJUSTMENTS").

- ★ After bleeding the air, check the oil level in the tank.





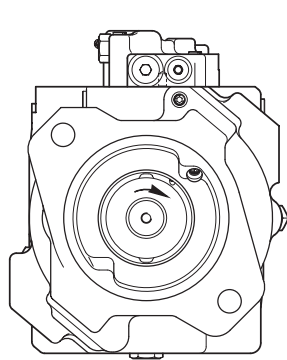
D - D



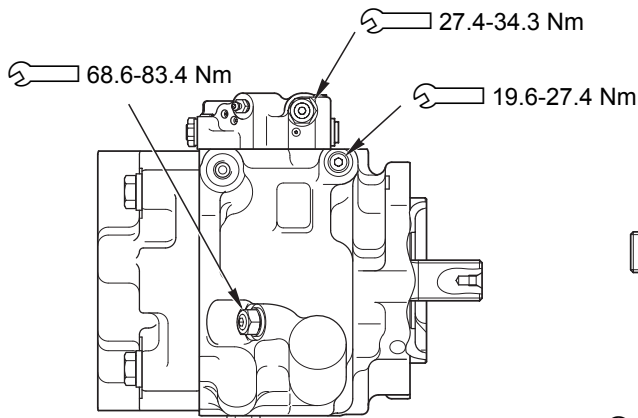
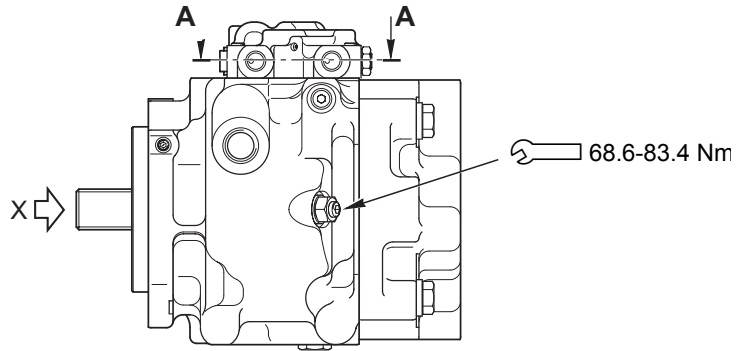
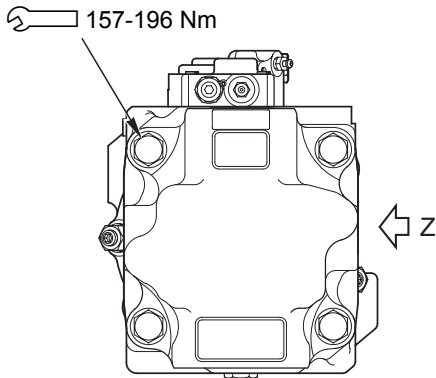
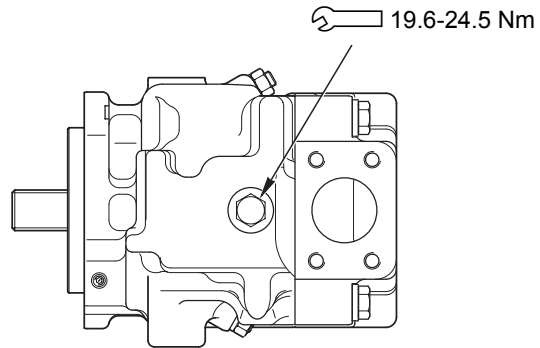
RKZ10340

E - E

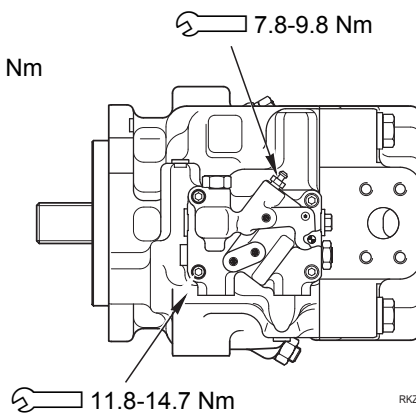
# HYDRAULIC PUMP



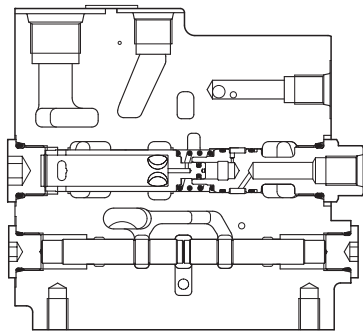
View X



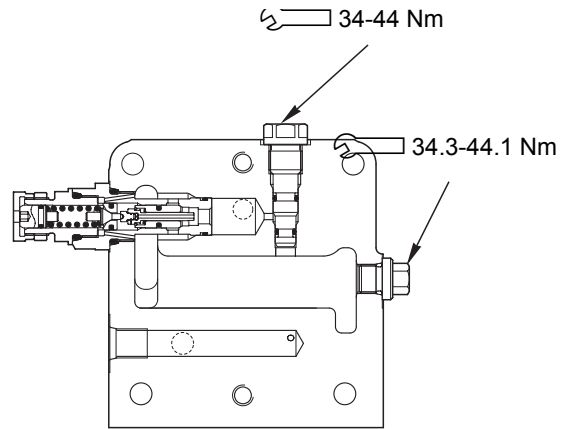
View Z



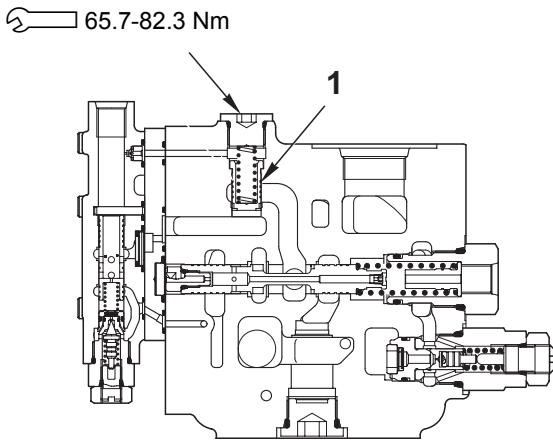
RKZ10440



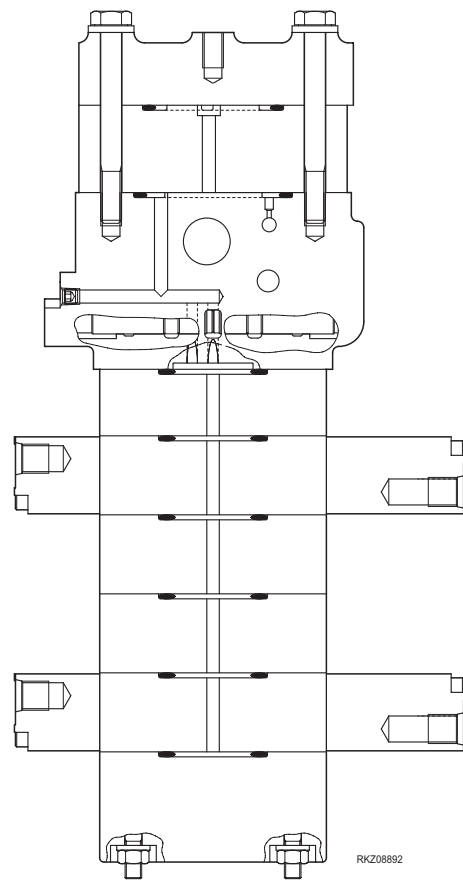
N - N



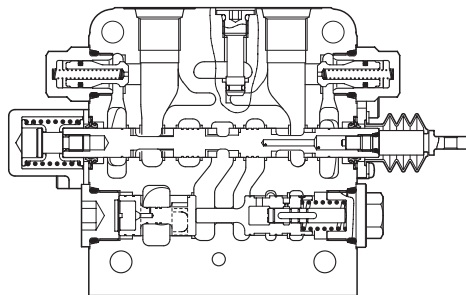
AC - AC



AA - AA



AE - AE

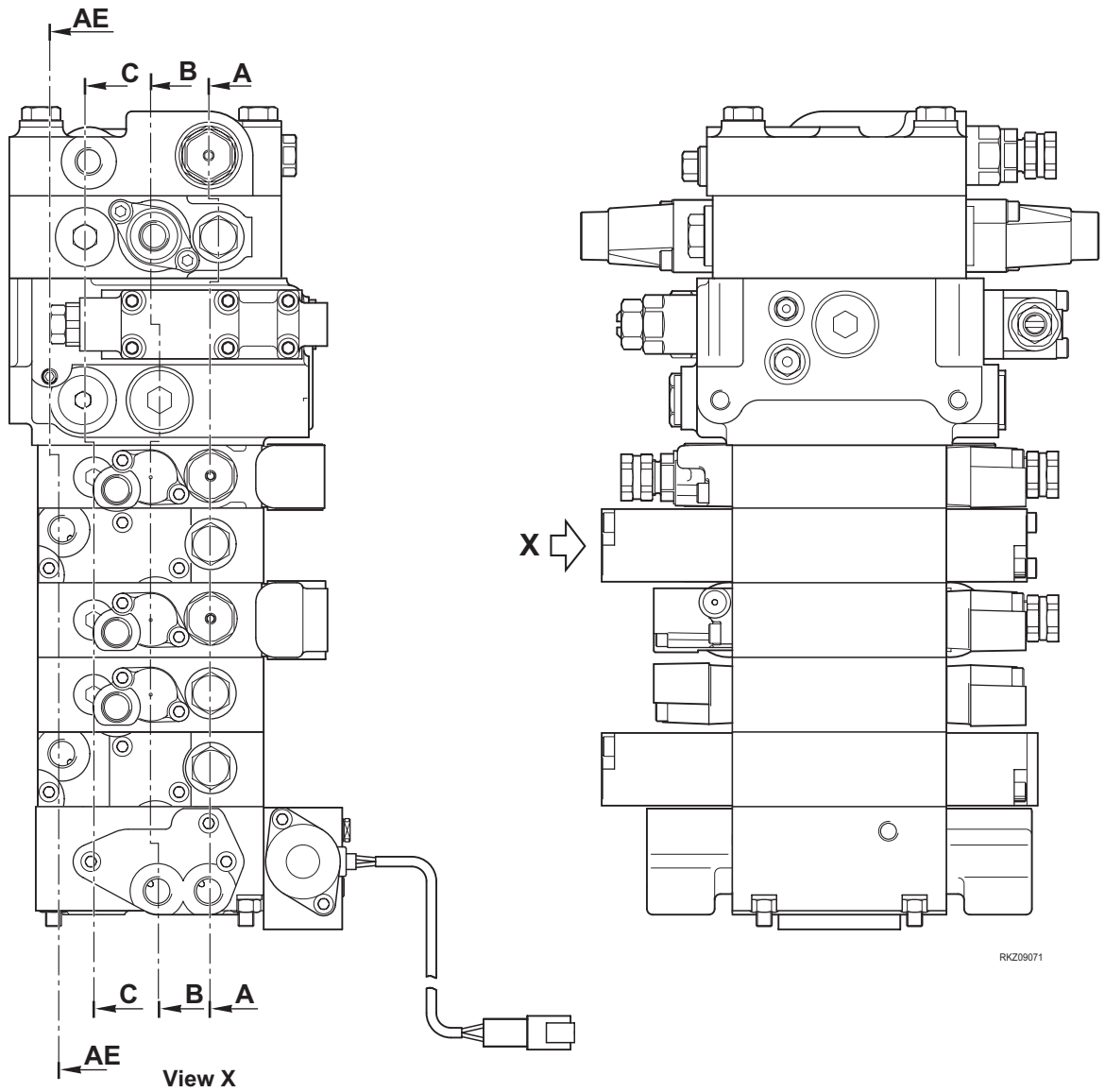


AB - AB

RKZ08892

Unit: mm

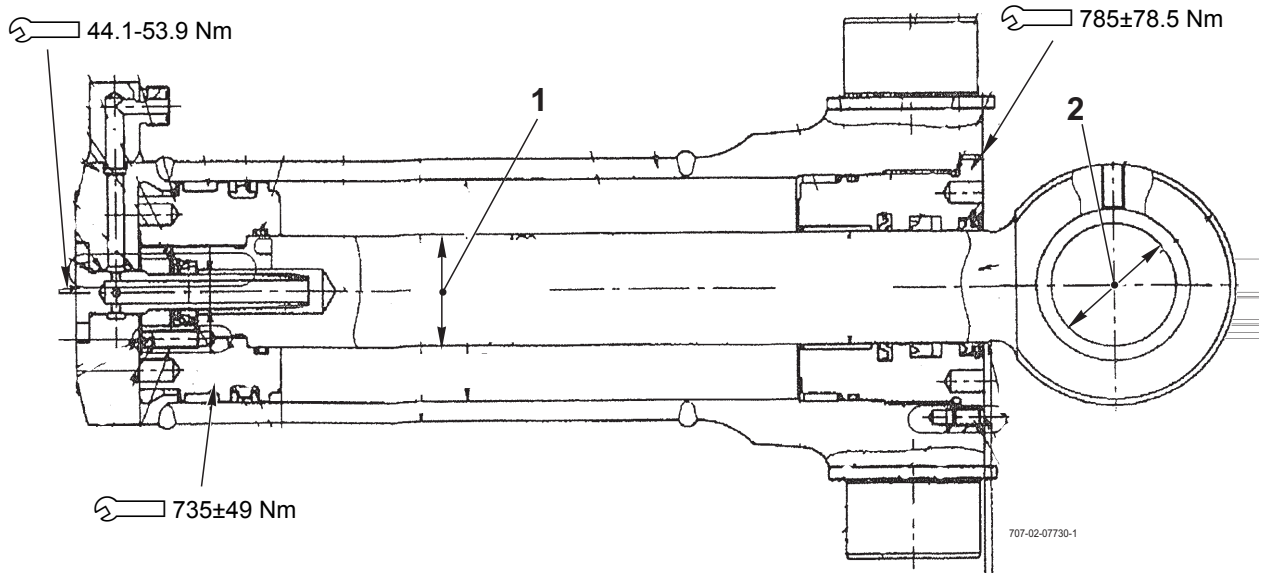
No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
1	Pressure compensation valve spring.	31.7x9.2	27.5	43.1N	-	34.5N	Replace spring



Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
1	Spool return spring (shovel arm raise control)	27.1x16.2	26.7	14.7N	–	11.8N	Replace spring
2	Spool return spring (in arm control)	41.1x19.3	40.5	34.3N	–	27.4N	
3	Spool return spring (out arm control)	42.3x19.2	40.5	54.9N	–	43.9N	
4	Spool return spring (boom swing control)	29x17.5	28.5	22.5N	–	18N	
5	Spool return spring (shovel control)	27.2x16.6	26.7	30.38N	–	24.3N	
6	Spool return spring (backhoe bucket boom control)	24.2x16.7	23.7	30.4N	–	24.3N	
7	Spool return spring (shovel arm float control)	19.4x17.6	19	14.7N	–	11.8N	
8	Spool return spring (shovel arm lower control)	38.7x18	27.6	355.7N	–	284.6N	
9	Priority valve spring	56.8x15.2	48.5	29.6N	–	23.7N	
10	Unloading valve spring	25.5x19.3	18	121.5N	–	97.2N	
11	Spool return spring (jig arm control, 4 in 1 bucket control)	29x17.5	28.5	22.5N		18.0N	

BOOM SWING



Unit: mm

No.	Check item	Cylinder	Criteria				Remedy	
			Standard size	Tolerance		Standard clearance		Clearance limit
				Shaft	Hole			
1	Clearance between piston rod and head	Boom	60	-0.030 -0.076	+ 0.151 + 0.006	0.036	Replace	
		Arm	60	-0.030 -0.076	+ 0.046 0	0.030		
		Bucket	55	-0.030 -0.076	+ 0.151 + 0.006	0.036		
		Boom swing	50	-0.030 -0.076	+ 0.164 + 0.007	0.037		
2	Tolerance between bushing and piston head mounting pin	Boom	60	-0.060 -0.106	+ 0.174 + 0.100	0.160	Replace pin and bushing	
		Arm	50	-0.050 -0.089	+ 0.142 + 0.080	0.130		
		Bucket	45	-0.050 -0.089	+ 0.142 + 0.080	0.130		
		Boom swing	55	-0.060 -0.106	+ 0.174 + 0.100	0.160		
3	Tolerance between bushing and cylinder mounting pin	Boom	60	-0.060 -0.106	+ 0.174 + 0.100	0.160	Replace pin and bushing	
		Arm	60	-0.060 -0.106	+ 0.174 + 0.100	0.160		
		Bucket	45	-0.050 -0.089	+ 0.142 + 0.080	0.130		

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL