

# **Operation & Maintenance Manual**

# **H285S**

## **HYDRAULIC SHOVEL**

**SERIAL NUMBER H285S 78067**

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May 2005



**1.0 CONTENTS OF THE BINDER**

Assembled in this file are the Operation-, Lubrication- and Maintenance Manuals for your DEMAG KOMATSU Excavator.

**1.1 Division of the Binder**

**Part 1:** Operation Manual

**Part 2:** Lubrication- and Maintenance Manual

**Part 3:** Excavator Assembly Manual. Technical Data Booklet. Service Literature for the Power Unit (Diesel Engine or Electric Motor) and for Special Equipment. Electrical- and Hydraulic Diagrams.

Refer to the table of contents for details.

**Read the Manuals before You Start the Engine.**

Before operating the machine, familiarize yourself with its instruments and controls.

Observe the instructions in these manuals for:

- **your Personal SAFETY**
- **Operating SAFETY, and**
- **READY and EFFICIENT PERFORMANCE of your DEMAG KOMATSU Excavator.**

Periodic preventive inspections and maintenance are the surest means of keeping the machine in proper working order. Prompt detection and correction of minor irregularities, and immediate replacement of worn out or broken parts will prevent failures and avoid expenses.

Replace damaged graphics and symbols.

**Observe Safety Precautions to prevent injury and damage.**

If you have any questions concerning this literature please contact

**Demag Komatsu GmbH**  
Parts & Service Information  
Department 8151.40  
P.O. Box 18 03 61  
D - 40570 Düsseldorf  
GERMANY



## 1.2 Designated Use of the Hydraulic Excavator

- 1.2.1 This machine has been manufactured in accordance with advanced and up-to-date technology standards including recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or of third parties, or cause damage to the machine and to other material property.
- 1.2.2 The machine must only be used in technically perfect condition in accordance with its designated use and the instructions set out in the operation manual. Only trained safety-conscious operators who are fully aware of the risks involved should operate the machine. Any functional disorders, especially those affecting the safety of the machine, should, therefore, be rectified immediately.
- 1.2.3. The hydraulic excavator is designed exclusively for excavating, i.e. excavation of bulk material and natural soil structure (e.g. earth, clay, sand and stones ashore and off-shore). Observe local and national safety regulations. Special conditions at the worksite require additional safe working precautions, follow your company's safety instructions. Short traveling distances for changing the working site are considered as part of the designated use of the excavator.
- Using the excavator for purposes other than those mentioned above (such as object handling and use as a transport vehicle) is considered contrary to its designated use. The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user.



- **SPECIAL USE OF THE EXCAVATOR BEYOND ITS DESIGNATED USE, E.G. OBJECT HANDLING OPERATIONS, REQUIRE WRITTEN AGREEMENT FROM THE MANUFACTURER AND RETROFITMENT OF THE EXCAVATOR WITH RESPECTIVE SAFETY RELATED EQUIPMENT BEFORE SUCH SPECIAL APPLICATIONS ARE PERMITTED.**



### **Delivery of the Excavator**

The Excavator is being delivered disassembled into its main components.

For assembling the Excavator refer to the separate Manual

“Assembly Procedure“ in Part 3 of this binder.



**Personnel entrusted with work on the machine must have read the Assembly Manual, the Operation,- Lubrication- and Maintenance Manual and in particular the section on safety before beginning work. Reading the instructions after work has begun is too late.**

If there are any questions concerning the assembling procedure, contact your nearest DEMAG KOMATSU Service Station.

Prior to first operation, inspect the excavator thoroughly with a DEMAG KOMATSU service engineer. Check all fluid levels according to the Lubrication and Maintenance Schedule.

Damages and defects caused by incorrect operation and maintenance are not covered by the manufacturers guarantee.



- *If the excavator is equipped with a fire suppression system, make sure that the system is ready for operation.*

### **Spare Parts**

For your spare part orders refer to the **Parts Catalogue**.

In order to keep your Excavator in first-class operating condition **use only genuine DEMAG KOMATSU spare and wear parts.**

The use of any part other than the genuine DEMAG KOMATSU part releases the DEMAG KOMATSU Company from any guarantee.

### **Service**

For all questions related to your excavator please contact Demag Komatsu GmbH.

Service Department 8151.

In all your written or phoned inquiries please indicate the model and serial number of your excavator.





**INTRODUCTION**

**GENERAL CONTENT**

**PART 1: OPERATION MANUAL**

<b>Section</b>	<b>Subject</b>
	<b>Table of Contents</b>
1	Foreword
2	Construction of the Excavator
3	Safety Precautions
4	Operator's Cab, Controls
5	Operator's Cab, Monitors
6	Operating Instructions
7	Working Instructions
8	Parking the Excavator
9	Refilling System
10	Exchange of Attachment

**PART 2: LUBRICATION- AND MAINTENANCE MANUAL**

<b>Section</b>	<b>Subject</b>
	<b>Table of Contents</b>
1	Foreword
2	Safety Precautions
3	Fluids and Lubricants
4	Filling Capacities
5	Lubrication and Maintenance Schedule
6	Lubrication and Maintenance Work
7	Excavator Storage
8	Trouble Shooting



**PART 3: DIVERSE LITERATURE**

- Excavator Assembly Manual
- Technical Data Booklet
- Engine Operation- and Maintenance Manual
- Lubricant Chart
- Electrical Diagram
- Hydraulic Diagram
- Subcontractor Manuals for Special Equipments, e.g.
  - Air Conditioning
  - Fire Detection and Suppression System
  - Automatic Lubrication Systems, etc.



1. Foreword
2. Construction of the excavator
  - 2.1 Superstructure
  - 2.2 Undercarriage
  - 2.3 Equipment
3. Safety instructions
4. Cab control elements
5. Cab - monitoring elements
  - 5.1 Power compartment, engine shut-off switch
  - 5.2 Monitoring elements of the central - and slewing ring toothing lubrication system
- 6.1 Before starting the engine
- 6.2 Starting
- 6.3 Stopping
- 6.4 Driving the excavator
- 6.5 Slewing and braking the superstructure
- 6.6 Working with the equipment
- 6.7 Combined operation cycles
- 6.8 Operating the heater, ventilation and air-conditioning
- 6.9 -
- 6.10. -
- 6.11 Operating the lubrication system
- 6.12 -
- 6.13 Fire detection and suppression system
7. Working instruction (hints)
8. Parking the excavator
9. Refuelling the excavator
10. Exchange of equipment and / or components
  - 10.1 -
  - 10.2 Removing backhoe equipment
  - 10.3 Fitting loading equipment
  - 10.4 -
  - 10.5 -
  - 10.6 -
  - 10.7 -
  - 10.8 -
  - 10.9 Removing the stick with bullclam bucket
  - 10.10 Removing the loading bucket or bullclam bucket





This Operation Manual contains the most important instructions for correct operation of the excavator. It should always be ready for use in the operator's cab.

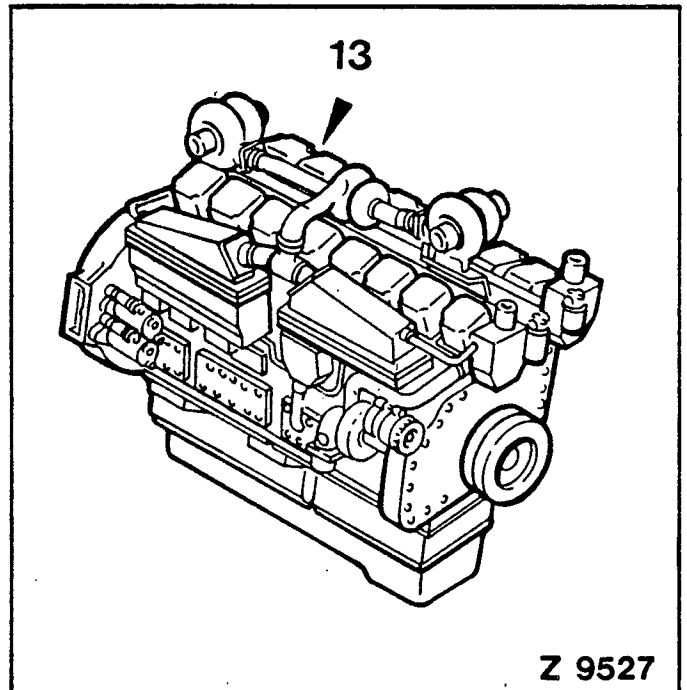
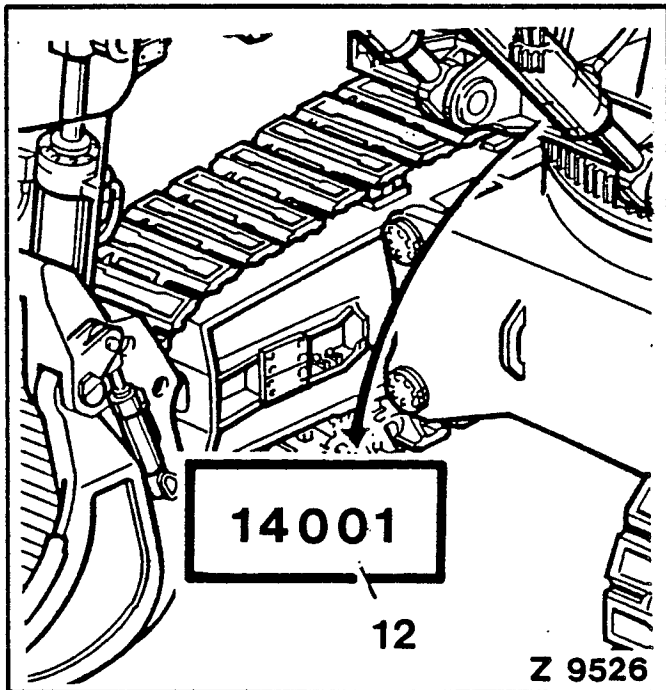
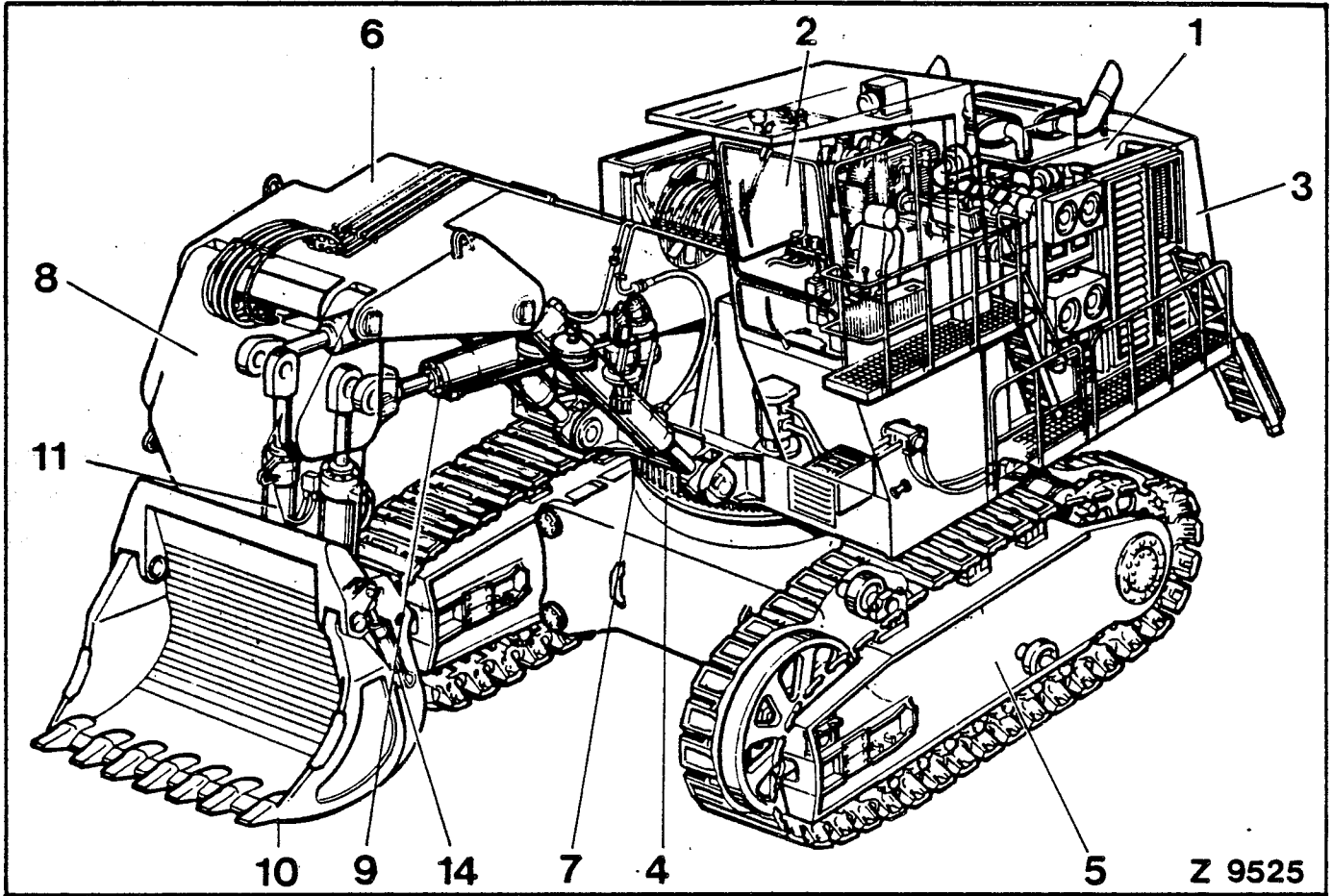
Note:

This manual contains two fold-out tables.

The table at the front shows the location of all controls mentioned in the manual.

The location of the indicators are shown on the fold-out table at the end of the manual.

For easy reference, fold out these tables when reading the Manual.

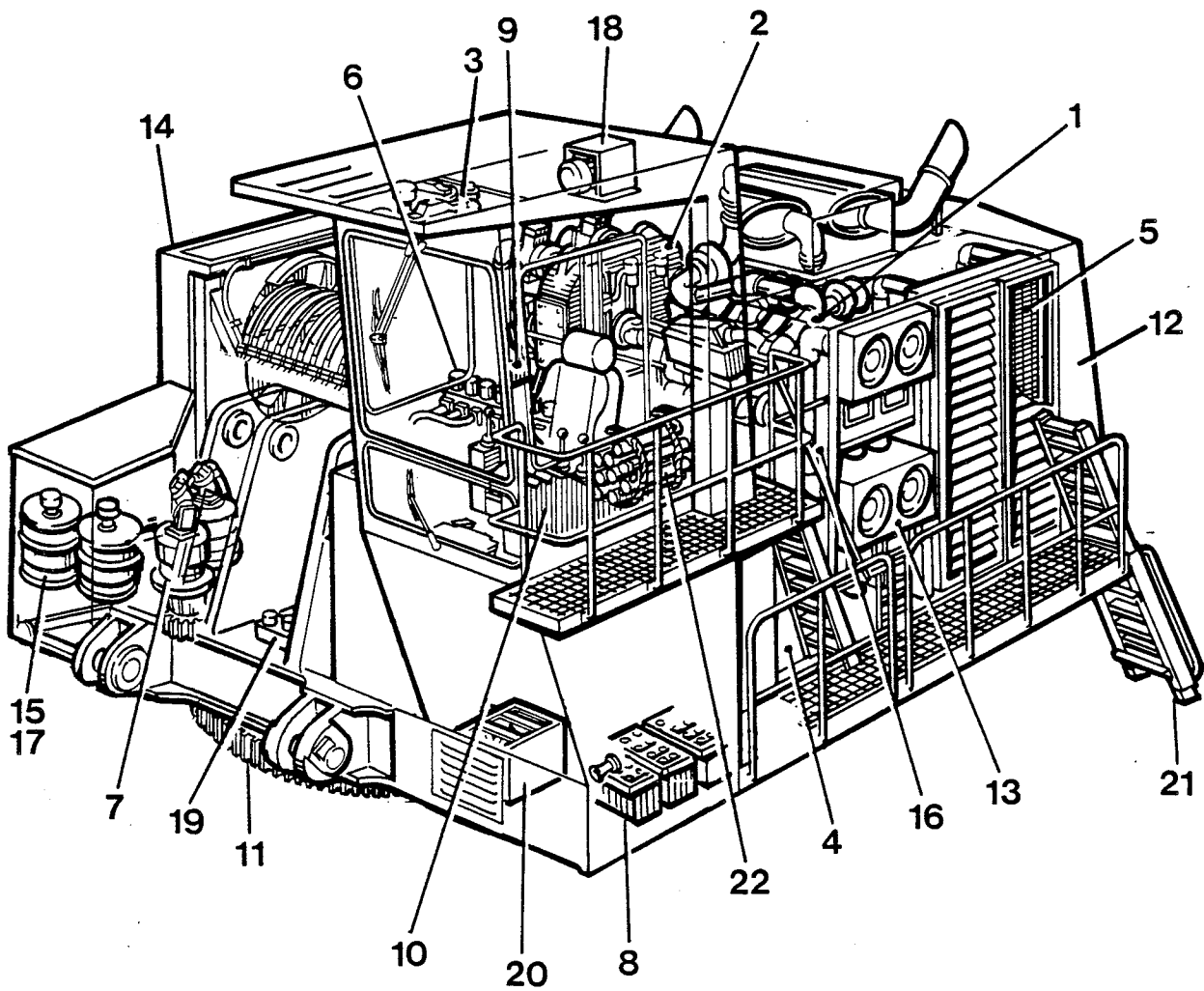




2. Overall view

Legend for illust. (Z 9525):

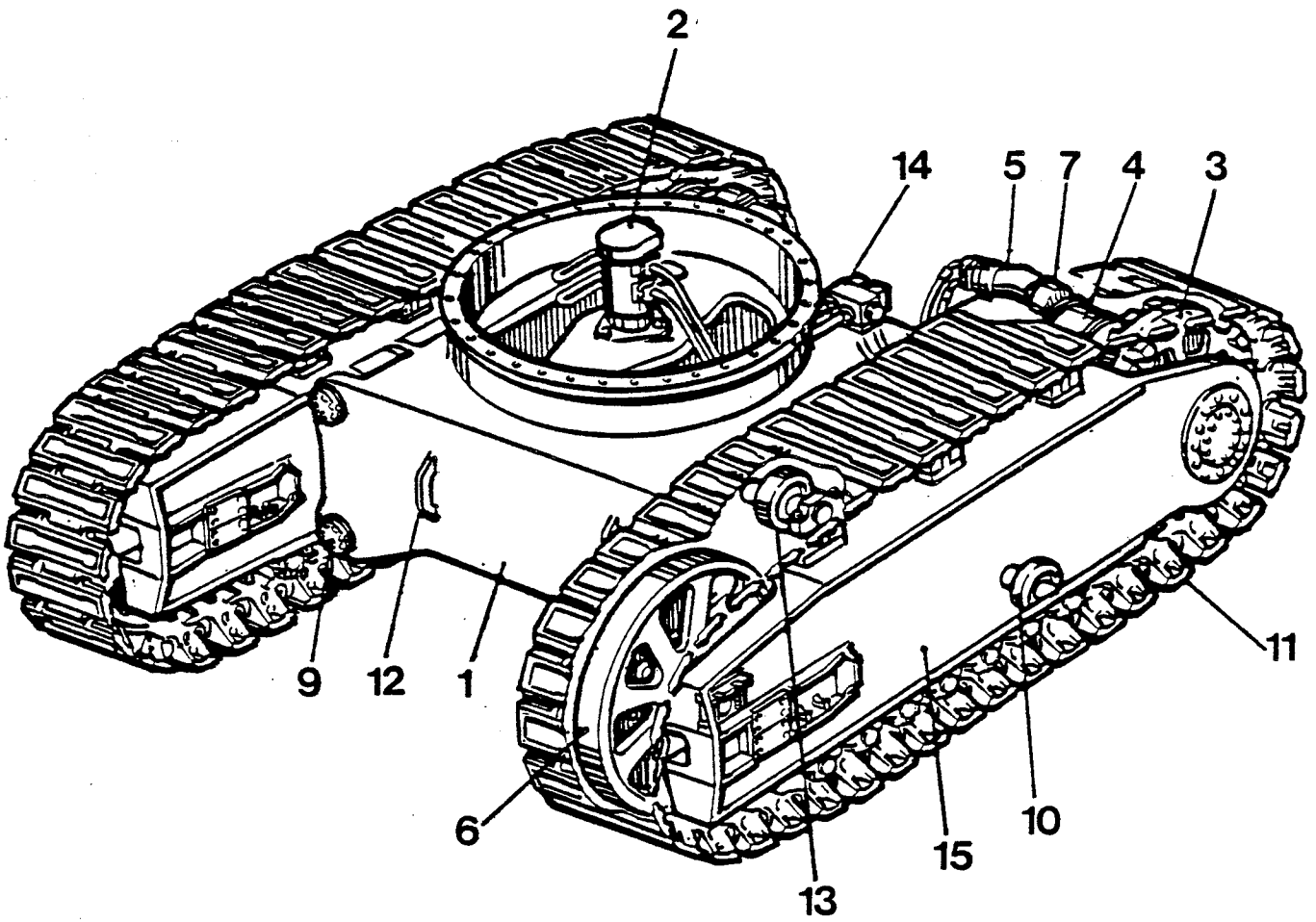
- (1) Superstructure
- (2) Cab
- (3) Counterweight
- (4) Slewing connection
- (5) Undercarriage
- (6) Boom
- (7) Boom cylinder
- (8) Stick
- (9) Stick cylinder
- (10) Bucket
- (11) Bucket cylinder
- (12) Serial no. illust. (Z 9526)
- (13) Engine serial no. illust. (Z 9527)
- (14) Bullclam bucket clam cylinder



2.1 Superstructure

Legend for illust. (Z 19063):

- (1) Diesel engine
- (2) Pump distributor gear
- (3) Hydraulic oil reservoir
- (4) Fuel tank
- (5) Radiator
- (6) Control blocks
- (7) Slewing gear
- (8) Batteries
- (9) Suction oil container
- (10) Control stand
- (11) Slewing ring
- (12) Counterweight
- (13) Air cleaner
- (14) Oil cooler
- (15) Central lubrication system
- (16) Refuelling system
- (17) Slewing ring toothing lubrication system
- (18) Generator
- (19) Progressive lubrication system
- (20) Air conditioning
- (21) Retractable ladder
- (22) Emergency rope-ladder



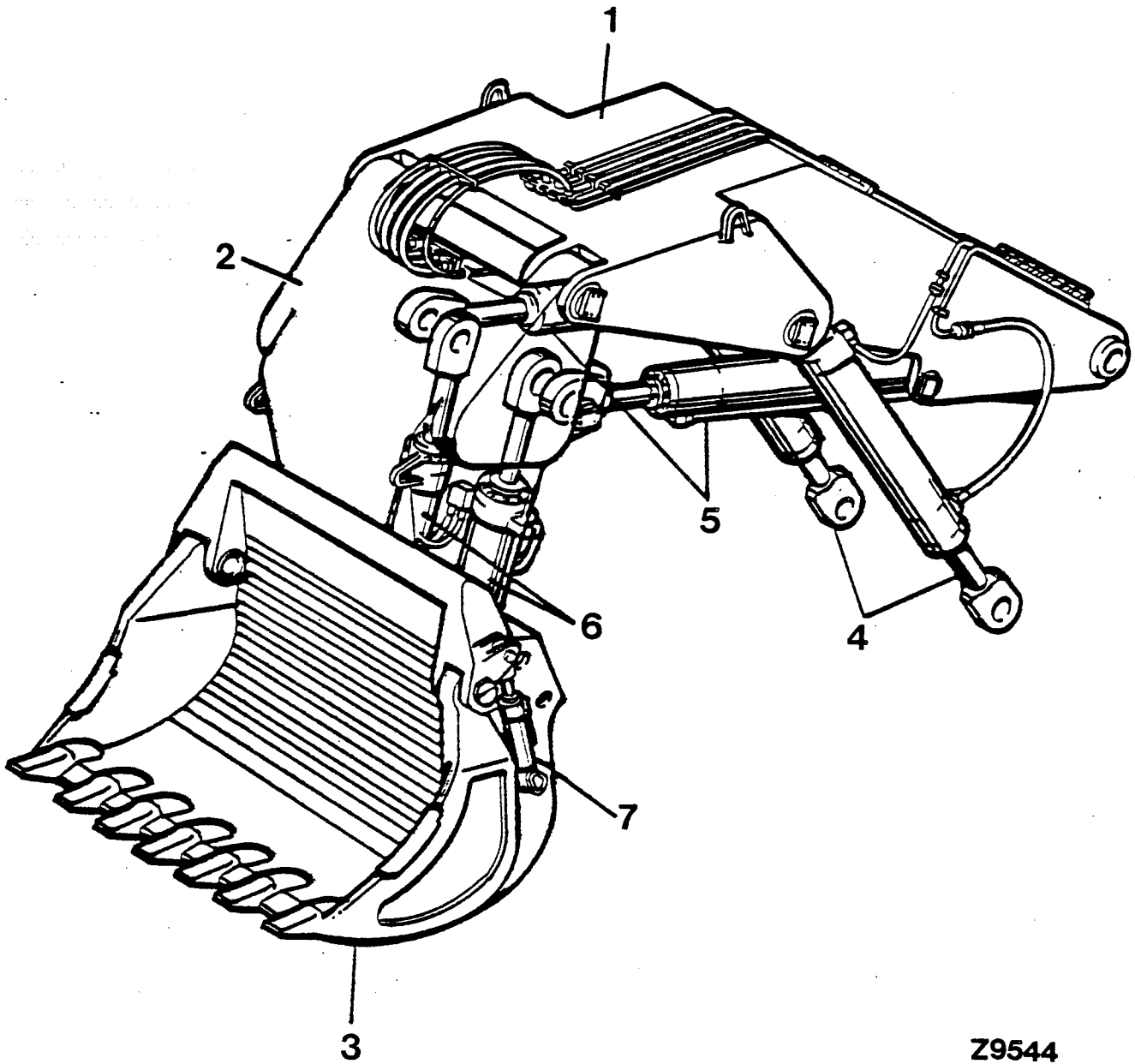
Z9529



## 2.2 Undercarriage

Legend: (Z 9529)

- (1) Undercarriage central part
- (2) Rotary distributor
- (3) Sprocket
- (4) Driving gear
- (5) Hydraulic travel motor
- (6) Guide wheel
- (7) Brakes - driving gear
- (8) -
- (9) Lubrication nipple
- (10) Track roller
- (11) Track
- (12) Bugle
- (13) Support roller
- (14) Brake valve
- (15) Crawler support



Z9544

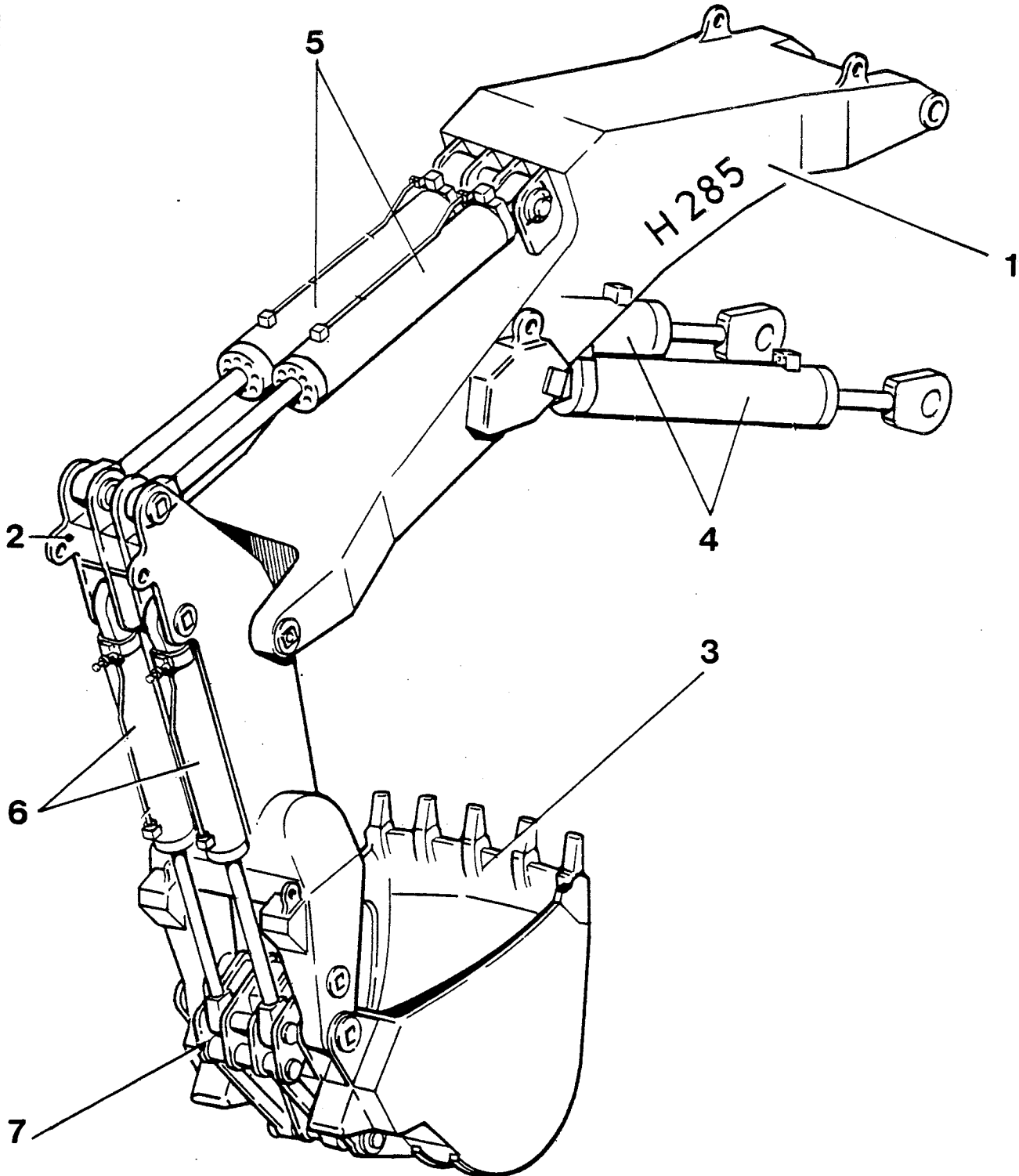


## 2.3 Equipment

### Loading equipment

Legend: (Z 9544)

- (1) Boom
- (2) Stick
- (3) Bucket
- (4) Boom cylinder
- (5) Stick cylinder
- (6) Bucket cylinder
- (7) Bullclam cylinder



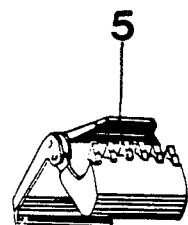
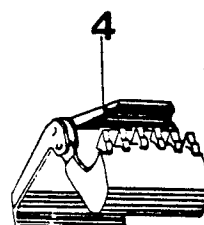
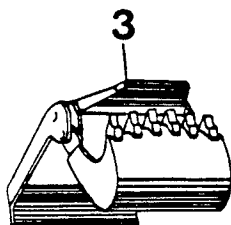
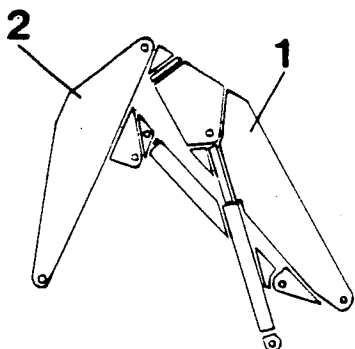
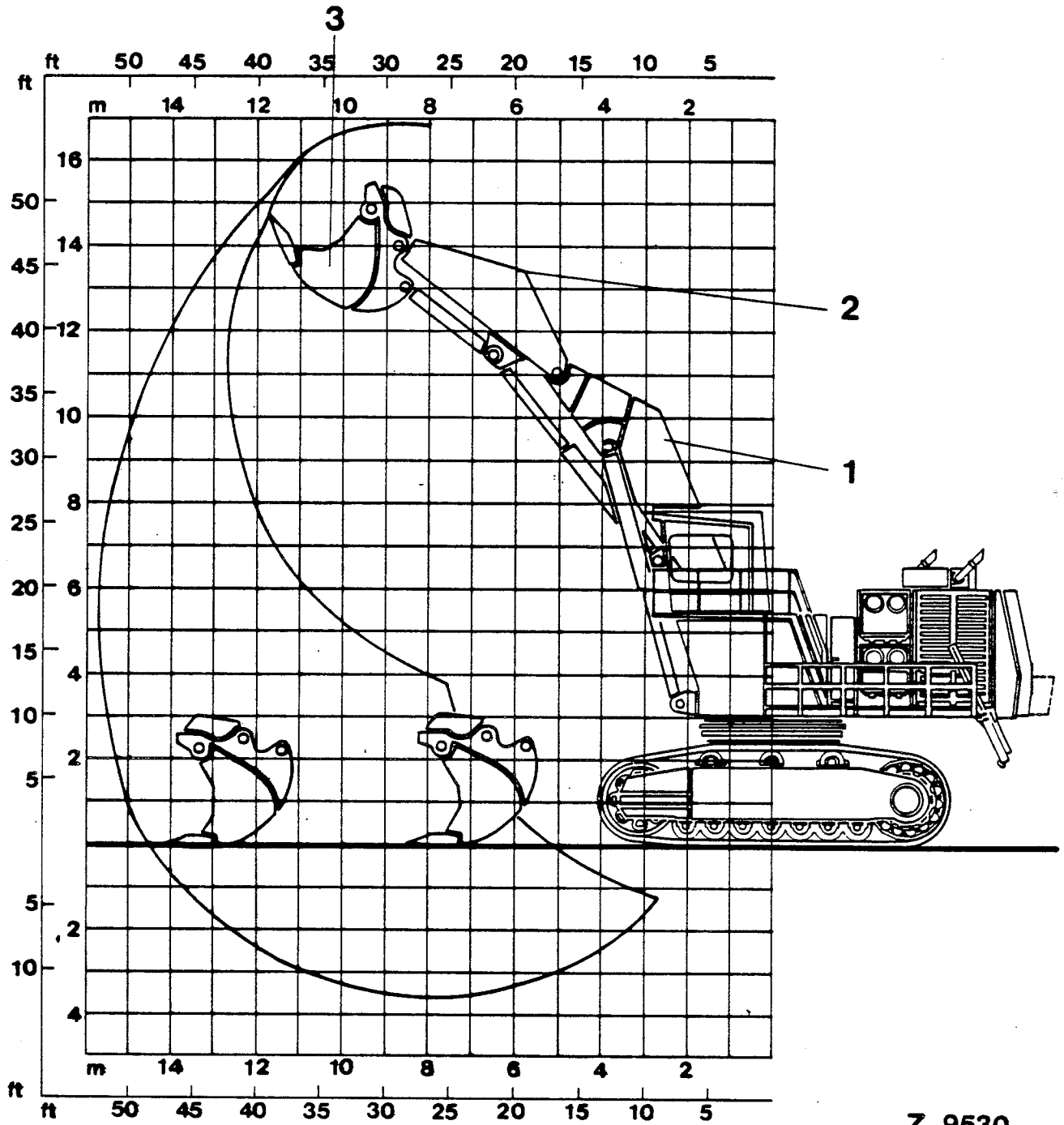




Backhoe equipment

Legend: (Z 10364)

- (1) Boom
- (2) Stick
- (3) Bucket (backhoe)
- (4) Boom cylinder
- (5) Stick cylinder
- (6) Bucket cylinder
- (7) Link and bar





Bulldozer bucket equipment

Radius diagram (Z 9530).

Curve with bucket (3).

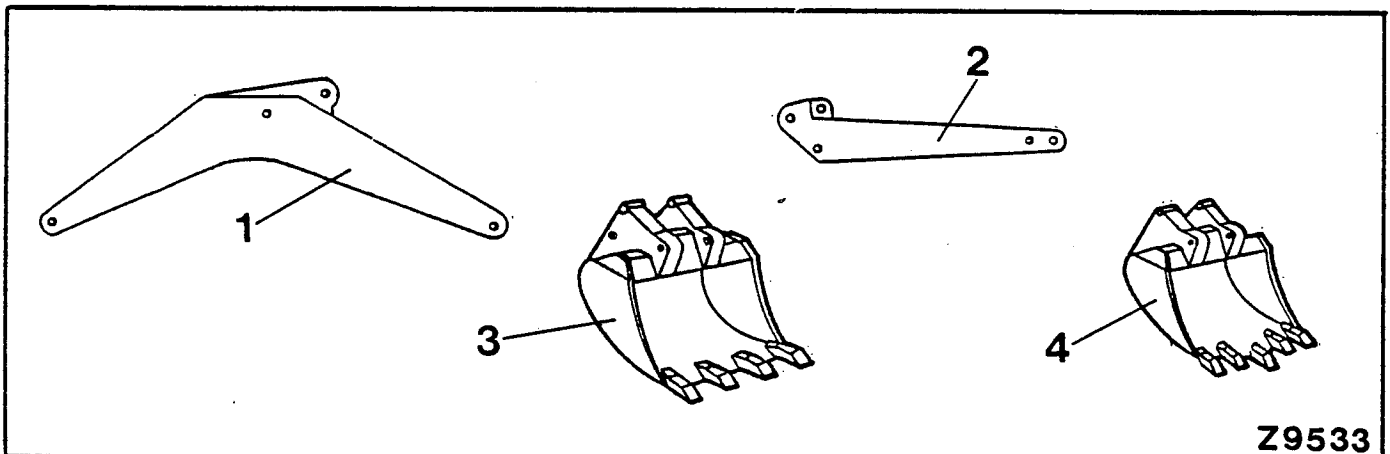
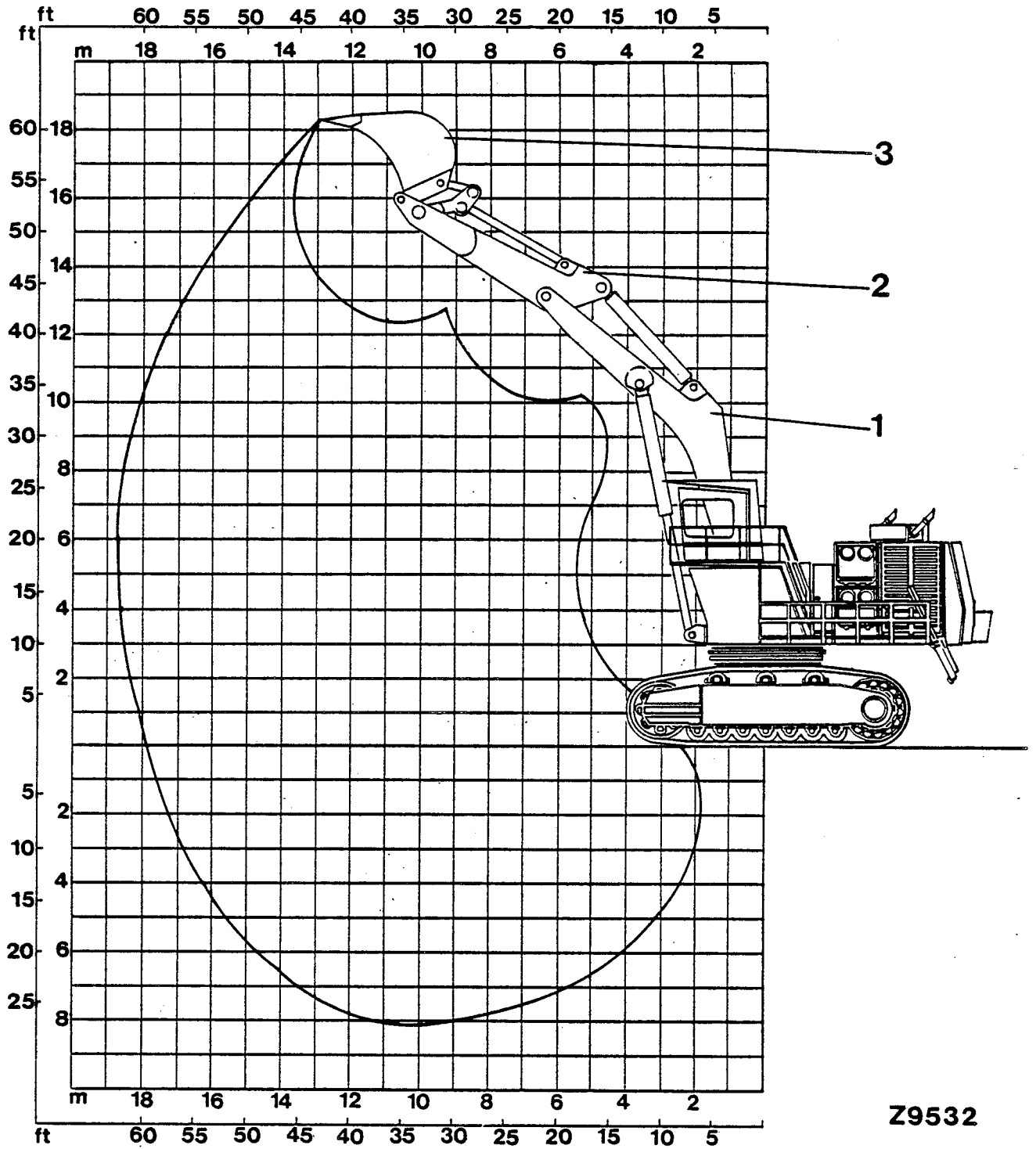
Equipment variations:

Legend: (Z 9531)

- (1) Boom
- (2) Stick
- (3) Light-load bucket
- (4) Standard bucket
- (5) Heavy-duty bucket

Specifications for the bulldozer bucket versions.

	3	4	5
Capacity	31.5 cuyd / 24 m <sup>3</sup>	21 cuyd / 16 m <sup>3</sup>	13 cuyd / 10 m <sup>3</sup>
Width	17' / 5200 mm	14' 3" / 4350 mm	11'11" / 3600 mm
Weight	58763 lbs / 26650 kg	53471 lbs / 24250 kg	55125 lbs / 25000 kg
Bulk Material	1860 lbs/yd <sup>3</sup> /	3050 lbs/yd <sup>3</sup> /	4700 lbs/yd <sup>3</sup> /
Weight/max.	1.1 Mp/m <sup>3</sup>	1.8 Mp/m <sup>3</sup>	2.8 Mp/m <sup>3</sup>





Backhoe equipment

Radius diagram (Z 9532).

Curve with bucket (3).

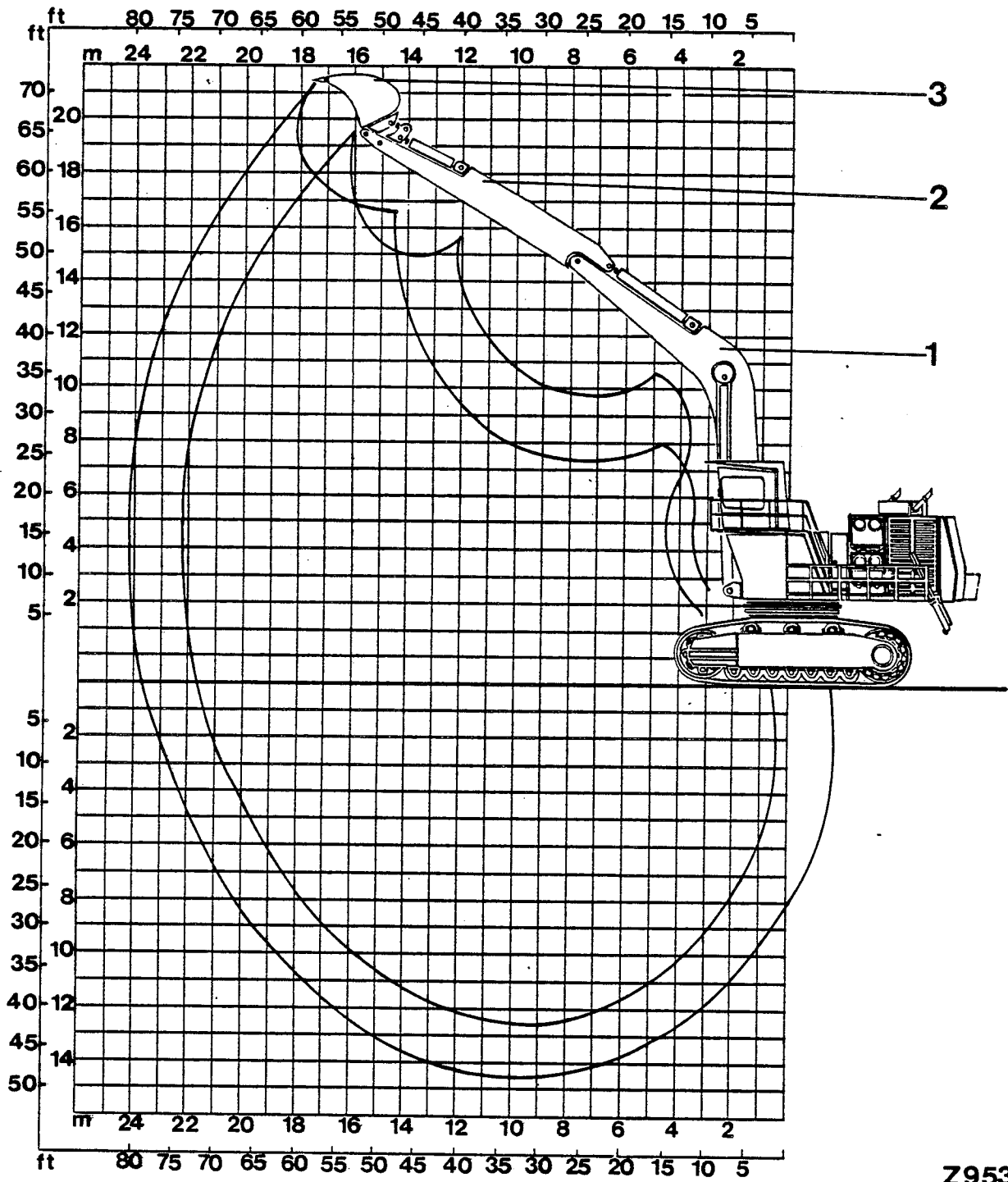
Equipment variations:

Legend: (Z 9533)

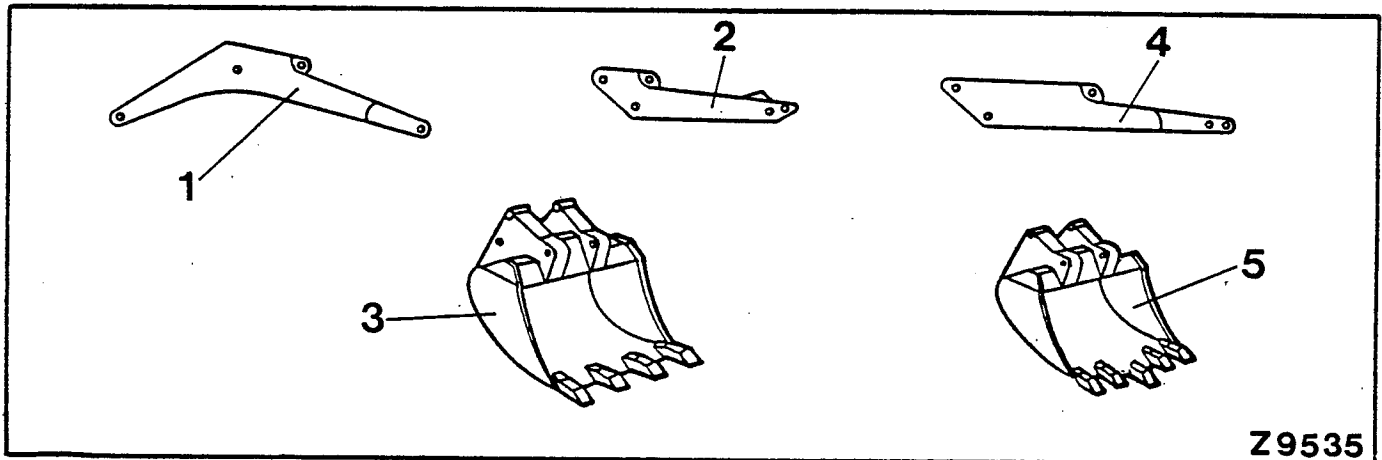
- (1) Boom
- (2) Stick
- (3) Bucket 21 m<sup>3</sup>
- (4) Bucket 14 m<sup>3</sup>

Specifications for the bucket versions:

	3	4
Capacity (CECE)	27.5 cuyd / 21 m <sup>3</sup>	18.5 cuyd / 14,3 m <sup>3</sup>
Capacity (SAE)	30.2 cuyd / 23 m <sup>3</sup>	20 cuyd / 15,5 m <sup>3</sup>
Width	9' 10" / 3000 mm	9' 2" / 2800 mm
Weight	35908 lbs / 16285 kg	29767 lbs / 13500 kg
Bulk Material Weight/max.	1860 lb/yd/ 1,1 Mp/m <sup>3</sup>	3050 lb/yd/ 1,8 Mp/m <sup>3</sup>



Z9534



Z9535



Backhoe equipment

Radius diagram (Z 9534).

Curve with stick (2) and bucket (3).

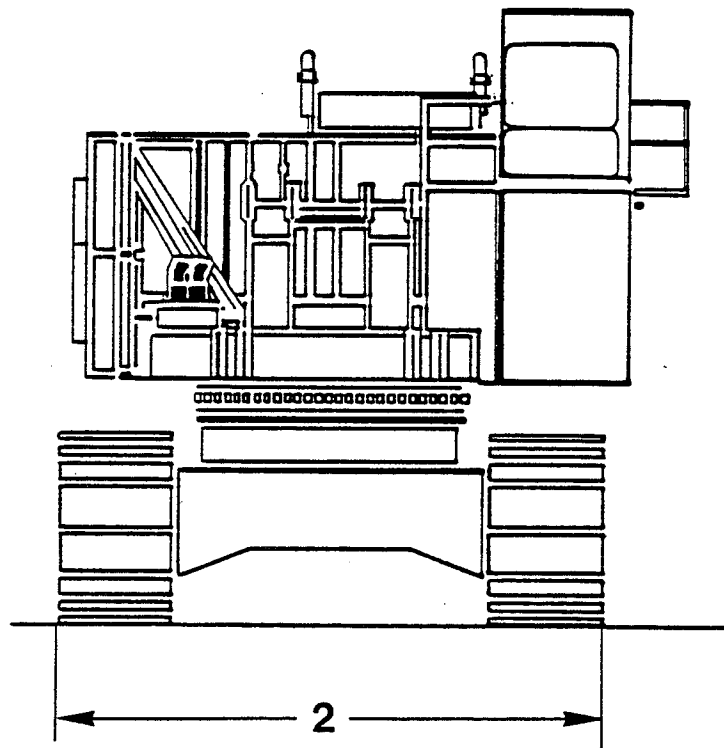
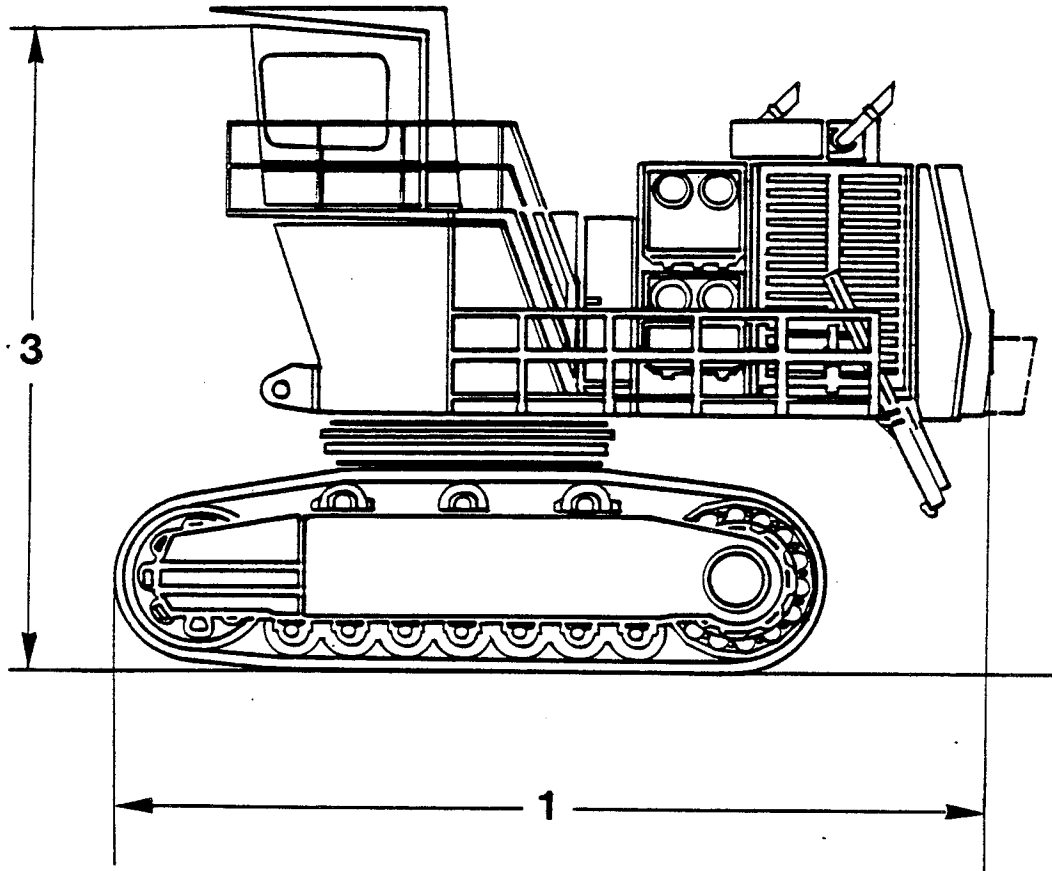
Equipment variations:

Legend: (Z 9535)

- (1) Boom
- (2) Stick 7000 mm
- (3) Bucket 7.5 m<sup>3</sup>
- (4) Stick 9000 mm
- (5) Bucket 5.0 m<sup>3</sup>

Specifications for the bucket versions:

	3	5
Capacity (CECE)	10 cuyd / 7,5 m <sup>3</sup>	6,5 cuyd / 5,0 m <sup>3</sup>
Capacity (SAE)	11 cuyd / 8,3 m <sup>3</sup>	7 cuyd / 5,5 m <sup>3</sup>
Width	7' 2" / 2180 mm	6' 7" / 2000 mm
Weight	20500 lbs / 9300 kg	16550 lbs / 7500 kg
Bulk Mater.Weight/max.	3050 lb/yd <sup>3</sup> 1,8 Mp/m <sup>3</sup>	3050 lb/yd <sup>3</sup> 1,8 Mp/m <sup>3</sup>







**MANNESMANN  
DEMAG**  
Baumaschinen

CONSTRUCTION OF THE EXCAVATOR

1604n-09

2.

Main dimensions

Legend: (Z 9537)

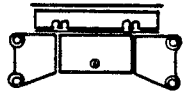
- (1) Length = 10 340 mm / 33'11"
- (2) Width = 6 450 mm / 21' 2"
- (3) Height = 7 595 mm / 24'11"



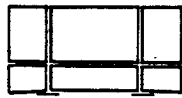
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2



3



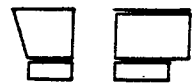
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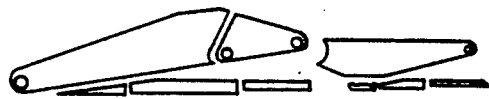
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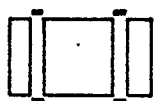
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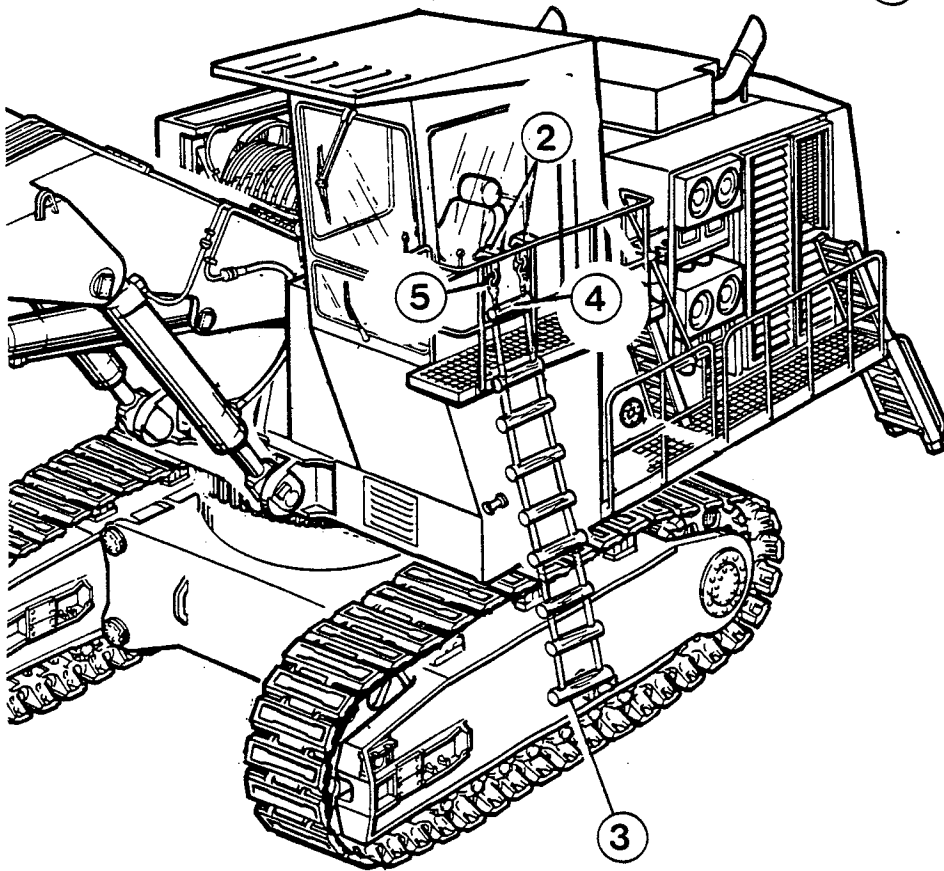
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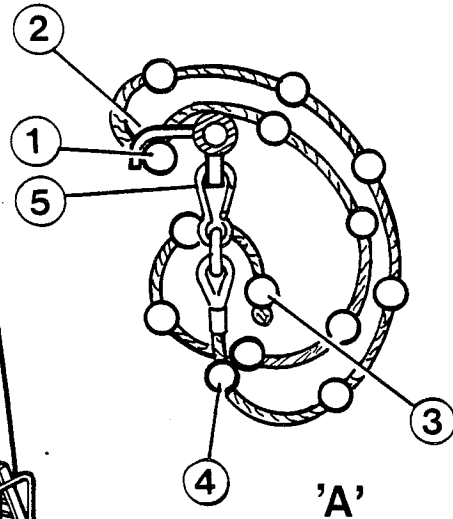


Individual dimensions and weights (Z 9538)

	Length Länge Longueur Longitud	Width Breite Largeur Anchura	Height Höhe Hauteur Altura	Weight Gewicht Poids Peso
1 Crawler support	8420 mm	2665 mm	2425 mm	46000 kg
(left / right)	27' 8"	8' 9"	7' 11"	101450 lbs
				48500 kg
				106942 lbs
2 Middle section	4320 mm	4000 mm	2200 mm	24350 kg
	14' 6"	11' 10"	7' 3"	53700 lbs
3 Counterweight	5850 mm	3045 mm	970 mm	35000 kg
	18' 6"	9' 1"	3' 1"	73000 lbs
4 Engine and Hydraulic Section	6100 mm	3450 mm	4100 mm	26000 kg
	20' 7"	11' 4"	13' 5"	57000 lbs
5 Super structure platform	8357 mm	4030 mm	2870 mm	30000 kg
	26' 7"	13' 3"	9' 5"	66150 lbs
6 Tank and cab landing	3590 mm	2540 mm	2460 mm	3740 kg
	11' 9"	8' 3"	8' 1"	8246 lbs
7 Cab and guard	2250 mm	1600 mm	2200 mm	900 kg
	7' 5"	5' 3"	7' 3"	2000 lbs
8 Boom, stick with Cylinders	12400 mm	3000 mm	2500 mm	48450 kg
	40' 7"	9' 2"	8' 2"	106800 lbs
9 Bucket	3450 mm	4350 mm	3100 mm	23600 kg
	11' 4"	14' 3"	10' 2"	52052 lbs
10 Oil cooler (complete)	1965 mm	1956 mm	3045 mm	1900 kg
	6' 5"	6' 5"	9' 11"	4200 lbs
11 Railing, platform miscellaneous	-	-	-	3000 kg
				6615 lbs



'B'



Z 19064

Special safety regulations are given in the rules for the prevention of accidents. It is your responsibility to observe these rules.

Note:

The information in this manual does not replace any safety rules or laws used in your area.

- Keep operator's cab and windows clean in order to ensure good visibility.
- Make sure that all safety devices (e.g. fan coverings, stone guard etc.) are properly fitted.
- Emergency rope-ladder (1) illust. (Z 19064)
  - A - Normal position
  - B - Lowered position
- (1) Rope ladder
- (2) Braces
- (3) Bottom rung
- (4) Upper rung
- (5) Snap hock

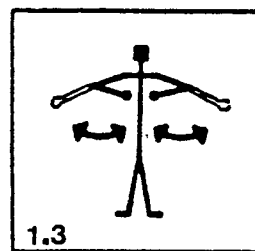
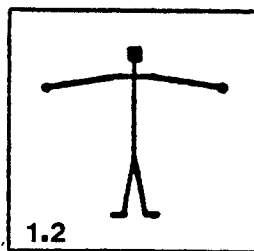
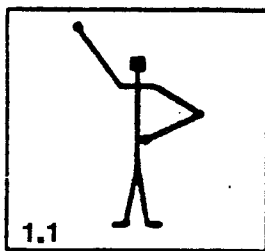
In case of emergency with normal walk-way obstructed use rope ladder for leaving the machine.

For lowering the rope ladder unhook rung (1) from braces (2) and lower the ladder (view "B").

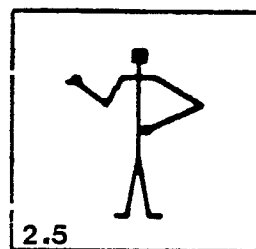
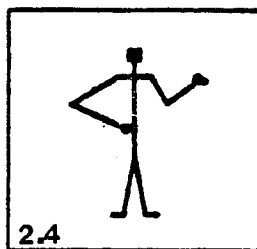
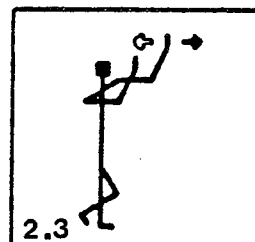
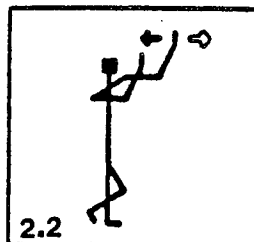
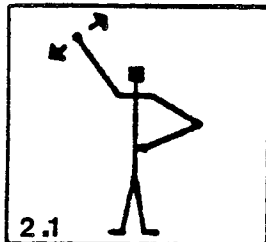
- Before starting work, the operator must make sure that there is no one in the machine's danger area. If necessary a warning signal must be given.
- Work must not be started or must be suspended if other persons do not leave the danger area.
- Prior starting work make an operational check to ensure that no faults are present and all units function smoothly.
- The controls must only be operated from inside the operator's cab.
- If the operator of the machine cannot visually monitor the operation of the working equipment a spotter must be provided. Spotters must be familiar with all signals.



1.



2.



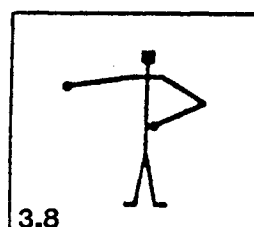
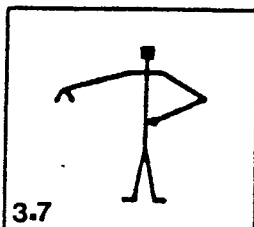
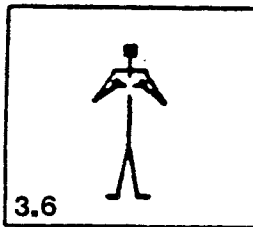
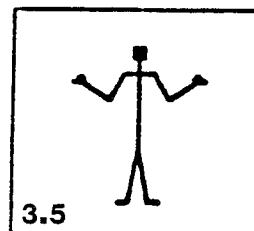
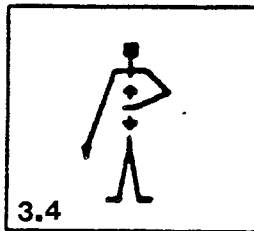
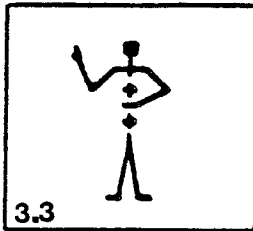
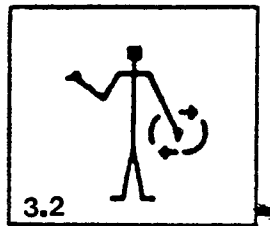
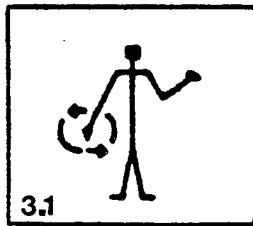
Z 11037



1. Hand signals (Z 11037)
1. General hand signals
  - 1.1 Attention  
Raise arm straight up with open hand
  - 1.2 Stop  
Hold both arms out horizontally
  - 1.3 Stop! Danger!  
Hold out both arms horizontally and bend in repeatedly
2. Hand signals for drive movements
  - 2.1 Starting off  
Wave raised arm with open hand back and forth
  - 2.2 Advance slowly  
Bend both arms with palms of hands facing inwards and wave forwards
  - 2.3 Reverse slowly  
Bend both arms with palms of hands facing outwards and wave backwards
  - 2.4 Right-hand turn  
Left thumb to left outwards
  - 2.5 Left-hand turn  
Right thumb to right outwards



3.



Z11038





3. Hand signals for working movements (Z 11038)
  - 3.1 Slew superstructure clockwise (cw)  
Left thumb to left outwards  
Turn right index finger in a circle
  - 3.2 Slew superstructure counterclockwise (ccw)  
Right thumb to right outwards  
Turn left index finger in a circle
  - 3.3 Hoisting equipment (load)  
Straight right index finger pointing upwards  
Left hand up and down
  - 3.4 Lowering equipment (load)  
Straight right index finger pointing downwards  
Left hand up and down
  - 3.5 Increase radius  
Both thumbs point outwards
  - 3.6 Reduce radius  
Both thumbs point inwards
  - 3.7 Open clam  
Hold arm horizontally to the side with hand half opened
  - 3.8 Close clam  
Hold arm horizontally to the side with hand closed

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3.

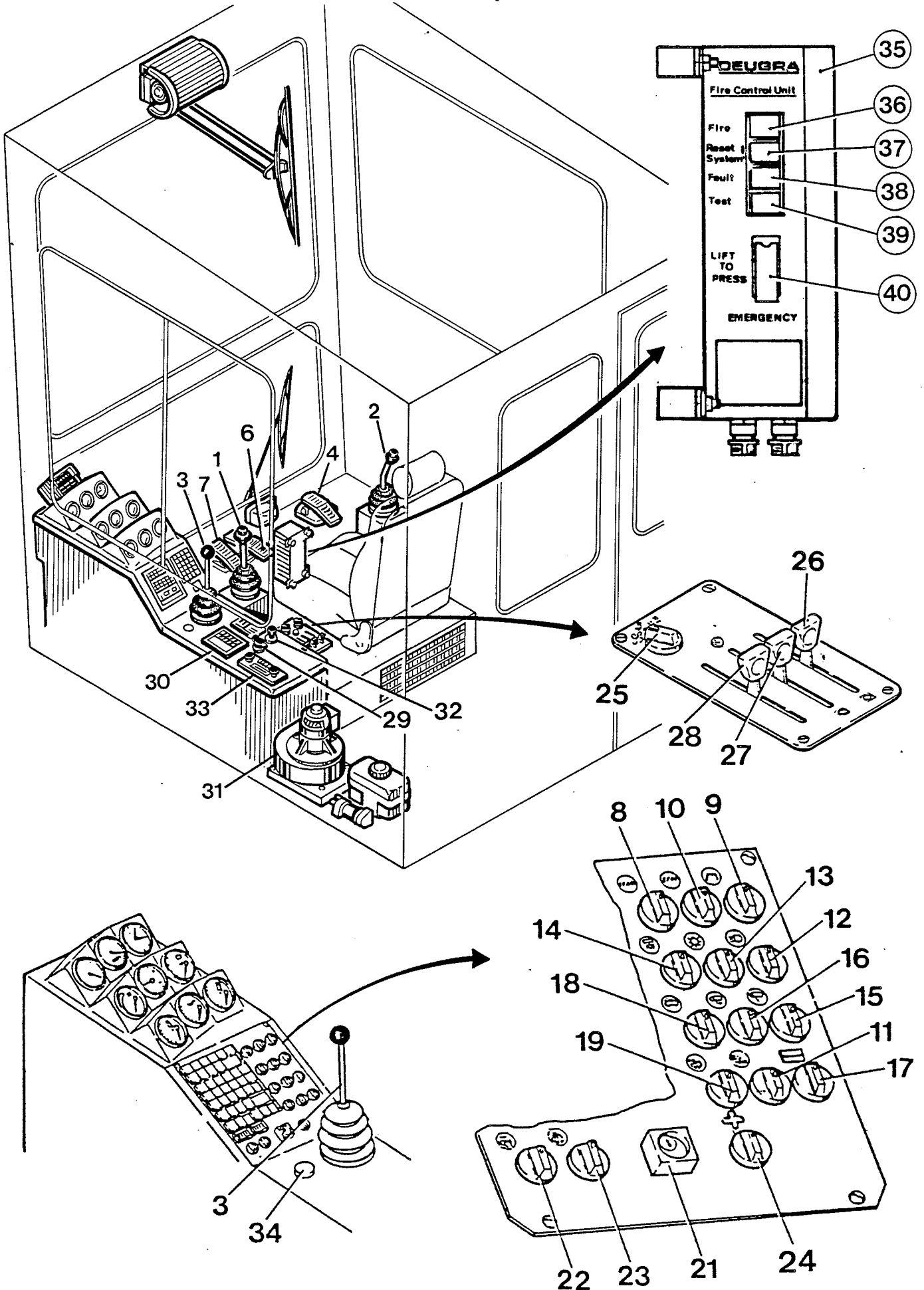


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Z7892

- Persons are not allowed to ride on the machine and must not be transported with the equipment.
- Persons may only get on or off the machine after having obtained the operator's permission and only when the machine is at stand still.
- Do not jump on or off the machine. Use ladders and hand grips.
- Secure open doors with catches to prevent accidental closing.
- Before leaving the excavator lower the equipment to the ground.  
Stop the engine and place all control levers into neutral position. Apply the parking brake.  
  
If the machine is parked on steep terrain, secure undercarriage with wedges and lock the superstructure.
- Keep machine and equipment clear from electrical overhead lines.
- If the excavator comes in contact with an overhead power line the cabin must not be left before the current has been cut off.  
Persons in the vicinity must be warned not to come too close to the excavator.
- Maintain a safe distance from slopes and pits.
- Before parking move machine away from slopes and pits.
- Carry out all necessary repairs immediately.



Legend for illust. (Z 13577):

Optional control systems

Control pattern of levers (1 and 2):

- Standard control pattern or
- EURO control pattern

see sections 6.4, 6.5 and 6.6 for additional information.

Caution!

Before starting the engine make sure you know the location and function of each control.

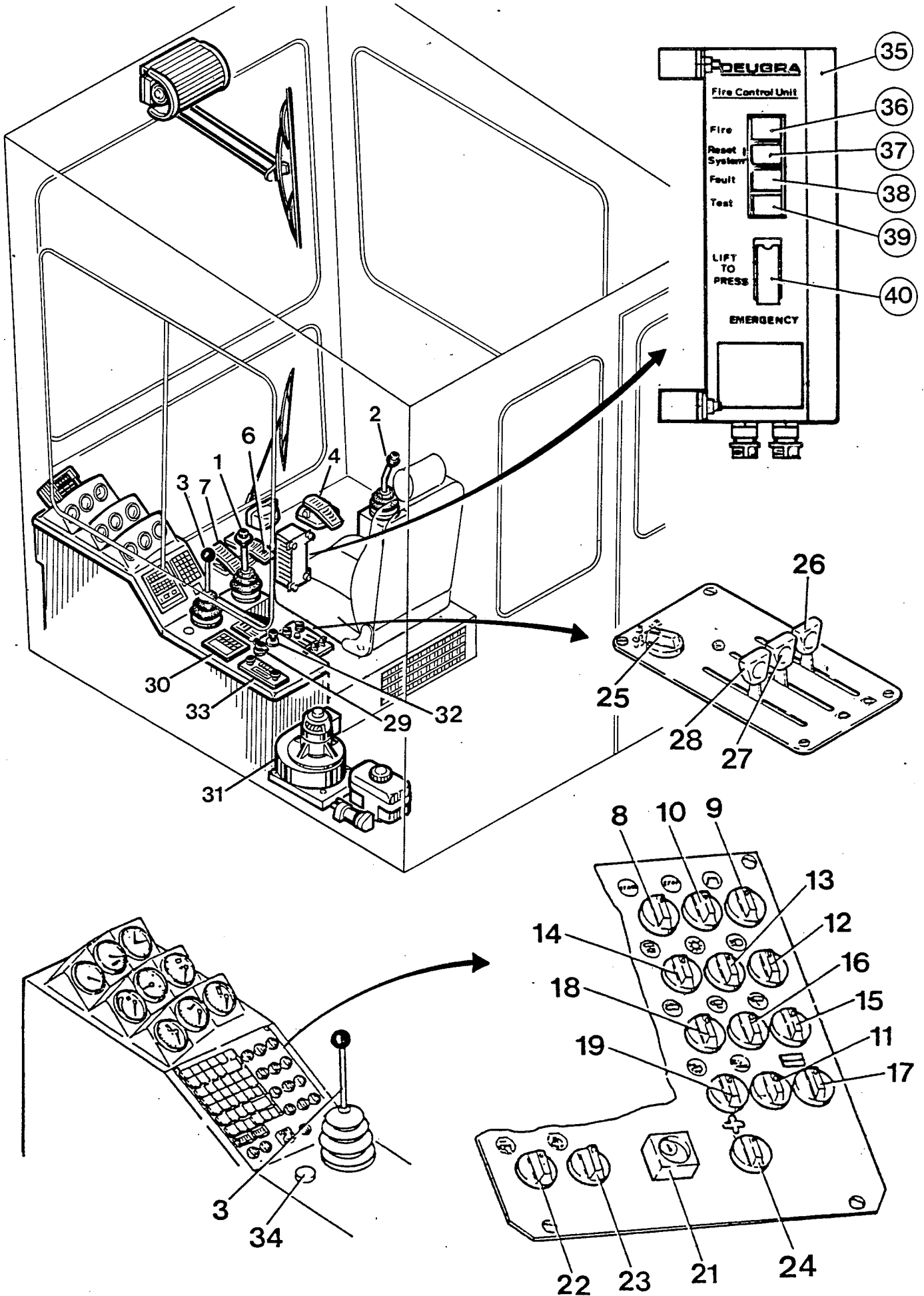
Wrong operation of the controls can cause mechanical break-down, property damage, injury or death.

Safety circuit for controls \*)

This system prevents movements of the excavator and its equipment as long as the operator is not sitting in his seat and / or with the ladder in lowered position.

- (1) - With standard control system: Control lever for boom and bucket
- (1) - With "Euro" control system: Control lever for stick and slew gear
- (2) - With standard control system: Control lever for stick and slew gear
- (2) - With "Euro" control system: Control lever for boom and bucket
- (3) Control lever for driving
- (4) Pedal slew brake
- (5) Not used
- (6) Pedal opening bullclam bucket
- (7) Pedal closing bullclam bucket
- (8) Switch "Engine Start"
- (9) Switch "Start Pilot", cold starting aid
- (10) Switch "Engine Stop"
- (11) Switch engine speed selection, low idle - high idle speed
- \*) Special equipment

continued

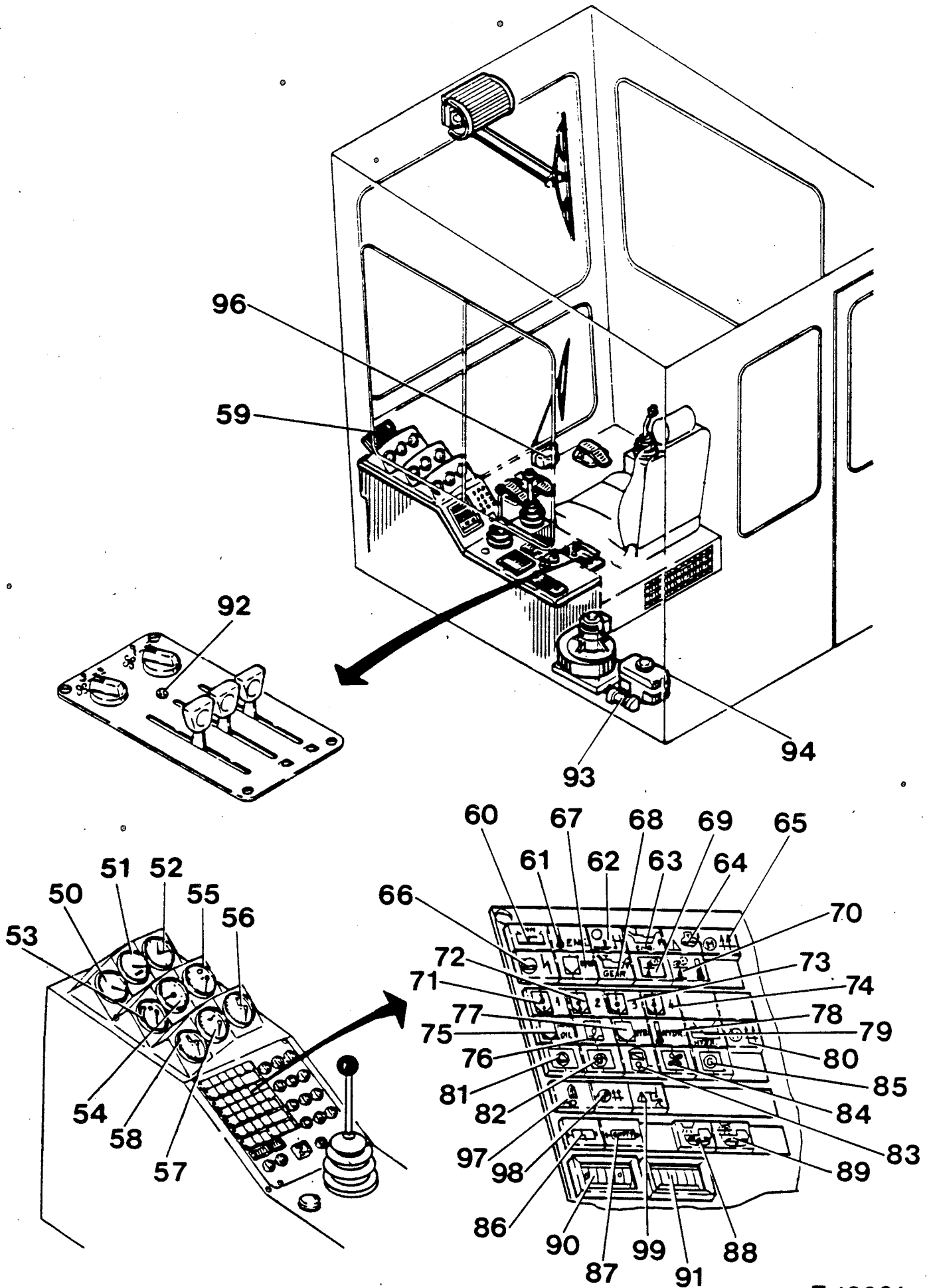


## Legend for illustration (Z 13577):

- (12) Switch head lights
- (13) Switch interior illumination
- (14) Switch dashboard illumination
- (15) Switch windshield wipers slow
- (16) Switch windshield wipers fast
- (17) Switch, venetian blind \*)
- (18) Switch windshield washer system
- (19) Switch slew brake (parking brake)
- (20) Not used
- (21) Key switch
- (22) Switch, manual actuation of centr. lubrication system \*)
- (23) Switch, manual actuation of slew ring gear lube system \*)
- (24) Blower switch cab ventilation (blower runs with low speed, even with switch in "0" position)
- (25) Blower switch air conditioning, heater (re-circulation of cab air)
- (26) Heater control
- (27) Air conditioning control \*)
- (28) Air distribution control; front position heating-rear position cooling
- (29) Socket
- (30) Performance measuring instrument "Detronic ELM" \*)
- (31) Blower
- (32) Cigarette lighter
- (33) Radio \*)
- (34) Engine, emergency shut-down
- (35) Control unit, fire detection and suppression system \*)
- (36) Press button with warning lamp "Fire"
- (37) Press button with signal lamp "Reset system"
- (38) Press button with signal lamp "Fault"
- (39) Press button "Test"
- (40) Actuating switch, fire suppression system
- \*) Special equipment

Note:

For more information regarding "Fire detection and suppression system" refer to section 6.13.







Legend: (Z 10361)

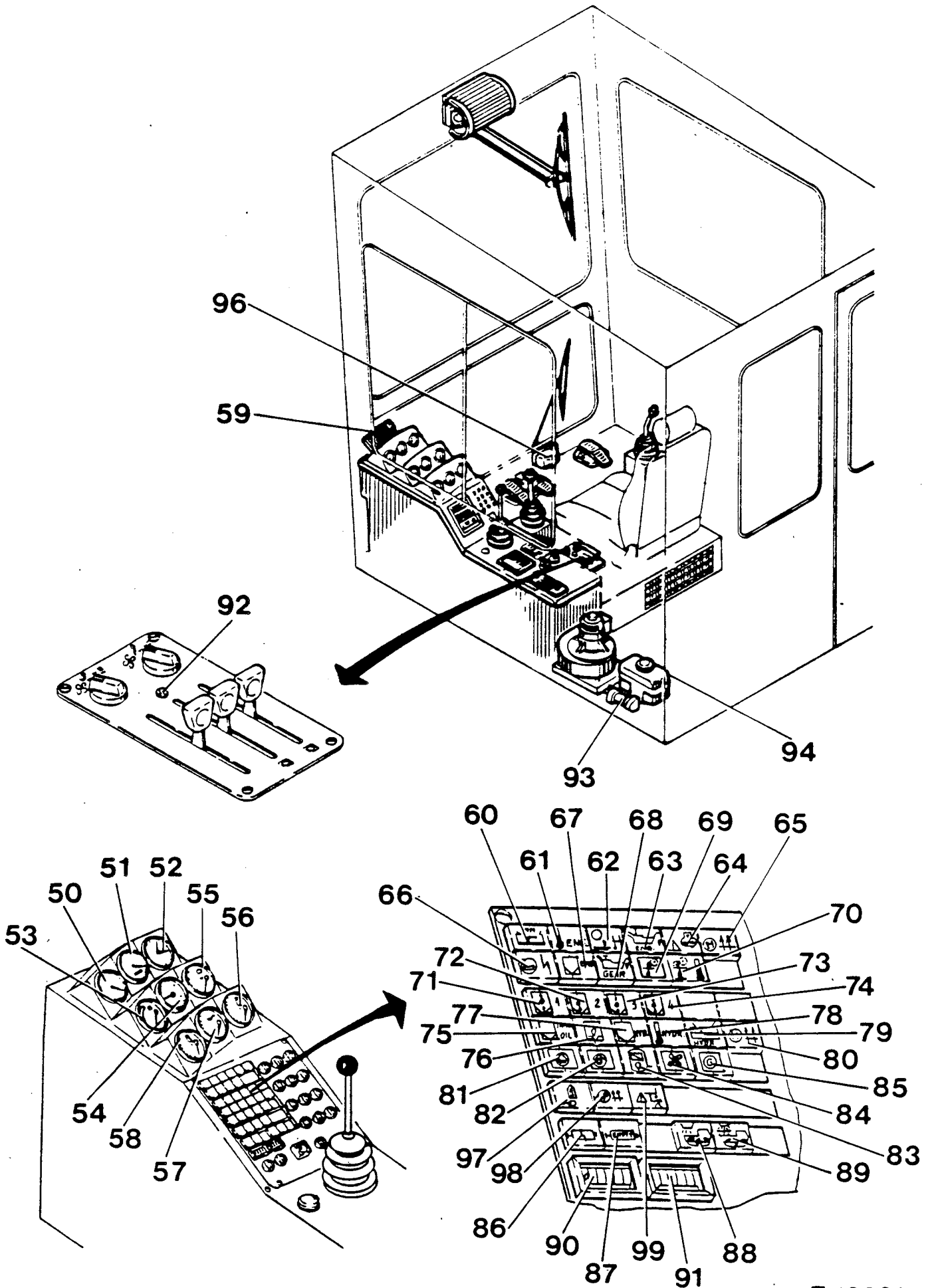
- (50) Tachometer
- (51) Hour meter
- (52) Clock
- (53) Fuel level gauge
- (54) Ammeter
- (55) Battery voltage indicator
- (56) Remote thermometer (coolant temp. engine)
- (57) Indicator - engine oil pressure
- (58) Remote thermometer - hydr. oil temp.
- (59) Fuel consumption indicator (special equipm.)

Indicator lamps drive

- (60) Coolant level
- (61) Coolant temperature
- (62) Coolant pressure
- (63) Engine oil pressure
- (64) Crankcase pressure
- (65) Engine speed too high
- (66) Engine speed sensor defect
- (67) Engine - air cleaner

Indicator lamps pump distribution gear

- (68) Lubrication oil pressure
- (69) Oil filter
- (70) Oil temperature





Legend: (Z 10361)

Indicator lamps hydraulic system

- (71) High pressure filter - pump 1
- (72) High pressure filter - pump 2
- (73) High pressure filter - pump 3
- (74) High pressure filter - pump 4
- (75) Return oil filter
- (76) Leak-oil filter
- (77) Air filter - oil reservoir
- (78) Oil temperature
- (79) Oil level
- (80) Oil filter for fan drive
- (81) Oil filter for pump lubrication
- (82) Oil filter - pump control
- (83) Shut-off valve - oil reservoir closed
- (84) Oil filter - air-conditioning drive
- (85) Oil filter - generator drive

Indicator lamps general

- (86) Failure - central lubrication system
- (87) Grease container empty - centr. lubr. system
- (88) Failure - slewing ring tothing lubr. system
- (89) Grease container empty - slewing ring  
tothing lubrication system
- (90) Pulse counter - centr. lubr. system
- (91) Pulse counter - slewing ring tothing lubr. system
- (92) Indicator lamp - air-conditioning \*)
- (93) Water pump - wiper system
- (94) Water container - wiper system
- (95) Windshield wiper system
- (96) Auxiliary wiper
- (97) Travel brake engaged (parking brake)
- (98) High idle speed
- (99) Warning lamp - entering requested \*)

\*) Special equipment

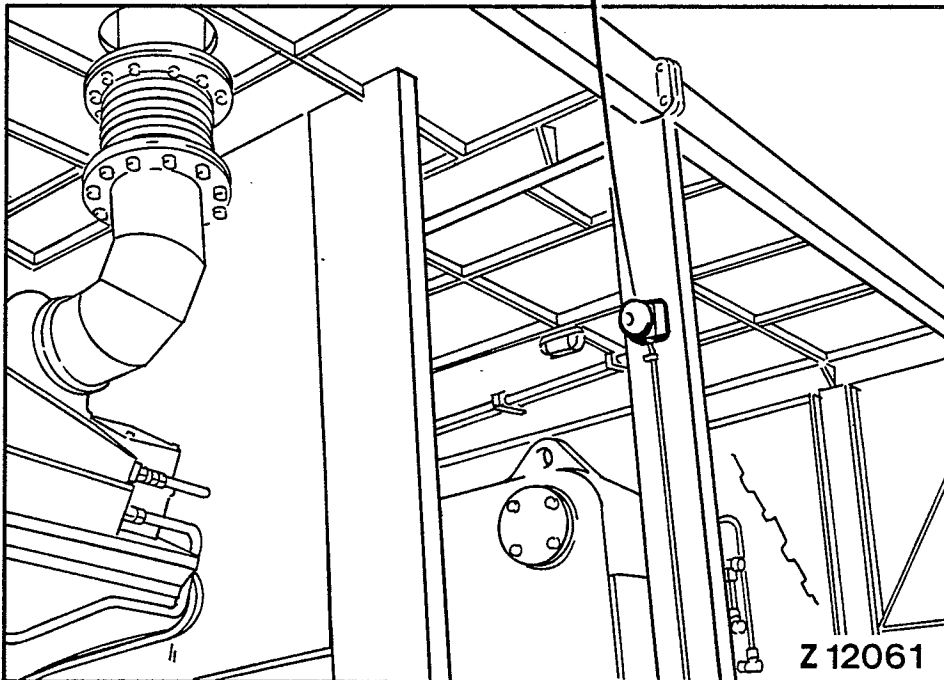
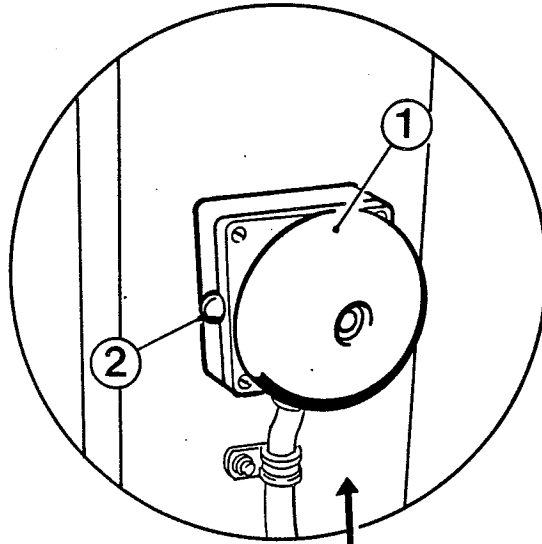
1799 -01

5.1

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**POWER COMPARTMENT  
ENGINE SHUT-OFF SWITCH**

1799n-01

5.1

**Engine shut-off switch (Z 12061)**

- (1) Push button, engine stop
- (2) Detent pin, button stop position

- For stopping the engine depress button (1).
- For restarting, first depress detent button (2) and then start the engine in the normal way at control panel in the operators cab.

**Note:**

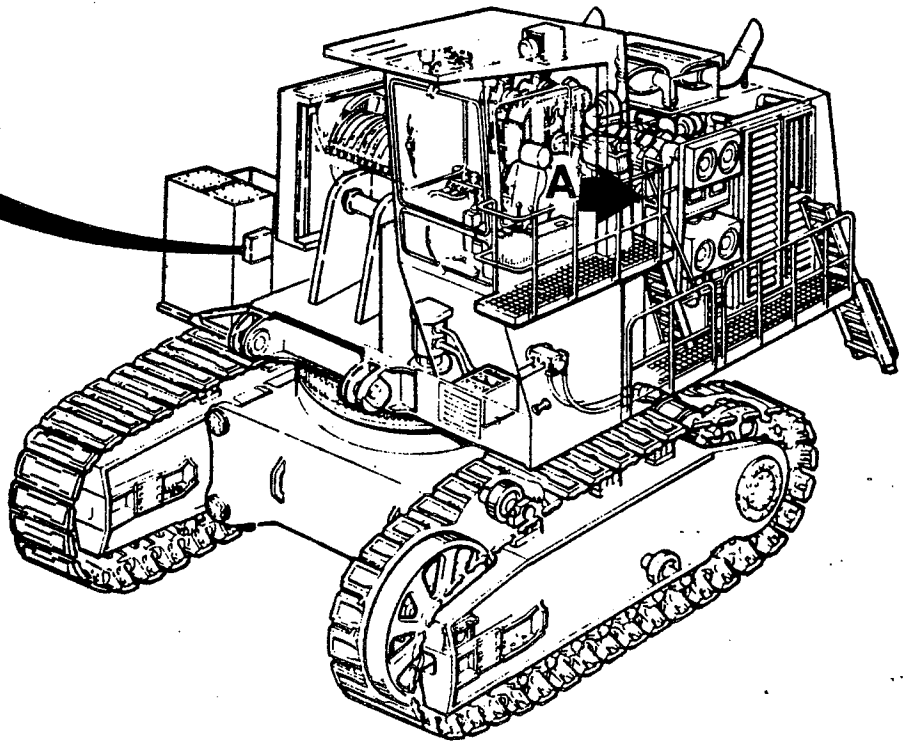
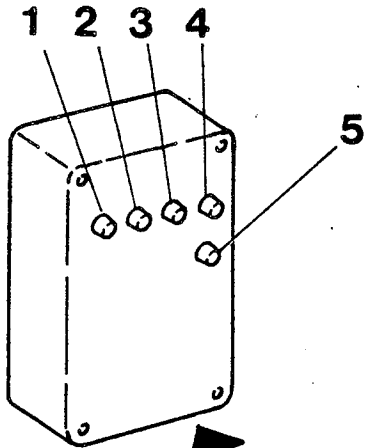
The engine can not be started with detent pin (2) in locked position.

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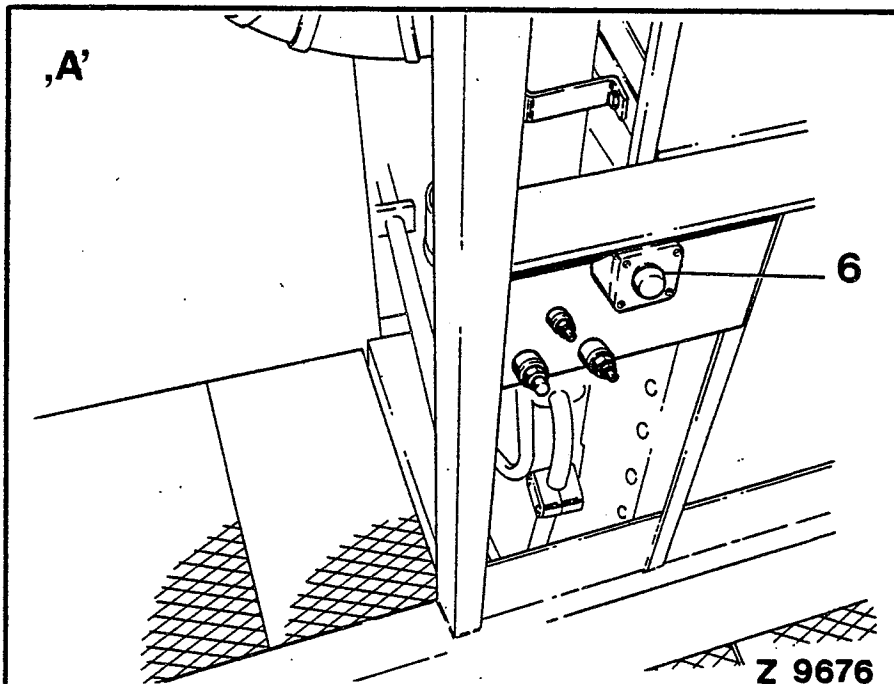
5.2



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Z 9865



Z 9676



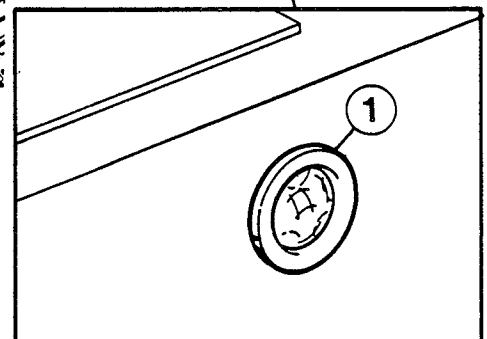
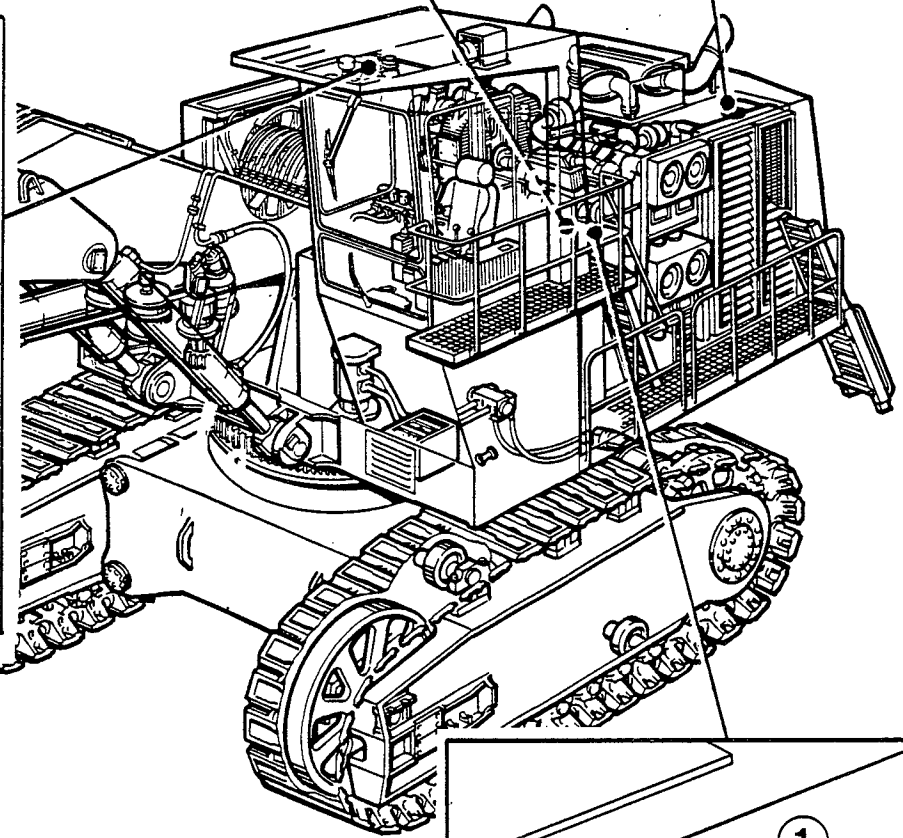
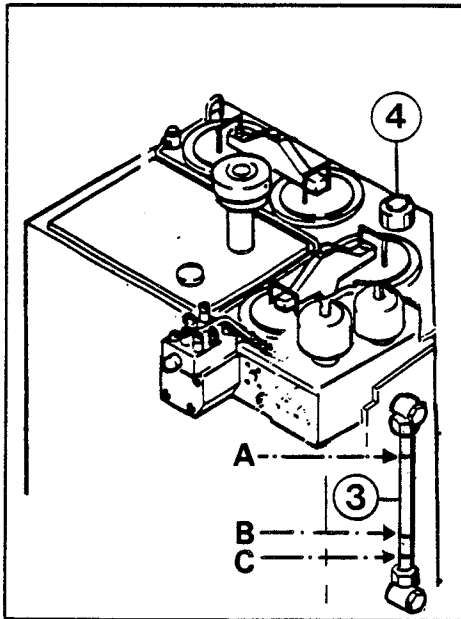
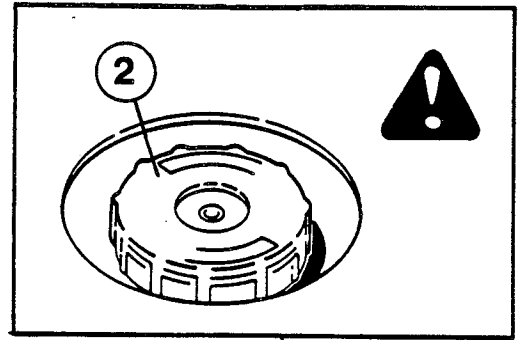
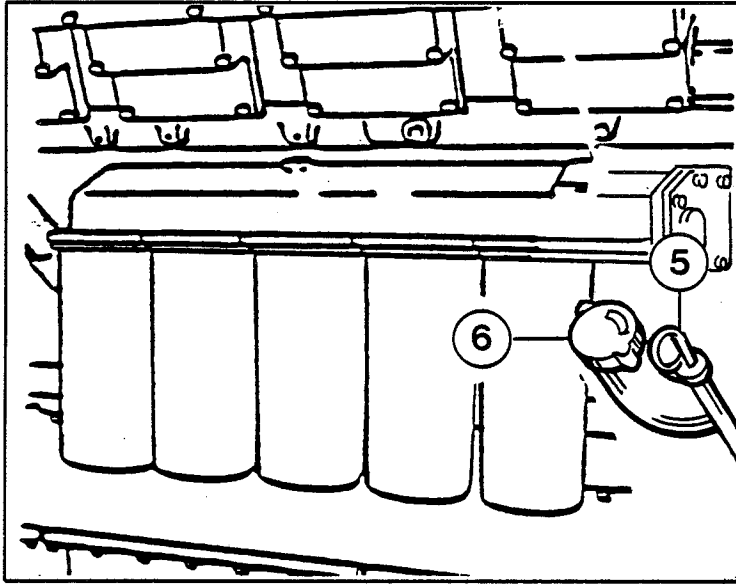
Legend: (Z 9865)

- (1) Grease container of the central lubrication is full
- (2) Grease container of the central lubrication is empty
- (3) Grease container of the slewing ring lubrication is full
- (4) Grease container of the slewing ring lubrication is empty
- (5) Control switch lamp check

Control equipment refilling - hydraulic oil

The indicator lamp (6, Z 9676) lights up when the oil reservoir has the max. oil level.

The indicator lamp (6) goes out when the oil level is below the min. oil level.





Important!

Before starting the engine carry out all checks according to the separate Engine Operation and Maintenance Manual.

Check the following systems refer to illust. (Z 19062):

1. Fuel supply (1)

The fuel tank is full with fuel level at center of sight gauge (1).

2. Coolant level

Remove radiator pressure cap (2).

The coolant level must be approx. 10 mm above the fins.

Caution!

If the coolant in the system is hot observe the following:

Turn the radiator cap (2) slowly counterclockwise to the safety stop to allow the pressure or any steam to escape, then press down on the cap and continue to turn until cap is free to be removed.

3. Hydraulic oil level (3)

Check oil level at sight gauge (3) with loader attachment on the ground.

A - Oil level with power cylinders retracted

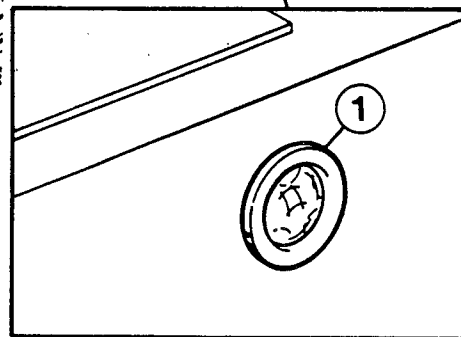
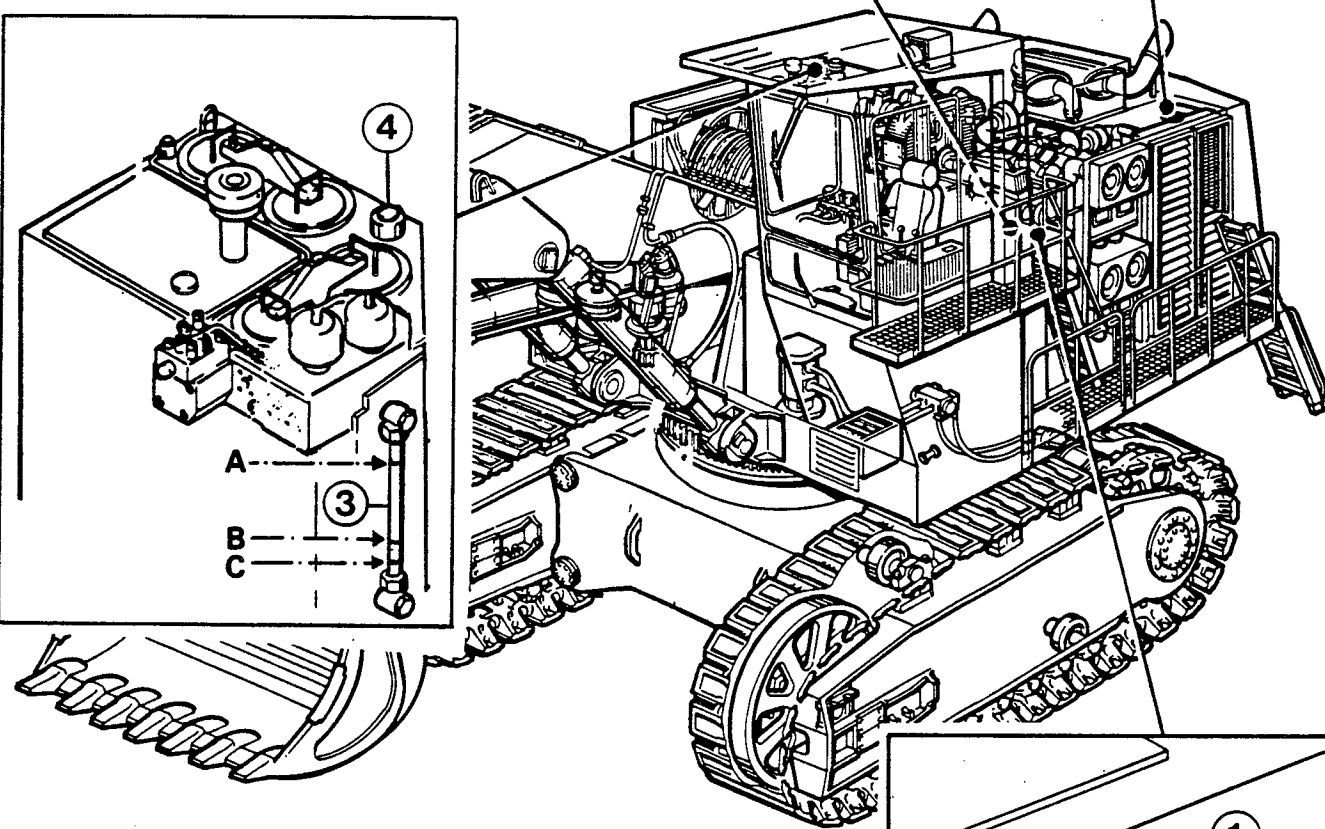
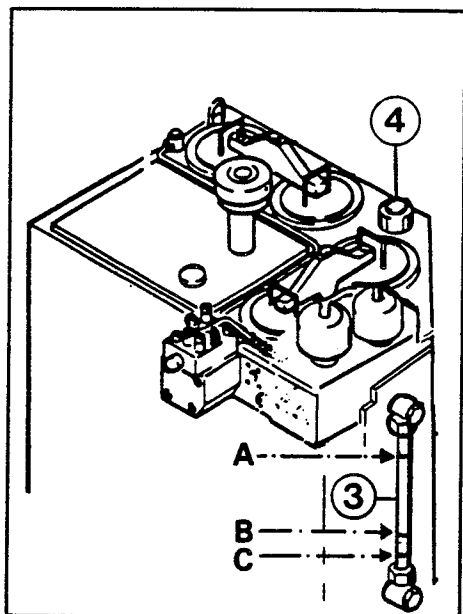
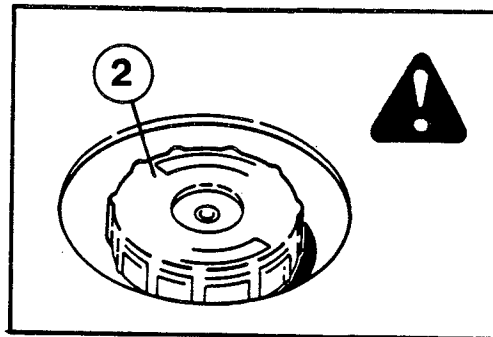
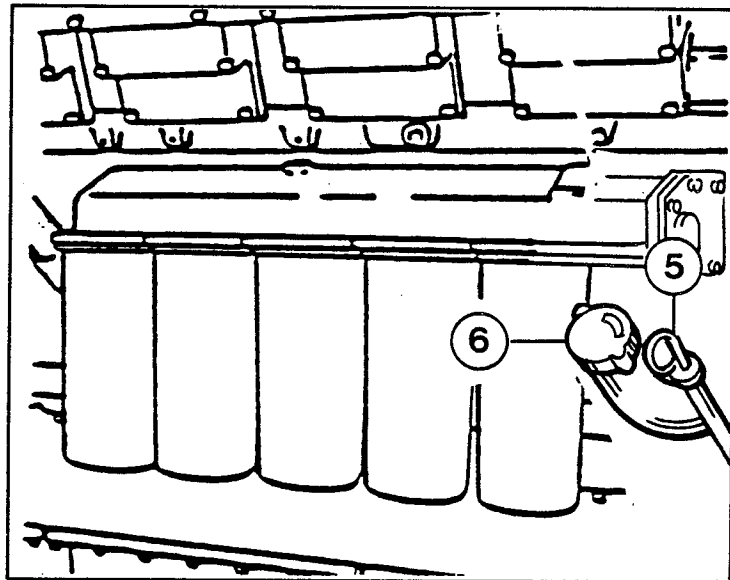
B - Oil level with power cylinders extended

C - Minimum oil level

Important:

With cylinders extended the oil level must remain above the minimum marking (C).

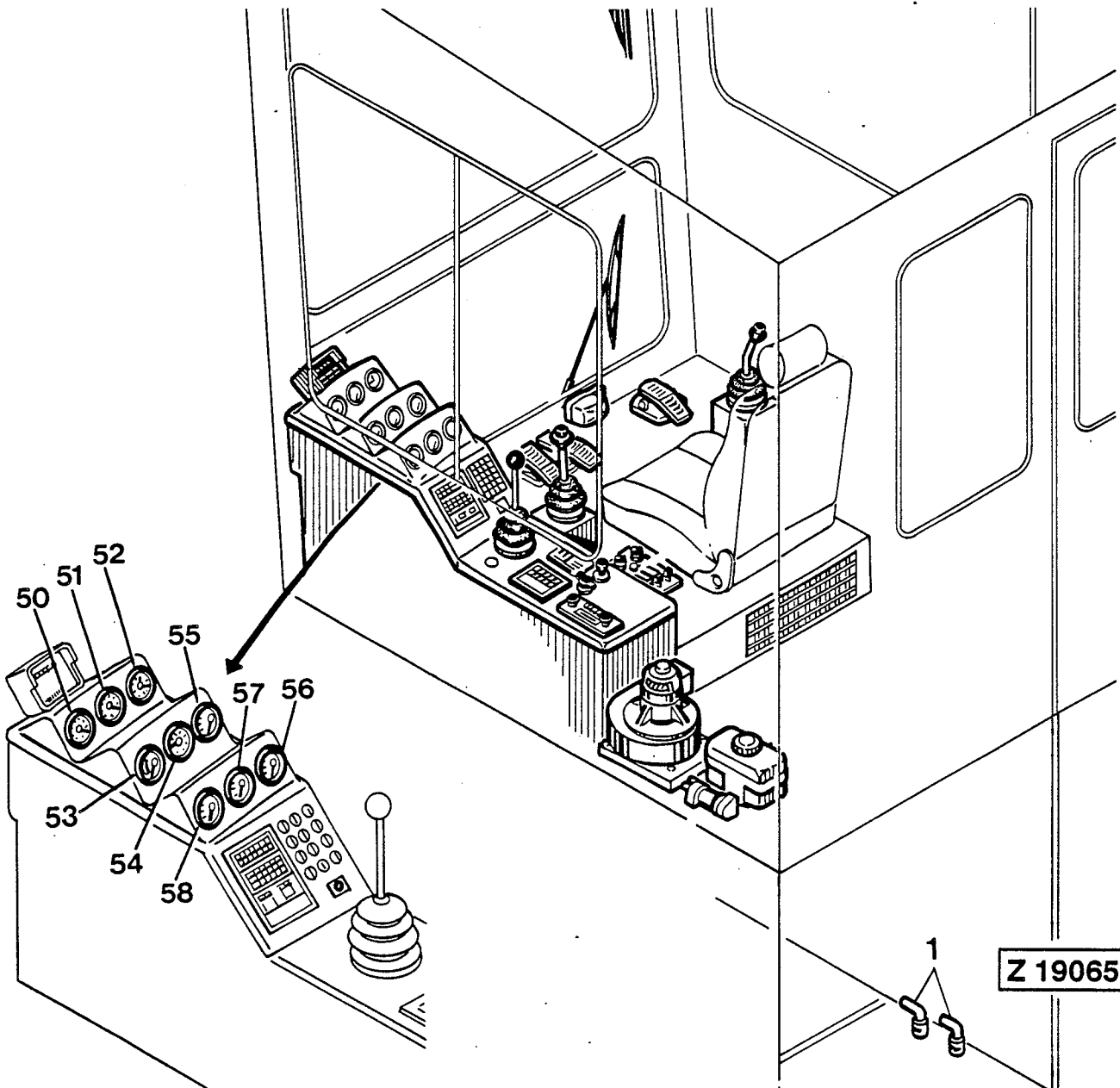
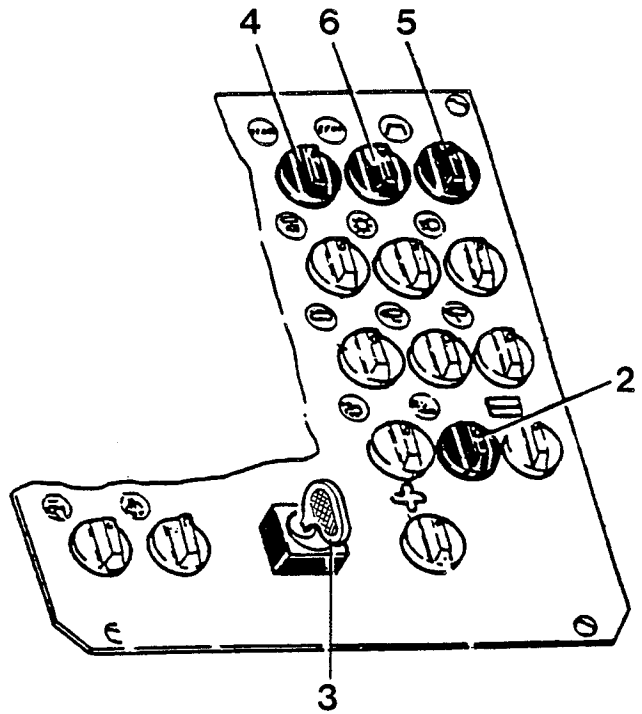
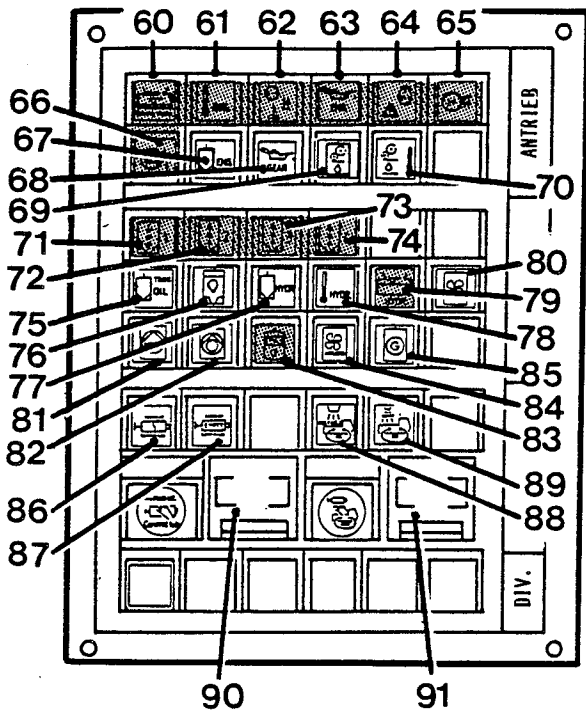
Add hydraulic oil through filler neck (4) as necessary.



5. Check engine oil level, illust. (Z 19062)
  - (5) Oil level gauge
  - (6) Oil filler tube

Check the oil level with excavator standing on level ground.

Proceed according to the engine operation and maintenance manual.



Note:

Before starting read the Engine Operation Manual. Observe the relevant instructions for starting the engine.

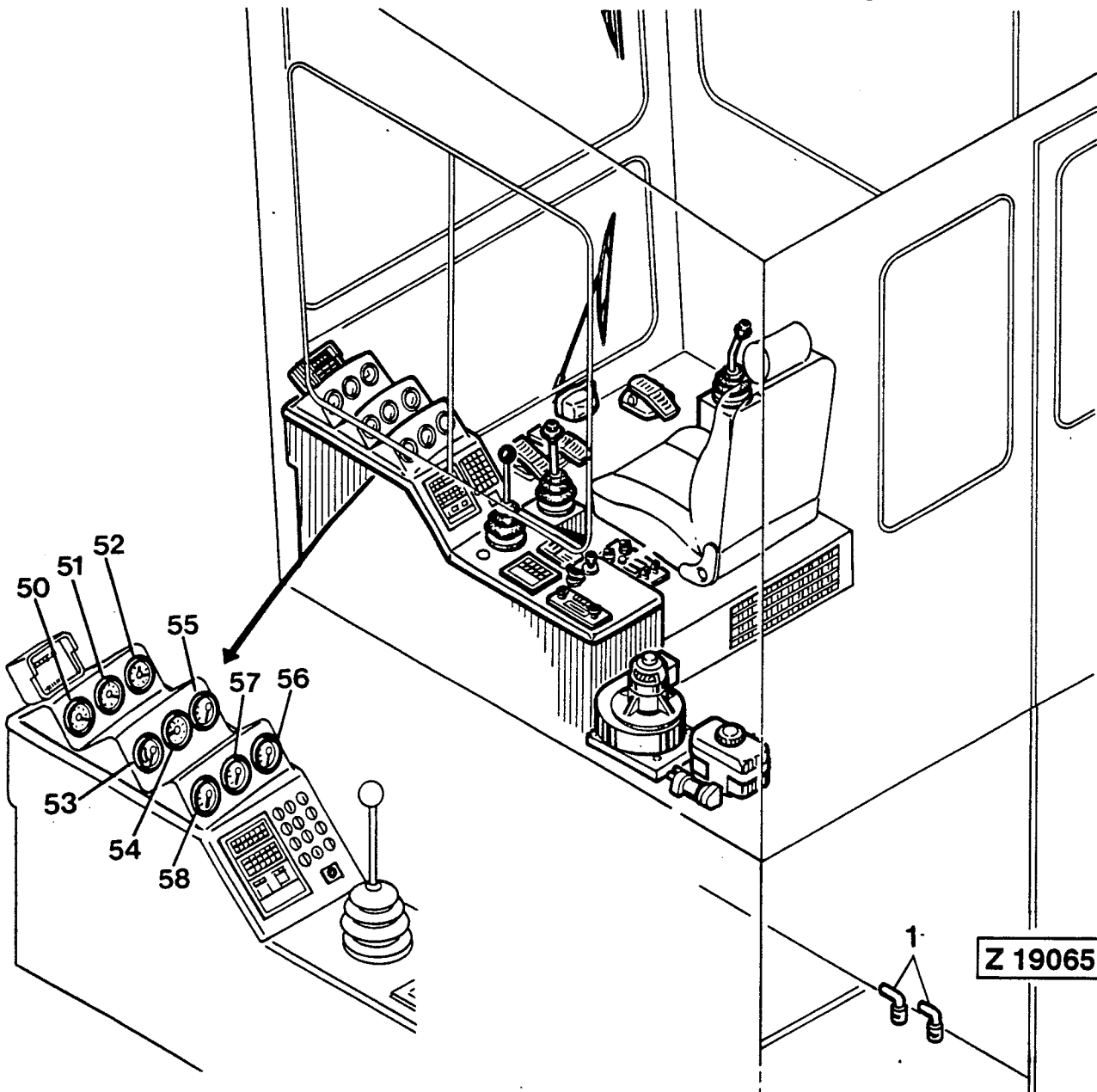
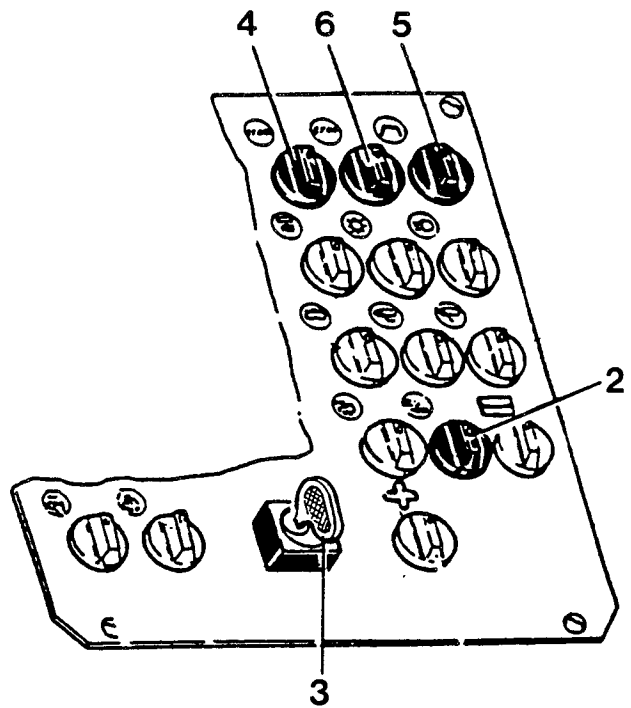
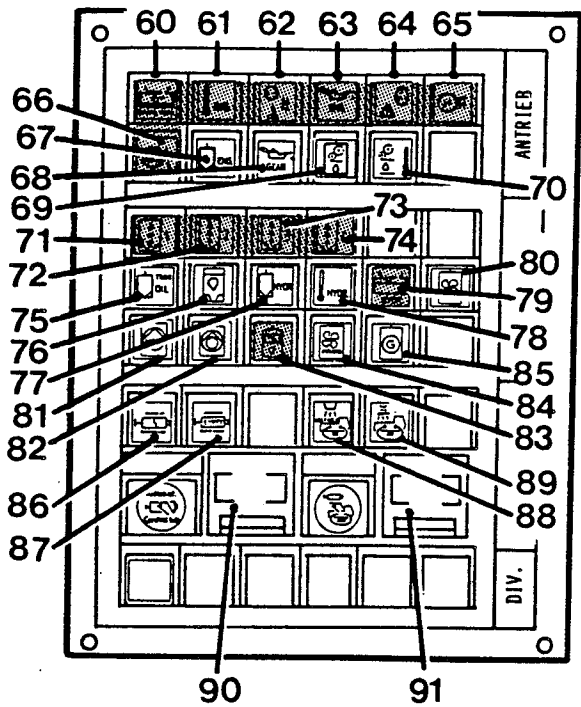
Caution!

- Before each starting make sure that all controls are in neutral position.
- Before starting the engine and again before starting work, pay attention to the hydraulic oil temperature.

Refer to paragraph "Hydraulic Oil Warm-up" in this section.

Controls for starting see illustration (Z 19065)

- (1) Battery main switch (located in cab base)
- (2) Engine speed selector switch, low idle - high idle
- (3) Key switch
- (4) Starting switch
- (5) Cold starting aid switch
- (6) Engine shut-down switch



Starting procedure, refer to illustration (Z 19065)

Note:

Start the engine only with switch (2) in the low idle position "0".

1. Insert battery main switches (1) and turn to operating position.
2. Turn switch (2) to low idle position "0".
3. Insert key (3) and turn.  
Key switch (3) automatically moves outward to its operating position.  
All indicator lamps must light up. If the lamps fail to function, corrective action must be taken.  
Check for burned out bulbs.
4. Start the engine by turning starter switch (4).

Note:

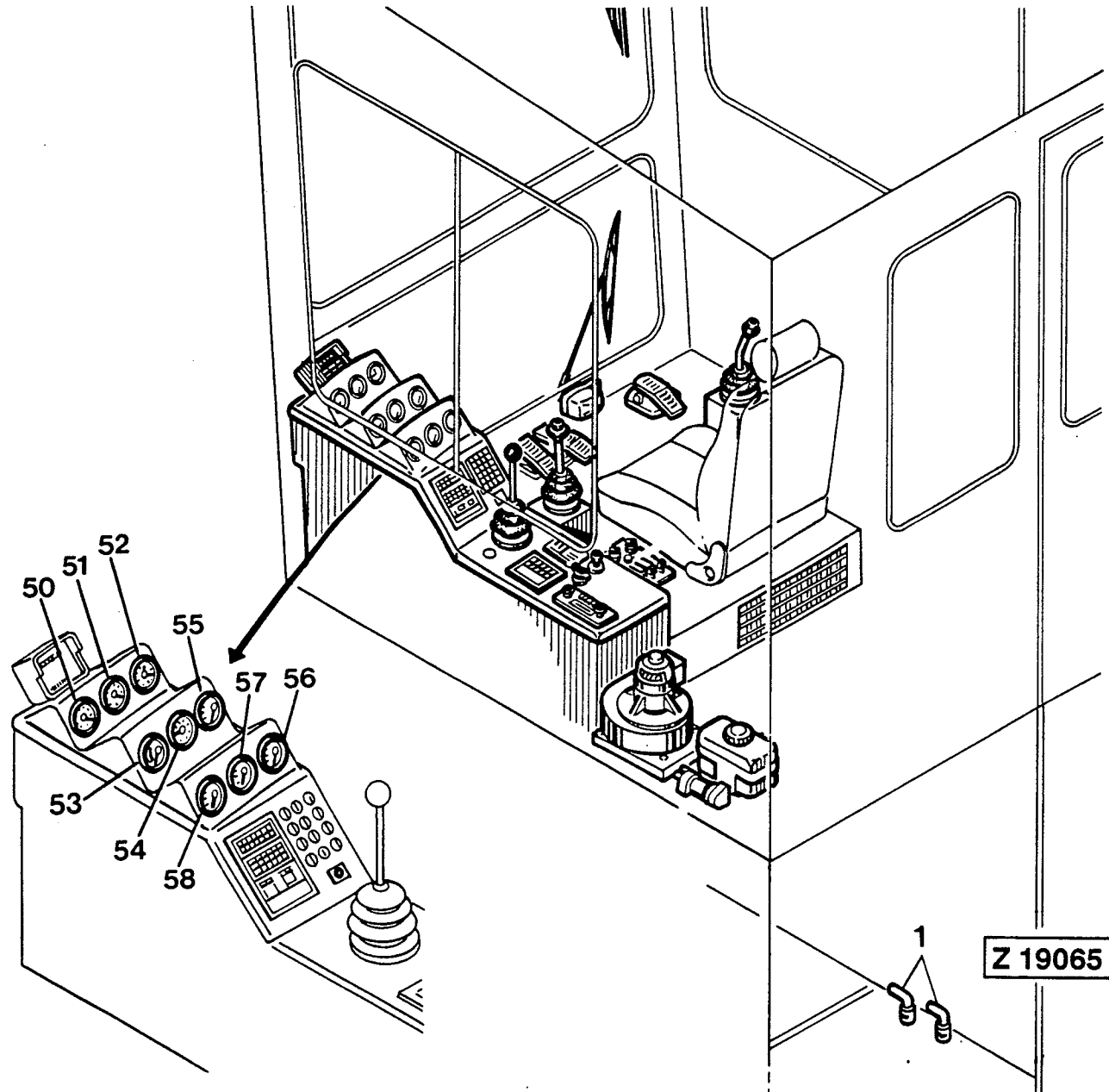
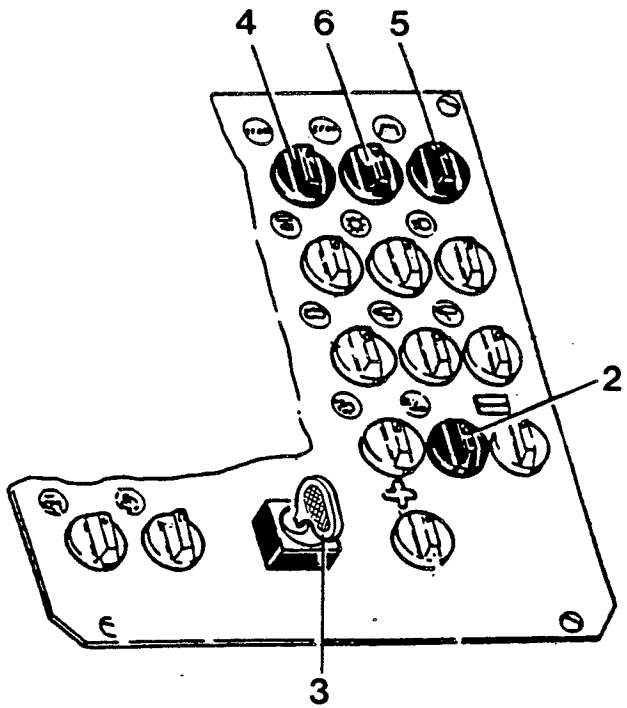
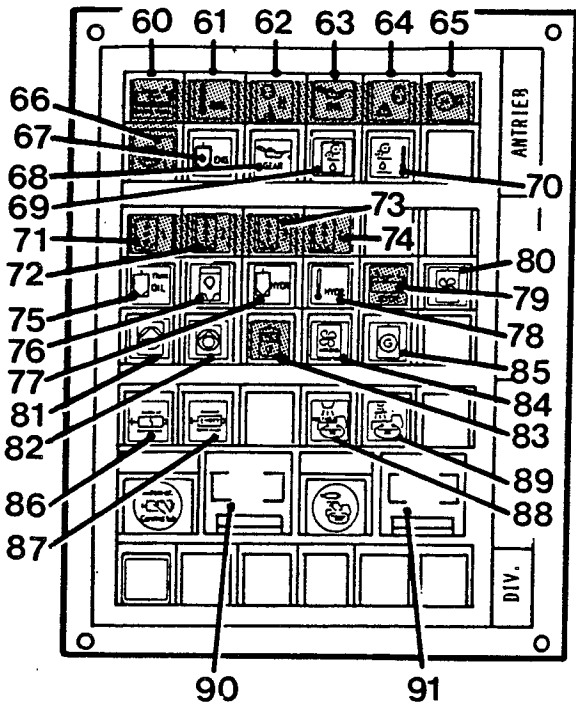
To facilitate starting at low outside temperatures (below +5° C) and with the engine cold, use the cold starting aid.

Cold starting aid with starting fluid

Engage the starter and while cranking, apply metered amounts of starting fluid using switch (5) until the engine idles smoothly.

Note:

Never operate the starter longer than 30 sec. at a time in order to avoid damage. If the engine does not start within the first 30 sec., wait 2 minutes before cranking again.





5. When the engine is running all the indicator lamps must go out, see illust. (Z 19065).
6. After warming up of the engine, the speed can be increased by turning switch (2) to high idle speed position "1".

After starting observe the following:

Check all instruments and indicator lamps immediately after starting, again upon reaching operating temperatures and at frequent intervals during operation to assure proper care through prompt detection of irregularities. If any of the instruments do not register properly or if an indicator lamp lights up, stop the engine, locate and correct the cause immediately.

Stop the engine under the following conditions:

- Ammeter (54) shows no charging current.
- Battery voltage indicator (55) shows less than about 24 V.
- The remote thermometer (56) shows too high coolant temperature.

Automatic engine shut-down system (safety chain)

The engine will be stopped automatically as soon as one of the following indicator lamps lights up:

- (60) Coolant level low
- (61) Coolant temperature high
- (62) Coolant pressure low
- (63) Engine oil pressure low
- (64) Crankcase pressure high
- (65) Engine speed too high
- (66) Engine speed sensor defect
- (71) High pressure filter - pump 1 restricted
- (72) High pressure filter - pump 2 restricted
- (73) High pressure filter - pump 3 restricted
- (74) High pressure filter - pump 4 restricted
- (79) Hydraulic oil level low
- (83) Shut-off valve - oil reservoir closed

Important:

Never let the engine run with disconnected batteries. This may cause alternator damage.

Engine warm-up

After starting let the engine run for a warm-up period before increasing the engine speed. This is necessary to avoid piston and bearing seizure.

Refer to the engine operation and maintenance manual for the most favorable coolant temperature.

Hydraulic oil warm-up

Important:

1. On machines without hydraulic oil pre-heating system:

DO NOT start the engine if the ambient temperature (oil temperature) is below the starting temperature shown in column "1" of the hydraulic oil viscosity chart on next page.

2. On machines with hydraulic oil pre-heating system:

Before starting the engine, warm-up the hydraulic oil to the starting temperature shown in column "1" of the hydraulic oil viscosity chart.

With the engine running, circulate the hydraulic oil for approx. 10 to 20 minutes depending on ambient temperature.

Thereafter, complete several operating cycles of all hydraulic movements without load. Avoid operation against limit stops. ( high pressure build up ). Work can be started when the minimum operating temperature shown in column "2" of the viscosity chart is obtained.

Hydraulic oil viscosity and temperature chart

Rated viscosity at 40° C of hydraulic oil grade:	Starting temperature (max. 1000 cSt)		Operating range (100 - 12 cSt)	
	"1"		"2"	
	°C	°F	°C	°F
ISO VG 22	-27	-16.6	4-55	39-130
ISO VG 32	-18	0	13-70	55-155
ISO VG 46	- 5	+23	22-80	72-170
ISO VG 68	- 3	+26.5	32-85	90-190
ISO VG 100	+ 5	+41	42-85	107-190

Note:

The starting and operating temperatures in the above chart depend on the hydraulic oil viscosity grade used in the system. See decal in the operator's cab for viscosity grade of the factory oil filling.

For example:

Hydraulic system filled with VG 22 viscosity grade oil.

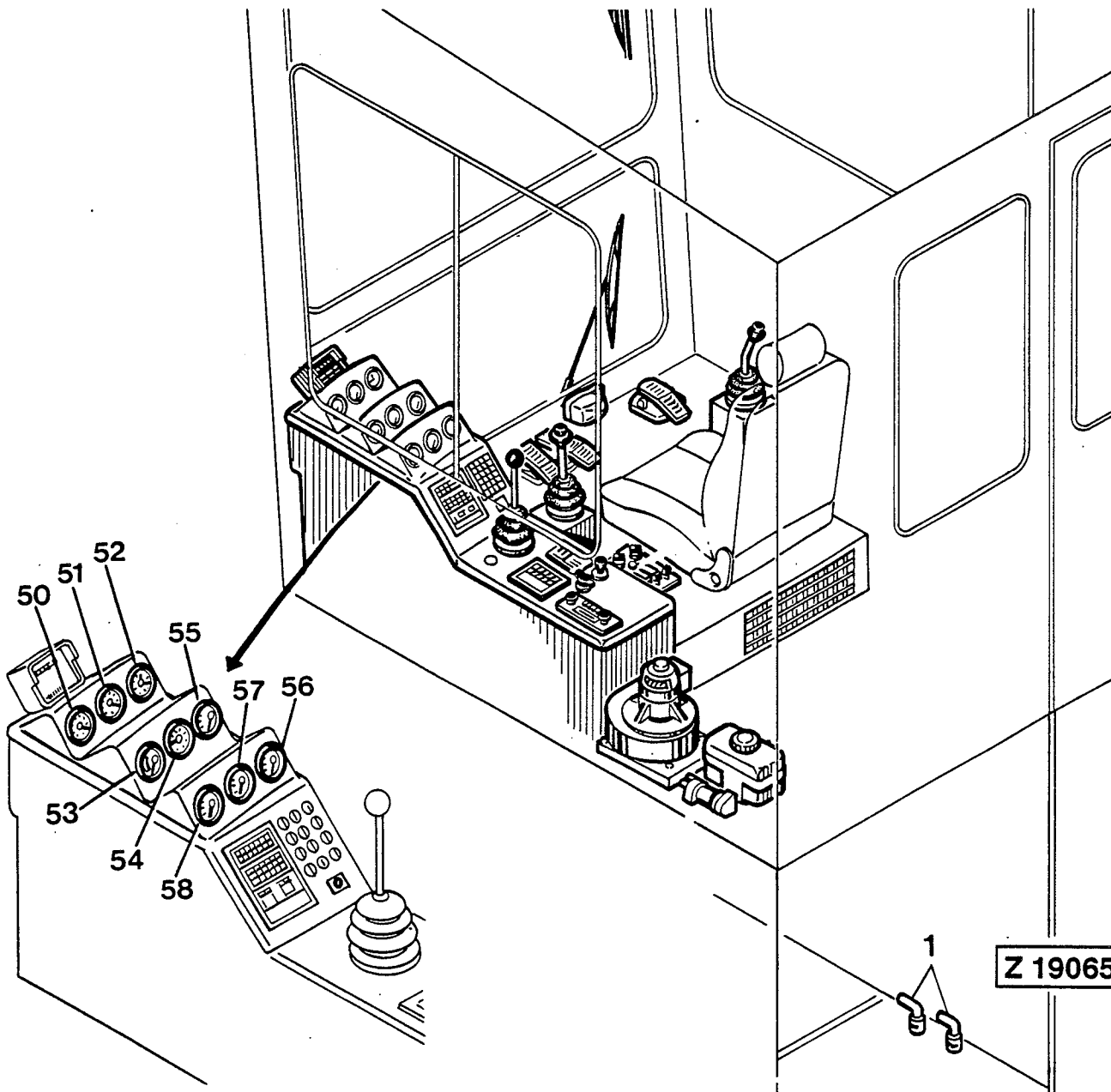
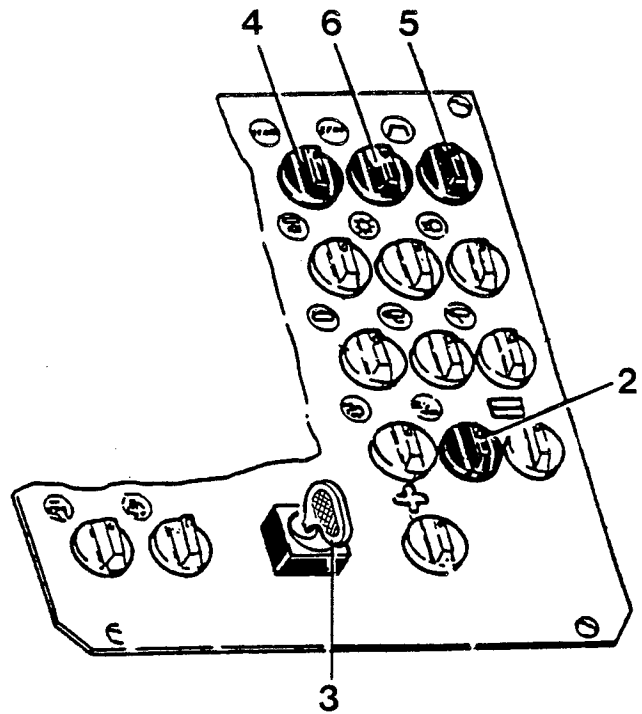
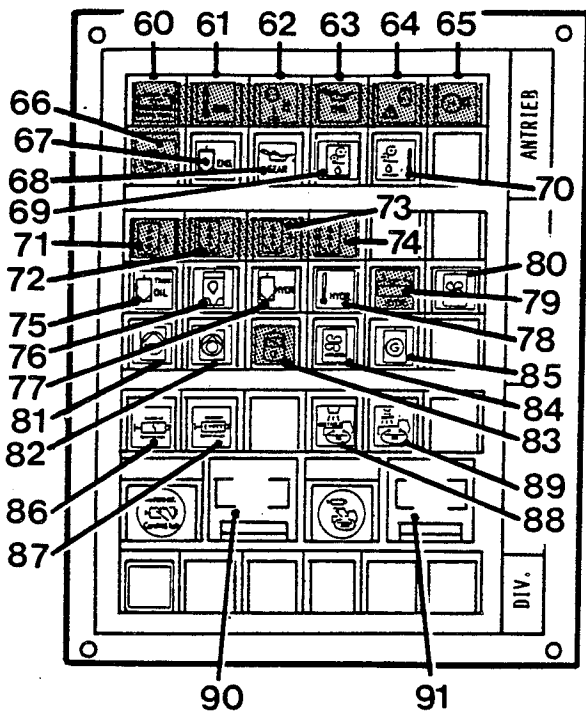
1. Lowest permissible starting temperature (ambient temperature):

- 27° C, see column "1"

2. Operating temperature:

min. + 4° C

max. + 56° C, see column "2"



Important:

Never stop the engine from a full load except in case of emergency

Before shutting down run the engine at idling speed for 3 to 5 minutes. This cooling down period of approx. 5 minutes prevents heat accumulation and thermal stress, especially in the turbo-charger.

Note:

Depending on the engine version, stopping procedure may vary slightly.

Pay attention to the engine manual for specific instructions.

The following description is the basic procedure for stopping the engine.

Do not idle engine for excessively long periods

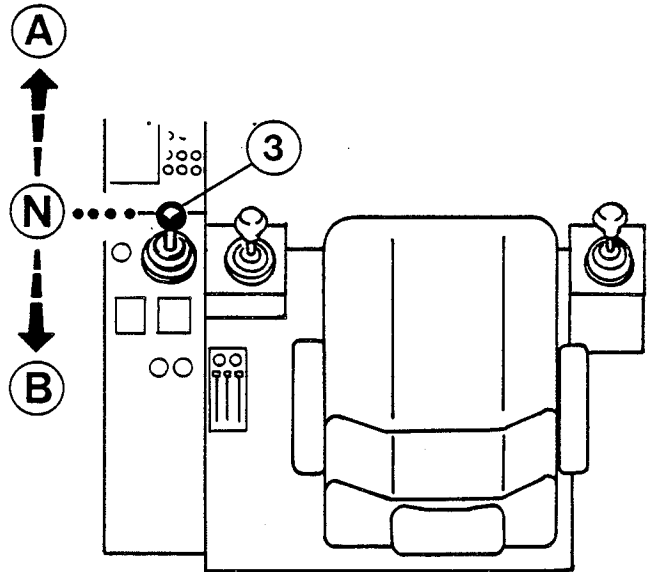
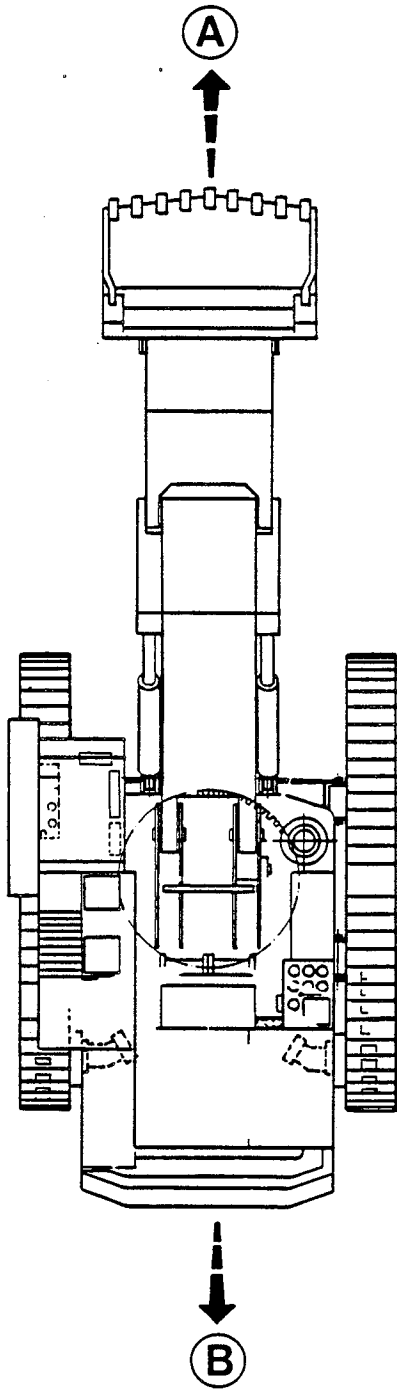
Long periods of idling are not good for an engine because the combustion chamber temperatures drop so low the fuel may not burn completely. This will cause carbon to clog the injector spray holes and piston rings and may result in stuck valves.

If the engine coolant temperature becomes too low, raw fuel will wash the lubricating oil off the cylinder walls and dilute the crankcase oil so all moving parts of the engine will suffer from poor lubrication.

If the engine is not being used, shut it down.

Stopping procedure, illust. (Z 19065)

1. Turn switch (2) into low idling position.  
Let the engine idle for about 5 minutes without load.
2. Turn switch (6) clockwise to stop the engine.
3. Remove switch key (3) and push switch down into lock position.
4. Remove battery main switch keys (1).



## Travel control

### Note:

Travelling directions with cab in normal working and travel position i.e. cab above idler wheel.

Counter weight above drive sprockets.

Legend for illust. (Z 19066):

(3) Driving control lever

(A) Forward travel

(N) Neutral, no propulsion

(B) Reverse travel

Regulate driving speed through control lever movement. Apply slew brake as necessary.

For braking the machine move control lever (3) to neutral position "N".

### Important:

The hydraulic travel motors work also as automatic travel brakes.

If travel motors produce an abnormal noise when going downhill, reduce speed with control lever (3).

Never reduce the engine speed for braking. This would cause damage to the hydraulic motors and the travel gears.

### Back-up alarm

#### Travel alarm

(Special equipment)

The excavator can be equipped with one of the above alarm systems.

The back-up alarm will sound at reverse travel.

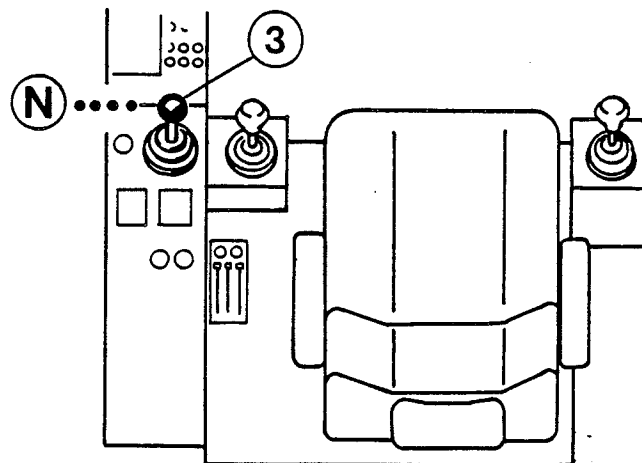
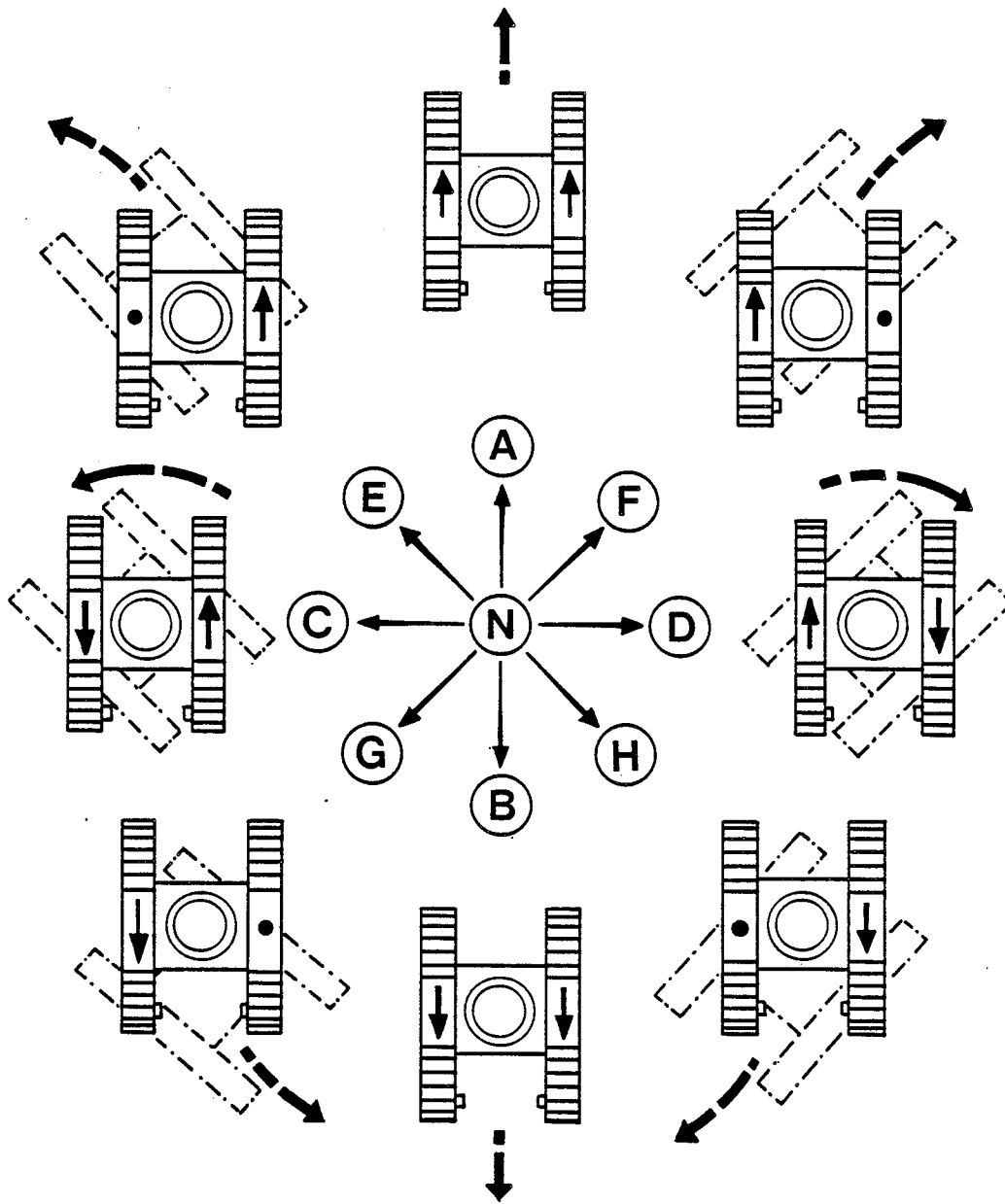
The travel alarm will sound at forward and reverse travel.

### Parking brake

The excavator is equipped with spring loaded disc brakes at the final drives.

These brakes are automatically applied when the engine is not running.

As soon as the engine is running the brakes will be released automatically by hydraulic pressure build-up.



Z 19067



#### 6.4.1 Controlling the undercarriage

Operating positions of control lever (3), illust. (Z 19067)

- (N) Neutral, no propulsion
- (A) Both crawlers forward (forward travel)
- (B) Both crawlers reverse (reverse travel)
- (C) R.H. crawler forward,  
L.H. crawler reverse (left turn on the spot)
- (D) R.H. crawler reverse,  
L.H. crawler forward (right turn on the spot)
- (E) R.H. crawler forward (left turn forward)
- (F) L.H. crawler forward (right turn forward)
- (G) L.H. crawler reverse (right turn backward)
- (H) R.H. crawler reverse (left turn backward)

#### Notes:

- The above travelling directions apply only when the counterweight is located above the drive sprockets.  
If the superstructure is slewed 180° the movements are inversed.
- The travel speed is proportional to the travel lever movement.



#### 6.4.2 Travelling instructions

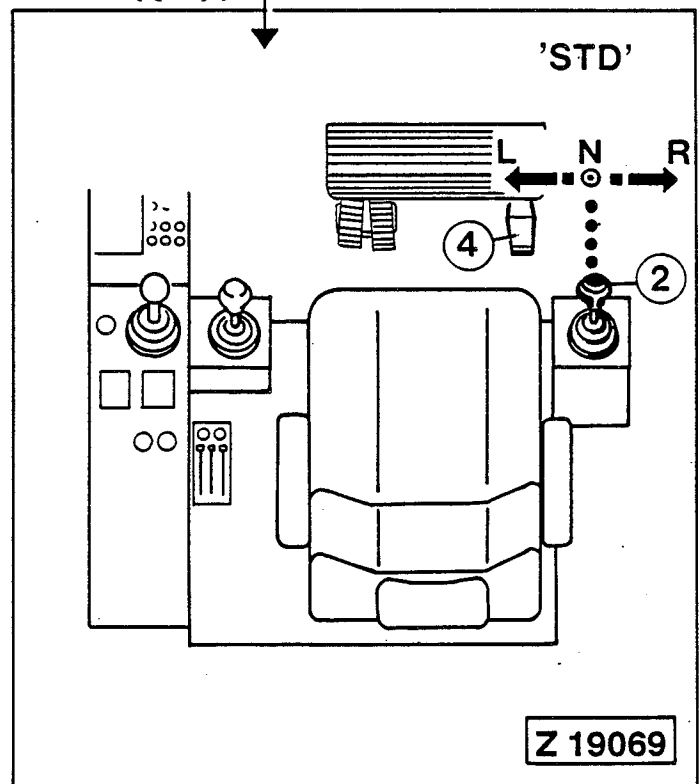
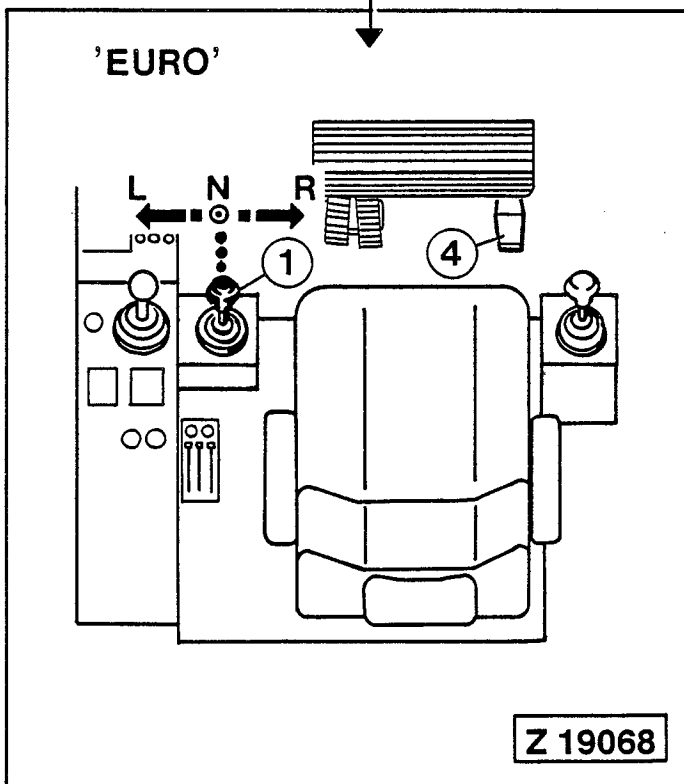
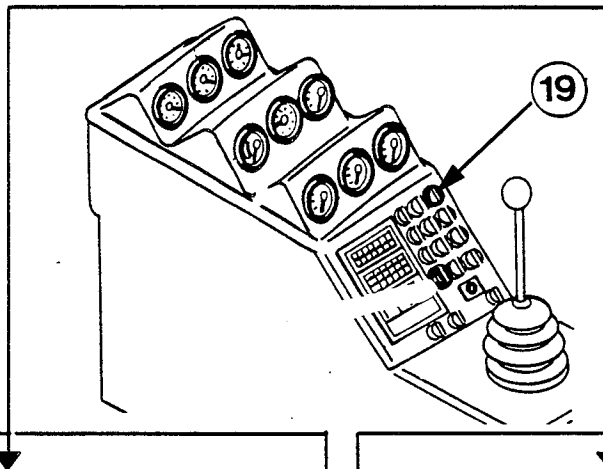
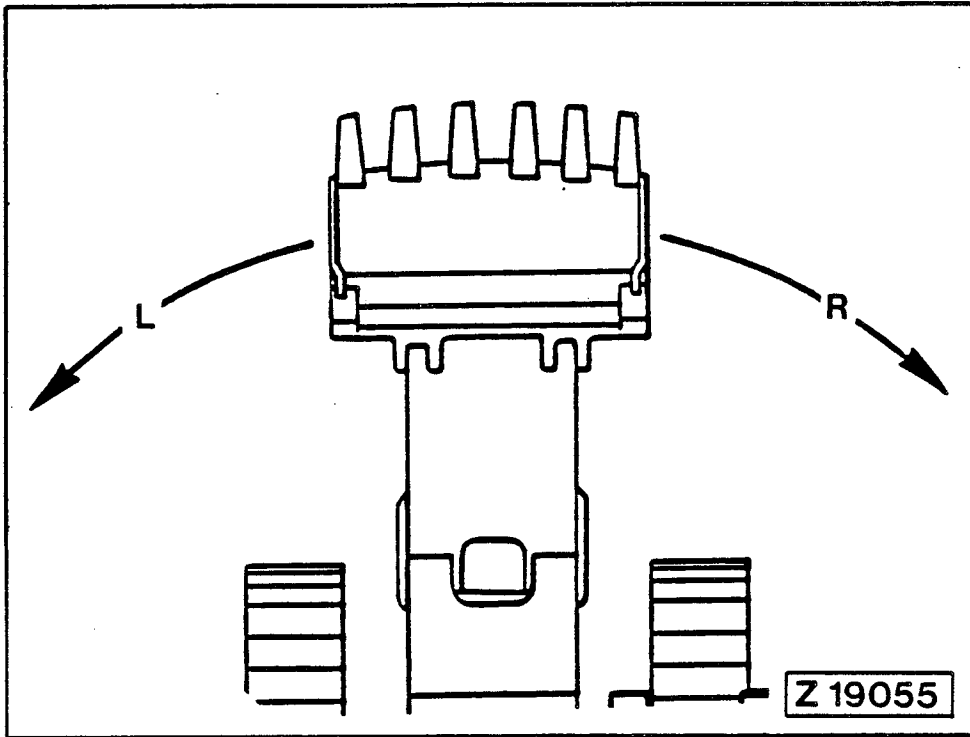
- Before travelling long distances slew the superstructure parallel to the undercarriage and apply the slew brake.
- When travelling over inclines and gradients raise the working equipment only to such a height, that the bucket has sufficient ground clearance.
- Do not travel crossway to slope.
- Whenever possible operate the excavator with the sprockets to the rear in the direction of travel.
- On steep terrain make sure that the final drives are at the rear in relation to travel direction.
- Before travelling over a bridge find out whether its bearing capacity is sufficient for the operating weight of the excavator.
- Check for sufficient clearance and use a spotter.
- Pay attention to high voltage lines. On rough terrain observe movement of the boom.



- Travel speed must conform to local conditions so that the excavator can be stopped at any time.
- Change travelling direction only after the machine is stopped.
- In order to avoid damage to track rollers and links, never turn the undercarriage over ditches and troughs.
- When working equipment is removed, the reduced stability of the excavator has to be considered during travelling or slewing and when basic boom is operated. The stability can be improved, when final drives are positioned opposite to counterweight.
- Observe permissible tilt angle of the engine when travelling uphill or downhill (superstructure must be in line with the undercarriage).

Maximum permissible tilt angle of the engine:

30° full circle



### 6.5.1 Slewing the superstructure

#### Optional control systems

- EURO control, see illust. (Z 19068)
- STANDARD control, see illust. (Z 19069)

#### Caution!

Before starting the engine make sure you know the location and function of each control.

Wrong operation of the controls can cause mechanical break-down, property damage, injury or death.

#### Machines equipped with EURO-control system,

see illust. (Z 19068)

"L" Counterclockwise lever (1) to the left "L"

"N" Neutral position

"R" Clockwise: Lever (1) to the right "R"

#### Machines equipped with STANDARD-control system,

see illust. (Z 19069)

"L" Counterclockwise: lever (2) to the left "L"

"N" Neutral position

"R" Clockwise: lever (2) to the right "R"

### 6.5.2 Braking the superstructure, illust. (Z 19068 or Z 19069)

Braking of the superstructure from a slewing movement is carried out first by returning the control lever to the neutral position (N).

This procedure can be shortened by depressing pedal (4).

#### Locking the slew brake (parking brake)

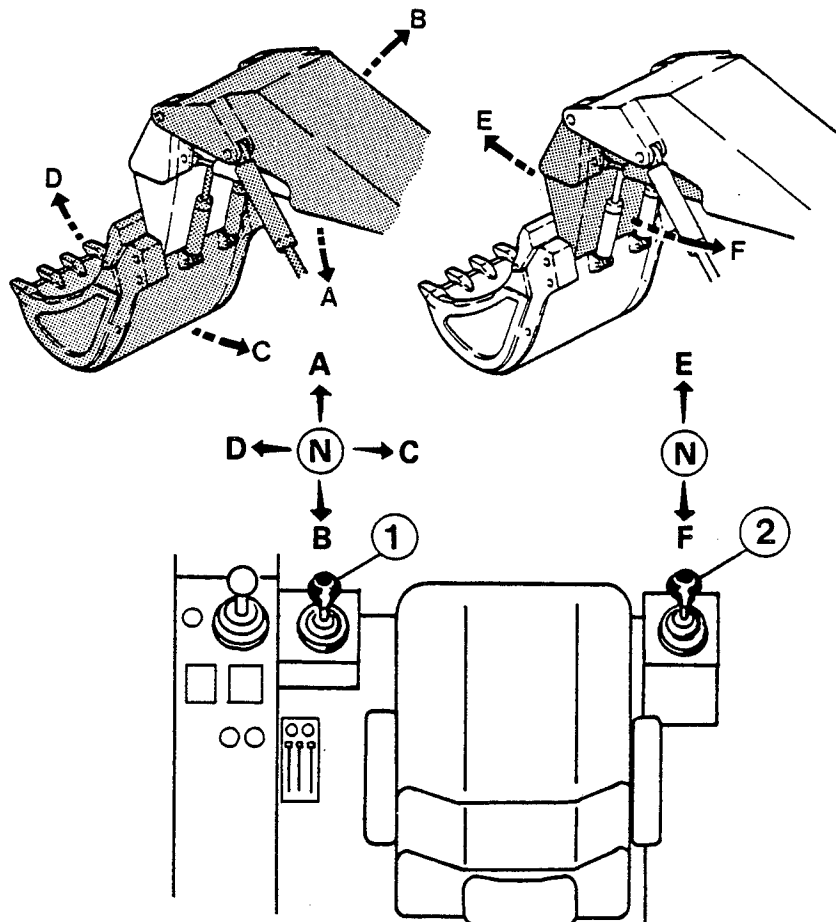
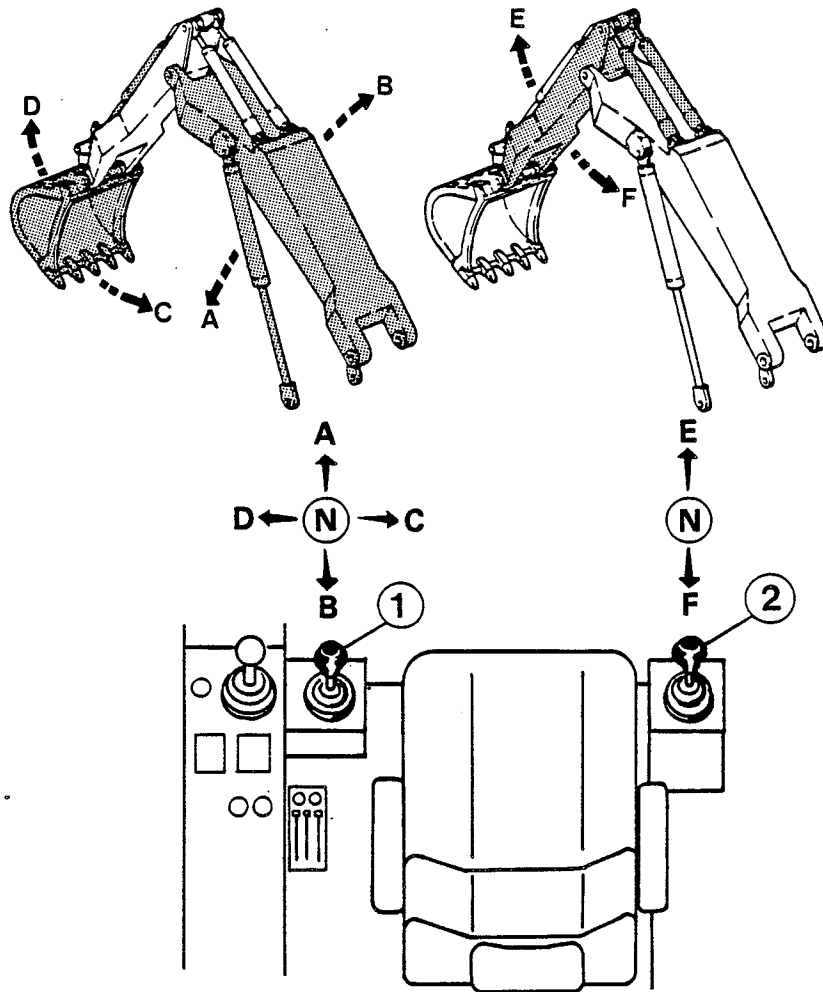
Turn switch (19) clockwise.

#### Unlocking the slew brake

Turn switch (19) counterclockwise.

#### Note:

Do not brake the rotating superstructure by actuating opposite slewing direction, otherwise slewing gears, slewing motor and gear ring can be destroyed.





Machines equipped with STANDARD control system.

Note:

- The illustrations show a typical construction of control stand and working attachment. However, the shown operation - and working movements apply to this machine.

6.6.1 Backhoe, see illust. (Z 19070)

L.H. control lever (1):

R.H. control lever (2):

A - Lowering boom

E - Extending stick

B - Lifting boom

F - Retracting stick

C - Filling bucket (roll back)

D - Emptying bucket (roll forward)

6.6.3 Front loader, see illust. (Z 19071)

L.H. control lever (1):

R.H. control lever (2):

A - Lowering boom

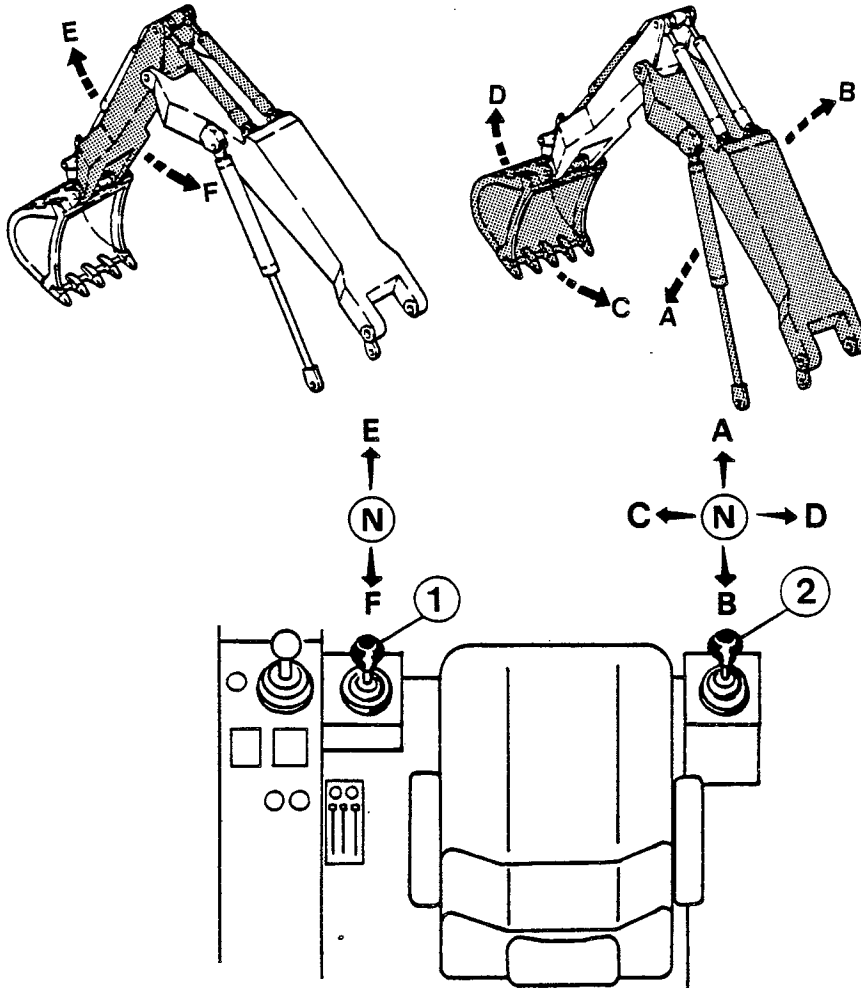
E - Extending stick

B - Lifting boom

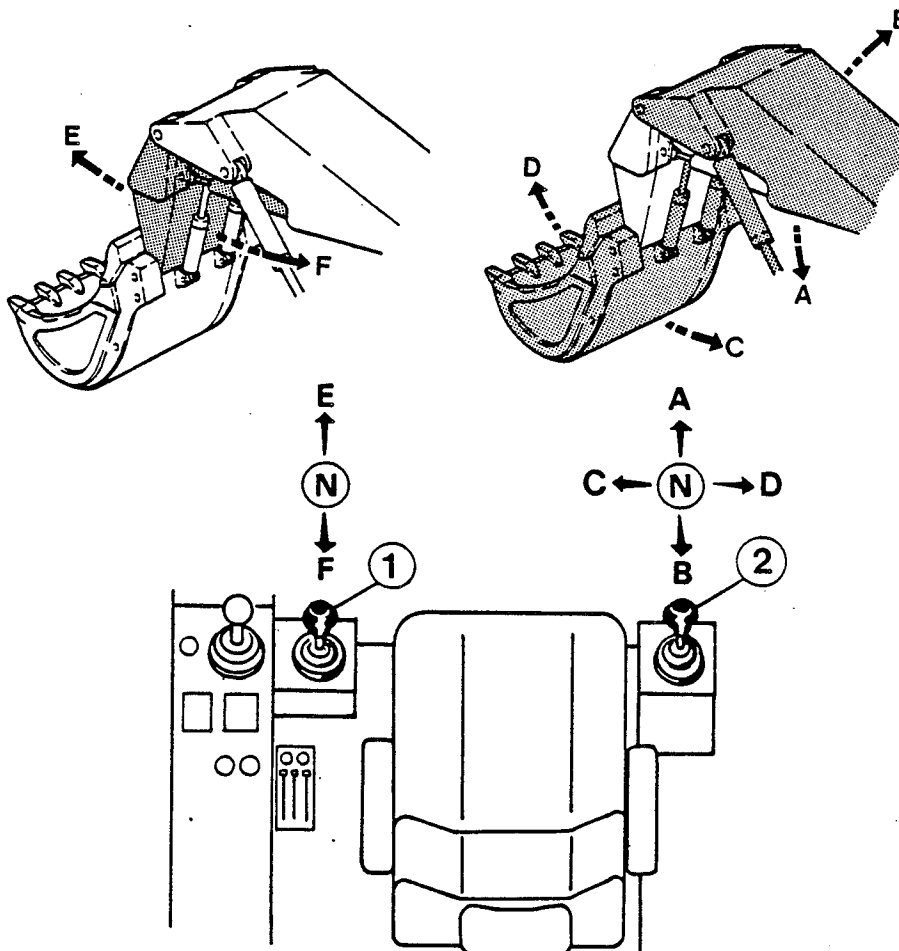
F - Retracting stick

C - Emptying bucket (roll back)

D - Filling bucket (roll forward)



Z 19072



Z 19073

Machines equipped with EURO control system

Note:

The illustrations show a typical construction of control stand and working attachment.

However, the shown operation - and working movements apply to this machine.

6.6.1 Backhoe, see illust. (Z 19072)

L.H. control lever (1):

R.H. control lever (2):

E - Extending stick

A - Lowering boom

F - Retracting stick

B - Lifting boom

C - Filling bucket (roll back)

D - Emptying bucket (roll forw.)

6.6.3 Front loader, see illust. (Z 19073)

L.H. control lever (1):

R.H. control lever (2):

E - Extending stick

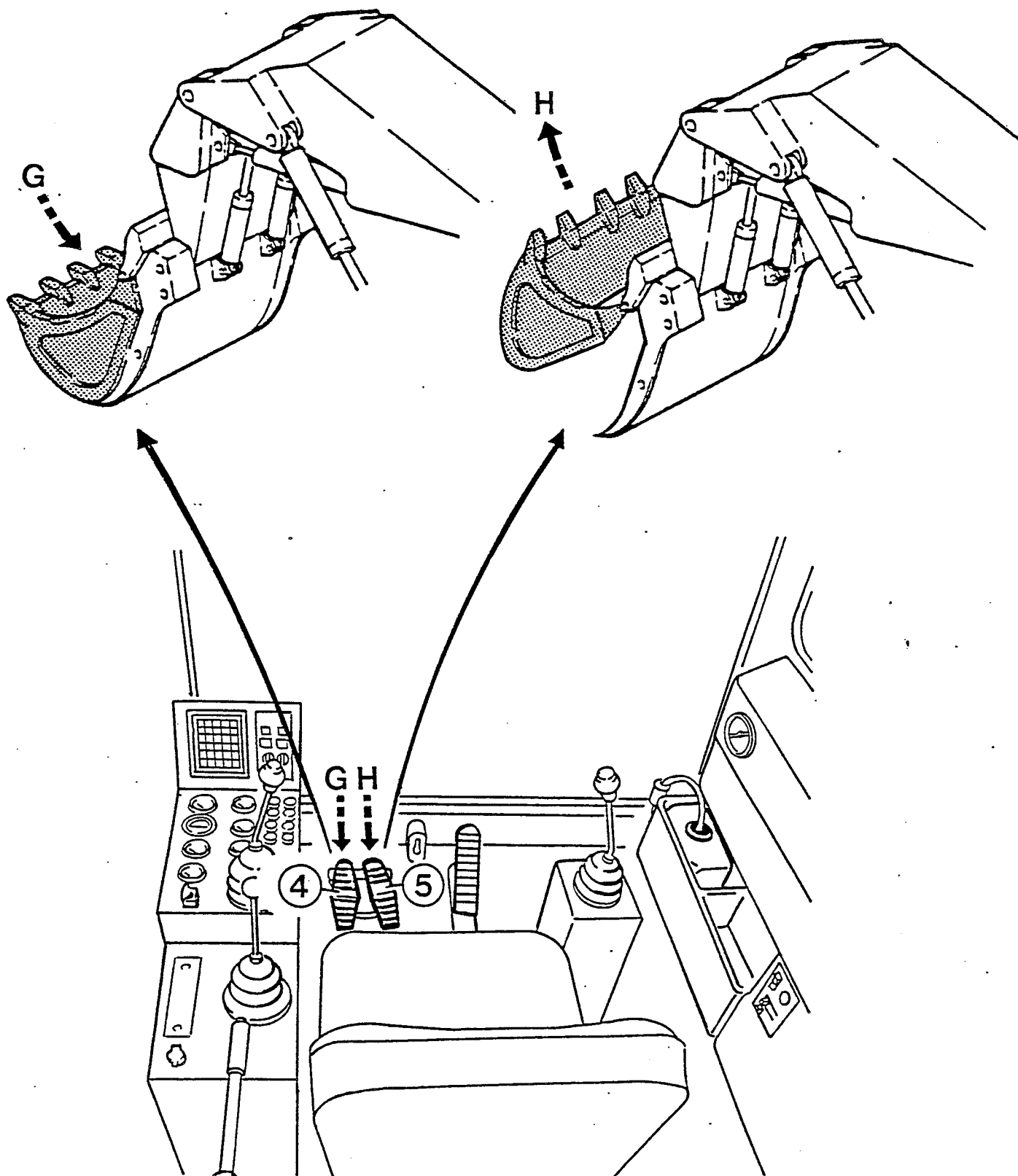
A - Lowering boom

F - Retracting stick

B - Lifting boom

C - Emptying bucket (roll back)

D - Filling bucket (roll forw.)



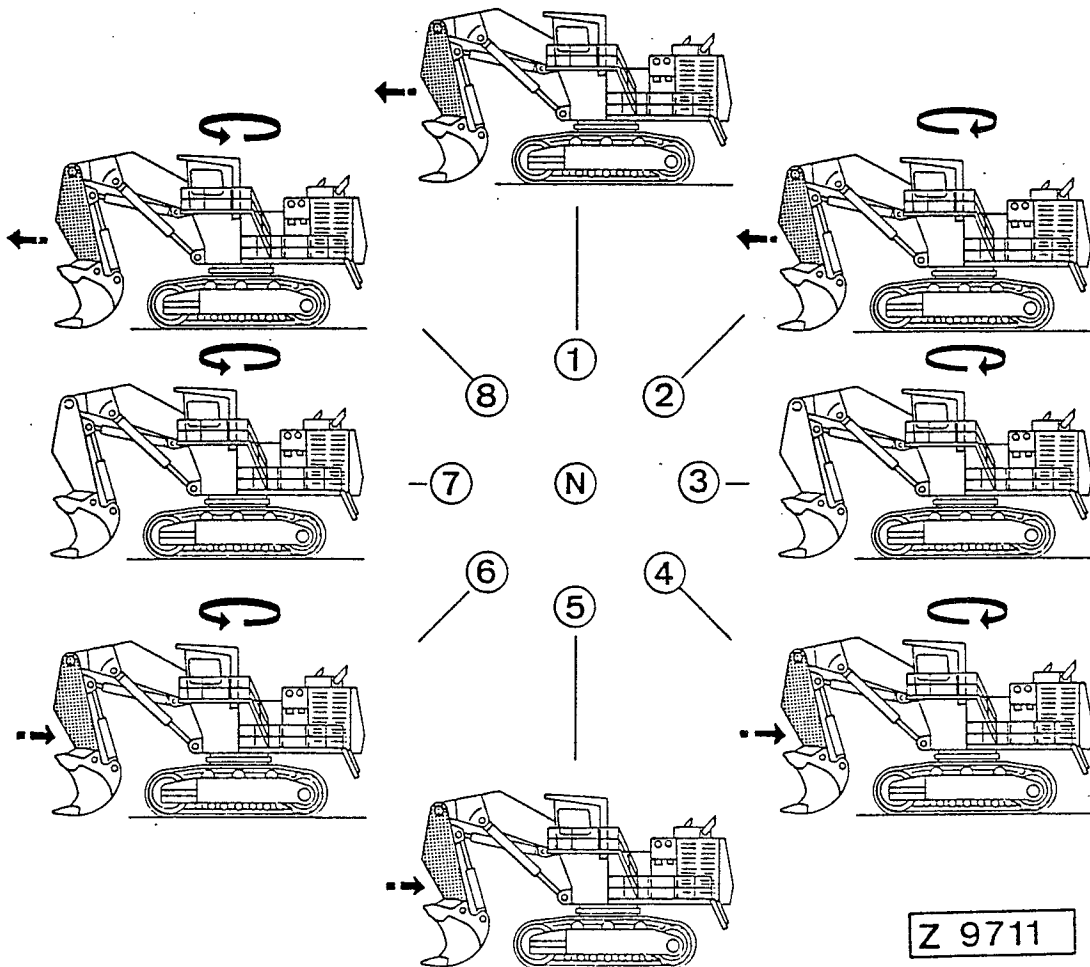
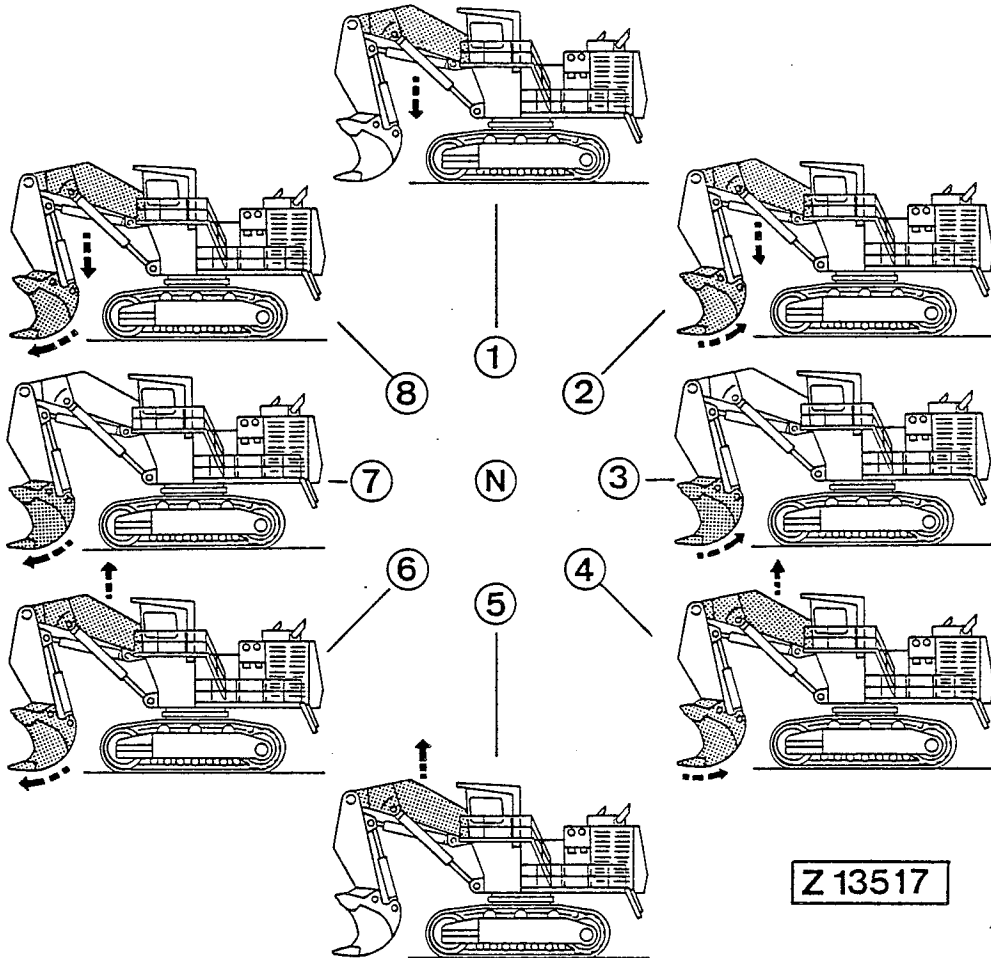
#### 6.6.4 Bullclam bucket (Z 18938)

Note:

The illustration shows a typical construction of control stand and working attachment.

However, the shown operation - and working movements apply to this machine.

- Closing (G)  
Depress LH pedal (4)
  
- Opening (H)  
Depress RH pedal (5)



With each of the control levers, two operation cycles can be initiated simultaneously.

In order to obtain efficient operation, always select intermediate control lever positions in relation to work load.

Note:

The illustrations show a typical excavator.

Legend for illust. (Z 13517):

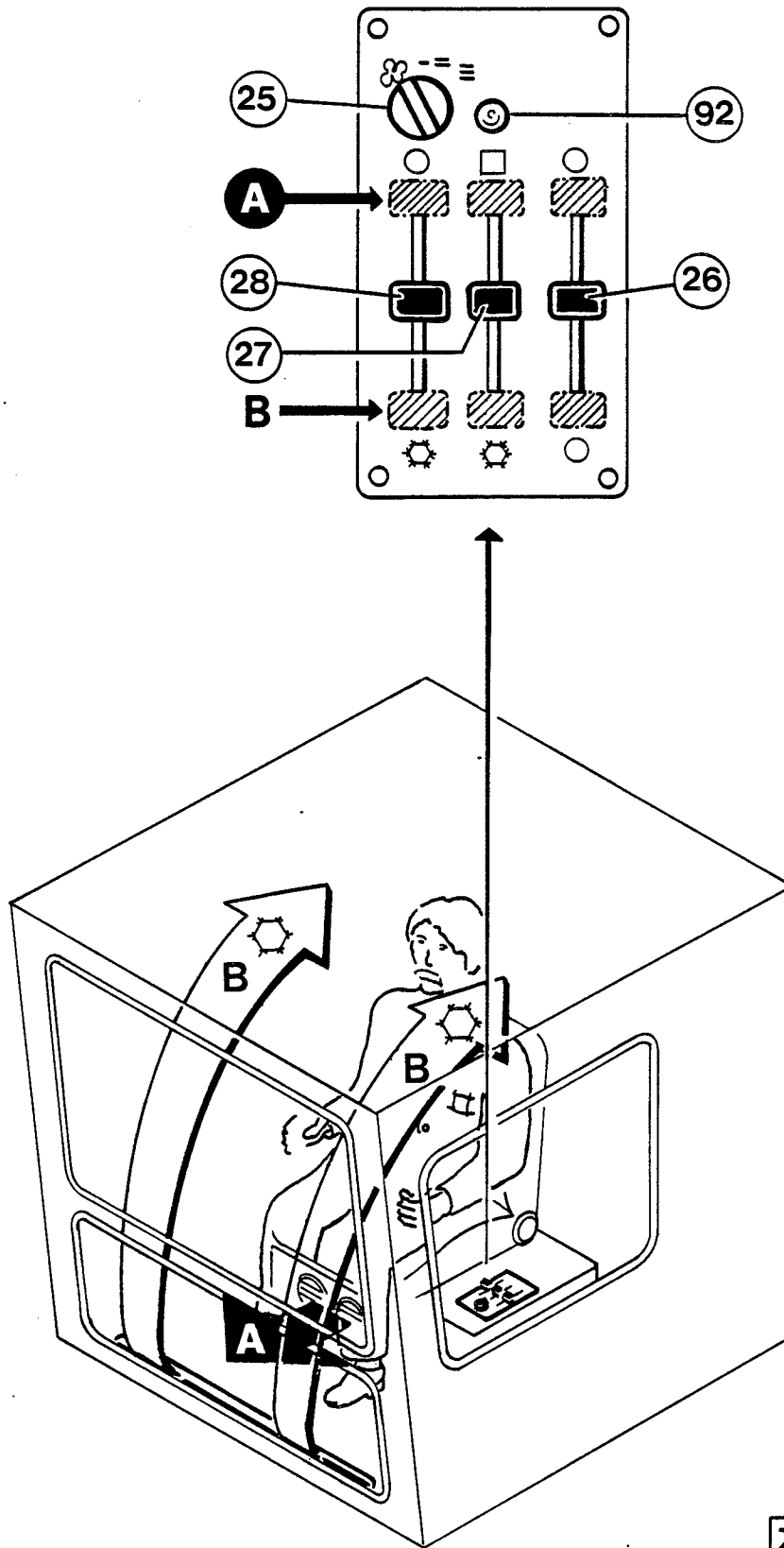
- With STANDARD control, L.H. lever
- With EURO control, R.H. lever

- (N) Neutral position
- (1) Lowering boom
- (2) Lowering boom and emptying bucket
- (3) Emptying bucket
- (4) Raising boom and emptying bucket
- (5) Raising boom
- (6) Raising boom and filling bucket
- (7) Filling bucket
- (8) Lowering boom and filling bucket

Legend for illust. (Z 9711):

- With STANDARD control, R.H. lever
- With EURO control, L.H. lever

- (N) Neutral position
- (1) Extending stick (away from machine)
- (2) Extending stick and slewing to the right
- (3) Slewing to the right
- (4) Retracting stick (towards machine) and slewing to the right
- (5) Retracting stick
- (6) Retracting stick and slewing to the left
- (7) Slewing to the left
- (8) Extending stick and slewing to the left





Legend for illust. (Z 19058):

- A - Controls in maximum heating position and resulting air flow in cab
- B - Controls in maximum cooling position and resulting air flow in cab
- (25) Blower switch
- (26) Heater control
- (27) Air conditioner control
- (28) Air flow control
- (92) Air conditioner indicator light

A - Heating

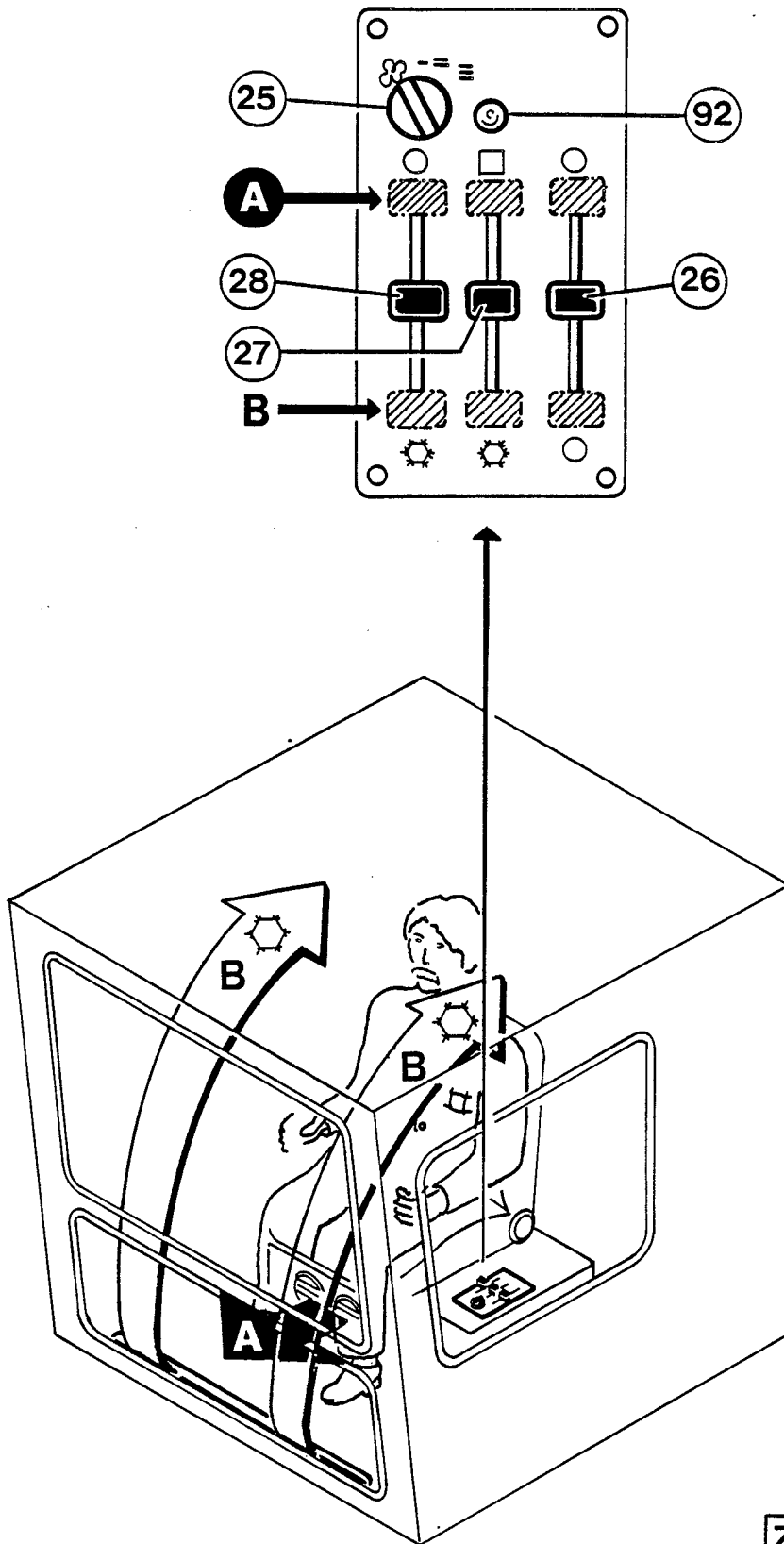
1. Move slide controls (26, 27 and 28) to front position (A).
2. Set blower switch (25) to desired stage.

B - Cooling

Note:

- The air-conditioning (special equipment) should only be operated with the engine running.
- When the air-conditioning is in operation the windows and other ventilating openings in the cab should be closed to ensure maximum cooling performance.

1. Move slide controls (26, 27 and 28) to rear position (B).
2. Set blower switch (25) to stage III.  
Indicator light (92) illuminates when the air-conditioner is working.



Z 19058

Air conditioning (special equipment), illust. (Z 19058)

Important!

If the fan switch (25) is not at the highest stage, the evaporator freezes up. In this case the temperature control (27) must be moved to front position (A).

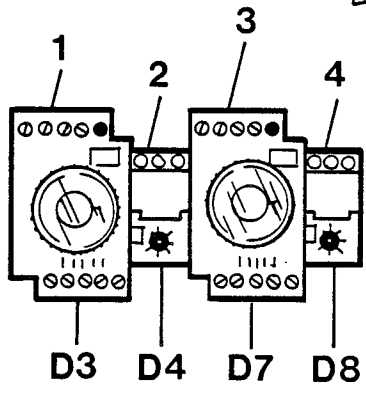
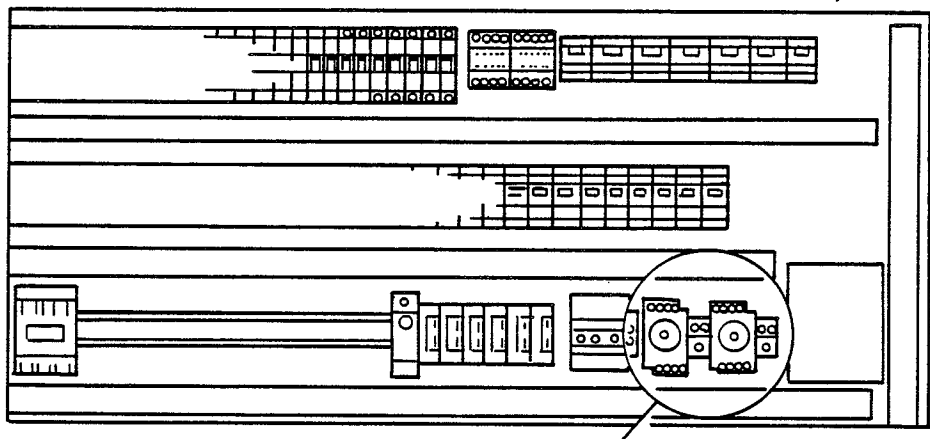
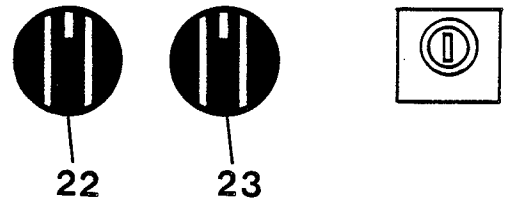
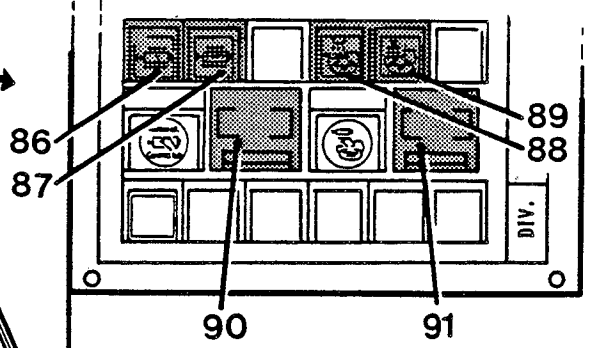
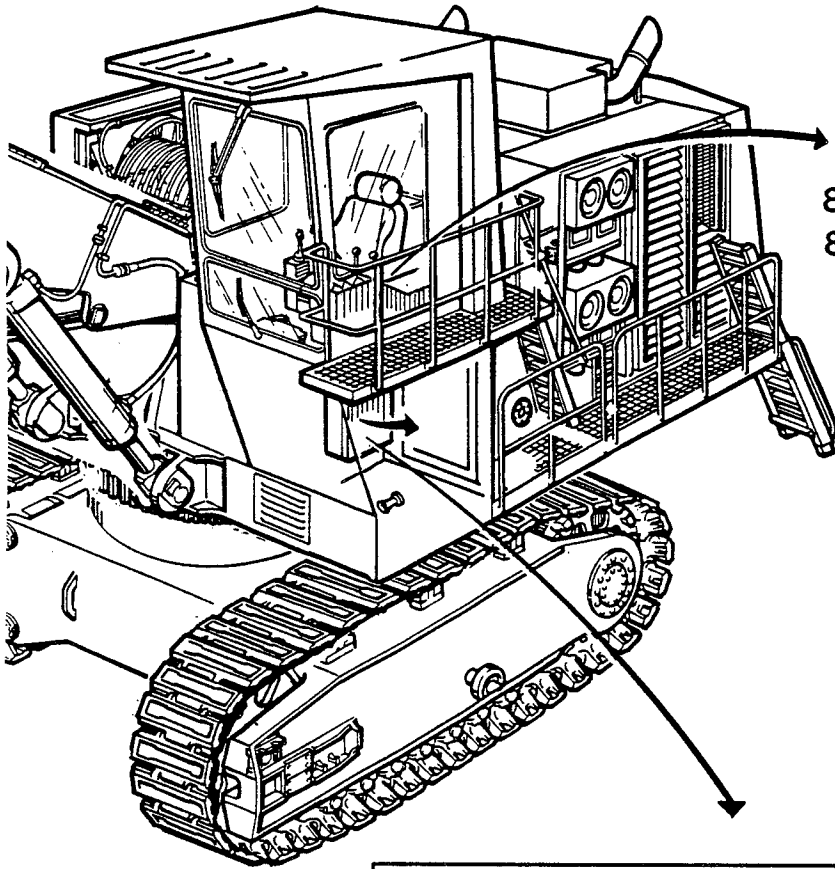
The ice will melt and the temperature control (27) can be operated again.

Notes:

1. If the excavator has been exposed to the sun for a long period it is recommended to ventilate the cab thoroughly by opening doors or windows until the hot air is expelled.
2. The air conditioner should be operated at least 10 minutes once a month. This operation will keep seals from drying out, causing possible damage to the compressor and / or system due to loss of refrigerant.
3. The blower switch for cab overpressure on the instrument panel (ref. no. 24) must be in position "0". Otherwise too much hot air will be sucked into the operator's cab.

Combined operation of air conditioning and heating

Mainly on wet and rainy days, if no or little heating is desired, it is possible to dehumidify (to dry) the cabin air by using the air conditioner and heater. To do this, select intermediate positions of controls (26, 27 and 28).



### 6.11.2 Central lubricating system (special equipment)

The central lubricating system works automatically as soon as the Diesel engine is running.

Legend for illust. (Z 19074):

#### Instrument panel

- (22) Switch, manual actuation of central lubrication system
- (86) Indicator light, failure - central lubrication system
- (87) Indicator light, grease container empty - central lubrication system
- (90) Pulse counter - central lubrication system

#### Switch box in cab base

##### Control units

- (1) Time relay for pause time adjustment
- (2) Time relay for monitoring time adjustment (including period of lubricating process).

#### Note:

If the lubricating system is manually operated allow pressure relief in the system by releasing switch (22) for approx. 30 sec. after each lube cycle. End of lube cycle is indicated through movement of figures in counter (90) into fully visible position.

Factory time adjustments: for relay (1) "D3" pause time

dual line system	= 1 hour
single line system	= 30 minutes
for relay (2) "D4"	= 6 minutes monitoring time

These factory time adjustments can be changed in order to meet local requirements and operating conditions.

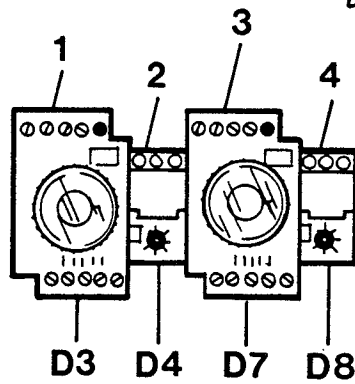
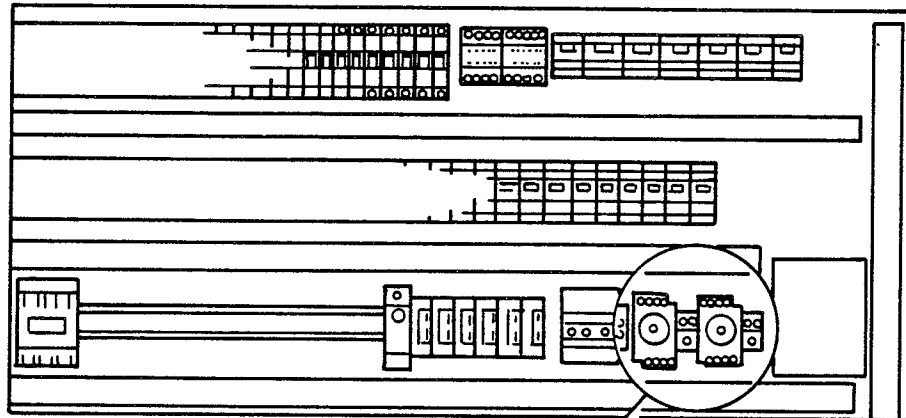
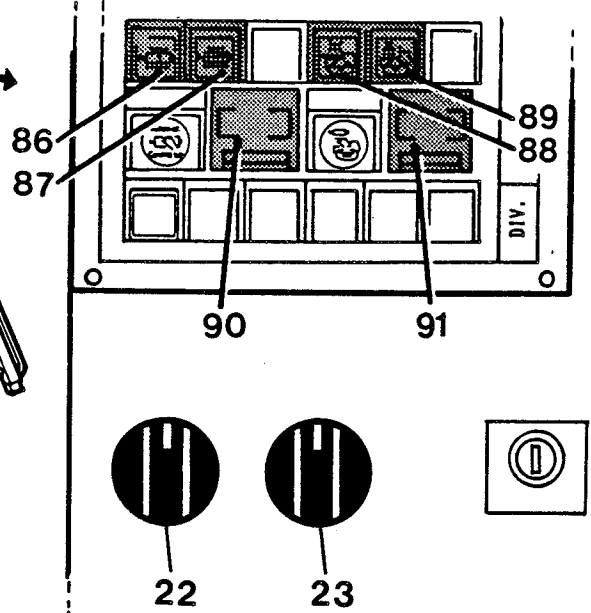
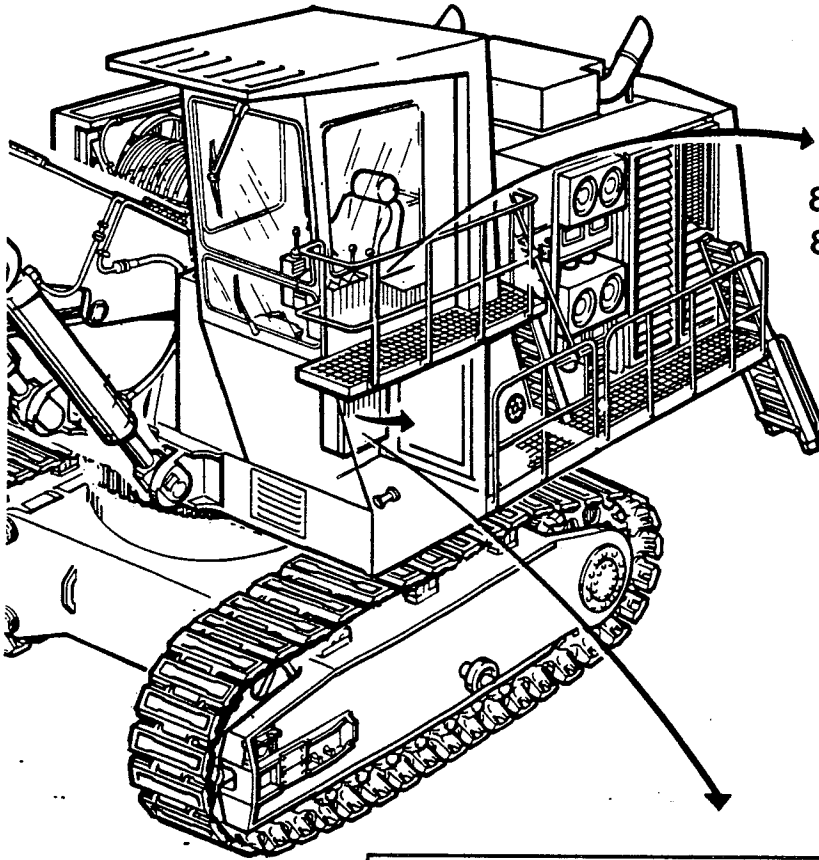
Adjustment procedure see page after next.

#### Caution!

If the central lubricating system fails to work, lubrication must be carried out manually, refer to Lubrication and Maintenance Manual.

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6.11

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Z 19074

### 6.11.3 Slew ring gear lubricating system (special equipment)

This system works automatically as soon as the Diesel engine is running.

Legend for illust. (Z 19074):

#### Instrument panel

- (23) Switch, manual actuation of slew ring gear lube system
- (88) Indicator light, failure - slew ring gear lube system
- (89) Indicator light, grease container empty - slew ring gear lube system
- (91) Pulse counter - slew ring gear lube system

#### Switch box in cab base

##### Control units

- (3) Time relay for pause time adjustment
- (4) Time relay for monitoring time adjustment (including period of lubricating process).

Factory time adjustments: for relay D7 (3) = 10 min. pause time  
for relay D8 (4) = 1 min. monitoring time

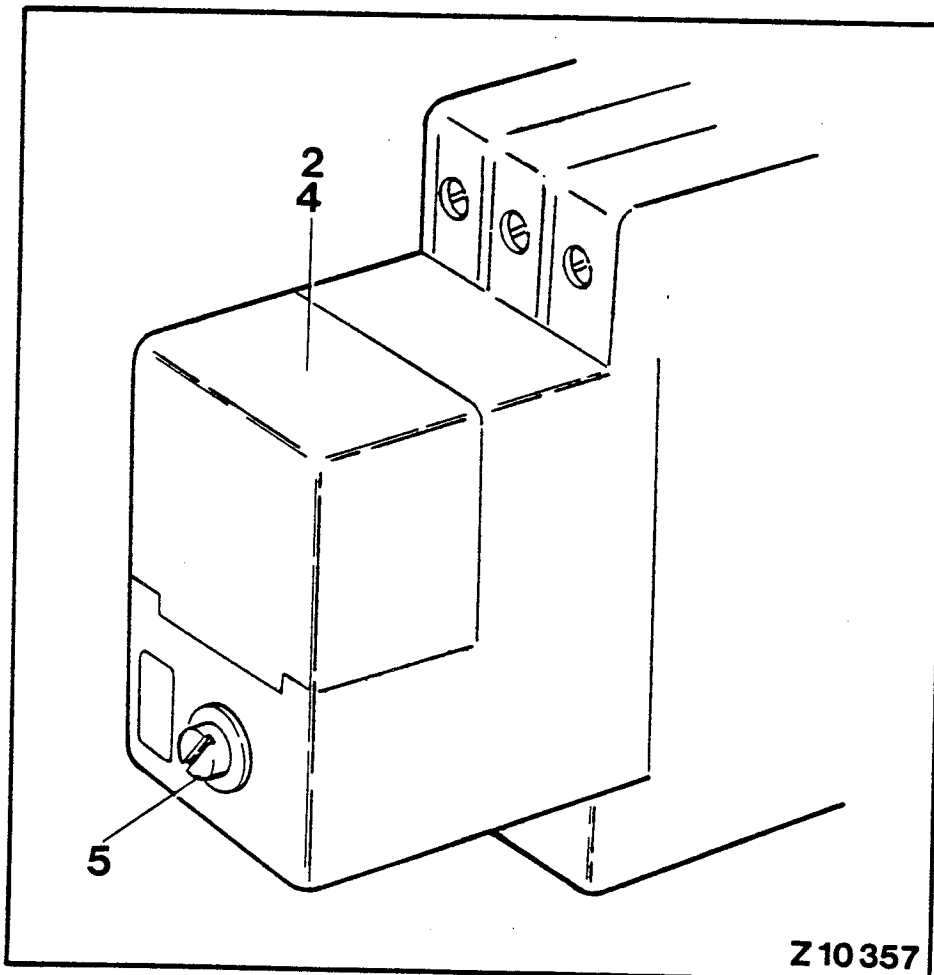
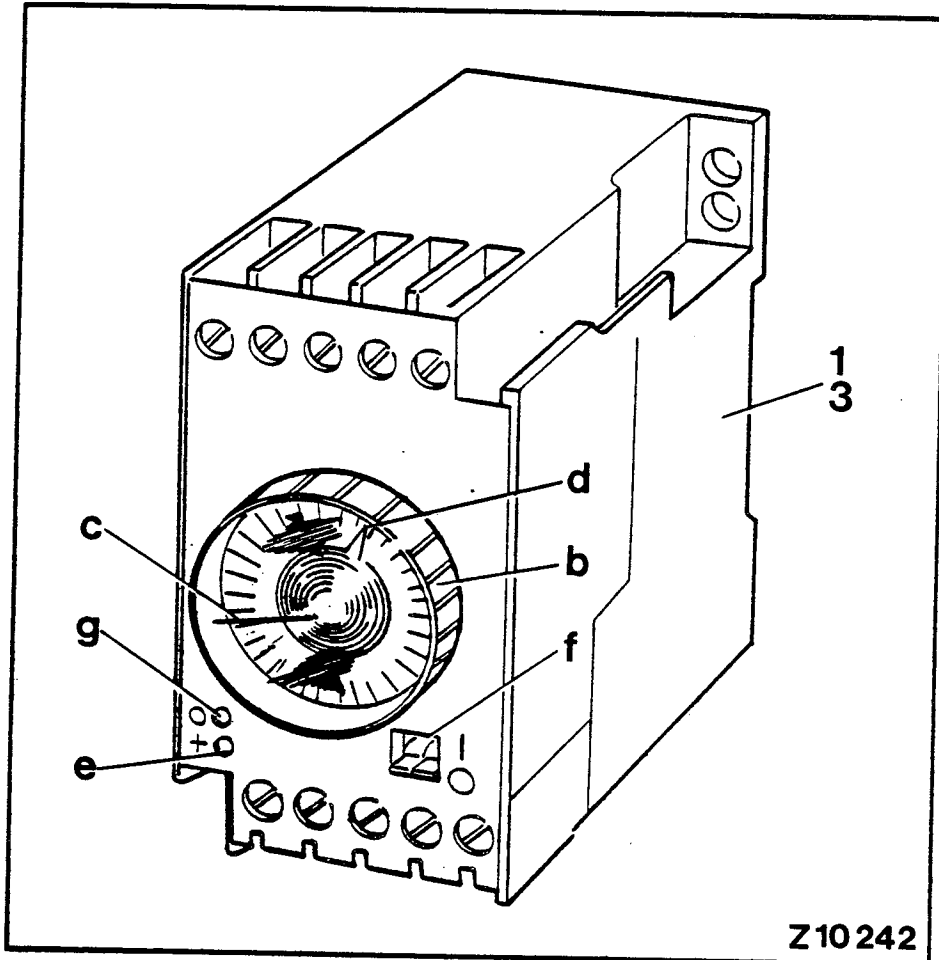
#### Note:

These factory time adjustments can be changed in order to meet local requirements and operating conditions.

Adjustment procedure see next page.

#### Caution!

If the slew ring gear lubricating system fails to work, lubricate ring gear manually, refer to Lubrication and Maintenance Manual.





Adjustment procedure "pause time" of relays (1 and 3, Z 10242)

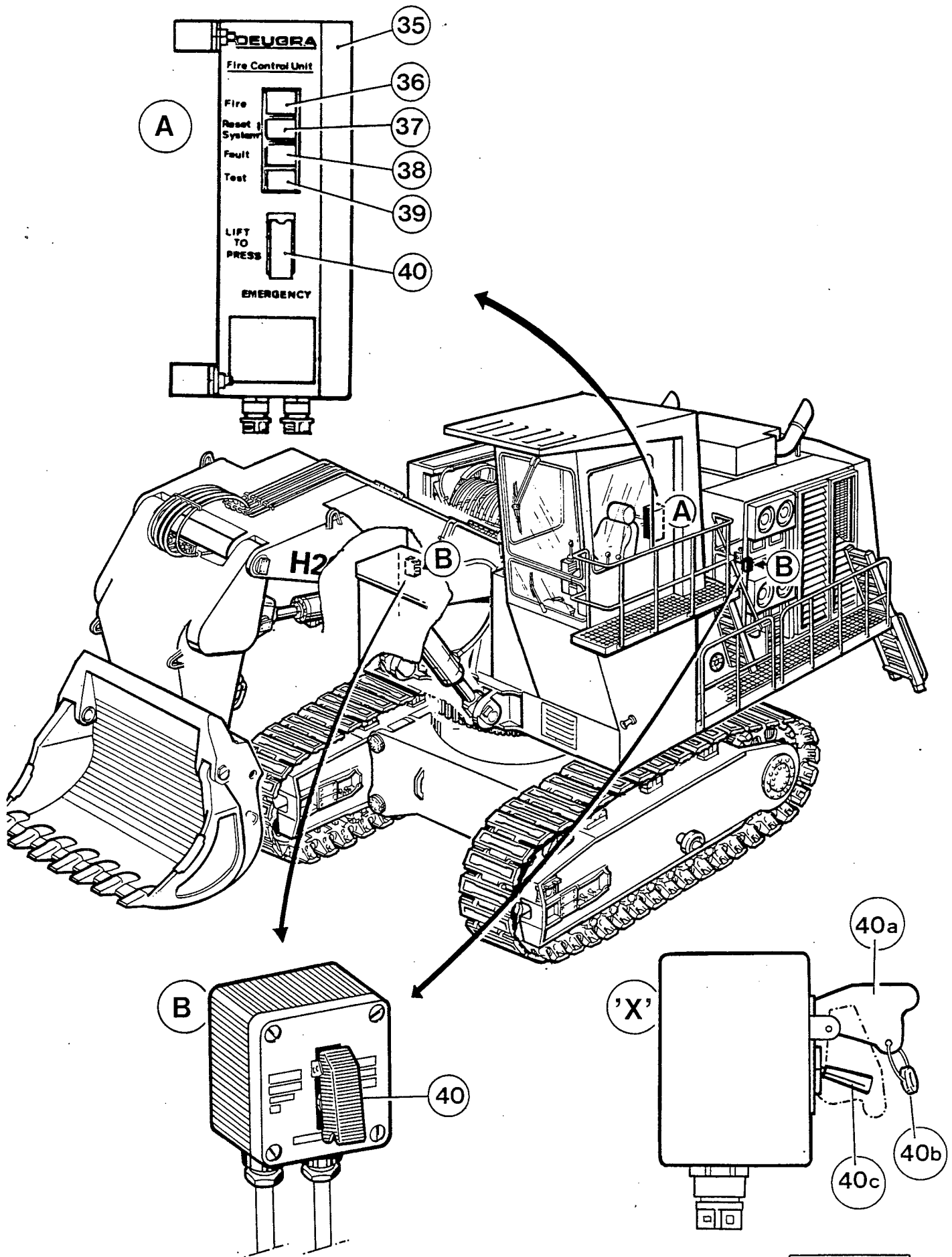
- (b) Rotary ring for pause time adjustment ("0" adjustment possible)
- (c) Pointer for adjusted time period
- (d) Pointer for lapse of time
- (e) Push button for "zero voltage security" and time adding operation (with/without zero voltage security)
- (f) Indicator mark for operating condition (in upper position "I")
  - white: Time lapsing, no lubrication
  - white/green: Time lapsing finished, lubricating process starts
- (g) Locking knob for ring (b)

The pause time can be adjusted with ring (b). Pointer (c) shows the adjusted time. During time lapse, pointer (d) shows the remaining time before the lubricating process starts. With button (e) the relay can be reset to zero voltage security and time adding position.

In case of a circuit interruption the relay will keep the actual time until the voltage supply is restored.

Adjustment procedure "Monitoring Time" (including period of lubrication process) of relay (2 and 4, Z 10357)

Adjustable are periods from 0.3 up to 10 minutes, using screw (5). The slot of the adjusting screw must point to the required time.



Caution!

Before operating the excavator make sure the fire detection and suppression system is operative. Carry out inspection and maintenance according to the separate Service Manual "Fire Detection and Suppression System".

Legend for illustration (Z 13578):

A - Control unit within operator's cab

(35) Control panel

(36) Press button with warning lamp "Fire", this lamp lights up when the fire suppression system is actuated.

(37) Press button with signal lamp "Reset System"

(38) Press button with signal lamp "Fault"

(39) Press button "Test"

(40) Actuating switch, fire suppression system (secured with lead wire)

B - Actuating switches on machines outside

(40) Actuating switch fire suppression system (secured with lead wire) see detail "X"

Detail "X"

(40a) Protection cap

(40b) Lead wire

(40c) Toggle switch, manual actuation of fire suppression system

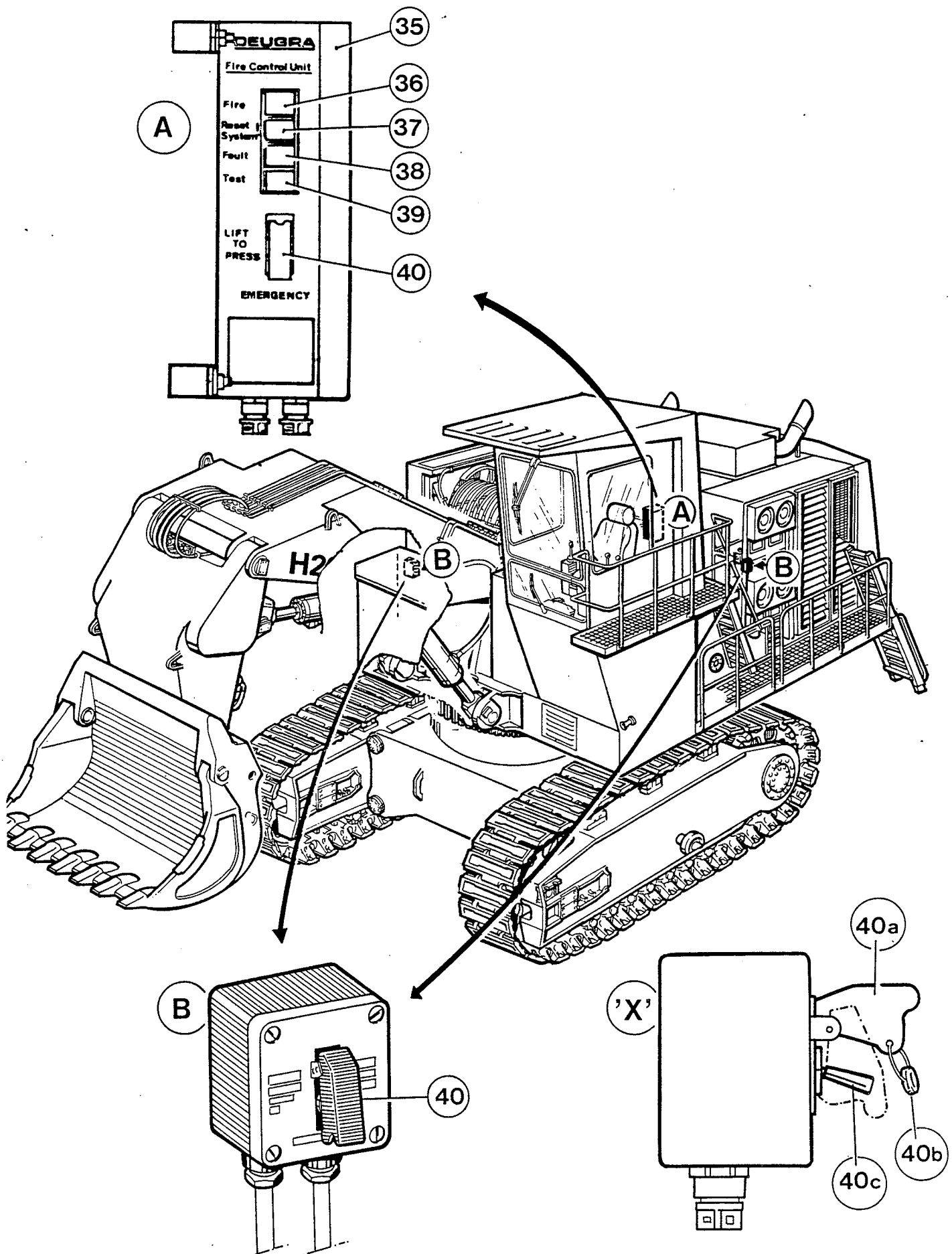
Actuation modes:

A/B - Manual actuation via switches (40) at control unit (A) or at machines outside (B).

Note:

For actuating the switches (40) remove the red protection cap (40a) secured with lead wire (40b) and tilt up toggle switch (40c).

C - Automatic actuation via the "fire wire" routed through the engine and power compartment.



Testing the system

refer to illustr. (Z 13578)

Prior starting a work shift make an operational check of the system.

Proceed as follows:

1. Depress button (39) "Test".

The warning lamp (36) "Fire" and (37) "Reset system" must light up immediately. Keep the switch depressed, after approx. 3 seconds the signal lamp (38) "Fault" must also light up.

2. Release switch (39) all lamps must go out.

- If the lamps fail to function:

a) Fire warning lamp (36) does not light up.

Probable cause:

- Burned out bulb
- Fire wire defective
- Control unit defective

Caution!

The automatic fire suppression system is inoperative.

b) Signal lamps (37 or 38) do not light up.

- Check for burned out bulbs.

c) Signal lamp (38) "fault" does not go out after releasing test switch (39).

Probable cause:

- capsule 1 and/or 2 open
- manual switches (40) actuated

Caution!

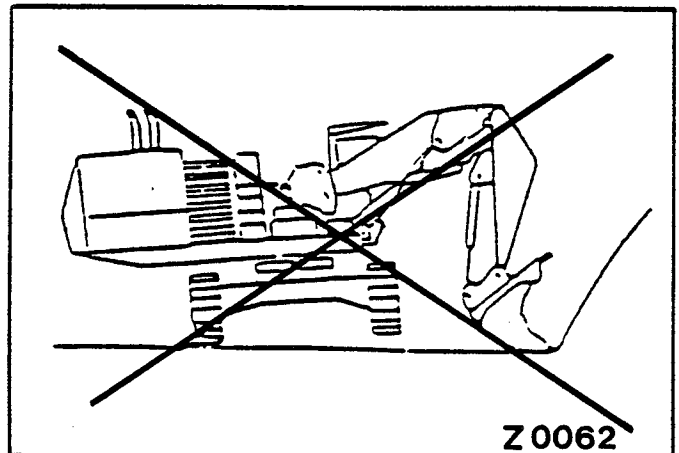
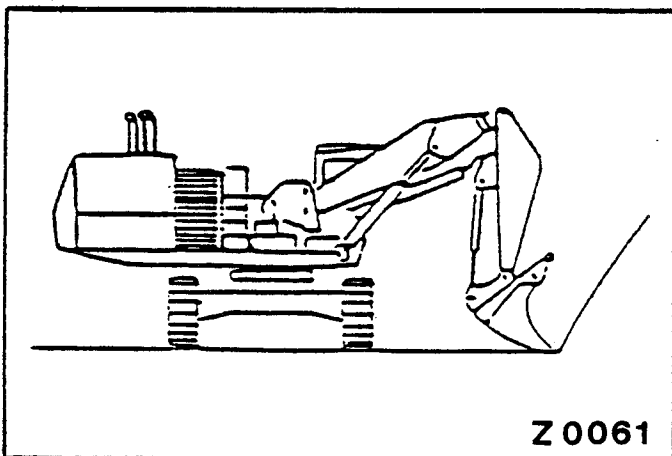
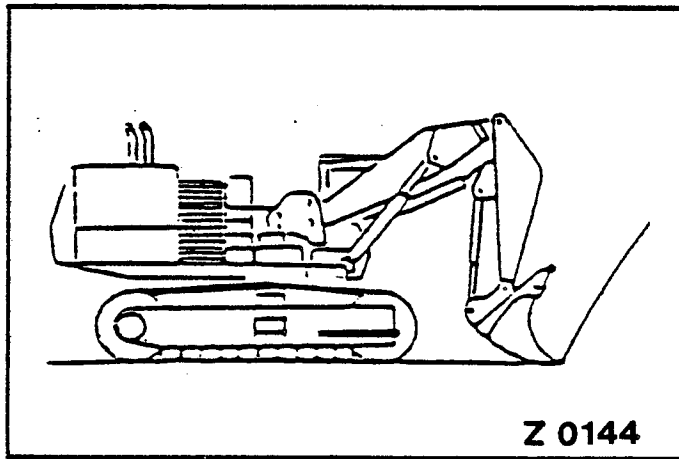
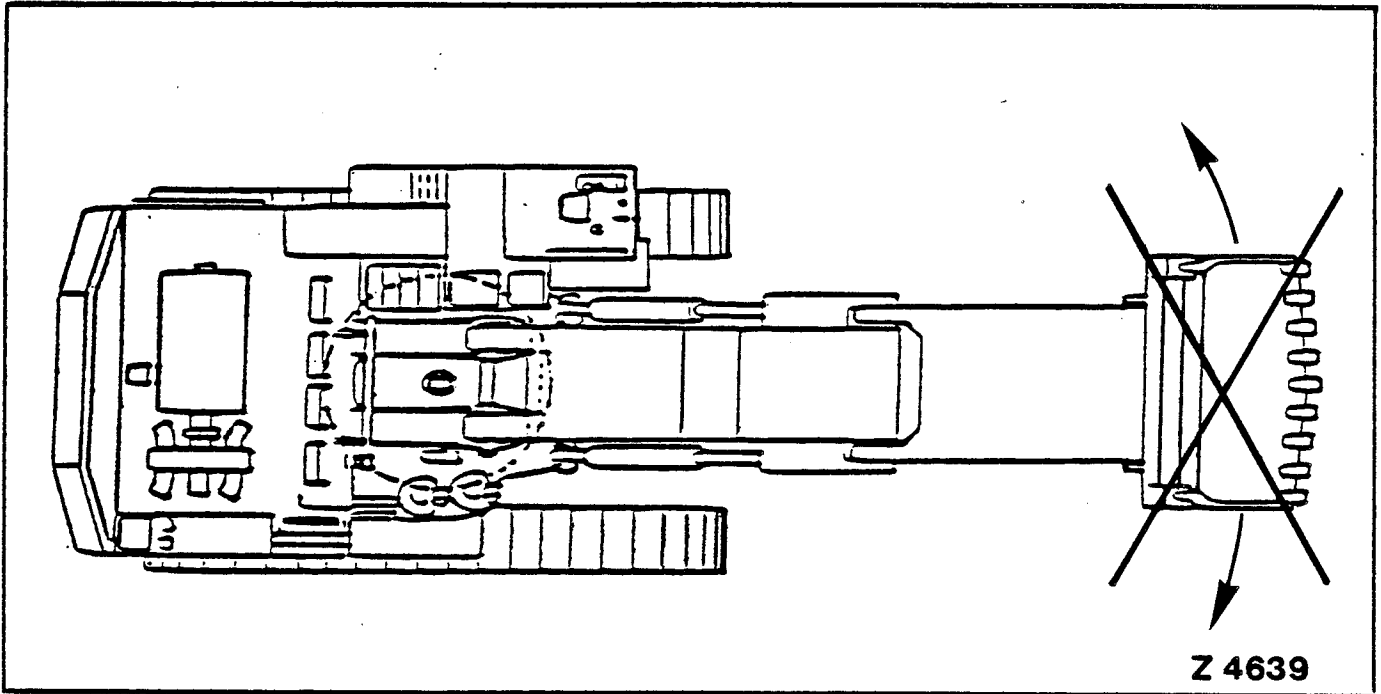
The system is inoperative.

DO NOT operate the excavator as long as the fire detection and suppression system is inoperative.

Refer to the separate Service Manual "Fire Detection and Suppression System" for trouble shooting and repair.

Note:

The bulbs of lamps (36, 37 and 38) can be checked by depressing the respective button.





- Do not move the operating levers jerkily.
- Before beginning work prepare a suitable excavator base, observe inclined position of engine and the machine's stability.
- Avoid continuous operation in sloping condition above 15°.
- Observe permissible sloping condition of engine (see section 6.4.2).
- "Sweeping" with the excavating equipment is forbidden (Z 4639).
- When working with the bullclam bucket or loader bucket in the longitudinal direction, the drive should be in the rear position (Z 0144).

This accomplishes the following:

- The travel motors and travel gears are protected from possible falling rocks and the like.
- When the excavator is operated on muddy ground and the tracks are covered with mud, the sprocket runs on a clean track when backing up because it comes from above.
- When working with loader in a cross direction to the track group, be sure that the track is not raised off the ground (Z 0061 and Z 0062). This can cause the track to set-off from the rollers when it is lowered down on the ground. Also the flanges of the track rollers and the track shoes can be bent by the excessive load.

- Loading trucks:

Have the truck drive up to the excavator as closely as possible.

Do not swing the equipment out over the driver's cab of the truck unless it is provided with special protection.

Swing the equipment over the loading platform at a sufficient height.

Distribute material evenly on loading platform.

Do not overload truck.







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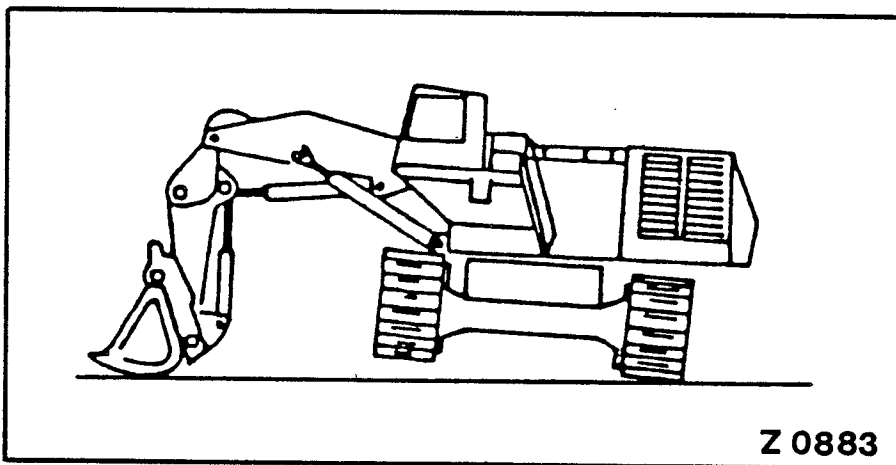
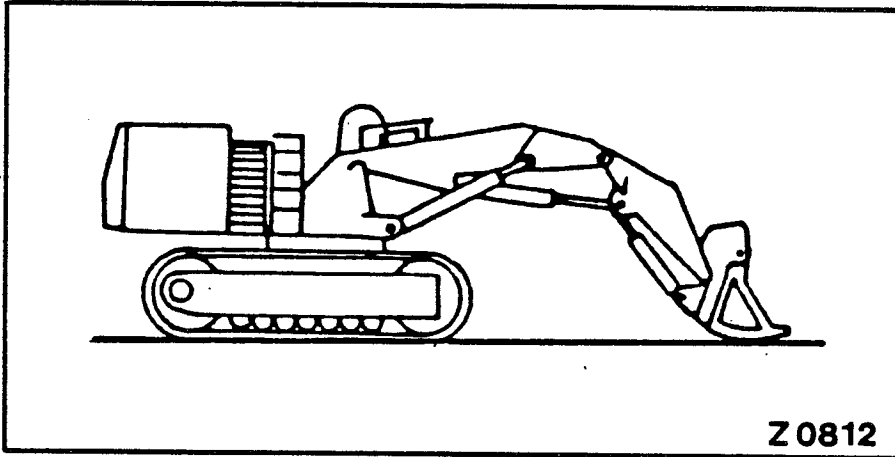
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WORKING INSTRUCTIONS

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7.

- Remove sticky material from the bucket.
- Always keep the excavator as close as possible to the work area. Short boom trips - high efficiency.
- When turning into a pit, the rotating motion must not be stopped by the walls of the pit.
- Only a bucket with a complete set of teeth and cutting edges in good condition ensures efficient performance.
- Loosen hard material and rocks with the bucket, not with the stick crowding thrust.
- Correct bucket size and properly adjusted equipment prevents overloading and ensures maximum operating efficiency of the excavator.





### Parking (Z 0812)

Park the machine at a safe place on level ground.

Lower the working equipment to the ground. Stop the engine as described in section 6.3. Turn off the battery main switch and lock the cab.

DO NOT leave the machine when the engine is running.

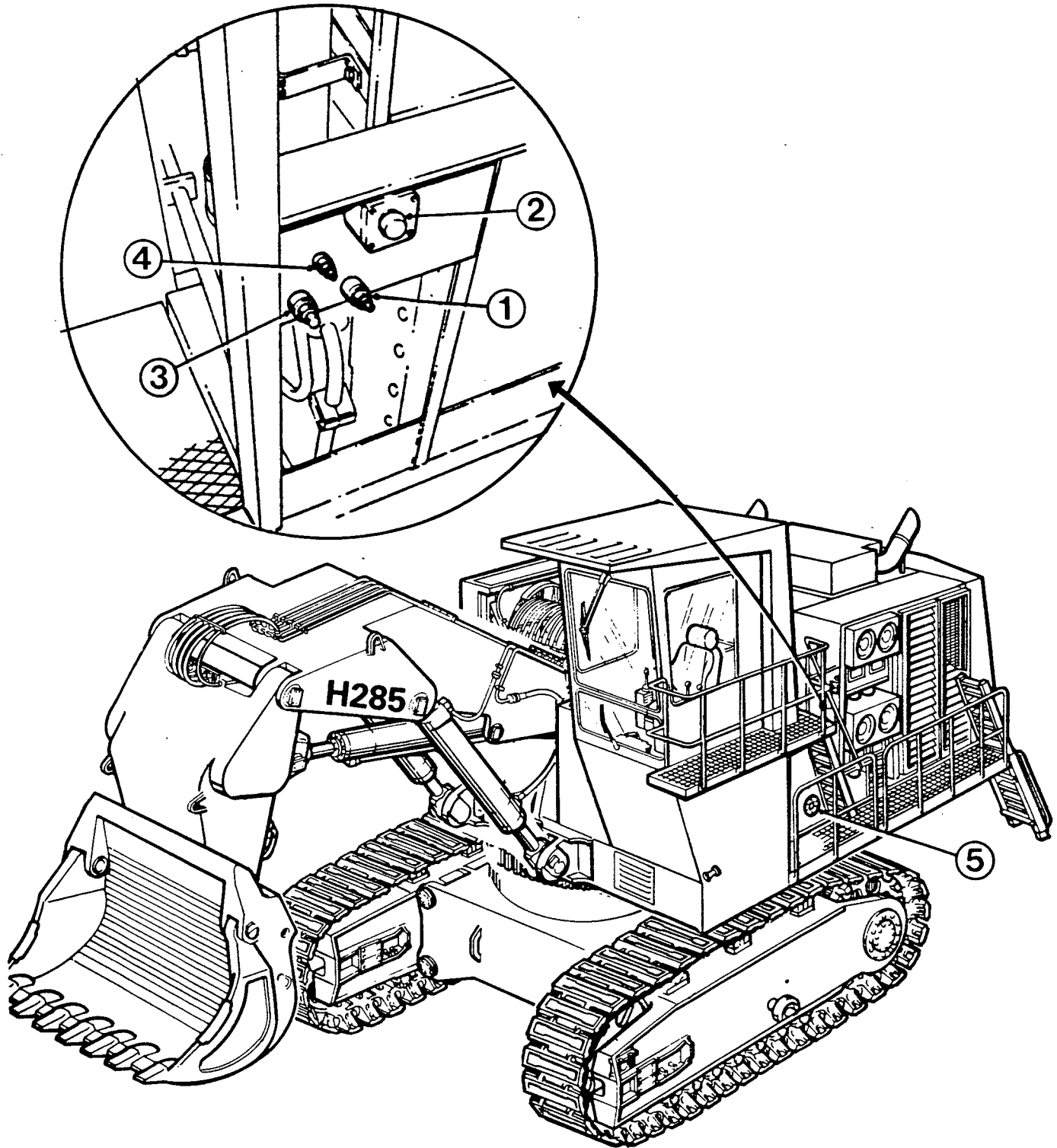
### Note:

- When there is danger of frost, dirt and soil should be removed from each track before the machine is parked after work.

Proceed as follows:

#### Cleaning the track group (Z 0883)

1. Rotate the equipment over one side of the track group.
  2. Raise one track group completely from the ground by lowering the equipment.
  3. Let the track group run backwards and forwards until the track is clean.
  4. Lower the track group to the ground.
  5. Repeat steps 1 to 4 on the other track group.
  6. If necessary, manually remove the remaining dirt, mud, and debris from the track and rollers.
- If the excavator has to be stopped on steep terrain, the track groups must be secured with wedges.
  - Before leaving the excavator make sure that the parked machine does not impair local requirements, have consideration for other construction traffic.



Central refilling unit (special equipment)

The machine can be equipped with a refilling unit, at which the following fluids can be filled up:

- Hydraulic oil
- Engine oil
- Coolant
- Fuel (at fuel tank)

Adapters of refilling unit (Z 12058):

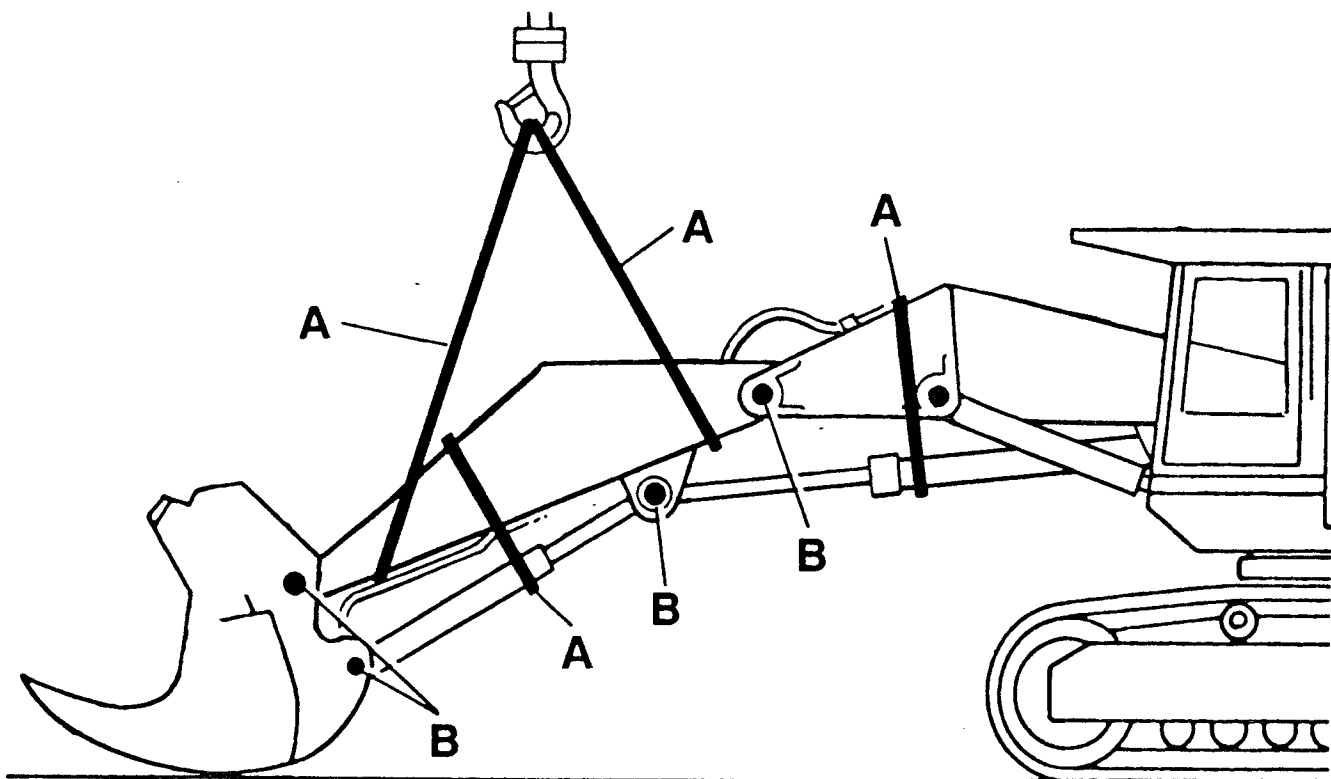
- (1) Hydraulic oil adapter; fill up with extended cylinders and observe indicator lamp (2).
- (2) Indicator lamp lights up when the hydraulic oil level of the reservoir is correct.
- (3) Engine oil adapter; monitor oil level at level gauge.
- (4) Coolant adapter; fill up until coolant level is approx. 10 mm above the radiator fins.
- (5) Fuel adapter, located at the fuel tank.

Note:

The drain points of these fluids remain at their original locations.

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Z 19257

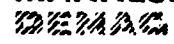
General, illust. (Z 19257)

- Provide hoists of sufficient capacity to lift heavy units.
- Before working on the loader attachment lower it to the ground, stop the engine and cycle all hydraulic control levers to relieve all pressure before disconnecting hydraulic lines.
- Be sure hydraulic cylinders and attachment components are properly supported from hoist and securely fastened (A) before removing supporting pins (B), illust. (Z 19257).
- Floors must be clean and dry. After draining operations be sure all spillage is cleaned up.
- Always bear in mind;  
First secure "A"  
then remove "B".

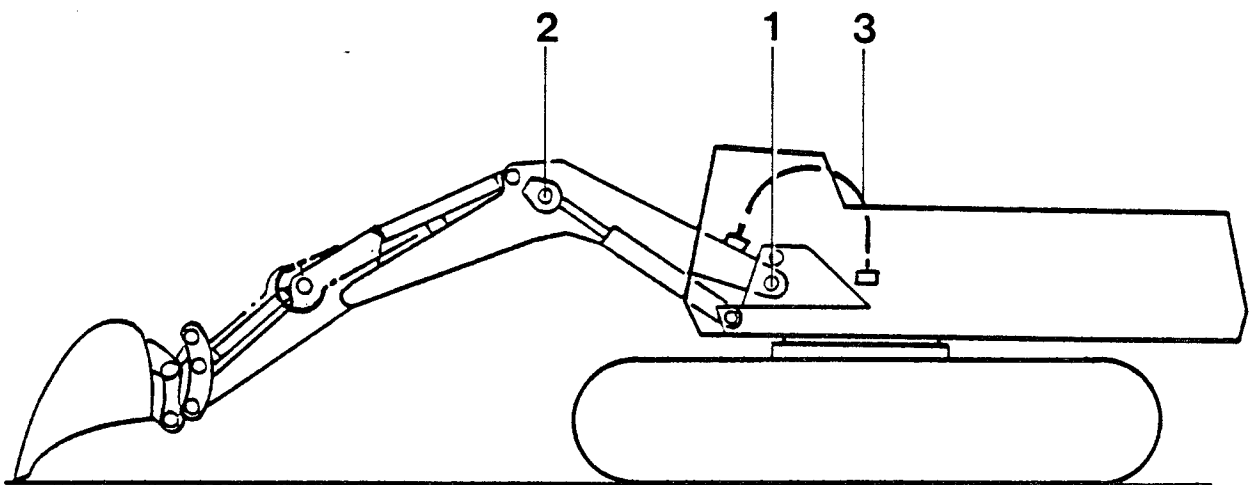
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Z0065



## 10.2 Removing the backhoe equipment (Z 0065)

Note:

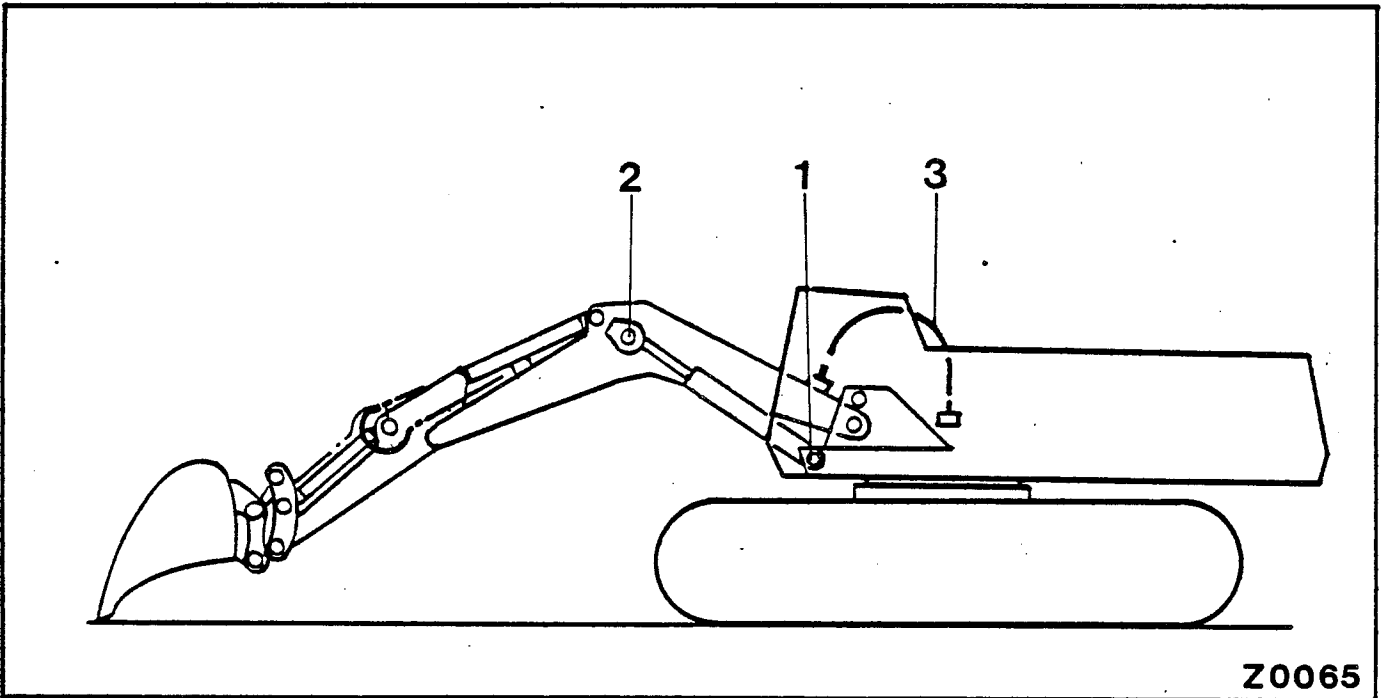
Provide a crane with sufficient lifting capacity for removal or installation of equipment and components.

1. Set the equipment extended down on the ground.
2. Stop the engine and relieve hydraulic pressure in the system by moving the levers a few times.
3. Loosen hose connections (3) and close them with blank flanges.

Note:

Depending on the equipment disconnect the lubricating grease lines of the progressive lubricant distribution system.

4. Hang the right boom cylinder on a crane. After removing the securing element, force the pin (2) out to the left until the cylinder hangs free. Start the engine, retract the piston rod and take off the cylinder.
5. Loosen the left cylinder in the same way. Now force the pin (2) out to the right until the cylinder hangs free.
6. Stop the engine and relieve hydraulic system.
7. Hang the equipment on a crane remove the pivot pin (1).



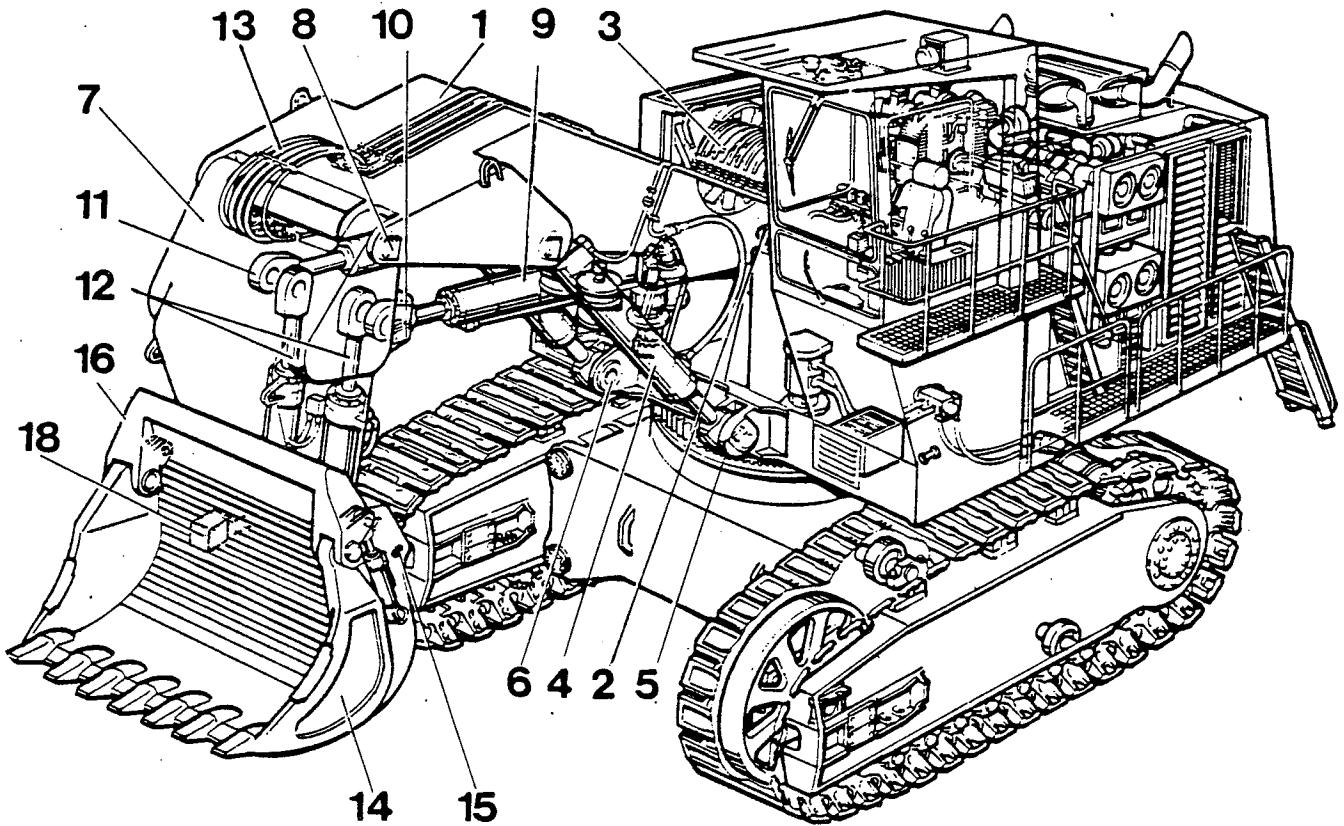
Z0065

Note:

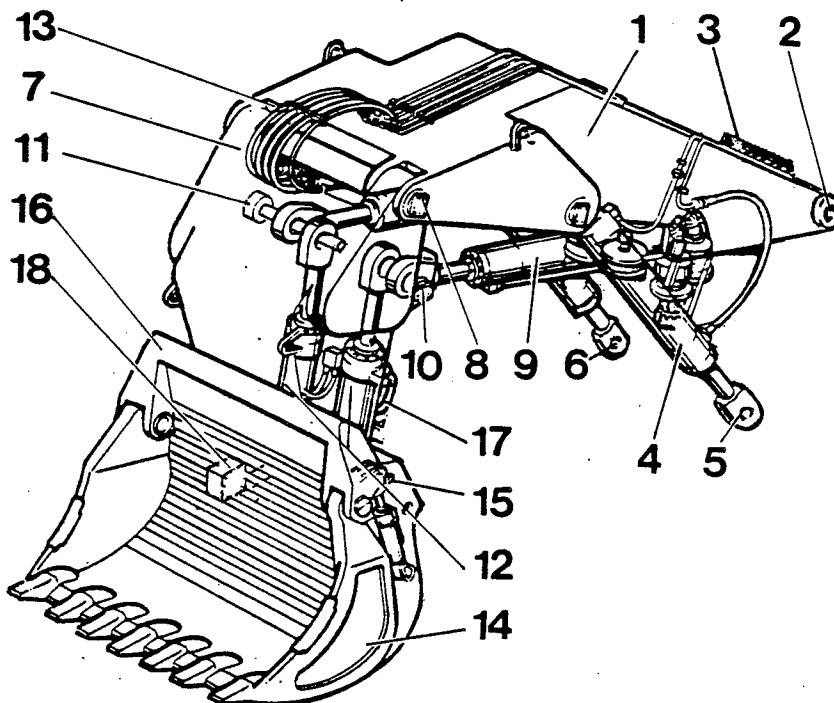
To facilitate pivot pin removal install an eye bolt into the bore provided. Fasten a rope to the eye bolt and carefully pull out the pivot pin using a wheel loader or other suitable machine.

8. Back the machine up a little and set the equipment down.

When fitting the backhoe equipment, follow the above directions but in reverse order.



Z 10353

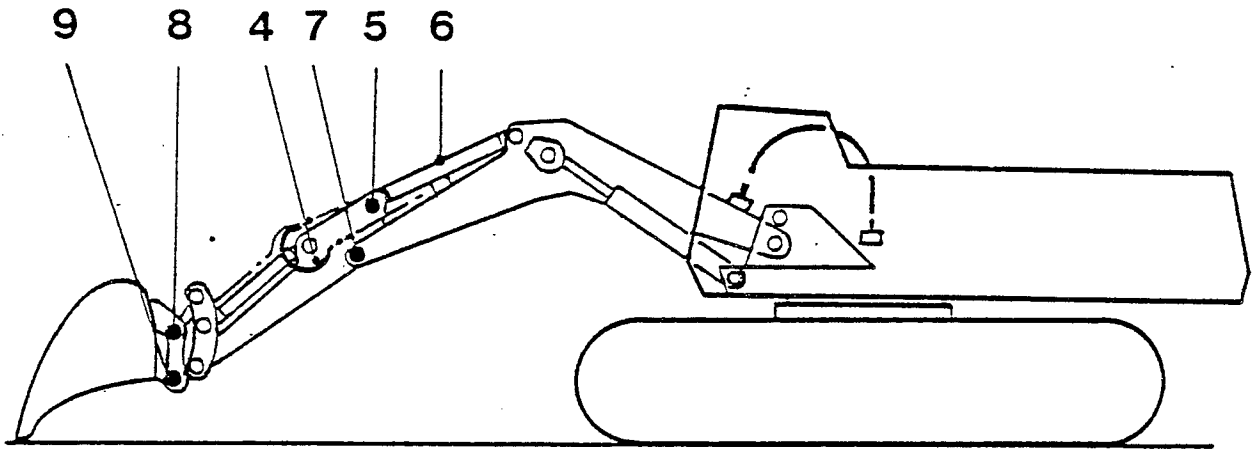


Z 10355

### 10.3 Mounting of the bullclam bucket equipment (Z 10353 / Z 10355)

The mounting procedure can only be carried out by means of a crane.

- 1) Lift the basic boom (1) and move it to the desired position.
- 2) Insert pins (2).
- 3) Connect the hose fittings (3) from the superstructure to the basic boom.
- 4) Carefully loosen the additional fasteners of boom cylinders (4) which are mounted to the basic boom and extend the piston rods.
- 5) Insert pins (5 and 6).
- 6) Lift the stick (7) and move it to the basic boom.
- 7) Insert pins (8).
- 8) Extend the stick cylinder (9) at the basic boom and align it with the bearing.
- 9) Do not insert the pins (10 and 11) fully, but in a way that they nearly reach the support of the bullclam bucket cylinder (12).
- 10) Connect the hose fittings (13) from the basic boom to the stick.
- 11) Move the bullclam bucket (14) to the stick.

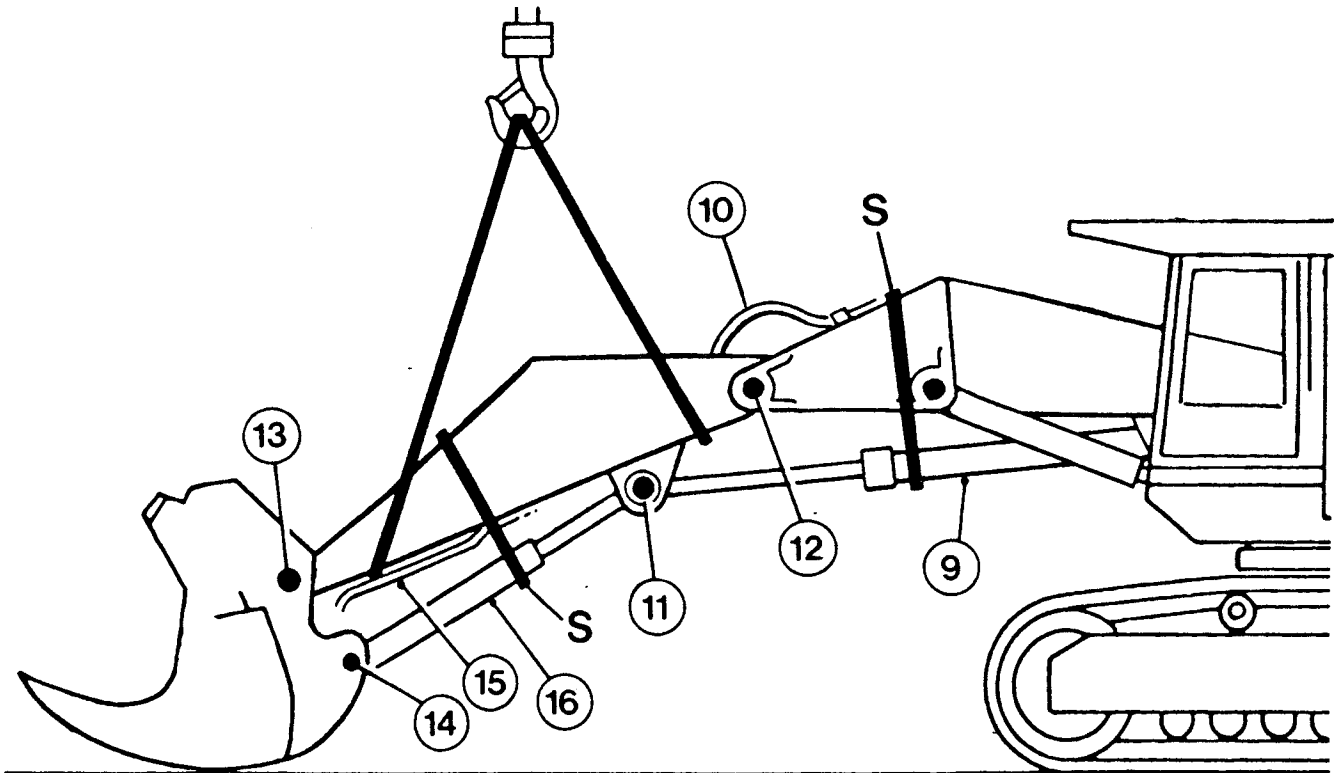


Z 0067

- 12) Insert pins (15 and 16).
- 13) Connect the bullclam bucket cylinder (12) to the stick by means of the hose fittings (17) and extend it into the support of the stick.
- 14) Slide pins (10 and 11) completely into the bearing bores.
- 15) Connect the hose fittings (18) from the stick to the bullclam bucket.
- 16) Connect all electrical cables to the corresponding connectors of the boom and the stick.  
The cables are premounted.
- 17) Note:  
  
Depending on the equipment connect the lubricating grease lines of the progressive lubricant distribution system.
- 18) Make sure that all pins are secured properly.

2066-05  
10.

**MANNESMANN  
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Baumaschinen



Z 19256



10.9 Removing stick with bullclam bucket (loading equipment)  
illust. (Z 19256)

Note:

Provide a crane with sufficient lifting capacity for removal or installation of equipment and components.

1. Lower the equipment to the ground.
2. Shut-off engine and with a few lever movements relieve pressure in the system.
3. Fasten cylinder (9) by means of a rope to the basic boom (S).
4. Fasten bucket cylinders (16) to the stick (S).
5. Remove securing element and drive out central pin (11). Retract piston rod.
6. Stop the engine and relieve pressure in hydraulic system, separate hose connection (10) and close with blind flanges.

Note:

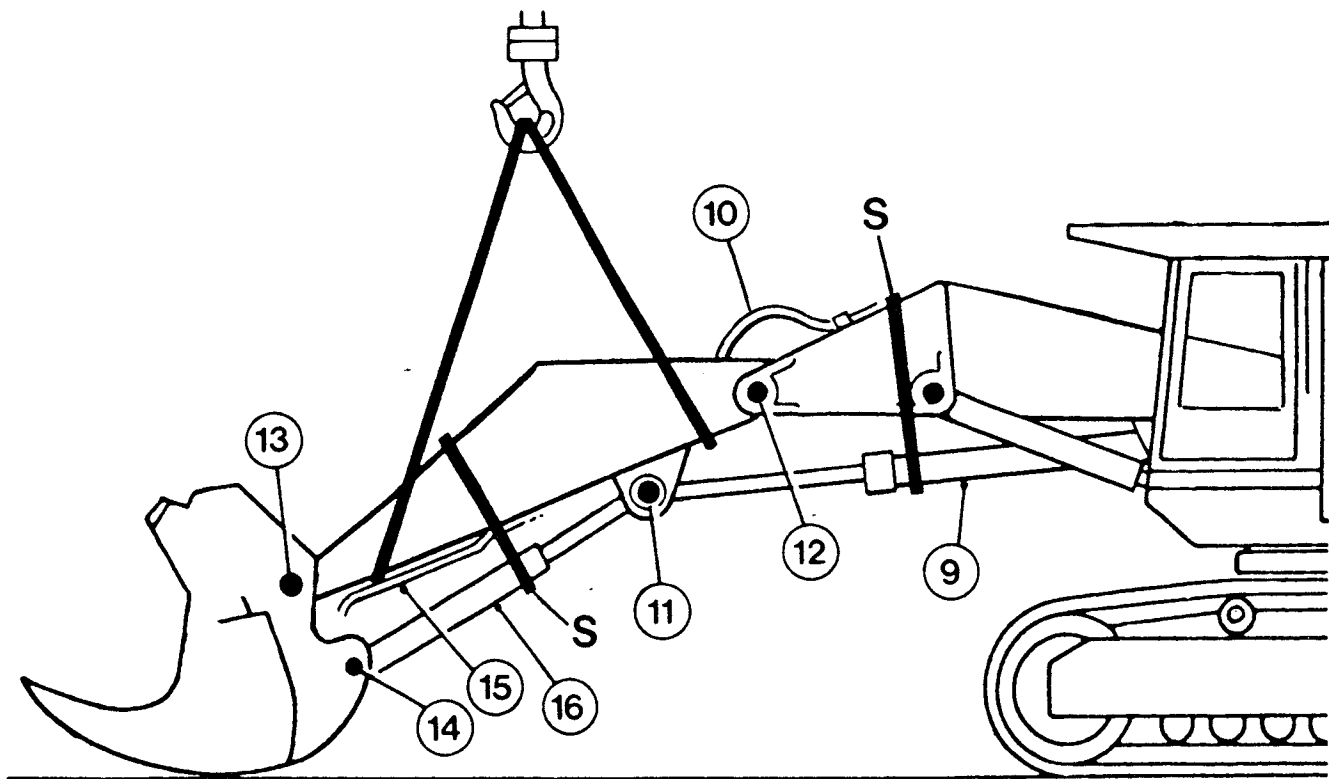
Depending on the equipment disconnect the lubricating grease lines of the lubrication system.

7. Hang the stick with bucket on a crane and force out pin (12).
8. Back-up machine a little and set the stick with bucket down on the ground.

When mounting the stick, follow the above instructions but in reverse order.

2066-06  
10.

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Z 19256

10.10 Removing the loader or bullclam bucket,  
illust. (Z 19256)

Fasten cylinders (16) to the stick (S).

After removing the securing elements, force out pin (13) and (14). With a bullclam bucket the hose connections (15) must be disconnected and closed with plugs.



<u>Section</u>	<u>Subject</u>	<u>Page</u>
1	Foreword	
2	Safety instructions	
3	Fuel and lubricants	
4	Filling capacities	
5	Lubrication and maintenance schedule	
5.1	Initial servicing	
5.2	Periodic servicing schedule	
5.3	Maintenance of the engine	
6	Lubrication and maintenance work	
6.1	Every 10 hours of operation or daily	
6.2	Every 50 hours of operation or weekly	
6.3	-	
6.4	-	
6.5	-	
6.6	Every 250 hours of operation or monthly	
6.7	-	
6.8	Every 500 hours of operation or every 3 months	
6.9	Every 1000 hours of operation or every 6 months	
6.10	Every 1500 hours of operation but at least once a year	
6.11	Every 2000 hours of operation or annually	
6.12	When necessary	
6.13	-	
6.14	-	
6.15	Excavator storage	
6.16	Trouble shooting	



This manual contains instructions for the correct care and maintenance of your machine.

Note:

Since this manual covers also special equipments and accessories, you may find illustrations and descriptions which do not apply to your machine.

Section contents

Section 2: Safety instructions. Read and understand these precautions before performing lubrication and maintenance on this machine.

Section 3: Fuel and lubricants.

Section 4: Capacities

Section 5: All maintenance points arranged in accordance to service intervals.

Maintenance points without fixed service intervals are shown under "When Necessary".

Carry out the periodic service in operating hours (hour meter indication) or in calendar intervals (daily, weekly etc.) whichever occurs first.

Section 6: Description of maintenance operations listed in section 5.

Note:

The information given in this manual are based on the development state of the machine at the time when this manual was written. Deviations in technical data, illustrations, and dimensions are possible, due to the progress in technical development.





Definitions:

Service point: Unit or system where the prescribed maintenance work has to be performed (e.g. engine, equipment etc.).

Service intervals: Number of operating hours after which the maintenance work has to be performed (e.g. "Every 10 Operating Hours", at 10, 20, 30 etc.; "Every 250 Operating Hours", at 250, 500, 750 etc.).

General recommendations

Thoroughly clean all grease fittings, caps and plugs before lubricating.

Seals must be replaced when oil drain plugs and oil level plugs have been opened.

Fill-up fuel tank at the end of the shift to prevent condensation of moisture.

It is recommended to carry-out oil change in assemblies when they are still at operating temperature to speed up draining.



Cleaning the excavator

Important!

In order to prevent risks of possible fire break out observe the following items:

1. Keep the excavator clean, especially from inflammable materials.

Clean the excavator after servicing the hydraulic system, engine and fuel system by means of a steam jet.

2. Clean engine compartment, hydraulic pump compartment and service platform of the superstructure.

Thereafter check fuel-lines, engine oil lines and hydraulic oil lines for leakage, loose fastenings and damage.

If any leakage, damage or loose fastening is found, corrective action must be taken immediately.

3. Check all electrical cables terminals and connections for loose fastenings, damage and wear. Replace or repair defective or worn parts without delay.

4. Check the turbocharger for correct mounting and tight exhaust, intake and lube oil connections.

Carry out all necessary repairs without delay.



5. On machines equipped with a fire detection and suppression system refer to the manufacturers service manual for correct maintenance and inspection of the system.

Note:

When cleaning the power compartment take care the heat detection sensors do not come in contact with hot steam or other hot agent. Otherwise the fire suppression system may be triggered.

6. Make sure fire extinguishers are charged and ready for use.

Important!

After cleaning lubricate all lubrication points by means of central lube system or manually. Lubricate slew ring gear after drying by means of the automatic spray grease system or manually.

Repair weldings

Before carry out repair weldings contact our Service Department "Excavators" in order to avoid improper welding operations.



Note:

If cracks are found in the steel construction of your excavator, please inform our Service Department "Excavator" as soon as possible.

Attach suitable information material (photos, catalog drawings etc.) showing the location and nature of the crack.

If you have questions concerning your machine, please contact our Service Department:

MANNESMANN DEMAG BAUMASCHINEN  
Service Department Excavators  
- 8012.10 -  
P.O. Box  
D - 4000 Düsseldorf 13

Damages and defects caused by incorrect maintenance are not covered by the manufacturers guarantee.







- Before starting any lubrication and maintenance work lower the equipment to the ground and stop the engine.

Note:

Some checks and adjustments can only be done with the engine running. For such jobs two men are necessary. Thereby, the controls must not be left unattended, while the other man carries out checks and adjustments.

The man in the operator's seat must keep constant visual contact with the other one and they must agree on suitable communication signals before they start their work.

- A warning plate must be fixed in the operator's cab before lubrication and maintenance work is started.
- Switch-off battery main switch and remove key, before working on the electrical system.
- Cycle all hydraulic control levers to relieve all pressure before servicing the hydraulic system. Make sure all connections are tight and hoses and lines are in good condition. To locate a leak under pressure use a small piece of cardboard or wood. Never use hands.  
Hydraulic fluid escaping under pressure can have enough force to penetrate the skin. Hydraulic fluid may also infect a minor cut or opening in the skin. If injured by escaping fluid, see a doctor at once.
- Block the machine to prevent machine movement.





- Keep work area organized and clean. Wipe up oil or spills of any kind. Keep tools and parts off of the floor. Eliminate the possibility of a fall which could result in a serious injury.
- Wear safety clothing, goggles, respirator and other safety devices, whenever working conditions make this necessary.
- Never allow unauthorized persons access to the machine during lubrication and maintenance work.
- Work which influences operational and traffic safety must be carried out only by trained servicemen.
- Oily cloth and inflammable material must be removed from the machine. Clean the excavator before starting maintenance work.
- Oil drained must be collected in containers, preventing that it enters the groundwater.
- When using an acetylene torch always wear welding goggles and gloves. Keep a "charged" fire extinguisher within reach. Be sure the acetylene and oxygen tanks are separated by a metal shield and are chained to the cart. Do not weld or heat areas near fuel tanks or fuel lines and utilize proper shielding around hydraulic lines.
- Always use safety devices to block hydraulic cylinders. Never rely on the machine hydraulic system to hold when working on loaders, etc. A hydraulic line or cylinder could fail or someone could accidentally strike the control levers causing the loader to fall.
- Be sure to reinstall safety devices, guards or shields after adjusting and/or servicing the machine.
- After servicing, be sure all tools, parts, or servicing equipment are removed from the machine. Clean the excavator with a steam jet, especially after servicing the fuel system, engine and hydraulic system.
- Observe safety instructions during every servicing!



Lubrication point	Lubricant	Ambient temperature °C	Viscosity grades	Quality grades	
Engine, cooling system, fuel tank	Refer to "Engine Operation Manual"				
Hydraulic-system	Hydraulic-oil "HLP"	- 25 to + 15	22	-	DIN-51524.2. - HLP
		- 15 to + 25	32	or	
		- 10 to + 30	46	32 -	
		- 5 to + 35	68	68	
		+ 5 to + 50	100	-	
Travel gear and slew gear	Gear lubricant "CLP or API"	- 25 to + 35	CLP 150 SAE 80	DIN 51517.3 - CLP API - GL 5	
Pump distributor gear		+ 5 to + 50	CLP 220 SAE 90		
		-15 to +50°	CLP 220 / SAE 90		
		-20 to +60°	CLP 150 - 220 SAE 80 W - 90		
		-40 to +10°	Klüber synth. D100		
Grease fittings (manual lubrication)	Multi-purpose grease "MPG"	- 20 to + 120	NLGI-Grade 2	DIN 51825-K2K	
Central lube system / progressive lube system		- 20 to + 60	NLGI-Grade 2	DIN 51825.1-KP2K	
		- 40 to + 60	NLGI-Grade 2	DIN 51825.2-KTB1G	
Slew ring gear (manual lubrication)	Spray grease	-	Special adhesive spray grease	Order from MANNESMANN DEMAG	
Slew ring gear (automatic lube system)		- 15 to + 50	Ceplattyn KG 10		
		- 40 to 0	Urethyn LT 60		

continued



<b>MANNESMANN DEMAG</b> Baumaschinen	FUEL AND LUBRICANTS	1828n-02 3.
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Cont'd

Lubrication point	Lubricant	Ambient temperature °C	Viscosity grades	Quality grades (DIN or API)
Drive shaft	Special grease	- 40 to + 60	-	DIN 51825.2-KTB2B NLGI Grade 2
Compressed air system: - Compressor	Engine oil		Use same oil as for the engine lube system	
- Service unit	Lube oil	-	Mineral oil with 12 mm <sup>2</sup> /s (cst) 50° C	-
- Anti-freezer	Ethyl alcohol	-	-	Methylated spirits
Air conditioning system	Refrigerant	-	R 12 e.g. "Freon"	DIN 51590.II-R12
Refrigerant compressor	Special oil	-	KC 68	DIN 51503-KC68

Notes:

1. More information regarding recommended lubricants, on request. The lubricating instructions in this book refer to the above recommended grade specifications. Damages caused by using lubricants other than specified above are not covered by the manufacturer's guarantee.
2. The above chart includes special equipments which may not be installed in your machine.

Unit or system	Liter	Unit or System	Liter
	(approx)		(approx)
Cooling system	385.00	Track roller, each	2.40
Engine oil	208.00	Guide wheels, each	2.90
Fuel tank	4570.00	Supp. rollers, each	4.00
Hydr. oil reserv.	2325,00	Brake - slew. gear	0.50
Suct. oil reservoir	634.00	Brake - travel gear	0.50
Hydr. system and oil reservoir	3960.00	Motor adapter hous.   travel gear	0.60
Pump distr. gear	180.00	Flexible coupling	1.10
Slew. gear, each	25.00		
Travel gear, each	125.00		
Drive shaft housing, final drive, each	125.00		

Note:

Capacities listed above are approximate values.  
For proper checking use level plugs, dipsticks,  
and inspection openings, provided for this pur-  
pose.





### 5.1 Initial servicing

After the first 150 and 500 h	Hydraulic system: Replace return oil filter elements. Inspect return oil strainers. Thereafter every 1000 hours.
After the first 150 to 250 h	Change oil in pump distributor gear, slew gears and travel gear assemblies. Thereafter every 1500 hours.
After the first 150 and 1000 h	Check tightening torque of high strength bolt connections. Thereafter every 1000 hours.

Note:

The above initial service is of vital importance for proper operation and long service life of the machine.

### 5.2 Periodic servicing intervals

All following intervals of time between services are based on average operating conditions. Under unusually severe conditions of operation, reduce the interval of time between services.

Note:

The maintenance schedule includes special equipments, e.g. air conditioning, central lubricating system etc. which may not be installed in your machine.



Service Intervals	No.	Service Point	Service
Every 10 operating hours or daily (see also section 6.1)	1	Excavator	Visual inspection
	2	Engine (1)	Maintenance
	3*	Equipment	Lubricate
	4*	Slewing connection	Lubricate
	5	Air cleaner	Clean pre-cleaner
	6	Compressed air system for lub- ricating systems	Service unit: - Check oil level - Drain con- densation
	7	Radiator	Check coolant level
	8	Track groups	Clean
	9	Fire suppression system, if so equipped (2)	Check indicator pin at extinguisher tank valve, located in the power compartment
Every 50 operating hours or weekly (see also section 6.2)	10	Slew gear assys	Check oil level
	11	Travel gear assys	
	12	Final drives	
	13	Pump distribu- tor gear	
	14	Track	Check tension, ad- just if necessary
	15	Oil cooler and radiator	Check and clean as necessary
	16	Batteries	Check fluid level
	17	Engine (1)	Maintenance

- (1) Perform maintenance according to separate engine manual.  
(2) Refer to separate Service Manual "Fire Detection and Suppres-  
sion System" for detailed information.

\* On machines without "CENTRAL LUBRICATING SYSTEM".



Service Intervals	No.	Service Point	Service
Every 250 operating hours or monthly (see also section 6.6)	50	Engine (1)	Maintenance
	51	Drive-belts (1)	Check tension
	52	Undercarriage pin connections	Lubricate
	53	Rotary distri- butor	
	54	Signal horn compressor	
	55	Cab, air filter	Clean or replace
	56	Air conditio- ning system, evaporator and condenser	Inspect, clean if necessary
	57	Hydraulic oil cooler, fan bearing	Lubricate
	58	Fire detection and suppression system(2)	Maintenance
	59	Lubrication systems	Clean grease screens
	60	Propeller shaft	Lubricate
	61	Slew gear pinion bearings	

- (1) Perform maintenance according to separate engine manual.  
 (2) Perform maintenance according to separate manuals "Fire  
 detection and suppression system".

Important:

Carry out initial service according to item 5.1 on  
 first page of section 5.



Service Intervals	No.	Service Point	Service
Every 500 operating hours or every 3 months (see also section 6.8)	70	Engine (1)	Maintenance
	71	Hydraulic oil reservoir	Replace breather filter elements. Clean filler screen. Drain sediments
	72	Fuel tank	Drain sediments
	73	Flexible coupling	Check oil level
	74	Track groups	Inspection
	75	Air conditioning	Check refrigerant level and inspect line connections
	76	Pump drive shaft housings (on distr. gear)	Check oil level
	77	Accumulators (return oil)	Check pressure
Every 1000 operating hours or every 6 months (see also section 6.9)	80	High strength bolt connections	Check torque load
	81	Engine (1)	Maintenance
	82	Hydraulic system	- Replace return and pressure filter elements - Clean or replace high pressure filter elements
	83	Compressed air system for lub- ricating systems (2)	- Air tank: Clean automatic drain valve - Service unit: Clean screen
	84	Signal horn compressor	Clean and lubricate
	85	Fire detection and suppression system (3)	Maintenance
	86	Air conditio- ning	Inspect the com- plete system
	87	Slip ring unit	Lubricate

- (1) Perform maintenance according to separate engine manual.  
(2) Service before onset of the cold season.  
(3) Perform maintenance according to separate manuals "Fire  
detection and suppression system".

Important:

Carry out initial service according to item 5.1 on first page  
of section 5.





Service Intervals	No.	Service Point	Service
Every 1500 operating hours however at least once a year (see also section 6.10)	90	Slew gears and brakes	Change oil
	91	Travel gears	
	91.1	Travel brake and motor adapter housings	
	92	Final drives	
	93	Pump distributor gear	
		94	Engine (1)
Every 2000 operating hours or yearly (see also section 6.11)	100	Hydraulic system	Change oil
	101	Cooling system (1)	Change coolant
	102	Air dryer	Replace granulate- cartridges
	103	Engine (1)	Maintenance
	104	Fire detection and suppression system (3)	
	105	Emergency rope- ladder	Inspect

(1) Perform maintenance according to separate engine manual.

(3) Perform maintenance according to the separate manuals "Fire  
detection and suppression system".

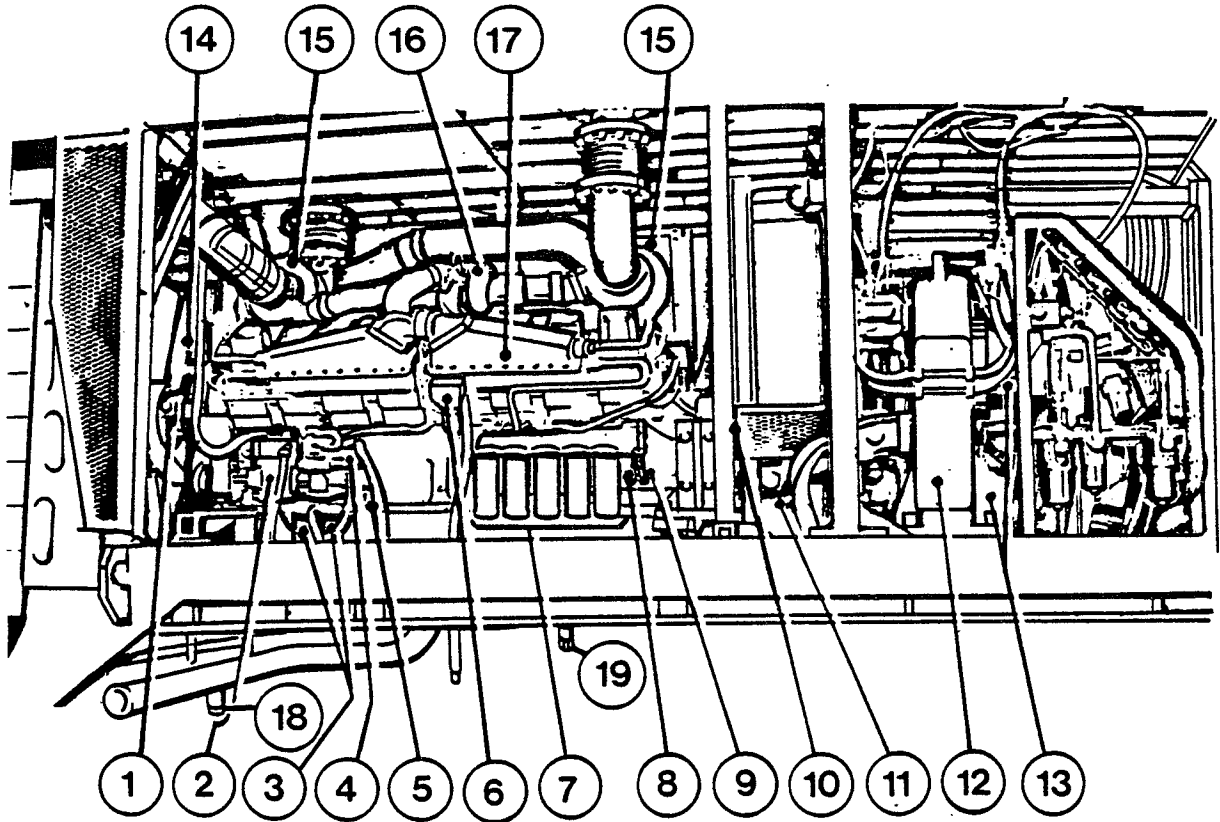


Service Intervals	No.	Service Point	Service
When necessary (see also section 6.12)	110	Engine air cleaner (1)	Service filter elements when warning lamp lights up.
	111	-	.
	112	Slew gear ring	Immediately spray grease if bare spots are visible
	113	Lubrication systems	- Replace or fill grease containers - Lubricate air pump motor
	114	-	
	115	Track rollers	If leakage occurs replace oil seals and fill with GL SAE 90 EP
	116	Carrier rollers	
	117	Idler wheel	
	118	Pump drive shafts	If leakage occurs replace oil seals
	123	Hydraulic system	When warning lamps light up, service the respective filter units.
	124	Cold starting aid (1)	Replace fluid cartridge
	125	Electrical system	Check circuit breakers and fuses

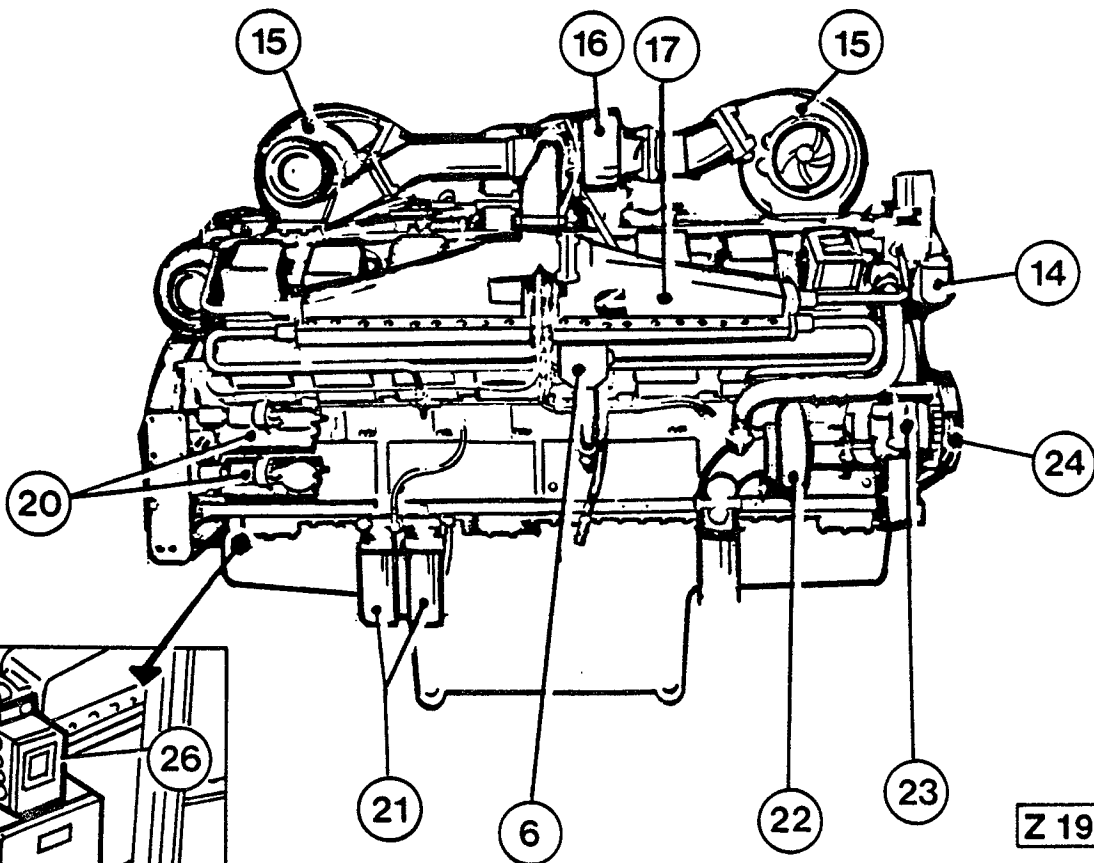
(1) Observe instructions of the separate engine manual.







Z 19075



Z 19076

### 5.3 Maintenance of engine

#### 5.3.1 "CUMMINS"-engine

Important:

All maintenance has to be carried out in accordance with the separate engine operation and maintenance manual.

The illustrations (Z 19075 and Z 19076) show only the location of engine components and maintenance points.

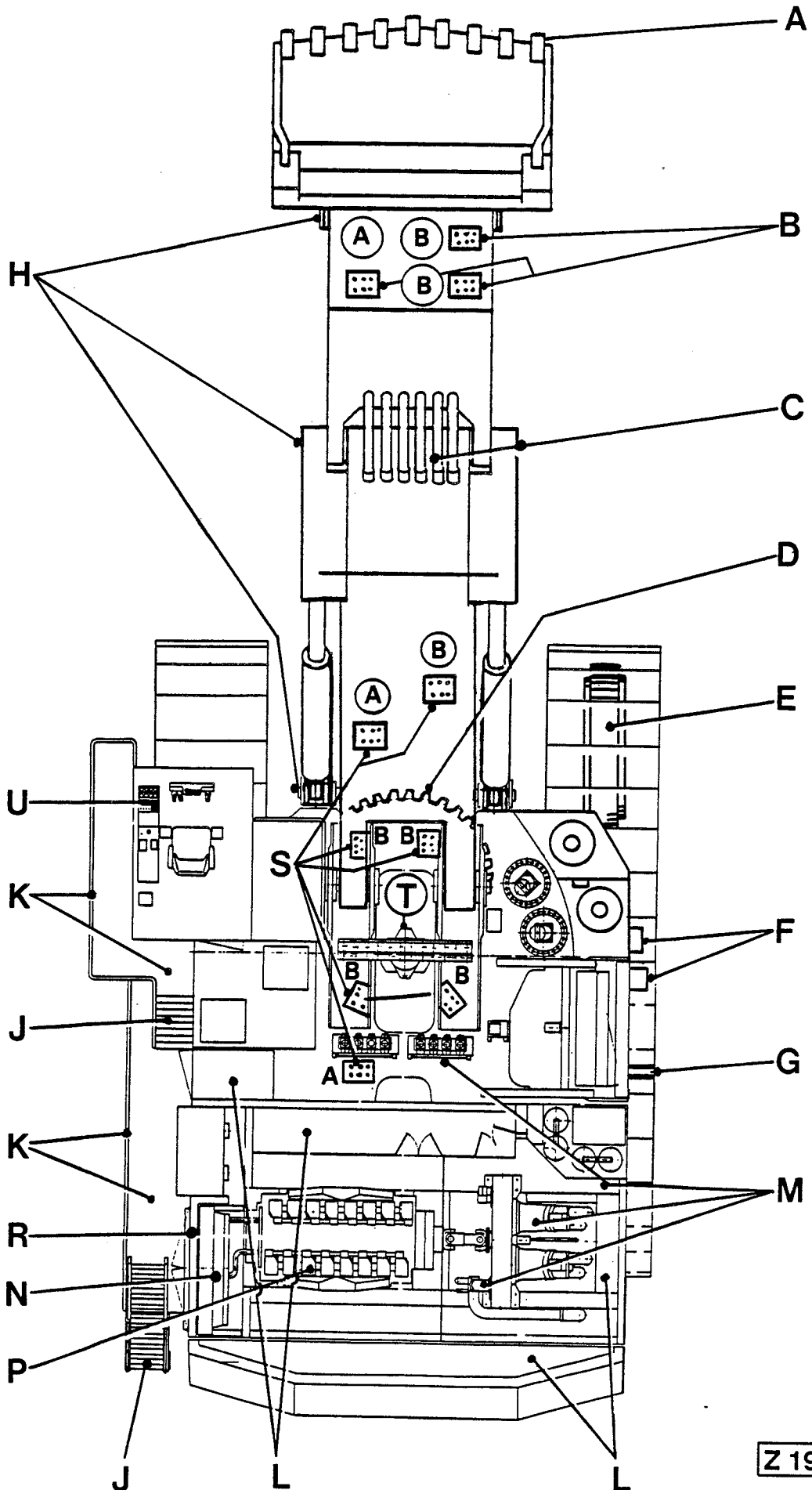
Legend for illust. (Z 19075) engine rear side view:

- (1) Adjusting device, fan belt tension
- (2) Air compressor
- (3) Fuel filters
- (4) Fuel pump
- (5) Fuel control valve
- (6) Crankcase breather
- (7) Full flow lube oil filters
- (8) Oil filler tube
- (9) Oil level gauge
- (10) Flexible coupling
- (11) Drive shaft
- (12) Pump distributor gear
- (13) Main hydraulic pumps
- (14) DCA water filters
- (15) Low stage turbochargers
- (16) High stage turbocharger
- (17) Intercooler
- (18) Radiator drain
- (19) Engine oil drain

Legend for illust. (Z 19076) engine front side view:

- (20) Starter motors
- (21) Bypass lube oil filters
- (22) Water pump
- (23) Generator
- (24) Generator drive belt
- (25) Electrical switch box
- (26) Compusave unit





1. Visual inspections, see illust. (Z 19077)

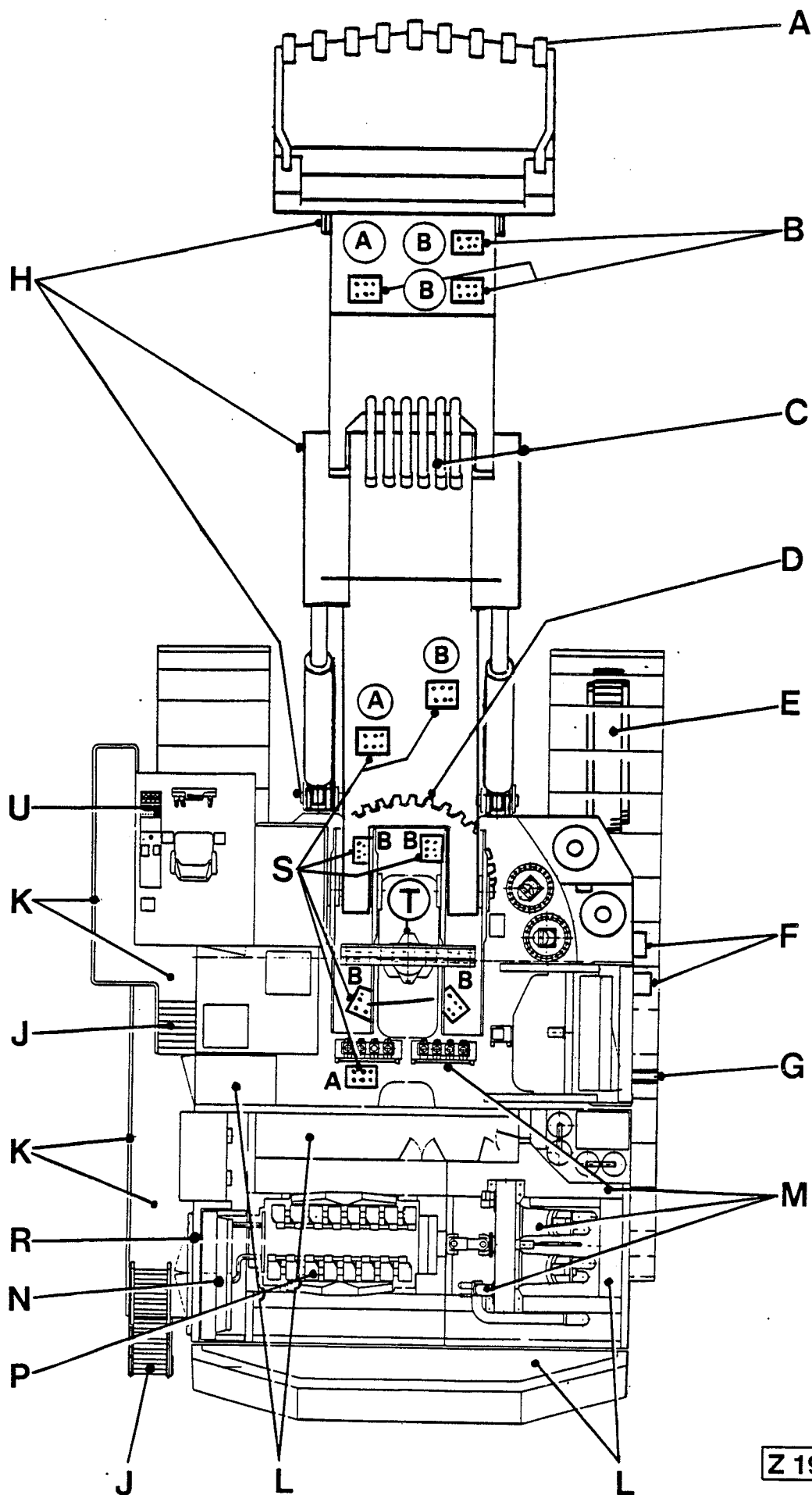
- A - Check bucket teeth for proper mounting. Inspect for loose or missing securing parts.
- B - Check operation of progressive grease distributors on back side of stick, refer to page after next for details.
- C - Check all hydraulic lines and connections for leakage and damage.
- D - Check slew ring teeth for adequate lubrication.
- E - Check guide wheels for leakage.
- F - Check track rollers and carrier rollers for leakage.

Note:

If leakage is found on guide wheels or rollers inspect the duo-cone seals of the respective unit, replace if necessary. Fill the unit with the correct gear lubricant.

- G - Check track pad connection pins for wear and security.
- H - Check all attachment pins and retainers for security.
- J - Check condition, fastening and security of all ladders and steps.
- K - Check condition, fastening and security of all walk-ways, railings and hand rails.

continued



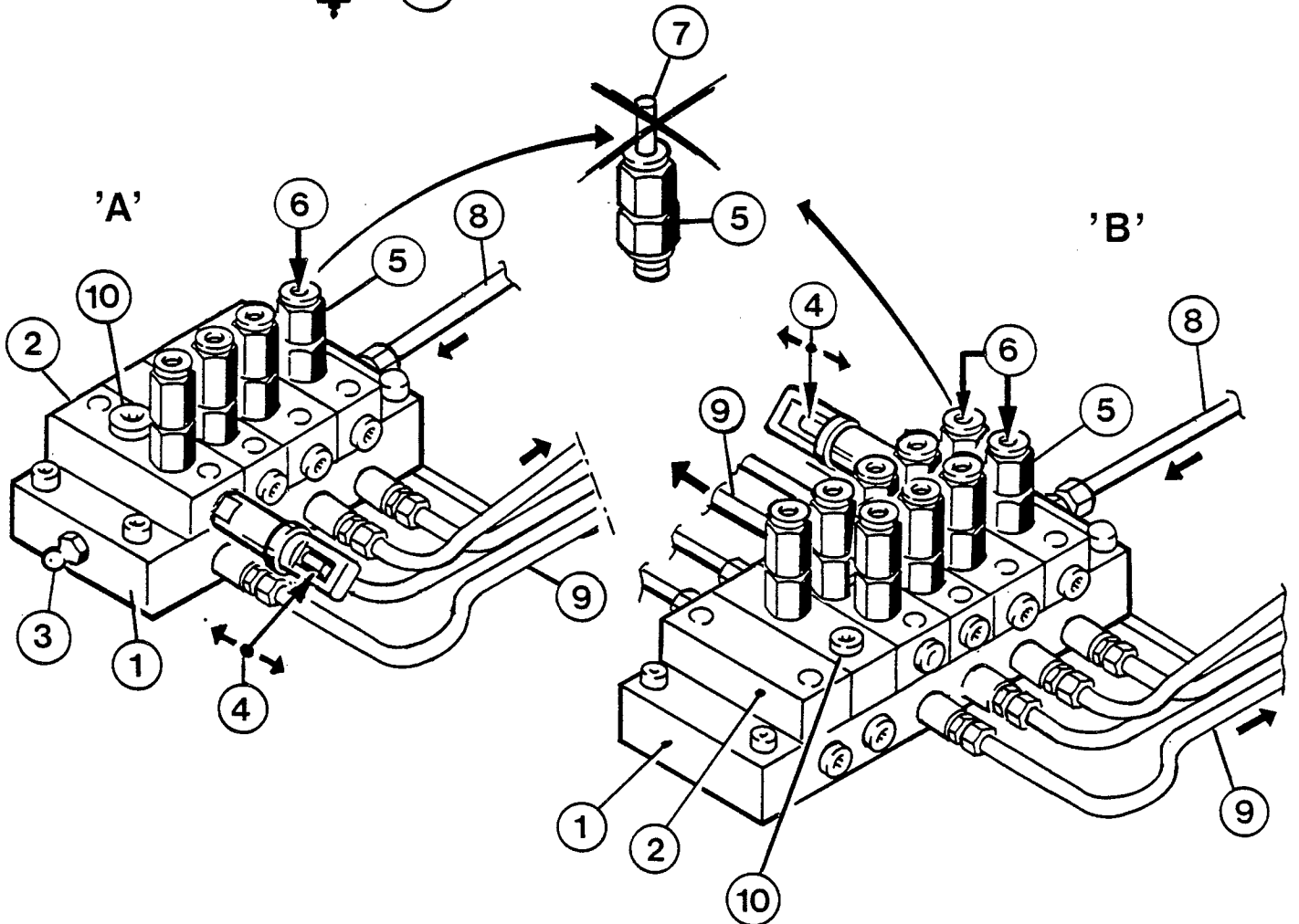
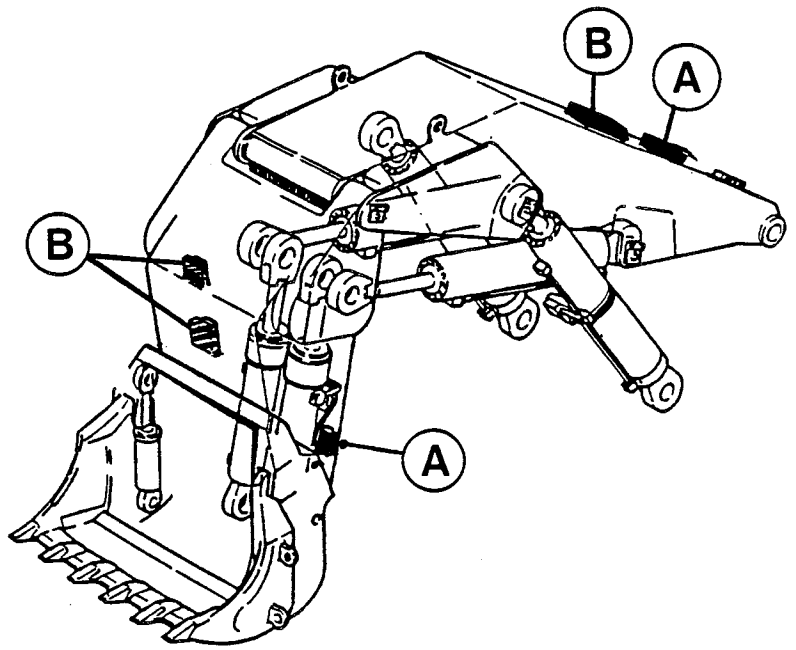
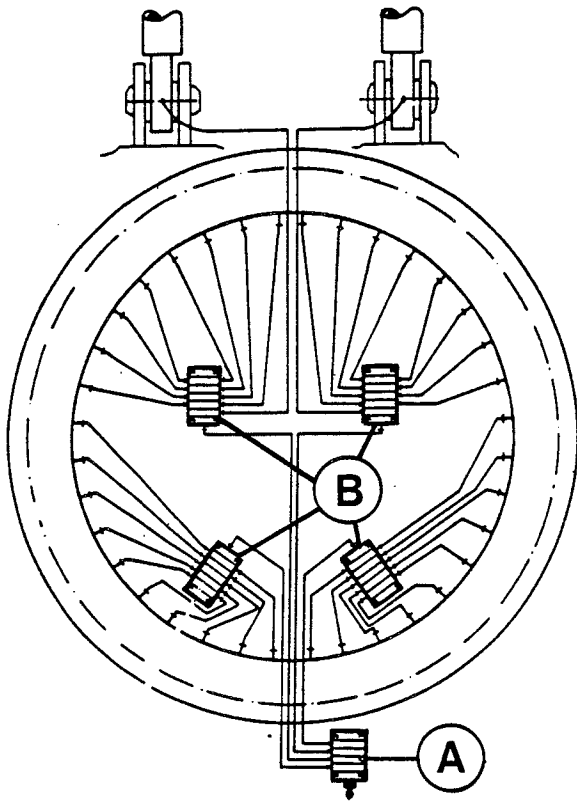
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1. Visual inspections, see illust. (Z 19077)

- L - Check all foot walks, safety devices, guards and shields for correct installation, good condition and security.
- M - Check hydraulic oil level. Check the system and components for leakage, damaged hoses and connections.
- N - Check cooling system for leakage, damaged hoses and connections.
- P - Check engine for oil and fuel leakages.
- R - Check coverings, panels and hoods for correct installation, good condition and security.
- S - Check operation of progressive grease distributors on top of boom and inside of slewing connection, refer to next page for more information.
- T - Check rotary distributor for leakage, loose fastenings and security.
- U - Check function of instruments and indicator lights.  
Make sure all warning systems are in proper working order.

Important!

If any damages, failures or wrong condition, have been found during the inspection, corrective action must be taken.



## 1.1 Check progressive grease distributors for proper operation

Legend for illust. (Z 19082):

A - Progressive distributors with grease fitting (3) for manual lubrication in case the central lubrication system fails to work.

B - Progressive distributors without grease fitting (3).

- (1) Base plate
- (2) Lubricant distributor elements
- (3) Grease fitting, on type "A" only
- (4) Cycle indicator pin for visual indication of system operation
- (5) Performance indicator
- (6) Indicator memory pin in normal position
- (7) Indicator memory pin in signal position
- (8) Grease inlet line
- (9) Grease outlet lines
- (10) Performance indicator port

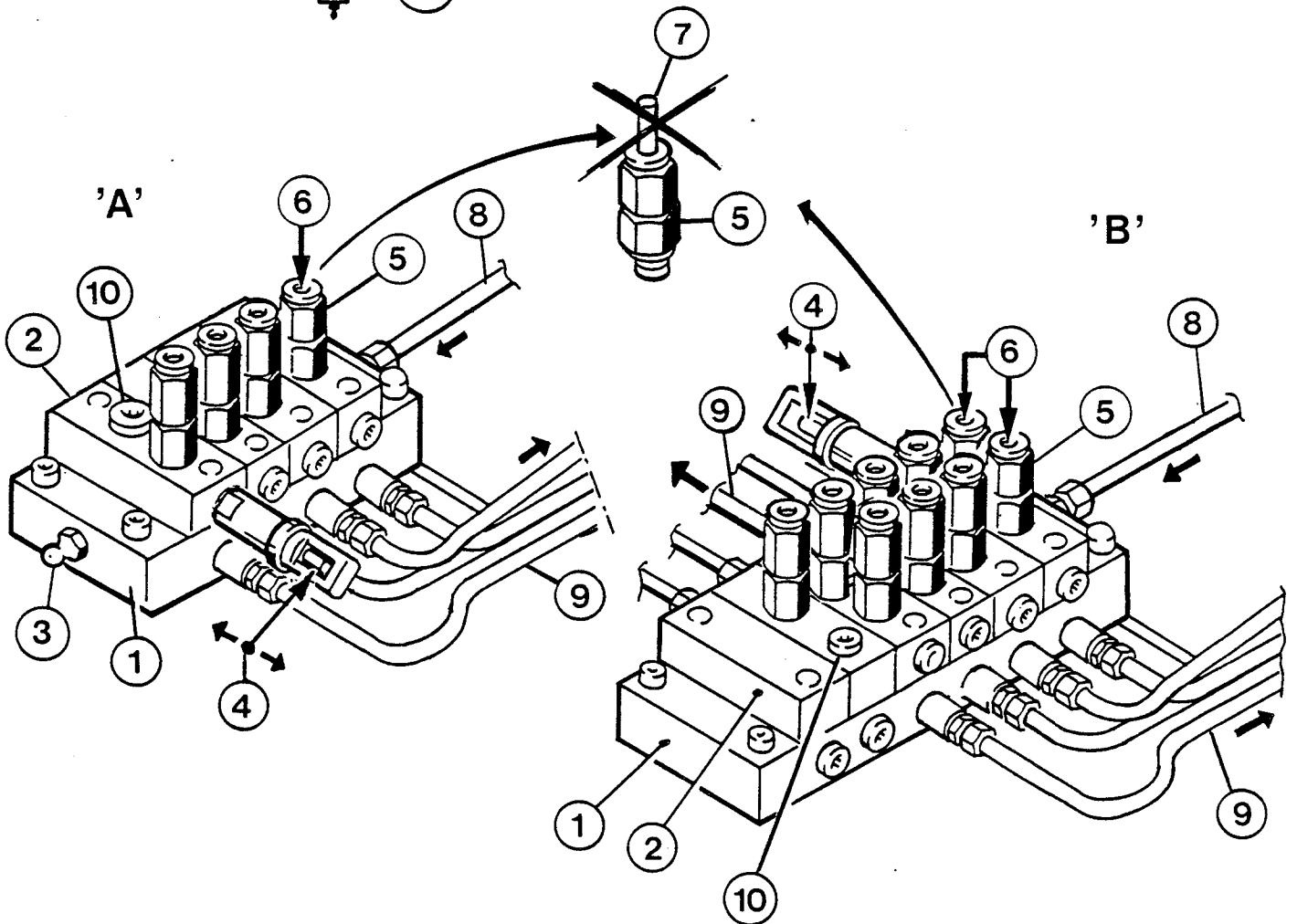
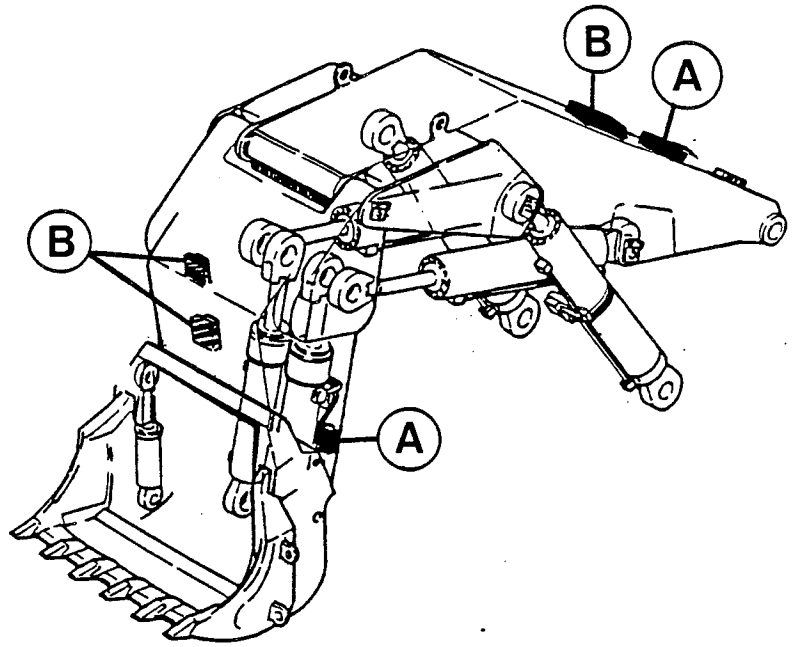
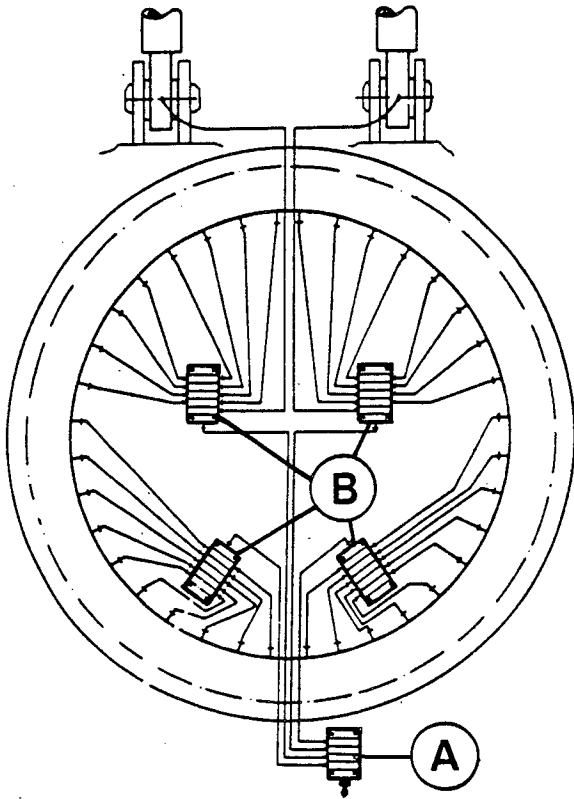
Check operation of all grease distributors by visually watching the cycle indicator pins (4) while operating the central lubrication system manually.

If a cycle indicator pin (4) does not move during lubrication process, grease supply to the lubrication points of the concerned distributor is interrupted.

### Corrective actions:

1. Check to make sure grease supply through line (8) is provided.

continued



Cont'd

Check progressive grease distributors illust. (Z 19082)

2. Check pin position (6, 7) of all performance indicators (5).

If a pin is in signal position (7), disconnect the outlet line (9) of the respective element (2).

3. Operate the central lubrication system manually.

A - If now the distributor works, i.e. cycle indicator pin (4) moves in and out the disconnected line (9) or the grease passage at the lubrication point is damaged or blocked by foreign matter.

Repair as necessary.

B - If the distributor does not work, i.e. cycle indicator pin (4) stationary, replace the respective distributor element (2).

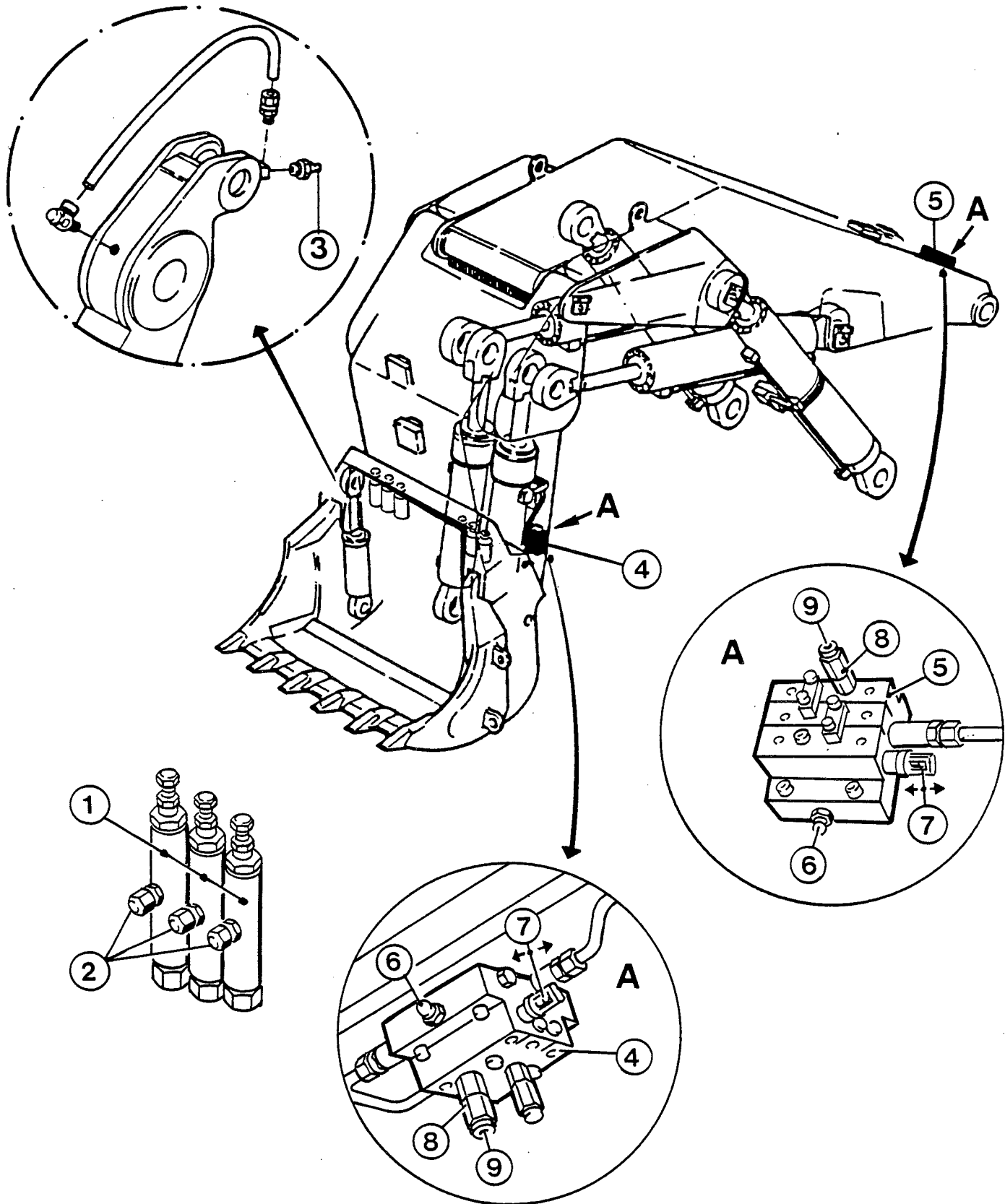
4. Push performance indicator pin (7) back to normal operating position (6).

5. Operate the central lubrication system and re-check operation of the progressive grease distributors.

Note:

If the failure is caused through a defective central lubrication system, manually lubricate at grease fitting (3) of the distributors (A).





3. Loader attachment lubrication, illust. (Z 19083)

Note:

Manual lubrication of the loader attachment is only necessary on machines without central lubrication system or in case the central lubrication system fails to work.

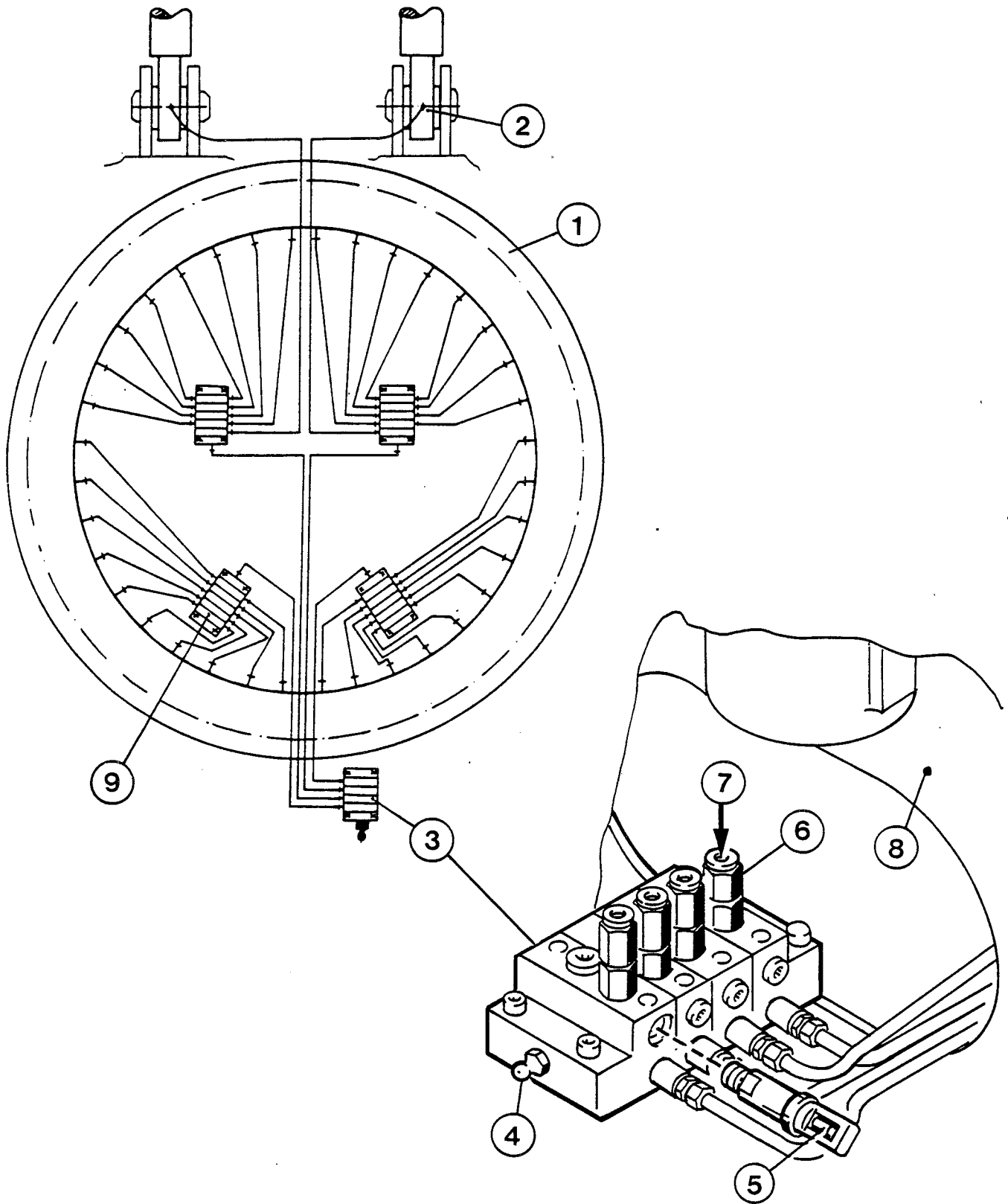
Important!

On machines with backhoe attachment, all bucket pivots must be lubricated manually.

Legend for illust. (Z 19083):

- (1) Grease metering valves of bucket
  - (2) Grease fittings with caps
  - (3) Grease fittings for clam pivots, on machines without central lubrication system only
  - (4) Progressive grease distributor for manual lubrication of the stick.
  - (5) Progressive grease distributor for manual lubrication of the boom
  - (6) Grease fitting
  - (7) Cycle indicator pin provides visual indication of system operation
  - (8) Performance indicator
  - (9) Performance indicator memory pin
- To lubricate the bucket pivots, remove protection caps from grease fittings (2) at all six metering valves (1) and apply grease gun to the six grease fittings (2).
  - On machines without central lubrication system lubricate at the four grease fittings (3) located on the clam cylinder pivots.
  - Lubricate stick and boom at the grease fittings of distributors (4 and 5).

Observe movement of cycle indicator pins (7) and position of performance indicator pins (9), refer to item no. 1.1 on the previous pages for more information.



4. Lubrication of slewing connection and lower pivots of boom cylinders (progressive lubricant distribution system)

Note:

Manual lubrication is only necessary on machines without central lubrication system or in case the central lubrication system fails to work.

Legend for illust. (Z 19081):

- (1) Slewing connection
- (2) Lower pivots of boom cylinders
- (3) Progressive grease distributor for manual lubrication
- (4) Grease fitting
- (5) Cycle indicator pin for visual indication of system operation
- (6) Performance indicator
- (7) Performance indicator memory pin
- (8) L.h. control block carrier
- (9) Progressive grease distributors

Manual lubrication

The whole slewing connection and lower pivots of boom cylinders are lubricated at grease fitting (4) of master distributor (3).

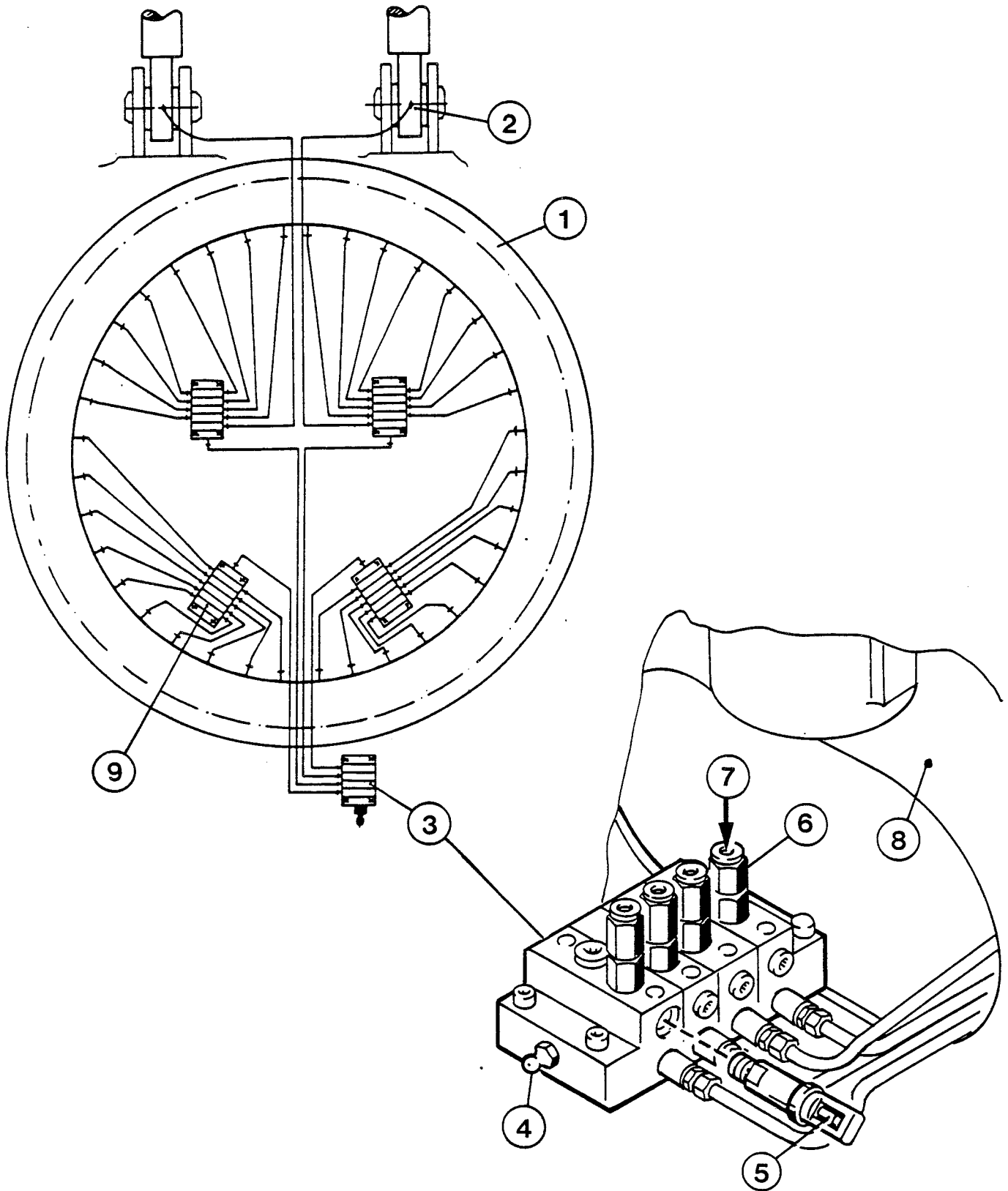
- Required grease quantity.  
Approx. 2 kg / 10 operating hours.
- Perform lubrication with superstructure slewing slowly.

Caution:

For this job two men are necessary. Thereby, the controls must not be left unattended, while the other man carries out the lubrication.

The man in the operator's seat must keep constant visual contact with the other one and they must agree on suitable communication signals before they start their work.

continued



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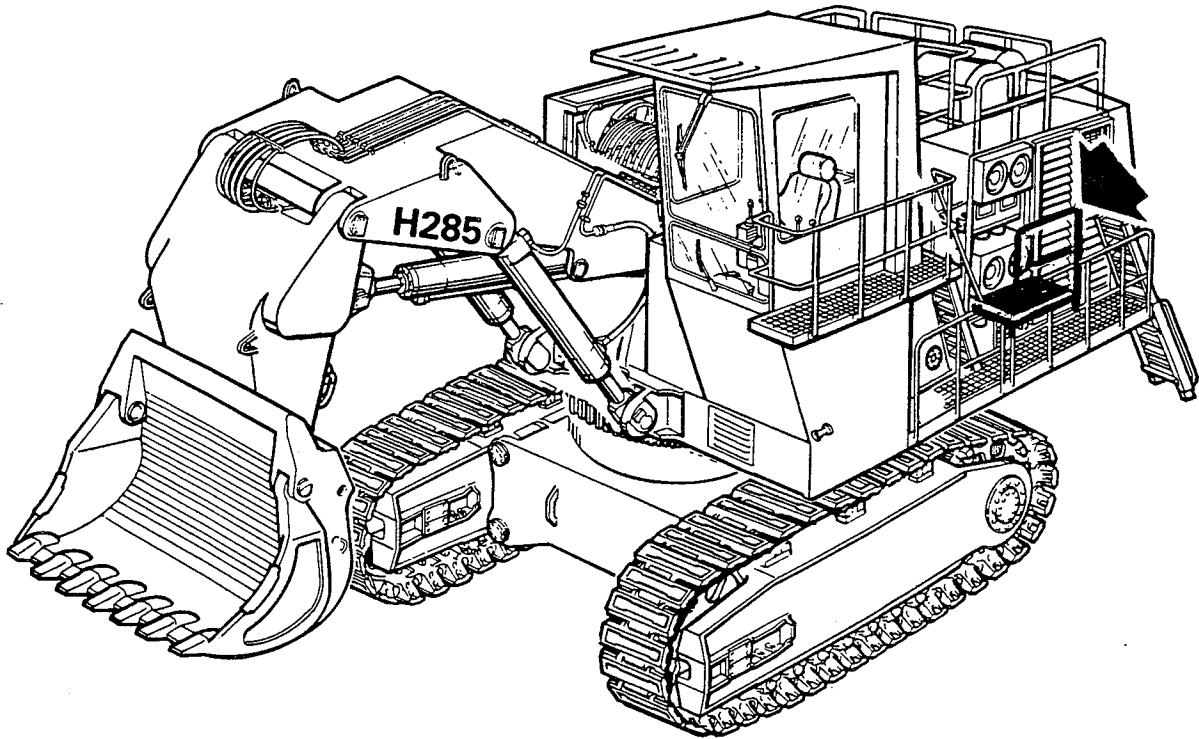
Lubrication of slewing connection and lower pivots of boom cylinders (progressive lubricant distribution system)

Illust. (Z 19081)

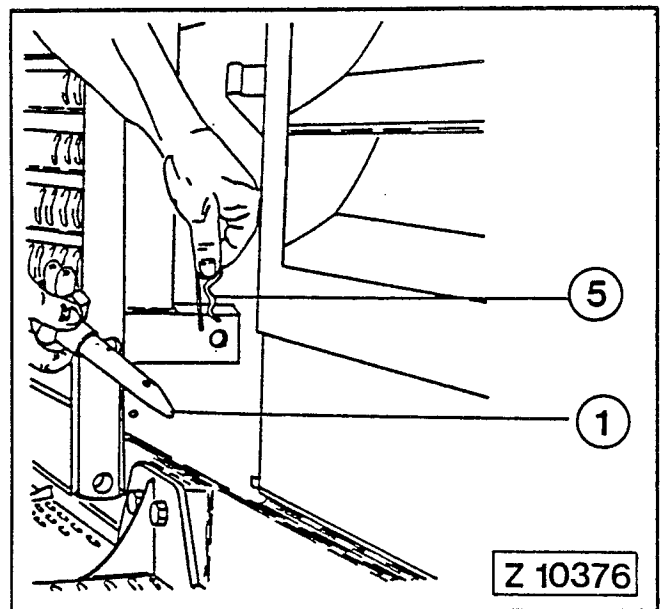
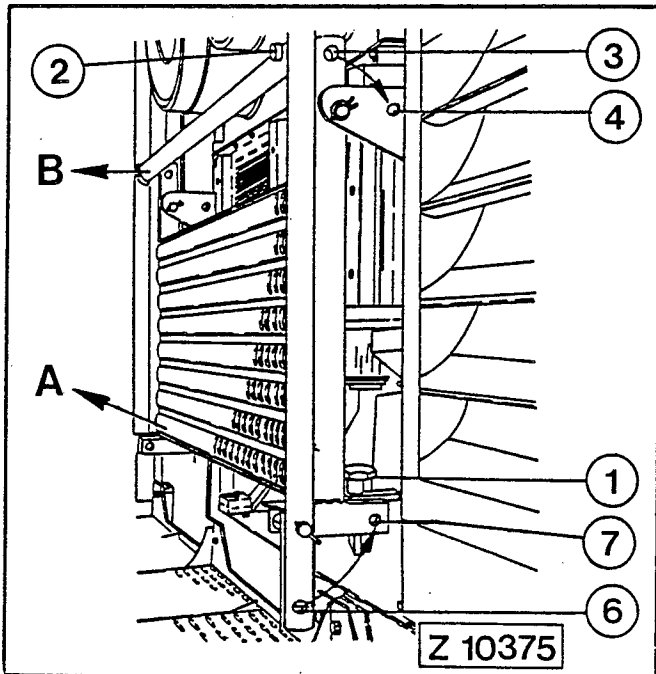
- Observe movement of cycle indicator pin (5) and position of performance indicator pins (7), refer to item no. 1.1 on the previous pages for more information.
- The 38 lubricating points are supplied with grease from master distributor (3) via secondary distributors (9).

Note:

Take care that the MPG of the slewing connection does not come in contact with the outer teeth of the ring gear because this will diminish lubrication capability of the ring gear spray grease. If necessary remove excessive grease from the slewing connection (above the dust seal ring).



Z 19078



5. Servicing the air cleaner

Auxiliary service platform, see illust. (Z 19078).

Note:

For servicing the upper pre-cleaner or air cleaner filter elements fold-up the auxiliary service platform in order to ensure safe access to the upper units.

Proceed as follows, illust. (Z 10375 and Z 10376):

1. Remove pins (1) at both sides.
2. Remove bolts (2) at both sides.

Caution!

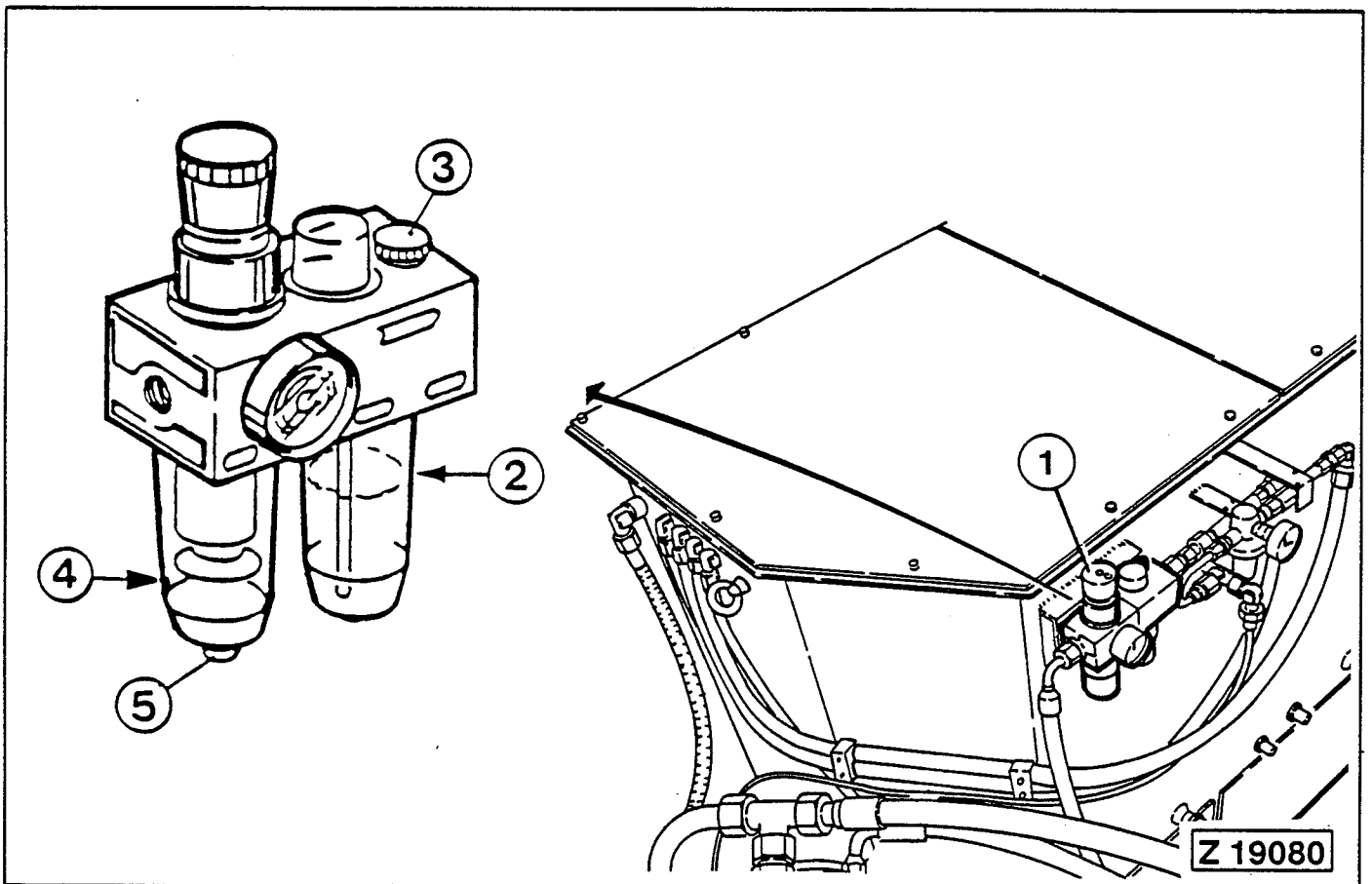
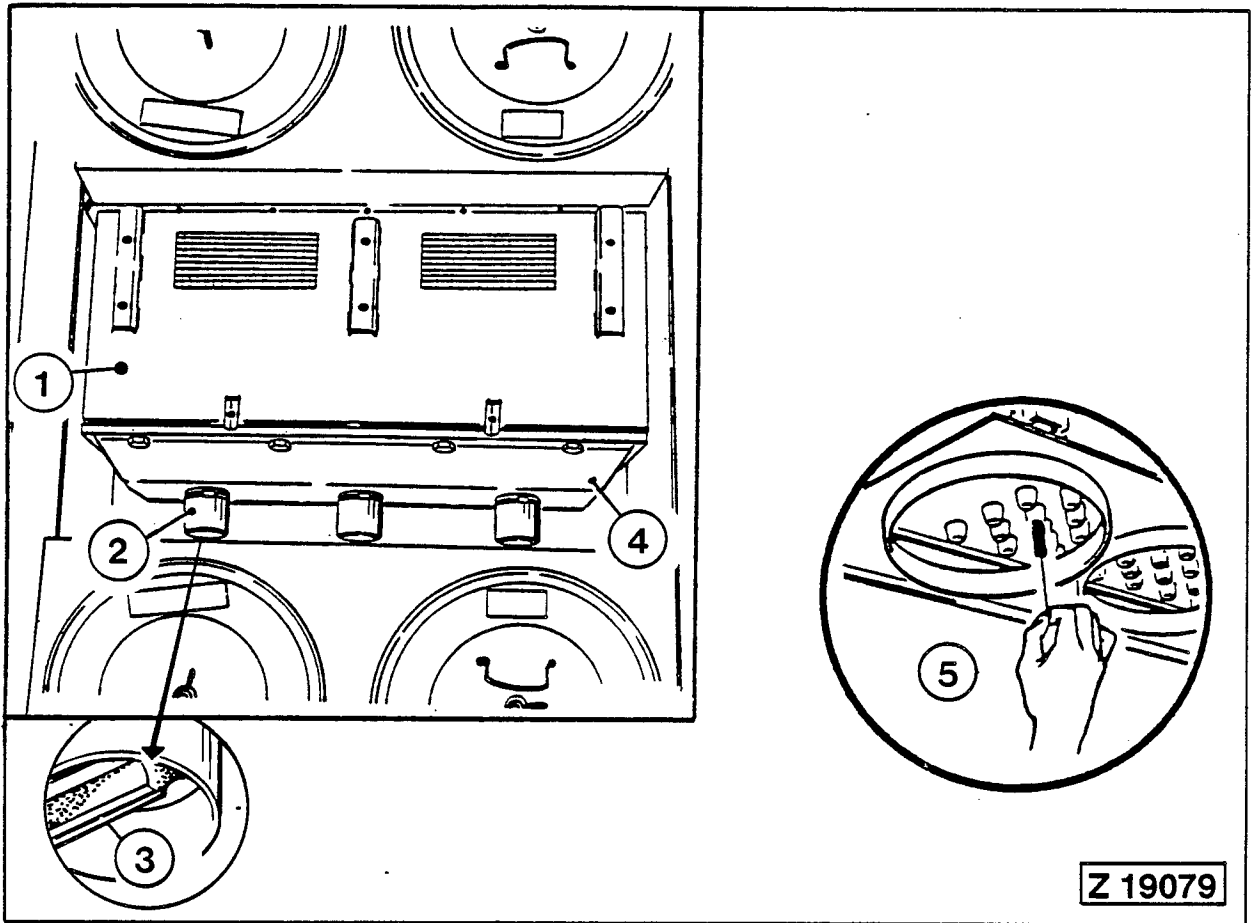
Keep railing "B" under control.

3. Lift platform "A" until holes (3 and 4) are in line. Insert pins (1) on both sides into holes (3/4) and secure with spring clips (5).
4. Move railing "B" in order to align holes (6 and 7) and install bolts (2) on both sides into these holes and tighten securely.

Folding down in reverse order.

5. For servicing the pre-cleaners refer to next page.





Servicing the pre-cleaners

Legend for illust. (Z 19079):

- (1) Pre-cleaner housing
- (2) Automatic dust unloader
- (3) Unloader valve lips
- (4) Lower cover
- (5) Pre-cleaner tubes

1. Squeeze the dust unloader (2) to be sure the rubber lips (3) are not blocked. Inspect the dust unloader for cracks, ruptures, wear or hardening of rubber.

Replace if necessary. Proper functioning of the unloader is important to achieve maximum air cleaner service life. The lips of the unloader should be closed when the engine is running at high idle.

If lips remain open replace the unloader.

2. When operating the machine under very dusty conditions, check jet tubes (5) for plugging. To do this, remove lower cover (4). Dust plugging of tubes can be removed with a stiff fiber brush (5).

Note:

Never clean tubes with compressed air unless both the primary and safety elements are installed in the air cleaner. Do not steam-clean tubes.

6. Compressed air system for lubricating systems (Z 19080)

Service unit (1):

1. Check oil level.

Bowl (2) should be filled up to the level mark (three-quarter of total volume).

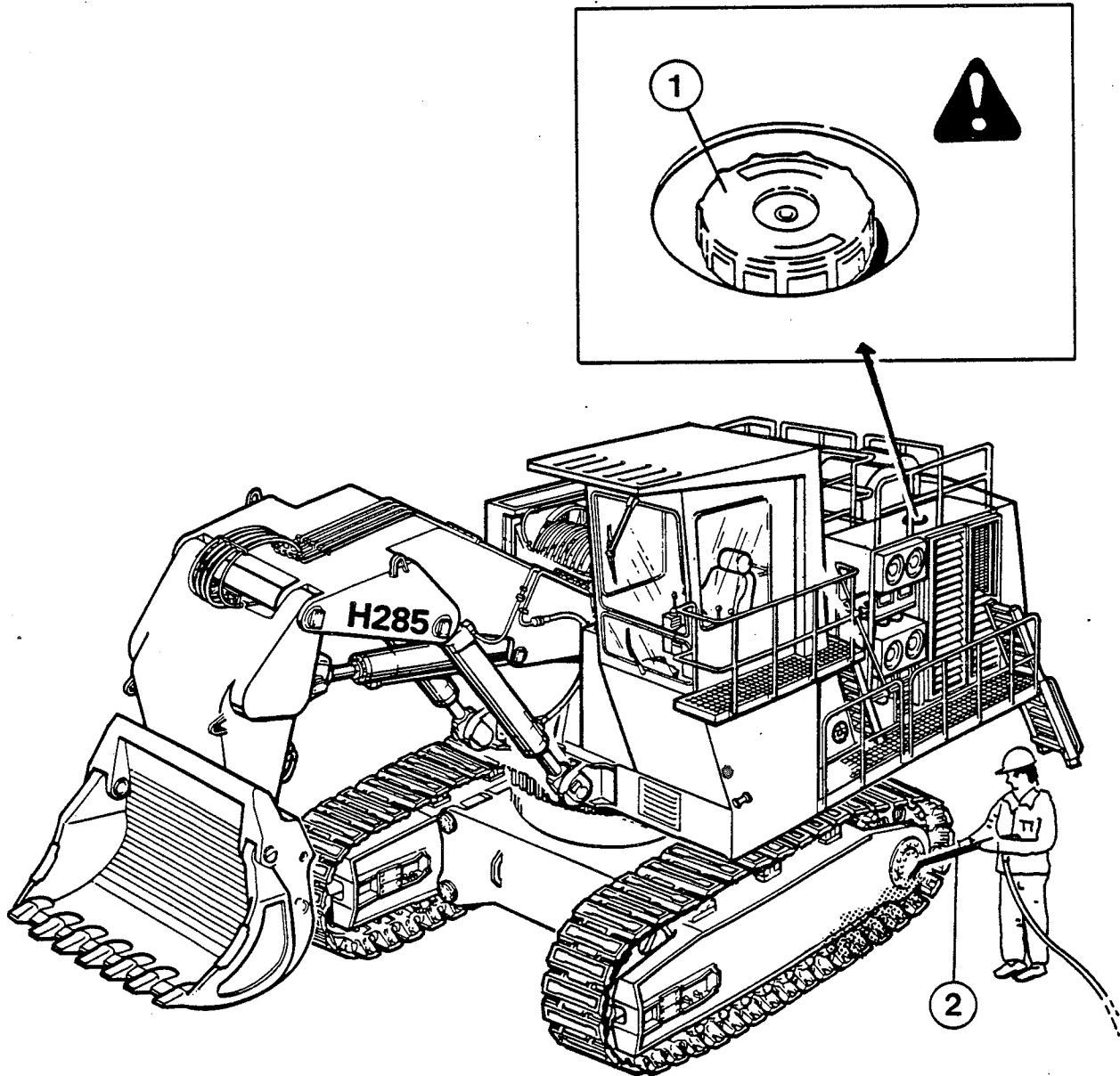
If necessary add lube oil.

Note:

Prior filling remove ignition key, in order to prevent operation of the system during servicing. Remove filler plug (3) and fill up to the level mark.

Install filler plug (3).

2. Drain condensation from bowl (4) by depressing valve (5).



Z 19084

7. RadiatorChecking the coolant level (1), illust. (Z 19084)

Check the Coolant Level with the Engine cold.

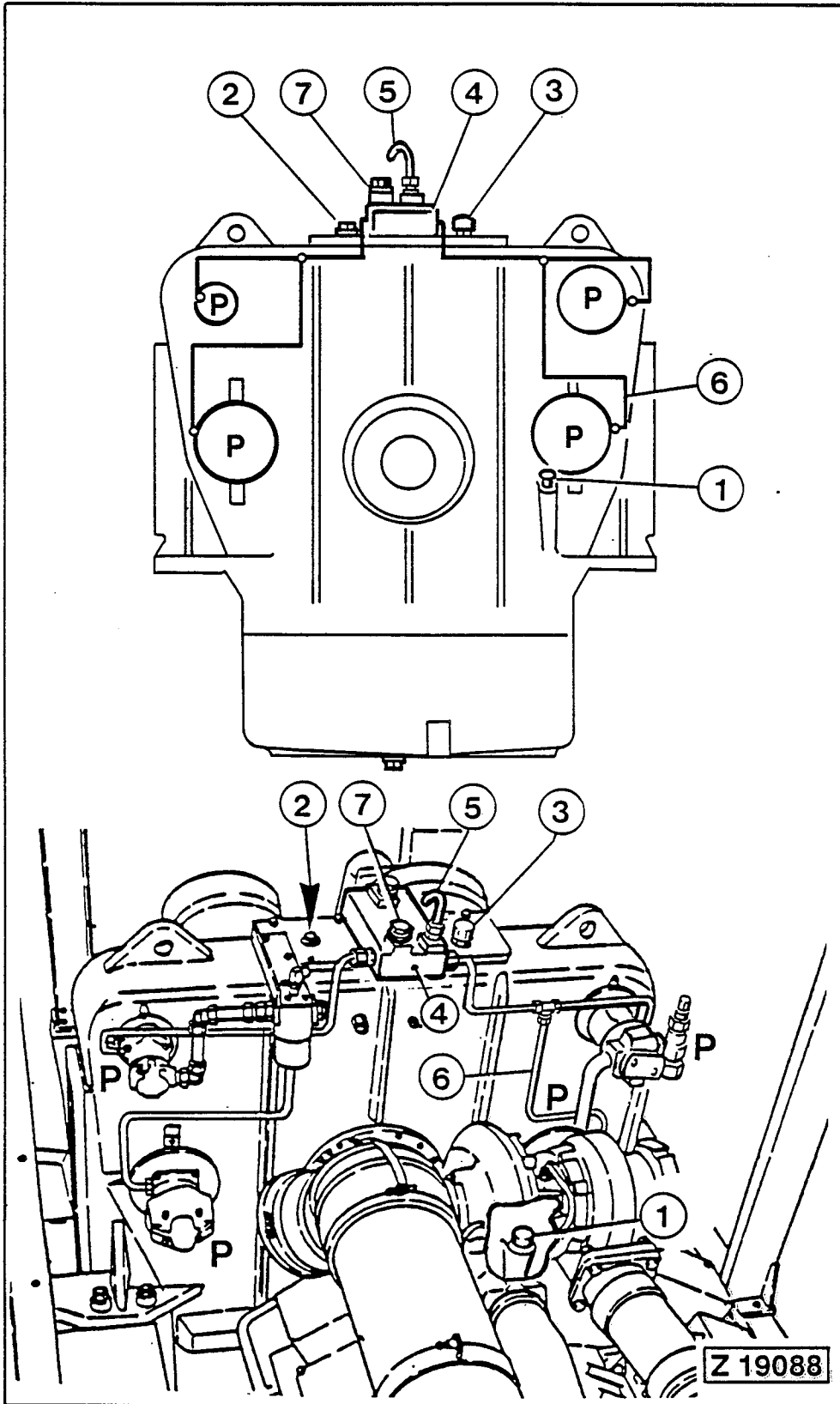
WARNING: DO NOT remove the radiator pressure cap from a hot engine. Wait until the temperature is below 50°C before removing the pressure cap. Remove the pressure cap (1) slowly to relieve cooling system pressure.

If necessary fill the radiator with clean coolant up to a level about 10 mm below the filler neck.

Refer to the Engine Operation and Maintenance Manual for the correct checking and filling procedure.

8. Track Groups (2), illust. (Z 19084)

Clean track groups especially during the cold season.



13. Pump distributor gear and oil reservoir

Check oil level, illust. (Z 19088):

- (1) Oil level gauge
- (2) Filler plug
- (3) Breather filter
- (4) Oil collector reservoir for secondary oil pump drive shaft housings
- (5) Breather pipe
- (6) Oil collector lines
- (7) Oil level and filler plug

- Pump distributor gear:

Loosen lock nut and remove level gauge (1).

If necessary add oil through filler opening (2) up to the upper mark on gauge (1). Install gauge (1) and tighten. Remove breather filter (3). Blow out with compressed air from inside to outside and reinstall.

- Oil collector reservoir:

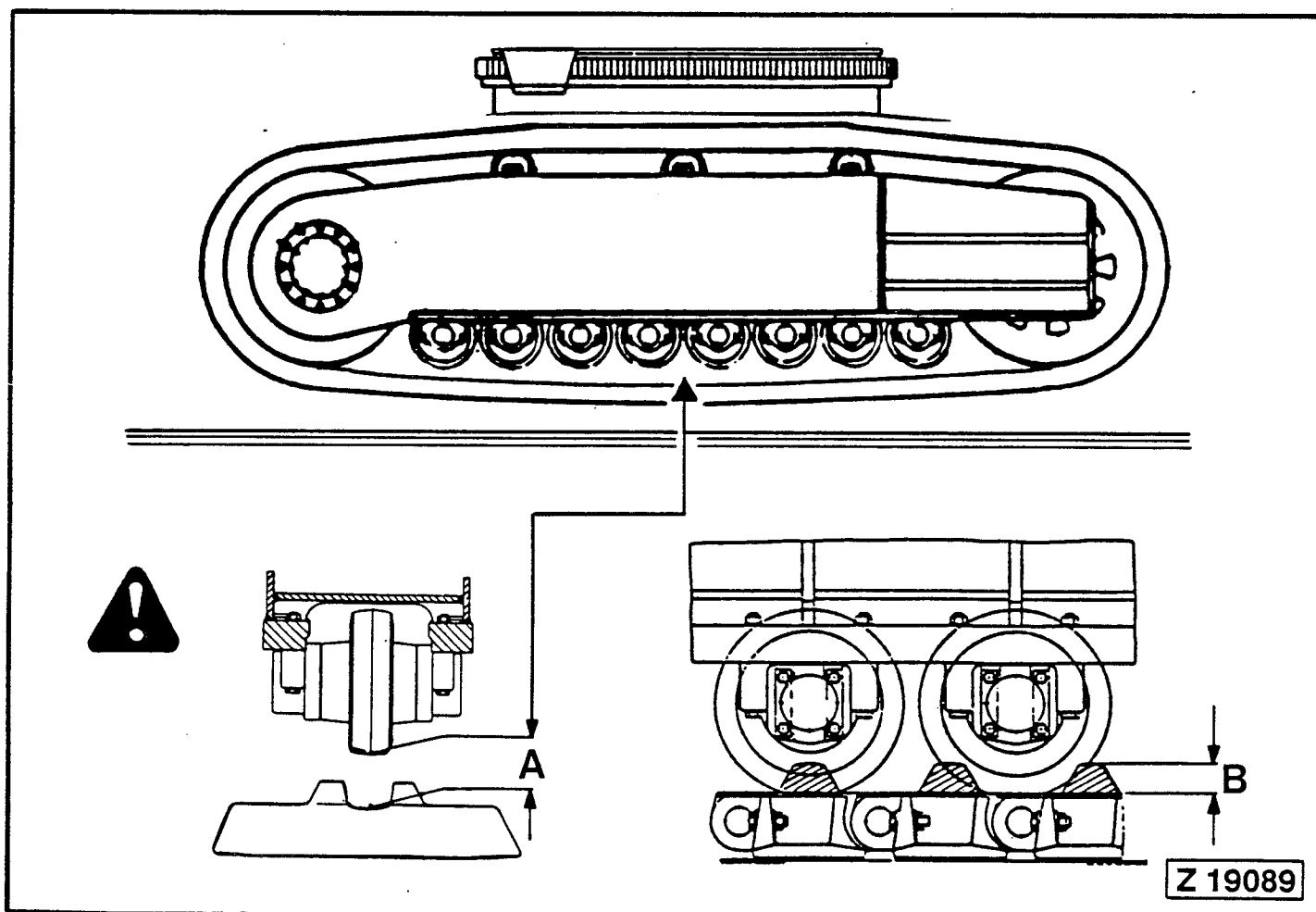
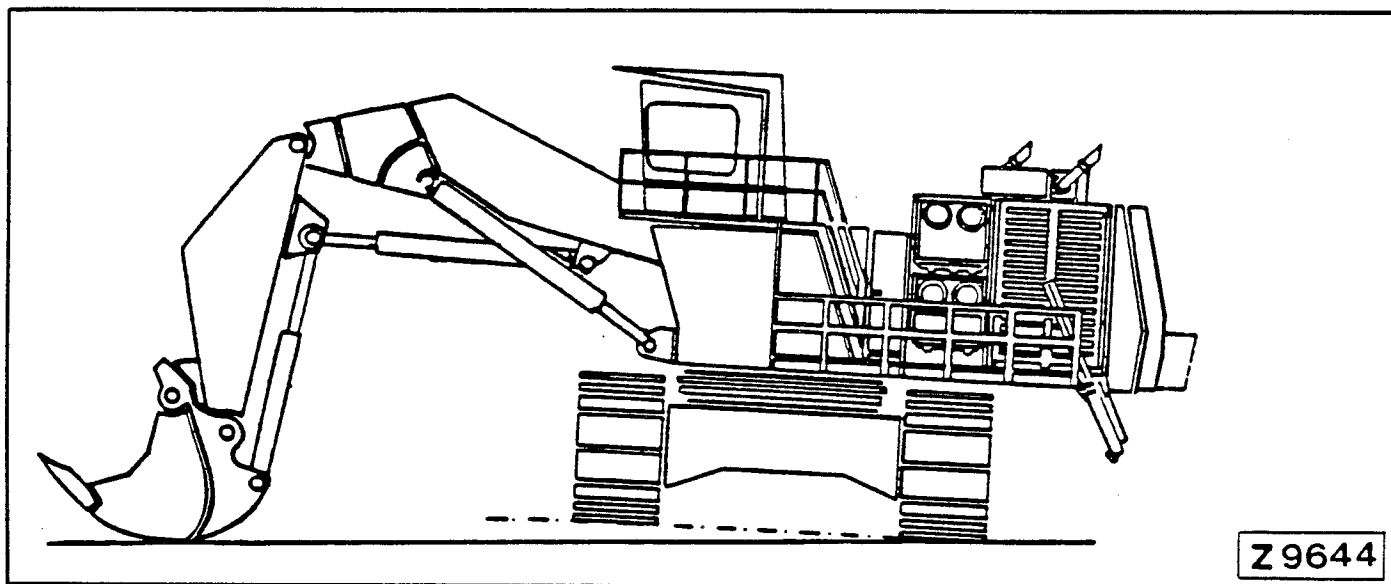
Remove plug (7). Oil level should reach lower edge of the opening. If necessary add oil.

Note:

If oil starts dropping out at breather pipe (5) check oil seals of secondary pump drive shafts for damage.

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14. Tracks

Check tension, illust. (Z 9644 and Z 19089):

A - Track sag: 240 to 300 mm

B - Tooth height: 110 mm; use as a reference dimension when checking the sag visually.

Note:

Under working conditions with excessive material build-up in the sprocket and idler wheel areas the track sag can be increased to meet these conditions.

However, it must be ensured that under all working conditions a slip over of sprocket teeth on track link cams does not occur.

Check the track sag:

Note:

Clean the tracks before checking the sag.

1. Rotate the equipment over one side of the track group.
2. Raise one track group completely from the ground by lowering the attachment.
3. Determine sag (A), illust. (Z 19089), at the lowest point, using dimension (B) for reference.

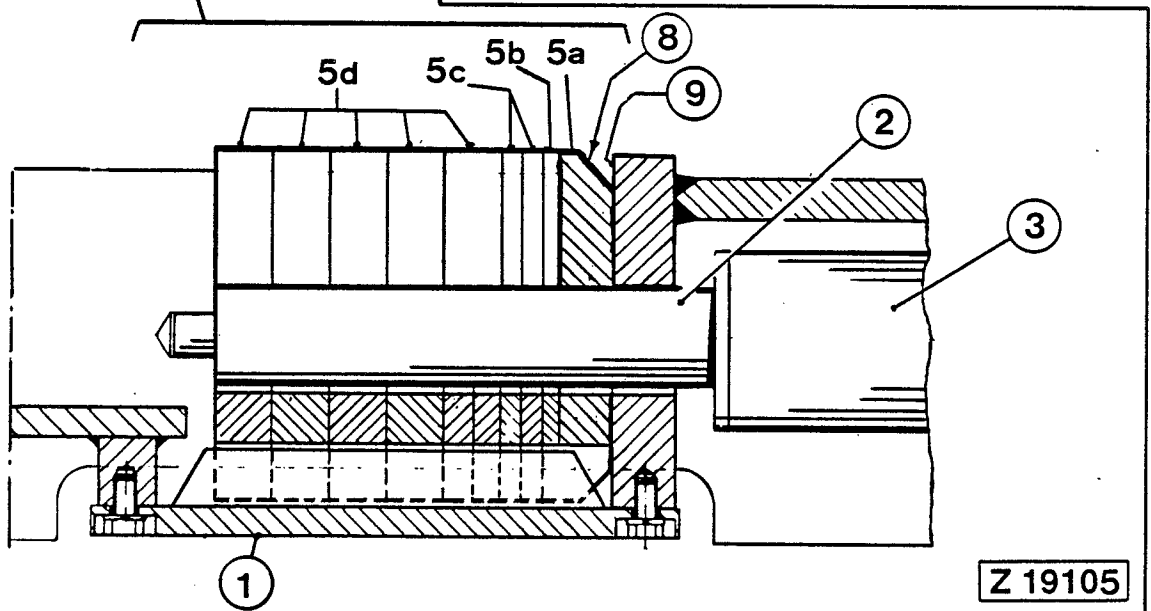
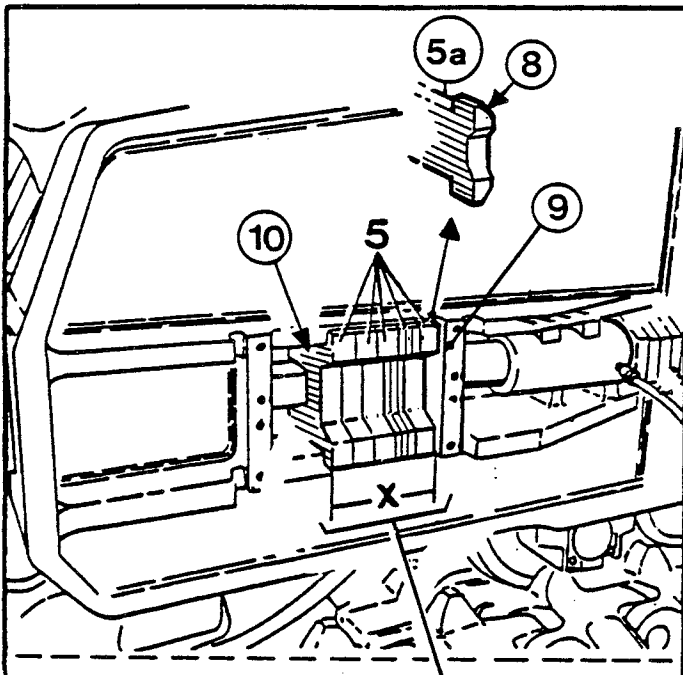
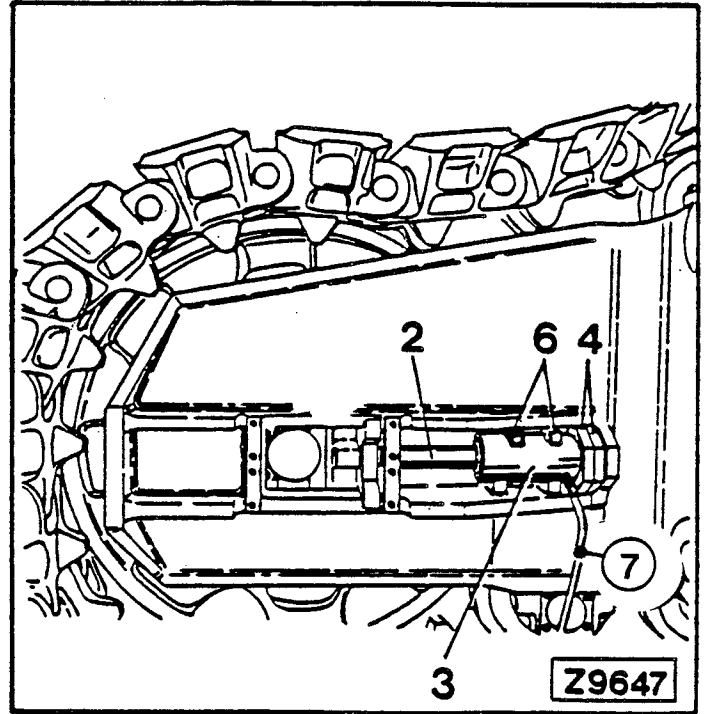
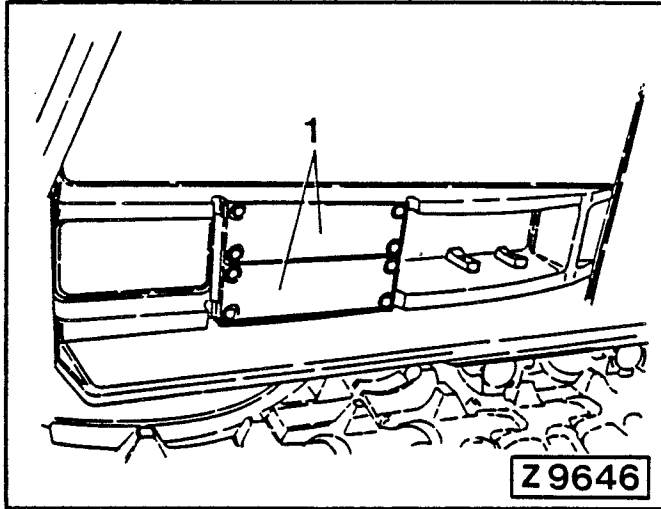
The sag must be equal on both track groups.

Caution!

For safety reasons it is sufficient to determine the sag visually. Do not stay close to the raised track group!

4. If track sag is not within specification "A" shown above, adjust track tension according to item no. 14.1 on next page.





14.1 Adjusting the track tension (if necessary)  
illust. (Z 9646, Z 9647 and Z 19105)

A - Increase track tension:

Note:

Adjust both track groups equally. Perform adjustment on the outer and inner adjusting device of each track. The necessary adjusting tools (2, 3, 4, 5 and 6) are part of the machines tool set.

1. Remove inner and outer covers (1) at the crawler carrier.
2. Insert rod (2) and position cylinder (3) into the holders provided.

Caution!

Secure cylinder (3) with the two upper locking bars (6). Install from the front.

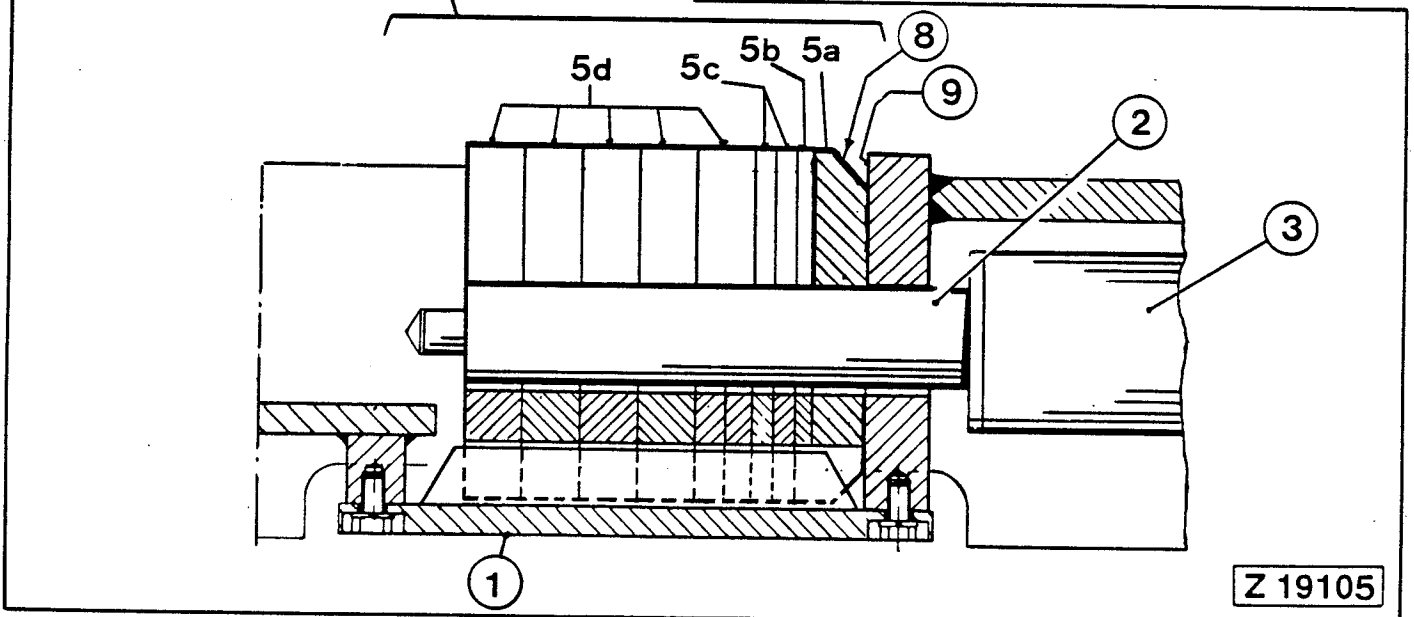
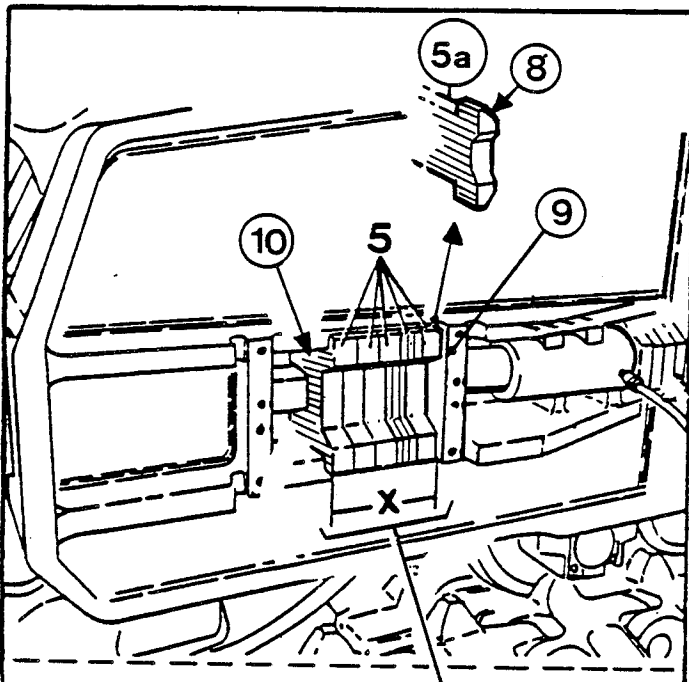
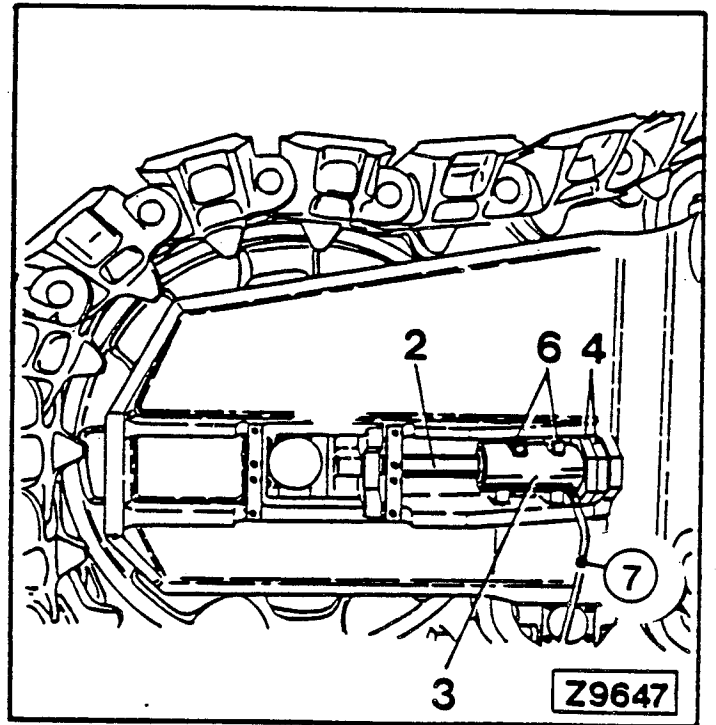
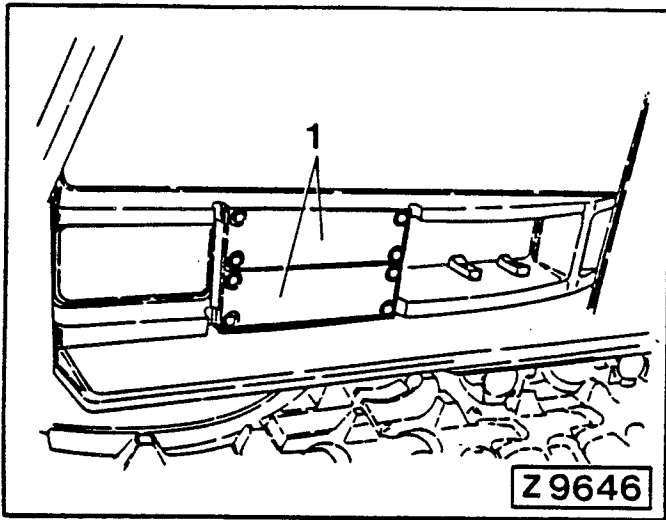
3. Compensate gap behind cylinder (3) by inserting spacers (4).
4. Connect hydraulic hand pump (7) to the adjusting cylinder and slowly actuate hand pump until correct tension is obtained.
5. Compensate gap "X" by inserting a corresponding number of spacer plates (5).

Important:

Install the spacer plates (5) in the following sequence:

- 5a - Spacer plate with chamfered corners (8) towards support (9). The special shape of this spacer plate prevents contact to the welding seams of the support frame.

continued



Cont'd

14.1 Adjusting the track tension (if necessary)

illust. (Z 9646, Z 9647 and Z 19105)

- 5b - spacer plate 10 mm thick
- 5c - spacer plates 20 mm thick
- 5d - spacers 50 mm thick

Select spacers according to the necessary increments for correct track tension.

Make sure the spacers are always installed in the prescribed order.

Important:

Adjust inner and outer side equally.

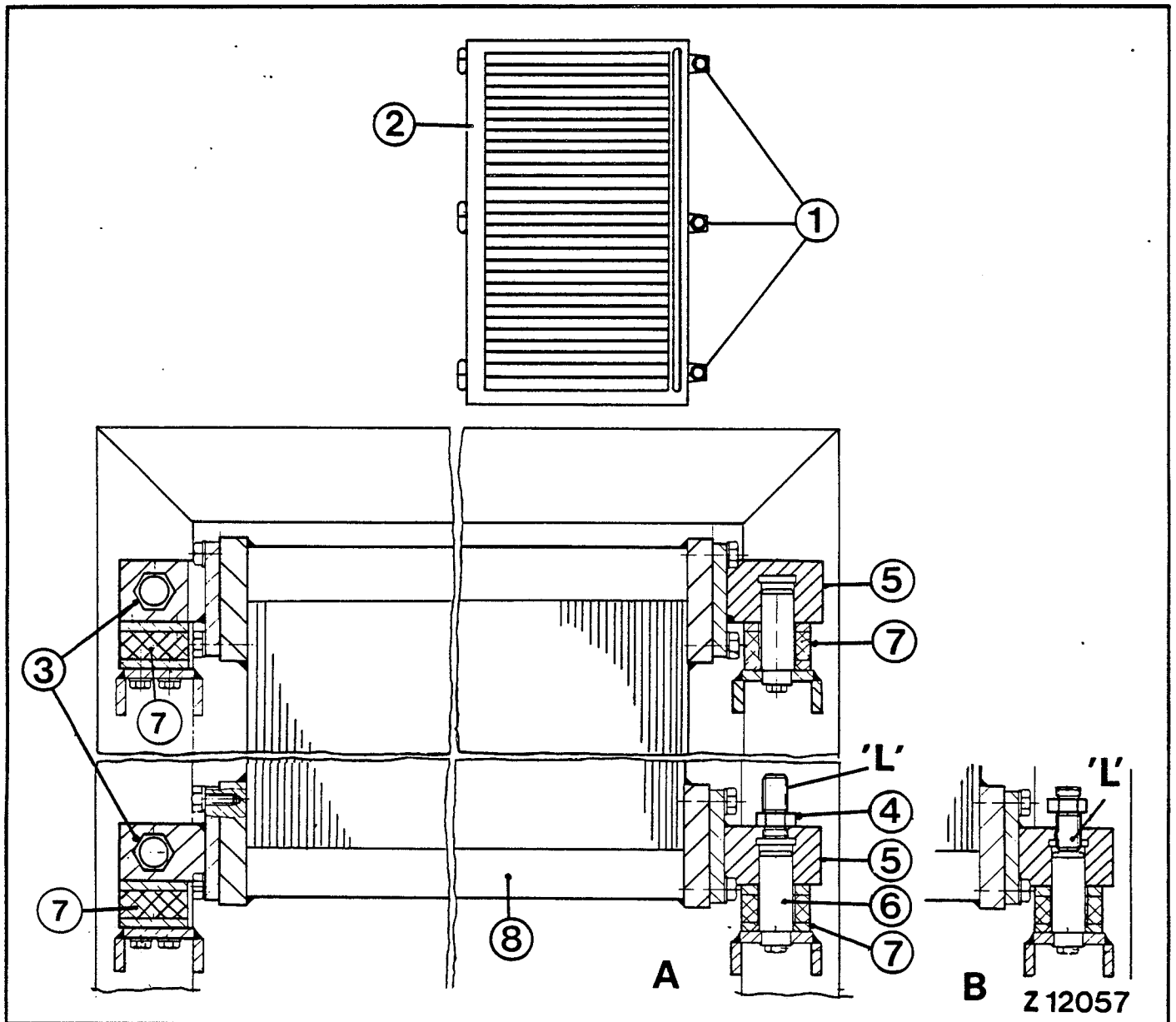
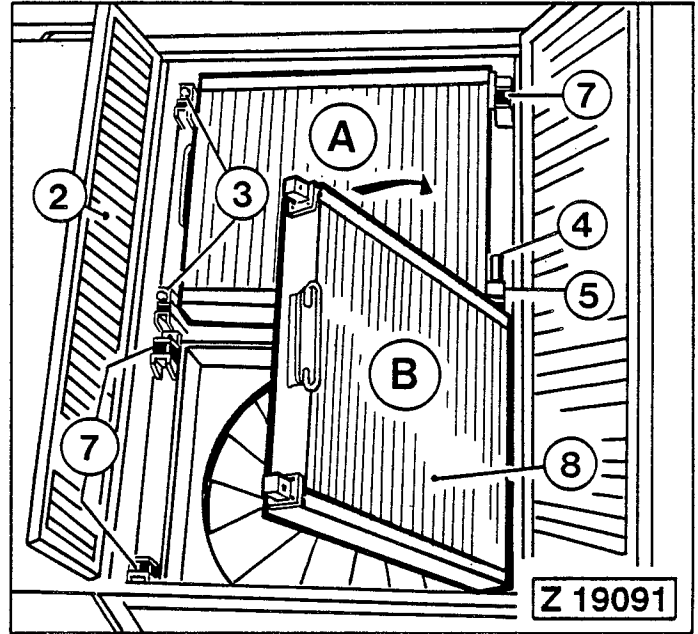
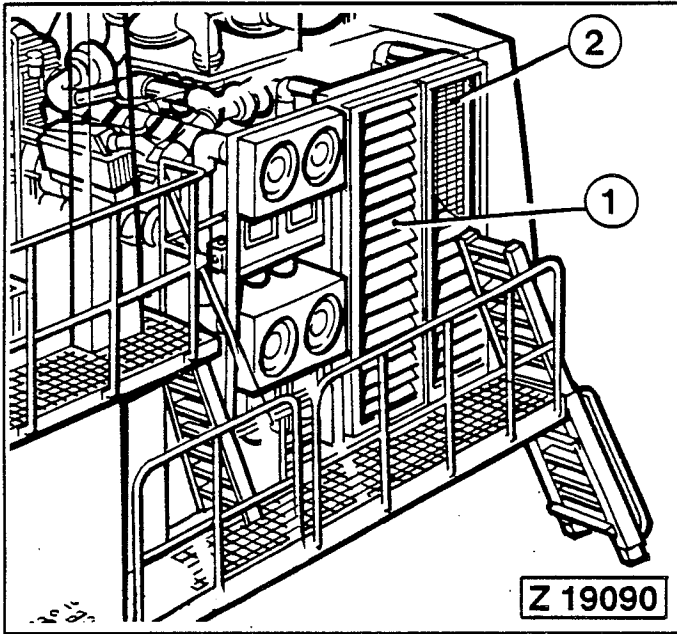
6. Move machine forward and reverse to distribute tension.
7. Check track sag, refer to section 6.2, item 14.

Note:

If the whole adjusting range is used up, i.e. chamber (10) is completely occupied by spacers (5) a track pad and a corresponding number of spacers (5) can be removed in order to re-establish adjustment space in chamber (10).

B - Decrease track tension:

The same procedure as described under "A", however the spacers (5) must be removed.



15. Radiator and hydraulic oil cooler

Inspect, clean if necessary:

- Radiator, illust. (Z 19090)
  1. Open radiator grille door (1).
  2. Blow out radiator (2) with compressed air from inside to outside.
  
- Hydraulic oil cooler, illust. (Z 19091)
  - A - Upper oil cooler in normal operating position.
  - B - Lower oil cooler in cleaning position.

Proceed as follows:

1. Remove retainer bolts (1), illust. (Z 12057).
2. Open cooler grille door (2), illust. (Z 19091 and Z 12057).
3. Remove cooler retainer bolts (3).

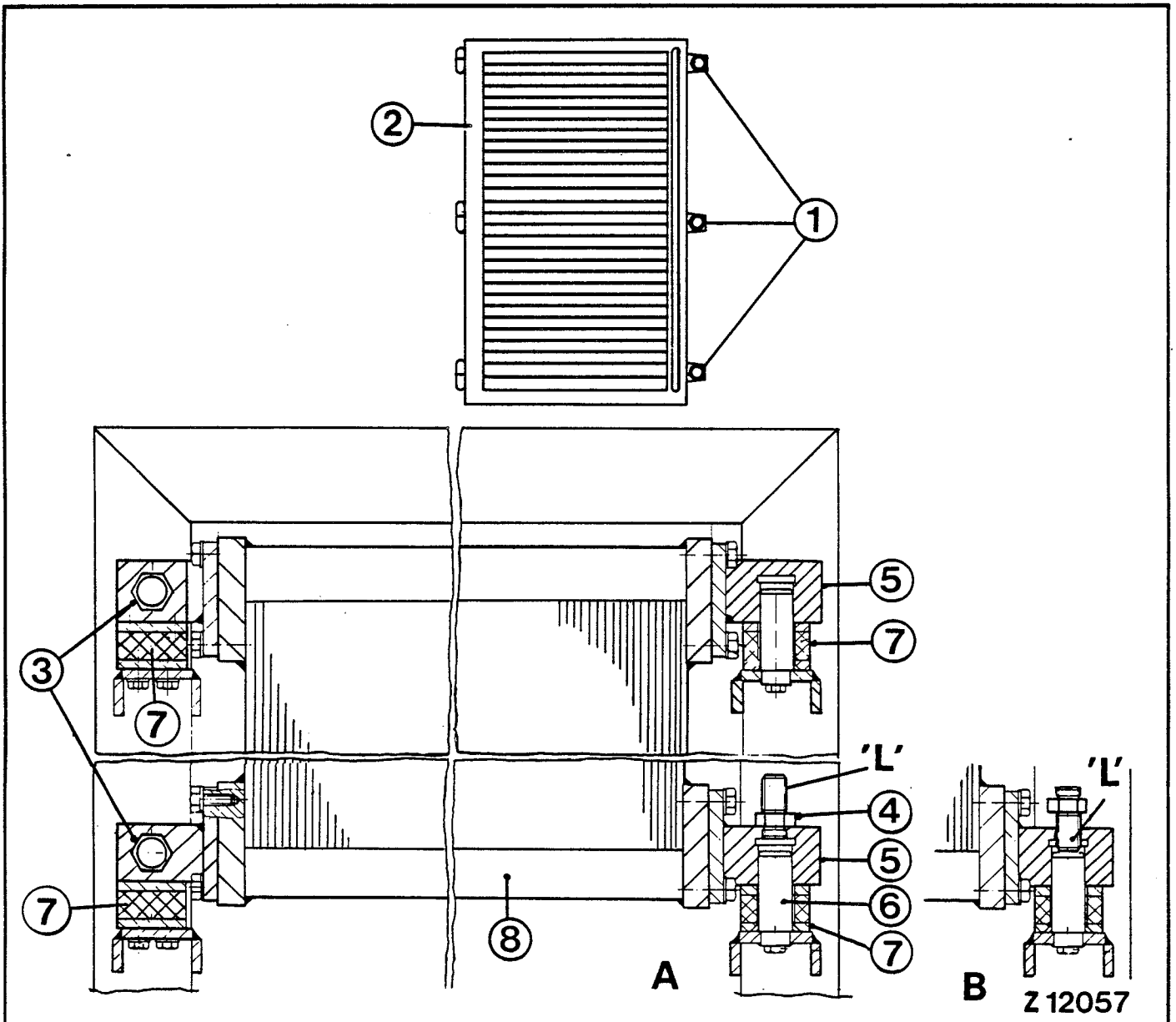
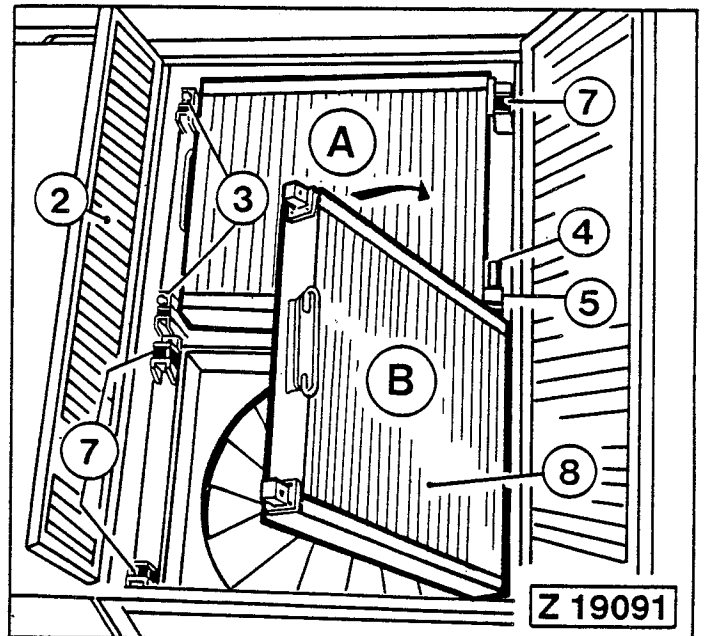
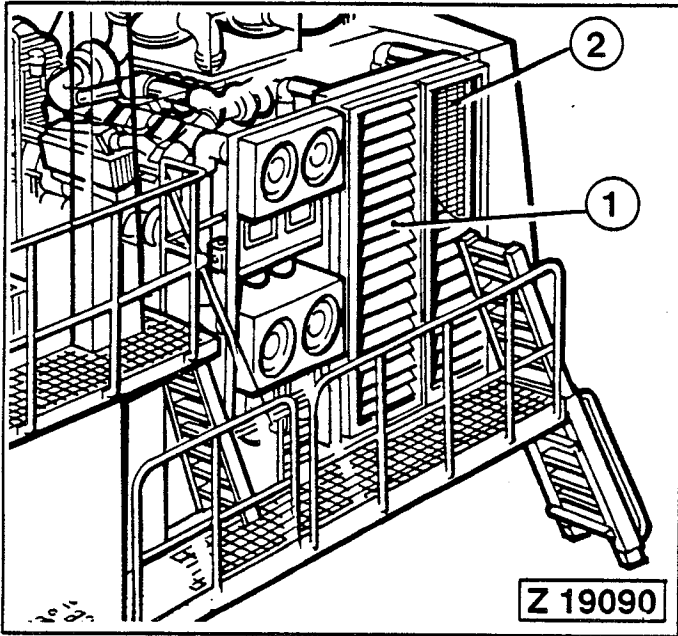
Note:

Illustration (Z 12057) shows two positions of cooler hinge lifting bolt (4):

A Normal operating position  
i.e. long thread side "L" up.

B Cooler swing position  
For this purpose screw lifting bolt (4) with long thread side "L" into bracket (5) until cooler weight rests on hinge pin (6) and the cooler can be swung out.

continued



4. Swing cooler (8) out and blow out with compressed air from inside to outside.
5. After cleaning swing cooler back to operating position.
6. Remove lifting bolt (4) and install with long thread side "L" up (position "A").
7. Install cooler retainer bolts (3) and tighten securely.  
Make sure that the four oil cooler brackets rest properly on supports (7).

Note:

Upper and lower hydraulic oil cooler are serviced in the same way.

8. Close door (2) and install bolts (1).

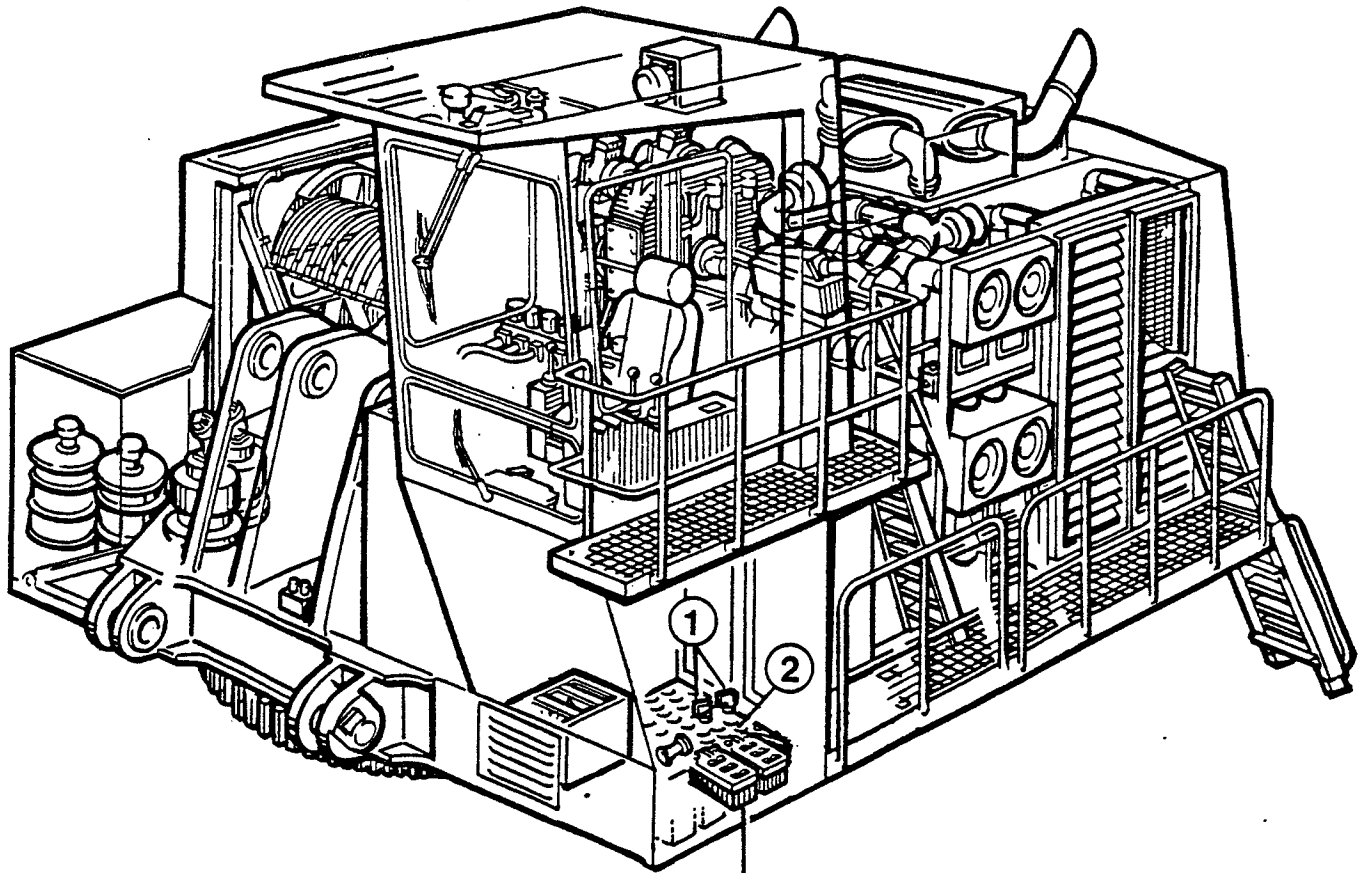




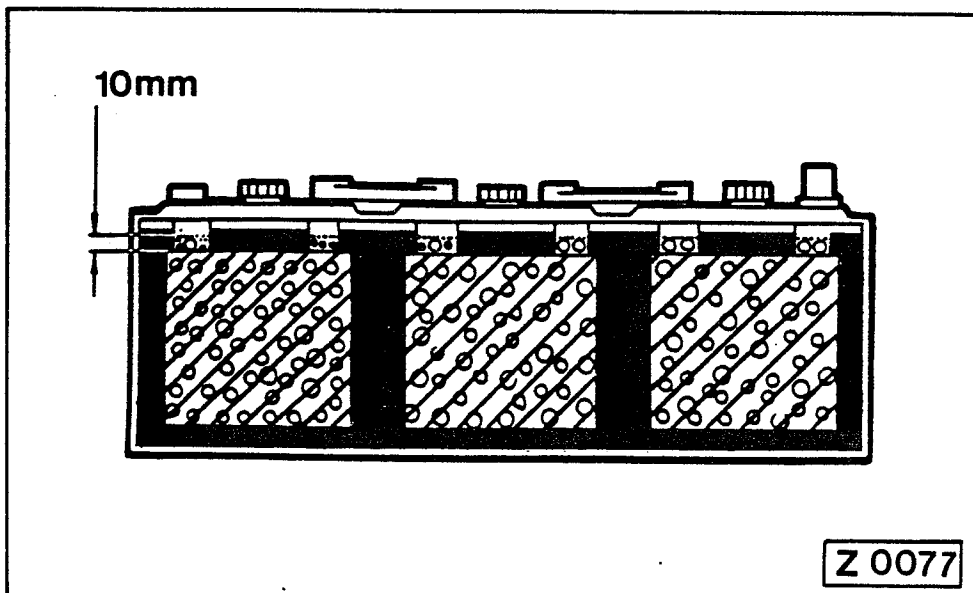


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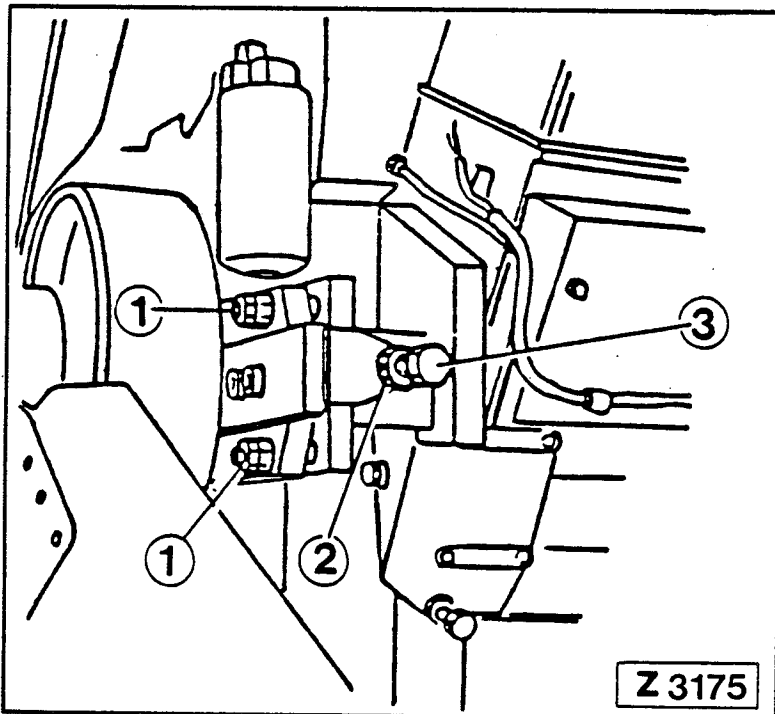
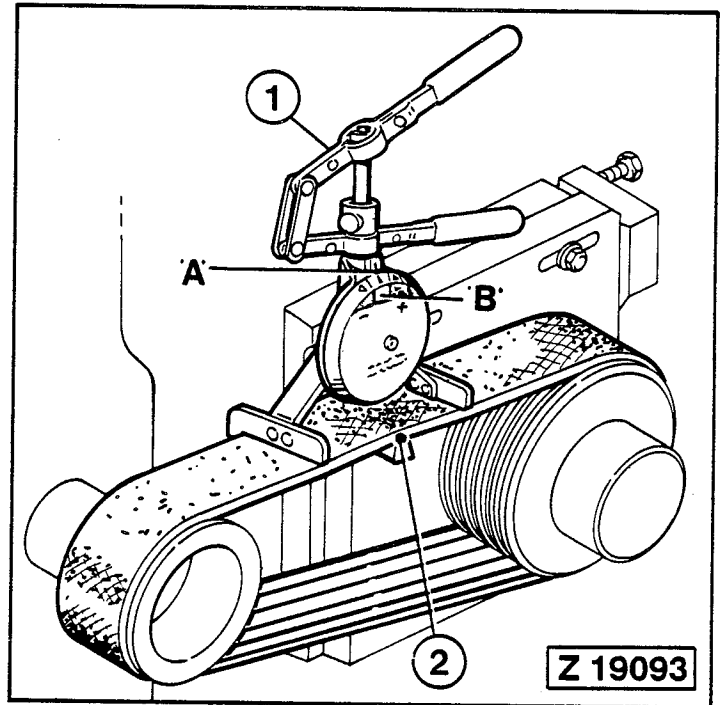
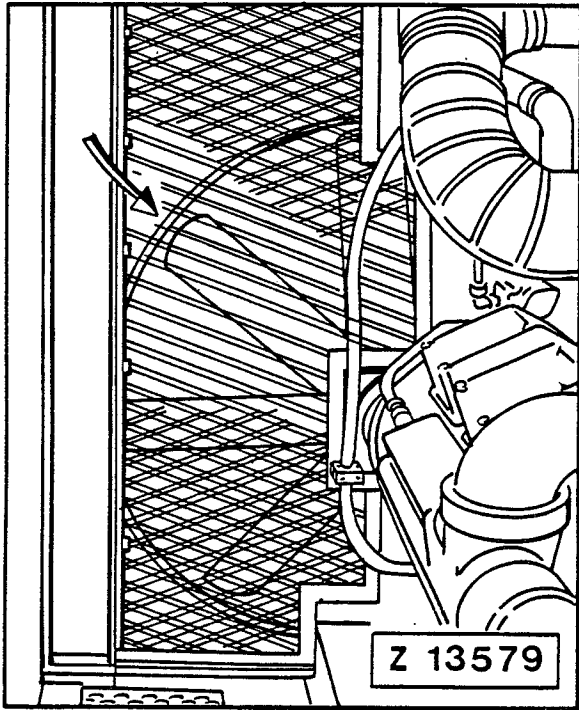


Z 0077

16. Batteries

Check electrolyte level:

1. Remove battery main switches (1), illust. (Z 19092).
2. Remove floor plates (2).
3. Check electrolyte level of batteries (3) see illustration (Z 0077).
4. If necessary remove filler and breather caps and top up with clean distilled water.
5. See that contact surfaces of battery terminals are bright. Clean if necessary and apply some vaseline to the terminal posts.



51. Drive belts

Check belt tension:

- Fan belt, illust. (Z 13579, Z 19093 and Z 3175):

Note:

For checking fan belt tension use the special gauge (1) illust. (Z 19093) included in the machines tool set.

1. Remove fan guard (Z 13579).
2. Use special gauge (1) illust. (Z 19093) to check belt tension midway between belt pulleys (2).
3. The belt tension is correct when field "B" of the dial disk is in line with the stationary mark "A".
  - If the field "LOW / NIEDRIG" is in line with mark "A" increase belt tension.
  - If the field "HIGH / HOCH" is in line with mark "A" decrease belt tension.
4. If necessary adjust belt tension as follows:
  - Loosen clamping nuts (1) illust. (Z 3175).
  - Loosen lock nut (2) and adjust belt tension with adjusting screw (3).
  - Re-check belt tension.
  - Tighten clamping nuts (1) and lock nut (2) in this sequence.
5. After adjustment of fan drive belt tension, check to make sure that there is sufficient space between fan blades and radiator shroud.

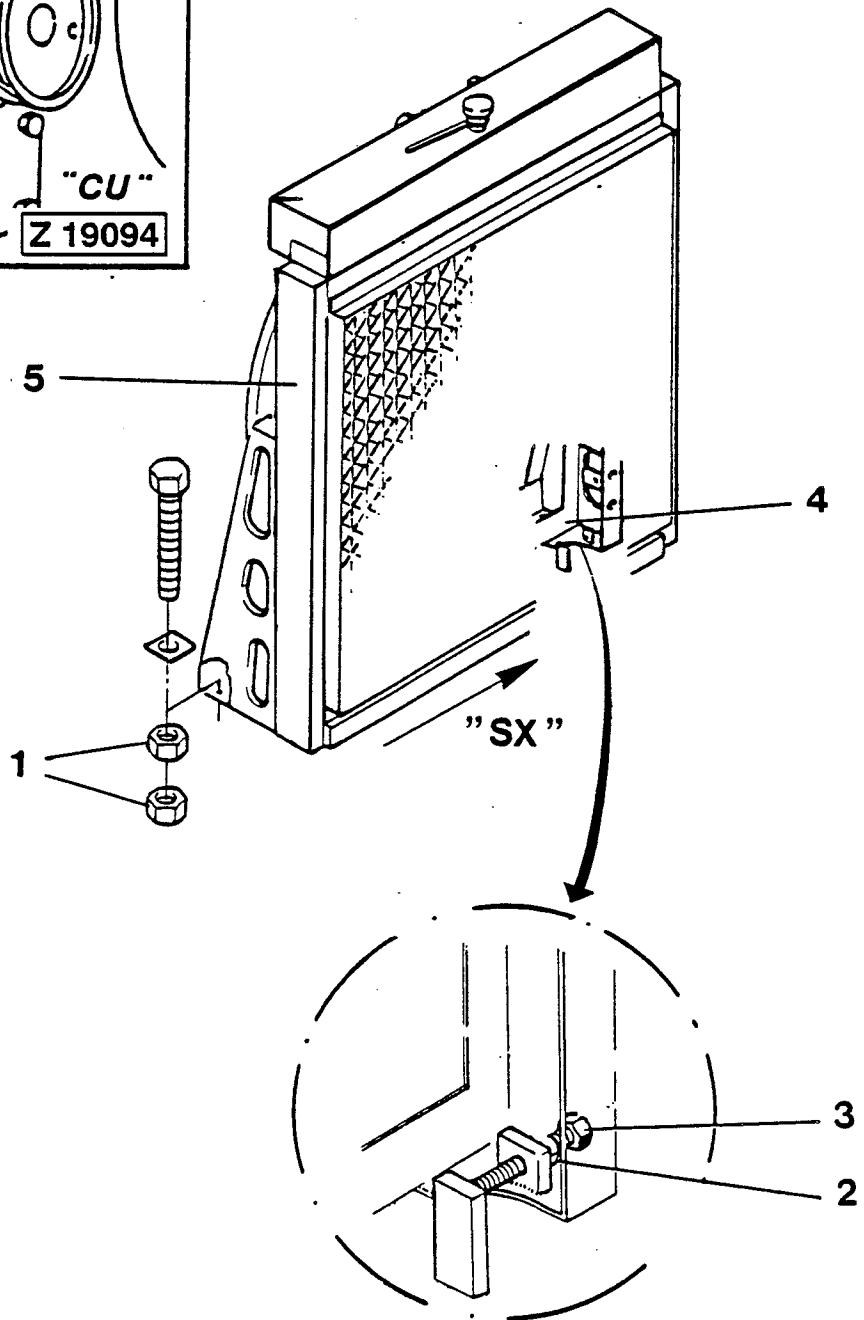
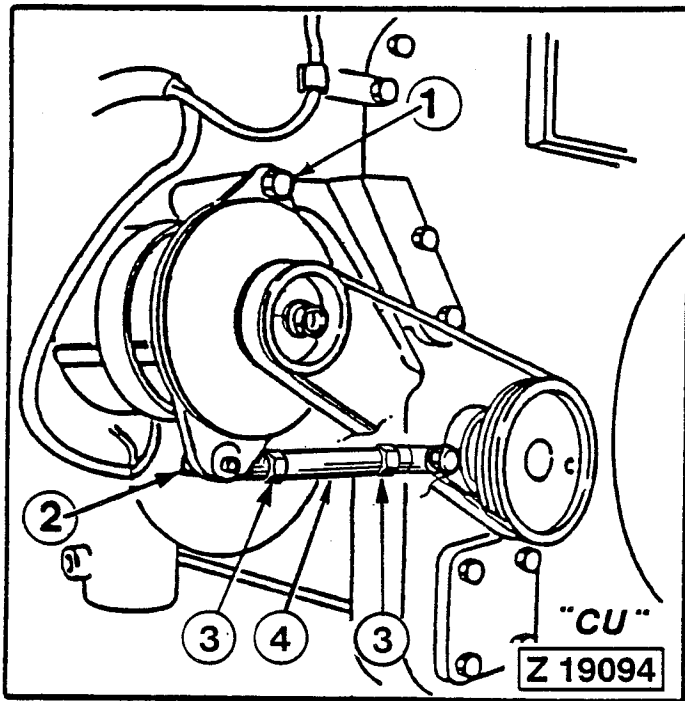
If necessary adjust radiator position according to item 51.1.
6. Install fan guard (Z 13579).

Important!

After a new belt has been in use for approximately 20 minutes, check the tension and adjust again if necessary.

Note:

If the special gauge (1) is not available, the "Thumb Method" may be used as a temporary measure.  
Deflection midway between belt pulleys: 15-20 mm.



- Generator belt, illust. (Z 19094)

Deflection midway between belt pulleys: 10 - 15 mm

Adjustment:

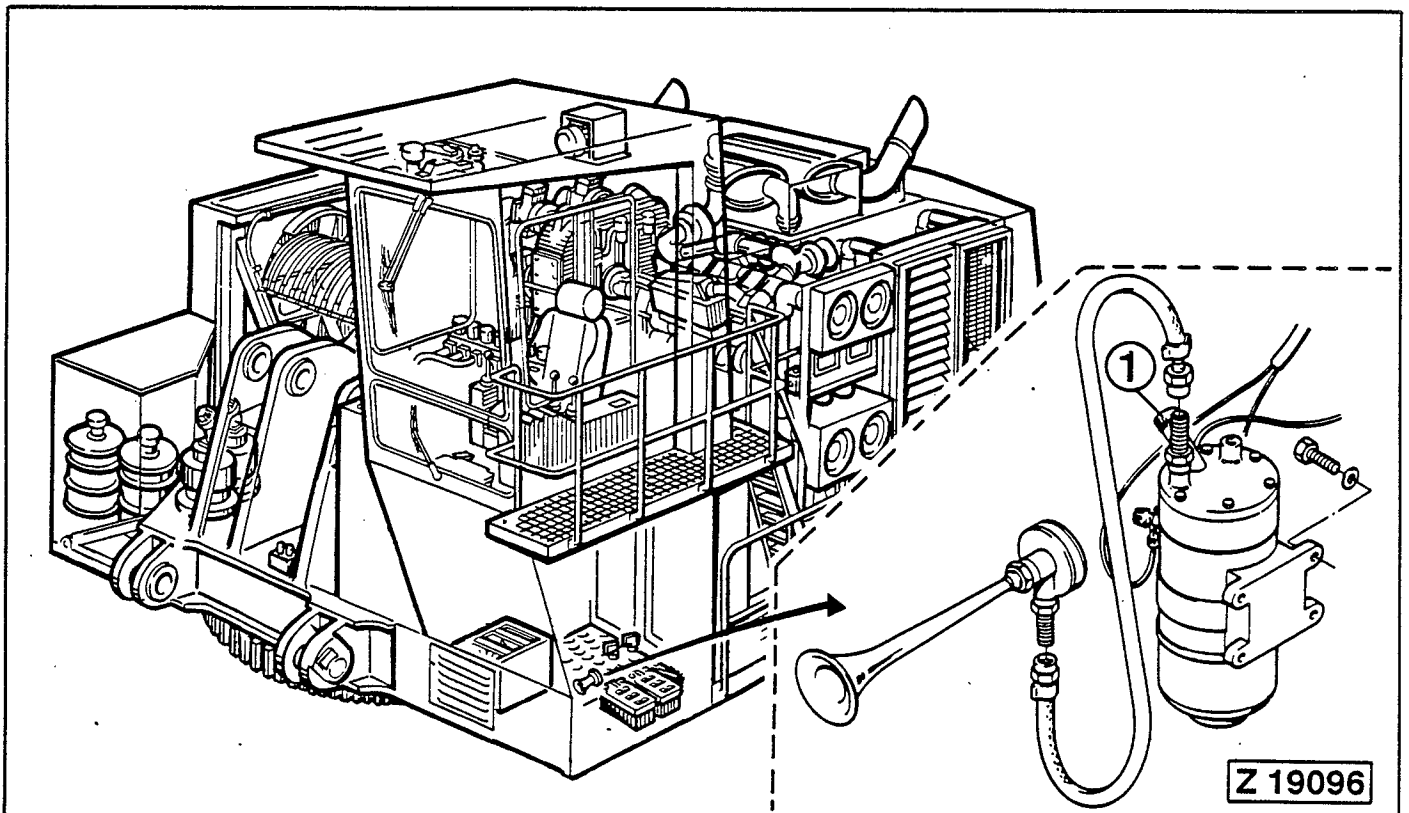
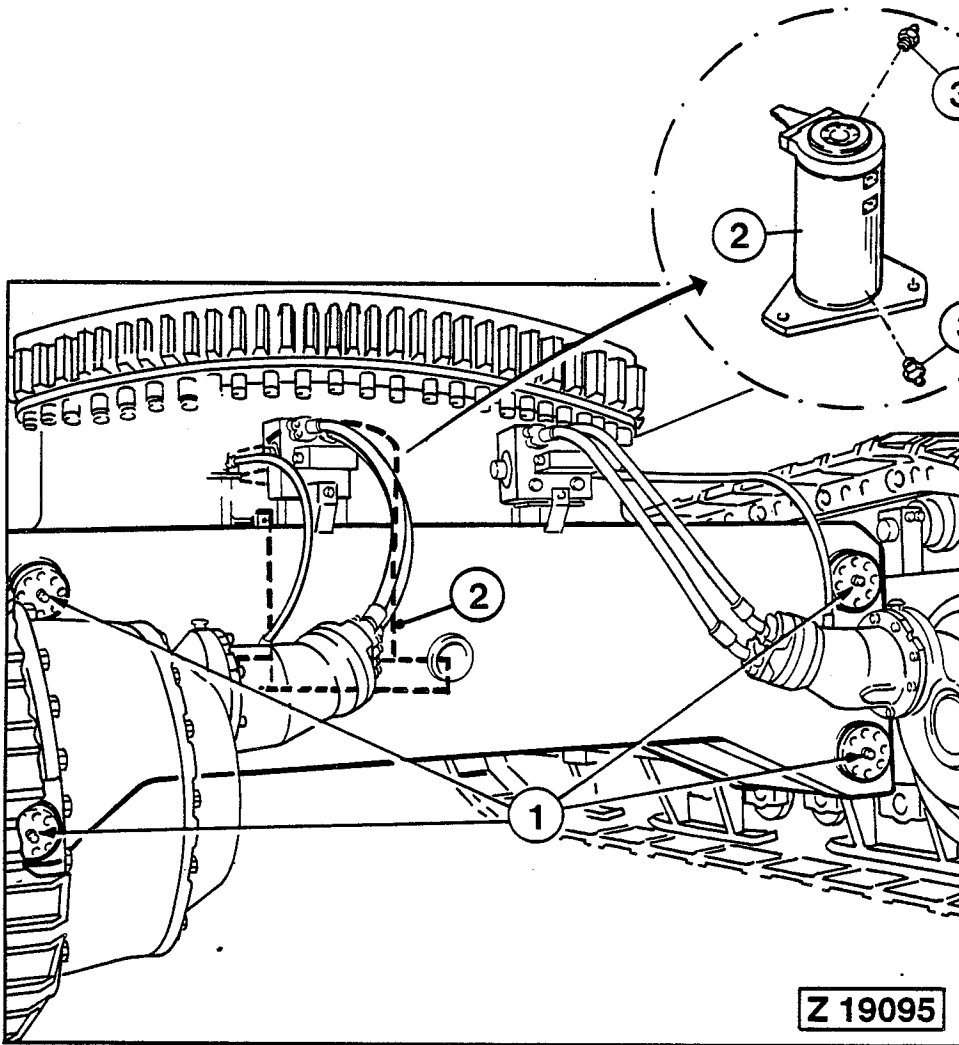
1. Loosen bolts (1 and 2).
2. Loosen lock nuts (3) and adjust belt tension with turn buckle (4).
3. Tighten lock nuts (3) and bolts (2 and 1) in this sequence.

51.1 Adjust radiator position, illust. (Z 10351)

Proceed as follows:

1. Loosen clamping nuts (1).
2. Loosen lock nut (2) and tighten adjusting bolt (3) in order to move support (4) with radiator (5) in the direction "SX" until the required space between fan blades and radiator shroud is obtained.
3. Retighten lock nut (2) and clamping nuts (1).





52. Undercarriage pin connection, central section - crawler carrier, illust. (Z 19095)

Lubricate at grease fittings (1) at center section (16 fittings; front, rear and from inside).

53. Rotary distributor (2), illust. (Z 19095)

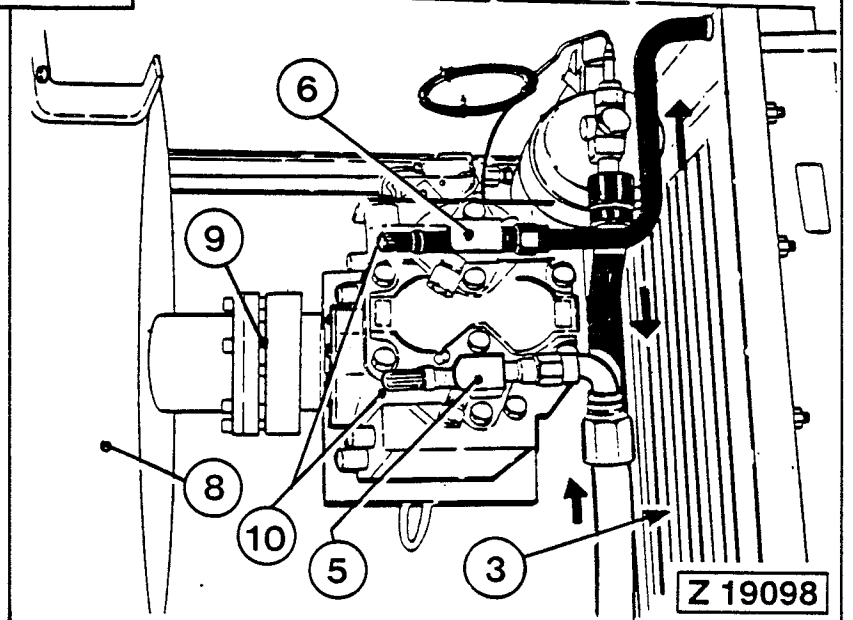
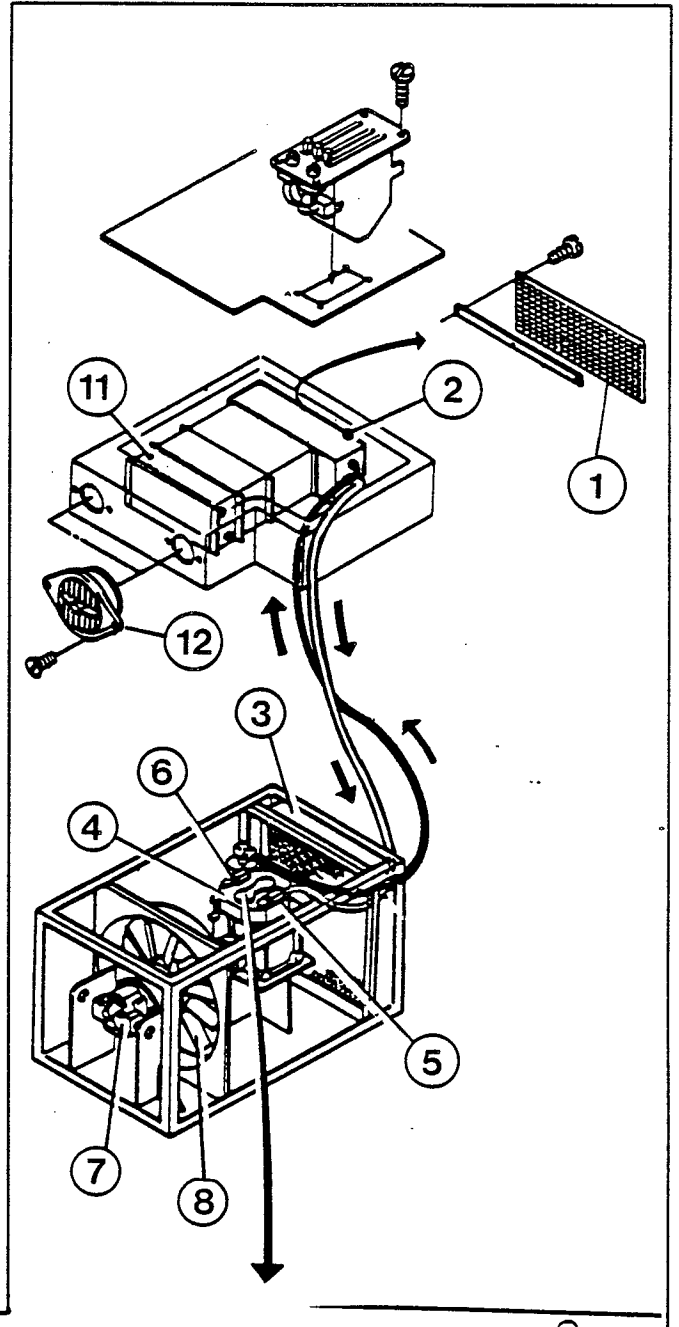
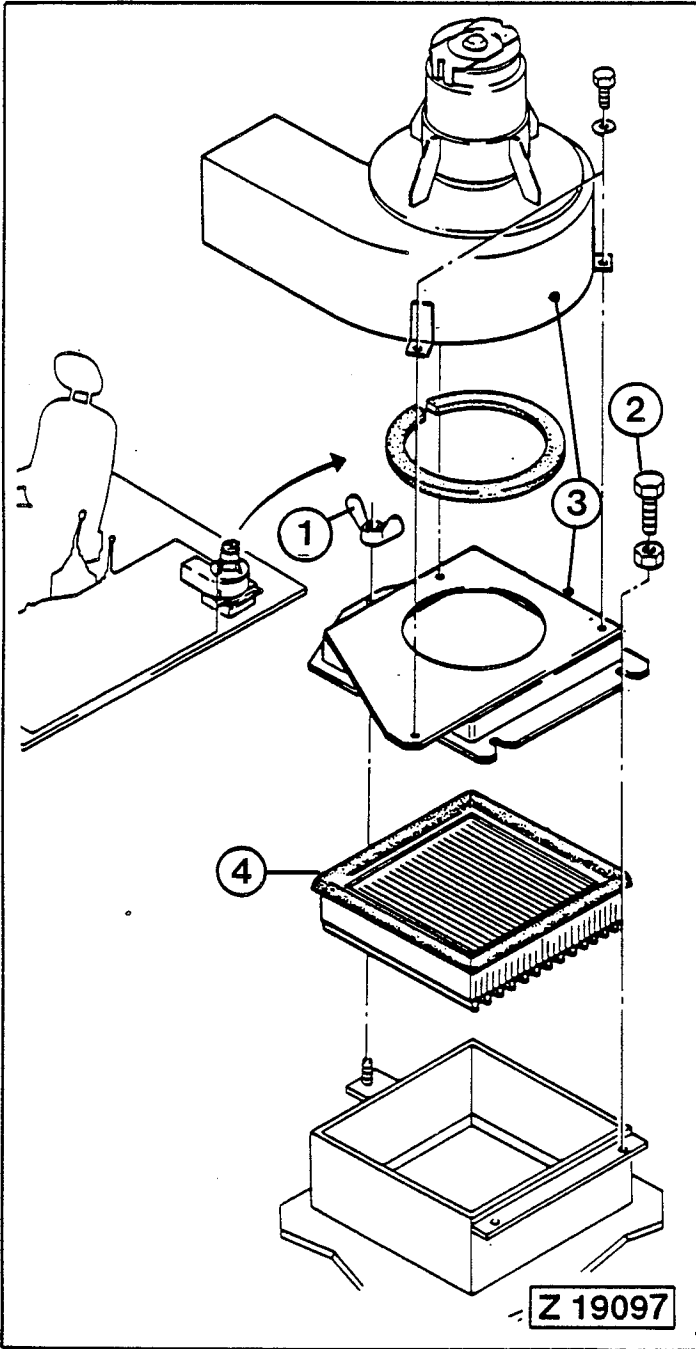
Lubricate at grease fittings (3).

54. Compressor for signal horn, illust. (Z 19096)

The compressor is located in cab base.

Fill several drops of thin oil into the lubricator (1).

The oil must be free from resin and acid and must have the lowest solidifying-point possible (below - 40 ° C).



55. Cab air cleaner, illust. (Z 19097)

Clean filter element (4):

1. Remove wing nut (1).
2. Loosen clamping bolts (2).
3. Lift off blower unit (3).
4. Inspect element (4). If any rupture, holes or damaged gaskets are discovered, replace.
5. If the element is useable, clean with compressed air and re-install.

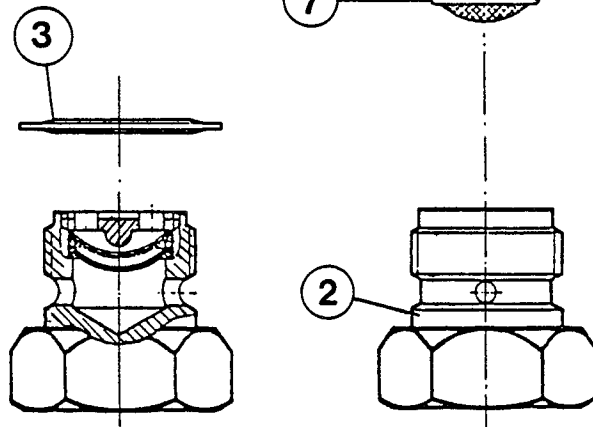
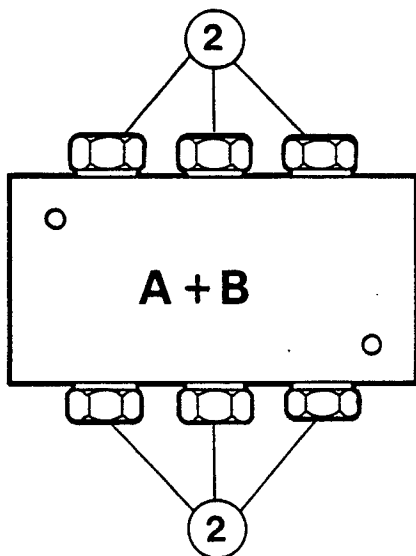
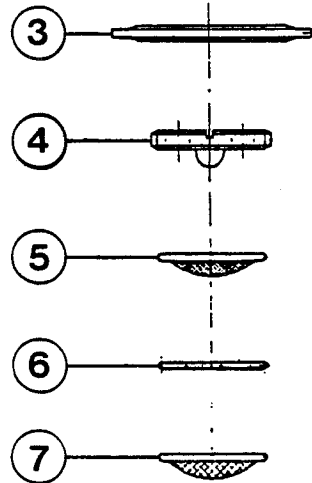
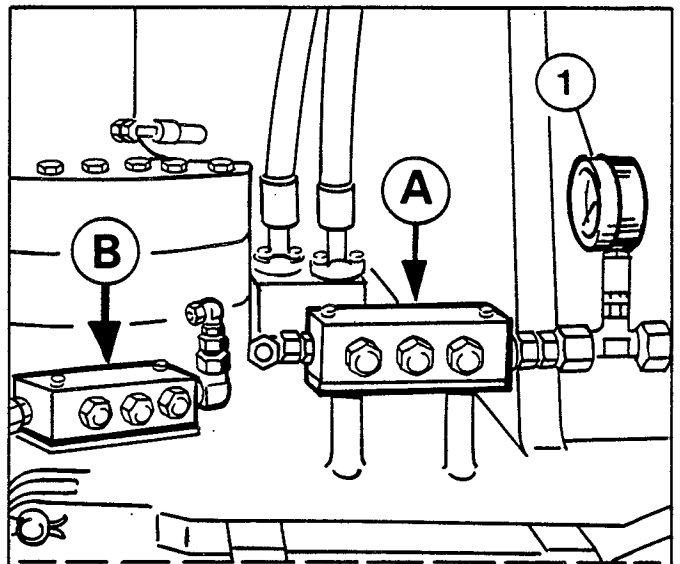
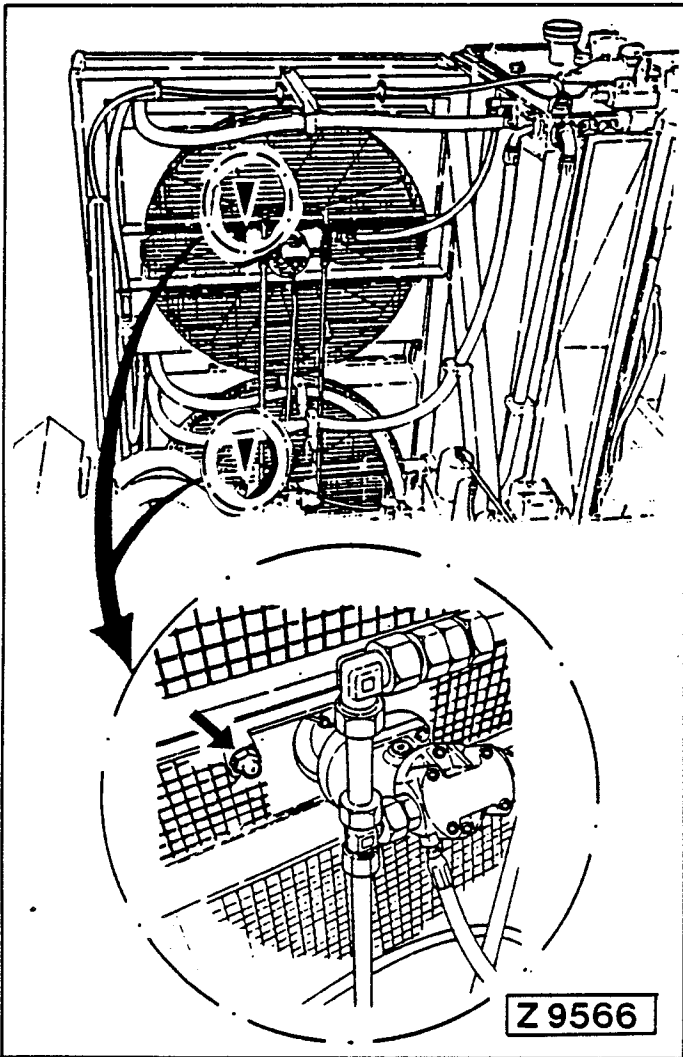
56. Air-conditioning

Legend for illust. (Z 19098)

- (1) Air inlet screen
  - (2) Evaporator
  - (3) Condenser
  - (4) Compressor
  - (5) Low pressure (suction) line
  - (6) High pressure line
  - (7) Hydraulic motor
  - (8) Blower
  - (9) Flexible coupling
  - (10) Service valves
  - (11) Heater unit
  - (12) Air louvers (warm air)
- Inspect fins of evaporator (2), clean if necessary.
  - Inspect coil fins of condenser (3), clean if necessary.

Note:

The condenser unit is located in the cab base and accessible after removal of cover plate.



57. Hydraulic oil cooler

Lubricate upper and lower fan bearing, see illust. (Z 9566).

59. Central lubrication system and slew ring spray system, clean grease screens

Legend for illust. (Z 19099):

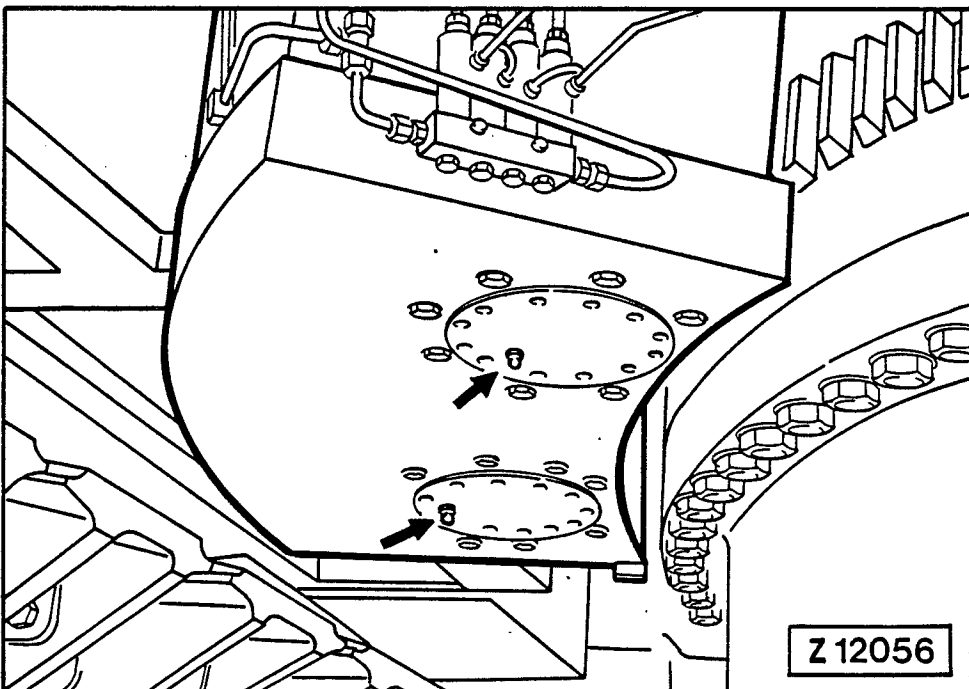
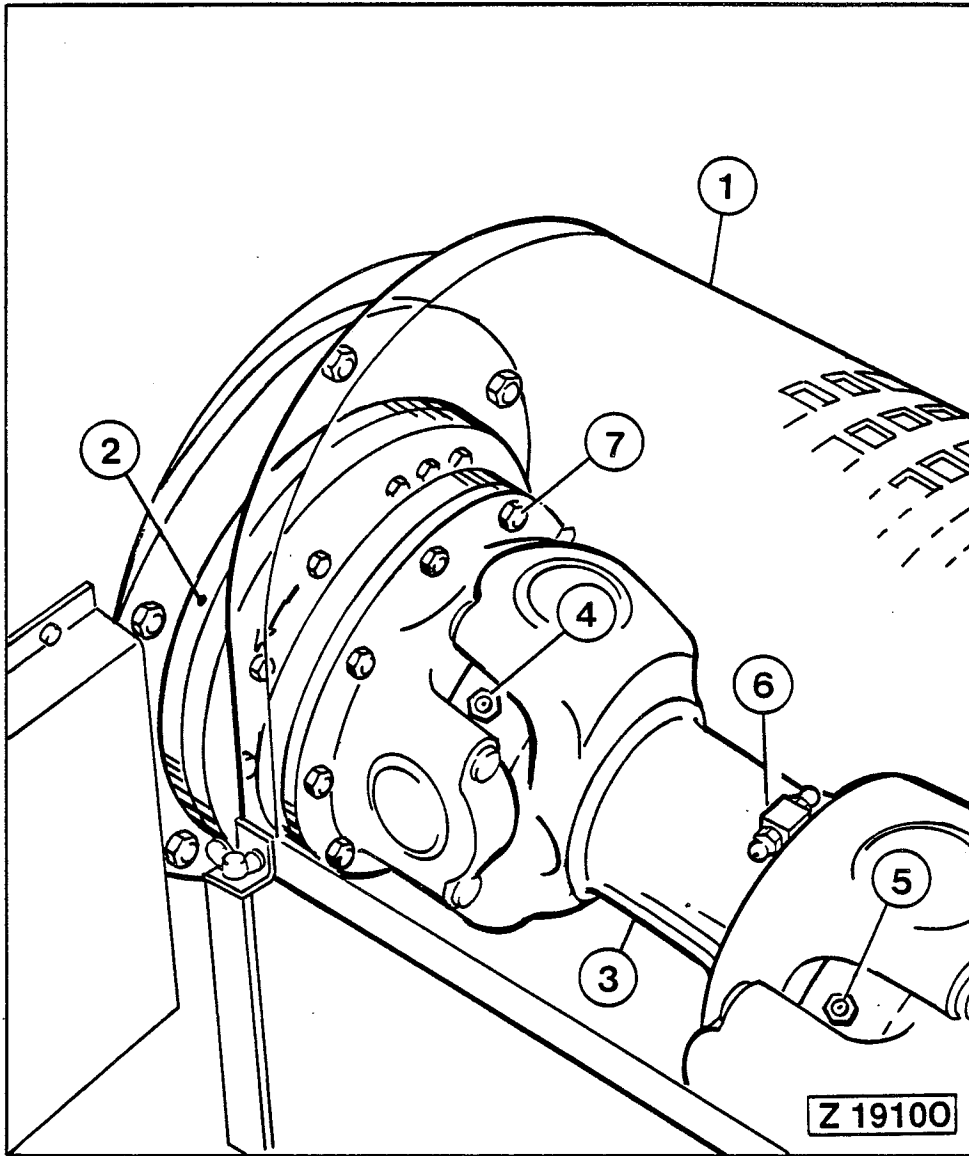
- A - Screen block of central lube system
- B - Screen block of slew ring lube system
- (1) Pressure gauge
- (2) Screen assy. (six each)
- (3) Packing ring
- (4) Threaded ring
- (5) Dual screen fine
- (6) Spacer ring
- (7) Dual screen coarse

Important:

Before servicing stop the engine and remove ignition key in order to prevent operation of the system.

Proceed as follows:

1. Unscrew screen assys (2) using 41 mm width wrench.
2. Remove packing ring (3).
3. Unscrew ring (4).
4. Take out screen (5), spacer (6) and screen (7).
5. Clean all parts and inspect for damage.  
Replace as necessary.
6. Assemble all parts according to the illustration.  
Make sure all sealing surfaces are clean.  
Take care for proper position of the screens, convex side towards (2).
7. Install screen assys and tighten with a wrench.



60. Propeller shaft, illust. (Z 19100)

- (1) Guard
- (2) Flexible coupling
- (3) Propeller shaft
- (4) Grease fitting L.H. spider
- (5) Grease fitting R.H. spider
- (6) Grease fitting and bleeder valve for slip joint lubrication
- (7) Mounting bolts (M18) on both sides

Lubrication:

1. Remove guard (1).
2. Lubricate both universal joints at grease fittings (4 and 5).
3. Lubricate slip joint at grease fitting bleeder valve assy (6) until grease comes out at the release holes of slip joint tube.

Important:

To prevent damage to drive line components observe the following:

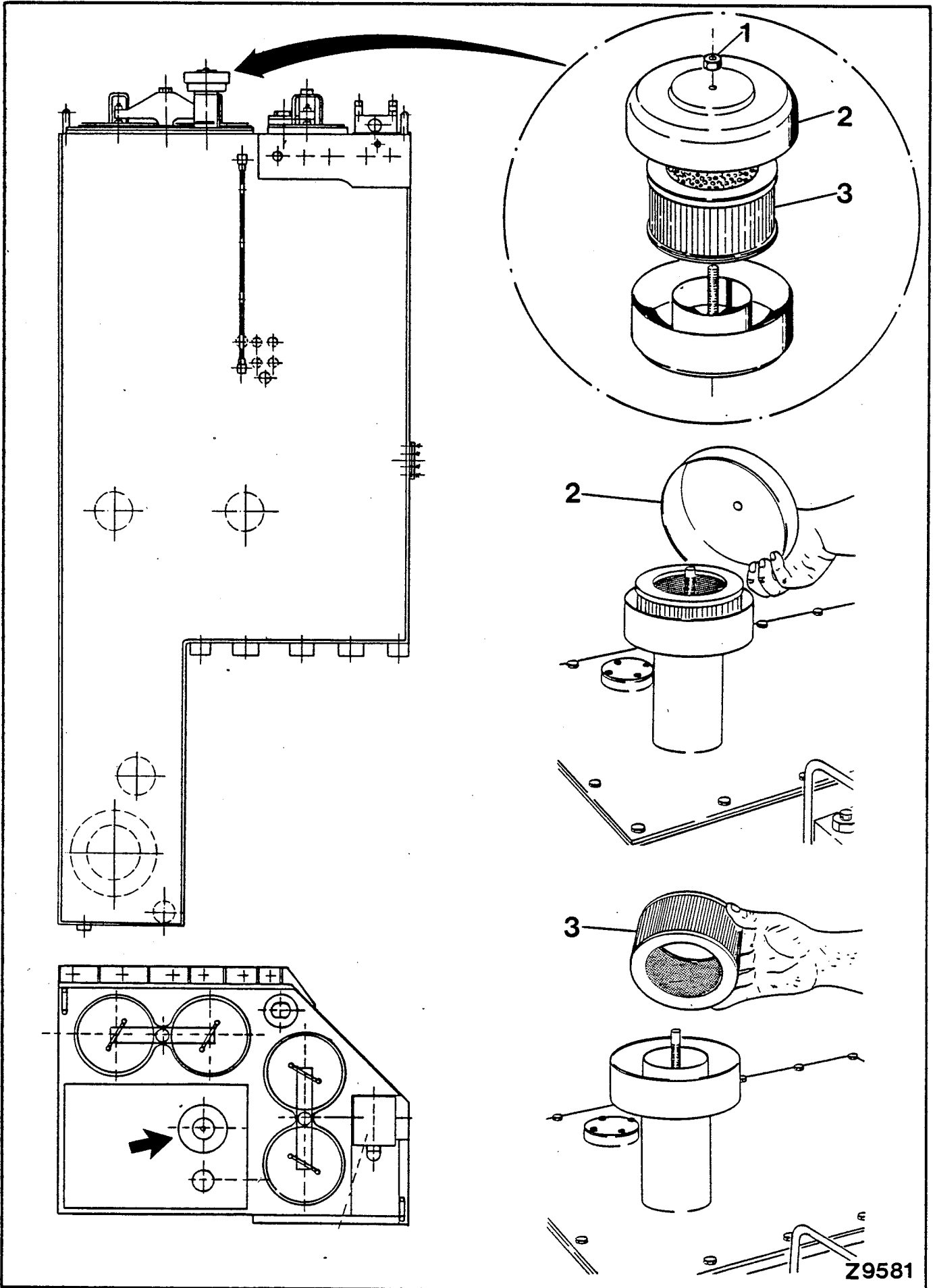
- Lubricating pressure must not exceed 15 bar.
- DO NOT press in lubricant with strong shocks.
- Make sure mounting bolts (7) are correctly tightened and joint cap screws secured with lock wire.

4. After lubrication install shaft guard (1).

61. Slew gear pinion bearings, illust. (Z 12056)

Lubricate at both grease fittings.







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71. Hydraulic oil reservoir

Replace breather filter element (Z 9581).

Note:

Under severe operating conditions, replace filter element more often.

Remove nut (1).

Remove cover (2).

Remove filter element (3).

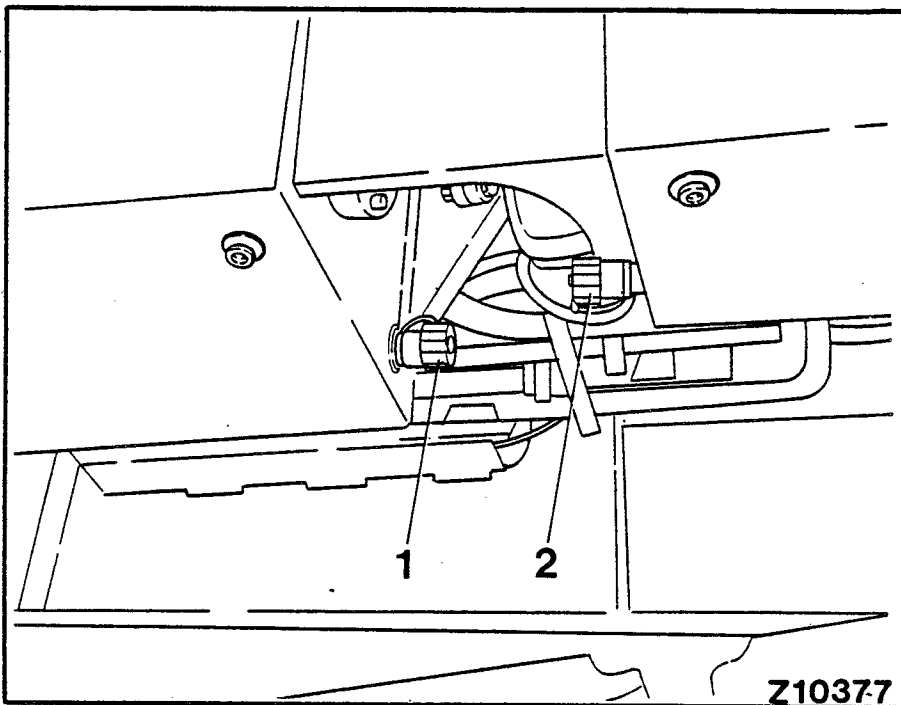
Insert new filter element.

1568-02

6.8



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6.8

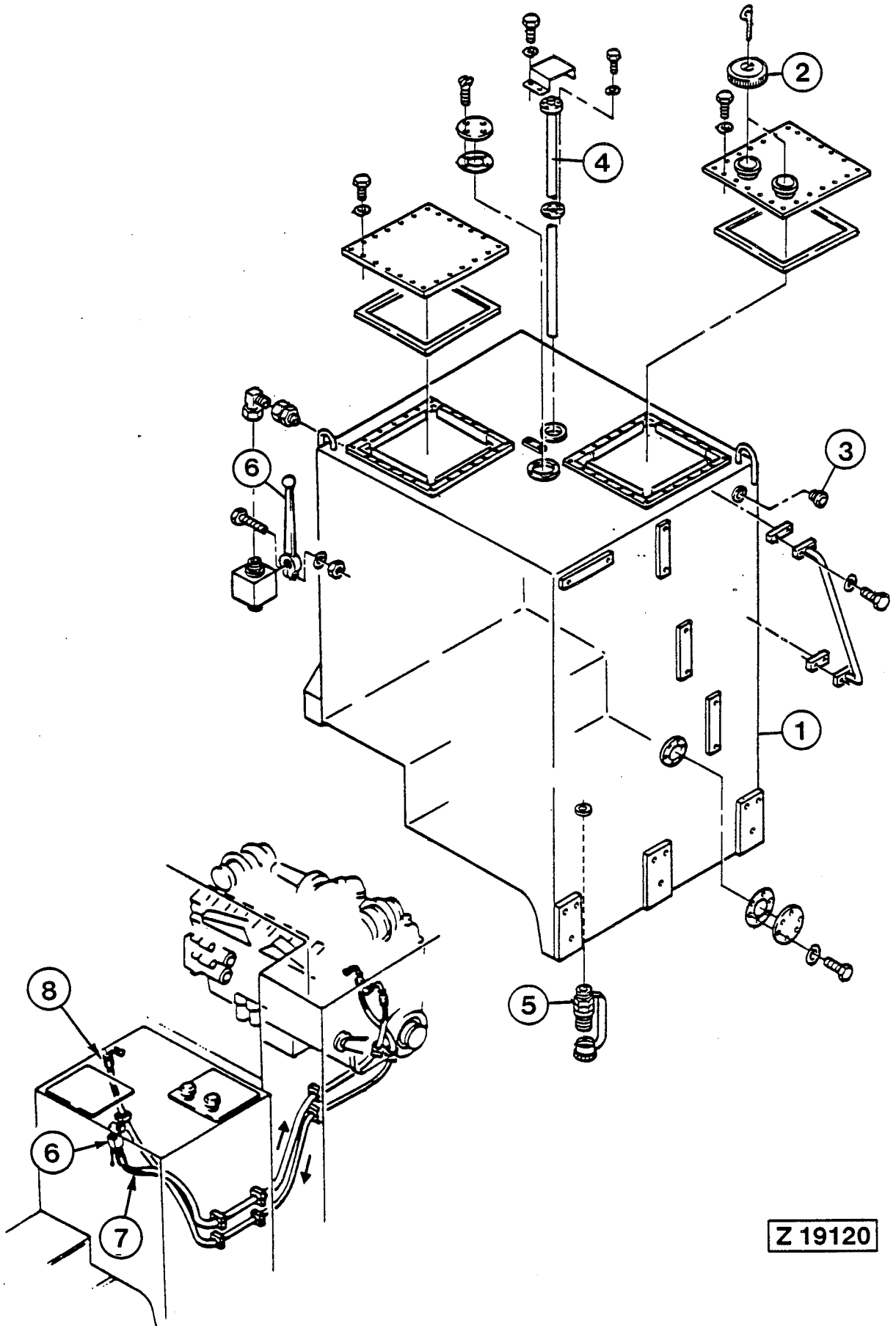
Main oil reservoir and suction oil reservoir

Draining water and sediments

Park the machine on level ground.

In order to allow sediments and water to settle, draining should be done after the excavator was out of operation for approx. 8 hours, e.g. over night.

For draining attach the drain hoses (part of the tool set) to the quick connect couplings (1 and 2, Z 10377).

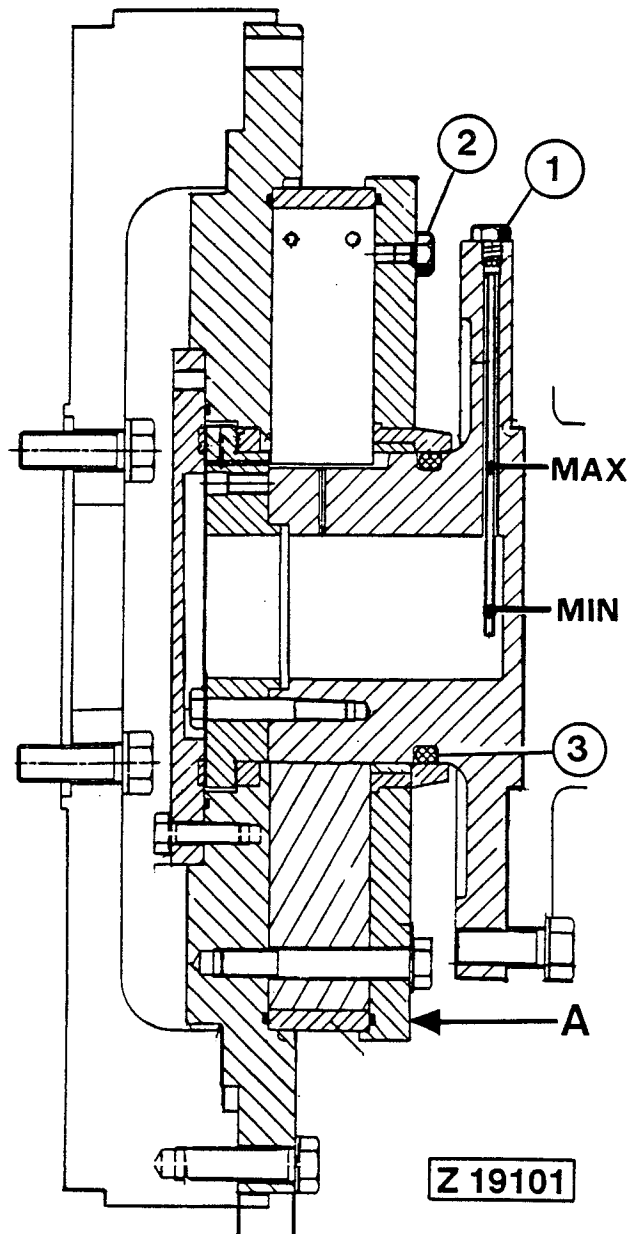
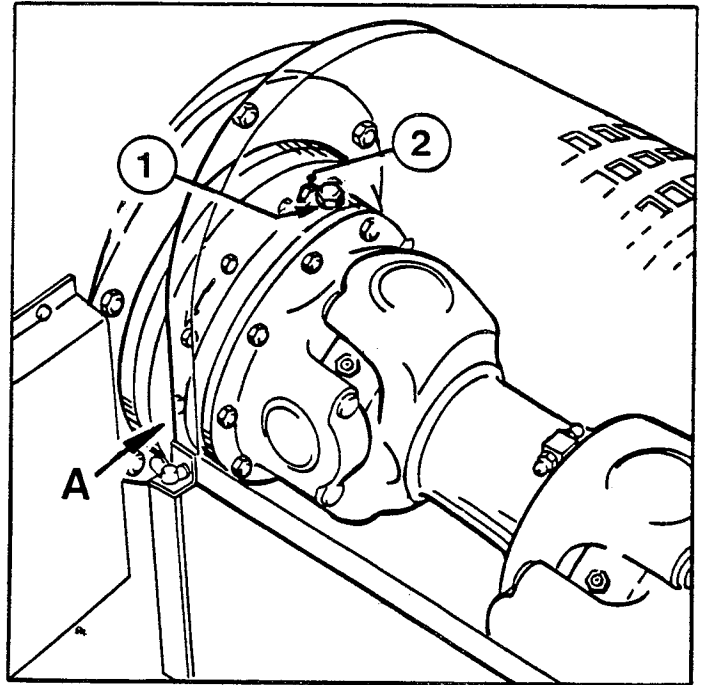
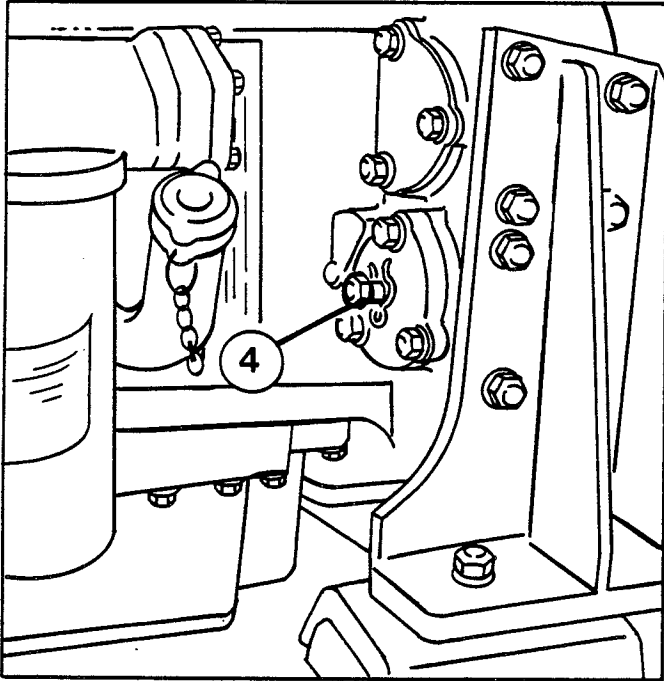


Z 19120

72. Fuel tank, illust. (Z 19120)

- (1) Fuel tank
- (2) Filler cap
- (3) Fuel level sight gauge
- (4) Sender unit
- (5) Drain plug
- (6) Fuel shut-off cock
- (7) Fuel supply line
- (8) Fuel return line

- Drain water and sediments from fuel tank.  
Attach drain hose and open drain plug (5). Collect out-flowing sediments in a suitable container.
- When servicing the fuel system close fuel shut-off cock (6).  
After finishing the service, open cock (6) and vent the fuel system according to the engine maintenance manual.  
Check to make sure all fuel lines and connections (7 and 8) are in good condition.  
Check the complete fuel system for leaks.

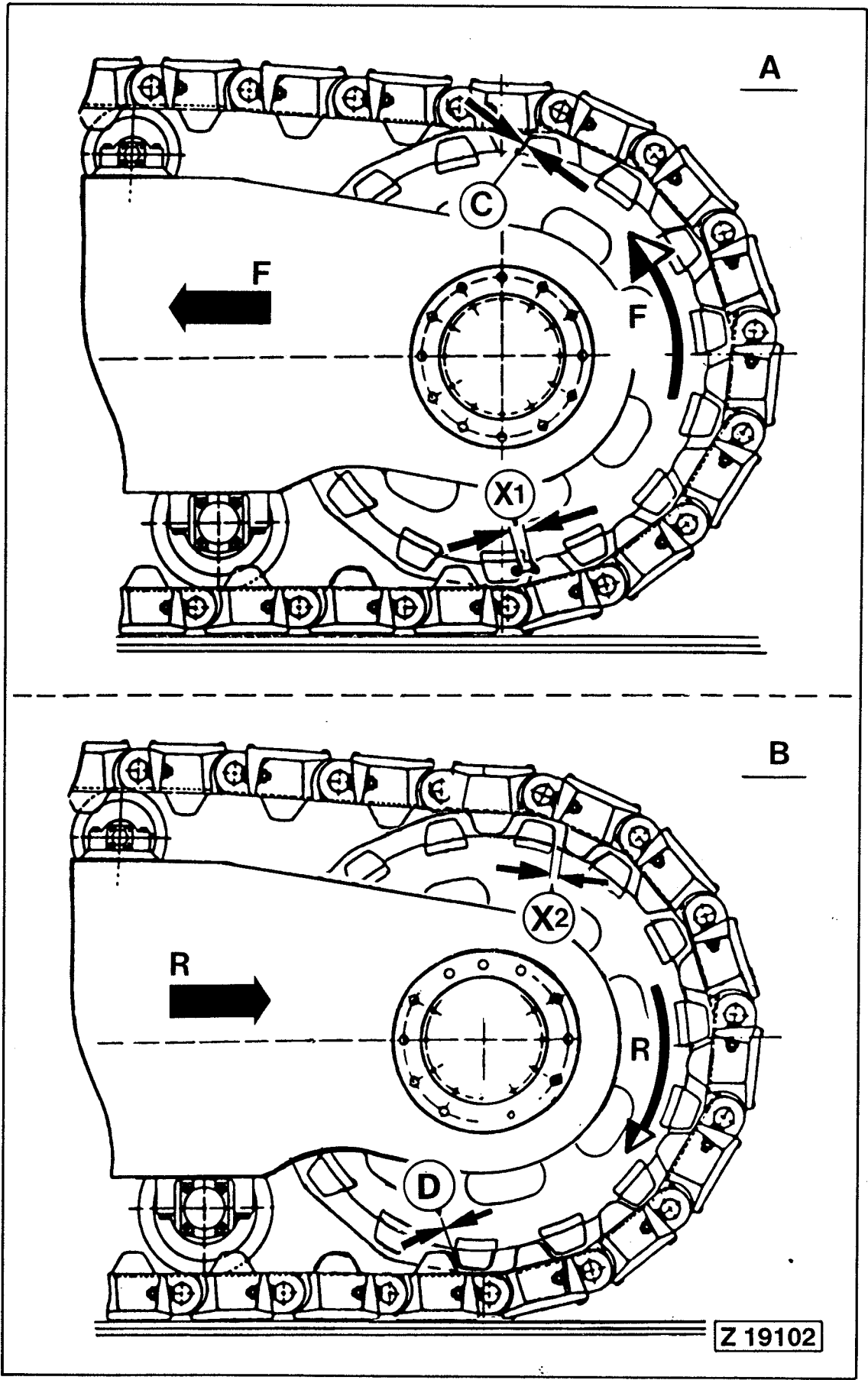


73. Flexible coupling

Check oil level, illust. (Z 19101)

1. Turn flexible coupling with drive bolt (4) to bring oil level gauge (1) in its uppermost position.
2. Unscrew gauge (1), wipe it clean and insert without tightening. Pull out and read the oil level.
3. If necessary add oil through gauge opening to bring the oil level up to the "MAX" mark on gauge (1). To speed-up filling remove bleeder screw (2).
4. Insert gauge (1) with packing ring and bleeder screw (2) with packing ring and tighten securely.
5. Check area (A) for leakage. If oil leakage is found (radial traces of oil), O-ring (3) must be checked for damage and replaced if necessary.





74. Preventive track inspection, illust. (Z 19102)  
General

The preventive track group inspection provides data helpful to determine the wear of track group components.

Therefore, it will be possible to plan the ordering date of an oversize sprocket.

Point of inspection:

A - Gap between sprocket - and track pad tooth in lower position (forward travel), measurement (X1).

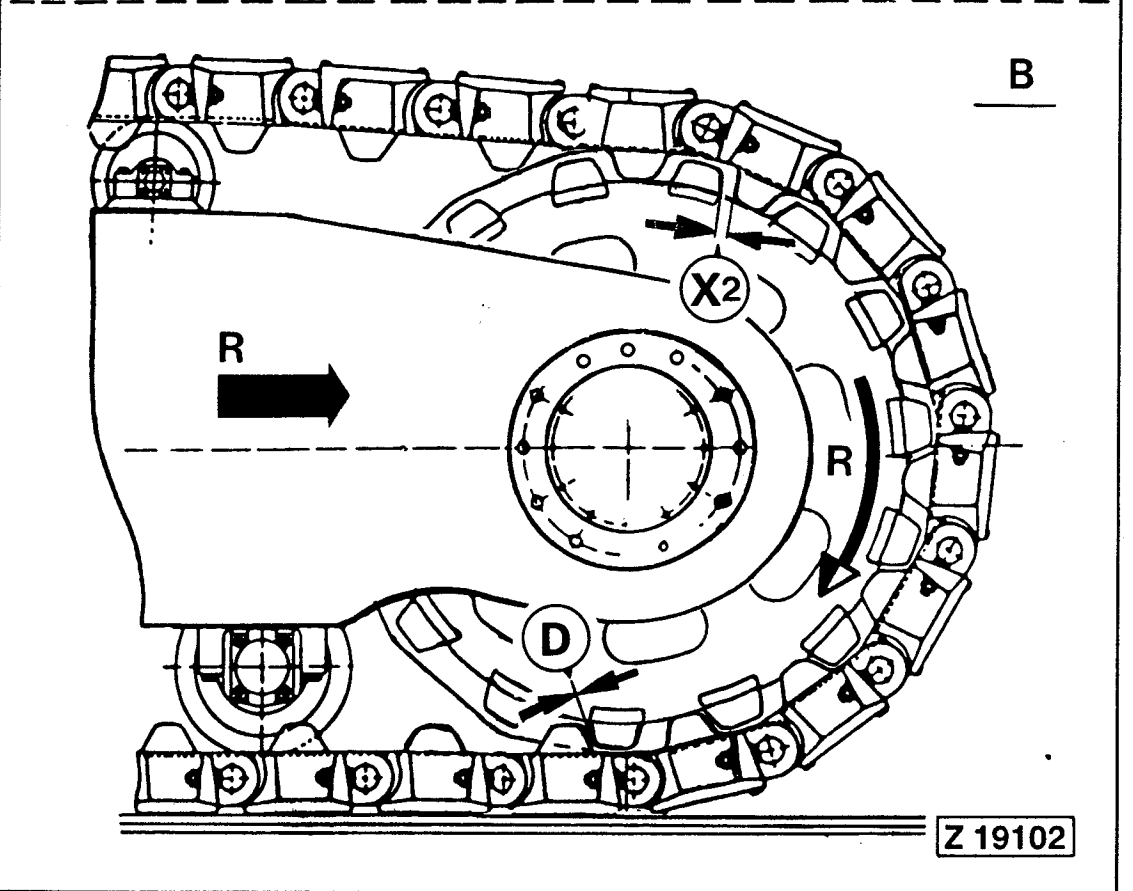
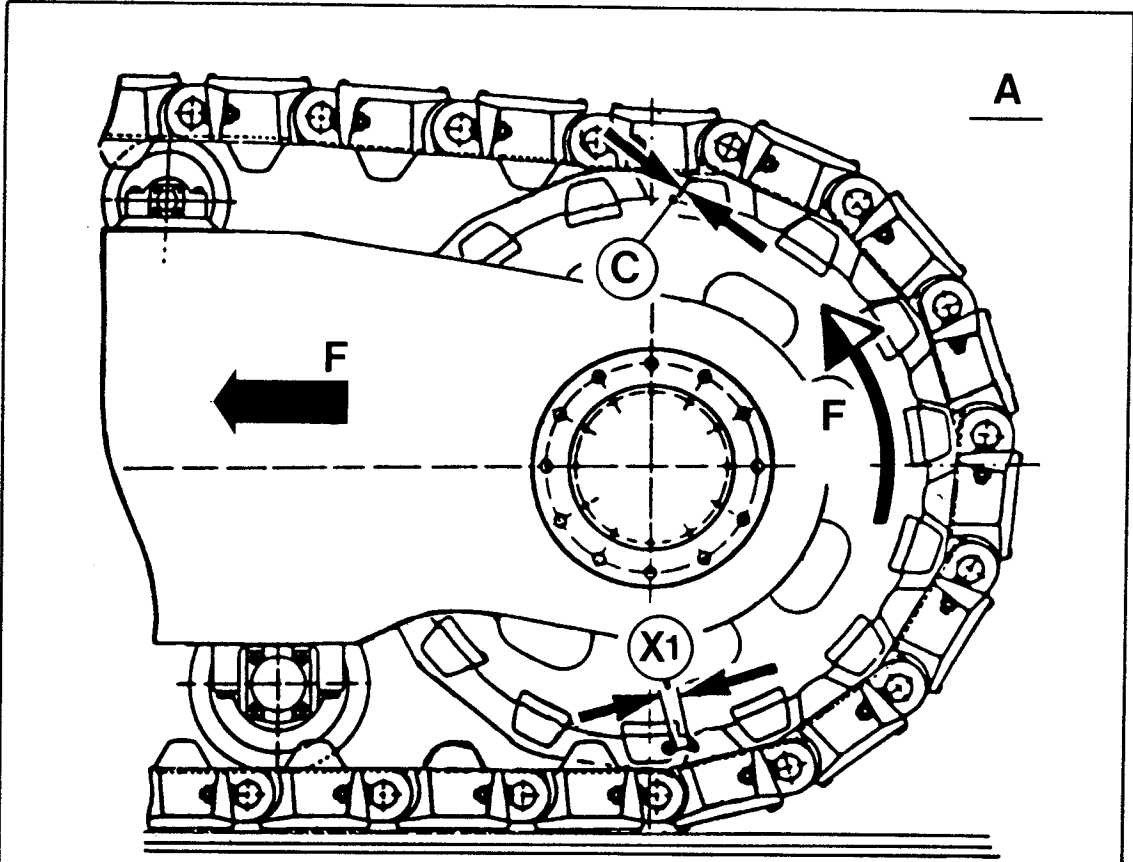
B - Gap between sprocket - and track pad tooth in upper position (reverse travel), measurement (X2).

Record the measuring results (X1 and X2) on the form sheets following the measuring instructions.

Measuring procedure

1. Make sure track groups are clean and track tension is correct.
2. Move machine forward (sprocket rotation "F") until the first upper sprocket tooth contacts a track pad tooth view "A" position (C).

continued



Cont'd

Preventive track inspection, illust. (Z 19102)

3. Measure gap (X1) between the bottom sprocket tooth and pad tooth as shown in the illustration. Measure at inside and outside of sprocket.

Record the measuring results on the form sheet.

4. Back-up the machine (sprocket rotation "R") until the first lower sprocket tooth contacts a track pad tooth view "B", position (D).

5. Measure gap (X2) between the upper sprocket tooth and pad tooth as shown in the illustration. Measure at inside and outside of sprocket.

Record the measuring results on the form sheet.

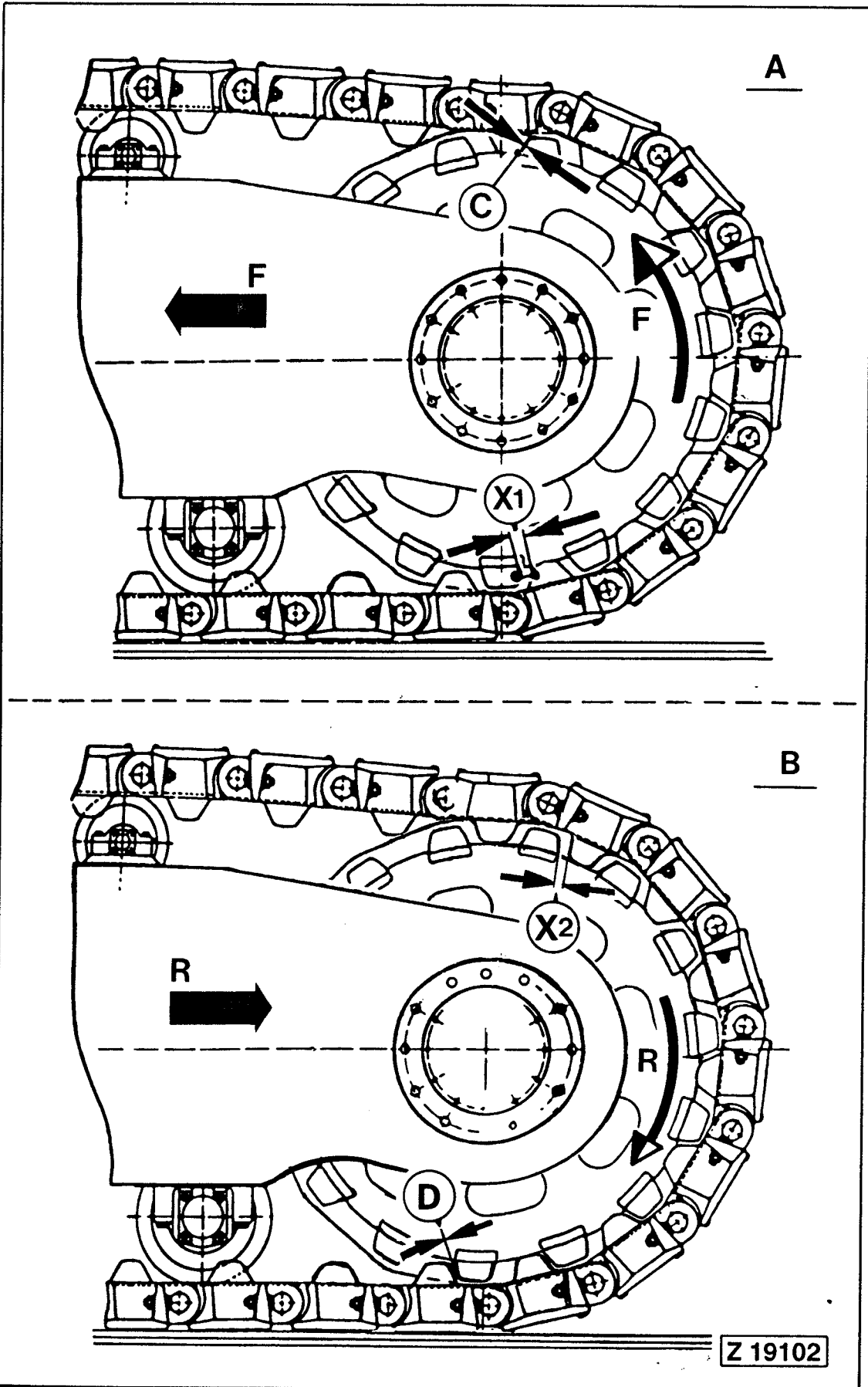
Note:

The determination of the power transmitting tooth faces (C and D) is easier when the machine is moving slowly by watching the meshing of sprocket - and pad teeth.

The resulting gaps (X1 and X2) on the opposite side can also be determined more exactly.

6. Repeat measurements (X1 and X2) at the opposite sprocket (inside and outside) and record the measuring results.

continued



Cont'd

Preventive track inspection, illust. (Z 19102)

Notes:

1. The measuring results recorded over a prolonged period will provide you with a calculation basis for early planning of track repairs or ordering date of oversize sprockets.
2. If you need additional information about the track wear evaluation please contact our Service Department No. 8012 through the regular service channels.

Forward copies of the filled out record sheets with all measuring results (X1 and X2) to the Service Department for quick reference.

Give as much information as possible concerning track repairs, installation of oversize sprockets, operating conditions etc.



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74.1 Preventive track inspection

R E C O R D   S H E E T

L.H. sprocket measuring results

Excavator serial number : .....

Date of inspection : .....

Operating hours on hour meter : .....

Record measuring results:

VIEW "A" illust. (Z 19102)

Contact at point "C"	sprocket	
	inside	outside
Gap (X1) mm :		

VIEW "B" illust. (Z 19102)

Contact at point "D"	sprocket	
	inside	outside
Gap (X2) mm :		

- Minimum permissible dimensions (X1 and X2) 0,5 mm.

Conclusion:

If one of the measuring results is 0,5 mm or less an oversize sprocket should be installed to prevent damage to the track components.





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74.1 Preventive track inspection

R E C O R D   S H E E T

R.H. sprocket measuring results

Excavator serial number : .....  
 Date of inspection : .....  
 Operating hours on hour meter : .....  
 Record measuring results:

VIEW "A" illust. (Z 19102)

Contact at point "C"	sprocket	
	inside	outside
Gap (X1) mm :		

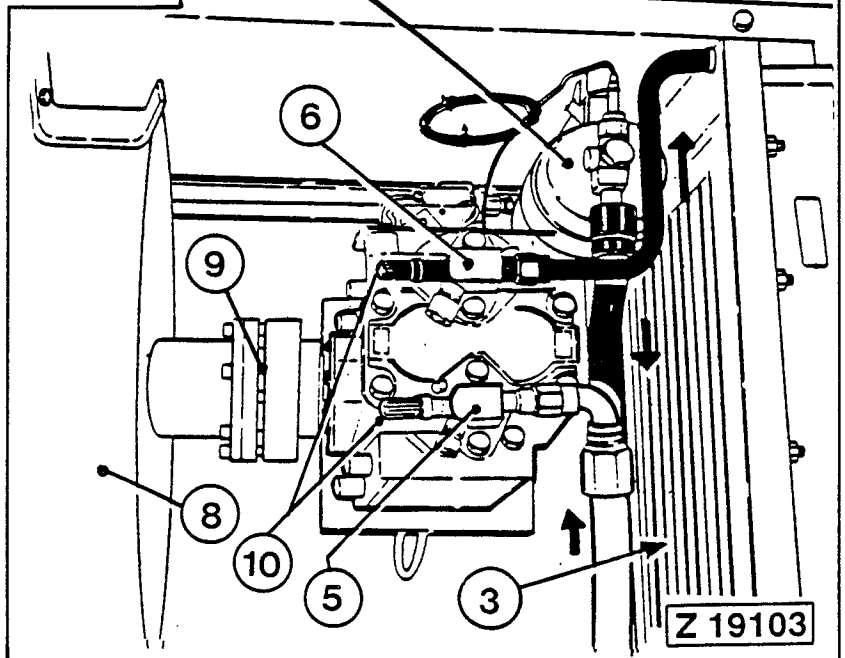
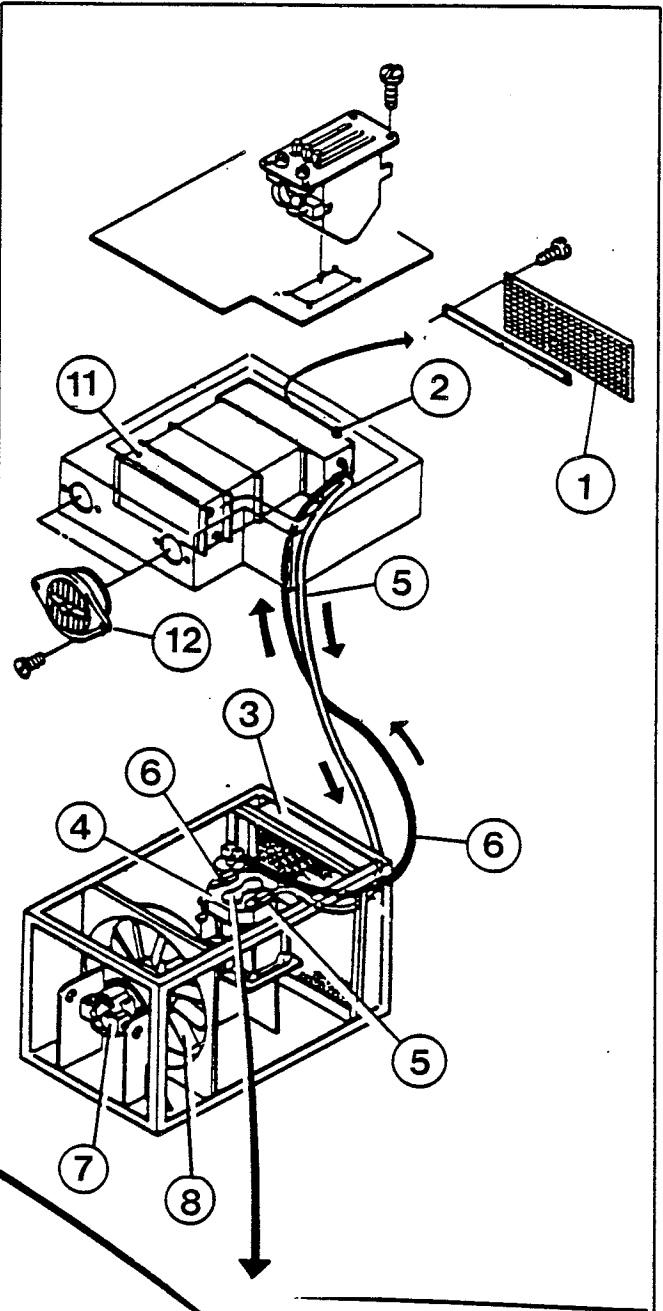
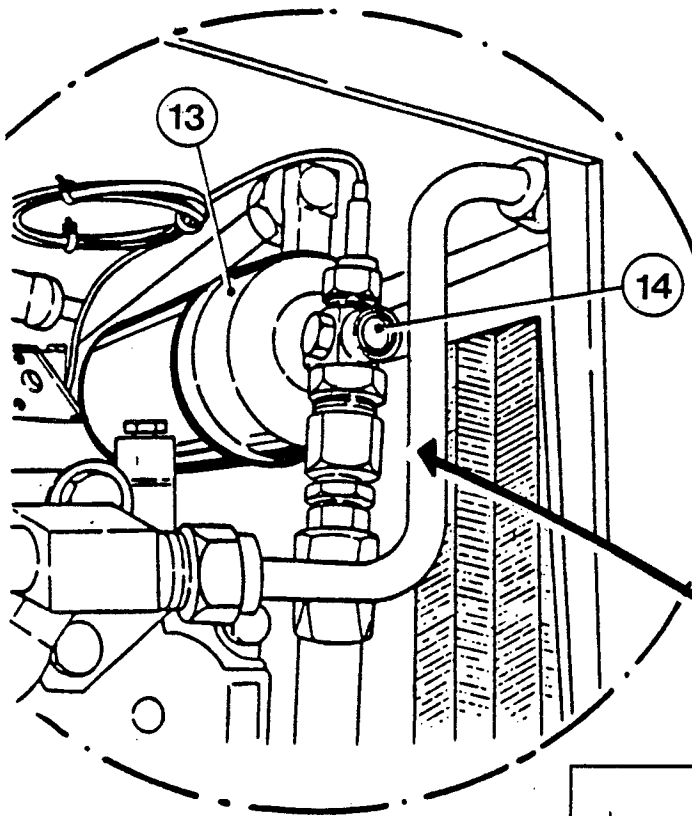
VIEW "B" illust. (Z 19102)

Contact at point "D"	sprocket	
	inside	outside
Gap (X2) mm :		

- Minimum permissible dimensions (X1 and X2) 0,5 mm.

Conclusion:

If one of the measuring results is 0,5 mm or less an oversize sprocket should be installed to prevent damage to the track components.



Z 19103

75. Air conditioning

Legend for illust. (Z 19103)

- (1) Air inlet screen
- (2) Evaporator
- (3) Condenser
- (4) Compressor
- (5) Low pressure (suction) line
- (6) High pressure line
- (7) Hydraulic motor
- (8) Blower
- (9) Flexible coupling
- (10) Service valves
- (11) Heater unit
- (12) Air louvers (warm air)
- (13) Refrigerant tank (dryer)
- (14) Inspection glass

Checking the refrigerant level:

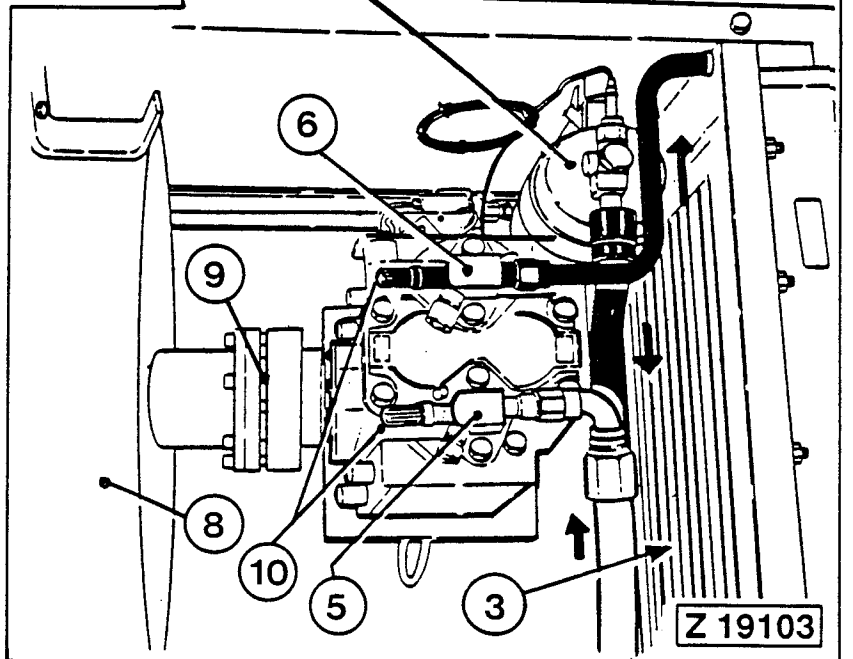
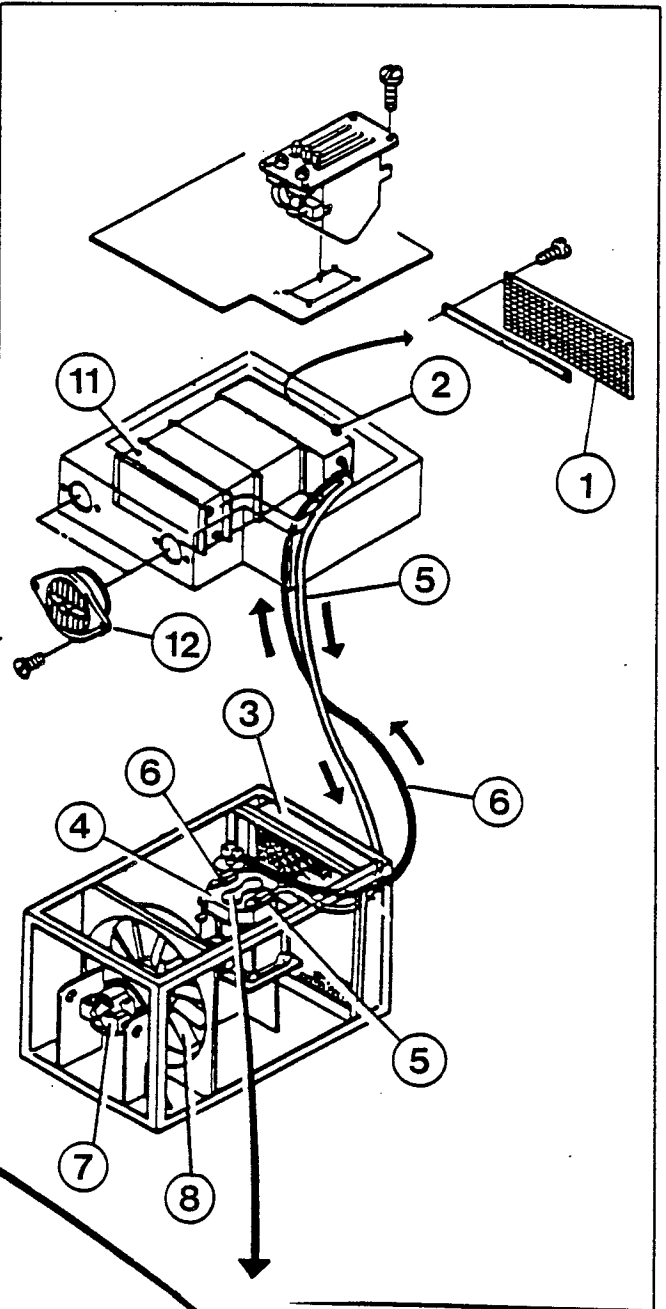
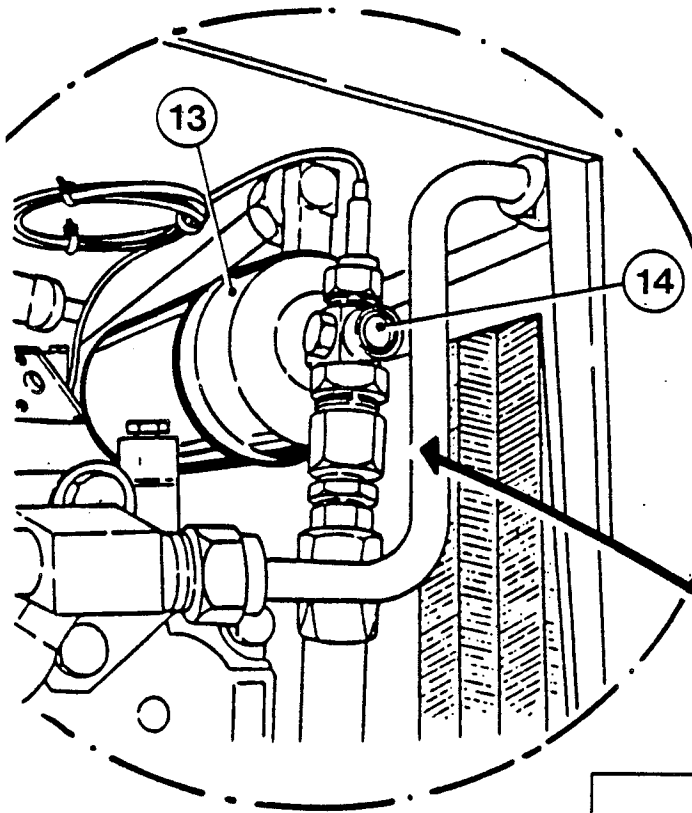
Switch on air conditioning equipment and run at maximum capacity for approx 5 minutes.

Observe inspection glass (14) at refrigerant tank (13). A refrigerant flow laden with bubbles or foam indicates a lack of refrigerant. In this case well equipped refrigeration specialists must check the circuit for tightness and must add the missing quantity of refrigerant. If more than 200 grams per year are lost check also oil level in compressor.

Isolated small bubbles in the inspection glass may be neglected.

Even with an absolutely tight equipment a certain amount of refrigerant is lost through the walls of the hoses. Therefore a small annual replenishment of the refrigerant quantity is normal.

continued



Cont'd

Air conditioner, illust. (Z 19103)

- Check hose connections (5 and 6) of refrigeration circuit

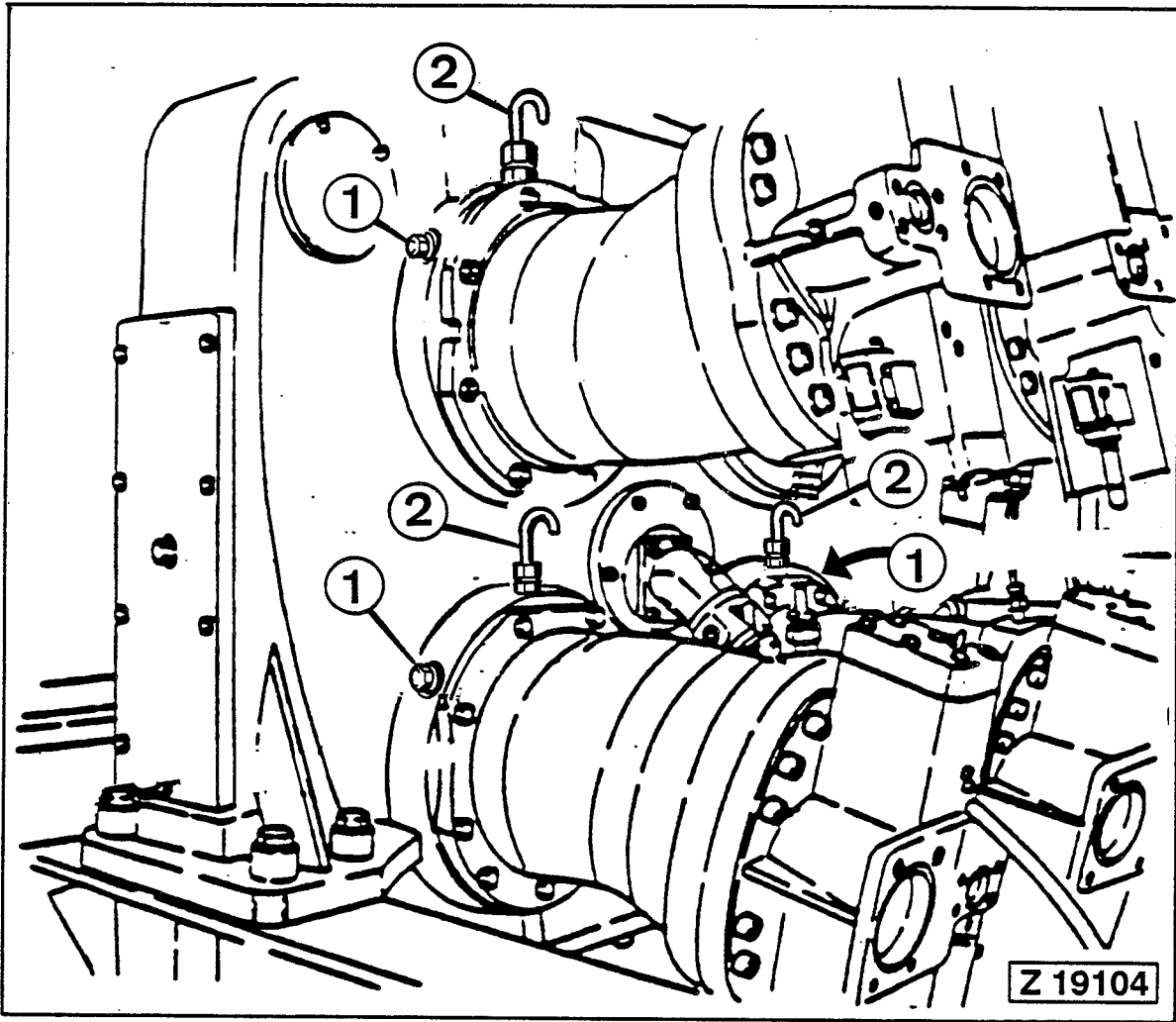
If leaky or loose hose connection are found they must be tightened. In this case refrigerant losses may have occurred. Check refrigerant level.

- Check functioning of fan motor in air conditioning unit (2)
- Check for proper operation of hydraulic motor (7), blower (8), and coupling (9).

These checks must be made by switching on the air conditioning equipment.

Caution!

Servicing of the air conditioner system is restricted to workshops especially equipped for this purpose.



76. Main hydraulic pump drive shaft housings, illust. (Z 19104)

Check oil level of the four main pump housings.

- (1) Oil level plugs
- (2) Oil filler plugs with breather pipe

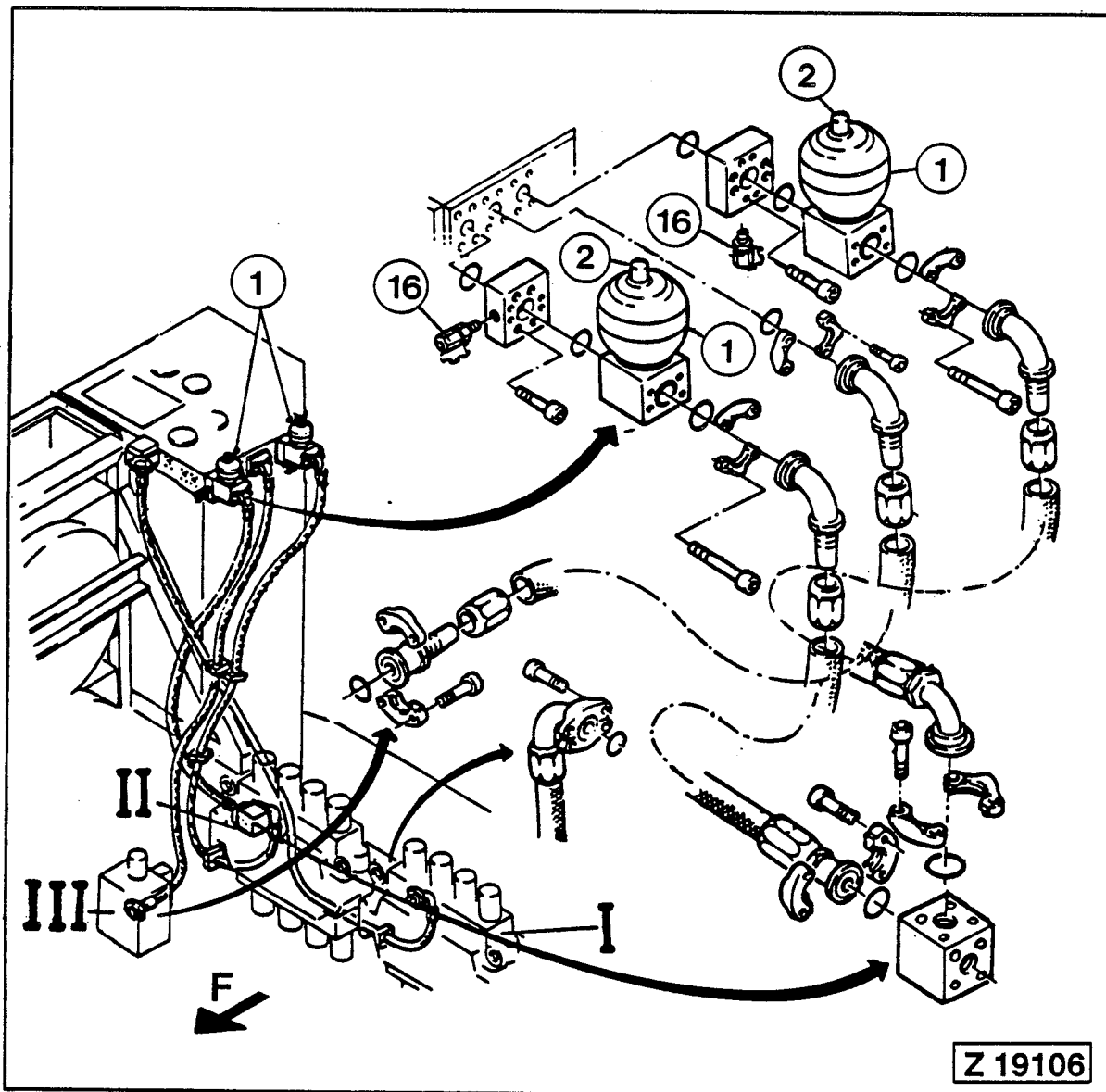
Oil level should reach up to level plug opening (1). If necessary remove filler plug with breather pipe (2) and add oil through filler opening.

Reinstall plugs (1 and 2) and tighten securley.

Note:

If oil starts dropping out at one of the breather pipes (2) the oil seal ring of the respective pump drive shaft must be checked and replaced if necessary.





77. Pressure accumulators for return oil

Legend for illust. (Z 19106):

Control blocks (I, II and III)

(1) Accumulators

(2) Test- and refilling connectors

(16) Connectors for pressure relief of return oil lines

Specifications

Accumulator charging pressure: 1,0 + 0,5 bar

Medium : air or nitrogen

Hydraulic oil filling : 300 cm<sup>3</sup>, each

General

For checking the pressure use testing and refilling device shown on next page, illust. (C) item no. (20).

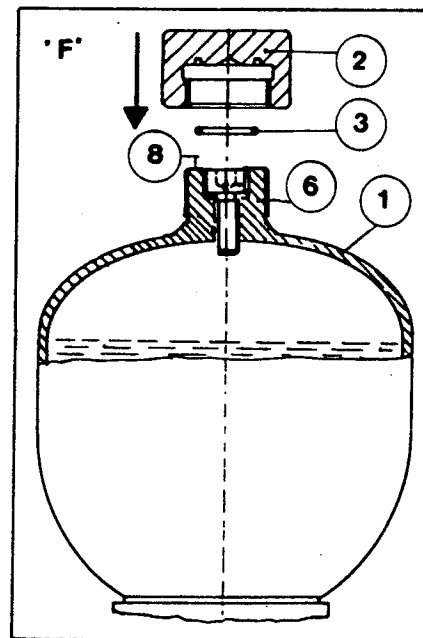
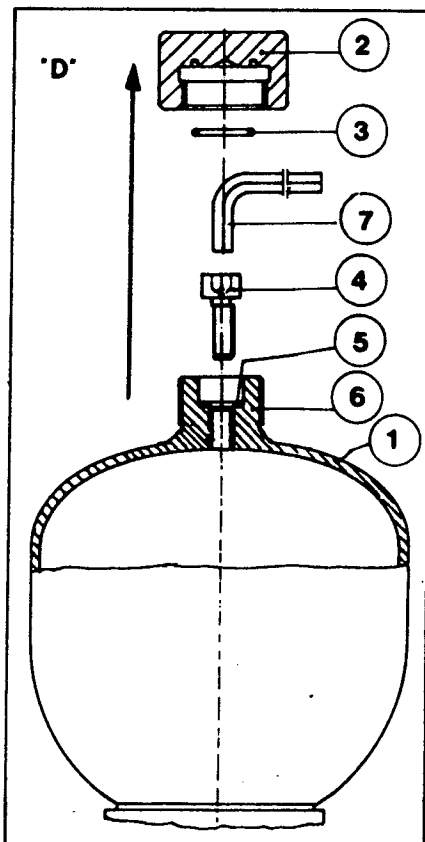
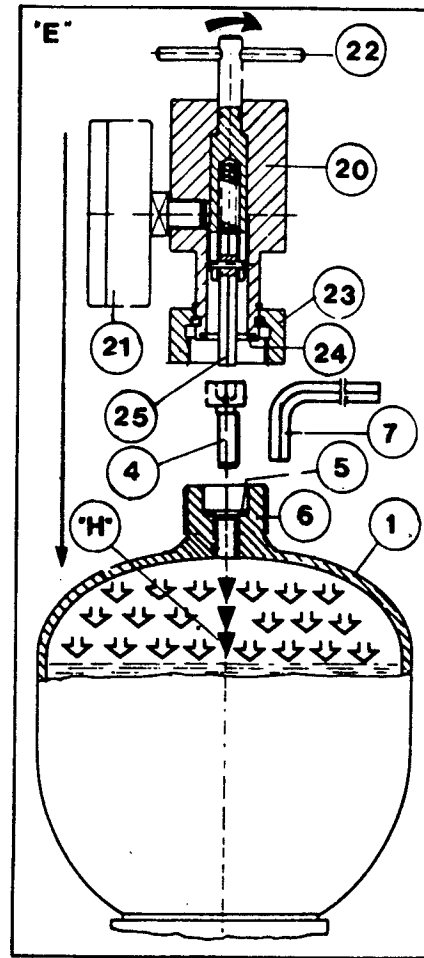
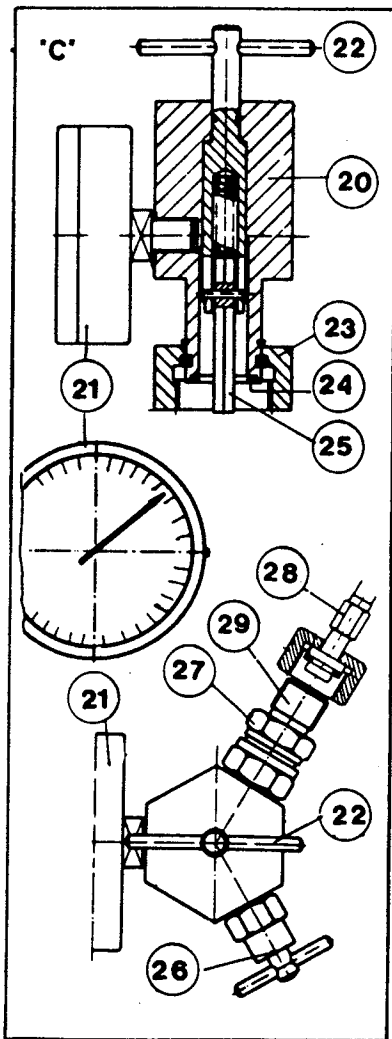
Proceed according to the description on next page.

Note:

If pressure loss is found remove the accumulator check for leakage and rectify the cause.

Fill accumulator with hydraulic oil and charge to the correct pressure, see specifications.

continued



Cont'd

Pressure accumulator

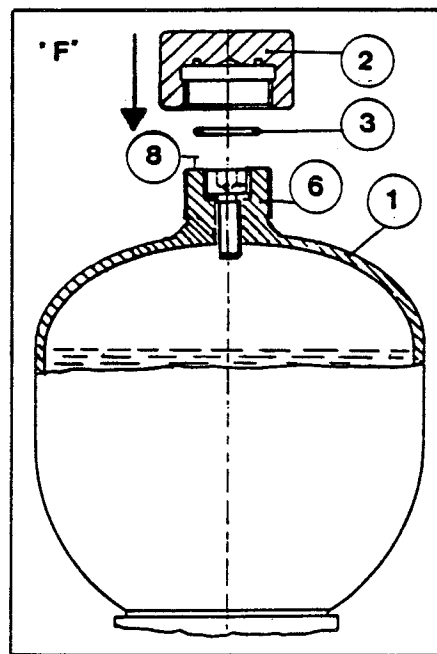
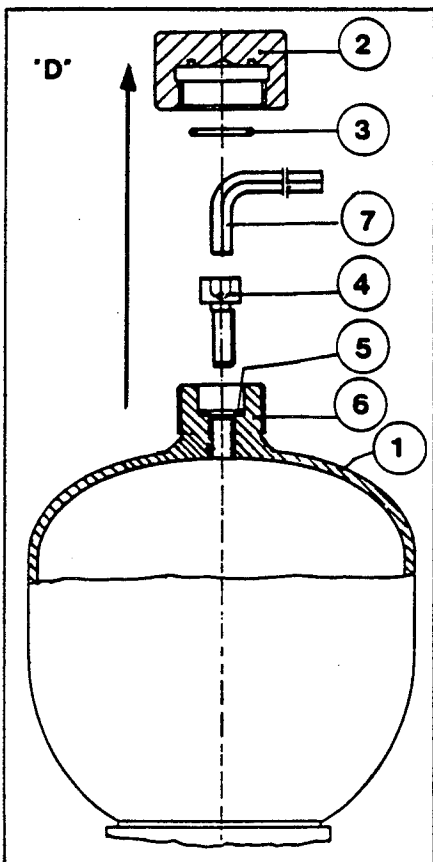
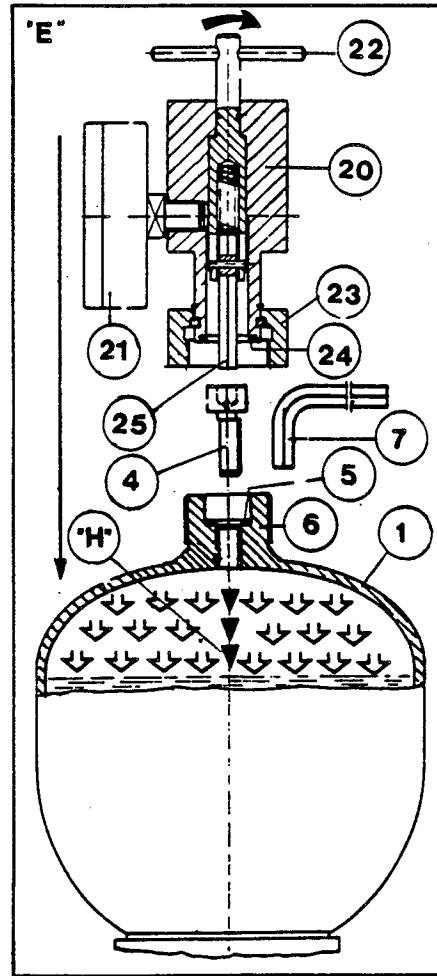
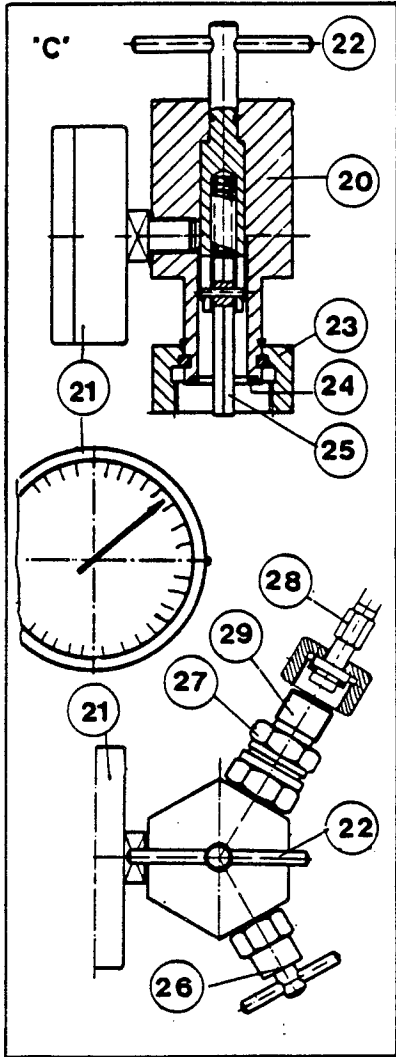
Legend for illust. (Z 19107) view "C"

- (20) Testing and refilling device
- (21) Pressure gauge 0 to 10 bar
- (22) Spindle
- (23) Union nut
- (24) O-ring
- (25) Allen head wrench
- (26) Relief valve
- (27) Check valve (gas)
- (28) Filling hose
- (29) Filling port

Check accumulator pressure, see illust. (Z 19107) view "C" and "D"

1. Place attachment on the ground, shut off the engine, and relieve pressure in the hydraulic system.
2. Connect drain hose with union nut to adapter (16) illust. (Z 19106) on previous page and drain oil to relieve hydraulic pressure acting on the accumulator diaphragm.
3. Carry out same procedure on the second accumulator.
4. Screw off cap (2) view "D" with O-ring (3) from valve head (6).
5. Fit testing and refilling device view "C" with union nut (23) to the valve head (6).
6. Loosen socket head screw (4) with spindle (22). After the first reaction of the pointer on the gauge (21), turn the spindle (22) for another full turn. The pressure gauge now indicates the accumulator pressure (21).
  - 6.1 If accumulator pressure is correct (1,0 + 0,5 bar), tighten screw (4) with spindle (22) of the testing device (20) and continue according to step no. 9.
  - 6.2 If accumulator pressure is not within specification, check for leakage and rectify the cause. Replace oil filling "H" (300 cm<sup>3</sup>).
7. Attach testing device again and refill accumulator to the correct pressure with nitrogen or air only.

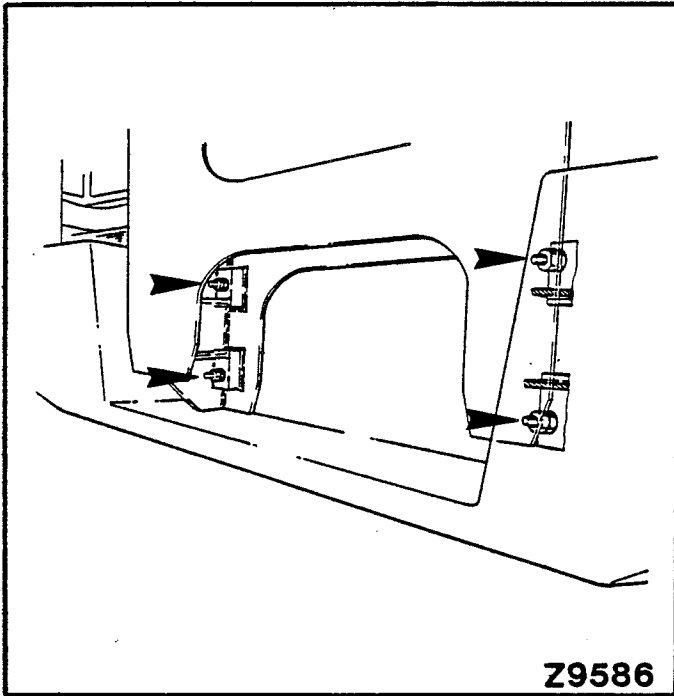
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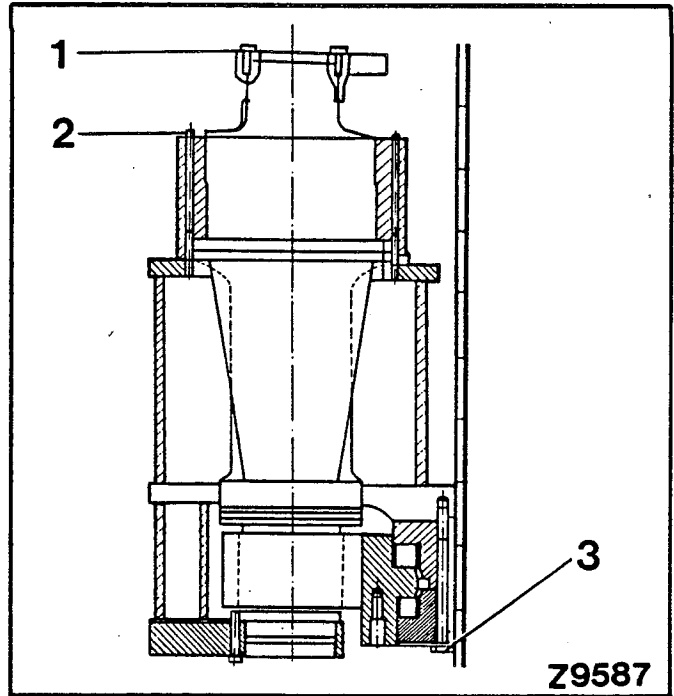
Cont'd

Pressure accumulator

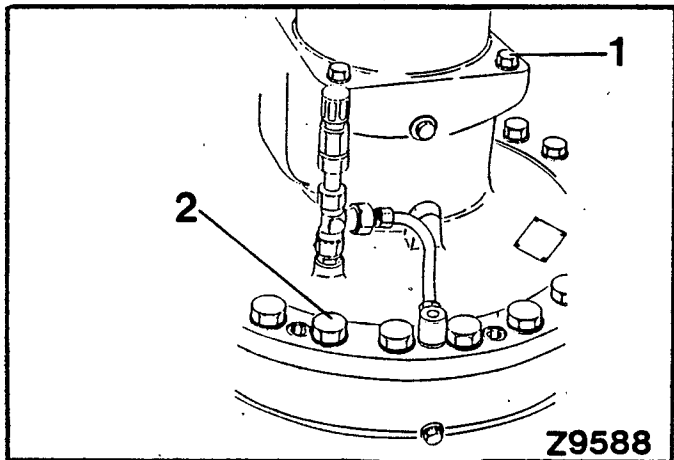
8. Fill as follows:
  - Connect filling hose (28) to the port (27) of testing device (20).  
After opening screw (4) with spindle (22) increase the pressure up to the required value (pressure gauge reading) with an air pump or nitrogen bottle.
  - Tighten screw (4) with spindle (22).
  - After waiting for appr. 5 min., check the pressure again. If required - correct.
9. Loosen union nut (23) and remove testing and refilling device (20).
10. Tighten screw (4) with allen head wrench (7) size 6 mm.  
Tightening torque: 11 Nm.
11. Check the accumulator (1) for leakage by applying spray or soapy water.
12. Screw on cap (2) with O-ring (3) to valve head (6) and tighten by hand.



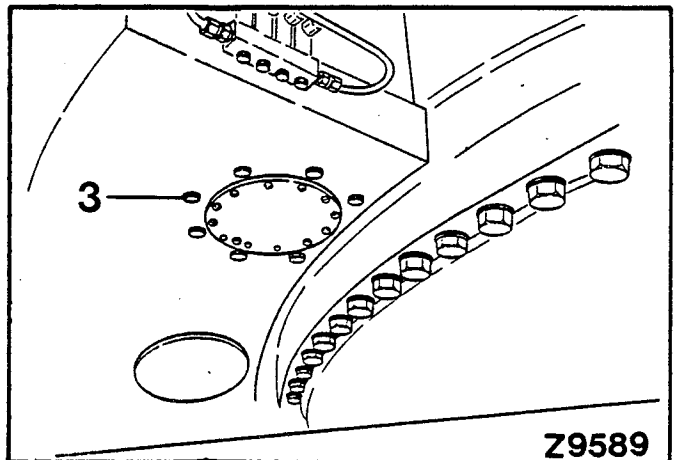
Z9586



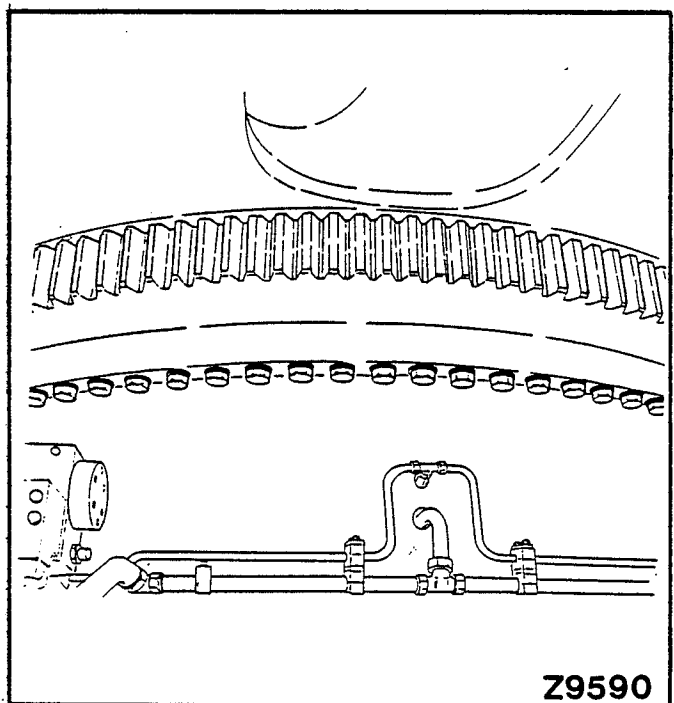
Z9587



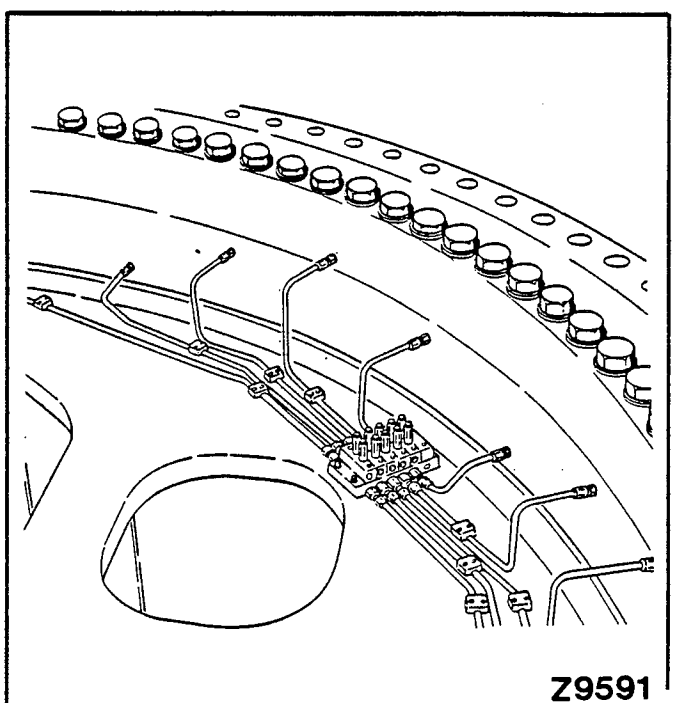
Z9588



Z9589



Z9590



Z9591



80. High-strength bolt connections

Retighten high-strength bolt connections according to the following table:

Note:

Bolts inserted with oil on thread and head.

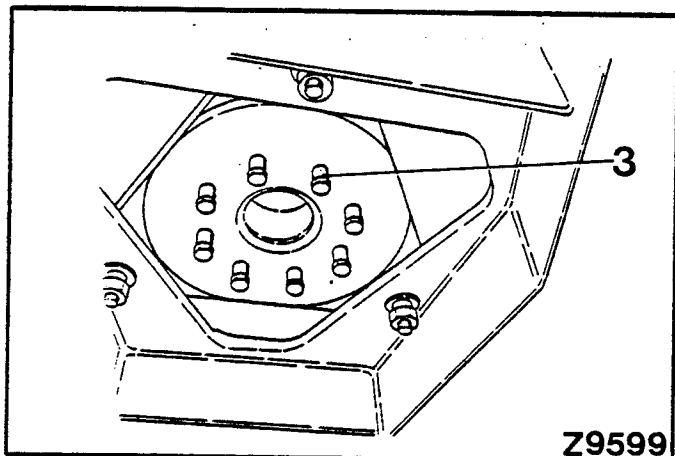
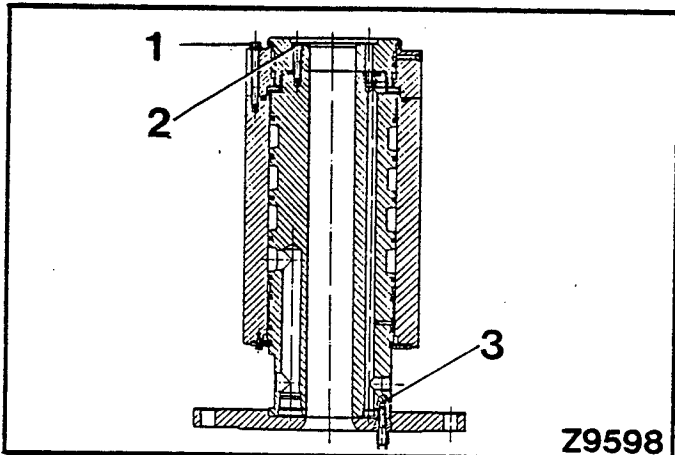
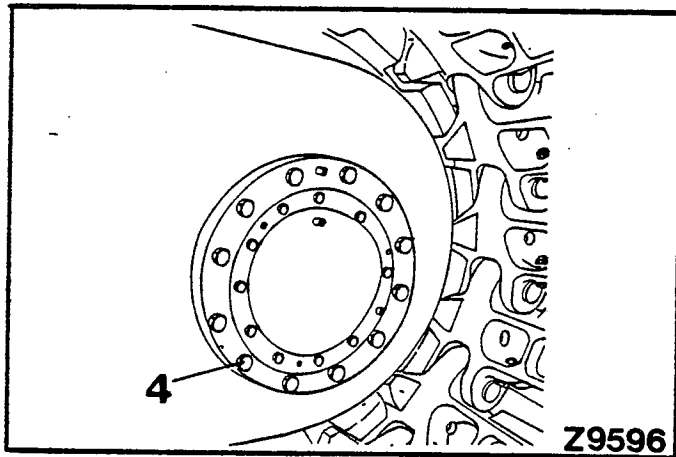
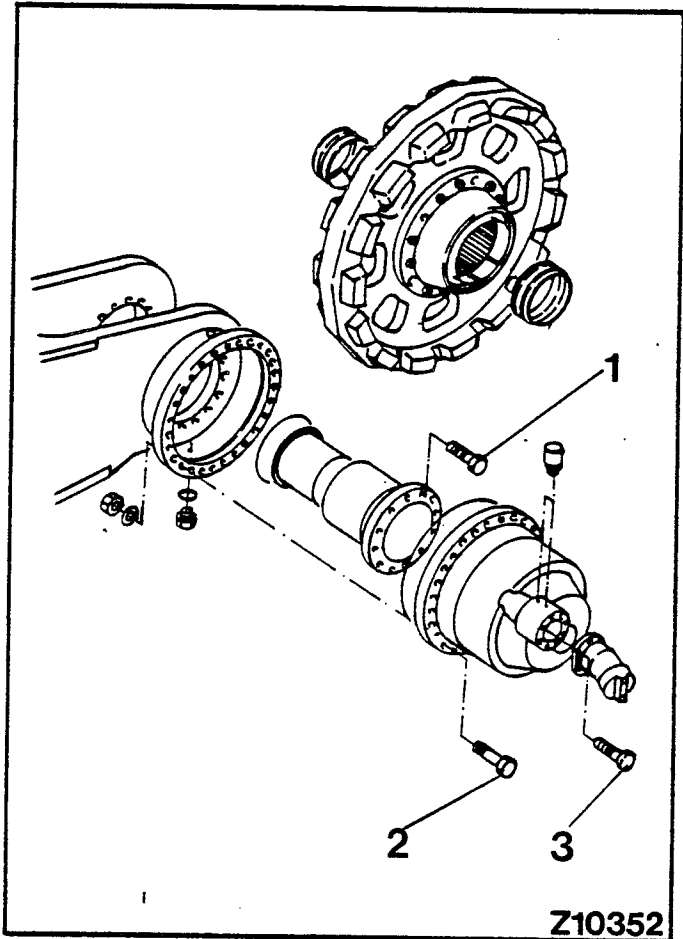
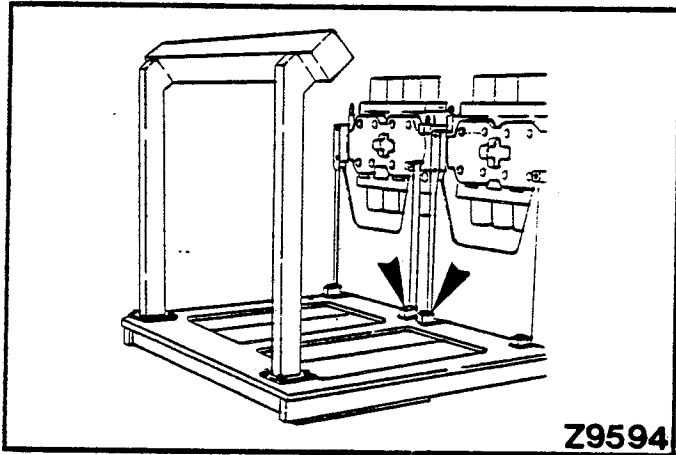
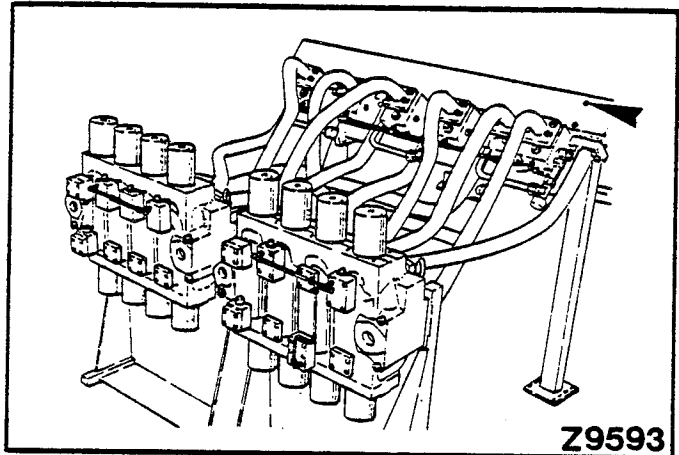
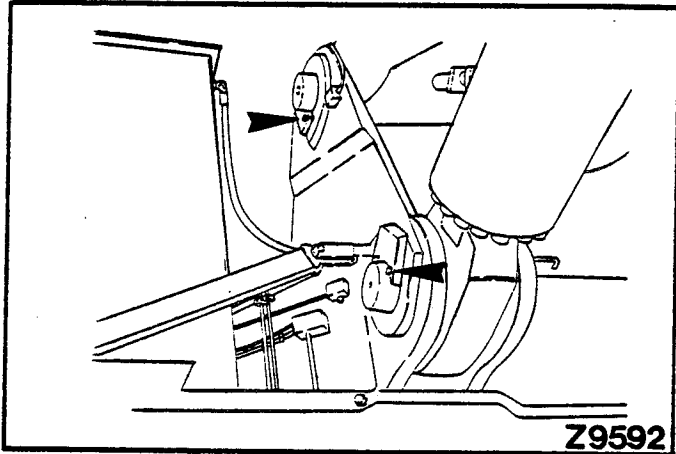
Unit	Bolt size mm	DIN Std.	Grade	SW* (mm)	Tightening torque Nm (mkp) with:	
					Wrench	Impact wrench
Counterweight (Z 9586)	M36 x 640	931	10,9	55	./.	3000 (306 mkp)
Slewing gear (Z 9587, Z 9588 Z 9589)	M20 x 55	933	8,8	30	./.	350 ( 37 mkp)
	M24 x 330	931	10,9	36	./.	840 ( 85 mkp)
	M16 x 120	931	8,8	24	./.	178 ( 18 mkp)
Slewing joint upper and lower (Z 9590/Z 9591)	M36 x 370	./.	TL10,9	55	./.	For correct re- tightening pro- cedure refer to Service-Bulle- tin No. 21-192.
	M36 x 220	./.	10,9	55	./.	

\* SW = Wrench size

Note:

Retightening of slewing joint is only necessary after the first 1000 operating hours.







Note:

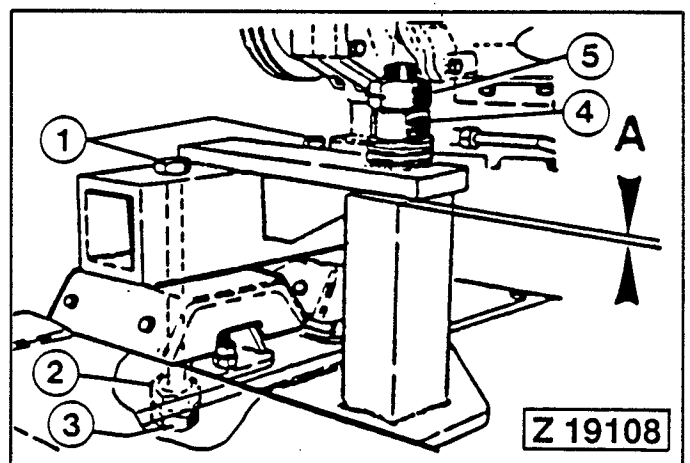
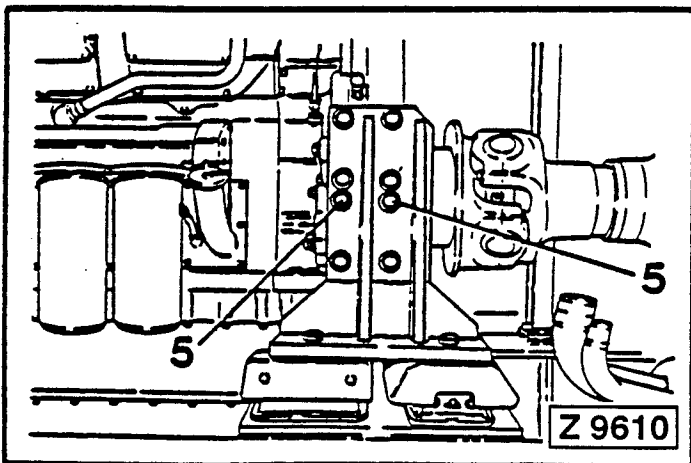
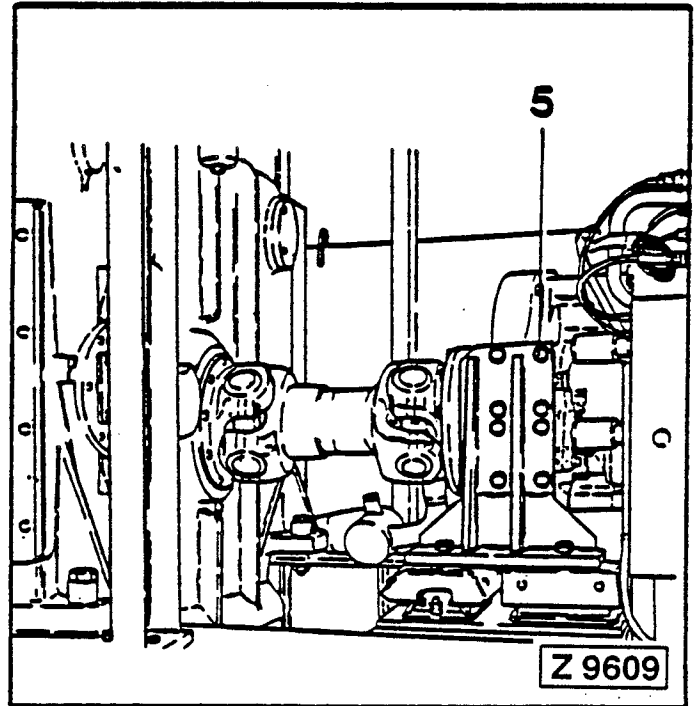
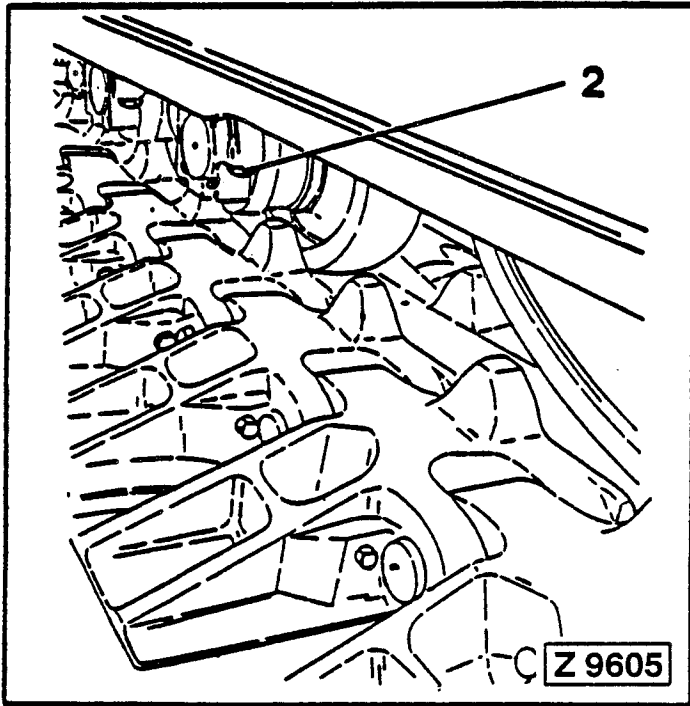
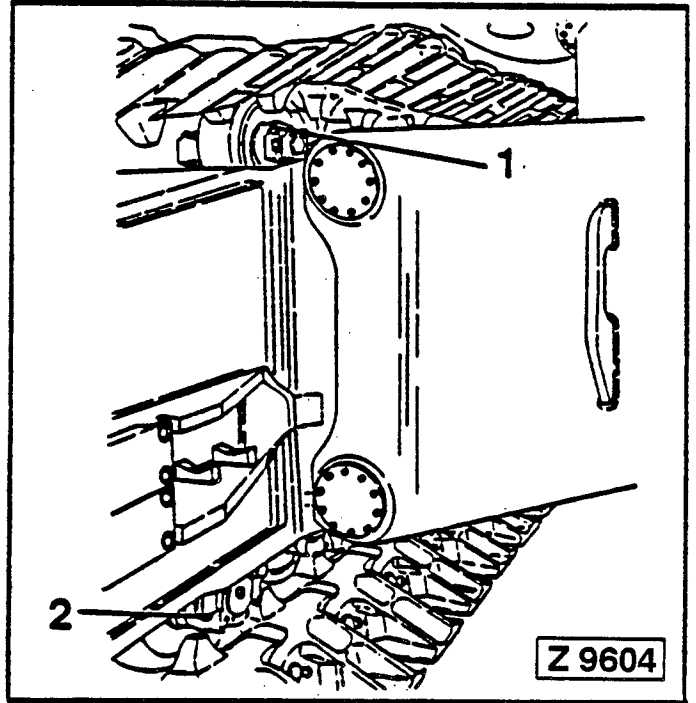
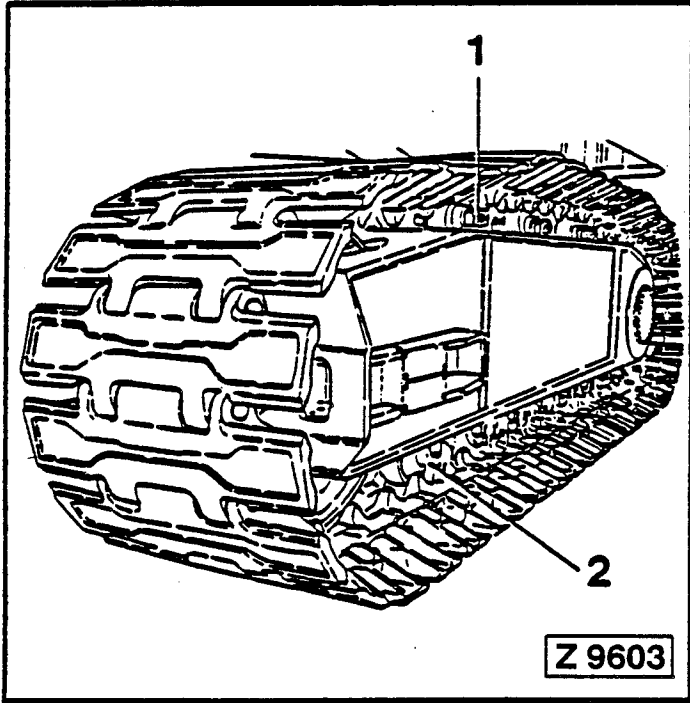
Bolts inserted with oil on thread and head.

Unit	Bolt size mm	DIN Std.	Grade	SW* (mm)	Tightening torque Nm (mkp) with:	
					Wrench	Impact wrench
Pin retainer base boom and base boom cy- linder (Z 9592)	M24 x 60	933	8,8	36	./.	600 (61,2 mkp)
Distributor block and con- trol block carrier (Z 9593/Z 9594)	M16 x 160	912	8,8	24	./.	178 (18 mkp)
	M20 x 100	931	8,8	30	./.	350 (37 mkp)
Travel gears 1) (Z 10352, Z 9596)	2) M30 x 110	931	8,9	46	./.	1192 (122 mkp)
	3) M36 x 160	931	10,9	55	./.	3000 (306 mkp)
	4) M20 x 60	933	8,8	30	./.	350 (37 mkp)
	M30 x 180	931	8,9	46	./.	1192 (122 mkp)
Rotary distributor (Z 9598, Z 9599)	1) M16 x 140	931	10,9	24	./.	250 (25 mkp)
	2) M16 x 70	912	10,9	24	./.	178 (18 mkp)
	3) M16 x 90	931	10,9	24	./.	250 (25 mkp)

\* SW = Wrench size

Note:

For re-tightening of bolts (1, Z 10352) the  
transmission assy must be removed.



Unit	Bolt size mm	DIN			Tightening torque Nm (mkp)	
		Std.	Grade	SW* (mm)	Wrench	Impact wrench
Track roller 1) and support roller (Z 9603, Z 9604, Z 9605)	M30 x 220		10,9	46	./.	1670 (170 mkp)
	M30 x 220	931	10,9	46	./.	1670 (170 mkp)
Engine mounting, rear (Z 9609, Z 9610)	3/4 - 10 UNCX6		10,9		./.	480 (49 mkp)
	M12 x 80	931	10,9	19	./.	105 (10 mkp)
	1/2 - 13 UNCX1		10,9		./.	135 (14 mkp)
	M18 x 45	933	10,9		./.	345 (35 mkp)
	5) 3/4 - 10 UNCK2		10,9		./.	480 (49 mkp)

Engine mounting, front

Legend for illust. (Z 19108)

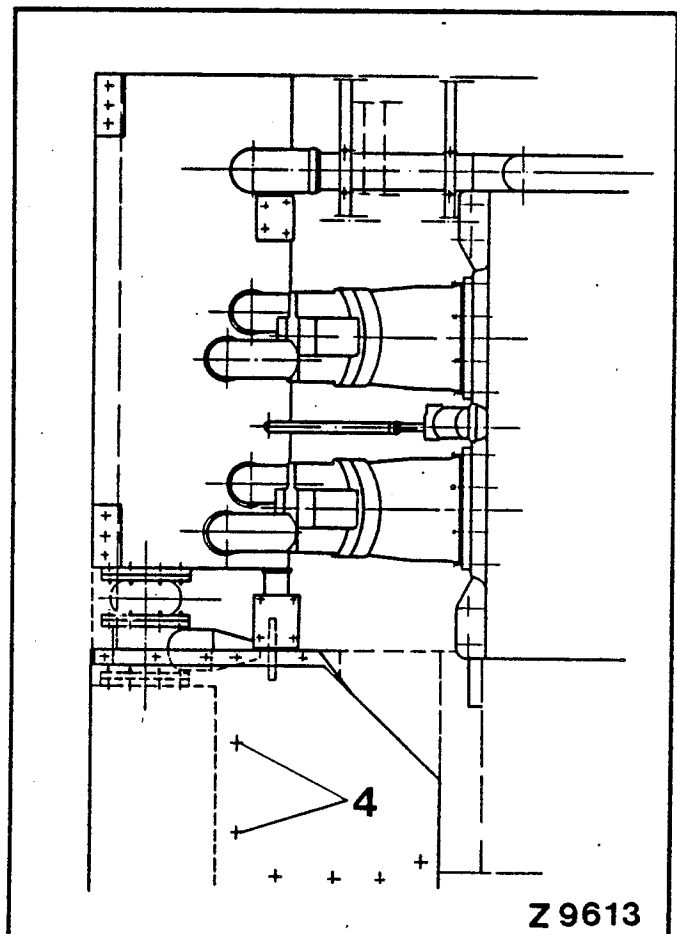
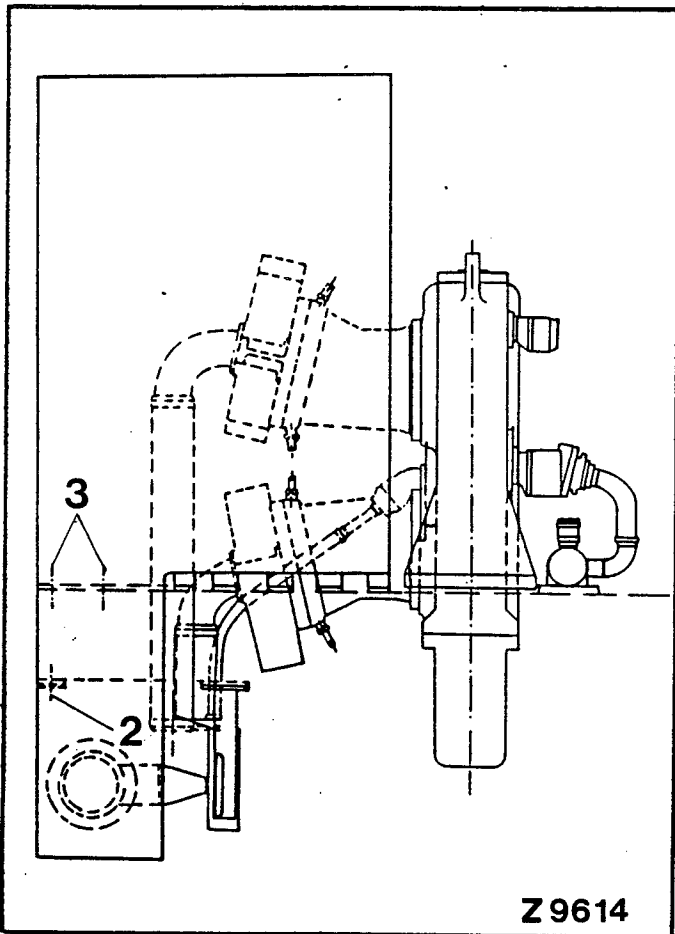
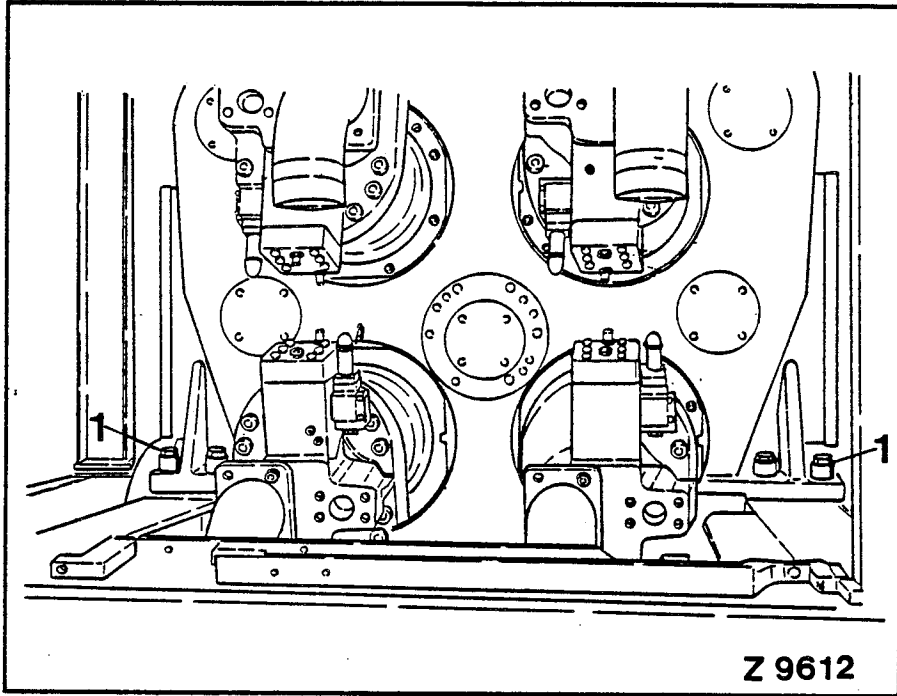
- (1) Tie bolts (quantity six; front, rear, LH and RH)
- (2) Retainer nuts of tie bolts (1), tighten snugly (torque: 5 Nm)
- (3) Lock nut

"A" Gap, approx 10 mm

- (4) Adjusting nut for "A"
- (5) Lock nut

Note:

- Check engine mounting for worn or damaged parts.
- Make sure that there is no contact of metal surfaces at engine mounting pads. Replace rubber elements if necessary.
- Check gap "A" and adjust if necessary.



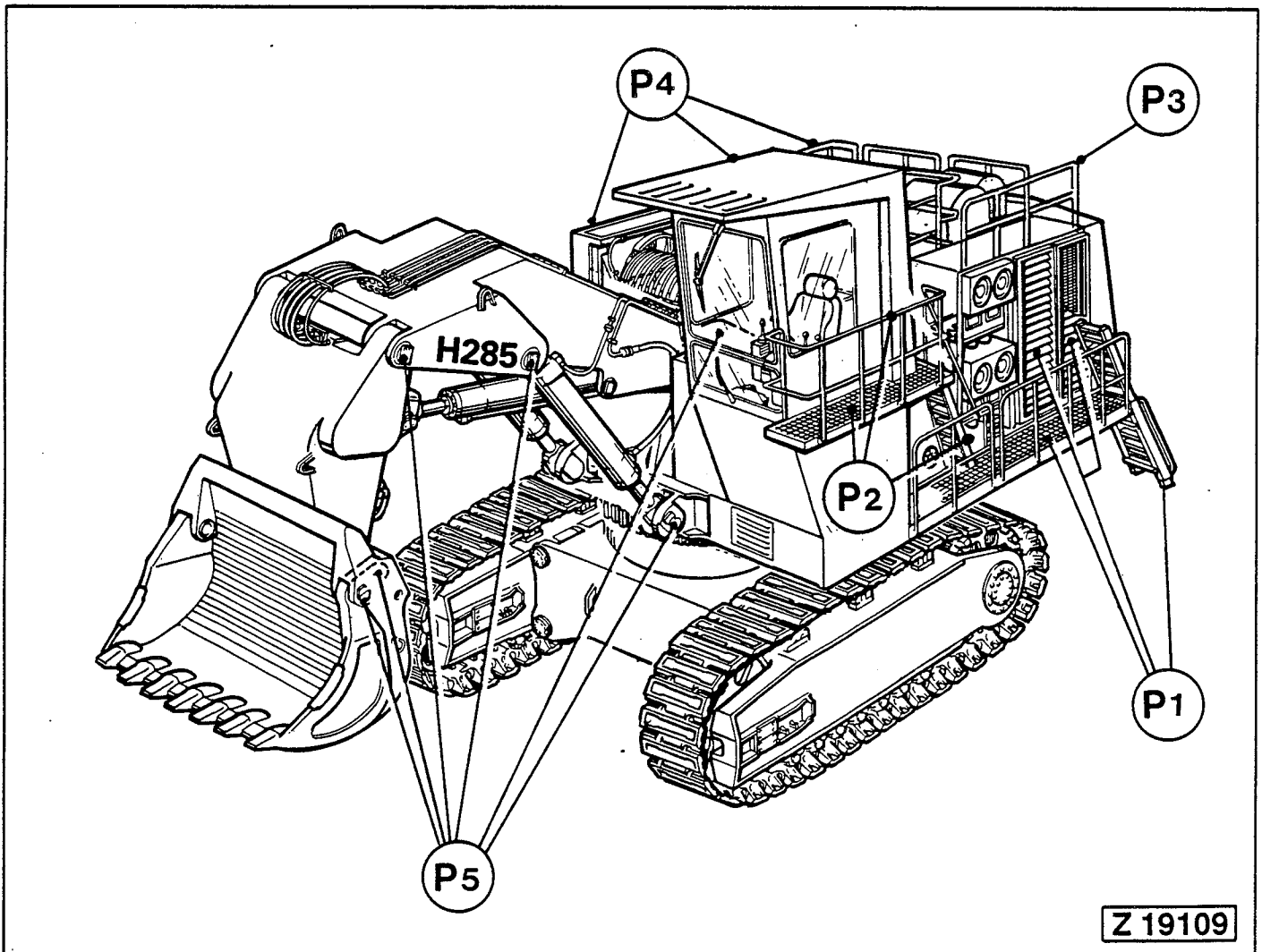
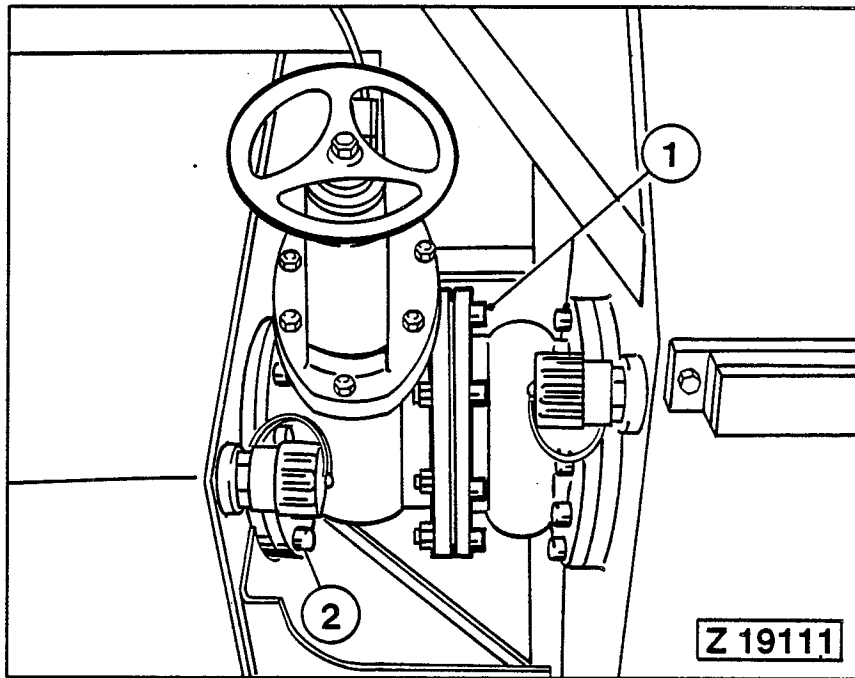


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Unit	Bolt size mm	DIN Std.	Grade	SW* (mm)	Tightening torque Nm (mkp)	
					Wrench	with: Impact wrench
Pump distributor gear (Z 9612)	1) M30 x 160	931	8,8	46	./.	1200 (122 mkp)
Hydraulic oil reserv. (Z 9613, Z 9614)	2) M20 x 120	931	10,9	30	./.	490 ( 50 mkp)
	3) M20 x 140	931	10,9	30	./.	490 ( 50 mkp)
	4) M16 x 80	931	10,9	24	./.	250 ( 25 mkp)
	M30 x 200	931	10,9	46	850 (86 mkp)	



Compensator between hydraulic oil main reservoir and suction oil reservoir, illust. (Z 19111)

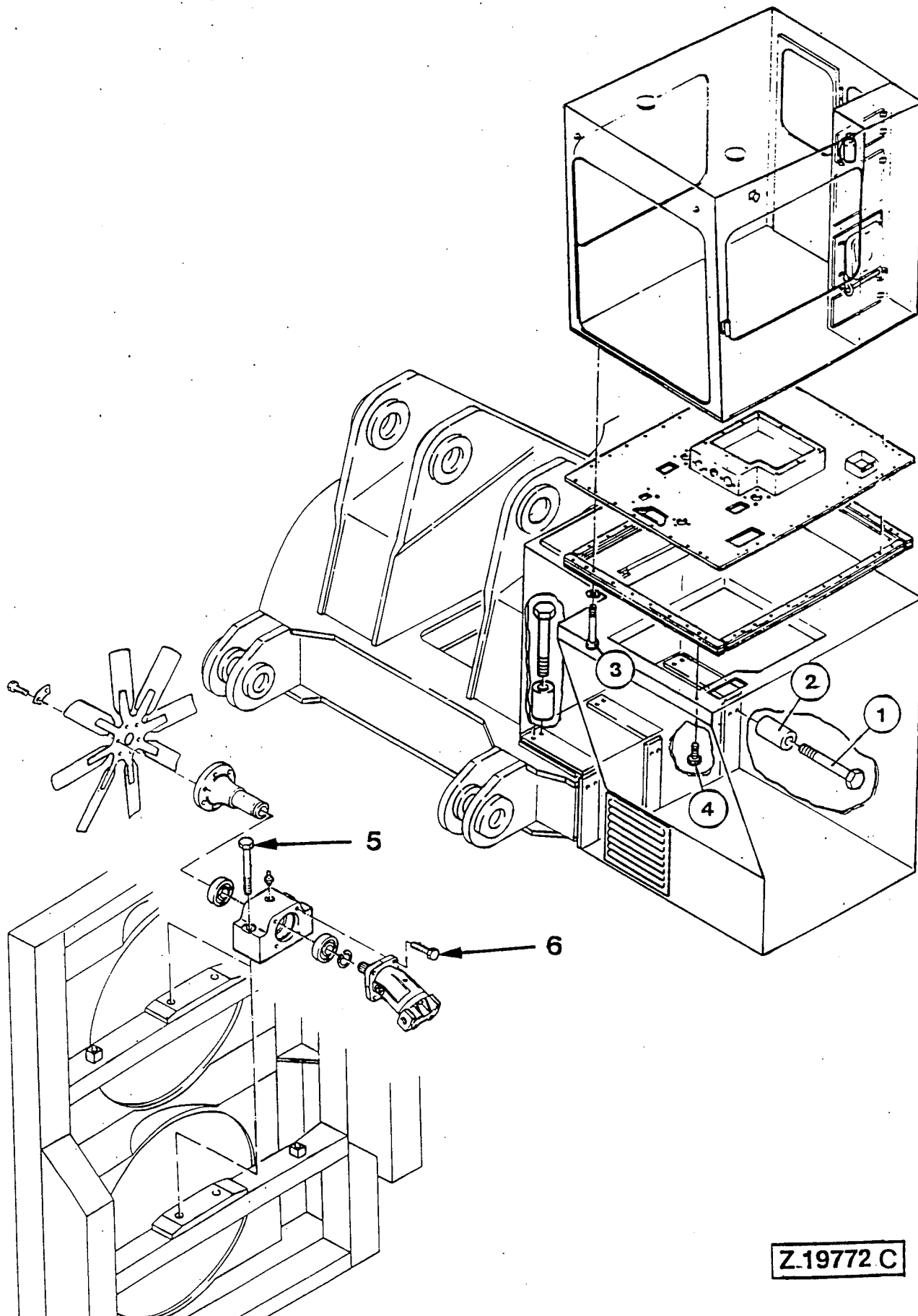
Check condition and fastening of compensator and shut-off valve unit. Make sure mounting bolts (1 and 2) are properly tightened.

Unit, illust. (Z 19109)	For retightening torque data refer to standard torque chart I in this sect.
Check condition and fastening of all ladders, steps, railings and hand rails (P1 to P4).	<u>Note:</u> When selecting the tightening torque observe quality grade and bolt size.
Make sure that all safety devices, guards and shields are correctly installed.	
Loader equipment - check condition and torque of pin retainer bolts (P5).	



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6.9

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Z.19772 C

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(Continued)

High Strength Bolt Connections, illust. (Z 19772C)

Unit, illust. (Z 19772)	Bolt size mm	Grade	SW*(mm)	Tightening torque Nm	Qty.
Cab base to main frame (1 and 2)	M 24	10,9		880	12
Cab to metal rubber frame (3)	M 10	8,8		43	33
Metal rubber frame to cab base (4)	M 10	8,8		43	36

\* SW = Wrench size

NOTE:        Inspect metal-rubber insulation frame for damage and fatigue.  
                   Replace defective parts without delay.

Hydraulic Oil Cooler - Check Fan Bearings

- (5) Bearing block mounting bolts
- (6) Hydraulic motor mounting bolts

Check condition and fastening of both fan bearings and hydraulic motors.



<b>MANNESMANN DEMAG</b> Baumaschinen	<b>Kundendienst-Mitteilung Service Bulletin</b>	Datum/Date	Nr./No.	Seite/Page
		07/92	21-385	01/01
ASSEMBLING THE SPLITTED COUNTERWEIGHT		Ersatz für/Supersedes		
		Datum/Date	Nr./No.	Seite/Page



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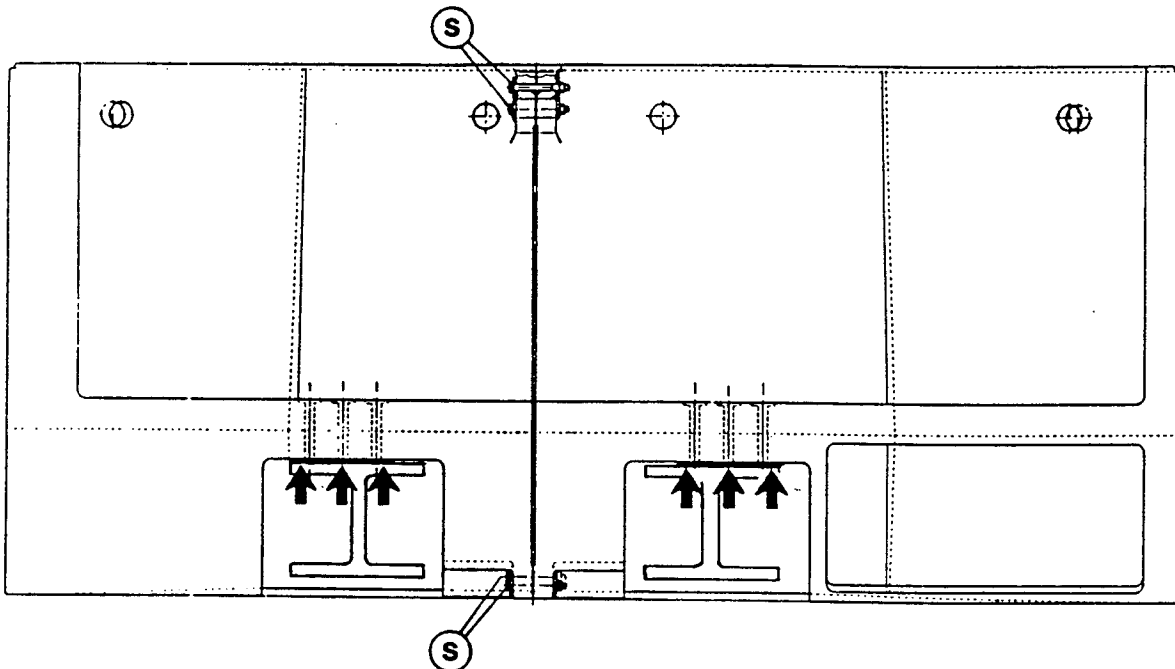
Hydraulic Excavator: H285 from Serial No. 78104 up  
H485 from Serial No. 12012 up

When assembling new machines, the counterweight halves must be bolted together.

Assembling sequence of the counterweight halves:

- Place the counterweight halves separately onto the support area of the superstructure.
- Be sure that there are no gaps between the mating surfaces of counterweight halves and supports.
- Lubricate threads and bolt heads slightly with oil.
- Install bolts (S) with nuts and washers.
- Torque bolts (S) to 3100 Nm.
  
- Bolt counterweight to superstructure:

Tightening torque H 285, thread M36 - 3100Nm  
Tightening torque H 485, thread M42 - 4950Nm



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Parts + Service-Information

*[Signature]*  
ppa. Cremer

*[Signature]*  
F.V. Brockhage

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After Sales Service

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After Sales Service

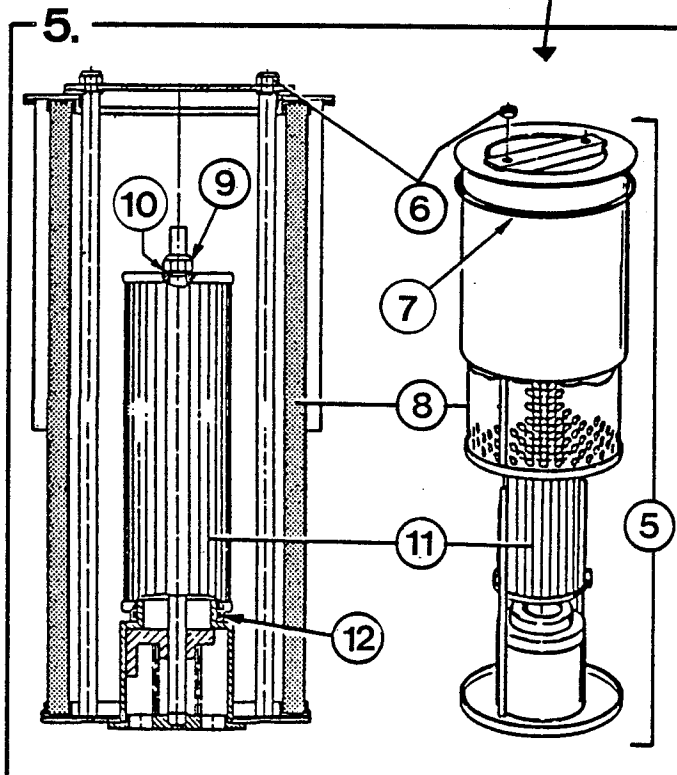
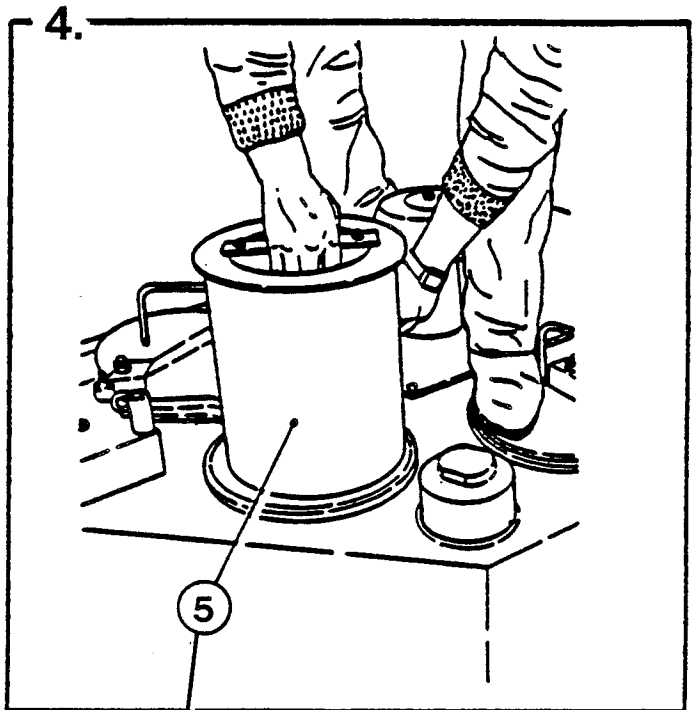
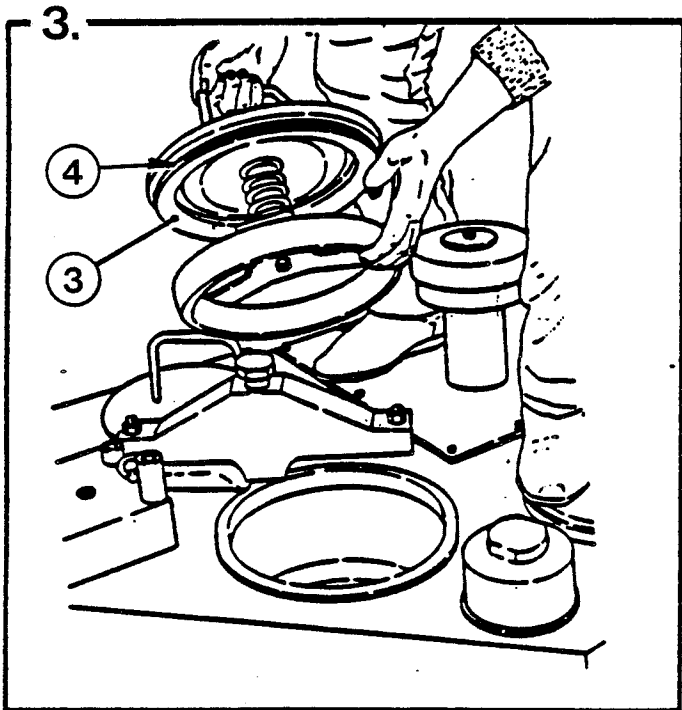
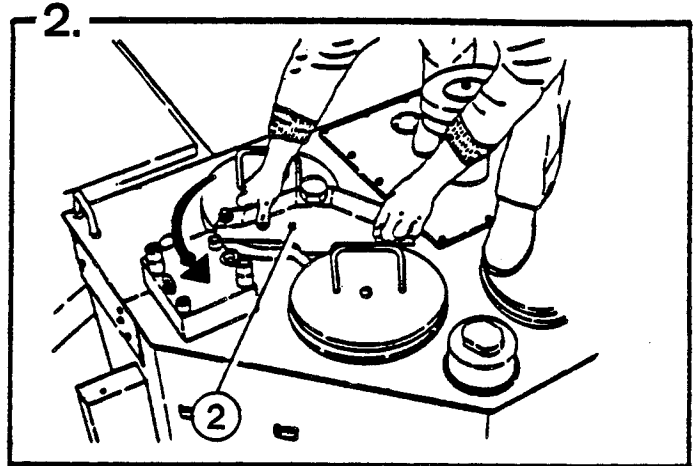
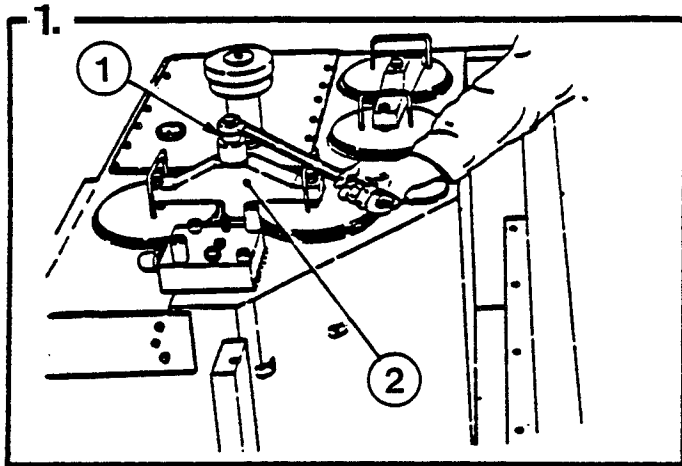
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Bolt torque chart I

Torque data in Nm  
for standard application

Bolt size mm	Quality grade	
	8.8 Nm	10.9 Nm
M 8	21	30
M 10	42	60
M 12	74	105
M 14	116	163
M 16	178	250
M 18	245	345
M 20	350	490
M 22	470	660
M 24	600	840
M 27	880	1240
M 30	1200	1670
M 33	1650	2300
M 36	2100	3000
M 39	2700	3800
M 42	3300	4700
M 45	4200	5900
M 48	5000	7000
M 52	6500	9100
M 56	8000	11300
M 60	10000	14000
M 64	12000	16800
M 68	14500	20300



82. Hydraulic system

- Replace elements of the four return oil filters.
- Clean screens.

Follow the steps shown in illust. (Z 19110):

1. Loosen bolt (1).
2. Turn retainer (2).
3. Remove cover assy (3). Inspect O-ring (4) and replace if necessary.
4. Lift out element assy (5).
5. Disassemble filter assy (5) in sequence of ref. nos. (6 to 12).
6. Discard element (8).
7. Inspect screen (11) and clean if necessary.

Note:

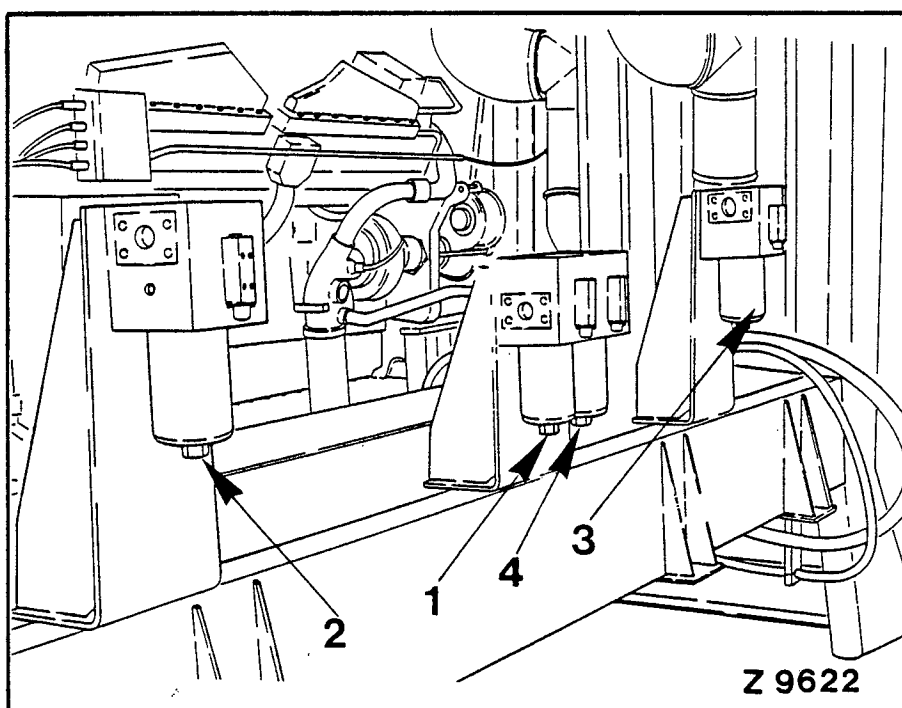
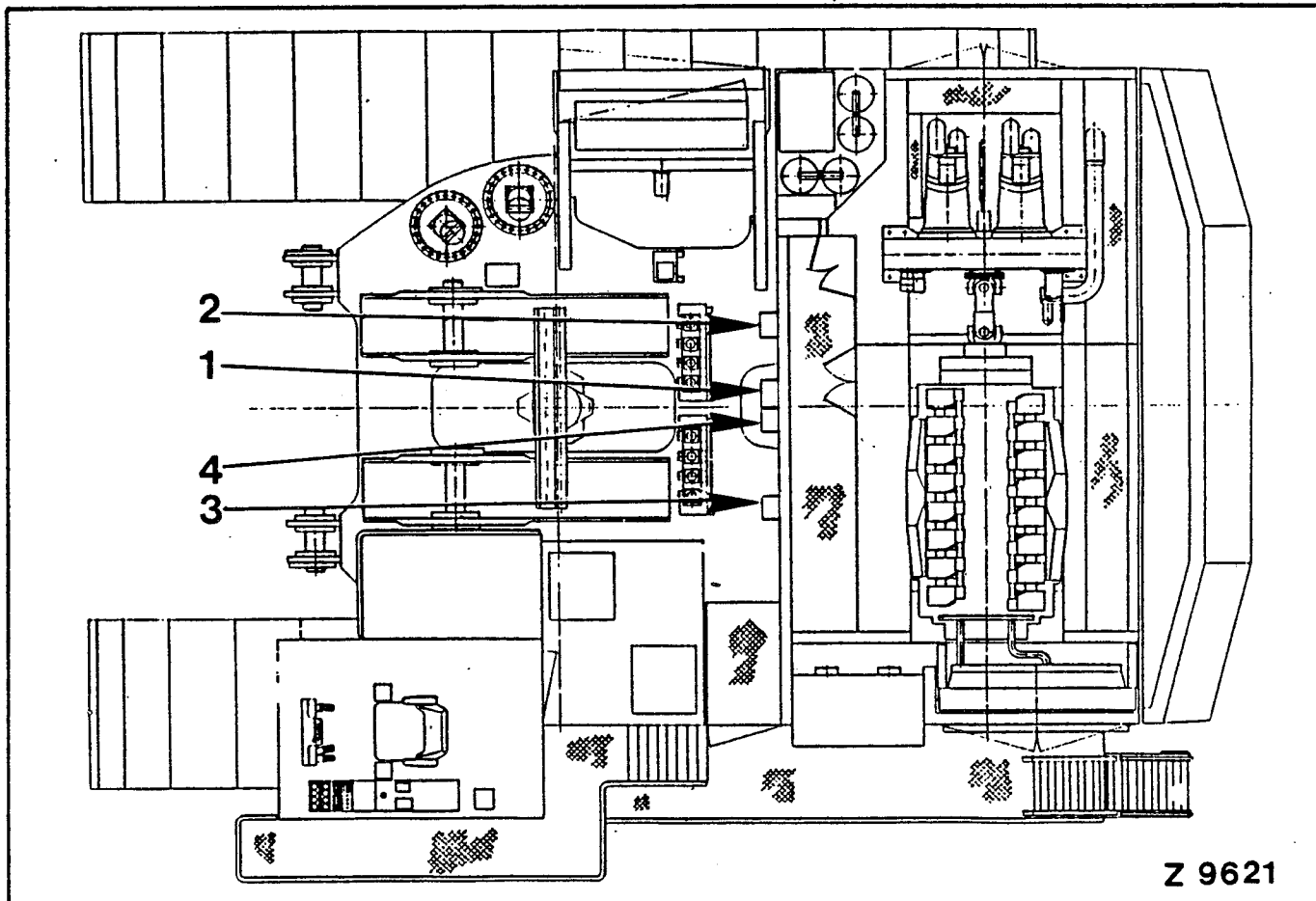
Take care not to contaminate the clean inside of the screen when flushing.

8. Inspect screen (11) and O-ring (12) for damage replace if necessary.  
Install screen (11) use new sealing washer (10) and self locking nut (9).
9. Reassemble filter assy (5) with new element (8) according to step 5.  
Use new self locking nuts (6).
10. Install filter assy use new gasket (7).  
Torque bolt (1) to 850 Nm.

Notes:

- After each repair of the hydraulic system the elements (8) should be replaced after about 50 hours.
- The filter element must also be replaced after illumination of the filter warning lamp.
- Replace screens (11) every 5000 operating hours at the latest.







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Clean resp. replace element of the high pressure filters  
(Z 9621 and Z 9622)

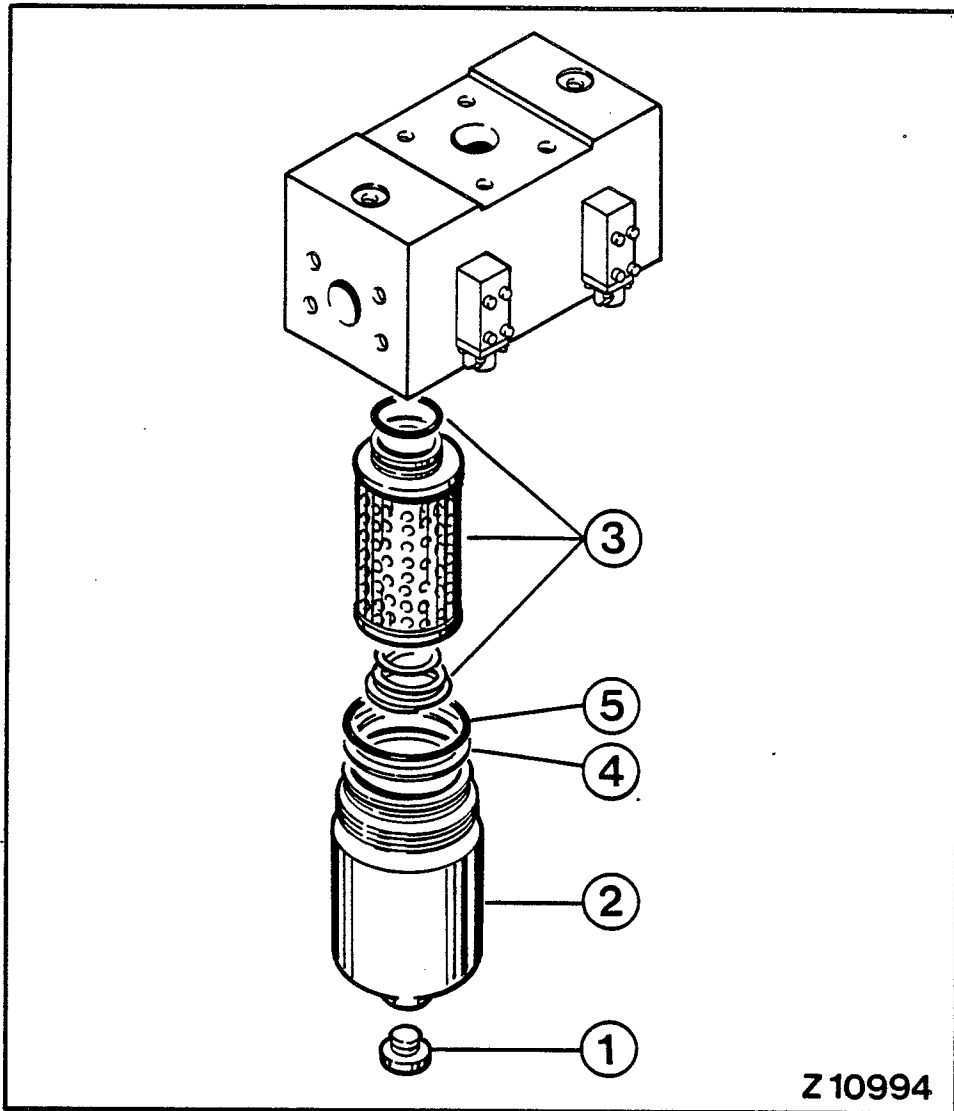
Legend:

- (1) Filter 1 - pump 1
- (2) Filter 2 - pump 2
- (3) Filter 3 - pump 3
- (4) Filter 4 - pump 4

If one of the warning lamps "High Pressure Filter" lights up during operation, the unit will be automatically stopped. Then the high pressure filter elements must be cleaned or replaced.

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Z 10994

Clean or replace high pressure filter elements,  
illust. (Z 10994):

1. Place working equipment on the ground and shut-off the engine.  
Relieve pressure in the hydraulic system with several movements of the control levers.
2. Place a suitable container below the filter in order to collect outflowing oil. Remove drain plug (1).
3. Screw off filter case (2).
4. Remove element assy (3) and clean. Take care not to contaminate the "Clean" inside of the element when flushing.  
Blow out element with compressed air from inside to outside.

Note:

Carefully inspect elements for damage. Always install new elements if ruptures or other damages are found.

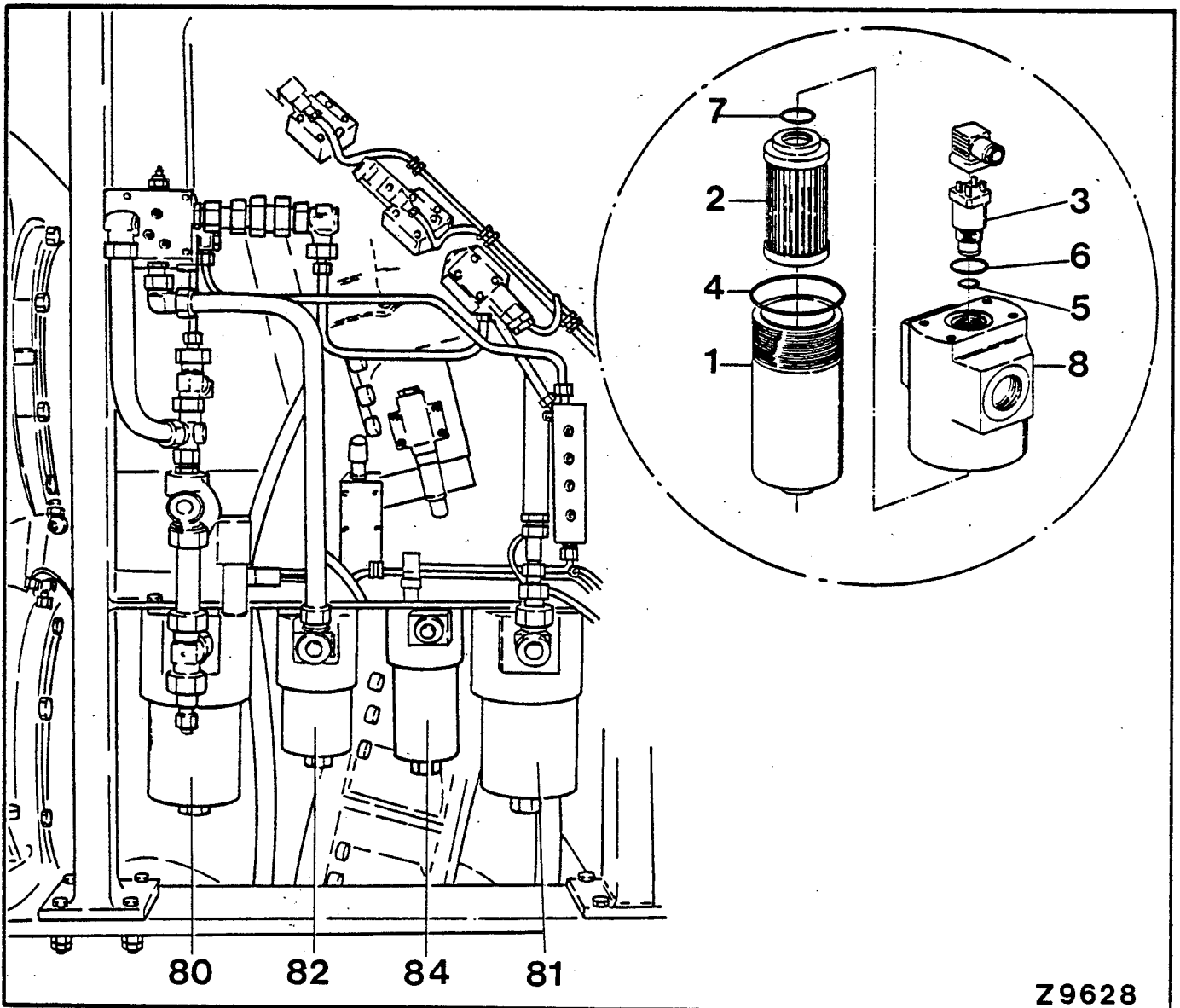
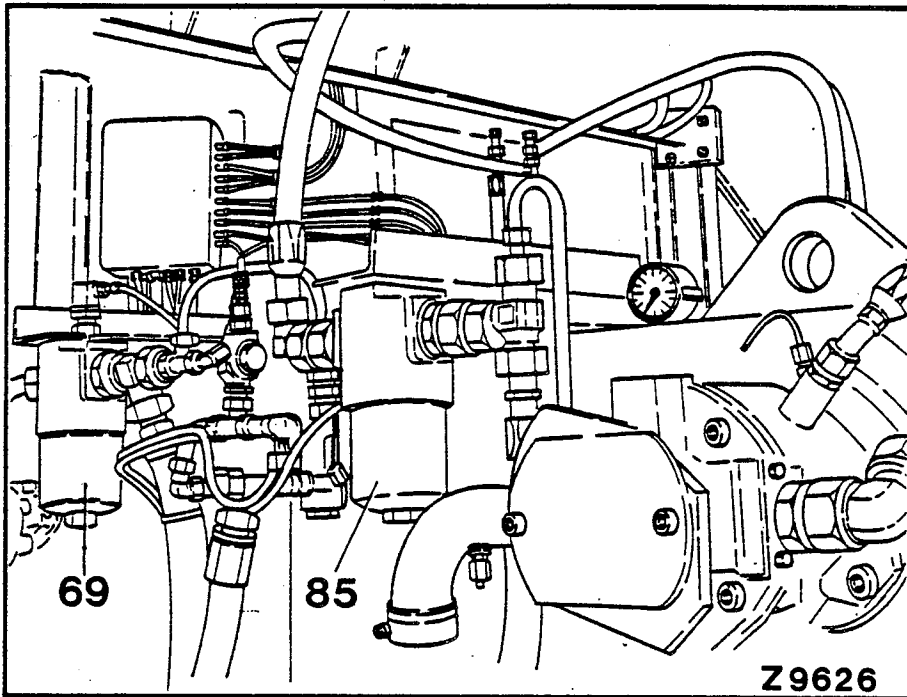
5. Inspect O-rings (3, 5) and back-up ring (4), replace if necessary.  
Prior installation apply clean hydraulic oil to back-up and O-rings. Install drain plug (1) with washer.
6. Fill filter case half way up with clean hydraulic oil.
7. Installation sequence vice versa.
8. After short operating period check filter units for leakage.

Important:

In case filter element (3) is soiled by metal chips, examine hydraulic pump for damages. Install new element (3).

Notes:

- If after cleaning, the warning lamp lights up again, replace the filter element.
- Replace elements (3) after three cleanings or after every 5000 operating hours, whichever occurs first.
- After pump repairs all high pressure filter elements must be replaced.





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6.9

Replace filter elements of the hydraulic pressure filters located at distributor gear and central control and filter frame (Z 9626 and Z 9628)

Note:

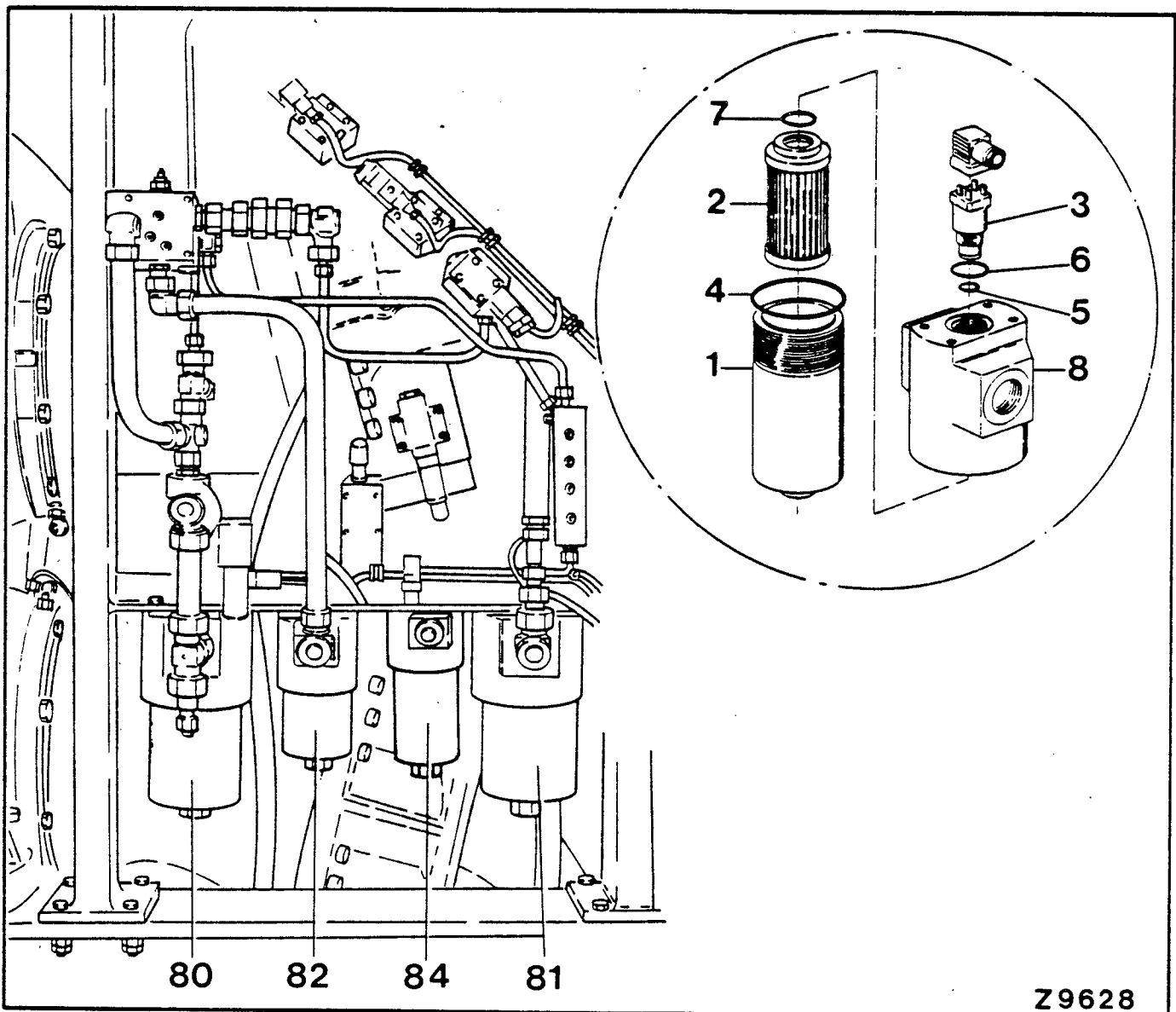
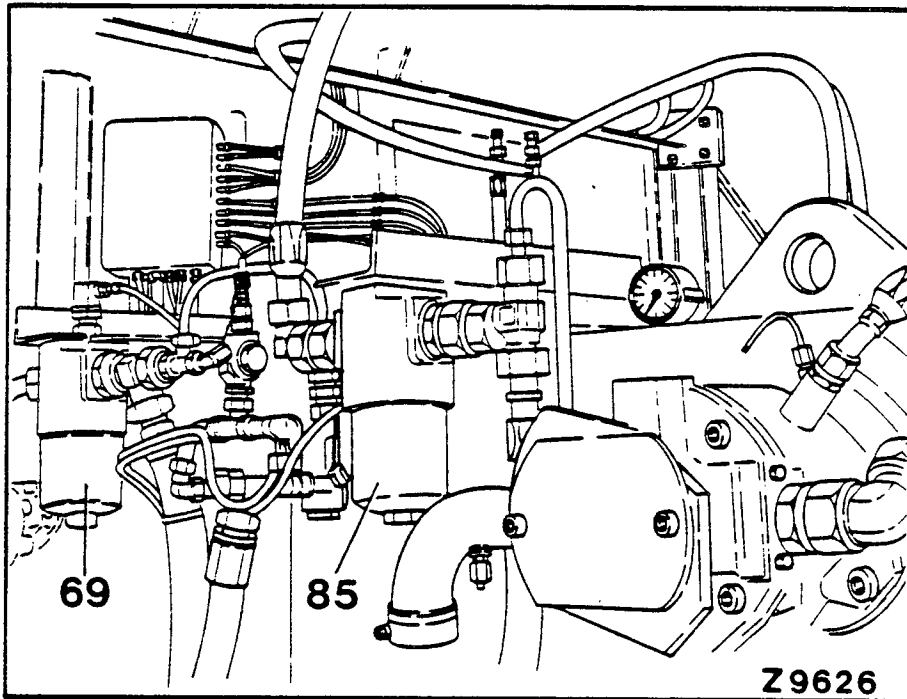
The reference numbers of the filters (Z 9626, Z 9628) correspond to the numbering of warning lamps in the Operating Manual section "5".

If a warning lamp lights up with the engine running, stop work and replace paper element of the corresponding pressure filter.

Pressure filters and circuits (Z 9626, Z 9628):

- (69) Pump distributor gear lubrication
- (80) Fan drive, hydraulic oil cooler
- (81) Pump lubrication
- (82) Pump control system
- (84) Air conditioning compressor drive
- (85) Generator drive

Refer to next page for filter element replacement.





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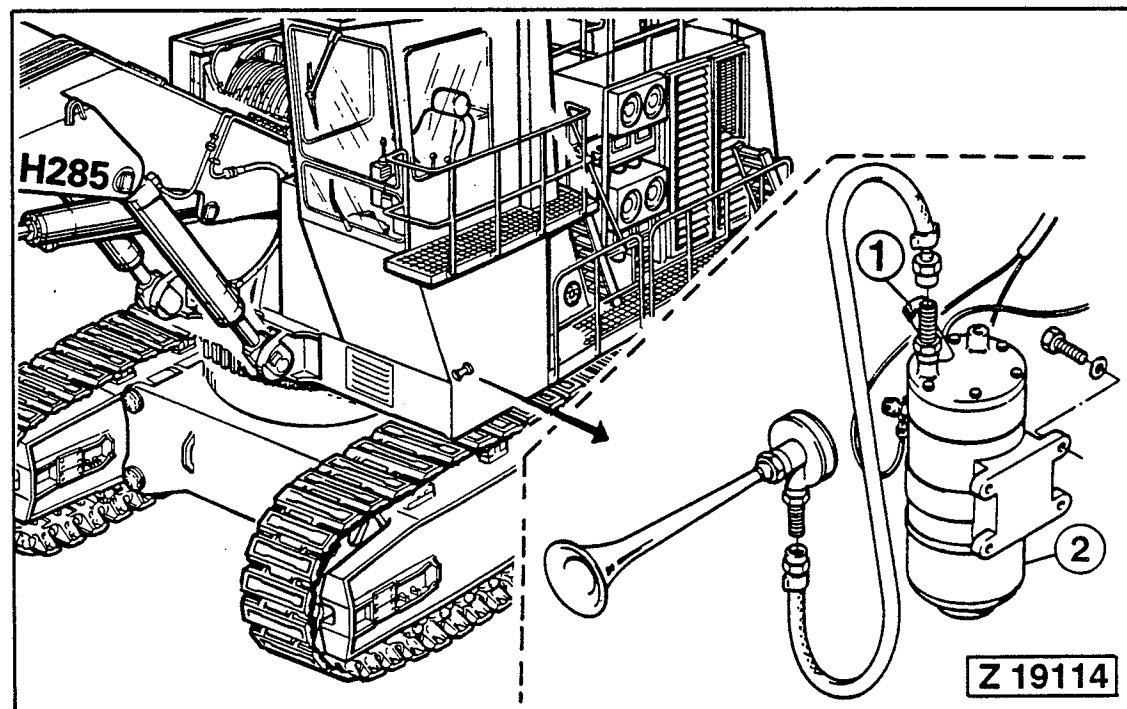
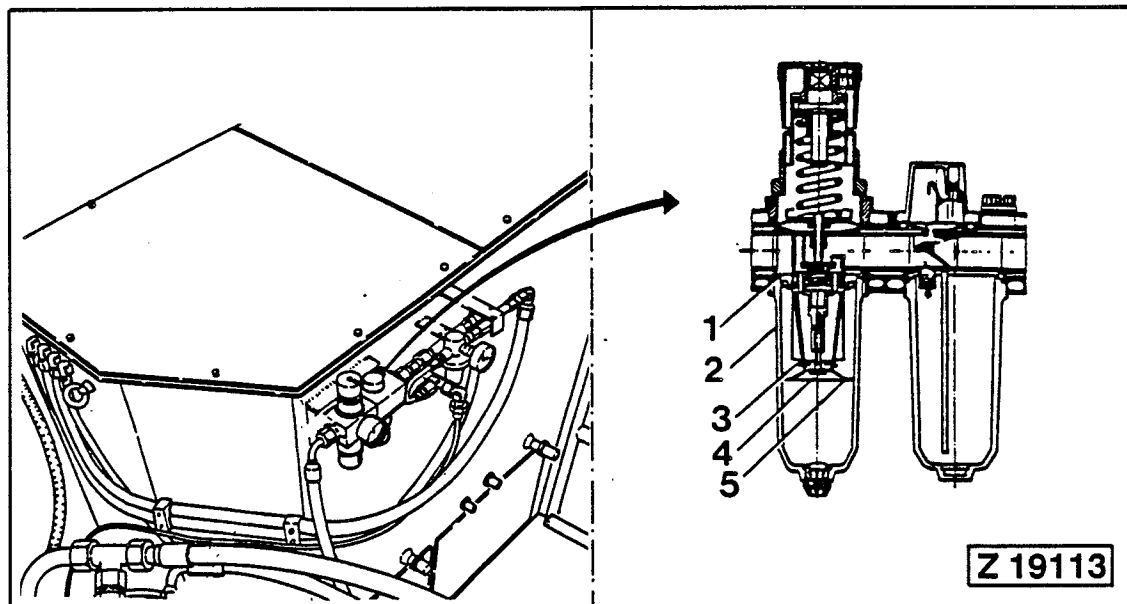
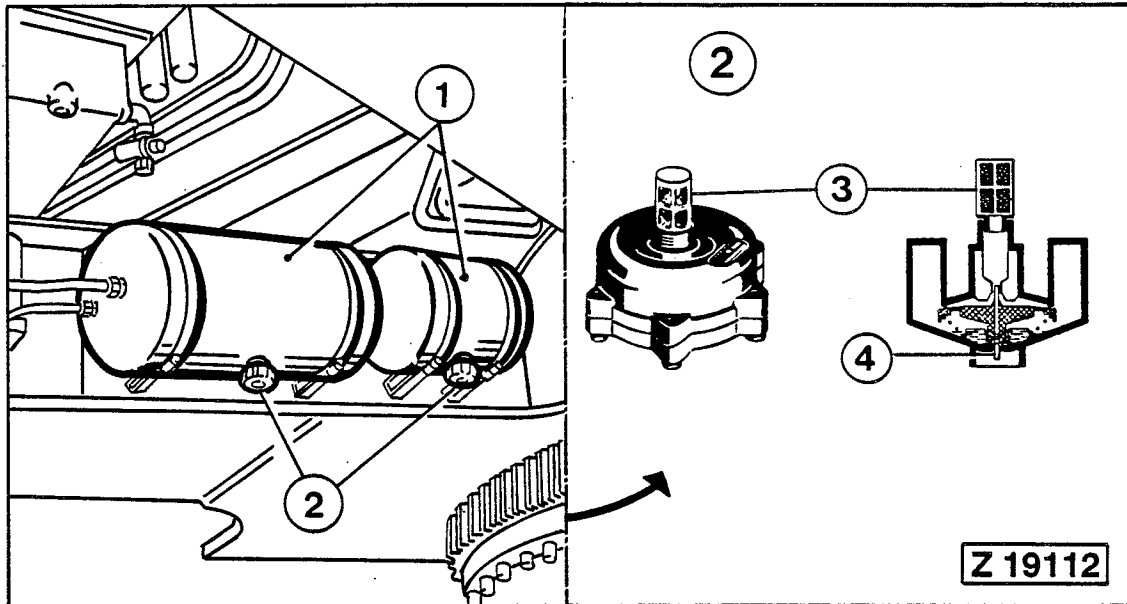
1795n-09

6.9

Replace filter elements as follows:

1. Place working equipment on the ground and shut-off the engine. Relieve pressure in the hydraulic system with several movements of the control levers.
2. Place a suitable container below the filter in order to collect outflowing oil.
3. Unscrew case (1, Z 9628), of the respective filter (Z 9626, Z 9628) using the square provided, clean the filter case.
4. Replace element (2) and O-ring (7). Inspect O-ring (4) replace if necessary.
5. Lubricate the thread at the filter head and at the lower case with multi-purpose grease K2K.
6. Install a new element (2).
7. Fill the lower case half way up with clean hydraulic oil.
8. Screw the lower case (1) into the head and tighten to 4 mkp.





83. Compressed air system for lubricating systems

Note:

Prior servicing remove ignition key, in order to prevent operation of the system.

Clean automatic drain valves (2) illust. (Z 19112) of air tanks (1):

For cleaning of valves (2), they must be unscrewed from the air reservoir and dismantled. Inspect screen (3), replace if necessary. The reservoir should be cleaned on this occasion.

To check the function of the drain valve the outlet can be opened manually by pressing inwards the pin (4) seated in the outlet.

Service unit, illust. (Z 19113):

Clean filter insert (3) of air filter.

1. Remove plastic-container (2) with O-ring (1).
2. Clean plastic-container with washing solution (soap-suds).
3. Remove nut (4) separating cap (5) and filter insert (3).
4. Wash out filter insert (3) in cleaning solvent and dry.
5. Fasten filter insert (3) and separating cap (5) with nut (4).
6. Insert O-ring (1) into filter head and install container (2).

84. Compressor for signal horn, illust. (Z 19114)

Lubricate ball bearing

Unscrew collector protection cap (2).

Unscrew ball bearing cover and fill it half way up with grease.

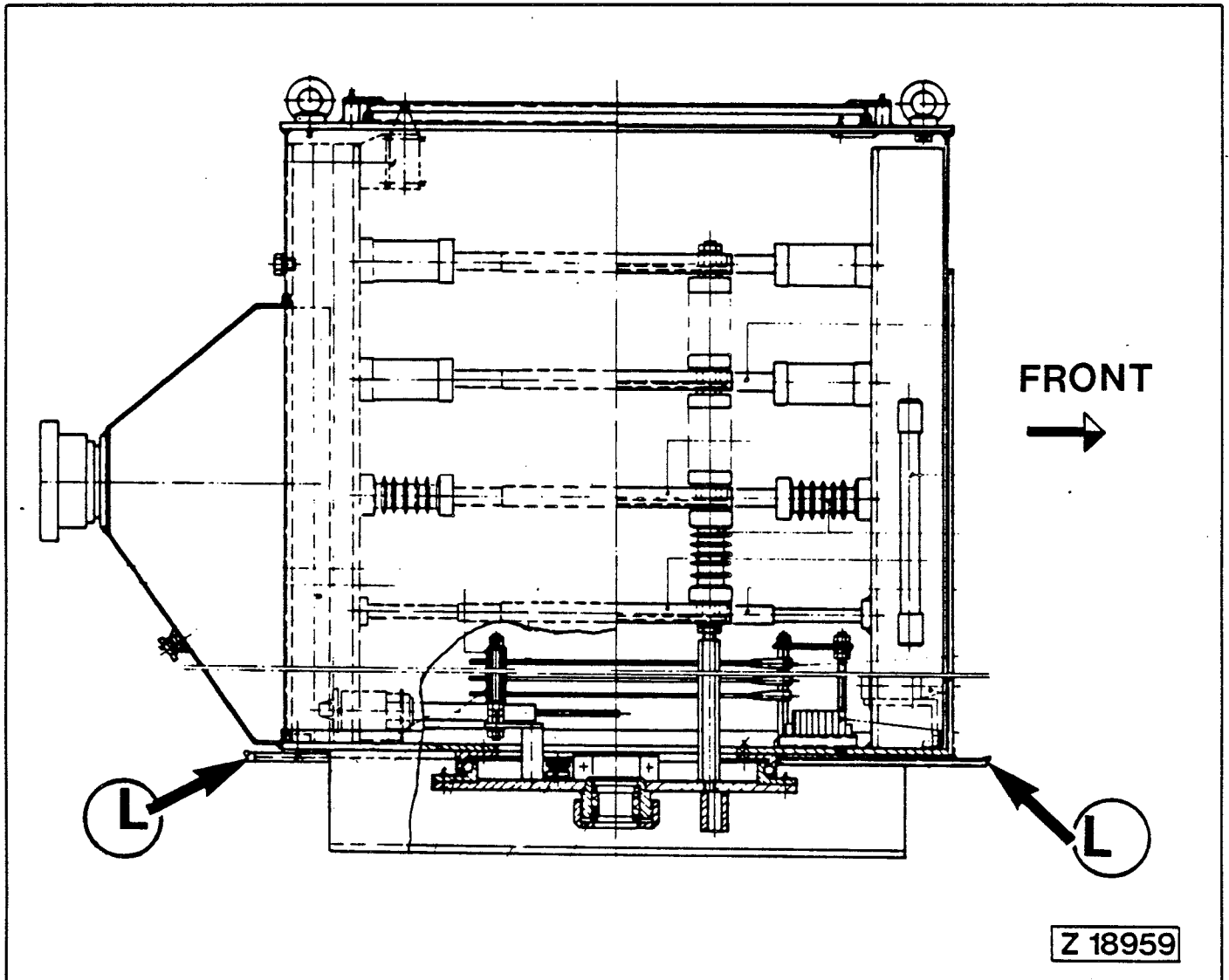
Clean the collector

If the fins of the collector are very strongly blackened or coated with verdigris, clean them with emery cloth.

1985-11

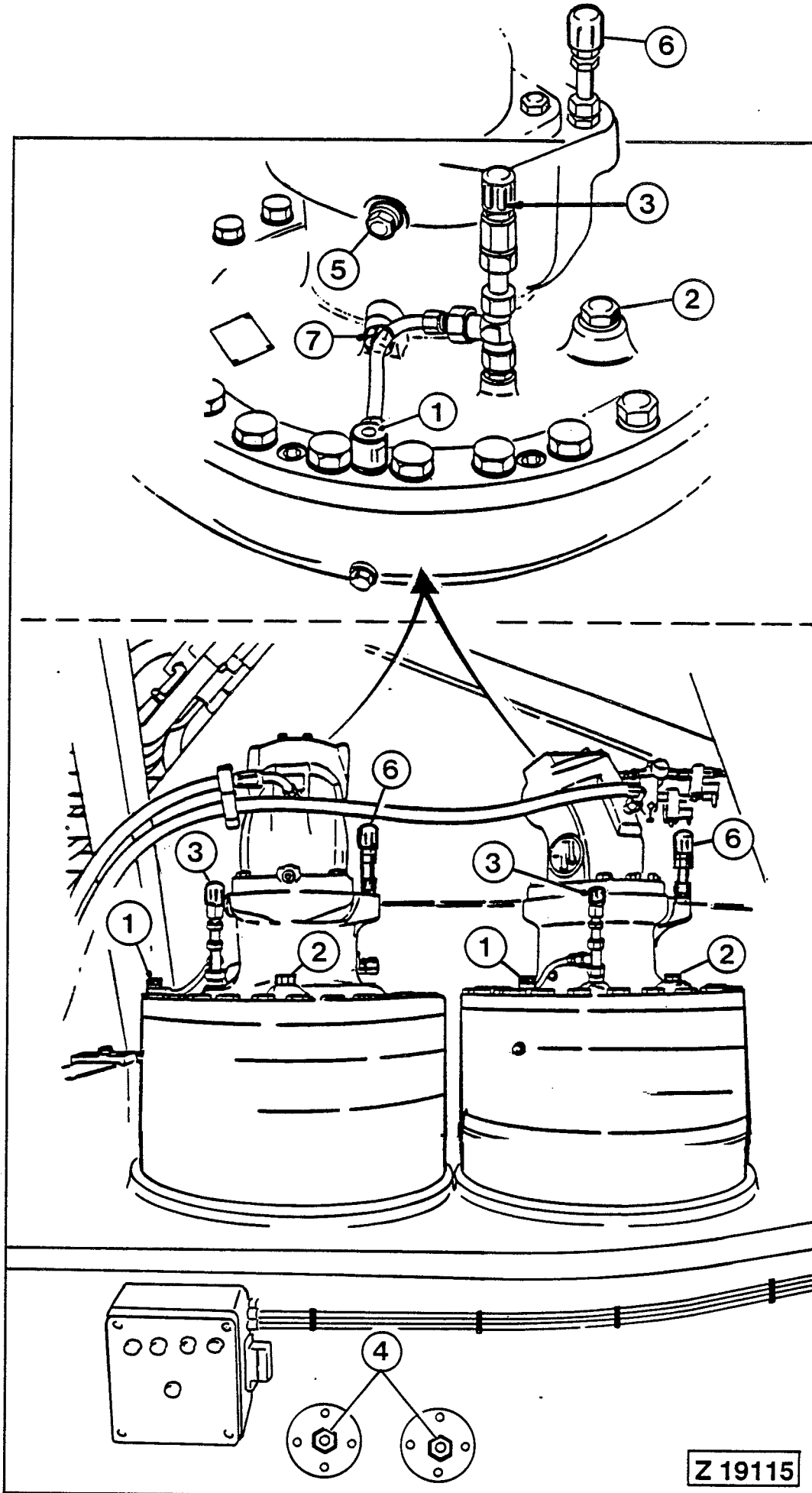
6.9

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87. Slip ring unit, illust. (Z 18959), on excavators with electric motor only

- Lubricate bearing of slip ring unit at both grease fittings (L).
  
- Check condition, fastening and security of the slip ring unit.  
Make sure all electrical connections are in proper working order.



90. Slew gears and brake housings

Change oil, illust. (Z 19115):

- (1) Oil level gauge slew gear
- (2) Oil filler plug
- (3) Breather filter
- (4) Oil drain plug
- (5) Oil level plug brake housing
- (6) Oil filler plug with breather filter
- (7) Oil drain plug

- Slew gears:

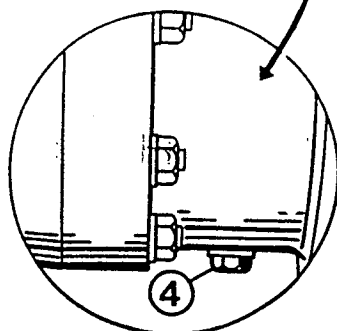
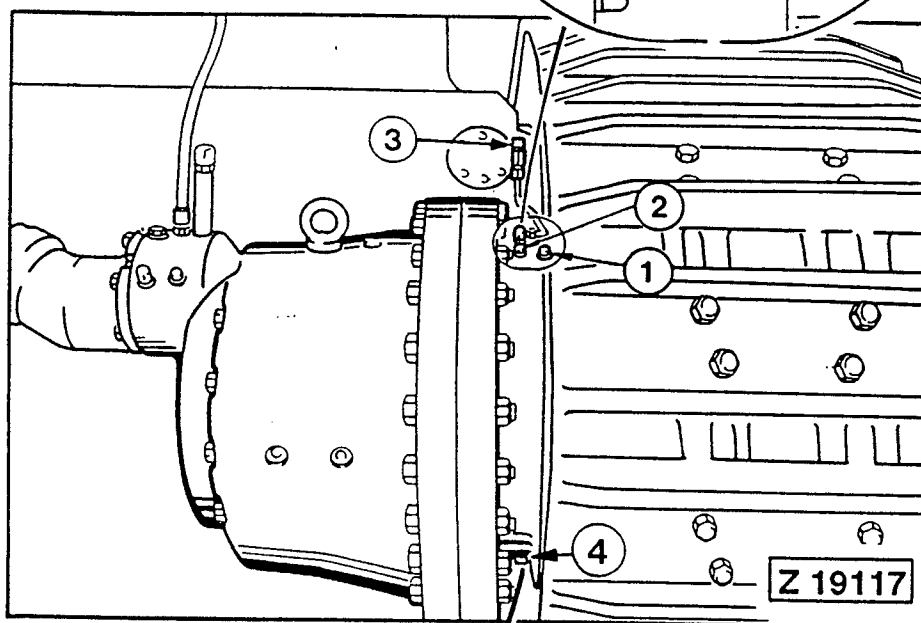
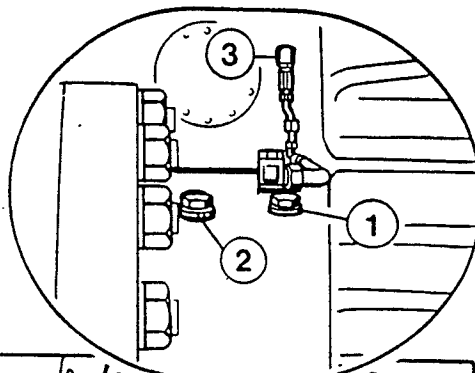
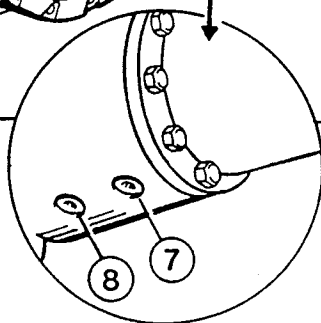
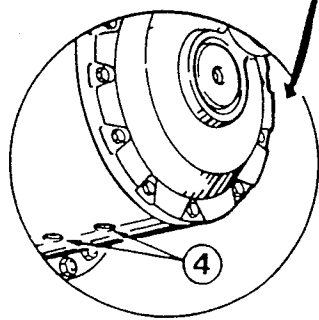
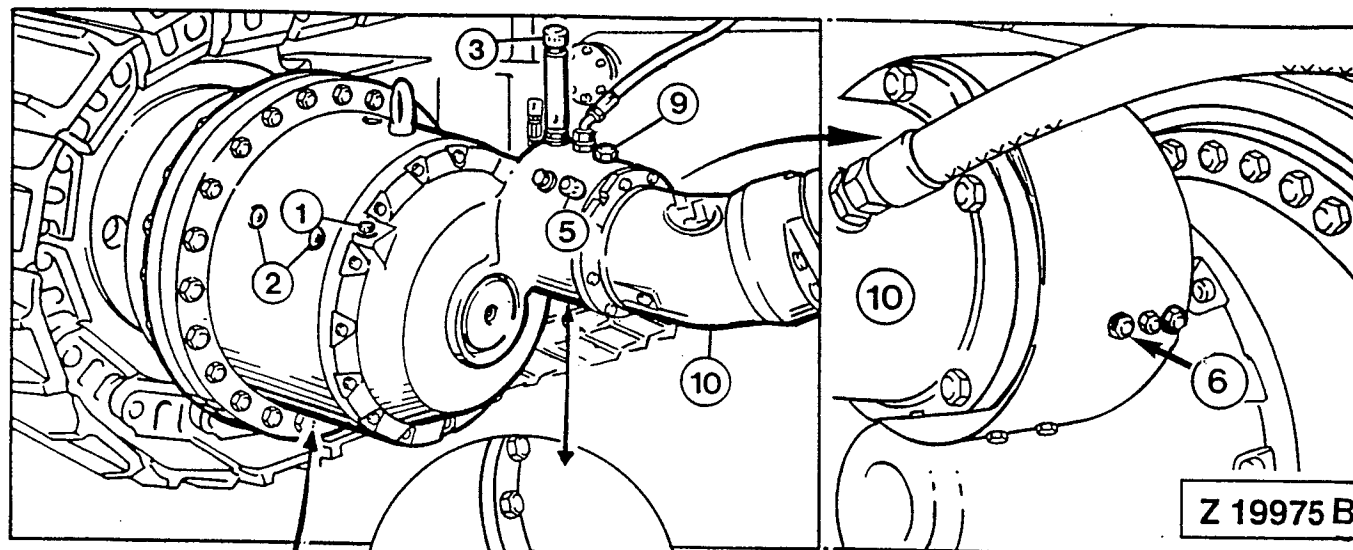
1. Remove parts (1, 2, 3 and 4).
2. Clean breather filters (3) with compressed air from inside to outside and re-install.
3. After the oil has completely drained, re-install drain plugs (4).
4. Fill compartments through filler openings (2) up to the upper "MAX" mark on level gauges (1) with fresh oil and reinstall plugs (2) and gauges (1).
5. After short operating period check oil levels and housings for leakage.

- Brake housings:

1. Remove drain plugs (7), level plugs (5) and filler plugs with breather filter (6).
2. Clean breather filters with compressed air from inside to outside.
3. After the oil has completely drained, clean the housings with scavenge oil and reinstall drain plugs (7).  
Fill the brake housings with fresh oil through filler openings (6) up to the oil level opening (5).  
Install filler plugs with breather filters (6) and level plugs (5).  
After short operating period check for leakage.

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91. Travel gears, brake- and motor adapter housings

Change oil, illust. (Z 19975B):

- (1) Oil level gauge travel gear
- (2) Oil filler plugs
- (3) Breather filter
- (4) Oil drain plugs
- (5) Oil level and filler plug with breather filter for motor adapter housing
- (6) Oil level plug for brake housing
- (7) Oil drain plug, motor adapter housing
- (8) Oil drain plug, brake housing
- (9) Oil filler plug, brake housing
- (10) Hydraulic motor

Travel Gears:

1. Remove drain plugs (4), filler plugs (2) and oil level gauge (1). Clean breather filter (3).
2. After the oil has completely drained, flush the gear with with the regular gear oil and reinstall drain plugs (4).
3. Fill the gear with fresh oil through filler openings (2) up to the "Max" mark on oil level gauge (1).
4. Install filler plugs (2) and gauge (1).
5. After short operating period check gears for leakage.

Brake Housings:

IMPORTANT: The brakes must be released for changing the oil.

Proceed as follows:

1. Place wedges at front and rear side of both crawlers.
2. Start the engine and lower the bucket to the ground.
3. Have a second person for control in the operator's cab.
4. Change the oil. Remove parts (6, 8 and 9) and drain the oil. Install plug (8) and fill in fresh oil up to level opening (6). Observe filling capacity. Install plugs (6 and 9).
5. Shut down the engine.

Motor Adapter Housings:

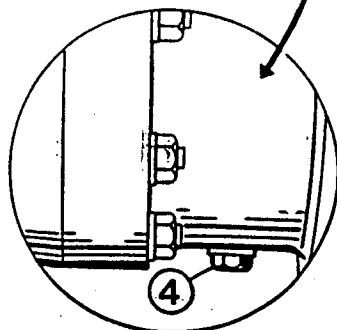
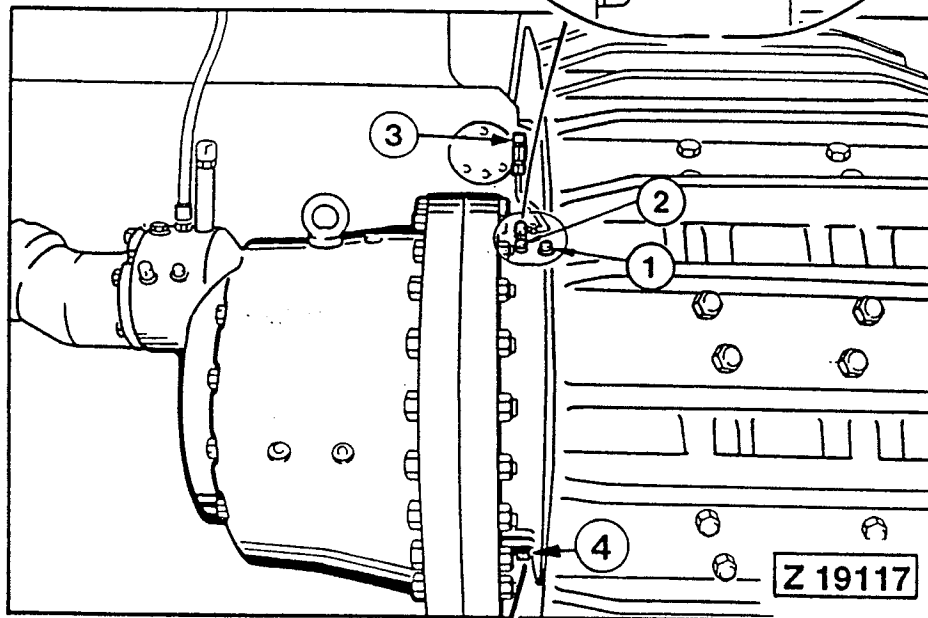
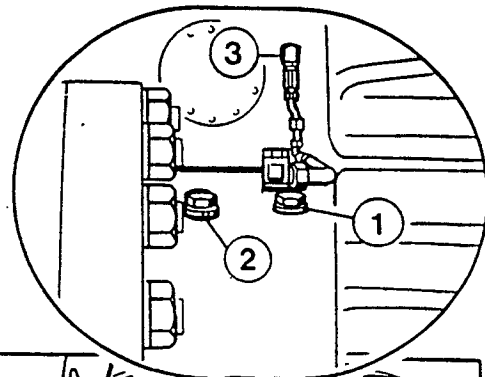
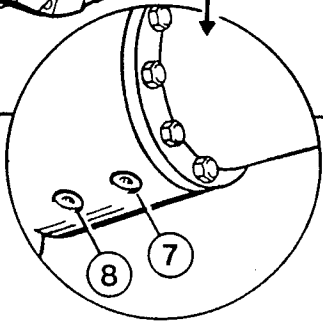
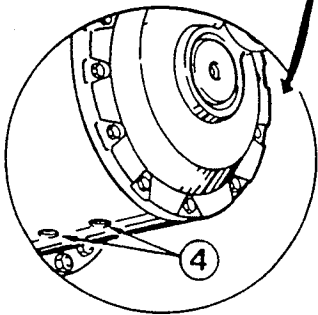
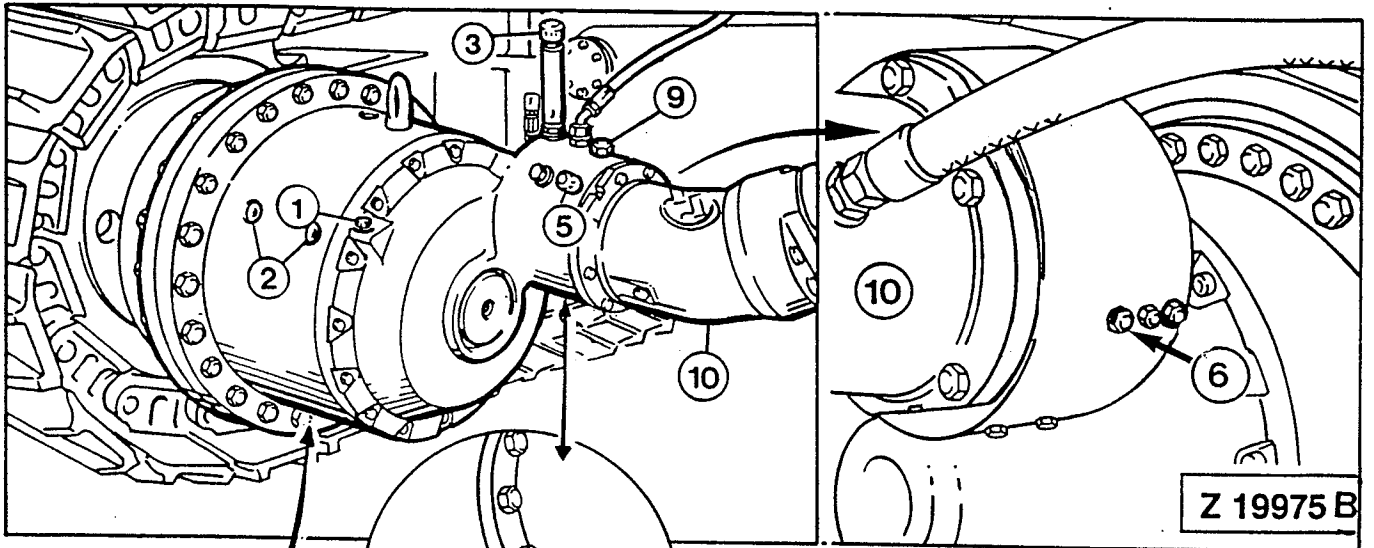
1. Remove parts (5 and 7) and drain the oil completely.
2. Clean breather filter (5) with compressed air.
3. Install drain plug (7) and fill-up oil to level opening (5). Install breather filter (5).



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6.10

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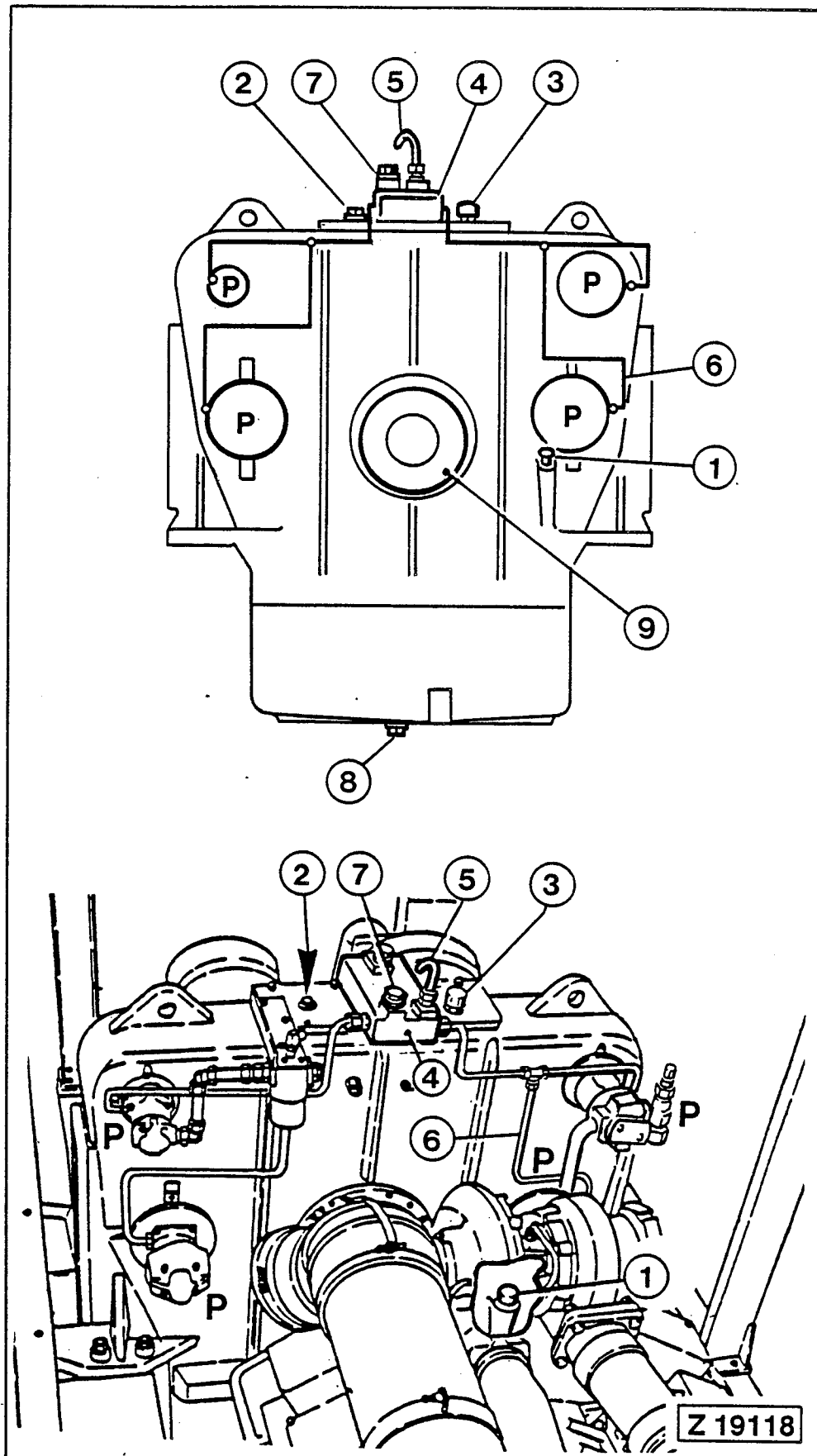


92. Final drives  
(drive shaft housings)

Change oil, illust. (Z 19117)

- (1) Oil level gauge
- (2) Oil filler plug
- (3) Breather filter
- (4) Drain plug

1. Remove drain plug (4), filler plug (2) and oil level gauge (1).
2. After the oil has completely drained reinstall drain plug (4).
3. Fill the gear with fresh oil through filler opening (2) up to the upper mark on gauge (1).
4. Install filler plug (2) and level gauge (1).
5. Remove breather filter (3). Clean with compressed air from inside to outside and re-install.
6. After short operating period check oil level and gear for leakage.



93. Pump distributor gear

Change oil, illust. (Z 19118):

- (1) Oil level gauge
- (2) Filler plug
- (3) Breather filter
- (4) Oil collector reservoir for secondary oil pump drive shaft housings
- (5) Breather pipe
- (6) Oil collector lines
- (7) Oil level and filler plug
- (8) Oil drain plug distributor gear
- (9) Drive shaft flange

1. Remove drain plug (8).
  2. Remove gauge (1) and filler plug (2).
  3. Remove breather filter (3), blow out with compressed air from inside to outside and re-install.
  4. After the oil is completely drained install drain plug (8) and fill in new oil through opening (2) up to the "MAX" mark on gauge (1).
  5. Re-install parts (1 and 2).
  6. After short operating period, check oil level and housing for leakage.
- Oil collector reservoir:  
Remove plug (7). Oil level should reach lower edge of the opening. If necessary add oil.

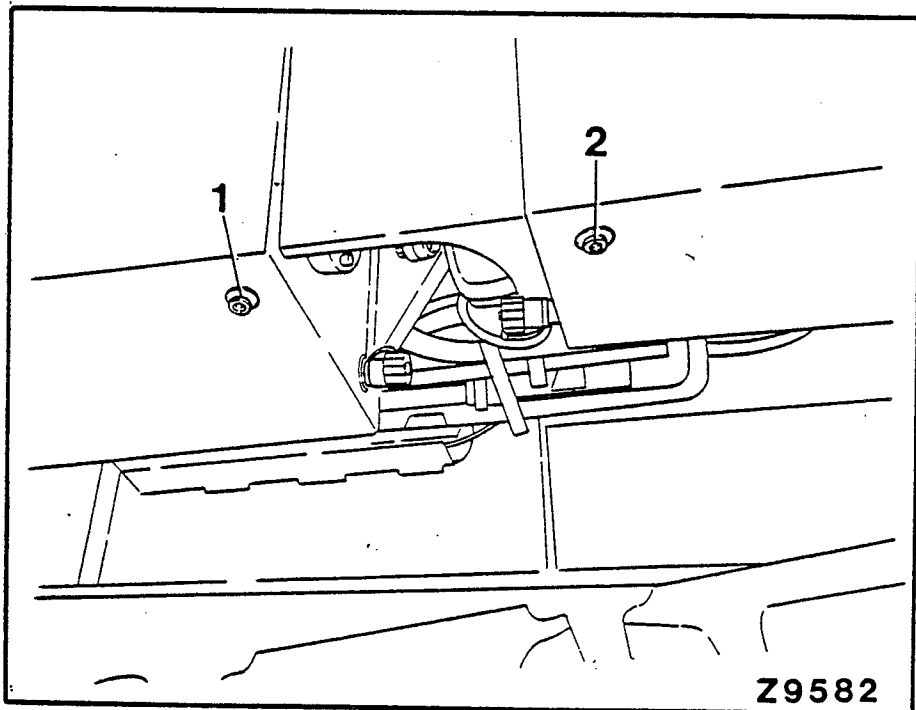
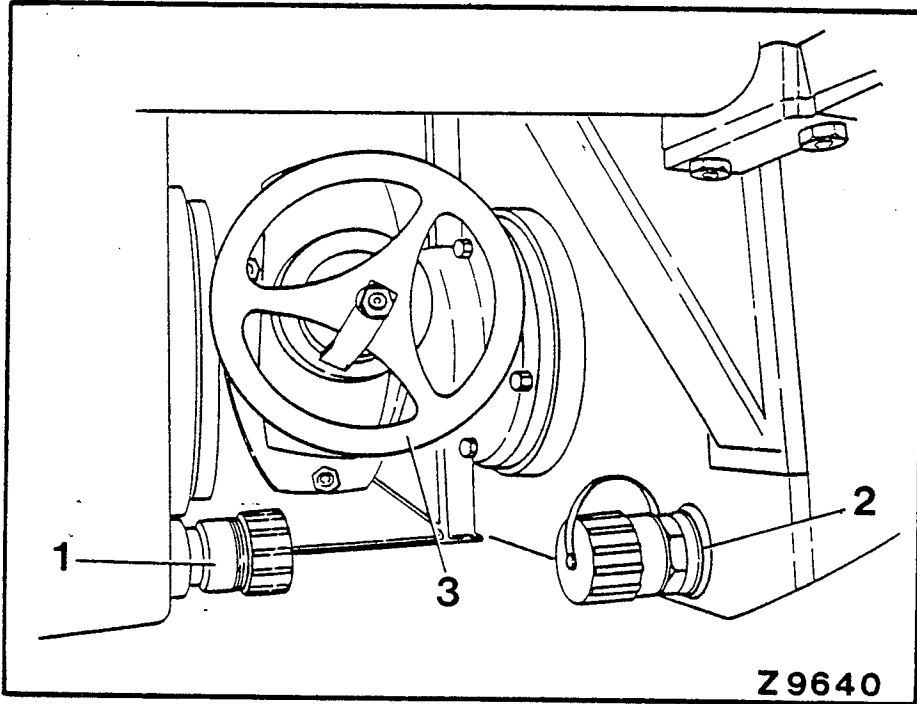
Note:

If oil starts dropping out at breather pipe (5) check oil seals of secondary pump drive shafts for damage.

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100. Hydraulic system

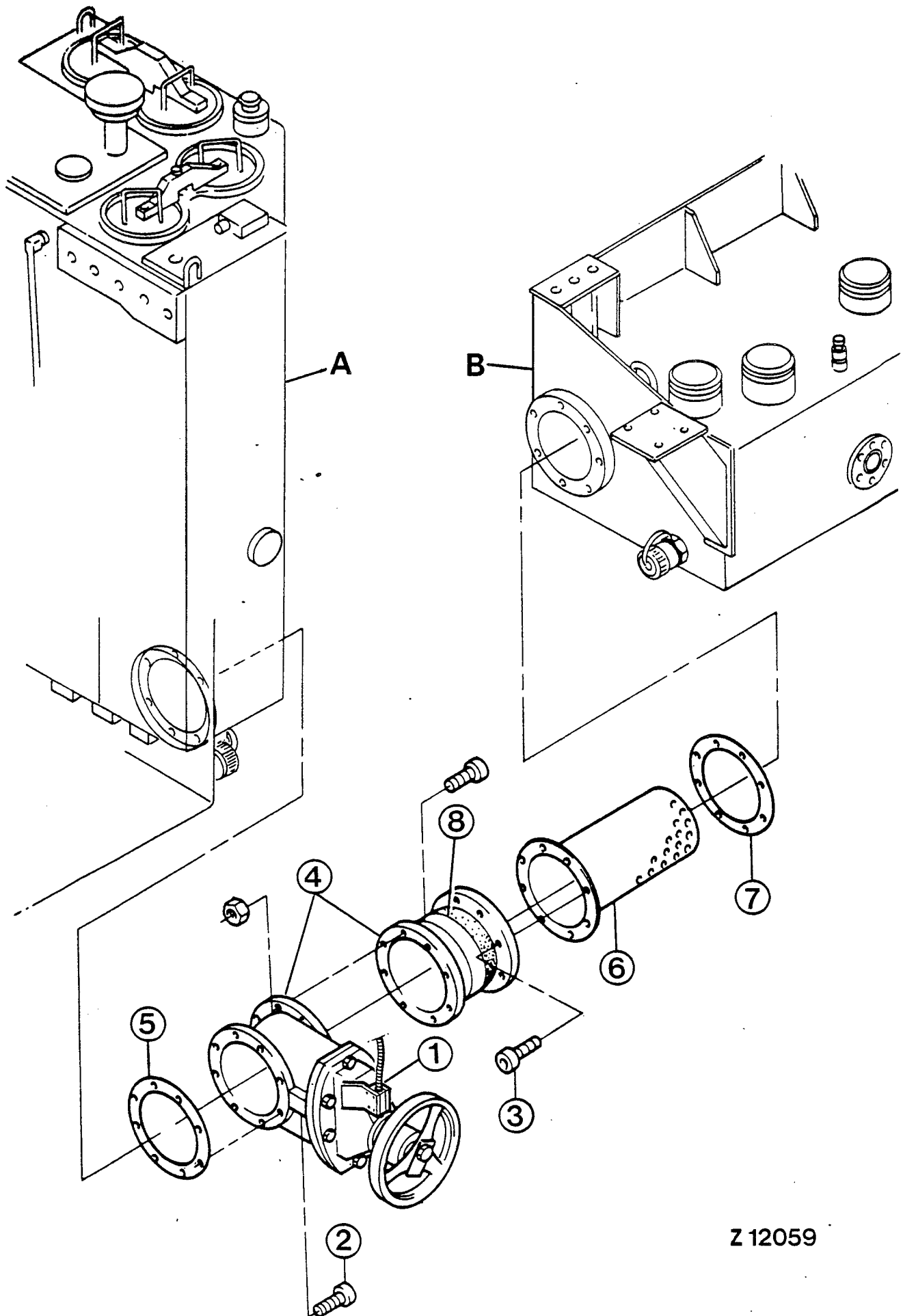
Change oil and replace suction strainer.

Note:

Hydraulic oil change intervals may be extended if an oil sample analysis shows a positive result.

Change hydraulic oil as follows (Z 9640):

1. With the hydraulic oil at operating temperature, park the machine on level ground.
2. Lower equipment to the ground. Retract cylinders as far as possible.
3. Stop the engine.
4. Close valve (3).
5. Connect drain lines (parts of tool set) to screw couplings (1 and 2).  
Regulate oil flow by screwing hose adapter more or less into the couplings.
6. After the oil is completely drained remove drain hoses and cover the couplings.
7. Service the return oil filters and inspect reservoir for sediments, drain condensation and sediments by removing drain plugs (1 and 2, Z 9582).  
After sediments are completely drained reinstall plugs (1 and 2).





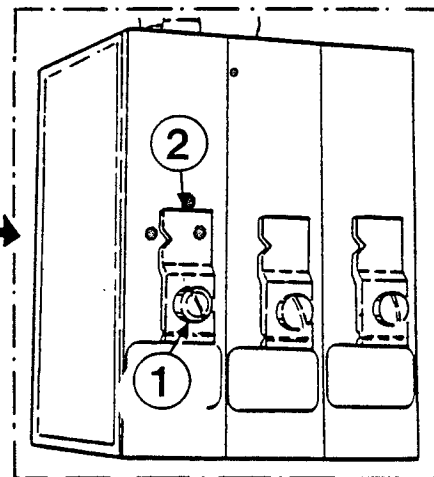
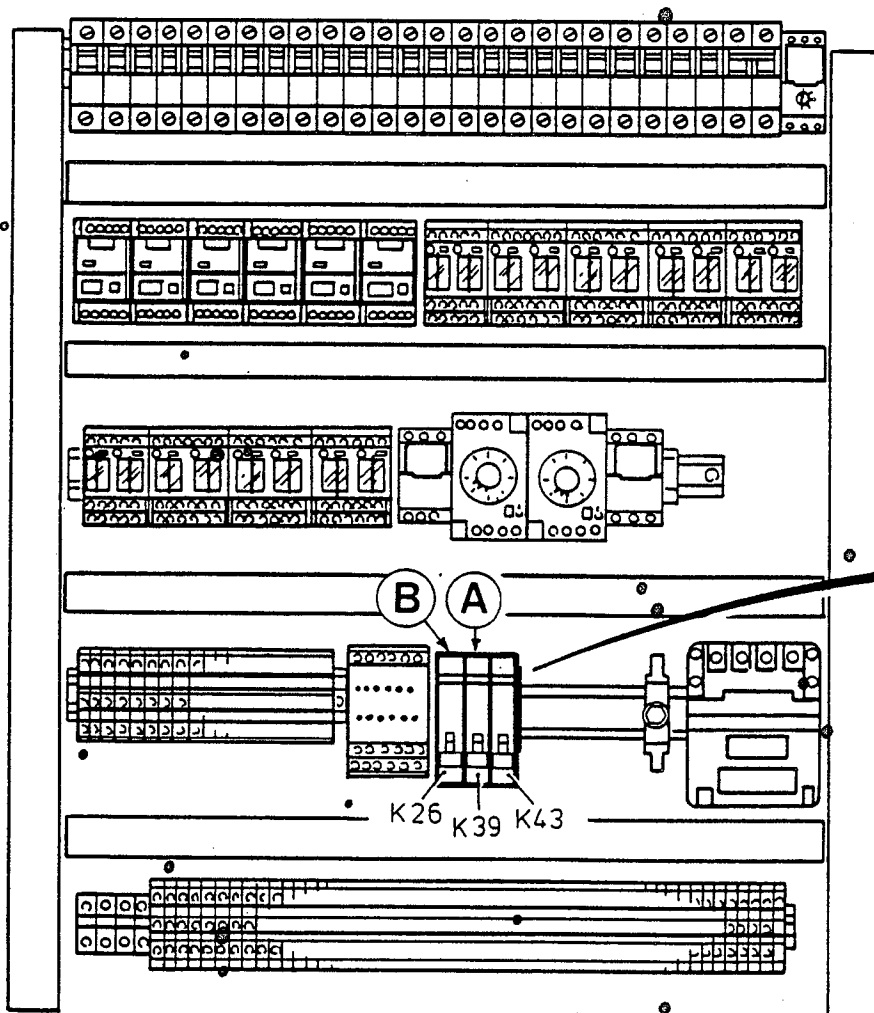
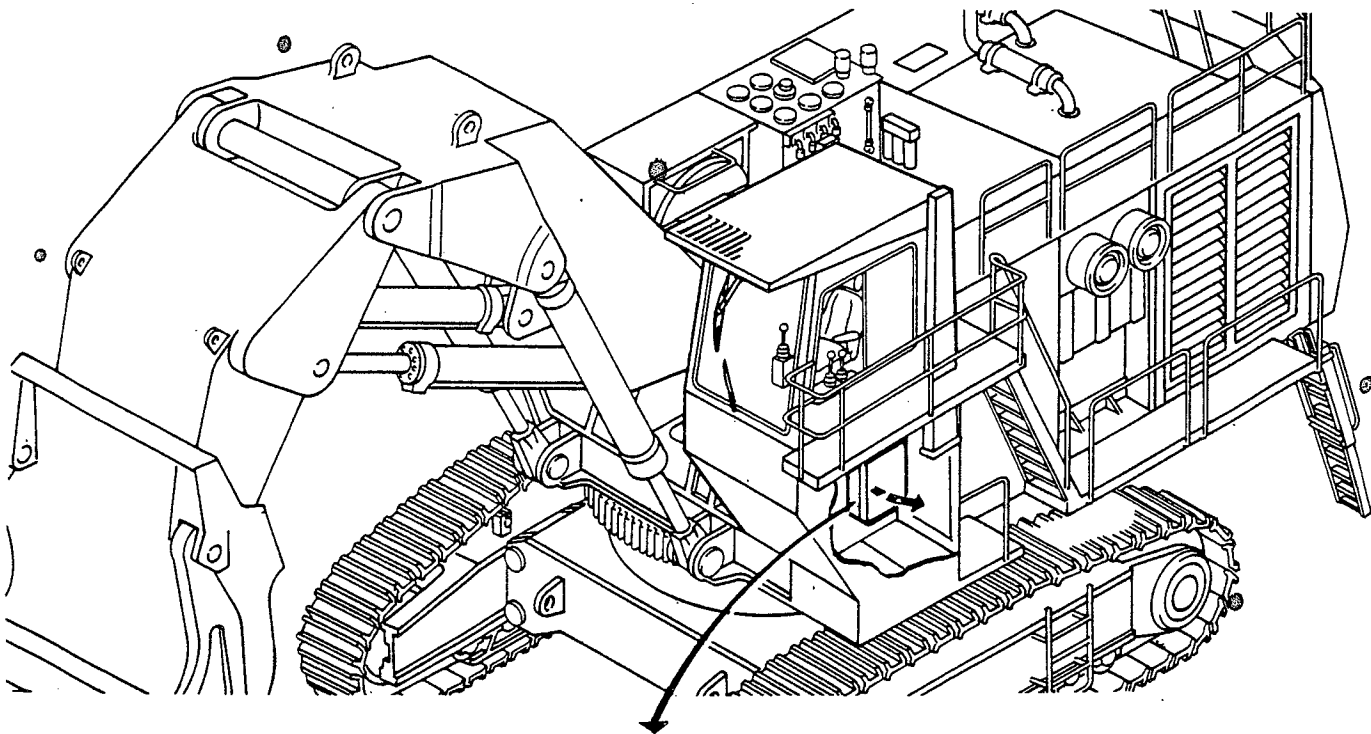
8. Replace suction strainer (6, Z 12059) of suction oil reservoir "B"; proceed as follows:

Important:

Cleanliness is of vital importance during servicing the hydraulic system.

- 8.1 Provide suitable supporting device for main valve unit (4).
- 8.2 Disconnect sender unit cable (1).  
Remove retainer bolts (2 and 3).
- 8.3 Carefully lower valve unit (4) until strainer (6) can be removed.
- 8.4 Install new strainer (6) with new gasket (7).
- 8.5 Install new gasket (5) at main oil reservoir "A" and place valve unit (4) in correct mounting position.
- 8.6 Install retainer bolts (2 and 3) and tighten securely.  
Make sure compensator (8) is properly fitted to ensure tight connection.
- 8.7 Reconnect cable (1).
9. Open main shut-off valve (4).





Hydraulic oil viscosity

If the new hydraulic oil has a different viscosity grade compared with the drained oil it is necessary to adjust the temperature limit value at switch units (A and B, illustration Z 13580).

Legend for illust. (Z 13580):

(A) Switch unit for hydraulic oil temperature warning lamp and bucket cut-out control.

(B) Switch unit for hydraulic oil cooler fan speed control.

"A" - Adjust switch unit (A) "K 39" to the respective oil viscosity grade as follows:

Viscosity grade accord. to ISO	VG 22	VG 32	VG 46	VG 68	VG 100	VG 32 ... 68 HV 46
Adjust temp. limit value °C (switching point)	+55°	+70°	+80°	+85°	+85°	+85°

"B" - Adjust switch unit (B) "K 26" to the respective oil viscosity grade as follows:

Viscosity grade accord. to ISO	VG 22	VG 32	VG 46	VG 68	VG 100
Adjust temp. limit value °C (switching point)	40°	50°	60°	65°	75°

Adjustment procedure for (A and B):

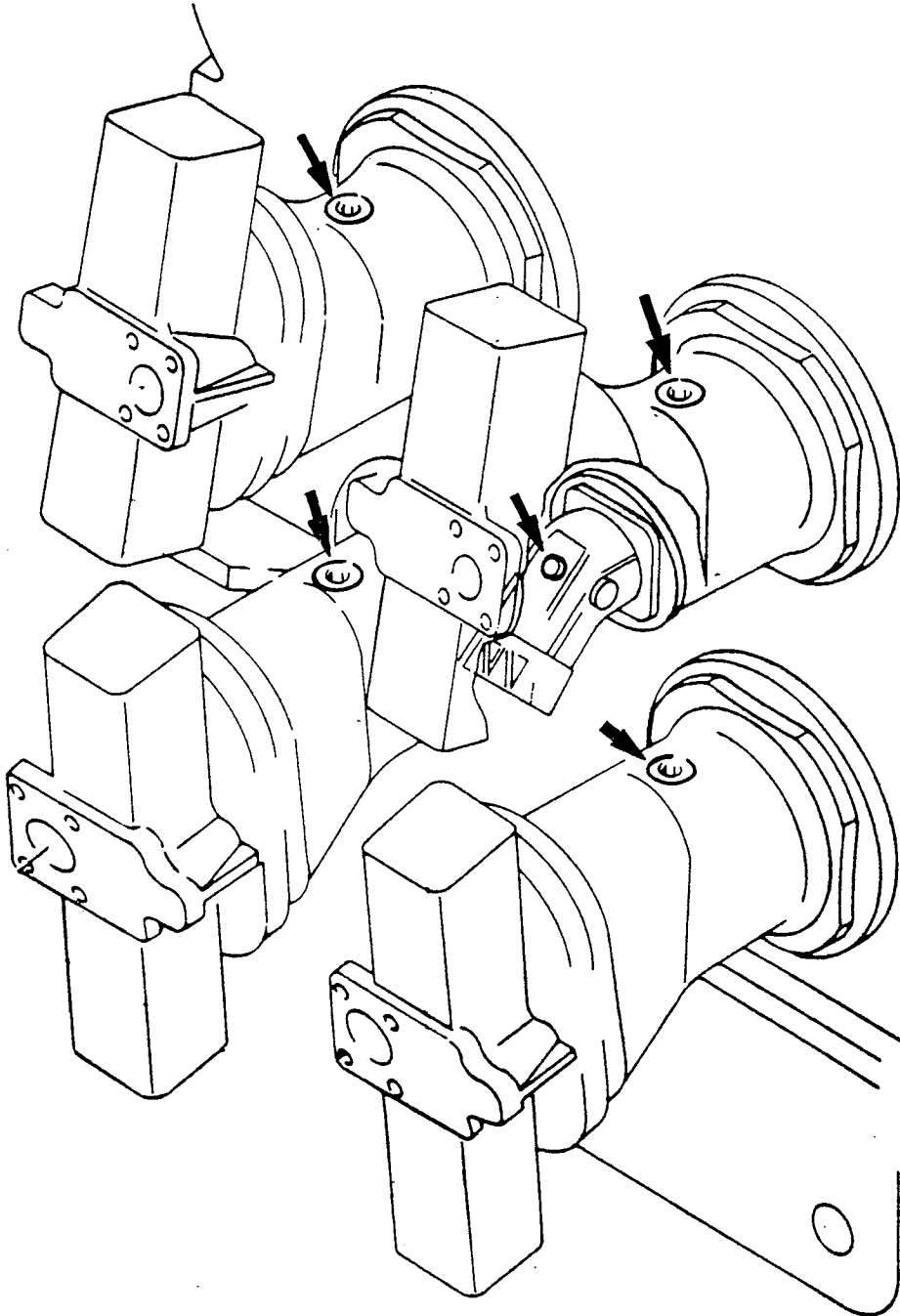
1. Remove screw (1).
2. Remove plastic cover (2).
3. Adjust the temperature limit value using the knurl.
4. Reinstall cover (2).

Note:

The location of units (A and B) within switch box may differ from that shown in illustration. However, they can easily be identified at their designation codes "K39 and K26".

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Z 12060



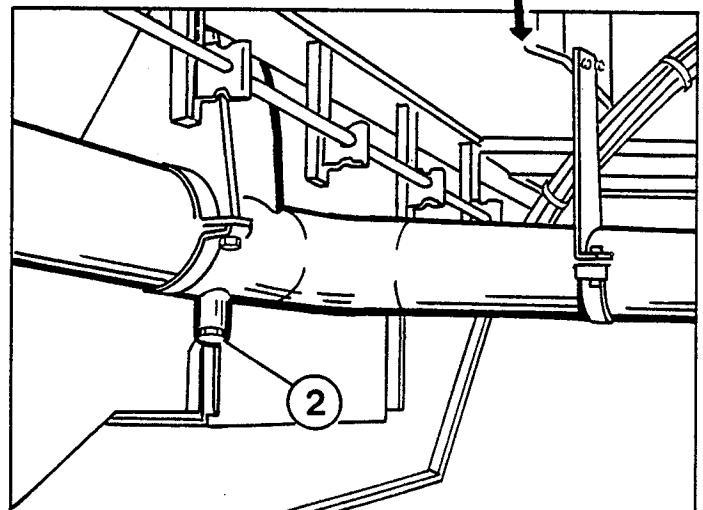
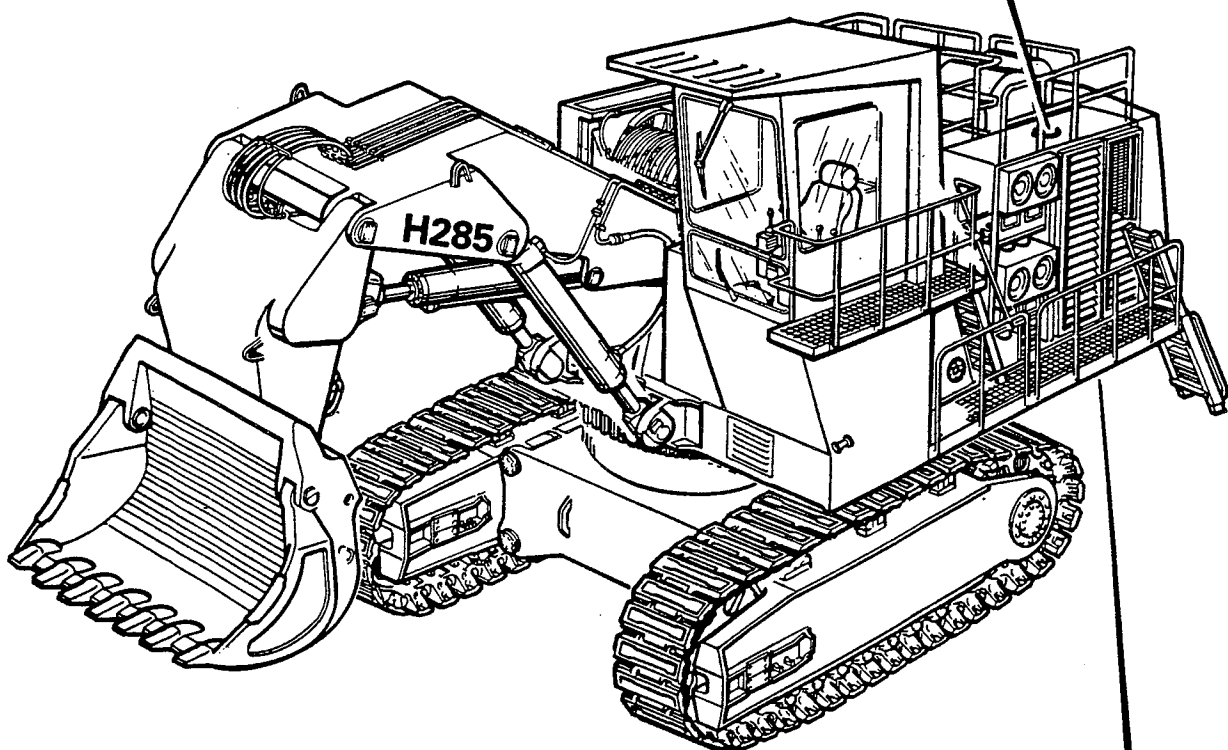
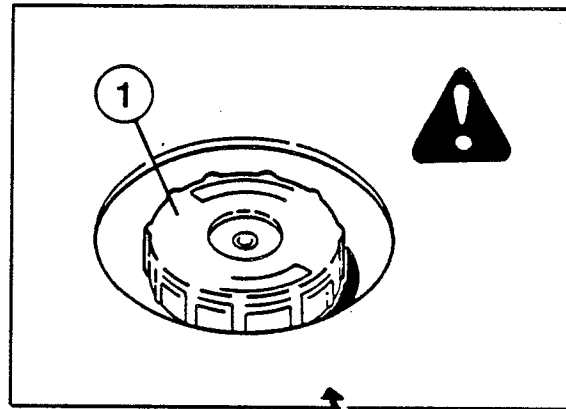
### Filling the hydraulic oil reservoir

- A - On machines equipped with central refilling unit proceed according to Operating Manual section "9".
- Vent the main hydraulic pumps according to paragraph "C".
- B - On machines without central refilling unit fill main oil reservoir up to the upper mark on sight gauge.
- Vent the main hydraulic pumps according to paragraph "C".
- C - Venting the hydraulic pumps  
(Necessary after hydraulic oil change.)

#### Note:

Make sure main shut-off valve is in open position.

1. Open vent screws (Z 12060) starting on the lower pumps, until oil flows out free from air bubbles.  
Close the vent screws.
2. Check hydraulic oil level and fill up if necessary, refer to paragraph "A" or "B".
3. Start the engine and perform several operating cycles at low engine speed without load.
4. Re-check hydraulic oil level and the complete system for leakage; especially the connection between main oil - and suction oil reservoir.



101. Cooling system

Change coolant according to the separate Engine Operation and Maintenance Manual.

1. Remove radiator pressure cap (1), illust. (Z 19119).

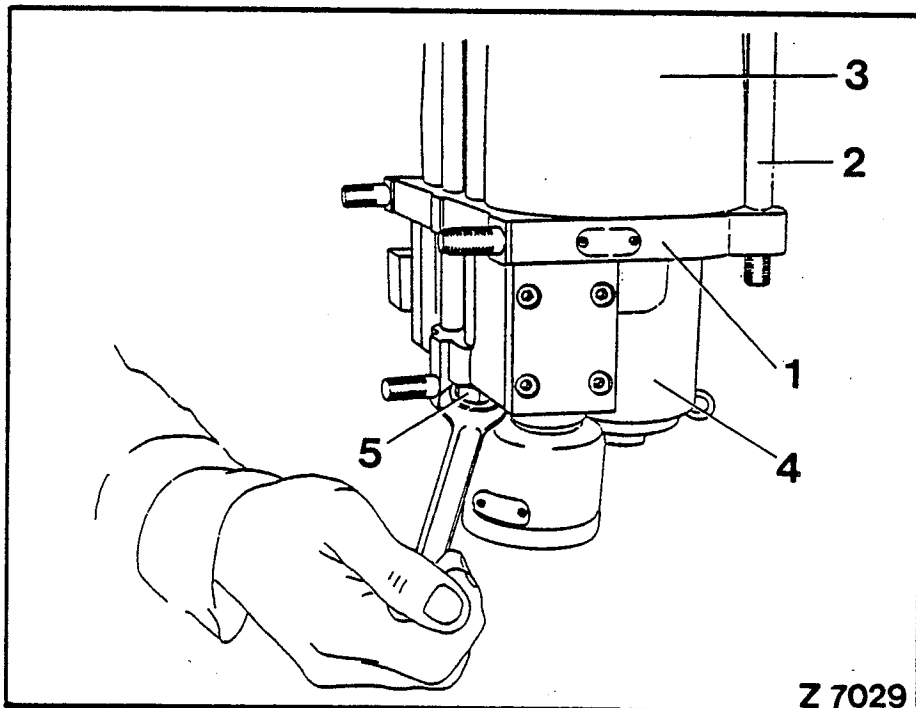
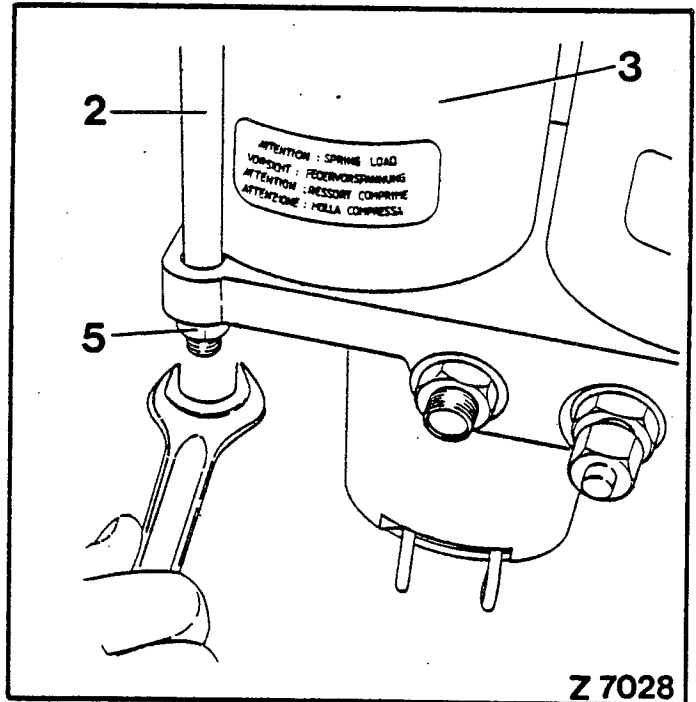
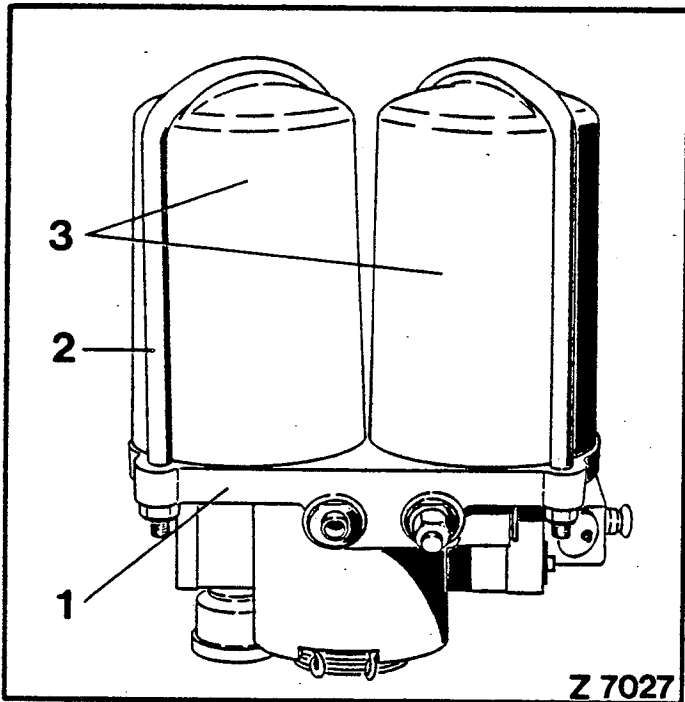
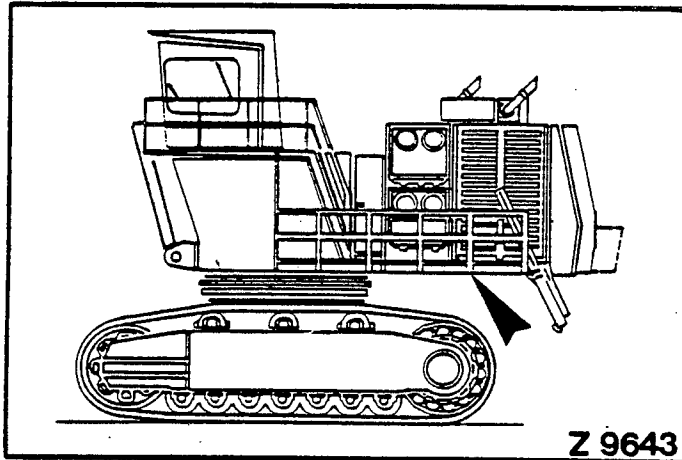
Caution:

If the coolant in the cooling system is hot, first turn the radiator cap slowly counterclockwise to the safety stop to allow the pressure or any steam to escape, then press down on the cap and continue to turn until the cap is free to be removed.

2. Remove radiator drain plug (2).

Note:

All further drain points and cooling system maintenance is shown in the Engine Operation and Maintenance Manual.





102. Air dryer

Location of the unit (Z 9643).

Legend to (Z 7027, Z 7028, Z 7029):

Valve plate (1)  
Tension bow (2)  
Casing (3)  
Pre-filter (4)  
Nuts (5)

Attention!

Prior to maintenance work the air dryer has to be bled resp. relieved of pressure.

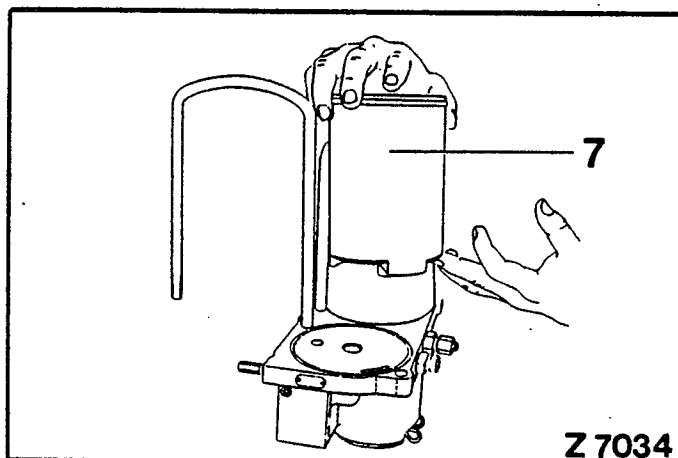
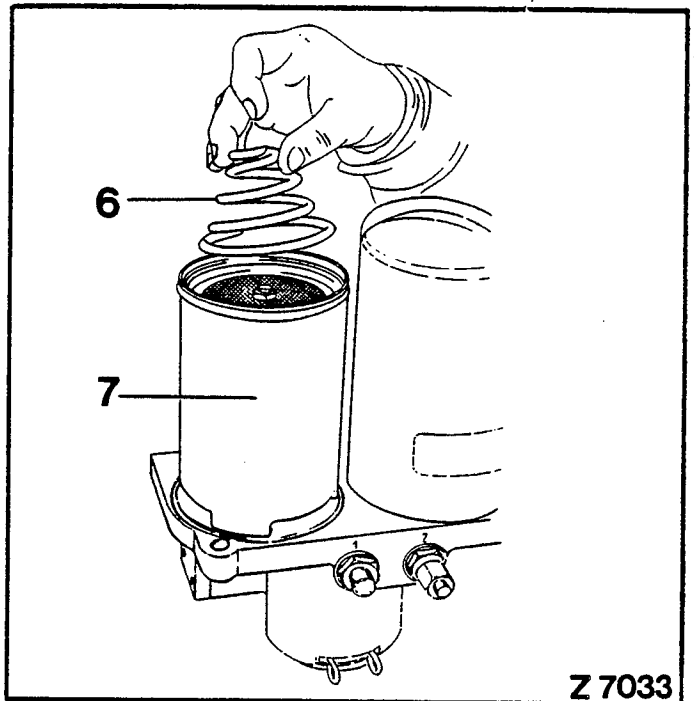
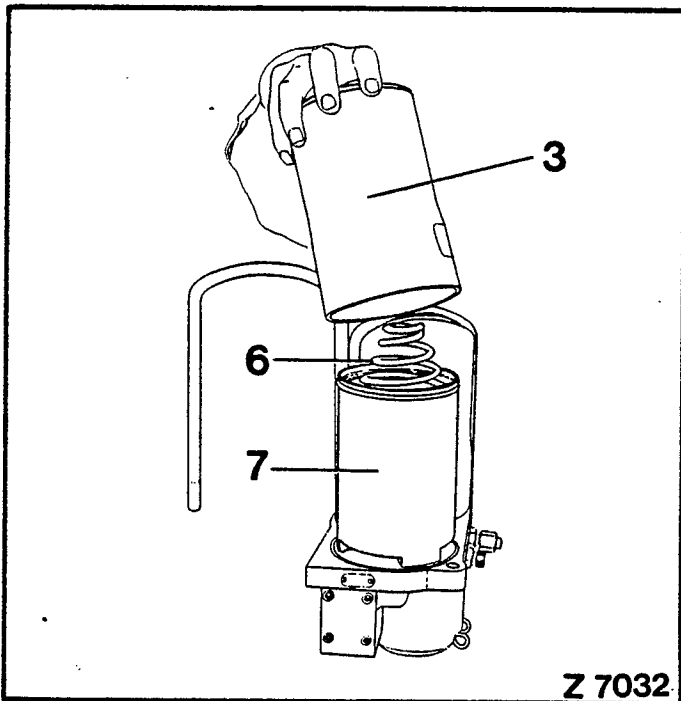
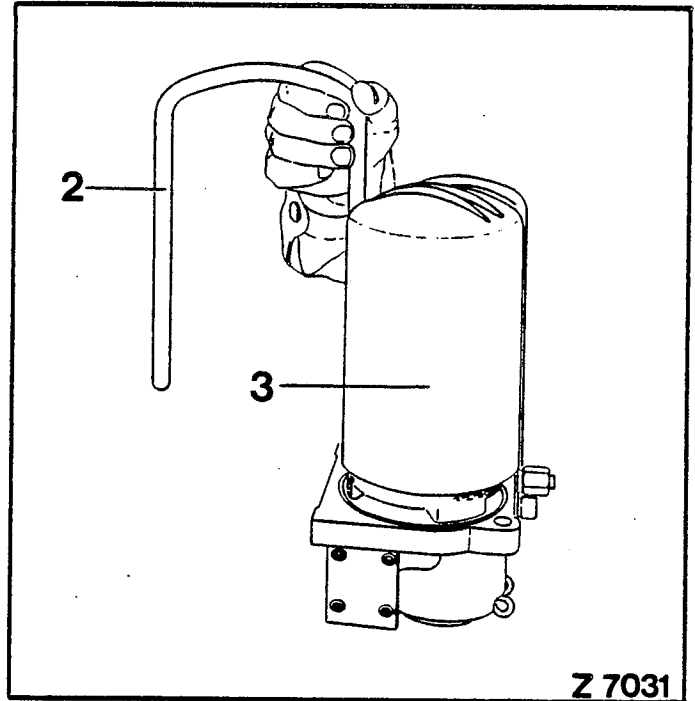
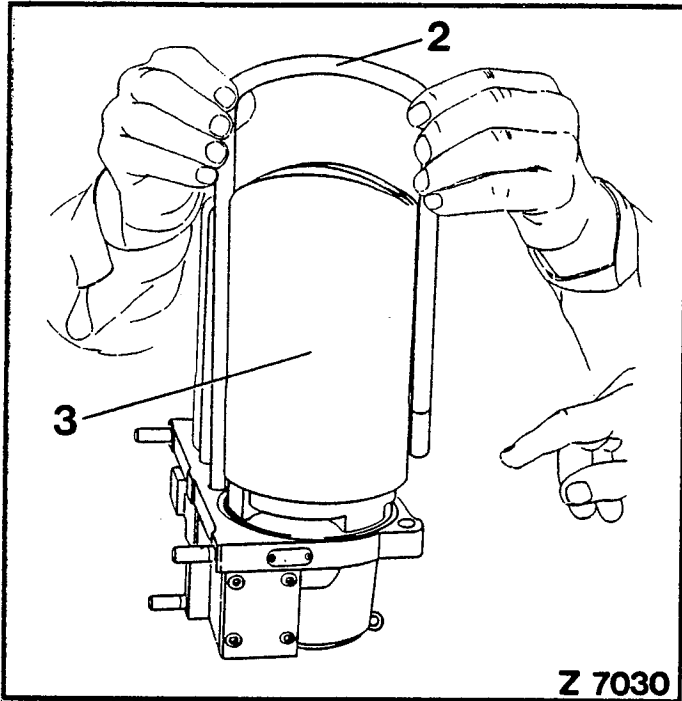
Replace granulate cartridges

Attention!

Tension bow (2) and casing (3) are under spring tension, therefore always loosen nuts of the short tension bow legs first.

1. Loosen nuts (5) on the short tension bow legs.
2. Loosen nuts (5) on the long tension bow legs.







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See illustration (Z 7030 to 7034)

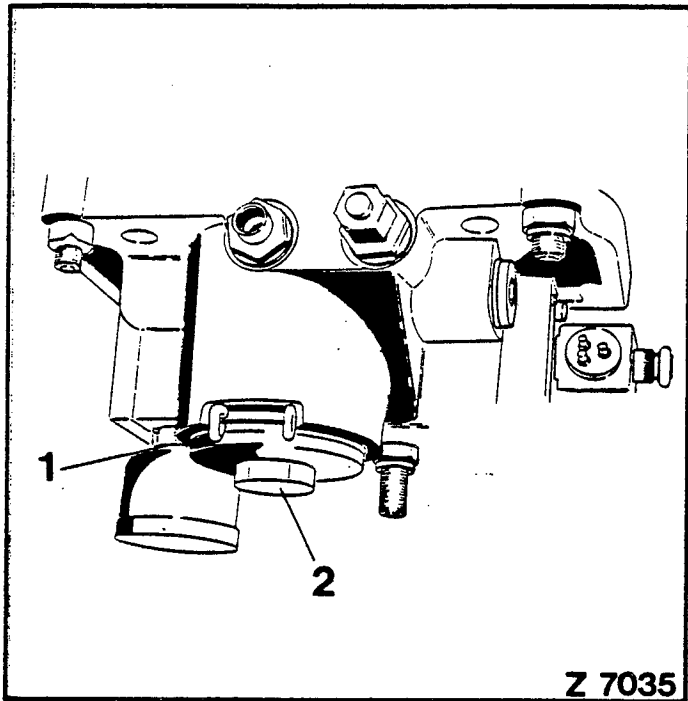
3. Pull up clamp clip (2).
4. Fold clamp clip (2) backward.
5. Remove housing (3).
6. Remove spring (6).
7. Remove granulates cartridge (7).

Note:

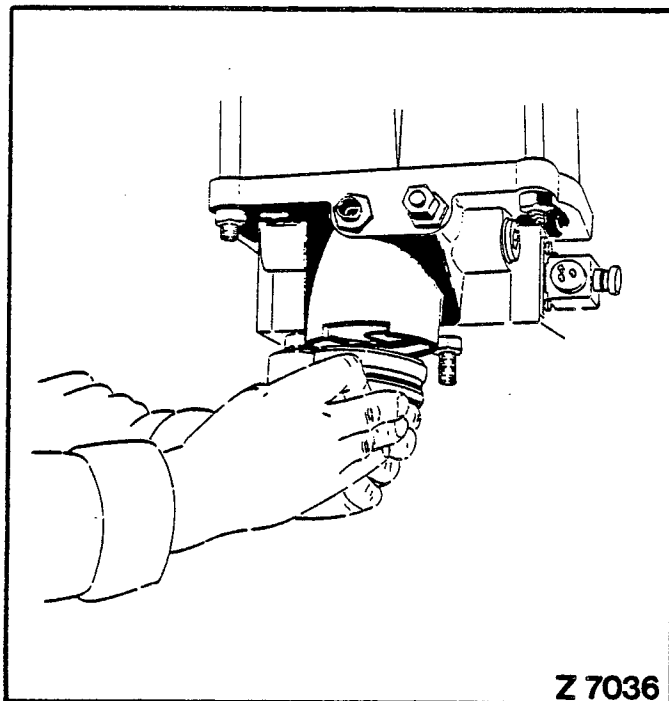
New granulates cartridges may be ordered from Spare Parts Sales of MANNESMANN DEMAG BAUMASCHINEN under spare part no. 969 327.

Note:

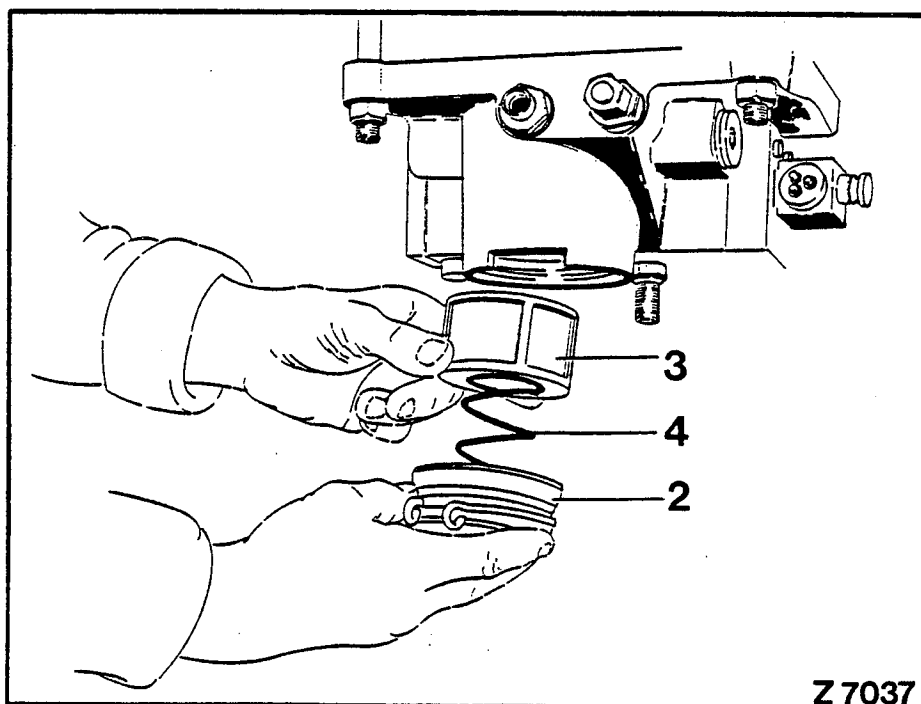
Assembling the air dryer is done in reverse sequence. Nuts (5, Z 7028 and Z 7029) must be tightened with a torque of 25 Nm.



Z 7035



Z 7036



Z 7037



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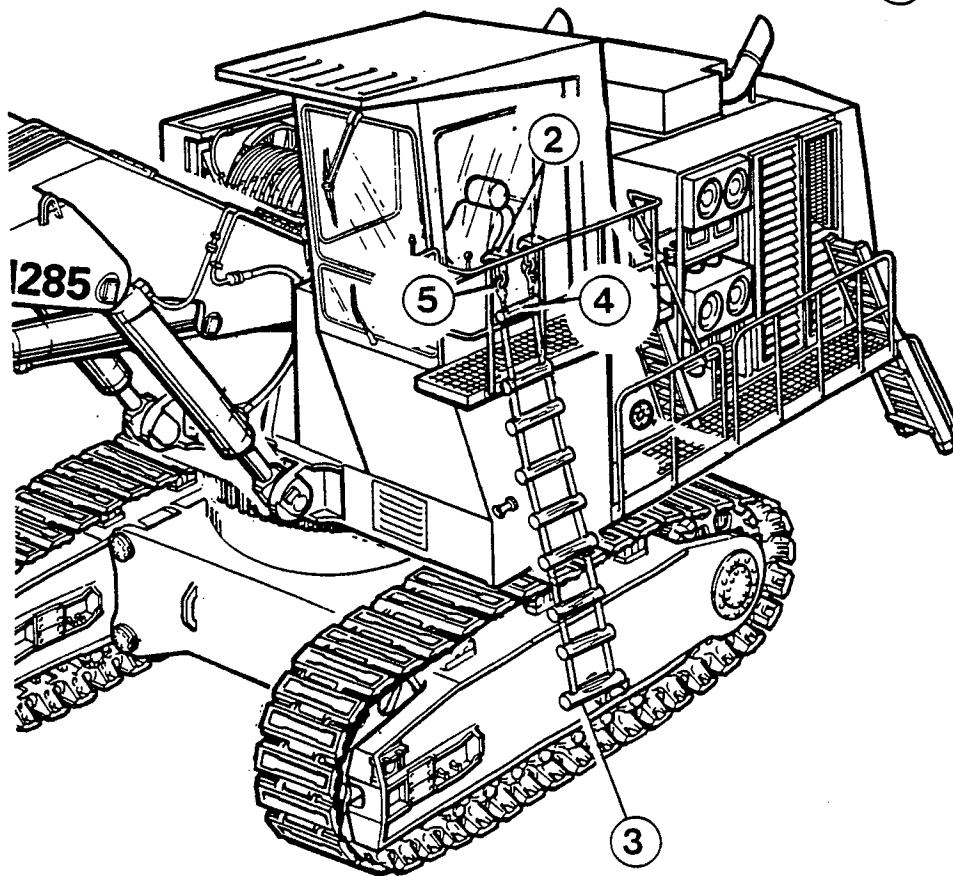
6.11

### Cleaning the preliminary filter

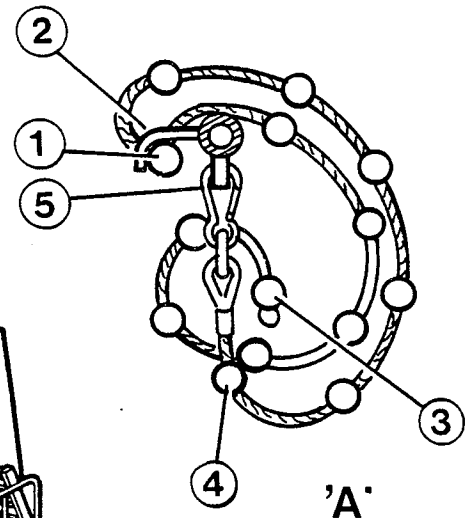
1. Push lock (2) upward (Z 7035).
2. Compress strap (1).
3. Pull out lock (2) with spring (4) and filter cartridge (3) (Z 7037).

#### Note:

Assembling the filter is done in reverse sequence.



'B'



'A'

Z 19064

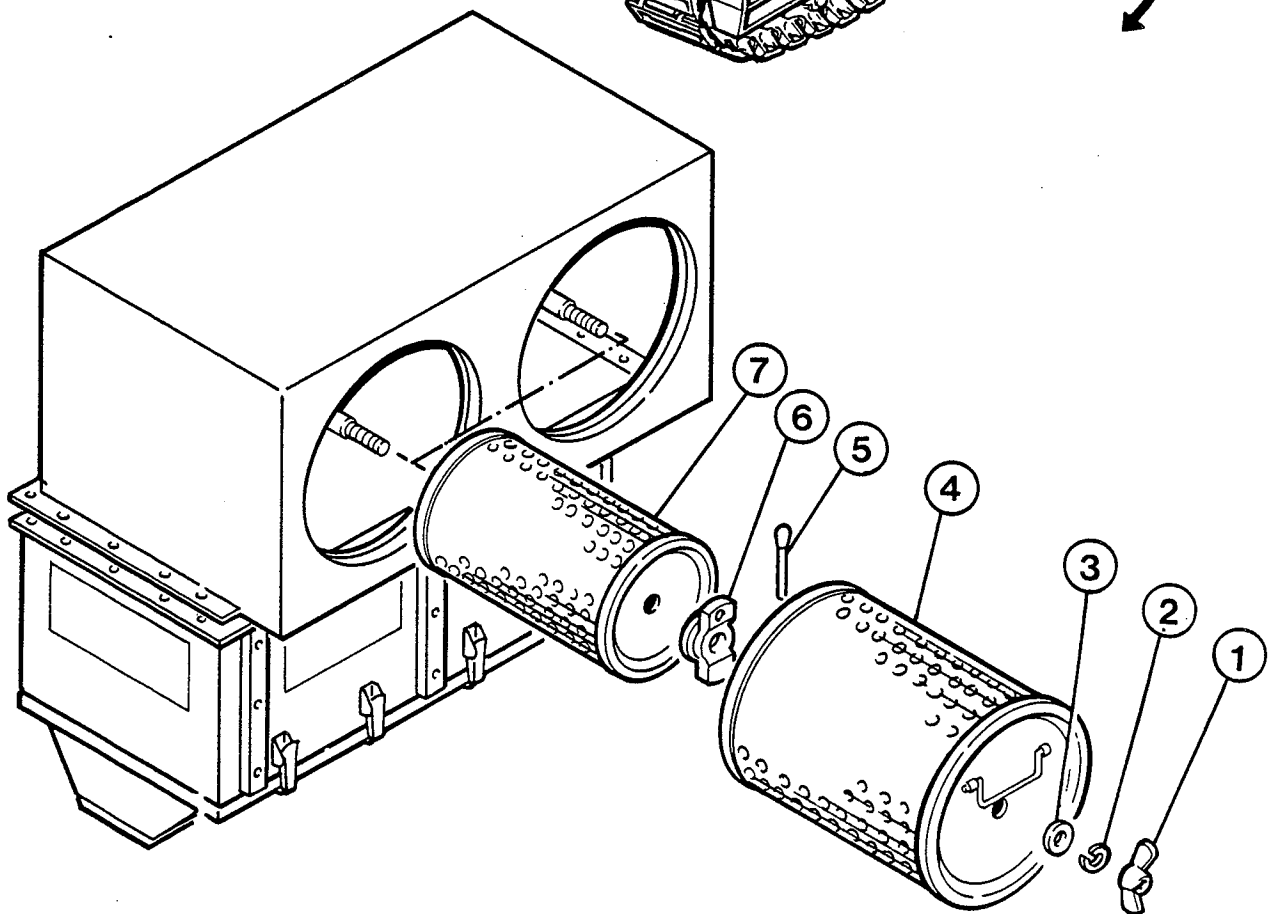
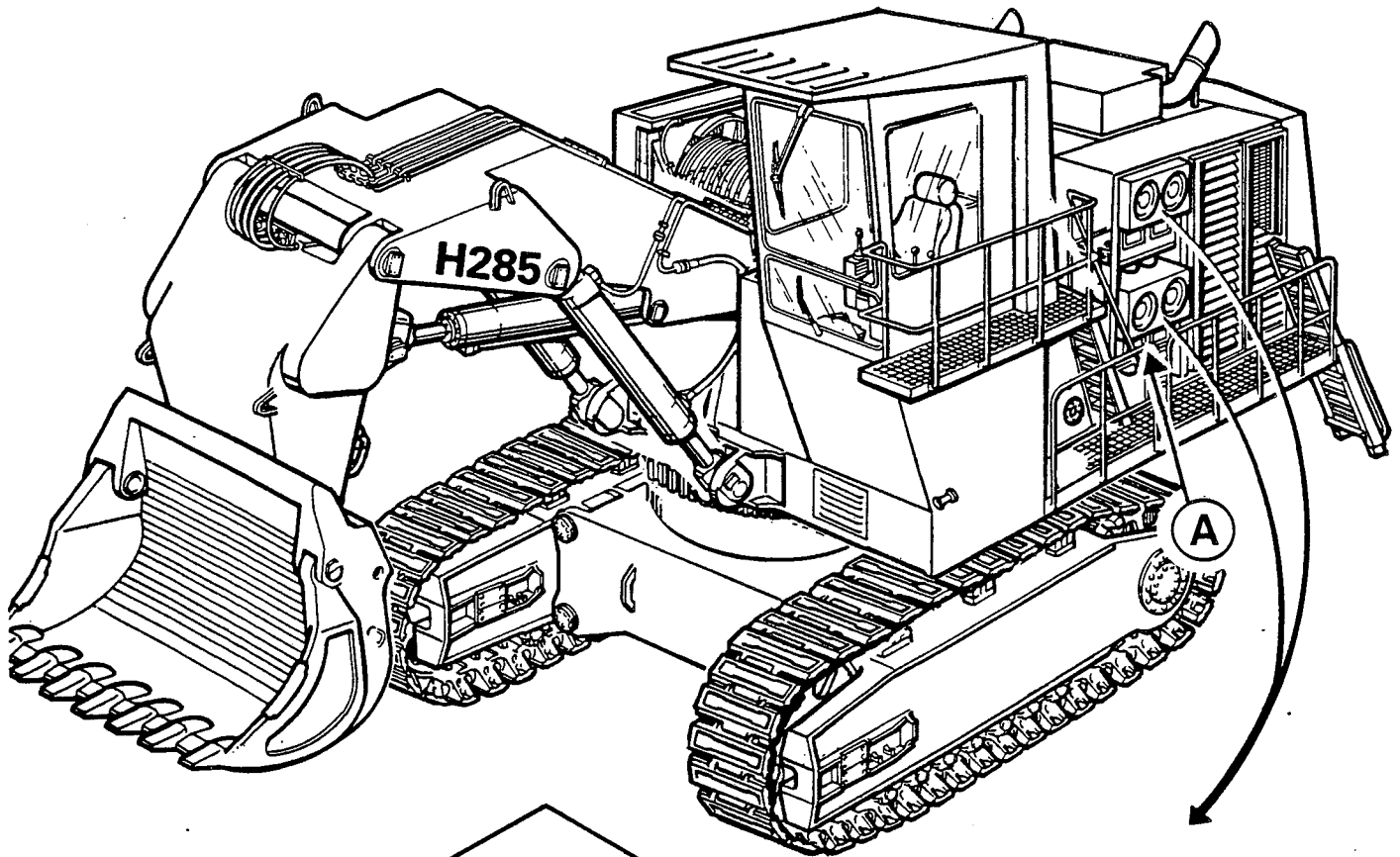
105. Emergency rope-ladder, illust. (Z 19064)

- A - Normal position
- B - Lowered position
- (1) Rope ladder
- (2) Braces
- (3) Bottom rung
- (4) Upper rung
- (5) Snap hook

Check both ropes and all rungs for good condition and fastening.

Check to make sure retainer eyes and snap hooks (5) are in good condition.

If any damage or bad condition is found replace the concerned parts without delay.



110. Servicing the air cleaner

Auxiliary service platform (A), illust. (Z 19121).

Note:

For servicing the upper air cleaner filter elements fold-up the auxiliary service platform in order to ensure safe access to the upper elements. Refer to section 6.1 page 1981n-08 for mounting procedure.

Air cleaner

Clean resp. replace filter elements.

Caution!

Never service air cleaner while engine is running. Clean main filter elements as soon as monitor lamp (67) illust. (Z 10361) in operation manual lights up while engine is running. Replace element after 6 cleanings or annually, whichever occurs first.

Replacing the main filter elements, illust. (Z 19121):

1. Remove elements in sequence of reference numbers (1 to 4).
2. Clean and check resp. replace main filter element.

Wipe out filter housing with a clean cloth.

3. Element cleaning methods:

Clean main element by one of the following methods.

Compressed air or washing:

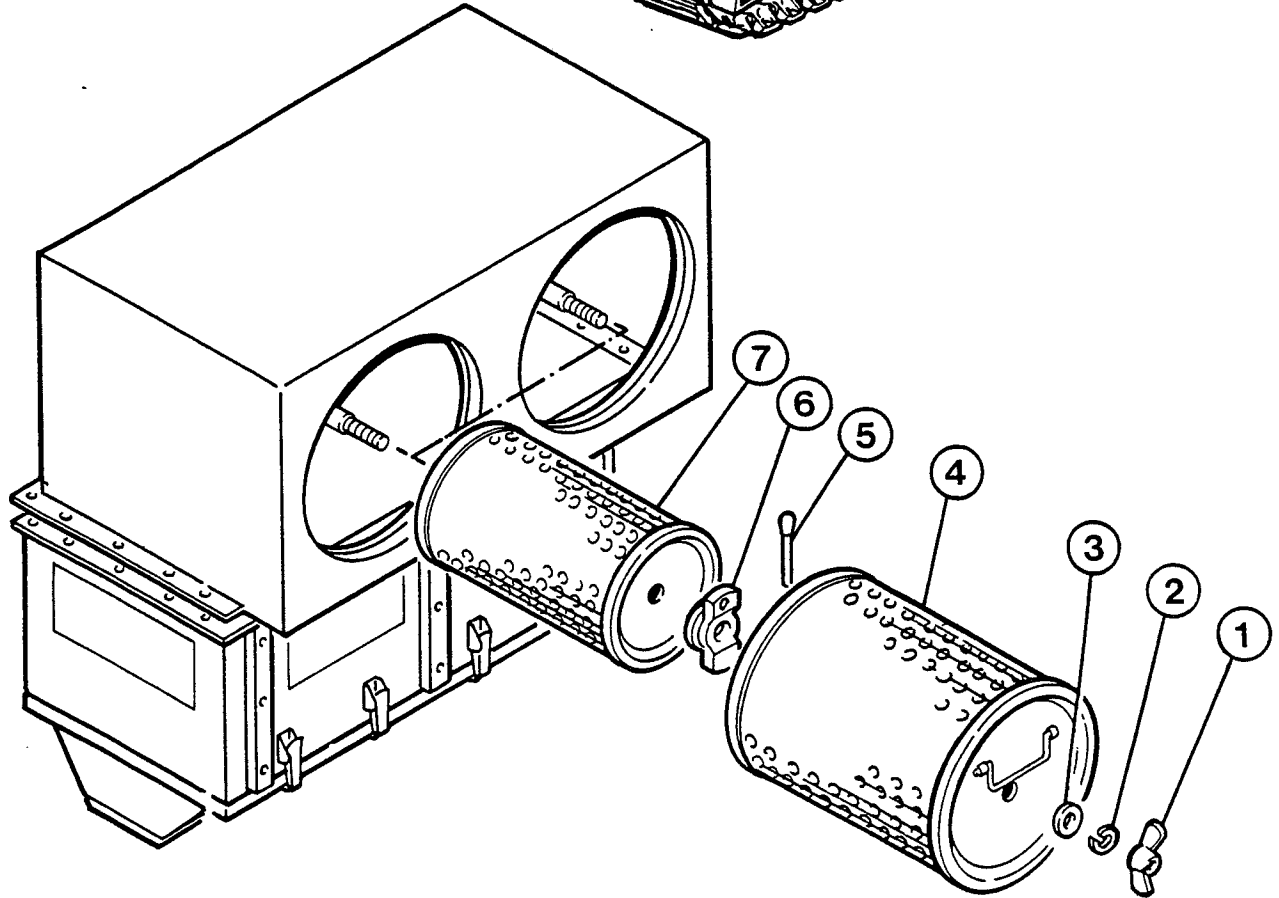
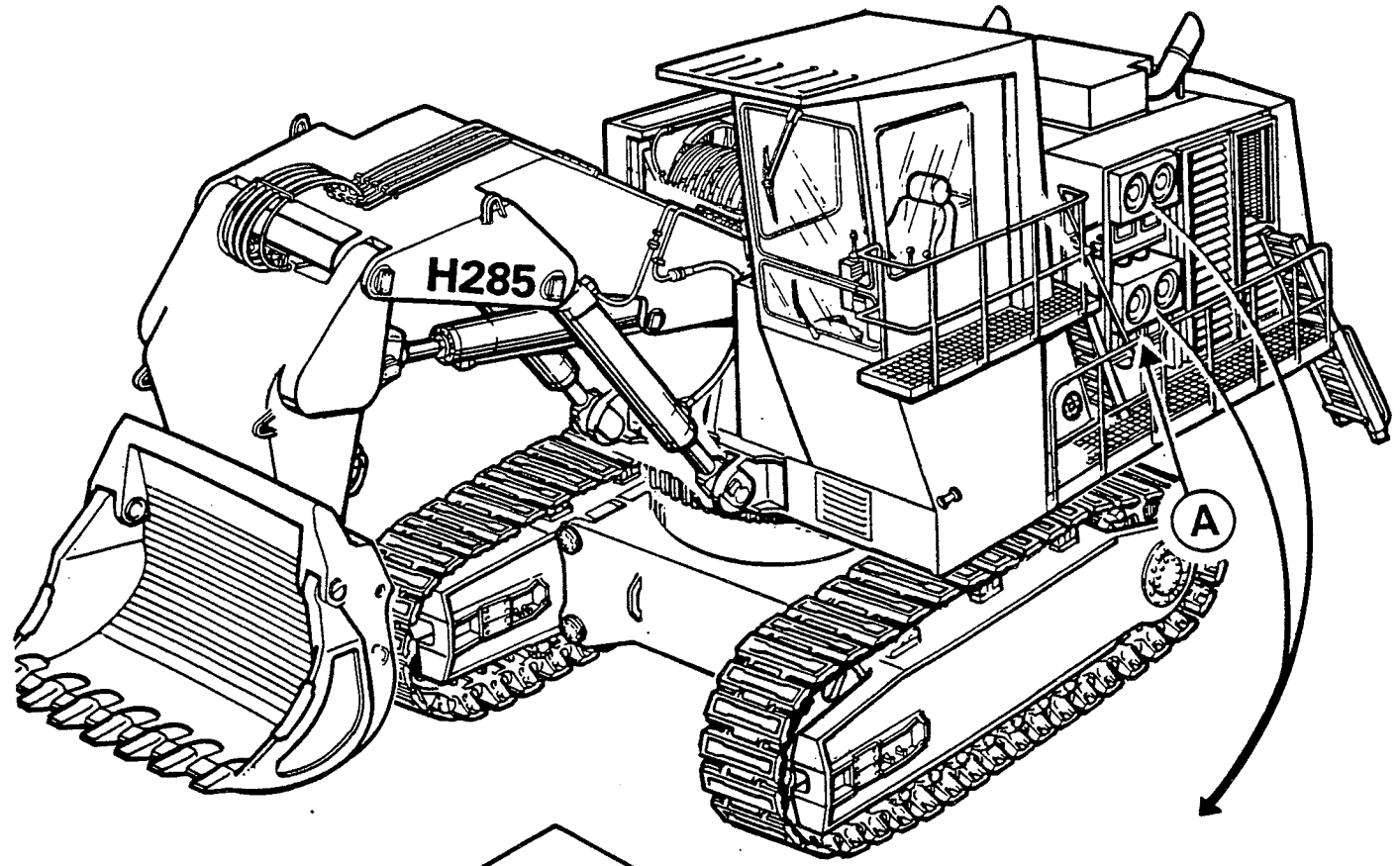
Compressed air is recommended when element will be re-used immediately because a washed element must be dried before re-use.

Compressed air:

Direct air through element in the direction opposite to normal air flow through the element. Move nozzle up and down while rotating element. Keep nozzle at least one inch from pleated paper. Maximum air pressure to prevent damage of element is 100 P.S.I. (6 bar).

continued





Cont'd

Air cleaner servicing, illust. (Z 19121):

Washing

1. Soak element 15 minutes or more in cleaning solution. See package for full instructions.
2. Rinse until water is clear maximum water pressure 40 P.S.I. (2,5 bar).
3. Air-dry or use warm flowing air, max. 160° F (+ 70° C). Do not use compressed air or light bulbs.

Note:

Before installing main elements (4) check service indicator (6) of safety element (7).

If a red signal is shown, replace safety element (7).

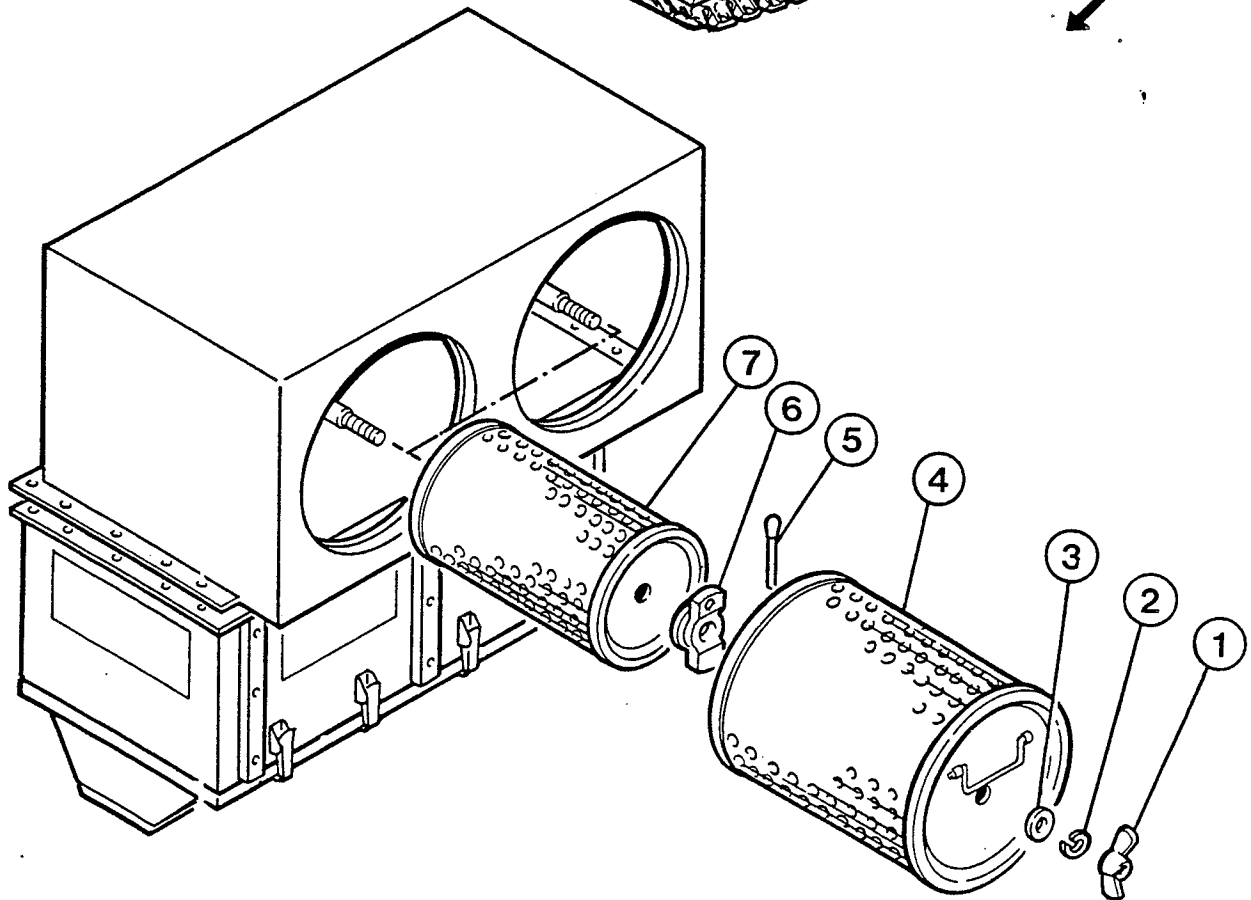
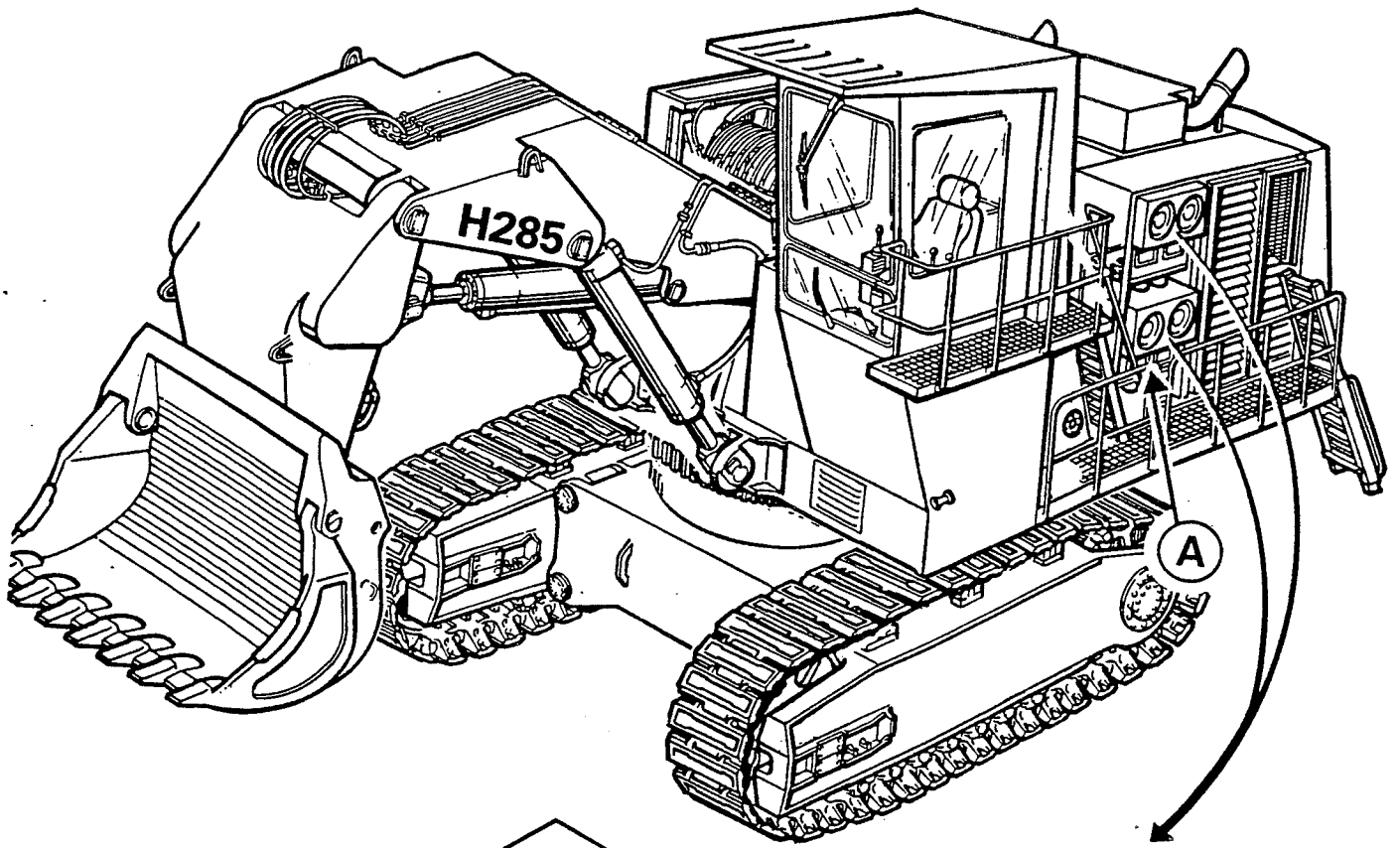
Clean indicator (6) then suck on the outer side of the indicator to reset signal to green indication.

4. Install main filter elements (4).

Notes:

- If monitor lamp continues to light up after installation of a new main filter element the safety-filter element has to be replaced.
- If faulty service or a defect has been detected while servicing the main filter element also the safety filter element has to be replaced.
- After having the main filter element cleaned three-times or replaced also the safety filter element has to be replaced.

continued



Cont'd

Air cleaner servicing, illust. (Z 19121)Replacing the safety filter element (7):

1. Remove element in sequence of ref. no. (1 to 7).
2. Cover air intake opening.
3. Install new safety filter element (7).

Caution!

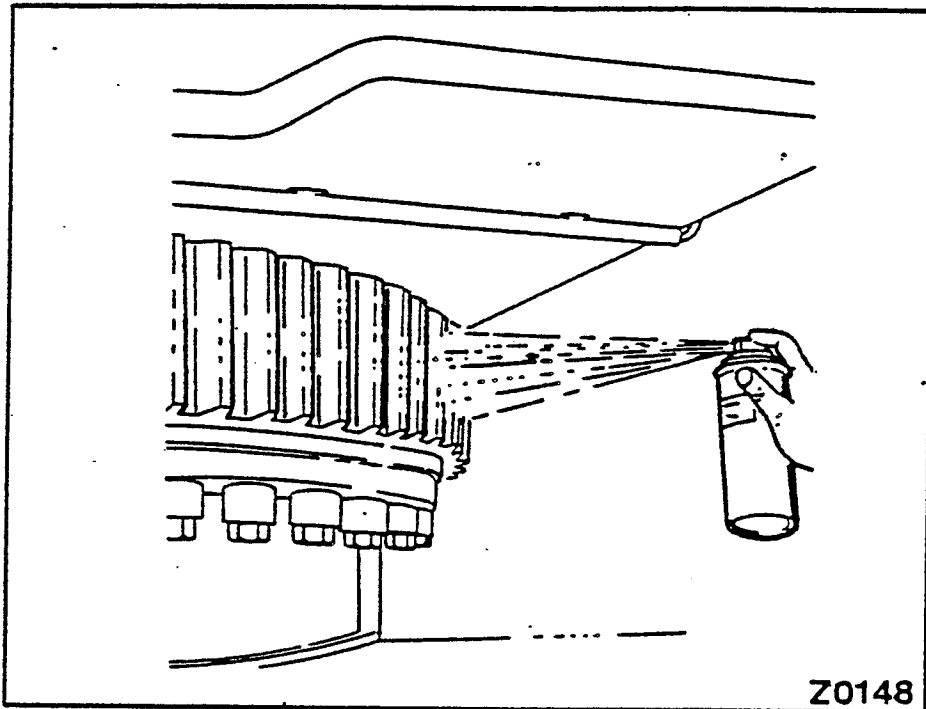
The safety filter element may not be cleaned and re-used.

4. Remove cover from air intake opening.
5. Install safety and main filter element, take care service indicator (6) is correctly secured by cotter pin (5).

General service tips

The air cleaner should be inspected periodically to maintain maximum engine protection and maximum service life. These inspections should include the following points.

1. Inspect the air transfer duct between the air cleaner and the engine to be sure all clamps are tight, all flange joints are tight, and there are no cracks in the ducting.
2. Air cleaner mounting bolts and clamps must be tight to hold the air cleaner securely.
3. Check the dust cup to make sure it is sealing 360° around the air cleaner body.
4. Automatic dust unloader valve must be in place, not inverted or damaged, and free from obstruction.



Z0148

112. Slew ring gear

If teeth are not completely covered with grease, they have to be sprayed immediately with special adhesive spray grease, see illust. (Z 0148).

Important:

1. In order to ensure proper adherence of the spray grease, clean the ring gear prior lubrication.
2. Make sure that the multi-purpose grease of the slewing connection bearing does not come in contact with the teeth of the ring gear, because this will diminish lubrication capability of the ring gear spray grease.  
If necessary remove excessive multi-purpose grease from the slewing connection above the dust seal ring.



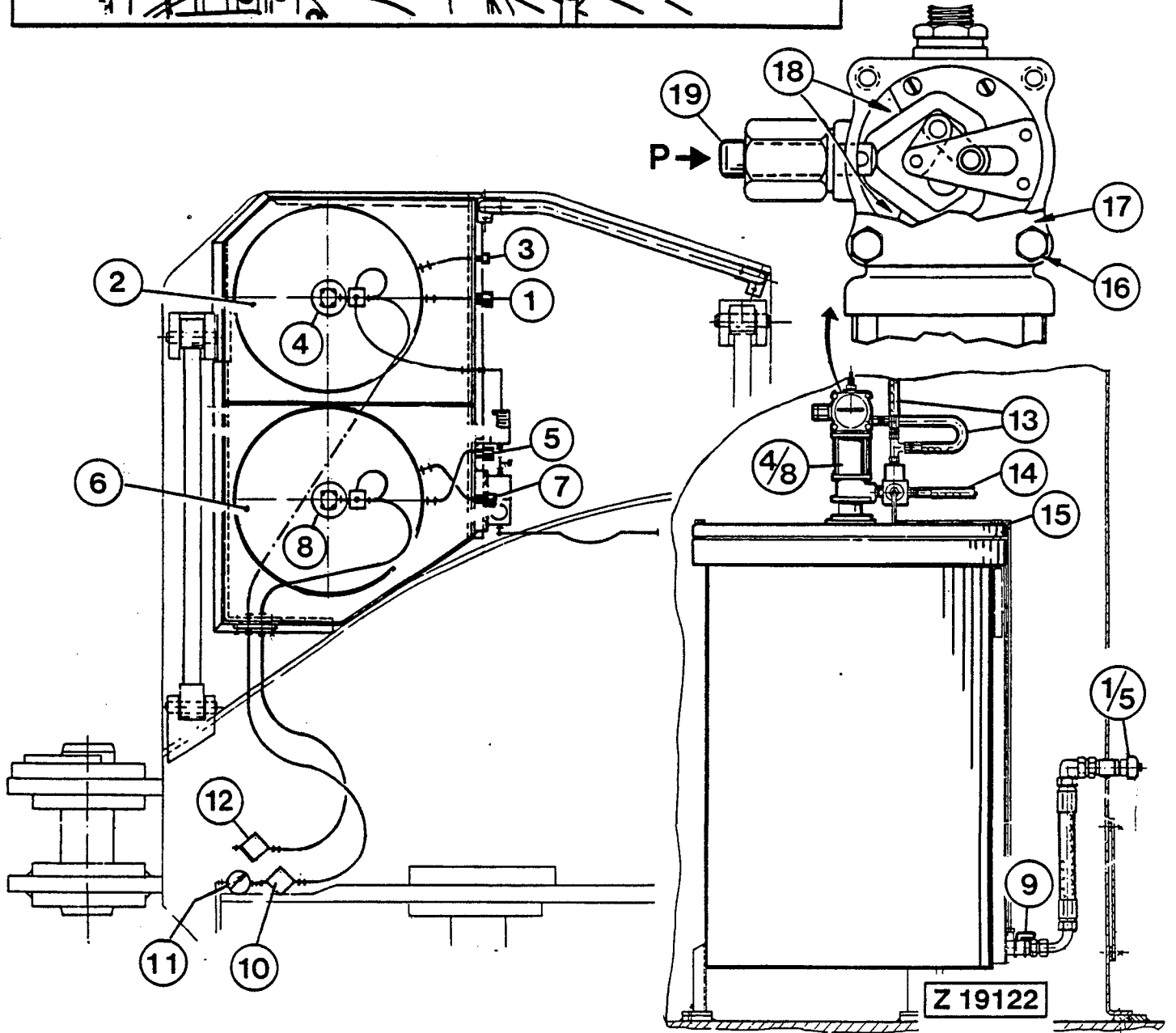
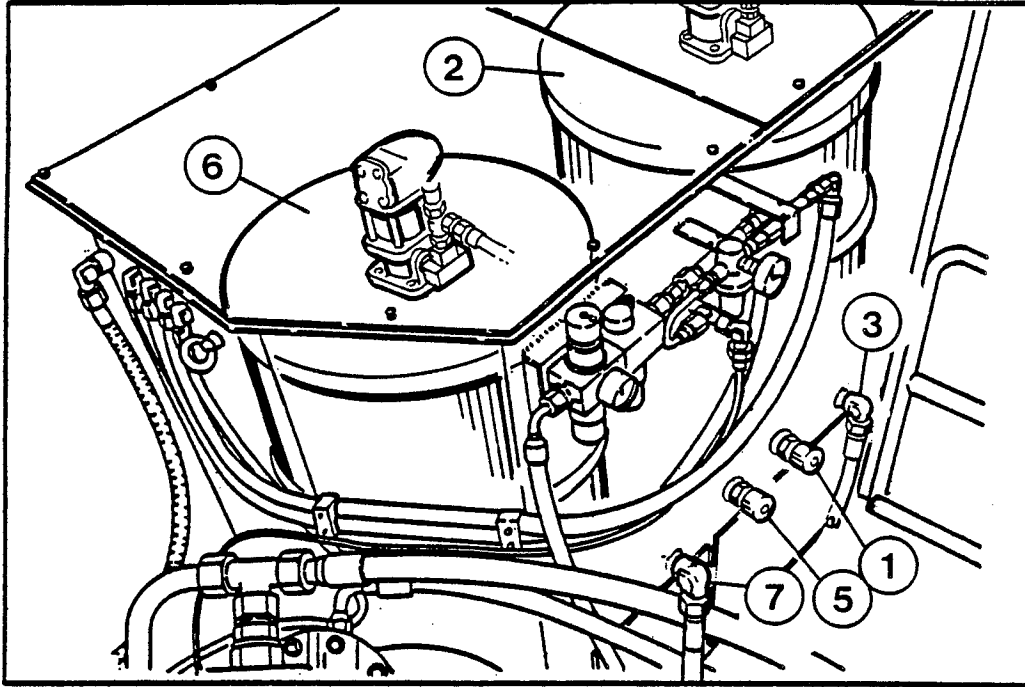
113. Central lubricating system and ring gear lubricating system

Legend for illust. (Z 19122):

- (1) Coupling for filling the central lubrication system
- (2) Grease container, central lubrication system
- (3) Overflow port ("Full indication")
- (4) Grease pump with air motor
- (5) Coupling for filling the slew gear ring spray grease system
- (6) Spray grease container
- (7) Overflow port ("Full indication")
- (8) Grease pump with air motor
- (9) Shut-off cocks
- (10) Grease screen assy, central lubrication system
- (11) Pressure gauge
- (12) Grease screen assy, spray grease system
- (13) Compressed air lines
- (14) Grease line
- (15) Grease return line
- (16) Cover screw
- (17) Cover, air motor
- (18) Pack grease behind toggle plate
- (19) Push pin to overcome dead center of air motor
- (P) Push in when air motor has come to a stand-still in dead center position.

continued





Cont'd

Central lubricating system and slew ring gear  
lubricating system, illust. (Z 19122)

1. Refill grease containers, when the indicator lamp "Grease Container Empty" at the tellite panel lights up.

Important!

Grease specification for central -and slew gear lube system if different.

Make sure to connect the correct refilling line to the corresponding coupling (1 or 5).

- Coupling (1) serves for filling of Central Lubricating System

Coupling (5) serves for Slew Ring Gear Lubricating System (spray grease).

Select the correct grease according to section "Fuels and Lubricants". For refilling open cocks (9).

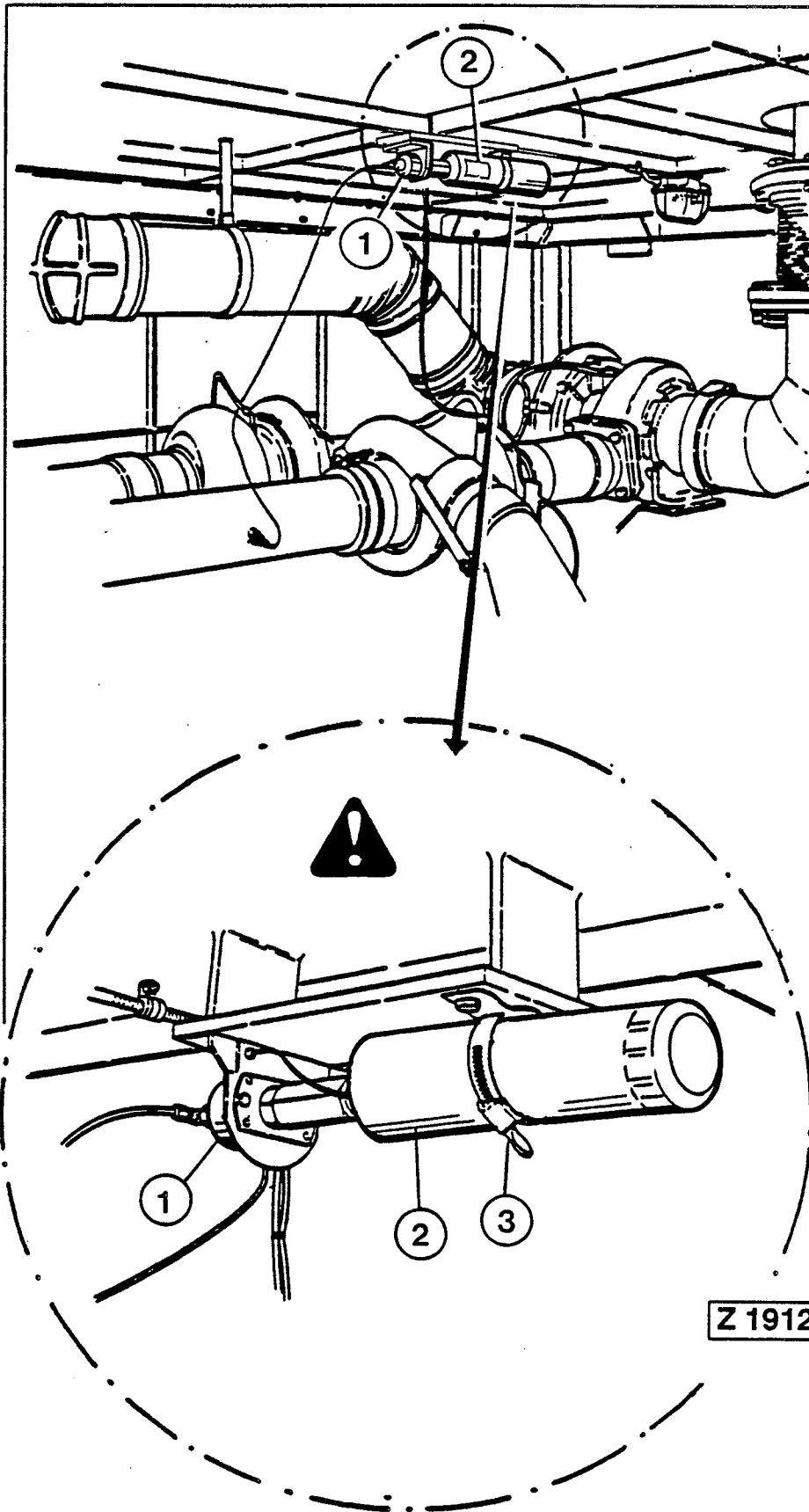
As soon as the containers are completely filled, an indicator lamp at the control box located next to the container cover lights up.

2. Lubricate air valve mechanism of air motors (4 and 8), illust. (Z 19122)

Disconnect air to pump. Remove the four cover screws (16), cover plate (17), and cover plate gasket. Grease should then be packed behind the toggle plate (18). Use N.L.G.I. No. 1 (light grade) water repellent grease, approximately 1-1/2 ounces. If toggle plate has been removed from air valve casting, pack cavity with grease before replacing toggle plate. Replace cover gasket, cover plate and cover screws. Tighten to avoid air leaks. Periodic inspection of these parts at least once a year is advisable.

Note:

In order to ensure proper operation of the lubrication systems carry out the periodic maintenance of the service unit and grease screens (10 and 12). Refer to "Lubrication and Maintenance Schedule" section 5 for service intervals.



Z 19123

124. Cold starting aid, replace fluid cylinder, illust. (Z 19123)

- (1) Electrically operated valve
- (2) Cold start fluid cylinder
- (3) Mounting clamp

Caution:

Starting fluid is poisonous and flammable.

Do not store replacement cylinders in living areas.

Do not smoke while changing cylinders.

Use only in well ventilated areas.

Use with care to avoid fires.

Avoid breathing of vapors or repeated contact with skin.

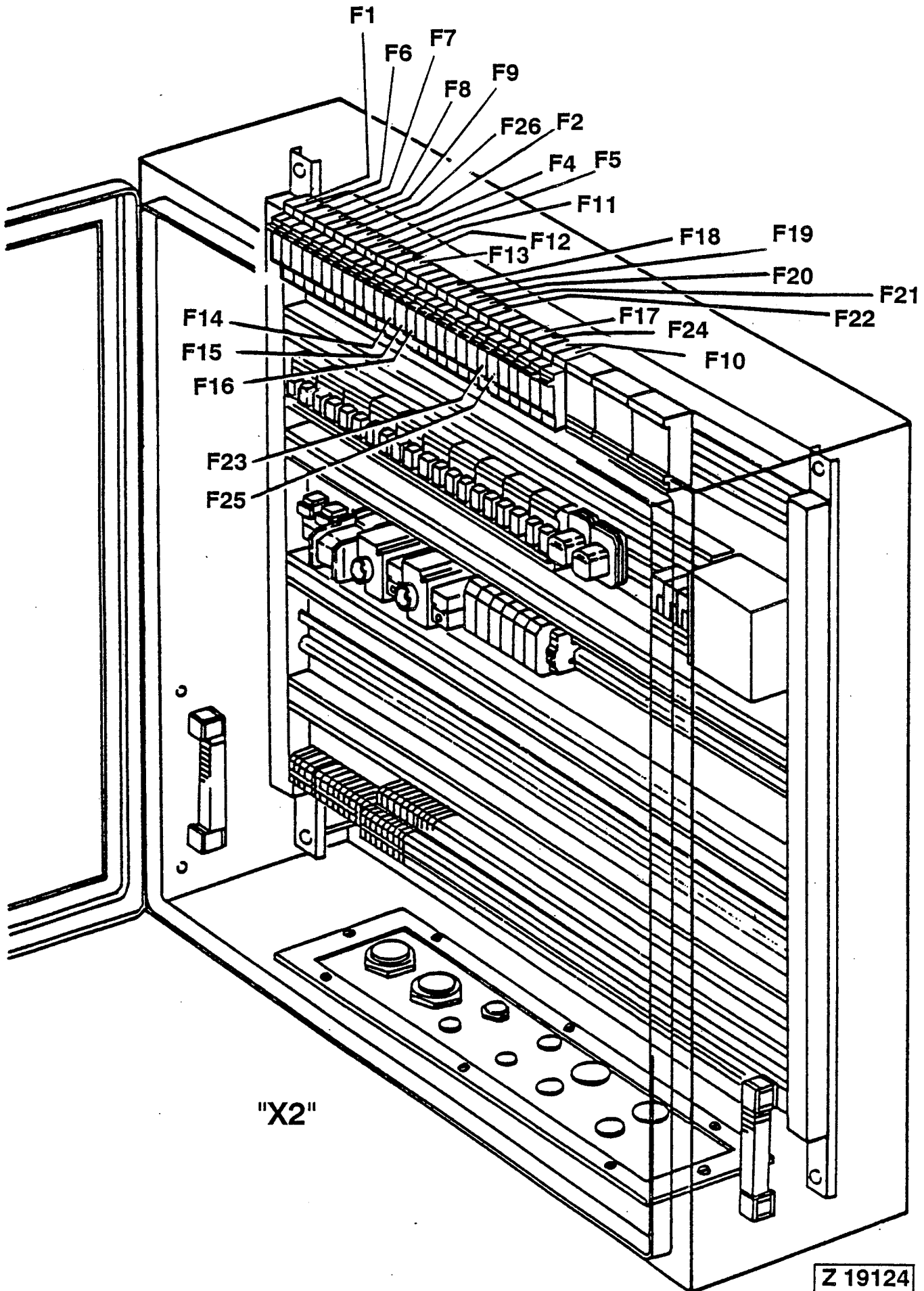
Do not puncture or burn cylinders.

Discard cylinders in a safe place.

Keep fluid container away from heat, sparks, open flame, or open sunlight. It may explode.

Observe instructions on the container.

Do not store or use at temperatures above 93° C (200° F).



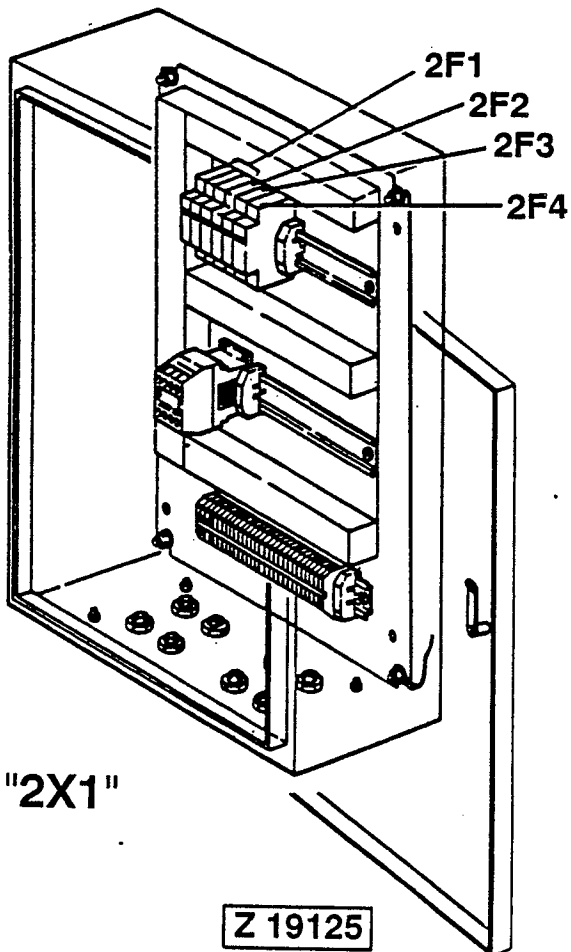
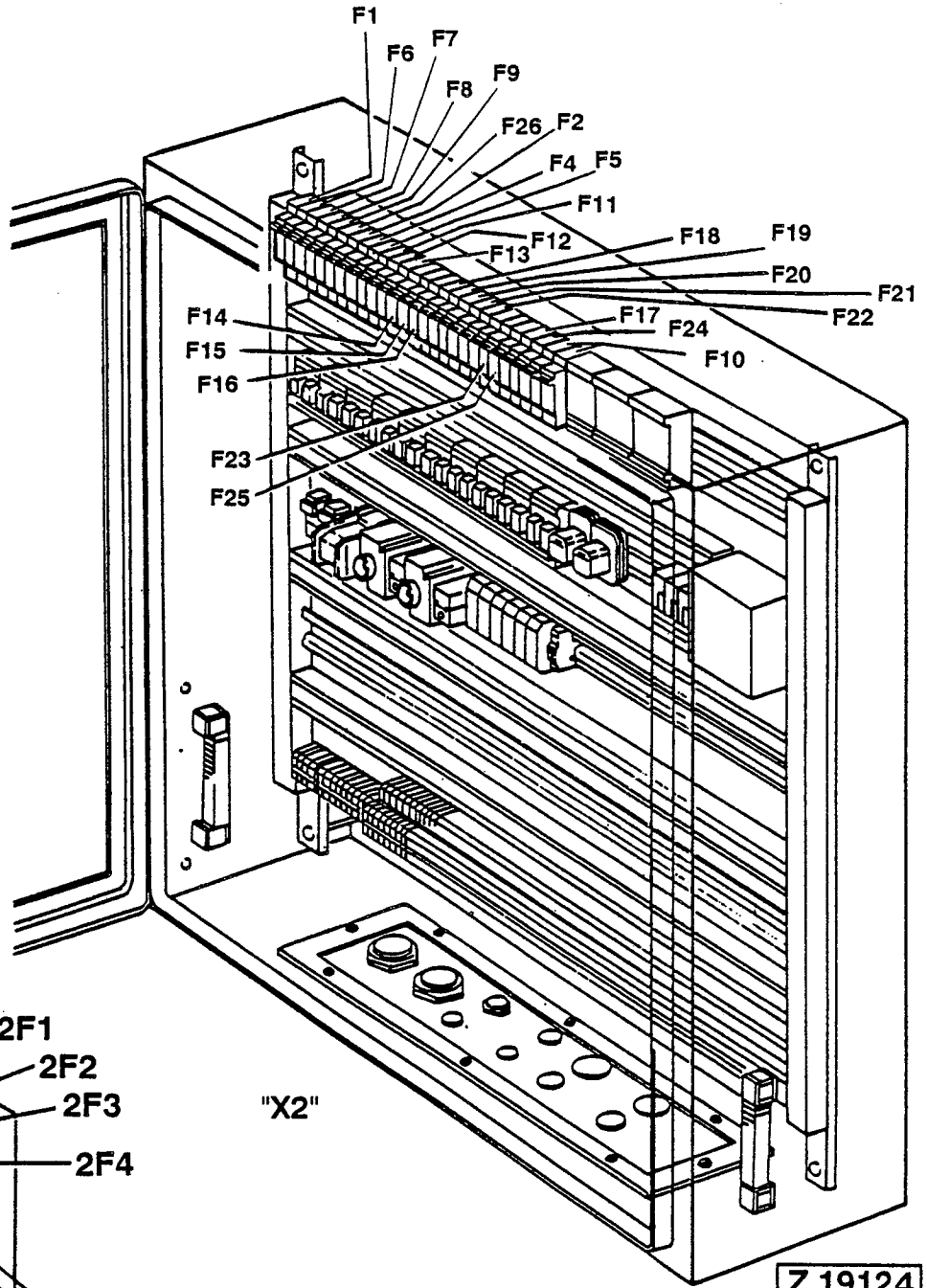
125. Electrical system of excavators with Diesel engine

Switch box "X2" (located in cab base compartment)

Location of circuit breakers (F), see illust. (Z 19124):

<u>Designation</u>	<u>Amp.</u>	<u>Application</u>
F1	50	Power supply, main circuit
F2	16	Signal horn, cold start aid, air compressor
F3	-	Reserve
F4	16	Engine stop
F5	16	Windshield wiper and washer system
F6	16	Illumination of cab, cab base, pump and engine compartment. Key switch and sockets. Cigarette lighter.
F7	16	Illumination superstructure
F8	16	Air conditioner condenser
F9	16	Air conditioner evaporator, heater unit
F10	1	Ammeter
F11	6	Engine start, restart lock relay, engine stop, cold start
F12	6	Engine shut-down system (safety chain)
F13	1	Coolant level
F14	1	Hydraulic oil level
F15	6	Indicator lights, bulb test, bucket cut-out
F16	6	Analogue gauges and indicators
F17	6	Radio, clock, compass
F18	6	Instrument panel illumination
F19	6	Superstructure illumination
F20	6	Engine speed modulator
F21	16	Pump delivery reduction (load limiting control system), switch- off slew circuit pump control, oil cooler fan stage control, travel gear brake, slew gear brake.

continued



Cont'd

Electrical system of excavators with Diesel engineSwitch box "X2" (located in cab base compartment)

Location of circuit breakers (F), see illust. (Z 19124):

<u>Designation</u>	<u>Amp.</u>	<u>Application</u>
F22	6	Air dryer, generator overspeed
F23	6	Central lube system, central re- filling unit
F24	1	Voltage transformer
F25	6	Slew ring gear lube system
F26	16	Blower cab

Switch box "2X1" (located in cab base compartment)

Location of circuit breakers (F), see illust. (Z 19125):

<u>Designation</u>	<u>Amp.</u>	<u>Application</u>
2F1	16	Generator 10 kVA, overspeed
2F2	6	Head lights (3 x 380 / 220 V, 50 Hz)
2F3	6	
2F4	6	

Note:

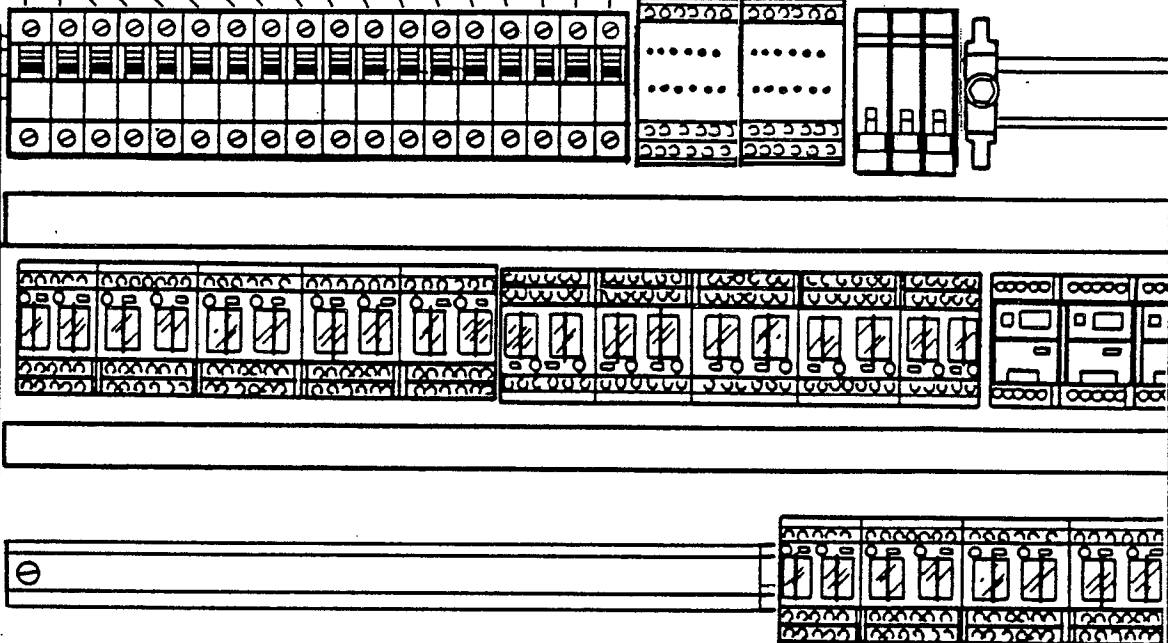
1. Designation code of circuit breakers is also shown in the electrical circuit diagrams.
2. The location of circuit breakers within switch box may differ from that shown in the illustration.  
However, they can easily be identified at their designation codes F1, F2 and so on.



1988-12  
6.12

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F ,6,9,26,2,5,11,12,14,15,16,18,19,21,22,23,25,17,24



Z 19126

125. Electrical system of excavators with electric motor

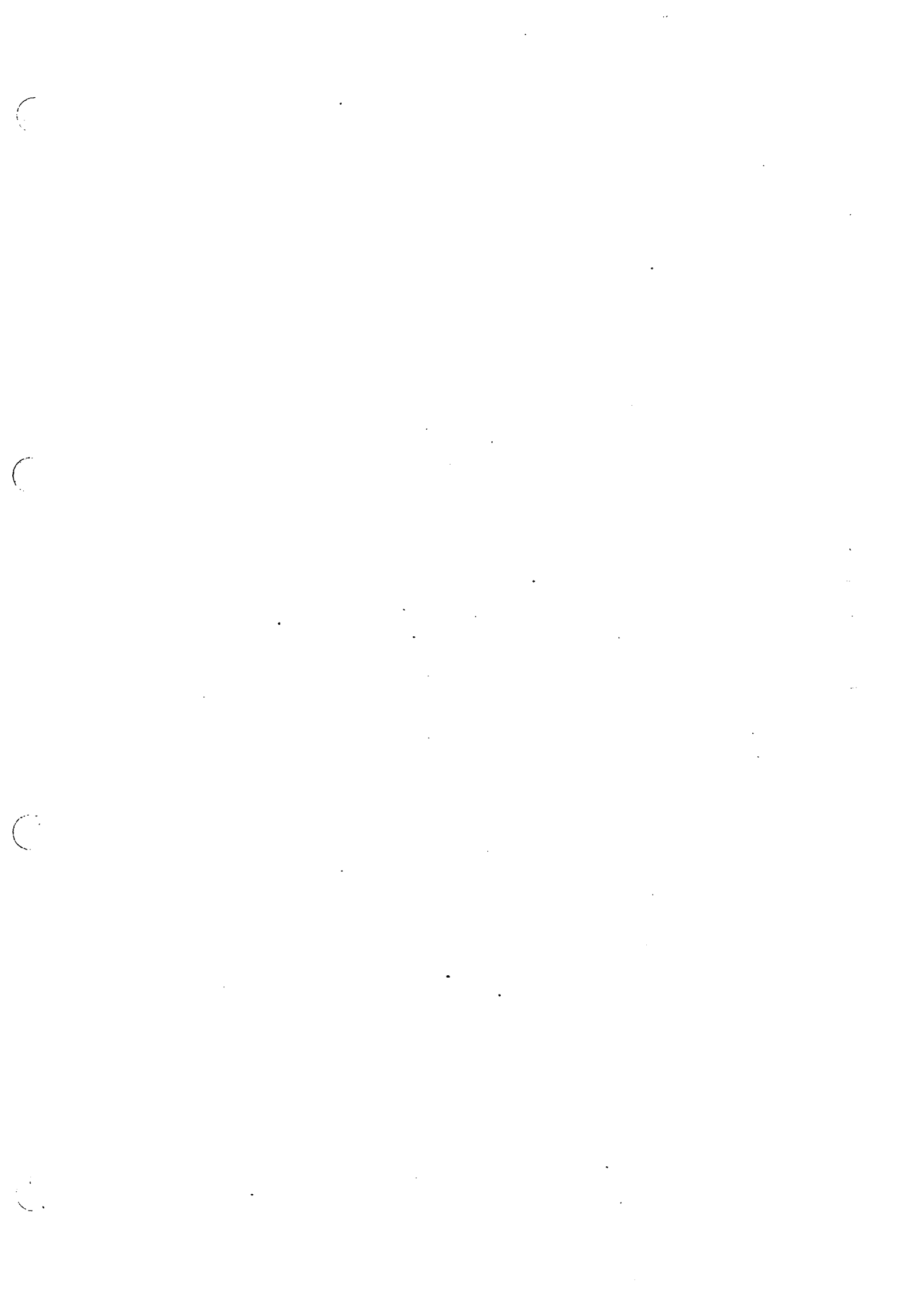
Switch box "X2" (located in cab base compartment)

Location of circuit breakers (F), see illust. (Z 19126):

<u>Designation</u>	<u>Amp.</u>	<u>Application</u>
F2	16	Signal horn, compressor
F5	16	Windshield wiper and washer system, sun blind
F6	16	Illumination of cab, cab base and motor compartment. Key switch and socket.
F9	16	Air conditioner evaporator and condenser
F11	6	Motor start, motor stop
F12	6	Motor shut-down system (safety chain)
F14	1	Hydraulic oil level
F15	6	Indicator lights, bulb test
F16	6	Analogue gauges
F17	6	Radio, clock
F18	6	Instrument panel illumination
F19	6	Superstructure illumination
F21	6	Slew brake locking system, oil flow reduction, pump control cut-out for slewing circuit, oil cooler fan speed governor, travel brake
F22	6	Air dryer
F23	6	Central lube system
F24	1	Voltage transformer
F25	6	Slew ring gear lube system
F26	16	Blower

Note:

1. Designation code of circuit breakers is also shown in the electrical circuit diagrams.
2. The location of circuit breakers within switch box may differ from that shown in the illustration.  
However, they can easily be identified at their designation codes F1, F2 and so on.



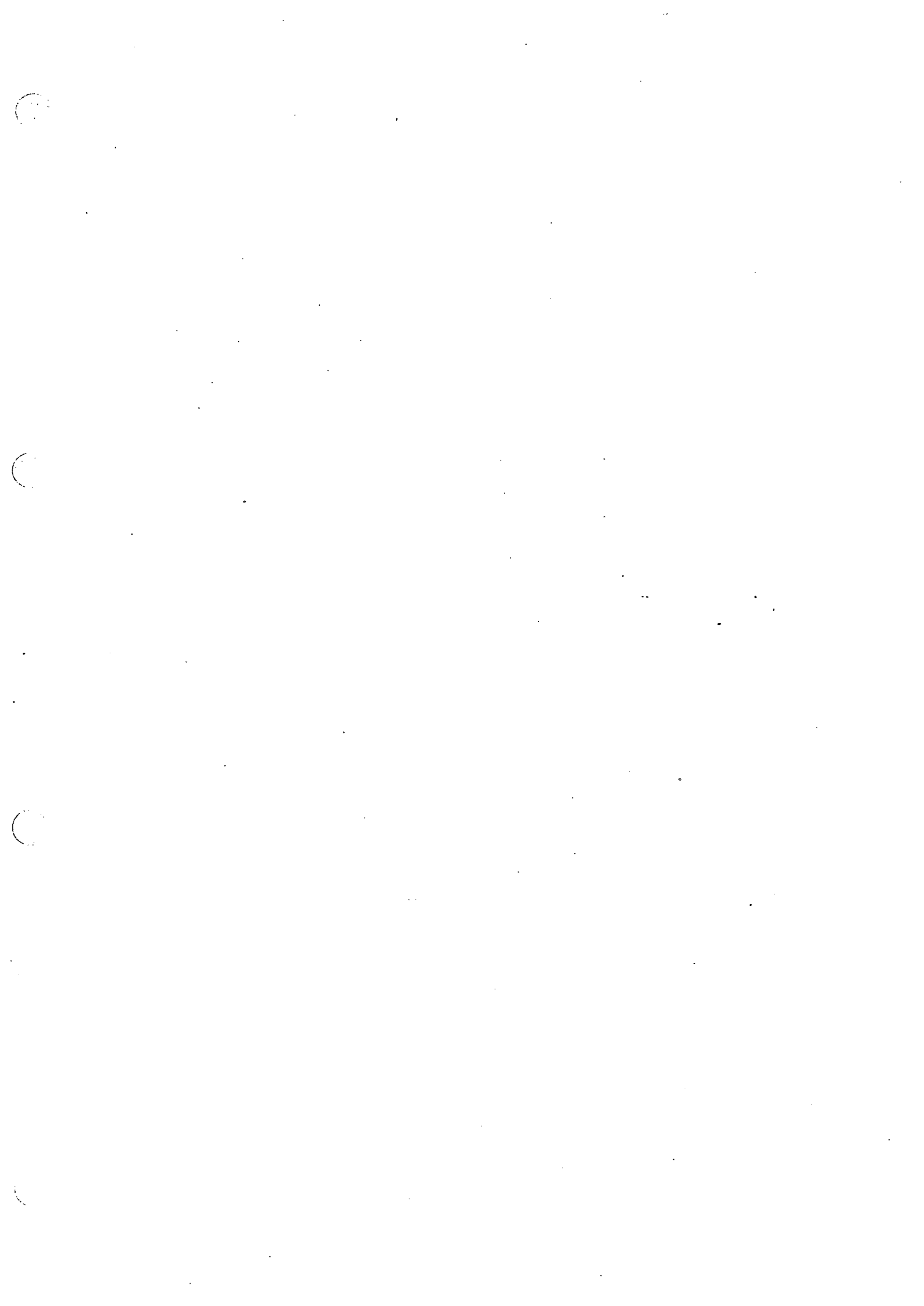
Storage periods up to 30 days require no special preservation when the unit is stored in a protected place.

When the excavator is placed in storage for 30 days or more follow the procedure below.

Note:

The description below includes special equipments which may not be installed in your machine.

1. Preparing for storage
  - 1.1 Clean the excavator thoroughly, lubricate all points according to the lubrication chart. Move the machine to a protected place or cover the excavator with a tarpaulin. Retract all hydraulic cylinders as far as possible. Cover the protruding piston rods with grease.
  - 1.2 Refer to engine Operation and Maintenance Manual for engine preservation procedure.
  - 1.3 Fill up the cooling system with antifreeze and coolant. Observe instructions of the engine manual.
  - 1.4 Service the engine air cleaner.
  - 1.5 Drain condensation from fuel tank and fill the fuel tank with a mixture of 90 % Diesel fuel and 10 % protection oil, e.g. Shell Ensis 20.
  - 1.6 Seal the engine air intake, exhaust outlet, electrical components, fuel tank ventilation and breather on the hydraulic oil reservoir to prevent dirt and moisture from entering.
  - 1.7 Remove the batteries and store them in a cool, dry place (0 to 10° C) to minimize self discharge. Be sure the batteries are fully charged. Never allow batteries to run down below 3/4 full charge.
  - 1.8 Loosen all drive belts.
  - 1.9 Repaint areas that have paint damage with a good quality paint. Grease all machined unpainted surfaces with good quality grease to prevent rust.
  - 1.10 Drain condensation from hydraulic oil reservoir.  
If necessary, add hydraulic oil.
  - 1.11 Drain condensation from pressure air tank and vent the system. Fill up antifreezer.
  - 1.12 Release slew brake (drum brake type only).  
Attach a tag to the instrument panel to indicate what work has been done.



2. One month repetitive service period
  - 2.1 Service the engine according to the engine manual.
  - 2.2 Check coolant level and cooling system for leakage.
  - 2.3 Check all oil levels according to the lubrication chart.
  - 2.4 Drain condensation from fuel tank and hydraulic oil reservoir.
  - 2.5 Operate independent heater unit for approx. 1/2 hour.
  
3. Six month repetitive service period
  - 3.1 Perform steps 2.1 through 2.4 of the one month repetitive service period.
  - 3.2 Lubricate excavator according to lubrication chart (manual lubrication only).
  - 3.3 Completely fill the fuel tank.
  - 3.4 Check hydraulic system and transmission units for leakage. If necessary - fill up the units with the specified lubricant. Repaint surfaces that have paint damage.
  - 3.6 Prepare the engine for operation according to the engine manual. Tighten all drive belts. Install fully charged batteries. Make sure that the alternator is correctly connected.
  - 3.7 Remove coverings from engine air intake, exhaust outlet, electrical components, fuel tank ventilation and breather on the hydraulic reservoir.
  - 3.8 Start the engine and run at low idle a few minutes to allow distribution of lubricating oil. Do not increase engine speed until normal oil pressure and temperature are reached.
  - 3.9 Operate heater unit and air conditioner.
  - 3.10 Operate the central lubricating system and slew ring gear spray grease system. Check the lubrication results at the respective lubrication points.
  - 3.11 Carry out several complete working cycles with the loader equipment.
  - 3.12 Stop the engine, observe the cooling down period. Install all coverings which have been removed according to step 3.7. Service the engine according to the engine manual. Lubricate all machined surfaces.  
Remove Batteries and store as described under step 1.7.  
Loosen all drive belts. Fill up the fuel tank.



4. Preparing for operation

- 4.1 Remove grease from all machined unpainted surfaces (piston rods).
- 4.2 Install fully charged batteries.
- 4.3 Remove all coverings.
- 4.4 Fill up the fuel tank with an approved Diesel fuel.
- 4.5 Check cooling system for leaks, loose connections and coolant level. Check mixture ratio of antifreeze. Refer to engine manual for details.
- 4.6 Service the engine according to the engine manual. Tighten all drive belts. Make sure the alternator is correctly connected.
- 4.7 Carry out the maintenance according to the lubrication and maintenance manual of the excavator.
- 4.8 Start the engine and run at low idle speed until the normal oil pressure and temperature are reached. Do not place the excavator under load before the normal values are indicated.
- 4.9 If the engine is misfiring or loss of power is evident, check the fuel system for restriction or loose parts.
- 4.10 Carry out several complete working cycles. Check the function of special equipments (central lubricating system, slew gear spray system, fire detection and suppression system etc.).





The chart below lists a number of the most common problems encountered in operation. Some of the faults may be due to careless handling or operation, improper maintenance or the use of fuel or lubricating oils other than specified. The "Probable Cause" column is formulated in such a way as to imply the answer to particular failure. For repairs requiring expert knowledge and tools, consult authorized service personnel.

Engine

Problem	Probable cause
Engine will not start	Fuel tank empty or filter clogged. Fuel supply system air-bound or clogged. Fuel filters not sealed properly. Engine speed control system defective. Cold starting aid, fluid container empty.
Uneven engine operation	Fuel filters clogged. Air in fuel system. Engine speed governor defective.
Engine overheats	Coolant supply insufficient. Fan belt slipping. Coolant passages in cooling system clogged with dirt or scale. Radiator air passages clogged with dirt. Exhaust pipe or muffler restricted. Thermostat defective.
Engine does not develop full power	Air cleaner clogged. Fuel filters clogged. Exhaust pipe or muffler restricted. Engine speed control system incorrectly adjusted. Valve (s) faulty. Fuel lines restricted. Turbocharger faulty, or inoperative
Loss of oil pressure	Oil filter (s) clogged. Low oil level. Poor quality oil. Oil pressure switch defective. Oil pump filter screen clogged. Dirt in regulating valve. Crankshaft, connecting rod or camshaft bearing (s) worn excessively.

Note: Refer to the engine manual for more detailed information.



Hydraulic system

Problem	Probable cause
<p>Poor hydraulic system performance</p>	<p>Hydraulic oil not at operating temperature.            Engine speed too low.            Reservoir low on oil.            Restrictions in lines.            Cooling circuit, pump control system and/or pilot control circuit defective.            Internal leakage (control blocks, valves or power units).            Pressure lines twisted or kinked.            Spool not in full stroke.            Relief valve defective, or out of adjustment.            Worn cylinders.            Defective hydraulic pump.</p>
<p>Excessive oil temperature</p>	<p>Low oil level.            Incorrect viscosity or type of oil.            Hydr. oil cooler clogged with dirt.            Oil cooler fan defective or wrong speed.            Cooling circuit defective.            Pump control system defective.            Spool not in full stroke.            Internal leakage (control blocks, valves or power units).            Worn pump components.            Job conditions (high temperature of materials being handled).</p>
<p>Jerky motion of power cylinders</p>	<p>Piston rod bent.            Piston sticking.            Inside diameter of cylinder tube partially increased or scored.            Air in control circuit.            Oil too cold.            Valve spool sticking, centering springs defective.            Pump and/or engine control system defective.            Valve of power circuit defective.</p>



Hydraulic system

Problem	Probable cause
Noise when slewing	Insufficient lubrication of slew ring gear and/or slewing connection Slewing connection mounting bolts loose. Drive pinion worn. Slew gear bearings worn. Sun gear or planetary pinions worn. High pressure circuit valves defective. Anti-cavitation valves sticking.
Excessive oil foaming	Air in hydraulic system. Poor quality oil. Excessive by-passing of oil over relief valves. Pressure hoses badly twisted or kinked. Restricted oil flow due to foreign matter. Breather on the reservoir clogged. Relief valve improperly adjusted.



Travel and slew gears

Problem	Probable cause
Noisy operation	Incorrect lubricant or oil level too low. Bearings scored or damaged. Sun gear teeth excessively worn or damaged. Bearings of planetary pinions worn.

Crawler tracks

Problem	Probable cause
Excessive track wear	Wrong track tension. Track roller loose or out of alignment. Track shoes loose. Track links stuck. Worn drive sprocket.
Excessive wear on drive sprocket	Wrong track tension. Track links (pins / bores) excessively worn. Sprocket, rollers and guide wheel out of alignment.



