Operation & Maintenance Manual

PC5500-6

HYDRAULIC MINING SHOVEL

SERIAL NUMBER 15049 and up

March 2007

KOMATSU
MINING GERMANY

- Always keep at a distance from the edges of building pits and slopes.
- Avoid any operation that might be a risk to machine stability.
- Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.
- On sloping terrain always adapt your travelling speed to the prevailing ground conditions. Never change to a lower gear on a slope but always before reaching it.
- Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use.

SPECIAL WORK IN CONJUNCTION WITH UTILIZATION OF THE MACHINE AND MAINTENANCE AND REPAIRS DURING OPERATION; DISPOSAL OF PARTS AND CONSUMABLES

- Observe the adjusting, maintenance and inspection activities and intervals set out in the Operation,- Lubrication and Maintenance Manual, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.
- Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.
- In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the Operation,- Lubrication and Maintenance Manual and the information on maintenance work.
- Ensure that the maintenance area is adequately secured.
- If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:
  - locking the principal control elements and removing the ignition key and/or
  - attaching a warning sign to the main switch
- Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.
- To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

INSTRUCTIONS FOR USE

Open the lock, lift the harness by the catch hook (C), the blue straps (leg straps J) are below. The harness is being put on just like a jacket. Pull the belly strap (E) through the lock, as shown on the illustration, and secure it.

By closing the breast strap, you avoid the shoulder straps to side-slip. Bring the leg straps (J) around the legs to the front, pull them in, as shown in the illustration, and tighten them. Adapt the harness to body form, seeing to perfect fit, in particular that the catching hook (C) be in the center of the back.

The safety harness should belong to its wearer personally.

The safety harness should only be used together with connectors acc. to EN 354, and fall arrest acc. to EN 355, or fall protection devices acc. to EN 360.

The attachment point for the safety harness should be above the wearer, and the carrying capacity of the attachment point should be sufficient to correspond with the minimum carrying capacity acc. to EN 795.

Legend for illustration Z22875

(1) Final drive, hub type travel gear

(2) Crawler carrier

(3) Track roller

(4) Carrier roller

(5) Guide wheel

(6) Swing circle guard

(7) Hydraulically operated access ladder, see page 46 for more information

(8) Hydraulic cylinder for access ladder

(9) Control switch for access ladder

(10) Battery main switches

(11) Emergency engine shut down switch and manual actuator switch for the fire suppression system, if so equipped.

⚠ CAUTION

Never stop the engines from a full load except in case of emergency.
If a hot engine is shut down without previous idling period of three to five minutes, the temperature in certain engine parts rising sharply after the cooling system ceases to function. The resulting thermal stress, especially in the turbochargers, may cause serious damage.

(12) Radiator of rear engine, designation number **1**

(13) Radiator of front engine, designation number **2**

(14) Sliding window of operator’s cab, see page 54 for more information

(15) Emergency escape ladder

(16) Exhaust muffler

(17) Engine air cleaners

(18) Hydraulically driven grease pump of the Swing circle pinion Lubrication System (SLS)

(19) Hydraulically driven grease pump of the Central Lubrication System (CLS)

(20) Counterweight

⚠ WARNING

The chambers of the counterweight are filled with a mixture of concrete, granulated ore and steel pellets. This mixture can create explosive gases which will accumulate in the chambers of the counterweight. Before any welding, flame-cutting, grinding or drilling procedures are carried out on the counterweight it is vital to expel these gases from the counterweight chambers. Failure to properly expel the gases from the counterweight chambers can result in an explosion with serious personal injury or death.
Follow the instructions given in PARTS & SERVICE NEWS No. AH04518 for expelling the gases from the counterweight chambers.

Legend for illust. Z24090

(1) Sliding window, serves also for emergency exit

REMARK

If the operator's cab is equipped with external metal sun visors, disengage the four catches and push out the sun visor panel.

(2) Release lever for hinged railing bar (3)

(3) Hinged railing bar

(4) Rigidly mounted emergency escape ladder. The rigidly mounted emergency escape ladder with rope ladder extension provides the means to go down to the ground.

(5) Rope ladder. The upper end of the rope ladder is fixed onto the lower rung of the rigid escape ladder (4) by means of the fasteners (6), see detail (X). The lower end of the rope ladder is fixed on brackets (8) and secured with rubber fasteners (7), see section (A-A).

(6) Hooks for fastening the rope ladder onto the rigid ladder (4)

(7) Rubber fasteners for rope ladder in lifted position

(8) Bracket for rope ladder in lifted position. The lower rung of the rope ladder is hooked up into the brackets (8)

Using the emergency escape ladder

In case of emergency with normal walkways obstructed use escape ladder (4) and (5) for leaving the machine. Proceed as follows:

1. Move up lever (2) and pull out.
2. Open the hinged railing bar (3).
3. Unhook fasteners (7) and take out rope ladder rung from brackets (8).
4. Let the rope ladder fall down to the ground. The upper end of the rope ladder is fixed onto the lower rung of the rigid ladder (4).
5. Use the rigid ladder (4) and then the rope ladder (5) for leaving the shovel.

Operator’s Seat Adjustment

Before operating the Shovel adjust the seat and mirrors for Operators maximum comfort, visibility, and complete control of the Shovel.

Legend for illust. (Z 21420):

(1) Seat suspension adjustment (firm to soft ride)

(2) Height adjustment

(3) Seat depth adjustment

(4) Seat cushion tilt adjustment

(5) Fore/aft adjustment

(6) Not used on this model

(7) Control lever carrier

(8) Headrest (optional)

(9) Seat heater switch (optional)

(10) Lumbar support adjustment

(11) Armrest, foldable

(12) Armrest adjustment

(13) Backrest adjustment

(14) Fore/aft isolator

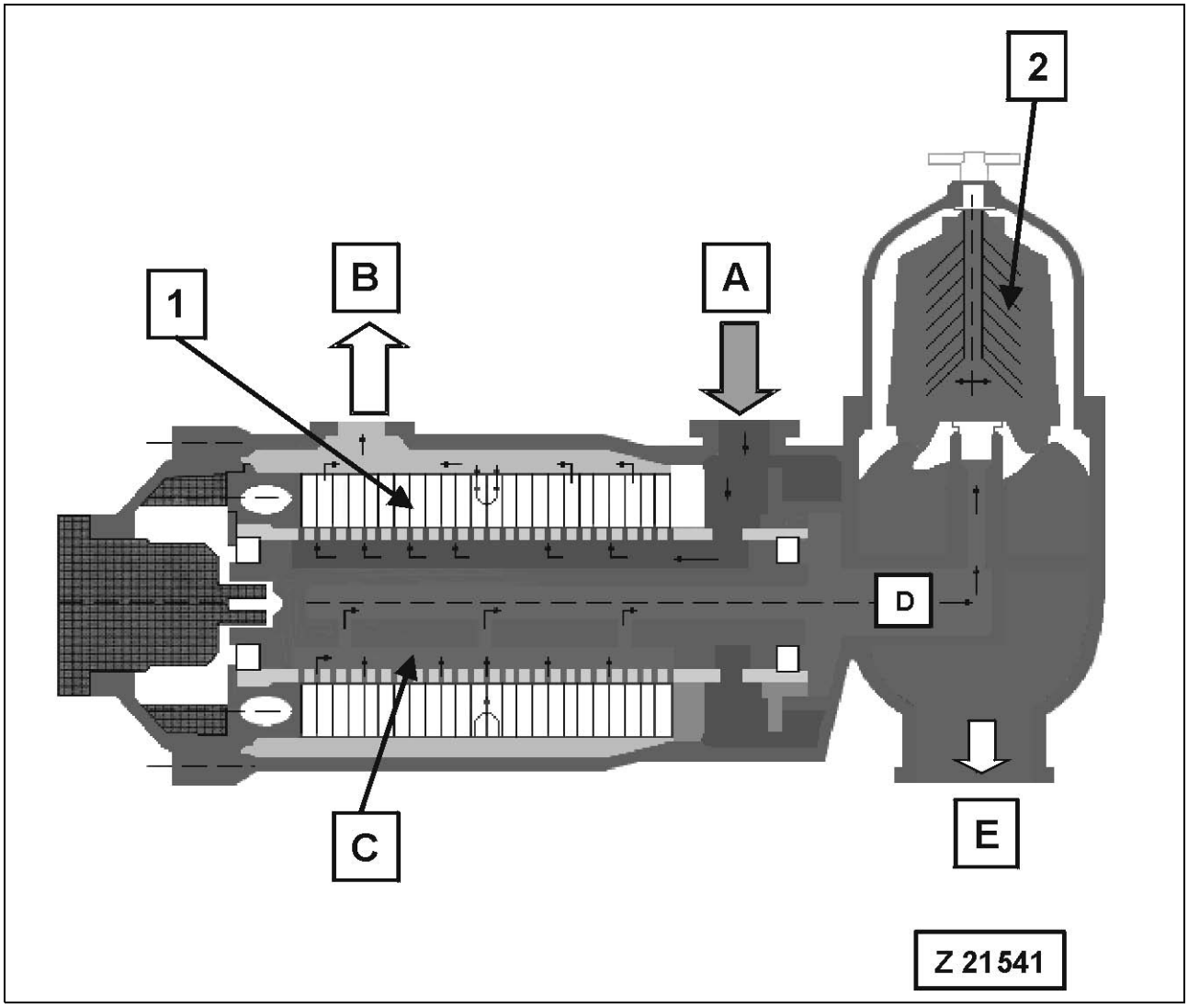
Seat belt (not shown)

⚠ WARNING

- **Use seat belt in accordance with the local safety regulations and laws.**
- **Check condition and fastening of the seat belt. Replace any worn or damaged part of the seat belt system.**
- **To ensure proper functioning of the seat belt replace the seat belt and securing parts after every three years.**

For more Information, refer to the separate Operating Instruction Manual ”AIR SUSPENSION SEAT” in volume 2 binder.

Eliminator Engine Oil Filtration System



Legend for illust. Z 21541 (schematic illustration)

(A)	Oil inlet from engine (100%)	(E)	Oil flow to engine oil pan (5%)
(B)	Oil outlet to engine (95%)	(1)	Stainless steel filter removes particles as small as 20 µm
(C)	Backflush oil (5%) for cleaning the filter	(2)	Centrifugal separator removes particles up to a size of 2 µm
(D)	Oil flow to centrifuge (5%)		

3.3.3 OPERATOR'S CONSOLE

Legend for illustration Z25500

(1) Analog gauges, see page 83 for more information

(2) Text display with key board of the Electronic Control and Monitoring System (ECS). Refer to page 92 for more information.

(3) Ashtray

(4) Switch board, see page 83 for more information

(5) Switch for adjustment of left and right cab mirror

(6) Control unit for air conditioning and heating, see page 198 for more information

(7) Cigarette lighter

(8) Plug sockets 24V DC

(9) Radio

(10) Switch board lighting with flexible arm

⚠ CAUTION

Make sure the cab door is always closed when working with the Shovel.
Secure the door in open position with the locking device provided.

3.3.5 CONTROL MODULE FOR AUXILIARY CAB HEATER

Special Equipment

Legend for illust. Z25502

(5) Control module for the engine independent auxiliary cab heater.
This module is used for switching ON and OFF the auxiliary cab heater during operation of the shovel with the Diesel engines running, and for pre-selection of heater start times and duration of heating periods. For detailed setting instructions of the control module refer to the separate operating instruction sheet in volume 2 binder.

(6) Button for actual time indication

(7) Button for preselection of heating time

(8) Button for heating indication

(9) Button for settings backwards

(10) Button for settings forward

(11) Not used

(12) Display shows the operating condition of the auxiliary cab heater

3.4.2 OPERATING THE ELECTRONIC MONITORING SYSTEM

1.0 TEXT DISPLAY (A) with integrated KEY BOARD (B)
illust. Z25958

After switching on the Shovel's key operated main switch, the following introductory messages will be displayed on screen (A):

1st. # Please be Safety Conscious when working!

This message will be displayed for approximately 10 seconds.

2nd. |QUI| Did you check the Operating Safety of the Shovel?

Press the "QUI" key (10) to acknowledge this message.

3rd. |QUI| Did you do Maintenance according to the Service Literature?

Press the "QUI" key (10) to acknowledge this message. Thereafter the basic ECS display normally automatically appears on the screen (A) if no information - or fault messages are present. Present information - or fault messages overwrite the introductory messages no. 2 and 3.

-0-	Date	h:	M1 *1) 1/min:
	Time		M2 *2) 1/min:

***1) M1 =** Short form for Rear Engine on counterweight side designated as Engine 1.

***2) M2 =** Short form for Front Engine on Operator's cab side designated as Engine 2.

All messages related to one of the two engines, their connected cooling systems and pump distributor gears are identified by the figure 1 or 2.

Example of an engine related message:

Fault No. 560: (563)	$h: Shut down of engine **1**: oil pressure at low idle too low
Help:	Message through sensor B1-**1**.

This message applies to the **rear engine** on counterweight side **"Engine 1".**

Emergency Indication of Operating Conditions.

The ECS system is equipped with an emergency indication. In case the text display (A) fails to work, it indicates faults in important operating systems of the Shovel. The indication is effected by means of LED's at the **P**rogrammable **L**ogic **C**ontroller "**PLC**" installed in the cab base. Refer to page 208 for the location of the "**PLC**".

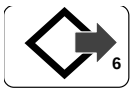
The following faults are indicated:

Fault:	LED No.:
The ECS system is by-passed (By-pass switch S27 actuated)	H30
Start of engine 1 and/or engine 2 blocked, resp. engine shifted to low idle speed by one or more of the six high pressure filters. **NOTICE** **The LED "H31" monitors all six high pressure filters. Refer to page 217 for description of the diagnostic codes flashed out by LED "H31".**	H31
Coolant pressure	H33
Coolant temperature	H34
Engine oil pressure	H36
Start of both engines blocked, resp. engine shut down, due to closed main shut-off (gate) valve hydraulic tank	H37
Faulty monitor channel for hydraulic oil temperature	H38
Too low hydraulic oil level! Stop the engines	H39
Faulty monitor channel engine speed	H112
Emergency shut down switch actuated	H116
Engine shutdown from ground man (if so equipped)	H135

How to print out Contents of Record (PROTOCOL) Memory:

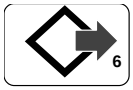
Print out the *complete* Contents of Record (PROTOCOL) Memory

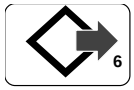
Display:



Press until the maximum amount of entries **(39)** is reached

Print from the last	**>**	1**<** PRO entries
page no all * PRO has		39 entries ***P***





The complete PROTOCOL is now being printed out.

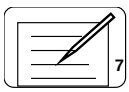
Distinctive marks for ”OLD” and ”NEW” entries:

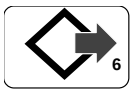
New entries, not yet displayed / called up / printed or downloaded are marked with ***P*.**
After being displayed / called up / printed or downloaded the marking will change to **-P-.**

Print out the *last* Entries of the Record (PROTCOL) Memory

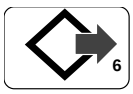
1st. Possibility - The last (X) Entries under consideration of all Messages

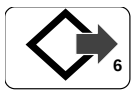
(X) = desired number of the last entries e.g. **10** (the last 10 entries of 39 total entries)





Press until the desired nos. of entries are reached,e.g. 10.





The record memory with the last 10 entries is now being printed out.

Print from the last	**>**	10**<**PRO entries
page no all * PRO has		39 entries *P*

Menu Control with Key Switch (C) and Key Group (D)

Display of Menu Options, see Menu Control Chart I (Z23063)

EXAMPLE: Display of **TRUCK COUNTER READING**, starting from basic display on level -0-

Proceed as follows:

1. Press the ”QUI” key (10), the menu level -1- with the current truck counter reading appears on the display.

2. If you want to reset the counter, press the ”QUI” key (10) again. Menu level -2- appears on display. Use key (12) for setting the counter to zero.

3. Press ”RET” key (9) twice for return to the standard display, level -0-.

EXAMPLE: Display of **LUBRICATION SYSTEMS CYCLE COUNTER READINGS**, starting from basic display on level -0-

Proceed as follows:

1. Press the ”QUI” key (10), the menu level -1- with the starting item truck counter reading appears on the display.

2. Press key (12) once the Central lubrication system cycle counter reading appears on display. By pressing key (12) again the swing ring gear cycle counter reading is displayed.

3. For returning to the standard display level -0- press ”RET” key (9).

REMARK

Changing of the lubrication cycle counter settings can be carried out in the main group SERVICE under the section *SETTINGS*, see also menu control chart III.

EXAMPLE: Display of **Service *POWER CHECK*** starting from basic display on level -0-

1. Press the “QUI” key (10), the menu level -1- with the starting item truck counter reading appears on the display.

2. Press key (12) three times the menu item *SERVICE* appears on the display.

3. Press the “QUI” key (10), Service *LANGUAGE* appears.

4. Press key (12) once the menu item Service *POWER CHECK* appears on the display.

5. Press the “QUI” key (10), the menu level -3- with the starting item Power check *DISPLAY* appears on the screen.

Continue according to description on next page, menu control chart II.

Menu Control with Key Switch (C) and Key Group (D)

Display of Menu Options

Example: Display of **INPUTS-OUTPUTS**, starting from basic display on level -0-, see Menu Control Charts I and IV (Z 23066).

The main group *INPUTS-OUTPUTS* is basically used for Testing procedures through authorized service staff and therefore locked during normal operation. Access to the *INPUTS-OUTPUTS* can be obtained in the main group *SERVICE* as described below.

Proceed as follows:

1. Press the ”QUI” key (10), the menu level -1- *TRUCKS* appears on the display, see Chart I.
2. Press key (12) three times, the main group *SERVICE* appears on display.
3. Press key (10), the menu level -2- with the starting group *Language* appears on the display.
4. Press key (12) four times, the group *INPUTS-OUTPUTS ON/OFF* appears on the display.
5. Press key (10), the menu level -3- with Menu item INPUTS-OUTPUTS Condition: 0 **(OFF)**” is displayed.
6. Press key (12), *OPERATE KEY SWITCH* appears on the display.
7. Operate key switch (C) ”Condition: 0 (OFF)” appears on the display.
8. Press key (12) to change the condition from ”0” to ”1 **(ON)**” Now access to main group *INPUTS-OUTPUTS* is possible.
9. Press the ”RET” key (9) two times for returning to the menu level -1-. The main group *SERVICE* appears on the display.
10. Press key (12), for display of the main group "INPUTS-OUTPUTS*.
    All menu levels and items within the main group INPUTS-OUTPUTS are now accessible by means of key group (D), refer to menu control charts on the following pages.

Data Transfer from Protocol and Statistics Memory to various Downloading Equipment

The illustration (Z 20731) shows typical arrangement of several downloading equipment connected to the text display interface plug socket (X27).

Legend for illust. (Z 20731)

(1)	Text display unit on instrument panel (E35)
(2)	Plug socket (serial interface X27) for connecting data transfer cable to units (4, 5, 6 or 9)
(3)	Plug socket for connecting current supply cable to units (5 or 6)
(4)	MODULAR MINING field computer system ”MMS”
(5)	Printer
(6)	Memory Card System ”MCS”. As a special equipment, this system can also be installed in the instrument panel ex works.
(7)	Memory card
(8)	Protective box for memory card
(9)	Laptop or PC
(10)	Soft- and hardware package for PROSTAT operation program
(11)	Data transfer cable (VL3)
(12)	Adapter for 25 pin interface on PC or laptop
(13)	3,5” disk PROSTAT software
(14)	Instruction manual PROSTAT (PARTS & SERVICE NEWS No. AH02512)
(15)	Change-over switch for connecting the internal output channel to plug socket (2) or to the onboard MCS system (6) if so equipped
(E6)	Programmable Logic Controller ”PLC”
(VL4)	Data transfer cable to Memory card system (6)
(VL5)	Current supply cable to Memory Card System (6)
(VL6)	Data transfer cable to printer (5)
(VL7)	Current supply cable to printer (5)
(VL8)	Data transfer cable to field computer system (4)

REMARK

The downloading units shown in illust. (Z 20731) are special equipment.
More information to these units on request.

Level 3: Service / MESSAGES ON / OFF

- 3 - Messages OPERATE KEY SWITCH
- 3 - Messages | 0 | 1 | Condition **:**

Level 3: Service / EVALUATION ON / OFF

- 3 - Evaluation OPERATE KEY SWITCH
- 3 - Evaluation | 0 | 1 | Condition **:**

Level 2: Inputs - Outputs

- 2 - Inputs - Outputs * ANALOG-INPUTS *
- 2 - Inputs - Outputs * DIGITAL-INPUTS *
- 2 - Inputs - Outputs * DIGITAL-OUTPUTS *

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS / Y53-1 Y53-2 GEAR OIL COOLER 1 / 2 BACK - PRESSURE

-4- Output signals | OPERATE KEY SWITCH
-4- Cooler 1 Y53-1 (A13.3): | 0 | 1 | Cooler 2 Y53-2 (A13.4):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS / Y101 VALVE OIL COOLER BACK-PRESSURE

-4- Output signals | OPERATE KEY SWITCH
-4- Valve oil cooler back-pressure | 0 | 1 | Y101 (A5.4):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS / Y124a VALVE SERVICE ARM LIFT

-4- Output signals | OPERATE KEY SWITCH
-4- Valve service arm lift | 0 | 1 | Y124a (A5.5):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS / Y124b VALVE SERVICE ARM LOWER

-4- Output signals | OPERATE KEY SWITCH
-4- Valve service arm lower | 0 | 1 | Y124b (A5.6):

Fault No. 824: (827)

$h: Faulty pressure switch for leak oil filter

Help:

Closed contact of pressure switch B25 for leak oil filter with switched off Engine.
- Check pressure switch and cables.

Fault No. 830: (833)

$h: No 24 V voltage at circuit breaker F13

Help:

No 24 V behind circuit breaker F13.
- Check circuit breaker F13.
- Check current supply to circuit breaker.

Fault No. 836 (839)

$h: Faulty pressure switch of fan drive oil filter for oil cooler 1

Help:

Closed contact of pressure switch B28-1 for oil cooler fan drive filter with switched off engine.
- Check pressure switch and cables.

Fault No. 842: (845)

$h: Hydraulic oil far below operating temperature. Wait for warm-up phase!

Help:

The machine was taken into operation although the start viscosity was not attained.
- Preheat hydraulic oil !

Fault No. 848: (851)

$h: Faulty monitor channel for hydraulic oil temperature

Help:

Sensor B15 shows inadmissible values.
- Check sensor and cables.

Fault No. 854: (857)

$h: PTO-gear 1 oil filter restricted

Help:

- Replace filter element.

Fault No. 860: (863)

$h: Pump regulation oil filter restricted

Help:

- Replace filter element.

Fault No. 866: (869)

$h: Oil tank breather filter restricted

Help:

- Replace filter element.

Fault No. 1274: (1277)	$h: Problems pump control.
Help:	Problem in the pump control. - If the fault further exist, inform service.

Fault No. 1280: (1283)	$h: Shutdown through emergency stop switch S33C.
Help:	Emergency stop S33C in pump compartment actuated. - Find cause

Fault No. 1286: (1289)	$h: Engine 1 shifted to low idle. Oil pressure too low.
Help:	Message through sensor B30-1.

Fault No. 1292: (1295)	$h: Engine 1 shifted to low idle. Coolant pressure too low.
Help:	Message through sensor B41-1.

Fault No. 1298: (1301)	$h: Engine 2 shifted to low idle. Oil pressure too low.
Help:	Message through sensor B30-2.

Fault No. 1304: (1307)	$h: Engine 2 shifted to low idle. Coolant pressure too low.
Help:	Message through sensor B41-2.

3.5.1 AUXILIARY HEATER FOR OPERATOR'S CAB

Special Equipment

REMARK

The auxiliary cab heater is located in the compartment below the stair to the operator's cab. View A-A shows the arrangement of components and the flow of water, fuel and air.

Legend for illustration Z25357

(1) Fuel tank

(2) Stair to operator's cab

(3) Heater unit HYDRONIC 10, refer to the separate operation manual HYDRONIC 10 for all operating and maintenance instructions. The manual is filed in volume 2 binder.

(4) Water supply line from engine to cab heater

(5) Water return line

(6) Water line to auxiliary heater

(7) Hot water line from auxiliary heater to cab heater

(8) Check valve

(9) Fuel shut off-cock for fuel supply to heater (3)

(10) Fuel strainer

(11) Fuel supply line

(12) Fuel dosing pump

(13) Combustion air intake line

(14) Exhaust muffler

(15) Fuel shut-off solenoid valves

Operation

To activate the heater (3), open fuel shut off-cock (9). Select the desired heating stage with the control module (5) shown on page 91.

REMARK

During the warm season the fuel shut-off cock (9) should be closed.

3.7.2 SWITCH BOARD (X2) IN CAB BASE

Legend for illustration Z25505

(S27) Emergency By-pass switch for the shutdown function of the PLC (E6). If an automatic shutdown is initiated by Shovel systems, with a dangerous situation for man or machine, which needs the Shovel to be operable to over-come the dangerous situation, actuate this switch to override the shutdown function of the system and to enable a restart of the Diesel engine.

NOTICE
This switch can not override engine initiated shutdowns.

⚠ CAUTION

As soon as the immediate situation of danger is over, shutdown the unit. Correct the fault that caused the shut down and re-set the Emergency By-pass switch (S27).

(S57.1) Diagnostic switch for flashing out fault codes via lamp (H97.1) of the Centry system for engine 1.

(S57.2) Diagnostic switch for flashing out fault codes via lamp (H97.2) of the Centry system for engine 2.

(H97.1) Fault lamp for flashing out diagnostic fault codes of the Centry system for engine 1.

(H97.2) Fault lamp for flashing out diagnostic fault codes of the Centry system for engine 2.

Diagnostic Fault Codes of the Engine Centry System

The fault lamps (H97.1 and H97.2) will light for about 2 seconds after main key switch-on and then go out when no faults are being detected. When a fault condition exist, the fault lamp will turn "ON" for warning faults, and "ON FLASHING" for more severe faults that can affect engine operation and need immediate attention. To determine an active fault, shut off the engine and turn main key switch to "ON" position (engine not running). Press diagnostic switch (S57.1 or S57.2) for 1 to 2 seconds and then release. If the corresponding fault lamp illuminates while the diagnostic switch is held depressed, there is an active fault or faults. Active faults MUST be corrected as soon as possible.

For more information, refer to the separate Operation and Maintenance Manual CENTRY, filed in volume 2 binder.

Components of Electrical Preheating System in Cab Base (continued)

⚠ WARNING

Be sure to switch off main switch (2), illust. Z25358 and to shut down the generator set or to disconnect the power supply cable from external power source before working on any part of the heating system.

Operating the Preheating System

Use the preheating system during stand-still periods e.g. over night and low ambient temperatures.

The heating system should be energized as soon as the engines are shut down. This allows the heating system to maintain the desired temperature with the use of minimum power.
The preheating systems for hydraulic oil and engine coolant are equipped with additional control boxes with separate ON/OFF switches. See following pages for more information.

Battery Charger (3)

Power supply to the battery charger is provided by the generator set or an external power source connected to the 1X2 plug socket at the cab stairway. The batteries of the shovel are charged by the battery charger (3). The battery charger is switched ON and OFF with main switch (5) and the switch on the front panel of the battery charger. For operating instructions refer to the separate Users Manual "MASTERVOLT" battery charger filed in volume 2 binder.

Coolant Level

⚠ WARNING

DO NOT remove the radiator pressure cap (6), illust. Z22468 from a hot engine. Wait until the temperature is below 50°C before removing the pressure cap (6). Failure to do so can result in personal injury from heated coolant spray or steam. Press the red button on the radiator pressure cap to allow the pressure to escape. Turn the radiator cap slowly counter-clockwise to the safety stop, then continue to turn until cap is free to be removed.

The coolant level should be in the upper field of the sight gauges (4). If necessary add coolant via the swing down service arm to the MAX marking on the sight gauge. Refer to section "CENTRAL REFILLING SYSTEM" on page 286 for more information.

REMARK

Refer to the Engine Manual for the correct coolant composition and filling procedure.

Fill Engine Fuel Tank

⚠ WARNING

Engine fuel is flammable and can cause a fire or an explosion. Do not fill the fuel tank or service the fuel system near an open flame, welding, burning cigar or cigarettes, etc.

Fill the fuel tank at the end of the of the shift to prevent condensation from forming. Fill the fuel tank via the swing down service arm. Refer to section "CENTRAL REFILLING SYSTEM" on page 286 for more information. Observe the fuel specifications in the engine operation and maintenance manual.

Emergency By-pass Switch for the ECS- Shut-down Function.

The unit is equipped with an Emergency By-pass Switch for the ECS-system.
This switch is located on the ”X2” switch board in the cab base compartment and marked with **”S27”**.
If an automatic shut-down of the Shovel happens, with a dangerous situation for man or machine, which needs the Shovel to be operable to overcome the dangerous situation, actuate this switch to override the shut-down function of the system and to enable a restart of the engines.

NOTICE
This switch can not override engine initiated shutdowns.

⚠ CAUTION

As soon as the immediate situation of danger is over, shut down the unit. Correct the fault that caused the shut down and re-set the Emergency By-pass switch.

REMARK

When a battery voltage fault has occurred, the operational data (oil vicosities, timer settings etc.) stored in the Programmable Logic Controller (PLC) can be lost and must be re-entered after the correct battery voltage has been re-established.

Hydraulic oil warm-up

- On machines without hydraulic oil pre-heating system:
  DO NOT start the engines if the ambient temperature (oil temperature) is below the starting temperature shown in column "1" of the hydraulic oil viscosity chart on page page 244 in this section.

- 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.

Switch Positions, illustration Z25223

- **”0”** Parking brake **OFF**
- **”1”** Parking brake **ON**

Applying the Parking Brake

Pull out toggle switch (4) against spring force and move down to position **”1”**.

Releasing the Parking Brake

Move up toggle switch (4) to position **”0”**. In this position the switch is automatically pulled down by spring force.

NOTICE
Be sure to release the parking brake before slewing the superstructure.

Hydraulic Swing Brake actuated by hydraulic access Ladder and Service Arm of Central Refilling System

The hydraulic swing brake will be applied automatically when the access ladder and/or the service arm of the central refilling system is not in its completely lifted position.

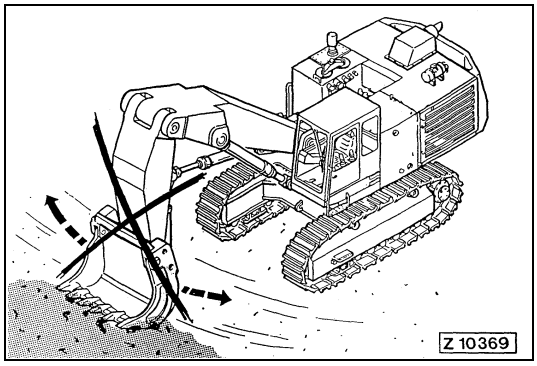
Important Instructions for Slewing the Superstructure

⚠ WARNING

- **DO NOT swing over persons or over the unprotected cab of a truck.**
- **DO NOT level the ground in front of the Shovel by turning superstructure back and forth.**
- **Never swing against the wall of a pit. First raise the attachment out of the pit and then start rotating the superstructure.**
- **Start digging only after finishing the slewing operation.**

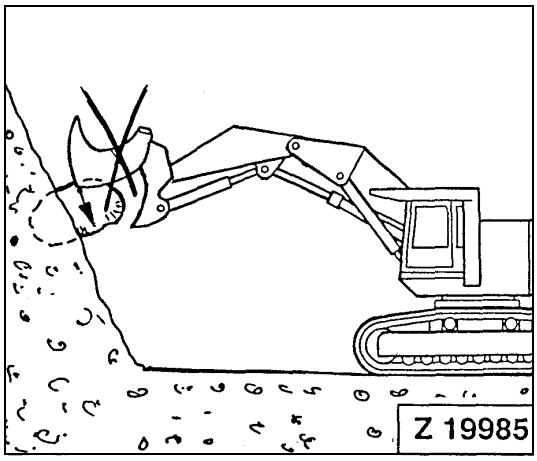
⚠ CAUTION

DO NOT "Sweep" with the loader attachment, illust. (Z 10369), as this may result in severe damage on swing gear components.



⚠ CAUTION

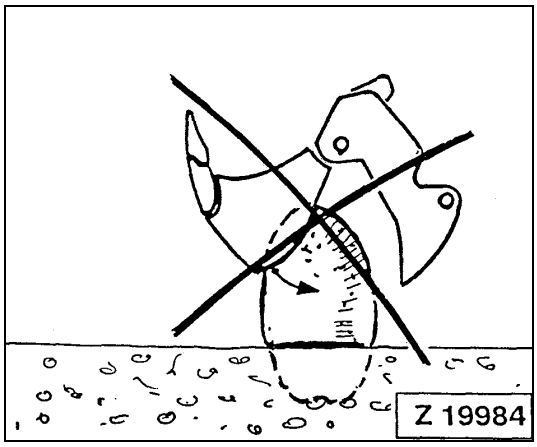
DO NOT use the bucket clam for loosening or removing anchored rocks or other solid objects (illust. Z 19984 and Z 19985), since such operations may result in severe damage to the clam pivot bearings.



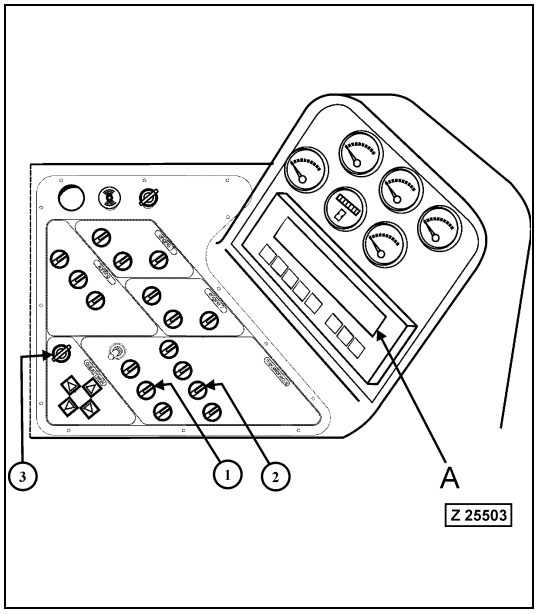
Precautions when operating hydraulic cylinders to end of stroke

Do not operate the hydraulic cylinders of the working attachment to the end of their strokes. This will bring excessive force onto the inner stoppers of the cylinders and will reduce the lifetime of the cylinders.

To prevent this, move the control levers to neutral position before the cylinders reach their end of stroke.



SWING CIRCLE LUBRICATION SYSTEM ”SLS”



Manual actuation Mode of the Lubrication System with Service Key

The manual actuation in the Service mode is useful for testing the electrical and hydraulic functions of the lubrication system. The pause time is reduced to 30 seconds and the holding time to 15 seconds permitting rapid sequences of lubrication cycles.

⚠ CAUTION

In the manual actuation mode all monitoring functions of the system are made inoperative and, because of the very short pause and holding times grease will not reach to all lubrication points.

Carry out manual lubrication by using the service key

REMARK

The swing ring lubrication system works only during slewing of the superstructure.

1. Insert key into service switch (3) and set to operating position.
2. Actuate the rotary switch (2) of the swing ring gear lubrication system. The message # SERVICE appears on the display. Up to ten repeated actuation of the switch are possible. The lubrication cycles are counted and displayed in the cycle counter window.
3. After finishing the manual lubrication remove service key. The system returns to the normal timer settings.

ADJUSTMENTS OF THE SWING CIRCLE LUBRICATION SYSTEM

The following adjustments can be made in the service menu of the ECS system:

Level 4: Service Menu / Settings

- 4 - Settings * CONDITION INDICATION *
- 4 - Settings (minutes) * PAUSE TIME : *
- 4 - Settings * LUBE CYCLE COUNTER : *

Refer to section "ELECTRONIC MONITORING AND CONTROL SYSTEM ECS" for description of adjustment procedure.

3.19.1 OPERATING THE TRANSFER PUMP

Legend for illust. Z25265

REMARK

The illustration shows the transfer pump arrangement viewed from center of the platform.

(1) Cock for suction oil reservoir (12)

(2) Cock for return oil collector pipe (13)

(3) Cock for back-pressure valve pipe (15)
- C - Closed
- O - Open

(4) Electric motor of the transfer pump

(5) Transfer pump

(6) Operating switch (S35) for transfer pump (4)

(8) Suction line to suction oil reservoir (12)

(9) Suction line to return oil collector pipe (13)

(10) Suction line to back-pressure valve pipe (15)

(11) Hand wheel of main shut-off valve between suction oil reservoir and main oil reservoir
- To OPEN the valve turn hand wheel (11) CCW to the stop.
- To CLOSE the valve turn hand wheel (11) CW to the stop.

A proximity switch located on the gearbox of the shut-off valve monitors the valve position. With the valve not fully open a corresponding message will be displayed on the ECS screen in the Operator's cab.

⚠ CAUTION

Before starting the engines make sure the shut-off valve is completely open by turning hand wheel (11) fully to the left (CCW).

(12) Suction oil reservoir

(13) Return oil collector pipe in front of main control valves

(14) Main control valves

(15) Back-pressure valve pipe

(16) Back-pressure valve

3.20.3 RECEIVER PANEL WITH MONITOR BOX

Legend for illustration Z 22469:

3	Service arm, hydraulically operated
4	Monitoring and control box
5	Push button for testing lamps (6, 7, 8, 9, 10 and 11). Push the button, all lamps must light up. If a lamp does not light up, corrective action must be taken.
6	Indicator lamp, fuel tank full. (H139)
7	Indicator lamp, grease container of Central lubrication System FULL. (H76)
8	Indicator lamp, grease container of Swing circle pinion Lubrication System FULL. (H78)
9	Indicator lamp, engine oil reserve tank for Front engine 2 FULL. (H142-2)
10	Indicator lamp, engine oil reserve tank for Rear engine 1 FULL. (H142-1)
11	Indicator lamp, main hydraulic oil reservoir FULL. Recheck hydraulic oil level at the sight gauge before operating the machine. (H52)
12	Receiver panel
13	Fuel filling adapter, observe lamp (6). **REMARK** The fuel nozzle cut-out pressure should be adjusted to 0,38 bar. If this pressure is too low for filling the fuel tank up to the correct level, gradually increase the cut-out pressure until the pressure is sufficient for filling up to the correct level The maximum flow rate should not exceed 680 liter per minute.
14	Adapter for filling the grease container of the Central Lubrication System (CLS). Before filling the grease container make sure the grease filter in the filling line is not obstructed. Observe lamp (7).
15	Adapter for filling the grease container of the Swing circle pinion Lubrication System (SLS). Before filling the grease container make sure the grease filter in the filling line is not obstructed. Observe lamp (8).
16	(Fr.) Front engine, (Rr.) Rear engine. Oil evacuation and filling adapter connected to the engine oil pan. Monitor oil level at level gauge.

3.24 SHOVEL STORAGE

GENERAL

Storage periods up to 30 days require no special preservation when the unit is stored in a protected place. When the Shovel is placed in storage for 30 days or more follow the procedure below.

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

3.24.1 PREPARING FOR STORAGE

1. Clean the Shovel thoroughly, lubricate all points according to the lubrication chart. Move the machine to a protected place or cover the Shovel with a tarpaulin. Retract all hydraulic cylinders as far as possible. Cover the protruding piston rods with grease.

2. Refer to Engine Operation and Maintenance Manual for Engine storage procedure.

3. Fill up cooling system with anti-freeze and coolant. Observe instructions in the Engine Manual.

4. Service the engine air cleaner.

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.

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.

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 ¾ full charge.

8. Loosen all drive belts.

9. Repaint areas that have paint damage with a good quality paint. Grease all machined unpainted surfaces with good quality grease to prevent rust.

10. Drain condensation from hydraulic oil reservoir. If necessary, add hydraulic oil.

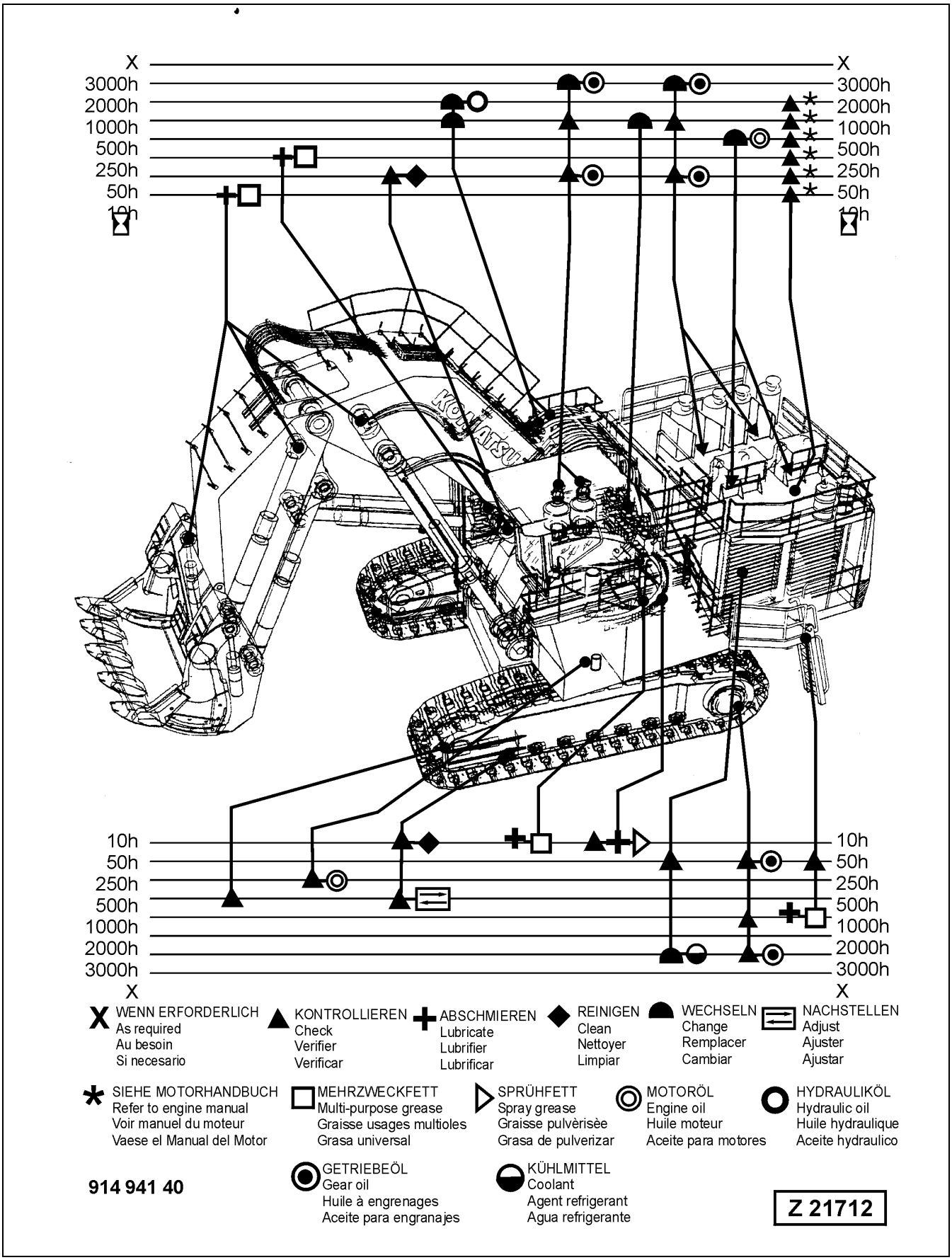
11. Attach a tag to the instrument panel to indicate what work has been done.

4.3 FLUIDS AND LUBRICANTS

4.3.1 LUBRICANTS FOR OPERATION IN COLD AND ARCTIC CLIMATES

Lubrication Point	Lubricant	Ambient Temperature °C
Hydraulic System (pre-heated)	Shell Tellus Arctic 32 ESSOTRANS EXTRA	- 50 to + 35 - 50 to + 28
Travel Gears	Shell Omala HD 220	All seasons
Final Drives	Shell Omala HD 220	All seasons
Swing Gears	Shell Omala HD 220	All seasons
Track Rollers and Idler Wheels	Shell Omala HD 220	All seasons
Pump Distributor Gears (pre-heated)	Shell Transaxle Oil 75W-90 Tranself Synthese FE 75W-90	All seasons - 45 to + 35
Brake housings and Motor adapter housings of Gears	Shell Tellus Arctic 32	All seasons
Fan Bearing Housings of Radiators and Hydraulic Oil Coolers	Shell Omala HD 220	All seasons
Central Lubrication System	Fuchs Stabyl L-TS MO Shell Darina XL 102 Moly Fuchs Urethyn HGO	- 10 to + 35 - 30 to + 35 - 50 to - 10
Swing Circle Lubrication System	Shell Malleus GL 400 Shell Malleus GL 25 Fuchs Urethyn HGO	- 10 to + 35 - 30 to 0 - 50 to - 10
Refrigerant Lubricant	Shell Clavus Oil R 68	- 50 to + 35
Refrigerant	Shell R 134 a	- 50 to + 35
Engine Oil	SAE15W-40 API Category CG-4SH	All seasons
Flexible Couplings	SAE15W-40 API Category CG-4SH	All seasons
Engine Coolant and Fuel	Refer to ENGINE OPERATION AND MAINTENANCE MANUAL for Specifications.	

Lubrication Chart



Extended Service Intervals for Engines with Engine Oil Management System

Reserve System Oil Flow Schematic, illust. Z 22452A.
Front engine -2- shown. Rear engine -1- is connected to the reserve tank in the LH side member of the main frame

(3) Oil filters for the engine oil reserve system

(4) Suction line from reserve tank

(5) Suction line to pumping unit

(6) Supply line from pumping unit to crankcase

(7) Withdrawal oil line from engine oil pan to pump

(8) Ventilation line for reserve tank

(11) Oil feed-back line to reserve tank

(12) Pumping unit, located in the cross member opposite of the oil filters (3). The pump unit works automatically as soon as the engine speed is above 300 RPM. The pump unit consists of a pumping element for feeding oil from tank (13) into the engine oil pan. The second pumping element withdraws oil from the engine oil pan and feeds it back into the reserve tank when the oil level in the oil pan exceeds the maximum running oil level. The combined operation of the pumping elements maintains an optimal oil level in the engine oil pan. Oil drawn off by the Centinel burn system is also replaced through the supply system "Reserve".

(13) Reserve oil tank. The reserve oil tank for the rear engine -1- is an integrated part of the LH main frame side member. The reserve oil tank for the front engine -2- is an integrated part of the RH main frame side member.

(14) Drain plug

(15) Machinery house frame cross member

(16) RH side member of main frame

(17) Oil level sight gauge. Be sure to add engine oil via the swing down service arm before the oil level is at the MIN marking on the sight gauge.

(18) Connector for refilling line from swing down service arm

4.6.8 MAINTENANCE OF THE ENGINES

All maintenance has to be carried out in accordance with the separate Engine Operation and Maintenance Manual.

REMARK

Service the Eliminator Oil Filter according to the separate Service Bulletin **"Eliminator Filter"** filed in volume 2 Binder.

4.7.3 AUTOMATIC LUBRICATION SYSTEMS FILL GREASE CONTAINERS

Fill the grease containers of the Central Lubrication System and Swing circle pinion Lubrication System when the corresponding message "grease container on reserve" is displayed on the ECS screen. Make sure the grease filters in the filling lines are not obstructed. If necessary service the Grease Filters.

Legend for illustration Z 22725

(1) Coupling on swing down service arm for filling the grease container (3) of the Swing circle gear Lubrication System "SLS"

(2) Grease filter for Swing circle gear Lubrication System "SLS" grease container.
Before filling the grease container make sure the filter is not obstructed.
Service the filter element according to instructions on page 343.

(3) Grease container of the Swing circle gear Lubrication System "SLS"

(4) Hydraulic motor with pump unit

(5) Grease pressure gauge for "SLS"

(6) Receiver panel on swing down service arm

(7) Coupling on swing down service arm for filling the grease container (9) of the Central Lubrication System "CLS"

(8) Grease filter for Central Lubrication System "CLS" grease container.
Before filling the grease container make sure the filter is not obstructed.
Service the filter element according to instructions on page 343.

(9) Grease container of the Central Lubrication System "CLS"

(10) Hydraulic motor with pump unit

(11) Grease pressure gauge for "CLS"

(12) Mounting bolts of the grease container housing

- Fill the grease containers according to the instructions on page 286.

REMARK

Check mounting bolts (12) on front and rear side of the grease container housing for correct tightening torque.

Walk - around Inspection (continued)

Legend for illustration Z22881

(14) Check condition, fastening and security of the automatic lubrication system grease container.

(15) Make a visual inspection of the engine room. Check engine oil level and coolant level.

Check engine for good condition and security. Check for oil and fuel leakages. Check fuel hoses, hose lines and fittings for leakage and damage.

Engine mounts, check for good condition and correct fastening.

Check radiator coolant level. Check cooling system for leakage, damaged hoses and connections.

Check housing of radiator fan bearing for leakage. Check fan guards and coverings for correct installation, good condition and security.

Check flexible coupling between engine and PTO for leakage.

Check condition and mounting of PTO and hydraulic pumps. Check hydraulic hoses, hose lines and fittings for leakage and damage.

Check housing of oil cooler fan bearing for leakage. Check fan guards and coverings for correct installation, good condition and security. Check hydraulic hoses, hose lines and fittings for leakage and damage.

Check hydraulic oil cooler for plugged cores.

Check hydraulic oil level. Check hydraulic oil reservoir for leakage, damaged hoses and connections.

Check condition and fastening of control valves. Check hydraulic hoses, hose lines and fittings for leakage and damage.

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

4.8.3 RADIATORS - CHECK COOLANT LEVEL

Legend for illustration Z 21770

(6) Coolant expansion tank of front and rear engine radiators

(7) Coolant level sight gauge on front and rear coolant expansion tanks

(8) Cover plates on power house roof above front and rear radiator pressure caps

(9) Radiator pressure caps

⚠ WARNING

DO NOT remove the radiator pressure cap (9), illust. Z21770 from a hot engine. Wait until the temperature is below 50°C before removing the pressure cap (9). Failure to do so can result in personal injury from heated coolant spray or steam. Press the red button on the radiator pressure cap to allow the pressure to escape. Turn the radiator cap slowly counterclockwise to the safety stop, then continue to turn until cap is free to be removed.

The coolant level should be in the upper field of the sight gauges (7). If necessary add coolant.

REMARK

Refer to the Engine Operation and Maintenance Manual for the correct coolant composition.

4.8.4 TRACK GROUPS - CLEAN

See (10), illustration Z 21770.

Clean track groups especially during the cold season.

TRAVEL GEARS, MOTOR ADAPTER HOUSINGS AND FINAL DRIVES - CHECK BREATHER FILTERS

Legend for illustration Z25243

(11)	Connector on travel gear box for breather filter (18)
(16)	Connectors on motor adapter housing for breather filter (19)
(18)	Breather filters for travel gears
(19)	Breather filters for motor adapter housings
(20)	Breather filters for final drives
(21)	Pilot oil pressure hydraulic lines for releasing the parking brakes

Check the six breather filters(18, 19 and 20), located inside the center frame, for restriction. If necessary, remove breather filters, blow out with compressed air from inside to outside and reinstall.

4.10.1 AIR CONDITIONING COMPRESSOR - CHECK DRIVE BELT TENSION

⚠ WARNING

Be sure to set the maintenance safety switch to 0 position before to start the checking procedure. Refer to page 205 for the location of the maintenance safety switch. In the 0 position the engines can not be started. Secure this position by inserting a padlock into the holes of the switch. Up to three padlocks can be attached to the holes provided.

Legend for illustration Z 22511

(1) Refrigerant compressor

(2) Electromagnetic clutch

(3) Compressor carrier

(4) Swivel bracket

(5) Pivot bolt, loosen for adjusting belt tension

(6) Drive belts

(7) Lock nut

(8) Adjusting bolt for belt tension

Check tension of each belt

The tension is correct if the belt can be depressed with 110 N (25 lb.) force approximately 15 to 20 mm midway between the belt pulleys.

Excessive belt tension causes undue wear on the bearings. After a new belt has been in use for approximately 20 minutes, check the tension and adjust again if necessary.

NOTICE
Always replace the belts in complete sets.

Adjust belt tension

1. Loosen pivot bolt (5)
2. Loosen lock nut (7)
3. Turn adjusting bolt (8) until correct belt deflection is obtained. Tighten lock nut (7)
4. Tighten pivot bolt (5) and check the belt adjustment.

4.10.7 AIR CONDITIONING FOR OPERATOR'S CAB - CHECK REFRIGERANT LEVEL

Legend for illustration Z 22591

(1) Air conditioner door with filter mat

(2) Air conditioner unit

(3) Sight glass for checking refrigerant filling

(4) Shut-off valve on dryer cartridge

(5) Dryer cartridge

(6) Refrigerant collector reservoir

(7) Condenser

(8) Condenser blower

(9) Low pressure switch

(10) High pressure switch

(11) Expansion valves

(12) Evaporator blower

(13) Evaporator

(14) Cool air outlets

Checking the refrigerant level:

Switch on air conditioning equipment and run at maximum capacity for approx. 5 minutes.
Observe inspection glass (3). A refrigerant flow loaded 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 or refrigerant. If more than 200 grams per year are lost, the oil level of the refrigerant compressor must also be checked. This is a special procedure and must be carried out by refrigeration specialists only. 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.
The dryer cartridge (5) must be replaced after every 1000 operating hours or once a year by refrigeration specialists.

Clean the filter mats of condenser (7) and evaporator (13).

REMARK

Servicing of the air conditioning systems is restricted to workshops especially equipped for this purpose. Refer to the separate booklet "AIR CONDITIONING" in Service Literature Binder – Volume 2 for more information.

4.11.4 CRAWLER TRACK - INSPECTION

CHECK ADJUSTING RANGE OF GUIDE WHEELS

(Track retensioning range)

GENERAL

The hydraulic track tensioning system, illust. Z 20371 maintains automatically the correct track tension. The pilot pressure oil of the travel brake release circuit is used, to pressurize the four adjusting cylinders (10) and (11). The resulting force moves the guide wheels toward the front, until the correct track tension is obtained. External forces acting upon the guide wheels are absorbed through the pressure accumulators (8A) and (8B).

Legend for illust. Z 20371:

(1)	Rotary distributor
(2)	Supply line, pilot pressure from travel brake release circuit
(3)	Return oil line (leakage oil)
(4)	Valve block
(5)	Pressure relief cock for hydraulic track tensioning system.
	“C” - Closed (Normal working position)
	“O” - Open
(6)	Shut-off cock in supply line (if so equipped)
	“O” - Open (Normal working position)
	“C” - Closed
(7)	Two stage pilot pressure operated relief valve
(8A)	Pressure accumulator, high pressure (150 bar)
(8B)	Pressure accumulator, low pressure (31 bar)
(9)	Shutoff cocks, RH & LH
	“O” - Open (Normal working position)
	“C” - Closed
(10)	Track adjusting cylinders, inner
(11)	Track adjusting cylinders, outer
(12)	Test connectors and vent valves

⚠ WARNING

Before working on the hydraulic track tensioning system, relieve all pressure in the system by opening cock (5), position ’0’. After finishing the service work close the pessure relief cock (5), position ’C’.

4.12.1 HIGH STRENGTH BOLT CONNECTIONS - CHECK TORQUE LOAD

Check high-strength bolt connections and securing elements for damage and looseness. If any damages, failures or wrong condition are found, corrective action must be taken.

NOTICE

- **If the torque load is not stated otherwise refer to standard torque chart for torque data.**
- **Bolts inserted with Multi-Purpose Grease MPG, KP2K on thread and head.**

REMARK

When selecting the tightening torque observe quality grade and bolt size

Hydraulic Access Ladder, illust. Z 21136

(01) Hinged ladder

(03) Ladder lifting cylinder

(06) Self locking nut

(17) Ladder bearing assembly

Check condition and fastening of hinged ladder (01), bearing assembly (17) and hydraulic cylinder (03).
Make sure the self locking nuts (06) are correctly tightened and have not lost their clamping torque.

Tightening Torque of Self Locking Nuts (06):

- New nut: 1000 Nm
- Used nut: 800 Nm

Clamping Torque of Self Locking Nuts (06):

- New nut: 200 Nm
- Used nut: 20 Nm minimum

  If the clamping torque is less than 20 Nm, use a new self locking nut.

Lubricate both eyes of hydraulic cylinder (03). Make sure both pivot pins (12 and 13) are properly secured with cotter pins (15). Check hydraulic lines (23 and 24) for leakage and damage. Replace as necessary.

High-Strength Bolt Connections (continued)

Check fastening and condition of hydraulic oil cooler, illust. Z 21673

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M30	10.9	46	1770	4
(2)	M30	10.9	46	1770	4

* SW = Wrench size

- Re-tighten mounting bolts to their correct torque and replace missing or damaged bolts.

Power house Roof, illust. Z 20708

- Check fastening and condition of power house roof segments (02 - 05).
- Check sealing elements (08) between roof segments for correct seat and good condition.
- Check sealing elements (11 - 16) between roof segments and roof frame (01) for correct seat and good condition.

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(06)	M12	10.9	19	108	50
(20)	M36	10.9	55	3100	12

* SW = Wrench size

- Re-tighten mounting bolts to their correct torque and replace missing or damaged bolts.

High-Strength Bolt Connections (continued)

Check condition and fastening of both swing gears (01) and swing motors (02), illust. Z 22514

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(8)	M 16	10.9	24	265	16
(25)	M 24	12.9	19	1030	34

* SW = Wrench size

- Re-tighten mounting bolts to their correct torque and replace missing or damaged bolts.

REMARK

After checking and retightening of swing gear mounting bolts (25), attach protection caps (26) onto the bolt heads.

High-Strength Bolt Connections (continued)

Check condition and fastening of travel gears, sprockets and travel motors

Legend for illustration Z 25249

- A - View of the RH Final drive. The configuration of the LH Final drive is the same.

(1) Travel gear

(2) Sprocket

(3) Travel motors

(4) Outer sprocket bearing

(5) Inner sprocket bearing

(6) Mounting bolts for travel gear to crawler carrier

(7) Mounting bolts for sprocket to hub

(8) Mounting bolts for travel motors

(9) Mounting bolts for outer bearing to crawler carrier

(10) Mounting bolts for inner bearing to crawler carrier

Reference No.:	Bolt size mm	Grade	SW *1) mm	Tightening torque Nm	Qty. *2)
(6)	M36	10.9	55	3100	80
(7)	M36	10.9	55	3100	72
(8)	M16	10.9	24	265	32
(9)	M30	10.9	46	1770	24
(10)	M30	10.9	46	1770	24

***1)** SW = Wrench size

***2)** Quantity for both final drives

- Re-tighten mounting bolts to their correct torque and replace missing or damaged bolts.

NOTICE
If the outer bolts (9) have been found loose, it is necessary to check also the inner bolts (10) for looseness.
For this purpose the travel gear assy has to be removed.
Contact your Komatsu Dealer for support.

High-Strength Bolt Connections (continued)

Check condition and fastening of railings (01/02) and of steps (03, 04, 05 and 23).
See details (A - D) for mounting parts arrangement.

Legend for illust. Z 20619

(A)	Mounting assembly for steps (03) to steel pipe, version I
(B)	Mounting assembly for railing posts to steps (03)
(C)	Mounting assembly for steps (03) to boom welded brackets
(D)	Mounting assembly for steps (03) to steel pipe, version II

FILTER SERVICE

- Replace return oil filter elements
- Replace leakage oil filter element
- Check filter screens

Follow the steps shown in illust. Z 19336:

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.

NOTICE
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.

NOTICE
- **After each repair of the hydraulic system the elements (8) should be replaced after about 50 operating hours.**
- **The filter elements must also be replaced when the fault message "Filter restriction" is displayd on the ECS screen.**
- **Replace screens (11) every 5000 operating hours at the latest.**

FILTER SERVICE

Replace pressure filter elements, illust. Z 22515, as follows:

1. Place working equipment on the ground and shut-off the engines.
   Relieve pressure in the hydraulic system according to page 264 in the operation section.
2. Place a suitable container below the filter in order to collect outflowing oil.
3. Remove plug (A) and drain the oil.
4. Unscrew case (C) of the respective filter and clean the filter case.
5. Discard element (F) with O-ring (G).
6. Inspect O-ring (D) and back-up ring (E), replace if necessary.
7. Install drain plug (A) with new packing ring (B).
8. Lubricate the thread at the filter head and at filter case (C) with multi-purpose grease K2K.
9. Insert a new element (F) with new O-ring (G).
10. Fill the case (C) half way up with clean hydraulic oil.
11. Screw the case (C) into the head and tighten.
12. After short operating period check filter for leakage.
13. Check restriction indicator (H) for proper mounting and good condition.

4.12.7 HYDRAULIC OIL COOLER - INSPECT AND LUBRICATE DOOR HINGES

⚠ WARNING

- **Provide adequate working platform for safe access to the hydraulic oil cooler.**
- **Check all door hinges (2) for good condition and proper fastening to their carrier frames. If cracks or distortion at the weld area of the hinges are found corrective action must be taken. DO NOT try to open the cooler doors before the damage has been repaired otherwise the cooler door may become detached and fall off. Danger of accidents.**

Legend for illust. Z25095

(1) Hydraulic oil cooler

(2) Cooler hinges

(3) Grease fitting

(4) Cotter pin

- Lubricate all cooler hinges (2) at grease fittings (3).
- Check to make sure that the hinge pins are properly secured with cotter pins (4).

HYDRAULIC SYSTEM - CHANGE OIL, REPLACE SUCTION STRAINERS AND PULSATION DAMPER

Legend for illust. Z 21171

(I-VI)	**Main Hydraulic pumps**
(D)	Location of the suction strainers for the six main pumps
(05-06)	Main pump suction lines
(8)	Secondary hydraulic pumps on PTO gear 1
(9)	Secondary hydraulic pumps on PTO gear 2
(10)	Suction hose elbow
(11)	Gaskets
(12)	Suction strainer for the six main pumps
(14)	Plug
(15)	Port of leakage oil return line, use this port as Oil level and filler opening for the main pump housing

Replace Suction Strainer of Main Pumps

1. Remove elbows (10), of all six main pump suction hoses (D), from suction oil reservoir.
2. Remove gaskets (11) and strainer (12) and discard.
3. Insert new strainer (12) with new gaskets (11) and mount suction hose elbow (10) onto the suction oil reservoir.
4. Check to make sure that the hose clamps of suction hoses (D) are in good condition and properly fitted.

Motor Adapter Housing, Change Oil:

1. Remove level gauge (4) and breather filter (5). Insert the hose of a suction pump into the gauge pipe (4) until the hose end just touches the bottom of the T-union. Place the oil outlet hose of the suction pump into a receptacle. Switch on the pump and completely suck off the oil from the motor housing. If a suction pump is not available, place a receptacle below drain plug (6).
   Remove plug (6) and drain the oil completely.

2. Clean breather filter (5) with compressed air from inside to outside and re-install.

3. If removed, install drain plug (6) and fill-up gear oil through filler opening (4), up to the "MAX" mark on level gauge (4) and install the level gauge.

4. After short operating period check oil level and housing for leaks.

4.14.3 PTO (PUMP DISTRIBUTOR GEAR) - CHANGE OIL

Legend for illustration Z 20696

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(4) Oil drain plug

(7) Oil collector reservoir for adapter housings of hydraulic pumps for fan drives of radiator and hydraulic oil coolers

(8) Breather filter with oil level gauge

(9) Adapter housings for main hydraulic pumps

(10) Oil level plug

(11) Oil filler plug with breather pipe

(12) Oil drain plug

Gear Oil Viscosity

Select gear oil viscosity grade according to ambient temperatures.
If the new gear oil has a different viscosity grade compared with the drained oil it is necessary to enter the new viscosity grade into the appropriate **"Excavator Components"** group.

Refer to page 92 for the INPUT procedure of the oil viscosity.

NOTICE
Before opening the access covers from below the pump distributor gears provide an adequate working platform with sufficient space for the oil collecting container (approx. 200 liters for both gears).

4.16.2 PROTECTIVE MEASURES BEFORE STARTING WELD REPAIRS ON THE LOADER ATTACHMENT

Legend for illustration Z 20675

(1) Electrical cable connector of the end-line pressure switch for the central lubrication system

(2) Plug socket

(3) Protection cap for (2)

(4) Protection cap for (1)

(5) Switch box of the electronic bucket levelling system ”EBL”, (Special Equipment)

(6) Bucket position detector box for the ”EBL” system (Special Equipment)

NOTICE
If weld repairs have to be carried out on the Loader Attachment (Bucket, Stick and/or Boom) disconnect the end line pressure switch cable connector (1) from socket (2) and close the openings with caps (3 and 4).
If the Excavator is equipped with an electronic Bucket Levelling System, disconnect also the cable connector on switch box (5).
Be sure to disconnect electrical connections of working lights and other electrical equipment mounted on the loader attachment.