

Operation & Maintenance Manual

HYDRAULIC
MINING
SHOVEL

PC4000-11

SERIAL NUMBER 08273

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept near the machine for reference and must be periodically reviewed by all personnel who will come into contact with it.

Komatsu has Operation and Maintenance Manuals written in other languages. If a foreign language manual is required, contact your local distributor for availability.

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1.6 SPECIFICATION AND SERIAL PLATE

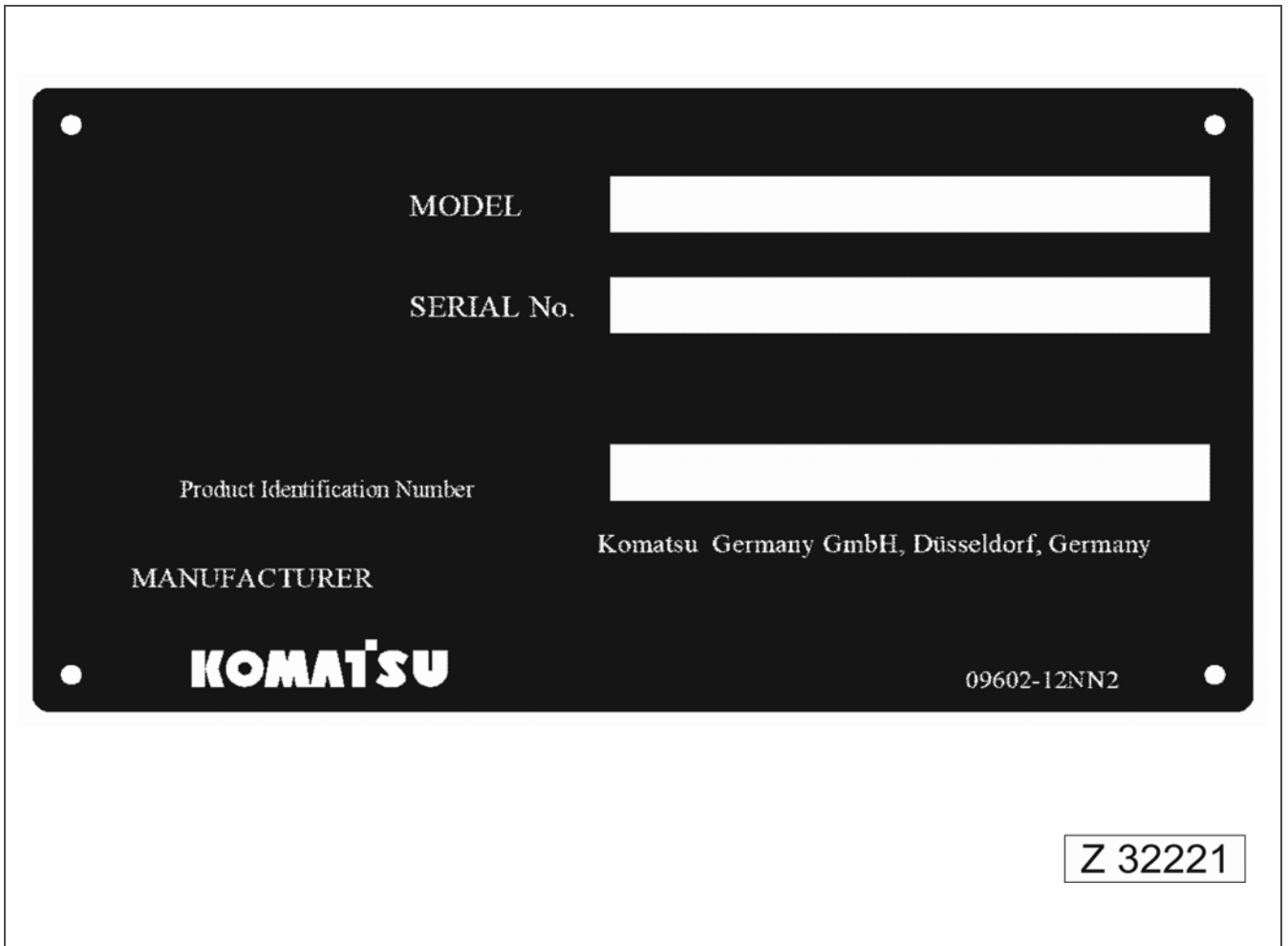


Fig. 1-4

The specification and serial plate is located on the outside of the driver's cab near the door.

1.6.1 PRODUCT IDENTIFICATION NUMBER

The product Identification Number Code (PIN-Code) is printed in the space provided on the specification and serial plate. (Fig. 1-4)

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2.4.3.6 PROVIDE FIRE EXTINGUISHER AND FIRST AID KIT

Always follow the precautions below to prepare for action if any injury or fire should occur, refer to Fig. 2-8.

- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them in emergencies.
- Carry out periodic inspection and maintenance to ensure that the fire extinguisher can always be used.
- Provide a first aid kit. Carry out periodic checks and add to the contents if necessary.

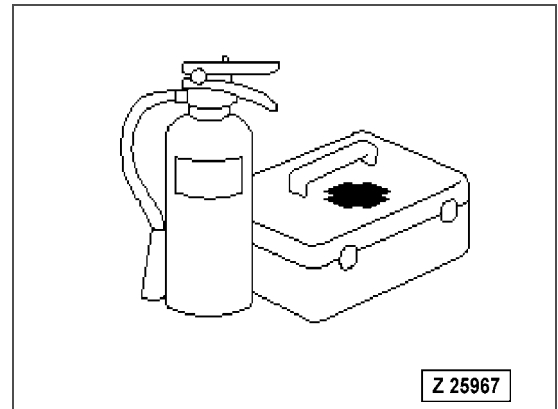


Fig. 2-8

2.4.3.7 IF A PROBLEM IS FOUND

If you find any problems in the machine during operation and maintenance (noise, vibration, smell, incorrect gages, smoke, oil, leakage, etc., or any abnormal display on the warning devices or monitor), report to the person in charge and have the necessary action taken. Do not operate the machine until the problem has been corrected.

2.4.4 FIRE PREVENTION

2.4.4.1 PRECAUTIONS TO PREVENT FIRE

Fire caused by fuel, oil, antifreeze, or window washer fluid.

Do not bring any flame or fire close to flammable substances such as fuel, oil, antifreeze, or window washer fluid. There is a danger they may catch fire. To prevent fire, always observe the following:

Refer to Fig. 2-9:

- Do not smoke or use any flame near fuel or other flammable substances.
- Stop the motors before adding fuel.
- Do not leave the machine while adding fuel or oil.
- Tighten all fuel and oil caps securely.
- Be careful not to spill fuel on overheated surfaces or on parts of the electrical system.
- After adding fuel or oil, wipe up any spillage.
- Put greasy rags and other flammable materials into a safe container to maintain safety in the workplace.
- When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline. There is a danger that they may catch fire.
- Do not weld or use a cutting torch to cut any pipe or tubes that contain flammable liquids.
- Determine well ventilated areas for storing oil and fuel. Keep the oil and fuel in the determined place and do not allow unauthorized persons to enter.

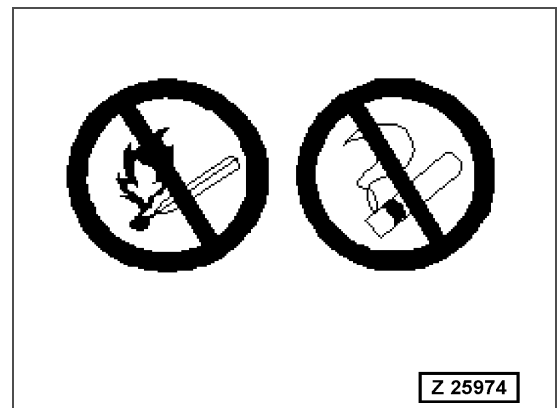


Fig. 2-9

On job sites where the machine may go close to electric cables, always do as follows.

- Before starting work near electric cables, inform the local power company of the work to be performed, and ask them to take the necessary action.
- Always maintain a safe distance (see the table on the right) between the machine and the electric cable. Check with the local power company about safe operating procedure before starting operations.
- To prepare for any possible emergencies, wear rubber shoes and gloves. Lay a rubber sheet on top of the seat, and be careful not to touch the chassis with any exposed part of your body.
- Use a signalman to give warning if the machine approaches too close to the electric cables.
- When carrying out operations near high voltage cables, do not let anyone near the machine.
- If the machine should come too close or touch the electric cable, to prevent electric shock, the operator should not leave the operator's compartment until it has been confirmed that the electricity has been shut off. Also, do not let anyone near the machine.

Voltage of Cables	Safety Distance
100 V - 200 V	Over 2 m (7 ft)
6,600 V	Over 2 m (7 ft)
22,000 V	Over 3 m (10 ft)
66,000 V	Over 4 m (14 ft)
154,000 V	Over 5 m (17 ft)
187,000 V	Over 6 m (20 ft)
275,000 V	Over 7 m (23 ft)
500,000 V	Over 11 m (36 ft)

2.4.11.7 LIGHTNING STRIKES

The machine is vulnerable to strikes by lightning. The operator must not leave the cabin. All workers in the working area must be inside a secure room (cabin, machinery house, closed metallic container, etc). Stop working when the storm is close, lower the attachment to the ground and wait for the storm to pass. A possible lightning strike may damage the mechanical bearings and the electrical systems. Check the machine after a lightning strike for possible damages and repair if necessary.

2.4.11.8 WORKING ON LOOSE GROUND

- Avoid traveling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse under the weight or vibration of the machine, there is a hazard that the machine may fall or tip over. Remember that the soil after heavy rain or blasting or after earthquakes is weak in these areas.
- When working on embankments or near excavated ditches, there is a hazard that the weight and vibration of the machine will cause the soil to collapse. Before starting operations, take steps to ensure that the ground is safe and to prevent the machine from rolling over or falling.

2.5 PRECAUTION FOR MAINTENANCE

2.5.1 GENERAL PRECAUTIONS

- 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 tag to the main switch or control levers.
 - setting the maintenance safety switch to the 0 position and securing it with a padlock
- 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.
- The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.
- For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid. Wear a safety harness when carrying out maintenance work at greater heights.
Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.
- Always tighten any screwed connections that have been loosened during maintenance and repair.
- Any safety devices removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.
- Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.
- Before starting any lubrication or maintenance work read the Fundamental Safety Instructions on page 2-21.
- Park the Excavator at a safe place on level ground. Proceed according to the instructions "Parking the Shovel". Lower the attachment flat onto the ground. Move all control levers to neutral position.
- Stop the motors and move all control levers through their shift positions to relieve the pressure in the hydraulic system. Refer to "Stopping the motors" for detailed description of the stopping procedure. Also see the chapter 'Relieving The Pressure In The Hydraulic System' in the 'Operation' part of this manual.
- Before any maintenance work is started, set the maintenance safety switch to 0 position.
Find to the location of the maintenance safety switch refer to section 2.5.1.3 on page 2-50. In the 0 position the motors can not be started. Secure this position by inserting a padlock into the holes of the switch. Up to ten padlocks can be attached to the holes provided.
- A warning plate "Caution Machine Maintenance" must be fixed in the Operator's cab before any lubrication or maintenance work is started.
- Block the machine to prevent machine movement

2.5.3.1 PRECAUTIONS WITH HIGH FUEL PRESSURE

- For details of the method of releasing the pressure, see the latest version of the Operation and Maintenance Manual. If the circuit is still under pressure, do not carry out any inspection or replacement operation.
- If there is any leakage from the piping or hoses, the surrounding area will be wet, so check for cracks in the piping and hoses and for swelling in the hoses.
- When carrying out inspections, wear full-face protection and penetration resistant clothing and gloves (leather).
- There is a hazard that high-pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes directly (Fig. 2-53). If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the place with clean water, and consult a doctor immediately for medical attention.

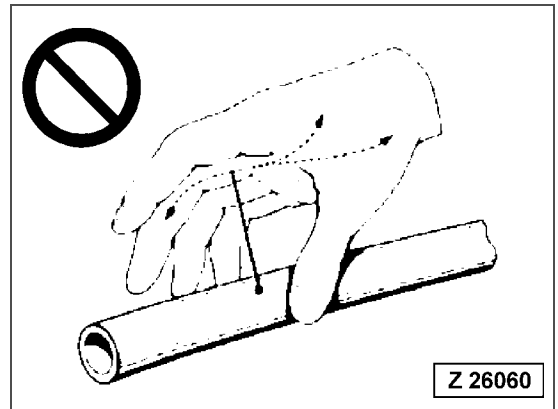


Fig. 2-53

High pressure is generated inside the motor fuel piping when the motor is running. When carrying out inspection or maintenance of the fuel piping system, wait for at least 30 seconds after stopping the motor to let the internal pressure go down before starting inspection or maintenance.

2.7.5.3 PRIOR TO USING THE HARNESS (1), THE WEARER SHALL

- Carry out a visual check of the system or component; correct functioning and perfect working order have to be assured.
- Make sure that the recommendations for use with other components of the system be observed in conformity with the instructions for use.

The system or component must no longer be used, if there are any doubts in respect of its safe condition. The equipment has to be inspected by the manufacturer or by a qualified person.

It is essential for safety reasons that a fall protection system or system component which has already been subjected to fall be removed from service and sent back to the manufacturer or an authorized qualified repair shop for maintenance and renewed testing.

Fall protection systems have to be treated with care and to be kept clean and ready for use. It has to be warned against bringing the systems into contact with acids or other caustic liquids and gases, oils, detergents, or sharp-edged objects.

Should the harness have become wet during use or cleaning, do not dry near a fire or other sources of heat, but rather in a natural way in not too warm rooms. Keep the harness freely suspended or loosely rolled up.

When using the fall protection systems, the pertaining safety regulations in force and the "Rules for Use of Personal Fall Arrest Systems" have to be observed for protection against danger.

The safety harness and its components have to be inspected at least every 12 months by a competent person authorized by the manufacturer and maintained, if the manufacturer considers it necessary.

2.7.5.4 RECOMMENDATIONS FOR USE OF THE HOLDING HOOKS AND HOLD-BACK HOOKS OF THE SAFETY HARNESS

The holding hooks should only be attached to the special attachment points (3) on the boom. Free-fall must be limited to 0.5m.

With the lateral holding hooks, work may only be carried out on horizontal or almost horizontal surfaces (roofs). The connectors have to be adjusted in such a way that the area, where danger of falling down prevails, cannot be reached.

Emergency escape route from machinery house

Fig. 3-64

Part number **518 669 98** (left upwards)Part number **519 760 98** (to the right)

For further information, refer to the chapter "Emergency Escape Ladders" in the "Operation" section of the Operation and Maintenance Manual.

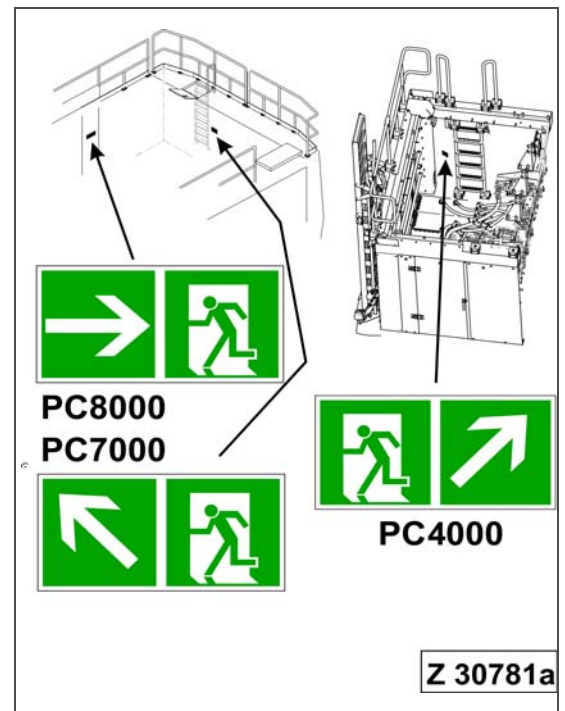


Fig. 3-64

Emergency escape route from machinery house roof to rear ladder (PC7000)

Fig. 3-64

Part number **519 756 98** (Instructions for operating the emergency escape ladder))

1. Turn pin handle CW (clockwise)
2. Remove pin handle
3. Kick against bar to disengage lever mechanism
4. Kick against bar to assist in lowering the ladder
5. Kick against angled section to push ladder downwards
6. Turn pin on latch on hand railing gateway CCW (counter-clockwise)
7. Remove pin
8. Raise hand railing gateway

Part number **519 758 98** (emergency escape ladder to the right))

For further information, refer to the chapter "Emergency Escape Ladders" in the "Operation" section of the Operation and Maintenance Manual.

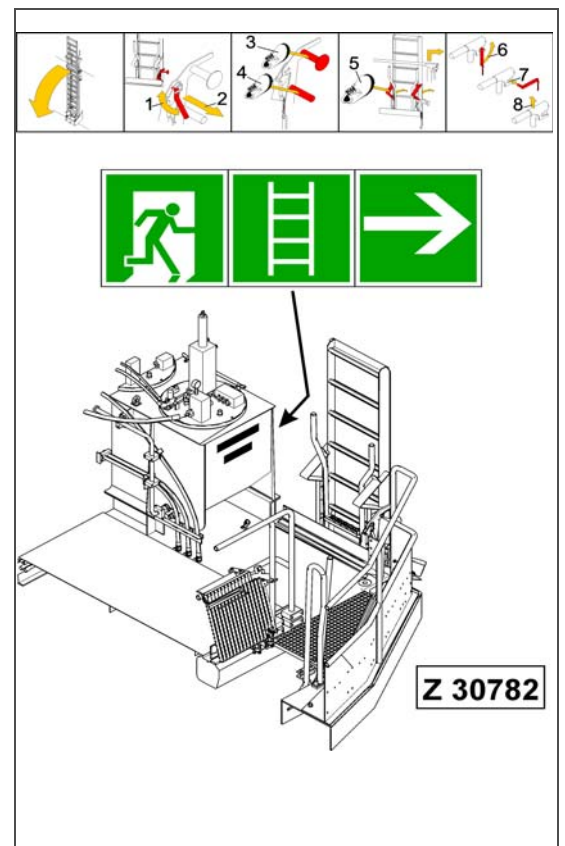


Fig. 3-65

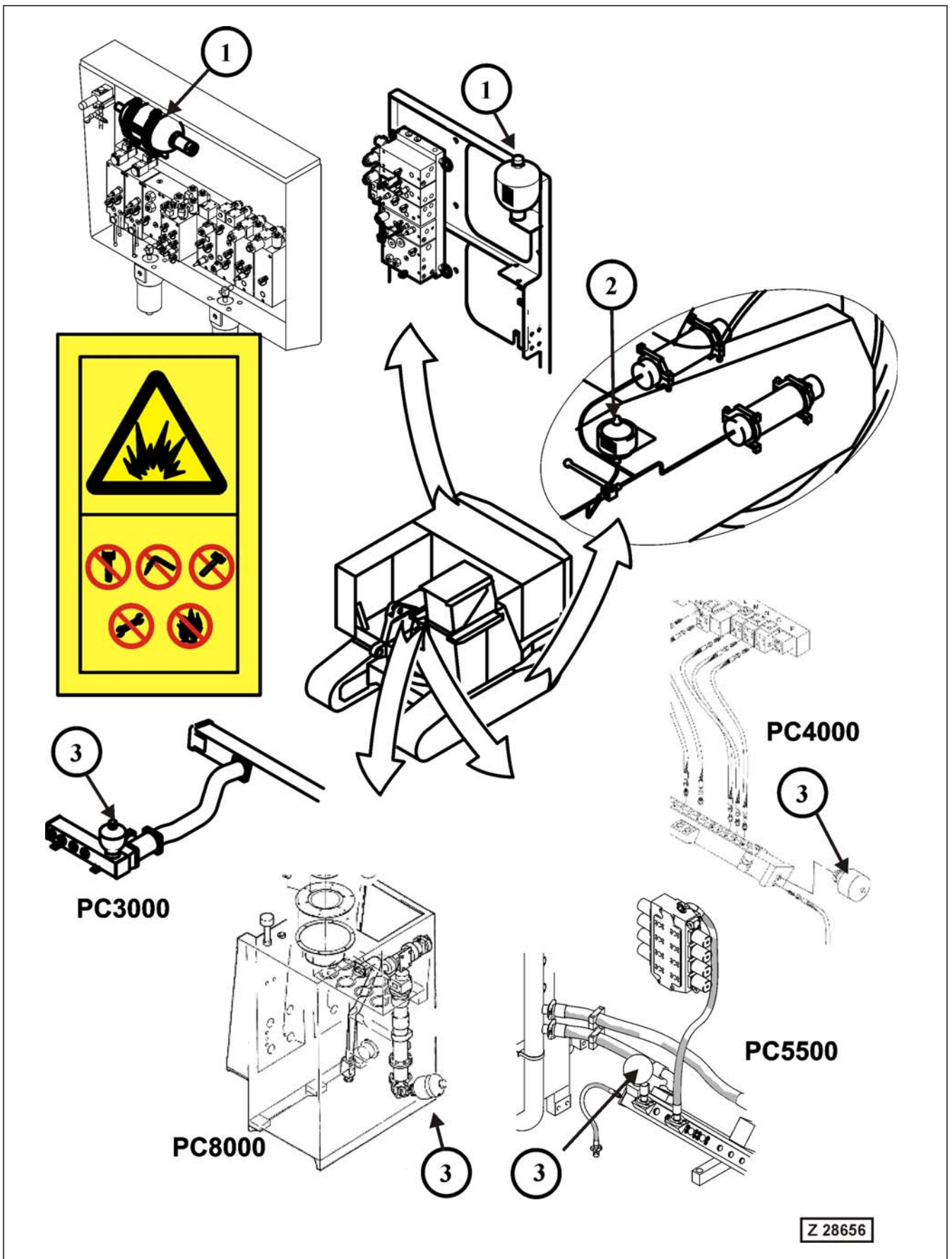


Fig. 3-78

Legend for Fig. 3-3 (continued)

(16) Counter weight

 WARNING**RISK OF EXPLOSION!**

Failure to properly expel the gases from the counterweight chambers can result in an explosion which may cause serious personal injury or death.

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.

Follow the instructions given in PARTS & SERVICE NEWS No. AH04518 for expelling the gases from the counterweight chambers.

- (17) Main control valves with high pressure in-line filters
- (18) Hydraulic oil reservoir
- (19) Return oil filters
- (20) Hydraulic oil cooler
- (21) Swing machinery
- (22) Distributor manifold
- (23) Swing circle pinion Lubrication System (SLS)
- (24) Central Lubrication System (CLS)
- (25) Escape ladder winch assembly

Operating the hydraulic Access Ladder, Fig. 3-11

WARNING

OPERATING THE ACCESS LADDER IMPROPERLY IS HAZARDOUS!

Operating the ladder improperly can result in serious injury or death.

Wait until the ladder has lowered completely before climbing. Do not lift people or objects (tools) with the ladder. Make sure the moving range of the ladder is clear of people when raising or lowering.

If there are any obstacles within the moving range of the ladder, stop the ladder by setting the control switch to -0- position.

Raise the ladder

Access the Shovel with ladder in fully lowered position (1).

Start the engine.

REMARKS: For starting procedure → See "[STARTING THE ENGINE](#)" on page 3-128.

Go back to the ladder control switch (70S084) on the hand railing of the ladder platform (2).

Raise the ladder by turning switch (70S084) to the left (arrow up) and hold until the ladder contacts the stop bar in completely raised position.

REMARKS: For stopping procedure → See "[STOPPING THE ENGINE](#)" on page 3-164.

Lower the ladder by turning switch (70S084b) to the right (arrow down) and hold until the ladder is completely lowered. If necessary, slightly push the ladder until it starts moving down by its own weight.

CAUTION

HAZARDOUS AREA!

People moving within the area of the lowering range of the ladder can be injured.

Make sure the moving range of the ladder is clear of all persons before lowering.

Access the ladder after the ladder is in fully lowered position (A) only.

REMARKS: Check safety sensor of access ladder for correct functionality every 50 operating hours or once a week. Refer to chapter "[MAINTENANCE](#)" on page 4-1 for checking procedure.

3.2.3.1 LOWERING THE LADDER IN EMERGENCY SITUATIONS

In cases of emergency or electrical fault on the machine, the hydraulic access ladder can be lowered independently of all other electrical safety shut down systems. To access the machine from the ground, pull down the pull chain (7) in order to lower the ladder. To escape the machine, pull down the pull chain (8) in order to lower the ladder. See detail (A).

REMARKS: When the emergency situation is over, the function of the ladder must be reset to normal conditions by raising the lever on the magnet valve (9b), see detail (B).

CAUTION

EMERGENCY LOWERING OF ACCESS LADDER INOPERABLE WITHOUT RESET!

If after use the manual reset of the switching valve is skipped, the emergency lowering of the access ladder is inoperable.

Legend for Fig. 3-16

- (1) Ladder rungs on boom
- (2) Handrails on boom
- (3) Door of cabin walkway
- (4) Walkway around operator's cabin
- (5) Boom access ladder

Accessing the boom

The walkway (4) on the inner side of the cabin leads to the access ladder (5). The door (3) is to be opened in order to gain access to the boom.

 WARNING**RISK OF FALLING!**

Falling off the boom can result in serious injury or death.

When working on the boom, a safety harness and fall absorber are to be worn at all times. Refer to chapter "SAFETY" on page 2-1 for further details.

Be sure to close the door (3) after leaving the boom.

3.2.7.2 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 Fig. 3-21

- (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)

CAUTION

CHECK SEAT BELT!

A defective seat belt may not prevent injury when the excavator is involved in an accident or moves suddenly or unexpectedly as planned.

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.

Use seat belt in accordance with the local safety regulations and laws.

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

Engine Oil Management System

The engine oil management system combines the automatic engine oil supply system **Reserve** and the oil burning system **Centinel** in connection with the **Eliminator** oil filtration system.

REMARKS: On machines destined for Australia, the **Centinel** system is made inoperative for legal reasons. The oil change intervals are reduced accordingly, see Servicing Intervals in the chapter "[Extended Service Intervals for Engines equipped with Engine Oil Management System \(continued\)](#)" on page 4-49 for more information.

Reserve System Oil Flow Schematic, [Fig. 3-28](#)

- (1) Reserve oil tank, integrated part of the RH main frame side member
- (2) Suction line to reserve system oil filters (3)
- (3) Oil filter of the reserve system. Replace both filter elements after every 500 operating hours.
- (4) Suction line to pump (5)
- (5) Pumping unit
- (6) Oil supply line from pump (5) to engine oil pan
- (7) Withdrawal oil line from oil pan to pump (5)
- (8) Oil feed-back line to reserve tank (1)

3.3.4.1 EURO CONTROL PATTERN

Legend for Fig. 3-34

- (1) Control lever for stick and swing machinery
- (2) Control lever for boom and bucket
- (3) Push button for deactivation of boom float position
- (4) Push button for deactivation of stick float position
- (5) Toggle switch for engine speed selection
Low idle – High idle
- (6) Push button for Truck counter number 1 (TR1)
For counting loaded trucks press this button. The total number of trucks loaded is shown on the Komtrax Plus monitor field TR1, refer to [page 3-68](#) for more information. A second truck counter switch is located on the control panel, refer to [page 3-61](#) for more information.

REMARKS: The push button (6) has a second function. When the Vehicle Health Monitoring System is switched to the PM CLINIC group within the SERVICE MENU, selected PM CLINIC data can be frozen by pushing button (6). Frozen data can then be stored in the PM CLINIC MEMORY. For more information refer to the SERVICE MANUAL Komtrax Plus-System.

- (7) This switch function is not available as your machine is equipped with a variable slew motor.
- (8) Signal horn button
- (9) Pedal for closing the bottom dump bucket
- (10) Pedal for opening the bottom dump bucket
- (11) Travel control pedal, left track forward - reverse
- (12) Travel control pedal, right track forward - reverse
- (13) Slew brake pedal

3.3.5 AUTOMATIC FLOAT POSITION FOR BOOM AND STICK

The Shovel operates automatically with the float position for boom and stick activated. That means the lowering movement of boom and stick is always done in the float position. To deactivate the float position, press button (3) for boom and/or (4) for stick, and keep depressed as long as the float position shall be deactivated. When releasing the buttons the float position is activated again.

REMARKS: For more information → See "[PARKING THE SHOVEL](#)" on [page 3-162](#).

3.3.8 CONTROL MODULE FOR AUXILIARY CAB HEATER

Special Equipment

Legend for [Fig. 3-39](#)

- (5) Control module for the engine independent auxiliary cab heater (if so equipped). This module is used for switching ON and OFF the auxiliary cab heater during operation of the shovel with the Diesel engine 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

3.4.5.2 AVERAGE FUEL CONSUMPTION LOGS

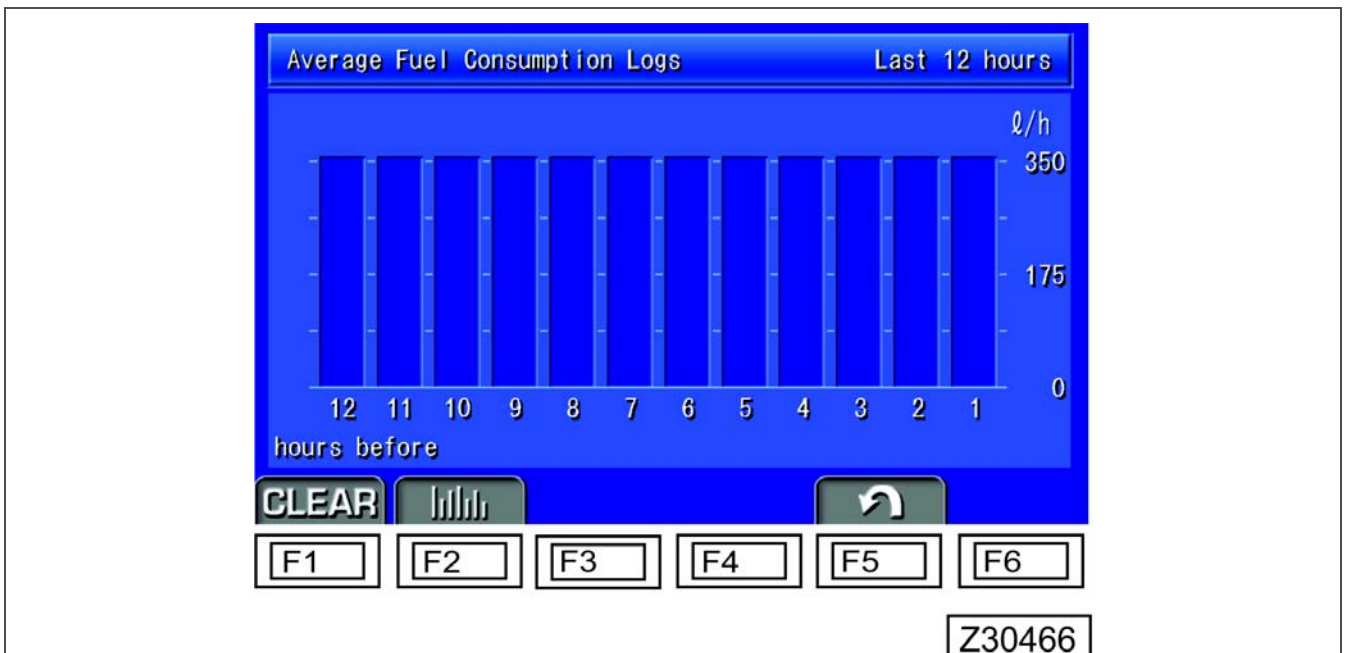


Fig. 3-47

F1- Clear the average fuel consumption log, Confirm with F6, press F5 to quit without deletion.

F2 - Display the average fuel consumption of the last 12 hours (l/h). Press F2 again to display the average fuel consumption of the last 7 days.

F5 - Standard monitor display button, switches back to the Eco Guidance Screen, [Fig. 3-45](#).

3.5.1.2 LOCATION OF MONITORS AND CONTROL UNITS

Special Equipment

Legend for [Fig. 3-58](#)

- I - Top view of Operator's cab
- (A) Components of the camera system mounted on the left machinery house railing, see page [3-97](#) for details.
- (B) Components of the camera system mounted on the right machinery house railing
- (C) Components of the camera system mounted on the counterweight railing
- (1) Monitor for viewing the left area of the excavator
- (2) Monitor for viewing the right area of the excavator
- (3) Monitor for viewing the rear area of the excavator
- (4) Control unit for monitor (1)
- (5) Control unit for monitor (2)
- (6) Control unit for monitor (3)

REMARKS: Refer to [page 3-98](#) for operating instructions of the monitors.

3.5.2.3 ARRANGEMENT OF THE CAMERAS

Check regularly the camera monitor in the operator's cabin to see if the cameras mounted on the excavator need cleaning or are defective. If cleaning is required, wipe with a non-abrasive cloth and substance.

Legend for Fig. 3-63

- (A) Camera mounted on the cab base
- (B) Camera mounted on the oil cooler
- (C) Camera mounted on the machinery house
- (D) Camera mounted on the counterweight
- (E) Camera mounted on the superstructure
- (F) Camera mounted on the fuel tank

3.7.2 MAINTENANCE SAFETY SWITCH AND BATTERY MAIN SWITCHES

Legend for Fig. 3-68

- (10) Rotary switch
Switch positions:
 - 0- Engine start blocked
 - 1- Normal operation
- (11) Securing flap for rotary switch in -0- position
- (12) Holes for attaching padlocks

NOTICE

Before beginning any maintenance operations set the rotary switch (10) to -0- position to prevent starting of the engine during maintenance. Fold up flap (11) and secure this position by inserting a padlock into the holes (12) of flap (11) and safety switch (7). Up to ten padlocks can be attached.

WARNING

Before working on the batteries or any other part of the electrical system make sure that the system operation lamp of the battery main switches (3) is off and remove both battery main switch keys (2).

Batteries give off highly inflammable gas! Never allow sparks or open flame near the batteries!

Avoid spilling any electrolyte on hands or clothing. Repair or replace all broken wires immediately. All terminals must be clean and securely fastened; never paint connections.

DO NOT short across or ground any terminals of the batteries.

CAUTION

KEEP DOOR CLOSED!

Make sure that all machinery house doors are securely closed before starting the engine and during operation of the shovel.

Components of Electrical Preheating System in Cab Base (continued)

WARNING

Be sure to switch off main switch (2), Fig. 3-73 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 engine is stopped. This allows the heating system to maintain the desired temperature with the use of minimum power.

The preheating system for engine coolant is equipped with an additional control box with separate ON/OFF switch. 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 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.

4. HYDRAULIC SYSTEM - CHECK Hydraulic System - Check Oil Level

General Information

The hydraulic oil level in the main oil reservoir fluctuates depending on the oil temperature and the position of the loader attachment (hydraulic cylinders retracted / extended).

Legend for Fig. 3-78

- (1) Main hydraulic oil reservoir
- (2) Hydraulic oil level sight gauge
- (3) Oil level plate
- (4) Oil filler plug

For checking the oil level lower the attachment (backhoe or bottom dump bucket) onto the ground in a position as shown in Fig. 3-78.

Depending on type of attachment and the present oil temperature, select the applying oil level range on plate (3). Be sure to use the correct marking on oil level plate (3).

Add hydraulic oil as necessary.

3.9.0.2 MACHINERY HOUSE DOORS

CAUTION

Make sure that all machinery house doors are securely closed before starting the engine and remain closed during operation of the shovel.

3.9.1 OPERATOR'S SEAT ADJUSTMENT

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

REMARKS: Use seat belt in accordance with the local safety regulations and laws. See also [page 3-37](#) for more information.

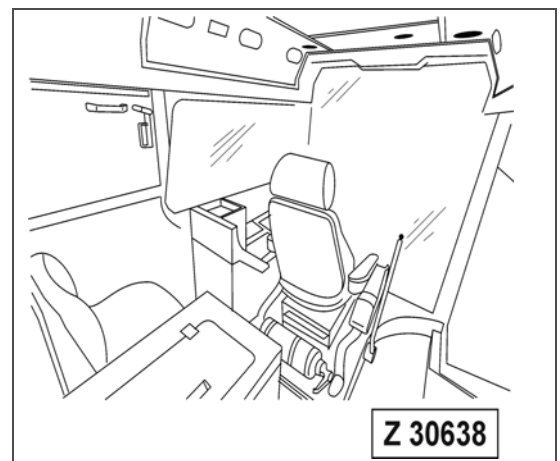


Fig. 3-79

Cold Weather Starting at ambient Temperatures below -25°C and to -40°C (continued)

7. Once the Engine is up to working temperature, switch OFF the remaining electrical preheating systems and, if an external power source is used, disconnect the power supply cable.
Carefully start moving the attachment by operating controls very slowly. Follow the steps below:
 - Raise the attachment slightly off the ground and start by holding the clam closed function over relief. Keeping in mind not to hold over relief for long periods of time as it may damage the relief valve due to overheating.
 - After holding clam closed function over relief, slowly open clam and hold open function over relief. Continue working clam and holding over relief until the hydraulic oil temperature begins to rise and then proceed on to the bucket functions.
 - While holding the bucket functions over relief, continue to work the clam to keep the oil flowing through the circuit.
 - As the temperature of the hydraulic oil rises, move on to the stick and then to the boom functions, keeping other functions in motion as well. Once the hydraulic oil temperature is approximately $+30^{\circ}\text{C}$, start adding swing functions into motion.
 - Once the hydraulic oil is close to working temperature swing over one track, raise the track off of the ground with the attachment, and slowly rotate the raised track to remove cold oil from the circuit. The running surfaces of track pads must not be obstructed with dirt, mud, or other debris. Once the track has been rotated in both directions for a few minutes, lower the track and repeat the same procedure with the opposite track.
8. Operate the Shovel normally but smoothly, avoiding shocks and jerky movements, as hydraulic hoses may burst when the outside ambient temperature is extremely low. Operators must be more careful as temperature goes down to the limit of -40°C .
9. If during operation, the ambient temperature drops below -40°C , stop work, move the loader attachment in the correct parking position, shut down the engine and switch on the electrical preheating systems.

NOTICE

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

10. As soon as the engine is running, check display (9) for messages.

3.11.2.1 TRAVELING LONG DISTANCES

The maximum permissible operating temperature of traveling gear components is 80°C. In order to prevent the overheating of traveling gear components when traveling with the machine over extended distances above 500m, observe the following precautions.

1. After traveling 500m, stop the machine and check the temperature of the following components (see A on [Fig. 3-90](#)) :
 - Bottom rollers
 - Guide wheels
 - Top rollers
 - Travel park brake housing.
2. If the temperature of the components is within the permissible range, continue traveling for a further 500m.
3. Stop the machine and check the temperature again, as the temperature has a tendency to develop. If the temperature of one of the components is near maximum, cool down to a temperature of at least 20°C below the maximum permitted 80°C. If the temperature of the components is within the permissible range, continue traveling for a further 500m.
4. Repeat the 500m stops and temperature measurements.
5. If the temperature of at least one of the above listed components is higher than 80°C, park the machine for at least 10 minutes and cool down the components with water.
6. When the final destination of the machine is reached, shut down the machine and check the above listed components for leakages and other irregularities.
7. Take action as necessary.

It is good practice to keep the attachment near to the machine when traveling (center of gravity) and to make stationary turns rather than traveling a continuous curve (see B on [Fig. 3-90](#)). This practice reduces strain on traveling gear components.

3.14.2 FURTHER OPERATING PRACTICES

DO NOT use the loader attachments to "sweep" an area in front of the shovel clean as this may result in severe damage on swing gear components.

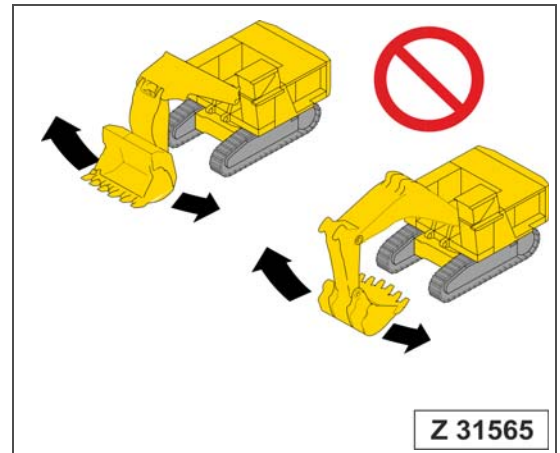


Fig. 3-104

DO NOT use the bucket clam for loosening or removing anchored rocks or other solid objects since such operations may result in severe damage to the clam pivot bearings.

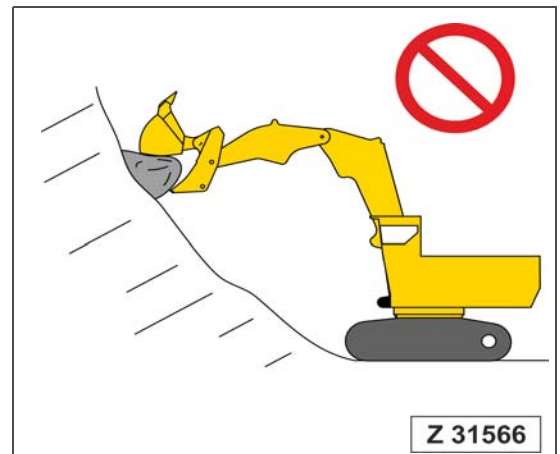


Fig. 3-105

When cleaning a facing slope, ensure the material is loose (blasted). If the slope is not loose, ensure that the shovel on the attachment does not scrape over protruding rocky outcrops which will cause the attachment to jerk downwards.

Do not hammer on to protruding material.

These actions will cause sever damage to the attachment components.

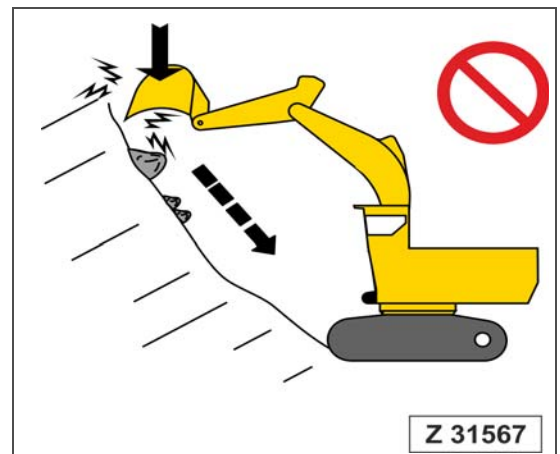


Fig. 3-106

3.16.1 RELIEVE PRESSURE IN THE HYDRAULIC SYSTEM

NOTICE

With the engine at standstill and main switch (1) in ON position, move all controls for working attachment and crawlers several times through all shift positions to relieve the pressure in the hydraulic system. The necessary oil pressure for shifting the spools of the main control valves is provided by a pressure accumulator in the pilot oil circuit.

The pressure accumulator in the pilot oil circuit serves also for lowering a raised working attachment to the ground with the engine at standstill. If, for example, the engine stalls with the working attachment in a raised position, lowering of the working attachment is possible by operating the respective control lever.

8. Set main switch key (1) to "0" position and remove.

NOTICE

After switching OFF the main key switch in the Operator's cab, wait at least 3 minutes before switching OFF the battery main switches. The Vehicle Health Monitoring System (Komtrax Plus) needs this period for saving data. If batteries are switched OFF before this time period is over, data will be lost. The system operation lamp of the battery main switches lights green during this saving period. Switch the battery main switches only OFF when the system operation lamp is OFF.

9. Set lock lever (7) fully to the rear in LOCKED position.
10. Make sure that the system operation lamp is off. Switch off the battery main switches and remove keys.

Legend for Fig. 3-123

- (1) Linear detector
- (2) EOL (End Of Line) device
- (3) Spot thermal detectors (with heat shield and bracket)
- (4) Branch terminator
- (5) Detection circuit cable
- (6) Electric manual actuator (and bracket)
- (7) Visual seal
- (8) Checkfire 210 display module (and bracket)
- (9) Display cable
- (10) Interface control module
- (11) Power circuit cable
- (12) Fused power circuit cable
- (13) Relay cable
- (14) Relay circuit cable
- (15) Release circuit cable
- (16) EOL (End of Line) device
- (17) Release circuit drop cable
- (18) Electric pneumatic actuator
- (19) Expellant gas cartridge
- (20) Agent tank

The linear detection cables (1 and 5), also known as 'firewire' provides fire protection in protected areas. There are also spot detectors (3) for use in fire hazardous areas where the 'firewire' is not in use. All detectors are connected to the control module. (see [page 3-181](#)).

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3.19.2 FUNCTIONS OF THE TRANSFER PUMP

A - Transfusing oil from the suction oil reservoir (11), Fig. 3-128 into the main oil reservoir. Necessary for evacuation of the suction oil reservoir, when changing the hydraulic oil (main oil reservoir will be evacuated via service arm connector, see page 3-190 for details). Before servicing the main hydraulic pumps it is advisable to empty the suction oil reservoir partially.

B - Transfusing oil from return oil collector pipe (12) and back-pressure valve pipe (13) into main oil reservoir. Necessary when changing the hydraulic oil and prior to servicing the high pressure filters or the main control valves (oil return system).

NOTICE

Before operating the transfer pump, lower the attachment to the ground with the stick fully retracted and the bucket fully rolled back. Shut down the engine.

During normal operation the valves (1, 2 and 3) must be in closed position -C-.

A - Pumping the oil from the Suction Oil Reservoir (11) into the Main Oil Reservoir

1. Close main valve (10).
2. Open cock (1), position -O-.

In order to prevent build-up of a vacuum in the suction system, open the vent plugs on the suction port of each main hydraulic pump.

3. Switch on pump (4) with switch (6).
When changing the hydraulic oil, be sure to evacuate the main oil reservoir via the service arm connector simultaneously with the transfusion procedure. Otherwise overfilling of the main oil reservoir. Observe oil level at sight gauge.
4. When the suction oil reservoir is empty or after completion of the maintenance job switch off transfer pump (4) with switch (6). Close cock (1), position -C- and open main valve (10).
5. With the main shut-off valve (10) open, the suction oil reservoir will be filled with oil from the main oil reservoir. Let the vent plugs on the main pump suction ports open to allow the air to escape from the suction oil reservoir and hoses.

Legend for Fig. 3-133

- 16 Oil evacuation and filling adapter for engine oil pan. Monitor oil level at level gauge.
- 17 Radiator coolant draining and filling adapter. Monitor coolant level at radiator sight gauge.

REMARKS: The two-loop type cooling system of the engine is equipped with two radiators. One radiator for the engine crankcase and cylinder heads and one radiator for the low temperature aftercooler (LTA) system. The radiators are connected with a pipe on the bottom side. This pipe contains a check valve which allows coolant flow from rear radiator to the front LTA radiator only. For draining the coolant from the front mounted LTA radiator, it is necessary to open the shut-off cock in the draining/filling hose line just below the radiators. Refer to the engine Operation and Maintenance Manual in volume 2 binder for the maintenance instructions of the cooling system.

NOTICE

Be sure to close the shut-off cock on the bottom side of the radiators as soon as the maintenance of the cooling system is finished.

- 18 Engine oil evacuation and filling adapter for the reserve tank. Observe the indicator lamp (10).

3.20.3.1 REFILLING PROCEDURE

REMARKS: Refer to Maintenance section 4, for the correct lubricant specifications and filling capacities. For Engine Lubricants and Coolants refer to the separate Engine Operation & Maintenance Manual in volume 2 Binder.

1. Connect supply lines to the respective adapters.
2. Monitor the respective fluid/lubricant level at the indicator lights (6, 7, 8, 9 and 10).
3. After finishing the refilling operation, cover the adapters with the protection caps provided and swing back hydraulic service arm (3) to its home position.

NOTICE

Recheck fluid levels before operating the machine.

3.25 TROUBLE SHOOTING

3.25.0.1 GENERAL

The following charts list 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 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.

3.25.1 ENGINE

Problem	Probable cause
Engine will not start	<ul style="list-style-type: none"> – 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	<ul style="list-style-type: none"> – Fuel filters clogged – Air in fuel system – Engine speed governor defective
Engine overheats	<ul style="list-style-type: none"> – 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	<ul style="list-style-type: none"> – 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	<ul style="list-style-type: none"> – 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.

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

4.3.2.1 RECOMMENDED HYDRAULIC OILS

Komatsu Germany recommends using Komatsu Genuine Hydraulic Oil in the hydraulic system as it is formulated especially for Komatsu using the latest tribological technology. It is designed to maintain the reliability and durability of Komatsu machines, ensuring extended fluid lifetimes and improved anti-wear characteristics of metallic hydraulic components.

	<i>Komatsu Lubricant</i>	<i>Ambient Temp. °C</i>
Hydraulic System using Komatsu Genuine Hydraulic Oil according to DIN 51524 part 2 (HLP) and part 3 (HVLP) and KES 07.841.1	HO-MVK	-30°C to +50°C
	HO46-HM	-20°C to +50°C
	HO68-HM	0°C to 40°C
	HO100-HM	+5°C to +50°C
Environment acceptable oil (according to ISO 15380 HEES)	BO46-G3A	-20°C to +50°C
	BO46-G4	-20°C to +50°C

NOTICE

- *1) **DO NOT mix ZINC-FREE Hydraulic oils with Hydraulic oils containing Zinc. DO NOT mix Mineral Hydraulic oils with Synthetic Hydraulic oils.**
Mixing of the above oils, will reduce anti wear properties and oxidation stability of the oil. Quick plugging of the oil filters in the hydraulic system will occur.
- *2) **Refer to the chart GEAR OILS filed in volume 2 binder for the released gear oil qualities and viscosity grades.**
- *3) **Brake housings of swing gears type GFB 174 have no separate oil compartment, as brake disks are lubricated by splash oil from gear box.**

The lubricating instructions in this book refer to the recommended grade specifications. Damages caused by using lubricants other than specified are not covered by the manufacturer's warranty.

4.6.4 PERIODIC SERVICING SCHEDULE

4.6.4.1 WHEN NECESSARY

Service Point	Service	See page
Engine Air Cleaners	Maintenance	4-53
Automatic lubrication systems	Replace or fill grease containers Clean or replace filter elements	4-57
Guide wheels	If leakage occurs replace floating seals and fill with gear oil CLP 220.	4-61
Cylinder rod protection	Exchange cylinder protection sliding blocks	4-135
Cold starting aid	Replace fluid cartridge The fluid cartridge is located on the LH air cleaner carrier.	(1)

4.6.4.2 EVERY 10 OPERATING HOURS OR DAILY

Service Point	Service	See page
Shovel	Walk-around inspection	4-63
Air cleaner	Clean pre-cleaner	4-67
Radiator	Check coolant level	4-69
Track groups	Clean, esp. in winter	4-69
Fuel system water separator	Drain water	4-71
Boom	Check ladder and walkway	4-73
Electrical Equipment	Visual check	4-73
Emergency escape from cabin	Visual check	4-75
Engine	Check oil level	(1)
Eliminator filter	Maintenance check	(4)

4.7.4 VENTING THE AIR FROM THE FUEL FILTERS

This image represents a generalized view of the engine. The actual engine variation may differ.

NOTICE

Do not pre-fill the fuel filters.

Legend for Fig. 4-5

- (1) Fuel tank
- (2) First stage fuel filter
- (3) Second stage fuel filters
- (4) Tube from connection block to first stage fuel filters
- (5) Connection block
- (6) Tube from air bleed check valve
- (7) Air bleed check valve

1. Ensure that the fuel tank (1) is full.
2. Loosen tube (4) on connection block (5) that runs from the first stage fuel filter(s) (2).
3. Ensure that the magnet valve is activated by very briefly turning the engine over. This ensures that fuel is flowing into the engine.
4. Re-tighten tube (4) to connection block (5).
5. Remove tube (6) from air bleed check valve (7).
6. Wait until bubble (air) free fuel runs out.
7. Reattach tube (6).
8. Start engine using starting procedure according to the engine maintenance manual filed in Volume 2.

NOTICE

For further detailed procedures to venting the air from the fuel filters, refer to the engine maintenance manual filed in Volume 2.

4.8.5 SWING CIRCLE - CHECK TORQUE OF BOLT CONNECTIONS

Fig. 4-10

Check tightening torque of inner and outer mounting bolts (02 and 04) according to PARTS & SERVICE NEWS, No. AH00511.

REMARKS: Checking/retightening of swing circle mounting bolts is only necessary after the first 1000 operating hours.

Check condition and fastening of swing circle guard (10) and bolts (15).

NOTICE

A visual check of the security and the conditions of the bolt connections must be performed every 1000 hours.

Extended Service Intervals for Engines equipped with Engine Oil Management System (Continued)**Reserve System Oil Flow, Fig. 4-16**

- (1) Reserve oil tank, integrated part of the RH main frame side member
- (2) Suction line to reserve system oil filters
- (3) Oil filter of the reserve system. Replace both filter elements after every 500 operating hours.
- (5) Pumping unit
- (8) Oil feed-back line to reserve tank (1)
- (9) Union for suction line (2)
- (10) Union for oil feed-back line (8)
- (11) Union for oil refill line from service arm
- (12) Oil level sight gauge. Check oil level in the reserve tank before starting the engine. If necessary refill reserve tank via service arm adapter, refer to the instructions on [page 3-191](#) for more information.
- (13) Union for reserve tank breather line connected to engine crankcase
- (14) Oil drain plug

4.11.2 AUTOMATIC LUBRICATION SYSTEMS FILL GREASE BARRELS

Fill the grease barrels of the Central Lubrication System and Swing circle pinion Lubrication System when a corresponding fault message is displayed on the health monitor. Make sure the grease filters in the filling line are not obstructed. If necessary service the Grease Filters. Refer to chapter "[CENTRAL REFILLING SYSTEM](#)" on [page 3-190](#) for further information.

Legend for [Fig. 4-22](#)

- (A) Grease supply line to the injectors for lubrication of the loader attachment, swing circle bearing and swing gears pinion bearing
- (B) Grease supply line to the injectors for lubrication of the swing circle toothing
- (P) Pressure oil supply from pilot oil circuit to hydraulically driven grease pumps (5 and 12)
- (R) Return oil to main hydraulic oil reservoir
- (1) Grease refilling line from service arm adapter to grease filter (2) of the central lubrication system
- (2) Grease filter for central lubrication system.
- (3) Grease refilling line from grease filter (2) to grease container (4) of the central lubrication system
- (4) Grease container of the central lubrication system
- (5) Hydraulically driven grease pump
- (7) Grease supply line to the injectors of the central lubrication system, see (A).
- (8) Grease refilling line from service arm adapter to grease filter (9) of the swing circle pinion lubrication system
- (9) Grease filter for swing circle pinion lubrication system.
- (10) Grease refilling line from grease filter (9) to grease container (11) of the swing circle pinion lubrication system
- (11) Grease container of the swing circle pinion lubrication system
- (12) Hydraulically driven grease pump
- (13) Grease pressure gauge
- (14) Grease supply line to the injectors of the swing circle pinion lubrication system, see (B).
- (15) Grease level gauge. Check grease level in both containers at regular intervals.
- (16) Grease pressure gauge
- (17) Level indicator, grease barrel empty
- (18) Level indicator, preliminary warning that grease level is low in barrel
- (19) Level indicator, grease barrel full
- (20) Dipstick
Before re-inserting the dipstick, clean its insertion opening and make sure that the dipstick is free of any kind of contamination.
- (21) Breather filter

4.12.2 AIR CLEANER - CLEAN PRE-CLEANER

4.12.2.1 CLEAN DUST CUPS OF PRE-CLEANERS

Legend for [Fig. 4-28](#)

- (1) Roof mounted air cleaner units
- (2) Air intake screen
- (3) Clamps
- (4) Dust cups
- (5) Jet tubes

1. Provide suitable container for collecting the dust before opening the dust cups (4).
2. Loosen the clamps and swing down dust cups (4).
3. Remove dust from pre-cleaner dust cups.
4. Check condition of the dust cup gaskets and replace if necessary.
5. Swing back dust cups (4) to closed position and secure with the clamps provided.
6. Check air cleaner mounting parts for tight fit and security.

NOTICE

When operating the machine under very dusty conditions, check pre-cleaner jet tubes (5) for plugging. Dust plugging of tubes can be removed with a stiff fiber brush. Never clean tubes with compressed air unless both the primary and safety elements are installed in the air cleaner. Do not steam-clean tubes.

4.13.1 SWING GEARS AND MOTOR ADAPTER HOUSINGS - CHECK OIL LEVELS

REMARKS: The machine can be equipped either with a swing machinery type GFB 174 or with type 89 DS 03. Refer to the data plate on each swing machinery housing to find out which swing machinery is installed.

4.13.1.1 SWING GEARS TYPE GFB 174

I Swing gear RH

II Swing gear LH

Legend for Fig. 4-34

Swing gears

- (A) Position of oil level gauge for checking the oil levels
- (1) Oil level gauge
- (2) Oil filler plug
- (3) Breather filter
- (10) Drain coupling or evacuation nozzles for Wiggins system

Motor Adapter Housing

- (4) Oil level gauge and filler opening. This opening can also be used for connecting a suction pump when changing the oil.
- (5) Breather filter
- (6) Oil drain plug

CHECK SWING GEAR OIL LEVEL

Remove oil level gauge (1), Fig. 4-34 and wipe it clean. Insert the gauge but DO NOT screw in, see detail "A". Remove the gauge. The oil level should be at the upper mark of gauge (1). If necessary add the specified gear oil through filler opening (2).
Remove breather filter (3). Blow out with compressed air from inside to outside and reinstall.

CHECK MOTOR ADAPTER HOUSING OIL LEVEL

Remove oil level gauge (4) and wipe it clean. Insert the gauge but DO NOT screw in, see detail "A". Remove the gauge. The oil level should be at the upper mark of gauge (4). If necessary add the specified oil through filler opening (4).
Remove breather filter (5). Blow out with compressed air from inside to outside and reinstall.

FINAL DRIVE HOUSINGS - CHECK OIL LEVEL

(Drive Shaft Housings)

Legend for Fig. 4-39

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

The breather filters for the final drives are mounted inside the center frame and connected with extension hoses.

Check oil level by removing oil level gauge (1).
Oil level must be between upper and lower mark on gauge (1).

If necessary top up fresh oil through filler opening (2) up to the upper (max.) mark on gauge (1).

CHECK BREATHER FILTERS

Check the breather filters located inside the center frame, of the travel gears, motor adapter housings and final drives, for restriction. If necessary, remove breather filters, blow out with compressed air from inside to outside and reinstall.

4.14.1 AIR CONDITIONING

This chapter describes the following two procedures:

1. "EVERY 250 OPERATING HOURS OR MONTHLY".
2. "AIR CONDITIONING FOR OPERATOR'S CAB - CHECK REFRIGERANT LEVEL".

REMARKS: The maintenance interval of 250 hours is different from the information in the separate manufacturer's booklet "AIR CONDITIONING" in Service Literature Binder - Volume 2 but valid for excavator operation.

Perform further maintenance according to the "PERIODIC SERVICING SCHEDULE". The maintenance mentioned in the periodic servicing schedule has to be performed by an authorized refrigeration and air conditioning specialist and has to be documented in a system service list.

NOTICE

Operate the air conditioning units at least once a month for a minimum of 30 minutes.

4.14.2 AIR CONDITIONING COMPRESSOR - CHECK DRIVE BELT TENSION

⚠ WARNING

ROTATING PARTS!

Serious personal injury can occur when the drive belt is moving. Be sure to set the maintenance safety switch to 0 position before starting the checking procedure. Refer to "MAINTENANCE SAFETY SWITCH AND BATTERY MAIN SWITCHES" on page 3-107 for the location of the maintenance safety switch. In the 0 position the engine 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 Fig. 4-44

- | | |
|-----|---------------------------------|
| (1) | Refrigerant compressor |
| (2) | Electromagnetic clutch |
| (3) | Compressor carrier |
| (4) | Drive belts |
| (5) | Clamping bolt |
| (6) | Lock nut |
| (7) | Adjusting bolt for belt tension |

4.14.9 CABIN AIR FILTERS - INSPECT

Legend for Fig. 4-49

- (1) Cabin air filter
- (2) Outlet to cabin
- (3) Air inlet
- (4) Safety filter
- (5) Primary filter
- (6) Vacuator valve
- (7) Cover
- (8) Latch
- (9) Seal plate

Inspect safety filter (4), primary filter (5) and vacuator valve (6):

1. Pull off vacuator valve (6). Squeeze it physically and ensure that it is flexible, not inverted, damaged or plugged.
2. Unlatch (8) the cover (7) and remove. Gently move the filter back and forth to break the initial resistance then pull out while rotating.
3. Inspect the safety filter (4) and the primary filter (5) surfaces for excess dirt and damage. Clean the inside of the outlet tube (2).

NOTICE

Do not wipe the filter sealing area, because the filter has an invisible dry lubricant on the seal.

4. Ensure that the safety filter (4) is properly seated in the housing. Re-install the primary filter (5), close cover (7) and latch (8) it.

4.15.3 FUEL TANK - DRAIN CONDENSATION

Legend for Fig. 4-54

- (1) Fuel tank breather valve on machines with central refilling system
- (2) Main fuel shut-off cock on machines without automatic fire suppression system
- (3) Shut-off cock for fuel pressure transducer (4). Close this cock when replacing pressure transducer (4).
- (4) Fuel pressure transducer
- (5) Protection cap
- (6) Drain coupling
- (7) Connector for fuel shut-off solenoid valve on machines with automatic fire suppression system

WARNING

RISK OF EXPLOSION!

Flammable fuels can ignite causing serious injury or death.

DO NOT smoke or use an open flame when working around flammable fuels.

4.15.3.1 DRAIN CONDENSATION AS FOLLOWS

1. Provide adequate working platform in order to ensure safe access to the tank bottom.
2. Connect drain hose to coupling (6). Collect outflowing sediments in a suitable container.
3. When servicing the fuel system, close main fuel shut-off cock (2).

REMARKS: On machines with automatic fire suppression system, the fuel shut-off solenoid valve connected to adapter (7) will automatically shut-off fuel supply to the engine when the engine is stopped.

4. After finishing the fuel system maintenance open cock (2) and vent the fuel system according to the Engine Maintenance Manual. Check to make sure all fuel lines and connections are tight and in good condition.

4.15.6 GROUND CABLE OF OPERATOR'S CAB - CHECK FOR CORRECT CONNECTION

Legend for [Fig. 4-59](#)

- (1) Ground cable fixing point inside the operator's console in the cab
- (2) Ground cable fixing point in the cab base on the right side of the switch board.

Check ground cable

1. Make sure that the system operation lamp of the battery main switches is off. Remove both battery main switch keys.

REMARKS: The green lamp of the battery main switches lights if the the main key switch in the cabin is turned off. After turning off the main switch key in the cabin it takes approximately 3 minutes until the system operation lamp of the battery key switches will turn off.

2. Open the dashboard of the operator's console and secure with the prop rod provided.
3. Check cable (1) for good condition and secure fastening.
4. Close the dashboard and secure with the clamps provided.
5. Check cable (2) in the cab base for good condition and secure fastening.

WARNING

ENSURE CABLES ARE IN GOOD CONDITION!

Loose or missing ground cables can cause fire, serious injury or death.

Be sure to replace a worn or damaged cable or fastening part without delay.

4.16.1 CRITICAL BOLT CONNECTIONS

Check mounting of Operator's cab, [Fig. 4-67](#)

<i>Reference No.:</i>	<i>Bolt size mm</i>	<i>Grade</i>	<i>SW *mm</i>	<i>Tightening torque Nm</i>	<i>Qty.</i>
(1) gate to attachment					
(2) viscous mount					
(3) Bolt	M24	10.9	36	880	44
(4) Bolt	M12	10.9	19	108	72
(5) Bolt	M16	10.9	24	265	26

- Re-tighten loose mounting bolts and replace missing or damaged bolts.
- Check condition and fastening of gate to attachment (1).
- Check the silicone oil filled viscous mounts (2) for leakage and signs of fatigue.

FILTER SERVICE (continued)

- Replace breather filter element
- Drain water and sediments from hydraulic oil tank

Legend for Fig. 4-72

- (6) Hand wheel of main shut-off valve located between suction oil tank and main oil tank

To open the valve, turn hand wheel (6) CCW to the stop

To close the valve, turn hand wheel 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 Komtrax Plus monitor in the operator's cab.

Before starting the engine, make sure the valve (6) is completely open.

- (11) Breather filter

Replace Element (C) of Breather Filter (11).

1. Remove nut (A).
2. Remove cover (B).
3. Remove filter element (C).
4. Insert new filter element and reassemble the breather filter (15).

Drain Water and Sediments

Drain water and sediments with machine standing on level ground and when machine was out of operation for some time.

REMARKS: Refer to Operation section 3.18 for evacuation procedure.

4.16.3 PTO (PUMP DISTRIBUTOR GEAR), SWING GEARS AND TRAVEL GEARS - OIL SAMPLE ANALYSIS

The oil sample analysis gives information about the grade of contamination and aging of the gear oils. Refer to the tables below for limits of contamination. Refer to the separate manual "Oil Analysis and Condition Monitoring" filed in the volume 2 binder for limits of contamination.

4.16.3.1 OIL DRAIN PLUGS, ILLUSTRATION

Fig. 4-77

- (1) PTO (Pump distributor gear)
- (2) Swing gear (RH and LH)
- (3) Travel gear (RH and LH)

NOTICE

The regular oil changes must be carried out every 3000 operating hours or once a year, whichever occurs first.

4.16.8 ALL OTHER HINGES AND AREAS TO LUBRICATE

Legend for Fig. 4-82

- (1) Grease nipples as example
- (2) Hinged areas as example
- (3) Emergency escape ladder articulated joint

Every component that has a hinged area where it helps in the movement of that part must also be adequately lubricated with grease.

Most hinges have greasing points (nipples) to aid in lubrication.

Some components such as cylinders, have greasing points in order to lubricate the bearing

Where there are no grease nipples, adequate grease must be applied to the hinges to ensure clean and easy movement.

The emergency escape ladder has an articulated joint that must also be adequately lubricated.

Areas to lubricate are:

- certain hand rails that are also gates.
- certain catwalks, such as the battery covering
- machinery house and firewall doors
- the cover over the couplings that connects the engines to the pumps
- on the roof mounted air cleaners
- the area below the fuel tank
- the area below the hydraulic oil tank
- radiator doors and auxiliary radiator doors where they are present
- the door to the cab support and the high voltage cabinet on electrically driven machines
- certain electric cable retainers that have to be lifted
- the movable joint of the refueling arm
- the observation door to the slip ring unit on electrically driven machines
- the door on the counterweight on machines that are so equipped
- the escape hatch onto the roof on machines that are so equipped
- the fuel filter door on the fuel tank on machines that are so equipped

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

NOTICE

The hydraulic oil change intervals can be extended for a further time period, when an oil sample analysis shows a positive result. When extending the oil change interval, it is necessary to carry out an oil sample analysis after every 1000 operating hours.

However, it is recommended to change the hydraulic oil after 6000 operating hours at the latest. The pulsation damper must be replaced after every 2000 operating hours.

Legend for Fig. 4-87

- (1) Main oil reservoir
- (2) Back-pressure valve
- (3) Return oil collector pipe
- (4) Drain coupling
- (5) Hand wheel of main shut-off valve
- (6) Return oil strainer
- (7) Bolt
- (8) Bolt
- (9) Intermediate pipe
- (10) Gasket
- (11) Gaskets
- (12) Compensator
- (13) Strainer for reducing air bubbles

REMARKS: Evacuate main hydraulic oil reservoir according to section "CENTRAL REFILLING SYSTEM" on page 3-190.

Use the transfer pump for emptying the suction oil reservoir, the return oil collector pipe (3) and the return oil manifold, see page 3-184 for transfusion procedure.

- Replace return oil strainer (6), Fig. 4-87 after major repairs on the hydraulic system and after every 6000 operating hours. Use new gaskets (10 and 11).
- With hydraulic oil reservoir empty, service the return oil filters, the leakage oil filter and inspect the reservoir for sediments. Clean the reservoir if necessary.
- Check the strainer of the main hydraulic reservoir (13) visually. If necessary, replace by a new one.

4.17.2 FILLING THE HYDRAULIC SYSTEM

1. Make sure main shut-off valve is in open position and all connections are securely tightened.

REMARKS: Select hydraulic oil viscosity grade according to ambient temperatures.

If the new hydraulic oil has a different viscosity grade compared with the drained oil it is necessary to enter the new viscosity grade into the appropriate **-Service SETTINGS-** group of the Komtrax Plus Menu Control.

2. On machines equipped with Central Refilling System fill main hydraulic oil reservoir according to section "[CENTRAL REFILLING SYSTEM](#)" on [page 3-190](#).
On machine without central refilling system fill main oil reservoir through opening (4), [Fig. 4-92](#). Depending on type of attachment and the present oil temperature, select the applying oil level range on plate (3). Be sure to use the correct marking on oil level plate (3).
3. Bleed the hydraulic system according to the instructions on [page 4-189](#).

Legend for [Fig. 4-92](#)

- | | |
|-----|---------------------------------|
| (1) | Main hydraulic oil reservoir |
| (2) | Hydraulic oil level sight gauge |
| (3) | Oil level plate |
| (4) | Oil filler plug |

4.17.7 HYDRAULIC HOSES - CHECK CONDITION

Legend for [Fig. 4-97](#)

- (1) Boom of attachment
 - (2) Hydraulic hoses from main excavator body to attachment boom.
 - (3) Stabilizing ledge of hoses
- Check the condition of the hoses (2), especially the boom arch hoses that lead from the excavator main body to the attachment boom. There should be no signs of rubbing, crimping, of overstretch, fatigue or leakage.
 - Check the condition of the stabilizing ledges (3). Ensure that there are no signs of loosening, slippage or movement.

NOTICE

Ensure that the stabilizing edge is positioned in such a way as to prevent contact with the protective bar on the top of the control block unit. This must be checked and adjusted if necessary during the regular PM tests.

REMARKS: If damage is apparent, repair or replace immediately as required. Be aware of tightening torques for hose connections. See [page 4-12](#) for more information.

Hose lines are considered safety critical parts. See [page 4-24](#) for further information.

Brake Housing - Change Oil

1. Remove level gauge (8), [Fig. 4-102](#), drain plug (9) and breather filter (7). Drain the oil into a receptacle of approx. 5 liter capacity.
2. Clean breather filter (7) with compressed air from inside to outside and re-install.
3. Install drain plug (9) and fill-up engine oil SAE 10 or hydraulic oil HLP 32 through filler opening **up to the lower mark (C) on level gauge (8)** and install the level gauge.
DO NOT overfill the brake housing, otherwise the brake could be damaged due to overheating.
4. After short operating period check oil level and housing for leaks.

REMARKS: Be sure to fill the brake housing and motor adapter housing with engine oil or hydraulic oil as specified on [page 4-4](#).

Motor Adapter Housing - Change Oil

1. Remove level gauge (6) and drain plug (5). Drain the oil into a receptacle of approx. 5 liter capacity.
2. Install drain plug (5) and fill-up engine or hydraulic oil through filler opening, up to the MAX mark on level gauge (6), see detail (A). Install level gauge and tighten securely.
3. After short operating period check oil level and housing for leaks.

REMARKS: For checking the oil level insert the level gauge (4) but DO NOT screw in, see detail (A).

MOTOR ADAPTER HOUSINGS - CHANGE OIL**Legend for Fig. 4-107**

1. Remove parts (5 and 6) and drain the oil completely.
2. Check breather filter, mounted inside center frame, and clean as necessary.
3. Install drain plug (6) and fill-up oil to level opening (5). Reconnect breather filter hose line to level and filler opening (5).

Critical Bolt Connections (continued)

Check fastening and condition of cab base, [Fig. 4-112](#)

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M36x3	10.9	55	3250	12

* SW = Wrench size

Critical Bolt Connections (continued)

Machinery house, check mounting of posts and cross member. Check roof frame and roof elements for proper mounting and good condition, [Fig. 4-117](#)

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M30	10.9	46	1770	40
(2)	M24	10.9	36	880	12
(3)	M36	10.9	55	3100	14
(4)	M16	10.9	24	265	57
(5)	M16	10.9	24	265	13

* SW = Wrench size

Critical Bolt Connections (continued)

Check condition and fastening of main control valves and high pressure filters, [Fig. 4-122](#)

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M24	10.9	36	880	4
(2)	M16	10.9	24	265	6
(3)	M16	10.9	24	265	6
(4)	M20	10.9	30	510	16
(5)	M16	10.9	24	265	16

* SW = Wrench size

4.18.4 CABIN HEATER FILTER - REPLACE FILTER ELEMENT

REMARKS: In extremely dusty environments, the filter replacement can be required earlier than every 3000 hours.

Legend for [Fig. 4-127](#)

- (1) Cabin heater filter
- (2) Cover
- (3) Bolts

1. Open the 4 bolts (3) and remove cover (2).
2. Remove filter element (1) and replace by new one.
3. Re-install cover (2).

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