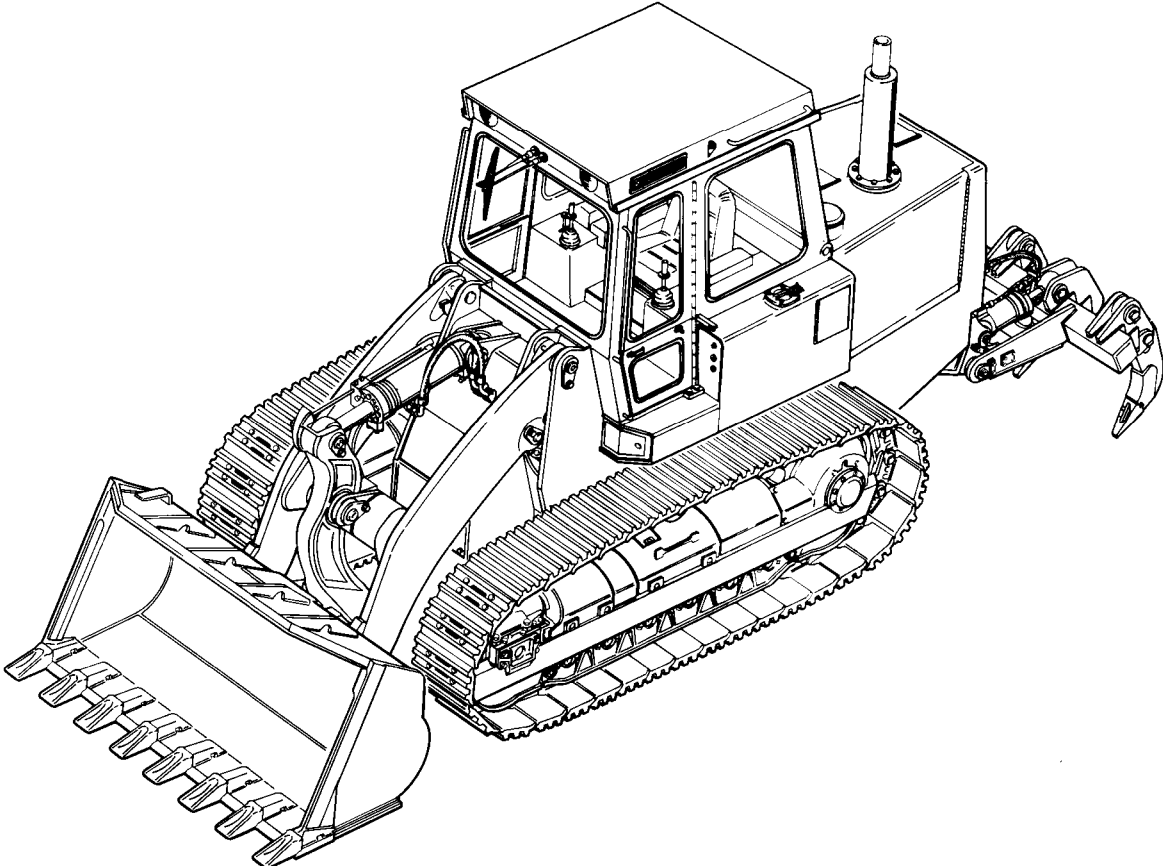

Operating manual

LR 641



FOREWORD

This manual has been written primarily for the operator of this **LIEBHERR** machine and for its maintenance personnel.

This manual contains:

- Safety information
- Operating instructions and guidelines
- Maintenance guidelines
- Instructions and guidelines for special attachments / optional equipment.

This manual should be given to the operator and maintenance personnel who should read it carefully at regular intervals and before operating or servicing the machine, before performing any of the following tasks:

- **Operation**, including set up, troubleshooting during operation, removal of production debris, service, removal of oils, lubricants, fuels and operating fluids,
- **Maintenance**, including inspection, upkeep and/ or
- **Transportation**.

Reading this manual will familiarize the operator with his **LIEBHERR** machine and prevent problems due to improper operation.

Following the operation and maintenance guidelines by maintenance personnel will:

- increase reliable service,
- increase service life expectancy of your **LIEBHERR** machine and
- reduce repair costs and downtime.

The Operation and Maintenance Manual is part of the machine. Keep a copy of this manual in the glove compartment in the operators cab to assure that it can be consulted and referred to at any time.

Any existing federal, state and local safety requirements and regulations governing accident prevention and environmental safety must be added to this Operation and Maintenance Manual.

In addition to the guidelines given in this Operation and Maintenance Manual, all safety and accident prevention regulations applicable to the country and job site you operate in, including any technical rules and regulations to assure safe and proper operation must be followed.

This Operation and Maintenance Manual includes the necessary information to operate and maintain your machine. If you need any additional information and / or clarification, please contact Liebherr's Technical Documentation, Customer Service School or Service Department.

We hope you will understand that **LIEBHERR** cannot honor warranty claims resulting from improper operation, inadequate maintenance, use of wrong, unauthorized oils, lubricants, fuels and operating fluids and /or from disregard of safety information and guidelines.

LIEBHERR reserves the right to reject any warranty claims, service contracts or agreements established by **LIEBHERR** or any of its dealers without prior notice, if any other than Original **LIEBHERR** part or parts sold by **LIEBHERR** are being or have been used for maintenance and repairs.

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OPERATION AND MAINTENANCE MANUAL - CRAWLER LOADER

ISSUE 10 / 99
ID. NO.: 9084506
VALID FOR: LR 641 from S/N 239 / 1548



We recommend that you fill in the following information in the space provided as soon as you receive your crawler loader.

This information will also be helpful when ordering parts.

S/N - PIN :

Year / Model : **CE**

Delivery date:

* This information is found on the data tag of your machine, on left rear of the main frame.

Manufacturer:

LIEBHERR Werk Telfs GMBH
 Hans Liebherr - Stra e 35,
 A - 6410 TELFS

The following certificates have been issued for this machine:

- CE (European Union) certificate
- Rops - Fops certificate
- Sound level certificate

Under extreme working conditions, the maintenance intervals may have to be reduced as compared to intervals listed in the maintenance guidelines.

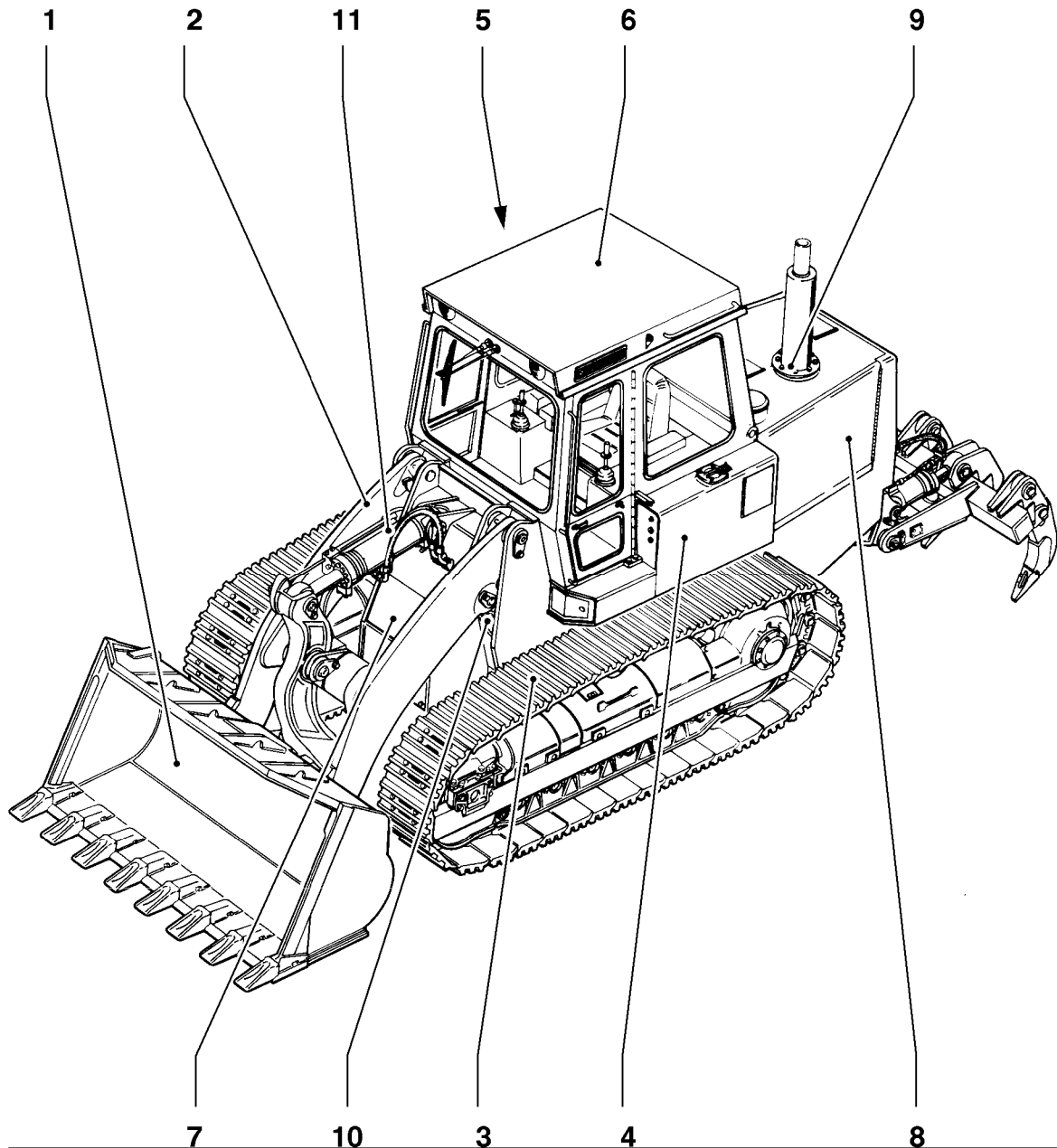
Some drawings and photographs in this manual may show details which are different from your machine. Improvements in design may cause changes in your machine not be reflected in this manual. We reserve the right to make technical changes. Manuals are reviewed and reprinted periodically to include such design changes.

The following guidelines will not expand LIEBHERR's general business conditions regarding warranties and liability.

This manual is intended for the internal use of the machine owner. No part of this publication, technical or otherwise, may be reproduced or copied in any form or by any means, without our written permission. All rights reserved.

1. TECHNICAL DATA

1.1 MAJOR COMPONENTS OF THE CRAWLER LOADER



- 1 Bucket
- 2 Bucket arm
- 3 Travel gear
- 4 Hydraulic tank
- 5 Fuel tank
- 6 Cab

- 7 Battery box
- 8 Covers
- 9 Diesel engine with pump assembly
- 10 Lift cylinder
- 11 Tilt cylinder

Technical Description

Crawler Loader

LR 641

Engine output 219 HP/161 kW

Operating weight 53,700 – 61,700 lb/24,4 – 28,0 t

Bucket capacity 3.8 cu.yd./2.9 m³

Hydrostatic travel drive



Economical – The robust Diesel engine with long service life and progressive crawler technology assure high performance at low operating costs.

Powerful – The hydrostatic travel drive allows travel and steering functions at constant positive power to both tracks and agility through turns and counterrotation.

Versatile – The rear mounted Diesel engine serves as a natural counterweight and permits the use of the powerful Z-bar loader linkage. The simple control, excellent visual conditions for the operator and low center of gravity permit work in the most difficult conditions.

Safe to operate – Protection of all drive components from overload due to automatic adjustment of travel speed to required push power.

Easy to operate – Simple and precise control of all travel and steering movements with only one joystick lever. This allows the operator to fully concentrate on the job at all times.

Easy to service – Good accessibility of centralized maintenance points through modular component design.

LIEBHERR

The Better Machine.



Diesel Engine

Diesel Engine	Mercedes-Benz OM 441 A
Rating per ISO 9249	161 kW (219 hp) at 2000 RPM
Displacement	11.3 l (690 cu.in.)
Bore/stroke	130 mm/142 mm (5.1/5.6 in)
Design	6 cylinder V engine, water-cooled, rear engine installation
Injection	direct fuel injection with in-line injection pump, mechanical governor
Fuel filter	pre-cleaner with water separator and 2 fine filters
Lubrication	pressurized lube system with full flow filter and integrated oil cooler, deep oil pan for inclinations, engine lubrication to an inclination of up to 45° to each side
Air filter	dry type air filter with main and safety element
Operating voltage	24 V
Alternator	27 Amp.
Starter	6.5 kW (8.8 hp)



Travel Drive

Design	closed-loop hydrostatic drive, each track is driven by one variable flow swash plate-type pump and one variable displacement motor
Pump flow	max. 242 l/min (64 gpm)
Max. pressure	adjusted to 420 bar (6090 PSI)
Travel speed	0-10 km/h (0 to 6.2 mph) infinitely variable, forward and reverse
Steering	hydrostatic
Service brake	hydrostatic
Parking/emergency brake	automatic spring-activated parking brake, released by servo-pressure during travel
Cooling system	hydraulic oil cooler with separate cooling circuit with 2 gear pumps and rear mounted cooler
Filter system	cartridge fine filters in the cooling circuit
Final Drive	3-stage spur gear drives formed as modular components



Track Frame

Design	maintenance-free tractor-type track frames
Chains	lubricated, track chain tension via grease tensioner cylinders, double or triple grouser pads
Chain links	40
Sprockets	5 replaceable segments
Track rollers	7
Carrier rollers	2



Travel Control

1 joystick lever	with servo-control for all travel functions: travel direction, speed, steering and counter-rotation
Low speed range	for difficult applications the maximum travel speed can be limited to 4 km/h (2.5 mph)
Engine speed sensing control	the engine speed sensing control assures constant balance between traction and travel speed guarantees maximum utilization of available engine horsepower and protects the Diesel engine from overload
Safety lever	inactivates complete travel and working hydraulic circuit and automatically activates parking brake



Attachment Hydraulics

Hydraulic system	variable flow piston pump for operation of front and rear-mounted attachments. The regulation of the variable flow pump causes an automatic proportioning of lift and tilt speed
Pump flow	max. 242 l/min (64 gpm)
Pressure limitation	max. 260 bar (3770 PSI)
Control valve	3 spool control block
Filter system	return filter with magnetic rod in hydraulic tank
Control	single servo-assisted joystick lever for all bucket functions, adjustable electrical switches for lift stop, bucket positioning and bucket-float



Attachments

Z-bar linkage	gives maximum of breakout-force and optimum of working speed, the 2 lift cylinders are protected by the main frame, the single tilt cylinder allows optimum view of the bucket
Buckets	standard and multi-purpose bucket are equipped with 9 replaceable teeth
Cycle times	lifting 7.8 seconds lowering 2.2 seconds tilting out 1.8 seconds



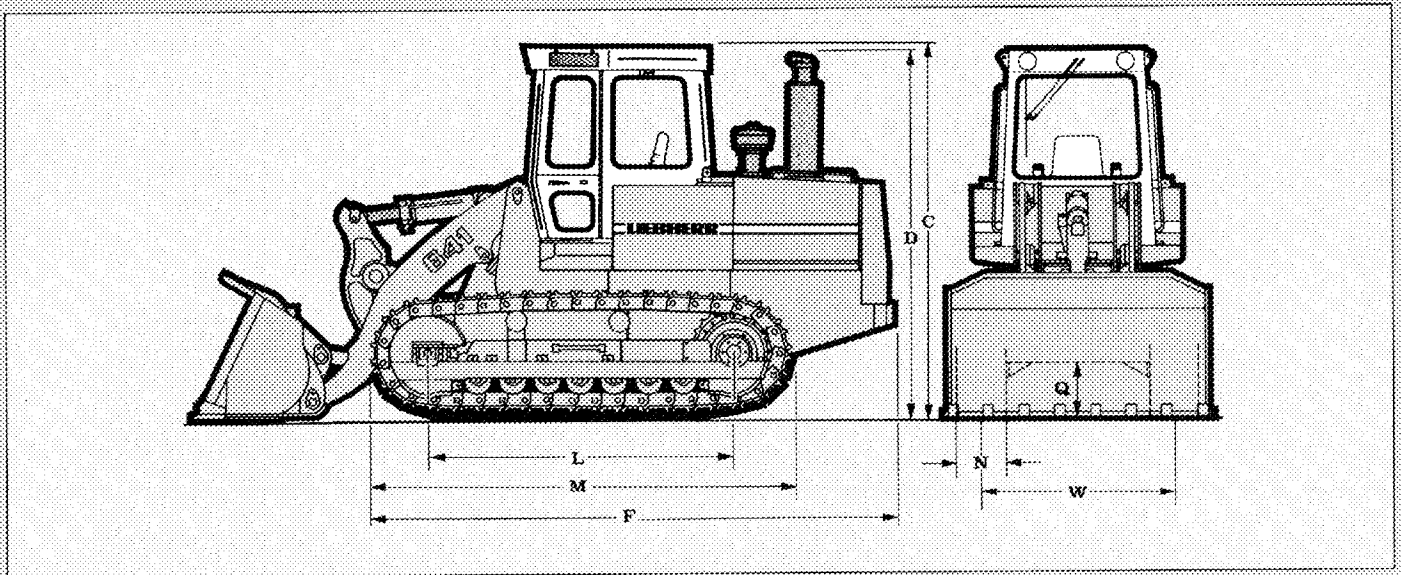
Operator's Compartment

Cab	resiliently mounted, with integrated ROPS (Roll Over Protective Structure, SAE J1040/ISO 3471) and FOPS (Falling Objects Protective Structure, SAE J231/ISO 3449), can be tilted with hand pump to 40° to the rear for accessibility to machine components, all around safety glass
Operator's Seat	fully adjustable, suspended swing seat, adjustable to operator weight
Instrument Panel	comprehensive instrument panel with acoustical warning buzzers, on the right side of the operator's seat
Ventilation	pressurized filtered air ventilation, 2 stage blower
Heater	hot water heater



Refill Capacities

Fuel tank	350 l (92 gal)
Cooling system	39 l (10 gal)
Engine oil	22 l (3.2 gal)
Splitterbox	2 l (0.5 gal)
Hydraulic tank	185 l (44 gal)
Final drive, each	31 l (8 gal)

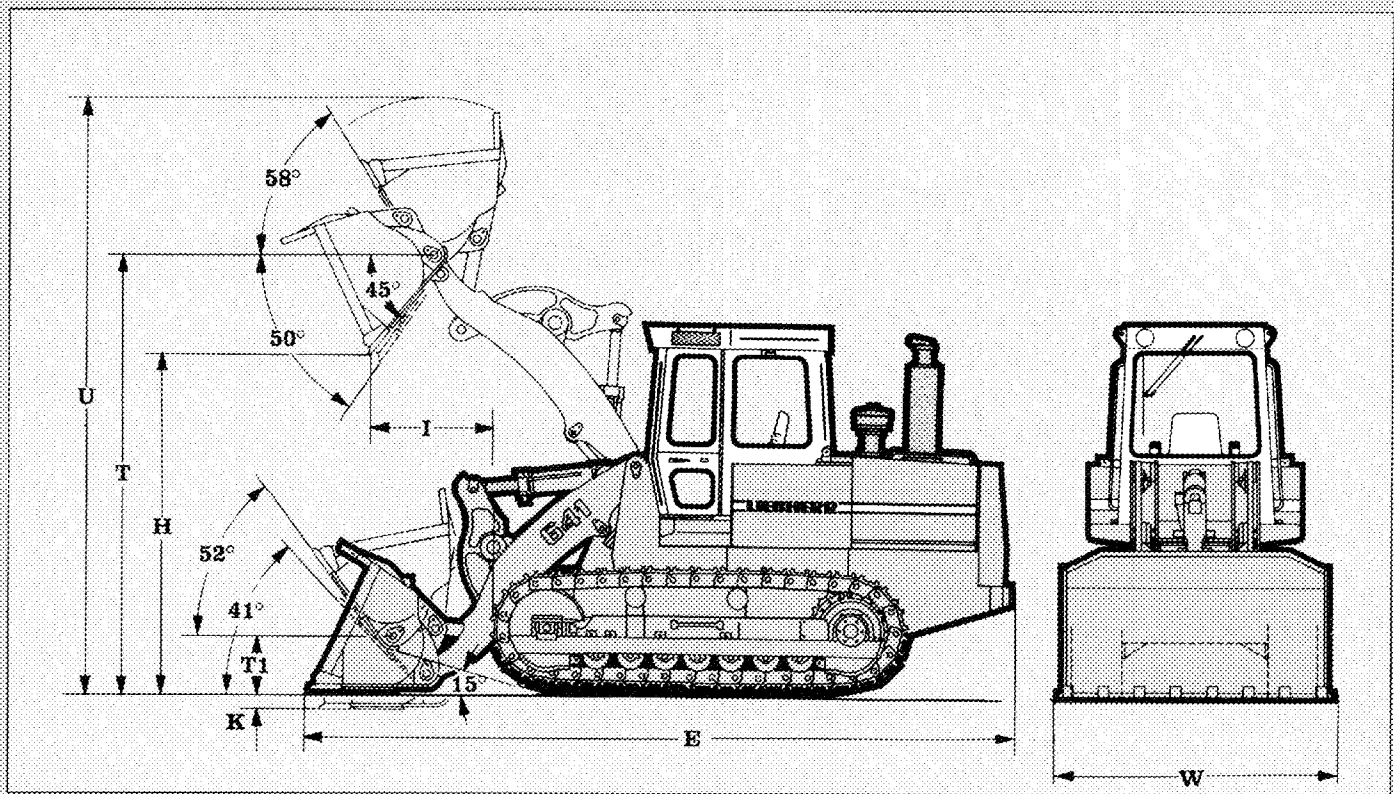


Dimensions

	ft-in/mm
C Height over cab	11'2"/3415
D Height over exhaust pipe	11'2"/3400
Q Ground clearance	1'6"/ 455
F Overall length without attachment	16'8"/5065
L Distance idler/sprocket center	9'7"/2930
M Crawler length	13'3"/4040
W Track gauge	6'5"/1950
N Width of trackpads	18"/ 457
	20"/ 508
	22"/ 560
	26"/ 660

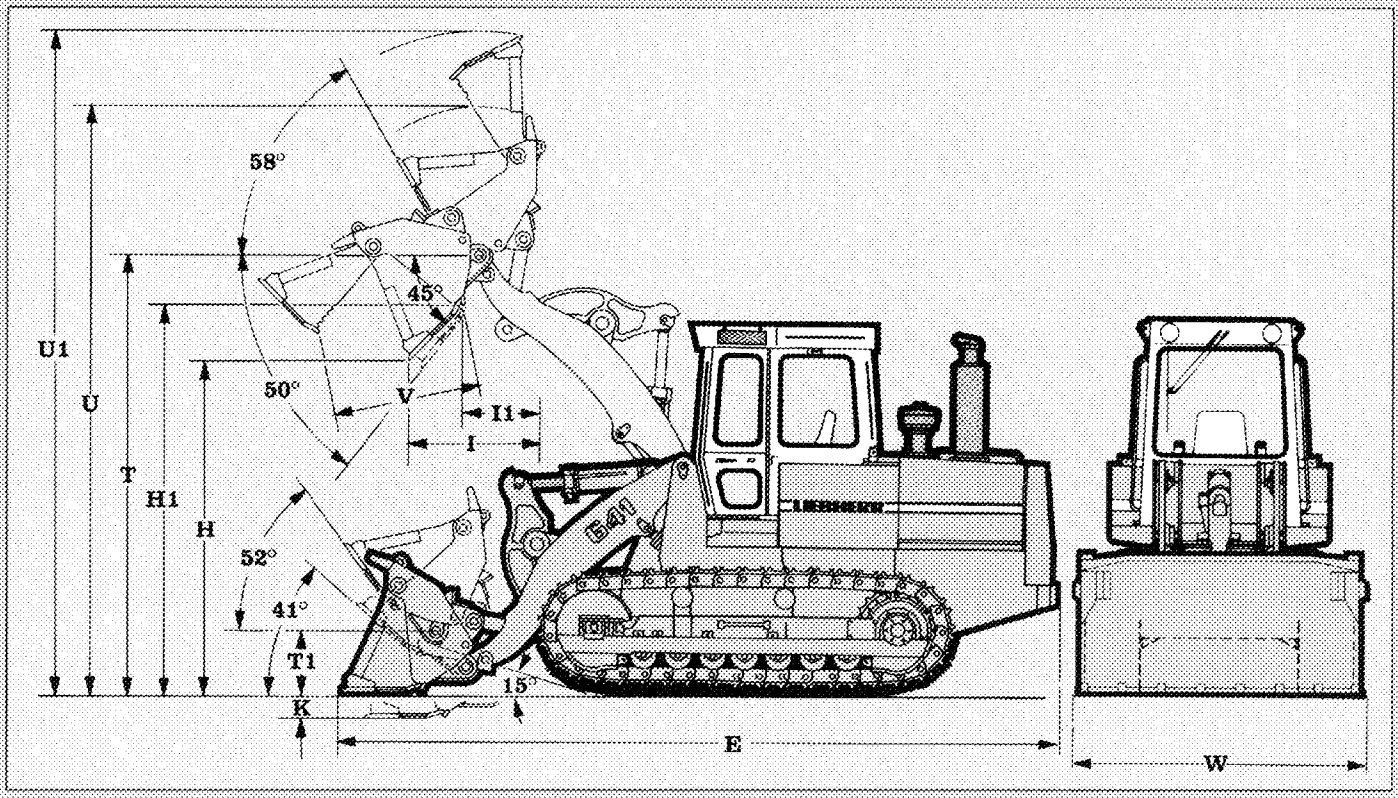
Ground contact area:	
trackpad-width 18"/457 mm	4,150 sq.in./2.68 m ²
trackpad-width 20"/508 mm	4,610 sq.in./2.98 m ²
trackpad-width 22"/560 mm	5,090 sq.in./3.28 m ²
trackpad-width 26"/660 mm	5,990 sq.in./3.87 m ²

Dimensions



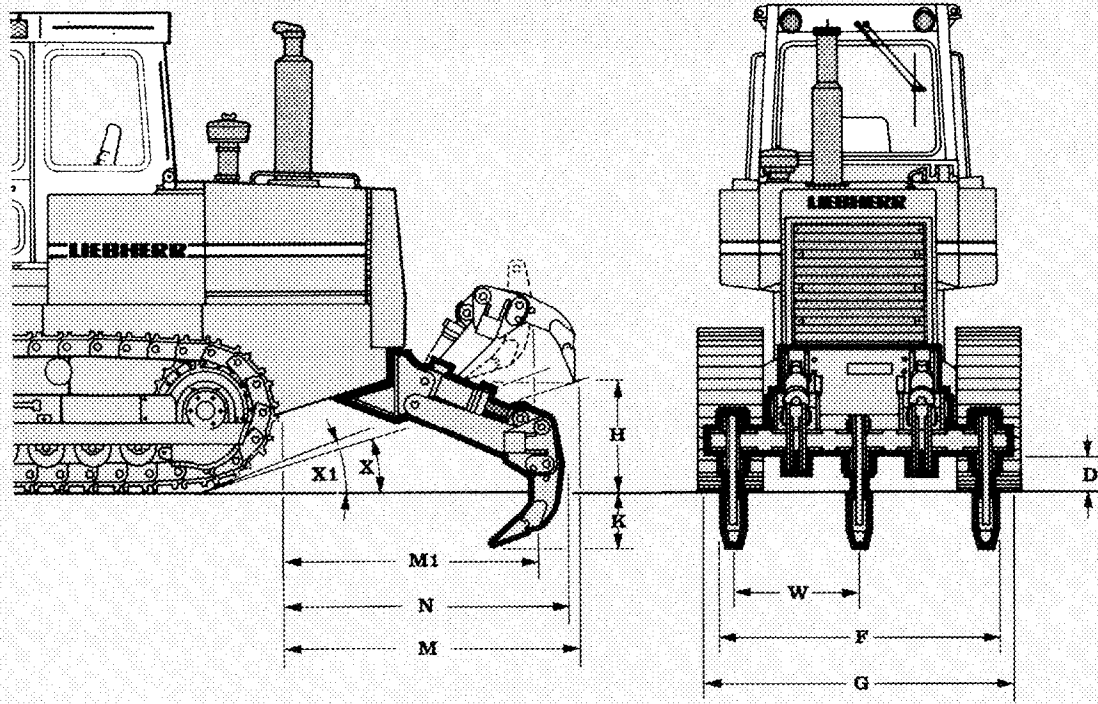
Capacity ISO heaped Breakout-force Static tipping load	3.8 cu.yd./2.9 m ³ 45,200 lbs/201 kN (20500 kg) 41,200 lbs/18690 kg
Dimensions	ft-in/mm
E Overall length	23'1"/6975
H Dumping height at 45°	10'6"/3200
I Reach at 45°	4'2"/1270
K Max. digging depth below grade	5"/125
U Overall height	18'7"/5675
T Max. height of hinge pin	13'9"/4180
T1 Height of hinge pin, transport position	1'10"/555
W Width of bucket	9'0"/2750
Operating Weights	lbs/kg
Standard bucket	3,000/1350
Basic machine with standard bucket and triple-grouser trackpads 18"/457 mm	53,900/24450
double-grouser trackpads 20"/508 mm	53,900/24450
double-grouser trackpads 22"/560 mm	54,300/24620
double-grouser trackpads 26"/660 mm	55,000/24950
Ground Pressures	PSI/kg/cm ²
Basic machine with standard bucket and triple-grouser trackpads 18"/457 mm	12.94/0.91
double-grouser trackpads 20"/508 mm	11.66/0.82
double-grouser trackpads 22"/560 mm	10.66/0.75
double-grouser trackpads 26"/660 mm	9.24/0.65

Standard Bucket



Capacity ISO heaped Breakout-force Static tipping load Max. clamping force	3.27 cu.yd./2.5 m ³ 42,600 lbs/189.5 kN (19320 kg) 34,400 lbs/15605 kg 27,800 lbs/123.6 kN (12600 kg)
Dimensions	ft-in/mm
E Overall length	23'5"/7115
H Dumping height at 45° (bucket)	10'2"/3090
H1 Dumping height at 45° (blade)	11'11"/3630
I Reach at 45° (bucket)	4'1"/1250
I1 Reach at 45° (blade)	2'5"/735
K Max. digging depth below grade	8 1/2"/220
U Overall height	18'7"/5660
U1 Overall height	20'10"/6355
T Max. height of hinge pin	13'9"/4180
T1 Max. height of hinge pin, transport position	1'10"/555
V Width of opening	4'7"/1405
W Width of bucket	9'0"/2750
Operating Weights	lbs/kg
Basic machine with multi-purpose bucket and triple-grouser trackpads 18"/457 mm	56,100/25450
double-grouser trackpads 20"/508 mm	56,100/25450
double-grouser trackpads 22"/560 mm	56,500/25620
double-grouser trackpads 26"/660 mm	57,200/25950
Ground Pressures	PSI/kg/cm ²
Basic machine with multi-purpose bucket and triple-grouser trackpads 18"/457 mm	13.51/0.95
double-grouser trackpads 20"/508 mm	12.09/0.85
double-grouser trackpads 22"/560 mm	11.09/0.78
double-grouser trackpads 26"/660 mm	9.53/0.87

Multi-purpose Bucket



Radial ripper, 5 shank rigid-type equipped with 3 shanks
Ripper tips: ESCO

Dimensions

D Ground clearance below toolbar
F Ripping width
G Toolbar width
H Lifting height
K Ripping depth
M Overall length attachment raised
M1 Overall length attachment, teeth angled in
N Overall length attachment lowered
W Distance between teeth
X Angle
X1 Angle, teeth angled in

ft-in/mm

11½"/290
6'5"/1960
7'5"/2250
2'9"/830
1'4"/405
7'2"/2195
6'1"/1860
6'11"/2105
3'1"/950
17°
22°

Weight

Ripper complete

When mounting the ripper, the rear 2000 lbs/900 kg counterweight must be removed

lbs/kg

4,500/2050

Ripper

Standard Equipment*

Diesel Engine:

- Fuel system with pre-filter, water separator and fine filters
- Dry-type air cleaner with main and safety element
- Alternator, 27 Amp
- Starter motor 6.5 kW/8.8 hp
- Electrically activated battery master switch
- Two HD cold start batteries - 110 Ah

Track Components:

- Maintenance-free track components, sealed and lubricated rollers, idlers and sprockets
- Segmented, bolted sprocket rims

Travel Drive:

- Hydrostatic drive with hydraulic control
- Automatic parking brake

Attachment Hydraulics:

- 3-spool control block
- Electrical switches for lift stop, bucket positioning and bucket-float
- Z-bar linkage

Operator's Compartment:

- Cab with integrated ROPS/FOPS, hot water heater, pressurized and filtered ventilation
- Fully adjustable suspension seat with seatbelt
- Windshield wipers front and rear
- Windshield washer system
- Dome light, rear view mirror, sun shade
- Preparation kit to install fire extinguisher and beacon
- Safety glass, tinted glass
- Two front and two rear working lights
- Lighted instrument panel with engine oil pressure and engine coolant temperature gauge, hour meter and fuel gauge

Basic Machine:

- Tool kit
- Rear drawbar hitch

Optional Equipment

- Perforated engine side covers
- Backup alarm
- Air conditioner
- Cab protection screens
- Power adjustable, air suspension seat
- Electric fuel pump
- Full length track guard
- Track guide, center
- Final drive protection
- Extra hydraulic controls
- Hydraulic winch
- Swinging drawbar
- Remote radio control
- Landfill package
- Forestry package
- Steel mill package
- Special paint, one or two tone
- Special buckets
- Lifting lugs

Other optional items on request

* Standard and optional equipment may vary.

Standard and Optional Equipment

2. SAFETY GUIDELINES

Working with earthmoving machinery can be dangerous, it could result in injury or death if proper precautions were not taken by you, the operator and/or maintenance personnel. We urge you to read these safety notes repeatedly and carefully, and to observe them to prevent danger and accidents.

This is especially important for any personnel that works on the machine only occasionally, such as during set up and/or maintenance.

Careful adherence to the below listed safety information will insure safe operation and maintenance and potentially prevent personal injury to yourself and others and possible damage to your machine.

Important safety notes are used throughout this manual, such as **DANGER**, **CAUTION** and/or **NOTE** to emphasize important and critical instructions.

In this Operation and Maintenance Manual, these safety notes are defined as follows:

DANGER

Denotes an extreme intrinsic hazard, which could result in a high probability of death or serious injury if proper precautions are not taken.

CAUTION

Denotes a reminder of safety practices or directs attention to unsafe practices if proper precautions are not taken, which could result in personal injury and/or damage or destruction of the machine.



NOTE

This symbol is used to describe operational and/or maintenance procedures which should be followed to keep your machine operational and insure long service life and/or to facilitate certain operating procedures.

In addition to these instructions, you must follow the safety regulations applicable to your work environment and job site, any federal, state and local laws governing travel on public roads and highways, and any guidelines issued by trade or professional associations.

2.0.1 PROPER AND INTENDED USE

With the standard loading attachment, the machine may only be used to loosen, take up, load and dump soil, rock, broken rock, or other materials and load them onto trucks, trailers, barges, conveyor belts or breaker systems.

Any other use above or beyond the destined use, such as breaking out rock or demolishing buildings, tamping poles or stakes, transporting persons, etc. is not considered to be destined use. The manufacturer/ dealer will not be responsible for any damage resulting from such or any other unauthorized use and the user alone must carry those risks.

Any machines used in special applications are subject to additional, special conditions and guidelines and, among other things, must be equipped with special safety devices.

Proper and destined use also includes observance of Operation and Maintenance Guidelines issued in this Operation and Maintenance Manual and careful adherence to inspection and maintenance schedules and guidelines.

2.1 DECALS ON THE MACHINE

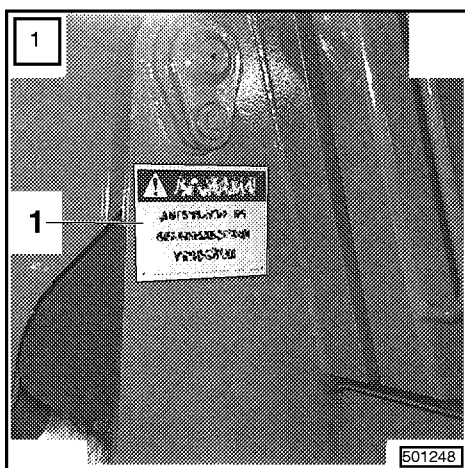
2.1.1 SAFETY DECALS


Several safety decals are attached to your machine. they must be strictly observed to prevent death or serious injury. The decals and the location of the decals on your machine are shown below.

These safety decals must be checked regularly to insure they are still complete and legible.

Missing or illegible safety decals must **ALWAYS** be replaced immediately.

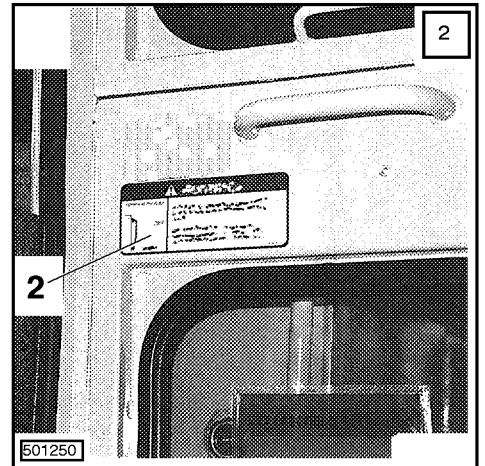
The Id. numbers are given on the chart below.




2  **CAUTION**

Always lower the attachment and place the safety lever in the full down position before leaving the operators seat.
Should loss of machine control occur, immediately lower the attachment, then the safety lever.

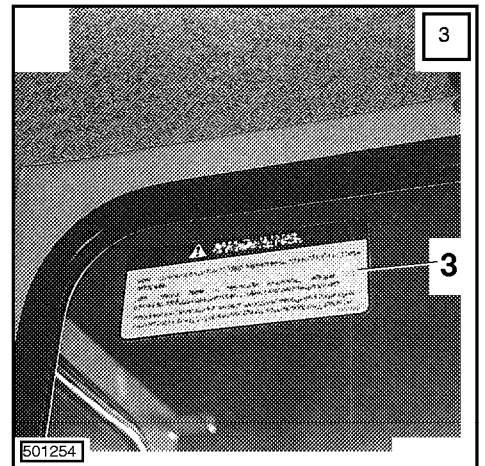
9784625




3  **CAUTION**

1. Fasten seat belt when operating machine.
2. Do not operate this machine unless you have read the Operation and Maintenance Manual and fully understand it.
3. Do not work, or allow work underneath or on the attachment unless it is properly supported.

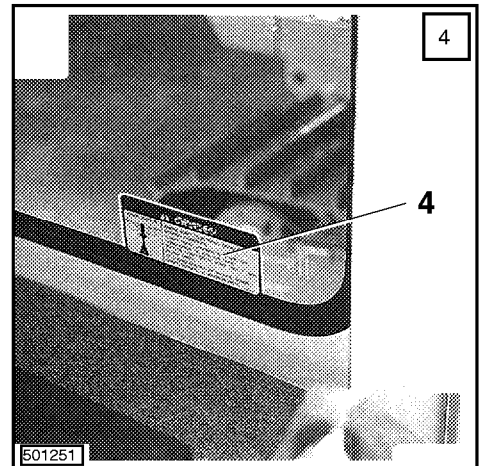
9784631




4  **CAUTION**

Always adapt your travel speed to working conditions.
Always travel downhill in either low speed range, or with the travel joystick deflected no more than ¼ - way in high range.
To ensure control of machine, never travel downhill at maximum speed.

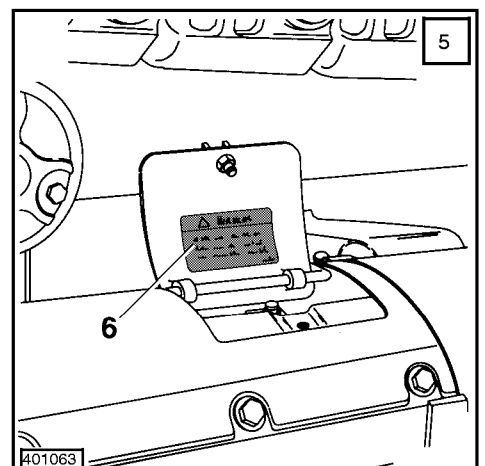
9784637

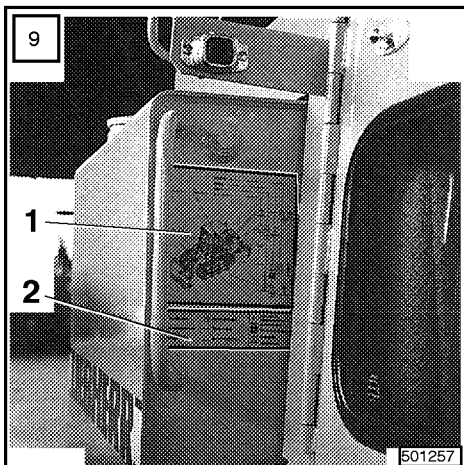
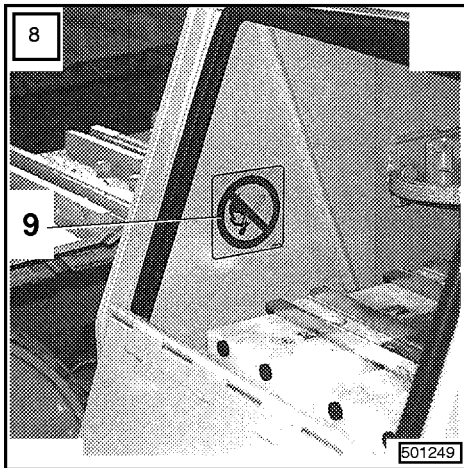
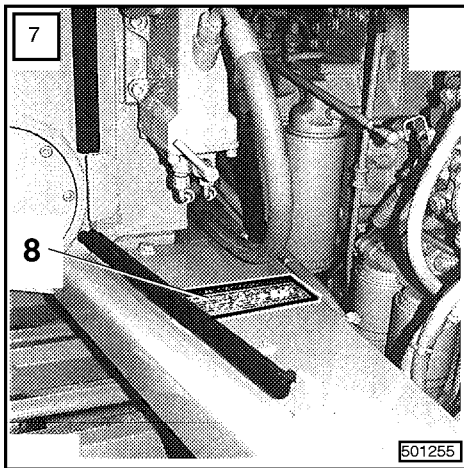
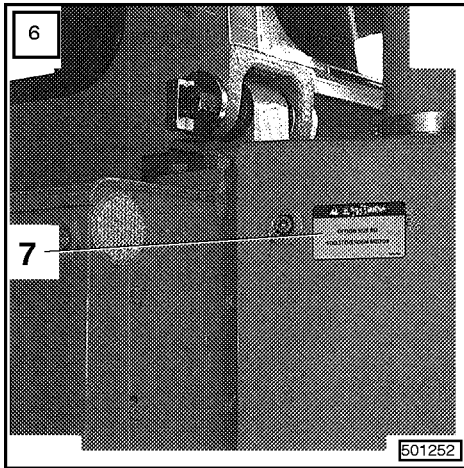



6  **CAUTION**

When releasing the chain tension, keep your head clear of the access hole and the chain. The grease cylinder is under high pressure and grease can squirt out, causing injury or death!

9052481






7  **CAUTION**

Do not open while engine is running!

9052441


8  **CAUTION**

Always secure a raised cab or canopy with the safety bar.

Stay clear of the cab or canopy until completely raised or lowered and secured.

Never start the engine and operate the machine with a raised cab or canopy. For safety reasons, place and leave the safety lever in the full down position as long as the cab or canopy is raised.

9784655

9  **CAUTION**

Battery Compartment. Do not smoke or keep and open flame near this area.

9796372

2.1.2 REFERENCE DECALS

LUBRICATION SCHEDULE, FIG. 1

The lubrication schedule shows all components which use oil, as well as the intervals to check and change the oil.

LR 641 Id. No. : 9796363

LUBRICATION SCHEDULE TEXT 2

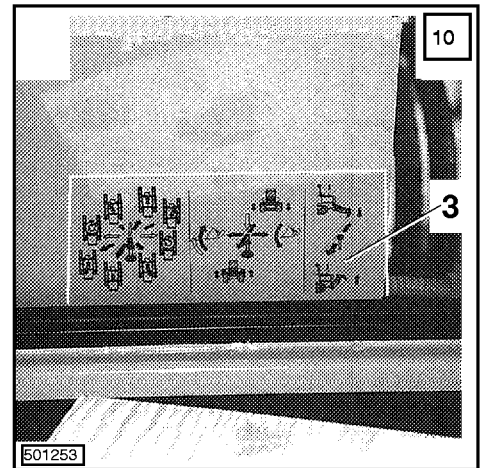
All symbols used in this view are described in the text of the lubrication schedule.

Id.No.: 9796408

MACHINE OPERATION 3

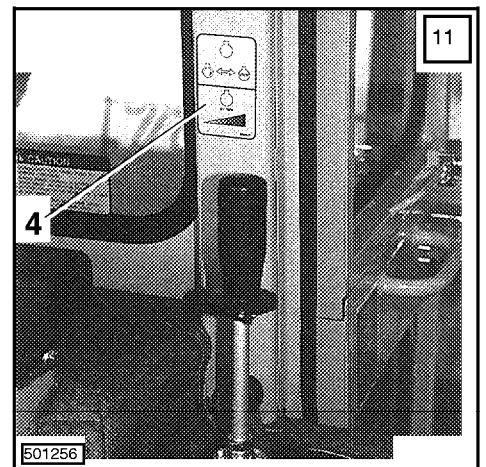
Shows the lever control for travel and working functions.

Id. No.: 9030775

**ENGINE OPERATION 4**

Shows the lever control to change engine speed and to shut the engine off.

Id. No.: 9796371

**ROPS / FOPS 11**

Shows the maximum performance criteria.

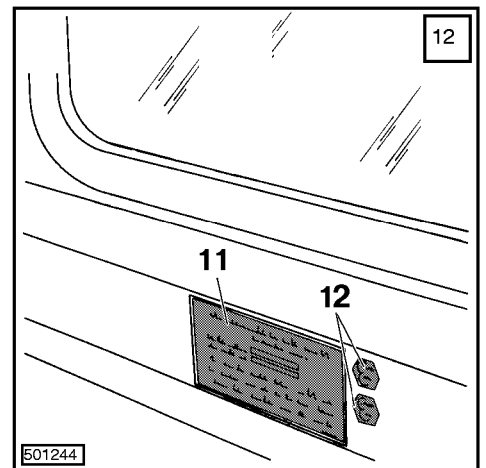
Id. No.: 9052407

EC CONFORMITY SYMBOL 12

These decals include the ROPS and FOPS test numbers.

ROPS Id. No.: 9780852

FOPS Id. No.: 9780859

**NOISE PROTECTION 13**

LpA = Sound pressure level (measured on driver's ear)

Id. No.: 9353567

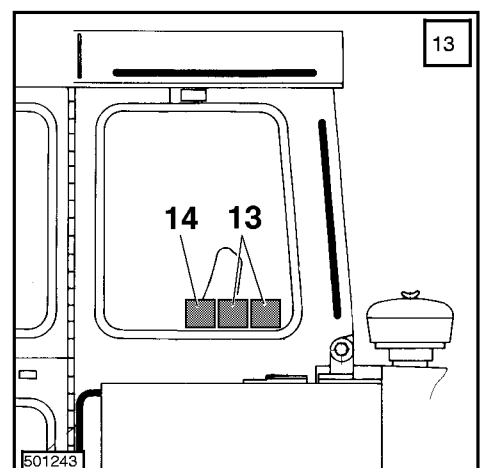
LWA = Sound emission level (sound emitted to surrounding area)

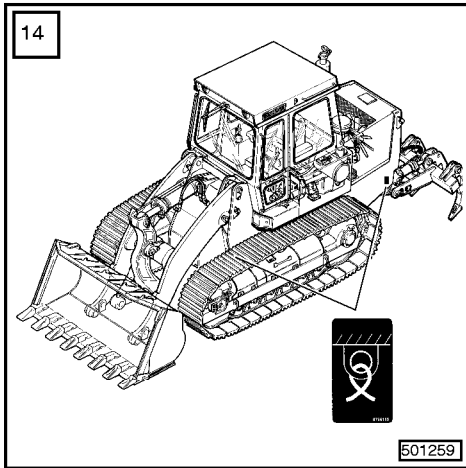
LR 641 Id. No.: 9353552

CE 14

The machine conforms to EC regulations.

Id. No.: 9239680

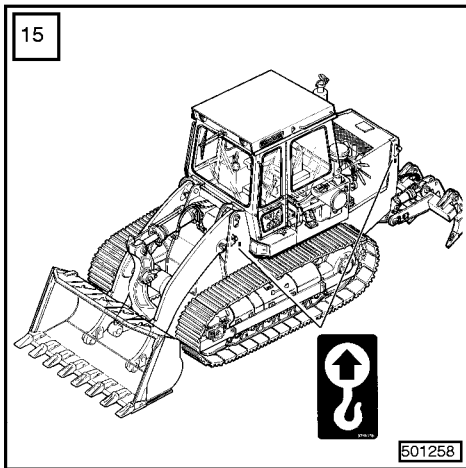




RIGGING POINT 15

Shows the four rigging points on the machine.

Id. No.: 9796155

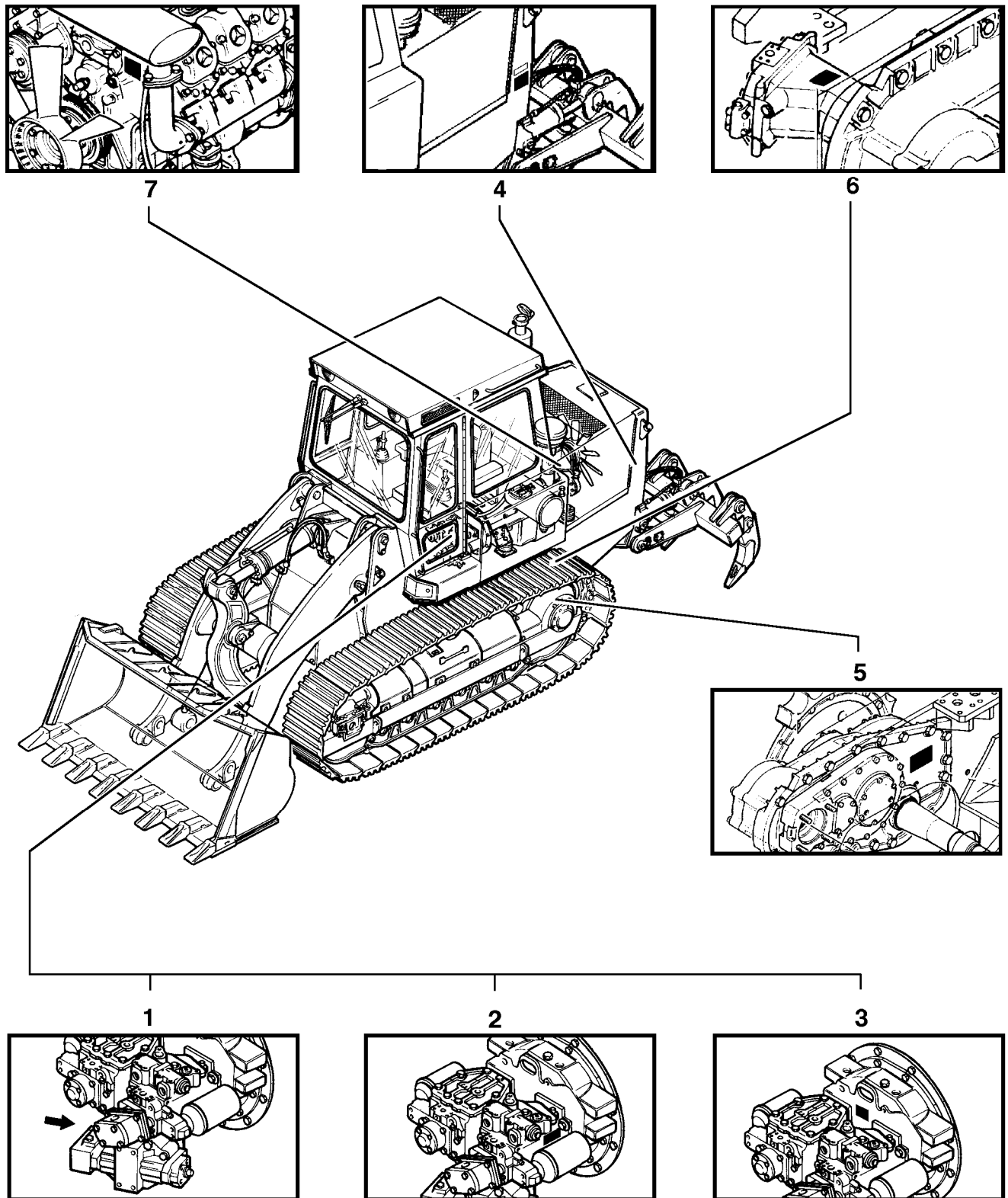


LIFTING POINTS 16

If special installations are installed, then these four lifting points will be marked.

Id. No.: 9796156

2.1.3 DATA TAGS FOR VARIOUS COMPONENTS



- 1 Regulating pump
- 2 Variable displacement pump
- 3 Splitterbox
- 4 Machine manufacturer's data tag

- 5 Travel gear
- 6 Variable flow motor
- 7 Diesel engine

2.2 GENERAL SAFETY GUIDELINES

- Study the Operation and Maintenance Manual before operating or working on the machine.
 - Make certain that you have additional information for the special attachments of your machine, read it and make sure you understand it.
- Only trained and authorized personnel may operate, maintain, service or repair this machine.
 - Make sure you are aware of the permissible minimum operator age, as stated by law.
- Utilize only trained or specially trained personnel, make sure that everybody is aware of the person / persons responsible for the operation, installation of attachments, maintenance and repair of the machine.
- Determine the responsibility of the operator, (to include adherence to traffic regulations) and permit him to refuse to carry out unsafe instructions or practices given by a third person.
- Do not allow any personnel, either still to be trained or already in training, to work on the machine unless that person is under the constant supervision of an experienced instructor or operator.
- Periodically, check to see if all persons observe all safety guidelines and work cautiously, as noted in the Operation and Maintenance Manual.
- Always wear proper clothing when operating or working on the machine.
 - Avoid wearing rings, watches, bracelets, ties, scarves, open jackets, loose clothing such as unbuttoned or unzipped jackets, etc. they are dangerous, could get caught in the machinery and could cause serious injury!
 - Wear the proper safety equipment for certain work, such as safety glasses, safety shoes, hard hats, gloves, reflective vests, ear protection.
- Consult your employer or supervisor for specific safety equipment requirements and safety regulations applicable to the job site.
- Never use the safety lever, control levers or joysticks as handholds. This could trigger inadvertent movement of the machine and cause serious accidents.
- Never jump off the machine! Climb on and off the machine only by using the steps, rails and handles provided. When climbing on or off the machine, use both hands for support and face the machine.
- Keep operator's cab, catwalks, steps, handrails and handles clean and free from oil, grease, mud, snow and ice. These precautions will minimize the danger of slipping, stumbling or falling.
- Familiarize yourself with the emergency exit route through the right cab door.
- If no other instructions were given, proceed as follows for maintenance and repairs:
 - Park the machine on firm and level ground and lower the attachment to the ground.
 - Bring all operating and control levers into neutral position.
 - Turn the engine off and leave the ignition key in contact position.
 - Actuate the operating lever / joystick several times to relieve pressure in the hydraulic lines.
 - Bring all operating and control levers into neutral position.
 - Place the safety lever in the full down position before leaving the machine.
 - Remove the ignition key.
- Before any work on the hydraulic circuit, you must also - with the ignition key in contact position - actuate all servo controls (joysticks and foot pedals) in both directions to relieve pressure in the servo and hydraulic system. Then relieve the hydraulic tank pressure.
- The safety lever must always be placed in the full down position before leaving the cab.
- Secure all loose parts on the machine properly .
- Never operate a machine until you have performed a complete walk around inspection. Also, check if all warning decals are on the machine and if all of them are legible.
- Check and follow all instructions given on the warning and safety decals.

- This machine can only be utilized in the special applications if equipped with the appropriate attachment and safeguards, and if supplied with specific operating and safety guidelines and/or decals.
- Never change, add or modify anything on the machine which could influence the safety of the machine without explicit written permission from the manufacturer. This also applies to the installation and adjustment of safety devices and valves as well as for any welding on load carrying machine parts or sections.
- Never install any attachments or parts without LIEBHERR's permission.

2.3 CRUSHING AND BURN PREVENTION

- Never work underneath the attachment unless it is safely placed on the ground or properly blocked and supported.
- Never use damaged or insufficient load carrying devices, such as chains, ropes, ... Always wear gloves when handling wire ropes.
- When working on the attachment, never align bores with your fingers, always use proper alignment tools when installing, changing or servicing attachments.
- When the engine is running, make sure that no objects touch the radiator fan. Rotating fans will swirl and throw out objects which can become very dangerous and, in addition to damaging the fan, they can cause severe injury to yourself and others.
- Avoid contact with components containing coolant. At or near operating temperature, the engine coolant is hot and under pressure and could cause severe burns.
- Check coolant level only after the radiator cap is cool enough to touch. Remove the radiator cap slowly to relieve pressure. .
- Do not allow your skin to come into contact with hot oil or components containing hot oil. At or near operating temperature, engine and hydraulic oil is hot and can be under pressure.
- Always wear safety glasses and protective gloves when handling batteries. Make sure there are no sparks and open flames in the vicinity.
- Never permit anyone to hand-guide the attachment to its proper position.
- Secure the engine compartment doors in open position to avoid unwanted closing.
- Insure that all engine and battery compartment doors are closed and locked before operating the machine.
- Never work underneath the machine if the machine has been raised with its attachment. Prior to working underneath, the machine and/or its attachment must always be properly blocked and supported with wooden blocks. Do not use steel on steel support.

2.4 FIRE AND EXPLOSION PREVENTION

- Always shut off the engine before refueling.
 - In addition, the heater must also be turned off before refueling.
- Never smoke or allow an open flame in refueling areas and / or where batteries or flammable material are being charged or stored.
- Always use the proper engine starting procedure, as described in the Operation and Maintenance Manual.
- Check the electrical system frequently. Correct any defects, such as loose connections, chafed wiring, or burnt out fuses and bulbs immediately.

2. SAFETY GUIDELINES

- Never store or carry any flammable fluids on the machine, except in the storage tank intended for machine operation.
- Regularly check all components, lines, tubes, and hoses for oil and fuel leaks and/ or damage. Replace or repair damaged components immediately. Oil and fuel leaks can cause fires!
- Be certain that all clamps, guards and heat shields are installed. These components prevent vibration, rubbing and heat build up. Install tie wraps to fasten hoses and wires as required.
- Cold start ether is extremely flammable! Never use cold start ether near heat sources, open flames, or near anyone who is smoking cigarettes! Use only in well ventilated areas and as directed!
- Never use the flame glow plug or preheat system when you use an ether cold start aid. Danger of explosion!
- Know the location of the fire extinguishers, make sure you know how to use them properly. Check out the location of where to report a fire and inform yourself about fire fighting capabilities on the job site before you start to work.

2.5 MACHINE START UP SAFETY

- Before starting the machine, perform a thorough walk around inspection.
- Visually check the machine for loose bolts, cracks, wear, leaks, and any evidence of vandalism.
- Never start or operate an unsafe or damaged machine.
- Be certain that all defects are taken care of immediately.
- Make sure that all covers and doors are closed and locked. Check if all warning and safety decals are on the machines, make sure that all of them are legible.
- Clean all windows and mirrors, secure all doors and windows to prevent any inadvertent movement.
- Always enter the cab through the left door. Use the right door only in emergencies.
- Make sure that no one is on or under the machine. Warn all personnel in the surrounding area on the job site before operating the machine.
- After entering the cab, adjust the operators seat, the rear view mirror, the arm rests and the seat belt as well as seat belt tethers. Be certain that all controls can be reached so you can work comfortably.
- All noise level protection devices on the machine must be operational during operation.
- Never operate a machine without a cab or canopy.

2.6 ENGINE START UP SAFETY

- Before starting the engine, check all indicator lights and instruments for proper function. Place all operating and control levers into neutral position.
- Before you start the engine, warn any personnel in the surrounding area by sounding the horn .
- Start the machine only while seated in the operators seat, and with the seat belt secured.
- If no other instructions were given, follow the engine starting instructions as outlined in the **Operation and Maintenance Manual**.
- Start the engine and check all indicator lights, gauges, instruments and controls.
- Start the engine only in a well ventilated area. If necessary, open doors and windows to assure sufficient fresh air supply. Warm up the engine and hydraulic system to bring engine and hydraulic oil to operating temperature, as low oil temperatures cause the machine to be unresponsive.

- Check that all attachment functions are operating properly.
- Move the machine slowly and carefully into an open area and check all travel and brake functions, the steering function as well as the turn signals and lights.

2.7 MACHINE OPERATING SAFETY

- Make sure you are aware of any special circumstances on the job site, make sure you are familiar with any special guidelines and warning signals. Familiarize yourself with the job site before starting to work, any special hindrances and obstacles influencing operation or movement, the ground conditions, and any special protection required to secure the job site from public highway traffic.
- Always keep a safe distance from overhangs, walls, drop offs and unstable ground.
- Make sure you are especially aware of changing ground conditions, visibility or weather conditions.
- Make sure you know the location of utility lines. Be aware of underground cables, gas and water lines. You must be especially careful when working near supply lines. If necessary, contact the appropriate utility company for information and location of utility lines.
- Keep sufficient distance from electrical lines with the attachment, avoid working near high voltage electrical lines.
 - **DANGER OF LOSS OF LIFE!**
 - You must inform yourself of proper distances to assure your safety while working.
- If you do touch an electrical line with the attachment or machine, proceed as follows:
 - DO NOT leave the machine!
 - If possible, move the machine a sufficient distance away from the danger area.
 - Warn all personnel in the surrounding area not to come close to the machine and/or touch the machine.
 - Instruct somebody to turn the electrical power off.
 - Do not leave the machine until you are assured that the electrical line which has been touched or damaged is no longer energized, and the power has been turned off!
- Before moving or working, make sure you always check that the attachments can be operated safely.
- When travelling or moving the machine on public roads, highways, or properties, make sure to observe all applicable laws, rules and regulations. After moving a machine it may become necessary to reassemble it and to bring it back to proper operating conditions.
- Always turn on the light if visibility is poor or as dusk approaches.
- Never allow another person to ride along on the machine.
- Always work while seated in the operators seat and with the seat belt secured.
- In the event the machine should tip, remain in the operators seat, with the seat belt securely fastened. Experience has shown that it is safer to remain in the cab in the event of an overturn.
- Report any functional problems or defects immediately, and make sure that all necessary repairs are completed before resuming operation.
- Be certain that no one is endangered by moving the machine.
- Do not get up from the operators seat as long as machine is still moving.
- Never leave the machine unattended, with the engine running.
- When traveling, make sure that the attachment is in transport position and keep the load as close to the ground as possible.
- Avoid any working movement which could cause the machine to tip or overturn. However, if the machine does begin to tip or slide or slip on a grade, immediately lower the attachment and load to the ground and turn the machine downhill. If possible, work downhill or uphill, never sideways on a slope!

- Always move slowly on rocky, rough or slippery ground or on a slope.
- Always adapt your travel speed to working conditions.
- Never travel on slopes that exceed the maximum permissible gradeability.
- Never travel downhill at maximum speed, always at low speed to prevent loss of control. The engine must be at high idle and the speed must be reduced by preselecting the low speed range. Always change to the low speed range before reaching the slope, never move onto a slope and then change the speed range.
- When loading a truck, the Truck operator must leave the cab, even if the cab is FOPS protected.
- The machine must always be equipped with proper protective devices designed for specific purposes. The machine must be equipped with proper protection when it is utilized in demolition work, land clearing, crane operation, etc.
- Always have another person guide you if visibility is restricted. Always take signals from one person only.
- Utilize only experienced personnel to attach loads and direct operators. The person giving signals must be visible to the operator or be equipped with a two way radios.
- When using a two way radios or Citizens Band radios (CB), the safety lever must be in the full down position.

2.8 MACHINE PARKING SAFETY

- Park the machine only on firm and level ground. If it becomes necessary to park the machine on a grade, it must be properly blocked with wedges to secure it and prevent any unintentional movement.
- Lower the attachment to the ground and lightly anchor it in the ground.
- Bring all operating levers and controls into the neutral position, place the safety lever in full down position and turn the engine off, as outlined in the Operation and Maintenance Manual, before you leave the operators seat.
- Lock the machine, remove all keys and secure the machine against vandalism and unauthorized use.
- Never park the machine in such a way as to block access to entrances, exits, ramps, fire hydrants, etc.

2.9 MACHINE TRANSPORTING SAFETY

- Use only safe transportation with adequate carrying capacity.
- If necessary, remove part of the attachment for transport.
- Never use a ramp that is steeper than 30° to move the machine onto a transporting vehicle, the ramp should be covered with wooden planks to prevent slipping.
- Before moving onto the ramp, remove any snow, ice and / or mud from chains or wheels.
- Align the machine with the ramp.
- Use another person as a guide to signal you, the operator. Move very slowly and carefully towards the ramp and the transporting vehicle.
- Raise the attachment and move onto the ramp. Hold the attachment as close as possible to the trailer platform.
- After the loading procedure, lower the attachment onto the trailer platform.

- Secure the machine and all remaining parts with chains and wedges to prevent any slipping or movement during transport.
- Relieve pressures from hydraulic lines and hoses, remove the ignition key, lock the cab and all covers before leaving the machine.
- Carefully check out the transporting route beforehand, check any regulations regarding width, height and weight.
- Make sure that there is enough clearance underneath all bridges and underpasses, utility lines and tunnels.
- During off-loading, use the same care and caution as during the loading procedure. Remove all chains, wedges and blocks. Start the engine as noted in the Operation and Maintenance Manual. Carefully move from the trailer platform down the ramp. Hold the attachment as close as possible above the ground. Use a guide to signal you.

2.10 MACHINE TOWING SAFETY

- Always follow the correct procedure: Refer to the Operation and Maintenance Manual section Towing the machine.
- Tow the machine only in exceptional cases, such as removing the machine from a dangerous area.
- Be sure that all towing and pulling devices, such as cables, hooks etc. are safe and adequate.
- The cable or towing bar, which is used to tow the machine must be adequate to pull the machine and must be connected to the appropriate bores and couplers. Any damage or accident which is the direct result of towing this machine is expressly excluded from the manufacturer's and/or LIEBHERR's warranty.
- Never allow anyone to stand near the cable or on the machine while pulling or towing.
- Keep the cable tight and free of kinks.
- Carefully pull the cable tight, do not jerk! A sudden jerk can cause a slack cable to snap.
- When towing, keep the machine straight and maintain, permissible speed and route.
- When returning the machine to operation, proceed as stated in the Operation and Maintenance Manual.
- After the towing the machine, and before continuing operation, be certain to return the machine to a safe operating condition.

2.11 MACHINE MAINTENANCE SAFETY

- Never perform any maintenance or repairs for which you are not qualified or you do not understand.
- Any maintenance / inspection should be performed in the intervals noted in the Maintenance Guidelines. To perform any repairs, make sure you have the proper tools.
- Maintenance work should be performed according to the chart at the end of this Operation and Maintenance Manual. It is also noted who should or may perform what type of work. The operator should only perform items marked OM on the maintenance and inspection chart. The remaining work should only be performed by trained personnel.
- All spare parts must conform to the technical requirements set forth by the manufacturer. This is only assured by using Original LIEBHERR spare parts.
- Always wear proper and safe work clothing. For certain jobs, in addition to hard hats and safety shoes, additional safety equipment is required, such as safety glasses and gloves.

2. SAFETY GUIDELINES

- Keep unauthorized personnel from the machine during maintenance and repair work.
- Secure the maintenance area, as necessary.
- Inform operators if any special tasks or maintenance work is required. Appoint one supervisory person to assure that this work has been done properly.
- Perform all maintenance work with the machine parked on firm and level ground and with the engine turned off, unless otherwise specified in the Operation and Maintenance Manual.
- The cab may only be raised if the machine is parked and the engine is turned off! Before raising the cab, make sure no personnel is within the proximity of the cab. Always secure the raised cab with the safety bar before working under the raised cab. The machine may **NEVER** be moved when the cab is raised! The safety lever must always remain in the full down position!
- After any maintenance and repair work on the machine, make sure that all screw connections or fittings, which had to be loosened, are retightened.
- If it becomes necessary to remove any safety devices during maintenance and repair, the safety devices which were removed, must be reinstalled immediately and then be inspected for proper function.
- Before servicing the machine, especially when working under the machine, attach an easily visible "**DO NOT OPERATE**" sign to the ignition switch. Remove the ignition key.
- Before any maintenance or repair, clean off any oil, fuel or service fluids from connections and couplings. Do not use any harsh cleaning fluids.
- To clean the machine, do not use flammable fluids.
- Before any welding, cutting or grinding, clean the machine and surrounding area of dust, and assure adequate ventilation.
 - Otherwise, there is a **DANGER OF EXPLOSION!**
- Before cleaning the machine with water, steam (high pressure cleaning system) or other cleaning fluids, cover or tape all openings, make sure no water, steam or cleaning fluid enters these openings for safety or functional reasons. Electrical motors, switch boxes and battery compartments are especially endangered.
 - Make sure that during cleaning work, the temperature sensor of the fire warning system and sprinkler system do not come in contact with the hot cleaning fluid, or the sprinkler system could be actuated.
 - After the cleaning procedure, remove all covers and tape.
 - After cleaning the machine, check all fuel, engine oil, and hydraulic lines for leaks, for loose connections, for chafed or damaged areas.
 - All problems must be remedied immediately.
- Adhere to the product safety instructions issued for the handling of oils, greases and other chemical substances.
- Make sure to dispose of any operating and service fluids as well as replacement parts properly and in an environmentally sound manner.
- Be very careful when handling any hot component or fluid on the machine as there is the **DANGER OF BURNS AND SCALDING**.
- Use combustion motors and fuel operated heaters only in areas with adequate ventilation. Before start up, make sure that the ventilation is adequate. Follow and adhere to any local guidelines and instructions pertaining to the present job site.
- Perform any welding, cutting or grinding work on the machine only if this work has been explicitly authorized, as there can be a danger of fire or explosion.
- Do not try to lift heavy parts. Always use appropriate lifting aids and devices with sufficient carrying capacity.
 - To lift spare parts and component assemblies for replacement on the machine, they must be securely mounted and secured onto the lifting devices, to prevent accidents. Use only suitable and flawless lifting devices, as well as hooks, ropes, slings, shackles etc. with sufficient lifting capacity.

- Do not allow anybody to work or remain underneath the lifted load!

- Do not use damaged or insufficient wire ropes. Always wear gloves when handling wire ropes.
 - Only experienced personnel may attach loads and signal the operator. The person used as a guide must be visible by the operator or be in direct voice contact with the operator via a two way radio.
 - When installing parts higher up or when working overhead, always use safe scaffolding or ladders suited for this purpose! Do not step on any parts to get closer to the working area. You must wear safety belts or similar safety equipment when working higher up. Make sure all handles, steps, walk ways, cat walks, and ladders, etc. are always free of dirt, snow and ice.
 - When working on or changing any part of the attachment, for example when changing the teeth, make sure that the attachment is properly supported. Never use metal on metal supports.
 - Never work underneath the machine if the machine has been raised with its attachment. Prior to working underneath, the machine and/or its attachment must always be properly blocked and supported with wooden blocks.
 - Always block the machine in such a way that any change in the center of gravity will not endanger its stability. Never use metal on metal supports.
 - Only authorized, trained personnel may work on the travel gear, brake and steering system.
 - If the machine must be repaired while parked on a slope, the track chains or wheels must be blocked to prevent any movement with wedges. The attachment must be brought into proper maintenance position.
 - Only authorized personnel who have received specialized training may work on the hydraulic system.
 - Always wear gloves when checking for leaks. Never check for leaks with your bare hands. A thin stream of fluid escaping from a small hole can have enough force to penetrate the skin.
 - Never loosen any hydraulic lines or connections until the attachment has been lowered to the ground, the engine has been turned off (with the ignition key in contact position) all servo controls (joysticks and foot pedals) have been actuated in both directions to release any servo pressure and to release all pressures in the working circuit, and the tank pressure has been released by slowly opening the bleeder screw.
 - Regularly check all hydraulic lines, hoses, and connections for any leaks and damage. Any defects must be repaired immediately. Any escaping fluid can cause serious injuries and fire.
 - Before beginning any repairs, you also must make sure all air pressures are relieved in any of the systems you need to gain access to; to be certain, refer to the description of the various component groups and assemblies.
 - Route and install all hydraulic and air pressure lines properly. Mark and check all connections to prevent any mix ups. All the fittings, including length and quality or type of hoses used must match the requirements set forth by the manufacturer.
- For that reason, use only Original LIEBHERR replacement parts.**
- Replace hydraulic hoses and lines in regular intervals, as stated, even if no defects can be seen.
 - Work on electrical components of the machine may only be performed by a certified electrician or by a person working under the guidance and supervision of such an electrician, and according to electro-technical procedures, rules and regulations.
 - When working on the electrical system or before any arc welding on the machine, the battery cables must be disconnected. Always disconnect the negative (- minus) terminal first, and reconnect it last.
In addition, before any welding, always remove the electronic box.
 - Use only Original fuses with the same amperage. In case of problems in the electrical power supply, turn the machine off immediately.
 - Inspect / check the electronic components of the machine regularly. Repair any problems or defects, such as loose connections or chafed wires and replace any burnt out fuses and bulbs immediately.

2. SAFETY GUIDELINES

- If any work is necessary on energized, voltage carrying parts, a second person must be utilized to disconnect the main battery switch or emergency off switch in case a problem should arise. Rope the working area off with a red/white safety chain and a warning sign. Use only insulated tools!
- When working on high voltage carrying components or sections, turn off the power supply, then connect the supply cable to the ground wire and use the grounding rod to ground these parts, such as the condenser, for example.
- Check the disconnected parts first to see if they are really voltage free, ground them and then close them off. Insulate the neighboring, voltage carrying parts.

2.12 SAFETY GUIDELINES TO BE OBSERVED WHEN WORKING ON THE ATTACHMENT

- Never work underneath or on the attachment unless it is securely placed on the ground or it is properly blocked and supported to keep it from drifting or falling.
- When replacing or changing any part of the attachment, such as blade, cutting edges, teeth ..., never use metal on metal supports.
- Never try to lift any heavy parts. Always select and use appropriate lifting devices with sufficient lifting capacity.
- When handling wire ropes, always wear gloves!
- Do not disconnect any lines or hoses or remove fittings, caps or covers while the hydraulic system is pressurized. Always lower the attachment, shut the engine off and release all pressures: with the ignition key in contact position, move all servo controls (joysticks and foot pedals) into both directions to release the servo pressure and any pressure remaining in the hydraulic circuit, then release the tank pressure by turning the bleeder screw.
- After completion of all maintenance and repairs, make sure that all lines and hoses and fittings are properly connected and retightened.
- Removing or installing steel pins with a hammer can be very dangerous. Metal chips can cause injury. Always wear gloves and safety glasses!
- Always use the appropriate tools for the job (such as pin pullers, punches, etc. ..)

2.13 SAFETY GUIDELINES TO BE OBSERVED WHEN LOADING A MACHINE WITH A CRANE

- Lower the attachment to the ground.
- Place all operating and control levers into neutral position.
- Turn the engine off, as described in the Operation and Maintenance Manual and place the safety lever in the full down position before you leave the operator's seat.
- Securely close all doors, covers and hoods.
- Utilize only experienced personnel to attach loads and direct the crane operators. The person giving signals must be visible by the operator or be equipped with a two way radio.
- Install the shackles and hooks to the appropriate and designated brackets / bore holes on the machine.
- Make sure the length of the lifting device is sufficient.
- Carefully lift the machine.
- **DANGER! Make sure nobody is near or underneath the lifted machine!**

- When you place the machine back in service, proceed according the guidelines given in the Operation and Maintenance Manual.

2.14 SAFETY GUIDELINES HYDRAULIC LINES AND HOSES

- Hydraulic lines and hoses may never be repaired!
- All hoses, lines and fittings must be checked regularly, but at least 1 x per year for leaks and any externally visible damage! Any damaged sections must be replaced immediately! Escaping oil can cause injuries and fires!
- Even if hoses and lines are stored and used properly, they undergo a natural aging process. For that reason, their service life is limited. Improper storage, mechanical damage and improper use are the most frequent causes of hose failures.

The service life of a hose may not exceed six years, including a storage period of not more than 2 years (always check the manufacturer's date on the hoses).

Using hoses and lines close to the limit ranges of permitted use can shorten the service life (for example at high temperatures, frequent working cycles, extremely high impulse frequencies, multi shift or around the clock operations).

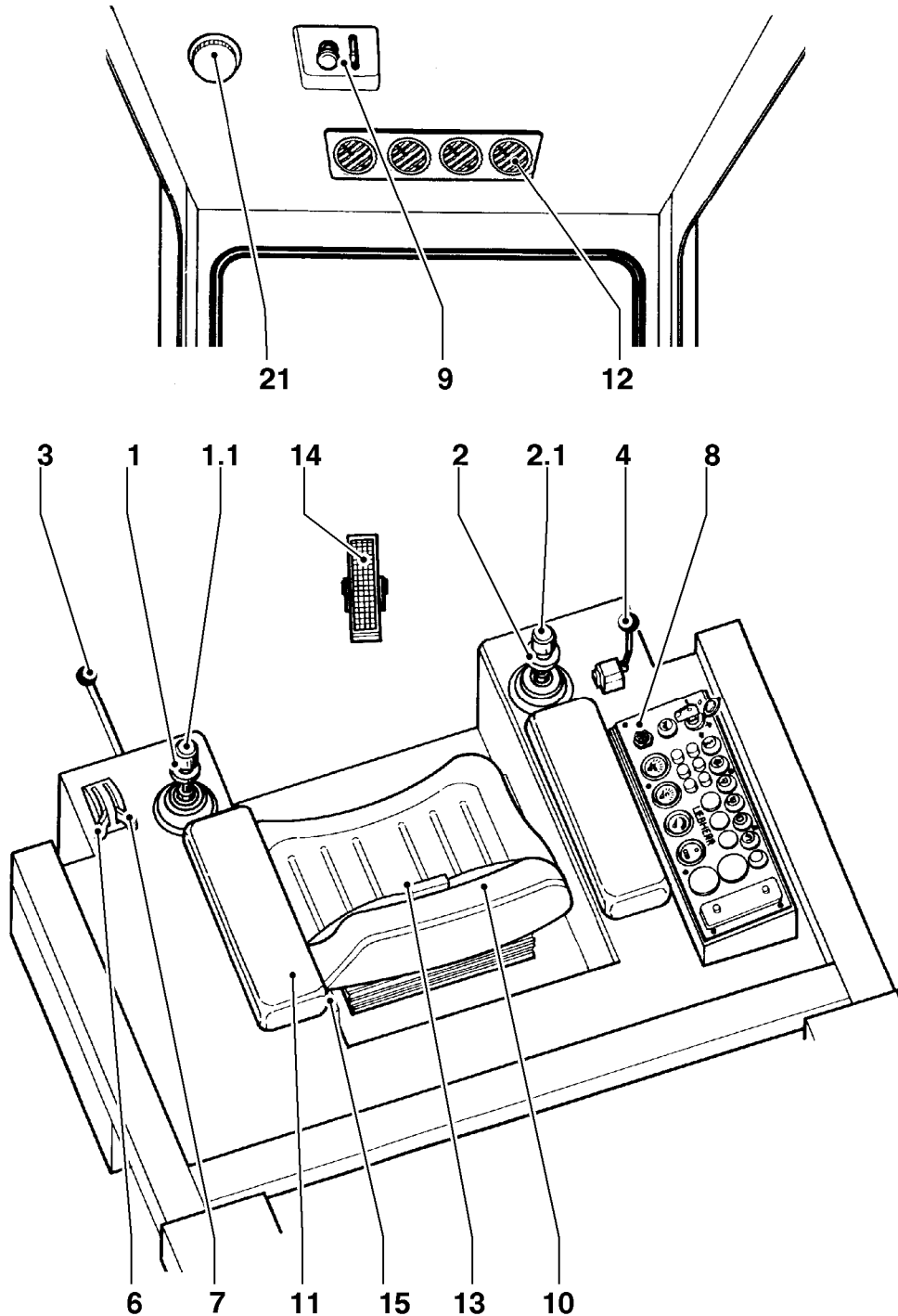
- Hoses and lines must be replaced if any of the following points are found during an inspection:
 - Damage on the external layer into the inner layer (such as chaffings, cuts and rips);
 - Brittleness of the outer layer (crack formation of the hose material);
 - Changes in shape, wich differ from the natural shape of the hose or line, when under pressure or when not under pressure, or in bends or curves, such as separation of layers, blister or bubble formation;
 - Leaks;
 - Non observance of installation requirements;
 - Damage or deformation of hose fittings, wich might reduce the strength of the fitting or the connection between hose and fitting;
 - Any movement of hose away from the fitting;
 - Corrosion on fittings, wich might reduce the function or the strength of the fitting;
 - Storage or service life has been exceeded;

When replacing hoses or lines, always use Original replacement parts.

- Route or install the hoses and lines properly. Do not mix up the connections!

3. CONTROLS AND INSTRUMENTATION

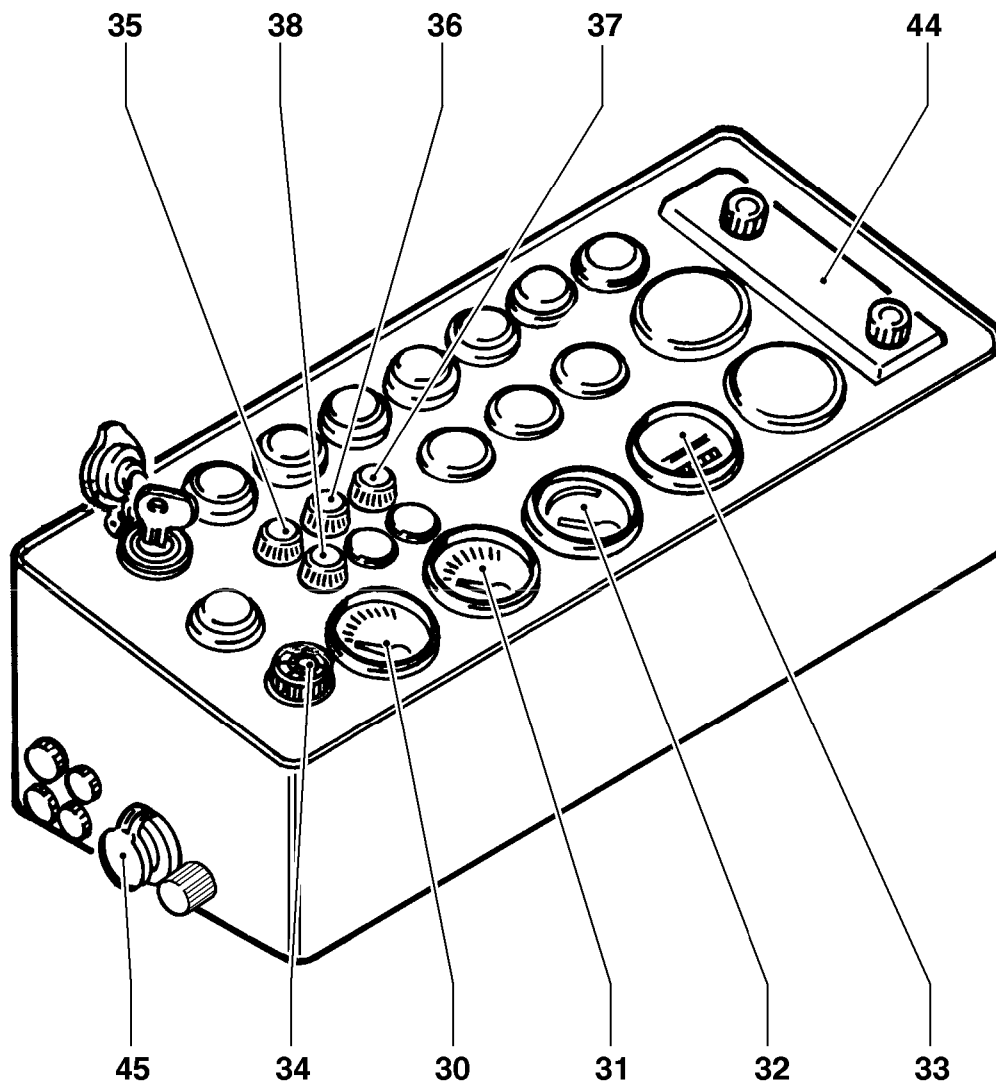
3.1 OPERATOR'S CAB



- | | | | |
|-----|---|----|---------------------------------|
| 1 | Travel joystick | 10 | Operator's seat |
| 1.1 | Push button for counterrotation | 11 | Arm rests |
| 2 | Bucket control lever | 12 | Heater vents |
| 2.1 | Push button - float position, bucket return | 13 | Seat belt |
| 3 | Safety lever | 14 | Foot pedal for 4 in 1 bucket * |
| 4 | Ripper control lever * | 15 | Compartment for machine manuals |
| 6 | Engine shut off lever | 21 | Interior lighting |
| 7 | Engine throttle control | | |
| 8 | Instrument panel | | |
| 9 | Heater control | | |

* Special equipment

3.2 INDICATOR LIGHTS AND GAUGES

**30 ENGINE OIL PRESSURE**

The engine oil pressure should not drop below the following values:

At low idle	1 bar
at full engine load	3.5 bar

If the engine oil pressure drops below these values, turn the engine off and check for and correct the problem (if necessary, change engine oil and filter)

**31 COOLANT TEMPERATURE GAUGE**

If the coolant temperature stays consistently above 100 °C (212 °F), turn the engine off and correct the problem (clean the cooler, add coolant, check for and repair any leaks or replace the water pump)

**32 FUEL LEVEL INDICATOR**

Indicates the fuel quantity in the tank. To reduce condensation, maintain a high fuel level in the tank.

**33 HOUR METER**

The hour meter indicates the number of hours the machine has been operated. Use the number of hours to schedule maintenance.

**34 BUZZER**

The buzzer will sound off :

- at increased coolant temperature
- at low engine oil pressure
- at low replenishing pressure
- when the ignition is turned on and the engine is not running.

**HINWEIS**

If the buzzer sounds off, turn the engine off, check for and remedy the problem.

**35 INDICATOR LIGHT - REPLENISHING OIL PRESSURE (red)**

Turn the engine off if the indicator lights comes on and check for and correct the problem.

**36 INDICATOR LIGHT - FLOAT POSITION (red)**

Lights up when the float position is actuated.

**37 INDICATOR LIGHT - PARKING BRAKE (red)**

Lights up when the safety lever is in the down position, the parking brake is applied or if loss of replenishing pressure occurs.

**38 CHARGE INDICATOR LIGHT (red)**

Indicator light must turn off once the engine is started. Should the light come on while the engine is running, stop the engine, check for and correct the problem.

**44 FUSES**

Location as well as size of fuses are described later in this manual.

**45 ELECTRICAL OUTLET 24 V**

Current is only available when the key is in contact position 50.1 .

3.3 CONTROLS ON THE INSTRUMENT PANEL

50 STARTER SWITCH



50.0 Off position



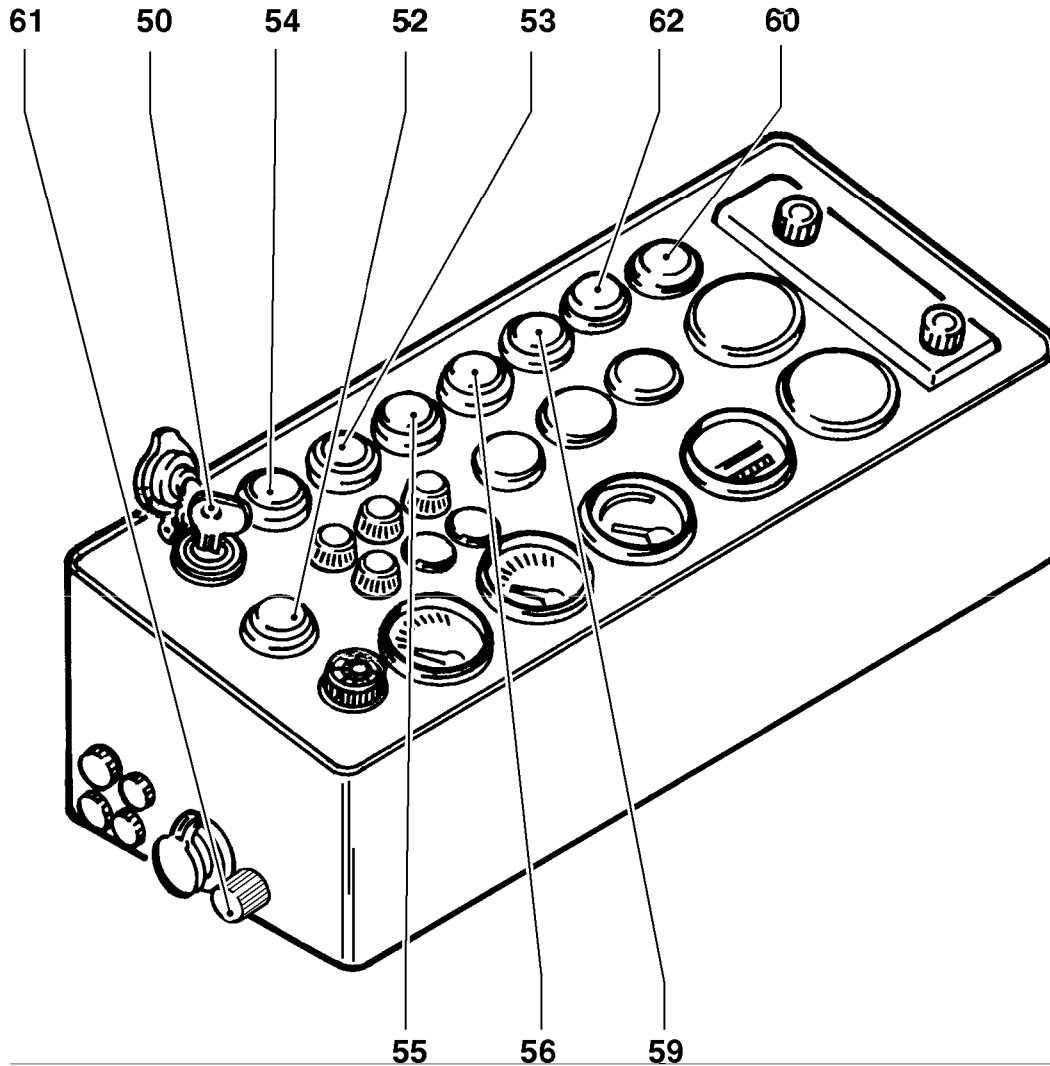
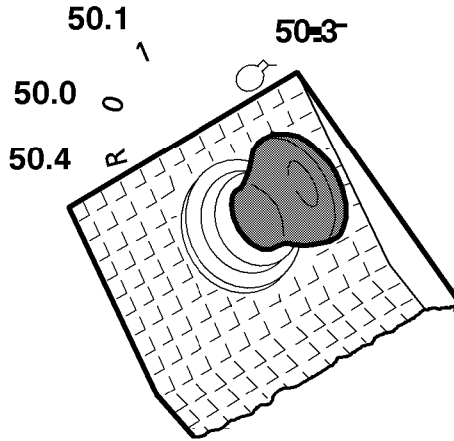
50.1 Contact position



50.3 Starting position



50.4 Parking position





- 52 HORN**
Push the button to sound the horn.



- 53 PRESELECTOR - FLOAT POSITION**
Push the switch to select float position.



- 54 HI/LOW TRAVEL SPEED SELECTOR**
Push the button to select low range and reduce the speed To 0 - 4.5 km/h (0 - 2.8 mph).



- 55 WINDSHIELD WIPER - FRONT**
On - Off



- 56 WINDSHIELD WIPER - REAR**
On - Off

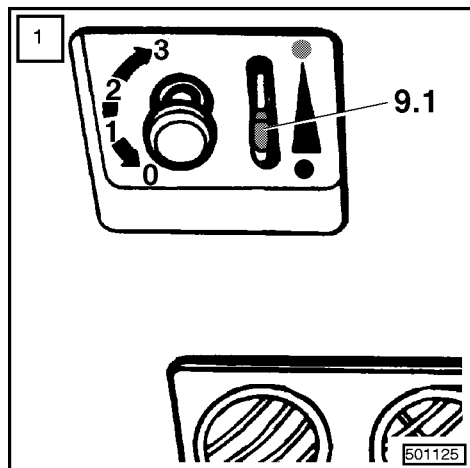


- 59 FLOODLIGHT**
On - Off

- 60 LOW IDLE AUTOMATIC (Special installation)**
On - Off

- 61 ROTARY KNOB - LOW IDLE AUTOMATIC (Special installation)**
Turn to set the desired delay time.

- 62 WINDSHIELD WASHER SYSTEM**
Push the button to turn the system on.



3.4 HEATER AND VENTILATION

3.4.1 HEATER

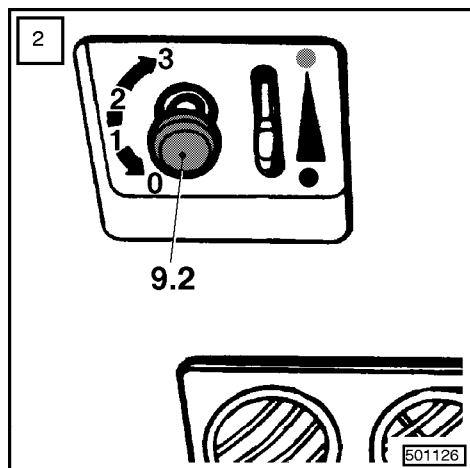


NOTE

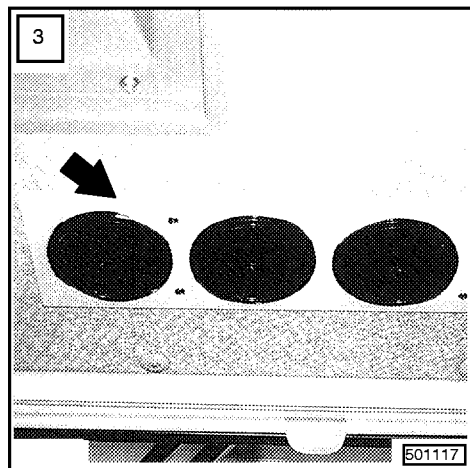
The cab can only be heated if the engine is at operating temperature and the shut off valves are open.

To adjust the temperature. (fig. 1)

- Push the lever (pos. 9.1) towards the front to increase air flow, push it back to decrease air flow. The heat output is steplessly adjustable.



- Choose the amount of air flow (fig. 2, pos. 9.2)
Turn the blower switch to stage 1 - 2 - 3 for more or less air. Turn the blower on and adjust the air flow as described in the chapter below - "Fresh air supply".



3.4.2 FRESH AIR SUPPLY

Set the heater lever to 0 - position, turn the rotary knob to stage 1, 2 or 3.

Fresh air is drawn via the air filter in the roof of the cab and is blown through 4 adjustable nozzles into the cab (fig. 3).



NOTE

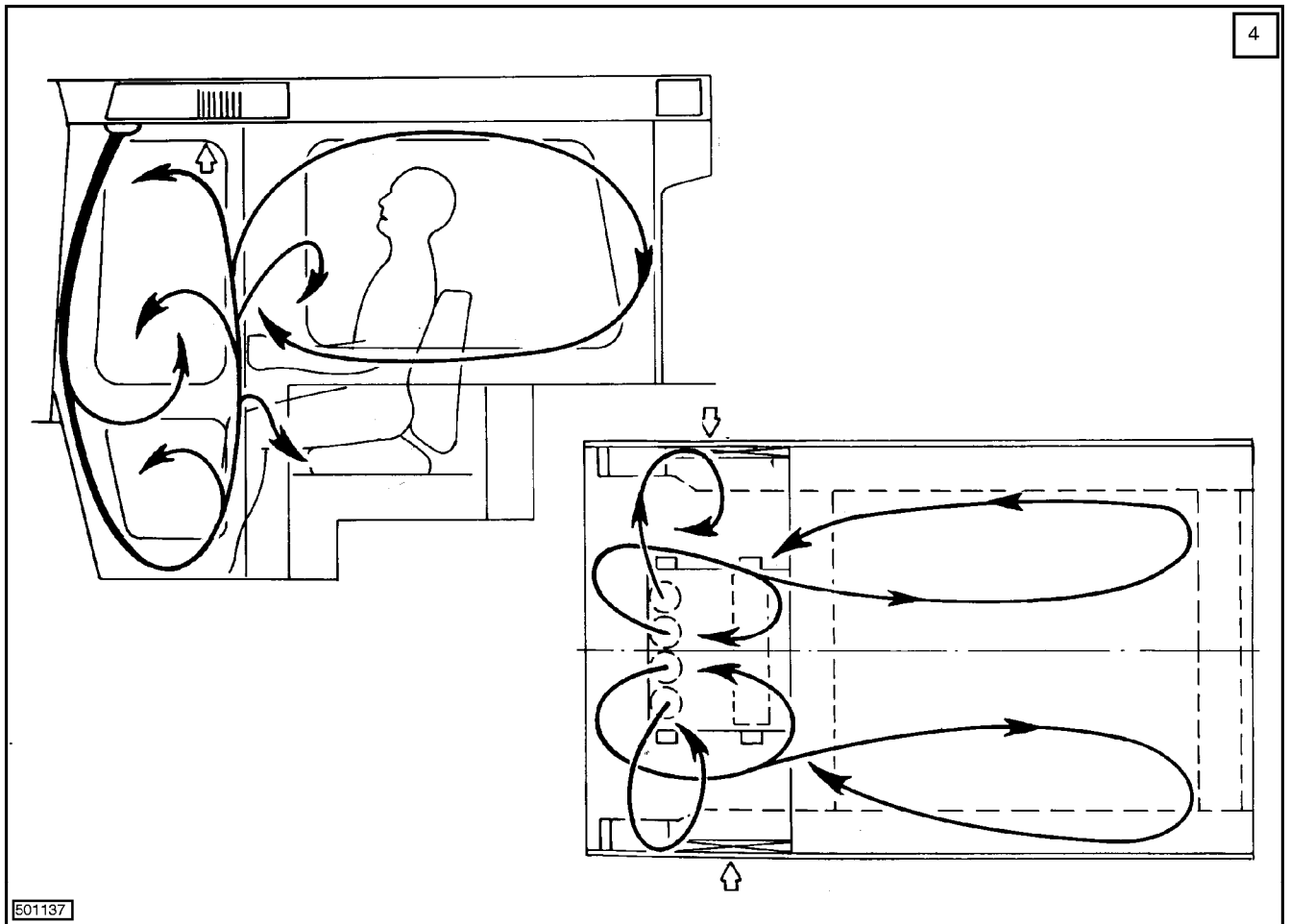
If the cab is closed and the fan is running, a slight pressure is created in the cab due to the fresh air supply, which helps to prevent dust infiltration.

Direct the air flow into the desired direction by adjusting the nozzles.



NOTE

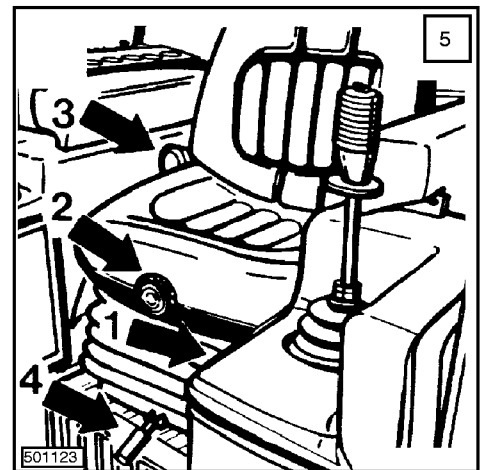
Optimum air circulation is obtained if the nozzles are adjusted as shown on fig. 4.



3.5 OPERATOR'S SEAT

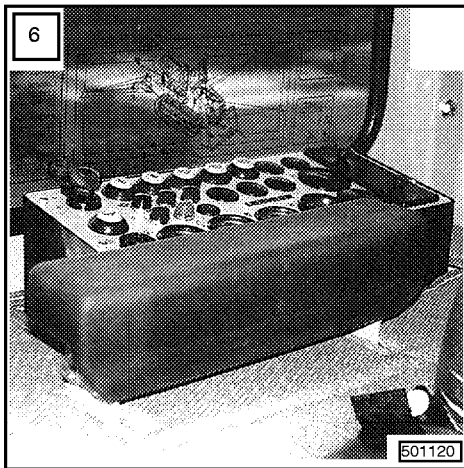
A few minutes spent on proper seat adjustment will contribute greatly to operator comfort.

- **Horizontal seat adjustment**
Lift the lever (pos. 1) on the left hand side of the operator's seat and bring the seat into the desired position (Fig. 5).
- **Seat cushion adjustment**
The seat cushion tilt can be adjusted by turning the knob (pos. 2).
- **Backrest tilt adjustment**
Turn the knob (pos. 3) on the right hand side behind the operator's seat and move the backrest into the desired position (fig. 5).
- **Seat suspension adjustment**
By turning the handle (pos. 4) on the front of the operator's seat to adjust the suspension to the weight of the operator. Turn to the left to increase suspension, turn to the right to decrease suspension (as viewed in direction of travel).



The scale showing the weight of the operator corresponds to a certain pretension.

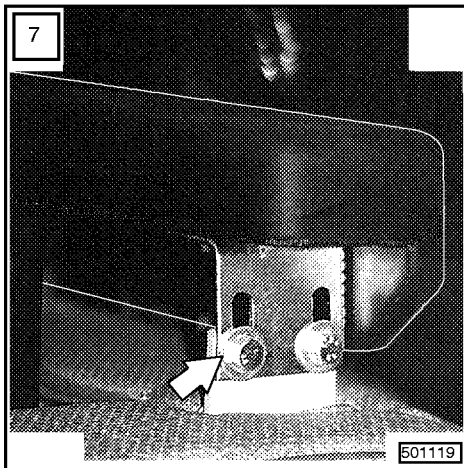
The proven swing acceleration a_{zw} , according to ISO 2631, part 1, when the machine is properly used, is between 0.5 and 2.5 m/s^2 .



3.6 ARM RESTS

The arm rests are located in such a way that the operator is able to use the operating levers of the machine optimally if his forearms rest on the arm rests (fig. 6).

By loosening the mounting screws, the arm rests can also be adjusted in height (fig. 7).



3.7 SEAT BELT

CAUTION

The operator must always fasten the seat belt before operating the machine.

To ensure safety, check condition, function and mounting of the belt frequently and replace worn, damaged or defective parts immediately.

Make sure that the seat belt is not twisted.

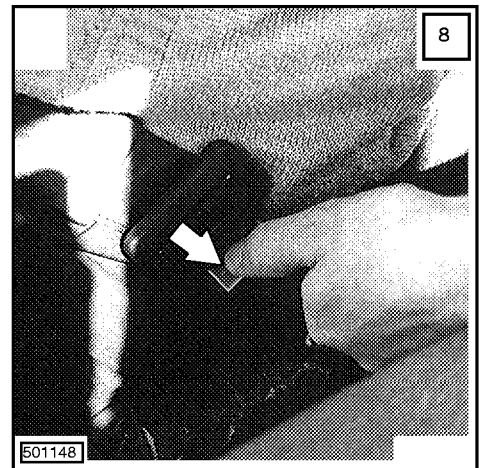
3.7.1 TO ADJUST THE SEAT BELT

The seat belt should fit snugly, but should not restrict. By changing the length of the belt, the seat belt can be adjusted individually.

- The seat belt is locked by pushing the end of the belt into the lock. Pull the belt to check if the lock is fastened. Pull the loose end of the belt to tighten the belt.

3.7.2 TO RELEASE THE SEAT BELT

- To release the belt, push the red button on the lock (fig. 8).



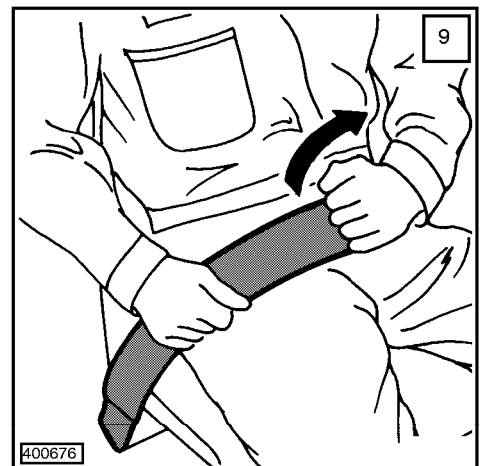
3.7.3 SEAT BELT - 76 mm (3") WIDE VERSION

(Optional equipment)

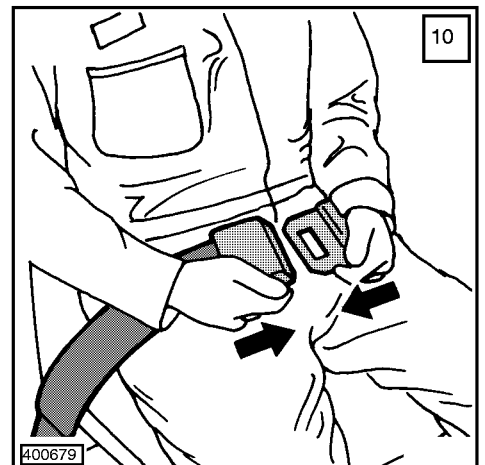
To change the length of the belt

Grasp the unfastened belt, bend the buckle about 90° and pull the belt forward until the desired length has been reached (fig. 9).

Repeat the same procedure on the second belt buckle.

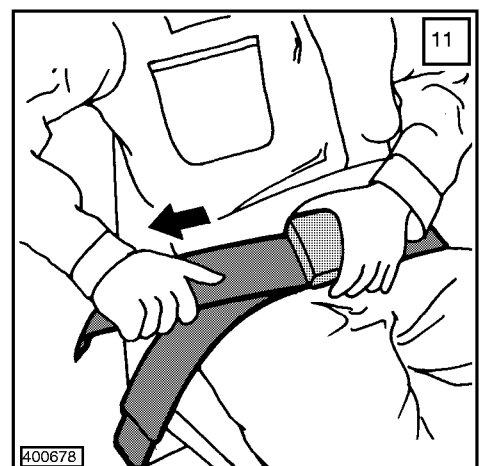


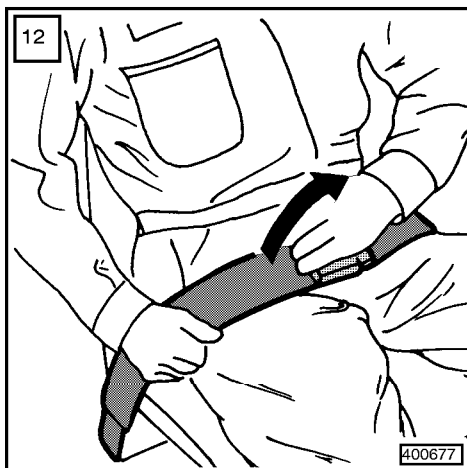
Fasten the seat belt (fig. 10). Pull on both buckles to check if the buckle is locked.



Grasp the belt buckle with one hand and tighten the belt alternately, pulling both both loose ends to tighten the seat belt (fig. 11).

The seat belt should be adjusted in such a way that the belt buckle is in the center of the body.





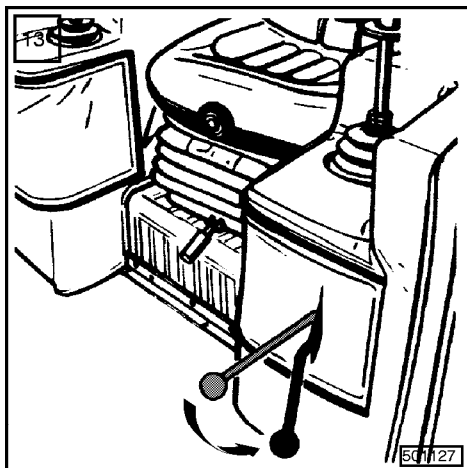
TO RELEASE THE SEAT BELT

To release the seat belt, lift the latch on the right hand side of the seat belt buckle (fig. 12).

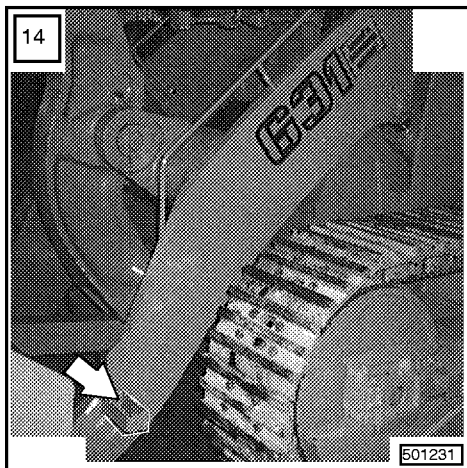
3.7.4 SECONDARY BELT (Special equipment)

The secondary seat belt tethers should be adjusted in such a way, that the belt is tight when the seat is relaxed. If the position of the seat is changed, readjust the seat belt tethers as well!

3.8 EMERGENCY EXIT



Always enter and leave the cab through the left cab door. Use the right cab door only in an emergency situation. Do not block the exit. Before machine start up, check if you can leave the cab through the right door without a problem. Before leaving the cab, make sure to place to safety lever in the full 'down' position (fig. 13).

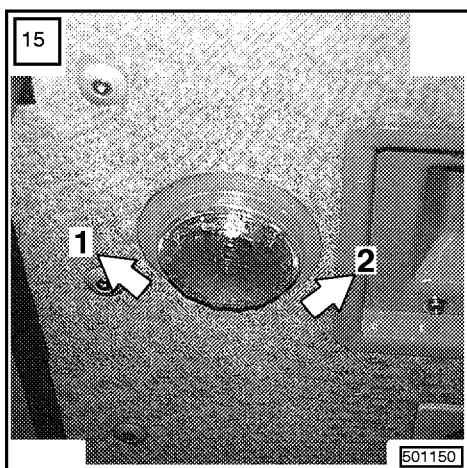


3.9 ENTERING AND LEAVING THE CAB

Always use the steps, rails and handles provided to leave and enter the cab.

- Enter and leave the machine on the left front, via the step on the push frame and chains (fig. 14). Make sure the steps and chains are clean before stepping on them. Always grasp the handles with both hands when stepping on or off the machine.

NEVER JUMP OFF THE MACHINE!



3.10 INTERIOR LIGHTING

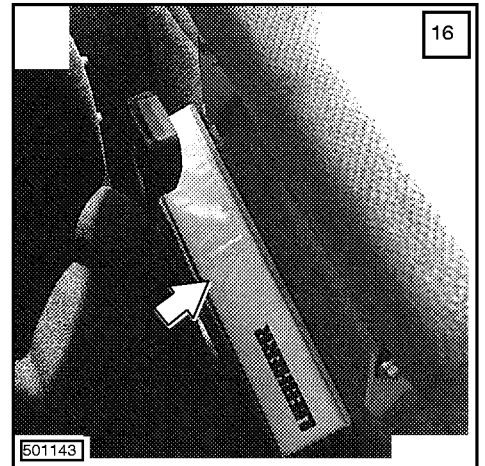
To turn the interior light on, turn the dome light in the cab roof to the right (fig. 15, pos. 1).

To turn the interior light off, turn the dome light in the cab roof to the left (fig. 15, pos. 2).

3.11 COMPARTMENT FOR MACHINE MANUALS

Always keep a copy of the machine manuals in the compartment on the left hand side behind the operator's seat (fig. 16).

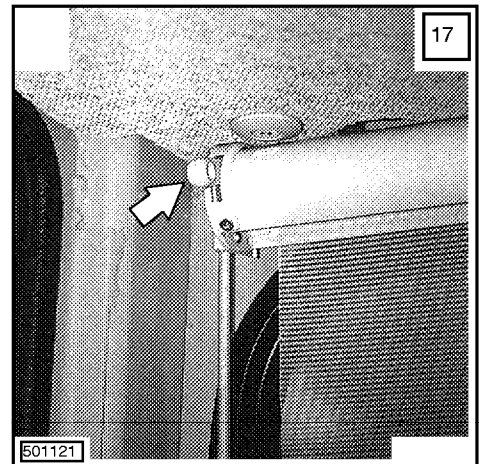
One set of manuals is part of the machine.



3.12 SUN SHADE

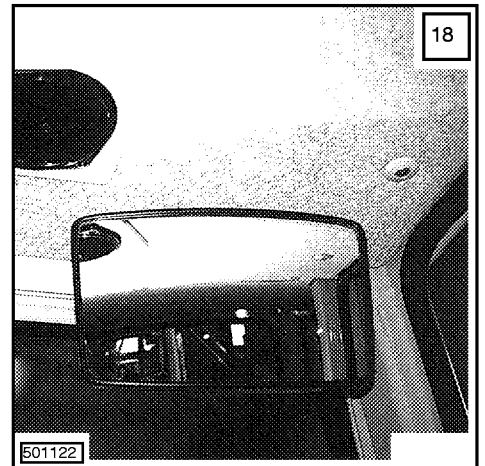
Every operator's cab is equipped with a sun shade, which can be individually adjusted by pulling the bottom rod.

By pushing the lever on the left hand side of the sun shade, the shade will roll up again (fig. 17).



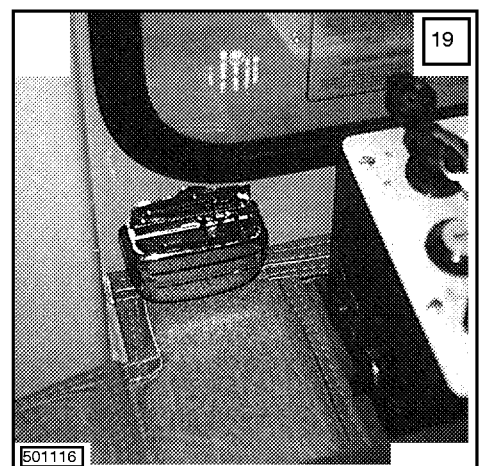
3.13 INSIDE REAR VIEW MIRROR

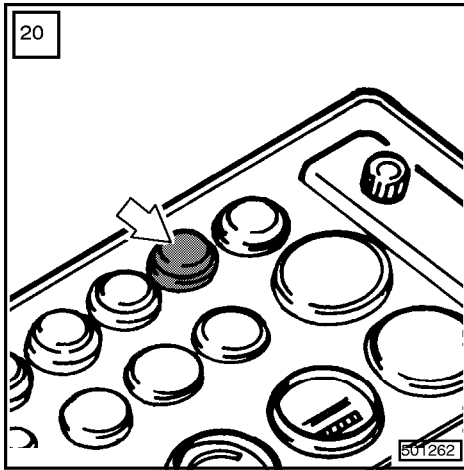
The operator's cab is equipped with a rear view mirror. Before starting to work, the operator should adjust the mirror so that he is able to monitor the complete rear area while seated in his seat (fig. 18).



3.14 ASHTRAY

The ashtray installed in the right front cab can be removed to be emptied by pulling the tray upward (fig. 19).

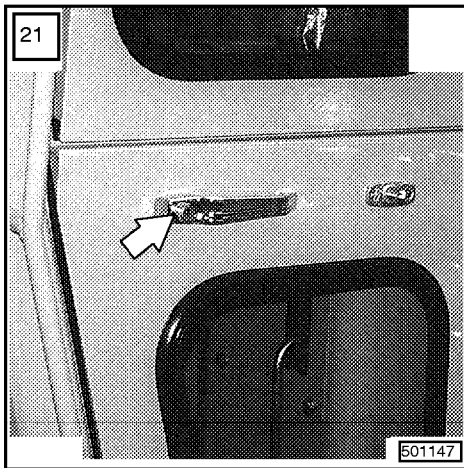




3.15 ELECTRIC WINDSHIELD WASHER SYSTEM

With the ignition turned on, push the button (fig. 20) to turn the electric windshield washer system on.

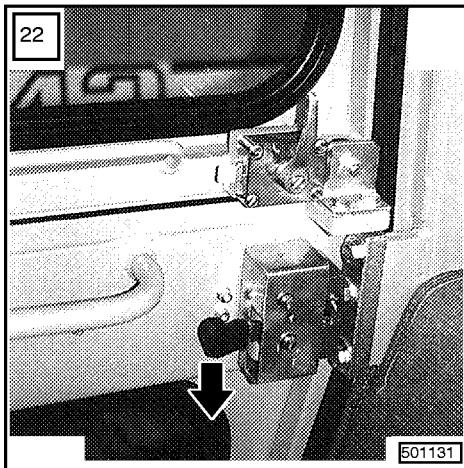
Windshield washer fluid is sprayed onto the windshield as long as the button is held down.



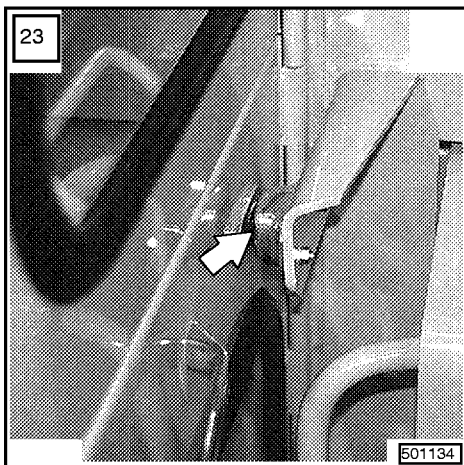
3.16 CAB DOORS

The cab doors are held closed by the door lock.

To open the doors from the outside, push the button (cylinder lock) on the door handle (fig. 21).

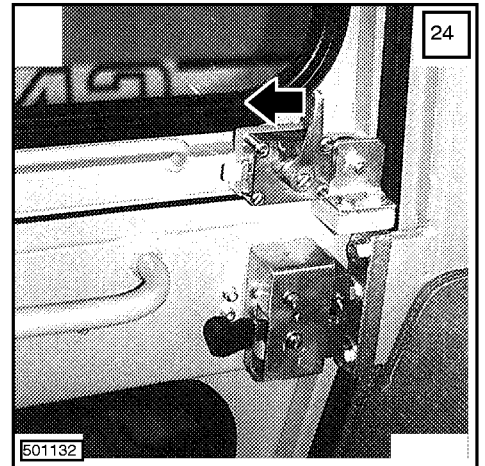


Open the cab doors from the inside by pushing the lever on the door lock down (fig. 22).

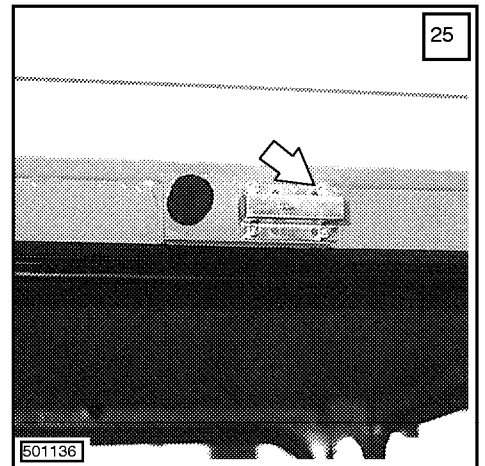


Opened cab doors must be held by the retainer (fig. 23).

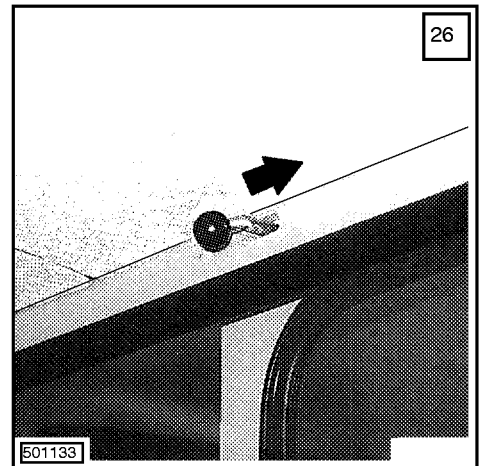
The upper door panel of the cab door can be folded back separately from the lower part by pulling the lever (fig. 24).



The open door panel must be notched in the door retainer on the cab (fig. 25).

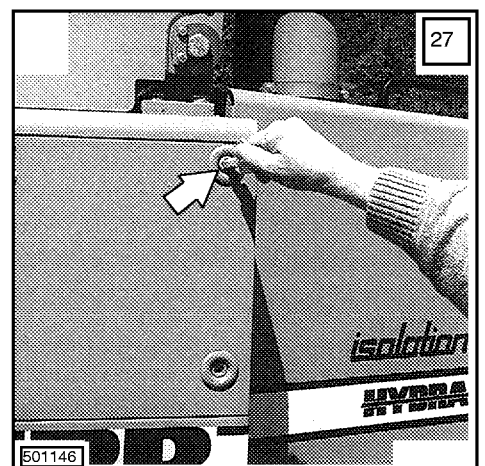


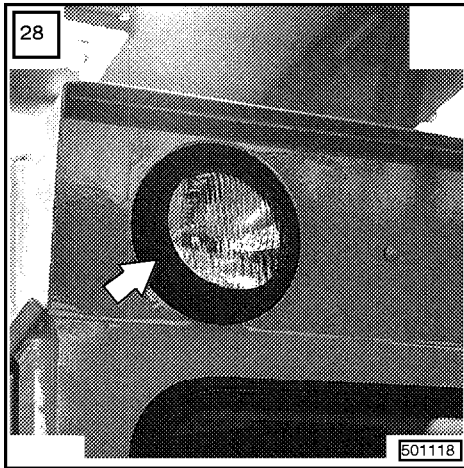
To release the door panel lock, push the lever (fig. 26) on the inside of the cab to the front.



3.17 MAINTENANCE ACCESS

To open and close the access covers to the engine compartment, air filter, battery compartment and under the operator's seat, insert a socket wrench, push and turn (fig. 27).





3.18 FLOODLIGHTS

The floodlights should be adjusted in such a way, that the working areas in front and behind the machine are fully illuminated (fig. 28).

3.19 FIRE EXTINGUISHER (Optional equipment)

Mounting brackets have been installed on the left hand side behind the operator's seat to hold a fire extinguisher.

Contact your Liebherr dealer for further details.

3.20 BEACON (Optional equipment)

Your machine has been prepared at the factory for the installation of a beacon.

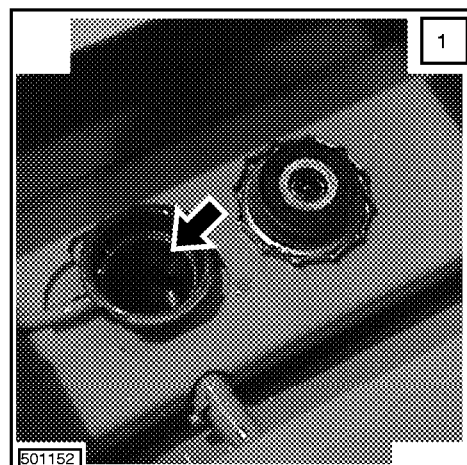
For Id. No. and retrofit installation, contact your Liebherr dealer or service center.

4. OPERATION

4.1 WALK AROUND INSPECTION

 CAUTION

Read and observe the safety guidelines in chapter 2 in this Operation and Maintenance Manual.



4.1.1 CHECK THE ENGINE OIL LEVEL

Check the engine oil level with machine on level ground. After engine shut down wait a few minutes for the oil to collect in the oil pan.

The oil level must be between the MIN and MAX mark on the dipstick.

Do not overfill the engine past the MAX mark. Refer to Mercedes - Benz manual.

4.1.2 CHECK THE COOLANT LEVEL

 CAUTION

At or near operating temperature the engine coolant is hot and under pressure.

Avoid contact with components containing coolant, since it could cause severe burns.

Check the coolant level only after the radiator cap is cool enough to touch. Read the instructions on the cap.

Turn the cap slowly to relieve pressure.

Check the coolant level. The coolant level must be visible at the lower edge of the filler neck (fig. 1).

Check the engine, fan and radiator for damage, dirt and restrictions to air flow. Clean as necessary.

After refilling or adding to the cooling system, let the engine run for a short time with the heater turned on. Recheck the coolant level.

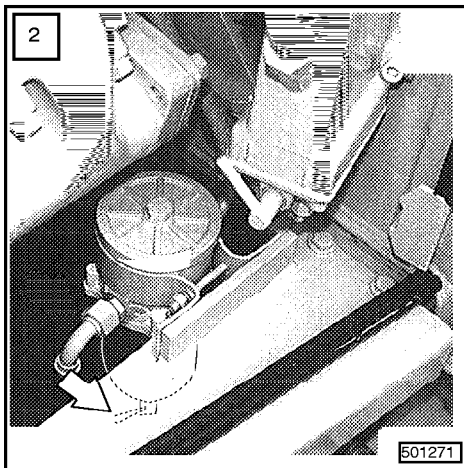


NOTE

The engine coolant is a mixture of antifreeze and water and must provide year round antifreeze protection.

The machine is filled at the factory with a coolant mixture of 50% antifreeze / 50% water, protecting the system to -36°C.

For quantities, refer to the lubrication chart.



4.1.3 CHECK THE FUEL SYSTEM

CAUTION

Do not store Diesel fuel on the machine or in glass containers. Do not add fuel in a closed area.

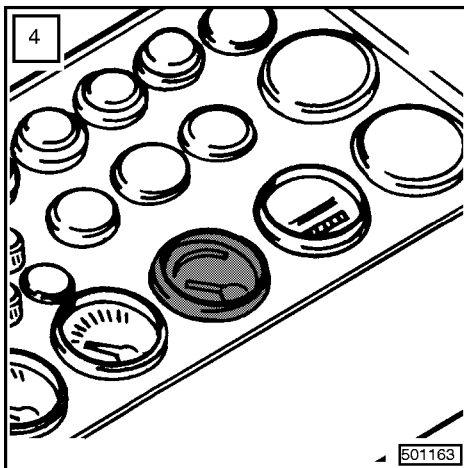
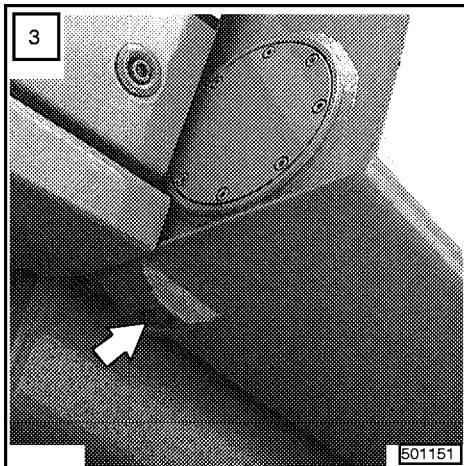
Never smoke or allow an open flame in refueling areas.

Drain water and sediments from the fuel filters, the fuel filter / water separator and from the fuel tank daily, or as necessary:

- Place a suitable container under the drain valve.
- Open the valve on the filter (fig. 2) or

carefully open the drain plug on the fuel tank (fig. 3) until clean fuel emerges.

- Close the valve and drain plug again.



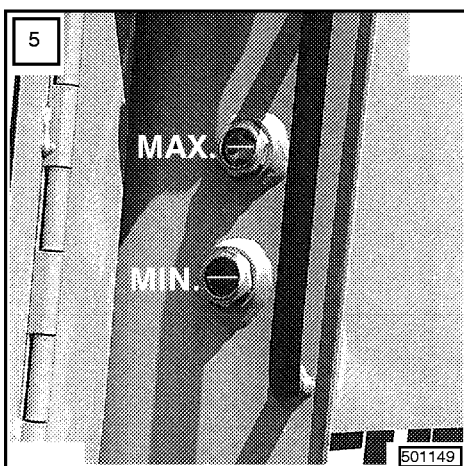
Note:

The fuel gauge in the instrument panel shows the fuel level in the fuel tank (fig. 4).



NOTE

Maintain a high fuel level in the tank to reduce condensation and corrosion.



4.1.4 CHECK THE HYDRAULIC OIL LEVEL

With machine on level ground and the hydraulic cylinders retracted, the oil level must not be above the center of the upper sight gauge (fig. 5 MAX.)

With machine on level ground and the hydraulic cylinders extended, the oil level may not drop below the center of the lower sight gauge (fig. 5 MIN.)



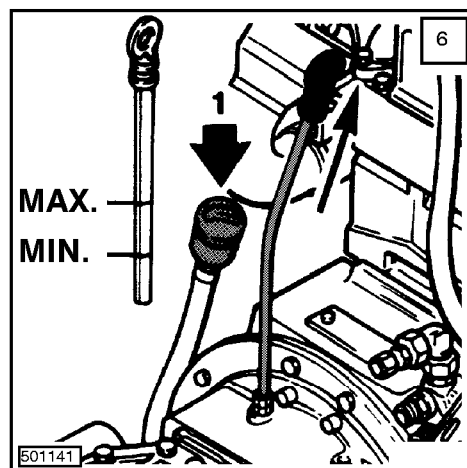
NOTE

Add hydraulic oil only through the return oil filter. Refer to chapter 5 in this Operation and Maintenance Manual for oil specifications.

4.1.5 CHECK SPLITTERBOX OIL LEVEL

Pull dipstick (fig. 6) and wipe off with a clean cloth. Insert the dipstick all the way. Pull the dipstick out and check the oil level. The oil level should be between the MIN and MAX mark on the dipstick.

Refer to chapter 5 in this Operation and Maintenance Manual for oil specifications.

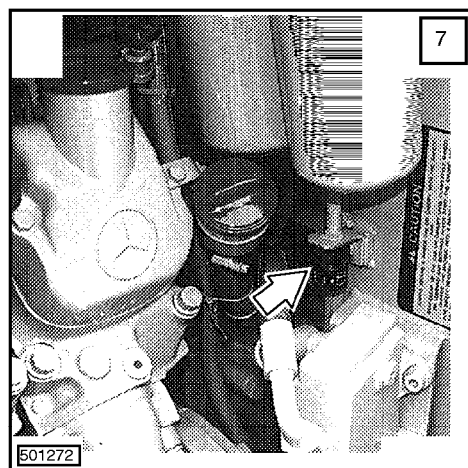


4.1.6 CHECK THE VACUUM INDICATOR FOR THE DRY AIR FILTER

The vacuum indicator (fig. 7) on the engine block shows the degree of contamination of the dry air filter.

If the dry air filter is clogged, the vacuum pressure in the clean air line rises and the red ring on the vacuum indicator becomes visible when the maximum vacuum pressure has been reached.

- Open the left engine compartment door and check if the red ring is visible in the vacuum indicator (fig. 7). If the red ring is visible, clean or change the dry air filter as outlined in the Operation Manual.

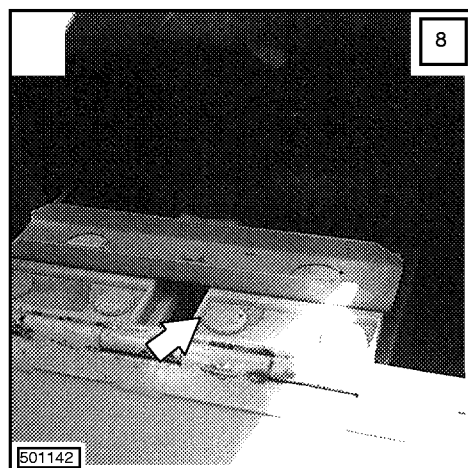


4.1.7 CHECK THE ELECTRICAL SYSTEM

Check the entire electrical system, such as switches, indicator lights, headlights, fuses, etc. for proper function and damage. Check battery condition and installation (fig. 8).



When working on the battery, always wear gloves and safety glasses. Do not smoke or keep an open flame near this area.



4.2 MACHINE START UP SAFETY

- Before starting the machine, perform a thorough walk around inspection.
- Visually check the machine for loose bolts, cracks, wear, leaks, and any evidence of vandalism.
- Never start or operate an unsafe or damaged machine.
- Be certain that all defects are taken care of immediately.
- Make sure that all covers and doors are closed and locked. Check if all warning and safety decals are on the machines, make sure that all of them are legible.
- Clean all windows and mirrors, secure all doors and windows to prevent any inadvertent movement.

- Always enter the cab through the left door. Use the right door only in emergencies.
- Make sure that no one is on or under the machine. Warn all personnel in the surrounding area on the job site before operating the machine.
- After entering the cab, adjust the operators seat, the rear view mirror, the arm rests and the seat belt as well as seat belt tethers. Be certain that all controls can be reached so you can work comfortably.
- All noise level protection devices on the machine must be operational during operation.
- Never operate a machine without a cab or canopy.

4.3 ENGINE START UP SAFETY

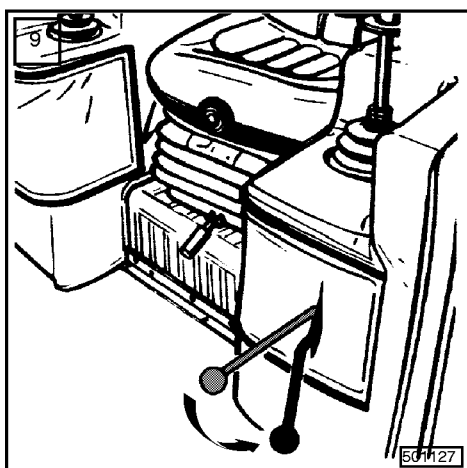
- Before starting the engine, check all indicator lights and instruments for proper function. Place all operating and control levers into neutral position.
- Before you start the engine, warn any personnel in the surrounding area by sounding the horn .
- Start the machine only while seated in the operators seat, and with the seat belt secured.
- If no other instructions were given, follow the engine starting instructions as outlined in the **Operation and Maintenance Manual**.
- Start the engine and check all indicator lights, gauges, instruments and controls.
- Start the engine only in a well ventilated area. If necessary, open doors and windows to assure sufficient fresh air supply. Warm up the engine and hydraulic system to bring engine and hydraulic oil to operating temperature, as low oil temperatures cause the machine to be unresponsive.
- Check that all attachment functions are operating properly.
- Move the machine slowly and carefully into an open area and check all travel and brake functions, the steering function as well as the turn signals and lights.

4.4 STARTING THE DIESEL ENGINE

NOTE

Before the engine is started, be sure you have read and understand the operating instructions.

Due to the hydrostatic drive, the engine cannot be started by towing or pushing.



CAUTION

The engine can only be started with the safety lever in the full down position. (fig. 9)

Should it be possible to start the engine with the safety lever in the up position, check and correct the defect.

4.4.1 STARTING THE ENGINE

- Move the engine shut off lever into operating position. (fig. 10, pos. 7.2)
- Set the throttle control lever to full load position (fig. 10, pos. 7.2)
- Insert and turn the ignition key to position 50.1 (fig. 11) to turn the electrical system on.

The following indicators, instruments and alarms must come on:

- Indicator light - travel brake (red)
- Indicator light - replenishing oil pressure (green)
- Battery charge indicator light (red)
- Acoustical warning signal
- Turn the ignition key without preheating to position 50.3 (fig. 11) and hold the key in this position until the engine starts.

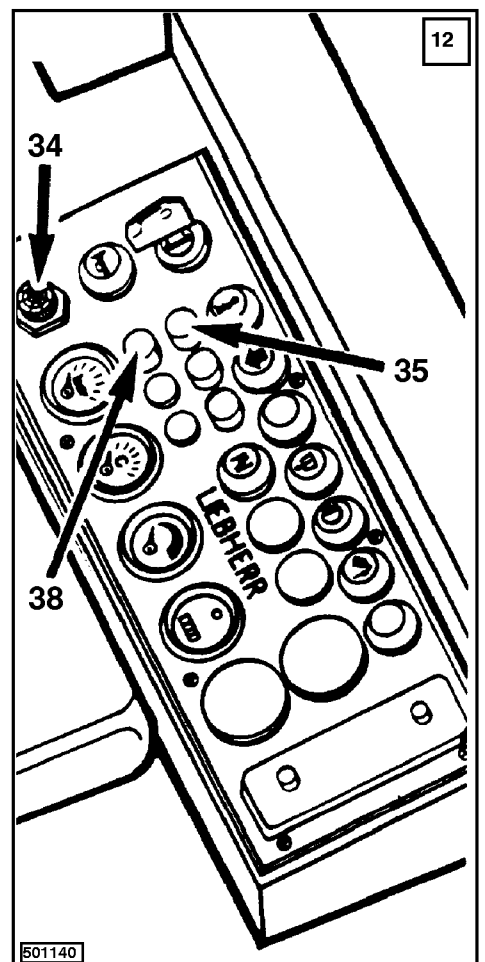
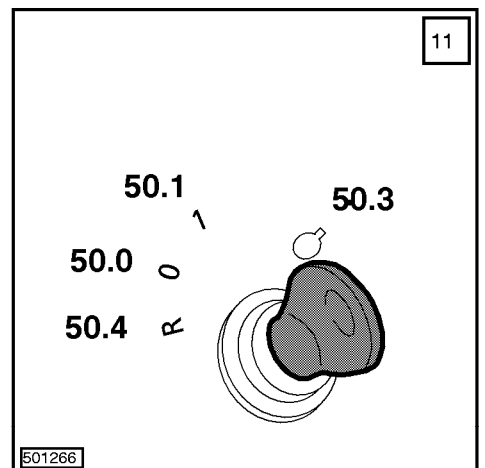
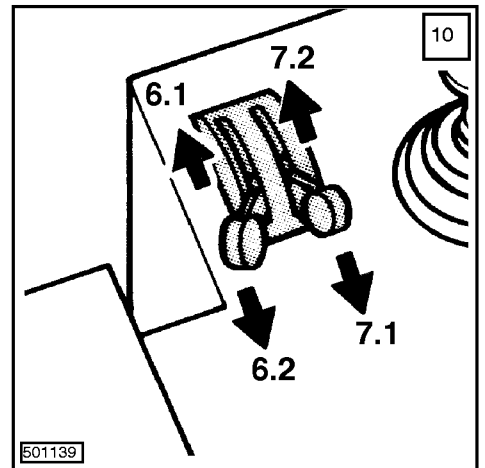
As soon as the engine is running, release the key - it automatically returns to operating position (50.1).

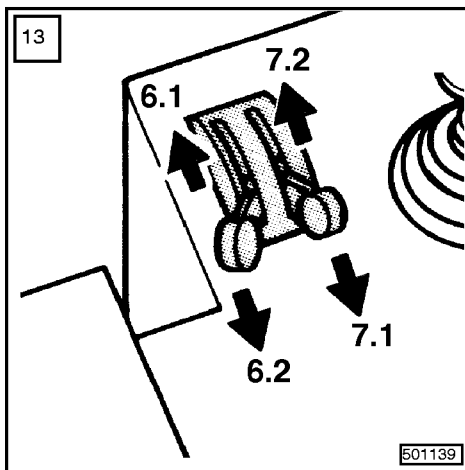
Note: Do not crank engine for more than 10 seconds! If the engine does not start, repeat starting procedures at 2 minute intervals.

Once the engine is running the following indicators and alarms must turn off (fig. 12):

- Indicator light - Replenishing oil pressure (pos. 35)
- Charge indicator light (pos. 38)
- Acoustical warning signal (pos. 34)

If the indicators and / or alarms do not turn off, the engine must be stopped immediately and the problem must be corrected.

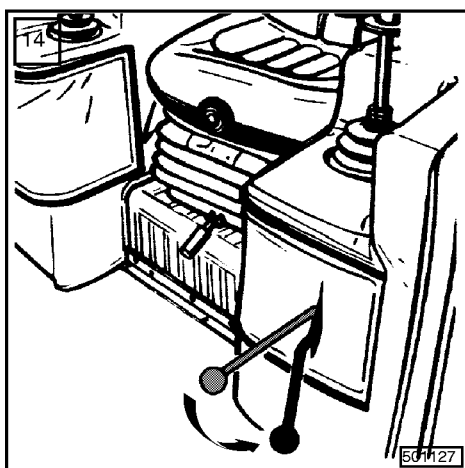




Move throttle control lever to low idle position (fig. 13, pos. 7.1). Avoid full engine RPM and load right after starting. Warm up engine and hydraulic system gradually until operating temperatures are reached.

4.5 MACHINE PARKING SAFETY

- Park the machine only on firm and level ground. If it becomes necessary to park the machine on a grade, it must be properly blocked with wedges to secure it and prevent any unintentional movement.
- Lower the attachment to the ground and lightly anchor it in the ground.
- Bring all operating levers and controls into the neutral position, place the safety lever in full down position and turn the engine off, as outlined in the Operation and Maintenance Manual, before you leave the operators seat.
- Lock the machine, remove all keys and secure the machine against vandalism and unauthorized use.
- Never park the machine in such a way as to block access to entrances, exits, ramps, fire hydrants, etc.



4.6 MACHINE SHUT DOWN

4.6.1 TO SHUT OFF THE ENGINE

Reduce engine speed to low idle (fig. 12, pos. 7.1) and let the engine run for a short time to lower the temperature and to give the turbocharger a chance to run out. Place the safety lever in the full down position (fig. 14) The indicator light for the travel brake must light up. Move the throttle control lever until the engine stops. (fig. 12, pos. 6.1)



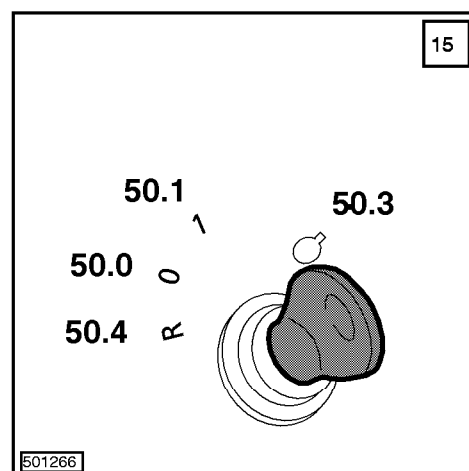
NOTE

Turn off all energy users before turning off the ignition switch.

Turn the ignition key to position 50.0 (fig. 15) and remove it

All indicator and warning systems should be off.

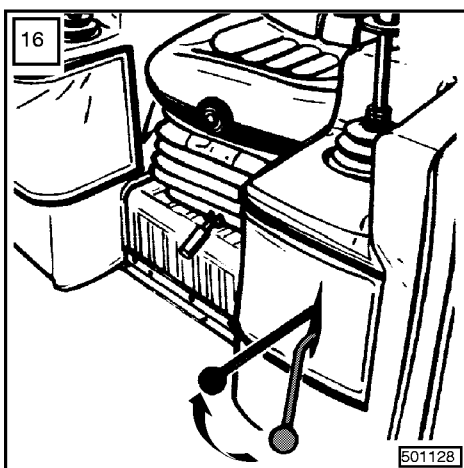
Turn the key to position 50.4 (fig. 15) to use the radio and the dome light.



4.7 MACHINE OPERATING SAFETY

- Make sure you are aware of any special circumstances on the job site, make sure you are familiar with any special guidelines and warning signals. Familiarize yourself with the job site before starting to work, any special hindrances and obstacles influencing operation or movement, the ground conditions, and any special protection required to secure the job site from public highway traffic.
- Always keep a safe distance from overhangs, walls, drop offs and unstable ground.
- Make sure you are especially aware of changing ground conditions, visibility or weather conditions.
- Make sure you know the location of utility lines. Be aware of underground cables, gas and water lines. You must be especially careful when working near supply lines. If necessary, contact the appropriate utility company for information and location of utility lines.
- Keep sufficient distance from electrical lines with the attachment, avoid working near high voltage electrical lines.
 - **DANGER OF LOSS OF LIFE!**
 - You must inform yourself of proper distances to assure your safety while working.
- If you do touch an electrical line with the attachment or machine, proceed as follows:
 - DO NOT leave the machine!
 - If possible, move the machine a sufficient distance away from the danger area.
 - Warn all personnel in the surrounding area not to come close to the machine and/or touch the machine.
 - Instruct somebody to turn the electrical power off.
 - Do not leave the machine until you are assured that the electrical line which has been touched or damaged is no longer energized, and the power has been turned off!
- Before moving or working, make sure you always check that the attachments can be operated safely.
- When travelling or moving the machine on public roads, highways, or properties, make sure to observe all applicable laws, rules and regulations. After moving a machine it may become necessary to reassemble it and to bring it back to proper operating conditions.
- Always turn on the light if visibility is poor or as dusk approaches.
- Never allow another person to ride along on the machine.
- Always work while seated in the operators seat and with the seat belt secured.
- In the event the machine should tip, remain in the operators seat, with the seat belt securely fastened. Experience has shown that it is safer to remain in the cab in the event of an overturn.
- Report any functional problems or defects immediately, and make sure that all necessary repairs are completed before resuming operation.

- Be certain that no one is endangered by moving the machine.
- Do not get up from the operators seat as long as machine is still moving.
- Never leave the machine unattended, with the engine running.
- When traveling, make sure that the attachment is in transport position and keep the load as close to the ground as possible.
- Avoid any working movement which could cause the machine to tip or overturn. However, if the machine does begin to tip or slide or slip on a grade, immediately lower the attachment and load to the ground and turn the machine downhill. If possible, work downhill or uphill, never sideways on a slope!
- Always move slowly on rocky, rough or slippery ground or on a slope.
- Always adapt your travel speed to working conditions.
- Never travel on slopes that exceed the maximum permissible gradeability.
- Never travel downhill at maximum speed, always at low speed to prevent loss of control. The engine must be at high idle and the speed must be reduced by preselecting the low speed range. Always change to the low speed range before reaching the slope, never move onto a slope and then change the speed range.
- When loading a truck, the Truck operator must leave the cab, even if the cab is FOPS protected.
- The machine must always be equipped with proper protective devices designed for specific purposes. The machine must be equipped with proper protection when it is utilized in demolition work, land clearing, crane operation, etc.
- Always have another person guide you if visibility is restricted. Always take signals from one person only.
- Utilize only experienced personnel to attach loads and direct operators. The person giving signals must be visible to the operator or be equipped with a two way radios.
- When using a two way radios or Citizens Band radios (CB), the safety lever must be in the full down position.



4.8 TRAVEL FUNCTIONS

Release the parking brake

To release the parking brake, the safety lever must be fully raised (fig. 16).



NOTE

Certain wave lengths could interfere with the travel operation of the machine. Before operating a two way or CB radio on the machine, return the travel joystick to neutral position and place the safety lever in the full down position.

CAUTION

In case of an emergency or loss of machine control, immediately lower the attachment, then the safety lever.

Note:

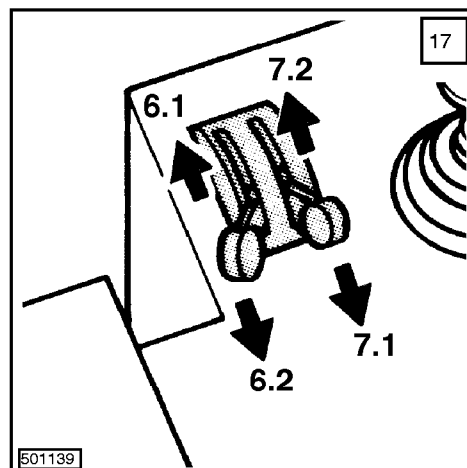
- Warm up engine and hydraulic system to operating temperatures.

**NOTE**

As a basic rule, the machine should be operated with the engine running at full RPM (fig. 17, pos. 7.2).

In isolated cases, such as tight working areas, the machine may be operated at reduced engine RPM.

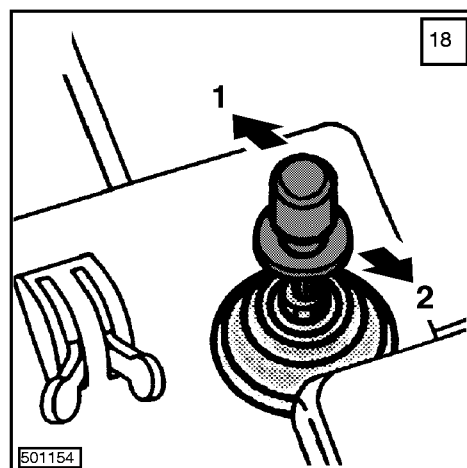
The engine and hydraulic system may be heated up by repeatedly actuating the attachment functions.

**4.8.1 STRAIGHT TRAVEL****TRAVEL FORWARD**

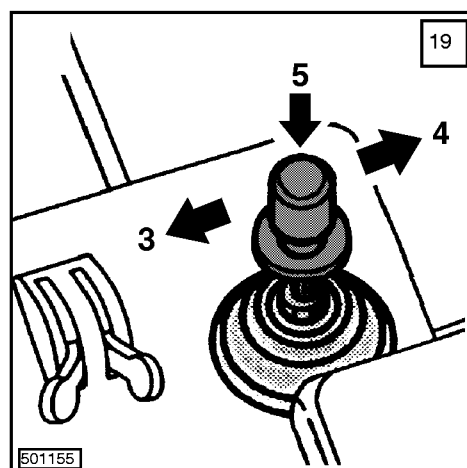
Slowly push the travel joystick forward. The more the travel joystick is pushed forward, the higher the travel speed will be (fig. 18, pos. 1)

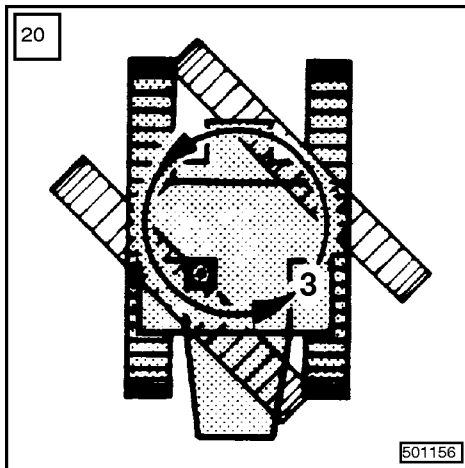
TRAVEL REVERSE

Slowly pull the travel joystick backwards. The more the travel joystick is pulled back, the higher the travel speed will be (fig. 18, pos. 2)

**4.8.2 VARIOUS TRAVEL FUNCTIONS**

In addition to forward, reverse and counterrotation, the operator can make any type of turn in forward and reverse at various speeds (fig. 19).





4.8.3 COUNTERROTATION



NOTE

During counterrotation, the two track chains turn in opposite directions. The counterrotation speed depends directly on the joystick deflection.

Counterclockwise Turn

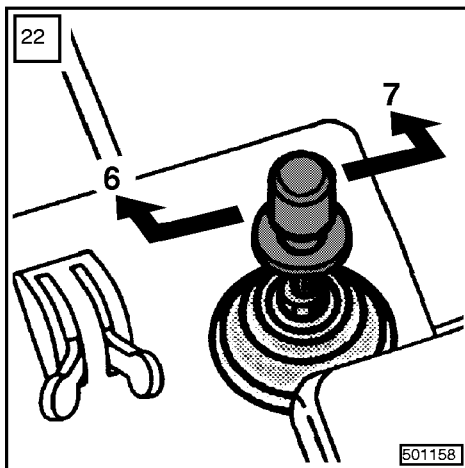
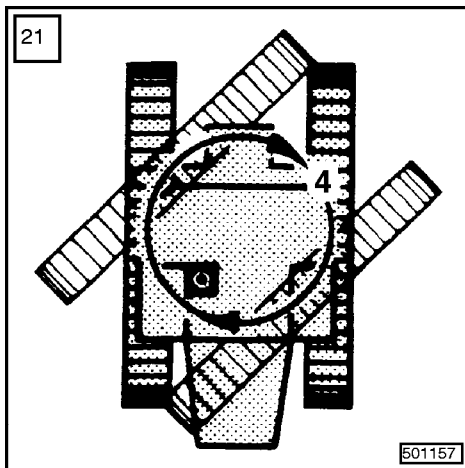
Depress the button on the travel joystick (fig. 19, pos. 5) and move the joystick to the left at the same time (fig. 19 / 20, pos. 3).

The more the joystick is moved to the left, the faster the machine will counterrotate.

Clockwise Turn

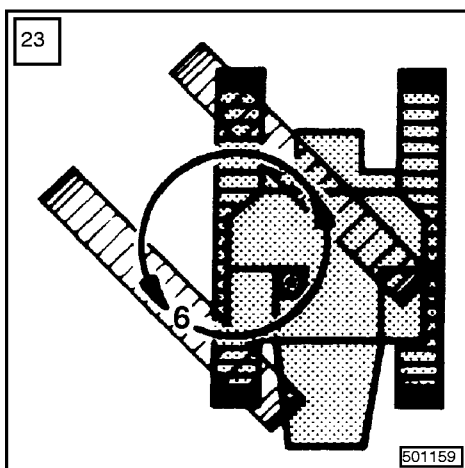
Depress the button on the travel joystick (fig. 19, pos. 5) and move the joystick to the right at the same time (fig. 19 / 21, pos. 4).

The more the joystick is moved to the right, the faster the machine will counterrotate.



4.8.4 PIVOT TURN

In addition to forward, reverse and counter rotation, the operator can make any type of turn in forward and reverse.

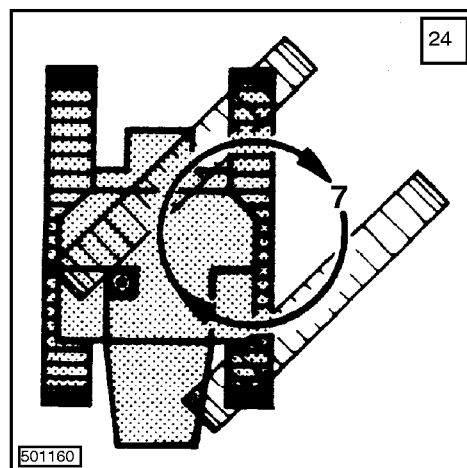


Pivot turn - left forward

Push travel joystick to the left and slowly forward (fig. 22 / 23, pos. 6). The more the joystick is pushed forward, the faster the pivot turn will be.

Pivot turn - right forward

Push travel joystick to the right and slowly forward (fig. 22 / 24, pos. 7).

**4.8.5 TURNING - POWER TURN****Power turn - left forward**

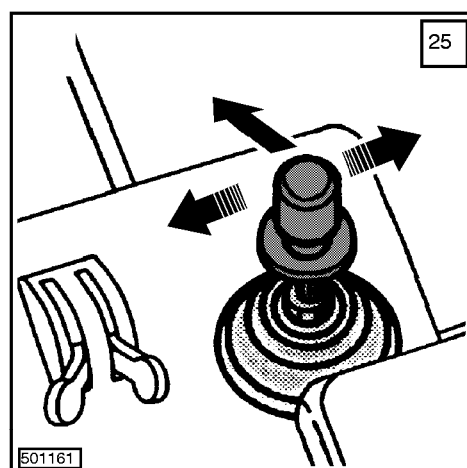
Move the travel joystick forward and slowly to the left. The machine will now travel forward with a slight left hand turn. Both tracks are turning.

The further the joystick is deflected to the left, the sharper the turn will be (fig. 25).

Power turn - right forward

Move the travel joystick forward and slowly to the right. The machine will now travel forward with a slight right hand turn. Both tracks are turning.

The further the joystick is deflected to the right, the sharper the turn will be (fig. 25).

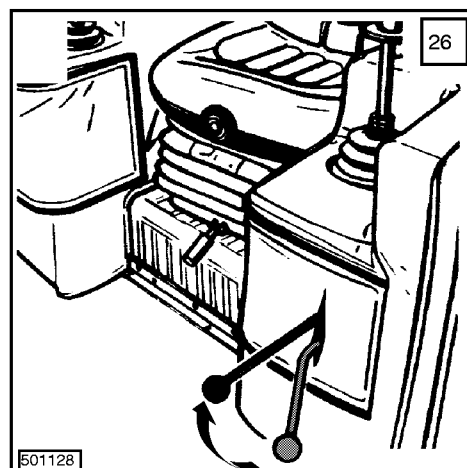
**4.8.6 BRAKE OPERATION**

The hydrostatic travel drive is also an operating brake. As soon as the travel joystick is moved towards the neutral position, the machine slows down.

By placing the travel lever in neutral position the hydrostatic drive will keep the machine from rolling off.

CAUTION

Moving the travel joystick into neutral position too fast during travel causes the machine to stop suddenly and abruptly.



The parking brake is applied by placing the safety lever in the full down position.

The parking brake is released by raising the safety lever (with the engine running) (fig. 26).

CAUTION

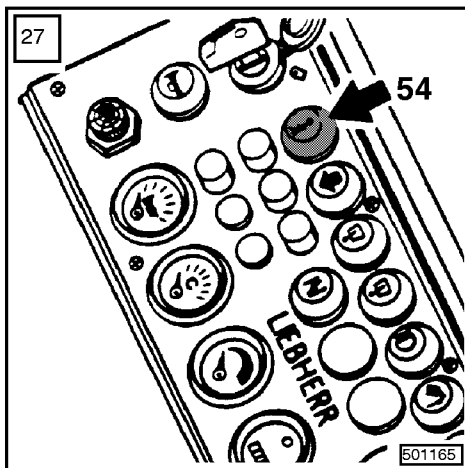
The safety lever must always be in the full down position when the engine is not running.

4.8.7 HI / LOW TRAVEL SPEED SELECTOR

CAUTION

When constantly pushing heavy loads, when working on inclines or slopes, the travel speed should be reduced by pushing the hi/low speed selector switch.

The machine is equipped with a travel speed selector switch to preselect the speed.



In neutral position, the travel speed can be varied between 0 and 11 km/h (0 and 6.8 MPH) (forward and reverse.)

In low range, with button of switch 54 depressed, the travel speed can be varied between 0 to 2.85 MPH (0 to 4.5 km/h).

By pushing the button again (fig. 27, pos. 54), the normal travel speed is reestablished.

4.9 ATTACHMENT OPERATION

DANGER

Do not work or allow work underneath or on the attachment unless it is properly supported or placed on the ground.

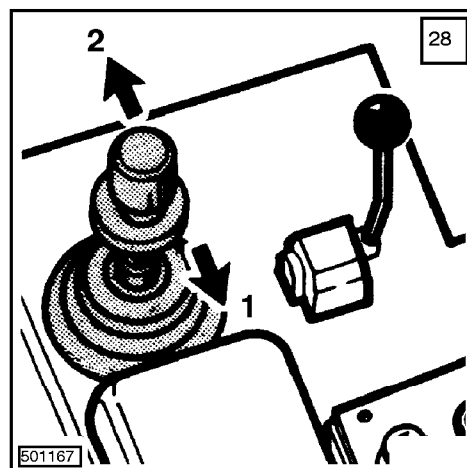
Note: All attachment functions are servo controlled for easy, comfortable and precise operation.

To operate the attachments, the safety lever must be raised.

4.9.1 TO RAISE / LOWER THE BUCKET

To raise the bucket:

Pull the bucket control lever to the rear (fig. 28 / 29, pos. 1).



To lower the bucket:

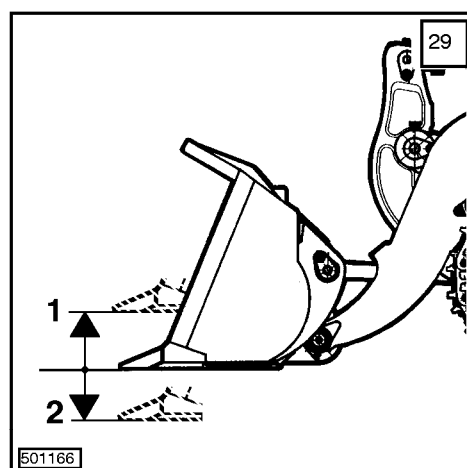
Pull the bucket control lever to the front until you feel some resistance (fig. 28 / 29, pos. 2).

The speed with which the bucket can be returned to the preselected working height depends on the lever deflection.



NOTE

Release the joystick and it will automatically return to the hold or neutral position. The attachment stays in the preselected working height.



4.9.2 TO LOWER THE ATTACHMENT IN AN EMERGENCY

In case the Diesel engine fails or in case of a drop in replenishing pressure, the attachment can be lowered by deflecting the joystick.

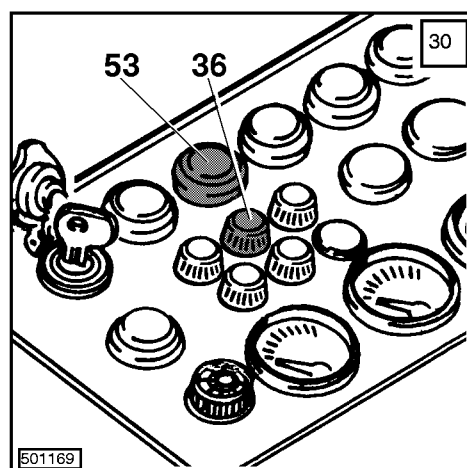
The safety lever must be in the raised position.

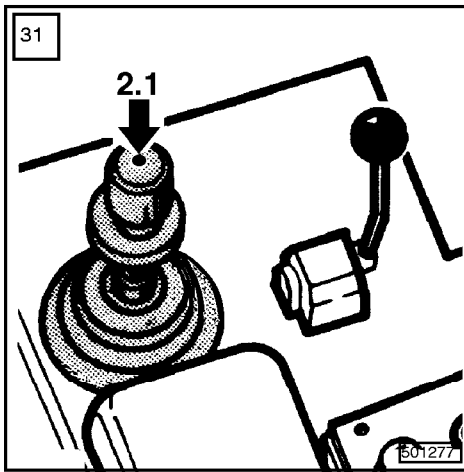
4.9.3 BUCKET FLOAT POSITION

Depress the switch (fig. 30, pos. 53) to preselect the float position.



Never activate the float position with the attachment raised! Before selecting the float position, always lower the bucket to the ground!





Engage or disengage the preselected float position by pushing the button on the joystick (fig. 31, pos. 2.1). When the float position is turned on, the indicator light on the instrument panel lights up (fig. 30, pos. 36).

This means that a raised bucket will immediately drop to the ground when released.

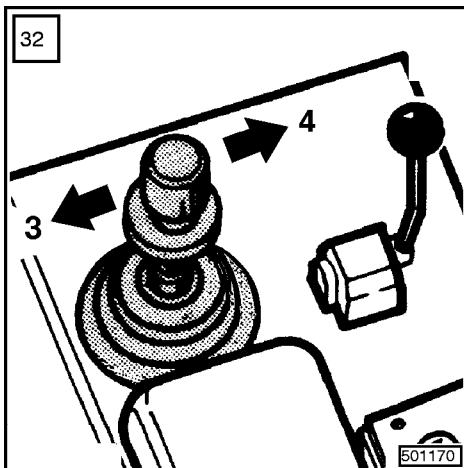
The bucket can freely follow existing ground contours.

By pressing the button again (fig. 31, pos. 2.1), the bucket float position is turned off.



NOTE

Always turn the bucket float position off first on the button 2.1 on the joystick, before turning off the switch - preselection bucket float position pos. 53 on the instrument panel (fig. 30).



4.9.4 TO CURL THE BUCKET OUT / IN

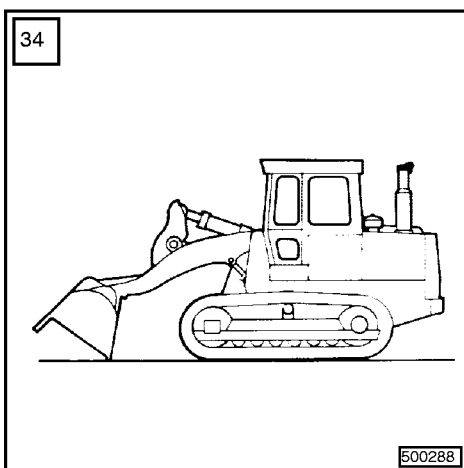
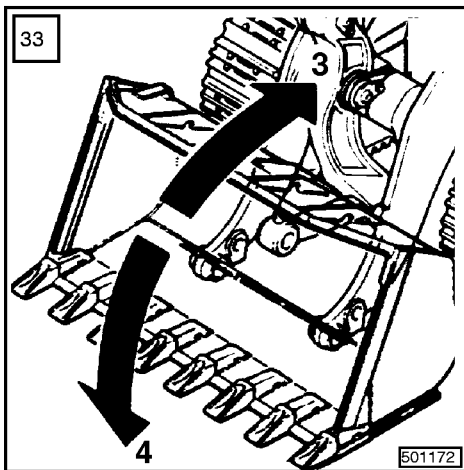
By moving the joystick from side to side, the bucket can be curled in or out. The speed depends on the lever deflection.

To curl the bucket in

Push the joystick to the left (fig. 32 / 33, pos. 3).

To curl the bucket out

Push the joystick to the right (fig. 32 / 33, pos. 4).



CAUTION

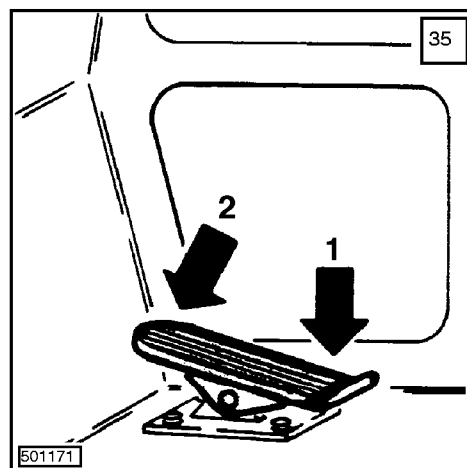
When the bucket is fully curled out (fig. 34), do not use the bucket to grade while moving forward. This practice could reduce the service life of the bucket loading system or damage it.

4.9.5 TO OPEN / CLOSE THE BUCKET (4 in 1 bucket)

By pressing the foot pedal down, the 4 in 1 bucket can be opened or closed, the speed depends on the pedal movement.

To open the bucket

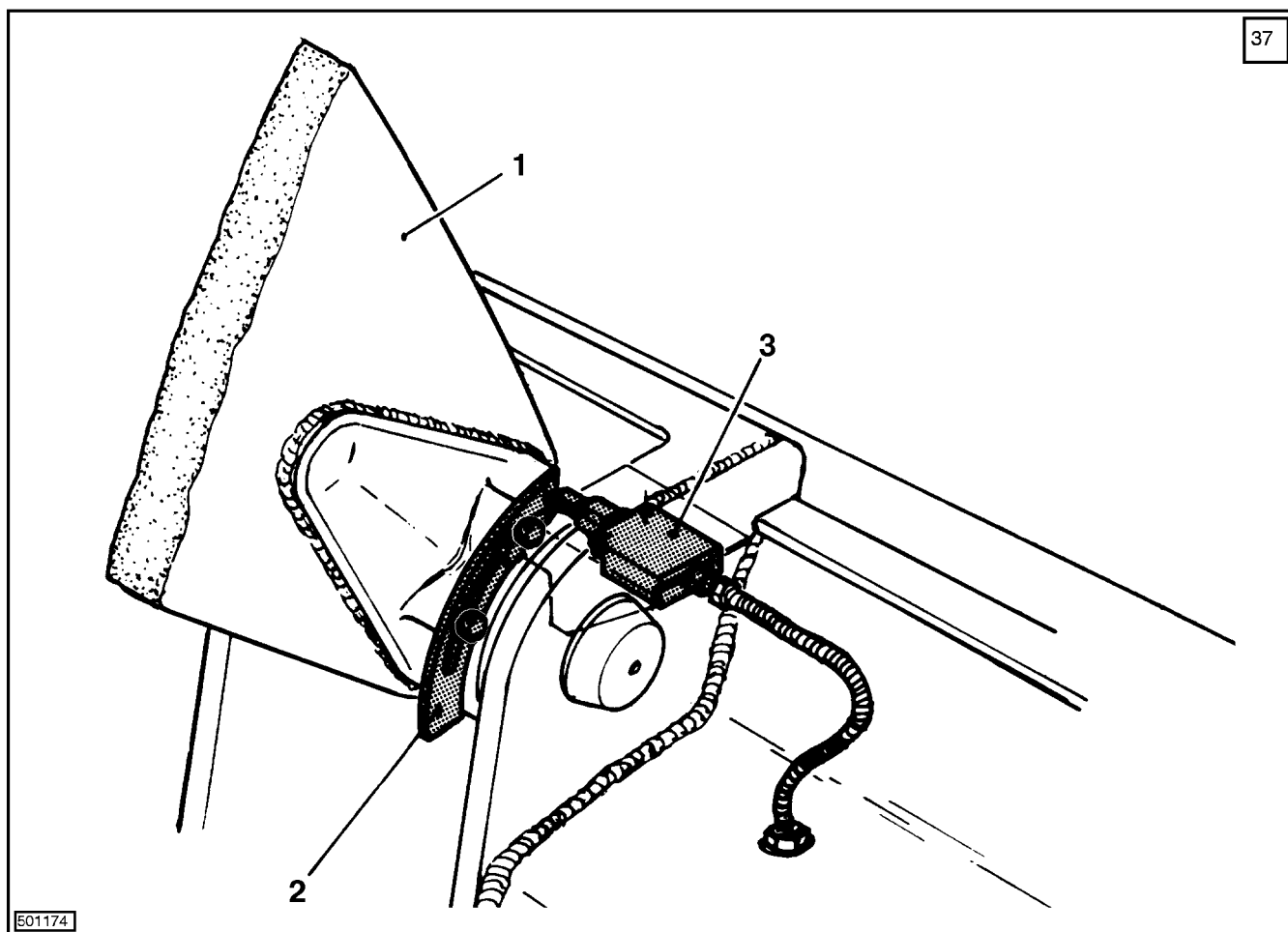
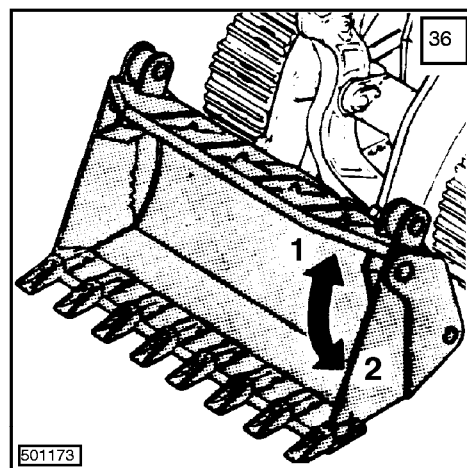
Press the foot pedal down to the rear (fig. 35/36, pos. 1).



To close the bucket

Press the foot pedal down to the front (fig. 35/36, pos. 2).

When the foot pedal is released, it returns automatically to neutral position, and the bucket back remains in the preselected position.



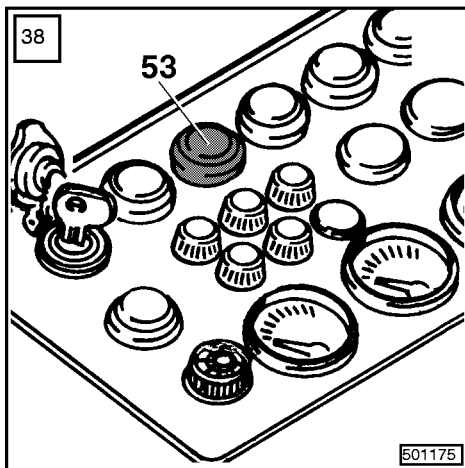
4.9.6 HOIST LIMIT SWITCH

For loading task, which do not require maximum dumping height, an adjustable hoist limit switch is available to preselect a reduced dumping height, and the "bucket up" movement is automatically interrupted at that predetermined point.

- Bring the bucket to the desired height.
- Release the mounting screws on the cam plate (fig. 37, pos. 2) and move the plate until the roller on the limit switch is pushed in (fig. 37, pos. 3).
- Retighten the mounting screws.
- Repeat the lifting procedure and check the dumping height.

Hoist limit switch (fig. 37)

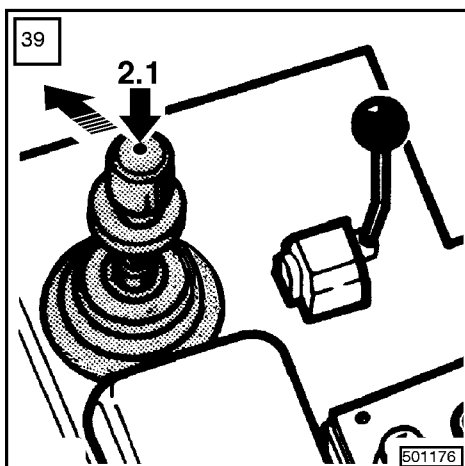
- 1 Bucket arm - right
- 2 Cam plate
- 3 Limit switch



4.9.7 AUTOMATIC BUCKET RETURN

If the bucket is to held at a certain angle, the bucket can be returned to this position from the curled out position via the automatic bucket return.

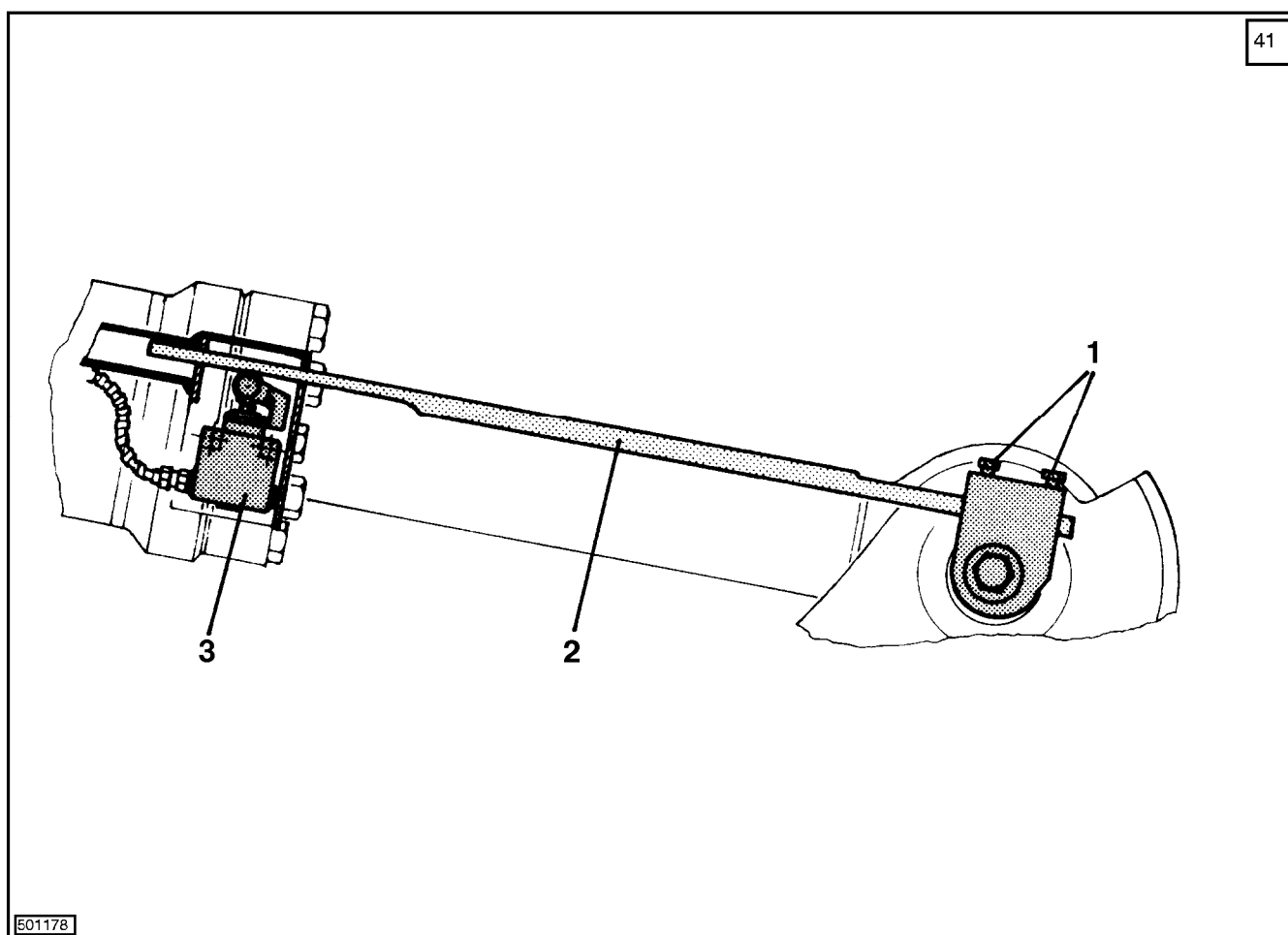
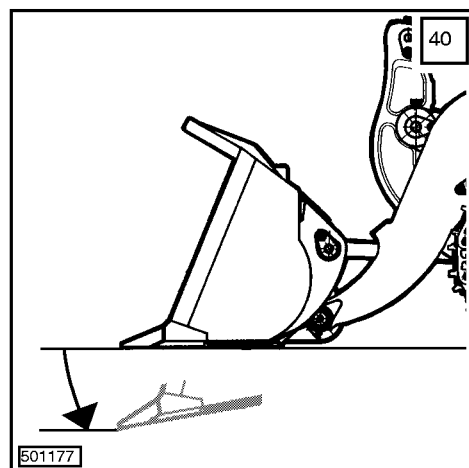
- Preselect bucket return on the instrument panel = DO NOT push switch (fig. 38, pos. 53) !



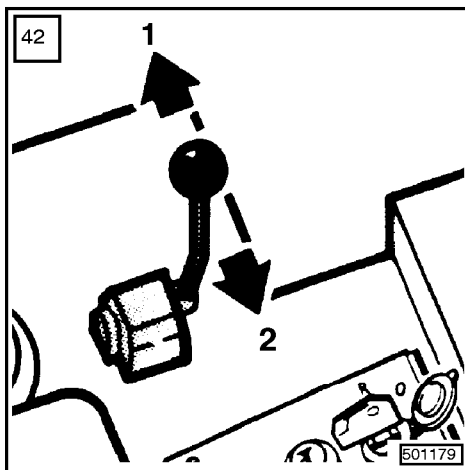
- Push the switch (fig. 39, pos. 2.1) on the joystick to curl in the bucket and it will remain in the preselected angled position.

Adjustment procedure to preselect the angle

- Lower the bucket and curl it out to a certain angle (fig. 40).



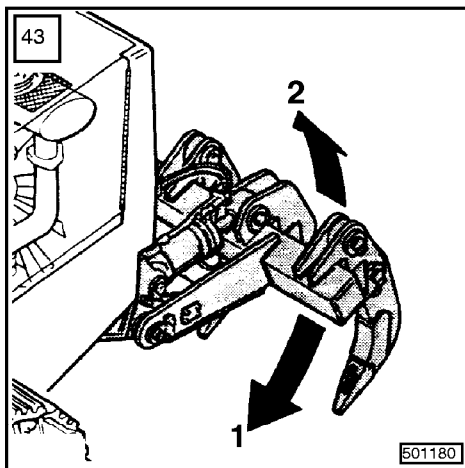
- Release the lock screws on the shifting rod (fig. 41, pos. 1), Move the shifting rod (fig. 41, pos. 2) in such a way that the shifting point touches the roller on the limit switch (fig. 41, pos. 3), but does NOT push it in.
- Retighten the lock screws.
- Lift the bucket and curl it out.
- Engage the automatic bucket return, lower the bucket and check the bucket angle.



4.9.8 RIPPER OPERATION

To lower the ripper

Push the ripper control lever to the front (fig. 42/43, pos. 1).



To raise the ripper

Push the ripper control lever to the rear (fig. 42/43, pos. 2).

4.10 CRUSHING AND BURN PREVENTION

- Never work underneath the attachment unless it is safely placed on the ground or properly blocked and supported.
- Never use damaged or insufficient load carrying devices, such as chains, ropes, ... Always wear gloves when handling wire ropes.
- When working on the attachment, never align bores with your fingers, always use proper alignment tools when installing, changing or servicing attachments.
- When the engine is running, make sure that no objects touch the radiator fan. Rotating fans will swirl and throw out objects which can become very dangerous and, in addition to damaging the fan, they can cause severe injury to yourself and others.
- Avoid contact with components containing coolant. At or near operating temperature, the engine coolant is hot and under pressure and could cause severe burns.
- Check coolant level only after the radiator cap is cool enough to touch. Remove the radiator cap slowly to relieve pressure. .
- Do not allow your skin to come into contact with hot oil or components containing hot oil. At or near operating temperature, engine and hydraulic oil is hot and can be under pressure.
- Always wear safety glasses and protective gloves when handling batteries. Make sure there are no sparks and open flames in the vicinity.
- Never permit anyone to hand-guide the attachment to its proper position.
- Secure the engine compartment doors in open position to avoid unwanted closing.

- Insure that all engine and battery compartment doors are closed and locked before operating the machine.
- Never work underneath the machine if the machine has been raised with its attachment. Prior to working underneath, the machine and/or its attachment must always be properly blocked and supported with wooden blocks. Do not use steel on steel support.

4.11 MACHINE TOWING SAFETY

- Always follow the correct procedure: Refer to the Operation and Maintenance Manual section Towing the machine.
- Tow the machine only in exceptional cases, such as removing the machine from a dangerous area.
- Be sure that all towing and pulling devices, such as cables, hooks etc. are safe and adequate.
- The cable or towing bar, which is used to tow the machine must be adequate to pull the machine and must be connected to the appropriate bores and couplers. Any damage or accident which is the direct result of towing this machine is expressly excluded from the manufacturer's and/or LIEBHERR's warranty.
- Never allow anyone to stand near the cable or on the machine while pulling or towing.
- Keep the cable tight and free of kinks.
- Carefully pull the cable tight, do not jerk! A sudden jerk can cause a slack cable to snap.
- When towing, keep the machine straight and maintain, permissible speed and route.
- When returning the machine to operation, proceed as stated in the Operation and Maintenance Manual.
- After the towing the machine, and before continuing operation, be certain to return the machine to a safe operating condition.

4.12 MACHINE TOWING

In case of a problem with the hydrostat, we recommend to repair the machine on site and to tow the machine only in cases when it must be removed from a danger zone.



DANGER

Improper towing of a disabled machine can be dangerous and could result in injury or death!

Always block and secure the machine against movement before disconnecting or releasing the brakes!

When towing a machine, observe all safety rules and regulations and follow the below listed guidelines.



NOTE

Towing the machine may be dangerous. The responsibility for safety rests with the person or persons performing the towing service.

Defects or accidents which may occur during the towing of the machine are not covered by the manufacturer's warranty.

The following towing instructions should only be used in case of emergencies in order to move a disabled machine to be repaired or hauled off. The machine should only be towed for a short distance at a maximum towing speed of not more than 1.2 mph (2 km/h).

Always haul the machine over long distances on a trailer!

The machine is equipped with a parking brake, which is released by replenishing oil pressure. The hydrostatic drive is used as an operating brake. Should the machine become disabled and/or loss of replenishing oil pressure occur, then the parking brake is spring applied and cannot be moved.

Before the machine is towed, observe the following safety rules:

- Never allow anyone to stand within the danger zone, near the machine or to stand or sit on the machine when it is towed.
- Do not use chains for towing, chains may break and cause injury. Use only wire cables or a towing bar.
- Be certain that the operator of the towing vehicle is protected in case the cable snaps or the towing bar breaks.
- Be sure all towing and pulling devices, such as hooks, cables and couplers have been inspected and are safe and adequate.
- The machine can only be towed backwards. Attach the towing cable on the rear.
Use a towing cable or rod with at least 1 1/2 times the capacity of the total weight of the machine to be towed. Keep the towing cable or bar as short as possible if the machine is stuck in mud or on an incline.
- Keep the angle of the towing cable in relation to the machine to a minimum. The angle should never exceed 30° from the machine longitudinal axle.
- Move the machine slowly and evenly, do not jerk. Jerky, uneven movements can stress the towing cable or rod and a sudden impact could snap the cable or rod.
- When towing the machine on a hill, the towing machine must be at least as large as the machine being towed.
Power, weight and braking power must be adequate to keep both machines under control.
If necessary, add a machine of the same size to the rear for braking purposes.

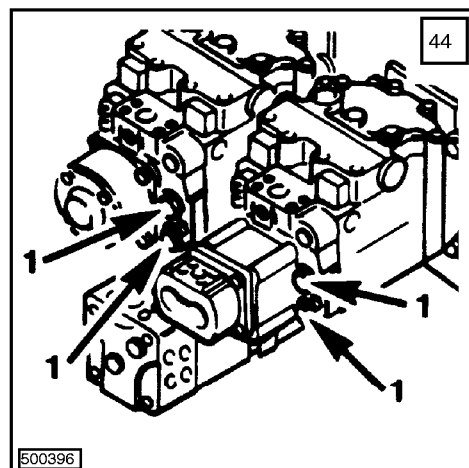
Prepare the machine for towing

In order to tow the machine, open the safety valves on the travel hydraulic pumps and mechanically release the parking brakes.

Proceed as follows:

⚠ DANGER

Always block and secure the machine against inadvertent movement before releasing the brakes!



Raise the cab, as outlined under paragraph 6.2.1.

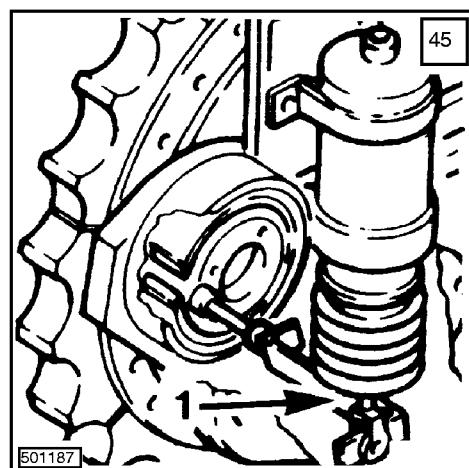
- Turn the safety valves on the travel hydraulic pumps to open them (fig. 44, pos. 1)

- Release and unhook the lever (fig. 45, pos. 1) to release the parking brake.
- Lower the cab properly, as outlined in paragraph 6.2.2.

The machine can now be towed. Observe all previously mentioned safety precautions.

⚠ CAUTION

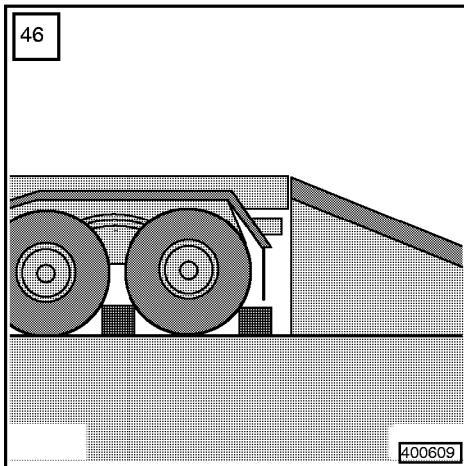
Before returning the machine to service, make sure and check that all items which were removed for the towing procedure have been reinstalled and the machine is returned to its original condition.



4.13 MACHINE TRANSPORTING SAFETY

- Use only safe transportation with adequate carrying capacity.
- If necessary, remove part of the attachment for transport.
- Never use a ramp that is steeper than 30° to move the machine onto a transporting vehicle, the ramp should be covered with wooden planks to prevent slipping.
- Before moving onto the ramp, remove any snow, ice and / or mud from chains or wheels.

- Align the machine with the ramp.
- Use another person as a guide to signal you, the operator. Move very slowly and carefully towards the ramp and the transporting vehicle.
- Raise the attachment and move onto the ramp. Hold the attachment as close as possible to the trailer platform.
- After the loading procedure, lower the attachment onto the trailer platform.
- Secure the machine and all remaining parts with chains and wedges to prevent any slipping or movement during transport.
- Relieve pressures from hydraulic lines and hoses, remove the ignition key, lock the cab and all covers before leaving the machine.
- Carefully check out the transporting route beforehand, check any regulations regarding width, height and weight.
- Make sure that there is enough clearance underneath all bridges and underpasses, utility lines and tunnels.
- During off-loading, use the same care and caution as during the loading procedure. Remove all chains, wedges and blocks. Start the engine as noted in the Operation and Maintenance Manual. Carefully move from the trailer platform down the ramp. Hold the attachment as close as possible above the ground. Use a guide to signal you.



4.14 TRANSPORTING THE MACHINE ON A LOW BOY OR TRAILER

4.14.1 LOADING THE MACHINE

If necessary, remove part of the attachment for easier transport.

Park the transporting vehicle (trailer, low boy etc.) on firm and level ground and secure the wheels to prevent them from rolling (fig. 46).

The loading ramp incline should not exceed 30° and should be covered with wooden planks to prevent the machine from sliding.



CAUTION

Be certain that the loading ramp is positioned on firm and level ground and is rated for the weight of the machine. Be certain that no one is being endangered in case the machine should slide or fall off the ramp.

DO NOT perform any steering or turning maneuvers on the ramp.

Remove all mud, snow or ice from the track components.

The machine may be loaded in forward or reverse. Always have another person guide and signal you!



NOTE

Select hi/low travel speed range when driving onto the ramp (fig. 47).

Raise the attachment slightly and carefully drive up the ramp and onto the trailer, hold the attachment as low as possible to the ground.

When on the transporting vehicle, lower the attachment onto the trailer and turn the machine off properly.

Close or lock all doors, covers, hoods and windows.

Cover the exhaust stack!

Securely block and chain the machine on the intended points (fig. 48/49) and brackets, by placing chains crosswise to prevent movement.

Place wedges in front and behind the travel gear to block the machine.



CAUTION

Be certain to properly block and secure the machine on the transporting vehicle to prevent it from rolling, sliding or tipping.

4.14.2 TRANSPORTING

Check and observe all on road travel guidelines and regulations concerning weight, width and length of the machine to be transported.

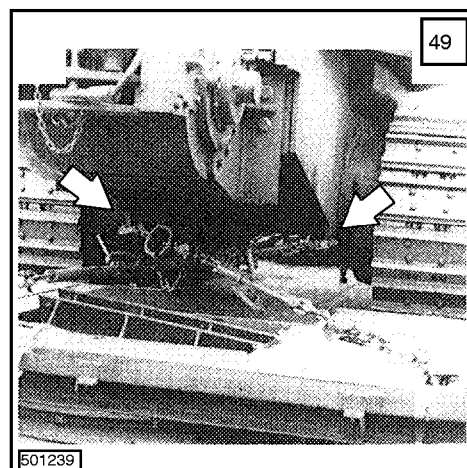
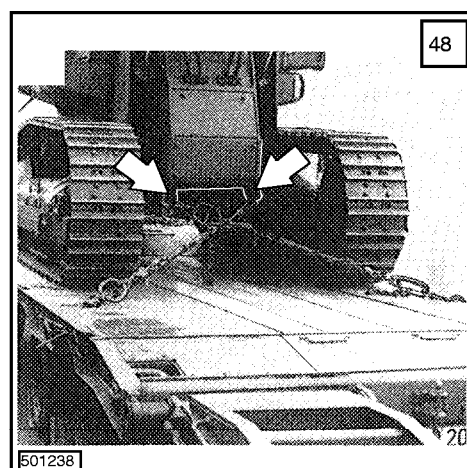
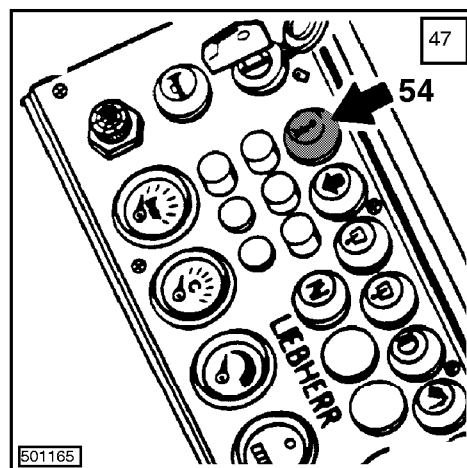
Carefully check out the transporting route beforehand. Check that there is enough clearance underneath bridges, underpasses, utility lines and tunnels. Be aware of weight, height and width restrictions.

If the height of the machine must be reduced, the smoke stack or canopy can be removed.



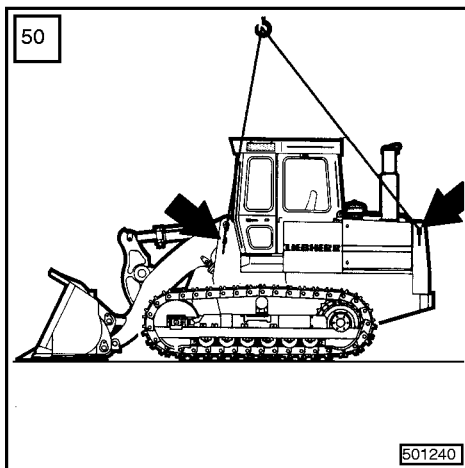
NOTE

For dimensions and weights, see Technical Data, chapter 1.



4.15 SAFETY GUIDELINES TO BE OBSERVED WHEN LOADING A MACHINE WITH A CRANE

- Lower the attachment to the ground.
- Place all operating and control levers into neutral position.
- Turn the engine off, as described in the Operation and Maintenance Manual and place the safety lever in the full down position before you leave the operator's seat.
- Securely close all doors, covers and hoods.
- Utilize only experienced personnel to attach loads and direct the crane operators. The person giving signals must be visible by the operator or be equipped with a two way radio.
- Install the shackles and hooks to the appropriate and designated brackets / bore holes on the machine.
- Make sure the length of the lifting device is sufficient.
- Carefully lift the machine.
- **DANGER! Make sure nobody is near or underneath the lifted machine!**
- When you place the machine back in service, proceed according the guidelines given in the Operation and Maintenance Manual.



4.16 LOADING THE MACHINE WITH A CRANE

Be sure that the crane / lifting device used to load the machine is of sufficient load carrying capacity. carrying capacity.

Before lifting the machine, lower the attachment to the ground.

To lift the machine, attach hoist cables onto the intended lifting eyes/hooks.



DANGER

Never step or stand underneath a raised machine or load.

Connect the cables only to the eye hooks designed for lifting the machine.

The machine may only be lifted if the special equipment / eye hooks are installed (fig. 50).

Eye hooks and installation guidelines can be ordered from your Liebherr dealer or company.

The eye hooks must be installed on the machine by a certified welder according to the installation guidelines.



NOTE

After the machine is loaded and secured, check and apply corrosion protection.

For grease specifications, refer to Technical Data, chapter 1.

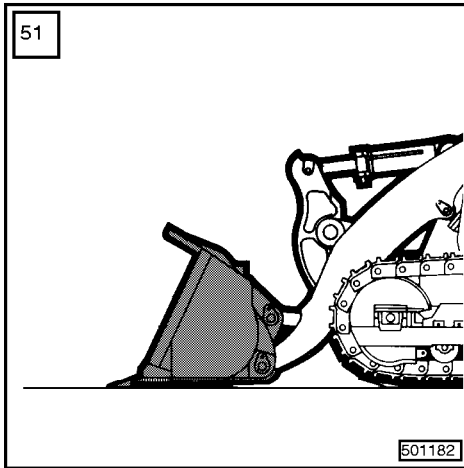
4.17 SAFETY GUIDELINES TO BE OBSERVED WHEN WORKING ON THE ATTACHMENT

- Never work underneath or on the attachment unless it is securely placed on the ground or it is properly blocked and supported to keep it from drifting or falling.
- When replacing or changing any part of the attachment, such as blade, cutting edges, teeth ..., never use metal on metal supports.
- Never try to lift any heavy parts. Always select and use appropriate lifting devices with sufficient lifting capacity.
- When handling wire ropes, always wear gloves!
- Do not disconnect any lines or hoses or remove fittings, caps or covers while the hydraulic system is pressurized. Always lower the attachment, shut the engine off and release all pressures: with the ignition key in contact position, move all servo controls (joysticks and foot pedals) into both directions to release the servo pressure and any pressure remaining in the hydraulic circuit, then release the tank pressure by turning the bleeder screw.
- After completion of all maintenance and repairs, make sure that all lines and hoses and fittings are properly connected and retightened.
- Removing or installing steel pins with a hammer can be very dangerous. Metal chips can cause injury. Always wear gloves and safety glasses!
- Always use the appropriate tools for the job (such as pin pullers, punches, etc. ..)

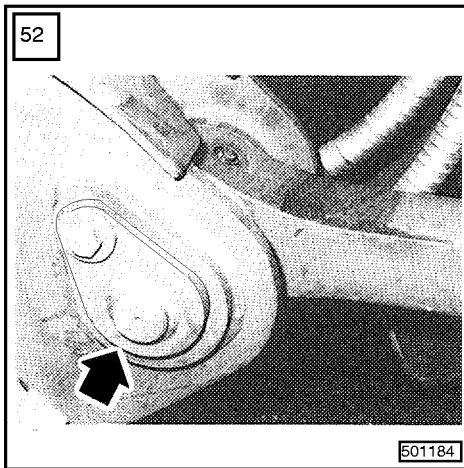
4.18 INSTALLATION GUIDELINES TO BE OBSERVED WHEN INSTALLING ATTACHMENTS

4.18.1 BUCKET REMOVAL AND INSTALLATION

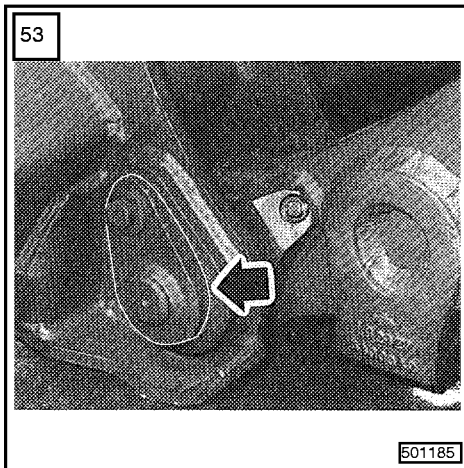
- To remove and install the attachment, use a suitable lifting device.
- Clean all connections, pins, flanges and threads of paint, rust and dirt. Check all components for damage and wear.



- Position the bucket on the ground. (fig. 51)

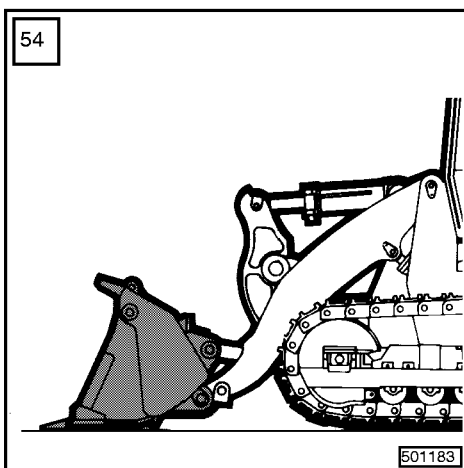


- Remove the lock screw of the bearing pin on the bucket and knock out the pin with a suitable tool (fig. 52).



- Remove the lock screws for the bearing pins on the left and right hand side of the bucket arm and drive out the pins (fig. 53).
- Carefully move the machine backwards until the bucket is free.

Install in reverse order.



4.18.2 REMOVAL AND INSTALLATION OF THE 4 IN 1 BUCKET

- To remove and install the attachment, use suitable lifting device.
- Check all bearing points, pins, threads and check for damage.
- Lower the 4 in 1 bucket onto the ground. (fig. 54)

- Mark hydraulic lines for the bucket cylinder on the distributor block of the bucket and remove them (fig. 55).

CAUTION

Hoses may be under pressure!

With the engine shut off and the ignition in "on" position, actuate the bucket control lever and the foot pedal several times to relieve pressure.



NOTE

Place a suitable container under the connections to catch emerging oil.

- Cover hydraulic lines and connections on the distributor block with blind flanges.
- Remove the mounting screws for the bearing pin on the 4 in 1 bucket and drive out the bearing pin (fig. 56).

- Remove the mounting screws of the bearing pin on the left and right hand side on the bucket arm and drive out the bearing pin with suitable tool (fig. 57).
- Carefully move the machine backwards until 4 in 1 bucket is standing free.

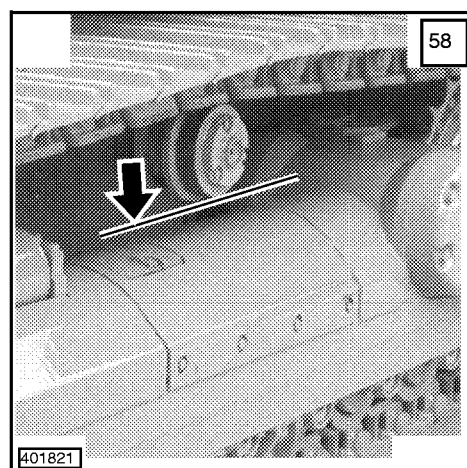
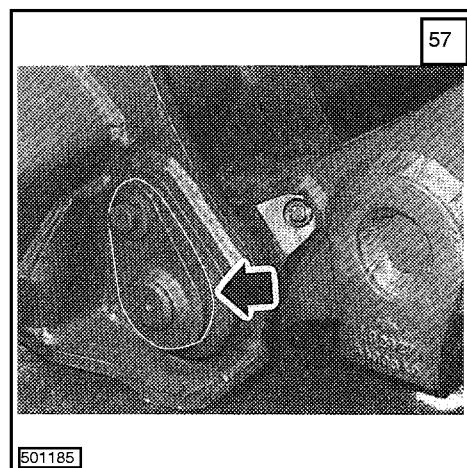
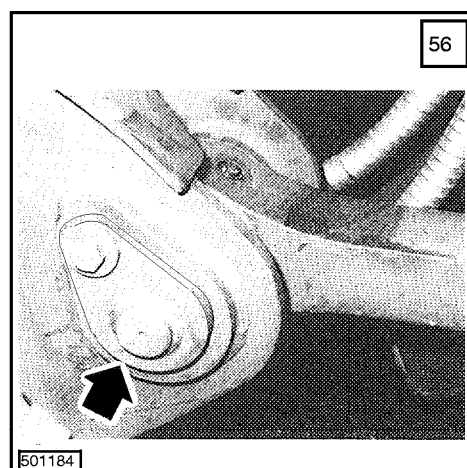
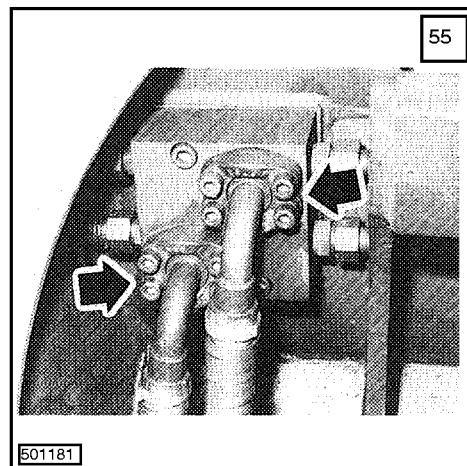
Install the bucket in reverse order.

If the bucket is removed for a longer period of time, protect it from corrosion.

4.19 NOTES FOR PASSING THROUGH AND WORKING IN WATER

When it is necessary to drive through water or to work in water, the maximum fording depth (lower edge of the carrier roller) may not be exceeded (fig. 58).

After working in water, make sure to lubricate / grease all lube points.



 **CAUTION**

- Be especially careful, danger of fan damage!
 - If the maximum fording height is being exceeded, the fan will be destroyed.
 - Never exceed the maximum fording depth (lower edge of the carrier roller).
-

4.20 MACHINE OPERATION IN VERY LOW AMBIENT TEMPERATURES

Your machine can be operated to an ambient temperature of -22°C without additional optional equipment.

If the ambient temperatures are always below -22°C, special optional equipment must be installed to ensure proper operation.

If you intend to operate the machine at temperatures below -22°C, contact your Liebherr Service Dept.

5. LUBRICANTS AND SERVICE FLUIDS

GENERAL INFORMATION

The conscientious adherence to the guidelines given for lubrication, fluid level check and changing of service fluids guarantees increased dependability and life expectancy of the machine .

It is particularly important that the various oil changes be performed regularly and within the recommended intervals and that the specified lubricants are used.

The quantities stated in this manual are theoretical. The dipstick or fluid level mark is always the deciding factor when adding service fluids.



When checking or changing service fluids, always observe the following guidelines:

Always perform the particular work only with the machine parked on firm and level ground and with the engine turned off, unless specified otherwise.

When working in the engine compartment, always secure the engine cover and the side doors to prevent them from accidentally moving or closing.

Always turn the engine off before refueling.

Never smoke or allow an open flame during refueling.




Cleanliness is of the utmost importance when changing the engine oil, gear or hydraulic oil. Before removing fittings, filler caps and covers, clean the parts and surrounding area carefully.


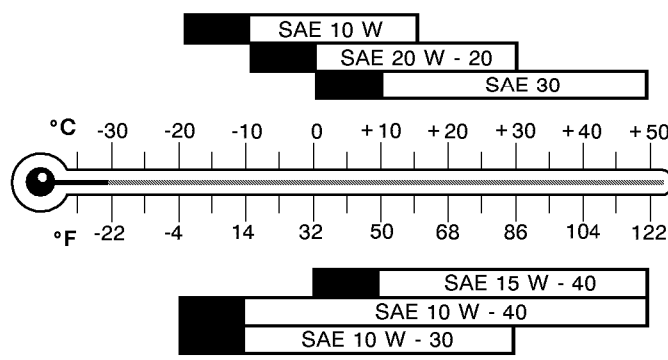




NOTE


Be certain to drain all oil into a suitable container and dispose of the oil and filter cartridges properly.

5.1 LUBRICANTS AND SERVICE FLUID CHART

QUANTITIES	SERVICE FLUIDS	SPECIFICATIONS
DIESEL ENGINE (Turbo charged)		
<p>22 l 5.8 USgal.</p> 	<p>Lubricants</p> <p>Refer to Mercedes Benz manual.</p>	
FUEL SYSTEM		
<p>350 l 92.5 USgal.</p> 	<p>Fuel</p> <p>For specifications and details, refer to Mercedes Benz manual.</p>	
COOLING SYSTEM		
<p>39 l 10.3 USgal.</p> 	<p>Antifreeze fluid</p> <p>Refer to Mercedes Benz manual.</p>	

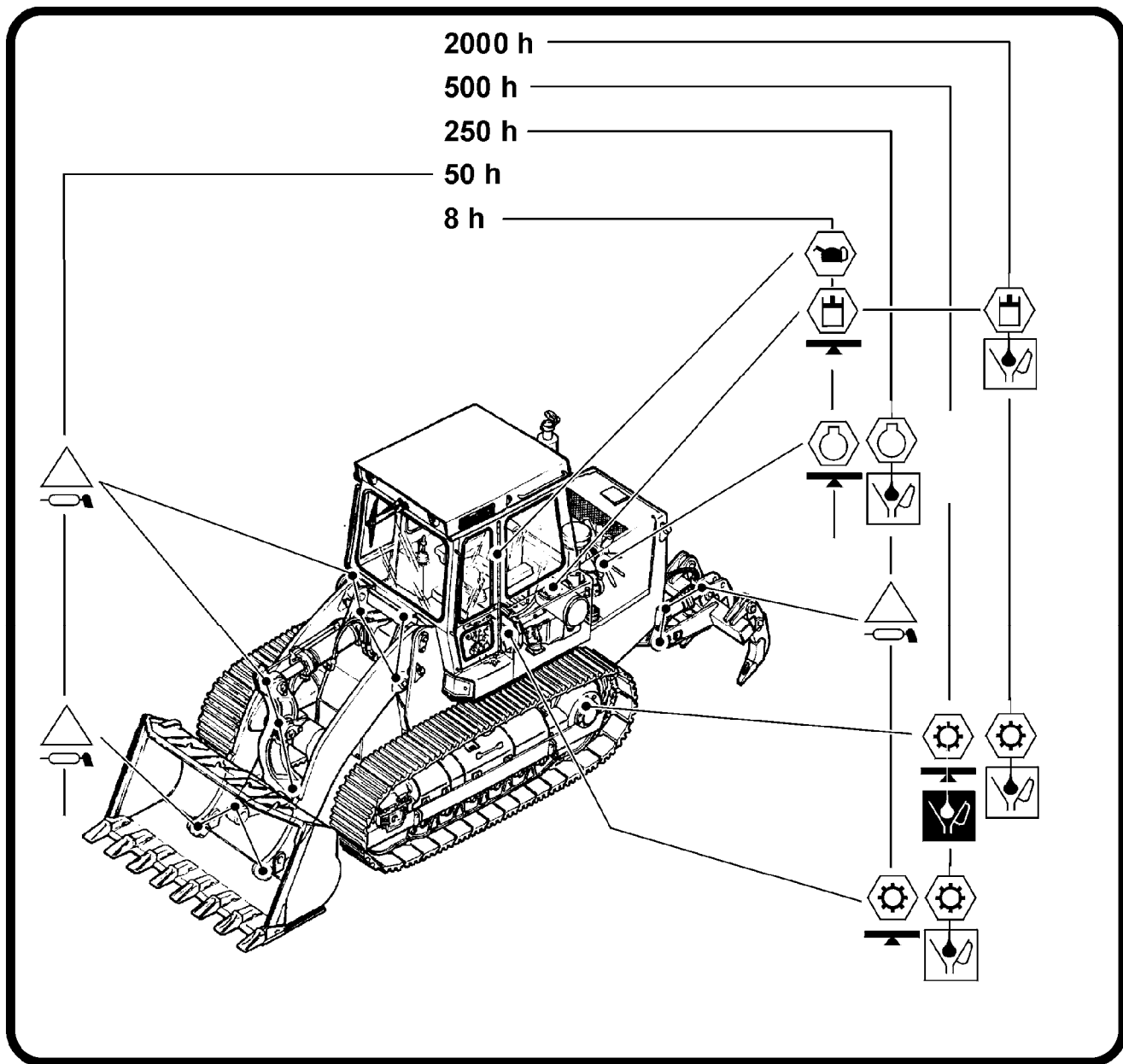
QUANTITIES	SERVICE FLUIDS	SPECIFICATION
HYDRAULIC SYSTEM		
<p>165 l 43.6 USgal.</p> 	<p>Hydraulic oil</p> <p>Viscosity per SAE Use engine oil according to Mercedes-Benz service fluid recommendation.</p>  <p>WARMING UP THE HYDRAULIC SYSTEM</p> <p>1. In temperatures 18° F (10°C): Run the Diesel engine at half speed. Warm up the motor hydraulic system by fully actuating the hydraulic cylinders and motors for short periods. Continue to warm up for about 10 minutes or until operating temperatures are reached.</p> <p>2. At even lower temperatures : Preheat the hydraulic oil in the tank before starting the engine.</p>	<p>Page No. 226.0 and 227.0 for single grade oils API CC/SF, CD/SF, CE/SF</p> <p>Page No. 227.1 and 228.1 for multi grade oils CD/SF, CE/SF, CD+ API CC/SF (MIL-L-46152 B) CD/SF, CE/SF (MIL-L-2104 D) CD/SF (MIL-L-2104 D) CE/SF, CD+ (MIL-L-46152 B)</p>
SPLITTERBOX		
<p>3,5 l 3.7 qt</p> 	<p>Gear oil</p> <p>Viscosity per SAE SAE 90 EP SAE 80 W - 90 EP SAE 85 W - 140 EP</p>	<p>API GL-5 and MIL-L-2105 B,C or D</p>
TRAVEL GEAR		
<p>31 l 8.2 USgal.</p> 	<p>Gear oil</p> <p>Viscosity per SAE SAE 90 EP SAE 80 W - 90 EP SAE 85 W - 140 EP</p>	<p>API GL-5 and MIL-L-2105 B,C or D</p>

5. LUBRICANTS AND SERVICE FLUIDS

QUANTITY	SERVICE FLUIDS	SPECIFICATION
LUBE POINTS - ATTACHMENT AND CHAIN TENSIONER		
	<p>Grease Viscosity per SAE Consistency 2 of NLGI classification The grease must be lithium based, with a VKA value of at least 2300 N per DIN 51350 or ASTM D 2596.</p>	<p>High pressure grease KP2k, Consistency 2 of NLGI classification per DIN 51818 and DIN 51825 or EP 2 per NF-T-60 132</p> <p>LIEBHERR Special grease CTK Id. NO.: 861331301</p>
HINGES - JOINTS		
	<p>Engine oil Viscosity per SAE</p>	
RUBBER SEALS ON DOORS AND COVERS		
	<p>Silicon spray or Talcum powder</p>	
CORROSION INHIBITOR		
	<p>Anti corrosion grease To protect exposed piston rods, cover them liberally with acid free anti corrosion grease.</p>	<p>for example: LIEBHERR Anti corrosion grease CTK Id.No.861331301</p>

5.2 LUBRICATION CHART

For quantities, see chapter 5.1



Diesel Engine



Hydraulic Tank



Splitter Box



Door Hinge



Travel Gear



Lubrication Point

h

Intervals in Operating Hours



Check Oil Level



First Oil Change



Change Oil



Lubricate

9796408

6. MAINTENANCE

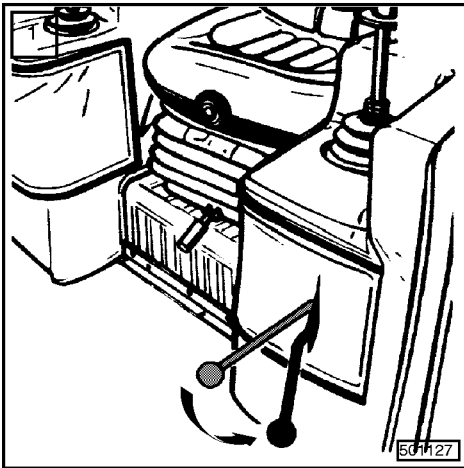
The listed maintenance and inspection intervals MAY NOT be extended, however, they may be shortened if required.

6.1 MACHINE MAINTENANCE SAFETY

- Never perform any maintenance or repairs for which you are not qualified or you do not understand.
- Any maintenance / inspection should be performed in the intervals noted in the Maintenance Guidelines. To perform any repairs, make sure you have the proper tools.
- Maintenance work should be performed according to the chart at the end of this Operation and Maintenance Manual. It is also noted who should or may perform what type of work. The operator should only perform items marked OM on the maintenance and inspection chart. The remaining work should only be performed by trained personnel.
- All spare parts must conform to the technical requirements set forth by the manufacturer. This is only assured by using Original LIEBHERR spare parts.
- Always wear proper and safe work clothing. For certain jobs, in addition to hard hats and safety shoes, additional safety equipment is required, such as safety glasses and gloves.
- Keep unauthorized personnel from the machine during maintenance and repair work.
- Secure the maintenance area, as necessary.
- Inform operators if any special tasks or maintenance work is required. Appoint one supervisory person to assure that this work has been done properly.
- Perform all maintenance work with the machine parked on firm and level ground and with the engine turned off, unless otherwise specified in the Operation and Maintenance Manual.
- The cab may only be raised if the machine is parked and the engine is turned off! Before raising the cab, make sure no personnel is within the proximity of the cab. Always secure the raised cab with the safety bar before working under the raised cab. The machine may **NEVER** be moved when the cab is raised! The safety lever must always remain in the full down position!
- After any maintenance and repair work on the machine, make sure that all screw connections or fittings, which had to be loosened, are retightened.
- If it becomes necessary to remove any safety devices during maintenance and repair, the safety devices which were removed, must be reinstalled immediately and then be inspected for proper function.
- Before servicing the machine, especially when working under the machine, attach an easily visible **"DO NOT OPERATE"** sign to the ignition switch. Remove the ignition key.
- Before any maintenance or repair, clean off any oil, fuel or service fluids from connections and couplings. Do not use any harsh cleaning fluids.
- To clean the machine, do not use flammable fluids.
- Before any welding, cutting or grinding, clean the machine and surrounding area of dust, and assure adequate ventilation.
 - Otherwise, there is a **DANGER OF EXPLOSION!**
- Before cleaning the machine with water, steam (high pressure cleaning system) or other cleaning fluids, cover or tape all openings, make sure no water, steam or cleaning fluid enters these openings for safety or functional reasons. Electrical motors, switch boxes and battery compartments are especially endangered.
 - Make sure that during cleaning work, the temperature sensor of the fire warning system and sprinkler system do not come in contact with the hot cleaning fluid, or the sprinkler system could be actuated.

- After the cleaning procedure, remove all covers and tape.
- After cleaning the machine, check all fuel, engine oil, and hydraulic lines for leaks, for loose connections, for chafed or damaged areas.
- All problems must be remedied immediately.
- Adhere to the product safety instructions issued for the handling of oils, greases and other chemical substances.
- Make sure to dispose of any operating and service fluids as well as replacement parts properly and in an environmentally sound manner.
- Be very careful when handling any hot component or fluid on the machine as there is the DANGER OF BURNS AND SCALDING.
- Use combustion motors and fuel operated heaters only in areas with adequate ventilation. Before start up, make sure that the ventilation is adequate. Follow and adhere to any local guidelines and instructions pertaining to the present job site.
- Perform any welding, cutting or grinding work on the machine only if this work has been explicitly authorized, as there can be a danger of fire or explosion.
- Do not try to lift heavy parts. Always use appropriate lifting aids and devices with sufficient carrying capacity.
 - To lift spare parts and component assemblies for replacement on the machine, they must be securely mounted and secured onto the lifting devices, to prevent accidents. Use only suitable and flawless lifting devices, as well as hooks, ropes, slings, shackles etc. with sufficient lifting capacity.
 - **Do not allow anybody to work or remain underneath the lifted load!**
- Do not use damaged or insufficient wire ropes. Always wear gloves when handling wire ropes.
- Only experienced personnel may attach loads and signal the operator. The person used as a guide must be visible by the operator or be in direct voice contact with the operator via a two way radio.
- When installing parts higher up or when working overhead, always use safe scaffolding or ladders suited for this purpose! Do not step on any parts to get closer to the working area. You must wear safety belts or similar safety equipment when working higher up. Make sure all handles, steps, walk ways, cat walks, and ladders, etc. are always free of dirt, snow and ice.
- When working on or changing any part of the attachment, for example when changing the teeth, make sure that the attachment is properly supported. Never use metal on metal supports.
- Never work underneath the machine if the machine has been raised with its attachment. Prior to working underneath, the machine and/or its attachment must always be properly blocked and supported with wooden blocks.
- Always block the machine in such a way that any change in the center of gravity will not endanger its stability. Never use metal on metal supports.
- Only authorized, trained personnel may work on the travel gear, brake and steering system.
- If the machine must be repaired while parked on a slope, the track chains or wheels must be blocked to prevent any movement with wedges. The attachment must be brought into proper maintenance position.
- Only authorized personnel who have received specialized training may work on the hydraulic system.
- Always wear gloves when checking for leaks. Never check for leaks with your bare hands. A thin stream of fluid escaping from a small hole can have enough force to penetrate the skin.
- Never loosen any hydraulic lines or connections until the attachment has been lowered to the ground, the engine has been turned off (with the ignition key in contact position) all servo controls (joysticks and foot pedals) have been actuated in both directions to release any servo pressure and to release all pressures in the working circuit, and the tank pressure has been released by slowly opening the bleeder screw.
- Regularly check all hydraulic lines, hoses, and connections for any leaks and damage. Any defects must be repaired immediately. Any escaping fluid can cause serious injuries and fire.

- Before beginning any repairs, you also must make sure all air pressures are relieved in any of the systems you need to gain access to; to be certain, refer to the description of the various component groups and assemblies.
- Route and install all hydraulic and air pressure lines properly. Mark and check all connections to prevent any mix ups. All the fittings, including length and quality or type of hoses used must match the requirements set forth by the manufacturer.
- **For that reason, use only Original LIEBHERR replacement parts.**
- Replace hydraulic hoses and lines in regular intervals, as stated, even if no defects can be seen.
- Work on electrical components of the machine may only be performed by a certified electrician or by a person working under the guidance and supervision of such an electrician, and according to electro-technical procedures, rules and regulations.
- When working on the electrical system or before any arc welding on the machine, the battery cables must be disconnected. Always disconnect the negative (- minus) terminal first, and reconnect it last.
In addition, before any welding, always remove the electronic box.
- Use only Original fuses with the same amperage. In case of problems in the electrical power supply, turn the machine off immediately.
- Inspect / check the electronic components of the machine regularly. Repair any problems or defects, such as loose connections or chafed wires and replace any burnt out fuses and bulbs immediately.
- If any work is necessary on energized, voltage carrying parts, a second person must be utilized to disconnect the main battery switch or emergency off switch in case a problem should arise. Rope the working area off with a red/white safety chain and a warning sign. Use only insulated tools!
- When working on high voltage carrying components or sections, turn off the power supply, then connect the supply cable to the ground wire and use the grounding rod to ground these parts, such as the condenser, for example.
- Check the disconnected parts first to see if they are really voltage free, ground them and then close them off. Insulate the neighboring, voltage carrying parts.



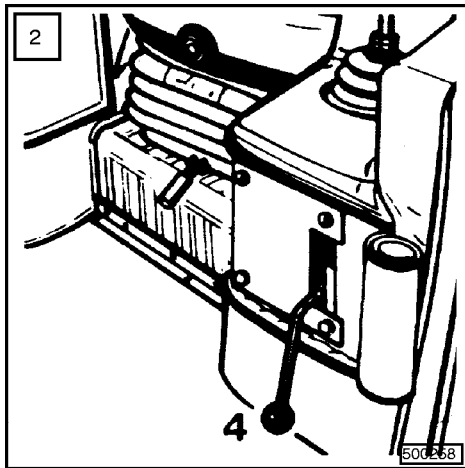
6.2 TILTING THE CAB

To simplify service and repairs on components within the main frame, the operator's platform with the cab can be tilted hydraulically.

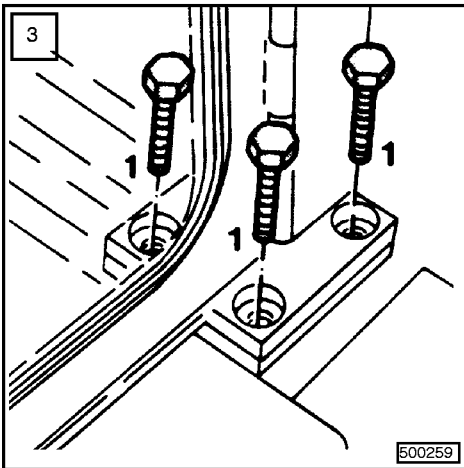
By actuating the hydraulic hand pump, the cab can be tilted back.

6.2.1 TO RAISE (TILT) THE CAB

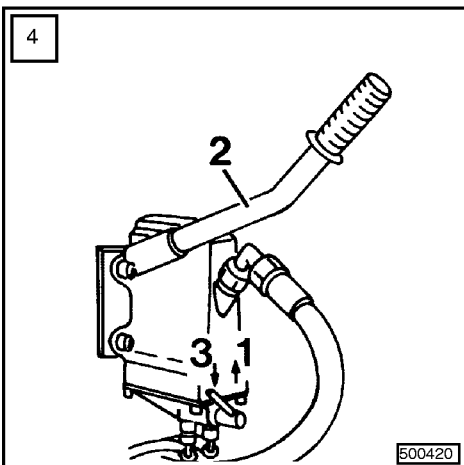
- Turn the engine off.
- Place the safety lever in the full down position (fig. 1).
- Move the throttle control lever and the engine shut off lever to center position.



- Open the covers on the cab, if installed, and remove the cover on the safety lever (fig. 2).
- Remove the safety lever.
- If a 4 in 1 bucket is installed, remove the floor mat in the cab and remove the cover plate underneath the foot pedal.
- Remove the mounting screws on the muffler and remove the muffler.
- Release the clamp on the intake pipe of the dust collector and pull it off, together with the dust collector.

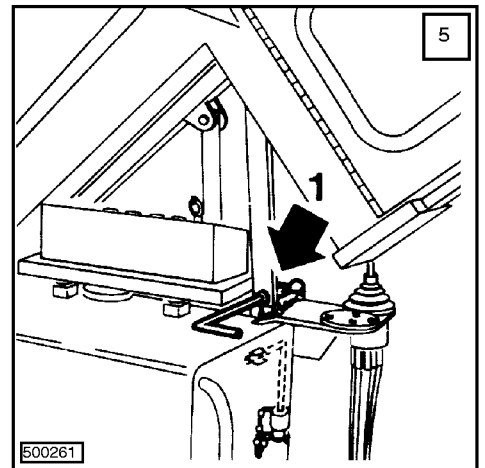


- Remove 3 hex head screws per side on the cab (fig. 3)
- Close both cab doors.



- Move the pump handle to "raise" position. (fig. 4, pos. 1)
- Insert the pump handle, located in the tool box.
- Operate the hydraulic hand pump by moving the handle up and down until the piston bottoms out DO NOT leave the cab in an intermediate position!

- Remove the pin from its retainer, insert it into the bore hole for the safety bar and secure with spring retainer (fig. 5)
- Then move the pump handle to the "down" position (fig. 4 pos. 3).
Actuate the hand pump to lower the cab a little until it is secured by the mechanical safety bar (fig. 5).



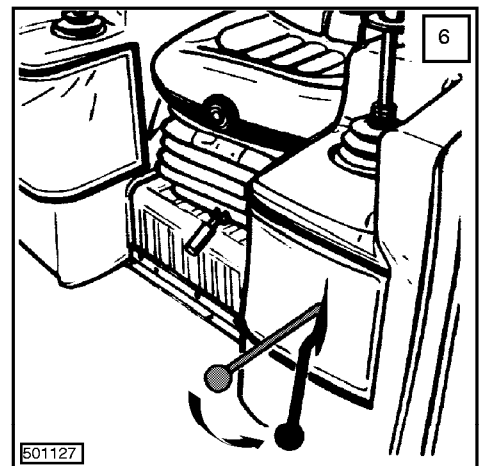
CAUTION

Never raise the cab with the engine running or while traveling.

Stay clear of the cab until it is completely raised or lowered and secured with the safety bar.

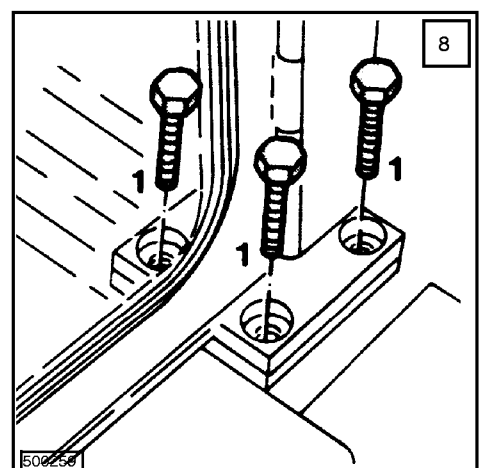
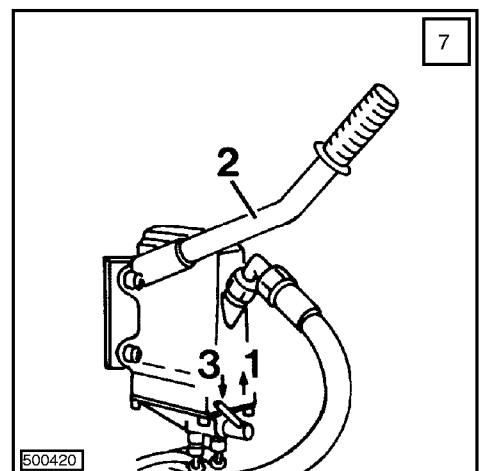
Do not work or allow work on or underneath the cab unless it is properly secured by the safety bar on the hydraulic cylinder and the machine is parked.

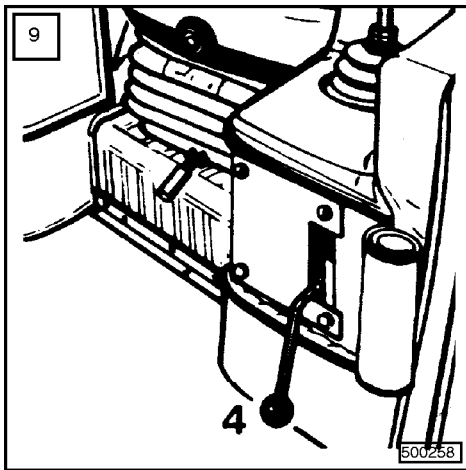
DO NOT start or move the machine with the raised cab, the safety lever must remain in the full "down" position (fig. 6).



6.2.2 TO LOWER THE CAB

- Move the pump lever to "raise" position (fig. 7, pos. 1). Operate the pump by moving the pump handle up and down until the cab is high enough so that the spring retainer and the pin can be removed and the safety bar can be released.
- Then move the lever to the "down" position (fig. 7, pos 3). Operate the hand pump by moving the handle up and down until the cab rests on the supports.
- Secure the cab with 3 hex head screws per side (fig. 8).





- Reinstall the muffler, air filter, safety lever, and cover (fig. 9).
- Reinstall the cover for the cab, if it was installed. On machines with 4 in 1 bucket, reinstall the cover and floor mat.
- Check all safety features for proper operating, be sure all protective structures have been reinstalled before operating the machine.

**DANGER**

DO NOT start the engine until the cab is lowered and secured.

6.3 DIESEL ENGINE

6.3.1 CHECK ENGINE OIL LEVEL

Check the engine oil level with the machine on level ground.

After engine shut down, wait a few minutes for the oil to collect in the oil pan.

Pull the dipstick and wipe it off with a clean cloth. Reinsert the dipstick all the way.

Pull the dipstick out again and check the oil level.

The oil level should be between the MIN and MAX mark on the dipstick .

Refer to Mercedes - Benz manual.

6.3.2 CHANGE ENGINE OIL

**CAUTION**

Never drain hot engine oil, it will cause severe burns!

Change the engine oil with the engine at operating temperature.

- Remove the access cover under the machine. If there is a large amount of contaminants in the area of the oil pan, remove the pan and clean it.

Refer to Mercedes - Benz manual.

6.4 COOLING SYSTEM

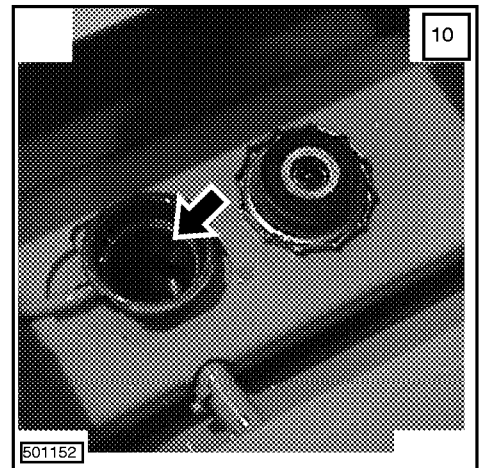
6.4.1 CHECK COOLANT LEVEL

CAUTION

At or near operating temperature, the engine coolant is hot and under pressure.

Avoid contact with components containing coolant, since it could cause severe burns!

Check coolant level only after radiator cap is cool enough to touch. Remove the radiator cap slowly to relieve pressure!



Check the coolant level, it must be visible in the filler neck of the expansion tank (fig. 10).

Check cooler, fan and engine for damage and contamination, clean as necessary.

After refilling and adding the cooling system, let the engine run for a short time with the heater turned on. Recheck the coolant level.



NOTE

The engine coolant is a mixture of antifreeze and water and must provide year round antifreeze protection.

The machine is filled at the factory with a coolant mixture of 50% antifreeze / 50% water, protecting the system to 32° F (-36°C). For quantities, refer to lubrication chart.

6.4.2 CHANGE COOLANT

Replace the contents of the cooling system every 2 years.



NOTE

Change coolant when the engine is cold.

Refer to Mercedes - Benz manual.

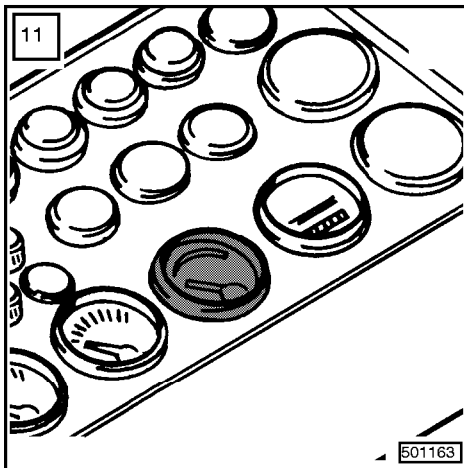
6.5 FUEL SYSTEM

CAUTION

Never smoke or allow an open flame in refueling areas.

Always shut off the engine during refueling.

NEVER drain fuel onto the ground, always use a suitable container to collect any service fluid.



For additional information, refer to Mercedes - Benz manual.

The fuel gauge in the instrument panel shows the fuel level in the fuel tank (fig. 11).

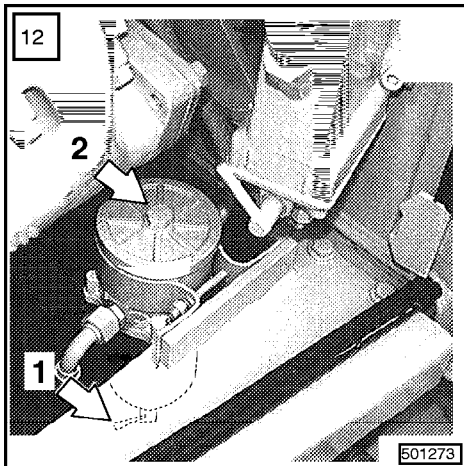
Maintain a high fuel level in the tank to reduce condensation and corrosion.

Before working on the fuel system, close the shut off valve on the fuel tank.

6.5.1 DRAIN WATER SEPARATOR

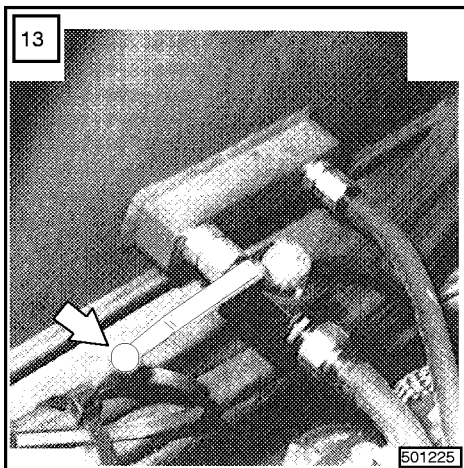
To drain water

- Place a suitable container under the drain valve.
- Open the drain plug underneath the filter and drain off any condensation until clean fuel emerges. Close the drain plug again (fig. 12, pos. 1).



6.5.2 CLEAN FUEL PRECLEANER

- Close the shut off valve on the fuel tank (fig. 13).
- Loosen the screw on the water separator (fig. 12, pos. 2), remove the cover with seal and pull out the strainer. Clean or replace the strainer, check the seal and assemble in reverse order.
- Open the shut off valve again.



6.5.3 DRAIN WATER AND SEDIMENTS FROM THE FUEL TANK

- Open the right engine compartment door and close the shut off valve on the fuel tank.
- Place a suitable container under the drain plug.
- Remove the drain plug. Drain the water and sediments in a suitable container until clean fuel emerges from the hose. Reinsert drain plug.

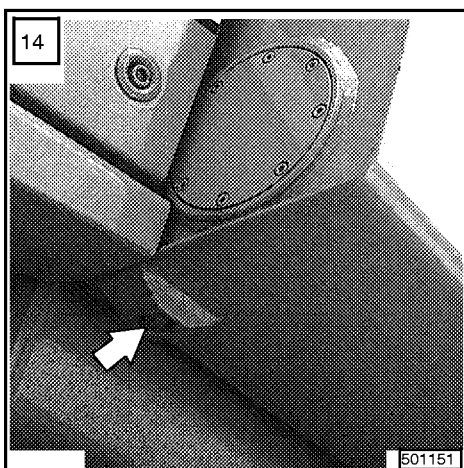
6.5.4 DRAIN FUEL TANK

If the fuel filters have to be changed too often, it may be necessary to drain and clean the fuel tank. Close the shut off valve on the fuel tank.

Remove the tank cover and the drain plug (fig. 14).

Catch emerging fuel in a suitable container. Remove the strainer, check it and replace it, if necessary.

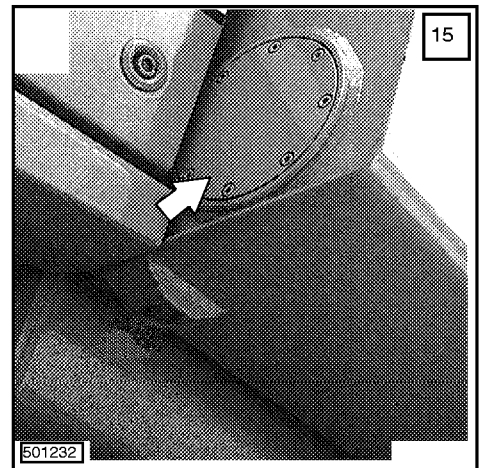
Check the inside of the fuel tank, clean it if necessary. Remove the drain hose and reattach the protective cap.



6.5.5 CLEAN FUEL TANK

Drain the fuel tank as outlined above. Remove the cover (fig. 15) to clean the tank.

Check the O-ring on the cover and replace it, if necessary. Reinstall the cover with the O-ring and add fuel.



6.5.6 ADD FUEL TO FUEL TANK

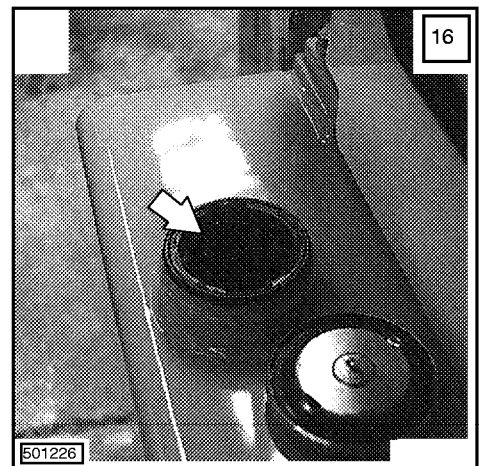


NOTE

Add fuel only through the fuel strainer (fig. 16). To reduce condensation, keep the fuel tank as full as possible, add fuel in the evening or after every shift change.

Check the fuel quality regularly.

If fuel is added from a canister, be certain you have proper support when climbing and standing on the machine.



6.6 ENGINE AIR INTAKE SYSTEM

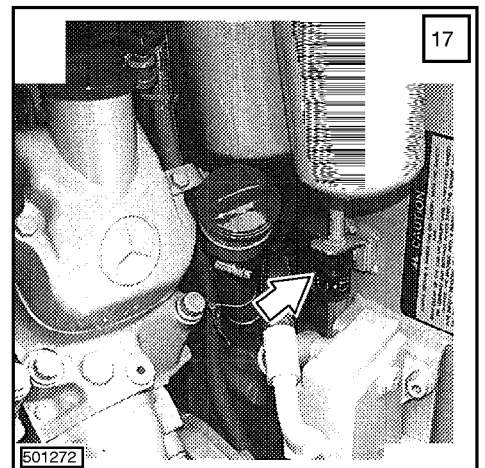
For maximum engine protection, the air intake system must be checked and serviced at regular intervals.

Check and clean all system parts regularly, replace them as stated on the maintenance and inspection schedule and check them for damage and leaks.

The air is drawn into the engine via the dust collector and the air filter, which consists of the primary filter element and the safety element.

Larger dirt particles in the air flow are collected in the dust collector.

At the end of the filter, a mechanical vacuum gauge is installed.



NOTE

When the maximum allowable restriction is reached, the piston in the vacuum indicator engages and a red ring becomes visible, it remains visible after the engine is turned off. (fig. 17).

Turn the engine off and service the air system.

NEVER run the engine without the air filter.

6.6.1 CLEAN THE PRIMARY FILTER ELEMENT

Change or clean the primary filter element only when the vacuum indicator indicates it (fig. 17).

Replace the primary filter element after it has been cleaned three times or once a year.

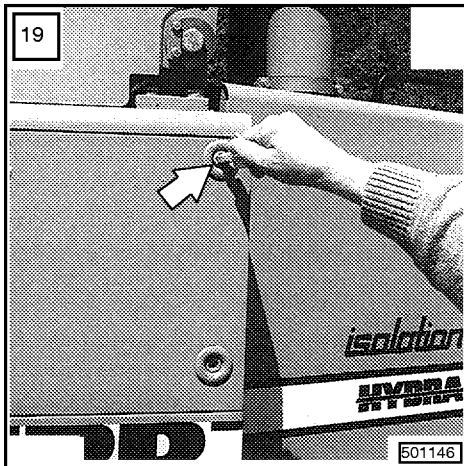
The primary filter element can be wet or dry cleaned. Wet cleaning is only necessary when the element is oily or sooty.



NOTE

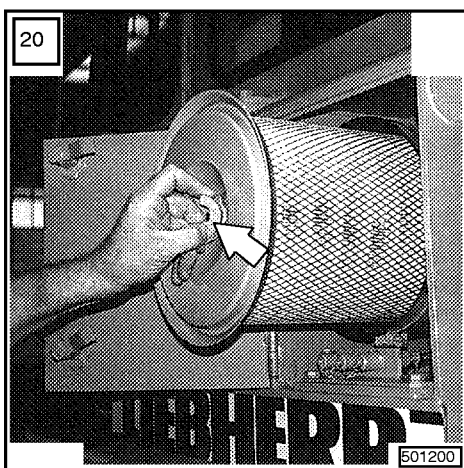
Remove the primary filter element only after the vacuum indicator determines it.

The safety element (fig. 18) should not be removed and cleaned, it should be replaced after the primary filter element has been cleaned three times and every time the primary filter element is replaced.



6.6.2 REMOVE THE PRIMARY FILTER ELEMENT

- Open the access cover on the hydraulic oil reservoir (fig. 19).
- Loosen the wing nut (fig. 20).
- Remove the cover with primary filter element from the air filter housing.



6.6.3 CLEAN THE PRIMARY FILTER ELEMENT

DRY CLEANING

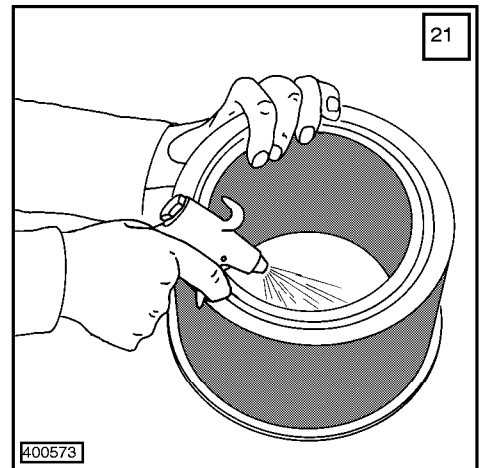
NOTE

NEVER Try to clean the primary filter element by hitting it.

Wet cleaning is necessary when the element is oily or sooty.

Direct compressed air (max. air pressure 100 PSI / 7 bar) through the element from the inside to the outside. Move the nozzle up and down while rotating the element. Keep at least 1" (2 cm) from the paper, clean until no more dust escapes from the element (fig. 21).

Check the primary filter element as described in paragraph 6.7.4.



WET CLEANING

Dry clean the element as described in paragraph 6.6.3.

Soak the element for about 15 minutes in a water and cleaner solution (fig. 22).

Follow manufacturer's guidelines and instructions.

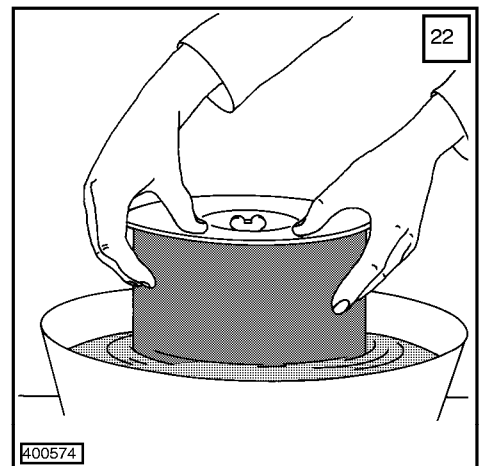
Rinse the element in clean water until the water runs clear (max. 3 bar water pressure).

Air dry the filter element or use warm air flow (max. 125° F (50°C).



NOTE

Do not use heat from a light bulb to dry filters.
Never install wet filters.

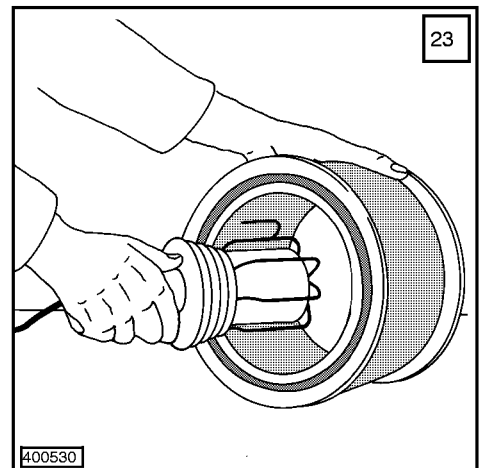


6.6.4 INSPECT THE PRIMARY FILTER ELEMENT

Place a bright light into the cleaned and dried primary filter element with seal (Fig. 23).

Even small holes show up as a light spot.

Inspect seals for wear and damage. Replace damaged filter elements or seals.



6.6.5 REPLACE THE SAFETY ELEMENT

NEVER clean the safety element (fig. 24).

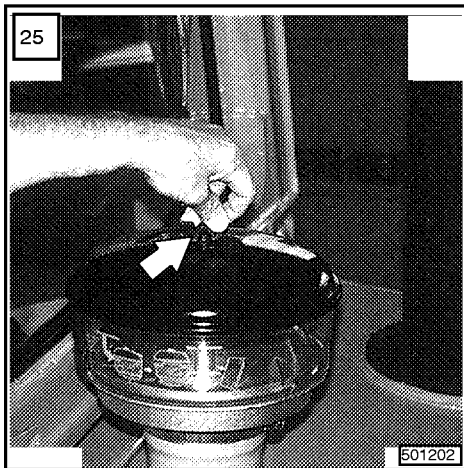
Replace the safety element after the primary has been cleaned three times, or at least once a year.

Remove the primary filter element as described.

Clean the inside of the filter housing with a damp cloth, never use compressed air.

Remove the wind nut, remove the safety element.
Install new element in reverse order.






 **NOTE**

Make sure the area you work in is dust free! Dust should not enter the air intake system.

6.6.6 CLEAN THE DUST COLLECTOR

 **NOTE**

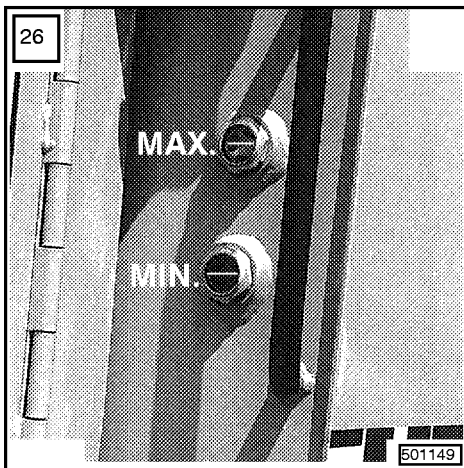
Clean the dust collector at least when the dust has reached the MAX mark.

- Release the wing nut and remove the cover (fig. 25).
- Remove the plastic insert and empty it.
- Reassemble in reverse order.

6.6.7 INSPECT AIR INTAKE COMPONENTS

Inspect the air intake connections and components between the filter exit and the air intake pipe for wear, damage and leaks at regular intervals and whenever the filter element is replaced.

If necessary, retighten the tension clamp screws. NEVER operate the machine without air filters.



6.7 HYDRAULIC SYSTEM

 **CAUTION**

Always lower the attachment to the ground before beginning any maintenance work. Shut off the engine, release hydraulic tank pressure. Actuate both joysticks to release the pressure in the hydraulic and servo system.

Water, air and dirt in the hydraulic system will cause component failure. Before removing any filters, hoses, lines or fittings, clean all connections and the surrounding area. As soon as the component is connected, plug, tape or cap openings to prevent dirt from entering the hydraulic system.

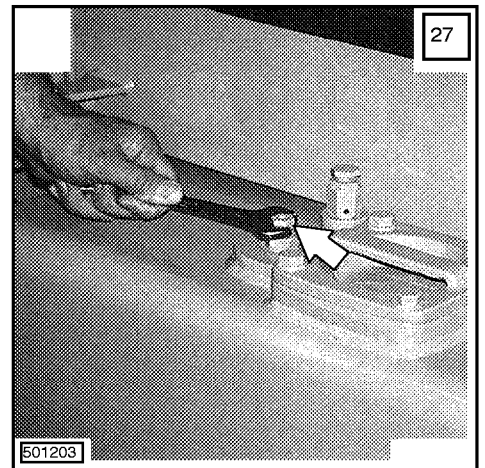
6.7.1 CHECK THE HYDRAULIC OIL LEVEL

With the machine on level ground and the hydraulic cylinders retracted, the oil level must not be above the center of the upper sight gauge (fig. 26 MAX.)

With the machine in the same position, and the hydraulic cylinders extended, the oil level must not be below the center of the lower sight gauge (fig. 26 MIN.).

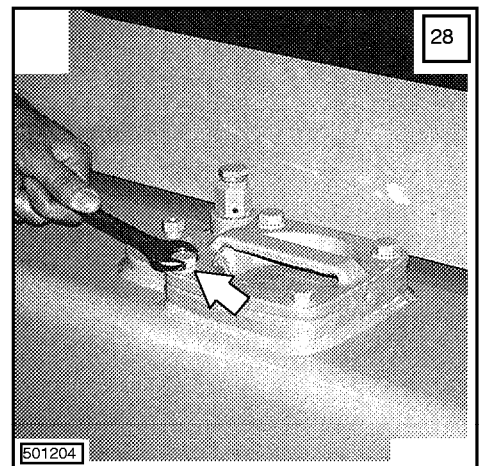
6.7.2 ADD HYDRAULIC OIL

Retract the hydraulic cylinders. Relieve tank pressure by opening the bleeder screw on the hydraulic tank by one turn (fig. 27).



Remove screws on the filter cover (fig. 28) and lift off the cover with the magnetic rod.

Check and clean the magnetic rod. Check the magnetic rod in the return filter according to the Maintenance and Inspection Schedule.



NOTE

Add hydraulic oil only through the return oil filter (fig. 29). Check the O-ring and replace it, if necessary. Reinstall the cover, tighten the screws and close the bleeder screw.

6.7.3 REPLACE THE HYDRAULIC TANK FILTER

Remove the filter cover with magnetic rod as described above (fig. 29, pos. 2).

Remove the spring and pressure plate (fig. 29, pos. 4/5).

Remove the filter and dispose of it properly (fig. 29, pos. 7).

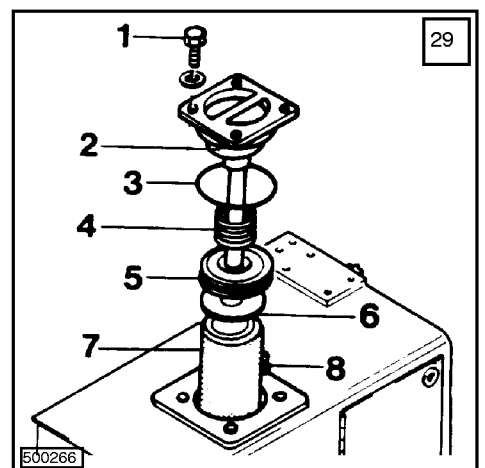
Carefully insert a new filter element.

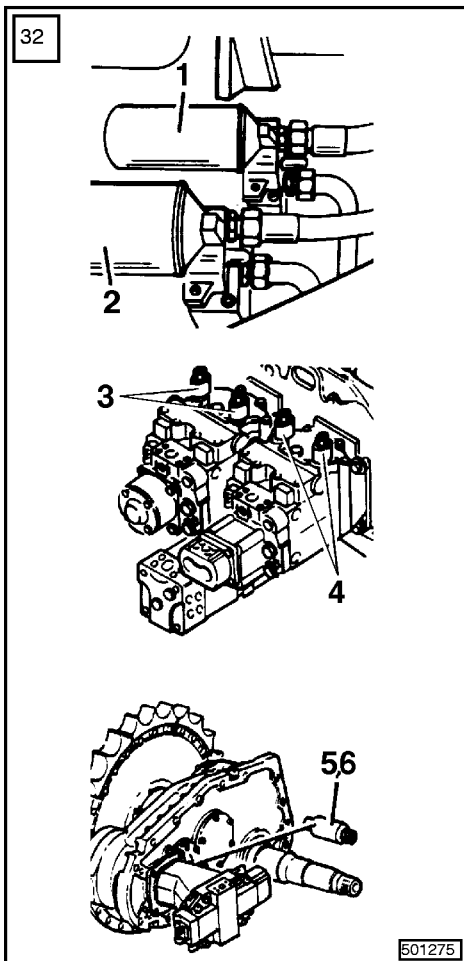
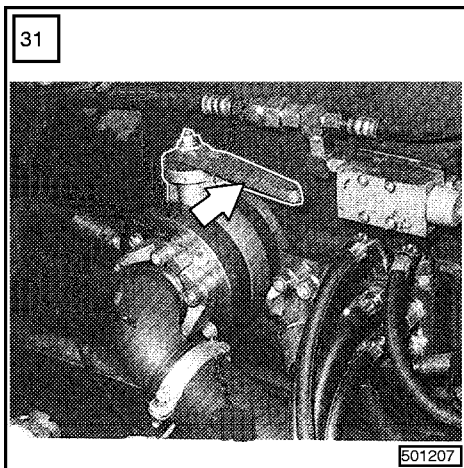
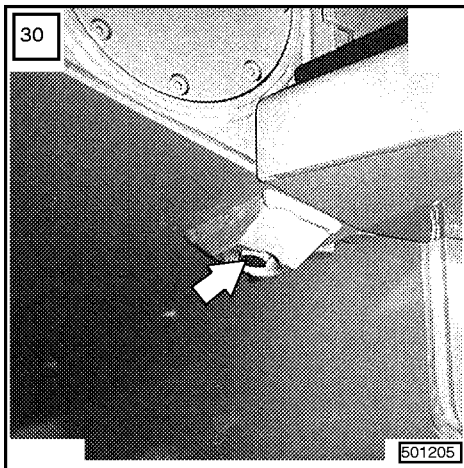
Check the O-ring and replace it, if necessary. Install the spring and pressure plate. Reinstall the cover after cleaning the magnetic rod.



NOTE

DO NOT clean or reuse hydraulic tank filters. Always replace the filters. Always keep replacement O-rings handy. Use only Original Liebherr replacement filters.





6.7.4 CHANGE HYDRAULIC OIL

- Relieve pressure in hydraulic tank, as described before.
- Remove the hydraulic tank filter. Remove the cap on the drain valve at the bottom of the tank (fig. 30) and drain the oil into a suitable container and dispose of it properly.
- Reinsert the plug with new seal ring.
- Install new filter (fig. 29) and add oil. Add oil only through the hydraulic tank filter (return filter).
For oil specification, refer to paragraph 5 "Service fluids".
- Insert the magnetic rod. Reinstall cover and retighten the bleeder screw.

6.7.5 REPLACE THE FILTER ELEMENTS ON THE PUMPS

- Raise the cab as described before.
- Close the shut off valve on the hydraulic tank (fig. 31).

- Remove the filters (use a filter wrench) and dispose of them properly (fig. 32, pos. 1/2).



NOTE

Catch emerging oil in a suitable container.

- Lightly lubricate the seal ring of the new filter with clean oil. Reinstall the filter and tighten by hand.

Note: Read the instructions on the filter! Be aware that the filter contains oil and dispose of the filter properly.

- Open the shut off valve on the hydraulic tank.
- Lower the cab, as described before, and attach it.
- Check oil level in the hydraulic tank again and add more oil, if necessary.
- Leave the shut off lever in stop position, and crank the Diesel engine with the starter until the indicator light / replenishing pressure turns off.



NOTE

DO NOT start the Diesel engine.

6.7.6 REPLACE / CLEAN HYDRAULIC REPLENISHING OIL FILTER

- When repairing the hydraulic system / oil motors or pumps, as well as after every oil change, take out the replenishing oil filters, take them apart and clean or change the strainers (fig. 32, pos. 3/4/5/6).

6.7.7 CLEAN / CHANGE HYDRAULIC OIL FILTER

- Clean surrounding area and place a suitable container under the filter (fig. 33).
- Remove the plug 1 and remove the filter element from its housing.
- Clean the sealing surface on the filter mount.
- Lightly lubricate the threads and sealing surfaces as well as the new filter element with clean oil.
- Set the filter into the housing.
- Reinsert the plug 1 and check the filter for leaks.

Note: Read and follow the manufacturers instructions on the filter!

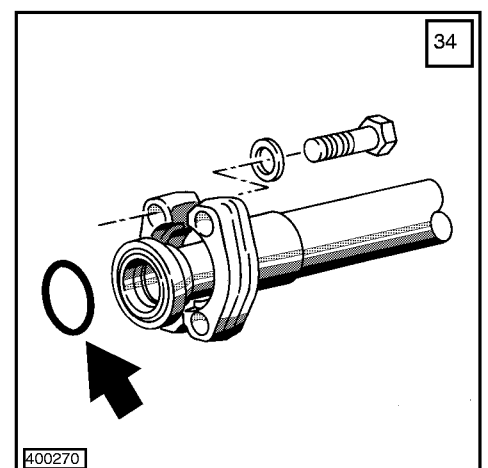
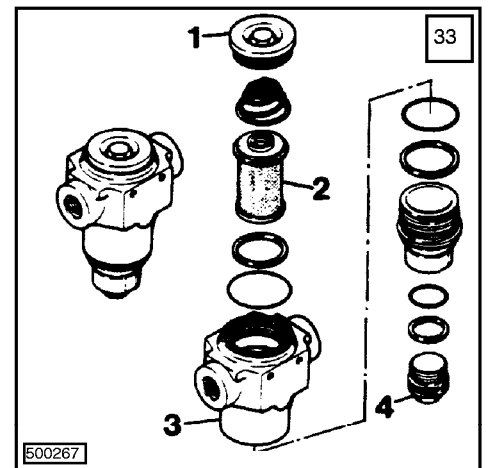


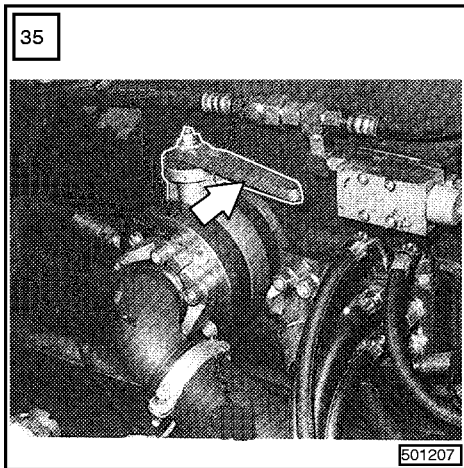
NOTE

To empty and clean the filter housing, remove the plug (fig. 33, pos. 4).

6.7.8 REPAIRS IN THE HYDRAULIC SYSTEM

Part of the maintenance consists of checking the complete hydraulic system for leaks, loose connections, frayed, worn or damaged lines, tubes and hoses and cleaning the hydraulic cooler as necessary.





CAUTION

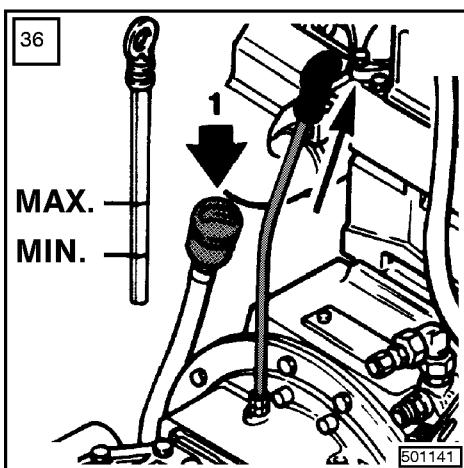
Never check for leaks with your bare hands. Fluid escaping from a small hole can have enough force to penetrate the skin.

Do not disconnect lines or hoses or remove fittings or caps with the hydraulic system pressurized. Lower the attachment, turn the engine off and bleed the hydraulic system.

- Repair all defects immediately. Hose and tube assemblies must be installed free of distortion. Do not twist or kink hoses.
- If there is a leakage on an SAE hose connection, replace the O-ring. Use only Original LIEBHERR O-rings (fig. 34).
- If the suction hose for the attachment pump has to be removed at the pump or the hydraulic tank, the shut off valve at the hydraulic tank has to be closed (fig. 35).
Remove the hose at the pump and drain the oil from the pump and the hose.
- Be certain, the valve is opened after repairs are completed.

6.7.9 HYDRAULIC CYLINDERS

Before attempting to repair, replace or reseal hydraulic cylinders or components, be sure to contact your LIEBHERR dealer.



6.8 SPLITTERBOX

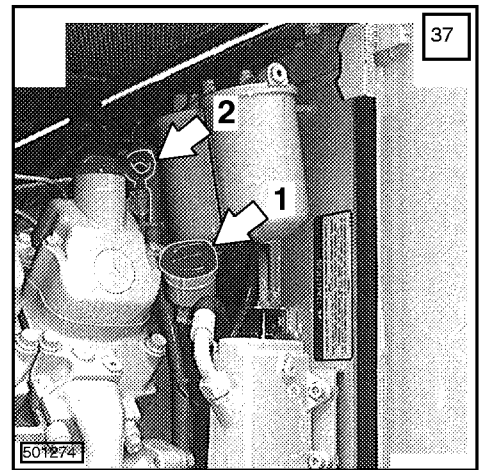
6.8.1 CHECK OIL LEVEL

- Park the machine on firm and level ground.
- Open the left engine compartment door.
- Pull the dipstick and wipe it with a clean cloth, reinsert it all the way (fig. 36, pos. 1).
- Pull the dipstick out again and check the oil level. The oil level must be between the MIN. and MAX. mark on the dipstick.

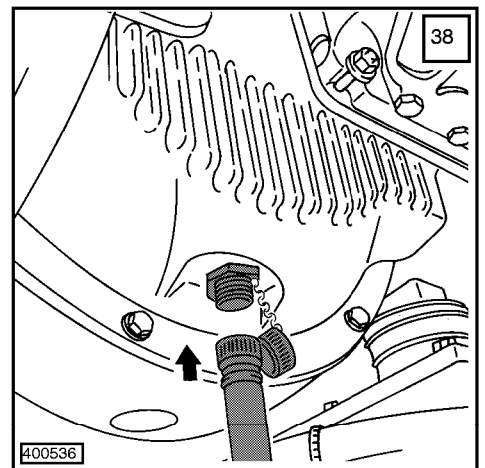
6.8.2 CHANGE THE OIL IN THE SPLITTERBOX

The oil in the splitterbox should be warm when changing oil.

- Open the access cover in the engine compartment (fig. 37, pos. 1).
- Remove the cover plate on the oil pan.
- Place a suitable container under the opening.



- Remove the cap from the drain valve (fig. 38). Attach a drain hose and oil will drain out immediately. Check for any particles in the oil and dispose of the oil properly.
- Remove the drain hose, reinstall the cap and cover plate.
- Fill the splitterbox with oil - do not overfill past the MAX. mark (fig. 36).



6.9 TRAVEL GEAR

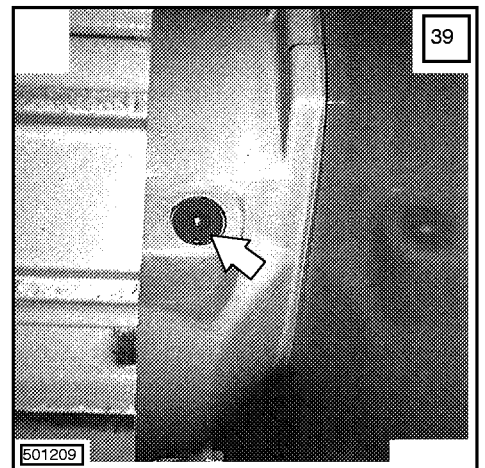
6.9.1 CHECK THE OIL LEVEL

Clean the area around the oil filler plug. Remove the plug (fig. 39), the oil level should be at the height of the filler neck. Add oil, if necessary.

6.9.2 CHANGE TRAVEL GEAR OIL

The oil of the travel gear should be warm when changing the oil.

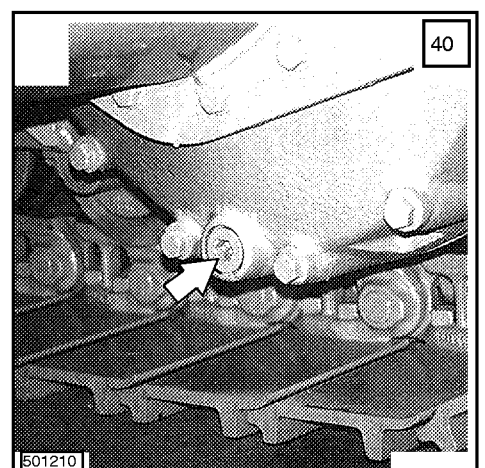
Clean the area around the filler and drain plug.
Place a suitable container under the drain plug.

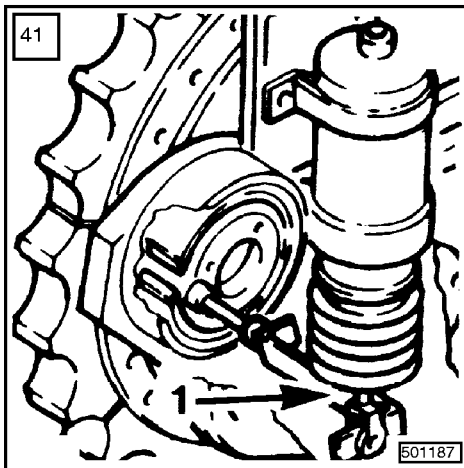


Remove the filler and drain plug (fig. 39 / 40).

Check oil for contamination and dispose of it properly.

Reinsert the drain plug and fill the gear with oil. Reinsert the filler plug and tighten it.





6.9.3 TRAVEL BRAKE

OPERATING BRAKE

The hydrostatic travel drive of the machine is also an operating brake.

PARKING BRAKE

A mechanical disk brake in the travel gear acts as a parking brake, which is released by replenishing oil pressure (fig. 41).

If the replenishing pressure in the hydraulic system drops, the mechanical brake is applied and holds the machine and prevents it from rolling.

The parking brake is released when the safety lever is raised, the engine is running and the travel joystick is deflected (fig. 41).

The mechanical disk brake is used only as a parking brake and requires no regular maintenance.

6.9.4 CHECK CONDITION OF TRAVEL GEAR

Check the travel gear for leaks.

Check the travel gear housing for wear and damage. Cables, wires, tape and ropes might wind around the gear and cause damage to the seals.

6.10 TRACK COMPONENTS

With exception of wear, track components are virtually maintenance free.

Improper operation and tolerances will accelerate wear and tear of track components.

However, visual inspections and wear checks of track components should be made at regular intervals.

Such inspections help detect abnormal and premature wear. Some track components can be reconditioned, providing the wear limit is not exceeded.

CHECK THE FOLLOWING PARTS

Check idlers, track and carrier rollers for leaks and wear. Check chains, track guides, track pads and sprockets for wear.

6.10.1 CHECK CHAIN TENSION

Due to wear of track components, it is necessary to check chain tension regularly and to adjust the chain, as necessary.

Park the machine on level ground and lower the attachment.

The conditions must be the same as stipulated for operation.

Before checking track tension, the track components must be cleaned, any material build up on the tracks should be removed.

Note:

Fig. 42 shows an improperly tensioned (loose) track chain.

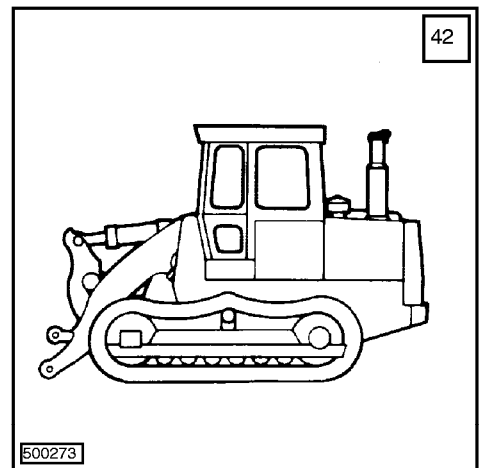
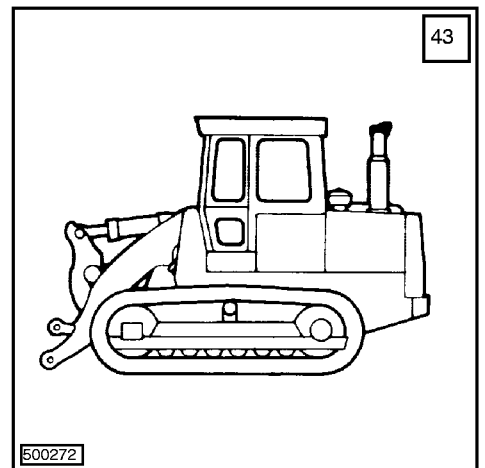
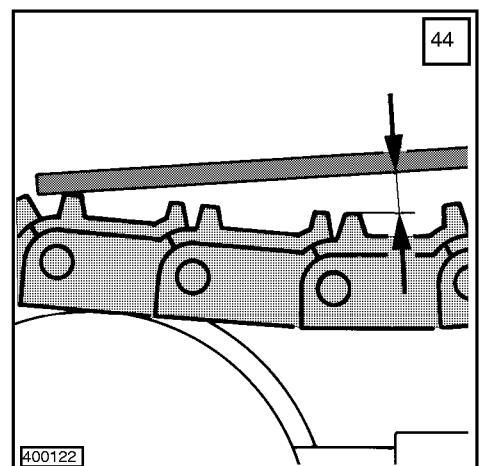
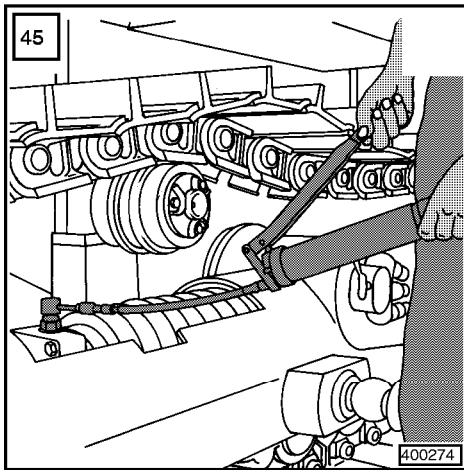


Fig. 43 shows a properly tensioned track chain.



The track chain tension is correct when the slack between the idler and the carrier roller is approx. 20-30 mm (3/4" - 1 1/4", fig. 44).





TO TIGHTEN TRACK TENSION

- Clean the surrounding area of the grease cylinder access area cover on the roller frame.
- Remove the hex head screw and flip the cover forward.
- Attach a grease gun with a special fitting and hose to the grease cylinder (fig. 45).
- Pump grease into the cylinder until the chain is properly tensioned.

TO RELEASE TRACK TENSION

CAUTION

When adjusting the chain tension, keep your head clear of the access hole and frame. The grease cylinder is under high pressure and the chain will sag. Grease is under high pressure and might squirt out.

To release the track tension, carefully release the pressure in the grease cylinder by loosening and turning the grease fitting until excess grease emerges.

6.10.2 CLEANING TRACK COMPONENTS

At the end of a work day, the complete undercarriage should be checked and cleaned or repaired, as necessary.

Note:

DO NOT operate the machine if large rocks, pieces of wood or metal, wire or cables are wedged into the track components.

Dried or frozen mud, as well as rocks or other debris in the track components could cause serious damage to the machine, if operated, or if it attempted to break the machine loose under engine power.



NOTE

If the machine is frozen to the ground, heat the ground or track pads to free the machine.

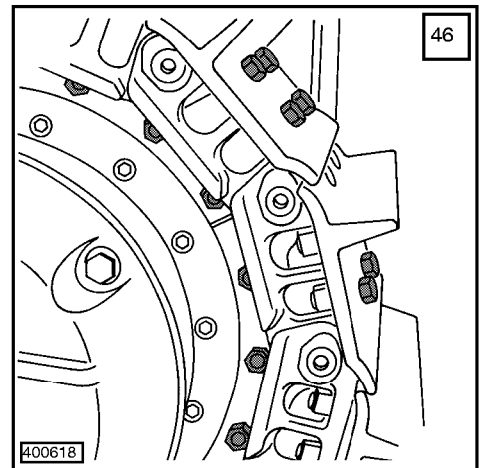
In freezing weather, park the machine on wooden planks to prevent the tracks from freezing to the ground.

6.10.3 CHECK TIGHTNESS OF TRACK PADS AND SPROCKET SEGMENTS

Visually check for loose track pad and sprocket segment mounting screws (fig. 46). Check tightening torques.

Torque track pad bolts 5/8" - 18 UNF to 350-390 Nm.

Torque sprocket segment mounting screws 5/8" - 18 UNF to 350-390 Nm.



6.10.4 CHECK IDLER GUIDE

The axial play between retainer plates and roller frame (fig. 47/48, pos. 1) should be approx. 0.06" (1.5 mm) per side. Total clearance should be approx. 0.12" (3 mm).

If the play is excessive (more than 0.20" = 5 mm), remove the shims between the retainer plates and the bearings.

If the play is too small, add shims (fig. 47/48, pos. 2).



NOTE

The difference in the number of inside shims and outside shims should never be more than 1.

The vertical play between the bearings and the roller frame (fig. 48, pos. 3) (spring path of rubber springs) should be approx. 0.12" (3 mm) per idler.

From model LR 621 on, if the play exceeds 0.20" (5 mm) remove shims in equal numbers on both sides underneath the screw heads and add them between the claws and bearings (fig. 48, pos. 4).

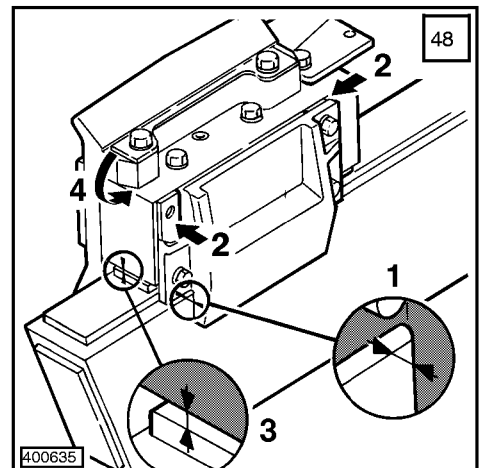
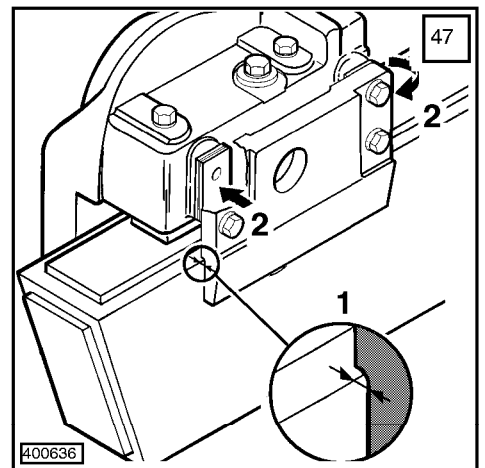
On the LR 611, if the play is too large, the wear strips must be replaced.

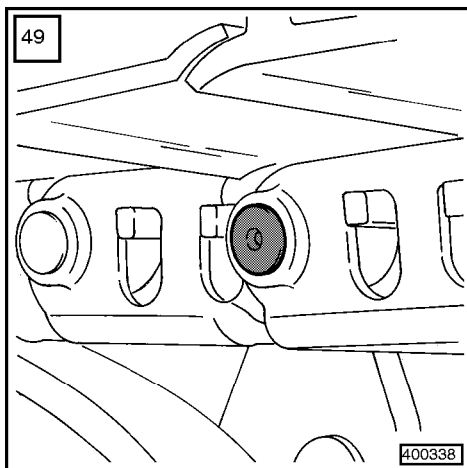


NOTE

The number of inside shims should always be equal to the number of outside shims.

If the play is no longer adjustable, replace the wear strips on the roller frame and claws.





6.11 TO REPLACE THE TRACK CHAIN

6.11.1 TO REMOVE A SEALED TRACK CHAIN

- Park the machine on firm and level ground, stop the machine when the master link / pin is halfway between the horizontal and vertical center.
- The master pin is identified by a chamfered edge or a countersunk bore (fig. 49 / 50 pos. 1 and 2)
- Release track tension carefully and push the idler assembly all the way in.
- Remove the master pin with a hydraulic press or proper pin removal tool (fig. 50, pos. 3).

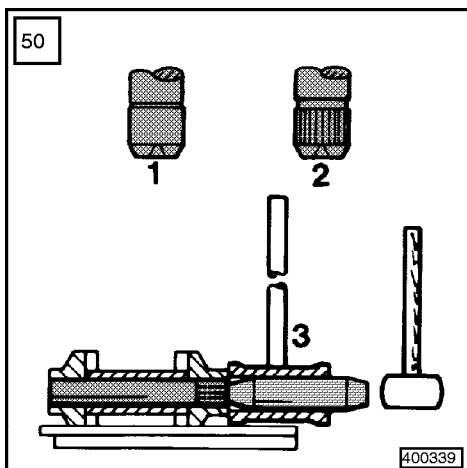


NOTE

Grooved master pins must be pressed in from the outside to the inside and knocked out from the inside of the chain towards the outside.

Countersunk pins can be pressed in or out from either side.

If the pin is removed with a punch, the chain link must be supported on the opposite side.

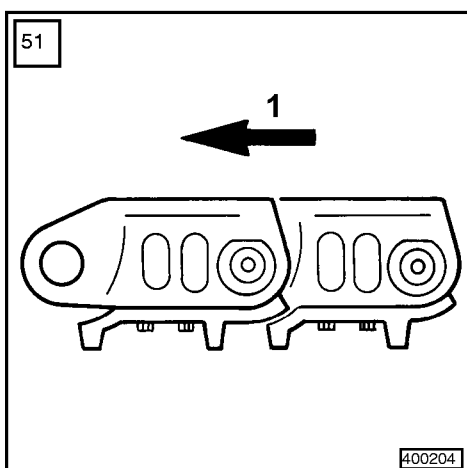


CAUTION

Knocking the master pin in or out with a sledge hammer can be very dangerous due to material chipping off the pin, which could cause serious injury.

If possible, use a hydraulic press to remove or install the master pin.

Raise the attachment and move the machine carefully forward on the chain, until the complete chain is on the ground.



6.11.2 TO INSTALL A SEALED TRACK CHAIN

- Drive backward on the old chain. Place the new track chain on the ground, in travel direction, and connect it with the old chain on the master link. Insert the master pins from the inside to the outside.



NOTE

Check the travel direction of chain and track pads (fig. 51).

- Align the chain to the track frame and drive the machine carefully onto the new chain.

- Disconnect the new chain from the old chain and attach the end of the new chain to the sprocket with a wire and drive the machine carefully forward.
- Continue to drive forward to bring the chain over the sprocket and carrier rollers. Stop the machine when the idler wheel approaches the last 2 chain links.
- Raise and support the last track pads, reinsert the spacer rings and align the master link sections, and insert and press or knock the master pin from the outside to the inside (fig. 52).

**NOTE**

If the pin is removed or installed with a punch, support the chain link on the opposite side to create sufficient counterpressure.

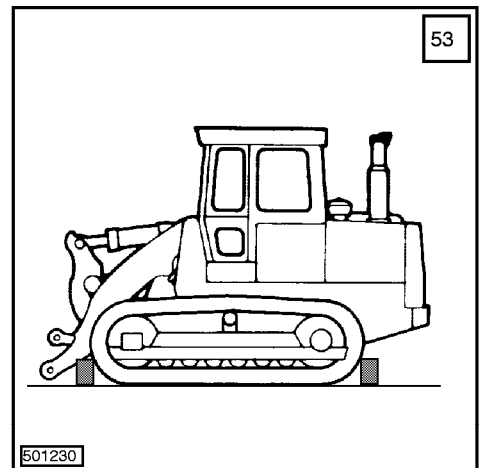
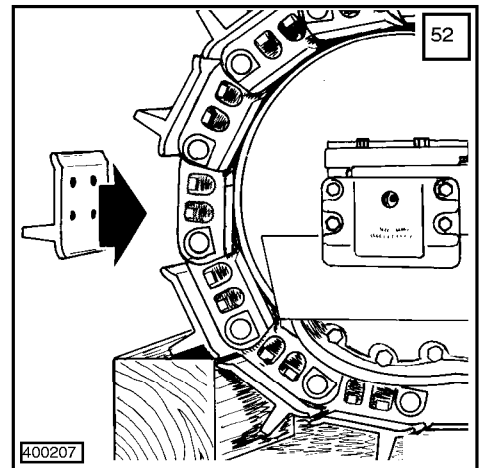
6.11.3 TO REMOVE A CHAIN WITH SPLIT MASTER LINK

Park the machine on firm and level ground. Release track tension, as outlined before.

Slowly travel with the idler against a wooden block until the idler is pushed in all the way.

Remove the block, move the machine until the master link and the sprocket are at the same height.

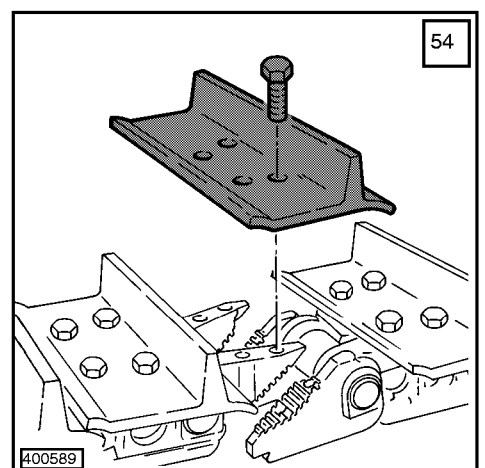
Secure the chain in front of the idler and behind the sprocket with a wooden block to prevent it from rolling off (fig. 53).

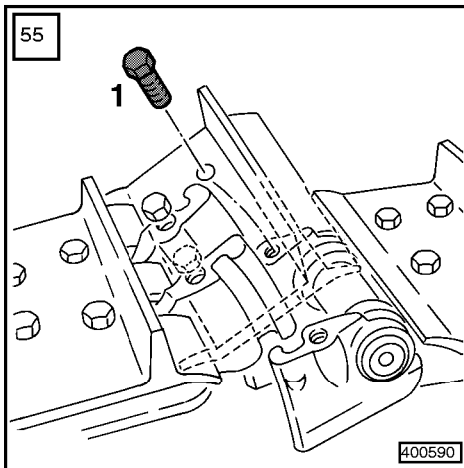


Spray the teeth or mating areas of the master link with penetrating oil, help oil penetration by hitting the master link lightly with a hammer.

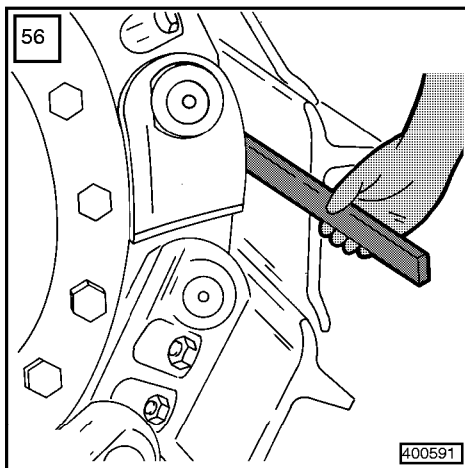
Remove the track pad screws, remove the track pads and separate the master track pad with light blows of a hammer.

If necessary, spray the master link again with penetrating oil (fig. 54).



**NOTE**

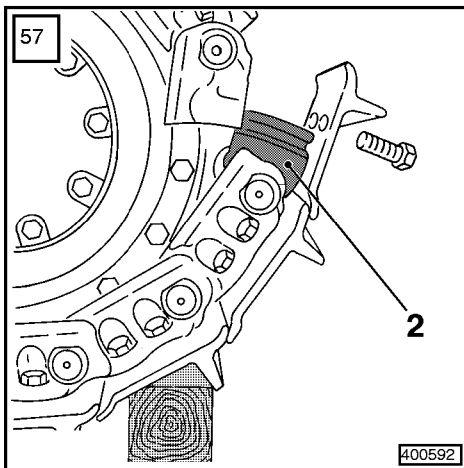
On Intertrac chains, remove only the two track pad screws from the bottom section (fig. 55, pos. 1)



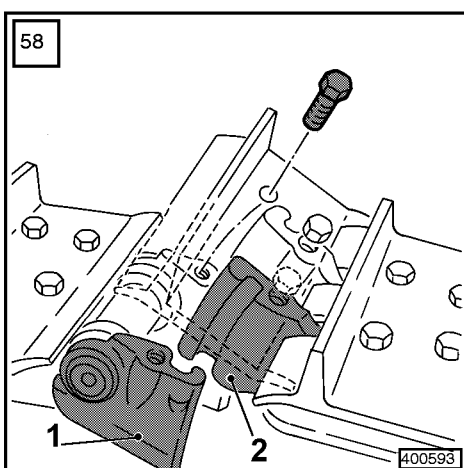
To separate the master link, drive hardened steel wedges between the track pad and the pin end of the master link (fig. 56).

Strike the track pad lightly with a hammer to help to loosen the pin.

Remove the track pad and carefully travel forward until the complete track chain is on the ground.



Only the bushing end of the master link (fig. 57, pos. 2) can be pushed outward.

**Identifying marks:**

Pin end (fig. 58, pos. 1): is pressed onto the pin, shows company logo and distance between the two track pad screws is greater than on the bushing end.

Bushing end (fig. 58, pos. 2): is pressed onto the bushing, appears shorter and distance between track pad screws is smaller.

6.11.4 TO INSTALL A CHAIN WITH SPLIT MASTER LINK

Track chains with master links can be easily installed at the sprocket or idler.

Release track tension and push the idler all the way in. Care should be taken that the threads, teeth and mating surfaces are clean, free of dirt, paint and burrs. Apply a light coat of grease.

Clean the threaded bore holes, apply Never Seize or screw grease to the track pad screw threads (threads should be clean enough so that screws can be turned in by hand).



NOTE

Make certain that the track chain is installed correctly. With the track chain laid out in front of the idler, the bushing end must point towards the idler.

Place the new chain on the ground in front of the idler and connect to the old track chain on the master link, using a wire. Align the track chain to the roller frame.

Carefully drive the machine onto the new chain and disconnect the new chain from the old chain.

Attach the end of the new chain to the sprocket, using a wire, and carefully drive forward to bring the chain over the sprocket.

Remove the wire from the chain and sprocket and carefully drive forward and bring the chain over the carrier rollers and idler.

Stop the machine when the master link is at the same height as the center of the idler wheel.

Secure the chain in front of the idler and behind the sprocket with a wooden block.

Connect the chain by sliding the pin end into the bushing end of the master link. Align holes in master link and install master pad using new track pad screws. Torque track pad screws to proper torque value (5/8" - 18 UNF 350 - 390 Nm).

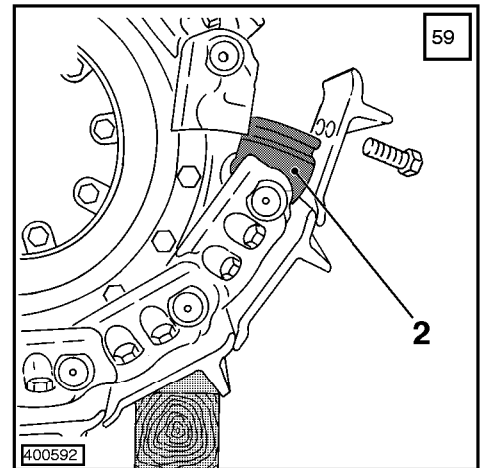


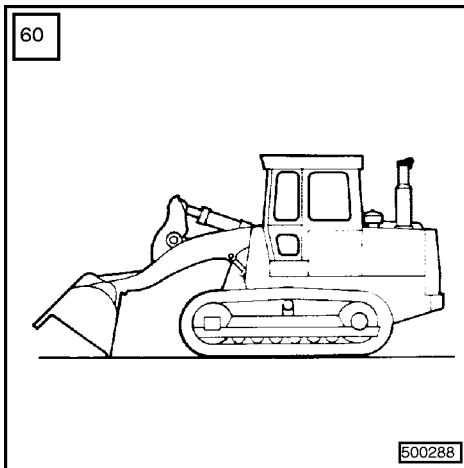
NOTE

On Intertrac chains, the master pad must be installed on the bushing end of the master link before the master link is connected (fig. 59).

Push the pin end towards the center of the idler. Insert the bushing end and slide both parts together until the track pad makes contact. Only the bushing end can be inserted (fig. 59).

DO NOT hit the mating surfaces with a hammer. Adjust the track chain tension as outlined before.





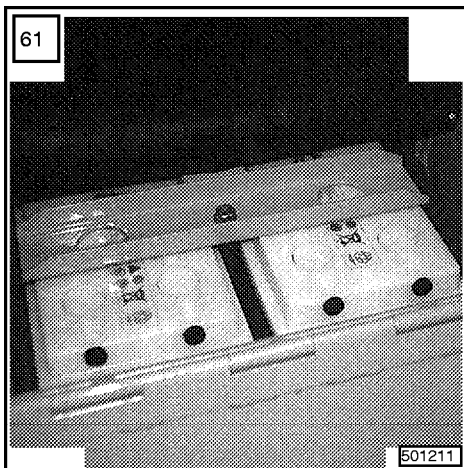
6.12 THE ELECTRICAL SYSTEM

⚠ DANGER

Before working on the front of the machine, lower the bucket and place the cutting edge on the ground, curl the bucket out to maximum position (fig. 60).

To insure troublefree operation of your machine, the electrical system must always be in good condition.

The gauges, indicators and components of the electrical system should be checked daily for proper function.



👉 NOTE

Before working on the electrical system and before any welding, always disconnect the battery cables. Always disconnect the negative (-) cable first, and reconnect it last.

Disconnect the battery before any arc welding work anywhere on the machine (fig. 61).

6.12.1 BATTERY

⚠ CAUTION

Wear protective gloves and safety glasses when handling batteries. Keep sparks and open flame away from the battery.

👉 NOTE

Do not store anything in the battery compartment! Cables can catch fire!

Always keep the battery clean. The battery terminals and cable clamps in particular should be cleaned regularly and then coated with acid resistant grease.

To check the electrolyte level, open the battery compartment, lift up the rubber cover and remove the caps (fig. 61).

The electrolyte level should be 5/8" (approx. 15 mm) above the plates. If the electrolyte level is low, add distilled water.

6.12.2 FUSES

The fuses are located on the control panel, on the right hand side of the operator's seat.

Remove the two grooved screws and take off the cover to remove and check the individual fuses (fig. 62).

Two additional glass fuses are installed on one side of the instrument panel (fig. 64).

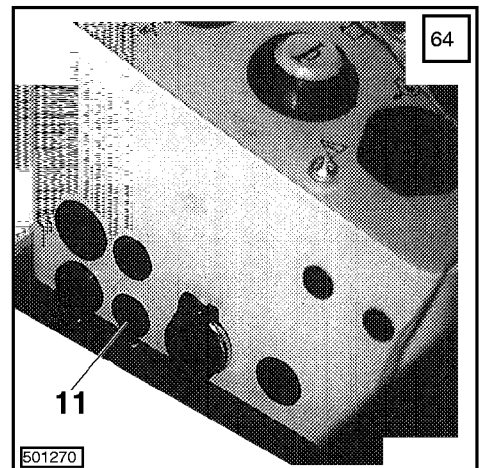
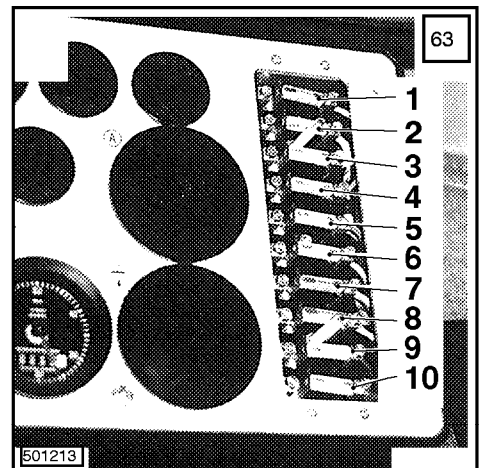
6.12.3 LOCATION OF FUSES (fig. 63/64)

1	5A	Instrument lighting
2	8A	Floodlights
3	8A	Floodlights
4	5A	Instruments, horn, back up alarm
5	8A	Windshield wiper, front
6	8A	Windshield wiper, rear, windshield washer system
7	5A	Counterrotation, bucket return, hoist limit switch
8	5A	Float position, hi/low control
9	8A	Heater, air conditioner
10	8A	Electrical socket, interior light, radio, charge indicator
11	10A	Condensor blower - air conditioner



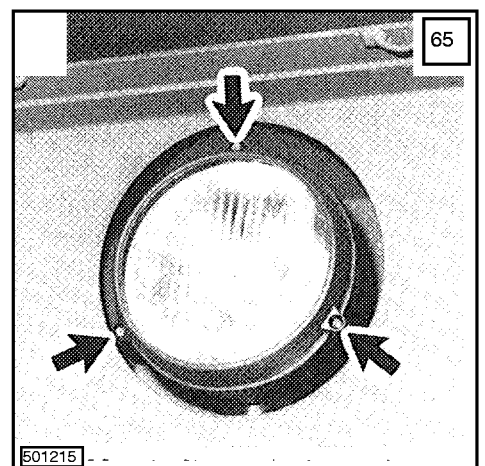
CAUTION

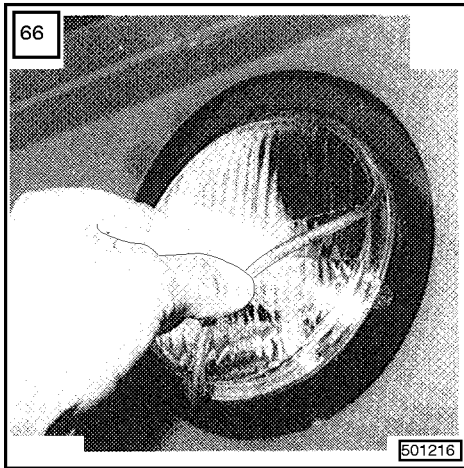
NEVER repair or short circuit a fuse. Never use a different size or stronger fuse than the original fuse. This could cause a fire!



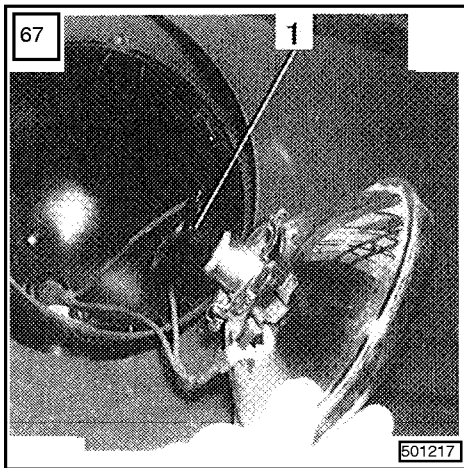
6.12.4 TO CHANGE FLOODLIGHTS

- Remove the mounting screws on the rim and remove the rim (fig. 65).

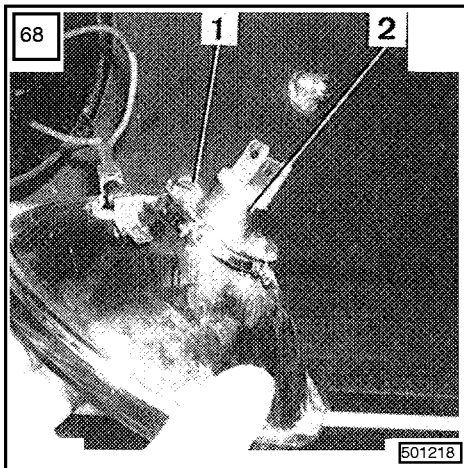




- Remove the seal ring from the light insert and check its condition, replace it if necessary (fig. 66).



- Remove the floodlight insert from the housing and pull out the plug from the bulb (fig. 67).



- Release both retainers, remove the bulb from the insert and replace it with a new bulb (fig. 68).



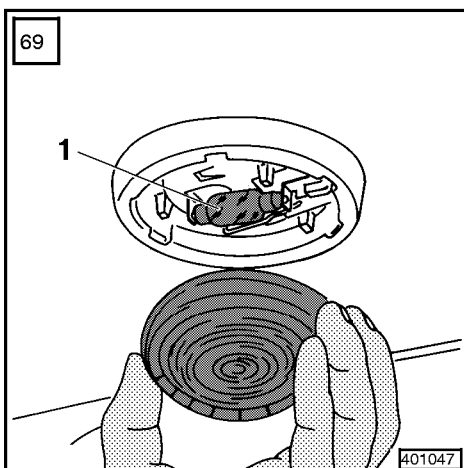
NOTE

Use a cloth to hold the bulb! Do not touch the new bulb with your bare fingers.

- Insert the socket into the insert, matching the nose on the rim with the recess on the insert.

Install in reverse order.

6.12.5 TO CHANGE THE BULB IN THE DOME LIGHT



- Turn the diffuser to the left, push it up slightly and remove it (fig. 69).
- Remove the bulb from the bracket and replace it with a new bulb (fig. 69, pos. 1).



NOTE

Do not touch the new bulb with your bare fingers.

- Insert a new bulb.
- Insert the diffuser and turn it to the right to lock it in place.

6.12.6 TO CHANGE THE BULBS IN THE INDICATOR LIGHTS

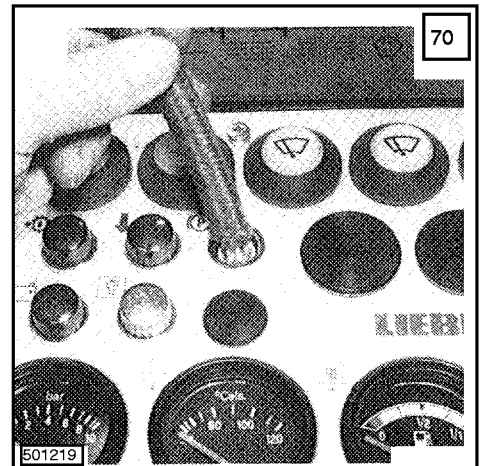
- Unscrew and remove the cap on the affected indicator light.
- Turn the bulb slightly to the left, remove it from the socket and replace it with a new bulb.



NOTE

If necessary, use a short section of a hose, with an inside diameter of 6-8 mm, to grasp the bulb (fig. 70).

Do not touch the new bulb with your bare fingers.
Install in reverse order.



6.12.7 TO CHANGE THE BULBS IN THE PUSH BUTTON SWITCHES

- Remove the switch cover with the symbol by turning it to the left.
- Pull the bulb from the switch (fig. 71).
- Insert a new bulb and reinstall the symbol cover.



NOTE

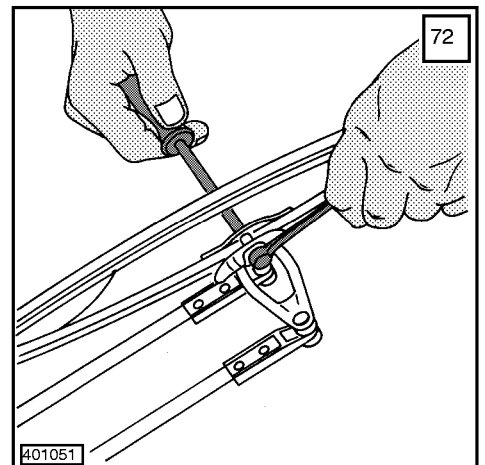
Do not touch the new bulb with your bare fingers.



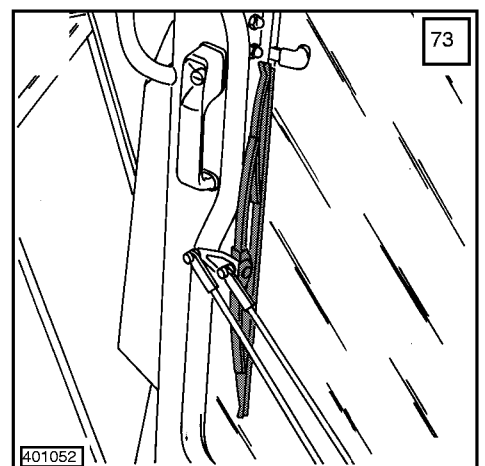
6.12.8 TO CHANGE THE WINDSHIELD WIPER BLADE

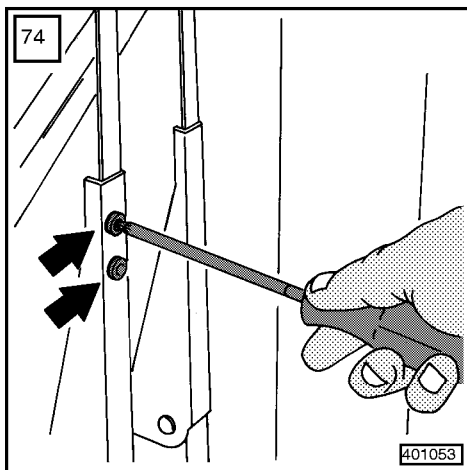
- Fold down the wiper arm.
- Remove the nut on the mounting screw (fig. 72).
- Remove the clip and washer and pull out the mounting screw.
- Remove the old wiper blade and replace it with a new one.

Install in reverse order.



The windshield wiper should be positioned vertically to the door frame (fig. 73).





To correct the position of the windshield wiper blade

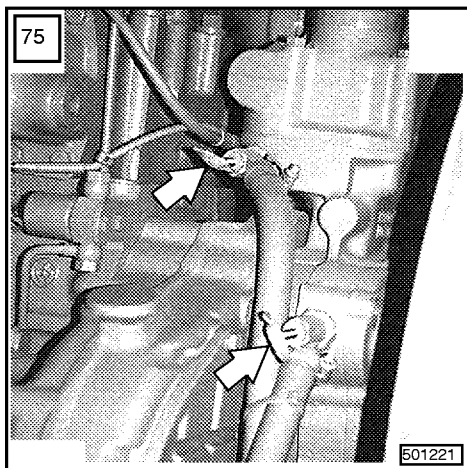
Release the lock screw on the wiper arm (fig. 74) and move the arm guide until the wiper blade is vertical.

6.13 HEATING AND FRESH AIR SYSTEM

Check the heating and fresh air system regularly, but at least once a year, before beginning of the cold season.

- Check the heater function.
- Check all connections of the hot water circuit for leaks.
- Check all clamps and hose connections and retighten them, if necessary. Replace worn or damaged hoses.
- Check and clean the fan motor and heat exchanger.
- Run the heater to insure that coolant containing sufficient antifreeze is in the heating circuit.

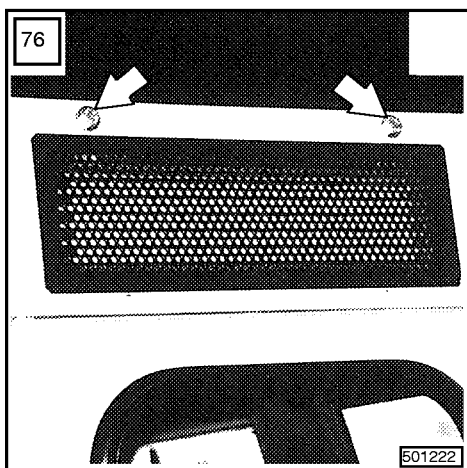
See chapter 5 for coolant specifications.



NOTE

During the summer months, when the heater is not used, or during maintenance and repair, close off the warm water flow to the heat exchanger by closing off the shut off valves on the engine (refer to Mercedes - Benz manual).

Decalcify and flush the heat exchanger until clean water emerges.



Fresh air filter - operator's cab

Replace the air filter in the cab as necessary. Remove the hex head screws (fig. 76) on the protective screen.

Replace the filter (fig. 76).

Reinstall in reverse order.

6.14 ATTACHMENTS

CAUTION

Before the attachments are serviced, be sure to lower the attachments to the ground. Shut off the engine and actuate all functions again to relieve pressure.

Place the safety lever in the 'down' position.

Do not work or allow work underneath or on the attachment unless it is properly supported.

6.14.1 CHECK THE ATTACHMENTS

Regularly check the condition of the attachment. Check bucket, teeth and bucket arm for damage and wear.

Check mounting screws for tightness.

Regularly check the bucket teeth for wear and that they are seated tightly.

To prevent damage to the tooth retainers, replace them when wear limit has been reached, replace the retainer element, if necessary (fig. 77).

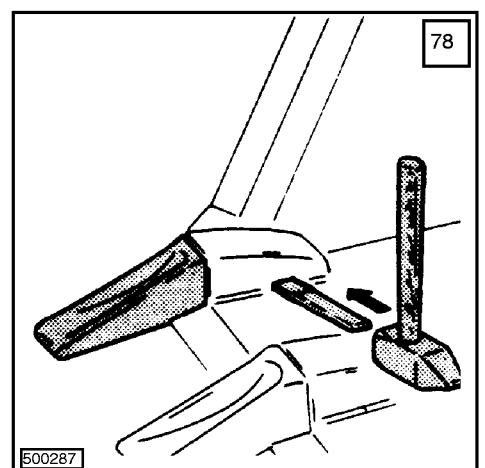
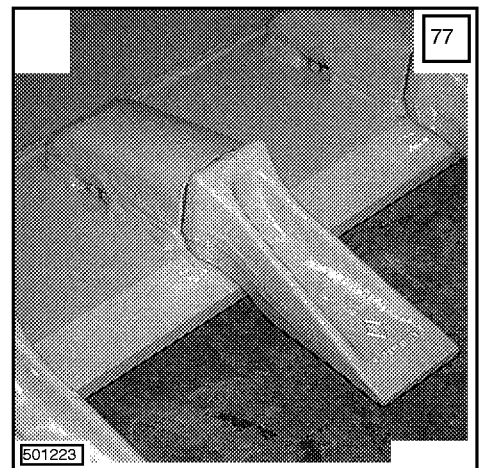
TO CHANGE THE TEETH

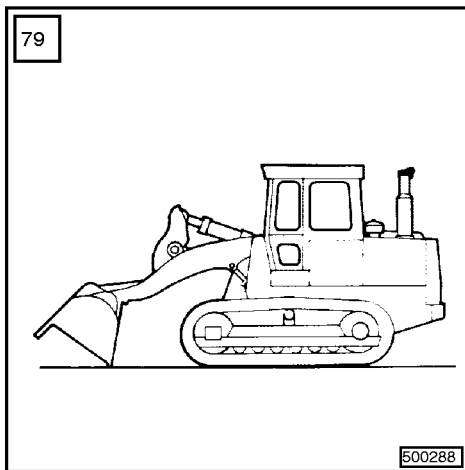
Never work underneath the attachment, if it is not properly supported or resting on the ground.

CAUTION

Make sure no other personnel is in the vicinity when knocking out the tooth retainer pin! Be sure to wear safety glasses.

- Lower the bucket to the ground.
- Knock out the tooth retainer with a hammer and flat iron (fig. 78).

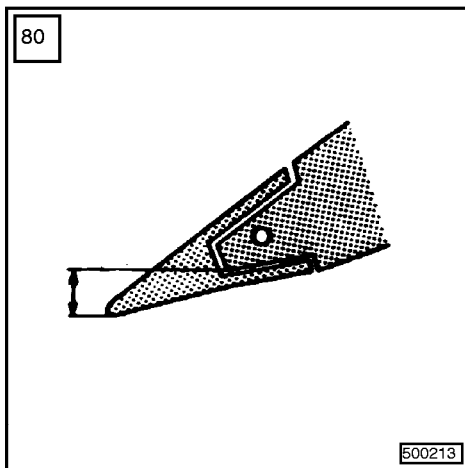




- Replace the worn tooth with a new tooth.
- Insert the retainer with a hammer and flat iron.

6.14.2 TO GREASE THE LOADING SYSTEM

To grease the loading system, place the bucket on the ground, curl the bucket out to maximum position (fig. 79). In this position, all bearing points are easily accessible.



6.14.3 RIPPER TEETH

The ripper teeth should be checked at regular intervals for wear and damage.

The ripper teeth should be replaced when they reach the wear limit (fig. 80).

The welding pint at the top may not be damaged.



NOTE

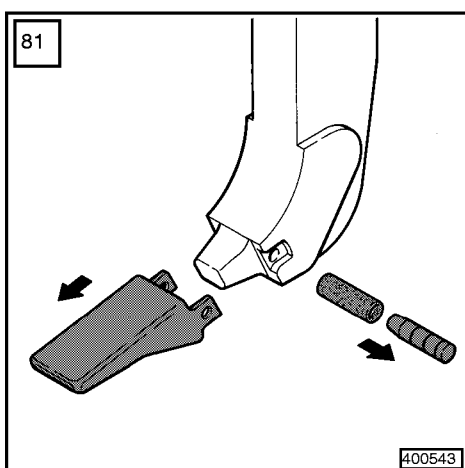
On assymetrical teeth, the point must point downward.

TO CHANGE RIPPER TEETH

- Lift the ripper and support the attachment properly. Never work or allow work underneath the ripper unless it is properly supported or resting on the ground.

CAUTION

Make sure no other personnel is in the vicinity when knocking out the tooth lock pin.



- Punch out the pin and remove the tooth (fig. 81).
- Clean and check the tooth retainer and pin for wear and damage.
- Install new tooth.

6.14.4 REPLACE WEAR AND TEAR ITEMS

In addition to normal maintenance work, which must be performed in stated intervals, the operator may also carry out certain repairs:

Replacement or repairs of track pads, track rollers, idler unit.

(After these tasks, make sure that the track chain is retightened, as described in this Operation and Maintenance Manual).

Replacement of high pressure hoses, hydraulic lines, Ermeto fittings, SAE fittings or O-rings in this fittings. Make sure to use only Original replacement parts. This applies especially to hoses and hydraulic lines, which must be preassembled at the factory.

If you have any questions regarding any repairs, contact your Liebherr dealer or service representative.

6.15 PISTON ROD PRESERVATION

If the machine is not being used or must be stored for a longer period of time, proceed as follows to prevent corrosion and damage to the piston rods:

- Park the machine in a way that the piston rods are retracted as much as possible. However, the attachment must rest on the ground.
- If the machine is not being used for an indefinite period, restart and operate it according to the Operation and Maintenance Manual, at least once every two weeks.

Operate the engine and the hydraulic system until the recommended operating temperatures are reached. Activate the travel and hydraulic functions alternately. The hydraulic cylinders must be fully extended and retracted several times. Prior to starting the machine, check all oil levels, lubrication points and electrical system.

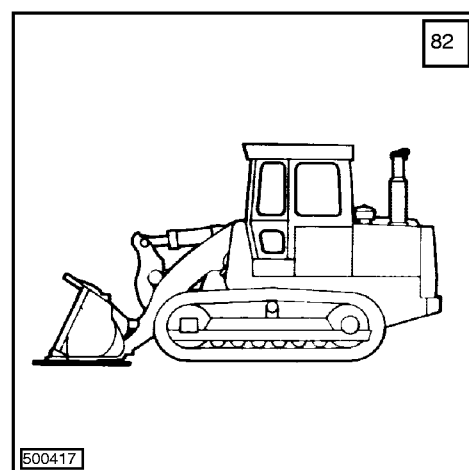
- If the machine is to be stored for longer than 4 weeks, clean the machine thoroughly on the inside and outside.

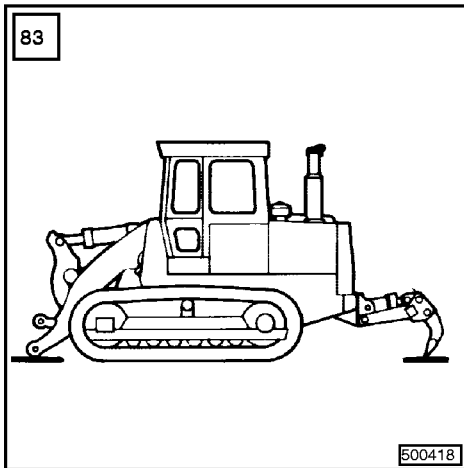
Lubricate all bearings, ball joints, hinges, exposed parts, cable connections and exposed cylinder rods with anticorrosive acid free grease. Fill the fuel tank to reduce condensation.

Note:

If the machine is to be transported by ship, check the piston rods again after the machine has been loaded, since the anti-corrosive grease may have been removed by the wiper ring.

The machine may be parked in several different ways, depending on the type of attachment the machine has.





- **with bucket**
Lower the attachment to the ground without pressure (fig. 82).
- **with ripper attachment**
Lower the ripper to the ground without pressure (fig. 83).
- **without bucket**
Lower the bucket arms to the ground without pressure (fig. 83).



CAUTION

If the machine is scheduled to be stored for an extended period of time, consult your LIEBHERR Service representative.

6.16 MAINTENANCE AND INSPECTION SCHEDULE

Maintenance / Inspection at operating hours

WORK TO BE CARRIED OUT

							<input checked="" type="checkbox"/> by maintenance personnel <input type="checkbox"/> First and only interval <input type="checkbox"/> Repeat interval	<input type="checkbox"/> by authorized expert personnel OM - Operation Manual OM-MB/ Mercedes Benz Documentation	Performance guidelines
at delivery	every 8 - 10	every 50	every 250	every 500	every 1000	every 2000			
DIESEL ENGINE									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil level and oil pressure		OM-MB
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check coolant level		OM
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check engine, radiator assembly and pan for contamination / clean as necessary		OM
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check fuel water separator / empty if necessary		OM
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Change engine oil ¹⁾ (<input type="checkbox"/> = already permitted from 20 hrs. on) - at least 1x annually		OM-MB
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Change lube oil filter (<input type="checkbox"/> = already permitted from 20 hrs. on) - at least 1x annually		OM-MB
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check radiator cap, fan, antifreeze / corrosion inhibitor		OM-MB
		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check condition, tension of V-belt		OM-MB
<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil, cooling and fuel system for leaks and condition		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check fuel pre-filter (strainer insert) / clean as necessary		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Change fuel fine filter (2 each)		OM-MB
<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check intake and exhaust system for mounting tightness and leaks		OM-MB
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil pan and engine mounting brackets for tight seating		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check / adjust engine RPM		
		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check / adjust valve play - with cold engine		OM-MB
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check and service injection pump actuator		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Drain condensation and contaminants from fuel tank - at least 1x annually		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grease flywheel teeth		OM-MB
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil separator		
							Replace air filter elements - as necessary / annually		OM
							Replace coolant with antifreeze - every 2 years		OM
							Check / adjust fuel injectors - as necessary		
							Clean dust collector - as necessary		OM-MB
HYDRAULIC SYSTEM									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil level in hydraulic tank		OM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Clean magnetic rod - up to 250 hrs. daily		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Replace main flow return filter element, check all flushing circuit / return filter elements for deposits (only by authorized personnel)		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Replace replenishing oil filter		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Replace filter insert - servo control		OM
<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check working and travel hydraulic system for function and leaks, check hose routing for chafing and damage.		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Drain condensation and sediments from hydraulic tank - at least once every 6 months		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check oil cooler for contamination / clean		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check / adjust all hydraulic pressures according to adjustment procedure / check list		
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check mounting and fittings for tight seating		OM
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Replace oil in hydraulic system (add oil through filter) ¹⁾ - at least once every 4 years, when using "environmentally friendly hydraulic oils" request / note special guidelines.		OM

WORK TO BE CARRIED OUT

Maintenance / Inspection at operating hours

							<input type="checkbox"/> by maintenance personnel <input type="checkbox"/> First and only interval <input type="radio"/> Repeat interval	<input type="checkbox"/> by authorized expert personnel OM- Operation Manual OM-MB/ Mercedes Benz Documentation	Performance guidelines
at delivery	every 8 - 10	at 10 - 50	every 250	every 500	every 1000	every 2000			
SPLITTERBOX									
<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check oil level		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace gear oil ¹⁾ - at least once every 2 years		OM
ELECTRICAL SYSTEM									
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check system function, including indicators and gauges		OM
<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check electrolyte level in battery		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check / clean / grease battery terminals		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check cable routing and connections		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check battery charge - before start of the cold season		
HEATER / VENTILATION SYSTEM									
<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check system for function and leaks		OM
							Replace fresh air filter - as necessary		OM
TRAVEL GEAR									
<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check oil level		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check fittings for tightness		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check effectiveness and function of brake		
				<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	Replace gear oil ¹⁾ - at least once every 4 years		OM
TRACK COMPONENTS									
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check mounting screws and nuts for tight seating		OM
	<input type="checkbox"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check carrier rollers, track rollers, idlers for leaks		OM
			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check / adjust idler guides, replace parts as necessary		OM
							Adjust track tension to suit current application - as necessary		OM
							Clean tracks - as necessary		OM
							Check for track wear - as necessary		
WORKING ATTACHMENT									
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check cutting edges, corners, ripper points for wear - make sure attachments are suited for application		OM
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Lubricate all bearing points - Shorten interval as necessary		OM
				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check all bearing points for play and wear		OM
<input type="radio"/>	<input type="checkbox"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check bucket attachment, stops and adjustment of limit switch		OM
	<input type="checkbox"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check screws, nuts and pin retainers for tight seating		OM
			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check attachment for intentional damage		OM
GENERAL									
<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check the complete machine for proper maintenance and condition		OM
							Cab - grease door hinges - as necessary		OM
<input type="radio"/>							Discuss machine documentation, special operating instructions / safety guidelines with operator		OM
							1) For oil quality and viscosity, refer to 'Service Fluids', section 5		

6.17 TIGHTENING TORQUES

According to WN 4037B

Installation preload forces F_M and tightening torques M_A according to DIN 13 section 13, wrench sizes for hex head screws according to ISO 4014, for socket head screws according to DIN 912. Beginning with grade 10.9, using lock washers no longer provides safety.

For special screws, such as Durlock or Tensilock, the tightening torques given by the manufacturer should be observed.

When using impact wrenches, make sure that the torque values are not exceeded. (Check torque with torque wrench!).

The torque values shown in the following charts can only be achieved with the use of a torque wrench.

If tightening torques are shown in drawings or in descriptions, then these values must be observed.

6.17.1 TIGHTENING TORQUES FOR SCREWS WITH STANDARD METRIC THREAD

Screw type: "black" or "5 μ m white galvanized A2E"

Metric Standard Thread	Preload values F_M based on grades in N			Tightening torques M_A based on grades in Nm			Wrench size for			
	8.8	10.9	12.9	8.8	10.9	12.9	Hex head screws		Socket head screws	
							mm	Inch	mm	Inch
M 4 x 0,7	3 900	5 700	6 700	3,1	4,5	5,3	7	9/32	3	---
M 5 x 0,8	6 400	9 300	10 900	6,1	8,9	10,4	8	---	4	5/32
M 6 x 1	9 000	13 200	15 400	10,4	15,5	18	10	---	5	---
M 7 x 1	13 100	19 300	22 600	17	25	30	11	---	---	---
M 8 x 1,25	16 500	24 200	28 500	25	37	43	13	1/2	6	---
M 10 x 1,5	26 000	38 500	45 000	51	75	87	(17)16	(11/16)	8	---
M 12 x 1,75	38 500	56 000	66 000	87	130	150	(19) 18	(3/4)	10	---
M 14 x 2	53 000	77 000	90 000	140	205	240	(22) 21	(7/8)	12	---
M 16 x 2	72 000	106 000	124 000	215	310	370	24	61/64	14	9/16
M 18 x 2,5	91 000	129 000	151 000	300	430	510	27	1 - 1/16	14	9/16
M 20 x 2,5	117 000	166 000	194 000	430	620	720	30	1 - 3/16	17	43/64
M 22 x 2,5	146 000	208 000	243 000	580	970	830	(32) 34	1 - 9/32	17	43/64
M 24 x 3	168 000	239 000	280 000	740	1 060	1 240	36	1 - 7/16	19	3/4
M 27 x 3	221 000	315 000	370 000	1 100	1 550	1 850	41	1 - 5/8	19	3/4
M 30 x 3,5	270 000	385 000	450 000	1 500	2 100	2 500	46	1 - 13/16	22	7/8
M 33 x 3,5	335 000	480 000	560 000	2 000	2 800	3 400	50	2	24	61/64
M 36 x 4	395 000	560 000	660 000	2 600	3 700	4 300	55	2 - 3/16	27	1 - 1/16
M 39 x 4	475 000	670 000	790 000	3 400	4 800	5 600	60	2 - 3/8	27	1 - 1/16



NOTE:

Preload forces and tightening torques are based on lightly lubricated screws and nuts (corresponds to medium friction $\mu_G=0.14$).

Wrench size (x) = wrench size according to DIN 931

6.17.2 TIGHTENING TORQUES FOR SCREWS WITH FINE METRIC THREADS

Fine metric threads	Preload values F_M based on grades in N			Tightening torques M_A based on grades in Nm			Wrench size for			
	8.8	10.9	12.9	8.8	10.9	12.9	Hex head screws		Socket head screws	
							mm	Inch	mm	Inch
M 8 x 1	18 100	26 500	31 000	27	40	47	13	1/2	6	---
M 9 x 1	23 800	35 000	41 000	40	58	68	---	---	---	---
M 10 x 1	30 500	44 500	52 000	57	84	98	17	11/16	8	---
M 10 x 1,25	28 500	41 500	48 500	54	79	93	17	11/16	8	---
M 12 x 1,25	43 000	64 000	74 000	96	140	165	19	3/4	10	---
M 12 x 1,5	40 500	60 000	70 000	92	135	155	19	3/4	10	---
M 14 x 1,5	58 000	86 000	100 000	150	220	260	22	7/8	12	---
M 16 x 1,5	79 000	116 000	136 000	230	340	390	24	61/64	14	9/16
M 18 x 1,5	106 000	152 000	177 000	350	490	580	27	1 - 1/16	14	9/16
M 18 x 2	98 000	140 000	164 000	330	460	540	27	1 - 1/16	14	9/16
M 20 x 1,5	134 000	191 000	224 000	480	690	800	30	1 - 3/16	17	43/63
M 22 x 1,5	166 000	236 000	275 000	640	920	1 070	32	1 - 9/32	17	43/64
M 24 x 1,5	200 000	285 000	333 000	830	1 180	1 380	36	1 - 7/16	19	3/4
M 24 x 2	189 000	270 000	315 000	810	1 160	1 350	36	1 - 7/16	19	3/4
M 27 x 1,5	258 000	367 000	430 000	1 200	1 710	2 000	41	1 - 5/8	19	3/4
M 27 x 2	245 000	350 000	410 000	1 190	1 700	2 000	41	1 - 5/8	19	3/4
M 30 x 1,5	323 000	460 000	538 000	1 670	2 370	2 780	46	1 - 13/16	22	7/8
M 30 x 2	309 000	440 000	515 000	1 610	2 300	2 690	46	1 - 13/16	22	7/8
M 33 x 1,5	396 000	563 000	659 000	2 220	3 170	3 710	50	2	24	61/64
M 33 x 2	380 000	540 000	630 000	2 250	3 200	3 700	50	2	24	61/64
M 36 x 1,5	475 000	677 000	792 000	2 910	4 140	4 850	55	2 - 3/16	27	1 - 1/16
M 36 x 3	425 000	610 000	710 000	2 800	3 900	4 600	55	2 - 3/16	27	1 - 1/16
M 39 x 1,5	562 000	801 000	937 000	3 720	5 300	6 200	60	2 - 3/8	27	1 - 1/16
M 39 x 3	510 000	720 000	850 000	3 600	5 100	5 900	60	2 - 3/8	27	1 - 1/16

**NOTE:**

Preload forces and tightening torques are based on lightly lubricated screws and nuts (corresponds to medium friction $\mu_G=0.14$).

Expanded standard WN 4037B according to Roloff Matek

6.17.3 TIGHTENING TORQUES FOR SCREWS WITH STANDARD METRIC THREADS

Screw type: "8 μ m galvanized, yellow chromated A3C"

Standard metric thread	Preload values F_M based on grades in N			Tightening torques M_A based on grades in Nm			Wrench size for			
	8.8	10.9	12.9	8.8	10.9	12.9	Hex head screws		Socket head screws	
							mm	Inch	mm	Inch
M 4 x 0,7							7	9/32	3	---
M 5 x 0,8	6 900	9 700		4,9	7,0		8	---	4	5/32
M 6 x 1	9 750	13 700		8,0	12,0		10	---	5	---
M 7 x 1							11	---	---	---
M 8 x 1,25	17 900	25 100		20	28		13	1/2	6	---
M 10 x 1,5	28 400	40 000		40	56		(17)16	(11/16)	8	---
M 12 x 1,75	41 500	58 500		69	98		(19) 18	(3/4)	10	---
M 14 x 2	56 500	80 000		110	155		(22) 21	(7/8)	12	---
M 16 x 2	78 500	110 000		170	240		24	---	14	9/16
M 18 x 2,5							27	1 - 1/16	14	9/16
M 20 x 2,5	122 000	172 000		330	465		30	1-3/16	17	43/64
M 22 x 2,5							(32) 34	1 - 9/92	17	43/64
M 24 x 3	176 000	248 000		570	800		36	1-7/16	19	3/4
M 27 x 3							41	1 - 5/8	19	3/4
M 30 x 3,5	282 000	397 000		1 150	1 600		46	1-13/16	22	7/8
M 33 x 3,5							50	2	24	---
M 36 x 4							55	2-3/16	27	1-1/16
M 39 x 4							60	2-3/8	27	1-1/16



NOTE:

Preload forces and tightening torques are based on lightly lubricated screws and nuts (corresponds to medium friction $\mu_G=0.10$).

Wrench size (x) = wrench size according to DIN 931

7. SPECIAL ATTACHMENTS / OPTIONS

The components or functions outlined in section 7 are special attachments or options which deviate from the machines standard equipment.

It is therefore possible that one or more of the functions outlined in section 3 or 4 are replaced by functions as outlined in group 7.

No matter which factory option is installed in the machine, the Operation and Maintenance Guidelines in section 1 through 6 remain valid.