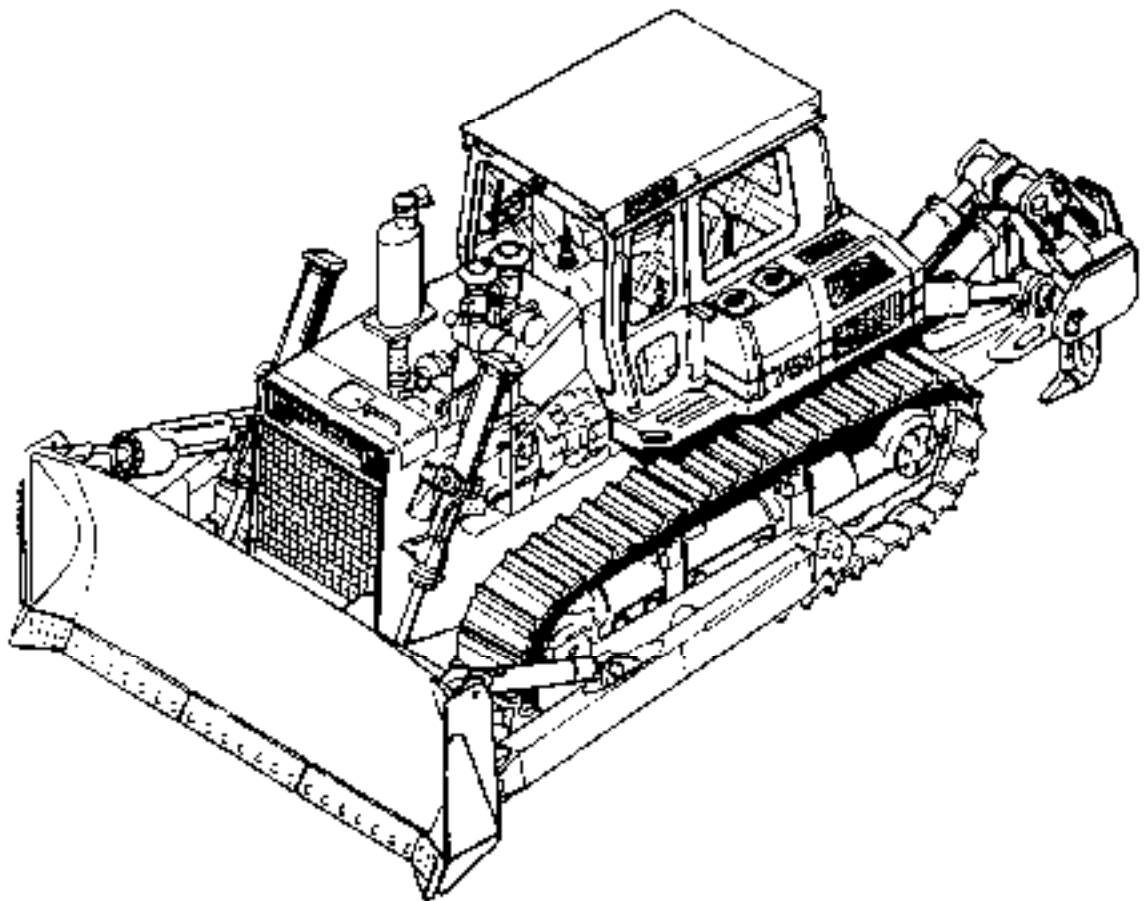


OPERATION AND MAINTENANCE MANUAL

PR 751



FOREWORD

This manual is primarily for the operator and the maintenance crew and contains information which is vital to the correct and secure operation and proper maintenance of the **LIEBHERR PR 751 Bulldozer**.

If you follow these instructions, your **LIEBHERR PR 751 Bulldozer** will give you constant and reliable service with excellent performance.

This manual should be given to the **OPERATOR**, who should read it carefully before operating the bulldozer and thereafter at regular intervals.

Please take notice that we cannot honor any claim which could arise due to careless handling, improper operation, or inadequate maintenance.

We reserve the right to modify the technical details of the machine as compared with the information and illustrations contained in these Operating instructions.

PR 751 from 280
Ed. 11.89, Id. No. 9083954, engl.

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1 TECHNICAL FEATURES

The Model 751 Dozer features full hydraulic control and operation for all functions resulting in extreme manoeuvrability.

1.1 DIESEL ENGINE

A water cooled, turbocharged, six cylinder in line Cummins Diesel Engine is shock-mounted into the mainframe. The engine develops 407 HP (295 KW) at 1800 RPM. At this low engine speed, the noise emission is greatly reduced. The two swash plate type, variable displacement final drive pumps and the gear type pumps for the attachment hydraulic are driven via a flex-coupling and splitter box.

Two dry type air cleaners with indicator and cyclon type pre-cleaner are installed into the engine compartment, however, very accessible for maintenance.

1.2 COOLING SYSTEM

The radiator-assembly is shock-mounted to the main frame in front of the engine.

1.3 MAIN HYDRAULIC AND SERVO CONTROL

All piston and gear type pumps are supplied with oil from a hydraulic tank containing 73 GAL (275 L) hydraulic oil.

Each of the final drives consists of a variable displacement pump and two variable displacement motors in closed loop configuration. Both, pump and motors controls are activated by means of remote servo control through a single two-axis joystick, located to the left of the operator's seat.

The hydraulic oil cooler assembly for the final drive and attachment hydraulic system allows for the needed heat exchange, even at extreme ambient temperatures. Two gear pumps, attached to each variable displacement pump unit, circulate oil from the hydraulic tank through an oil cooler core back into both hydrostatic final drive loops.

Part of this cool oil flow is being used to replenish the closed loop. The rest-oil is being returned to the hydraulic tank through the return-oil filter assembly.

In the working hydraulic system the hydraulic oil flows from the gear pump via the control valve to the individual end users and via the return oil filter back to the hydraulic tank.

The valve spools for the thrust frame and blade functions are servo controlled by means of one remote two-axis joystick, located to the right of the operator's seat. The joystick operated remote servo control valve is also pressurized through one of the cooling oil circulating pumps.

The other valve spool, for the ripper functions is activated by an additional pilot (servo) control valve located on the right side of the operator's seat.

1.4 MAIN FRAME

The chassis consists of box type main girders with increasing section modulus in the final drive area. Combined with the many box type cross-members, these main girders build up to a torsion-resistant main frame structure. The cross-members in the final drive area build a very rigid box structure, that is the base for both final drives and the rear mounted ripper attachment. The cross-members to the front are designed to allow the best possible load distribution induced by the two blade lift cylinders.

Two contoured belly pans protect the main frame and the installed components from damage. Generously sized openings in these pans allow for unrestricted access to all maintenance items.

A one-piece main shaft, centered in the sprocket wheel, connects both track frames to the main frame. At the front, both track frames are guided by an equalizer bar, pivoted to the main frame.

1.5 UNDERCARRIAGE

The torsion resistant track frame structure design is based on box type, pre-fabricated sections. The frame is reinforced with bulk heads and gussets.

The maintenance free tractor type components such as track rollers, carrier roller, idler assembly and multiple segment type sprocket are lifetime lubricated.

Single grouser pads 22" (560 mm), 24" (610 mm) and 28" (711 mm) wide, together with a sealed and lubricated track chain are installed on the track frames. Both track frames are pivoted to the main frame at the sprocket center, creating the best possible traction even under difficult ground conditions.

The idler assembly is axially and radially guided and can be readjusted with shims depending on it's wear. To reduce impact loads, the idler assembly is guided by shock mounts in the vertical plane.

The chain tension can be adjusted by means of a hydraulic tension unit. The pretension of the track chain is induced by a pre-loaded recoil spring assembly and retains the chain on rollers, idler and sprocket. For extreme ground conditions an optional full length track guide must be installed.

The track guides on idler and sprocket feature replaceable wear strips.

The final drive is powered by the closed loop hydrostatic system. Each final drive consist of two variable displacement, axial piston motors which is flange mounted to a triple stage, spur gear. The out-put shaft of this gear in turn drives the sprocket and the track chain. Based on the remote servo signal, any speed level for forward or reverse traveling can be controlled. Curve traveling or immediate changes in travel direction can be achieved through track counter rotation.

An engine speed sensing horsepower control protects the engine from overload at all times and automatically controls traction pump and motors, to allow an optimum draw bar pull or travel speed.

The closed loop hydrostatic travel drive can be controlled to act as brake during traveling. However, an automatically operated parking brake increases the safe operation of the machine. Without the engine in operation, this parking brake is automatically locked.

1.6 CONTROLS PLATFORM

To disrupt the structure born noise and vibration, the operator's cab is shock-mounted to the main frame. To simplify service and repair on components within the main frame, the operator's cab can be tilted.

All joystick controls for the attachments are located to the right of the operator, next to the battery box. The joystick control for all travel functions is located to the left of the operator next to the hydraulic tank. Armrests on both sides of the operator's seat allow support for the operator during banking and dozing on a slope.

Positioned to the right of the operator, in easy range, is also the control and instrumentation panel. In addition to the indicator lights and instruments there is an audible warning for low engine oil pressure, high engine coolant temperature and low replenishing oil pressure.

The bucket type operator's seat is shock-mounted, fully adjustable and its position and shock absorber can be adapted to operators of different size and weight.

1.7 OPERATOR'S CAB

The LIEBHERR Cab is designed accordingly to the newest ergonomic, safety and environmental standards, including falling object and roll-over protection. The roomy cab has the best possible all-around visibility through large safety glass windows. The view is extended to both track chains and dozer blade corners by two lower windows (on both sides of the engine compartment). There are doors on both sides of the cab, the right hand doors should be limited for emergency exit only. Both, the front and rear window areas are equipped with heavy duty windshield wiper motor/gear modules and guarantee good visibility even under severe weather conditions. The cab interior is covered with sound suppression material for the best noise reduction possible. A cab heater, utilizing the engine coolant as heat source, allows for comfortable cab temperatures, even at sub-zero ambient weather conditions. During hot and humid summer months, the cab heater fan can be used to circulate ambient air through the cab interior. For dusty work conditions, the ambient air is filtered through an air cleaner before it enters the cab.

1.8 COVERS

The side covers completely enclose the engine compartment. The top or engine covers have louvers to allow either the fresh air intake for the radiator fan or hot air escape from the engine compartment.

1.9 ATTACHMENTS

The bulldozer blade is made of abrasion resistant steel plates. The shape of the dozer reflects the newest design based on long term experience. The bolt-on type cutting edges and corner pieces are made of high tensile strength steel.

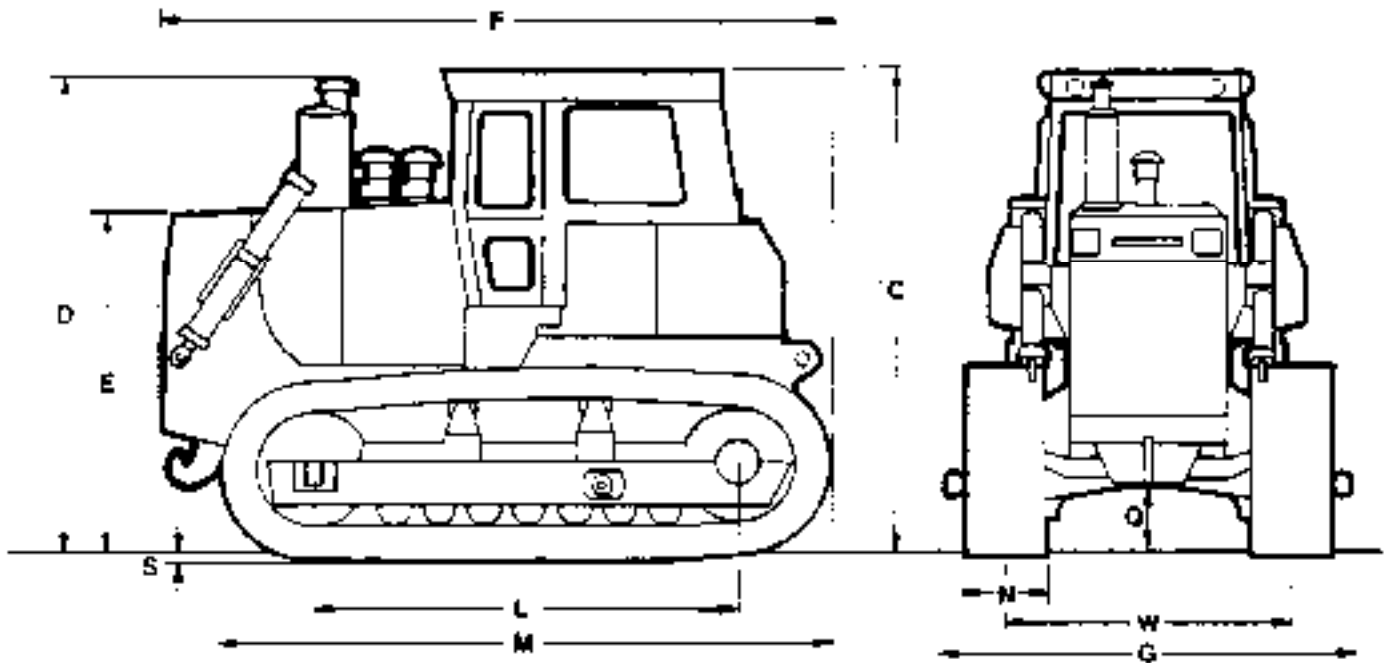
To simplify the push arm installation, the push arms itself features trunnion type connection elements on both sides. The trunnions connect the push arms securely to track frame and rear dozer blade structure. The push arms transfer the blade push force into both track frames.

Adjustable diagonal braces assure a stable dozer attachment geometry. The tilt brace with spindle adjustment allows for blade pitch changes if ground conditions require to do so. The dozer blade is tilted by a brace type hydraulic cylinder, connecting the right hand push arm and the right hand dozer blade top. The lifting and lowering of the dozer attachment is accomplished through two, from the main frame structure suspended hydraulic cylinders.

Other optional attachments such as single or multiple shank rippers are available. The ripper tooth or teeth position can be controlled by the ripper lift hydraulic cylinder.

2 DIMENSIONS PR 751

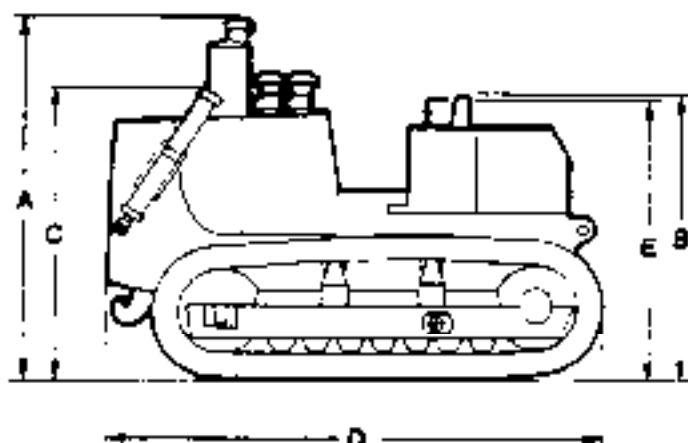
BASIC MACHINE



DIMENSIONS

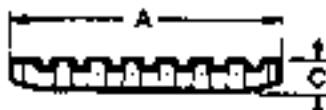
	ft - inch/ mm
C Overall Height of Basic Machine	11' 9" / 3580
D Height including Mulcher and Tailpipe	10' 10" / 3300
E Height including Engine Cover	7' 10" / 2400
F Overall length without Attachment	15' / 4865
G Overall Width without Push Arms	10' 4" / 3160
O Ground Clearance	6" / 150
M Track Length	14' 7" / 4436
L Sprocket Center to Sprocket Center	10' 4" / 3150
W Track Gauge	7' 2" / 2180
N Track Pad Width	22"/24"/28" / 560/610/711
S Grouser	3" / 78

3. TRANSPORT DIMENSIONS AND WEIGHTS



3.1 BASIC MACHINE

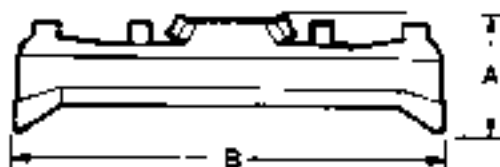
Trackpads	ft-in/mm	1' 10" / 560	2' 6" / 10	2' 8" / 711
A Height over exhaust pipe	ft-in/mm	11' 1" / 3378	11' 1" / 3378	11' 1" / 3378
B Height over operator's seat	ft-in/mm	8' 11" / 2730	8' 11" / 2730	8' 11" / 2730
D Total length	ft-in/mm	8' 3" / 2520	8' 3" / 2520	8' 3" / 2520
C Height over cylinders	ft-in/mm	16' 10" / 5125	16' 10" / 5125	16' 10" / 5125
Width over running gear	ft-in/mm	9' 3" / 2830	9' 3" / 2830	9' 3" / 2830
Weight	lb/kg	6540/2955	6560/2977	6690/3020



3.4 TRACK GUARD (1PIECE)

(1 set = 3 pieces)

A Length	ft-in/mm	9' 5" / 2800
C Height	ft-in/mm	9" / 320
Width	ft-in/mm	4" / 110
Weight	lb/kg	200 / 90



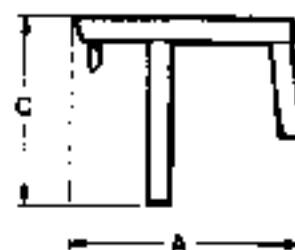
3.5 TILT BLADE

A Length	ft-in/mm	3' 7" / 1100
B Width	ft-in/mm	3' 5" / 1100
Height	ft-in/mm	6" / 1830
Weight	lb/kg	1866/850



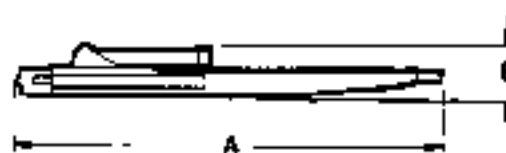
3.2 OPERATOR'S CAB

A Length	ft-in/mm	4' 2" / 1240
C Height	ft-in/mm	5' 9" / 1750
Width	ft-in/mm	6' 2" / 1860
Weight	lb/kg	1879/ 850



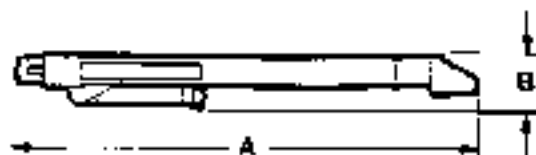
3.3 PROTECTION ROOF

A Length	ft-in/mm	7' 2" / 2140
C Height	ft-in/mm	5' 9" / 1750
Width	ft-in/mm	5' 5" / 1640
Weight	lb/kg	1526/680



3.5.1 THRUST FRAME R.H. WITH TILT CYLINDER AND PRESSING BRACE

A Length	ft-in/mm	12' 3" / 3950
B Width	ft-in/mm	11' 6" / 350
Height	ft-in/mm	21' 4" / 700
Weight	lb/kg	3150/1425



3.5.1 THRUST FRAME L.H. WITH CYLINDER AND PULLING BRACE

A Length	ft-in/mm	12' 9" / 3850
B Width	ft-in/mm	11' 5" / 420
Height	ft-in/mm	19' 0" / 550
Weight	lb/kg	2250/1025

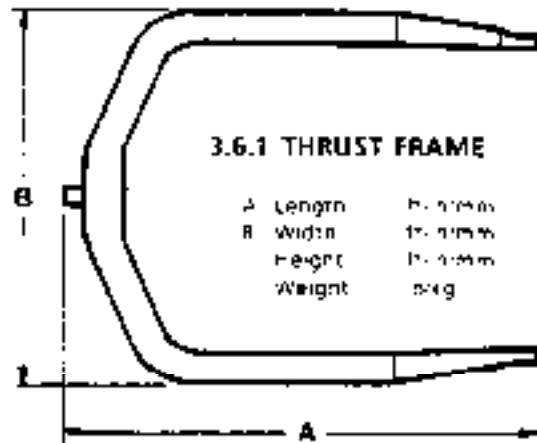
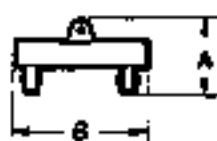
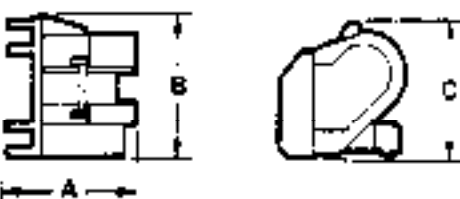
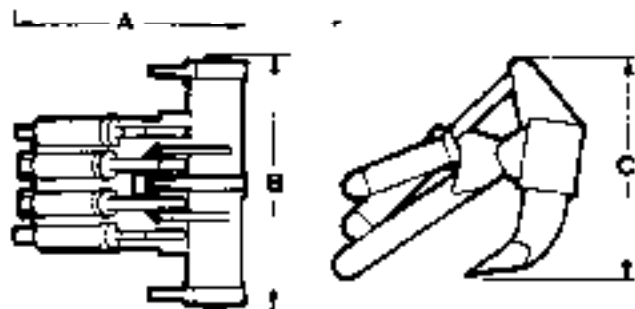
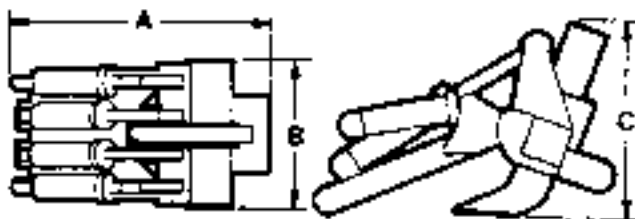


3.6 ANGLE BLADE

A Length	in/mm	21' 6" / 650
B Width	in/mm	15' 8" / 4800
Height	in/mm	3' 4" / 1030
Weight	lb/kg	5238/2376

3.6.2 PRESSING BRACES (2 PIECES)

A Length	in/mm	11' 6" / 350
B Width	in/mm	7' 3" / 2200
Height	in/mm	1' 4" / 400
Weight	lb/kg	2276/1030



3.6.1 THRUST FRAME

A Length	in/mm	14' 1" / 4300
B Width	in/mm	11' 5" / 3500
Height	in/mm	2' 1" / 630
Weight	lb/kg	5525/2500

3.7 RIPPER - SINGLE SHANK

A Length	in/mm	3' 5" / 250
C Height	in/mm	4' 3" / 1370
Width	in/mm	6' 1" / 2100
Weight	lb/kg	10600/4800

3.8 RIPPER - THREE-SHANK

A Length	in/mm	6' 11" / 2120
C Height	in/mm	7' 6" / 2280
Width	in/mm	6' 9" / 2050
Weight	lb/kg	12155/5500

3.9 WINCH

A Length	in/mm	4' 6" / 380
C Height	in/mm	4' 9" / 450
Width	in/mm	3' 8" / 680
Weight	lb/kg	11050/5000

3.10 COUNTER WEIGHT

A Length	in/mm	2' 9" / 835
B Width	in/mm	4' 3" / 1300
Height	in/mm	3' 1" / 1195
Weight	lb/kg	9819/4400

4. TECHNICAL DATA

4.1 ENGINE INSTALLATION

4.1.1 ENGINE	KT 19-C Water Cooled Cummins, Diesel Engine Displacement 1150 cu. inch (18,900 cms) Number of Cylinders 6 cylinder in line Output 295 KW at 1800 RPM per DIN 6271 401 HP at 1800 RPM per SAE J816 b Lub Oil Consumption Approx. 1% of Fuel consumption Max. Engine Tilt 45° all sides
4.1.2 AIR CLEANER	One Donaldson Dry Type Air Cleaner with Pre-Cleaner
4.1.3 COUPLING	Shock Absorbing Centraflex
4.1.4 COOLING SYSTEM	Water/Air Radiator
4.1.5 FUEL SYSTEM	Fuel Tank with Fuel Level Indicator
4.1.6 SPLITTER BOX	Spur Gear
4.2 HYDRAULIC SYSTEM	
4.2.1 HYDROSTATIC FINAL DRIVE	Two Swashplate Type Piston Pumps Pump Output Max. 2 x 116 GPM (2 x 439 l/min) Operating Pressure Max. 6100 PSI (420 bar)
4.2.2 ATTACHMENT HYDRAULICS	Fixed Displacement, Gear Pump Pump Output Max. 72 GPM (271 l/min) Operating Pressure Max. 2300 PSI (160 bar)
4.2.3 CONTROL VALVE	Casted, Multiple Spool Monoblock
4.2.4 SERVO CONTROL	Low Pressure, Proportional Joystick Control for all Functions. One two-axis Joystick controlling the Final Drives, one two-axis Joystick controlling all Blade Functions. The Ripper Tooth Attachment is operated by individual Hand-Control Levers.
4.2.5 SERVO PUMP	Fixed Displacement, Gear Pump Pump Output Max. 3.2 GPM (12 l/min) Servo Pressure Max. 330 PSI (23 bar)
4.2.6 Hydraulic Oil Tank	Completely enclosed with one integrated Shut-off Valve to the Suction Line Hydraulic Tank Capacity Approx. 73 Gal (275 l)

4.2.7	HYDRAULIC OIL COOLER Cooler Fan Drive Pump Output Operating Pressure Cooler Assembly	2 Gear Pumps 2 x 9 GPM (2 x 34 l/min) max. 2200 PSI (150 bar) Aluminium Core
4.2.8	HYDRAULIC OIL FILTERS Return-Oil Servo Oil Hydraulic Pump	Paper type Filter Assembly with one Magnet Rod and disposable Paper Element. In-Line Pressure Filter Assembly with disposable Paper Element. In-Line Filter Assembly with disposable Filter Element
4.3	UNDERCARRIAGE Track Components Track Adjustment Track Chain Pre-Tension Track Pads	Tractor-Type maintenance free, Size D8K, sealed and lubricated track chains. Life-time lubricated Track and Carrier Rollers, Idler and Sprocket Assembly. The Sprocket Rim consists of 9 bolt-on type segments Hydraulically with Grease Cylinder Recoil Spring Assembly Single Grouser track shoe 22" (560 mm), 24" (610 mm) or 28" (711 mm)
4.3.1	FINALE DRIVE Reduction Gear Travel Speed Range Travel Brakes	Hydrostatic Drive in closed-loop configuration. Two variable displacement Piston Motors per Drive. Triple-Stage Spur Gear (Ratio 64) 0 to 6 MPH (0-9.5 km/h) forward and reverse Hydrostatic drive in closed-loop configuration with Working Brake Capabilities. Automatic self-locking, Drum Type, Parking Brake.

4.4 ELECTRICAL SYSTEM

Battery	Two 12 Volt Units, 170 AMP-HR each
Starter Motor	24 Volt, 13.6 HP (10 KW)
Alternator	28 Volt, 50 AMP max. Output

4.5 CAB HEATER

Output	Max. 30,300 BTU (9200 W) per hour
Fan	Two speed Air Fan

4.6 ATTACHMENTS

4.6.1 BLADE LIFT CYLINDER

Piston Diameter	5"	(130 mm)
Rod Diameter	3"	(70 mm)
Stroke	4'5"	(1340 mm)

4.6.2 BLADE TILT CYLINDER - 3 SHANK

Piston Diameter	9"	(220 mm)
Rod Diameter	4"	(90 mm)
Stroke	6"	(160 mm)

4.6.3 RIPPER LIFT CYLINDER

Piston Diameter	8"	(200 mm)
Rod Diameter	4"	(110 mm)
Stroke	2'2"	(650 mm)

4.6.4 RIPPER LIFT CYLINDER - 1 SHANK

Piston Diameter	8"	(200 mm)
Rod Diameter	4"	(110 mm)
Stroke	2'2"	(650 mm)

5 CAPACITIES

Engine Lub Oil	(see Lubricant Chart and Mercedes-Benz Instruction Manual)	13.2 GAL (50 l)
Cooling System	Water + Anti-Freeze + Additives (see Mercedes-Benz Instruction Manual)	19.8 GAL (75 l)
Hydraulic System	Total (see Lubricant Chart) Hydraulic Tank	106 GAL (400 l) 73 GAL (275 l)
Splitter Box Reduction Gear	SAE 90 (API-GL-5-90) SAE 90 (AP-GL-5-90)	0.8 GAL (3 l) 2 x 16.1 GAL (61 l)
Carrier Roller	SAE 80 (API-GL-4-80)	0.63 QT (0,6 l)
Track Roller	SAE 80 (API-GL-4-80)	0.69 QT (0,65 l)
Idler Wheel	SAE 80 (API-GL-4-80)	0.48 QT (0,45 l)
Fuel Tank	Diesel Fuel	161 GAL (610 l)

6 V-BELTS

	ID. NO.	Quantity
Radiator + Fan	7401862	1
Alternator	7402613	1

7 COLD START DEVICE

	ID. NO.	Quantity
Starting fluid Cylinder	8500300	1

8 FILTER ELEMENTS

8.1 ENGINE FILTERS

	ID NO	Quantity
Fuel Filter Filter Element	7364434	2
Lube oil Filter Filter Element	7363165	2
By-Pass Filter Filter Element	5604365	1
Water Filter Filter Element	7361501	1
Air Cleaner Primary Filter Element	7360972	2
Safety Filter Element	7360973	2

8.2 HYDRAULIC FILTERS

Servo Oil Filter (In-Line) Filter Element	7002929	1
Return Oil Filter (Hydraulic Tank) Filter Element	7211198	2
Dual Filter Assembly (Hydraulic Pump)	7004209	4

8.3 OPERATOR'S CAB-FILTER

Air Filters	7401426	2
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9. SAFETY INFORMATION

9.1 ACCIDENT PREVENTION

For further information, see "TGB Safety Regulations for Dump Trucks and Crawler Tractor Operation".

In the United States or Canada, see the CIMA "Safety Manual" supplied with the machine.

THE SAFE OPERATION OF THE MACHINE DEPENDS ON COMPLIANCE WITH THE FOLLOWING SAFETY RULES.

- 9.1.1 **KEEP CLEAR OF MACHINE.** Keep all other persons out of the working range of the machine to prevent bodily injury.
- 9.1.2 **ALLOW NO ONE OTHER THAN THE OPERATOR ON THE MACHINE.** While operating the machine, do not permit another person in the cab or canopy unless an additional, safe seat arrangement is available. NEVER ALLOW ANYBODY TO STAND ON STEPS, PLATFORMS, ATTACHMENTS, ETC. DURING MACHINE OPERATION. Allow other persons on the crawler dozer only after the machine is parked and the engine turned off. The operator must consent to anyone else boarding the machine.
- 9.1.3 **SEAT BELT MUST BE WORN.** The seat belt must be worn any time the machine is in operation.
- 9.1.4 **ADAPT MACHINE SPEED.** Always adapt the speed of the machine to the jobsite conditions. You must be able to control and stop the crawler loader at any time and in any working position. NEVER TRAVEL DOWNHILL AT MAXIMUM SPEED. SHOULD YOU LOSE CONTROL OF THE MACHINE, IMMEDIATELY MOVE THE TRAVEL JOYSTICK TO NEUTRAL, LOWER THE ATTACHMENT TO THE GROUND AND PLACE THE SAFETY LEVER INTO THE DOWN POSITION.
- 9.1.5 **SECURE MACHINE AFTER OPERATION.** Whenever the crawler loader is parked, put the machine on firm and level ground. LOWER ALL ATTACHMENTS (bucket and ripper) to the ground until the attachment makes solid contact with the ground. If needed, block both tracks to keep the machine from rolling or running away. BEFORE YOU LEAVE THE OPERATOR'S SEAT, TURN OFF THE ENGINE AND PLACE THE SAFETY LEVER IN THE FULL DOWN POSITION TO DISENGAGE THE TRAVEL AND ATTACHMENT CONTROL AND TO ENGAGE THE PARKING BRAKE.
- 9.1.6 **FOLLOW INSTRUCTIONS.** When performing maintenance or repair work, follow the instructions given in the Operation and Maintenance and Service Manual carefully.
- 9.1.7 **NO SMOKING NEAR BATTERY COMPARTMENT.** Do not smoke or keep an open flame in or near the battery compartment.
- 9.1.8 **TURN OFF THE ENGINE BEFORE OPENING ENGINE COMPARTMENT DOORS.** Never open the engine compartment with the engine in operation.
- 9.1.9 **INSPECT HYDRAULIC LINES.** Frequently examine hydraulic lines. If hose or tubing assemblies must be replaced, use only ORIGINAL LIEBHERR SPARE PARTS TO ENSURE SAFETY AND RELIABILITY.
- 9.1.10 **PROPERLY SUPPORT RAISED MACHINE.** If the crawler dozer must be jacked up and raised for repairs, support and block the machine properly. NEVER USE A STEEL-ON-STEEL SUPPORT. NEVER RAISE AND LEAVE THE MACHINE IN AN ELEVATED POSITION SUPPORTED BY ATTACHMENT CYLINDERS ONLY.
- 9.1.11 **DO NOT ADJUST VALVE SETTINGS.** All control, relief and safety valve settings in the hydraulic system must be adjusted by LIEBHERR personnel OR AN AUTHORIZED DEALER MECHANIC ONLY.
- 9.1.12 **DO NOT PERFORM WELDING.** All load-bearing steel structures should be welded by the manufacturer OR AN AUTHORIZED DEALER OR MACHINE SHOP ONLY.
- 9.1.13 **NEVER WORK UNDER A RAISED ATTACHMENT.** Any time work is performed at the front of the crawler dozer or in the engine compartment, the attachment (blade) must be lowered all the way to the ground. Whenever work is required on the attachment or its hydraulic system, the attachment (blade, push arms, ripper, etc.) must be properly supported and blocked to keep it from drifting or falling.
- 9.1.14 **SECURE A RAISED CAB OR CANOPY.** Always secure a raised cab or canopy with the safety bar. Stay clear of the cab or canopy until it is 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 (off) position as long as the cab or canopy raised.
- 9.1.15 **KEEP MACHINE CLEAN.** Keep all steps and platforms clean at all times to avoid slipping. Clean engine compartment and mainframe interior periodically from debris, oil and fuel deposits to avoid fire hazards.

9.2 GENERAL SAFETY INFORMATION

- **STUDY THE INSTRUCTION AND / OR OPERATION AND MAINTENANCE MANUALS, AS WELL AS THE "CIMA" SAFETY MANUAL** before operating or working on the crawler tractor/loader.
- **ALLOW ONLY AUTHORIZED PERSONNEL TO OPERATE, SERVICE OR REPAIR THE CRAWLER TRACTOR/LOADER.**
- **WEAR PROPER WORK CLOTHING WHEN OPERATING OR WORKING ON THE CRAWLER TRACTOR / LOADER.** Rings, watches, bracelets and loose clothing such as ties, scarves, unbuttoned or unzipped shirts and jackets are dangerous and could cause injury.

WEAR PROPER SAFETY EQUIPMENT. When appropriate, utilize safety equipment such as a hard hat, safety shoes, safety glasses, ear protection, reflector vest or respirator
- **CONSULT YOUR EMPLOYER OR SUPERVISOR** for specific safety equipment requirements
- **KEEP OPERATOR'S CAB, OPERATOR'S PLATFORM, 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.
- **IF NEEDED, USE THE RIGHT DOOR AS AN ESCAPE ROUTE.**
- **NEVER JUMP OFF THE CRAWLER TRACTOR / LOADER**
- **DO NOT CARRY TOOLS, PARTS OR OTHER SUPPLIES WHILE CLIMBING ON OR OFF THE CRAWLER TRACTOR / LOADER**
- **NEVER USE THE SAFETY LEVER, CONTROL LEVERS, OR JOYSTICKS AS HANDHOLDS.** Climb on and off the crawler tractor / loader, using only the steps, rails and handles provided. When climbing on or off the crawler tractor / loader, use both hands for support and face machine.
- **PROPERLY SECURE ALL LOOSE ITEMS THAT ARE NOT PART OF THE CRAWLER TRACTOR/LOADER**
- **EQUIP THE CRAWLER TRACTOR / LOADER WITH PROPER PROTECTION** when utilizing it in demolition, land clearing and logging applications.
- **BEFORE SERVICING THE CRAWLER TRACTOR / LOADER ATTACH A "DO NOT OPERATE" TAG** to the starter switch.
- **PERFORM MAINTENANCE OR REPAIRS UTILIZING THE FOLLOWING PRECAUTIONS:**
 - Park crawler tractor / loader on firm and level ground
 - Place all controls in neutral position.
 - Shut off engine
 - Turn ignition key to 0-position
 - Deactivate travel and working hydraulic by lowering the safety lever.
- **NEVER ATTEMPT MAINTENANCE PROCEDURES OR REPAIRS YOU DO NOT UNDERSTAND.**
- **NEVER SERVICE THE CRAWLER TRACTOR / LOADER WITH THE ENGINE RUNNING UNLESS OTHERWISE SPECIFIED IN THE INSTRUCTION AND / OR OPERATION AND MAINTENANCE MANUAL.**
- **ALLOW ONLY TRAINED AND AUTHORIZED PERSONNEL TO MAINTAIN, SERVICE OR REPAIR THE CRAWLER TRACTOR / LOADER.**

- **USE ONLY ORIGINAL LIEBHERR SPARE PARTS** such as hoses, tubing, electrical wires, filters, etc.
- **NEVER JACK UP THE CRAWLER TRACTOR / LOADER WITH ITS ATTACHMENT TO PERFORM ANY MAINTENANCE OR REPAIR WORK.**
- **BLOCK AND SUPPORT THE CRAWLER TRACTOR / LOADER PROPERLY.** Be aware that the center of gravity will shift if attachments or other major components are being removed

9.3 CRUSHING AND BURN PREVENTION

- **NEVER WORK UNDERNEATH OR ON THE CRAWLER TRACTOR / LOADER UNLESS IT IS PROPERLY BLOCKED AND SUPPORTED.**
- **ALWAYS PROPERLY SUPPORT THE ATTACHMENT WHEN CHANGING ANY PART OF IT SUCH AS BUCKETS, TEETH, CUTTING EDGES, OR WEAR SHROUDS. NEVER USE METAL ON METAL SUPPORT.**
- **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 CRAWLER TRACTOR / LOADER WITH A RAISED CAB OR CANOPY.**
- **NEVER USE DAMAGED OR INSUFFICIENT WIRE ROPES AND SLINGS.** Always wear gloves when handling wire ropes.
- **NEVER REACH INTO BORES DURING ATTACHMENT INSTALLATION OR REMOVAL.** Rotating fans will swirl and throw out objects, which can become very dangerous and cause severe injury to yourself and others.
- **KEEP OBJECTS AWAY FROM THE RADIATOR FAN.** Rotating fans will swirl and throw out objects, which can become very dangerous and 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 RADIATOR CAP IS COOL ENOUGH TO TOUCH.** Remove 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.
- **DO NOT DISCONNECT LINES OR HOSES, OR REMOVE FITTINGS, CAPS OR COVERS WHILE THE HYDRAULIC SYSTEM OR ENGINE FUEL AND COOLING SYSTEM IS PRESSURIZED. ALWAYS LOWER ATTACHMENT, SHUT OFF ENGINE, AND RELEASE ALL PRESSURES.** After servicing, be certain that all lines, hoses and fittings are properly connected and all caps and covers properly closed.
- **ALWAYS WEAR SAFETY GLASSES AND PROTECTIVE GLOVES** when handling batteries. Keep sparks or open flames away.
- **NEVER PERMIT ANYONE TO HAND-GUIDE** the bucket or ripper into position
- **DISCONNECT THE BATTERIES BEFORE WORKING ON THE ELECTRICAL SYSTEM OR BEFORE PERFORMING ANY ARC-WELDING. ALWAYS DISCONNECT THE NEGATIVE TERMINAL FIRST, AND RECONNECT IT LAST.**

9.4 FIRE AND EXPLOSION PREVENTION

- **NEVER SMOKE OR ALLOW AN OPEN FLAME** in refueling areas or where batteries are being charged, or where batteries or flammable materials are stored.
 - **ALWAYS SHUT OFF ENGINE DURING REFUELING.**
 - **NEVER STORE FLAMMABLE FLUIDS ON THE MACHINE EXCEPT IN THE STORAGE TANK INTENDED FOR THE CRAWLER TRACTOR / LOADER'S OPERATION.**
 - **ALWAYS USE PROPER ENGINE START OR JUMP START PROCEDURES.** Consult the Instruction and / or Operation and Maintenance Manual.
 - **FREQUENTLY CHECK THE ELECTRICAL SYSTEM AND CORRECT ALL WIRING DEFECTS.**
 - **DO NOT USE FLAMMABLE FLUIDS TO CLEAN THE CRAWLER TRACTOR / LOADER.**
 - **INSPECT ALL COMPONENTS, LINES, TUBES AND HOSES FOR OIL AND FUEL LEAKS OR DAMAGE. REPLACE OR REPAIR ANY DAMAGED COMPONENTS.**
 - **NEVER CHECK FOR LEAKS WITH YOUR BARE HANDS.** Fluid escaping from a small hole can have enough force to penetrate the skin
 - **BE CERTAIN THAT ALL CLAMPS, GUARDS, AND HEAT SHIELDS ARE INSTALLED.** These components prevent vibration, rubbing and heat buildup. Install tie-wraps to fasten hoses and wires as required
 - **USE ETHER ONLY IN VENTILATED AREAS AND AS DIRECTED.** Cold start ether is extremely flammable
- NEVER SMOKE WHILE HANDLING ETHER CANS OR CHANGING ETHER CYLINDERS.**
- **KNOW THE LOCATION OF THE CRAWLER TRACTOR / LOADER'S FIRE EXTINGUISHER, IF INSTALLED, AND BE FAMILIAR WITH ITS OPERATION.**

9.5 MACHINE START-UP SAFETY

BEFORE CRAWLER TRACTOR / LOADER START-UP PERFORM A THOROUGH WALK-AROUND INSPECTION.

- **VISUALLY INSPECT THE CRAWLER TRACTOR / LOADER.** Look for loose parts, cracks, wear, leaks and evidence of vandalism.
- **NEVER START OR OPERATE AN UNSAFE CRAWLER TRACTOR / LOADER.**
- **REPORT ALL DEFECTS TO YOUR FOREMAN OR SUPERVISOR AND MAKE SURE THEY ARE CORRECTED.**

FAMILIARIZE YOURSELF WITH JOBSITE RULES. Be informed about traffic hand signals and safety signs. Ask who is responsible for signaling.

- **TAKE SIGNALS FROM ONLY ONE PERSON.** In tight quarters, on jobsites with limited visibility, or if necessary, have another person guide and signal you.

- BE CERTAIN THAT THE AREA SURROUNDING THE CRAWLER TRACTOR / LOADER IS FREE OF OTHER PERSONNEL.
- BE CERTAIN NO ONE IS WORKING ON OR UNDER THE CRAWLER TRACTOR / LOADER.
- AFTER ENTERING THE CRAWLER TRACTOR / LOADER, ADJUST THE OPERATOR'S SEAT AND CONTROLS, ADJUST MIRRORS IF INSTALLED, FASTEN AND ADJUST SEAT BELT. Be certain that all controls can be reached.
- CLEAN ALL WINDOWS AND SECURE DOORS.
- ALERT NEARBY PERSONNEL THAT THE CRAWLER TRACTOR / LOADER IS BEING STARTED.

9.6 ENGINE START-UP AND OPERATION SAFETY

- PLACE ALL CONTROLS IN NEUTRAL POSITION BEFORE STARTING THE ENGINE.
- FOLLOW THE ENGINE STARTING INSTRUCTIONS. These instructions are outlined in the Instruction and / or Operation and Maintenance Manual.
- CHECK ALL LIGHTS, INDICATORS, INSTRUMENTS AND CONTROLS FOR THEIR PROPER FUNCTION.
- START ENGINE AND CHECK INDICATORS, GAUGES, WARNING DEVICES AND CONTROLS FOR THEIR PROPER INDICATION.
- START AND OPERATE ENGINE ONLY IN A WELL-VENTILATED AREA.
- WARM UP ENGINE AND HYDRAULIC SYSTEM TO OPERATING TEMPERATURES. Low engine and hydraulic oil temperatures cause the crawler tractor / loader to be unresponsive.
- CHECK THAT ALL ATTACHMENT FUNCTIONS ARE PROPERLY OPERATING.
- MOVE THE CRAWLER TRACTOR / LOADER SLOWLY INTO AN OPEN AREA AND CHECK ALL TRAVEL FUNCTIONS FOR THEIR PROPER OPERATION.

9.7 MACHINE OPERATING SAFETY

- OPERATE CRAWLER TRACTOR / LOADER ONLY WHILE SEATED AND WITH THE SEAT BELT FASTENED.
- NEVER OPERATE THE MACHINE WITHOUT THE "ROPS" (ROLL-OVER PROTECTIVE STRUCTURE) CAB OR CANOPY.
- NEVER ALLOW OTHER PERSONNEL ON THE CRAWLER TRACTOR / LOADER.
- REPORT PROBLEMS OR NEEDED REPAIRS TO YOUR FOREMAN OR SUPERVISOR.
- BE CERTAIN THAT NO ONE IS BEING ENDANGERED BY MOVING THE CRAWLER TRACTOR / LOADER.
- CHECK THE BRAKE AND STEERING SYSTEM. The proper operation of the brake and steering system is outlined in the Instruction and / or Operation and Maintenance Manual.
- NEVER LEAVE THE CRAWLER TRACTOR / LOADER WHILE THE ENGINE IS RUNNING OR IF THE CRAWLER TRACTOR / LOADER IS IN MOTION.

- KEEP THE ATTACHMENT CLOSE TO THE GROUND.
- KEEP A SAFE DISTANCE FROM OVERHANGS, WALLS, DROP-OFFS AND UNSTABLE GROUND.
- NEVER TRAVEL DOWNHILL AT MAXIMUM SPEED.
- 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 HALF WAY IN HIGH RANGE.
- NEVER TRAVEL ON SLOPES THAT EXCEED THE MAXIMUM PERMISSIBLE GRADE-ABILITY.
- IF THE CRAWLER TRACTOR / LOADER BEGINS TO TIP OR SLIP ON A GRADE, IMMEDIATELY LOWER ATTACHMENT AND LOAD TO THE GROUND AND TURN THE CRAWLER TRACTOR / LOADER DOWNHILL.
- KEEP SEAT BELT SECURELY FASTENED WHEN OPERATING. Experience has shown that it is safer to stay in the (ROPS) cab, in the event of an overturn.
- CRAWLER LOADERS:
NEVER DIG, LIFT OR LOAD SIDEWISE ON SLOPES. ALWAYS OPERATE THE CRAWLER LOADER WITH THE ATTACHMENT POSITIONED UPHILL OR DOWNHILL.
- CRAWLER TRACTORS:
AVOID SIDESLOPE TRAVEL AND WORK WHENEVER POSSIBLE. OPERATE THE CRAWLER TRACTOR UPHILL OR DOWNHILL.
- ALWAYS TRAVEL SLOWLY ON ROUGH OR SLIPPERY GROUND AND ON SLOPES.
- BE ALERT TO CHANGING GROUND CONDITIONS, VISIBILITY AND WEATHER CONDITIONS.
- BE ALERT FOR UTILITY LINES. Be aware of the location of underground cables, gas and water lines.
- AVOID HIGH VOLTAGE ELECTRICAL LINES.
 - Keep at least 10' from lines with a voltage up to 57,000 volts.
 - At least 17' from lines with a voltage above 57,000 volts.
- ASK ABOUT FEDERAL, STATE AND LOCAL SAFETY REQUIREMENTS.

9.8 MACHINE TOWING AND PULLING SAFETY

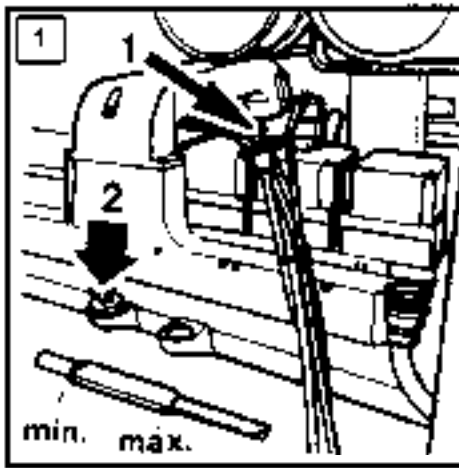
- Consult the Towing Section of the Instruction and / or Operation and Maintenance Manual.
- BE SURE ALL TOWING AND PULLING DEVICES SUCH AS CABLES, HOOKS AND COUPLERS ARE SAFE AND ADEQUATE.
- CONNECT CABLES TO THE APPROPRIATE TOWING HOOKS OR COUPLERS ONLY.
- NEVER ALLOW ANYONE TO STAND NEAR THE CABLE WHILE PULLING OR TOWING. KEEP CABLE TIGHT AND FREE OF KINKS.
- ENGAGE TRAVEL SLOWLY AND DO NOT JERK. With a slack cable , the sudden impact of the load being towed could snap the cable

9.9 MACHINE PARKING SAFETY

- **PARK CRAWLER TRACTOR / LOADER ONLY ON FIRM AND LEVEL GROUND, AND ENGAGE THE PARKING BRAKE BY PLACING THE SAFETY LEVER IN THE FULL DOWN POSITION.** If it becomes necessary to park the machine on a grade, properly block and secure it.
- **NEVER LEAVE THE CAB OR THE CRAWLER TRACTOR / LOADER UNATTENDED WITH THE ENGINE RUNNING.**
- **ALWAYS LOWER THE ATTACHMENTS TO THE GROUND.**
- **RETURN ALL CONTROLS TO THE NEUTRAL POSITION AND ENGAGE THE PARKING BRAKE BY PLACING THE SAFETY LEVER IN THE FULL DOWN POSITION.**
- **WHEN STOPPING THE ENGINE, ALWAYS FOLLOW THE PROCEDURES AS OUTLINED IN THE INSTRUCTION AND / OR OPERATION AND MAINTENANCE MANUAL.**
- **BEFORE LEAVING THE CAB ALWAYS PLACE THE SAFETY LEVER IN THE FULL DOWN POSITION TO DEACTIVATE THE TRAVEL AND ATTACHMENT SERVO CONTROLS.**
- **LOCK CRAWLER TRACTOR / LOADER, REMOVE ALL KEYS, AND SECURE THE CRAWLER TRACTOR / LOADER AGAINST VANDALISM AND UNAUTHORIZED USE.**

9.10 MACHINE TRANSPORTATION SAFETY

- **REMOVE ALL MUD, SNOW OR ICE FROM TRACK COMPONENTS.**
- **BE SURE THAT THE LOADING-RAMP INCLINE IS LESS THAN 30 DEGREES AND COVERED WITH WOODEN PLANKS.**
- **REMOVE BUCKET, BLADE OR RIPPER FROM THE CRAWLER TRACTOR / LOADER ONLY IF NECESSARY.**
- **RETRACT THE ATTACHMENT AS FAR AS POSSIBLE.**
- **VERY CAUTIOUSLY DRIVE UP ON RAMP AND TRAILER.** Have another person guide and signal you.
- **RETRACT ATTACHMENT AS FAR AS POSSIBLE AND LOWER BUCKET, BLADE OR RIPPER ON TRAILER PLATFORM.**
- **SECURELY BLOCK AND CHAIN THE CRAWLER TRACTOR / LOADER TO THE TRAILER.**
- **CAREFULLY CHECK OUT THE TRANSPORT ROUTE BEFOREHAND.** Check that there is enough clearance underneath all bridges and underpasses, utility lines, and in tunnels.
- **UNLOAD THE CRAWLER TRACTOR / LOADER AS CAUTIOUSLY AS IT WAS LOADED.** Remove all chains and blocks. Start the engine as outlined in the Instruction and / or Operation and Maintenance Manual. Carefully drive off the trailer and down the ramp, holding the attachment as low as possible. Have another person guide and signal you.



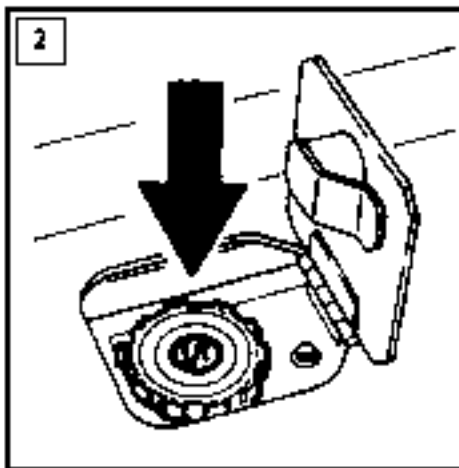
10 PRE-STARTING INSTRUCTIONS

10.1 ENGINE OIL LEVEL

Check engine lub oil level with machine on level ground. (After engine shut-down, the oil has to be allowed sufficient time to accumulate in engine oil pan). The oil level must be between min. and max. marks on dipstick (Fig. 1, Pos. 1). Position 2 shows an engine oil refill.

⚠ CAUTION

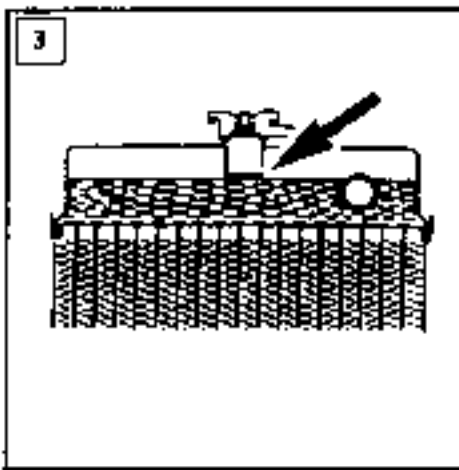
Do not overfill. The oil amount between minimum and maximum fill marks is 2 GAL (7,6 l).



10.2 COOLANT LEVEL

For location of radiator filler neck on the bulldozer see (Fig. 2). Remove radiator cap slowly to relieve pressure. The coolant level should reach the filler neck (Fig. 4). If the coolant level is lower, the radiator must be topped off.

After refilling the cooling system, let the engine run for a short time with open heating system. Check coolant system once more.

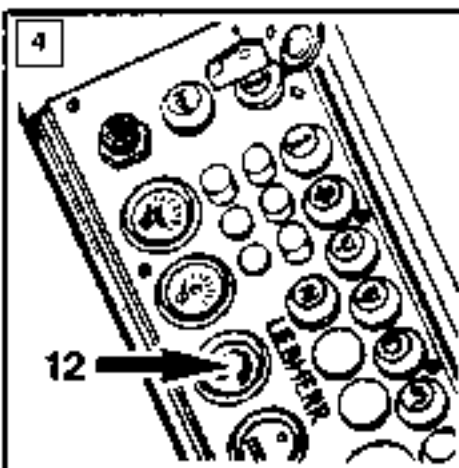


10.3 ELECTRICAL SYSTEM

Check the entire electrical system, especially all switch functions, the lighting system, the dozer blade flotation solenoid, the fuses, the electrolyte level in the batteries and the battery brackets (For the electrical schematic see page 55).

10.4 FUEL SUPPLY LEVEL

Check fuel level indicator in control panel (see page 22 Position 12)



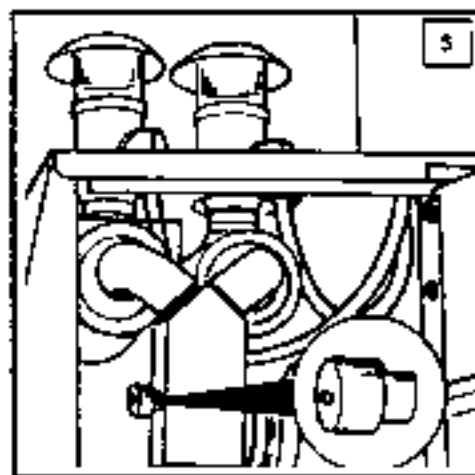
10.5 AIR CLEANER

A red-green contamination indicator, located in the engine compartment on the air cleaner assembly, will show when the filter elements must be serviced (Fig. 5).

The air cleaner should always be checked in conjunction with the engine oil level.

The required daily maintenance is indicated on the **MAINTENANCE CHART**.

For detailed engine maintenance, refer to the **CUMMINS "Operation and Maintenance Manual"**.



10.6 HYDRAULIC OIL LEVEL

NOTE:

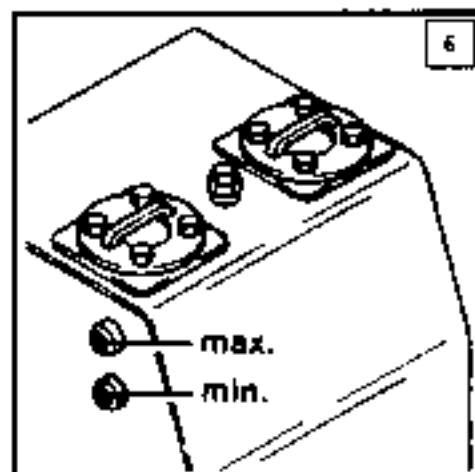
When topping the hydraulic tank observe the following:

With the bulldozer on level ground and retracted hydraulic cylinders, the oil level should not be above the center of the sight gauge marked "MAX" (Fig. 6).

In the same level position, however, with the hydraulic cylinders extended, the oil level should not fall below the center of the sight gauge marked "MIN" (Fig. 6).

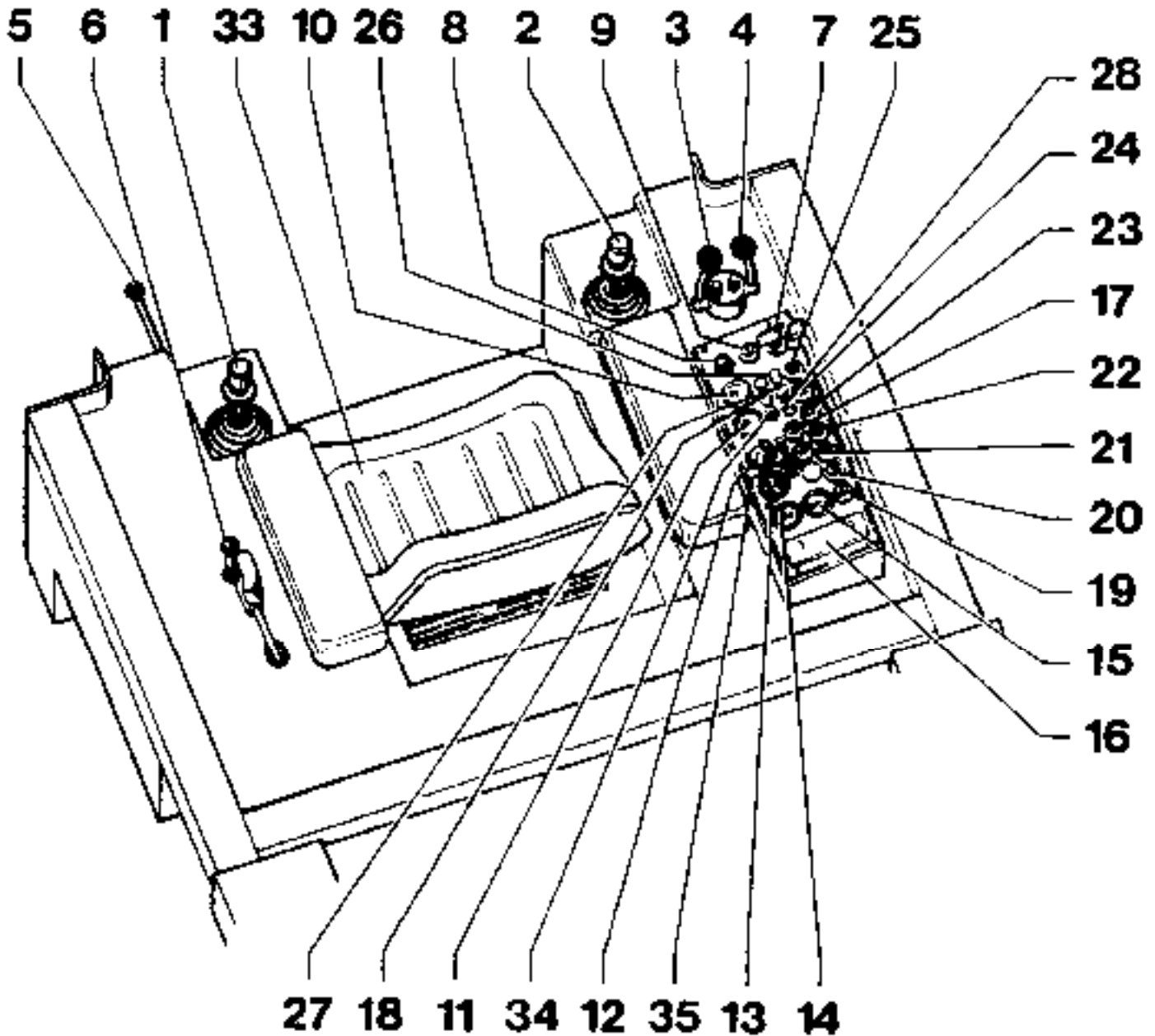
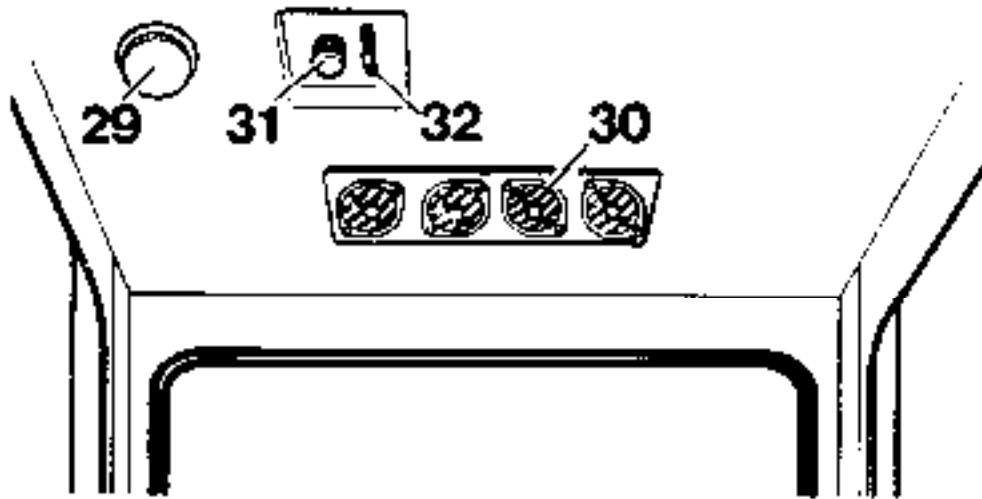
When refilling the hydraulic tank becomes necessary, refer to the **LUBRICANT CHART**.

The hydraulic tank should be filled or refilled through the return oil filter element only.

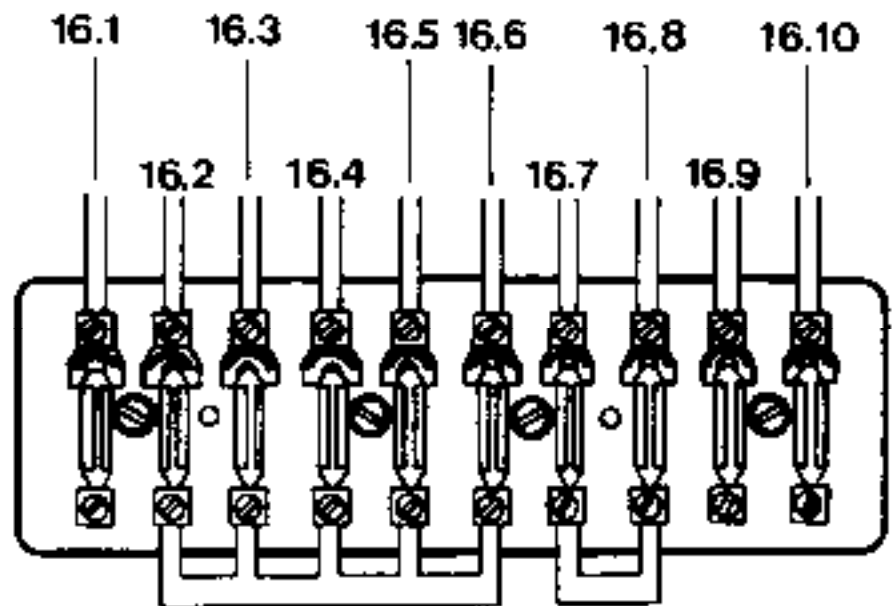
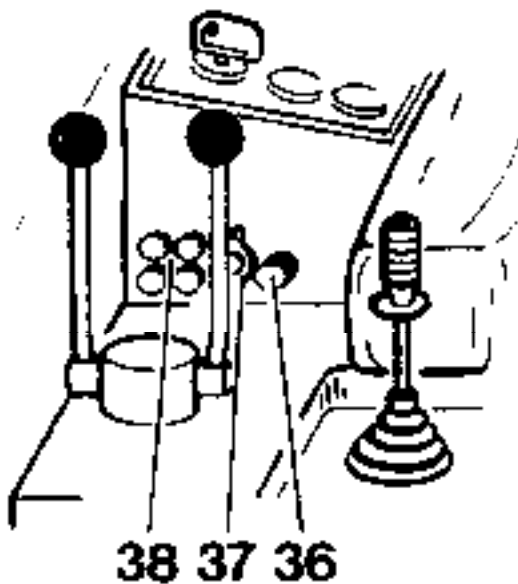


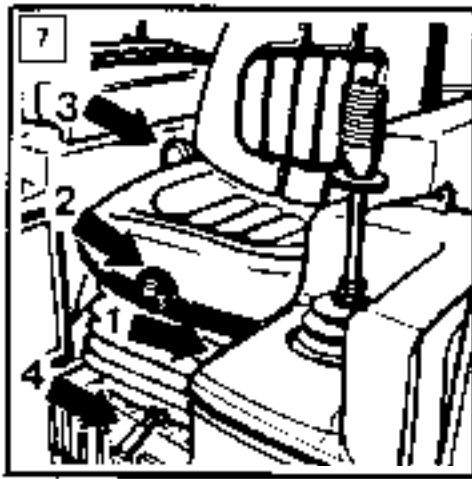
11. CONTROLS AND INSTRUMENTATION IN CAB

11.1 OPERATOR'S CAB



- | | | | |
|------|---|-------|--|
| 1 | Joystick-Final Drive | 16.10 | 8-Amp-Fuse for Dome Light, Outlet |
| 1.1 | Push Button for Counter-rotation | 17 | Pin puller |
| 2 | Joystick-Dozer Blade | 18 | Pin puller indicator |
| 2.1 | Push Button Blade Quick Drop/ Float Position | 19 | Cold Start |
| 3 | Joystick-Ripper, Lift Cylinder | 20 | Head Lights |
| 4 | Joystick Ripper, Tilt Cylinder | 21 | Working Lights |
| 5 | Safety lever | 22 | Windshield Wiper-Rear Window |
| 6 | Engine Throttle | 23 | Windshield Wiper-Front Window |
| 7 | Ignition Switch | 24 | Switch- Blade quick drop / float position selector |
| 8 | Signal Horn | 25 | Load Switch |
| 9 | Horn-Push Button | 26 | Servo Oil Pressure Indicator |
| 10 | Engine Oil Pressure | 27 | Blade Flotation Indicator |
| 11 | Coolant Temperature | 28 | Parking Brake Indicator |
| 12 | Fuel Gauge | 29 | Dome Light |
| 13 | Hour Meter | 30 | Air Louvers |
| 14 | Water Temperature | 31 | Heater Fan Switch |
| 15 | Ammeter | 32 | Heater Control |
| 16 | Fuse Box | 33 | Operator's Seat |
| 16.1 | 5-Amp-Fuse for Gauge Illumination | 34 | Battery charge indicator |
| 16.2 | 8-Amp-Fuse for Head Lights, | 35 | Automatic Idling Turn Switch (Optional Equipment) |
| 16.3 | 8-Amp-Fuse for Working Lights | 36 | Automatic Idling Switch (Optional Equipment) |
| 16.4 | 8-Amp-Fuse for Working Lights | 37 | Outlet |
| 16.5 | 8-Amp-Fuse for Windshield Wiper-Front Signal Horn Indicators and Gauges | 38 | Additional Fuse for Optional Equipment |
| 16.6 | 8-Amp-Fuse for Windshield Wiper-Rear | | |
| 16.7 | 8-Amp-Fuse for Counter-rotation Quick drop, Back-up alarm | | |
| 16.8 | 5-Amp-Fuse for Float position/ Travel speed selector | | |
| 16.9 | 8-Amp-Fuse for Heating | | |





11.2 OPERATOR'S SEAT

A horizontal seat adjustment can be made by pulling the lever (Fig. 7, Pos. 1).

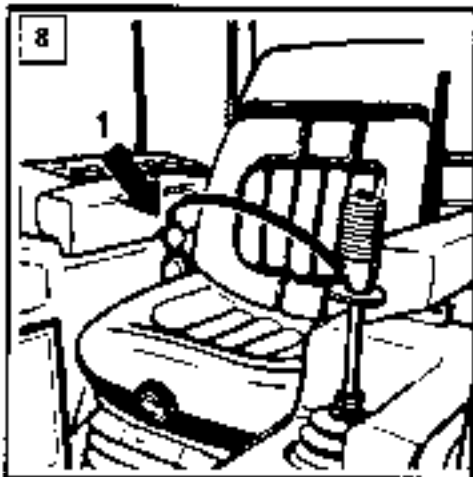
The seat tilt can be adjusted by turning the knob (Fig. 7, Pos. 2).

The back rest tilt can be adjusted by turning the knob (Fig. 7, Pos. 3).

The seat suspension is matched to the weight of the operator by turning the knob (Fig. 7, Pos. 4)

Turning the knob clockwise will stiffen the suspension. Turning the knob counter-clockwise will soften the suspension.

Seat belts are fastened by interlocking tongue and lock part, located on both seat belt ends. Releasing the seat belt is accomplished by pushing the red button on the lock (Fig. 8, Pos. 1).



11.3 CAB HEATING AND FRESH AIR CONTROL

FRESH AIR CIRCULATION CONTROL:

Set warm air control lever to "0" position (Fig. 9, Pos. 32). Set fan motor speed selector switch to position "1" or position "2" (Fig. 9, Pos. 31).

Fresh air is drawn from the ambient through air cleaners, mounted in the cab's roof structure and pushed into the cab through four fully adjustable louvers (Fig. 9, Pos. 30)

HEATING OR WARM AIR CONTROL:

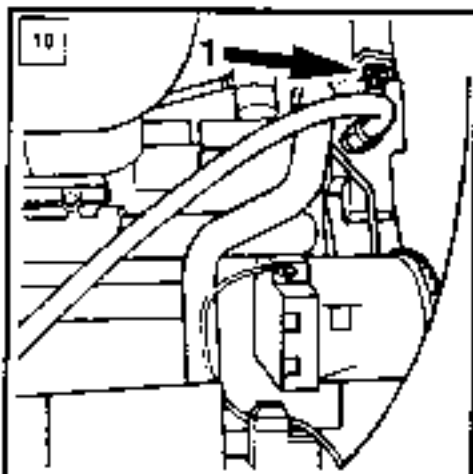
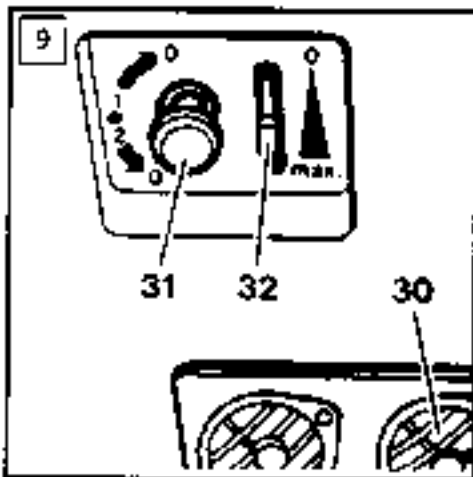
Set warm air control lever to "Max." heating position (Fig. 9, Pos. 32). The heater output can be infinitely adjusted between "0" and "Max" heater control position.

The hot air flow can be adjusted by setting the fan motor speed selector switch to either position "1" or position "2" (Fig. 9, Pos. 31)

Re-circulated or fresh air is being circulated through the heat exchanger and pushed into the cab through four fully adjustable louvers.

With the fan motor in operation, a certain minimum amount of fresh air is always pushed through the heat exchanger into the cab. This causes a slight cab pressurization avoiding dust to enter the operator's cab

During summer months when the heater is not utilized or during maintenance and repair work, the hot water supply to the heat exchanger can be interrupted by closing both shut-off valves, located on the engine block (Fig. 10, Pos. 1).



12. OPERATING INSTRUCTIONS

12.1 START-UP PROCEDURES

CAUTION

The engine can only be started with the safety lever completely in the full "Down" position (see Fig. 11, Pos. 5.2).

Important!

Before the engine is started, it is absolutely necessary to check all functions.

12.1.1 START-UP PROCEDURES

- Set throttle lever to "Low Idle" position (Fig. 12, Pos. 6.1)
- Insert and set ignition key / switch to the "Run" position (Fig. 13, Pos. 7.2).
The following indicators, instruments and the audible signal must switch on (Fig. 13):
 - Battery Charge Indicator on (Pos. 18)
 - Parking Brake Indicator (Pos. 28)
 - Servo / Replenishing oil Supply / Indicator (Pos. 26)
 - Amperemeter in 0-Position (Pos. 15)
 - Audible Signal - indicating low Engine Oil Pressure, low Servo Oil Supply Pressure and / or high Coolant Temperature (Pos. 8)
- Set ignition key / switch to "Start" position (Fig. 13, Pos. 7.3) to start engine.

Do not energize starter motor more than 15 seconds!

If engine does not start on the first attempt, repeat starting procedures at 60 seconds intervals.

Once the engine is running, the following indicators and the audible signal must switch off.

- Battery Charge Indicator (Pos. 18)
- Supply Indicator (Pos. 26)
- Audible Signal (Pos. 8)

In case the indicator and audible signal do not switch off, the engine must be stopped immediately and the cause for the indication or signal investigated.

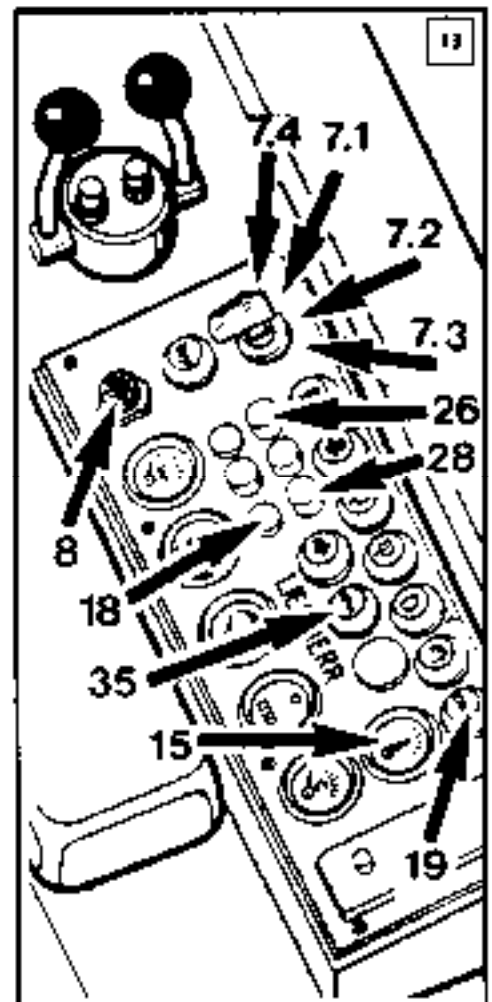
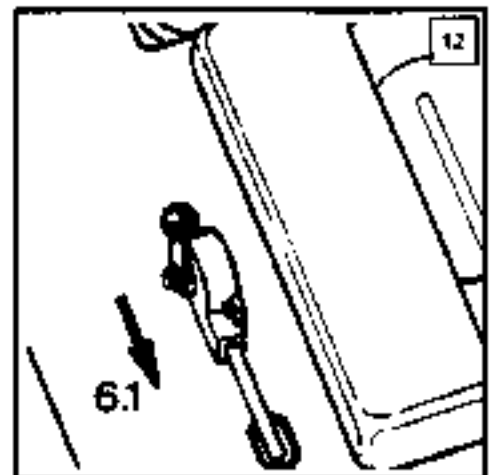
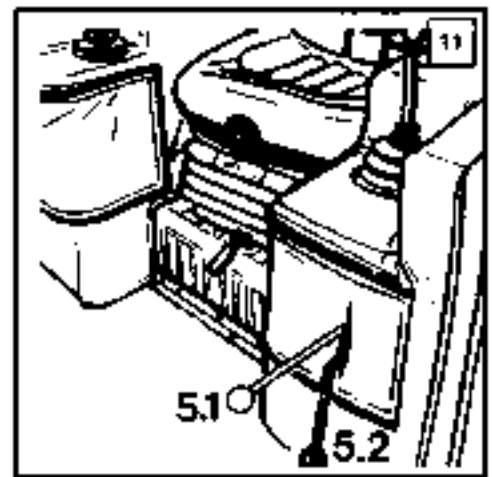
Avoid full engine load right after the starting procedures.

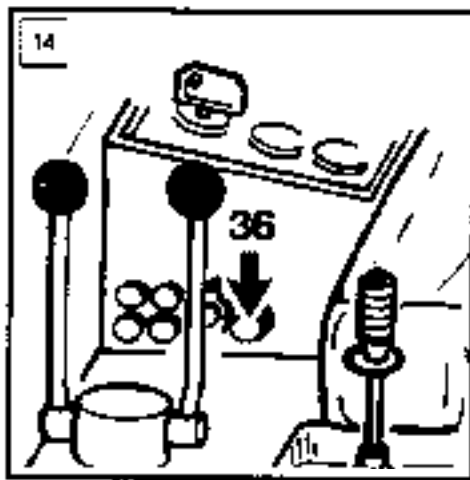
After the engine is started and running, turn the parking brake and servo oil supply lever into the upmost position (Fig. 11, Pos. 5.1).

The parking brake indicator (Fig. 13, Pos. 28) must switch off

Note:

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





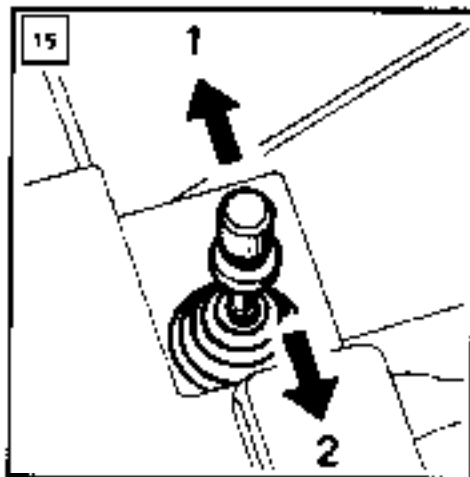
12.1.2 STARTING PROCEDURE USING THE COLD STARTING AID AT LOW AMBIENT TEMPERATURES

Preliminary steps and control function test as described in 12.1.1. Use of the cold starting aid facilitates cold temperature engine starts.

- At low temperatures, place starting aid switch (Fig. 13, Pos. 19) into position "1". Turn ignition key to "Start" (Fig. 13, Pos. 7.3), while pushing the cold start aid switch (Fig. 13, Pos. 19) at the same time.

Do not crank engine for more than 15 seconds.

If engine does not start, wait 60 seconds before cranking again.

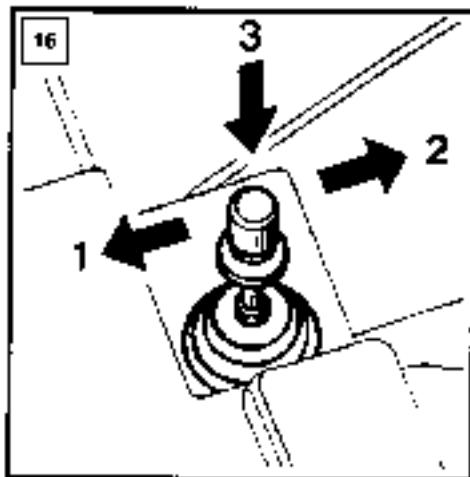


12.1.3 SENSORS FOR AUTOMATIC IDLING (Optional Equipment)

In different applications a continuous high idling is not necessary. In such cases it is sensitive to activate the sensor controlled automatic idling.

- Give throttle lever to high idle
- Activate with switch (picture 13, Pos. 17)
- Adjust delay time at relay turn switch, 1-10 sec (picture 14, pos. 16)

Touching one of the joysticks the engine gets set to the adjusted idle, releasing both joystick sets the engine on low idle again.



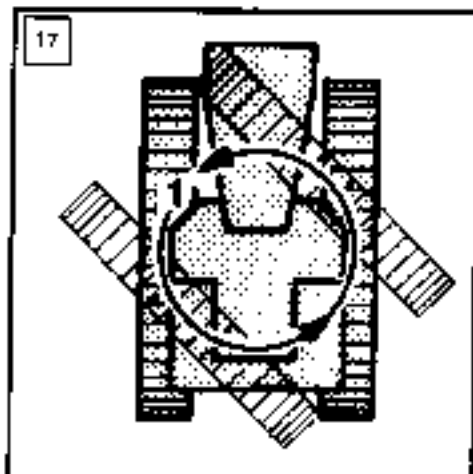
12.1.4 SHUT-DOWN PROCEDURES

Before leaving or shutting down the machine move the safety lever for the parking brake and the travel hydraulics down (Fig. 11, Pos. 5.2), the machine is now secured.

SHUTTING DOWN THE ENGINE

Slowly lower engine speed to low idle (Fig. 12, Pos. 6.1), then turn ignition key to position "0" (Fig. 13, Pos. 7.1). Always enter and leave the cab on the left side. The right cab door is only to be used in emergencies.

Radio can be used also if the engine is not running (Fig. 13, Pos. 7.4)



12.2 TRAVEL FUNCTIONS

Before attempting to travel the safety lever has to be pointing up (Fig. 11, Pos. 5.1).

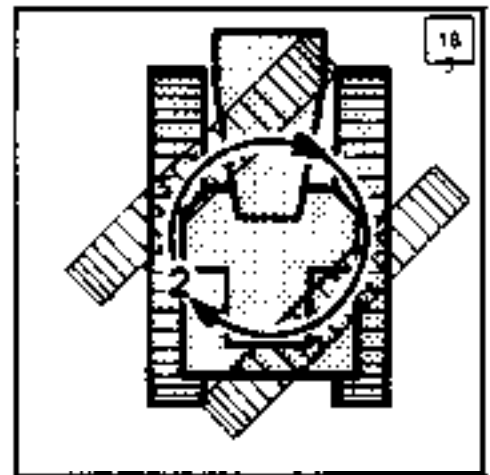
12.2.1 STRAIGHT TRAVELING

Forward:

Push travel joystick forward. The more travel joystick is deflected the higher will be the travel speed (Fig. 15, Pos. 1).

Reverse:

Pull the travel joystick back. This will cause the machine to travel in reverse (Fig. 15, Pos. 2).



12.2.2 COUNTER-ROTATION ON SPDT

Counter-Clockwise Turn

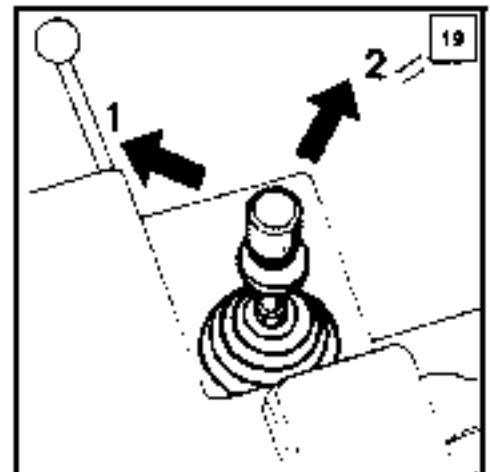
Push button (Fig. 16, Pos. 3), push travel joystick to the left. Amount of joystick deflection affects turning speed (Fig. 16/17, Pos. 1).

Clockwise Turn

Push button (Fig. 16, Pos. 3), push travel joystick to the right (Fig. 16/18, Pos. 2).

Note:

Push the travel joystick left or right takes a higher force than moving the joystick forward for straight travel.



⚠ CAUTION

Moving the joystick left or right, without depressing button (Fig. 16, Pos. 3), should not actuate the travel.

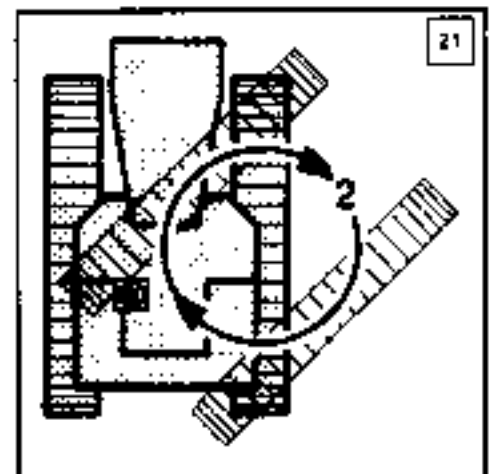
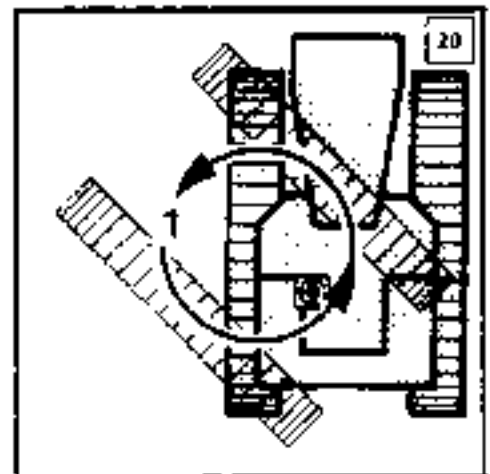
12.2.3 TURNING BY ENERGIZING ONE FINAL DRIVE

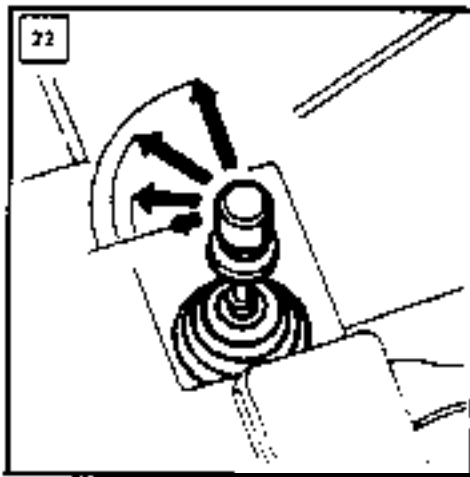
To turn left forward:

Push travel joystick to the left to a position 45° from the longitudinal axis (Fig. 19/20, Pos. 1)

To turn right forward:

Push travel joystick to the right to a position 45° from the longitudinal axis (Fig. 19/21, Pos. 2).





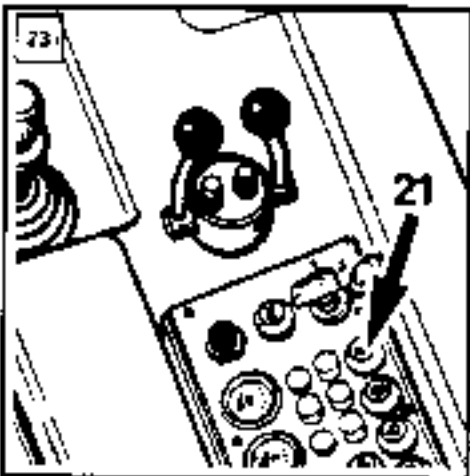
12.2.4 INDEPENDENT FINAL DRIVE OPERATION

Any combination of direction and speed of the two tracks is possible by moving the travel joystick into the corresponding direction with the required deflection (Fig. 22). This means any radius turn can be traveled at variable speeds.

12.2.5 BRAKE OPERATION

Moving the travel joystick towards the vertical neutral position will slow the machine down. Bringing the joystick into the neutral position will bring the machine to a quick stop.

Observe all safety regulations when parking the machine (see page 13-19)



12.2.6 REDUCED TRAVEL SPEED

In applications that demand a constant high torque at the drive sprocket or a inclination applications the travel speed must be reduced by actuating a switch (Fig 23, Pos. 25).

12.2.7 TOWING

CAUTION

The following instructions are for emergencies only. Always haul the machine over long distances.

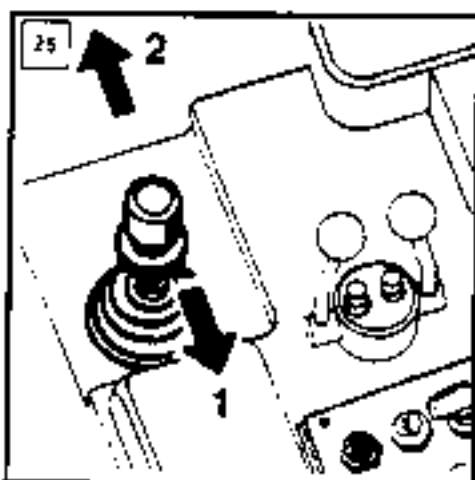
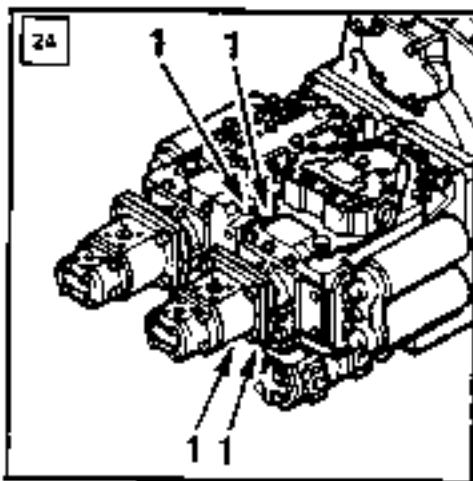
When towing, please observe all safety rules!

- Before the machine can be towed, raise the cab and perform the following service.
- Turn all four high pressure relief valves two turns counterclockwise (Fig. 24, Pos. 1).
- Disconnect parking brake at the brake cylinder. See page 39.

If necessary, contact your LIEBHERR dealer.

WARNING

If the machine is hauled with relief valves and the brakes disconnect, the machine must be securely loaded. Block the machine to prevent movement.



12.3 ATTACHMENT OPERATION

12.3.1 BLADE LIFTING / LOWERING

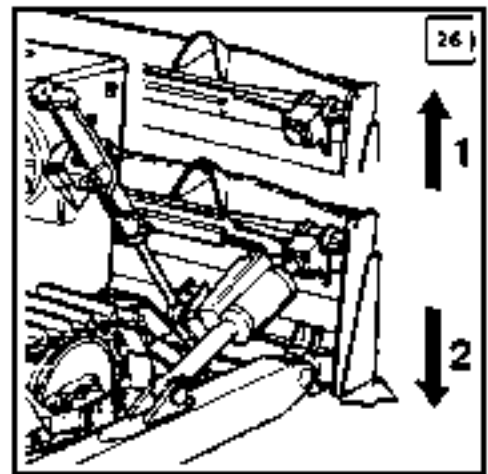
By moving the blade joystick forward or back the blade will move vertical to the ground either down or upward. The speed is proportional to the angle of deflection of the joystick.

Lifting:

- Pull joystick back (Fig. 25 / 26, Pos. 1)

Lowering:

- Push joystick forward (Fig. 25/26, Pos. 2)



Blade quick drop

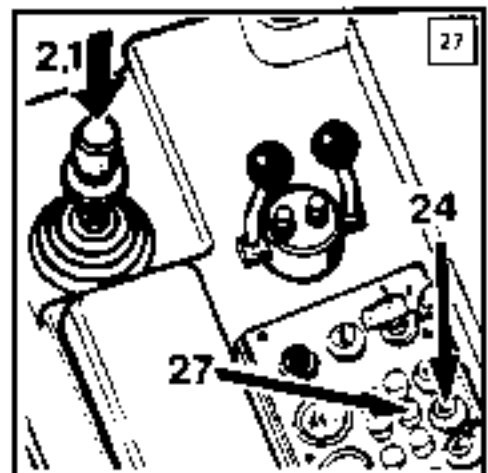
- The blade quick drop is standard equipment and may be used to lower the attachment at a faster speed.

Note:

Before actuating the quick drop function, be sure that the button (Fig. 27, Pos. 24), is in the "UP" position.

Actuate quick drop

With the blade in the raised position, depress and hold the button 2.1. (Fig 27, Pos. 2.1), on top of the right joystick and fully push the joystick forward. The dozer blade will now fall to the ground at maximum speed. Release button dozer 2.1.



12.3.2 BLADE FLOAT POSITION

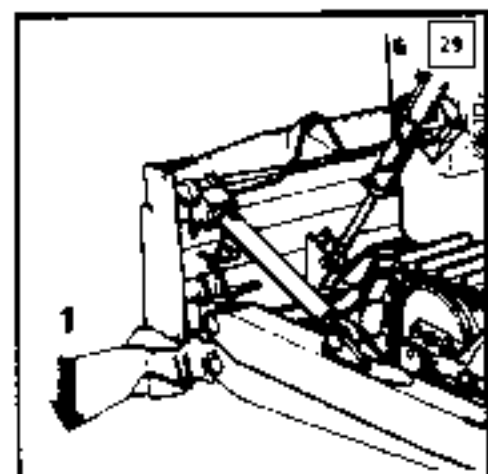
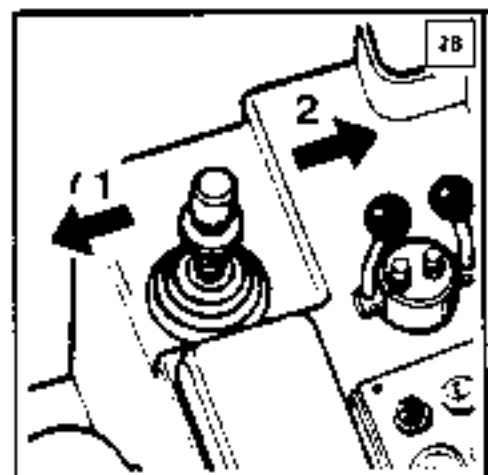
⚠ CAUTION

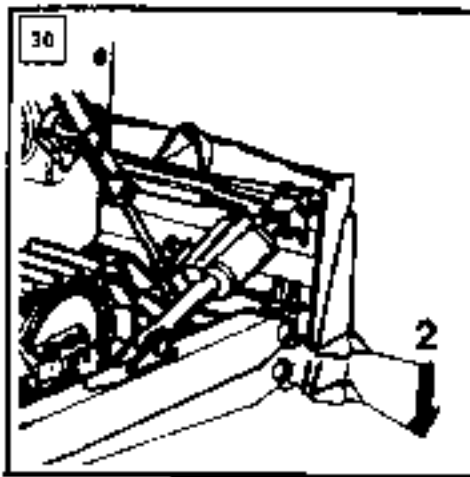
Never activate the float position with the attachment raised. Before selecting the float position, lower the attachment to the ground.

- Select float position.
Depress push button (Fig. 27, pos. 24). With the button in the "DOWN" position, the float position is armed.
- Engage float position.
Depress and release the push button (Fig. 27, pos. 2.1). The indicator light (Fig. 27, pos. 27) will now come on and the entire attachment will lower and rest on the ground due to its own weight. This means that the blade can freely follow the ground contour.
- Disengage the float position.
Depress and release the push button (pos. 2.1). The indicator light (pos. 27) will now go off.

Note:

Always disengage the float position at the push button switch (pos. 2.1), before selecting bucket quick drop on the switch (pos. 24).





12.3.3 BLADE TILTING (Push Blade)

The tilt cylinder mounted on the right side of the blade enables an efficient insertion of the blade

To insert blade left

Push blade joystick to the left (Fig. 28/29, Pos. 1)

To insert blade right:

Push blade joystick to the right (Fig. 28/30, Pos. 2).

12.3.4 BLADE PITCH ADJUSTMENT (Push Blade)

By adjusting the jack mounted on the right side of the blade the pitch of the blade can be adjusted to suit the ground conditions

Steep penetration angle - for hard ground conditions, turn jacks clockwise (Fig. 31, Pos. 1).

Low penetration angle - for soft ground conditions, turn jacks counter-clockwise (Fig. 31, Pos. 2)

12.3.5 MANUAL BLADE ANGLING (Angle Blade)

For side-casting the angle blade can be positioned straight or angled to either side (see Fig. 32).

Procedure (Fig. 33):

Lift blade slightly off the ground

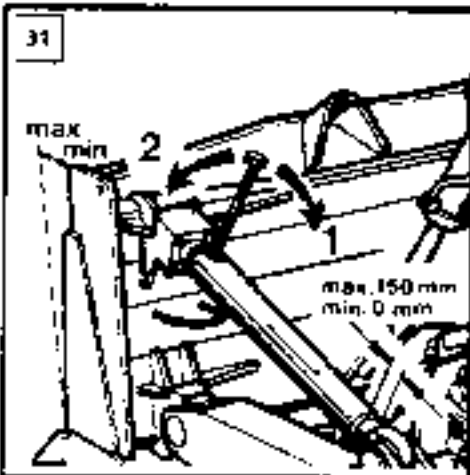
Remove safety pin from tapered pin (Pos. 1)

Knock out tapered pin from push frame (Pos. 2)

Angle blade as required

Insert tapered pin into push frame

Insert safety pin into tapered pin



12.3.6 MANUAL BLADE TILTING (Angle Blade)

To work ditches the angle blade can be tilted mechanically. To tilt the blade the adjusting jacks have to be shortened on one side and made longer on the other.

Procedure:

Lift blade slightly off the ground

Remove safety pin from tapered pin on one side

Knock out this tapered pin from push frame

open clamping screws

Shorten the jack on the blade side that is to be lowered

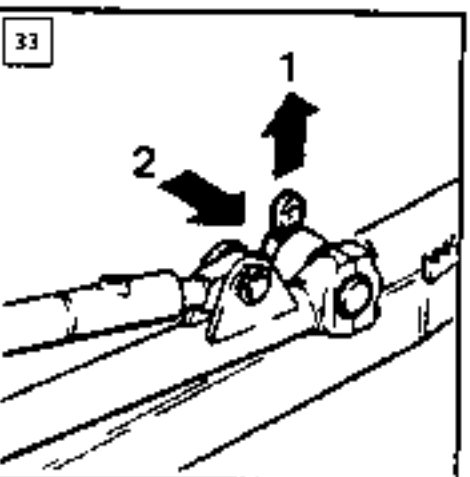
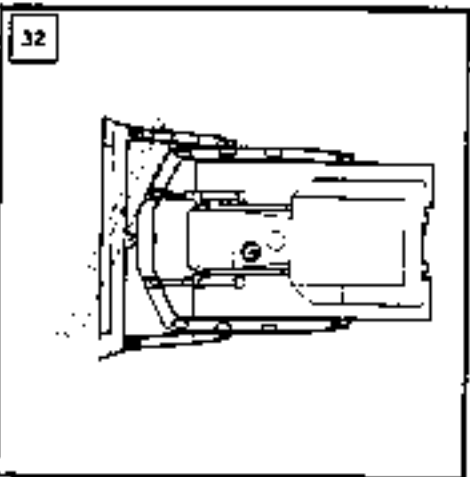
Lengthen the other adjusting jack by turning

Insert tapered pin into push frame

Tighten clamping screws

The lever for adjusting the jacks is in the tool box.

As an option the angle blade can be equipped with hydraulic tilt cylinders. With this option the adjustment is the same as with the push blade



12.3.7 RIPPER ATTACHMENT

Inserting Ripper:

Push lever forward (Fig. 34, Pos. 1)

Lifting Ripper:

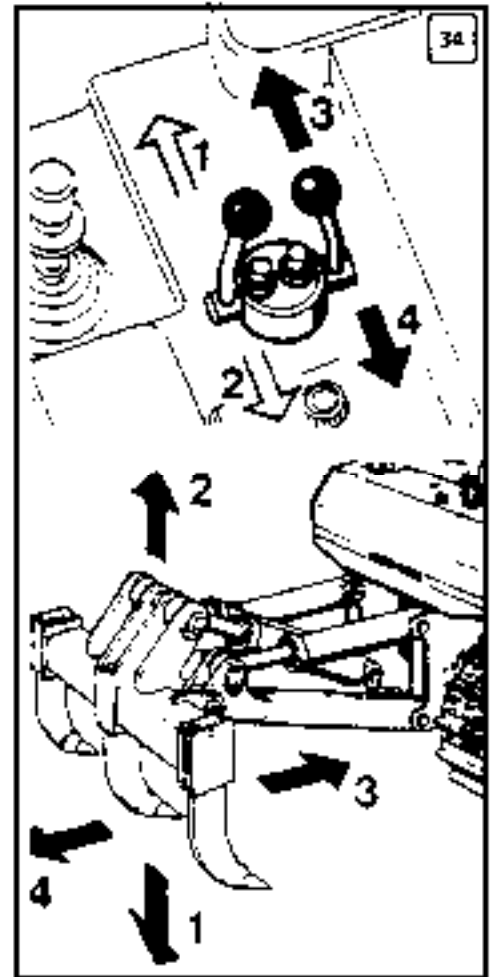
Pull lever back (Fig. 34, Pos. 2)

Steeper Entry Angle:

Pull lever back (Fig. 34, Pos. 4)

Lower Entry Angle:

Push lever forward (Fig. 34, Pos. 3)



12.3.8 RIPPER (pin-puller)

To adjust the length of the shank the single-shank ripper has a hydraulic pin-puller device as a standard.

Procedure for adjustment of shank length:

Extract tilt cylinder completely
(Fig. 34, Pos. 3)

Lower ripper on solid ground
(Fig. 34, Pos. 1)

Activate pin-puller with switch
(Fig. 35, Pos. 3) control-light
(Fig. 35, Pos. 4) comes on.

Activate joystick-control for ripper tilt advice until
the pin is pulled out (Fig. 34, Pos. 3)

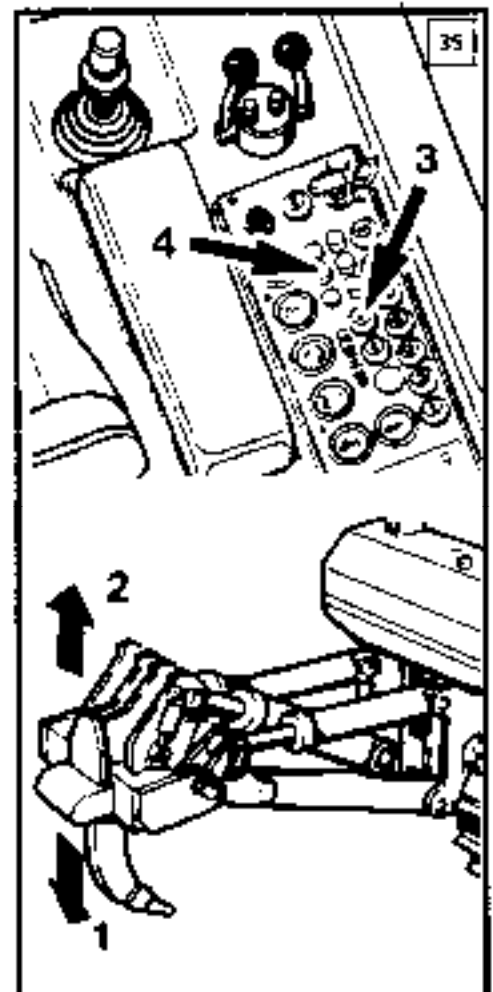
Lift or lower ripper to required length of shank
(Fig. 35, Pos. 1 or 2)

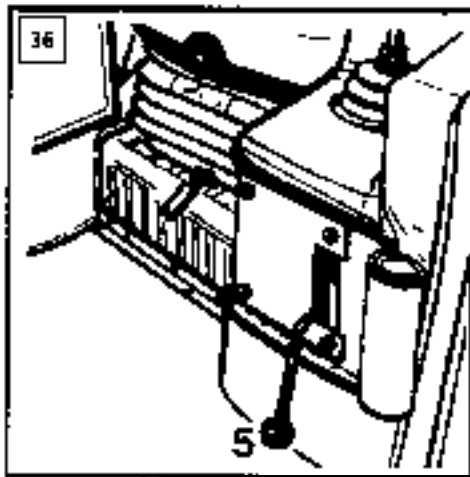
Bring switch to normal position 3 (Fig. 35, Pos. 3),
control light (Fig. 35, Pos. 4) comes off.

Activate joystick-control for ripper tilt advice until
the pin is pushed in (Fig. 34, Pos. 3)

Attention:

While pulling out the pin make sure that the
ripper stands on solid ground. Lift the toolbar
only that high, that the shank can not fall out of
the guidance



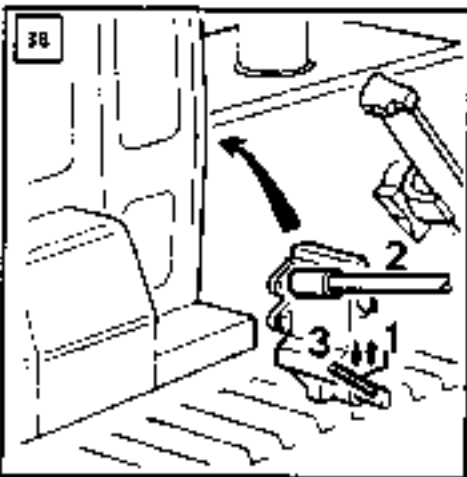
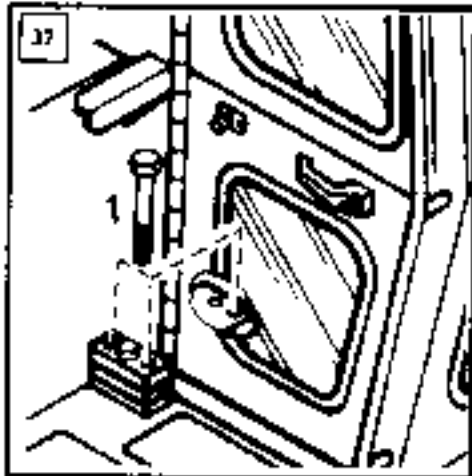


12.4 TILTING THE CAB / CANOPY

To simplify service and repair on components within the main frame, the operators platform with cab or canopy can be tilted hydraulically.

12.4.1 RAISE (TILT) CAB

- Shut down engine.
- Place the safety lever in the full down position - (Fig. 36, pos. 5).
- Remove and/or disconnect protective structures (sweeps for example) as necessary.
- Remove sound insulation - if applicable and left panel below the travel servo valve. Remove the complete safety lever (Fig. 36, pos. 5).
- Remove 3 hex head screws per side (Fig. 37).
- Close both cab doors, if applicable.
- Open right rear engine compartment door. Move the pump lever to the raise position (Fig. 38, pos. 1).
- Insert the pump handle, located in the tool box into the hand pump (Fig. 38, pos. 2).
- Operate the hand pump by moving the lever up and down until the piston bottoms out, hydraulic cylinder is fully extended (DO NOT leave the cab in an intermediate position).
- Insert the safety bar at the battery compartment (Fig. 39, pos. 1).
- Move the pump lever to the "down" position (Fig. 38, pos. 3). Lower the cab by actuating the hand pump, until the cab is secured by the mechanical safety bar (Fig. 39, pos. 1)



⚠ WARNING

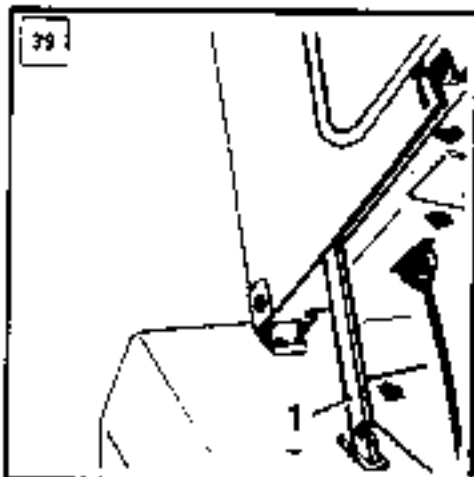
Never raise the cab or canopy with the engine running or when traveling. Stay clear of the cab or canopy until completely raised or lowered and secured. Do not work underneath or on the cab or canopy unless it is properly secured by the safety bar and the machine is parked.

12.4.1 LOWER CAB

- Move the pump lever to the "raise" position (Fig. 38, pos. 1). Operate the hand pump by moving the lever up and down until the cab is high enough, so that the safety bar can be released.
- Move the pump lever to the "down" position (Fig. 38, pos. 3). Operate the hand pump by moving the lever up and down until the cab/canopy rests on the supports.
- Line up the mounting holes and secure cab/canopy with (3) hex head screws per side (Fig. 37, pos. 1).
- Install safety lever, panel and sound insulation (if applicable).
- Check all safety features for proper operation. Be sure to reinstall all removed protective structures to make machine operational and safe.

⚠ WARNING

It is not permitted, under any circumstances, to start the engine until the cab/canopy is lowered and secured.



13. MAINTENANCE OF THE PR 751

13.1 DIESEL ENGINE

See CUMMINS Diesel Engine Operation and Maintenance Manual.

13.2 ENGINE DRY AIR CLEANER

Maximum engine protection against dust is only possible if the air filter is cleaned and changed regularly.

The connections between the air cleaner and intake manifold should also be inspected regularly for an air tight fit. **DEFECTS MUST BE REPAIRED IMMEDIATELY.**

The two dry type air cleaners with service indicator and cyclon pre-cleaner is designed to give maximum engine protection with very long service intervals. We recommend to service the dry air filters only, after the service indicator displays the red signal. (Fig. 40). Removing and installing the filter elements too often increases the possibility of damaging the filter elements or the seals.

Note:

The service indicator is installed in the intake manifold. When reaching the maximum allowable restriction, which is recommended by the engine manufacturer, a red signal will lock in full view. This red signal is visible even with the engine shut down and indicates that the air filters has to be serviced.

13.2.1 SERVICING THE AIR CLEANER

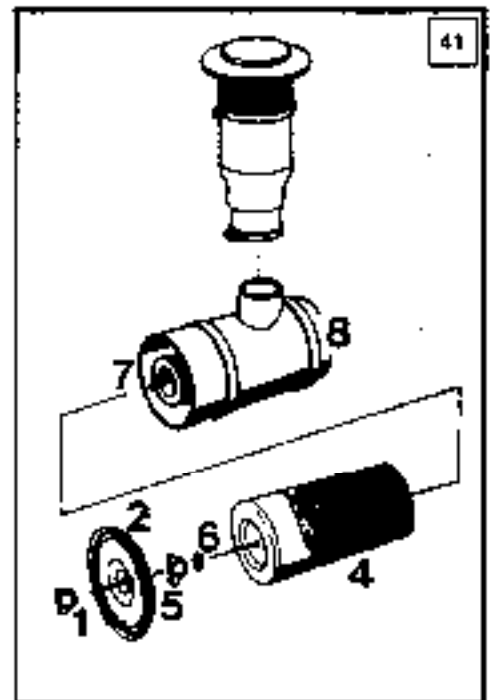
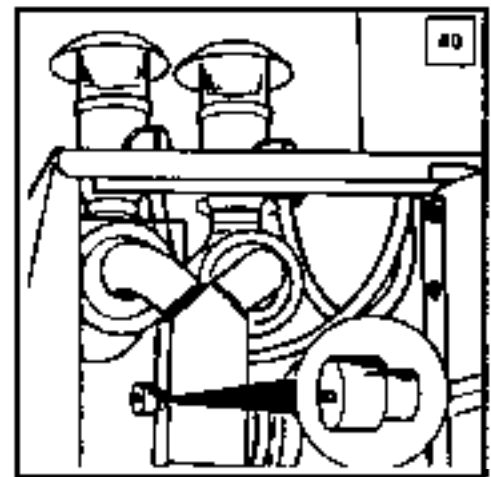
Note:

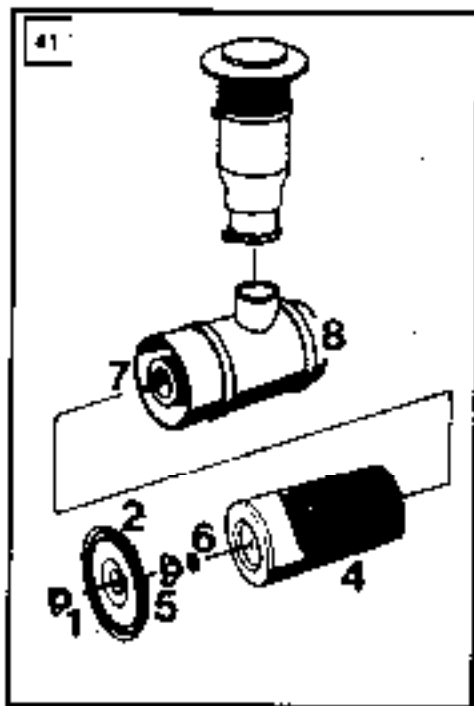
Clean cyclon pre-cleaner regularly, if necessary several times a day. Clean or replace paper element when service indicator actuates (Fig. 40).

The main filter element (Pos. 4) can be wet or dry cleaned. Wet cleaning is only necessary when the element is oily or sooty. In this case dry cleaning would not be sufficient (Fig. 41).

CAUTION

The main filter element should be replaced, after being cleaned 3 times or once a year.





THE SAFETY ELEMENT should not be removed and never be cleaned (Fig. 41, Pos. 7).

CAUTION

The safety element Pos. 7 should be changed after the main element Pos. 4 has been cleaned 3 times.

Note: We recommend that this work is performed in the shop.

Use only original Donaldson Filter elements for maximum engine protection
Remove wing nut Pos. 1 and cap Pos. 2.

Remove wing nut Pos. 5 and seal Pos. 6 and remove primary element. Depending on the contamination (see remarks) the element can be dry or wet cleaned (Fig. 41).

13.2.2 DRY CLEANING

Direct compressed air (max. air pressure 100 PSI/7 BAR) through the primary element Pos.4 from the inside to the outside. Move nozzle up and down while rotating the element. Keep at least 1" (2cm) from pleated paper.

The cleaning is complete when no more dust escapes from the element.

CAUTION

Never try to clean the element by hitting it. Hitting the element will not clean the element but could damage it.

13.2.3 WET CLEANING

Dry clean primary element as outlined before.
Soak element 15 minutes or more in Donaldson D-140G and water solution (See carton for full instructions).

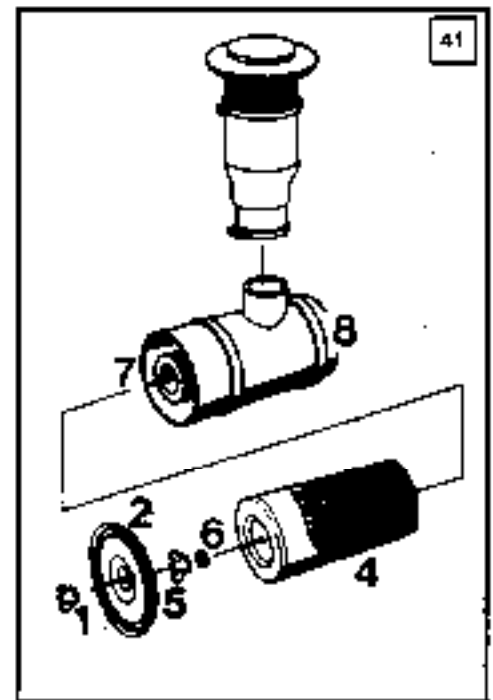
Use a water hose without nozzle (max. water pressure 40 PSI / 3 BAR) and rinse the element with plain water until the water runs clear. Particular attention should be paid to areas where the pleats are glued into the end caps. Air dry or use warm flowing air of max 125° F (50°C).

13.2.4 PRIMARY ELEMENT INSPECTION

Place bright light inside primary element and rotate it slowly. If any rupture holes or damaged seals are discovered, replace at once.

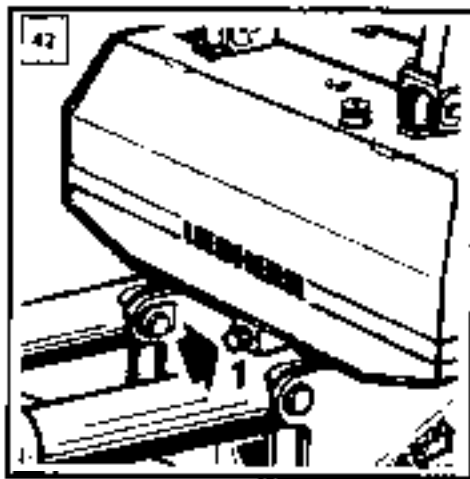
13.2.5 PRIMARY ELEMENT INSTALLATION (Fig. 41)

- Clean the housing Pos. 8 and the sealing surface with a damp cloth (Never use compressed air)
- Check installation of the safety element. If necessary, retighten wing nut.
- Carefully install primary element in housing Pos. 8, check for proper sealing, tighten wing nut with seal Pos. 5,6. When replacing the primary element always use a new wing nut seal Pos. 6, which is included with the element.
- Reinstall cup Pos. 2 and tighten wing nut Pos. 1.
- Reset service indicator.



13.2.6 INSPECTION OF AIR INLET AND PRE-CLEANER SECTION

The combustion air intake system has to be checked to damages and tightness whenever a filter element is replaced. If necessary, replace rubber connectors and tighten clamps.



13.3 FUEL-HYDRAULIC TANK WITH DRAIN COCK

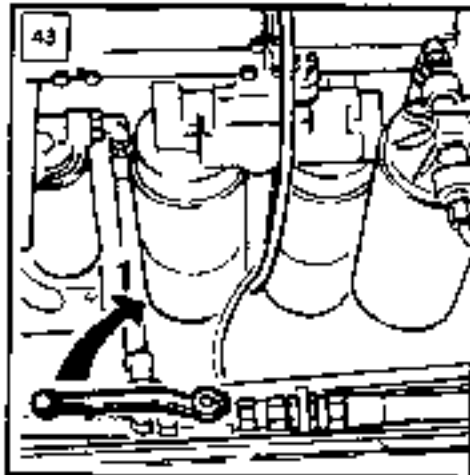
Both tanks are equipped with drain cocks to drain water and sludge from the tanks.

Also, the complete tanks can be drained if necessary (Fig. 42, Pos. 1).

The water has to be drained daily from the fuel filter and the fuel tank.

Only if climatic conditions and the fuel quality warrants this can the service interval be increased to one week.

The shut-off valve has to be closed before the filter is replaced (Fig. 43, Pos. 1).



13.4 HYDRAULIC SYSTEM

Only the hydraulic oil tank requires regular maintenance. None of the other components in the system require special attention. The system should of course be checked for leaks at all hose, tube and valve connections at regular intervals.

When topping-off the hydraulic tank all lift, tilt and ripper cylinders have to be retracted. In this condition the oil level should not be above the center of the upper sight gauge of the hydraulic tank.

Absolute cleanliness in the hydraulic system is of utmost importance, it is therefore essential to adhere to the prescribed intervals for the cleaning of the oil cooler and the return filters.

⚠ CAUTION

Fill the hydraulic tanks only through the return filters.

- ◆ Clean the magnetic rods in the return filters daily during the first 250 hours of operation.
- ◆ Change filter elements during the first inspection service.
- ◆ Change filter cartridge every 500 hours thereafter and whenever a damage occurs which has contaminated the hydraulic system.

Filter Element ID No. 7211198

13.4.1 CLEANING THE HYDRAULIC OIL FILTER (Fig. 44)

Relieve the hydraulic tank pressure by lifting valve Pos. 8

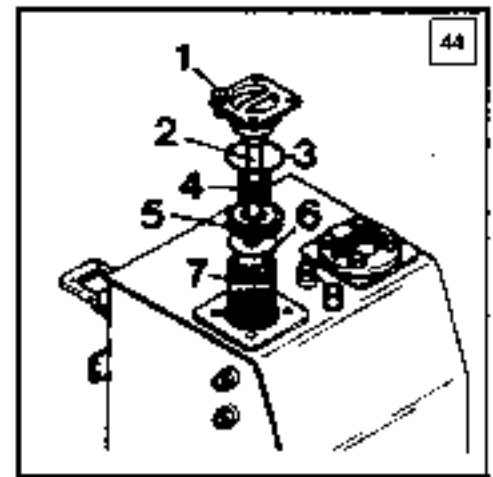
Remove the four screws Pos. 1 on each filter cover and remove covers with magnetic rods Pos. 2.

Carefully clean all dirt from the magnetic rods Pos. 2.

During the reassembly insure the correct positioning of the O-ring Pos. 3 and the compression Spring Pos. 4

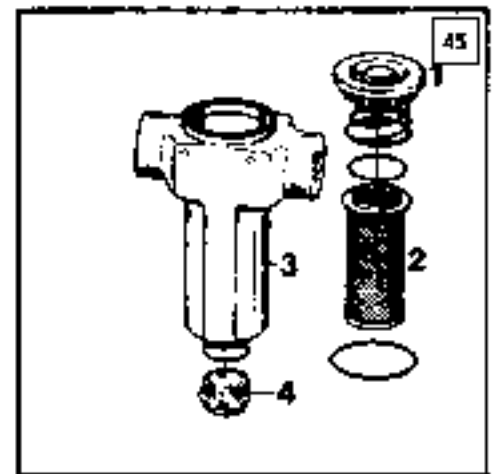
Note:

Paper filter elements should never be cleaned. Always use a new element.



13.4.2 REPLACEMENT OF FILTER ELEMENT (See Fig. 44)

- Remove filter cover as outlined under 13.4.1
- After removing the spring Pos. 4 and the pressure plate Pos. 5, the filter element Pos. 7 can be removed
- Insert new filter element and install pressure plate Pos. 5, if necessary, replace damaged O-ring Pos. 6. Install spring Pos. 4 and cover Pos. 2 with O-ring Pos. 3. Assure the spring and the O-ring properly positioned.

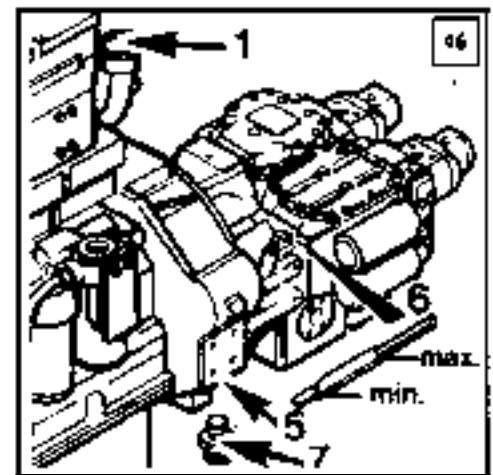


13.4.3 IN-LINE HIGH PRESSURE FILTER FOR SERVO CONTROL (Fig. 45)

- Loosen plug Pos. 1. Remove dirty paper element Pos. 2 and install new element. To drain and clear the filter housing Pos. 3, remove the lower plug Pos. 4 (Fig. 45).

13.4.4 OIL FILTERS AT THE TRAVEL PUMP (Fig. 47)

Remove spin-on filter 1, 2, 3 and 4, and replace with new filters (fig 47)



13.4.5 SPLITTER BOX

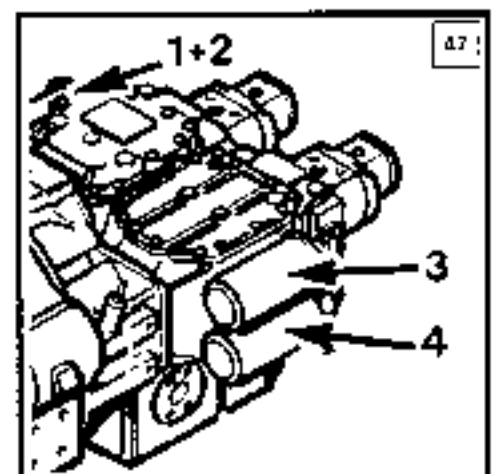
Fig. 46, Pos 1 shows filling oil

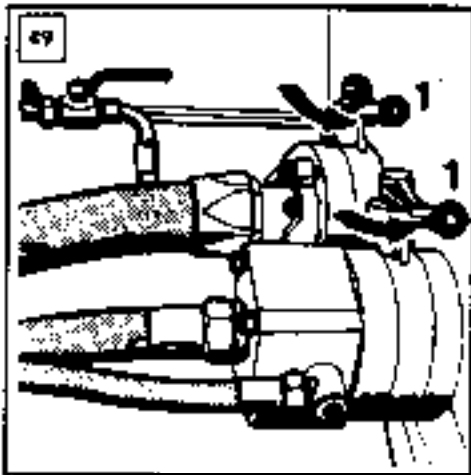
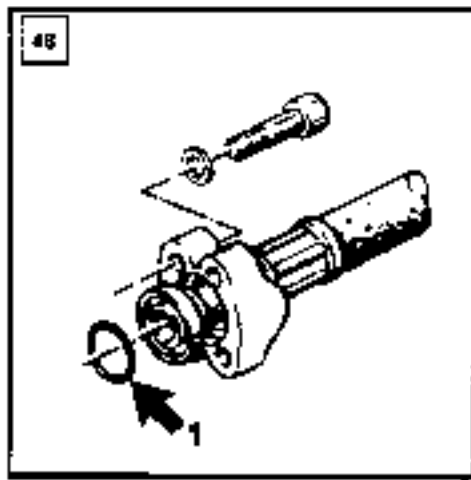
Fig. 46, Pos 5 shows the drain valve

Fig. 46, Pos 6 shows the dipstick. The oil level should be at the upper mark of the dipstick.

CAUTION

Do not overfill





13.4.6 REPAIRS ON HYDRAULIC SYSTEM

All hose and tube assemblies and all connections have to be checked regularly for leaks.

⚠ WARNING

Do not disconnect lines, hoses, fittings or caps with the hydraulic system pressurized. Lower the attachment, shut off engine, vent hydraulic tank and servo system.

- ◆ A defective high pressure hose must be replaced at once. Replacement hose assemblies must be installed free of distortion (do not twist hose)
- ◆ When a SAE 4-bolt split flange connection is leaking, the O-ring Pos. 1 has to be replaced (Fig. 48).
- ◆ If the suction hose of the double pump has to be removed, the shut-off valve at the hydraulic tank Pos. 1 has to be closed first (Fig. 49). The screws at the pump suction elbow with SAE connection have to be loosened and the oil drained from the hose. After completion of the repair, the shut-off valve has to be opened.
- On a leaking ferrule type connection, the swivel nut has to be tightened.

13.4.7 HYDRAULIC CYLINDERS

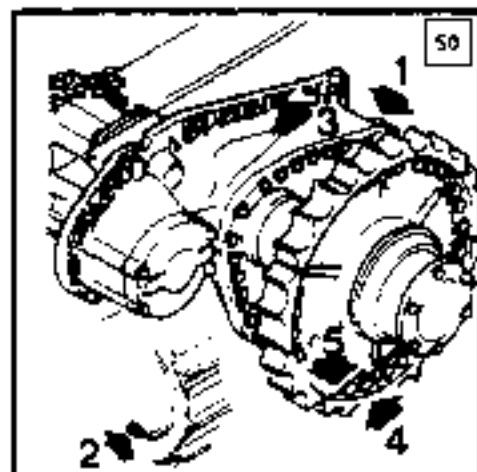
If a rod bearing of a hydraulic Cylinder should start to leak, a seal kit should be installed by trained service personal.

13.5 FINAL DRIVE

13.5.1 REDUCTION GEAR

Fig. 50, Pos. 1 shows the oil fill and check plug of the reduction gear. The oil level has to correspond to the oil fill opening high. Pos. 2 is the drain plug, and Pos. 3 the mounting screws.

Pos. 4 shows the segmented sprocket O8K, Pos. 5 the mounting screws 7/8" - 14 UNF torque 754 to 824 ft-lbs (1020-1120 Nm)



13.5.2 TRAVEL BRAKES

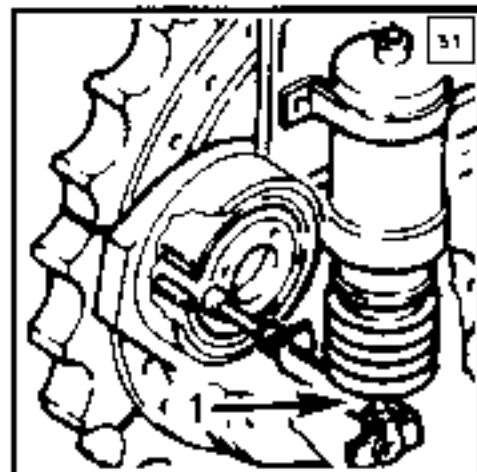
The drum type brake which is mechanically actuated by a hydraulic spring brake cylinder.

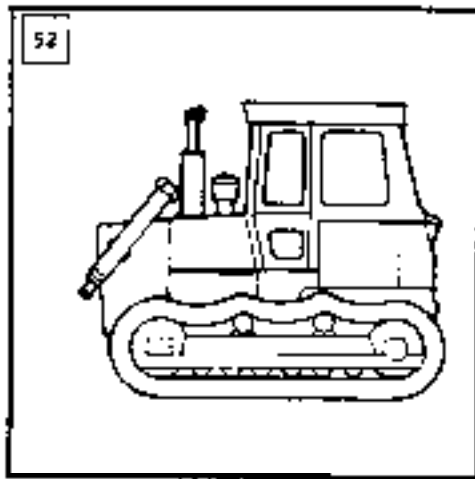
Adjusting the brake shoes is not necessary

To tow the machine in emergencies the brake can be released by disconnecting the lever (Fig. 51, Pos. 1). See as under "Towing", Page 28).

WARNING

The brake cylinder is spring loaded, improper handling may cause injury.





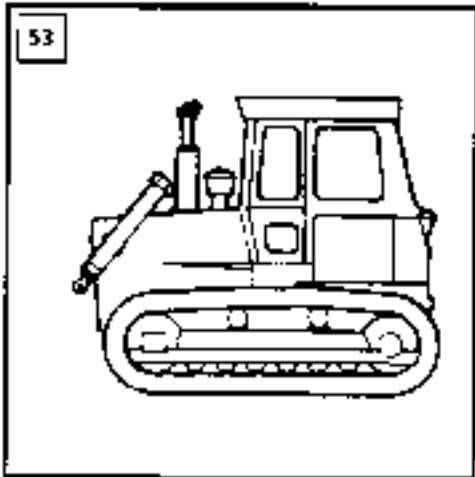
13.6 TRACK COMPONENTS

Due to the metal lifetime seals the rollers and idlers are not affected by dirt and require no regular maintenance until the load carrying surfaces have to be rebuilt or the components replaced.

Although the track components are maintenance free the following points must be noted:

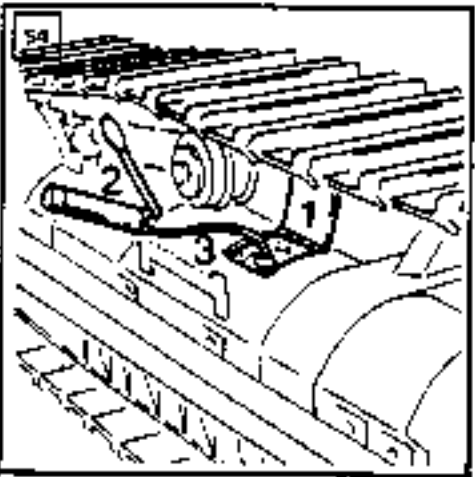
Due to normal wear of the track components it is necessary to check the track tension regularly and adjust the tension is necessary

Fig. 52 shows an improperly tensioned track chain, Fig. 53 a properly tensioned track chain



13.6.1 TRACK TENSION ADJUSTMENT

- Remove access cover (Fig. 54, Pos. 1)
- Attach reinforced lubricating hose (Fig. 54, Pos. 3) to grease fitting of the grease cylinder.
- Pump grease until chain is properly tensioned (Fig. 53).
- The chain should sag approximately 1" (25 mm) between the carrier rollers and the idler or the sprocket (Fig. 55)

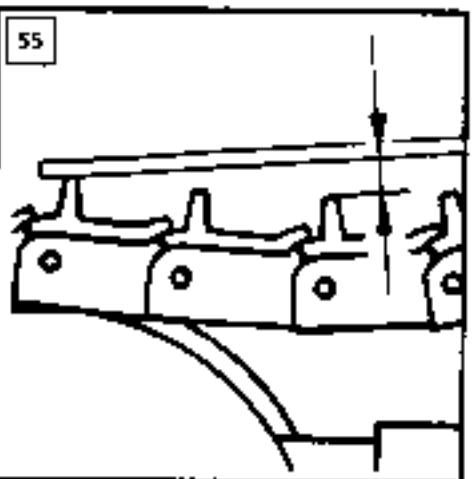


13.6.2 RELEASING THE TRACK TENSION

To release the chain, unscrew the grease fitting of the grease cylinder a few turns until grease escapes through the groove in the fitting

CAUTION

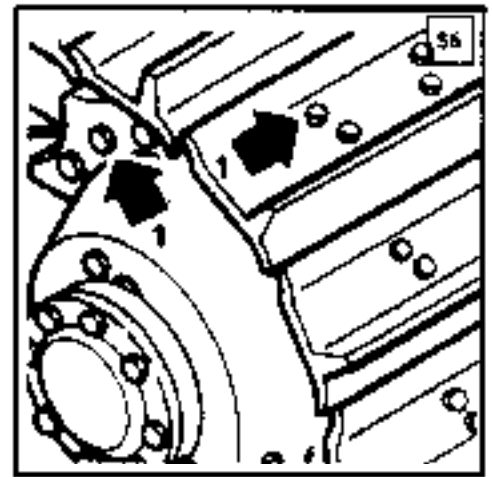
When adjusting or releasing the chain tension, keep your head clear of the access hole. The grease cylinder is under high pressure and the chain will sag.



13.6.3 TRACK PADS AND SPROCKET SEGMENTS

The mounting bolts must be checked weekly for tightness and retorqued if necessary (Fig. 56, Pos. 1).

The torque for the track bolts 7/8" - 14 UNF is 754-824 ft-lbs (1020-1120 Nm). The torque for the sprocket bolts 7/8" - 14 UNF is 754-824 ft-lbs (1020-1120 Nm).



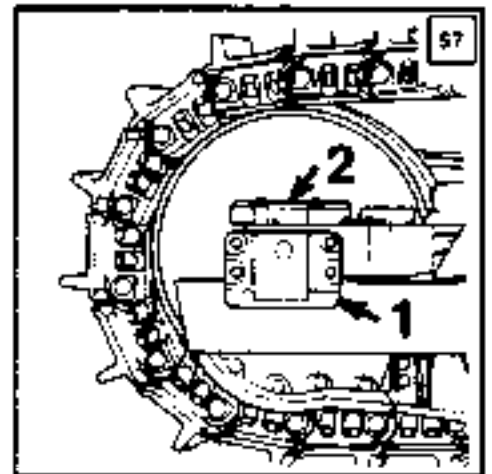
13.6.4 CHECK IDLER GUIDANCE

The axial clearance between the guide plates and the roller frame (Fig. 57, Pos. 1) should be about 1 to 1,5 mm per side = total clearance 2 to 3 mm.

Note:

The number of inside shims should be equal to the number of outside shims. A difference of no more than one shim is permissible.

Vertical clearance between the bearings and the roller frame (Fig. 57, Pos. 2) = shock absorber spring travel, should be about 3 mm. When clearance exceeds 5 mm, remove the appropriate number of shims from underneath the bolt heads and install them between retainer claw and bearings.



Note:

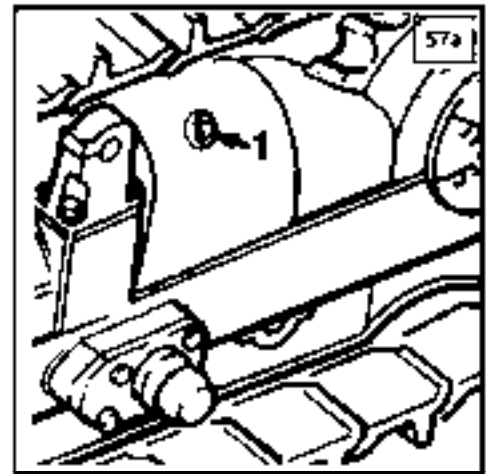
The number of inside shims must be equal to the number of outside shims!

13.6.5 CLEANING OF THE TRACK COMPONENTS

Before shutting down the machine, the working parts of the tracks should be cleaned of excessive dirt.

Dirt that is baked or frozen on is harmful to the track components and will shorten their life expectancy.

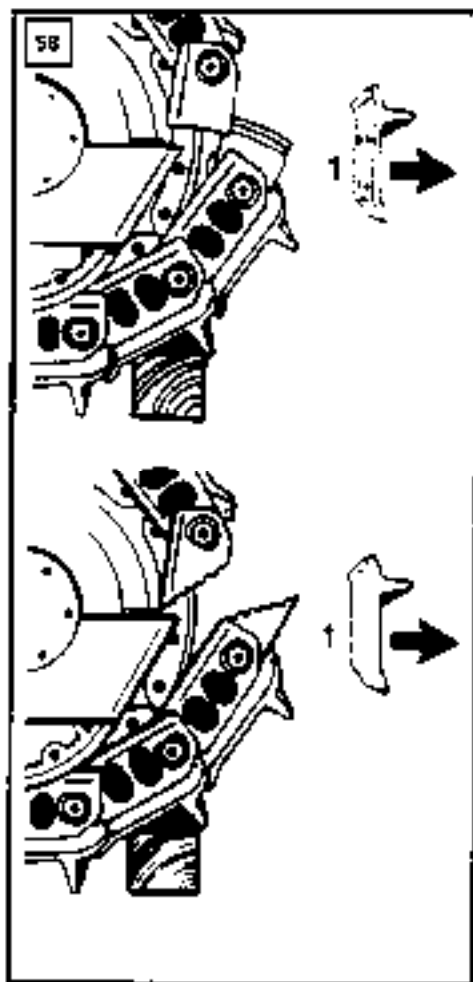
The tracks can be jacked up with the attachment. Before the tracks can be cleaned the dozer has to be securely supported.



Clean all dirt from the idler and roller guide rails and lubricate them with grease.

13.6.6 FRAME OIL FILLING ROLLER

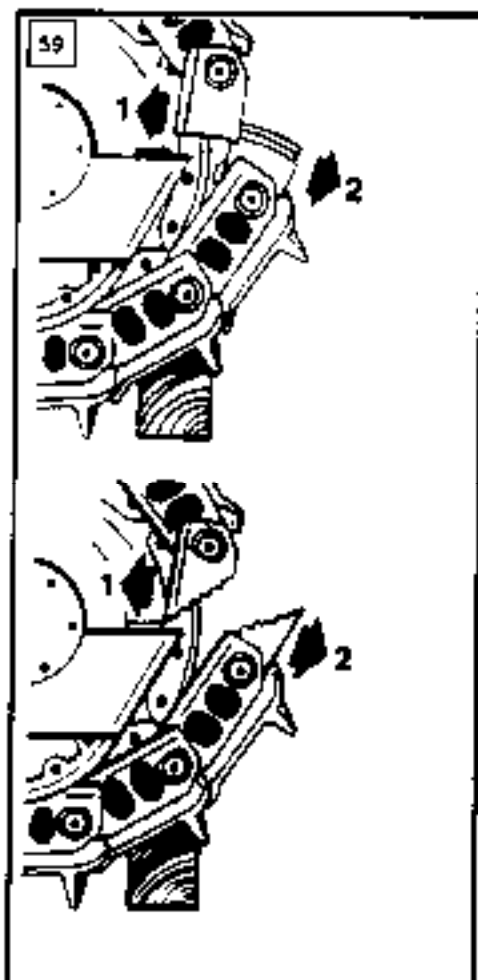
To prevent corrosion of the spring assembly in the roller frame, the spring chamber is filled with appr. 3 l (3 qt) of oil. Whenever the spring assembly is removed, the oil level should be checked and, if necessary, replenished via the filler plug shown in figure 57 a.



13.7 CHANGING THE TRACK

13.7.1 REMOVAL OF TRACK CHAIN (sealed and lubricated)

- Park the machine on flat and solid ground. Stop the machine when the master link is at the sprocket at the height of its center (Fig. 58).
- Release track tension as described under 13.6.2, page 40. Push the idler assembly all the way in.
- Secure chain so it will not come off sprocket (Fig. 58, Pos. 1)
- Master track-shoe over master link (Fig. 58, Pos. 1)
- Knock pin half of master link (Fig. 59, Pos. 1) towards center of sprocket or push the bushing end of the master link (Fig. 59, Pos. 2) out with a pry bar
- Only the bushing half of the master link can be opened to the outside.
- Travel with the machine forward until the complete chain is laying on the ground.



13.7.2 INSTALLATION OF TRACK CHAIN (Sealed and lubricated)

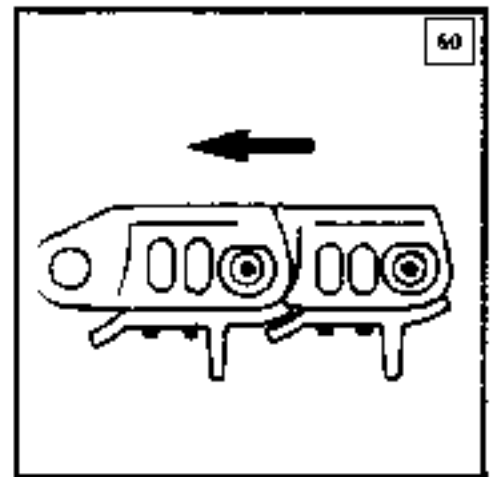
- Travel in reverse on the old chain, push the new chain onto the old one and connect them at the master link. Align the new chain to the track frame.

Note:

Make sure new chain will be installed in the correct travel direction of chain and pads.

- Travel slowly onto the new chain. Disconnect from the old chain. Attach the end of the chain to the sprocket with wire. Travel the machine slowly forward to bring the chain onto the sprocket
- After removing the wire bring the chain onto the carrier rollers and the idler. Wooden blocks will be needed to keep the chain from sagging between sprocket, rollers and idler. Stop the machine when the idler end is in line with the master link (Fig. 61), secure lower master link half with wooden block, leave space to swivel the link half

- Serrations of master link must be clean, undamaged and free of burrs of paint, grease slightly.
- Fit the pin-side part and the bushing-side part of the master link together until the contact area for the truck-shoe lines up. Do not damage mounting surface. Use only the bushing half for meshing up.
- Coat track bolts with anti-size grease
- Clean threads in master link. Alignment of bolt holes must be such that the bolts can be turned several turns by hand.
- Torque track bolts with prescribed torque.
- Tension tracks as explained on page 40 under 13.6 1.



13.8 ELECTRICAL SYSTEM

The dozer's electrical system must always be in perfect condition. Blown or corroded fuses and bulbs must be replaced immediately

13.8.1 BATTERY CARE

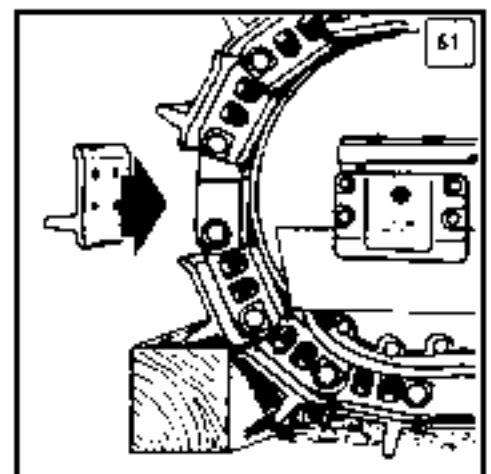
In order for the batteries to function properly, it is important to keep them clean at all times. The battery poles and cable clamps in particular should be cleaned regularly and then coated with acid resistant grease.

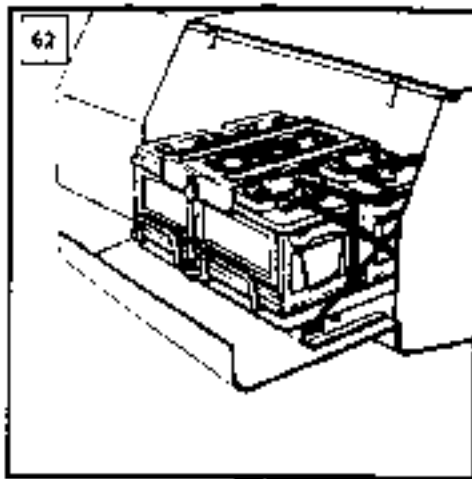
The fluid level in the cells should always be 0.5" (15 mm) above the plates. If necessary fill with distilled water only. The acid content should be checked regularly with a hydrometer. When fully charged the battery's specific gravity should be 1.28. If the hydrometer shows a lower value the battery may be low and must be recharged

Before starting repair work on the electrical system or before welding is attempted the batteries have to be disconnected (Fig 62)

Note:

Never disconnect the voltage regulator when the alternator is running.





13.8.2 REPLACING FUSES

The fuse box is easily accessible on the right side of the instrument panel (page 22, Pos. 16). Should fuses blow frequently, the affected circuit must be checked for a possible short circuit and / or overload. Never repair a blown fuse. Always have replacement fuses handy.

13.9 HEATING SYSTEM

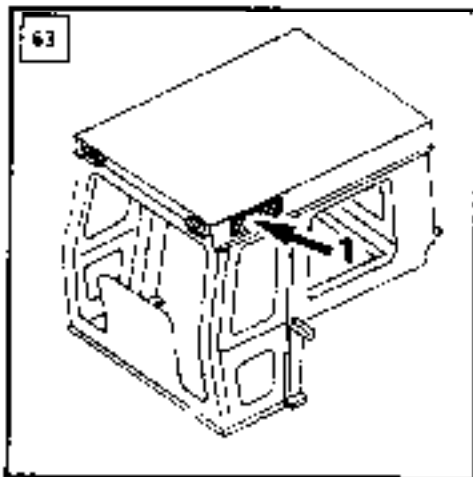
The following maintenance should be performed annually, before the beginning of the cold season

Check all connections of the hot water circuit, the hose connections at the heat exchanger, the seals on the valve as well as the connections on the diesel engine and tighten hose clamps.

Always use coolant containing antifreeze when running the heater. Vent the heating system after each coolant change.

Use bleeder-screw on cab roof.

After refilling water run engine with opened heater and check water level again
If necessary clean air filters in cab roof (Fig. 63, Pos. 1).



Every second year the following service should be performed:

Decalcify the heat exchanger and flush it with water until water runs clear.

The blower motor should be cleaned and serviced every year.

Clean the heater core when necessary

13.10 ATTACHMENTS

13.10.1 CUTTING EDGES AND CORNER PIECES

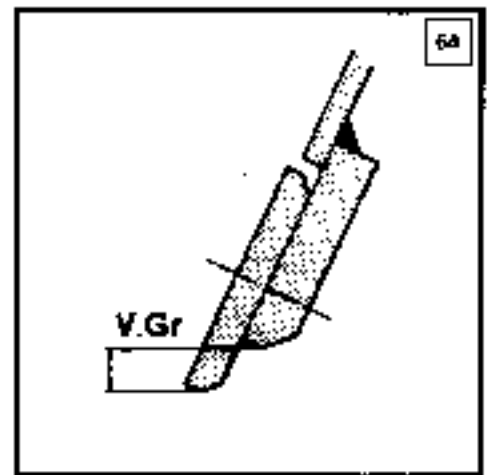
The mounting screws of the cutting edges have to be checked for tightness and retorqued if necessary.

The torque is 299 to 403 ft-lbs (405 - 545 Nm).

The cutting edges have to be checked regularly for wear.

The corner pieces have to be replaced when they exceed the wear limit (Fig. 64). The cutting edges can be turned once after reaching the wear limit. After that they have to be replaced.

Do not damage the mounting surfaces.



13.10.2 BLADE MOUNTING AND SUSPENSION

Due to normal wear it is necessary to check the bearings for the blade regularly for wear.

When the following bearing clearances are noted, the original shims must be removed and replaced with new ones, or replacement shims must be removed; as appropriate. If further wear has occurred, the bearings must be replaced.

Permissible clearances:

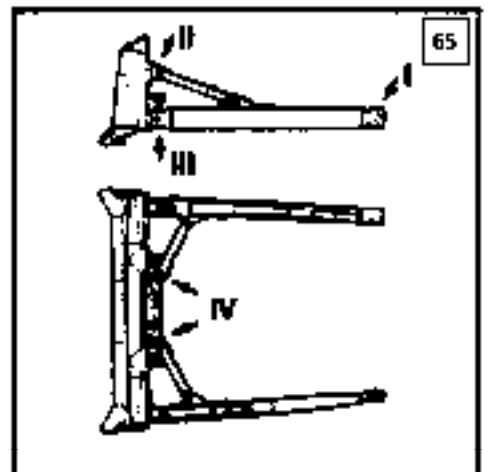
push frame bearing at roller frame:
3,0 to 3,5 mm.

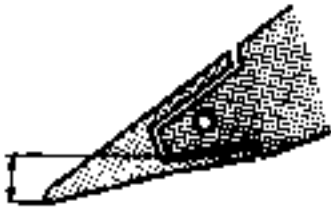
Brace bearings, tilt cylinder bearing and angle blade center pivot bearing: 1,5 to 2,0 mm.

The bolt connections at the bearings have to be checked regularly for tightness.

The torques are (Fig. 65):

I	1 290 ft-lbs (1757 Nm)
	Push Blade and Angle Blade
II	643 ft-lbs (872 Nm)
	Push Blade Only
III	643 ft-lbs (872 Nm)
	Push Blade Only
IV	643 ft-lbs (872 Nm)
	Push Blade Only





13.10.3 RIPPER SHANKS AND TIPS

The points have to be checked regularly for wear. After exceeding the wear limit they have to be replaced (Fig. 66)

The adaptor should not be damaged.

Note:

Only asymmetrical points the cutting edge has to point down.

13.11 REPLACEMENT OF WEAR AND TEAR COMPONENTS

In addition to the every day maintenance work, which must be carried out at the listed intervals, the following repairs can be performed by the machine operator

- 13.11.1** Replacing or repairing the track pads, the rollers and the idler assembly
(Afterwards the track tension has to be adjusted)

- 13.11.2** Replacing hose assemblies, tube assemblies tube fittings, split flanges AND O-RINGS.
Only original replacement parts must be used. This is especially important for hose and tube assemblies that carry hydraulic fluid at high pressures

All other repairs, in particular removing the main components should be performed by or with the supervision of a factory or dealer mechanic.

13.12 PISTON ROD PRESERVATION

Corrosion is comparable to wear and tear. Therefore, if the machine is not being used, or for longer storage, the following preservation should be performed.

- Park the crawler loader in a way so that the piston rods are retracted as much as possible
- If the machine is not being used for an indefinite period without preservation, it must be restarted and operated at no less than 14 day intervals. Start machine according to operators manual. Operate the diesel engine and hydraulic system until the recommended operating temperatures are reached. Activate all travel and working hydraulic functions alternately for a total of approx. 20 minutes. The hydraulic cylinders must be fully extended and retracted several times.
Prior to starting the machine, check all oil levels and lubrication points. Check complete electrical system.
- If the machine is scheduled to be stored for more than 4 weeks, clean inside and outside of machine thoroughly. Perform time scheduled maintenance which would become due during the scheduled storage period. Park machine on level, dry and solid ground and secure against movement.
Lubricate all bearings, ball joints, hinges, exposed parts cable connections and exposed cylinder rods with anti-corrosive grease. Fill fuel tank to reduce condensation.

Important!

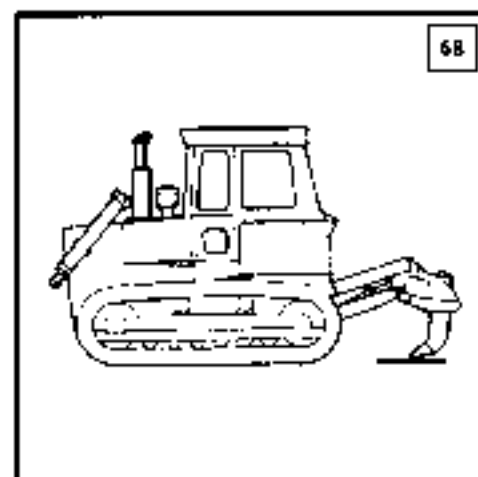
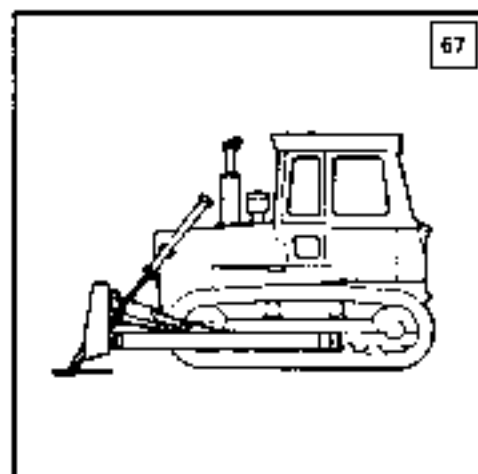
If the machine is transported by ship (sea water) or in the winter (road salt), the preservation of the piston rods must be rechecked after the machine has been loaded since the anti-corrosive grease may have been removed by the wiping ring.

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

- With push arms (C-frame) and blade.
Lower the attachment to the ground without pressure. See figure 67.
- With ripper attachment
Lower ripper to the ground without pressure. See figure 68.
- Without push arms (C-frame)
Retract lift cylinder and secure the cylinder so the cylinder can not extend. During this procedure the vent screw on the hydraulic tank (see page 36, fig. 44, pos. 8) must be opened by one turn.

Important!

If the machine is scheduled to be stored for an extended time period, please contact your LIEBHERR dealer.



14 SERVICE CHART

14.1 DAILY

14.1.1 DIESEL ENGINE Page 20/30

See attached engine operation and maintenance manual.

14.1.2 COOLING SYSTEM Page 20

Check coolant level, check if air flow is restricted, see attached engine operation and maintenance manual.

14.1.3 AIRCLEANER - DRYTYPE Page 21

Check state of filters at indicator.
Check pre-cleaner section and clean if necessary, test system for leaks

14.1.4 HYDRAULIC TANK Page 21/36

Check oil level. Clean magnetic rods in return filters daily during first 250 working hours.

14.1.5 FUEL SYSTEM Page 36

Drain water from fuel filter and fuel tank

14.1.6 RUNNING GEAR Page 41

Clean running gear.

14.1.7 ELECTRICAL SYSTEM Page 45

Check function of system and indicators

14.1.8 WORKING EQUIPMENT Page 46

Grease and check all bearings.

14.1.9 DOZER ARRANGEMENT Page 46

Check cutting edge and corners for wear-failures.

14.1.10 RIPPER ARRANGEMENT Page 47










Check tips for wear.

14.2	EVERY 250 OPERATING HOURS	
14.2.1	DIESEL ENGINE	Page 20/33
	Check bolts of engine support for tightness, check V-belt tension See attached "Engine Operation and Maintenance Manual"	
14.2.2	COOLING SYSTEM	Page 20
	Check fan belt tension See attached "Engine Operation and Maintenance Manual"	
14.2.3	HYDRAULIC TANK	Page 21/36
	Clean magnetic bar from sediments. First and second change of filters (paper cartridge).	
14.2.4	HYDRAULIC SYSTEM	Page 36/37
	Check pipes and hoses for leaks. First and second change of oil filters at pump and cartridge of pressure filter. Check oil cooler for cleanness	
14.2.5	FINAL DRIVE LEFT AND RIGHT	Page 39
	Check bolts and nuts for tightness Check oil level (remove check-plug and refill).	
14.2.6	SPLITTER BOX	Page 37
	Check oil level. First and second oil-change. Filling capacity 0.8 GAL (3 liters) SAE 90	
14.2.7	TRAVELING GEAR	Page 40
	Check all bolts and nuts for tightness.	
14.2.8	CHAIN	Page 41
	Check tensioning and wear Check for cracks an loose bolt.	

14.2.9	TRACK AND SUPPORT ROLLERS	Page	41
	Check for wear and leakages		
14.2.10	FRONT IDLER	Page	41
	Check for wear and leakages. If necessary, adjust idler guidance with shims.		
14.2.11	SPROCKET	Page	41
	Check for wear and mounting. If necessary, replace segments.		
14.2.12	COVERS	Page	45
	Check covers for damages.		
14.2.13	HEATER AND VENTILATION	Page	46
	Check for function and leaks.		
14.2.14	ELECTRICAL SYSTEM	Page	45
	Check for function and filling of battery. See attached "Engine Operation and Maintenance Manual"		
14.2.15	WORKING EQUIPMENT	Page	46
	Check bolts and nuts for tightness.		
14.2.16	DOZER ARRANGEMENT	Page	47
	Adjust clearance of ball-joints.		
14.3	EVERY 500 OPERATING HOURS		
14.3.1	HYDRAULIC TANK	Page	36/37
	Third and following changes of oil filters cartridge. Drain sediments and condensates from tank.		


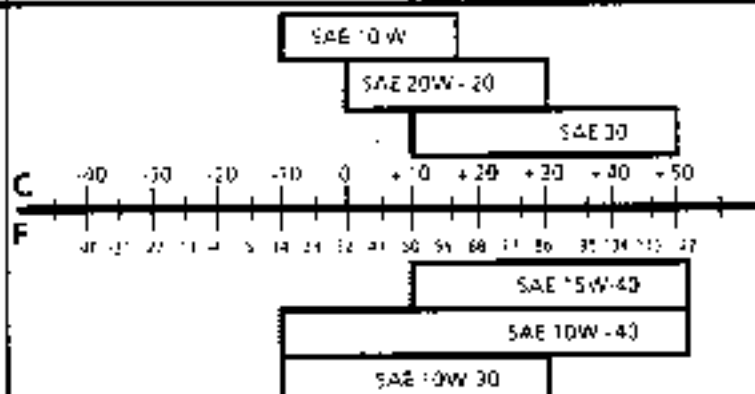
14.3.2	HYDRAULIC SYSTEM	Page	36/37
	Third and following changes of oil filters at hydraulic pumps and cartridge of pressure filter.		
14.3.3	FINAL DRIVE LEFT AND RIGHT	Page	39
	First oil-change, filling capacity 16.1 GAL (61 liters) SAE 90 each side.		
14.3.4	SPLITTERBOX	Page	37
	Third and following oil-changes. Filling capacity 0.8 GAL (3 liters) SAE 90		
14.3.5	PARKING BRAKE	Page	40
	Check for function		
14.3.6	TRAVELING GEAR	Page	40
	Check bearing of equalizer bar and silent blocks.		
14.3.7	FUEL TANK	Page	36
	Drain sediments and condensate.		
14.4	EVERY 2000 OPERATING HOURS		
14.4.1	FINAL DRIVE LEFT AND RIGHT	Page	39
	Second and following oil-changes. Filling capacity 16.1 GAL (61 liters) SAE 90 each side		
14.4.2	FIRST OIL-CHANGE, 73 GAL (275 liters)	Page	36/37
	(Use only oil recommended in the lubricants chart) With every oil-change replace paper cartridge of filter Attention. Fill only via filter.		

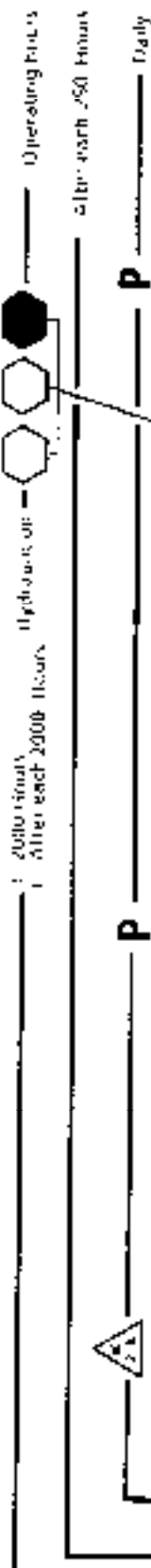
14.5 LUBRICATION CHART

SYMBOL ACC. TO THE LUBRICATION CHART	DESCR. OF THE LUBRICATION POINT	NO. GENERAL LUBRIC. POINT	DESCR. OF THE LUBRICANT	VISCOSITY SAE DW 51 512	COMPARABLE SPECIFICATIONS REMARKS LIEBHERR-IDENT-NO.
	DIESEL ENGINE		THE INSTRUCTIONS OF THE ENGINE MANUFACTURER HAVE TO BE OBSERVED, SEE INSTRUCTION AND MAINTENANCE MANUAL		
	Gearbox		API-GL-4-80 API-GL-5	SAE 80 SAE 80 W 90	MIL-L-2105 MIL-L-2105 C or D
	Gearbox		API-GL-5-90 API-GL-5	SAE 90 SAE 80 W 90	MIL-L-2105 B MIL-L-2105 C or D
	Wheel Loader Axles		Special Lubricant	SAE 90	Special Lubricant released by ZF - according to list TE-ML 05 for Wheel Loaders
	Ball & Roller bear. / gener. lubric. points			Consistency 2 NLGI-Grade DIN 51 818	DIN 51 825 also for the ball race of the swing ring
			Special grease LD		Liebherr-Part-No. 8613313
	Swing ring teeth - by autom. lubric system	*	Grease RHZ		Liebherr-Part-No. 8612304
	- by manual lubrication	*	Compound Spray 2000 E		Liebherr-Part-No. 8612107
	for open teeth and cables		Cohesion grease BB		
	Telescopic slide ways (Plastic bearing)	*	Special grease 906 LS		Liebherr-Part-No. 8613314
	Quick change attachments	*	Thermocup 1200		Liebherr-Part-No. 8700067

HYDRAULIC OILS RECOMMENDED FOR HYDRAULIC EXCAVATORS, DOZERS, WHEEL LOADERS AND CRAWLER LOADERS

Single and multi grade engine oils are specified in accordance with the Mercedes Benz Lubricant Recommendations, pages 226.0, 227.0, 227.1 and 228.1

SYMBOL ACC. TO THE LUBRICATION CHART	VISCOSITY / AMBIENT TEMPERATURE RANGE	INSTRUCTIONS FOR WARM UP
		<p>1. With temperatures down to about 10° below the limit indicated, run engine at half-rpm after starting.</p> <p>Operate motors and cylinders, holding cylinders at extremes of travel for a short time. Warming-up time approx. 10 minutes.</p> <p>2. Where temperatures are of greater severity, warm oil tank before starting engine.</p>



LUBRICATION CHART

OIL - AND GREASE TYPES SEE LUBRICATION CHART DURING FIRST 250 OPERATING HOURS. CLEAN STRAIGHT MAGNETIC HYDRAULIC OIL IS DAILY. SEE DIESEL ENGINE OPERATING AND INSTRUCTION MANUAL.

⬡ Engine - gear and hydraulic oils

⚠ Greases

P Check and top up

Travel gear	2 x 16.1 gal (2 x 61 l)
Hydraulic oil	72.7 gal (275 l)
Engine	13.2 gal (50 l)
Gearbox for double pump	3.2 qt (3.0 l)

I + II 250 Hours / After each 250 Hours — ⚠ — Greases — Gearbox for double pump — ⬡ — 500 Hours / After each 500 Hours — ⬡ — Hydraulic oil — 500 Hours / After each 500 Hours — ⚠ — Travel gear — ⬡ — Daily

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 Tenslock, 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.

TIGHTENING TORQUES FOR SCREWS WITH STANDARD METRIC THREAD

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

Metric Standard Thread	Preload values F_M based on grades in N			Tightening torque 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	8 700	3,1	4,5	5,3	7	9/32	3	---
M 5 x 0.8	5 400	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	18 500	24 200	28 500	25	37	43	13	1/2	6	---
M 10 x 1,5	28 000	38 500	45 000	51	75	87	(17)16	(11)16	8	---
M 12 x 1,75	39 500	56 000	66 000	87	130	150	(19)18	(3)41	10	---
M 14 x 2	53 000	77 000	90 000	140	205	240	(22)21	(7)91	12	---
M 16 x 2	72 000	106 000	124 000	215	310	370	24	51/64	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	148 000	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	35	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	51/64
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 $G = 0.14$).

Wrench size (x1) = wrench size according to DIN 931

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	5	...
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	98	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	88 000	100 000	150	220	260	22	7/8	12	...
M 16 x 1.5	79 000	116 000	136 000	230	340	390	24	51/64	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	480	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	930	1 070	32	1 - 9/32	17	43/64
M 24 x 1.5	200 000	295 000	333 000	830	1 190	1 380	36	1 - 7/16	19	3/4
M 24 x 2	189 000	270 000	315 000	810	1 150	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	1 730	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	2 900	3 930	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	5 130	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 $G = 0.14$).

Expanded standard WN 4037B according to Roloff Matek

TIGHTENING TORQUES FOR SCREWS WITH STANDARD METRIC THREADS

Screw type: "8 m galvanized, yellow chromatised A3C"

Standard metric thread	Preload values F_M based on grades in N			Tightening torque 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	6 500	9 700		4,9	7,0		8	---	4	5/32
M 6 x 1	9 750	13 700		9,0	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	1-9/32	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 $G = 0,10$).

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

ELECTRIC SCHEMA

- 31 Pressure switch - parking brake
- 32 Pressure switch - repl. oil pressure
- 33 Pressure switch - engine oil pressure
- 34 Temperature sending unit - engine coolant
- 35 Fuel sending unit
- 36 Pressure switch - quick drop
- 37 Horn
- 38 Temperature sending unit - hydraulic oil

- E1 Headlights
- E2 Working lights - front
- E3 Working lights - rear
- E4 Dome light

- F1 Fuse box complete
 - 1 5A Instrument lights
 - 2 8A Headlights
 - 3 8A Working lights, left front, right rear
 - 4 8A Working lights, right front, left rear
 - 5 8A Windshield wiper front gauges, indicators, horn
 - 6 8A Windshield wiper rear
 - 7 3A Quick drop, counterrotation, back up alarm
 - 8 5A Float position, Hi/Low travel speed selector
 - 9 8A Heater / Fresh air fan
 - 10 8A Dome light, electrical outlet
- F2 Fuses - optional equipment

- G1 Alternator
- G2 Batteries

- H1 Audible Alarm
- H2 Indicator light - float position
- H3 Indicator light - repl. oil pressure
- H4 Indicator light - pin puller
- H5 Indicator light - parking brake
- H6 Indicator light - battery disconnect switch

- K1 Battery disconnect switch
- K2 Relay - starter cut off
- K3 Relay - power guard
- K4 Relay - headlights
- K5 Relay - working lights
- K6 Relay - starter
- K7 Relay - float position
- K10 Step relay

- M1 Starter
- M2 Windshield wiper - front
- M3 Windshield wiper - rear
- M4 Heater / fresh air fan

- P1 Engine oil pressure gauge
- P2 Coolant temperature gauge
- P3 Fuel gauge
- P4 Hourmeter

- P5 Hydraulic oil temperature gauge
- P6 Amp gauge

- S1 Starter switch
- S2 Switch - Hi / Low travel speed selector
- S3 Switch - float position
- S4 Switch - windshield wiper front
- S5 Switch - windshield wiper rear
- S6 Switch - headlights
- S7 Switch - working lights
- S8 Horn button
- S9 Switch - quick drop
- S10 Switch - counterrotation
- S11 Switch - card start
- S12 Switch - pin puller
- S15 Switch - neutral starting

- V Diode

- X1 Quick disconnect plug
- X2 Quick disconnect plug
- X3 Quick disconnect plug
- X4 Quick disconnect plug
- X5 Plug - electrical outlet
- X6 Plug - connection for pin puller / ripper

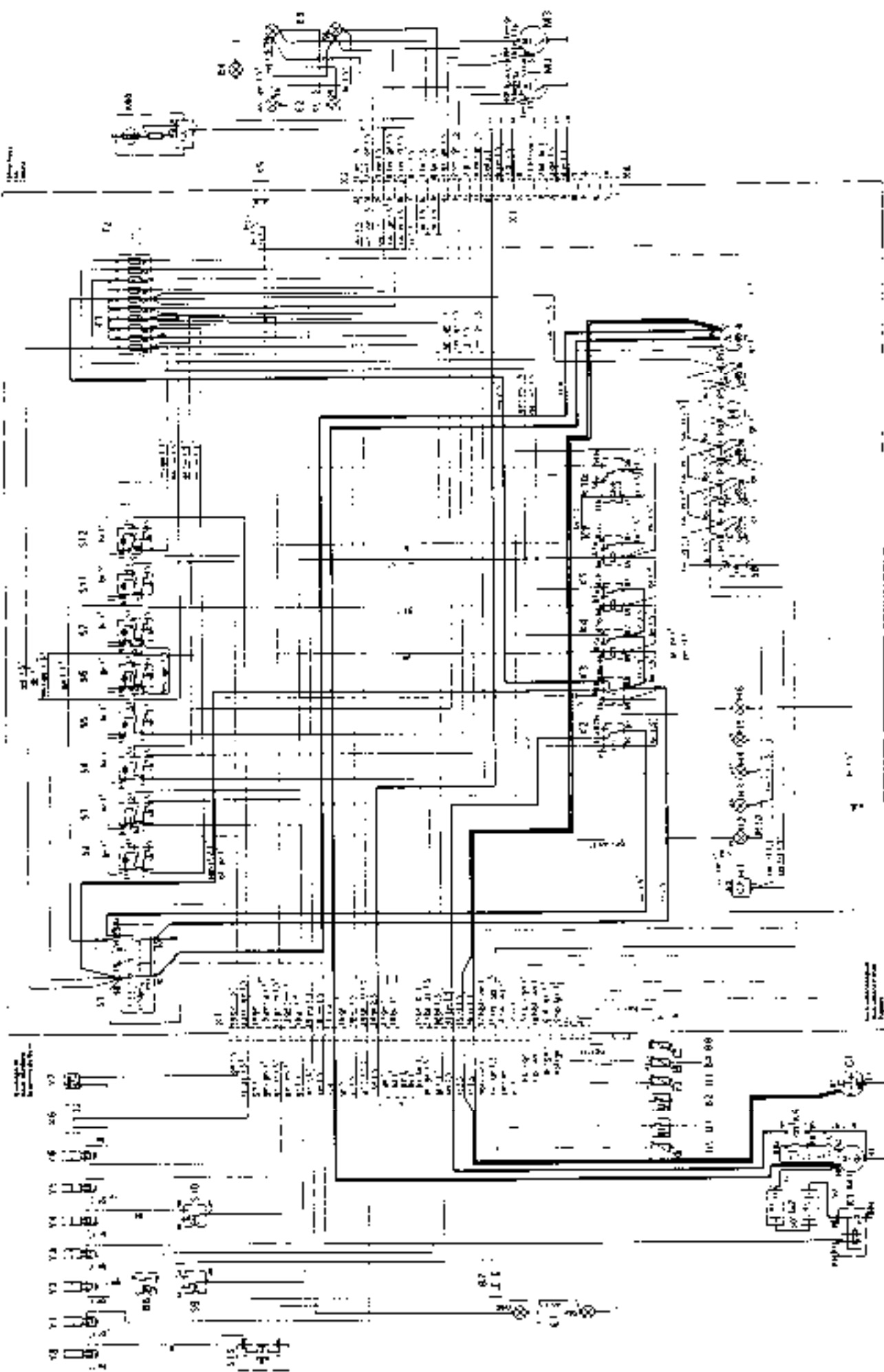
- Y1 Solenoid valve - fuel pump
- Y2 Solenoid valve - quick drop
- Y3 Solenoid valve - float position
- Y4 Solenoid valve - counterrotation
- Y5 Solenoid valve - Hi/Low travel speed selector
- Y6 Solenoid valve - Ecomat (low idle automatic)
- Y7 Solenoid valve - cold start
- Y8 Solenoid valve - safety feature

- 1 Ground

Connections for Additional / Optional Circuits:

- II Back up alarm
- V Air conditioning - compressor
- VII Open connections
- VIII Ecomat (low idle automatic)
- IX Air conditioning
- XI Visual alarm - canopy - see H1

rt	= red
bl	= blue
br	= brown
gr	= grey
gr	= green
ws	= white
ge	= yellow
sw	= black
be	= beige
vi	= violet
hbl	= lightblue



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