

OPERATOR'S MANUAL

560C

SERIAL NUMBERS
15001 AND UP



DRESSTA Co. Ltd.

A JOINT VENTURE OF KOMATSU AMERICA INTERNATIONAL CO. AND HUTA STALOWA WOLA S.A



FOREWORD

Welcome to the growing group of value-conscious people who operate DRESSTA machines

This manual covers the instructions for safe operation, lubrications, adjustments and maintenance for normal daily care. These instructions are divided into six sections to simplify your reference to the information most important to you. Refer to the contents page at the beginning of the section for a complete list of the subjects covered except for Section 1, which should be read entirely.

This manual has been prepared to help you operate and maintain your machine with utmost efficiency and safety. Read this manual thoroughly and learn your machine before you attempt to operate it.

It is our policy to improve our products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Due to this continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

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SECTION 1 - INTRODUCTION

This section discusses the use of this manual and serial number locations.

SECTION 2 - SAFETY PRECAUTIONS

This section lists safety rules concerning personal safety. Read this section carefully and observe safety precautions specified herein.

SECTION 3 - STORAGE AND SHIPPING

This section discusses how to ship or store this machine.

SECTION 4 - OPERATING

The front portion of this section provides you with instructions for trouble free operation of the machine. A universal symbol chart for instruments and controls designation is provided. The instrument and controls area is designed to tell you "where it is, what it does and how to use it". Read this area carefully. The remaining portion of this section outlines and illustrates the step-by-step procedures for starting, operating and stopping the machine and discusses a few operating suggestions and techniques and simple ideas to help ease the work and lengthen the useful life of your machine.

SECTION 5 - MAINTENANCE

The beginning of this section outlines a complete scheduled maintenance program, which helps to reduce down-time and expense, and increase the profit and work from your machine. Read and use this area. Following the maintenance program are the lubrication recommendations and requirements for the machine. The remainder of the section is devoted to clearly explaining the "how to" of the many maintenance and adjustment procedures listed in the maintenance program.

SECTION 6 - SPECIFICATIONS

This section covers the general dimensions schematics, forces and weights, refill capacities, ground speeds and the standard and special torque values.

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SECTION 1

INTRODUCTION

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1.1. INTRODUCTION



Fig. 1.1. 560 Series C Wheel Loader

a - Right Hand Side of the Machine
 b - Left Hand Side of the Machine

c - Front of the Machine
 d - Rear of the Machine

GENERAL

Throughout this manual there will be two types of cross references. One type is to a heading in another section. The other is to a heading within the same section. Unless it is otherwise stated, references will be to the same section. Refer to the section contents page at the beginning of the individual sections for specific page numbers.

Throughout this manual the use of the terms "left", "right", "front", and "rear" must be understood to avoid confusion when following instructions. "Left" and "right" indicate the left and right sides of the machine when facing forward in the operator's seat. See Fig. 1.1.

Some illustrations are of general application of this model and may not show your machine accurately in all details.



WARNING! This symbol and text in bold letters is used throughout this manual to call your attention to instructions concerning personal safety. Observe and follow these instructions. Be certain anyone operating and servicing this machine is aware of these rules. Failure to follow these rules may result in injury or death.

IMPORTANT: *This sign and text in italics is used throughout this manual to call your attention to key problems for machine operation. Failure to follow such instructions may result in damage of the machine and heavy material losses.*

INTRODUCTION

INTRODUCTION

NOTE: *This sign and text in italics is used throughout this manual to call your attention to important function having influence on the right functioning of the machine or for informational purposes.*

1.2. SERIAL NUMBERS

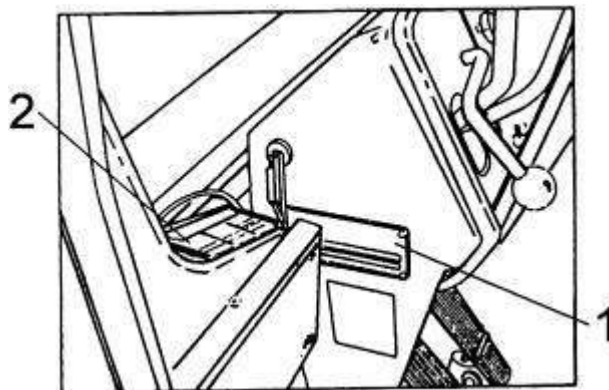


Fig.1.2. Location of Chassis and ROPS-FOPS Cab Serial Number plates

- 1. Chassis Serial Number Plate
- 2. ROPS-FOPS Cab Serial Number Plate

The chassis serial number plate and ROPS-FOPS Cab Serial Number Plate are located in the cab in the locations shown in Fig. 1.2. The chassis serial number is also stamped on the left rear corner of the rear frame under the engine access door.

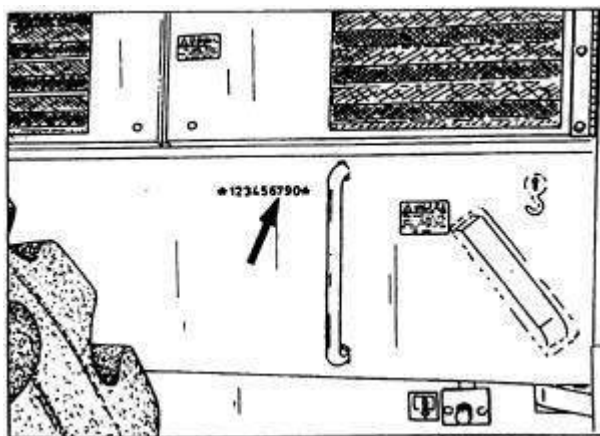


Fig.1.3. Location of stamped chassis serial number

SERIAL NUMBERS

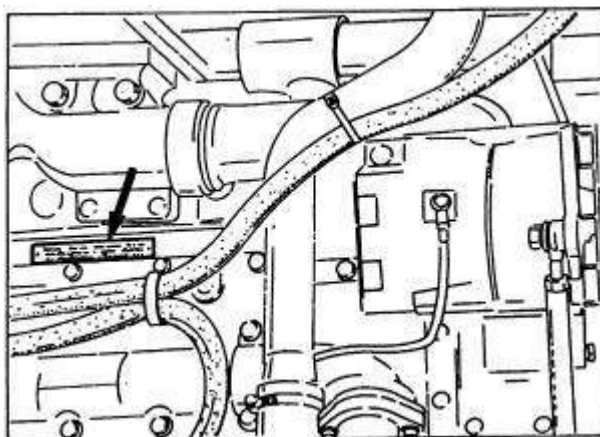


Fig.1.4. Engine Serial Number Plate

All other main components having serial numbers are each equipped with a separate serial number plate.

Use respective serial numbers when requesting information or ordering parts and proper numbers from Parts Catalogue.

SECTION 2

SAFETY PRECAUTIONS

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2.1. GENERAL

WORK SAFETY - FOLLOW THESE RULES



WARNING! This symbol and text with bold letters is used throughout this manual to call your attention to instructions concerning personal safety. Observe and follow these instructions. Be certain anyone operating and servicing this machine is aware of these rules. Failure to follow these rules may result in injury or death.

Recommendations and information given in this Section do not cover all subjects to be acquired for safe operating of the machine. Detailed information respecting safe operating of the machine are specified in the following Sections. Observe and follow these rules.

Operation and servicing this machine can be hazardous if performed improperly. Personnel must have necessary skill information and use proper procedures and recommendations included in this manual.

Only trained and authorized personnel should be allowed to operate and service this machine.

Do not rush. Hurrying can lead to accidents. Haste, carelessness and lack of training are the primary causes of equipment-related injuries.

The machine must be equipped with a fully charged fire extinguisher recharged immediately after use and first-aid kit. Operator's seat must be equipped with safety belt. Also, the machine must be equipped with safety triangle and wedges.

If the machine is equipped with a suction fan (or a reversible fan in the suction position), check the engine exhaust system periodically for leaks. Exhaust gases are dangerous to the operator. On machines equipped with a cab without a suction fan, keep sliding windows open to outside air.

The operator must not wear loose fitting or hanging clothing, belts of jewelry and shoes with non-slipping soles as well as a hard hat (during cold weather)

Do not jump on or off the machine. Keep two hands and one foot, or two feet and one hand in contact with the steps and handholds at all times. Always face the machine when climbing on or off to reduce the chances of slipping and injury.

Follow all machine-mounted safety signs before starting, operating, maintaining or servicing the machine.

The operator must be alert, physically fit and free from the influences of alcohol, drugs or medications that might affect his eyesight, hearing, reactions or judgment.

Do not use controls or hoses as hand holds when climbing on or off the machine. Hoses and controls can move and do not provide solid support. Movement of the controls may cause inadvertent and unexpected movement of the machine or its equipment.

Be sure the area of the operator's compartment, all mounting steps and grab handles are free of oil, grease, loose objects, ice and mud to lessen the possibility of slipping. Remove or secure all maintenance and personal items so they will not interfere with the operator or jam the controls.

SAFETY PRECAUTIONS**2.2. BEFORE STARTING THE ENGINE**

Never start the engine indoors unless proper exhaust ventilation is provided to remove deadly exhaust gases. Once the engine is operating, move the machine outdoors as soon as possible

Perform a visual check of the machine before starting the engine. Look for such things as improper fluid levels, oil leaks, and loose, damaged or missing parts. Do not start the engine until any unsafe conditions are corrected.

Be sure all filler caps, dipsticks, plugs, latches, service doors, etc. are secure before starting.

Walk completely around the machine before entering the operator's compartment, clear the immediate area surrounding the machine of personnel and obstructions.

Know the alternate exit routes from the operator's compartment for use in an emergency.

Before operating the machine, check that the frame locking bar and pins are stowed on the rear frame. Broken or lost frame locking bar and pins should be repaired or replaced immediately so that this device is always available for use.

Sit in the operator's seat before starting the engine. Keep hands and footwear free of grease, water and mud to insure positive control movement.

Before starting the engine or when the machine is standing with the engine running idle; lock the transmission shift lever in neutral (N), apply the parking brake, and lower the bucket if raised

2.3. OPERATING THE MACHINE

Release the parking brake before moving the machine. The brake could burn or be damaged if the machine is driven with it applied.

Before driving the machine, adjust the seat and fasten the seat belt. Never wear the seat belt across the abdomen.

Always carefully check overhead clearance before operating in areas with overhead obstructions such as guy wires, power lines, bridges, tree branches and building doors).

Do not smoke when using the ether injector. Do not use the ether injector when the air temperature is above freezing. Follow the correct method for starting the engine.

Before moving the machine, sound the horn to warn nearby personnel.

Check the brakes, steering and attachment controls. All system must be fully operative.

After starting and while operating, observe instruments and warning lights frequently. Investigate any unusual indications or noises in the machine.

Know the locations of underground cables, water mains, gas lines, etc. A broken gas line or electrical cable could cause personal injury or death.

Avoid undercutting high backs because the bank may cave in. Ramp up and remove the top layers first.

Avoid operating too close to an overhang, deep ditch, or excavation because the machine's weight may cause the edge to collapse and result in personal injury.

OPERATING THE MACHINE

If the ground driven steering light comes on, immediately stop the machine in a safe place. Shut off the engine and apply the parking brake. Correct the cause before operating again.

Keep the work area free from obstructions and as smooth as possible.

Turn on the machine lights at night and times of poor visibility to see and be seen.

When loading trucks, be careful not to hit the truck with the loader or its bucket.

If engine has a tendency to stall for any reason under load or at idle, stop the machine immediately and correct the malfunction.

Trucks should be loaded from the driver's side whenever possible. When the truck is being loaded, be sure the driver either stays in the cab (on cab-protected trucks) or away from the truck and loader.

If the machine begins to tip over because of an overload, immediately lower the bucket to regain stability.

Do not swing a load over the heads of other workers or a truck cab.

A machine's weight and the vibration it creates can cause the edge of a high wall to collapse. Keep your machine back from the edges of banks and excavations. If this cannot be avoided, face the machine towards the bank's edge while operating.

Operating in rough virgin terrain with such hazards as trees, logs, large rocks and brush calls for special attention. Avoid falling branches and upturning roots.

When pushing over trees never allow the machine to climb up the root structure, especially when the tree is being felled. Use extreme care when pushing over any tree with dead branches.

Operate at speeds low enough to ensure complete control of the machine. Travel slowly in congested areas or on rough ground, slopes or near drop-offs or on snow, ice or slippery surfaces.

Maintain a safe distance between your machine and other vehicles according to the condition of the road and load.

Keep the machine as close to the side of the road as is possible to provide for oncoming or passing vehicles. Pass other vehicles only when the road is clear and there is enough room and reserve power to pass.

Do not operate the machine in a condition of extreme fatigue or illness. Be especially careful at the end of a work shift.

Never try to get on or off the machine while it is moving. A serious injury or death could result.

Never shift the transmission into neutral when travelling downhill. The machine may go out of control and a rollover could result or the transmission, torque converter or engine could be damaged when the transmission is again placed in gear. Always put the transmission in low range position before starting downhill. Use the brake/decelerator pedal to slow the machine.

Never haul passengers. Only the operator should be on the machine when it is moving.

If the brake system warning light or buzzer comes on during operation, immediately stop the machine in a safe place. Apply the parking brake. Correct the cause before operating again.

SAFETY PRECAUTIONS**OPERATING THE MACHINE**

Keep the bucket in carry position when roading the machine and take care not to actuate accidentally the levers.

Maintain clear vision of all work and travel areas. Keep windows and mirrors clean and repaired.

Look in the intended travel direction to be sure the personnel and allied equipment do not interfere with the machine's work pattern. Do not operate if exposed personnel enter the immediate work area.

When traveling fast or downhill never apply the brake with disengaging the drive as this shifts the transmission into neutral (N). The machine could go out of control or the power train could be damaged when the pedal is released and the transmission is shifted into gear again.

Do not drive the machine without checking the brakes for correct operation.

Avoid sidehill travel whenever possible. Drive straight up and down the hill. If the machine starts slipping sideways, turn downhill immediately, and lower the bucket.

Do not overspeed the engine. Excessive speeds can be hazardous and harmful to the power train. Select the proper gear before starting downhill. Control the speed with the brakes.

Avoid crossing obstacles such as ridges, curbs, logs, rocks, and railroad tracks. If you cannot avoid them, reduce speed and cross at an angle.

Never use the bucket as a brake except in an emergency.

Do not adjust the seat while the machine is moving because a loss of control may result. Stop the machine, apply the parking brake and then adjust the seat.

Never allow anyone to stand on the ladder when the bucket is raised or the machine is moving.

Carry the bucket low for maximum visibility and stability when traveling.

Use extra caution when moving with the bucket raised. The stability is reduced as the bucket is raised.

Know the traffic flow patterns of the job site. Obey flagmen, signs and signals.

There is no substitute for good judgment when working on a slope. Slope operation should be limited according to the ground and traction conditions, the load being carried, and the speed of the machine.

2.4. GENERAL MAINTENANCE PRECAUTIONS

Replace any missing or defaced product graphics. When parts which have product graphics on them are replaced, be sure to install new product graphics. New product graphics are available from the Authorized Distributor of Construction Equipment.

Never let anyone near the machine's articulation pivot. If the machine is turned, they could be crushed.

Before servicing the machine use the frame safety bar to prevent accidental articulation.

GENERAL MAINTENANCE PRECAUTIONS

Before servicing the machine, be sure the engine is off, the bucket is lowered, the transmission shift lever is locked in neutral (N), the electrical system master switch is off and the key is removed. Tag the machine.

Use only approved parts for repairs and maintenance. Failure to do so could compromise personal safety, machine performance, and reliability.

Before working under the machine, block the tires to prevent machine movement.

It is not possible to anticipate all conceivable ways or conditions under which this machine may be serviced or to provide precautions for all the possible hazards that may result. Safety is always the most important rule. Constantly be aware of dangers involved in working on the machine and take proper precautions. Standard and accepted safety precautions and equipment should be used.

Never attempt to start servicing close to operating fan as it may result in serious injury.

When changing cutting edges, securely support the bucket for your protection.

If the bucket is provided with teeth, use wooden hammer for installation to prevent teeth breakage. Wear safety goggles.

Lift and handle all heavy parts with lifting devices of adequate capacity. Secure parts with proper slings and hooks. Use lifting eyes provided. Warn nearby personnel to stand clear.

Keep work area clean and dry. Remove water and oil spills immediately to reduce the chance of slipping and injury.

Do not pile up oily or greasy rags; they are a fire hazard. Store them in an approved, closed metal container.

Do not carry loose objects in pockets because they might catch on the machine and result in a fall or injury.

Use the proper tool for the job. Be sure all tools are in good condition. Do not use tools which are worn, bent or have mushroomed heads because they can lead to injury.

Do not use the loader bucket or forks to lift personnel or as a work platform.

When service requires access to areas that cannot be reached from the ground or service platform on the machine, use a ladder or platform of adequate size and capacity.

Never adjust relief valves higher than the specified pressure because this may damage the machine and lead to injury. When checking pressures, use the correct gauge for the expected pressure. Consult the Authorized Distributor of Construction Equipment

Jacking up the machine can be hazardous if performed improperly. Use jacking equipment with sufficient capacity. Be sure the jacking points are strong enough for the expected load. Be sure the supports for the jacks are stable. Before jacking up the machine, block the tires on the opposite side of the machine. Because the rear axle pivots, securely block it in position. Do not run the engine with the machine on jacks. For your safety, transfer the load to approved blocks before servicing the machine.

This machine is assembled using high strength fasteners. Replacement fasteners must be of the same size and strength as the originals.

GENERAL MAINTENANCE PRECAUTIONS

Refer to the parts catalog for this machine. Tighten fasteners to the proper torque.

When cutting, grinding, pounding, prying, or whenever material could fly or fall, wear proper protective equipment (such as goggles, hard hat, safety shoes, and heavy gloves).

During servicing do not allow anyone in the operator's compartment who is not trained and assisting in the servicing.

When it is necessary to make any checks or adjustments with the engine running, use two people. A trained operator must be at the controls to safeguard the mechanic making the checks or adjustments. Be sure the transmission shift lever is locked in neutral (N), the parking brake is applied and the frame halves are locked together.

Never stand near the bucket or tires while the engine is running.

If compressed air or water under pressure is used for cleaning the parts, wear safety goggles. Limit air pressure to 200 kPa and water pressure to 270 kPa.

Never run the engine when cleaning or lubricating the machine because serious injury could result from contacting moving parts. Use a nontoxic, nonflammable commercial solvent for cleaning parts unless otherwise specified.

Avoid use of gasoline, diesel fuel, kerosene or other flammable solvents for cleaning parts.

Never place these solvents in an open pan.

Use gloves and safety goggles when draining hot fluids.

For your safety lower the bucket before servicing the machine. Be sure no one is standing near the bucket when it is being lowered.

Do not service the air conditioning system (if equipped) unless you are completely familiar with air conditioning and the safety precautions for handling liquid refrigerant which can cause severe frostbite. Contact the Authorized Distributor of Construction Equipment

Before working on the engine or electrical system turn off the master switch and take the ignition key out. Tag the cables and controls to warn against starting.

Keep the engine exhaust manifold(s) and exhaust system clear of combustible material to reduce the chance of fire.

Never remove any guards or shields with the engine running because of the danger of contacting rotating parts.

Before working on the hydraulic system, be sure the system pressure is relieved. To do so lower the bucket on the ground, move boom control lever in float position and switch off the engine.

Do not use hands to search for hydraulic leaks. Hydraulic oil escaping under pressure from a very small hole can be almost invisible yet have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected leaks. If injured by escaping oil, see a doctor immediately because of the possibility of infection or reaction to the oil.

Never work or walk under a raised bucket without proper blocking.

GENERAL MAINTENANCE PRECAUTIONS

Use extra caution when adjusting the loader's bucket leveler or boom kick-out. Use two trained people and guard against accidental movement of the machine or loader linkage.

The roll-over protective structure (R.O.P.S.) provides operator protection in the event of machine rollover or upset. It is designed to bend during a rollover to protect the operator from sudden impact loads. Do not attempt to repair a R.O.P.S. after an accident. Repaired structures do not provide the original strength and protection. Contact the Authorized Distributor of Construction Equipment for information on R.O.P.S. (or cab) replacement. Do not operate the machine again until the R.O.P.S. has been replaced. Periodically inspect the R.O.P.S. for fatigue cracks. Cracks indicate a weakened structure which should be replaced for your protection. Bolts fastening cab or R.O.P.S. must be torqued to specific value. Do not cut, grind, weld, drill or tap holes in the R.O.P.S. This could weaken the structure or affect the overall energy absorption capability. Always wear the seat belt during all operation in order to realize protection of the R.O.P.S. (or cab)

When transporting the machine, lock the frame halves together with the frame locking bar and pins.

Corrosion inhibitors are volatile and flammable. Use them only in a well ventilated area. Keep flames and sparks away. Do not smoke. Store container in a cool, well ventilated place.

For your safety never push or tow a disabled machine farther than absolutely necessary. When using a chain or cable, be sure it is strong enough for the expected load and properly secured to the drawbar pin or towhook. Avoid kinking. Do not pull with a kinked chain or cable because the high stresses could cause failure in the kinked area. Wear heavy gloves when handling chain or cable. When pulling with a chain or cable, take up the slack slowly to avoid jerking. A chain or cable which fails under load can whip and cause serious injury. Do not pull or tow unless the operator's compartment is guarded against or out of reach of a whipping chain or cable. Hitch only to the drawbar pin or towhook. Prior to towing release the parking brake.

Rims and tires must be repaired in specialized shops featuring proper technology. Improper repairs may result in malfunctions and accidents.

Never inflate a flat tire without inspecting the tire and rim for damage. Be sure the components are properly assembled. Unmounted tires being inflated or deflated should be placed in a tire safety cage. Inflate the tire to 35 kPa and check that all components are properly seated. Never stand directly in front of a tire and rim assembly while inflating. Use a clip-on chuck with a hose long enough to allow person inflating the tire to stand to the side. Serious injury could result if the tire and rim were to separate.

Hydraulic accumulators are filled with nitrogen and operate under high pressure. For safe operation observe the following precautions:

- if the accumulator is damaged or operates incorrectly refer to authorized service station for servicing
- the accumulator must be filled with nitrogen only by personnel authorized for servicing high pressure equipment
- never tap the accumulator nor expose to fire. Do not perform any welding nor cutting holes in it
- relieve nitrogen completely thru vent valve prior to repair or disposal.

2.5. WHEN PARKING

Avoid parking on a slope. If necessary to park on a slope, park at a right angle to the slope and block the tires.

Park the machine in place free from grease and fuel to prevent tire damage.

Never leave the machine with the engine running or the bucket raised. When parking the machine, shut off the engine, lower the bucket to the ground, lock the transmission shift lever in neutral (N), apply the parking brake, turn off the electrical system disconnect switch, and remove the key .

Park the machine in a nontraffic area. If parking near or in traffic lanes cannot be avoided, identify the machine in accordance with traffic rules.

Always lock the machine, including any anti-vandalism attachments when leaving it unattended.

If the loader is equipped with a multi-purpose bucket, close the clam before dismounting.

When operating in bad weather and storm lightning is nearby, dismount and seek shelter away from the machine. Lightning will be attracted to the machine and cause serious injury or death.

ADDITIONAL INFORMATION

1. Wheel Loader has CE mark - declaration of conformity with EEC directive of March 18,1998.
2. Wheel Loader has TBG certificate (Tiefbau-Berufsgenossenschaft) No 612.17/242 Sp-061 awarded on March 30,1998.
3. The Loader complies with „B” Safety Mark Requirements according to State Certificate No 015/98 (being upgraded).
4. The Loader was given TÜV Hannover Laboratory DE 10-893 641 11 Noise Level Certificate on 17 March 1998.
5. Wheel Loader in standard configuration is not adapted to operation in terrain where a mixture of gasses, vapors, aerosols or dust with air create explosion hazard zones.

2.6. SAFETY GRAPHICS LOCATION

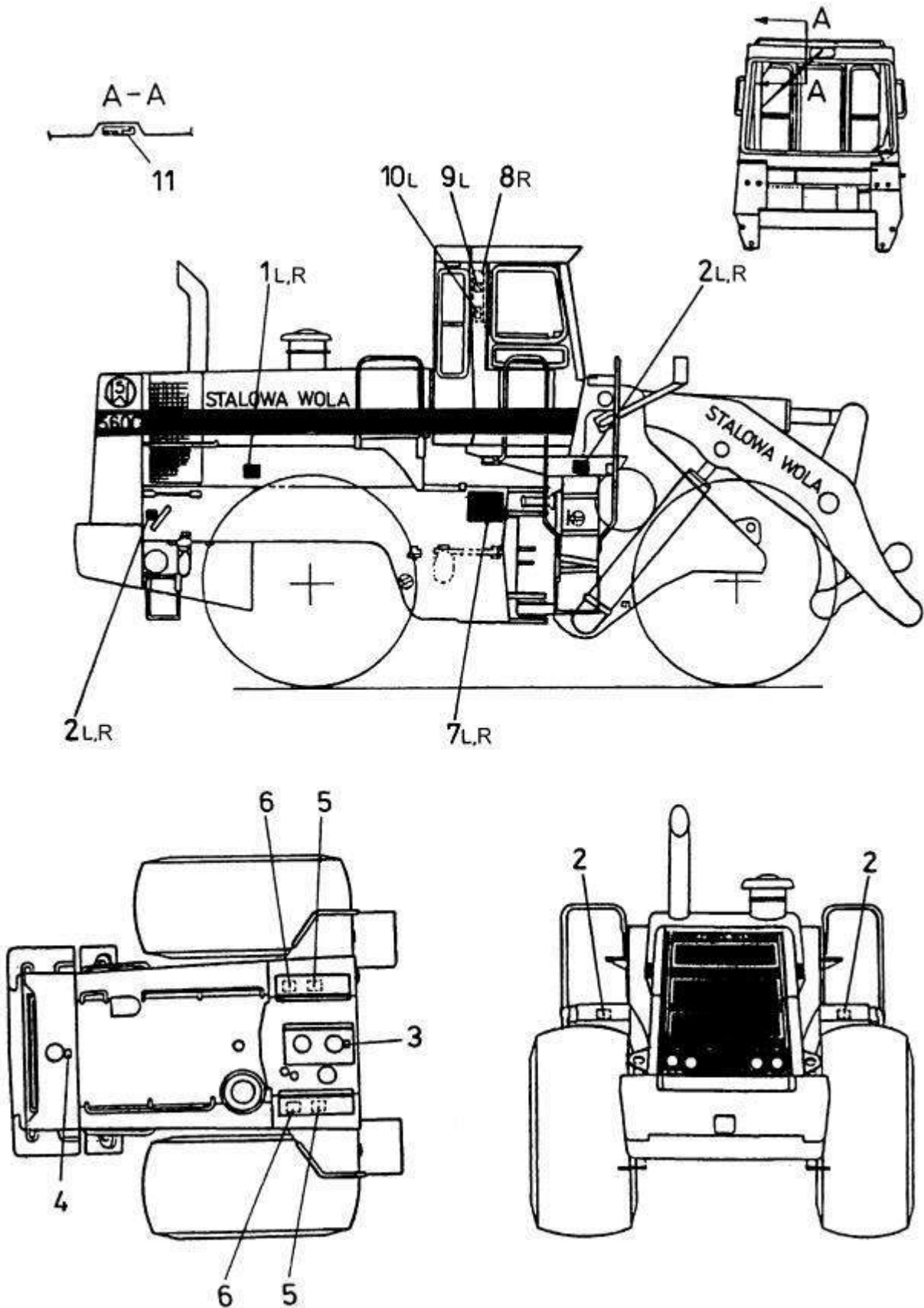


Fig. 2.1. Safety Graphics Location

L, R – Graphics attached on left hand side or right hand side of the machine

SAFETY PRECAUTIONS

SAFETY GRAPHICS LOCATION

2.6.1. SAFETY GRAPHICS



Decal 1 - On the engine side access panels

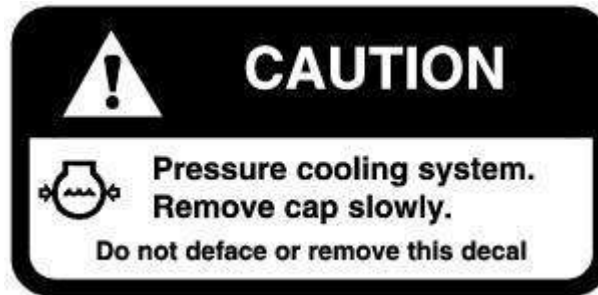


Decal 2 - Near the ladders and steps

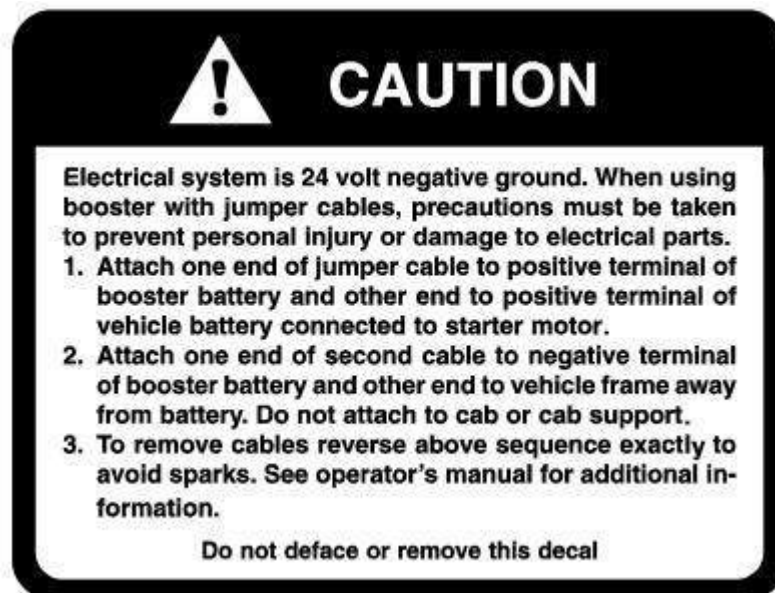


Decal 3 - On the hydraulic reservoir

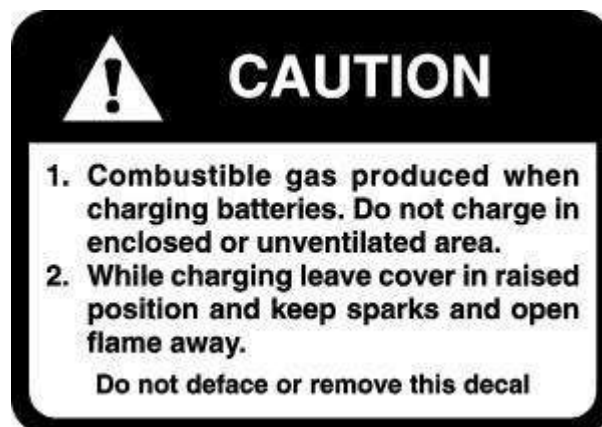
SAFETY GRAPHICS LOCATION



Decal 4 - Near the radiator filler cap



Decal 5 - On the battery box



Decal 6 - On the battery box

SAFETY PRECAUTIONS

SAFETY GRAPHICS LOCATION



Decal 7 - On the rear frame near the center articulation pivot



Decal 8 - On the right post in the cab

SAFETY GRAPHICS LOCATION



Decal 9 - On the left post in the cab



Decal 10 - On left post in the cab



Decal 11 - In the cab

SECTION 3
MACHINE TRANSPORT AND STORAGE

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3.1. MACHINE TRANSPORT

3.1.1. GENERAL



ATTENTION! During transportation of the machine the front and rear frame should be blocked by means of special connector and interlocking pins.

A frame locking bar and two pins (Fig. 3.1 and Fig. 3.2) - in stowed position are provided on the LH side of a loader. They are used to lock the front and rear frame of the loader to prevent accidental frame turning during service and lifting on lifting slings.

METHOD OF LOCKING OF FRONT AND REAR FRAME OF THE LOADER

Prior to operating of the machine place the locking bar in the stowed position as shown in Fig. 3.1. Repair or replace the frame locking bar and pins if damaged or lost to ensure frame locking, Fig. 3.2.

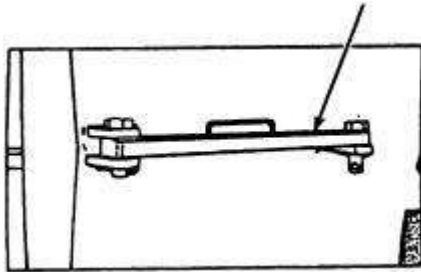


Fig. 3.1. Frame Locking Bar and Pins
in stowed position

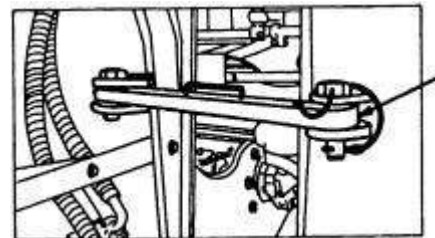


Fig. 3.2. Frame Locking Bar and Pins
in locked position

Always tie down securely the machine for transport to prevent movement.



ATTENTION! When transporting the machine be especially careful during loading and unloading. Load and unload the machine on even surface that makes full support for the machine and transport facility. Block the transport facility so that it cannot move. Make use of loading platform of sufficient strength, small approach angle and appropriate height.

1. Clean clay, oil and other slippery material of the loader tires.
2. The hydraulic, cooling and braking system should be filled up.
3. The fuel tank should be filled with app. 60 l of fuel.
4. The parking brake should be applied. The pressure in the tires should conform to this instruction TIRES, Section 6.
5. The batteries should be fully charged, the electric system master switch turned off.
6. The ignition switch should be in the neutral position and the ignition key removed.

ATTENTION! When transporting this machine on a high speed carrier or railway car, seal the exhaust pipe opening to prevent turbocharger damage.

ATTENTION! When the reserve level of fuel is signalled, drive on trailer bed or ramps of grade exceeding 10° reverse to prevent aeration of the engine fuel system.

MACHINE TRANSPORT

REAR LIGHTS

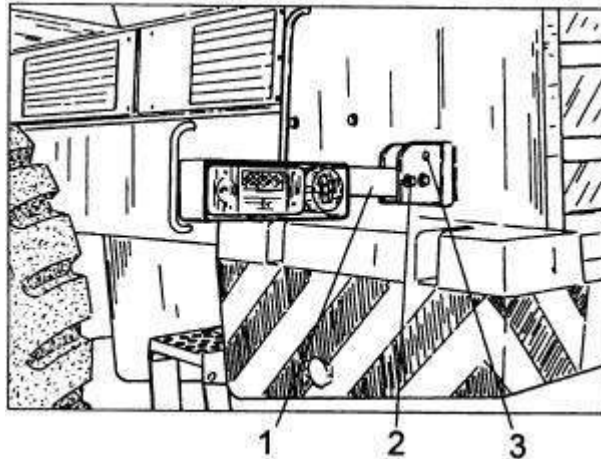


Fig. 3.3. Rear Lights

Rear lights are mounted on pivotable brackets 1, Fig. 3.3. Lights positioned as shown in the drawing above, conform to traffic regulations. To change rear lights position:

1. Undo and remove bolt 2.
2. Turn bracket 1 in required position.
3. Reinstall the bolt in hole 3 and tighten.

ATTENTION: *It is recommended to change position of lights (brackets) before machine transport to prevent damage.*

3.1. 2. TRANSPORTATION ON TRAILER, RAILWAY CAR OR BY SEA

1. When using automotive trailer or railway car for transportation of the machine, you should take into account state, local and railway regulations obligatory in particular country or region. If necessary, co-ordinate the details of transportation and safety measures with competent authorities.
2. During transportation by the sea, when it is necessary to carry the loader by means of a crane, use the method of fastening the loader that will ensure maximum safety of persons loading the machine and will not result in damage of the machine. The lifting slings used for fastening the loader should be attached only to special lifting lugs marked with special plates on the machine, refer to Fig. 3.4.

3.1. 3. TRANSPORTATION BY MACHINE OWN DRIVE

ATTENTION ! *Long distance driving is forbidden. Short distance driving is permitted under special circumstances, i.e. from unloading place to workplace.*

1. The passage conditions must be coordinated with local road traffic administration.
2. Observe traffic regulations ensuring safe travel.
3. Place boom and bucket in carry position.
4. Interlock the working system control lever and unlock the articulated frame by setting the connector in the neutral position as shown in Fig. 3.1.
5. Detailed information on safety precautions when operating – see Section 2 SAFETY PRECAUTIONS.

3.2. LIFTING ON SLINGS

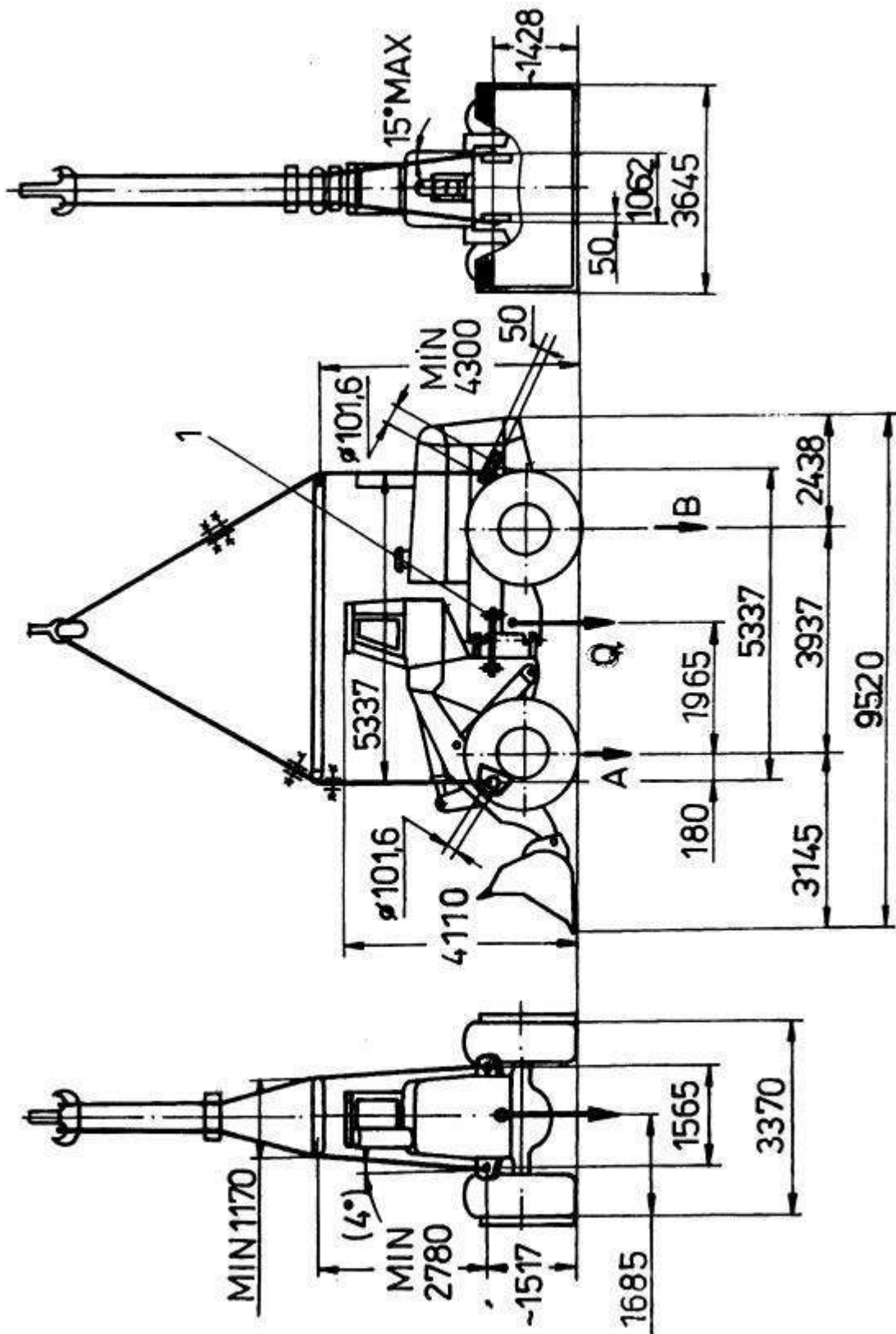


Fig. 3.4. Method of Handling (for standard machine configuration)

- 1 - Frame Locking Bar
- Q= 41800 kg – Machine Weight
- A = 20500 kg – Front Axle
- B = 21300 kg – Rear Axle

3.3. MOVING A DISABLED MACHINE

Towing this machine is not recommended. To move a disabled machine, use a trailer or low-boy truck if possible. If towing is necessary, such as freeing a stuck machine, tow it only as far as necessary. Towing machine backwards is recommended. When towing, the engine must be running (if operative) to enable turning and braking of the machine.

Towing of machines equipped with ground driven system is easier. Prior to towing release spring parking brake (refer to PARKING BRAKE, Section 5) and unlock frames by placing locking bar in stowed position as shown in Fig. 3.1 Use chains or cables of adequate strength, be sure they are properly secured to the draw bar pin.



WARNING: When pulling with a chain or cable, take up the slack slowly to avoid jerking. A chain or cable which fails under load can whip and cause serious injury. Stand clear. Do not pull or tow unless the operator's compartment is guarded against or out of reach of a whipping chain or cable.



WARNING: Observe safety precautions specified in this manual. Refer to SAFETY PRECAUTIONS , Section 2.

3.4. MACHINE STORAGE

3.4.1. PREPARING FOR STORAGE

When a machine is taken out of service and stored for a period of time exceeding 30 days, steps must be taken to protect the machine. Wash and dry the machine and place in dry enclosure. An enclosure will protect the machine from rapid temperature changes and lessen the amount of condensation that forms in hydraulic components, engine, fuel tank, axles and transmission. Leaving equipment outdoors exposed to the elements will materially shorten its life. If it is not possible to put the machine in an enclosure, cover it with a tarpaulin. After the machine has been positioned for storage and the engine shutdown, perform the following operations:

1. Visually inspect the machine for external leakage and other defects.
2. Clean the radiator, refer to "COOLING SYSTEM" in Section 5.
3. Thoroughly clean the machine, be sure to rinse off any caustic residue.
4. Correct any defects found. Consult authorized service of manufacturer
5. Clean or replace the air cleaner filter elements. Refer to "AIR CLEANING SYSTEM" in Section 5.
6. The cooling system should be completely drained, chemically flushed, and refilled with a conditioned water/anti-freeze solution suitable for the lowest temperature anticipated. Refer to "COOLING SYSTEM" in Section 5 for the proper anti-freeze and conditioner concentrations.

IMPORTANT: To avoid corrosion, under no circumstances should the machine or cab heaters (if equipped) be stored with a dry cooling system.

7. Drain the water from the fuel tank. Refer to "FUEL SYSTEM" in Section 5. Clean fuel filter installed in the filler neck.
8. Remove and replace the fuel filters. Refer to "FUEL SYSTEM" in Section 5.
9. It is recommended to use fuel stabilizer in quantity specified by the manufacturer. Stabilizer will prevent degrading of fuel, sludge buildup, and stop the growth of bacteria in fuel during storage. Fuel stabilizer may be purchased from:

MACHINE STORAGE

**FUEL PREP 1000
NALCO CHEMICAL COMPANY
2901 BUTTERFIELD ROAD
OAK BROOK, ILLINOIS 60521, USA
or Machine Distributor**



WARNING: Corrosion inhibitors are volatile and flammable. Use them only in a well-ventilated area. Keep flames and sparks away. **DO NOT SMOKE.** Store a container in a cool, well-ventilated place.



CAUTION: Avoid prolonged exposure to volatile corrosion inhibitors because eye and skin irritation may occur.

10. It is recommended to use volatile corrosion inhibitor ("VCI") in the fuel tank. The "VCI" provides corrosion protection by contact with the metal, and in a closed system, the vapors provide sufficient protection for areas that are not in contact with the oil. When using VCI per HMS B00-0006 pour 120 of volatile corrosion inhibitor for each 100 l of total fuel capacity. The "VCI" may be purchased from:

**NOX RUST VCI #105 OIL
DAUBERT CHEMICAL COMPANY
1200 JORIES BLVD.
OAK BROOK, ILLINOIS 60521, USA
or Machine Distributor**

11. Deaerate the fuel system . Refer to FUEL SYSTEM Section 5.
12. Start the engine and run idle at 1400 to 1600 rpm for 4 minutes and then stop the engine.
13. Lubricate all points of the machine as outlined in the "SERVICE GUIDE" in Section 5.

IMPORTANT: *Be sure to oil or grease all linkage connections, joints, nuts, pins, shafts, and bushings not covered in the "SERVICE GUIDE".*

14. Drain the engine oil, replace the engine oil filters and fill them with proper grade of oil. Refer to ENGINE Section 5.
15. Add 15 ml VCI for each liter of engine oil to the crankcase. (example: if the total capacity of the crankcase is 10 l add 150 ml VCI).
16. Start the engine and run it idle at 1400 to 1600 rpm for 30 seconds and then stop the engine.
17. Remove the air precleaner.
18. Seal all external openings (i.e. engine exhaust outlet, filler caps, breathers, etc.) with tape wide enough to cover the opening, regardless of its size.

NOTE: *When sealing with tape, be sure to extend tape approximately one inch (25 mm) beyond opening to insure a good seal.*

19. Pour 120 ml VCI to the intake manifold to prevent corrosion of the space between piston and bottom part of the head.
20. It is recommended to pour 390 ml VCI type 1 oil per HMS B00-0006 (KDC Standard) to the hydraulic reservoir.
21. Remove the batteries and place them on wooden skids. Then, store them in a cool, clean, dry, well-ventilated place away from the areas provided for storing or dispensing fuel and oil, not near any heat source and preferably where the temperature range is between 0° to +21 °C . Be sure the batteries are fully charged.

MACHINE STORAGE

IMPORTANT: Do not place battery on concrete floor or in temperature below 0° C.

IMPORTANT: If the machine is stored with dry charged batteries or no batteries, the alternator output lead (+) must be disconnected and insulated. Failure to do so may result in permanent damage to the alternator.

22. If the bucket is detached for storage, secure the cylinder piston rods to the machine to avoid damage.
23. Coat all machined and unpainted surfaces with chassis grease to prevent rust. It is recommended to use AKORIN N-2 grease.
24. If it is desirable to leave the tires on the machine, jack the machine up and place it on blocks leaving the tires in suspension. Deflate and cover the tires. Tires should not be exposed to direct sunlight or any fuel or solvent vapors.



WARNING: Use extra caution when jacking up the machine. Jacking up the machine can be hazardous if performed improperly. Use jacking equipment of sufficient capacity. Be sure the jacking points are strong enough to support the machine. Be sure the jack is stable and well supported. Before jacking up the machine, block the tires which will not be lifted. Lock the frame halves together with the locking bar and pins. If the rear tires are being lifted, block the rear axle to prevent it from pivoting unexpectedly. **DO NOT** run the engine with the machine on jacks.

3.4.2. SERVICING DURING STORAGE

ONE-MONTH REPETITIVE SERVICE PERIOD

MACHINE EQUIPPED WITH LOW MAINTENANCE BATTERIES.

Be sure batteries are fully charged. Never allow batteries to run down below 3/4 full charge.



WARNING: **DO NOT** charge batteries in a closed area. Provide proper ventilation to guard against explosion of an accumulation of the gas given off in the charging process.

SIX-MONTH REPETITIVE SERVICE PERIOD

1. Visually inspect the engine and radiator for leakage and other defects. Correct all defects, consult Construction Equipment Distributor.
2. Remove all seals from the machine ports: crank-case and hydraulic breathers, engine air intake, fuel tank vent lines, etc.
3. Install fully charged batteries. Refer to "BATTERIES" in Section 5.



WARNING: Be sure the electrical system master switch is off when connecting or disconnecting batteries to minimize the chance of sparks and explosion.



WARNING: Check that batteries are level in the holders and securely held. The hold-down fasteners should hold the batteries firmly but not tight enough to warp or damage either the hold-down bar or batteries.



WARNING: Battery cables must be so arranged to enable easy removal of all pugs. Lay the cables so they do not chafe against the hold-down bar. Always connect the negative ground cable last to minimize the chance of sparks or an explosion. Electrical master switch must be in off position and key removed.

MACHINE STORAGE

4. Check the coolant level in the radiator and add proper concentrations of antifreeze and coolant conditioners, if required. Refer to CHECKING COOLANT LEVEL in Section 5.
5. Perform steps 7 thru 21 per item 3.4.1.

3.4.3. PREPARING FOR OPERATION

1. Visually inspect the machine for external leakage and other defects.
2. Clean the radiator, refer to "CLEANING THE RADIATOR" in Section 5.
3. Thoroughly clean the machine, being sure to rinse off any caustic residue.
4. Correct any defects found. Consult Construction Equipment Distributor.
5. If the machine was jacked up (refer to 3.4.1. item 24) inflate the tires to normal operating inflation pressure. Refer to "TIRES AND RIMS" in Section 6.
6. Remove all seals from the machine: crank-case and hydraulic breathers, engine air intake, fuel tank vent lines, etc.
7. Remove the air cleaner filter elements for cleaning or replacement.. Refer to "AIR CLEANING SYSTEM" in Section 5.
8. Remove and replace fuel filters. Refer to REPLACEMENT OF FUEL FILTERS Section 5.
9. Fill the fuel tank with approved diesel fuel. Refer to "REFILL CAPACITIES" in Section 5.
10. Lubricate all points of the machine as outlined in the "SERVICE GUIDE" in Section 5.

IMPORTANT: Be sure to oil or grease all linkage connections, joints, nuts, pins, shafts, and bushings not covered in the "SERVICE GUIDE".

11. Change the engine oil and fuel filters. Refer to ENGINE Section 5.



WARNING: Be sure the electrical system master switch is off when connecting or disconnecting batteries to minimize the chance of sparks or explosion.

12. Install fully charged batteries. Refer to " BATTERIES" in Section 5.



WARNING: Check that batteries are level in the holders and securely held. The hold-down fasteners should hold the batteries firmly but not too tight to warp or damage either the hold-down bar or batteries. Lay the cables so they do not chafe against the hold-down bar or the fasteners.



WARNING: Never start the engine indoors unless proper exhaust ventilation is provided. Once the engine is running, move the machine outdoors as soon as possible. Exhaust gases are dangerous and can cause unconsciousness and death.

13. Start the engine, refer to "STARTING THE ENGINE AFTER OIL CHANGE OR LONG STORAGE" in Section 4.
14. Start the engine in accordance with STARTING AND STOPPING THE ENGINE Section 4 and SERVICE GUIDE recommendations (daily service) Section 5.

SECTION 4

OPERATING

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4.1. GENERAL

Stay alert and aware of what you are doing. Use common sense. Do not operate when ill or fatigued.

Know your machine.

For your safety, read the Operator's Manual carefully and follow all instructions and precautions. Read carefully Section 2 and follow safety precautions specified therein.

Before starting or operating this machine, read the following general precautions. These are listed there to help you protect the machine and to remind you of protection for yourself and those around you. Sound judgment and observance of these rules will help make your job a safer one. Perform a visual check of the machine before starting the engine. Look for such things as missing protective devices, leaks, improper fluid levels, trash buildup and loose, damaged or missing parts. **DO NOT** start the engine until any unsafe conditions are corrected.

Keep the transmission in low gear when going downhill. Never coast downhill with the transmission in neutral. The machine could go out of control and tip over. Always drive the machine slowly when on hillsides, ramps or rough terrain. Be extremely careful when working around trenches or banks. Failure to do so could cause the machine to roll over.

Before starting operation, check the machine for correct function of steering controls, brake controls, hydraulic controls, instruments and safety equipment. Make all necessary repairs or adjustments before operating the machine.

Do not place the machine under load without the proper engine oil pressure and operating temperature. After starting the engine, move the accelerator pedal to the low idle position.

Allow the engine to run at low idle for 3 to 5 minutes at 1000 rpm until normal oil pressure registers on the gauge to obtain complete distribution of the lubricating oil. After 15 seconds oil pressure must be correct. Do not run the engine idle more than 10 minutes. To prevent any possible damage to the alternator, the electrical system master switch must be in ON position when engine is running. The switch must be in OFF position when the engine is shut down at the end of each day or when the operator leaves the machine unattended.

Never park in places contaminated with grease or oil to prevent tires damage.
Never park in swampy area as it may cause freeze-up of the tires.

Never pour cold coolant into the radiator when the engine is hot unless conditions make it absolutely necessary. Use extreme caution as hot coolant could cause burns. Keep your face away from the filler neck. Under such conditions, start the engine and let it idle while slowly pouring coolant into the radiator. The engine is recommended to be allowed to cool down to 50°C.

Pouring cold coolant into a hot engine may cause damage to the cast components of the engine.

Never use water alone in the cooling system.

Fill the fuel tank at the end of each day's work to reduce condensation.

When towing with a long chain or cable, take up the slack slowly to avoid jerking. Before shutting down operate the engine at idle (no load) for 3 to 5 minutes. This will aid in cooling the engine and turbocharger.

4.2. UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

The use of universal symbols will pictorially identify various instruments and controls. These symbols are an effort to overcome language differences for all operators in a positive way, thus enhancing their safety through quicker recognition of the instruments and controls while operating the equipment.

Study the following symbols so you will know their meaning immediately and at a glance.

NOTE: *Some symbols may not pertain to your machine.*










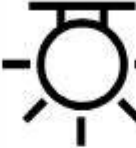




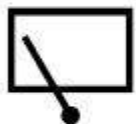


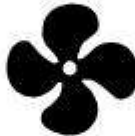



















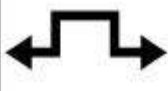




UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56

Fig. 4.1. Universal Symbols for Instruments and Controls

OPERATING

UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

57 	58 	59 	60 	61 	62 	63 
64 	65 	66 	67 	68 	69 	70 
71 	72 	73 	74 	75 	76 	77 
78 	79 	80 	81 	82 	83 	84 
85 	86 	87 	88 	89 	90 	91 
92 	93 	94 	95 	96 	97 	98 

UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

Description to Fig. 4.1.

1. Left
2. Right
3. Positive
4. Negative
5. Invariable by Sliding
6. Invariable by Turning
7. Caution
8. Caution-High Pressure
9. Grease Lubricant
10. Oil Lubricant
11. Hourmeter
12. Horn
13. Attach Point
14. Brake (General)
15. Parking Brake (General)
16. Parking Brake On
17. Parking Brake Off
18. Wheel Machine –Forward and Reverse
19. Articulated Frame Locking
20. Engine Start
21. Engine Speed
22. Engine Stop
23. Throttle
24. Engine Oil Fill
25. Engine Oil Level
26. Engine Oil Pressure
27. Engine Oil Temperature
28. Engine Oil Filter
29. Engine Starting Aid
30. Fuel Fill
31. Fuel Level
32. Fuel Reserve
33. Fuel Filter
34. Air Pressure
35. Air Filter
36. Coolant Fill
37. Coolant Level
38. Coolant Pressure
39. Coolant Temperature
40. Power Train Oil Fill
41. Power Train Oil Level
42. Power Train Oil Pressure
43. Power Train Oil Temperature
44. Power Train Oil Filter
45. Power Train Oil Pressure Diagnostic Point
46. Hydraulic Oil Fill
47. Hydraulic Oil Level
48. Hydraulic Oil Pressure Diagnostic Point
49. Hydraulic Oil Filter
50. Test
51. Brake Fluid Fill
52. Brake Fluid Level
53. Battery Charge Indicator
54. Battery Disconnect
55. Voltmeter
56. Road Lights
57. Low Level Lights
58. Parking Lights

UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

59. Contour Light
60. Work Light
61. Search Light
62. Flash Light
63. Turning Signal Light
64. Front Floodlights
65. Rear Floodlights
66. Dome Light
67. Instrument Panel Illumination Light
68. Backup Light
69. Emergency Light
70. Windshield Wiper
71. Rear Window Wipers
72. Window Washer
73. Mirror Heating
74. Fan
75. A/C
76. Receptacle 24 V
77. Electric Lighter
78. Neutral Position
79. Slow
80. Outside Air for Heating (Blue)
81. Recirculation Air for Heating (Red)
82. Roll Back of Multi-Purpose Bucket
83. Hold of Multi-Purpose Bucket
84. Dump of Multi-Purpose Bucket
85. Closing of Grapple
86. Hold of Grapple
87. Opening of Grapple
88. Boom With Bucket Raise
89. Boom With Bucket Hold
90. Boom With Bucket Lower
91. Boom With Bucket Float
92. Bucket Roll Back
93. Bucket Dump
94. Ground Driven System
95. Change of Direction: Forward- Reverse
96. RSM- Ride Control
97. Quick Coupler Connected
98. Quick Coupler Disconnected

4.3. INSTRUMENTS AND CONTROLS

GENERAL

Before operating the machine you must be thoroughly familiar with the location and use of all instruments and controls.



WARNING: Understand all control functions before starting the engine.

Each reference number in the illustrations of this section has a corresponding reference number and explanation in the text.

INSTRUMENTS AND CONTROLS



WARNING! Check all instruments and warning lights indicating operation of individual systems of the machine prior to starting and at frequent intervals during operation.

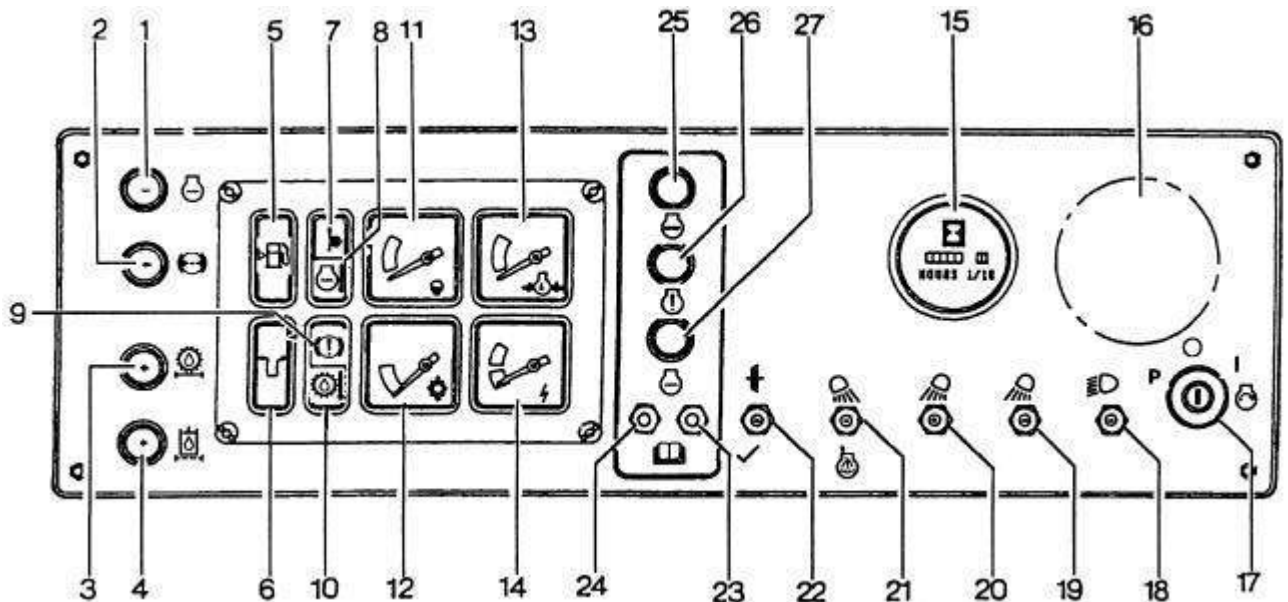


Fig. 4.2. Instrument Panel – QSK 19C Engine

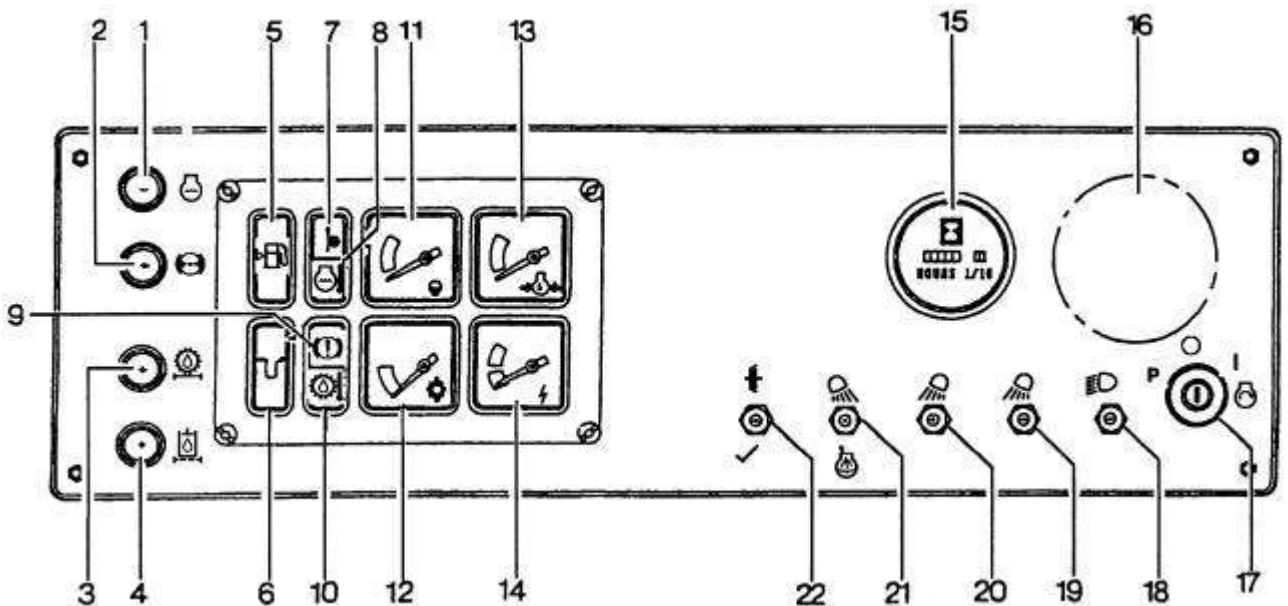


Fig. 4.3. Instrument Panel – KT19C Engine

INSTRUMENTS AND CONTROLS

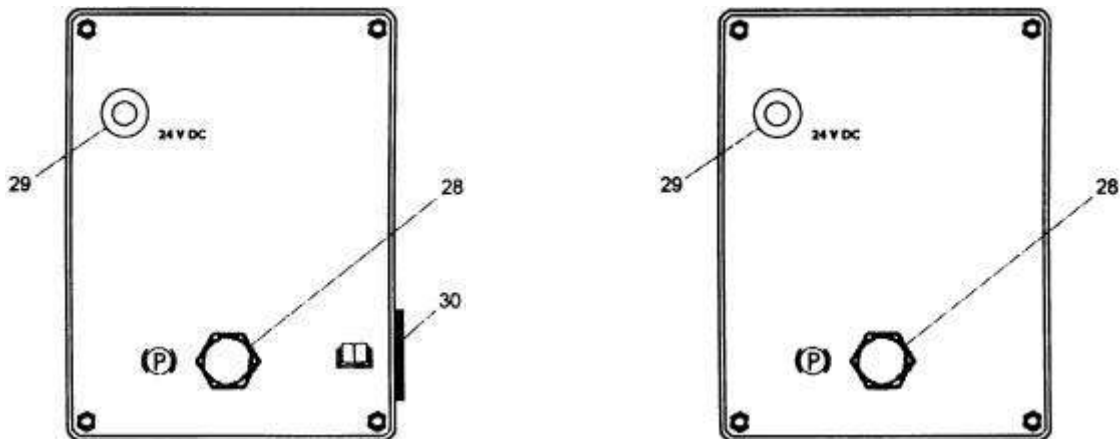


Fig. 4.4. Instrument Panel – RH Side

QSK 19C Engine

KT 19-C Engine

1. Low Engine Coolant Warning Light
2. Service Brake Filter Warning Light
3. Transmission Filter Warning Light.
4. Hydraulic Filter Warning Light.
5. Fuel Level Light.
6. Ground Driven Steering Warning Light (If Equipped)
7. Parking Brake Warning Light.
8. Engine Coolant Temperature Warning Light
9. Service Brake Warning Light.
10. Torque Converter Oil Temperature Warning Light.
11. Engine Coolant Temperature Gauge.
12. Torque Converter Temperature Gauge.
13. Engine Oil Pressure Gauge.
14. Voltmeter.
15. Hourmeter.
16. Tachometer (If Equipped).
17. Ignition Switch.
18. Front Auxiliary Lamps Switch (If Equipped).
19. Front Work Lamps Switch.
20. Low Level Lamp Switch (if Equipped).
21. Ether Start and Rear Work Lamps Switch (If Equipped).
22. Transmission Disconnect / Bulb Check Switch on Instrument Panel
23. Engine Diagnostic ECM Select Switch.
24. Engine Diagnostic ECM Check Switch.
25. Engine Stop Light (Red).
26. Engine Warning Light (Yellow).
27. Engine Fluid Light (Orange).
28. Parking Brake Switch
29. 24 V Receptacle
30. Engine Diagnostic Connector (Second Connector Located Above Engine Fuel Pump)

IMPORTANT: Components No's 23, 24, 25, 26, 27 and 30 are included in the machine equipped with QSK-19-C engine only.

1. LOW ENGINE COOLANT WARNING LIGHT

This light will come on if the coolant level in the radiator top tank reaches minimum level. If this light comes on, stop the engine, allow coolant to cool down in the cooling system and add coolant to the proper level or correct leaks found beforehand, if any, and refill the radiator to the proper level.

INSTRUMENTS AND CONTROLS

2. SERVICE BRAKE FILTER WARNING LIGHT

The light will come on when oil flow through the filter is restricted. It means that the filter element is contaminated and must be replaced. The light may come on when starting cold machine and should go off when the oil is warmed in the system.

3. TRANSMISSION FILTER WARNING LIGHT

The light will come on when oil flow through the filter is restricted. It means that the filter element is contaminated and must be replaced. The light may come on when starting cold machine and should go off when the oil is warmed in the system.

4. HYDRAULIC FILTER WARNING LIGHT

The light will come on when oil flow through the filter is restricted. It means that the filter element is contaminated and must be replaced. The light may come on when starting cold machine and should go off when the oil is warmed in the system.

5. FUEL LEVEL LIGHT

The light indicates that 60 l of fuel (app. 1 hour of operation) is available for operation and the fuel tank must be filled.

6. GROUND DRIVEN STEERING WARNING LIGHT

This warning light is not included in standard configuration of the machine. If the machine is equipped with ground driven system (that enables steering of the machine at loss of pressure in steering system) the light will come on when the system is activated. The vehicle must be in motion to activate the ground driven steering system.

7. PARKING BRAKE WARNING LIGHT

The light will indicate if the parking brake is applied. At the same time a buzzer will sound.



WARNING: Release the parking brake before starting the machine.

8. ENGINE COOLANT TEMPERATURE WARNING LIGHT

The light will indicate when the coolant temperature exceeds allowable limit. If the light comes on, maneuver the machine to the side and operate the engine at low idle. If the light stays on, investigate the cause and take corrective action before operating the machine again.

9. SERVICE BRAKE WARNING LIGHT

The light will indicate:

- drop of pressure in brake cooling system below allowable limit,
- failure of one of the brake circuits,
- drop of pressure in brake system below allowable limit,
- drop of nitrogen pressure in nitrogen accumulators below allowable limit.

Also, a buzzer will come on. Stop the machine immediately and remove the cause of the failure. To maintain optimum performance nitrogen accumulators must be filled with nitrogen (at gas side). Nitrogen pressure is 8.78 to 9.84 MPa (for temperature range 10 to 43° C). Accumulators are equipped with electrical switches indicating loss of nitrogen pressure below the allowable limit. Warning light 9 will come on and buzzer will sound when pressure drops below the allowable value. Starting the machine is followed with rapid oil and nitrogen pressure rise in accumulators and short period when the light is on might not be noticed by the operator. The signal is supported by an electronic device and may be cancelled by the representative of Authorized Service upon filling the accumulators with nitrogen. Indication of nitrogen low pressure in accumulators does not exclude machine operation, however, it means reduced efficiency or loss of emergency braking with the engine running.

INSTRUMENTS AND CONTROLS



WARNING: If loss of nitrogen pressure in accumulators is signaled, inform service personnel immediately to fill accumulators.

10. TORQUE CONVERTER OIL TEMPERATURE WARNING LIGHT

The light will come on if the torque converter oil temperature exceeds allowable limit.



WARNING: *If the light comes on during operation, reduce the work load by operating in a lower gear. If the light stays on, stop the machine and run the engine until the temperature drops to app. 90°C. Find the reason of oil overheating:*

- *transmission oil low level,*
- *dirty radiator,*
- *dirty suction filter.*

11. ENGINE COOLANT TEMPERATURE GAUGE

The gauge indicator should remain within green area equivalent to 71 to 93 °C temperature range. Do not operate the machine if the gauge indicator is above or below this area. If the temperature remain high in spite of interruption in engine, check: coolant level, the condition of the radiator, fan water pump and thermostat.

12. TORQUE CONVERTER TEMPERATURE GAUGE

The gauge indicator should remain within green. If the temperature is too high, follow the recommendations specified in "Torque converter oil temperate warning light"

13. ENGINE OIL PRESSURE GAUGE

Engine lubricating oil pressure at low idle is 0.11 MPa, at high idle is 0.31 to 0.48 Mpa. Green area is the normal operating range. If gauge pointer enters red area stop the engine immediately and correct the malfunction.

14. VOLTMETER

The voltmeter has two areas. If the pointer is in "alternator" area it means battery charging. If the pointer is in "battery" area it indicates a full battery charge. With the engine operating at idle speed, the gauge pointer should be within this area. With the engine operating at higher speed, the gauge pointer should go in upper area (alternator), otherwise it means no battery charging. Check the batteries, alternator and remove the malfunction.

15. HOURMETER

The gauge (electronic) is activated by the engine oil pressure. It records the actual hours of engine operation.

16. TACHOMETER. (IF EQUIPPED)

The gauge indicates engine crankshaft r.p.m.

INSTRUMENTS AND CONTROLS

17. IGNITION SWITCH.

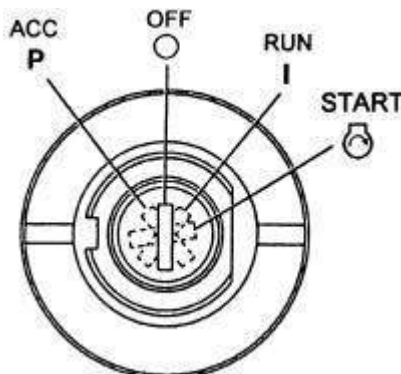


Fig. 4.5. Ignition Switch Positions

The starting switch is used to connect and disconnect circuits of electrical system and switching on and off the engine and is equipped with a key.

Ignition switch position:

ACC – to the left – not used,

OFF - after inserting the key- disconnects the electrical circuit,

RUN - to the right – activates electrical circuits,

START- to the right with automatic return to RUN when released – engine startup.



WARNING: Do not hold the key in START position for more than 30 second. Allow a 2 minute interval between cranking. Never place the key in START position when engine is running.

18. FRONT AUXILIARY LAMPS SWITCH

Not equipped in standard machine. If equipped, push the switch up to turn the front roof mounted lights and place in center position to switch them off.

19. FRONT WORK LAMPS SWITCH (only in CE configuration)

Push the switch up to turn on the passing lights, place in the central position to switch the parking lights on. When placed in the lower position it switches the lights off.



WARNING! Always operate with work lights switched on when visibility is reduced (fog, down, at night). Rear lights are switched on simultaneously with front lights. Remember, lights are designed not only for the operator but also for personnel working nearby, indicating position and movement of the machine.

20. LOW LEVEL LIGHTS SWITCH

If the machine is equipped with additional lights mounted on the front frame supports, push the switch up to turn on the low level lights and place in the central position to turn off the lights. Not equipped in the standard configuration of the machine.

21. ETHER START AND REAR WORK LAMPS SWITCH

The switch has three positions:

- in the upper position switches on the rear work lights. Switch the lights when loading at night or in fog. Do not switch the lights when traveling on public roads,
- in the central neutral position - switches off rear lights,
- in the lower position switches ether injection to inlet manifold of the engine. Injected dose does not depend on time the switch is held in the lower position. When released the switch automatically returns to the central position. For additional information refer to COLD WEATHER STARTING (not equipped in the standard configuration of the machine).

INSTRUMENTS AND CONTROLS



CAUTION: DO NOT use the ether injector when air temperature is above freezing (0°). Follow the correct method for starting the engine. Refer to Section 5 ETHER INJECTOR.

22. TRANSMISSION DISCONNECT/BULB CHECK SWITCH

Used for selection method of braking and to check that instrument and warning lights are working. It has three positions:

- braking with transmission connected,
- braking with transmission disconnected,
- warning and illumination lights check (lower position).

Before operating the machine the operator should check that instrument and warning lights are working, i.e. bulbs are not burnt or bulb circuits broken. Therefore, before starting operation move the switch in down position for 2 to 3 seconds. Additional information on using the switch, see Section 5 SERVICE BRAKES.

23. ECM FAULT CODE DISPLAY SWITCH

This switch has three positions. The upper and lower position enables to display successive fault codes. The switch automatically returns to the central position.

24. ECM MEMORY SWITCH

The switch can be placed in two positions: the upper position (normal), the lower position fault memory (memory on)

ECM registers all abnormal engine and its systems parameters (high temperature of coolant, low coolant level, low oil pressure, etc)

Active faults (persisting) may be displayed using lights 25,26,27. Inactive faults (instantaneous) may be read using computer.

25. WARNING LIGHT (RED)

This light indicates serious malfunction of the engine. Stop the engine immediately, or the engine will be stopped by ECM module.

26. WARNING LIGHT (YELLOW)

This light indicates minor malfunction of the engine, the engine can still be operated but for its protection ECM may reduce some parameters (power, rpm). The failure must be repaired as soon as possible.

27. WARNING LIGHT (ORANGE)

The light indicates low coolant level. Low coolant level results in deterioration of some parameters resulting in stopping the engine.

NOTE: *The engine protection system records separate fault codes when an out-of-range condition is found for any of the sensors in the engine protection system. (Coolant temperature, coolant level, oil temperature, and oil pressure - Refer to the "ENGINE OPERATOR'S MANUAL" for more information).*

28. PARKING BRAKE KNOB

This knob applies and releases the parking brake. Pull the knob to apply the parking brake. The parking brake is released with hydraulic cylinder supplied from the brake system. The brake is spring applied. In case of pressure loss the brake release with this knob is not possible. For the method of emergency brake release see Section 5 PARKING BRAKE . The parking brake warning light 7 Fig. 4.2 and 4.3 will light and alarm is activated when the brake is applied.

NOTE: *Before moving the machine release the parking brake.*

INSTRUMENTS AND CONTROLS

29. PORTABLE LAMP RECEPTACLE

Used for connecting portable lamp with cable (included in machine accessories)

30. ENGINE DIAGNOSTIC CONNECTOR

This connector is used to connect diagnostic kit (computer) for full engine diagnostics, display and canceling faults form ECM memory.

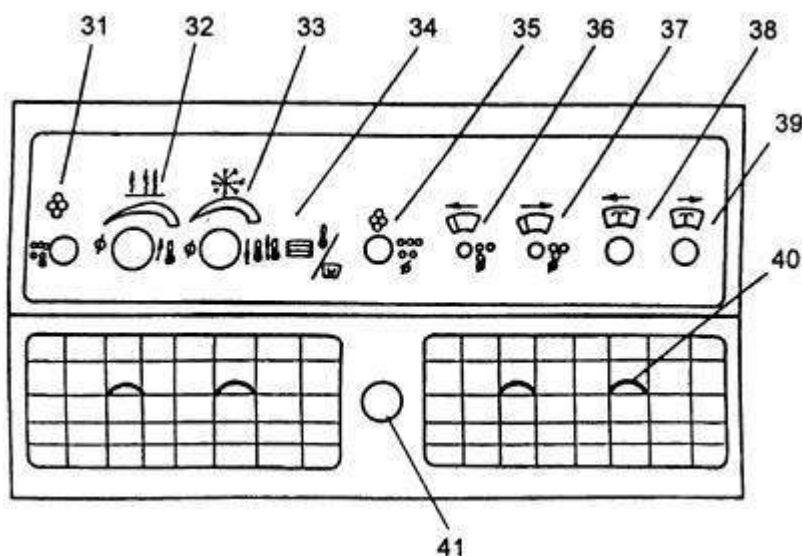


Fig. 4.6. Side Control Panel

- 31. Blower Fan Control Switch
- 32. Heater Temperature Control Knob
- 33. A/C Control Knob
- 34. Master Switch
- 35. Defroster Fan Switch (If Equipped)
- 36. Windshield Wiper Control Switch
- 37. Rear Window Wipers Control Switch (If Equipped)
- 38. Windshield Washer Button
- 39. Rear Window Washer Button
- 40. Air Control Knob
- 41. Air Intake Mode Knob

31. BLOWER FAN CONTROL SWITCH

This switch controls speed of heater fan circulating air inside the cab. This switch has three positions:

- OFF
- LO
- HI

Place the switch in the desired position.

If the outside air is extremely dusty, set the fan speed switch to the "HI" position. This will pressurize the cab and prevent the dust from entering.

32. HEATER TEMPERATURE CONTROL KNOB

Turn the knob to the left to reduce temperature, to increase temperature turn he knob to the right.

INSTRUMENTS AND CONTROLS

33. A/C CONTROL KNOB

Turn the knob to the right for increased cooling, to decrease turn the knob to the left. A machine in the standard configuration is not equipped with A/C.

34. MASTER SWITCH

This switch is used to switch heating or A/C on.

It has three positions:

- neutral,
- heating,
- A/C.

35. DEFROSTER FAN SWITCH (IF EQUIPPED)

This switch is used to control defroster fan speed circulating the air in the cab

This switch has three positions:

- OFF,
- LO,
- HI.

Place the switch in the desired position.



WARNING! Switch off the defroster fan before adjusting the direction of flow to avoid injury.

36. WINDSHIELD WIPER CONTROL SWITCH

This switch controls the speed of the windshield wiper motor, it has three positions:

- OFF
- LO
- HI

Place the switch in the desired position.

37. REAR WINDOW WIPERS CONTROL SWITCH (IF EQUIPPED)

This switch controls the speed of the rear window wiper motors, it has three positions:

- OFF,
- LO,
- HI.

Place the switch in the desired position.

38. WINDSHIELD WASHER SWITCH BUTTON

This switch controls the windshield washer. Push the switch button down to activate the washer, release the button to stop the washer. Always activate the washer before switching on wiper not to scratch the windshield.

39. REAR WINDOW WASHER SWITCH BUTTON (IF EQUIPPED)

This switch controls the rear window washer. Push the switch button down to run the washer. Release the button to stop the washer. Always activate the washer before switching on wiper not to scratch the window.

40. AIR CONTROL KNOB

This knob is used to control quantity and direction of air (heated or cooled) supplied to the cab.

INSTRUMENTS AND CONTROLS

41. AIR INTAKE MODE KNOB

It is used to change mode of air intake: outside (fresh) or inside heated (recalculation)

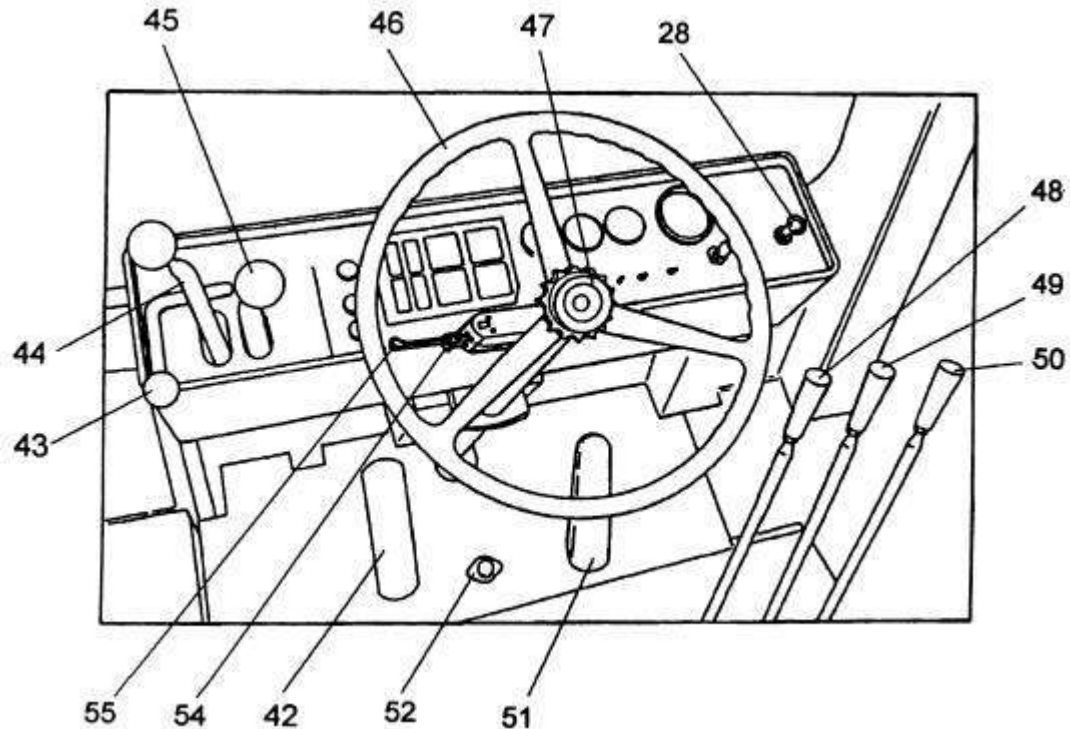


Fig. 4.7. Controls

- 28 - Parking Brake Knob (description above)
- 42 - Brake Pedal
- 43 - Transmission Neutral Lock Lever
- 44 - Transmission Gear Range Lever
- 45 - Transmission Direction Lever
- 46 - Steering Wheel
- 47 - Steering Wheel Height Adjustment Knob
- 48 - Auxiliary Equipment Lever
- 49 - Bucket Control Lever
- 50 - Boom Control Lever
- 51 - Accelerator Pedal
- 52 - Horn Button
- 54 - Hazard Light Switch With Control Light
- 55 - Directional Signal Switch

42. BRAKE PEDAL

This pedal actuates the machine service brakes. Depress the pedal, gradually increasing pressure, a desired braking action is achieved. The faster pressure is applied to the pedal, the stronger the braking



WARNING! Do not “pump” the brakes. Repeatedly pressing and releasing the brake pedal will reduce the oil pressure in the system and result in reduced braking.

As required, there is possibility of braking as described above with transmission connected and disconnected. Braking with transmission disconnected is with all transmission clutches released. Therefore full power of the engine can be used to operate the machine hydraulics . Braking with transmission disconnected is more efficient because eliminates detrimental effect of rotating masses on braking. Selection of braking method is made with switch 22, Fig. 4.2. and 4.3.

INSTRUMENTS AND CONTROLS



WARNING! Do not switch the transmission disconnect switch when traveling fast or going downhill . Loss of control or damage to the power train could result when the pedal is released and transmission re-engages.

43. TRANSMISSION NEUTRAL LOCK LEVER

The lever locks the transmission direction lever in neutral position. To release the direction lever from the neutral position, push the lock lever up.



WARNING! Before leaving the machine, lock the transmission direction lever in neutral position with the lock lever.

44. TRANSMISSION GEAR RANGE LEVER

This lever is used to select the gear range according to operation conditions. Refer to SHIFTING GEARS for additional information.

45. TRANSMISSION DIRECTION LEVER

This lever is used to select machine direction. Refer to SHIFTING GEARS for additional information.



WARNING! Before leaving the machine, lock the transmission direction lever in neutral position with the lock lever.

46. STEERING WHEEL

The wheel loader is equipped with hydraulic steering system. Movement of the steering wheel actuates the steering valve which directs oil to steering cylinders. For a right turn rotate the wheel clockwise and for the left turn, rotate the wheel counterclockwise. Steering system operates as long as steering wheel is turned . No effort exerted on steering wheel stops turning and machine maintains preset direction.

47. STEERING WHEEL HEIGHT ADJUSTMENT KNOB

Steering wheel height can be varied by loosening the knob, moving the steering wheel to the desired height and then tightening the knob.

48. AUXILIARY EQUIPMENT LEVER

Not equipped in standard configuration of the machine. Located near to bucket control lever close to the operator.

49. BUCKET CONTROL LEVER

The lever controls roll back and dumping operation of the bucket. Refer to BUCKET CONTROL LEVER POSITIONS for additional information.

50. BOOM CONTROL LEVER

The lever controls raising and lowering operations of the boom. Refer to BOOM CONTROL LEVER POSITIONS for additional information.

51. ACCELERATOR PEDAL

Depress the pedal to increase engine speed, release the pedal to decrease engine speed. Pedal returns automatically to low idle position.

52. HORN BUTTON

Depress the button to sound horn, release the button to stop.

INSTRUMENTS AND CONTROLS

53. CONTROL LEVER LOCKING PLATE (FIG. 4.8)

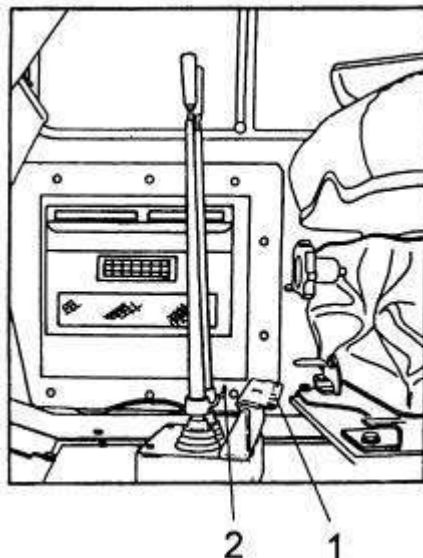


Fig. 4.8. Control Lever Locking Plate

1- Locking Plate

2 - Locking Bar

Locking plate 1 is used to lock the control levers in the neutral position. In the drawing the plate is shown in the non-locked position.

54. HAZARD LIGHTS WITH CONTROL LIGHT

Switch on hazard lights in case of malfunction of loader in a hazardous place e.g. building site. Red light comes on when hazard lights are switched on.

55. DIRECTIONAL SIGNAL SWITCH

Used to switch on right or left turn signal (forward or backward movement of the switch). Green lights come on when the directional signal is switched on.



WARNING! When roading the machine, engage the hydraulic control lever locking plate. Accidental actuation of the levers may cause personal injury or damage of the machine.

4.4. SUSPENSION SEAT



WARNING! Before driving the machine, adjust the seat and fasten the seat belt. Adjust the seat belt to fit snugly and low around the hips to lessen the chance and severity of injury in the event of an accident. Never wear the seat belt across the abdomen.



WARNING! Do not adjust the seat position while the machine is moving, because a lose of control may result.

Stop the machine, apply the parking brake and then adjust the seat as described below.

OPERATING

SUSPENSION SEAT

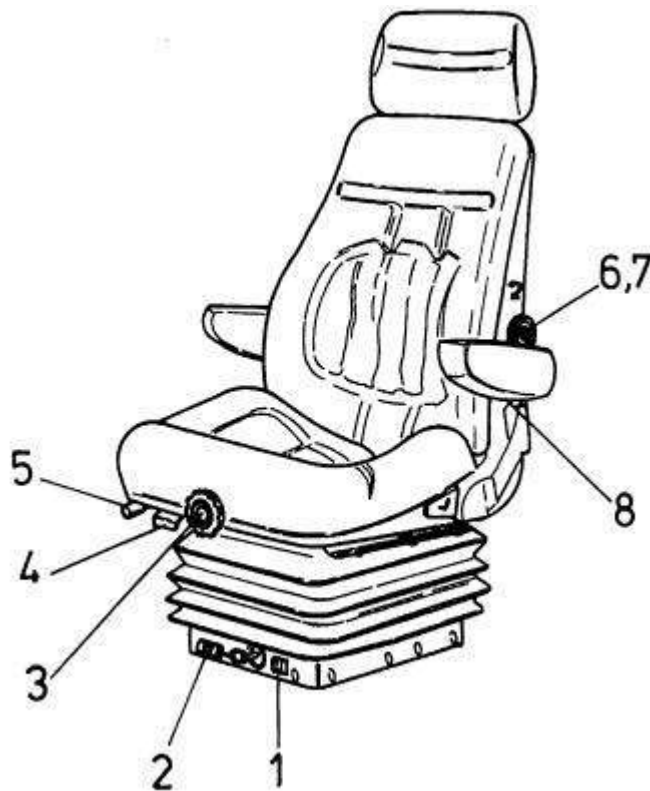


Fig. 4.9. Suspension Seat

- | | |
|------------------------------------|-------------------------------------|
| 1. Weight indicator | 5. Seat travel lever |
| 2. Weight adjustment knob | 6. Backrest profile adjustment knob |
| 3. Height adjustment knob | 7. Backrest profile adjustment knob |
| 4. Backrest angle adjustment lever | 8. Armrest angle adjustment screw |

This is a suspension seat with several adjustments to provide maximal comfort to the operator.

Adjustment to operator's weight – seated in the operator's seat turn adjustment knob (2) clockwise or counterclockwise until proper weight value corresponding to the operator's weight is in the weight indicator window 1.

Seat travel adjustment - pull up the lever 5 (on the right hand side of the seat) and slide the seat forward or rearward to the desired position and lock with the lock lever.

Seat height adjustment - turn knob 3 clockwise to lift the seat cushion and counterclockwise to lower the seat cushion.

Backrest angle adjustment - pull up lever 4 to release the lock. Upon adjustment of backrest angle (pressing the backrest) apply the lock.

Backrest profile adjustment – performed with two knobs: knob 6 located on the left hand side of the seat and knob 7 located on the right hand side of the seat. Turn knob 6 to change backrest profile in the middle part, turn knob 7 to change lower and upper part of backrest profile.

Armrest angle adjustment – performed with screws 8 located under armrests (tilt back armrests to facilitate adjustment).

4.5. SEAT BELT

The seat belt is for operator's safety and should be worn at all times while operating the machine. Adjust the seat to the desired position before fastening the seat belt



WARNING: DO NOT use bleach, dye, or solvents on the seat belt, because this may weaken the webbing and result in personal injury. Clean the seat belt with warm water and a mild detergent. Replace belts with worn, frayed, torn, faded, stiff, or rotted webbing.



WARNING: Before driving the machine, adjust the seat and fasten the seat belt. Adjust the seat belt to fit snugly and low around the hips to lessen the chance and severity of injury in the event of an accident. NEVER wear the seat belt across the abdomen.

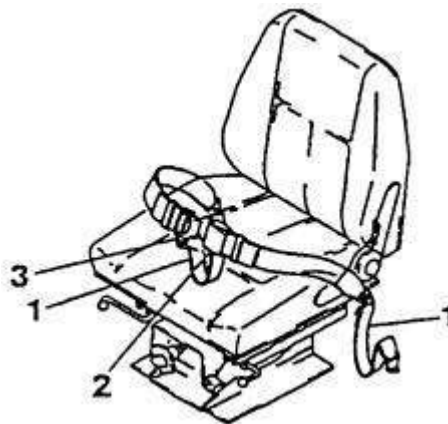


Fig. 4.10. Seat Belt

1 - Belt

2 - Buckle

3 - Tang

Fasten the belt and remove it in the following manner:

1. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.
2. With the seat unoccupied, tense the belt 1 lightly across the seat and install. Check that there are no kinks in the belt.
3. Sit in the seat. Hold buckle 2 and insert tang 3 into the buckle. Check that the belt has locked by pulling it.
4. When removing the belt, raise the tip of the buckle lever to release it.

When leaving the operator's seat, release the seat belt and hang it over the arm rest.

Fasten the belt across your body without kinking it. Adjust the lengths of the belt on both the buckle and tang ends so that the buckle is located at the mid-point of your body front.

Adjust the belt length in the following manner:

1. To shorten the belt, pull the free end of the belt at either the buckle or tang end or at both ends.
2. To lengthen the belt, pull the belt while holding it at a right angle to the buckle or tang.

OPERATING

SEAT BELT

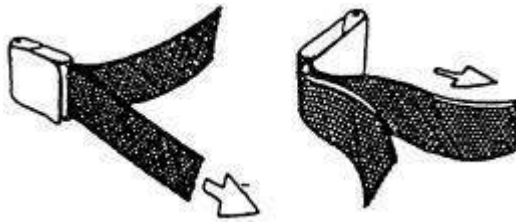


Fig. 4.11. Adjusting the Belt Length

4.6. CAB HEATING AND VENTILATION

4.6.1. DEFROSTER FAN

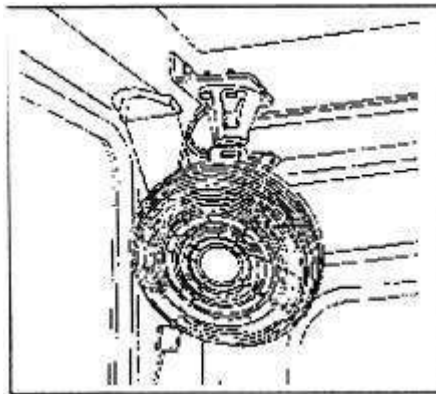


Fig. 4.12. Defroster Fan

The fan is designed for cab ventilation (air circulation) and defrosting or defogging the windshield. The switch has two positions and is located on the side control panel. (Fig. 4.6. item 35). Move the switch up to operate the fan.



WARNING! Turn off the engine before adjusting defroster fan to avoid hand injury.

4.6.2. HEATER

For cab heating, ventilation and air conditioning integrated heater and air conditioner installed in right hand side of the cab wall is used. The heater and air conditioner controls are situated in side control panel.

CAB HEATING AND VENTILATION

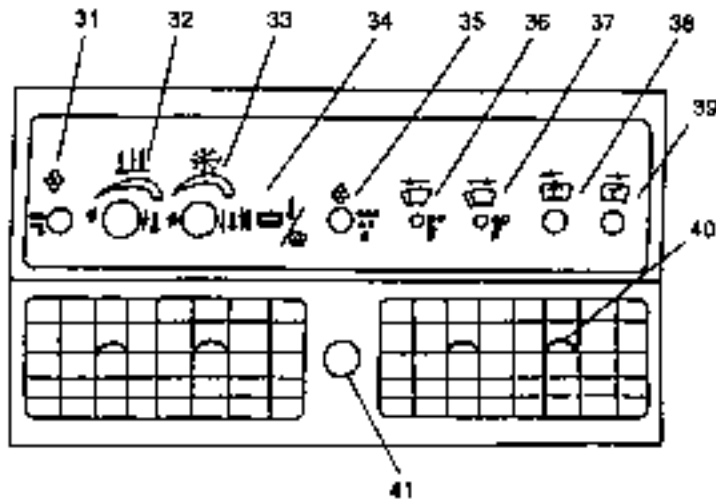


Fig. 4.13. Side Control Panel

- | | |
|---|----------------------------------|
| 31. Heater Fan Control Switch | 37. Rear Window Wiper Switch |
| 32. Heater Temperature Control Knob | 38. Windshield Washer Switch |
| 33. Air Conditioner Temperature Control Knob | 39. Rear Window Washer Switch |
| 34. Main Switch | 40. Air Control Knob |
| 35. Window Defroster Fan Switch (If Equipped) | 41. Air Intake Mode Control Knob |
| 36. Windshield Wiper Switch | |

For description of controls refer to Section 4.3

4.6.3. AIR CONDITIONER

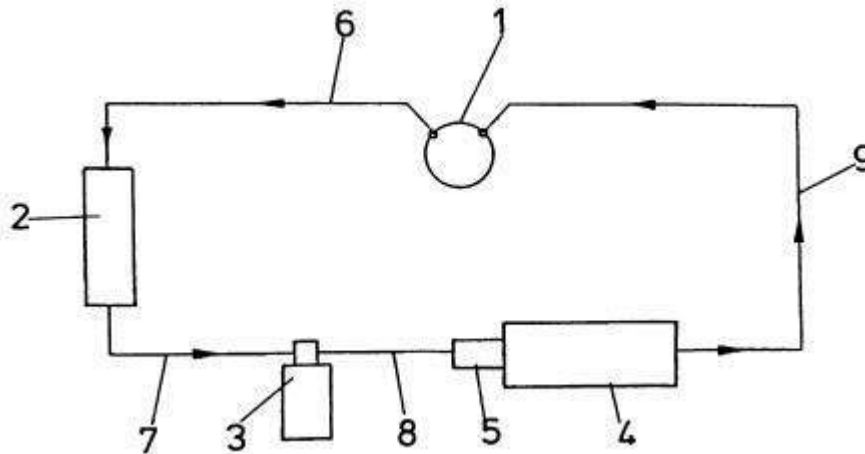


Fig. 4.14. Block Diagram of A/C Connections

The wheel loader may be equipped with an air conditioner to reduce air temperature and relative humidity inside the cab. An air conditioner consists of the following principal components:

1. Compressor – V-belt driven thru pulley mounted on the LH side of the engine
2. Condenser - radiator mounted
3. Dehumidifier – mounted on a bracket on the RH side of rear frame
4. Evaporator – RH side cab wall mounted
5. Relief valve – integrated with evaporator

The a/m components are connected with hoses 6+9, A/C system is filled with R-134A gas.

IMPORTANT: If A/C system refilling is required contact Construction Equipment Authorized Distributor. The system must be filled in accordance with the manufacturer's instructions.

OPERATING

4.7. AIR CLEANER SERVICE INDICATOR

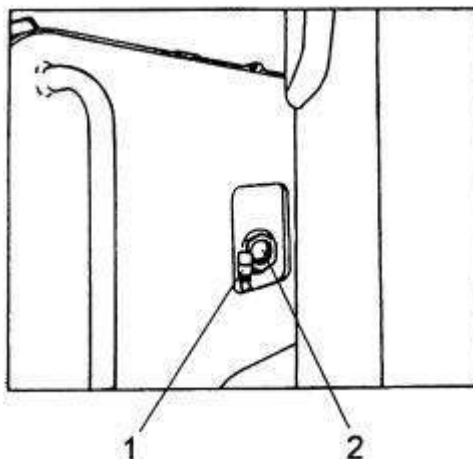


Fig. 4.15. Service Indicator and Hydraulic Reservoir Sight Gauge

1. Service Indicator

2. Hydraulic Reservoir Sight Gauge

During operation, the red band will gradually rise in the indicator window as dirt accumulates in the air filter elements. When the filter elements reach the maximum allowable restriction, the red band will completely fill the indicator window and automatically lock in this position. The red band will remain fully exposed even after stopping the engine. Press the reset button on top of indicator after the elements have been serviced.

4.8. DOME LIGHTS WITH SWITCHES

Dome lights are installed in the roof of the cab on the right and left hand side of operator's head. The lights are equipped with switches.

4.9 CAB DOOR LATCH

The cab door may be locked in an open position. The latch is particularly useful for cab ventilation when operating in high ambient temperatures.

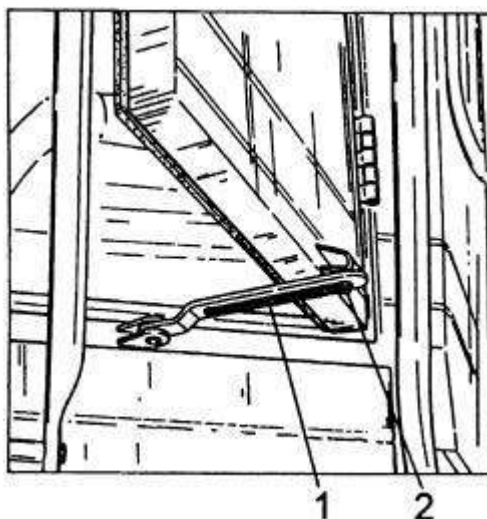


Fig. 4.16. Cab Door Latch

1 - Arm

2 - Pin

CAB DOOR LATCH

To lock the door depress the arm (with a foot) when the door is in fully open position. The pin 2 will engage the cutout of arm 1.

The door will be released automatically when moved further to open (until the limiting strip is fully tightened).

4.10. ACCESS PANEL "T" HANDLE

The access panels to service the hydraulic reservoir filters, the air cleaner elements, and the batteries are all locked and unlocked using the "T" handle. It is stored in rubber holder attached to the RH side of the instrument panel.

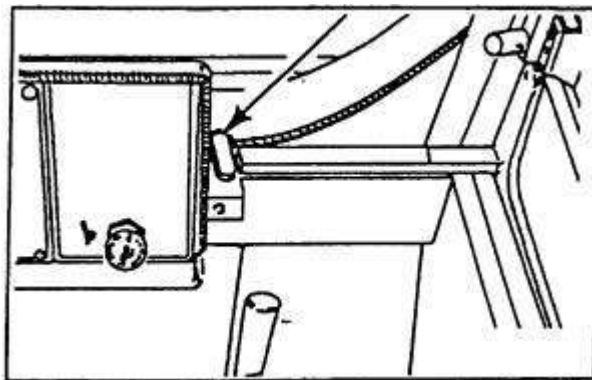


Fig. 4.17. Access Panel "T" Handle

4.11. ELECTRICAL MASTER SWITCH

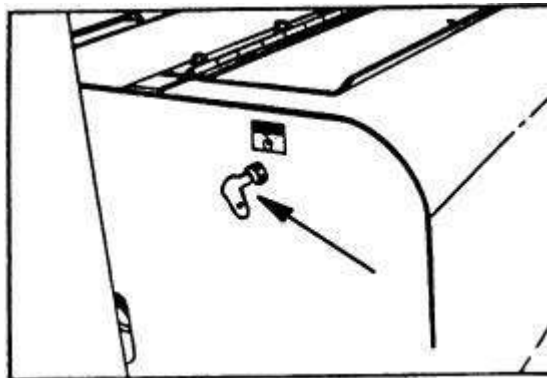


Fig. 4.18. Electrical System Master Switch

The switch is located on the LH side of the hydraulic tank behind the cab and is connected in series between the battery positive terminal (+) and receivers, thus turning "ON" or "OFF" battery voltage to all electrical systems. The master switch must always be turned to the "ON" position when the engine is running to prevent any damage to the alternator and/or electrical system.



WARNING: Before servicing the machine, turn off the electrical system master switch and remove the key. Tag the machine to warn against starting the engine.

4.12. STARTING AND STOPPING THE ENGINE

4.12.1. NORMAL START (AMBIENT TEMPERATURE ABOVE 0° C)



WARNING: DO NOT jump on or off the machine. Keep two hands and one foot, or two feet and one hand in contact with the steps and hand holds at all times. Always face the machine when climbing on or off to reduce the chances of slipping and injury. Place objects on the machine from the ground level before climbing on.

1. Check that the parking brake switch is applied (machine stopped)
2. Check that transmission directional lever is in the "N" (neutral) position.
3. Turn the master electrical system switch "ON".
4. With your back against the back rest of the operator's seat, adjust the seat position so that the brake and decelerator pedal(s) can be easily depressed.
5. Sound the horn to clear the area of personnel.

ATTENTION: The engine will not start while the directional lever is in any position other than "N" (neutral).

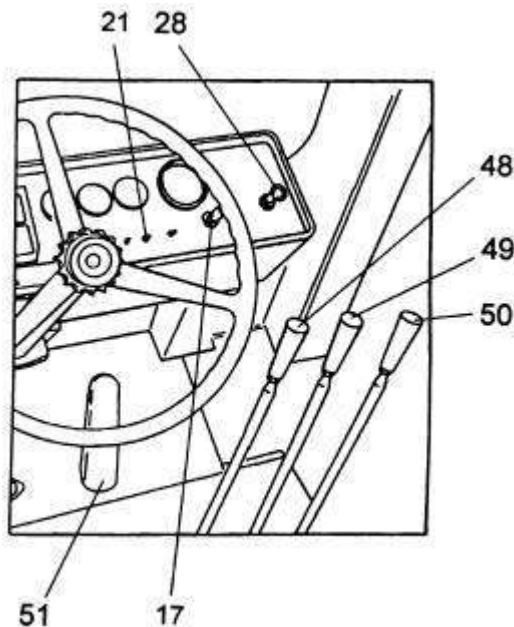


Fig. 4.19. Starting and Stopping the Engine

- | | |
|---|---------------------------|
| 17 - Ignition Switch | 49 - Bucket Control Lever |
| 21 - Ether Start and Rear Work Lamps Switch | 50 - Boom Control Lever |
| 28 - Parking Brake Knob | 51 - Accelerator Pedal |
| 48 - Auxiliary Equipment Control Lever | |

6. Turn the ignition key from RUN to START position to start the engine with accelerator pedal released (idle speed).

ATTENTION: To prevent damage to the cranking motor and avoid low battery output, do not continuously crank engine for more than 30 seconds. Allow a recovery period of 2 minutes between crankings.

ATTENTION: Engine oil pressure must register 15 seconds after startup. If no oil pressure is registered stop the engine immediately.

- 6a. QSK 19C ENGINE ONLY. Turn the ignition key from RUN to START position to start the engine. In this key position lights 25, 26, 27, Fig. 4.2. on the instrument panel come on. After 2 seconds the lights go off in the following order: 26, 25, 27, which indicates no malfunctions has been found by the ECM in the engine electronic control system.

STARTING AND STOPPING THE ENGINE

If a malfunction is found by ECM in the system (sender malfunction, low oil pressure, low coolant level, etc) it is stored in memory as active malfunction.

To read active malfunction codes turn the ignition key to the OFF position, place switch 24 in CHECK top position, then turn the ignition key to the RUN position.

Place 23 SELECT switch in top or bottom position. In this position the malfunction code is displayed, Fig. 4.20.

Exemplary malfunction code displayed:

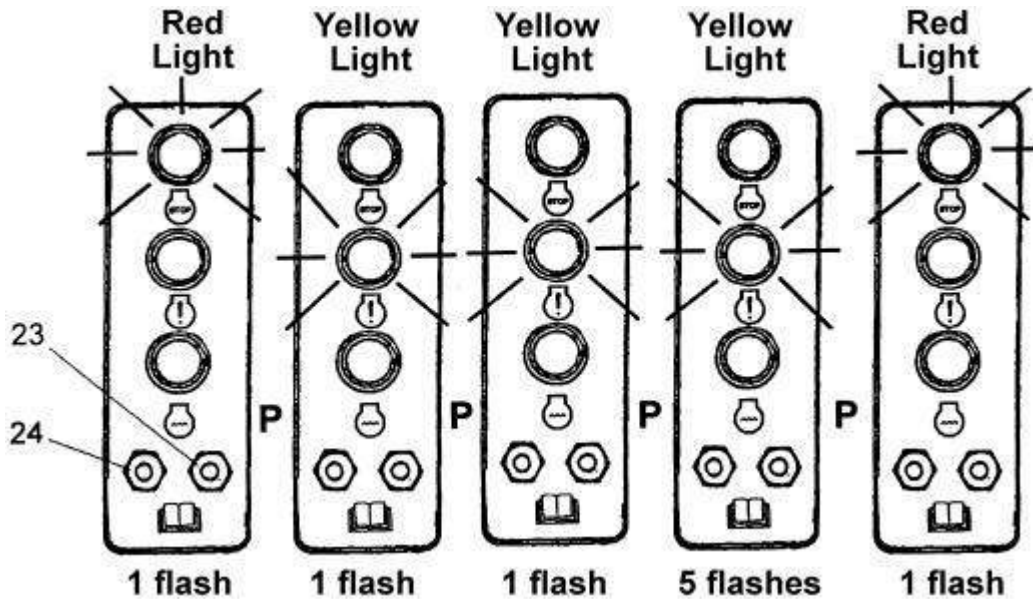


Fig. 4.20. Malfunction Code Displayed

- P - 1 Second Pause
- 23 - Engine Malfunction Code Switch Stored In ECM Memory
- 24 - ECM Memory Activation Switch

Malfunction code 115 – engine speed sender

For the list of malfunction codes – see ENGINE MANUAL

If any active malfunctions are found contact Construction Equipment Authorized Distributor.

7. Keep the key till the engine starts but no longer than 30 seconds. Then release the key immediately, it returns automatically to the RUN position.

ATTENTION: To prevent damage to the cranking motor and avoid low battery output, do not continuously crank engine for more than 30 seconds. Allow a recovery period of 2 minutes between crankings.

ATTENTION: Never start the engine indoors unless proper exhaust ventilation is provided to remove deadly exhaust gases. Once the engine is running, move the machine outdoors as soon as possible. Exhaust gases are hazardous and can cause unconsciousness and death.

If the engine fails to start make another attempt to start it after app. 2 minutes.

IMPORTANT: Low emission Cummins engine QSK-19C undergoes automatic cycle of warming until coolant temperature attains 10C. During that period of time the engine runs at 1000 rpm, and accelerator pedal is not active, depressing the accelerator pedal is not followed by an increase of speed.

STARTING AND STOPPING THE ENGINE

Allow the engine to run idle for 3 to 5 minutes before placing it under load.

ATTENTION: *Do not run the engine at idle speed more than 10 minutes as it may cause engine damage.*

4.12.2. COLD WEATHER START (USING ETHER INJECTOR, AMBIENT TEMPERATURE BELOW 0°C)

When starting the engine in low temperatures, do as follows:

1. Perform the steps 1 thru 7 of NORMAL START.
2. Move ether injector switch to the ON position for a couple of seconds then release it immediately. Refer to Fig. 4.2 and 4.3., item 21. Do NOT hold it in the ON position for more than 5 seconds. Ether dose does not depend upon time the switch is held. The switch will return to neutral position when released.

If the engine does not start, repeat this procedure 2-3 times. This may occur at low ambient temperatures.

3. When the engine starts, release the ignition key and the key will automatically return to the RUN position.

ATTENTION: *Never operate ether injector switch except when starting the engine.*



WARNING! Ether starting fluid is highly flammable. Follow the precautions on the container. An explosion can result if sparks or flame contact the ether or if the container is stored where the temperature exceeds 70° C.

Observe the following precautions:

- a) Do not use the ether injector when the air temperature is above freezing.
- b) Never smoke when using ether starting fluid or installing the container.
- c) Do not store fluid containers in the operator's compartment. Store the containers in a cool, well-ventilated place.
- d) Keep the fluid containers out of reach of children.
- e) Do not breathe the hazardous ether vapor.
- f) Do not let ether contact your skin, as it can cause frostbite.
- g) Never puncture the fluid container or put it into fire. Dispose of empty containers properly.
- h) For your safety, remove the ether container when welding, grinding, or using a torch on the machine.
- i) Follow the correct method for starting the engine.

Do not hold the key in the start position more than 30 seconds. A machine in its standard configuration is designed for starting in ambient temperatures above -20° C. For starting in lower temperatures special version of wheel loader is needed.

4.12.3. STARTING AFTER OIL CHANGE OR LONGER STORAGE.

When starting the engine after running out of fuel, first fill the fuel tank and then, fill the fuel filter with fuel before starting.

When starting the engine after each engine oil change or after the engine has been shut off for more than five days, perform the following steps to insure the engine receives proper lubricating oil flow through the lubricating system.

1. Perform the steps 1 thru 5 of NORMAL START.
2. Disconnect the electrical wire from the fuel pump solenoid valve.

STARTING AND STOPPING THE ENGINE

2a. QSK19C engine only. Disconnect the EPS connector of the engine speed sensor. Refer to Fig. 4.21.

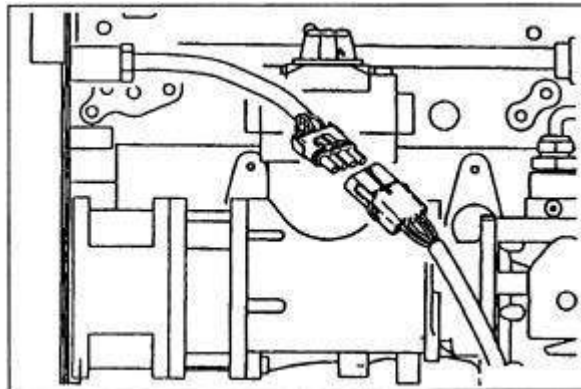


Fig. 4.21. ECM Connector of Engine Speed Sensor

3. Using the ignition switch, crank the engine until the oil pressure monitor light goes out.
4. Reconnect the electrical wire to the fuel pump solenoid valve.
- 4a. QSK19C engine only. Connect the EPS connector of the engine speed sensor.
5. Start the engine as described under "NORMAL START".

4.12.4. STOPPING THE ENGINE

1. Apply the parking brake, lock the transmission direction lever in the neutral position and lower the bucket.
2. Allow the engine to cool down. Run the engine with no load at idle speed for about 3 to 5 minutes
3. Reduce the engine speed to the idle speed.

ATTENTION: *Failure to do so may result in damage to the engine and turbocharger.*

4. Shut down the engine by turning the ignition key to the OFF position. Before leaving the cab remove the key and lock the cab.
5. Turn off the electrical system master switch and remove the key before leaving the machine unattended.

4.13. DRIVING THE MACHINE

After starting the engine in temperature above 0° C do not start operations immediately. First, carry out the following operations and checks:

1. Depress accelerator pedal 51 lightly and run the engine at the midrange idle speed for about 3 to 5 minutes.
2. Warm the engine up to the operating temperature. Continue to run the engine with light load until the engine coolant temperature gauge and torque converter oil temperature gauge pointers settle in the green area.

Warm-up may be reduced as follows:

- a) apply the parking brake,
- b) move transmission shift lever to 3rd forward,
- c) increase the engine speed gradually to maximum speed and run the engine until the pointer of torque converter temperature gauge is in the upper part of the green area,

OPERATING

DRIVING THE MACHINE

- d) move the transmission shift lever into the neutral position and run the engine until the pointer of torque converter temperature gauge drops to the lowest position,
 - e) Perform steps b) to d) until the pointer stops in the lower position of the green area.
3. Upon the completion of the engine warm-up check the warning lights for correct operation.
 4. Check if the exhaust fumes color is normal or whether there is any abnormal noise or vibration.

After starting the engine in the ambient temperature below 0°C perform the following steps before driving the machine.

1. Warm-up the engine. The following are the approximate warm-up times with the engine idling.

Ambient temperature	-20°C	-10°C	0°C
Warm-up time	15 minutes	10 minutes	5 minutes

Avoid sudden acceleration of the engine before the warming-up procedure is completed. Do not idle the engine continuously for more than 10 minutes.

2. When the engine is warm completed warm up the equipment hydraulic system as follows:
 - a) Move the boom control lever slowly to the RAISE position and raise the bucket slightly,
 - b) Move the boom control lever slowly to the LOWER position and lower the bucket slightly,
 - c) Repeat the above procedure several times gradually increasing stroke of the boom lift cylinders,
 - d) Repeat steps a) to c) with the bucket control lever
 With the accelerator pedal depressed by 1/3 of the full stroke perform the following steps.
3. Raise the bucket 10 - 30 cm above the ground level, push the bucket control lever to the roll back position to actuate the overflow valve for approximately 5 seconds, then return the lever to the neutral position and hold it for approximately 2 seconds. Repeat this procedure to warm up the equipment hydraulic system.

Increase the engine speed gradually up to high idle.

ATTENTION: *If the machine is operated immediately after starting the engine without the warming procedure, the equipment may undergo accelerated wear.*

IMPORTANT: *After starting and prior to operation check carefully indications of all instruments and warning lights, corrects found irregularities if any.*

DRIVING THE MACHINE

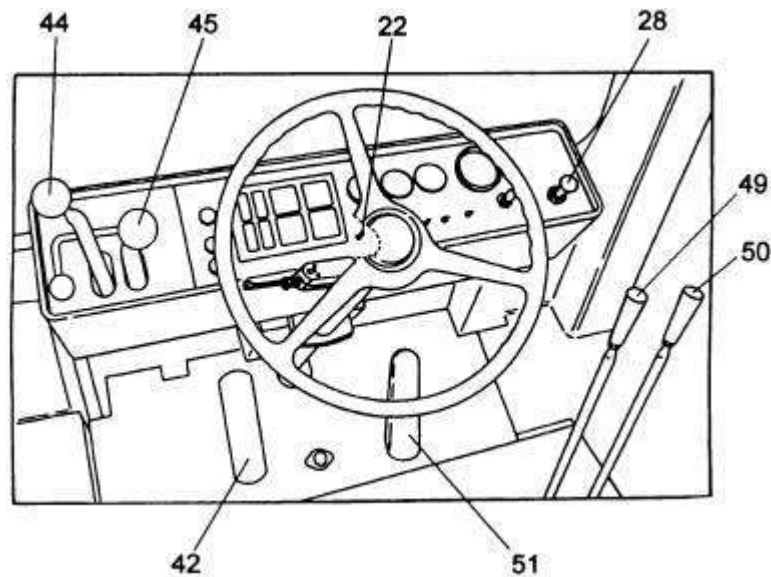


Fig. 4.22. Starting and Stopping the Machine

- | | |
|---|------------------------------------|
| 22 - Transmission and Instrument Panel Lights
Check Switch | 44 - Transmission Gear Range Lever |
| 28 - Parking Brake Switch | 45 - Transmission Direction Lever |
| 42 - Brake Pedal | 49 - Bucket Control Lever |
| 43 - Transmission Neutral Lock Lver | 50 - Boom Control Lever |
| | 51 - Accelerator Pedal |



WARNING! Before operating the machine observe strictly the following precautions:

- a) never haul passengers in the cab if the loader is equipped with a cab for the operator only,
- b) never allow anyone to stand on steps or on the platform when driving and operating the machine,
- c) Sit in the operator's seat before operating any controls or switches,
- d) Keep your hands and footwear free of grease, water and mud to insure positive control movement,
- e) Before driving the machine, adjust the seat and seat belt to fit snugly and low around the hips,
- f) Sound the horn to warn the nearby personnel,
- g) Never try to get on or off the machine when it is moving,
- H) Check all instruments, gauges and warning lights for correct operation

To start moving perform the following steps in accordance with Fig. 4.22:

1. Depress and hold down brake pedal 42.
2. Release parking brake 28.
3. Raise the boom with lever 50 until the bucket is off the ground and in carry position.
4. Rollback the bucket with lever 49.
5. Unlock transmission direction lever 45 and place it in the required direction forward or reverse.

ATTENTION: If the machine is equipped with a back-up alarm, the alarm will sound when the direction lever is placed in REVERSE.

6. Place the transmission gear range lever 44 in the 1st gear (foremost position).
7. Release brake pedal 42 and gradually depress accelerator pedal 51 until the machine starts moving.

4.14. SHIFTING GEARS

The transmission has three forward gear ranges, three reverse gear ranges, and neutral, which are manually selected with transmission gear range lever 44 and direction lever 45.

The transmission is full powershift type and any gear range or direction can be changed at any time without stopping the machine.

The first gear is the lowest and main working range. The second gear can be used when working in loose material or hauling at short distances. The third gear is used to road the machine at longer distances at maximal machine speeds.

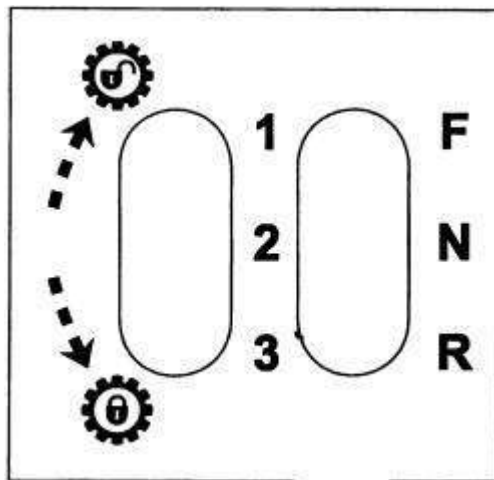


Fig. 4.23. Shifting Gears

1,2,3 – Gears
F - Forward

N - Neutral
R – Reverse

DOWN-SHIFTING

Down-shifting should never be made at a vehicle ground speed higher than the maximal speed for the gear you intend to shift down to. Failure to do so results in sudden braking of the machine. For speed ranges in the respective gears refer to TRANSMISSION , Section 6.

ATTENTION: *Down-shifting from 3 to 1 or 2 when driving at maximum speed may result in drive train damage.*

UP-SHIFTING

An up-shift from "1" to "2" or from "2" to "3" can be made at any speed. To get proper acceleration, speed up the machine to maximum speed before up-shifting. For speed ranges in the respective gears refer to TRANSMISSION, Section 6.

4.15. STEERING

The machine is articulated and steering is accomplished by hydraulic power which pivots the main frames at the center articulation pivot. Turn the steering wheel until reaching the desired angle of turn. Hydraulic power holds the angle of turn until the steering wheel is turned again.



WARNING! Never allow anyone near the center articulation pivot with engine running.

GROUND DRIVEN STEERING (IF EQUIPPED)

If there is a drop in hydraulic steering pressure, the ground driven steering will be actuated automatically and warning light on the instrument panel will flash. The amount of the oil supplied by

STEERING

the ground driven pump depends upon the machine ground speed (pump driven by transmission output shaft). The steering response is reduced as the machine slows down.



WARNING! If the ground driven steering warning light comes "ON", immediately maneuver the machine to a safe place. Shut down the engine and apply the parking brake. Correct the problem before operating the machine again.



WARNING! The steering response with ground driven steering system actuated depends upon the machine ground speed. The steering response is reduced as the machine slows down.

4.16. STOPPING THE MACHINE (FIG. 4.22)

Perform the steps the in following order:

1. Fully release accelerator pedal 51.
2. Apply brake pedal 42 until the machine comes to a complete stop. Braking efficiency depends upon the amount of pressure exerted on the brake pedal, the higher pressure the more efficient braking.



WARNING! Never brake with drive disconnected with switch 22 when travelling fast or going downhill. When released, it automatically makes transmission clutches to re-engage. With ground speed higher than the maximal speed at the previously shifted gear the machine will brake suddenly what may result in loss of control or damage to the power train.

3. Place transmission direction lever 45 in "N" (neutral) position and lock the lever in this position.



WARNING! The transmission can remain in gear when the machine is brought to a temporary stop during operation. However, the operator must remain seated with the seat belt fastened.

4. Apply parking brake 28.
5. Place bucket control lever 50 in the detented position - bucket roll back.
6. Push forward boom control lever 50 to lower the boom and rest the bucket on the ground. The bucket will be leveled automatically.



WARNING! Never leave the machine unattended with the engine running or the bucket raised. When parking the machine, stop the engine, lower the bucket to the ground, lock the transmission shift lever in neutral (N), apply the parking brake, turn off the electrical system master switch, and remove the key.

4.17. PARKING THE MACHINE

When parking the machine observe the following rules:

Park the machine in a non-traffic area. If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares, and warning signals. Also provide advance warning signals in the traffic lane for approaching traffic.

Always lock the machine, including any anti-vandalism attachments, when leaving the machine unattended.

PARKING THE MACHINE

Avoid parking on a slope, however, if parking on a hillside is necessary, park at the right angle to the slope of the hill and block the tires as shown in Fig. 4.24.

ATTENTION: *Avoid parking the machine in puddles of oil, grease or gasoline because this damages the tires.*



Fig. 4.24. Hillside Parking

ATTENTION: *Park the machine on level ground to obtain accurate coolant, lubricant, hydraulic, fuel level checks.*

4.18. LOADER OPERATIONS

Loader equipment is hydraulically operated. When the bucket circuit is being operated, oil flow to the boom is cut off.

4.18.1. BOOM CONTROL LEVER POSITIONS (FIGURE 4.25.)

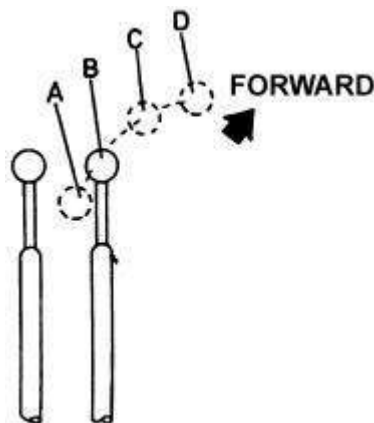


Fig. 4.25. Boom Control Lever Positions

- A. Raise
- B. Hold
- C. Lower
- D. Float

IMPORTANT: *Holding the control lever in any position except B "hold" and D "float" for an extended period of time after the hydraulic cylinder rod has reached the limit of its travel will produce excessive heat in the hydraulic system which may affect loader performance.*

The boom control is located to the far right of the operator's seat. It has four positions: A, B, C, D ("raise", "hold", "lower", and "float")

LOADER OPERATIONS

Raise A

To raise the boom assembly, pull the lever back as far as it will go. A detent in the valve locks the lever in this position. The return to "HOLD" must be done manually or will be done automatically when the boom reaches the preset stopping height of the automatic boom kick-out.

Hold B

The control lever, when not in a detected position, will automatically return to "HOLD" when released. The boom will remain stationary in this position.

Lower C

Push the lever part way forward to lower the boom. The lever will automatically return to "HOLD" when released.

Float D

The boom assembly can be lowered at any time by moving the lever to C "lower" or D "float" position. Push the lever all the way forward for this position. This position is detented so the lever must be pulled back manually to the "hold" position. Use the "float" position to follow the contour of the ground when leveling or to lower the boom by gravity.



WARNING! It is forbidden to lower the boom from fully raised position by moving the control lever to "float" position. Due to weight of loader linkage it may be dangerous for nearby personnel.

4.18.2. AUTOMATIC BOOM KICK-OUT (FIG. 4.26.)

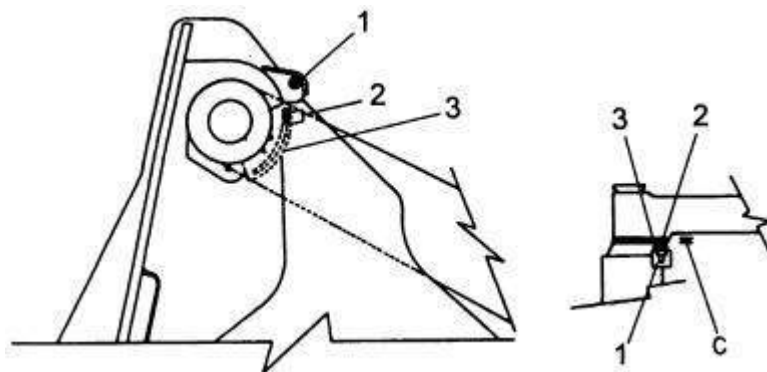


Fig. 4.26. Automatic Boom Kick Out

- | | |
|---------------------|-----------------------------|
| 1. Proximity Switch | 3. Bracket |
| 2. Bar | C – Bar-To-Switch Clearance |

The electronically operated kick-out control system stops boom travel automatically at a preselected height. This eliminates unnecessary boom travel during operation and provides for a more efficient cycle. Proximity switch 1 is mounted to the front frame and is adjustable (in and out) to achieve proper clearance C to bar 2. Bar 2 is slide mounted on bracket 3 and is locked in position corresponding to the required height of the boom. The bracket is bolted to the inside of the left boom arm up near the boom pivot. As the boom is raised to its preselected height, bar 2 has moved out of the magnetic field of proximity switch 1, breaking the circuit. Breaking the magnetic field circuit causes the boom control lever to move out of the detented "raise" position and into the "hold" position, thereby stopping the travel of the boom arms. Bar-to-switch clearance C necessary for proper operation of proximity switch is 7 mm to 8 mm.

LOADER OPERATIONS

Adjustment of automatic boom kick-out

To change the automatic boom kick-out position, raise the boom arms to the desired stopping height (factory set stopping height is maximum boom height). Loosen the bolt holding bar 2 in place and slide it in bracket 3 so as it is positioned directly in front of proximity switch. Tighten the bolt holding the bar. Start the machine and test the adjustment. Repeat this procedure until the automatic kick-out height is obtained.



WARNING! Use extra caution when adjusting loader's bucket leveler or boom kick-out. Use two trained people and guard against accidental movement of the machine or loader linkage. No personnel is allowed within the reach of loader linkage. Never work or walk under raised bucket without proper blocking.

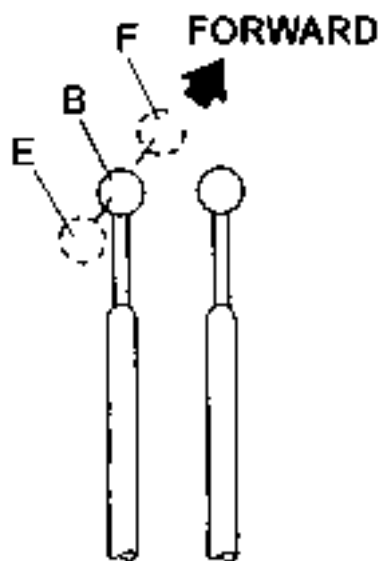
4.18.3. BUCKET CONTROL LEVER POSITIONS (FIGURE 4.27)

Fig. 4.27. Bucket Control Lever Positions

E. Rollback B. Hold C. Dump

The bucket control lever is situated on the RH side of the operator's seat and close to the boom control lever (closest to the operator's seat). It has three positions E, B, F ("roll back", "hold", and "dump").

Roll back E

To roll the bucket back- load the bucket and pull the lever all the way back. When the automatic leveler is inoperative, the lever automatically returns to the hold position when released. When the automatic leveler is operative, the lever will be locked automatically with the solenoid latch. This latch can be released manually.

Hold B

The control lever, if not in E detented position, will return automatically to hold position B when released and will maintain the bucket in the required position.

Dump F

To dump the bucket, push the lever forward. When the lever is released, it will automatically return to hold position B.

LOADER OPERATIONS

4.18.4. AUTOMATIC BUCKET LEVELER

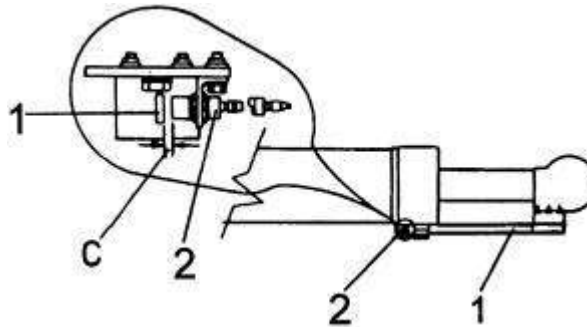


Fig. 4.28. Automatic Bucket Leveler

1. Trip Bar

2. Proximity Switch

C – Bar-To-Switch Clearance

The principle of operation is as follows:

The bucket control lever may be maintained automatically in roll back position E (Fig. 4.27) with a solenoid latch. Stopping the lever in this position is possible only when the induction proximity switch 2 closes the circuit. When trip bar 1 attached to the bucket cylinder rod uncovers the switch, the magnetic field is broken, solenoid latch is released which results in automatic retrun of the bucket control lever to hold position B, Fig. 4.27. Operation of loader linkage using the leveler is as follows. The operator after raising the boom to the required height and dumping the bucket places the bucket control lever in roll back position E , Fig. 4.27 (detented position) and lowers the boom with boom control lever placing it in F position, Fig. 4.27. The bucket control lever will be maintained by the solenoid in roll back position E , Fig. 4.27 until proximity switch 2, Fig. 4.28 has been uncovered by trip bar 1. The length of the trip bar is so selected that it will occur when the bucket is in position prepared for the next cycle, when the bucket is in horizontal position and is resting on the ground.

Bar-to-switch clearance C necessary for the proper operation of the proximity switch is 7 mm to 8 mm. No other adjustments are needed.

4.19. LOADER TECHNIQUES

Terrain, footing conditions, types of materials being worked and maneuvering space determine the speed at which the loader can function. When the bucket is at work, keep the engine speed at full throttle and operate in the first (1) gear transmission range.

Use gear range two (2) and three (3) for traveling purposes. The techniques for using the loader as described below are not intended to be all inclusive. Each work situation will vary. Loader operation may be altered for each particular application for its best efficiency. When possible, start all jobs from relatively level ground. If necessary, level an area large enough to provide sufficient working space. This prevents back and forth pitching of the loader and will result in easier operation. Avoid wheel spin whenever possible; this wastes effort and causes ruts and piles that pitch and tilt the loader. In cold weather, this material can freeze and cause additional difficulty the following day.

4.19.1. LOADING, TRANSPORTING AND PILING

When loading from a bank or stockpiling, use the V-method shown in Figure 4.29, or the step loading method shown in Figure 4.30. Keep the trucks close to the work area to minimize loader travel. Keep work areas clean and level. When possible, spot the next truck to be loaded on the opposite side as shown in Figure 4.29.

OPERATING

LOADER TECHNIQUES

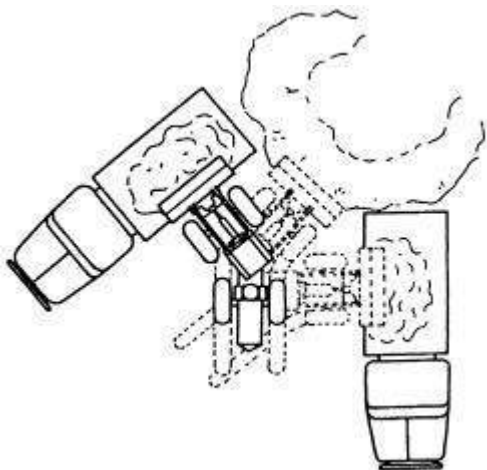


Fig. 4.29. "V" Loading Method

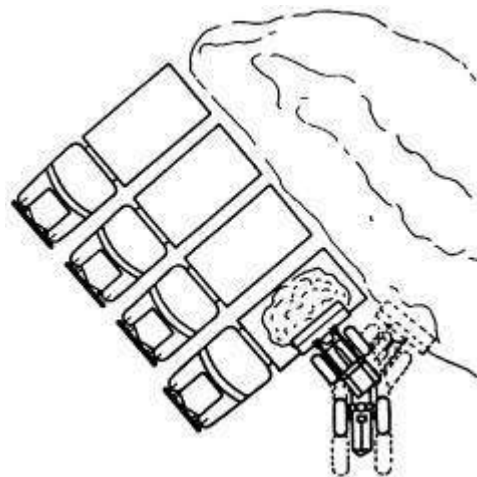


Fig. 4.30. Step Loading Method

Approach the bank or stockpile with the engine at full governed speed. Keep the bucket flat, working into the material at or near ground level. As the bucket penetrates the material, raise the bucket slightly. When the material boils to the top of the spillboard, roll the bucket all the way back, raise the bucket to provide ground clearance and, at the same time, disengage the forward travel of the loader as shown in Fig. 4.29. Back away in an arc from the bank or stockpile as show in Figure 4.29 and Figure 4.30 just far enough to allow turning of the loader for the approach to the truck. Digging in hard material can be aided by "wiggling" the bucket edge immediately after penetration. Operate the bucket control lever alternately between its roll back and dump positions. This action will loosen the material and improve bucket loading. Coordinated operation of the two hydraulic control levers as the bucket enters the material will yield satisfactory bucket loads. The boom assy need not be fully raised to dump the bucket. Adjust the dump height to height of the side of loader vehicle.

When bank loading, keep the cutting edge flat as shown in Figure 4.31. Tilting the bucket back too far forces the flat of the cutting edge against the bank preventing the bucket from digging. This non-productive maneuver causes waste of power and time and possible damage to the bucket cylinders and linkage.

When stockpiling, move each load only once and keep travel distance down to a minimum. When possible, locate stockpiles as close as possible without hindering other work on the site.

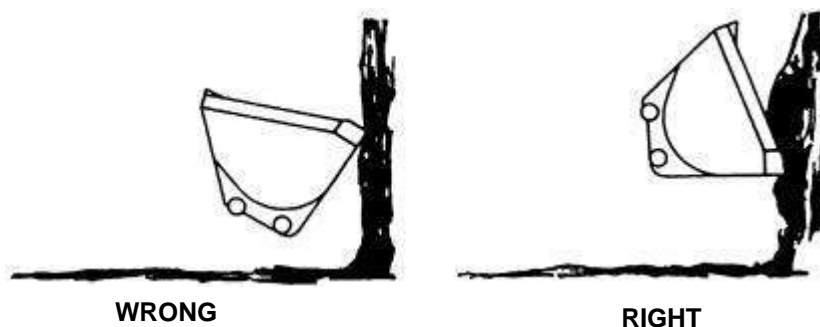


Fig. 4.31. Bank Loading

LOADER TECHNIQUES

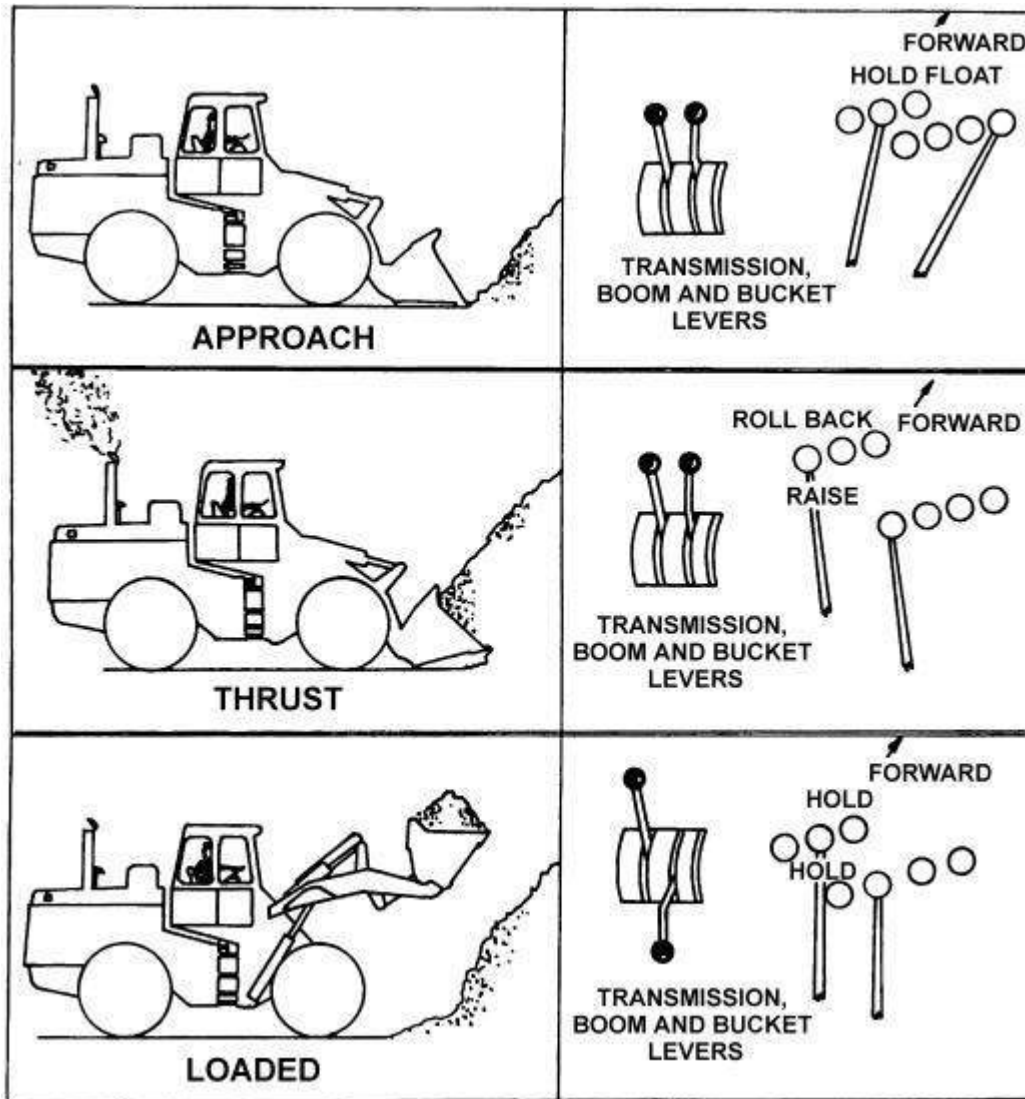


Fig. 4.32. Loading Sequence

Transport filled bucket in the roll back position raised approximately 0.5 meter above the ground. A loaded bucket must never be transported in the fully raised position. Keep the travel speed reasonable for safe operation. Upon reaching the truck, raise the bucket high enough to clear the truck body, Fig. 4.33. Dump load slowly to reduce the shock of weight transfer to the rear axle when the bucket is emptied. Shake bucket only to loosen dirt from within.



WARNING! Transport loads with bucket in carry position only. A loaded bucket must never be transported in the fully raised boom or with boom in horizontal position.

OPERATING

LOADER TECHNIQUES

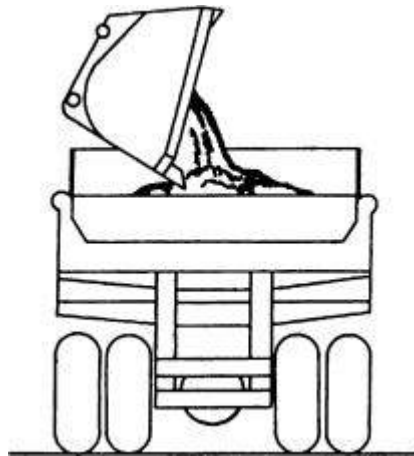


Fig. 4.33. Dumping Into Truck

Put enough loose rock or dirt into the truck first to act as cushioning material before proceeding to load larger rocks (Figure 4.34.)

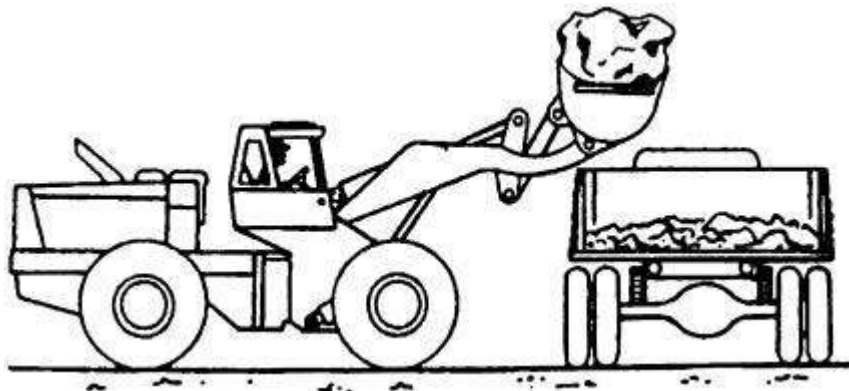


Fig. 4.34. Dumping Large Rocks Into Truck

After the bucket empties, move the bucket control lever back into the rollback position. The lever will be maintained in this detached position by the solenoid latch. If the bucket is clear off the truck body, back the loader way from the truck, lower the boom and return to the loading site. The bucket will automatically return to its pre-set working position.

Lower loaded or unloaded bucket to the ground when waiting for any length of time.



WARNING! Never travel with an unstable and solid rock.

4.19.2. DIGGING, CLEARING AND LEVELING

When digging or excavating lower the bucket to the ground. Adjust the angle of the cutting edge when the machine moves forward, Fig. 4.35. Change inclination of the angle of the cutting edge and cutting edge depth using boom and bucket control levers depending on bucket filling. Establish the parameters to obtain the best bucket filling. When the bucket is full, roll it back and raise it clear off the ground and carry the load to the desired dump area.

LOADER TECHNIQUES

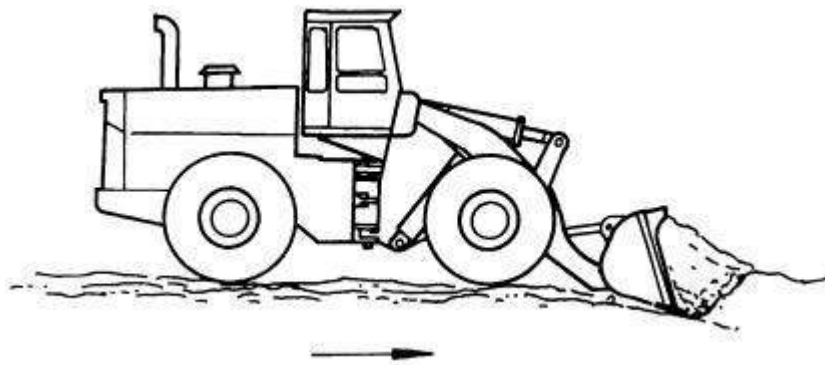


Fig. 4.35. Digging or Excavating

Clearing an excavation. Fig. 4.36 may be performed with the bucket partly in the dump position by disposing of the material carried in the bucket.

It is recommended to clear an excavation a little above the ground level because after compaction the ground will be level. Approach an excavation at the right angle and stop the front wheels at a safe distance from the edge of the excavation.

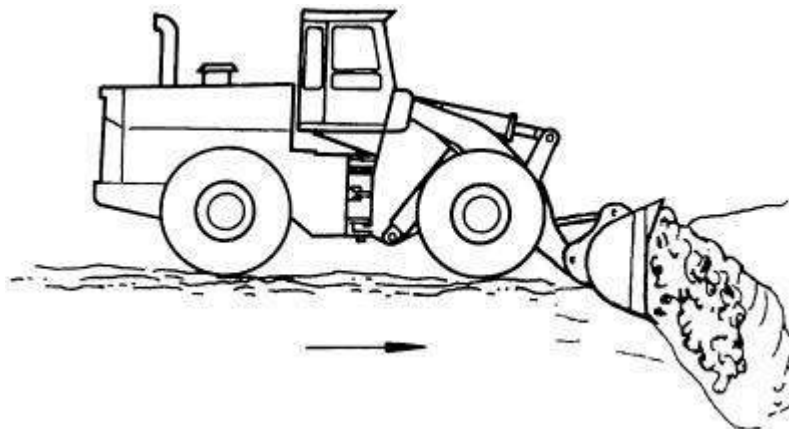


Fig. 4.36. Clearing an Excavation

When clearing a rocky area, remove the small and loose rocks first, large and solid rocks can then be loosened and moved with less difficulty.

Method of digging and removing large rocks is shown in Fig. 4.37. It is easier to load the rock by digging under the rock with the bucket. Push on the bucket and roll it back simultaneously.

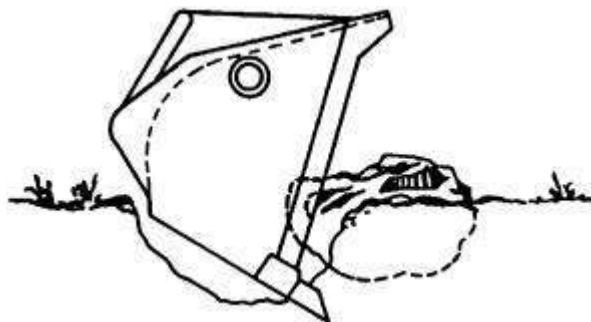


Fig. 4.37. Large Rock Removal

LOADER TECHNIQUES



WARNING! Never backdrag, push any objects (trees, rocks, etc) with the bucket in the utmost dump position as due to unfavorable distribution of forces a serious damage to loading mechanism can result. It is particularly unfavorable when operating with boom raised.



WARNING! Do not operate close to dangerous overhangs. Unskillful operation of the loader may result in occurrence of overhangs that may slide on the loader. Prevent occurrence of the overhangs or remove them using other methods e.g. firing, digging from the top, etc.

Level the ground when driving backward. Lift the bucket and dump it slightly, Fig. 4.38 then use float position of the boom. Then weight of the loading mechanism presses on the ground and scrapes and spreads uniformly. The ground may be leveled as described above but with fixed boom position. Selection of the method depends upon the local conditions and the operator.

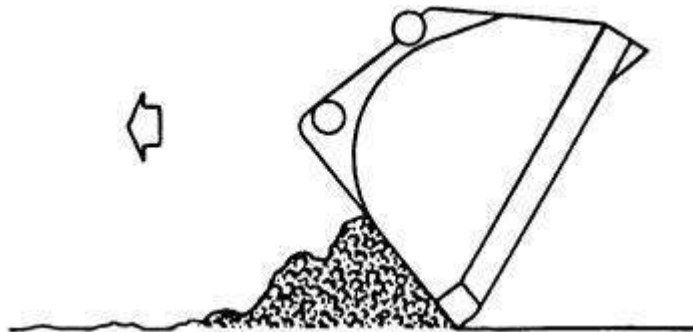


Fig. 4.38. Backdragging and Leveling

Small or medium trees may be removed with bucket raised at operator's eyes level and positioned horizontally pushing the tree with the middle part of the bucket. Do not hit the tree with bucket. Topple the tree, back the loader and lower the bucket to the ground and push the tree from the site.

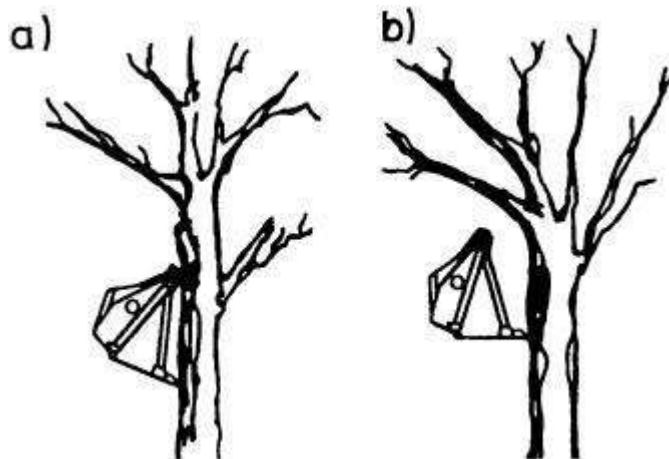


Fig. 4.39. Position of the Bucket When Removing a Small Tree

A - Wrong

B - Right



WARNING! Using the loader to carry large objects which do not fit the bucket is **NOT RECOMMENDED**. Handling large objects can be extremely dangerous because objects may roll or slide down the lift arms on to the operator. **NEVER** lift large objects higher than the operator unless the machine has a device which prevents the objects from falling back onto the operator.

LOADER TECHNIQUES

Sequence of bank loading is shown in Fig. 4.40.

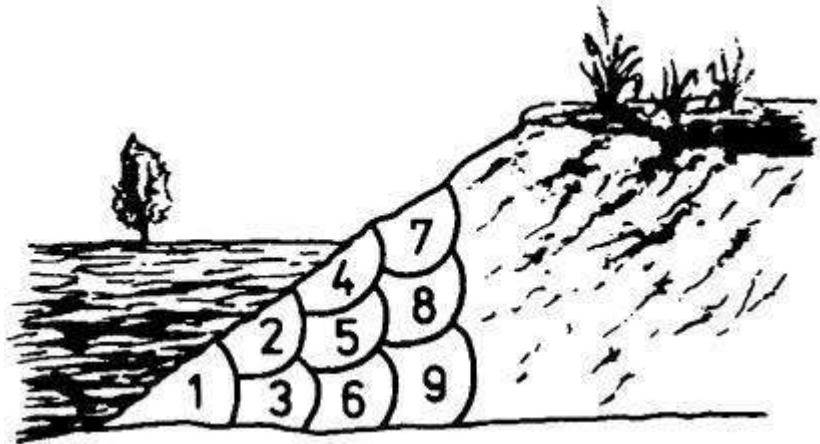


Fig. 4.40. Bank Loading

Heavy roots of large trees may require cutting from several sides of the tree (Fig. 4.41). Upon completion of cutting push the tree as described above for small trees removal. Use a cable to topple and remove trees from soft ground. Topple the tree, back the loader and lower the bucket to the ground and push the tree from the site.



Fig. 4.41. Removing Large Trees

The wheel loader can be used for removing objects employing breakout force. However, avoid removing of spring materials because it may cause splitting of the material.

Employ breakout force available applying the load in the middle of the bucket width.

The wheel loader may be used for pushing and pressing against brick walls, etc. following the procedure for a tree removal. For those operations the bucket must be positioned horizontally.

The wheel loader may be used for towing trailers or pulling the loads, if necessary, however spinning of the wheels must be avoided.

4.20. ECONOMICAL OPERATION OF THE MACHINE

Fuel consumption during operation of the loader depends on many factors as: engine characteristics, load, terrain, operator' s skill and experience, manner of operation.

A relatively conclusive indicator of fuel consumption is quantity of moved material per unit of consumed fuel. To reach the most favorable value of this ratio observe the following principles of loader operation:

- avoid long distance transporting of material,
- loading and pushing of material must be performed in a gear which ensures maximum drawbar pull (at high torque converter efficiency),
- take care to fill the bucket correctly during operation, use 1st and 2nd gear, avoid maximum speed of the engine,
- avoid stopping machine due stall of the engine.

SECTION 5

MAINTENANCE

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5.1. GENERAL PRECAUTIONS

WORK SAFELY - FOLLOW THESE RULES



WARNING! This symbol and text with bold letters is used throughout this manual to call your attention to instructions concerning personal safety. Observe and follow these instructions. Be certain anyone operating and servicing this machine is aware of these rules. Failure to follow these rules may result in injury or death.

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT

The procedures in this section contain many notes and precautions which should be followed along with standard safety procedures to minimize the possibility of personal injury or improper service.

Improper service could compromise the machine's safety or cause it to function improperly, which could result in personal injury or death. Review the precautions listed in Section 2 "SAFETY PRECAUTIONS."

Do not attempt to do repairs you do not understand. Use your "Service Manual" or consult your Authorized Distributor for information.

Do not jump on or off the machine. When working under the machine, turn off the electrical system master switch, apply parking brake and tag controls to warn against starting the machine.

When servicing in the area of the engine fan or belts, take care to prevent accidental cranking of the engine. Turn off and lock the electrical master switch and tag the machine.

It is not possible to anticipate all conceivable ways or conditions under which this machine may be serviced or to provide precaution for all the possible hazards that may result. Safety is always the most important rule.

Constantly be aware of dangers involved in working on the machine and take proper precautions. Standard and accepted safety precautions and equipment should be used.

This machine is assembled using high strength fasteners. Do not substitute. Replacement fasteners must be of the same size and strength as the originals (refer to Section 6 SPECIFICATIONS). Tighten fasteners to the proper torque value specified in Section 6 SPECIFICATIONS, unless otherwise specified.

Refer to Spare Parts Catalog of respective model for all replacement parts.

Use safety goggles, hard hats, safety shoes, heavy duty gloves and other protection during cutting, grinding, chiseling, prying or any other process which could cause material removal or projectiles.

Many machined parts are hardened and can chip. Use the proper size and type of tool for the job being done. Select a wrench that fits and be sure it is on straight. Keep your tools clean and in good condition. Some procedures require the use of tools specially designed for that specific purpose. Before substituting another tool or procedure, you must be completely satisfied that neither personal safety nor the performance of the machine will be endangered.

Scheduled maintenance is a normal procedure necessary to provide machine's proper operation.



WARNING! For your personal safety carry out all maintenance service in accordance with specified scheduled maintenance guide and instructions.

To prolong the service life of your equipment follow the scheduled maintenance listed in 5.2. and 5.3.

5.2. SCHEDULED MAINTENANCE GUIDE**Every 10 Hours of Operation (daily maintenance)**

1. Perform the ground level inspection per 5.2.1.
2. Check the hydraulic tank oil level and add oil if necessary. Refer to 5.14.1.
3. Check the transmission oil level and add oil if necessary. Refer to 5.18.1.
4. Check the coolant level in the radiator. When adding coolant check for DCA concentration and freezing temperature in cold weather. Refer to 5.8.5.
5. Check the engine oil level. Refer to 5.11.1.
6. Visually check the condition of the fan blades and fan drive belt. Refer to 5.11.5 and 5.11.6.
7. Check and inflate the tires, if necessary. Refer to 5.17.
8. Check and clean the precleaner screen, if necessary. Refer to 5.6.5.
9. Check the service indicator and perform service if the filter contamination is signaled by the indicator. Refer to 5.6.2 and 5.6.3.
10. Drain the water from fuel tank and fuel filter water separator. Refer to 5.13.1. and 5.13.2.
11. Refill the fuel tank at the end of each day's operation. Refer to 5.13.2.

Every 50 Hours of Operation

1. Perform the service as specified in "Every 10 hours of operation"
2. Check the air intake system (for leaks, hoses and clamps, filter contamination). Refer to 5.6.4.
3. Lubricate:
 - the bucket link pins,
 - the bucket pivots,
 Refer to 5.4.7.
- 4*) Clean transmission system suction strainer. Refer to 5.18.4.
- 5*) Replace transmission system filters. Refer to 5.18.3.
- 6*) Replace hydraulic system filters. Refer to 5.14.3.

*) after initial 50 hours of operation only

Every 100 Hours of Operation

1. Perform the service as specified in "Every 50 hours of operation"
2. Clean the radiator core. Refer to 5.8.10.
3. Lubricate the transfer drive. Refer to 5.4.7.
4. Lubricate the steering cylinders pivots. Refer to 5.4.7.
5. Lubricate the center driveshaft. Refer to 5.4.7.
6. Lubricate the bolster pivots. Refer to 5.4.7.

Every 250 Hours of Operation

1. Perform the service as specified in "Every 50 hours of operation"
3. Check the coolant for DCA concentration and replace the coolant filter. Refer to 5.8.3., 5.8.8.
4. Check and clean the transmission and torque converter breather. Refer to 5.18.5.
5. Check and clean the hydraulic reservoir breathers. Refer to 5.14.4.
6. Check and clean the fuel tank breather. Refer to 5.13.2.
7. Check the engine crankcase breather hoses and breather. Refer to ENGINE OPERATOR MANUAL
8. Change the engine crankcase oil. Refer to 5.11.2. and 5.11.4.
9. Change the engine crankcase oil filters. Refer to 5.11.3.
10. Replace the fuel filters. Refer to 5.13.1.
11. Replace the coolant filter. Refer to 5.8.8.
12. Lubricate:
 - the boom pivots,

SCHEDULED MAINTENANCE GUIDE

- the bucket cylinder pivots,
- the boom cylinders pivots,
- the bucket link.

Refer to 5.4.7.

13. Check the condition and tension of the engine belts. Refer to 5.11.6.
14. Check the condition of the fan. Refer to 5.11.5.
15. Check the parking brake shoes and brake disc for wear. Refer to 5.7.2.

Every 500 Hours of Operation

1. Perform the service as specified in "Every 250 hours of operation"
2. Check and add oil in the drive axles. Refer to 5.9.1.
3. Check and add oil in the steering gear. Refer to 5.16.
4. Replace the transmission system filters. Refer to 5.18.3.
5. Replace the oil filter element of the brake cooling system. Refer to 5.7.1.
6. Lubricate the tracking system linkage pivots. Refer to 5.3.1.

Every 1000 Hours of Operation

1. Perform the service as specified in "Every 500 hours of operation"
2. Check the parking brake operation. Refer to 5.7.2.
3. Change the oil in the transmission and brake system. Refer to 5.18.2., 5.7.1.
4. Clean the transmission strainer. Refer to 5.18.2.
5. Replace the oil in hydraulic system. Refer to 5.14.2.
6. Replace the hydraulic tank filter elements. Refer to 5.14.3.
7. Replace the oil in the drive axles (differential and planetaries). Refer to 5.9.2.
8. Lubricate:
 - the driveshafts,
 - the center articulation pivots, refer to 5.4.7.
9. Check and add electrolyte in the batteries, if necessary. Refer to 5.10.4.

Periodic (at least once a year or as required)

1. Check the condition of the hydraulic lines and electrical wires. Repair or replace if necessary. Refer to 5.5.3.
 2. Check the condition of the safety belt and replace if necessary. Weak spots and damage of the seat belt are inadmissible. Refer to 5.15.
 3. Check the bucket teeth and cutting edge for wear.
 4. Check the condition and torque of the cab-to-frame mounting hardware. Refer to 6.17.
- SPECIAL TORQUES**
5. Clean the fuel tank strainer. Refer to 5.13.2.
 6. Replace the ether container (if empty). Refer to 5.12.
 7. Lubricate:
 - the control levers,
 - the parking brake linkage,
 - the pedals,
 - the superstructure hinges, etc.
 8. Clean the air conditioner filter (if equipped)
 9. Check the condition of discs and hardware mounting the wheels. Refer to 5.17.
 10. Clean the air filter. Refer to 5.6.2. and 5.6.3.

SCHEDULED MAINTENANCE GUIDE

Every 1500 Hours of Operation or every year (per Engine Operation Manual)

1. Steam clean the engine.
2. Check the torque of turbocharger mounting nuts and torque if necessary.
3. Check the torque of engine mounting bolts and torque if necessary.
4. Check the water pump.
5. Check the condition of the engine hoses and replace if necessary.
6. Adjust the valve lash and injectors.
7. Grease the fan hub.
8. Clean the crankcase breather and replace if necessary.
9. Check the crankshaft end clearance.

Every 6000 Hours of Operation or every 2 years (per Engine Operation Manual)

1. Perform the service as specified in "Every 1000 hours and 1500 hours of operation".
2. Clean the cooling system and change the coolant. Refer to 5.8.6., 5.8.7., 5.8.9.
3. Check the condition of the fan hub.
4. Check the condition of the idler pulley assembly.
5. Check the condition of the water pump.
6. Check the condition of the turbocharger.
7. Check the condition of the vibration dumper.
8. Clean and calibrate the injectors.
10. Inspect the fan idler.

5.2.1. GROUND LEVEL INSPECTION

1. Loader Equipment: condition, efficiency.
2. Radiator: condition, evidence of leakage and condition of the grill
3. Hydraulic components: condition, leakage, operation.
4. Drive train: condition, leakage, noise, clearance.
5. Wheels: condition of tires, mounting on wheel rims.
6. Engine compartment: fuel, lubrication and the cooling system for leaks.
7. Control panels: check the condition and operation of instruments, gauges and warning lights
8. ROPS: the condition of the ROPS cab, operator's seat with seat belt, access openings. No defects are permissible that may adversely affect its protection in case of machine rollover.
9. Visually check the screw joints, particularly:
 - ◆ Drive axle to frame mounting,
 - ◆ Driveshaft connecting,
 - ◆ Center articulation pivot mounting,
 - ◆ Wheel mounting,
 - ◆ Cab to frame mounting.



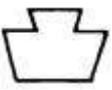
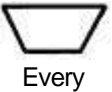

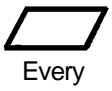

5.3. MAINTENACE AND SERVICE CHART

IMPORTANT: *The points of service are individually explained in more details in the following text. Always use clean lubricators and containers. Wipe the dirt from the fittings before fresh grease is added. Use the hourmeter to determine service intervals. Do not use the warning lights to determine the service intervals.*

IMPORTANT: *The intervals of time between services are based on the average operating conditions. In severe conditions of operation reduce the interval of time between the services.*

MAINTENACE AND SERVICE CHART

Chart 1.

Service Interval	Ref.No	Point of Service	Service Points	Lubricant	Service
 Every 10 Hours	1	Hydraulic Reservoir Oil Level	1	HDTF	Check
	7	Radiator Coolant Level	1	-	Check
	13	Transmission Oil Level	1	HDTF	Check
	15	Fuel Tank	1	-	Drain Sediment
	17	Engine Crankcase Oil Level	1	EO1	Check
 Every 50 Hours	8	Bucket Pivots	2	MPG	Lube
	9	Bucket Link Pins	2	MPG	Lube
 Every 100 Hours	5	Transfer Drive	1	MPG	Lube
	5	Steering Cylinder Pivots	4	MPG	Lube
	10	Center Drive Shaft	3	MPG	Lube
	12	Bolster Pivots	2	MPG	Lube
 Every 250 Hours	3	Loader Linkage Pivots	10	MPG	Lube
	6	Engine Oil Filters	1	-	Change
	6	Fuel Filters – all	2	-	Replace
	6	Engine Crankcase Breather	1	-	Clean
	6	Coolant for DCA-4, Filter	1	-	Add, change
	6	Engine Crankcase Oil	1	-	Change
	13	Torque Converter and Transmission Breather	1	EO1	Clean
 Every 500 Hours	4	Drive Axle Oil	2	MPL	Check
	19	Steering Gear Oil	1	MPL	Check
	14	Transmission Filters	2	-	Replace
	14	Brake System Filters	1	-	Replace
	20	Tracking System linkage	4	MPG	Lube
 Every 1000 Hours	1	Hydraulic System Oil	1	HDTF/EO2	Change
	1	Hydraulic Oil Filters	2	-	Replace
	1	Hydraulic Reservoir Breather	2	-	Clean
	4	Drive Axles Oil	2	MPL	Change
	11	Center Articulation Pivots	1	-	Clean
	13	Transmission Strainer	2	MPG	Lube
	13	Transmission Oil	1	HDTF	Change
	13	Transmission Breather	1	-	Clean
	18	Drive Shafts	12	MPG	Lube
 Periodic or at Least Once a Year	2	Air Filter Elements	1	-	Clean
	15	Fuel Tank Strainer	1	-	Clean
	-	Cab Hinges and Side Doors, Pedals, Levers		MPG	Lube
Every 6000 hours or every 2 years	21	Radiator Coolant	1	-	Change

MAINTENANCE AND SERVICE CHART

DESCRIPTION:

E01 – Engine Oil

E02 – Multigrade Engine Oil

MPG – Multi-Purpose Grease

HDTF – Hydraulic Transmission Fluid

MPL - Multigrade Transmission Oil

5.3.1. SERVICE POINTS

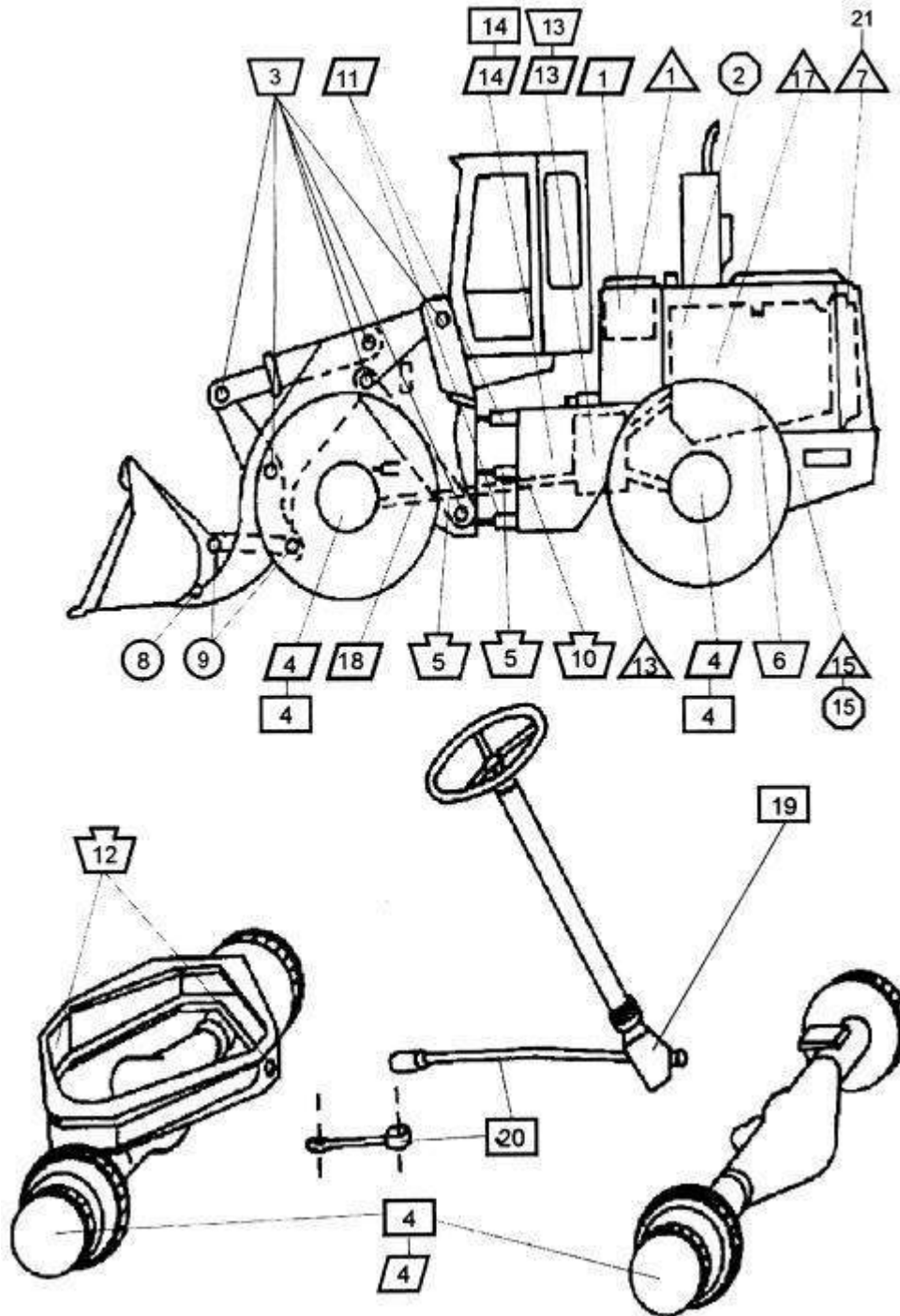


Fig. 5.1. Service Points

Service point description is given in Chart 1.

5.4. LUBRICATION**5.4.1. WHEN SHIPPED**

This Wheel Loader has been lubricated at the factory for operation in an air temperature range of +21°C to -23°C. If this machine is to be operated above or below this range, change to the correct lubricants. Unless an exception is shown below, all lubricants can be used (within above temperature range) until regular scheduled (normal) change intervals occur. Refer to "SERVICE CHART" for the scheduled (normal) change intervals and to "REFILL SPECIFICATIONS AND CAPACITIES" for the proper oil grades for ambient temperatures.

5.4.2. WHEN SERVICED

The life and performance of a wheel loader and its equipment depends on the service that it is given. Proper lubrication is an important part of the maintenance service.

Thorough lubrication service performed at the specified intervals will aid in prolonging the life of the loader and its equipment and in reducing operating expense. The type of work being done, load, ground and weather conditions are all factors to consider in frequency of lubrication.

The scheduled intervals between the lubrication periods shown on the "SERVICE CHART" are approximate, based on average operating conditions. It may be necessary to lubricate after shorter working periods under severe operating conditions such as extreme dust, low engine temperatures, intermittent operation, excessively heavy loads with high oil temperatures, or when diesel fuel with a high sulfur content is used. However, the time intervals between lubrication periods must never exceed those indicated in this manual.

5.4.3. LUBRICANT SELECTION

The selection of the proper type (specification) and the grade (weight or viscosity) of lubricant is important.

Many tests have been made to determine the correct lubricants for this wheel loader and its equipment.

5.4.4. VISCOSITIES

During cold weather, base the selection of a crankcase lubricating oil viscosity on the lowest anticipated temperature for the day to make starting easier. For hot weather operation, base the selection on the highest anticipated temperature. Refer to the "REFILL SPECIFICATIONS AND CAPACITIES" chart.

MAINTENANCE

LUBRICATION

5.4.5. REFILL SPECIFICATIONS AND CAPACITIES

Chart 2.

Lubrication point	Capacity [l]	Grade	Temp. +49° to -7°C	Temp. +21° to -23°C	Temp. -12° to -34°C	Temp. -12° to -54°C
Crankcase	57	EO1	Engine oil per B21-0002 CE, CF-4 or CD per API SAE 15W/40 SAE 5W/30 SAE 5W/40 NOTE: Refer to Operating and Maintenance Instruction of Cummins Engine			Arctic grease Per HMS B21-0001
Hydraulic System	382	HDTF LUB EO2	Hydraulic & Transmission Fluid Per HMS B21-0006 passing Test C-4/TO-4*) SAE 10W Or Engine oil per HMS B21-0003 or CD MIL-L-2104C SAE 10W			
Transmission and Converter System	144	HDTF	Hydraulic & Transmission Fluid Per HMS B21-0006 passing Test C-4/TO-4*) SAE 10W			
Drive Axles (each)	80	MPL	Transmission oil per HMS B22-0003 or GL-5, MIL-L-2105C			Arctic grease Grade 75 Per HMS B22-0003
Steering Gear Housing	0.33		SAE 85W/140 SAE 80W/90 SAE 80W/90 SAE 85W/140			
All Lube Fittings	As required	MPG	Myulti-purpose grease per HMS B27-0002 Or Lithium Grease NLG12 with 3% MoS			Arctic grease Per HMS B27-0003
Cooling System	101		Antifreeze per HMS B21-0001 50% antifreeze concentrate 50% water			62% antifreeze concentrate 35% water
Fuel Tank	625		Diesel oil per HMS B32-0001 or ASTM D975 1D 2D			DFA

*) oil should not include viscosity improving additives

LUBRICATION

5.4.6. LUBRICANT, COOLANT AND FUEL EQUIVALENTS

Chart 3

RECOMMENDED LUBRICANT	EQUIVALENT LUBRICANT			TYPE
	POLISH	SHELL	TEXACO	
Engine oil per HMS B21-0002 or API CE, CF-4, or MIL-L2104C with sulfated ash of 1.65%				E01
SAE 10W/40	LOTS DIESEL CE/SF SAE 15W/40 SUPEROL FALCO CD 15W/40	MYRINA TX 15W/40 RIMULA X 15W/40	URSA SUPER LA 15W/40	
SAE 10W/30		MYRINA TX 10W/30	URSA TDX 10W/30	
SAE 5W/40				
Engine oil per HMS B21-0003 or CD MIL-L2104C				E02
SAE 10W	SUPEROL CD SAE 10W	ROTELLA TX 10W	URSA SUPER LA 10W	
SAE 30	SUPEROL CD SAE 30	ROTELLA TX 30	URSA SUPER LA 30	
Transmission Fluid HDTF per HMS B21-0006 passing formula C-4 and TO-4				HDTF
SAE 10W	GERAX TKD 10W	DONAX TC 10	TEXTRAN HD 10W	
SAE 30	GERAX TKD 30	DONAX TC 30	TEXTRAN HD 30	
Gear Lube per HMS B22-0003 or API GL-5 or MIL-L-2105C				MPL
SAE 85W/140	HIPOL 85W/140	SPIRAX HD 85W/140	GEARTEX EP-C 85W/140	
SAE 80W/90	HIPOL 80W/90	SPIRAX HD 80W/90	GEARTEX EP-C 80W/90	
Multi-purpose grease per HMS B27-0002 or NLGI grade #2 Multi-purpose lithium grease with 3% minimum molybdenum disulfide (MoS ₂)	LITMOS EP-23	RETINAX EPX2	MOLYTEX EP-2	MPG
Anti-freeze, ethylene glycol base per HMS B01-0001	ERGOFRYZ	GLYCOSHELL DILUTED	ANTIFREEZE ETX 6042	
Arctic oil, synthetic 75W per HMS B22-0003			SYN-STAR 75W CODE 2080	MPL ARCTIC
Arctic oil, synthetic per HMS B21-0001 OR MIL L-46167		Cheveron subzero fluid OW-30 or Frigid-go Code 2809A by Emery Industries		EO Arctic
Arctic grease per HMS B27-0003 or MIL-L-10924D		SRI grease manufactured by CONOCO Grease 2816 manufactured by EMERY Ind.		MPG ARCTIC
Diesel Fuel Per HMS B32-0001	Diesel fuel per Polish Standard PN-C-96051:1992 DL above 0°C DP above -12°C DZ above -20°C IZ-40 above -30°C For temperatures below -30°C add depersator			

LUBRICATION

5.4.7. LUBRICATING FITTINGS



WARNING! Never run the engine when cleaning or lubricating the machine because serious injury could result from contacting moving parts. Before servicing the machine, be sure the engine is off, the bucket is lowered, the transmission range gear lever locked in neutral position, the parking brake applied and the electrical master switch is off and the key is removed.

The lubricating fittings (see Fig. 5.1.) are to be greased at the intervals indicated in the service chart. Always use a clean lubricator. Wipe all accumulated dirt from fittings before applying fresh grease. Apply grease at each fitting until fresh grease appears. If grease fails to go through the fitting, determine the cause and correct it.

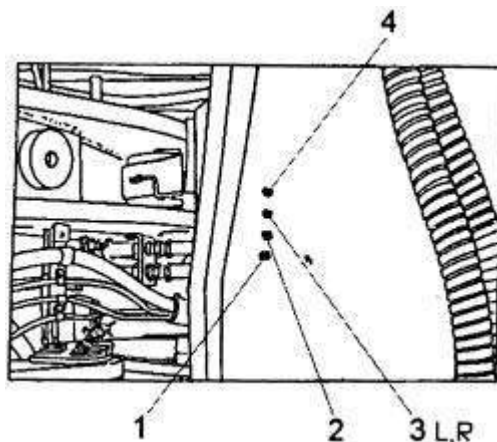


Fig. 5.2. Lubricating Fittings

- 1 - Transfer Drive
- 2 - Lower Articulation Pivot
- 3 - Steering Cylinders
- 4 - Upper Articulation Pivot

L, R- fittings are located on the left (L) hand side and right (R) hand side of the machine frame.

Lubricating fittings of other service points are shown in Fig. 5.3. to 5.8. Easier access to service points may be gained by proper positioning of loader linkage.

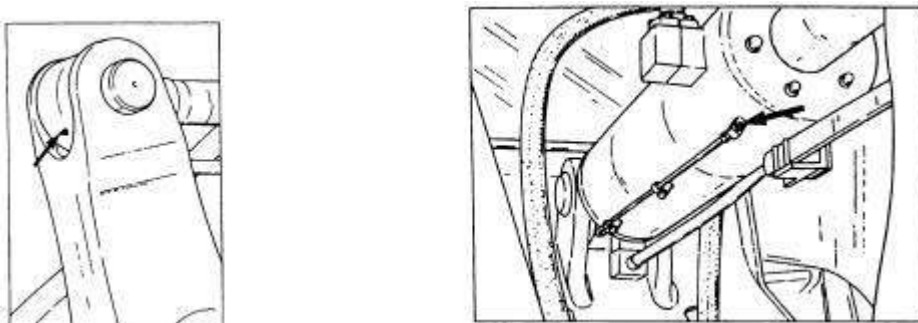


Fig. 5.3. Bucket Cylinder Pivot Fittings

LUBRICATION

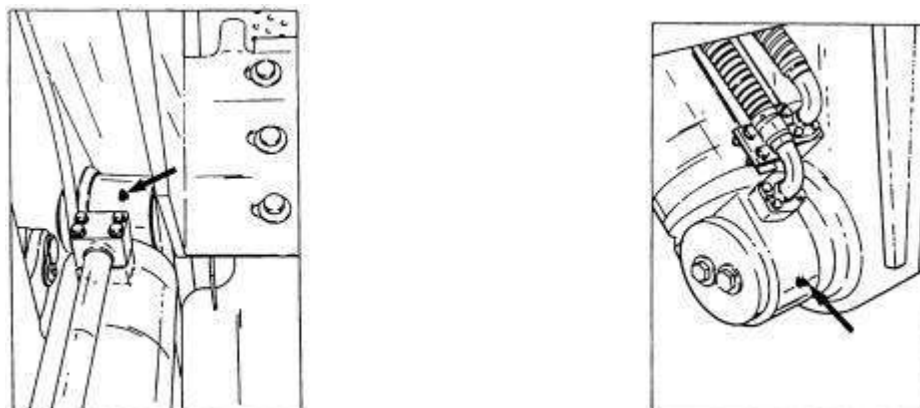


Fig. 5.4. Boom Cylinders Pivot Fittings

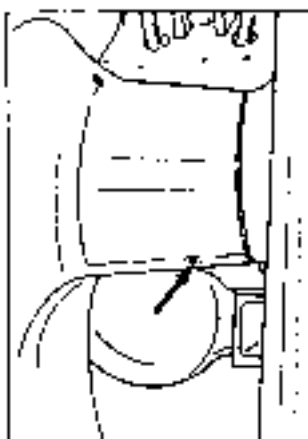


Fig. 5.5. Bellcrank Fittings

Fittings are arranged symmetrically on both sides of the bellcrank.

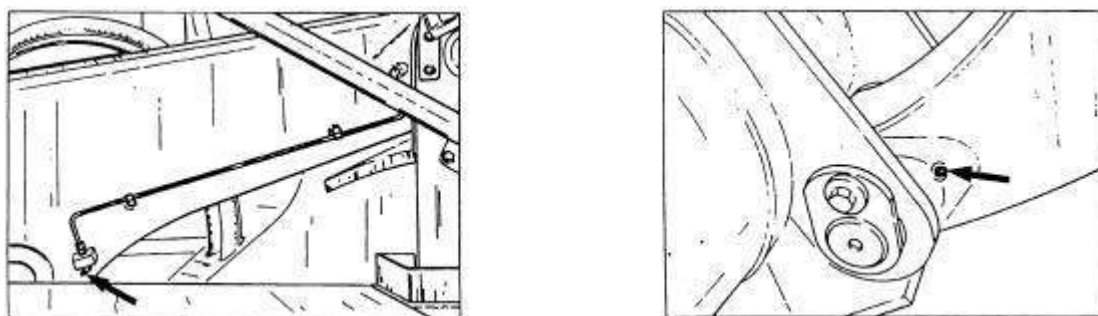


Fig. 5.6. Boom Pivots Fittings

MAINTENANCE

LUBRICATION

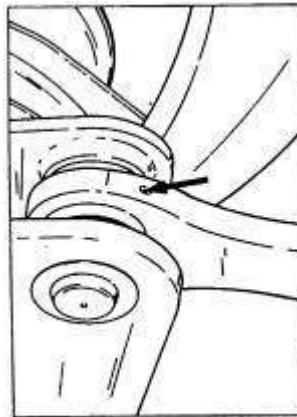


Fig. 5.7. Bucket Link Fittings

Fittings are arranged symmetrically at both ends of the link

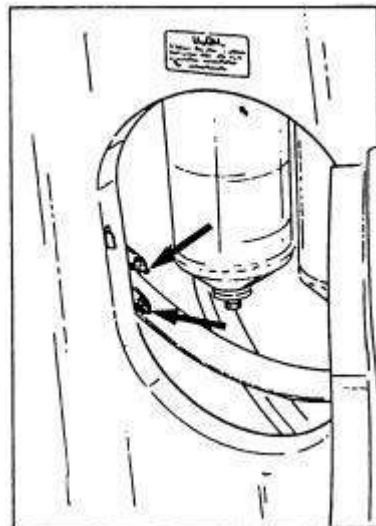


Fig. 5.8. Bolster Pivots Fittings

Fittings are arranged symmetrically at both ends of the link.

5.5. SEASONAL PREPARATION

GENERAL

Mechanical efficiency is enhanced during seasonal air temperature changes, when these instructions are followed.

OPERATION IN SUB-ZERO WEATHER.

Wheel loaders left outside for prolonged periods in sub-zero weather will suffer from "cold-soak." Lubricants become viscous and incapable of lubricating moving parts. Extreme wear could result to the engine, transmission and final drives unless proper precautions are taken. A source of outside heat is necessary under these conditions. There are electric as well as propane-fired engine coolant heaters available. Gas-fired forced air heaters may also be obtained to heat the transmission and final drives.

If a loader is to be used in low temperatures it is best to order a machine designed for operation in low temperatures, which is equipped with necessary heaters.

SEASONAL PREPARATION



WARNING! For your personal safety, use caution and follow the manufacturer's instructions when using external heaters

5.5.1. FUEL SYSTEM

Refer to LUBRICANT, COOLANT AND FUEL EQUIVALENTS for recommended diesel fuels which give the most satisfactory performance of the engine.

5.5.2. COOLING SYSTEM

Prepare the cooling system as follows:

1. Check the entire engine system for leaks.
2. Inspect the condition of all hoses and replace the hoses and hose clamps as necessary.
3. Clean the cooling system.
4. Check the drive belts tension and adjust the tension or replace a worn belt.
5. Remove all debris from the radiator core using air or water under pressure. Direct the flow through the core, opposite the normal direction of air flow.



WARNING! For your personal protection, water pressure should not exceed 275 kPa and air pressure should not exceed 210 kPa. Use safety goggles.

6. Clean the radiator guard and the outside of the core.
7. Protect your cooling system from damage by using approved antifreeze (based on ethylene glycol) and coolant.
8. Keep your cooling system clean and minimize corrosion by changing the coolant filter at correct intervals. Refer to "COOLING SYSTEM."

5.5.3. ELECTRICAL SYSTEM

Clean batteries and remove all corrosion from the battery terminals and cables. Repair or replace all wires which have worn, cracked or frayed insulation and broken or loose wires. Service the batteries.

5.6. AIR CLEANING SYSTEM

5.6.1. AIR CLEANER

This machine has a „dry-type” cleaner with replaceable elements (Fig. 5.9.) The cleaner has two elements: outer and inner. The outer cleaner can be cleaned for a limited number of times before replacement is necessary, however, the inner element must be replaced when plugged.

To protect the engine against dirt penetration perform as follows:

CHECKING AIR INTAKE SYSTEM FOR LEAKS

As a precaution against dirt entering the engine, all gasket and rubber hoses between the air cleaner, turbocharger and intake manifold, and between the manifold and cylinder head must be in a good condition and the joints or connections must be tight.

IMPORTANT: Never operate the engine unless a filter element is installed.

Never start the engine unless air cleaner elements are in place and the covers are tight.

AIR CLEANING SYSTEM

5.6.2. OUTER FILTER ELEMENT

The air cleaner outer element must be serviced whenever indicated by the air cleaner filter warning light. Refer to "AIR CLEANER SERVICE INDICATOR AND OIL SIGHT GAUGE."

The element can be cleaned by either of the two methods: washing or compressed air. Washing is the preferred method as it removes more dust and soot and restores the element to an almost new condition. The result being better performance and longer intervals between the required element service. It is recommended that a spare element be obtained for use while the serviced element is drying. This will reduce unit down time to only a few minutes and will allow sufficient time to wash and dry removed element properly.



WARNING! The filter element must be replaced after six washings.

Cleaning the element with compressed air is not considered an entirely satisfactory method. Some dust will remain in the element causing more frequent servicing of the element. Use this method only as a temporary measure until sufficient time is available to clean the element by washing. Always wash the filter element when contaminated with greasy dust.



WARNING! After cleaning, if an element is to be stored for later use, place it in a plastic bag and store in an element shipping container to protect against dirt and damage.

REMOVAL (Fig. 5.9.)

1. Stop the engine. Clean thoroughly cover 2 and accessible cleaner body 10.
2. Release the three lock straps and remove cover 2.
3. Unscrew wing nut 4 and remove outer element 6.

IMPORTANT: Be careful not to dislodge dust from the dirty element onto the inner element

4. Check the condition of gasket 3 at the end of the outer element. If the gasket is damaged or missing, replace it.
5. Remove all dirt from inside the air cleaner body with a damp cloth. A small amount of nonsudsing detergent added to the water will remove the soot.

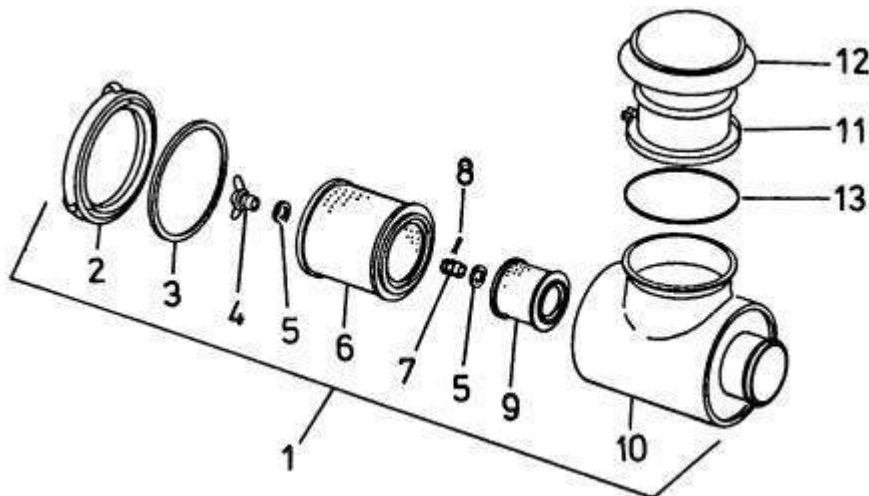


Fig. 5.9. Air Cleaner Assembly

1. Filter Assembly	4. Wing Nut	7. Wing Nut	10. Body	13. O-Ring
2. Cover	5. Washer	8. Cotter Key	11. Clamp	
3. Cover Gasket	6. Outer Element	9. Inner Element	12. Precleaner Hood	

AIR CLEANING SYSTEM

WASHING



WARNING! Never wash an element in fuel, oil, gas or solvent. **DO NOT OIL ELEMENTS.** Do not tap the element against a hard surface; this will damage the element.

1. Carefully tap the side or end of the element against the palm of your hand to remove loose dust.
2. Wash the element in clean, warm water 20°C to 40°C. A small amount of nonsudsing detergent added to the water will remove the soot.
3. Rinse the element in clear water. Shake the element carefully to remove excess water.



WARNING! Do not use compressed air to speed the drying of the element; the air pressure will rupture the wet element.

4. Lay the element on its side and allow it to air-dry before reinstalling. Overnight drying is usually sufficient. When drying the element, protect it from dirt and/or freezing

IMPORTANT: *If no spare element is available, the wet element, after excess water has been shaken out, may be installed in the air cleaner and the engine operated at low idle for 10 minutes before operating.*

COMPRESSED AIR CLEANING

1. Carefully tap the side or end of the element against the palm of your hand to remove loose dust.
2. Direct clean dry compressed air (max. pressure 200 kPa) up and down the pleats on the inside of the element. Always direct the flow of compressed air opposite the normal operating air flow direction through the element.

INSPECTION

1. Inspect the filter element for leaks or damage by placing a bright light inside the element. Inspection of the element on the outside will disclose any holes where concentrated light shines through. The slightest rupture requires replacement of the filter element.
2. Inspect the contact surfaces of the air cleaner body. If faulty or damaged surfaces are noted, correct these conditions immediately.

INSTALLATION

1. Insert the open end of element 9 into the air cleaner body. Install washer 5 and wing nut 4.
2. Install gasket 3 (replace if damaged), cover 2 and secure the cover to the body with the three locking clamps .
3. Inspect and tighten all air cleaner connections before resuming operation.

IMPORTANT: *After servicing the filter element press reset button 1, Fig. 5.10. to reset the air cleaner service indicator.*

MAINTENANCE

AIR CLEANING SYSTEM

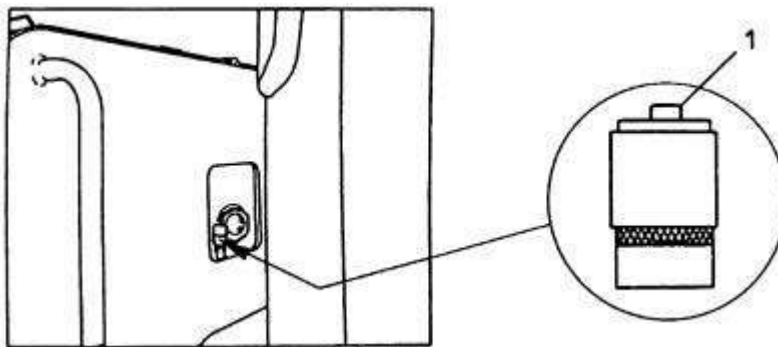


Fig. 5.10. Air Cleaner Service Indicator

1. Reset button

4. Start the engine. If the air cleaner service indicator light indicates air restriction, stop the engine and replace outer or outer and inner filter elements.

5.6.3. INNER FILTER ELEMENT

Replace the inner element with every third change of the outer element or when plugged, as shown by the service indicator.

REMOVAL

1. Remove the outer element as described above.
2. Remove cotter key 8, nut 7 and washer 5 and pull inner element 9 out of the body.
3. Check the condition of the gasket at the end of the inner element.
4. Clean the inside of body 10 with a damp cloth. A small amount of non-sudsing detergent added to the water will facilitate to remove the soot.

INSTALLATION

1. Install new inner element 9 the open end first into body 10.
2. Install washer 5, wing nut 7 and secure with cotter key 8.
3. Install outer element as described above.

5.6.4. SERVICE INDICATOR ORIFICE FITTING

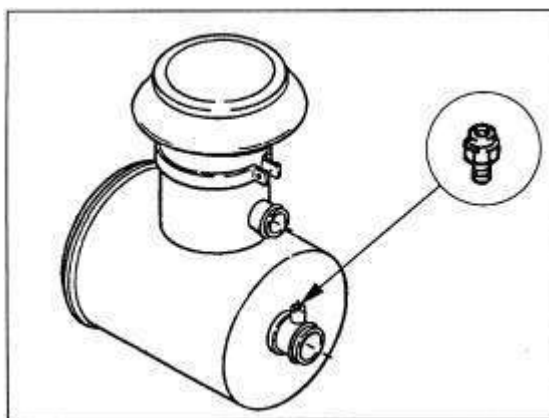


Fig. 5.11. Orifice Fitting

Service indicator orifice fitting is installed on the air cleaner elbow close to the service indicator. If the indicator or its tubing becomes damaged, the orifice fitting will prevent unfiltered air from entering the engine. If a leak occurs, this orifice will, with continued operation, plug up. This will be

AIR CLEANING SYSTEM

indicated by a loss of indicator operation and can be checked as follows: Remove the pre-cleaner hood 12, Fig. 5.9. Start the engine and operate at low idle. Gradually seal off the air intake opening with a flat piece of cardboard until it is almost completely covered. If the red signal band of the indicator fails to rise and lock in position, the service indicator orifice is plugged. Once detected, the leak must be located and corrected immediately and service indicator orifice fitting cleaned or replaced to regain the full advantage of the service indicator.

Service the indicator orifice fitting as follows:

1. Disconnect the indicator tube from orifice fitting at the air cleaner elbow.
2. Remove the orifice fitting from the air cleaner elbow.
3. Wash the orifice in solvent and blow with compressed air. Clean the orifice opening with wire in the direction opposite to the air flow, if necessary.
4. Install the orifice fitting and service indicator.

5.6.5. PRECLEANER HOOD

The dome of the precleaner hood 12, Fig. 5.9. serves as a rain shield and the screen prevents chaff and coarse dirt from getting into the air cleaner. Keep this screen clean from all chaff, oil or dust. Clogged holes in the screen will reduce the power of the engine by restricting the flow of air. Loosen clamp screw 11 on the precleaner hood. Twist and pull upward to remove the cap. Use compressed air to clean the screen. If compressed air is not available, wash in clean hot water or water containing a small amount of nonsudsing detergent.



CAUTION: Never wash precleaner installed on the machine as water may penetrate to the engine.

5.7. BRAKES

5.7.1. SERVICE BRAKE SYSTEM

A wheel loader is equipped with “wet” brakes inboard mounted close to the planetaries of the drive axles. They do not require servicing during the operation of a machine. The brake system is supplied with a multi-piston pump with output compensation driven directly from the engine (engine mounted). The brake cooling is secured by a separate cooling system supplied by a gear pump (driven from the torque converter). Both systems and drive system of the machine operate in one hydraulic system, with common oil reservoir in transmission. The brake system is equipped with hydraulic accumulators protecting emergency braking if the engine fails to operate.



WARNING! The brake system pump is driven directly by the engine. The brake system is inoperative with the engine stopped. The hydraulic accumulators secure emergency braking only.

The service brake system is divided into two separate circuits:

- front wheels brake circuit,
- rear wheels brake circuit.

These circuits can operate independently securing safe operation of a wheel loader. The service brake is actuated with the brake pedal from the operator’s cab. Increasing gradually pressure exerted on the brake pedal the required braking effect is obtained. The more the pedal is depressed the stronger the braking effect.

MAINTENANCE

BRAKES



WARNING! Do no “pump” the brake. Each time the pedal is released the oil pressure is reduced in the system resulting in reduction of braking efficiency in case of loss of engine speed.

As required, there is possibility of braking as described above with the transmission connected or disconnected. Braking with the transmission disconnected occurs with all clutches of the transmission released. In such a case the full engine power may be used to operate the loader hydraulics. Braking with the transmission disconnected is more efficient because the detrimental effect of rotating masses on braking is eliminated. The braking method is selected with the selector switch, see INSTRUMENTS AND CONTROLS.



WARNING! Do not use the braking method with the transmission disconnected when traveling fast or downhill. Loss of control or damage to the power train could result when the pedal is released and the transmission re-engages.



WARNING! Aerated brake fluid lines reduce braking efficiency. Take care to vent the lines properly and efficiently.

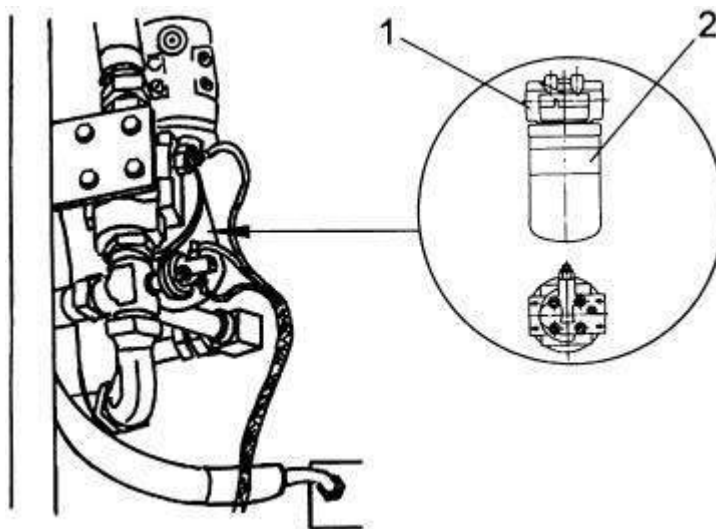


Fig. 5.12. Brake Cooling System Filter.

1- Head

2- Filter Element

REPLACING THE FILTER IN BRAKE COOLING SYSTEM

Replace filter element 2 of the brake cooling system located inside the rear frame on the right hand side directly behind the transmission as shown in Fig. 5.12. When the gasket contacts the head torque the filter to 40 to 50 Nm. The filter replacement should be made when replacing the transmission and torque converter system filters.

BRAKES

VENTING THE SYSTEM

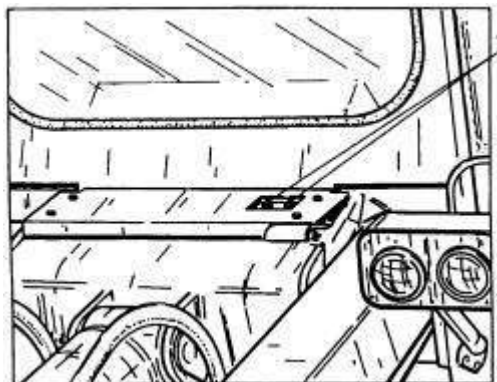


Fig. 5.13. Differential Valve.

1 - Vents

Two servicemen are required to perform the service. Vented are brakes of individual wheels, differential valve signaling a failure of one brake system and the transmission disconnecting valve. The differential valve is located on the front wall of the cab below the windscreen (access thru a cutout in the platform), Fig. 5.13. The brakes and differential valve should be vented in accordance with the procedure specified below (total of 6 vents).

1. After removing the protecting rubber cap install a transparent plastic tube on the vent valve. Put the other end of the tube in a small amount of oil in a clean container.
2. Open the vent valve slightly by turning it, simultaneously the operator in the cab should depress lightly the brake pedal (brake valve). Let the oil with air flow until the outflowing oil is free from air bubbles.
3. Turn off the vent valve and release the brake pedal.
4. Install the protecting rubber cap.
5. Check that the valves are securely tightened with the brake valve fully open.

Pour the drained, clean oil into the transmission.

The venting procedure of the transmission disconnecting circuit is as follows:

1. Start the engine and let it operate at low idle with the transmission neutral lock lever and parking brake applied.
2. Place the transmission disconnect switch in brake position with the transmission disconnected, see INSTRUMENTS AND CONTROLS
3. Loosen hose fitting 2 of hose 1, Fig. 5.14. on the transmission at the transmission disconnecting valve by app. 1 turn.
4. Depress slightly the brake pedal. Observe the outflow of air and oil at loosened hose connection.
5. Tighten the connection when clear oil without air bubbles starts to flow.

MAINTENANCE

BRAKES

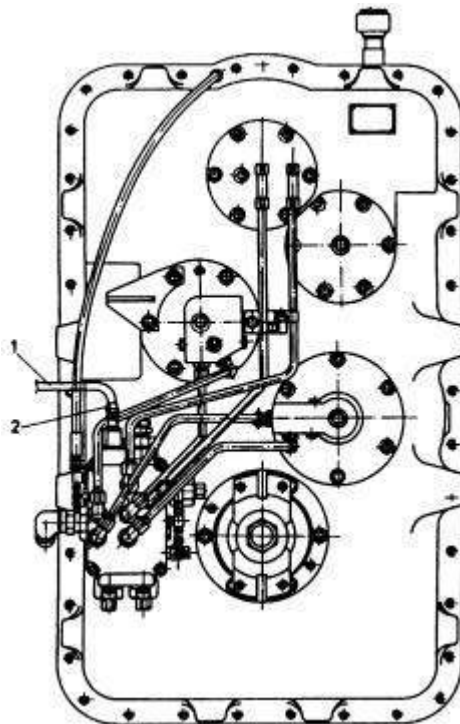


Fig. 5.14. Location of Transmission Disconnecting Valve

1- Supply Hose

2- Hose Fitting

In case of failure of one of the circuits of the service brake system, the other circuit will serve as an auxiliary brake as it enables stopping of the machine.

5.7.2. PARKING BRAKE

The parking brake is mounted on the front differential housing. The principle of operation is shown in Fig. 5.15. It is a disc type brake that is spring actuated and hydraulically released. The brake is electrically controlled with a switch located on the instrument panel, see INSTRUMENTS AND CONTROLS.

CHECKING THE OPERATION



WARNING! When testing the parking brake, be sure the area near the machine is clear of personnel and obstructions because the machine may move during this test.

1. Start and operate the engine at low idle to fill nitrogen accumulators and warm hydraulic system oil.
2. Apply the parking brake, if not applied.
3. With the machine stopped with service brake and engine running at low idle shift the transmission into second speed forward.
4. Release service brake and slowly bring the engine to maximum speed. The machine should not move. If an adjustment is necessary consult service personnel.



WARNING! If the parking brake does not hold the machine stationary correct the cause. Until the cause is corrected, park the machine on level ground and block the tires to prevent it from moving.

BRAKES

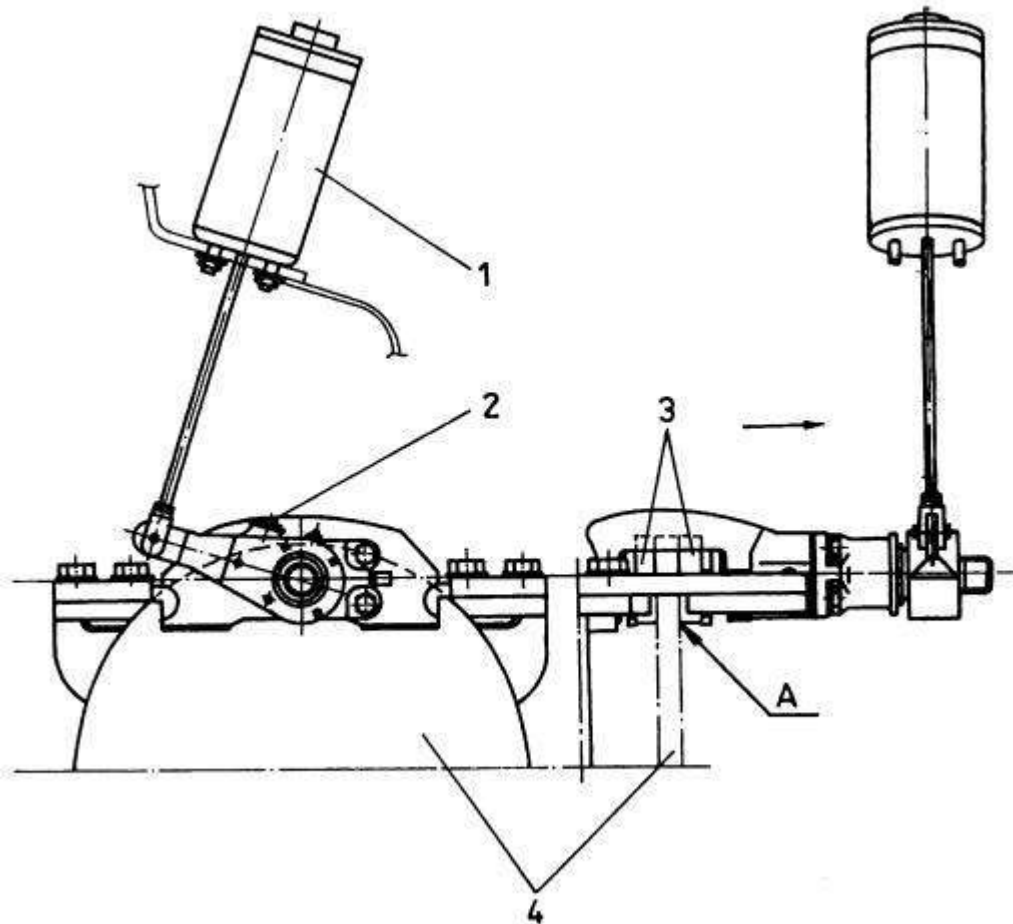


Fig. 5.15. Parking Brake

- | | |
|-------------------------|-----------------|
| 1 - Hydraulic Cylinder | 3 - Brake Shoes |
| 2 - Worm Slack Adjuster | 4 - Brake Disc |

EMERGENCY RELEASING OF THE BRAKE

If the parking brake is required to be released in emergency with pressure loss in hydraulic system perform the following steps:

1. Undo worm slack adjuster 2 until hydraulic cylinder spring 1 tension is completely removed.
2. Make sure a proper gap is between brake shoes (3) and brake disc (4).

NOTE: After emergency releasing of the brake, perform re-adjustment of parking brake as follows.

PARKING BRAKE ADJUSTEMENT

Adjustment of the parking brake is possible with the engine running and brake system operative only.,

1. Start and operate the engine at low idle to fill the nitrogen accumulators and warm the hydraulic system oil.
2. Release the brake with the switch located on the instrument panel.
3. With the parking brake released set the worm slack adjuster so as to obtain a total gap of 0.5 to 0.75 mm between the brake disc and brake shoe. Take the measurement in mid position of brake lining "A" as shown in Fig. 5.15. after placing the brake head in the utmost position in the direction shown by the arrow, Fig. 5.15.

NOTE: No not exceed specified values as jamming of the brake shoes may occur and accelerated wear of brake linings.

BRAKES

CRITERIA OF BRAKE SHOE AND BRAKE DISC REPLACEMENT

1. Brake shoe should be replaced when its minimum thickness (without steel plate) is 3.2 mm when measured at any place
2. Brake disc should be flat and smooth. Circumferential scratches must not be deeper than 0.5 mm. Repair by grinding and precise turning is allowed. Minimum allowable thickness of disc is 18 mm.

5.8. COOLING SYSTEM

GENERAL

The cooling system operates under pressure. The water pump circulates the coolant through the oil cooler, engine block, cylinder heads, radiator. The circulation is controlled by the thermostats which prevent coolant flow through the radiator until the engine reaches the operating temperature. The proper cooling is assured only when the system is sealed, radiator cap and gasket in good condition, thermostats operate properly, system is free of coolant and/or air flow restrictions and is filled to the proper level.

Selection and maintenance of the system coolant is important to long engine life. The following information provides recommendations for selecting the engine coolant, maintaining the coolant inhibitors, and servicing the cooling system. This system will operate with a water/antifreeze mixture or inhibited water as a coolant. Never use water alone because water will allow rust, scale deposits, and corrosion to occur within the system.

5.8.1. WATER

Use water which has a low mineral content. Water used in conjunction with antifreeze, coolant filters and inhibited water must meet the following standards:

Total hardness: Not to exceed 170 parts per million to prevent scale deposits. Water containing dissolved magnesium and calcium (the usual reason for water hardness) above the specified amount will cause scale deposits to develop in the engine.

Chlorides - Not to exceed 100 parts per million to prevent corrosion.

Dissolved solids - Not to exceed 340 parts per million to minimize sludge deposits, scale deposits and corrosion.

If any of the requirements cannot be met, use distilled, de-ionized or de-mineralized water. To determine if the local water supplies meet these standards, water samples can be tested by water treatment laboratories. Softened water that is prepared using common salt (sodium chloride) contains excessive amounts of chlorides and should not be used.

5.8.2. ANTIFREEZE

Low silicate ethylene glycol antifreeze is recommended. The antifreeze should contain no more than 0.1% anhydrous alkali metasilicate. Low silicate antifreeze is recommended to avoid the formation of silica-gel (hydro-gel). This gel formation can occur when the cooling system contains an over concentration of high silicate antifreeze and/or supplemental coolant additive. DO NOT use methanol or alcohol as an antifreeze because of its low boiling point. Antifreeze may retain its freeze protection for more than one season but coolant conditioners must be added to maintain corrosion protection. Antifreeze formulated with methoxy propanol, or propylene glycol is not recommended for this system.

COOLING SYSTEM



WARNING! Do not mix types of antifreeze solutions. Mixed solutions make it impossible to determine the protection against freezing. Antifreeze containing sealer or anti-leak additives should not be used in this system. Sealer or anti-leak additives will plug the coolant filter and cause plugging problems in the cooling system.

Table included in Engine Manual shows percentage of antifreeze concentration required for various temperatures.

5.8.3. INHIBITORS / CONDITIONERS

1. All cooling system inhibitors, including those in antifreeze solutions, become depleted through normal operation. If the inhibitors in antifreeze are allowed to become depleted, the antifreeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system, which reduces heat transfer. Cooling system conditioners which contain these inhibitors must be added to maintain corrosion protection.
2. SOLUBLE OIL IS NOT RECOMMENDED for use in the engine as its use will reduce heat transfer.

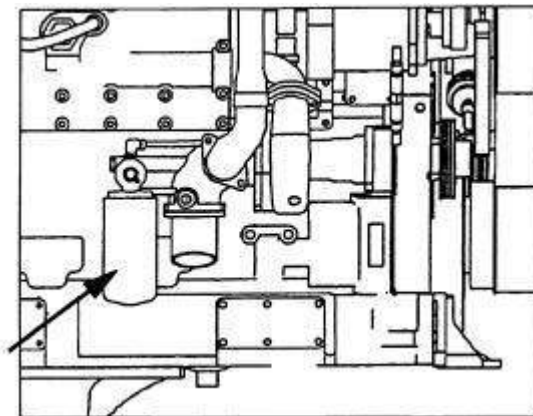


Fig. 5.16. Coolant Filter

REPLENISHING COOLANT CONDITIONER

Replenishing coolant conditioner is performed by periodical replacement of the filters (Fig. 5.16) containing DCA4 inhibitor protecting the cooling system against corrosion and cavitation erosion of the cylinder sleeves and coolant pump blades.

COOLANT TESTING FOR CONDITIONER CONCENTRATION

Coolant testing for DCA4 concentration should be performed periodically before the coolant filter replacement to determine the proper capacity of a filter to be applied. CC2626 test kit of the filter manufacturer is designed for this purpose. The test procedure is included in the Engine Manual.

Prior to installation of a new coolant filter close the shut-off valve (Fig. 5.21) - OFF position. Upon installation of a new coolant filter open the shut-off valve - ON position.

NOTE: *Mixing of DCA4 and other supplemental coolant additives is not recommended because there is currently no test kit available to measure concentration levels with mixed chemical solutions.*

5.8.4. RADIATOR CAP

The radiator cap seals the coolant filler opening in the top tank of the radiator. Positive sealing requires the cap gasket and contacting surfaces to be in good condition and a properly tightened cap.

The radiator cap incorporates a pressure relief valve.

The pressure relief valve maintains the pressure of the cooling system. When preset pressure is exceeded the excess of steam is released to the atmosphere thru an overflow tube routed under the radiator.



WARNING! Never remove radiator cap if engine is hot. Wait until the temperature drops below 50°C. Failure to meet this recommendation may result in personal injury with hot coolant or steam.



WARNING! Hot, scalding coolant can spray out if the radiator cap is removed suddenly. Relieve system pressure by slowly turning the cap to the first notch or lifting the safety lever (if equipped). Remove the cap only after the pressure is relieved.

To remove the cap, press it down and turn until it is free to be removed. Prior to removing the cap make sure all pressure is released. When installing the cap, the gasket and contacting surfaces must be clean. Turn the cap to the right or clockwise until snug.

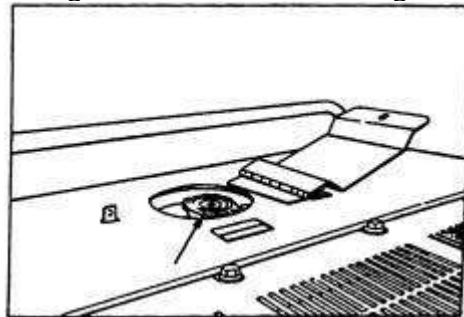


Fig. 5.17. Radiator Cap

5.8.5. CHECKING THE COOLANT LEVEL

NOTE: Check the coolant level before starting the engine. To obtain the proper reading place the machine on level ground.

1. Check the coolant level through the sight gauge (Figure 5.18) in the radiator top tank on the right side of the machine. The coolant should be visible in the sight gauge and the coolant level should be midway of the sight gauge.
2. Add coolant if it must be added; remove the radiator cap as outlined above.
3. Add coolant until the level in sight gauge is reached.
4. After adding coolant, check and replenish DCA4 concentration.
5. Reinstall the radiator cap.



Fig. 5.18. Radiator Sight Gauge

COOLING SYSTEM



WARNING! Never add coolant when the engine is hot. This may result in damage to the engine. Allow the engine to cool down below 50° C prior to replenishing the coolant in the radiator. Failure to meet this recommendation may result in personal injury.

5.8.6. DRAINING THE SYSTEM



WARNING! To drain the coolant allow the coolant to cool down below 50°C. Failure to meet this recommendation may result in personal injury.

1. Remove the radiator cap (Figure 5.17) as outlined above.
2. Remove castellated nut protecting the automatic valve shown in Fig. 5.19. Install the drain hose (included in the machine accessories) on the open thread. The drain valve will be opened automatically as the hose nut is thread in.
3. Open the coolant drain valves on the engine, refer to Engine Operation and Maintenance Manual)
4. Allow the system to drain completely.
5. Remove the drain hose and install the castellated nut on the drain stub and shut the drain valves on the engine.
6. Turn fully to the right the heater temperature control knob 32 in the cab to drain the coolant from the heater. Refer to INSTRUMENTS AND CONTROLS.

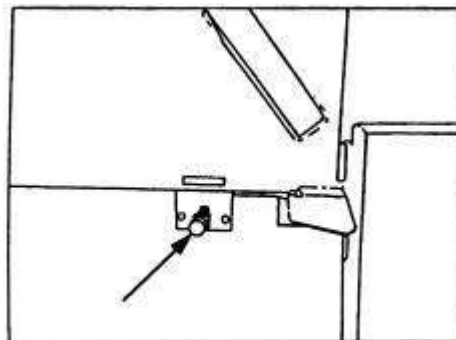


Fig. 5.19. Radiator Drain Plug

5.8.7. CLEANING THE SYSTEM

NOTE: If necessary, clean the cooling system in accordance with the instructions of Engine Operation and Maintenance Manual and the cleaning compound's manufacturer.

5.8.8. REPLACING THE COOLANT FILTER

GENERAL

The coolant filter is a spin-on type filter. This filter cannot be cleaned and should not be disturbed except when it becomes necessary to replace it.

The proper coolant filter to be applied depends upon the total capacity of the cooling system and operating conditions of the engine, refer to Engine Operation and Maintenance Manual.

MAINTENANCE

COOLING SYSTEM

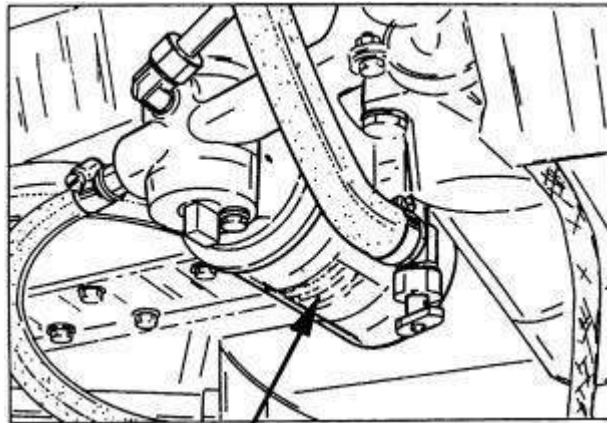


Fig. 5.20. Location of Coolant Filter

Coolant filter is located on the left side of the engine.

Be careful not to allow dirt, water or other foreign material to get into a new filter. Keep new filters in the original package until ready for installation.

REPLACEMENT



WARNING! Hot, scalding coolant can spray out if the radiator cap is removed suddenly. Relieve system pressure by slowly turning the cap to the first notch or lifting the safety lever (if equipped). Remove the cap only after the pressure is relieved.

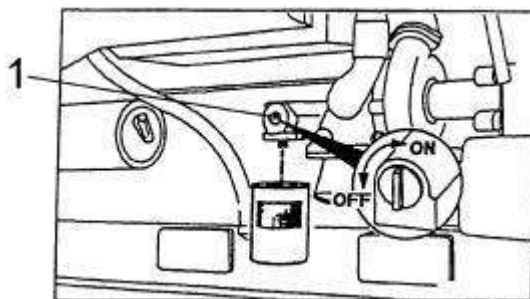


Fig. 5.21. Shut-Off Valve of Coolant Filter

1. Open the engine side access door on the left side of the machine.
2. Open the radiator cap. Close shut-off valve (1) located on the left side of the engine, by placing it in OFF position.

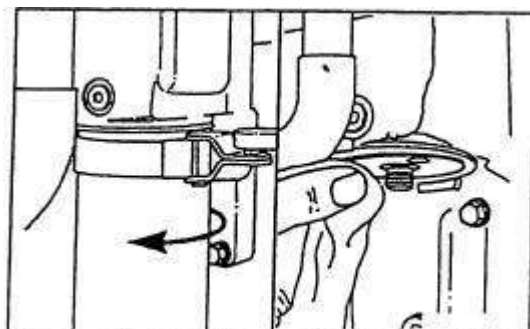


Fig. 5.22. Cleaning Coolant Filter Head

COOLING SYSTEM

3. Clean the area around the coolant filter.
4. Using a filter wrench, remove the coolant filter by turning it counterclockwise. Discard the filter in a suitable manner if it is not needed for any reason.
5. Clean the filter gasket surface of the filter header.



Fig. 5.23. Preparation of Coolant Filter for Replacement

6. Apply a thin coat of clean engine oil to the seal of the new filter. Do not allow the engine oil to get into the filter, because it will adversely affect the - DCA concentration level.

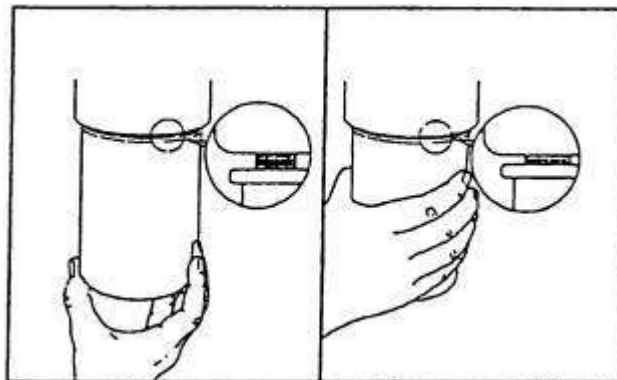


Fig. 5.24. Method of Coolant Filter Installation

7. Install the new filter on the filter header until the filter seal contacts the seal surface of the filter header and then, turn the filter an additional 1/2 to 3/4 turn by hand. Do not overtighten the filter or damage may result to the filter seal or threads.
8. After filter replacement, turn shut-off valve 1, Fig. 5.21 to the open position, located on the left side of the engine, and reinstall the radiator cap.
9. Start the engine and idle it for a few minutes. Check the filter for possible coolant leakage.

5.8.9. FILLING THE SYSTEM

NOTE: Be sure to fill the heater and heater supply lines with fresh coolant, even if the heater is not in use (warm weather). Leaving the heater core empty causes corrosion in the heater.

1. Be sure the radiator drain valve and engine drain valves are closed.
2. Fill the cooling system to the required capacity. For filling use antifreeze specified in SPECIFICATIONS AND CAPACITIES. It is recommended to use antifreeze according to the ambient temperature.
3. Start the engine and run it idle until the normal operating temperature is reached. Add coolant as needed to keep the level to the neck of the radiator.
4. After all air is removed and level remains fixed, install the radiator cap and check the system for leaks.



WARNING! Never add coolant into the radiator of an overheated engine unless absolutely necessary.

IMPORTANT! Cooling system must be deaerated and filled with the engine running and with the stabilized engine water temperature, i.e. water temperature gauge in the green area.

5.8.10. CLEANING THE RADIATOR

Remove all bugs and dirt from the radiator core, using air or water under pressure. Direct the flow to the core, opposite to the normal direction of air flow. The following should be cleaned:

- the radiator,
- the air conditioner cooler mounted on the engine fan shroud in the engine compartment, on the right side of the engine compartment, if equipped,
- the fuel cooler of QSK-19C engine located directly under the fan - for QSK 19C engine only.

Access to the radiator is gained after removing bolts 1, Fig. 5.25 and lifting the grill mounted on gas springs.

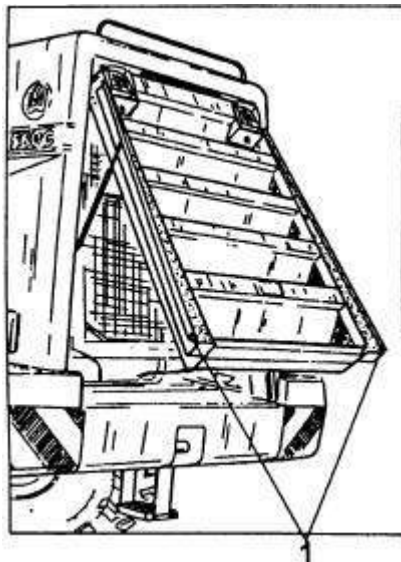


Fig. 5.25. Cleaning Radiator Grill

1 - Bolt

5.9. DRIVE AXLES



WARNING: Prior to servicing the machine block securely the wheels to prevent accidental moving of the machine.

5.9.1. CHECKING THE OIL LEVEL

IMPORTANT: Both front and rear axles are checked, drained and filled in the same manner.

1. Position the machine on level ground. Move the machine until the planetary plug (as shown in Fig. 5.28) is on the horizontal center line of the axle.
2. Apply the parking brake. Let the machine sit long enough for the oil in the axle and planetary to level out.

DRIVE AXLES

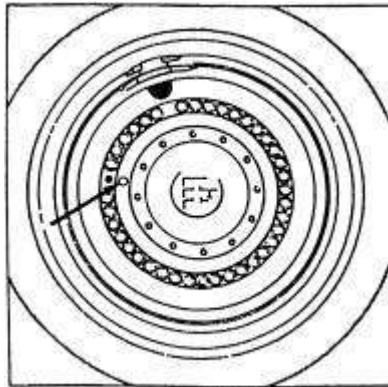


Fig. 5.26. Planetary Level Plug

3. Lubricant should flow from the planetary when the plug is removed. If necessary, remove the axle filler plug, Fig. 5.27 and add lubricant up to the level of the planetary level plug.
4. Install planetary level and axle filler plugs.

5.9.2. CHANGING THE OIL

1. Work the machine until the axle lubricant reaches the operating temperature. Park the machine on level ground. Apply the parking brake. Remove the axle filler plugs shown in Fig. 5.27 and drain plugs shown in Fig. 5.28. Allow lubricant to drain thoroughly.
2. Release the parking brake and move the machine only enough to locate each planetary plug in turn to the lowest point for draining. With the drain plugs in this position remove planetary plugs and drain oil. Allow lubricant to drain thoroughly. The above described steps should be performed for all four wheels.

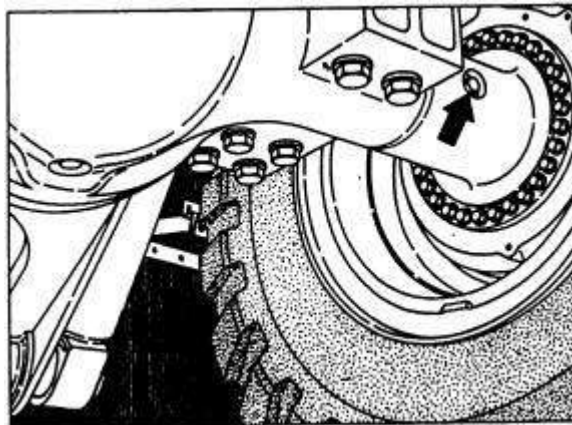


Fig. 5.27. Axle Filler Plug

3. Install the drain plugs in both axles. In the first axle install the planetary plug only in one wheel. Moving the machine position the other plug in oil level check position (horizontal). Fill the axle with fresh lubricant through the fill hole in the axle until the lubricant starts to flow from the hole. Install all plugs. Fill the other axle in the same manner. Refer to REFILL SPECIFICATIONS AND CAPACITIES CHART.
4. Operate the machine for a couple of minutes to distribute the lubricant throughout the axle and planetaries.
5. Recheck each axle level as outlined above.

MAINTENANCE

DRIVE AXLES

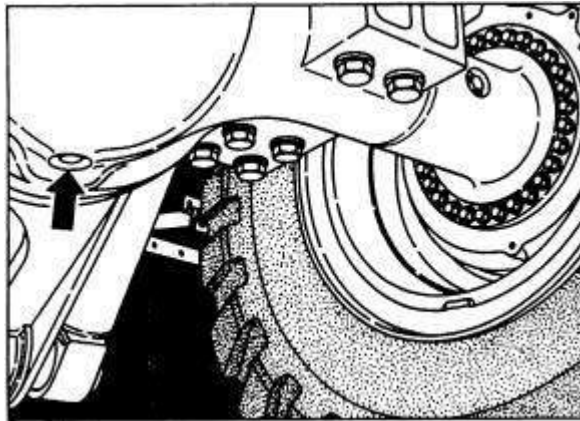


Fig. 5.28. Axle Oil Drain Plug

5.10. ELECTRICAL SYSTEM

5.10.1. ELECTRIC WIRES



WARNING! Before working on the electrical system, disconnect the electrical system master switch and remove the key.

All terminals must be clean and fastened securely. Repair or replace all broken wires immediately. Surface under all terminals must be clean and good electrical connections must be established after reassembly. Also all clips must grip cables tightly to prevent vibrations and rapid cable wear. All clips a straps must be closed in a workmanlike manner, so as not to damage the insulation.

5.10.2. CIRCUIT BREAKERS

Electrical circuits are protected by automatic reset circuit breakers. Electrical system is protected with circuit breakers:

10 amp (2 units), 20 amp (1 unit), 25 amp (1 unit) and 30 amp (1 unit). In the event of a "short circuit" or "ground", the circuit breaker will open before damage occurs and will continue to open and close until the trouble clears or is corrected. When replacing use circuit breakers of the same amps.

To replace circuit breaker carry out as follows:

1. Remove the screws mounting the instrument panel, lift the instrument panel and shift to the side.
2. Remove the screws mounting the circuit breaker and replace it.
3. Reassembly in the reverse order.

5.10.3. BULB OR LAMP REPLACEMENT

GAUGE CLUSTER BULBS

For a bulb replacement carry out as follows:

1. Remove the screws mounting the gauge cluster to the instrument panel
2. Lift and shift the gauge cluster to the side.
3. Remove the socket, remove the burnt bulb install a new bulb and press in the socket home.
4. Re-install gauge cluster.

ELECTRICAL SYSTEM

INSTUMENT PANEL LIGHTS

For a bulb replacement carry out as follows:

1. Remove the instrument panel mounting screws and lift it and shift to the side.
2. Pull the bulb socket free.
3. Press in the bulb, turn it home counterclockwise and remove it form the socket.
4. Install a new bulb, press it in home and turn it clockwise.
5. Install the socket with the bulb.
6. Secure the instrument panel with the screws.

FRONT AND REAR DRIVING LIGHTS, INDICATORS, STOP AND TAIL LAMPS

All lights are demountable from outside. For a bulb replacement carry out as follows:

1. Remove the screws mounting the optical element.
2. Remove the optical element.
3. Replace the bulb.
4. Reassemble in the reverse order.

Back up lights, stop and rear indicators are mounted on a folding bracket to position them as required by the traffic regulations.

ECM WARNING LIGHTS BULBS

Use genuine bulbs only

5.10.4. BATTERIES

The loader is equipped with 4 standard maintenance free batteries located in the compartment to the left-hand side of the hydraulic reservoir. When equipped with 2 maintenance free batteries or 8 batteries for arctic version, they will be located in compartments on each side of the hydraulic reservoir. When standard batteries are used, the right hand compartment may be used as a tool storage compartment.



WARNING! Batteries give off a highly flammable gas. Do not smoke or allow sparks open flame near the batteries because a fire or explosion could result.



WARNING! Battery acid causes severe burns. Avoid contact with eyes, skin, or clothing. Wear goggles, rubber glove, and apron. If eye contact occurs, flush with water for 15 minutes and get prompt medical attention. If skin contact occurs, flush with water.



WARNING! When using a booster battery and jumper cables, connect the negative (ground) cable to the machine's frame, away from the battery. Always connect the ground cable last and disconnect it first to avoid sparks near the battery. A spark could cause a battery explosion and injury.



WARNING! Never check the battery charge by placing a metal object across the terminals. The sparks could cause a battery explosion. Use a voltmeter or hydrometer to measure the charge.



WARNING! Be sure the electrical system disconnect switch is off when connecting or disconnecting batteries to minimize the chance of sparks and explosion.

ELECTRICAL SYSTEM



WARNING! Never start the engine by connecting across the terminals on the starter motor. Such starting is particularly dangerous with transmission in gear.

MAINTENANCE

Proper battery maintenance will assure maximum service. Following are a few simple rules:

1. Keep the battery cable terminals clean and tight.
2. Replace the worn, cracked, broken or corroded cables.
3. Keep the batteries fastened securely in the frame.
4. Maintain the proper electrolyte level when using regular batteries.
5. Maintain the batteries fully charged, particularly in winter.

NOTE: Excessive tightening can warp or crack the battery case.

CLEANING THE BATTERIES

If the top of a battery is dirty, it may be cleaned with a brush dipped in ammonia or soda solution. After the foaming stops, flush off the battery with clean water and unseal the vent plugs. Brighten the terminal contact surfaces with steel wool or a stiff brush.

ATTACHING BOOSTER BATTERY

When the charge in the machine's batteries is too low to crank the engine, a booster battery can be used to help start the engine.



WARNING! Always connect the ground cable last and disconnect the ground cable first to avoid sparks near the battery. A spark could cause a battery explosion and injury.

Connect the positive cable of the booster battery to the cranking motor and connect the negative (ground) cable of the booster battery to the machine frame. Be sure the negative cable is 300 mm or more away from the battery. The parking brake should be applied, and transmission lever locked in neutral position.

ELECTROLYTE LEVEL

The electrolyte in each cell must be at the proper level (21 to 27 mm above the plates) at all times to prevent battery failure. Check the level of the electrolyte. When the electrolyte is below this level, pure distilled water must be added. Never use hydrant water or any water which has been in a metal container. Acid or electrolyte must never be added except by a skilled battery man.

Under no circumstances add any special battery solutions or powders. It is especially important to keep the battery at full charge for cold weather operation. Add distilled water to the battery in freezing temperatures only when the engine is to operate for several hours, to thoroughly mix the water and the electrolyte, or damage to the battery may occur.

CHARGING FULLY DISCHARGED BATTERIES.

Check amount of charge of batteries:

100% of full charge	1.26 - 1.28 g/cm ³
75% of full charge	1.23 - 1.25 g/cm ³
50% of full charge	1.20 - 1.22 g/cm ³
Fully discharged	1.11 - 1.13 g/cm ³

When a machine is not in use for an extended period, the maintenance-free battery can become discharged. For this reason, when a machine will not be used for over 30 days, it is recommended that the negative ground terminal cable be disconnected. Prior to starting up a machine that has been idle, always make a visual inspection of the battery and take an open circuit voltage test. A reading of 1.23 g/cm³ (75% of full charge) or less indicates a state of discharge.

5.11. ENGINE



WARNING! Wear hand and eye protection when draining hot fluids.



WARNING! Before servicing the engine, be sure the bucket is lowered to the ground, the transmission shift lever is locked in neutral (N), the parking brake is applied, electrical system disconnect switch is off, and the key removed. Tag the machine.

5.11.1. CHECKING THE CRANKCASE OIL LEVEL

1. Open the engine side door on the right side of the machine.
2. Check the oil level using dipstick 1, Fig. 5.29.
3. The oil level should be between L and H marks, Fig. 5.30. Add oil if necessary thru filler port (2, Fig. 5.29). Check the oil level daily. Never start the engine when the oil level is below L mark (too low) or above H (too high) at the dipstick (see Fig. 5.30). Check the oil level prior to starting the engine or at least 5 minutes after stopping the engine. This allows the oil to drain back into the crankcase.

IMPORTANT: Park the loader on level ground for correct oil level reading.

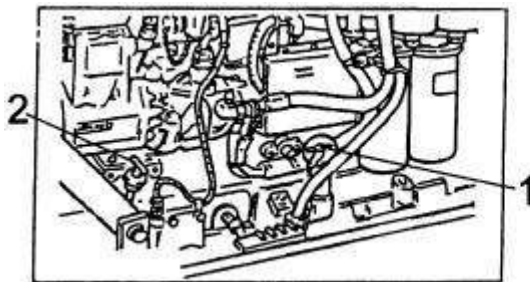


Fig. 5.29. Location of Dipstick

1 - Filler Port 2 - Dipstick

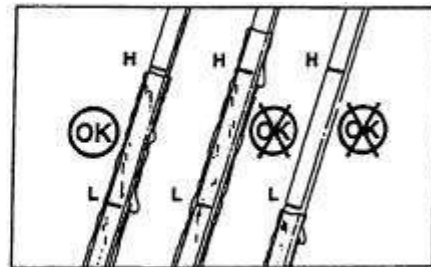


Fig. 5.30. Engine Oil Dipstick

5.11.2. DRAINING THE CRANKCASE OIL

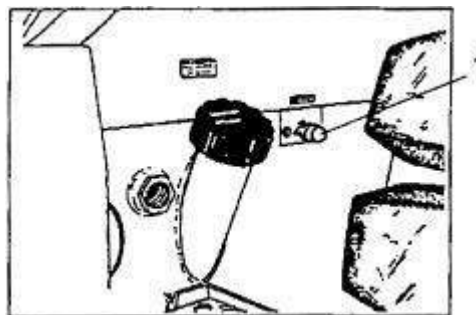


Fig. 5.31. Oil Drain Valve

1. Place the machine on level ground, start the engine and warm it to the operating temperature.
2. Remove the castellated nut protecting automatic valve 1, Fig. 5.32. Install drain hose (included in the machine accessories) on the open thread. Drain valve will be opened automatically as the hose nut is thread in. Drain the oil completely to a container.



WARNING! Avoid direct contact of hot oil with your skin. Hot oil can cause personal injury.

ENGINE

5.11.3. CHANGING THE LUBRICATING OIL FILTERS

Change the engine lubricating oil and filters at every oil change interval.

1. Drain the crankcase oil as outlined in 5.11.2.
2. Open the engine side access door on the right side of the machine.

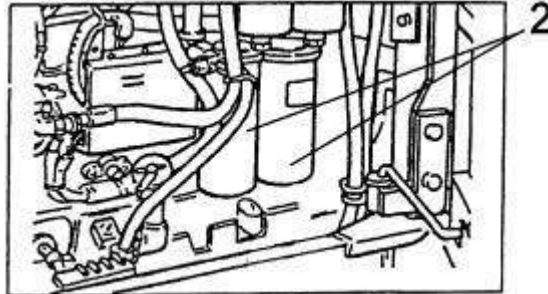


Fig. 5.32. Lubricating Oil Filters

3. Clean the area around two full flow oil filters (2).
4. Using a filter wrench, remove the two full flow oil filters by turning them counterclockwise. Discard the filters in a suitable manner if they are not needed for any reason.
5. Clean the filter gasket surface of the filter header for each filter. The oil filter O-ring may stick on the filter header. Make sure the O-ring is removed.
6. Fill the new filter with clean engine oil. Then, apply a thin coat of clean engine oil to the seal of the filter, as shown in Fig. 5.33.

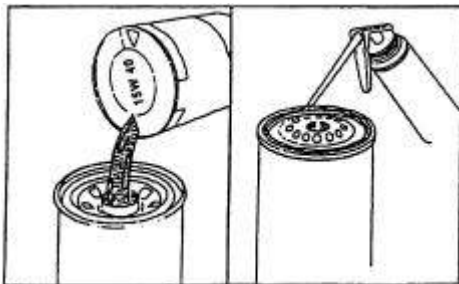


Fig. 5.33. Preparing Filters for Installation.

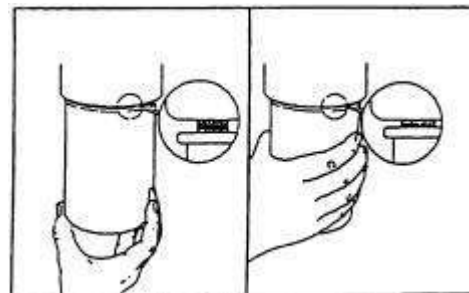


Fig. 5.34. Method of Oil Filter Installation

IMPORTANT: If the filter is not filled with engine oil, there will be a lack of lubrication during the delay until the filters are pumped full of oil. This lack of lubrication is harmful to the engine.

7. Install the filter on the filter header until the filter seal contacts the seal surface of the filter header and then, turn the filter an additional 1/2 to 3/4 turn by hand, Fig. 5.34. Do not overtighten the filter or damage may result to the filter seal or threads. Use genuine filters only.

5.11.4. FILLING WITH OIL.

1. Remove oil drain line. Check that automatic drain valve is tight. Install and tighten the metal locknut.
2. Remove oil filler cap 2, Fig. 5.29. Fill the engine with the type and quantity of engine oil specified on the oil filler. The type of lubricant used depends on the ambient temperature. Select according to the table specified in REFILL SPECIFICATIONS AND CAPACITIES CHART.
3. After refilling the engine with oil and before starting the engine, perform the procedure outlined under 4.12.3. STARTING AFTER OIL CHANGE OR LONGER STORAGE. This procedure insures that the engine receives proper lubricating oil flow. Lack of lubrication will damage the engine.

ENGINE

4. Start the engine and idle it for a few minutes. Inspect for oil leaks at the filters and drain plug. Then stop the engine, wait for a couple of minutes to allow the oil to drain and check the oil level per 5.11.1. If necessary, add oil to bring the oil level up to the specified mark on the oil level gauge.
5. Close the engine side access door.

NOTE: Check the condition of drained oil.

- black oil indicates dilution with fuel
 - milky discoloration indicates dilution with coolant
- Such leaks may cause serious damage to the engine.

5.11.5. FAN



WARNING! Damaged fan blades may cause serious injury. Never pull the fan blades nor lift them. This may damage the fan and cause injury.

NOTE: Turn the fan as recommended by the engine manufacturer. Inspect the fan for cracked and bent blades and loosened rivets. Check that the fan is securely mounted. Tighten the bolts if necessary. A damaged fan must be replaced.

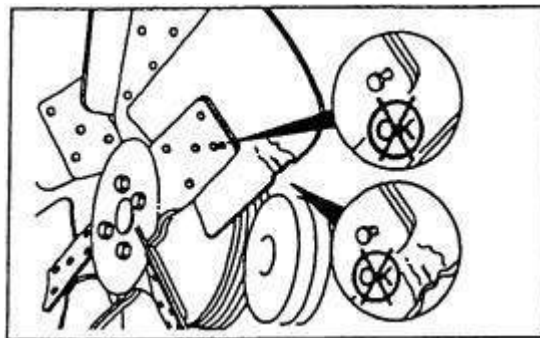


Fig. 5.35. Fan Defects

5.11.6. BELTS

INSPECTION

Inspect visually the drive belts. Replace badly worn, greasy or severely cracked belts immediately. These conditions prevent proper function. Adjust the tension of the belts that have glossy surface mating the pulley. This indicates belt slippage. If the belts are properly installed and tensioned, the belt and pulley will wear evenly.

MAINTENANCE

ENGINE

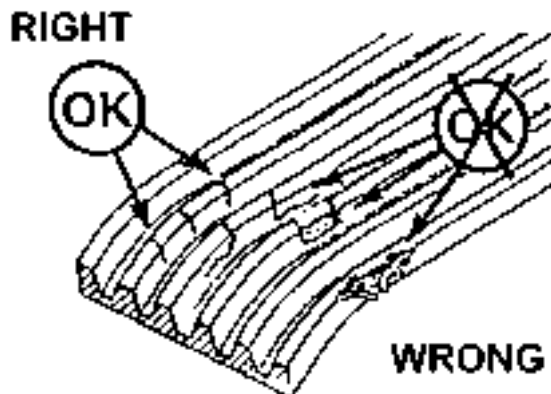


Fig. 5.36. Belt Inspection

Belt damage may occur due to:

- improper tension,
- improper installation,
- severe operating conditions,
- contamination with oil or grease.

CHECKING THE TENSION

Check the belt tension midway at the longest span between the pulleys using a tension gauge.

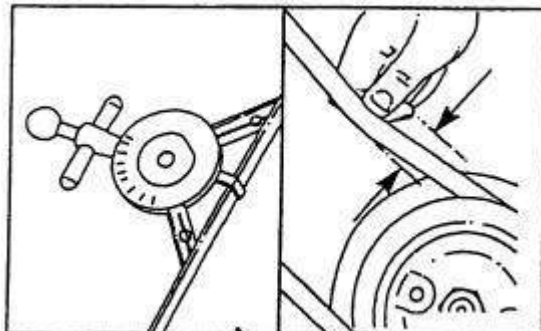


Fig. 5.37. Checking Belt Tension

Refer to Engine Operation Manual for the type of a tension gauge as well as the tension values for various belt widths.

For QSK 19-C (5-groove belt) these values are as follows: a new belt tension 670 N, retension 270 to 530 N.

For KT 19-C (15-groove belt) those values are as follows: a new belt tension 1670 N, retension 670 to 1340 N.

A belt is considered used when operated at least 10 minutes.

Alternately belt tension may be checked by pressing the belt midway between pulleys as shown in Fig. 5.37. Deflection under a force of 110 N should not exceed belt thickness at a 30 cm distance between the pulleys. Adjust the belt if deflection exceeds the above value. New belts lose their tension during operation.

ENGINE

ADJUSTMENT

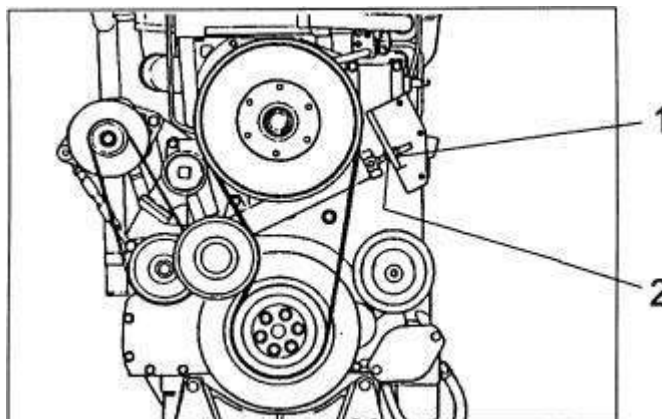


Fig. 5.38. Fan Belt Adjustment

Loosen nut 2 to the end of the thread. Tension by hand the adjuster roller until it contacts with the belt. Tighten nut 1 finger tight, then tighten nut 1 using a wrench by 9 turns. Torque nut 2 to 81 Nm.

5.12. ETHER INJECTOR

PRECAUTIONS



WARNING! Ether starting fluid is highly flammable. Follow strictly the precautions on the container. An explosion can result if sparks or flame contact the ether or if the container is stored where the temperature exceeds 70°C.

1. Do not use the ether injector when the air temperature is above freezing (0°C).
2. Do not smoke when using ether starting fluid.
3. Do not store fluid containers in the operator's compartment.
4. Keep the fluid containers out of reach of children.
5. Do not breathe the hazardous ether vapor.
6. Do not let ether contact you skin, because it can cause frostbite.
7. Never puncture the fluid container or put it into a fire. Dispose of empty containers properly.
8. For your safety, remove the ether container when welding, grinding, or using a torch on the machine.

NOTE: *Improper starting fluids can cause valve seizure and severe damage to the engine. Consult distributor for the recommended starting fluid to be used.*

IMPORTANT: *The ether starting valve inlet must be sealed against the entry of dirt at all times by having a container installed or by installing the dust cap provided with the valve.*

INSPECTION AND CLEANING

Make certain that ether is available under pressure. To do so, remove the ether container and check if a good spray is obtained. If not, replace with a new container. If a good spray was obtained, install the container and test the ether injector as follows:

1. Disconnect the ether tube at the spray nozzle in the engine manifold. Remove the spray nozzle.
2. Reconnect the nozzle to the tube.
3. Direct the nozzle away from the engine and actuate the ether injector.
4. Dribbling or no spray indicates a blocked spray nozzle or tube. If necessary, clean or replace nozzle and/or tube.

ETHER INJECTOR

CHANGING THE FLUID CONTAINER

1. Loosen wing nuts 1 securing the fluid container support saddle 4.
2. Unscrew and discard container 2 from the ether starting valve in a suitable, closed refuse container.
3. Install the new container 3 in the valve.
4. Secure the container in place by tightening the saddle nuts. Do not over tighten the nuts.

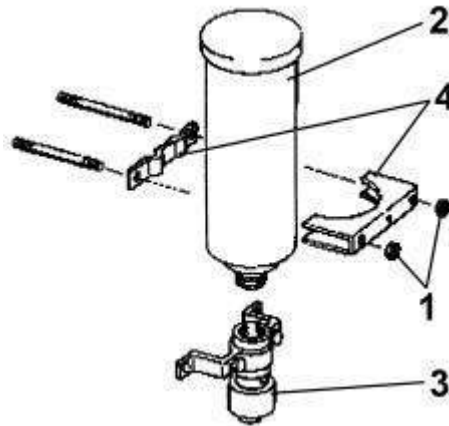


Fig. 5.39. Installing Ether Injector

- | | |
|---------------------|------------|
| 1 - Mounting Nuts | 3 - Valve |
| 2 - Ether Container | 4 - Saddle |

5.13. FUEL SYSTEM

Cleanliness of diesel fuel determines the service life of the fuel injection components. Water contaminants, allowed to reach precision injection components, cause rapid wear and poor performance. Clean fuel and regular servicing of the fuel tank and fuel filtering components are necessary for long service life. Always clean the area around the fuel tank filler cap before refueling.



WARNING! Do not smoke while filling the fuel tank or servicing the fuel system because a fire or explosion could result



WARNING! When filling the fuel tank, place the fuel nozzle against the side of the neck to reduce the chance of static electricity sparks.



WARNING! Never remove the fuel filler cap or fill the fuel tank while the engine is running or when the machine is indoors. The fumes are hazardous and a spark or flame can cause a fire or explosion.



WARNING! Never mix gasoline, gasohol (a mixture of corn alcohol and 90% gasoline), or alcohol with diesel fuel. This creates a fire or explosion hazard which could result in personal injury or death.

5.13.1. CHANGING THE FUEL FILTERS

GENERAL

The fuel filters are spin-on type filters. These filters cannot be cleaned and should not be disturbed except when it becomes necessary to replace them.

FUEL SYSTEM

Change the fuel filters as listed in the SCHEDULED MAINTENANCE GUIDE or sooner if a power loss is evident. If a power loss persists, find the cause and correct. Fuel containing more than the average impurities may require changing filters at shorter intervals.

The fuel filters are located as shown in Fig. 5.40.

Be careful not to allow dirt, water or other foreign material to get in a new filter. Keep new filters in the original package until ready for installation.

NOTE: Use only genuine filters because of possibility of damage of the fuel system.

REPLACEMENT

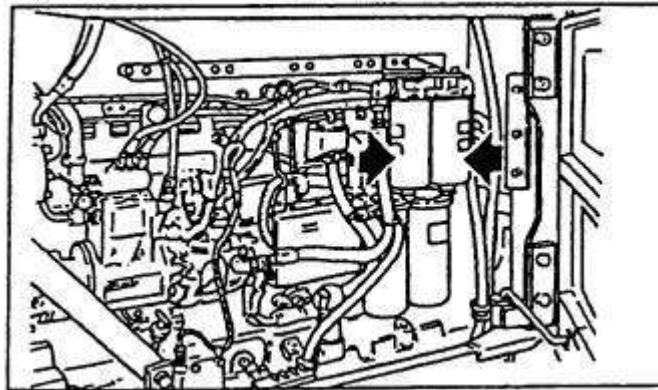


Fig. 5.40. Fuel Filters

1. Open the engine side access cover on the right side of the machine.
2. Clean the area around the fuel filters.
3. Using a filter wrench, remove the fuel filters by turning them counterclockwise. Discard the filters in a suitable manner if they are not needed for any reason.
4. Clean the filter gasket surfaces of the filter header for each filter (Fig. 5.40). Replace the filter O-rings.

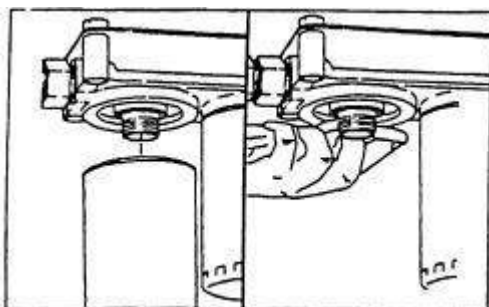


Fig. 5.41. Cleaning Fuel Filter Header

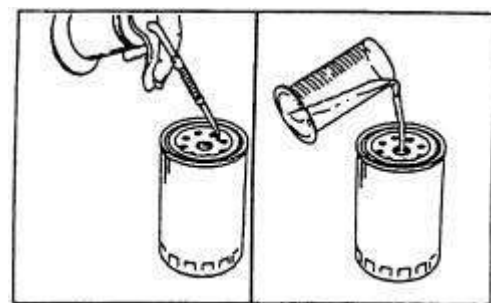


Fig. 5.42. Preparing Filters For Installation

5. Fill the new filters with clean diesel fuel. Then apply a thin coat of clean engine oil to the seal of the filter. See Fig. 5.42.
6. Install the filters on the filter header until the filter seal contacts the seal surface on the filter header and then turn the filter an additional 1/2 to 3/4 turn by hand (Fig. 5.43). Do not overtighten the filter or damage may result to the filter seal or threads. Use genuine filters only.

MAINTENANCE

FUEL SYSTEM

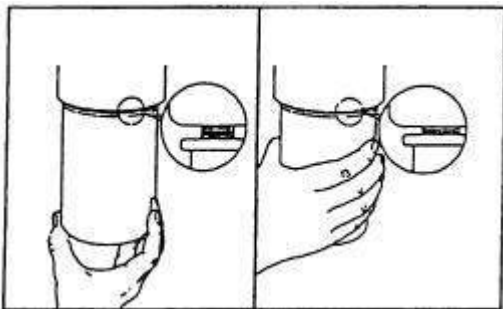


Fig. 5.43. Method of Fuel Filter Installation

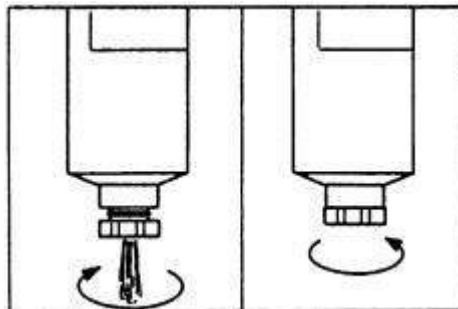


Fig. 5.44. Draining Fuel Filter Water Separator

Fuel filters are equipped with water separators., Fig. 5.44.

To drain water and sediment carry out as follows:

- stop the engine,
- turn the water separator drain valve to the left by 1.5 to 2 turns,
- drain the water until clear fuel start to flow,
- close the valve by turning home to the right.

NOTE: Do not overtighten the valve not to damage valve thread.

5.13.2. FUEL TANK

FUEL STRAINER

The fuel strainer is installed in filler pipe (1, Fig. 5.45). Access is possible upon the removal of the filler cap and retainer. The fuel strainer performs a coarse filtration of the fuel facilitating the operation of the fuel filters. Keep the fuel strainer clean. Use kerosene or diesel fuel for cleaning.

FUEL LEVEL SIGHT GAUGE

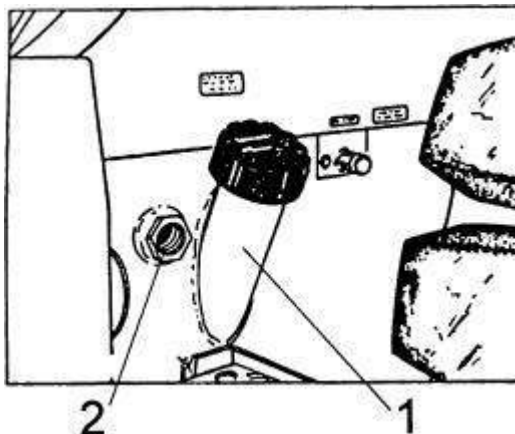


Fig. 5.45. Fuel Tank

1 - Filler Pipe

2 - Sight Gauge

Sight gauge (2, Fig. 5.45.) is located on the right side of the fuel tank. If the fuel level is not visible in the gauge, fill the tank. To prevent moisture due to condensation, the fuel tank should be refilled at the end of each day's operation.

FUEL SYSTEM

FUEL TANK BREATHER

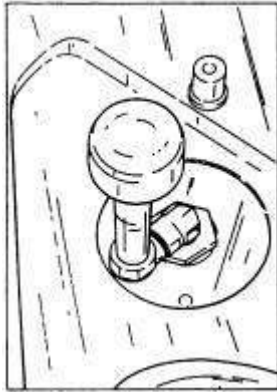


Fig. 5.46. Fuel Tank Breather

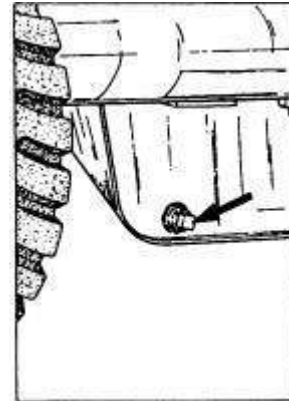


Fig. 5.47. Fuel Tank Drain Plug

The breather (Fig. 5.46) is located on the right side of the fuel tank, close to the engine crankcase. Access is possible upon opening the engine side panels. Clean the breather with a suitable solvent and dry with compressed air.

DRAINING WATER

Remove the drain plug (Fig. 5.47) located on the front wall of the tank in its lowest point. Wait until clean fuel starts to flow. Reinstall the drain plug. Drain fuel to a clean container. Allow water and sediment to collect on the bottom of the container and refill the clean fuel collected above the sediment and water.

5.14. HYDRAULIC SYSTEM

GENERAL

Before removing any components from the hydraulic reservoir, clean the top surface of the reservoir and the components to be dismantled with a commercial cleaning solvent.



WARNING! Before servicing the machine, be sure the engine is off, the bucket is lowered, the transmission shift lever is locked in neutral (N), the parking brake is applied, the electrical system disconnect switch is off, and the key is removed.



WARNING! This machine has a pressurized hydraulic reservoir. Loosen the filler cap slowly to relieve the pressure before disassembly of any hydraulic system component. Do not overfill.



WARNING! Always lock the frame halves together with the frame locking bar and pins before performing service near the machine's articulation pivot.

5.14.1. CHECKING THE RESERVOIR OIL LEVEL

1. Park the machine on level ground. Lower the bucket to the ground.
2. Stop the engine and apply the parking brake.
3. Check the oil level sight gauge. If the ball is not floating in the window, fluid must be added.

MAINTENANCE

HYDRAULIC SYSTEM

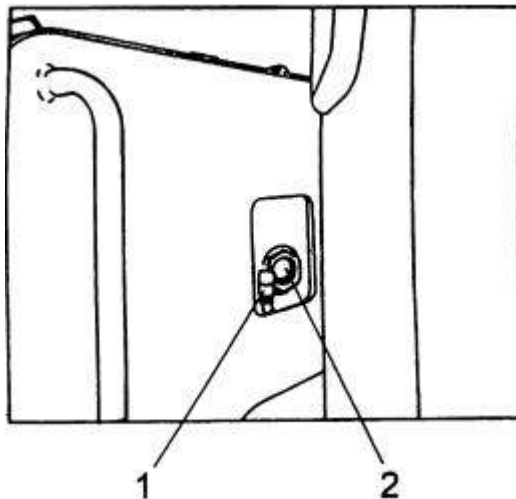


Fig. 5.48. Hydraulic Tank Sight Gauge

1 - Air Filter Service Indicator

2 - Hydraulic Reservoir Sight Gauge



WARNING! This machine has a pressurized hydraulic reservoir. Loosen the filler cap slowly to release the pressure. It is obligatory before disassembly of any hydraulic system components.

4. Slowly remove the reservoir filler cap. Add fluid until the ball in the sight gauge reaches the top of the gauge. Refer to "REFILL SPECIFICATIONS AND CAPACITIES CHART" for the grade of fluid specified.
5. Install the filler cap.

5.14.2. CHANGING THE HYDRAULIC SYSTEM OIL

1. Operate the boom, bucket and steering circuits until the hydraulic oil becomes warm.
2. Park the machine on level ground, lower the bucket flat on the ground.
3. Stop the engine, and apply the parking brake.
4. Open access cover 1, Fig. 5.49.
5. Clean the top of the reservoir with kerosene or cleaning solvent.
6. Remove the plug from the reservoir drain valve, Fig. 5.50.
7. Fit a short threaded pipe P/N 470-90-1008 into the end of a piece of hose P/N 470-90-1006 (enclosed in accessories). Screw the pipe into drain valve (4). Put the other end of the hose into a container large enough to hold the fluid from the reservoir.
8. Raise the bucket completely, and roll the bucket all the way back.



WARNING! NEVER work or walk under a raised bucket without proper blocking in raised position.

9. Remove reservoir covers 2, Fig. 5.49.

HYDRAULIC SYSTEM

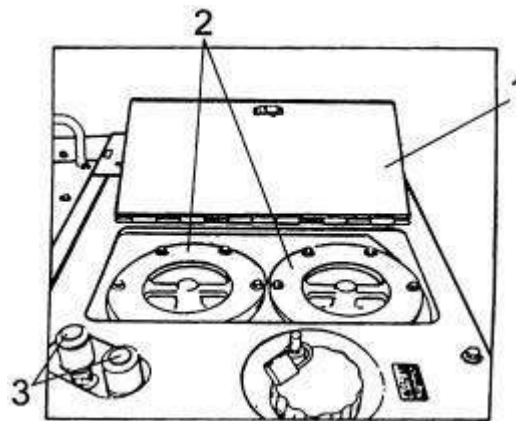


Fig. 5.49. Hydraulic Reservoir Oil Filters

1 - Access Door 2 - Filter Covers 3 - Breathers

10. Open the drain valve , allow the reservoir to drain, then close the valve.
11. Lower the boom slowly. After the boom comes to rest on the ground, push the bucket lever forward, and let the bucket down slowly. This will force the hydraulic oil out of the boom and bucket cylinders and into the reservoir.
12. Open the reservoir drain valve again.
13. Allow the reservoir to drain completely.
14. Clean the reservoir screens at the bottom of the tank using kerosene and dry with compressed air.
15. Replace the reservoir filters, refer to 5.14.3. Close the drain valve. Remove the drain pipe and hose from the drain valve. Install the plug into the drain valve.
16. Fill the reservoir with clean fluid until the ball in sight gauge (2, Fig. 5.48) reaches the top of the gauge, refer to REFILL SPECIFICATIONS AND CAPACITIES CHART.
17. Install and tighten the filler cap.
18. Start the engine and operate the boom and bucket to fill the hydraulic cylinders with fluid.
19. Lower the bucket to the ground and shut down the engine. Check the oil level as described in 5.14.1.

IMPORTANT: The reservoir must be refilled in this manner until the proper level is maintained after the hydraulic system is operated at least five complete cycles.

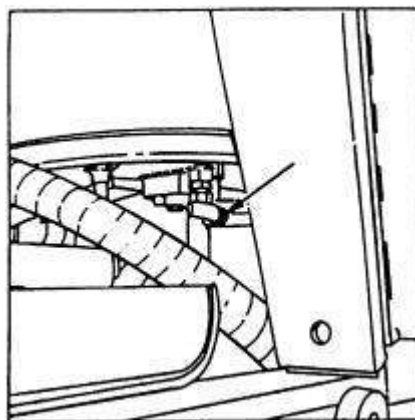


Fig. 5.50. Hydraulic Reservoir Drain Plug

HYDRAULIC SYSTEM

5.14.3. CHANGING THE OIL FILTERS

Replace the oil filters when changing oil or earlier, when filter warning light comes on.

1. Drain the reservoir as described in 5.14.2.
2. Remove reservoir covers 2, Fig. 5.49.
3. Remove the two filter elements 2 from inside of the reservoir.
4. Clean the reservoir screens at the bottom of the tank using kerosene and dry with compressed air.
5. Install new filter elements. Torque mounting nuts to 14-16 Nm
6. Install the plug into the drain valve.
7. Close the drain valve.
8. Install reservoir covers 2, Fig. 5.49.
9. Fill the reservoir per REFILL SPECIFICATIONS AND CAPACITIES CHART.

5.14.4. SERVICING THE HYDRAULIC RESERVOIR BREATHER



WARNING! This machine has a pressurized reservoir. Loosen the filler cap slowly to relieve the pressure before disassembly of any hydraulic component.

1. Loosen the reservoir cap slowly to relieve the pressure.
2. Remove lock ring 2 and cover 4.

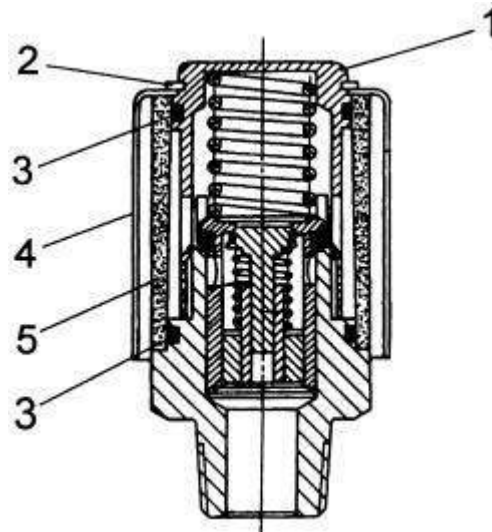


Fig. 5.51. Hydraulic Reservoir Breather

- | | |
|---------------|------------|
| 1 - Cap | 4 - Cover |
| 2 - Lock Ring | 5 - Filter |
| 3 - Seal Ring | |

3. Remove filter 5 and clean in a commercial solvent and dry with compressed air.
4. Check seal rings 3 for wear or deterioration. Replace if necessary.
5. Reinstall filter 5 and cover 4. Secure with ring 2.
6. Tighten the reservoir filler cap.
7. Service the other breather in a similar manner.

5.15. SEAT BELT



WARNING! Do not use bleach, color dye or solvents on the seat belt webbing, because this can weaken it and cause personal injury. Clean the seat belt only with warm water and a mild detergent. Replace belts when worn, frayed, torn, stiff, or rotted webbing or defects of the tang, buckle or anchors are detected.

Keep belt flat to avoid twisting and roping when not being used. Do not place heavy or sharp objects on the belt.

The entire seat belt assembly should be inspected periodically for corrosion, wear, fraying or weak spots. The seat belt mounting bolts should also be periodically inspected for looses.

5.16. STEERING GEAR

Check the lubricant level by removing the cap screw in the side cover, Fig. 5.52. If the lubricant is below the cap screw hole add lubricant through the hole as necessary. Refer to "REFILL SPECIFICATIONS AND CAPACITIES CHART" for grade of lubricant specified.

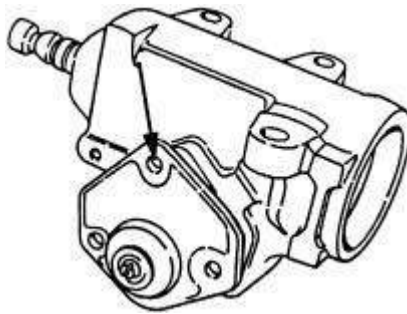


Fig. 5.52. Steering Gear Fill Location

5.17. TIRES AND RIMS

Avoid parking the machine in puddles of oil, grease or gasoline because this damages the tires.

INFLATION



WARNING! Never inflate a flat tire without inspecting the tire, rim and wheel for damage. Be sure all components are properly assembled. Unmounted tires being inflated or deflated should be placed in a tire safety cage. Inflate the tire to 35 kPa and check that all components are properly seated. Never stand directly in front of a tire and rim assembly while inflating. Use a clip-on chuck with a hose long enough to allow the person inflating the tire to stand to the side. Serious injury could result if the tire and mounting were to separate.

PROPER INFLATION

Maintaining the proper air pressure provides maximum road contact and results in increased tire life. Check inflation pressures with an accurate tire pressure gauge when the tires are cool. Be sure to install valve caps after inflating a tire. Refer to SPECIFICATIONS for normal operating inflation pressure. Never vent built-up pressure in a tire, such as encountered on hot days. Pressure build-up on hot days actually protects the tires by avoiding excessive sidewall flexing and its overheating, which are detrimental to tire life. Venting tires will also result in underinflation when the tire cools.

UNDERINFLATION

To little air pressure increases deflection, causes the tire to wipe and scuff over the road, results in extra strain on the tire and increases the chance of bruising.

OVERINFLATION

Overinflation reduces the tire deflection and the tire contact area causing the tire to ride on the crown and results in rapid wear in the center of the tread.

CHANGING



WARNING! Tire and rim repairs must be done by specially trained persons using special safety tools. An improperly repaired tire or rim can separate suddenly and cause serious injury.

Wheel rim components should be checked for damage and cracks. Damaged parts must be replaced, NOT repaired. Disassembly of tubeless tire of this size is very difficult. Therefore, do not replace parts yourself. Contact Construction Equipment Authorized Distributor or tire distributor where persons with special training and safety tools are available.

5.18. TRANSMISSION AND TORQUE CONVERTER

5.18.1. CHECKING THE OIL LEVEL



WARNING! When it is necessary to make any checks or adjustments with the engine running, use two people. A trained operator must be at the controls to safeguard the mechanic making the checks or adjustments. Be sure the transmission shift lever is locked in neutral (N), the frame halves are locked together and the parking brake is applied.

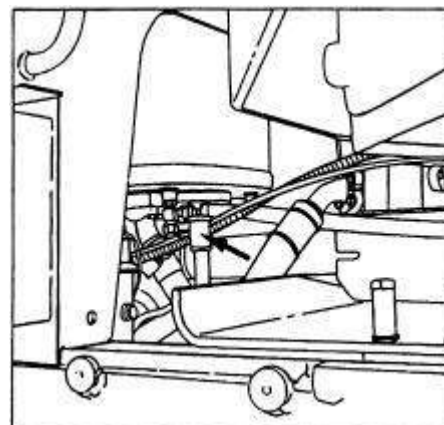
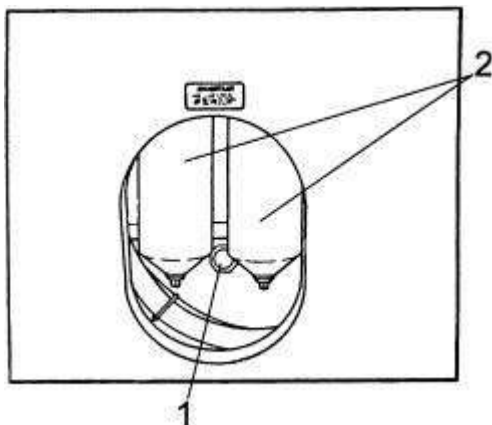


Fig. 5.53. Transmission Oil Level Sight Gauge Fig. 5.54. Transmission Oil Filler Tube

1 - Sight Gauge 2 - Filters

1. Park the machine on level ground.
2. Lock the transmission in "N" (neutral), lower the bucket to the ground and apply the parking brake.
3. Stop the engine and install the frame locking bar.
4. Start the engine and let it run at low idle.
5. Check that oil can be seen in the top half of sight gauge 1, Fig. 5.53. in the cutout on the right side of the rear frame close to the transmission. The transmission oil level is correct when the ball is 10 mm above the middle of sight gauge with the engine running at low idle.

TRANSMISSION AND TORQUE CONVERTER

6. Add oil if necessary thru the filler tube, Fig. 5.54 upon the removal of the filler cap. The oil level should be visible in the sight gauge. Refer to "REFILL SPECIFICATIONS AND CAPACITIES CHART".

IMPORTANT: If the oil level is above the sight gauge, drain the oil until the level is in the middle of the sight gauge. Too much oil in the transmission will cause aeration of the oil.

5.18.2. CHANGING THE OIL

1. With the oil at the operating temperature, park the machine on level ground. Lower the bucket to the ground, apply the parking brake and stop the engine. Install the frame locking bar.
2. Remove the drain plugs from the transmission and torque converter.
3. Replace the filter elements of the transmission and torque converter and brake cooling systems as described in 5.18.3. and 5.7.1.
4. Drain the transmission and torque converter completely and reinstall the drain plugs.
5. Clean the transmission strainer as described in 5.18.4.
6. Fill the transmission with fresh oil as described in 5.18.1.
7. Prior to starting the machine check for leaks the following connections: drain plugs, transmission and torque converter filters, brake cooling filter and transmission strainer.
8. Deaerate the brake system.

5.18.3. CHANGING THE OIL FILTERS

In Fig. 5.55 are shown two filters visible in cutout of right wall of the rear frame.

1. Remove all the dirt from around filter base 1, Fig. 5.55 and case 6. Both filters have identical design. Each element is changed in the same manner.
2. Loosen bolt 8, hold case 6, and unscrew the bolt completely.
3. Pull case 6 free out of base 1 together with element 3 and other parts.

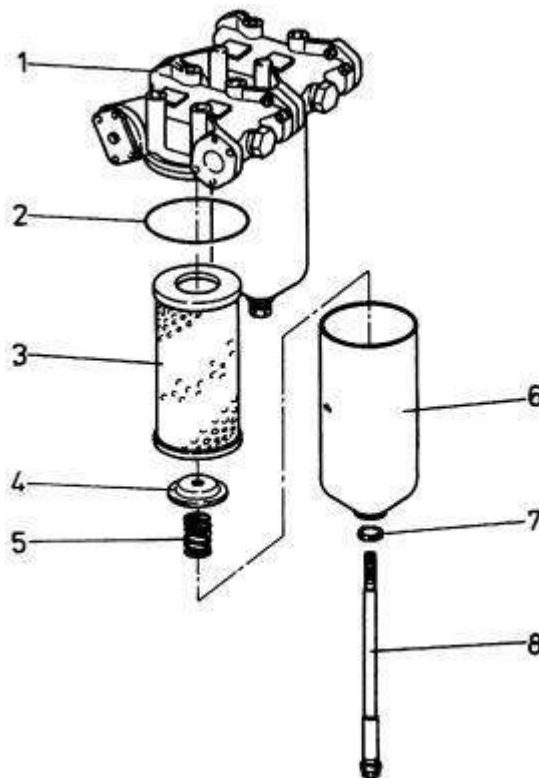


Fig. 5.55. Transmission and torque converter filters

TRANSMISSION AND TORQUE CONVERTER

- | | |
|---------------------|--------------------|
| 1 - Base | 5 - Spring |
| 2 - Seal ring | 6 - Case |
| 3 - Filter element | 7 - Sealing washer |
| 4 - Element support | 8 - Hold-down bolt |

4. Turn case 6 upside down to drain the oil.
5. Remove and discard element 3.
6. Remove and discard seal ring 2.
7. Wash all parts thoroughly in solvent and dry with compressed air. Wash the inside of base 1 thoroughly.
8. Insert hold-down bolt 8 with washer 7 through case 6.
9. Install spring 5, element support 4 and new filter element 3. Check that all parts are it is seated completely.
10. Coat new sealing ring 2 with chassis grease, if necessary, and install into base 1.
11. Install the filter case to the base with hold-down bolt 8 so the case seats squarely in the base. Torque the hold-down bolt to 140 Nm.
12. Start the engine and let it idle for approximately five minutes. Stop the engine and check the filters for leakage, correct all leaks.
13. Check the oil level as described in 5.18.1.

5.18.4. CLEANING THE TRANSMISSION OIL STRAINER (FIG. 5.56)

1. The transmission should have been drained as described under 5.18.2. Install drain plugs.
2. Disconnect tube 1. Protect its end against contamination.
3. Remove retainer 3, gasket 4 , check valve 5, gasket 6 and strainer assembly 7.
4. Thoroughly clean the gasket material 4 and 6 and replace if necessary.
5. Wash the strainer in a commercial cleaning solvent. Remove ail particles from the magnetic rods on the strainer. If necessary, the rods can be removed. Dry the strainer with compressed air, if available.
6. Install strainer assembly 7, gasket 6, check valve 5, gasket 4 and retainer 3.
7. Attach tube 1.
8. Fill the transmission with fresh lubricant in accordance with 5.18.2. Check the sump strainer for leaks before putting the machine into operation.

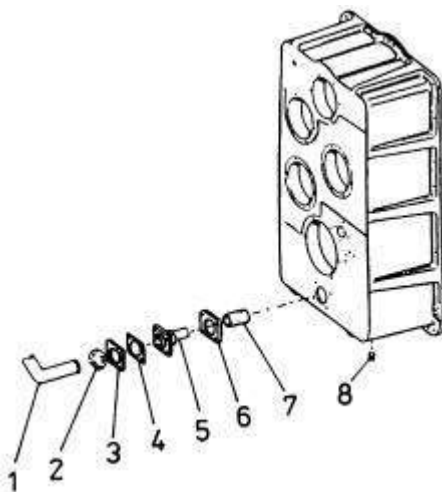


Fig. 5.56. Transmission Oil Strainer

- | | |
|------------------|-----------------|
| 1 - Tube | 5 - Check Valve |
| 2 - Split Flange | 6 - Gasket |
| 3 - Retainer | 7 - Strainer |
| 4 - Gasket | 8 - Drain Plug |

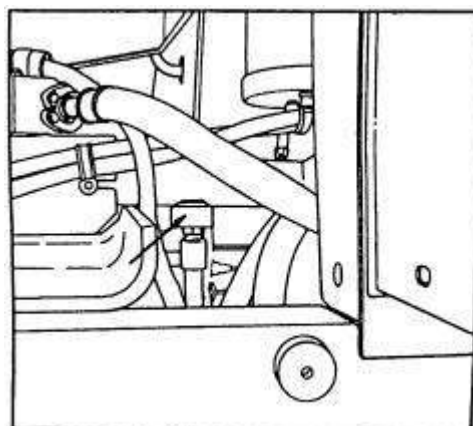


Fig. 5.57. Transmission And T.C. Breather

TRANSMISSION AND TORQUE CONVERTER

5.18.5. SERVICING THE BREATHER

The breather is located on the LH side of the rear main frame close to the torque converter (Fig. 5.57).

The breather vents the entire drive train, i.e. torque converter and transmission. Remove the breather, disassembly and wash the breather in a commercial cleaning solvent available.

5.19. CAB

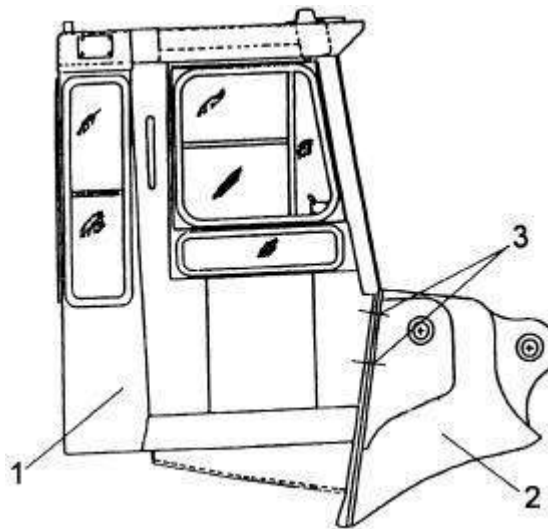


Fig. 5.58. Cab Mounting

- 1 - Cab 2 - Front Frame 3 - Bolts

Check periodically torque of ROPS cab mounting bolts. Refer to Section 6 SPECIAL TORQUES.

5.20. LOADER EQUIPMENT

BUCKET INSTALLATION AND REMOVAL

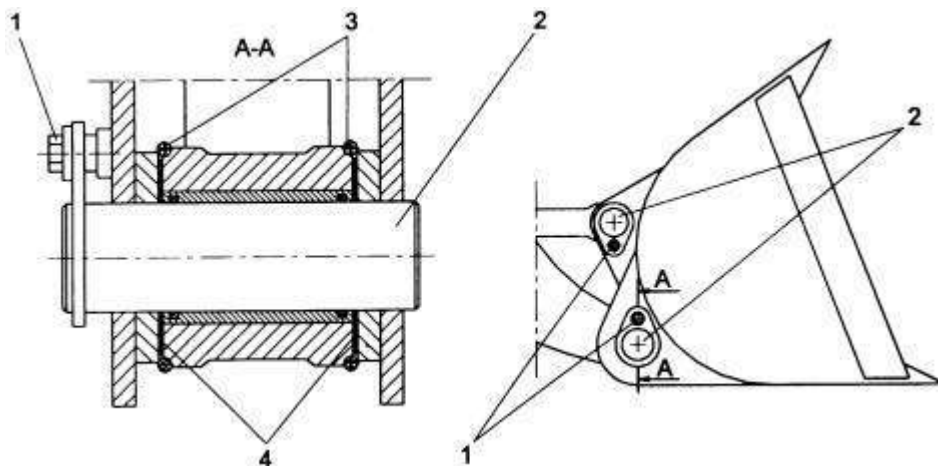


Fig. 5.59. Bucket Installation

- 1 - Bolt 3 - O-Ring
2 - Pin 4 - Shim

LOADER EQUIPMENT

To replace the bucket carry out as follows:

1. Park the machine on level ground or in the workshop.
2. Place the bucket in position as shown in Fig. 5.59.
3. Remove bolts 1 and tap pins 2 out.
4. Move away with the machine or lift the boom.
5. Protect disassembled O-rings 3 and 1.5 mm shims 4.
6. Reinstall the bucket in the reverse order.

IMPORTANT: Allowable gap between bucket supports and boom arms is 1.5 mm. If gaps are bigger, fill symmetrically with shims.



WARNING! When replacing the bucket take care. Disassembled heavy components of loader linkage system (boom arms, connector) must be securely protected against sudden movement.

SECTION 6

SPECIFICATIONS

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6.1. APPLICATION

560C Wheel Loader is a modern machine featuring the following foredesign criteria: optimization of performance, long service life, reliability, maximum unification of parts and assemblies, simplified maintenance and serviceability. This rugged loader is designed for continuous heavy reloading operations. It is particularly useful for loading heavy dump trucks. Wheel loader may also perform the following works:

- Bank loading of cohesive soils,
- Dozing and stockpiling,
- Digging and excavating,
- Snow removal from streets and squares,
- Transport building semi-products for short distances,
- Backdragging and leveling.

The scope of works may be increased by the application of specialized equipment mounted instead of a standard bucket and high-lift boom.

6.2. TECHNICAL DESCRIPTION

Main units of the wheel loader include:

- Chassis,
- Superstructure,
- loader linkage system and mounted equipment.

CHASSIS

The chassis includes an articulated frame supported on two drive axles. The front one is rigidly mounted to the frame, whereas the rear one is trunnion mounted and oscillates allowing the machine to operate in uneven ground. The chassis comprises hydraulic, compressed air, electrical and cooling systems, as well as drive train that consists of torque converter, transmission, drive shafts, drive axles.

SUPERSTRUCTURE

The superstructure consists of a front mounted cab, hood, fenders and platforms, oil, fuel and air tanks. The instrument panel located in the cab includes gauges necessary for continuous monitoring operation of the machine and convenient and easy to operate controls of the machine. The instrument panel is equipped with instruments necessary to control operation of the machine. The control levers and pushbuttons necessary to operate a machine are located in the cab. The operator's seat is equipped with armrests and a seat belt. A cab includes ROPS-FOPS protecting structure providing the operator protection against injury under weight of the machine in the event of machine rollover or upset. Also, the structure provides protection against falling objects. The cab meets safety requirements of SAE standard 1040C.

LOADER LINKAGE

The Z-type loader linkage system provides significant dump angle within the whole operating range of loader linkage system. It features excellent capacity, breakout force and resistance to dynamic loads ensuring high operational durability and reliability.

SPECIFICATIONS

6.3. SCHEMATIC OF WHEEL LOADER DRIVE TRAIN

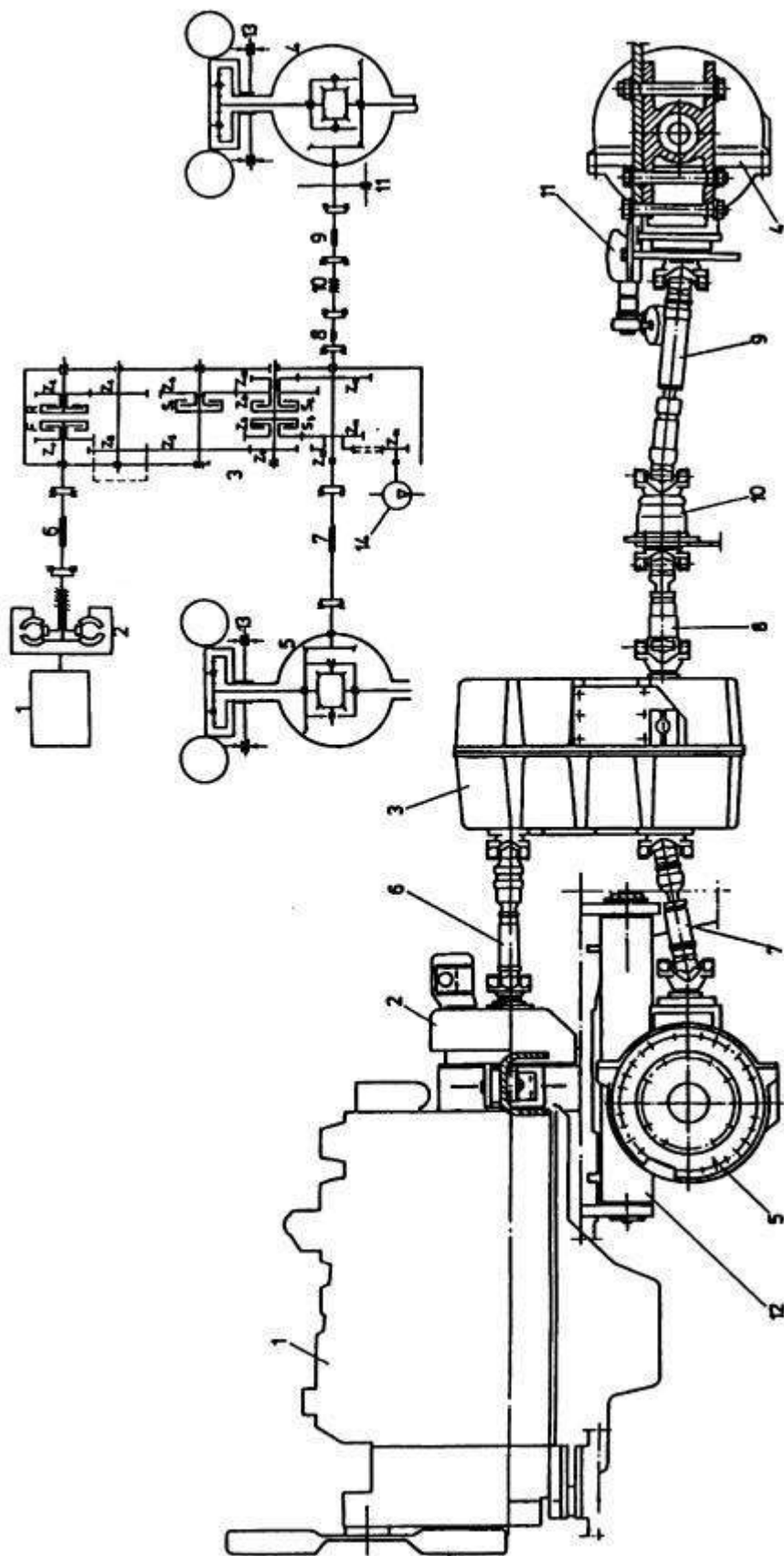


Fig. 6.1. Wheel Loader Drive Train Schematic

SCHEMATIC OF WHEEL LOADER DRIVE TRAIN

The description of the drive train assemblies shown in Fig. 6.1.

- 1 - Engine
- 2 - Torque Converter
- 3 - Transmission
- 4 - Front Drive Axle
- 5 - Rear Drive Axle
- 6-9 Drive Shafts
- 10 - Transfer Drive
- 11 - Parking Brake
- 12 - Bolster
- 13 - Service Brake
- 14 - Ground Driven Steering Pumps
- F, R, S₁, S₂, S₃ - Clutches

6.4. SCHEMATIC OF TORQUE CONVERTER AND TRANSMISSION HYDRAULIC SYSTEM

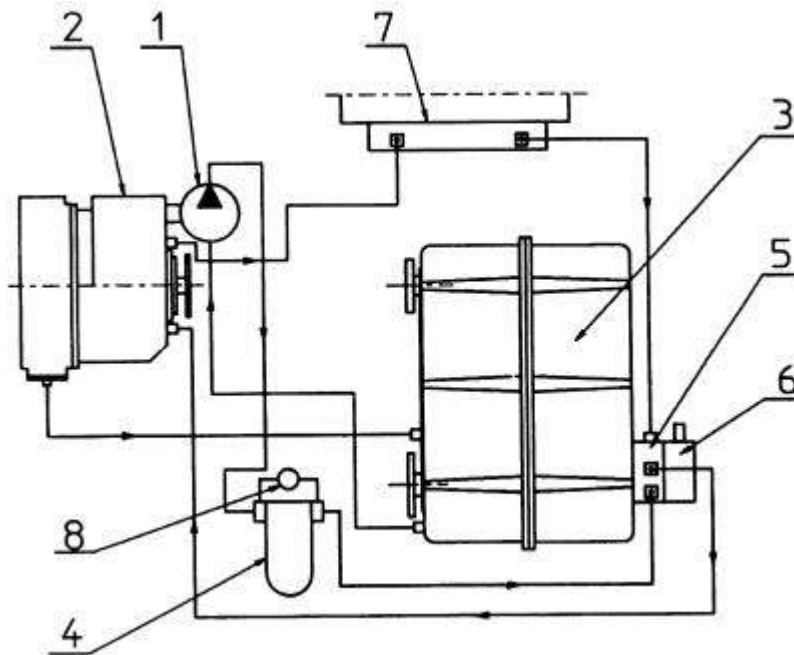


Fig. 6.2. Schematic of Torque Converter and Transmission Hydraulic System

- | | |
|---------------------|----------------------|
| 1. Pump | 5. Regulating Valves |
| 2. Torque Converter | 6. Steering Valves |
| 3. Transmission | 7. Radiator |
| 4. Pressure Filter | 8. Filter Switch |

6.5. LOADER EQUIPMENT AND STEERING HYDRAULIC SYSTEM SCHEMATIC

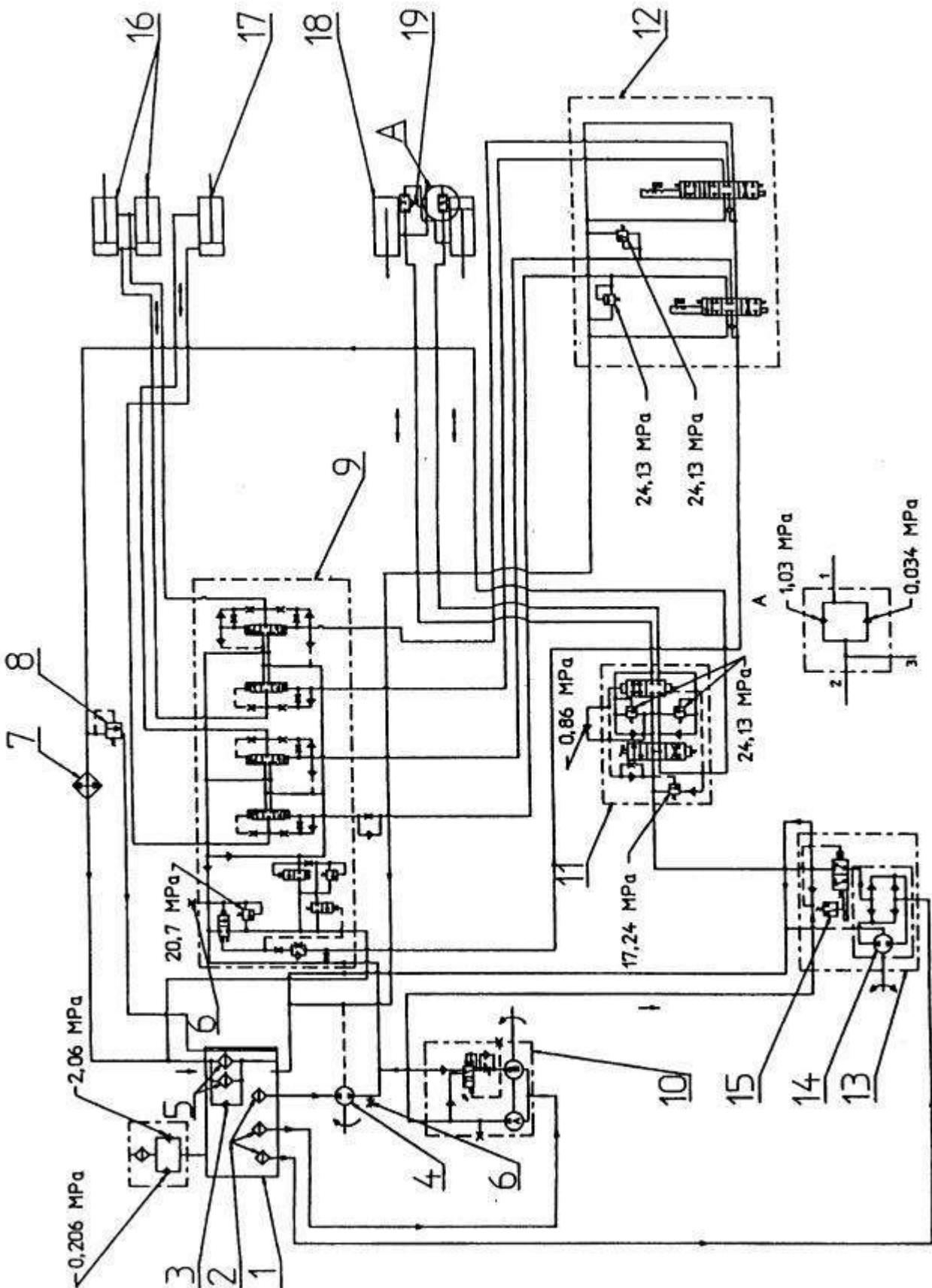


Fig. 6.3. Loader Equipment and Steering Hydraulic System Schematic

LOADER EQUIPMENT AND STEERING HYDRAULIC SYSTEM SCHEMATIC

The description of the assemblies shown in hydraulic system schematic, Fig. 6.3.:

1. Hydraulic Reservoir
2. Strainers
3. Bypass Valve
4. Hydraulic Pump
5. Return Filters
6. Measurement Point
7. Oil Cooler
8. Surge Valve
9. Hydraulic Control Valve
10. Double Gear Pump with Diverter Valve
11. Steering Valve
12. Pilot Control Valve
13. Ground Driven Steering System
14. Ground Driven Steering Pump
15. Warning Light Switch
16. Boom Cylinders (2)
17. Bucket Cylinder
18. Steering Cylinders(2)
19. Check Valve

BRAKE HYDRAULIC SYSTEM SCHEMATIC

The description of the assemblies shown in schematic, Fig. 6.4.:

1. Cooling Pump
2. Brake Pump
3. Cooling Filter
4. Regulating Valve
5. Nitrogen Accumulator
6. Brake Valve (Brake Pedal)
7. Parking Brake Solenoid Valve
8. Parking Brake Hydraulic Cylinder
9. Differential Valve
10. Cooling System Low Pressure Switch
11. Valve Block
12. Transmission Disconnect Solenoid Valve
13. Parking Brake Warning Light Switch
14. Suction Strainer
15. Wheel Brake Assembly
16. Wheel Brake Piston
17. Supply From Transmission System
18. Transmission Oil Reservoir
19. Supply of Transmission Disconnect Valve

SPECIFICATIONS

6.7. WIRING DIAGRAM

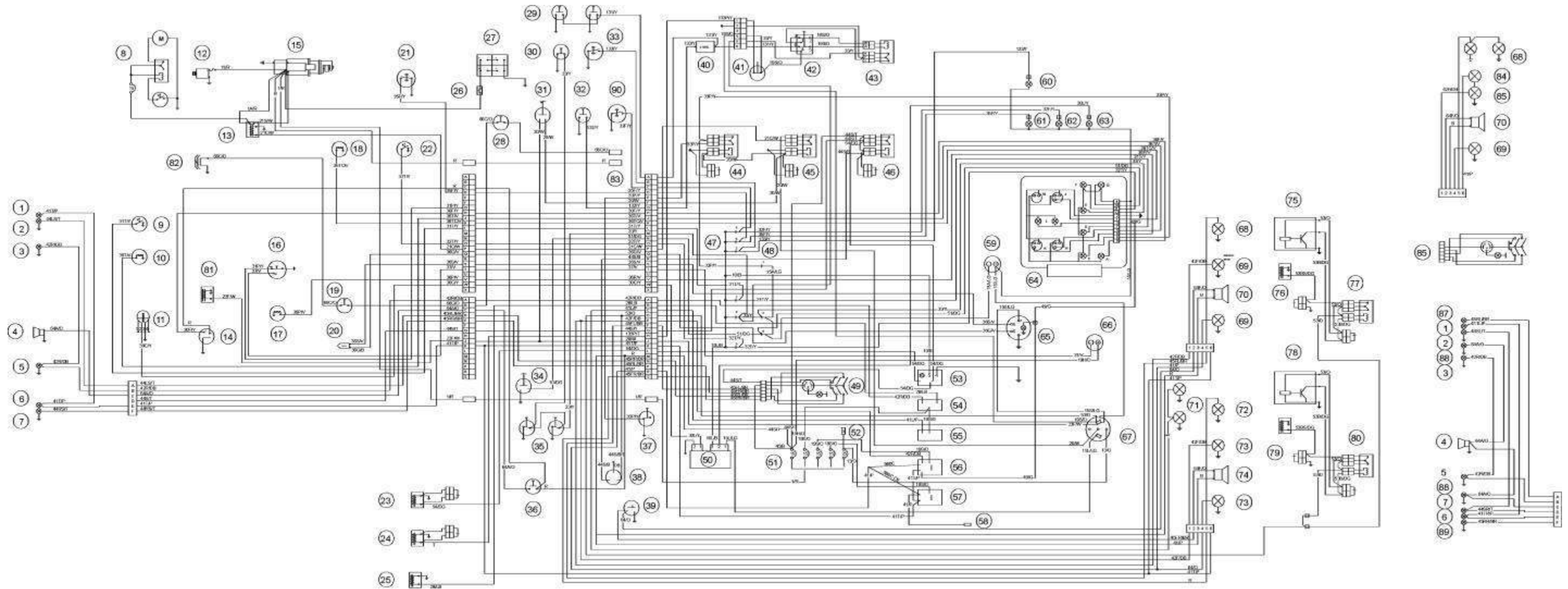


Fig. 6.5. Wiring Diagram

WIRING DIAGRAM

The legend for the wiring diagram in Fig. 6.5.:

1. Rear Parking Lamp
2. Left Stop Lamp
3. Rear Left Work Lamp
4. Back-up Alarm
5. Right Work Lamp
6. Rear Right Parking Lamp
7. Right Stop Lamp
8. Auxiliary Cooler Fan Assembly (if equipped)
9. Coolant Temperature Warning Light Switch
10. Coolant Temperature Sensor
11. Coolant Low Level Sensor
12. Alternator
13. Magnetic Switch
14. Fuel Level Sensor
15. Cranking Motor
16. Hourmeter Oil Pressure Switch
17. Engine Oil Pressure Sensor
18. Torque Converter Temperature Sensor
19. Air Conditioner High Pressure Switch (if equipped)
20. Tachometer Sensor (if equipped)
21. Hydraulic Oil Filter Warning Light Switch
22. Transmission Oil Temperature Switch
23. Drive Disconnection Solenoid Valve
24. Parking Brake Solenoid Valve
25. Start Ether Solenoid Valve (if equipped)
26. Master Switch
27. Battery
28. Air Conditioner Low Pressure Switch (if equipped)
29. Hydraulic Accumulators Gas Pressure Switches
30. Cooling Brake Low Pressure Switch
31. Directional Neutral Safety Switch
32. Brake System Differential Pressure Switch
33. Brake System Oil Filter Warning Light Switch
34. Ground Drive Steering Alarm and Lamp Switch
35. Main Brake Low Pressure Switches
36. Back-up Alarm
37. Parking Brake Warning Light Switch
38. Stop Light Switch
39. Horn Button
40. Brake Differential Pressure Delay Relay
41. Brake Parking Switch
42. Brake Alarm Elimination Switch
43. Brake Alarm Relay
44. Parking Brake Relay
45. Neutral Safety Switch Relay
46. Stop Light Relay
47. Warning Light Diodes
48. Alarm Diodes
49. Directional Signal Switch (if equipped)
50. Cooling Low Level Relay (if equipped)
51. Circuit Breakers
52. Auxiliary Power Supply
53. Bulbs Check and Drive Disconnection Switch
54. Ether Start and Rear Work Lamps Switch
55. Low Level Lamps Switch (if equipped)
56. Front Work Lamps Switch (Parking and Passing, 560C CE)
57. Front Auxiliary Lamps Switch (if equipped)
58. Cab Work Lamp Connector

WIRING DIAGRAM

59. Alarm (Emergency Steering, Main and Parking Brake)
60. Brake Cooling Filter Warning Lamp
61. Hydraulic Oil Filter Warning Lamp
62. Transmission Oil Filter Warning Lamp
63. Coolant Low Level Warning Lamp (if equipped)
64. Cluster Gauge
 - A. Fuel Reserve Warning Lamp
 - B. Ground Drive Steering Warning Lamp
 - C. Parking Brake Warning Lamp
 - D. Coolant Temperature Warning Lamp
 - E. Brake Warning Lamp
 - F. Transmission Oil Temperature Warning Lamp
 - H. Coolant Temperature Gauge
 - J. Transmission Temperature Gauge
 - K. Engine Oil Pressure Gauge
 - L. Gauge Cluster Lamps
 - M. Voltmeter
65. Tachometer (If Equipped)
66. Hourmeter
67. Ignition Key Switch
68. Front Left Directional Lamp (If Equipped)
69. Front Left Work Lamp
70. Horn
71. Low Level Work Lamp (If Equipped)
72. Front Right Directional Lamp (If Equipped)
73. Front Right Work Lamp
74. Horn
75. Boom Raise Limit Magnetic Switch
76. Boom Raise Limit Electromagnet
77. Boom Rise Limit Magnetic Switch Relay
78. Bucket Dump Limit Magnetic Switch
79. Bucket Dump Limit Electromagnet
80. Bucket Dump Limit Magnetic Switch Relay
81. Engine Fuel Shutoff Solenoid Valve
82. Air Conditioner Clutch (If Equipped)
83. Cab Connectors
84. Front Parking Lamps 560C - CE
85. Passing Lamps 560C - CE
86. Directional And Emergency Light Switch 560C - CE
87. Rear Left Directional Lamp 560C - CE
88. Back-Up Lamp 560C - CE
89. Rear Right Directional Lamp 560C - CE
90. Transmission Oil Filter Warning Light Switch

Wire color code:

R - red	O - orange
T - brown	P. - pink
W - white	V - violet
Y - yellow	DB - dark blue
B - black	LB - light blue
BR - dark gray	DG - dark green
G - gray	LG - light green

WIRING DIAGRAM

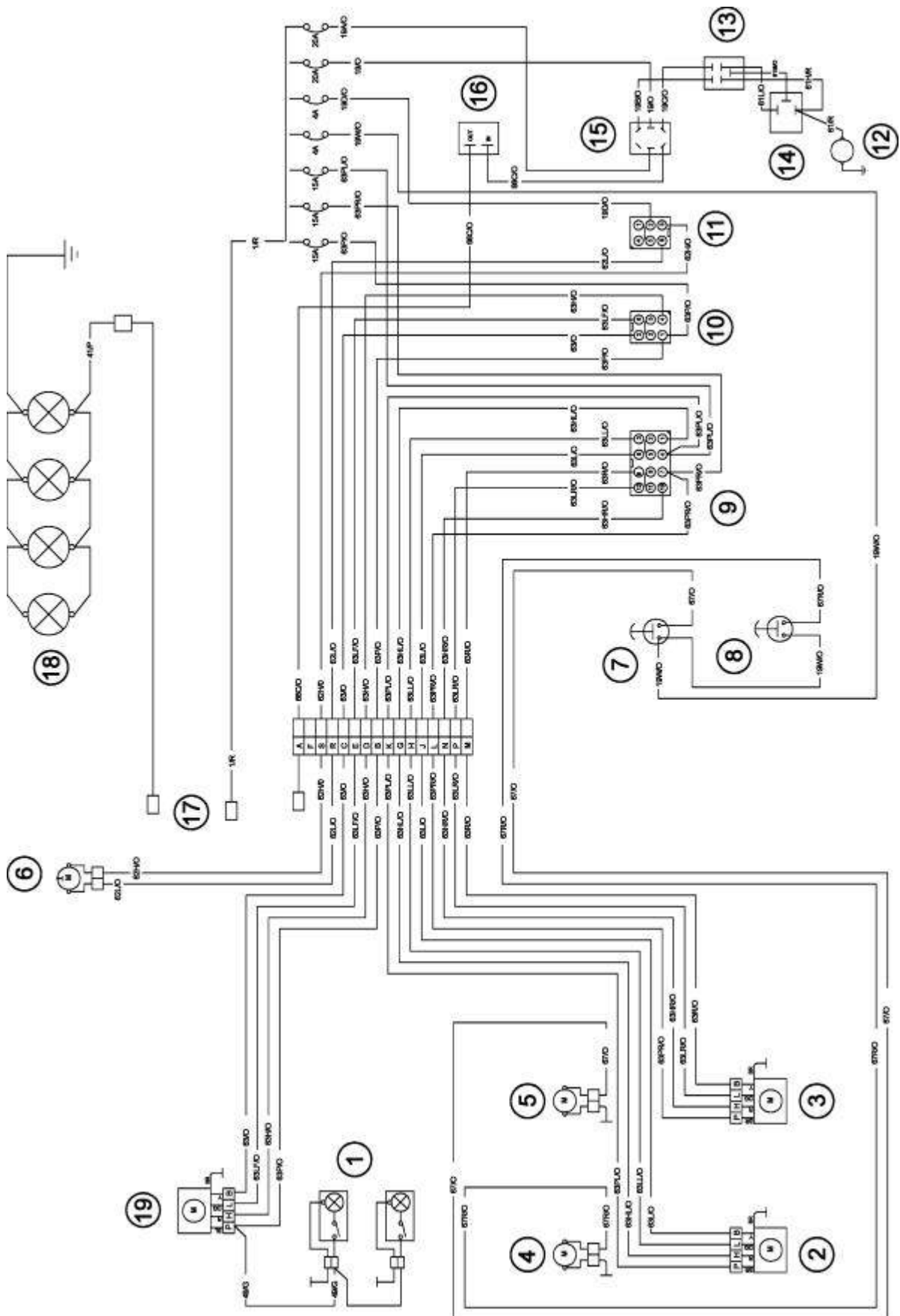


Fig. 6.6. Wiring Diagram Of Cab

WIRING DIAGRAM

The Legend for the wiring diagram in Fig. 6.6.

1. Cab Light
2. Rear Left Wiper Motor
3. Rear Right Wiper Motor
4. Rear Window Washer Pump
5. Front Window Washer Pump
6. Front Window Defroster Fan Motor
7. Front Window Washer Pump Button
8. Rear Window Washer Pump Button
9. Rear Wipers Motor Switch
10. Front Wiper Motor Switch
11. Defroster Fan Motor Switch
12. Heater Fan Motor
13. Heater Fan Motor Switch
14. Resistor
15. Heater Switch
16. Thermostat
17. Supply Connector
18. Top Work Lamp
19. Front Wiper Motor

Wire color code:

R - red	O - orange
T - brown	P. - pink
W - white	V - violet
Y - yellow	DB - dark blue
B - black	LB - light blue
BR - dark gray	DG - dark green
G - gray	LG - light green

6.8. SPECIFICATIONS

6.8.1. GENERAL SPECIFICATIONS OF THE LOADER (Refer to Fig. 6.7. and 6.8.)

Below specified specifications are for standard configuration of 560C wheel loader equipped with ROPS-FOPS cab, standard bucket, counterweight and 29.5 x 29 tires.

Rated bucket capacity.....	5.73m ³
Bucket width.....	3645 mm
Dump clearance – H ₈ *).....	3630 mm
Reach L ₆	1470 mm
Dump height – H ₉	4110 mm
Breakout force.....	310.5 kN
Static tipping load **)	
• straight.....	282 kN
• full turn.....	250.6 kN
Operating weight.....	41800 kg
Load capacity [kN] ± 10%.....	125.3
Overall length with bucket L ₇	9520 mm
Turning radius, outside corner of bucket @ carry.....	8600 mm
Articulation.....	35°
Tread - W ₃	2590 mm
Wheelbase - L ₃	3940 mm
Height to the top of cab – H ₁	4110 mm
Ground clearance – H ₄	500 mm
Machine width – W ₁	3380 mm
Axle oscillation.....	11.5°

Operating weight, LOGGER version

- Grapple 90-108-119..... 50011 kg
- Grapple HC-90-112..... 50478 kg

*) increases or decreases according to the tire size

**) machine stability, weight and performance are affected by the machine configuration and optional equipment

NOTE: Performance specified per SAE J732.

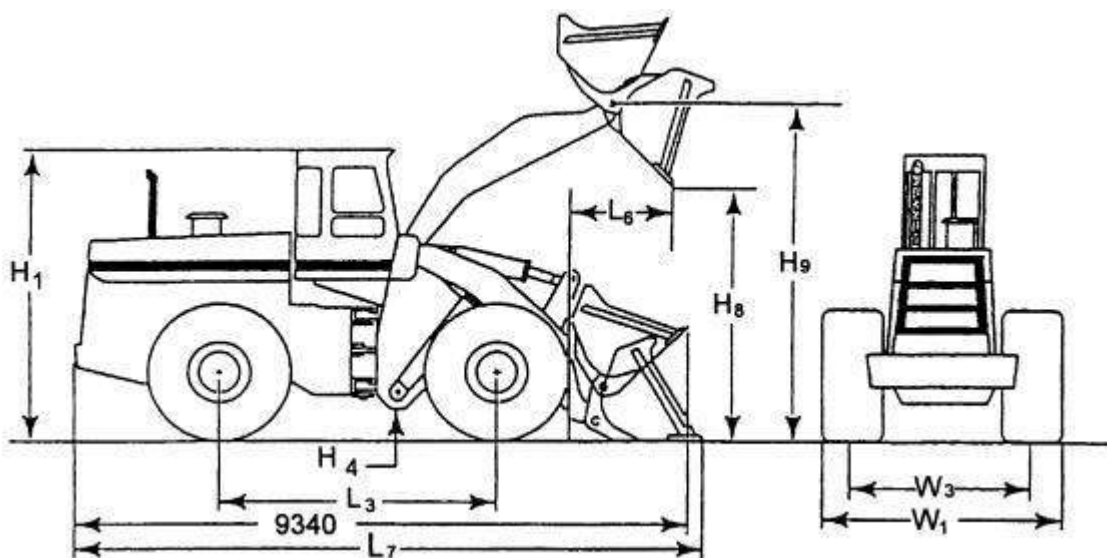


Fig. 6.7. Overall Dimensions – Wheel Loader 560C

SPECIFICATIONS

SPECIFICATIONS

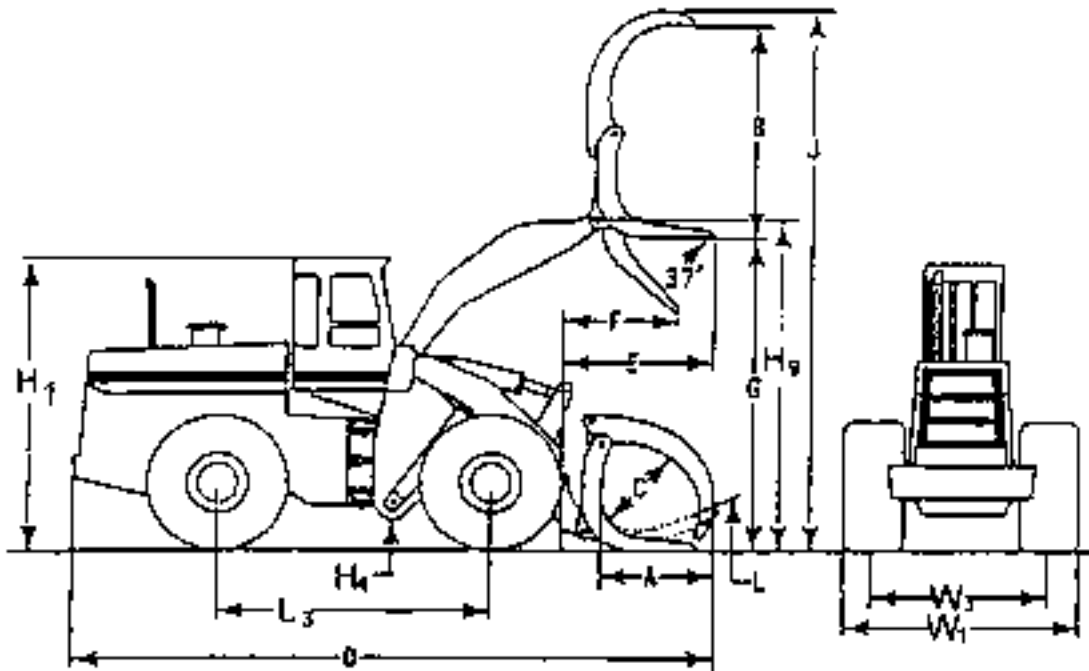


Fig. 6.8. Overall Dimensions - 560C LOGGER with Grapple

90-108-119

	GRAPPLE	
	HC-90-112	
A Length of tines	2290 mm	2290 mm
B Maximum clamp opening	4280 mm	4060 mm
C Minimum closure diameter.....	2290 mm	2790 mm
D Overall machine length, tines on ground	10440 mm	10640 mm
E Reach at maximum lift, tines level	2730 mm	2940 mm
F Reach at maximum dump and maximum lift	2000 mm	2170 mm
G Maximum tine height with tines level.....	4540 mm	4540 mm
J Maximum overall height.....	9390 mm	9390 mm
L Maximum grapple rollback at ground.....	9.5°	9.5°
Grapple width (not shown in Fig. 6)	3500 mm	3500 mm

6.8.2. CAPACITIES

	Refill	Service
Fuel tank.....	625 l	
Cooling system	101 l	
Front axle	80 l	
Rear axle.....	80 l	
Hydraulic system (loader and steering).....	382 l	
Hydraulic tank		185 l
Transmission system	144 l	
Transmission		85 l
Engine and filter	57 l	
Steering gear.....	0.33 l	
Air conditioner	1.22 kg	

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6.8.8. TIRES

Standard-tubeless.....	29.5-29 22 PR L4
Optional-tubeless.....	29.5 R29 ZRD 1A
Optional-tubeless.....	29.5-29 34 PR L3
Optional-tubeless.....	6535-33 24 PR L5
Optional-tubeless.....	6535-33 30PR L4
Optional-tubeless.....	6535-33 24PR L4

INFLATION PRESSURE [Mpa]

Front wheels	0.35
Rear wheels	0.35

6.8.9. RIMS

Size.....	25 x 29.5
-----------	-----------

6.8.10. BRAKES

Service brakes	multi-disc wet inboard
Control.....	hydraulic

Parking brake

Type	disc type on front axle
Control.....	spring applied
Hydraulically	released

6.8.11. LOADER HYDRAULIC SYSTEM

Main control valve

Standard.....	2-spool
Optional.....	3-spool

Pilot control valve

Standard.....	2-spool
Optional.....	3-spool

6.8.12. CYCLE TIMES

Boom raise.....	9.1 s
Boom lower.....	9.3 s
Bucket dump.....	2.8 s
35° articulation	1.5 s

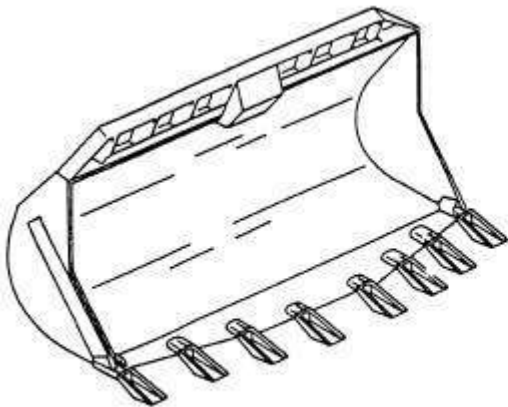
6.8.13. FUEL CONSUMPTION

During tests consisting in intensive operation of a loader in excavation, sandy soil (bulk density 1.6 t/cu. m) the average fuel consumption is app. 70 l/h.

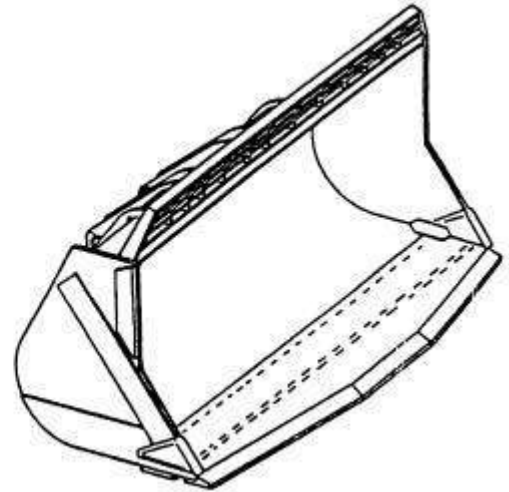
AVERAGE FUEL CONSUMPTION IN OPERATION

Specified above fuel consumption is for short intensive operation of the machine. Practically, considering longer periods of operation, fuel consumption is much lower and for medium intensive operation is app. 50 l/h.

6.9. 560C LOADER EQUIPMENT



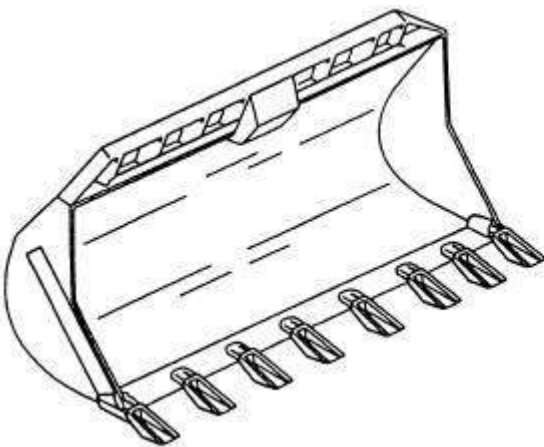
A- bucket w/teeth



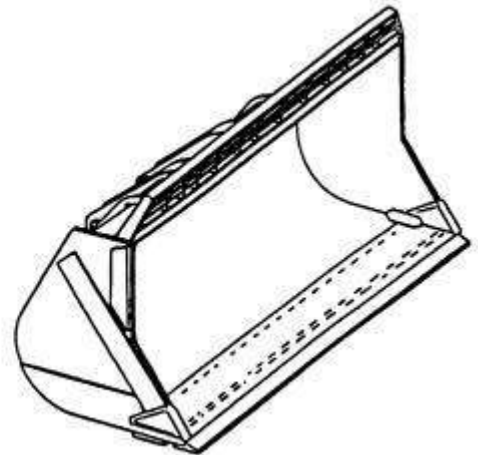
B- bucket w/o teeth

Fig. 6.9. Spade Nose Buckets

Bucket capacity 5.35 cu. m., 5.73 cu. m and 5.73 cu. m.
Applications – quarry



A- bucket w/teeth



B- bucket w/o teeth

Fig. 6.10. Straight Edge Buckets

Bucket capacity 5.35 cu.m.,6.5 cu. m., 11.5 cu. m.
Applications – reloading operations 6.5 cu. m., light materials (coal, coke) 11.5 cu. m.

560C LOADER EQUIPMENT

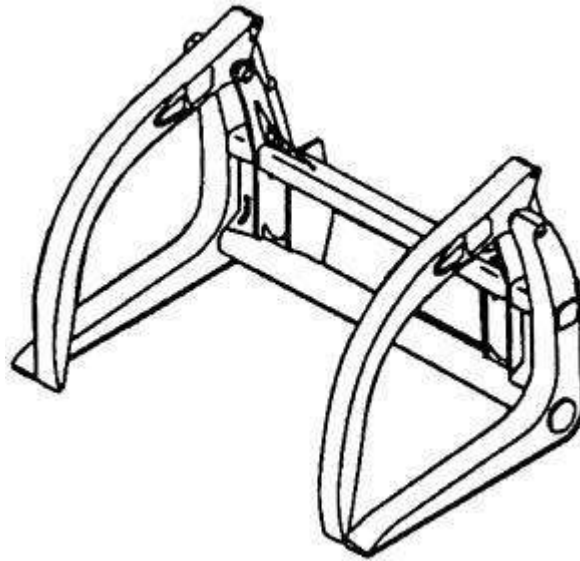


Fig. 6.11. Grapple

Capacity app.18000 kg

Dimensions - see Fig. 6.8.

Grapples:

90-108-119

HC-90-112

LOGGER version is required for grapple application.

6.10. TORQUE VALUES FOR STANDARD METRIC FASTENERS

Chart 1 provides tightening torque for general purpose applications using original equipment standard hardware. Original equipment standard hardware is defined as coarse thread metric class 10.9 bolts and class 10.0 nuts and thru hardened flat washers (Rockwell "C" 38-45), all phosphate coated and assembled without supplemental lubrication (as received) condition. The torques shown below apply to phosphate coated bolts designed for 60% yield strength.

The torques shown below also apply to phosphate coated bolts used with phosphate coated prevailing torque nuts, phosphate coated bolts used with copper plated weld nuts and are applied to steel and grey iron threaded parts.

STANDARD METRIC FASTENERS

Chart 1

Nominal Thread Diameter [mm]	Standard Torque $\pm 10\%$ [Nm]
6	10
7	16
8	23
10	46
12	80
14	125
16	200
18	275
20	385
22	530
24	670
27	980
30	1330
33	1790
36	2325

6.11. TORQUE VALUES FOR STANDARD ENGLISH FASTENERS

Chart 2 provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Catalog for the machine involved. **DO NOT SUBSTITUTE.** Original equipment standard hardware is defined as Type 8, coarse thread bolts and nuts and thru hardened flat washers (Rockwell "C" 38-45), all phosphate coated and assembled without supplemental lubrication (as received) condition. Phosphate coated bolts used in tapped holes in steel or gray iron, phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts), phosphate coated bolts used with copper plated weld nuts. Markings on bolt heads or nuts indicate material grade **ONLY** and are **NOT** to be used to determine required torque.

SPECIFICATIONS

TORQUE VALUES FOR STANDARD ENGLISH FASTENERS

Chart 2

Nominal Thread Diameter [inch]	Standard Torque $\pm 10\%$ [Nm]
1/4	10
5/16	21
3/8	38
7/16	60
1/2	92
9/16	130
5/8	180
3/4	325
7/8	520
1	780
1- 1/8	1110
1- 1/4	1565
1- 3/8	2050
1- 1/2	2720
1- 3/4	3380
2	5080

6.12. TORQUE VALUES FOR SPLIT FLANGE CONNECTIONS

The following chart 3 provides the tightening torques for split flange connections used in hydraulic systems. Split flanges and fitting shoulders should fit squarely. Install all bolts, finger tighten and then torque evenly. Overtorquing bolts will damage the flanges and/or bolts, which may cause leakage.

Chart 3

Bolt size in inches	Flange size in inches*	Torque Value Nm
1/2	5/16	20÷24
3/4	3/8	30÷37
1	3/8	37÷47
1-1/4	7/16	47÷61
1- 1/2	1/ 2	62÷79
2	1/ 2	75÷88
2- 1/2	1/ 2	107÷123
3	5/8	187÷203
3- 1/2	5/8	159÷180

*) Outside diameter of hydraulic tube or hose fitting.

6.13. TORQUE VALUES FOR HYDRAULIC TUBES AND FITTINGS

Chart 4

Size	Tubing O.D. in inches	Thread size in inches	Torque values for 37° flared fittings, Nm	Torque values for O-ring boss plugs, locknuts and 37° flared fittings, Nm
4	1/4	7/16 – 20	12 – 16	8 – 14
5	5/16	1/2 – 20	16 – 20	14 – 20
6	3/8	9/16 – 18	29 – 33	20 – 27
8	1/2	3/4 – 16	47 – 54	34 – 41
10	5/8	7/8 – 14	72 – 79	47 – 54
12	3/4	1 – 1/16 – 12	104 – 111	81 – 95
14	7/8	1 – 3/16 – 12	122 – 138	95 – 109
16	1	1 – 5/16 – 12	149 – 163	108 – 122
20	1- 1/4	1 – 5/8 – 12	190 – 204	129 – 156
24	1- 1/2	2 – 1/2 – 12	217 – 237	163 – 190
32	2	2 – 1/2 – 12	305 – 325	339 – 407

Above torque figures are recommended for plain, cadmium or zinc plated fittings, dry or wet installations.

These torques are not recommended for tube with wall thickness of 0.89 mm or less.

6.14. TORQUE VALUES FOR HOSE CLAMPS

The following chart 5 provides the tightening torques for hose clamps used in all rubber applications: radiator, air cleaner, operating lever boots, hydraulic system, etc.).

Chart 5

CLAMP TYPE AND SIZE	TORQUE ± 0.6 Nm	
	Radiator, Air Cleaner, Boots, etc, Nm	Hydraulic System, Nm
"T" Bolt (any diameter)	6.2 ÷ 7.3	
Worm Drive - 1-3/4 in. Open Diameter & Under	2.2 ÷ 3.3	4.5 ÷ 5.6
Worm Drive - Over 1-3/4 in. Open Diameter	4.5 ÷ 5.6	
Worm Drive - All "Ultra-tite"	10.7 ÷ 11.8	4.5 ÷ 5.6

6.15. TORQUE VALUES FOR AIR CONDITIONING TUBES AND FITTINGS

SWAGED 45° CONNECTIONS

Chart 7

Size	Thread size in inches	Torque values for materials, Nm			
		Steel-steel	Bronze - steel	Copper-steel	Aluminum-steel
1/4	7/16 - 20	16 ÷ 23	15 ÷ 20	15 ÷ 20	12 ÷ 18
3/8	5/8 - 18	27 ÷ 33	23 ÷ 38	23 ÷ 38	20 ÷ 25
1/2	3/4 - 16	47 ÷ 54	38 ÷ 46	38 ÷ 46	28 ÷ 36
5/8	7/8 - 14	61 ÷ 68	45 ÷ 53	45 ÷ 53	34 ÷ 32
3/4	1 - 1/6 - 12	72 ÷ 80	49 ÷ 57	49 ÷ 57	45 ÷ 53
	1 - 1/6 - 14	72 ÷ 80	49 ÷ 57	49 ÷ 57	45 ÷ 53

6.16. TORQUE VALUES FOR AIR CONDITIONING O-RING CONNECTIONS

Chart 8

Size	Thread size in inches	Torque values for materials, Nm	
		Steel-steel	
1/4	7/16 - 20	15 ÷ 25	
3/8	5/8 - 18	27 ÷ 33	
1/2	3/4 - 16	40 ÷ 48	
5/8	7/8 - 14	47 ÷ 54	
3/4	1- 1/16 - 12	54 ÷ 61	
	1- 1/6 - 14	54 ÷ 61	

6.17. SPECIAL TORQUES

Chart 9

Description	Thread Size	Torque Nm
U-joint fastening bolts:		
• Transmission-planetary	½	130
• Transmission- rear axle	½	130
• Transmission- support	½	130
• Support- front axle	½	130
Drive axle fastening bolts:	1-1/2	3180
Transmission fastening bolts:		
• Support to transmission	¾	390
• Support to frame	1	390
Engine mounting bolts:		
• Engine - frame (at fan)	1	940
• Support frame (at flywheel)	5/8	220
• Gear ring - flywheel	1/2	83
Wheel lug nuts	1	1250-1300
Radiator grill fastening bolts	5/8	220
Counterweight fastening bolts	1-¼	1800
Oil tank frame mounting bolts	¾	390
Fuel tank mounting bolts	¾	390
Ladder mounting bolts	½	110
Steering mechanism mounting bolts:		170-220
• arm		
• mounting to the frame	5/8	110
• tracking system support trunnion	1	300
• steering wheel nut	-	48
Pin mounting bolts:		
• boom - frame	1-1/8	820
• boom - bucket	1-1/8	820
• hydraulic cylinders - boom	1-1/8	820
• boom cylinder - frame	1-1/8	820
• boom cylinder - bellcrank	1-1/8	820
• bellcrank - link	1-1/8	820
• link - bucket	1-1/8	820
• steering cylinders - frame	¾	280
• bolster - frame	¾	280
Transfer drive line mounting bolts	3/4	390
Cab mounting bolts:		
• cab - floor	3/8	47
• floor - frame	1	940

Tightening torque tolerance ± 10%.

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6.18. LIST OF SERVICE TOOLS

Tool-wrench size	Service (removal and installation)
3/8"	Alternator cables Circuit breakers mounting strips
7/16"	Brake system breathers
9/16" socket screw wrench	Battery terminals Service indicator orifice Parking brake slack adjuster (after pressing in protecting bushing) Axle oil level plug Steering gear drain plug Ether injector nozzle
5/8" screw wrench	Plug in hydraulic tank drain valve Torque converter drain plug Transmission system filter housings
3/4"	Inner filter element Rear light cover Filter covers on equipment and steering hydraulic tank Nuts fastening filter elements in hydraulic tank Transmission strainer cover
1-1/8"	Coolant drain plug (not applicable for machines sold in EC market) Engine oil drain plug (not applicable for machines sold in EC market) Fuel tank breather Transmission breather
1-1/4"	Axle filler plug Axle drain plug Transmission drain plug
1-1/2"	Brake system deaeration, transmission connector. Wheel to axle fastening bolts. Oil Reservoir Breather
10 mm	Ether injector connector
13 mm	Work lights
18 mm	Fuel tank sediment drain plug
Cross screwdriver 2 mm	Gauge cluster on instrument panel
Cross screwdriver 3 mm	Instrument panel screws
Flat screwdriver 1 z 6.5	Primary filter clamp
Filter wrench 110mm	Fuel filters Oil filters Coolant filter