

Product: EXCAVATOR

Model: 235 EXCAVATOR 81X

Configuration: 235 EXCAVATOR 81X00404-UP (MACHINE) POWERED BY 3306 ENGINE

Operation and Maintenance Manual 235 AND 235B TRACK-TYPE EXCAVATORS

Media Number -SEBU6035-00

Publication Date -01/12/1985

Date Updated -11/10/2001

Foreword

SMCS - 7606

This guide contains operation instructions and lubrication and maintenance information.

The operation section is a reference for the new operator and a refresher for the experienced one. Read - study - and keep it handy.

Illustrations guide the operator through correct procedures of checking, starting, operating and stopping the machine.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the machine and its capabilities.

The maintenance section is a guide to equipment care. The illustrated, step-by-step instructions are grouped by servicing intervals. Items without specific intervals are listed under "When Required." Items in the "Lubrication and Maintenance Chart" are referenced to detailed instructions that follow.

Use the service meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) may be used instead of service meter intervals if they provide more convenient servicing schedules and approximate the indicated service meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Lubrication and Maintenance Chart" may be necessary.

Perform service on items at multiples of the original requirement. For example, at Every 500 Service Hours or 3 Months, also service those items listed under Every 250 Service Hours or Monthly, Every 50 Service Hours or Weekly and Every 10 Service Hours or Daily.

Some photographs in this publication show details or attachments that may be different from your machine. Also, guards and covers may have been removed for illustrative purposes.

Continuing improvement and advancement of product design may have caused changes to your machine which are not included in this publication.

Whenever a question arises regarding your machine, or this publication, please consult your Caterpillar dealer for the latest available information.

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Safety

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Warning Signs and Labels

There are several specific safety signs on your machine. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarize yourself with these safety signs.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See your Caterpillar dealer for new labels.



Do not operate this machine unless you have read and understand the instructions in the "Operation" Guide. Improper machine operation is dangerous and could result in injury or death. The "Operation" Guide is in holder located in operator's compartment or on seat back. Contact any Caterpillar dealer for a replacement guide. Proper operation is your responsibility.



Located in the cab.

 **WARNING**

Know the maximum height and reach of your machine. Serious injury or death by electrocution can occur if machine or attachments are not kept a safe distance from electrical power lines. Keep distance at least 3 m (10 feet) plus additional 10 mm (0.4 inch) for each 1,000 volts over 50,000 volts.



Located in the cab.

 **WARNING**

Lubrication, maintenance or repair of this machine can be dangerous unless performed properly. Each person must satisfy himself that he has the necessary skill and information, proper tools and equipment, and that his work method is safe and correct. Caterpillar dealers are available to provide service and information.



Located on the cab door.

 **WARNING**

To prevent possible injury refer to the "Operation" Guide before attempting to boost start this machine.



Located in the battery compartment.

POISON/DANGER CAUSES SEVERE BURNS Contains sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote: EXTERNAL - Flush with water. INTERNAL - Drink large quantities water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. Eyes: Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gases. Keep sparks, flame, cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.

KEEP OUT OF REACH OF CHILDREN.

 **WARNING**

Swing lock must be engaged before shipping machine. If lock is not engaged, upper structure can swing, resulting in possible personal injury.



Located in the cab.

 **WARNING**

CLAMSHELL SWING

Personal injury may result if clamshell swings into the cab or a person in the work area.

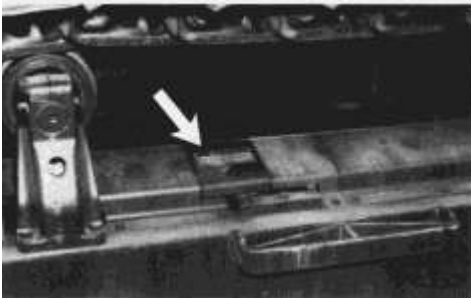
Clamshell can swing in all directions.



Located in the cab.

 **WARNING**

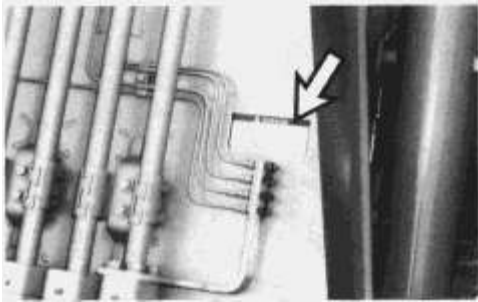
HIGH PRESSURE CYLINDER Apply lubricant through fitting only to tighten track. Track sag should be between 25 and 38 mm (1 and 1 1/2 inches). When track is too tight relieve pressure by opening relief valve 1 turn.



Located on the roller frame.

 **WARNING**

Covered external vent plugs may be under high pressure. Do not loosen or remove without consulting your CATERPILLAR DEALER for proper procedure.



Located on the boom.

 **WARNING**

With final drive disconnected machine has no brakes and will roll free on a slope or while towing.

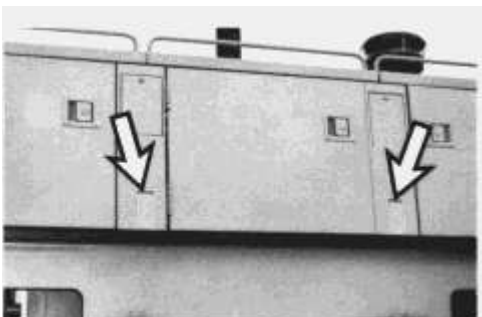
When final drive is disconnected always block both tracks.



Located on the cab door.

 **WARNING**

Do not lift vehicle by counterweight eyes. See Operator's Guide for proper method for lifting vehicle.



Located on the counterweight.

General



Attach a "DO NOT OPERATE" or similar warning tag to start switch or controls before servicing or repairing the machine. These tags, Form SEHS7332, are available from your Caterpillar dealer.

Perform all maintenance unless otherwise specified as follows:

The swing lock pin locked.

The travel pedals released.

The hydraulic and directional lever engaged.

The engine stopped.

The start switch key off and the key removed.

The disconnect switch off and the key removed.

Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the machine.

Make certain all protective guards and covers are secured in place on the machine.

Keep the machine, especially the deck, walkways and steps, free of foreign material, such as debris, oil, tools and other items which are not part of the machine.

Secure all loose items such as lunch boxes, tools and other items which are not part of the machine.

Know the hand signals and who gives them. Accept signals from one person only.

Never put maintenance fluids into glass containers.

Report all needed repairs.

Do not allow unauthorized personnel on the machine.

Pressure air can cause personal injury. When using pressure air for cleaning, wear a protective face shield and protective clothing.

Caution should be used to avoid breathing dust that may be generated when handling components containing asbestos fibers. If this dust is inhaled, it can be hazardous to your health. Components

in Caterpillar products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates and some gaskets. The asbestos used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust which contains asbestos is not generated.

If dust which may contain asbestos is present, there are several common sense guidelines that should be followed.

1. Never use compressed air for cleaning.
2. Use vacuum or wet methods for cleanup.
3. Use exhaust ventilation on permanent machining jobs.
4. Wear an approved respirator if there is no other way to control the dust.
5. Follow environmental rules and regulations for disposal of asbestos.
6. Avoid areas where asbestos particles may be in the air.

Crushing or Cutting Prevention

Never attempt adjustments while the machine is moving or the engine is running unless otherwise specified.

Support equipment and implements properly when working beneath them. Do not depend on hydraulic cylinders to hold it up. Any implement can fall if a control is moved, or a hydraulic line breaks.

Where there are implement linkages, the clearance in the linkage area will increase or decrease with movement of the implement.

Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades. They will throw or cut any object or tool that falls or is pushed into them.

Do not use a kinked or frayed wire rope cable. Wear gloves when handling the wire rope cable.

Retainer pins, when struck with force, can fly out and injure nearby persons.

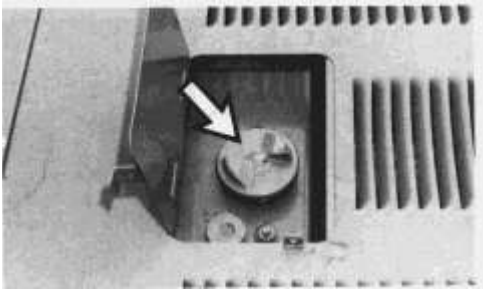
Wear protective glasses when striking a retainer pin to avoid injury to your eyes.

Chips or other debris can fly off objects when struck. Make sure no one can be injured by flying debris before striking any object.

Burn Prevention

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam. Any contact can cause severe burns.

Check the coolant level only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand.



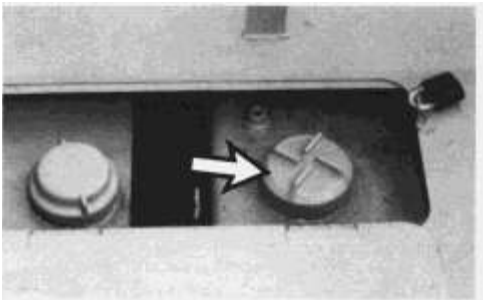
Remove the cooling system filler cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes and do not drink, to prevent personal injury.

Allow cooling system components to cool before draining.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

At operating temperature, the hydraulic tank is hot and can be under pressure.



Remove the hydraulic tank filler cap only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand.

Remove the hydraulic tank filler cap slowly to relieve pressure.

Relieve all pressure in air, oil, fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

Battery electrolyte contains acid and can cause injury. Avoid contact with the skin and eyes.

Fire or Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable.

Do not smoke while refueling or in a refueling area.

Do not smoke in areas where batteries are charged, or where flammable materials are stored.

When starting from an external source, always connect the positive (+) boost cable to the positive (+) terminal of the battery of the engine to be started.

Attach the negative (-) boost ground cable last, away from the battery. See the Operation Guide for specific instructions.

Clean and tighten all electrical connections. Check daily for loose or frayed electrical wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operating the machine.

Keep all fuels and lubricants stored in properly marked containers and away from all unauthorized persons.

Store all oily rags or other flammable material in a protective container, in a safe place.

Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

Remove all flammable materials such as fuel, oil and other debris before they accumulate on the machine.

Do not expose the machine to flames, burning brush, etc., if at all possible.

Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes or hoses.

Repair any loose or damaged fuel and oil lines, tubes and hoses. Leaks can cause fires.

Inspect all lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Tighten all connections to the recommended torque.

Make sure that all clamps, guards and heat shields, are installed correctly to prevent vibration, rubbing against other parts and excessive heat during operation.

Shields, which protect hot exhaust components from oil or fuel spray in the event of a line, tube or seal failure, must be installed correctly.

Ether is flammable. Do not smoke while changing ether cylinders.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Use ether only in well ventilated areas.

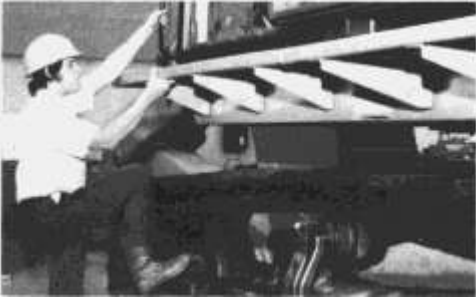
Keep ether cylinders out of the reach of unauthorized persons.

Do not store ether cylinders in direct sunlight. Discard cylinders in a safe place. Do not puncture or burn cylinders.

Fire Extinguisher

Always have a fire extinguisher on the machine and know how to use it. Inspect and have it serviced as recommended on its instruction plate.

Mounting and Dismounting



Mount and dismount the machine only where steps and/or handholds are provided.

Use both hands and face the machine, when mounting and dismounting.

Never get on or off a moving machine. Never jump off the machine.

Do not try to climb on or off the machine when carrying tools or supplies. Use a hand line to pull equipment up onto the platform.

Preparing to Start the Engine



Inspect the condition of the seat belt and mounting hardware. Replace any damaged or worn parts. Replace the seat belt regardless of appearance, after three years of use.

Adjust the seat so that full brake pedal travel can be obtained with the operator's back against the seat back.

Make sure the machine is equipped with a lighting system as required by conditions.

Make sure all lights are working properly.

Make sure no one is working on, underneath or close to the machine before starting the engine or beginning to move the machine. Make sure the area is free of personnel.

Starting the Engine



Do not start the engine or move any of the controls if there is a "DO NOT OPERATE" or similar warning tag attached to the start switch or controls.

Move all implement controls to the HOLD position before starting the engine.

Engage the hydraulic and directional control. Engage the swing brake control.

Start and operate the engine in a well ventilated area only. In an enclosed area, vent the exhaust to the outside.

Preparing to Operate the Machine

Clear all personnel from the machine and the area.

Clear all obstacles from the path of the machine. Beware of hazards such as wires, ditches, etc.

Be sure all windows are clean. Secure the doors and windows in either the open or shut position.

For best vision, especially close to the machine, adjust the rear view mirrors.

Make sure the machine horn, the backup alarm and all other warning devices are working properly.

Fasten the seat belt securely.

Check for proper operation of all controls and protective devices while moving slowly in an open area.

Operating the Machine

The operator must satisfy himself that no one will be endangered before moving the machine.

Operate the machine only while seated.

Operate the controls only with the engine running.

Do not allow riders on the machine unless additional seat, seat belt and Falling Object Protective Structure (FOPS) are provided.

Report any needed repairs noted during operation.

Carry implements close to the ground, approximately 40 cm (15 inches) above ground level.

Stay a safe distance from the edge of cliffs, overhangs and slide areas.

If the machine begins to sideslip on a grade, immediately dispose of the load and turn the machine downhill.

Be careful to avoid the condition which could lead to tipping when working on hills, banks or slopes, and when crossing ditches, ridges or other obstructions.

Work up and down slopes, rather than sideways, whenever possible.

Keep the machine under control and do not work it over its capacity.

Be sure hitch points and the towing device are adequate.

Connect trailing equipment to a drawbar or hitch only.

Never straddle a wire rope cable or similar device, nor allow others to do so.

Personnel should not be between the machine and trailing equipment when maneuvering to connect them. Block the tongue or hitch of trailing equipment to align it with the drawbar or hitch.

Parking the Machine

Park on a level surface. If necessary to park on a grade, block the machine.

Release the directional pedals to stop the machine.

Engage the hydraulic and directional control

Engage the swing brake control.

Lower all implements to the ground and apply slight down pressure.

Stop the engine.

Turn the start switch key to the OFF position.

Remove the start switch key and the disconnect switch key.

Seat Belt



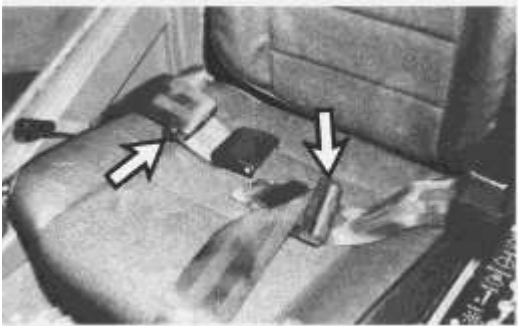
Inspect the seat belt and attaching hardware frequently.

Replace it at least every 3 years, regardless of appearance.

Fasten the seat belt before operating the machine.



1. Inspect the webbing for rips, tears or wear. Replace the belt if damage or excessive wear is present.



2. Inspect the adjusters for wear, damage and correct operation. Replace the belt if the adjusters are damaged or worn.
3. Inspect the mounting eye bolts and fasteners for wear or damage. Replace any worn or damaged hardware.
4. Be sure all seat belt mounting bolts are tight.



5. Fasten the buckle. Pull the loose ends of the belt to remove the slack. The belt should be snug but comfortable.

Seat Adjustment



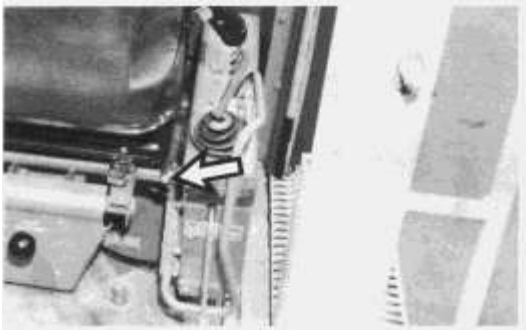
WARNING

Adjust the seat at the beginning of each shift or when changing operators.

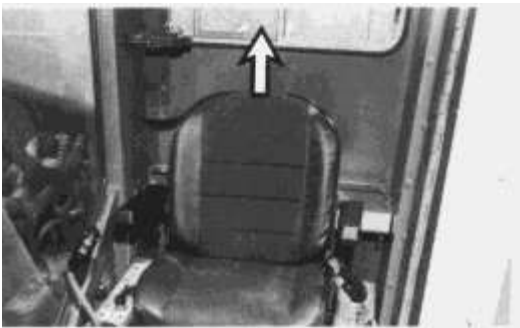
Adjust the seat to allow full travel of the pedals when the operator is seated against the seat back.



Push the lever down to permit raising or lowering of the seat.



Push the lever to the right to permit moving the seat forward or backward.



To adjust seat back tilt, lift the back and tilt to one of 3 positions. Release the back.

Suspension Seat



The optional suspension seat has a ride adjustment lever located at the right rear corner of the seat cushion. Adjust the seat with the operator seated.



Pull the handle up and twist to the right (clockwise) for a firmer ride or to the left (counterclockwise) for a softer ride. The seat is correctly adjusted when the indicator is even with the seat frame upright.

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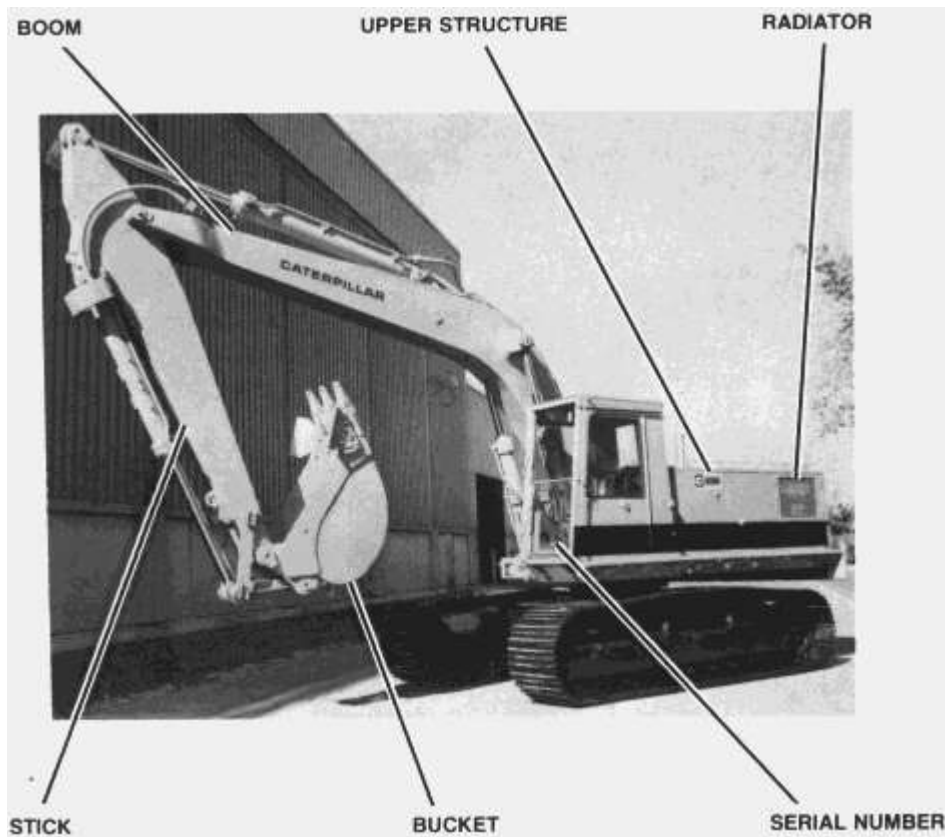
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Model Views

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Backhoe Equipped

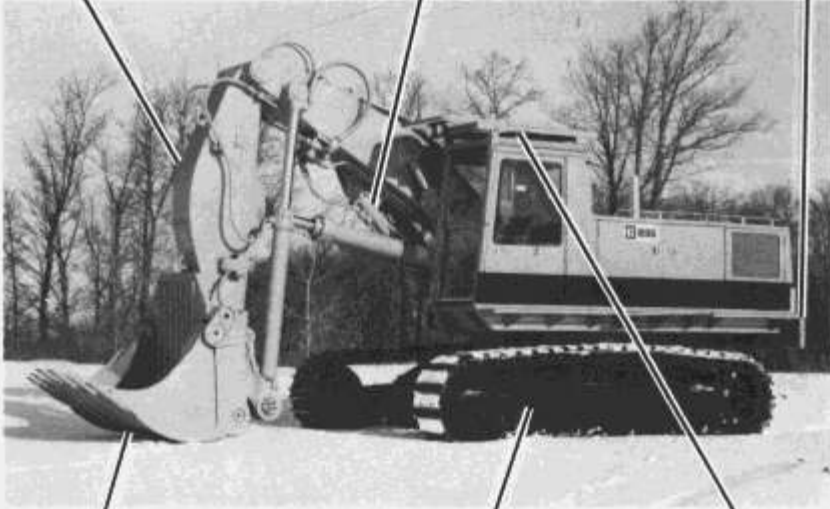


Front Shovel Equipped

STICK

MASTER CYLINDER

COUNTERWEIGHT



SHOVEL BUCKET

CARBODY

OVERHEAD GUARD

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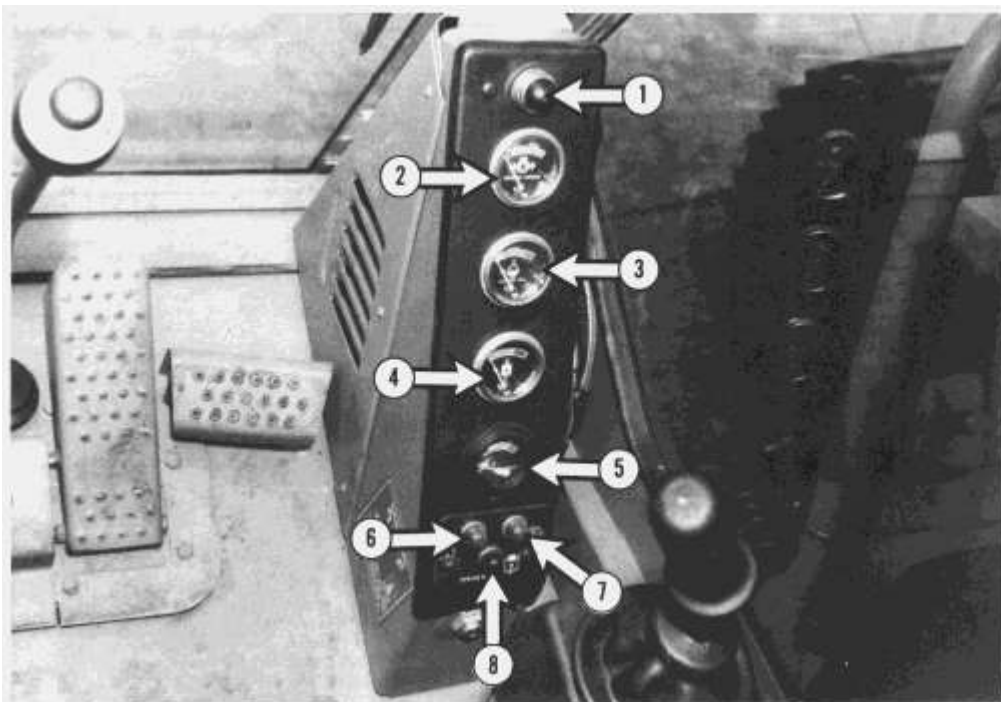
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Operator's Compartment

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Indicators



Master Warning Light (Red) (1) Flashes to warn the operator of a machine malfunction. It operates if engine coolant temperature is high, engine oil pressure is low or if the hydraulic oil level is low.

Engine Oil Pressure Gauge (2) Indicates the engine oil pressure. The GREEN range is normal at engine full load speed. The WHITE range is normal for engine low idle speed.

Coolant Temperature Gauge (3) Indicates the temperature of the engine coolant. The GREEN range is the normal operating temperature.

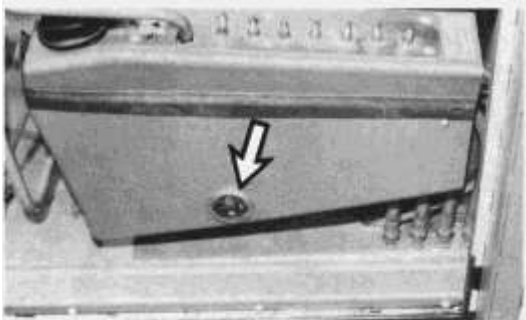
Hydraulic Oil Temperature Gauge (4) Indicates the hydraulic oil temperature. The GREEN range is the normal operating temperature.

Voltmeter (5) Indicates the voltage output of the alternator.

Hydraulic Oil Filter Indicator (AMBER) (6) When it lights it indicates plugged hydraulic oil filters.

Engine Air Filter Indicator (AMBER) (7) When it lights it indicates that the engine air filter requires service.

Hydraulic Oil Level Indicator (RED) (8) When it lights it indicates that the level of the hydraulic oil is too low.



Service Meter Indicates the total service hours on the engine. It should be used to determine service intervals.

Electrical Devices



Battery Disconnect Switch

To activate the electrical system, insert the key and turn the switch to the right.

Turn the switch off and remove the key when parking the machine. This will prevent battery drain.



Interior Light Switch Move the switch to turn the cab inside light on or off.

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