

Product: EXCAVATOR

Model: 224 EXCAVATOR 5TC

Configuration: 6.3544 DIESEL ENGINE FOR 224 EXCAVATOR 5TC00001-UP (MACHINE)

Operation and Maintenance Manual 214 AND 224 WHEEL-TYPE EXCAVATOR

Media Number -HEBU6004-01

Publication Date -01/06/1985

Date Updated -10/10/2001

Foreword

SMCS - 7606

This guide contains operation instructions and lubrication and maintenance information.

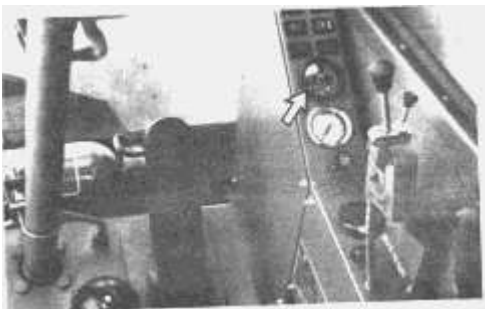
The operation section is a reference for the new operator and a refresher for the experienced one. Read - study - and keep it handy.

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.



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 on the cab.



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.



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.



Do not open door while engine is running. Personal injury could result from contact with moving parts.

Located on engine access door.

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 parking brake lever engaged.

The parking/service brake switch engaged.

The engine stopped.

The start switch key off and the key removed.

Follow the lift capacity sign in the cab for lifting.

To avoid possible weakening of a FOPS, consult a Caterpillar dealer before altering FOPS in any way. The protection offered by this FOPS will be impaired if it has been subjected to structural damage or has been involved in an overturn incident.

With the parking brake or transmission disconnected, the machine has no brakes. It will roll free on a slope or while towing. Block wheels before they are disconnected.

The upper structure can swing and cause personal injury during shipping or roading, if the swing lock pin is not engaged.

Lower the clamshell (if equipped) in the open position.

Use the front windshield or rear window as an emergency exit if the door is blocked.

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.

When using pressure air for cleaning, wear a protective face shield and protective clothing.

Maximum air pressure from the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

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 (Perkins Engine only) 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 (Perkins Engine) only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand.

Remove the cooling system (Perkins Engine) filler cap slowly to relieve pressure.

Cooling system conditioner (Perkins Engine) contains alkali that can cause personal injury. Avoid contact with the skin and eyes and do not drink.

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 that 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 "Starting the Engine" in the this 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.

Do not use ether in the engine when equipped with an air inlet manifold preheater.

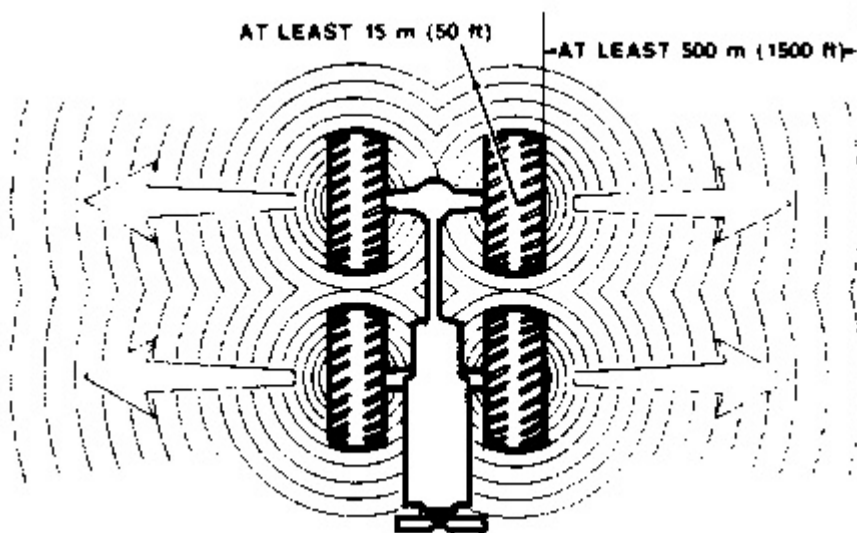
Fire Extinguisher

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.

Tire Information

Explosions of air-inflated earthmoving tires have resulted from heat-induced gas combustion inside the tires. The heat, generated by welding or heating rim components, external fire, or excessive use of brakes can cause gaseous combustion.

A tire explosion is much more violent than a blowout. The explosion can propel the tire, rim and final drive components as far as 500 m (1500 ft) or more from the machine. Both the force of the explosion and the flying debris can cause personal injury or death, and property damage.



Do not approach a tire closer than the outside of the area represented by the shaded area in the above drawing.

Dry nitrogen (N_2) gas is recommended for inflation of tires. The tires were originally inflated with air. Nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air.

Nitrogen inflated tires reduce the potential of a tire explosion, because nitrogen does not support combustion. Also, nitrogen helps prevent oxidation and the resulting deterioration of rubber and corrosion of rim components.

Proper nitrogen inflation equipment and training in its use are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

Stand behind the tread and use a self-attaching inflation chuck when inflating a tire.

Servicing and changing tires and rims can be dangerous and should be performed only by trained personnel using proper tools and procedures. If correct procedures are not followed while servicing tires and rims, the assemblies could burst with explosive force and cause serious personal injury or death. Follow carefully the specific information provided by your tire or rim servicing man or dealer.

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.

Make sure the machine is free of personnel before turning.

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 parking brake. Shift the transmission control lever to neutral.

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

Operate the machine only while seated.

Operate the controls only with the engine running.

Watch boom clearances when moving the machine. Uneven ground can cause the boom to move from side to side or up and down.

Know the maximum height and reach of your machine.

For safety, local or state codes or jobsite operating directives may require a greater distance.

Always keep the Falling Object Protective Structure (FOPS) (if equipped) installed when operating the machine.

Personal injury may result if the clamshell swings into the cab or into a person in the work area. The clamshell can swing in all directions.

Use caution when working around shear blades and grapples. Personal injury can result if shear blades or grapple are accidentally closed.

Do not allow riders on the machine unless additional seat, seat belt and falling object protection are provided.

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

Report any needed repairs noted during operation.

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

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

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.

No personnel should 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.

Engage the parking brake lever.

Engage the parking/service brake switch.

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

Stop the engine.

Turn the start switch key to the OFF position and remove the key.

Remove the electrical disconnect switch key.

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Service Number Locations

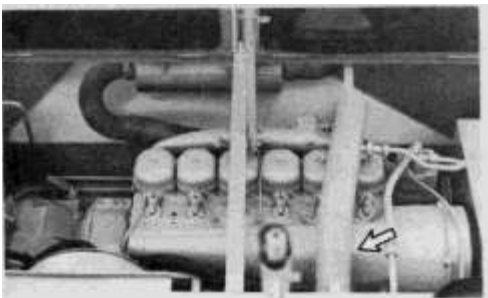
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For quick reference, record your machine's Product Identification Numbers (PIN) and serial numbers in the spaces provided below the photographs.



Product Identification Number (PIN) _____

Engine Model Number



Engine Serial Number _____



Combined Product Identification and Engine Serial Number Plate

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The inflation pressures shown in the chart below are cold inflation operating and shipping pressures for tires on Caterpillar machines.

The inflation pressure is based on the weight of a ready-to-work machine without attachments, at rated payload, and in average operating conditions. Pressures for each application may need to be varied from those shown and should always be obtained from your tire supplier.

Size	Ply Rating or Strength Index	Inflation Pressure	
		kPa	psi
10.00-20	PR12 8 ply	650	94
11.00-20	PR12 8 ply	650	94
18-19.5 XS	PR16 4 ply	650	94

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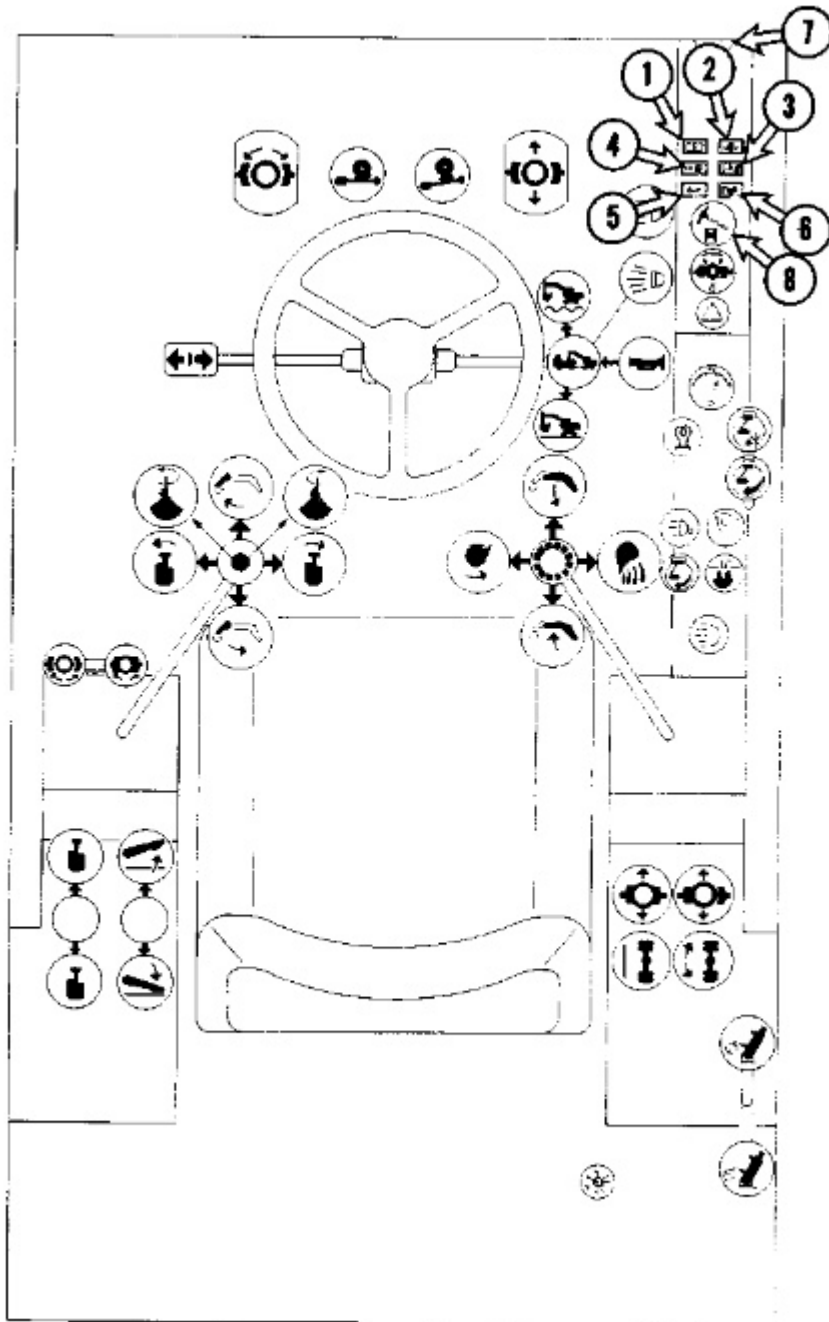
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Controls

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Indicators, Gauges and Switches

1. Alternator Fault Light - This light monitors the charging current. It should come on if the ignition key is inserted. It goes out if the alternator is charging. If it does not go out with the engine running, the batteries are not being charged. Determine the cause and repair the defect; if necessary, check the fan belts.

2. Engine Oil Pressure Fault Light - This light monitors the engine oil pressure. After starting the engine and building up sufficient oil pressure, the light goes out. If the the light comes on with the engine running, the lubrication system may have developed a fault. Stop the engine immediately.

3. Engine Temperature Fault Light - A red light shows that the engine is overheating. Stop engine immediately. When the light comes on, the horn sounds at the same time. Check fan belts.

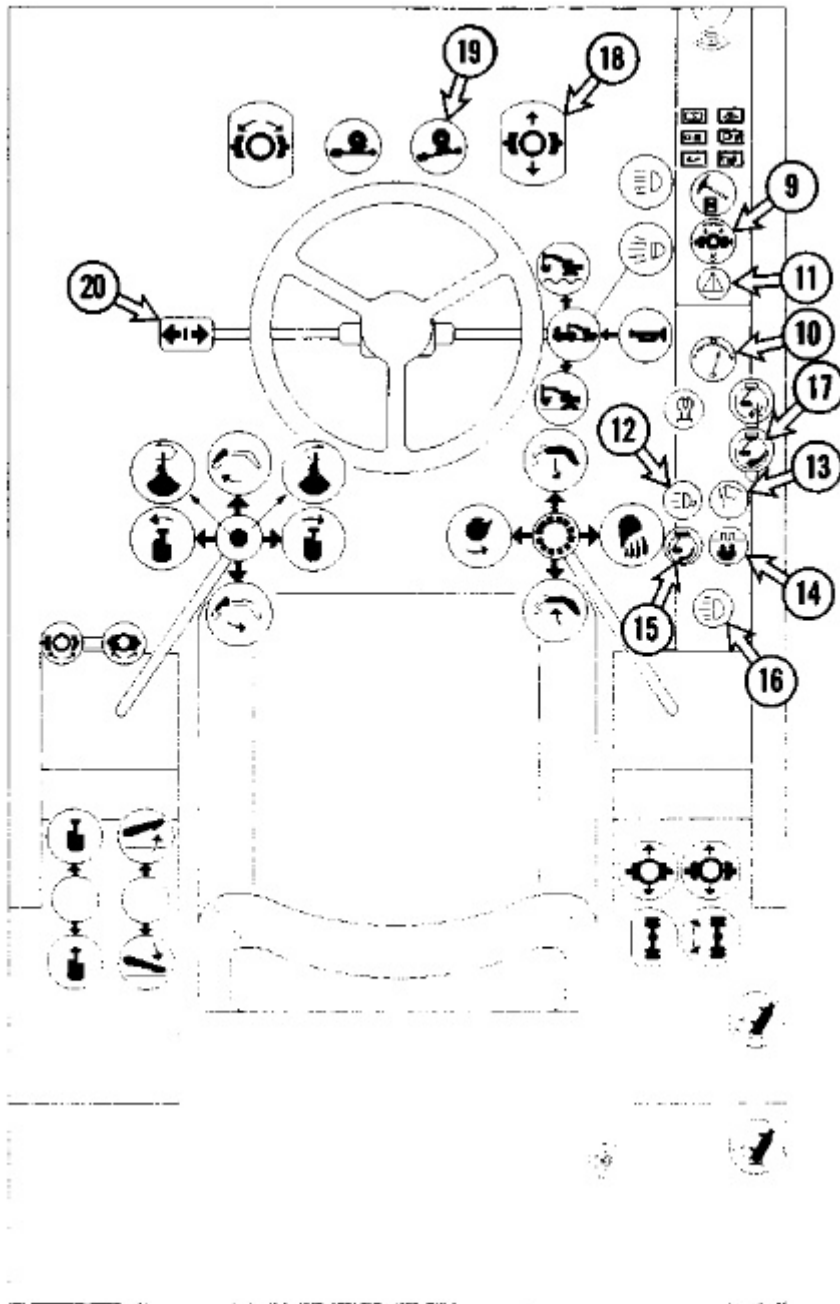
4. Main Headlight Beam Indicator Light

5. **Parking Brake Indicator Light** - This lights when the parking brake is engaged. The light extinguishes when the brake is released.

6. Spare Light

7. Spare Alarm

8. **Service Hour Meter** - Indicates the total number of hours the engine has operated. Use it to determine service intervals.



9. **Double Pressure Gauge for the Service Brake** - The pressure in the air tanks should always be between 6.2 and 7.35 bar (606 and 720 kPa or 88 and 105 psi) and is displayed by the black pointer. The red pointer shows the feed pressure during braking. Never drive the machine with insufficient tank pressure, as low tank pressure also reduces the braking efficiency.

10. Fuel Gauge - The fuel gauge monitors the quantity of fuel in the fuel tank.

11. Hazard Flasher Light Switch

12. Working Lights Switch

13. Windshield Wiper Switch

14. Power Socket - This socket may be used for hand lamps, cigarette lighters or similar devices. Check voltage.

15. Key Start Switch - Four positions to the right after key insertion.

1 - Off

2 - No Function

3 - Heat-Start (Control light will light when ready to start engine.)

4 - Engine Start - Release the key after the engine starts (224 only).

Use the push button starter on 214.

Release the starter after the engine starts.

16. Electric Disconnect Key - Three positions to the right after key insertion.

1 - Ignition On - Ready to use starter.

2 - Parking Lights

3 - Head Lights

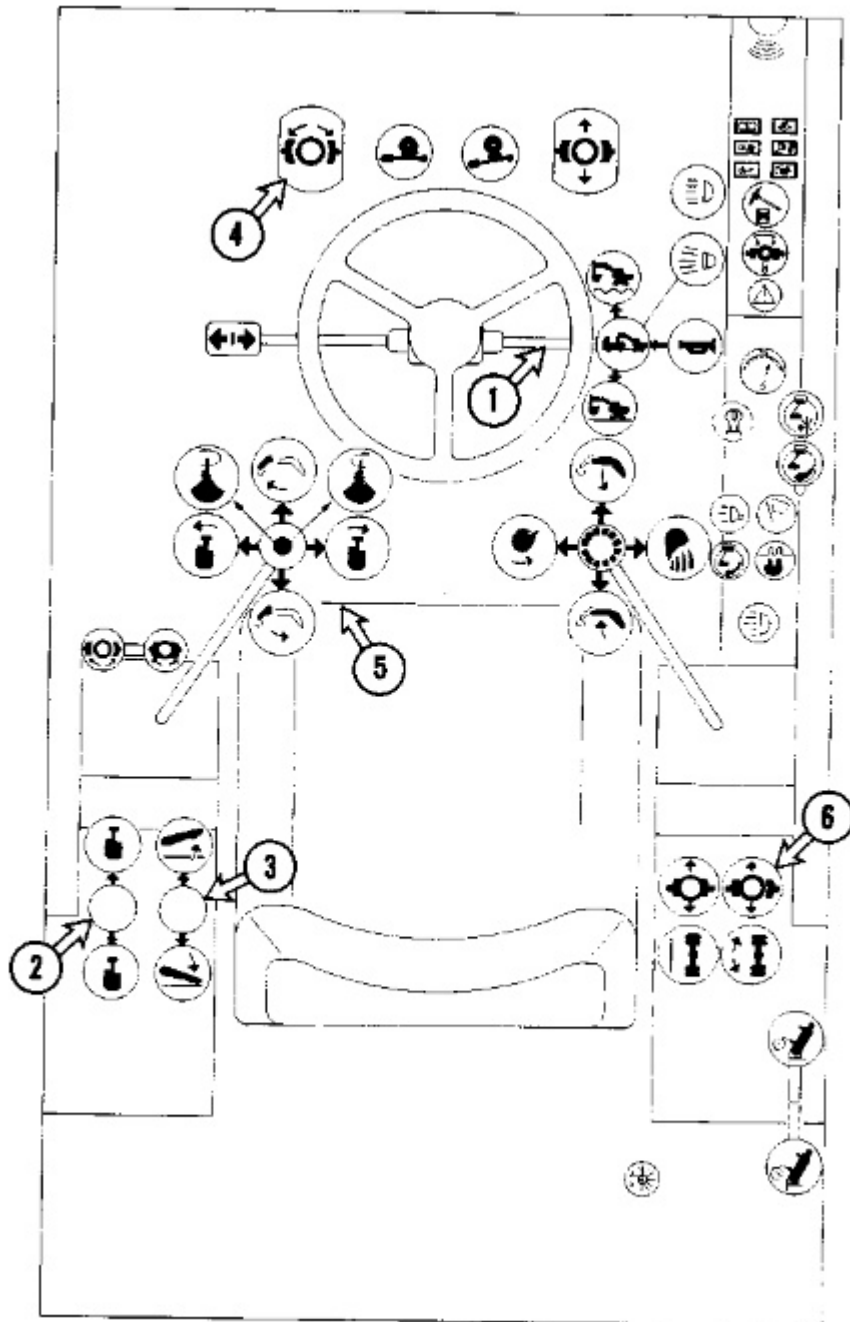
NOTE: Directional control must be in NEUTRAL to start engine.

17. Governor Control Lever - Pull back to increase the engine speed. Push lever forward past detent to stop the engine.

18. Service Brake Pedal - Push down to slow or stop the machine.

19. Parking Brake Shift Lock Lever - Engage to prevent from engaging and damaging transmission.

20. Flasher Switch with Integrated Fault Light Direction Signal Lever - Push forward to flash left turn signals. Pull back to flash right turn signals. Tip of lever flashes when either signal light flashes.



NOTICE

Stop the machine completely before changing the speed selector range.

Transmission and hydraulic drive motor will be damaged if this operating instruction is not observed.

In order to use the speed selector, lift the shift lock with the left hand. This shift lock should prevent simultaneous shifting of the transmission and the drive lever.

In case the machine must be towed in an emergency, shift the drive transmission in the undercarriage to neutral (detent position on shift

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