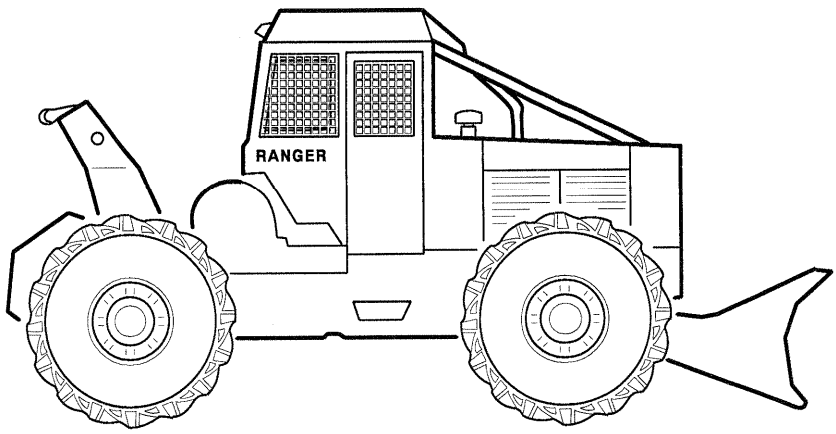
RANGER

F68 SKIDDER

OPERATORS MANUAL

PUBLICATION NO.

R6413



Allied Systems COMPANY

SHERWOOD, OREGON USA

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FOREWORD

The purpose of this manual is to serve as a guide to the proper operation and maintenance of your machine. Study this manual carefully before starting, operating the machine or performing any preventive maintenance procedures. Many hours have been spent in designing and producing the safest and most efficient machine possible. All this may be wasted if you do not read the safety instructions and follow them. Become familiar with all controls and instructions and keep this manual in the machine for handy reference. Machines usually do not cause accidents, people do. A safety conscious person and a well maintained machine make a safe, efficient and profitable combination.

NOTE: This manual has been written to include options not necessarily fitted to the version of the machine you have purchased. We therefore ask you to disregard information which is not applicable to your machine.

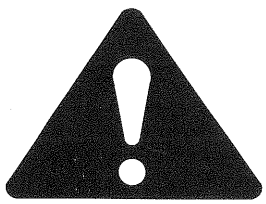
It is our policy to constantly strive to improve our products. The right therefore is reserved to make changes in design and improvements whenever it is believed the efficiency of the product will be improved, without incurring any obligation to incorporate such improvements in any product which has been shipped or is in service.

SAFETY REGULATIONS

Each country has its own safety legislation. It is in the operator's own interest to be conversant with these regulations and to comply with them in full. This also applies to local bylaws and regulations in force on a particular worksite.

Should the recommendations in this manual deviate from those in the user's country, the national regulations should be followed.

SAFETY ALERT SYMBOL



The symbol shown above will appear at various points in this manual in conjunction with warning statements. Its appearance means: "WARNING! BE ALERT! YOUR SAFETY IS INVOLVED!"

NOTE: Make sure that the warning Decals are readable, otherwise accidents may occur.

KNOW THE CAPACITY AND LIMITS OF YOUR MACHINE!

UNAUTHORIZED MODIFICATION OF ROLLOVER PROTECTIVE STRUCTURE (ROPS)

Do not make unauthorized modifications or alterations to the ROPS such as: welding on fire extinguisher brackets, antenna brackets, or fire suppression systems. Unauthorized modifications will affect the structural limits of the ROPS and will void the certification.

The Rollover Protective Structures (ROPS) have been certified to meet specified test requirements. These certifications are required by the U.S. Department of Labor under OSHA Regulation 1926.1000 and other regulations.

Any planned modification or change must be reviewed in advance by the Engineering Department to determine if the modification or change can be made within the limits of the certifying tests.

It is important that each person in your organization, including management, be made fully aware of these rules involving the ROPS.

Whenever anyone sees a machine ROPS with unauthorized modifications or changes, both the customer and manufacturer should be notified in writing.

SPARK ARRESTER MAY BE REQUIRED

Many states and other governmental entities have adopted laws and regulations which require spark arresters on machines operating on or near forests, brush or grass covered lands within their jurisdiction. The Federal government also has regulations (Forest Services) which require spark arresters on machines operating on National lands.

Use of machines without spark arresters in areas where such use is prohibited by law or regulation can subject the owner or operator of the machine to penal fines or civil damages, including the costs of fire suppression.

Spark arresting equipment complying with the applicable laws and regulations must be installed on any machines which are likely to be operated in such areas. All machines which are converted for woodland use (loggers, harvesters, etc.) should be equipped with approved spark arresting equipment.

The F68 machine has a turbocharged engine which does not require additional spark arresting equipment to comply with currently known laws and regulation.

FIRE; (PREVENTION, EQUIPMENT AND SUPPRESSION)

Fire Preventive Instructions

Forest fires are both costly and dangerous. Fire prevention must be foremost in the mind of a log skidder operator. Observe the following instructions to reduce the chance of a fire.

- Fire prevention features provided by the manufacturer should be maintained in operational condition and should be used to supplement the operator's fire prevention efforts. In no case should the features be used or assumed as replacement for operator efforts at preventing fires.
- Keep the machine and all equipment free of dirt, wood, oil etc. This will decrease possible fire hazards and make it easier to find loose or defective parts. This is especially important when working with combustible materials.
- The engine compartment and frame assembly should be inspected and cleaned at least daily, To do a thorough job, remove the access panels. Use regulated compressed air, steam or water with a non–flammable degreasing agent to remove all foreign materials. Maintain the engine cooling system to avoid overheating.
- Remove any debris from the operator's compartment and winch platform after each work shift.
- Check all the electrical wiring and connections for defects. Keep battery terminals clean and tight. if you find a problem, repair or replace immediately.
- Inspect the driveshaft and brakes for debris and remove all traces.
- Inspect all fuel, oil and hydraulic lines and connections. Tighten or replace any that show any leakage.
- Clean up any fuel, oil or hydraulic fluid spills after making repairs or servicing.
- Oily clothes are a serious fire hazard.
- Never perform welding operations until the entire machine has undergone a thorough cleaning. In addition, cover rubber hoses etc. and have at least a fire extinguisher at hand.
- Hydraulic fluid is flammable. Do not weld on pipes or tubes that are filled with fluid. Be careful when welding next to filled pipes or tubes.
- There is always a risk of fire. Find out which type of fire extinguisher to use, where it is and how to use it.
- Gasoline is highly flammable and should never be used as a cleaning fluid. Use an approved solvent for cleaning.
- Some solvents can cause skin rashes and or fire dangers. Do not inhale solvent vapors.
- Store flammable starting aids in a cool, well ventilated location away from combustible materials.
- Smoking, open flames, etc. should not be permitted around any machine during fueling operations and/or when fuel system is open to the atmosphere.

Fire Fighting Equipment

- Keep your fire extinguishers fully charged and in good working order. Know how to use them.
- Carry an approved fire extinguisher rated for all class of fires.
- A 5 pound rated extinguisher is the minimum size recommended in some areas. Check local laws.
- Install it within reach of the operator in a position that protects it from damage.
- Use only a "quick release" type of mount.
- Service the extinguisher according to the manufacturer's specifications. Service after every use, no matter how short a time and never operate the machine without both in full working order.

Fire Suppression

- Do not panic!
- Stop the machine and turn off engine in the clearest area available.
- Lower the blade (and log grapple if applicable).
- Shut off fuel and battery disconnect.
- Take the extinguisher and proceed to the source of the fire calmly.
- Though the manufacturer's instructions may vary, normally aim at the base of the fire.
- Even when the fire seems to be out , stand by with the extinguisher until the fire area is dead cool. Check this by removing any panels and looking for hot spots.
- Locate the cause of the fire and correct it before re–starting the machine.
- Thoroughly inspect the entire machine and recharge or replace the extinguisher(s) before returning to work.

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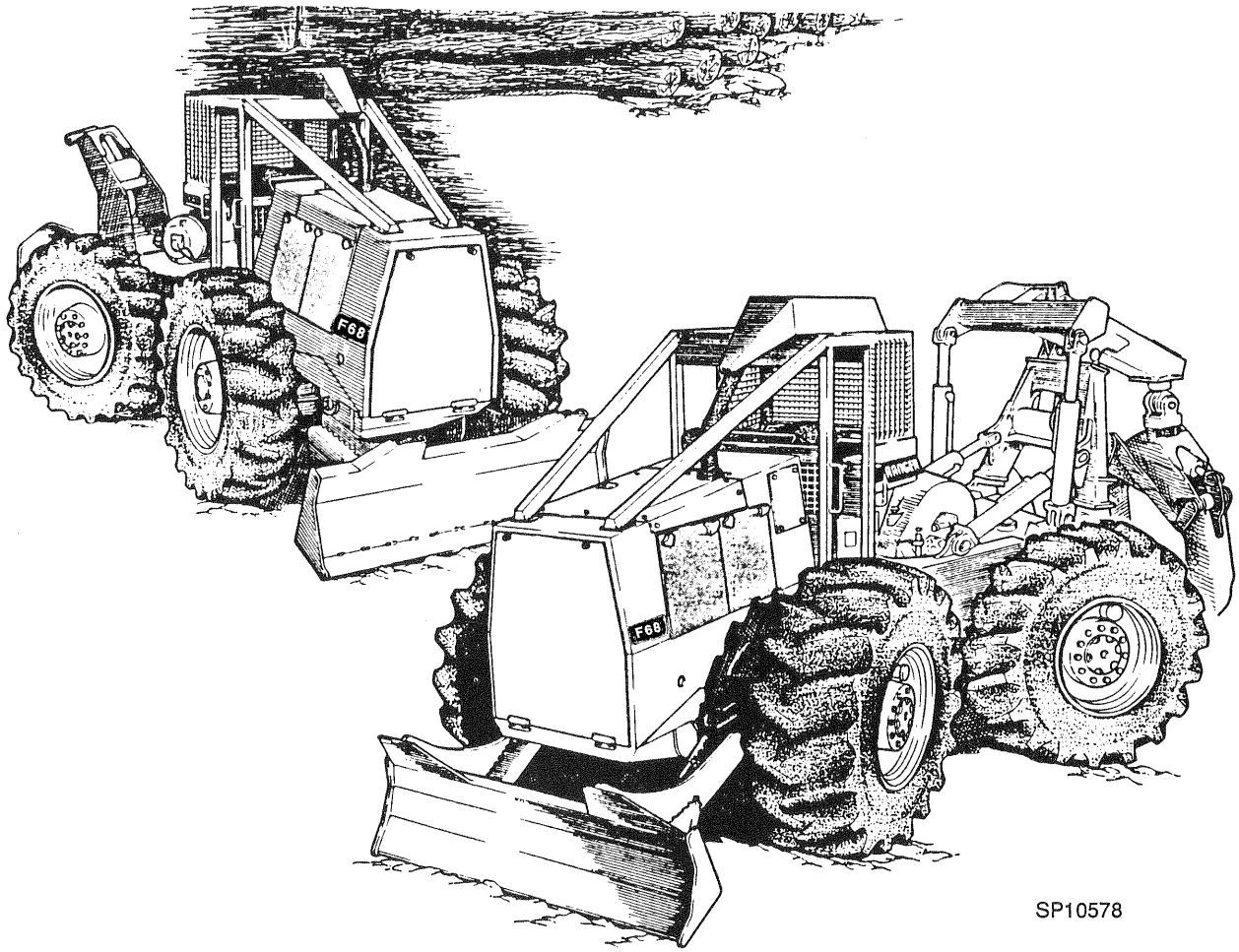

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PRESENTATION F68

The Ranger F68 articulated log skidders are available in two model styles. A Cable Skidder with a bare drum winch line pull of 178kN (39,900 lbf), Ranger Parallelogram Grappler Skidder With a 3149 mm (124 in) grapple opening and 360° rotation. All F68 grapple skidders are equipped with the above mentioned winch.

Engine

The machine is powered by a 8.3 liter (506 cubic inch), six cylinder, four cycle, turbocharged aftercooled Cummins diesel engine that produces 175 kW (234 hp).

Drivetrain

The transmission is a three speed power shift, full reversing, hydraulic transmission. A separate torque converter provides up to 1.82 to one torque multiplication. Gear shifting is through a lever operated, hydraulic control valve and Forward and Reverse modulation is provided for use in the first and second speed ranges.

Both drive axles incorporate No–Spin differentials and have additional gear reduction in the planetary wheel hubs.

The winch is shaft driven and hydraulically controlled. It can be operated with the machine standing or with it moving in forward or reverse.

Driveshafts incorporate universal and slip shafts.

Brakes

A single brake pedal actuates two sealed, multiple wet disc type break units. One is mounted on the rear of the transmission and the other is an enclosed midmount brake in the rear frame between the transmission and rear axle in the drive line. The mechanism of the transmission brake is mechanically applied for use as a parking brake.

Brake Pump

A gear type (4.5 gpm at 2350 PSI) pump driven by the engine draws oil from the main hydraulic reservoir. This rated flow is generated at a pump speed of 2500 RPM. The brake pump is dedicated to the power brake system, providing oil flow to the brake actuating system and charging the brake accumulators.

Brake Accumulators

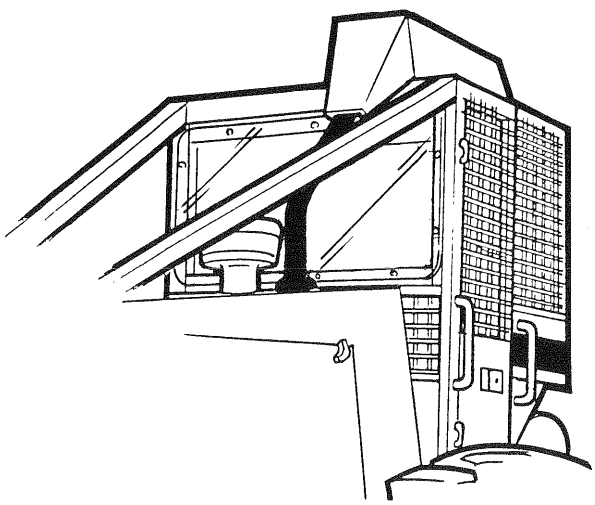
If the oil flow to the brake actuating circuit is interrupted, safe brake operation will temporarily provided by pressure stored in the brake accumulators, one for each brake circuit. By storing the energy required by the brake system, the brake pump does not have to operate continuously at high pressure.

Steering

Two dual acting hydraulic cylinders, controlled by a lever or actuated control valve move the hinged front and rear frames to steer the machine.

Canopy

The canopy and optional enclosed cab provide roll–over and falling object protection in accordance with applicable certification requirements.



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MAINTENANCE AND INSPECTIONS

MAINTENANCE

If the machine is to work as economically as possible, thorough maintenance is necessary. The recommended intervals for maintenance and lubrication refer to normal working and environmental conditions. The maintenance work described in this manual can be carried out by a trained operator. Further adjustments and repairs to the machine should be performed by an authorized dealer.

INSPECTIONS

Delivery Inspections

Before the machine left the factory it was tested and adjusted. In addition to this, your dealer has carried out a further check, the "Predelivery Inspection", according to our instructions before the machine was delivered to you.

Follow-Up Inspections

It is important that the machine receive further checks. Re-tightening of bolts, checking adjustments and other minor measures have to be carried out. You are entitled to two service inspections free of charge. The first must be carried out within the first 30 days or 100 hours of operation. The second is to be completed within 6 months, but not more than 1000 hours of operation.

The points in time at which these services should be carried out may be changed without prior notice.

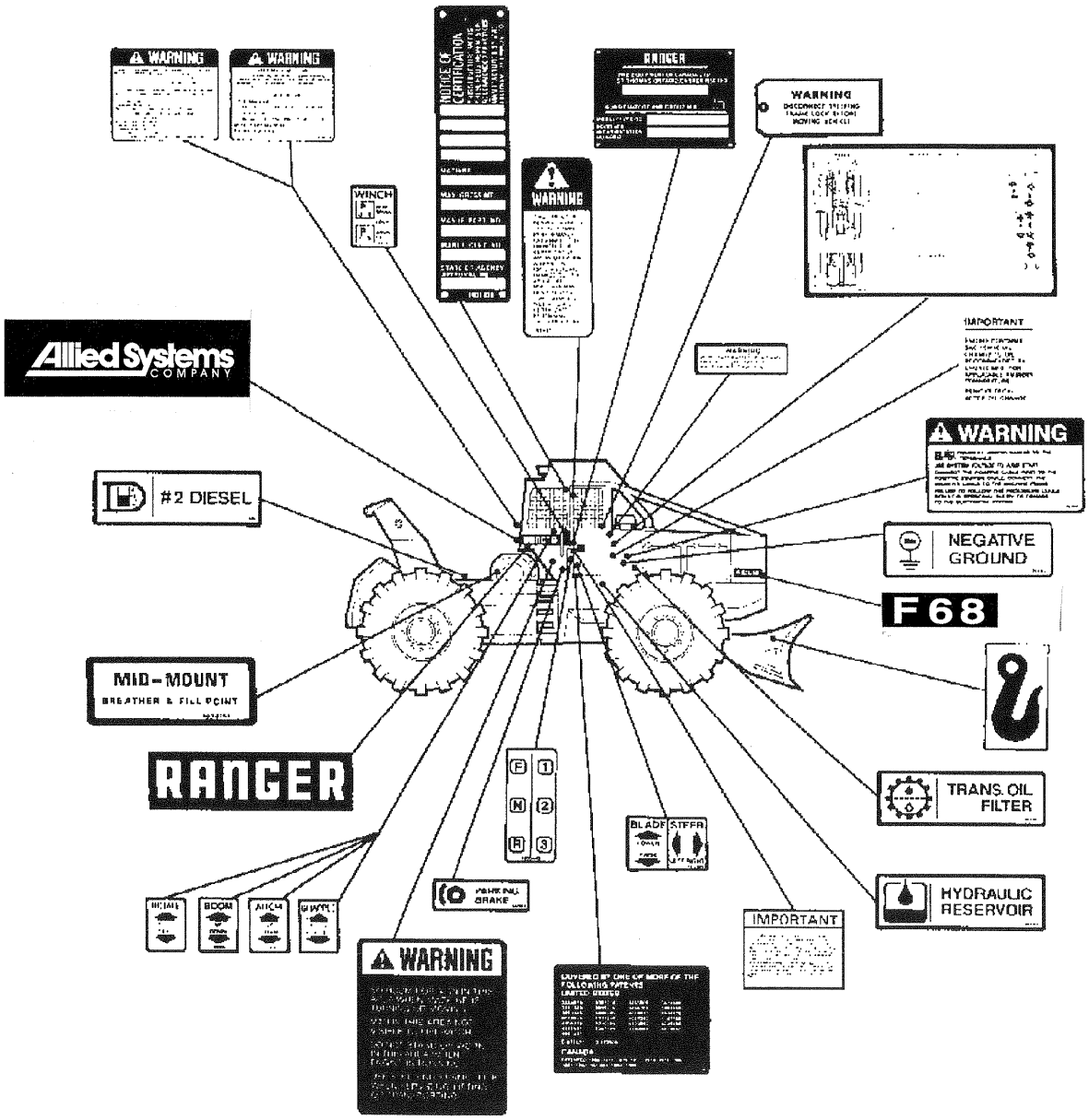
Maintenance Inspections

In addition to the maintenance listed in this manual, authorized dealers offer maintenance programs which give an indication of the general condition of the machine.

Further information about these programs can be obtained from the nearest authorized dealer.

NAMEPLATES, WARNING AND INFORMATION DECALS

Decals and plates are installed at specific places on the Skidder to aid the operator or serviceman by warning him of potential hazards and by outlining the procedures that must be followed for proper service. Decals and plates should be inspected frequently for damage and deterioration. Plates should be checked for loose or missing hardware.



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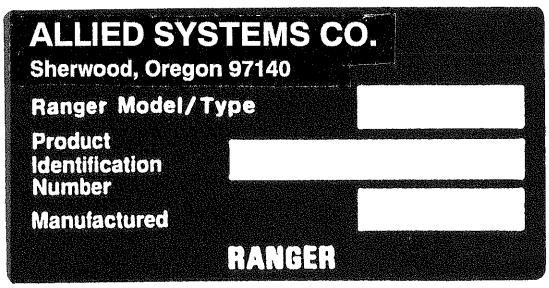
PRODUCT IDENTIFICATION NUMBER

At the time of manufacture, every machine is assigned a product identification (serial) number to identify that machine from all others built by allied systems co.

Product Identification Breakdown (Current Production)

The following breakdown explains the product identification (serial) numbering system.



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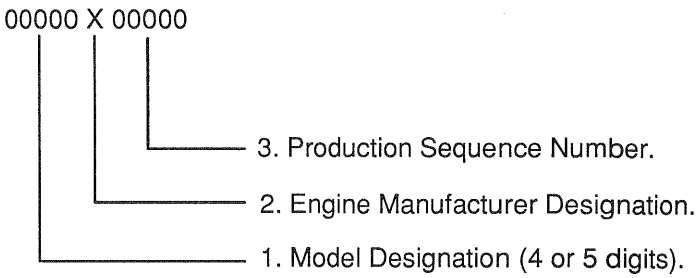
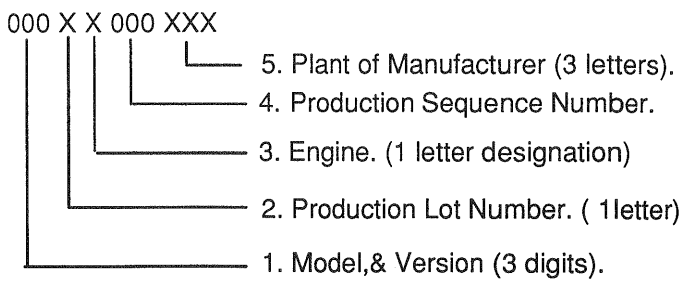


Always use the complete product identification (serial) number on all correspondence, service reports, literature and parts orders.

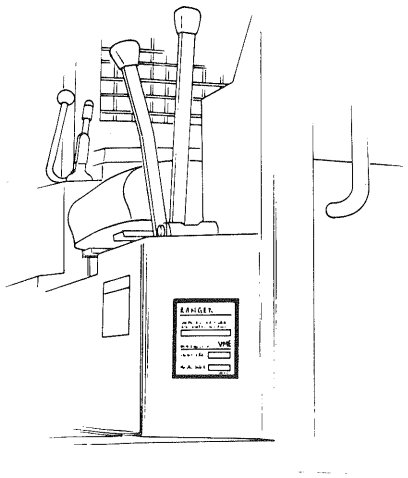
Product Identification Breakdown (Earlier Production)

The following breakdown explains the product identification (serial) numbering system.



Always use the complete product identification (serial) number on all correspondence, service reports, literature and parts orders.

PRODUCT IDENTIFICATION NUMBER LOCATIONS (Serial Number)



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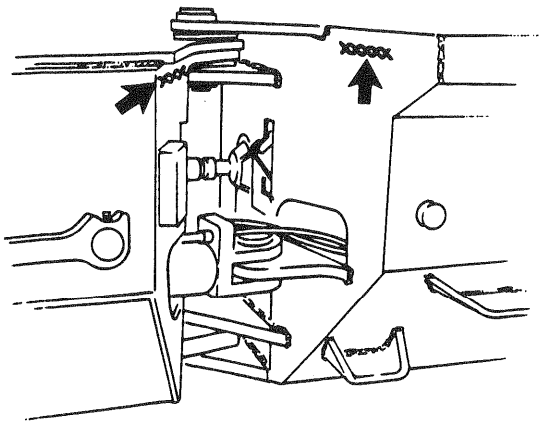
Serial Number Plate – Located on the floorboard panel to the left of the operator's seat.



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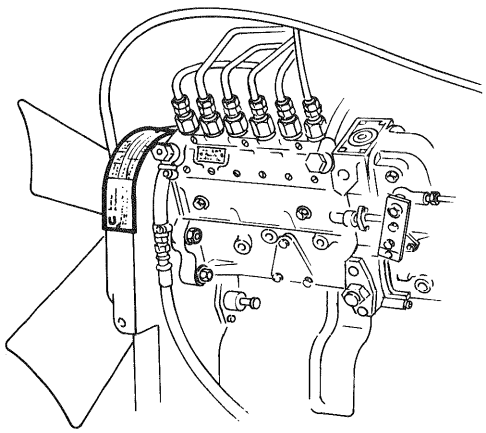
Frame – The machine serial number is stamped into the front and rear frames in the center hinge area on the right hand side of the machine.



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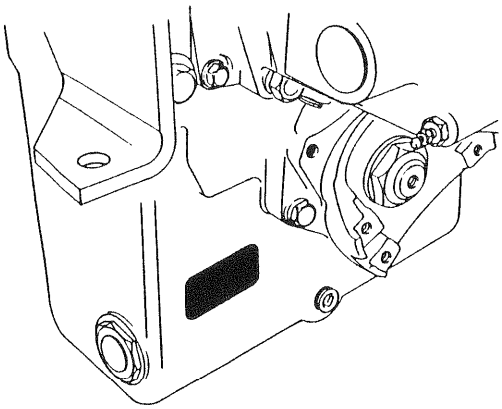
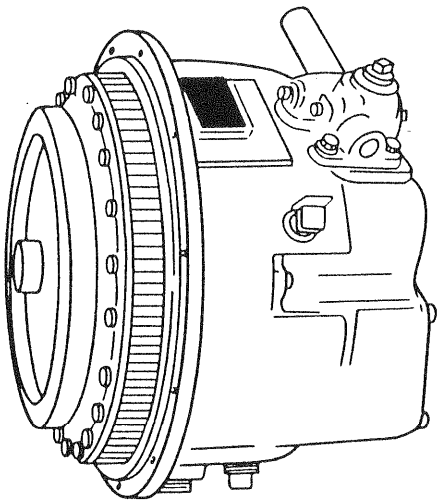
Engine Serial Number And Data Plate – Located on front left side of the engine.



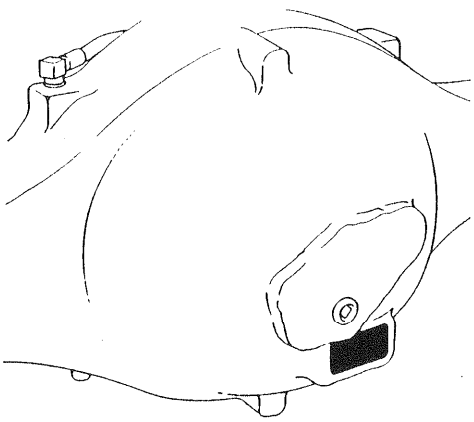
SP-10558

Transmission Serial Number And Model Plate – Located on the metal tag, attached to the rear of the transmission.



RP-10882

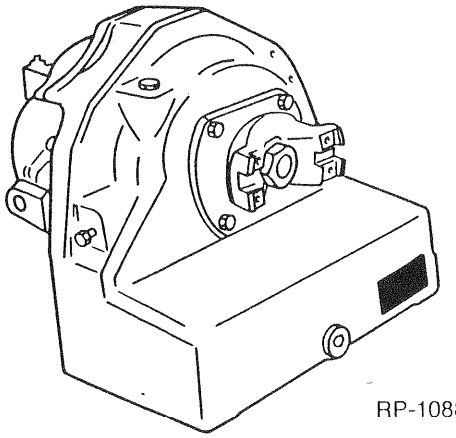
Torque Converter Serial Number And Model Plate – Located on the metal tag on the converter housing.



SP-10452

Drive Axle Ratio And Serial Number Model Plate – Located on the metal tag on the differential housing.

Midmount Brake Serial Number And Model Plate



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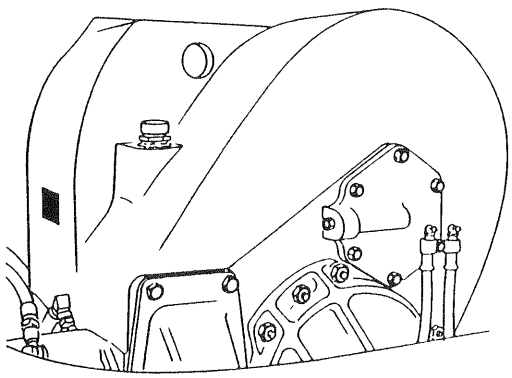
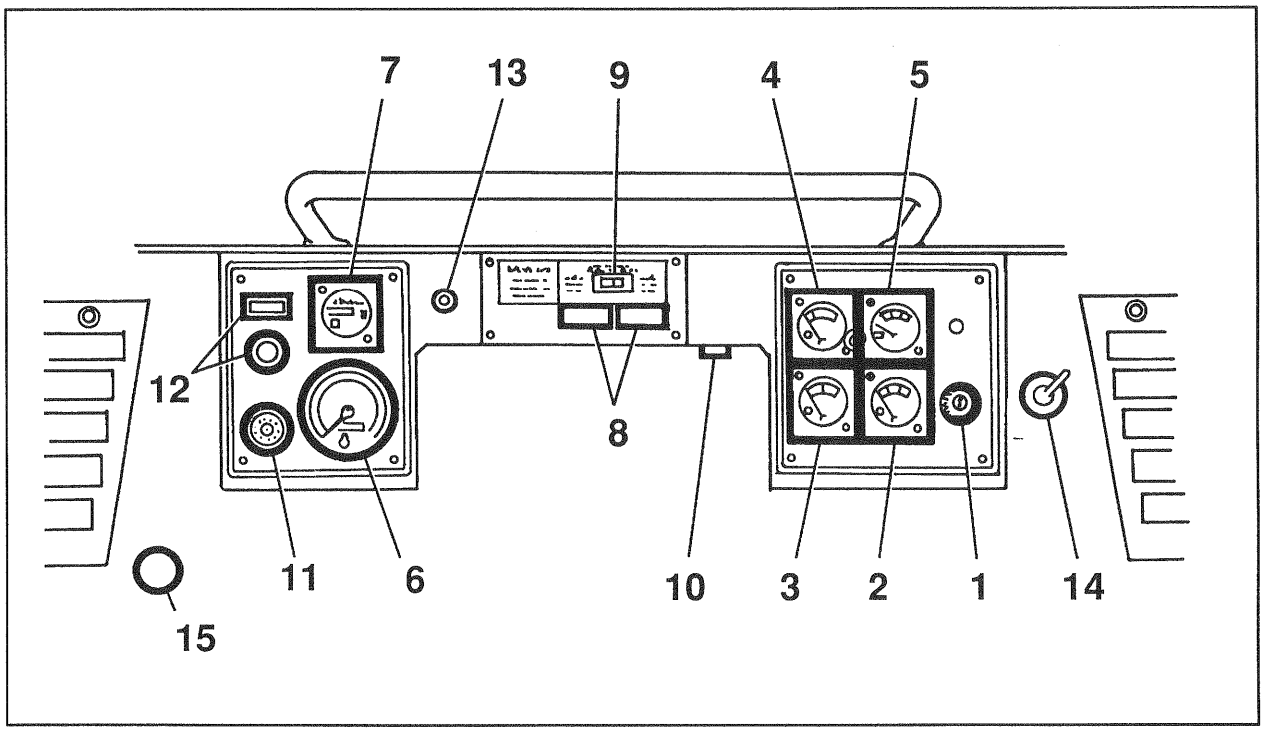
Winch Serial Number And Model Plate



SP-10559

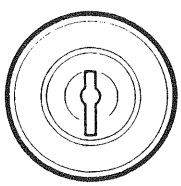
INSTRUMENT PANEL



RP10647

Note: See OTHER CONTROLS section of this manual for items 14 & 15.

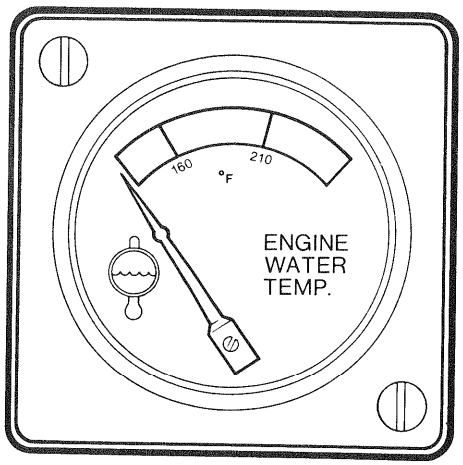
*Note: **Do not operate the machine until you study this manual carefully. Make yourself familiar with the operation of the machine, including the position and function of the various instruments and controls. Monitor the instruments occasionally, noting any abnormal readings,and take the appropriate corrective action to prevent serious damage.***



SP-10386

1. Ignition Switch

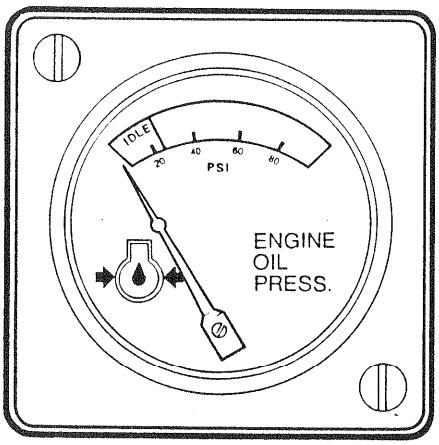
Insert the key into the ignition switch and turn it fully to the right to start the engine. The transmission must be in neutral to be able to start the engine. If the engine stops cranking while starting or will not crank, push the circuit breaker reset button on the side of the engine and try again. If the engine will not crank, further troubleshooting will be required.



RP-10698

2. Engine Coolant Temperature Gauge

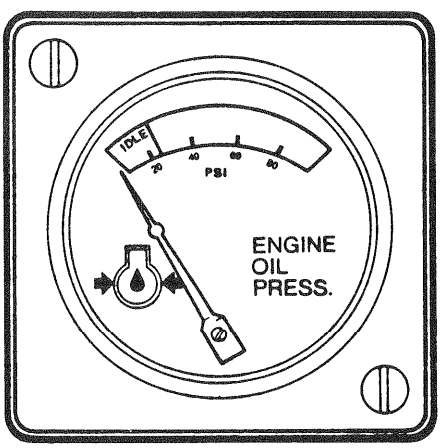
This gauge allows the operator to monitor the temperature of the engine coolant. Do not allow the indicator needle to enter the red zone on the gauge or serious damage to the engine and its components can result. If overheating does occur, shut down the engine immediately and determine the cause.



SP-10384

3. Converter Oil Temperature Gauge

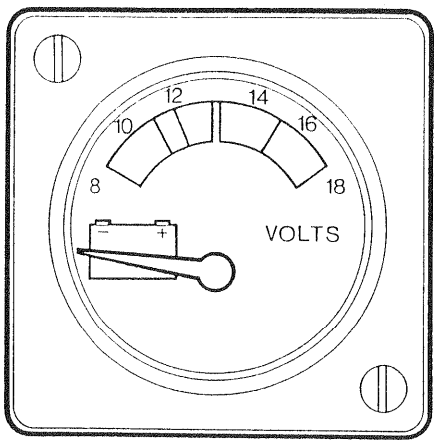
This gauge allows the operator to monitor the temperature of the transmission/ converter hydraulic fluid. DO NOT allow the indicator needle to enter the red zone on the gauge or serious damage to the system can result. If the system begins to overheat, choose a lower transmission speed range. If the system continues to overheat, shut down the engine and determine the cause.



SP-10384

4. Engine Oil Pressure Gauge

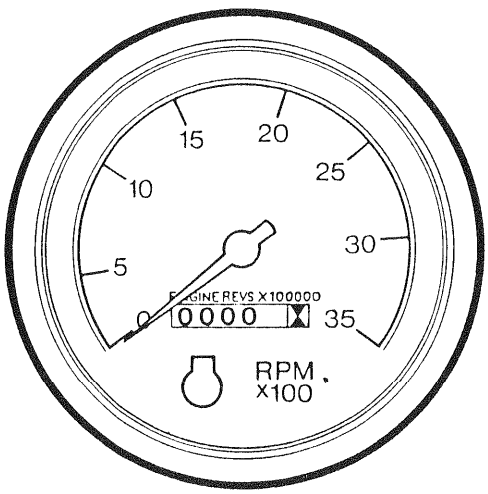
This gauge allows the operator to monitor the operating pressure of the engine lubrication system. After 15 seconds of operation, the guage should read 70 kPa (10 PSI) minimum at Low Idle RPM. If the pressure is below this, shut down the engine immediately and determine the cause.



SP-10630

5. Voltmeter

This gauge shows the electical system voltage with the ignition switch ON. Under normal conditions, the needle will be within green area of the gauge (12-15 volts). If the needle enters the red zones (under 11 or over 15 volts) and remains there while operating, the electrical system should be serviced.



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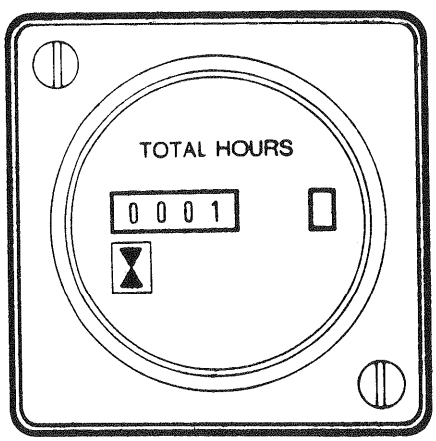
6. Tachometer

The tachometer shows the operating speed of the engine in revolutions per minute (RPM).

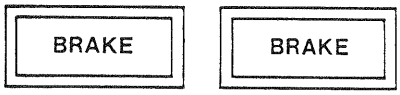


SP-10382

7. Hourmeter

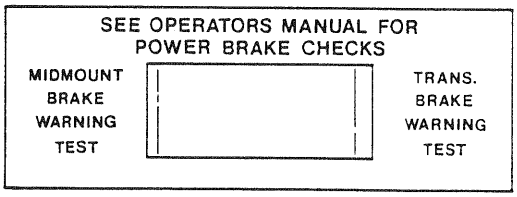
The hourmeter indicates the number of hours of operation that the machine has worked. Monitor the hourmeter closely to enable periodic lubrication and maintenance operations to be done at the recommended operating intervals. This will contribute to longer, trouble–free operation of your Ranger Log Skidder.

8. Brake Accumulator Warning Lights



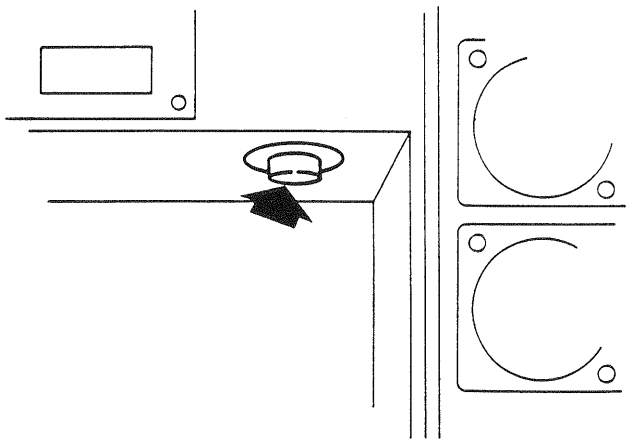
RP-10903

9. Brake Accumulator Test Switch



RP-10904

10. Brake Accumulator Warning Buzzer



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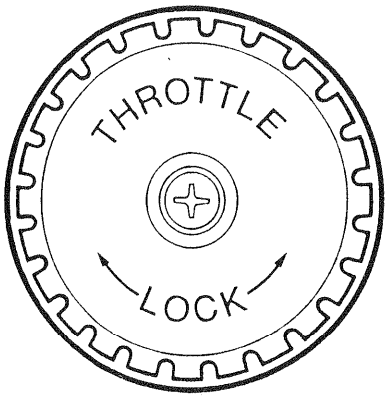


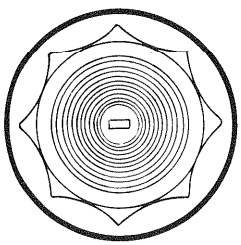
SP-10537

11. Hand Throttle Control (Optional)

This control is for use during warm–up or while making checks or adjustments at specified engine speeds. Pull the handle out until the desired engine speed is reached and turn the handle clockwise to lock it in that position. Turn the handle counter clockwise and push it in all the way to return the engine to Low idle RPM.

WARNING!

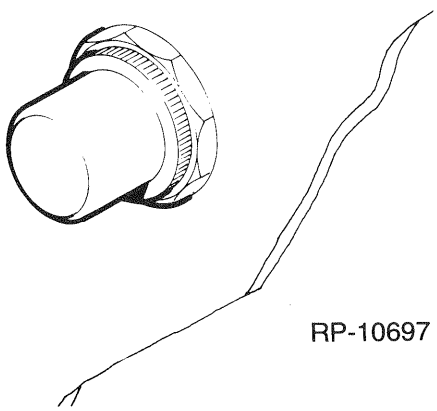
DO NOT use the hand throttle while traveling. When the control is locked, the accelerator linkage is locked as well and it will not be released by the service brake. Release the lock to restore throttle control to the accelerator pedal for traveling.



RP-10646

12. Emergency Steering Warning Light & Test Switch (Optional)

When the Steer Warning light is lit, it indicates that the secondary steering system is activated. The secondary steer system is driven by an electric motor and pump assembly. The secondary steer pump is activated by loss of hydraulic fluid to the main system and maintains the hydraulic fluid flow to the main steering system until the machine can be maneuvered to a safe stop.



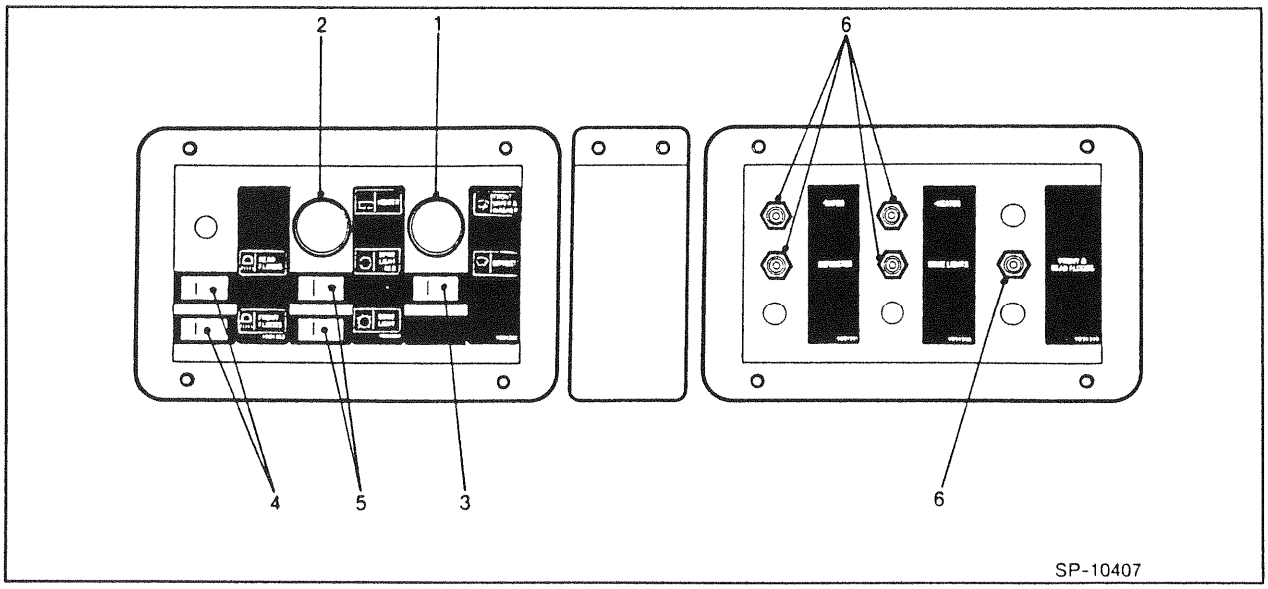
RP-10697

13. Cold Start Switch (Optional)

The cold start aid system is for quick starts in inclement weather. To activate the system crank the engine while depressing the cold start switch. This injects the starting fluid into the engine, do not depress the cold start switch for more than 5 seconds, it will cause damage to the electric valve solenoid.

WARNING!

Inject starting fluid only while cranking engine. Use only for starting. This system uses ether which is extremely flammable.



OVERHEAD INSTRUMENT PANEL

1. Windshield Wiper And Washer Switch (Optional)

Turn this switch clockwise one or two positions to turn on the windshield wiper (two speeds). Turn the switch fully counterclockwise to turn the wiper off. Press the switch to activate the windshield washer.

NOTE: Use only clean windshield washer solvent in the washer reservoir. Use a quality brand of washer anti–freeze if the ambient temperature falls below O° C (32 °F).

2. Heater Switch (Optional)

Turn this switch clockwise one position for a low fan speed or two positions for a fast fan speed to heat the interior of the enclosed cab.

3. Defrost Fan Switch (Optional)

This switch controls the windshield defrost fan to clear the inside of the windshield of frost and condensation.

4. Front And Rear Flood Lamp Switches (Optional)

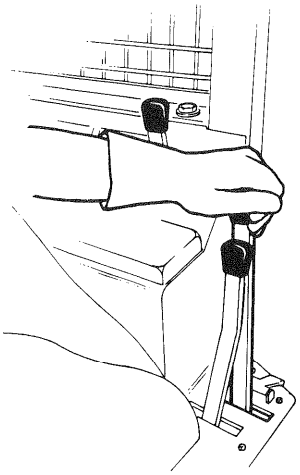
These switches control the front and rear flood lamps independently for use when the machine is operated at night.

5. Dome Light Switch (Optional)

The red dome light switch controls the red light inside the top of the cab for use when traveling at night. The other switch controls the white dome light ,which is to be used ONLY when the machine is stationary.

6. Accessory Circuit Breakers (Optional)

If any of the controls do not work, push the appropriate circuit breaker reset button and try the control switch again. If this fails to correct the problem, further troubleshooting will be required.



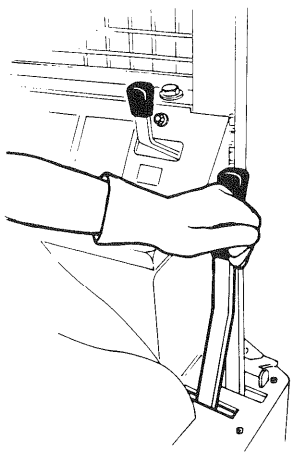
RP-10648

OTHER CONTROLS

Direction Control Lever

This lever is connected to the transmission control valve and controls the transmission's Forward and Reverse functions and has a center Neutral position.

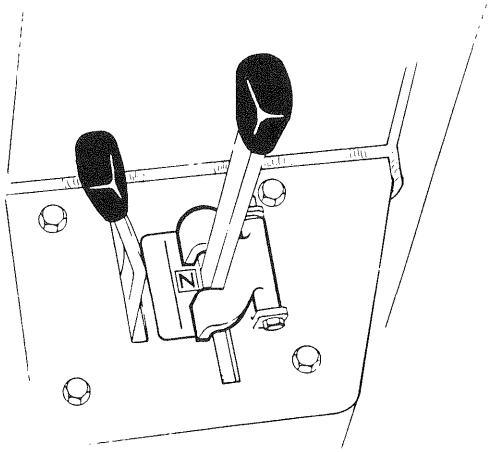
Note: ***Your machine is equipped with Forward/Reverse modulation to provide a system cushion when the machine's direction is changed while it is still moving. This feature should ONLY be used in First or Second speed ranges. Damage to the transmission can result if this feature is used in the Third speed range at travel speeds.***



RP-10650

Speed Range Control Lever

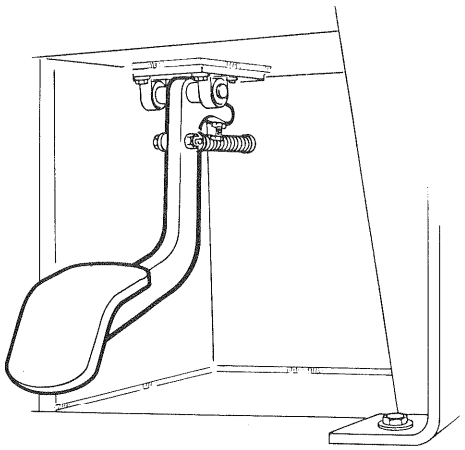
This lever also connected to the transmission's First, Second and Third speed ranges. The lower the range selected, the less strain is put on the engine when the machine is pulling a load



SP-10520

Neutral Lock

Turn this latch to the right when the direction control lever is in the NEUTRAL position to lock the lever in that position. ALWAYS engage the neutral lock when you leave the seat with the engine running.



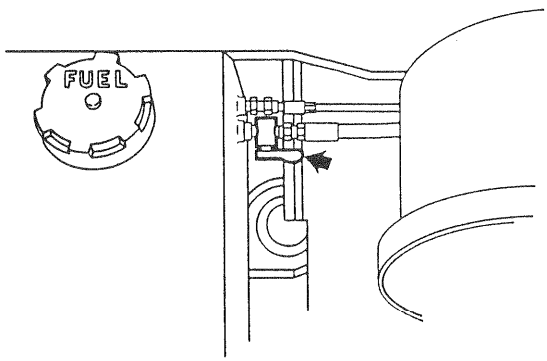
RP-10652

Accelerator Pedal

This pedal is located in the right operator's footwell and controls the engine throttle. Depress the pedal to increase the speed of the machine or release it to decrease the speed.

Fuel Shut Off Valve

The fuel shut off valve located at the fuel tank should be closed at the end of the work shift. Remember to turn the valve on prior to starting the machine.



RP-10892

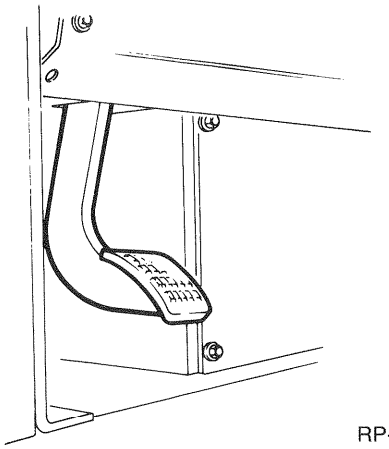
Battery Disconnect Switch

Turn this switch to the OFF position to disconnect the current supply from the battery to the electrical system.

NOTE: DO NOT turn this switch to the OFF position with the engine running. Serious damage to the alternator and electrical system can result.

NOTE: Turn the battery disconnect to the OFF position at the end of each workshift or when the machine is not to be operated.

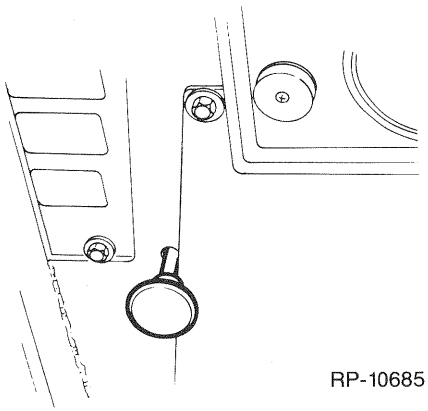
SP-10397



RP-10651

Service Brake Pedal

This pedal is located in the left hand operator's footwell and is a dual braking system which controls both the transmission mounted hydraulic brake and the enclosed midmount brake for normal machine braking. Depress the pedal to decrease the speed of the machine or to stop the machine completely.



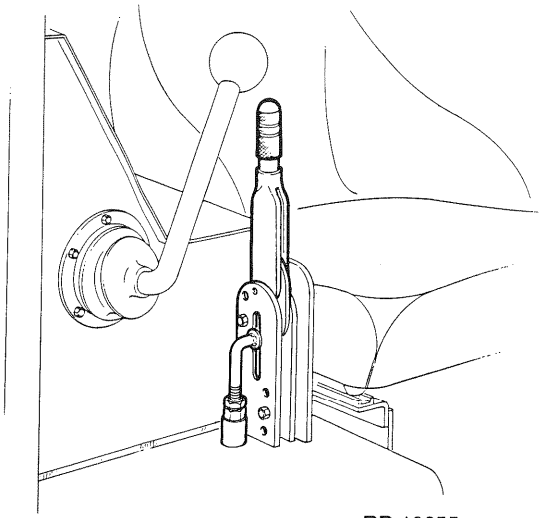
RP-10685

Brake Accumulator Discharge Lever

The accumulator discharge lever located on the firewall in the operator compartment is used to test the condition of the power brake system on your machine. It is also used for checking the midmount and transmission brake warning circuits. This is done by the inverted shuttle valve in the brake hydraulic system. It's function in the system is to maintain pressure in one of the accumulators if one of them stops functioning, as in the case of a ruptured brake line, the functioning one can act as a secondary brake so that the machine can be brought to an immediate stop. To insure that the inverted shuttle valve in the brake accumulator system is functioning properly use the following procedure.

1. Ensure both accumulators are charged by running the engine for 30 seconds at idle or until warning lights and buzzer go off, then shut down the engine.
2. Discharge the transmission brake accumulator by pulling the accumulator discharge lever until the right light comes on and the buzzer sounds, then releasing it. (DO NOT push it or you will discharge the midmount brake accumulator).
3. Wait one minute to ensure that the left light for the midmount brake warning system does not come on. If the left light does come on, there is a fault in the inverted shuttle valve, continue check–out.
4. Re–start the engine to recharge accumulators, run 15 seconds at half throttle or until the lights and buzzer go off and shut down the engine.
5. Discharge midmount brake accumulator by pushing accumulator discharge lever until left light comes on and the buzzer sounds, then releasing it.(DO NOT pull to release or you will discharge the transmission brake accumulator).
6. Wait one minute to ensure that the right light for the transmission brake warning system does not come on. If the right light light does come on, there is a fault in the inverted shuttle valve. It should be removed and checked for defects. If defective, replace it.

Note: This test should be done daily at the start of the shift and the brake warning lights and buzzer should be checked periodically during the day by actuating the test switch.

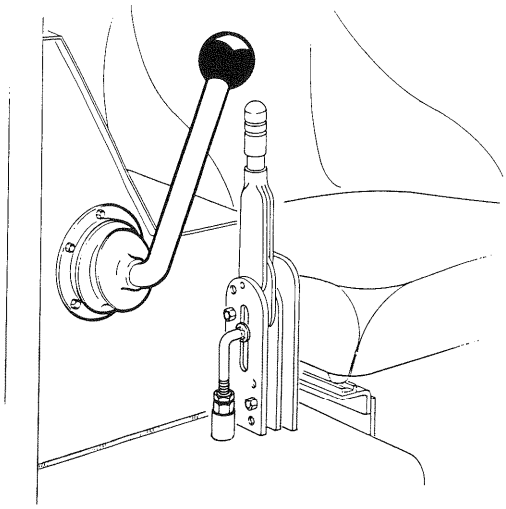


RP-10655

Parking Brake Lever

Pull this lever up and back to actuate the parking brake mechanism.

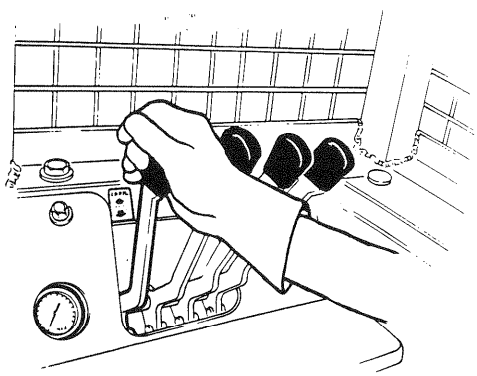
NOTE: F68 machines automatically declutch the transmission when the parking brake is applied to prevent driving thru the parking brake.



RP-10653

Steer And Blade Control Lever

This lever is connected to the main control valve end controls both functions. Moving the lever to the left and right steers the machine in that direction. Pulling the lever straight back lifts the blade and pushing it straight forward lowers it.

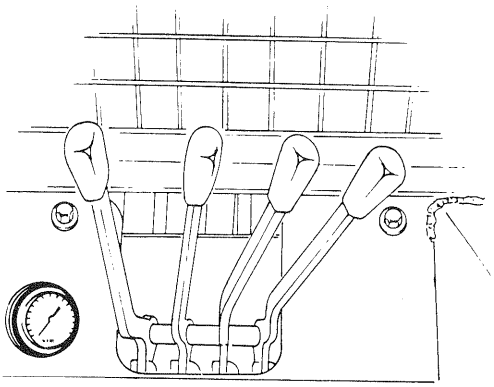


RP-10694

Grapple Control Lever

On grapple skidders, this lever opens and closes the grapple tongs to pick up or drop a load of logs.

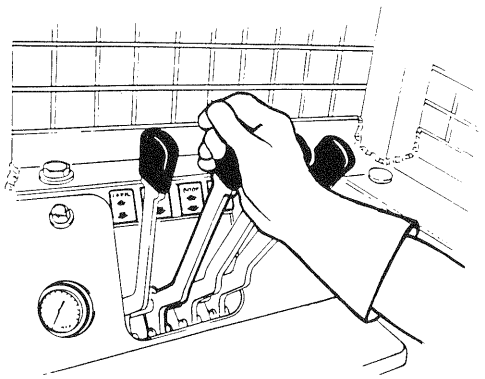
Note: Parallelogram Grapple Skidders are equipped with a log grapple accumulator system that uses a hydraulic accumulator to store hydraulic energy for the grapple hydraulic circuit to maintain a firm hold on the log bundle in the grapple tongs.



RP-10659

Grapple Accumulator System Pressure Gauge

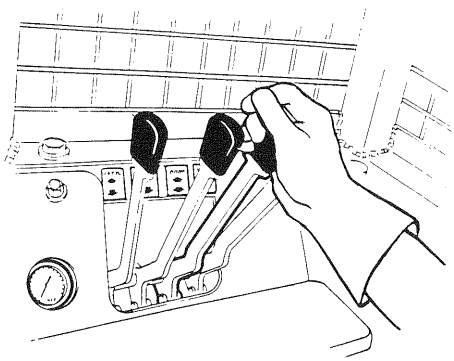
This gauge reads the pressure in the hydraulic accumulator and the base end of the log grapple cylinder to allow the operator to monitor the operation of the system. If there is a pressure drop shown on the guage, hold the grapple control lever in the CLOSE position long enough to allow the system to reach maximum pressure, about 15.2 MPa (2200 PSI). Experience with your specific operating conditions will tell you what pressure reading on the gauge will require that the accumulator be re–energized.



RP-10656

Arch Control Lever

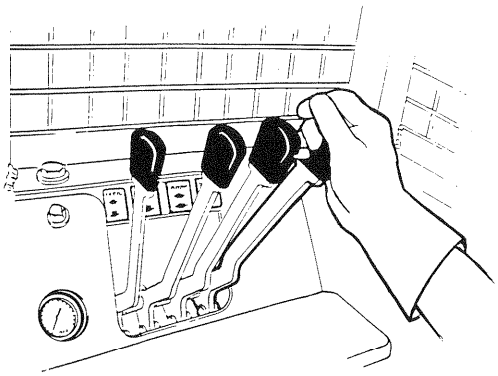
On grapple skidders, this lever moves the grapple arch forward or back to position the grapple tongs over the load.



RP-10657

Boom Control Lever

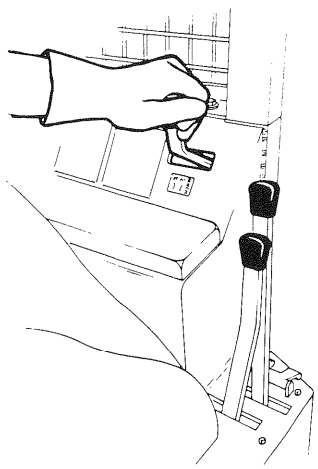
On Parallelogram grapple skidders this lever controls the boom pivot to better access the grapple over the load.



RP-10658

Grapple Rotating Head Control Lever

This lever rotates the log grapple assembly to the left and right to position the grapple around the load.



RP-10661

Winch Control Lever

This lever actuates the winch control valve to operate the winch with the engine running. When the lever is moved to the detented FREE–SPOOL position, the winch mainline can be pulled out from the winch cable drum. When the lever is moved to the WINCH–IN position, the winch cable drum will rotate and pull the load. When the lever is in the detented center LOCK position, the cable drum is held in the SKIDDING mode and the load can be transported to its destination.

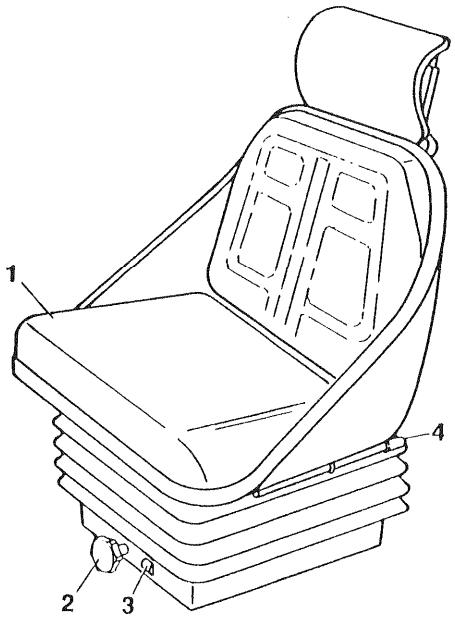
WARNING!

The winch must only be operated from the operator's seat. NEVER stand in the articulation area (outside the operator's guard) when you operate the winch. The operator's guard will protect you in the event that the cable should snap under tension.

Note: ***When the load has been WINCHED–IN to the butt pan, release the winch control lever to the LOCK position IMMEDIATELY. Serious damage to the winch and transmission can result if the winch is made to pull against the butt pan longer than momentarily.***

OPERATORS SEAT

Adjust the operator's seat to a comfortable position.



RP-10763

WARNING!

Do not attempt to make seat adjustments while machine is in motion.

SUSPENSION SEAT (Current Production)

Forward and Back Adjustment

Lift lever (Item 4) up and hold, slide seat to desired position, then release lever.

Height Adjustment

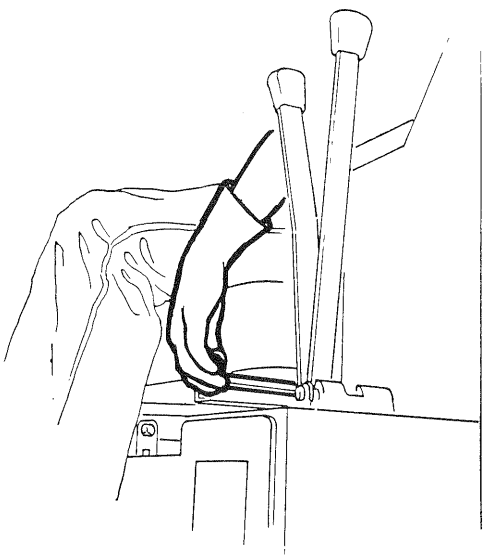
To raise the height of the seat you must manually lift the seat (Item 1) to the first or second click stop.

To lower the seat lift it to its highest position, seat will then lower into its lowest position. Adjustments can be made accordingly.

Weight Adjustment

By turning the weight adjustment knob (Item 2), located at the bottom of the seat, the operator's weight can be set for a more stable and comfortable ride. The weight selected can be seen through a window (Item 3) next to the adjustment knob with the seat in the unloaded position.

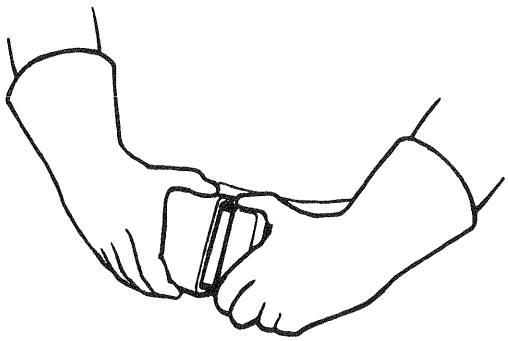
The suspension seat can be adjusted from 110 lbs (50 kg) to 287 lbs. (130 kg) and should be set so the seat does not bottom out during normal operation for maximum suspension life.



RP-10660

Seat Adjustment Lever (Earlier Production)

This lever is located below the operator's seat and allows the operator to position the seat forward or back for his operating comfort.

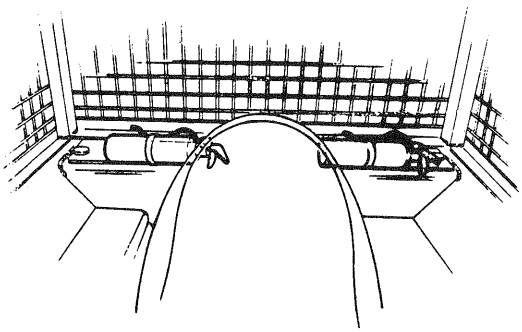


SP-10405

Seat Belt

Always fasten your seat belt when you operate the machine. Adjust the belt so that it fits snugly around the hips.

Seat belt and mounting must be inspected for damage or wear. Check the buckle for correct operation. Replace as needed.



SP-10536

Fire Extinguishers

Ranger Log Skidders are equipped with two 2.3 kg (5 lb.) hand operated fire extinguishers mounted behind the operator's seat. Read and understand the instructions printed on the canister and learn how to operate them. Learn how to remove the canisters from their mounting brackets in the shortest possible time.

V50385

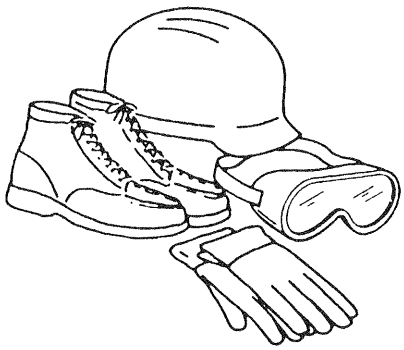
PREPARE TO OPERATE

Before you operate the machine, read and understand this manual.

Never operate the machine while under the influence of alcohol, medicine or other drugs.

The optional enclosed cab has two exits; the left hand door and the right hand door.

The canopy and optional cab are for the protection of the operator. They meet the requirements for R.O.P.S./F.O.P.S protection according to the S.A.E. and I.S.O. Standards.



EL13914

Wear suitable clothing.

Know the area and the company rules and regulations.

PROCEDURE BEFORE STARTING

1. A walk around inspection should be carefully performed looking for leaks, loose, missing or damaged parts. Defects should be corrected prior to starting the engine.

2. Daily maintenance checks should be completed.

Note: Perform maintenance checks in a sequence to avoid repeatedly mounting and dismounting the machine.

WARNING!

When mounting and dismounting the machine, use three point mount (i.e. Two hands and one foot/one hand and two feet). Don't Jump!

In addition to the walk around inspection and daily maintenance check, the following checks should be made:

- Frame locking link is in the stored position.
- Wheel blocks removed.
- Battery disconnect switch is in the "On" position.
- Fuel shut off valve is turned on.
- Windows are clean, if applicable.
- Park brake is applied.

RUN IN INSTRUCTIONS

During the first 50 hours of a new machine's operation, the machine must be operated with extra care until all components are adequately run in.

Engine

See the Cummins Operation and Maintenance Manual for the break–in instructions for the engine. The engine lubricating oil and filters should be changed after the first 50 hours of operation and every 250 hours of operation thereafter under normal operating conditions.

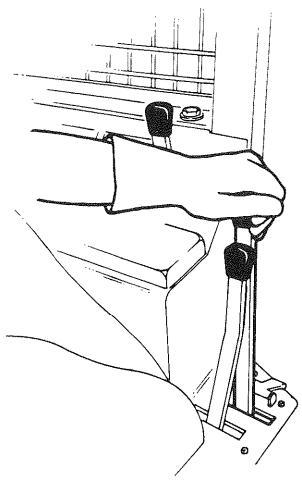
Transmission

The fluid in the transmission/converter hydraulic system should be checked daily and changed every 1000 hours of operation. The transmission filter element should be changed after the first 50 and 100 hours and every 500 hours thereafter.The sump screen should be cleaned every 1000 hours of operation.

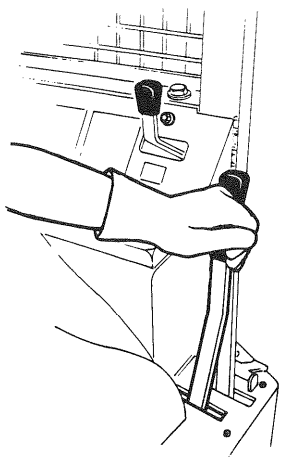
Hydraulic System

The hydraulic fluid should be checked daily and changed every 1000 hours of operation. Change the filter after the first 50 hours and every 500 hours thereafter. Clean the magnet in the bottom of the tank the first 50 hours and when the fluid is changed.

Note: ***Cleanliness is very important when you work on the engine, transmission/converter or hydraulic systems.***



RP-10648



RP-10650

GENERAL INFORMATION

Transmission

The powershift transmission in your machine allows the operator to shift directly to a higher speed range, even at full throttle. When shifting to a lower speed range, it is recommended that the engine speed be increased to reduce drag from the wheels. The transmission is equipped with Forward–Reverse modulation that allows the direction to be changed under power while the machine is still moving in the First and Second speed ranges.

Note: ***This feature should not be used in the THIRD speed range because damage to the transmission can result.***

WARNING!

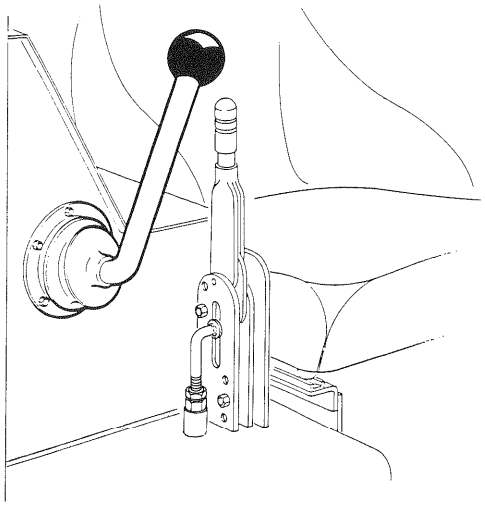
DO NOT use the transmission as a downhill brake, shifting the transmission into reverse while going forward down a grade. The engine can stall and there will be no steering.

Use the FIRST speed range for maximum tractive effort while pulling a load.

Use the SECOND speed range for normal skidding or decking operations.

Use the THIRD speed range for operating the machine without a load, to travel at maximum speed.

Note: ***If the reading on the converter oil temperature gauge starts to enter the red zone, shift the machine to a lower speed range to reduce the strain on the torque converter.***

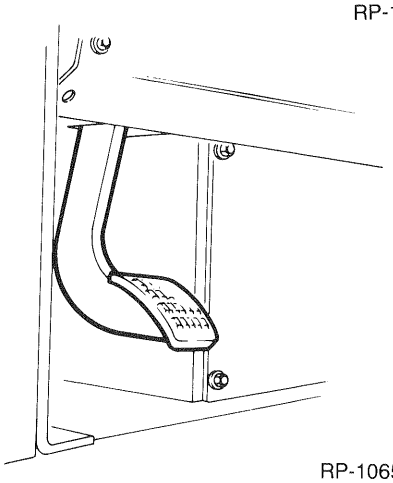


RP-10653

Steering

The hydraulic steering on the machine is controlled by the steer and blade control lever. The steering section of the main hydraulic system receives priority so that if another hydraulic function is being used and the steering is needed, full hydraulic power is given to the steering. Since the main hydraulic pump that supplies flow to the steering hydraulics is driven by the engine and torque converter, if the engine stalls for any reason steering will be lost and the machine should be brought to a complete stop immediately.

Note: ***The power brake system will be operative for a short time until the accumulator are discharged when the engine stops.***



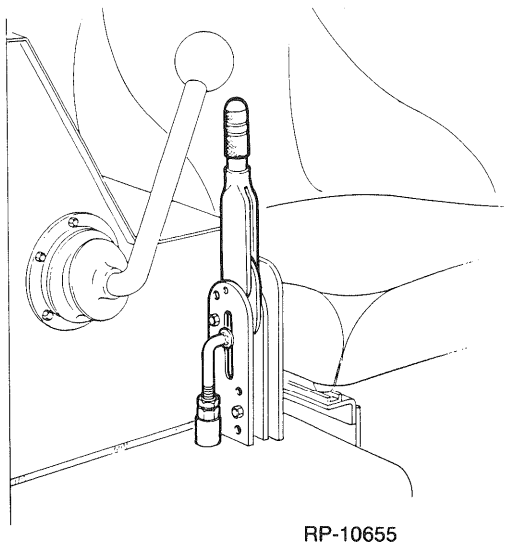
RP-10651

Service Brakes

The service brake pedal uses full hydraulics to control the enclosed wet disc brake unit mounted on the back of the transmission and the enclosed midmount brake in the rear frame. The brake units are sealed to reduce the effect of operating in wet or muddy conditions. The transmission mounted brake applies directly on the output of the transmission and the midmount brake applies directly on the lower driveshafts to brake all drive wheels equally. Although the actuating fluid of the transmission mounted brake is separated from the transmission fluid system, the brake is cooled and lubricated by the transmission/converter hydraulic system. The enclosed midmount brake has its own lube oil sump in its housing. Although one pedal actuates both systems, they are totally two separate fluid systems with separate accumulators. But if one of the systems should fail the other would assume the function of a secondary brake and sufficient braking will be available to bring the machine to a complete stop.

WARNING!

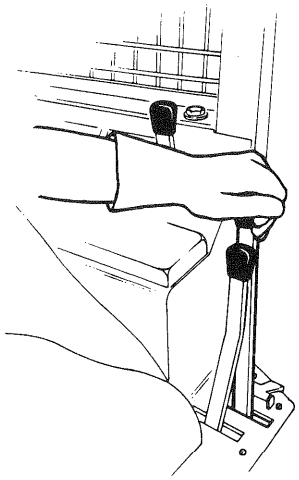
DO NOT operate any of the RANGER machines with only one brake system operational. Both brake systems should be kept in good working condition at all times.



RP-10655

Parking Brake

The brake mechanism of the transmission mounted hydraulic service brake is mechanically applied for use as a parking brake. Always apply the parking brake and lower the blade when you leave the operator's seat. It should be released before you put the machine in motion. If you park the machine on a grade, the tires should be securely blocked in addition to applying the parking brake and lowering the blade.



RP-10648

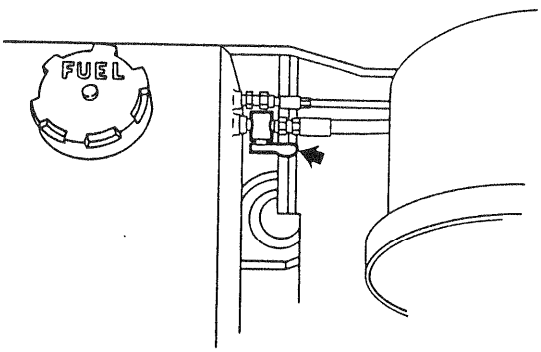
STARTING THE ENGINE

1. Check that the transmission is in NEUTRAL with the neutral lock applied and that the parking brake is applied. If the machine is equipped with a hand throttle, it should be pushed all the way in (to its low idle position).

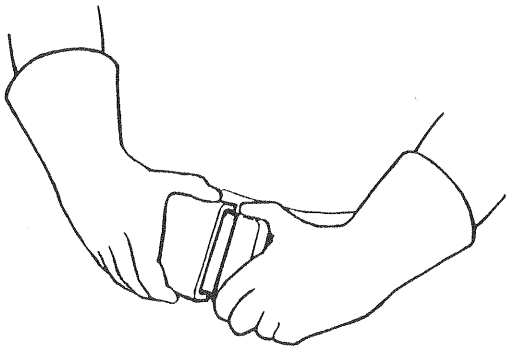
SP-10397

2. Put the battery disconnect switch in the ON position.

3. Turn on fuel shut off valve.

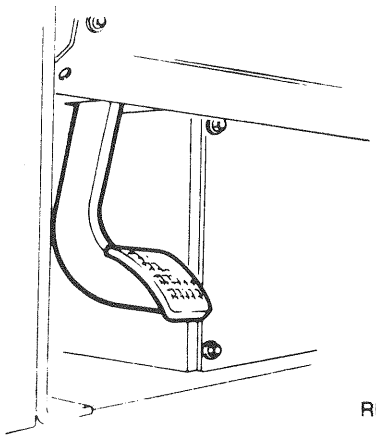


RP-10892



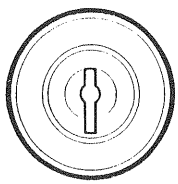
SP-10405

4. Fasten the seat belt.



RP-10651

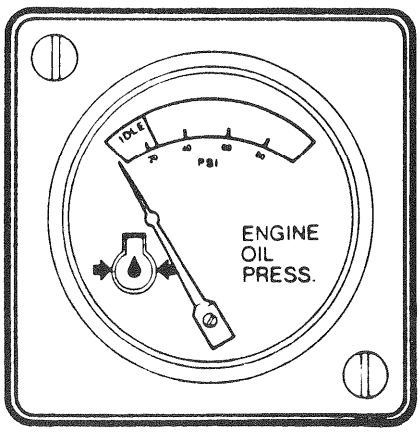
5. Apply and hold the service brake pedal.



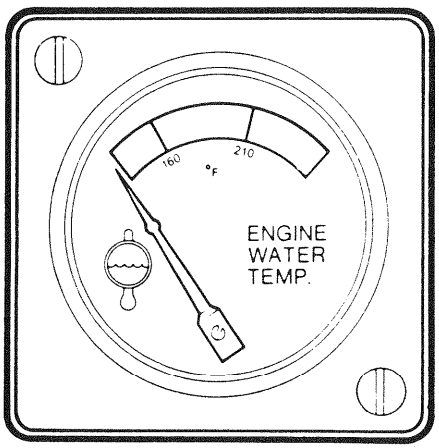
SP-10386

6. Insert the key into the ignition switch and turn it fully clockwise to the Start position until the engine starts and then release the key. If the reading on the engine oil pressure gauge is less than the 70 kPa (10 PSI), after 15 seconds of operation, shut down the engine immediately and determine the cause before you operate the machine.

Note: ***DO NOT crank the engine for longer than 30 seconds if the engine fails to start promptly. Wait until the starter stops turning before you turn the key again. Serious damage to the starter motor and to the flywheel drive gear can result.***



SP-10384



RP-10698

7. Allow the engine coolant temperature gauge to reach a temperature of 66° C (150° F) before you put the machine into full power operation.

Note: ***DO NOT operate the engine at a high RPM until it has reached this temperature. The engine should be run at Low Idle (800–900) RPM for three to five minutes, then at 1000 RPM for three minutes and at 1800 RPM for three minutes to warm the engine.***

Starting Engine In Cold Weather

Other than the use of a suitable low temperature motor oil and a suitable anti–freeze mixture in the engine cooling system, extensive preparation is not required for cold weather starts. For operation at temperatures below –18° C (O° F), a change of oil in the main hydraulic system to the lubricant recommend in the specification section will aid starting by reducing resistance in the main hydraulic pump. Choose a good quality brand of winter diesel fuel. It may be necessary to change the lubricant in the drive axle planetary hubs and differential housing or in the transmission/converter hydraulic system as shown in the specification section. It is important to cold weather starting that the electrical system, especially the batteries, be properly maintained.

Note: ***See your Cummins engine distributor for the cold starting aids recommended for their engine.***

If The Engine Does Not Start

1. Wait until engine flywheel comes to a complete stop.
2. Turn the ignition key to the OFF position before trying to start the engine again.
3. Repeat the procedure for starting the engine.

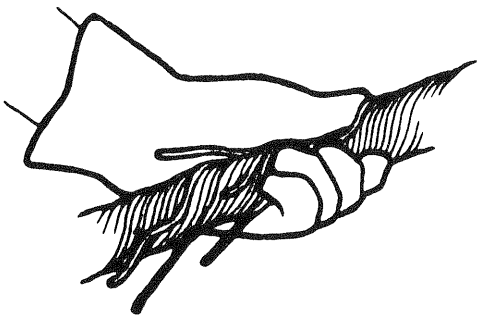
WARNING!

If auxiliary batteries are to be utilized for starting in cold weather, be sure to refer to the electrical section in the maintenance section of this manual.

OPERATING A CABLE SKIDDER

Note: Do not try to work too fast. Know your capability and that of the machine.

Note: Make sure the path of operation is clear of large rocks or other large debris. Failure to do so may result in damage to the machine.



SP-10411

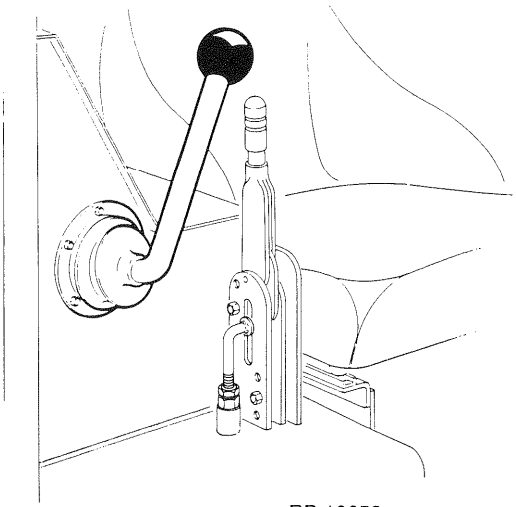
WARNING!

Never enter or leave the operator's compartment while the machine is still moving.

Operate the machine only when seated. Do not allow riders! Watch where you are going. Stay away from people, the edge of cliffs, other machines and vehicles; etc.

Check the condition of the winch mainline and chokers regularly. If they become worn or damaged, they could break under stress and cause serious bodily injury to yourself or co–workers. Replace badly worn or damaged cables promptly.

Always wear protective work gloves when you handle winch cables.

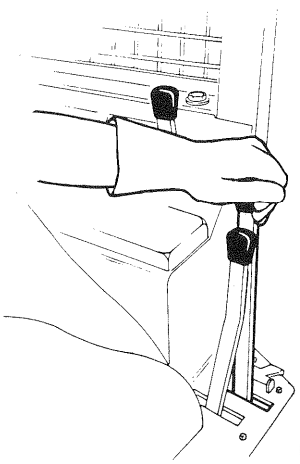


RP-10653

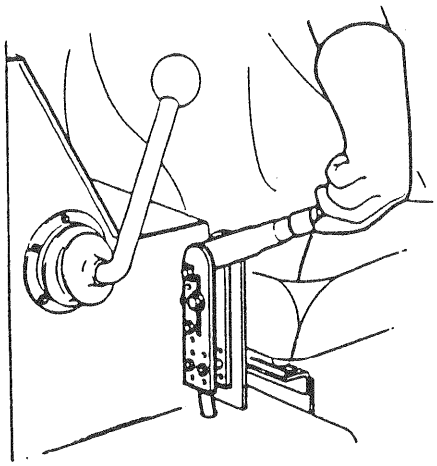
Operation

1. Raise the blade to the desired operating height. High enough to clear objects on the ground, but not so high as to restrict air flow thru the radiator.

2. Put the transmission control levers in the desired direction and speed range position.

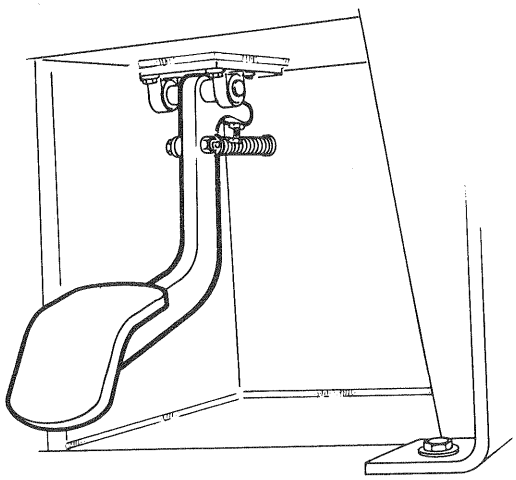


RP-10648



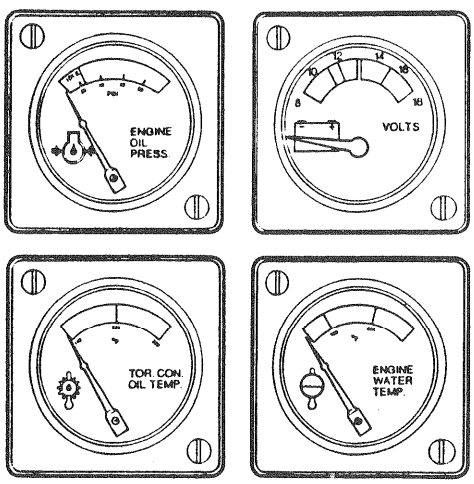
RP-10894

3. Release the parking brake lever.



RP-10652

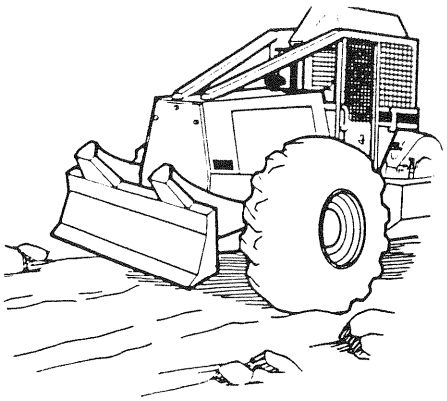
4. Depress the accelerator pedal to put the machine in motion.



SP-10419

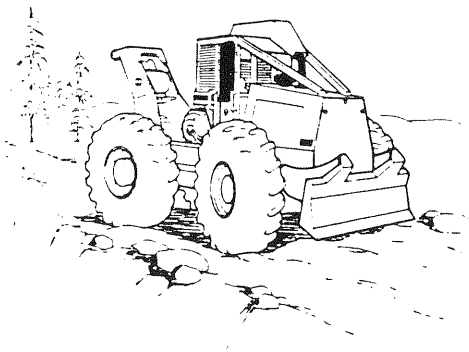
5. Check all gauges to see that all systems are operating correctly.

6. Watch out for any obstructions such as rocks and stumps that could overturn or damage the machine.



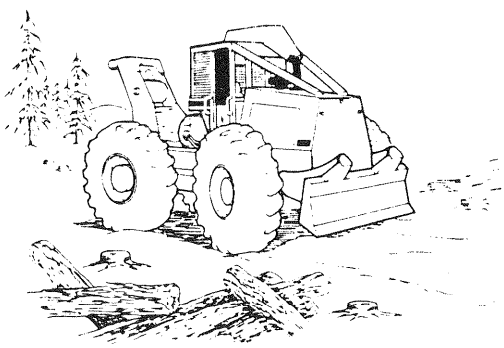
RP-10665

7. Pay attention along the route you travel to see if there is a easier way to return. The machine will behave much differently when it is pulling a load. This change in mobility can make it necessary to change your return route.

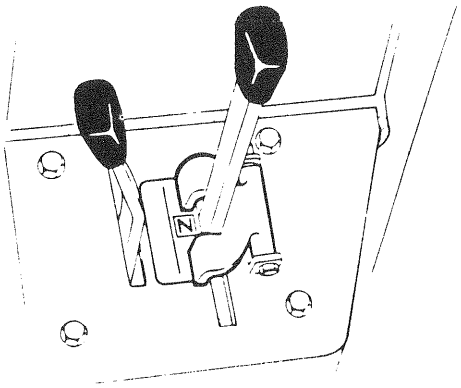


RP-10666

8. When you enter the stump area make a slow turn to see the best position to approach the logs with the least amount of effort and time. Avoid obstructions that can snag or tangle the load.



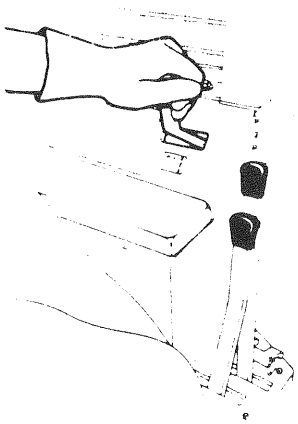
RP-10662



SP-10520

9. Before you leave the operator's seat, put the transmission in NEUTRAL and engage the neutral lock mechanism, lower the blade and apply the parking brake.

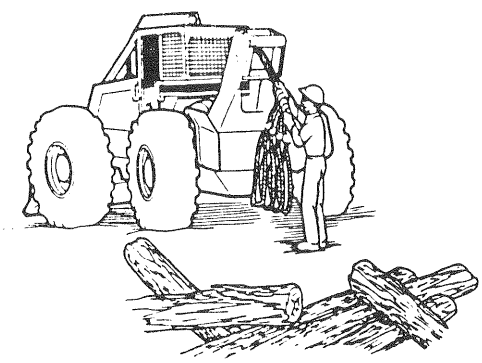
10. Put the winch control lever in the FREE–SPOOL position. Unbuckle your seat belt and exit the operator's compartment.



RP-10661

WARNING!

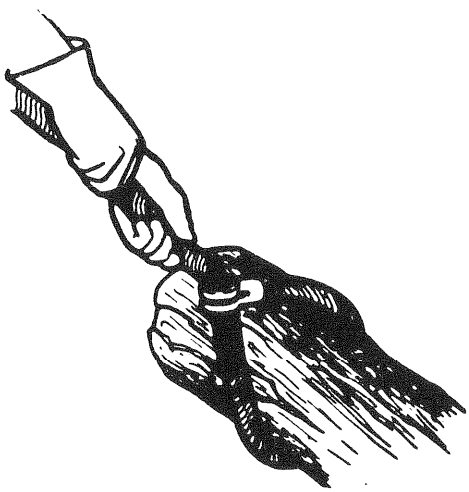
Never enter or leave the operator's compartment while the machine is still moving.



RP-10686

11. Go to the rear of the machine and pull the winch mainline and chokers from the winch cable drum far enough to reach the ends of the logs to be attached.

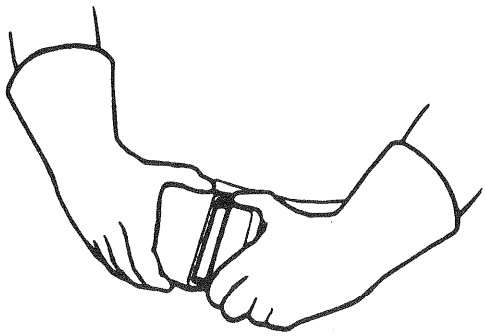
Note: Remember to wear protective work gloves when you handle winch cables.



SP-10423

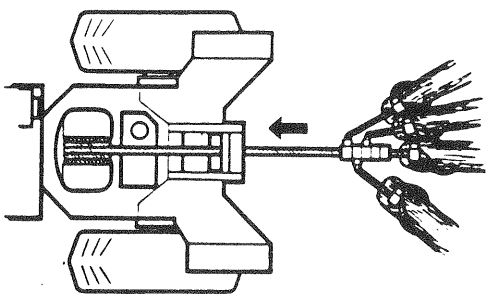
12. Attach the chokers around the butt ends of the logs approximately 60 cm (24 in.) from the ends, pulling the cables snug.

Note: ***The size and number of the logs you can skid at one time will depend on the terrain and the conditions in which you are working as well as the nature of the wood itself. Experience and common sense will tell you the load you should skid.***



SP-10405

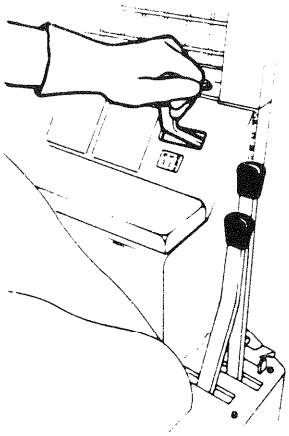
13. With all the chokers set, remount the skidder and fasten your seat belt.



SP-10424

14. Before you winch in the logs, make sure that the machine is pointing in the same general direction as the logs are to be pulled. It is best to pull the load straight into the rear of the machine,especially on a grade.

Note: ***Watch for co–workers that may be in your path and advise them to stand clear.***



RP-10661

15. Raise the blade, release the parking brake and put the winch control lever in the WINCH–IN position to pull in the load. The winch cable drum speed is determined by the speed of the engine and the load on the torque converter,so increase the engine speed as required. As the logs are pulled in, they will be bunched together. Make sure that the load is neatly bunched and pull snug against the butt pan. Put the winch control lever in the LOCK position and return to the landing.

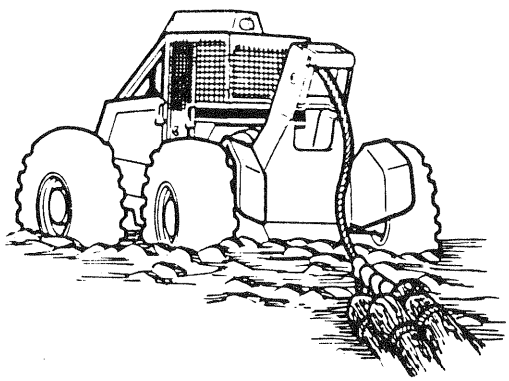
WINCHING TECHNIQUES

Bunching

RP-10687

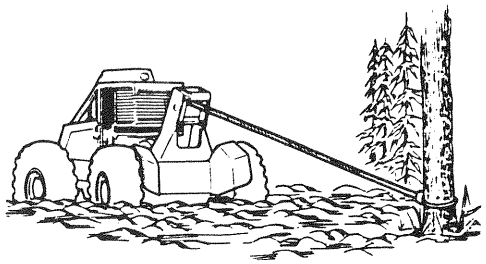
As stated earlier, when the logs are winched up to the butt pan, they will bunch together. Increasing the speed of the winch can help to pull the load easier over obstructions but you must use common sense to avoid breaking the cables on large rocks or stumps or even overturning the machine. Bunching can also be done with the machine in motion if necessary. This can help to bunch the logs under certain conditions.

Drop – Winching



RP-10688

If the machine loses traction in soft or muddy ground or because of obstructions, quickly put the winch control lever in the FREE–SPOOL position and drop the load until the machine reaches firmer or clearer ground. Remember not to out run the length of your main-line. When better conditions are reached winch in the load, put the winch control lever in the LOCK position and proceed to the landing.

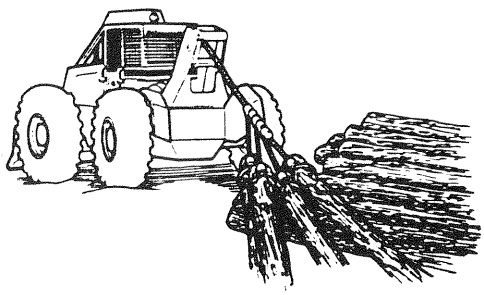


RP-10689

Reverse – Winching

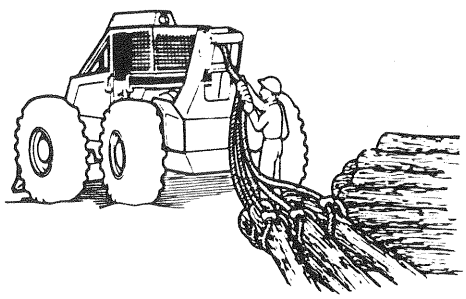
If the machine becomes stuck and cannot be freed in either direction , the winch cable can be fastened to a stationary object such as a large tree and with the transmission in REVERSE, winch in the cable under power to free the machine.

DECKING



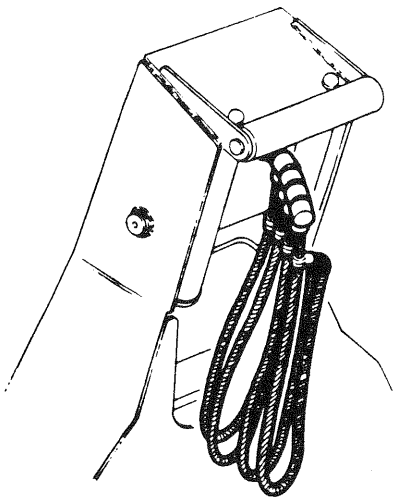
RP-10690

1. When you reach the landing, pull the logs onto the pile and put the winch control lever in the FREE–SPOOL position while the machine is still moving to drop the logs in the desired position on the pile.



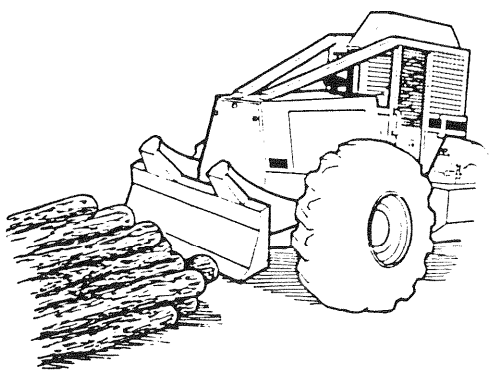
RP-10691

2. Before you leave the operator's seat put the transmission in NEUTRAL and engage the neutral lock mechanism, lower the blade and apply the parking brake.
3. Unfasten your seat belt and exit the operator's compartment.
4. Pull the mainline from the cable drum so that the chokers are loose enough to remove easily and remove all of the chokers from the logs.



SP-10549

5. Remount the machine, fasten your seatbelt and winch the mainline onto the winch cable drum until the chokers are pulled up to the fairlead main roller.



RP-10663

6. To make a pile and even up the logs. Release the neutral lock mechanism and the parking brake, put the transmission in the first or second speed range so that more power will be available to the hydraulic system and position the machine so the logs can be evened and pilled up with the blade.

OPERATING A PARALLELOGRAM GRAPPLE SKIDDER

Note: Do not try to work too fast. Know your capability and that of the machine.

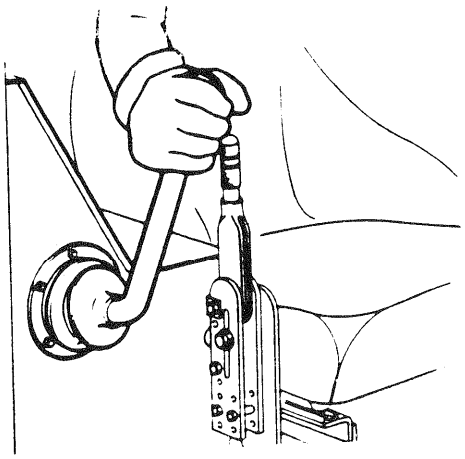
Note: Make sure the path of operation is clear of large rocks or other large debris. Failure to do so may result in damage to the machine.

WARNING!

Never enter or leave the operator's compartment while the machine is still moving.

Operate the machine only when seated. Do not allow riders! Watch where you are going. Stay away from people, the edge of cliffs, other machines and vehicles; etc.

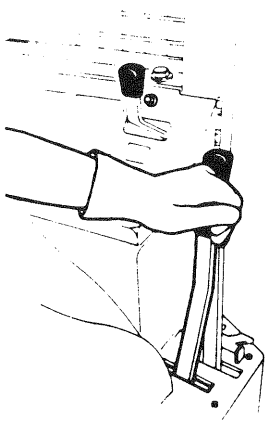
Operation



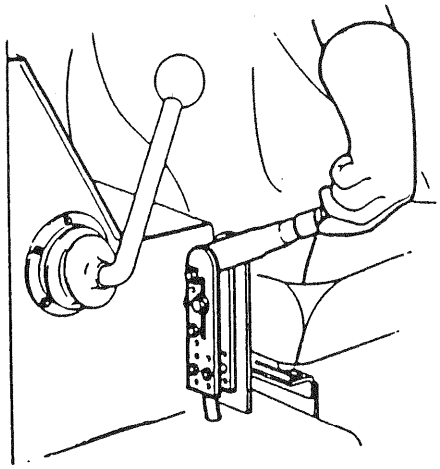
SP-10507

1. Raise the blade to the desired operating height. High enough to clear objects on the ground, but not so high as to restrict air flow thru the radiator.

2. Put the transmission control levers in the desired direction and speed range position.



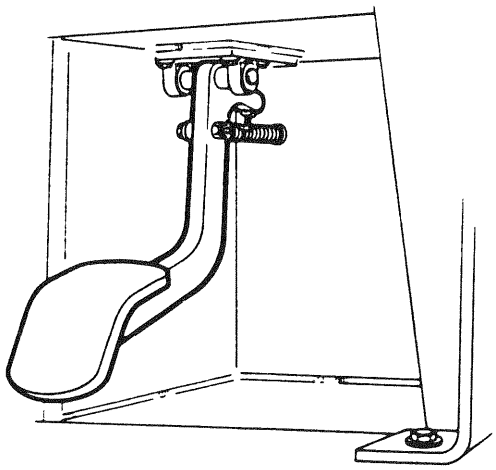
RP-10650



RP-10894

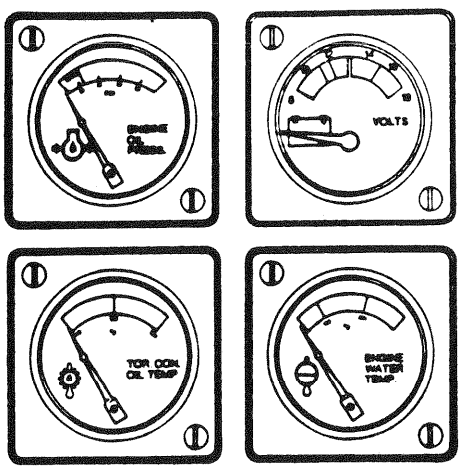
3. Release the parking brake lever.

4. Depress the accelerator pedal to put the machine in motion.



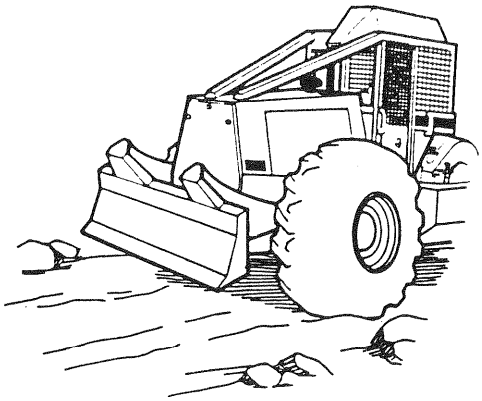
RP-10652

5. Check all gauges to see that all systems are operating correctly.



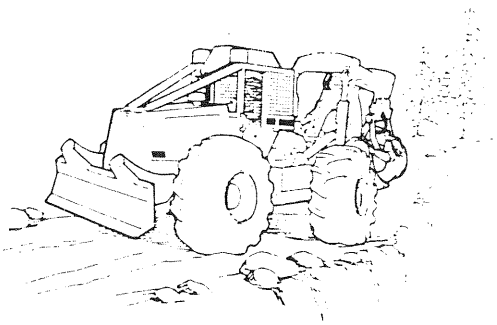
SP-10419

6. Watch out for any obstructions such as rocks and stumps that could overturn or damage the machine.



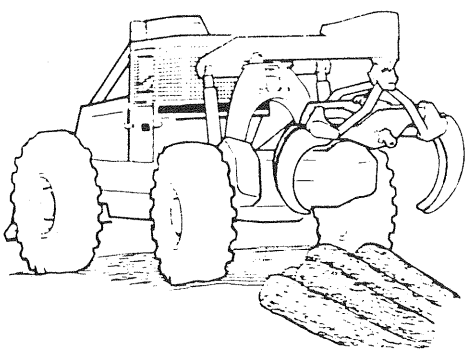
RP-10665

7. Pay attention along the route you travel to see if there is a easier way to return. The machine will behave much differently when it is pulling a load. This change in mobility can make it necessary to change your return route.

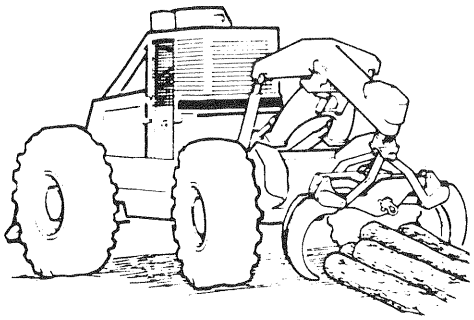


RP-10668

8. Approach the log pile with the transmission in REVERSE, the grapple tongs OPEN, the arch pulled forward and the boom in the raised position so that the grapple can fit around the load .

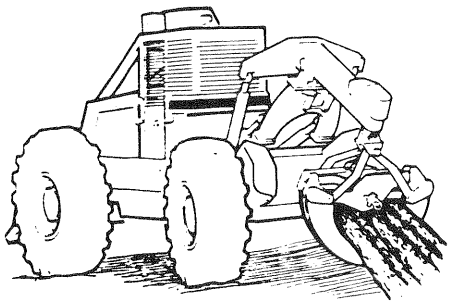


RP-10667



RP-10669

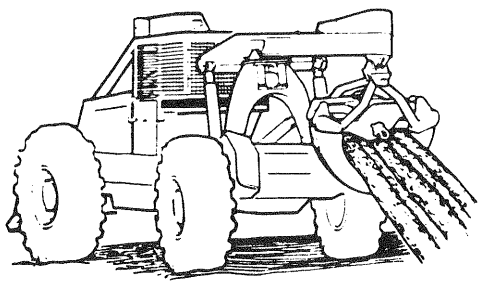
9. Move the arch back and lower the boom to position the grapple on the log pile so that the grapple tongs will pick up the logs approximately one meter (three feet) from their butt ends to prevent any unevenly bunched logs from being lost.



RP-10670

10. Put the transmission in NEUTRAL, and put the grapple control lever in the CLOSE position. Increase the speed of the engine to increase power and speed to the hydraulic system. Close the grapple firmly around the logs.

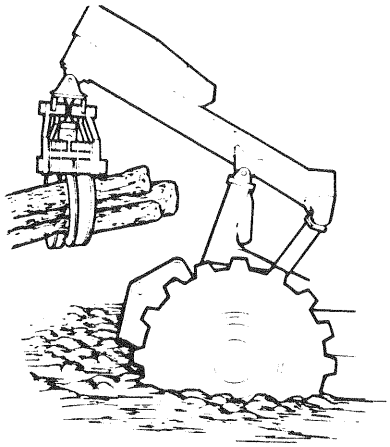
Note: ***If the machine is equipped with a reverse declutch mechanism, applying the service brake with the in reverse, will put the transmission in neutral.***



RP-10671

11 When the grapple tongs have closed hold the grapple control lever in the **CLOSE** position until approximately 2,200 psi reading shows on the grapple accumulator system gauge. Put the grapple control lever in the center **HOLD** position , pull the arch and position the boom until the load makes contact with the arch butt grille and return to the landing.

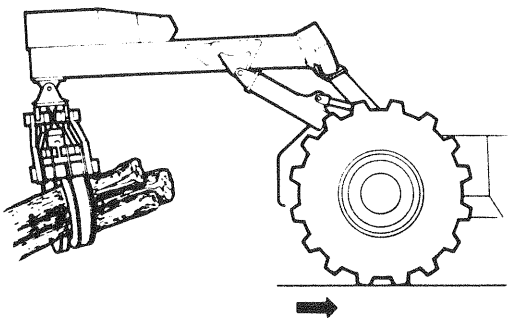
Note: ***As the load is pulled across the ground, it will shift position in the tongs. On the Parallelogram grapple skidders, the grapple accumulator system should be re–energized when a pressure drop is noticed on the pressure gauge.***



RP-10672

12. The load should be carried high enough to clear obstructions on the ground. Carry the load properly; low for stability, high for clearance.

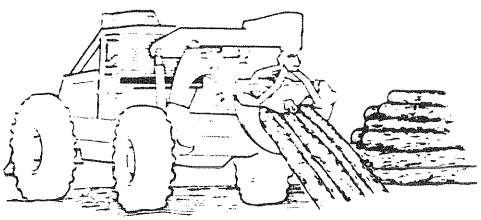
13. The load should be carried as low as possible when traveling down a steep grade especially when turning.



RP-10673

14. If you are to add to a pile, move along the side of the pile with the log grapple at its highest position. Open grapple and drop logs when butts are equal to butts in pile. Approach pile from a 90 degree angle and push logs onto pile using the utility blade.

15. If the log pile is small enough straddle and drive over the pile, open the grapple arms and release the load on the pile. Drive forward away from the pile and close the grapple tongs. Position the arch approximately halfway forward and return to the area for another load.



RP-10674

Note: ***Ranger grapple skidders are equipped with a winch and can be fitted with a winch cable to perform any of the WINCHING TECHNIQUES described earlier in this manual.***

To use a parallelogram grapple skidder as a cable skidder, raise the rear of the boom as high as is possible and open the grapple. This will keep the mainline from tangling in the grapple and allow the arch fairlead to be use for cable skidding.

WARNING!

The Weldco–Beales log grapples are equipped with snubbers that prevent it from swinging when the machine is traveling without a load. Their adjustment should be checked at the beginning of each work shift and adjusted if necessary.

STOPPING

The machine can be stopped regardless of the gear selector control position.

Stop the Machine as Follows:

- Remove foot from the accelerator pedal.
- Apply service brake and, after the machine has come to a complete stop, move the transmission gear selector to the desired gear range to either continue operation or to neutral for parking.

PARKING MACHINE

Short Term:

1. Move the machine to a safe area for parking.
2. Set the park brake.
3. Put the transmission gear selector in the "NEUTRAL" position, engage the neutral lock mechanism.
4. Lower the blade and (if so equipped) log grapple to the ground and make sure the levers are in the "HOLD" position.
5. Let the engine run at low idle rpm for approximately 5 minutes to allow the engine to cool down.
6. Turn the ignition switch key to the "OFF" position.
7. Check that all switches and controls are in the "OFF" position.
8. When leaving the machine unattended, remove the ignition switch key, turn the battery disconnect switch to the "OFF" position and shut off the fuel valve.

WARNING!

When mounting and dismounting the machine, use three point mount (i.e. Two hands and one foot/one hand and two feet). DON'T JUMP!

Note: If necessary, secure the frame locking link and block the wheels.
Machines should be parked far enough away from each other so as not to allow fire to spread from one to the other.

Long Term:

WARNING!

When mounting and/or dismounting the machine, use a three point mount (i.e. Two hands and one foot or one hand and two feet) NEVER JUMP!

1. Thoroughly clean machine. Touch-up paint where necessary to prevent rust.
2. Cover exhaust pipe openings.
3. Check all fluid levels (Hydraulic, transmission, axles, engine oil, radiator, check for proper anti-freeze protection).
4. Fill fuel tank and hydraulic reservoir.
5. Set parking brake.
6. Grease unpainted parts for protection (Cylinder rods, driveshaft splines, hydraulic valve spools and transmission linkage).
7. Apply anti-corrosion spray to exposed pin ends and lock plates.
8. The battery disconnect switch should be in the off position and batteries cleaned of all external acid and corrosion. For additional protection, remove ground cables from batteries.
9. Check tire pressures.
10. Check for signs of oil or water leaks.
11. Check air filter and piping.
12. Check fans and all belts.
13. Grease machine thoroughly.
14. Cover canopy with waterproof tarpaulin.Optional cab doors should be closed.
15. Remove all keys.
16. Store the machine in a position to allow forward and reverse motion (for scheduled maintenance of stored machines).

Start and Operate Machine Every 30 Days (sooner if conditions warrant)

1. Check all fluid levels (Hydraulic, transmission, axles, engine oil, coolant, check for proper anti-freeze protection and battery electrolyte level). Refill as required.
2. Check air filter and piping.
3. Check tire pressure.
4. Check condition of the fan and belts.
5. Turn battery disconnect switch to **"ON"** position (make sure batteries are fully charged).
6. Remove any hardened grease on the cylinder rods.
7. Remove exhaust pipe opening covers, start engine. See starting the engine.
8. Release parking brake.
9. Check the brakes (service and secondary).
10. Actuate the transmission through all gears (forward and reverse).
11. Move the machine forward and backward. A minimum of one complete tire revolution.
12. All hydraulic components to be cycled to assure oil flow through the complete system.
13. Reposition machine with blade and grapple lowered.
14. Run engine at low idle for three (3) minutes.
15. Set the parking brake.
16. Stop the engine.
17. Reinstall waterproof covering over entire canopy (if machine is not equipped with enclosed cab).
18. Grease all exposed cylinder rods or any other rod that cannot be retracted.
19. Battery disconnect switch to be off.
20. Check for leaks on the machine.
21. Install exhaust pipe opening covers.
22. Fill out the machine record card: Date, operator's name. Note the conditions to be repaired as well as any discrepancy.

TRANSPORTING

1. Always load and unload on a level non–slippery surface.
2. Use adequate chains, blocks, cables, etc. to secure to trailer anchoring points.
3. Measure overall height and width of the machine on the trailer.

Note: It is important that you know the overall height, width, and weight when transporting the machine.

4. Transporting in foggy, dusty, or stormy weather conditions requires extreme care and in most cases should not be attempted.
5. Check local laws about transporting machinery prior to shipment.

MOVING DISABLED MACHINES

Note: The engine cannot be started by towing the machine.

If the machine must be towed, put all control levers in their neutral positions. Remove the front and rear drive axle input driveshafts from the machine but do not separate the driveshaft halves.

Note: When the engine is shut down, the transmission/converter charging (lubricating) pump is inoperative. Serious damage to the transmission will occur if it is driven by the wheels without lubrication.

Note: When the engine is shut down, the power brake pump is inoperative. Safe brake operation will temporarily be provided by pressure stored in the brake accumulators. The midmount brake will stop the machine only if the midmount to rear driveshaft is in place.

Note: ALWAYS fasten the steering frame lock between the frames and tie a red warning flag to the operator's handrail to indicate that the steering frame lock is fastened.

Use a solid tow bar or raise one end of the machine because with the engine shut down and the steering frame lock fastened, the machine cannot be steered.

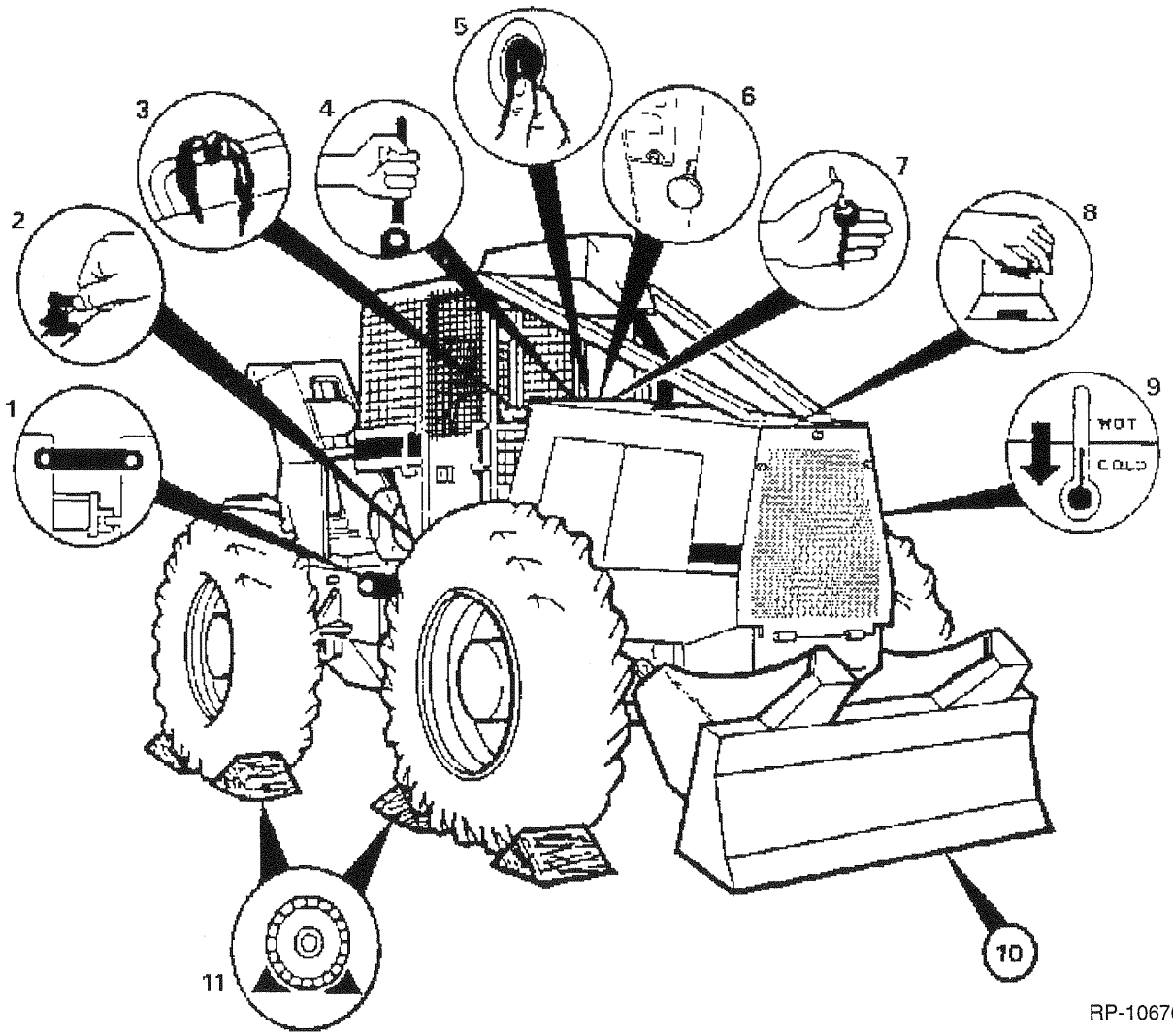
When you reinstall the driveshafts use only the special bolts provided and tighten them to the specified torque.

NOTES

Put the machine in the SERVICE POSITION

SERVICE POSITION

Before working on the machine, park it on a level surface and put in the "SERVICE POSITION"



RP-10676

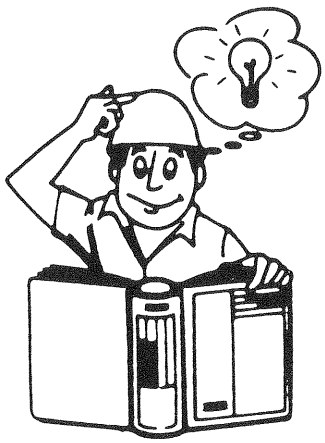
1. Steering frame lock connected.
2. Fuel shut-up valve OFF.
3. Do not operate tag or Red warning flag operator's handrail.
4. Parking brake applied.
5. Battery disconnect switch OFF.
6. Accumulator Discharge Lever.
7. Engine shut down and key removed from the ignition switch.
8. Remove all pressure caps slowly to relieve pressure.
9. Allow the machine to cool down.
10. Blade and grapple assembly on the ground .
11. Wheels securely blocked.

WARNING!

Use caution if you must work on a warm machine. Hot fluids and components can cause personal injury.

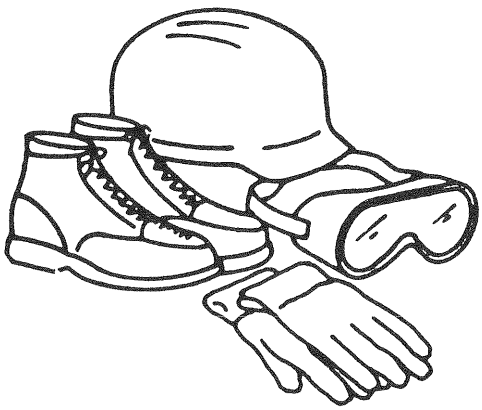
Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING



SP-10409

- Do not perform any work on the machine unless you are authorized to do so.
- Maintenance can be dangerous unless performed properly. Be satisfied that you have the necessary skill and information, correct tools and equipment to do the job correctly.
- Standard maintenance procedures should always be observed. Read the manufacturer's manual or find assistance if you do not understand what you are doing.
- Keep the work place clean. Oil or water on the floor makes it slippery and also dangerous in connection with electrical equipment or electrically powered tools. Oily clothes are a serious fire hazard.
- When running a machine indoors, be sure the building is properly ventilated.



SP-10502

- Do not wear loose fitting clothing or jewelry when working on a machine.
- Always wear a hard hat, safety glasses, gloves, boots, or other protective articles as the job requires.
- Keep the machine and all equipment free of dirt and oil. This will decrease the possible fire hazards and make it easier to find loose or defective parts. This is especially important when working with combustible materials.
- Machines should be clean of debris particularly around the engine, exhaust, and drive line components.

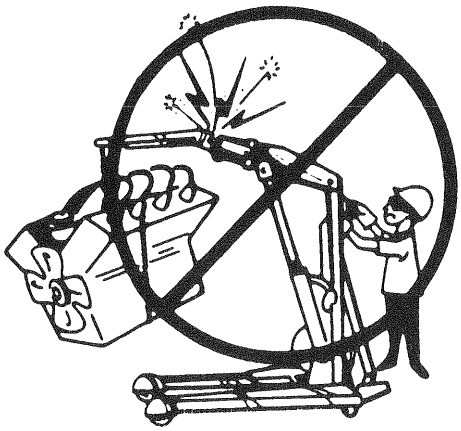
Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING (con't)

SP-10412

- Fire prevention features provided by the manufacturer should be maintained in operational condition and should be used to supplement operator's fire prevention efforts. In no case should the features be used or assumed as replacement for diligent operator efforts at preventing fires.
- Prior to welding or brazing on any part of the machine, the part and the surrounding area should be cleaned and a fire extinguisher should be made readily available.
- There is always a risk of fire. Find out which type of fire extinguisher to use, where it is and how to use it.
- In case of fire be prepared to run for safety, but if time permits first:

  Stop the engine.
  Turn off the battery disconnect switch and close the fuel shut–off valve.
  Start combating the fire and/or call for help.
- Gasoline is highly flammable and should never be used as a cleaning fluid. Use an approved solvent for cleaning.
- Some solvents can cause skin rashes and or fire dangers. Do not inhale solvent vapors.
- Store flammable starting aids in a cool, well ventilated location.
- Smoking, open flames, etc., should not be permitted around any machine during fueling operations and/or when the fuel system is open to the atmosphere.



SP-10410

- Always be sure the "Frame Locking Link" is connected when working on the machine except when it is necessary to articulate it.
- When lifting or supporting components, use equipment with a weight capacity as great as or greater than the weight of the component.
- Use the correct tool(s) for the job. Repair or replace any broken or defective equipment or tools.
- Make sure that no tool(s) or other object(s) are left inside the machine where they may cause damage.
- Check that there is no damage to electric wires and hoses.

Put the machine in the SERVICE POSITION

SP-10413

SP-10414

SP-10416

A FEW SIMPLE RULES WHEN SERVICING (con't)

- Release all system pressure slowly before working on any part of the hydraulic system. Be alert – There could be high pressure stored in the grapple circuit on units with a grapple accumulator system.

WARNING!

See discharging the grapple accumulator pressure on page 81.

- Remove all pressure caps slowly.
- Be careful of hot fluid when changing oil in the engine, hydraulic system, transmission, etc.
- Before you work on the machine always lower the blade and grapple (If so equipped). If you must work on the machine with the blade or grapple raised, always securely support them.
- Be sure the machine is in the SERVICE POSITION before lifting the machine. Always support an elevated machine using proper blocks and/or cribbing before beginning work on it.
- To find leakage, use cardboard or wood, not your hand.
- Never adjust a pressure relief valve above the manufacturer's recommendations.
- Hydraulic fluid is flammable. Do not weld on pipes or tubes that are filled with fluid. Be careful when welding next to filled pipes or tubes.
- Always inspect the cooling system with the engine stopped. This as a pressurized system, relieve the pressure by slowly turning the cap off.
- Read all nameplates and decals before you operate the machine. Each nameplate and decal has important information about operation or service.
- Always stop the engine before removing inspection covers. Do not let tools or parts fall into the opening.

Put the machine in the SERVICE POSITION

NOTES

Put the machine in the SERVICE POSITION

MAINTENANCE INTERVAL CHART

MAINTENANCE INTERVALS OPERATING HOURS

	Page No.	Daily	First 50	Every 50	First 100	Every 100	Every 250	Every 500	Every 1000	Every 2000	Yearly or Every 2500	As Req'd
GENERAL												
Check for Leaks		●										
Check Tire Pressure	75	●										
LUBRICATION		SEE LUBRICATION CHART										
ENGINE												
Engine Oil Level, Check	61	●										
Engine Oil, Change	61		●				●					
Engine Oil Filters, Change	61		●				●					
Fuel Filter, Drain Water and Sediment	62	●										
Fuel Filter, Change	62											●
Fuel Strainer, Clean or Replace	62											●
Fuel Tank, Drain Water and Sediment	62	●										
Empty Air Pre Cleaner	63											●
Air Cleaner Service Indicator, Check	63	●										
Air Cleaner Element Outer, Change	63											●
Air Cleaner Element inner, Change	63									●		
Coolant Level, Check	64	●										
Coolant Protection, Check	64						●					
Change Coolant, Flush System,	64								●			
Radiator, Clean	64	●										
Belt Tension, Check	65								●			
ELECTRICAL SYSTEM												
Battery Condition, Check	69	●										
POWER TRANSMISSION												
Trans. / Converter Oil Level, Check	79	●										
Transmission / Converter Oil, Change	80								●			
Transmission Oil Filter, Change	80		●		●			●				
Transmission Suction Screen, Clean	80								●			
Transmission & Converter Vents, Clean	81						●					
Axle Lubricant Levels, Check	74			●								
Axle Lubricant, Change	74								●			
Axle Breathers	74							●				
Driveshafts, Check	78	●										
Slip Joints, Lube	78					●						
Universal Joint, Lube	78								●			

Put the machine in the SERVICE POSITION

MAINTENANCE INTERVALS OPERATING HOURS (cont'd)

	Page No.	Daily	First 50	Every 50	First 100	Every 100	Every 250	Every 500	Every 1000	Every 2000	Yearly or Every 2500	As Req'd
BRAKE SYSTEM												
Parking Brake, Adjustment of	70											●
Service Brake, Adjustment of	71											●
Midmount Brake Oil Level, Check	70			●								
Midmount Brake Oil, Change	70							●				
Midmount Brake Breather, Clean	72						●					
Bleed The Brakes	73											●
OTHER FUNCTIONS												
Hydraulic Fluid Level, Check	82	●										
Hydraulic Fluid, Change	82								●			
Hydraulic Fluid Filter, Change	83		●					●				
Log Grapple Snubbers, Check & Adjust	77	●										
Winch Free Spool, Adjustment	76											●

NOTE: * After wheel removal, check torque of bolts at 5 & 10 hours of operation.

Put the machine in the SERVICE POSITION

GENERAL INFORMATION

If the machine is to work as economically as possible, thorough maintenance is necessary. The most important care a machine receives is the preventive maintenance that you perform, which comprises of lubrication, various checks and adjustments. The recommended intervals for maintenance and lubrication refer to normal working and environmental conditions.

Most of the maintenance procedures are simple to perform. The necessary detailed instructions are provided in this manual.

All maintenance and service work should be performed by qualified personnel.

SP-10415

WARNING!

When working in the center hinge area the frame locking link must be used.

WARNING!

There is a risk of the machine moving even with the park brake applied.

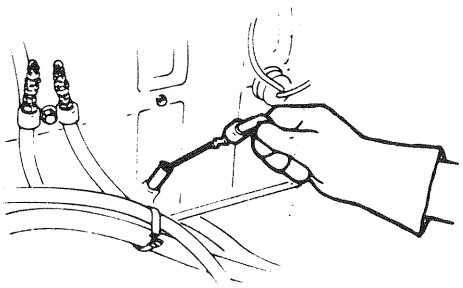
- When checking fluid levels, the machine should be on level ground.
- Fluid levels should be checked in the morning when the fluids are cold and have drained to the bottom of each component. This does not apply to the hydraulic transmission and the hydraulic tank.
- Schedule servicing to avoid damage to the machine. Keep good records. Read the machine manuals.
- Make a complete visual inspection.
- Check for loose bolts and capscrews, leaks and worn parts. Report everything that needs attention.

Put the machine in the SERVICE POSITION

ENGINE

WARNING!

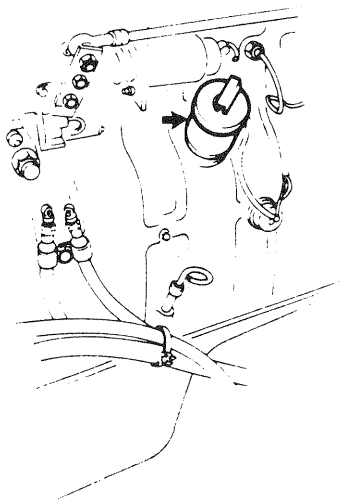
Be careful if the engine is hot, hot oil can cause severe burns.



RP-10677

Checking Oil Level

The oil level should be checked daily and should be between the high – H and – L marks on the dipstick.



RP-10704

Changing Engine Oil

Drain the engine oil when the engine is hot. Hot Oil flows more freely and carries more contaminants with it.

Replace the engine lube oil filter with the filter specified in the Parts Manual for your Skidder.

Choose an oil viscosity that is correct for the ambient operating temperature as recommended in the Cummins Engine Operation and Maintenance Manual.

Engine lube oil capacity is approximately 22.4 liters (5.6 US gallons.)

Put the machine in the SERVICE POSITION

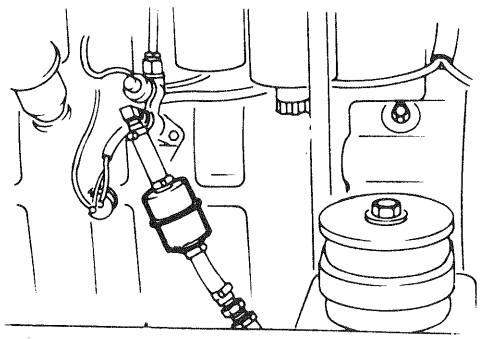
RP-10678

FUEL SYSTEM

Fuel Filters

Drain any water and sediment from the engine fuel/water separator at the beginning of each work shift

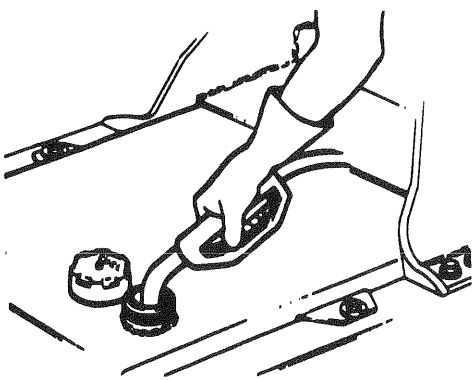
Change the engine fuel filters according to the instructions in the Cummins Operation and Maintenance Manual.



RP-10705

Check The Fuel Strainer

Check the in line fuel strainer for a build–up of foreign material by blowing through it orally. The strainer should be replaced if it is contaminated.



SP-10553

Fuel Tank

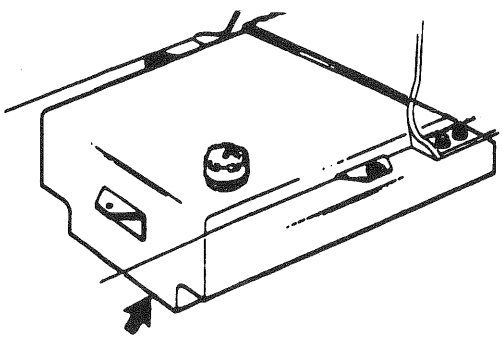
Clean fuel is essential for trouble–free operation of the engine. Clean the area around the fuel filler cap before you remove it. Avoid spilling fuel to reduce the chance of a fire and to reduce the build–up of dirt. Fill tank at the end of each work shift to inhibit condensation.

WARNING!

Do not smoke while refueling.

If the strainer screen in the fuel filler hole becomes clogged or dirty, it should be cleaned in solvent and blow dried with compressed air.

Before each shift, open the drain cock on the bottom of the fuel tank and drain sufficient fuel to remove any sediment and water from the tank. Check and clean the vent hole in the fuel cap.



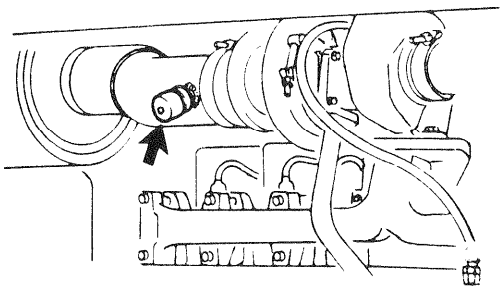
SP-10562

Put the machine in the SERVICE POSITION

AIR CLEANER SYSTEM

Air Cleaner

The air cleaner prevents dust and other impurities from entering the engine. The air first passes through the outer filter element and then through the inner element. Engine wear is largely affected by the cleanliness of the intake air therefor it is very important to check the air cleaner regularly and to service it correctly.



SP-10563

Check Air Cleaner Service Indicator

Check the air cleaner service indicator located on the air intake tube between the air cleaner and turbocharger. When the indicator shows red, the air cleaner elements should be serviced.

Check Air Intake Tubes and Clamps

Check the intake tubes and clamps between the air cleaner and turbocharger and replace any tubes that are cracked or damaged. Tighten any loose clamps.

Service Air Cleaner

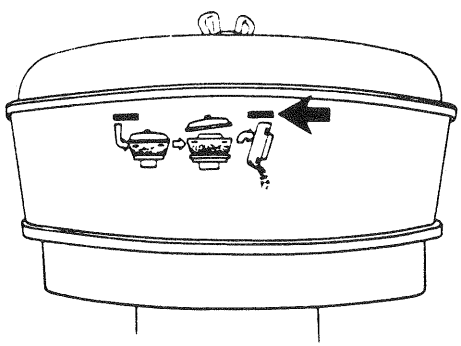
SP-10598

Remove the outer element from the air cleaner body and use compressed air (from the inside of the element) to blow any dirt particles from the element. Wash the element in a non–sudsing detergent for about 15 minutes. Rinse with warm tap water from the inside until the water that passes through the element is clean. Air dry the element .

Shine a bright light from the inside of the element and check it for pin holes, ruptures or thin spots. Replace the element if any of these conditions exist.

Note: Do not remove the inner element except to change it. Replace both elements after second cleaning of the outer element or every 2000 hours of operation. The frequency of air cleaner servicing depends on the working conditions of the machine.

Clean the Air Cleaner Vacuator Valve



SP-10628

Tap the rubber vacuator valve to remove dust and dirt on a daily basis.

Note: It may be necessary to remove the vacuator valve to remove caked particles of dirt from the valve.

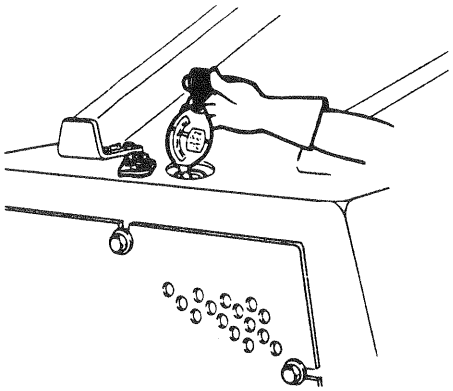
AIR PRE CLEANER

When the level of debris in the air pre cleaner reaches the full line on the bowl, remove the pre cleaner and empty it.

Put the machine in the SERVICE POSITION

COOLING SYSTEM

The following measures must be carried out regularly to ensure that the cooling system operates correctly.



SP-10554

Antifreeze:

The cooling system of the machine was shipped with a solution of equal parts of ethylene glycol and water. This concentration is recommended for subsequent fills. The coolant should be changed every 1000 hours of operation.

Checking Coolant

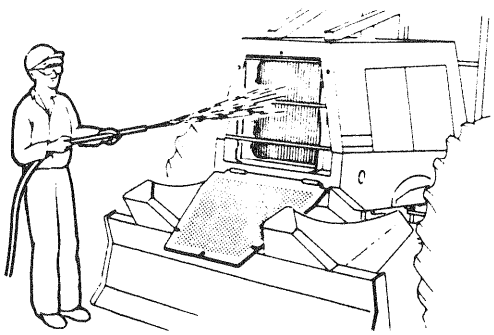
Check the coolant level daily. The level should be up to the bottom of the filler neck in the radiator. Add coolant as required.

WARNING!

The cooling system is pressurized and there is a risk of scalding whenever removing the radiator cap.

Check Hoses and Clamps

Check hoses and clamps and replace any hoses that are cracked or damaged. Tighten any loose clamps.



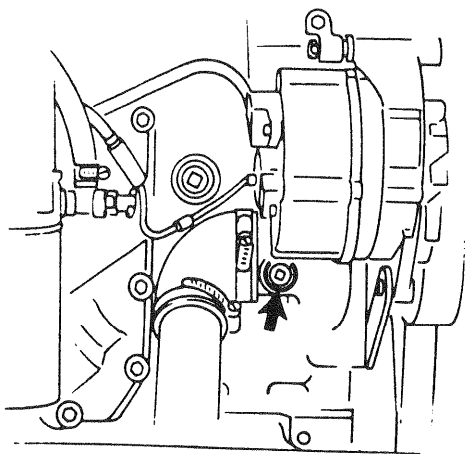
RP-10679

Cleaning the Radiator

The radiator should be cleaned daily to reduce the chance of fire and possible engine damage caused by improper engine cooling.

Remove the bolts from the top of the grill and lower the grill so that rests on the blade. Use compressed air or a steam cleaner to clean the radiator in the opposite direction to the air flow.

Note: Be careful not to damage the radiator core while cleaning.



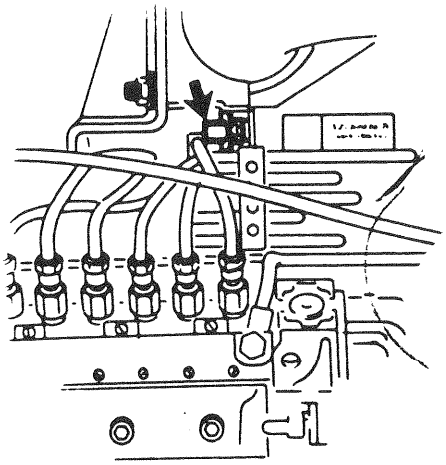
RP-10708

Change Coolant and Flush System

1. Slowly remove the radiator cap.
2. Open the drain cock on the bottom of the radiator.
3. Remove the drain plug from the bottom of the coolant inlet elbow on the engine and the one on the front cylinder head.
4. Open the bleeder cock on the engine aftercooler to drain system.

Note: See engine manufacture's manual for correct cooling system cleaning procedures.

Put the machine in the SERVICE POSITION



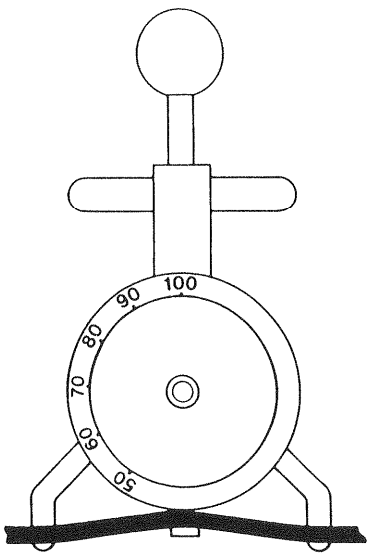
RP-10707

Change Coolant and Flush System (con't.)

5. Clean and flush the cooling system.
6. Close the drain cocks and install the drain plug leaving the aftercooler bleeder cock open.
7. Add coolant to the radiator filler hole until it reaches the correct level. Then close the aftercooler and front cylinder head bleed cocks, after a continuous flow of coolant flows through it.
8. Start the engine and add coolant until the radiator is full and free of air.
9. Check the coolant level when the engine reaches its operating temperature and again when it has cooled.

WARNING!

Never pour cold coolant into a hot engine. This could cause the cylinder head or engine block to crack. The failure to change the coolant can result in the cooling system becoming clogged and the engine can be seriously damaged by overheating.



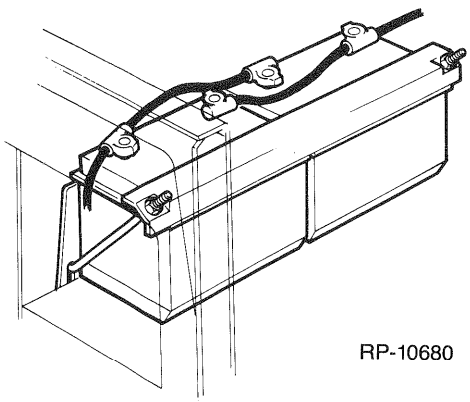
EL14032

FAN BELT TENSION

Visually check belts for looseness or wear, replace worn belts.

The engine is equipped with a fan belt tensioner that eliminates the need to adjust the belt. Use a belt tensioner gauge to check belt tension every 1000 hours of operation to make sure the tensioner is working properly. See the Cummins Engine Operation and Maintenance Manual.

Put the machine in the SERVICE POSITION



RP-10680

ELECTRICAL SYSTEM

Batteries

The batteries are located in the engine compartment to the right of the engine.

Check Battery Condition

WARNING!

All lead–acid batteries generate hydrogen gas which is highly flammable. If ignited by a spark or flame, the gas may explode violently, causing spraying of acid, fragmentation of the battery, and possible severe personal injuries. Wear safety glasses when working near batteries.

ANTIDOTE: EXTERNAL – Flush with water. INTERNAL – Drink large quantities of 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.

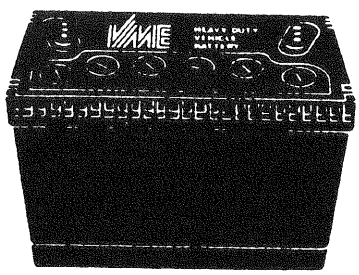
SP-10417

The batteries are connected in a parallel 12 volt system. Check the electrolyte level weekly (more often in warm weather). The level should be approximately 10mm (3/8 in) above the plates. If necessary add distilled water. Check that the cable terminals and battery posts are clean, tight and coated with an anti–corrosive substance. During cold weather, it is very important that the batteries do not become discharged, because the electrolyte can freeze and damage the battery.

WARNING!

Do not attempt to charge or load test a frozen battery. If it is frozen it may explode, allow the battery to warm to 15.5° C (60° F) before placing it on charge.

Note: VME Maintenance –Free batteries allow you to use a hydrometer to test the specific gravity of the electrolyte. Individual plugs can be unscrewed allowing access to each cell. Specific gravity of each cell can then be tested. When installing plugs be sure they are properly seated. If the specific gravity, when corrected to 27° C (80° F) is less than 1.225, the battery is to be charged.



TS40415

Note: When checking battery at temperature other than 27° C (80° F), for every 10° above 27° C (80° F) - Add .004 to reading. For every 10° below 80° F- Subtract .004 from the reading.

Put the machine in the SERVICE POSITION

STEP-1

VISUAL INSPECTION
CHECK FOR OBVIOUS DAMAGE SUCH AS CRACKED OR BROKEN CASE, LOSS OF ELECTROLYTE OR TERMINAL DAMAGE

- **OBVIOUS DAMAGE** → **REPLACE BATTERY**
- **NO OBVIOUS DAMAGE** → **PROCEED TO STEP-2**

STEP-2

CHECK OPEN CIRCUIT VOLTAGE FOR STATE OF CHARGE

NOTE: STABILIZE VOLTAGE BY TURNING ON LIGHTS OR 15 AMP LOAD FOR 15 SECONDS.

STABILIZED OPEN CIRCUIT VOLTAGE	PERCENT CHARGED
12.6 VOLTS OR MORE	100%
12.4	75%
12.2	50%
12.0	25%
11.7 OR LESS	0%

STABILIZED VOLTAGE BELOW 12.4 VOLTS	STABILIZED VOLTAGE ABOVE 12.4 VOLTS
CHARGE BATTERY AND RETEST	**Proceed To STEP-3**

STEP-3

LOAD TEST

1. ATTACH TESTER CLAMPS TO BATTERY TERMINALS IN CORRECT POLARITY (USUALLY RED TO POSITIVE (+) AND BLACK TO NEGATIVE (–). FOLLOW TESTER MFG. INSTRUCTIONS ON STUD TERMINALS. BE SURE TO CONNECT TESTER LEADS TO THE HEAVY LUG SECTION, NOT TO STUDS.
2. SET SELECTOR SWITCH ON LOAD TESTER TO 1/2 CRANKING AMP RATING @ 0°F (–18°C) OF BATTERY.
3. APPLY LOAD FOR 15 SECONDS, AND READ LOAD TESTER JUST BEFORE RELEASING THE LOAD.

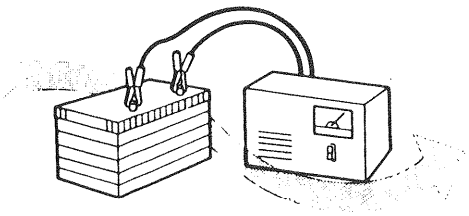
- **VOLTAGE BELOW CHART VALUE** → **REPLACE BATTERY**
- **VOLTAGE EQUAL TO OR ABOVE CHART VALUE** → **RETURN BATTERY TO SERVICE**

VOLTAGE CHART

ESTIMATED ELECTROLYTE TEMPERATURE		MINIMUM REQUIRED VOLTAGE UNDER 15 SEC. LOAD
70° F	(21° C) & ABOVE	9.6
60° F	(16° C)	9.5
50° F	(10° C)	9.4
40° F	(4° C)	9.3
30° F	(–1° C)	9.1
20° F	(–7° C)	8.9
10° F	(–12° C)	8.7
0° F	(–18° C)	8.5

Put the machine in the SERVICE POSITION

Charging Maintenance–Free or Low–Maintenance Batteries



TS20788

WARNING!

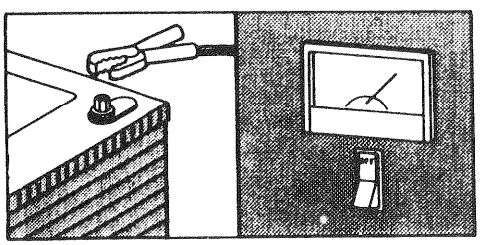
When batteries are being charged, explosive gases are formed. A short circuit, open flame or spark near the battery can cause a serious explosion. Provide good ventilation, especially if the battery is being charged in an enclosed area.

WARNING!

Make sure the battery charger is OFF. Connect the positive (+) charger lead to the positive (+) terminal on the battery first. Connect the negative (–) charger lead to the negative (–) terminal on the battery.

WARNING!

Always use a voltmeter or hydrometer to check the battery charge. Never use a metal object across the posts to test a battery. Sparks may cause an explosion.



V50391

WARNING!

Never let fluid be pushed out of the battery or the temperature go above 52° C (125° F). If the battery case feels hot, stop charging for 20 minutes then start the charger at a lower amperage rate. High temperature will prevent the battery from holding a charge. Make sure the battery is a minimum of 16° C (60° F) before charging.

Note: Check the voltage from one terminal to the other on the same battery. Do not connect the voltmeter to the battery cables.

Note: Follow the instructions of the battery charger or the manufacturer.

VOLTAGE OF 12.4 OR ABOVE		VOLTAGE BETWEEN 11.7 AND 12.4		VOLTAGE 11.7 OR BELOW	
Amps of Recharge	Hours of Recharge	Amps of Recharge	Hours of Recharge	Amps of Recharge	Hours of Recharge
5	5	5	14	5	27
10	2.5	10	7	10	14
15	1.5	15	4.5		

Put the machine in the SERVICE POSITION

Check Battery Cables and Connections

Check the battery cables and connections for damage, looseness and corrosion. Replace damaged cables as needed. Clean and tighten connections as needed. Disconnect the ground cables first at end remote from battery when removing a battery to avoid causing sparks which could cause an explosion. Connect the ground cable last during installation.

Starting With Auxiliary Batteries

DO NOT connect jumper cables to the battery terminals. Use system voltage to jump start. Connect the positive cable first to the positive starter cable. Connect the negative cable to the machine frame.

WARNING!

Failure to follow this procedure could result in personal injury or damage to the electrical system.

SP-10397

Battery Disconnect Switch

Note: When performing any welding operation on a machine turn off the battery disconnect switch and disconnect the positive and negative cable connections at the battery.

Note: Never connect the arc welder (or cutter) ground cable to the opposite frame to the one being welded on. Connect the ground cable as close as possible to the area to be welded. Thoroughly clean the weld area before welding to reduce the chance of fire and have a fully charged fire extinguisher on hand.

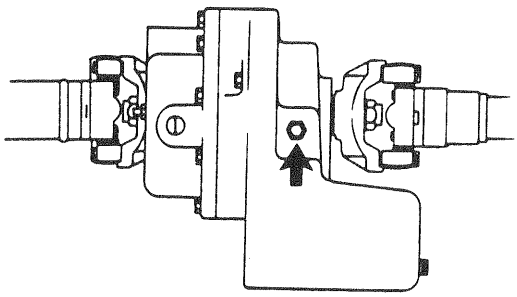
Check Neutral Start Switch

Put the transmission control lever in the FORWARD position. Try to start the engine. If the starter turns the engine, replace the neutral start switch.

Put the transmission control lever in the REVERSE position. Try to start the engine. If the starter turns the engine, replace the neutral start switch.

Note: If the starter will turn the engine with the transmission control lever in the NEUTRAL only position, the neutral start switch is good.

Put the machine in the SERVICE POSITION



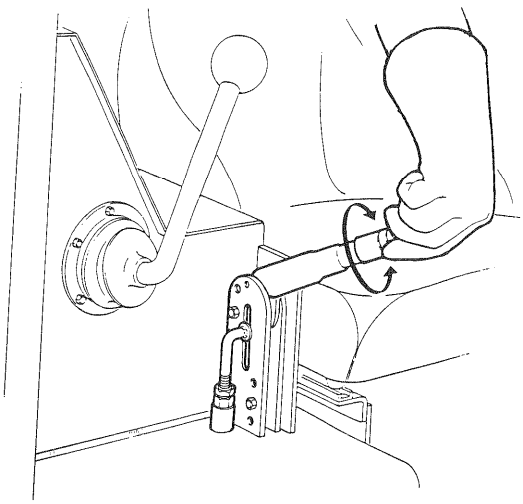
SP-10622

BRAKE SYSTEM

Checking the Fluid Level Midmount Brake

Check the fluid level in the midmount brake unit every 50 hours.This is done by removing the level check plug on the side of the brake housing. If the level of the fluid is not up to the bottom of the check hole, remove the midmount brake breather on the hose fastened to the right hand side of the winch and add Automatic Transmission Fluid to the hose until the correct fluid level is reached. Install the breather and replace the check plug. Drain and refill the midmount brake housing every 500 hours of operation. Always use Approved Automatic Transmission Fluid.

NOTE: Do not overfill.



RP-10681

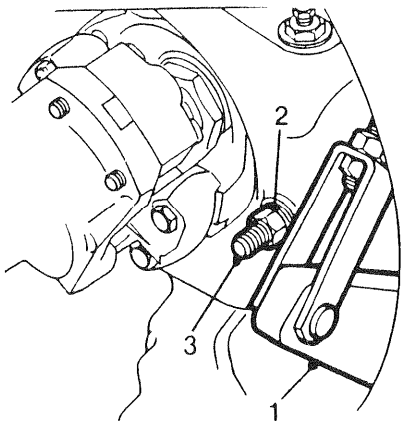
Adjusting the Parking Brake Lever

If slack develops when the parking brake lever is applied, release the parking brake lever and turn the acorn nut on the end of the lever to clockwise to tighten the cable.

Put the machine in the SERVICE POSITION

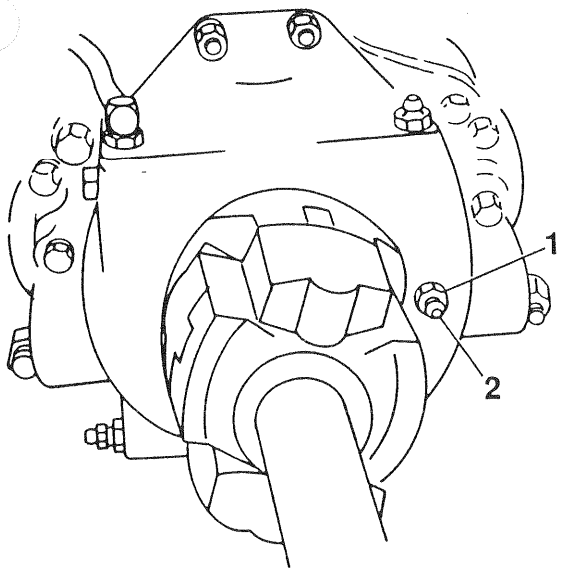
Adjusting the Service Brake, Transmission

Note: ***The parking brake lever arm (1) applies only to the transmission mounted brake, not the midmount brake.***



SP-10613

- Loosen locknut (2) on brake adjusting screw (3).
- Disconnect parking brake linkage from brake lever arm (1). Brake lever arm end only.
- Apply pressure by turning brake arm until springs and clutch brake plate clearance is removed and brake assembly is locked up.
- Tighten adjusting screw (3) until tight against brake yoke.
- Back adjusting screw (3) out one turn.
- Hold adjusting screw (3) from turning and tighten locknut (2).
- Connect parking brake linkage to brake lever arm.



RP-10907

Adjusting the Service Brake, Midmount

- Loosen locknut (1) on brake adjusting screw (2).
- Tighten adjusting screw (2) until tight against brake yoke.
- Back adjusting screw (2) out two turns.
- Hold adjusting screw (2) from turning and tighten locknut (1).

Put the machine in the SERVICE POSITION

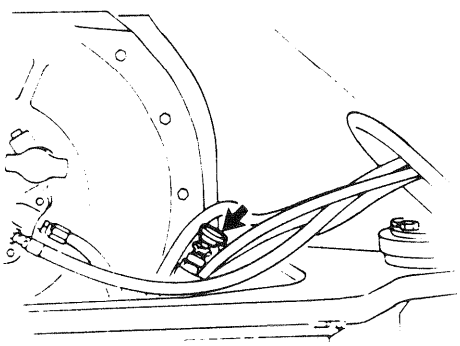
Adjusting the Parking Brake Linkage

Before adjusting the clevis at the brake lever arm:

- Adjust the transmission service brake clearance.
- Rotate the adjustment knob on the hand lever to full release position.
- Adjust the clevis until the pin slides freely through the brake lever arm.
- Adjust the knob on the hand lever until the lever force is firm.

Midmount Brake Breather

The breather should be cleaned every 250 hours of operation. Remove the breather from the hose on the right hand side of the winch, clean it in a solvent and blow dry it with compressed air.



RP-10712

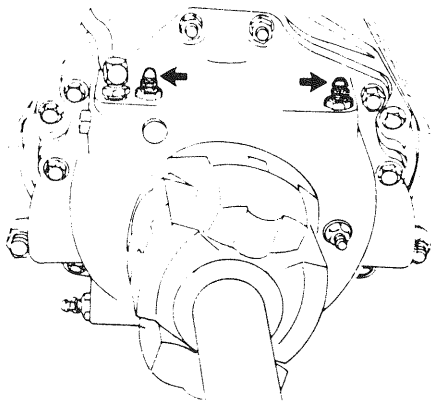
Put the machine in the SERVICE POSITION

Bleeding the Brakes

WARNING!

Never reuse fluid that has been collected during bleeding, it could be contaminated and could interfere with the safe operation of the brakes.

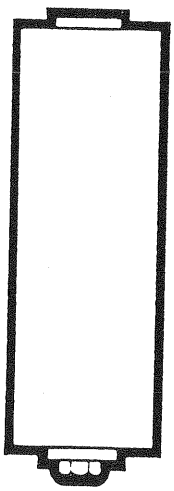
NOTE: Both brake units must be correctly adjusted before you begin to bleed the brakes. Correct brake adjustment can correct certain brake conditions.



RP-10718

Always remember to close bleeder screws before the brake pedal is released. This should be done with the engine operating at idle.

- Hold the service brake fully applied and open the two bleeder screws on the top of the transmission mounted brake unit.
- If no fluid is expelled and the pedal goes to the floor, close the bleeder and release the pedal.
- Repeat the procedure until a clear steam of fluid (free of air) is expelled from the bleeder and close the bleeder screws and repeat the procedure three more times.
- Repeat the procedure to bleed the midmount brake unit.



SP-10159

BRAKE ACCUMULATORS

If the oil flow to the brake actuating circuit is interrupted, safe brake operation will be temporarily provided by pressure stored in two brake accumulators, one for each brake circuit. These piston - type accumulators are precharged with nitrogen gas to a pressure of 6.900 ± 345 kPa (1000± 50 PSI) and pressurized by the oil supply from the brake pump. If the accumulator (s) will not maintain this precharge pressure, they will have to be repaired or replaced.

See Service Manual for further information.

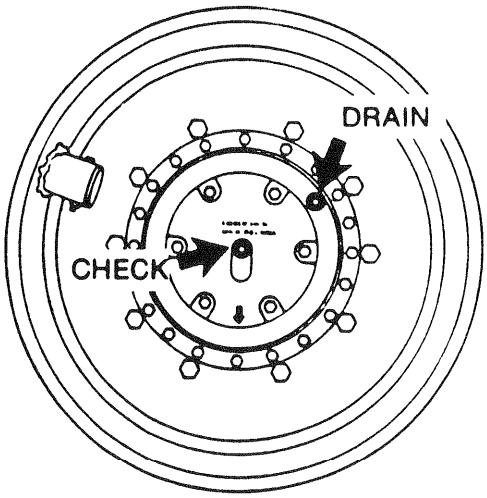
Put the machine in the SERVICE POSITION

FRONT AND REAR DRIVE AXLES

Checking the Axle Lubricant Levels

The lubricant in the drive axle differentials and planetary hubs should be checked every 50 hours of operation and changed every 1000 hours. A change may also be dictated by ambient temperature expectation. The differential level check plugs are located in the center of the differential housings opposite the input flanges. The differential drain plugs are located on the bottom of the differential housings.

SP-10470

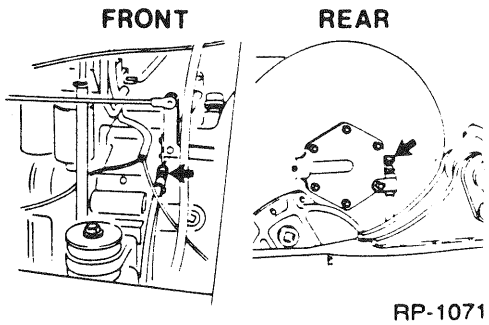


SP-10568

Checking the Planetary Hub Level

The planetary hub level check plugs are located in the center of each planetary hub. The arrow on the hub should point down when the level is checked. The planetary drain plugs are located on the outer edge of the hubs and should point down for complete draining

Note: ***On some planetary hubs the planetary oil level plugs are higher then the differential plugs. Therefore the differential plug should be used to determine the axle assembly oil level.***



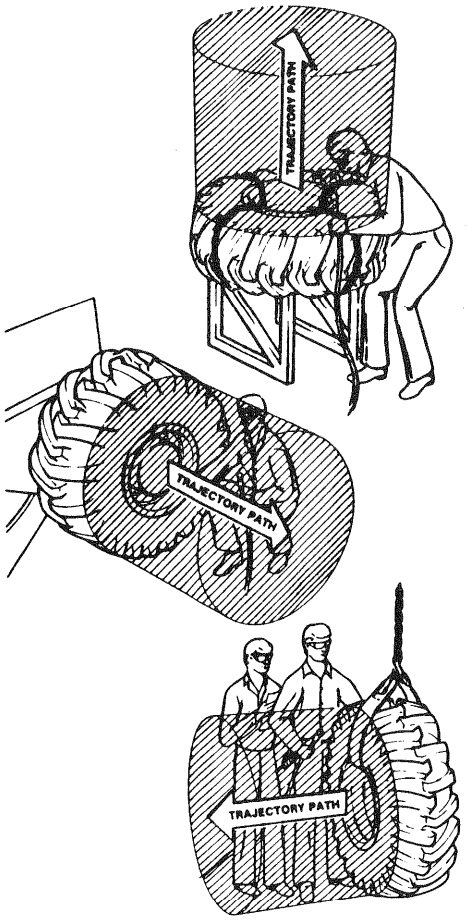
RP-10711

Axle Breathers

The axle breather Caps should be rotated every 50 hours of operation to clear the passages. Every 500 hours of operation the breathers should be cleaned with compressed air to remove any debris.

Put the machine in the SERVICE POSITION

WHEELS AND TIRES



SP-10102

WARNING!

When doing any tire service, especially tire inflation, NEVER stand in the TRAJECTORY PATH. Serious injury or death can result if an explosion should occur.

Use a self attaching air chuck with a hose long enough to avoid stranding in the trajectory path when inflating a tire.

Use an inflation cage, safety cables or chains when inflating tires.

Never use air from a compressed air system to inflate a tire if alcohol has been used as antifreeze.

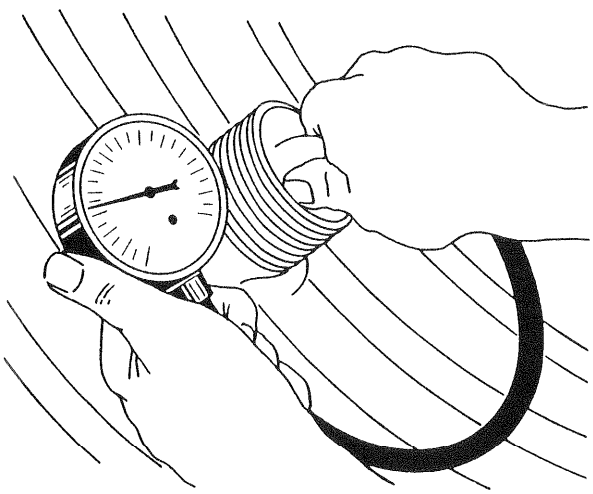
Tire Inflation Pressure

When checking the air pressure of the tires, examine the valves and make sure all valve caps are in place. For the recommended Tire inflation pressures see the specification section of this manual.

Note: Never check tire pressures with a load (of logs) in place.

Check Tire Condition

Check the condition of the tires with the machine empty. Make a report of any damaged tires.



RP-10896

WARNING!

Completely deflate a tire before removing foreign material from the tire tread. Keep your fingers away from bead breakers and rims, and stay out of the trajectory path when removing foreign material. If a bead breaker disengages, it will release with enough force to cause injury or death.

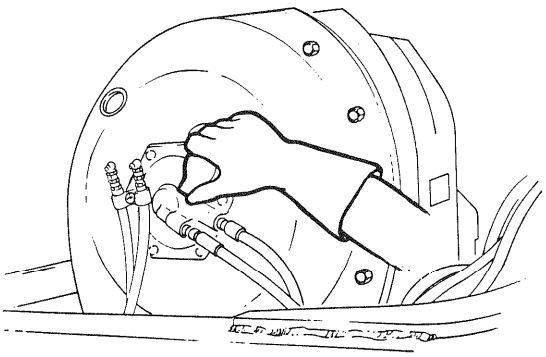
WARNING!

For complete information pertaining to dismounting and mounting the tires on rims, refer to the Tire Manufacturer's Off-Highway Tire Maintenance Manual.

Put the machine in the SERVICE POSITION

WINCH

Adjust the Winch Free–Spool Tension



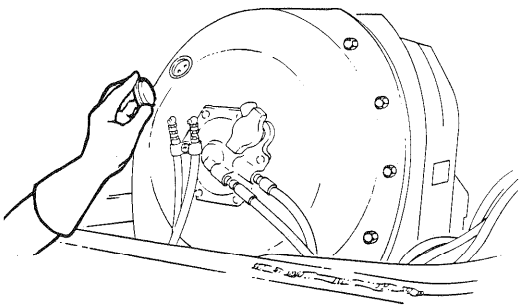
RP-10682

If the winch cable requires too little effort to pull it from the cable drum, the tension can be adjusted as follows:

- Loosen the lockscrew.
- Tighten the adjusting nut to increase the tension and loosen it to decrease it.
- Tighten the locknut.

Installing The Winch Mainline

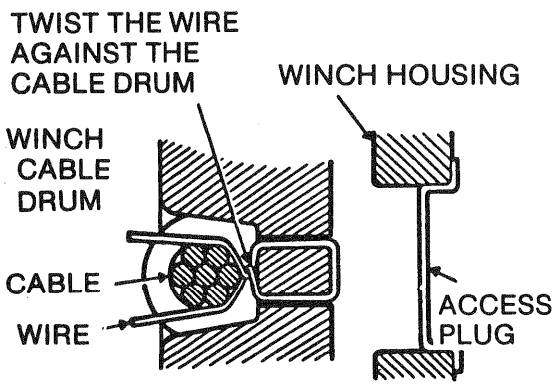
Note: ***Installing the winch cable this way provides a safety break away if the load should fall down a grade as well as a method of holding the cable under normal operation.***



RP-10683

WARNING!

This break–away feature will help to prevent the machine from being pulled by the load should the load slip down a hillside, but it is imperative that the operator put the winch control lever in the FREE–SPOOL position immediately to allow the cable to unwind from the winch.

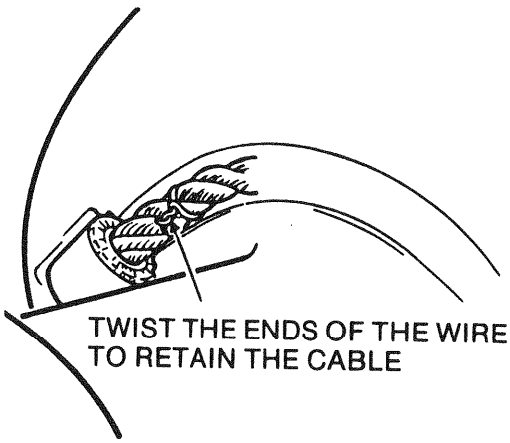


SP-10082

Install the winch mainline to the winch cable drum as follows:

- Remove the access plug from the winch housing.
- Start the machine and put the winch in the FREE–SPOOL mode.
- Rotate the cable drum by hand until the two cable anchor wire holes are in the center of the hole.
- Put the winch in the HOLD mode and return the machine to the SERVICE POSITION.
- Choose a gauge of wire that will insert through the holes.

Put the machine in the SERVICE POSITION



SP-10083

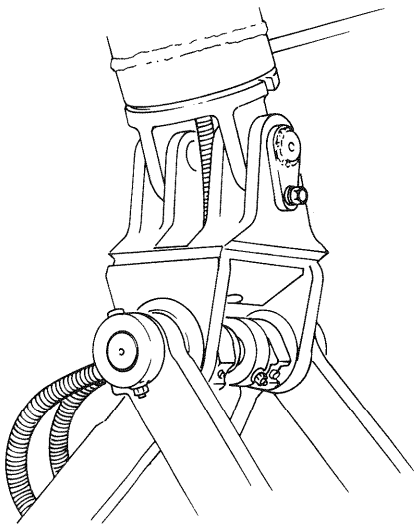
- Twist the wire ends together against the cable drum.
- Install the cable into the groove between the ends of the wire so that the cable ferrule is in the ferrule groove.
- Twist the ends of the wire together to hold the cable.
- Start the engine and WINCH–IN the cable onto the cable drum.
- Install the access plug.

LOG GRAPPLE

Checking and Adjusting the Grapple Snubbers

The operation of the snubbers should be checked at the beginning of each work shift as follows:

Pull back the grapple 30 cm (12 in) and release it. It should stop completely just before it reaches the bottom of its swing. If the grapple swing is greater than this, the snubber should be adjusted as follows:



RP-10684

- Loosen each self adjusting nut (with special wrench provided by Weldco) and then tighten until each of the Belleville washers collapses about halfway.
- Recheck the grapple swing.

Check the adjustment of the lower snubbers by pulling the grapple 30mm (12 in) to each side and releasing it. The bottom snubbers are adjusted the same way as the top.

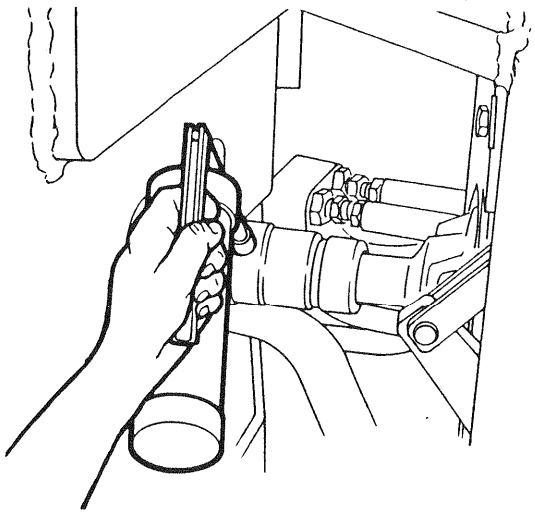
Note: Keep oil and grease away from the snubbers so they will operate at maximum efficiency.

Additional information about the WPG 600 Parallelogram Grapple will be provided in the form of a manufacturing instruction booklet from Weldco-Beales.

Put the machine in the SERVICE POSITION

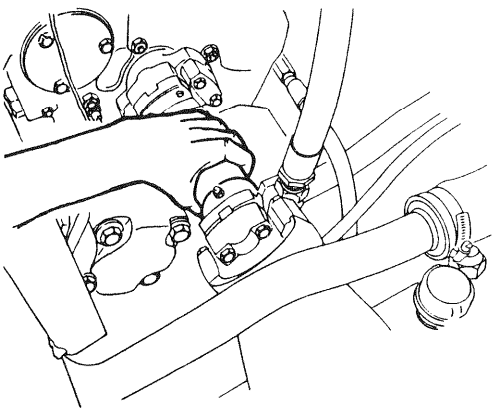
DRIVE SHAFTS

Lubrication



SP-10610

Grease the slip joints of the driveshafts every 100 hours of operation using a hand grease gun. Some of the universal joints used are sealed, non greasing type that require no lubrication maintenance. They can be identified by a hole in the center of the U-joint cross. Greaseable U-joints should be greased every 1000 hours of operation. A needle type grease gun adapter may be required to reach the grease fittings on some U–joints. this may be purchased from a local tool supplier.



SP-10611

Checking the Drive Shafts

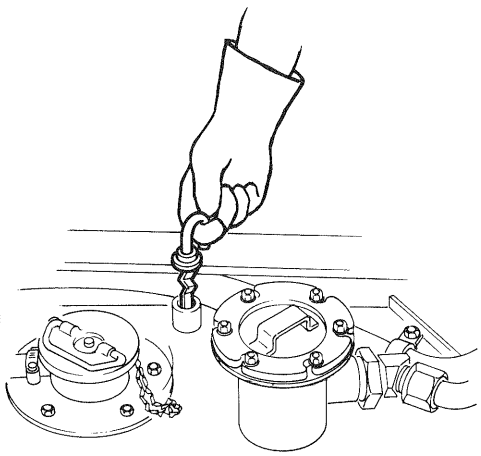
Check for play in the universal joints, slip joints and loose missing or damaged bolts.

Put the machine in the SERVICE POSITION

HYDRAULIC SYSTEM

Transmission, Converter and Winch

The fluid in the transmission, converter and winch hydraulic system serves several purposes. It lubricates the transmission, converter and winch, transmits engine power through the torque converter. The fluid also cools the components. It is very important that the oil level is always correct. Too low an oil level will affect the transfer of power and can damage the system. Too much oil will cause foaming and the system will overheat. Damage can also be caused by dirty oil. It is important to keep contaminants away from the dipstick and the system clean.



RP-10703

Checking Fluid Level

The fluid level should be checked daily as follows:

- Park the machine on level ground.
- Apply the parking brake.
- Transmission in neutral.
- Fluid at operating temperature 82° – 93° C (180° – 200° F)
- Start engine and operate it at low idle RPM.
- Check fluid level on dipstick.
- Add fluid to filler tube as required to bring level to between marks on the dipstick.

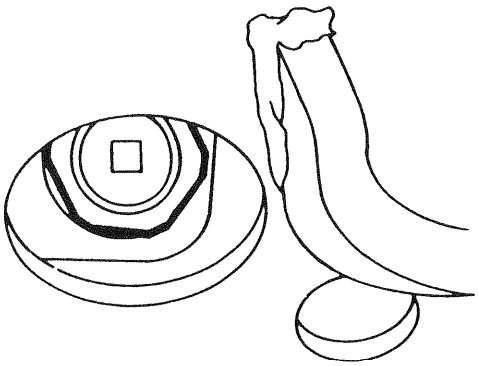
Note: ***If adding a large quantity of oil, it may be poured into the winch through the breather hole on top of the housing.***

Transmission and Torque Converter Fluid Warm–Up Procedure

- Block tires and hold service brake pedal applied.
- Transmission in FORWARD and THIRD.
- Run the engine at two thirds throttle until the fluid reaches its operating temperature.

Note: ***Do not apply parking brake as this will declutch the transmission on some models.***

Put the machine in the SERVICE POSITION



SP-10600

Changing Hydraulic Transmission Fluid

The fluid should be changed every 1000 hours of operation. Drain the fluid by removing the plug from the bottom of the transmission housing. Drain with the fluid at 65° – 93° C (150° – 200° F)

WARNING!

Be careful when working with hot fluids

Flushing the Transmission and Torque Converter

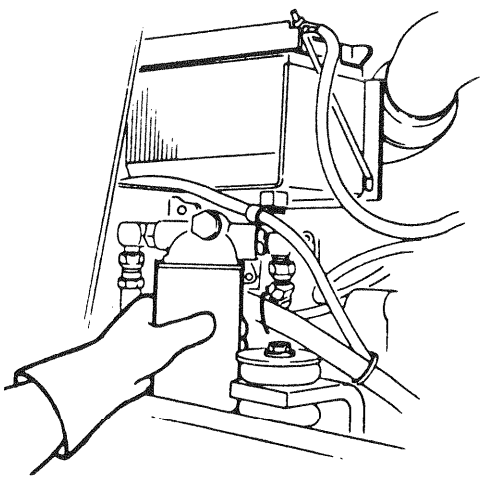
In the event of a major failure or when it becomes necessary to change most of the oil in the circuit the following procedure should be followed:

- Drain the transmission oil.
- Clean and replace the suction screen.
- Change the transmission filter.
- Remove lube line at transmission brake (from cooler) and divert into a 10 gallon pail.
- Over fill transmission a few extra gallons until oil comes out the breather.
- Start engine and run at idle until clean oil appears at lube line or oil stops flowing.
- Shut off engine as soon as oil flow stops.

Suction Screen

The suction screen should be cleaned every 1000 hours of operation. It is located on the bottom on the right hand side of the transmission beside the steps. Clean the screen when the fluid in the system is drained for changing. When the cleaned screen is replaced, use a new gasket. It should be tighten just enough to seat the suction screen.

Refill transmission to low mark on the dipstick. Start the engine and run at 500–600 RPM to prime converter and lines. Recheck level with engine running at 500–600 RPM and add oil to bring level to low mark. When the oil temperature is hot 82° –93° (180–200° F) make final oil check bringing oil level to full mark. Check system for leaks.



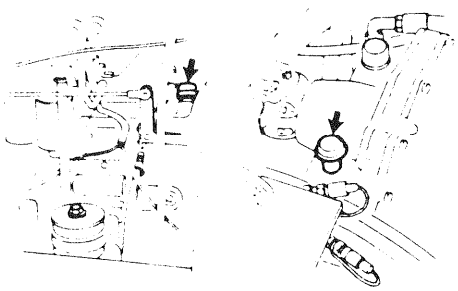
RP-10710

Changing the Transmission Filter

The filter should be changed after the first 50 hours of operation and every 500 hours of operation thereafter. It s accessible behind the left hand rear engine side panel. The filter cannot be cleaned, it must be replaced. Apply a thin coat of transmission fluid to the gas-

ket surface and tighten the filter. Operate the engine for five minutes at 1500 RPM and check for leaks. If leaks appear, remove and replace the filter and repeat the installation. It usually does not help to tighten the filter further.

Note: ***Normal drain periods and filter change intervals are for average environmental and duty–cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination. For extreme conditions judgment must be used to determine the required change intervals.***

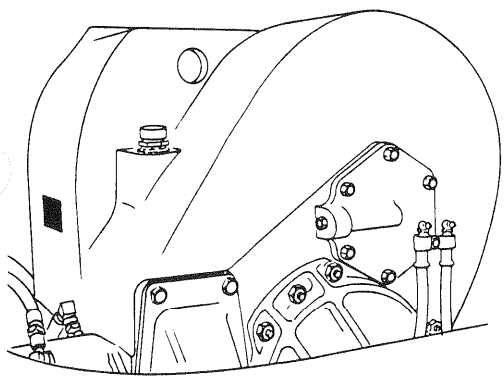


RP-10709

Torque Converter and Transmission Vent and Breather

The vent and breather should be cleaned every 250 hours of operation. Remove them from the top of the torque converter and transmission, clean them in solvent and blow dry with low pressure compressed air as not to damage the internal parts.

Note: ***Breather – transmission***
Vent – converter and winch



SP-10559

HYDRAULIC SYSTEM; Steer, Blade & Grapple

WARNING!

GRAPPLE HYDRAULIC ACCUMULATOR SYSTEM

If your Skidder is equipped with a grapple hydraulic accumulator System the hydraulic fluid the in the accumulator is stored under high pressure. BEFORE doing any service on grapple circuit of the hydraulic system, the accumulator must be discharged COMPLETELY. If the accumulator is to be disassembled, the nitrogen precharge pressure must also be discharged completely.

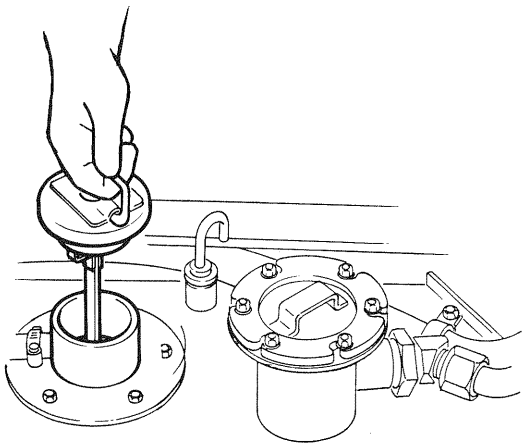
Discharge the Accumulator Hydraulic Pressure as Follows:

- With the engine running, open the grapple tongs halfway (tip to tip) – do not close the tongs halfway.
- Raise the grapple tips a few centimeters (inches) off the ground.
- Shut down the engine and put the machine in the service position (with the exception of the raised grapple).

Put the machine in the SERVICE POSITION

- Hold the grapple control lever in the OPEN position for ten seconds.
- Check the grapple accumulator system pressure gauge to ensure that the pressure reading is zero.

Note: ***If the grapple cannot be opened (because of a problem such as a pump or engine failure) then the above procedure should be done with the closed grapple on the ground. If the pressure still cannot be reduced to zero, loosen the hose 1–2 turns (Do Not Remove) at the pilot operated check valve to the accumulator CAREFULLY at the the check valve until all of the hydraulic pressure is removed. There will be approximately 3.8 liters (1 US gal.) of oil in the accumulator.***



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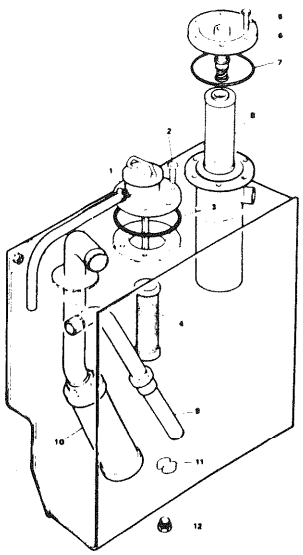
Checking the Hydraulic Fluid Level

Note: ***The blade should be on the ground, arch forward, grapple open, and the boom cylinders at mid stroke.***

The hydraulic fluid should be checked daily and be between the add and full mark on the dipstick. Add fluid to the reservoir as required through the filler tube.

Changing the Hydraulic Fluid

Change the hydraulic fluid every 1000 hours of operation or whenever the main hydraulic pump or the power brake pump fails and must be overhauled.



- Run the Skidder until the hydraulic fluid reaches its operating temperature.
- Raise the blade, move the arch forward and the boom up (if applicable) and open the log grapple tongs.
- Shut the engine down.
- Raise the floor board to gain access to the hydraulic tank. Remove the pressure cap (4 PSI under pressure) then remove the drain plug (Item 12) on the bottom of the reservoir. Draining the oil into a suitable container.
- Slowly lower the blade, close the grapple arms move the arch back (and lower the boom) to flush the fluid from those cylinders.
- Remove the hydraulic reservoir top plate (Item 1) and clean the inside of the tank using diesel fuel as a solvent and clean the magnet (11).
- Remove and clean the hydraulic suction screen (10) & brake pump suction screen (Item 9). Replace them if damaged.

Put the machine in the SERVICE POSITION

- Refill the reservoir to the correct level. Start the engine and operate it at Low Idle RPM for a few minutes.
- Raise the blade, move the arch forward, level boom and open the grapple arms.
- Recheck the level, adding fluid as required.

Note: Never use flushing oil or compounds to clean the system, use only the recommended operating fluid.

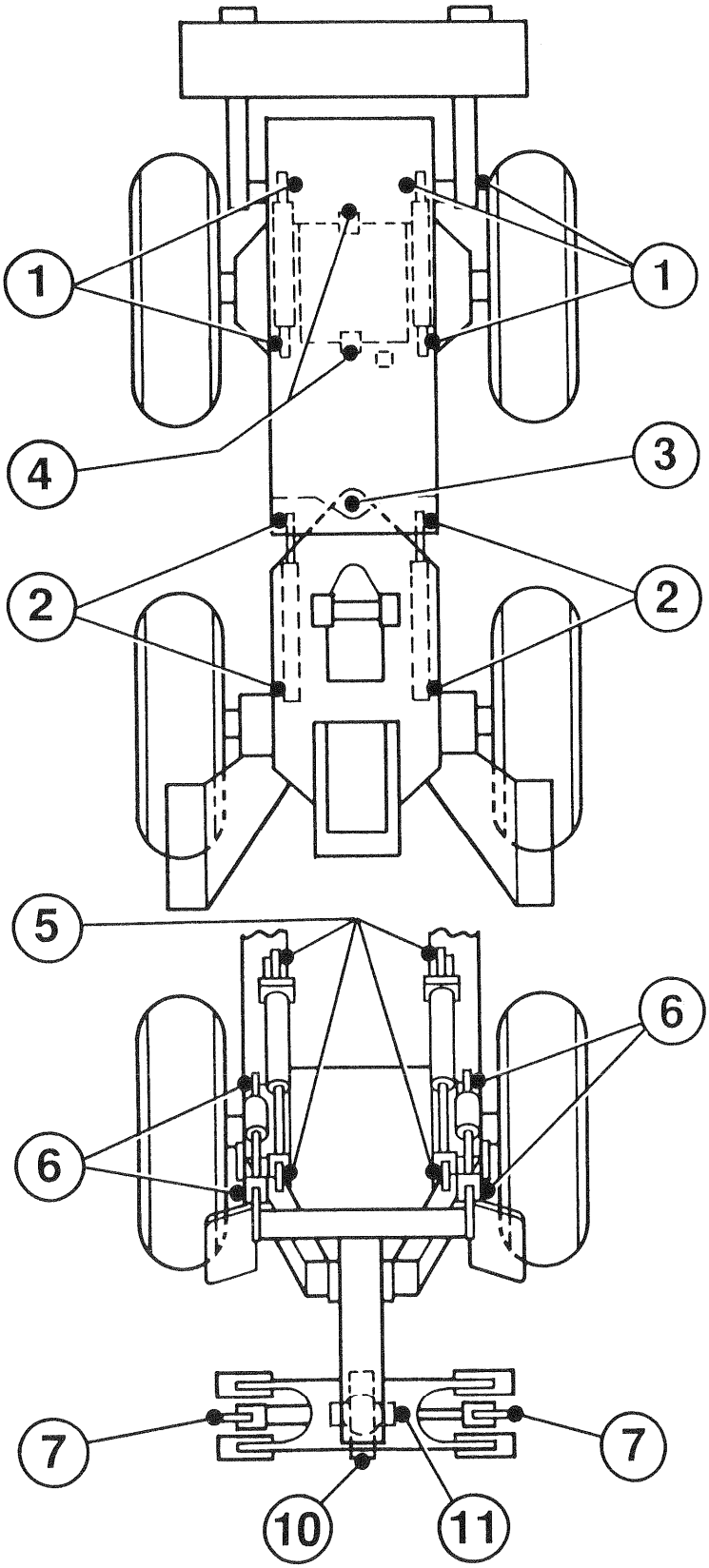
Changing the Main Hydraulic Filter

Change the filter element after the first 50 hours of operation and every 500 hours of operation thereafter.

See Hydraulic section in Service Manual (6414) for further information on hydraulic system.

Put the machine in the SERVICE POSITION

Lubrication Instructions



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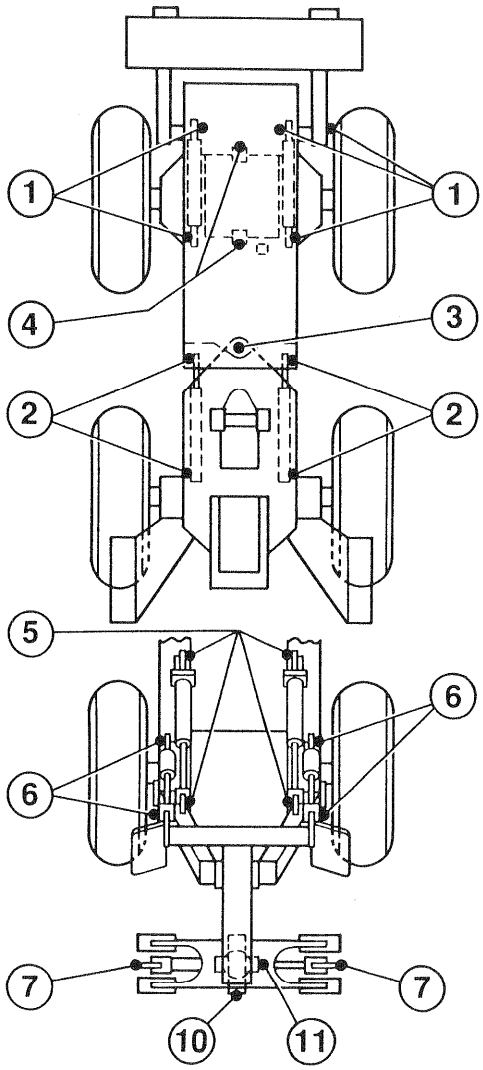
Put the machine in the SERVICE POSITION

LUBRICATION INSTRUCTIONS

ITEM	EVERY 10 HOURS OF OPERATION
1	Utility Blade and Cylinder Pins
2	Steer Cylinder Pins
3	Center Hinge Pins
4	Axle Cradle Pins
5	Arch and Cylinder Pins
6	Boom and Cylinder Pins
7	Grapple and Cylinder Pins
	EVERY 100 HOURS OF OPERATION
8	Driveshaft Slip Joints
	EVERY 500 HOURS OF OPERATION
10	Main Shaft Bearing
11	Snubber Pins
	EVERY 1000 HOURS OF OPERATION
9	Greaseable U–Joints



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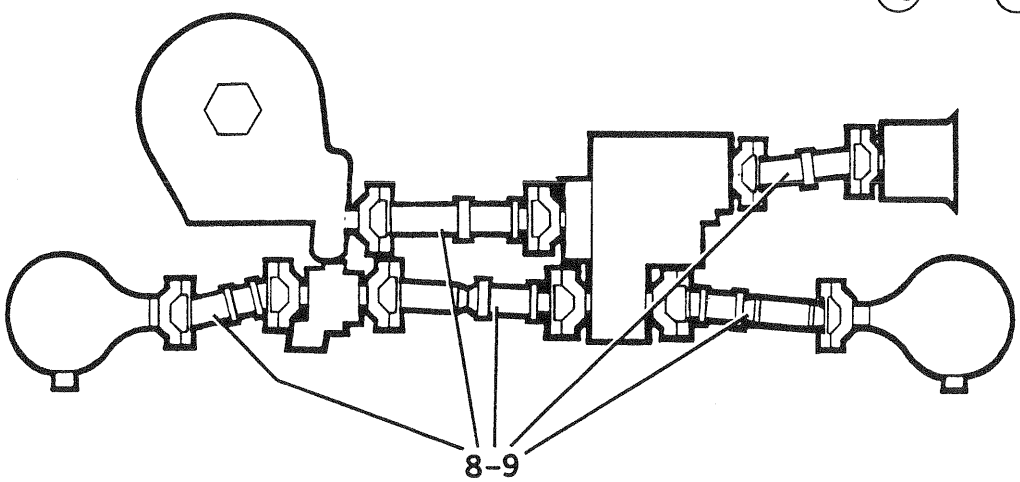

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Put the machine in the SERVICE POSITION

NOTES

Put the machine in the SERVICE POSITION

SPECIFICATIONS

RECOMMENDED LUBRICANTS

Main Hydraulic System: (Blade, Steer, Arch, Boom and Grapple Cylinders)

PREVAILING AMBIENT TEMPERATURE	FLUID TO BE USED
-23° C (-10° F) TO 50° C (120° F)	Mobil DTE 13M Premium Grade Hydraulic Oil ISO VG32

Transmission/Converter/Winch Hydraulic System and Midmount Brake

PREVAILING AMBIENT TEMPERATURE	FLUID TO BE USED
–1° C (30° F) and Above	C–3 Grade 30 Transmission Fluid
–23° C (–10° F) and Above	C–3 Grade 10 Transmission Fluid
–34° C (–30° F) and Above	Dextron II D Transmission Fluid
–55° C (–65° F) to –18° C (0° F)	MIL –L–46167 or MIL–L–46167A
–55° C (–65° F) and above	Conoco Polar Start DN–600 Fluid

Hydraulic fluid must be kept clean. Any fluid added to the reservoir must be filtered through a 100 mesh screen. It is important to service filters and breathers at the correct hourly intervals.

Any time oil is added to top off the fluid level, the same oil as is already in the system must be used. If the same fluid is not available, another approved fluid (for the given temperature range) can be added if the fluid is supplied by the same manufacturer and the amount added is not greater than 50% of the system capacity. If these conditions cannot be met, the system must be drained completely and refilled.

When the fluid is changed because of changes in ambient temperature, the system must be drained and the fluid replaced.

Because of the many types and brands of fluids that are available, it is not practical to test each one. Selecting the correct fluid should be done with the help of a reputable oil supplier who is responsible for the quality of the fluid. It is important to change fluids and filter elements at the intervals specified in this manual.

Front and Rear Axle Differentials and Planetary hubs

Extreme Pressure Gear Lubricant
Multi–grade Viscosities MIL–L–2105C

PREVAILING AMBIENT TEMPERATURE	LUBRICANT TO BE USED
–12° C (+10° F) and Above	85W –140
–26° C (–15° F) and Above	80W –140
–26° C (–15° F) to 38° C (100° F)	80W –90
–40° C (–40° F) and Above	75W –140
–40° C (–40° F) to 38° C (100° F)	75W –90
–40° C (–40° F) to –18° C (0° F)	75W –80
Below – 23° C (– 10° F)	Special Polar MIL–L 2105C 75W

Chassis and Driveshaft Lubrication

PREVAILING AMBIENT TEMPERATURE	LUBRICANT TO BE USED
–18° C (0° F) and Above	NLGI Grade 2 Lithium Base Extreme Pressure Multi–puposeGrease with 3% to 5% Molybdenum Disulfide added.
–32° C (–25° F) and Above	NLGI Grade 0 Lithium Base Extreme Pressure Multi–purpose Grease.

Fuel Specifications

Fuel: N°. 2 Diesel

Put the machine in the SERVICE POSITION

UNITS OF MEASUREMENT

The new SI units have been used in this Instruction Manual. Previously used units are given within brackets. The new units used are as follows:
Power is stated in kW (kilowatt) , hp (horse power)
Torque is stated in N.m (newton meter) , lbf. ft (pound force foot)
Force is stated N (newton) ,lbf (pound force)
Pressure of liquids and gases are stated in kPa (kilo Pascal) , MPa (mega Pascal) , PSI (pounds per square inch)

CAPACITIES	LITERS	GALLONS
Engine crankcase	22.4	6.0
Cooling System	38.6	10.2
Transmission/Converter/Winch System	36.3	9.6
Differential – Front	16.0	4.4
Differential – Rear	24.6	6.5
Planetary Hubs – Front	9	2.4
Planetary Hub – Rear	7.0	1.9
Fuel Tank	326	86
Midmount Brake housing	10.0	2.6
Hydraulic System – Cable Skidder	77	20.4
Hydraulic System – Parallelogram Boom	96	25.2
Windshield Washer Reservoir	2.0	0.5

MACHINE WEIGHTS (Cable Skidder)

Front Axle	9208 kg (20300 lb)
Rear Axle	6486 kg (14300 lb)
Total	15694 kg (34600 lb)

MACHINE WEIGHTS (Paralleogram Grapple Skidder)

Front Axle	8755 kg (19302 lb)
Rear Axle	8753 kg (19298 lb)
Total	17508 kg (38600 lb)

TRAVELING SPEEDS

30.5L x 32 Tires	km/h	mile/h
1st Gear	6.9	4.3
2nd Gear	13.4	8.3
3rd Gear	26.9	16.7

NOTE: The weights and fluid capacities listed are approximates. Weights given are for machines with standard tires and equipment.

ENGINE SPECIFICATION

Make	Cummins Diesel
Model	6CTA–8.3
Configuration	Inline 6 Cylinder–Turbocharged Aftercooled
Gross Power @ 2200 RPM	175 kw (234 hp)
Maximum Torque @ 1500 RPM	864N•m (640 lbf. ft)
Bore	114 mm (4.49 in)
Stroke	135 mm (5.32 in)
Displacement	8.27 liter (504.3 cu. in)
Low Idle RPM	750–950
High Free Idle RPM	2320–2520

ENGINE LUBRICATING SYSTEM

Oil Pressure –Low Idle RPM	207 kPa (30 PSI)
Oil Pressure–Operating RPM	345 kPa (50 PSI)

ELECTRICAL

System Voltage	12 Volt
Batteries	Two 31D Parallel
Battery Voltage	12 Volt
Battery Capacity	700 CCA
Alternator Rating	1765 W (65 A)
Ground	Negative

HYDRAULIC TRANSMISSION

Make	Clark
Model	R 32328
Type	Powershift with Forward–Reverse Modulation
Number of Forward Gears	3
Number of Reverse Gears	3

TORQUE CONVERTER

Make	Clark
Model	C5451-200
Stall Torque Ratio	1.82:1

AXLES

Make	Clark
Model	Front 16D2149 Current Production Front D 33640 Earlier Production Rear 37660
Differential Type	No–Spin
Differential Ratio	Front 5.286:1 Current Production Front 6.333:1 Earlier Production Rear 6.286:1
Planetary Ratio	Front 4.941:1Current Production Front 4.125:1 Earlier Production Rear 4.125:1
Total Ratio	Front 26.824:1Current Production Front 26.125:1Earlier Production Rear 25.930:1

Put the machine in the SERVICE POSITION

BRAKE SYSTEM

Service Brake Actuation	4.5GPM @ 2200 RPM engine mounted pump and two 51.5 cu. in. piston type accumulators precharged to 1000 50 PSI with warning and test system
Service Brake, Type	Enclosed Wet Disc, Transmission and Enclosed Wet Disc, Midmount Brake
Parking Brake, Type	Transmission Brake Mechanically Applied

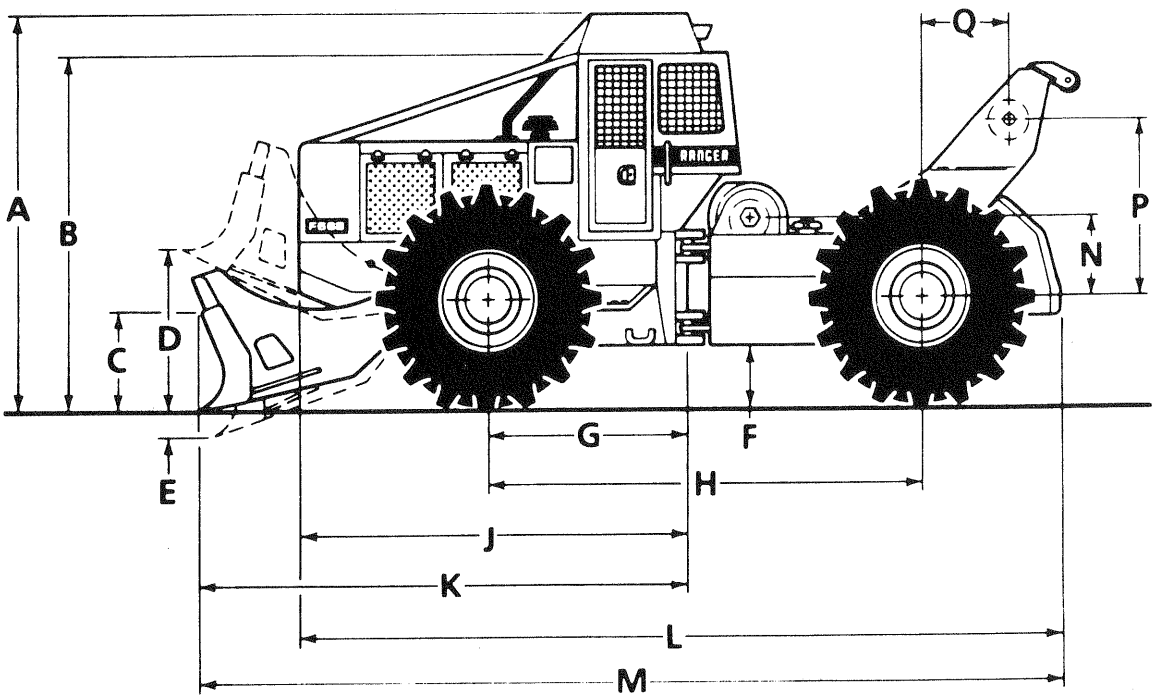
HYDRAULIC SYSTEM

Pump	Gear Type
Pump Capacity	155 l/min (41 gal/min) @ 2000 RPM
Cylinders– Steer Blade	Double Acting, 101.6 mm (4 in) diameter
Cylinders– Arch, Boom	Double Acting, 114.3 mm (4.5 in) diameter
Cylinders– Grapple (Paralleogram Boom)	Double Acting, 165.1 mm (6.5 in) diameter
Main Relief Pressure	2.05– 2.15 MPa (2050 – 2150 PSI)
Grapple Accumulator	Piston type 232 cu. in. 1000 $\pm$ 50PSI precharge

MACHINE DIMENSIONS (F68 Cable Skidder)

The following machine specifications are provided for your convenience. All specifications are approximate and are subject to change without notice or obligation.

Turning Radius . . . . . 6350 mm (20 ft10 in)
Width Over Tires . . . . . 3403 mm (11ft 2 in)
Track, Front & Rear . . . . . 2438 mm (8 ft)
Blade Width . . . . . 2438 mm (8 ft)



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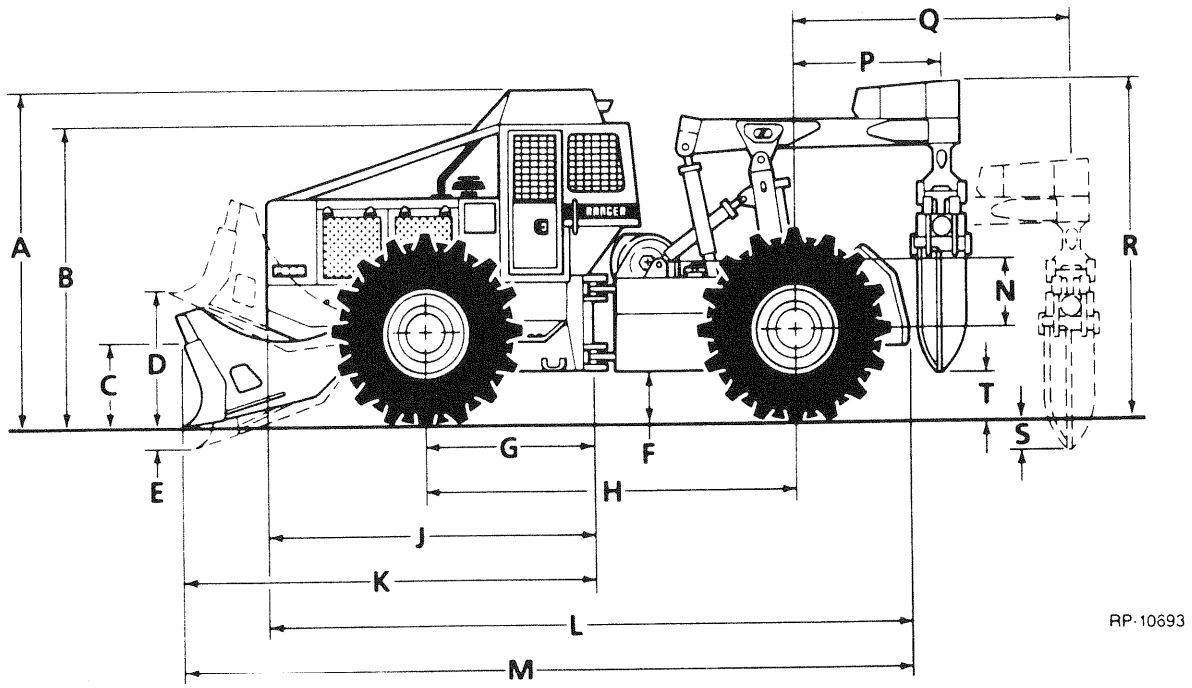
TIRES	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
30.5L-32															
mm	3327	2992	851	1384	203	533	1702	3759	3353	4166	6604	7417	673	1499	767
ftin	10'11"	9'10"2	'10"	4'6"	0'8"	1'9"	5'7'	12'4"	11'0"	13'8"	21'8"	24'4"	2'2"	4'11"	2'6""
35.5L-32															
mm	3353	3073	851	1460	127	609	1702	3759	3353	4166	6604	7264	673	1499	767
ftin	11'0"	10'1"	2'10"	4'9"	0'5"	2'0"	5'7"	12'4"	11'0"	13'8"	21'8"	23'10"	2'2"	4'11"	2'6""

Put the machine in the SERVICE POSITION

MACHINE DIMENSIONS (F68 Parallelogram Grapple Skidder)

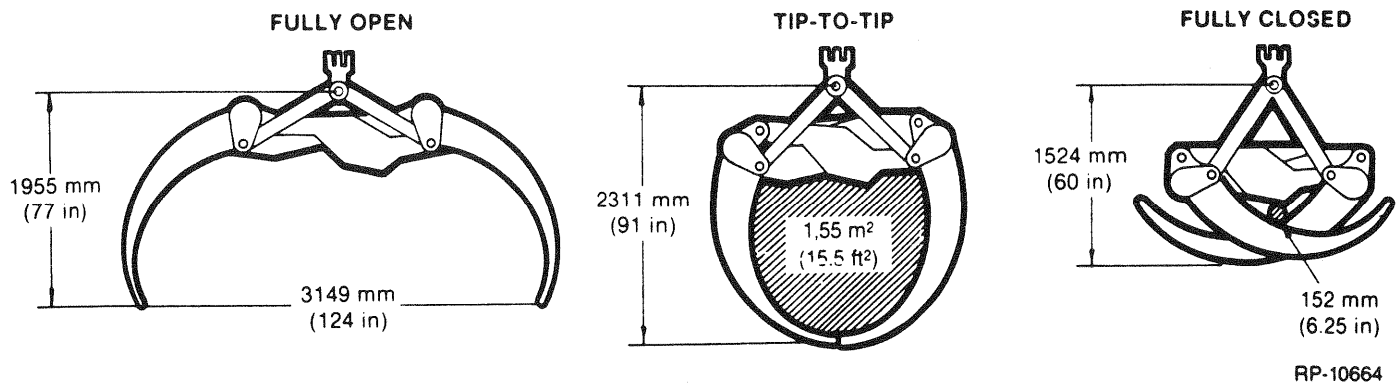
The following machine specifications are provided for your convenience. All specifications are approximate and are subject to change without notice or obligation.

Turning Radius	6350 mm (20 ft10 in)	Track, Front & Rear	2438 mm (8 ft)
Width Over Tires	3403 mm (11ft 2 in)	Blade Width	2438 mm (8 ft)



TIRES	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
30.5L-32																		
mm	3327	2992	851	1384	203	533	1702	3759	3353	4166	6604	7417	673	1524	2794	3429	318	470
ftin	10'11⅜"	9'10"2	'10"4	'6"	0'8"	1'9"	5'7'	12'4"	11'0"	13'8"	21'8"	24'4"	2'2"	5'6"	9'2"	11'3"	1'0"	1'6"
35.5L-32																		
mm	3353	3073	851	1460	127	609	1702	3759	3353	4166	6604	7264	673	1524	2794	3505	241	546
ftin	11'0"	10'1"	2'10"	4'9"	0'5"	2'0"	5'7"	12'4"	11'0"	13'8"	21'8"	23'10"	2'2"	5'6"	9'2"	11'6"	0'10"	1'9"

LOG GRAPPLE



TIRE PRESSURES - kPa (PSI)

TIRE SIZE :30.5L-32 STD	PLY RATING (16)	FRONT	REAR
Cable		16 PSI (110kPa)	18 PSI (124kPa)
Grapple		30 PSI (206 kPa)	30 PSI (206 kPa)

Note: ***Inflation seating pressure not to exceed 35 PSI (241kPa).***

Put the machine in the SERVICE POSITION

BOLT TORQUE CHART - GENERAL

Note: Use this chart only if the torque is not shown on the BOLT TORQUE CHART APPLICATION.

Thread Diameter		GRADE 5 Coarse Fine Thread		Grade 8 Coarse Fine Thread		Socket Head and 12 Point Head Capscrew– Coarse and Fine Thread	
Fraction	Decimal	N•m	lbf. ft	N•m	lbf ft	N•m	lbf. ft
1/4	0.2500	10	7	12-14	9-10	15-16	11-12
5/16	0.3125	20-22	15-16	24-27	18-20	31-34	23-25
3/8	0.3750	34-38	25-28	50-55	34-40	60-65	45-50
7/16	0.4375	55-60	40-45	80-90	60-65	95-100	70-75
1/2	0.5000	90-95	65-70	125-135	90-100	150-160	110-120
9/16	0.5625	125-135	90-100	170-190	125-140	205-225	150-165
5/8	0.6250	170-190	125-140	240-255	175-190	285-310	210-230
3/4	0.7500	300-330	220-245	405-445	300-330	490-540	360-400
7/8	0.8750	450-490	330-360	645-710	475-525	815-880	600-650
1 in	1.0000	645-710	475-525	985-1085	725-800	1220-1355	900-1000
1-1/8	1.1250	800-975	650-720	1425-1595	1050-1175	1760-1965	1300-1450
1-1/4	1.2500	1220-1355	900-1000	2000-2205	1475-1625	2510-2710	1850-2000
1-3/8	1.3750	1630-1830	1200-1350	2710-2980	2000-2200	3320-3660	2450-2700
1-1/2	1.5000	2035-2235	1500-1650	3523-3865	2600-2850	4270-4680	3150-3450
1-5/8	1.6250	2710-2980	2000-2200	4680-5150	3450-3800	5630-6240	4150-4600
1-3/4	1.7500	3390-3730	2500-2750	5830-6510	4300-4800	6910-7730	5100-5700
1-7/8	1.875	4270-4745	3150-3500	7460-8270	5500-6100	8810-9760	6500-7200
2 in	2.000	5150-5965	3800-4200	8810-9760	6500-7200	10575-11660	7800-8600

BOLT TORQUE CHART, APPLICATION

	Thread	N•m.	lbf. ft
Bushing Retainer Cap Hinge and Cradle	.500-13*	41-47	30-35
Converter to Engine Flywheel Housing	.438-14	82-88	60-65
End Plate to Pin-Hinge and Cradle	.625-18*	245-250	180-185
Fiber Ring Gear Converter	.375-24	31-34	23-25
Front Axle to Cradle	1.00-14	950-1255	700-925
Front Engine Mount to Frame	.625-18	235-260	175-190
Front Engine mount to Support	.625-18	237-258	175-190
Lower Driveshaft–Mech. 7C	.500-20	120-155	90-115
Midmount Break to Frame	.750-10	385-420	285-310
Pin to Frame	.500-13*	110-115	80-85
Rear Axle to Frame	1.250-12	1970-2500	1450-1850
Rear Engine Mount to Engine	16mm*	230-258	170-190
Rear Engine Mount to Frame	.625-11	235-258	175-190
Snubber Adjusting Nut	1.250-12	45-55	35-40
Transmission Mount to Frame	.750-10*	395-515	290-380
Transmission Mount to Transmission	.750-10	385-420	290-380
Upper Driveshaft–Mech. 5C	.375-24	45-60	35-45
Wheel Nuts– Rim to Axle (Spherical)	.750-16	407-447	300-330
Winch to Frame	1.250-7	1150-1355	850-1000

When you install the above mounting bolts, lubricate the threads with SAE NO.30 unless otherwise instructed.

*When you install these mounting bolts, apply Loctite–271 or equivalent to the threads.

BOLTS NOT LISTED ARE TO BE DRAWN UP TIGHT IN A MANNER CONSISTENT WITH GOOD WORKMANSHIP– SEE BOLT TORQUE CHART– GENERAL.

ALPHABETICAL INDEX

A

B

C

D

E

F

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