

# **RANGER**

## **668C**

### **FOR SERIAL NUMBERS**

668 Detroit -	505C
668 Cummins -	507C
668 Detroit -	533A
668 Cummins -	532A
668 Detroit -	538C
668 Cummins -	539C

Record Your Machine Serial Number and Engine  
Model Specification and Serial Number Here

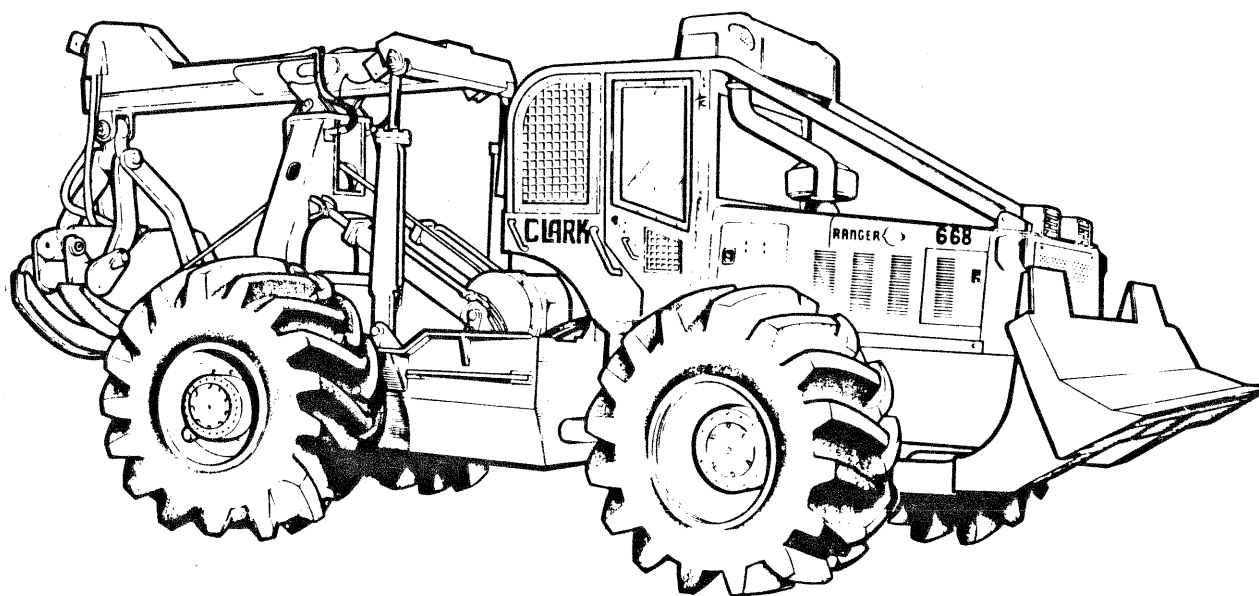
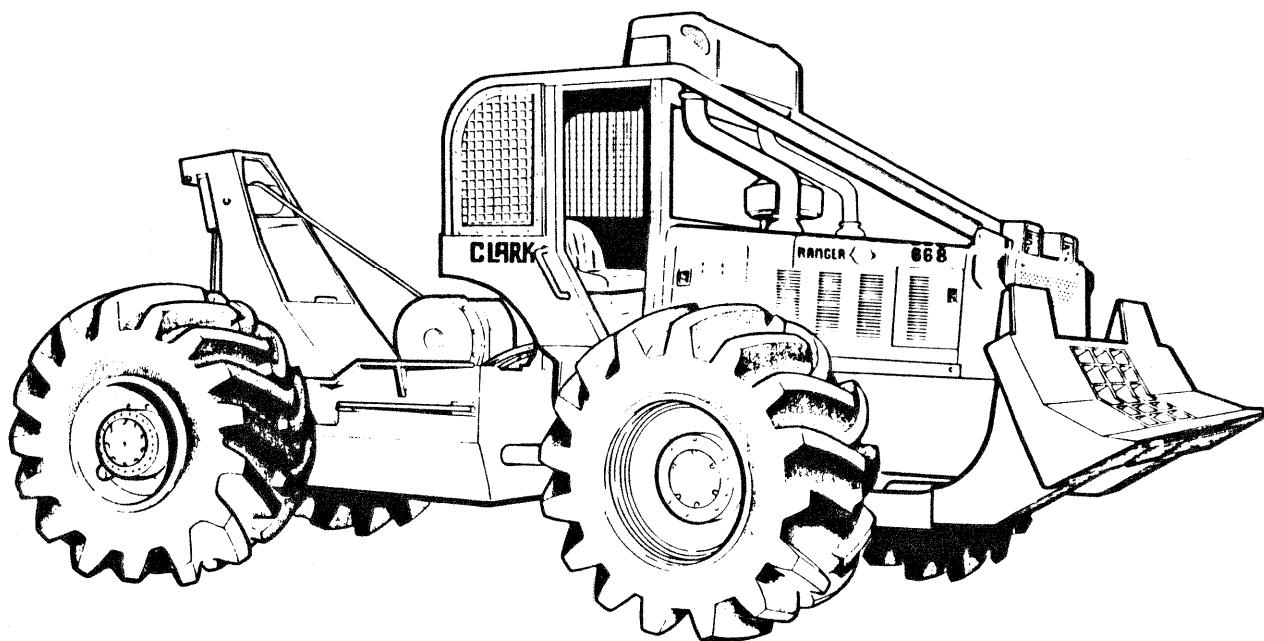
Machine Serial \_\_\_\_\_

Engine Model \_\_\_\_\_

Engine Serial \_\_\_\_\_

## **OPERATOR'S MANUAL**

### **NO. 6400 R-2**



# TO OWNERS

The purpose of this manual is to serve as a guide to the proper operation of Ranger Log Skidders. Study this manual carefully before starting or operating the machine the first time. Become familiar with all controls and procedures, and keep the manual in the machine for handy reference.

You have purchased this Ranger Log Skidder machine with the expectation that it will give you long and faithful service. In its construction, we have taken every precaution to see that you get an efficient, satisfactory machine. It is our sincere hope that you derive from its operation the full measure of value and utility which you looked forward to when purchasing it.

For these reasons, we take the liberty of suggesting that your Ranger Log Skidder will always respond at its best with considerate treatment and care. The slight outlay in personal attention and the cost required to give it regular and proper lubrication, inspection, and such adjustments as may be necessary, will repay you many times in low cost operation and trouble-free service.

Whenever repair or replacement of component parts is required, only the approved parts as listed in the applicable parts manual should be used. The use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. VME Americas Inc. does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the VME Americas Inc.

Operating instructions for many options are given in this manual. The photographs and illustrations in this manual may show optional equipment.



**This SAFETY ALERT SYMBOL will appear at various points in this manual and on the machine to accompany WARNING statements. When it appears, PAY ATTENTION, BECOME ALERT, YOUR PERSONAL SAFETY IS INVOLVED.**

## IMPORTANT

### UNAUTHORIZED MODIFICATION OF ROLL-OVER PROTECTIVE STRUCTURES (ROPS)

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

The Roll-Over Protective Structures (ROPS) manufactured and sold by VME Americas Inc. have been certified to meet specified test requirements. These certifications are required by the Canada Standards Association under CSA B352 and by the U.S. Department of Labor under OSHA Regulation 1926.1000.

Any planned modification or change must be reviewed in advance by the Engineering Department of VME Americas Inc., 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 the factory should be notified in writing.

\_\_\_\_\_

Circumstances	Percentage of respondents
Self-defense	85
To protect others	75
To protect property	65
To protect the community	55
To protect the environment	45

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000



















.....

$\tau_{\text{max}} = \tau_0 + \alpha \ln(\sigma - \sigma_0)$

1000 JOURNAL OF MANAGEMENT INQUIRY / December 2005



# INDEX

1. INTRODUCTION .....	
2. OPERATING SAFETY INSTRUCTIONS .....	
3. OPERATING CONTROLS .....	
4. STARTING INSTRUCTIONS.....	
5. OPERATING THE MACHINE.....	
6. ENGINE SYSTEMS .....	
7. FUEL SYSTEM .....	
8. TRANSMISSION/CONVERTER SYSTEM .....	
9. CLARK WINCH .....	
10. HYDRAULIC SYSTEM .....	
11. AXLES & PROPSHAFTS .....	
12. WHEELS & TIRES .....	
13. BRAKES .....	
14. ELECTRICAL .....	
15. MISCELLANEOUS.....	
16. SPECIFICATION DATA .....	
17. HOURLY LUBRICATION & MAINTENANCE SCHEDULE.....	
18. SERVICE PUBLICATIONS .....	

## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# INTRODUCTION

Your Ranger Log Skidder is designed and manufactured for rugged, heavy duty logging applications. A powerful diesel engine supplies power to the Clark drive train components.

Power from the engine comes through a Clark torque converter with a three to one torque multiplication factor to a power shifted, full reversing transmission and finally to the Clark winch and axle assemblies. All components are joined with universal slip joint drive shaft assemblies.

The axle assemblies are Clark all wheel drive units. All differentials are full floating, spiral bevel, ring gear and pinion types and further reduction is provided by planetary gear sets in the wheel hubs.

Steering is controlled by a single lever which articulates the machine at a mid point by two hydraulic cylinders. The blade and grapple assemblies are also hydraulically operated.

This manual contains valuable periodic service information to keep your machine trouble-free and operating at its peak of performance. Any problems and/or adjustments not in this manual can be handled by the Service Department at your Ranger Distributor.

A great deal of the checks and adjustments are recommended to be done at *Operating Temperature*. The operating temperature of the engine is 66°C (150°F), as indicated on the engine water temperature gauge. The operating temperature of the transmission/converter system is between 82°C and 93°C (180°F and 200°F) as indicated by the converter oil temperature gauge. The operating temperature of the hydraulic system is between 66°C and 77°C (150°F and 170°F). This can be reached after the recommended warm-up procedures.

## Warm the engine as follows:

Run the engine at idle for three to five minutes, then at 1000 RPM for three minutes and at 1800 RPM for three minutes.

**NOTE:** If the machine is equipped with a hand throttle, lock the throttle at the desired position to facilitate warm-up.

**NOTE:** DO NOT accelerate the engine to its maximum RPM until it has reached its operating temperature.

## Warm the transmission/converter oil as follows:

Put the shift control levers in the FORWARD and THIRD positions and stall the converter with the parking and service brakes applied and the wheels blocked. Stall the converter for 30 seconds and then shift the levers in neutral for 15 seconds.

## Warm the hydraulic oil as follows:

With the engine operating between 1400 and 1500 RPM, operate the steer and blade system over relief pressure, for five seconds every 10 seconds. Hold the cylinders open or closed to bring the pressure over relief.



**WARNING:** Before doing any work on your machine, make sure that you follow these instructions to put your machine in the **SERVICE POSITION**. For your safety and the safety of those around you, we recommend the positions as follows:



Fig 1-1

1. Park the machine on level ground if it is to be serviced away from the shop.

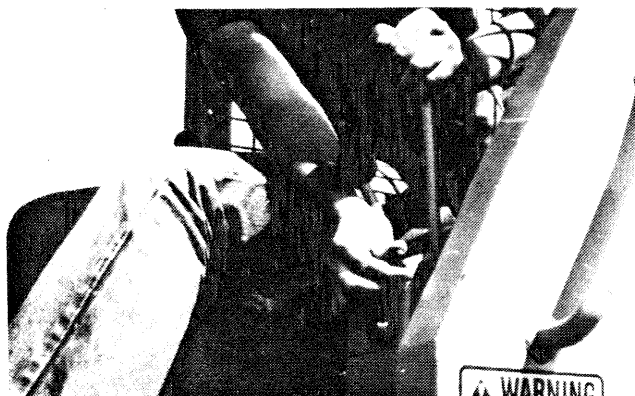


Fig 1-2

2. Put the direction control lever in the NEUTRAL position and engage the neutral lock mechanism.



Fig 1-3

3. Actuate the parking brake.

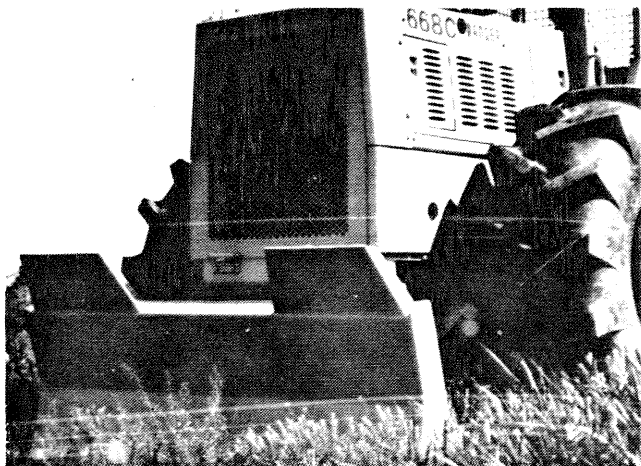


Fig 1-4

4. Lower all hydraulic attachments (blade and grapple assemblies) to the ground.

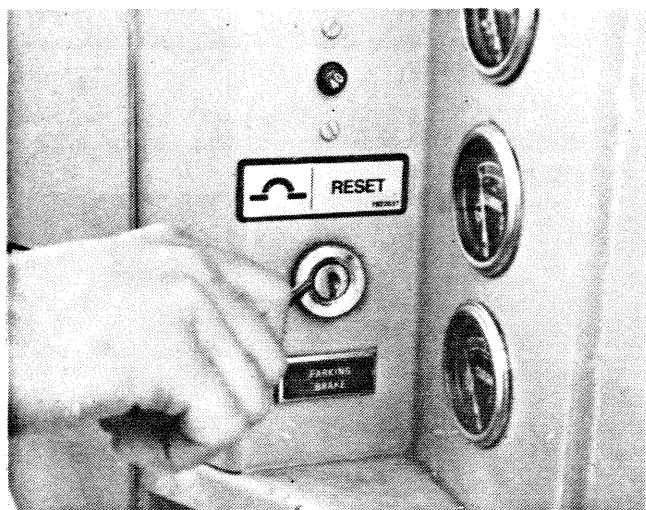


Fig 1-5

5. Stop the engine and remove the key from the ignition switch.

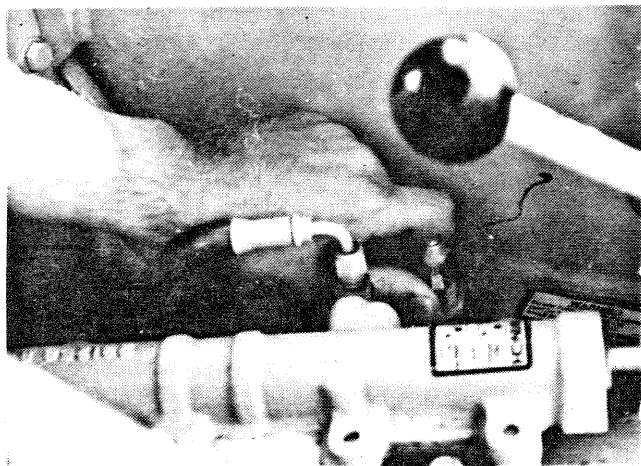


Fig 1-6

6. Turn the battery disconnect switch to the OFF position.



Fig 1-7

7. Fasten the articulation lock between the frames.



Fig 1-8

8. Fasten a red warning flag to the canopy upright to indicate that the articulation lock is fastened.



Fig 1-9

9. Block the tires.

# OPERATING SAFETY INSTRUCTIONS



**This SAFETY ALERT SYMBOL will appear at various points in this manual and on the machine to accompany WARNING statements. When it appears, PAY ATTENTION, BECOME ALERT, YOUR PERSONAL SAFETY IS INVOLVED.**

Your Ranger Log Skidder is heavy equipment and must be treated with care and respect. Be a careful and efficient operator and observe the following simple but fundamental rules of safety to avoid unnecessary and careless accidents. Read and understand this manual before you operate the machine.

**The following personal safety rules should be followed to protect yourself and your co-workers.**

1. Be careful not to strike persons or vehicles with the machine.
2. DO NOT leave your machine with the engine running or with any hydraulic implements (blade and/or grapple assemblies) in their raised positions.
3. Be careful when operating the machine on steep grades to avoid sudden tipping.
4. When making repairs or doing any service to the machine, ALWAYS put the machine in the Service Position (See Sec. 1).
5. Be aware of the hazards from tree limbs and other overhead obstructions. Watch out for stumps and all ground obstructions.
6. NEVER use the transmission as a downhill brake, (operating the transmission in reverse when traveling forward down a hill). The engine can stall and the steering system will not operate.
7. ALWAYS obey ALL safety decals; they are there for your protection and the protection of those around you.
8. NEVER carry passengers in your machine; there is only one seat and it should carry only one person.
9. Take special care when operating in wet or icy conditions.
10. NEVER use the blade as a brake when travelling.
11. NEVER travel in the NEUTRAL mode when you operate on a grade.
12. ALWAYS operate your machine at speeds that are safe for the conditions of each job.

**The following personal safety rules should be followed to protect yourself and your co-workers:**

1. NEVER wear jewellery or loose fitting clothing such as scarves, loose cuffs or fringed jackets.
2. Know and understand all the safety equipment on your job site and use it when you need it.
3. Know and understand all the hand signals used on the job and always obey the signalman.
4. Allow only trained operators to use the machine; read and understand this manual before you operated the machine.

**Before you start the machine, observe the following instructions:**

1. Walk around the machine and warn all persons in the area before you enter the operator's compartment.
2. Report or correct all apparent machine malfunctions.
3. Note all hazards and obstructions such as ditches, electrical wires and wheel blocks.
4. Ensure proper ventilation if you are going to start the machine indoors.
5. Be particularly careful if this is not the machine you normally operate.
6. Check the seat belt for wear or damage and replace the belt if necessary.
7. Adjust the operator's seat to allow convenient access to all control levers and pedals.
8. Fasten the seat belt.

**When you enter or leave the operator's compartment, observe the following instructions:**

1. Make sure all steps and handles are free of grease, oil and mud. Keep hands, floor and all controls clean.
2. NEVER leave the machine unattended with the engine running.
3. ALWAYS put the transmission in the NEUTRAL mode, engage the neutral lock, lower the blade and actuate the parking brake when you leave the operator's compartment.
4. NEVER leave or enter the operator's compartment when the machine is moving.
5. ALWAYS actuate the parking brake and lower the blade when you park the machine, block the wheels when you park on a grade.
6. At the end of the work shift, or when the machine is not to be operated, turn the battery disconnect switch to the OFF position.

**When you start or stop the machine, observe the following instructions:**

1. Remove or secure all maintenance or personal items such as lunch boxes, chains, and tools.
2. Start the engine only from the operator's seat.
3. ALWAYS apply both the service brake and the parking brake before you start the machine.

**Before you put the machine in motion, make the following checks:**

1. Check all gauges and instruments for incorrect or abnormal operating conditions. Report or repair any problems.
2. Operate the machine slowly in the forward direction and test the steering system. Steer completely to the left and right and report or repair any problems.
3. Test the service and emergency (if applicable) brake systems against the power of the engine and report or repair any problems.
4. Test the auxiliary steering system (See Sec. 10).

**When you do any service on the machine, observe the following instructions:**

1. NEVER stand in the articulation area when the engine is running.
2. When you are filling tires, stand away from them to avoid serious injury in case of a rupture.
3. Use extreme caution when removing radiator caps, tank filler caps, and drain plugs.
4. DO NOT attempt repairs you do not understand, ask for help if you need it.
5. When compressed air must be used to dry or clean parts use EXTREME CAUTION to protect the skin (especially cuts and open sores) from the air jet. Serious injury or death can result if air and/or foreign material should penetrate the skin.
6. The same precaution must be taken with fluid under pressure. Oil escaping from an orifice can enter the skin and can cause serious injury or death.
7. NEVER adjust a pressure relief valve to a pressure higher than the specified value.
8. Take care to clean up any spilled fluids.

**Forest fires are both costly and dangerous. Fire prevention must be foremost in the mind of a skidder operator. Follow these instructions to reduce the chance of fire:**

1. Keep your hand fire extinguisher charged and in good working order at all times.
2. Make periodic checks of all electrical connections and make note of any frayed or broken wires. Repair any electrical faults immediately.
3. Check all fuel and hydraulic lines for damage and loose connections. Repair these promptly and clean up any leaked fluid.
4. Clean all debris such as leaves, needles and twigs after each work shift. Periodic steam cleaning of the frames and articulation area will help prevent build-up of flammable materials.
5. Take care to clean up any spilled fluids to reduce the chance of a fire.
6. Non turbocharged 668C machines are factory equipped with a regulation (U.S.D.A. Forest Service) approved spark arrestor installed in the exhaust system. All machines that are to be operated on or near forest-covered, brush-covered, or grass-covered lands must be so equipped and maintained in proper working order to comply with certain government requirements. Failure to maintain this device may be violation of certain regional or local laws. See Sec. 6 for spark arrestor service instructions. A turbocharged engine is approved as a spark arrestor device and requires no spark arrestor service.

**IMPORTANT NOTE: On machines with enclosed cabs, an escape hatch is provided to the rear of the operator's seat. Loosen the handles on the sides of the rear window and push out the window to exit from the cab if the doors are jammed closed for any reason.**

## OPERATING CONTROLS

The controls on the left hand side of the operator's seat are as follows:

### Battery Disconnect Switch

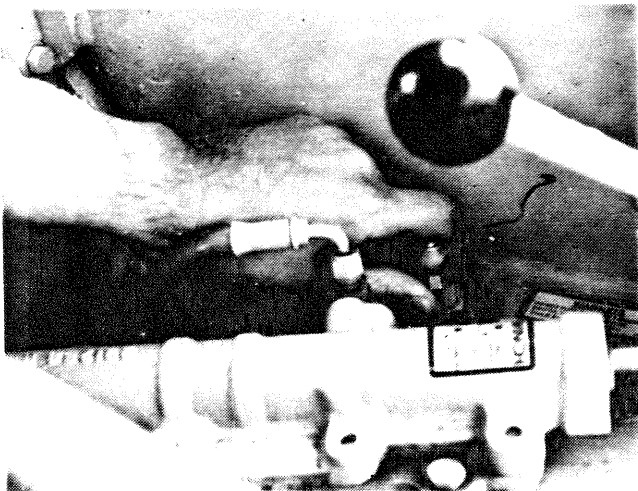


Fig 3-1

Turn this switch to the OFF position to disconnect the current supply from the battery to the electrical system. This switch should be in the OFF position when you do any work on the machine especially arc welding.

**IMPORTANT NOTE:** DO NOT turn this switch to the OFF position when the engine is operating. Serious damage to the alternator and electrical system can result.

### Winch Control Lever

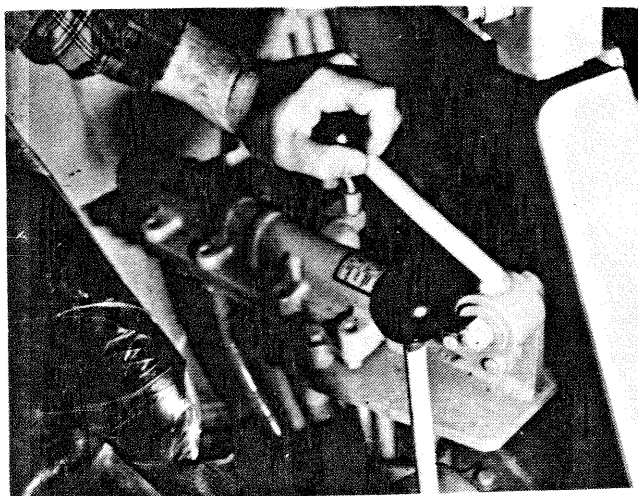


Fig 3-2

This lever actuates the winch control valve to operate the winch. When the lever is pulled to the rear FREE SPOOL position, the winch mainline can be pulled out from the winch cable drum. When the lever is pushed to the front WINCH IN position, the winch cable drum will rotate and pull the logs up to the machine's butt pan. When the lever is in the centre LOCK position the cable drum is held in the SKIDDING position and the load can be pulled.

### Direction Control Lever



Fig 3-3

This lever is connected to the transmission control valve and controls the transmission's FORWARD and REVERSE functions and has a centre NEUTRAL position.

### Neutral Lock Lever

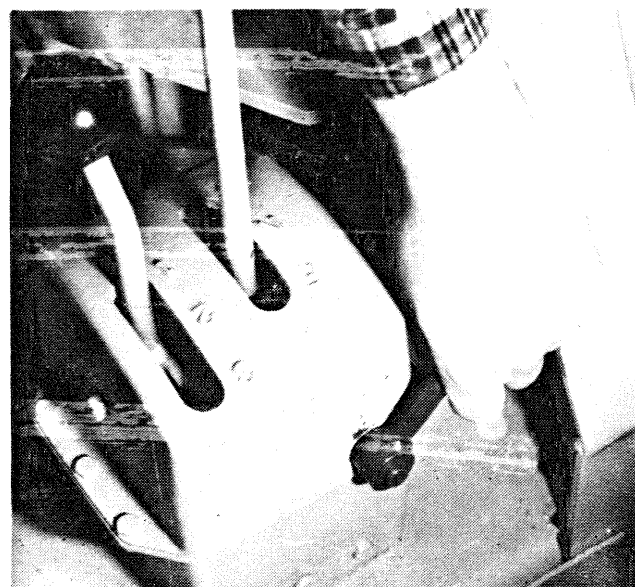


Fig 3-4

Turn this lever to the left when the Direction Control Lever is in the NEUTRAL position, locks the lever in that position.



### Speed Range Control Lever

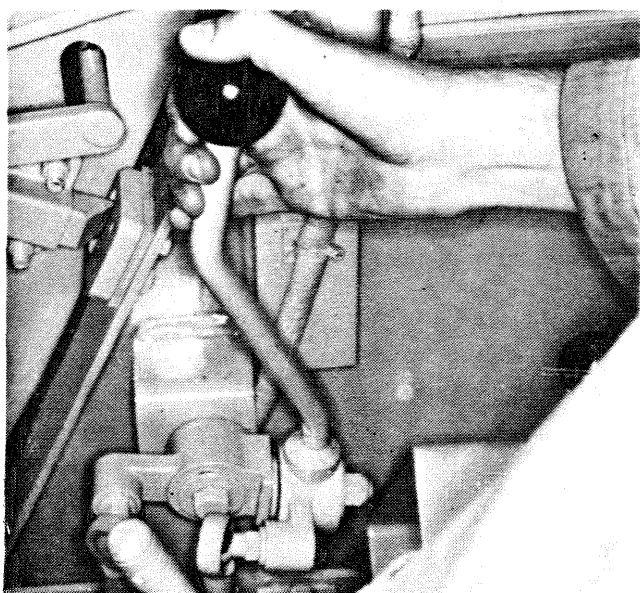


**Fig 3-5**

This lever is also connected to the transmission control valve and controls the transmission's **FIRST**, **SECOND** and **THIRD** speed ranges. The lower the range selected, the less strain is on the engine when a load is being pulled.

**The controls on the right hand side of the operator's seat are as follows:**

### Steer and Blade Control Lever



**Fig 3-6**

This lever is connected to the steer and blade control valve and controls both functions. Moving the lever to the left and right steers the machine to the left and right. Pulling the lever straight back raises the blade. Pushing the lever straight forward lowers the blade.

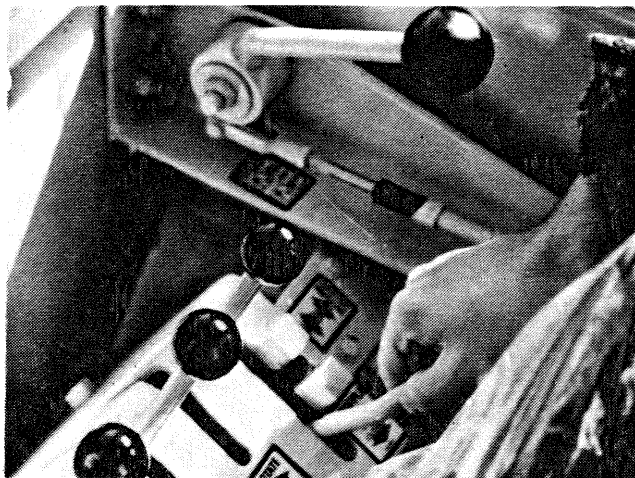
### Parking Brake Lever



**Fig 3-7**

Pull up and back on this lever to actuate the parking brake mechanism. An indicator light on the dash panel glows when the parking brake is applied, and the ignition switch is in the **ON** position.

### Arch, Boom and Grapple Control Levers



**Fig 3-8**

Four control levers (three for Esco) control the operation of the Weldco or Esco Grapple system. From the front of the machine, the levers are as follows: Arch control which moves the arch (Weldco only) forward or back, Boom Control which moves the Grapple end of the boom up or down, Grapple Rotating Control which rotates the Grapple either left or right and the Grapple Control which opens and closes the Grapple assembly. This lever has a centre **CONSTANT PRESSURE** detent position which should be actuated when carrying a load in the grapple.

**NOTE:** See the Grapple Carry Position decal on the firewall directly in front of the operator's seat for information on operation of the grapple assembly without a load.

On the grapple machine, the winch lever is mounted adjacent to the Grapple/Constant Pressure Control lever, to the right of the operator's seat.



## Air Service Indicator



Fig 3-9

This indicator shows the working condition of the air filter elements. When the red *flag* appears in the indicator, the air filter elements should be serviced (See Sec. 6). Push the button on the end of the indicator to reset the *flag* after servicing the elements.

## Auxiliary Steering Switch

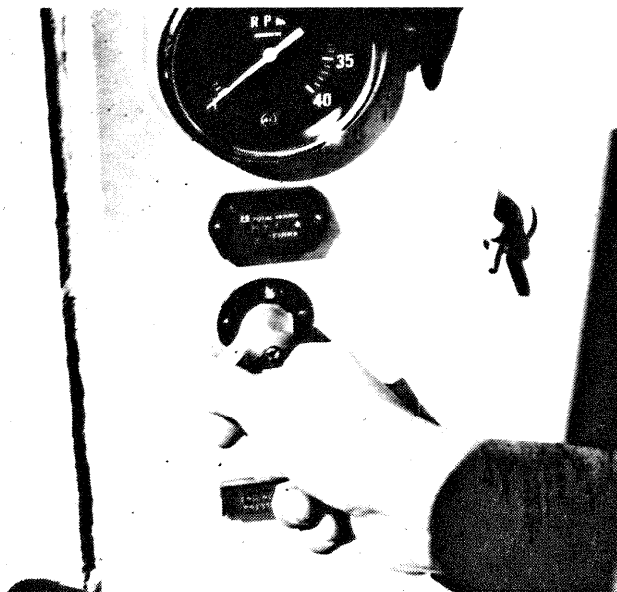


Fig 3-11

In the event that the engine stalls, and the steering system fails, turn this switch to the ON position and the machine's batteries will take over and restore steering. DO NOT use this system any longer than necessary to bring the machine to a safe stop to minimize battery drain.

## Engine Oil Pressure Warning Light

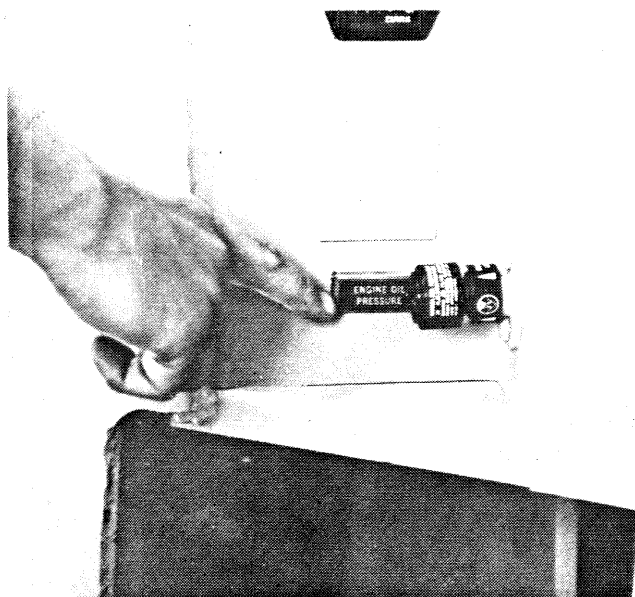


Fig 3-10

This light glows when the operating pressure in the engine's lubrication system drops to below acceptable levels. If this light remains on for more than 10 or 20 seconds, stop the engine immediately and determine the cause if possible.

## Auxiliary Steering Light

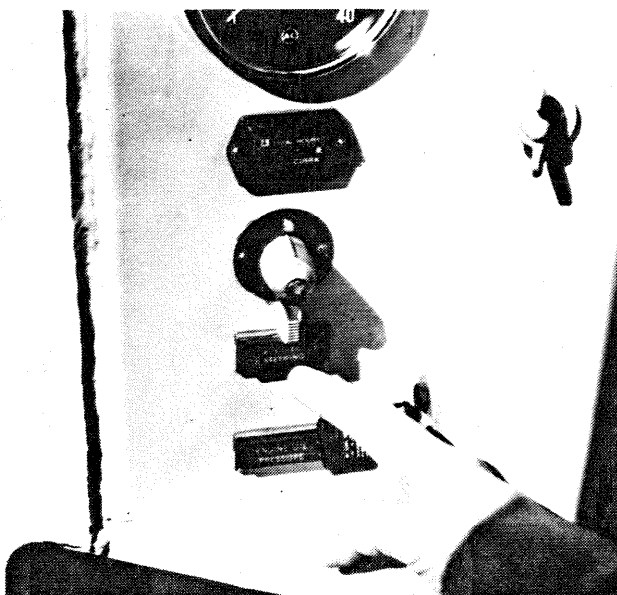


Fig 3-12

This light glows to indicate that the auxiliary steering system is activated.

### Hourmeter

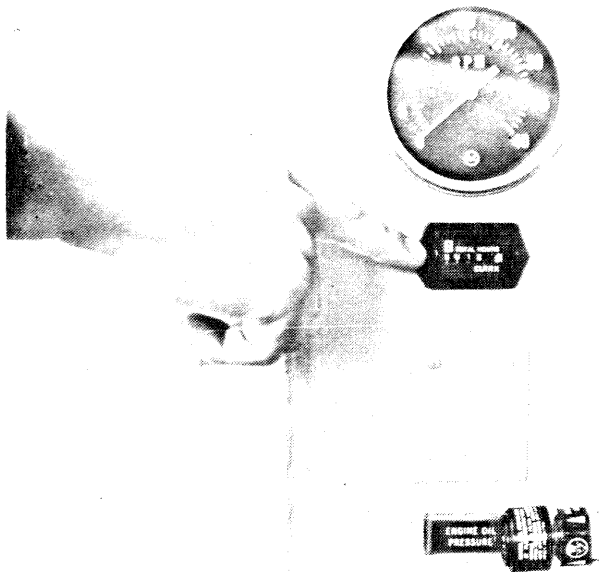


Fig 3-13

To keep your Ranger Skidder in optimum running condition, follow this hourmeter closely and do all required periodic lubrication and maintenance promptly as recommended in this manual.

### Tachometer



Fig 3-14

The tachometer shows the operating speed in R.P.M. (revolutions per minute) of the engine. The engine in your machine is designed to operate most efficiently at a recommended operating speed (See Sec. 14). The tachometer allows the operator to select and maintain the proper speed ranges for each specific application.

### Engine Stop Handle (Detroit Diesel Only)



Fig 3-15

Pull this handle toward you to stop the engine. When the engine has stopped, push the handle in before the engine can be restarted.

### Emergency Brake Lever



Fig 3-16

If the service brake fails, pull up on the emergency brake lever to stop the machine.

**WARNING:** DO NOT operate the machine with the emergency brake operational only, make sure that both the service brake and the emergency brake are fully operational at all times.

**NOTE:** Older 668C cable machines with the single service brake system (See Sec. 13) only are equipped with this brake system.

### Starter Button, Circuit Breaker and Ignition (Key) Switch

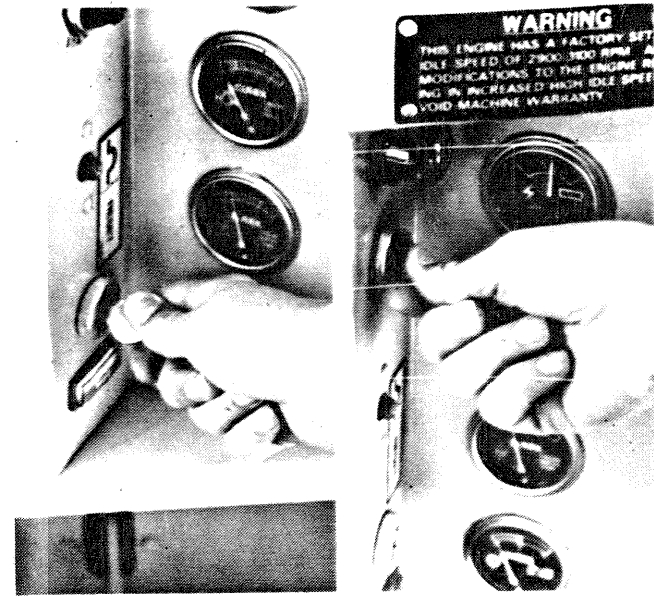


Fig 3-17

Insert the key into the ignition switch, put the direction control lever in the neutral position, turn the key to the right (on) position and push the starter button to start the engine. If, for any reason, the engine stops suddenly, and the machine will not start again, push the circuit breaker reset button and try again. If the engine will not start, further troubleshooting may be required.

### Converter Temperature Gauge

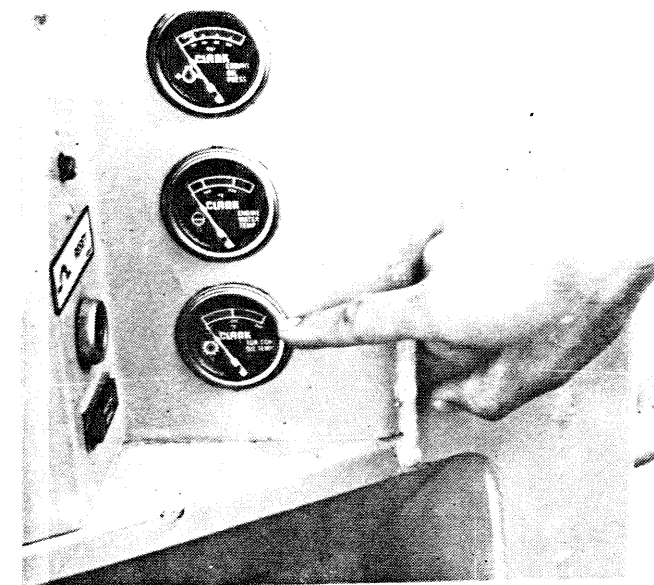


Fig 3-18

This gauge allows the operator to monitor the temperature of the converter/transmission 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 appears to overheat, choose a lower transmission speed range. If the system continues to operate with the needle in the red zone, a proper check should be made to determine the cause.

### Water Temperature Gauge

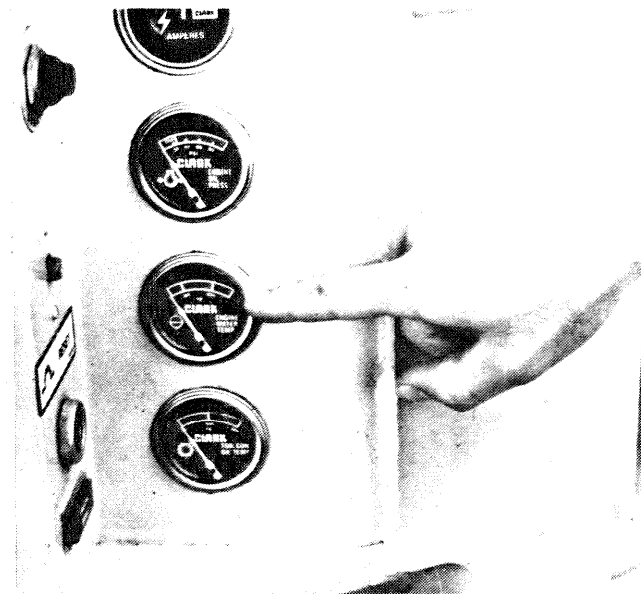


Fig 3-19

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, check the fan belt tension (See Sec. 6) and check the radiator for debris that can restrict the air flow.

### Engine Oil Pressure Gauge

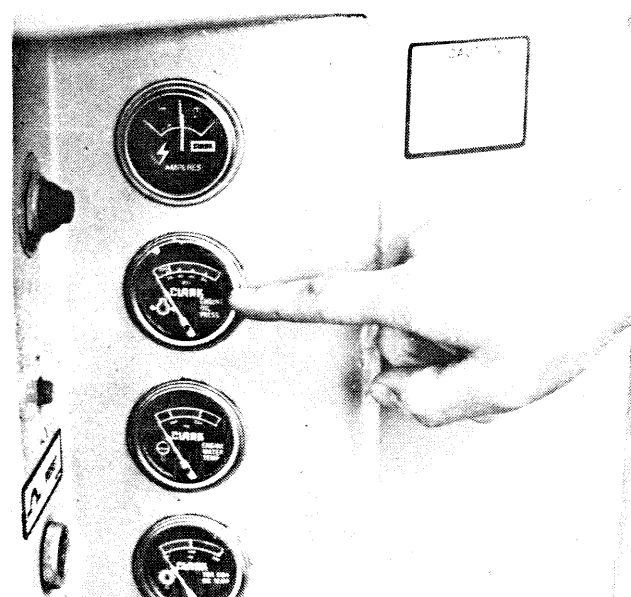
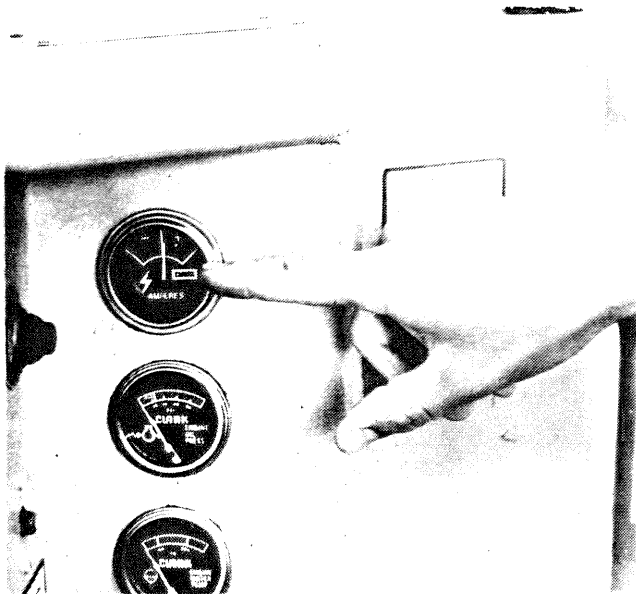
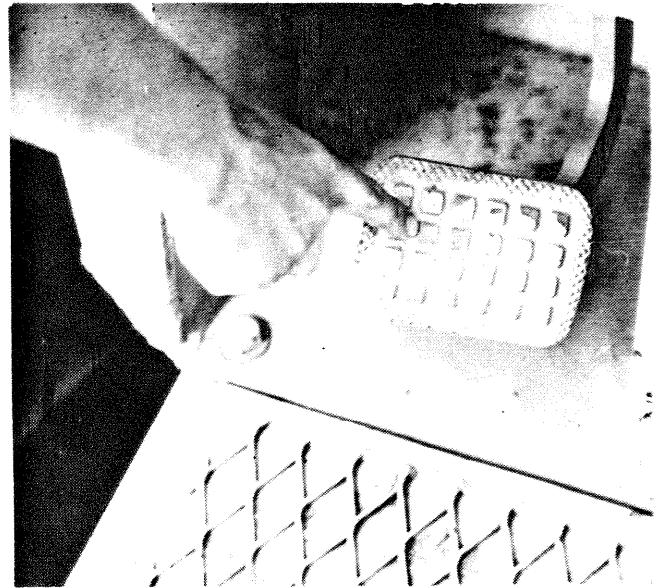


Fig 3-20

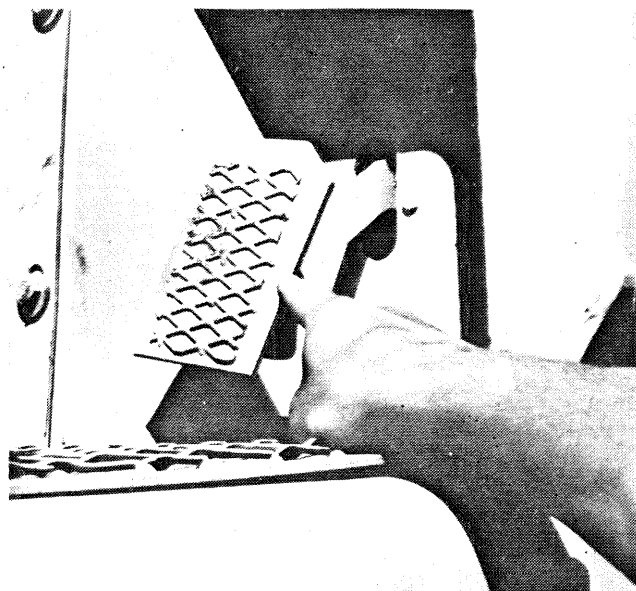
This gauge allows the operator to monitor the operating pressure of the engine lubrication system. After 15 seconds of operation, the gauge should be between 10 and 25 P.S.I. at idle. Refer to your engine service manual if the pressure is below 10 P.S.I. at idle speed.

**Ammeter****Fig 3-21**

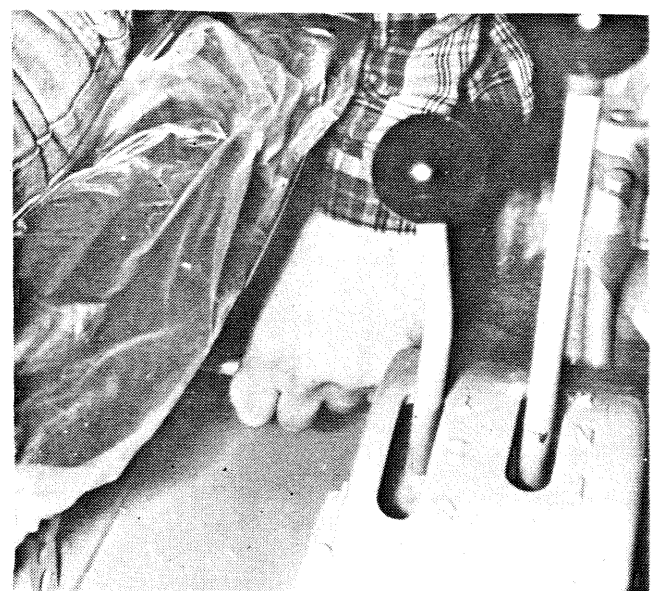
The ammeter indicates the current entering or leaving the battery (except when starting the engine). The indicator needle should show a slight charge (+) during the machine's operation. If the needle indicates either excessive charge or discharge (-) for an extended period of time, have the electrical system checked for faults.

**Service Brake Pedal****Fig 3-23**

The service brake pedal, on the floorboard on the left hand side of the firewall, controls the service brake system. Depress the pedal to slow or stop the machine (See Sec. 13).

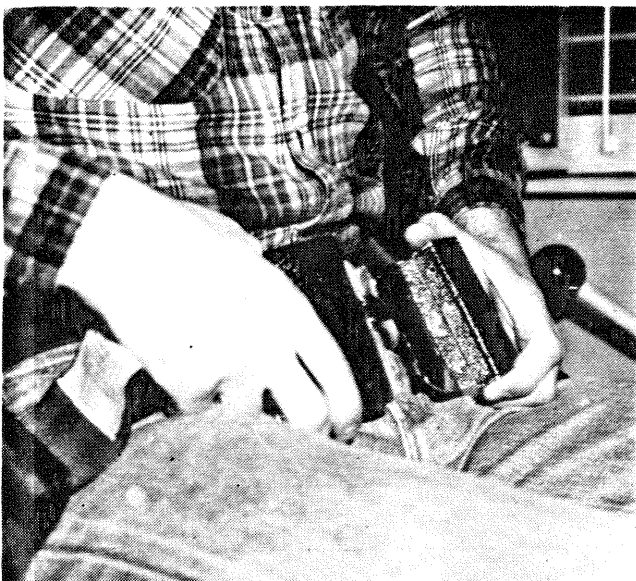
**Accelerator Pedal****Fig 3-22**

The accelerator pedal, on the floorboard on the right hand side of the firewall, controls the throttle on the engine. Depress the pedal to increase the engine R.P.M. and the speed of the machine.

**Seat Adjustment Lever****Fig 3-24**

The seat adjustment lever is located to the left of the operator at the bottom of the operator's seat. Pull the lever back to allow the seat to be moved forward or backward to suit the operator.

## Seat Belt



**Fig 3-25**

**ALWAYS** wear your seat belt when you operate your machine.

**NOTE:** Make sure the seat belt is adjusted to fit snugly around the hips.

## Fire Extinguishers

Your machine is equipped with a 4.5 kg (10 lb) hand operated fire extinguisher mounted on the canopy screen to the left of the operator's seat. Read and understand the instructions on the canister and know how to remove the extinguisher from the bracket in the shortest possible time.

Locate all instruction plates and decals in the operator's compartment. These contain important operation, service and safety information. Read and understand all of these instructions for safe, trouble free operation of your Ranger Log Skidder.

## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# STARTING INSTRUCTIONS

At the beginning of the work shift before you start the machine, make the following PRE-START checks:



Fig 4-1



Fig 4-4

1. Put the machine in the Service Position (See Sec. 1).

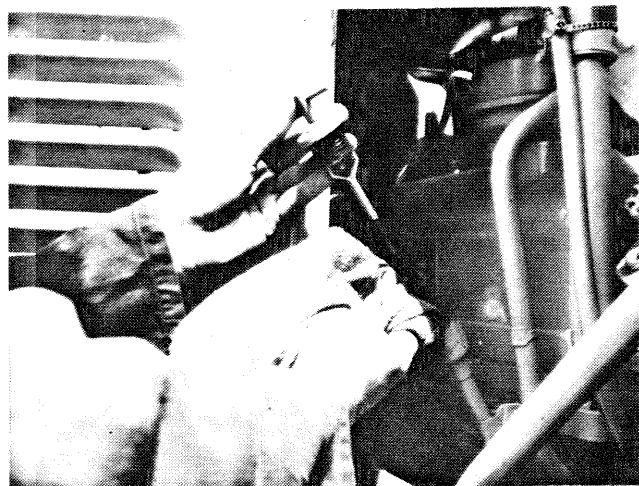


Fig 4-2

4. Check the fuel level.



Fig 4-5

2. Check the engine oil level.

5. Check the engine coolant level.

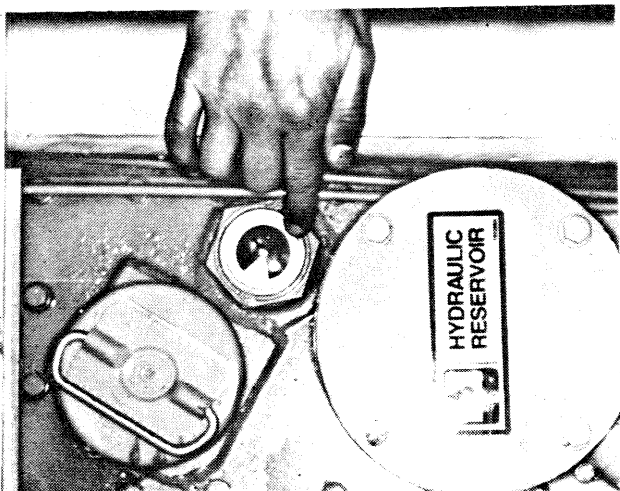


Fig 4-3

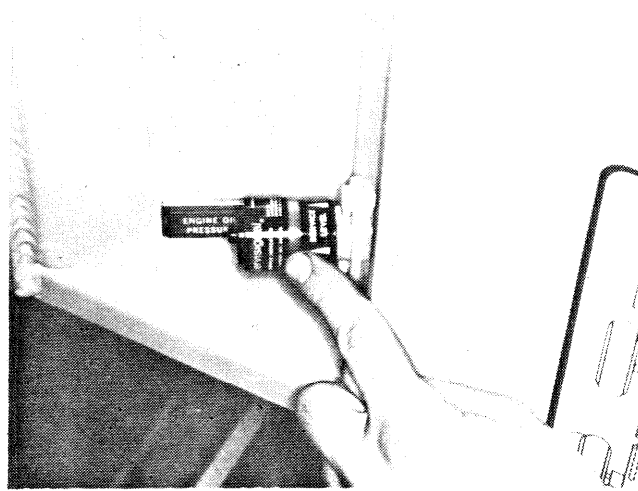


Fig 4-6

3. Check the hydraulic oil level (See Sec. 10).

6. Check the *flag* on the air cleaner service indicator.



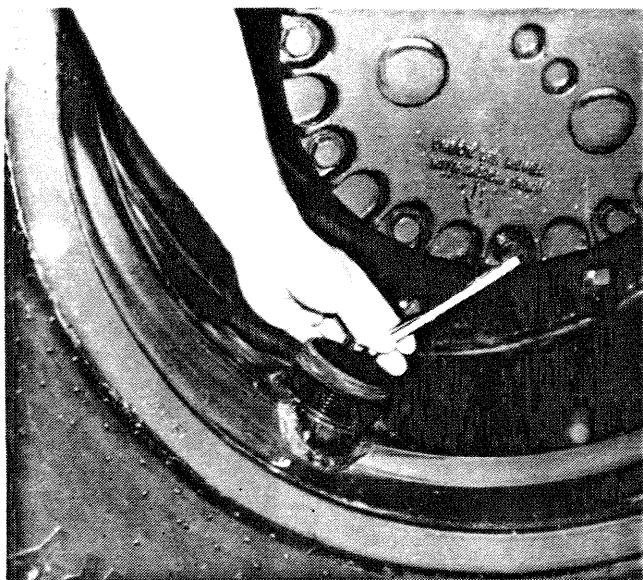


Fig 4-7

7. Check the tire pressures.

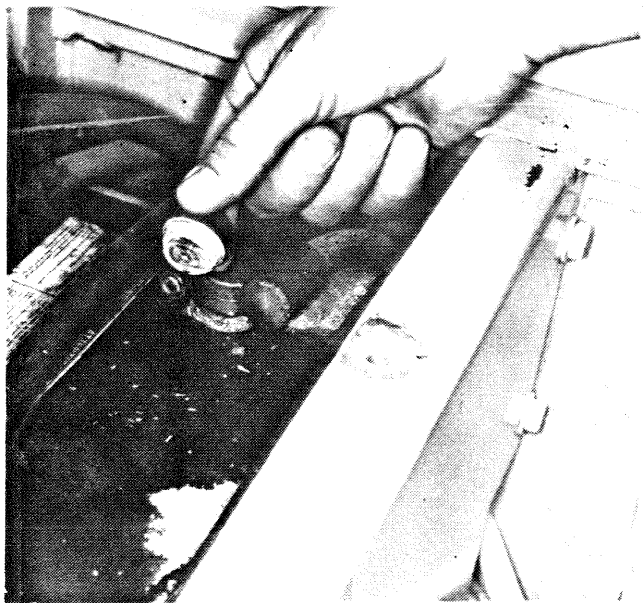


Fig 4-8

8. Check the battery electrolyte levels.



**WARNING: DO NOT smoke while servicing the batteries.**

If these checks reveal any problems or potential problems, make sure they are corrected before you start your work shift.

ALWAYS walk around the machine and make sure that no one is in the DANGER AREA BEFORE you enter the operator's compartment.

**Normal Starting Procedure** (If temperatures are above 5°C (40°F) Detroit or 10°C (50°F) Cummins).

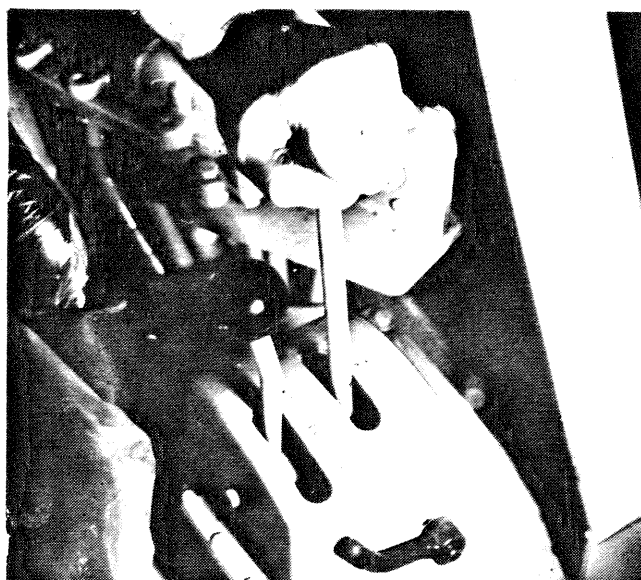


Fig 4-9

1. Put the forward and reverse control lever in the NEUTRAL position.
2. Make sure that the engine stop (Detroit Diesel machines only) is pushed in to the operating position.

**NOTE:** If the machine is equipped with a hand throttle, make sure that it is pushed in also.

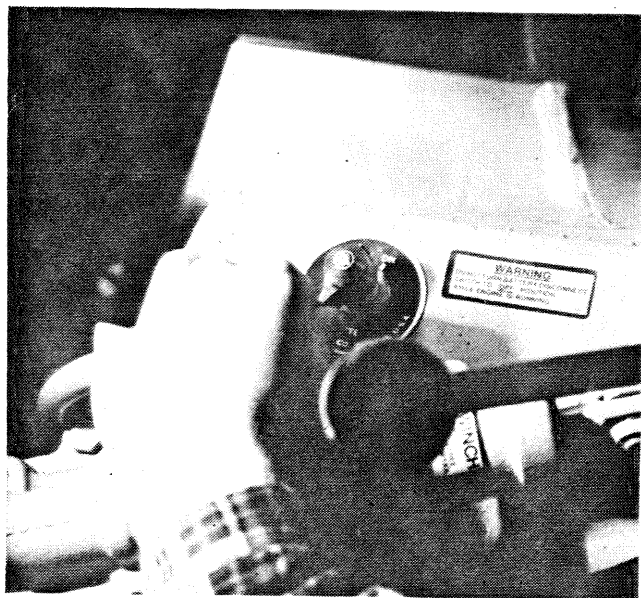


Fig 4-10

3. Turn the battery disconnect switch to the ON position.



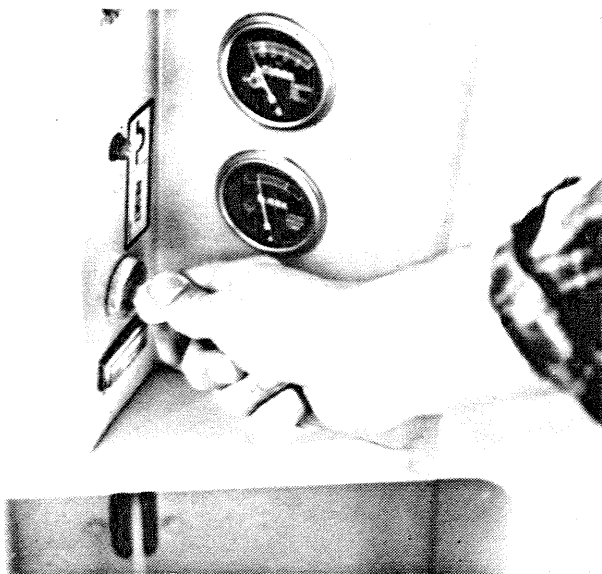


Fig 4-11

4. Turn the key in the ignition switch to the ON position (clockwise until it *clicks*).
5. Push the starter button to start the engine.

**IMPORTANT NOTE: DO NOT** actuate the starter for longer than 30 seconds if the engine fails to start promptly. Wait until the starter motor stops rotating before you repeat this step. Serious damage to the starter motor and the flywheel drive gear on the engine can result.

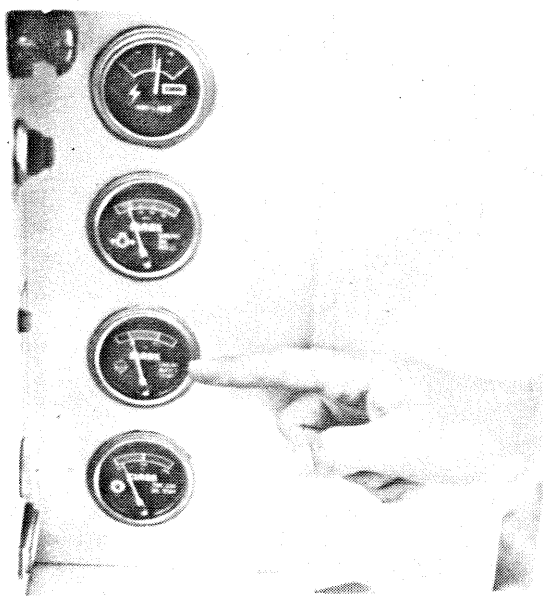


Fig 4-12

6. When the engine starts, release the starter button and immediately check the engine oil pressure gauge. If no more than 10 PSI oil pressure is shown on the gauge after 15 seconds of operation, shut down the engine immediately and determine the cause.

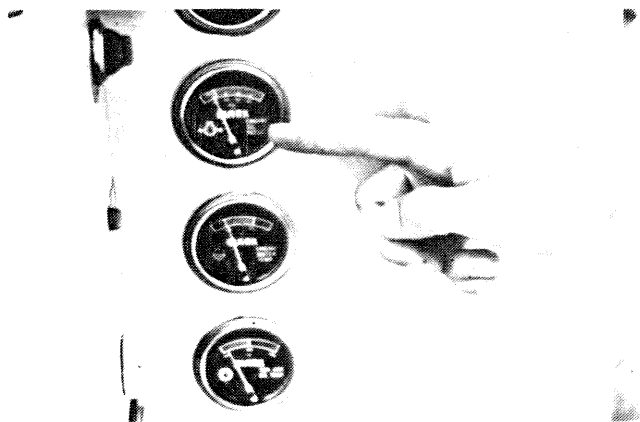


Fig 4-13

7. Allow the engine to reach its operating temperature before you operate the machine (See Sec. 1).

### Cold Weather Operation

Other than the addition of a permanent type anti-freeze to the cooling system, and the use of a suitable low temperature motor oil, extensive preparation is not required for cold weather starts. Operation at temperatures below  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), a change of oil in the main hydraulic system to the lubricant recommended in the lubrication chart will aid starting by reducing resistance in the main pump. Choose a good quality brand of winter diesel fuel. It may be necessary to change the lubricant in the drive axle planetary and differential housings (See Sec. 16). The most important item for cold weather starting is proper maintenance of the electrical system, especially the batteries.

Batteries must be kept fully charged at all times. In cold weather their ability to deliver full power is greatly reduced. A fully charged battery at  $-10^{\circ}\text{C}$  ( $15^{\circ}\text{F}$ ) can deliver only 70% of its rated amperage. At lower temperatures, its output is substantially reduced. Service the batteries every 50 Hours as follows:

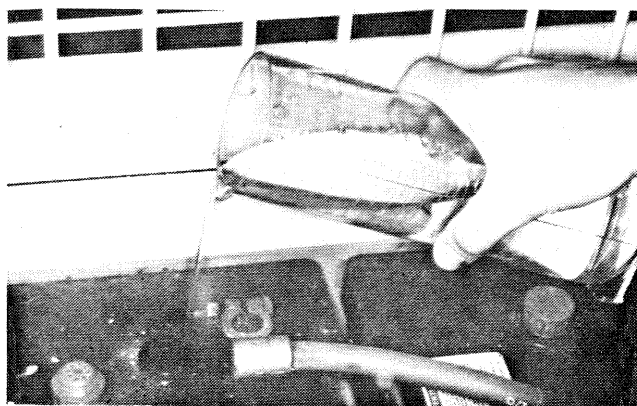


Fig 4-14

1. Add distilled water to cover plates, but do not overfill the cells. Overfilling dilutes the electrolyte, and causes spattering in the electrolyte. Diluted electrolyte can freeze or cause corrosion in the terminals.

**NOTE:** Add water during the work shift to allow the charging system to mix the electrolyte and prevent the water from freezing.

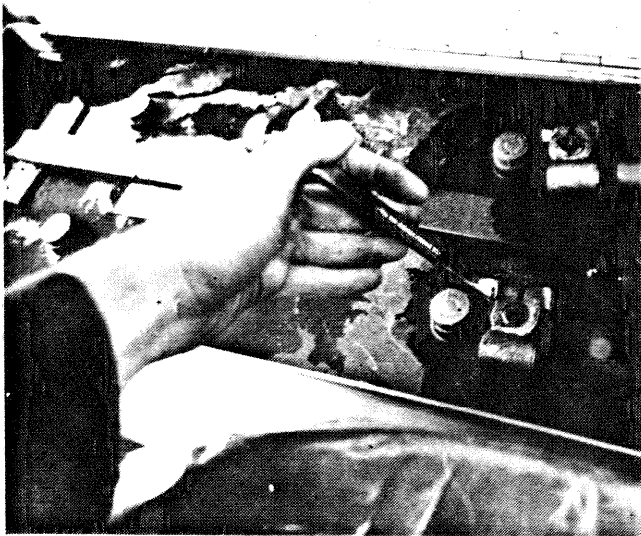


Fig 4-15

2. Keep the terminals and batteries clean and make sure the connections are tight. Loose or dirty terminals restrict current flow.

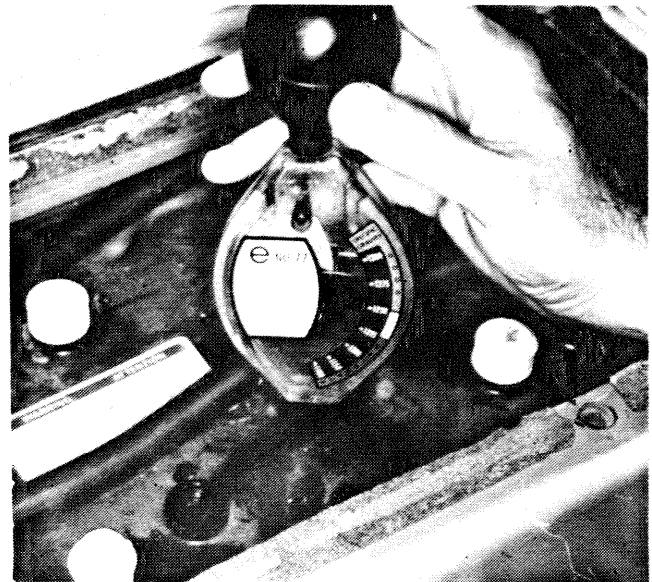


Fig 4-17

4. Check the specific gravity of the electrolyte regularly with a hydrometer. Recharge or replace batteries that show continual low readings.

**NOTE:** If periodic checks show that the specific gravity is constantly low, have the electrical system checked. The alternator voltage regulator, or batteries themselves may be at fault.

Service the other electrical components as follows:



Fig 4-16

3. Keep the vent plugs in place, and installed tightly, to keep foreign material from the cells.

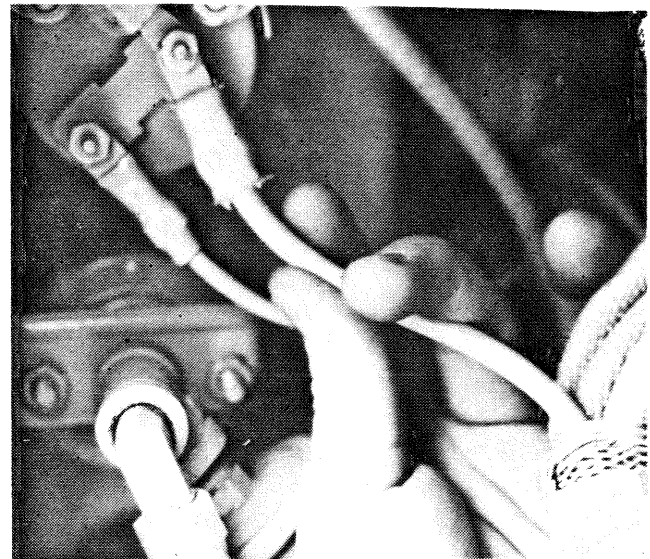


Fig 4-18

1. Visually check the wiring for worn or damaged insulation and loose terminal connections.
2. Clean the connections to the starter motor, alternator voltage regulator, solenoid switch, relays and sender units. Clean and tighten the external ground straps and replace it if it is badly frayed or corroded.
3. Check to see that any wires are not in danger from burrs or wear points and make sure that all grommets are in place.

# OPERATING THE MACHINE

**BEFORE** you put the machine in motion, make sure that the articulation lock has been removed and has been secured to the rear frame so the machine can be steered. Remove all blocks from the tires.

Make sure all persons are clear of the danger area.

Fasten the seat belt.

Raise the blade (and grapple assembly) to its operating height.

Put the transmission in the desired directional and speed range positions.

Release the parking brake.

Depress the accelerator pedal to put the machine in motion.

Your Ranger Log Skidder employs a Clark powershift transmission which allows a shift to a higher speed range even at full throttle. When shifting to a lower speed range, accelerate the engine to reduce the drag from the wheels.

As you move to the work area, take care to avoid any obstructions such as rocks and stumps that could cause the machine to upset. Check all gauges to see at a glance if all systems are operating correctly.

Pay attention to the surrounding terrain and notice if there is a quicker and easier way to return. Remember, the skidder will behave much differently with a load. The change in mobility may make it necessary to choose a different return route.

## Work The Cable Skidder As Follows:

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.

Put the direction control lever in the NEUTRAL position, apply the neutral lock lever, lower the blade and apply the parking brake.

Put the winch control lever in the FREE SPOOL position.

Remove your seat belt and dismount from the operator's compartment.

Go to the rear of the machine and pull the mainline and chokers from the winch cable drum to the ends of the logs to be skidded.



**WARNING:** When handling winch cables, ALWAYS use protective gloves.

Attach the chokers to the logs about 60 cm (24 in) from the ends and pull them snug.

**NOTE:** The size and number of logs you can skid at one time depends on the terrain and conditions in which you are working and on the nature of the wood itself. Only experience and common sense can tell you the load you should skid at one time.

With the chokers secured, remount the skidder and fasten your seat belt.

Before you pull in the logs, make sure that the machine is in line with the general direction of the logs' travel.

Lift the blade and release the parking brake.

Put the winch control lever in the WINCH-IN position, and pull the logs towards the rear of the machine. Remember, the speed of the cable drum is controlled by the engine R.P.M. so accelerate the engine to increase the speed of the mainline. As the logs move, they will be bunched together. Make sure the logs are bunched tightly and pull them snug against the butt pan. Put the winch control in the LOCK position and return to the landing.

As you approach the landing, take care to warn any co-workers to stand clear in case the logs become tangled and thrown by the tires.

## Winching Techniques:

**Bunching:** When the logs are winched-in to the butt pan, they will bunch together. Increasing the speed of the mainline can help pull the load easier over obstructions but you must use common sense to avoid breaking the cable(s) on large stumps and rocks, or even overturning the machine. Bunching can be done with the machine in motion if necessary. This can help to bunch the logs under certain conditions.

**Drop-Winching:** If the skidder loses traction due to soft or muddy underfooting, or due to obstructions, quickly put the winch control lever in the FREE-SPOOL position and drive the machine to more stable or clear ground. Remember not to exceed the length of your mainline. When the machine is on safe ground, winch-in the load, put the winch control lever in the LOCK position and proceed to the landing.

**Reverse-Winching:** If the machine becomes stuck and cannot be freed in either direction, fasten the winch cable to a large tree or similar stationary object and with the direction control lever in the REVERSE position, winch in the cable under power to free the machine. The Clark powertrain will provide equal power to the winch and drive axles and provide uniform speed to the mainline and the wheels.

Once you have reached the landing, pull the logs onto the pile and while still moving forward, put the winch control lever in the FREE-SPOOL position when the logs are piled correctly.

Put the direction control lever in the NEUTRAL position, and apply the neutral lock lever. Apply the parking brake, lower the blade to the ground, unfasten your seatbelt, and dismount from the machine.

Pull the mainline from the cable drum so that the chokers are loose enough to remove easily.

**NOTE: Remember your gloves.**

After you have removed all of the chokers, remount the skidder and fasten your seat belt.

Put the winch control lever in the WINCH-IN position and pull in the mainline until the chokers are just on the fairlead mainroller.

Release the parking brake lever, and raise the blade. Position the machine so that the butts of the logs can be evenly piled with the blade.

If you are to make a pile (decking), approach the pile in first gear, so that the most amount of power possible can be supplied to the hydraulic system to ensure adequate lifting with the blade, and pile the logs evenly.

Make periodic checks to see that the mainline and chokers are in good working condition. If they are worn or damaged they could break under stress and cause serious bodily injury to yourself or your co-workers. Replace badly worn or damaged cables promptly.

#### **Work the Grapple Skidder As Follows:**

Observe all safety precautions given for the cable skidder and remember, ALWAYS use your seat belt.

As with the cable skidder, make note of the surrounding terrain and look for the easiest route back to the landing.

With the transmission in the REVERSE mode, approach the log pile with the grapple in its highest position and the grapple arms open.

Lower the grapple so that it contacts the logs about 1 meter (3 feet) from the ends so that it will not lose any logs that are not evenly bunched. Make sure that the grapple is centered on the pile and put the transmission in the NEUTRAL mode. Apply the parking brake.

**NOTE: If your machine is equipped with a DE-CLUTCH, applying the parking brake will disengage the transmission.**

Close the grapple arms while accelerating the engine to allow sufficient power to the hydraulic system to roll the logs into a neat, compact bundle.

When the grapple arms have closed on the bundle, put the grapple control lever in the central neutral position and then into the detented CONSTANT PRESSURE position. This feature supplies a constant periodic PULSE of hydraulic pressure to the grapple cylinders to pack and hold the logs if they move about in the grapple arms due to the machine's motion over the terrain.

Before you proceed to the landing move the load forward to the butt pan of the machine. The load should be lowered if you travel down a steep grade, especially when turning. The load should be carried as high as possible in muddy areas and when you approach the landing.

If you are to add to a pile, move along the side of the pile with the grapple in its highest position. When the load is just past the butts of the existing logs in the pile, put the transmission in the REVERSE mode and back the load onto the pile.

Open the grapple arms and release the load on the pile. Drive forward away from the pile and close the grapple arms. Put the grapple as close to the rear of the machine and as low as possible and return to the stump area for another load.

Remember your grapple skidder has a Clark winch and equipped with a winch cable you can perform the same winching techniques described earlier in this section as the needs arise.

#### **If you Must Tow the Machine:**

Put all control levers in their NEUTRAL positions.

Remove the drive shafts that connect the rear drive axle to the midmount (brake) and the front drive axle to the transmission.

**NOTE: With the engine/converter system shut down, the transmission/converter charging (lubricating) pump is inoperative. Serious damage to the transmission will result if it is driven by the wheels with no lubrication.**

ALWAYS fasten the articulation lock between the frames.

**NOTE: Never separate the slip shafts because of the balance and wear characteristics of each assembly. If they are separated, mark them so they can be reassembled the same as they were disassembled.**

When you replace the driveshafts, use only the special heat treated nuts and bolts provided and tighten them to the torque specified in Sec. 15.

When you must tow a machine, use a solid tow bar or raise one end off the ground because with the engine shut down and the frames locked, the machine cannot be steered.

## ENGINE SYSTEMS

**NOTE:** Check the *Operation and Maintenance Manual* of the engine manufacturer for lubrication and maintenance instructions for your engine and its accessories.

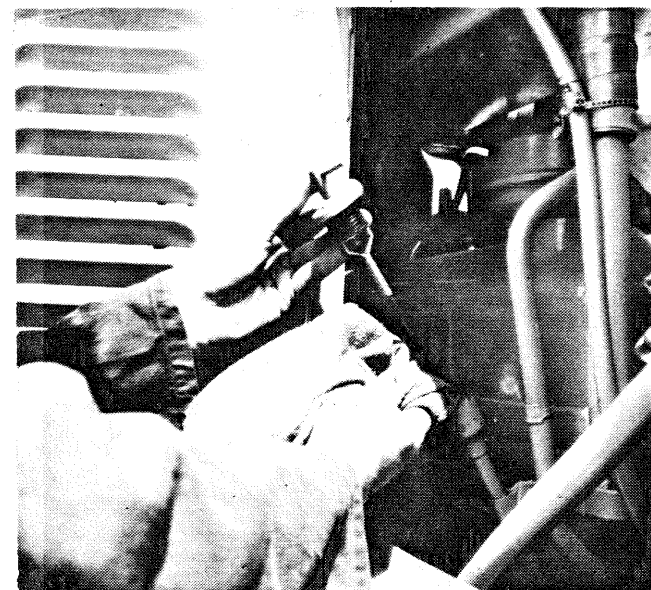
**Every 10 Hours of Operation:**



**Fig 6-1**

Check the coolant level at the sight gauge on the engine compartment side rail. If the level is low, add coolant to the surge tank filler hole directly above the sight gauge.

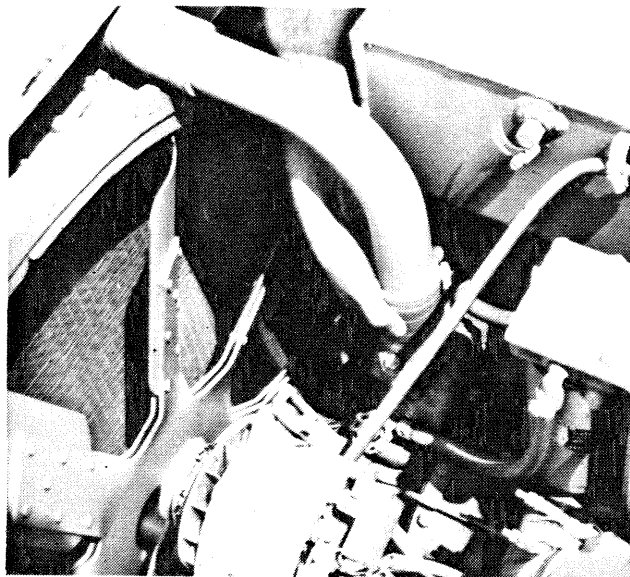
**NOTE:** The cooling system of your Ranger Log Skidder is factory filled with permanent anti-freeze. Clark recommends the use of this coolant for improved cooling, low temperature protection and to reduce corrosion.



**Fig 6-2**

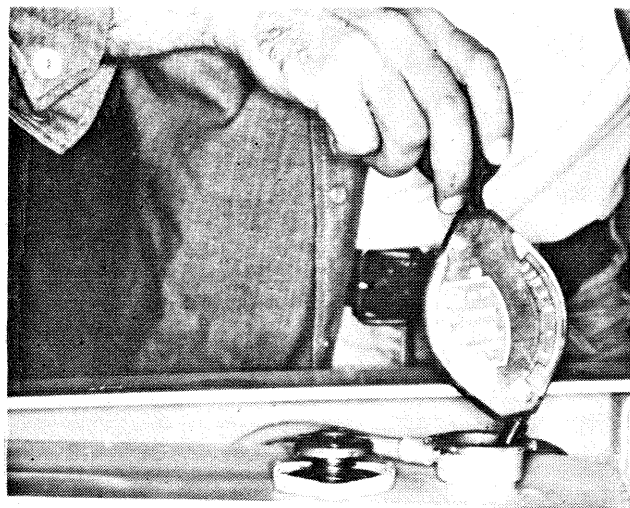
Check the engine lube oil level on the crankcase dipstick and add oil if required.

**Every 50 Hours of Operation:**



**Fig 6-3**

Check the cooling system for leaks. Inspect the radiator core as well as all hoses, clamps and fittings in both the engine cooling system and the transmission/converter oil cooler (located at the bottom of the radiator) and clean the radiator/oil cooler if necessary.



**Fig 6-4**

Check the freezing point of the coolant with an anti-freeze hydrometer. If the freezing point is not low enough to protect the engine, drain some of the coolant and add anti-freeze to lower the freezing point. Clark recommends the use of a solution of equal parts of Ethylene Glycol and water for maximum protection.



### Service the Carbon Trap

**IMPORTANT NOTE:** Naturally aspirated 668C machines are factory equipped with a regulation (U.S.D.A. Forest Service) approved Spark Arrestor as required by certain government regulations. These regulations also state that the spark arrestor device must be user serviced to keep it in optimum operating condition. The 668C Cummins powered machine has a turbo-charged engine. This feature is approved as a spark arrestor device.

**WARNING:** This procedure must be done in a clear area free of flammable material. Flying sparks of hot carbon particles can cause a fire. Have a fully charged fire extinguisher on hand and wear adequate eye and hand protection. Take care to avoid burns. The exhaust system must be allowed to cool before proceeding.

1. Shut down the engine and allow the exhaust system to cool.

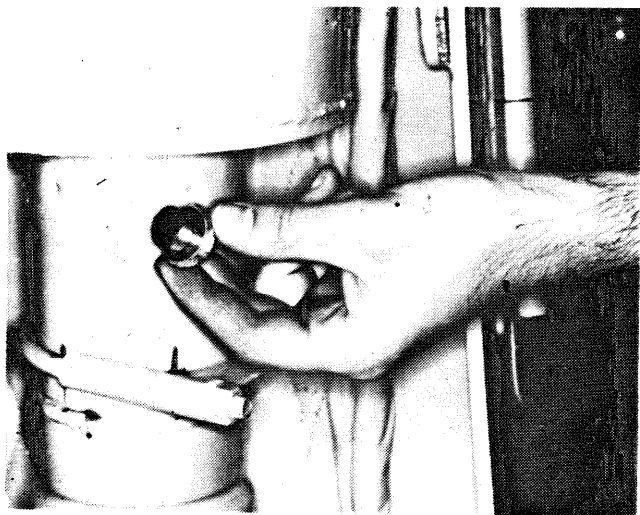


Fig 6-5

2. Check to see that the clean-out hole is open. It may be necessary to remove a carbon crust from the hole.
3. Start the engine and run at idle to blow collected particles from the clean out hole. If particles are slow to discharge, momentarily cover the end of the exhaust system.

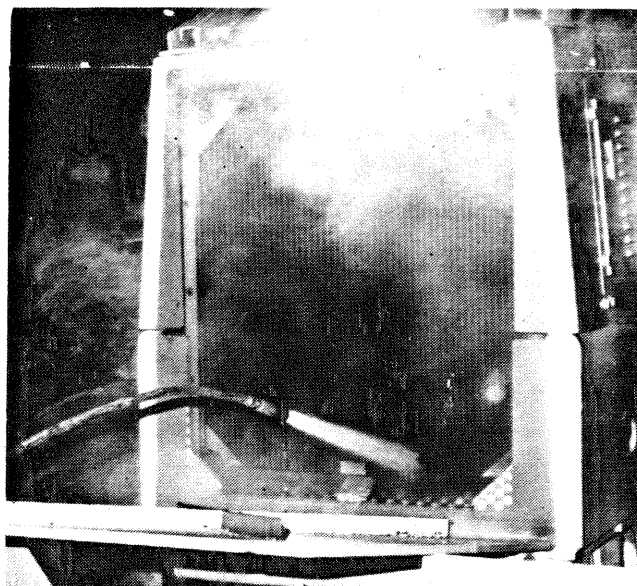


Fig 6-6

Steam clean the radiator core. Direct the steam jet in the opposite direction to the flow of air from the fan. A clogged radiator can cause overheating due to the restricted air flow.

### Every 100 Hours of Operation:

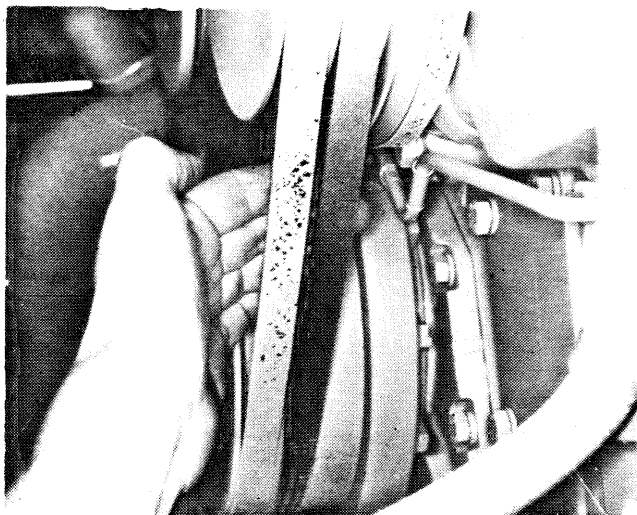


Fig 6-7

Check the engine drive belts. If they are worn, cracked or show signs of glaze or grease they should be replaced.

Check the throttle linkage to see that all levers, rods and bell cranks operate freely in all positions. This is to ensure that the accelerator pedal fully controls the throttle on the engine. Adjust the linkage as follows:

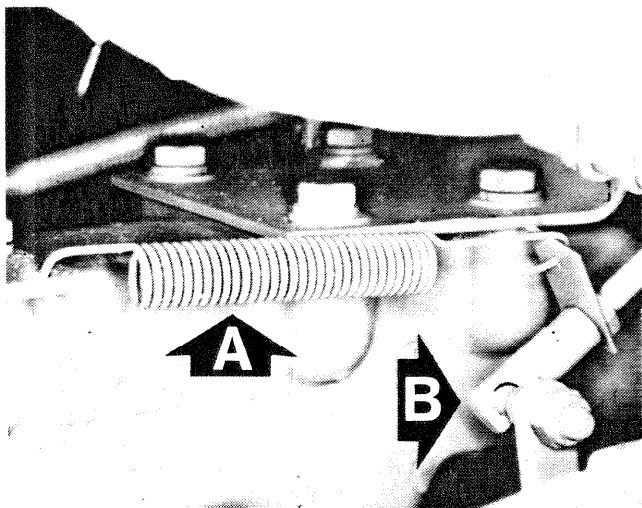


Fig 6-8

1. Unhook the spring (A) from the accelerator linkage and disconnect the ball joint assembly (B) from the throttle lever.
2. Depress the accelerator pedal until it makes contact with the pedal stop on the floorboard.
3. Turn the throttle lever by hand until it reaches its full throttle position.
4. Adjust the ball joint at the end of the accelerator rod until the threaded part of the ball joint will connect with the hole in the throttle lever with no force required on the ball joint. An additional adjustment is available at the other end of the accelerator rod if this is not sufficient.
5. Reconnect the linkage and install the accelerator spring. Release the pedal and depress it again. The throttle lever must be free to move from the idle position to full throttle when the pedal is depressed.

Check the engine RPM to see that the engine is operating at its performance peak. This will ensure that the machine will operate at its best and that the correct operating conditions exist for the transmission/converter system to operate properly. The engine RPM can be checked with the tachometer on the left hand side instrument panel.

**IMPORTANT NOTE:** DO NOT accelerate the engine to its maximum RPM until it has reached its *operating temperature* (See Sec. 1).

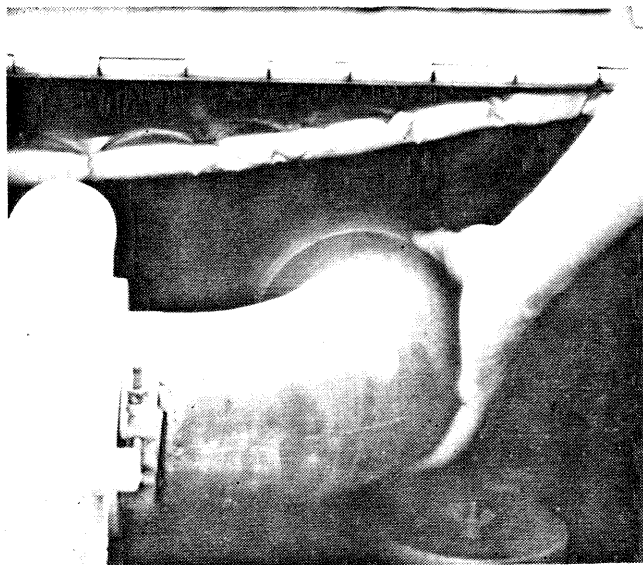


Fig 6-9

Check the flexible tube(s) between the air cleaner and the engine air intake. If they are cracked or show any signs of leakage, they must be replaced to prevent dirt from damaging the engine. Check all of the air cleaner connections and tighten the clamps if necessary. Tighten the air cleaner mounting bolts if necessary.

#### Every 250 Hours of Operation:

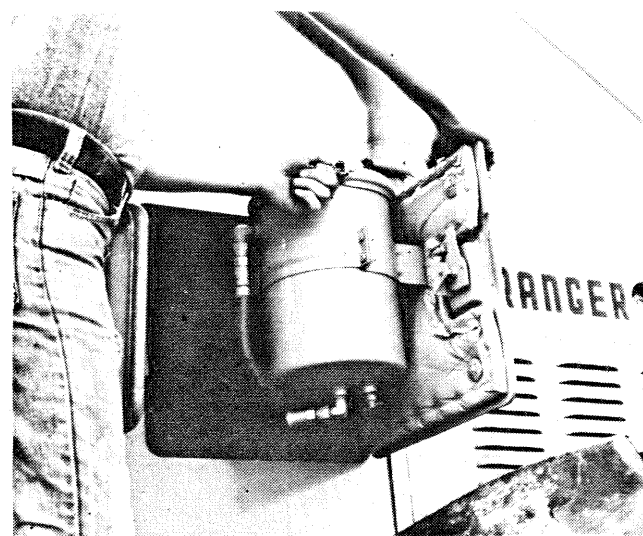


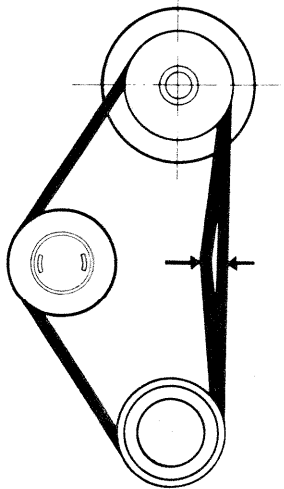
Fig 6-10

Replace the Cummins engine by-pass filter. Locate the by-pass filter behind the access door on the right hand side of the firewall on all Cummins powered machines. Remove and discard the oil filter element. Clean the filter case thoroughly and install a new element.

**NOTE:** Refer to the *Operation and Maintenance Manual* for your machine's engine for information on the other engine filters.

**Check the drive belt tension as follows:**

1. Measure the span length. This is the distance between the centres of the two pulleys.

**Fig 6-11**

2. Attach a spring scale to the belt at the centre of the span and apply enough force to deflect the belt 1 mm for each 64 mm (1/64 inch for each 1 inch) of span.
3. Measure the outside diameter of the small pulley. If it is between 17 cm and 28 cm (7 in and 11 in) the scale should read between 3,6 kg and 5,4 kg (8 lb and 12 lb). If it is between 29 cm and 41 cm (11½ in and 16 in) the scale should read between 4,5 kg and 6,8 kg (10 lb and 15 lb). If the tension is incorrect, check your engine manual for tension adjustment. New belts should be checked after a few days of use because they will stretch.

**NOTE:** Drive belts must be replaced in sets to ensure even distribution of load on them.

Check the low and high idle speeds. These are derived from the tachometer reading taken with no load on the engine. The correct values are located in Sec. 15 under *Specifications and Service Data*.

Check the converter stall RPM to ensure that the engine is developing its rated power and that the converter is operating efficiently. This check should be done when the oil in the converter is at its operating temperature (See Sec. 1) and the main hydraulic relief pressure setting is correct (See Sec. 10).

**Check the stall speed as follows:**

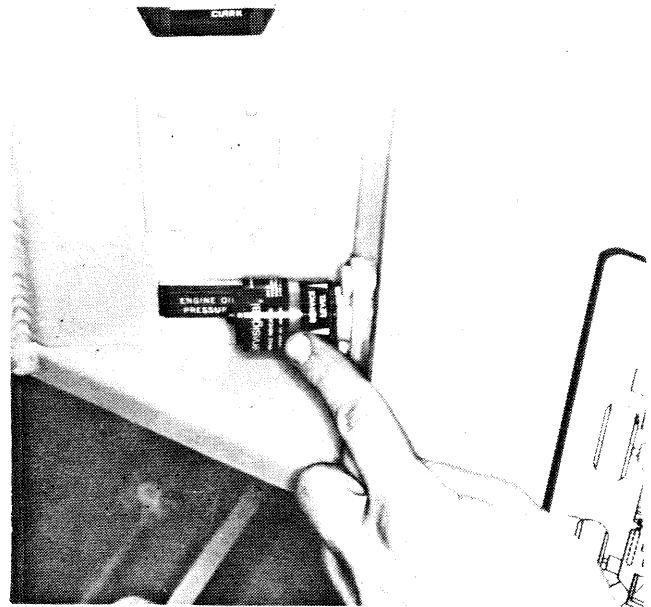
1. Raise the blade a few centimeters (inches) above the ground and put the machine in a full right turn. Apply the parking brake, block the wheels, put the transmission control levers in the neutral position and actuate the neutral lock.
2. Follow the engine, converter and hydraulic system warm-up procedures in Sec. 1.

3. Put the transmission control levers in the FORWARD and THIRD positions and depress the brake pedal.
4. Accelerate the engine to full throttle. The maximum RPM that the tachometer reads is the converter stall speed.

**IMPORTANT NOTE:** DO NOT HOLD the engine/converter in a stall condition for more than 30 seconds or if the reading on the converter temperature gauge is in the red area of the gauge.

5. Actuate a hydraulic cylinder to its fully closed position (such as the blade lever held in its UP position) and hold the converter in its stall position, to obtain the engine RPM reading with the main pump over relief.

Compare the stall speeds of your machine with the proper readings in Sec. 15, if they are not within the allowable figures further troubleshooting will be required. See your Clark dealer.

**Service the Air Cleaner Elements as Required:****Fig 6-12**

When the red flag appears in the air service indicator the air filter elements should be serviced. Locate the air cleaner assembly behind the firewall cover in the operator's compartment.



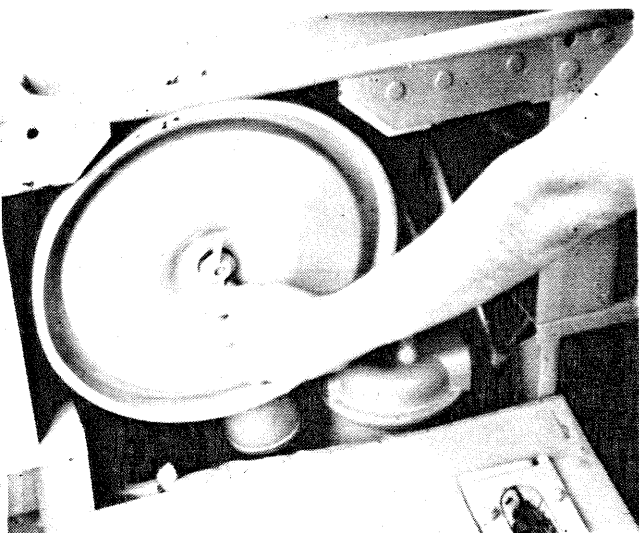


Fig 6-13

1. Loosen the wing-nut on the air cleaner assembly and remove the air cleaner end cap.

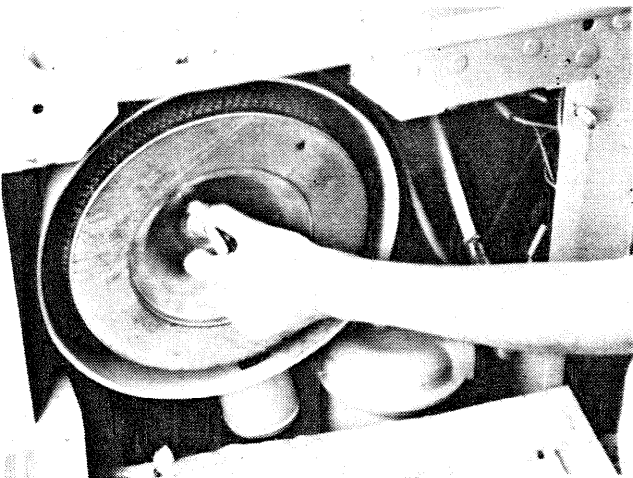


Fig 6-14

2. Loosen and remove the wing nut in the centre of the primary filter element and remove the filter elements from the air cleaner body. Do not remove or wash the safety element.
3. Use compressed air (690 kPa/ 100 PSI maximum) to remove dirt particles from the element. Direct the air from the inside of the element.
4. Wash the elements in a non-sudsing detergent for about 15 minutes.

**IMPORTANT NOTE:** DO NOT wash the safety filter element (left inside the air cleaner body). Replace the safety element when the primary element is washed for the third time or if the primary element ruptures. Replace the primary element after six cleanings or 2000 Hours of Operation, more often if required.

5. Rinse the elements from both the inside and outside until the water that passes through the element is clear.
6. Air dry the elements at a temperature no higher than 70°C (160°F).

7. Shine a bright light from the inside of the element. Check both elements for damage such as pin holes, ruptures or thin spots. Discard any damaged elements and replace them with new ones.
8. Clean the filter case thoroughly, removing all foreign matter.
9. Reinstall the filter elements and reassemble the air cleaner assembly. Make sure that the housing clamp is tight.
10. Replace the firewall access panel.

#### Every 1000 Hours of Operation:



Fig 6-15

Drain the radiator. Open the draincock at the bottom of the radiator and empty the coolant into a container of at least 55 l (14 U.S. gal).

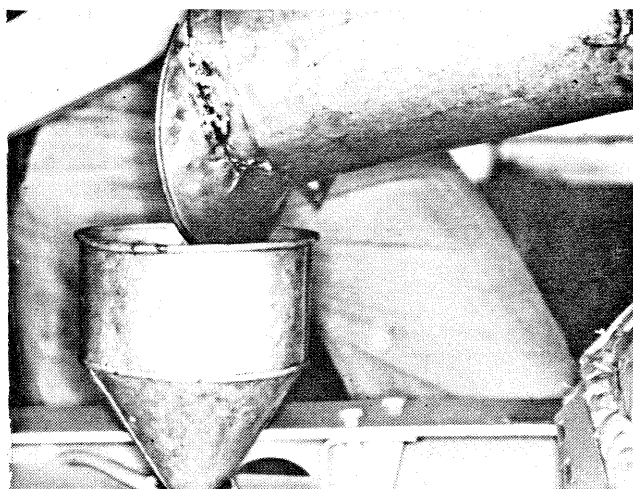


Fig 6-16

Close the draincock and add coolant to the surge tank until the correct coolant level is reached.

**NOTE:** Operate the engine until the coolant becomes warm enough to open the thermostat, shut down the engine and recheck the level.

See *Every 10 Hours of Operation* in this section for information on anti-freeze.



## FUEL SYSTEM

**IMPORTANT NOTE:** DO NOT attempt to adjust the fuel controls on the engine. They are factory calibrated and should only be adjusted by a qualified mechanic.

### Every 10 Hours of Operation:

Refill the fuel tank as required AND at the end of each work shift. The fuel tank filler is located on the fuel tank behind the winch. Make sure the area around the filler hole is clean before removing the cap. If the strainer screen is clogged or dirty, clean it in a solvent and blow dry with compressed air.



**WARNING:** DO NOT smoke while refueling.

**IMPORTANT NOTE:** Use only clean fuel to prevent engine damage.

**NOTE:** Clark recommends the use of #2 diesel fuel. Refill the tank after each work shift to prevent condensation in the fuel tank.

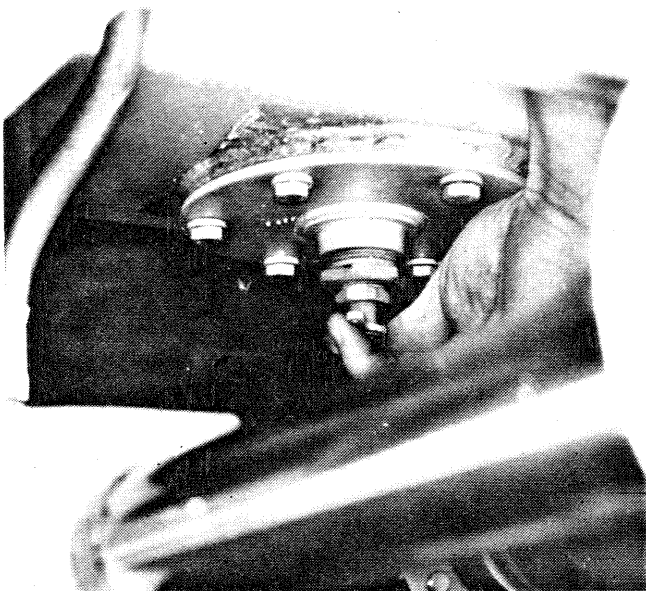


Fig 7-1

Before each work shift, open the draincock on the bottom of the fuel tank and drain sufficient fuel to remove any sediment and water. When clean fuel begins to flow, close the drain cock.



**CAUTION:** Drain fuel into an appropriate container and dispose of it in a safe place.

### Every 50 Hours of Operation:

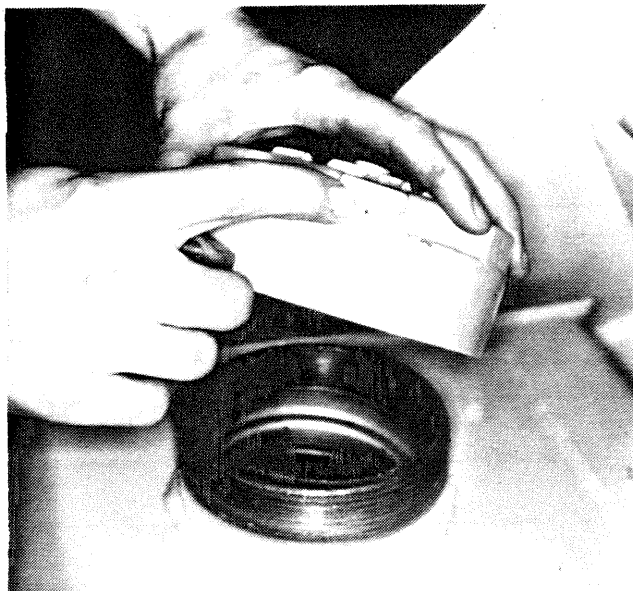


Fig 7-2

Remove the fuel filler cap and check to see if the vent hole is free from obstruction. Clear the hole if it becomes plugged.

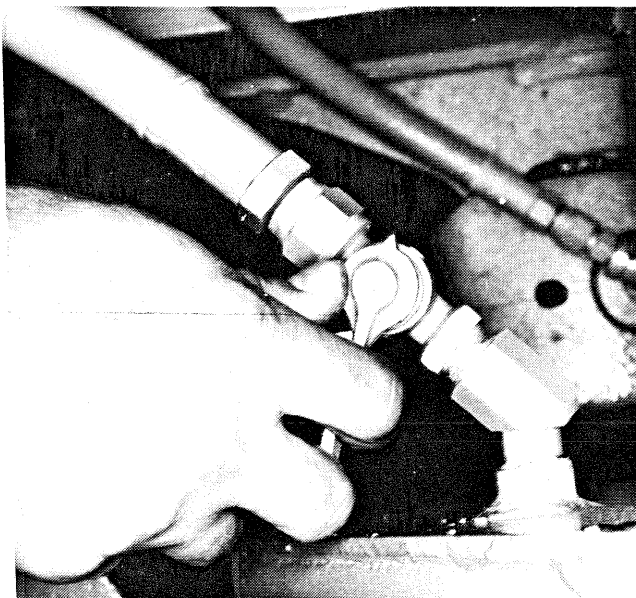


Fig 7-3

**IMPORTANT NOTE:** Your machine is equipped with a fuel line shut-off valve on the right hand side of the fuel tank. Use this valve in case of fire or if the fuel tank must be removed.

### Every 1000 Hours of Operation:

Drain the fuel tank (See Fig 7-1). Do this at the end of a shift or when the tank is almost empty. When the fuel has drained, remove the cover at the bottom of the tank and clean the magnet.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# TRANSMISSION/CONVERTER SYSTEM

Every 10 Hours of Operation:

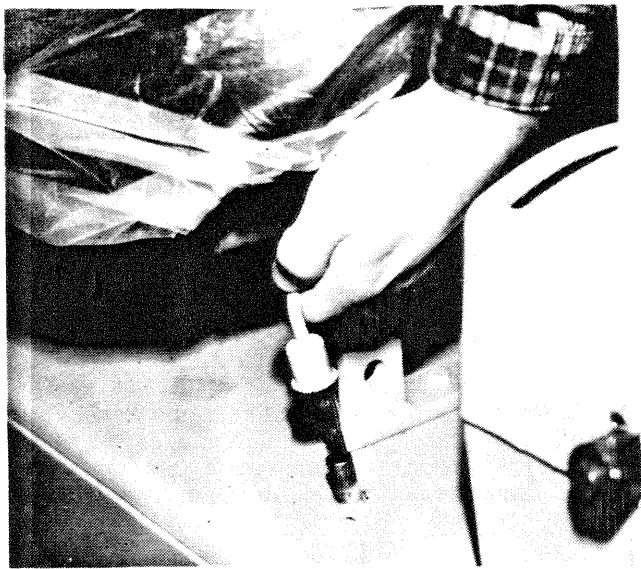


Fig 8-1

Check the fluid level in the system with the engine running and the direction control lever in the neutral position. The transmission/converter dipstick is located on the seat plate to the left of the operator's seat.

**NOTE:** When you do this check, the oil should be at its operating temperature, the engine must be operating but the machine must otherwise be in the Service Position.

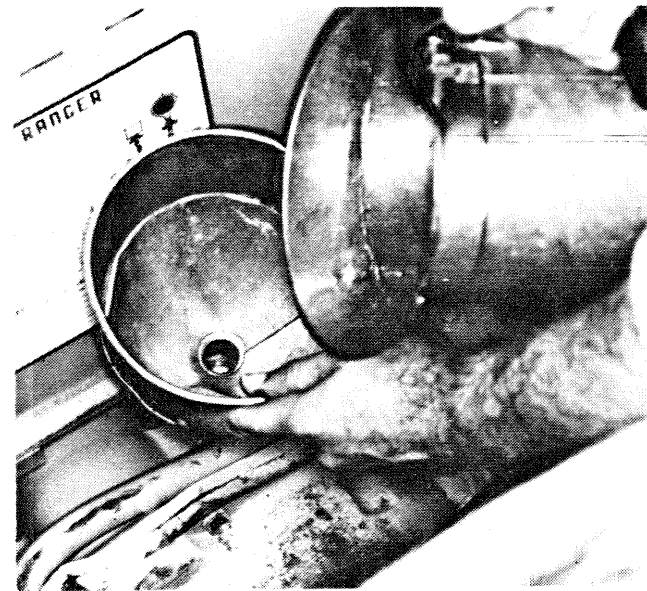


Fig 8-2

If the level on the dipstick is low, add Approved Automatic Transmission Fluid to the filler hole on top of the transmission until the correct level is achieved.

**IMPORTANT NOTE:** Clark recommends DEXRON II Automatic Transmission Fluid to fill this system.

Every 250 Hours of Operation:



Fig 8-3

Remove the breathers on top of the transmission and converter housings and wash them in a solvent, blow them dry with compressed air and reinstall them on the components.

Every 500 Hours of Operation:

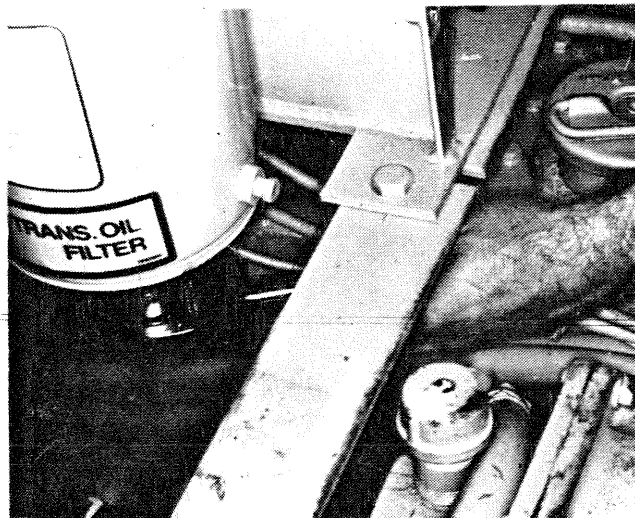


Fig 8-4

Replace the transmission/converter filter element. This element must also be replaced when the converter pump, winch, transmission or converter is repaired or overhauled. Loosen the centre bolt and remove the filter case carefully because the case is filled with oil.

Clean the filter case and base casting thoroughly and install a new Clark replacement filter element and casing gasket. DO NOT use will fit elements as they may endanger the proper operation of the system and can cause costly repairs and downtime.

Tighten the centre bolt to a torque of 4,5 to 5,6 N.m (40 to 50 lbf.ft). Take care that you do not damage the gasket.

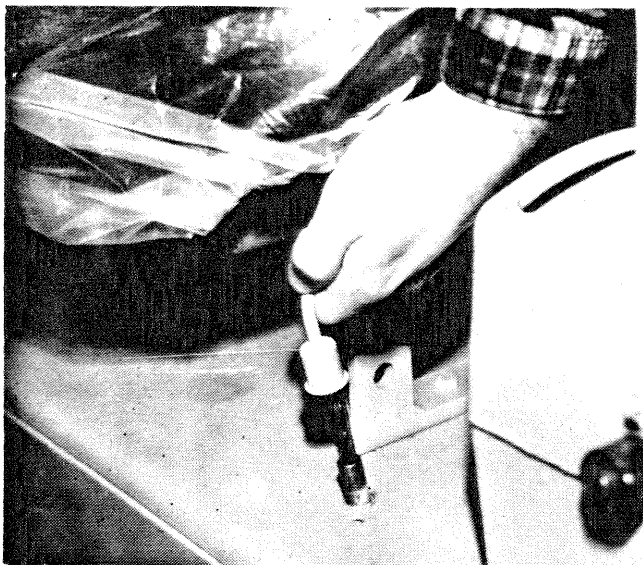


Fig 8-5

Operate the engine for five minutes at 1500 RPM and check the system for leaks. Check the level in the system and add fluid if necessary.

Check the converter OUT pressure. This check should also be made if the system appears to overheat and if a visual inspection fails to reveal any collapsed or ruptured hoses that can cause overheating. Check the converter out pressure at the operating temperature as follows:

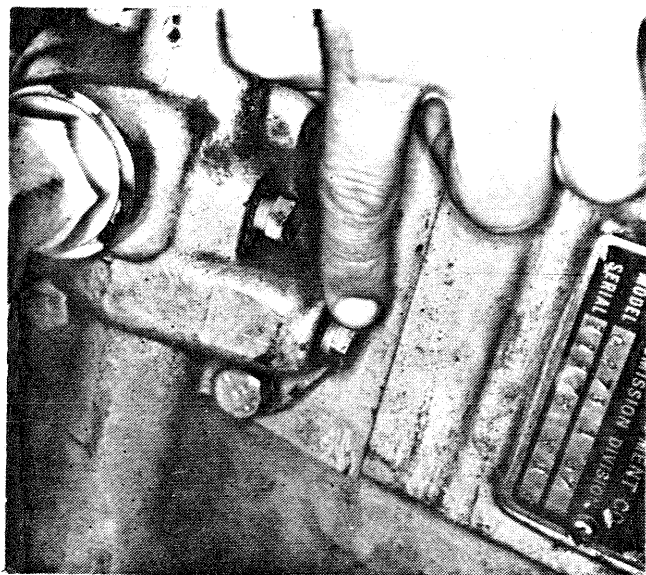


Fig 8-6

1. Connect a pressure gauge to the converter OUT pressure port located on the rear of the converter.
2. With the machine in the Service Position, operate the engine at 2000 RPM and read the gauge. The gauge should not exceed 275 kPa (40 PSI) with the oil at its operating temperature (See Sec. 1).

**NOTE:** If the reading on the gauge is greater than the above figure, you may have to clean or replace the hoses, oil cooler and/or radiator assemblies.

Check the pressure drop across the oil cooler. This figure is the difference between the cooler IN (converter OUT) pressure and the cooler OUT pressure. Check the pressure drop as follows:

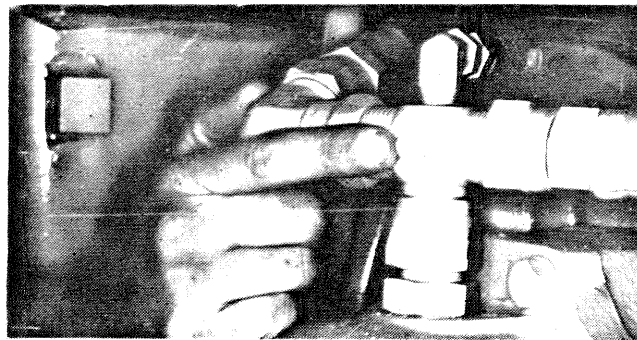


Fig 8-7

1. Use the same procedure as for checking the converter OUT pressure but also install a gauge at the cooler OUT pressure check port on the T connector on top of the transmission brake housing in the articulation area.
2. Record the readings on the gauges, and subtract the cooler OUT pressure from the cooler IN pressure to get the pressure drop. The pressure drop should be between 35 and 140 kPa (5 to 20 PSI).

If the pressure drop is greater than the accepted range, you may have to clean or replace the hoses, oil cooler and/or radiator assemblies.

Check the transmission clutch pressure. This check should also be made whenever there is improper operation in any speed range or direction. Check the clutch pressure as follows:

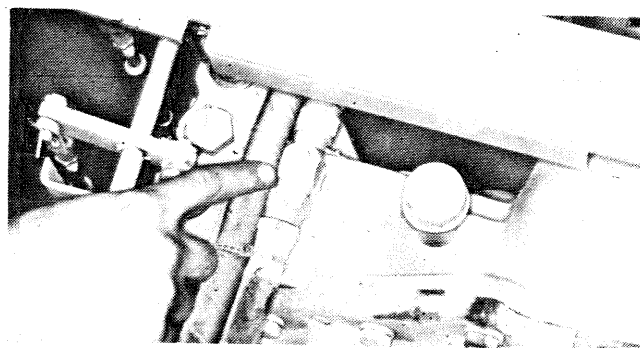


Fig 8-8

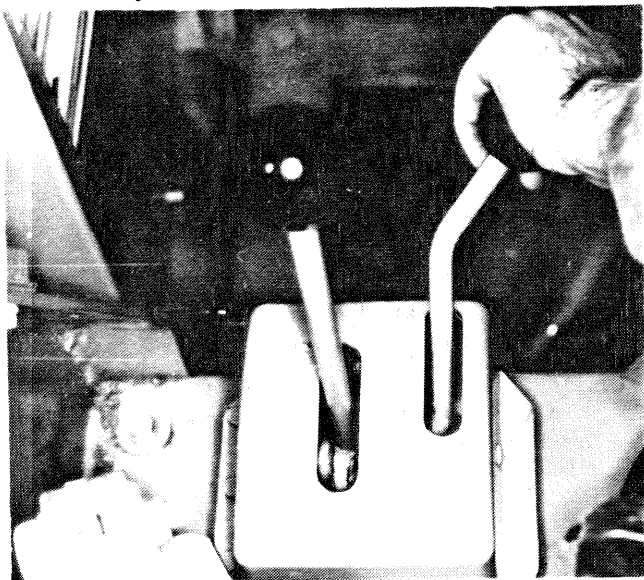
1. Install a test gauge of at least 2000 kPa (300 PSI) to the clutch pressure check port on the T connector on top of the transmission.
2. At operating temperature and the engine at idle, the gauge should read between 1655 and 1930 kPa (240 to 280 PSI) in all speed ranges both FORWARD and REVERSE directions with no more than 35 kPa (5 PSI) difference between the readings.

If the pressure reading is not within these limits, contact your Ranger distributor for further troubleshooting.



**Every 1000 Hours of Operation:**

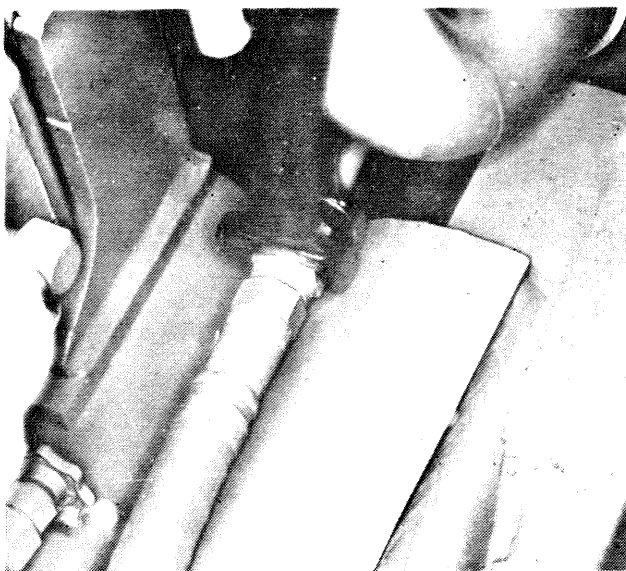
Drain the transmission/converter/winich system. The system must also be drained when the converter pump, winich, transmission or converter is repaired or overhauled.

**Drain the system as follows:****Fig 8-9**

1. With the machine in the Service Position, operate the engine with the gear shift levers in the FORWARD and THIRD positions to warm the oil. Hot oil flows more freely and carries more foreign material with it.

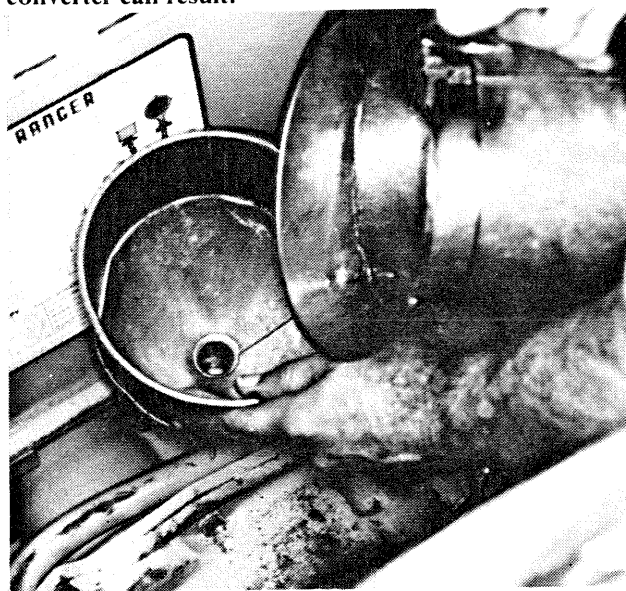
**Fig 8-10**

2. When the oil reaches its operating temperature shut down the engine, remove the drain plugs at the bottom of the transmission and converter housings and drain all of the oil into a container of at least 40l (10 U.S. gal).
3. Remove the transmission suction screen, clean it in a solvent, blow dry it with compressed air. Reinstall the suction screen using a new O-ring.
4. Reinstall the drain plugs and overfill the system with the recommended fluid.

**Fig 8-11**

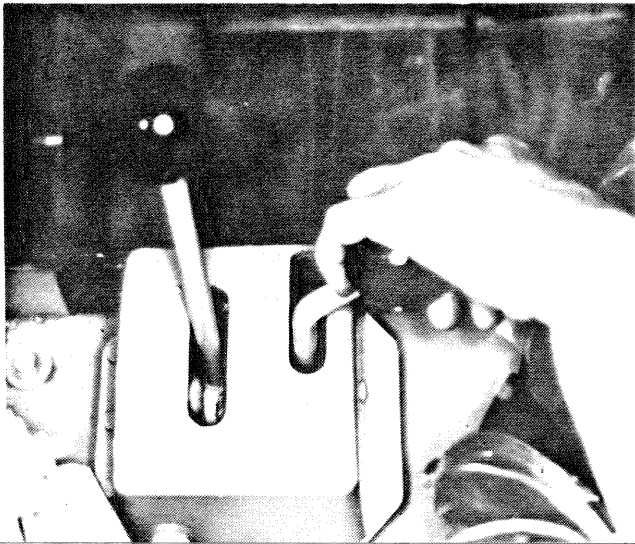
5. Disconnect the return oil cooler hose from the radiator and put the open end of the hose into a container of at least 20l (5 U.S. gal).
6. Start the engine and operate it at low idle speed to flush any trapped fluid from the system. Drain and discard approximately 18l (4.8 U.S. gal). Reconnect the oil cooler hose.

**IMPORTANT NOTE: DO NOT operate the engine with the oil cooler hose disconnected for more than 60 seconds or serious damage to the transmission and converter can result.**

**Fig 8-12**

7. Bring the oil in the system to the correct level and operate the engine for five minutes at 1500 PRM. Check the system for leaks and correct if necessary.

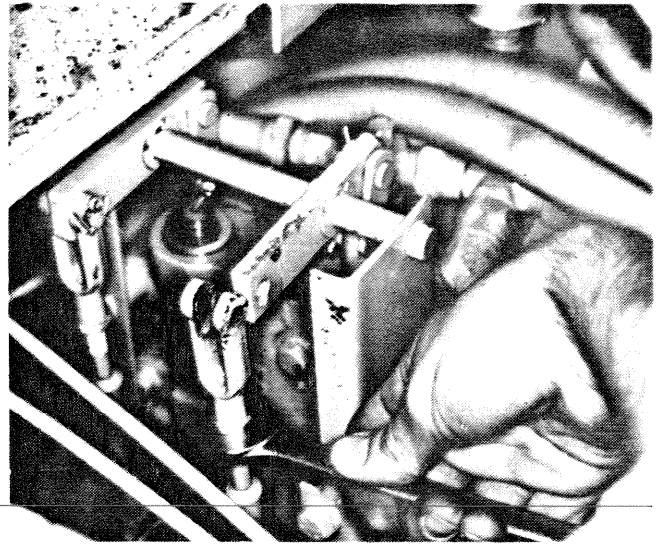
**IMPORTANT NOTE: NEVER USE FLUSHING OIL OR COMPOUNDS TO CLEAN THIS SYSTEM. USE ONLY THE RECOMMENDED OPERATING FLUID.**



**Fig 8-13**

Check and adjust the transmission control linkage. Check all rods, bell cranks, ball joints and other components for damage or wear. Check to see that all parts move freely and that no binding and rubbing exists.

Adjust the control linkage as follows:



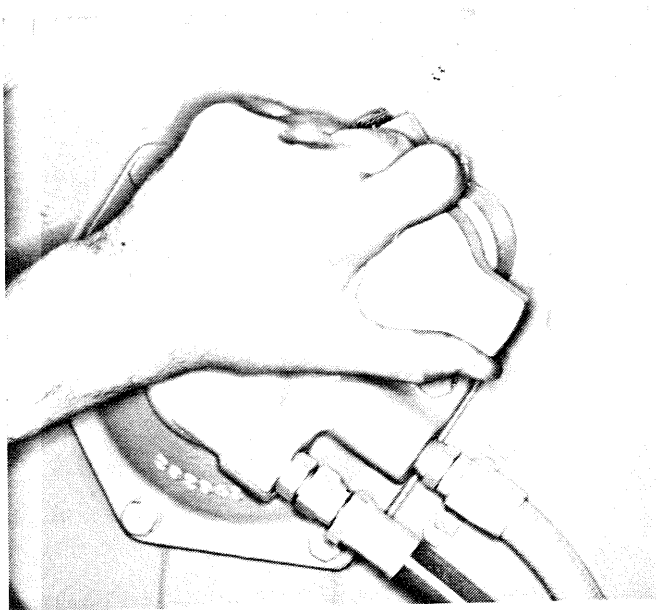
**Fig 8-14**

1. With the transmission control lever in the NEUTRAL position, and the speed range control lever in SECOND loosen the locknuts on both ends of the control cables and adjust the clevises on each until the levers are properly aligned.
2. Tighten the locknuts and check that the levers will go into all detent positions without interference from the floorboard or transmission.



# CLARK WINCH

**Every 100 Hours of Operation:**



**Fig 9-1**

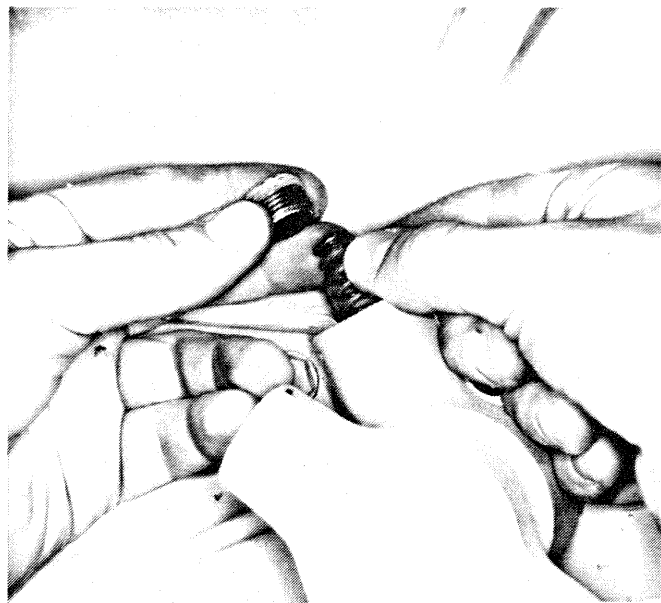
Check the operation of the winch free-spool drag adjustment. If the operation of the free-spool provision is unsatisfactory, loosen the locknut on the free-spool adjusting handle and turn the handle clockwise to increase the tension or counterclockwise to decrease the tension.

**Every 250 Hours of Operation:**



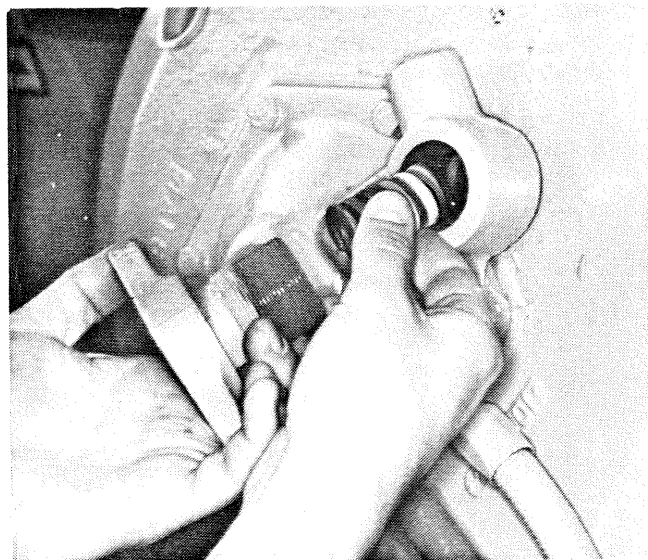
**Fig 9-2**

Remove the breather on top of the winch housing, to the left of the winch cable drum. Clean the breather in a solvent, blow dry it with compressed air and reinstall it on the winch. The winch has a one-way breather.



**Fig 9-3**

Check the condition of the wear button. Remove the lock-screw, spring and lock button from the free spool adjustment provision.



**Fig 9-4**

Remove the adjusting handle, spring and wear button to check its condition.

**NOTE:** The winch hydraulic system is integral with the transmission/converter system. Anytime the winch is overhauled, the transmission/converter/winch hydraulic system will have to be drained and refilled.

**IMPORTANT NOTE:** See your Clark Winch Maintenance and Service Manual for all troubleshooting and overhaul instructions. **DO NOT** attempt to disassemble or make any repairs to the inside of the winch before **FIRST** reading and understanding the instructions in the manual.

### Installing the Winch Cable:

1. Remove the access plug from the upper right hand side of the winch housing.

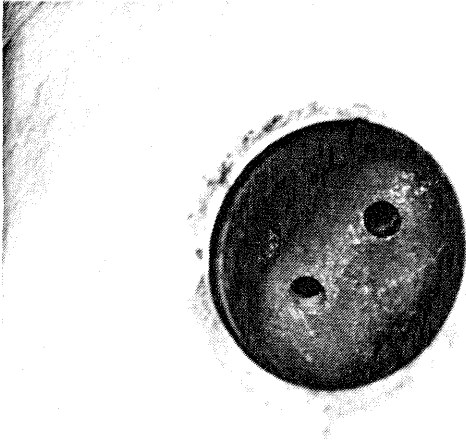


Fig 9-5

2. Put the winch control lever in the FREE-SPOOL position and rotate the cable drum until the cable anchor wire holes are seen through the access hole. Put the lever in the center LOCK position and return the machine to the Service Position (See Sec. 1).
3. Choose a gauge of anchor wire that will insert in the holes and install both ends of the wire through the holes. Install the access plug.

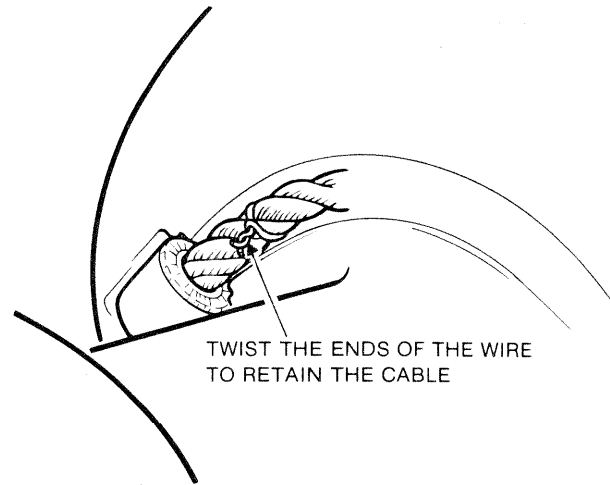


Fig 9-7

5. Twist the ends of the wire together to hold the cable in place.
6. Start the engine and put the winch control lever in the WINCH-IN position to wind the mainline onto the cable drum.

**IMPORTANT NOTE:** Installing the winch cable in this manner provides a means to hold the cable ferrule in place during normal operation and acts as a safety break-away function to prevent the machine from being pulled over should the load fall down a grade.

**WARNING:** It is imperative that the operator put the winch in the FREE-SPOOL mode if the load should begin to fall for this provision to be effective.

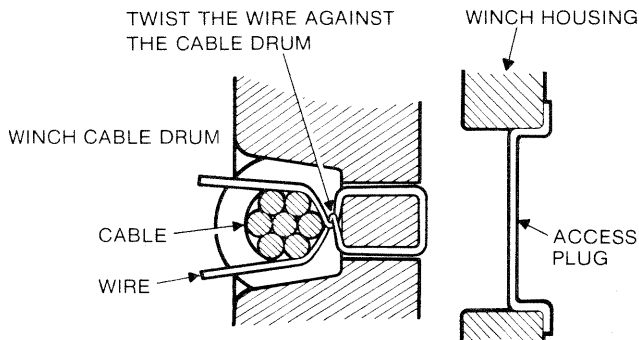


Fig 9-6

4. Twist the wire ends to tighten the wire against the cable drum and install the mainline in the cable groove between the ends of the wire. The cable ferrule should be inserted in the ferrule groove.

# HYDRAULIC SYSTEM

## Every 10 Hours of Operation:

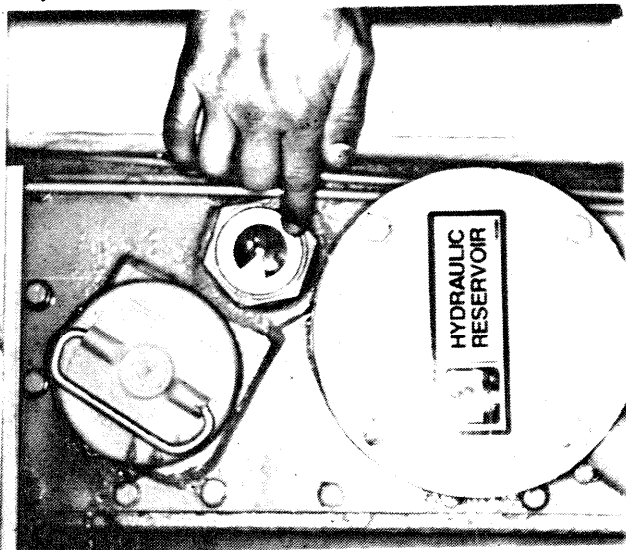


Fig 10-1

Check the oil level in the hydraulic reservoir. There is a hydraulic level gauge on top of the tank, below the floorboard on the right hand side of the operator's compartment.



Fig 10-2

If the level is low, add only SAE 10W oil, API Class SD or SE, MIL-L-2104B or MIL-L-2104C lubricant to the filler hole adjacent to the level gauge.

## Every 50 Hours of Operation:

Test the auxiliary steering (optional) in a level area free from obstructions.

1. Shut down the engine but leave the ignition switch to the ON position. Turn the auxiliary steering switch ON.
2. Make complete left and right turns until the steer stops make contact.

**IMPORTANT NOTE:** The auxiliary steer system is powered by the machine's batteries, to prevent excessive battery drain and system damage; do not operate this system for more than two minutes.

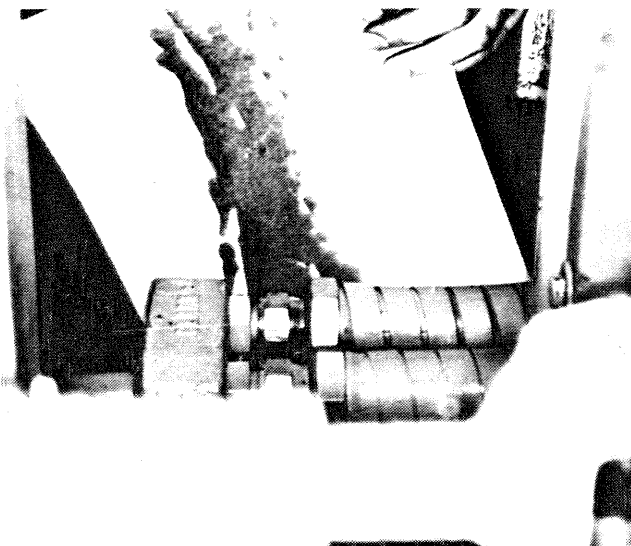


Fig 10-3

If the auxiliary steering does not respond properly to the test, check all hydraulic connections as well as the main relief pressure; (See *EVERY 500 HOURS OF OPERATION*). See your Ranger distributor if you cannot locate the problem.



**WARNING:** DO NOT use your hands to check for oil leaks, escaping oil under pressure can penetrate the skin. Use a piece of cardboard.

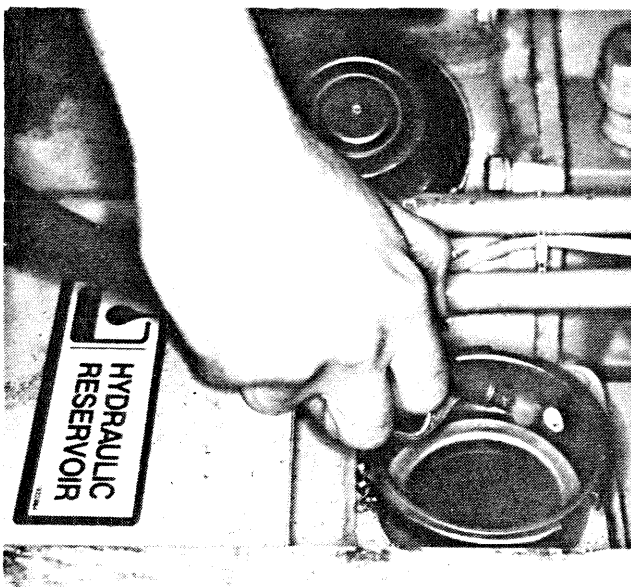
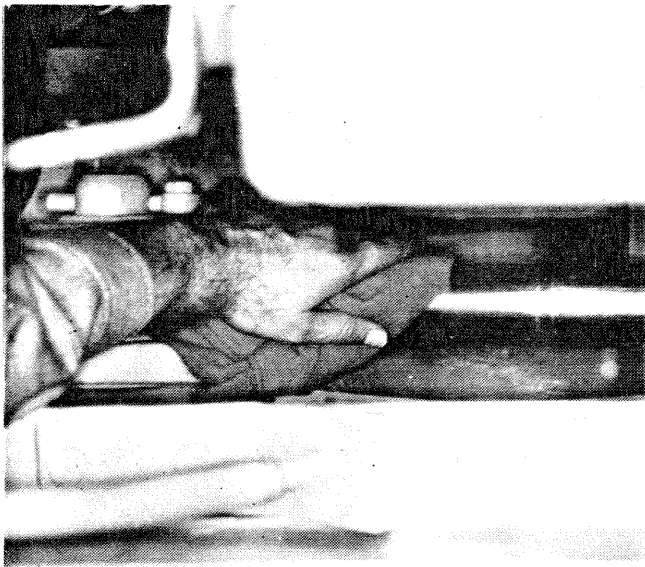


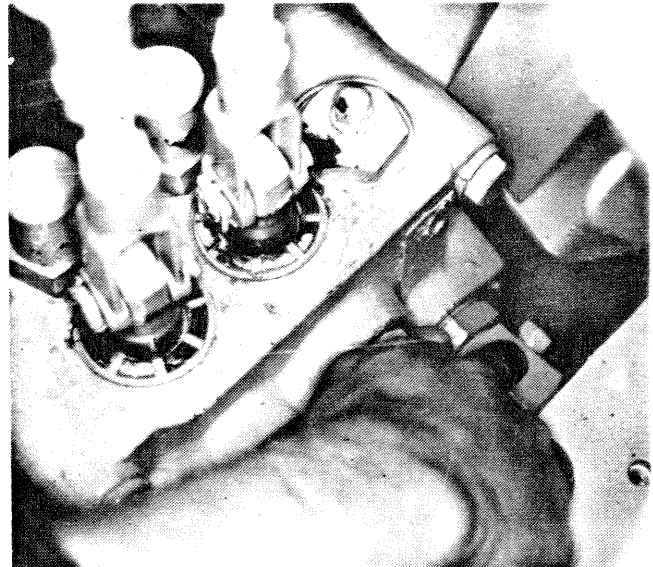
Fig 10-4

Use compressed air (34 to 69 kPa/5 to 10 PSI) to clean any foreign material from the hydraulic tank breather in the filler neck of the tank.



**Fig 10-5**

Clean the steer and blade cylinder rods (and the arch, boom, and grapple cylinder rods if applicable) with a clean cloth soaked in the same oil as in the hydraulic system. Remove any burrs or nicks on the rods with a fine grained hand stone or crocus cloth.



**Fig 10-7**

Check the main relief pressure with a test gauge attached to the main relief pressure port on the main control valve. Use a gauge of at least 20,000 kPa (3,000 PSI).

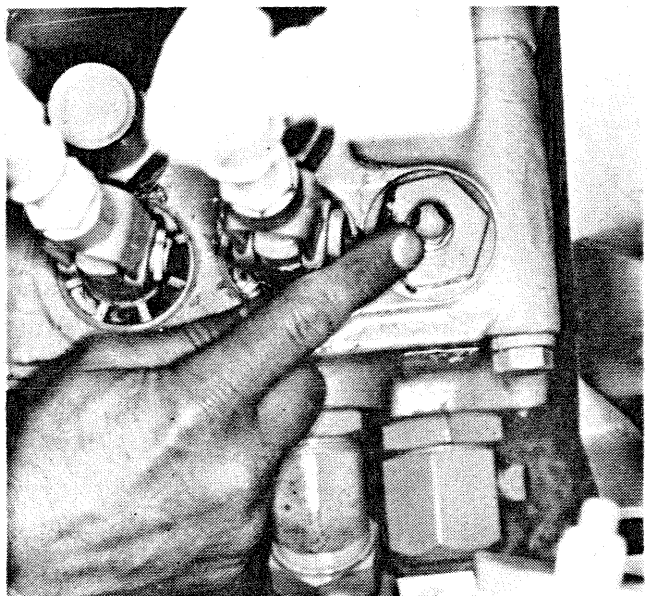
Raise the blade and hold it in its highest position with the engine operating at maximum. The gauge should read 12410 kPa (1800 PSI) on the 668C Cable Skidder. The main relief pressure on the 668C Grapple Skidder is 14480 kPa (2100 PSI).

#### Every 500 Hours of Operation:



**Fig 10-6**

Replace the main hydraulic filter element with a Clark replacement element. This element is located under the cover on top of the hydraulic tank. Make sure no dirt enters the tank when you remove the cover. Tighten the cover bolts to a torque of 4,5 to 5,6 N.m (40 to 50 lbf.in) when you replace them.



**Fig 10-8**

If the main relief pressure of your machine is incorrect, remove the acorn nut on the main control valve, loosen the locknut below it and turn the adjusting screw until the correct value is achieved. If the relief valve cannot be adjusted, see your Ranger distributor.

Replace the locknut and acorn nut. Shut down the engine and work the steer and blade lever to remove any pressure from the system. Remove the test gauge and replace the plug in the port.

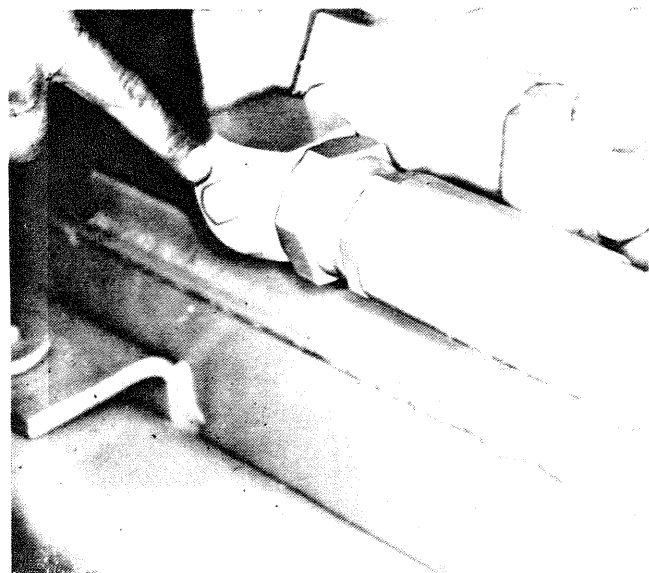


Fig 10-9

Check the grapple relief pressure with a test gauge attached to the pressure port on the grapple control valve. Use a test gauge of at least 20,000 kPa (3000 PSI).

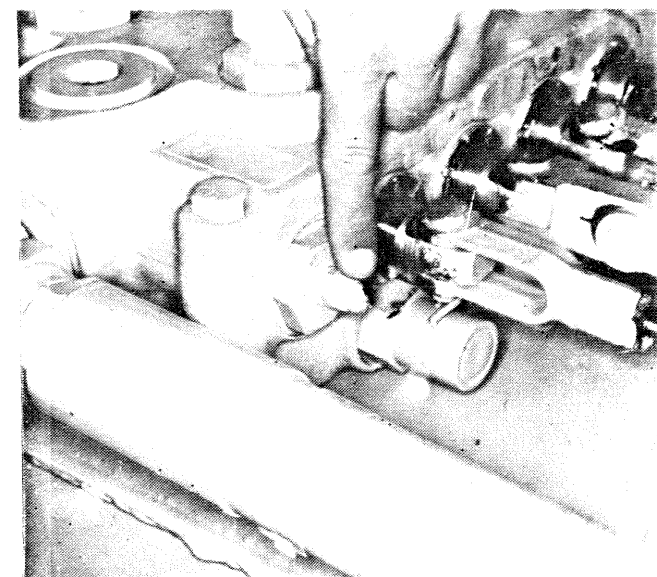


Fig 10-10

Actuate the grapple cylinder(s) and hold the grapple in its OPEN position with the engine operating at 2000 RPM. The gauge should read 13,790 kPa (2000 PSI). If the grapple relief pressure is incorrect, remove the acorn nut on the grapple control valve, loosen the locknut below it and turn the adjusting screw until the correct value is achieved.

### Every 1000 Hours of Operation:

Drain the hydraulic reservoir as follows when the oil is at its operating temperature. Hot oil flows more freely and carries more dirt with it. The operation may have to be done more frequently when the machine is operating in extremely dusty or dirty conditions to prevent damage to system components.

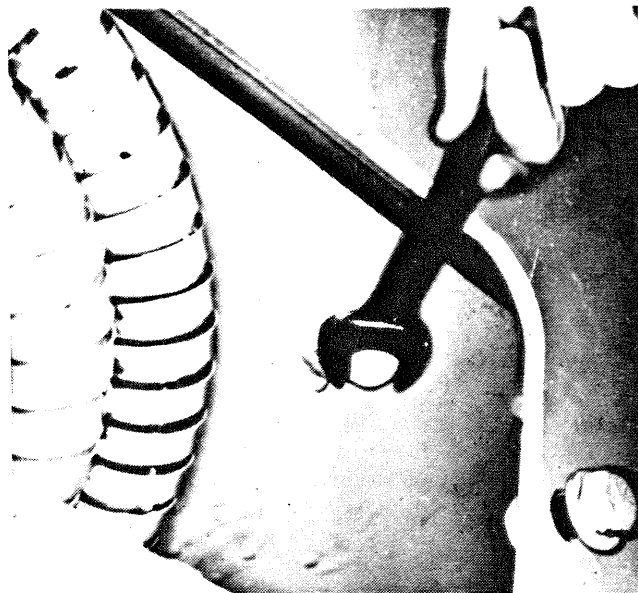


Fig 10-11

1. Remove the hydraulic reservoir filler cap. Remove the plug at the bottom of the tank and drain the oil into a container of at least 85ℓ (22 U.S. gal).

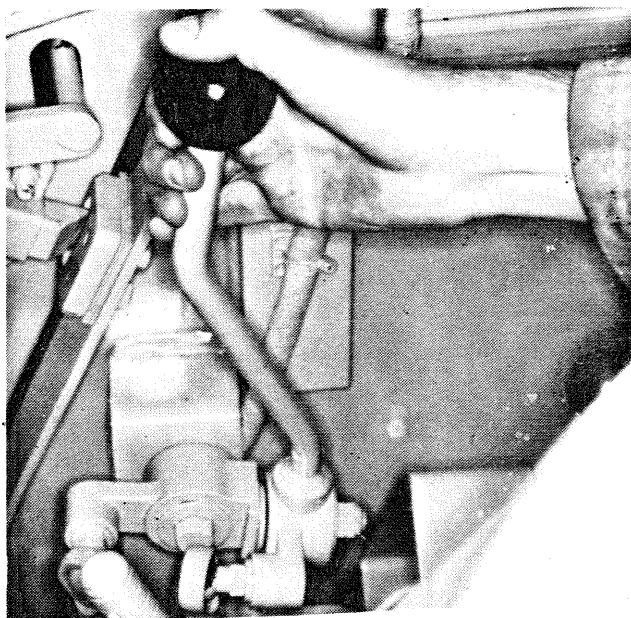


Fig 10-12

2. Slowly lower the blade (and boom and arch if applicable) and allow the grapple arms to close to force the oil in the cylinders back to the tank.



**WARNING:** Exercise **EXTREME CAUTION** to avoid serious personal injury that can occur if struck by one of these attachments.



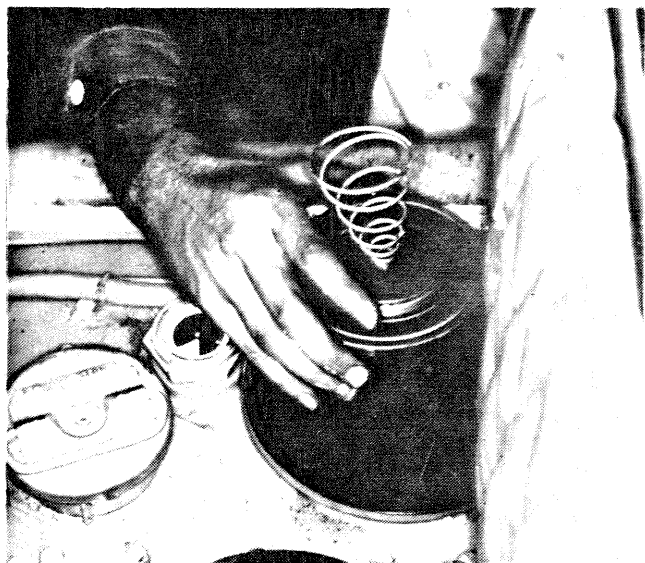


Fig 10-13

3. Remove the filter access cover and discard the old filter. Clean the inside of the tank and remove the magnet at the bottom of the tank. Clean the magnet thoroughly and replace it in the tank.
4. Remove the hydraulic tank suction screen located on the suction tube in the tank. Wash the screen in a solvent and blow dry it with compressed air. If the screen is damaged, it must be replaced to prevent dirt from entering the pump and damaging it.
5. Install a new filter element. Install the plug on the bottom of the tank and refill the reservoir with the recommended fluid (See *Every 10 Hours of Operation*).

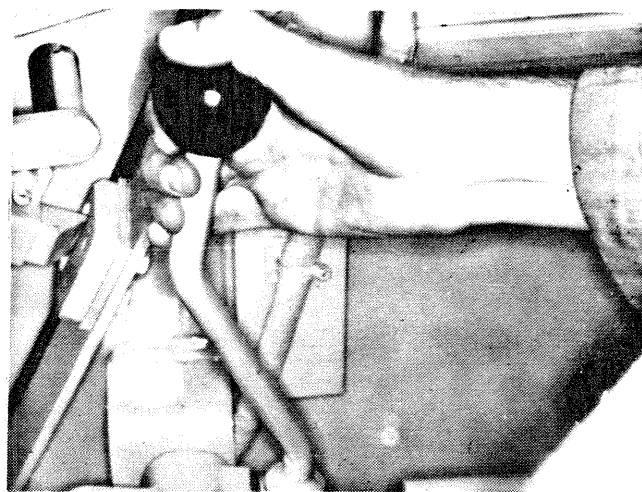


Fig 10-14

6. Make sure all control levers are in their NEUTRAL positions (with the neutral lock lever applied). Start the engine and run it at idle for a few minutes. Put the blade in the UP position to fill the cylinders with oil. Similarly fill the arch, boom and grapple cylinders if applicable.
7. Shut down the engine and allow the oil in the reservoir to stand until all the air has escaped from the oil. Add more oil until the level gauge reads correct. This will replace the oil sent to the cylinders.
8. Check all connections for leaks and replace the reservoir cap securely.

**IMPORTANT NOTE: NEVER use flushing oil or compounds to clean the system under ANY circumstances.**



# AXLES, PROPSHAFTS AND MIDMOUNT

Every 50 Hours of Operation:

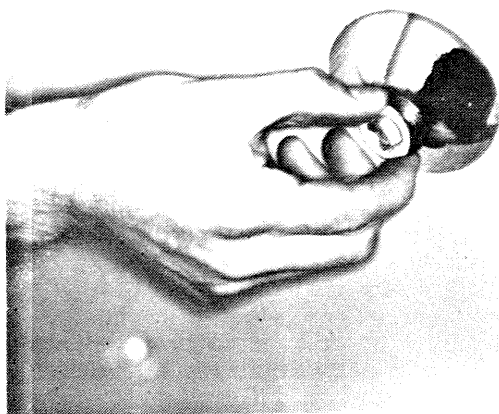


Fig 11-1

Check the lubricant level in the front and rear axle differentials. Remove the check plug in the centre of each differential housing. The lubricant level should be up to the bottom of the check hole. If the level is below the hole, add the recommended lubricant to the check hole (See Sec. 16).

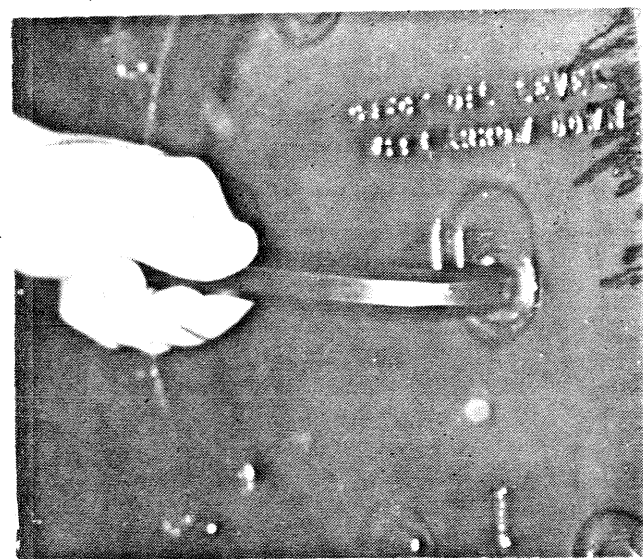


Fig 11-2

Check the lubricant level in the front and rear axle planetary hubs. Turn the wheel until the check plug on the hub is pointing upwards. Remove the check plug. The lubricant level should be up to the bottom of the check hole. If the level is below the hole, add the recommended lubricant to the check hole (See Sec. 16).

**NOTE:** Both the axle planetary hubs and the axle differentials are factory filled with SCL type gear lube. SCL signifies Sulfo-Chlor-Lead type lubricant however certain temperature conditions require a change of lubricant for optimum performance (See Sec. 16).

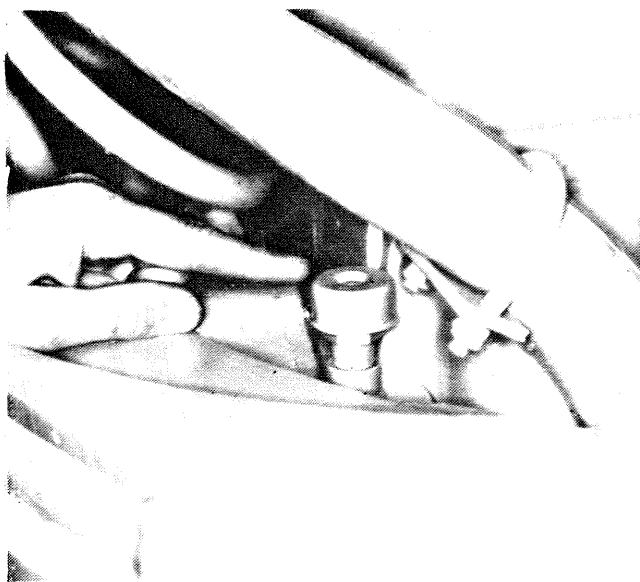


Fig 11-3

Locate the midmount (brake) breather in the rear frame on the left hand side of the winch. Remove the breather, wash it in a solvent and blow dry it with compressed air. Reinstall it on the breather hose.

Every 100 Hours of Operation:

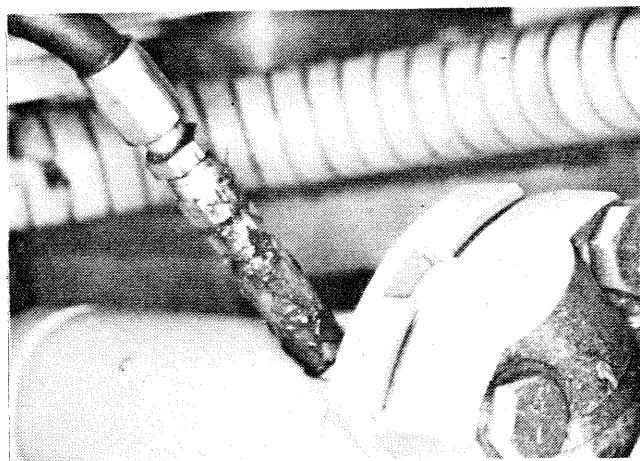
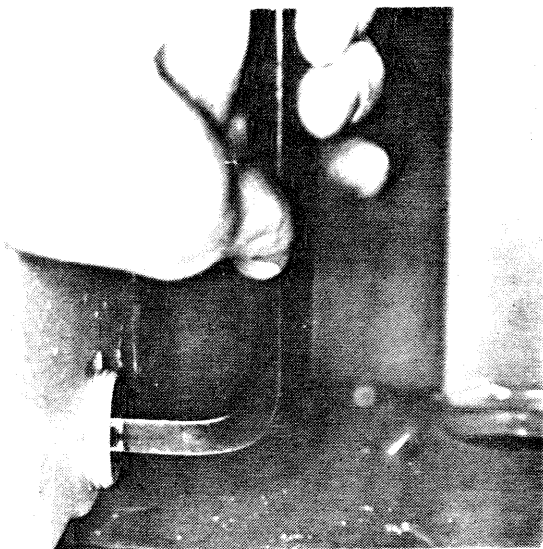


Fig 11-4

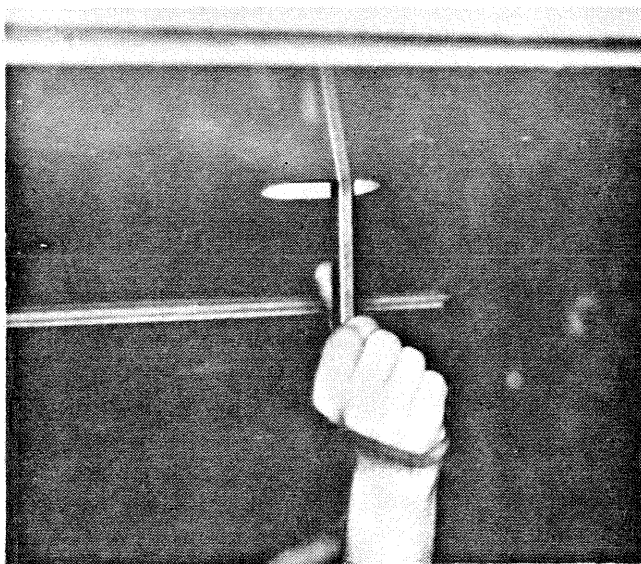
Grease all propshaft slip joints with Extreme Pressure Molybdenum Disulphide Grease. Use a hand grease gun and grease all fittings sparingly. Each propshaft has three grease points, one on the slip yoke and one on each spider and bearing assembly. When the machine is operated at temperatures above  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) use a Grade 2 lubricant. When the machine is operated below  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) use a Grade 0 lubricant.

**Every 500 Hours of Operation:**

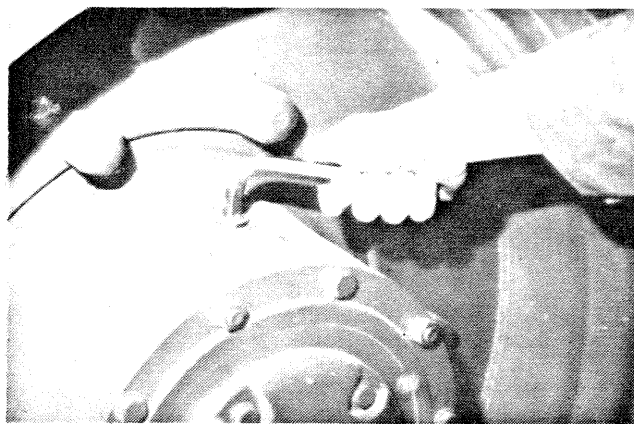
Locate the axle breathers on top of the front and rear axles. Remove the breathers and wash them in a solvent. Rotate the cap on each breather to free the air passages of foreign material, and blow dry the breathers with compressed air. Reinstall the breathers.

**Fig 11-5**

Drain the midmount brake housing through the drain plug at the rear of the housing and refill it through the breather hose on the side of the winch.

**Every 1000 Hours of Operation:****Fig 11-6**

Drain the front and rear axle differentials. Locate and remove the drain plugs at the bottom of each differential and drain the old gear lube into a container of at least 17l (4½ U.S. gal). Reinstall the drain plug and fill each differential check hole with the recommended fluid (See *Every 50 Hours of Operation*).

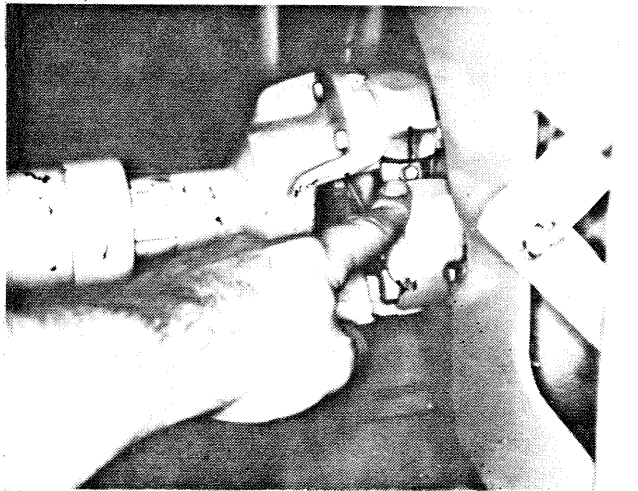
**Fig 11-7**

Drain the front and rear axle planetary hubs. Locate the drain plug on the outer rim of each hub. Rotate each wheel until the drain plug is at the bottom of its rotation. Remove the drain plug and drain the old gear lube into a container of at least 9l (2½ U.S. gal). Reinstall the drain plug, remove the check plug. Rotate the wheel until the check plug is pointing upwards. Fill each hub through its drain plug with the recommended fluid. Reinstall the drain plugs and the check plugs.

**NOTE:** It may be necessary to change the lubricant in the differentials and planetaries more often when operating in heavy mud or water.

Drain the midmount bearing. Locate and remove the drain plug and the check plug in the midmount bearing assembly located at the bottom of the rear frame, and drain the old lubricant into a container of at least 2 l (½ U.S. gal). Reinstall the drain plug and add approved automatic transmission fluid to the midmount breather hose until it reaches the proper level. Reinstall the check plug and the midmount breather.

**NOTE:** This midmount is available on older cable machines that have the single service brake system (See Sec. 13).

**Fig 11-8**

The grease fittings on the spider and bearing assemblies on the winch input propshaft are difficult to reach with a grease gun. A long fitting is available (see your machine's parts manual) for greasing only, and must be removed and replaced with the original fittings before the engine is started.

## WHEELS AND TIRES

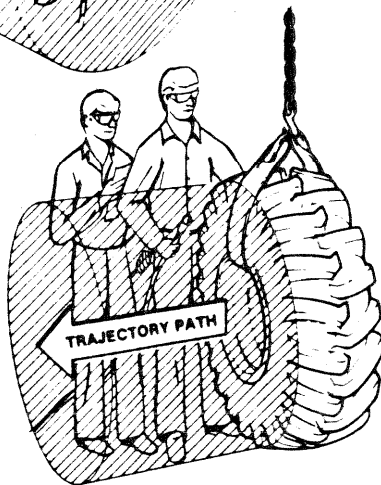
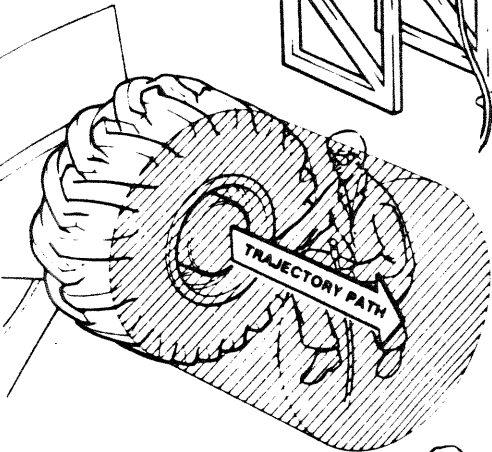
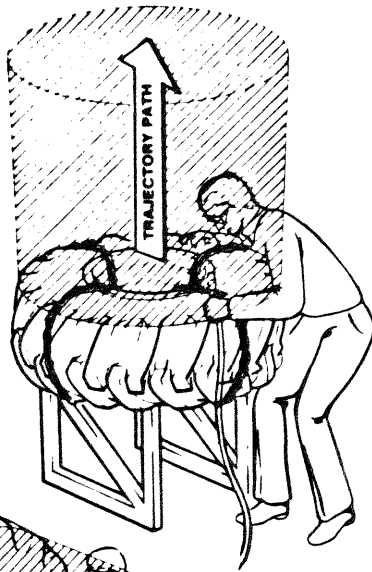


Fig 12-1

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

ALWAYS use a self-attaching air chuck with a hose long enough to avoid standing in the trajectory path when inflating a tire.

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

NEVER cut or weld on a wheel rim except to replace damaged split rim coupling studs.

NEVER use damaged rim parts or parts not specified for use on the actual wheel rim.

COMPLETELY DEFLATE a tire before removing foreign material from the tire bead or tread. Keep your fingers away from bead breakers and stay out of the trajectory path when removing foreign material. If a bead breaker disengages, it will do so with enough force to cause serious personal injury or death.

### Every 10 Hours of Operation:

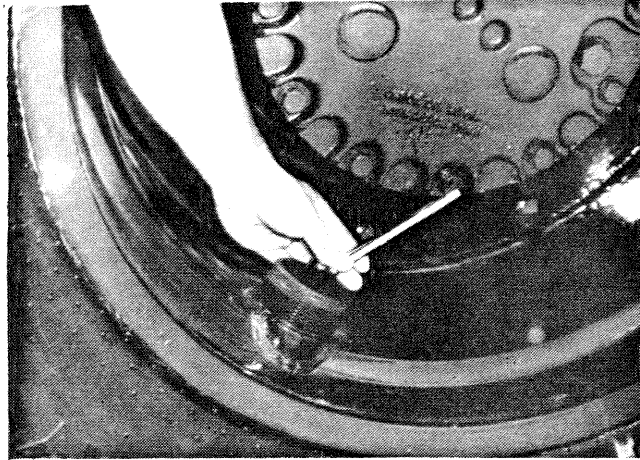


Fig 12-2

Check the air pressure of the tires. Examine the valves and make sure all valve caps are in place. See the tire pressure chart in this section for the correct tire pressure.



**WARNING:** NEVER check tire pressures with a load (of logs) in place.

### Every 50 Hours of Operation:

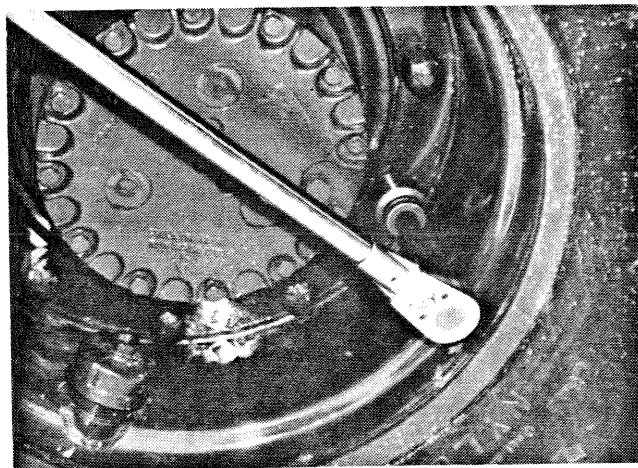


Fig 12-3

Check the wheel and wheel nuts for damage. Tighten the wheel nuts as required to a torque of 405 to 445 N.m (300 to 330 lbf.ft) for FLAT wheel nut seats or 575 to 645 N.m (425 to 475 lbf.ft) for SPERICAL wheel nut seats (See Fig 12-4).



**WARNING:** IF ANY wheel studs or wheel nuts are missing or damaged, they MUST BE REPLACED.

## Split Rim Examples

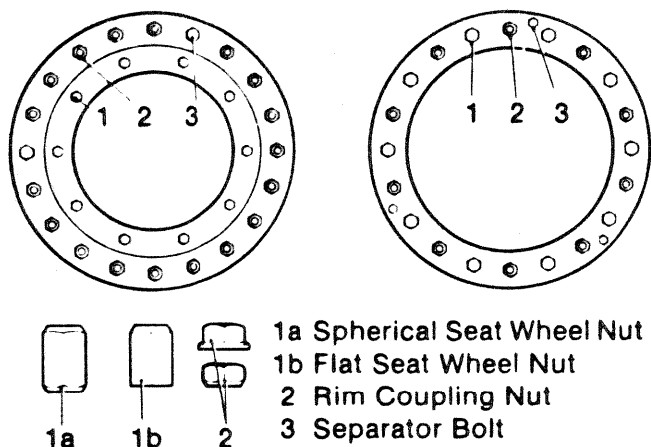


Fig 12-4

Check the rim coupling nuts (if applicable) for damage. Tighten the rim coupling nuts to a torque of 575 to 645 N.m (425 to 475 lbf.ft) for 3/4 in - 16 threads OR 980 to 1085 N.m (725 to 800 lbf.ft) for 1 in - 14 threads.

**WARNING:** IF ANY rim coupling studs or nuts are missing or damaged, they **MUST BE REPLACED**.

**WARNING:** USE Extreme Caution when you remove or install wheels and tires. Improper handling can cause serious personal injury or death. Always wear eye protection. Read and understand the following instructions completely before proceeding.

**Tire changing can be dangerous, and should be done by trained personnel using proper tools and procedures.**

## Repairing Tires on Split Wheel Rims:

1. Put the machine in the Service Position, **SECURELY** blocking the wheels (See Sec. 2).
2. Use a jack of sufficient capacity to jack the machine and securely block the machine in place.
3. Use tire tongs or another suitable tire lifting device to support the rim and remove the **WHEEL STUD NUTS** (See Item 1 in Fig 12-4). Remove the assembly from the machine.

**WARNING:** IF YOU HAVE ANY DOUBT that the nuts you are to remove **ARE THE WHEEL STUD NUTS**, **COMPLETELY DEFLATE THE TIRE BEFORE YOU REMOVE ANY NUTS**.

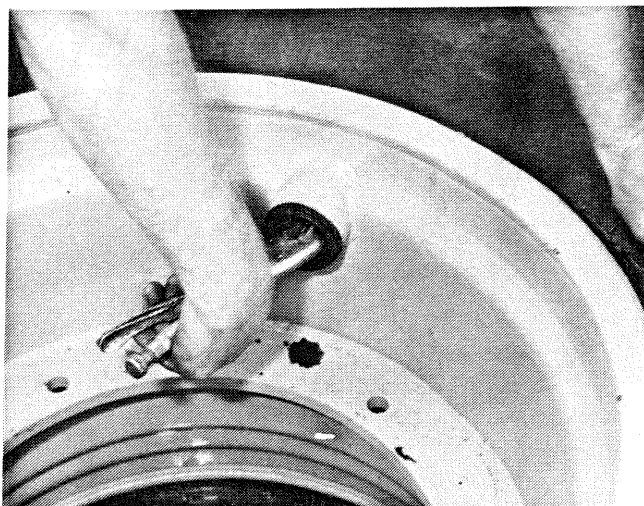


Fig 12-5

4. Remove the valve protection cap and carefully remove the valve stem to deflate the tire and allow the tire to deflate **COMPLETELY**. Use a piece of tire chalk to mark the tire adjacent to the valve stem as a reference point to locate the cause of the puncture.

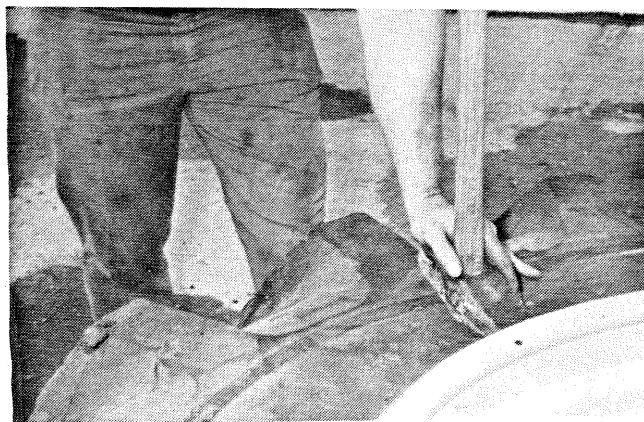


Fig 12-6

5. Drive a bead unseating tool between the tire bead and the rim flange taking care not to damage the bead. When the bead is completely unseated, turn the tire over and unseat the other bead.

**WARNING:** **DO NOT** begin to unseat the bead until the tire is completely deflated.



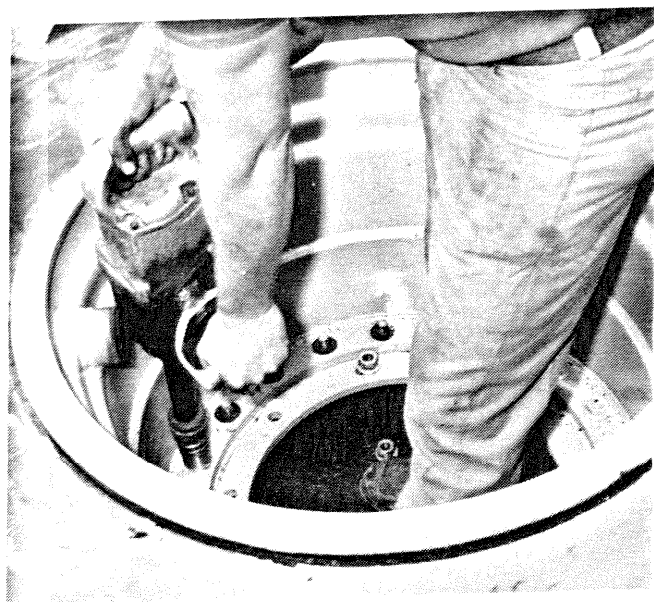


Fig 12-7

6. Mark the wheel halves to facilitate reassembly and remove the rim coupling nuts.



Fig 12-9

8. Remove the tube from the tire and inspect it to see if it is in good enough condition to repair or if it should be replaced. Repair or replace the tube as required.

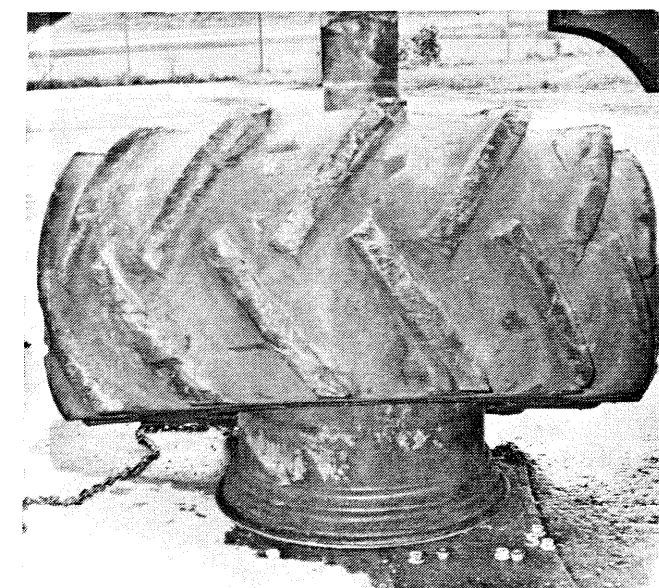


Fig 12-8

7. Use a suitable tire lifting device to lift the tire and the top rim half from the bottom rim half.



Fig 12-10

9. Clean the interior of the tire to remove any foreign material that could damage the tube.



**Fig 12-11**

10. Thoroughly clean the mating surfaces of each rim half and remove any nicks or burrs that could interfere with proper mating. Inspect the parts for damage and **REPLACE** any damaged rim parts.



**Fig 12-13**

12. Install the tire on the bottom rim half and install the tube in the tire making sure that the valve will align with the opening in the wheel. Install the valve stem.



**Fig 12-12**

11. Lubricate the tire bead and rim flange with a rubber lubricant that is recommended for this application

**NOTE:** Never use silicone or petroleum base lubricants.



**Fig 12-14**

13. Lubricate the other tire bead and rim flange with a rubber lubricant that is recommended for this application and install the top rim half using the marks from Step 6.

**NOTE:** Never use silicone or petroleum base lubricants.





Fig 12-15

14. Inspect all of the rim coupling nuts and studs and replace any that are worn or damaged. Install all of the coupling nuts so the assembly can be turned over.

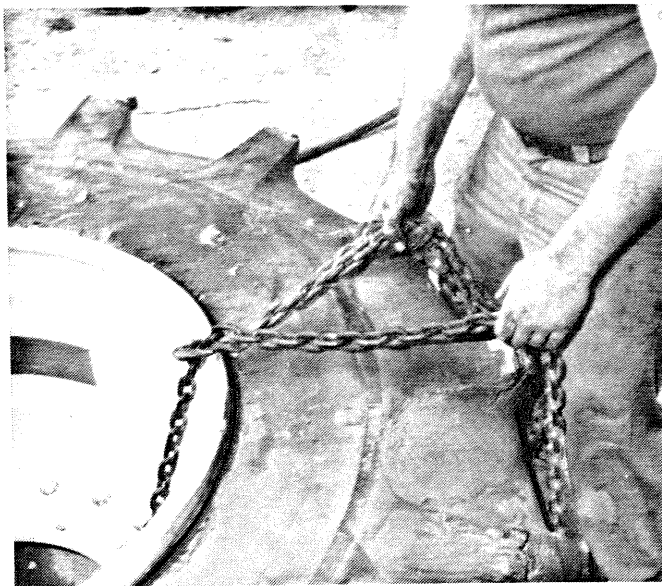


Fig 12-17

16. Securely fasten four sets of tire safety chains through the center of the rim and around the tire.



Fig 12-16

15. Tighten the rim coupling nuts alternately (across the hub opening) to a torque of 575 to 645 N.m (425 to 475 lbf.ft) for 3/4 in - 16 threads or 980 to 1085 N.m (725 to 800 lbf.ft) for 1 in - 14 threads.

**IMPORTANT NOTE:** Recheck the torque on the rim coupling nuts after the first 50 Hours of machine operation.

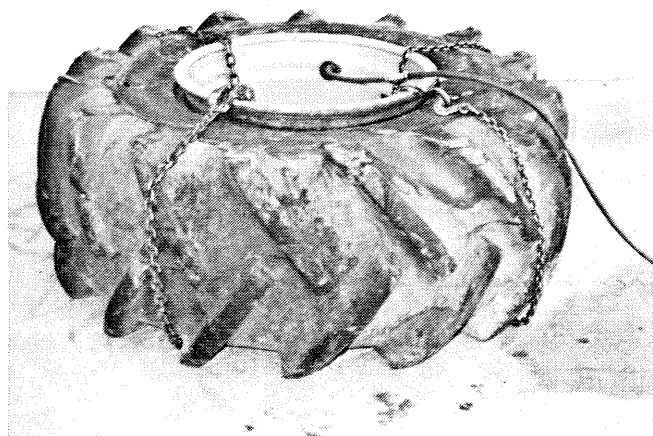


Fig 12-18

17. Attach a self-locking air chuck to the valve stem and inflate the tire to seat the beads. **DO NOT EXCEED 240 kPa (35 PSI) inflation pressure to seat the beads.**



**WARNING:** Stand well away from the tire and rim while it is inflating to avoid serious injury if there should be an explosion.

### Repairing Tires on Single Piece Wheel Rims:

1. Put the machine in the Service Position, SECURELY blocking the wheels.
2. Use a jack of sufficient capacity to jack the machine and securely block the machine in place.
3. Use tire tongs or another suitable tire lifting device to support the rim and remove the wheel stud nuts. Remove the wheel/tire assembly from the machine.

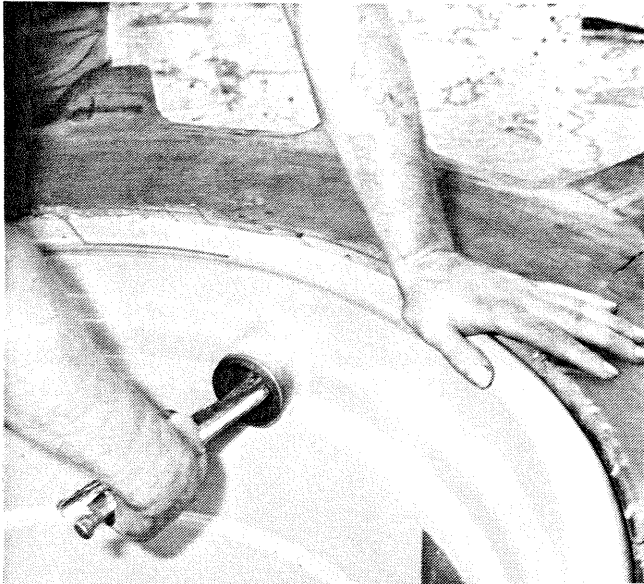


Fig 12-19

4. Remove the valve protection cap and carefully remove the valve stem to deflate the tire and allow the tire to deflate COMPLETELY. Use a piece of tire chalk to mark the tire adjacent to the valve stem as a reference point to locate the cause of the puncture.



Fig 12-20

5. Drive a bead unseating tool between the tire bead and the rim flange taking care not to damage the bead.

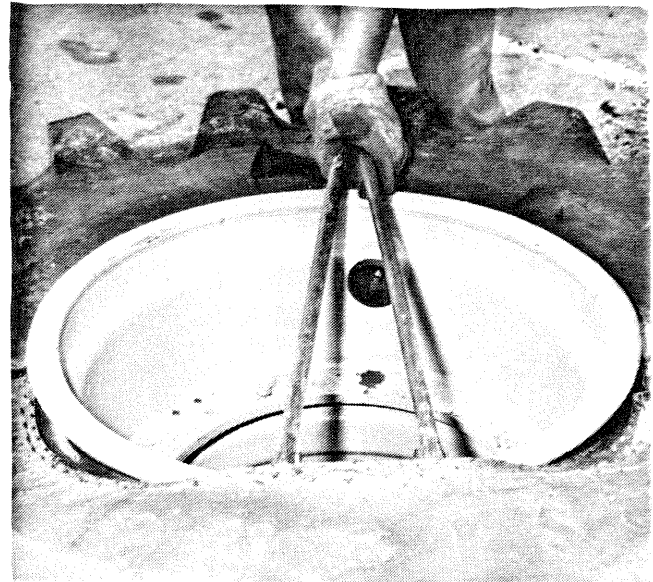


Fig 12-21

6. Use tire irons to pry the bead over the rim flange.



Fig 12-22

7. Leave one tire iron in the original position and pry the bead (in small sections) from the rim flange until the bead is completely unseated.

**IMPORTANT NOTE:** Prying too large a bead section at one time can damage the bead.

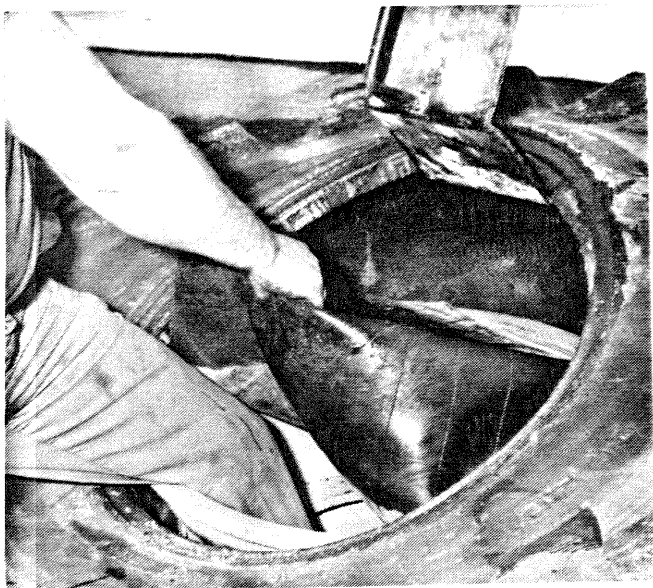


Fig 12-23



Fig 12-25

8. Use a suitable lifting device to lift the tire bead enough to remove the tube. Remove the tube and inspect it to see if it is in good enough condition to repair or if it should be replaced. Repair or replace the tube as required.

10. Install the tube in the tire making sure that the valve will align with the opening in the wheel. Install the valve stem.



Fig 12-24



Fig 12-26

9. Clean the interior of the tire to remove any foreign material that could damage the tire.

11. Lubricate the tire bead and rim flange with a rubber lubricant that is recommended for this application.



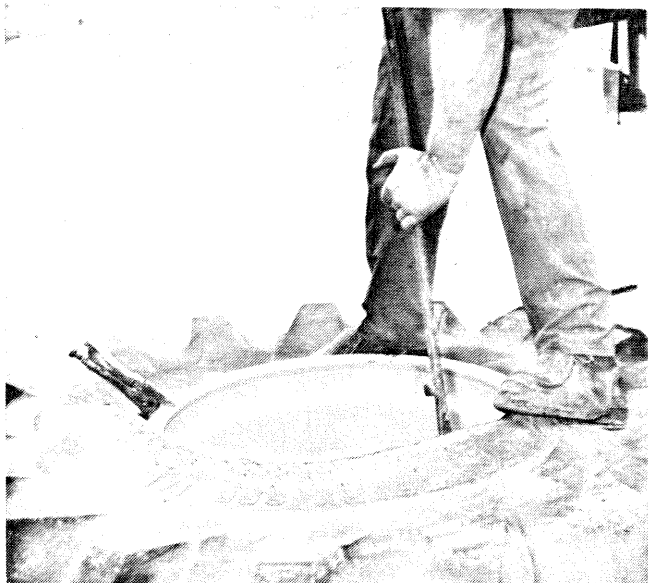


Fig 12-27

12. Use a tire iron to pry the bead onto the rim flange using a self-locking tool to keep the first bead section from unseating.

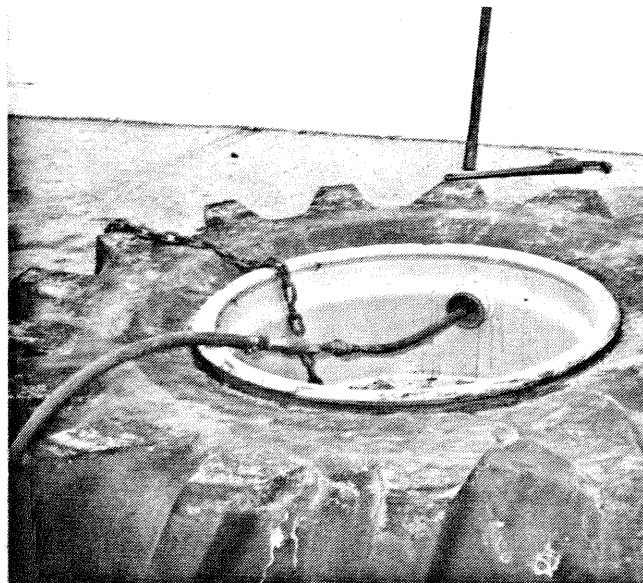


Fig 12-28

13. Attach a self-locking air chuck to the valve stem and inflate the tire to seat the beads. **DO NOT EXCEED 240 kPa (35 PSI) inflation pressure to seat the beads.**



**WARNING:** Stand well away from the tire and rim while it is inflating to avoid serious injury if there should be an explosion.

#### RECOMMENDED PRESSURES

TIRE SIZE	Ply Rating	(Minimum)		(Maximum)	
		kPa	PSI	kPa	PSI
24.5 x 32	10	105	15	140	20
24.5 x 32	12	105	15	170	25
30.5 x 32	12	105	15	140	20
30.5 x 32	16	105	15	170	25

**HYDROINFLATION:** For information on hydro-inflation, see your Ranger distributor

# BRAKES

Every 250 Hours of Operation:

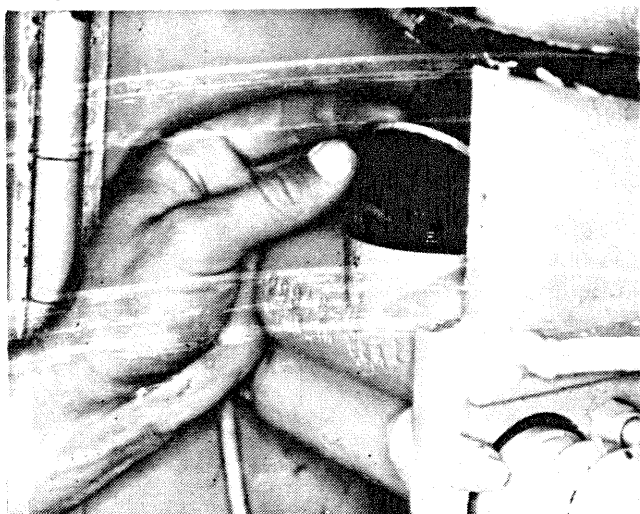


Fig. 13-1

Check the fluid level in the service brake master cylinders located under the access panel on the left side of the firewall. 668C cable and grapple skidders have two service brake master cylinders except 668C cable skidders S/N 505C-101 thru 1312-CAC and 507C-101 thru 1353-CAC which have only one master cylinder in the same location. Maintain the fluid levels to within 6 mm ( $\frac{1}{2}$  in) of the top of each master cylinder. Each master cylinder operates independently from the other and must be serviced as separate systems:

**WARNING: USE ONLY APPROVED AUTOMATIC TRANSMISSION FLUID TO FILL THESE MASTER CYLINDERS.**



Fig. 13-2

Make sure that the vent holes in the filler caps are open at all times. If the holes is plugged, REMOVE the cap, clean the hole and reinstall the cap.

**WARNING: MAKE SURE NO DIRT ENTERS THE RESERVOIR AND CONTAMINATES THE SYSTEM.**



Fig 13-3

Adjust the brake pedal stop and the master cylinder push rods as follows:

**NOTE:** Both adjustments must be done at the same time to ensure proper adjustment. Adjust the brake pedal stop on the firewall until the required dimension of 20,6 cm (8.1 in) is obtained between the master cylinder mounting face and the centre line of the clevis joint that connects the master cylinder pushrod to the brake pedal assembly.

**NOTE:** Make sure that the roller tracks are in contact with the cam followers (See A) when you do this adjustment.

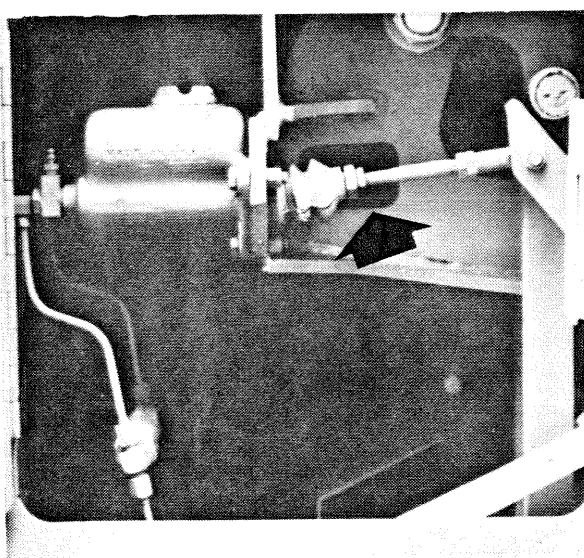


Fig 13-4

Loosen the locknuts on each master cylinder pushrod and adjust each pushrod until 1,5 mm (.06 in) of freeplay exists between the master cylinder pistons and pushrod ends. Tighten the locknuts.

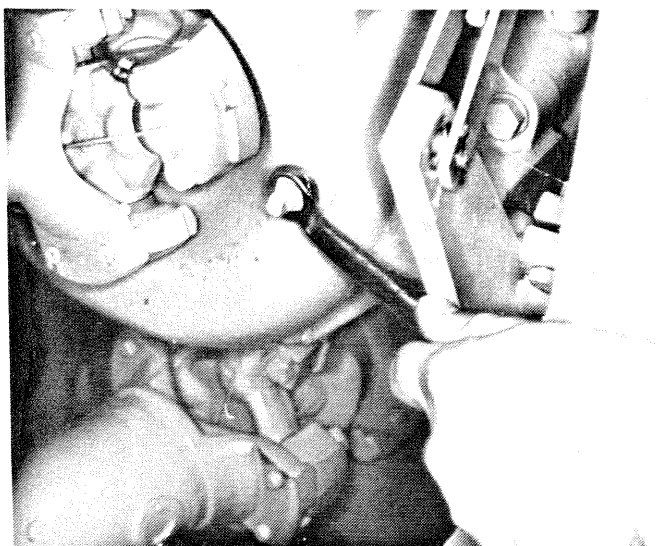


Fig 13-5

Loosen the locknut on the brake adjusting screw.

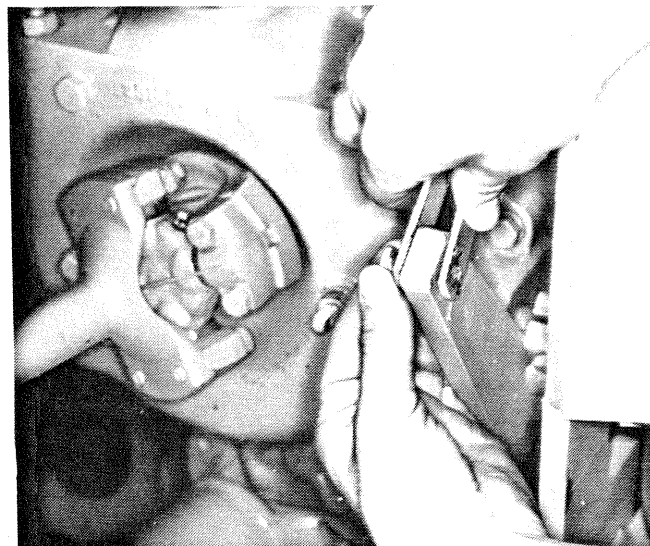


Fig 13-8

Connect the parking brake linkage to the brake lever arm.

**NOTE:** Adjust the midmount brake (if applicable) the same way; however the instructions referring to the parking brake should be omitted. Adjust both brake systems at the same time.

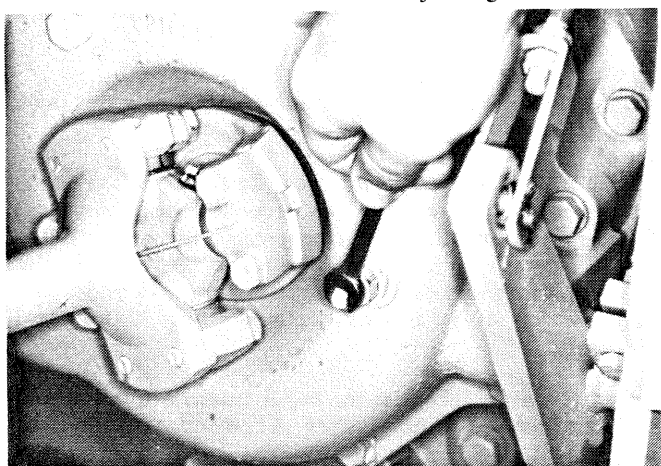


Fig 13-6

Turn the brake adjusting screw until it tightens against the brake yoke.

**Every 250 Hours of Operation:**

If slack develops as the parking brake is applied, adjust the brake cable as follows:

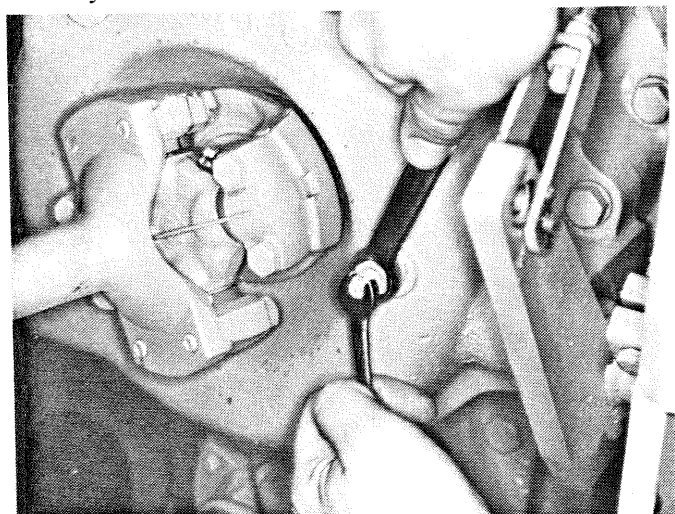


Fig 13-7

Loosen the adjusting screw one turn, hold the adjusting screw and tighten the jam nut.



Fig 13-9

With the parking brake in the released position, turn the acorn nut on the end of the lever clockwise to tighten the cable. Apply the brake lever and recheck the tension.



Adjust the brake pedal stop and the master cylinder push rods as follows:

**IMPORTANT NOTE:** Both adjustments must be done at the same time to ensure proper adjustment.

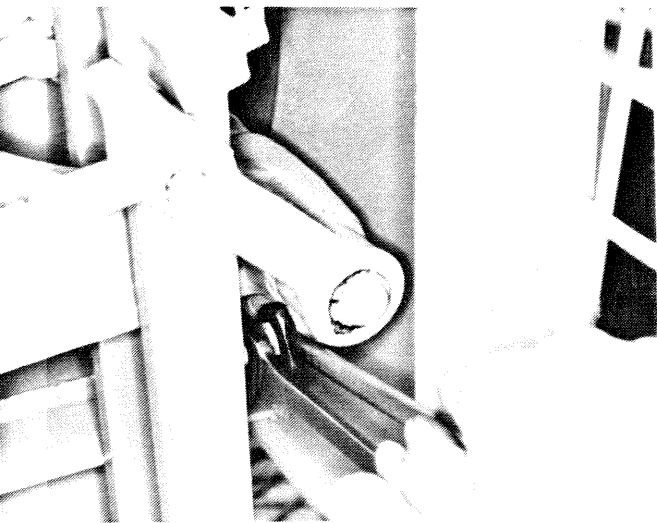


Fig 13-10

Adjust the brake pedal stop until the required dimension of 20,6 cm (8.1 in) is obtained between the master cylinder mounting face and the centre line of the clevis joint that connects the master cylinder pushrod to the brake pedal assembly.

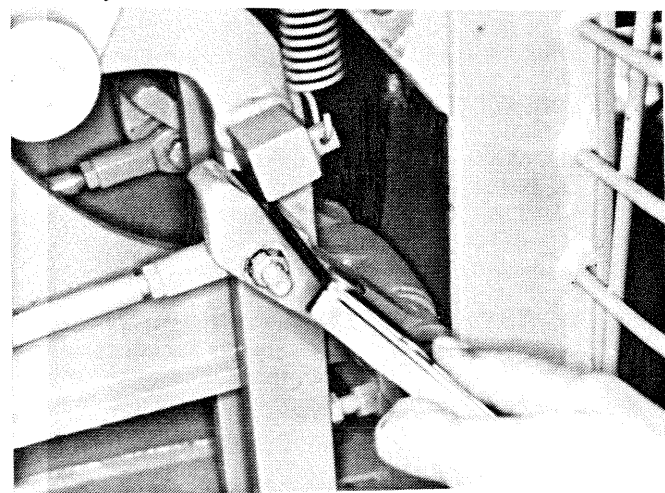


Fig 13-11

Loosen the locknuts on each master cylinder pushrod and adjust each pushrod until gaps of 1,5 mm (.06 in) of freeplay exist between the contact cams and the cam followers. Hold the adjusting nuts and tighten the locknuts.

Check the operation of the brake(s) when you complete these adjustments, if they feel spongy or if the pedal stroke appears to be longer than normal (See Fig 13-16 NOTE), bleed the brakes as follows:

**IMPORTANT NOTE:** The following are **MANUAL** bleeding procedures for 667C machines, Clark **DOES NOT RECOMMEND** the use of a pressure bleeder to bleed the brake systems because of the nature of the actuating fluid, and possible master cylinder damage.

The midmount and transmission brake systems are totally separate fluid systems and should be thought of as two individual systems.

1. Remove the reservoir filler cap(s) and fill with Approved Automatic Transmission Fluid.

**NOTE:** Keep the reservoir(s) full at all times during the bleeding procedure to protect air from entering the system.

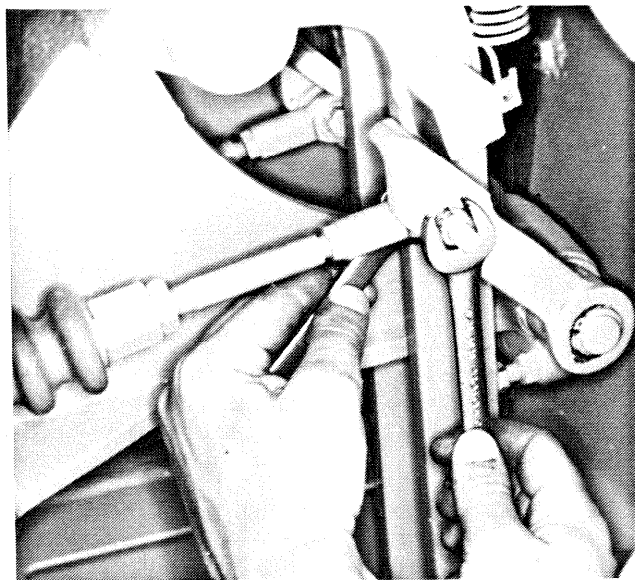


Fig 13-12

2. Disconnect the pushrod clevis from the outer roller track.

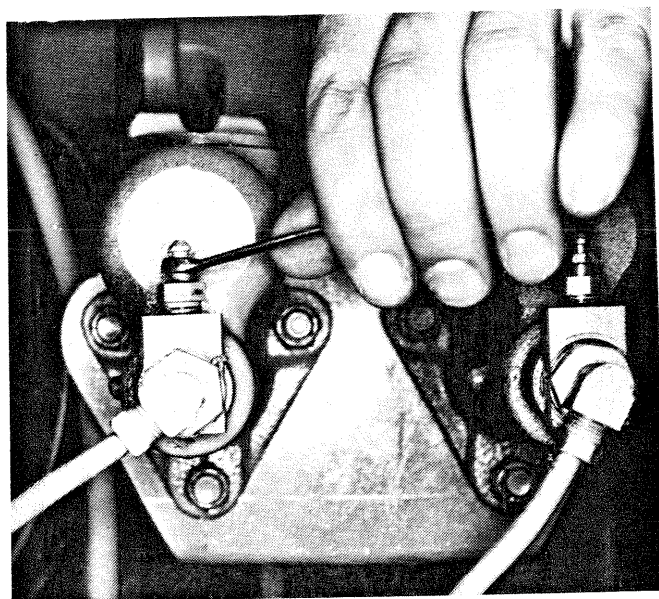


Fig 13-13

3. Have a helper hold the service brake pedal applied and open the bleeder screw on the inner master cylinder until a clear stream of fluid (free of air) flows through it and close the bleeder screw.

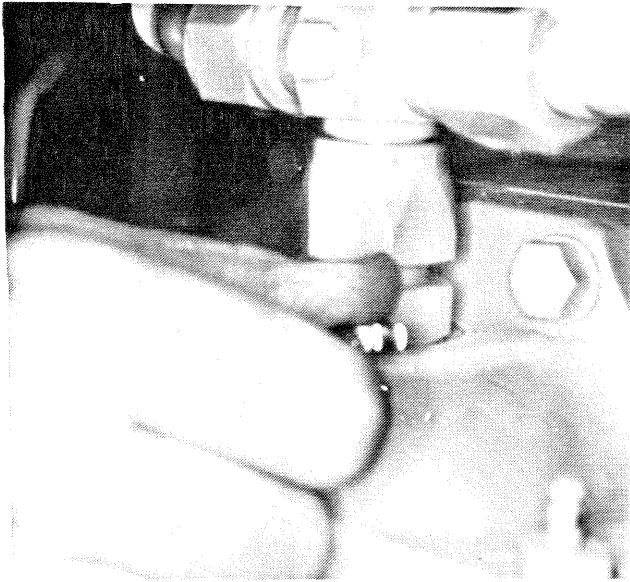


Fig 13-14

4. Repeat the procedure several times with all bleeder screws in the inner system (working toward the brake assembly) making sure to keep the reservoir filled with fluid.

**NOTE:** Allow the pushrod enough time to return by itself (so the oil can replenish the void in the master cylinder because transmission fluid flows slower than brake fluid) before pumping the brake pedal.

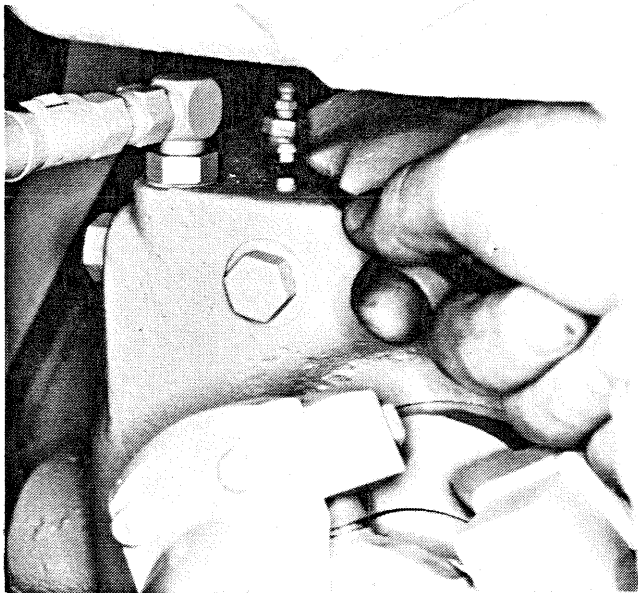


Fig 13-15

5. Reconnect the outer pushrod clevis and disconnect the inner clevis, then bleed the outer system using the same procedure as for the inner system.



Fig 13-16

6. Reconnect the inner pushrod clevis and check the brake pedal for proper operation of the service brake system. If the pedal is not firm, but feels spongy and/or has too long a pedal stroke, air is still present in the system(s) or a mechanical fault exists that must be corrected before proceeding.

**NOTE:** The acceptable pedal stroke is 16,5 cm (6.5 in).

7. Allow the brakes to stand for 20 minutes and recheck the pedal stroke to determine if there is any air left in the system(s). If the pedal stroke is longer than the acceptable value, further troubleshooting is required.
8. Allowing the machine to stand for 8 hours can allow any remaining air in the system to rise from the oil and can be expelled through the master cylinders or to collect at the bleeder ports for easy rebleeding.

### BRAKE SYSTEM TROUBLESHOOTING

The failure of one of the two brake systems will force the remaining system to assume the function of a secondary brake. When this happens, the brake pedal stroke should increase, however, there should be adequate operation to bring the machine to a safe stop.

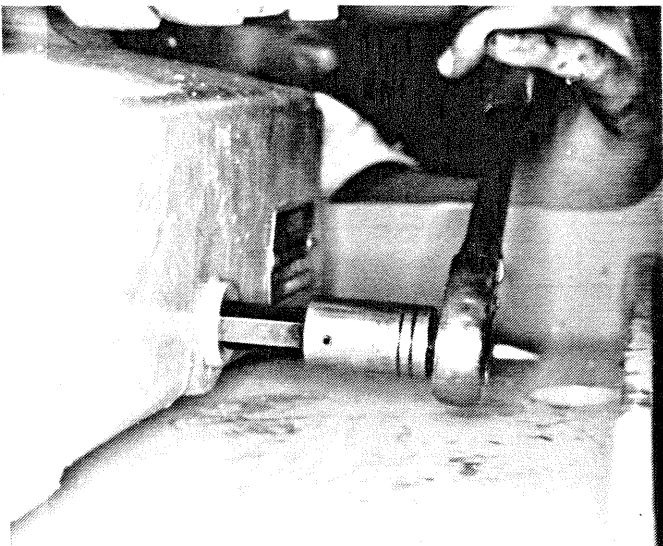
**WARNING:** NEVER operate the machine with only one brake system operative except to bring the machine to a safe stop when the failure of the other system occurs. Find the problem and correct it before continuing.

#### Locate the Problem as Follows:

1. Check the fluid level in each master cylinder reservoir.
2. If one or both reservoirs are empty, check the lines from the master cylinder(s) to the brake housing(s) for leaks. Repair any damage found.
3. Check the master cylinder seals for leaks that would allow oil to leak from the pushrod area, or to leak inside the master cylinder.
4. If there are no visible external leaks, check for leaks inside the brake housing(s).

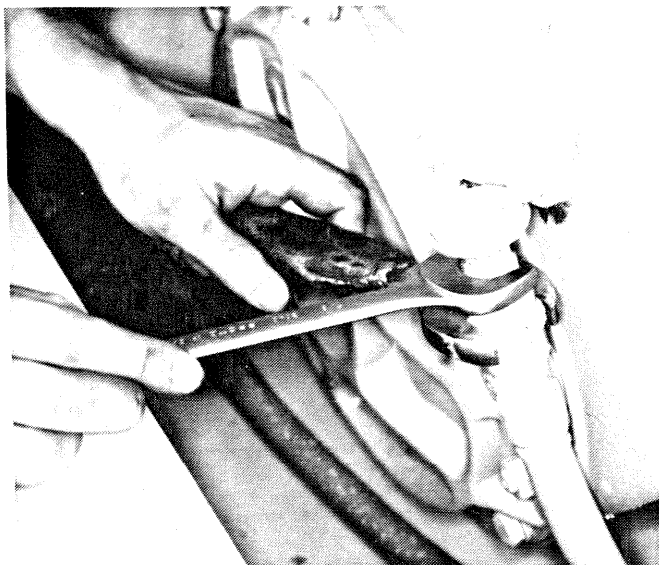
**NOTE:** When the problem has been found and corrected, adjust and bleed the brake systems as shown previously in this section.

**Every 500 Hours of Operation:**



**Fig 13-17**

Drain the midmount brake unit (if applicable). Locate the drain plug at the rear of the brake housing. Remove the drain plug and drain the old fluid into a container of at least 11 l (3 U.S. gal). Install the drain plug and refill the brake unit with Approved Automatic Transmission Fluid until the correct level is reached (See Fig. 13-13).



**Fig 13-19**

When the breather is removed to refill the midmount brake unit, wash the breather in solvent and blow dry it with compressed air. Install the breather.

## This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There is no handwriting or printed text on the page.

## ELECTRICAL SYSTEM

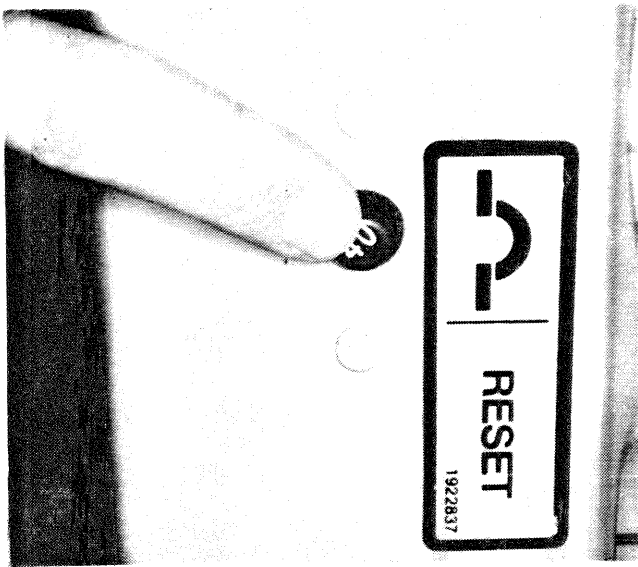


Fig 14-1

The electrical system in the 668C is protected from overload by a circuit breaker located on the right hand side of the instrument panel. If there are sudden surges of current, the circuit breaker will actuate and prevent damage to the system. Push the red button to reset it.

Lights on your machine are located on the front radiator cowling (four) and on the rear of the canopy (four) on the cable skidder and the Esco grapple machine. The tail-lights on the Weldco grapple machine are located on the boom (three) and on the grapple rotating head cover (one). The angles of the beams are adjustable by loosening the mounting nuts and turning the lamp to the desired position.

Replace the lamps by pushing the lamp in and spreading the lip of the rubber retainer.

With the rubber lip spread, remove the lamp, unplug the harness and replace the lamp.

Check and service the batteries as shown in Sec. 4.

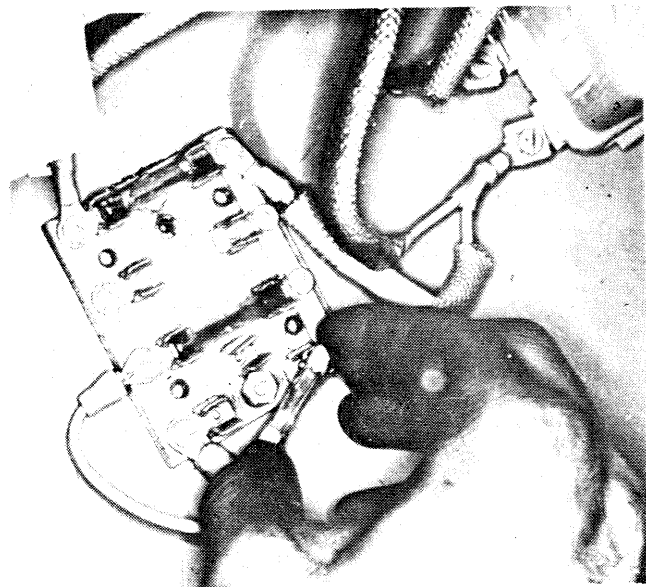


Fig 14-2

Check the fuse box located inside the right side firewall access panel. If you must replace a fuse, replace it with a fuse of the same amperage to prevent damage to the system.

### Every 500 Hours of Operation:

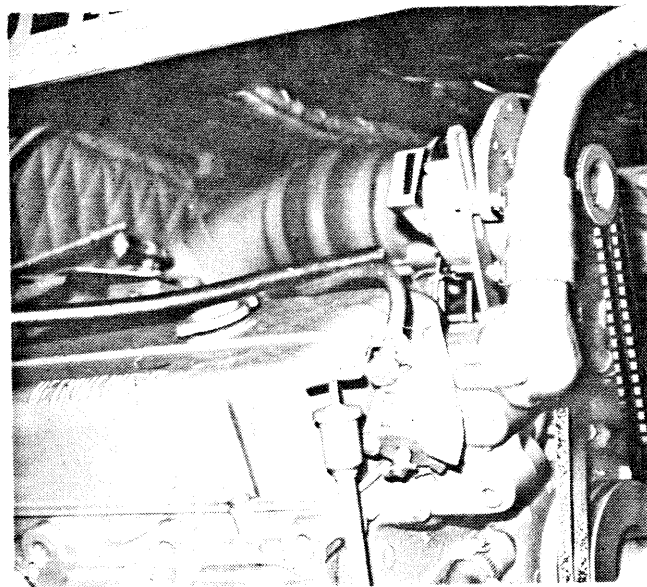
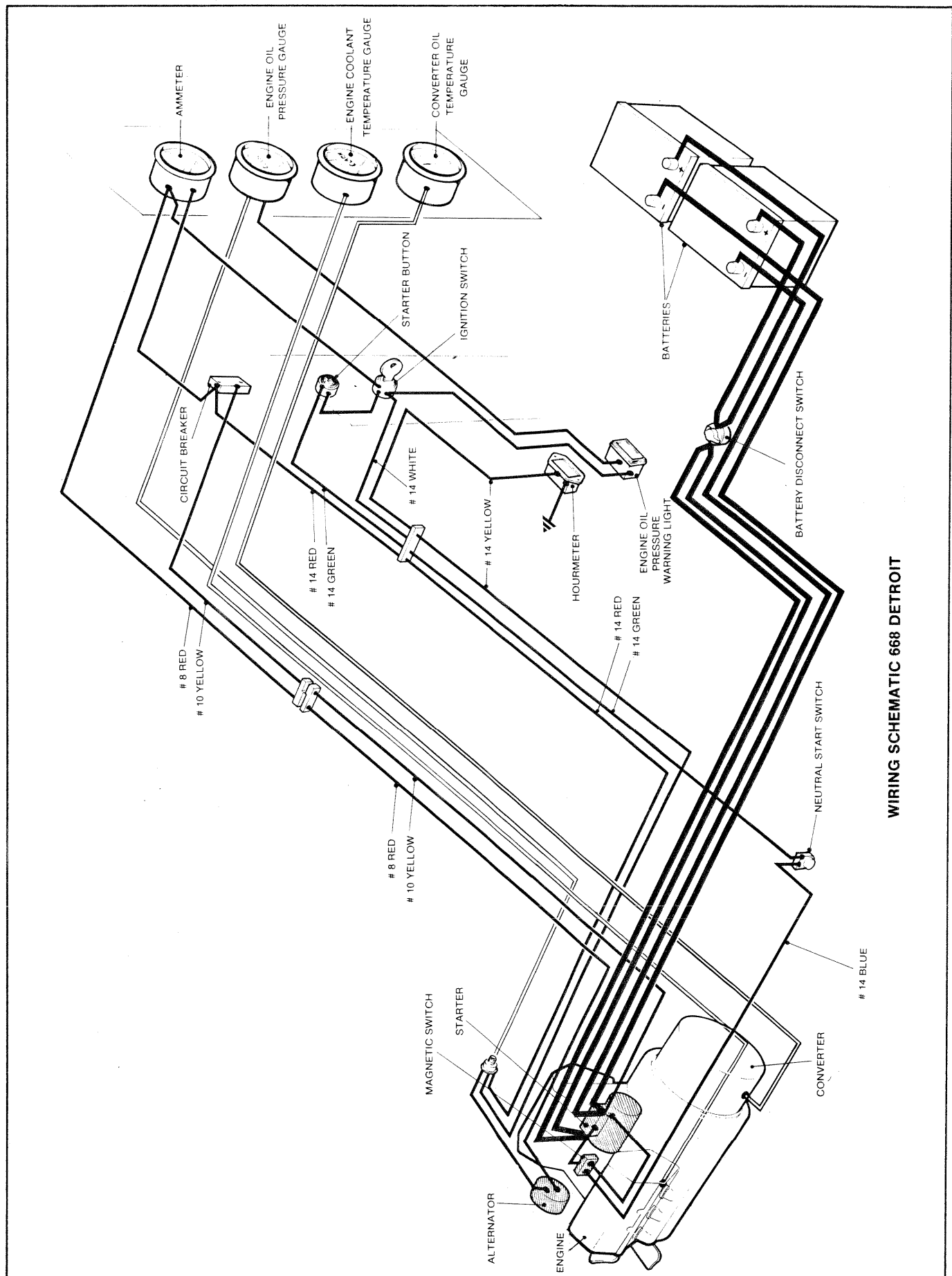


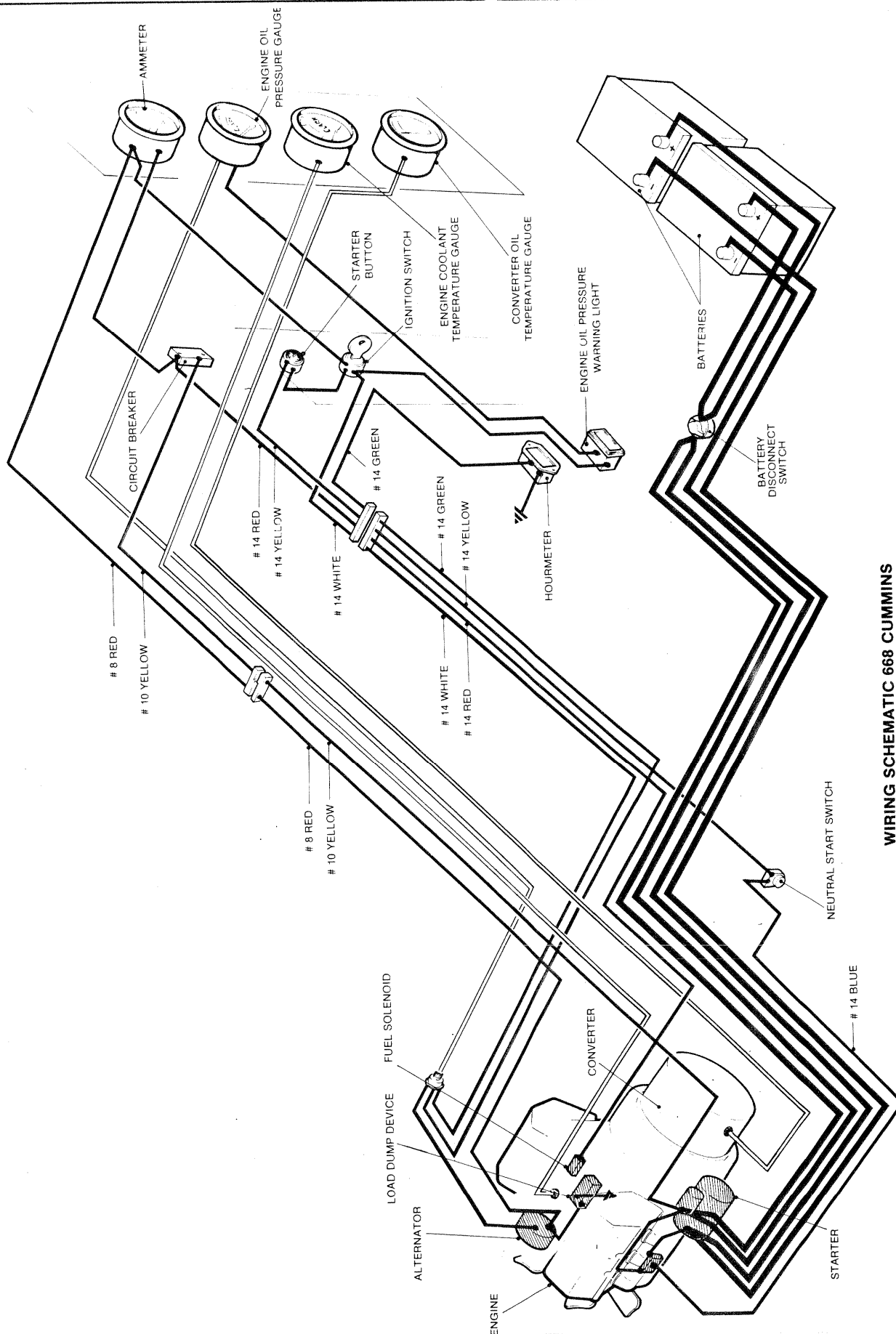
Fig 14-2

Clean the alternator with compressed air or a low pressure spray of water. Both air and water pressure should be no greater than 207 kPa (30 PSI).



WIRING SCHEMATIC 668 DETROIT





WIRING SCHEMATIC 688 CUMMINS

## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## MISCELLANEOUS


### If you must tow the machine:

Put all control levers in their NETRUAL positions.

Remove the driveshafts that connect the front and rear drive axles to the transmission.

**NOTE:** Never separate the propshaft halves because of the balance and wear characteristics of each assembly.

**IMPORTANT NOTE:** With the engine shut down, the transmission/converter charging (lubricating) pump is inoperative. Serious damage to the transmission will result if it is driven by the wheels with no lubrication.

 **WARNING:** ALWAYS fasten the steering frame lock between the frames and install a red warning flag to the canopy upright to indicate that the steering frame lock is fastened.

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

When you replace the driveshafts, use only the special bolts provided and tighten them to the torque specified in Sec. 16.

### If you must transport the machine:

Load and unload the machine on a level surface.

Always center the machine on the trailer bed.

Always put the machine in the Service Position (See Sec. 1).

Use adequate chains, blocks and cables to safely fasten the machine to the floor of the trailer.

Measure the overall height and width of the machine on the trailer.

**NOTE:** It is very important that you know the overall height, width and weight when you transport the machine.

Be especially careful in foggy, dusty or stormy weather conditions.

### If you must store the machine:

Thoroughly steam clean the machine to reduce the chance of fire and use touch-up paint where necessary to prevent rust.

Put the machine in the Service Position (See Sec. 1).

Check all fluid levels as shown in this manual and check the freezing point of the engine coolant. Add fluids as required.

FILL the fuel tank and the hydraulic oil reservoir.

Apply a coating of grease to all unpainted metal parts such as cylinder rods, propshaft splines, valve spools and control linkages. Use a rustproof spray on exposed pin ends and lock plates.

Cover the exhaust opening on the muffler.

Disconnect the ground cable(s) from the battery(ies).

Make a visual inspection for any oil or coolant leaks.

Check the air cleaner and air intake tubes for cracks or damage that would allow foreign material to enter and damage the engine.

Check the condition of the fan belt(s).

Grease ALL lubrication points thoroughly (See Sec. 17).

Remove the ignition key and keep it in a safe place.

Tilt the operator's seat against the handrail and cover the instruments and controls with a waterproof cover.

If possible, raise and block the machine to remove the load from the tires and reduce the tire inflation pressure to 105 kPa (15 PSI) and cover the tires to protect them from sunlight and weather.

If the machine cannot be raised, increase the inflation pressure 35 kPa (5 PSI) above the operating pressure and check the pressure every two weeks to maintain it. The tires should also be covered for protection. Do not leave tires standing on oil or fuel spills or any oil stabilized surface such as blacktop.

**Start and operate the machine every 30 days as follows:**

1. Check to see that the battery(ies) is (are) fully charged and reconnect the ground cable(s) to the negative battery terminal(s).
2. Clean any hardened grease from the cylinder rods.
3. Remove the covers from the tires (and lower the machine if it is raised).
4. Remove the cover from the exhaust opening on the muffler.
5. Start the engine at Low Idle RPM.
6. Check all gauges, lights and circuit breakers for proper operation.
7. Operate the engine at Low Idle RPM for approximately 15 minutes.
8. Release the parking brake and check the operation of the brake system(s) in an area free from obstructions.
9. Operate the transmission in both directions and all speed ranges for at least ten tire revolutions in each direction.
10. Operate the steering, blade (and grapple if applicable) hydraulic systems.

Stop the engine and return the machine to the Service Position (See Sec. 1). Tilt the operator's seat forward and reinstall the waterproof cover. Grease all exposed cylinder rods and check for leaks. Disconnect the ground cable(s), reinstall the cover on the muffler opening and cover the tires.

## This image shows a single page of white paper with horizontal black lines, resembling notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# SPECIFICATION AND SERVICE DATA

Engine	Detroit Diesel	Cummins Diesel
Model	6V-53N	VT-555
Configuration	V6	V8 Turbo
Bore & Stroke, cm (in.)	9,8 x 11,4 (3.875 x 4.5)	11,7 x 10,5 (4.625 x 4.12)
Displacement, l (in <sup>3</sup> )	5,2 (318.6)	9,1 (555)
Maximum Torque, N.m (kgf.m/lbf.ft)	60.3 (61,5/445) at 1500 RPM	60,3 (61,5/445) at 1900 RPM
Gross Power, kW (hp) at governed RPM	156,6 (210)	167,8 (225)
Governed RPM (under full load)	2800	2850
Low Idle RPM	800	800
High Idle RPM	3080	3100
Stall Speed (with hydraulics over relief)	2000-2200	2000-2200
Converter Stall RPM	2350 to 2550	2350 to 2500

**NOTE:** The stall RPM is the maximum obtainable RPM with oil at the operating temperature, brakes applied, the wheels blocked, the directional and speed range shift levers in forward and 3rd and the machine turned full against stops.

The stall speed is applicable to an altitude of 150 m (500 ft) and ambient temperatures of 30°C (85°F). Due to the many combinations of altitude and temperature possible in the field, space does not permit publishing here all the corrections necessary to the stall RPM indicated to accommodate such variations. It is suggested that the engine manufacturer's distributor be contacted to determine the correction necessary for the altitude and temperature in your application.

## ELECTRICAL SYSTEM

**Fuses:** Lights 20 amp

**Lamps:** Font and rear lamps 12 volt

**Instruments:** Panel gauges 12 volt  
Sender units 12 volt

**Alternator:** 1 negative ground  
12 volt 35 amp.

**Voltage Regulator:** 12 volt

**Starting Motor:** 12 volt

## BATTERIES

**Number Required:** 2 (parallel connected)

**Electrical System:** 12 volt

**Grounded Terminal:** Negative

**Hydrometer Test Readings:**  
1.260 - Fully charged  
1.230 - 3/4 charge (fair)  
1.200 - 1/2 charge (recharge)  
1.170 - 1/4 charge (unserviceable)

**NOTE:** Readings between cells must be within 0.050.

**PRESSURE READINGS** - At operating temperatures (See Sec. 1).

## Engine Lube Oil

- At Idle: 69 to 70 kPa (10 to 25 PSI).
- At Operating Speeds: G.M. - 372 kPa (55 PSI).  
CUM - 345 to 517 kPa (50 to 75 PSI).

## Transmission Clutches:

1655 to 1931 kPa (240 to 280 PSI).  
In all speed ranges and directions at engine idle speed.

## Hydraulic Relief Settings:

Cable Skidder - 12410 kPa (1,800 PSI)

Grapple Skidder - 13790 kPa (2,000 PSI) Arch and Grapple Control Valve.  
14479 kPa (2,100 PSI) Steer and Blade Control Valve.

**Model 668 Cummins**

<b>CAPACITIES (Approximate)</b>	<b>Litres</b>	<b>U.S. Gallons</b>
Engine Lube Oil System - Detroit .....	18	4.8
Engine Lube Oil System - Cummins .....	32	8.4
Engine Cooling System - Detroit .....	50	13.2
Engine Cooling System - Cummins .....	52	13.7
Fuel Tank - Cable .....	227	60
Fuel Tank - Grapple .....	273	72
Hydraulic System - Cable .....	75	19.7
Hydraulic System - Grapple .....	95	25.2
Transmission/Converter System .....	38	9.9
Front and Rear Axle Differential (Front Only on Grapple Machines).....	16	4.3
Rear Axle Differential (Grapple Machines) .....	25	6.5
Front and Rear Planetary Hubs (Front Only on Grapple Machines).....	9	2.4
Rear Planetary Hubs (Grapple Machines) .....	7	1.9

<b>BOLT TORQUE CHART, APPLICATION</b>	<b>Thread</b>	<b>N.m</b>	<b>lbf.ft</b>
Front Engine Mount to Engine - Detroit	7/16-14	31-34	23-25
Front Engine Mount to Engine - Detroit	3/8-16	31-34	23-25
Front Engine Mount to Engine - Cummins	1/2-13	77-85	57-63
Front Engine Mount to Pedestal Mount	5/8-18	122-149	90-110
Pedestal Mount to Frame	5/8-11	216-237	159-175
Rear Engine Mount to Engine - Cummins	5/8-11	115-122	85-90
Rear Engine Mount to Engine - Detroit	1/2-13	77-85	57-63
Rear Engine Mount to Frame	5/8-11	122-136	90-100
Torque Converter to Flywheel	3/8-16	31-34	23-25
Transmission Mounting to Transmission	3/4-10	382-420	282-310
Transmission Mounting to Frame	3/4-10	382-420	282-310
Steer and Blade Valve to Seat Plate	1/2-13	77	57
Upper Drive Shaft	3/8-24	54-61	40-45
Lower Drive Shaft	1/2-20	136-149	100-110
Mid-Mount Bearing to Frame	5/8-11	216-237	159-175
* Winch to Frame	1 1/4-7	1152-1356	850-1000
Fairlead to Frame	3/4-10	275	203
* Front Axle to Cradle	1-14	1011-1113	746-821
* Rear Axle to Frame	1-14	1011-1113	746-821
Wheel Nuts	3/4-16	644	475
Split Rim Coupling Nuts	3/4-16	644	475
Alternator Belt Tension	5/16-18	19	14
Hydraulic Pump to Torque Converter	7/16-14	46	34
Firewall to Frame	5/8-11	165	122
Firewall Rails to Shroud and Firewall	5/8-11	165	122
Canopy to Firewall and Frame	5/8-11	165	122
Hydraulic Tank Filter Mounting Bolts	5/16-24	**5-6	40-50

All bolts are grade 8.

The wheel nut spherical seat in the wheel disc must be concentric with the stud — ream if necessary.

**BOLTS NOT LISTED ARE TO BE DRAWN UP TIGHT IN A MANNER CONSISTANT WITH GOOD WORKMANSHIP.**

\*When replacing these mounting bolts, us SAE #30 oil on the threads.

\*\*N.m (lbf.ft)

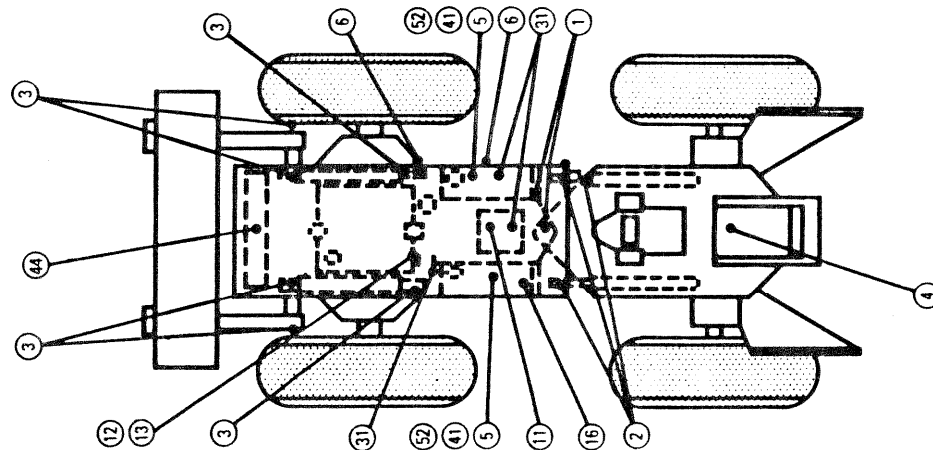


# HOURLY LUBRICATION & MAINTENANCE SCHEDULE

SYSTEM	OPERATION	TEXT LOCATION	INTERVALS					
Engine Cooling System and Accessories	Engine Maintenance	See Engine	•					
	Check & Refill Radiator as Required	Sec. 6	•					
	Check Cooling System for Leaks	Sec. 6		•				
	Check Anti-Freeze Protection	Sec. 6		•				
	Check and Adjust Belt Tension	Sec. 6				•		
	Tighten Air Cleaner Connections	Sec. 6			•			
	Engine By-pass Filter (Cummins Only) 250 hrs.	Sec. 6				•		
	Check Engine RPM	Sec. 6				•		
	Clean Radiator Core	Sec. 6		•				
	Service Air Cleaner Element and Body as Required	Sec. 6				•		
Fuel System	Drain Fuel Tank Sediment	Sec. 7						
	Check Fuel System for Leaks	Sec. 7		•				
	Clean Fuel Tank Filter Cap	Sec. 7		•				
	Check Accelerator Linkage, Adjust as Required	Sec. 7				•		
	Drain & Clean Fuel Tank	Sec. 7						•
Transmission /Converter Hydraulic System	Check Fluid Level Daily, at the Transmission	Sec. 8	•					
	Clean Torque Converter and Transmission Breathers	Sec. 8				•		
	Replace the Filter Element	Sec. 8					•	
	Check System for Leaks	Sec. 8				•		
	Check Converter out Pressure	Sec. 8				•		
	Check & Adjust Transmission Control Linkage	Sec. 8						•
	Drain & Refill Transmission, Converter, Winch, Hydraulic System	Sec. 8						•
	Check Transmission Clutch Operating Pressures	Sec. 8				•		
Winch	Check & Adjust the Clark Winch Free Spool	Sec. 9			•			
	Check Clark Winch Free Spool Wear Button	Sec. 9				•		
Steer & Blade Hydraulic System	Clean Cylinder Rods	Sec. 10		•				
	Check & Adjust as Required							
	Control Valve Relief Pressures	Sec. 10					•	
	Replace Filter Element	Sec. 10					•	
	Drain, Clean & Refill Hydraulic Oil Reservoir	Sec. 10						•
Axles, Propshafts & Pillow Blocks	Check Fluid Level of Differential & Planetary	Sec. 11		•				
	Clean Axle Breathers	Sec. 11					•	
	Drain & Refill Differential & Planetary	Sec. 11						•
	Check For and Repair Drive Line noises	Sec. 11	•					
Wheels & Tires	Check Tire Pressures & Castings	Sec. 12	•					
	Tighten Wheel Nuts & Inspect Rims	Sec. 12		•				
Brakes	Check & Adjust as Required, Brake Pedal & Linkage	Sec. 13					•	
	Check & Adjust Brake	Sec. 13					•	
	Check Fluid Level in Master Cylinder	Sec. 13		•				
Electrical System	Check Lights & Fuses	Sec. 14		•				
	Service the Batteries	Sec. 14					•	
	Clean the Alternator	Sec. 14					•	
	Clean & Tighten the Electrical Connections	Sec. 14					•	
	Inspect, Test, & Lubricate Electrical Units	Sec. 14						•
	Check Cranking Motor Operation	Sec. 14						•

# CLARK

Chassis

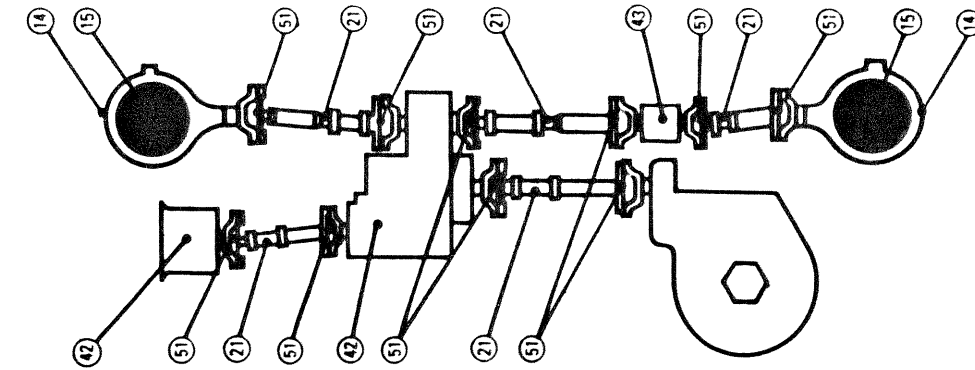


NOTE: THIS DECAL ONLY FOR  
MACHINES WITH TOTALLY  
ENCLOSED MID-MOUNT BRAKE

# RANGER

Lubrication Instructions

Drive Line



ITEM	10 HOUR OR DAILY SERVICE	664	667	668	CHECK	LUBE CHANGE	KEY
1	CRADLE AND HINGE PINS	X	X	X		•	EPMD
2	STEER CYLINDER PINS	X	X	X		•	EPMD
3	UTILITY BLADE & CYLINDER PINS	X	X	X		•	EPMD
4	FUEL TANK	X	X	X		•	DF
5	OIL RESERVOIR	X	X	X		•	DX
6	COOLANT LEVEL	X	X	X		•	
<b>50 HOUR OR WEEKLY SERVICE</b>							
11	TORQUE CONVERTER & TRANSMISSION	X	X	X		•	DX
12	MASTER CYLINDER ENCLOSED SERVICE BRAKE	X	X	X		•	DX
13	MASTER CYLINDER EMERGENCY BRAKE	X	X	X		•	DX
14	DIFFERENTIAL	X	X	X		•	EPGL
15	PLANETARY	X	X	X		•	EPGL
16	WINCH LEVER	X	X	X		•	EPMD
<b>100 HOUR OR 2 WEEK SERVICE</b>							
21	SLIP JOINT	X	X	X		•	EPMD
<b>250 HOUR OR MONTHLY SERVICE</b>							
31	TORQUE CONVERTER & TRANSMISSION FILTER	X	X	X		•	
<b>500 HOUR OR 2 MONTH SERVICE</b>							
41	HYDRAULIC TANK FILTER	X	X	X		•	
42	TORQUE CONVERTER & TRANSMISSION	X	X	X		•	DX
43	ENCLOSED MIDMOUNT BRAKE	X	X	X		•	DX
44	CLEAN RADIATOR CORE	X	X	X		•	
<b>1,000 HOUR OR 6 MONTH SERVICE</b>							
51	UNIVERSAL JOINTS	X	X	X		•	EPMD
52	OIL RESERVOIR	X	X	X		•	DX

## Lubricant Key

EPMD	Extreme Pressure Multi-Addendum Dispersible Grease		DF	Diesel Fuel — See Engine Manual	
	Ambient Temp Range	SAE Grade / API Class		Ambient Temp Range	Extreme Pressure Grease Lubricant
DX	Above -23°C (-10°F) 71	10W CC	EPGL	Below -23°C (-10°F)	SAE Grade 75
		10W CC		-18°C to -23°C (-10°F to -10°F)	SAE Grade 80
		Automatic Transmission Fluid		-18°C to -38°C (-10°F to -100°F)	SAE Grade 90
	Above -34°C (-34°F)	Automatic Transmission Fluid		Above 38°C (100°F)	SAE Grade 140
	Above -54°C (-65°F)	CONOCO DM 600 Ford			

\*\*SCI signifies SUELO CHLORIDE lead type active full is made with 90 SCI type lube. It is recommended that the same type be used when adding or refilling.

1929732

## SERVICE PUBLICATIONS

The following Service Publications may be obtained by submitting a purchase order to your local Ranger Distributor, along with the description and quantity of the publication required, and a MACHINE SERIAL NUMBER the books are to be used for.

Prices may be obtained from your Distributor. Where manuals have been updated and a new number assigned, the latest issue will be sent.

## SHOP MANUALS

The following manuals are the concerned with disassembly and reassembly of Ranger Log Skidder component parts.

**NOTE: Component Parts on your particular machine may be found by observing your copy of the Machine Record Card, or, by contacting your Local Distributor.**

	Manual No.
R-28320 Series Transmission .....	2485
R-28320 Hydraulic Brake Supplement .....	HB-280
C-270 Series Torque Converter .....	2249
FD-30,001, 30,600, 36,500, 37,500, RD-30,500, 30,600, RD-36,500, 37,500 Series Drive Axle .....	6957
Enclosed Mounted Brake .....	6960
Cylinders .....	3275

## ENGINE MANUALS

If additional Engine manuals are required you will have to contact your local Engine Distributor giving him the engine model, and serial number, to obtain a parts, operators or maintenance manual.

## PARTS & OPERATORS MANUALS

	Manual No.
ALL PARTS MANUALS .....	See Note
ALL OPERATOR'S MANUALS .....	See Note

**NOTE: These manuals are to be ordered by specific machine serial number only.**

All new Ranger Log Skidders have a Service Publication package consisting of one Parts, Operators, Preventive Maintenance and Engine manual mailed to the Distributor to be delivered to the customer purchasing the new machine on a no-charge basis.

Manuals in addition to one Service Publication package for each new machine will have a charge applied.

## MACHINE DATA

Model \_\_\_\_\_ Serial No. \_\_\_\_\_ Unit No. \_\_\_\_\_  
 Engine \_\_\_\_\_ Serial No. \_\_\_\_\_  
 Distributor \_\_\_\_\_  
 \_\_\_\_\_  
 Telephone \_\_\_\_\_ Parts Manager \_\_\_\_\_ Service Manager \_\_\_\_\_

**INTENTIONALLY BLANK**