

RANGER

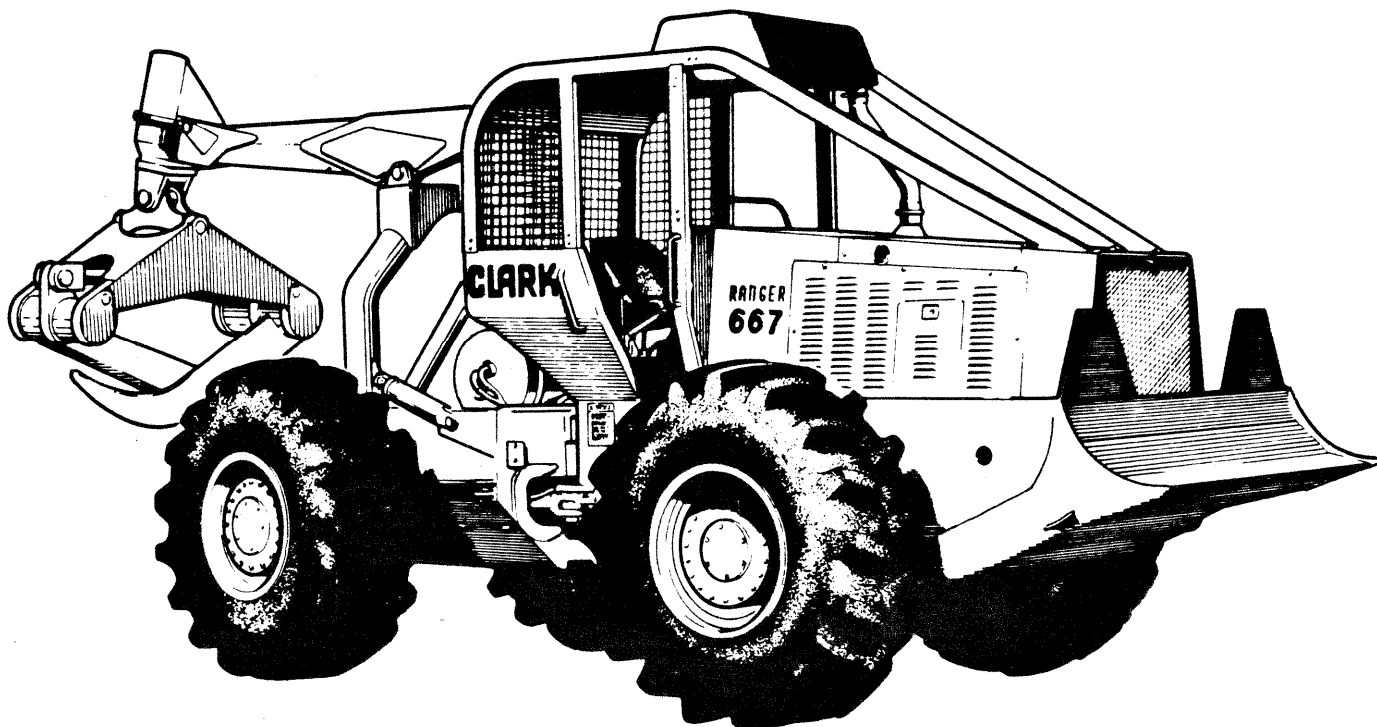
667C LOG SKIDDER OPERATORS MANUAL

PUBLICATION NO. 6401-R1

**FOR MACHINE
SERIAL NUMBERS**

**667C CABLE DETROIT 503B 534B AND 534C
667C CABLE CUMMINS 504B, 504C AND 535A
667C GRAPPLE DETROIT 509B, 536B AND 536C
667C GRAPPLE CUMMINS 510B, 510C AND 537A**

**RECORD YOUR MACHINE
SERIAL NUMBER HERE**



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 for 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. The Clark Michigan Company does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Michigan Company.

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 the Clark Michigan Company 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 the Clark Michigan Company, 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.

NOTES

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NOTES

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 Clark Power Shift, 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 with further reduction 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. Read and understand the instructions in this manual **BEFORE** you attempt to operate this machine. Any problems and/or adjustments not in this manual can be handled by the Service Department at your Ranger Distributor.

A number of 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 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). These temperatures will 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 transmission control levers in the FORWARD and THIRD positions, stalling the converter with the service and parking brakes applied and the wheels blocked. Stall the converter at one third throttle until the converter temperature reaches the operating range.

Warm the hydraulic oil as follows:

With the engine operating between 1400 and 1500 RPM, raise the blade and hold the lever in the RAISE position to bring the main hydraulic system over relief pressure, for five seconds every 10 seconds.

NOTES

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. Allow only trained operators to use the machine.
2. ALWAYS obey ALL safety decals; they are there for your protection and the protection of those around you.
3. NEVER wear jewellery or loose fitting clothing such as scarves, loose cuffs or fringed jackets.
4. Know and understand all the safety equipment on your job site and use it when you need it.
5. Know and understand all the hand signals used on the job and always obey the signalman.

Before you enter the operator's compartment, 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 mal-functions.
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. Remove the steering frame lock and fasten it in position on the rear frame.

As you enter 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. Check the seat belt for wear or damage and replace the belt if necessary.
3. Remove or secure all maintenance or personal items such as lunch boxes, chains, and tools.

4. Adjust the operator's seat to allow convenient access to all control levers and pedals.

5. Fasten the seat belt.

As you start the machine, observe the following instructions:

1. ALWAYS apply both the service brake and the parking brake before you start the machine.
2. Start the engine from the operator's seat only.

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 secondary (if applicable) brake systems against the power of the engine and report or repair any problems.

When you are operating the machine (See Sec. 5), observe the following instructions:

1. 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.
2. NEVER leave or enter the operator's compartment when the machine is moving.
3. Be careful not to strike persons or vehicles with the machine.
4. Be careful when operating the machine on steep grades to avoid sudden tipping.
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. NEVER carry passengers in your machine; there is only one seat and it should carry only one person.

SEC. 2

8. Take special care when operating in wet or icy conditions.
9. NEVER use the blade as a brake when travelling.
10. NEVER travel in the NEUTRAL mode when you operate on a grade.
11. ALWAYS operate your machine at speeds that are safe for the conditions of each job.
12. ALWAYS actuate the parking brake and lower the blade when you park the machine. Block the wheels when you park on a grade.
13. At the end of the work shift, or when the machine is not to be operated, turn the battery disconnect switch and the fuel shut-off valve to the OFF position.
14. Do not leave your machine with any hydraulic implements (blade or grapple assemblies) in their raised positions.

The Service Position

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:

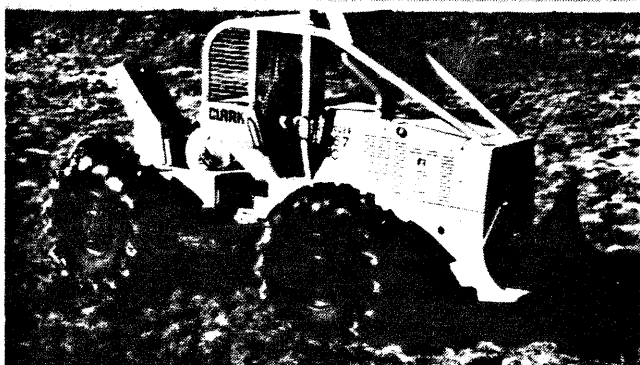


Fig 2-1

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

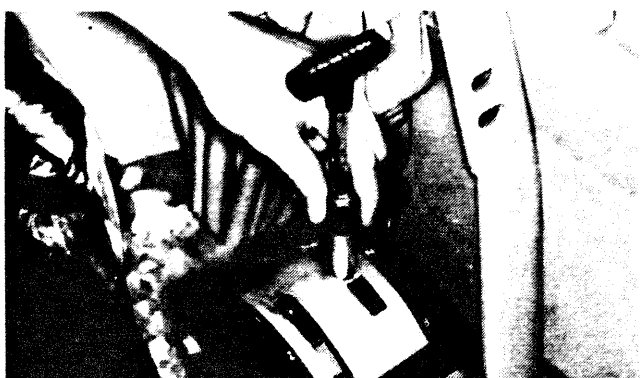


Fig 2-2

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

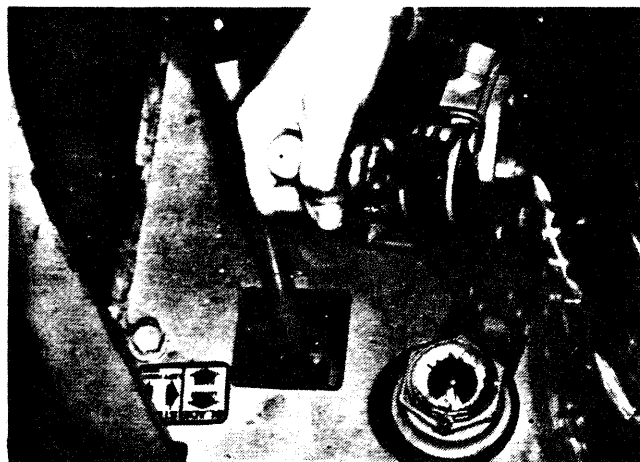


Fig 2-3

3. Actuate the parking brake.

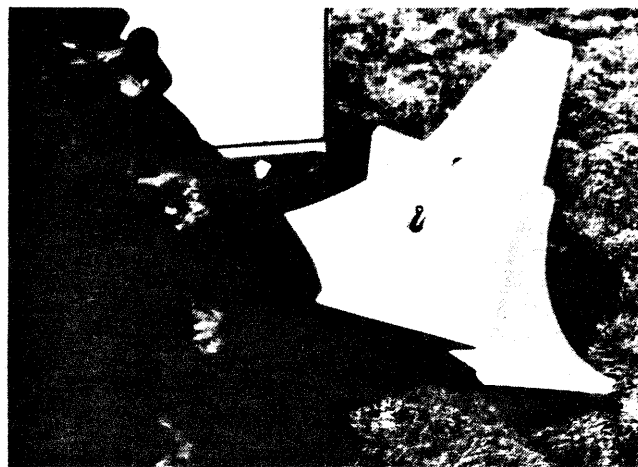


Fig 2-4

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

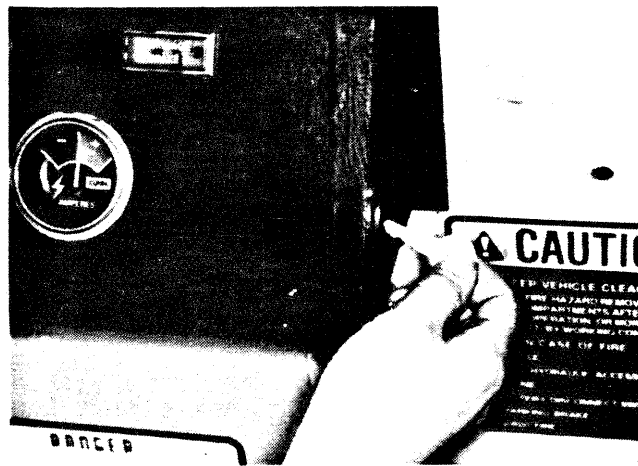


Fig 2-5

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



Fig 2-6

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

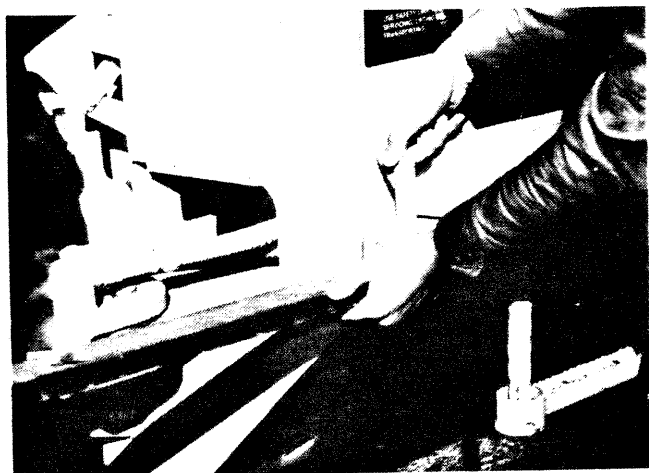


Fig 2-7

7. Fasten the steering frame lock between the frames.

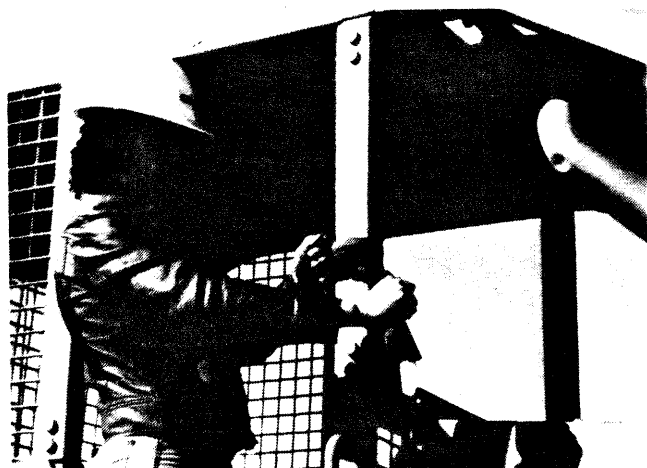


Fig 2-8

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



Fig 2-9

9. Block the tires.



Fig 2-10

10. Turn the fuel shut-off valve to the OFF position.

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 extinguishers 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 667C 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 turbo-charged 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 at the front of the operator's seat. Remove the keeper pins around the front windshield 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:

Winch Control Lever

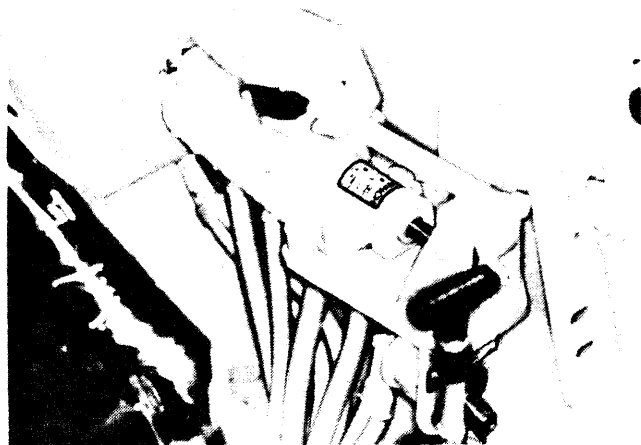


Fig 3-1

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 load to the machine's butt pan. When the lever is in the centre **LOCK** position the cable drum is held in the **SKIDDING** mode and the load can be transported to its destination.

Direction Control Lever



Fig 3-2

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 Sleeve

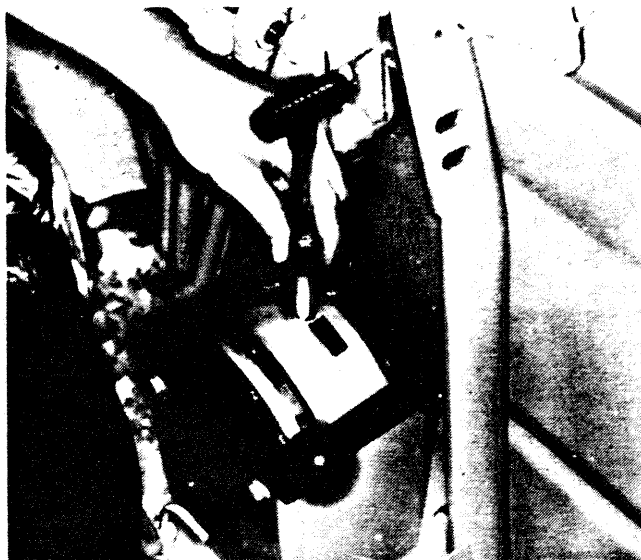


Fig 3-3

Push the sleeve around the **Direction Control Lever** into the groove in the shift console when the lever is in the **NEUTRAL** position to lock the lever in that position.

Speed Range Control Lever

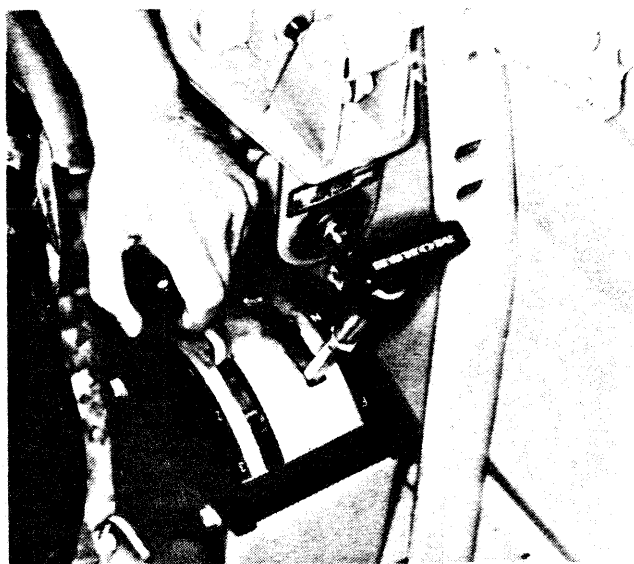


Fig 3-4

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 put on the engine when the machine is pulling a load.

Battery Disconnect Switch



Fig 3-5

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 arc welding on the machine.

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.

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

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

Steer and Blade Control Lever

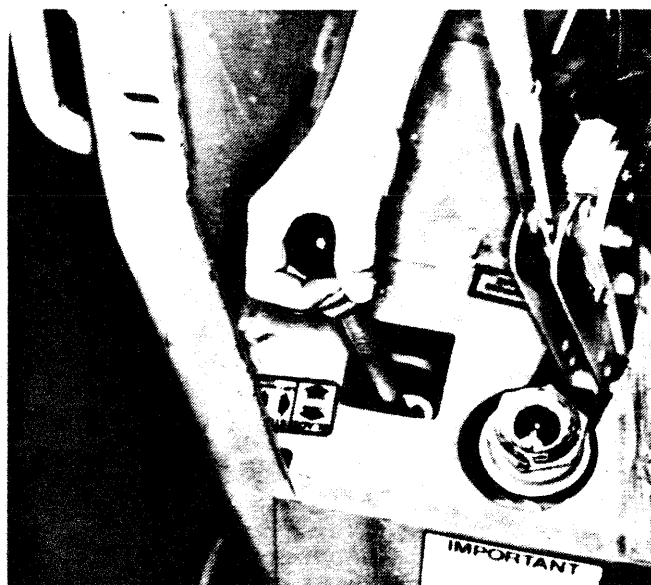


Fig 3-6

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, lifts the blade and pushing it straight forward, lowers it.

Parking Brake Lever

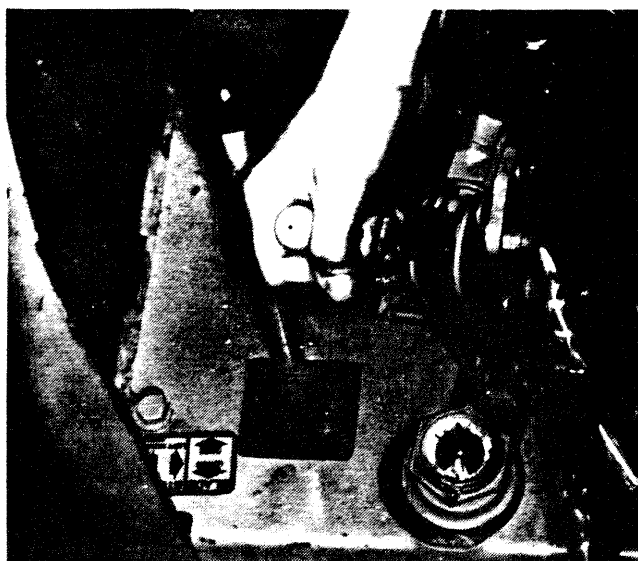


Fig 3-7

Pull this lever up and back to actuate the parking brake mechanism. An indicator light on the instrument panel of 666D machines glows to indicate the parking brake is actuated when the ignition switch is in the ON position.

Arch, Boom, and Grapple Control Levers



Fig 3-8

The Arch Control moves the arch forward and back to position the grapple assembly, the Boom Control raises and lowers the grapple assembly to position the load, the Grapple Rotating Control rotates the grapple assembly to the left and right to position the load on a pile of logs, and the Grapple Control opens and closes the grapple arms to pick up or drop the load.

IMPORTANT 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.

The instruments and controls on the instrument panel from left to right are as follows:

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.

Engine Oil Pressure Warning Light

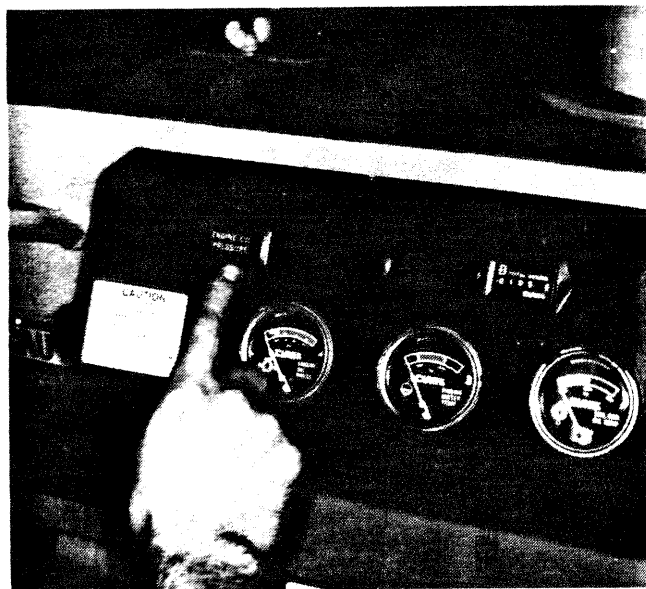


Fig 3-10

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.

Engine Oil Pressure Gauge

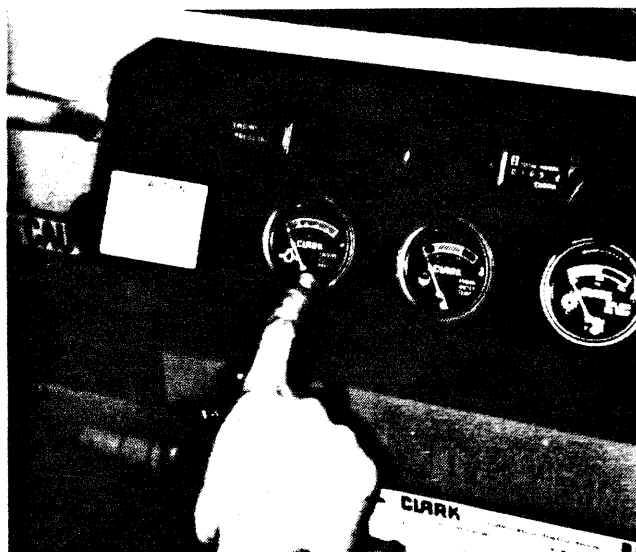


Fig 3-11

This gauge allows the operator to monitor the operating pressure of the engine lubrication system. After 15 seconds of operation, the gauge should read 10 PSI minimum at low idle RPM. If the pressure is below 10 PSI, shut down the engine immediately and determine the cause.

Water Temperature Gauge

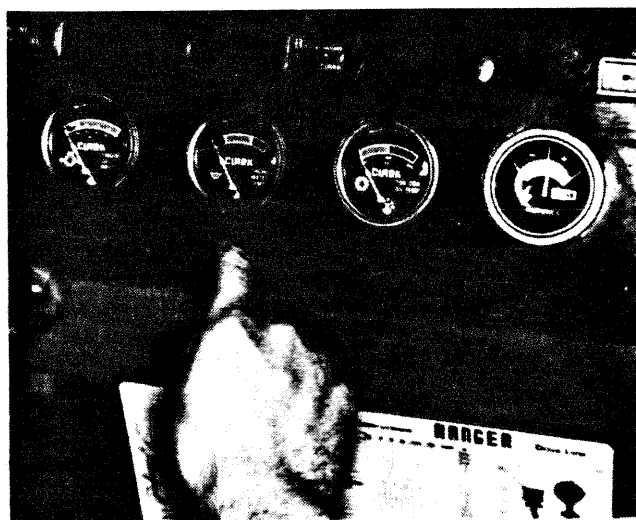


Fig 3-12

The 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 be restricting air flow.

Hourmeter



Fig 3-13

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

Converter Temperature Gauge

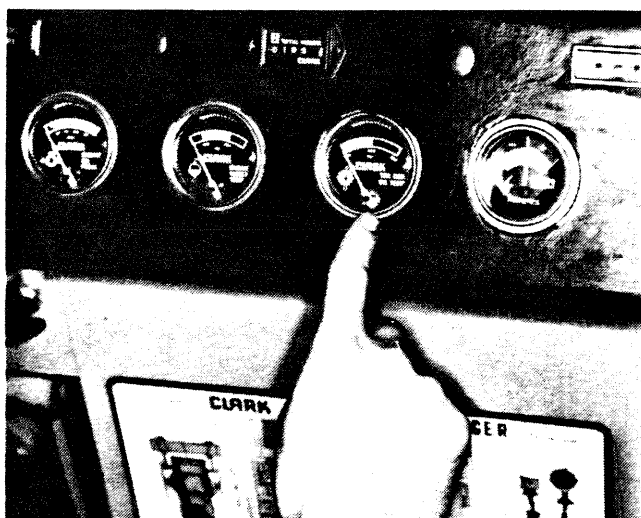


Fig 3-14

This gauge allows the operator to monitor the temperature of the converter/transmission operating fluid. DO NOT allow the indicator needle to enter the red zone on the gauge or serious damage to the system can result. If the system begins to overheat, choose a lower transmission speed range. If the system continues to overheat, stop the engine and determine the cause (See Sec. 8).

Ammeter

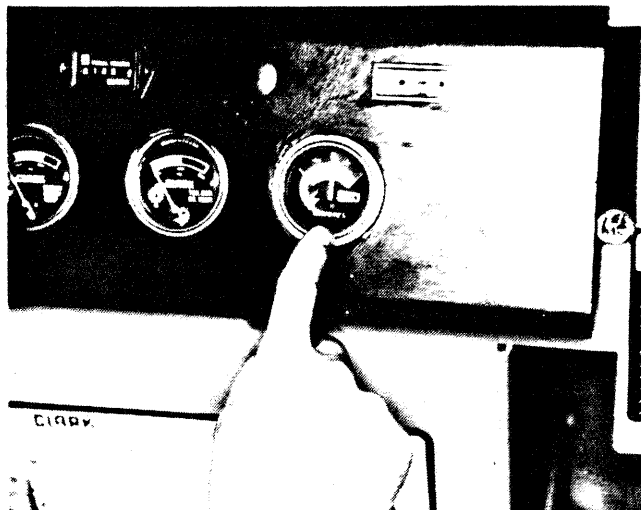


Fig 3-15

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, the electrical charging system will have to be checked for faults.

Parking Brake Light



Fig 3-16

This light glows to indicate that the parking brake is actuated. The lever must be released before the machine can be moved.

Ignition (Key) Switch (and Starter Button)

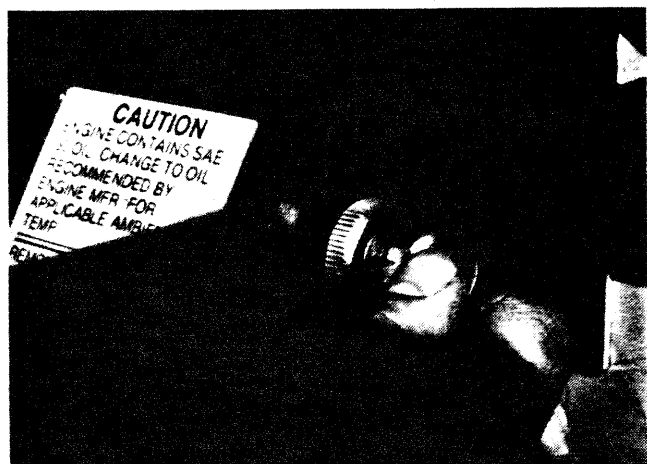


Fig 3-17

Insert the key into the Ignition Switch, put the Direction Control Lever in the NEUTRAL position, and turn the key to the (ON) position to start the engine. If, for any reason, the engine stops cranking while starting, push the circuit breaker inside the engine compartment (See Sec. 14) and try again. If the engine will not crank, further troubleshooting may be required.

NOTE: Older 667C machines have a Starter Button adjacent to the ignition switch. Turn the Ignition Switch to the (ON) position and push the button until the engine starts and release it.

Hand Throttle

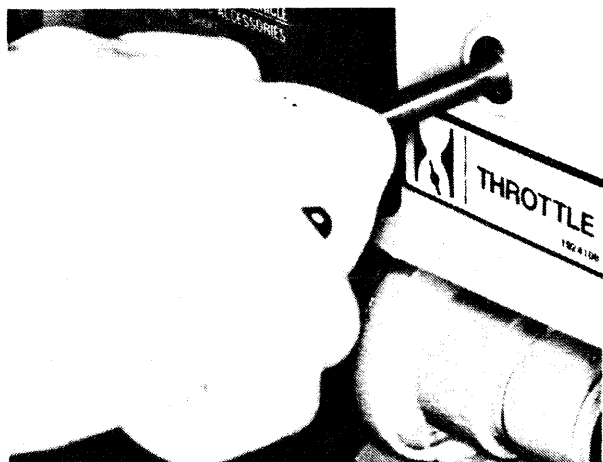


Fig 3-18

Pull the handle out until the desired engine speed is reached and turn the handle clockwise to lock the control in the desired throttle position for a constant engine speed. Turn the handle counterclockwise to release the control and push the handle in to return the engine to low idle RPM.

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

Auxiliary Steering Light



Fig 3-19

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

Auxiliary Steering Control Switch



Fig 3-20

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.

Emergency Brake Lever



Fig 3-21

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

WARNING: DO NOT operator 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.

IMPORTANT NOTE: Because this brake system is not used regularly, it should be operated before each work shift to prevent the parts from seizing due to lack of use.

Engine Stop Handle (Detroit Diesel Only)



Fig 3-22

Pull this handle toward you to stop the engine. When the engine has stopped, turn the ignition (key) switch to the OFF position, and push the engine stop handle in. The engine cannot be restarted with the handle pulled out.

NOTE: Older 667C machines with the single service brake system (See Sec. 13) only are equipped with this brake system.

Accelerator Pedal



Fig 3-23

This pedal is located on the floorboard on the right hand side of the firewall and controls the engine throttle. Depress the pedal to increase the speed of the machine, and release it to decrease the speed.

Service Brake Pedal



Fig 3-24

This pedal is located on the floorboard on the left hand side of the firewall and controls the hydraulic brake system(s). Depress the pedal to decrease the speed of the machine or to stop the machine completely.

Seat Adjustment Lever



Fig 3-25

This lever is located at the side of the operator's seat and allows the operator to position the seat for his operating comfort.

Fire Extinguishers



Fig 3-27

Your machine is equipped with two 2.3 kg (5 lb) hand operated fire extinguishers mounted inside the operator's compartment behind the seat. Read and understand the instructions printed on the canister and learn how to remove the canisters from the mounting brackets in the shortest possible time and how to operate them.

Seat Belt



Fig 3-26

ALWAYS fasten your seat belt when operating the machine. Adjust the belt so that it fits snugly around the hips.

Instruction Plates and Decals

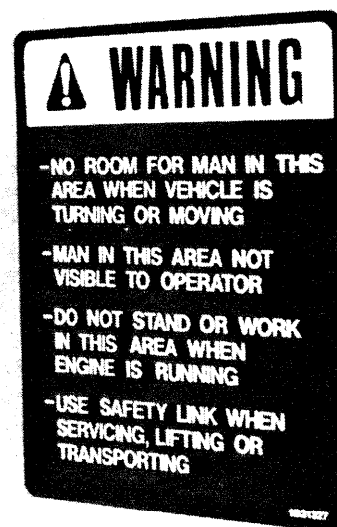


Fig 3-28

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

NOTES

STARTING INSTRUCTIONS

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

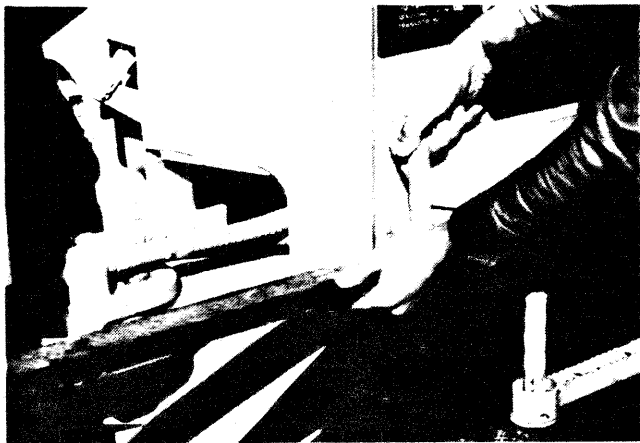


Fig 4-1

1. Put the machine in the Service Position (See Sec. 2).



Fig 4-2

2. Check the engine oil level.



Fig 4-3

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

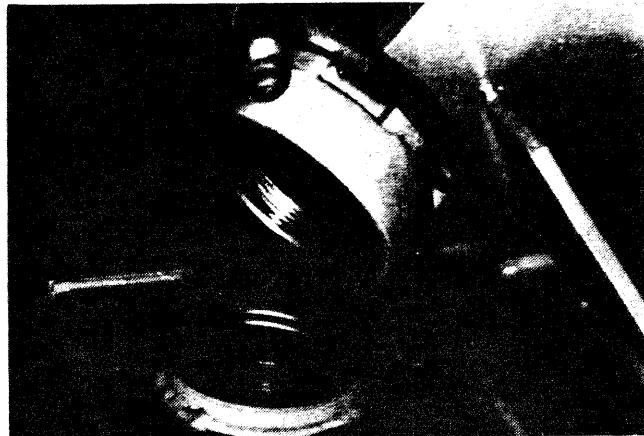


Fig 4-4

4. Check the fuel level.

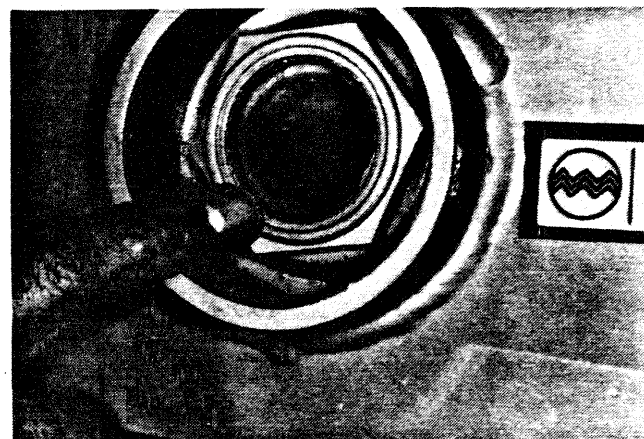


Fig 4-5

5. Check the engine coolant level.

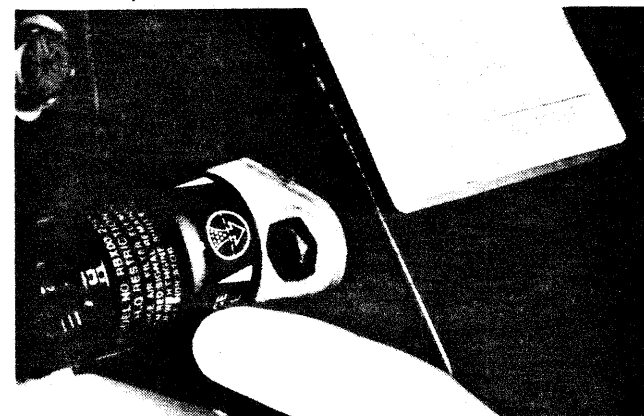


Fig 4-6

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

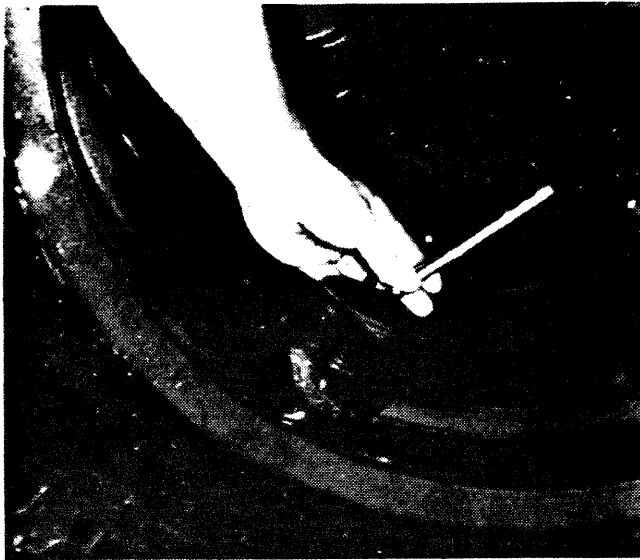


Fig 4-7

7. Check the tire pressures.

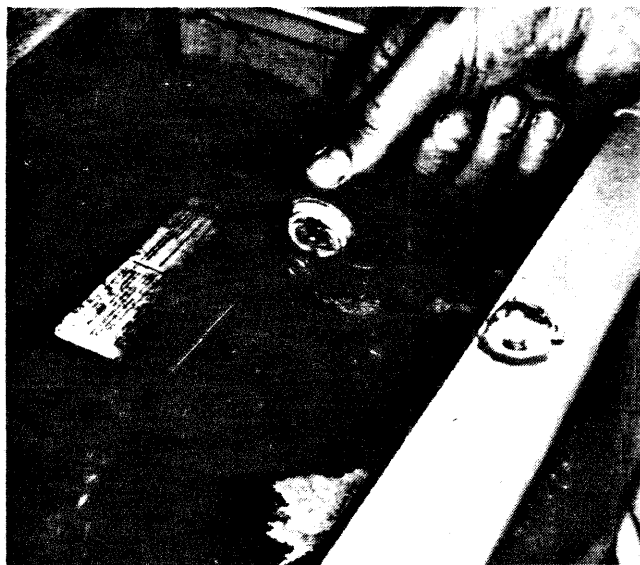


Fig 4-8

8. Check the battery electrolyte levels.

! WARNING: DO NOT smoke while servicing the batteries. Batteries give off flammable gases.

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 immediate area BEFORE you enter the operator's compartment.

Normal Starting Procedure (If temperatures are above 5°C (40°F).



Fig 4-9

1. Turn the fuel shut-off valve to the ON position.

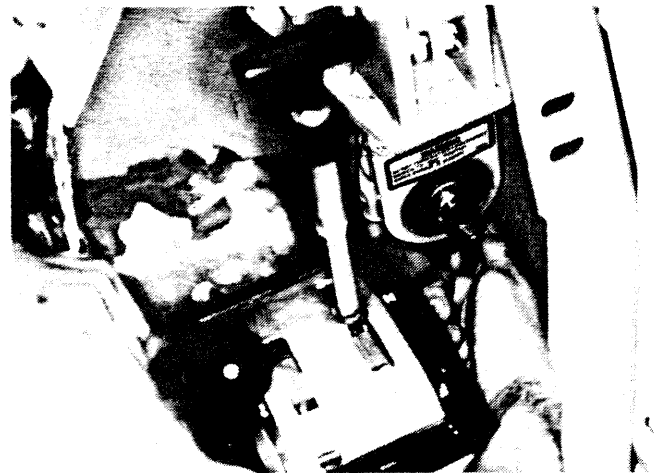


Fig 4-10

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



Fig 4-11

3. Fasten your seat belt.



Fig 4-12

4. Put the Direction Control Lever in the NEUTRAL position.
5. Make sure that the engine stop (Detroit Diesel machines only) is pushed into the operating position.

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

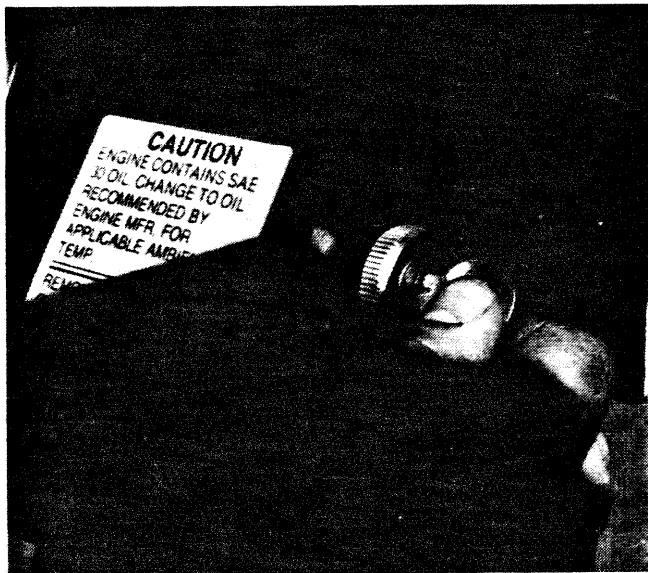


Fig 4-13

6. Turn the key in the ignition switch to the ON position (clockwise) to start the engine.
7. Push the starter button to start the engine (if applicable, See Sect. 2).

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.

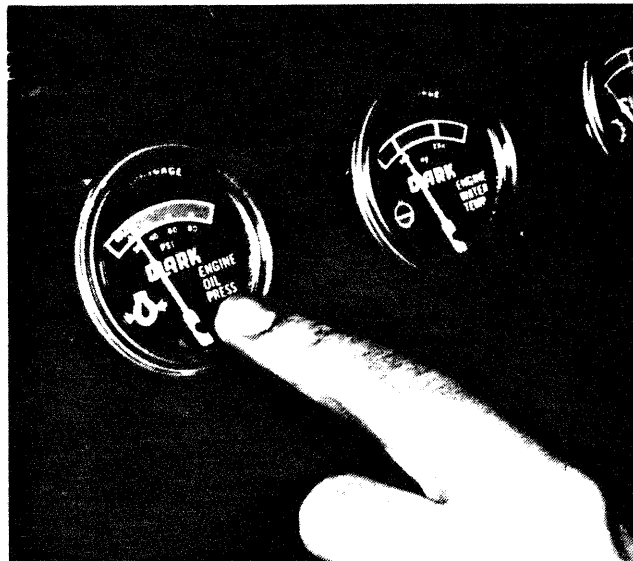


Fig 4-14

8. When the engine starts, release the ignition key 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.

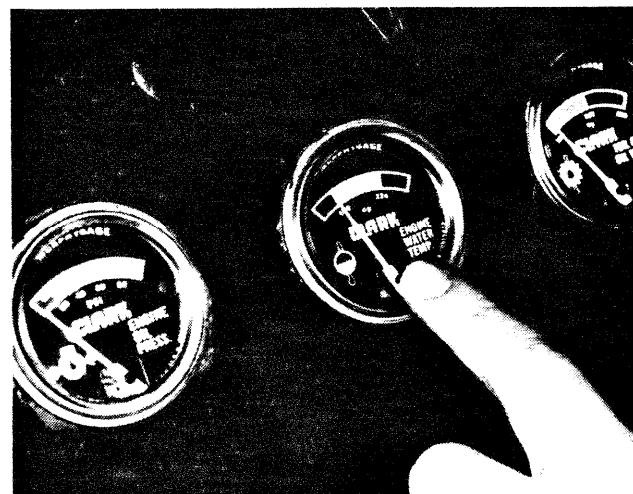


Fig 4-15

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

Cold Weather Operation

Other than the use of a suitable low temperature motor oil and a suitable anti-freeze mixture in the cooling system, extensive preparation is not required for cold weather starts. For operation at temperatures below -18°C (0°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. (See Sec. 14).

NOTES

OPERATING THE MACHINE

BEFORE you put the machine in motion, make sure that the steering frame 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 immediate area.

Always Fasten the seat belt.

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

Put the transmission in the desired direction 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 latch, 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 seatbelt.

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 RPM, 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, make sure to watch for co-workers in your path and advise them to stand clear.

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.

IMPORTANT NOTE: Remember your gloves.

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

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 seatbelt.

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.

IMPORTANT NOTE: When shutting down the machine it is important to let the engine idle for at least three minutes to allow proper cooling before shut-down.

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. All 667C Grapple machines are equipped with a grapple CONSTANT PRESSURE system. Put the grapple control lever in the center detent position to actuate the system and provide a periodic pulse of hydraulic pressure to the grapple cylinder if the load should shift during travel or if the system pressure should drop due to internal leakage.

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.

IMPORTANT NOTE: Newer Clark Grapple Assemblies are equipped with grapple snubbers which prevent the grapple from swinging while travelling without a load. Before each work shift, check the grapple snubbers' performance as shown in Sec. 15.

ENGINE SYSTEMS

NOTE: Check the Detroit or Cummins Diesel Engine Operator's Manual for further lubrication and maintenance instructions for the engine and its accessories.

Every 10 Hours of Operation:

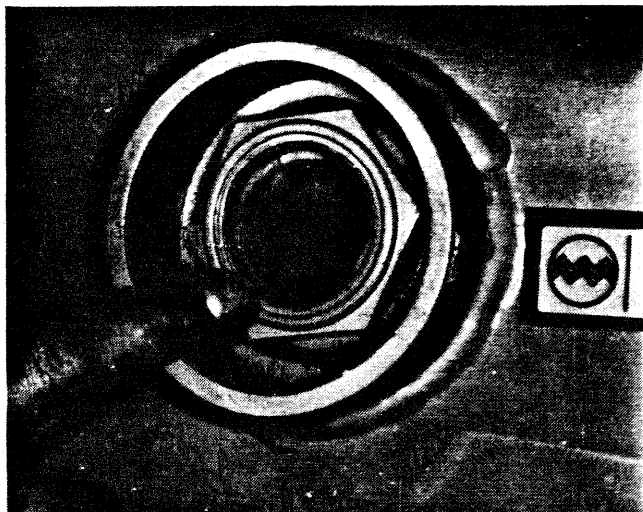


Fig 6-1

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.

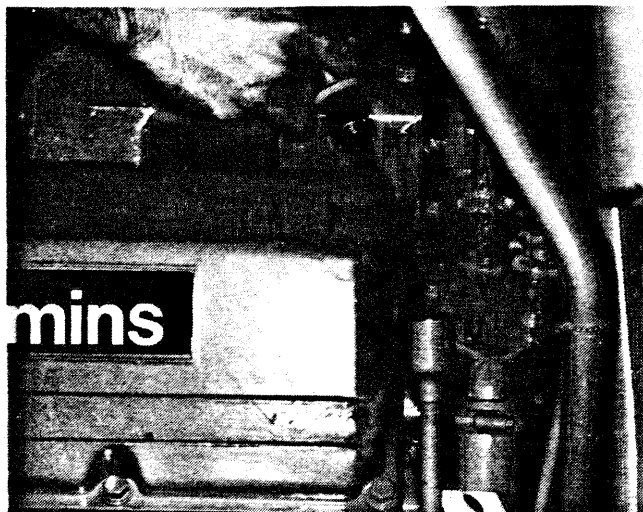


Fig 6-2

Check the engine lube level on the crankcase dipstick on the side of the engine and add oil as required.

Every 50 Hours of Operation:

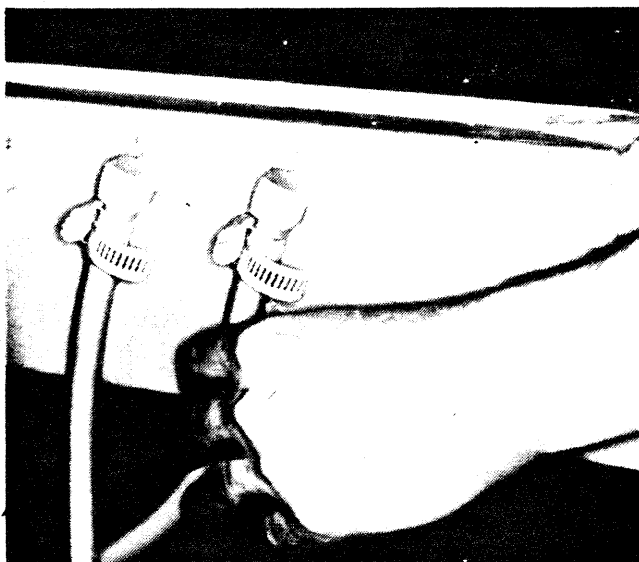


Fig 6-3

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 at the bottom of the radiator assembly. Clean the radiator if necessary.

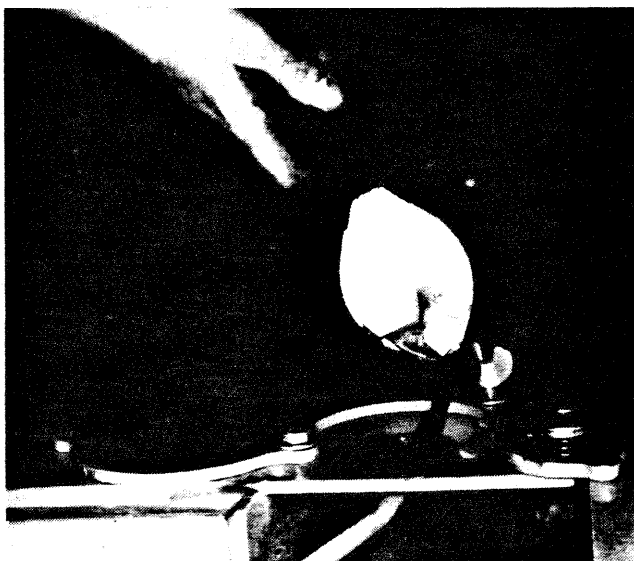


Fig 6-4

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 (if the surge tank is full) 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 Spark Arrestor Carbon Trap

IMPORTANT NOTE: Non-turbocharged 667C 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 must be user-serviced to keep it at optimum operating condition. Service the device as follows:

⚠ 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.



Fig 6-5

1. Remove the spark arrestor clean-out plug at the bottom of the muffler.
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 operate it at low idle RPM to blow any collected particles from the carbon trap. Covering the outlet hole of the muffler with a large asbestos cloth will help to force the particles out of the hole.
4. Allow the exhaust system to cool and install the clean-out plug.



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:

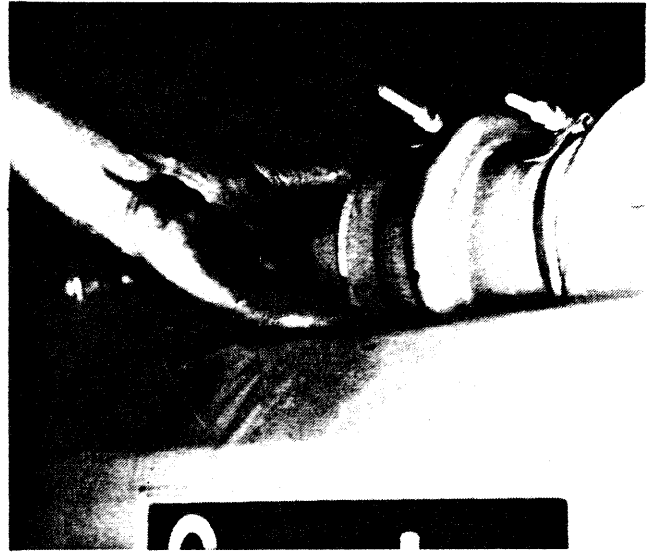


Fig 6-7

Check the condition of the flexible tubes between the air cleaner and the engine air intake. If they are cracked or show signs of leakage, they must be replaced to prevent dirt from entering the engine. Check all intake connections for leaks and tighten clamps where required. If the air cleaner assembly is loose, tighten the mounting bolts.



Fig 6-8

Check the condition of the alternator belt(s). 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 to ensure that the accelerator pedal fully controls the engine throttle. Adjust the linkage as follows:

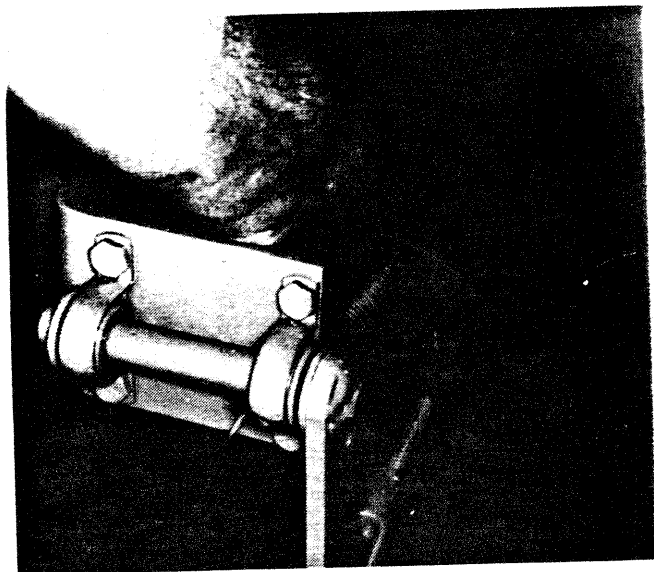


Fig 6-9

1. Unhook the spring from the accelerator linkage and disconnect the ball joint assembly from the throttle lever.
2. Have a helper hold the accelerator pedal to the pedal stop on the floorboard.
3. Turn the throttle lever fully clockwise (to its full throttle position).
4. Adjust the ball joint on the end of the accelerator rod until threaded part aligns with the hole in the throttle lever (with no force required). Further adjustment is available at the other end of the accelerator rod.
5. Reconnect the ball joint to the throttle lever and check the movement of the linkage.

Every 250 Hours of Operation:

Check the engine RPM specifications (See Sec. 16):

Use a tachometer to check the low and high idle RPM with no load on the engine.

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

Check the converter and hydraulic stall RPM to ensure that the engine is developing its rated power. The oil in the transmission/converter system should be at its operating temperature (See Sec. 1) and the main hydraulic relief setting should be correct (See Sec. 10).

1. Put the direction control lever in the NEUTRAL position, engage the neutral lock mechanism and block the tires.

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 speed range positions and fully depress the service brake pedal.
4. Accelerate the engine to full throttle and record the maximum tachometer reading - this is the converter stall RPM.

IMPORTANT NOTE: DO NOT HOLD the engine/converter in this stall condition for more than 30 seconds or if the reading on the converter temperature gauge enters the red zone.

5. Raise the blade and hold the blade control lever in its raised position with the converter stalled and record the maximum tachometer reading - this is the hydraulic stall RPM.

Compare the stall speed readings of your machine with the readings in Sec. 16. If your readings are not within the allowable readings, further troubleshooting will be required. See your Ranger dealer.

Check the drive belt tension as follows:

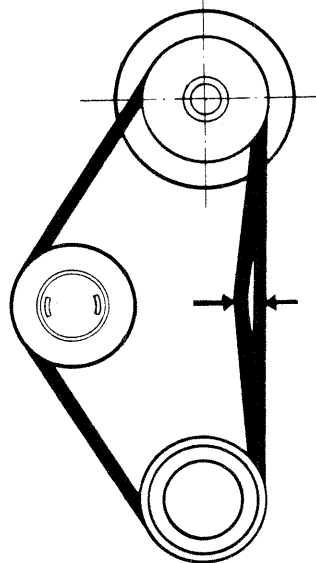


Fig 6-10

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



Fig 6-11

Replace the Cummins engine by-pass filter. Locate the by-pass filter under the floorboard near the left side frame channel on all Cummins powered machines. Remove and discard the oil filter element. Clean the filter case thoroughly and install a new element. The 667C Cummins Turbo machine has a spin-on by-pass filter.

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

Service the Air Cleaner Elements as Required:



Fig 6-12

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

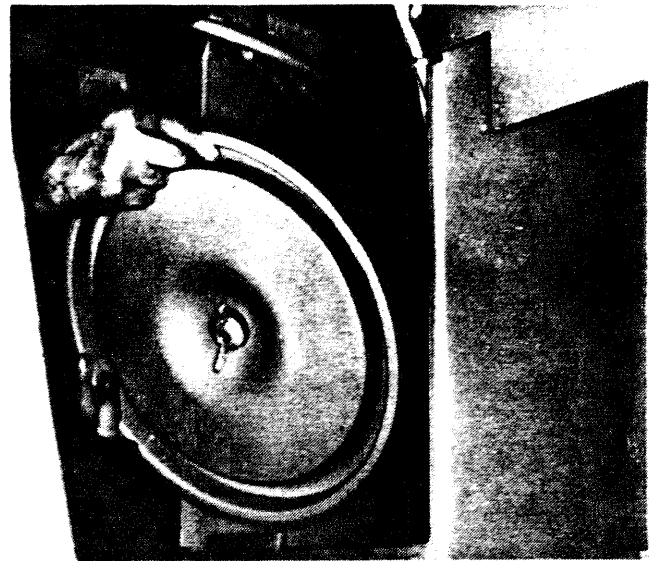


Fig 6-13

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

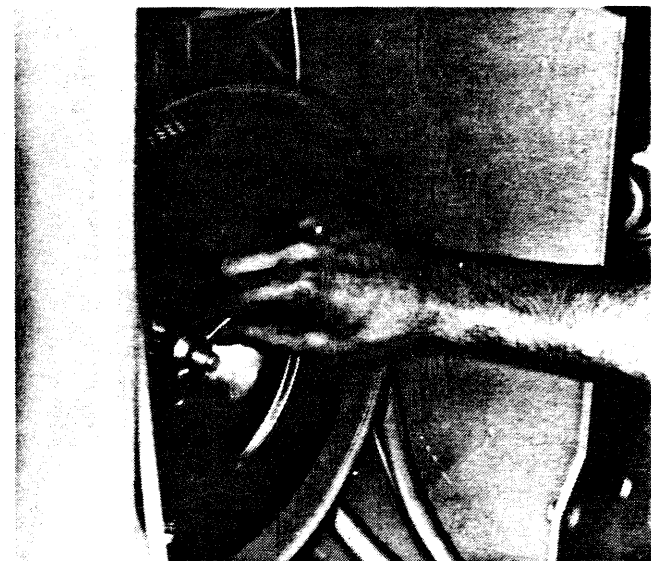


Fig 6-14

2. Loosen and remove the wing nut in the centre of the primary filter element and remove the filter element from the air cleaner body.
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 PRIMARY element 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 element with warm tap water from inside, then the outside until the water passing through the element is clean.
6. Air dry the element at a temperature no higher than 70°C (160°F).
7. Shine a bright light from the inside of the element and check it for pin holes, ruptures or thin spots. If any of these conditions exist, the element should be replaced.
8. Clean the filter case thoroughly, removing all foreign matter.
9. Re-install the element into the air cleaner body, position the end cap correctly and install the clamp snugly.

Every 1000 Hours of Operation:

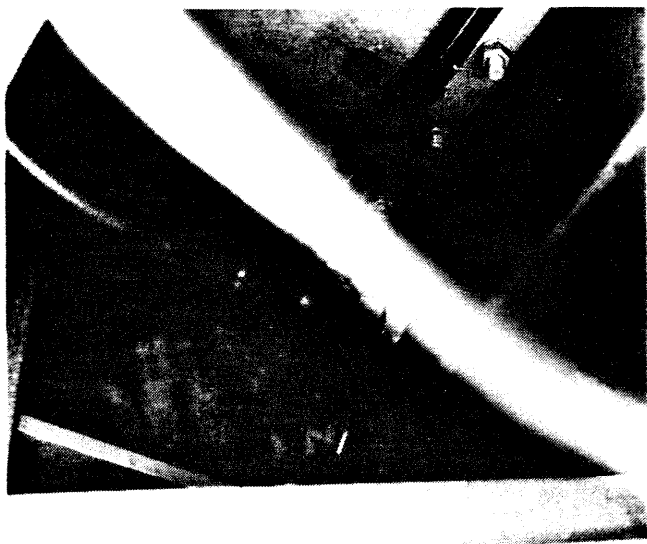


Fig 6-15

Drain and flush the engine cooling system. Open the draincocks at the bottom of the radiator and engine block and empty the coolant into a container of at least 55 l (12 Imperial gal/14 U.S. gal) and flush the system. If the machine is equipped with an optional heater, put the heater valve in the ON position to drain the coolant from the heater also.



Fig 6-16

Close the draincocks and fill the cooling system until the correct 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.

NOTES

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.

Every 50 Hours of Operation:



Fig 7-2

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

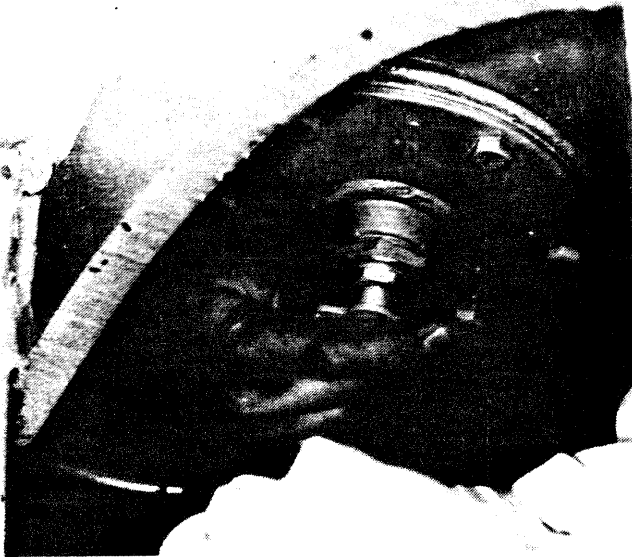


Fig 7-1

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 draincock.

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

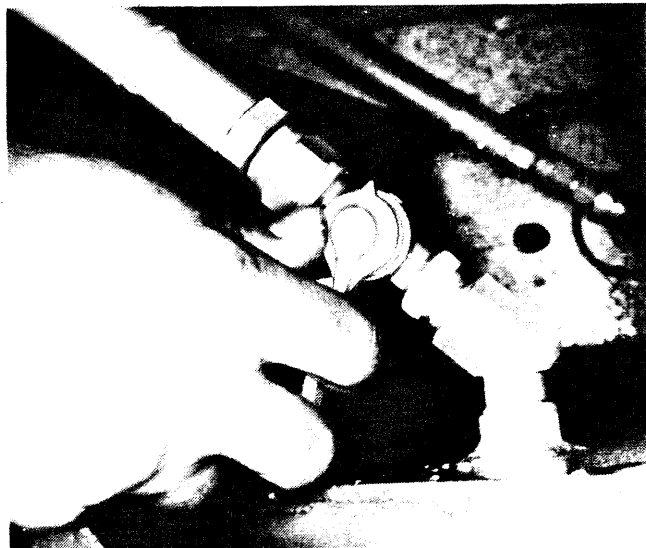


Fig 7-3

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.

NOTES

TRANSMISSION/CONVERTER SYSTEM

Every 10 Hours of Operation:



Fig 8-1

Check the fluid level in the system with the transmission/converter dipstick located on the seat plate to the left of the operator's seat.

IMPORTANT NOTE: When you do this check, the engine should be running and the battery disconnect switch and fuel shut-off valve must be in their ON positions but the machine must otherwise be in the Service Position (See Sec. 2). The fluid in the system must be at its Operating Temperature (See Sec. 1).



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 reached.

IMPORTANT NOTE: Clark recommends the use of DEXRON II Automatic Transmission Fluid to fill this system.

Every 250 Hours of Operation:

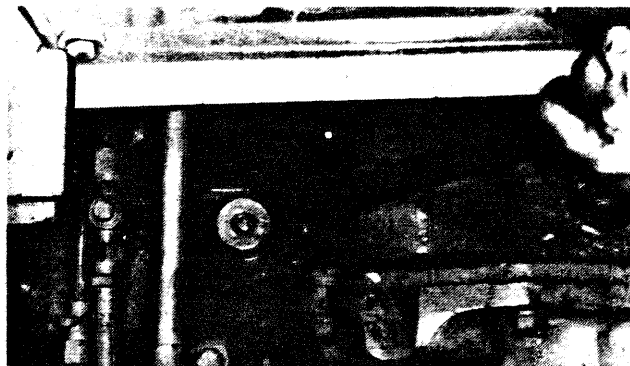


Fig 8-3

Remove the breathers on top of the transmission and converter housings, wash them in a solvent, blow dry with compressed air and reinstall the breathers. The transmission has a two-way and the converter has a one-way breather.

Check the transmission/converter pressures with the oil in the system at its Operating Temperature (See Sec. 1) as follows:

NOTE: These checks should also be performed if the system overheats or if the machine does not perform properly.

NOTE: DO NOT apply the service brake pedal during these tests or accurate readings cannot be obtained.

Check the converter IN pressure:



Fig 8-4

1. Connect a 1.000 kPa (150 PSI) pressure test gauge to the converter IN pressure port on the hose at the side of the engine.
2. Install a tachometer on the engine to monitor engine RPM.
3. With the engine operating at full throttle but the machine otherwise in the Service Position (See Sec. 2), record the reading on the gauge. The pressure reading should be no more than 825 kPa (120 PSI).

Check the converter OUT pressure:



Fig 8-5

1. Connect the pressure gauge to the converter OUT pressure port located on the hose on top of the transmission.
2. Install a tachometer on the engine.
3. 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 system lube pressure:

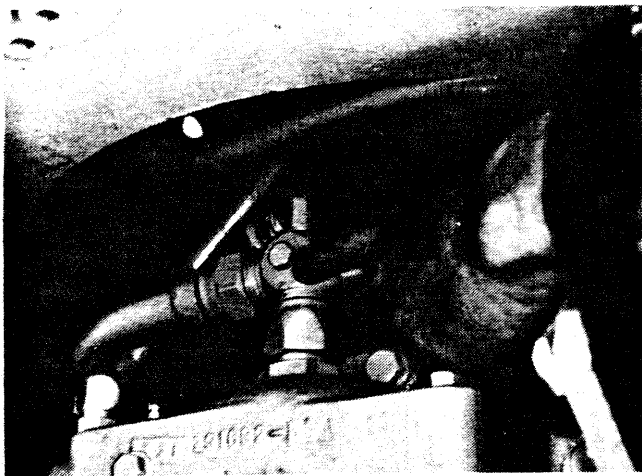


Fig 8-6

1. Connect the test gauge to the system lube pressure port on the T-connector on top of the hydraulic brake housing.
2. With the engine operating at 2,000 RPM but the machine otherwise operating in the Service Position (See Sec. 1), record the reading on the gauge. The pressure reading should be 105 to 170 kPa (15 to 25 PSI).

Check the transmission/winich clutch pressure:

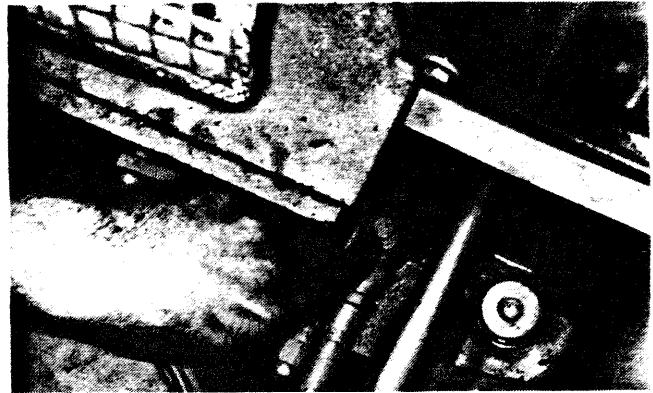


Fig 8-7

1. Install a test gauge of at least 2.000 kPa (300 PSI) to the clutch pressure check port on the T connector on top of the transmission.
2. With the engine operating at low idle RPM but the machine otherwise in the Service Position (See Sec. 2), record the readings on the gauge in ALL speed ranges, both forward and reverse, and all winch operations. The pressure readings should be 1.655 to 1.930 kPa (240 to 280 PSI) with no more than 35 kPa (5 PSI) difference between the readings.

If any of the transmission/converter pressure readings are not within the acceptable limits, contact your Ranger distributor for further troubleshooting.

Every 500 Hours of Operation:

Replace the transmission/converter filter element:



Fig 8-8

Replace the transmission/converter filter element. This element must also be replaced whenever 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. Lightly oil the gasket on the new filter element with Approved Automatic Transmission Fluid and install the element into the filter housing.

Tighten the centre bolt to a torque of 55 to 65 N.m (40 to 50 lbf.ft). Take care that you do not damage the gasket.

Use only a Genuine Clark replacement filter element. The use of elements other than those supplied or approved by the Clark Equipment Company can interfere with the proper operation of the system.

Operate the engine for five minutes at 1500 RPM and check the gasket for leaks using a piece of cardboard. Check the fluid level in the system and add fluid as required.

Every 1000 Hours of Operation:

Drain the transmission/converter system. This should also be done if the converter pump, transmission, converter or winch is repaired or overhauled. Bring the oil in the system to its Operating Temperature (See Sec. 1). Hot oil runs more freely and carries more foreign material than cold oil. Drain the system as follows:



Fig 8-9

1. With the machine in the Service Position (See Sec. 1), remove the drain plug and sump screen from the rear of the transmission housing and drain the oil in the sump into a container of at least 40l (10.6 U.S. gal). Clean the sump screen in a solvent and blow dry the screen with compressed air and install the screen, a new gasket, and the drain plug.

NOTE: If the screen is damaged, it should be replaced.

2. Overfill the system with Approved Automatic Transmission Fluid.



Fig 8-10

3. Disconnect the return oil cooler line from the oil cooler assembly. Direct the end of the hose into a container of at least 20l (5 U.S. gal).

4. Start the engine and flush the system at low idle RPM until approximately 18l (4.8 U.S. gal) has been drained or until clean oil flows from the hose.

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

5. Reconnect the oil cooler line. Bring the oil in the system to the correct level and check the connections for leaks with a piece of cardboard.

IMPORTANT NOTE: NEVER use flushing oil or compounds to clean this system. Use only Approved Automatic Transmission Fluid.

Check and adjust the transmission control linkage:

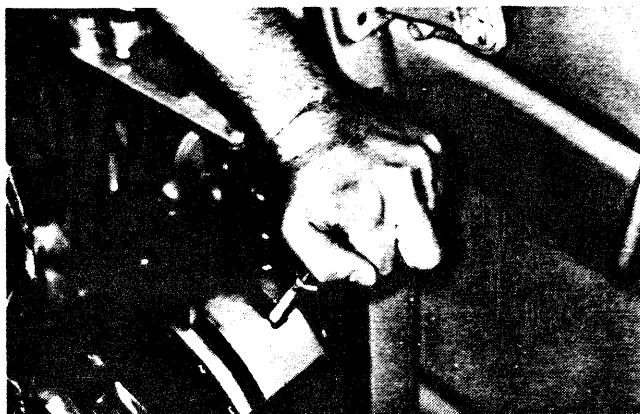


Fig 8-11

Operate the transmission control levers to see that all parts move freely. Check all rods, bell cranks, and ball joints for wear and damage and repair if necessary.

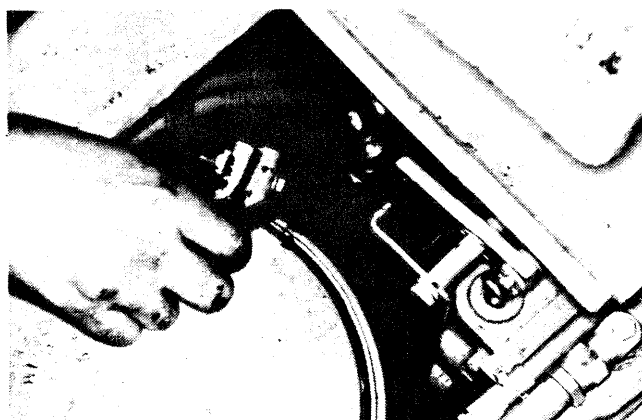


Fig 8-12

1. With the direction control lever in the NEUTRAL position and the speed range control lever in SECOND remove the cotter pins from the linkage at the transmission control valve, loosen the locknuts and adjust the clevises until the holes in the clevises and the holes in the control valve spools align.
2. Install the clevis pins and new cotter pins and recheck the operation of the levers. Both levers should go into all detent positions without interference.

NOTES

CLARK WINCH

Every 100 Hours of Operation:

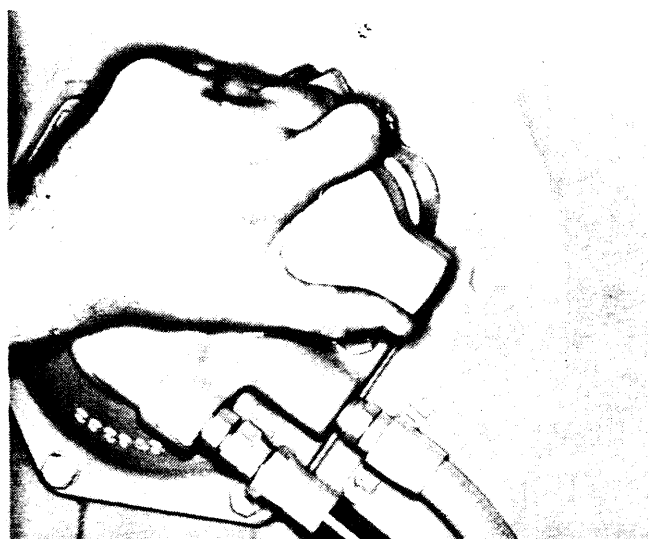


Fig 9-1

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



Fig 9-3

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

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 9-4

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.

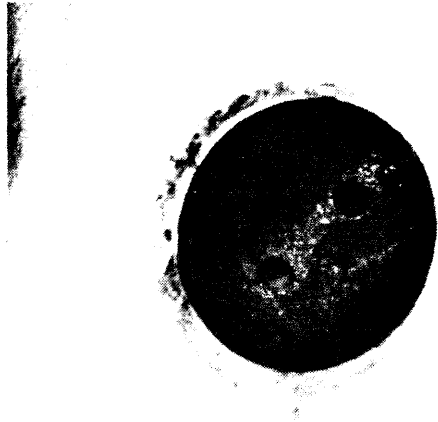


Fig 9-5

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. 2).
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.

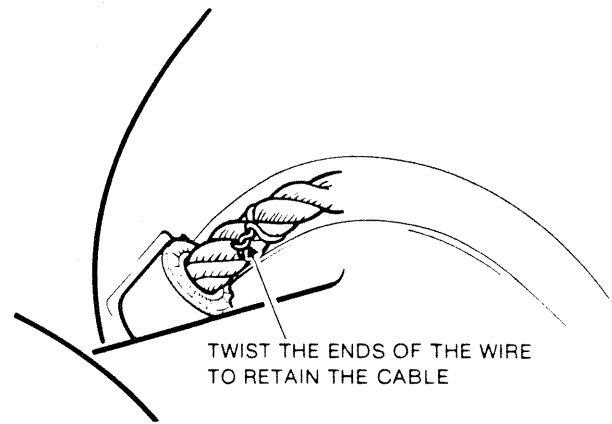


Fig 9-7

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.

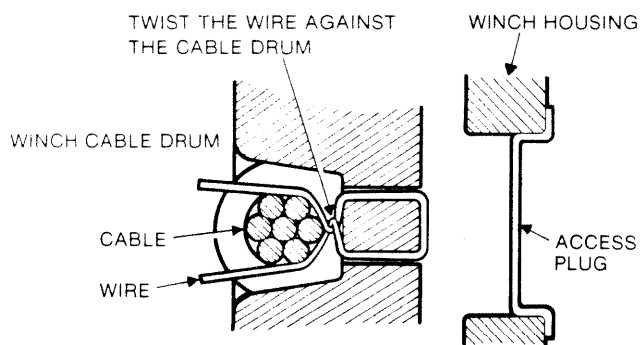


Fig 9-6

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 in the operator's compartment to the right of the seat on the seat plate.

NOTE: All hydraulic cylinders should be retracted when doing this check.



Fig 10-2

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

Every 50 Hours of Operation:



Fig 10-3

Clean the hydraulic cylinder rods 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.

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

1. Turn the ignition switch to the ON position but do not start the engine. Turn the auxiliary steering switch ON.

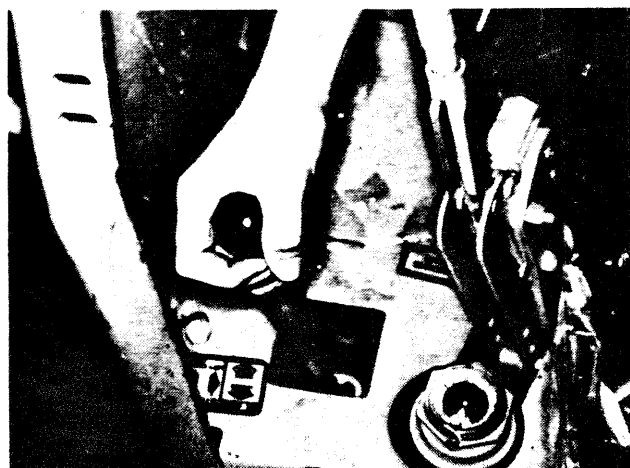


Fig 10-4

2. Make complete left and right turns until the steer stops make contact.
3. Turn the ignition switch to the OFF position.

IMPORTANT NOTE: The auxiliary steering system is powered by the machine's batteries. **DO NOT** operate the system for longer than two minutes to prevent excessive battery drain and damage to the electrical system.

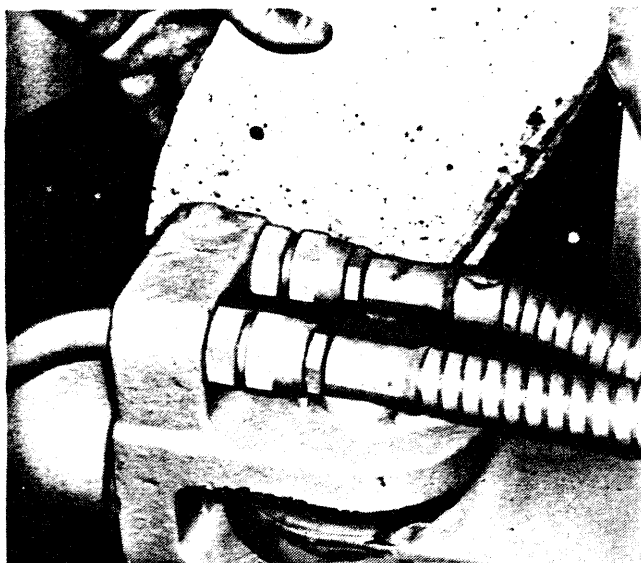


Fig 10-5

If the auxiliary steering does not respond properly to the test, check all hydraulic and electrical 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.

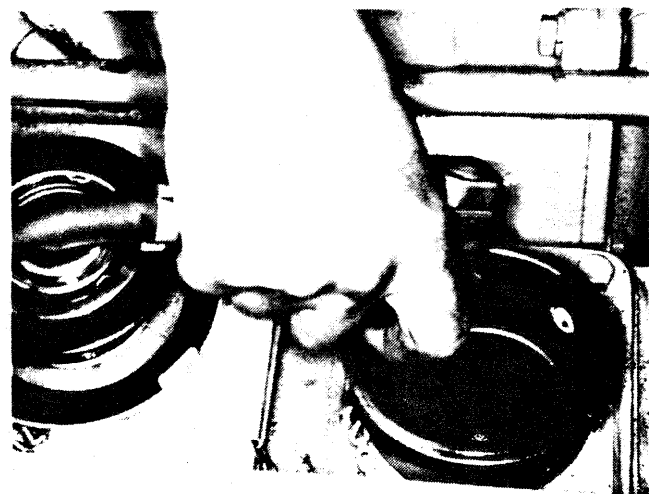


Fig 10-6

Use compressed air (35 to 70 kPa/5 to 10 PSI) to clean any foreign material from the hydraulic tank breather in the filler neck of the tank.

Every 500 Hours of Operation:

Replace the main hydraulic filter element.

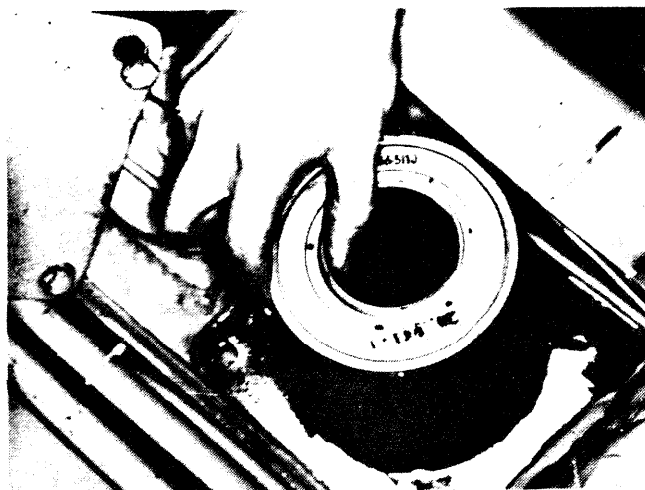


Fig 10-7

The element is located under the plate on top of the hydraulic tank. Remove the plate mounting bolts and remove the plate making sure no dirt enters the system.

Remove and discard the old filter element and install a new Clark replacement element. Install the filter plate and tighten the mounting bolts to a torque of 55 to 65 N.m (40 to 50 lbf.ft).

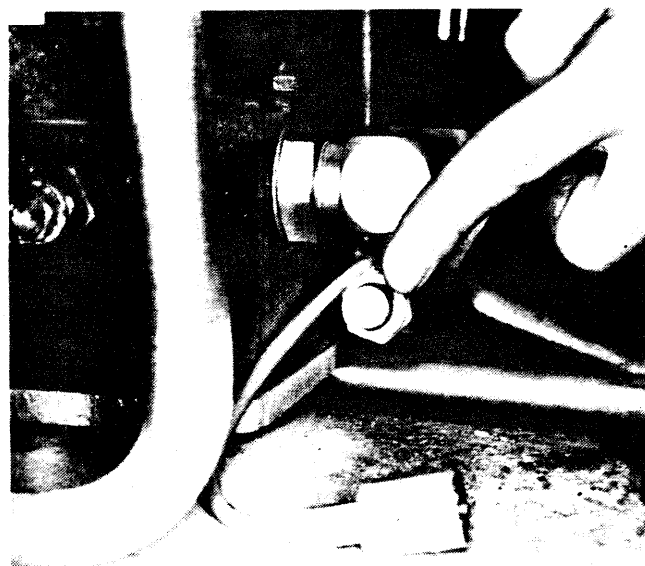


Fig 10-8

Check the main relief pressure with a 20.000 kPa (3,000 PSI) pressure test gauge connected to the main relief pressure port on top of the transmission. With the engine operating at maximum RPM, and the blade held in its highest position (to put the hydraulic system over relief), the gauge should read 12.410 (1800 PSI) on the 667C cable machine and 13.790 kPa (2000 PSI) on the 667C grapple machine.

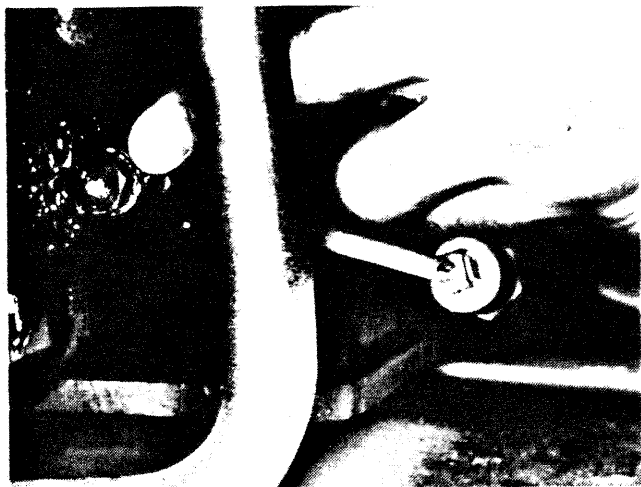


Fig 10-9

If the reading on the gauge is not correct remove the acorn nut on the main control valve, loosen the locknut below it and turn the adjusting nut until the reading is correct. If the relief valve cannot be properly 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.

Check the arch and 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).

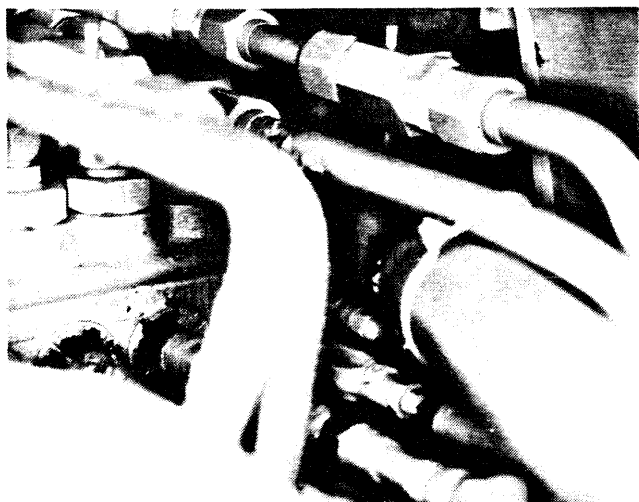


Fig 10-10

Actuate the grapple cylinder 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.

NOTE: The steer and blade relief pressure must be set correctly to properly adjust the arch and grapple relief.

Every 1000 Hours of Operation:

Drain the main hydraulic system. This should also be done if the main hydraulic pump fails and must be removed and overhauled. Bring the oil in the system to its Operating Temperature (See Sec. 1). Hot oil runs more freely and carries more foreign material than cold oil. Drain the system as follows:



Fig 10-11

1. Remove the hydraulic reservoir filler cap. Remove the drain plug at the bottom of the hydraulic reservoir and drain the oil into a container of at least 60l (16 U.S. gal).

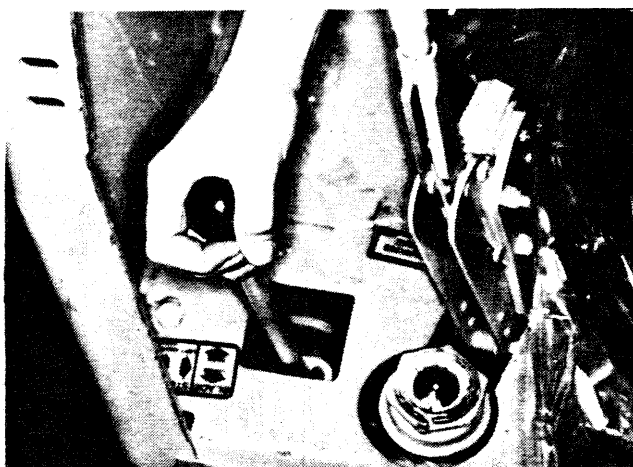


Fig 10-12

2. Slowly lower the blade, (boom) and arch and close the grapple arms to force the oil in the cylinders back to the reservoir.



WARNING: Use Extreme Caution to avoid serious bodily injury that can occur if struck by the blade or grapple assembly. Make sure all tools and other personal property are clear of these attachments as they lower.

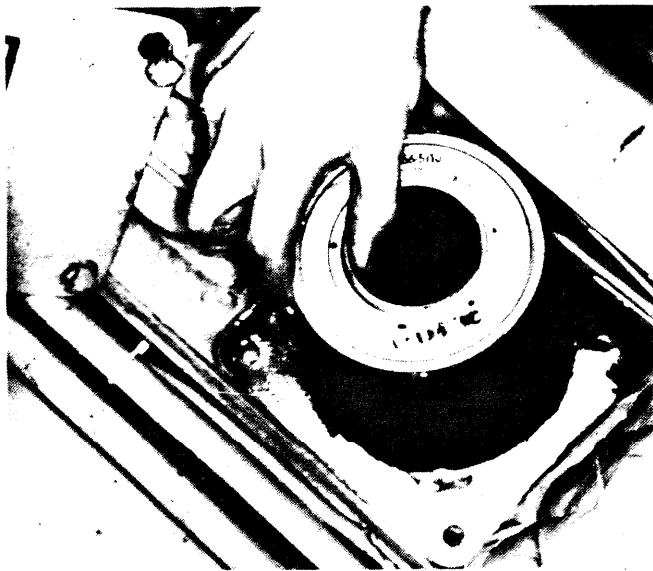


Fig 10-13

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 end of the suction tube to the pump, inside the reservoir. Wash the screen in a solvent, blow dry it with compressed air, and install the screen on the suction tube.

NOTE: If the screen is damaged, it should be replaced to prevent dirt from damaging the pump.

5. Replace the hydraulic filter element, install the plug at the bottom of the reservoir and refill the system with the recommended fluid (See Every 10 Hours of Operation:).
6. With the machine in the Service Position, with the exception of the battery disconnect switch and the fuel shut-off valve, start the engine and operate the engine at low idle RPM for a few minutes.
7. Raise the blade, (boom) and arch and open the grapple arms to fill the cylinders with oil.
8. Put the machine in the Service Position (See Sec. 2), and allow the system to stand for a few minutes so any air will escape from the oil. Bring the level in the reservoir to the full line on the dipstick (to replace the oil in the blade cylinder) and replace the filler cap securely.

IMPORTANT NOTE: NEVER use flushing oil or compounds to clean the system, use only the recommended operating fluid.

AXLES, PROPSHAFTS AND MIDMOUNT

Every 50 Hours of Operation:

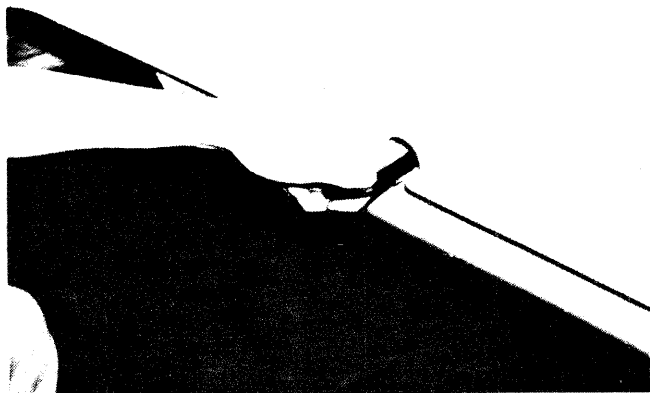


Fig 11-1

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. 17).

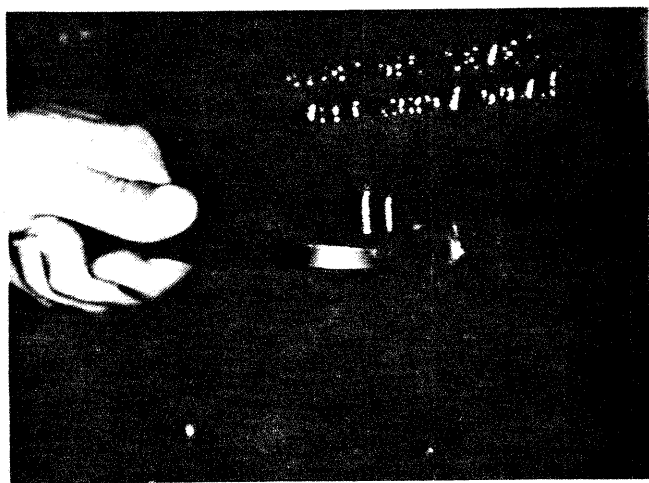


Fig 11-2

Check the lubricant level in the front and rear axle planetary hubs. Turn the wheel until the check plug on the hub is pointing down. 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. 17).

Every 100 Hours of Operation:

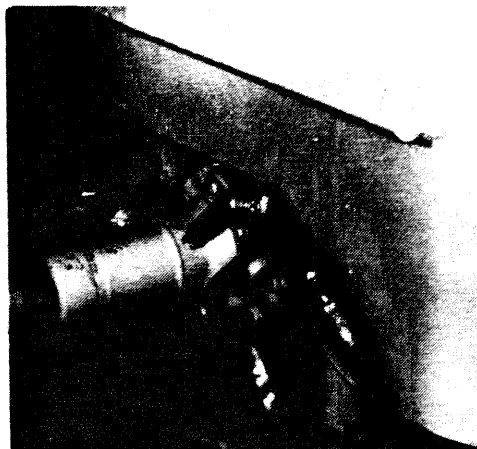


Fig 11-3

Grease all propshaft lubrication points 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°C (0°F) use a Grade 2 lubricant. When the machine is operated below -18°C (0°F) use a Grade 0 lubricant.

Every 500 Hours of Operation:

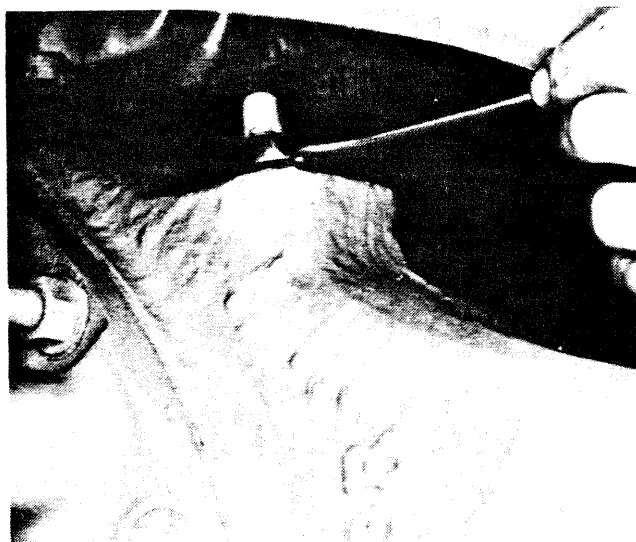


Fig 11-4

Locate the axle breathers on top of the front and rear axles. Rotate the cap on each breather to free the air passages and blow the breathers with compressed air to remove any debris.

NOTE: Every 50 Hours of Operation, the breather caps should be rotated to clear the passages also.

Every 1000 Hours of Operation:



Fig 11-5

Grease all propshaft universal joint lubrication points with Extreme Pressure Molybdenum Disulphide Grease. Use a hand grease gun and grease all fittings sparingly. When the machine is operated at temperatures above -18°C (0°F) use a Grade 2 lubricant. When the machine is operated below -18°C (0°F) use a Grade 0 lubricant.



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 (2.4 U.S. gal). Re-install 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. Re-install the check plugs.

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



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 12l (3.2 U.S. gal). Re-install the drain plugs and fill each differential check hole with the recommended fluid (See Sec. 17).

WHEELS AND TIRES

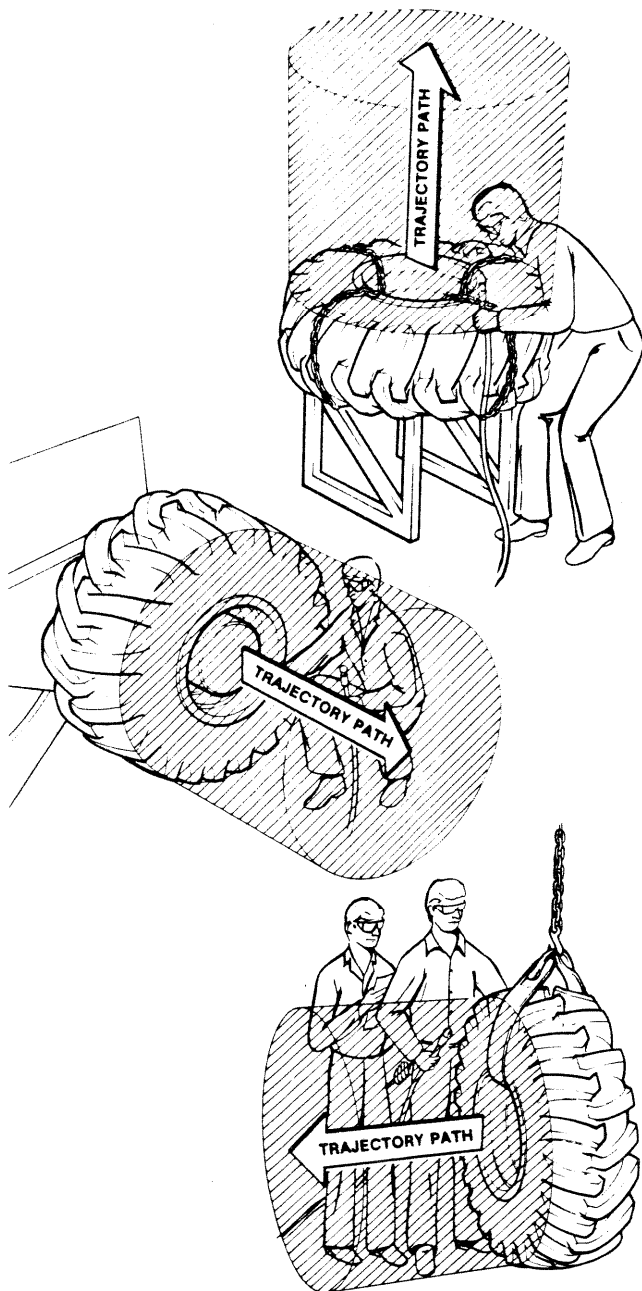


Fig 12-1

⚠ 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

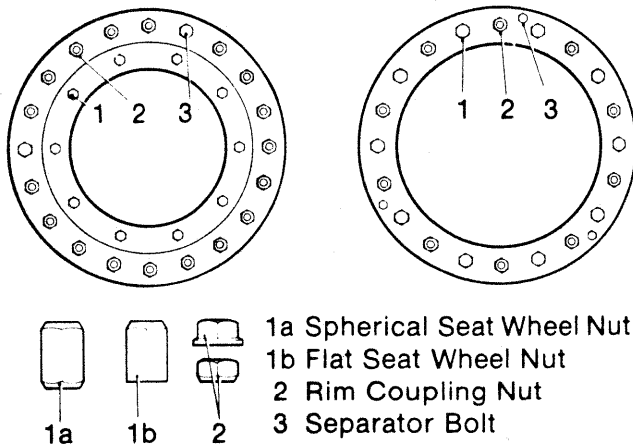


Fig 12-4

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**.

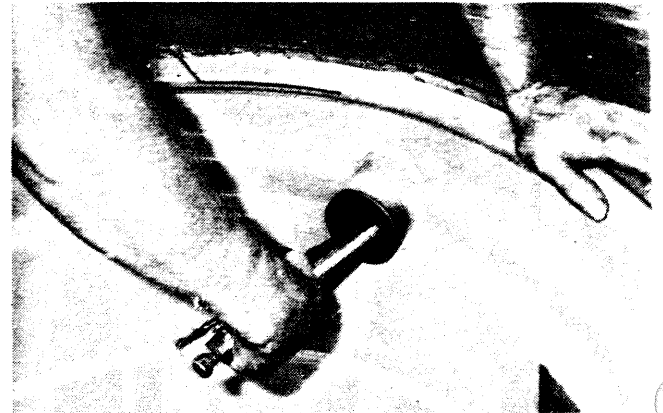


Fig 12-5

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.

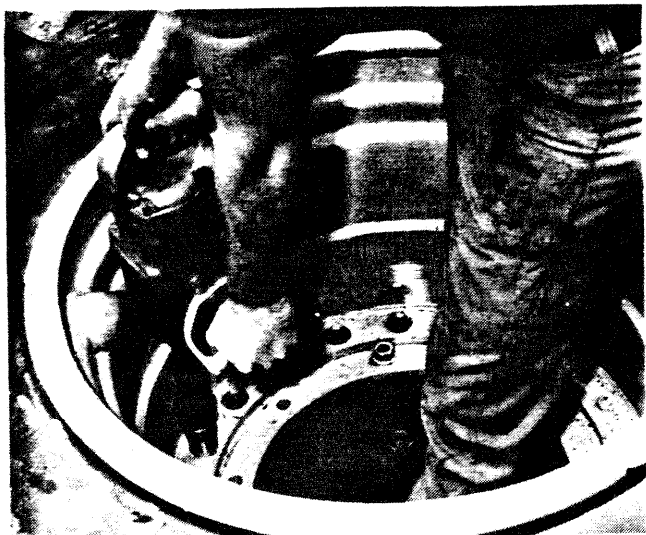


Fig 12-7

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.

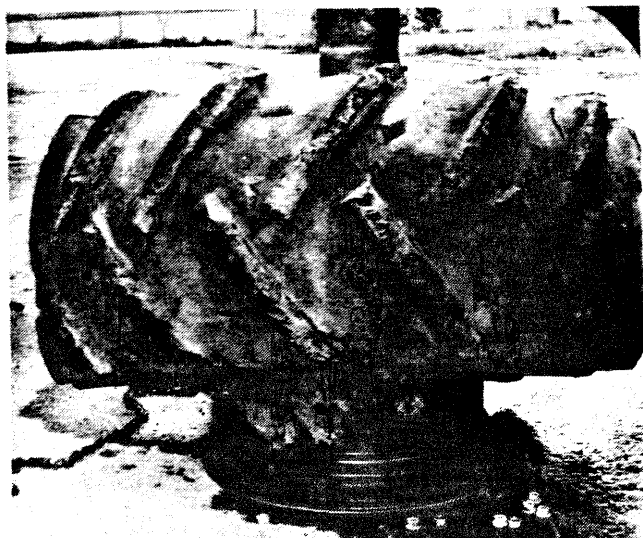


Fig 12-8

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.

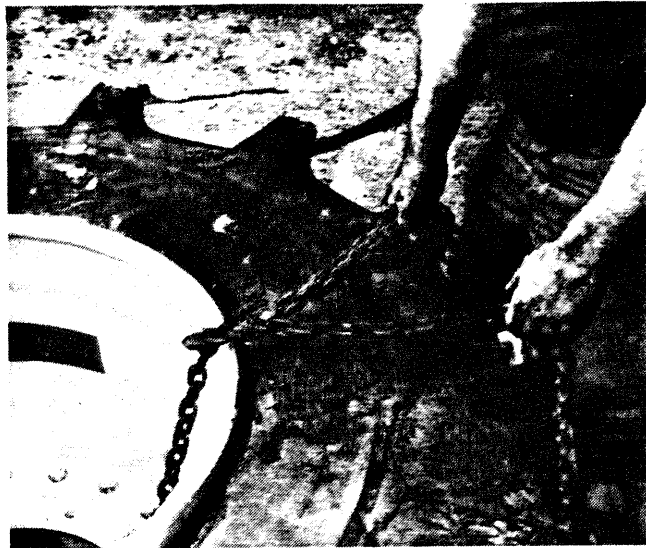


Fig 12-17

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

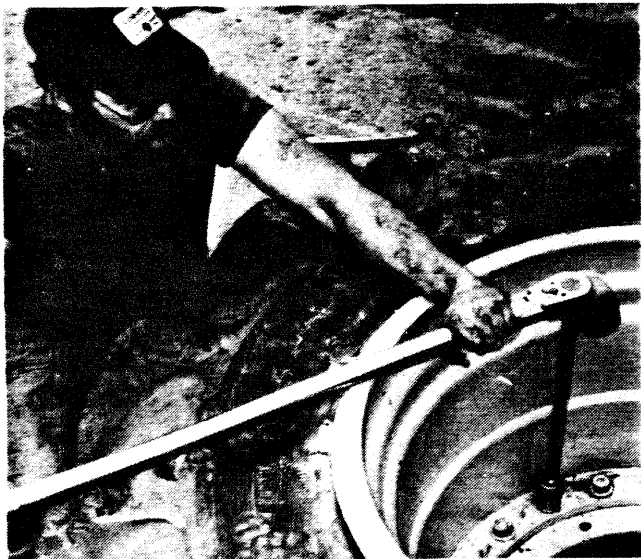


Fig 12-16

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.

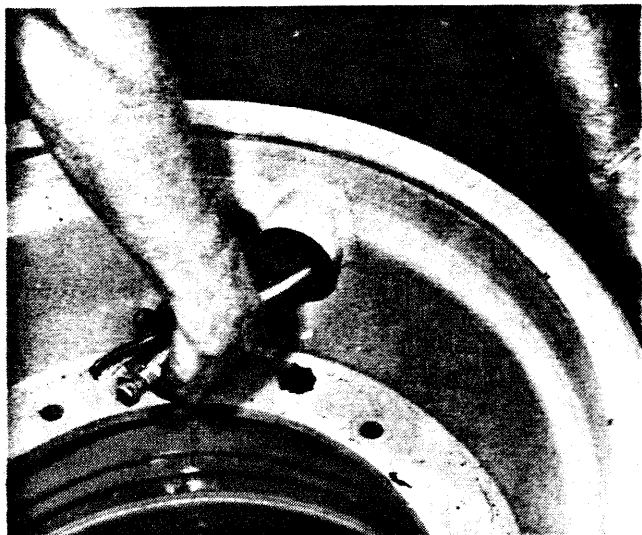


Fig 12-19

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.

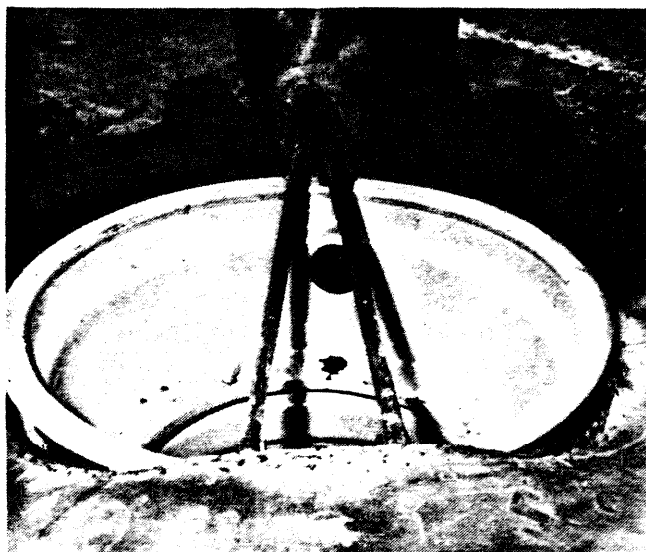


Fig 12-21

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.

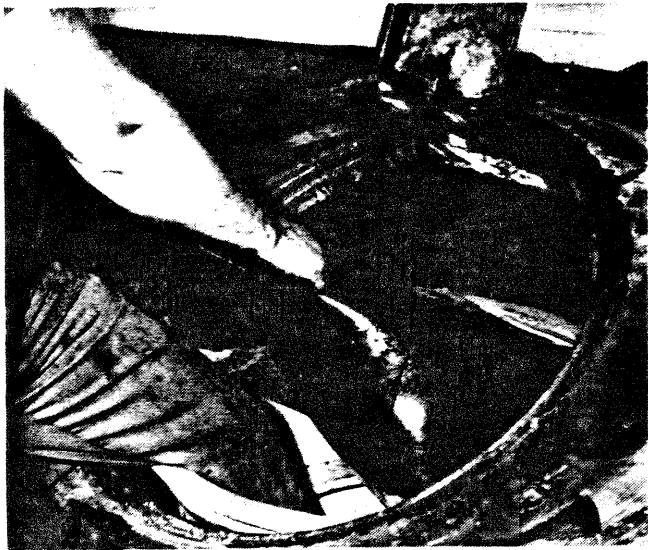


Fig 12-23

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.

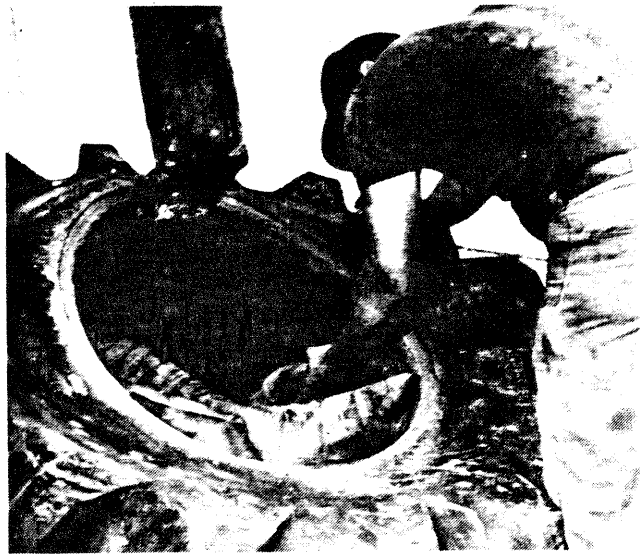


Fig 12-25

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

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



Fig 12-26

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.

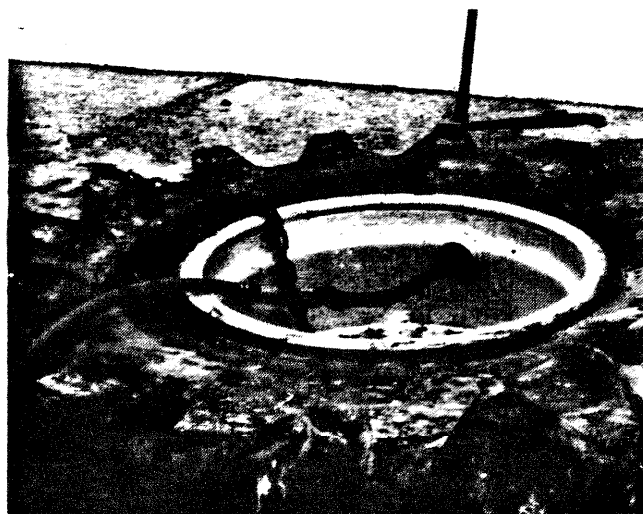


Fig 12-28

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
18.4 x 34	10	105	15	170	25
18.4 x 34	16	105	15	170	25
23.1 x 26	10	105	15	140	20
23.1 x 26	16	105	15	140	20
24.5 x 32	10	105	15	140	20
24.5 x 32	12	105	15	170	25
24.5 x 32	16	105	15	170	25
28.1 x 26	10	105	15	140	20
30.5 x 32	12	105	15	140	20
30.5 x 32	16	105	15	170	25

BRAKES

Every 50 Hours of Operation:

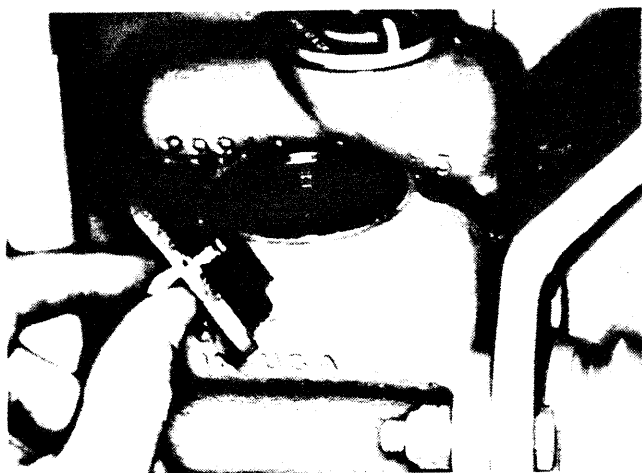


Fig. 13-1

Check the fluid level in the service brake master cylinder(s) located under the access panel on the left side of the firewall. 667C cable and grapple skidders have two service brake master cylinders except 667C machines: S/N 503B-101 thru 975-CAC, 504B-101 thru 1095-CAC, 534B-101 thru 595-CAC, 509B-101 thru 930-CAC, and 510B-101 thru 1145-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 cylinder(s).

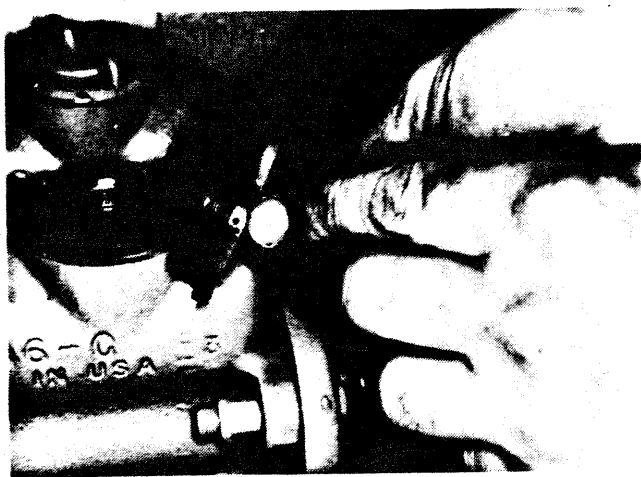


Fig. 13-2

Make sure the vent hole(s) in the filler cap(s) are open at all times. If the hole(s) are plugged, REMOVE the cap(s), clean the hole(s) and reinstall the cap(s).

WARNING: Make sure no dirt enters the reservoir and contaminates the system.

Every 100 Hours of Operation:

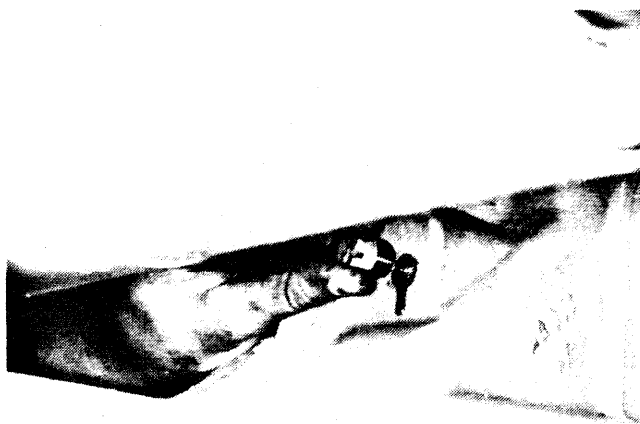


Fig 13-3

Check the fluid level in the midmount brake unit (if applicable - See Fig 13-1). Remove the level check plug on the left hand side of the brake housing. If the level of the fluid is not up to the bottom of the check hole, remove the midmount brake breather on the hose fastened to the left hand side of the winch and add Approved Automatic Transmission Fluid to the hose until the correct fluid level is reached. Install the breather and replace the check plug.

Adjust the transmission brake and the midmount brake as follows:

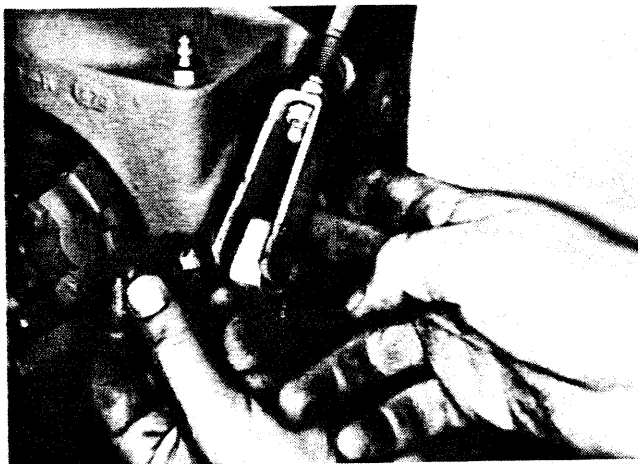


Fig 13-4

Disconnect the linkage from the parking brake clevis to the brake lever arm.



Fig 13-5

Loosen the locknut on the brake adjusting screw.

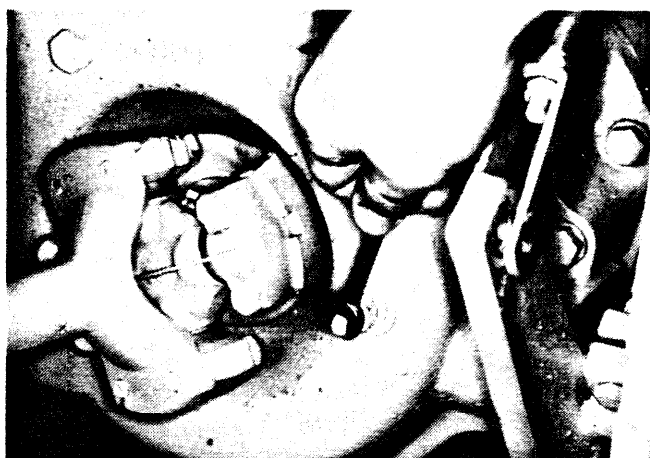


Fig 13-6

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



Fig 13-7

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



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.

Every 250 Hours of Operation:

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



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.

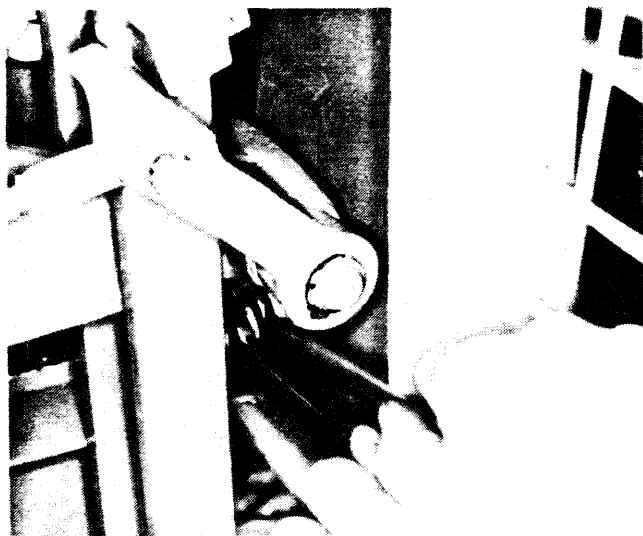


Fig 13-10

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.

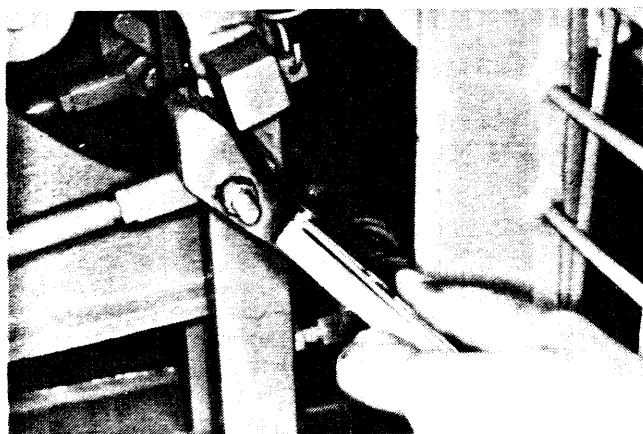


Fig. 13-11

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.

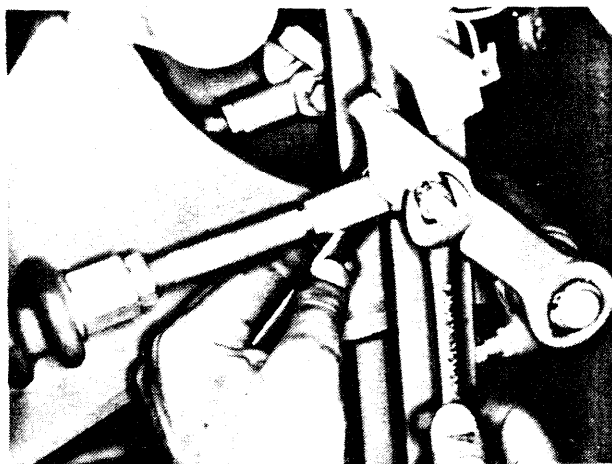


Fig 13-12

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

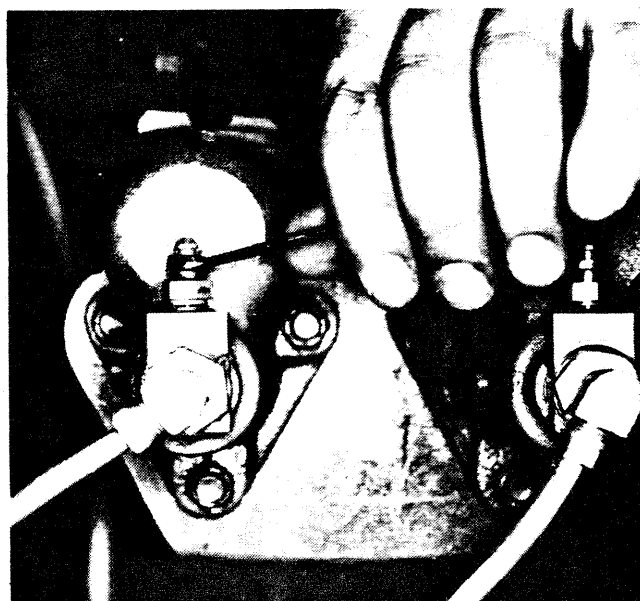


Fig 13-13

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.

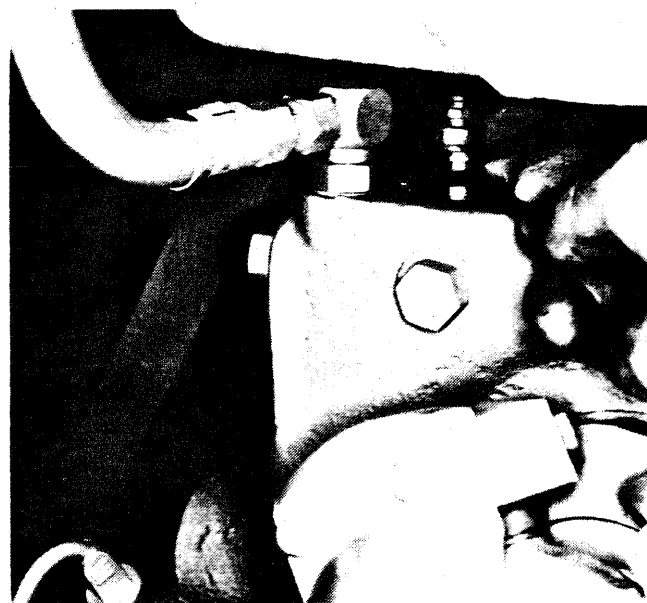


Fig 13-15

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

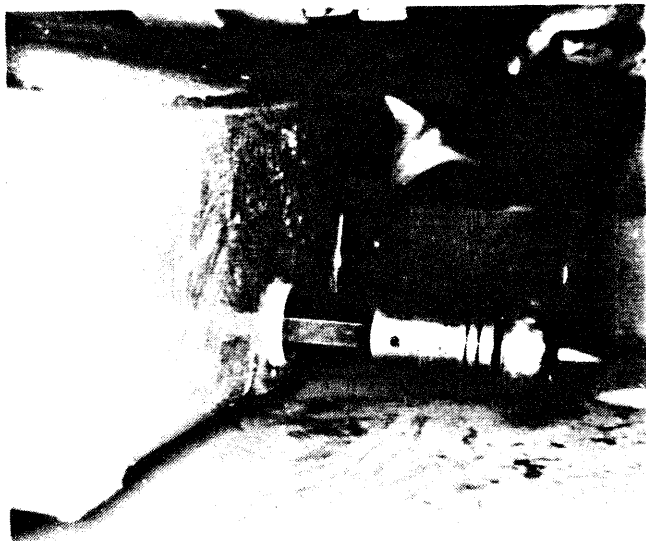
The failure of one of the two brake systems will force the remaining system to assume the function of a secondary brake. When this happens, the brake pedal stroke should increase, however, there should be adequate operation to bring the machine to a safe stop.

! 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 $\frac{1}{2}$ (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 13-18**

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.

NOTES

ELECTRICAL SYSTEM



Fig 14-1

The electrical system in the 667C is protected from overload by a circuit breaker located on the left hand side of the engine. 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.

Optional lights on your machine are located behind the grill plate (two) and on the rear of the canopy (two).

The angles of the beams are adjustable by loosening the mounting nuts and turning the lamps 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.

Every 500 Hours of Operation:

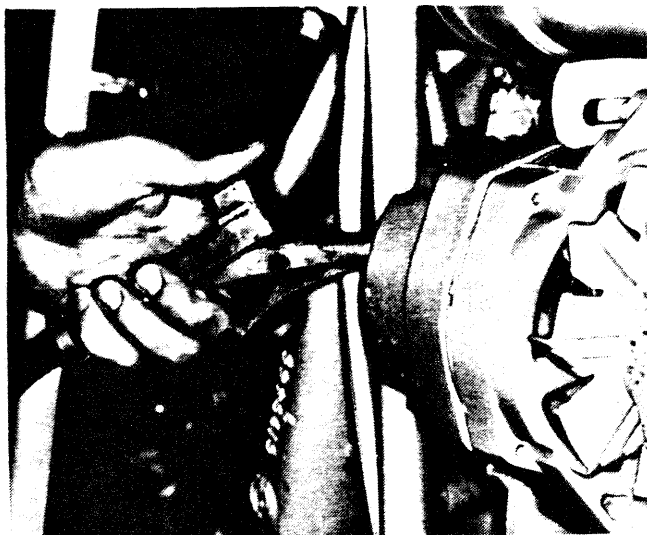


Fig 14-2

Clean the alternator with compressed air (140 to 200 kPa/20 to 30 lbf.ft).

Clean and tighten the electrical connections. Periodically inspect all wiring and connections to the batteries, cranking motor, voltage regulator, alternator, solenoid switch, relays, instruments and switches for worn, cracked, broken or frayed insulation and loose terminal connections. Check for frayed or corroded external ground straps and corrosion on the battery posts. Where inspection reveals dirt, looseness or damage, clean, tighten, adjust or replace where required. Make sure that wires do not rub on rough surfaces or sharp edges.

Batteries must be kept clean and fully charged at all times. In cold weather their ability to deliver full power is greatly reduced. A fully charged battery at -10°C (15°F) can deliver only 70% of its rated amperage. At lower temperatures, its output is substantially reduced. Service the batteries every 500 Hours as follows:

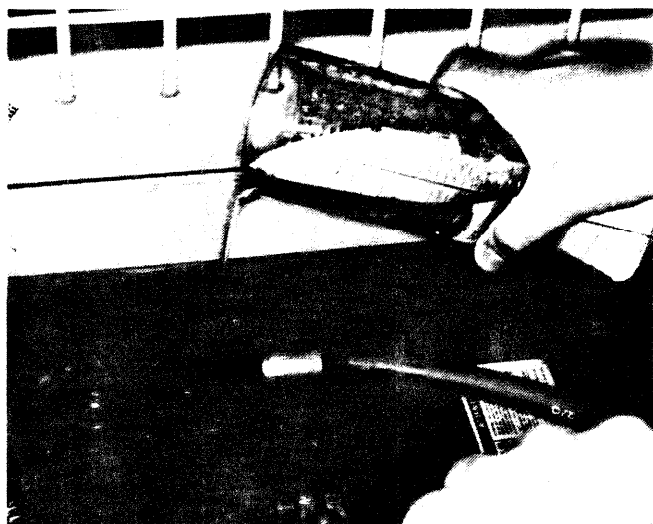


Fig 14-3

1. Add distilled water to cover the 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.

! WARNING: ALWAYS use eye protection, as battery electrolyte will cause serious eye injury and DO NOT smoke while servicing batteries.

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

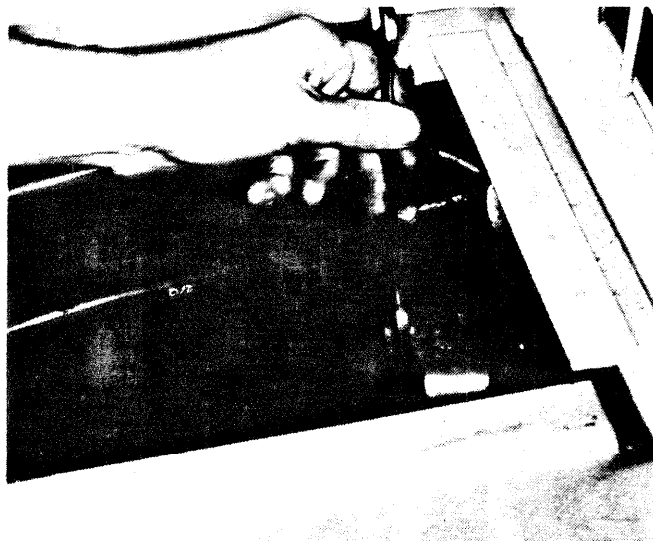


Fig 14-4

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

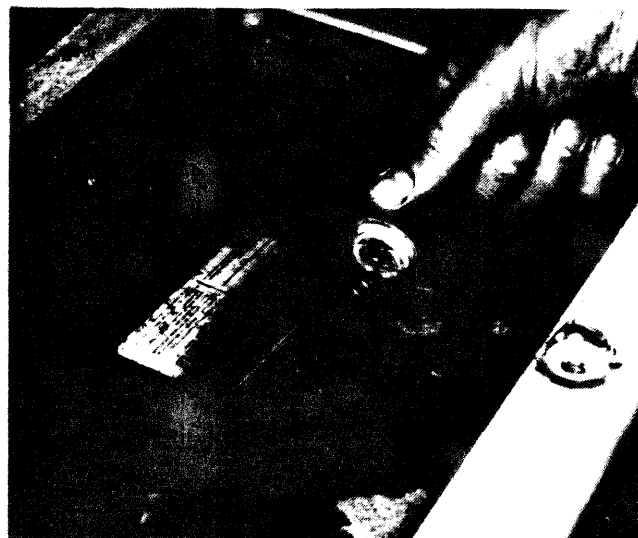


Fig 14-5

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



Fig 14-6

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 starter, alternator, voltage regulator, or batteries themselves may be at fault.

VOLTAGE CHART FOR CHARGING THE BATTERY

Open Circuit Volts	Specific Gravity at 27C (80F)	% Charge	% Discharge
12.60	1.265	100%	0%
12.56	1.257	95%	5%
12.52	1.249	90%	10%
12.48	1.241	85%	15%
12.44	1.233	80%	20%
12.40	1.225	75%	25%
12.36	1.218	70%	30%
12.32	1.211	65%	35%
12.28	1.204	60%	40%
12.24	1.197	55%	45%
12.20	1.190	50%	50%
12.16	1.183	45%	55%
12.12	1.176	40%	60%
12.08	1.169	35%	65%
12.04	1.162	30%	70%
12.00	1.155	25%	75%
11.70	1.120	Discharged	100%

Electrolyte Temperature	Minimum Voltage for a 15 Second Carbon Pile Load Test
21° C (70° F)	9.6
16° C (60° F)	9.5
10° C (50° F)	9.4
4° C (40° F)	9.3
-1° C (30° F)	9.1
-7° C (20° F)	8.9
-12° C (10° F)	8.7
-18° C (0° F)	8.5

Service the other electrical components as follows:

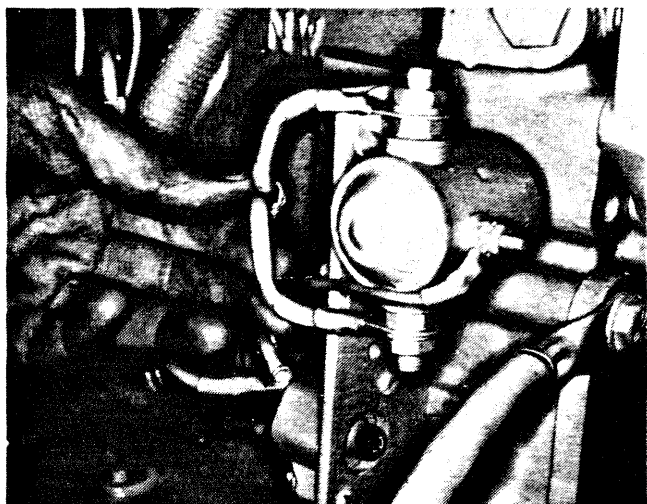


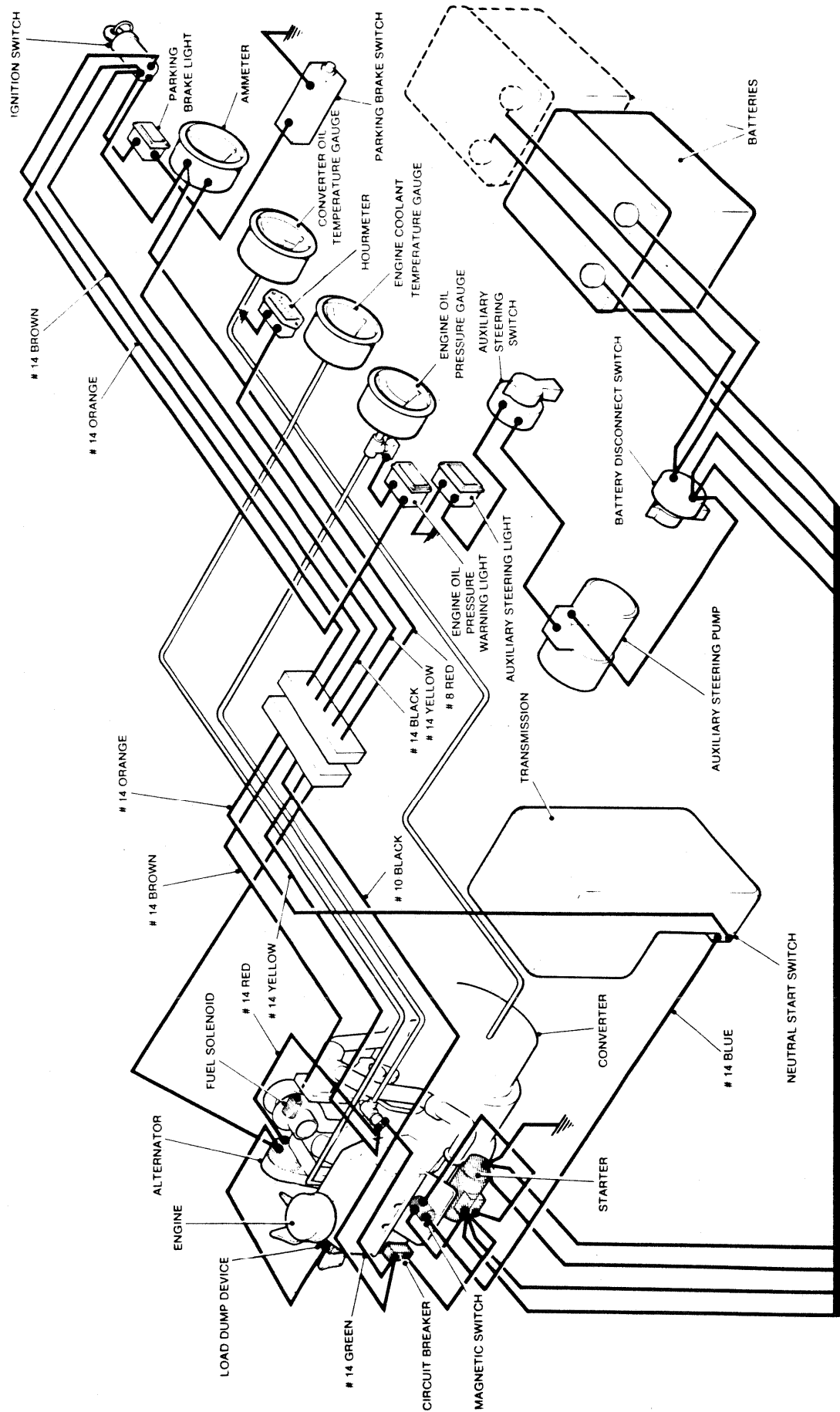
Fig 14-7

1. Visually check the wiring for worn or damaged insulation and loose terminal connections.

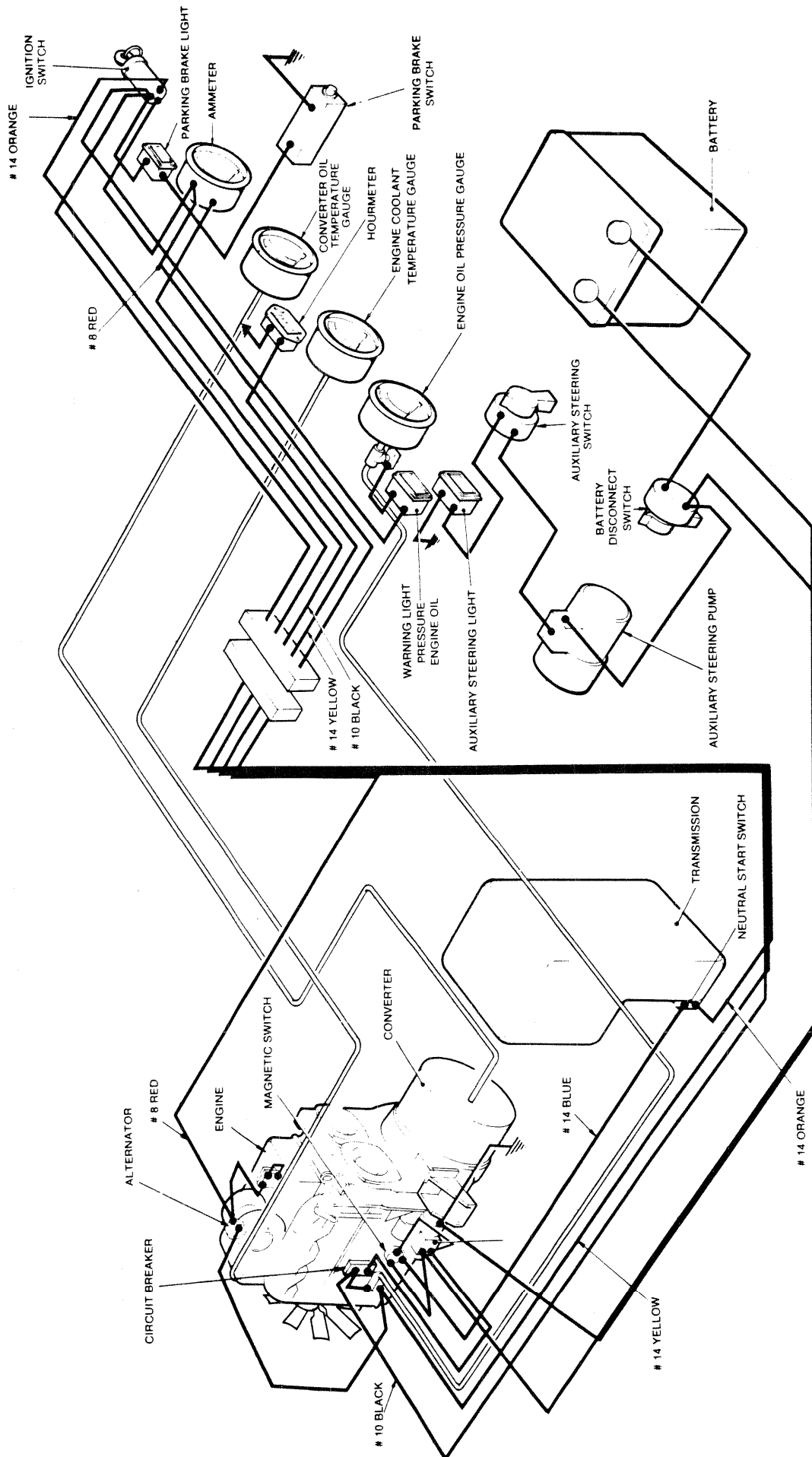
2. Clean the connections to the starter motor, alternator, voltage regulator, solenoid switch, relays and sender units. Clean and tighten the external ground strap and replace it if it is badly frayed or corroded.
3. Check to see that any wires are not in danger from burrs or wear points and make sure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

Every 1000 Hours of Operation:

Inspect, test and lubricate the electrical units. Replace any defective or worn out parts.



WIRING SCHEMATIC 667 CUMMINS



WIRING SCHEMATIC 667 DETROIT

NOTES

MISCELLANEOUS

Every 10 Hours of Operation:

Check the operation of the grapple snubbers before each work shift as follows:

1. Pull back the grapple assembly approximately 30 cm (12 in) and release it. The grapple should stop completely just before it reaches the bottom of its swing.

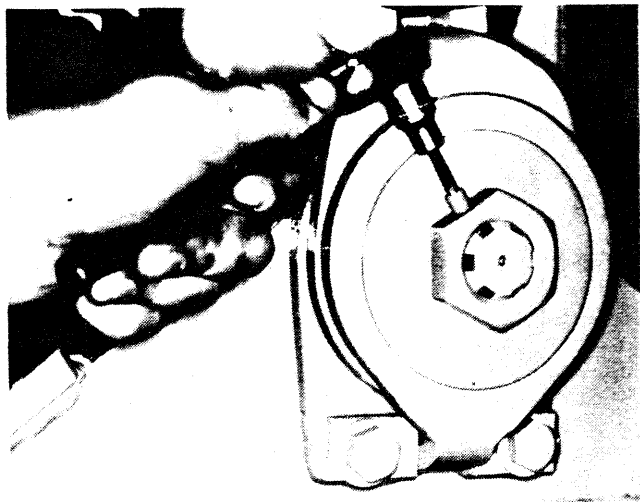


Fig 15-1

2. If the grapple swings farther than the allowable amount, remove the lock screws from the top snubber adjusting nuts.

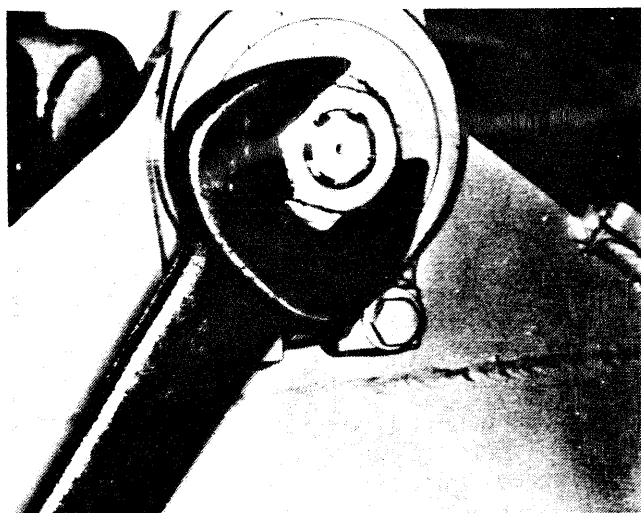


Fig 15-2

3. Loosen both adjusting nuts and then tighten them alternately until the Belleville washers compress approximately halfway. Recheck the grapple swing.

IMPORTANT NOTE: Never overtighten the adjusting nuts.

4. Install the lock screws to maintain the positions of the adjusting nuts.

NOTE: It may be necessary to loosen or tighten the adjusting nut(s) a small amount to align the cotter pin(s) with the holes in the snubber pin(s).

5. Repeat the procedure to adjust the bottom snubbers by pulling the grapple assembly 30 cm (12 in) to each side and releasing it.

IMPORTANT NOTE: Keep oil and grease away from the snubbers so they will work at maximum efficiency.

Every 500 Hours of Operation:

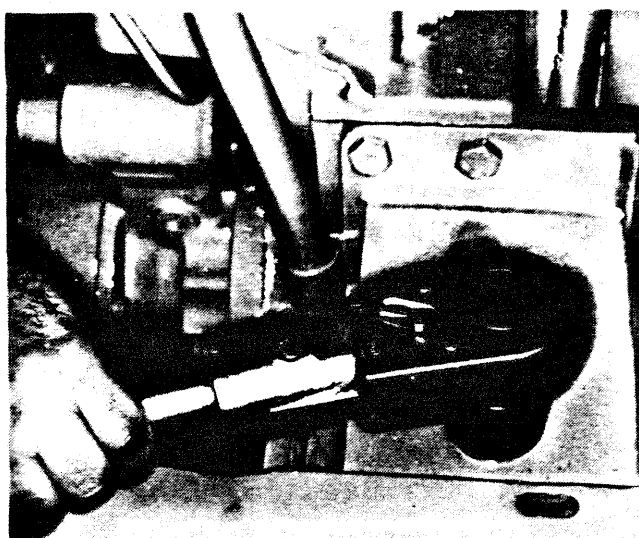


Fig 15-3

Tighten all component mounting bolts to the torques specified in Sec. 16. Wear and breakage can result from improperly installed or loosened mounting bolts (or nuts). If no torque values are given, bolts should be tightened in a manner consistent with good workmanship - See Sec. 16 - BOLT TORQUE CHART, GENERAL.

NOTE: Do not overtighten.


If you must tow the machine:

Put all control levers in their NEUTRAL 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. 2).

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. 2).

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. 2). 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.

SPECIFICATIONS AND SERVICE DATA

Engine	Detroit Diesel	Detroit Diesel
Engine Model	4-53N	4-53T
Engine Configuration	Inline 4 - Natural	Inline 4 - Turbo
Bore X Stroke, cm (in)	9,85 x 11,43 (3.88 x 4.50)	9,85 x 11,43 (3.88 x 4.50)
Displacement, l (in ³)	3,5 (212)	3,5 (212)
Maximum Torque, N.m (lbf.ft) @ RPM	382 (282) @ 1800	514 (379) @ 1600
Gross Power, kW (hp) at governed RPM	101 (136)	116 (155)
Governed RPM (under Full Load)	2800	2500
Low Idle RPM	550-650	575-625
High Free Idle RPM	2900-3000	2600-2700
Converter Stall RPM Cable/Grapple	2400-2560	1920-2060/1900-2040
Hydraulic Stall RPM	2670-2780	2100-2220
Engine	Cummins Diesel	Cummins Diesel
Engine Model	V-378	VT-378
Engine Configuration	V-6 Natural	V6 - Turbo
Bore X Stroke, cm (in)	11,73 x 9,53 (4.62 x 3.75)	11,73 x 9,53 (4.62 x 3.75)
Displacement, l (in ³)	6,2 (378)	6,20 (378)
Maximum Torque, N.m (lbf.ft) @ RPM	393 (290) @ 1900	442 (326) @ 1800
Gross Power, kW (hp) at governed RPM	104 (139)	113 (152)
Governed RPM (under Full Load)	2800	2800
Low Idle RPM	600-650	600-650
High Free Idle RPM	2900-3040	3000-3160
Converter Stall RPM	2640-2800	2300-2460
Hydraulic Stall RPM Cable/Grapple	2360-2540/2310-2440	2060-2240/2030-2210

NOTE: The above Converter Stall RPM readings are the maximum engine RPM obtained with oil at its Operating Temperature (See Sec. 1), the Direction Control Lever in its Forward position, the Speed Range Control Lever in its Third position and the Service Brake applied.

These Stall Specifications are applicable to an altitude of 150 m (500 ft), ASL at an ambient temperature of 30° C (85° F). The numerous combinations of altitude and temperature make it difficult to publish Stall Specifications for all conditions. Contact your local engine distributor for the corrections required to calculate the Stall RPM values for your specific application.

PRESSURE READINGS

At Operating Temperature (See Sec. 1). - kPa (PSI).

Engine Lube Oil:

69 to 172 (10 to 25) at Low Idle RPM.
207 (30) minimum - Detroit at Operating RPM.
310 to 448 (45 to 65) - Cummins at Operating RPM.

Transmission/Winch Clutches:

1.655 to 1.930 (240 to 280) in both Directions, all Speed Ranges and all Winch Modes at Low Idle RPM with no more than 35 kPa (5 PSI) difference between all readings.

Hydraulic Relief Settings:

Steer and Blade Main Relief
- 12.410 (1800) cable skidder.
- 13.790 (2000) grapple skidder.

Arch and Grapple Relief - 12.410 (1800) cable skidder.

BATTERY AND ELECTRICAL SYSTEM

12V negative ground system with 35 amp. alternator.

Battery Charge Test:

Carbon Pile test method should be used to test the battery under load.

CAPACITIES (Approximate)

	Litres	U.S. Gallons
Engine Cooling System	34	9.0
Engine Lube Oil System - Detroit	16	4.2
Engine Lube Oil System - Cummins	30	7.9
Fuel Tank	145	38.3
Main Hydraulic System - Cable	73	19.3
Main Hydraulic System - Grapple	83	22.0
Transmission/Converter Hydraulic System	40	10.6
Midmount Brake Unit	10	2.6
Axle Differentials	12	3.2
Axle Planetary Hubs	9	2.4

BOLT TORQUE CHART, APPLICATION

	Thread	N.m	lbf.ft
Front Engine Mount to Engine - Detroit	.375-16	31-33	23-25
Front Engine Mount to Engine - Cummins	.500-13	75-85	55-65
Front Engine Support to Frame	.625-11	215-240	160-175
Front Engine Mount to Pedestal Mount	.625-11	120-135	90-100
Side Frame Mount to Engine	.500-13	75-85	55-65
Side Engine Mount to Frame	.625-11	55-135	40-100
Torque Converter to Flywheel Housing	.375-16	27-34	20-25
* Transmission Bracket to Transmission	.750-10	385-420	285-310
Transmission Bracket to Frame	.625-11	215-240	160-175
Upper Drive Shaft	.313-24	27-34	20-25
Lower Drive Shaft	.375-24	55-60	40-45
* Winch to Frame (Cradle)	1.25-7	1150-1360	850-1000
* Winch Cradle to Frame	1.00-8	930-1020	685-750
* Rear Axle to Frame	1.00-14	1010-1115	745-820
Mounting Flange to Rear Drive Shaft	.875-14	800	590
* Midmount Bearing to Rear Frame	.375-16	45-50	33-36
Wheel Nuts	.750-16	575-645	425-475
Alternator Pulley	.313-18	60	45
Hydraulic Pump to Torque Converter	.375-24	27	20
Hydraulic Tank Filter Mounting Bolts	.313-24	55-75	40-50

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

*The spherical wheel nut seat in the rim must be concentric with the stud - ream the hole if necessary.

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

BOLT TORQUE CHART - GENERAL

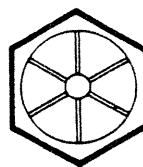
NOTE: Use this chart only if the torque is not shown on the BOLT TORQUE CHART, APPLICATION.

Thread Diameter		GRADE 5		GRADE 8		Socket Head and 12 Point Head Capscrews	
		Part Number Prefixes Coarse Thread 1C, 15C, 61D Fine Thread 2C, 16C, 62D		Part Number Prefixes Coarse Thread 17C, 23C, 63D Fine Thread 18C, 24C, 64D		Part Number Prefixes Coarse Thread 25C, 73G, 93G Fine Thread 26C, 74G, 94G	
Fraction	Decimal	N.m	lbf.ft	N.m	lbf.ft	N.m	lbf.ft
1/4	0.2500	10	7	12-14	9-10	15-16	11-12
5/16	0.3125	20-22	15-16	24-27	18-20	31-34	23-25
3/8	0.3750	34-38	25-28	50-55	34-40	60-65	45-50
7/16	0.4375	55-60	40-45	80-90	60-65	95-100	70-75
1/2	0.5000	90-95	65-70	125-135	90-100	150-160	110-120
9/16	0.5625	125-135	90-100	170-190	125-140	205-225	150-165
5/8	0.6250	170-190	125-140	240-255	175-190	285-310	210-230
3/4	0.7500	300-330	220-245	405-445	300-330	490-540	360-400
7/8	0.8750	450-490	330-360	645-710	475-525	815-880	600-650
1 in	1.0000	645-710	475-525	985-1085	725-800	1220-1355	900-1000
1-1/8	1.1250	880-975	650-720	1425-1595	1050-1175	1760-1965	1300-1450
1-1/4	1.2500	1220-1355	900-1000	2000-2205	1475-1625	2510-2710	1850-2000
1-3/8	1.3750	1630-1830	1200-1350	2710-2980	2000-2200	3320-3660	2450-2700
1-1/2	1.5000	2035-2235	1500-1650	3523-3865	2600-2850	4270-4680	3150-3450
1-5/8	1.6250	2710-2980	2000-2200	4680-5150	3450-3800	5630-6240	4150-4600
1-3/4	1.7500	3390-3730	2500-2750	5830-6510	4300-4800	6910-7730	5100-5700
1-7/8	1.8750	4270-4745	3150-3500	7460-8270	5500-6100	8810-9760	6500-7200
2 in	2.0000	5150-5965	3800-4200	8810-9760	6500-7200	10575-11660	7800-8600

NOTE: The torque values shown are for fasteners coated with zinc phosphate and oil, and used with hardened plain or zinc phosphate and oil coated washers.



Grade 5 Identification
3 Radial Lines 120° Apart
on Heads of Bolts.



Grade 8 Identification
6 Radial Lines 60° Apart
on Heads of Bolts.

NOTES

HOURLY LUBRICATION & MAINTENANCE SCHEDULE

SYSTEM	OPERATION	TEXT LOCATION	INTERVALS					
			10	50	100	250	500	1000
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						•

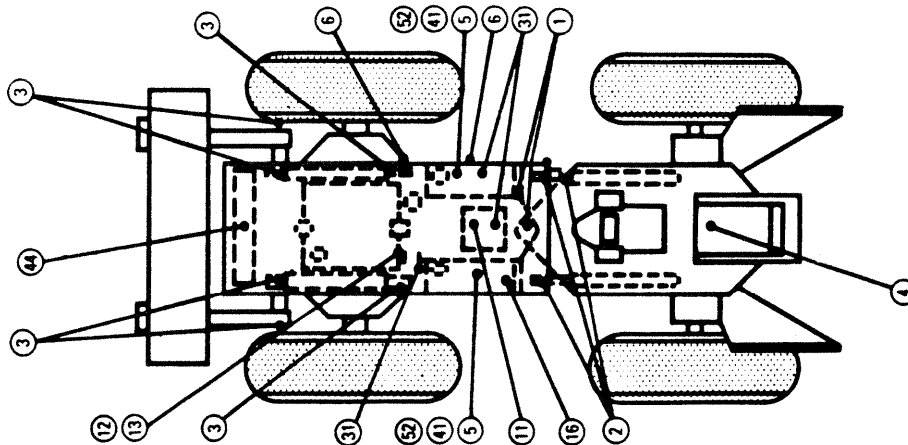
Chassis

CLARK

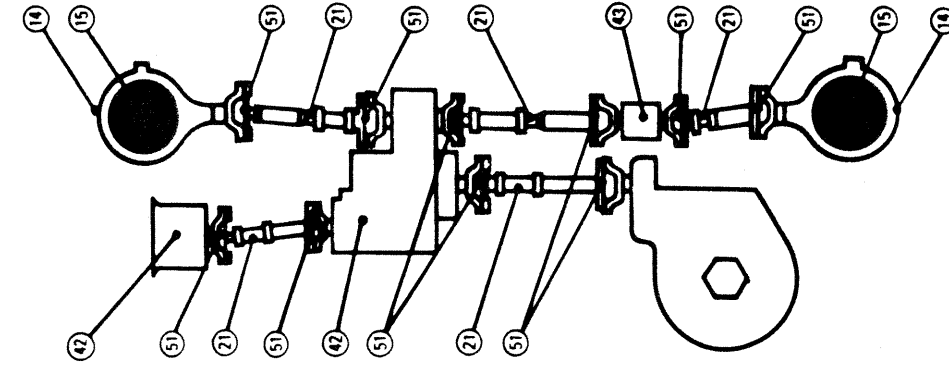
Lubrication Instructions

RANGER

Drive Line



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



ITEM	10 HOUR OR DAILY SERVICE	64	66	67	68	CHECK	LUBE	CHANGE	KEY
1	CRADLE AND HINGE PINS	X	X	X	X				EPMD
2	STEER CYLINDER PINS	X	X	X	X				EPMD
3	UTILITY BLADE & CYLINDER PINS	X	X	X	X				EPMD
4	FUEL TANK	X	X	X	X				DF
5	OIL RESERVOIR	X	X	X	X				DX
6	COOLANT LEVEL	X	X	X	X				
90 HOUR OR WEEKLY SERVICE									
11	TORQUE CONVERTER & TRANSMISSION	X	X	X	X				DX
12	MASTER CYLINDER ENCLOSED SERVICE BRAKE	X	X	X	X				DX
13	MASTER CYLINDER EMERGENCY BRAKE	X	X	X	X				DX
14	DIFFERENTIAL	X	X	X	X				EPGL
15	PLANETARY	X	X	X	X				EPGL
16	WINCH LEVER	X	X	X	X				EPMD
180 HOUR OR 2 WEEK SERVICE									
21	SLIP JOINT	X	X	X	X				EPMD
250 HOUR OR MONTHLY SERVICE									
31	TORQUE CONVERTER & TRANSMISSION FILTER	X	X	X	X				
500 HOUR OR 2 MONTH SERVICE									
41	HYDRAULIC TANK FILTER	X	X	X	X				
42	TORQUE CONVERTER & TRANSMISSION	X	X	X	X				DX
43	ENCLOSED MIDMOUNT BRAKE	X	X	X	X				DX
44	CLEAN RADIATOR CORE	X	X	X	X				
1,000 HOUR OR 6 MONTH SERVICE									
51	UNIVERSAL JOINTS	X	X	X	X				EPMD
52	OIL RESERVOIR	X	X	X	X				DX

Lubricant Key

EPMD	Extreme Pressure Molybdenum Disulfide Grease		DF	Diesel Fuel — See Engine Manual	
	Ambient Temp Range	Lubricant To Be Used		Ambient Temp Range	Extreme Pressure Gear Lube
DX	Above -23°C (1) (-10°F) 2	SAE Grade 10W CC 1-2104B	FPGI	Below -23°C (-10°F)	SAE Grade 75
	Above -23°C (1) (-10°F) 2	10W CC 1-2104C		-18°C to -23°C (0°F to (-10°F)	SAE Grade 80
	Above -34°C (-30°F) 1	Depron or Depron II Automatic Transmission Fluid		-18°C to -38°C (0°F to (-30°F)	SAE Grade 90
	Above -54°C (-65°F) 1	Depron or Depron II Automatic Transmission Fluid		Above 38°C (100°F)	SAE Grade 140
		CONOCO DN 800 Fluid			

**SCI signifies SUETO CHLORO lead type factory fill is made with 90 SCI type lube. It is recommended that the same type be used when adding or refilling.

1929732

SERVICE PUBLICATIONS

All new **RANGER** Log Skidders are supplied with a Service Publication package consisting of one Parts, one Operator's, one Engine Manual and one Preventive Maintenance Guide to be delivered to the customer at no charge at the time of the delivery. Additional manuals are available at a nominal cost from your **RANGER** distributor. The machine serial number should be supplied along with the publication order. Prices may be obtained from your distributor. Where manuals have been updated, and the publication number changed, the latest issue will be sent.

SHOP MANUALS

The following are the component Shop Manuals for your Ranger Log Skidder.

	Manual No.
300 and 400 Series Master Clark Winch	2561
C-270 Converter	2249
R-28,320 Transmission	2485
28,000 Transmission Mounted Hydraulic Brake	HB-280
Enclosed Mounted Brake	6960
17,000 & 19,000 Series Drive Axle	6956
Hydraulic Cylinders	3275

PARTS MANUALS

All Parts Manuals must be ordered by specific machine serial number.

MACHINE DATA

Model _____ Serial No. _____ Unit No. _____
 Engine _____ Serial No. _____
 Distributor _____

 Telephone _____ Parts Manager _____ Service Manager _____

NOTES