RANGER 664D/665D LOG SKIDDER OPERATORS MANUAL

PUBLICATION NO. 6405-R4

FOR MACHINE
SERIAL NUMBERS

664D CABLE DETROIT 528A thru 528C
664D CABLE CUMMINS 551D thru 551F
664D CABLE DEUTZ 529C
664D GRAPPLE DETROIT 540A
665D CABLE DETROIT 541B THRU 541F
665D GRAPPLE DETROIT 543A THRU 543E AND 558F

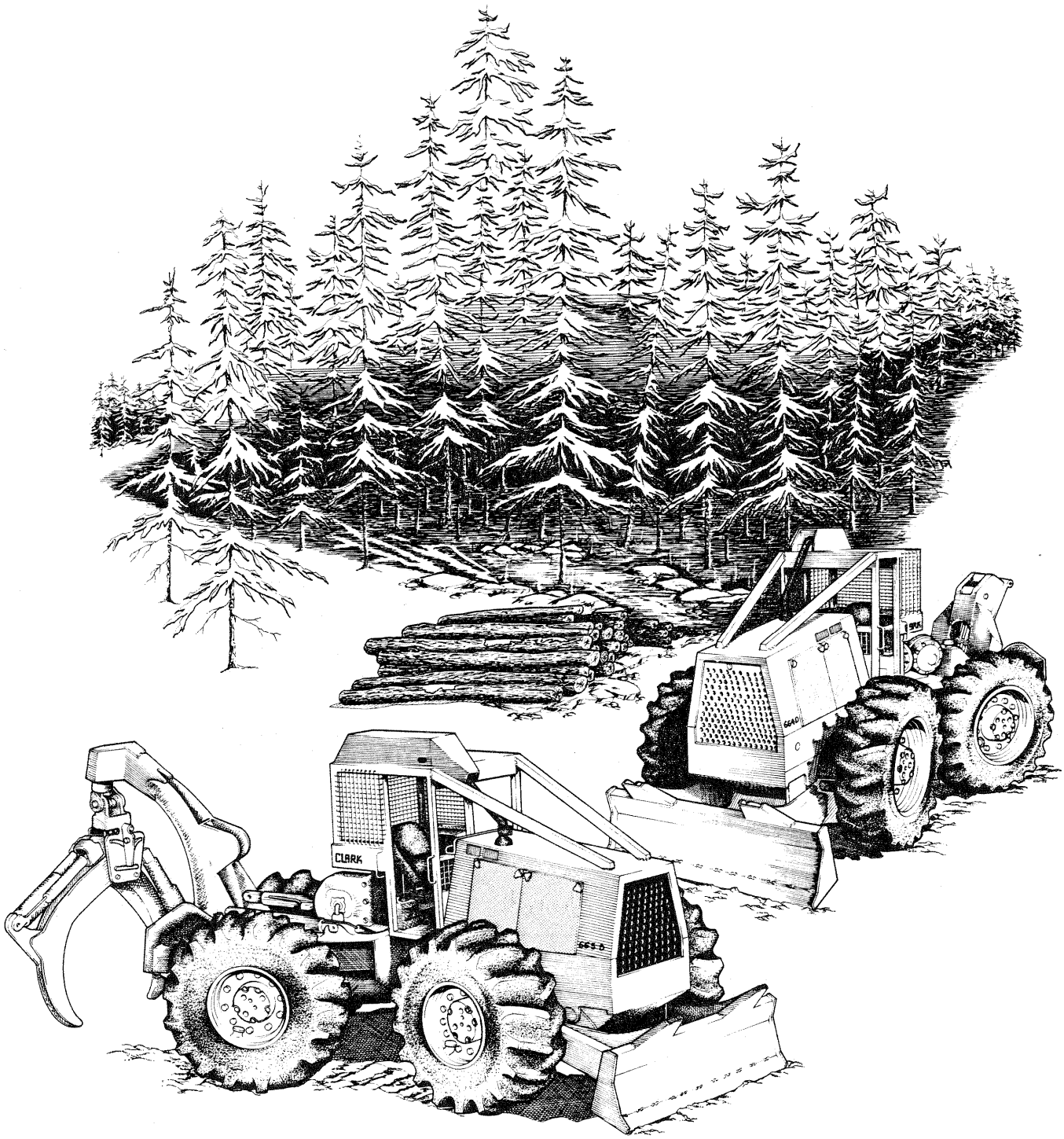
RECORD YOUR MACHINE
SERIAL NUMBER HERE

_____

The Clark Product Support Language is a special technical language designed to improve the readability of Clark manuals.

Printed in Canada

MARCH 1985


CLARK

TO OWNERS

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

You have purchased this Clark 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 Clark machine will always respond at its best with considerate treatment and care. The slight outlay in personal attention and 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 Clark-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. The Clark Equipment Company does not warrant repair or replacemnt parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Equipment Company.

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 to1the 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 Clark Equipment 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 Clark Equipment Company, Construction Machinery Division, 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 Clark should be notified in writing.

NOTES

INDEX

NOTES

INTRODUCTION

Your **CLARK** 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 2.85 to one (on the 664D) or a 2.29 to one (on the 665D) 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 a hydraulic cylinder. 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 **CLARK** 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 parking and service 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 to 1500 RPM (approximately half throttle), raise the blade and hold the lever in the raise position to bring 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 CLARK 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 malfunctions.
3. Note all hazards and obstructions such as ditches, electrical wires and wheel blocks.
4. Ensure proper ventilation if you are going to start the machine indoors.
5. Be particularly careful if this is not the machine you normally operate.
6. 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 travelling 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.

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.

⚠ WARNING: The operator protective structure is not specifically designed to protect the operator from loads generated during a delimbing gate operation. Responsibility for the application of the machine in this manner rests with the end user.

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:

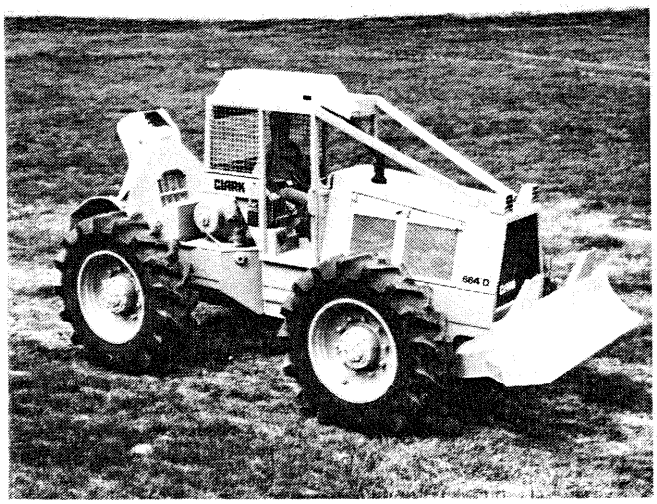


Fig 2-1

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

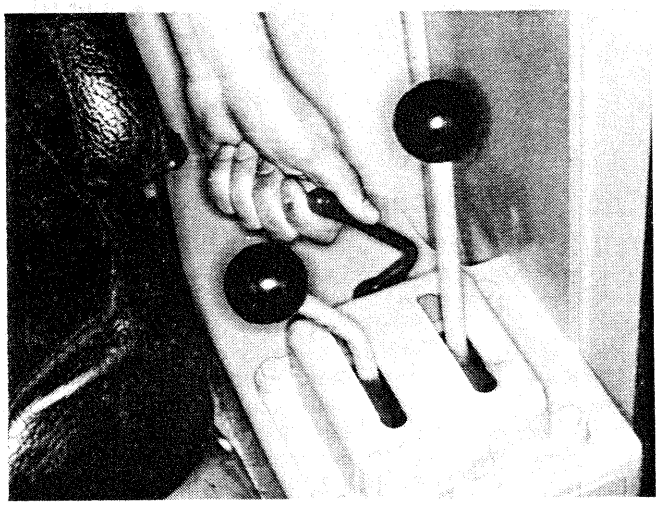


Fig 2-2

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

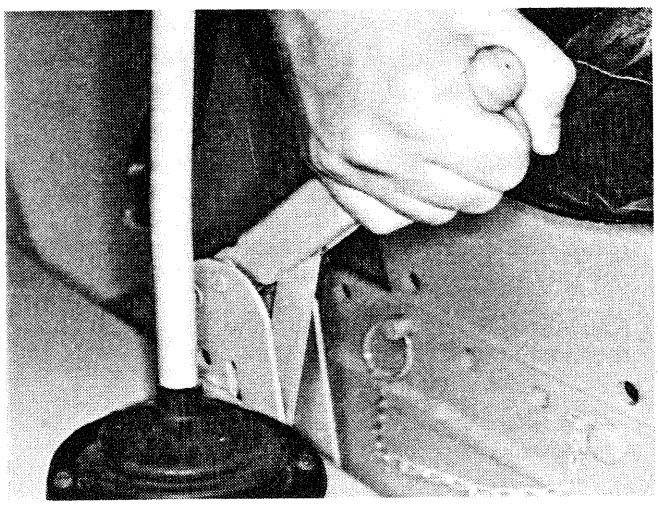


Fig 2-3

3. Actuate the parking brake.

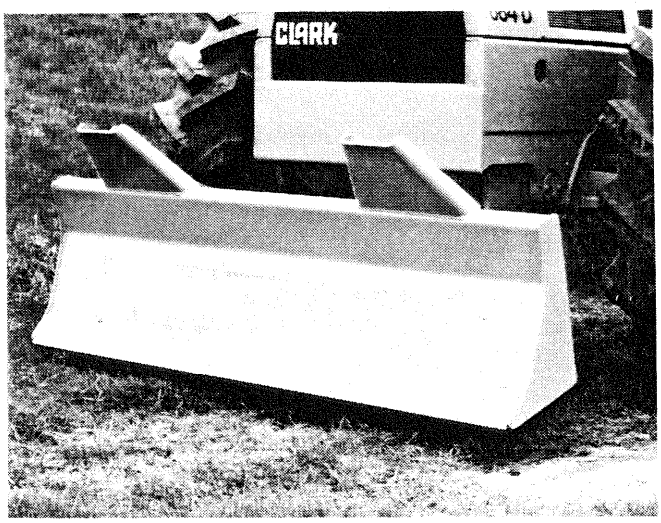


Fig 2-4

4. Lower the blade to the ground.

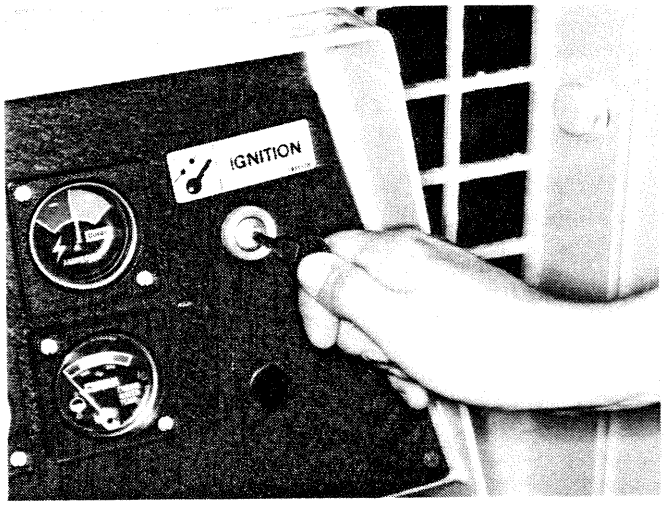


Fig 2-5

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

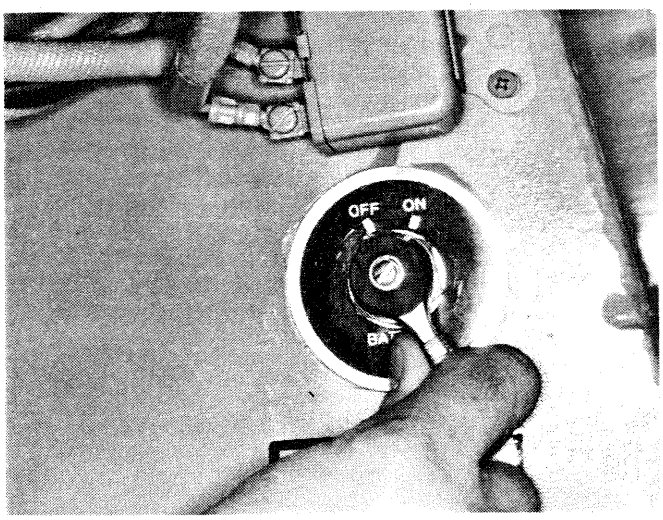


Fig 2-6

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

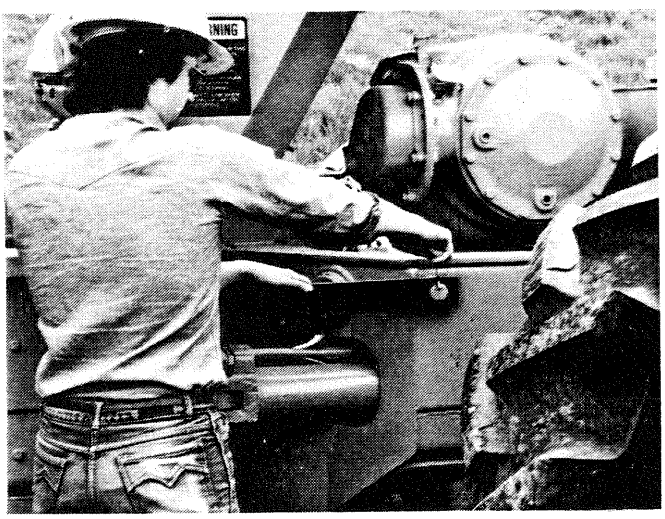


Fig 2-7

7. Fasten the steering frame lock between the frames.

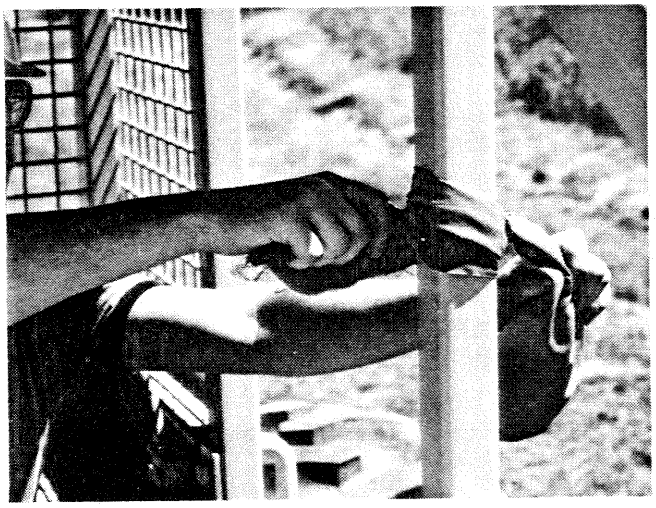


Fig 2-8

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.

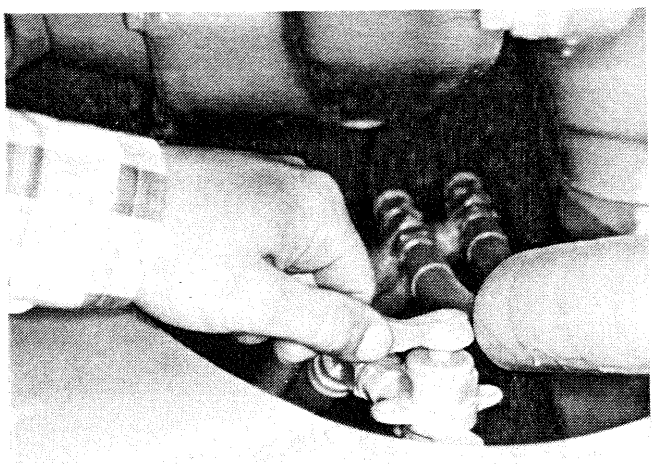


Fig 2-10

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 inflating 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 orfice 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. The **CLARK** 664D Detroit and Deutz machines are factory equipped with regulation (U.S.D.A. Forest Service) approved spark arrestors installed in their exhaust systems. 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 in violation of certain regional or local laws. See Sec. 6 for spark arrestor service instructions. The **CLARK** 664D Cummins and the 665D Detroit machines have turbocharged engines which are approved as spark arrestor devices and require no such service.

OPERATING CONTROLS

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

Winch Control Lever

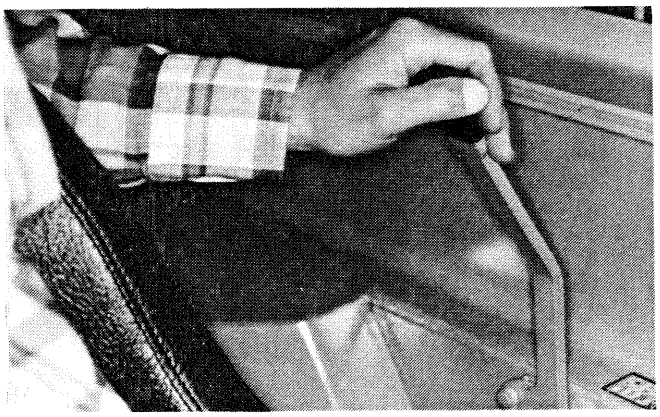


Fig 3-1

This lever actuates the winch control valve to operate the winch. When the lever is moved to the detented FREE-SPOOL position, the winch mainline can be pulled out from the winch cable drum. When the lever is moved to the WINCH IN position, the winch cable drum will rotate and pull the load to the machine's butt pan. When the lever is in the detented centre LOCK position, the cable drum is held in the SKIDDING mode and the load can be transported to its destination.

IMPORTANT NOTE: When the load has been WINCHED-IN to the butt pan, release the winch control lever to the LOCK position IMMEDIATELY. Serious damage to the winch and transmission can occur if the winch is made to pull against the butt pan.

NOTE: On the grapple machines, the winch control lever is mounted adjacent to the grapple control levers to the right of the operator's seat.

Direction Control Lever

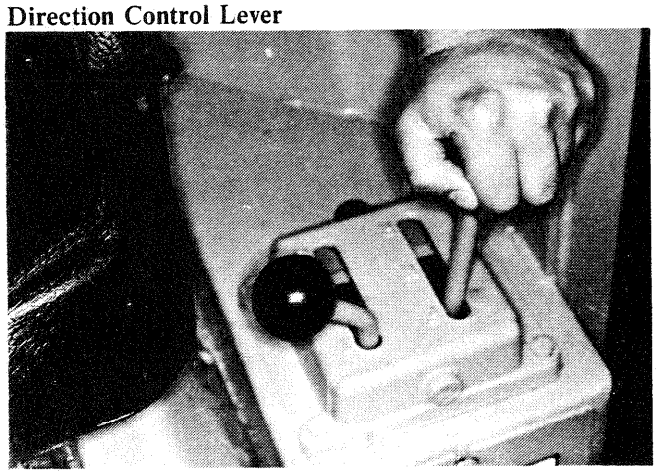


Fig 3-2

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

IMPORTANT NOTE: 551E, 551F, 541E, 541F, 543E and 558F serial number machines are equipped with Forward-Reverse Modulation to provide a system cushion when the machine's direction is changed while it is still moving. This feature should ONLY be used in the FIRST or SECOND Speed Ranges (See Fig 3-4). Damage to the transmission can result if this feature is used in the THIRD Speed Range at travel speeds.

Neutral Lock Lever

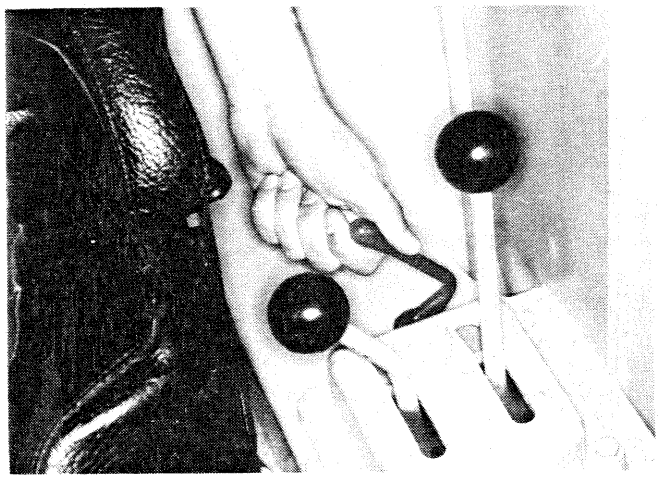


Fig 3-3

Turn this latch to the right when the Direction Control Lever is in the NEUTRAL position to lock the lever in that position.

Speed Range Control Lever

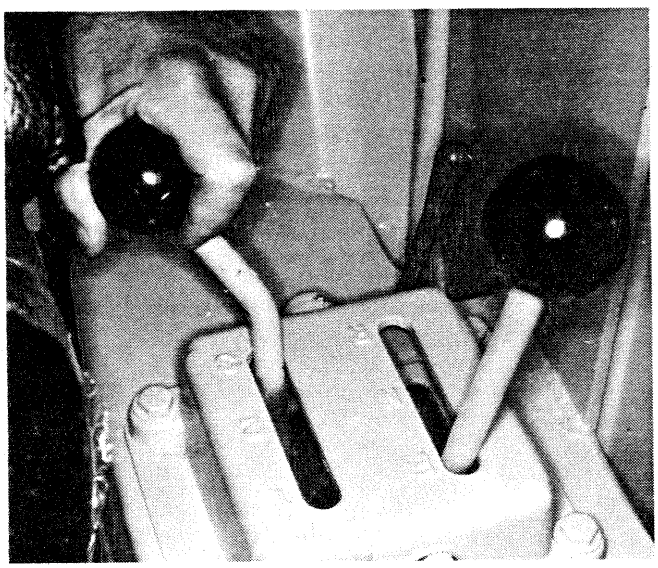


Fig 3-4

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.

Steer and Blade Control Lever

Fig 3-5

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.

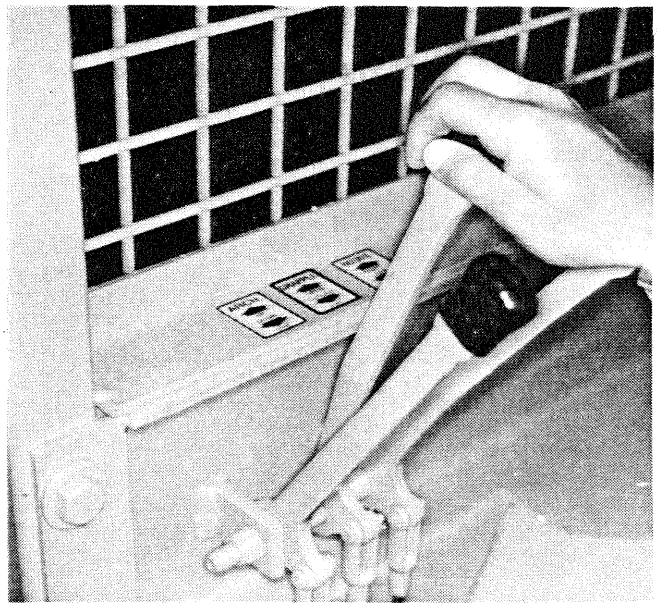


Fig 3-7

Three levers control the operation of the arch and grapple assembly. From the front of the machine the levers are as follows: Arch control, with moves the arch forward or back, Grapple control which opens and closes the grapple assembly and the Grapple Rotating control which rotates the grapple to the left or right. On grapple machines, the winch control lever is mounted adjacent to the grapple rotating control lever.

Parking Brake Lever

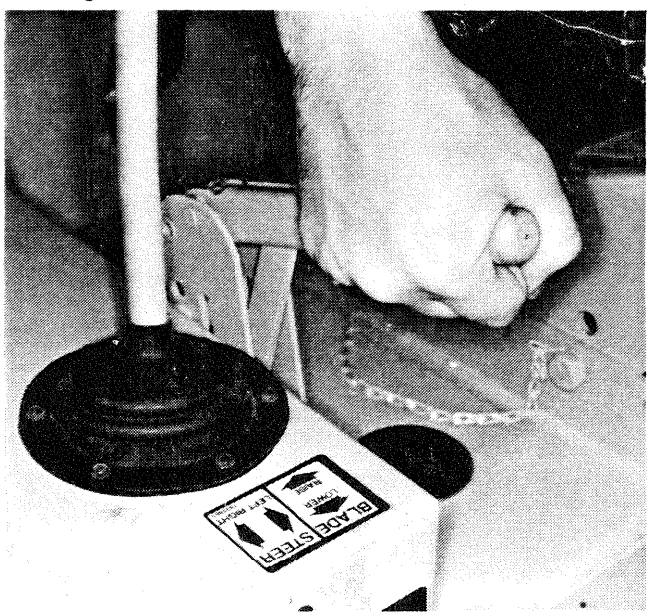


Fig 3-6

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

Hourmeter

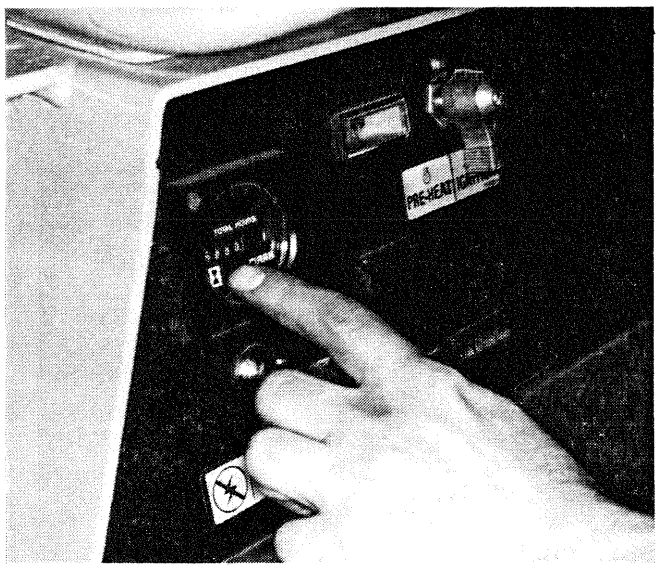


Fig 3-8

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 **CLARK** skidder.

Engine Stop Handle

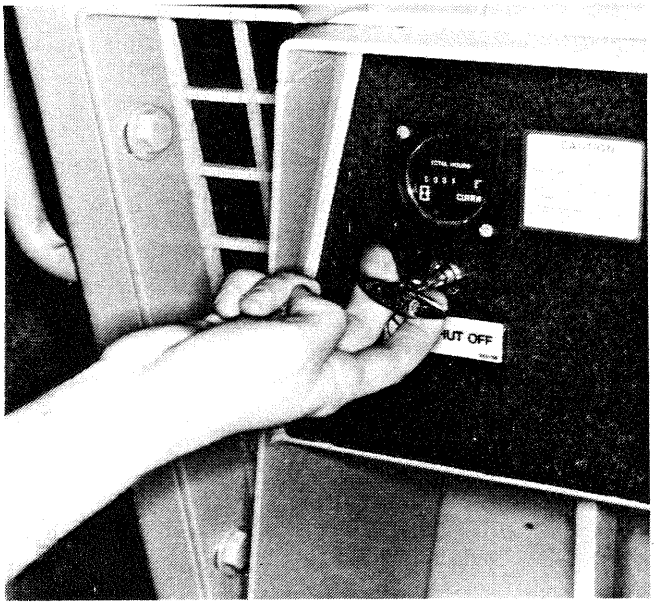


Fig 3-9

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.

Parking Brake Light

Fig 3-11

This light glows to indicate that the parking brake is actuated. The lever must be released before the machine can be moved. If the light fails to glow when the brake is applied and the ignition switch is in the ON position, adjust the parking brake light switch (see Sec. 13).

Engine Pre-Heat Switch and Indicator Light (Deutz only)

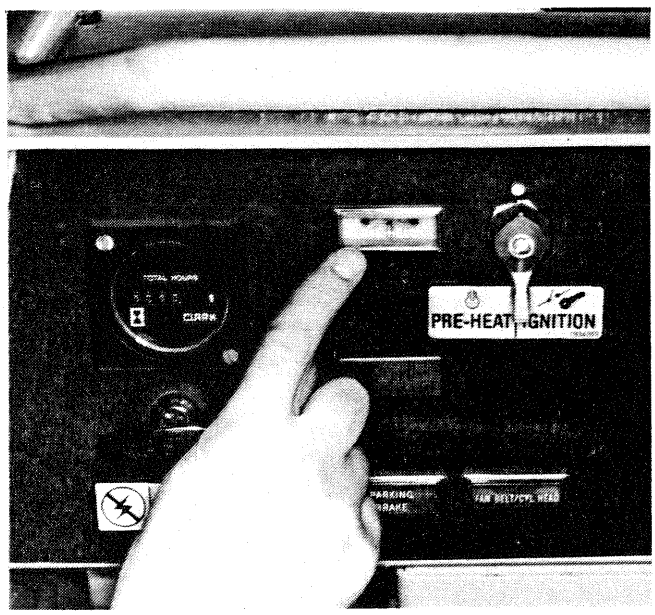


Fig 3-10

This system is to be used to start the machine in freezing temperatures, see Sec. 4 - "Cold Weather Operation" for more information.

Fan Belt/Cylinder Head Warning Light (Deutz only)

Fig 3-12

The air cooled Deitz Diesel engine depends for its cooling on a belt-driven blower fan. The drive belt is adjusted by a self-tensioner on the engine. If the drive belt should break, this warning light will glow to indicate this condition. Shut down the engine immediately and replace the belt.

Engine Oil Pressure Gauge

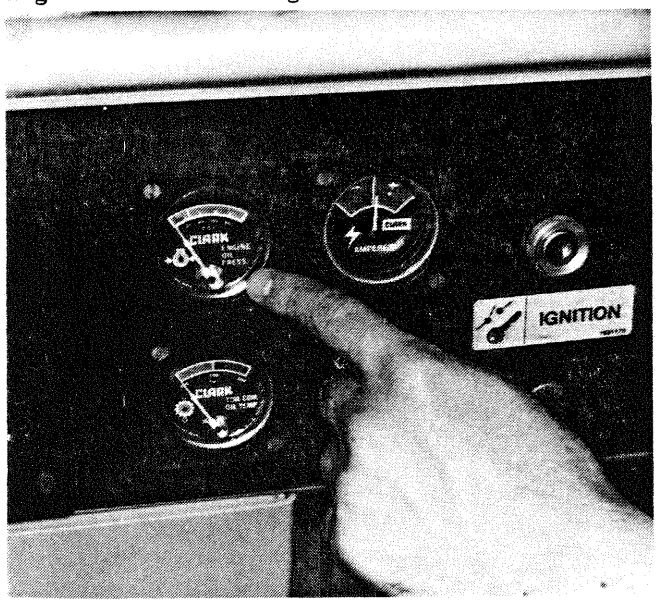


Fig 3-13

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.

Converter Temperature Gauge

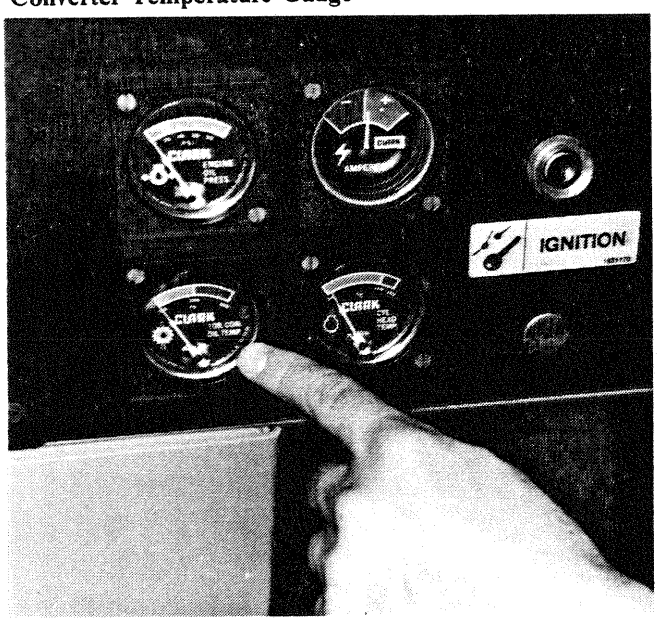


Fig 3-14

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.

Engine Water Temperature Gauge (Detr. and Cumm.)

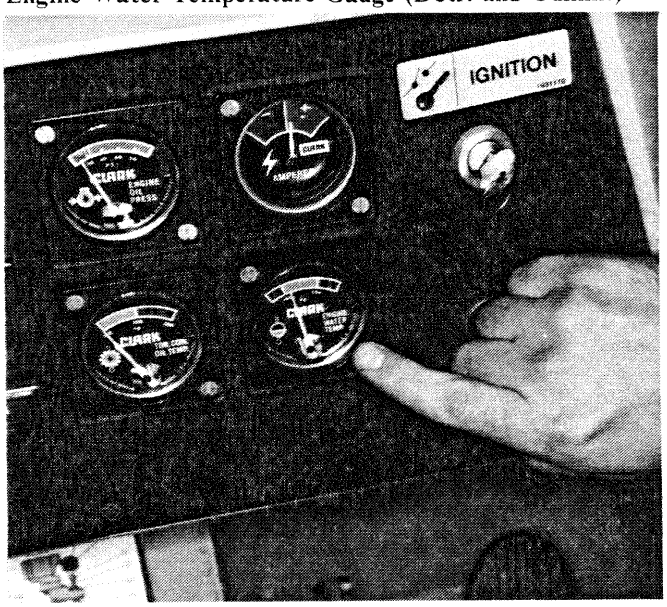


Fig 3-16

This gauge allows the operator to monitor the temperature of the engine coolant. Do not allow the indicator needle to enter the red zone on the gauge or serious damage to the engine and its components can result. If overheating does occur, check the fan belt tension (See Sec. 6) and check the radiator for debris that can be restricting air flow.

Engine Cylinder Head Temperature Gauge (Deutz)

Fig 3-17

This gauge allows the operator to monitor the temperature of the Deutz engine cylinder head. 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 to see that the grille, the cooling blower and the cylinder cooling fins are free of debris that can restrict air flow and interfere with proper engine cooling.

Ignition (Key) Switch

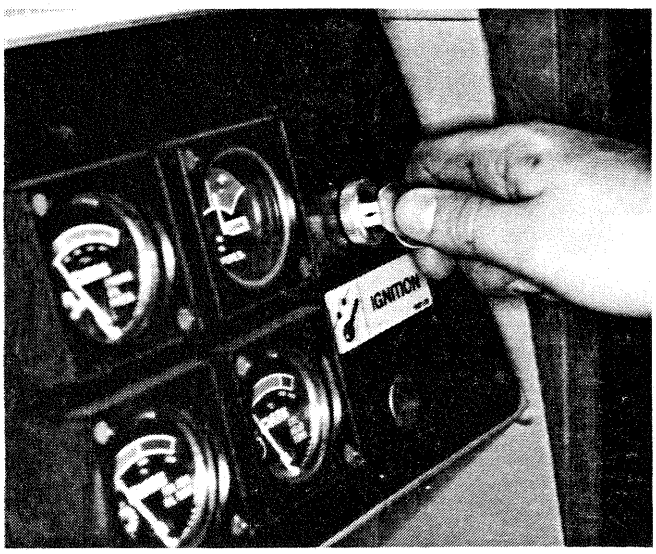


Fig 3-18

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

Hand Throttle Control

Fig 3-19

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.

Battery Disconnect Switch

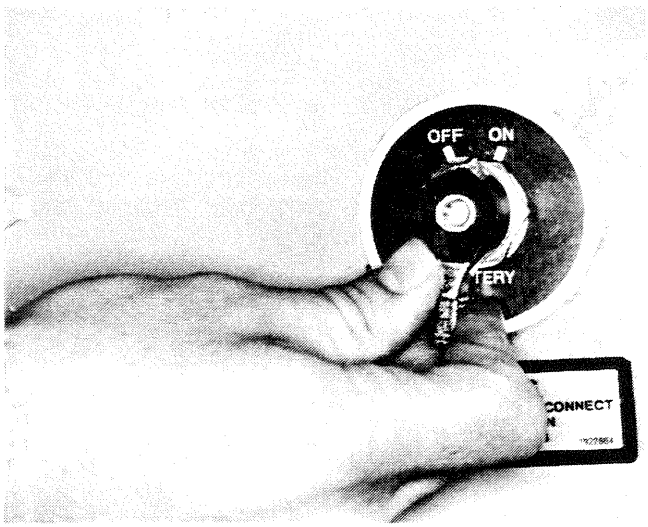


Fig 3-20

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.

Windshield Wiper/Washer Switch

Fig 3-21

Turn the switch clockwise one or two positions to actuate the windshield wiper. Turn the switch counterclockwise to turn the wiper OFF. Press the switch to actuate the windshield washer.

NOTE: **Use only clean windshield washer solvent in the washer reservoir. Use a quality brand of windshield washer anti-freeze if the ambient temperature falls below 0°C (32°F).**

Heater Switch (Detroit only)

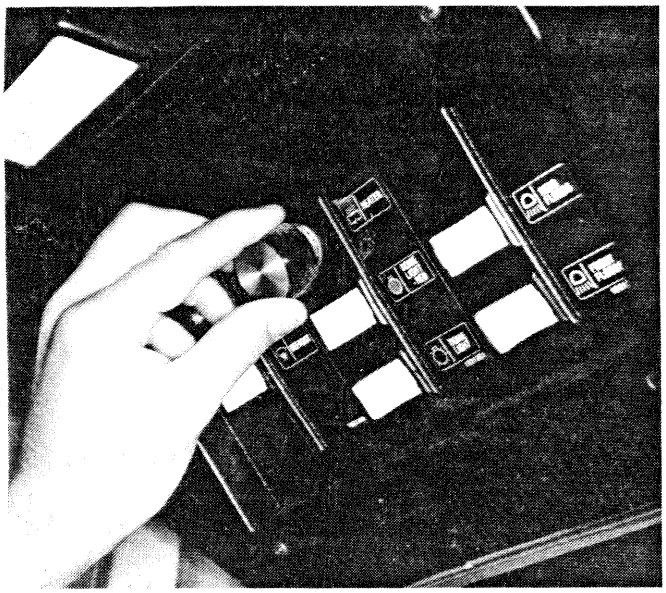


Fig 3-23

Turn the switch clockwise to the FIRST position for LOW fan speed and to the SECOND position for HIGH speed. Turn the switch counterclockwise to turn the heater OFF.

Defroster Fan Switch

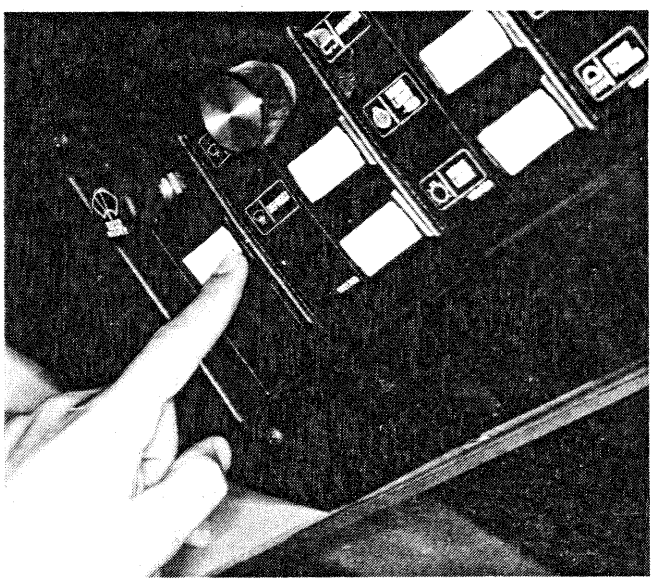


Fig 3-22

This switch turns the windshield defroster fan ON and OFF to clear condensation and frost from the windshield.

Dome Light Switch

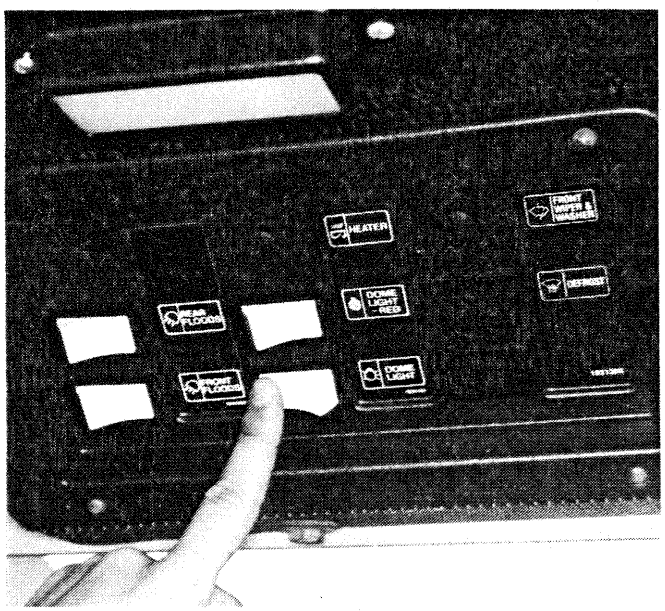


Fig 3-24

The "RED" dome light switch turns the red cab dome light ON for use at night for safe travel. The Dome Light switch below turns the white cab dome light ON for use at night ONLY when the machine is stationary.

Front and Rear Flood Light Switches

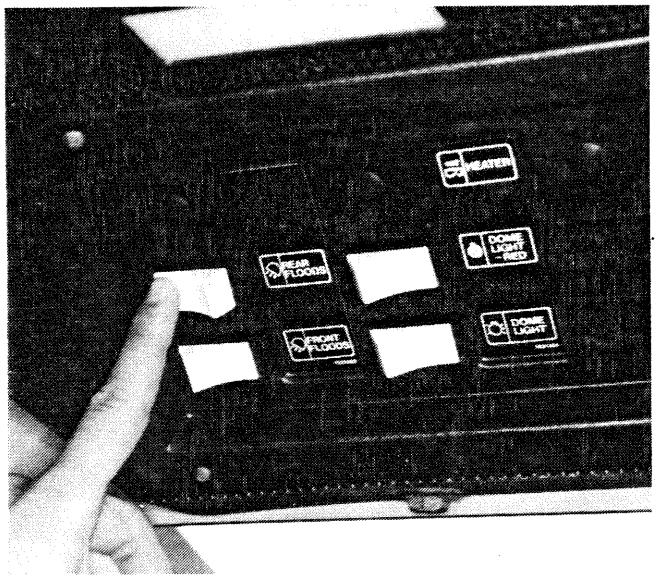


Fig 3-25

These switches actuate the front and/or rear flood lights for operating the machine at night.

Accelerator Pedal

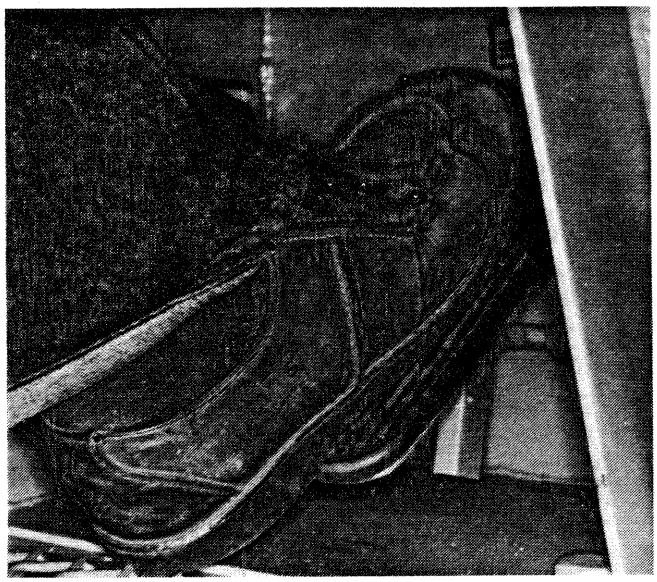


Fig 3-27

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.

Accessory Circuit Breaker Panel

Fig 3-26

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

Service Brake Pedal

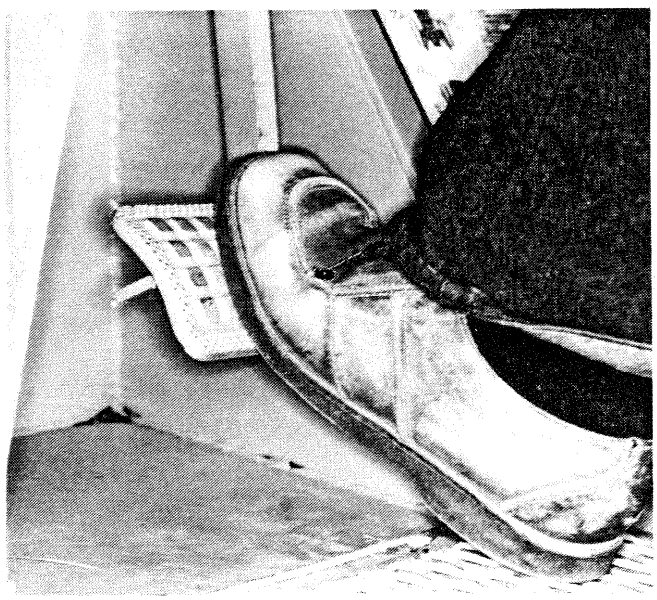


Fig 3-28

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

Secondary Brake Pedal

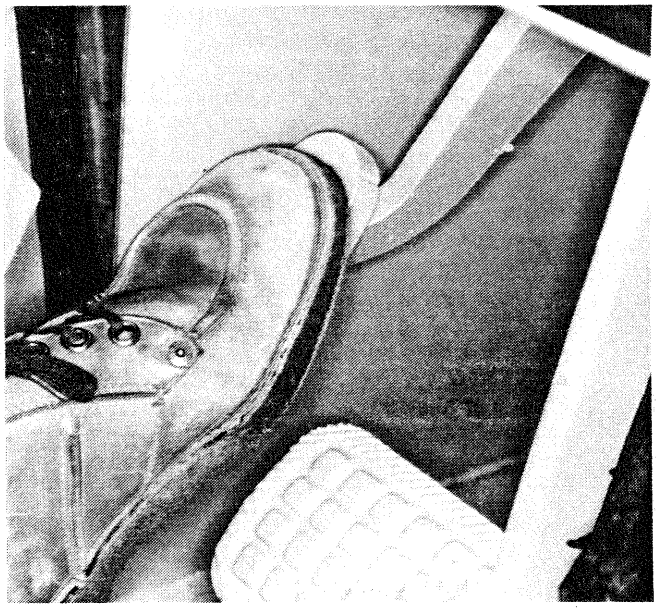


Fig 3-29

This pedal is located adjacent to the service brake pedal and should be used to stop the machine in the event that the service brake system should fail.

WARNING: DO NOT operate the machine with the secondary brake system operational ONLY. Make sure that both brake systems are 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.**

Seat Adjustment Lever

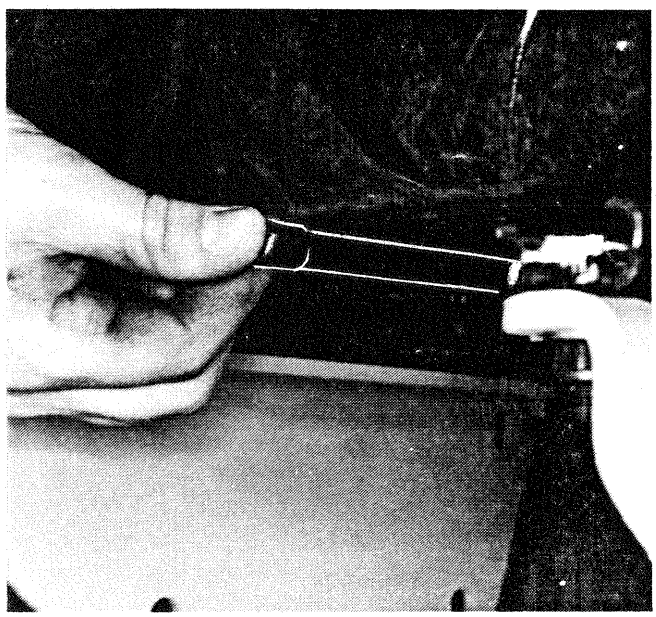


Fig 3-30

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

Seat Belt

Fig 3-31

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

Fire Extinguishers

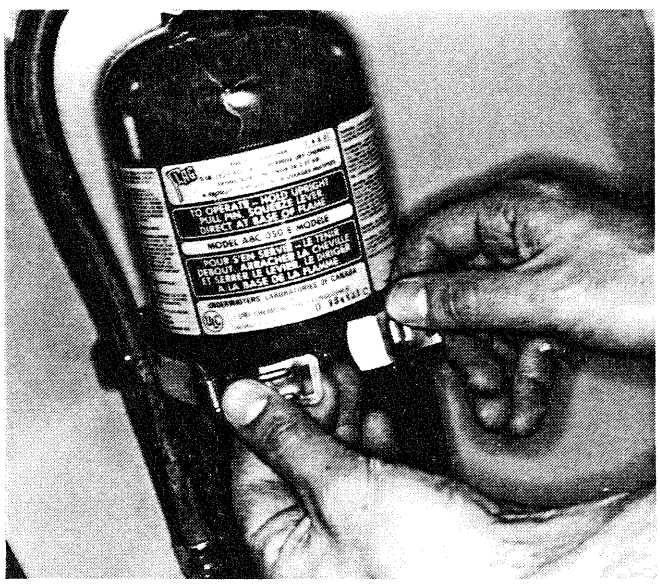


Fig 3-32

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.

Instruction Plates and Decals

Fig 3-33

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 **CLARK** skidder.

NOTES

STARTING INSTRUCTIONS

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

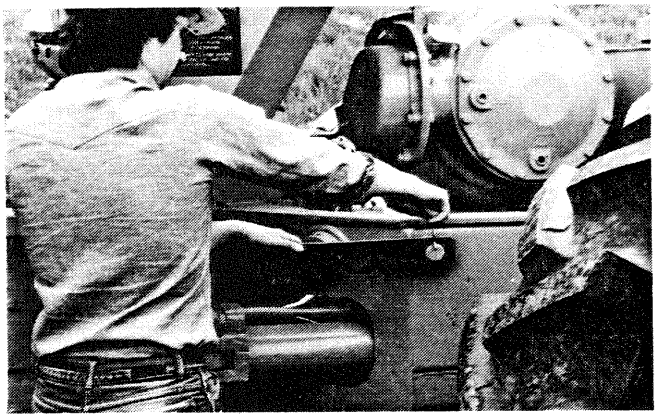


Fig 4-1

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

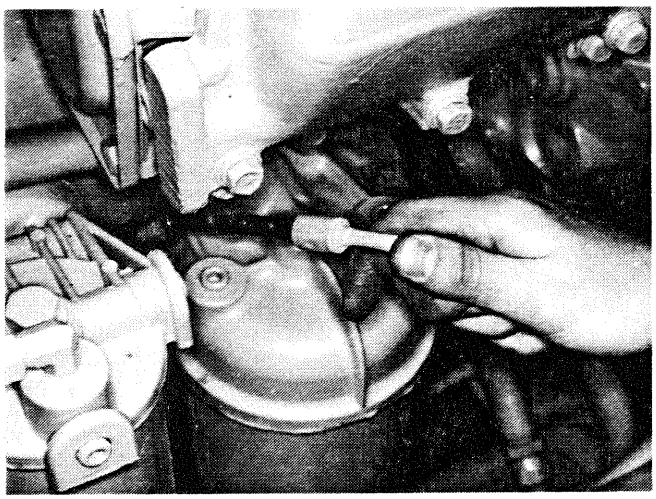


Fig 4-2

2. Check the engine oil level.

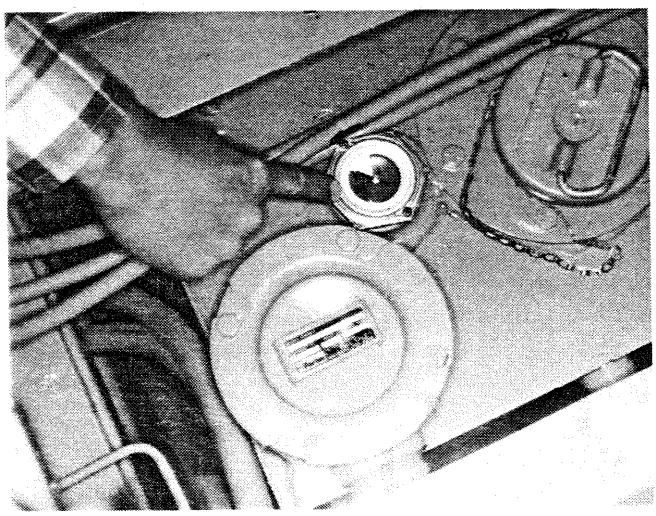


Fig 4-3

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

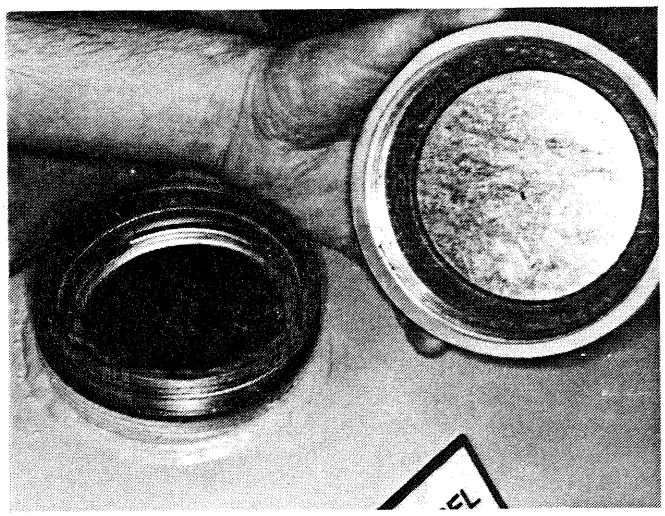


Fig 4-4

4. Check the fuel level.

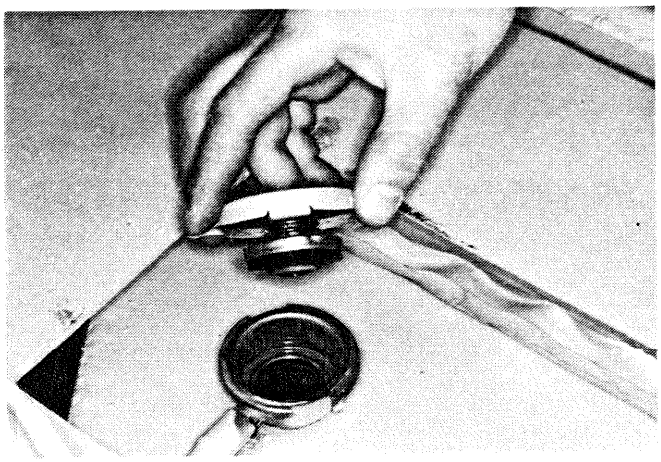


Fig 4-5

5. Check the engine coolant level (Detroit and Cummins only).

Fig 4-6

6. Check the flag on the air cleaner service indicator in the engine compartment.

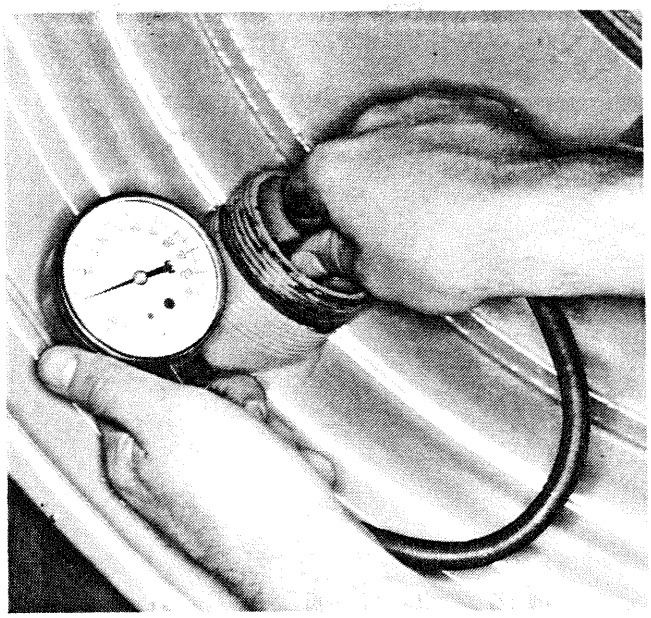


Fig 4-7

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).

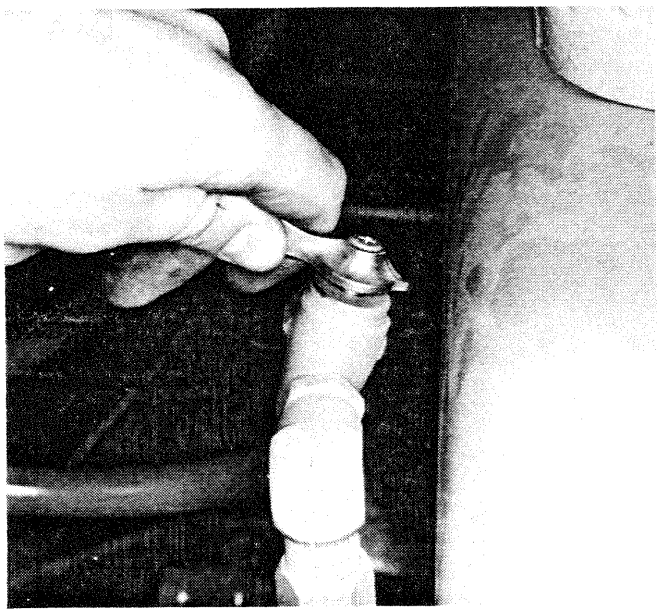


Fig 4-9

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

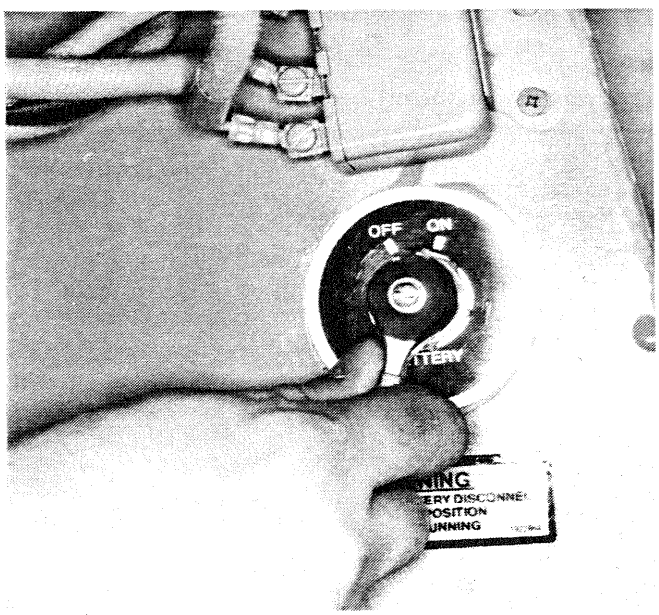


Fig 4-10

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

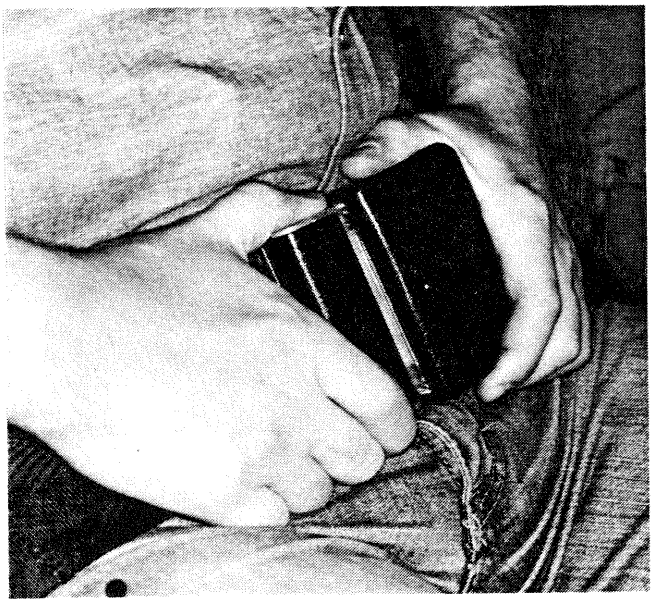


Fig 4-11

3. Fasten your seat belt.

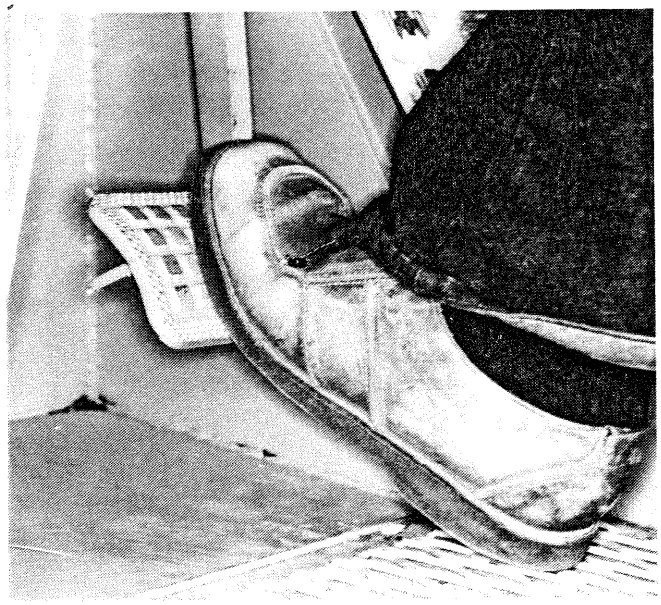


Fig 4-13

6. Apply and hold the service brake pedal actuated.

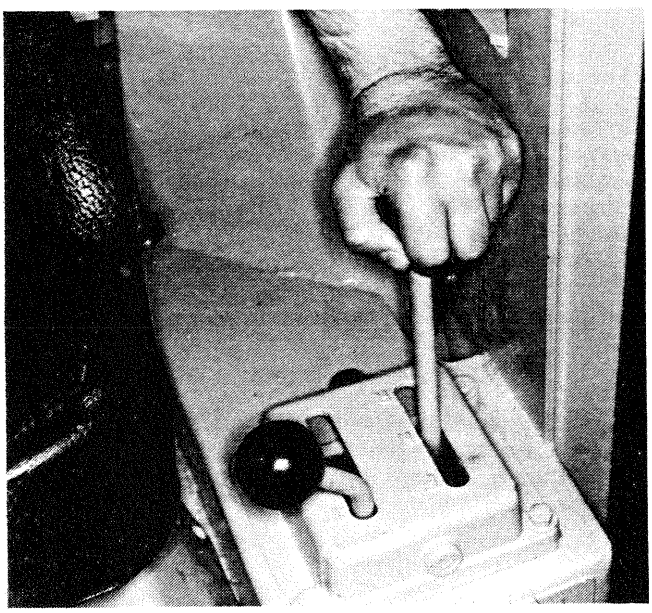


Fig 4-12

4. Put the Direction Control Lever in the NEUTRAL position.

5. Make sure that the engine stop is pushed into the operating position.

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

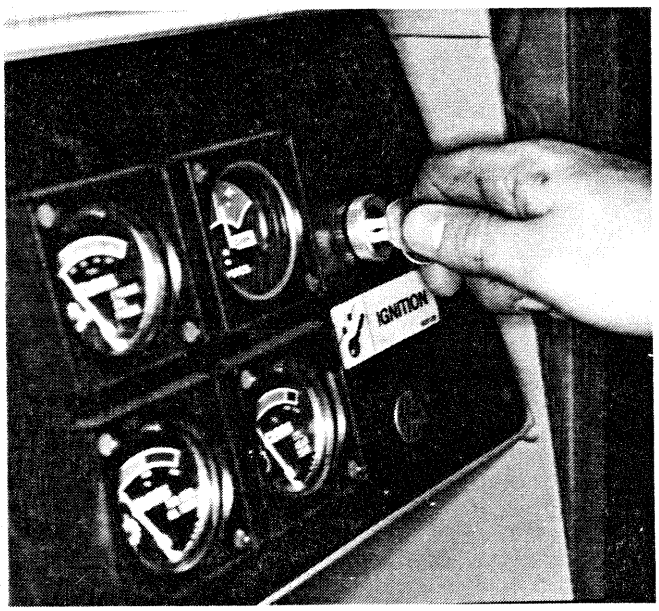


Fig 4-14

7. Turn the key in the ignition switch to the ON position (clockwise) to start the engine.

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

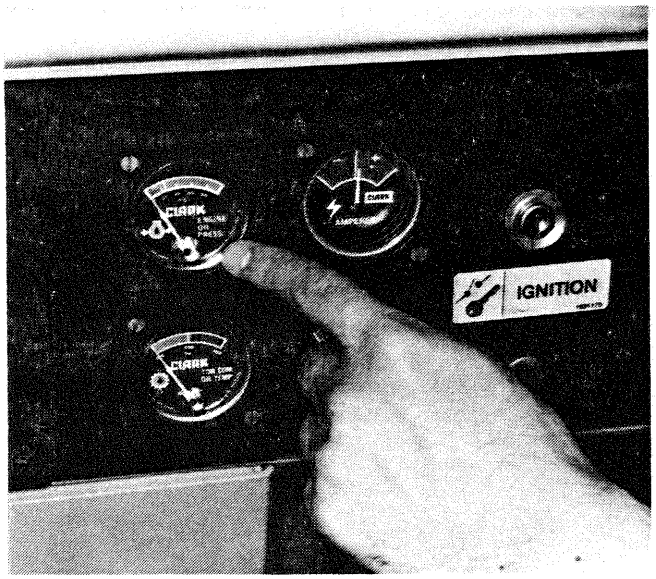


Fig 4-15

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.

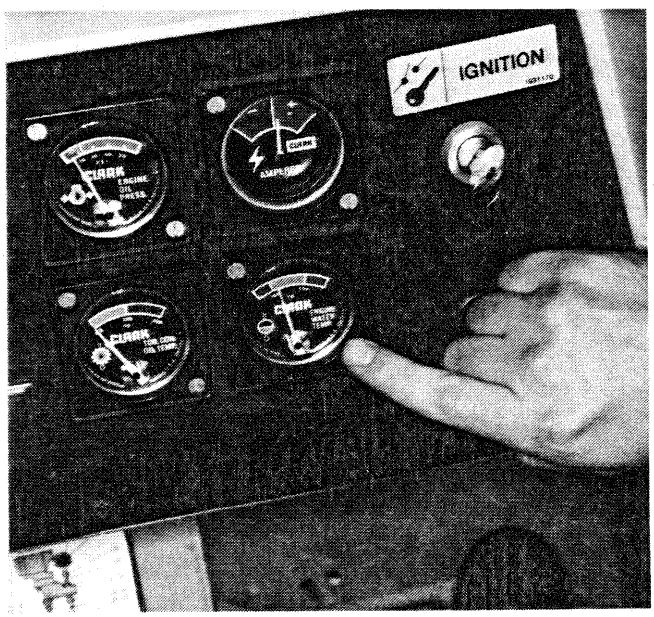


Fig 4-16

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

Cold Weather Operation

For temperatures too cold for regular starting, an Engine Pre-Heat System is provided on Deutz powered machines to aid in starting the machine. Operate the system as follows:

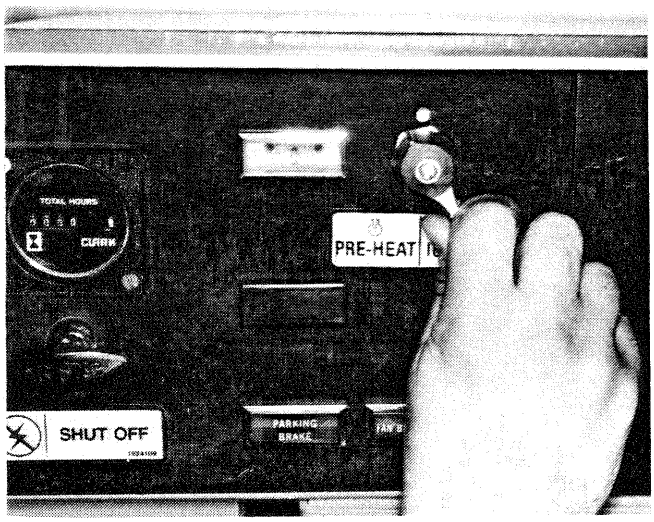


Fig 4-17

1. Put the Pre-Heat switch in the PRE-HEAT position and hold it in this position until the Indicator Light to the left of the switch glows (approximately 1 minute).

2. Put the switch in the IGNITION position and hold it in this position to start the engine. When the engine starts and fires smoothly, release the switch to return to its centre detent position.

NOTE: **If the engine does not fire within 15 seconds of cranking, release the switch and continue Pre-Heating. If some firing occurs, you may continue cranking for 25 seconds. If the engine does not run smoothly or gives off grey-white exhaust smoke, pre-heating should be continued. The system should be allowed to rest for 2 minutes between attempts to allow the batteries to recover.**

NOTE: **CLARK recommends the installation of an oil pump heater for cold weather operation of the 664D Deutz machine. See Sec. 6 for installation instructions of this feature.**

NOTE: **Consult your Detroit or Cummins dealer for cold starting aids for their engine. CLARK recommends the use of an optional second battery for cold starting, see your CLARK distributor.**

Other than the use of a suitable low temperature motor oil and a suitable anti-freeze mixture in the cooling system (Detroit and Cummins), 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).

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 your 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 **CLARK** 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.

IMPORTANT NOTE: 551E, 551F, 541E, 541F, 543E and 558F serial number machines are equipped with Forward-Reverse Modulation to provide a system cushion when the machines direction is changed while it is still moving. This feature should ONLY be used in the FIRST or SECOND Speed Ranges. Damage to the transmission can result if this feature is used in the THIRD Speed Range at travel speeds.

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.

WARNING: The operator protective structure is not specifically designed to protect the operator from loads generated during a delimbing gate operation. Responibility for the application of the machine in this manner rests with the end user.

Work The Cable Skidder As Follows:

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

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

Put the winch control lever in the FREE-SPOOL position.

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

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

NOTE: 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 any 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.

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.

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.

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: **The CLARK Grapple Assembly is 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 (DETROIT AND CUMMINS)

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:

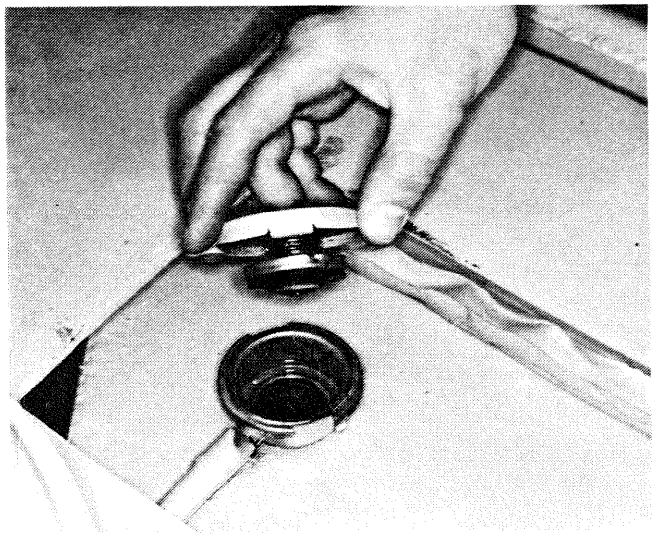


Fig 6-1

Check the coolant level at the surge tank. The surge tank on Detroit Diesel machines is located below the large access cover on top of the firewall. On Cummins machines, the surge tank is mounted on the right hand side of the radiator shroud inside the engine compartment.

⚠ WARNING: **The cooling system is under pressure. Hot coolant can escape rapidly if the cap is removed too quickly. Allow the pressure to be released slowly.**

NOTE: **The cooling system of your CLARK 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.**

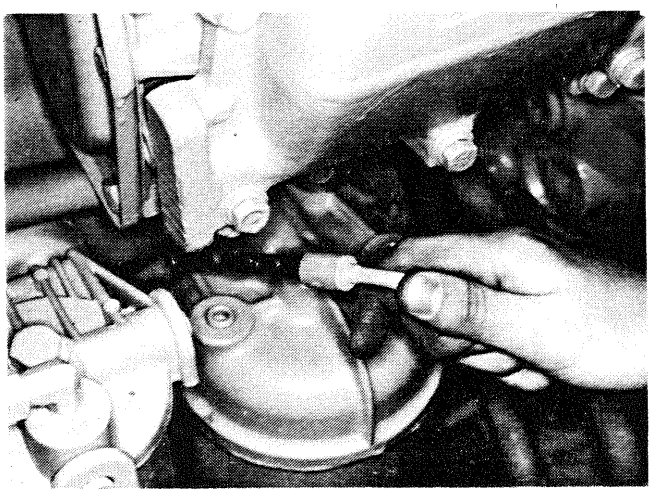


Fig 6-2

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

Every 50 Hours of Operation:

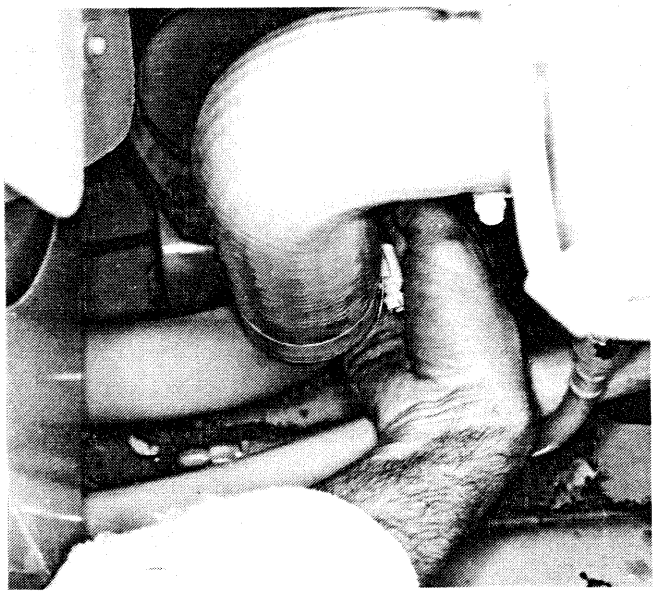


Fig 6-3

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.

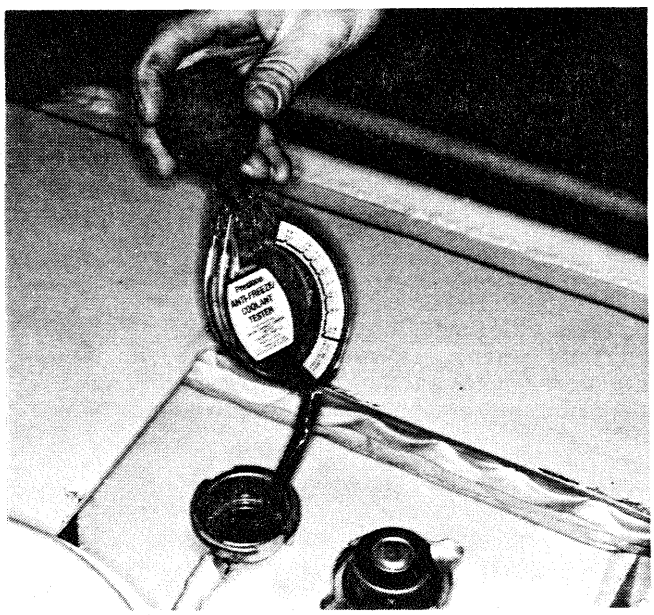


Fig 6-4

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 from freezing temperatures and cooling system corrosion.

Every 100 Hours of Operation:

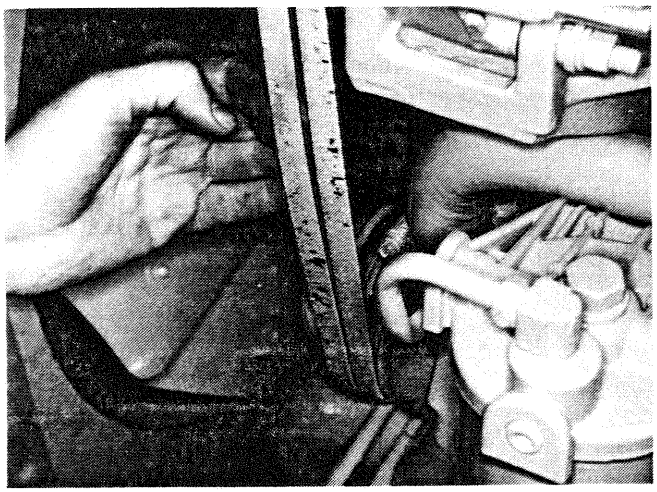


Fig 6-5

Check the condition of the alternator belt(s). If they are worn, cracked or show signs of glaze or grease, they should be replaced.

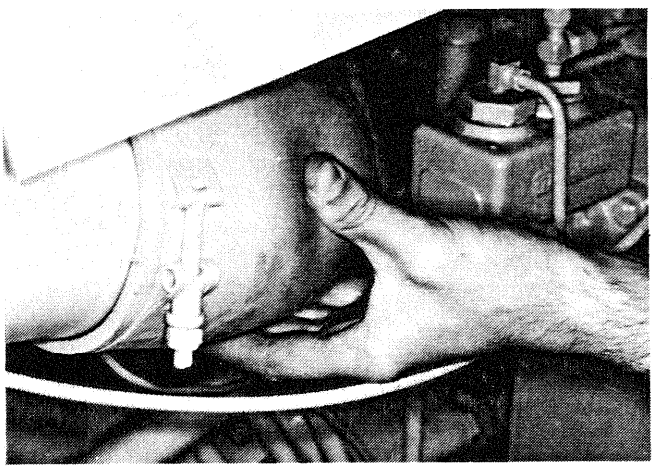


Fig 6-6

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.

Service the Spark Arrestor Carbon Trap

IMPORTANT NOTE: **The 664D Detroit powered machine is 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.

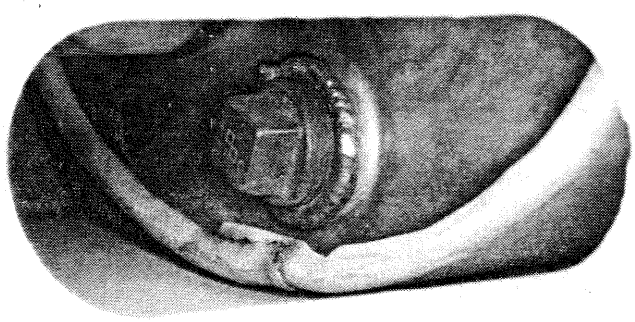


Fig 6-7

1. Remove the spark arrestor clean-out plug at the front 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.

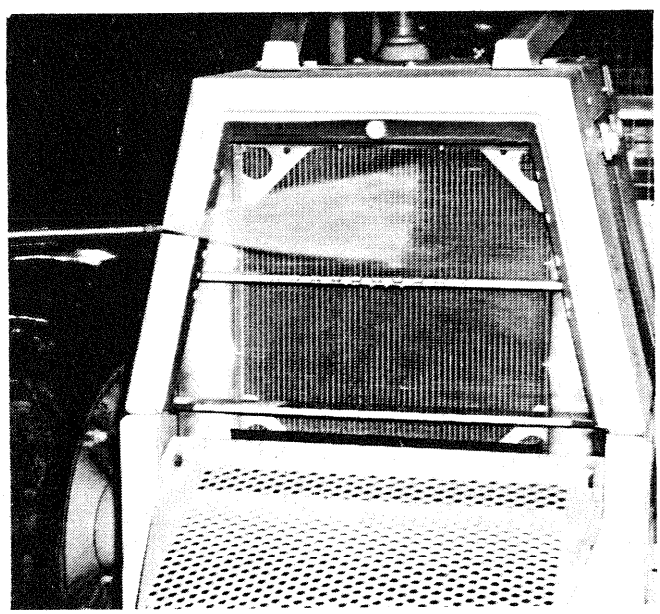


Fig 6-8

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 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. Raise the blade a few centimeters (inches) above the ground, actuate the parking brake, put 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 **CLARK** dealer.

Check the drive belt tension on Detroit Diesel machines as follows:

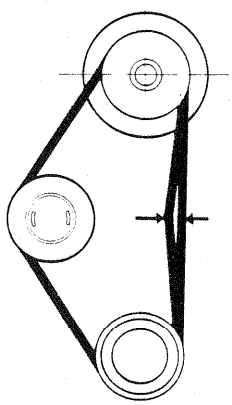


Fig 6-9

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.

NOTE: The 664D Cummins powered machine is equipped with a drive belt tensioner that maintains belt tension automatically.

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:

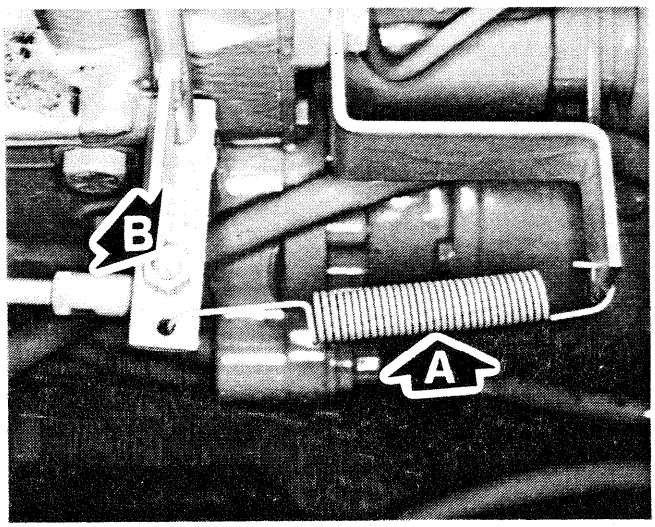


Fig 6-10

1. Unhook the spring (A) from the accelerator linkage and disconnect the ball joint assembly (B) 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 (or cable) until the 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 (or cable).

5. Reconnect the ball joint to the throttle lever and check the movement of the linkage.

Service the Air Cleaner Elements as Required:

Fig 6-11

When the red flag appears in the air service indicator the air cleaner elements should be serviced. Locate the air cleaner assembly inside the engine compartment in front of the firewall.

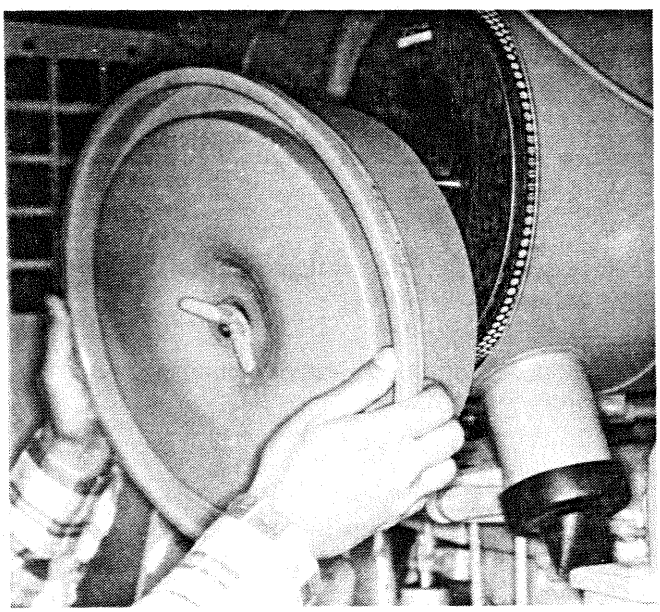


Fig 6-12

1. Loosen the clamp on the air cleaner assembly and remove the end cap.

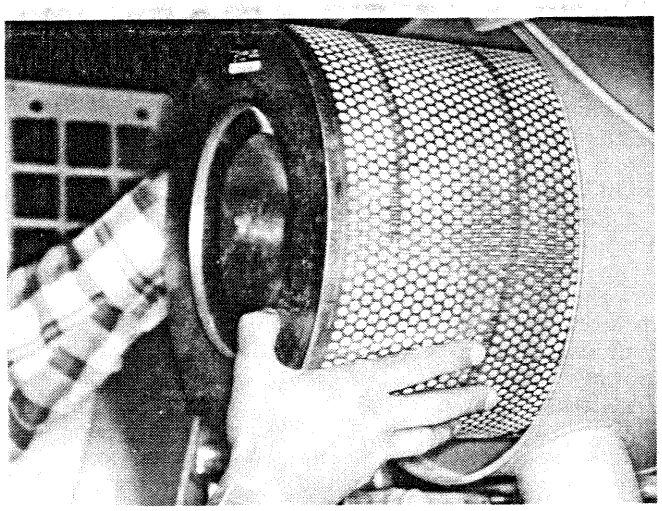


Fig 6-13

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 6-14

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.

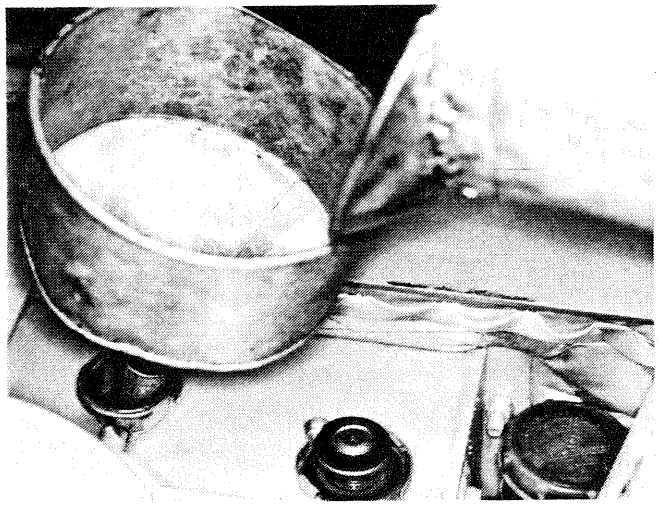


Fig 6-15

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

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

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

NOTES

ENGINE SYSTEMS (DEUTZ)

NOTE: Check the Deutz Engine Instruction Manual for further lubrication and maintenance instructions for the engine and its accessories.

Every 10 Hours of Operation:

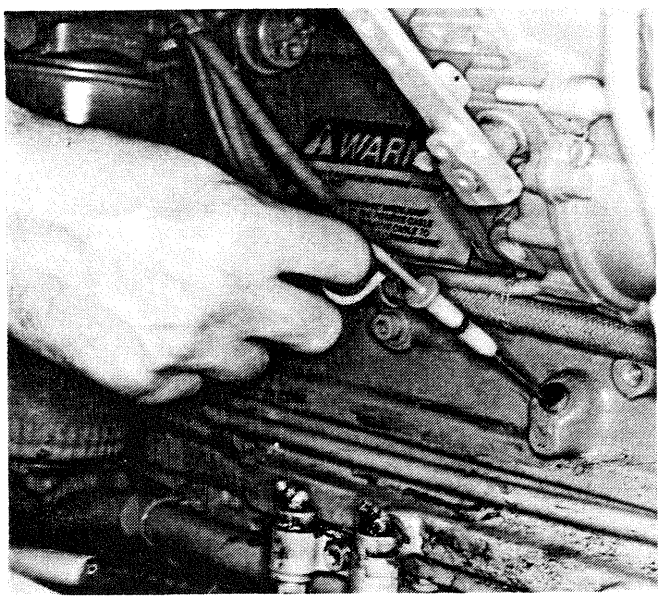


Fig 6-16

Check the engine lube oil level with the crankcase dipstick on the right hand side of the engine adjacent to the battery and add oil as required.

Every 100 Hours of Operation:

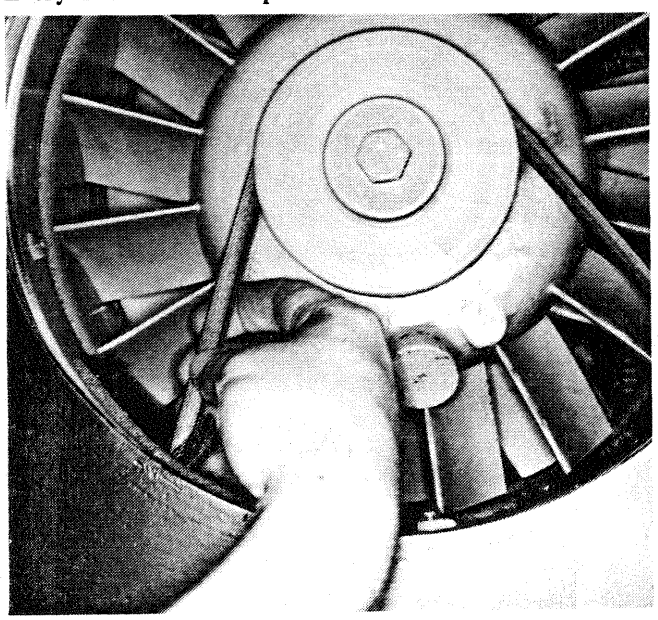


Fig 6-17

Check the condition of the alternator and cooling blower drive belts. If they are worn, cracked or show signs of glaze or grease, they should be replaced.

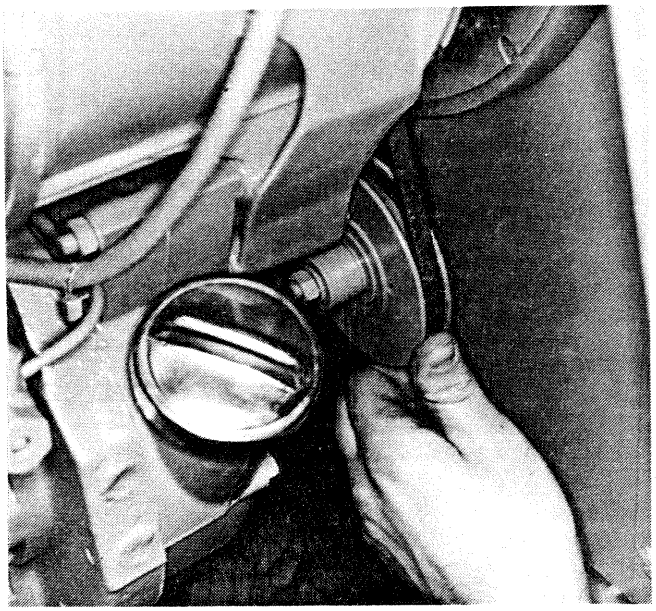


Fig 6-18

Check the operation of the cooling fan belt warning switch. With the engine stop handle OUT and the ignition and battery disconnect switches in the ON position, have a helper pull up on the actuating pin. The Fan Belt/Cyl. Head warning light on the instrument panel should glow to indicate the system is working properly.

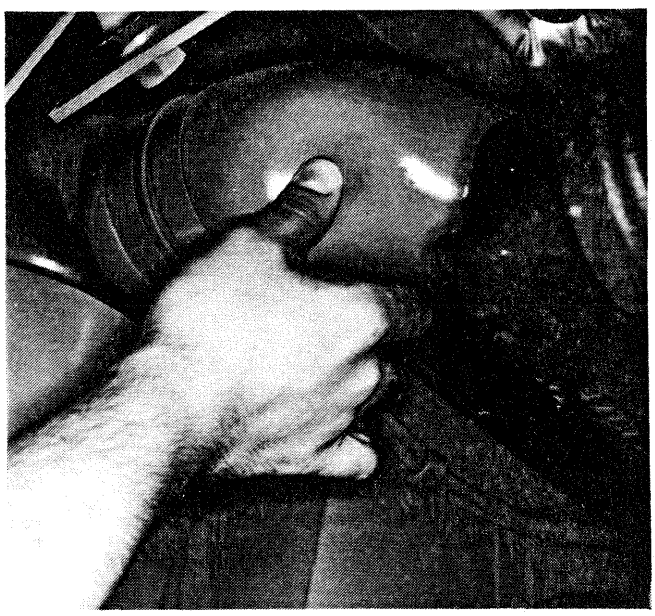


Fig 6-19

Check the condition of the flexible tubes between the air cleaner and the engine air intake. If they are cracked or show any signs of leakage, they must be replaced to prevent dirt from 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.

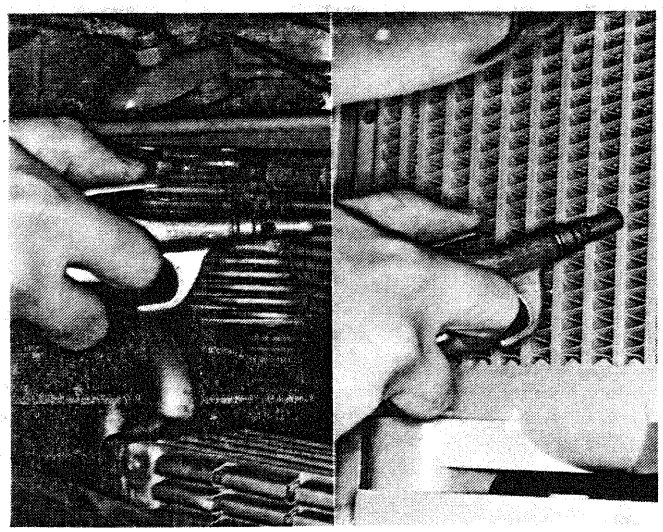


Fig 6-20

Use compressed air (35 to 70 kPa/5 to 10 PSI) to clean any debris from the cylinder cooling fins, transmission/converter oil cooler and the blower body. Remove the blower cowling, oil cooler debris basket and the cylinder baffle to gain access to the fins and oil cooler.

NOTE: Make sure the grill and blower intake are not plugged with debris.

Service the Spark Arrestor Carbon Trap

IMPORTANT NOTE: **The 664D Deutz powered machine is 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 maintain 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.

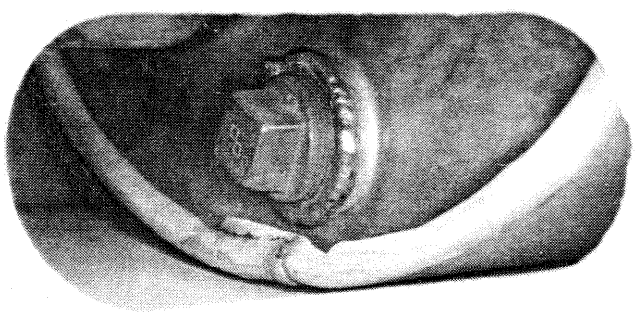


Fig 6-21

1. Remove the spark arrestor clean-out plug at the front of the muffler through the access hole in the cover.
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 replace the clean-out plug.

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. Raise the blade a few centimeters (inches) above the ground, actuate the parking brake, 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 **CLARK** dealer.

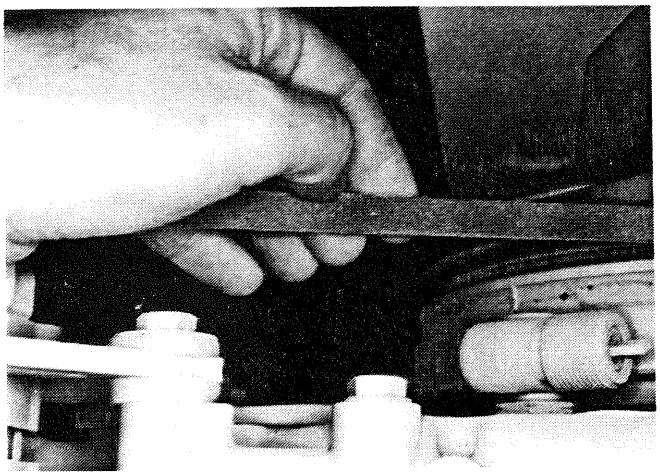


Fig 6-22

Check the alternator drive belt tension. Measure the belt deflection in the centre of the two pulleys. The deflection of the belt should not exceed 10 to 15 mm (0.4 to 0.6 in.). New belts should be checked after a few days of use because they will stretch.

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:

1. Disconnect the ball joint assembly from the throttle lever on the right hand side of the engine above the lube oil dipstick.

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).

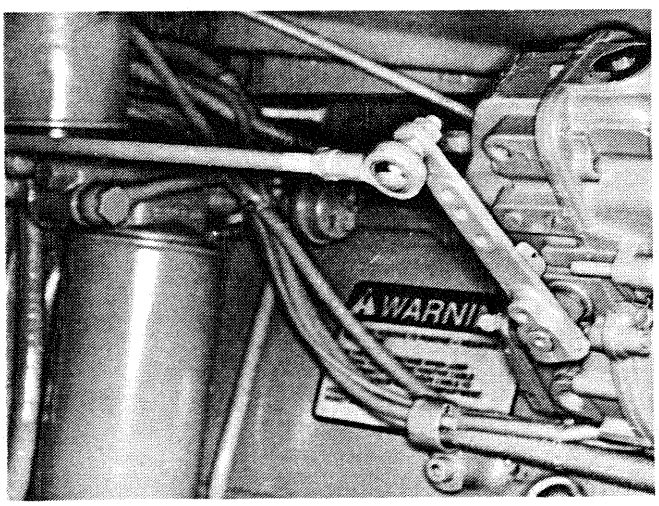


Fig 6-23

4. Adjust the ball joint on the end of the accelerator rod until the threaded part aligns with the hole in the throttle lever (with no force applied). 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.

Service the Air Cleaner Elements as Required:

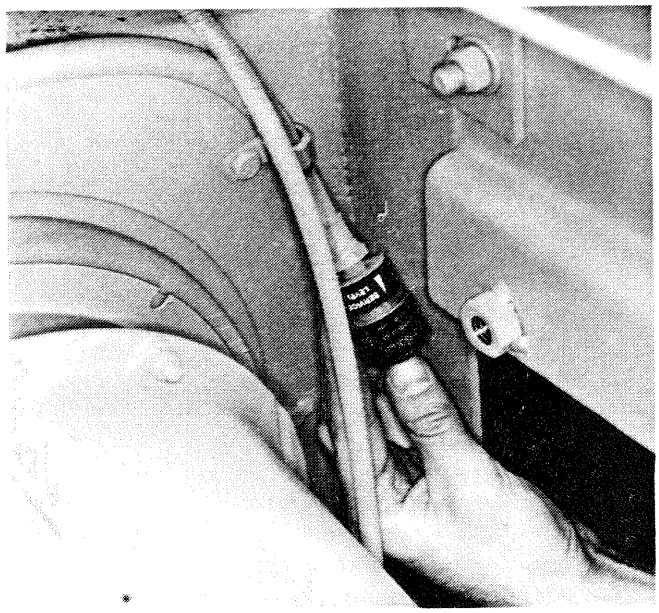


Fig 6-24

When the red flag appears in the air service indicator, the air cleaner elements should be serviced. Locate the air cleaner assembly inside the grill shroud in front of the engine.

Fig 6-25

1. Loosen the clamp on the air cleaner assembly and remove the end cap.

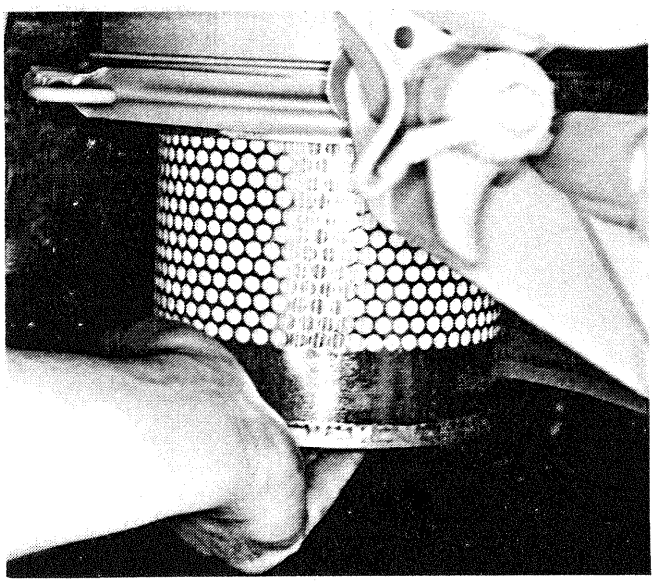


Fig 6-26

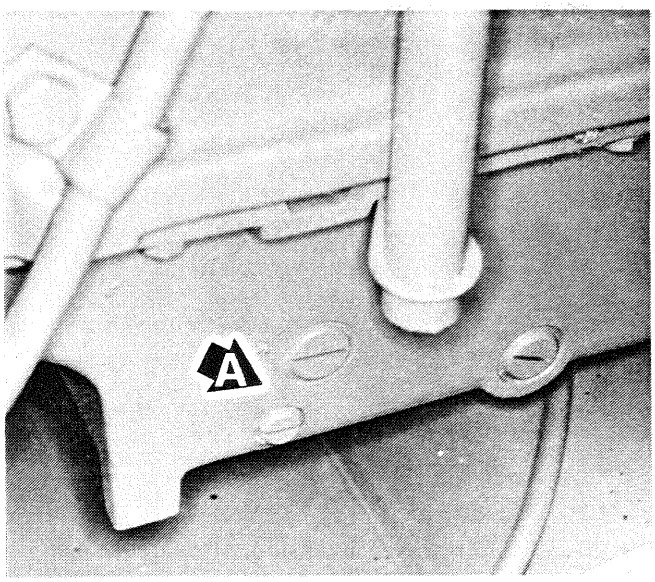


Fig 6-27

2. Loosen and remove the wing nut in the centre of the primary filter element and remove the primary 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 the 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.

For cold weather operation, an oil sump heater can be installed in the left hand side of the oil pan. Remove the two plugs "A" and install the oil sump heater and the oil sump temperature sender into the open holes in the oil pan. See your Deutz Engine Distributor for details.

FUEL SYSTEM

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

Every 10 Hours of Operation:

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

WARNING: DO NOT smoke while refueling.

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

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

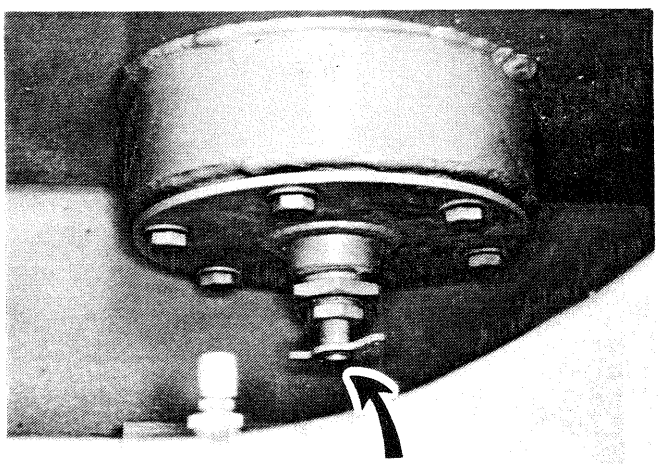


Fig 7-1

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

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

Every 50 Hours of Operation:

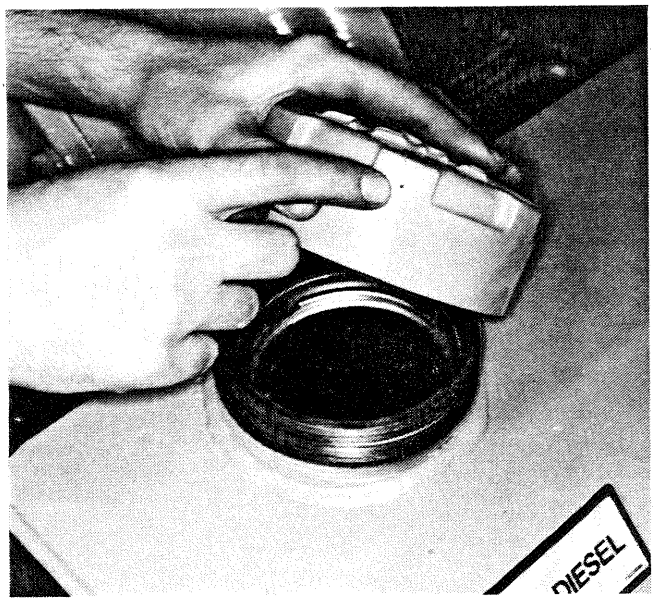


Fig 7-2

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

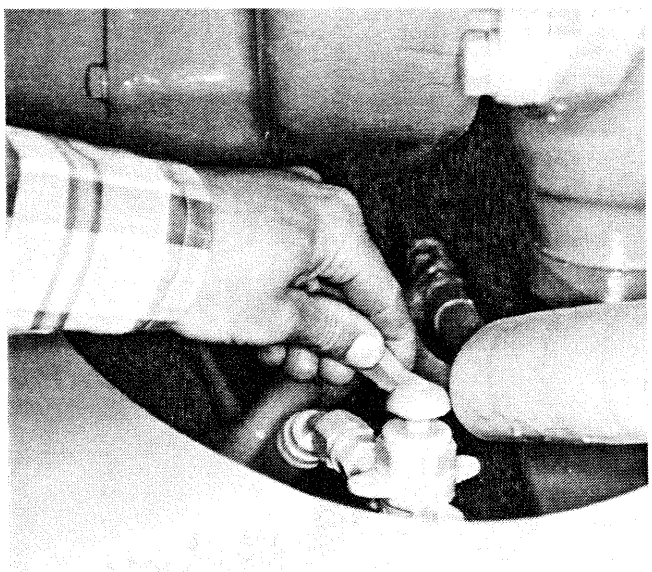


Fig 7-3

IMPORTANT NOTE: **Your machine is equipped with a fuel line shutoff 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 (if applicable) at the bottom of the tank and clean the magnet.

NOTES

TRANSMISSION/CONVERTER SYSTEM

Every 10 Hours of Operation:

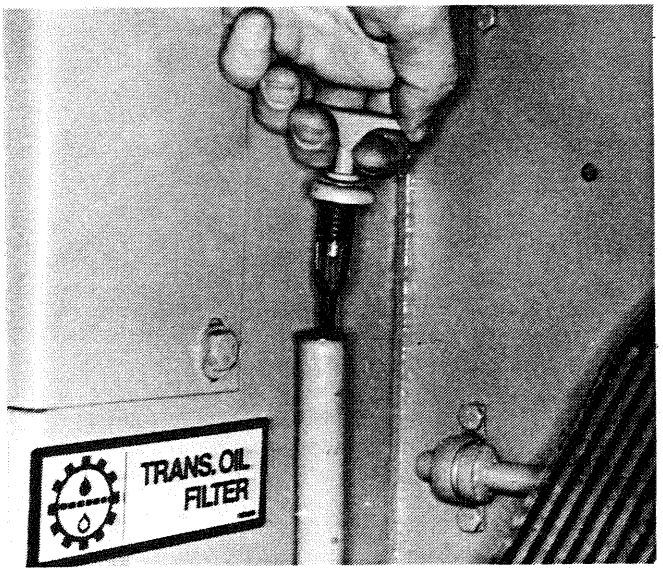


Fig 8-1

Check the fluid level in the system with the transmission/converter dipstick located below the instrument panel adjacent to the accelerator pedal.

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).**

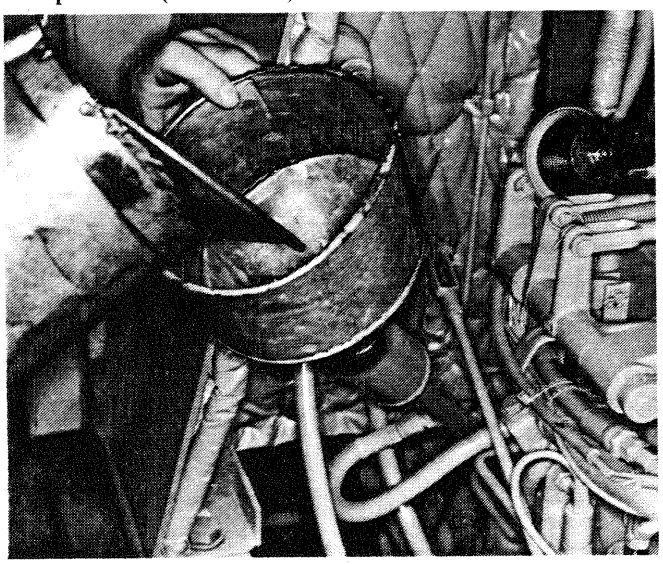


Fig 8-2

If the level on the dipstick is low, add **CLARK** approved automatic transmission fluid to the filler hole on right hand side 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:

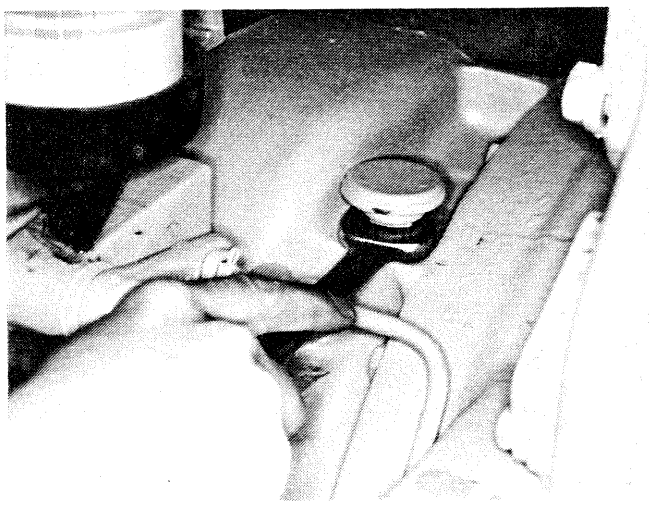


Fig 8-3

Remove the breather on top of the transmission/converter housing and and wash it in a solvent, blow dry with compressed air and re-install the breather.

NOTE: **On the 664D Deutz machine, this breather may be cleaned while it is installed.**

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:

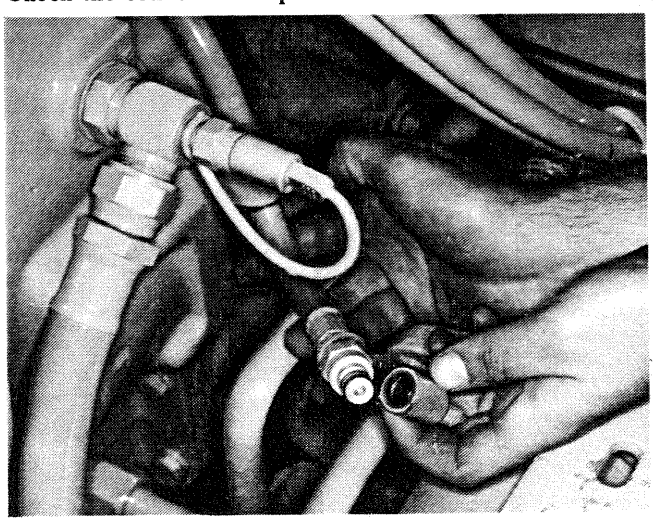


Fig 8-4

1. Connect a 1.000 kPa (150 PSI) pressure test gauge to the converter IN pressure port on the narrow tube on the left hand side of the converter.

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:

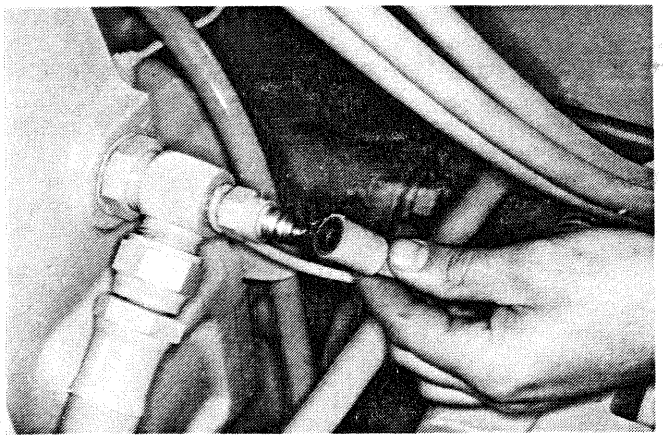


Fig 8-5

1. Connect the test gauge to the converter OUT pressure port on the oil cooler supply line on the left hand side of the converter.

2. With the engine operating at 2,000 RPM but the machine otherwise in the Service Position (See Sec. 2), record the reading on the gauge. The pressure reading should be 170 kPa (25 PSI) minimum.

3. Increase the engine RPM to full throttle and record the reading on the gauge. The pressure reading should be no more than 480 kPa (70 PSI).

Check the system lube pressure:

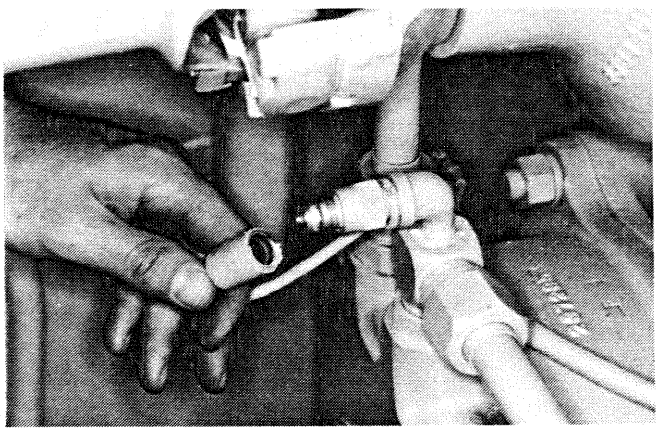


Fig 8-6

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. 2), record the reading on the gauge. The pressure reading should be 105 to 170 kPa (15 to 25 PSI).

Check the transmission/winch clutch pressure:

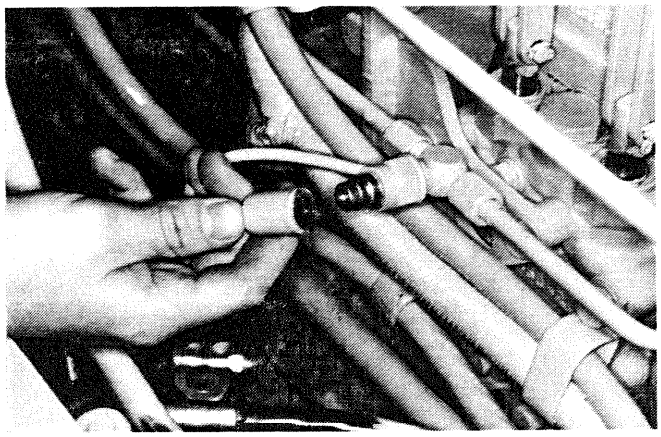


Fig 8-7

1. Connect a 2.000 kPa (300 PSI) pressure test gauge to the clutch pressure port on the right hand side of the transmission adjacent to the winch control valve.

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 1.240 to 1.520 kPa (180 to 220 PSI) with no more than 35 kPa (5 PSI) difference between the readings.

NOTE: On machines with modulated transmissions (See Page 3-1/Fig 3-2: IMPORTANT NOTE), clutch pressures in the Forward and Reverse modes must be checked as follows:

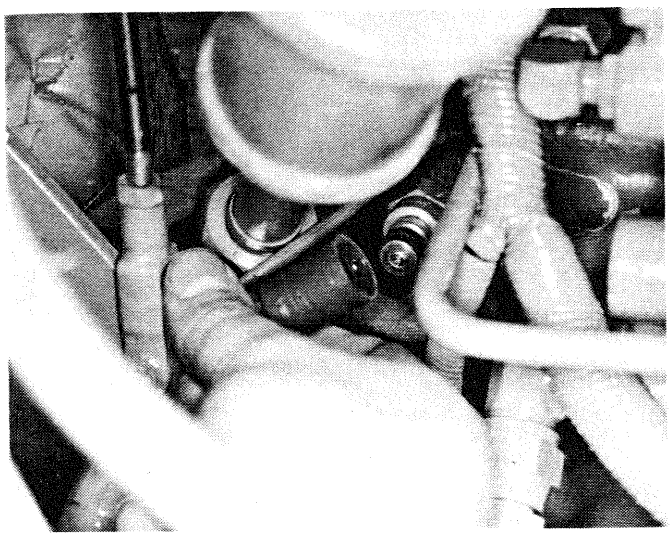


Fig 8-8

Connect a 2.000 kPa (300 PSI) pressure test gauge to the Forward clutch pressure port on the tube on the right hand side of the transmission case adjacent to the filler tube and record the readings as shown in Step 2 of Fig 8-7.

NOTE: There will be a delay of approximately two seconds caused by the action of the modulator before the actual Forward (and Reverse) clutch pressure reading(s) are shown on the gauge.

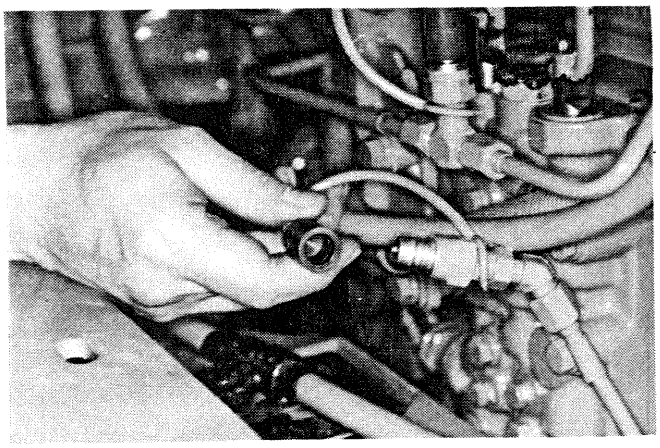


Fig 8-9

Connect a 2.000 kPa (300 PSI) pressure test gauge to the Reverse clutch pressure port on the tube on the right hand side of the converter housing adjacent to the control valve. Record the readings as shown in Step 2 of Fig 8-7.

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

Every 500 Hours of Operation:

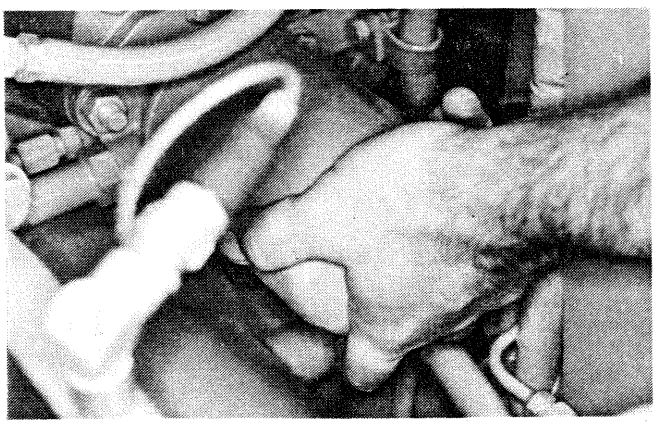


Fig 8-10

Replace the transmission/converter filter element. This element must also be replaced whenever the converter pump, transmission, converter or winch P.T.O. clutch is repaired or overhauled. Remove the existing filter element with a filter band wrench and discard it.

Lightly oil the gasket on the new filter element with **CLARK** Approved Automatic Transmission Fluid and install the element into the rear of the converter housing. Tighten the element to a torque of 27 to 34 N•m (20 to 25 lbf. ft) taking care not to damage the filter case.

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 P.T.O. clutch 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:

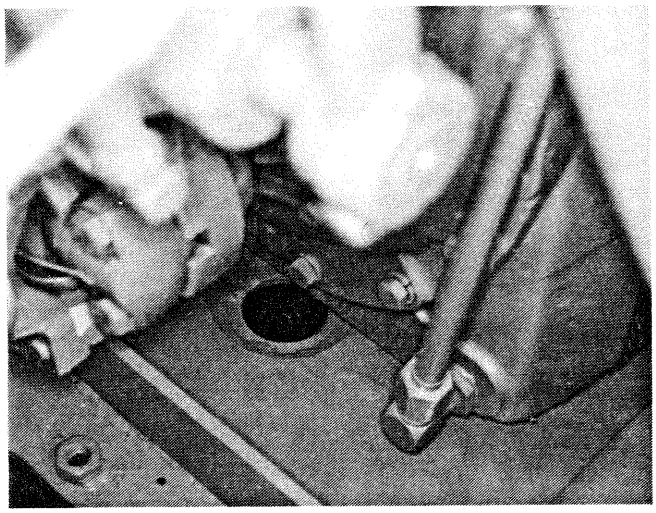


Fig 8-11

1. With the machine in the Service Position (See Sec. 2), remove the drain plug from the rear of the transmission housing and drain the oil in the sump into a container of at least 27ℓ (5.5 Imp. gal/7 U.S. gal).

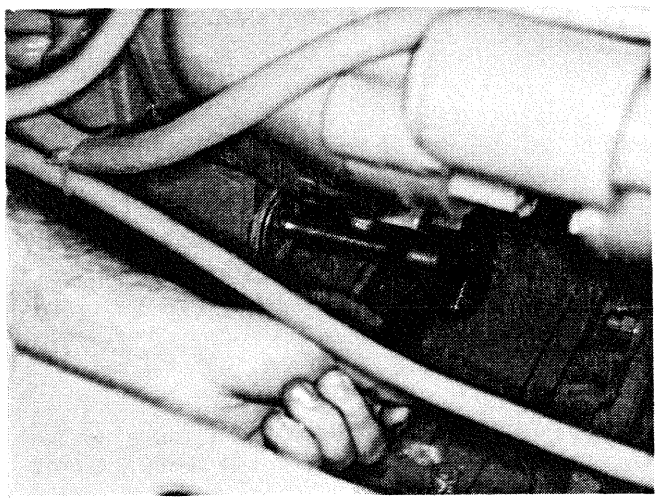


Fig 8-12

2. Remove the transmission sump screen from the transmission housing under the engine flywheel housing and wash it in a solvent. Blow dry the screen with compressed air and install the screen using a new gasket.

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

3. Replace the drain plug securely and overfill the system with **CLARK** Approved Automatic Transmission Fluid.

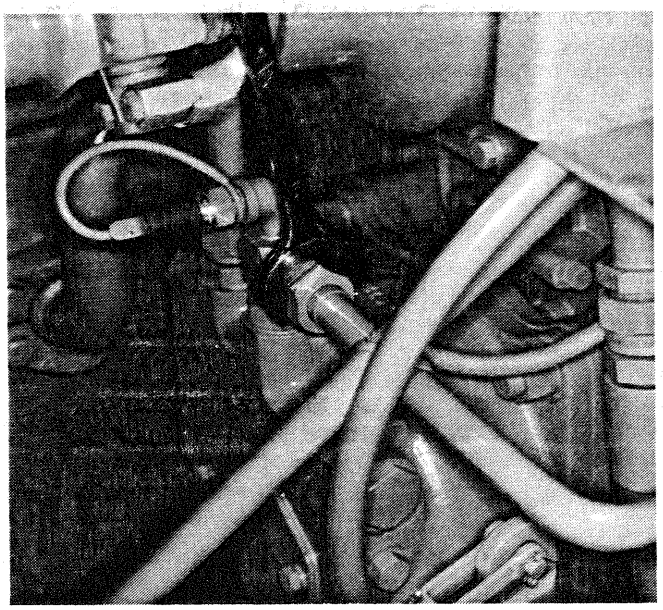


Fig 8-13

4. Disconnect the return oil cooler line from the right hand side of the T-connector on the hydraulic brake housing. Direct the end of the tube into a container of at least 20 ℓ (4.5 Imperial gal/5 U.S. gal).

NOTE: **On the 664D Deutz machine, a temporary drain hose should be connected to the cooler outlet port.**

5. Start the engine and flush the system at low idle RPM until approximately 18 ℓ (4 Imperial gal/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.**

6. (Remove the temporary drain hose and) 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 CLARK Approved Automatic Transmission Fluid.**

Check and adjust the transmission control linkage:

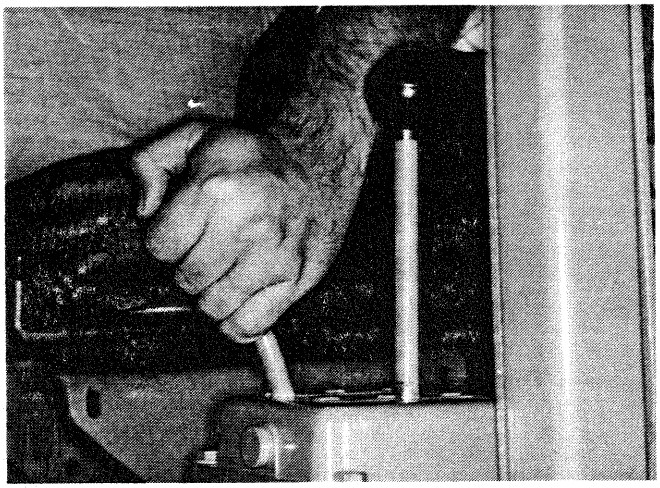


Fig 8-14

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.

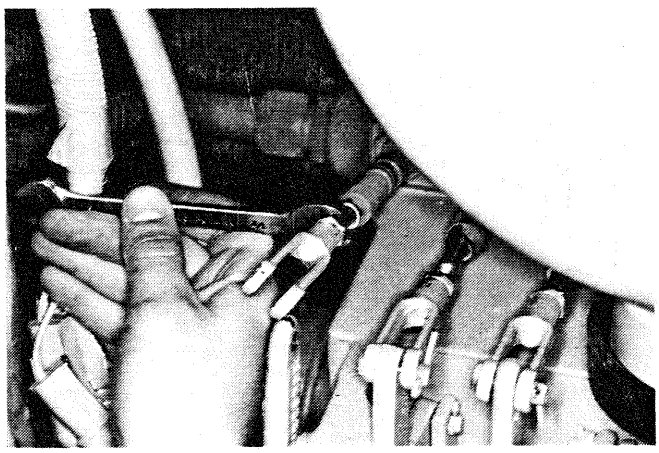


Fig 8-15

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.

CLARK WINCH

Every 50 Hours of Operation:

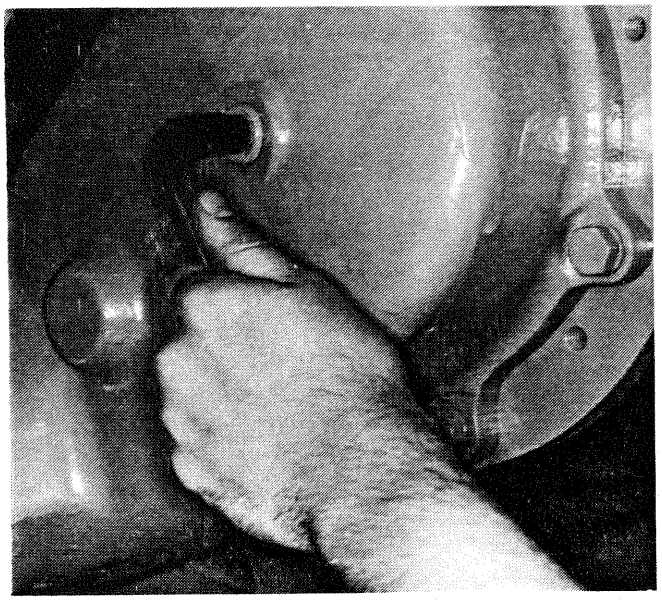


Fig 9-1

Check the lube oil level in the drop gear housing in the front of the winch. If the level is low, add **CLARK** Approved Automatic Transmission Fluid to the level check hole to bring the level to the bottom of the hole.

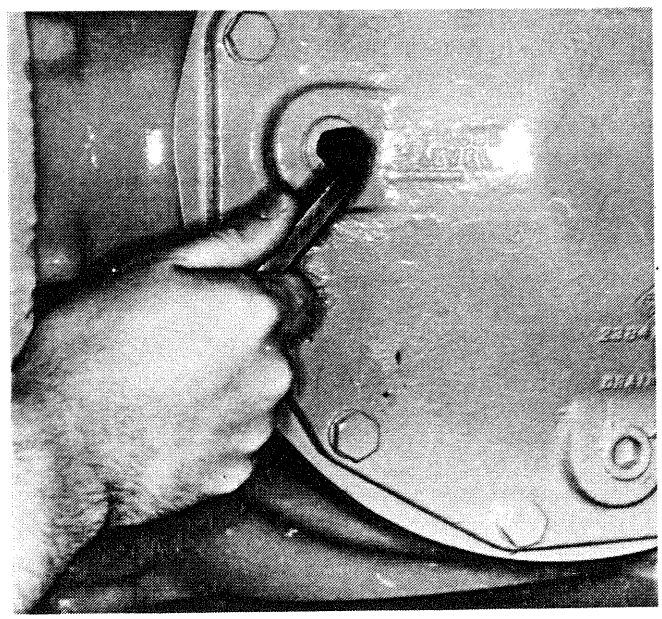


Fig 9-2

Check the lube oil level in the ring gear housing on the left hand side of the winch. If the level is low, add **CLARK** Approved Automatic Transmission Fluid to the level check hole to bring the level to the bottom of the hole.

Every 100 Hours of Operation:

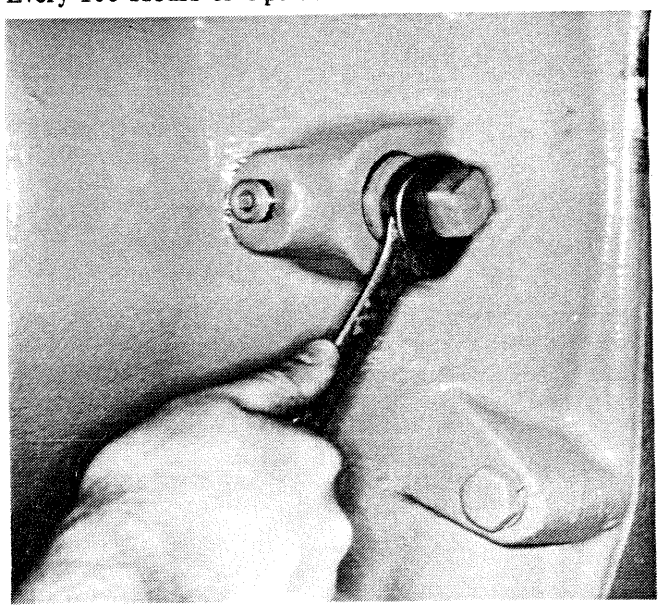


Fig 9-3

Check the operation of the winch free-spool drag adjustment. The maximum acceptable tension is 40 N•m (30 lbf. ft) of rolling torque. If the operation is unsatisfactory, loosen the lockscrew on the free-spool adjusting bolt and turn the bolt clockwise to increase the tension and counterclockwise to decrease it. Tighten the lockscrew.

Every 250 Hours of Operation:

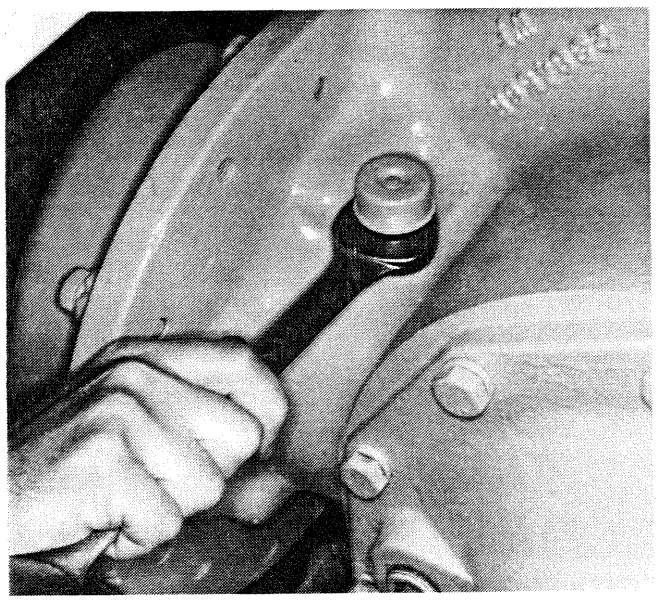


Fig 9-4

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

Check the condition of the wear button:

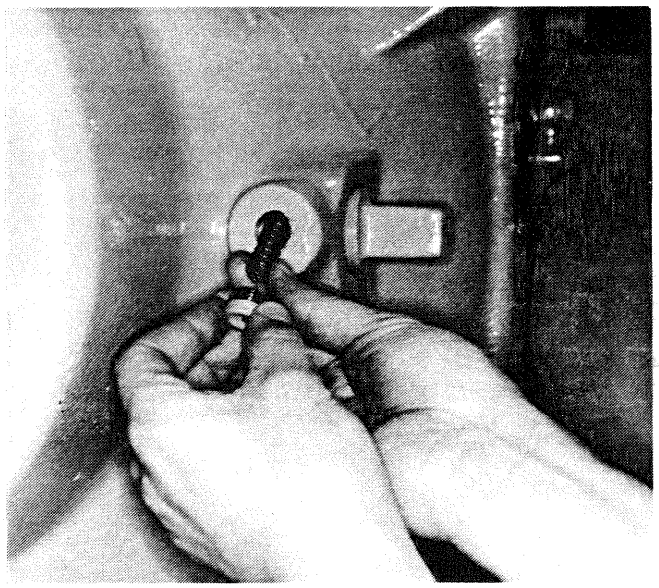


Fig 9-5

Remove the lockscrew, spring and lock button from the winch free-spool adjustment provision.

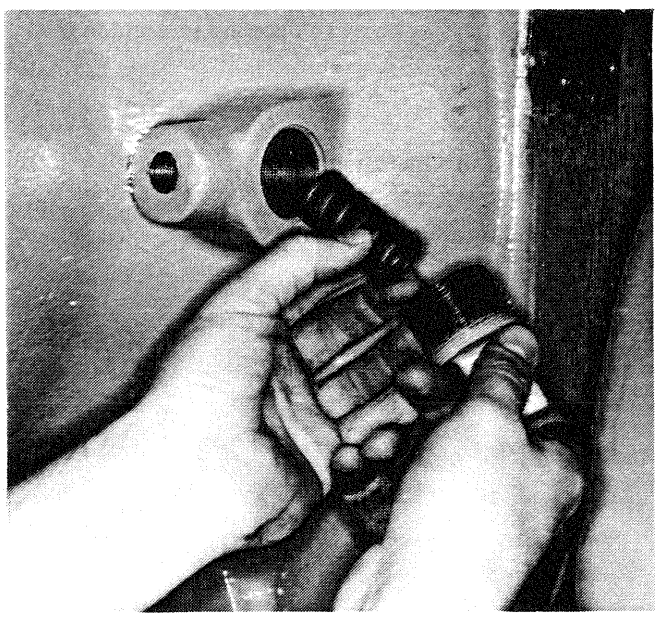


Fig 9-6

Remove the adjusting bolt, spring and wear button and check the condition of the wear button. If it is worn or damaged, it should be replaced. Re-assemble the components and adjust the free-spool tension.

IMPORTANT NOTE: See your **CLARK** Winch Maintenance and Service Manual - #3231-R2 for all troubleshooting and repair instructions. DO NOT attempt ANY repairs without reading and understanding the instructions in the manual.

Installing the Winch Cable:

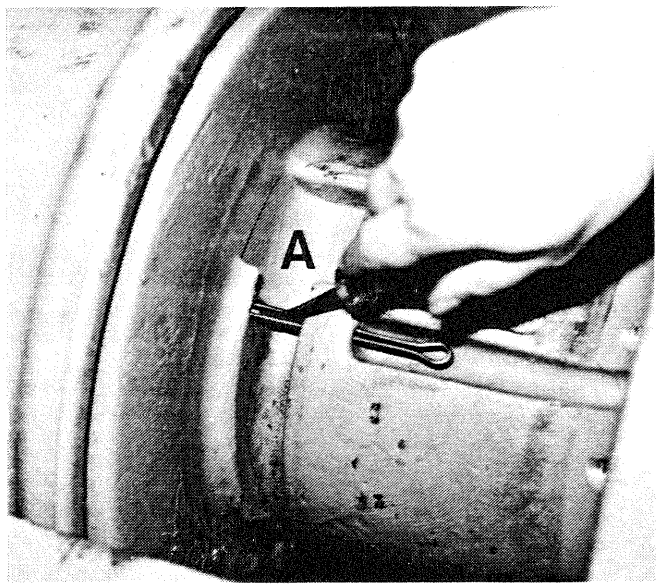


Fig 9-7

1. Insert the cable ferrule into the ferrule groove (See A).
2. Insert a large cotter pin through the two holes in the cable drum over top of the cable.
3. Use a screwdriver to open the cotter pin over the cable.
4. Put the winch in the "WINCH-IN" mode to wind the cable 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.

HYDRAULIC SYSTEM

Every 10 Hours of Operation:

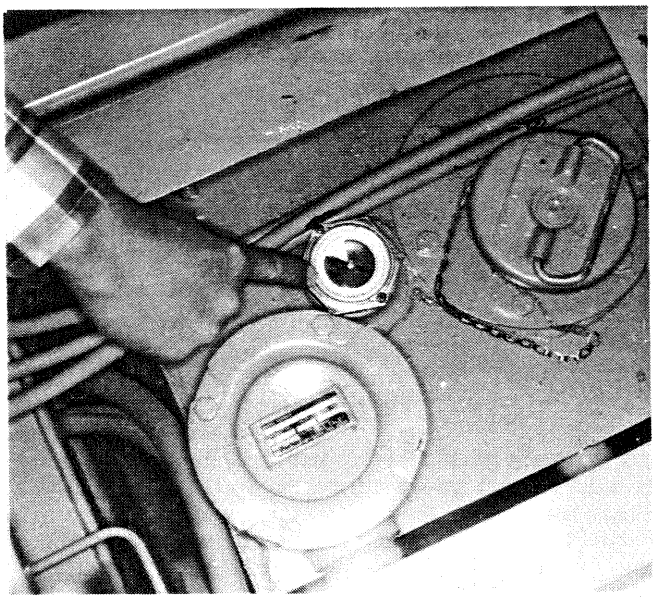


Fig 10-1

Check the oil level in the hydraulic reservoir. There is a dipstick on the filler cap below the floorboard panel on the left hand side of the operator's compartment. Newer machines have a sight gauge adjacent to the filler cap.

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

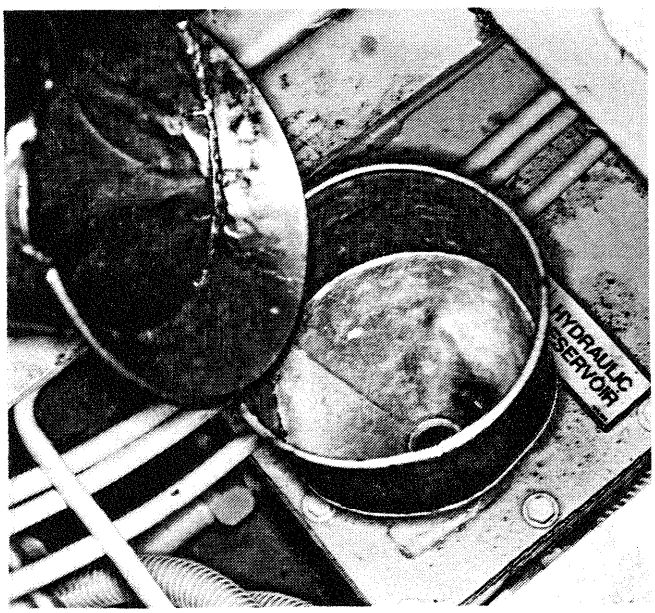


Fig 10-2

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.

Every 500 Hours of Operation:

Replace the main hydraulic filter element.

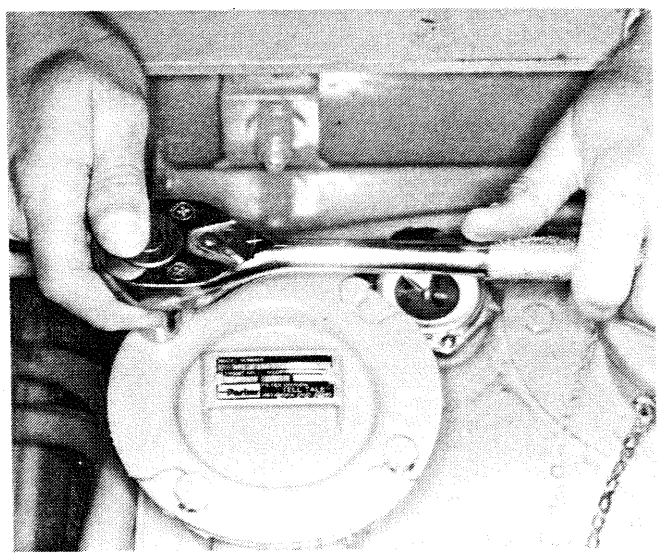


Fig 10-4

The element is located in the top plate of the hydraulic tank. Loosen the bolts on top of the filter case and turn the cap clockwise to remove it making sure no dirt enters the system.

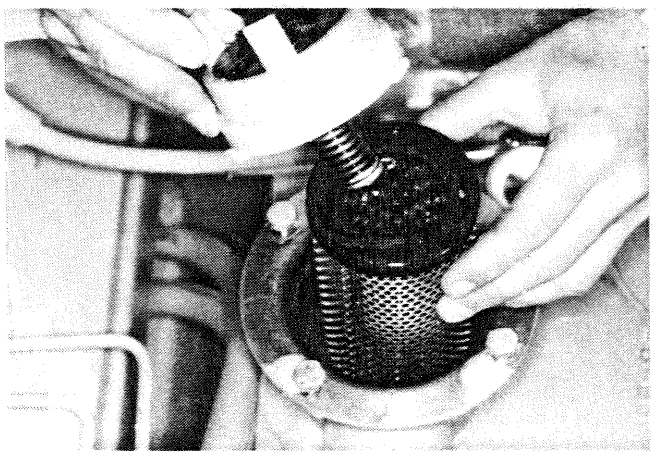


Fig 10-5

Remove the poppet valve assembly from the filter case and remove and discard the old filter element.

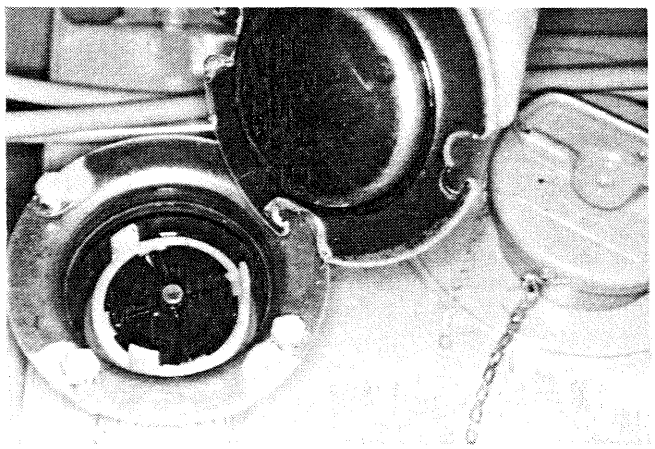


Fig 10-6

Install a new **CLARK** replacement filter element, replace the poppet valve assembly and the filter cap and tighten the cap mounting bolts to a torque of 16 to 18 N.m (140 to 160 lbf.ft).

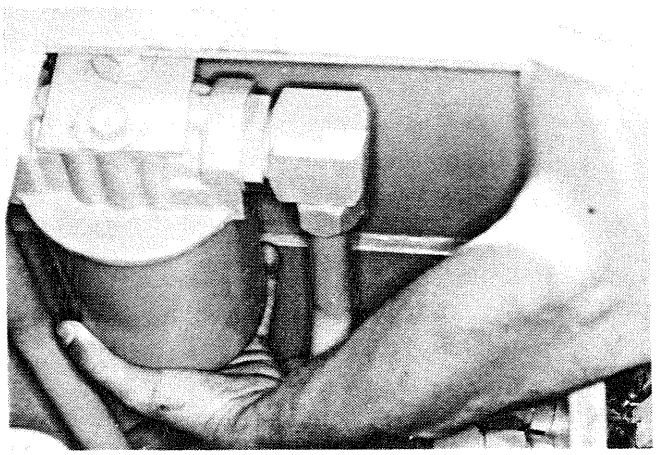


Fig 10-7

On earlier machines, a spin-on hydraulic filter element is located under the right hand floorboard panel. Remove the existing element with a filter band wrench and discard it. Lightly oil the gasket of the new element with hydraulic fluid and install the element snugly.

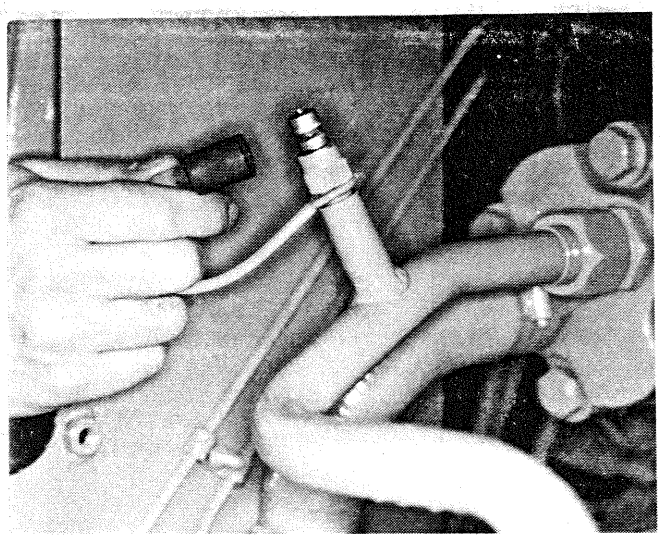


Fig 10-8

Check the main relief pressure with a 20.000 kPa (3,000 PSI) pressure test gauge connected to the main relief pressure port on the main hydraulic pump outlet tube below the instrument panel. 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 14.800 to 15.500 kPa (2,150 to 2,250 PSI).

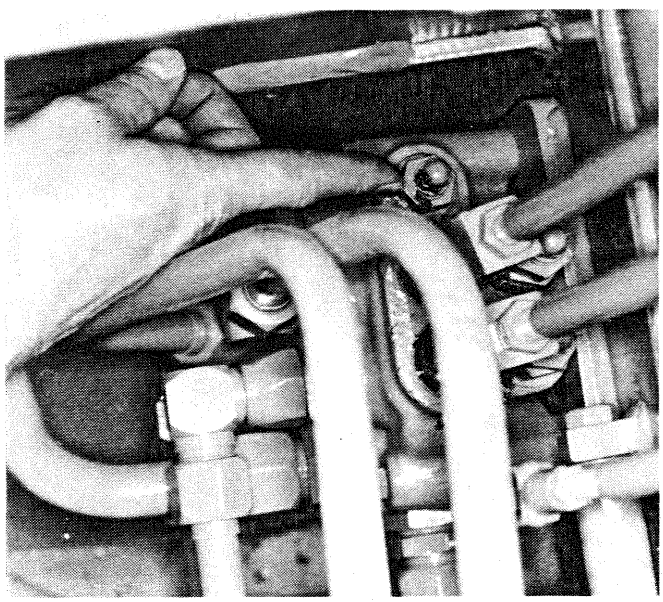


Fig 10-9

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 **CLARK** distributor.

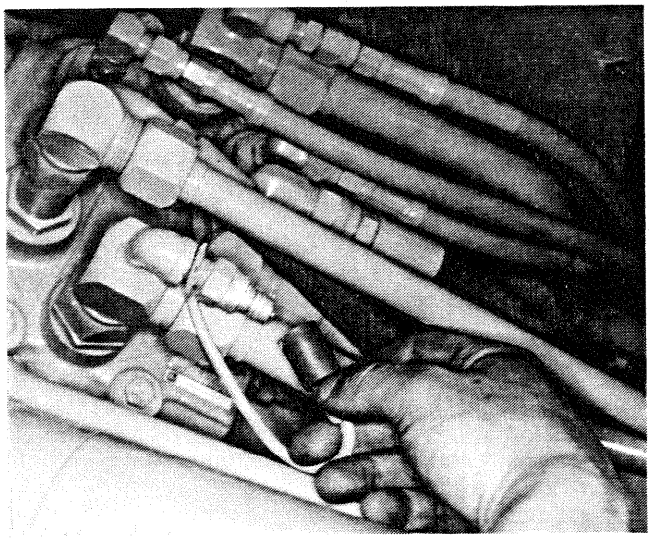


Fig 10-10

Check the arch and grapple relief pressure with a 20.000 kPa (3,000 PSI) pressure test gauge connected to the grapple relief pressure port on the arch and grapple control valve on the fuel tank. With the engine operating at maximum RPM, and the grapple hold fully open (to put the hydraulic system over relief), the gauge should read 13.650 to 14.350 kPa (1,950 to 2,050 PSI).

NOTE: On 558F S/N machines, the arch and grapple control valve is located under the right hand floorboard panel adjacent to the steer and blade control valve.

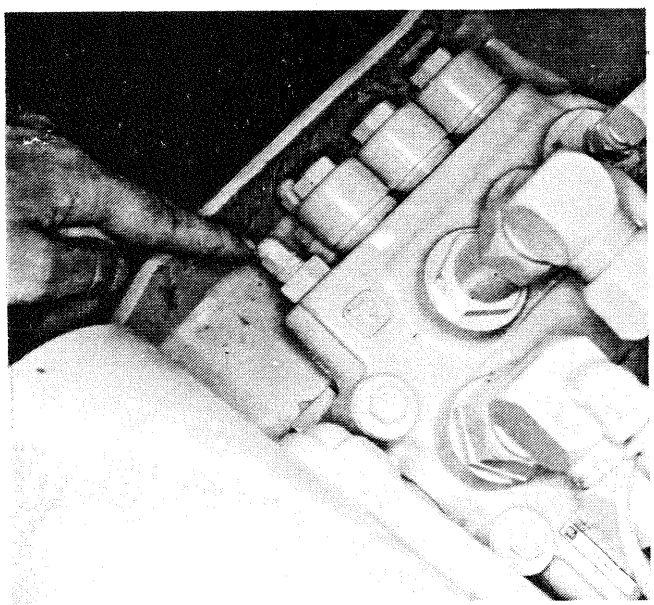


Fig 10-11

If the reading on the gauge is not correct, remove the acorn nut on the grapple 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 **CLARK** distributor.

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. With the blade raised, the arch forward, and the grapple open, drain the system as follows:

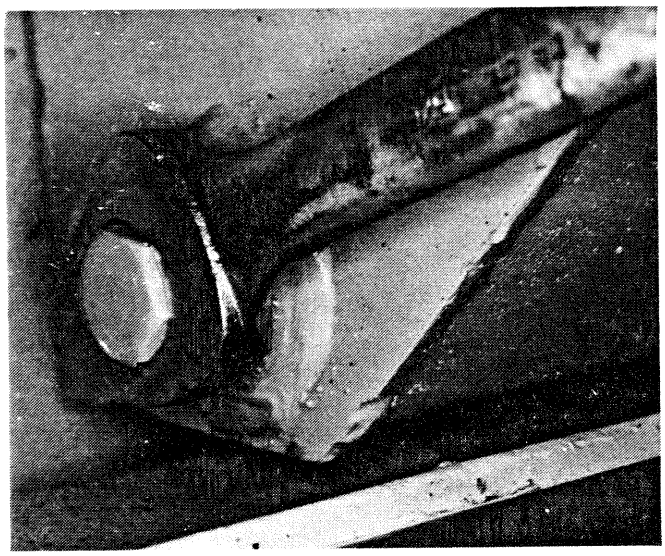


Fig 10-12

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 60 ℓ (13.5 Imperial gal/ 16 U.S. gal).

Fig 10-13

2. Slowly lower the blade 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.

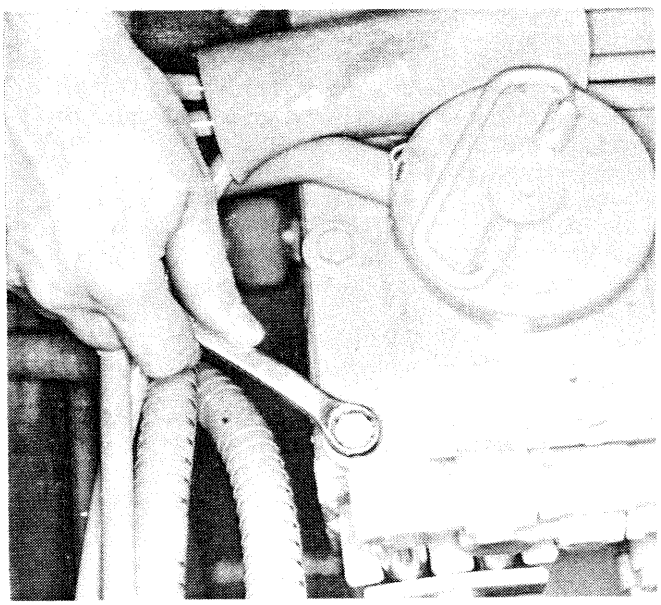


Fig 10-14

3. Remove the hydraulic reservoir top plate and clean the inside of the tank. Remove the magnet at the bottom of the tank, clean it thoroughly and replace it inside the reservoir.

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 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 10 Hours of Operation:

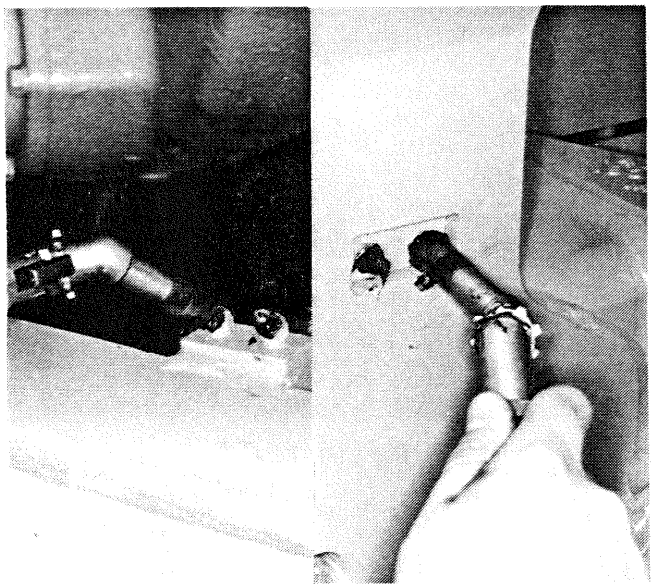


Fig 11-1

Grease the front and rear midmount pillow blocks with the lubricant specified in Sec. 17. Use a hand grease gun and grease all fittings sparingly.

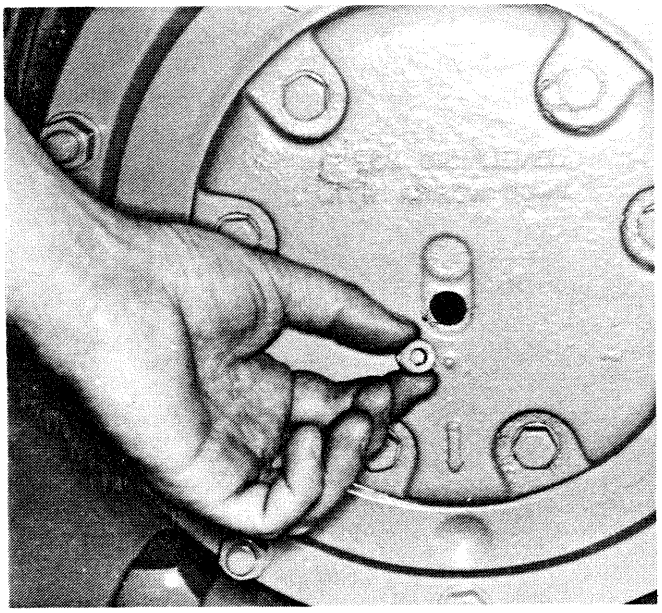


Fig 11-3

Check the lubricant level in the front and rear axle planetary hubs. Turn the wheel until the check plug on the hub is pointing upwards. Remove the check plug. The lubricant level should be up to the bottom of the check hole. If the level is below the hole, add the recommended lubricant to the check hole (See Sec. 17).

Every 50 Hours of Operation:

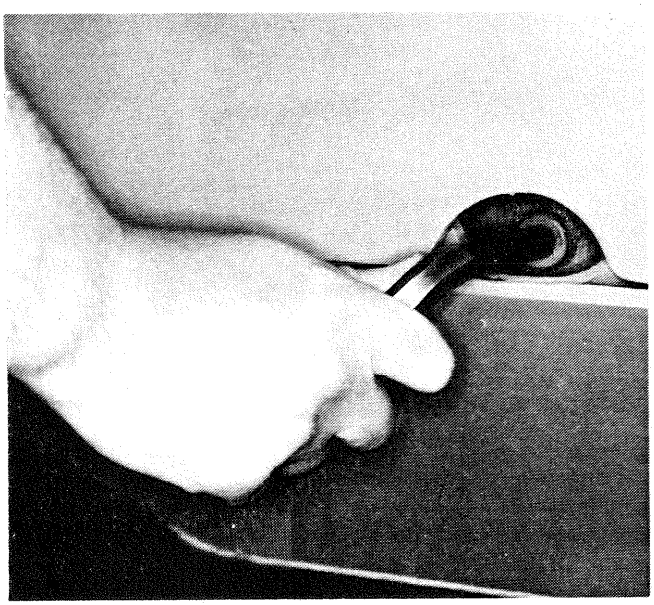


Fig 11-2

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

Every 100 Hours of Operation:

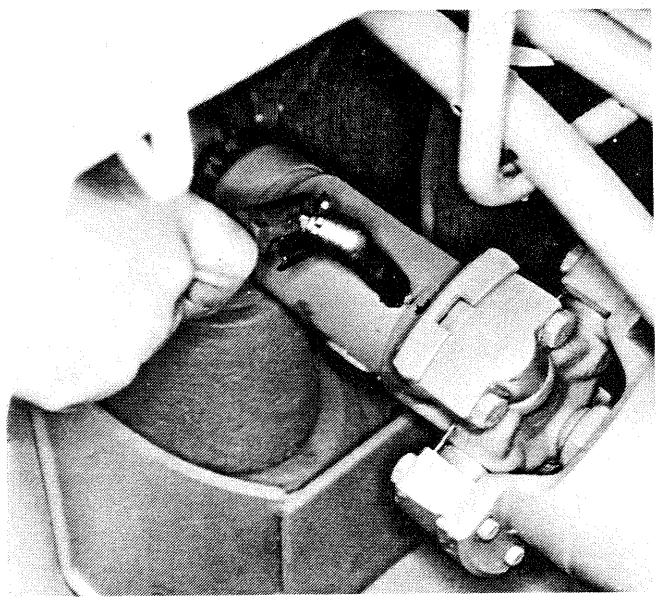


Fig 11-4

Grease all propshaft slip joints with Extreme Pressure Molybdenum Disulphide Grease. Use a hand grease gun and grease all fittings sparingly. When the machine is operated at temperatures above -18°C (0°F) use a grade 2 lubricant.When operating in temperatures below -18°C (0°F) use a grade 0 lubricant

Every 500 Hours of Operation:

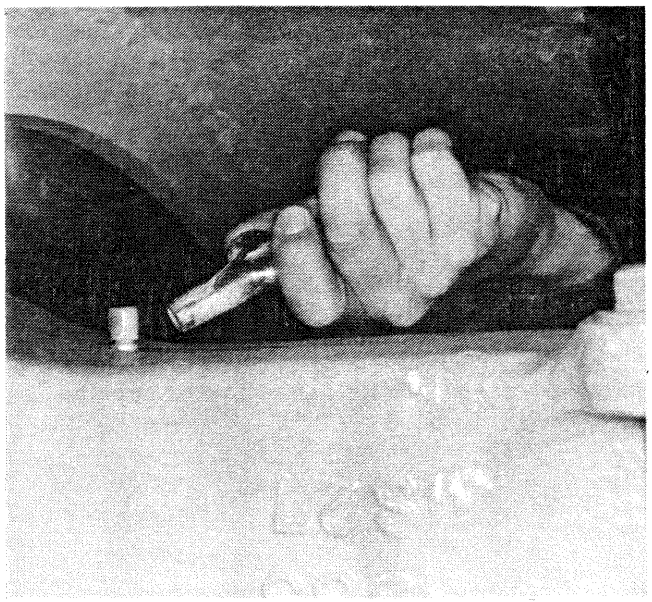


Fig 11-5

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 11-6

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 8 ℓ (2 Imperial gal, 2 U.S. gal). Re-install the drain plugs and fill each differential check hole with the recommended fluid (See Sec. 16).

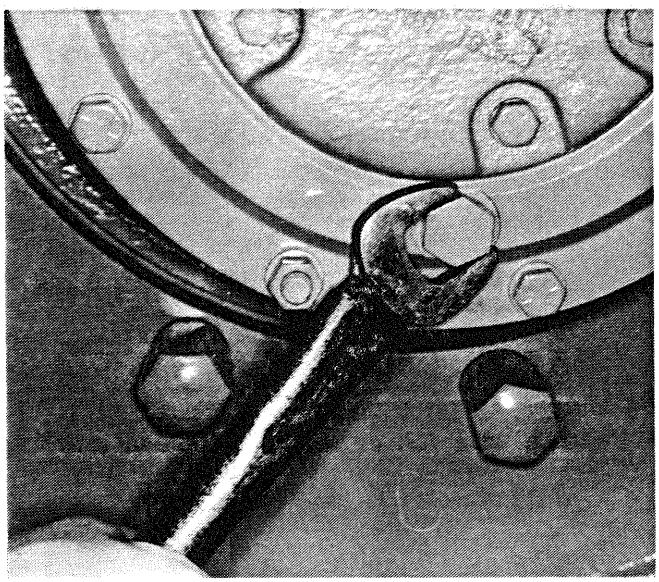


Fig 11-7

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 5 ℓ (2 Imperial gal, 2 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.**

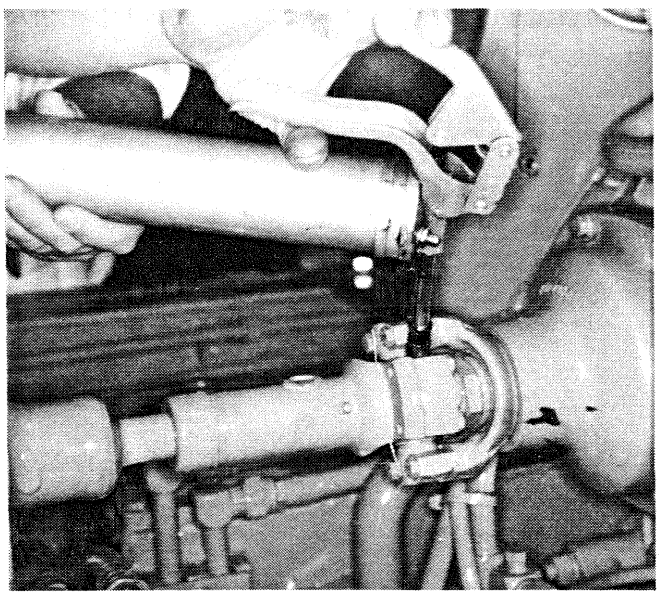


Fig 11-8

Grease all propshaft universal joint lubrication points with Extreme Pressure Molybdemum 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.

WHEELS AND TIRES

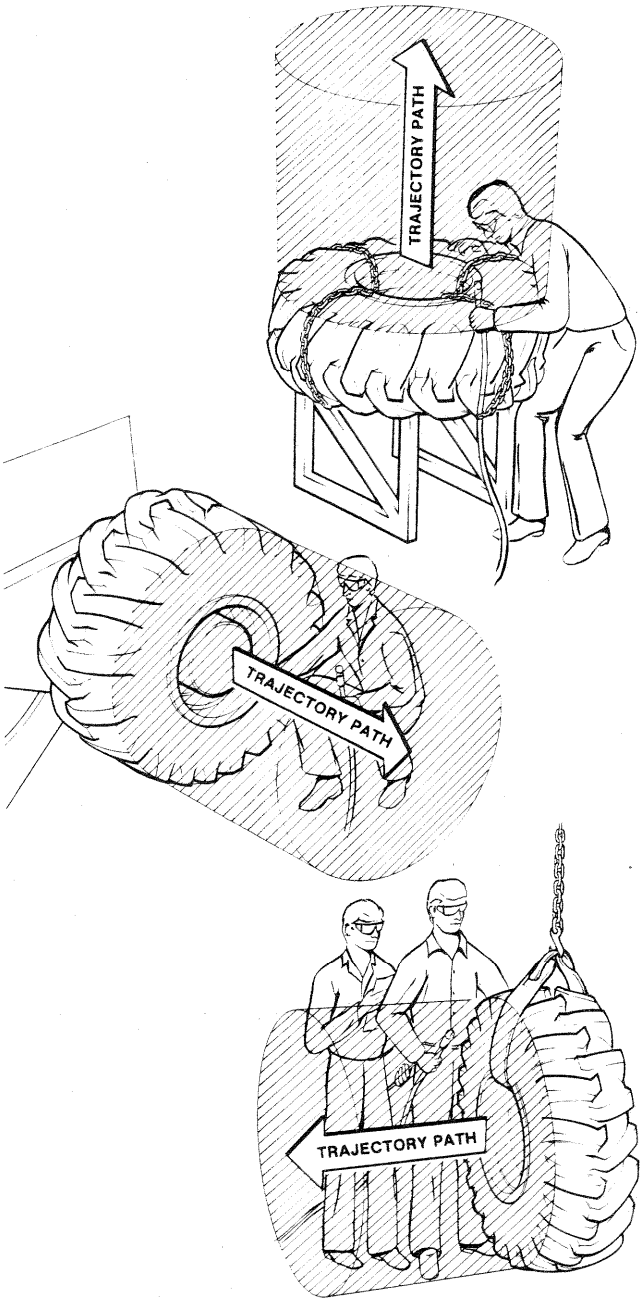


Fig 12-1

⚠ 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:

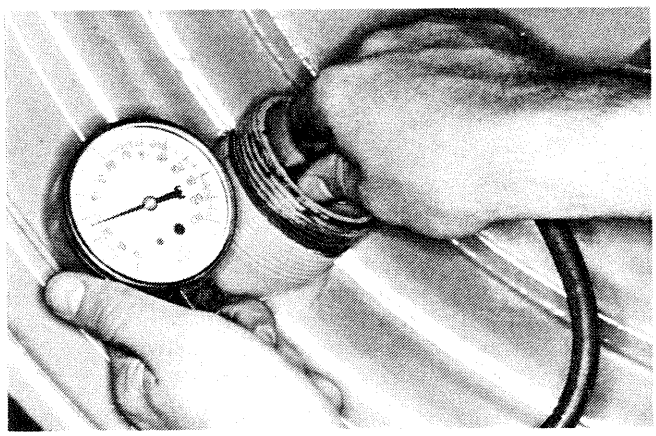


Fig 12-2

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:

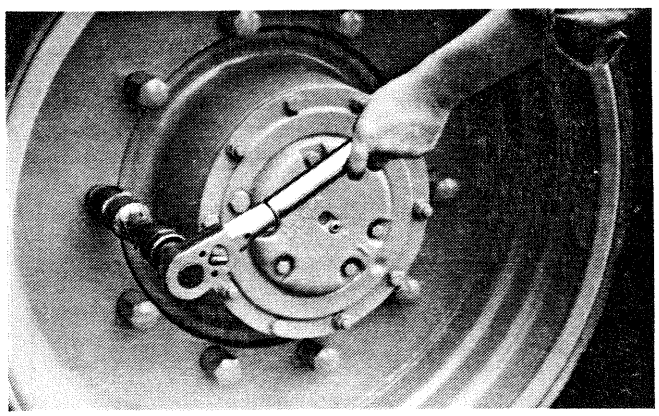


Fig 12-3

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

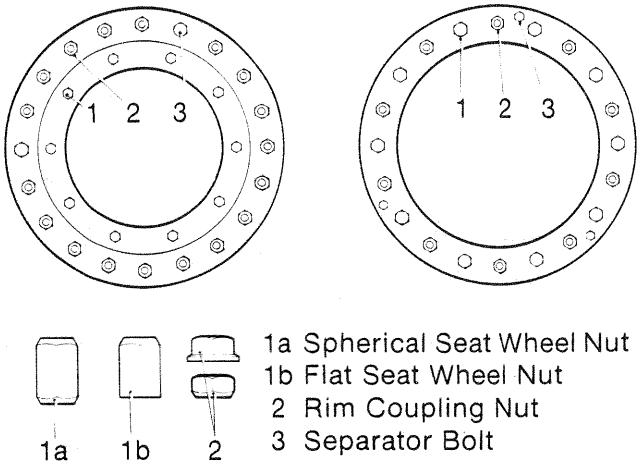


Fig 12-4

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.

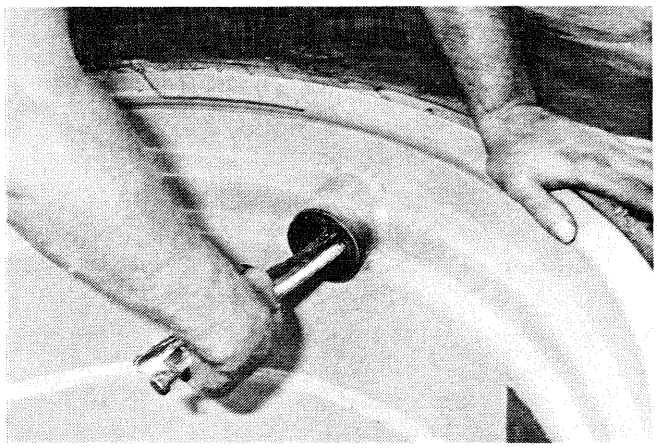


Fig 12-5

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.

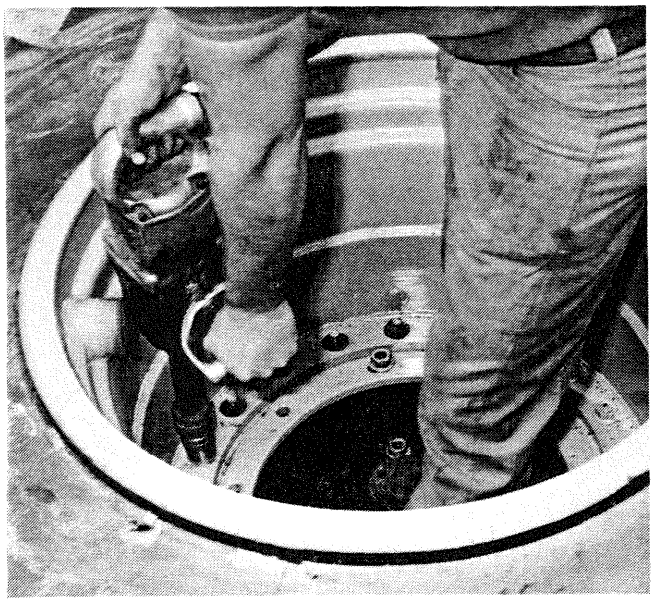


Fig 12-7

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

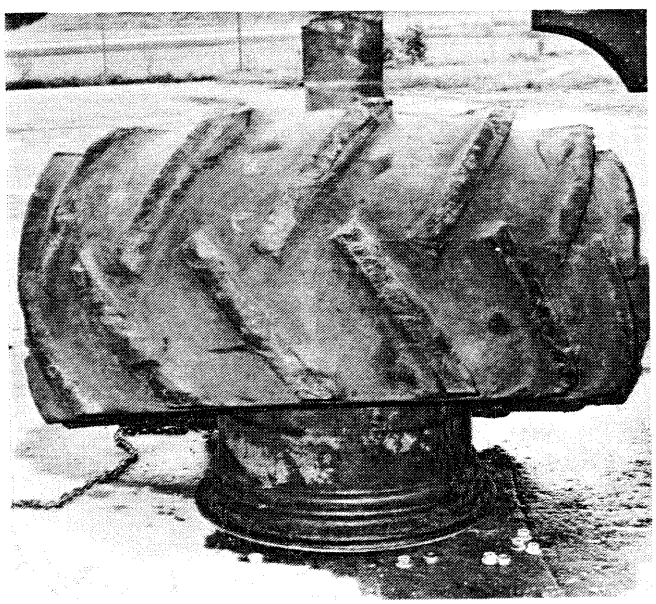


Fig 12-8

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

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.

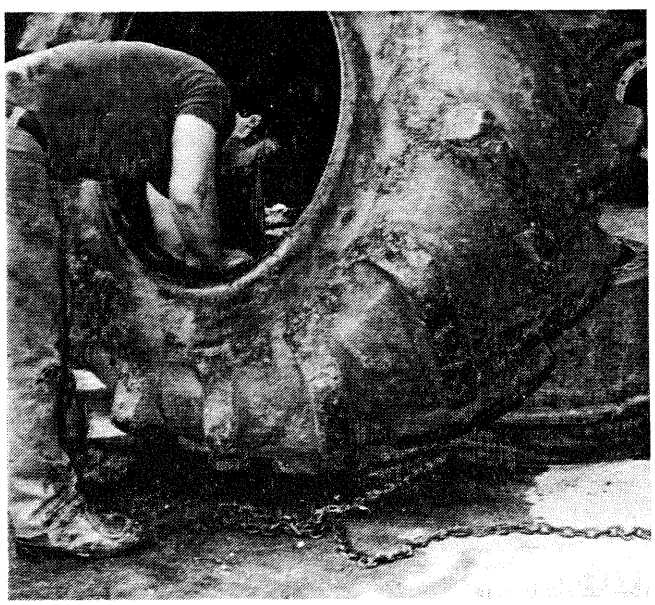


Fig 12-10

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

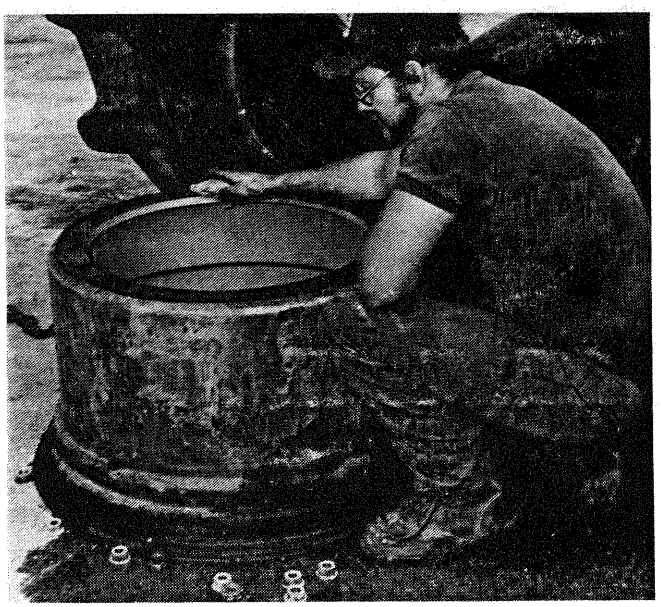


Fig 12-11

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 12-12

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 12-13

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 12-14

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.**

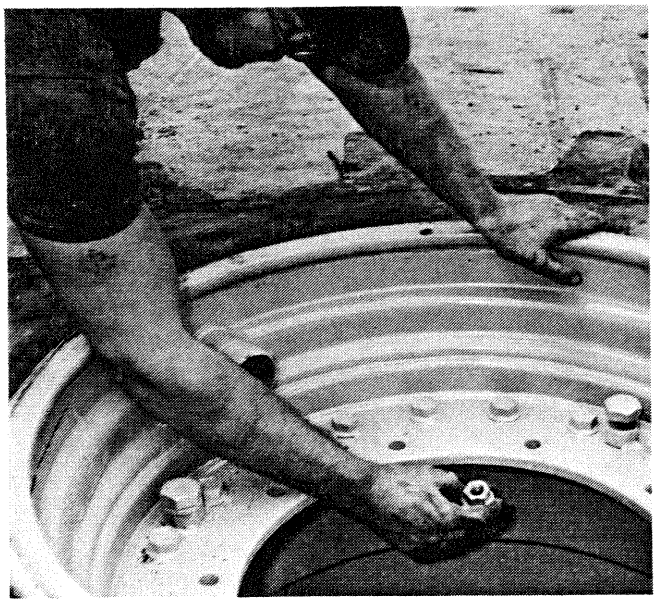


Fig 12-15

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 12-16

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.**

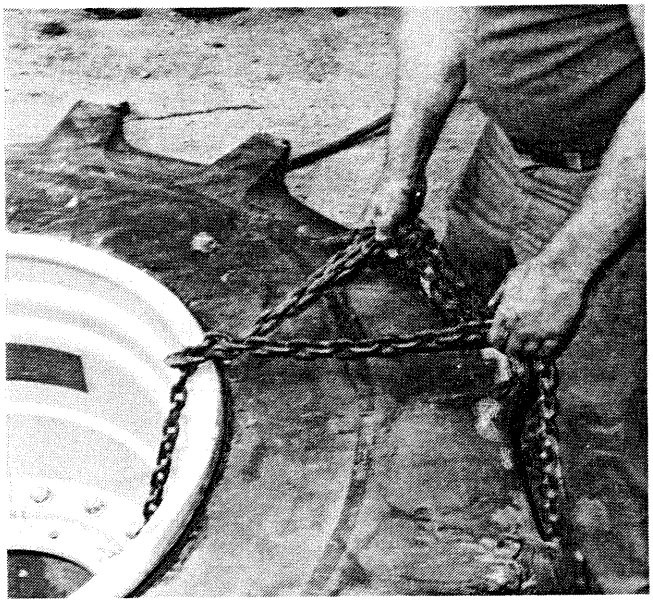


Fig 12-17

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

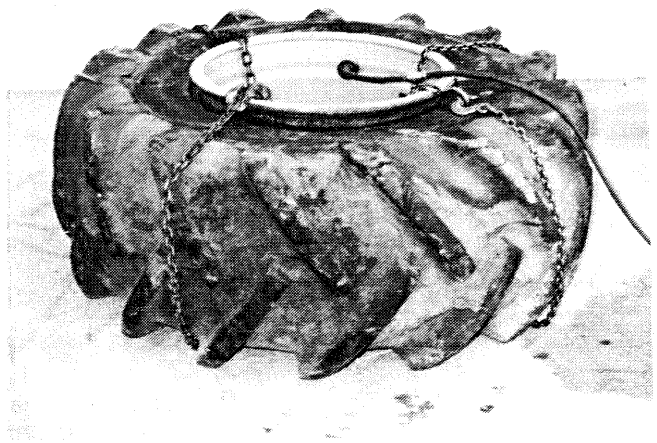


Fig 12-18

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 of 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.

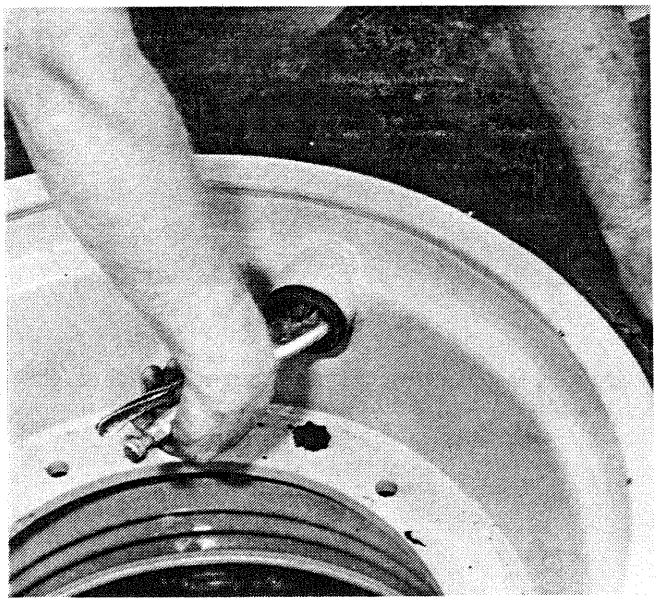


Fig 12-19

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.

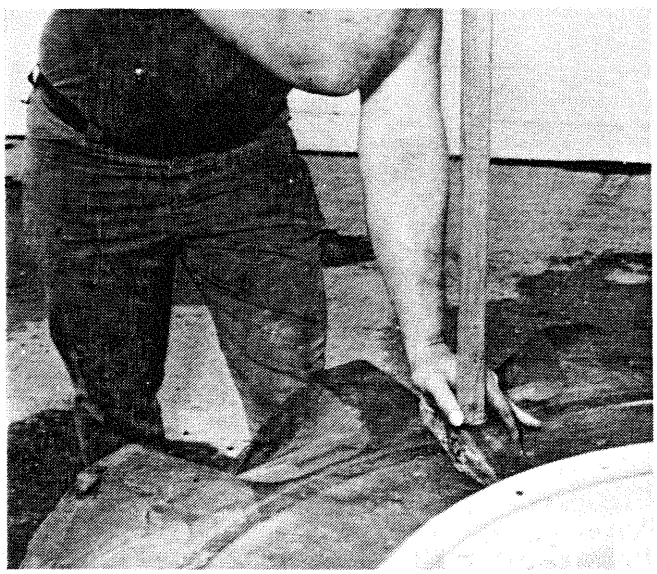


Fig 12-20

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

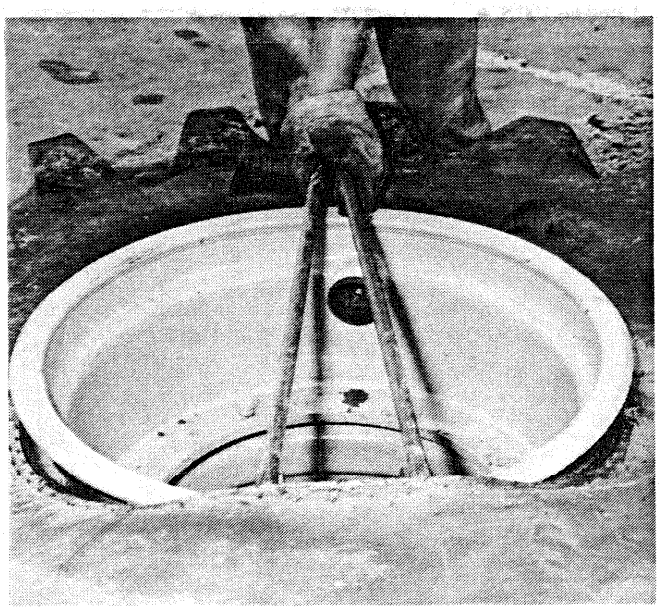


Fig 12-21

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

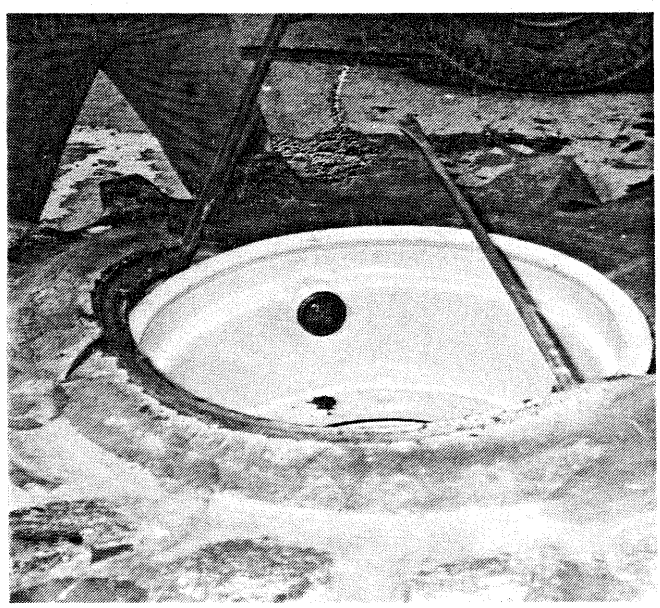


Fig 12-22

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.**

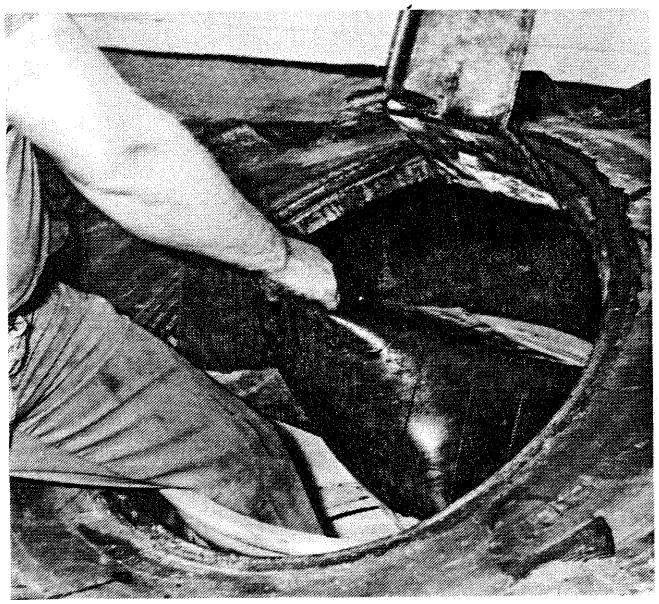


Fig 12-23

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.

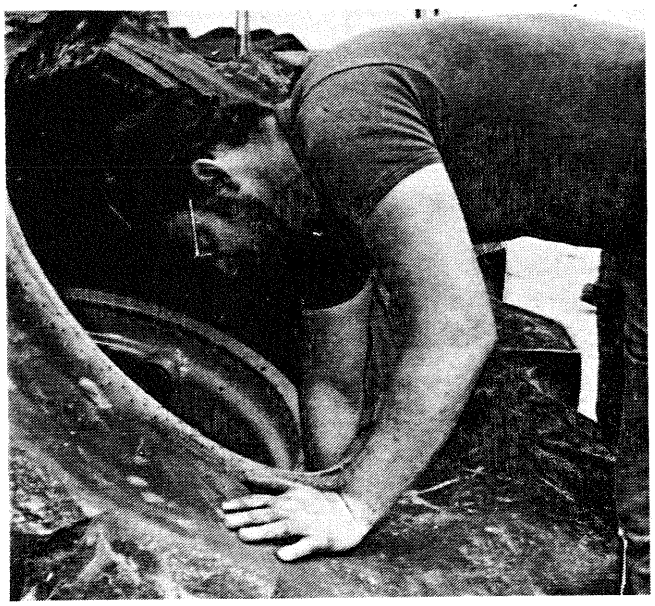


Fig 12-24

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

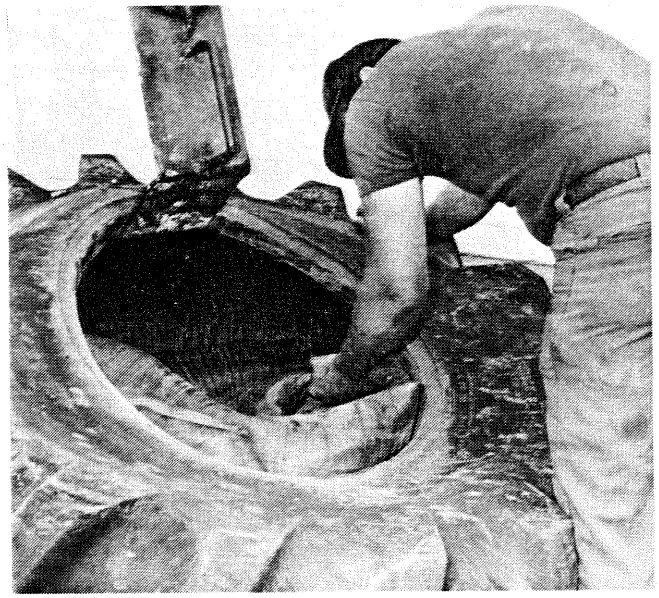


Fig 12-25

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 12-26

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.

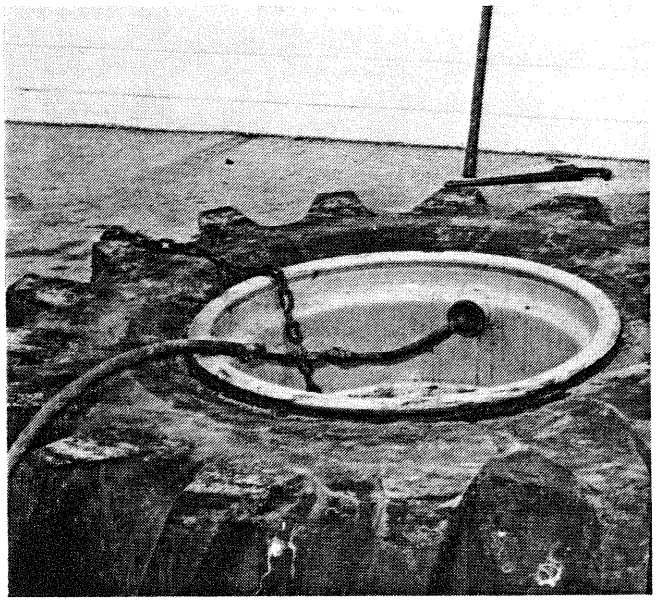


Fig 12-28

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) kPa	(Minimum) PSI	(Maximum) kPa	(Maximum) PSI
18.4 x 26	10	105	15	170	25
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

BRAKES

Every 50 Hours of Operation:

Fig. 13-1

Check the fluid level in the service brake master cylinder (reservoir) located under the access panel on the top of the firewall.

WARNING: Use ONLY CLARK Approved Automatic Transmission Fluid to fill the reservoir.

NOTE: **If your machine is equipped with an optional Secondary Brake System, the Service Brake reservoir supplies operating fluid to both brake master cylinders.**

Fig. 13-2

Make sure the vent hole in the filler cap is open at all times. If the hole is plugged, REMOVE the cap from the reservoir, clear the hole and reinstall the cap onto the reservoir.

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

Every 250 Hours of Operation:

Check and adjust the service (and secondary) brake pedal free travel as follows:

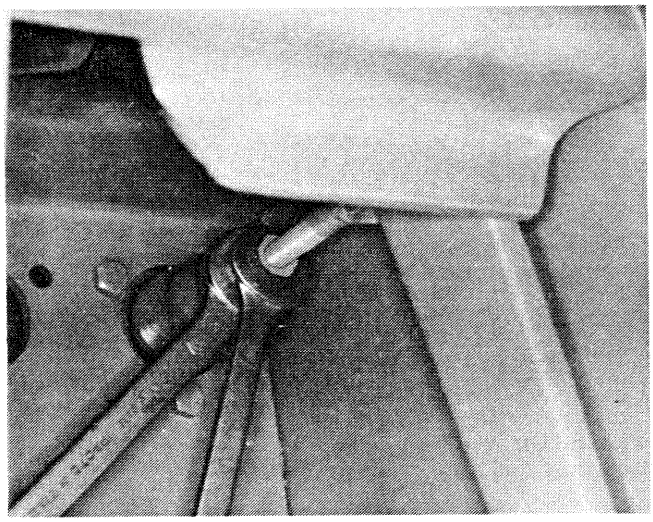


Fig 13-3

Loosen the locknut on the master cylinder pushrod and turn the adjusting nut clockwise to decrease the travel and counterclockwise to increase it. The brake pedal free travel must not exceed 5,0 mm (.20 in) when the pedal is depressed by hand from its rest position to the point that it begins to actuate the master cylinder.

IMPORTANT NOTE: On machines equipped with a reverse declutch system, the brake pedal free travel must not exceed 2,5 mm (.10 in).

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

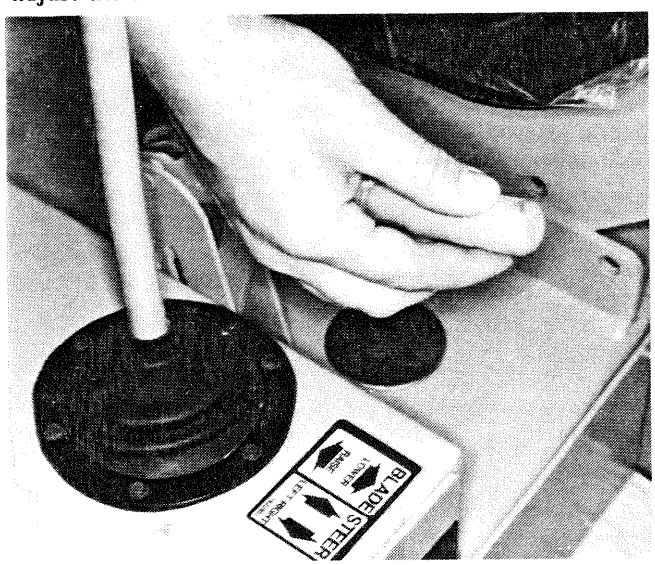


Fig. 13-4

With the parking brake lever 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.

If the Service Brake Pedal stroke is excessive or if the Parking Brake Light on the instrument panel fails to light when the parking brake lever is applied, adjust the actuating switch on the hydraulic brake housing as follows:

1. Apply the parking brake lever fully.

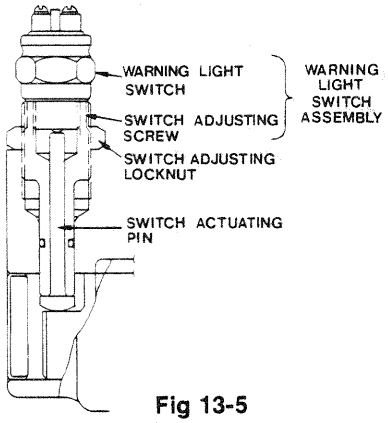


Fig 13-5

2. Loosen the warning light switch and the switch adjusting locknut.

3. Tighten the warning light switch assembly until it makes contact with the brake actuating shaft.

4. Loosen the warning light switch assembly one turn, hold the assembly in this position and tighten the locknut.

NOTE: **When the switch is properly adjusted, the Parking Brake Light on the instrument panel will glow to indicate the Parking Brake Lever is applied when the ignition switch is in the ON position.**

Check the operation of the brake system(s). If the brakes feel spongy or the pedal stroke seems to be longer than normal, bleed the brake system(s) as follows:

1. Fill the fluid reservoir with recommended fluid. The fluid level in the reservoir must not drop below half.

IMPORTANT NOTE: **If the master cylinder is drained during the bleeding procedure, air will enter the system and the system will have to be rebled.**

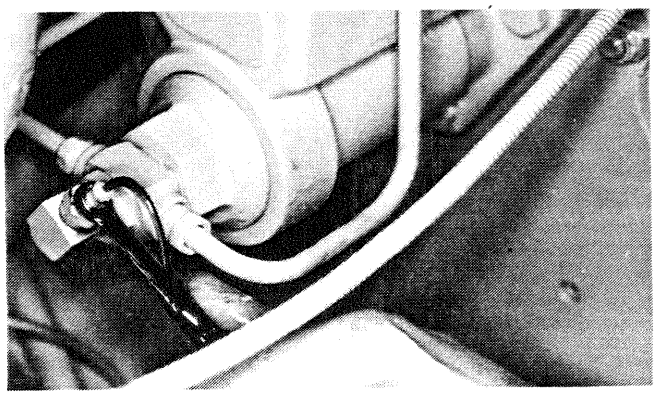


Fig 13-6

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

IMPORTANT NOTE: **The bleeder screw must be closed BEFORE releasing the pedal to prevent air from re-entering the system.**

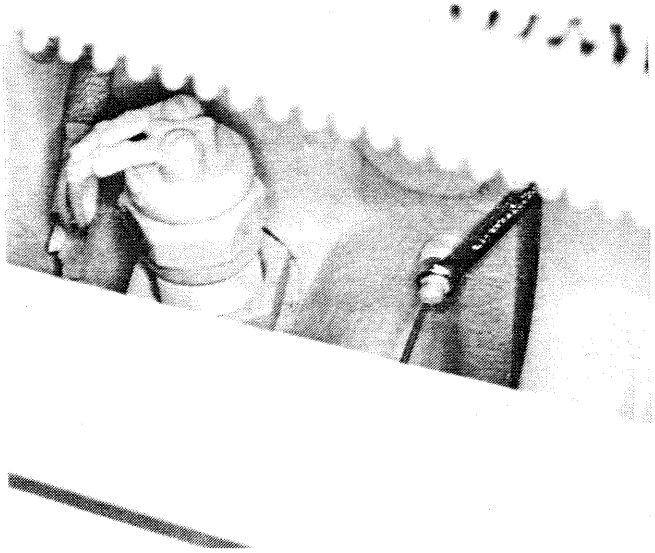


Fig 13-7

3. Hold the brake pedal fully applied and open the bleed screw on the left hand side of the transmission mounted hydraulic brake housing until a clear stream of fluid (free of air) flows through it. Close the bleeder screw.

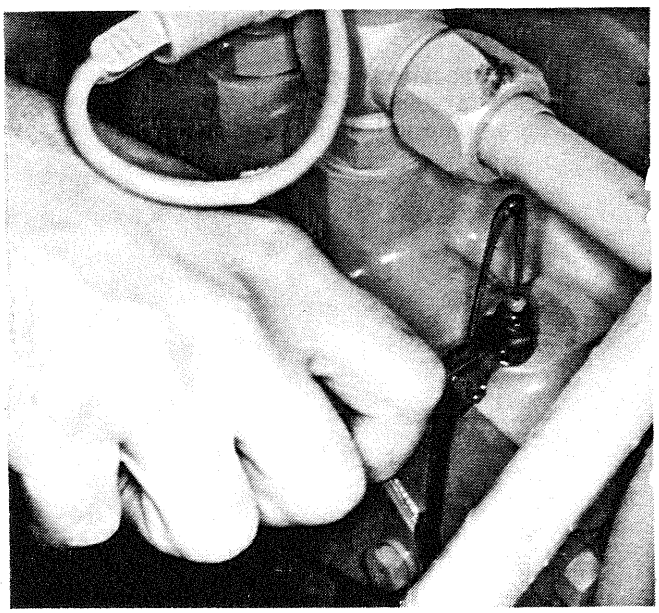


Fig 13-8

4. Hold the brake pedal fully applied and open the bleeder screw on the right hand top of the brake housing until a clear stream of fluid (free of air) flows through it. Close the bleeder screw.

IMPORTANT NOTE: **DO NOT reuse any fluid that was drained during the bleeding operation. This fluid is probably contaminated and could interfere with the safe operation of the brake system(s).**

NOTE: **Refill the fluid reservoir after each bleeding step.**

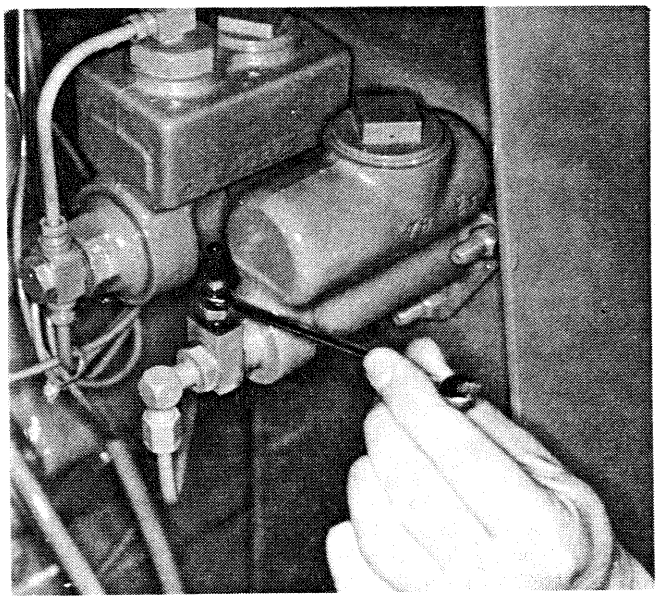


Fig 13-9

5. Have a helper hold the secondary brake pedal fully applied and open the bleeder screw on the front of the master cylinder until a clear stream of fluid (free of air) flows through it. Close the bleeder screw..

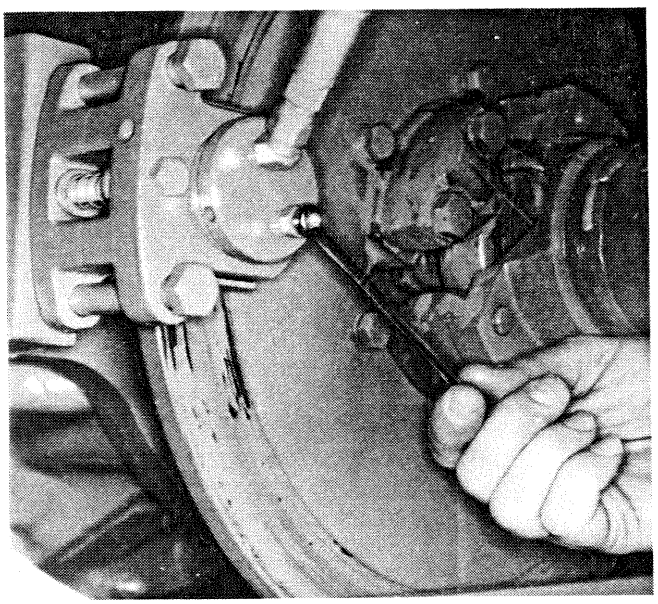


Fig 13-10

6. Hold the brake pedal applied and open the bleeder screw on the front of the secondary brake head (at the rear drive axle) until a clear stream of fluid (free of air) flows through it. Close the bleeder screw.

NOTE: **While manually bleeding the brake system(s), the master cylinder pushrods (and the brake pedals) may not return or may return slowly when the pedal(s) is released. There may still be air in the system or the pedal linkage may be binding. This does not necessarily indicate that the master cylinder is faulty. Check the pedal linkage to see that it moves freely and correct if necessary. If the linkage is not binding, the pedal should be manually returned and the system should be bled until the problem is corrected.**

Every 500 Hours of Operation:

Check the secondary brake assembly for wear or damage as follows:

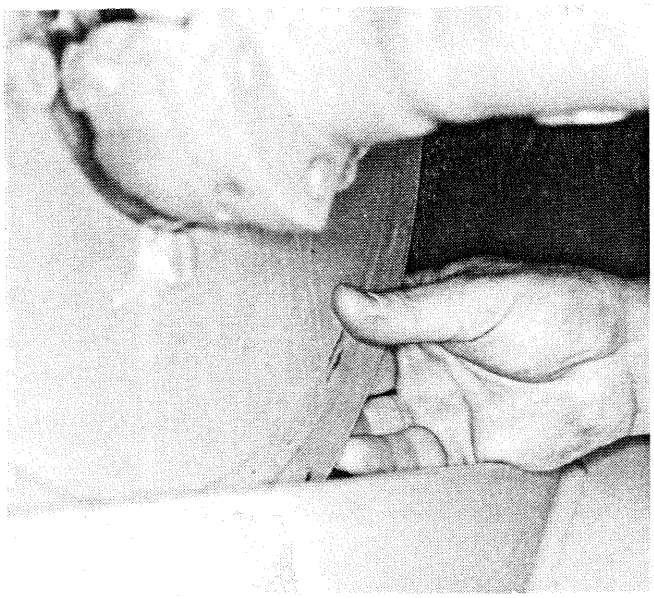


Fig 13-11

Check the condition of the disc. If it is warped or pitted, replace the disc. Measure the thickness of the pads for wear. The maximum allowable pad thickness for safe operation is 2,5 mm (0.10 in). If the pads are worn, they must be replaced.

NOTES

ELECTRICAL SYSTEM

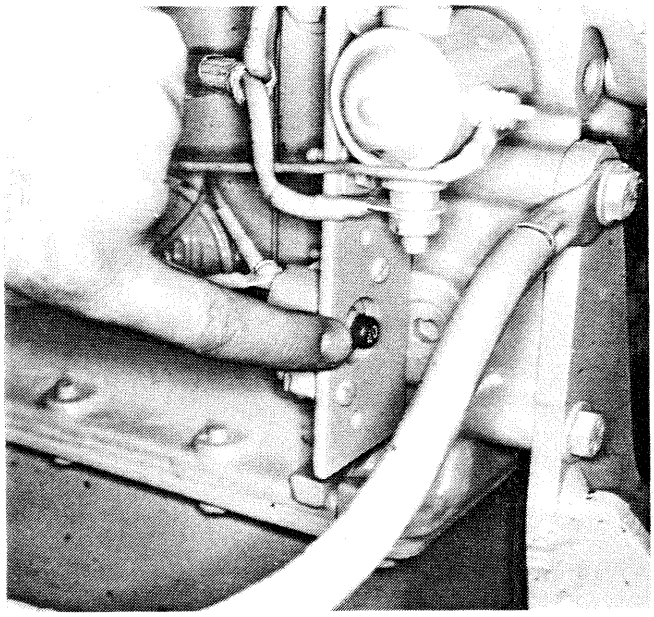


Fig 14-1

The electrical system in the 664D/665D 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.

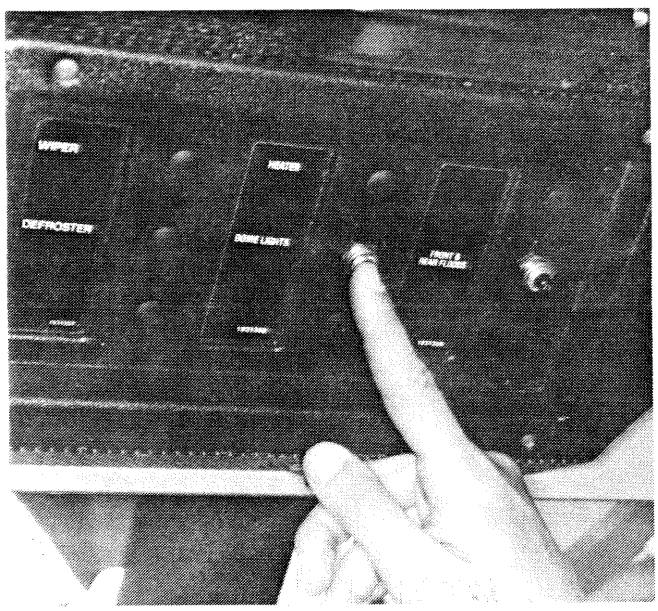


Fig 14-2

On 664D/665D machines with enclosed cabs and optional dome lights, heater, defroster fan and/or windshield wiper and washers the operating controls are located on the inside of the enclosed cab above the windshield. Each option is protected by a circuit breaker located to the right of the controls. Push the appropriate button to reset the circuit breaker if it has been actuated.

Optional lights on your machine are located on the grill shroud (four) and on the rear of the canopy (four).

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:

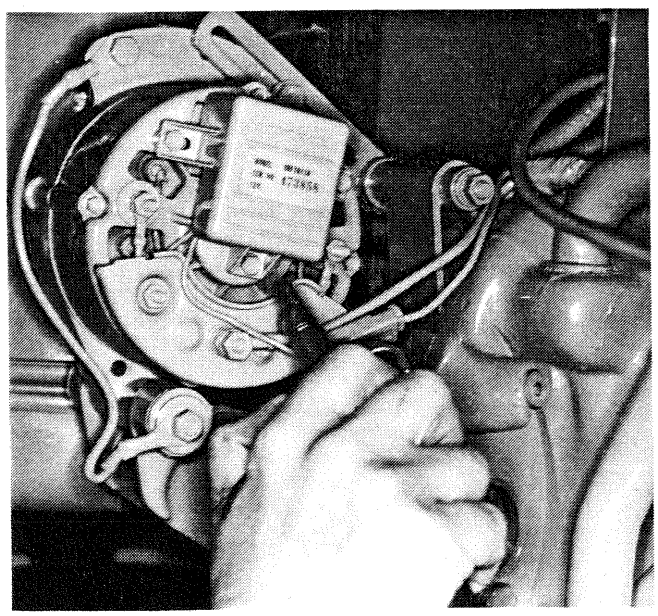


Fig 14-3

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 14-4

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.

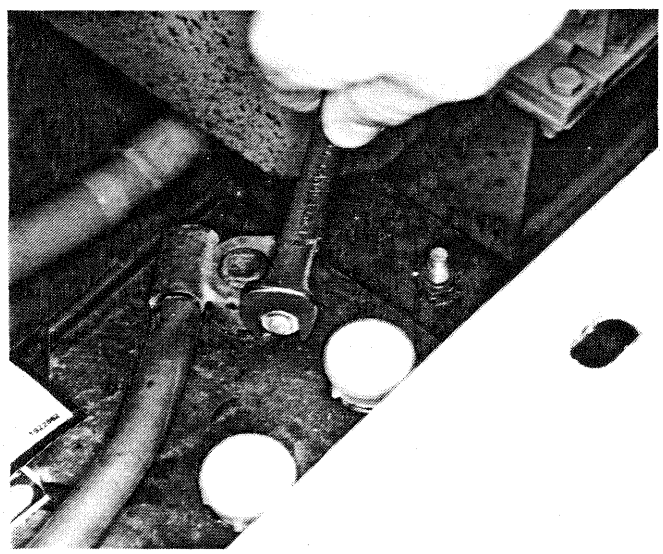


Fig 14-5

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

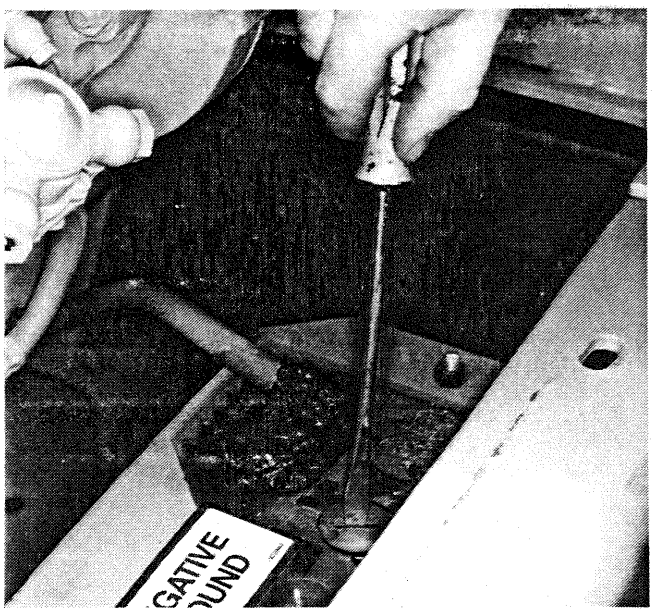


Fig 14-6

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

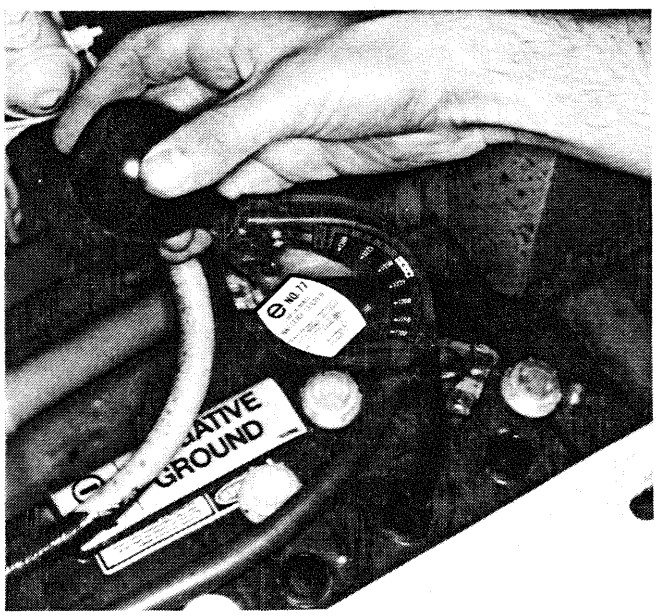


Fig 14-7

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 consistantly 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 27°C (80°F)	% 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:

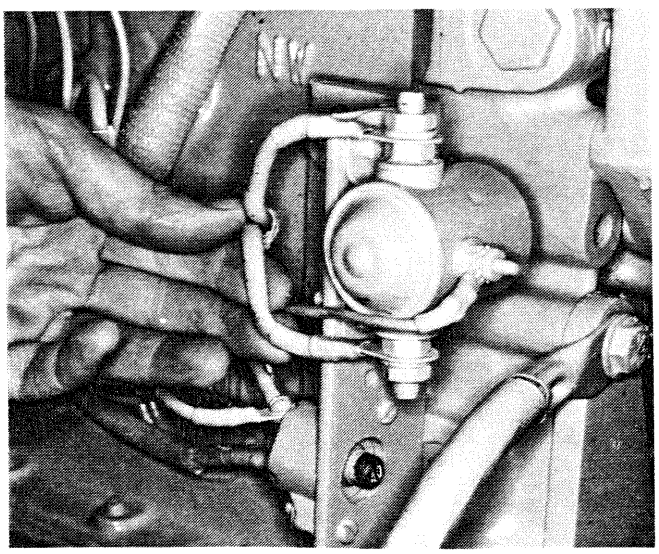
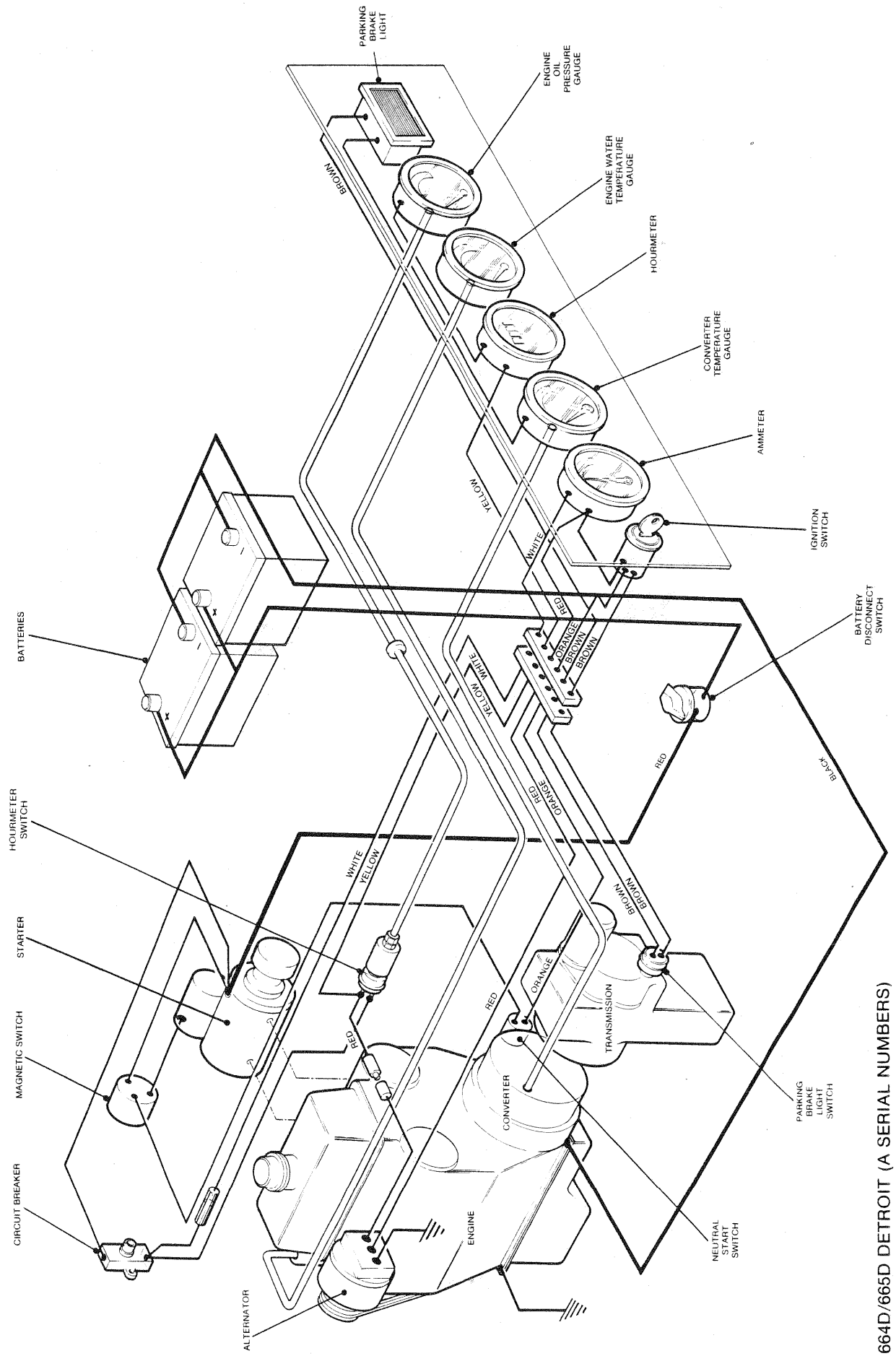


Fig 14-8

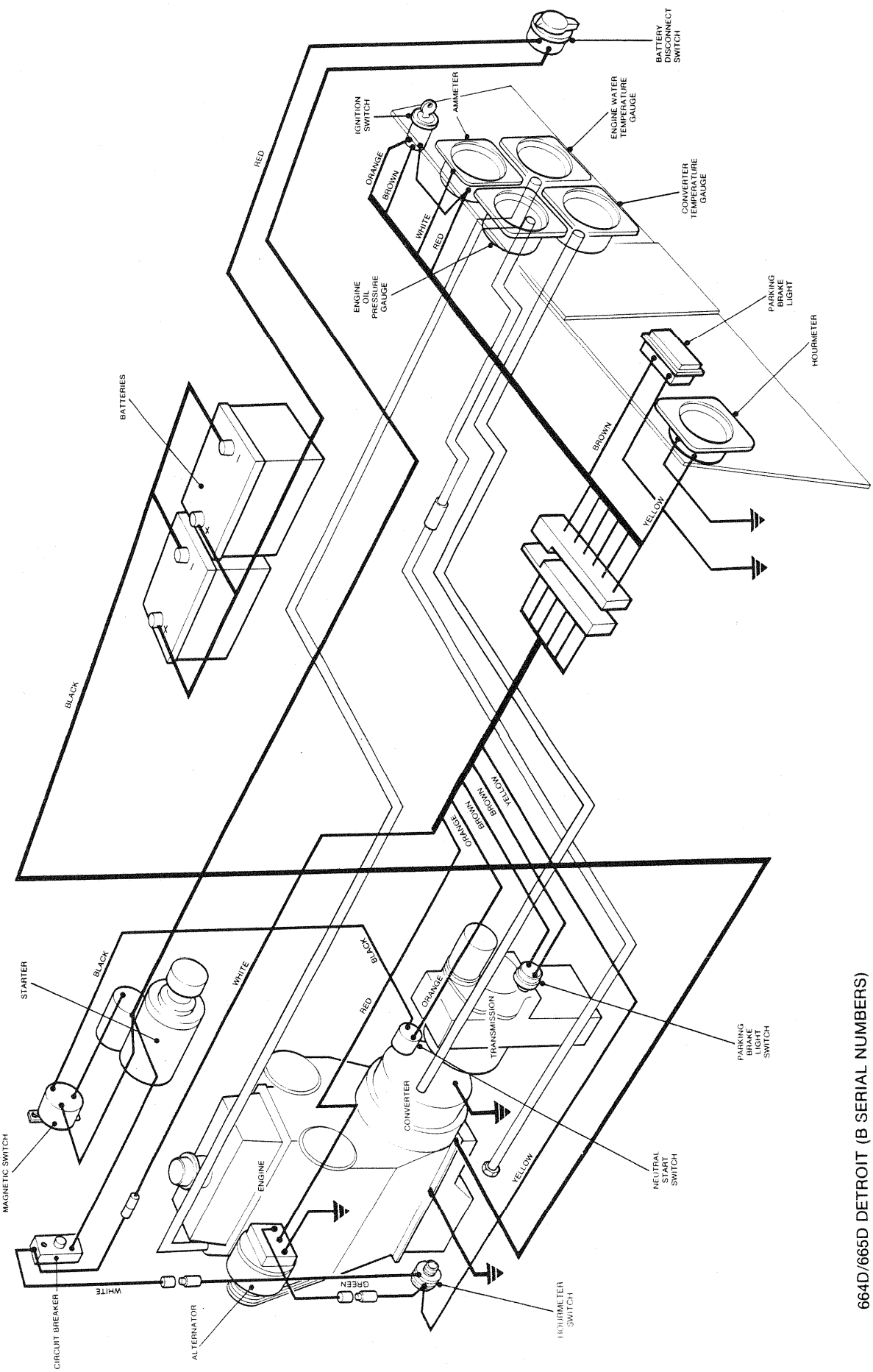
1. Visually check the wiring for worn or damaged insulation and loose terminal connections.
2. Clean the connections to the starter motor, alternator, voltage regulator, solenoid switch, relays and sender units. Clean and tighten the external ground strap and replace it if it is badly frayed or corroded.
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:

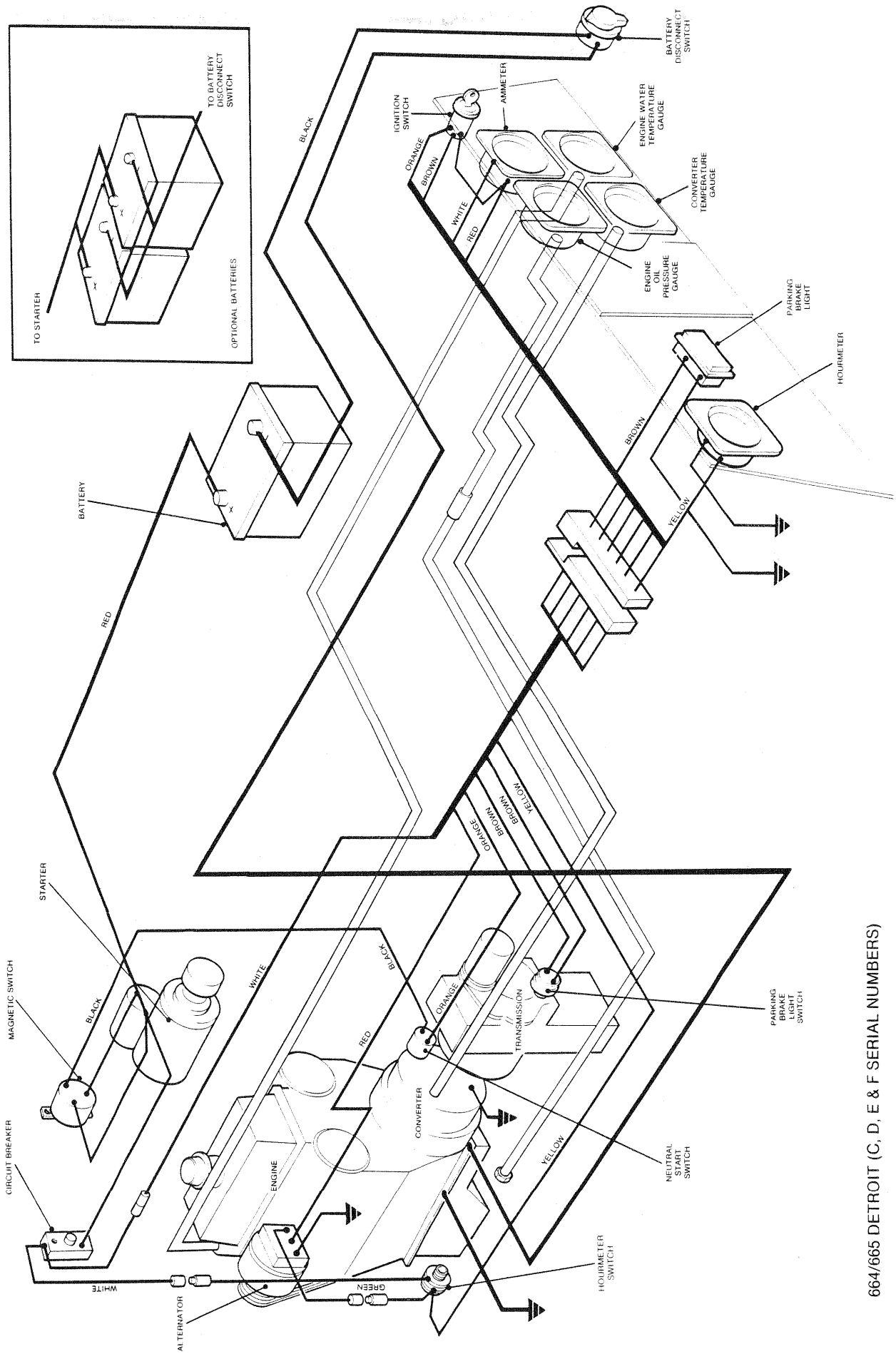
Inspect, test and lubricate the electrical units. Replace any defective or worn out parts.



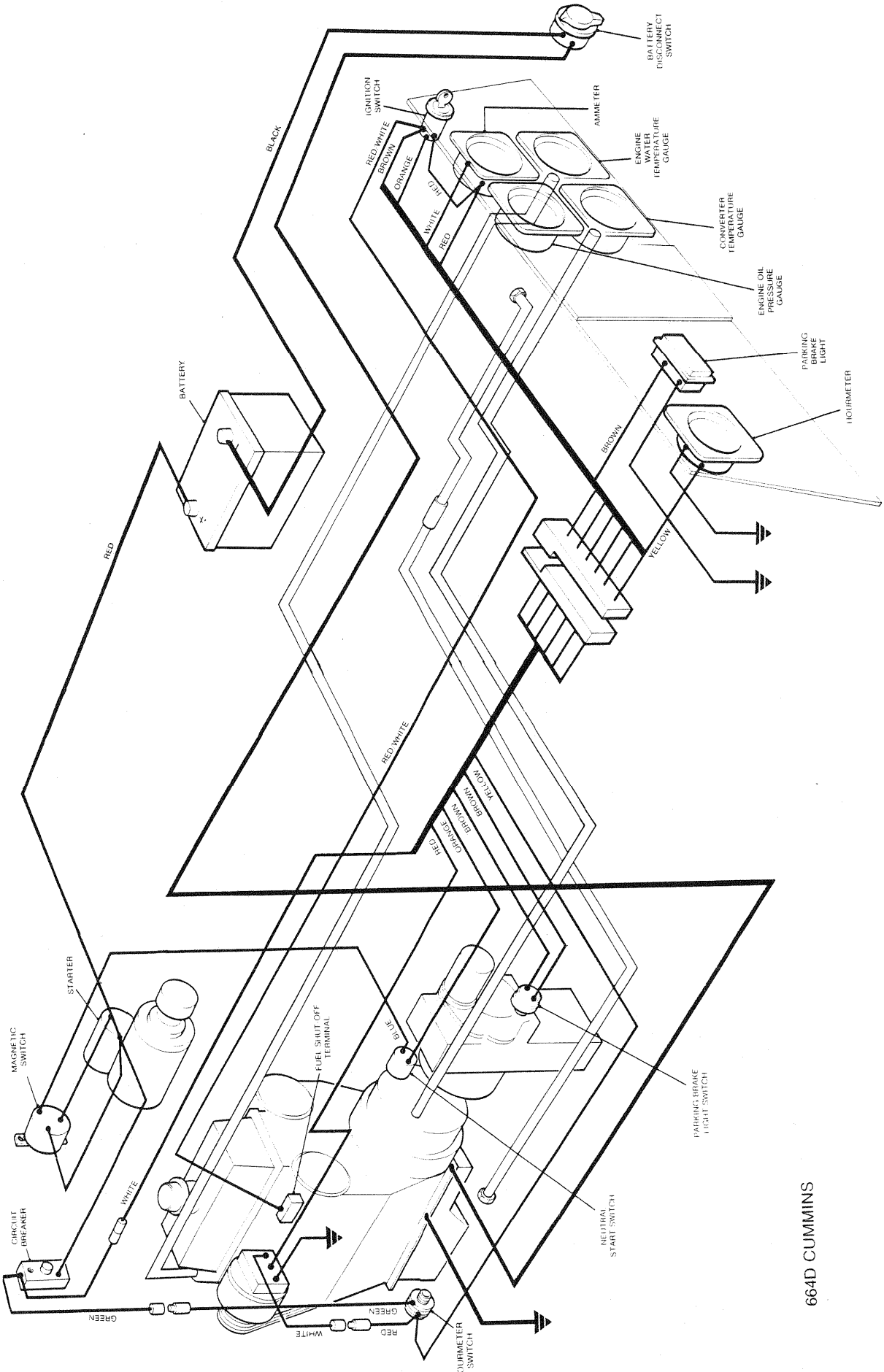
664D/665D DETROIT (A SERIAL NUMBERS)



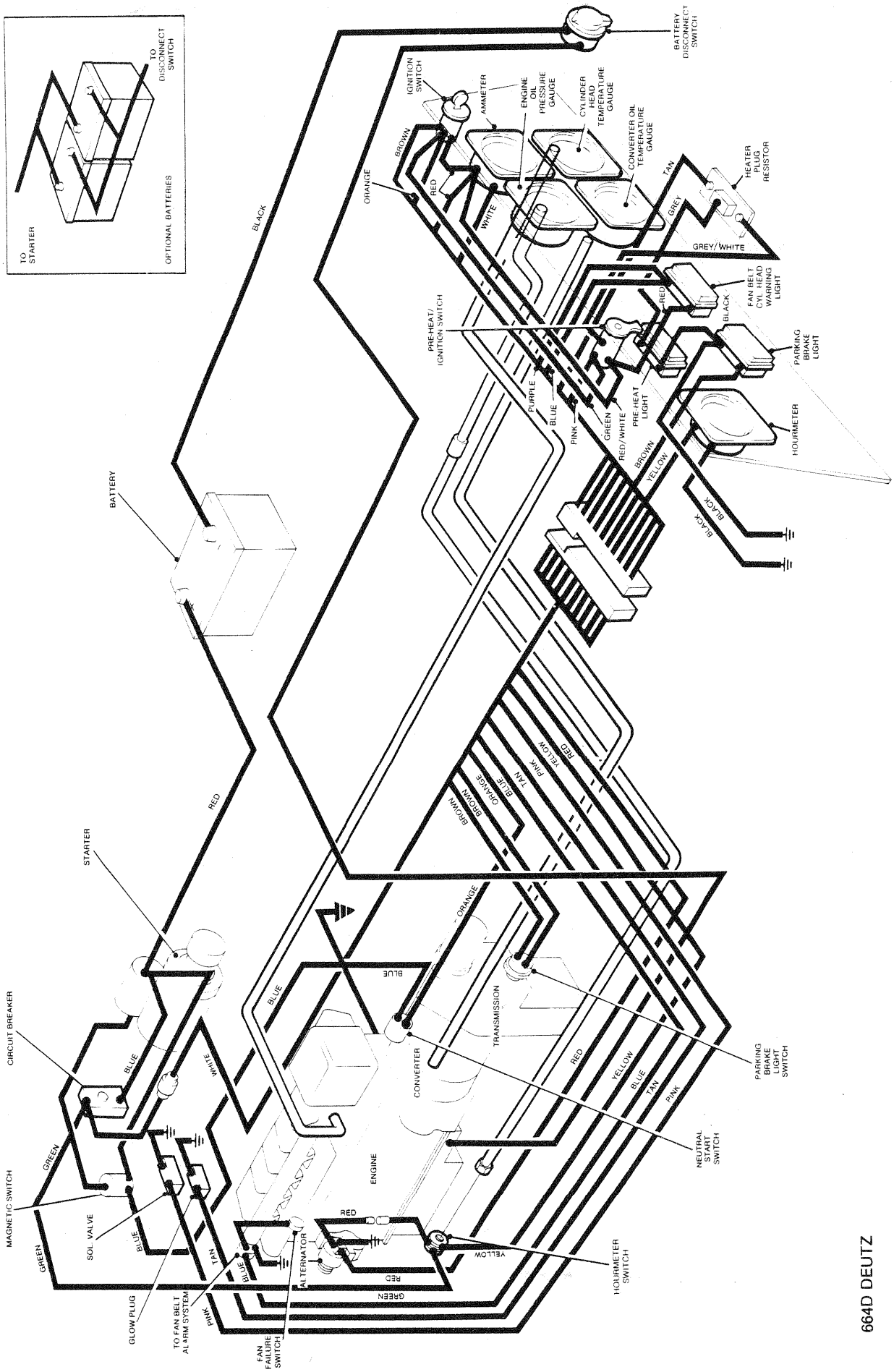
664D/665D DETROIT (B SERIAL NUMBERS)



664/665 DETROIT (C, D, E & F SERIAL NUMBERS)



664D CUMMINS


TO STARTER
TO DISCONNECT SWITCH
OPTIONAL BATTERIES
BATTERY DISCONNECT SWITCH
IGNITION SWITCH
AMMETER
ENGINE OIL PRESSURE GAUGE
CYLINDER HEAD TEMPERATURE GAUGE
CONVERTER OIL TEMPERATURE GAUGE
HEATER PLUG RESISTOR
FAN BELT CYL HEAD WARNING LIGHT
PARKING BRAKE LIGHT
HOURMETER
PRE-HEAT LIGHT
PRE-HEAT/ IGNITION SWITCH
BATTERY
STARTER
CIRCUIT BREAKER
MAGNETIC SWITCH
SOL VALVE
GLOW PLUG
TO FAN BELT ALARM SYSTEM
FAN FAILURE SWITCH
ALTERNATOR
ENGINE
CONVERTER
TRANSMISSION
PARKING BRAKE LIGHT SWITCH
NEUTRAL START SWITCH
HOURMETER SWITCH
BLACK
RED
BROWN
ORANGE
BLUE
TAN
PINK
YELLOW
GREEN
WHITE
GREY
GREY/WHITE
PURPLE
RED/WHITE

664D DEUTZ

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.

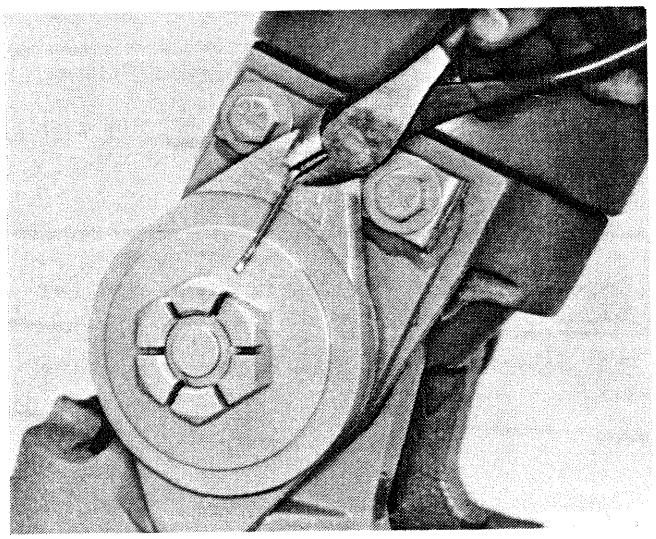


Fig 15-1

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

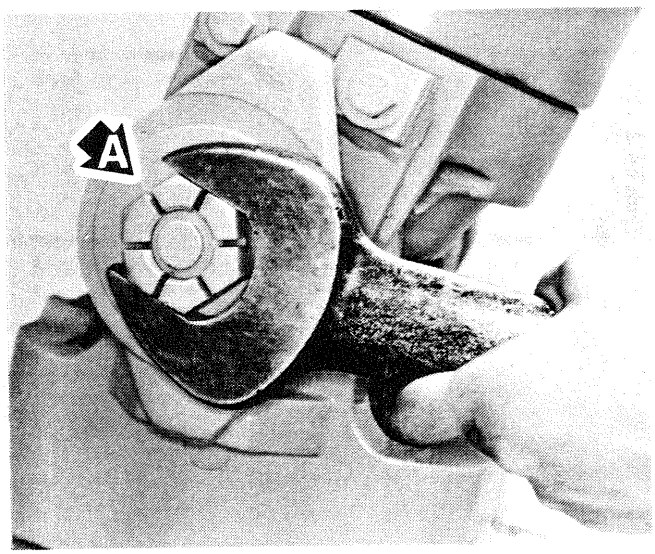


Fig 15-2

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

IMPORTANT NOTE: **Never overtighten the adjusting nuts.**

4. Install new cotter pins 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:

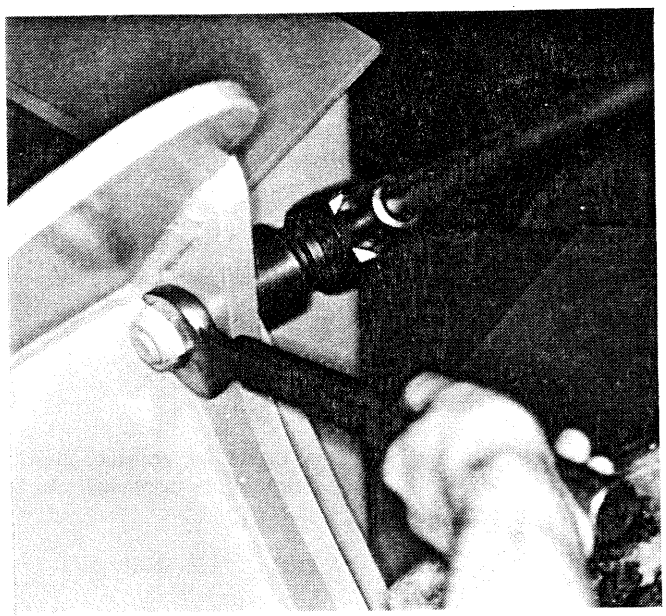


Fig 15-3

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 consistant 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 NETRUAL positions.

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

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

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

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

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

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

If you must transport the machine:

Load and unload the machine on a level surface.

Always center the machine on the trailer bed.

Always put the machine in the Service Position (See Sec. 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 (Machine Model)	Detroit Diesel (664)	Detroit Diesel (665)
Model	3-53N	3-53T
Configuration	Inline 3 - Natural	Inline 3 - Turbo
Bore X Stroke, cm (in.)	9,84 X 11,43 (3.88 X 4.50)	9,84 X 11,43 (3.88 X 4.50)
Displacement, ℓ (in^3)	2,61 (159)	2,61 (159)
Maximum Torque N.m (lbf. ft)@ RPM	278 (205) @ 1800	409 (302) @ 1600
Gross Power, kW (hp) at governed RPM	73 (98)	93 (125)
Governed RPM (under Full Load)	2800	2500
Low Idle RPM	575-625	575-625
High Free Idle RPM	2920-3020	2645-2745
Converter Stall RPM	2180-2340	1875-1995
Hydraulic Stall RPM	1650-1880	1500-1600

Engine (Machine Model)	Cummins Diesel (664)	Deutz Diesel (664)
Model	4BT - 3.9	F5L912D
Configuration	Inline 4 - Turbo	Inline 5 - Air Cooled/Natural
Bore X Stroke, cm (in.)	10,2 X 12,0 (4.02 X 4.72)	10 X 12 (3.93 X 4.72)
Displacement, ℓ (in^3)	3,92 (239)	4,71 (288)
Maximum Torque N.m (lbf. ft)@ RPM	339 (250) @ 1500	287 (212) @ 1600
Gross Power, kW (hp) at governed RPM	75 (100)	69 (93)
Governed RPM (under Full Load)	2500	2500
Low Idle RPM	800-900	625-675
High Free Idle RPM	2700-2800	2575-2675
Converter Stall RPM	2140-2300	2150-2310
Hydraulic Stall RPM	1650-1880	1600-1760

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 both the Service and Parking Brakes 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.

Transmission/Winch Clutches:

1.240 to 1.520 (180 to 220) 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.

Steer and Blade Main Hydraulic Relief:

15.150 ± 345 (2,200 ± 50) using blade only.

Arch and Grapple Main Hydraulic Relief:

14.000 ± 345 (2,000 ± 50).

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	Imperial Gallons	U.S. Gallons
Engine Cooling System - Detroit	51	11	13.5
Engine Cooling System - Cummins	34	7.5	9.0
Engine Lube Oil System - Detroit	15	3.3	4.0
Engine Lube Oil System - Cummins	11	2.4	2.9
Fuel Tank - Cable	132	29	35
Fuel Tank - Grapple	151	33	40
Main Hydraulic System - Cable	58	13	15
Main Hydraulic System - Grapple	71	16	19
Transmission/Converter Hydraulic System	26	5.7	6.9
Winch Lube Oil	6	1.3	1.6
Axle Differentials	7	1.5	1.8
Axle Planetary Hubs	5	1.1	1.3

BOLT TORQUES	Thread	N.m	lbf.ft
*Front Engine Mount to Engine Block-Detroit	3/8-16	40-50	30-35
*Front Engine Mount to Engine Block-Cummins/Deutz	M12/M14	90-95	65-70
*Engine/Transmission Mounts to Frame	5/8-11	235-260	175-190
Converter Flex Plate to Engine Flywheel-Detroit/Cummins	3/8-24	35-40	25-30
*Converter Flex Plate to Engine Flywheel-Deutz	M10	35-40	25-30
Alternator Pulley to Alternator	5/16-18	60	45
*Converter to Engine Flywheel Housing-Detroit	3/8-16	25-35	20-25
*Converter to Engine Flywheel Housing-Cummins/Deutz	M10	30-35	20-25
**Transmission Mount to Transmission Case	3/4-10	385-420	285-310
*Upper Driveshaft-to Winch/PTO Clutch Flanges	5/16-24	25-35	20-25
*Lower Driveshaft-to Front Drive Axle	3/8-24	55-60	40-45
*Lower Driveshaft-to Rear Drive Axle (664)	3/8-24	55-60	40-45
*Lower Driveshaft-to Rear Drive Axle (665)	1/2-20	135-150	100-110
*Upper Stub Shaft to Stub Shaft Flange Nut	1-20	340-375	250-275
*Lower Stub Shaft to Stub Shaft Flange Nut (664)	1-20	340-375	250-275
*Lower Stub Shaft to Stub Shaft Flange Nut (665)	1 1/4-18	405-475	300-350
*Front Midmount Bearing to Front Frame	5/8-11	230-300	170-220
*Rear Midmount Bearing to Rear Frame (664)	5/8-11	230-300	170-220
*Rear Midmount Bearing to Frame (665)	3/4-10	395-515	290-380
*Front Winch to Rear Frame	1-8	985-1085	725-800
*Rear Winch to Rear Frame	3/4-10	405-445	300-330
*Steer Cylinder Mounting Block to Rear Frame	1-8	985-1085	725-800
*Front and Rear Drive Axle to Mounting Pad	1-8	985-1085	725-800
*Fairlead to Rear Frame	1-8	985-1085	725-800
*Emergency Brake Head to Mounting Bracket	5/8-18	230-300	170-220
*Emergency Brake Disc to Rear Axle Flange	7/16-20	75-100	55-75
Split Rim Coupling Bolts to Wheel Rim	3/4-16	985-1085	725-800
***Wheel Nuts to Wheel Hub Studs-Spherical/Flanged	3/4-16	575-645/405-445	425-475/300-330
**†Outer Hinge and Cradle Pin Stake Nuts	1 9/16-18	475-540	350-400
*Inner Hinge and Cradle Pin Hex Nuts	1 1/4-18	985-1085	725-800
**Hinge and Cradle Bearing Cap Capscrews	3/8-16	45-60	35-45
*Cradle Mounting Bolts to Frame	1 1/4	2000-2200	1475-1625

*When you install these mounting bolts, lubricate the threads with SAE No. 30 oil.

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

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

†See Ranger Service Gram #266B and #273B.

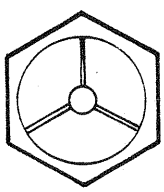
BOLTS NOT LISTED ARE TO BE DRAWN UP TIGHT IN A MANNER CONSISTANT WITH GOOD WORKMANSHIP.

BOLT TORQUE CHART - GENERAL

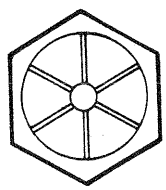
NOTE: Use this chart only if the torque is not shown on the BOLT TORQUE CHART, APPLICATION.

Thread Diameter		GRADE 5 Part Number Prefixes Coarse Thread 1C, 15C, 61D Fine Thread 2C, 16C, 62D		GRADE 8 Part Number Prefixes Coarse Thread 17C, 23C, 63D Fine Thread 18C, 24C, 64D		Socket Head and 12 Point Head Capscrews 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	35-40	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	3525-3865	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.



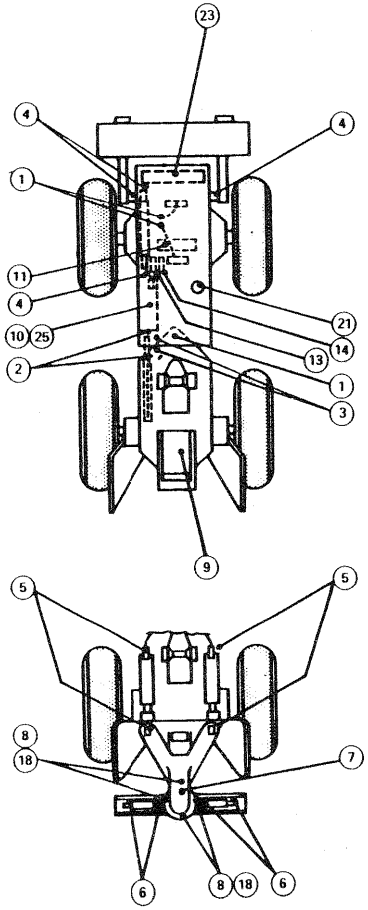
Grade 8 Identification
6 Radial Lines 60° Apart
on Heads of Bolts.

NOTES

HOURLY LUBRICATION & MAINTENANCE SCHEDULE

SYSTEM	OPERATION	TEXT LOCATION	HOURLY INTERVALS					
			10	50	100	250	500	1000
Engine Cooling System and Accessories	Engine Maintenance (See Engine Manual)							
	Check & Refill Radiator as required (Detroit and Cummins only)	Sec. 6		•				
	Check Cooling System for Leaks (Detroit and Cummins only)	Sec. 6		•				
	Check Anti-Freeze Protection (Detroit and Cummins only)	Sec. 6		•				
	Check and Adjust Belt Tension	Sec. 6		•				
	Tighten Air Cleaner Connections	Sec. 6			•			
	Check Engine RPM	Sec. 6				•		
	Clean Radiator Core (Detroit and Cummins only)	Sec. 6					•	
	Service Air Cleaner Element and Body	Sec. 6						
Fuel System	Drain Fuel Tank Sediment	Sec. 7		•				
	Check Fuel System for Leaks	Sec. 7		•				
	Clean Fuel Tank Filter Cap	Sec. 7		•				
	Drain & Clean Fuel Tank	Sec. 7						•
Transmission /Converter Hydraulic System	Check Fluid Level Daily, at the Transmission	Sec. 8	•					
	Clean Transmission Breather	Sec. 8		•				
	Check Converter out pressure	Sec. 8				•		
	Check & Adjust Transmission Shift Linkage	Sec. 8					•	
	Replace the Filter Element	Sec. 8					•	
	Check Transmission Clutch Operating Pressures	Sec. 8					•	
	Drain & Refill Transmission/Converter System	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 and Adjust 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 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 Fluid Level in Master Cylinder	Sec. 13		•				
	Check & Adjust Brake	Sec. 13				•		
	Check & Adjust as Required, Brake Pedal & Linkage	Sec. 13				•		
Electrical System	Service the Batteries	Sec. 14					•	
	Check Lights & Fuses	Sec. 14		•				
	Clean the Alternator	Sec. 14					•	
	Clean & Tighten Electrical Connections	Sec. 14					•	
	Inspect, Test, & Lubricate Electrical Units	Sec. 14						•
	Check Cranking Motor Operation	Sec. 14						•
Miscellaneous	Tighten Component Mounting Bolts	Sec. 15					•	

Chassis



Lubrication Instructions

ITEM	10 HOUR OR DAILY SERVICE	CHECK	LUBE	CHANGE	KEY
1	CRADLE AND HINGE PINS		•		EPMD
2	STEER CYLINDER PINS		•		EPMD
3	MID MOUNT		•		EPMD
4	UTILITY BLADE & CYLINDER PINS		•		EPMD
5	ARCH PIVOTS & ARCH CYLINDER PINS		•		EPMD
6	GRAPPLE PIVOTS & GRAPPLE CYLINDER PIN		•		EPMD
7	ROTATING HEAD BEARING		•		EPMD
8	SNUBBER PINS		•		EPMD
9	FUEL TANK	•			DF
10	OIL RESERVOIR	•			DX
11	COOLANT LEVEL	•			
	50 HOUR OR WEEKLY SERVICE				
12	TORQUE CONVERTER & TRANSMISSION	•			DX
13	MASTER CYLINDER—SERVICE	•			DX
14	MASTER CYLINDER—EMERGENCY	•			DX
15	DIFFERENTIAL	•			EPGL
16	PLANETARY	•			EPGL
17	WINCH	•			DX
18	SNUBBER ADJUSTMENT	•			
	100 HOUR OR 2 WEEKS SERVICE				
19	SLIP JOINT		•		EPMD
	250 HOUR OR MONTHLY SERVICE				
20	TORQUE CONVERTER & TRANSMISSION FILTER			•	
	500 HOUR OR 2 MONTH SERVICE				
21	HYDRAULIC TANK FILTER			•	
22	TORQUE CONVERTER & TRANSMISSION			•	DX
23	CLEAN RADIATOR CORE	•			
	1000 HOUR OR 6 MONTH SERVICE				
24	UNIVERSAL JOINTS		•		EPMD
25	OIL RESERVOIR			•	DX

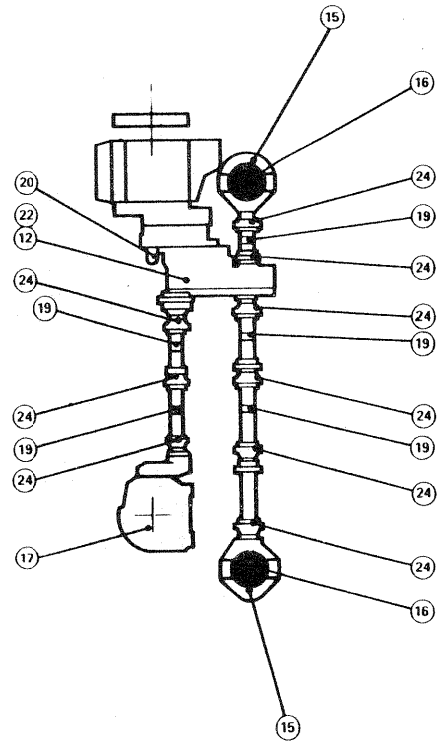
Lubricant Key

EPMD	Extreme Pressure Molybdenum Disulphide Grease			
	Ambient Temp. Range	Lubricant To Be Used		
		SAE Grade	API Class	Military Spec
DX	Above −23°C (−10°F) 1	10W	CC	L-2104 B
	(−10° F) 2	10 W	CD	L-2104C
		Dexron or Dexron II Automatic Transmission fluid		
	Above −34° C (−30°F)	Dexron or Dexron II Automatic Transmission Fluid		
	Above −54°C (−65°F)	CONOCO DN-600 Fluid		

DF	Diesel Fuel—See Engine Manual	
	Ambient Temp. Range	Extreme Pressure Gear Lube (**SCL Type)
EPGL	Below −23°C (−10°F)	SAE Grade 75
	−18°C to −23°C (0°F to −10°F)	SAE Grade 80
	−18°C to +38°C (0°F to +100°F)	SAE Grade 90
	Above 38°C (100°F)	SAE Grade 140
BF	Heavy Duty Brake Fluid SAE J1703	

**SCL signifies SULFO CHLORO-lead type factory fill is made with 90 SCL type lube
It is recommended that the same type be used when adding or refilling

Drive Line



1931326

NOTES

NOTES