RANGER

F665 MAINTENANCE INSTRUCTION MANUAL

PUBLICATION NO. 6408

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SERIAL NO .....
ENGINE TYPE/NO .....
HYDRAULIC TRANSM. TYPE/NO .....
STARTING KEY NO .....
CAB KEY NO .....

5C0890R1BAT

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FOREWORD

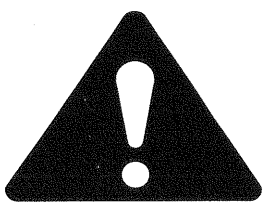
The purpose of this manual is to serve as a guide to the proper inspection and maintenance of your machine. Study this manual carefully before performing any preventive maintenance procedures. Become familiar with the instructions and keep this manual in the machine for handy reference. The Maintenance Inspections are divided into two sections: Basic Checks Supplemental Checks. The Basic Checks give an indication of the general condition of the machine, and should be carried out at regular intervals according to the Maintenance Interval Chart at the front of the maintenance section. The Supplemental Checks should be combined with the Basic Checks to keep the machine maintained in accordance with its operating conditions. This manual describes how the various points in the maintenance inspections should be carried out, giving procedures, adjustment values, and wear tolerances. The headings and service points are listed in the same order as the appear in the service manual and parts catalogs. Special tools are found in the Service Manual. We retain the right to alter the specifications and equipment without prior notification.

SAFETY REGULATIONS

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

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

SAFETY ALERT SYMBOL



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

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

KNOW THE CAPACITY AND LIMITS OF YOUR MACHINE!

UNAUTHORIZED MODIFICATION OF ROLLOVER PROTECTIVE STRUCTURE (ROPS)

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

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

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

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

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

SPARK ARRESTER MAY BE REQUIRED

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

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

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

The F665 machines have turbo charged engines which do not require additional spark arresting equipment to comply with currently known laws and regulation.

FIRE; (PREVENTION, EQUIPMENT AND SUPPRESSION)

FIRE PREVENTIVE INSTRUCTIONS

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

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

FIRE FIGHTING EQUIPMENT

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

FIRE SUPPRESSION

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

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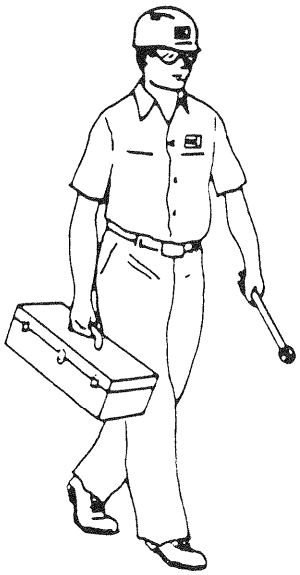

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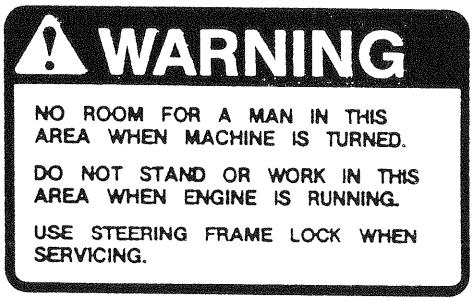
GENERAL INFORMATION

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

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

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



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WARNING!

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

WARNING!

Block the wheels when any of the wheels are off the ground. There is a risk of the machine moving even with the park brake applied.

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

8 MAINTENANCE INTERVALS

Put the machine in the SERVICE POSITION

MAINTENANCE INTERVAL CHART

MAINTENANCE INTERVALS OPERATING HOURS

	Page No.	Daily	First 50	Every 50	First 100	Every 100	Every 250	Every 500	Every 1000	Every 2000	Yearly or Every 2500	As Req'd
GENERAL												
Check for Leaks		●										
Check Tire Pressure*	35	●										
LUBRICATION		SEE LUBRICATION CHART										
ENGINE												
Engine Oil Level, Check	21	●										
Engine Oil, Change	21		●				●					
Engine Oil Filters, Change	21		●				●					
Fuel Filter, Drain Water and Sediment	22	●										
Fuel Filter, Change	22											●
Fuel Strainer, Clean or Replace	22											●
Fuel Tank, Drain Water and Sediment	22	●										
Empty Air Pre Cleaner (Optional)	23											●
Air Cleaner Service Indicator, Check	23	●										
Air Cleaner Element Outer, Change	23											●
Air Cleaner Element inner, Change	23									●		
Coolant Level, Check	24	●										
Coolant Protection, Check	24						●					
Change Coolant, Flush System	24								●			
Radiator, Clean	24	●										
Belt Tension, Check	25								●			
Engine RPM, Check	43						●					
Throttle Control, Check & Adjustment	43		●									●
ELECTRICAL SYSTEM												
Battery Condition, Check	26	●										
POWER TRANSMISSION												
Trans. / Converter Oil Level, Check	39	●										
Transmission / Converter Oil, Change	40								●			
Transmission Oil Filter, Change	41		●		●			●				
Transmission Suction Screen, Clean	40								●			
Transmission & Converter Vents, Clean	41						●					
Axle Lubricant Levels, Check	34			●								
Axle Lubricant, Change	34								●			
Axle Breathers	34							●				
Driveshafts, Check	38	●										
Slip Joints, Lube	38					●						
Universal Joint, Lube	38								●			
Trans./Converter, Pressure Checks	44		●									●

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

Put the machine in the SERVICE POSITION

MAINTENANCE INTERVALS OPERATING HOURS (cont'd)

	Page No.	Daily	First 50	Every 50	First 100	Every 100	Every 250	Every 500	Every 1000	Every 2000	Yearly or Every 2500	As Req'd
BRAKE SYSTEM												
Master Cylinder Fluid Level, Check	30			●								
Service Brake, Adjustment of	31											●
Secondary Brake Pads, Check	31							●				
Parking Brake, Adjustment of	32											●
Bleed The Brakes	32											●
OTHER FUNCTIONS												
Hydraulic Fluid Level, Check	41	●										
Hydraulic Fluid, Change	41								●			
Hydraulic Fluid Filter, Change	42		●					●				
Main Hydraulic Relief Pressure, Check	46		●									●
Winch Lubricant, Check	36			●								
Winch Lubricant, Change	36									●		
Winch Free Spool, Adjustment	36											●
Log Grapple Snubbers, Check & Adjust	37	●										

10 MAINTENANCE INTERVALS

Put the machine in the SERVICE POSITION

LUBRICATION INSTRUCTIONS

Put the machine in the SERVICE POSITION

LUBRICATION INSTRUCTIONS

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

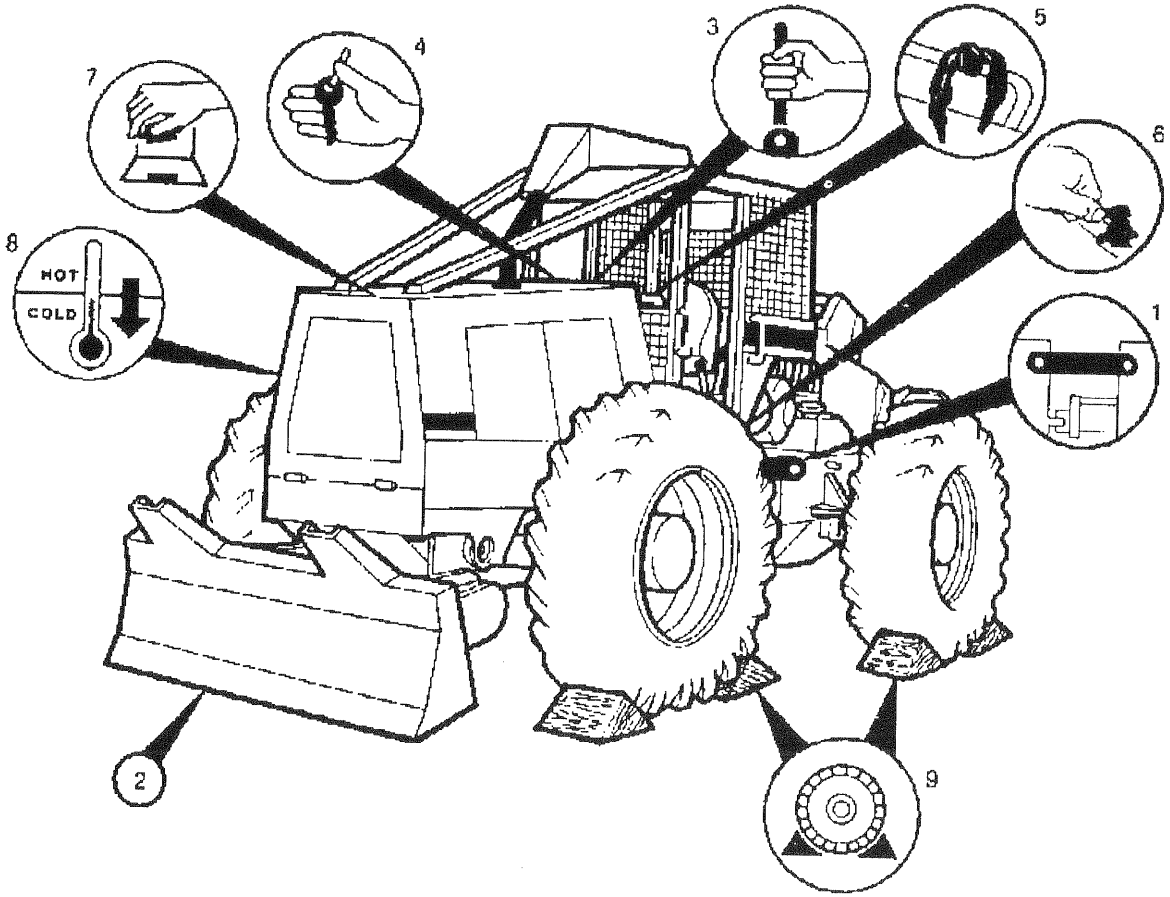
Put the machine in the SERVICE POSITION

NOTES

Put the machine in the SERVICE POSITION

SERVICE POSITION

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



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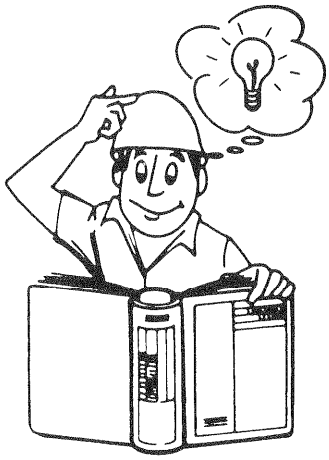
1. Frame locking link connected
2. Blade and grapple assembly (if applicable) on the ground
3. Parking brake applied
4. Stop Engine, key removed except when service requires engine operating.
5. Do not operate tag or Red warning flag on steering wheel or operator's handrail.
6. Fuel shut–off valve OFF
7. Remove all pressure caps slowly to relieve pressure.
8 Allow the machine to cool down.
9. Wheels securely blocked.
10. Battery disconnect switch OFF.

WARNING!

If work must be done on a warm machine, beware of hot fluids and components.

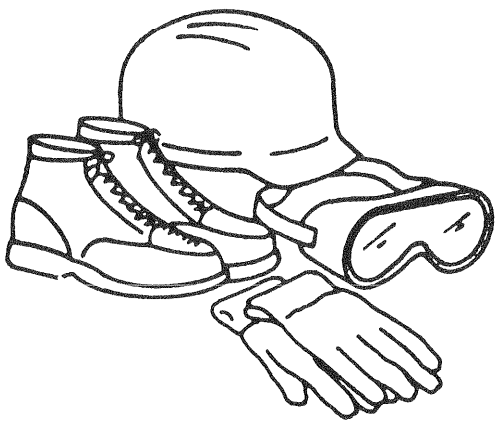
Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING



SP-10409

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



SP-10502

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

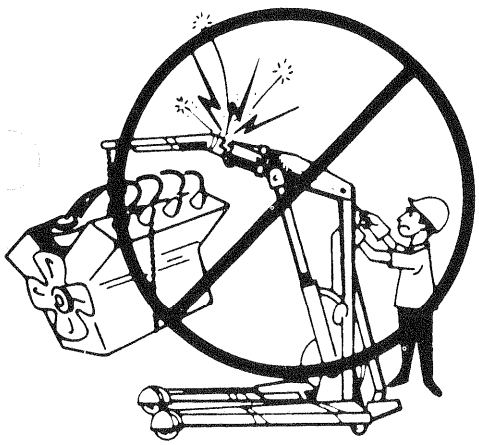
Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING (con't)

SP-10412

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

  Stop the engine.
  Turn off the battery disconnect switch and close the fuel shutoff valve.
  Start combating the fire and/or call for help.



SP-10410

- Gasoline is highly flammable and should never be used as a cleaning fluid. Use an approved solvent for cleaning.
- Some solvents can cause skin rashes and or fire dangers. Do not inhale solvent vapors.
- Store flammable starting aids in a cool, well ventilated location.
- Smoking, open flames, etc., should not be permitted around any machine during fueling operations and/or when the fuel system is open to the atmosphere.
- Always be sure the "Frame Locking Link" is connected when working on the machine except when it is necessary to articulate it.
- When lifting or supporting components, use equipment with a weight capacity as great as or greater than the weight of the component.
- Use the correct tool(s) for the job. Repair or replace any broken or defective equipment or tools.
- Make sure that no tool(s) or other object(s) are left inside the machine where they may cause damage.
- Check that there is no damage to electric wires and hoses.

Put the machine in the SERVICE POSITION

SP-10413

A FEW SIMPLE RULES WHEN SERVICING (con't)

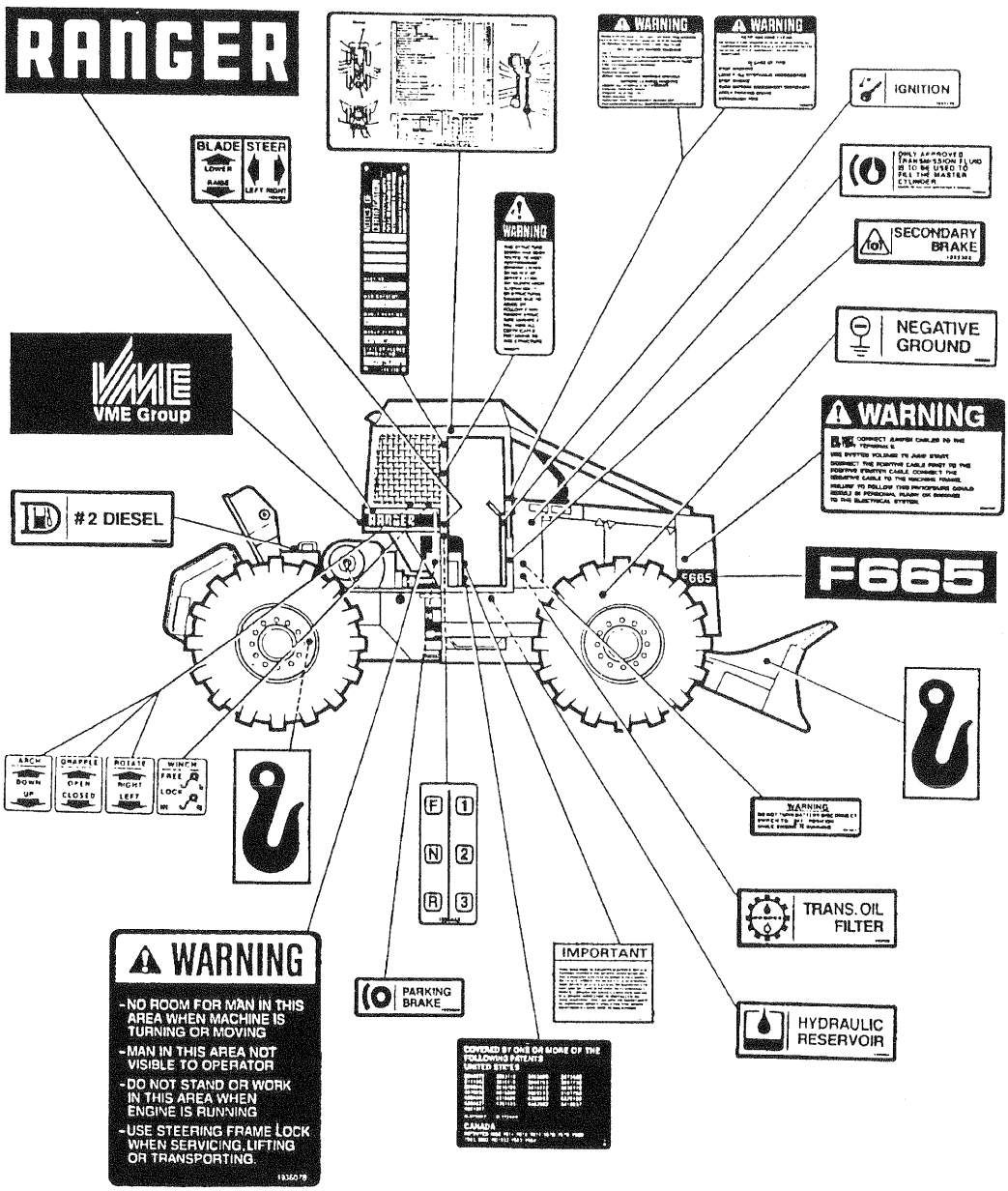
- Release all system pressure slowly before working on any part of the hydraulic system.
- Remove all pressure caps slowly.
- Be careful of hot fluid when changing oil in the engine, hydraulic system, transmission, etc.
- Before you work on the machine always lower the blade and grapple (If so equipped).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

SP-10414

Put the machine in the SERVICE POSITION

NAMEPLATES, WARNING AND INFORMATION DECALS

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



RP-10644

Put the machine in the SERVICE POSITION

PRODUCT IDENTIFICATION NUMBER

VME AMERICAS INC. is a world wide company with manufacturing facilities in many countries. To aid in production scheduling certain machine models are produced in only one plant and other machine models are produced in several plants and exported to meet our world market requirements.

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

Product Identification Breakdown (Current Production)

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

RP-10884

00000 X 00000

3. Production Sequence Number.
2. Engine Manufacturer Designation.
1. Model Designation (4 or 5 digits).

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

Product Identification Breakdown (Earlier Production)

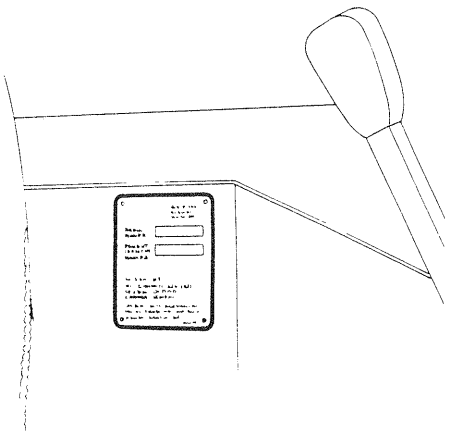
The following breakdown explains the product identification (serial) numbering system.

000 X X 000 XXX

5. Plant of Manufacturer (3 letters).
4. Production Sequence Number.
3. Engine. (1 letter designation)
2. Production Lot Number. (1letter)
1. Model,& Version (3 digits).

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

Put the machine in the SERVICE POSITION



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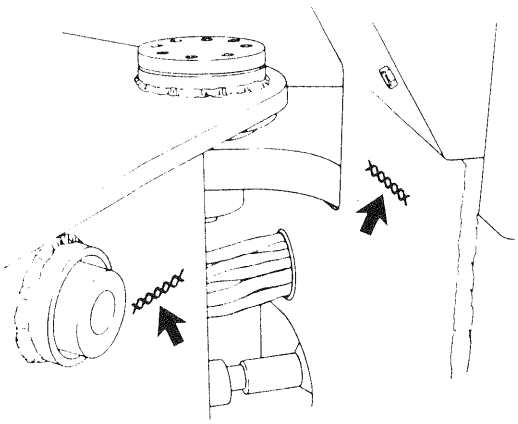
PRODUCT IDENTIFICATION NUMBER LOCATIONS (Serial Number)

Serial Number Plate – Located on the inside of the operator's guard behind the seat.



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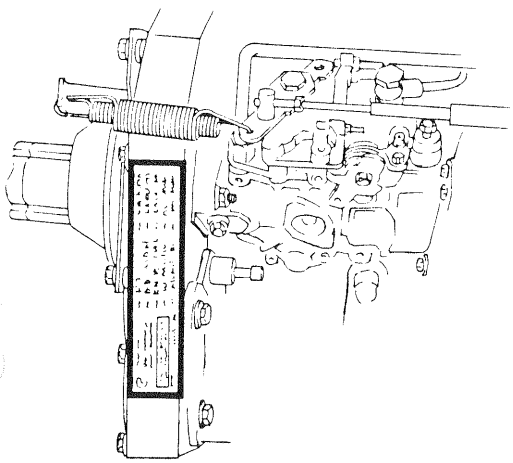
Frame – The machine serial number is stamped into the front and rear frames in the center hinge area on the right hand side of the machine.



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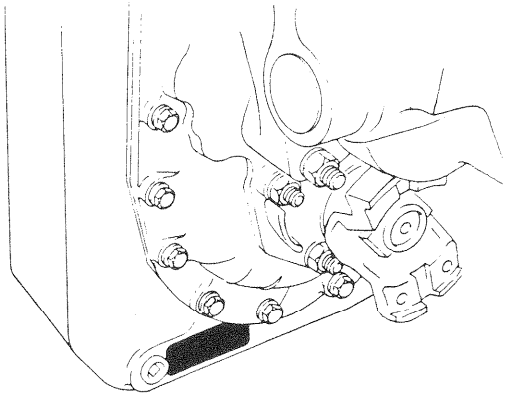
Engine serial number and data plate

Put the machine in the SERVICE POSITION

Transmission serial number and model plate – Located on the metal tag, attached to the rear of the transmission.



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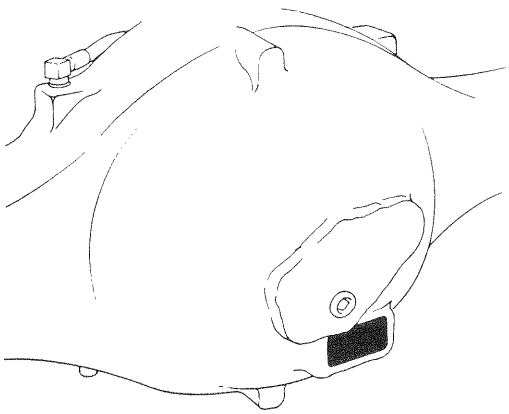
Drive axle ratio and serial number model plate – Located on the metal tag on the differential housing.



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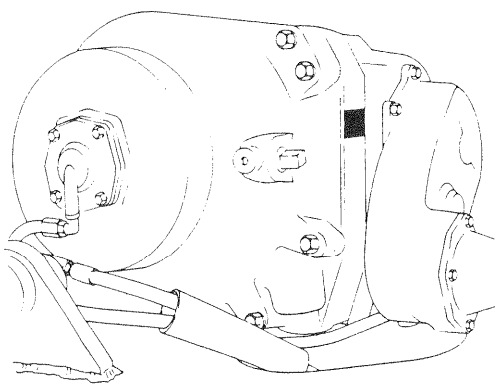
Winch serial number and model plate



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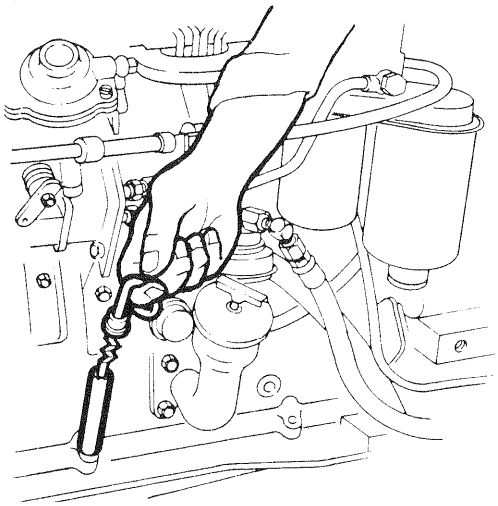
Put the machine in the SERVICE POSITION

ENGINE



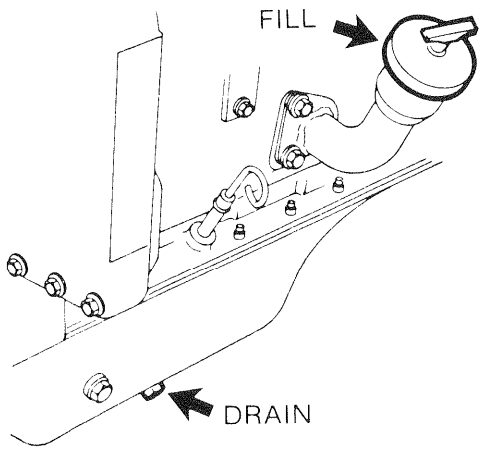
SP-10454

WARNING!

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

Checking Oil Level

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



SP-10455

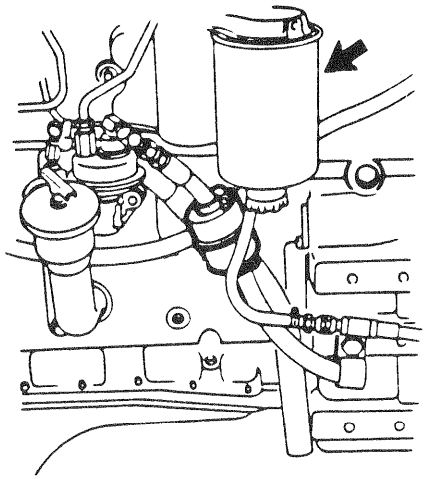
Changing Engine Oil

Drain the engine oil into a suitable container when the engine is hot. Hot oil flows more freely and carries more contaminants with it.

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

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

Put the machine in the SERVICE POSITION



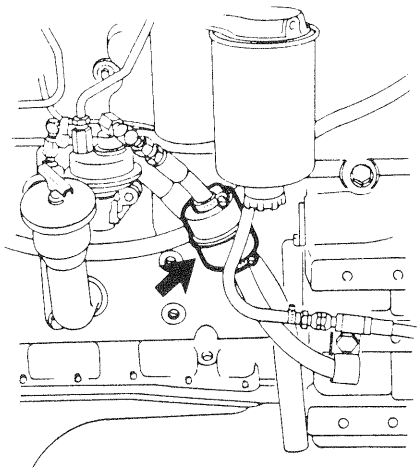
SP-10842

FUEL SYSTEM

Fuel Filters

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

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



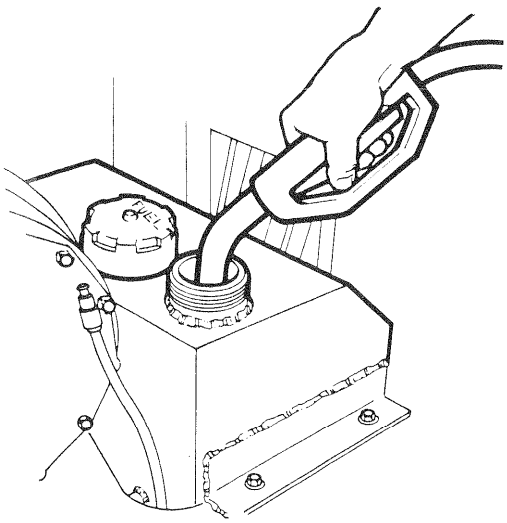
SP-10458

Check The Fuel Strainer

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

Fuel Tank

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



SP-10445

WARNING!

Do not smoke while while refueling.

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

Before each shift, open the drain cock on the bottom of the fuel tank and drain sufficient fuel to remove any sediment and water from the tank.

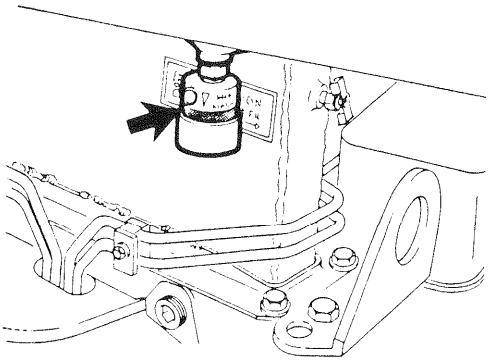
Check and clean vent hole in the fuel cap.

Put the machine in the SERVICE POSITION

AIR CLEANER SYSTEM

Air Cleaner

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



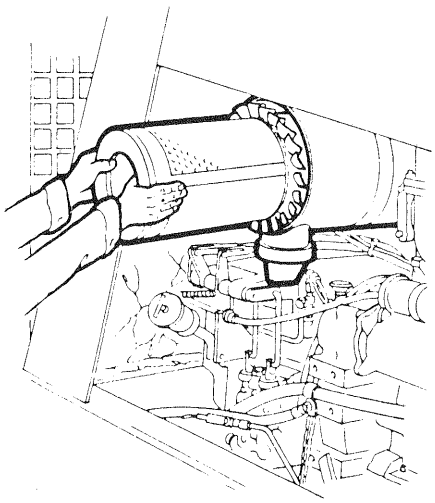
SP-10459

Check Air Cleaner Service Indicator

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

Check Air Intake Tubes and Clamps

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



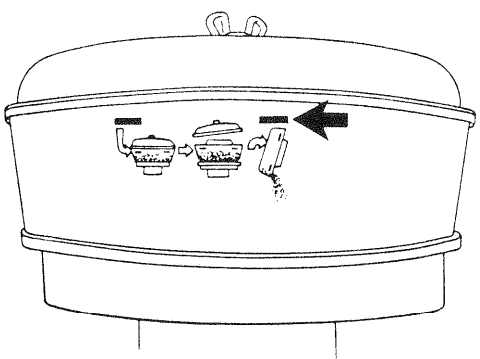
SP-10460

Service Air Cleaner

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

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

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



SP-10628

Clean the Air Cleaner Vacuator Valve

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

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

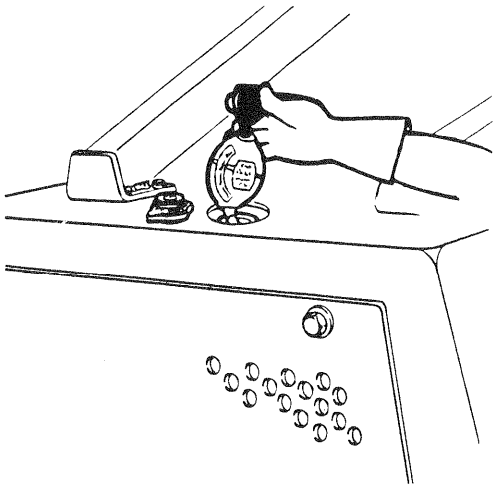
AIR PRE CLEANER (Optional)

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

Put the machine in the SERVICE POSITION

COOLING SYSTEM

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



SP-10554

Antifreeze:

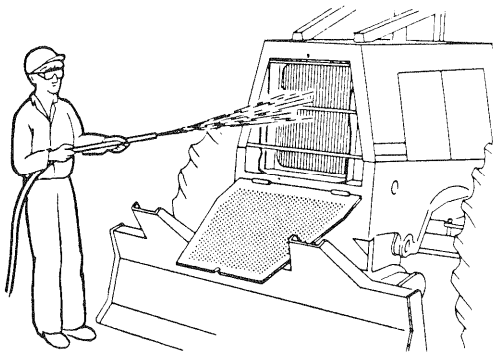
The cooling system of the machine was shipped with a solution of equal parts of ethylene glycol and water. This concentration is recommended for subsequent fills. The coolant should be changed every 1000 hours of operation.

Checking Coolant

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

WARNING!

The cooling system is pressurized and there is a risk of scalding whenever removing the radiator cap. Remove slowly with gloved hand. Wear safety glasses.



SP-10463

Check Hoses and Clamps

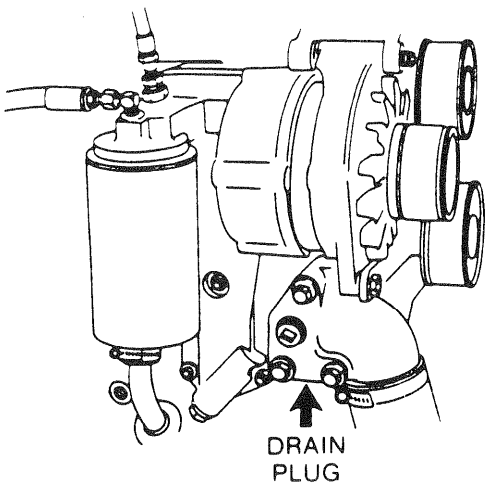
Check hoses and clamps and replace any hoses that are cracked or damaged. Tighten any loose clamps, do not over tighten the clamps.

Cleaning the Radiator

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

Remove the bolts from the top of the grill and lower the grill so that rests on the blade. Use a fire hose or pressure washer to clean the radiator in the opposite direction to the air flow.

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



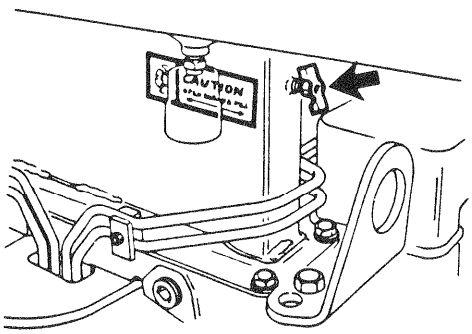
SP-10621

Change Coolant and Flush System

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

Put the machine in the SERVICE POSITION

Change Coolant and Flush System (con't.)



SP-10461

5. Install drain plugs.

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

6. Flush the cooling system by running clean water thru it.

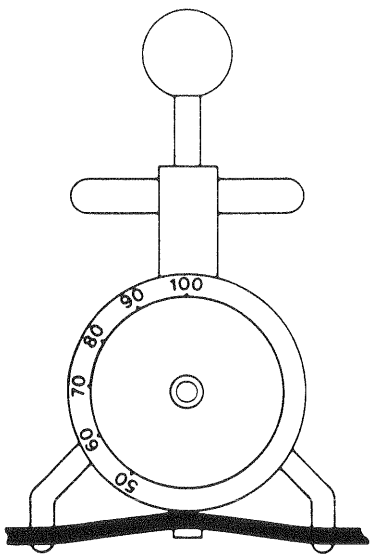
7. Close the drain cocks and install the drain plug leaving the aftercooler bleeder cock open.

8. Add coolant to the radiator filler hole to the correct level, closing the aftercooler bleeder cock when a continuous flow of coolant flows through it.

9. Pressure test system and cap for leaks using a cooling system pressure tester.

10. Start the engine and add coolant until the radiator is full and free of air.

11. Check the coolant level when the engine reaches its operating temperature and again when it has cooled.



EL14032

WARNING!

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

FAN BELT TENSION

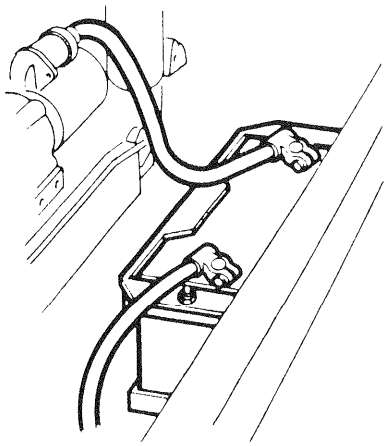
Visually check belts for looseness, or warn belts, replace worn belts.

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

Put the machine in the SERVICE POSITION

ELECTRICAL SYSTEM

Battery



SP-10464

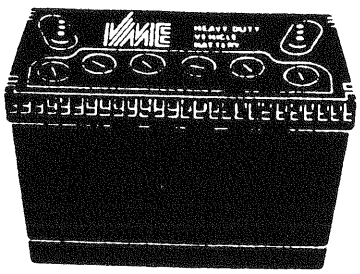
The battery is located in the engine compartment to the right of the engine.

Check Battery Condition

WARNING!

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

ANTIDOTE: EXTERNAL – Flush with water. INTERNAL – Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. EYES – Flush with water for 15 minutes and get prompt medical attention.



TS40415

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

WARNING!

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

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

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

Put the machine in the SERVICE POSITION

STEP-1

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

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

STEP-2

CHECK OPEN CIRCUIT VOLTAGE FOR STATE OF CHARGE
NOTE: STABILIZE VOLTAGE BY TURNING ON LIGHTS OR 15 AMP LOAD FOR 15 SECONDS.

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

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

STEP-3

LOAD TEST

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

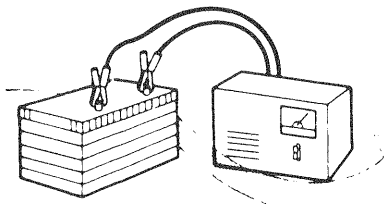
- **VOLTAGE BELOW CHART VALUE** → **REPLACE BATTERY**
- **VOLTAGE EQUAL TO OR ABOVE CHART VALUE** → **RETURN BATTERY TO SERVICE**

VOLTAGE CHART

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

Put the machine in the SERVICE POSITION

Charging Maintenance–Free or Low–Maintenance Batteries



TS20788

WARNING!

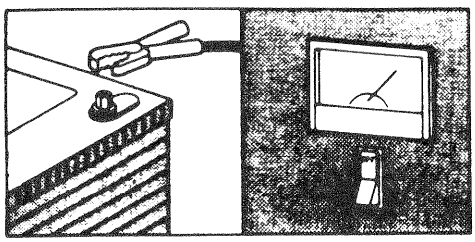
When batteries are being charged, explosive gases are formed. A short circuit, open flame or spark near the battery can cause a serious explosion. Provide good ventilation, especially if the battery is being charged in an enclosed area.

WARNING!

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

WARNING!

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



V50391

WARNING!

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

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

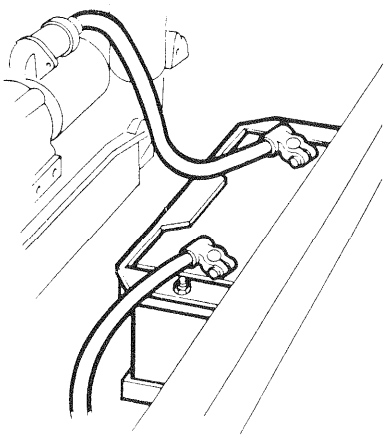
Note: Follow the instructions of the battery charger or the manufacturer.

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

Put the machine in the SERVICE POSITION

Check Battery Cables and Connections

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



SP-10464

Starting With Auxiliary Batteries

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

WARNING!

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

SP-10397

Battery Disconnect Switch

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

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

Check Neutral Start Switch

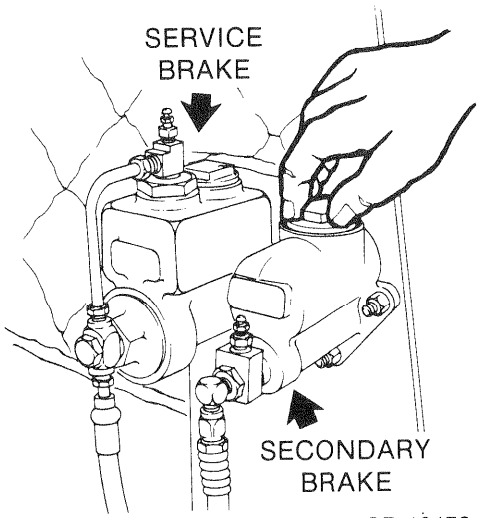
Put the transmission control lever in the FORWARD position. Try to start the engine. If the starter turns the engine, replace the neutral start switch.

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

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

Put the machine in the SERVICE POSITION

BRAKE SYSTEM



SP-10473

Checking the Master Cylinder Fluid Level

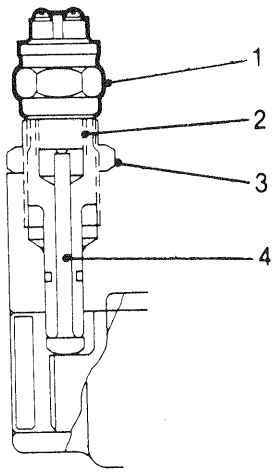
Check the fluid levels in the service and secondary brake master cylinders every 50 hours of operation. The master cylinders are located under the access panel on top of the firewall. The levels in the reservoirs should be within 6mm (1/2 in) from the top of the filler hole. Add approved automatic transmission fluid to the reservoirs as required.

Adjusting the Service and Secondary Brake Master Cylinder Freeplay

Freeplay between master cylinder pushrods and pushrod ends to be 1.5mm (.06 in.) gap.

Put the machine in the SERVICE POSITION

Adjusting the Service Brake, Transmission (Service Brake Light Switch)

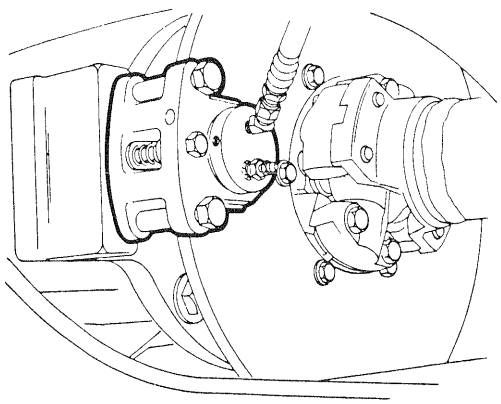


SP-10475

If the service brake pedal stroke becomes excessive, it may be necessary to adjust the brake unit. This should also be done if the parking brake light on the dash fails to light and you have determined that the light is not faulty.

- Parking brake applied so that all slack is taken up in the friction plate pack.
- Disconnect the wires from parking brake light switch (1).
- Remove the parking brake light switch (1) and loosen the switch adjusting locknut (3).
- With the locknut loose turn switch adjusting screw (2) until the switch actuating pin (4) makes contact with shaft.
- Back off adjusting screw (2) one full turn and tighten switch adjusting locknut (3).
- Install parking brake light switch (1) and reconnect wires.

Checking the Secondary Brake Pads



SP-10474

WARNING!

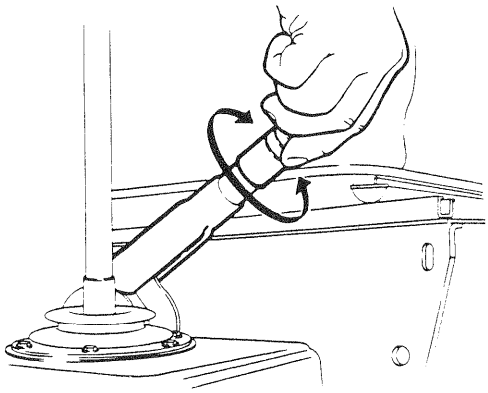
Operating the secondary brake with excessive brake pad wear can result in unsafe brake operation and damage to the brake disc.

Check the secondary brake pads every 500 hours of operation. The pads should be replaced if pad thickness is less than 2.5 mm (0.10 in).

Check the condition of the brake disc. If it is warped or pitted, it should be replaced.

Put the machine in the SERVICE POSITION

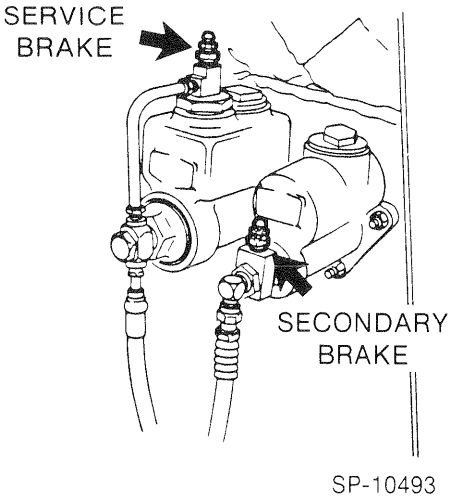
Adjusting the Parking Brake Lever



SP-10476

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

Bleeding the Brakes



SP-10493

WARNING!

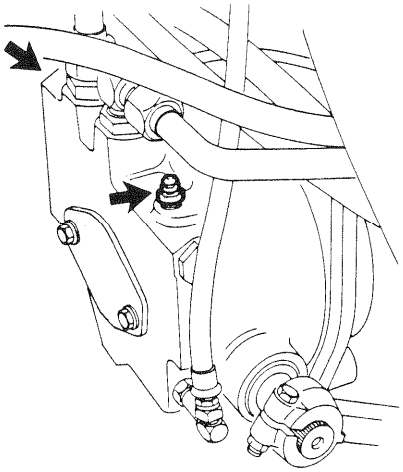
Never reuse fluid that has been collected during bleeding, it could be contaminated and could interfere with the safe operation of the brakes.

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

When bleeding the brake systems it is imperative that the master cylinder reservoirs be kept filled. If a reservoir is allowed to empty air will enter the system and it will have to be rebled. Refill the reservoir after each step. Always remember to close a bleeder screw before the brake pedal is released.

Put the machine in the SERVICE POSITION

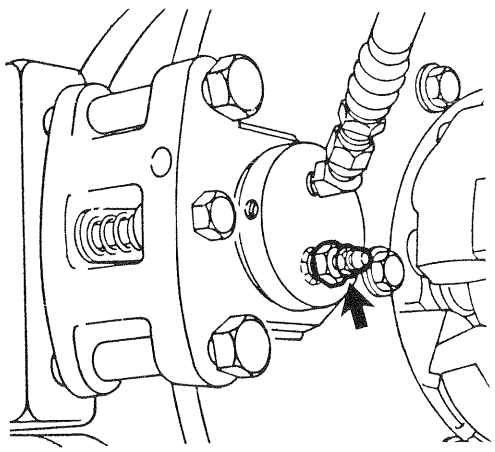
Service Brake



SP-10494

- Hold the service brake pedal fully applied and open the bleeder screw on the service brake master cylinder.
- Close the bleeder when the pedal goes to the floor then release the pedal.
- Repeat the procedure with the two bleeder screws on the transmission mounted brake unit. If any air is expelled at this time, repeat several times.

Secondary Brake



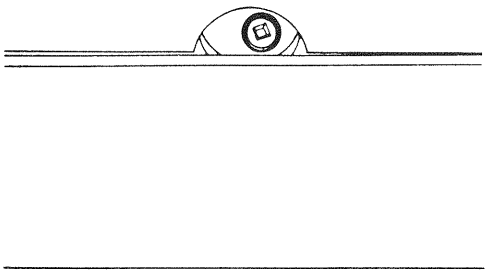
SP-10495

- Hold the secondary brake pedal fully applied and open the bleeder screw on the secondary brake master cylinder.
- Close the bleeder when the pedal goes to the floor then release the pedal.
- Repeat the procedure with the bleeder screws on the disc brake unit at the rear drive axle. If any air is expelled at this time, repeat several times.

NOTE: If the brakes feel spongy, too long a pedal stroke, brake pedal does not return, or is slow to return when it is released, air could still be in the system or the pedal linkage is binding. Check the linkage for binding and correct condition. If no binding is found the pedal should be returned by hand to continue the bleeding procedure.

Put the machine in the SERVICE POSITION

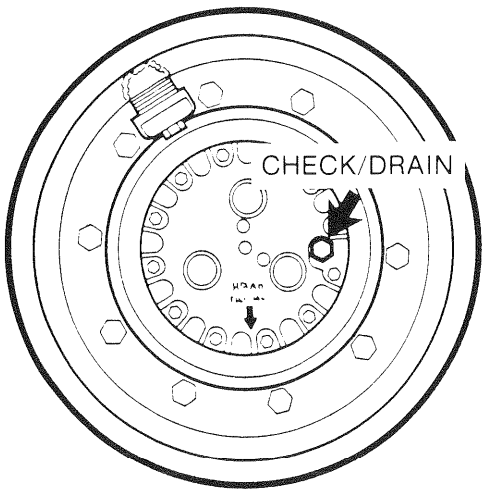
FRONT AND REAR DRIVE AXLES



SP-10470

Checking the Axle Lubricant Levels

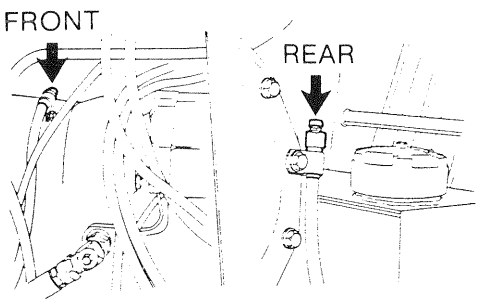
The lubricant in the drive axle differentials and planetary hubs should be checked every 50 hours of operation and changed every 1000 hours. A lubricant change may be needed earlier due to ambient temperatures. The differential level check plugs are located in the center of the differential housings opposite the input flanges. The differential drain plugs are located on the bottom of the differential housings.



SP-10471

Checking the Planetary Hub Level

The planetary hub level check / drain plug is located on the outer edge of each planetary hub. The arrow on the hub should point down when the level is checked. When the hub is drained, the plug should be at the bottom of the hubs rotation for complete draining.



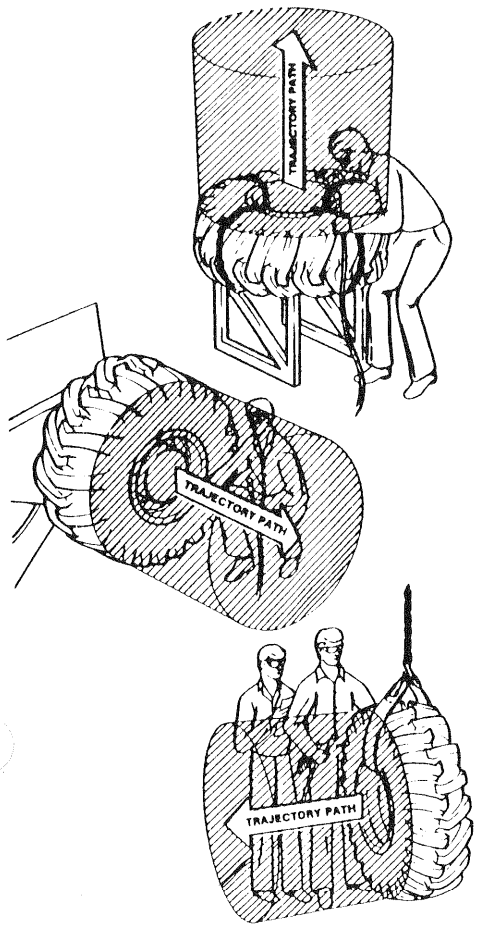
SP-10483

Axle Breathers

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

Put the machine in the SERVICE POSITION

WHEELS AND TIRES



SP-10102

WARNING!

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

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

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

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

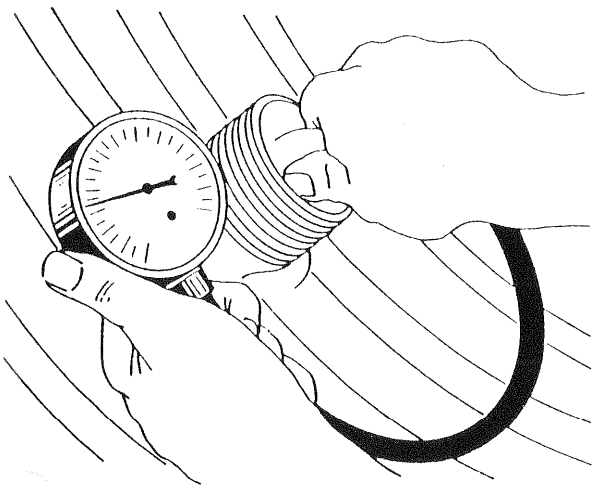
Tire Inflation Pressure

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

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

Check Tire Condition

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



RP-10896

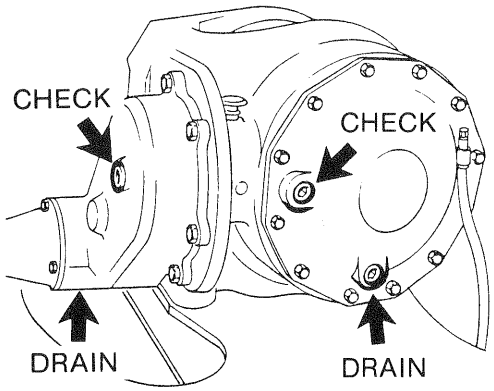
WARNING!

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

WARNING!

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

Put the machine in the SERVICE POSITION



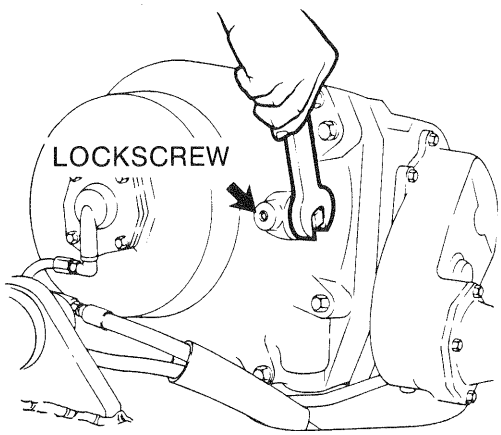
SP-10480

WINCH

Checking the Winch Lubricant Levels

The lubricant in the winch should be checked every 50 hours of operation and changed every 2000 hours. There are two level check plugs on the winch, one on the front in the drop gear housing and one on the right hand side in the ring gear housing. Add automatic transmission fluid as required. The drain plugs are located on the bottom of the drop gear housing and at the bottom of the ring gear cover.

Every 250 hours of operation, remove the breather from the top of the winch housing and clean it in a solvent. Blow dry the breather with compressed air.



SP-10481

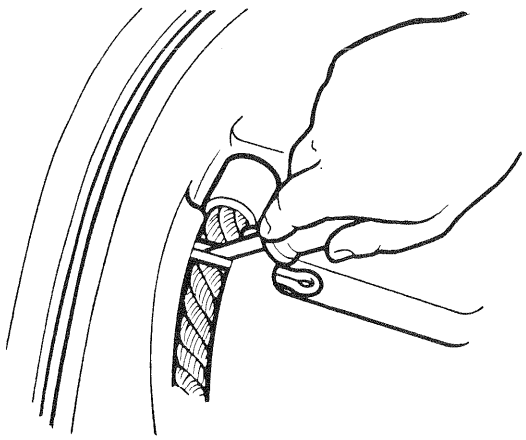
Adjust the Winch Free–Spool Tension

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

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

Installing The Winch Mainline

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



SP-10482

WARNING!

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

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

- Install the cable ferrule into the ferrule groove in the cable drum.
- Insert a large cotter pin through the two holes in the cable drum over the cable.
- Open the pin over the cable.
- Start the engine and winch–in the cable onto the cable drum.

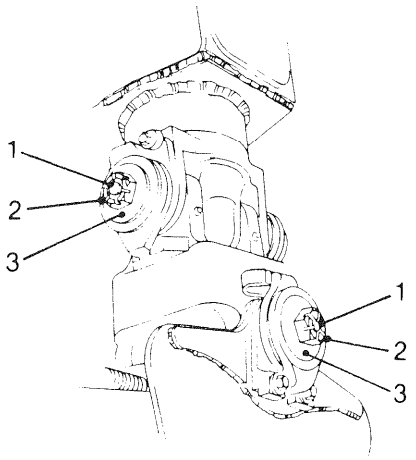
Put the machine in the SERVICE POSITION

LOG GRAPPLE

Checking and Adjusting the Grapple Snubbers

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

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



SP-10484

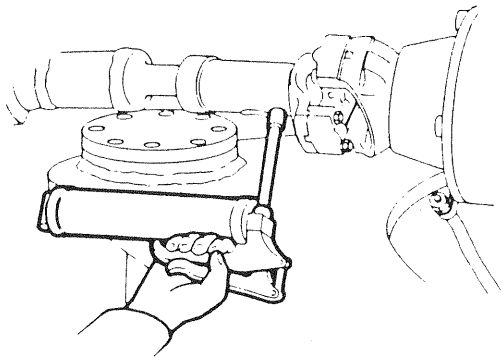
Each set of upper and lower adjusting nuts should be adjusted equally. Tightening only one nut per set can over load the snubber causing premature wear.

- Remove the cotter pins (1) from the top snubber adjusting nuts (2).
- Loosen each adjusting nut and then tighten them until each Belleville washer (3) collapses about halfway.
- Recheck the grapple swing.
- Install new cotter pins to maintain the adjustment. It maybe necessary to tighten or loosen an adjusting nut to install the cotter pin.

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

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

Put the machine in the SERVICE POSITION

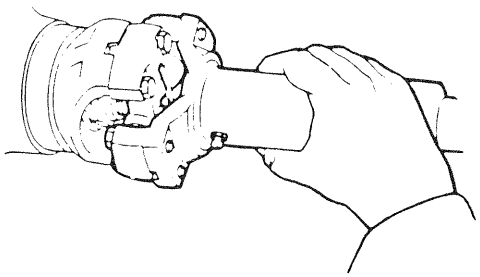


SP-10472

DRIVESHAFTS

Lubrication

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



SP-10492

Checking the Driveshafts

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

Put the machine in the SERVICE POSITION

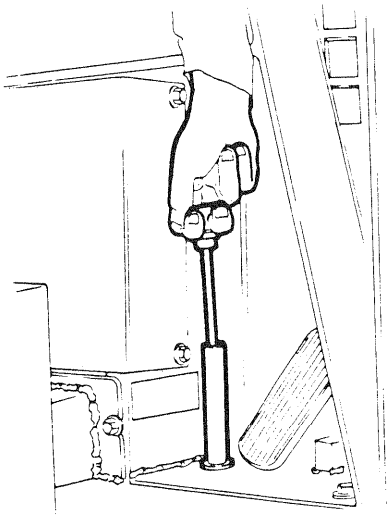
HYDRAULIC SYSTEM

Transmission, Converter and Winch

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

Note: The winch has it's own lube sump.

Checking Fluid Level



SP-10466

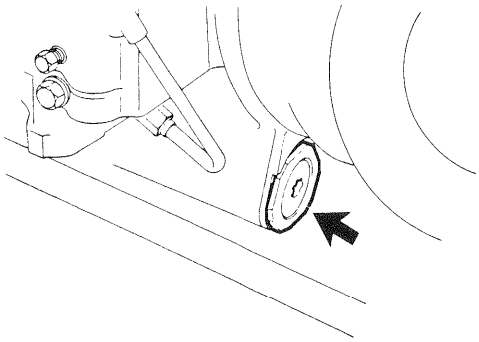
The fluid level should be checked daily as follows:

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

Transmission and Torque Converter Fluid Warm–Up Procedure

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

Put the machine in the SERVICE POSITION



SP-10467

Changing Hydraulic Transmission Fluid

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

WARNING!

Be careful when working with hot fluids

Flushing the Transmission and Torque Converter

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

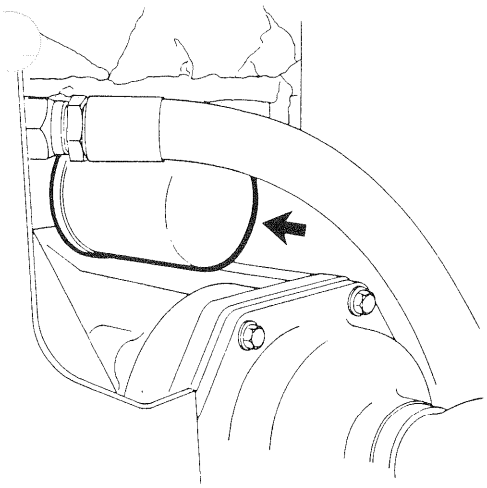
- Drain the transmission oil.
- Clean and replace the suction screen.
- Change the transmission filter.
- Remove lube line at transmission brake (from cooler) and divert into a 10 gallon pail.
- Over fill transmission a few extra gallons until oil comes out the breather.
- Start engine and run at idle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

Suction Screen

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

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

Put the machine in the SERVICE POSITION

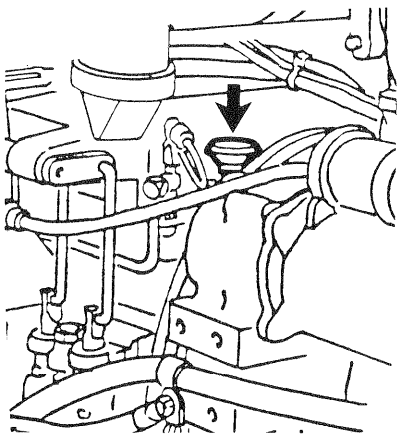


SP-10468

Changing the Transmission Filter

The filter should be changed after the first 50 hours of operation and every 500 hours of operation thereafter. It s accessible behind the access panel below the instrument panel. The filter cannot be cleaned, it must be replaced. Apply a thin coat of transmission fluid to the gasket surface and tighten the filter. Operate the engine for five minutes at 1500 RPM and check for leaks. If leaks appear, remove and replace the filter and repeat the installation. It usually does not help to tighten the filter further.

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



SP-10469

Transmission Breather

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

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

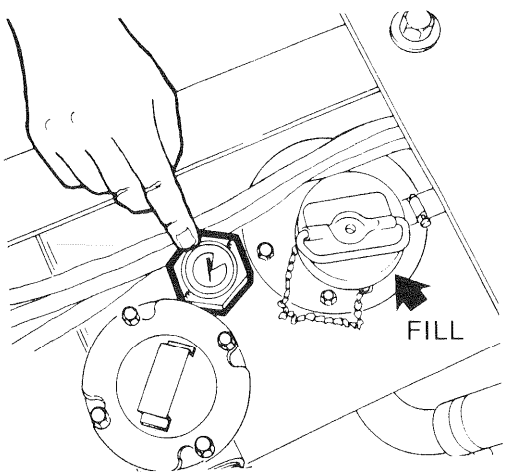
HYDRAULIC SYSTEM

Steer, Blade and Grapple

Checking the Hydraulic Fluid Level

Note: ***The blade should be on the ground, arch forward, grapple open.***

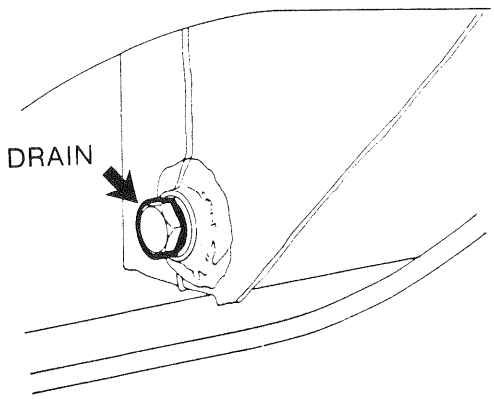
The hydraulic fluid should be checked daily. The fluid level should be in the green section of the sight gauge. Add fluid to the reservoir as required through the filler tube beside the sight gauge.



SP-10477

Put the machine in the SERVICE POSITION

Changing the Hydraulic Fluid

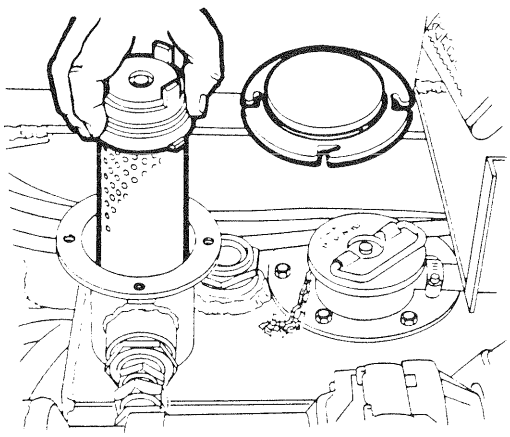


SP-10478

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

- Run the Skidder until the hydraulic fluid reaches its operating temperature.
- Raise the blade, move the arch forward and the boom up (if applicable) and open the log grapple tongs.
- Shut the engine down.
- Remove the hydraulic reservoir access panel to gain access to the hydraulic tank. Remove the pressure cap (4 PSI under pressure) then remove the drain plug on the bottom of the reservoir. Draining the oil into a suitable container.
- Slowly lower the blade, close the grapple arms move the arch back (and lower the boom) to flush the fluid from those cylinders.
- Remove the hydraulic reservoir top plate and clean the inside of the tank using diesel fuel as a solvent and clean the magnet.
- Remove and clean the suction screen. Replace it if it is damaged.
- Refill the reservoir to the correct level. Start the engine and operate it at Low Idle RPM for a few minutes.
- Raise the blade, move the arch forward, level boom and open the grapple arms.
- Recheck the level, adding fluid as required.

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



SP-10479

Changing the Main Hydraulic Filter

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

See Hydraulic section in Service Manual (6416) for further information on hydraulic system.

Put the machine in the SERVICE POSITION

ENGINE

Checking Engine Performance

The engine performance should be checked every 250 hours of operation to verify that the engine is operating efficiently. This machine is not equipped with a tachometer so one will be required.

Check the low idle RPM with the engine at its operating temperature and no load on the engine. The acceptable value is 700–850 RPM.

Check the High Free Idle RPM under the same conditions. The maximum acceptable value is 2750 RPM.

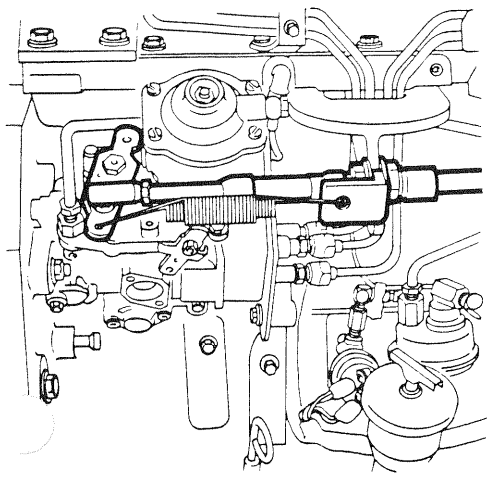
Check the Converter Stall RPM as Follows:

- With the blade lowered, a few centimeters above the ground, apply the parking and secondary brake.

Note: Do not apply the service brake. Applying the service brake may change the readings.

- Accelerate the engine to full throttle with the transmission in FORWARD and THIRD. The acceptable value is1920-2040 RPM.
- Raise the blade and hold the blade control lever in the raise position with the engine at full throttle and the transmission in FORWARD and THIRD. The acceptable value is 1590-1730 RPM. It is important that the Main Hydraulic Relief Pressure be correct for this check.

If any of these conditions are not met, further troubleshooting will be required.



SP-10485

WARNING!

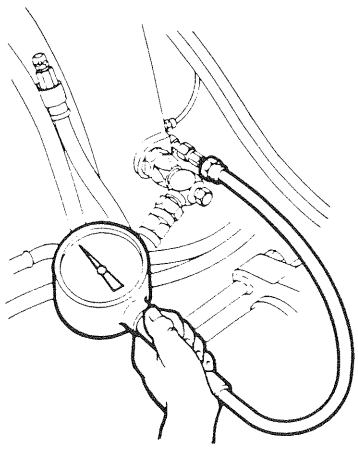
Do not hold the engine/converter in this stall condition for more than 30 seconds or if the converter oil temperature gauge enters the red area. Serious damage to the converter will result.

Checking and Adjusting the Throttle Control Linkage

The accelerator pedal must be free to operate the engine from Low idle RPM to High Free Idle RPM with no binding in the linkage. The engine must return fully to low Idle RPM when the pedal is released.

Adjust the linkage if necessary as follows:

Put the machine in the SERVICE POSITION



SP-10486

- Unhook the throttle return spring.
- Disconnect the ball joint from the engine throttle lever.
- With the accelerator pedal fully applied, and the engine throttle lever at the full throttle position, adjust the ball joint so it is aligned with the throttle lever with no force required.

WARNING!

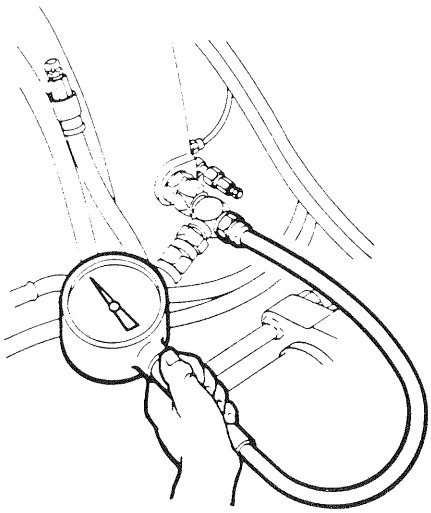
Do not adjust throttle linkage to the point that it forces the fuel pump past the full fuel position.

CHECKING THE TRANSMISSION / CONVERTER PRESSURES

Note: To obtain accurate pressure readings the service brake pedal must not be applied during these procedures.

The fluid in the transmission/converter hydraulic system must be at its operating temperature of 82° – 93° C (180° – 200° F).

Check the converter in ,out and lubrication pressures with a 1000 kPa (150 PSI) pressure gauge.



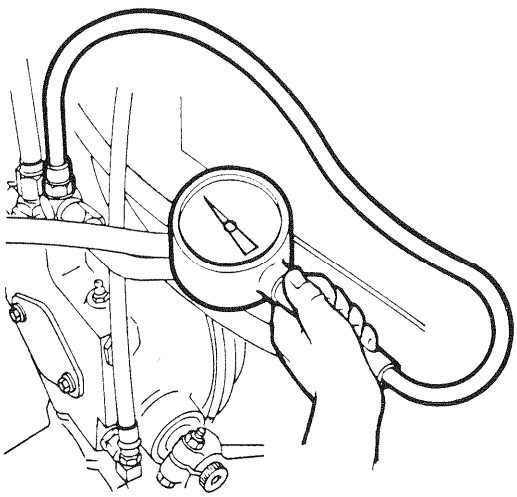
SP-10487

Converter In

The converter IN test port is located on the narrow tube on the left hand side of the converter. The maximum acceptable converter IN pressure is 825 kPa (120 PSI) at maximum engine RPM.

Converter Out

The converter OUT test port is located at the large oil cooler supply hose on the left hand side of the converter. The minimum acceptable converter OUT pressure is 170 kPa (25 PSI) at 2000 RPM. The maximum acceptable converter OUT pressure is 482 kPa (70 PSI) at maximum RPM, with the transmission in neutral.



SP-10488

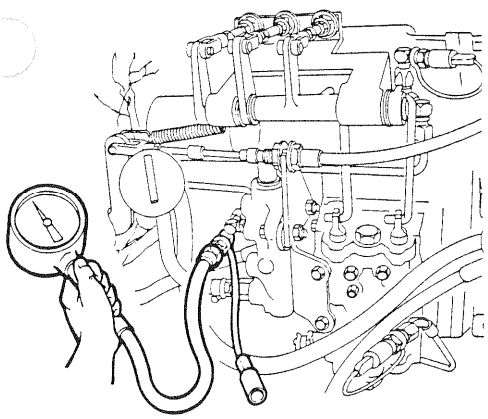
Lubrication Pressure

The transmission/converter lube pressure test port is located on top of the hydraulic brake unit. The maximum acceptable lube pressure is 103 - 172 kPa (15 to 25 PSI) at 2000 RPM.

Put the machine in the SERVICE POSITION

Clutch Pressure

The acceptable clutch pressure is 1655 - 1931 kPa (240 - 280 PSI) in all combinations of speed ranges and winch modes. The speed range clutch should be checked in neutral and the forward and reverse clutch pressures should be taken in the appropriate direction mode. There should be no more than 35 kPa (5 PSI) difference between the highest and the lowest clutch pressure readings.



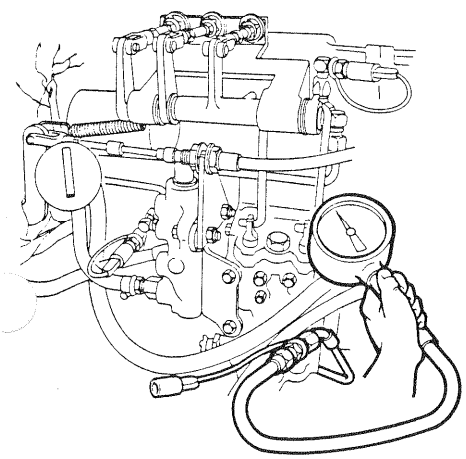
SP-10489

Note: ***There will be a delay of about two seconds before the forward and reverse clutch pressures are shown on the gauge. This is caused by the action of the modulation.***

If any of the transmission/ converter pressures are not within the acceptable limits, further troubleshooting will be required.

Forward Clutch

The forward clutch pressure test port is located next to the transmission filler tube on the right hand side of the transmission.



SP-10490

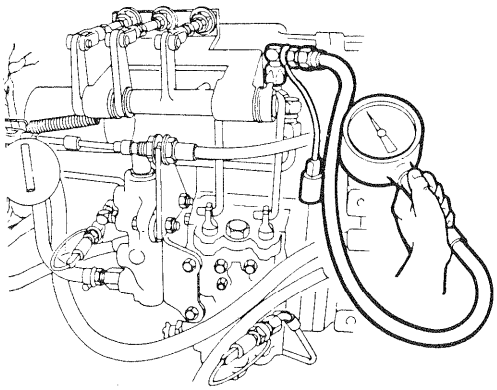
Reverse Clutch

The reverse clutch pressure test port is located next to the transmission control valve on the right hand side of the transmission.

Put the machine in the SERVICE POSITION

Regulated Clutch

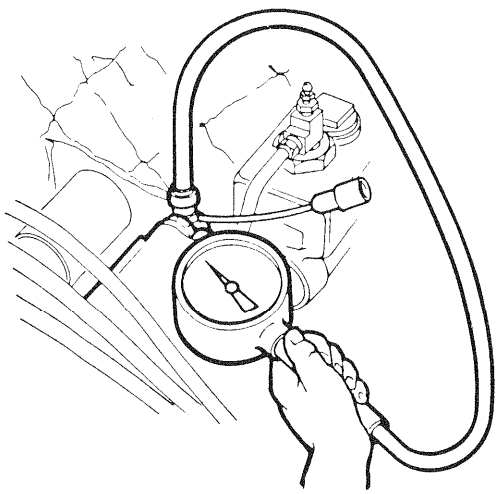
The Regulated pressure port is located on top of the converter.



SP-10491

Checking the Main Hydraulic Relief Pressure

The main hydraulic pressure check port is located on the pump outlet tube below the instrument panel. Use a 20 MPa (3000 PSI) pressure test gauge. With the blade control lever held in the raise position, to bring the hydraulic system over relief, the pressure should be 2150 - 2250 PSI 14.8 - 15.5 MPa at low idle and at maximum engine RPM with the fluid at its operating temperature of 66° - 77° C (150° - 170° F).



SP-10496

SPECIFICATIONS

RECOMMENDED LUBRICANTS

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

PREVAILING AMBIENT TEMPERATURE	FLUID TO BE USED
–18° C (0° F) and Above	1. VME Hydraulic Fluid P/N 885385–0.95 l (1 U.S. qt) P/N 885382–3.8 l (1 U.S. gal) . 2. SAE 10W Engine Oil, API Class SD, SE, CC or CD, MLI–L–2104C or MIL–L– 46152B.
–18° C (0° F) and Below	1. Conoco Polar Start DN–600 Fluid. 2. Automatic Transmission Fluid (can be used only if it meets the following specifications) : A. Contains the types and contents of anti–wear compounding found in API Class SD, SE, CC or CD engine oils or have passed pump tests similar to those used in developing anti-wear type hydraulic fluids. B. Have enough chemical stability for mobile hydraulic system service. C. Meets the viscosity requirements of API Class SD, SE, CC,or CD engine oil– Grade SAE 10 W.
–34° C (30° F) and Below	The following should be used as a guide in consultation with a reputable oil supplier. Any fluid may be used which meets the following requirements: 1. Oil to be used must contain anti-wear properties and rust oxidation inhibitors plus anti-foam agents equal to that found in API Class SD,SE,CC or CD engine oils or have passed pump tests, similar to those used in developing anti-wear type hydraulic oils. 2. Oil must have a Saybolt Universal Viscosity of 145 to 225 seconds at 38° C (100° F) and viscosity of not less than 42 seconds at operating temperature. The oil selected should have a high shear stability to ensure that the viscosity remains within recommended limits. Viscosity Index should not be less than 90. 3. Have a pour point of 11° C (20° F) below start - up temperature. 4. Diesel fuel, kerosene, transformer oil, etc., MUST NOT be used to dilute normal fluids.

Put the machine in the SERVICE POSITION

Transmission/Converter/Winch Hydraulic System

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

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

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

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

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

Front and Rear Axle Differentials and Planetary hubs

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

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

Chassis and Driveshaft Lubrication

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

Pillow Block Bearing Lubrication

PREVAILING AMBIENT TEMPERATURE	LUBRICANT TO BE USED
–18° C (0° F) and Above	Unirex EP Grease (ESSO-Canada, Mobil-U.S.) Grade 2.
–Below –18° C (0° F)	Unirex EP Grease (ESSO-Canada, Mobil-U.S.) Grade 0.

Fuel Specifications

Fuel: N°. 2 Diesel

Put the machine in the SERVICE POSITION

UNITS OF MEASUREMENT

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

CAPACITIES	LITERS	GALLONS
Engine Crankcase	11	2.9
Cooling System	34	9
Transmission/Converter/Winch System	26	6.9
Differential – Front	9.5	2.5
Differential – Rear	9.5	2.5
Planetary Hubs – Front	4.0	1.0
Planetary Hubs – Rear	4.0	1.0
Fuel Tank – Cable Skidder	132	35
Fuel Tank – Grapple Skidder	151	40
Hydraulic System – Cable Skidder	58	15
Hydraulic System – Grapple Skidder	71	19
Windshield Washer Reservoir	10	2.6

MACHINE WEIGHTS (Cable Skidder)

Front Axle	4354 kg	(9600 lb)
Rear Axle	3030 kg	(6680 lb)
Total	7384 kg	(16280 lb)

MACHINE WEIGHTS (Grapple Skidder)

Front Axle	4289 kg	(9451 lb)
Rear Axle	4511 kg	(9950 lb)
Total	8800 kg	(19401 lb)

TRAVELING SPEEDS

	km/h	mile/h
1st Gear	6.0	3.7
2nd Gear	11.6	7.2
3rd Gear	26.0	16

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

ENGINE SPECIFICATION

Make	Cummins Diesel
Model	4BTA–3.9
Configuration	Inline 4 Cylinder–Turbocharged Aftercooled
Gross Power	86.5 kw (116 hp) @ 2500 RPM
Maximum Torque @ 1700 RPM	404N•m (298 lbf. ft)
Bore	102 mm (4.02 in)
Stroke	120 mm (4.72 in)
Displacement	3.9 liter (239 cu. in)
Low Idle RPM	700–850
High Free Idle RPM	2500–2750

ENGINE LUBRICATING SYSTEM

Oil Pressure –Low Idle RPM	70– 207 kPa (10–30 PSI)
Oil Pressure–Operating RPM	207– 414 kPa (30–60 PSI)

ELECTRICAL

System Voltage	12 Volt
Batteries	One Standard, Two Optional (Parallel)
Battery Voltage	12 Volt
Battery Capacity	625 CCA
Alternator Rating	1710 W (61 A)
Ground	Negative

HYDRAULIC TRANSMISSION / TORQUE CONVERTER

Make	Clark
Model	HR18320
Type	Powershift with Integral Torque Converter and Forward–Reverse Modulation
Number of Forward Gears	3
Number of Reverse Gears	3
Stall Torque Ratio	2.29:1

AXLES

Make	Clark
Model	D17620
Differential Type	No–Spin
Differential Ratio	4.375:1
Planetary Ratio	4.125:1
Total Ratio	18.047:1

Put the machine in the SERVICE POSITION

BRAKE SYSTEM

Service Brake, Type	Enclosed Wet Disc, Transmission Mounted
Secondary Brake, Type	Caliper Disc, Rear Drive Axle Mounted
Parking Brake, Type	Transmission Brake Mechanically Applied

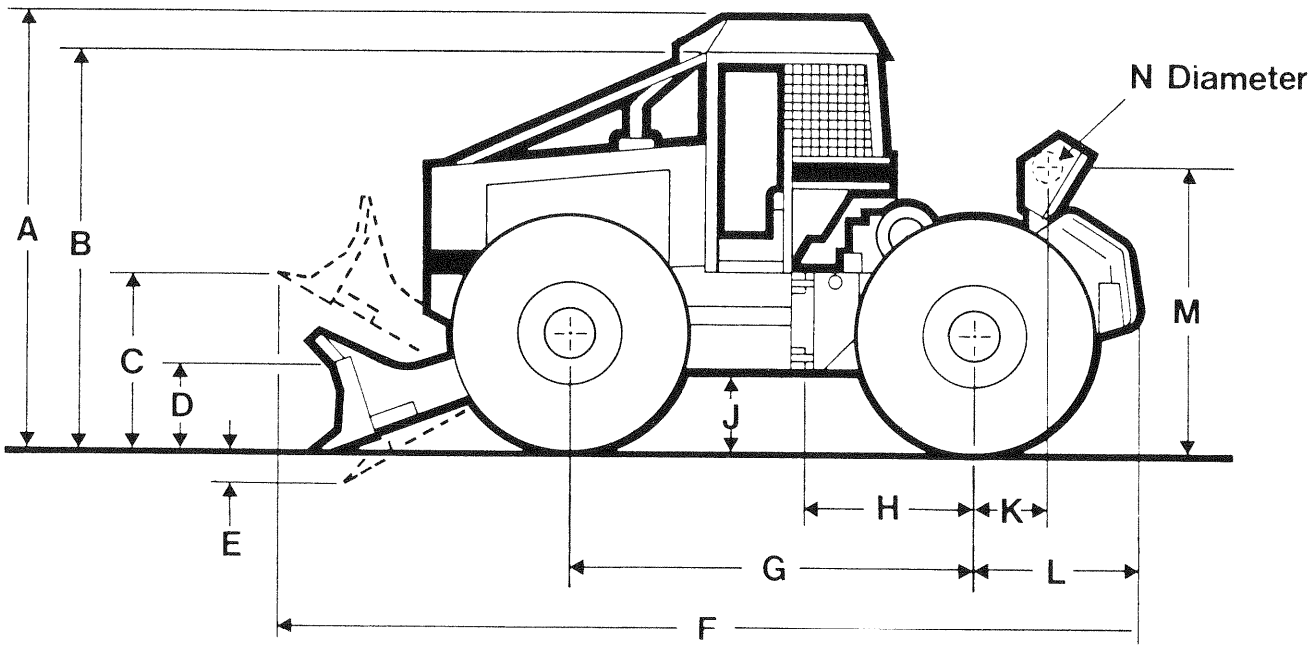
HYDRAULIC SYSTEM

Pump	Gear Type
Pump Capacity	106 l/min (28 gal/min) @ 2000 RPM
Cylinder– Steer, Blade	Double Acting, 102 mm (4 in) diameter
Cylinder– Arch,	Double Acting, 102 mm (4 in) diameter
Cylinder– Grapple	Double Acting, 102 mm (4 in) diameter
Main Relief Pressure	15.2 MPa (2200 PSI)

MACHINE DIMENSIONS (F665 Cable Skidder)

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

Turning Radius . . . . . 5217 mm (17 ft 2 in)
Width Over Tires . . . . . 2636 mm (8 ft 8 in)
Track, Front & Rear . . . . . 2127 mm (7 ft)
Blade Width . . . . . 2134 mm (7 ft)



SP-10498

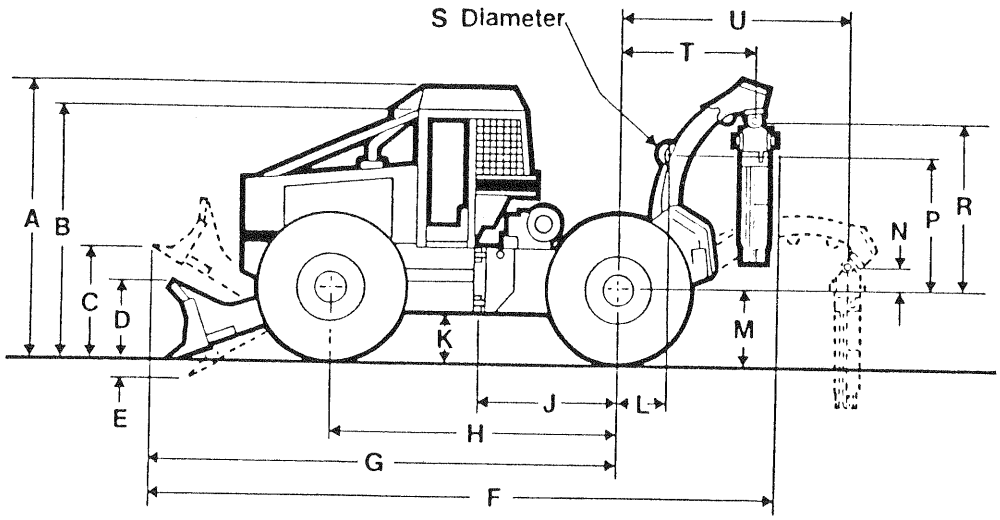
TIRES		A	B	C	D	E	F	G	H	J	K	L	M	N
18.4-26														
	mm	2845	2611	1092	619	290	5588	2794	1143	422	478	1054	1824	218
	ft in	9'4"	8'7"	3'7"	2'0"	1'0"	18'4"	9'2"	3'9"	1'5"	1'7"	3'6"	6'0"	0'9"
18.4-34														
	mm	2946	2713	1194	619	188	5588	2794	1143	523	478	1054	1925	218
	ft in	9'8"	8'11"	3'11"	2'6"	0'7"	18'4"	9'2'	3'9"	1'9"	1'7"	3'6"	6'4"	0'9"
23.1–26														
	mm	2921	2687	1168	619	213	5588	2794	1143	498	478	1054	1900	218
	ft in	9'7"	8'10"	3'10"	2'0"	0'8"	18'4"	9'2"	3'9"	1'8"	1'7"	3'6"	6'3"	0'9"
24.5–32														
.....	mm	3007	2774	1255	619	127	5588	2794	1143	584	478	1054	1986	218
	ft in	9'10"	9'1"	4'1"	2'0"	0'5"	18'4"	9'2"	3'9"	1'11"	1'7"	3'6"	6'6"	0'9"

Put the machine in the SERVICE POSITION

MACHINE DIMENSIONS (F665 Grapple Skidder)

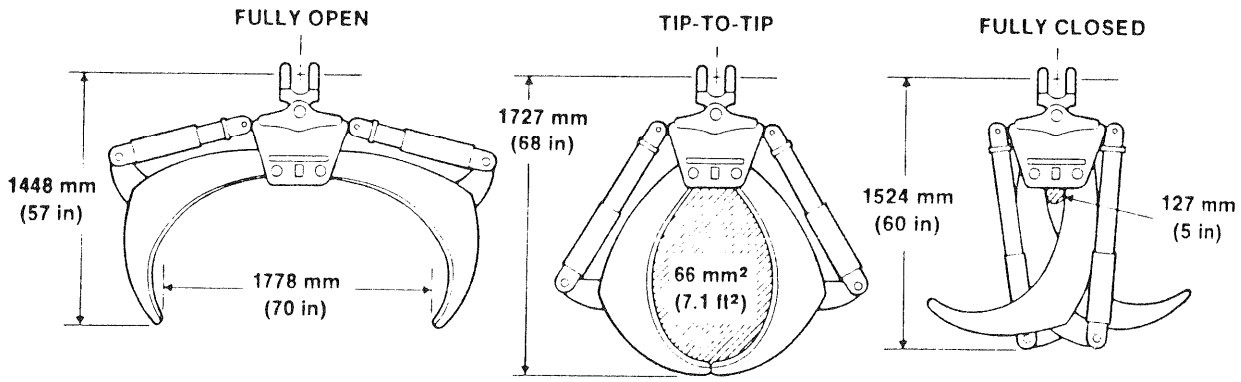
The following machine specifications are provided for your convenience. All specifications are approximate and are subject to change without notice or obligation.

Turning Radius ..... 5160 mm (17 ft)
Width Over Tires ..... 2762 mm (9 ft)
Track, Front & Rear ..... 2127 mm (7 ft)
Blade Width ..... 2134 mm (7 ft)



TIRES		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U
18.4-26																			
	mm	2845	2611	1092	619	290	6413	4788	3048	1397	422	396	660	229	1199	1676	218	1397	2362
	ft in	9'4"	8'7"	3'7"	2'0"	1'0"	21'1"	15'9"	10'0"	4'7"	1'5"	1'4"	2'2"	0'9"	3'11"	5'6"	0'9"	4'7"	7'9"
18.4-34																			
	mm	2946	2713	1194	619	188	6413	4788	3048	1397	523	396	762	229	1199	1676	218	1397	2362
	ft in	9'8"	8'11"	3'11"	2'6"	0'7"	21'1"	15'9'	10'0"	4'7"	1'9"	1'4"	2'6"	0'9"	3'11"	5'6"	0'9"	4'7"	7'9"
23.1-26																			
	mm	2921	2687	1168	619	213	6413	4788	3048	1397	498	396	736	229	1199	1676	218	1397	2362
	ft in	9'7"	8'10"	3'10"	2'0"	0'8"	21'1"	15'9"	10'0"	4'7"	1'8"	1'4"	2'5"	0'9"	3'11"	5'6"	0'9"	4'7"	7'9"
24.5-32																			
	mm	3007	2774	1255	619	127	6413	4788	3048	1397	584	396	823	229	1199	1676	218	1397	2362
	ft in	9'10"	9'1"	4'1"	2'0"	0'5"	21'1"	15'9"	10'0"	4'7"	1'11"	1'4"	2'8"	0'9"	3'11"	5'6"	0'9"	4'7"	7'9"

LOG GRAPPLE



TIRE PRESSURES –kPa (PSI)

TIRE SIZE	PLY RATING	MINIMUM	MAXIMUM
18.4-26	10	105 (15)	170 (25)
18.4-34	10	105 (15)	170 (25)
18.4-34*	16	105 (15)	170 (25)
23.1-26	10	105 (15)	140 (20)
23.1-26	14	105 (15)	205 (30)
23.1-26**	16	105 (15)	205 (30)
24.5-32	10	105 (15)	170 (25)
24.5-32	12	105 (15)	205 (30)
24.5-32	16	105 (15)	205 (30)

*Standard F665 Cable.
**Standard F665 Grapple.

Put the machine in the SERVICE POSITION

BOLT TORQUE CHART - GENERAL

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

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

BOLT TORQUE CHART, APPLICATION

	Thread	N•m.	lbf. ft
Converter to Engine Flywheel Housing	.M10	55-60	40-45
Converter Flex Plate to Engine Flywheel	.375-24	35-40	25-30
Cradle Mounting Bolts to Frame	1.25-7	1965-2500	1450-1850
Engine/Transmission Mounts to Frame	.625-11	230-300	170-220
Front Engine Mount to Engine Block *	M12	90-95	65-70
Front and Rear Drive Axle Mounting Bolt	1.00-8	950-1255	700-925
Front Winch to Rear Frame	1.00-8	950-1255	700-925
Grapple Motor Box Cover to Arch	.375-24	45-60	35-45
Hinge and Cradle Bearing Capscrew *	.375-16	45-60	35-45
Inner Hinge and Cradle Pin Hex Nuts	1.25-12	985-1085	725-800
Lower Driveshaft - to Front Drive Axle	.375-24	45-60	35-45
Lower Driveshaft - to Rear Drive Axle	.500-20	120-155	90-115
Lower Stub Shaft to Stub Shaft Flange Nut	1.25-18	405-475	300-350
Midmount Bearing to Frame	.650-18	230-300	170-220
Outer Hinge and Cradle Pin Stake Nuts ***	1.56-18	475-540	350-400
Rear Winch to Rear Frame	.750-10	395-515	290-380
Secondary Brake Disc to Rear Axle Flange	.437-20	75-100	55-75
Secondary Brake Head to Mounting Bracket	.500-13	120-155	90-115
Snubber Adjusting Nut	1.250-12	45-60	35-45
Transmission Mount to Transmission Case *	.750-10	385-420	290-380
Upper Driveshaft - to Winch /P.T.O. Clutch Flanges	.315-24	24-31	18-23
Wheel Nuts - Rim to Axle (Spherical) **	.750-16	575-645	425-475

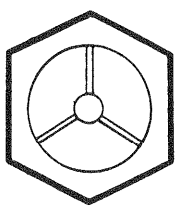
When you install the above mounting bolts, lubricate the threads with SAE NO.30 unless otherwise instructed.

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

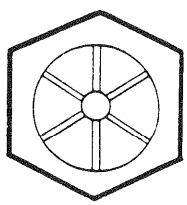
**The nut spherical seat in the wheel disc must be concentric with the stud - ream the hole if necessary.

***See Service Bulletin Group 714, No. 011, 9/86 and Group 717, No. 03, 9/86.

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



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



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

Put the machine in the SERVICE POSITION

NOTES

ALPHABETICAL INDEX