RANGER

F68 MAINTENANCE INSTRUCTION MANUAL

PUBLICATION R6414

DISTRIBUTOR .....
ADDRESS ..... PHONE NO .....
DLR/BRCH .....
ADDRESS .....
PHONE NO .....
SERVICE PHONE NO .....

SPARE PARTS PHONE NO .....

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

12/95

PRINTED IN U.S.A.

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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 F668 machine has a turbocharged engine which does not require additional spark arresting equipment to comply with currently known laws and regulation.

FIRE; (PREVENTION, EQUIPMENT AND SUPPRESSION)

Fire Preventive Instructions

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

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

Fire Fighting Equipment

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

Fire Suppression

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

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Put the machine in the SERVICE POSITION

GENERAL INFORMATION

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

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

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

WARNING!

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

WARNING!

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

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

Put the machine in the SERVICE POSITION

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	36	●										
LUBRICATION		SEE LUBRICATION CHART										
ENGINE												
Engine Oil Level, Check	22	●										
Engine Oil, Change	22		●				●					
Engine Oil Filters, Change	22		●				●					
Fuel Filter, Drain Water and Sediment	23	●										
Fuel Filter, Change	23											●
Fuel Strainer, Clean or Replace	23											●
Fuel Tank, Drain Water and Sediment	23	●										
Empty Air Pre Cleaner	24											●
Air Cleaner Service Indicator, Check	24	●										
Air Cleaner Element Outer, Change	24											●
Air Cleaner Element inner, Change	24									●		
Coolant Level, Check	25	●										
Coolant Protection, Check	25						●					
Change Coolant, Flush System,	25								●			
Radiator, Clean	25	●										
Belt Tension, Check	26								●			
Engine RPM Check	45					●						
Throttle Control check & adjustment	45		●									●
ELECTRICAL SYSTEM												
Battery Condition, Check	27	●										
POWER TRANSMISSION												
Trans. / Converter Oil Level, Check	40	●										
Transmission / Converter Oil, Change	41								●			
Transmission Oil Filter, Change	41		●		●			●				
Transmission Suction Screen, Clean	41								●			
Transmission & Converter Vents, Clean	42						●					
Axle Lubricant Levels, Check	35			●								
Axle Lubricant, Change	35								●			
Axle Breathers	35							●				
Driveshafts, Check	39	●										
Slip Joints, Lube	39					●						
Universal Joint, Lube	39								●			
Pressure Checks	46											●
Wheel Nut Torque*	**58**						●					

Put the machine in the SERVICE POSITION

MAINTENANCE INTERVALS OPERATING HOURS (cont'd)

	Page No.	Daily	First 50	Every 50	First 100	Every 100	Every 250	Every 500	Every 1000	Every 2000	Yearly or Every 2500	As Req'd
BRAKE SYSTEM												
Parking Brake, Adjustment of	31											●
Service Brake, Adjustment of	32											●
Midmount Brake Oil Level, Check	31			●								
Midmount Brake Oil, Change	31							●				
Midmount Brake Breather, Clean	33						●					
Bleed The Brakes	34											●
OTHER FUNCTIONS												
Hydraulic Fluid Level, Check	43	●										
Hydraulic Fluid, Change	43								●			
Hydraulic Fluid Filter, Change	44		●					●				
Log Grapple Snubbers, Check & Adjust	38	●										
Main Hydraulic Relief Pressure Check	48						●					
Winch Free Spool, Adjustment	37											●

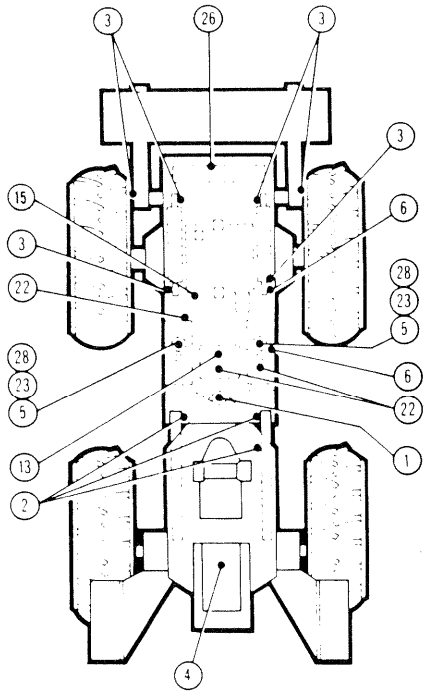
NOTE: * After wheel removal, check torque of bolts at 5 & 10 hours of operation.

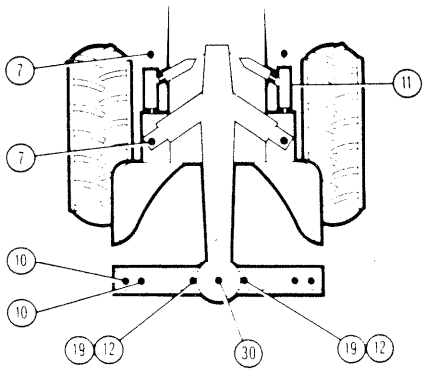
10 MAINTENANCE INTERVALS

Put the machine in the SERVICE POSITION

LUBRICATION INSTRUCTIONS

ITEM	EVERY 10 HOURS OF OPERATION	F68	CHECK	LUBE	CHANGE	KEY
1	HINGE & CRADLE PINS	X		•		EPMD
2	STEER CYLINDER PINS	X		•		EPMD
3	UTILITY BLADE & CYLINDER PIN	X		•		EPMD
4	FUEL TANK	X	•			DF
5	HYDRAULIC OIL RESERVOIR	X	•			DX
6	ENGINE COOLANT LEVEL	X	•			
7	ARCH & CYLINDER PINS	X		•		EPMD
10	GRAPPLE & CYLINDER PINS	X		•		EPMD
11	BOOM CYLINDER PINS	X		•		EPMD
	EVERY 50 HOURS OF OPERATION					
13	TRANSMISSION / CONVERTER HYD FLUID	X	•			DX
14	ENCLOSED SERVICE BRAKE(S)	x	•			DX
16	AXLE DIFFERENTIALS	X	•			EPGL
17	AXLE PLANETARY HUBS	X	•			EPGL
18	ENCLOSED MIDMOUNT BRAKE	X	•			DX
19	SNUBBER ADJUSTMENT	X	•			
20	POWER BRAKE SYSTEM	X	•			
	EVERY 100 HOURS OF OPERATION					
21	DRIVESHAFT SLIP JOINTS	X		•		EPMD
	EVERY 500 HOURS OF OPERATION					
22	TRANSMISSION / CONVERTER HYD FILTER	X			•	
23	HYDRAULIC TANK FILTER	X			•	
25	ENCLOSED MIDMOUNT BRAKE	X			•	
26	CLEAN RADIATOR CORE	X	•			
12	SNUBBER PINS	X		•		EPDM
	EVERY 1000 HOURS OPERATION					
28	HYDRAULIC OIL RESERVOIR	X			•	DX
29	TRANSMISSION/CONVERTER HYD FLUID	X			•	DX





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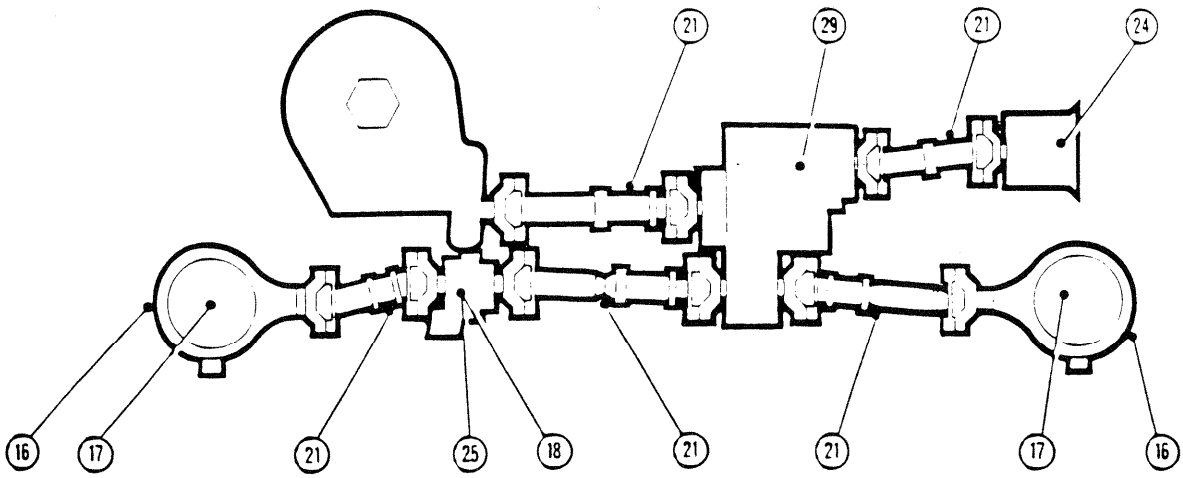
DRIVE LINE

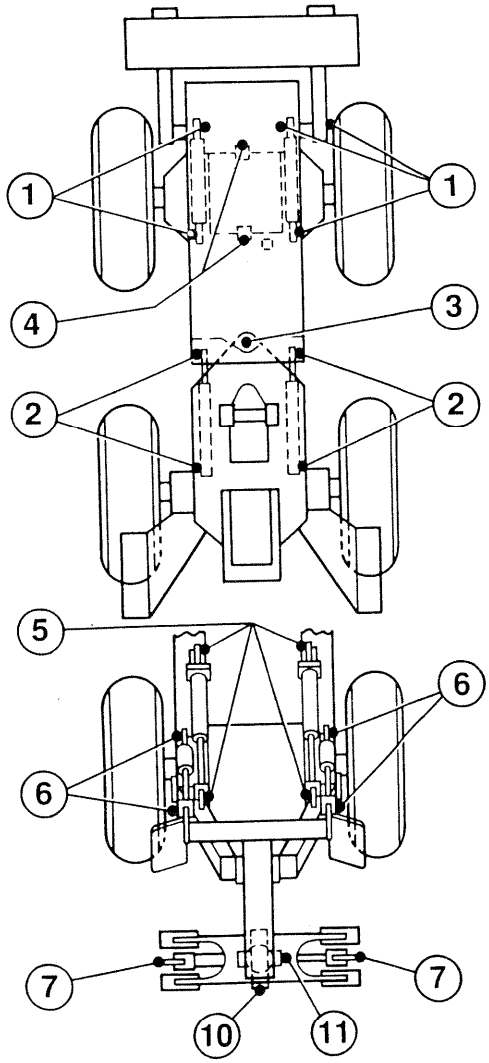


SP-10092

Put the machine in the SERVICE POSITION

LUBRICATION INSTRUCTIONS

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



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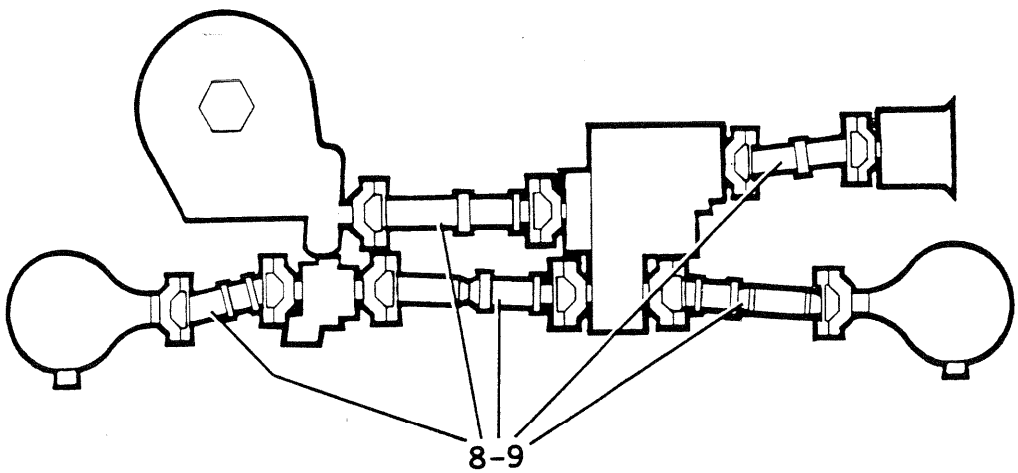


RP-10908

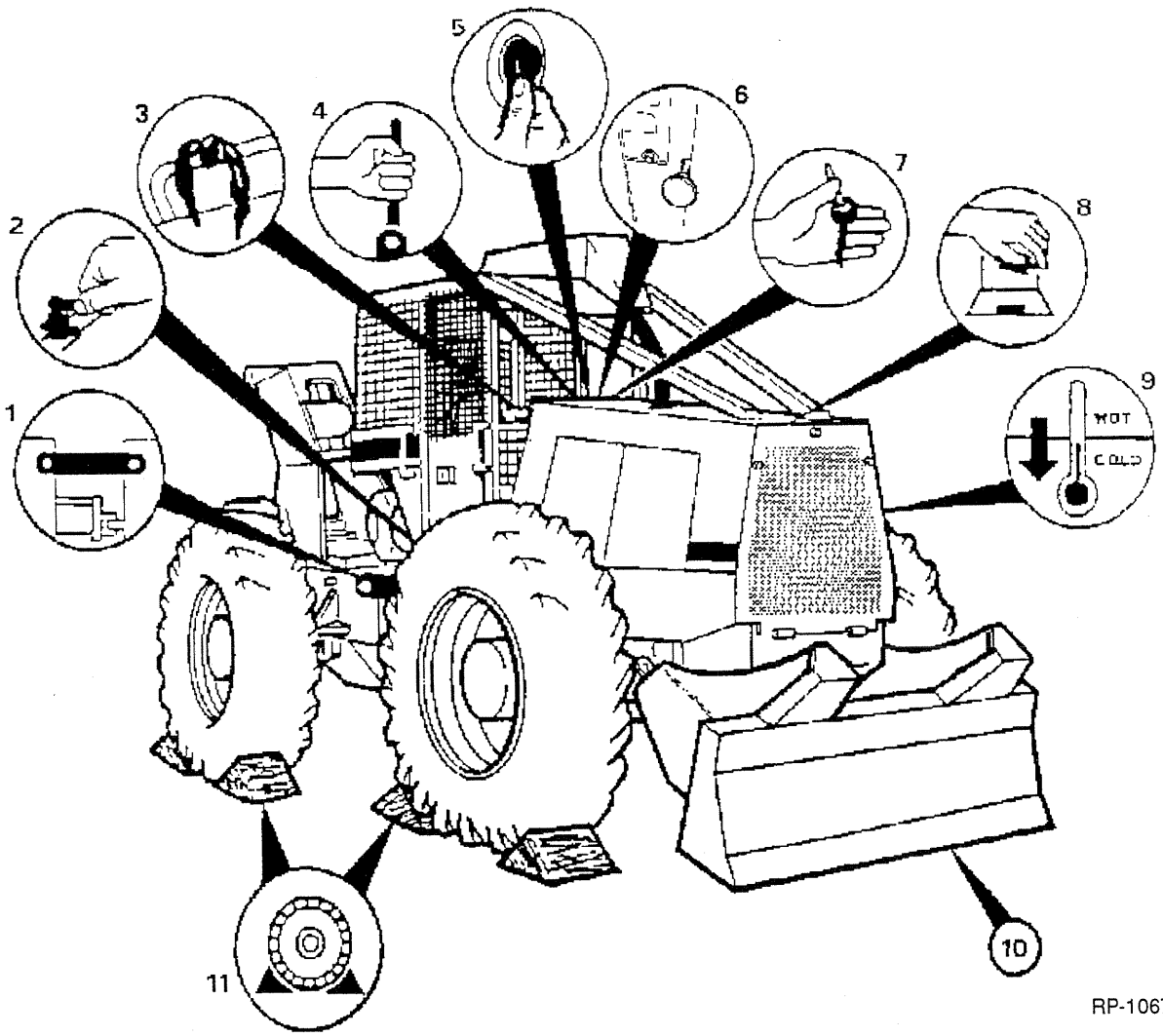
Put the machine in the SERVICE POSITION

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"



RP-10676

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

WARNING!

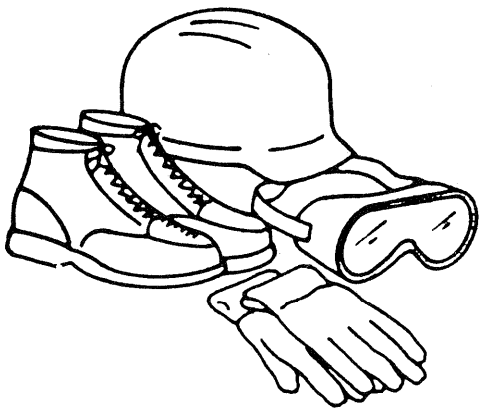
Use caution if you must work on a warm machine. Hot fluids and components can cause personal injury.

Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING

SP-10409

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



SP-10502

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

Put the machine in the SERVICE POSITION

A FEW SIMPLE RULES WHEN SERVICING (con't)

SP-10413

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

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

SP-10414

- 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

A FEW SIMPLE RULES WHEN SERVICING (con't)

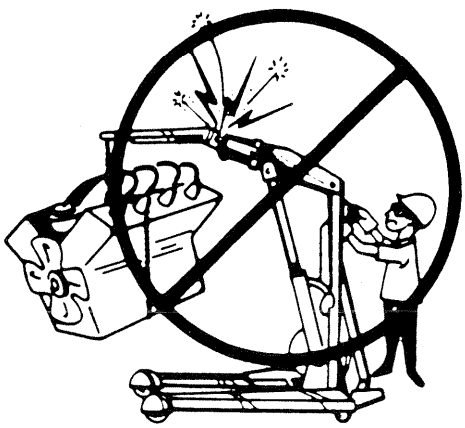
SP-10412

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

WARNING!

See discharging the grapple accumulator pressure on page 42.

- 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.

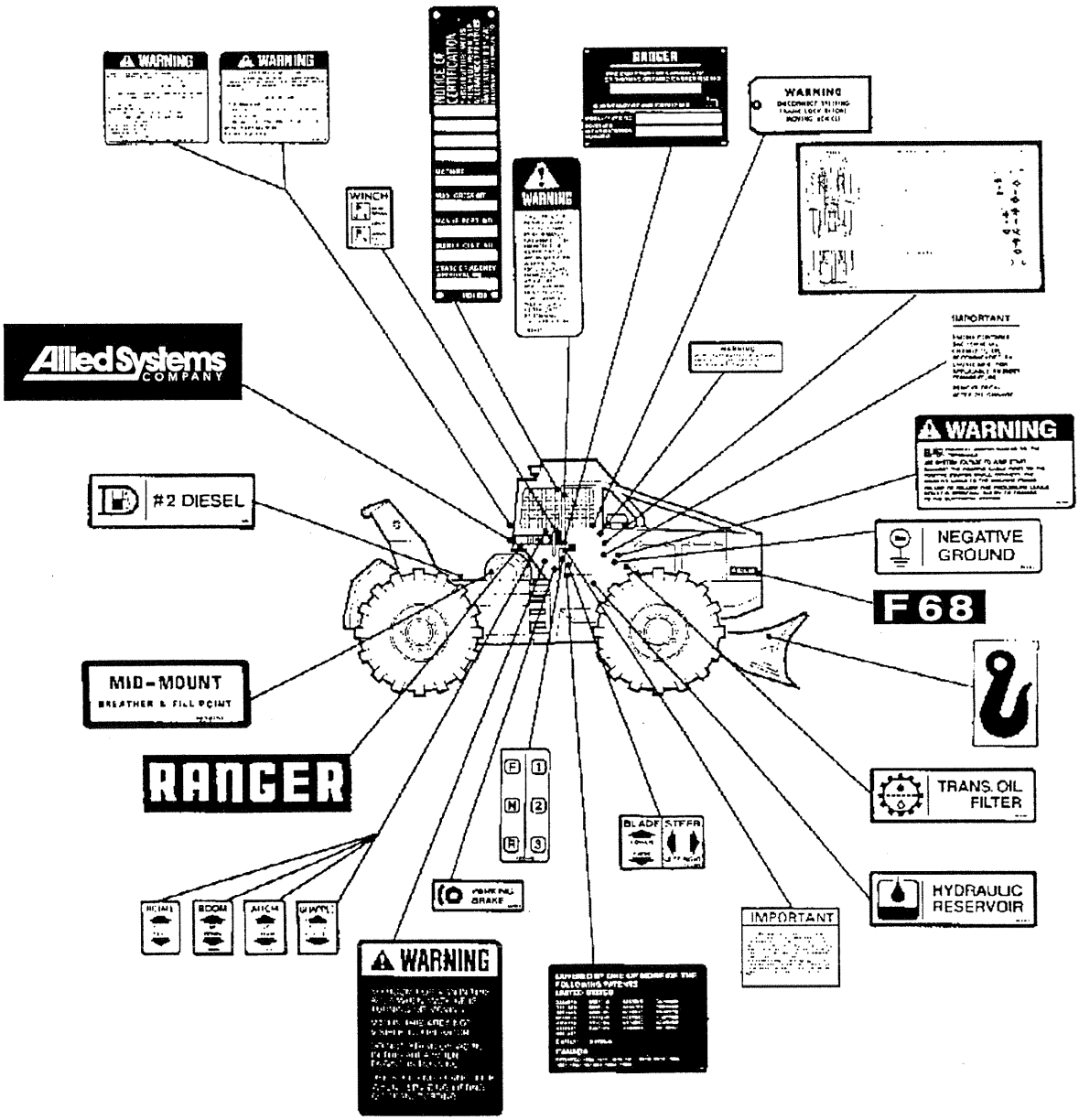


SP-10410

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.



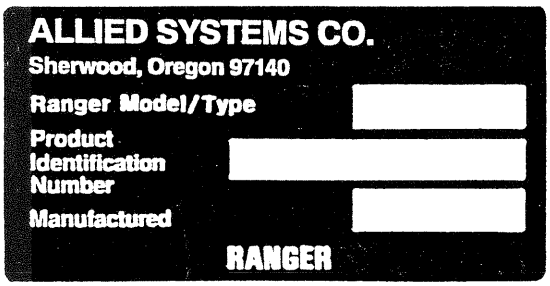
RP-10644

PRODUCT IDENTIFICATION NUMBER

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

Product Identification Breakdown (Current Production)

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



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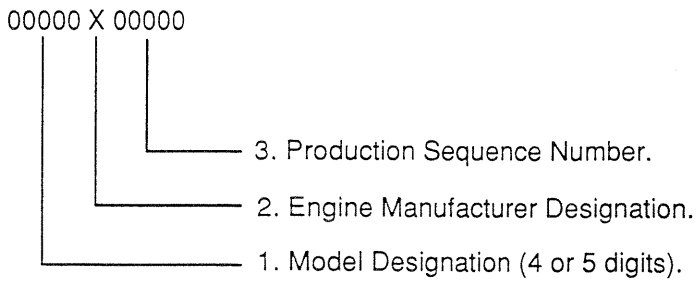
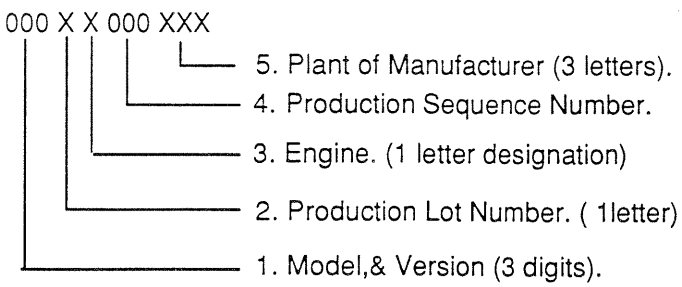


Always use the complete product identification (serial) number on all correspondence, service reports, literature and parts orders.

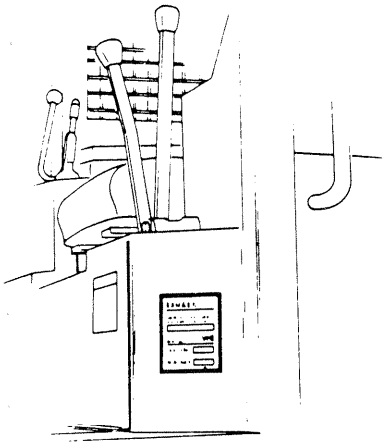
Product Identification Breakdown (Earlier Production)

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



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

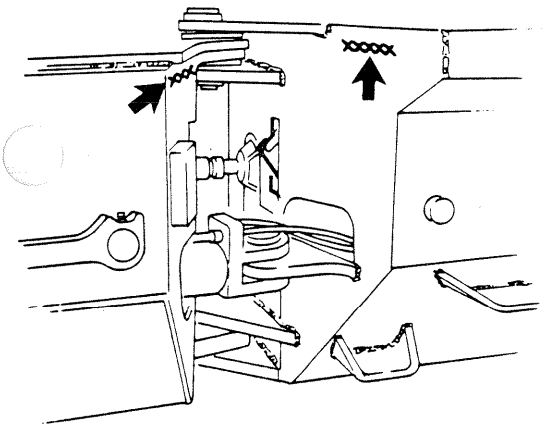
Put the machine in the SERVICE POSITION



RP-10645

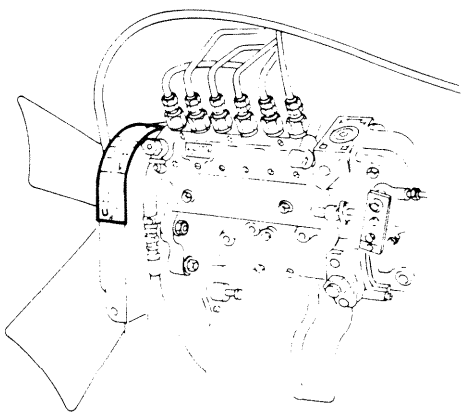
PRODUCT IDENTIFICATION NUMBER LOCATIONS (Serial Number)

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



SP-10557

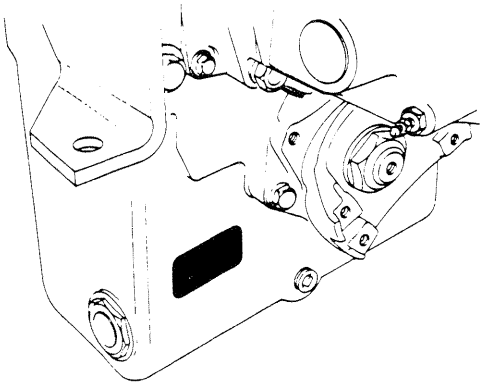
Frame – The machine serial number is stamped into the front and rear frames in the center hinge area on the right hand side of the machine.



RP-10706

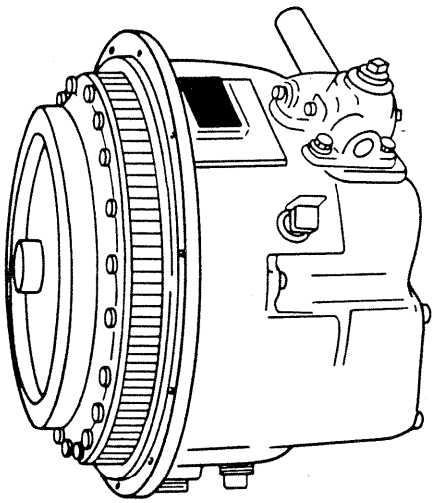
Engine Serial Number And Data Plate – Located on front left side of the engine.

Put the machine in the SERVICE POSITION



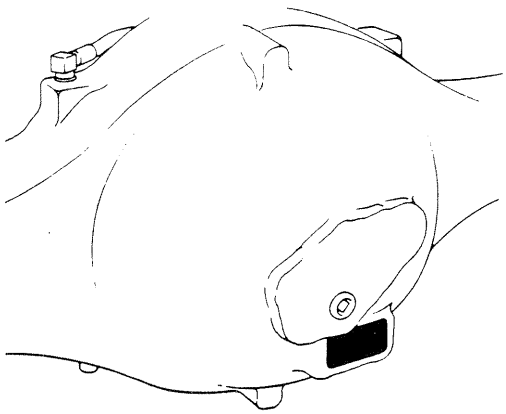
SP-10558

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



RP-10882

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

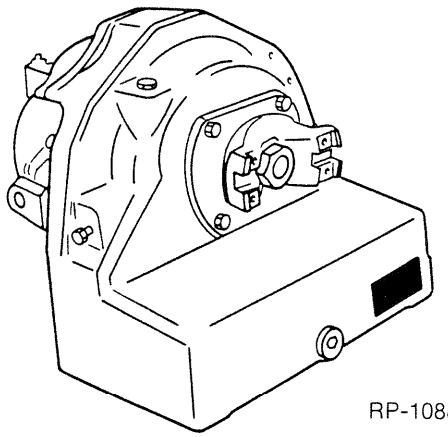


SP-10452

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

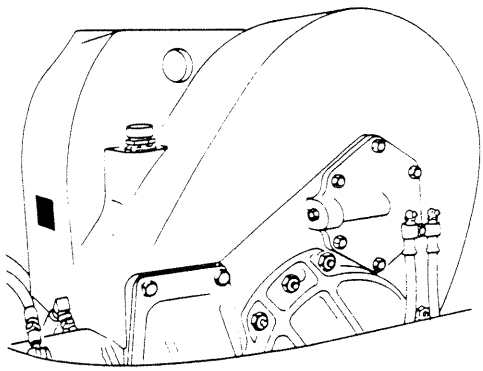
Put the machine in the SERVICE POSITION

Midmount Brake Serial Number And Model Plate



RP-10883

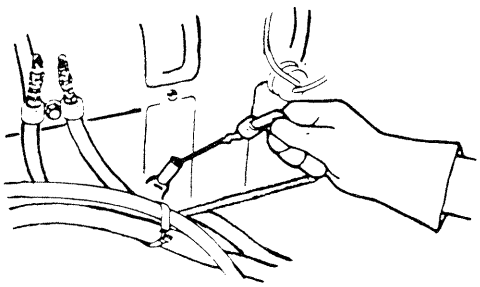
Winch Serial Number And Model Plate



SP-10559

Put the machine in the SERVICE POSITION

ENGINE



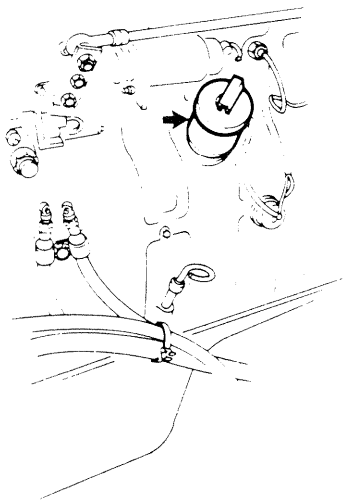
RP-10677

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.



RP-10704

Changing Engine Oil

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

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

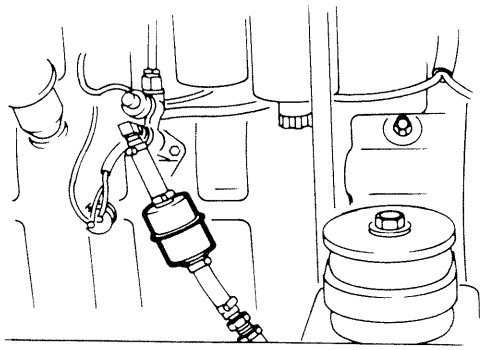
Choose an oil viscosity that is correct for the ambient operating temperature as recommended in the Cummins Engine Operation and Maintenance Manual.

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

Put the machine in the SERVICE POSITION

FUEL SYSTEM

Fuel Filters

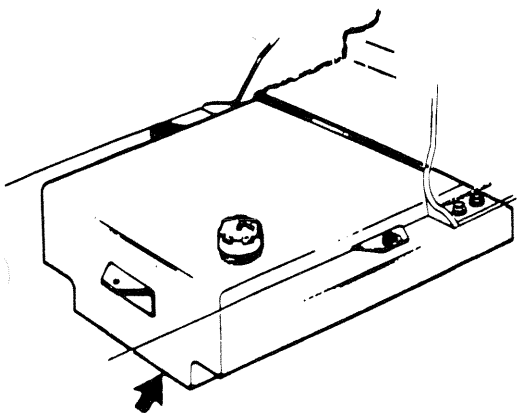


RP-10705

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.

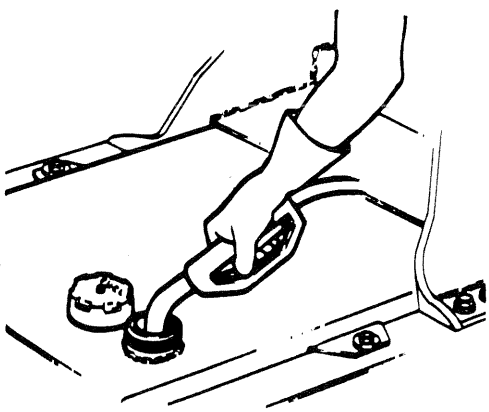
Check The Fuel Strainer



SP-10562

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



SP-10553

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

WARNING!

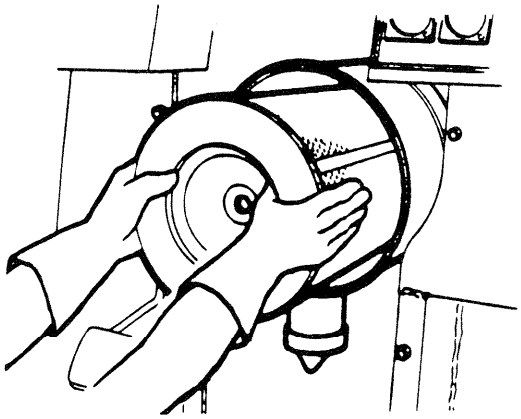
Do not smoke while refueling.

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

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

Put the machine in the SERVICE POSITION

AIR CLEANER SYSTEM



SP-10598

Air Cleaner

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

Check Air Cleaner Service Indicator

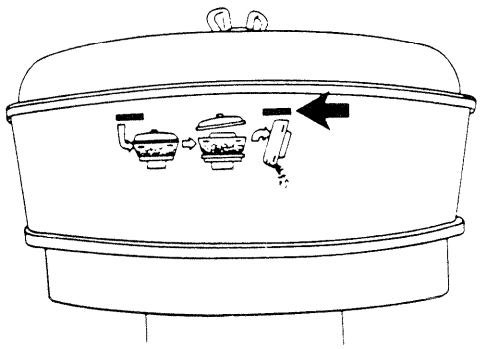
Check the air cleaner service indicator located on the air intake tube between the air cleaner and turbocharger. When the indicator shows red, the air cleaner elements should be serviced.

Check Air Intake Tubes and Clamps

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

Service Air Cleaner

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 .



SP-10628

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

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

Clean the Air Cleaner Vacuator Valve

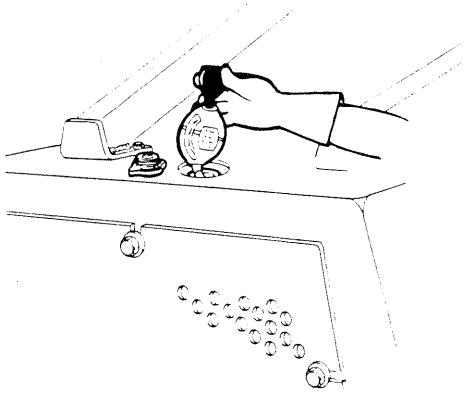
Tap the rubber vacuator valve to remove dust and dirt on a daily basis.

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

AIR PRE CLEANER

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

Put the machine in the SERVICE POSITION



SP-10554

COOLING SYSTEM

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

Antifreeze:

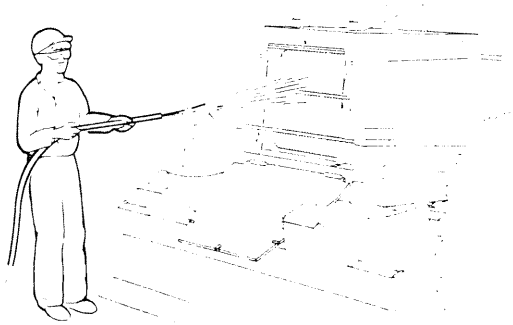
The cooling system of the machine was shipped with a solution of equal parts of ethylene glycol and water. This concentration is recommended for subsequent fills. The coolant should be changed every 1000 hours of operation.

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.



RP-10679

Check Hoses and Clamps

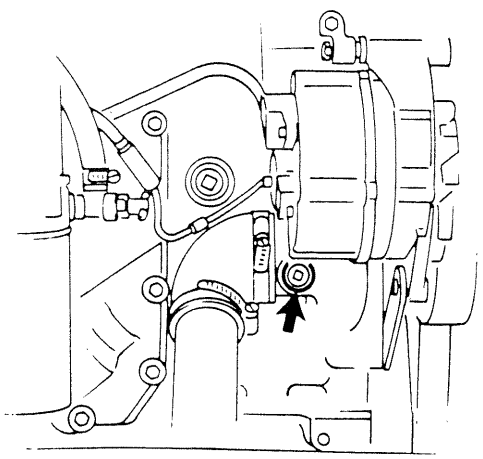
Check hoses and clamps and replace any hoses that are cracked or damaged. Tighten any loose clamps.

Cleaning the Radiator

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

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

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



RP-10708

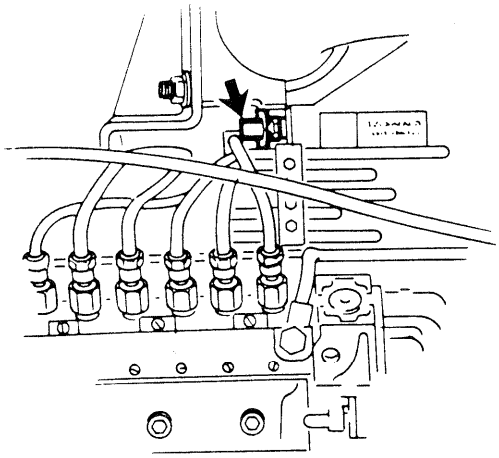
Change Coolant and Flush System

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

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

Put the machine in the SERVICE POSITION

Change Coolant and Flush System (con't.)

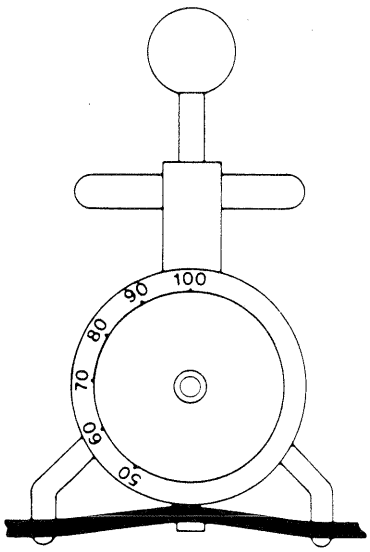


RP-10707

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

WARNING!

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



EL14032

FAN BELT TENSION

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

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

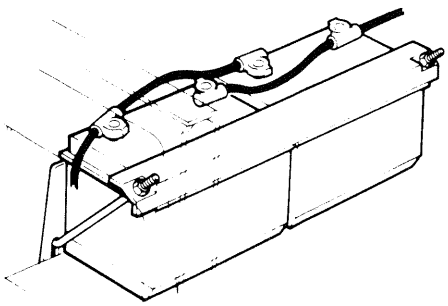
Put the machine in the SERVICE POSITION

ELECTRICAL SYSTEM

Batteries

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

Check Battery Condition



RP-10680

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.

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

SP-10417

WARNING!

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

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

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

Put the machine in the SERVICE POSITION

STEP-1

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

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

STEP-2

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

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

STABILIZED VOLTAGE BELOW 12.4 VOLTS CHARGE BATTERY AND RETEST	STABILIZED VOLTAGE ABOVE 12.4 VOLTS **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

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.

WARNING!

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

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

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

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

Put the machine in the SERVICE POSITION

Check Battery Cables and Connections

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

SP-10397

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.

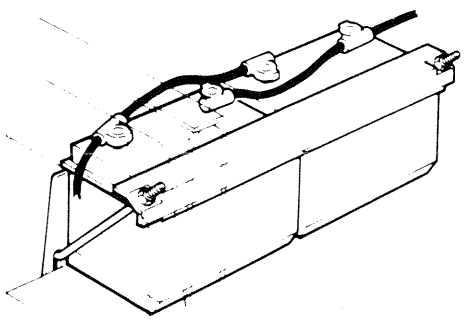
WARNING!

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

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.***



RP-10680

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.

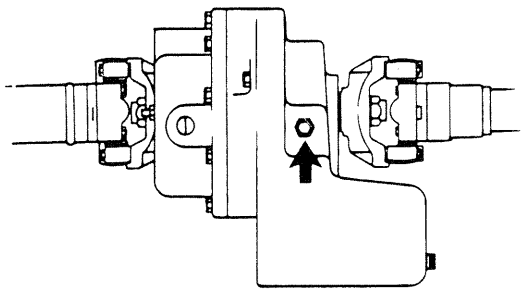
Put the transmission control lever in the REVERSE position. Try to start the engine. If the starter turns the engine, replace the neutral start switch.

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

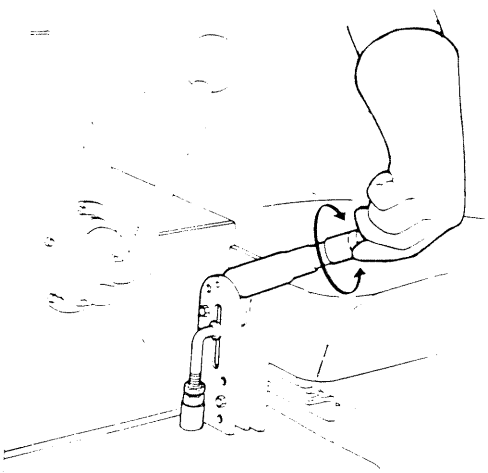
Checking the Fluid Level Midmount Brake



SP-10622

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

NOTE: Do not overfill.



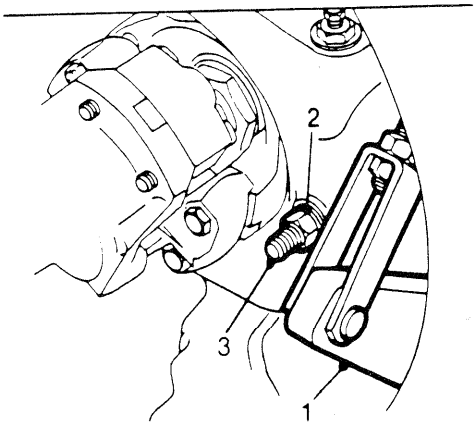
RP-10681

Adjusting the Parking Brake Lever

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

Put the machine in the SERVICE POSITION

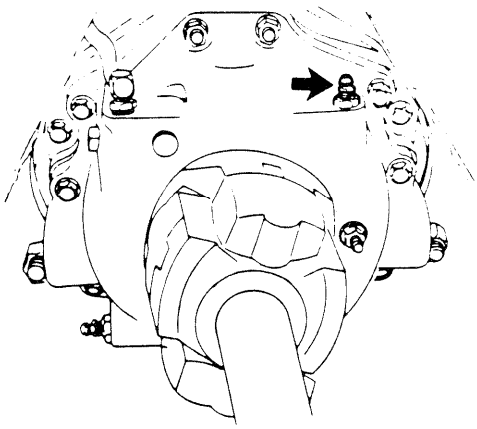
Adjusting the Service Brake, Transmission



SP-10613

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

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



SP-10627

Adjusting the Service Brake, Midmount

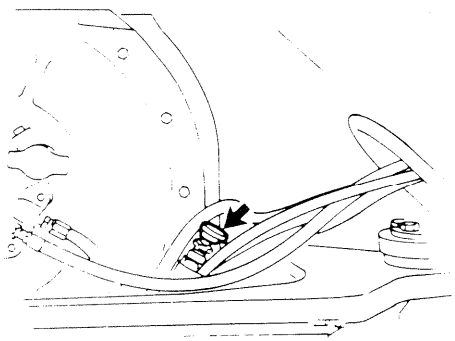
- Loosen locknut (1) on brake adjusting screw (2).
- Tighten adjusting screw (2) until tight against brake yoke.
- Back adjusting screw (2) out two turns.
- Hold adjusting screw (2) from turning and tighten locknut (1).

Put the machine in the SERVICE POSITION

Adjusting the Parking Brake Linkage

Before adjusting the clevis at the brake lever arm:

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



RP-10712

Midmount Brake Breather

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

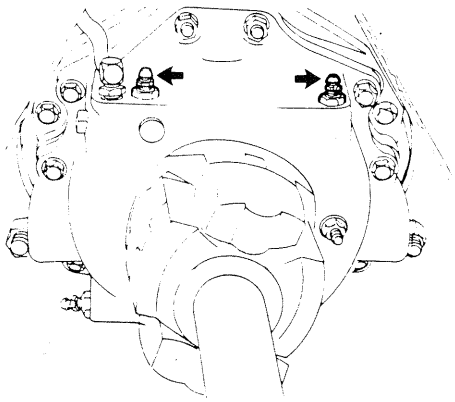
Put the machine in the SERVICE POSITION

Bleeding the Brakes

WARNING!

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

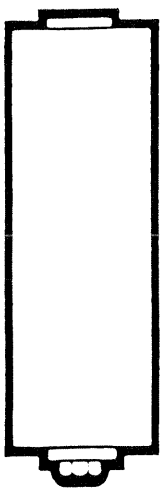
NOTE: Both brake units must be correctly adjusted before you begin to bleed the brakes. Correct brake adjustment can correct certain brake conditions.



RP-10718

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

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



RP-10159

BRAKE ACCUMULATORS

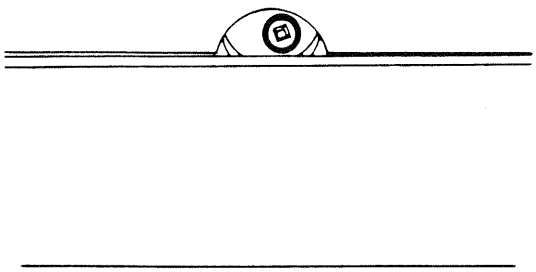
If the oil flow to the brake actuating circuit is interrupted, safe brake operation will be temporarily provided by pressure stored in two brake accumulators, one for each brake circuit. These piston - type accumulators are precharged with nitrogen gas to a pressure of 6.900 ± 345 kPa (1000± 50 PSI)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

See Service Manual for further information.

Put the machine in the SERVICE POSITION

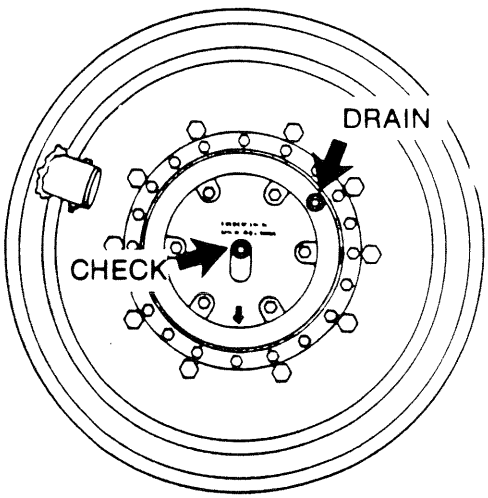
FRONT AND REAR DRIVE AXLES

Checking the Axle Lubricant Levels



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

SP-10470

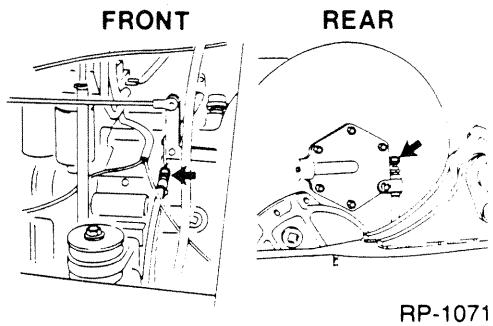


SP-10568

Checking the Planetary Hub Level

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

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



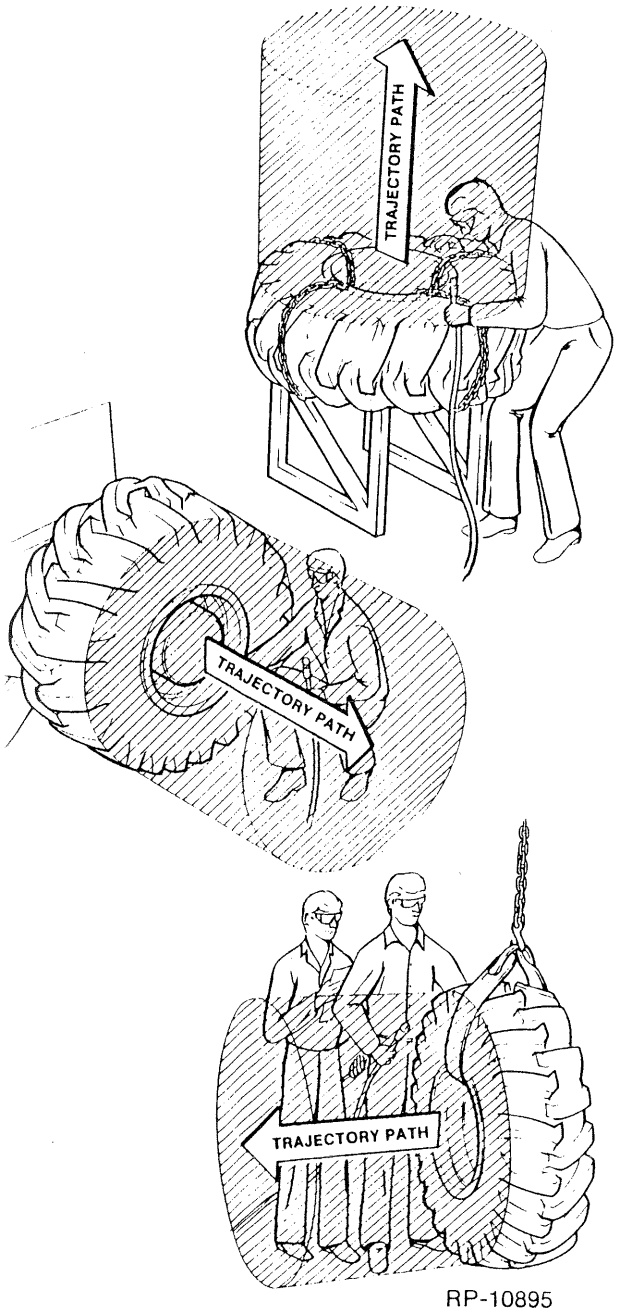
RP-10711

Axle Breathers

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

Put the machine in the SERVICE POSITION

WHEELS AND TIRES



RP-10895

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.

WARNING!

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

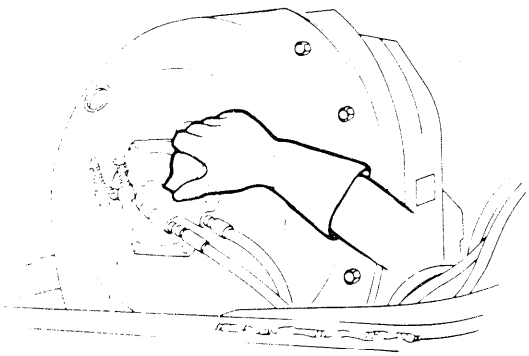
WARNING!

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

Put the machine in the SERVICE POSITION

WINCH

Adjust the Winch Free–Spool Tension



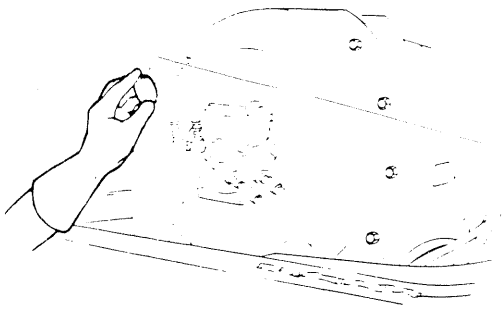
RP-10682

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

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

Installing The Winch Mainline

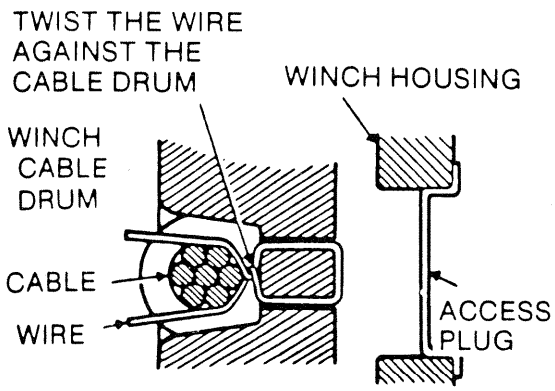
Note: ***Installing the winch cable this way provides a safety break away if the load should fall down a grade as well as a method of holding the cable under normal operation.***



RP-10683

WARNING!

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

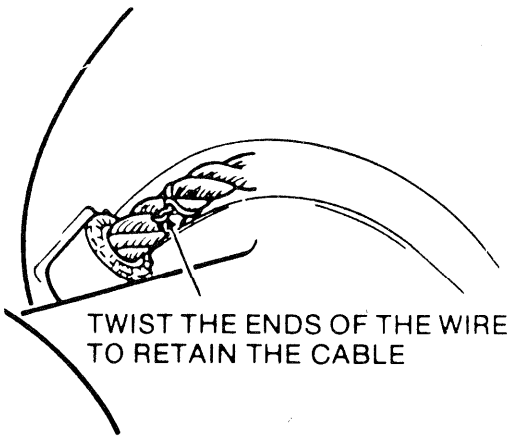


SP-10082

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

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

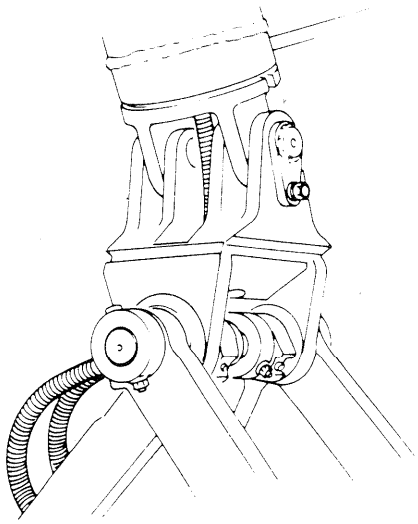
- Twist the wire ends together against the cable drum.
- Install the cable into the groove between the ends of the wire so that the cable ferrule is in the ferrule groove.
- Twist the ends of the wire together to hold the cable.
- Start the engine and WINCH–IN the cable onto the cable drum.
- Install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



SP-10083

LOG GRAPPLE

Checking and Adjusting the Grapple Snubbers



RP-10684

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:

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

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

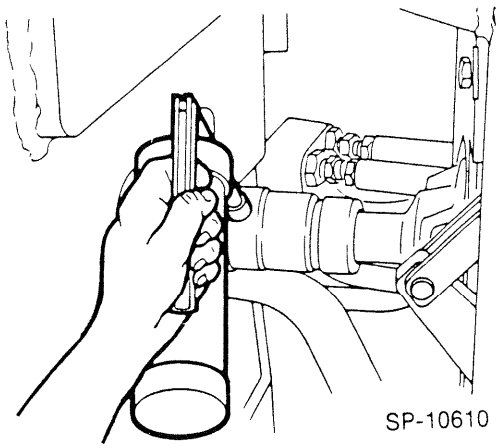
Note: Keep oil and grease away from the snubbers so they will operate at maximum efficiency.

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

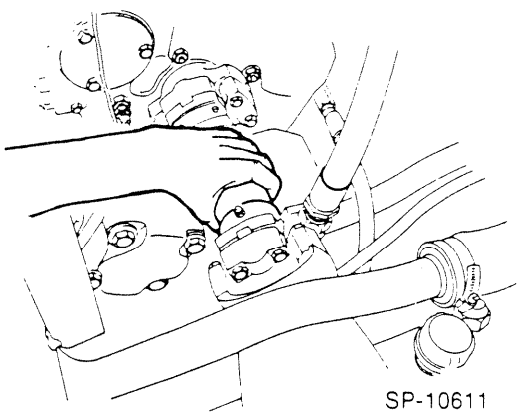
Put the machine in the SERVICE POSITION

DRIVE SHAFTS

Lubrication


SP-10610

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


SP-10611

Checking the Drive Shafts

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

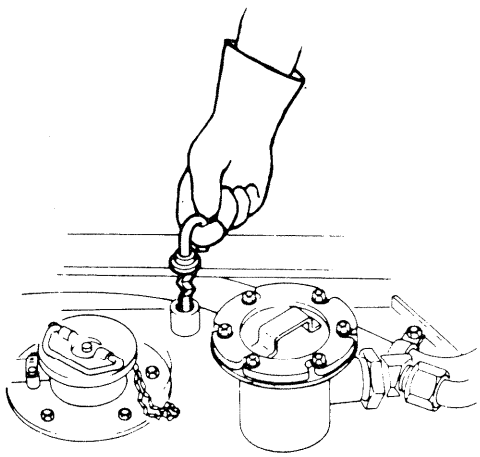
Put the machine in the SERVICE POSITION

HYDRAULIC SYSTEM

Transmission, Converter and Winch

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

Checking Fluid Level



RP-10703

The fluid level should be checked daily as follows:

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

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

Transmission and Torque Converter Fluid Warm–Up Procedure

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

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

Put the machine in the SERVICE POSITION

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)

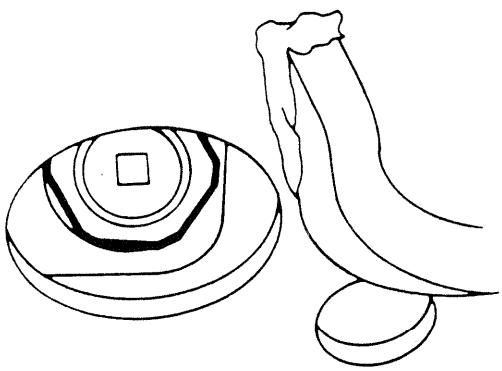
WARNING!

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.

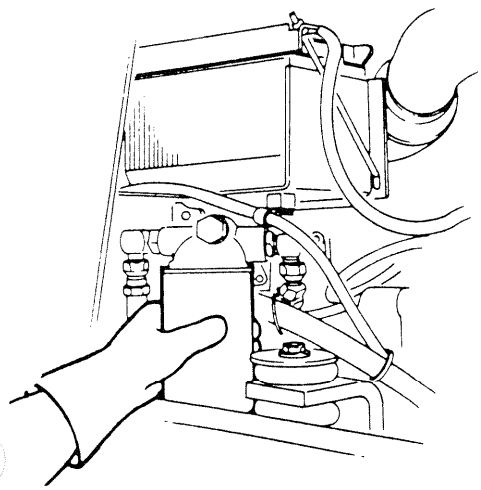


SP-10600

Suction Screen

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

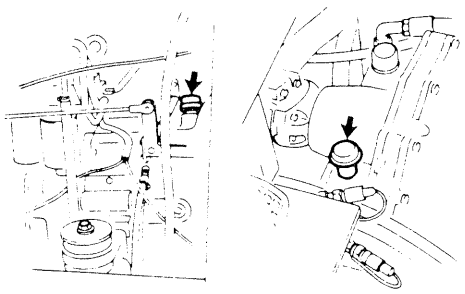
Refill transmission to low mark on the dipstick. Start the engine and run at 500–600 RPM to prime converter and lines. Recheck level with engine running at 500–600 RPM and add oil to bring level to low mark. When the oil temperature is hot 82° –93° (180–200° F) make final oil check bringing oil level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



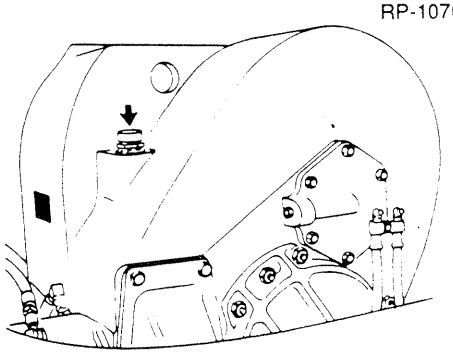
RP-10710

Changing the Transmission Filter

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



RP-10709



SP-10559

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

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

Torque Converter and Transmission Vent and Breather

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

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

HYDRAULIC SYSTEM; Steer, Blade & Grapple

WARNING!

GRAPPLE HYDRAULIC ACCUMULATOR SYSTEM

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

Discharge the Accumulator Hydraulic Pressure as Follows:

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

Put the machine in the SERVICE POSITION

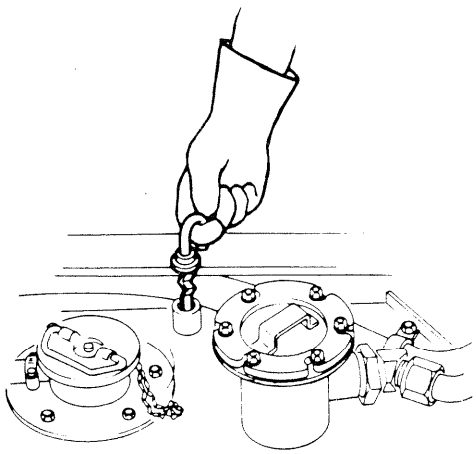
- Hold the grapple control lever in the OPEN position for ten seconds.
- Check the grapple accumulator system pressure gauge to ensure that the pressure reading is zero.

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

Checking the Hydraulic Fluid Level

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

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

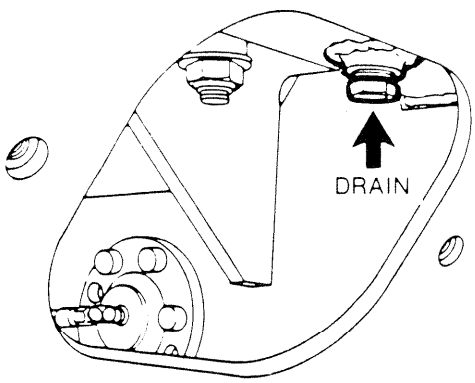


RP-10703

Changing the Hydraulic Fluid

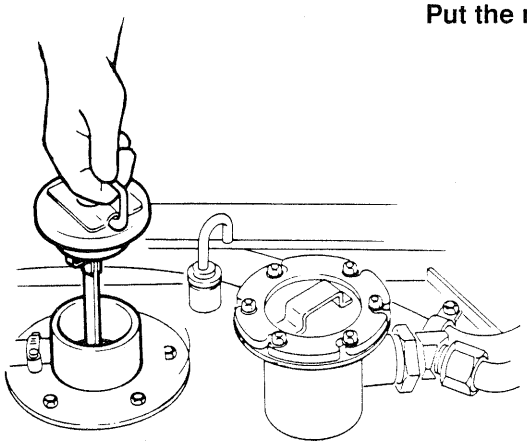
Change the hydraulic fluid every 1000 hours of operation or whenever the main hydraulic pump or the power brake pump fails and must be overhauled.

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



SP-10617

Put the machine in the SERVICE POSITION



RP-10715

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

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

Changing the Main Hydraulic Filter

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

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

RP-10713

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.

Check the low idle RPM with the engine at its operating temperature and no load on the engine. The acceptable value is 700 – 900 RPM.

Check the High Free Idle RPM under the same conditions. The maximum acceptable value is 2460 RPM.

Check the Converter Stall RPM as Follows:

- With the blade lowered apply the service brakes.

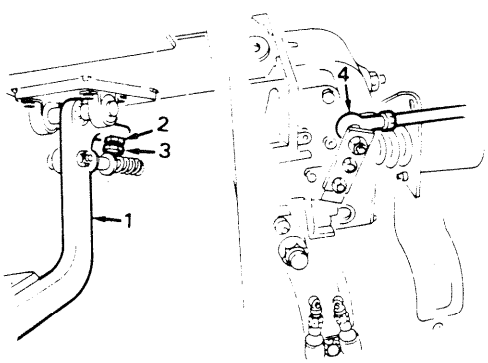
Note: ***The parking brake must be off for these tests as it declutches the transmission and will change the readings.***

- Accelerate the engine to full throttle with the transmission in FORWARD and THIRD. The acceptable value is 2100 – 2220 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 1870 – 2010 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.

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.



RP-10717

Checking and Adjusting the Throttle Control Linkage

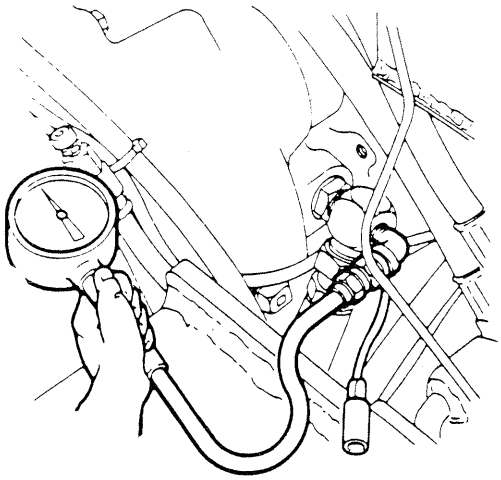
- Loosen lock nut (2) and back out the adjusting screw (3).
- Depress pedal (1) by hand (noting the effort required until a high resistance is felt. This indicates full fuel pump throttle arm travel.

- Hold the pedal in this position, adjusting the screw until it makes contact then back out one half turn. holding the adjusting screw, tighten the lock nut.

If no resistance is felt and the pedal bottoms out this indicates that the fuel pump is not going into full fuel and the throttle rod and ball joint assembly (4) has to be shortened. This can be accomplished by unscrewing four locknuts and the ball joint on the rod and adjust accordingly.

WARNING!

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



SP-10604

HYDRAULIC TRANSMISSION / CONVERTER

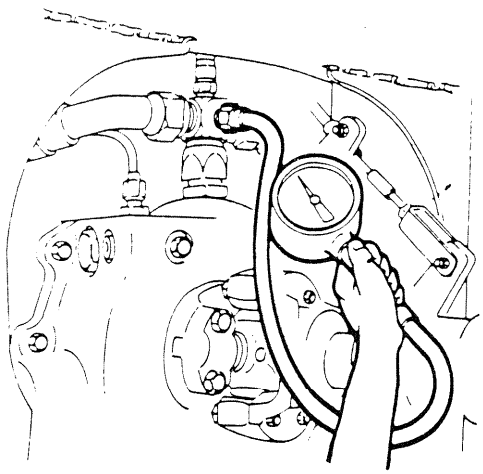
Note: To obtain accurate pressure readings the service brake pedal must not be applied during these procedures.

Checking the Transmission / Converter Pressures

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

Check the converter Pressures with a 1000 kPa (150 PSI) pressure gauge.

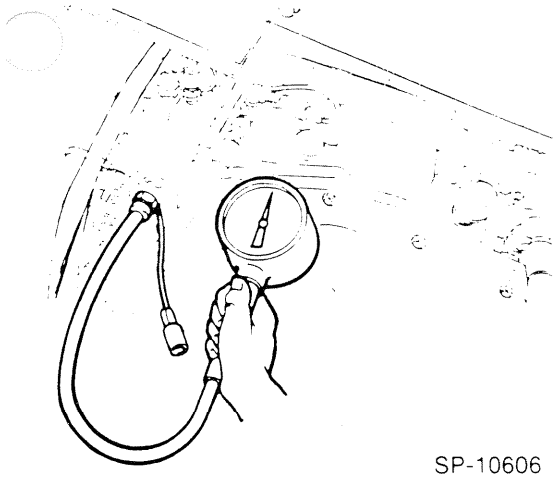
The converter OUT test port is located on the left hand side of the converter. The minimum acceptable converter OUT pressure is 170 kPa (25 PSI) at 2000 RPM. The maximum acceptable converter OUT pressure is 480 kPa (70 PSI) maximum at maximum RPM.



SP-10605

The transmission/converter lube pressure test port is located on top of the hydraulic brake unit. The maximum acceptable lube pressure is 170 kPa (25 PSI) at maximum RPM.

Put the machine in the SERVICE POSITION



SP-10606

Checking the Transmission / Converter Pressures

Check the transmission and winch clutch pressures with a 2000 kPa (300 PSI) pressure gauge. Use the same gauge to test all circuits.

The forward clutch pressure teat port is located on the rear of the modulation valve on the left hand side of the transmission.

REGULATED Clutch Pressure

Spec. 240–280 PSI
1st _____
2nd _____
3rd _____
Winch-in _____
Hold _____
Free Spool _____

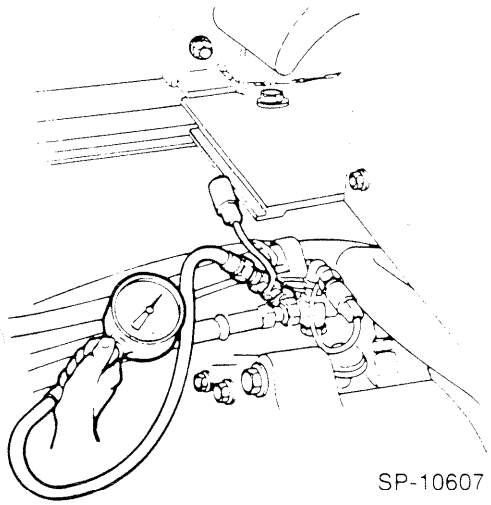
- with speed control in neutral
- using 0–300 PSI gauge
- engine is at idle RPM
- oil temperature at operating

DIRECTIONAL Clutch Pressure

Using the "Same" gauge then check the directional clutches.

Forward _____ Checked with the following speed and winch clutches applied.
_____ 1st
_____ Hold

Reverse _____ **SPEC.** This may be up to 20 PSI less than regulated.

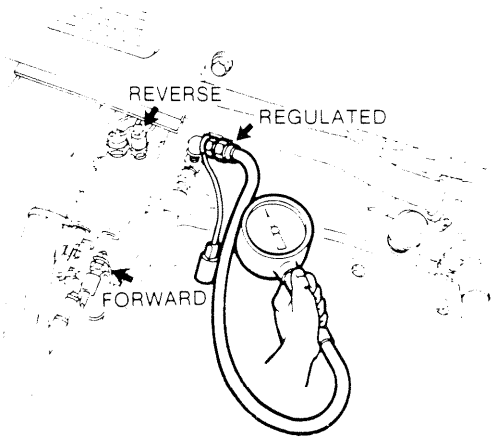


SP-10607

The reverse clutch pressure test port is located on top of the modulation valve on the left hand side of the transmission.

The regulated clutch pressure test port is located on the T–fitting on top of the transmission control valve.

The acceptable regulated clutch pressure is 1.65 – 1.93 MPa (240 – 280 PSI) in all combinations of speed ranges and winch modes. Regulated clutch pressure should checked in neutral, the forward and reverse clutch pressures should be taken and the speed mode recorded. Regulated pressure must be recorded in 1st, 2nd, 3rd, free–spool, winch–in and hold with the transmission directional selectors in neutral. There should be no more than 35 kPa (5 PSI) difference between the highest and lowest regulated clutch pressure readings however it is normal for the Forward and Reverse clutch pressure to be up to 140 kPa (20 PSI) lower than the regulated clutch pressures.

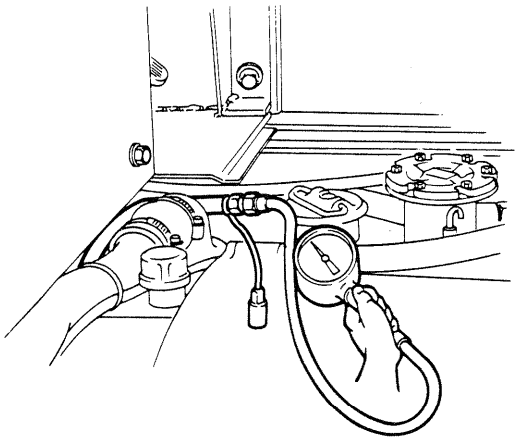


SP-10608

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 valve.***

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

Put the machine in the SERVICE POSITION



RP-10714

HYDRAULIC SYSTEM

Transmission, Converter and Winch

Checking the Main Hydraulic Relief Pressure

The main hydraulic pressure check port is located on the test hose on top of the hydraulic tank. 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 2000 – 2200 PSI at maximum engine RPM with the fluid at its operating temperature.

Put the machine in the SERVICE POSITION

SPECIFICATIONS

RECOMMENDED LUBRICANTS

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

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

Transmission/Converter/Winch Hydraulic System and Midmount Brake

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

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

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

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

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

Front and Rear Axle Differentials and Planetary hubs

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

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

Chassis and Driveshaft Lubrication

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

Fuel Specifications

Fuel: N°. 2 Diesel

Put the machine in the SERVICE POSITION

UNITS OF MEASUREMENT

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

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

MACHINE WEIGHTS (Cable Skidder)

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

MACHINE WEIGHTS (Paralleogram Grapple Skidder)

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

TRAVELING SPEEDS

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

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

ENGINE SPECIFICATION

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

ENGINE LUBRICATING SYSTEM

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

ELECTRICAL

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

HYDRAULIC TRANSMISSION

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

TORQUE CONVERTER

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

AXLES

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

Put the machine in the SERVICE POSITION

BRAKE SYSTEM

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

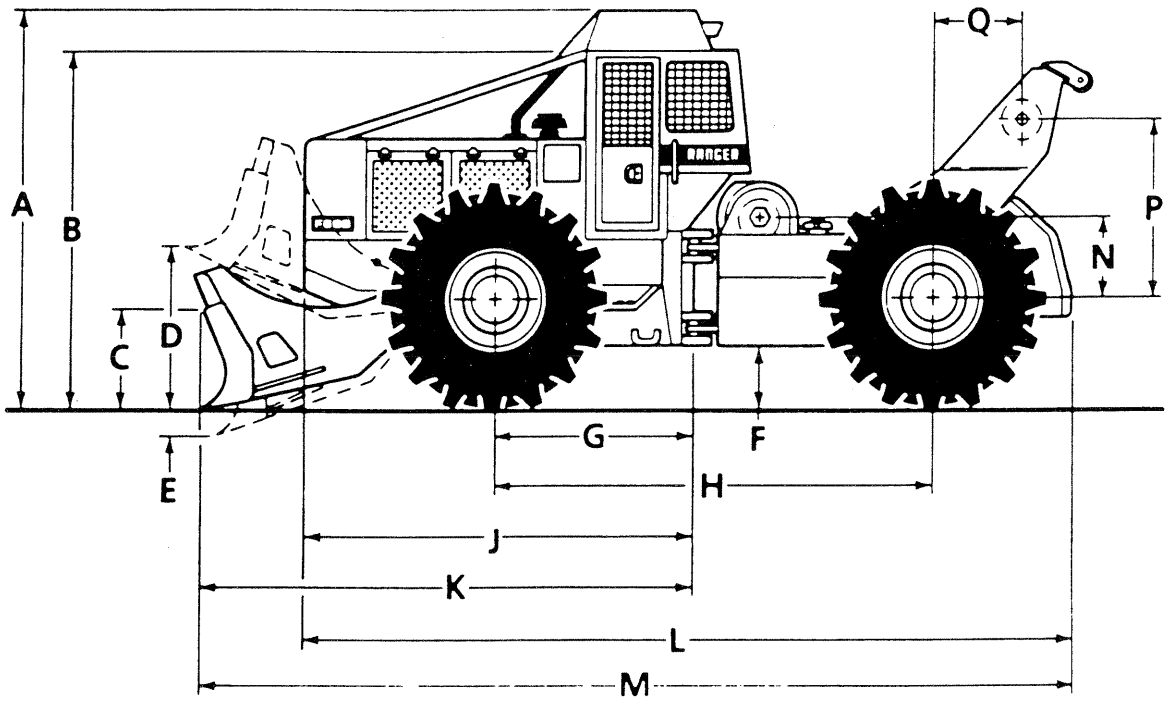
HYDRAULIC SYSTEM

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

MACHINE DIMENSIONS (F68 Cable Skidder)

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

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



RP-10716

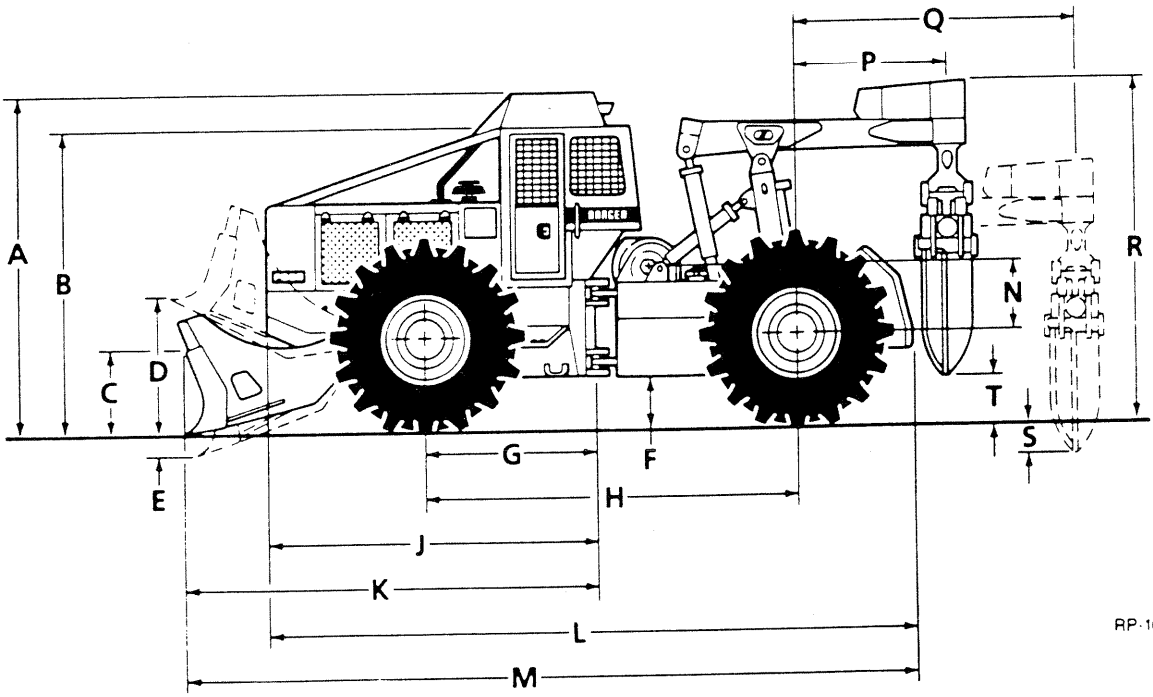
TIRES	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
30.5L-32															
mm	3327	2992	851	1384	203	533	1702	3759	3353	4166	6604	7417	673	1499	767
ftin	10'11"	9'10"	2'10"	4'6"	0'8"	1'9"	5'7"	12'4"	11'0"	13'8"	21'8"	24'4"	2'2"	4'11"	2'6""
35.5L-32															
mm	3353	3073	851	1460	127	609	1702	3759	3353	4166	6604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

Put the machine in the SERVICE POSITION

MACHINE DIMENSIONS (F68 Parallelogram Grapple Skidder)

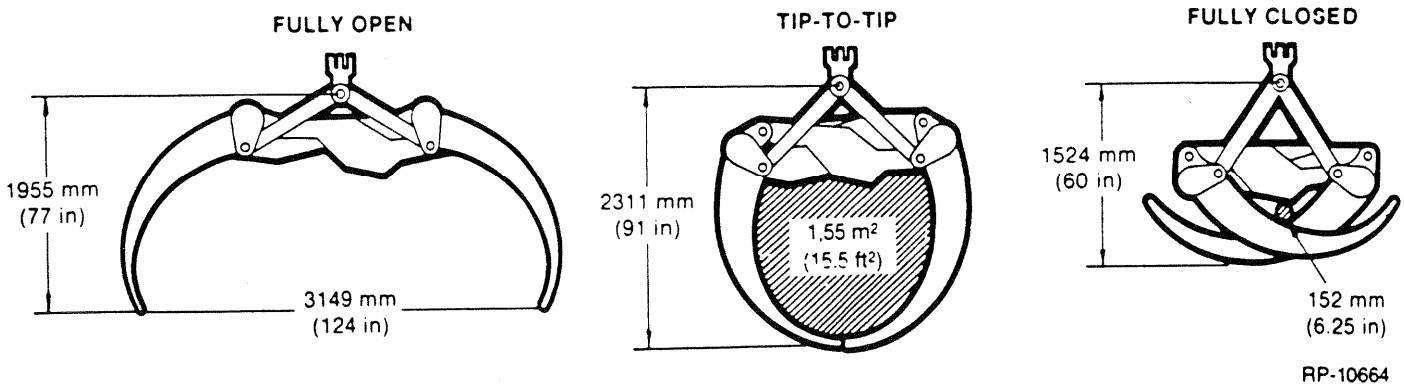
The following machine specifications are provided for your convenience. All specifications are approximate and are subject to change without notice or obligation.

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



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

LOG GRAPPLE



TIRE PRESSURES - kPa (PSI)

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

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

Put the machine in the SERVICE POSITION

BOLT TORQUE CHART - GENERAL

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

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

BOLT TORQUE CHART, APPLICATION

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

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

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

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

ALPHABETICAL INDEX

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