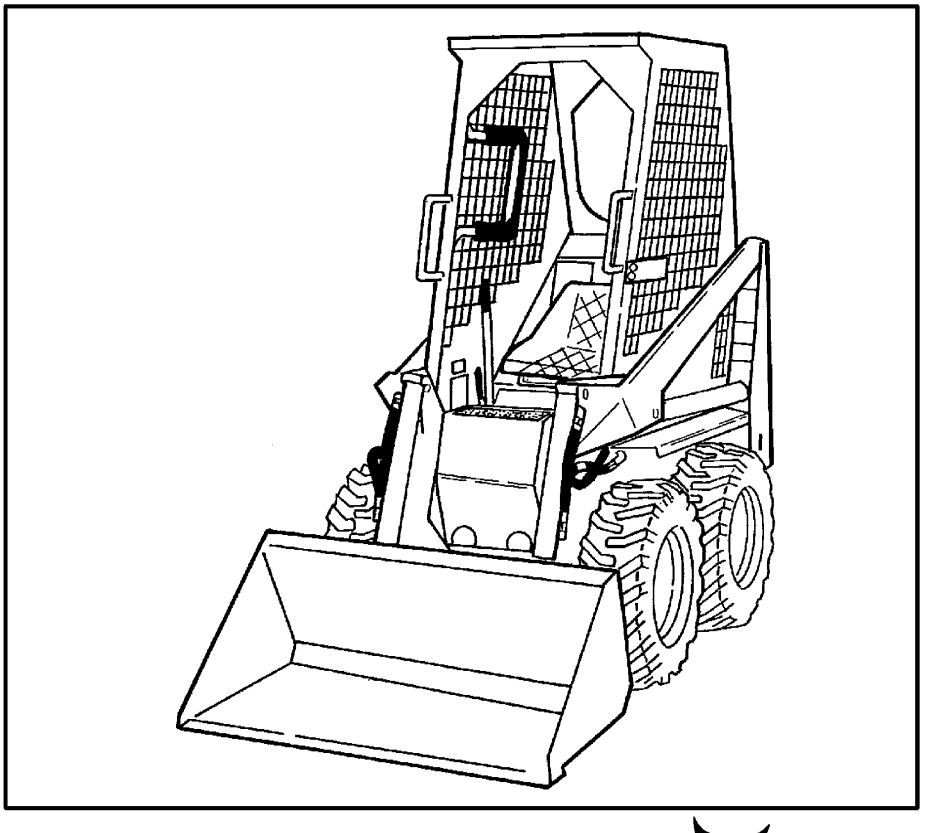
313
310

Service Manual



MELROE
INGERSOLL-RAND

bobcat®

6556606(12–82)

Printed in U.S.A.

MAINTENANCE SAFETY

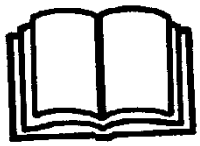
WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0903

Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

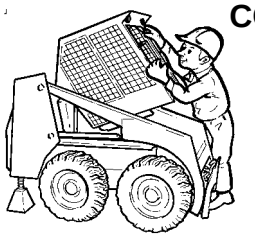
CORRECT



B-10731a

Never service the Bobcat Skid-Steer Loader without instructions.

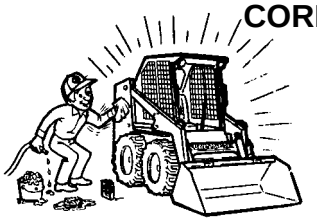
CORRECT



B-12365

Use the correct procedure to lift or lower operator cab.

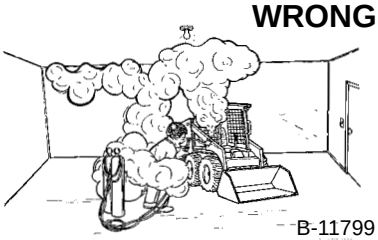
CORRECT



B-7469

Cleaning and maintenance are required daily.

WRONG



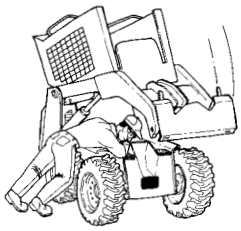
B-11799

Have good ventilation when welding or grinding painted parts.

Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.

Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.

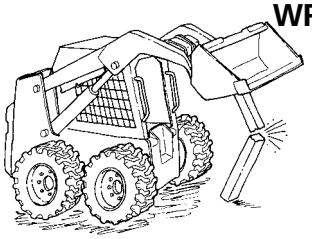
WRONG



B-15231

Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.

WRONG

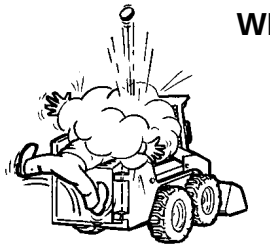


B-15280

Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.

Never modify equipment or add attachments not approved by Bobcat Company.

WRONG



B-6590

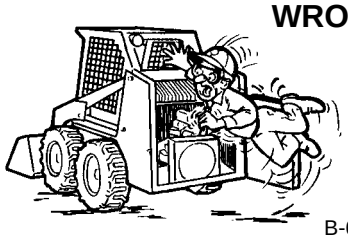
Stop, cool and clean engine of flammable materials before checking fluids.

Never service or adjust loader with the engine running unless instructed to do so in the manual.

Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.

Never fill fuel tank with engine running, while smoking or when near open flame.

WRONG



B-6580

Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.

Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.

Keep rear door closed except for service. Close and latch door before operating the loader.

WRONG

B-6589

Lead-acid batteries produce flammable and explosive gases.

Keep arcs, sparks, flames and lighted tobacco away from batteries.

Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.

MSW01-0805

FOREWORD

This manual gives instruction for correct servicing and adjustment of the Bobcat, and overhaul instructions of the, hydraulic system, electrical system, engine and general mainframe parts.

Make reference to the Owner's Manual for operating instructions (Starting Procedure, Daily Checks and Maintenance, Bobcat Operation, etc.).

A general inspection of the following items should be made whenever the loader has had service or repair.

1. Check hydraulic fluid level, engine oil level and fuel supply.
2. Inspect for any fuel, oil or hydraulic fluid leaks.
3. Lubricate the loader.
4. Check battery condition, electrolyte level and cables.
5. Inspect air cleaner system for damage or leaks. Check element and replace as needed.
6. Check electrical charging system.
7. Check indicator lamps.
8. Check tires for wear and pressure.
9. Check the Bob-Tach attachment for condition. Inspect the wedges for damage or wear.
10. Inspect safety items for condition (Operator Enclosure, Seat Belt, Saftey Treads, Lamps, etc.).
11. Make visual inspection for loose or broken parts or connections.
12. Operate the loader, checking all functions.

Check the above items, if any are in need of repair tell the Owner:

CONTENTS

1 PREVENTIVE MAINTENANCE

1—1 INTRODUCTION

The Preventive Maintenance section gives general maintenance and adjustment procedures for the Bobcat. The other sections give the detailed description necessary for disassembly and assembly and when replacement parts are needed.

1—1.1 Symbols

IMPORTANT

This notice shows important procedures which must be followed to prevent damage to the loader.

⚠ WARNING

For your safety, warnings are on the loader and in the manual. Failure to obey warnings may cause injury or death.

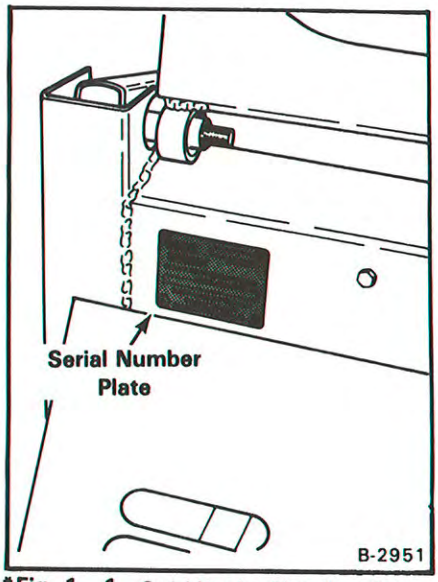


*Fig. 1—1 Serial Number Plate (Location)

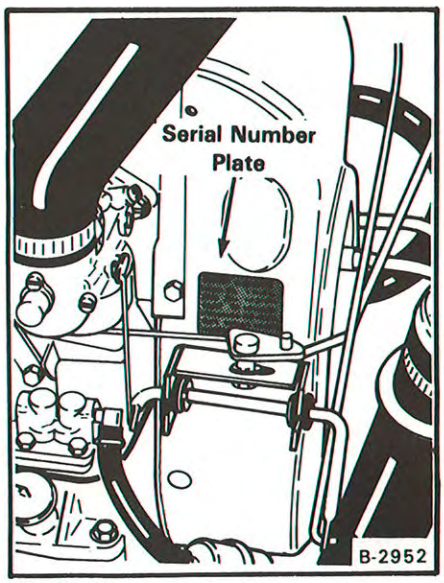


Fig. 1—2 Engine Serial Number (310)

1—1.2 Serial Number Identifications

It is important to make correct reference to the serial number of the loader when making repairs or ordering parts. It is possible that the present loaders do not use all the same parts as earlier loaders; or it is possible that different procedures are used for service or repair.

1—1.3 Loader Serial Number

The loader serial number plate location is inside the left upright (Fig. 1—1).

Explanation of the Serial Number:

XXX M XXXX

- XXXX — Production Sequence
- M — Plant Location
- XXX — Model, Engine Version

1—1.4 Engine Serial Number

The 310 engine serial number plate is located on the blower cover (Fig. 1—2).

The 313 engine serial number plate is located at the bottom of the engine, near the oil filter (Fig. 1—3).

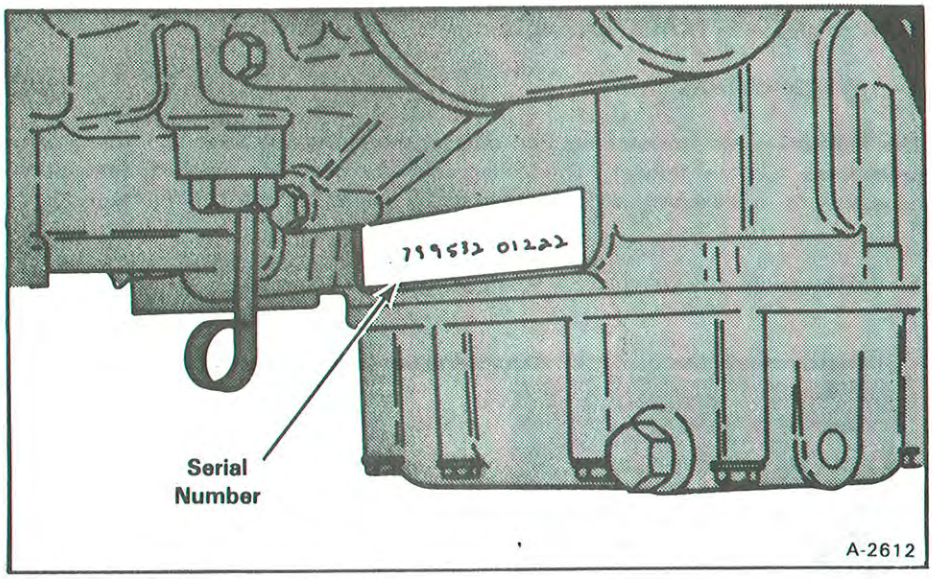


*Fig. 1—3 Engine Serial Number (313)

1—1.5 Pre-Delivery Inspection

The Pre-Delivery Inspection form must be completed by the Bobcat dealer.

The purpose of the pre-delivery inspection is to make sure that the loader is in correct operating condition when it comes to the dealer and before it is delivered to the customer.

The pre-delivery inspection also lets the factory know when something is wrong with the loader so that action can be taken to prevent the problem from happening in the future.

All items on the inspection form (Fig. 1—4) must be done according to specifications in this manual.

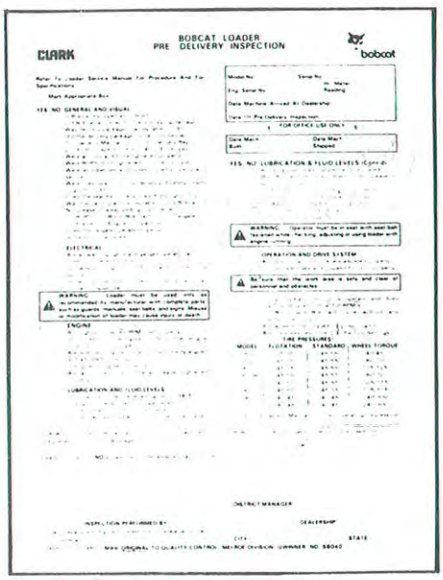


Fig. 1—4 Pre-Delivery Inspection

One copy of the completed form is mailed to:

CLARK EQUIPMENT COMPANY
Melroe Division
Quality Control Dept.
Gwinner, ND 58040

The other copy is for the dealer.

1—1.6 30 Hour Inspection

The 30 hour inspection must be made after the first 30 hours of the loader operation.

The purpose of the 30 hour inspection is:

(1) For adjustment and inspection after the first work period.

(2) To correct wrong maintenance and operation methods.

(3) For demonstration of correct service procedures to customer.

All items on the 30 hour inspection form (Fig. 1—5) must be done by the mechanic according to specifications in this manual.

When the 30 hour inspection has been completed, the form must be signed by (1) the mechanic that completed the inspection, (2) the dealer, and (3) the owner or operator.

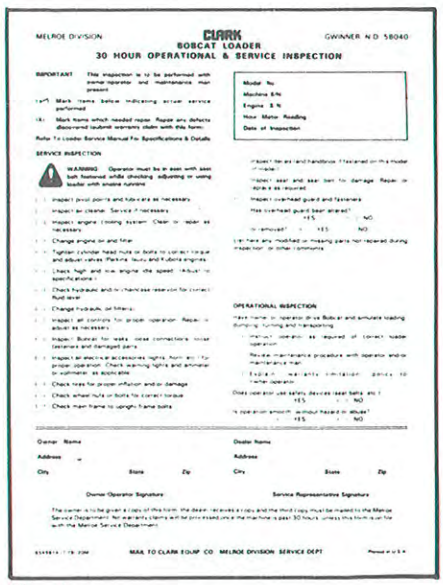


Fig. 1—5 30 Hour Inspection

One copy of the completed form is to be mailed to:

CLARK EQUIPMENT COMPANY
Melroe Division
Service Dept.
Gwinner, ND 58040

One copy is for the owner and one copy for the dealer.

1—2 SERVICE SCHEDULE

Maintenance work must be done at regular intervals. Failure to do so will result in damage to the loader or the engine. The service schedule is a guide for correct maintenance of the Bobcat loader. Do not change from service schedule unless to increase frequency of intervals when the Bobcat loader is operated in very hot, cold, dusty or corrosive conditions.

ITEM	SERVICE REQUIRED	HOURS							
		8-10	25	50	100	200	300	500	1000
Engine Air Cleaner	Empty dust cup.	■							
All Loader Pivot, Control Pedals and Levers	Add grease to lubricant fittings until extra grease shows.	■							
Engine Coolant Level (313)	Check level and add coolant if needed.	■							
Engine Oil	Check and add as needed.	■							
Engine Air Inlet (310)	Check and clean as needed.	■							
Cooling Fins and Shroud (310)	Clean with air pressure.	■							
Engine Oil (310)	Change oil.		■						
Tires	Check tire pressure and add air as needed.		■						
Hydraulic/Transmission Fluid	Check level.		■						
Engine Oil (313)	Change oil and replace oil filter.			■					
Drive Chains	Check tension and adjust as necessary.			■					
Battery	Check electrolyte level and add water as needed.			■					
Lift Arm, Cylinders, Bob-Tach Pivots	Tighten the pivot bolts to 160 ft.-lbs. torque.			■					
Spark Arrestor Muffler	Remove plug. Clean carbon from muffler.				■				
Fan and Alternator Belt (313)	Check tension and adjust as needed.				■				
Hydraulic Fluid Filter	Replace element.				■				
Belt Sheaves	Check to make sure the sheave mounting screws or nuts are tight. Check electric clutch bracket and wires.				■				
Crankcase Breather (310)	Inspect. Service as needed.				■				
Steering Clutches	Adjust when lever movement is over 3" in either direction.				■				
Carb. Sed. Bowl (310)	Remove and clean.				■				
Spark Plugs (310)	Remove, clean and set gap. Install and tighten to specification.				■				
Breaker Points (310)	Remove cover. Check contacts and replace if necessary.				■				
Engine Air Cleaner	Remove and clean. Replace element when necessary.				■				
Engine Cylinder (310)	Remove and clear carbon from cylinder head.					■			
Engine Shroud (310)	Remove to clean cooling fins.					■			
Injector Nozzle (313)	Remove, clean, test and adjust as needed.						■		
Cylinder Head Nuts (313)	Tighten to specifications and adjust valves.						■		
Fuel Filter (313)	Replace the element.						■		
Spark Plug (310)	Replace.						■		
Ignition Timing (310)	Check and adjust as necessary.						■		
Engine Valve Tappets	Check clearance. Adjust as necessary.							■	
Hydraulic/Transmission Fluid	Drain condensation. Check fluid level. Add as needed.							■	
Hydraulic/Transmission Fluid	Replace fluid.								■
Drive Belts	Check for wear. Replace worn belts.								■
Coolant System (313)	Drain system, flush and fill with coolant.								■

■ **On very dusty conditions, clean more often as needed.**

1—3 ENGINE SERVICE (General)

Turn the handle to open the rear door to get access to the engine (On early loaders). Pull the lock pin on the right side of the rear door (Fig. 1—6). Open the rear door to the left.

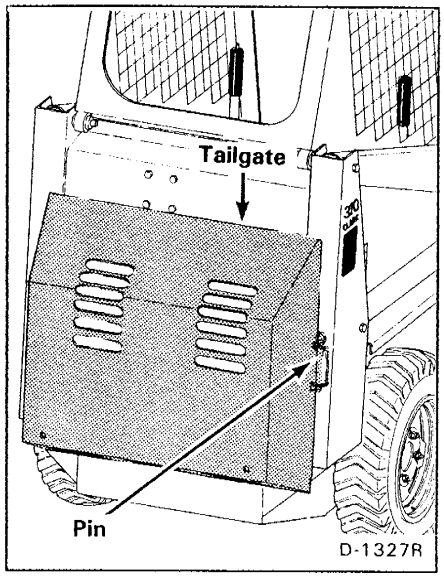
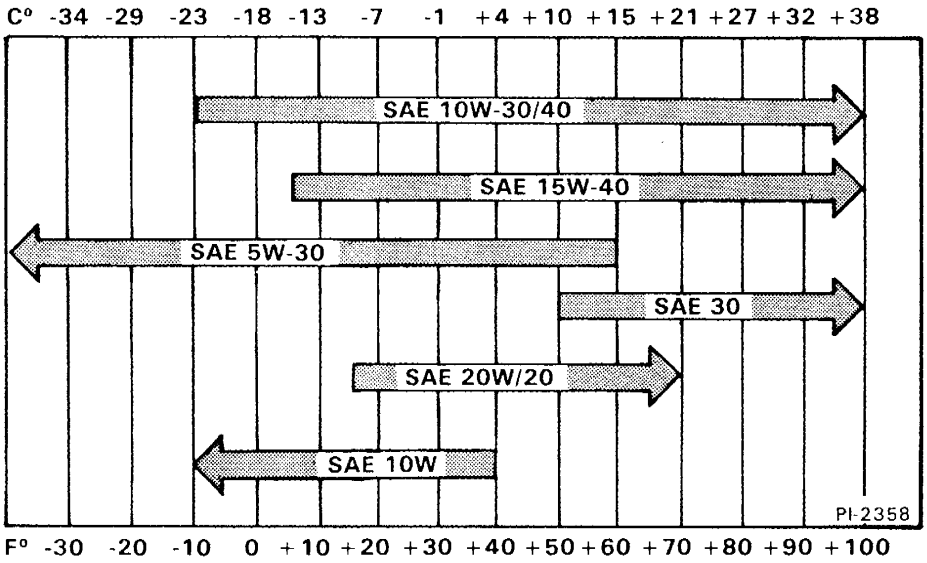


Fig. 1—6 Open Tailgate

1—3.1 Oil Specifications

Use a good quality detergent motor oil that meets API Service Classification SE for gasoline engine (310) and CD for the diesel engine (313). Use the proper SAE viscosity for temperature conditions at the time of starting, not for the highest temperature during the work day (See Chart Below).

RECOMMENDED SAE VISCOSITY NUMBER
(LUBRICATION OILS FOR ENGINE CRANKCASE)



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE
(GASOLINE: USE API CLASSIFICATION SE or SF)
(DIESEL: USE API CLASSIFICATION CC or CD)

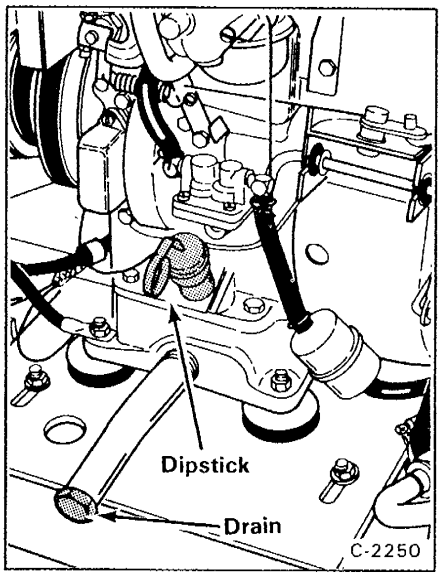


Fig. 1—7 Engine Dipstick Location (310)

1—3.2 To Check Oil, Add or Replace

Check the oil level every 4 hours for the first 50 hours of operation and than check the oil level daily. To check the oil, remove the dipstick (Fig. 1—7) and (Fig. 1—8). Clean the oil from the dipstick and put the dipstick back into the hole. Remove the dipstick again and look for the oil level. The oil level must be between the "FULL" and "LOW" marks on the dipstick (Fig. 1—9).

Add oil as needed, through the dipstick hole on the 310. On the 313, add oil through the oil fill hole. DO NOT OVERFILL.

For new or reconditioned engines, replace the oil after the first 5 hours of operation. Then replace oil after every 25 hours of operation on the 310 and every 50 hours on the 313. Replace the oil more often if the loader is run in dirty conditions.

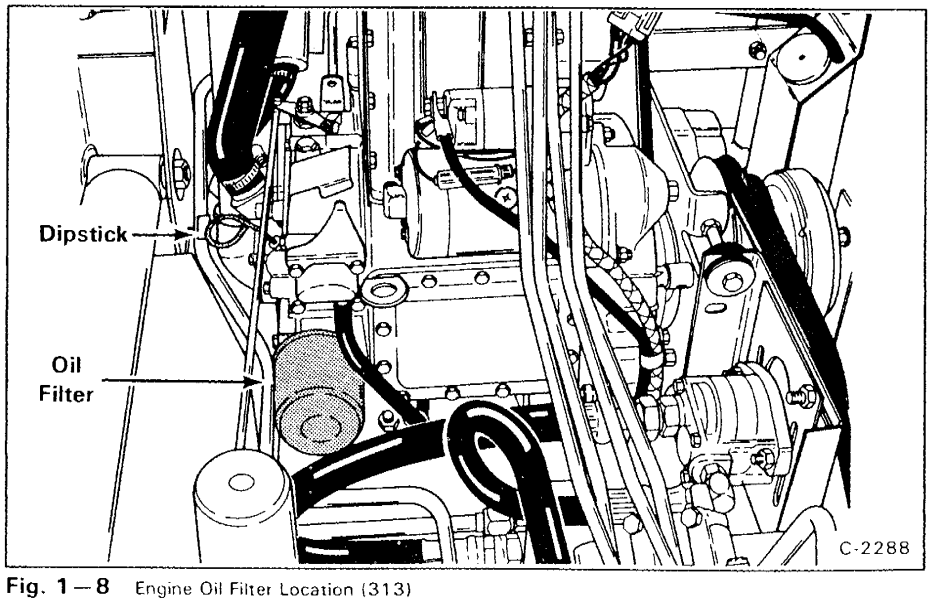


Fig. 1—8 Engine Oil Filter Location (313)

1—3.3 Engine Oil Filter (313)

The 313 oil filter (Fig. 1—8) needs replacement each time the engine oil is replaced (every 50 hours of operation). The oil filter is located in the front of the engine. It is necessary to remove the front two operator enclosure fastening bolts and tilt it to reach the filter.

Use a filter wrench to remove the oil filter. When installing the new oil filter element, turn it on hand tight, only.

To replace the oil and oil filter on the 310 and 313:

(1) Put the loader on a level surface. Stop the engine.

(2) Remove the drain plug and let all the oil out of the engine (Fig. 1—7). (On the 313, the oil drain is located under the alternator.)

(3) Remove the oil filter (313).

(4) Put oil on the gasket on the new oil filter. Install the oil filter and tighten by hand only (313).

(5) Install drain plug.

(6) Put 2 quarts (1,9 liter) of oil in the crankcase on the 310 and put 3.3 quarts (3,1 liter) of oil in the crankcase on the 313.

(7) Start the engine and check for leaks.

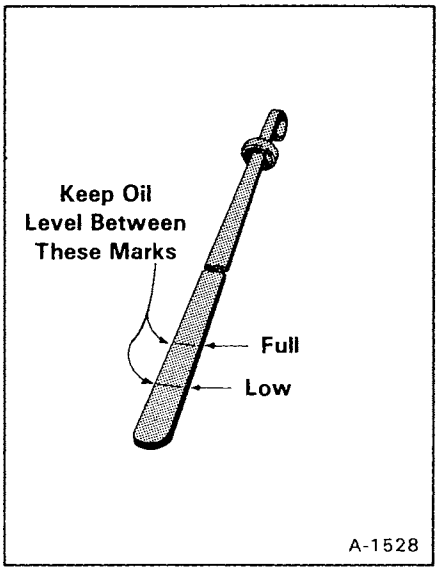


Fig. 1—9 Engine Dipstick

NOTE: Check for a leak at the tubeline on the 313 engine. If there is a leak, replace tubeline with a hose and plug (Fig. 1—9a) (See the Parts Book or Microfiche for the correct part numbers).

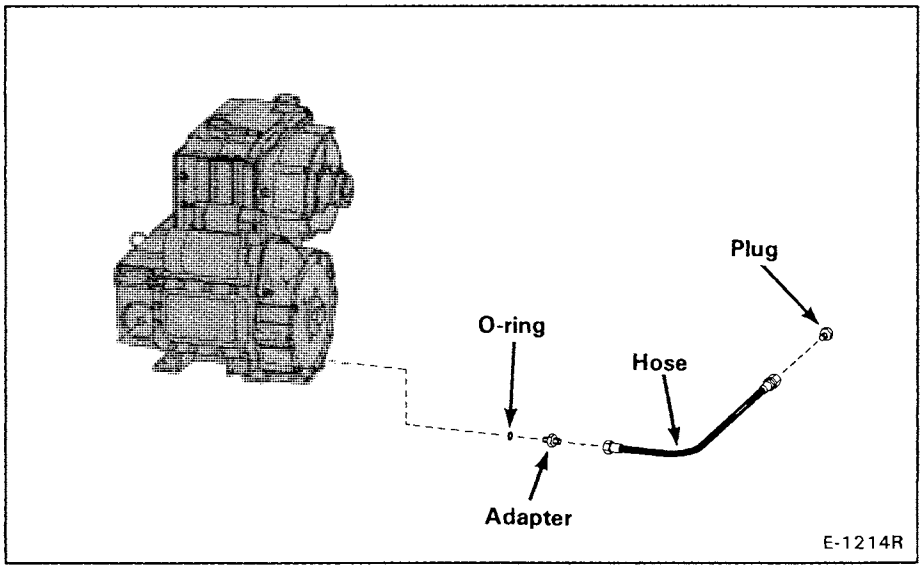


Fig. 1—9a Engine Oil Drain Tubeline

1—3.4 Crankcase Breather (Fig. 1—10)

A crankcase reed type breather is used to keep a slight vacuum in the crankcase.

Remove the components, check the reed valve and gasket and clean the filter every 80 - 100 hours.

Replace the reed valve, gasket and filter after the engine has been reconditioned.

A faulty breather can cause high engine temperature and oil leakage at the engine seals.

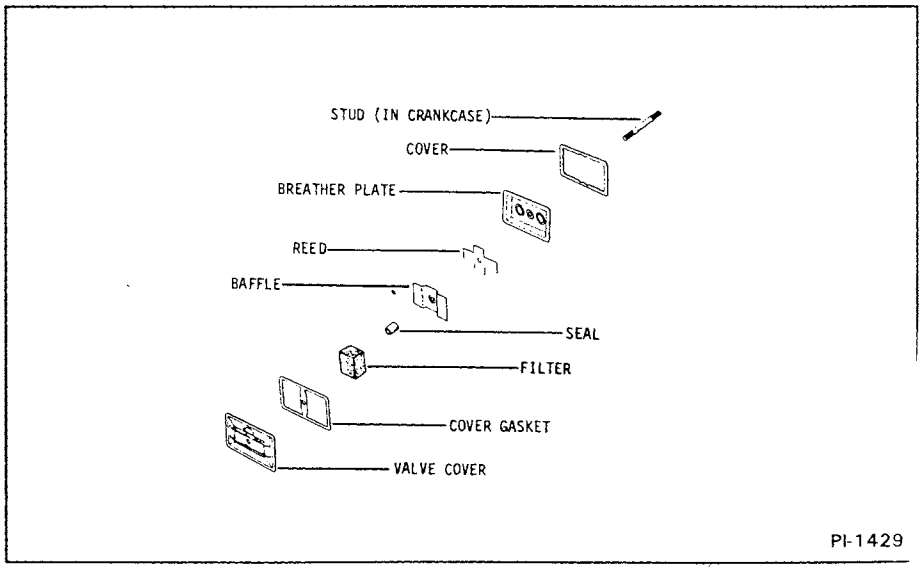


Fig. 1—10 Crankcase Breather (310)

1—3.5 Air Cooling System (310)

The flywheel is designed to push air through the cover, around the cylinder block to cool the engine. The air screen and cooling fins must be kept clean and free of debris so that there is no restriction of air flow.

To clean cylinder head fins:

(1) Remove the air screen from the flywheel.

(2) Remove the covers from the engine.

(3) Clean debris from cooling fins air screen.

NOTE: DO NOT operate engine with any of the engine covers or screen removed.

(4) Install the covers and air screen.

1—3.6 Engine Cooling System (313)

Check the coolant level in the coolant recovery tank (Fig. 1—11) and add clean coolant daily, as necessary, to prevent possible overheating of the engine.

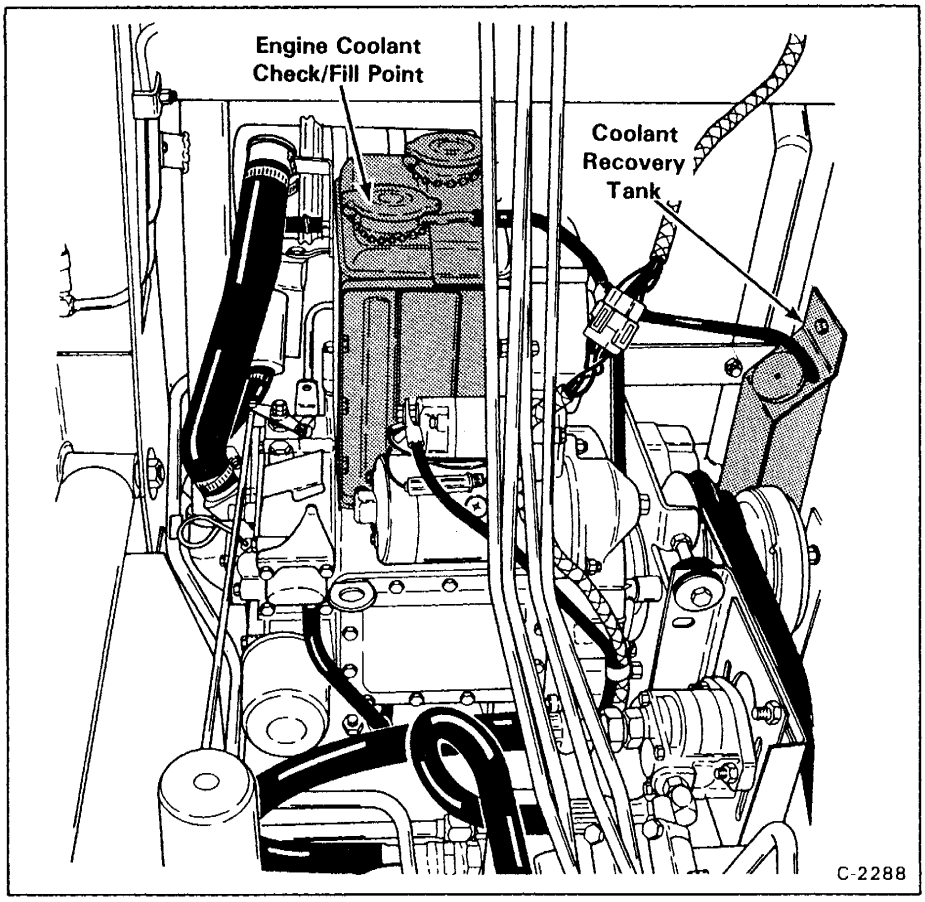


Fig. 1—11 Cooling System (313)

1—3.7 Spark Arrestor Muffler

The Model 310 (S/N 14276 & Above) & Model 313 (S/N 11268 & Above) are equipped with spark arrestor muffler. The spark arrestor muffler must be serviced ever 100 hours of loader operation.

Use the following procedure to service the spark arrestor muffler:

(1) Stop the engine. Open the rear door.

(2) Remove the plug at the bottom of the muffler (Fig. 1—11a & Fig. 1—11b).

⚠ WARNING

DO NOT run the engine in an area that has materials that can cause combustion.

(3) Start the engine.

(4) Hold a piece of wood over the exhaust outlet for 10 seconds. Stop the engine.

(5) Install the plug.

(6) Close the rear door.

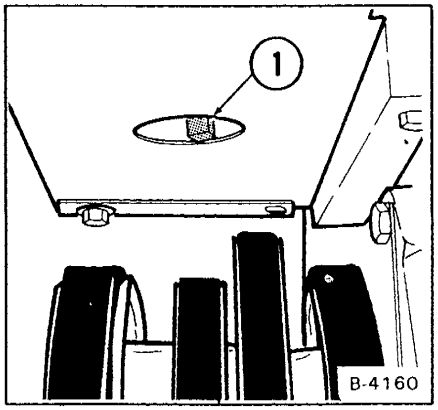


***Fig. 1—11** Spark Arrestor Muffler (310)

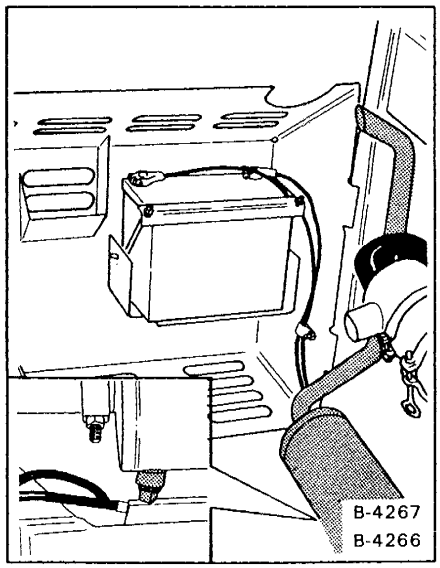


***Fig. 1—11b** Spark Arrestor Muffler (313)

To check the coolant level:

(1) Remove the cover on the recovery tank (Fig. 1—11).

(2) Fill to correct level of 1/3 full when engine is cold and 2/3 full when engine is hot.

(3) Use coolant with anti-freeze added when there is a possibility of freezing temperatures.

1—3.7 Cleaning The Cooling System (313)

⚠ WARNING

NEVER remove radiator cap when engine is hot.

The air passage area of the radiator core must be kept clean of debris. Use water spray or an air pressure to remove any debris.

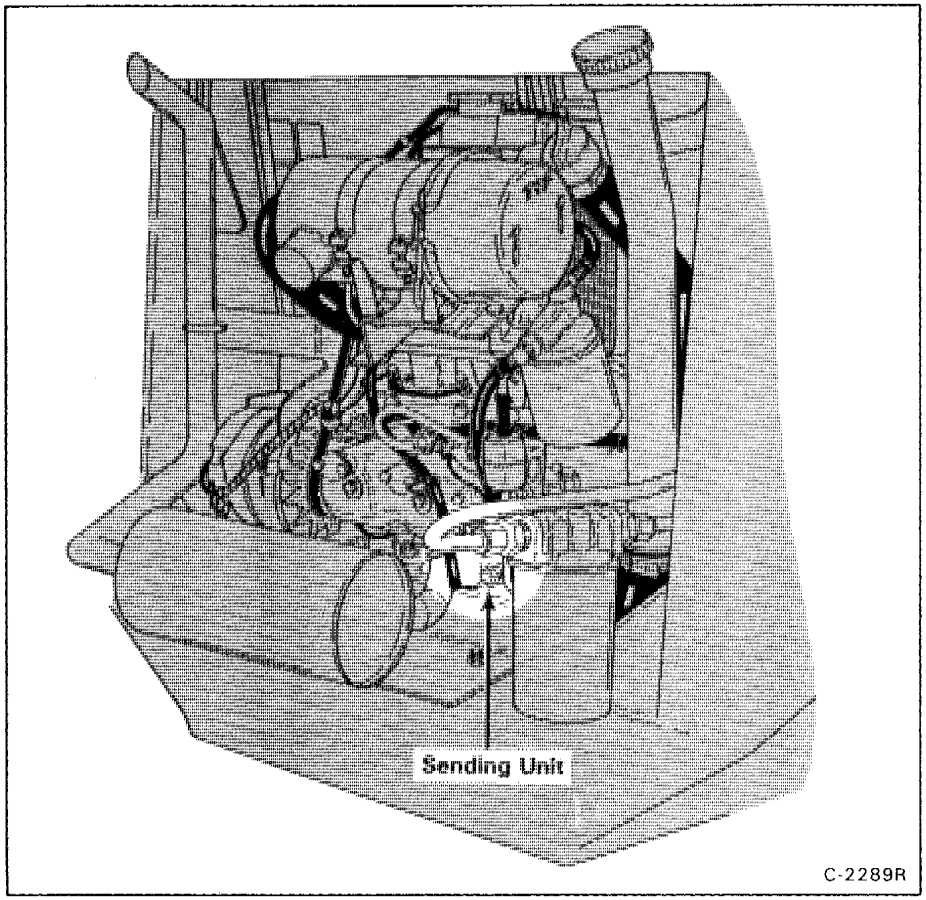


*Fig. 1—12 Draining Coolant (313)

⚠ WARNING

Be sure to wear safety glasses to prevent possible eye injury when using air pressure to clean the radiator core.

The cooling system must be cleaned after every 1000 hours of operation.

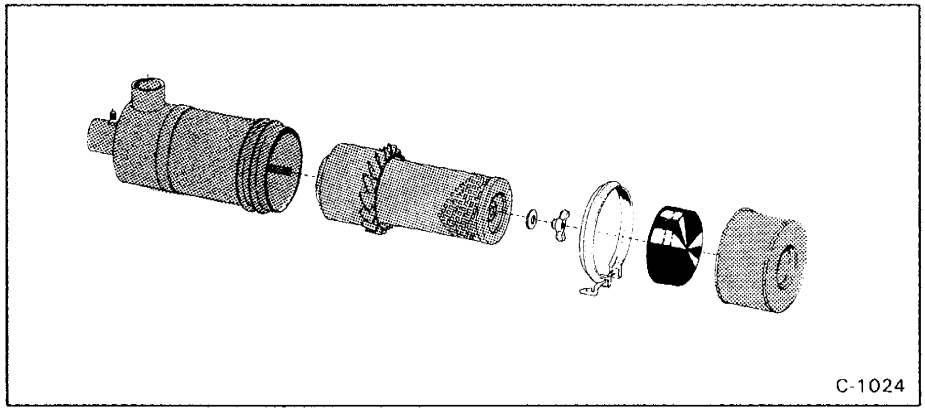


Fig. 1—13 Air Cleaner

To remove coolant:

(1) Remove the sending unit (Fig. 1—12) and let out the coolant.

NOTE: The radiator pressure cap must be removed to drain out all the coolant from the engine.

(2) Install and tighten the sending unit and fill the system with a cleaning solution and start engine, run until operating temperature is reached.

(3) Drain and flush the system completely with clean water.

(4) Add coolant containing a corrosion preventive solution. Fill to just below the over flow pipe.

NOTE: Make sure you install the low-pressure radiator cap (marked 0.9) on the fill pipe with the hose line to the recovery tank.

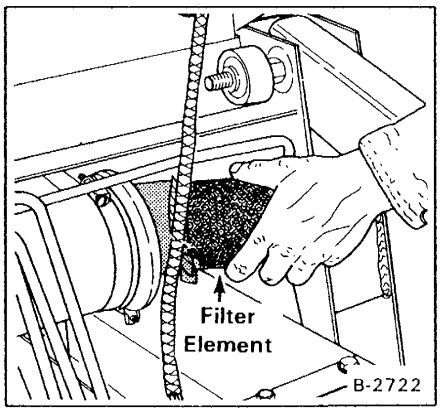


Fig. 1—14 Remove Air Cleaner Element (310)

1—4 AIR CLEANER SYSTEM (Fig. 1—13)

(1) Remove the dust cup and clean it daily (Fig. 1—13, Item 1).

(2) Remove the element only when replacement is necessary. Contamination can easily enter the system whenever the element is removed (Fig. 1—14 and Fig. 1—15). Make sure to clean the inside of the container before installing new element. Also check that the gasket is correctly in place and the arrow on the dust cup is up.

(3) Inspect complete air inlet system and make replacement of any parts with defect.

(4) Check operating condition of system as follows:

a. Run engine at idle.

b. Hold a piece of wood over the inlet pipe of the air cleaner (Fig. 1—16 or Fig. 1—17). The engine must slow down and finally stop.

c. If the engine does not stop, the system has a leak. Inspect and make repair of system as necessary.

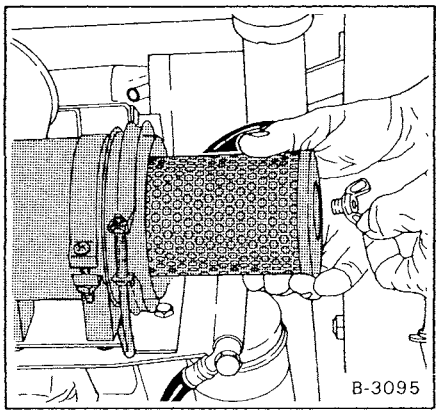


Fig. 1—15 Remove A/C Element (313)

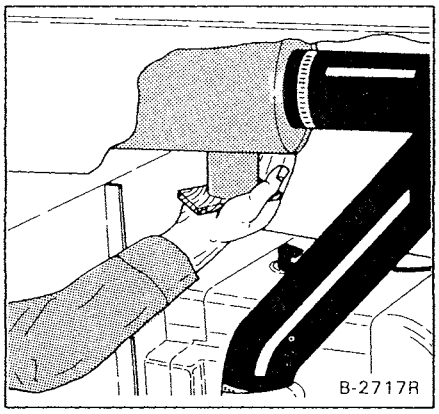


Fig. 1—16 Check Air Cleaner System (310)

1—5 FUEL SYSTEM

Use only regular or non-leaded gasoline in the 310 engine. Do not use premium gasoline.

Use only fresh and clean number 2 diesel fuel in the 313 engine.

⚠ WARNING

Never fill the loader fuel tank when the engine is running or hot!

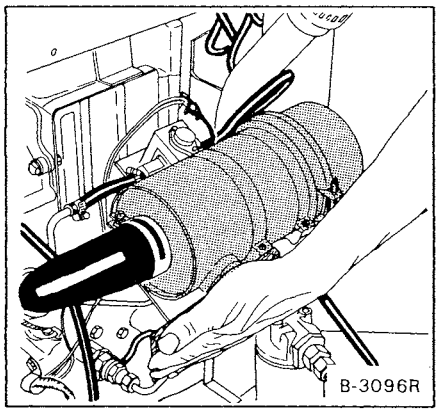


Fig. 1—17 Check Air Cleaner System (313)

1—5.1 Fuel System Service

Remove the filler cap to service fuel tank as follows (Fig. 1—18):

(1) Use a clean approved safety container to refuel.

(2) The ignition must be off and the engine cooled.

(3) Add fuel only in well ventilated area, free from open flames or sparks (NO SMOKING).

(4) Use only clean fuel.

(5) Be sure to tighten the cap on the filler pipe.

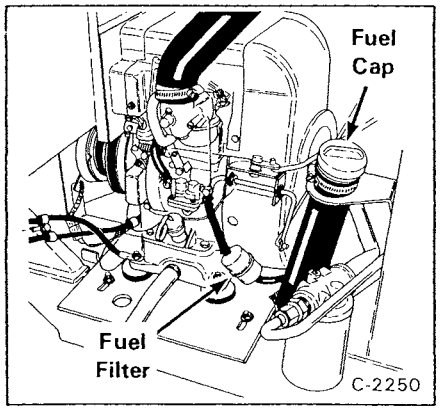


Fig. 1—18 Fuel System (310)

1—5.2 Fuel Filter (310)

An inline fuel filter is located next to the carburetor (Fig. 1—18).

To check or replace the filter element:

(1) Remove fuel lines from filter.

(2) Check by blowing through the element in the direction of the arrow (must have free passage of air).

NOTE: When installing a filter element be sure the arrow is pointed in the direction of the carburetor.

(3) Inspect for leaks after installation of an element.

1—5.3 Fuel Filter (313)

Two fuel filters are used.

The spin-on fuel filter is located below the air cleaner (Fig. 1—19, Item 1).

The inline filter is located by the fuel pump (Fig. 1—19, Item 2).

The filter element must be replaced at regular intervals (See Service Schedule) or when ever it has become contaminated due to dirt or water.

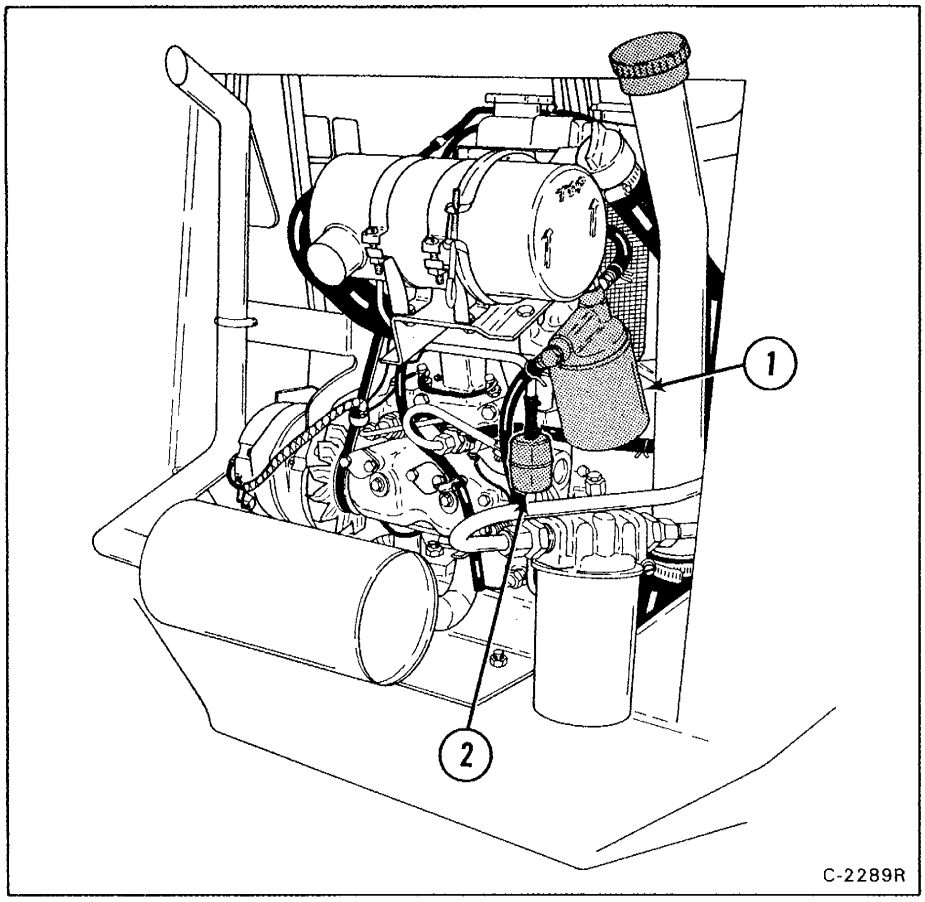


***Fig. 1—19** Fuel System Service (313)

To replace the spin-on filter element:

(1) Clean the filter head area.

(2) Remove the filter element by turning it in a counterclockwise direction.

(3) Put a small amount of oil on the rubber seal of new filter element and install it by turning it on hand tight only.

To remove air from fuel system:

(1) Loosen the plug on the injector pump (Fig. 1—19a, Item 1).

(2) Turn the switch key to the "on" position. This will activate the electric fuel pump.

(3) When the fuel is free of air coming from the plug, tighten the plug. Turn the switch key to "off".

(4) Loosen the pipe nuts on the injector nozzles (Fig. 1—19b, Item 1).

(5) Turn the switch key to the "start" position to turn the engine.

NOTE: Leave speed control lever in low idle position.

(6) Continue turning engine until there is no evidence of air coming from the loosened pipe nuts, then tighten the nuts. Turn switch key to "off".

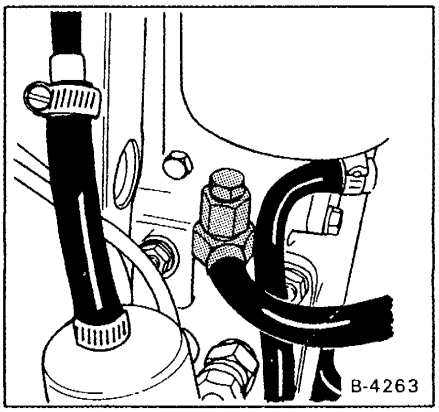


***Fig. 1—19a** Injection Pump Vent

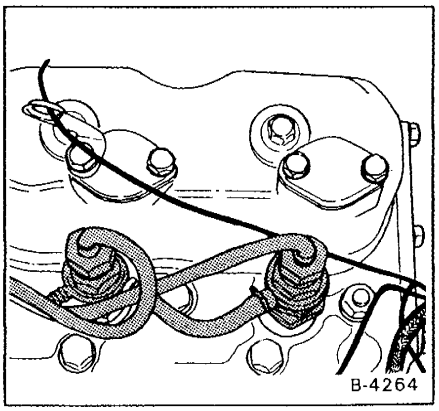


***Fig. 1—19b** Injectors

1—5.4 Electric Fuel Pump

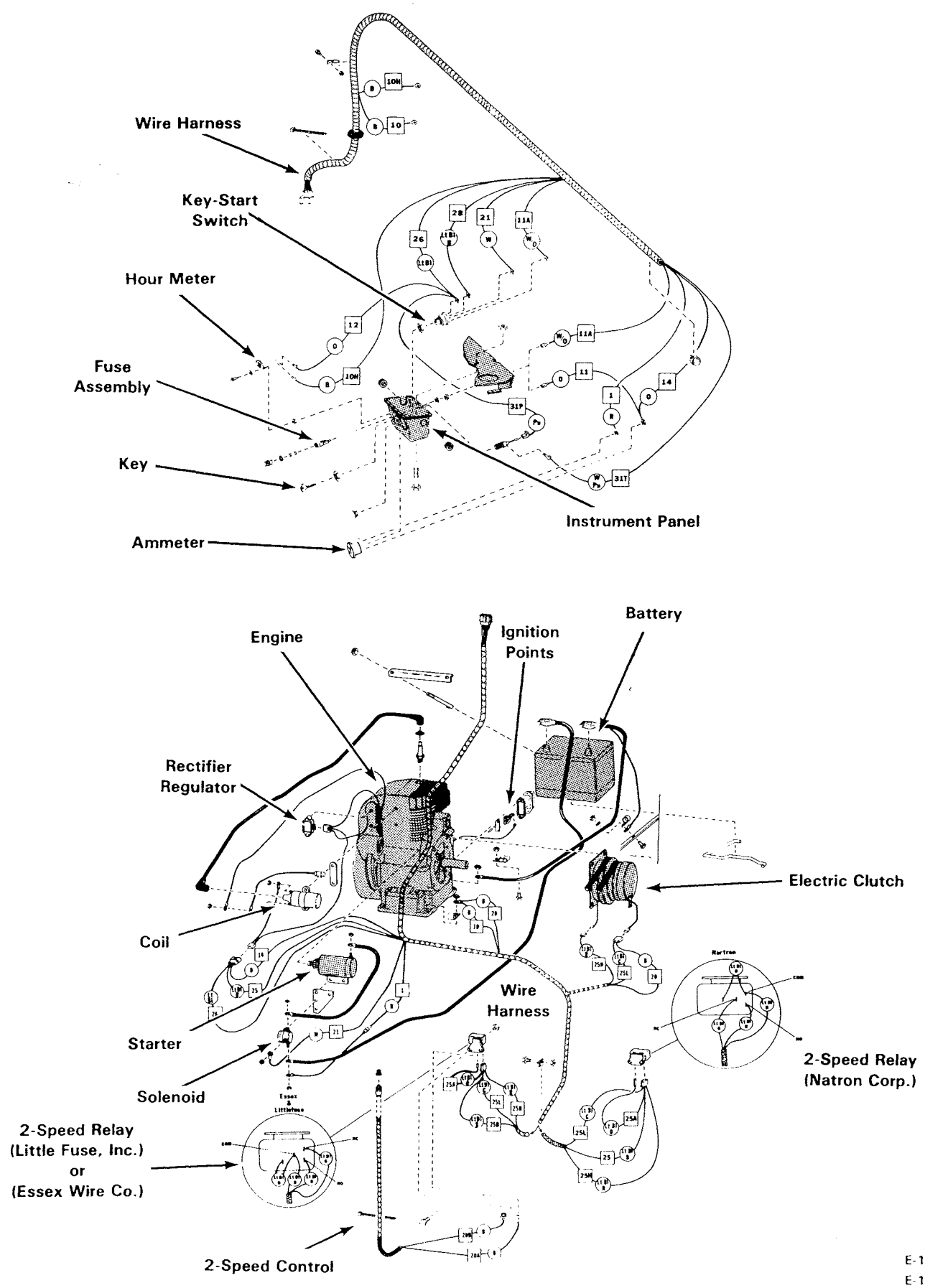
If electric fuel pump is replaced it is necessary to:

(1) Put 5 - 10 lbs. PSI pressure into the fuel tank.

(2) Turn switch key to "on" to activate electric fuel pump.

(3) Loosen the plug on the injector pump (Fig. 1—19, Item 1).

(4) When the fuel is free of air coming from plug, tighten the plug. Turn switch key to "off".



* Fig. 1—20 Electrical Wiring Diagram (310)

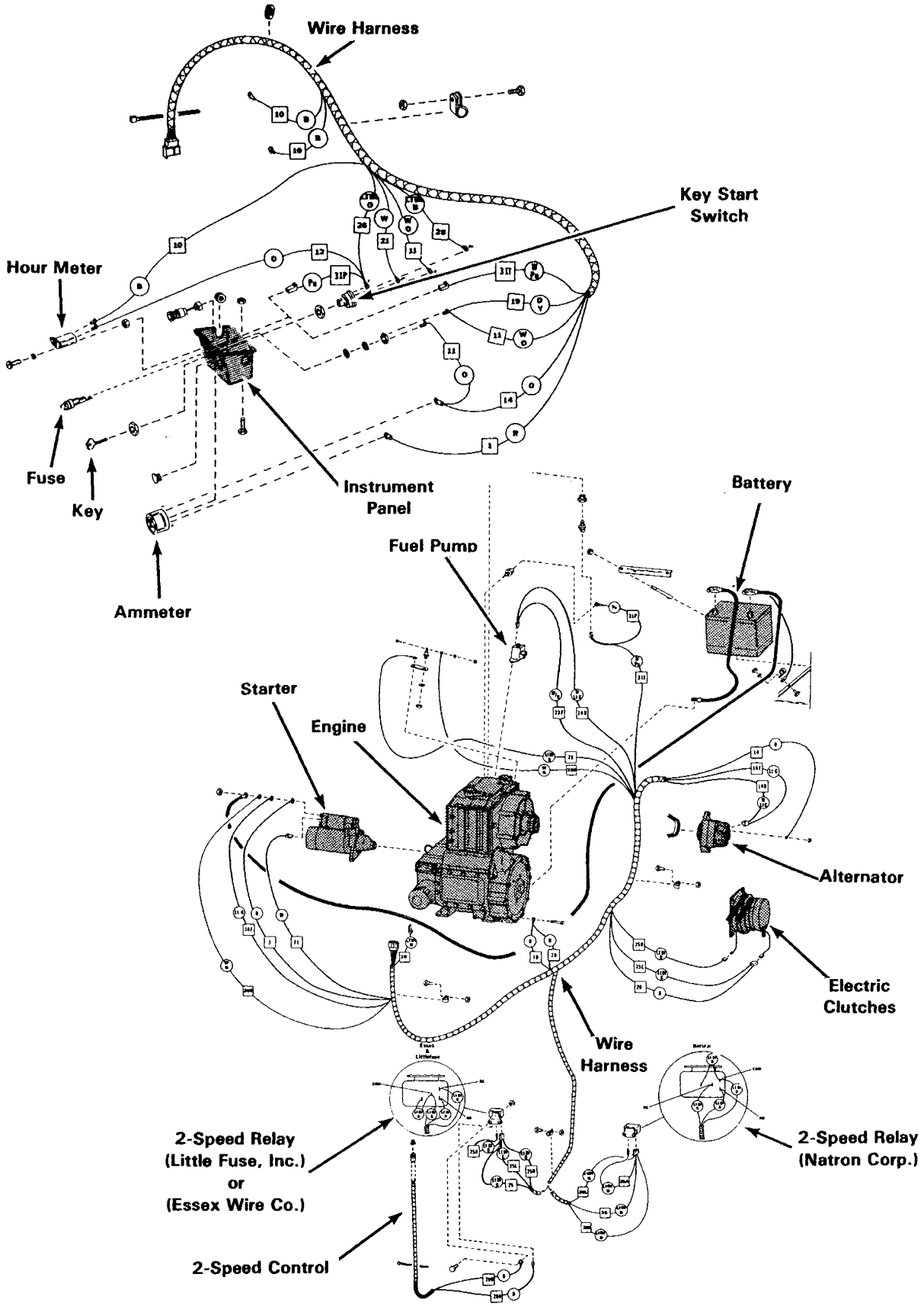


*Fig. 1—20 Electrical Wiring Diagram (313)

1—6 ELECTRICAL SYSTEMS

The 310 loader is equipped with a 12 volt, 15 amp. negative ground, flywheel alternator charge system (See Fig. 1—20 for wiring diagram).

The 313 loader is equipped with a 12 volt, 42 amp. alternator charge system (See Fig. 1—21 for wiring diagram).

Service the electrical system as follows:

(1) Check the battery electrolyte level and when low, fill to the mark with distilled water.

(2) Keep the battery cables and terminals clean and tight. Remove acid corrosion with a baking soda and water solution. Coat the terminals with grease to prevent a corrosion build up.

(3) Inspect for bare or loose wiring.

(4) There is a fuse in the electrical system. These fuses protect the electrical system from an electrical overload. If a fuse opens, it is from an overload in the circuit. Find the reason for the overload and make a repair before the loader is operated again. Look for a bare wire or short in the electric system.

1—6.1 Fan and Alternator Belt Tension (313)

To adjust the tension:

(1) Loosen the adjustment screw on the alternator.

(2) Move the alternator to set tension of the belt at 1/4" (7 mm) freeplay when pressed by thumb.

(3) Tighten the alternator adjustment screw.

NOTE: Be sure that the alternator sheave and the fan sheave are in straight alignment.

1—6.2 Ignition System and Ignition Testing (310)

Difficult starting, loss of power and rough operation are caused by ignition problems. All components must be in good condition. Correct ignition timing is important. Rough operation can also be caused by a bad electrical ground. Clean and tighten the ground strap on the engine.

To test for ignition problems, remove the wire from the spark plug and hold the wire about 1/16" to 1/8" (1.5 to 3 mm) from the cylinder block (ground). Operate the starter and look for a white/blue spark from the wire. If spark is white/blue the problem is not the ignition coil, condensor or points, although the spark plug could be faulty. If the spark is red, check the ignition coil.

1—6.2 Cleaning or Replacing Spark Plugs

Clean the area around the spark plug before removing it to keep dirt from falling into the combustion chamber.

After every 100 hours, remove the plug. Check the condition and set the gap.

(1) Remove wire from spark plug.

(2) Remove spark plug.

(3) Remove carbon deposits from spark plug.

NOTE: DO NOT use a wire brush or a knife blade to remove the deposit from the spark plug.

(4) Set spark plug gap to .025 in. (,635 mm).

(5) Install spark plug and tighten to 22 ft.-lbs. (29.8 Nm) torque.

Replace the spark plug after every 300 hours of operation.

1—6.3 Ignition Points and Condenser (Fig. 1—22)

If the engine does not run at all or if it runs rough at high speed the points could be causing the problem.

Check the points for burning or corrosion. Normal operation will cause some, but too much burning or corrosion can be an indication of a worn condenser.

To make and adjustment of point gap:

(1) Turn engine until rubbing block is on high point of cam.

(2) Put correct thickness feeler gauge between contact points.

(3) Loosen adjustment screw. Move breaker arm contact until the gap is .020 in. (,508 mm). Tighten adjustment screw.

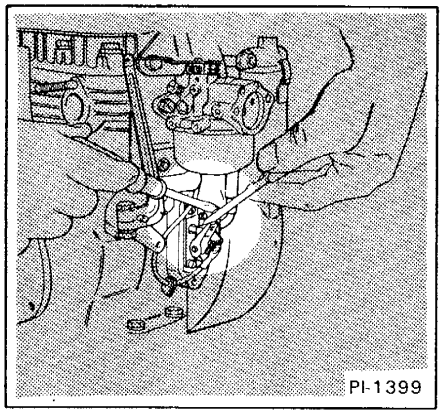


*Fig. 1—22 Setting Breaker Points

1—6.4 Ignition Timing (Fig. 1—23)

There is a timing sight hole in the blower cover of the engine. The flywheel has two marks on it. The "T" mark is for Top Dead Center (TDC) and the "S" mark is for the Spark Point, which is 20 degrees before TDC. When you install ignition points, set the point gap at .020 in. (,508 mm). Rotate the engine by hand. The "S" mark should show in the sight hole when you hear the spark if the timing is correct.

When you use a timing light to set the timing, align the "S" mark in the sight hole and put a mark on the flywheel and the housing for easier use. Start the engine and run it at 1200 to 1800 RPM. The marks should align or the "S" can be seen in the sight hole. To make a timing adjustment.

(1) Remove the points cover.

(2) Loosen the adjustment screw on points.

(3) Move the stationary part of the points until timing marks align.

(4) Tighten the adjustment screw and install point cover.

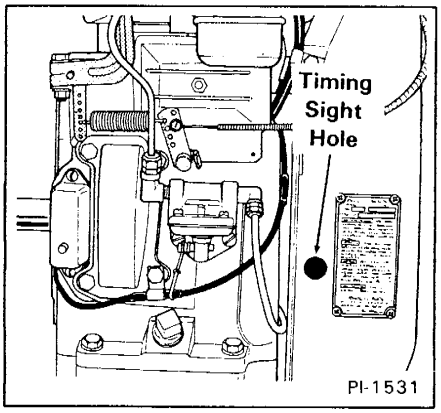


Fig. 1—23 Ignition Timing Procedure

1—6.5 Using An Extra Battery

If it is necessary to use an extra battery to start the engine, be careful.

⚠ WARNING

BE SURE TO WEAR GOGGLES WHEN YOU WORK NEAR BATTERIES. DO NOT LET ACID MAKE CONTACT WITH YOUR BODY OR WITH CLOTHING YOU ARE WEARING.

(1) Make sure the ignition is in the "off" position.

(2) Be sure that the battery to be used is of the same voltage.

(3) Battery terminals have identification marks. The positive terminal is marked (+) and the negative terminal is marked (-).

(4) Be sure that the negative terminal (-) is connected to the engine.

⚠ WARNING

NEVER CONNECT BATTERY TO THE EXTRA BATTERY WHEN THE BATTERY FLUID HAS BECOME SOLID BECAUSE OF FREEZING TEMPERATURES. BE SURE BATTERY FLUID IS AT CORRECT LEVEL.

(5) Connect the end of the first cable to the positive terminal (+) of the extra battery. Connect the other end of the same cable to the positive terminal (+) of the loader battery.

(6) Connect the end of the second cable to the negative terminal (-) of the extra battery. Connect the other end of the second cable to the engine. DO NOT connect directly to negative terminal (-) of the loader battery. Connecting cable directly to the terminal (-) of the loader battery can cause a spark and destroy the battery and cause personal injury.

(7) Keep the cables away from fans and belts.

(8) Start the engine.

(9) After engine has started, first remove the cable connected to the engine.

(10 Then remove cable from the loader battery positive terminal (+).

IMPORTANT

DAMAGE TO ALTERNATOR WILL OCCUR IF:

(1) Engine is operated with battery cables disconnected.

(2) Cables are connected when using fast charger or when welding on the loader. (Remove both cables from battery) (Ground cable first).

(3) Extra battery cables are connected to the wrong terminals of the loader battery.

1—6.6 To Install New Battery

To install new battery and remove old battery:

(1) Note the position of the positive terminal (+) and the negative terminal (-) of the battery. To remove the old battery, pull and lift up on the holddown lever (Fig. 1—24) or remove the two nuts and remove battery holddown bracket (Fig. 1—25).

(2) Clean the cable end connections with a wire brush.

(3) Place the new battery in the same position as the old battery. Fasten the holddown.

(4) Make certain that the battery terminals do not touch any metal holddown or other body metal.

(5) Connect the cable tightly. CONNECT THE GROUND CABLE LAST TO AVOID SPARKS.

NOTE: If the battery cables are too close to the holddown bracket, grind away 1/4" (6, 35 mm) on the holddown bracket on the battery (Fig. 1—25a). Fasten the positive cable to the negative cable with a plastic strip (Fig. 1—25b) to keep the cables from getting between the rear door and frame.

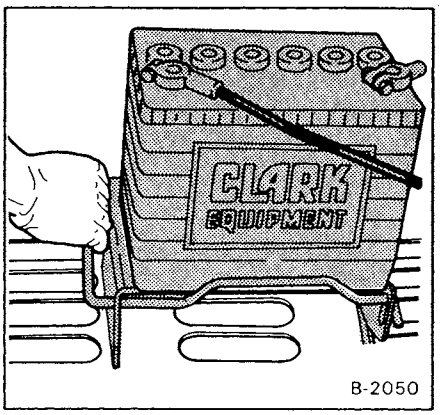


Fig. 1—24 Removal of Battery (Early)

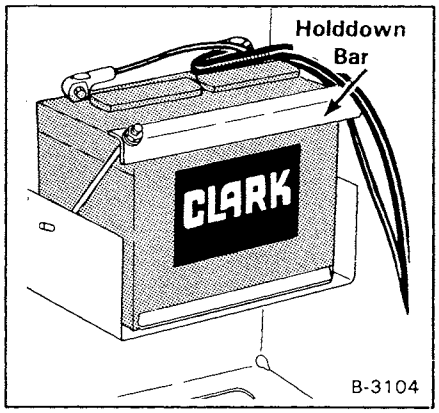


Fig. 1—25 Removal of Battery (Current)

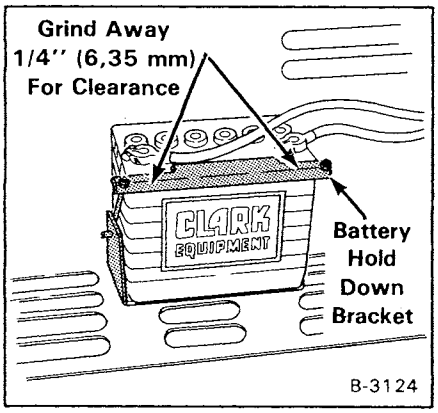


***Fig. 1—25a** Battery Holddown Bracket

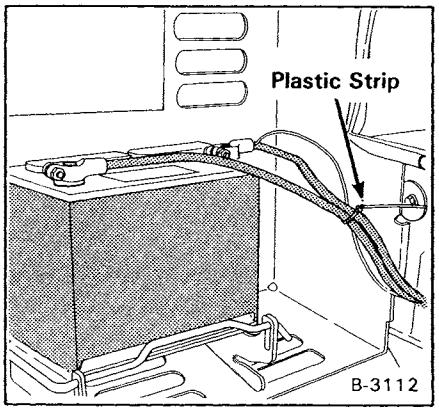


***Fig. 1—25b** Fastening Battery Cables

1—7 HYDRAULIC SYSTEM (313)

A belt driven gear-type hydraulic pump is used to supply hydraulic fluid to the control valve to operate the lift and tilt cylinders and the auxiliary function. Hydraulic fluid is stored in a reservoir located under the operator guard (Fig. 1—26). The hydraulic fluid is cleaned by a 10 micron filter which is located at the rear of the loader (Fig. 1—28).

1—7.1 Checking Hydraulic Fluid Level

(1) Lower the lift arms and tilt the Bob-Tach fully back. Stop the engine.

(2) Open the check valve on the hydraulic reservoir (Fig. 1—27). If fluid comes out of open valve the reservoid level is correct.

(3) If no fluid flows, add recommended fluid (See "Specifications") until fluid comes out of open check valve. Then close the check valve and add one additional quart (,946 L) to the reservoir.

NOTE: Full capacity of hydraulic reservoir is one quart (,946 L) over the check valve.

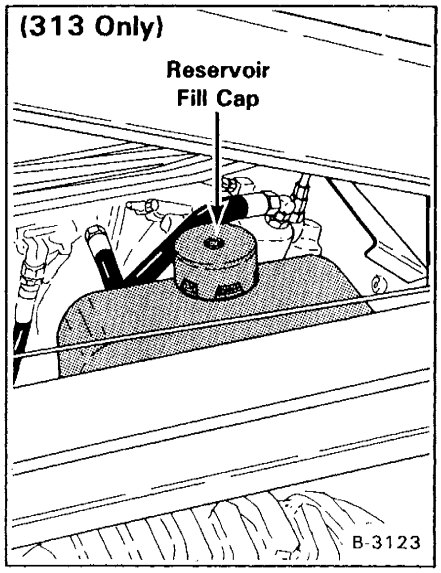


Fig. 1—26 Hydraulic Reservoir/Fill Location

1—7.2 To Replace Hydraulic Fluid

The hydraulic fluid needs replacement after each 1000 hours of loader operation (See "Service Schedule").

(1) Open the rear door.

(2) Put a bucket under the hydraulic filter and use filter wrench to remove filter element.

(3) Let oil flow from the filter mounting base into the bucket until the reservoir is empty.

(4) Put oil on the rubber gasket of the filter element and install the filter element on the mounting base and tighten it hand tight.

(5) Remove the front nuts and bolts for the operator enclosure and lift it up and toward the rear of the loader.

NOTE: Put a support under the operator guard to hold it when it is tilted back.

(6) Remove the breather cap from hydraulic reservoir (Fig. 1—26).

(7) Open the level check valve at the reservoir. Add Recommended fluid to the reservoir until it flows out of open check valve.

(8) Close the check valve and put additional quart (,946 L) of fluid into the reservoir.

(9) Replace breather cap. Lower and fasten operator enclosure.

(10) Start the engine. Check for hydraulic leaks. Repair any leaks.

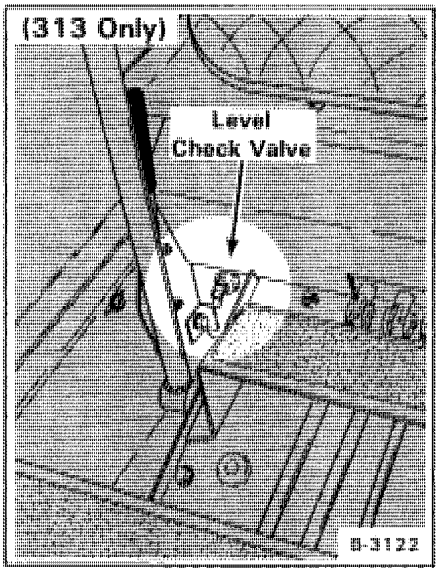


Fig. 1—27 Hydraulic Reservoir Level Check

1—7.3 To Replace Hydraulic Filter

Replace the hydraulic filter element after every 100 hours of loader operation.

(1) Raise the rear of the loader about 6 inches.

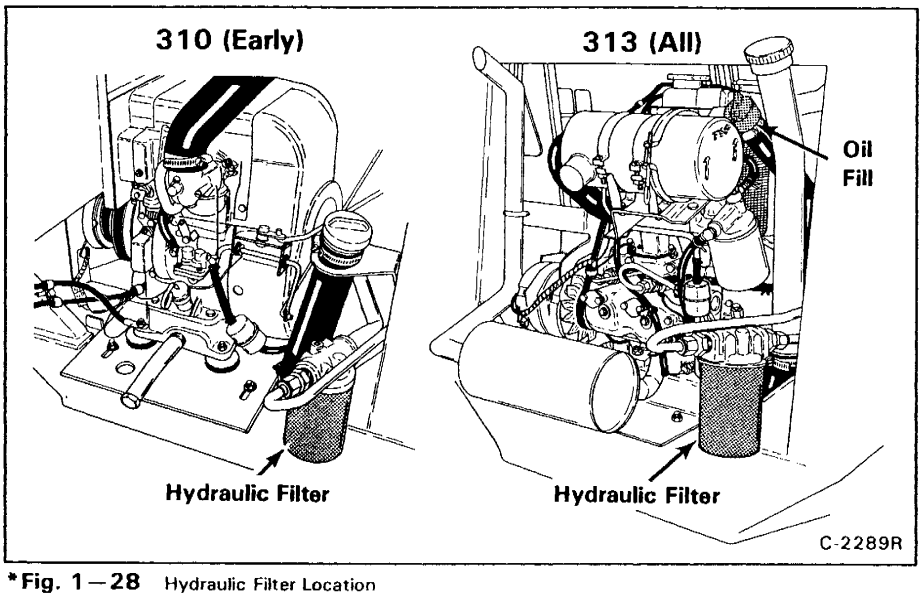


*Fig. 1—28 Hydraulic Filter Location

(2) Open the rear door.

(3) Use a filter wrench to remove the hydraulic filter element (Fig. 1—28).

(4) Put oil on the rubber gasket of the new filter element.

(5) Install the new filter element and tighten it hand tight.

(6) Lower the loader. Start the engine and check for leaks.

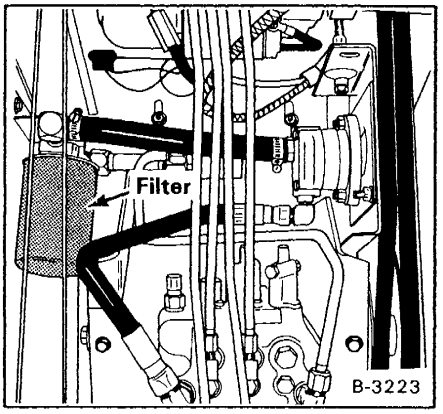


Fig. 1—28a Hydraulic Filter (Current)

1—8 HYDRAULIC SYSTEM (310)

In the 310 loader the hydraulic reservoir is the mechanical drive chain case. A belt driven, gear type, hydraulic pump is used to supply hydraulic fluid to the control valve to operate the lift and tilt cylinders and the auxiliary function.

On 310 loaders with serial number 13695 or below the hydraulic fluid is cleaned by a 10 micron filter which is at the rear of the loader (Fig. 1—28).

On 310 loaders with serial number 13696 and above or 310 loaders with conversion kit on the hydraulic line, the fluid is cleaned by a 33 micron filter which is shown in (Fig. 1—28a).

1—8.1 Check Hydraulic Fluid Level

To check the hydraulic fluid level in the hydraulic/chaincase reservoir.

(1) Place the loader on a level surface.

(2) Lower the lift arms and tilt the Bob-Tach fully back. Stop the engine.

(3) Loosen the lower check plug on the right side of the chaincase (Fig. 1—29). If fluid flows the level is correct. If no fluid flows, tighten the check plug.

(4) Loosen the upper check plug (Fig. 1—29). Remove the reservoir fill plug (Fig. 1—30). Add recommended fluid until it flows at the upper check plug. Tighten the check plug and replace the chaincase fill plug and tighten.

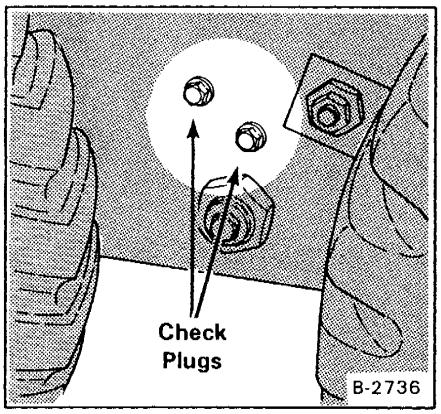


Fig. 1—29 Hydraulic Reservoir Plug

1—8.2 To Replace The Hydraulic Fluid

The hydraulic fluid needs replacement every 1000 hours of loader operation (See "Service Schedule").

(1) Raise the rear of the loader about 6 inches.

(2) Remove the chaincase drain plug from the front of the reservoir/chaincase (Fig. 1—31). Let fluid drain out. Replace the drain plug.

NOTE: Make an inspection of fluid to see if there are any abrasive contaminants present. If there are abrasive contaminants it could be there is a sprocket, chain or bearing failure. Remove cover and inspect and flush reservoir chaincase.

(3) Lower the loader and fill the reservoir/chaincase to the upper check plug with fluid (Fig. 1—29).

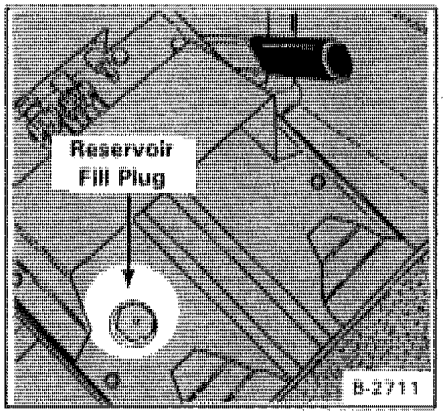


Fig. 1—30 Reservoir Fill Plug

1—8.3 Remove Hydraulic Fluid Condensation

Remove condensation (water) from the reservoir/chaincase every 500 hours of loader operation or more often in a high humidity conditions.

(1) Raise the rear of the loader about 6 inches. Leave it in this position for 6 to 8 hours.

(2) Remove chaincase drain plug from the front of the reservoir/chaincase (Fig. 1—31). Let condensation drain out. Replace drain plug.

(3) Lower the loader and fill the reservoir to the upper check plug level with the recommended fluid (Fig. 1—29).

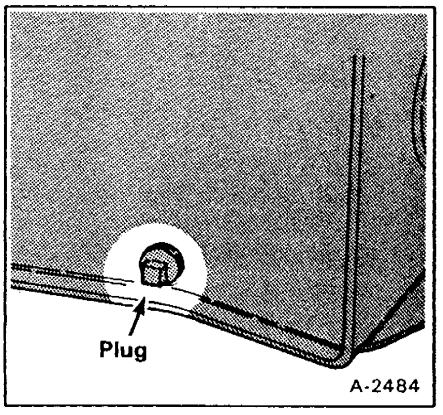


Fig. 1—31 Drain Plug

1—8.4 To Replace The Hydraulic Filter

Replace the hydraulic filter element every 100 hours of loader operation.

(1) Remove the hydraulic filter element using a filter wrench (Fig. 1—28) for 310 loaders with serial number 13695 and below. The 310 loader with serial number 13696 and above or 310 loaders with the conversion kit on the hydraulic line refer to (Fig. 1—28a).

(2) Clean the base of the filter mounting base.

(3) Put oil on the rubber gasket of the filter element.

(4) Install the filter element and tighten hand tight.

(5) Start the engine. Check for leaks.

1—9 DRIVE SYSTEM

The loader has 3 belts. One belt is a hydraulic pump drive and the other 2 belts are the high and low speed range drive belts. The chaincase contains the chain reduction drive system, clutches, roller chains and sprockets. These parts run in an oil reservoir.

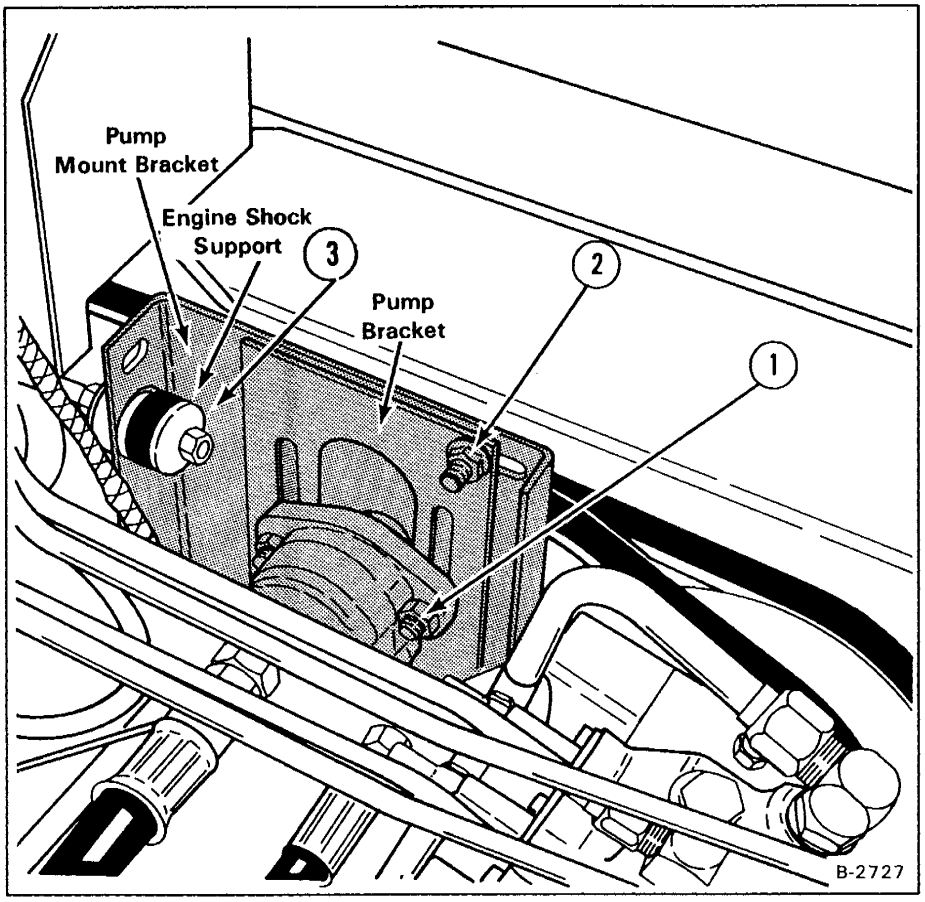


Fig. 1—32 Pump and Pump Mounting Bracket

1—9.1 Adjustment Of Driven Belts

To adjust the belts:

NOTE: See figure 1—33A for correct movement and force at center of the belts.

(1) Loosen the hydraulic pump mounting bolts (Fig. 1—32, Item 1).

(2) Loosen the bolts for the hydraulic pump mounting bracket (Fig. 1—32, Item 2).

(3) Loosen the nuts for the engine shock mount (Fig. 1—32, Item 3).

(4) Loosen the bolts on the engine mounting plate.

(5) Move the engine mounting plate to the rear with a pry bar to adjust tension on the outside belt (Fig. 1—33). Tighten the bolts for the engine mounting plate.

(6) Move the hydraulic pump up and the pump mounting bracket to the rear at the same time to adjust the inside drive belt and the drive belt for the hydraulic pump. Tighten the hydraulic pump mounting bolts and the bolts for the hydraulic pump mounting bracket.

(7) Tighten both nuts on the engine shock support an equal amount, until the rubber bushings are at one half their original length.

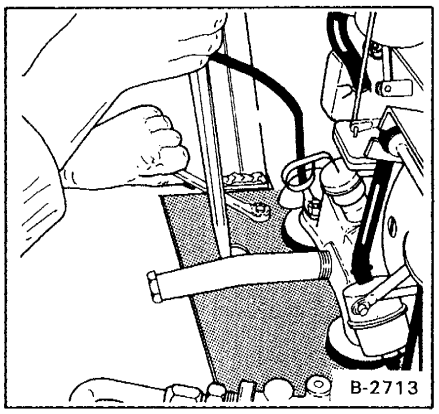


Fig. 1—33 Adjust Belt Tension

BELT	MOVEMENT	FORCE
Pump	1/4" (6,35 mm)	4-5 lbs.
Low Speed	1/2" (12,7 mm)	10-13 lbs.
High Speed	1/2" (12,7 mm)	9-11 lbs.
Tighten	Low Speed	Belt First

Fig. 1—33A Belt Tighten Chart

1—9.2 Chaincase Hydraulic Fluid

To check the chaincase oil level:

(1) Place the loader on a level area (on the 310 Model, lower the lift arms and tilt the Bob-Tach fully back). Stop the engine.

(2) Remove the lower plug on the right side of the chaincase (Fig. 1—29). If fluid flows the level is correct. If no fluid flows, tighten the check plug.

(3) Remove the upper check plug (Fig. 1—29). Remove the chaincase fill plug (Fig. 1—30). Add recommended fluid until it flows at the upper check plug. Tighten the check plug and replace the chaincase fill plug and tighten.

1—10 HYDRAULIC CYLINDERS AND CONTROL VALVE

The loader uses two lift hydraulic cylinders on the lift arms and two tilt hydraulic cylinder on the bucket and these are controlled by the control valve.

1—10.1 Inspecting Hydraulic Cylinders

There are several conditions that can cause failure of a hydraulic cylinder. Some of the conditions are:

(1) A scratch or other mark on the cylinder rod can cause seal damage and leakage.

NOTE: Inspect the cylinder rods at regular intervals by moving your hand along the length of the rod with the rod fully extended. Carefully remove any scratches or marks on the cylinder rod with a pocket stone (Fig. 1—34).

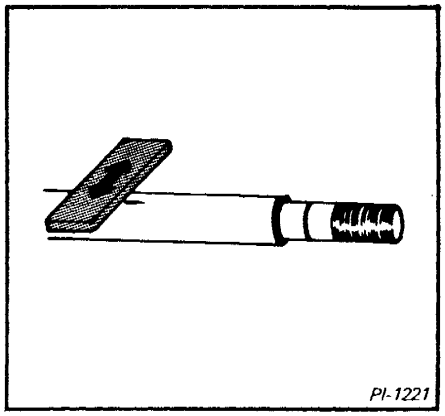


Fig. 1—34 Remove Marks on Shaft

(2) Small holes at either of the hydraulic cylinder ports can cause leakage. You can weld the holes closed with a gas or electric (arc) weld. Extend the cylinder rod when you weld at the pivot end to keep heat from causing damage to the piston seals. Loosen fittings to release pressure. Disassemble the cylinder when you weld at the rod end of the cylinder. Use a low hydrogen type welding rod (7018). Do not fasten the ground clamp for the electric (arc) welder to the cylinder rod. This could cause damage to the cylinder rod.

IMPORTANT

Before doing any welding, first remove the connector from the alternator, to prevent damage to the alternator (Fig. 1—35).

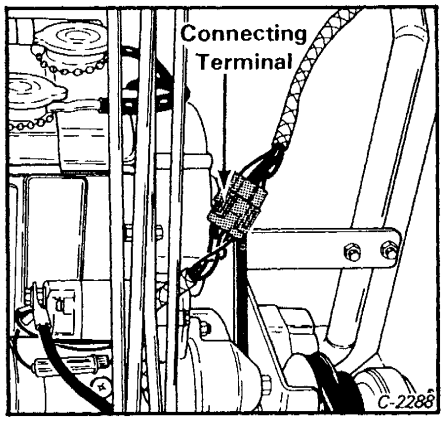


Fig. 1—35 Terminal Plug

(3) A bent area on the hydraulic cylinder housing can cause piston wear and leakage. Replace the cylinder housing if it is bent.

1—10.2 To Check Hydraulic Cylinder Seals

If the lift arms or the Bob-Tach will not hold when moved up or tilted back or if lift is slow at fast engine RPM and there are no outside leaks in the system, the cylinder piston seals or the control valve spools can have internal leakage.

The procedure to check the tilt cylinders piston seals is:

(1) Fully lower the lift arms. Tilt the Bob-Tach fully back. Use a block to hold the Bob-Tach in this position.

(2) Disconnect the hoses from the base end of each cylinder (Fig. 1—36). Put plugs in the hydraulic hose ends.

(3) Start the engine and run at slow RPM. Push the bottom of the tilt pedal. Look for oil leakage at the open cylinder ports. Move the throttle to fast RPM and check open cylinder ports for oil flow.

(4) The cylinder piston are good if only a small amount of oil come from the open cylinder ports.

(5) Install the hoses and check rod end of cylinder for leakage past the head seals.

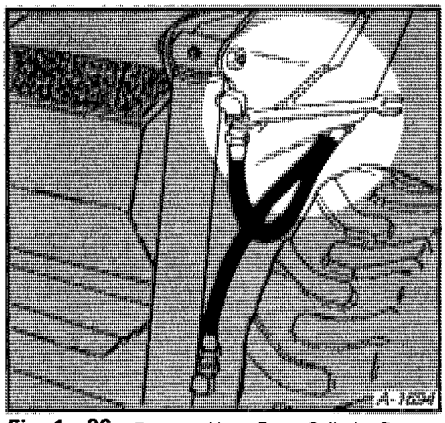


Fig. 1—36 Remove Hose From Cylinder Port

The procedure to check the lift cylinder piston seals is:

(1) Fully lower lift arms.

(2) Disconnect the hydraulic hoses from the base end of the hydraulic cylinder (Fig. 1—37). Put plugs in the hydraulic hose ends.

(3) Start the engine and run at slow RPM. Push the bottom of the lift pedal. Look for fluid leakage at the open cylinder ports. Move the throttle to fast RPM and check the open cylinder ports for leakage.

(4) The cylinder piston seals are good if only a small amount of oil come from the open cylinder ports.

(5) Install the hoses and check rod end of cylinder for leakage past the head seals.

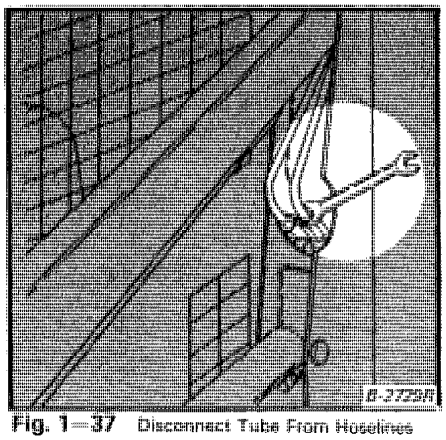


Fig. 1—37 Disconnect Tube From Hoselines

1—10.3 Control Valve

If the control valve is removed for any reason, be sure to remove foreign material from the mounting plate (gravel, sand, etc.) before reinstalling the control valve. A foreign object under the valve could cause distortion of the valve body when mounting bolts are tightened. This will cause seizure of the valve spools.

A valve spool which will not return to neutral can sometimes be corrected by removing the pedal linkage and rotating the spool 180 degrees.

A broken centering spring will also prevent the spool from returning to neutral position.

1—10.4 Adjustment of Pedal Linkage

Improper adjustment of the pedal linkage can cause the lift arms or the bucket to raise, lower, or tilt too slowly, or keep the control valve spool from going to center position (neutral.)

Adjust the linkage so that the pedals will not touch the floor when pedals are in the "heeldown" position. Valve spools must stroke fully when pedals are pushed.

To adjust a linkage rod:

(1) Remove the connecting pin at the control valve spool.

(2) Loosen the yoke lock nut on the rod.

(3) Turn the yoke on the rod to lengthen or shorten the rod (Fig. 1—38).

(4) Tighten the lock nut. Install the yoke pin and cotter pin.

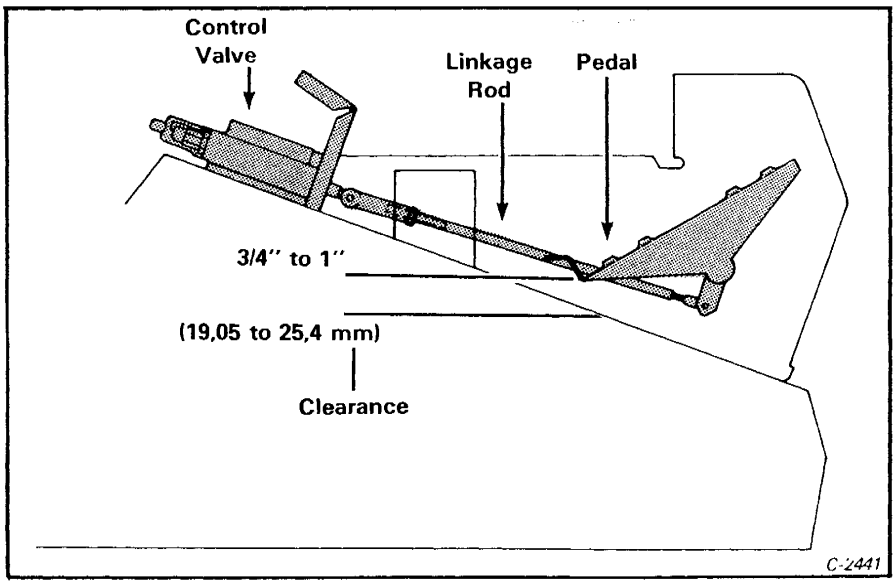


Fig. 1—38 Pedal Adjustment

1—11 TRANSMISSION AND DRIVE SYSTEM

Forward and reverse movement of the loader is controlled by four clutches; two for forward and two for reverse. The loader has two separate drive systems; one for each side of the loader.

1—11.1 Clutches

The steering levers must not move more than 3 inches (76,2 mm) in either direction. Check clutch adjustment every 80 to 100 hours of loader operation (See Section 3 For Adjustment Procedure).

1—11.2 Drive Chains

Drive chain adjustment must be checked after first 40 to 50 hours of loader operation, then every 50 hours (See Section 3 For Adjustment Procedure).

1—11.3 Tire Inflation

Inflate the 5:70-16 tires to 50 PSI maximum. Do not let pressure go lower than 40 PSI or the loader will be hard to turn and tire wear will be much greater.

Inflate the 23:00-8.50 flotation tires to 20-25 PSI. These tires may be inflated to 50 PSI for road travel, or to provide easier steering on hard surfaces.

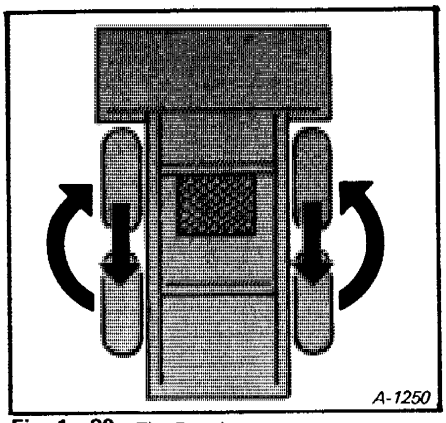


Fig. 1—39 Tire Rotation

1—11.4 Tire Rotation

If both front and rear tires wear excessively, rotate them to the opposite end of the loader as shown in figure 1—39. Excessive wear can be caused by wrong tire inflation or by operating the loader with the front wheels held off the ground by the bucket.

1—11.5 Tire Replacement

If you need to replace a damaged or worn tire, it is important that the replacement be the same size as the tires still on the loader. Two different size tires on the same side of the loader will cause a fast rate of drive chain and tire wear and loss of power. When you replace two worn tires, install the new ones on the same side of the loader. Put the two used tires on the opposite side. If the tires slip on the rim while loading bucket, increase the inflation pressure slightly and be sure to keep all four wheels on the ground.

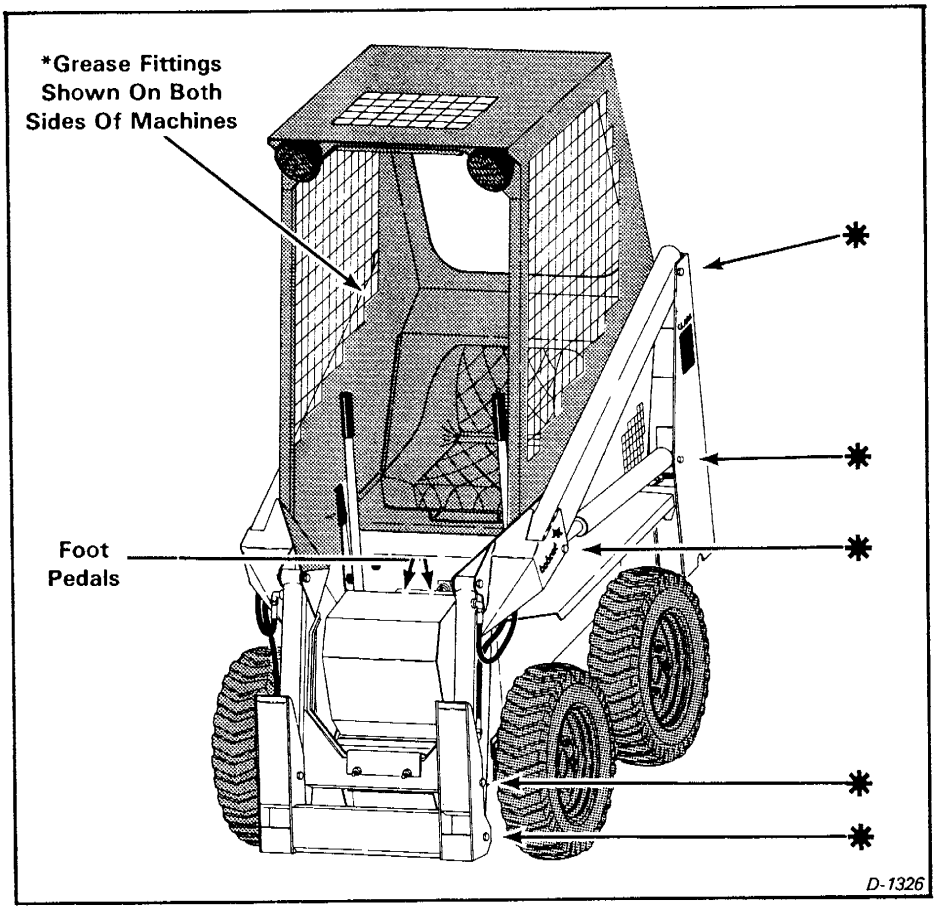


Fig. 1—40 Lubrication Points

1—12 LUBRICATION

Figure 1—40 shows the grease fitting locations. Use a good lithium base grease on all the fittings every 10 hours of loader operation. Also put lubricant on the seat rails (Fig. 1—41).

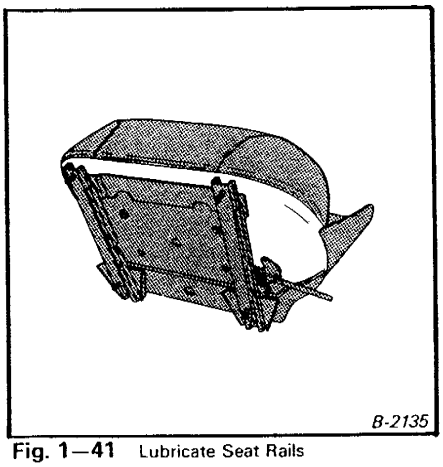


Fig. 1—41 Lubricate Seat Rails

1—13 OPERATOR ENCLOSURE

The operator enclosure is for the protection of the operator. Check at regular intervals to see that all mounting bolts are installed and are tight. Check the welds on the pivots brackets for cracks and weld when necessary.

2 HYDRAULIC SYSTEM

2—1 DESCRIPTION OF HYDRAULIC CIRCUIT

Hydraulic fluid moves from the reservoir to the hydraulic pump. The hydraulic pump forces the fluid through the control valve and back through the hydraulic filter.

This occurs when the control pedals are in neutral. When a control spool is activated to extend the cylinders, fluid is directed into one end of the selected cylinder. Fluid flows from the other end of the double-acting cylinders back to the control valve and through the hydraulic filter to the reservoir. When the control pedal is returned to neutral, fluid is held in the cylinder to hold the load in place.

When a control spool is activated to retract the cylinders, fluid is diverted from one end og the selected cylinders back to the control valve and through the hydraulic filter to the reservoir. When the cylinders reach the end of the stroke or when the load is more than the loader rated lifting capacity, a relief valve opens. The relief valve lets fluid go by the overloaded circuit and return to the reservoir. Do not change the relief valve setting unless a hydraulic check shows that it is too low or too high.

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps or plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0284

2—1.1 Tubelines, Hoses, Fittings

Since tubelines, hoses and several types of fittings are used in the 310 and 313 hydraulic/hydrostatic systems, certain procedures in maintenance must be used. Wrong tightening procedures and o-ring installation will result in fluid leaks.

The correct method of installation is as follows:

2—1.2 37° Flare Connections

Use the following procedure to tighten the flare fittings:

(1) Tighten the nut until it makes contact with the seat.

(2) Make a mark across the "flats" of both the male and female parts of the connection (Fig. 2—1).

(3) Use the chart below to find the correct tightness needed.

Wrench Size	Tube Size Outside Diameter	Thread Size	Rotate No. of Hex Flats
5/8"	5/16"	1/2 - 20	2-1/2
11/16"	3/8"	9/16 - 18	2
7/8"	1/2"	3/4 - 16	2
1"	5/8"	7/8 - 14	1-1/2 - 2
1-1/4"	3/4"	1-1/16 - 12	1
1-3/8"	1"	1-5/16 - 12	3/4 - 1
2"	1-1/4"	1-5/8 - 12	3/4 - 1
2-1/4"	1-1/2"	1-7/8 - 12	1/2 - 3/4

If the fitting leaks after tightening, disconnect it and inspect the seat area for damage. Replace as needed.

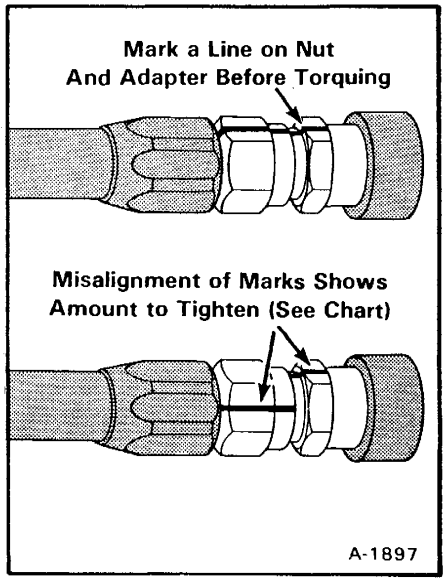


Fig. 2—1 Tightening Flared Fittings

Suggest:

If the above button click is invalid.

Please download this document

first, and then click the above link

to download the complete manual.

Thank you so much for reading

2—1.3 Straight Thread O-ring Fitting (Elbows, Adapter, Etc.)

When installing this fitting, the o-ring must be first lubricated with oil Loosen the jam nut, screw the fitting into place and connect the tubeline first, before tightening the jam nut.

Tighten the jam nut until it and the washer are tight against the face of the opening (Fig. 2—1a). The o-ring must be pushed into the space shown.

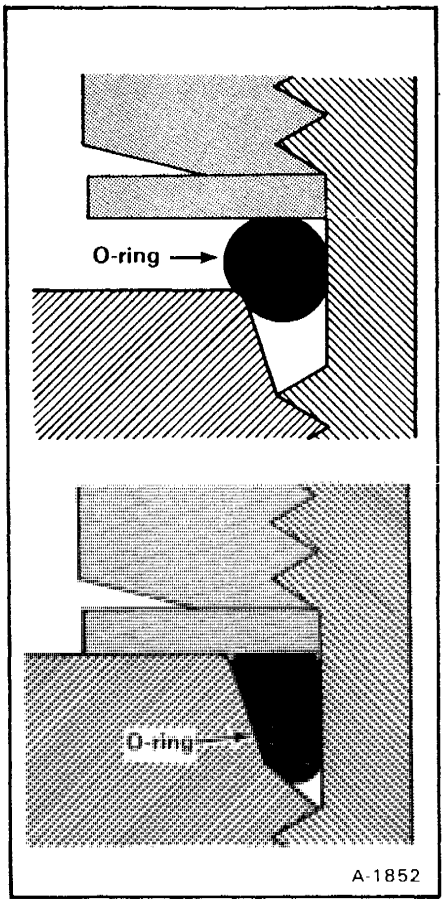


Fig. 2—1a Straight Thread Seal

2—1.4 Pipe Thread Fittings

Pipe threads tend to leak more at high pressure and will leak if under-torqued or over-torqued.

Always use a good pipe sealant on the thread. When applying pipe sealant, do not put any on the first two threads form the end. Put the sealant on the male thread only - never on the female thread.

Be sure the threads are clean and free from any scratches. Make replacement of damaged fittings.

2—1.5 Tubelines and Hoses

Make replacement of tubelines which are bent or have become flat. They will make restriction fo fluid flow, resulting in slower hydraulic action and cause heat. Make replacement of hoselines which show signs of wear, damage or weather cracked rubber. When installing tubelines or hoses, be sure to support them with clamps.

2—1.6 Hydraulic Reservoir

The 310 loaders use the chaincase as the hydraulic fluid reservoir. With this system it is important to keep the fluid clean, because this same fluid is also used to lubricate the sprockets, chains and bearings which are running in the reservoir. More particles of dirt are present with this system, especially if there is a failure of the drive system. Frequent flushing and cleaning of the reservoir must be done to prevent dirt particles from entering the hydraulic pump and system.

The 313 loaders have a separate reservoir as a supply location of the hydraulic fluid. This reservoir is smaller in size and is important that it be kept full of fluid at all times. This is very important when the loader is used with a Backhoe Attachment.

2—1.7 To Check the Hydraulic System

NOTE: Be sure the hydraulic fluid is at the proper level in the reservoir.

To check the condition of the hydraulic system:

(1) Put a full rated load in the bucket. Start the engine and run at maximum RPM.

(2) Press the bottom of the lift pedal. Check the time it takes to raise the load to full height. If the load can be raised to full height in eight seconds or less the system is normal.

If the load is raised to full height in more than eight seconds, check the following:

(1) The drive belt for the hydraulic pump is defective or has incorrect tension. Replace the belt or adjust the tension (See Page 1—16, Fig. 1—33a).

(2) The pedal linkage adjustments are not correct. Adjust the linkage so the bottom of the pedal will not hit the floor when heel of the pedal is pressed fully down.