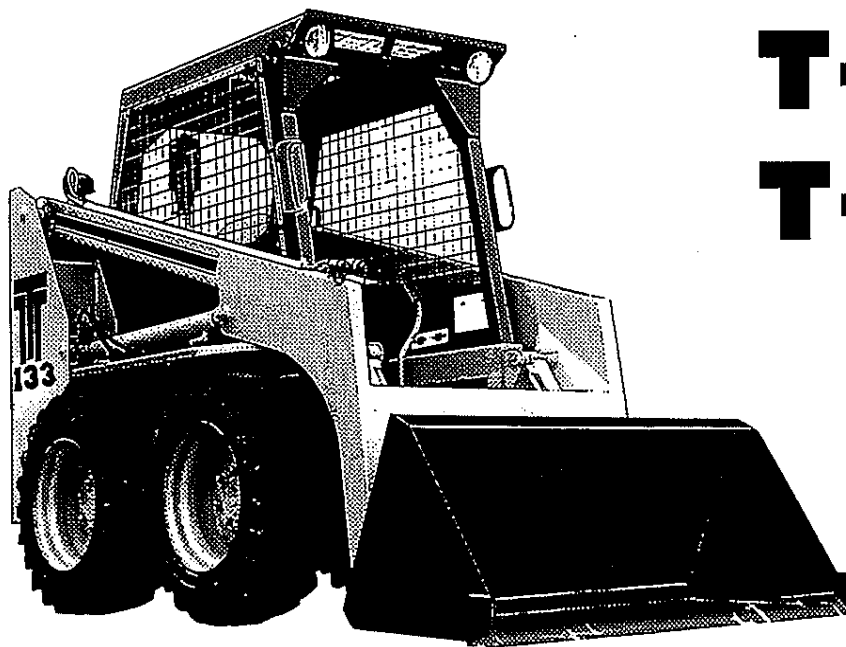


THOMAS

SKID-STEER LOADER

T-103

T-133



REPAIR MANUAL

Publication No. 30232

FOREWORD

This repair manual provides information for the proper servicing and overhaul of Thomas Model T103 and T133 Compact Loaders and is an essential publication for all service personnel carrying out repairs and maintenance procedures.

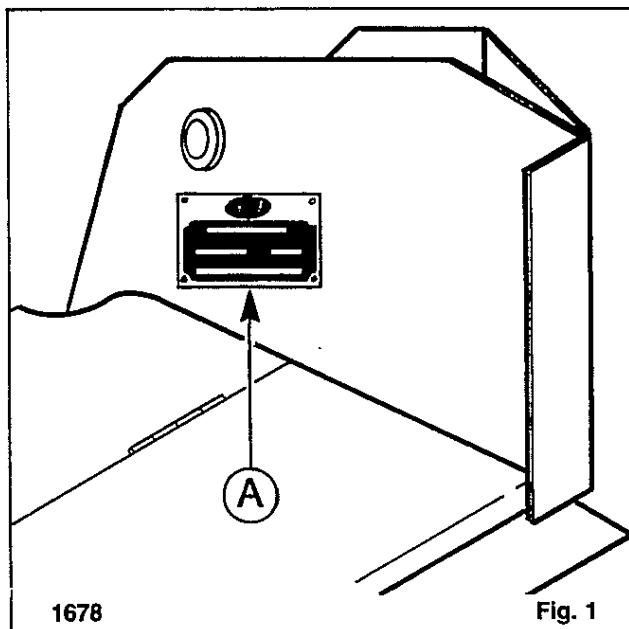
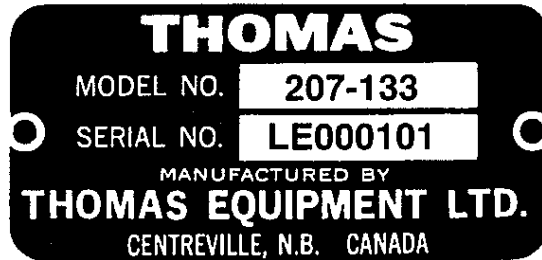
This manual covers units produced in 08/82 and later. Special service instructions are identified by loader serial number or applicable production dates throughout the text.

The manual is divided into 8 sections, each divided into subsections. Each subsection contains information on general operating principles, detailed inspection and overhaul and, where applicable, trouble shooting, special tools and specifications.

The material contained in this manual was correct at the time of going to print but Thomas policy is one of continuous improvement and the right to change prices, specifications, equipment or design at anytime without notice is reserved. All data in this manual is subject to production variations, so overall dimensions and weights should be considered as approximate only and illustrations do not necessarily depict the unit to standard built specifications.

Thomas Equipment Ltd.

SERIAL NUMBERS



This plate is stamped with the following information:

- Model number
- Serial number

It is important when ordering replacement parts or making a service inquiry to provide both the model number and serial number of your Thomas loader.

R.H. and L.H. when mentioned in the manual is always referred from the drivers seat looking in a forward position.

A vehicle identification plate is located on the inside of the fuel tank above the engine compartment cover at the rear of the machine (fig. 1 item A).

Whenever effecting repair or overhaul of the Thomas Compact Loader, the relevant information should be noted and used when referring to service bulletins or ordering parts.



SAFETY PRECAUTIONS



Practically all Service work involves the need to drive the loader. The Operator's Manual, supplied with each loader, contains detailed safety precautions relating to Driving, Operating and Servicing that loader. These precautions are as applicable to the service technician as they are to the operator, and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or re-assembly operations, whether within a workshop facility or out "in the field", consideration should be given to factors that may have an effect upon Safety, not only upon the mechanic carrying out the work, but also upon bystanders.

PERSONAL CONSIDERATIONS

- **The wrong clothes or carelessness in dress can cause accidents.** Check to see that you are suitably clothed.
Some jobs require special protective equipment.
- **Skin Protection**
Used motor oil may cause skin cancer. Follow work practises that minimize the amount of skin exposed and length of time used oil stays on skin.
- **Eye Protection**
The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, discing, welding, painting, etc.
- **Breathing Protection**
Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.
- **Hearing Protection**
Loud noise may damage your hearing and the greater the exposure the worse the damage. If you feel the noise excessive, wear ear protection.
- **Hand Protection**
It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents such as white spirit, paraffin, etc., may harm the skin.
- **Foot Protection**
Substantial or protective footwear with reinforced toe-caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.
- **Special Clothing**
For certain work it may be necessary to wear flame or acid-resistant clothing.
- **Avoid injury through incorrect handling of components.** Make sure you are capable of lifting the object. If in doubt get help.

EQUIPMENT CONSIDERATIONS

• Machine Guards

Before using any machine, check to ensure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.

• Lifting Appliances

Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

Never stand under a suspended load or raised implement.

• Compressed Air

The pressure from a compressed air line is often as high as 100 PSI (6.9 BAR) 7 (kgf/cm²). It is perfectly safe if used correctly. Any misuse may cause injury.

Never use compressed air to blow dust, filing, dirt, etc., away from your work area unless the correct type of nozzle is fitted.

Compressed air is not a cleaning agent, it will only move dust, etc., from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears or skin.

• Hand Tools

Many cuts, abrasions and injuries are caused by defective tools. Never use the wrong tool for the job, as this generally leads either to some injury, or to a poor job.

Never use

- A hammer with a loose head or split handle.
- Spanners or wrenches with splayed or worn jaws.
- Wrenches or files as hammers; or drills, clevis pins or bolts as punches.

For removing or replacing hardened pins use a copper or brass drift rather than a hammer.

For dismantling, overhaul and assembly of major and sub components, always use the Special Service Tools recommended.

These will reduce the work effort, labor time and the repair cost.

Always keep tools clean and in good working order.

• Electricity

Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

Before using any electrical equipment — particularly portable appliances — make a visual check to make sure that the cable is not worn or frayed and that the plugs, sockets, etc., are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

• Solvents

Use only cleaning fluids and solvents that are known to be safe. Certain types of fluids can cause damage to components such as seals, etc., and can cause skin irritation. Solvents should be checked that they are suitable not only for the cleaning of components and individual parts, but also that they do not affect the personal safety of the user.

• Housekeeping

Many injuries result from tripping or slipping over, or on, objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it — remove it.

A clean, hazard-free place of work improves the surroundings and daily environment for everybody.

• Fire

Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realized. Everyone must be constantly on guard.

- Extinguish matches / cigars / cigarettes, etc., before throwing them away.
- Work cleanly, disposing of waste material into proper containers:
- Locate the fire extinguishers and find out how to operate them.
- Do not panic — warn those near and raise the alarm.
- Do not allow or use an open flame near the loader fuel tank, battery or component parts.

• First Aid

In the type of work that mechanics are engaged in, dirt, grease, fine dusts, etc., all settle upon the skin and clothing. If a cut, abrasion or burn is disregarded it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become painful and injurious. It only takes a few minutes to have a fresh cut dressed, but it will take longer if you neglect it. Make sure you know where the First Aid box is located.

• Cleanliness

Cleanliness of the loader hydraulic system is essential for optimum performance. When carrying out service and repairs plug all hose ends and component connections to prevent dirt entry.

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high pressure washer or steam cleaner is recommended.

OPERATIONAL CONSIDERATIONS

- Stop the engine, if at all possible, before performing any service.
- Place a warning sign on loaders which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended.
- Do not attempt to start the engine while standing beside the loader or attempt to by-pass the safety start system.
- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.
- Always turn the radiator cap to the first stop, to allow pressure in the system to dissipate when the coolant is hot.
- Never work beneath a loader which is on soft ground. Always take the unit to an area which has a hard working surface — preferably concrete.
- If it is found necessary to raise the loader for ease of servicing or repair, make sure that safe and stable supports are installed, beneath the main frame, before commencing work.
- Use footsteps or working platforms when servicing those areas of a loader that are not within easy reach.
- Before loosening any hoses or tubes, switch off the engine, remove all pressure in the lines by operating the foot pedals several times. This will remove the danger of personal injury by oil pressure.
- Prior to pressure testing, make sure all hoses and connectors not only of the loader, but also those of the test equipment, are in good condition and tightly sealed. Pressure readings must be taken with the gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment, and to eliminate the possibility of personal injury.
- Always lower equipment to the ground when leaving the loader.
- If high lift attachments are installed on a loader beware of overhead power, electric or telephone cables when traveling. Drop attachment near to ground level to increase stability and minimize risks.
- Do not park or attempt to service a loader on an incline. If unavoidable, take extra care and block all wheels.
- Escaping hydraulic/diesel fluid under pressure can penetrate the skin causing serious injury. Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Stop engine and relieve pressure before connecting or disconnecting lines. Tighten all connections before starting engine or pressurizing lines. If any fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

- Prior to removing wheels and tires from a loader, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.
- When inflating tires beware of over inflation — constantly check the pressure. Over inflation can cause tires to burst and result in personal injury.

Safety precautions are very seldom the figment of someone's imagination. They are the result of sad experience, where most likely someone has paid dearly through personal injury.

Heed these precautions and you will protect yourself accordingly. Disregard them and you may duplicate the sad experience of others.

SERVICE TECHNIQUES

A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

B. SERVICE TECHNIQUES

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficient working life of a component and lead to costly replacement.

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in overhauled components being more reliable and efficient in operation.

Use cleaning fluids which are known to be safe. Certain types of fluid can cause damage to 'O' rings and cause skin irritation. Solvents should be checked that they are suitable for the cleaning of components and also that they do not risk the personal safety of the user.

Replace 'O' rings, seals or gaskets whenever they are disturbed. Never mix new and old seals or 'O' rings, regardless of condition. Always lubricate new seals and 'O' rings with hydraulic oil before installation.

When replacing component parts use the correct tool for the job.

HOSES AND TUBES

Always replace hoses and tubes if the end connections are damaged.

When installing a new hose loosely connect each end and make sure the hose takes up the designed position before tightening the connection. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing.

The hoses are the arteries of the unit, be sure they are in good condition when carrying out repairs or maintenance otherwise the machine's output and productivity will be affected.

After hose replacement to a moving component check the hose does not foul by moving the component through the complete range of travel.

Be sure any hose which has been installed is not kinked or twisted.

Hose connections which are damaged, dented, crushed or leaking, restrict oil flow and the productivity of the components being served. Connectors which show signs of movement from the original swaged position have failed, and will ultimately separate completely.

A hose with a chafed outer cover will allow water entry. Concealed corrosion of the wire reinforcement will subsequently occur along the hose length with resultant hose failure.

Ballooning of the hose indicates an internal leakage due to structural failure. This condition rapidly deteriorates and total hose failure soon occurs.

Kinked, crushed, stretched or deformed hoses generally suffer internal structural damage which can result in oil restriction, a reduction in the speed of operation and ultimate hose failure.

Free-moving, unsupported hoses must never be allowed to touch each other or related working surfaces. This causes chafing which reduces hose life.

BEARINGS

Bearings which are considered suitable for further service should be cleaned in a suitable solvent and immersed in clean lubricating oil until required.

Installation of a bearing can be classified in two ways: press fit on rotating parts such as shafts, and gears, and push fit into static locations such as reduction gear housings. Where possible, always install the bearing onto the rotating component first.

Use the correct tools or a press, to install a bearing or bushing. In the absence of the correct tools or press, heat the bearings and/or the casing in hot oil to assist the installation of the bearing.

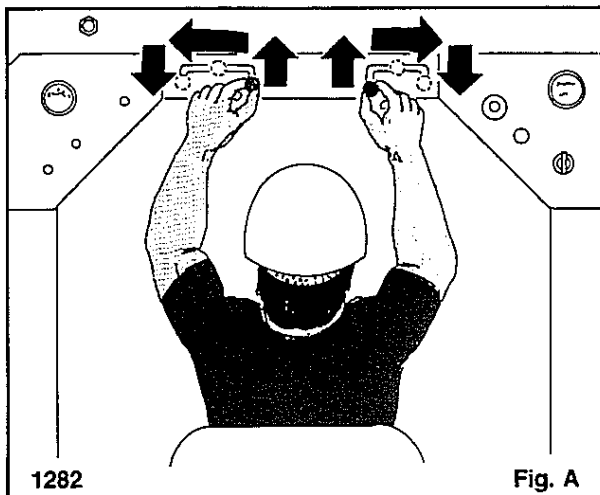
When bearings or bushings are removed always carefully check that the bearing is free from discoloration and signs of over-heating. Also check for mechanical damage such as excessive clearance, nicks and scuffing. If in doubt replace the bearings or bushings.

Bearings should never be removed unless absolutely necessary. Always use the recommended puller to reduce the risk of bearing or related component damage.

The reliability and durability of a unit depends on the effective operation of the many types of bearings and bushings which are incorporated in the complete assembly.

These bearings and bushings are subjected, in normal operation, to high working loads and adverse conditions.

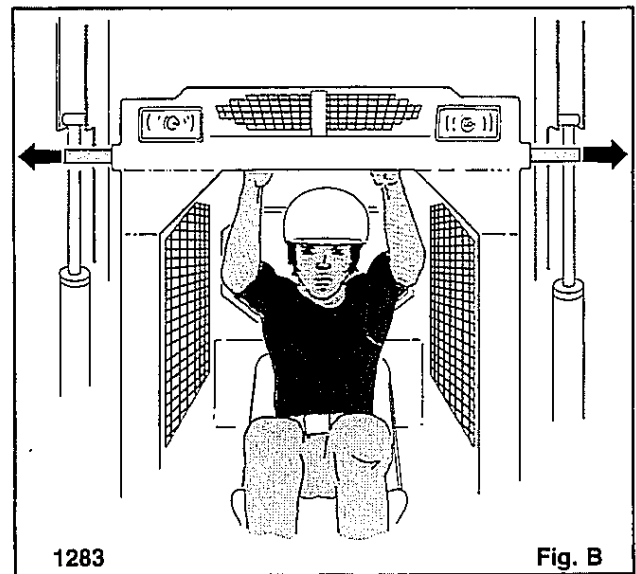
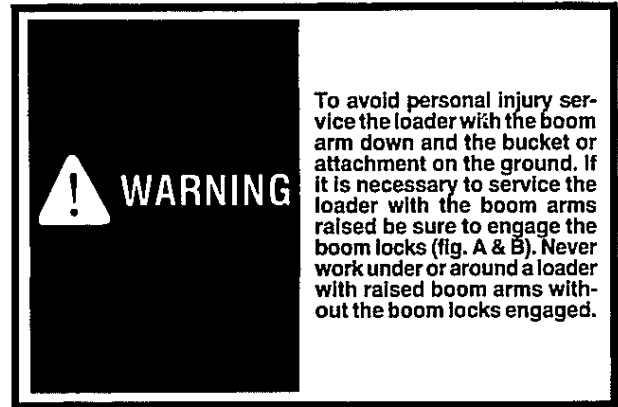
Be sure during normal routine servicing, maintenance or repair that bearings are given the right attention and are installed with care.



PRESSURE TESTING

Prior to pressure testing be sure all hoses are in good condition and all connections tight. Pressure readings must be taken with gauges of specified pressure ratings.

The correct procedure should be rigidly observed to prevent damage to the system or the equipment and to eliminate the possibility of personal injury.



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HYDRAULIC SYSTEM

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SECTION 1 HYDRAULICS

1.1.1 Specifications:

	T103	T133
Pump type	Gear	
Capacity (at rated RPM and Pressure).....	9 GPM (34.1 l/m)	14.5 GPM (55 l/m)
Rated RPM.....	2800	2550
Rated Pressure	2150 PSI (148 Bar)	
Reservoir Capacity	8 gal. (30.3 l.)	
Fluid type.....	10W30 API class SE, CD oil	
Filtration.....	10 Micron	
Filtration, reservoir.....	Two, 100 micron elements	
Control valve, type	Series type with float on lift and detent on auxiliary	
Oil cooler	440 BTU	
Cylinders.....	LIFT	TILT
Type.....	Double Acting	Double Acting
Qty. per machine	2	2
Bore dia.	2 in.	2.5 in.
Rod dia.	1.25 in.	1.125 in.
Stroke	27.125 in.	13.375 in.

1.1.2 General Information — Hydraulic System Operation:

(Refer to illustration 1.1.2)

Oil flows from the hydraulic reservoir (1) through a 100 micron element (2) located in the reservoir to the hydraulic pump (3).

The hydraulic pump (3) is a gear type pump which is driven by a shaft through the hydrostatic drive pumps (4) at engine speed. The hydraulic pump (3) capacity is directly

related to engine speed. Oil goes from the hydraulic pump (3) to the hydraulic control valve (5).

The hydraulic control valve (5) is equipped with an adjustable relief valve (6) which is set at 2150 PSI (148 BAR). The hydraulic control valve (5) is a 3 spool, mono block, series type valve. The third spool provides hydraulic flow to the two bucket cylinders (7). The center spool provides flow to the auxiliary hydraulic circuit (8) allowing operation of hydraulic attachments and tools. The center spool is equipped with a detent position to allow constant flow to the auxiliary hydraulic circuit (8). The first spool provides hydraulic flow to the two boom lift cylinders (9). The lift section spool is equipped with a float position.

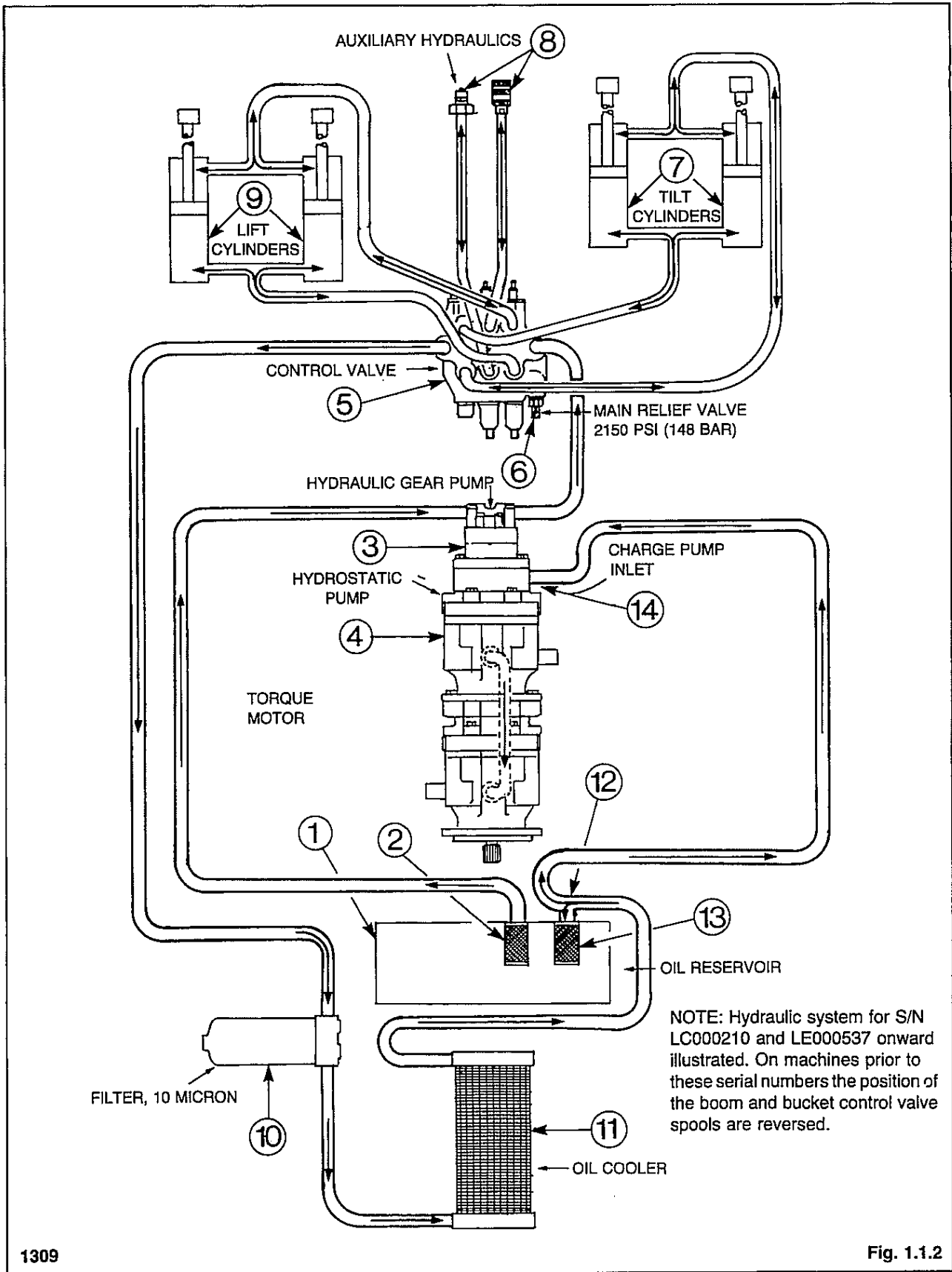
Oil flows from the control valve to the hydraulic filter (10). The hydraulic filter (10) has a replaceable 10 micron element with a built in by-pass valve to allow the hydraulic fluid to flow if the element is plugged.

Oil flows from the hydraulic filter (10) through a 440 BTU hydraulic oil cooler (11). Oil flows from the hydraulic oil cooler (11) to a tee (12) located at the hydraulic reservoir (1). Oil flows from the tee (12) into the hydraulic reservoir (1) through a 100 micron element (13) and also to the hydrostatic drive pump (4) charge pump inlet (14). All hydraulic oil flowing to the hydrostatic drive pumps passes first through the 10 micron hydraulic filter (10) and the hydraulic oil cooler (11).

WARNING

To prevent personal injury do not service the loader without instruction or taking the necessary safety precautions. Before working on the loader see the warnings and instructions at the beginning of the service manual.

HYDRAULIC/HYDROSTATIC CIRCUIT



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Fig. 1.1.2

SECTION 1 HYDRAULICS

1.1.3 Control Functions:

The T103 compact loader has a rated lift capacity of *1000 lbs. (454 kg.) to full height. The T133 has a rated lift capacity of *1300 lbs. (590 kg.). Operation of the loader hydraulic functions are controlled by three foot pedals (fig. 1.1.3).

WARNING

To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

Boom Lift — The L.H. pedal is the boom lift control (fig. 1.1.3). To raise the boom press on the heel (2) of the pedal. To lower the boom press on the toe (1) of the pedal. Firm pressure on the toe (1) of the pedal will lock the boom in float position. This allows the bucket to follow the ground as the loader moves backward.

Auxiliary Hydraulics — The center pedal is used to engage the auxiliary hydraulic circuit to power an attachment such as a back hoe. Pressing on the toe (3) of the pedal provides hydraulic pressure to the female quick-connect coupling located at the front of the boom arms. Firm pressure on the toe (3) of the pedal places the valve in detent position providing a continuous flow of hydraulic oil to the attachment. Pressing on the heel of the pedal (4) provides hydraulic pressure to the male quick-connect coupling reversing the flow of hydraulic oil. When the auxiliary circuit is not in use return the foot pedal to neutral position otherwise starting the loader may be difficult or impossible and damage to the starter may occur.

IMPORTANT

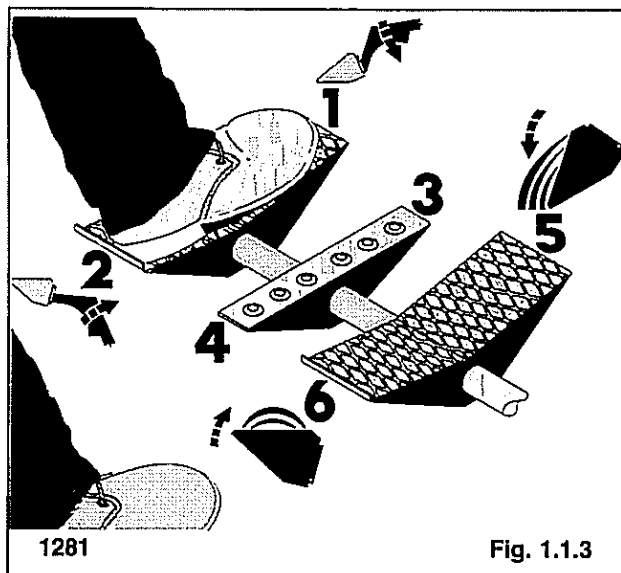
Return auxiliary hydraulic foot pedal to neutral position when not in use.

WARNING

To prevent personal injury always keep feet on the foot pedal controls while operating the loader.

Bucket Tilt — The R.H. pedal is the bucket tilt (dump) control. Pressing on the toe (5) of the pedal will dump the bucket. Pressing on the heel (6) of the pedal will roll the bucket back.

*with equipment specified in section 8



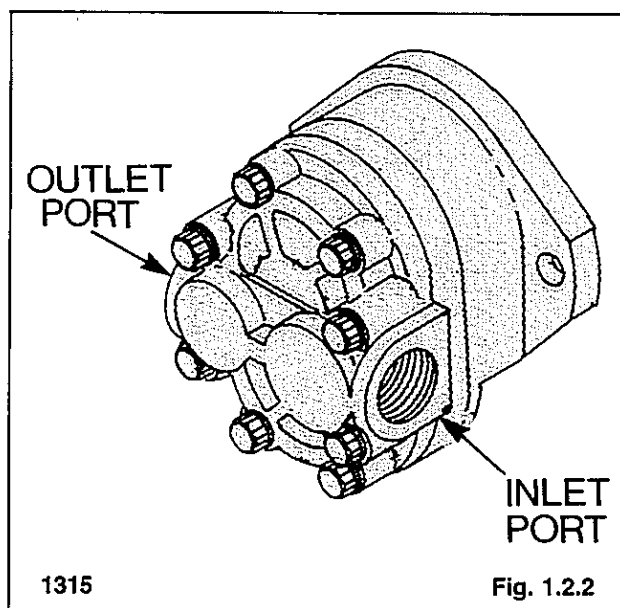
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Fig. 1.1.3

1.1.4 Maintenance Schedule:

	First (Hours)	Every (Hours)
Oil level, check	8	8
Oil filter, change.....	50	150
Oil cooler, clean.....	8	8
General system check (leaks etc.)	8	8
Cylinders, lubricate	8	8
Reservoir filters, change.....	1000	1000
Hydraulic oil, change	1000	1000

1.2 GEAR PUMP



1315

Fig. 1.2.2

SECTION 1 HYDRAULICS

1.2.1 Specifications:

	T103	T133
Pump, type.....	Gear	Gear
Displacement.....	.84 cu. in. (13.8 c.c.)	1.48 cu. in. (24.3 c.c.)
Capacity (at rated speed and pressure).....	9 GPM (34.1 l/m)	14.5 GPM (55 l/m)
Rated speed (RPM).....	2800	2550
Rated pressure.....	2150 PSI (148 BAR)	
Rotation.....	R.H. (viewed from shaft end)	
Tie bolt torque.....	25-28 ft. lbs. (34-38 N.M.)	

1.2.2 General Information:

The hydraulic gear pump (fig. 1.2.2) is mounted at the end of the two hydrostatic piston drive pumps. The splined shaft of the hydraulic gear pump is driven by the internal splined shaft of the front hydrostatic pump at engine crankshaft speed. The output flow of the hydraulic gear pump is directly related to engine speed. Maximum output will be at full rated engine speed.

Oil is drawn from the hydraulic oil reservoir and enters the hydraulic gear pump at the inlet port. The oil is pressurized and is directed through the outlet port to the hydraulic control valve for boom, bucket and auxiliary hydraulic functions.

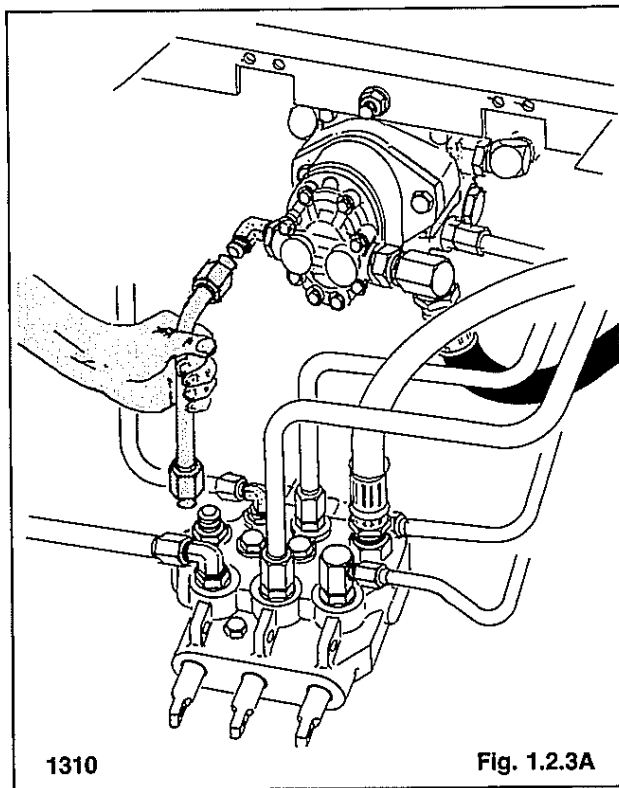
1.2.3 Testing — Hydraulic Pump Flow:

Use test equipment which will meet the following performance figures when performing the test:

Flow Meter — Capable of reading up to 30 GPM (114 l/m) and equipped with a flow control valve.

Pressure Gauge — Capable of reading up to 3000 PSI (206.9 BAR).

1. This test must be performed with the engine running. Before performing the test, block the loader securely with all four wheels clear of the ground.
2. Raise the seat and remove the front shield.
3. Disconnect the line between the hydraulic gear pump and control valve (fig. 1.2.3A).



IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

4. Connect the hydraulic tester between the gear pump and the hydraulic control valve (fig. 1.2.3B).

The inlet hose from the hydraulic tester connects to the outlet port of the hydraulic gear pump.

The outlet hose from the tester connects to the control valve inlet port. Ensure the flow control on the hydraulic tester is fully open before starting the engine to prevent damage to the gear pump.



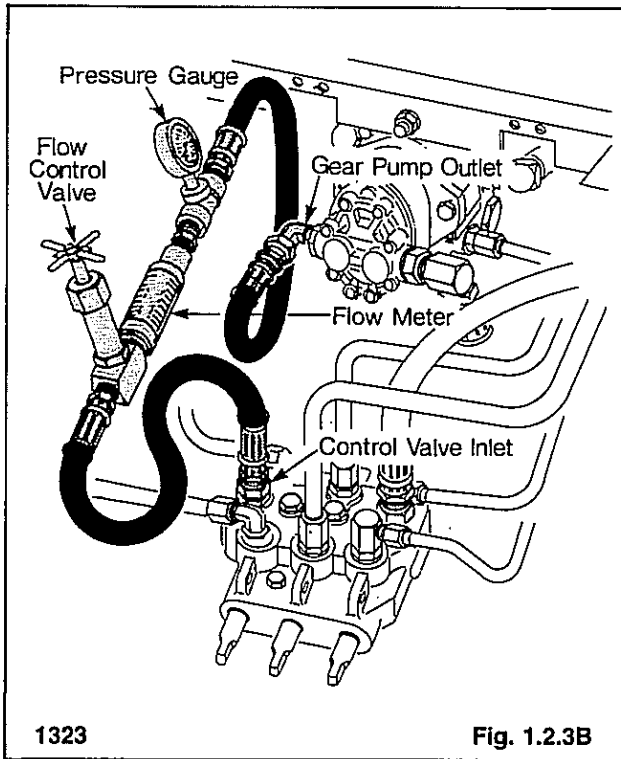
WARNING

To prevent personal injury never repair or tighten hydraulic hoses or fittings with the engine running or the system under pressure.

IMPORTANT

There is no relief valve protecting the pump when the tester is connected. To prevent pump damage do not close the valve on the tester all the way or exceed 2150 PSI (148 BAR).

SECTION 1 HYDRAULICS

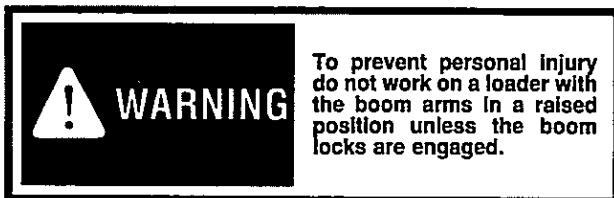


5. With the flow control on the tester fully open, start the engine and run it until it reaches normal operating temperature.
6. Set the engine speed to 1700 RPM and record the flow meter reading under no load conditions. (Refer to section 4.4 on setting the engine speed).
7. Apply load gradually to 2150 PSI (148 BAR). Correct the engine speed to 1700 RPM by increasing the throttle. Record the flow meter reading under load.

NOTE: The flow readings taken at no load and at 2150 PSI (148 BAR) must be at a constant 1700 RPM. If the RPM is not kept constant, the flow readings will be incorrect and pump efficiency will not be determined properly.

8. Determine pump efficiency by dividing the no-load reading into the 2150 PSI (148 BAR) reading. If the efficiency is less than 75% the pump should be repaired or if necessary replaced.
9. Disconnect the tester. If the pump is not to be removed from the loader reconnect the hydraulic line between the control valve and gear pump.

1.2.4 Removal and Replacement:



IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

REMOVAL —

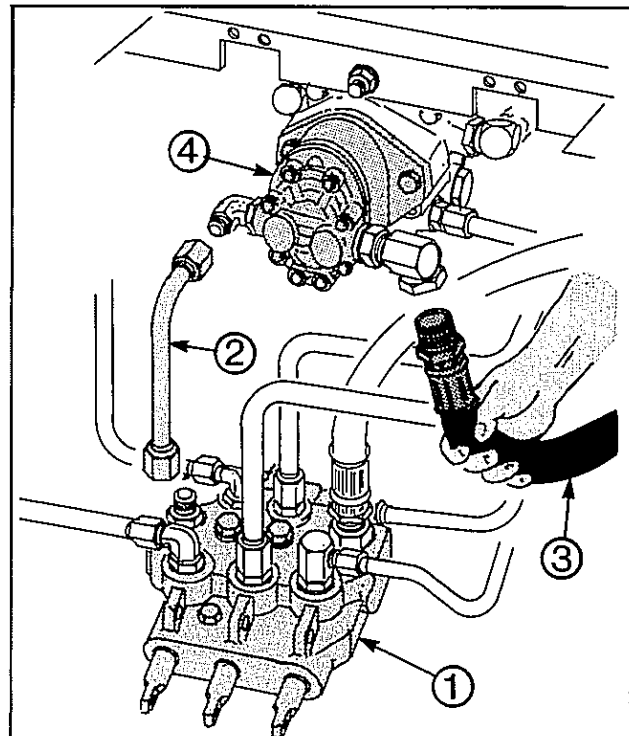
1. Raise the seat and remove the front shield.



WARNING

To prevent personal injury never repair or tighten hydraulic hoses or fittings with the engine running or the system under pressure.

2. Disconnect the line between the hydraulic oil reservoir (fig. 1.2.4a) and the hydraulic gear pump at the gear pump inlet port. Cap the hose with a 3/4 inch N.P.T. cap to prevent loss of hydraulic oil.
3. Disconnect the line between the hydraulic gear pump and hydraulic control valve (fig. 1.2.4a).



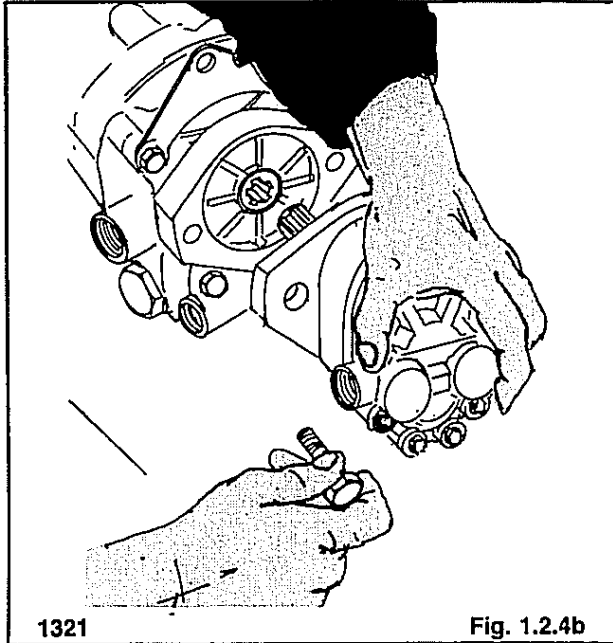
1. CONTROL VALVE
2. LINE, GEAR PUMP TO CONTROL VALVE
3. LINE, GEAR PUMP INLET TO RESERVOIR
4. GEAR PUMP

1311

Fig. 1.2.4a

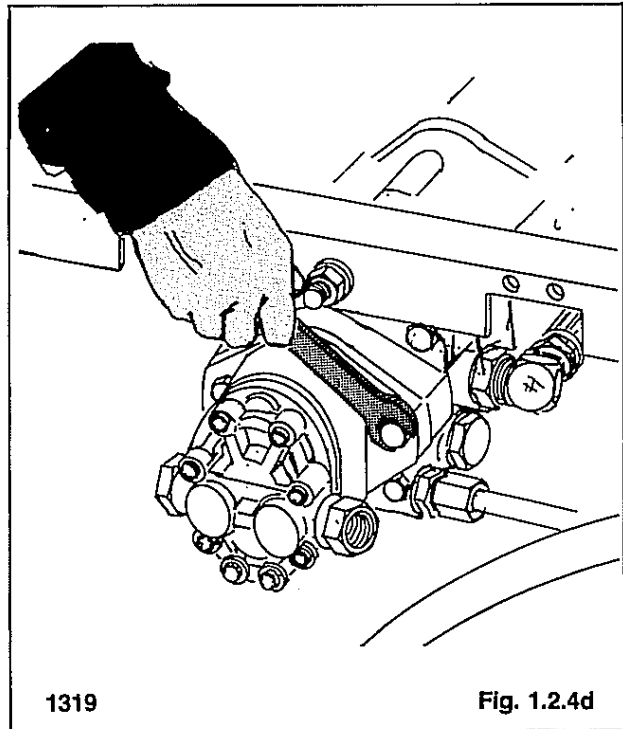
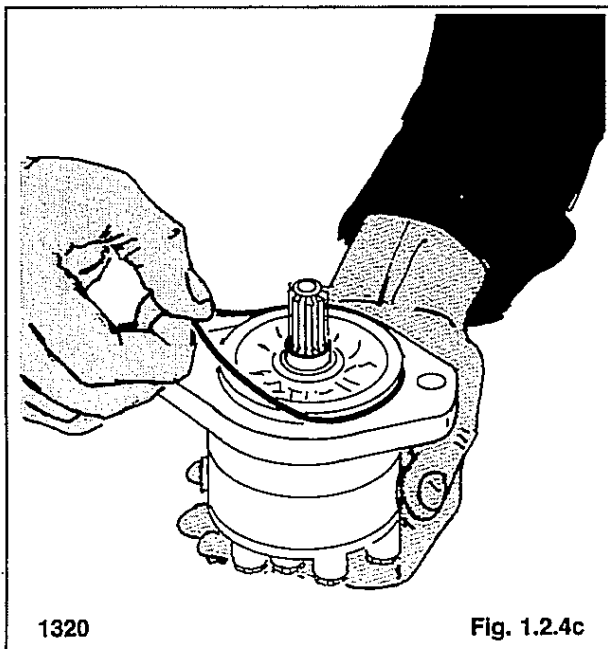
SECTION 1 HYDRAULICS

4. Remove the two (2) bolts which hold the hydraulic gear pump to the hydrostatic pump (fig. 1.2.4b).
5. Remove the hydraulic gear pump from the hydrostatic pump (fig. 1.2.4b).



REASSEMBLY —

1. Install a new O-Ring on the mounting flange of the hydraulic gear pump (fig. 1.2.4c).
2. Install the hydraulic gear pump on the hydrostatic pump.
3. Install the two (2) mounting bolts and torque to 27-31 ft. lbs. (36.6-42 N.M. (fig. 1.2.4d).



4. Install the hydraulic line between the gear pump and hydraulic control valve.
5. Install the hydraulic hose from the oil reservoir at the gear pump inlet.
6. Install the front shield and lower the seat.

IMPORTANT

To prevent damage after removal or repair of hydraulic components refer to start up procedure sect. 1.2.6.

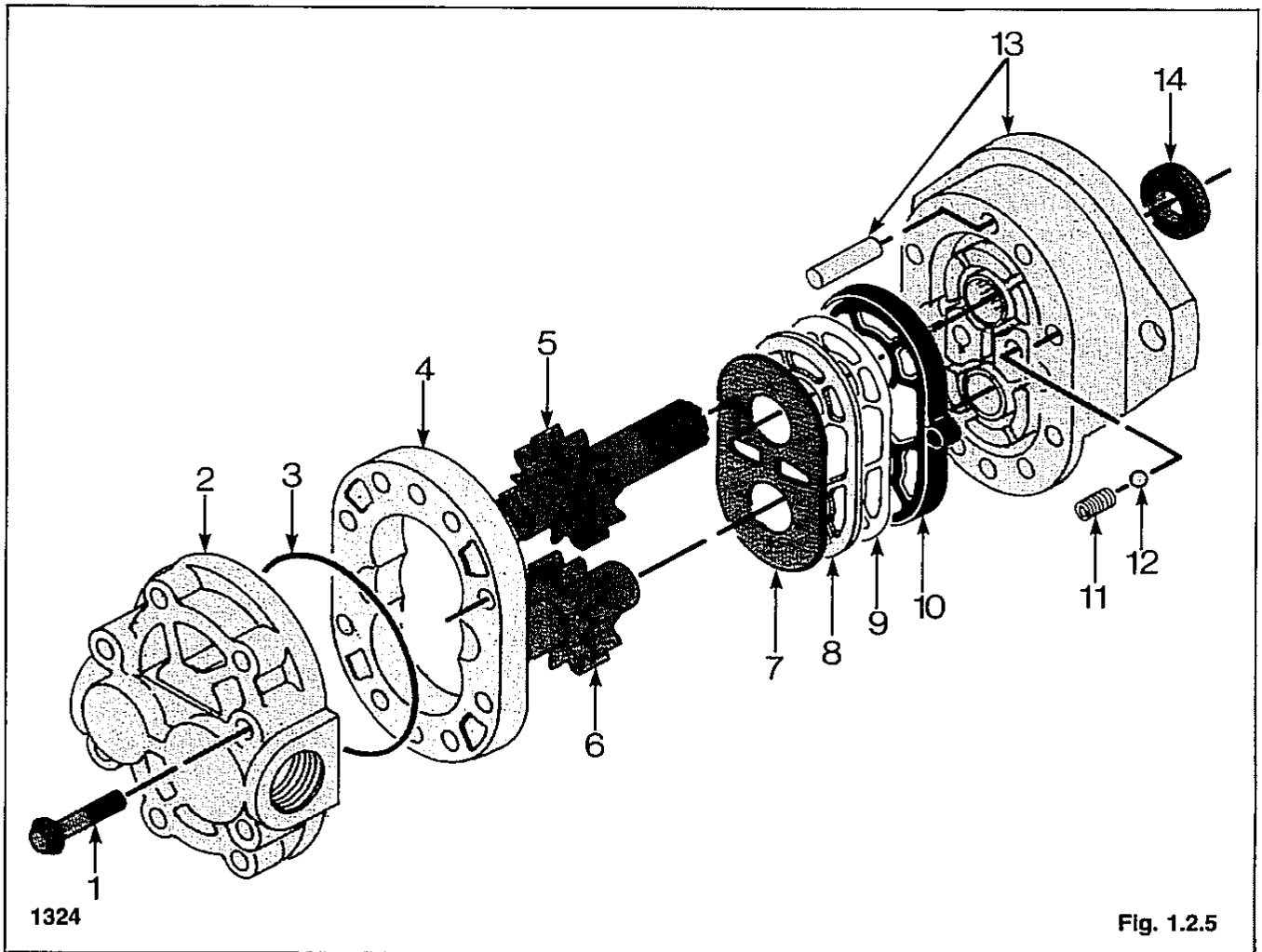
1.2.5 Disassembly and Inspection:

Before disassembling the pump, clean the body with a suitable solvent and dry with compressed air. Ensure all openings are plugged to prevent solvent entering the pump. Mark the pump across the front plate, body and back plate to assist reassembly.

WARNING

To avoid eye injury use safety goggles when cleaning with compressed air.

SECTION 1 HYDRAULICS



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Fig. 1.2.5

- | | | | |
|------------------------|---------------|---------------------|-----------------|
| 1. TIE BOLTS | 4. BODY | 7. DIAPHRAGM | 11. SPRING |
| 2. BACK PLATE ASSEMBLY | 5. DRIVE GEAR | 8. BACK-UP GASKET | 12. BALL |
| 3. O-RING | 6. IDLER GEAR | 9. PROTECTOR GASKET | 13. FRONT PLATE |
| | | 10. DIAPHRAGM SEAL | 14. SHAFT SEAL |

DISASSEMBLY — (Refer to fig. 1.2.5)

1. Remove the eight tie bolts (1).
2. Hold the pump in both hands and tap the drive shaft against a wooden block to separate the front plate (13) from the back plate (2). The body (4) will remain with either the front plate or back plate.
3. To separate the body from the section it remains with, place the drive gear (5) in the body and tap the protruding end of the gear shaft with a plastic mallet.
4. Remove O-Ring (3) from the back plate and discard.
5. Using a sharp tool remove and discard the diaphragm (7) from the front plate.
6. Remove the two springs (11) and two balls (12) from the front plate.
7. Remove and discard the back-up gasket (8), protector gasket (9) and the diaphragm seal (10) from the front plate.
8. Remove and discard the shaft seal (14) from the front plate.

INSPECTION —

1. Thoroughly clean and dry all parts.
2. Inspect the shaft and gear assemblies for roughness or excessive wear at the bearing and seal areas.
3. Inspect the gear faces for scoring or excessive wear. Carefully remove any sharp areas on the gear teeth with emery cloth.

SECTION 1 HYDRAULICS

4. Inspect the bearings in the front and back plate. The bearings are an integral part of the front and back plate and are not serviced separately. The complete plate should be changed if the following conditions are not met.
 - (a) The bearings in the front plate should be flush with the raised portions of the groove pattern.
 - (b) The oil grooves in the bearings should line up with the dowl pin holes and be 180° apart for both front and back plate.
 - (c) The inside diameter of each bearing should not exceed .691 in. (17.551 mm).
5. Inspect the gear pockets of the body for excessive scoring or wear.

REASSEMBLY —

The diaphragm, back-up gasket, diaphragm seal, protector gasket, o-ring and shaft seal should be replaced as new parts during reassembly.

1. Using a dull tool, fit the diaphragm seal (10), into the groove in the front plate with the open part of the "V" section facing down.
2. Press the protector gasket (9) and the back-up gasket (8) into the diaphragm seal.
3. Insert the two steel balls (12) into their respective seats and place the two springs (11) over the balls.
4. Place the diaphragm (7) on top of the back-up gasket with the bronze face up.
5. Check that the entire diaphragm fits inside the raised rim of the diaphragm seal.
6. Dip the gear assemblies in system oil and install into the front plate bearings.
7. Apply a thin coat of heavy grease to both milled faces of the body. Install the body over the gears onto the front plate. The halfmoon, port cavities in the body must face away from the front plate and the small drilled hole in one of the cavities must face the outlet (pressure) side of the pump.
8. Install O-Ring (3) in the groove on the backplate.
9. Slide the back plate over the gear shafts until the dowel pins are engaged.
10. Install and evenly tighten the eight tie bolts (1). Torque to 25-28 ft. lbs. (34-38 N.M.).
11. Dip the shaft seal (14) in system fluid and install it on the drive shaft being careful not to cut the rubber sealing lip. Fully seat the seal into the recessed bore in the front plate.
12. Rotate the pump shaft by hand. A small amount of resistance should be felt, however, the pump should turn freely after a short period of use.

IMPORTANT

To prevent damage after removal or repair of hydraulic components refer to start up procedure sect. 1.2.6.

1.2.6 Start-up After Repair:

To prevent damage on start-up, after draining the hydraulic oil reservoir or replacing major hydraulic or hydrostatic components, follow the procedures below:

1. Fill the hydraulic oil reservoir to the correct level with 10W30 API classification SE, CD oil. Refer to section 1.7.3 for procedure and capacities.
2. On diesel engines — with the throttle lever set in the off position, intermittently turn the engine over with the starter motor for approximately two (2) minutes. This allows both the gear pump and hydrostatic drive pump draw oil from the reservoir ensuring the system is full on start-up.
On gasoline engines — disconnect the coil wire and follow the above procedure.
3. Start the engine and run it at half throttle with no hydraulics engaged for several minutes.

WARNING

To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

4. With the engine running at half throttle, operate the hydraulic control valve to build up pressure at 3 second intervals for approximately three (3) minutes.
5. Increase the engine speed to full throttle, operate the hydraulic control valve to build up pressure at 3 second intervals for approximately three minutes.
6. Shut off the engine and check for leaks.

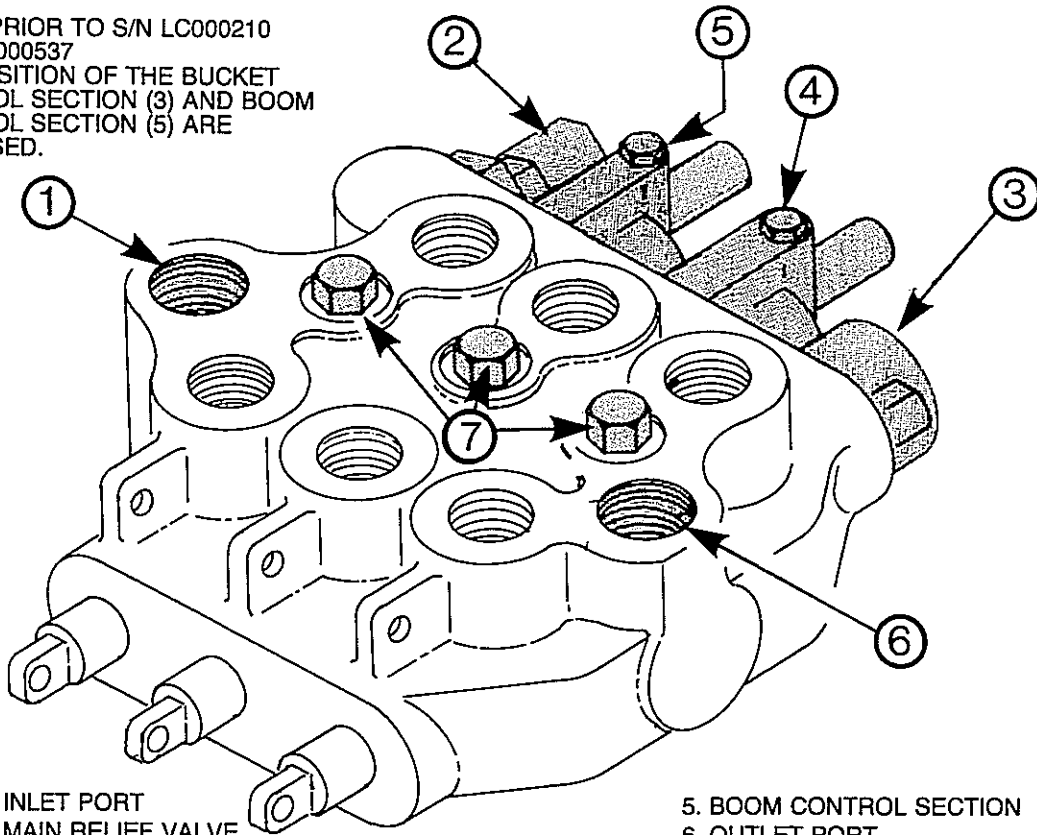
WARNING

To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

SECTION 1 HYDRAULICS

1.3 CONTROL VALVE

NOTE: PRIOR TO S/N LC000210 AND LE000537 THE POSITION OF THE BUCKET CONTROL SECTION (3) AND BOOM CONTROL SECTION (5) ARE REVERSED.



- 1. INLET PORT
- 2. MAIN RELIEF VALVE
- 3. BUCKET CONTROL SECTION
- 4. AUX. HYDRAULIC CONTROL SECTION
- 5. BOOM CONTROL SECTION
- 6. OUTLET PORT
- 7. LOAD CHECK (3)

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Fig. 1.3

1.3.1 Specifications:

Model.....	DV32
Valve type.....	3 spool, monoblock, series type with float on boom & aux. detent
Flow capability.....	20 GPM (75.7 l/m)
Main relief, type.....	Pilot operated, adjustable
Main relief, setting.....	2150 PSI (148 BAR)
Load check.....	one per valve circuit

1.3.2 General Information:

LOADER CONTROL VALVE

The loader hydraulic control valve is a series type, mono block valve. The valve contains 3 spools which control loader bucket, auxiliary hydraulic and boom operations.

The spools are hardened, ground, chrome plated steel. Each spool is selectively fitted to the section spool bore. Because of this selective fitting, the spools are not interchangeable or serviced individually. Each spool is sealed at the rear with an O-Ring and at the front with an O-Ring and rod wiper.

When the spools are in neutral, oil flows from the hydraulic gear pump, through the control valve, and returns to the

hydraulic reservoir. As a spool is moved, oil is directed to one end of the cylinders. Oil returning from the cylinders is ported to the next valve circuit which allows operation of more than one function at the same time.

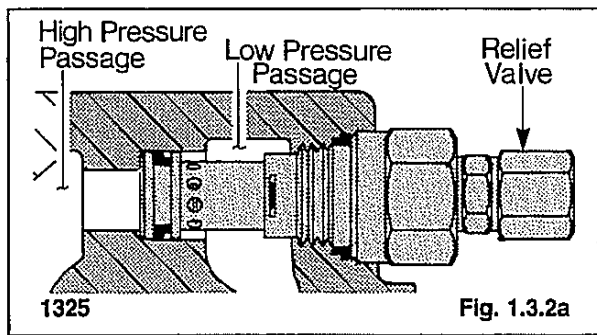
Each spool end contains a centering spring which returns the spool to neutral position if the foot pedal control is released. The auxiliary section contains a detent mechanism to hold the spool in position, providing constant flow to the auxiliary hydraulic circuit when required. The boom section has a detent mechanism to hold the spool in position, when float is desired.

SYSTEM RELIEF VALVE OPERATION

The system relief valve (fig. 1.3.2a), is located at the rear of the valve near the inlet port between the high pressure passage and the low pressure passage. When a spool is moved, oil is directed to one end of the cylinders. If the cylinders are restricted, or reach the limit of their travel, oil pressure builds up in the system. To protect against the pressure increase, the relief valve opens and allows high pressure oil to return to the reservoir.

The system relief valve is a pilot operated relief and is adjustable. Refer to section 1.3.3. The relief valve is preset at 2150 PSI (148 BAR).

SECTION 1 HYDRAULICS

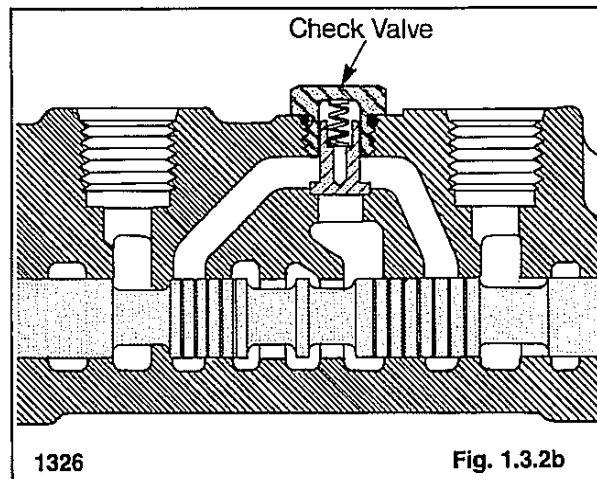


LOAD CHECK VALVE OPERATION

Load check valves are located between the ports of each spool circuit. The function of the check valves is to hold the boom arms or bucket in position during initial spool movement.

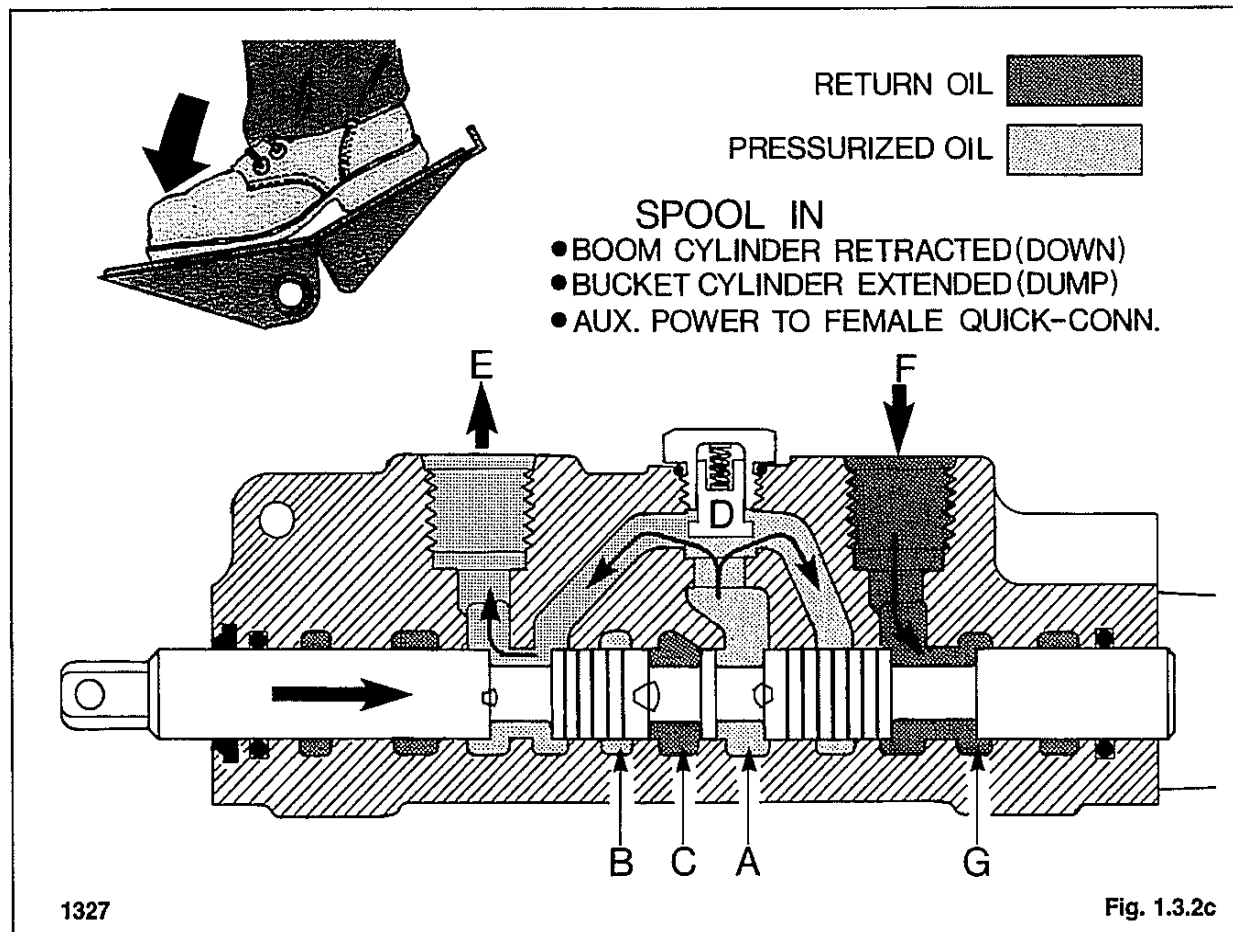
In operation, the check valve (fig. 1.3.2b), is retained on its seat by spring force. At initial spool movement, the natural tendency is for the oil, which is being pressurized by the closing of the open center passage to flow to an area of lower pressure. As the open center passage is being blocked, the oil would then attempt to flow past the open spool. This oil is held at the check valve until the pumped oil overcomes the force holding the check valve on its seat. As the pressure

increases, the oil pressure unseats the check valve and pressurized oil flows to the cylinder.



OPERATION — SPOOL IN

Fig. 1.3.2c illustrates oil flow through the valve to the cylinder hose ports. Pushing the spool in causes the boom to lower in the boom spool section, the bucket to dump in the bucket spool section and oil to flow to the female quick-connect coupling on the auxiliary hydraulic spool section.



SECTION 1 HYDRAULICS

Oil enters the inlet section at A and B. The spool land blocks the oil from flowing to port C. All pumped oil is directed through passage A, the pressure increases until the load check valve D is unseated. Oil passes by the load check valve and out hose port E to one end of the cylinders.

Oil forced out of the cylinders by the piston, enters the valve through hose port F and flows to the reservoir through passage G.

The auxiliary hydraulic spool has a detent mechanism to hold the spool in this position if a constant flow of oil to the auxiliary circuit is required.

OPERATION — SPOOL OUT

Fig. 1.3.2d illustrates oil flow through the valve to the cylinder hose ports when the spools are out. Pulling the spool out in the boom section causes the boom to raise, in the bucket section the bucket to roll back and in the auxiliary section oil to flow to the male quick-connect coupling.

Oil enters the inlet valve section at A and B. The spool land blocks the oil from flowing to passage C. All pumped oil is directed through passage A where it is blocked by the load check valve D. The pressure increases until it overcomes the force

holding the check valve on its seat. The oil pressure unseats check valve D and flows out hose port E to one end of the cylinders.

Oil forced out of the cylinders by the pistons, enters the valve through hose port F and flows to the reservoir through passage G.

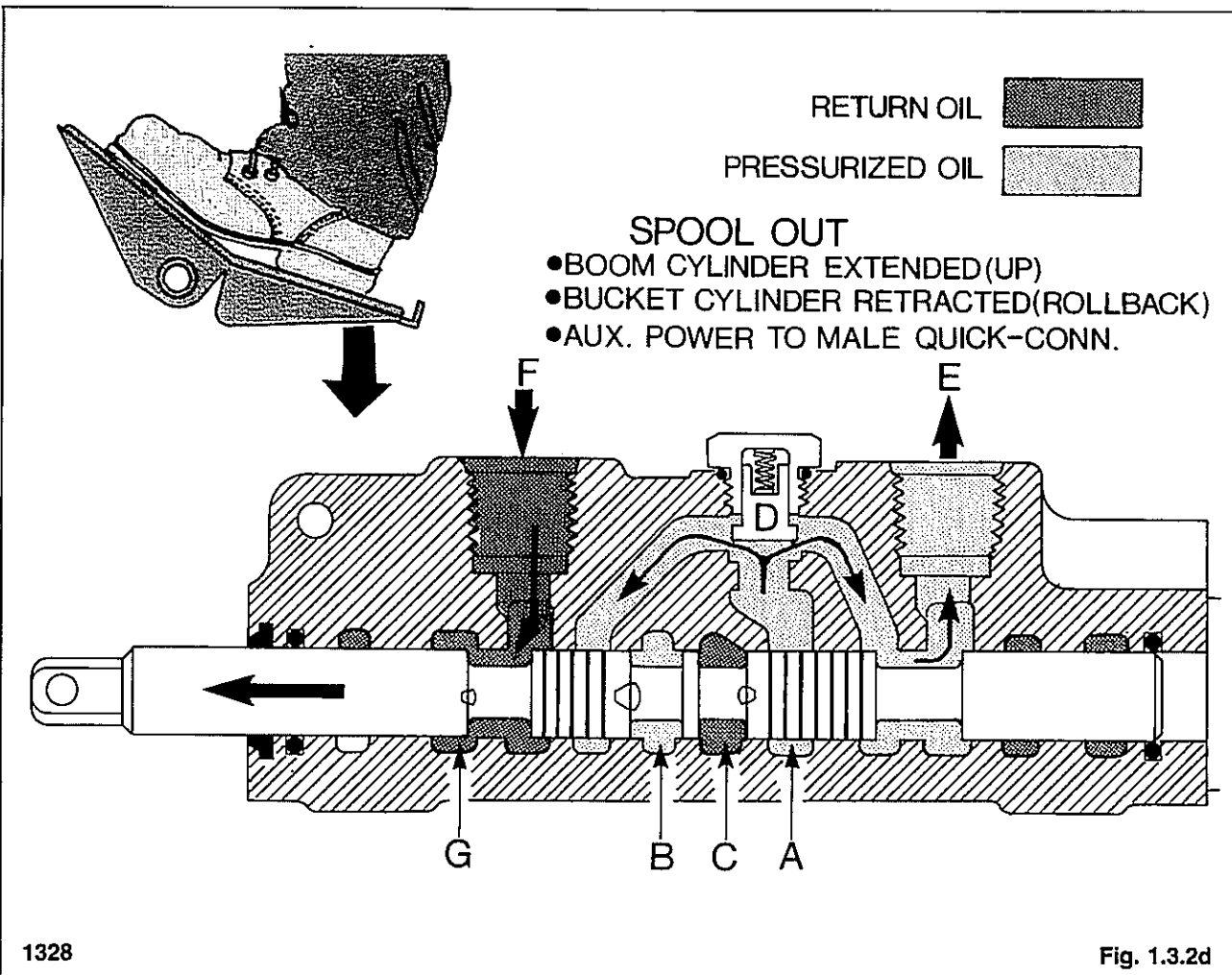
OPERATION — BOOM FLOAT POSITION

Incorporated at the end of the boom spool is a detent locking device that holds the spool in float position. With the spool in this position, oil is permitted to flow freely between the rod and piston end of the boom cylinders as illustrated in fig. 1.3.2e. As the working surface varies the boom arms "float" with the ground contour.

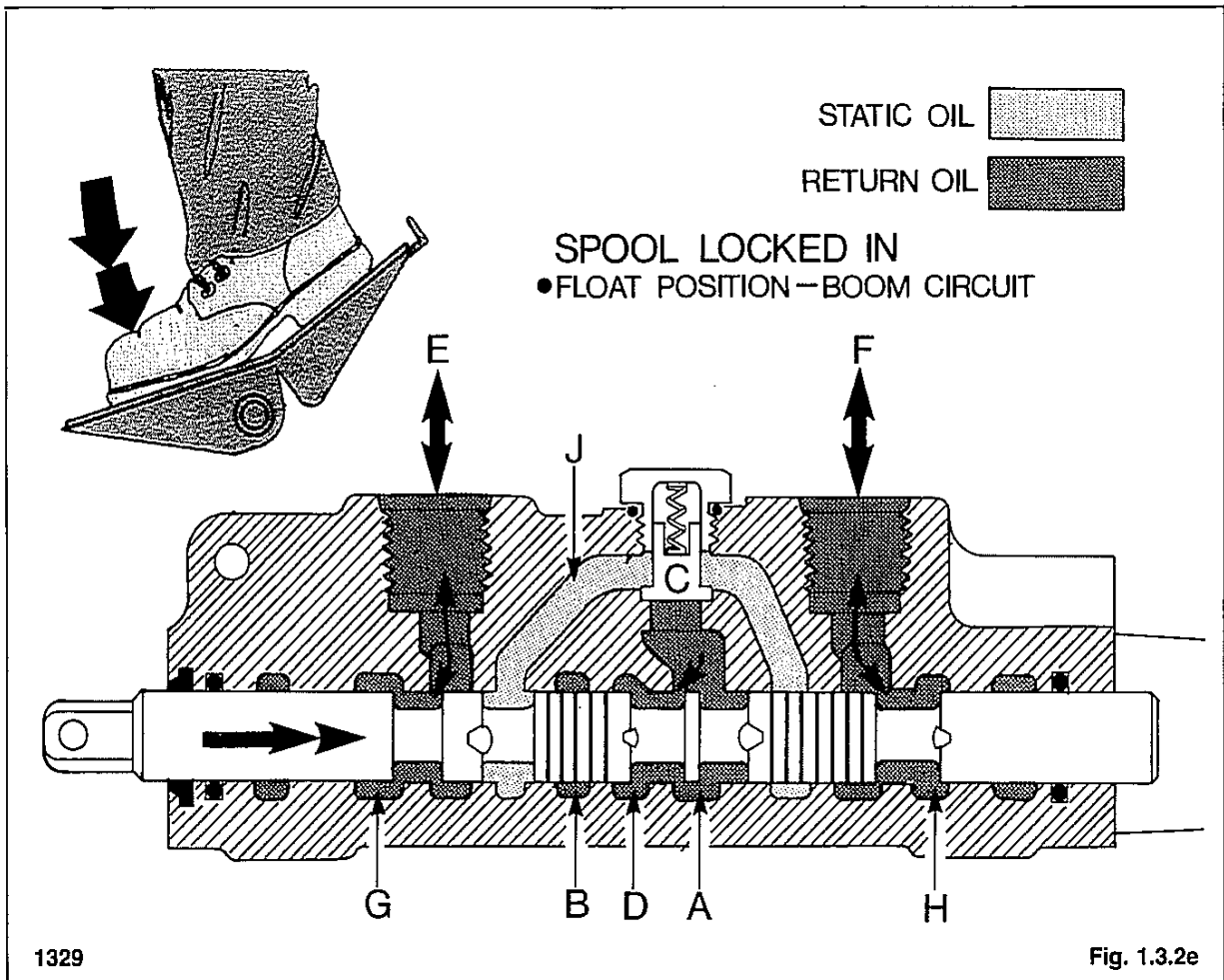
Oil travels through passages A and B to passage D which is connected to the reservoir and to passages G and H.

Oil being displaced or forced out of one cylinder end circulates to the other cylinder end through hose port E or F, depending on whether raising or lowering conditions occur.

The load check valve C will not unseat as passage J is blocked by the spool land.



SECTION 1 HYDRAULICS



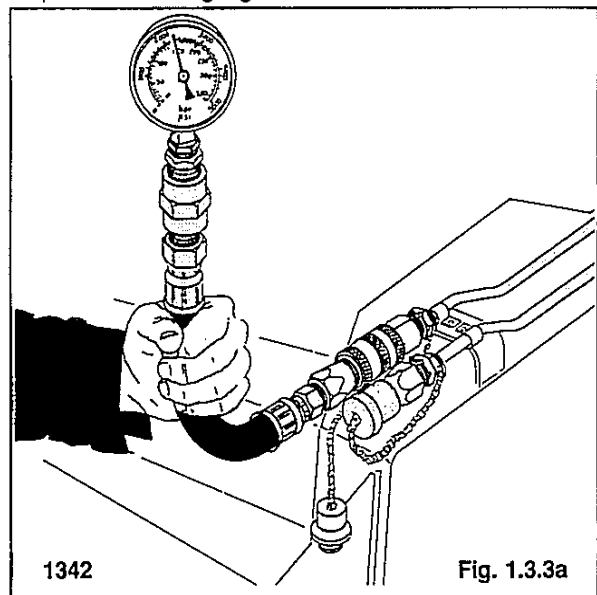
1.3.3 Testing and Adjusting the Relief Valve

TESTING — SYSTEM RELIEF VALVE

Use a pressure gauge capable of reading up to 3000 PSI (206.8 BAR) and hose and fittings capable of 3000 PSI (206.8 BAR) continuous pressure when performing the test.

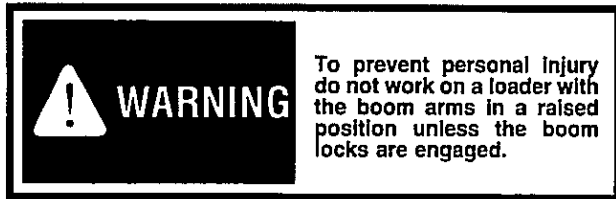
1. Operate the loader until the hydraulic oil is warm. Shut off the engine.
2. This test must be performed with the engine running. Before performing the test remove any attachment and block the loader securely with all four wheels clear of the ground.
3. Connect a pressure gauge in the female quick-connect coupling on the auxiliary hydraulic circuit located at the front of the boom arm (fig. 1.3.3a).
4. Start the engine.
5. Press the toe of the auxiliary (center) pedal to activate the auxiliary hydraulic circuit.
6. Pressure must be 2150 PSI (148 B) \pm 50 PSI (\pm 3.4 BAR).

7. Shut off the engine and cycle the foot pedal to relieve pressure at the gauge.

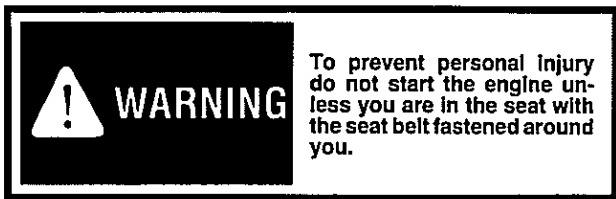


SECTION 1 HYDRAULICS

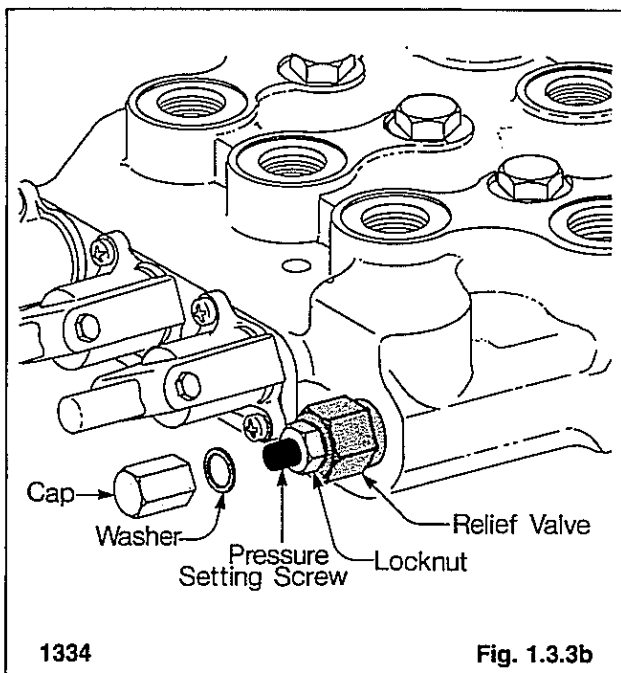
ADJUSTMENT — SYSTEM RELIEF VALVE



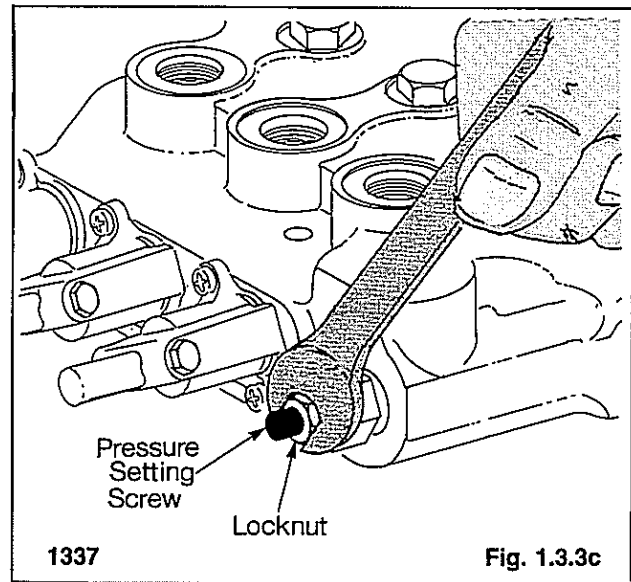
1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



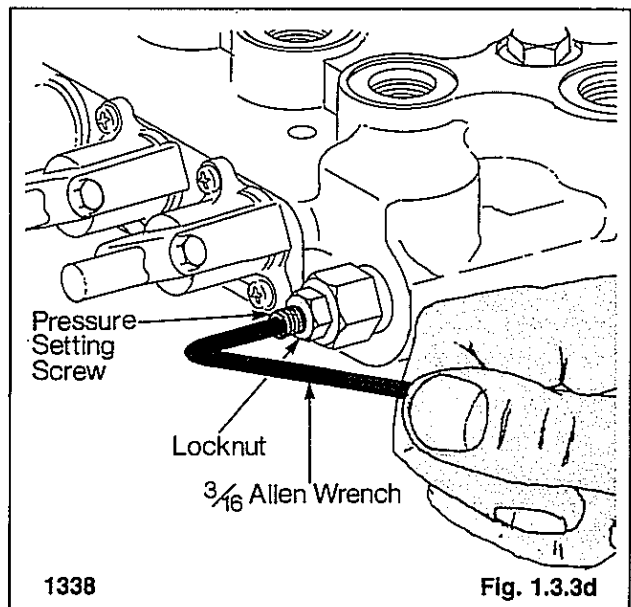
2. The engine must be run after making any adjustment to check the relief pressure. Block the loader securely with all four wheels clear of the ground.
3. Connect a pressure gauge in the female quick-connect coupling on the auxiliary hydraulic circuit. The pressure gauge, hoses and fittings used should be capable of accepting 3000 PSI (148 BAR) continuous pressure.
4. Raise the seat and remove the hydrostatic shield.
5. Remove the relief valve cap screw and washer from the relief valve (fig. 1.3.3b).



6. Loosen the relief valve locknut (fig. 1.3.3c).



7. Using a 3/16 inch allen wrench (fig. 1.3.3d) turn the pressure setting screw a maximum of 1/4 turn. To increase the pressure setting, turn the pressure setting screw in. To decrease, turn the pressure setting screw out.



8. Tighten the relief valve locknut.
9. Start the engine. Press the toe of the auxiliary foot pedal to activate the auxiliary hydraulic system and read the pressure setting on the gauge. Pressure should be 2150 PSI (148 BAR) \pm 50 PSI (\pm 3.4 BAR). Shut off the engine. If necessary repeat steps 6 through 9.

SECTION 1 HYDRAULICS

IMPORTANT

Do not set the relief pressure above 2150 PSI (148 BAR) to prevent damage to the hydraulic system components.

10. When the correct relief pressure is obtained tighten the locknut to 16-20 ft. lbs. (22-27 N.M.).
11. Install the cap and washer and tighten to 16-20 ft. lbs. (22-27 N.M.).

1.3.4 Control Valve Removal, Replacement

IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

REMOVAL—

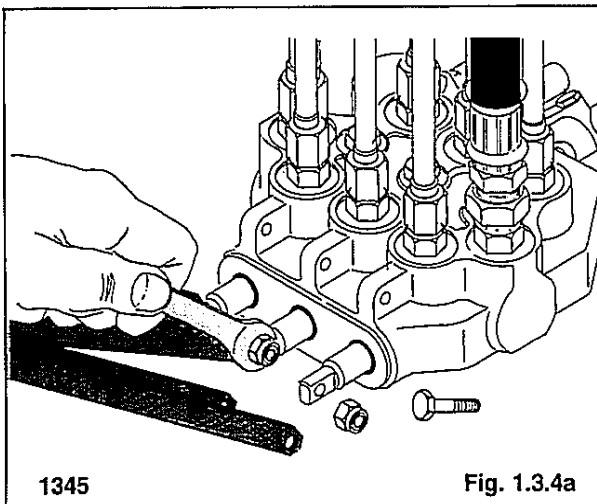
1. Remove any attachment. Raise the boom arms and engage the boom locks. Shut off the engine.



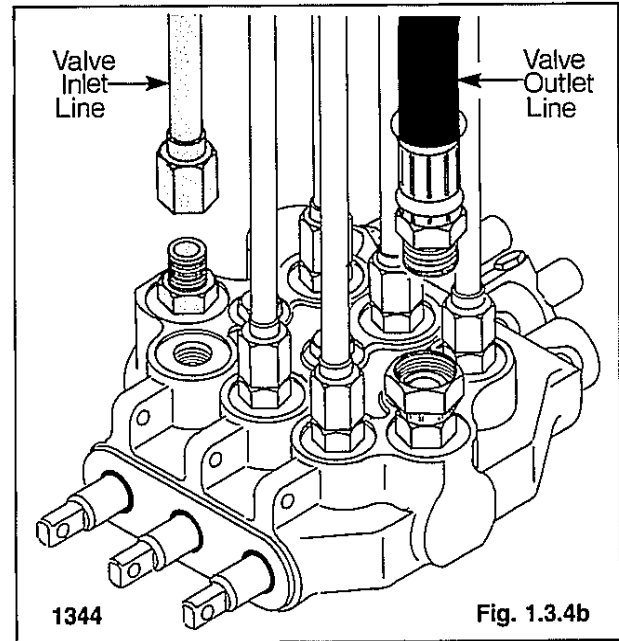
WARNING

To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.

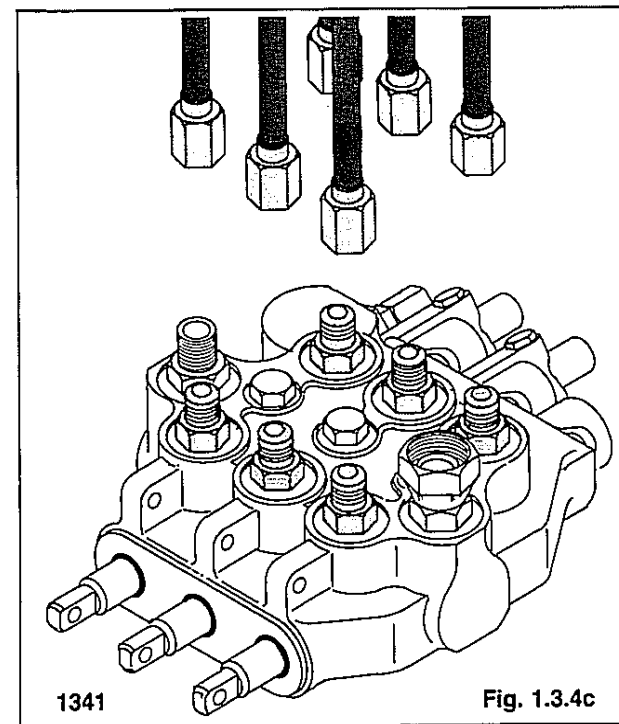
2. Drain the oil from the hydraulic reservoir. Refer to section 1.7.3.
3. Raise the seat and remove the hydrostatic shield.
4. Disconnect the foot pedal linkage at the control valve spool (fig. 1.3.4a).



5. Disconnect the line between the hydraulic gear pump outlet and control valve inlet (fig. 1.3.4b). Cap the hydraulic line and plug the control valve inlet port.
6. Disconnect the line from the control valve outlet port (fig. 1.3.4b). Cap the hydraulic line and plug the control valve outlet port.



7. Disconnect all six lines going to the bucket, boom and auxiliary hydraulic circuits at the control valve (fig. 1.3.4c). Cap all six hydraulic lines and hose ports on the control valve.



SECTION 1 HYDRAULICS

8. Remove the two bolts and nuts which secure the hydraulic control valve to the valve mount.
9. Remove the hydraulic control valve.

REPLACEMENT—

1. Install the valve and secure with two bolts and nuts.
2. Connect the six hydraulic lines going to the bucket, boom and auxiliary hydraulic circuits at the control valve.
3. Connect the hydraulic hose going to the oil filter at the hydraulic control valve outlet port.
4. Connect the hydraulic pipe going to the hydraulic gear pump at the hydraulic control valve inlet port.

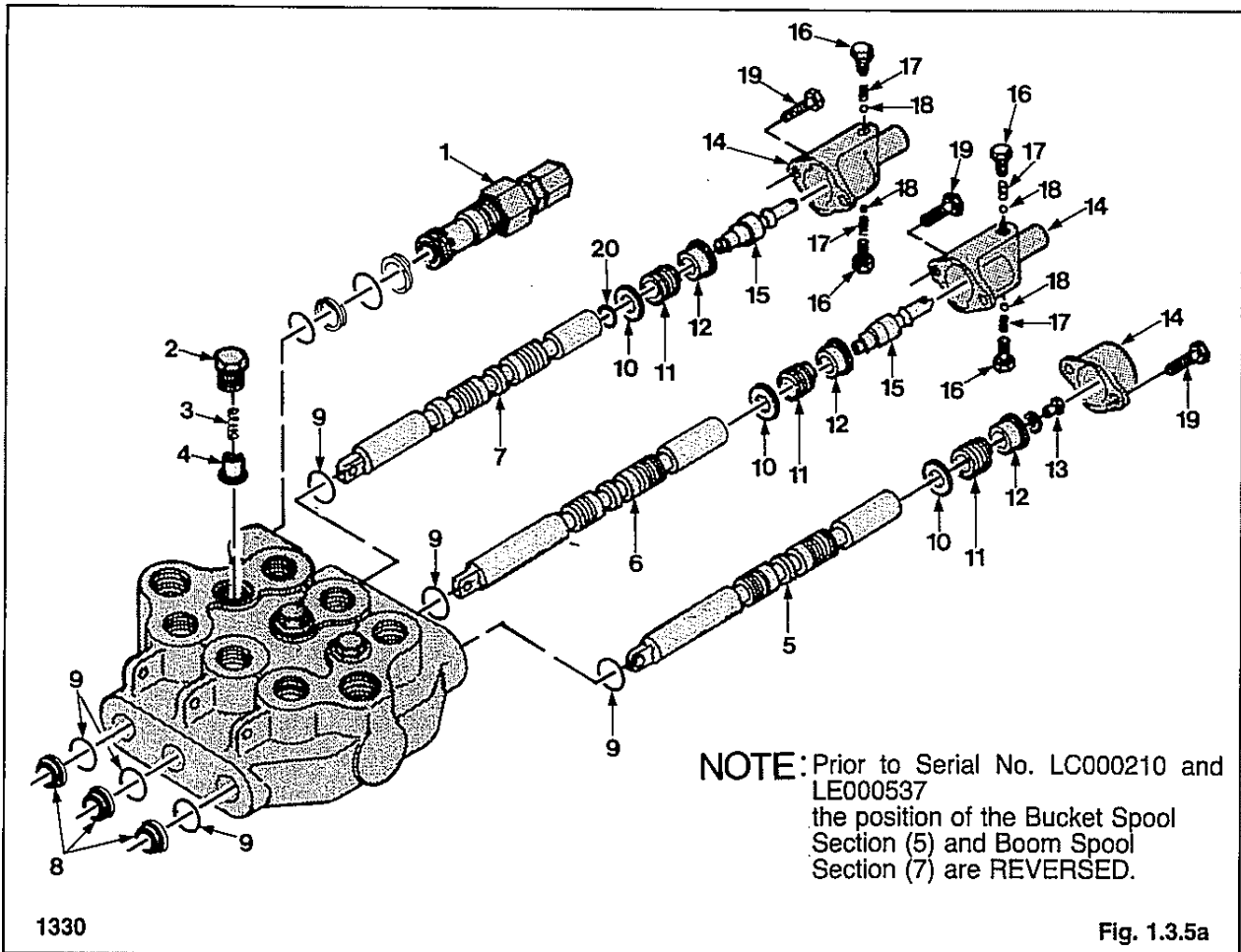
5. Connect the foot pedal linkages to the hydraulic control valve spools.
6. Fill the hydraulic reservoir to the correct level with 10W30 API classification SE, CD or Ford No. 48 oil. Refer to section 1.7.3 for procedure and capacities.

IMPORTANT

To prevent damage after removal or repair of hydraulic components refer to start up procedure sect. 1.2.6.

7. Before start up refer to section 1.2.6 for correct procedure to prevent damage to the hydraulic system components.

1.3.5 Disassembly and Inspection:



- | | | | |
|-------------------------|----------------------------|-------------------|-------------------|
| 1. RELIEF VALVE | 6. AUXILIARY SECTION SPOOL | 11. SPRING | 16. DETENT PLUG |
| 2. LOAD CHECK, PLUG | 7. BOOM SECTION SPOOL | 12. SPRING SPACER | 17. DETENT SPRING |
| 3. LOAD CHECK, SPRING | 8. SPOOL WIPER SEAL | 13. SCREW | 18. DETENT BALL |
| 4. LOAD CHECK, POPPET | 9. SPOOL O-RING | 14. END CAP | 19. END CAP SCREW |
| 5. BUCKET SECTION SPOOL | 10. RETURN WASHER | 15. DETENT SPOOL | 20. O-RING |

SECTION 1 HYDRAULICS

IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

DISASSEMBLY —

Before disassembling the hydraulic control valve, clean the body with a suitable solvent and dry with compressed air. Ensure all openings are plugged to prevent solvent entering the pump. Refer to figure 1.3.5a to assist in disassembly.



WARNING

To avoid eye injury use safety goggles when cleaning with compressed air.

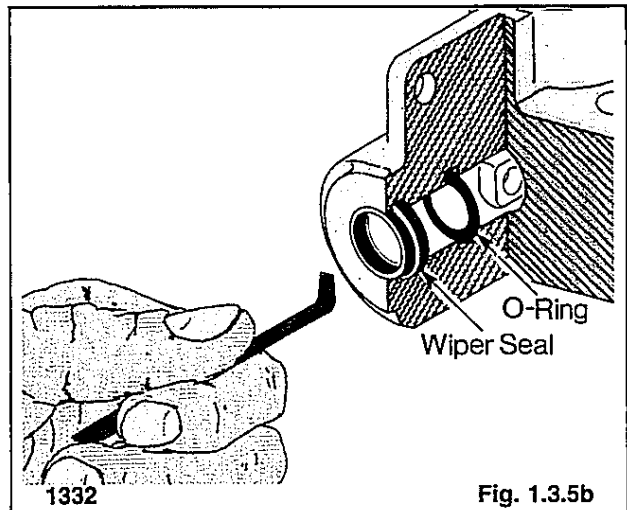
1. Remove the pressure relief valve (1). Discard O-rings and back-up washers.
2. Remove three load check plugs (2), springs (3) and poppets (4). Discard the O-rings which seal the load check plugs.
3. Remove the two end cap screws (19) from the bucket spool end cap (14). Remove the end cap (14).
4. Remove the return spring screw (13) and lockwasher from the bucket spool spring return assembly.
5. Remove the spring spacer (12), spring (11) and return washer (10) from the bucket section spool (5). Remove the bucket spool (5).

IMPORTANT

Do not intermix parts from one spool with another. Keep spool parts separate.

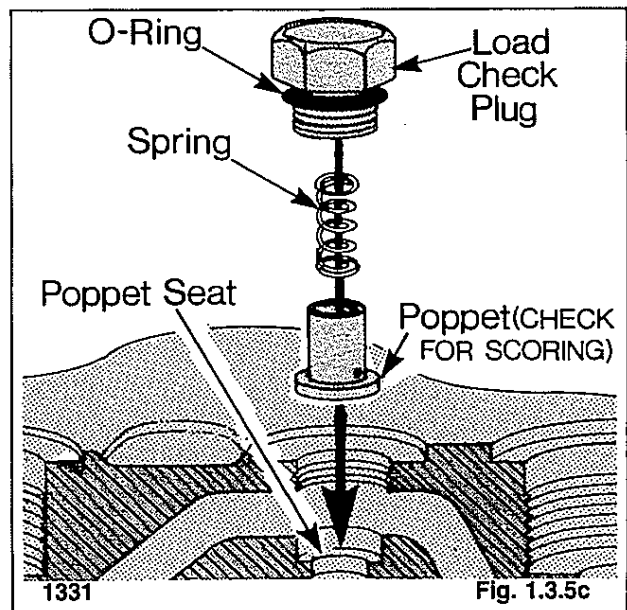
6. Remove the two detent plugs (16) detent springs (17) and detent balls (18) from the auxiliary spool end cap (14).
7. Remove the two end cap screws (19) from the auxiliary spool end cap (14). Remove the end cap.
8. Remove the detent spool (15), spring spacer (12), spring (11) and return washer (10) from the auxiliary spool (6). Remove the auxiliary spool (6).
9. Remove the two detent plugs (16), detent springs (17) and detent balls (18) from the boom spool end cap (14).
10. Remove the two end cap screws (19) from the boom spool end cap (14). Remove the boom spool end cap (14).

11. Remove the detent spool (15), spring spacer (12), spring (11) and return washer (10) from the boom spool (7). Remove the boom spool (7).
12. Remove and discard the six spool O-rings (9) and the spool wiper seals (8) from the spool bores (fig. 1.3.5b). Be careful not to scratch the spool bores.



INSPECTION —

1. Thoroughly clean and dry all parts.
2. Inspect the load check valve springs (3) for breakage or loss of tension.
3. Inspect the load check poppets (4) for scoring or wear (fig. 1.3.5c).



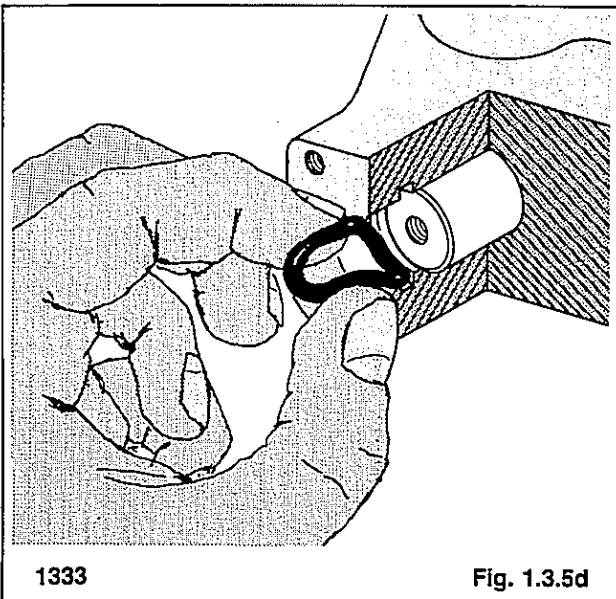
4. Inspect the poppet seats inside the valve body for scoring (fig. 1.3.5b). Scoring on the poppet or poppet seat will allow leakage and may result in the boom or bucket being unable to hold their position when the spools are in neutral or at initial spool movement.

SECTION 1 HYDRAULICS

5. Check the spools for scoring or wear. The spools are selectively fitted to each section spool bore. Because of this selective fitting, the spools are not interchangeable or serviced individually.
6. Inspect the spool bores in the control valve body for scoring or wear.
7. Inspect the return washers (10), return springs (11), spring spacers (12) and the detent spools (15) for damage or wear.
8. Check the relief valve and relief valve seat in the control valve housing for scoring or wear.

ASSEMBLY —

1. Install the three load check poppets (4), poppet springs (3) and load check plug (2) in the control valve housing. Install a new O-ring on the load check plug (2) before assembly.
2. Install the relief valve (1) in the control valve housing. Install new O-rings and backup washers on the relief valve before assembly.
3. Lubricate with system oil, three spool O-rings (9) and install them in the 'O' ring grooves at the front of the valve housing.
4. Carefully insert each spool into its proper bore from the back of the valve housing. Rotate the spools as they pass through the O-rings at the front of the valve body. Pull the spools out of the front of the valve body until the back edge of the spool is in line with the back edge of the O-ring groove at the rear of the valve housing (fig. 1.3.5d).
5. Lubricate with system oil, three spool O-rings and install them in the O-ring grooves at the rear of the valve housing (fig. 1.3.5d). Push the spools back into the valve body rotating while pushing until the back of the spools are even with the outside of the valve housing.



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Fig. 1.3.5d

6. Install three wiper seals (8) at the front of the control valve housing.
7. Install the return washer (10), spring (11), spring spacer (12) on the end of the bucket spool and secure in place with the lockwasher and screw (13). Torque to 2-3 ft. lbs. (2.7-4 N.M.).
8. Install the bucket spool end cap (14) and secure with two end cap screws (19). Torque the end cap screws 2-3 ft. lbs. (2.7-4 N.M.).
9. Install the return washers (10), springs (11) and spring spacer (12) on the ends of both the auxiliary and boom spools. Secure in place with the detent spools (15). Apply lock-tite RC609 to the detent spool threads (15) and torque the detent spools (15) to 2-3 ft. lbs. (2.7-4 N.M.).

IMPORTANT

Do not intermix parts from one spool with another. Keep spool parts separate.

10. Install the auxiliary and boom spool end caps (14) and secure with end cap screws (19). Torque the end cap screws 2-3 ft. lbs. (2.7-4 N.M.).
11. Install the detent balls (18), detent springs (17) and detent plugs (16) in the spool end caps (14) on both the auxiliary and the boom sections.

1.3.6 Spool Seal Replacement:

It is not necessary to remove the hydraulic control valve from the loader or to remove the spools from the valve body to replace the spool seals.

The spool is sealed on both ends with an O-ring (fig. 1.3.6a). In addition a wiper seal is located at the front of each spool to prevent dirt entering the valve body as the spool is moved.

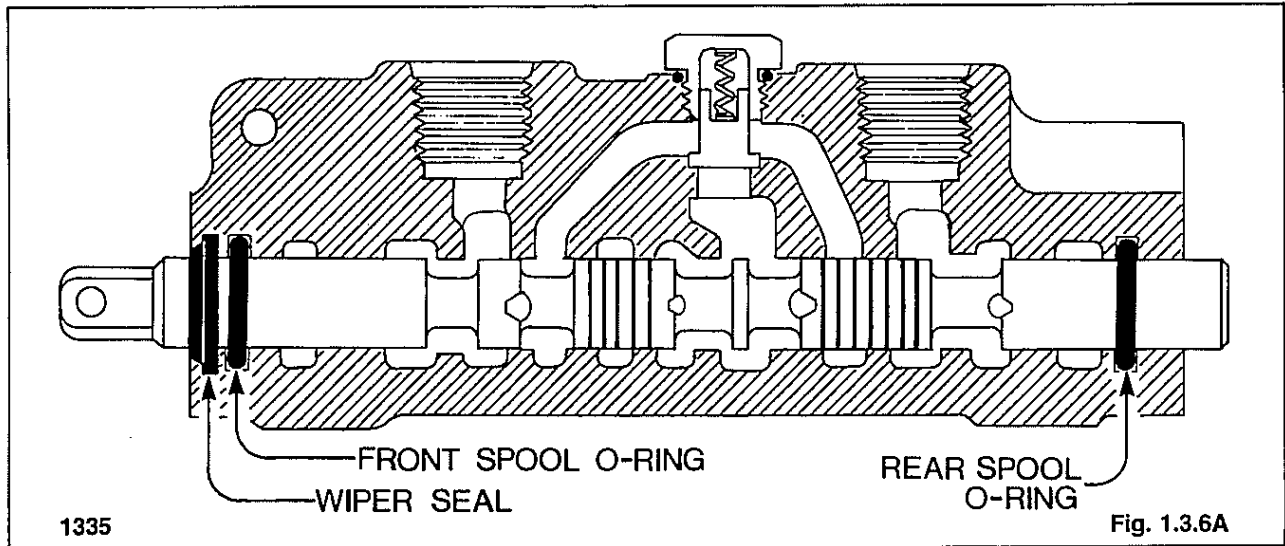
The following instructions refer to replacement of the spool seals on the boom lift spool. The procedure on the other two spools will be the same with the exception of removing the spring mechanism on the bucket spool. Refer to section 1.3.5 for additional information.

IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.

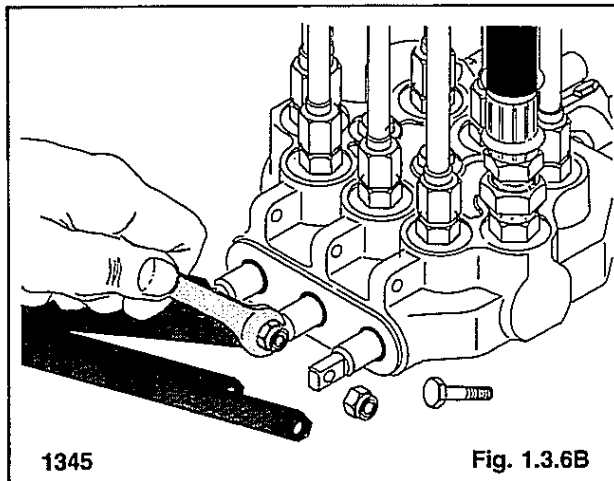
SECTION 1 HYDRAULICS



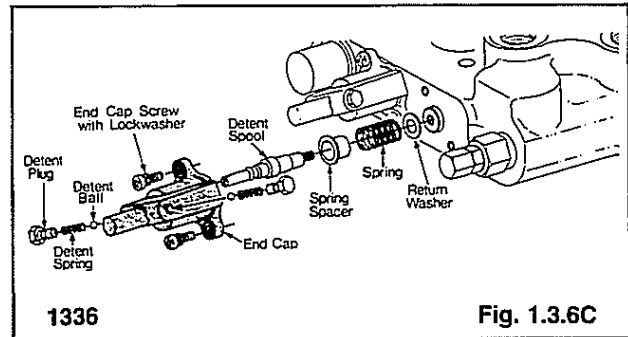
WARNING

To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.

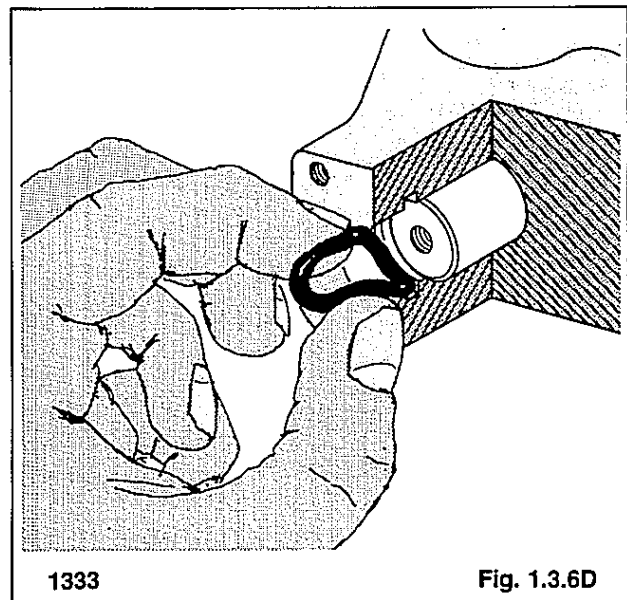
2. Raise the seat and remove the hydrostatic shield.
3. Disconnect the foot pedal linkage at the control valve spool (fig. 1.3.6b).



4. Remove the detent plug, detent spring and detent ball from the end cap (fig. 1.3.6c).
5. Remove the end cap (fig. 1.3.6c).
6. Remove the detent spool, spring spacer, spring and return washer from the end of the spool (fig. 1.3.6c).
7. Pull the spool out of the front of the valve body until the back edge of the spool is in line with the back edge of the O-ring groove at the rear of the valve housing (fig. 1.3.6d).

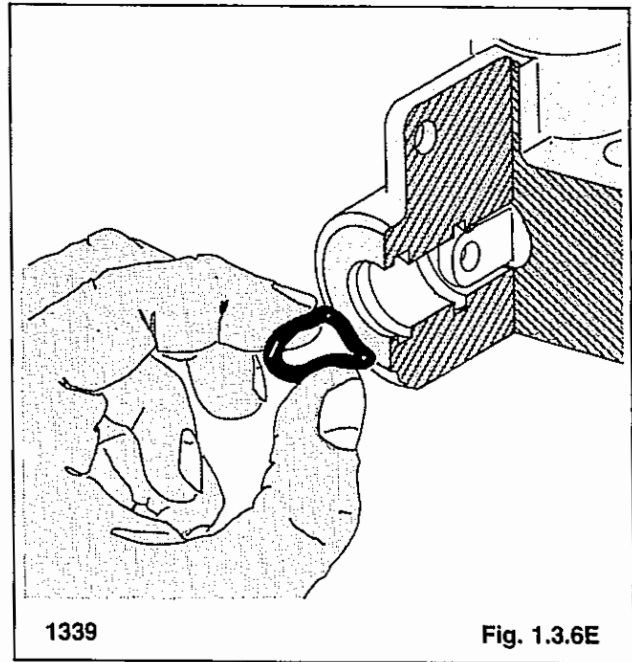


8. Remove and discard the O-ring.
9. Lubricate a new O-ring with system oil and install in the O-ring groove (fig. 1.3.6d).

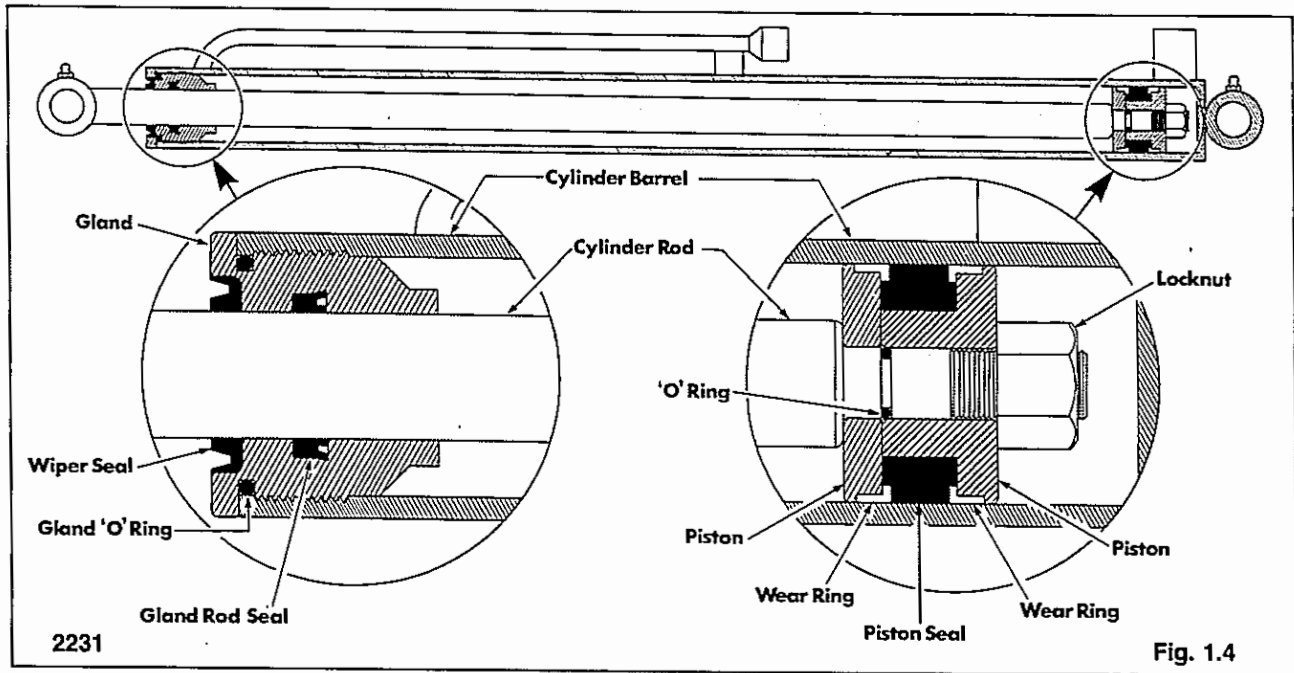


SECTION 1 HYDRAULICS

10. Push the spool back into the valve body, rotating the spool while pushing, until the clevis end of the spool is even with the back edge of the O-ring groove at the front of the valve body (fig. 1.3.6e).
11. Remove and discard the O-ring and wiper seal.
12. Lubricate a new O-ring with system oil and install in the O-ring groove (fig. 1.3.6e).
13. Pull the spool out of the valve housing. Rotate the spool while pulling until the back of the spool is even with the outside of the valve housing at the rear.
14. Install a new wiper seal at the front of the valve housing.
15. Install the end cap and spring return parts in the reverse order of disassembly.
Apply loctite RC609 to the detent spool and torque the detent spool 2-3 ft. lbs. (2.7-4 N.M.).
Torque the end cap screws 2-3 ft. lbs. (2.7-4 N.M.).
16. Reconnect the foot pedal linkage.
17. Start the engine and check for leaks.



1.4 HYDRAULIC CYLINDERS



1.4.1 Specifications:

		Bore diameter	2 in. (50.8 mm)	2.5 in. (63.5 mm)
		Stroke	27.125 in. (689 mm)	13.375 in. (340 mm)
		CYCLE TIMES (sec.)	T103	T133
Type	BOOM CYLINDERS	BUCKET CYLINDERS	Boom up.....	4.5 3.5
Qty. per model	2	2	Boom down	3.5 3.0
Rod diameter	1.25 in. (31.8 mm)	1.125 in. (28.6 mm)	Bucket dump.....	3.0 3.0
			Bucket rollback.....	3.0 2.0
			Total cycle time.....	8.5 8.0

SECTION 1 HYDRAULICS

1.4.2 General Information:

All cylinders are double acting being designed to both extend and retract under hydraulic pressure.

The piston rods, which are made of high strength distortion free material, are precision ground and hard chrome plated. The cylinder barrels are microhoned to close tolerance, straightness and smooth finish for long piston packing life.

All cylinders have a two piece piston assembly made of ductile iron and a polypac seal arrangement consisting of a piston seal and two wear rings.

The gland rod seal consists of a 'U' cup which faces the pressurized oil. The rod wiper keeps foreign matter from entering the cylinder by wiping the rod clean as the cylinder retracts.

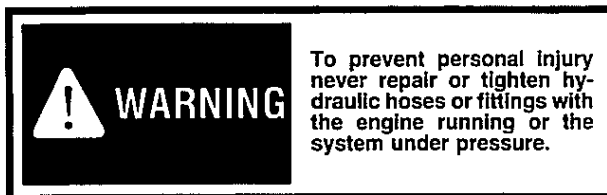
Two types of outer gland seals are used. One type consists of an O-ring with a teflon back-up washer installed on the low pressure side of the O-ring. The other type consists of an O-ring which seals between the gland and the end of the cylinder barrel. The seal kit contains seals to service both types of glands.

1.4.3 Testing, Piston Seals:

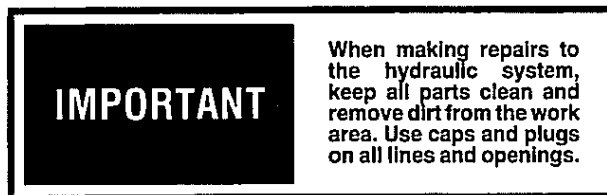
If the boom or bucket cylinders drift down with the control valve in neutral position, and with no external leaks in the hydraulic system, the following test will indicate if oil is leaking by the cylinder piston seal. Before performing the test ensure the foot pedals are not binding and the hydraulic control valve spools are centering in neutral position.

BOOM CYLINDERS:

1. This test must be performed with the engine running. Remove any attachment and block the loader securely with all four wheels clear of the ground.
2. Lower the lift arms completely down. Shut off the engine and cycle the foot pedals to release hydraulic pressure.

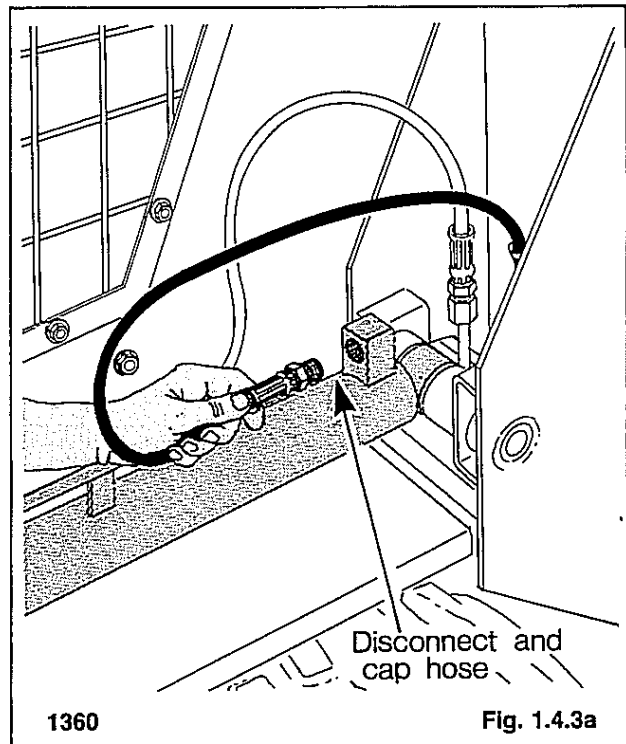


3. Disconnect the hydraulic hose from the boom cylinder rear port (fig. 1.4.3a). Cap the hose.



4. Start the engine. Push down on the toe of the boom foot control pedal (do not put in float position).

5. If oil leaks from the rear boom cylinder port, remove the cylinder or cylinders and make repairs as needed (see

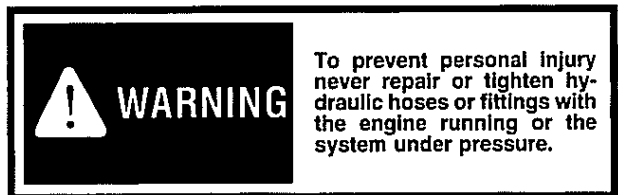


section 1.4.4 and 1.4.5). If there is no leakage from the rear boom cylinder port check for internal leakage at the control valve (section 1.3.5).

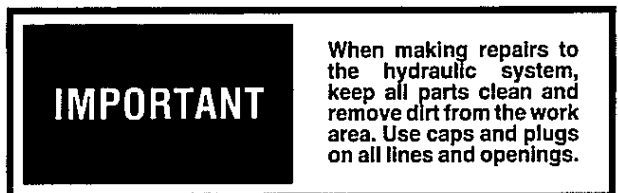
6. Connect the hydraulic hose to the rear port of the boom cylinder.

BUCKET CYLINDERS:

1. This test must be performed with the engine running. Remove any attachment and block the loader securely with all four wheels clear of the ground.

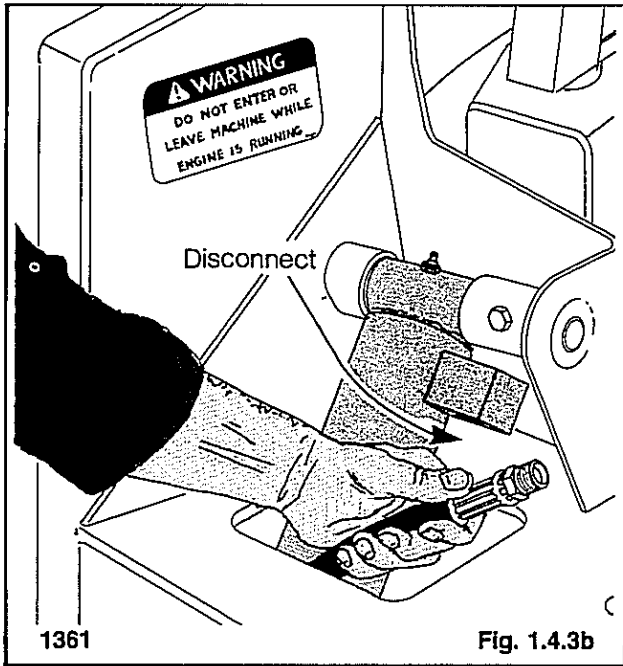


2. Retract the bucket cylinders fully (rollback) and stop the engine. Cycle the foot pedals to release hydraulic pressure.



SECTION 1 HYDRAULICS

3. Disconnect the hydraulic hose from the bucket cylinder rear port (fig. 1.4.3b). Cap the hose.

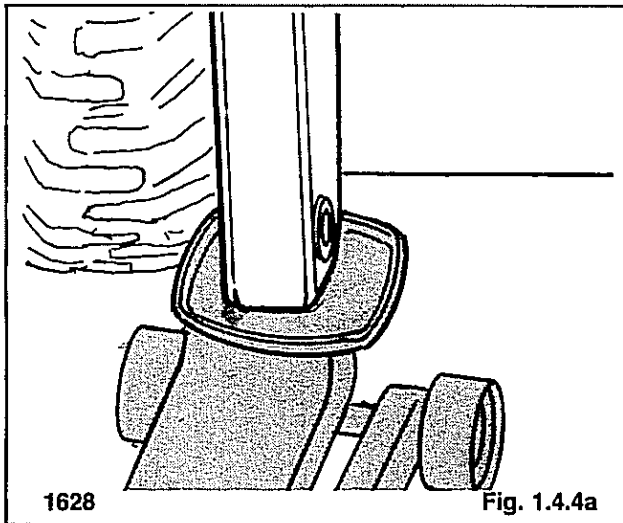


4. Start the engine. Push down on the heel of the bucket foot control pedal.
5. If oil leaks from the rear bucket cylinder port, remove the cylinder or cylinders and make repairs as needed (see section 1.4.4 and 1.4.5). If there is no leakage from the rear bucket cylinder port check for internal leakage at the control valve (section 1.3.5).
6. Connect the hydraulic hose to the rear port of the bucket cylinder.

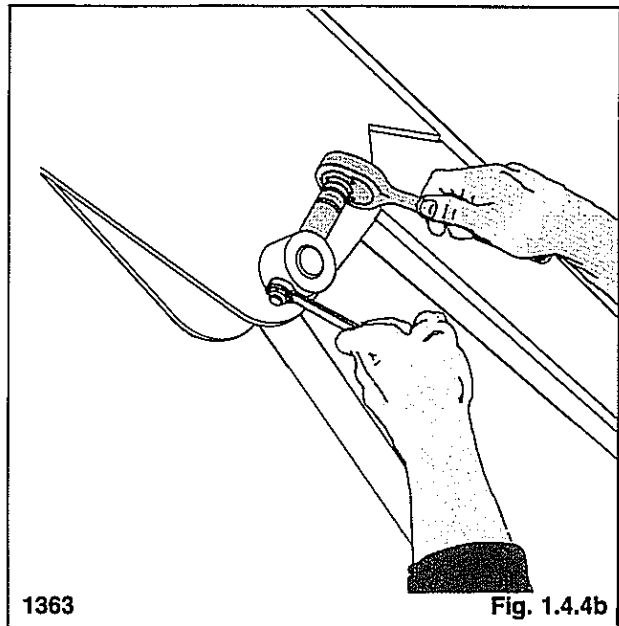
1.4.4 Cylinder, Removal:

BOOM CYLINDER — REMOVAL:

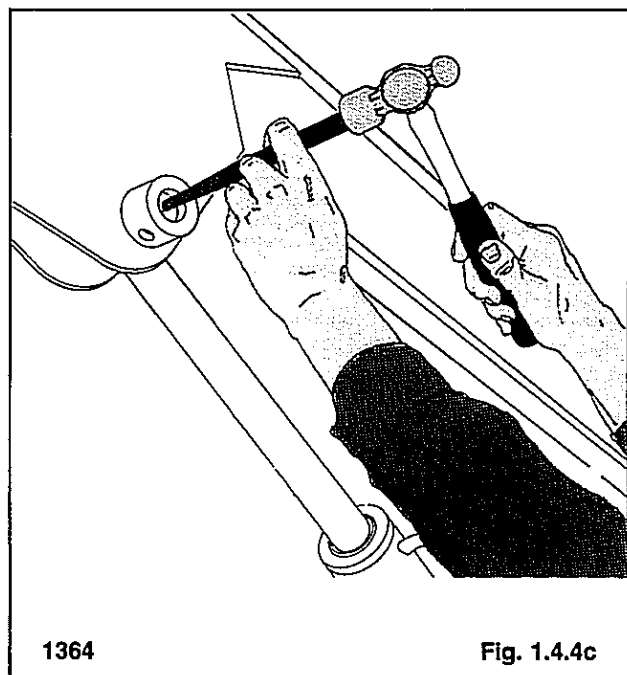
1. Stop the engine and cycle the foot pedals to relieve any hydraulic pressure in the system.
2. Put a floor jack under the boom arms (fig. 1.4.4a).



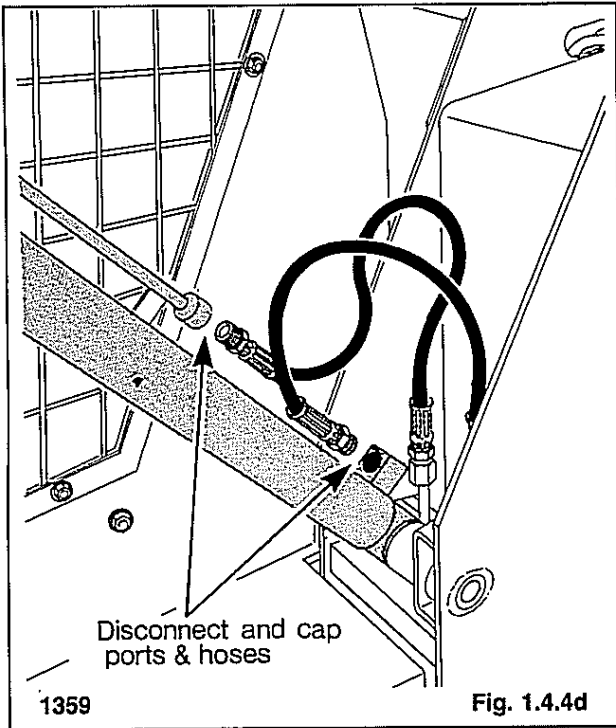
3. Lock the boom lift foot pedal in float position by pushing firmly down on the toe of the pedal (see section 4.2.1).
4. Raise the boom arms with the floor jack until the pivot pins in the rod end of the boom cylinders can be removed.
5. Remove the locknut, washer and bolt from the pivot pin at the rod end of the boom cylinders (fig. 1.4.4b).



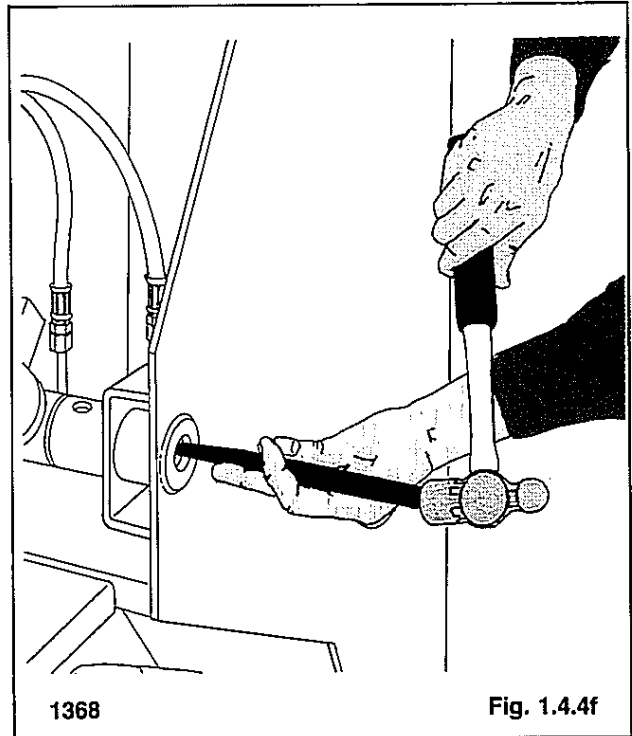
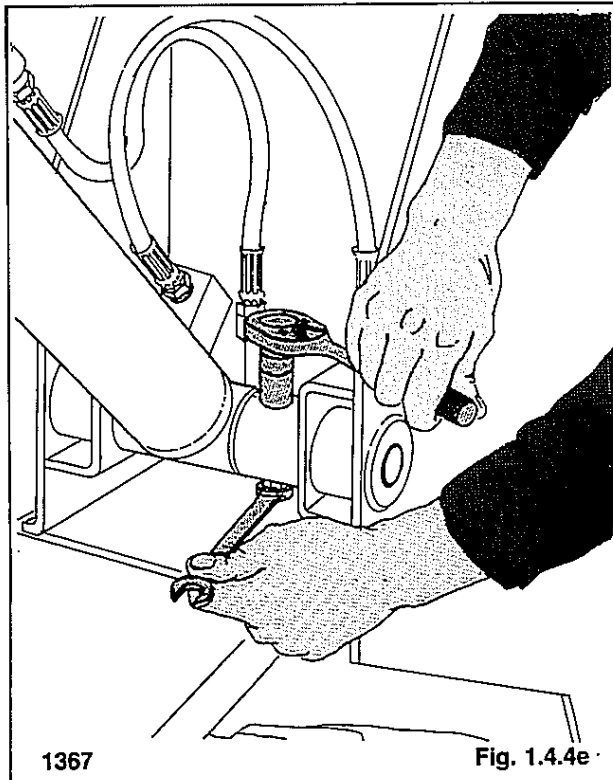
6. Remove the pivot pins (fig. 1.4.4c). Place a support under the boom cylinder to prevent the cylinder from falling when the pivot pin is removed.



SECTION 1 HYDRAULICS



7. Remove the hydraulic hose from the front and rear ports on the boom cylinder (fig. 1.4.4d). Cap cylinder ports and hoses.
8. Remove the locknut, washer and bolt at the base of the cylinder (fig. 1.4.4e).



9. Remove the pivot pin (fig. 1.4.4f).
10. Remove the boom cylinder from the loader.
11. Lower the boom arms and remove the floor jack.

BUCKET CYLINDER — REMOVAL:

1. Lower the boom arm, remove any attachment and extend the bucket cylinders (dump). Shut off the engine. Cycle the hydraulic pedals to release pressure.



WARNING

To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.



WARNING

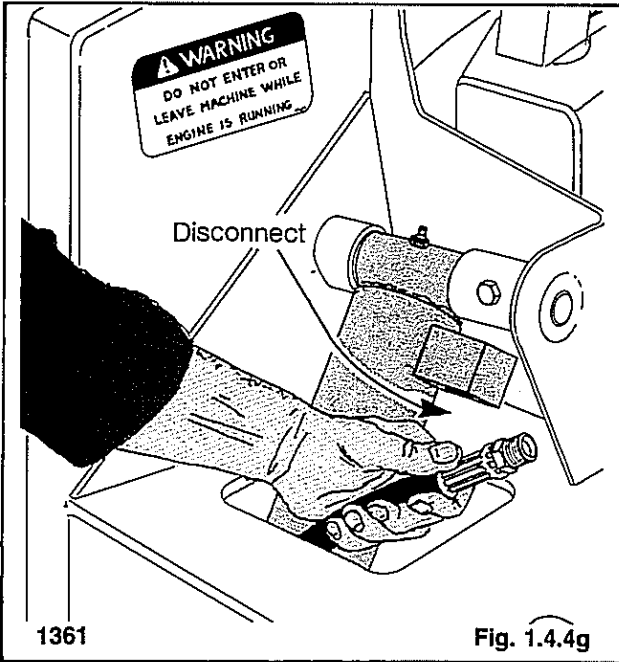
To prevent personal injury never repair or tighten hydraulic hoses or fittings with the engine running or the system under pressure.

SECTION 1 HYDRAULICS

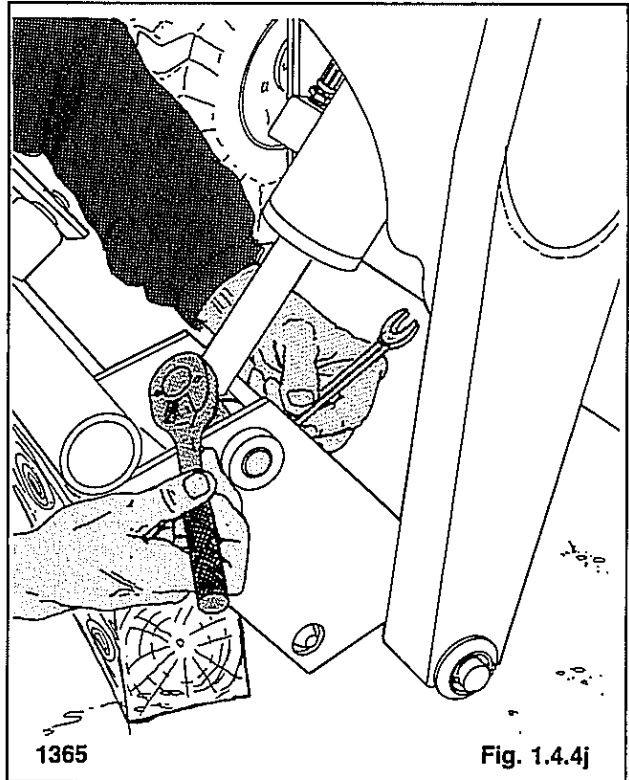
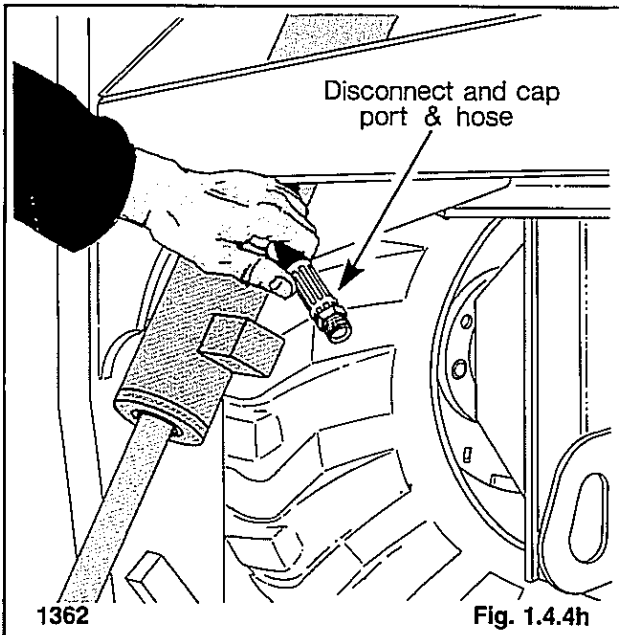
2. Remove the hydraulic hose from the rear port of the bucket cylinder (fig. 1.4.4g). Plug the cylinder port and cap the hydraulic hose.

IMPORTANT

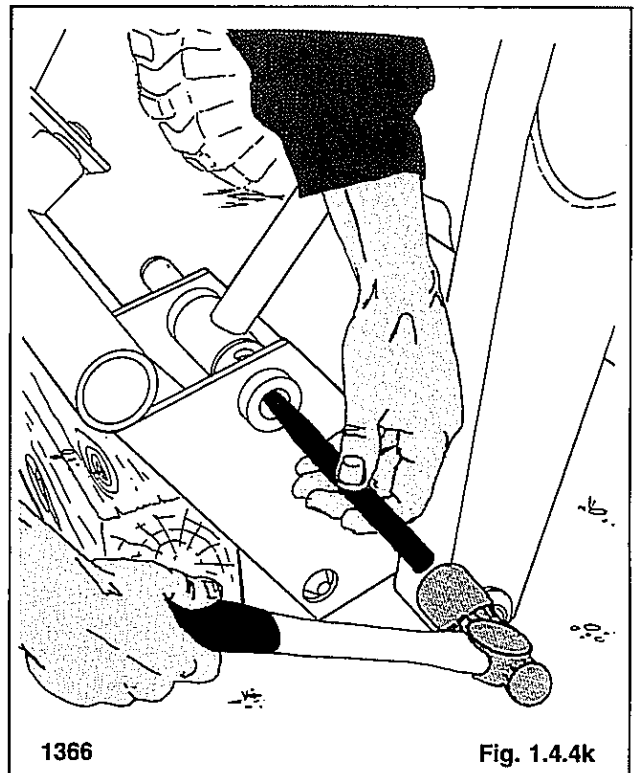
When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.



3. Remove the hydraulic hose from the rod end port of the bucket cylinder (fig. 1.4.4h). Plug the cylinder port and cap the hydraulic hose.

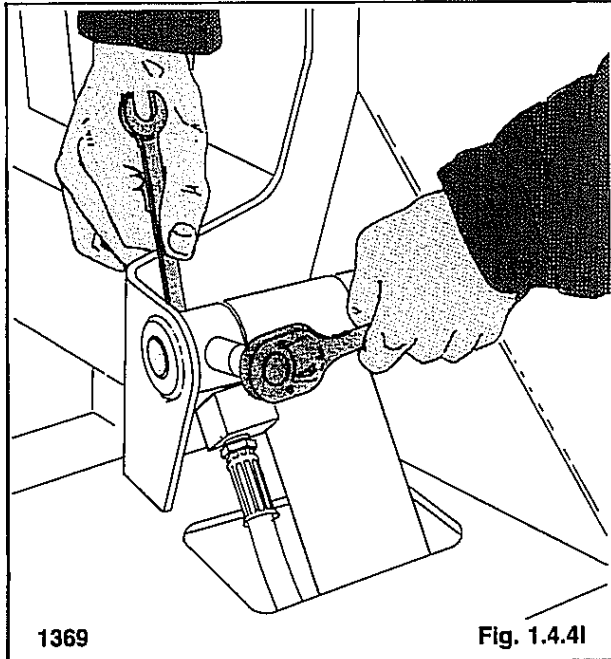


4. Remove the locknut, washer and bolt at the rod end of the cylinder (fig. 1.4.4j).
5. Remove the pivot pin (fig. 1.4.4k).

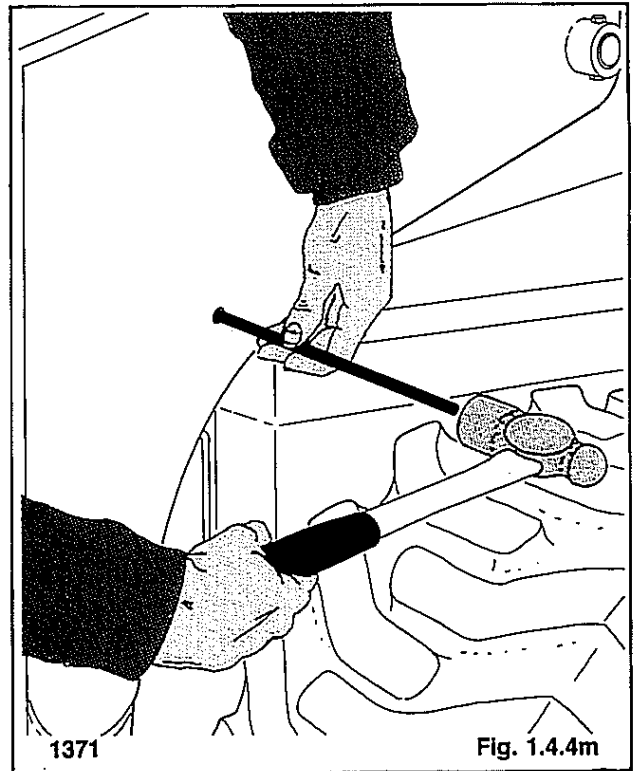


SECTION 1 HYDRAULICS

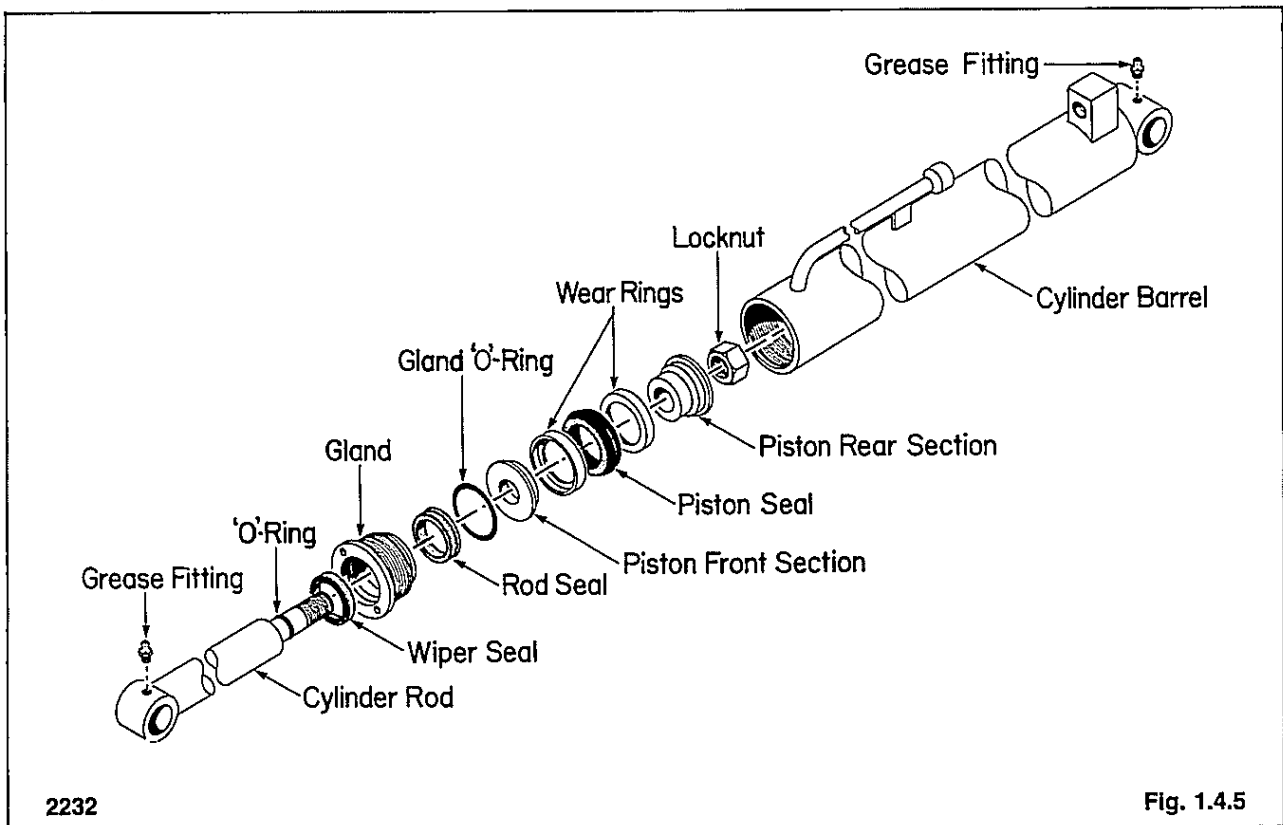
6. Remove the locknut, washer and bolt at the rear bushing of the bucket cylinder (fig. 1.4.4l).
7. Remove the pivot pin (fig. 1.4.4m). A hole is located on the boom arm side plate to allow driving out the pivot pin.



8. Remove the cylinder from the loader.



1.4.5 Cylinder Disassembly and Inspection



SECTION 1 HYDRAULICS

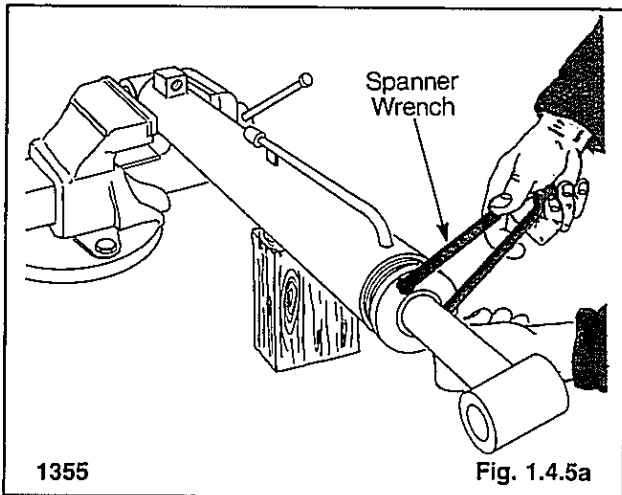
Before disassembling the hydraulic cylinder, clean the body with a suitable solvent. Ensure all openings are plugged to prevent solvent entering the cylinder.

IMPORTANT

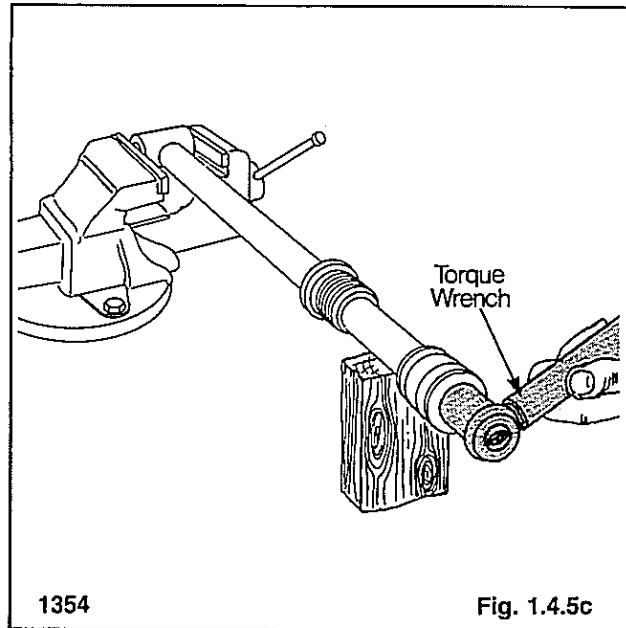
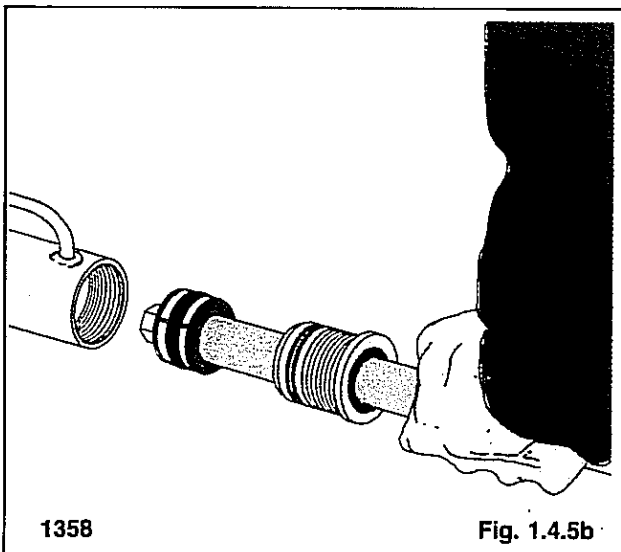
When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

DISASSEMBLY:

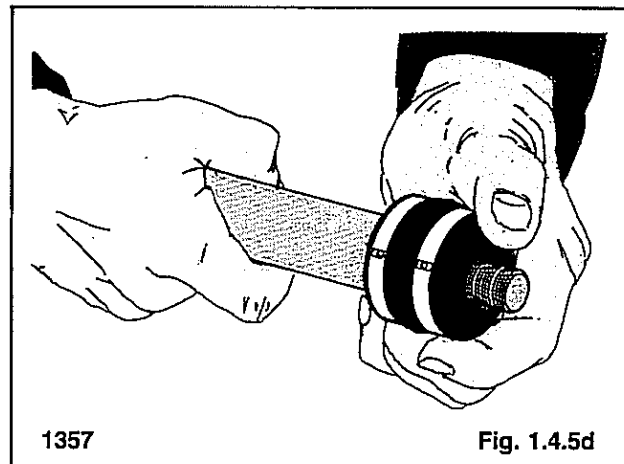
1. Place the base end of the cylinder in a vice and support the front end of the body (fig. 1.4.5a). Remove the plugs from the hose ports.
2. Using a spanner wrench, unscrew the gland from the cylinder barrel (fig. 1.4.5a).



3. Remove the rod, gland and piston assembly from the cylinder barrel (fig. 1.4.5b).

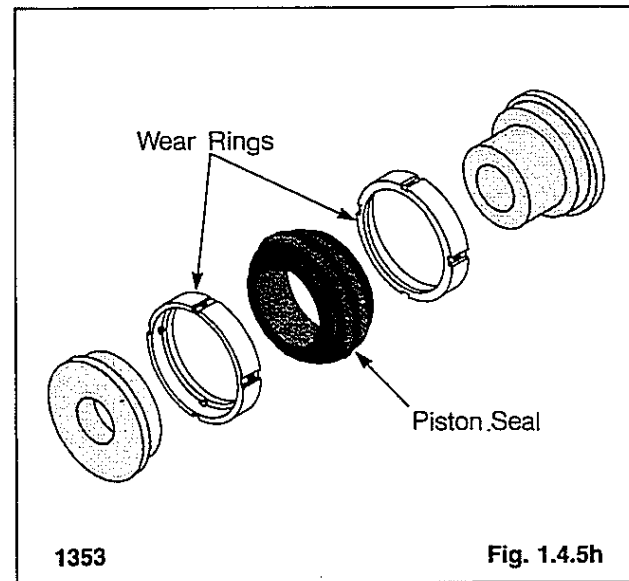
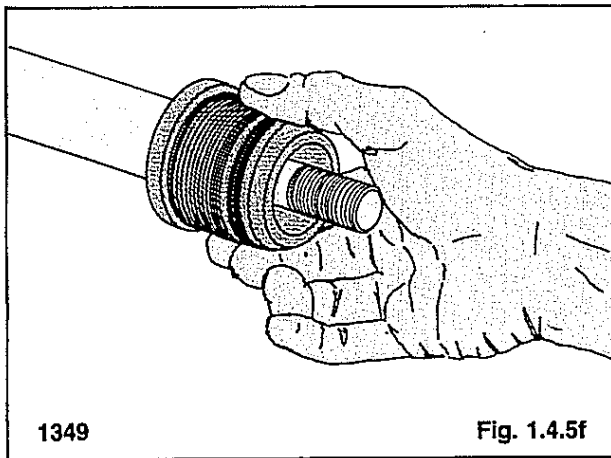
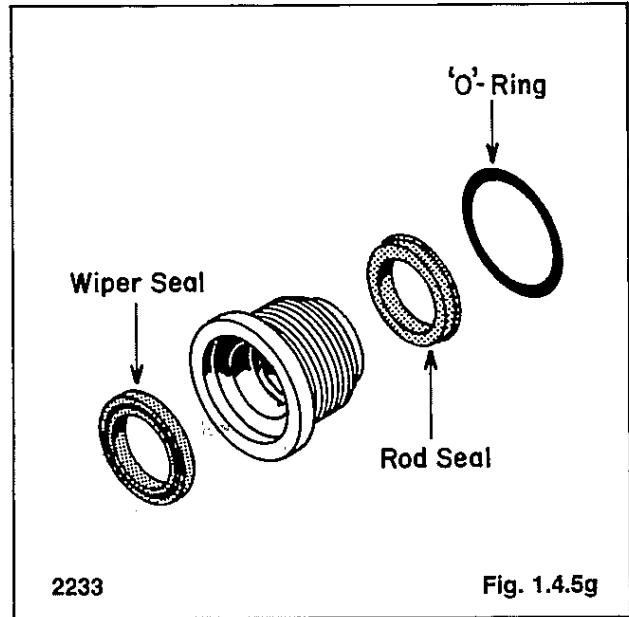
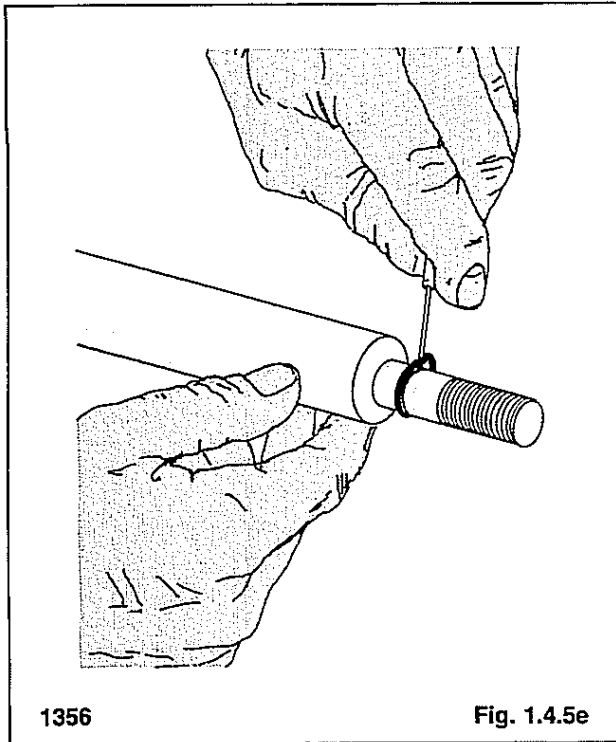


4. Place the rod end in a vice and remove the nut (fig. 1.4.5c).
5. Remove two piece piston assembly from the cylinder rod (fig. 1.4.5d).



6. Remove and discard the O-ring from the end of the cylinder rod (fig. 1.4.5e).
7. Remove the gland assembly from the cylinder rod (fig. 1.4.5f).
8. Remove and discard the wiper seal, rod seal and O-ring from the gland assembly (fig. 1.4.5g).
9. Remove and discard the wear rings and piston seal from the piston assembly (fig. 1.4.5h).

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INSPECTION:

1. Inspect the cylinder rod for scratches, dents and other damage. Minor rod damage may be repaired using a fine abrasive. Major scratches or dents are not repairable and the rod should be replaced. The chrome surface must be intact to provide a rust-resistant surface. Blemishes on the rod will damage the rod seal and wiper and will cause leaking after a short period of use.
2. Inspect the cylinder rod threads. The threads must be in good condition because of the high torque required to secure the piston assembly.
3. Inspect the gland for nicks, burrs or other damage. Minor

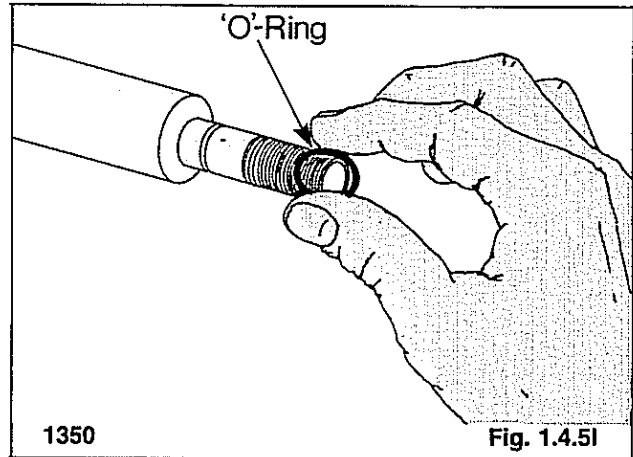
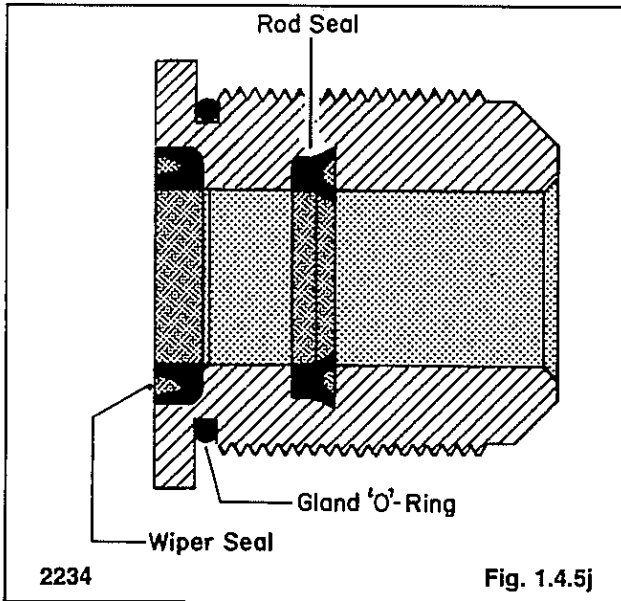
damage can be repaired using a fine abrasive. Smooth down any sharp edges that could damage seals and cause leakage.

4. Inspect the gland threads for damage.
5. Inspect the piston assembly for damage. Remove minor scratches or damage with a fine abrasive.
6. Using a suitable light inspect the cylinder bore for scratches, dents, burrs or other damage. Install a new cylinder barrel if there is any evidence of damage.
7. Inspect the cylinder barrel threads for damage. The threads must be in good condition because of the high torque required to secure the gland assembly.

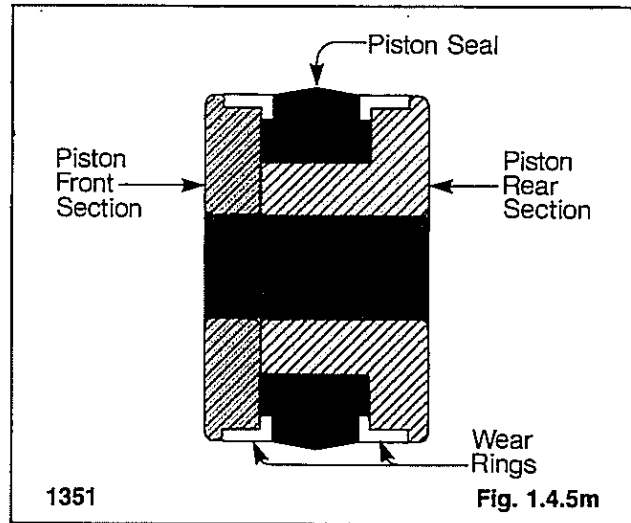
SECTION 1 HYDRAULICS

ASSEMBLY:

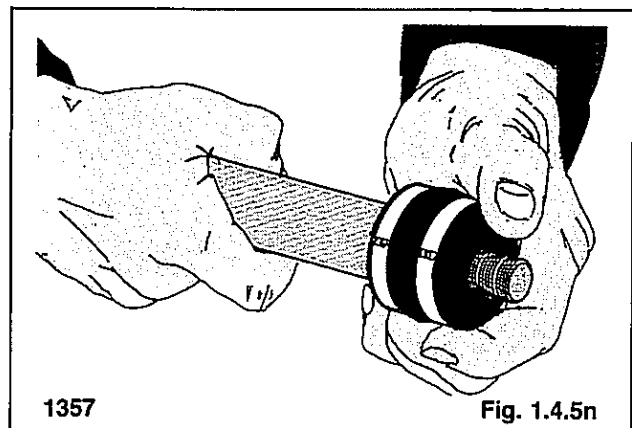
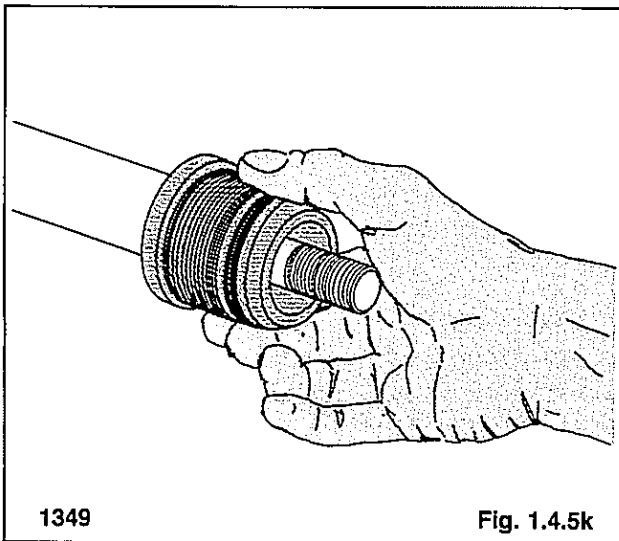
1. Install a new gland rod seal by forming the seal into a 'U' shape, seating it in its groove, and straightening the seal back into its original shape (fig. 1.4.5j).
2. Install a new rod wiper seal in the gland (fig. 1.4.5j).



5. Install a new O-ring on the cylinder rod (fig. 1.4.5i).
6. Install new wear rings and piston seal on the two piece piston assembly (fig. 1.4.5m).
7. Install the piston assembly on the cylinder rod (fig. 1.4.5n).



3. Install a new gland O-ring (fig. 1.4.5j).
4. Coat the cylinder rod with light oil and assemble the gland assembly (fig. 1.4.5k) on the rod.



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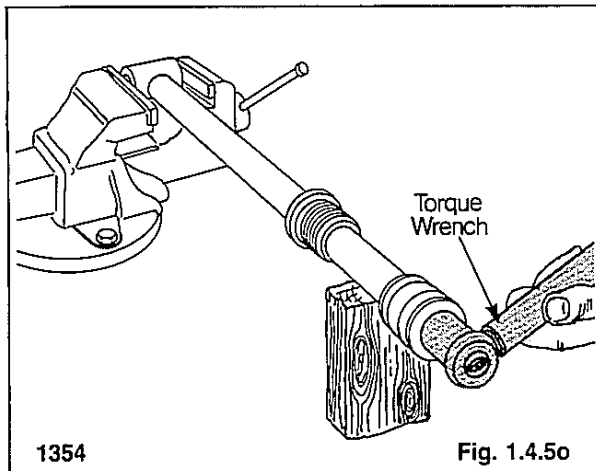
1.5 HYDRAULIC OIL FILTER

1.5.1 Specifications:

Filter type	replaceable element
Filtration rating	10 micron
Filtering area	800 sq. in. (5161 cm ²)
Relief valve setting	17-19 PSI (1.2-1.3 bar)
Case capacity	1.5 qts. (1.4 l)
Max. operating pressure	250 PSI (17.2 bar)
Max. operating temperature	250°F (121°C)
Case torque	30 ft. lbs. (41 N.M.)
Initial filter replacement	50 hrs.
Filter replacement (every)	200 hrs.

1.5.2 General Information:

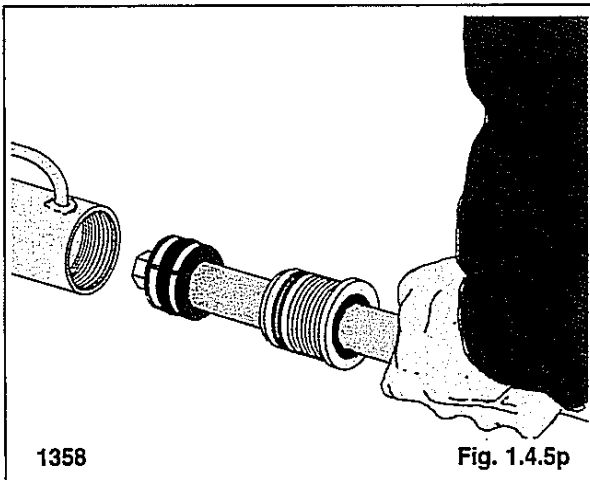
The hydraulic oil filter (fig. 1.5) is located on the left hand side of the machine inside the engine compartment.



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Fig. 1.4.5o

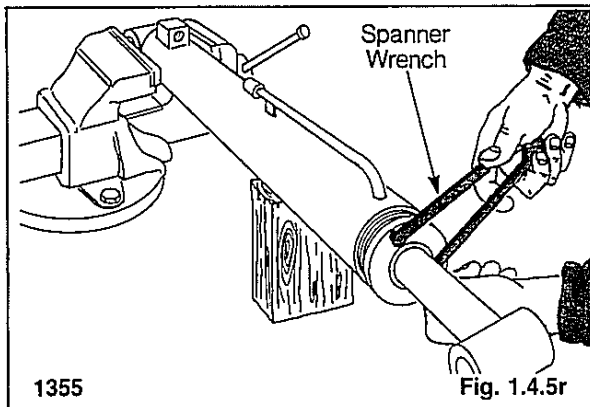
8. Place the cylinder rod in a vice and install the nut. Torque the nut to 225-250 ft. lbs. (305-339 N.M.) (fig. 1.4.5o).
9. Coat gland and piston seals with light oil. Install the cylinder rod assembly in the cylinder barrel (fig. 1.4.5p).



1358

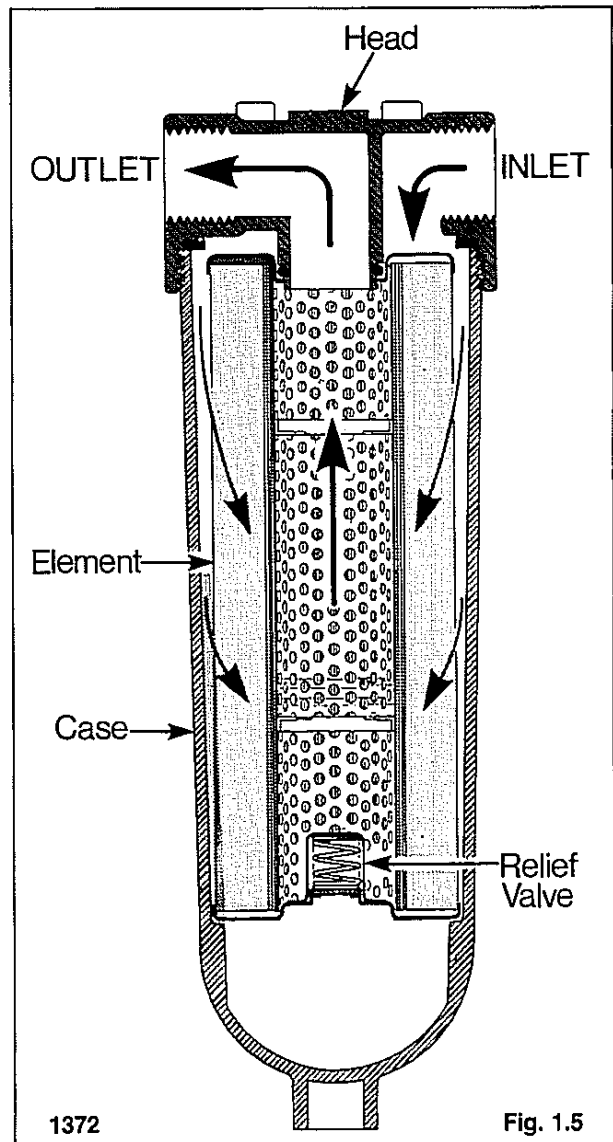
Fig. 1.4.5p

10. Place the cylinder body in a vice and using a spanner wrench tighten the gland.
11. Cap the hose port openings on the cylinder body until the cylinder is reinstalled on the loader.



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Fig. 1.4.5r



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Fig. 1.5

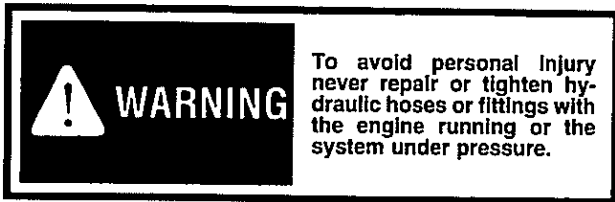
SECTION 1 HYDRAULICS

The 10 micron, replaceable element filters all oil returning from the control valve before it enters the oil cooler and returns to the oil reservoir or enters the hydrostatic drive system charge pump. The filter material is a resin impregnated cellulose which features an accordian pleated design to provide maximum filtering area. A bypass relief valve built into the replaceable element diverts oil from the filter when more than 17-19 PSI (1.2-1.3 bar) differential pressure is required to force oil through the element.

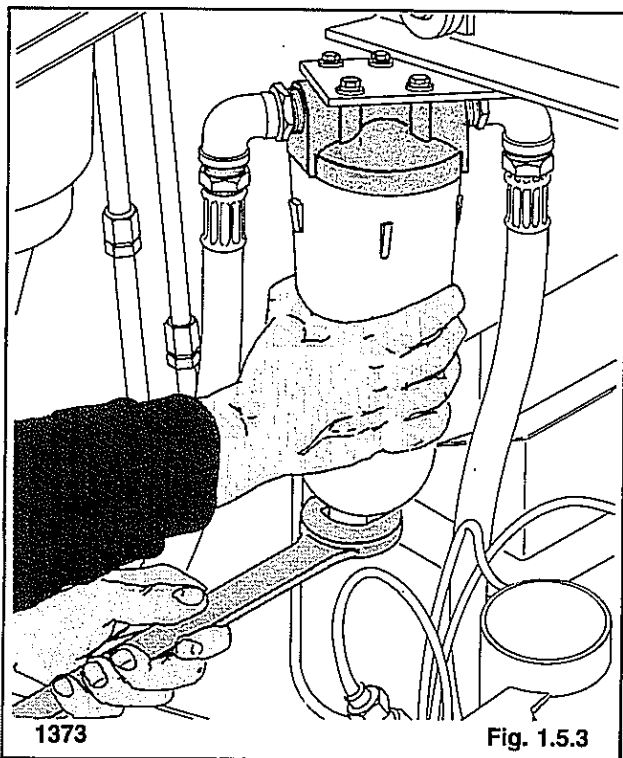
1.5.3 Filter Replacement:

The hydraulic filter must be changed after the first 50 hours of operation and every 150 hours thereafter. Clean the filter case with a suitable solvent before disassembly.

1. Shut off the engine, lower the boom arms, ground any attachment and set the parking brake.



2. Open the rear door. Using a 1 1/4 inch wrench, remove the filter case and element (fig. 1.5.3).
3. Lubricate the new cover gasket and O-ring supplied with the new filter with system fluid.
4. Install the filter element in the case making sure the relief valve built into the filter element is at the bottom of the filter case.



5. Screw the filter case onto the head assembly. Torque the filter case to 30 ft. lbs. (41 N.M.). Do not overtorque the filter case. The case material is aluminum and may crack if overtorqued.

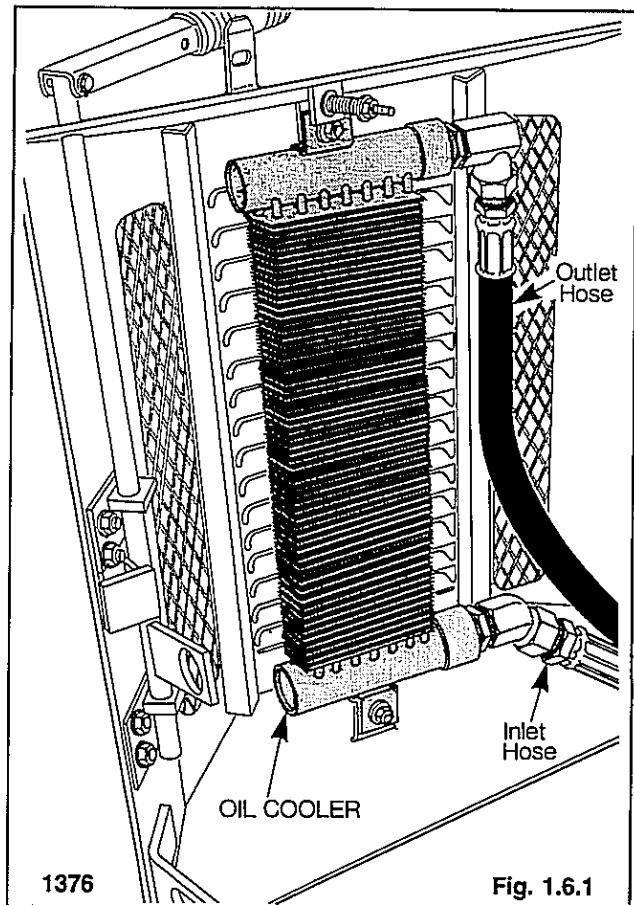
1.6 OIL COOLER

1.6.1 Specifications:

Rating BTU per min.....	440
Max. work pressure.....	500 PSI (34.5 Bar)
Min. burst pressure.....	1500 PSI (103.4 Bar)
No. of tubes.....	14
No. of fins.....	7 per in. (25 mm)
Fin gauge.....	.018 (.457 mm)
Core area.....	140 sq. in. (903 cm ²)

1.6.2 General Information:

The hydraulic oil cooler (fig. 1.6.2) is mounted on the inside of the rear door. All hydraulic oil returning from the hydraulic control valve circulates through the cooler before returning to the hydraulic reservoir or entering the hydrostatic drive system charge pump. Air forced through the oil cooler fins by the engine fan cools the oil.



1.6.3 Cooler Service:

The hydraulic oil cooler should be checked daily for dirt buildup on the cooling fins. If the air flow through the cooling fins is blocked or restricted overheating of the hydraulic system will occur. Clean any dirt buildup on the cooling fins with compressed air.



1.7 OIL RESERVOIR

1.7.1 Specifications:

Reservoir capacity	8 gal. (30.3 l)
Oil type.....	10W30 API, SE, CD
No. of suction filters	2
Suction filter rating.....	100 micron
Breather cap filter	10 micron
Filler inlet screen	30 mesh
Change oil every	1000 hours
Change suction filters every.....	1000 hours

FIGURE 1.7

- | | |
|---------------------------|--------------------------------|
| 1. Oil reservoir | 7. Gear pump suction port |
| 2. Filler cap ass'y. | 8. Cooler return port |
| 3. Pump/motor drain ports | 9. Suction filter (2) |
| 4. Max. oil check | 10. Cover plate |
| 5. Min. oil check | 11. Drain plug |
| 6. Temperature sender | 12. Hyd. oil heater (optional) |

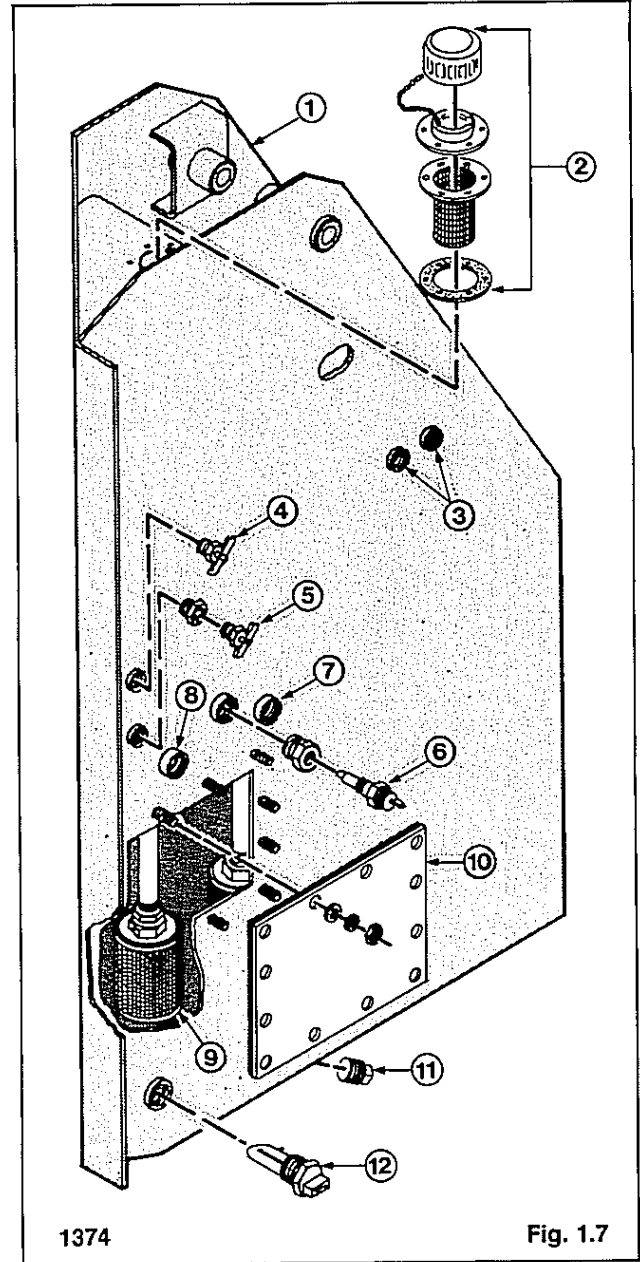
1.7.2 General Information:

The hydraulic oil reservoir is located at the rear of the loader on the left hand side (fig. 1.7). The reservoir is completely separate from all chain and gear drives to eliminate contamination. A magnetic drain plug is installed in the bottom of the reservoir to assist in removing metal particles from the oil.

The breather filler cap is located at the top of the tank and has a built in 10 micron filter to reduce contaminated air entering the reservoir as it breathes.

The filter is also equipped with a 30 mesh screen. Oil flowing to the hydraulic gear pump or returning to the reservoir from the oil cooler pass through two 100 micron suction filters located inside the hydraulic reservoir (fig. 1.7).

Oil level is checked through two check cocks which indicate both maximum and minimum oil levels. To assist in cleaning or service work inside the reservoir there is a bolt on inspection cover. For cold weather operation an optional hydraulic oil heater is available.



1.7.3 Checking and Adding Oil:

OIL LEVEL CHECK:

The oil level should be checked daily.

1. Check the oil level with the machine on level ground.
2. Shut off the engine, lower the boom arms, ground any attachment and engage the parking brake.

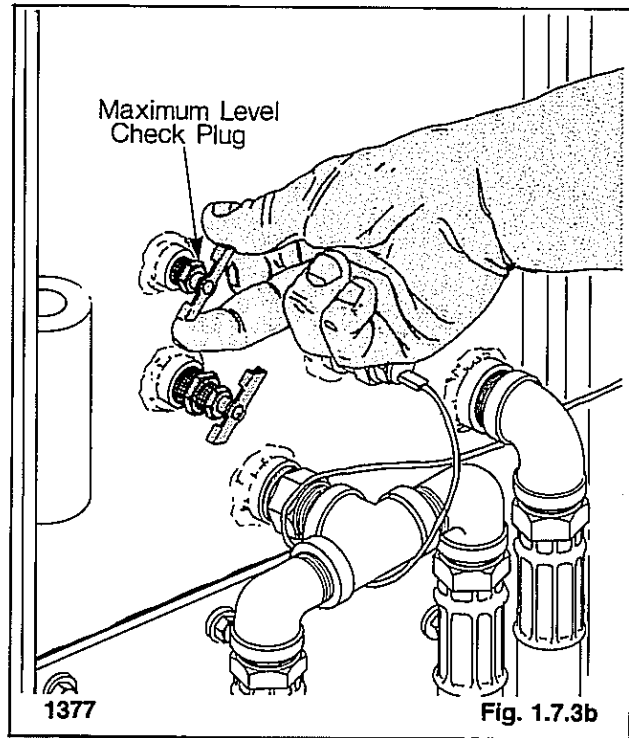
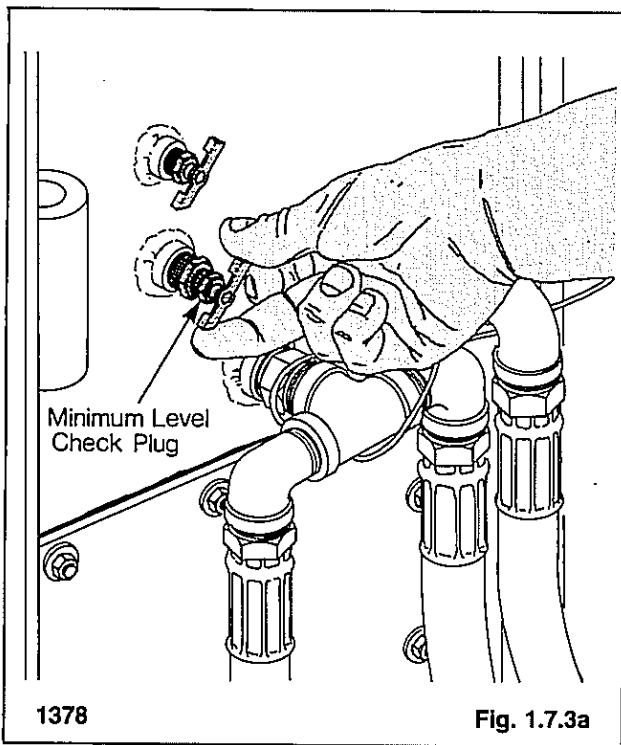
SECTION 1 HYDRAULICS



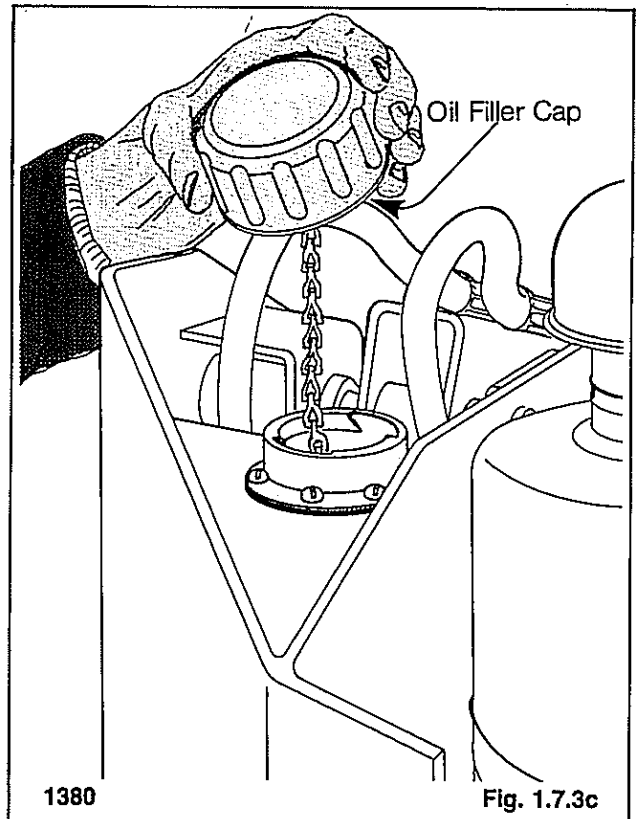
WARNING

To avoid personal injury do not service the loader with the engine running.

3. Open the rear door.
4. Open the bottom or minimum oil level check cock (fig. 1.7.3a). If oil flows from the check cock the level is satisfactory.
5. Close the check cock.



4. Using a clean container add 10W30 API Classification SE, CD Oil until it flows from the maximum level check cock. Total reservoir capacity is 8 gal. (30.3 l).
5. Close the check cock and replace the filler cap.



ADDING OIL:

1. Open the top or maximum oil level check plug (fig. 1.7.3b).



WARNING

To avoid personal injury do not service the loader with the engine running.

2. Remove the filler cap (fig. 1.7.3c).
3. Inspect the filler screen in the filler neck for damage. If the filler screen is damaged replace it.

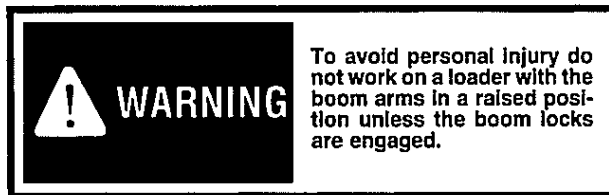
SECTION 1 HYDRAULICS

NOTE: If the reservoir has been completely drained refer to the start up procedure section 1.2.6 to prevent damage to the hydraulic components.

DRAINING THE OIL RESERVOIR:

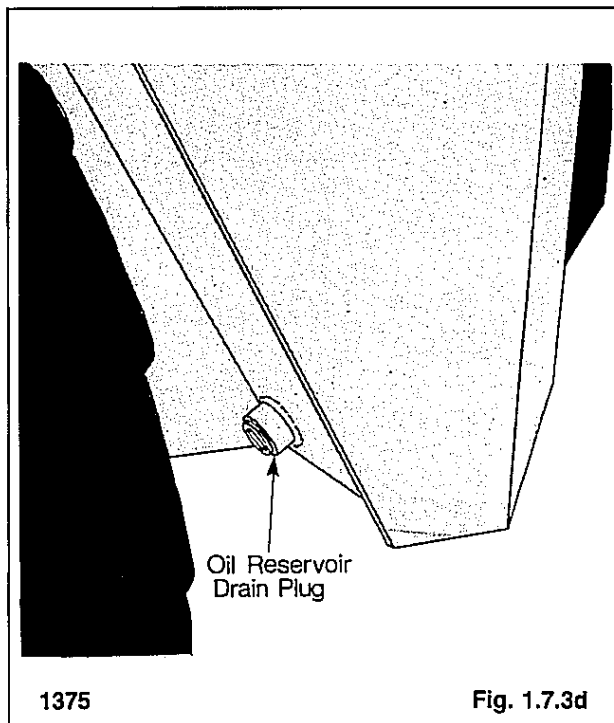
Change the hydraulic oil after 1000 operating hours or if the oil has become contaminated or after any major hydrostatic drive system repair.

1. Remove any attachment, raise the lift arms and engage the boom lock. Shut off the engine and engage the parking brake.



2. To drain; remove the drain plug located at the bottom of the hydraulic oil reservoir (fig. 1.7.3d).

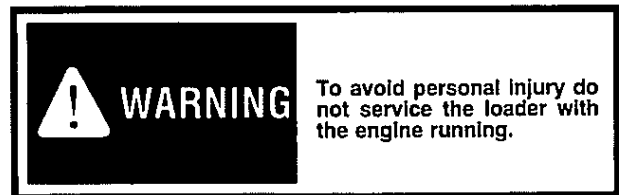
When refilling use only 10W30 API Classification SE/CD engine oil. Total reservoir capacity 8 gal. (30.3 l).



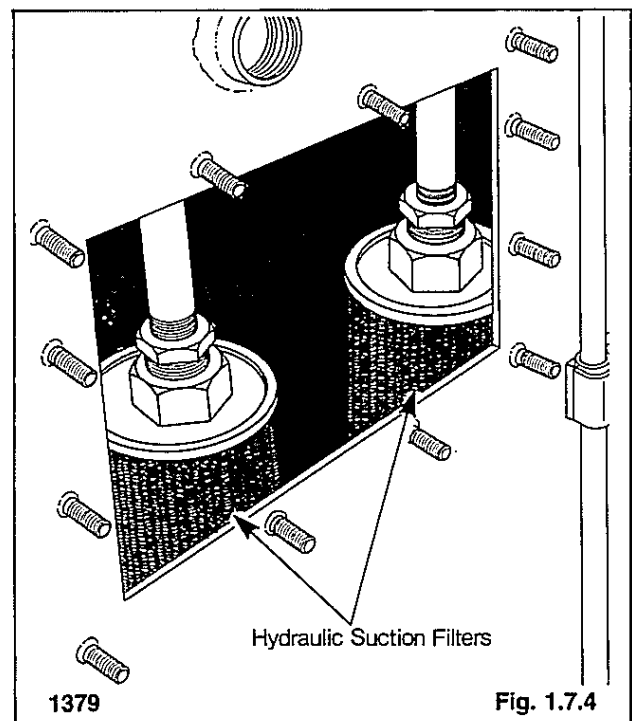
1.7.4 Filter Replacement:

The 100 micron hydraulic suction filters located inside the oil reservoir should be changed every 1000 operating hours or if the oil becomes contaminated or after a major hydrostatic drive system repair.

1. Drain the oil from the hydraulic oil reservoir (refer to section 1.7.3).
2. Open the rear door and clean the area around the oil reservoir inspection cover.



3. Remove the inspection cover.
4. Remove the two 100 micron suction filters (fig. 1.7.4).
5. Install two new suction filter elements.
6. Install the coverplate. Seal with silicon.
7. Refill the oil reservoir using 10W30 API Classification SE/CD Oil only. Total reservoir capacity 8 gal. (30.3 l).



NOTE: If the reservoir is completely drained refer to the start up procedure section 1.2.6 to prevent damage to the hydraulic components.

SECTION 1 HYDRAULICS

1.8 TROUBLE SHOOTING — HYDRAULIC SYSTEM

Problem	Cause	Corrective Action	Refer to Section
Loss of hydraulic power (no flow from gear pump)	Reservoir low on oil	Check for leaks. Fill reservoir with 10W30 API, SE/CD oil	1.7.3
	Universal joint between engine and pump failure	Inspect and replace damaged parts. Check for misalignment	
	Gear pump not functioning	Inspect and replace damaged parts	1.2.4 1.2.5
	Hydrostatic charge pump shaft failure	Inspect and replace damaged parts	2.2.6
	Spline coupling between front and rear hydrostatic pump failure	Inspect and replace damaged parts	2.2.6
Loss of hydraulic power (full flow from gear pump)	Auxiliary foot pedal engaged	Disengage	
	Foot pedal linkage disconnected or binding	Inspect and adjust or repair	4.2
	Relief valve failure or out of adjustment	Check pressure and adjust or repair	1.3.3
Hydraulic action jerky	Reservoir low on oil	Check for leaks. Fill with 10W30 API SE/CD oil	1.7.3
	Foot pedal linkage worn or loose	Inspect and adjust or replace damaged parts	4.2
	Air in hydraulic system	Check for leaks between oil reservoir and pump. Bleed system by extending and retracting boom cylinders several times	
	Load check valve not functioning	Inspect and replace damaged parts	1.3.5
	Control valve spool spring return mechanism not functioning	Inspect and replace damaged parts	1.3.5

SECTION 1 HYDRAULICS

Boom raises slowly at full RPM	Reservoir low on oil	Check for leaks. Fill with 10W30 API SE/CD oil	1.7.3
	Foot pedal linkage binding	Inspect and adjust	4.2
	Auxiliary foot pedal engaged	Disengage	
	Attempting to lift more than rated capacity	Reduce load	
	Engine RPM too slow	Check engine RPM and reset	
Boom raises slowly at full RPM	Relief valve failure or out of adjustment	Check pressure and adjust or repair	1.3.3
	Oil bypassing one or both boom cylinder piston seals	Check piston seals for leakage and repair	1.4.3
	Internal leakage in gear pump	Test gear pump flow and repair	1.2.3 1.2.5
	Internal leakage in control valve	Inspect control valve and repair	1.3.5
Bucket or boom cylinders will not support a load (leak down)	External leak between control valve and cylinders	Inspect and repair	
	Control valve spool not centering	Check foot pedals for binding repair	
		Check for damaged spring return mechanism on control valve spools	1.3.5
	Oil bypassing one or both cylinder piston seals	Check piston seals for leakage and repair	1.4.3
	Internal leakage in control valve	Inspect control valve and repair	1.3.5

SECTION 1 HYDRAULICS

Hydraulic oil overheating	Reservoir low on oil	Check for leaks and fill with 10W30 API SE/CD oil	1.7.3
	Oil cooler plugged or dirty (also check engine radiator)	Clean the cooling fins	1.6.3
	Auxiliary foot pedal engaged	Disengage	
	Engine RPM too slow	Check engine RPM and reset	
	Engine cooling fan reversed	Check fan and install correctly	
	Relief valve failure or out of adjustment	Check pressure and adjust	1.3.3
	Temperature sender defective	Replace	
	Wrong type of fluid	Replace	1.7.3

2 HYDROSTATIC DRIVE SYSTEM

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TROUBLE SHOOTING	2.4

2 HYDROSTATIC DRIVE SYSTEM

2.1.1 Specifications:

	T103	T133
Pump type.....	Hydrostatic, variable displacement, reversible piston	
No. of drive pumps	2	2
Mounting	Tandem	Tandem
Rotation (viewed from shaft end).....	R.H.	R.H.
Displacement	1.24 in. ³ /REV (20.32 cm ³)	2.48 in. ³ /REV (40.64 cm ³)
Operating speed	2800	2550
Relief valve setting	3750 PSI (258.5 BAR)	3750 PSI (258.5 BAR)
No. relief valves per pump...	2	2
Max. surge pressure.....	4150 PSI (286 BAR)	4150 PSI (286 BAR)
Max. allowable case pressure.....	25 PSI (1.7 BAR)	25 PSI (1.7 BAR)
Motor type.....	Geroler, Torque Motor	
Displacement	19.9 cu. in. (326 cm ³)	29.9 cu. in. (489.9 cm ³)
Reservoir capacity	8 gal. (30.3 l)	8 gal. (30.3 l)
Fluid type	10W30 API classification SE/CD	
Filtration	10 micron	10 micron
Reservoir filtration.....	Two, 100 micron elements	

2.1.2 General Information — Hydrostatic Drive Circuit:

The hydrostatic drive system (fig. 2.1.2) consists of two hydrostatic variable displacement piston pumps (5) and (6), mounted in tandem, and connected through high pressure lines to two fixed displacement torque motors (7). Hydrostatic pump (5) and the R.H. torque motor (7) provide power through a chain drive to the wheels on the R.H. side of the loader. The rear pump (6) and torque motor (7) provide drive power to the L.H. wheels.

The hydrostatic pumps (5) and (6) are connected directly to the engine through a double universal joint located between the rear pump (6) input shaft and the engine flywheel.

The steering levers, which control both the loaders speed and direction are connected through a mechanical linkage to the two hydrostatic pump camplate shafts (15) which control the flow of oil from both pumps. As the steering levers are moved, oil is pumped from the hydrostatic pumps to the torque motors (7) which in turn drive the loader wheels. Drive speed is controlled by the amount the steering levers are moved which controls the volume of oil pumped from the variable displacement pumps (5) and (6) to the fixed displacement torque motors (7).

The oil pumped under pressure from the hydrostatic pumps (5) and (6) returns from the torque motors (7) back to the hydrostatic pumps where it is repressurized. This creates a closed loop circuit. Each pump has two relief valves set at 3750 PSI (258.5 BAR) for circuit protection.

A certain amount of leakage oil occurs internally within the pumps and motors for lubrication as well as to remove some of the warm working oil from the closed loop circuit. This oil enters the pump and motor housings where it is drained through lines (16) back to the oil reservoir (1).

To replenish the leakage oil from the closed loop circuits a charge pump (13) is located in the end of the front hydrostatic pump (5). The charge pump draws oil from the return side of the hydraulic system after the oil passes through the 10 micron hydraulic filter (8) and the oil cooler (9). The charge pump (13) supplies clean and cooled replenishing oil to the front hydrostatic pump (5) through internal check valves and to the rear hydrostatic pump (6) through a transfer line (14). A relief valve is located at the charge pump inlet port (12) to recirculate oil not required to replenish the closed loop circuits.

Hydrostatic Drive Circuit

2.1.3 Control Functions:

Two steering levers control speed direction and turning the loader. The R.H. lever controls the wheels on the R.H. side of the loader and the L.H. lever the L.H. wheels. Loader speed is controlled by the amount each lever is moved from centre or neutral position (fig. 2.1.3). The further away from neutral the faster the travel speed. For maximum power and slow travel speed move the control levers only a small amount.

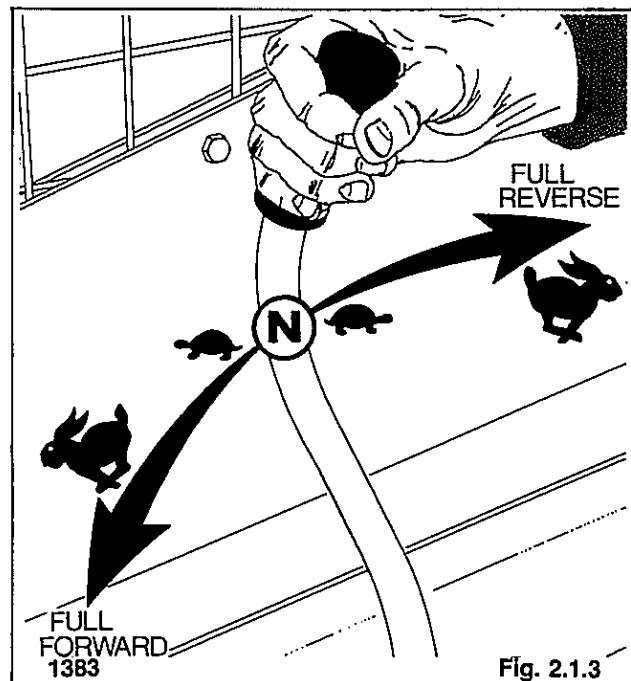
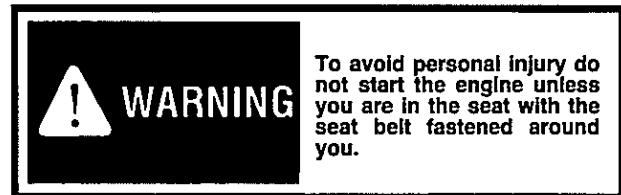
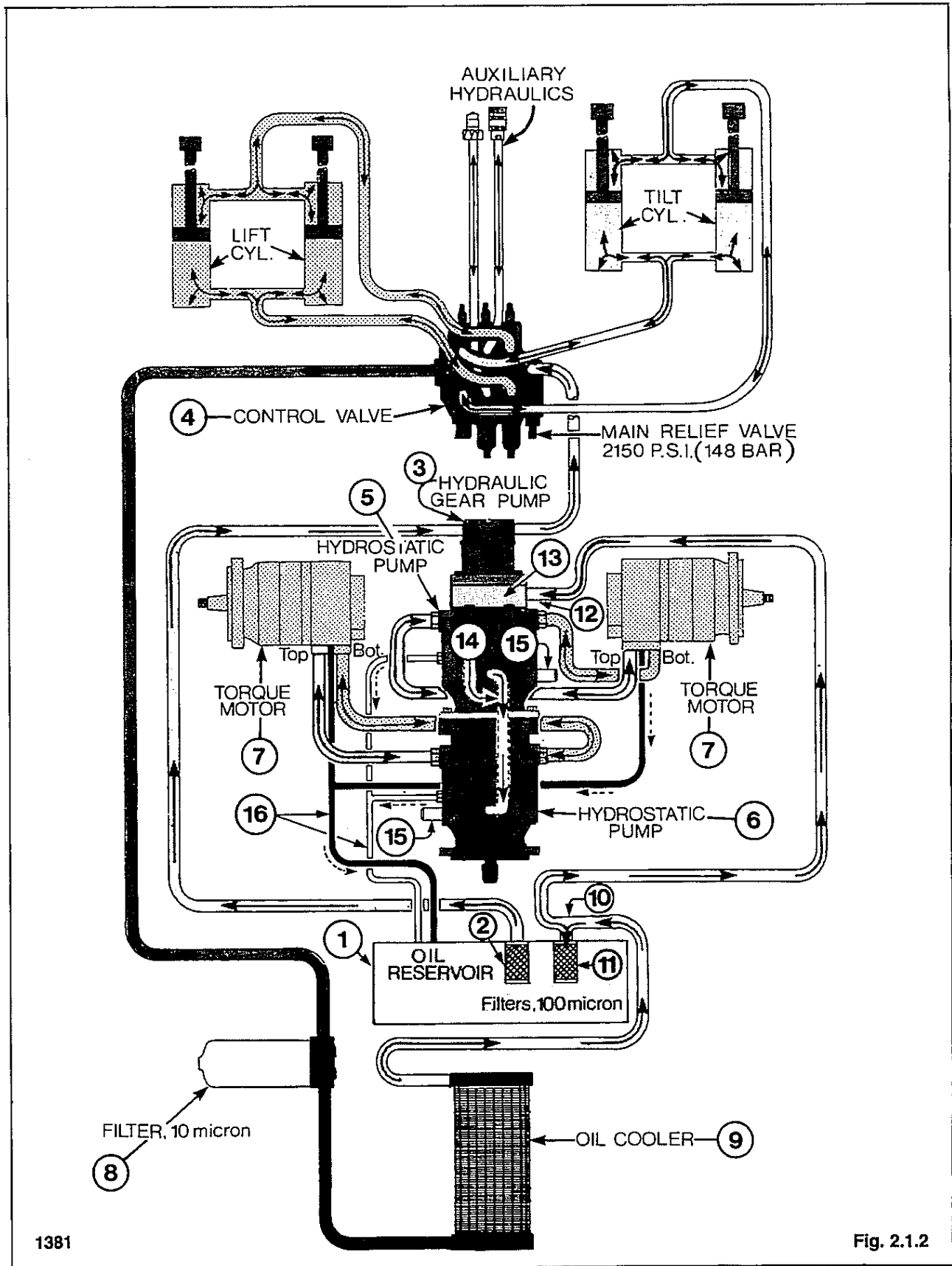


Fig. 2.1.3

2 HYDROSTATIC DRIVE SYSTEM



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Fig. 2.1.2

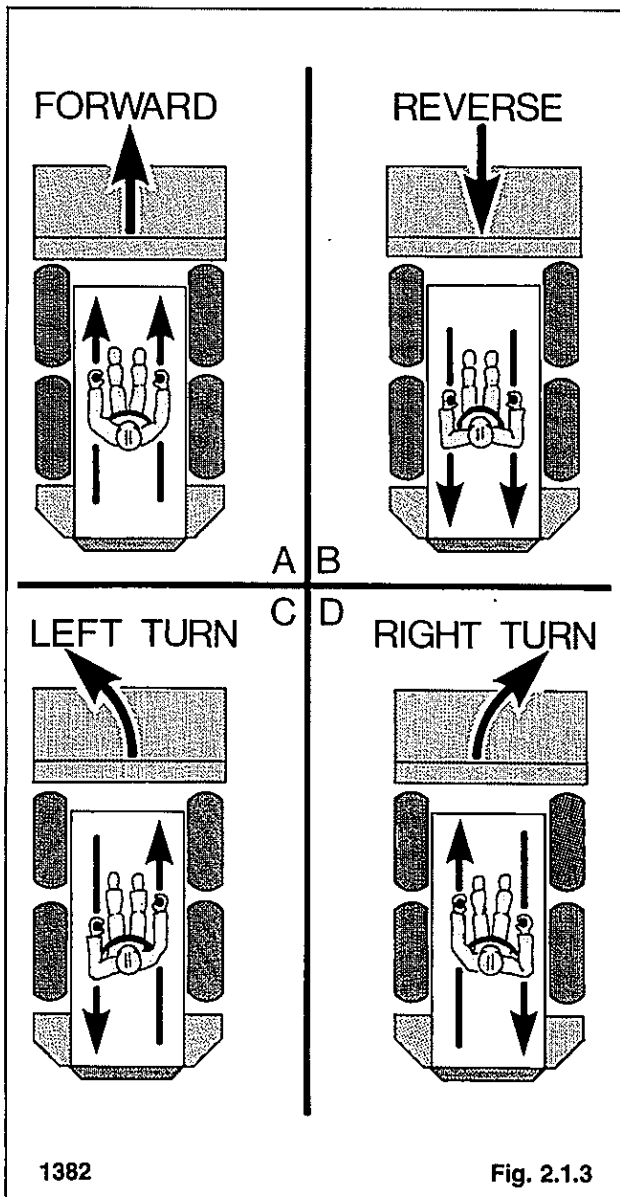
2 HYDROSTATIC DRIVE SYSTEM

To drive the loader forward in a straight line, move both control levers forward the same amount (fig. 2.1.3A).

To drive the loader in reverse in a straight line, move both control levers back the same amount (fig. 2.1.3B).

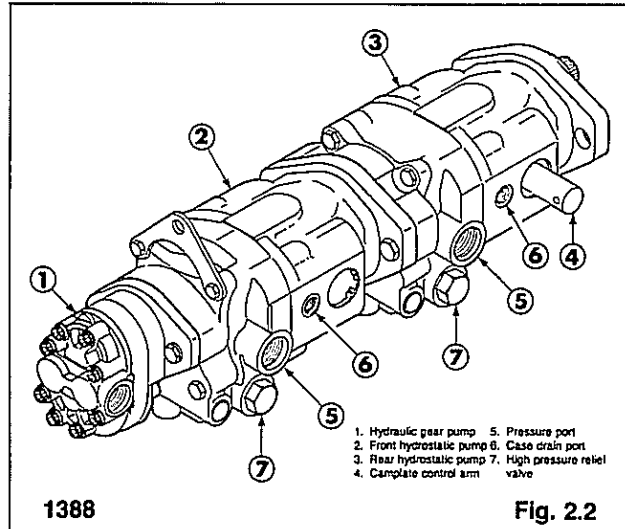
The loader is steered by moving one lever further forward than the other. To turn right move the left lever further than the right lever, to turn left move the right lever further than the left lever.

For the loader to turn or "skid-steer" within its own length, one lever is moved forward and the other back. This causes the wheels on one side to turn forward and the wheels on the other side to reverse turning the loader (fig. 2.1.3 C & D).



NOTE: The steering control levers automatically center in neutral position when the seat bar is in the up position.

2.2 HYDROSTATIC PUMPS



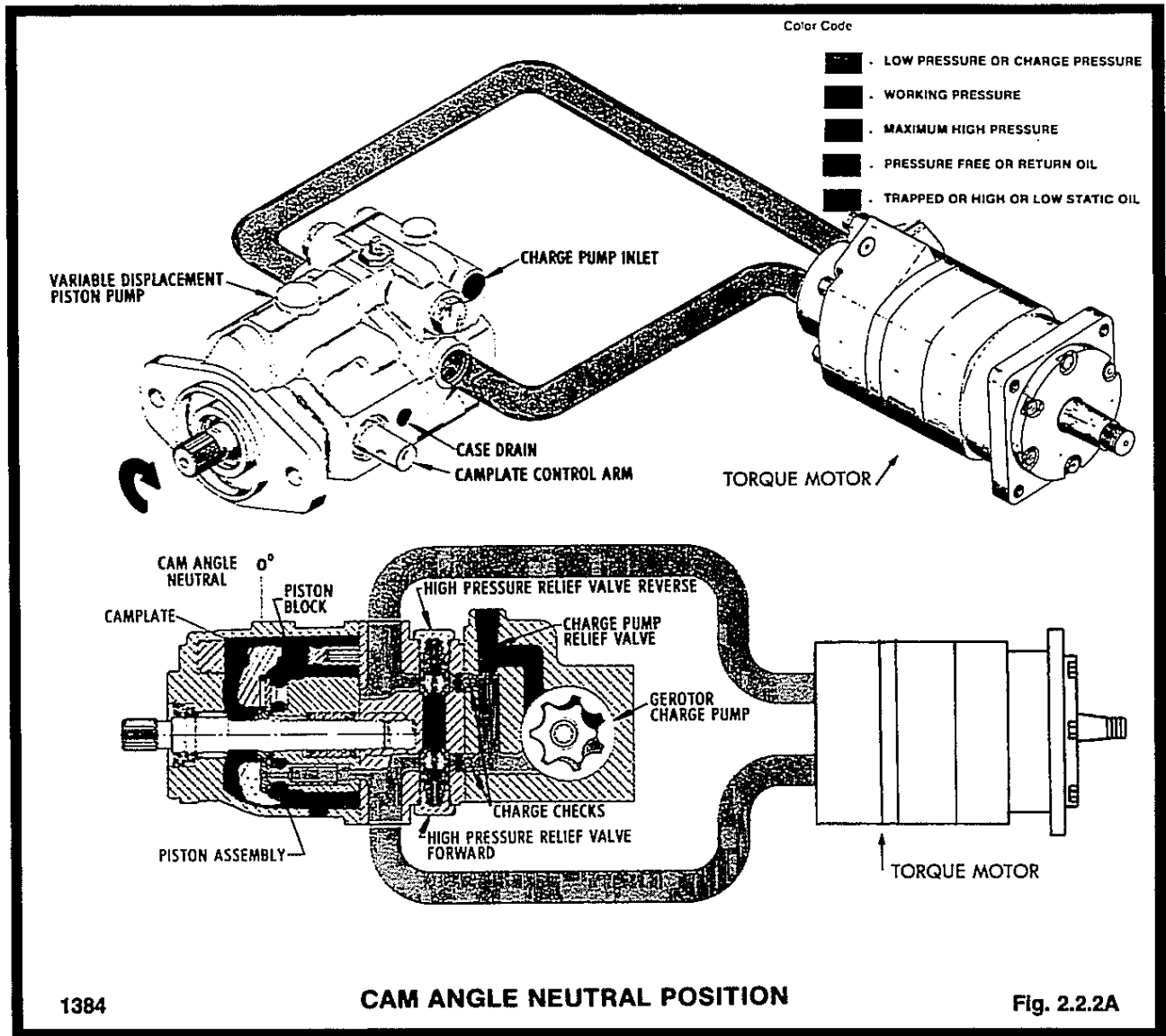
2.2.1 Specifications:

	T103	T133
Pump type.....	Hydrostatic, variable displacement, reversible piston	
No. of drive pumps	2	2
Mounting	Tandem	Tandem
Rotation (viewed from shaft end).....	R.H.	R.H.
Displacement	1.24 in. ³ /REV (20.32 cm ³)	2.48 in. ³ /REV (40.64 cm ³)
Operating speed	2800	2450
Relief valve setting	3750 PSI (258.5 BAR)	3750 PSI (258.5 BAR)
No. relief valves per pump...	2	2
Max. surge pressure.....	4150 PSI (286 BAR)	4150 PSI (286 BAR)
Max. allowable case pressure.....	25 PSI (1.7 BAR)	25 PSI (1.7 BAR)

2.2.2 General Information:

The drive shaft of the piston pump is rotated by the engine. The piston block which is splined to the drive shaft also turns. The piston block contains nine piston assemblies which have free swiveling shoes swagged on the ball end of the piston assembly. The shoe end of the piston rides against the smooth surface of the camplate. With the camplate in the neutral or 0° position (fig. 2.2.2A) the piston assemblies do not reciprocate in the piston block, but only rotate. No oil is

2 HYDROSTATIC DRIVE SYSTEM



drawn into or discharged from the pump. The pump is in a zero displacement position and the loader remains stationary.

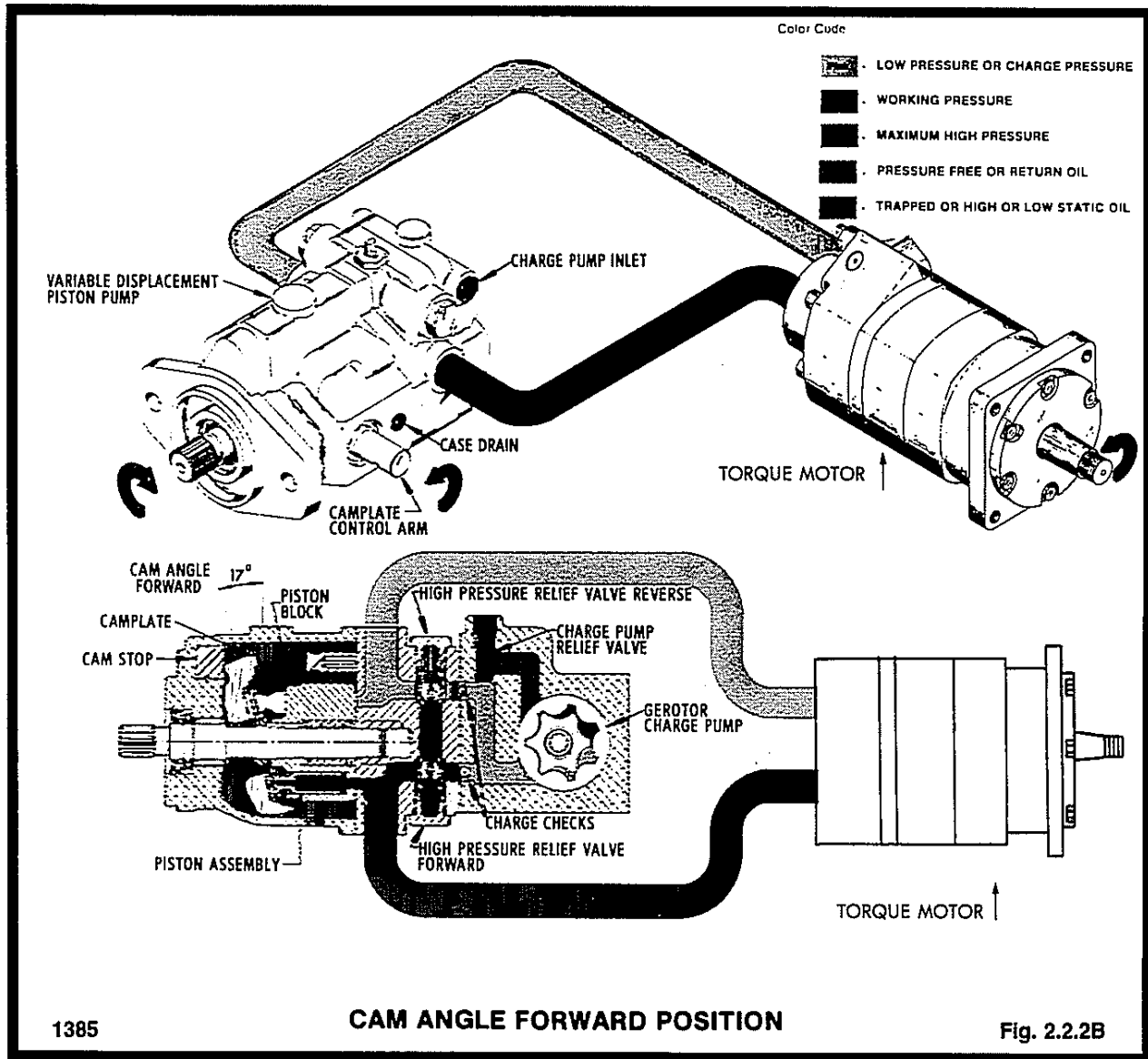
The purpose of the gerotor charge pump is to keep the closed loop full by replenishing the oil that is lost through internal leakage. The gerotor charge pump keeps the intake or low pressure side of the system supplied with oil.

With the camplate in the 0° or neutral position the pressure of the charge oil, which ranges from 60 to 150 PSI (4.1-10.3 BAR), is able to unseat both charge checks and supply oil to both sides of the pump because of the balance in pressure. There is very little internal leakage while the camplate is in the 0° position so the excess charge oil is bypassed over the charge pump relief valve and is recirculated back into the

intake side of the gerotor charge pump. The oil that leaks internally in the pump and motor collects in their body housings and is returned to the reservoir by the case drains in each pump and motor housing. This leakage oil is the only oil returning to the reservoir in a closed loop system.

As the steering lever is moved forward the loader starts a forward movement (fig. 2.2.2B). As the camplate begins to move, the piston assemblies start to reciprocate in the piston block. As the steering lever continues a forward movement the cam angle increases, the pistons reciprocate further, more oil is being pumped and the speed of the loader is increased. The steering lever can be moved forward until a full cam angle of 17° has been reached, which also achieves maximum volume of oil being discharged from the pump.

2 HYDROSTATIC DRIVE SYSTEM



When the camplate begins to move the charge check on the discharge or pressure side seats because of the higher pressure differential. The other charge check remains open on the intake or low pressure side to continue supplying the closed loop system with a charge of oil.

The motor, which is a fixed displacement type, delivers a constant output torque for a given pressure throughout the speed range of the motor.

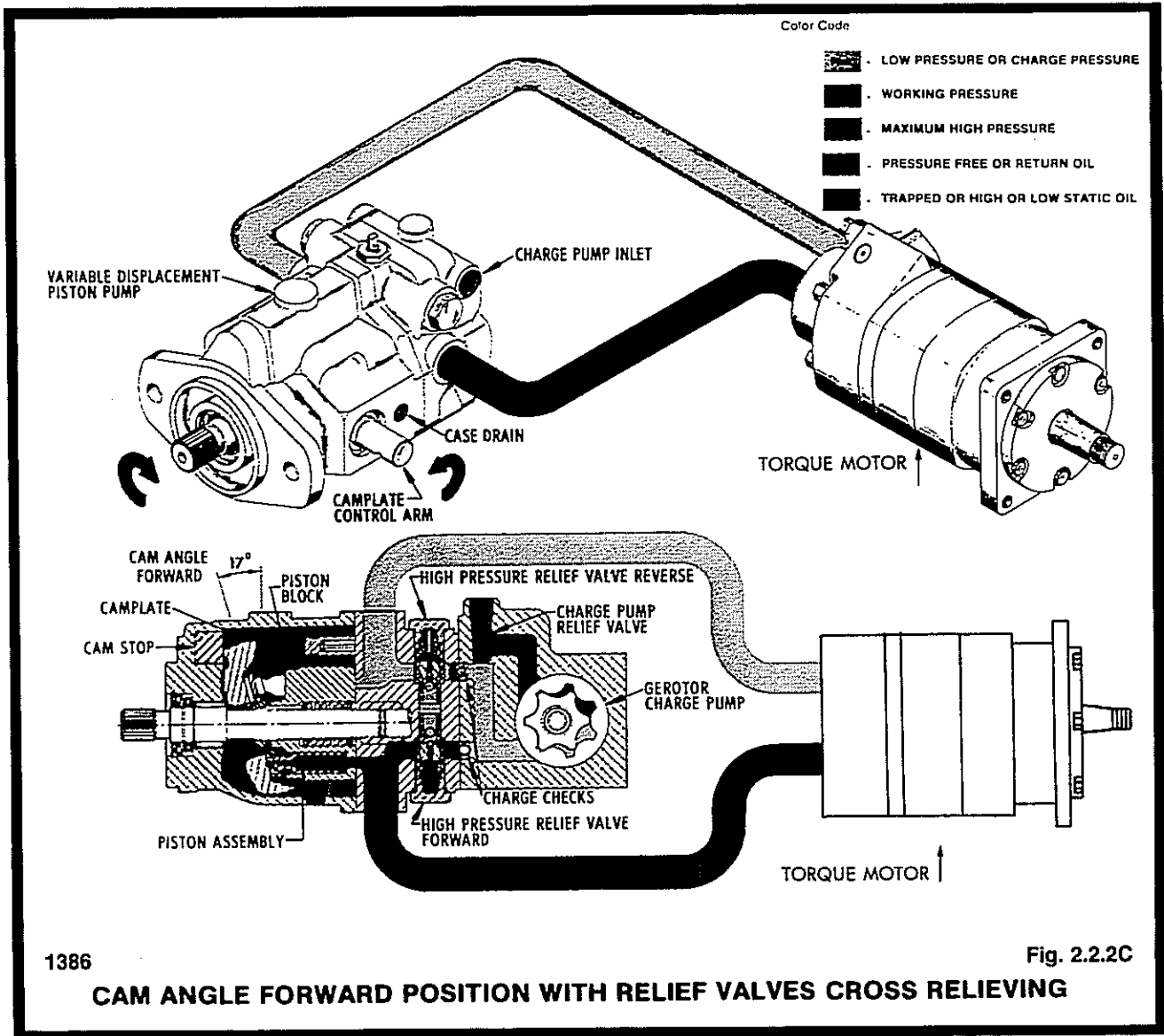
The movement of the pump camplate from 0° to 17° in either forward or reverse position controls the direction of rotation of the motor.

Figure 2.2.2C shows the camplate in the full 17° forward position with the relief valve cross relieving. The function of the system relief valve is to relieve the pressure side of the

system of excessive high pressure when the loader encounters a heavy load or stalls out.

The high pressure surrounding the relief valve enters the relief valve body cavity through a drilled orifice in the cartridge. This pressurized oil that enters the relief valve starts to push on a spool, which is seated by spring tension and moves it forward, exposing the cross holes drilled in the end of the spool. A small volume of oil starts to flow across to the other relief valve. This relief valve is exposed to the low pressure on the intake side of the pump and is seated by the spring tension within the relief valve body. The pressure of the small volume of oil being bypassed is enough to unseat the relief valve and let it recirculate back into the intake side of the pump. As the pressure continues to build on the pressure side, a larger volume of oil flows and at a greater

2 HYDROSTATIC DRIVE SYSTEM



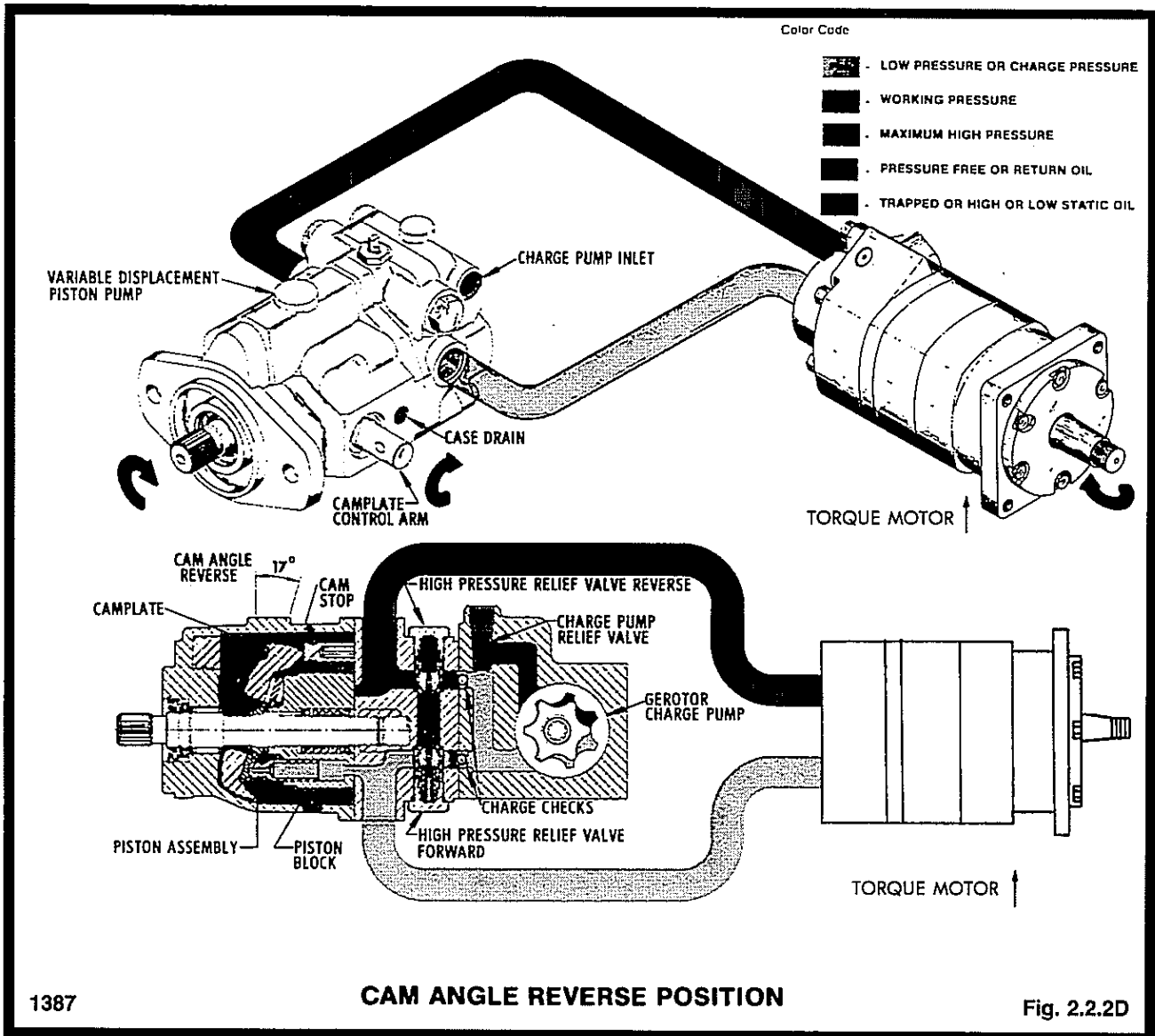
speed through the drilled orifice in the relief valve cartridge, causing a pressure drop inside the relief valve. The surrounding pressure is now able to unseat the relief valve and bypass maximum volume of oil. The system relief valves function the same for both sides of the system.

When the steering lever is slowly moved to the reverse position, the vehicle starts a reverse movement (figure 2.2.2D). As the camplate begins to move, the piston assemblies start to reciprocate in the piston block. As the lever continues a reverse movement the cam angle increases, the pistons reciprocate further, more oil is being pumped and the speed of the vehicle is increased.

The steering lever can be moved in reverse until a full cam angle of 17° has been reached, which also achieves maximum volume of oil being discharged from the pump. When the camplate begins to move the charge check on the discharge or pressure side seats because of the higher pressure differential. The other charge check remains open on the intake or low pressure side to continue supplying the closed loop system with a charge of oil.

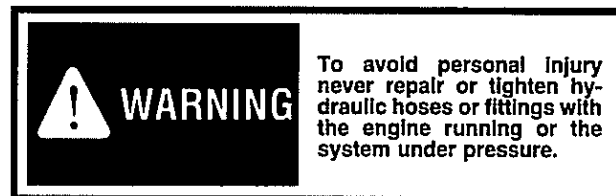
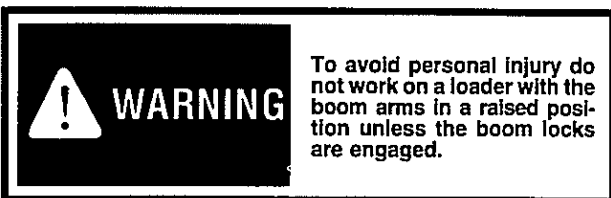
In the reverse position the pump shaft still rotates in the same direction, but the discharge of oil from the pump is reversed, thus reversing the rotation of the motor.

2 HYDROSTATIC DRIVE SYSTEM



2.2.3 Hydrostatic Pump, Removal:

1. Remove any attachment, raise the boom arms and engage the boom lock. Shut off the engine.



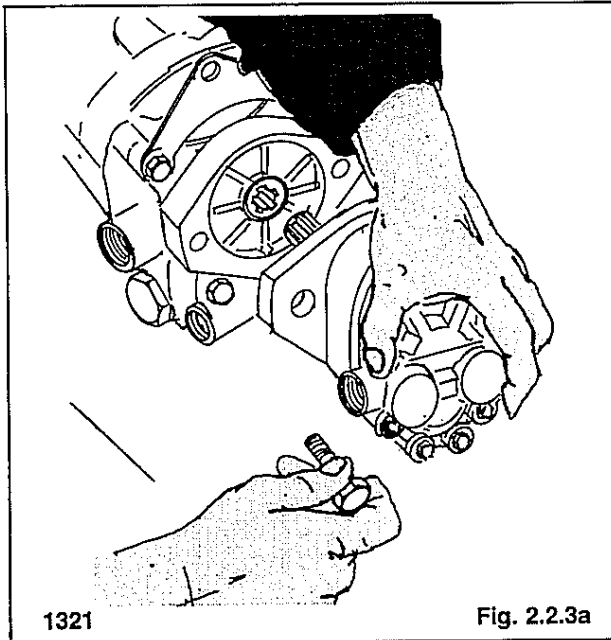
2. Drain the hydraulic oil from the hydraulic oil reservoir. Refer to section 1.7.3 for procedure.
3. Raise the seat and remove the hydrostatic shield.

2 HYDROSTATIC DRIVE SYSTEM

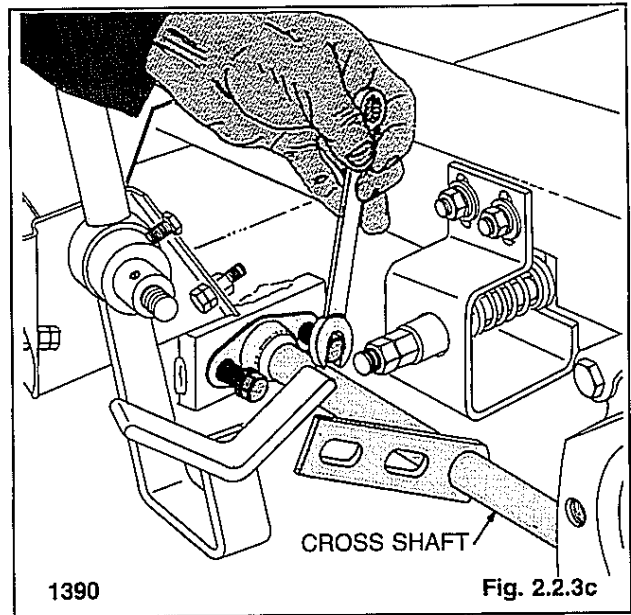
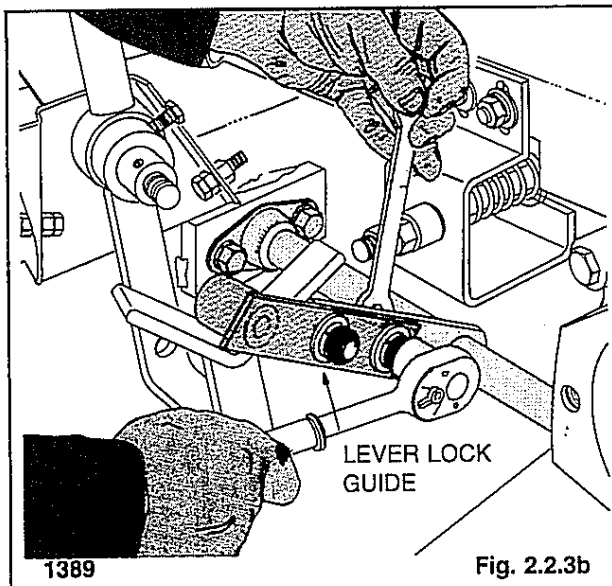
IMPORTANT

When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

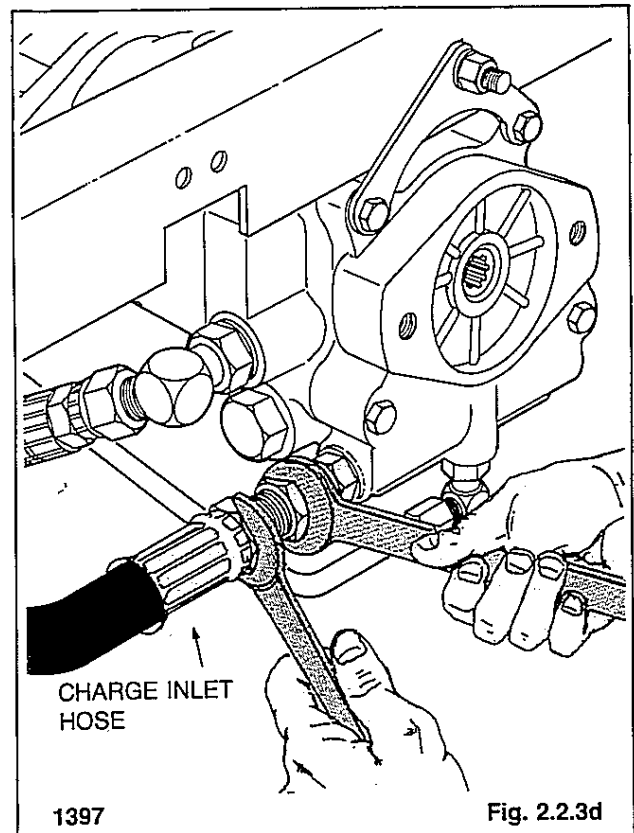
4. Disconnect the hydraulic lines from the hydraulic gear pump and remove the gear pump from the loader (fig. 2.2.3a). Refer to section 1.2.4 for procedure. Plug all openings in the gear pump and control valve and cap all hydraulic lines.



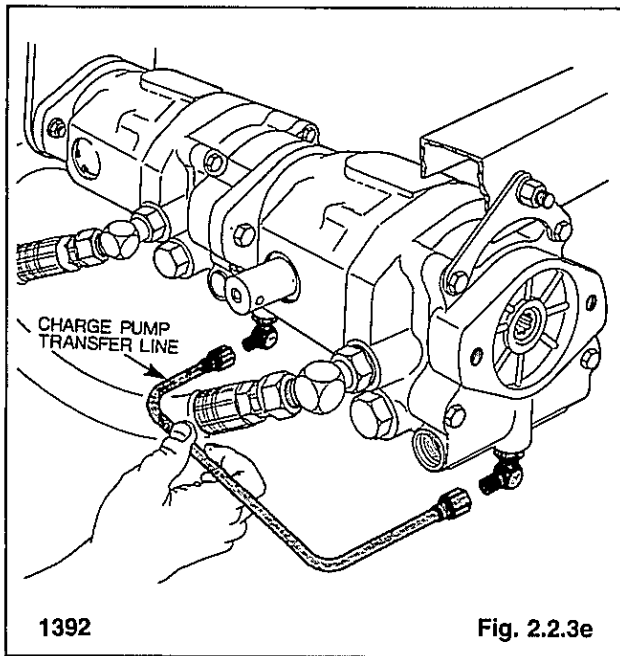
5. Remove the two nuts and bolts securing both steering lever lock guides (fig. 2.2.3b). Remove the steering lever lock guides.



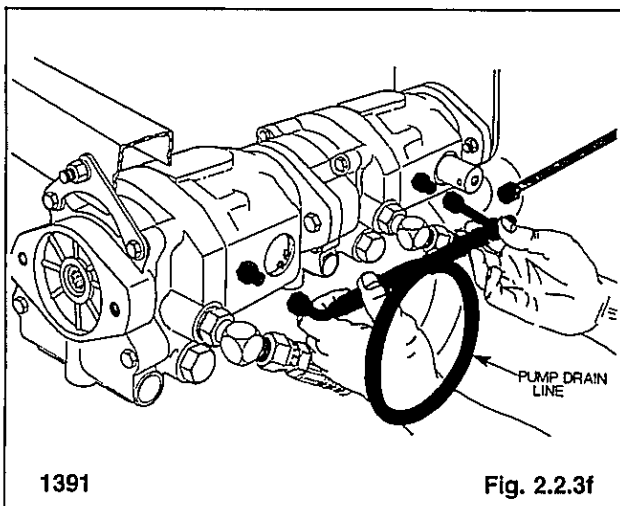
6. Remove the bolts holding the steering lock cross shaft bearings in place (fig. 2.2.3c). Drop the cross shaft down out of the way.
7. Remove the hydraulic hose from the charge pump inlet port (fig. 2.2.3d). Plug the inlet port and cap the hydraulic line.



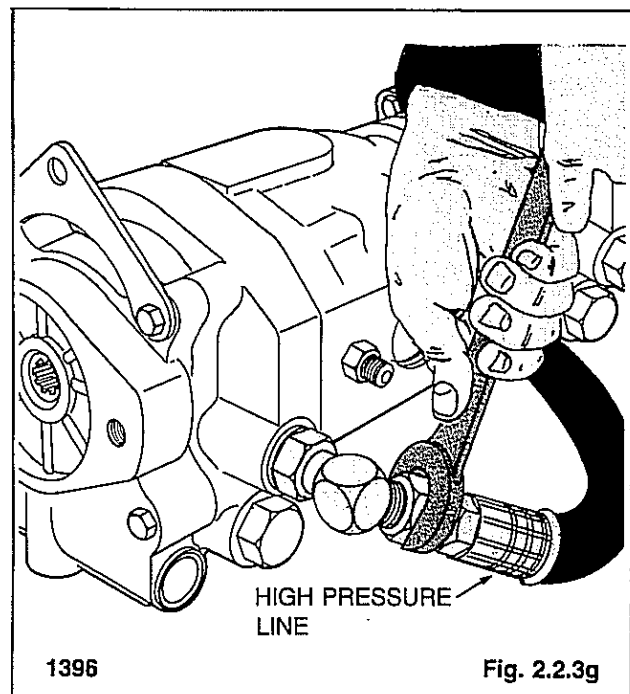
2 HYDROSTATIC DRIVE SYSTEM



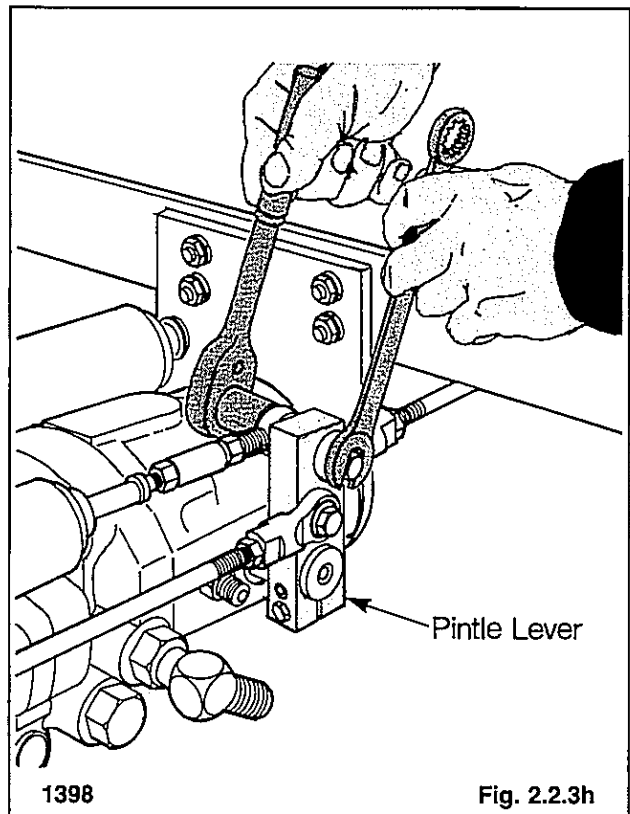
8. Disconnect and remove the charge pump transfer line between the front and rear hydrostatic pump (fig. 2.2.3e). Cap the line and plug both transfer ports.
9. Disconnect both the front and rear pump drain lines from the pumps (fig. 2.2.3f). Cap the drain lines and plug the pump drain line ports.



10. Disconnect and remove the high pressure lines between the front pump and torque motor (fig. 2.2.3g). If the rear pump is to be removed, disconnect the rear pump high pressure lines. If the high pressure lines are rubber it is only necessary to disconnect them at the pump end. Plug the pump and motor ports and cap both ends of the high pressure lines.

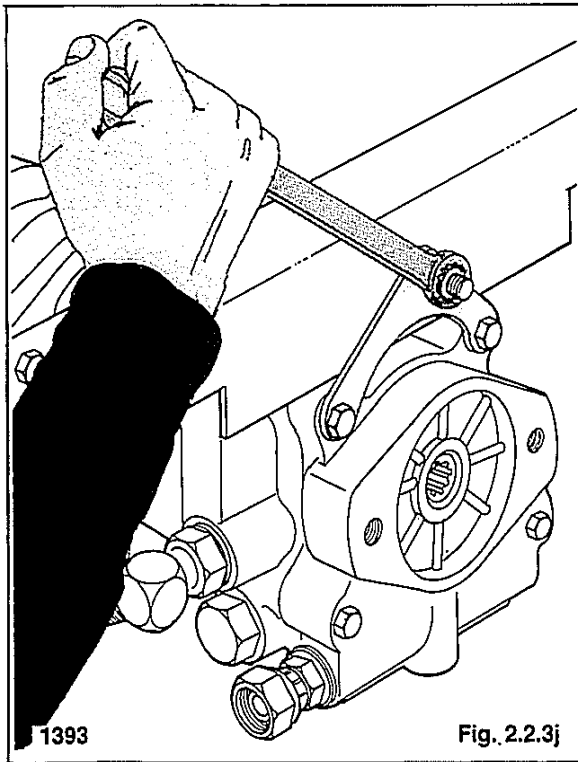


11. Disconnect the steering control linkages and shock absorber from the front pump pintle lever (fig. 2.2.3h). If the rear pump is to be removed disconnect the steering linkage from the rear pump pintle lever.



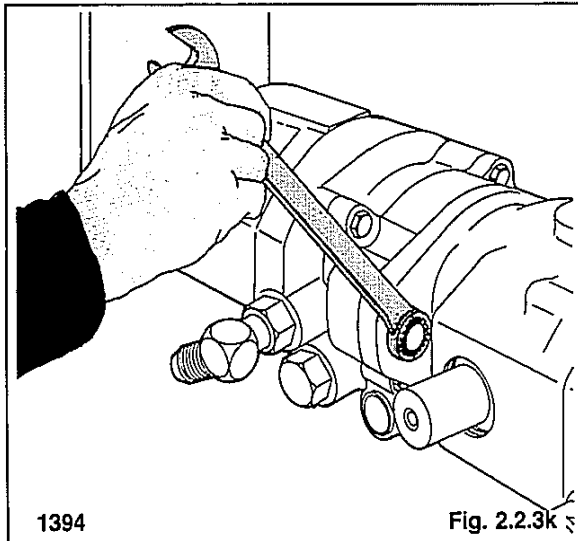
2 HYDROSTATIC DRIVE SYSTEM

12. Disconnect the front pump mounting bracket (fig. 2.2.3j).



13. Remove the mounting bolts which secure the front pump to the rear pump (fig. 2.2.3k).

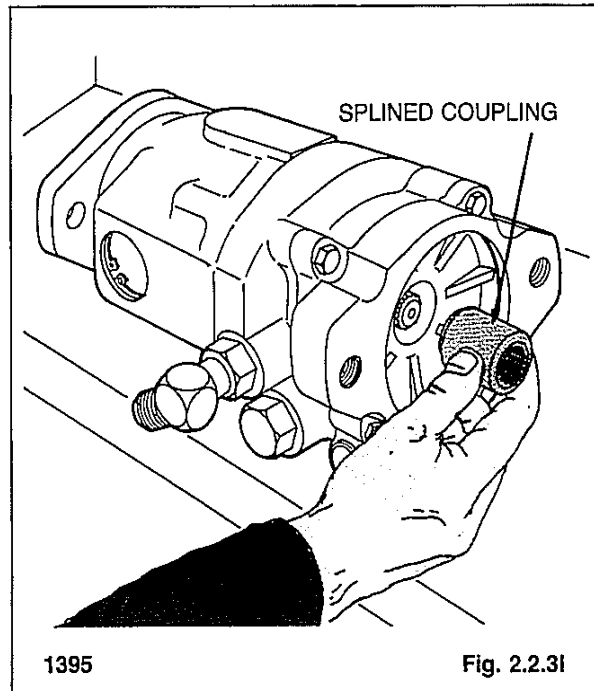
14. Remove the front pump from the loader.



15. Remove the splined drive coupling from the rear pump (fig. 2.2.3l).

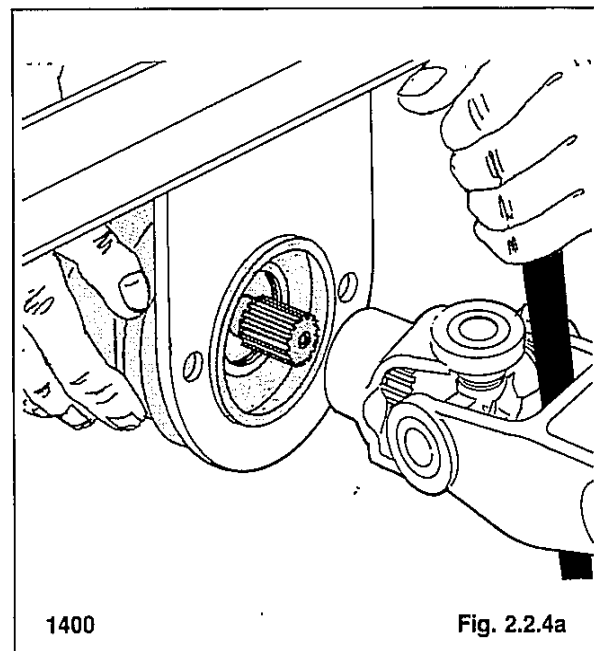
16. Remove the mounting bolts which secure the rear pump to the frame.

17. Remove the rear pump from the loader.



2.2.4 Hydrostatic Pump, Replacement:

1. Line up the universal joint with the splines on the rear pump shaft and install the rear pump in the loader (fig. 2.2.4a). Install the rear pump mounting bolts which fasten the pump to the frame.

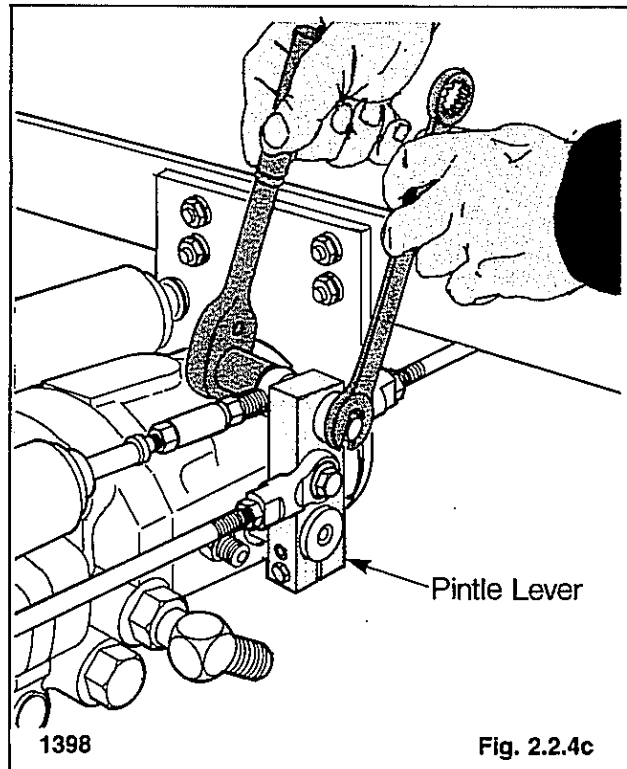
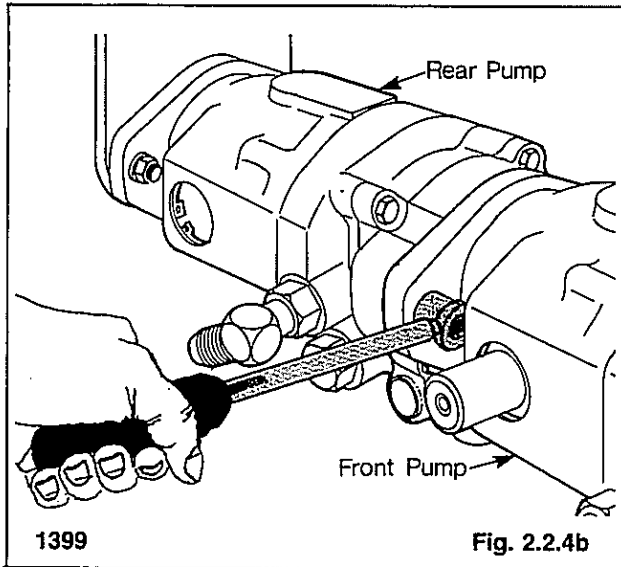


2 HYDROSTATIC DRIVE SYSTEM

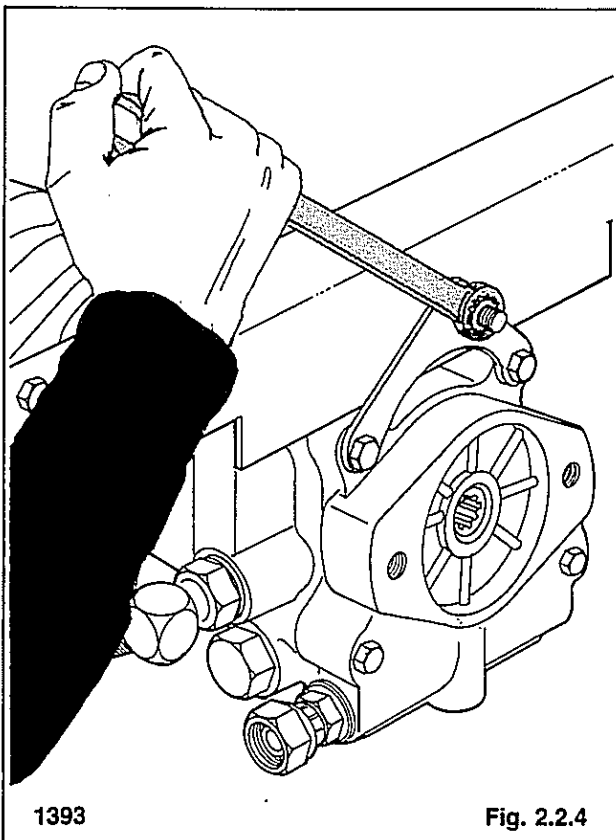
2. Install the front pump in the machine. Tighten the mounting bolts which fasten the front pump to the rear pump to the following torques: (fig. 2.2.4b)

T103 27-31 ft. lbs. (1.9-2.1 Bar)

T133 55-60 ft. lbs. (3.8-4.1 Bar)

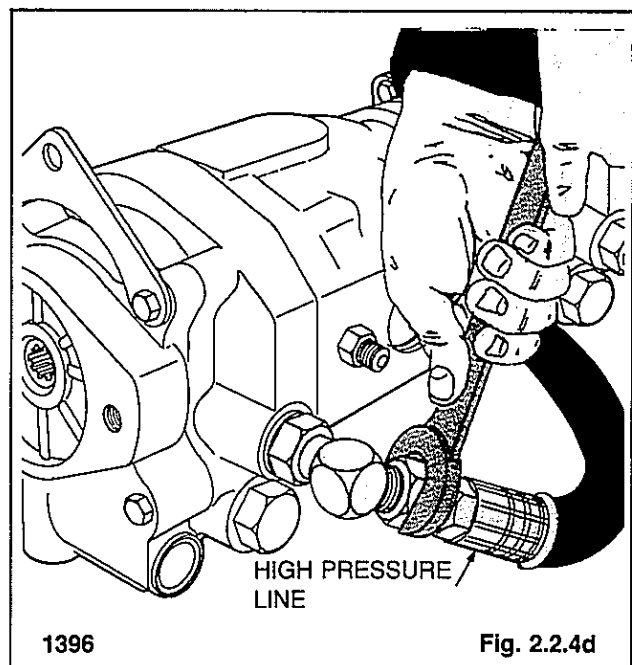


3. Install the front pump mounting bracket (fig. 2.2.4).

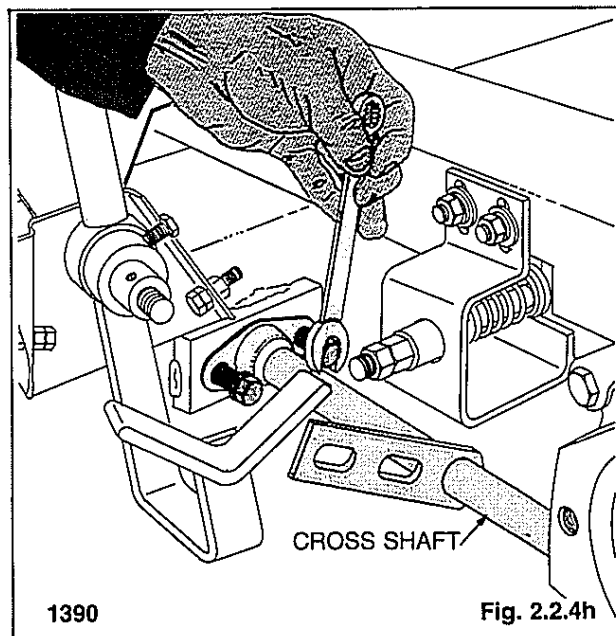
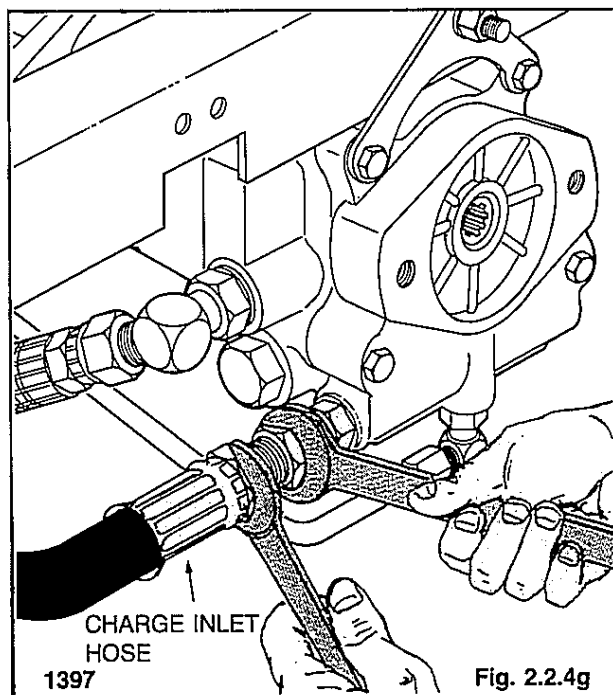
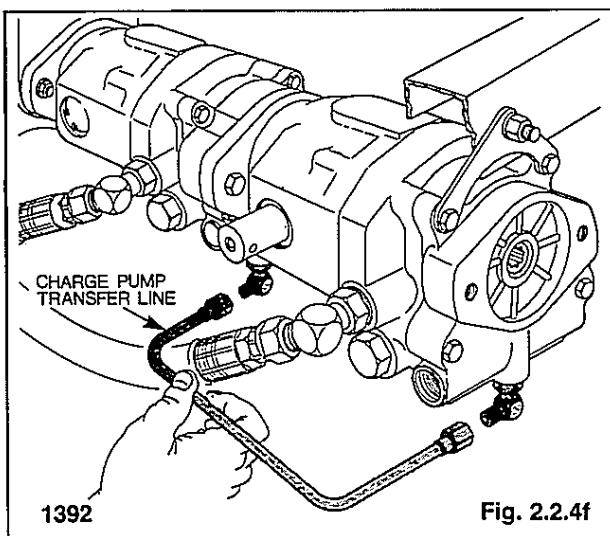
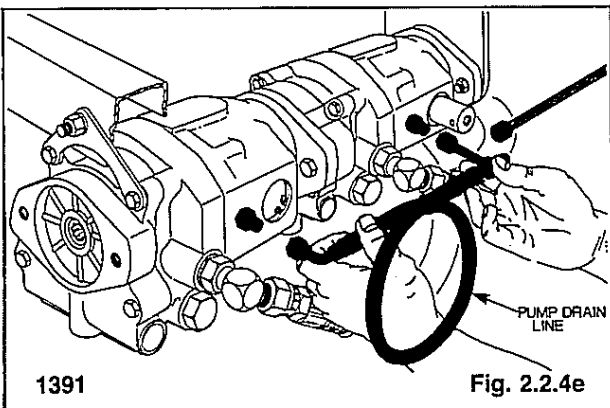


4. Reconnect the steering control linkages and shock absorbers to the front and rear pump pintle levers (fig. 2.2.4c). On start up it may be necessary to adjust the steering linkage. Refer to section 4.1.

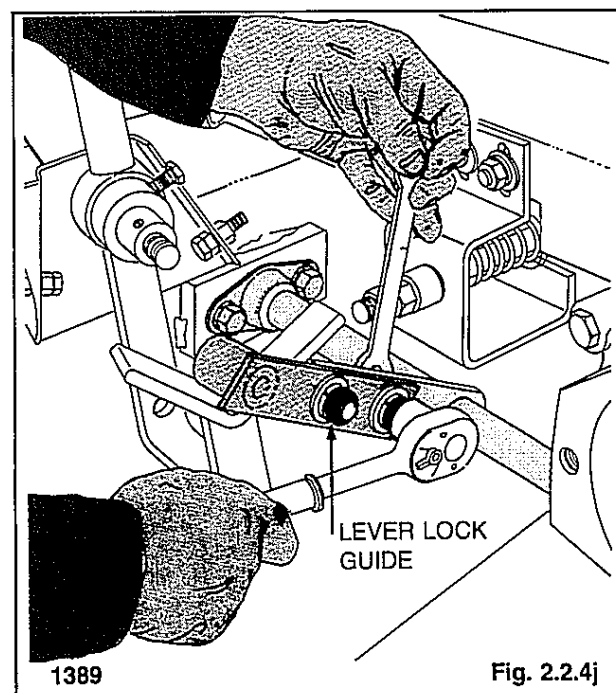
5. Install the four high pressure hoses between the pumps and motor (fig. 2.2.4d).



2 HYDROSTATIC DRIVE SYSTEM



6. Install the front and rear pump drain lines (fig. 2.2.4e).
7. Install the charge pump transfer line between the front and rear pump (fig. 2.2.4f).
8. Install the hydraulic hose from the oil reservoir at the charge pump inlet port (fig. 2.2.4g).
9. Raise the steering lock cross shaft up into place and install the bearing mounting bolts (fig. 2.2.4h).
10. Install the lock guides on the steering lock cross shaft (fig. 2.2.4j). Before start up adjust the steering lock as shown in section 4.1.

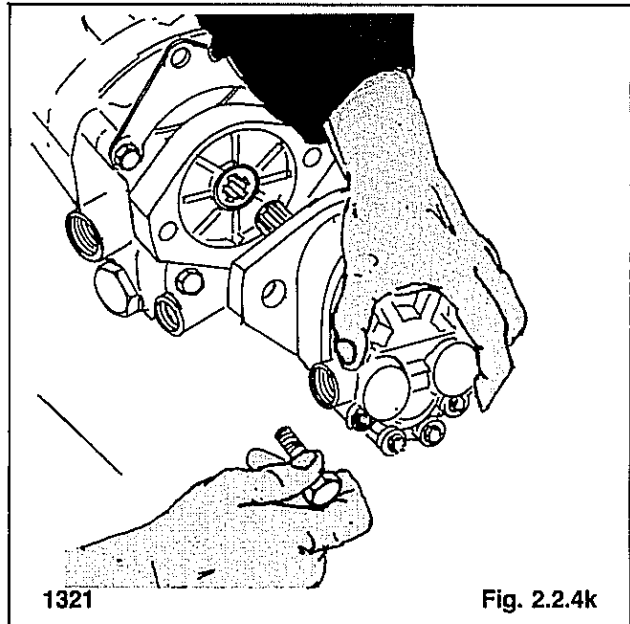


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11. Install the hydraulic gear pump on the hydrostatic pump and reconnect the gear pump inlet hose and the hydraulic line between the gear pump and control valve (fig. 2.2.4k). Refer to section 1.2.4 for procedure. Tighten the hydraulic gear pump mounting bolts 27-31 ft. lbs. (36.6-42 N.M.).
12. Refill the hydraulic reservoir to the proper level with 10W30 API classification SE/CD oil.
13. Before starting the loader refer to the start up procedure in section 1.2.6 to prevent damage to the hydraulic or hydrostatic components.

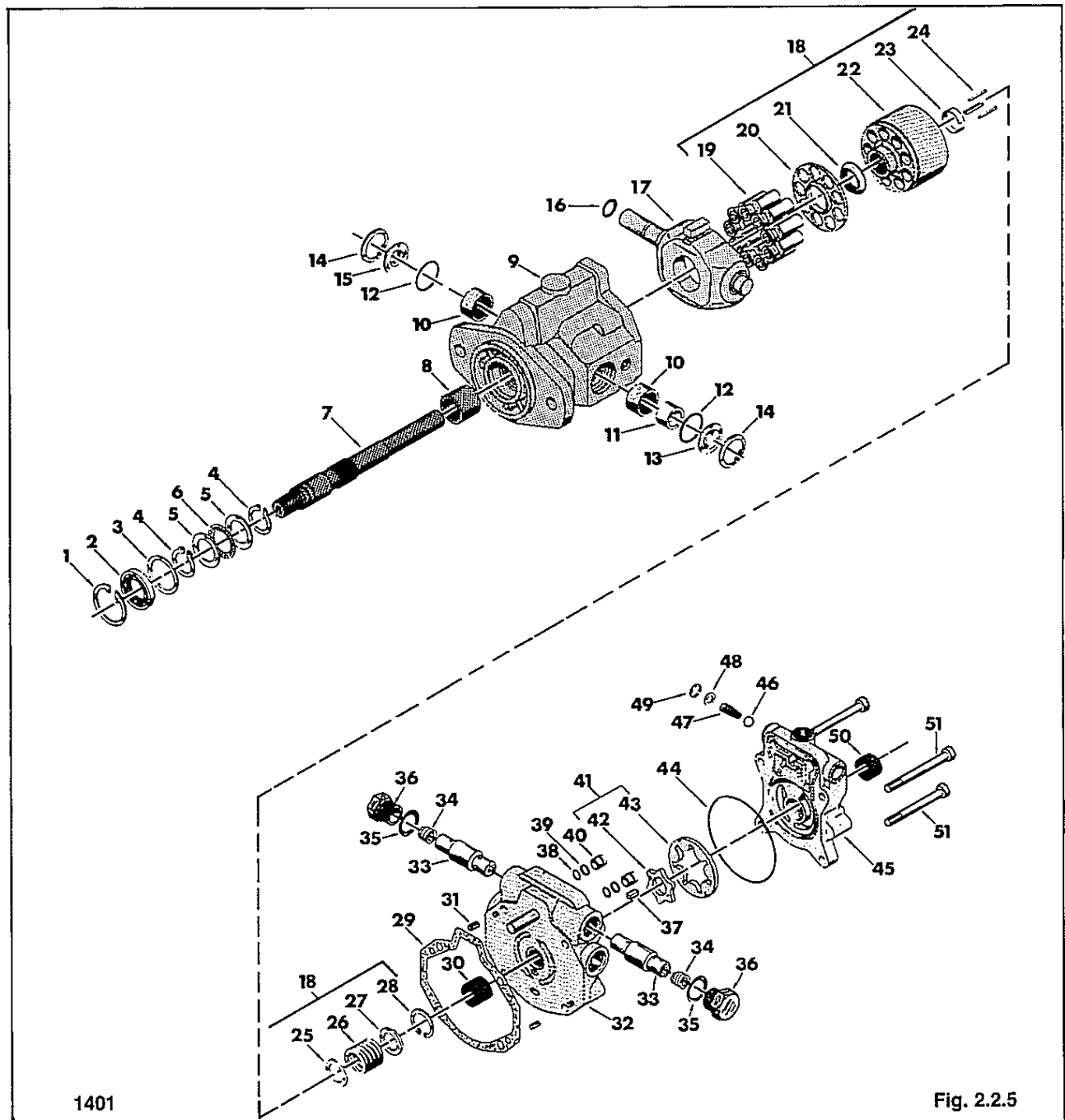
IMPORTANT

To prevent damage after removal or repair of hydraulic components refer to start up procedure sect. 1.2.6.



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2.2.5 Hydrostatic Pump, Disassembly:



- | | | | | |
|--------------------|--------------------|--------------------|---------------------|--------------------|
| 1. Retaining ring | 12. O-ring | 23. Pin keeper | 34. Spring | 45. Adaptor plate |
| 2. Shaft seal | 13. Camplate cover | 24. Pin (3) | 35. O-ring | 46. Poppet |
| 3. Washer | 14. Retaining ring | 25. Washer | 36. Plug | 47. Spring |
| 4. Retaining ring | 15. Camplate cover | 26. Spring | 37. Key | 48. Washer |
| 5. Thrust race | 16. O-ring | 27. Washer | 38. Back-up washer | 49. Retaining ring |
| 6. Thrust bearing | 17. Camplate | 28. Retaining ring | 39. O-ring | 50. Bearing |
| 7. Drive shaft | 18. Rotating group | 29. Gasket | 40. Check valve | 51. Cap screw |
| 8. Bearing | 19. Piston (9) | 30. Bearing | 41. Charge pump kit | |
| 9. Housing | 20. Spider | 31. Dowel pin (2) | 42. Inner gerotor | |
| 10. Needle bearing | 21. Spider pivot | 32. Back plate | 43. Outer gerotor | |
| 11. Inner race | 22. Piston block | 33. Relief valve | 44. O-ring | |

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Before disassembling the pump, clean the body with a suitable solvent and dry with compressed air. Be sure all openings are plugged to prevent solvent entering the pump.

Disassembly instructions are given for the front pump. Disassembly of the rear pump is identical unless otherwise noted.



WARNING

To avoid eye injury use safety goggles when cleaning with compressed air.

IMPORTANT

When making repairs to the hydrostatic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

1. Remove the four cap screws and the pump support bracket from the pump assembly (fig. 2.2.5a).

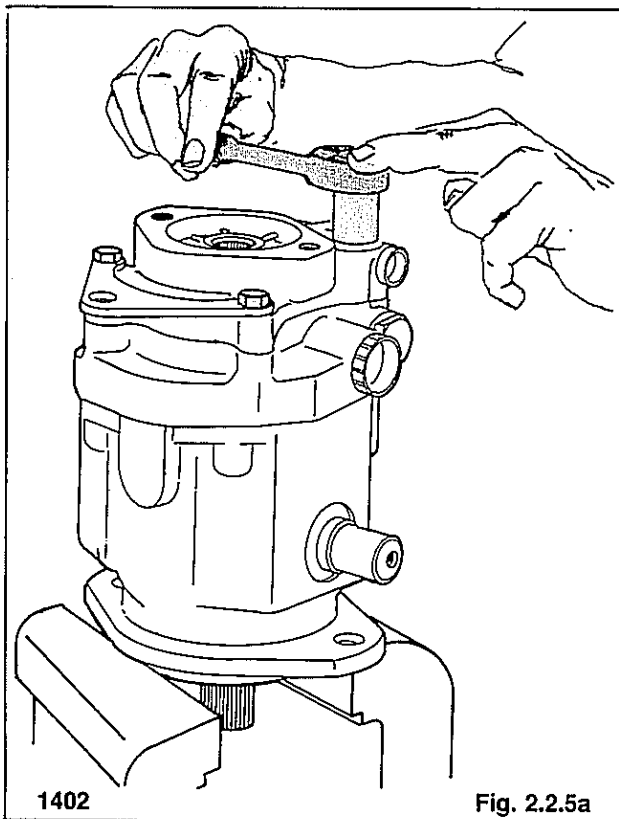


Fig. 2.2.5a

2. Use a plastic hammer and tap the adaptor plate to loosen it from the back plate. Remove the adaptor plate from the pump assembly (fig. 2.2.5b).

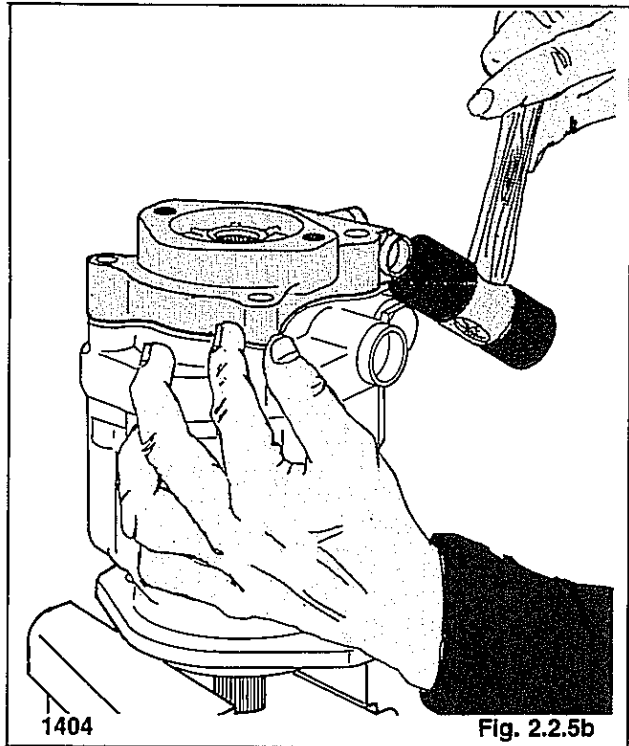


Fig. 2.2.5b

IMPORTANT

Do not intermix parts from one pump with another. Keep all pump parts separate.

3. Remove the retaining ring, washer, spring and poppet from the adaptor plate assembly (fig. 2.2.5c).

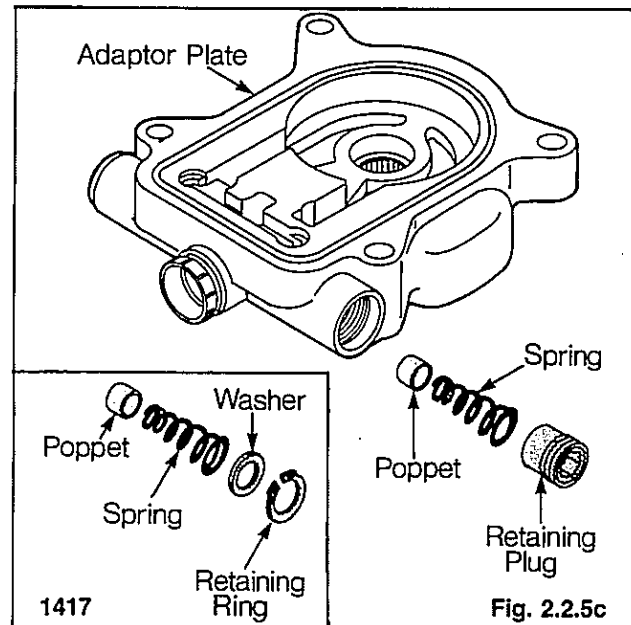


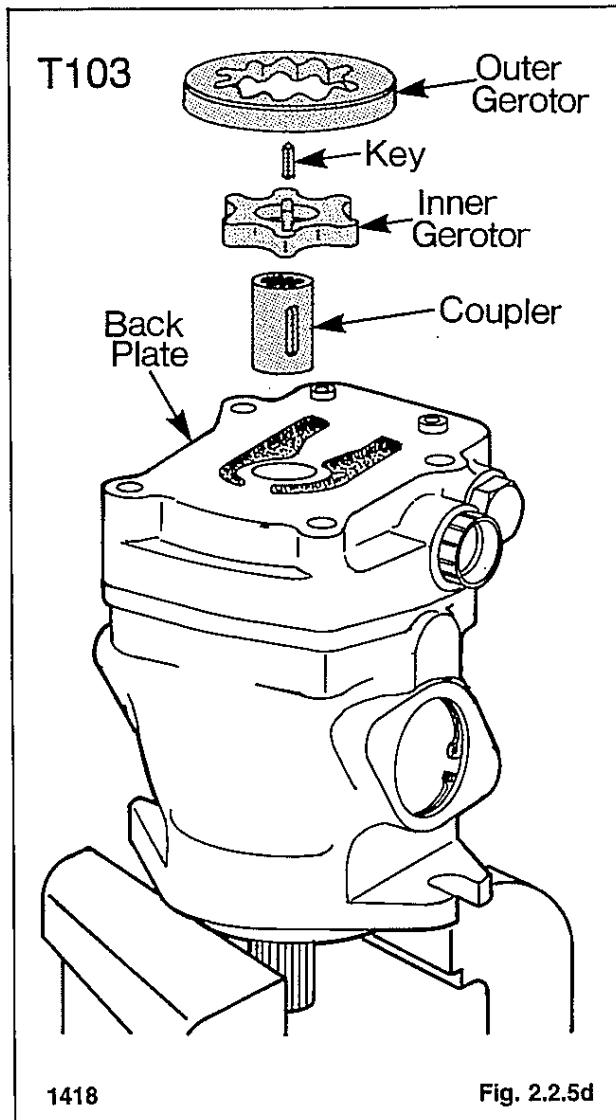
Fig. 2.2.5c

2 HYDROSTATIC DRIVE SYSTEM

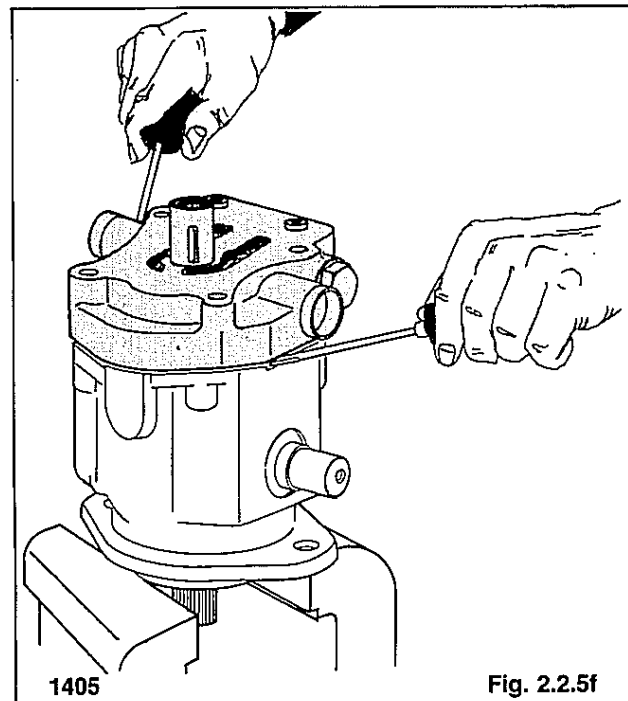
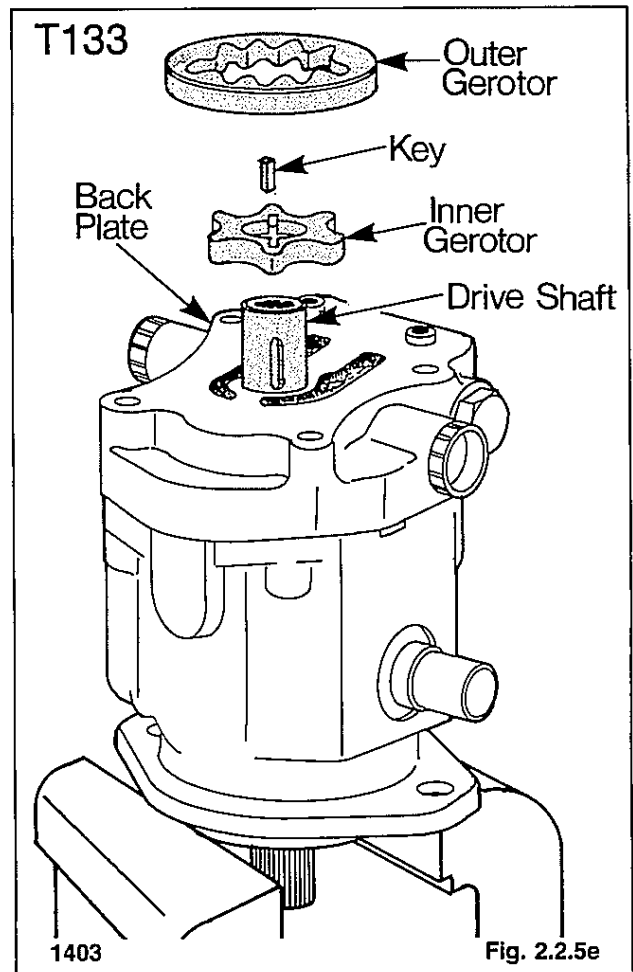
4. Remove the charge pump kit from the back plate assembly (fig. 2.2.5d, fig. 2.2.5e).

IMPORTANT

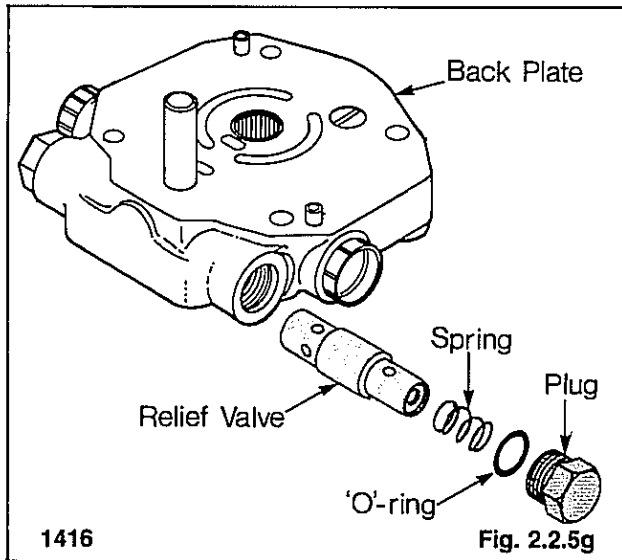
Do not attempt to check charge pump flow. Checking flow can cause cavitation and damage to the piston pumps.



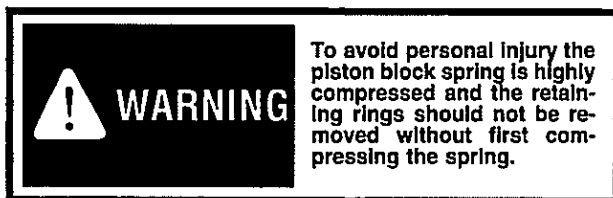
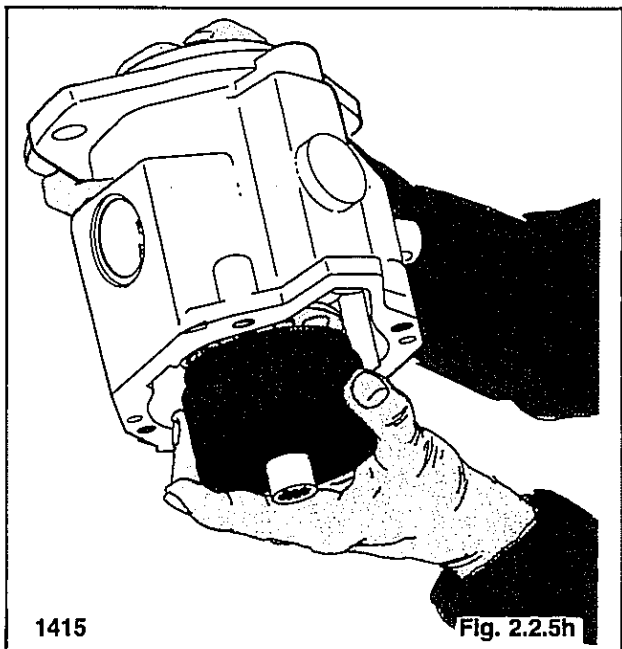
5. Using the two screw driver slots cast in the pump housing, separate the back plate from the housing (fig. 2.2.5f).
6. Remove and discard the gasket between the housing and back plate assembly.



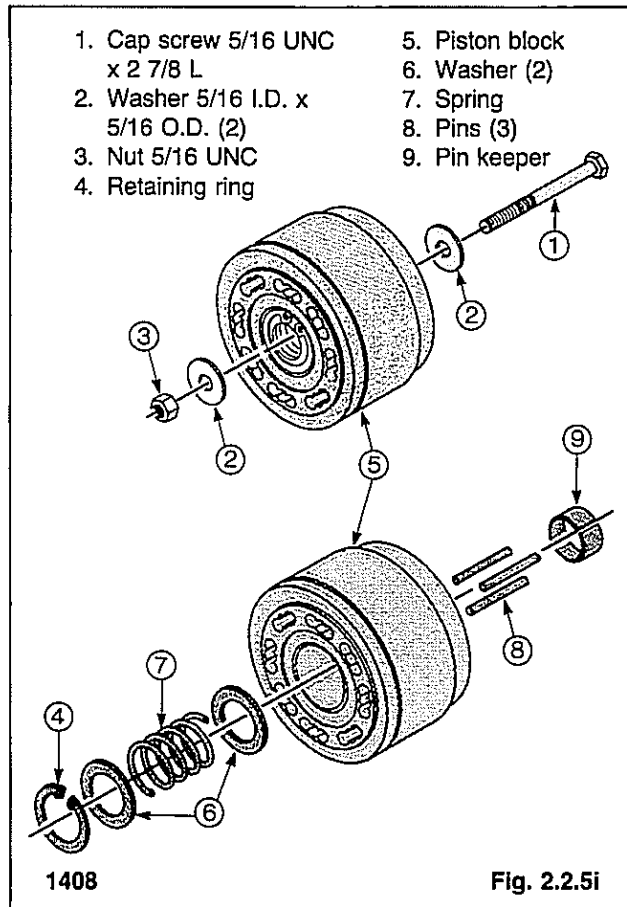
2 HYDROSTATIC DRIVE SYSTEM



7. Remove the two high pressure relief valves from the back plate assembly (fig. 2.2.5g).
8. Remove the rotating group from the housing (fig. 2.2.5h).
9. The piston block assembly does not require to be disassembled unless the pins or spring are damaged.



If the piston block spring needs to be removed use the following procedure (fig. 2.2.5i).

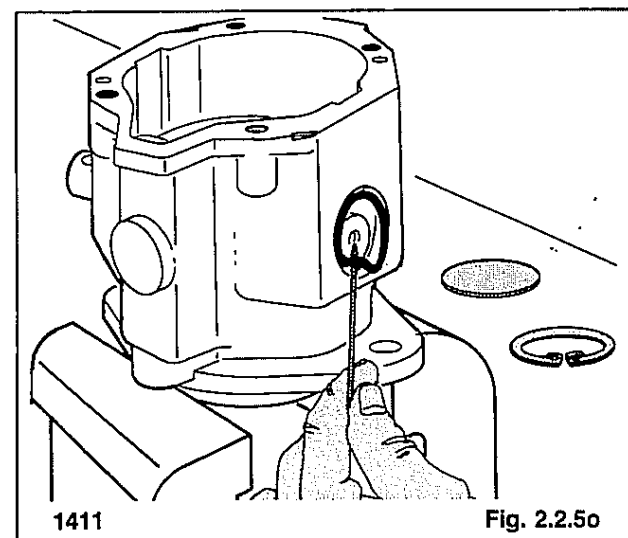
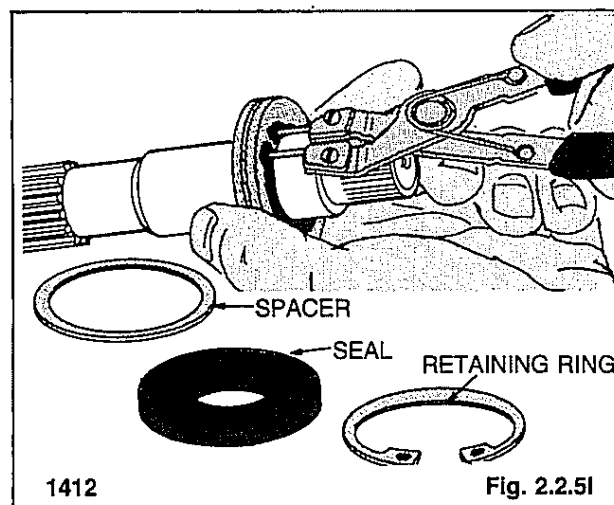
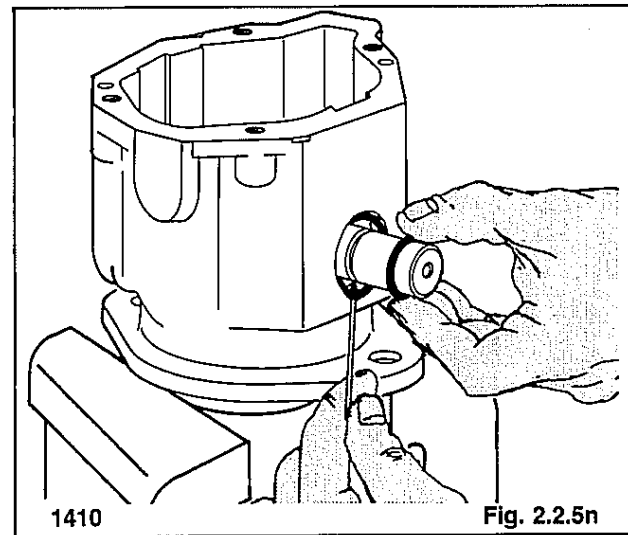
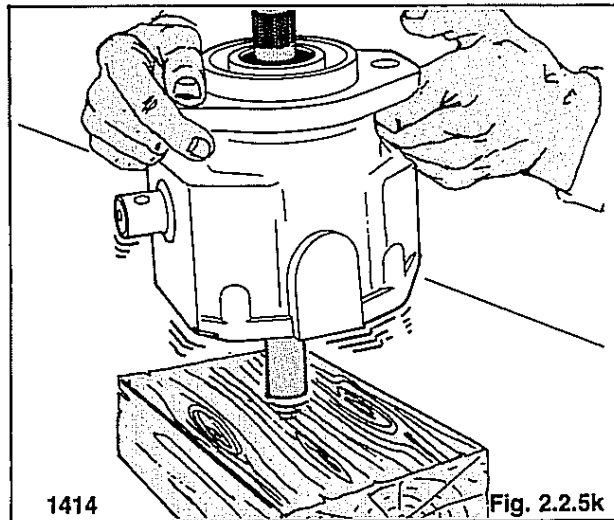
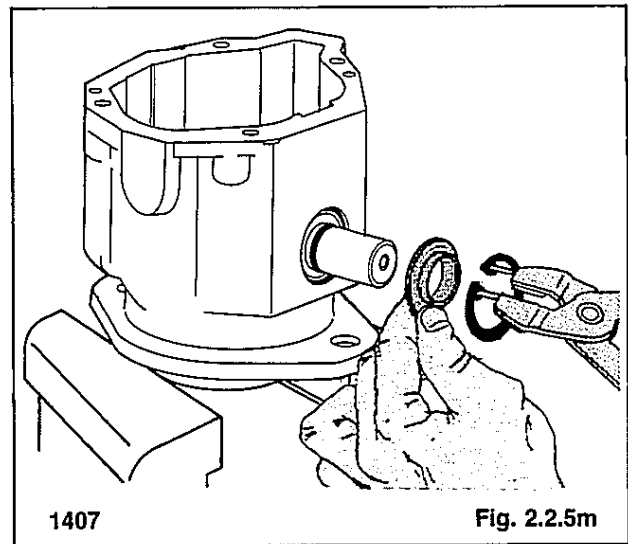
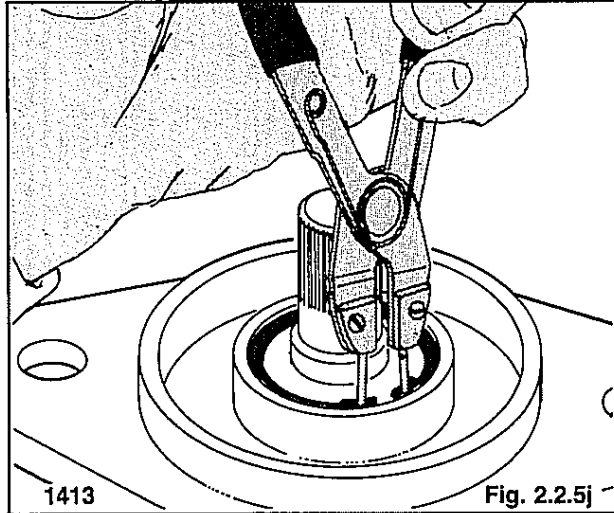


1. Cap screw 5/16 UNC x 2 7/8 L
 2. Washer 5/16 I.D. x 5/16 O.D. (2)
 3. Nut 5/16 UNC
 4. Retaining ring
 5. Piston block
 6. Washer (2)
 7. Spring
 8. Pins (3)
 9. Pin keeper
- (a) Place a 5/16" flat washer over the 5/16 x 2 7/8 cap screw and insert the cap screw through the center of the piston block.
 - (b) Place a 5/16 flat washer over the end of the cap screw and screw on the 5/16 UNC nut.
 - (c) Tighten the nut and compress the spring.
 - (d) Remove the retaining ring.
 - (e) Slowly back off the 5/16 nut relieving the compression on the spring.
 - (f) Remove the two washers, spring and three pins from the piston block.
10. Remove the retaining ring from the housing (fig. 2.2.5j).
 11. Tap the end of the shaft against a wooden block to remove the shaft, seal and bearing assembly from the housing (fig. 2.2.5k).
 12. Remove the seal, spacer, retaining ring, thrust bearing and races from the pump shaft (fig. 2.2.5l).
 13. Remove the retaining ring and the camplate cover (fig. 2.2.5m).

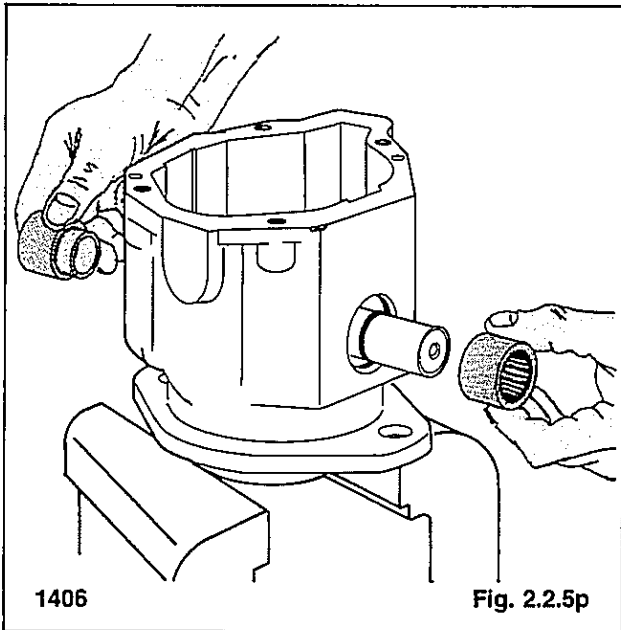
2 HYDROSTATIC DRIVE SYSTEM

14. Remove the camplate cover plate O-ring and the camplate shaft O-ring (fig. 2.2.5n).

15. Remove the retaining ring, camplate cover and O-ring from the opposite side of the pump housing (fig. 2.2.5o).

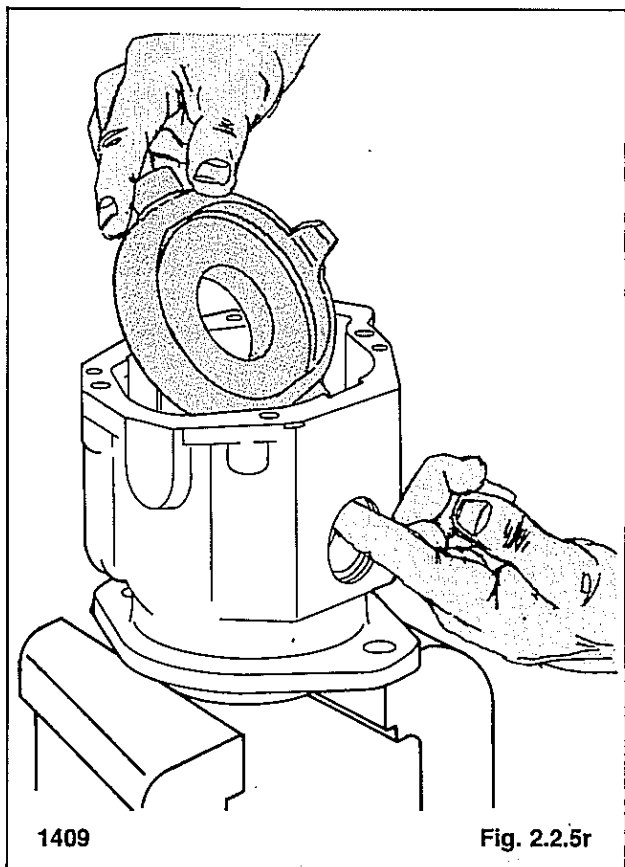


2 HYDROSTATIC DRIVE SYSTEM



16. Remove the camplate bearings and races from the housing. The camplate bearings are a loose, slip fit into the housings (fig. 2.2.5p).

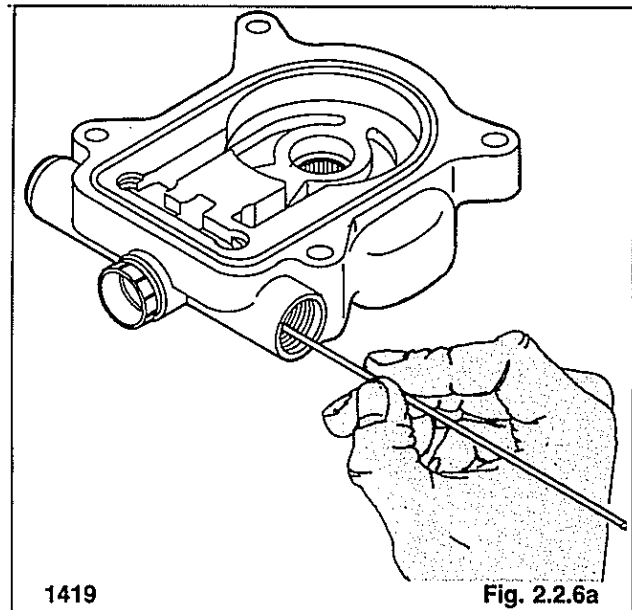
17. Remove the camplate from the housings (fig. 2.2.5r).



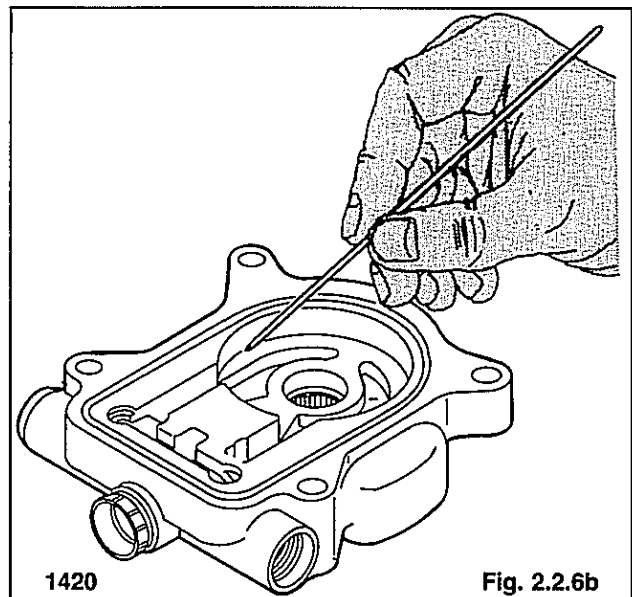
2.2.6 Hydrostatic Pump, Inspection:

IMPORTANT

Do not intermix parts from one pump with another. Keep all pump parts separate.

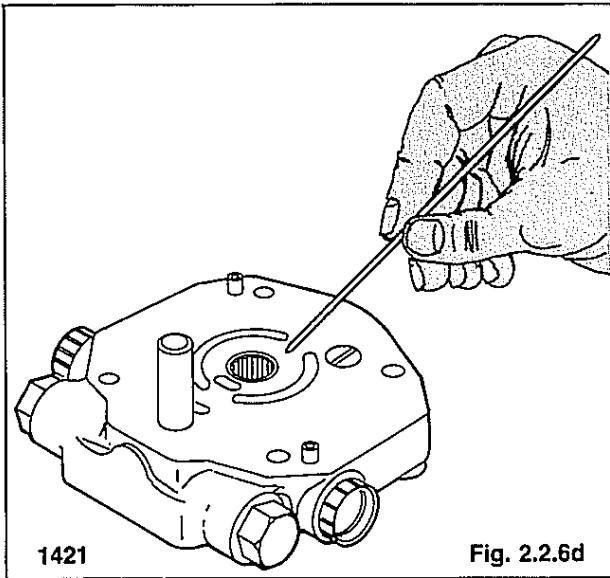
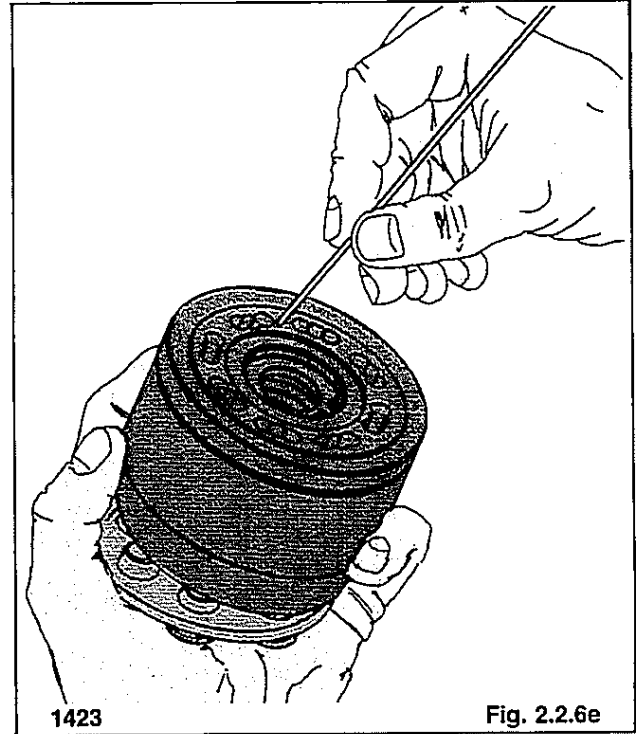
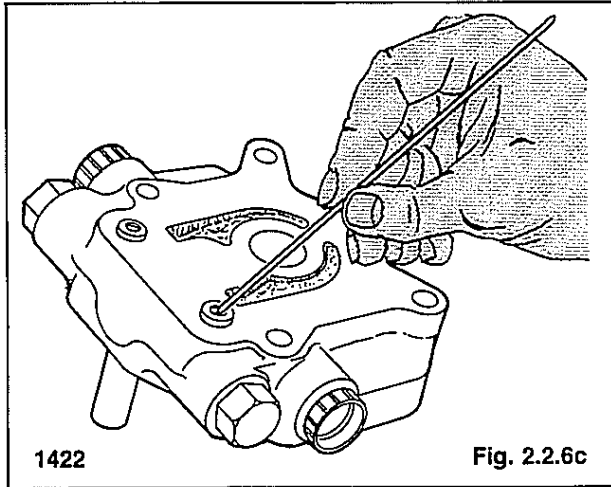


1. Inspect the charge pump relief valve seat inside the charge pump adaptor (fig. 2.2.6a). It should be smooth and free from burrs or other defects.
2. Inspect the charge pump spring and poppet for damage.
3. Inspect the gerotor pocket inside the charge pump adaptor plate for excessive scoring or wear (fig. 2.2.6b).



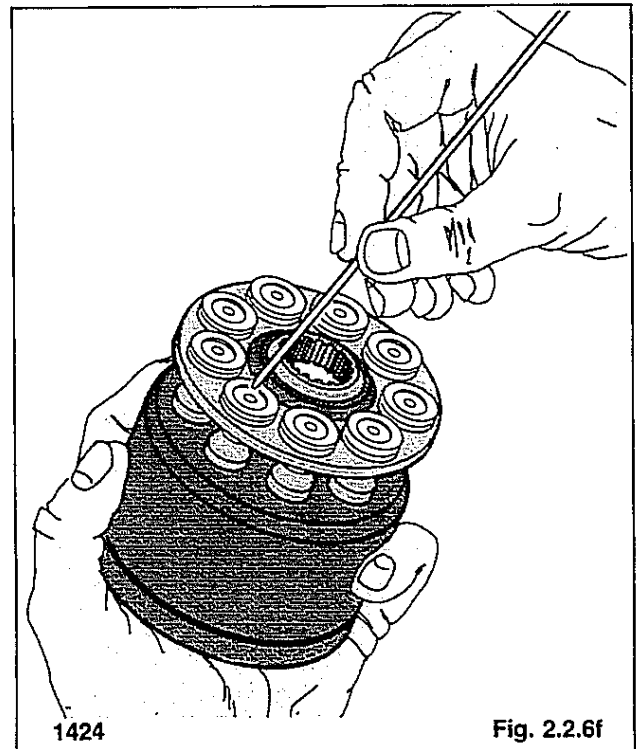
2 HYDROSTATIC DRIVE SYSTEM

4. Inspect the needle bearing inside the charge adaptor housing. If the needles are free from excessive play and remain in the bearing cage there is no need to replace the bearing.
5. Inspect the check valve assemblies in the back plate (fig. 2.2.6c). Make sure the balls move freely.
6. Inspect the face of the back plate that the charge pump runs against for excessive scoring or wear (fig. 2.2.6c).



IMPORTANT

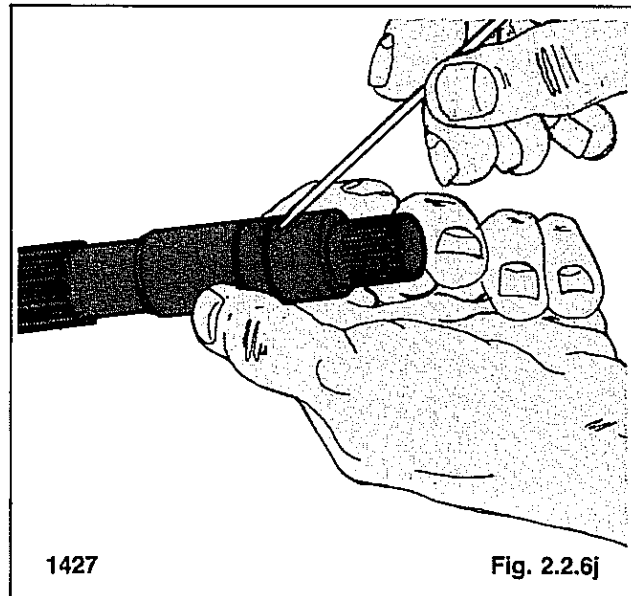
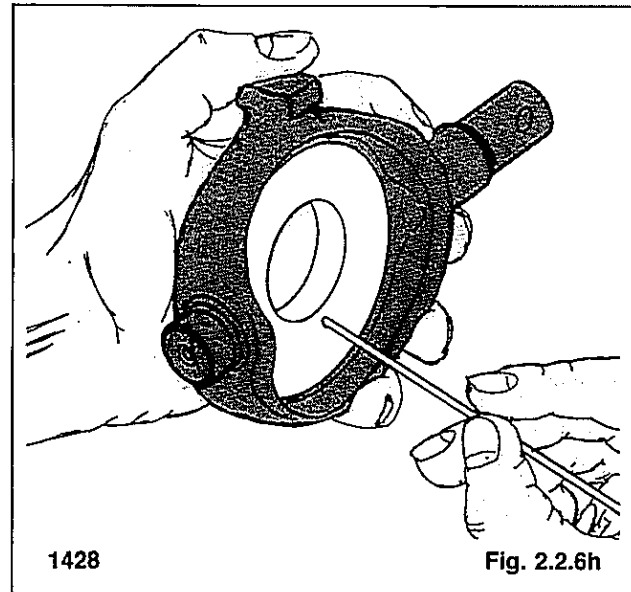
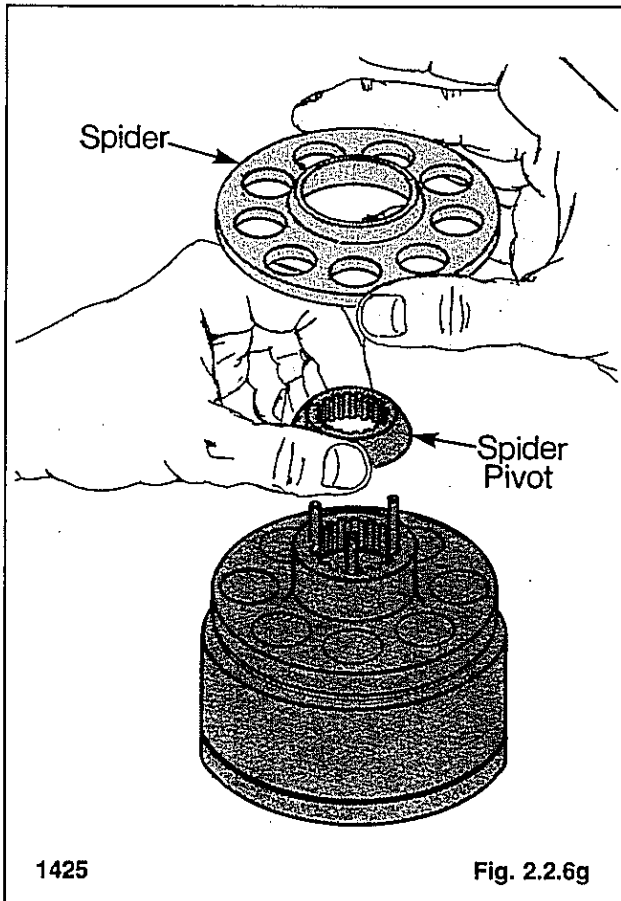
The piston block spring is highly compressed and the retaining ring should not be removed without first compressing the spring.



7. Inspect the face of the back plate that the rotating group piston block runs against for scoring or wear. The plate should be smooth and free of grooves. If not replace (fig. 2.2.6d).
8. Inspect the piston block (fig. 2.2.6e). The face that contacts the back plate should be smooth and free from grooves.
9. Inspect the piston block spring and the three pins for damage.

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10. Check that the pistons move freely in the piston block bore (fig. 2.2.6f). If they are sticky in the bore, check the bore for scoring or contamination.
11. Inspect the piston shoes (fig. 2.2.6f). The flat surface of the shoe should be flat and smooth. The corners of the piston shoe should be square and not rounded.
12. Inspect the finish on the outside diameter of the pistons. The surface should be free from scratches or wear.



13. Inspect the spider pivot (fig. 2.2.6g). It should be smooth and show no signs of wear.
14. Inspect the spider (fig. 2.2.6g). It should be flat with no cracks or any signs of wear in the pivot area.
15. Inspect the polished surface of the camplate for scoring (fig. 2.2.6h).
16. Inspect the pump drive shaft bearing surfaces and splines for signs of scoring, wear or any damage (fig. 2.2.6j).
17. Inspect the thrust bearing and washers for wear.
18. Inspect the needle bearing in the housing assembly. If the needles are free of excessive play and remain in the bearing cage there is no need to replace the bearing.

2.2.7 Hydrostatic Pump, Reassembly:

Discard all old gaskets, seals and O-rings and replace with new ones on reassembly.

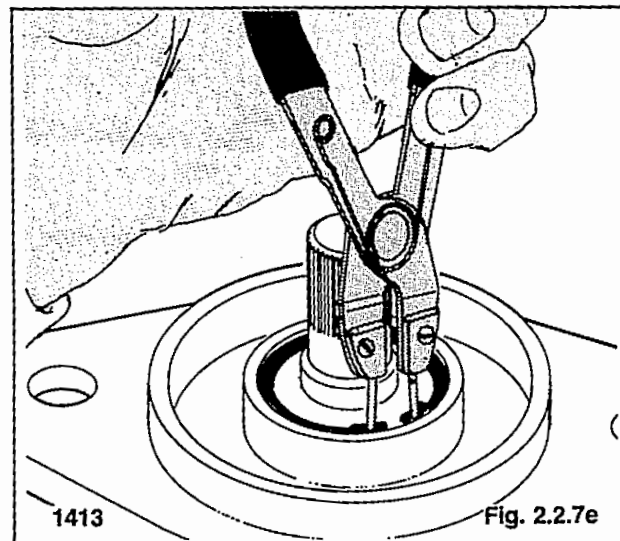
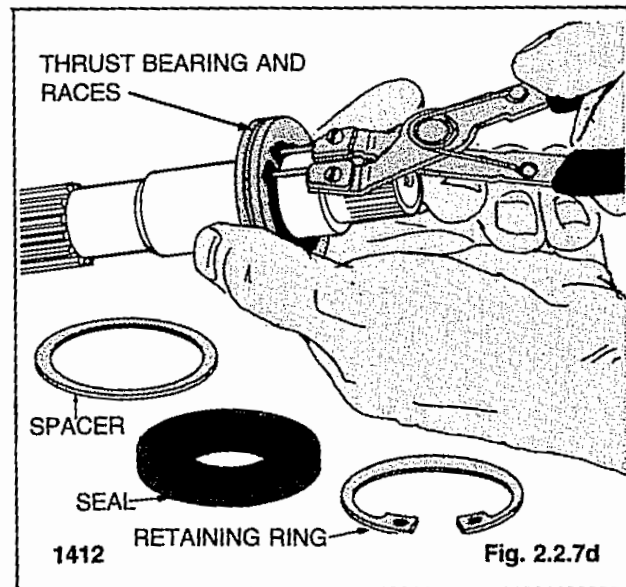
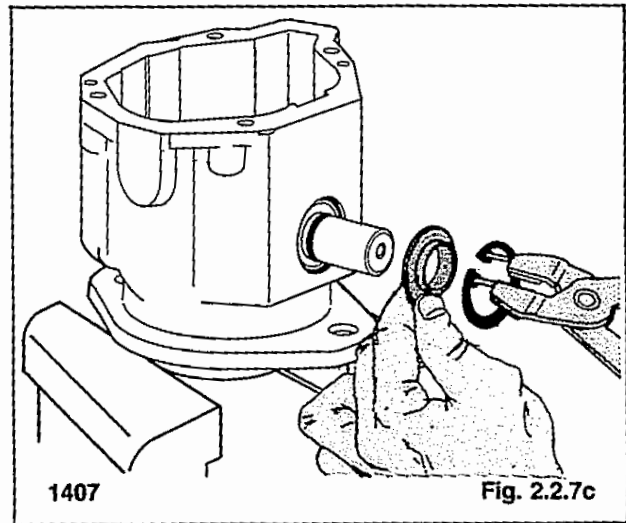
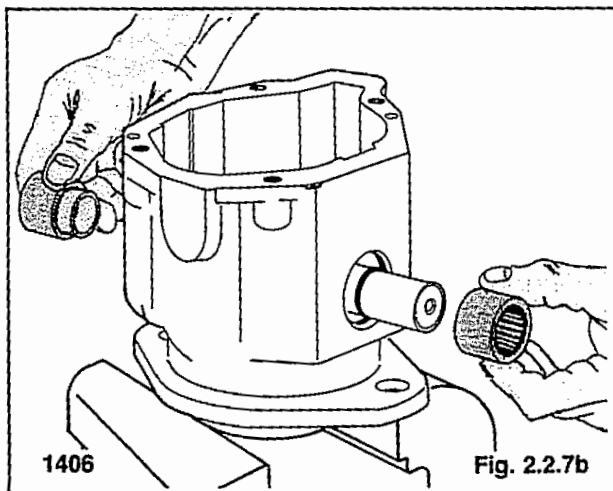
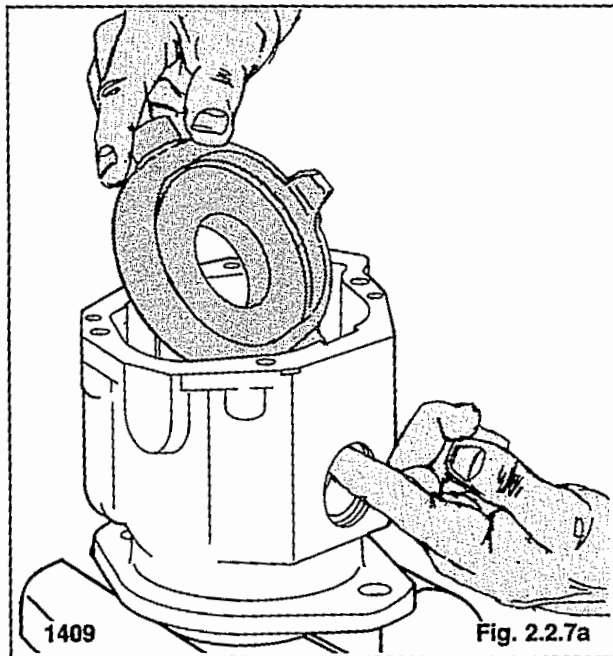
Clean all parts in a suitable solvent and lubricate with system oil before reassembly.

IMPORTANT

Do not intermix parts from one pump with another. Keep all pump parts separate.

2 HYDROSTATIC DRIVE SYSTEM

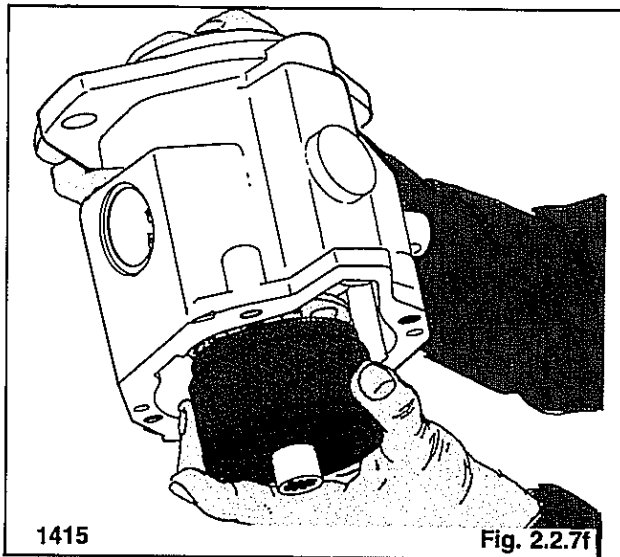
1. Install a new O-ring on the camplate shaft and install the camplate in the pump housing (fig. 2.2.7a).
2. Insert the needle bearings and inner races over the camplate shafts and slide them into the housing (fig. 2.2.7b). The numbered end of both the bearings and races should face outward and the chamfered I.D. of the races should face inward.



3. Install new O-rings around the O.D. of the camplate bearings. Install the camplate covers and secure with the retaining rings (fig. 2.2.7c).
4. Install the thrust bearing and races on the pump shaft and secure with the retaining ring (fig. 2.2.7d). Install the shaft in the pump housing.
5. Install the shaft seal spacer washer and a new shaft seal in the housing. Secure in place with the retaining ring (fig. 2.2.7e).

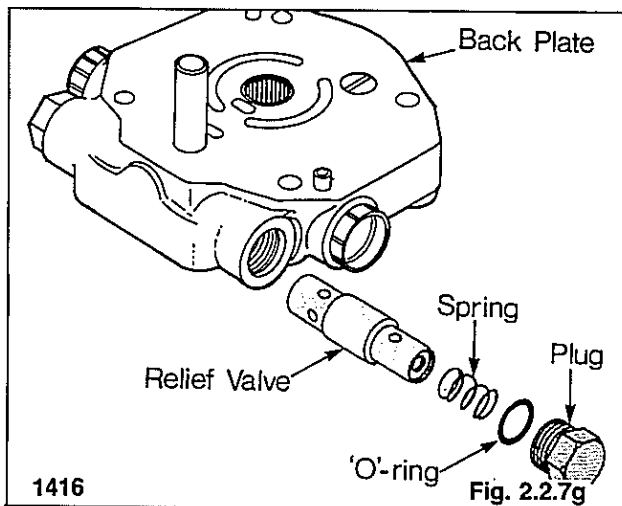
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6. If the piston block has been disassembled, install the 3 pins, washers and spring. Compress the spring and install the retaining ring.

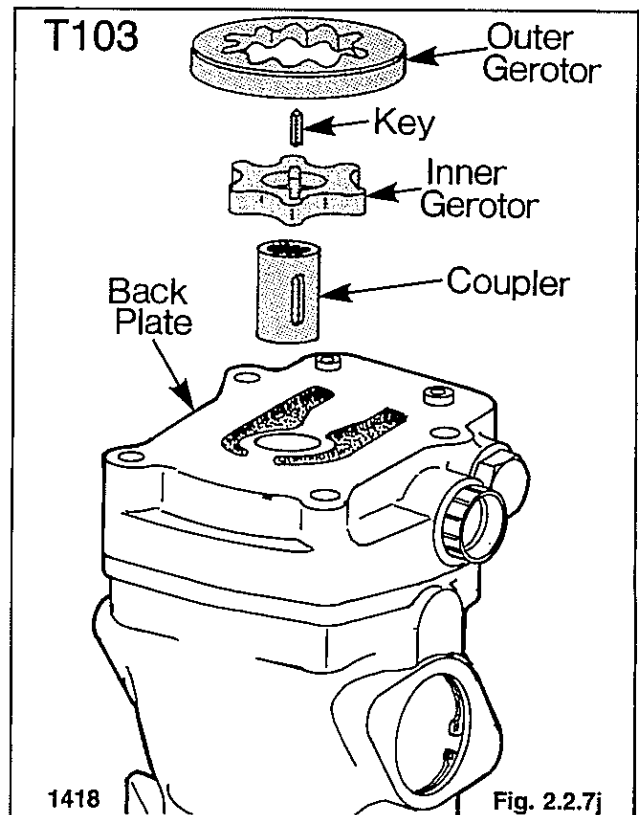
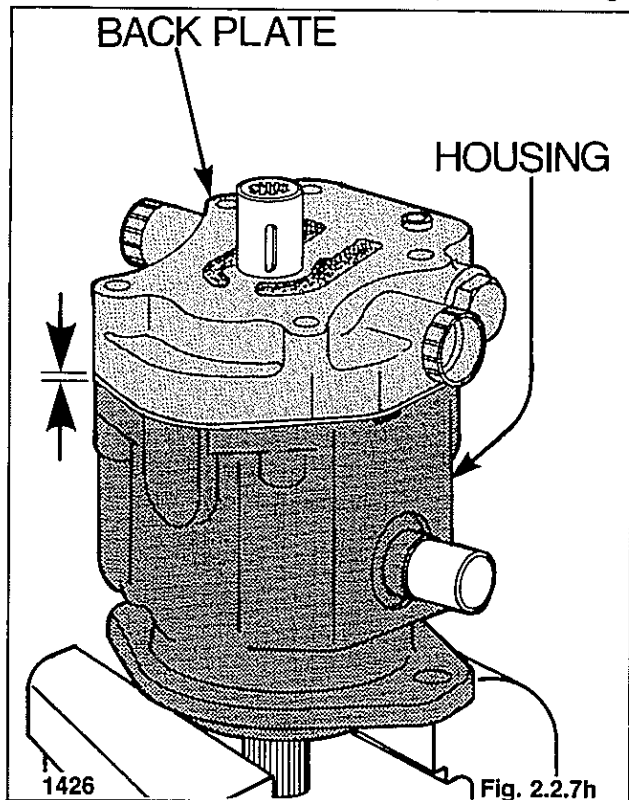


WARNING To prevent personal injury the piston block spring is highly compressed and the retaining ring should not be removed without first compressing the spring.

7. Install the spider pivot, spider and nine pistons in the piston block. Install the piston block in the housing (fig. 2.2.7f). Line up the spline on the piston block with the spline on the pump shaft. Ensure the piston shoes come in contact with the camplate. The piston block will extend slightly beyond the housing when installed.
8. Install a new gasket on the housing.
9. Install the two relief valves and springs into the back plate assembly (fig. 2.2.7g). Place a new O-ring on the plugs and torque the plugs to 55-60 ft. lbs. (75-81.3 N.M.).

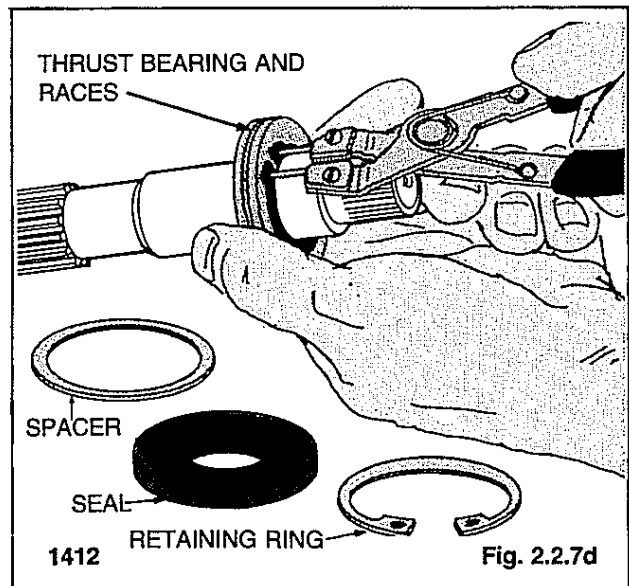
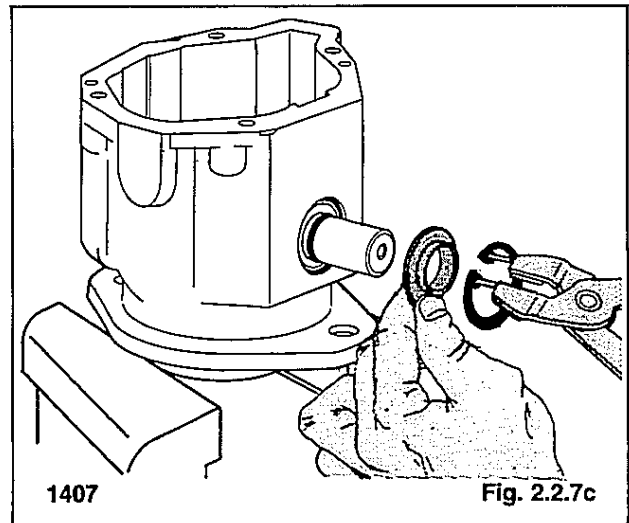
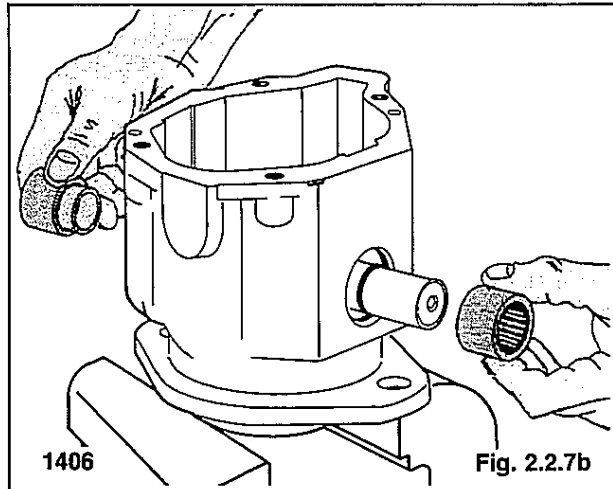
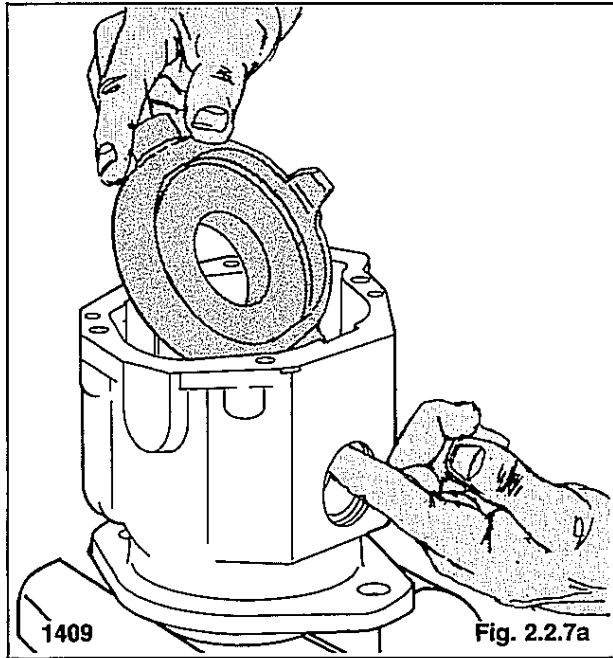


10. Install the back plate on the housing being careful not to damage the gasket (fig. 2.2.7h). When installed there will be a slight gap between the back plate and housing.

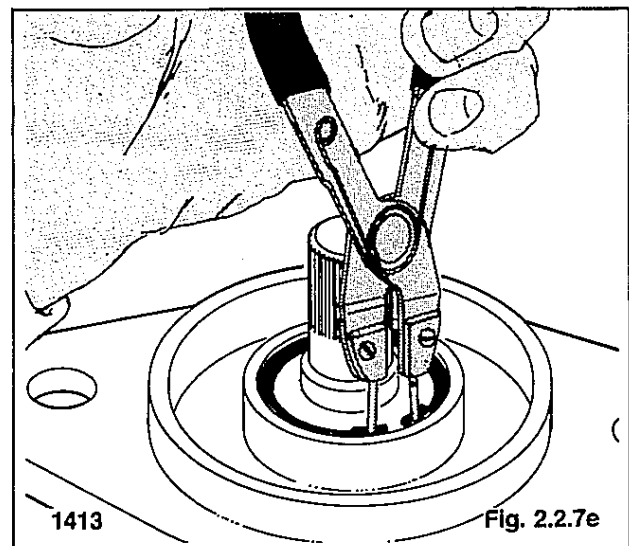


2 HYDROSTATIC DRIVE SYSTEM

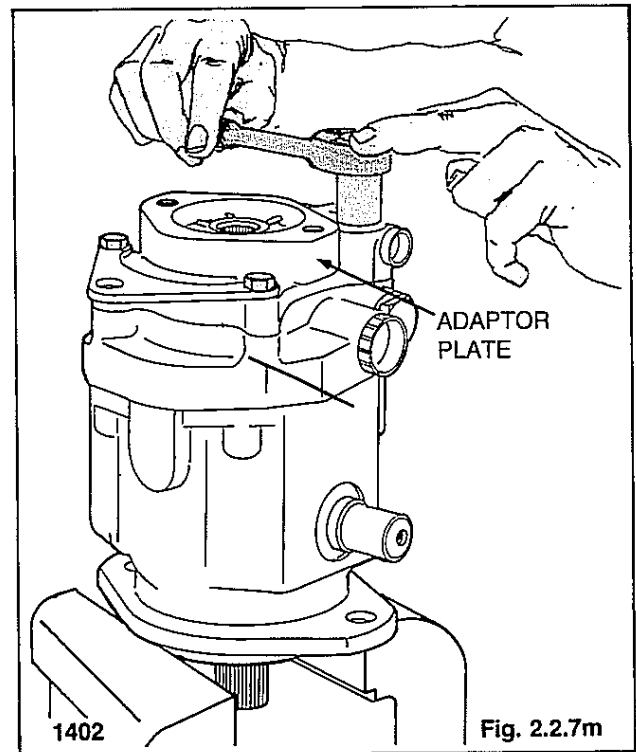
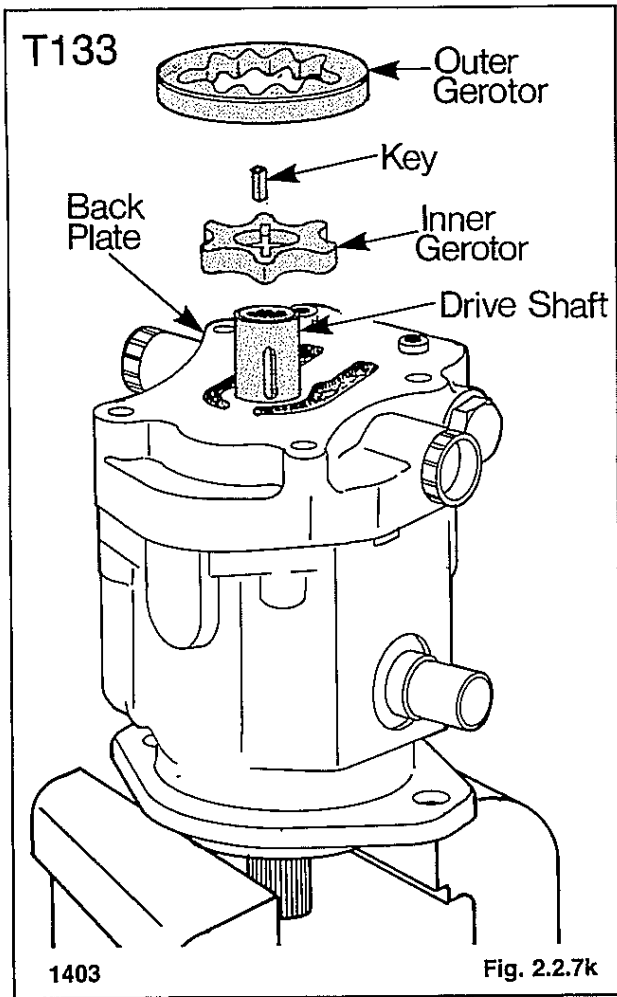
1. Install a new O-ring on the camplate shaft and install the camplate in the pump housing (fig. 2.2.7a).
2. Insert the needle bearings and inner races over the camplate shafts and slide them into the housing (fig. 2.2.7b). The numbered end of both the bearings and races should face outward and the chamfered I.D. of the races should face inward.



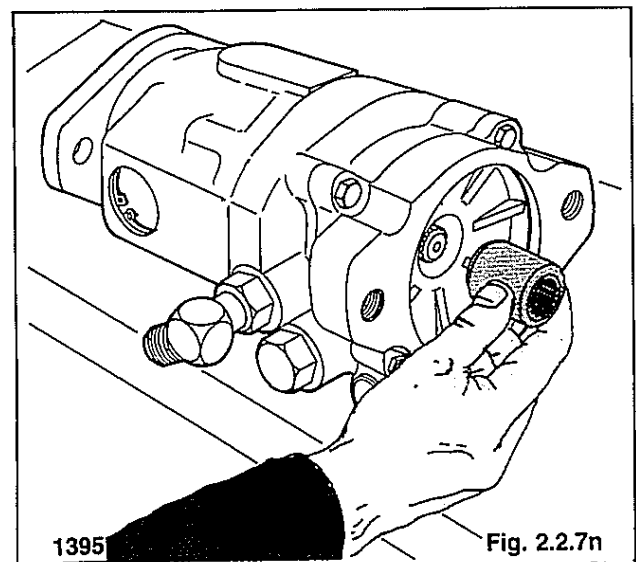
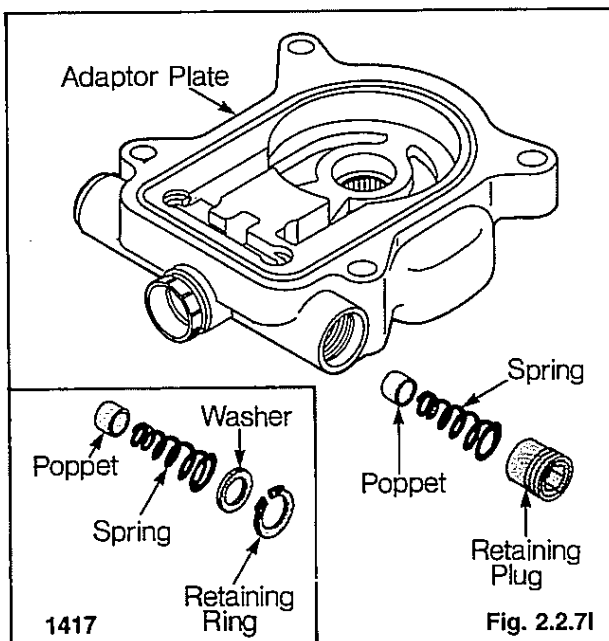
3. Install new O-rings around the O.D. of the camplate bearings. Install the camplate covers and secure with the retaining rings (fig. 2.2.7c).
4. Install the thrust bearing and races on the pump shaft and secure with the retaining ring (fig. 2.2.7d). Install the shaft in the pump housing.
5. Install the shaft seal spacer washer and a new shaft seal in the housing. Secure in place with the retaining ring (fig. 2.2.7e).



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11. Install the charge pump assembly on the back plate (fig. 2.2.7j and 2.2.7k).
12. Install the charge pump relief valve in the adaptor plate (fig. 2.2.7l).
13. Install a new O-ring in the groove on the adaptor plate and install the adaptor plate on the back plate. Torque the cap screws to the following valves (fig. 2.2.7m).
T103 . . . 17-20 ft. lbs. (23-27 N.M.)
T133 . . . 27-31 ft. lbs. (36.6-42 N.M.)
14. Install the splined drive coupler in the rear piston pump (fig. 2.2.7n).



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IMPORTANT

When making repairs to the hydrostatic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

2.2.8 Charge Pump Removal:

The hydrostatic charge pump can be inspected and repaired without removing the front hydrostatic pump from the loader.

Discard all seals and replace as new upon reassembly.

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



WARNING

To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.



WARNING

To prevent personal injury never repair or tighten hydraulic hoses or fittings with the engine running or the system under pressure.

2. Raise the seat and remove the hydrostatic shield.

IMPORTANT

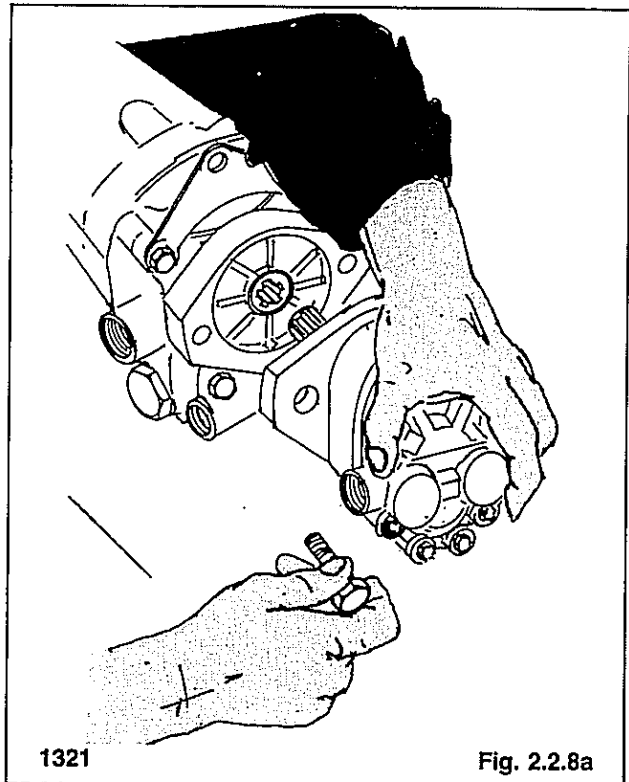
When making repairs to the hydraulic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

3. Disconnect and cap the inlet and outlet lines from the hydraulic gear pump.
4. Remove the two hydraulic gear pump mounting bolts (fig. 2.2.8a).

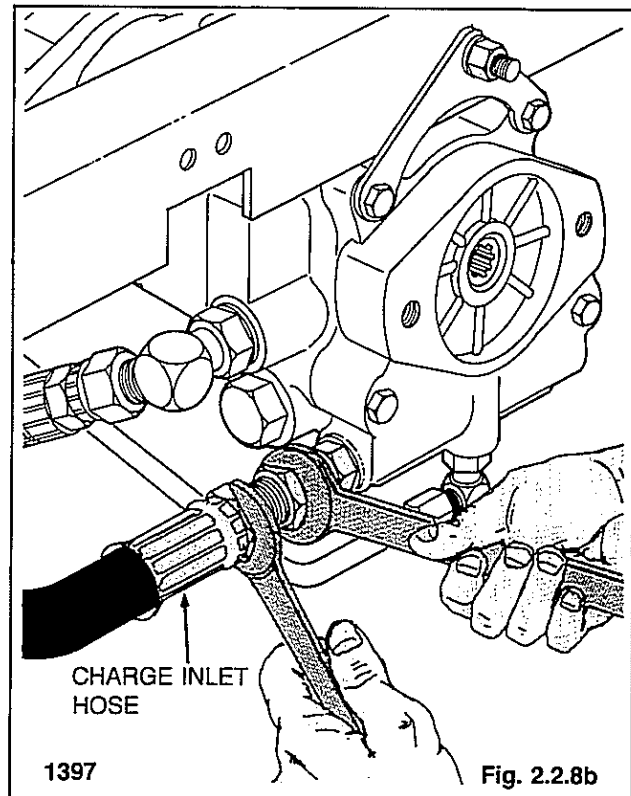
On reassembly torque the two mounting bolts 27-31 ft. lbs. (36.6-42 N.M.).

5. Remove the hydraulic gear pump from the front hydrostatic pump (fig. 2.2.8a).

On reassembly install a new O-ring on the hydraulic gear pump mounting flange.



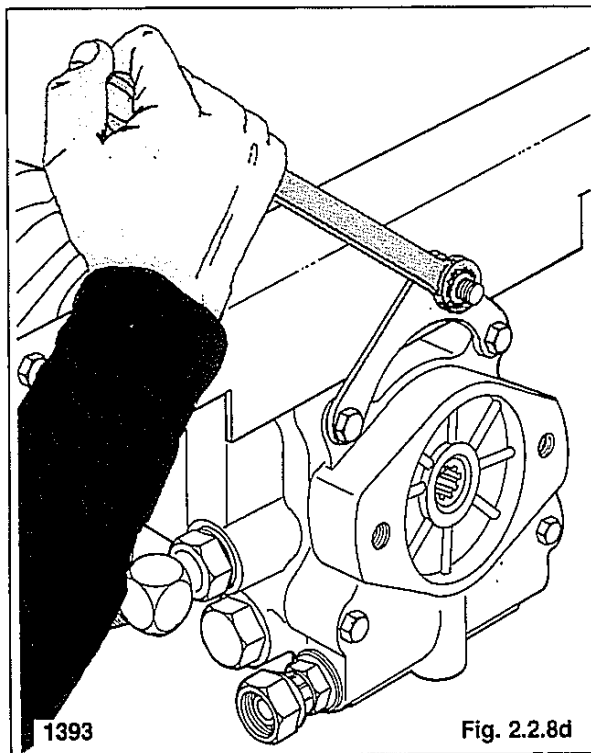
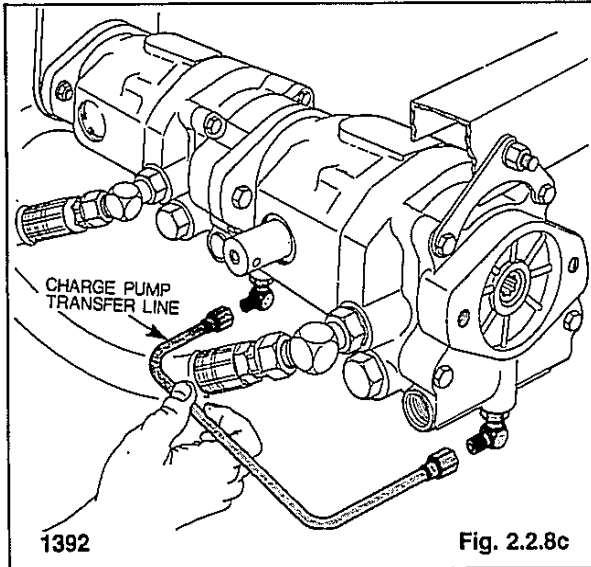
6. Remove the hydraulic hose from the charge pump inlet port (fig. 2.2.8b). Plug the inlet port and cap the hydraulic line.



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7. Remove the charge pump transfer line located between the front and rear hydrostatic pump (fig. 2.2.8c).

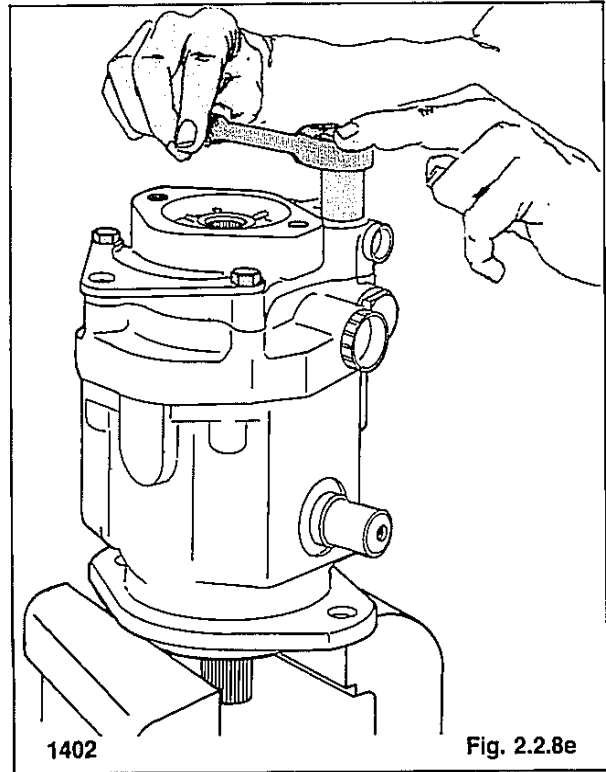
Cap the transfer line and both transfer ports.



8. Remove the bolt from the front pump mounting bracket (fig. 2.2.8d).

9. Remove the four bolts and the pump mounting bracket from the front pump (fig. 2.2.8e).

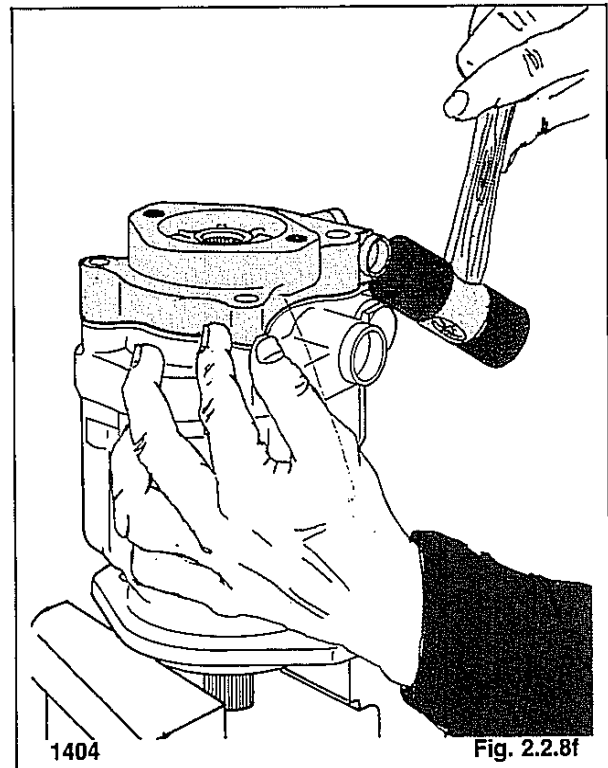
On reassembly torque the four bolts:
T103 . . . 17-20 ft. lbs. (23-27 N.M.)
T133 . . . 27-31 ft. lbs. (36.6-42 N.M.)



10. Use a plastic hammer and tap the adaptor plate to loosen it from the pump back plate (fig. 2.2.8f).

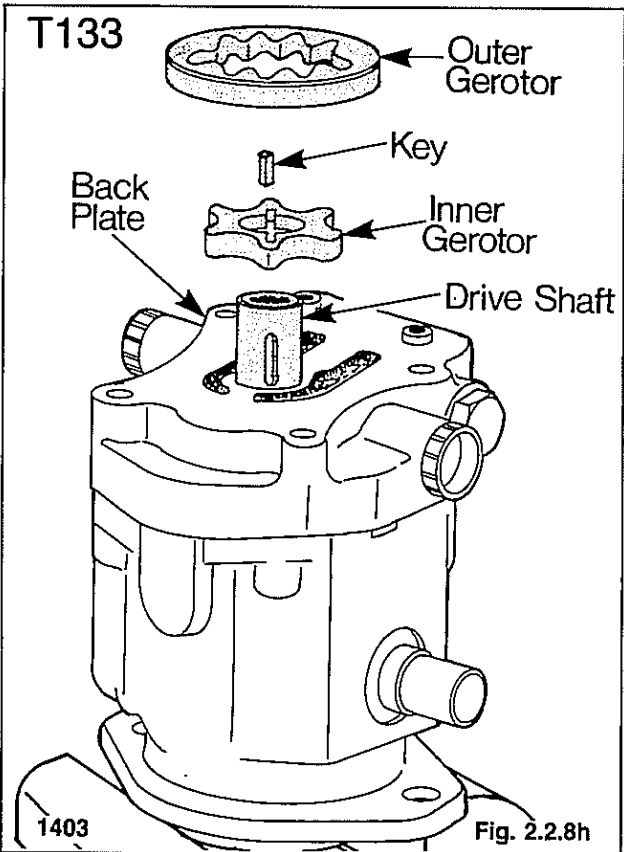
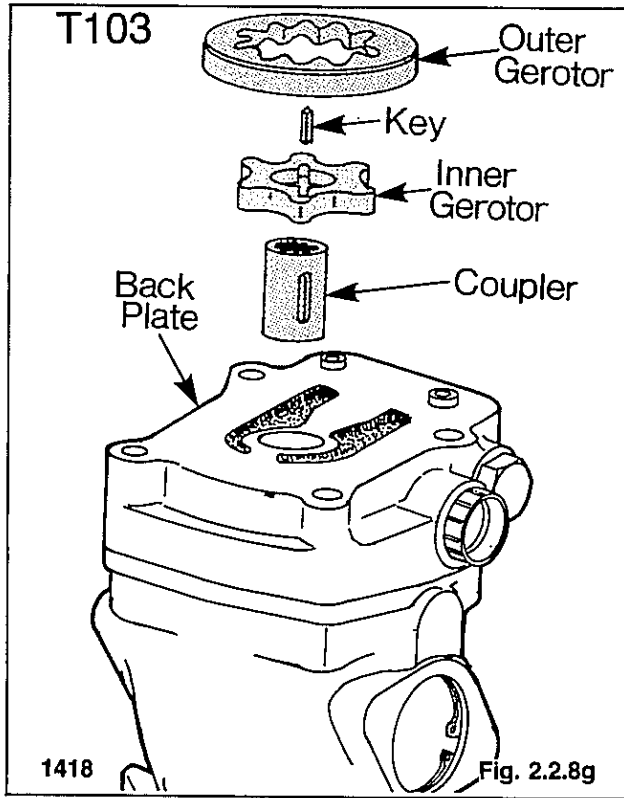
Remove the adaptor plate from the pump assembly.

On reassembly install a new O-ring on the adaptor plate.



2 HYDROSTATIC DRIVE SYSTEM

11. Remove the charge pump assembly from the back plate (fig. 2.2.8g and fig. 2.2.8h).

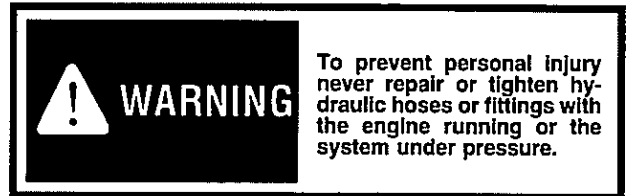
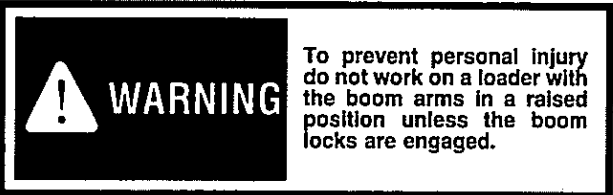


2.2.9 Camplate — Seal Replacement:

The hydrostatic pump camplate seals can be replaced without removing the hydrostatic pump from the loader.

Discard all seals and replace as new upon reassembly.

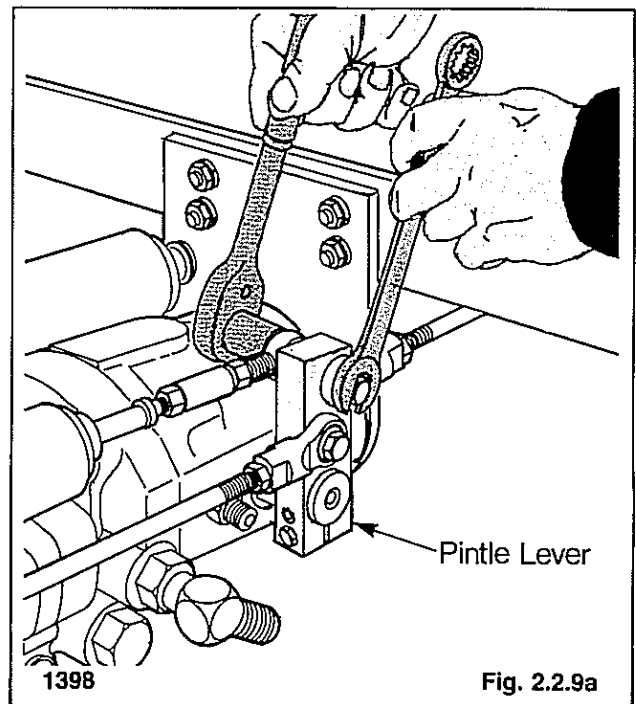
1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



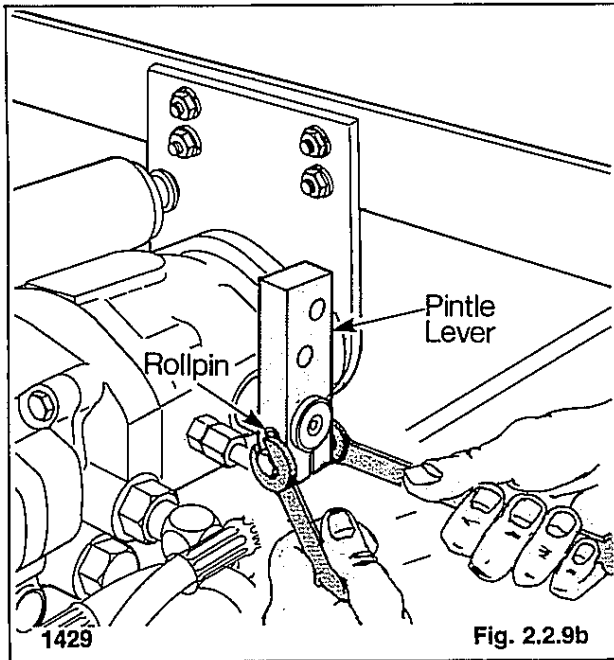
2. Raise the seat and remove the hydrostatic shield.



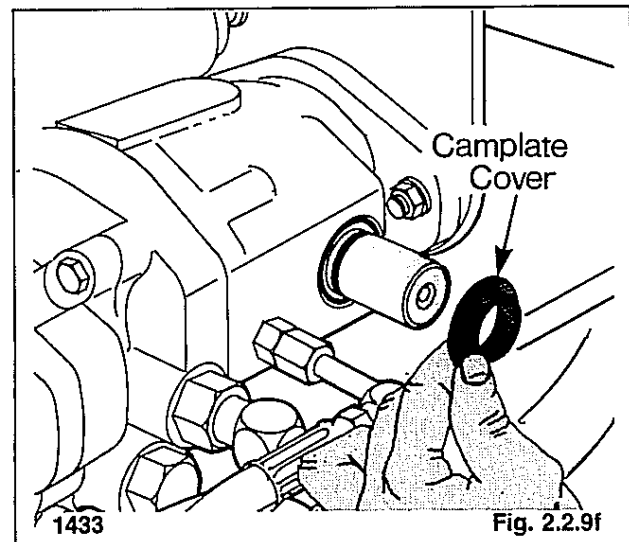
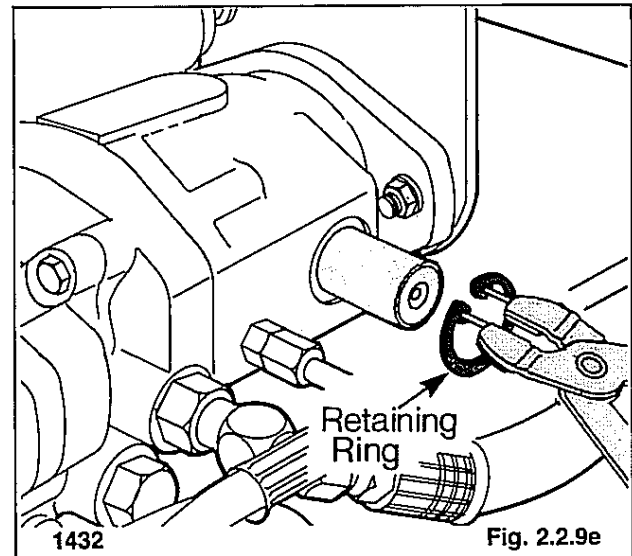
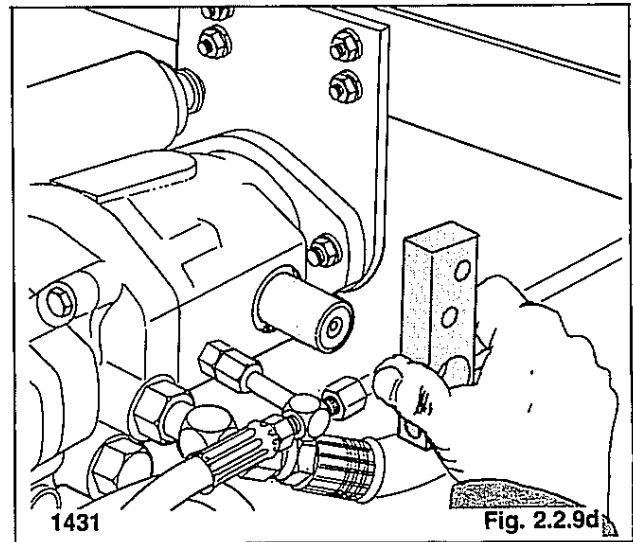
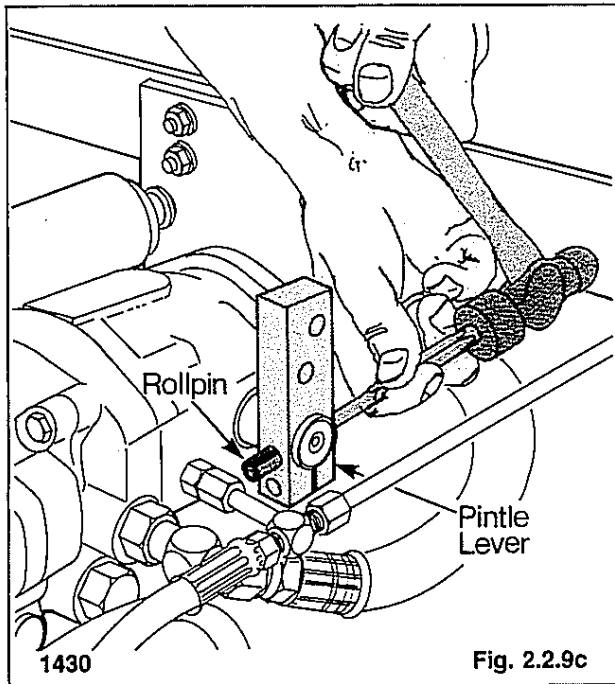
3. Disconnect the steering control linkage and the shock absorber from the pump pintle lever (fig. 2.2.9a).



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4. Remove the clamp bolt from the bottom of the pintle lever (fig. 2.2.9b).
5. Remove the roll pin from the pintle lever (fig. 2.2.9c).
6. Remove the pintle lever from the camplate shaft (fig. 2.2.9d).
7. Remove the retaining ring holding the camplate cover in place (fig. 2.2.9e).
8. Remove the camplate cover (fig. 2.2.9f).



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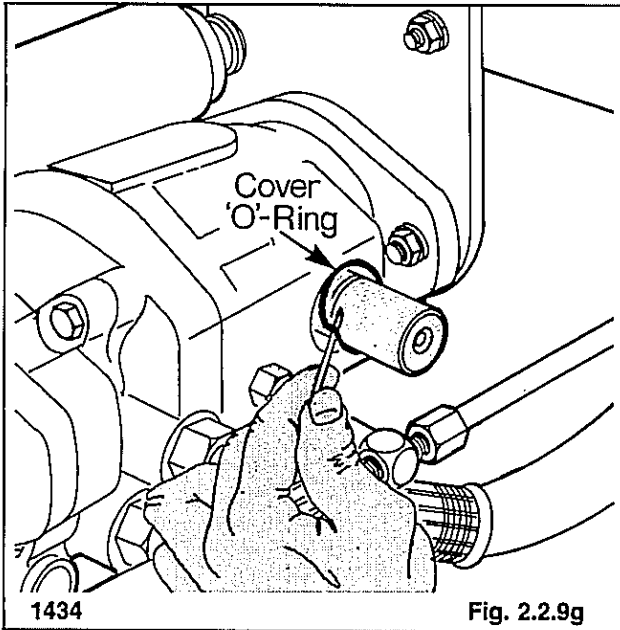


Fig. 2.2.9g

9. Remove the camplate cover O-ring (fig. 2.2.9g).

On reassembly install a new O-ring.

10. Remove the needle bearing from the camplate shaft (fig. 2.2.9h).

The needle bearing is a slip fit into the housing. On reassembly the numbered end of the bearing should face outward.

11. Remove the camplate shaft O-ring (fig. 2.2.9h).

On reassembly install a new O-ring.

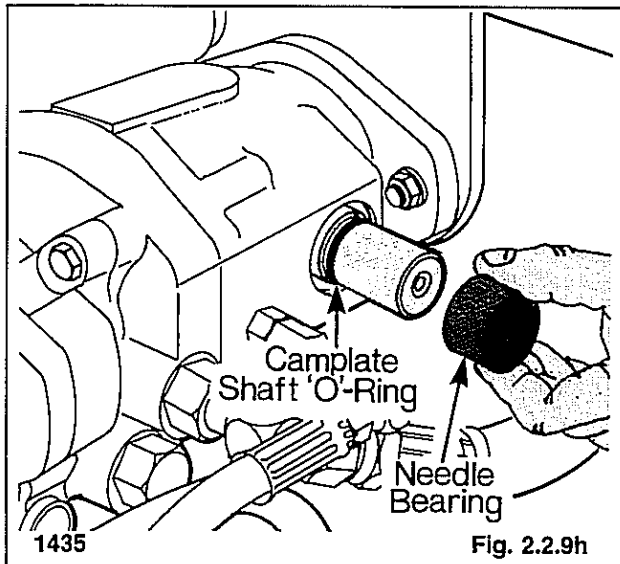


Fig. 2.2.9h

12. Remove the retaining ring and camplate cover from the opposite side of the pump housing (fig. 2.2.9j).

13. Remove the camplate cover O-ring (fig. 2.2.9j).

On reassembly install a new O-ring.

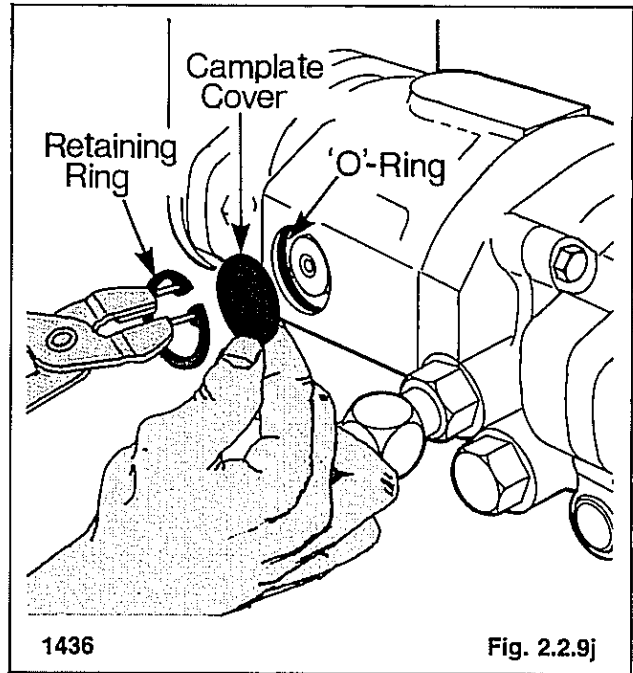


Fig. 2.2.9j

2.2.10 Rear Pump — Shaft Seal Replacement:

1. Disconnect the exhaust pipe and air intake from the engine.
2. Remove the engine mounting bolts and counternuts from the engine (fig. 2.2.10A).

NOTE: On reassembly torque the mounting nut to 40 ft. lbs. (54 N.M.). Torque the counternut against the mounting nut 80 ft. lbs. (108.5 N.M.). Do not overtorque the mounting nut.

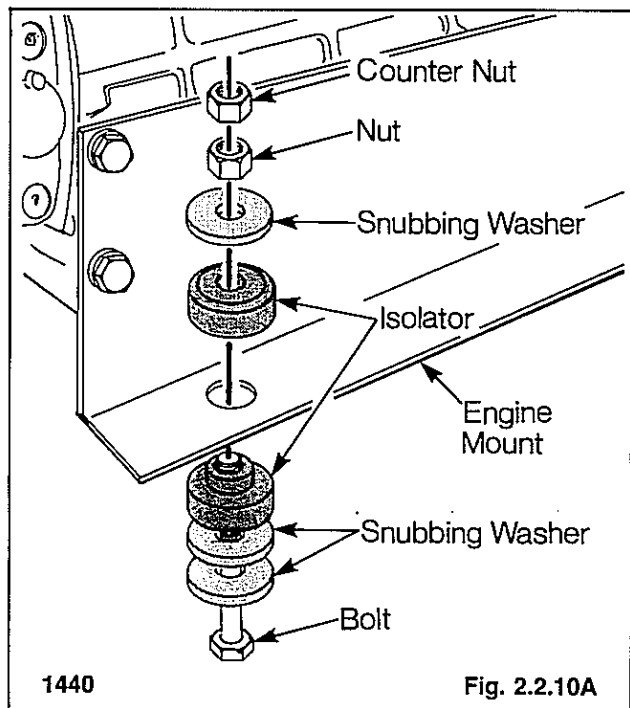
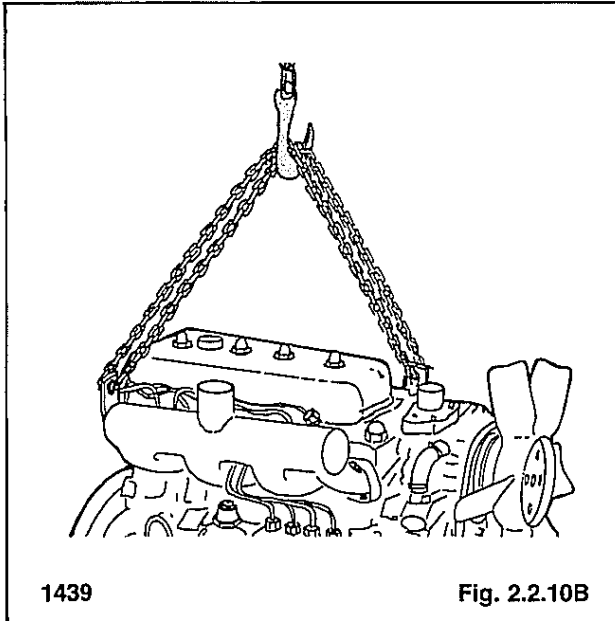
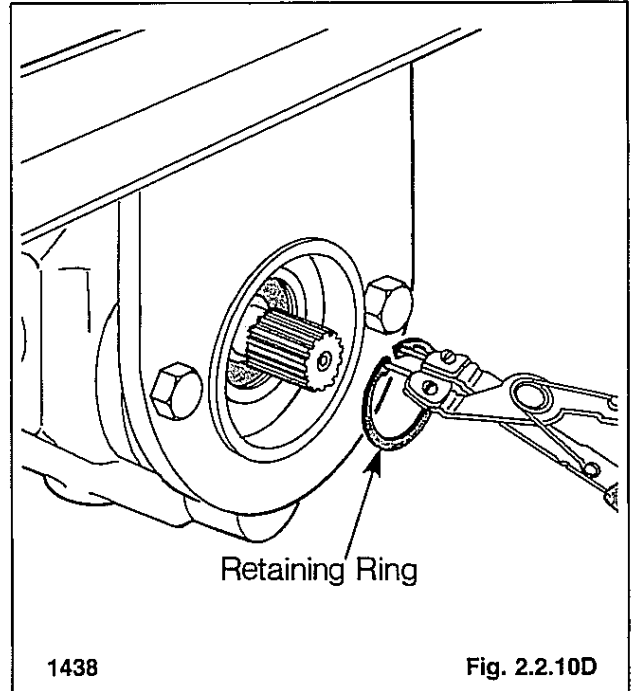
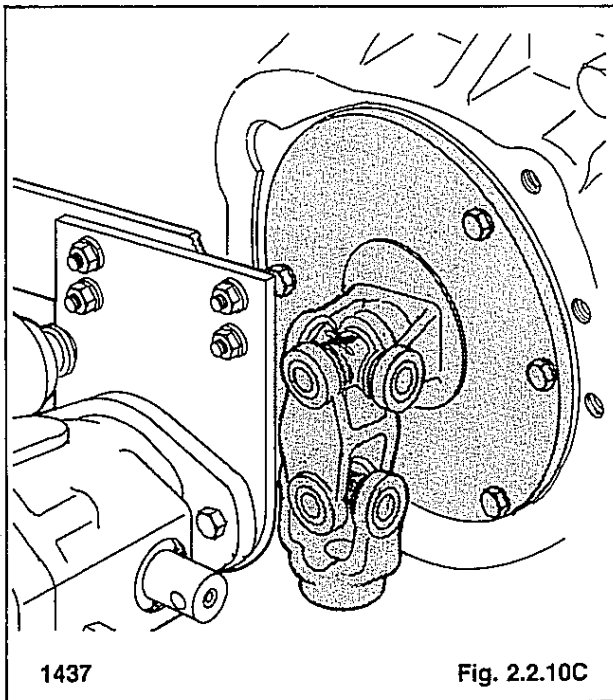


Fig. 2.2.10A

2 HYDROSTATIC DRIVE SYSTEM

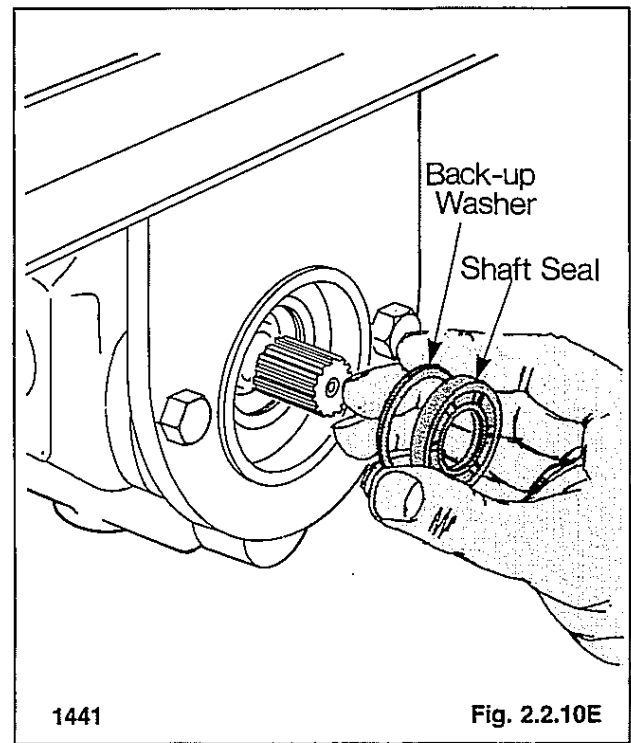


3. Connect chains to the two lifting hooks located on the front and rear of the engine (fig. 2.2.10B).
4. Using a chain hoist lift the engine and move it toward the rear of the loader until the universal joint slides off the end of the rear pump shaft (fig. 2.2.10C).
5. Remove the retaining ring from the hydrostatic pump (fig. 2.2.10D).
6. Remove the pump shaft seal (fig. 2.2.10E).



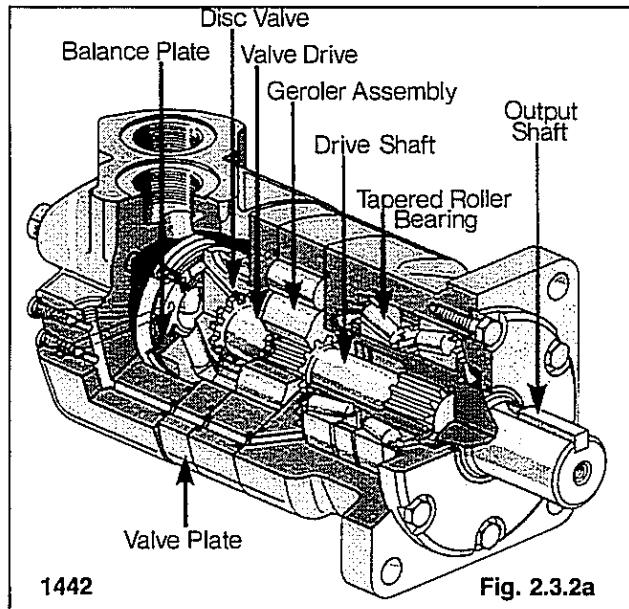
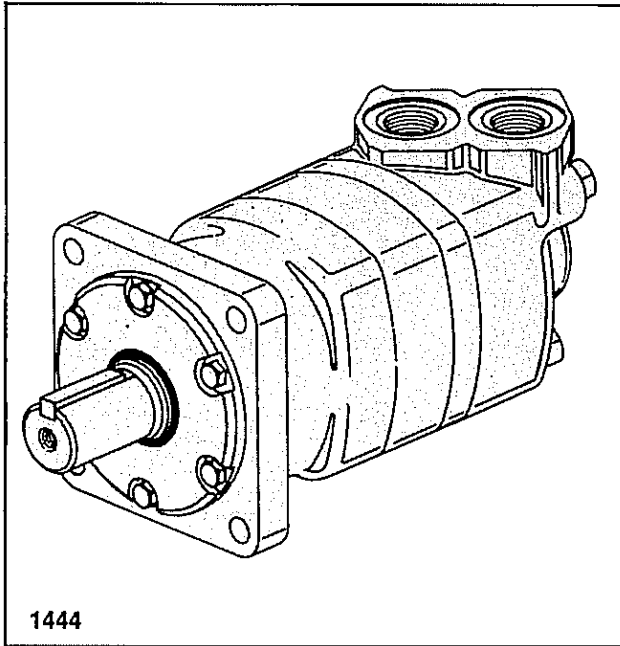
NOTE: The back up washer may come out when the shaft seal is removed. Ensure the washer is reinstalled before installing a new pump shaft seal.

7. Lubricate a new pump shaft seal with system fluid and install it in the pump.



2 HYDROSTATIC DRIVE SYSTEM

2.3 TORQUE MOTOR



2.3.1 Specifications:

	T103	T133
Motor type.....	Geroler	Geroler
Displacement.....	19.9 cu. in. (326 cm ³)	29.9 cu. in. (489.9 cm ³)
Rotation.....	Dual	Dual
Section bolt torque.....	50 ft. lbs. (67.8 N.M.)	62.5 ft. lbs. (84.7 N.M.)
Retainer cover bolt torque.....	21 ft. lbs. (28.5 N.M.)	25 ft. lbs. (33.9 N.M.)
Mounting nut torque (to frame).....	100-110 ft. lbs. (136-149 N.M.)	100-110 ft. lbs. (136-149 N.M.)
Sprocket nut torque.....	350 ft. lbs. (475 N.M.)	350 ft. lbs. (475 N.M.)

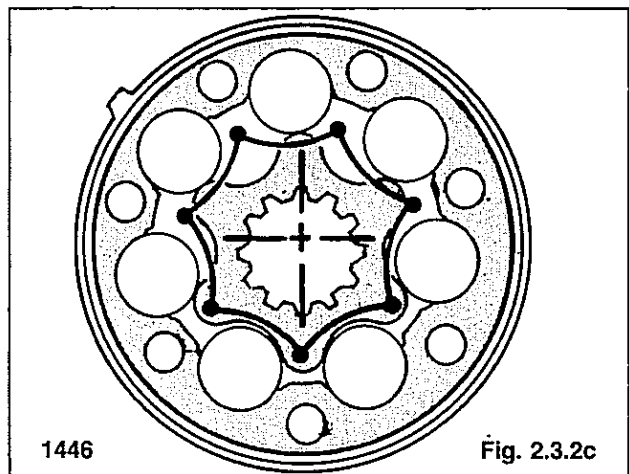
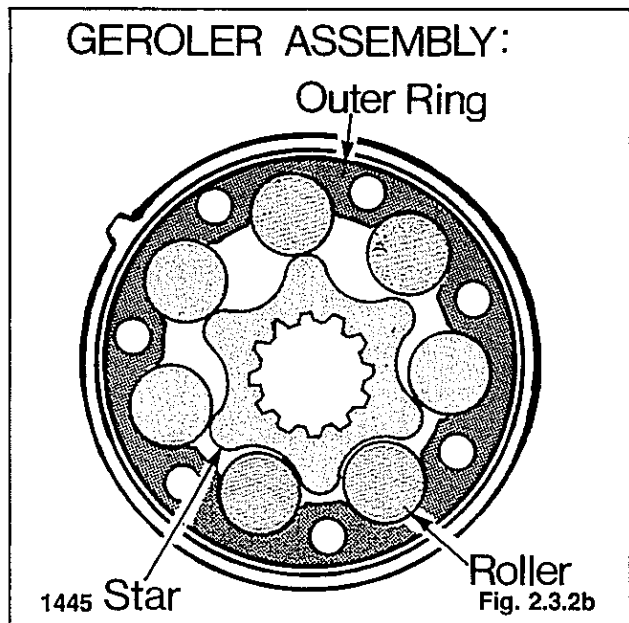
2.3.2 General Information:

The basic geroler design uses a combination of mechanical and hydraulic principles that are utilized in the high torque, low speed motors.

The outer ring (fig. 2.3.2b) of the geroler assembly is similar to an internal gear that is held in a fixed position by securing it to the motor housing. The rotating inner gear, called a star, orbits inside the secured outer ring.

Because of the different number of teeth on the star and outer ring, the star rotates in an eccentric circular orbiting motion from the housing center line (fig. 2.3.2c).

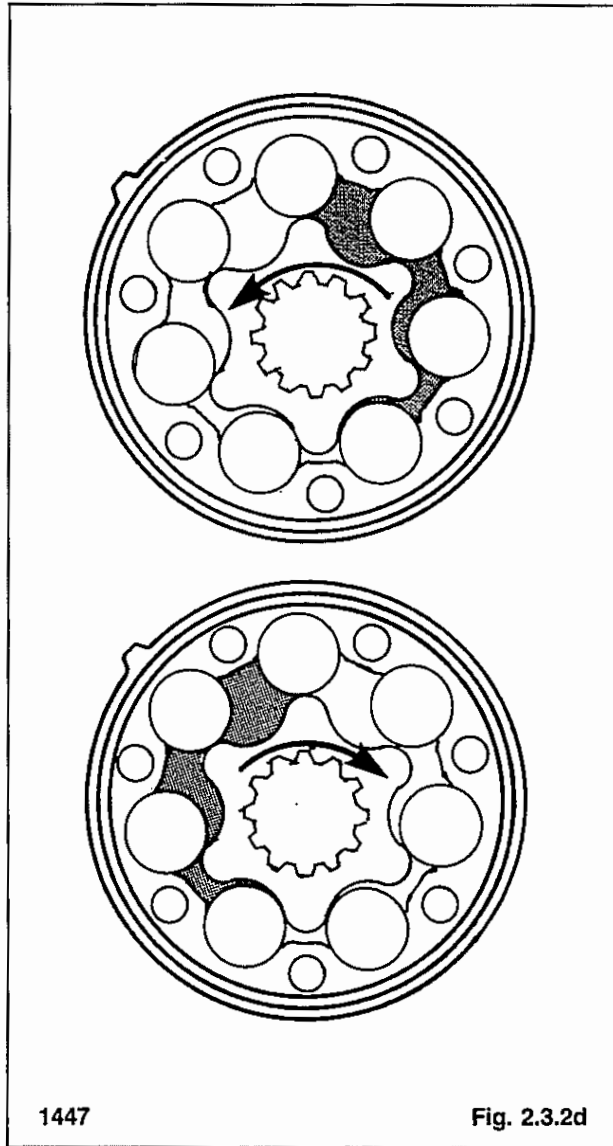
A drive shaft is used to transmit the rotation of the star to the output shaft. The drive shaft has crowned external splines to match the internal splines in the star and output shaft. This type of drive is used because the star center line continuously changes during rotation.



2 HYDROSTATIC DRIVE SYSTEM

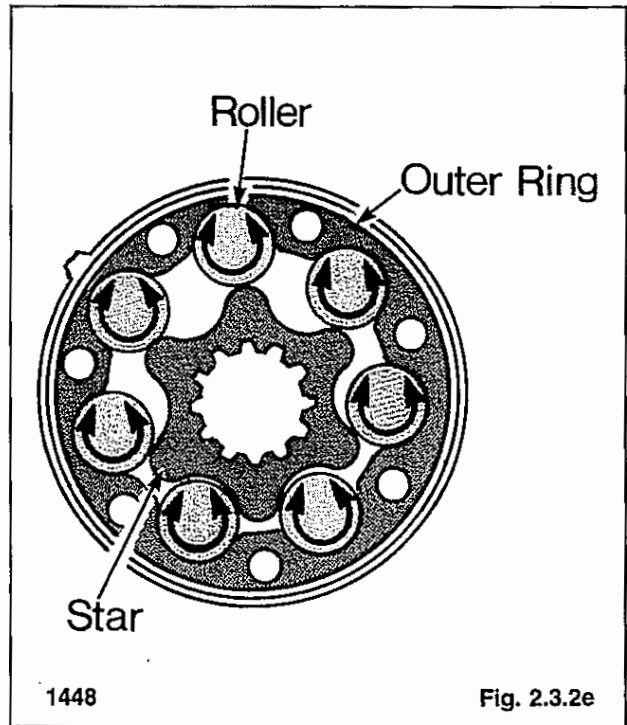
As the star orbits it, it causes a continuous opening and closing of the outer ring fluid pockets. Half of these fluid pockets are subject to fluid pressure, causing star rotation, and the opposing half are connected to a return line.

When pressure is introduced into the fluid pockets on the right side of the star (fig. 2.3.2d) the output rotation will be counterclockwise. When the fluid pockets on the left side of the star are pressurized the output rotation will be clockwise.

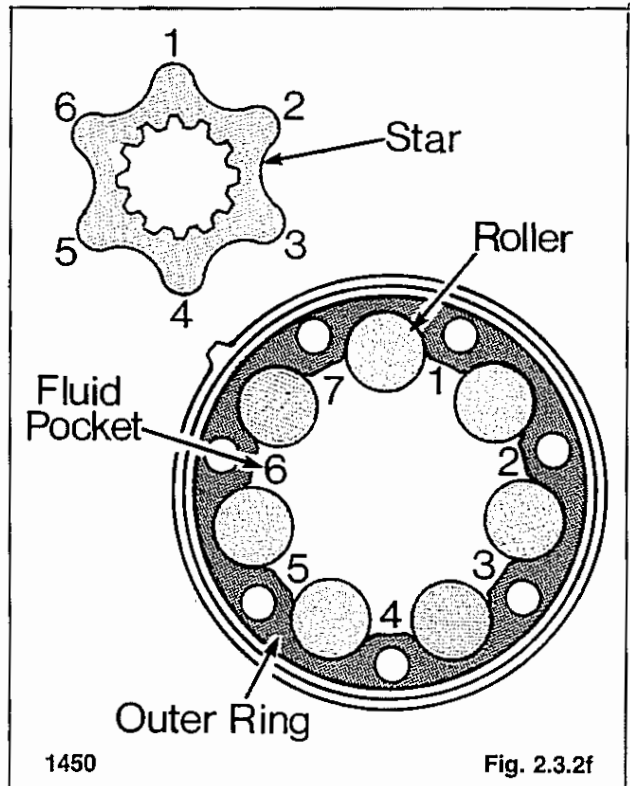


To seal the fluid pockets the torque motor incorporates a rotating roller type seal (fig. 2.3.2e). This type of a rolling seal reduces friction at the star points providing increased efficiency and reduced component wear.

The geroler (fig. 2.3.2f), is both a fluid displacement motor and a gear reducer. It provides six times (the number of star points) greater power per revolution than a gear, vane or

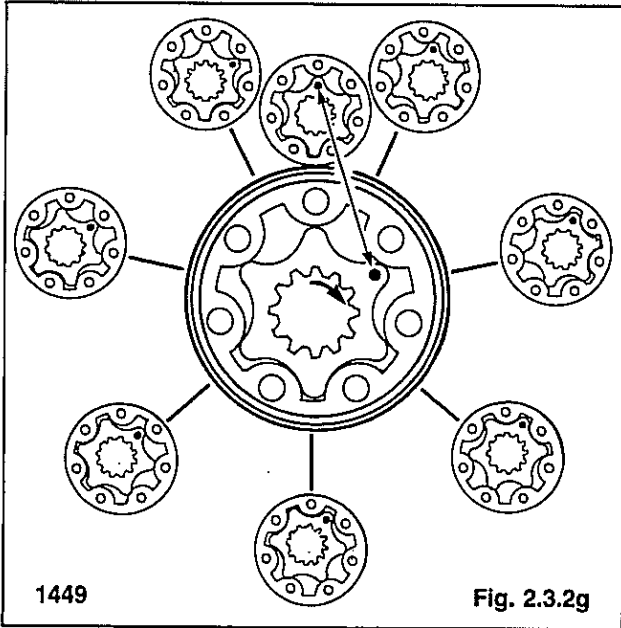


piston type motor. This means that six times greater torque can be developed at one-sixth the speed without further gear reduction.

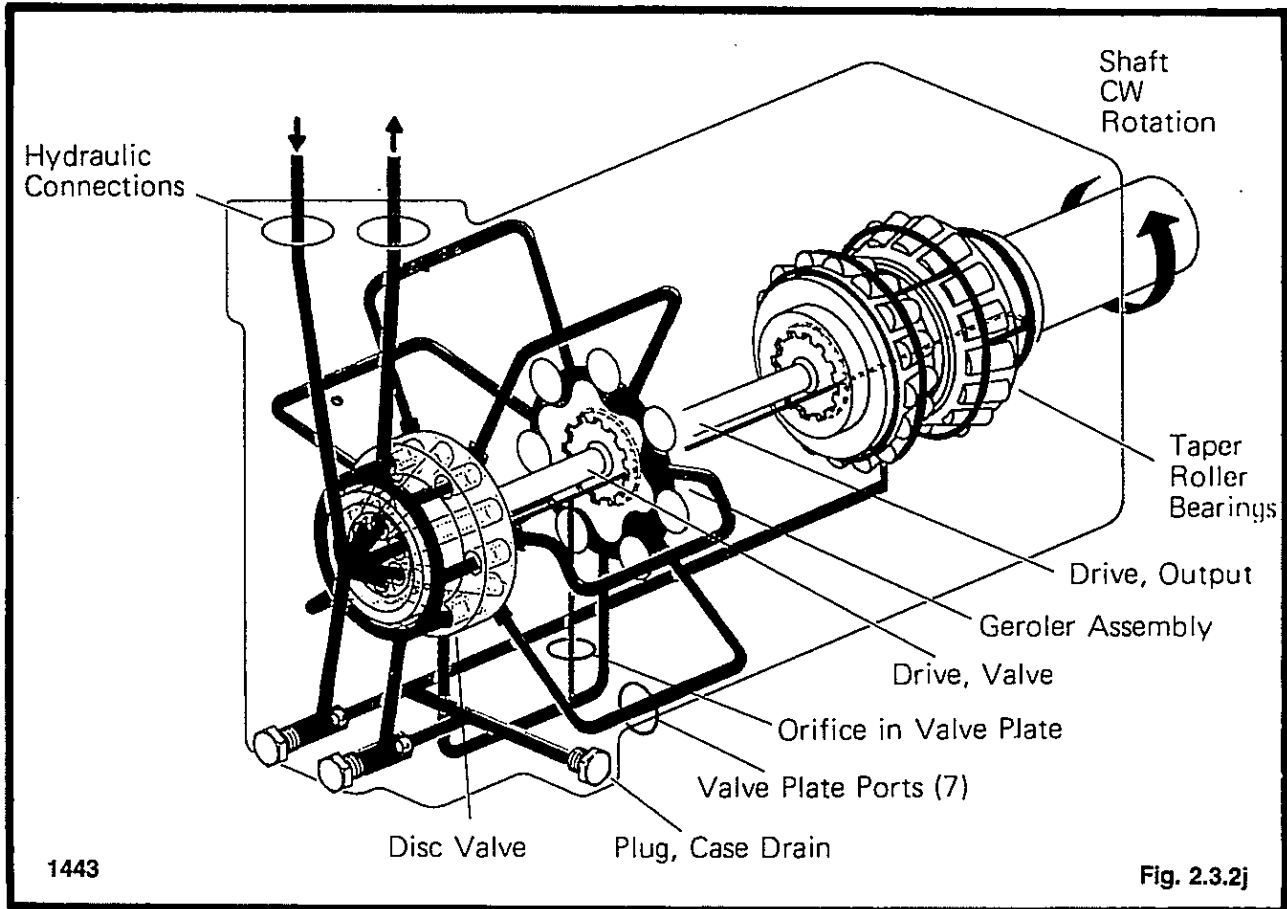
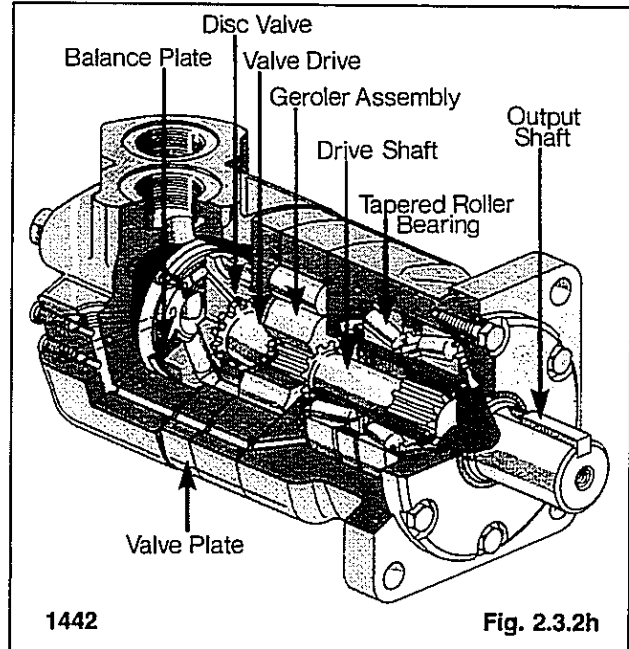


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Shown in figure 2.3.2g is one complete star orbit, or one-sixth of the output shaft rotation. The star must travel through six complete orbits for each single rotation of the output shaft creating a speed reduction of six to one. The use of seven fluid power pockets with the six to one ratio provides forty-two fluid power cycles per each complete shaft rotation.



For smooth and continuous motor output rotation, the torque motor utilizes a disc valve which operates in synchronization with the geroler star. The disc valve arrangement consists of a stationary balance plate, rotating disc valve and a stationary valve plate (fig. 2.3.2h).



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The disc valve contains an inlet fluid passage port for each star valley area and a return fluid passage port. A separate crowned drive shaft is used to synchronize the disc valve and geroler star so that they turn as one.

To accept fluid from the disc valve, the valve plate also contains internal porting passages to each outer ring pocket area.

Figure 2.3.2j illustrates the fluid flow through the torque motor for clockwise rotation.

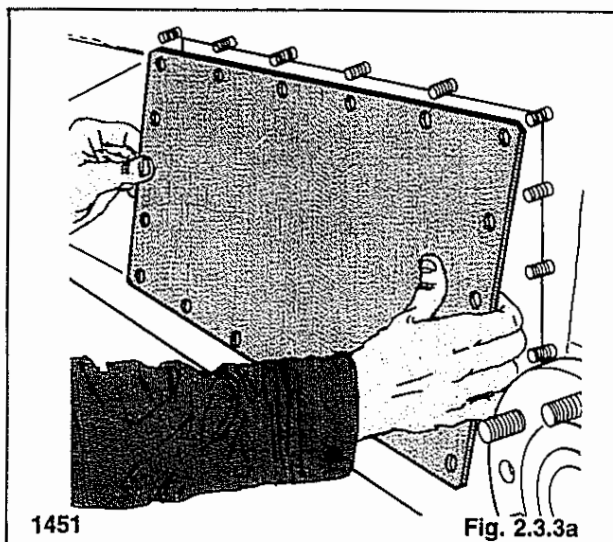
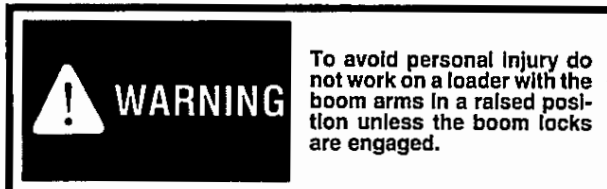
Fluid enters the housing through the inlet port and is directed to the balance plate. The balance plate contains an inner and outer seal to separate the high and low pressure fluid passages. Fluid passes through the stationary balance plate to the rotating disc valve. The rotating disc valve ports the fluid to the stationary valve plate and proper side of the geroler pockets causing the rotor star to turn.

As the rotor star rotates, and each fluid pocket reaches its full open position, the return porting in the rotating disc valve opens to allow the fluid in the pocket area to pass back through the valve plate, disc valve, balance plate and out through the housing return port, as the pocket closes.

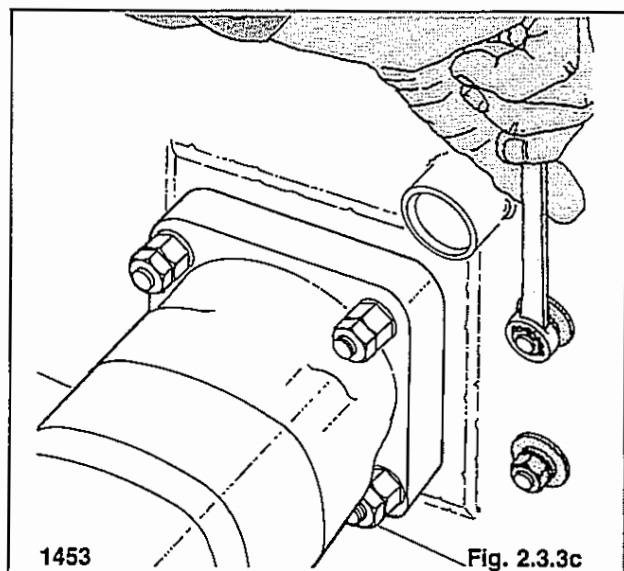
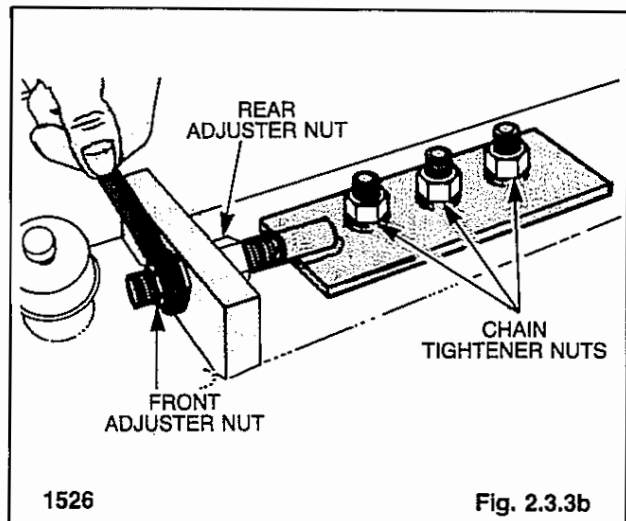
The disc valve is timed to the geroler rotor star to govern the inlet fluid flow to output shaft rotation. If the timing of the disc valve to geroler star is off one tooth, the relationship of input fluid flow to output motor shaft rotation will be reversed.

2.3.3 Torque Motor Removal:

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



2. Block the loader securely with all four wheels clear of the ground.
3. Remove the wheels on the side of the machine that the torque motor is to be removed from.
4. Drain the hydraulic reservoir. (Refer to section 1.7.3 for procedure).
5. Drain the lubricating oil from the final drive housing. (Refer to section 3.2.2 for procedure).
6. Remove the final drive inspection plate cover (fig. 2.3.3a) located between the axles on the final drive housing.
7. Loosen the three chain tightener nuts (fig. 2.3.3b). Back off the front and rear adjuster nuts. Move the chain tightener plate back to loosen the chain.
8. Remove two nuts located inside the loader next to the torque motor which secure the parking brake bracket (fig. 2.3.3c).



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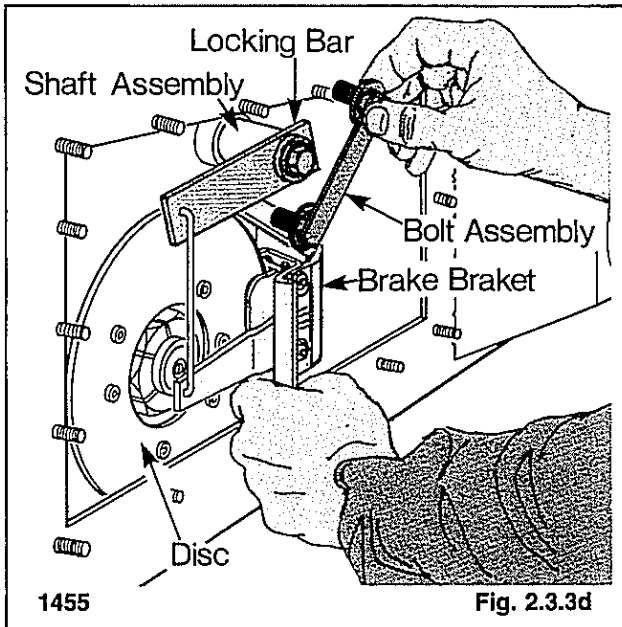


Fig. 2.3.3d

9. Remove the bolt assembly from the parking brake bracket (fig. 2.3.3d). Remove the bolt which secures the locking bar to the brake shaft. Remove the brake bracket and locking bar assembly from the loader.
10. Remove the brake disc from the torque motor sprocket (fig. 2.3.3e).

On reassembly apply Loctite RC609 to the brake disc screws.

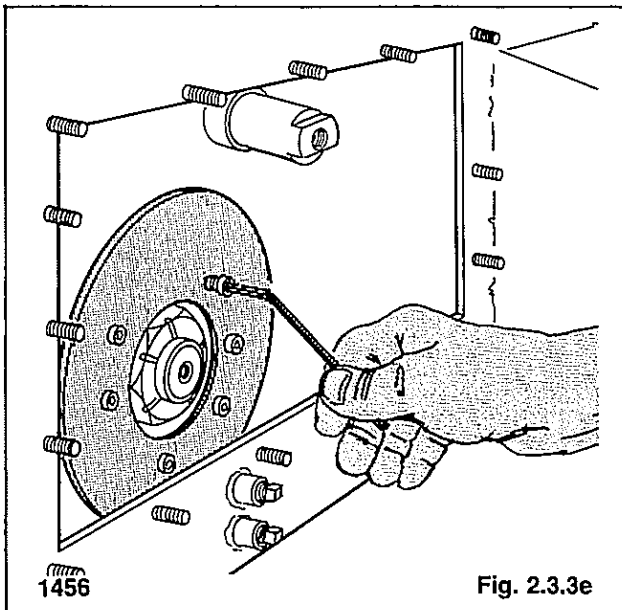


Fig. 2.3.3e

11. Place a bolt through the axle and screw it into the welded nut located on the final drive housing to prevent the torque motor shaft turning as the sprocket nut is loosened.

Remove the torque motor sprocket nut (fig. 2.3.3f).

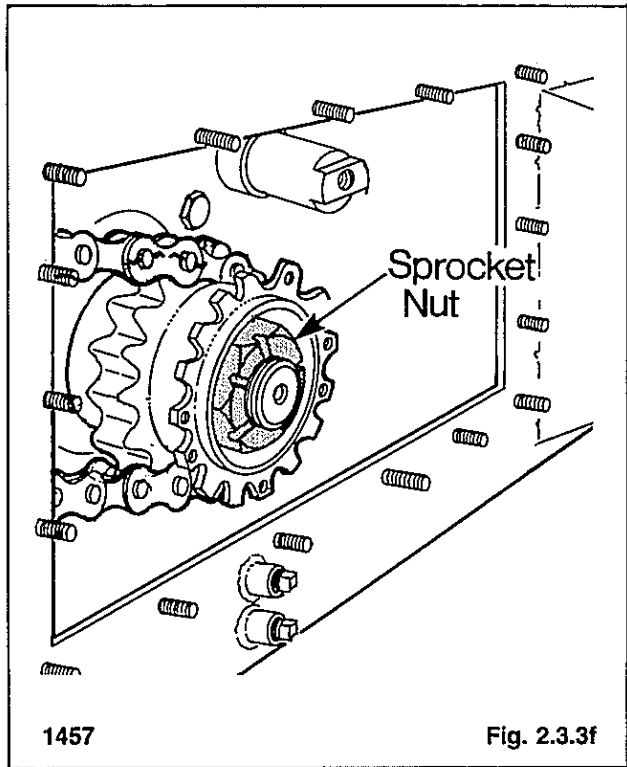


Fig. 2.3.3f

The sprocket and nut are only required to be removed on the T103. The T133 torque motor can be removed with the sprocket and nut in place.

On reassembly torque the nut to 350 ft. lbs. (474.5 N.M.).

12. Straighten and remove the chain connection link cotter pin (fig. 2.3.3g, 2.3.3h) and remove the connection link.

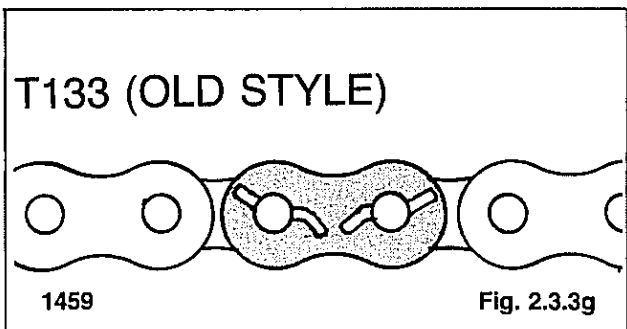


Fig. 2.3.3g

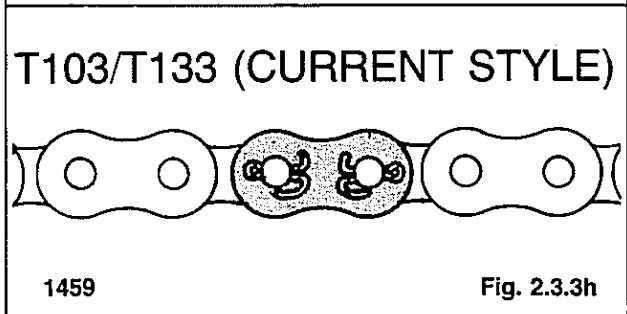
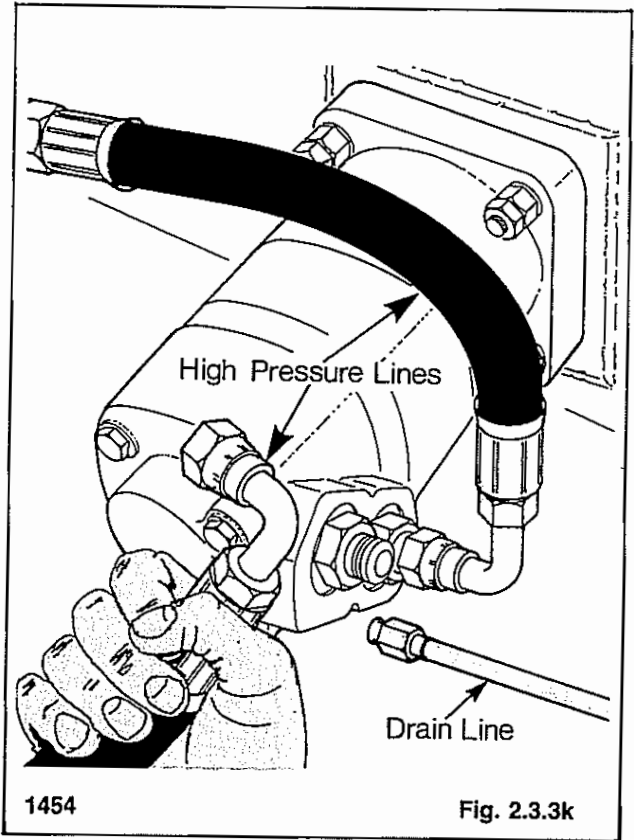
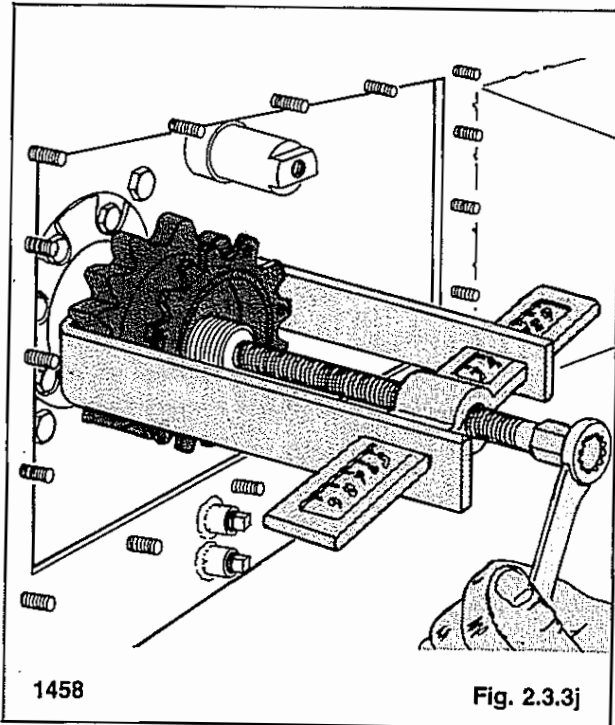


Fig. 2.3.3h

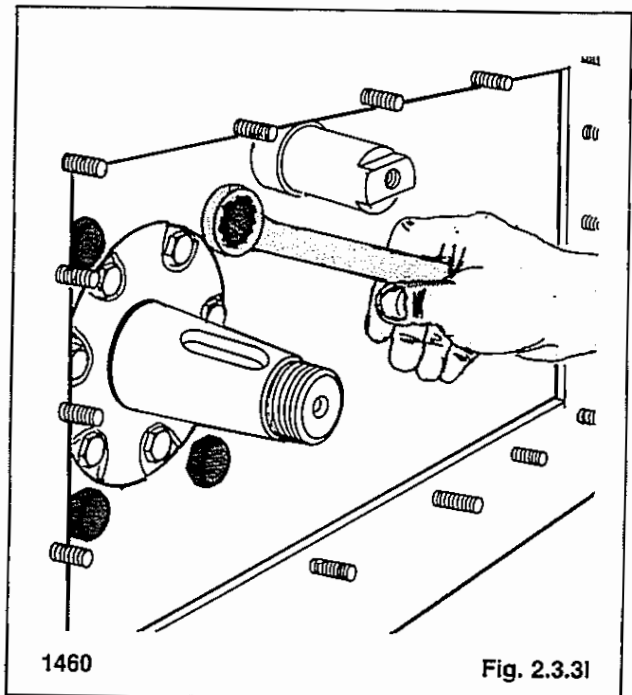
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NOTE: On reassembly the cotter pin side of the connection link faces the inspection opening of the final drive housing.

13. Remove the drive chain from the final drive housing.
On reassembly install a new connection link and cotter pins.
14. Using a proper gear puller, remove the sprocket and key from the torque motor shaft (fig. 2.3.3) on the T103. The T133 torque motor can be removed with the sprocket attached.



17. Hold the torque motor mounting bolts from turning when the mounting nuts are loosened (fig. 2.3.3l).



15. Disconnect and remove the two high pressure pipes between the pump and motor (fig. 2.3.3k).

If rubber high pressure lines are installed in the loader only the torque motor end needs to be disconnected.

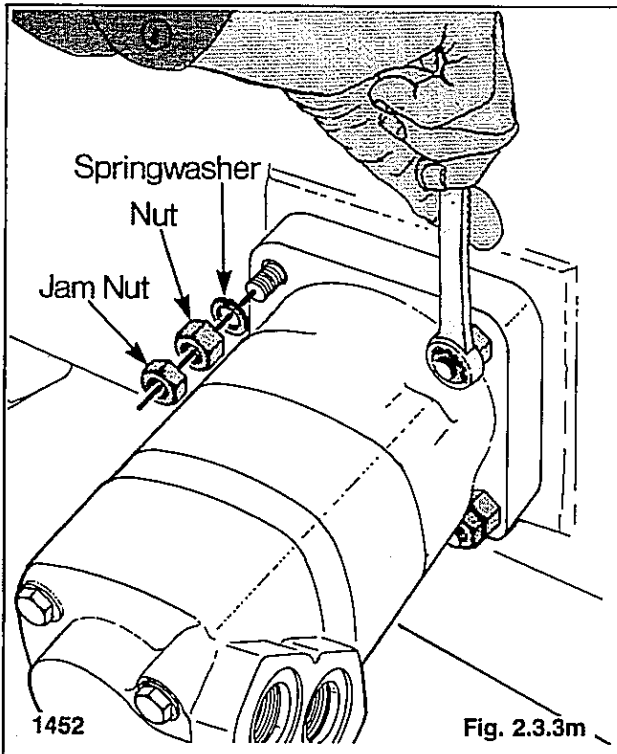
Cap the lines and plug the pump and torque motor port openings.

16. Disconnect and remove the drain line from the torque motor (fig. 2.3.3k). Cap the line and plug the motor drain port.

IMPORTANT

When making repairs to the hydrostatic system, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

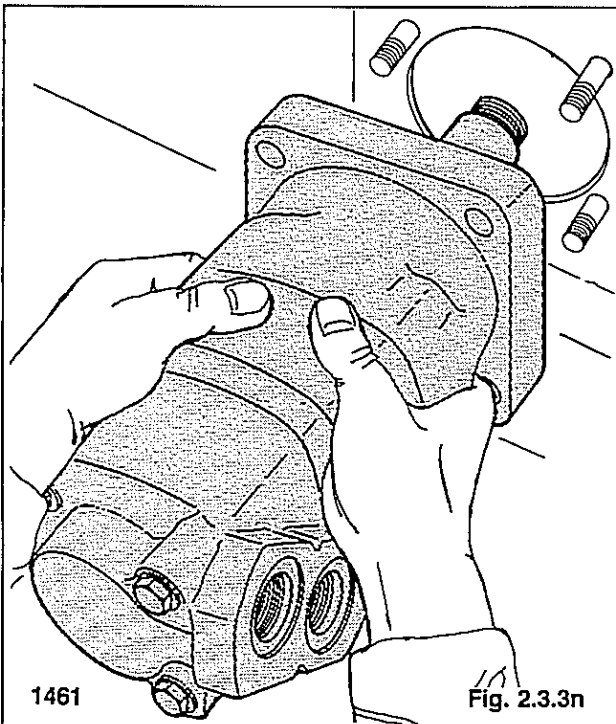
2 HYDROSTATIC DRIVE SYSTEM



18. Remove the jam nuts, mounting nuts and lockwashers from the torque motor (fig. 2.3.3m).

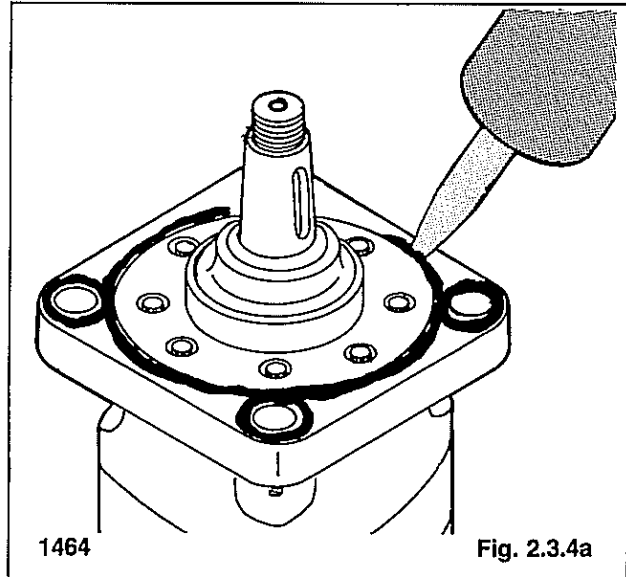
On reassembly torque the mounting nuts 85-90 ft. lbs. (115-122 N.M.). Torque the jam nuts against the mounting nuts 40-60 ft. lbs. (54-81 N.M.).

19. Remove the torque motor from the final drive housing (fig. 2.3.3n).



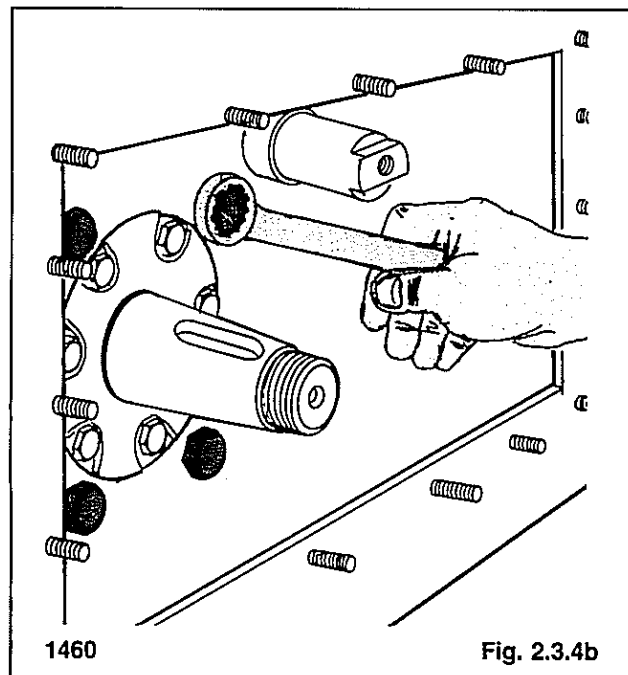
2.3.4 Torque Motor Replacement:

1. Apply silicon sealant around the torque motor flange (fig. 2.3.4a) to prevent oil leakage from the final drive housing.

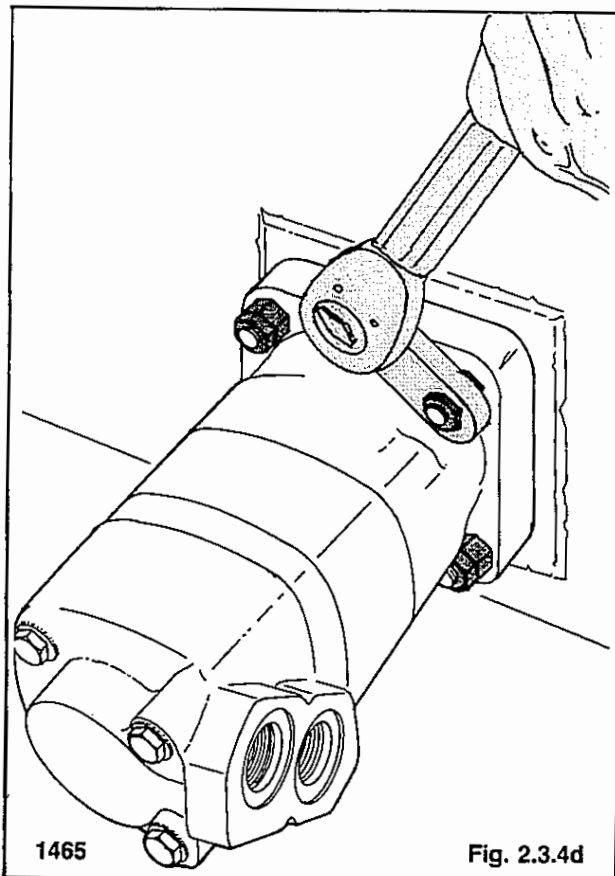
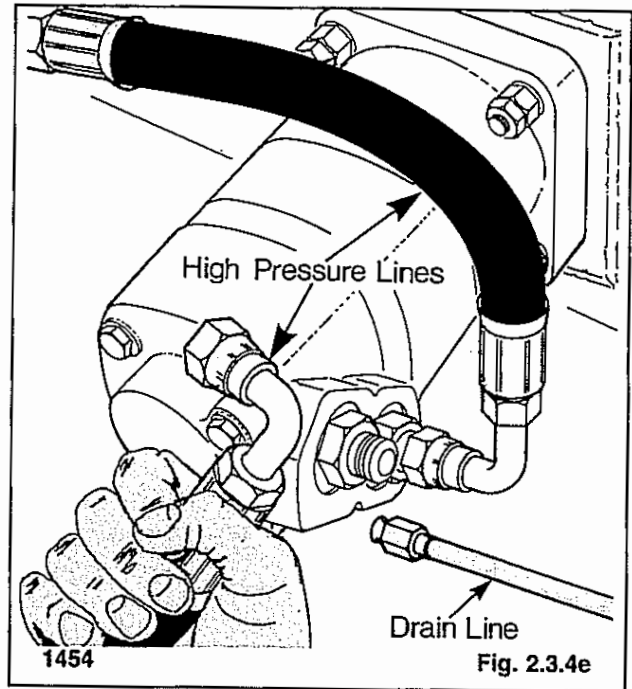
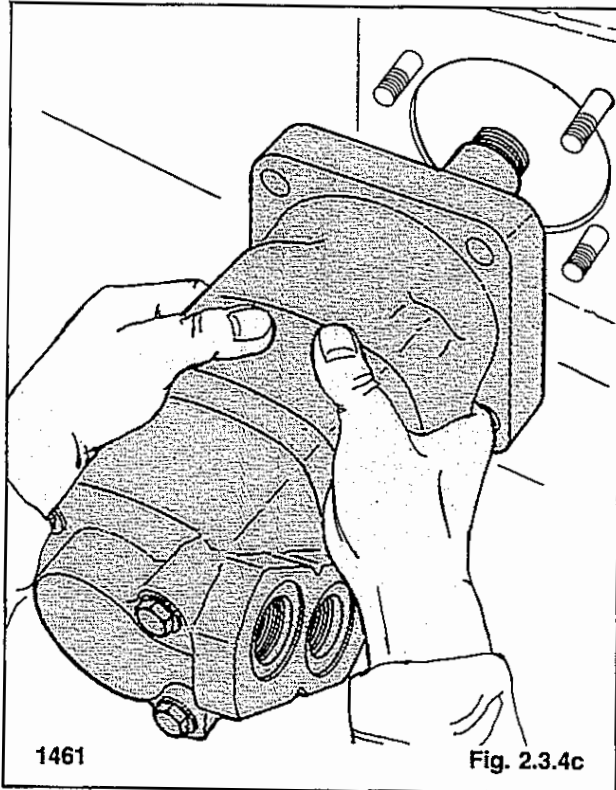


2. Install the torque motor mounting bolts from inside the final drive housing (fig. 2.3.4b).

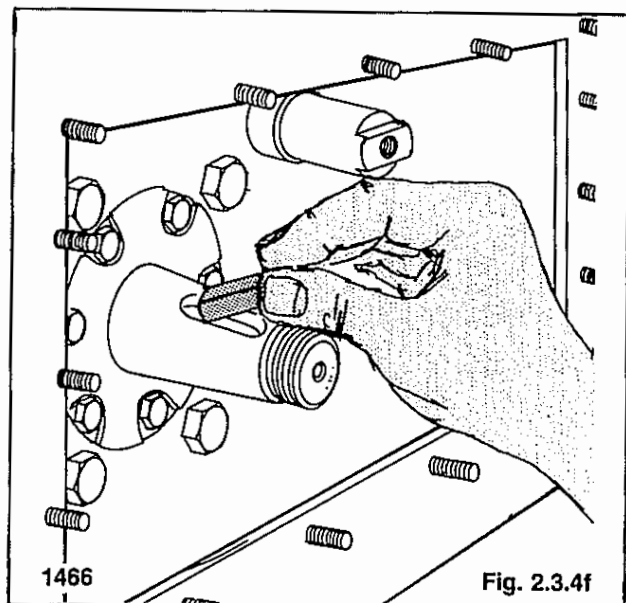
Hold the bolts in place with a wrench while the torque motor mounting nuts are being tightened.



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3. Install the torque motor in the final drive housing (fig. 2.3.4c).
4. Install the lockwashers, mounting nuts and jam nuts which secure the motor to the housing (fig. 2.3.4d).
Torque the mounting nuts 85-90 ft. lbs. (115-122 N.M.).
Torque the jam nuts 40-60 ft. lbs. (54-81 N.M.).
5. Install the torque motor drain line (fig. 2.3.4e).
Install the two high pressure lines between the hydrostatic pump and torque motor (fig. 2.3.4e).
6. Install the key on the torque motor shaft (fig. 2.3.4f).

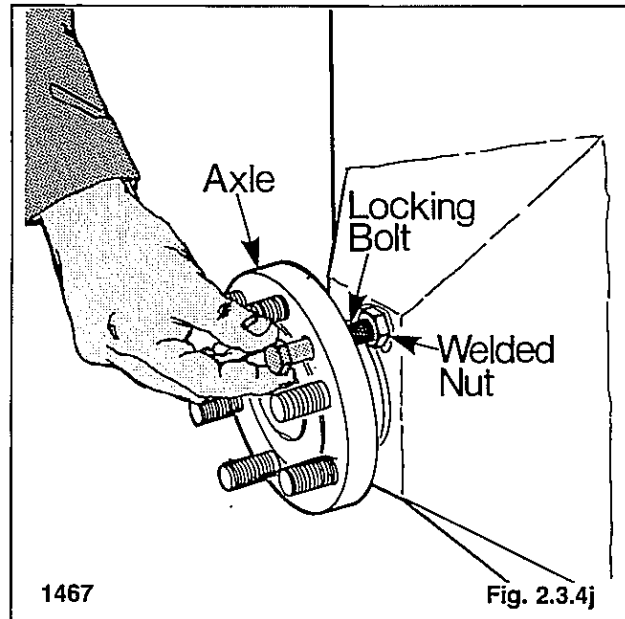
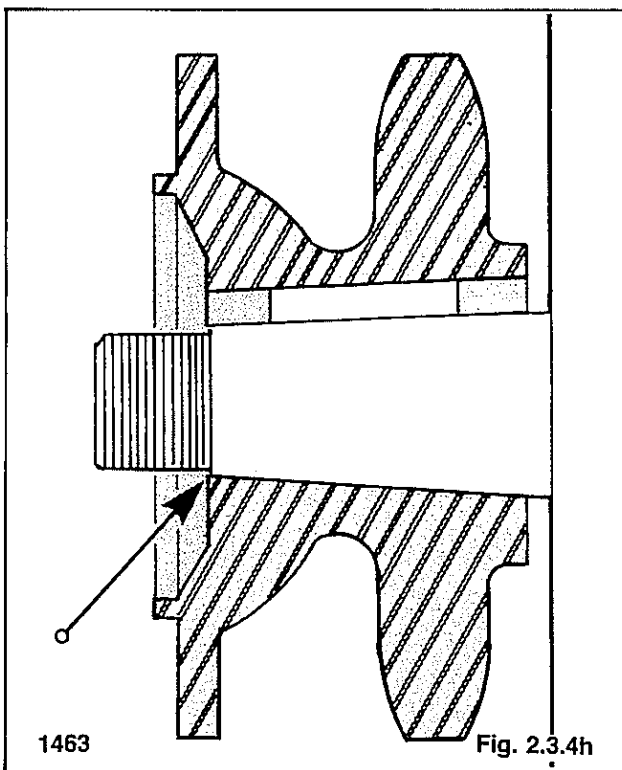
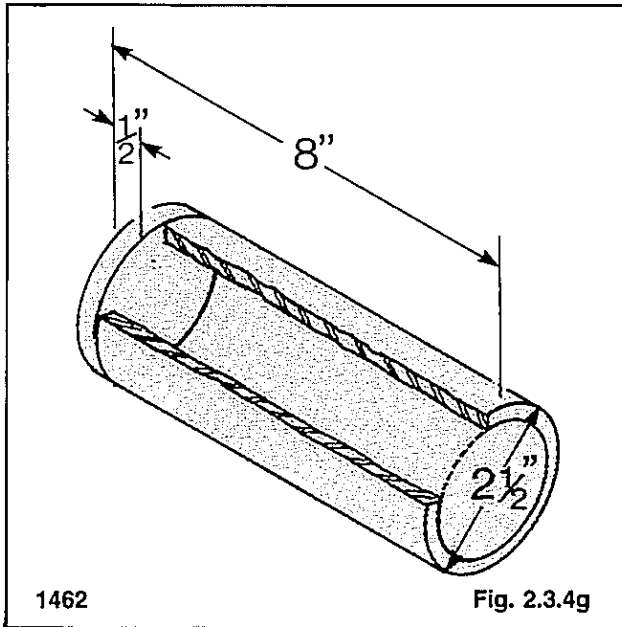


2 HYDROSTATIC DRIVE SYSTEM

7. T103 — Using a sprocket driver (fig. 2.3.4g) install the sprocket on the torque motor shaft until the end of the threaded portion of the shaft is almost flush with the inside face of the sprocket (fig. 2.3.4h).

T133 — Line up the sprocket with the key and install the sprocket on the shaft.

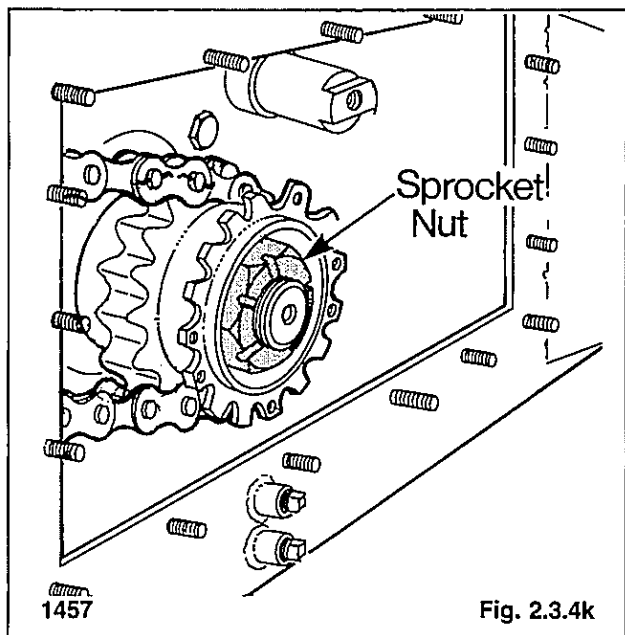
8. Install the drive chain in the final drive housing. (Refer to section 3.3.3 for the correct procedure.) Use new connection links and cotter pins.



9. Install a bolt through axle to prevent the torque motor shaft turning as the sprocket nut is tightened (fig. 2.3.4j).
10. Install the axle sprocket nut and torque to 350 ft. lbs. (474.5 N.M.) (fig. 2.3.4k).
11. Install the brake disc on the torque motor sprocket. Apply Loctite RC609 to the allen screws on assembly (fig. 2.3.4l).
12. Install the brake bracket and locking bar assembly.

Secure the brake bracket in place with the bolt assembly (fig. 2.3.4m).

Install the bolt, lockwasher and plainwasher on the locking bar and secure it to the shaft assembly (fig. 2.3.4n).



2 HYDROSTATIC DRIVE SYSTEM

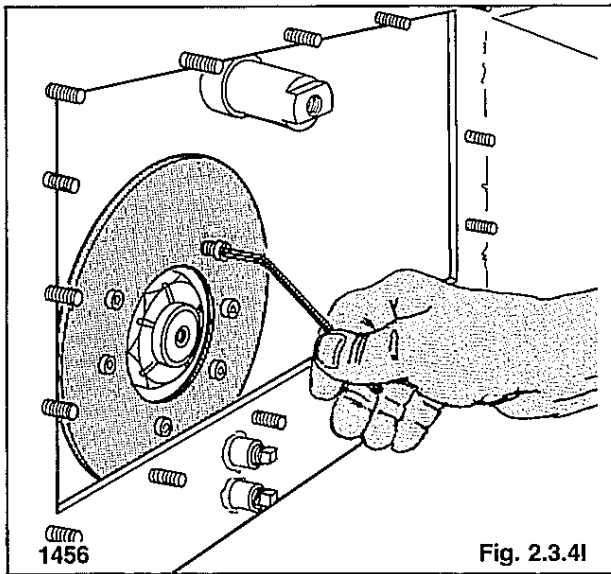


Fig. 2.3.4l

IMPORTANT

To obtain correct brake performance it may be necessary to readjust the brake caliper assembly after removal or replacement of parts. Refer to section 4.5 for procedure.

IMPORTANT

To prevent damage after removal or repair of hydraulic components refer to start up procedure sect. 1.2.6.

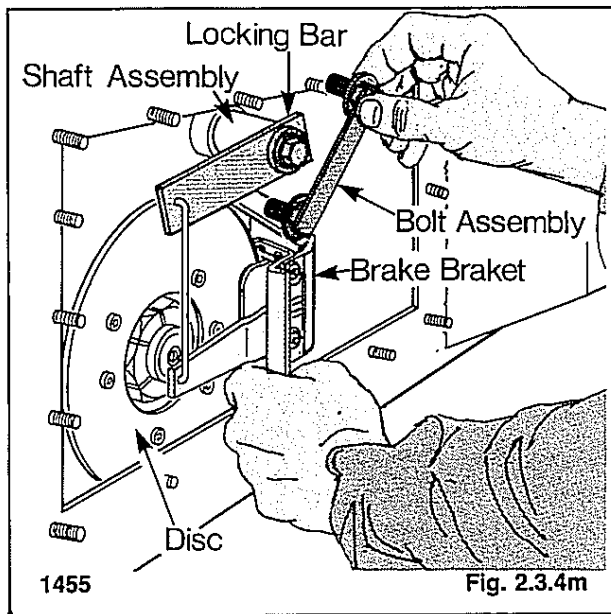


Fig. 2.3.4m

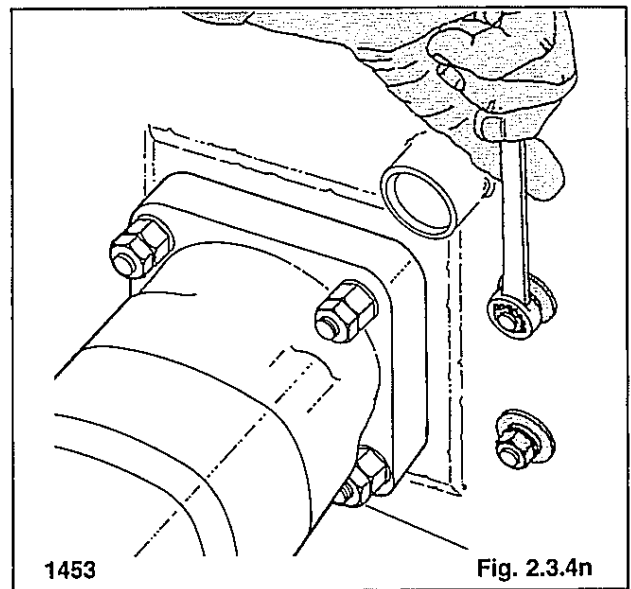


Fig. 2.3.4n

13. Install the plainwashers, lockwashers and nuts on the bolt assembly where it protrudes on the inside of the loader (fig. 2.3.4n).
14. Adjust the chain tension as shown in section 3.3.1.
15. Install the final drive housing drain plug and fill the housing with 10W30 API classification SE/CD oil to the correct level. Refer to section 3.2.
16. Apply silicon to the inspection cover and install the cover (fig. 2.3.4r).
17. Install the wheels. Torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).
18. Refill the oil reservoir to the correct level with 10W30 API classification, SE/CD oil. Refer to section 1.7.

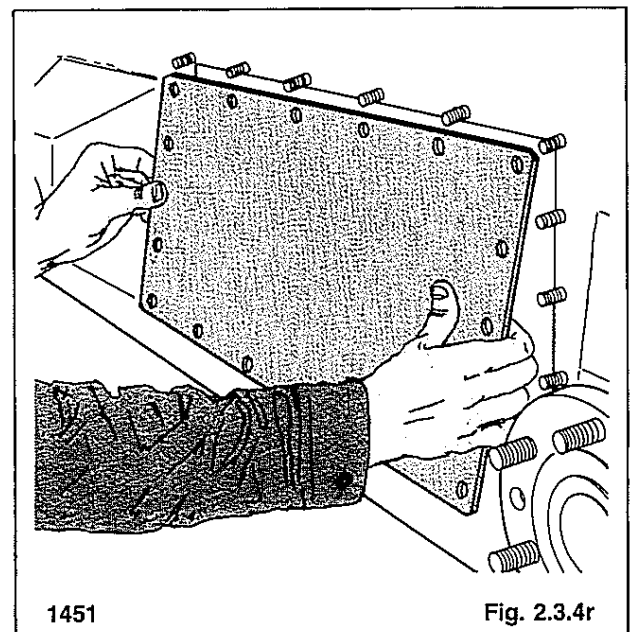
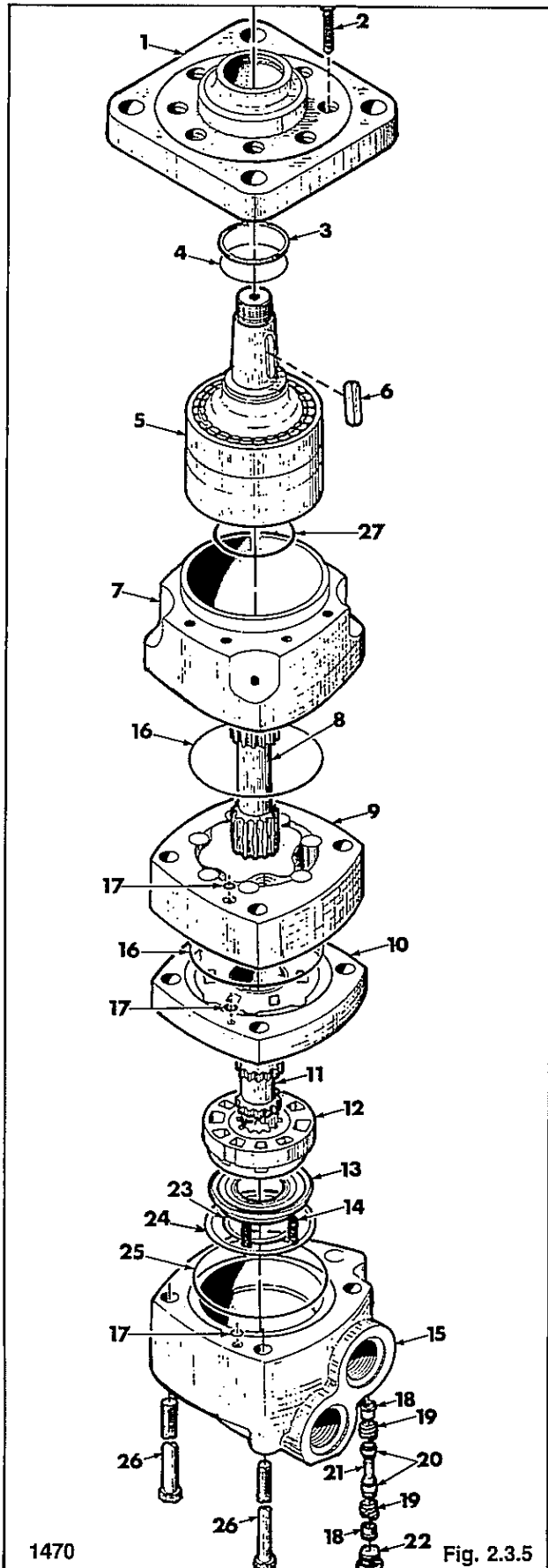


Fig. 2.3.4r

2 HYDROSTATIC DRIVE SYSTEM



2.3.5 Torque Motor Disassembly — T103:

- | | |
|--------------------------|-----------------------------|
| 1. retainer plate | 14. balance ring spring (3) |
| 2. bolt (8) | 15. valve housing |
| 3. back-up washer | 16. valve seal |
| 4. quad ring | 17. drain seal |
| 5. shaft & bearing assy. | 18. sleeve |
| 6. key | 19. spring |
| 7. bearing housing | 20. poppet |
| 8. geroler drive | 21. piston |
| 9. geroler assy. | 22. plug |
| 10. valve plate | 23. inner valve seal |
| 11. valve drive | 24. outer valve seal |
| 12. valve | 25. valve housing seal |
| 13. balance ring | 26. bolt (4) |
| | 27. shaft face seal |

Before disassembling the torque motor, clean the body with a suitable solvent and dry with compressed air. Be sure all openings are plugged to prevent solvent entering the torque motor.



WARNING

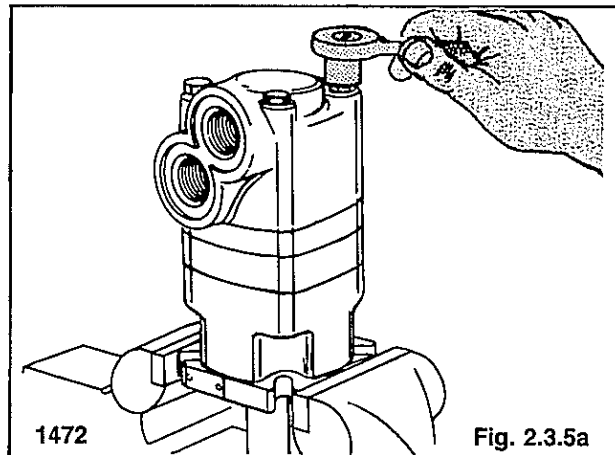
To avoid eye injury use safety goggles when cleaning with compressed air.

IMPORTANT

When making repairs to the torque motors, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

Discard all old seals and on reassembly replace with new seals.

1. Place the motor in a vise with the output shaft facing down (fig. 2.3.5a). Clamp the motor at the flange not on the housing. Excessive clamping pressure on the housing will cause distortion.



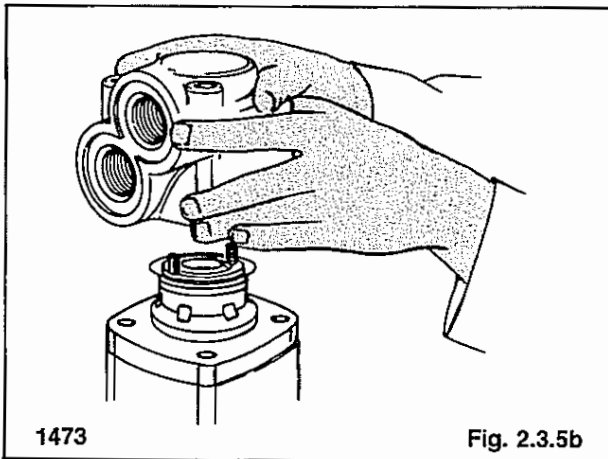
1472

Fig. 2.3.5a

1470

Fig. 2.3.5

2 HYDROSTATIC DRIVE SYSTEM

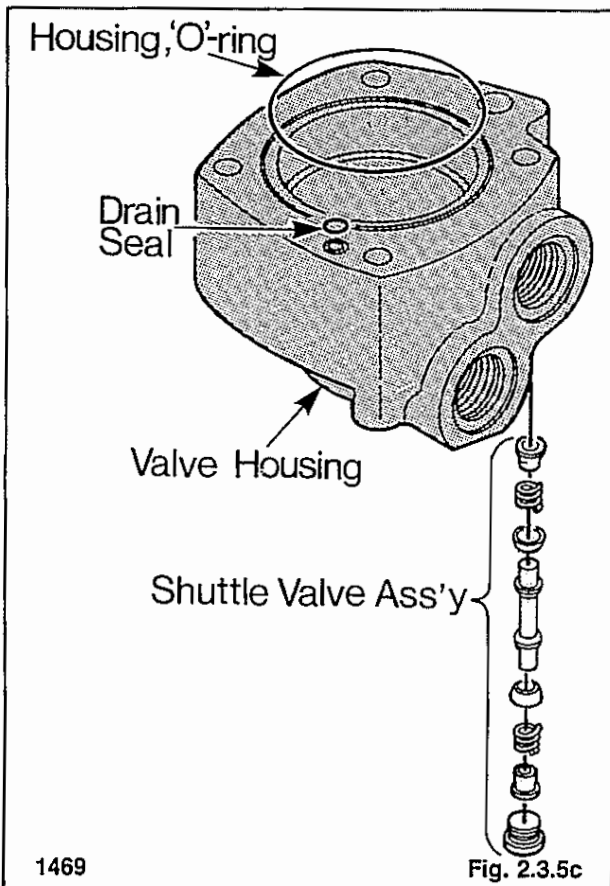


Mark the body sections to assist in reassembly.

- Remove the four bolts from the motor valve housing (fig. 2.3.5a).

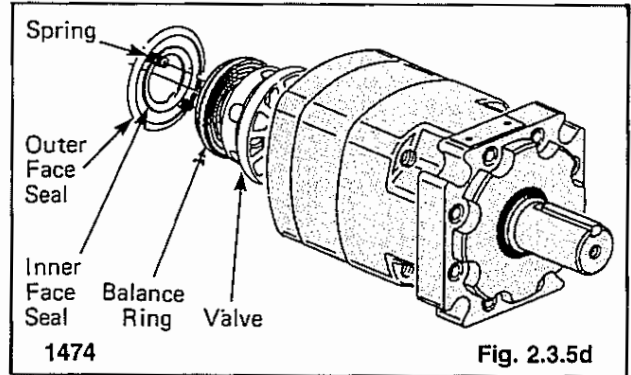
On reassembly torque the mounting bolts in sequence to 50 ft. lbs. (67.8 N.M.). Follow the torque procedure outlined in section 2.3.8.

- Carefully lift the valve housing straight up (fig. 2.3.5b). The balance ring subassembly and springs should remain on the valve.



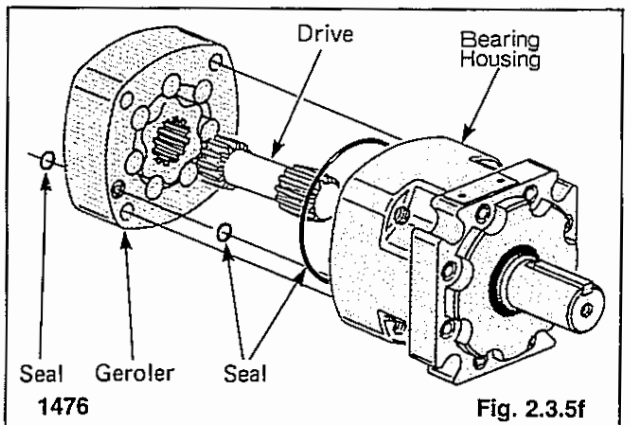
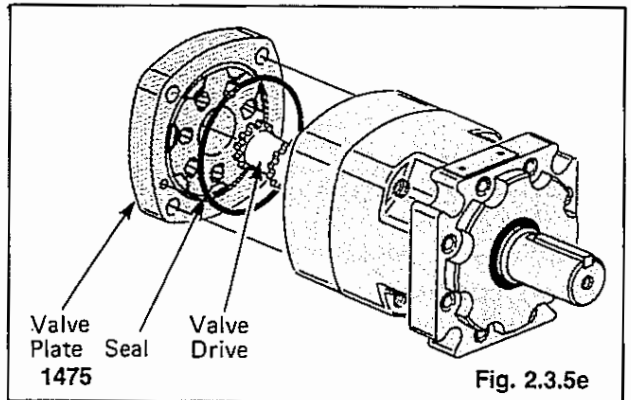
- Remove the following from the valve housing (fig. 2.3.5c).
 - l — housing seal
 - l — drain seal
 - l — shuttle valve assembly
- Remove the two balance springs, balance ring and valve (fig. 2.3.5d).

Remove the inner and outer face seal from the balance ring.



- Remove the valve plate, seal and valve drive (fig. 2.3.5e).

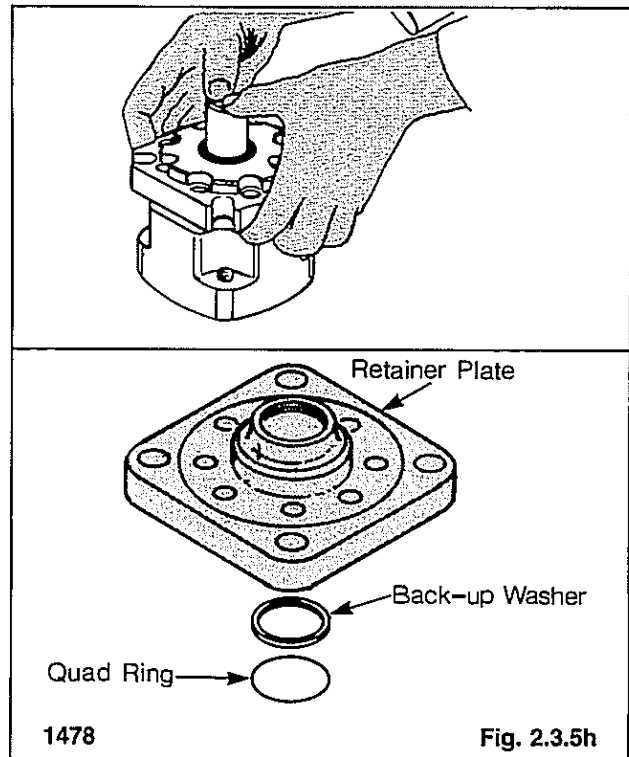
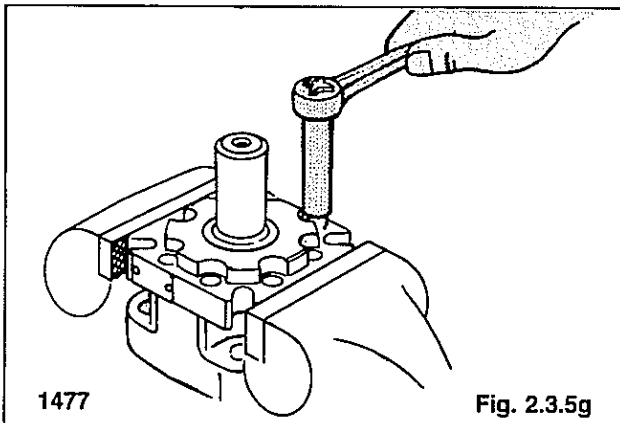
- Remove the geroler assembly (fig. 2.3.5f). Keep the rollers and inner geroler in the outer geroler ring.



2 HYDROSTATIC DRIVE SYSTEM

8. Remove the two drain seals from each side of the geroler assembly (fig. 2.3.5f).
9. Remove the geroler drive and the seal from the bearing housing (fig. 2.3.5f).
10. Turn the bearing housing over in the vise and remove the eight (8) cap screws from the retainer plate (fig. 2.3.5g).

On reassembly torque the eight cap screws in sequence to 21 ft. lbs. (28.5 N.M.). For torque procedure see section 2.3.8.



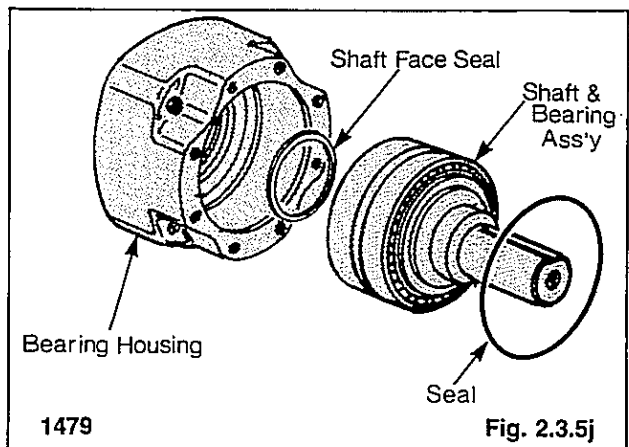
11. Remove the retainer plate from the bearing housing (fig. 2.3.5h).

Remove the back-up washer and quad ring from the retainer plate.

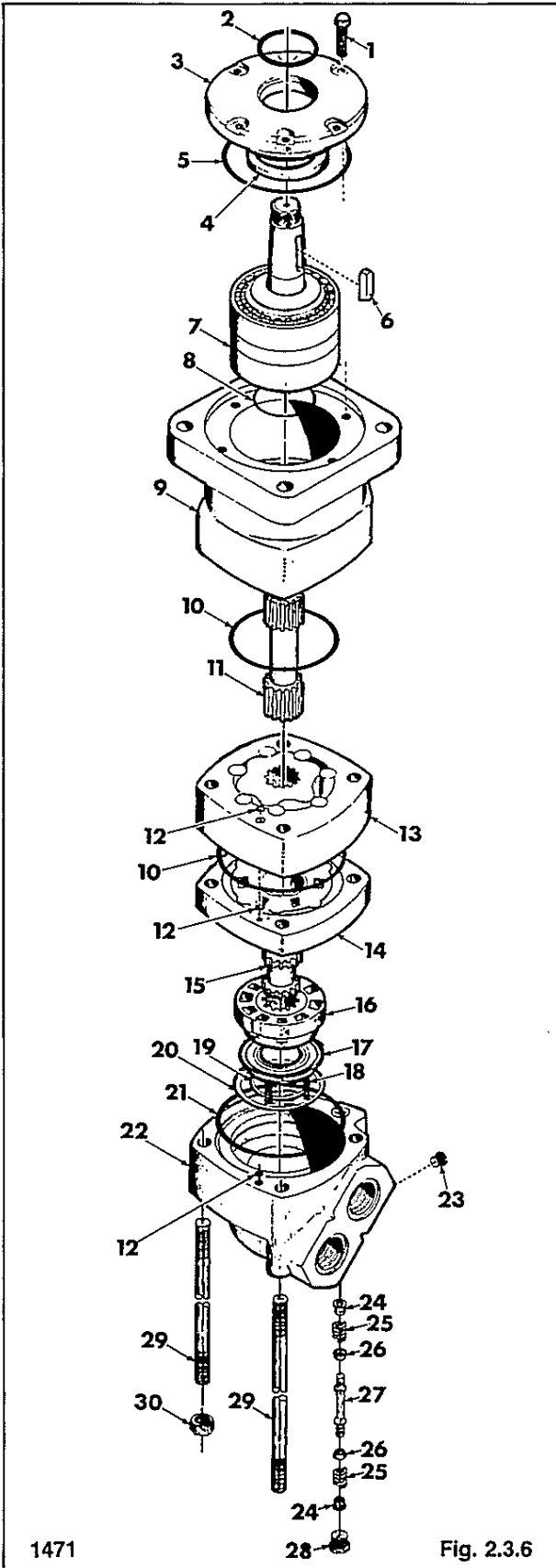
12. Remove the shaft and bearing assembly from the housing (fig. 2.3.5j). The shaft may have to be pressed out.

Remove the shaft face seal from the bore of the bearing housing (fig. 2.3.5j). Be careful not to damage the bore of the bearing housing.

NOTE: Individual parts of the shaft and bearing assembly are not sold or serviced separately and must be replaced as a complete unit.



2 HYDROSTATIC DRIVE SYSTEM



2.3.6 Torque Motor Disassembly — T133:

- | | |
|--------------------------|------------------------|
| 1. bolt (6) | 16. valve |
| 2. dust seal | 17. balance ring |
| 3. retainer plate | 18. balance spring (3) |
| 4. shaft seal | 19. inner face seal |
| 5. o-ring | 20. outer face seal |
| 6. key | 21. o-ring |
| 7. shaft & bearing assy. | 22. valve housing |
| 8. shaft face seal | 23. plug |
| 9. bearing housing | 24. sleeve |
| 10. o-ring | 25. spring |
| 11. drive, geroler | 26. poppet |
| 12. drain seal | 27. piston |
| 13. geroler assembly | 28. plug |
| 14. valve plate | 29. stud |
| 15. valve drain | 30. nut |

Before disassembling the torque motor, clean the body with a suitable solvent and dry with compressed air. Be sure all openings are plugged to prevent solvent entering the torque motor.



WARNING

To avoid eye injury use safety goggles when cleaning with compressed air.

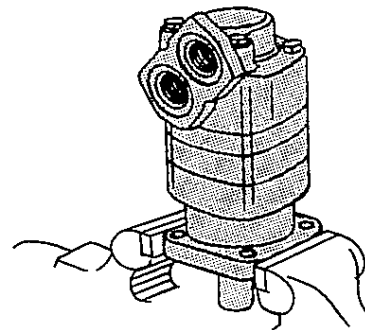
IMPORTANT

When making repairs to the torque motors, keep all parts clean and remove dirt from the work area. Use caps and plugs on all lines and openings.

Discard all old seals and on reassembly replace with new seals.

1. Place the motor in a vise with the output shaft facing down (fig. 2.3.6a). Do not clamp the motor on the housing as excessive pressure will cause distortion.

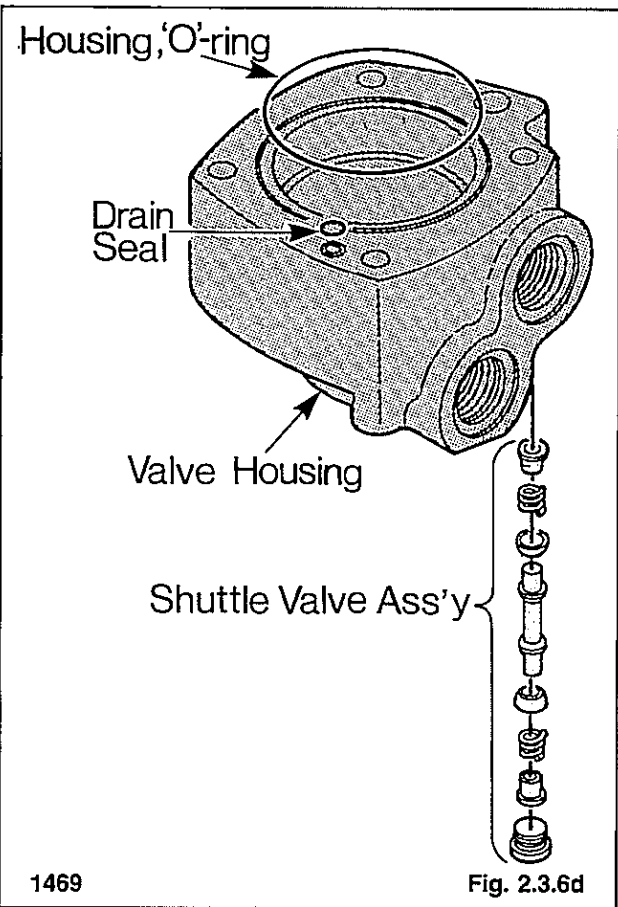
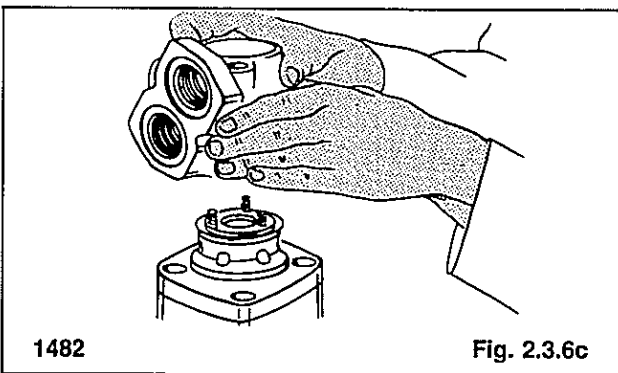
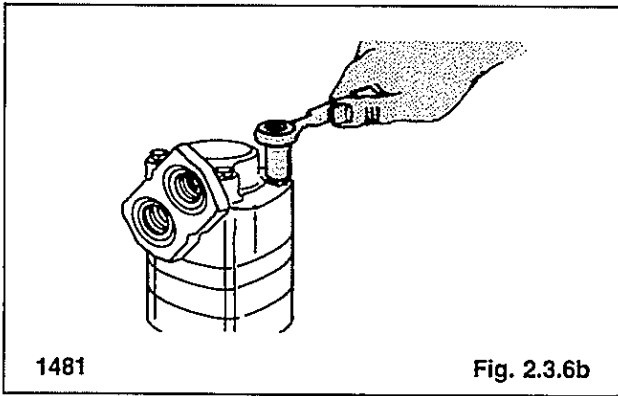
Mark the body sections to assist in reassembly.



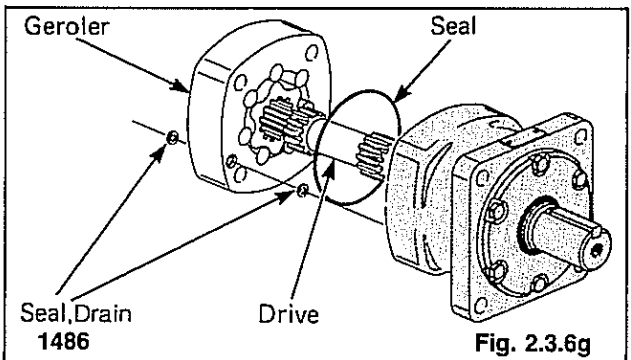
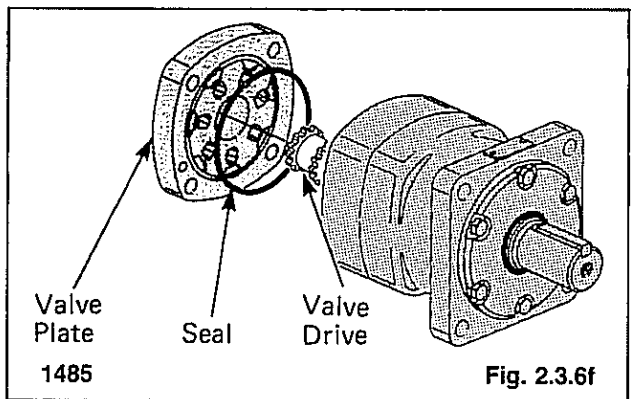
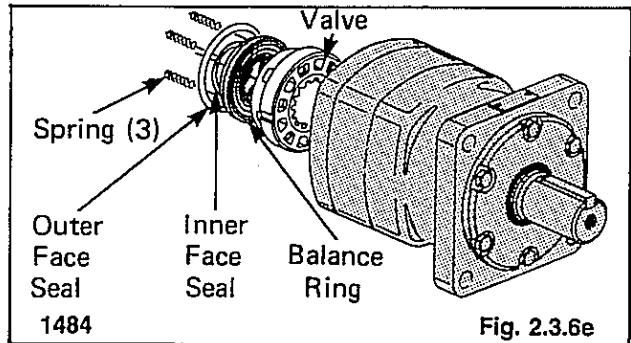
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Fig. 2.3.6a

2 HYDROSTATIC DRIVE SYSTEM

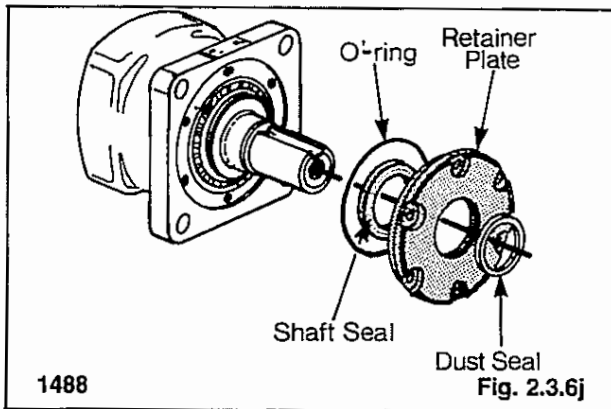
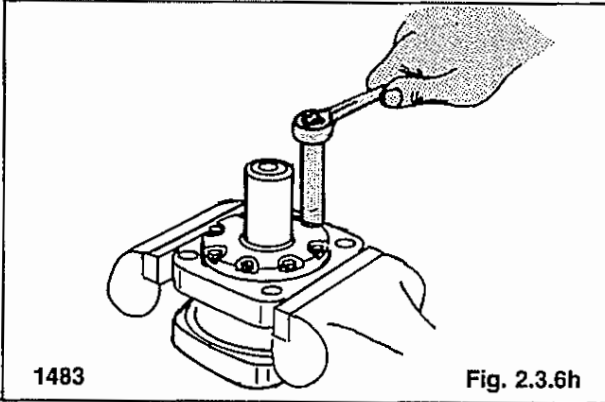


2. Remove the four bolts from the motor valve housing (fig. 2.3.6b). On reassembly torque the mounting bolts to 62.5 ft. lbs. (84.7 N.M.). Follow the torque procedure outlined in section 2.3.9.
3. Carefully lift the valve housing straight up (fig. 2.3.6c). The balance ring subassembly and springs should remain on the valve.
4. Remove the following parts from the valve housing (fig. 2.3.6d).
 - 1 — housing seal
 - 1 — drain seal
 - 1 — shuttle valve assembly
5. Remove the three balance springs, balance ring and valve (fig. 2.3.6e). Remove both the inner and outer face seal from the balance ring.
6. Remove the valve plate, seal and valve drive (fig. 2.3.6f).



2 HYDROSTATIC DRIVE SYSTEM

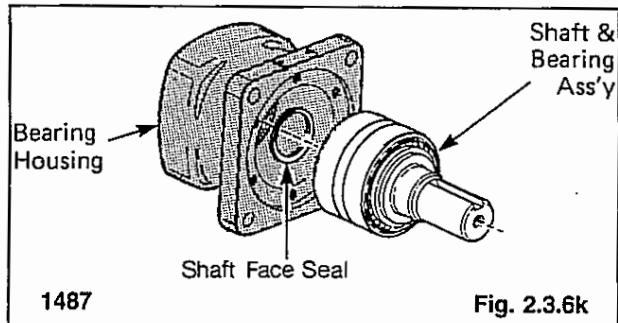
7. Remove the geroler assembly (fig. 2.3.6g). Keep the rollers and the inner geroler in the outer geroler ring.
8. Remove the two drain seals from each side of the geroler ring (fig. 2.3.6g).
9. Remove the geroler drive and the seal from the bearing housing (fig. 2.3.6g).



10. Turn the bearing housing over in the vice and remove the six retainer plate bolts (fig. 2.3.6h).

On reassembly torque the retainer plate bolts to 25 ft. lbs. (33.9 Bar). Follow the torque sequence as outlined in section 2.3.9.

11. Remove the retainer plate from the bearing housing (fig. 2.3.6j). The retainer plate may have to be pried free. Be careful not to damage the bearing housing or the retainer plate.



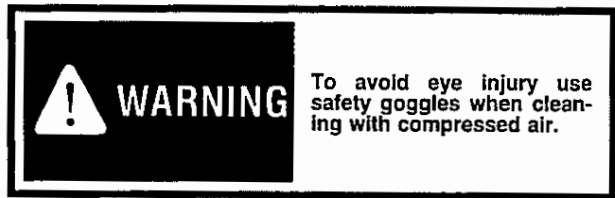
12. Remove the dust seal, shaft seal and O-ring from the retainer plate (fig. 2.3.6j).
13. Remove the shaft and bearing assembly from the bearing housing (fig. 2.3.6k). The shaft may need to be pressed out.

Remove the shaft face seal from the bore of the bearing housing (fig. 2.3.6k). Be careful not to damage the bore of the bearing housing.

NOTE: Individual parts of the shaft and bearing assembly are not sold or serviced separately and must be replaced as a complete unit.

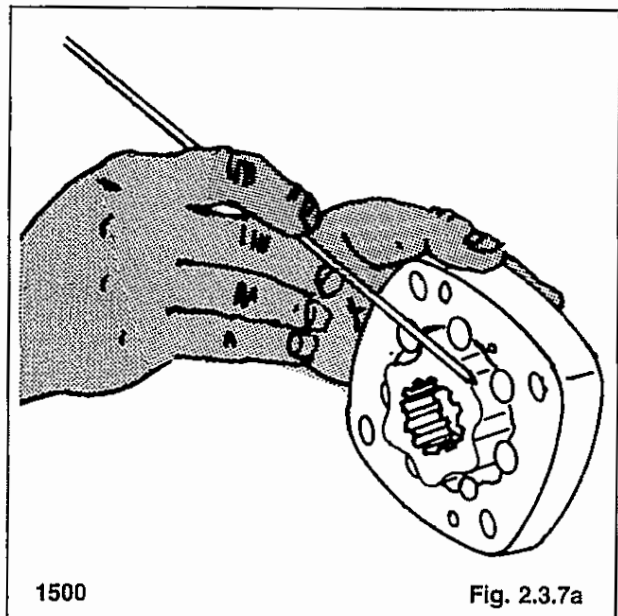
2.3.7 Torque Motor — Inspection:

Clean all parts in a suitable solvent and blow dry with air. Do not wipe dry with cloth or paper towels.

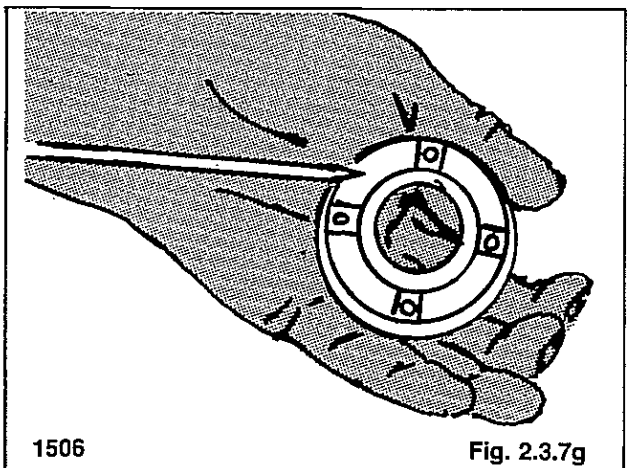
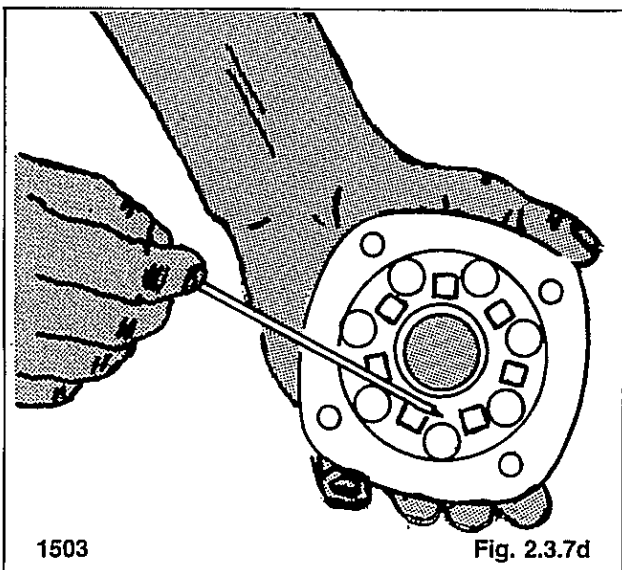
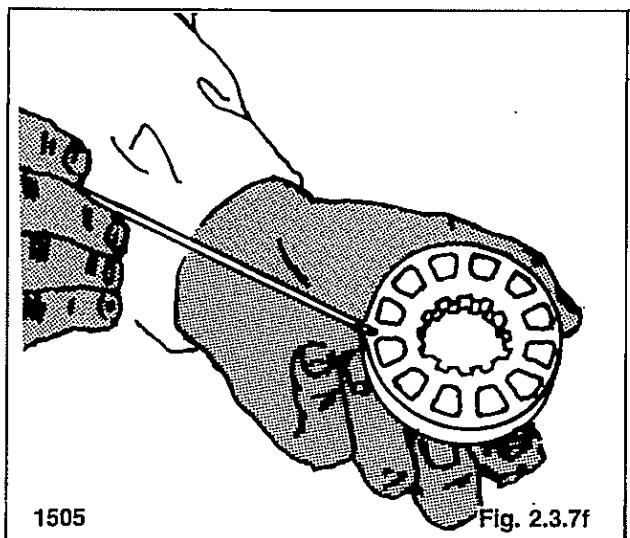
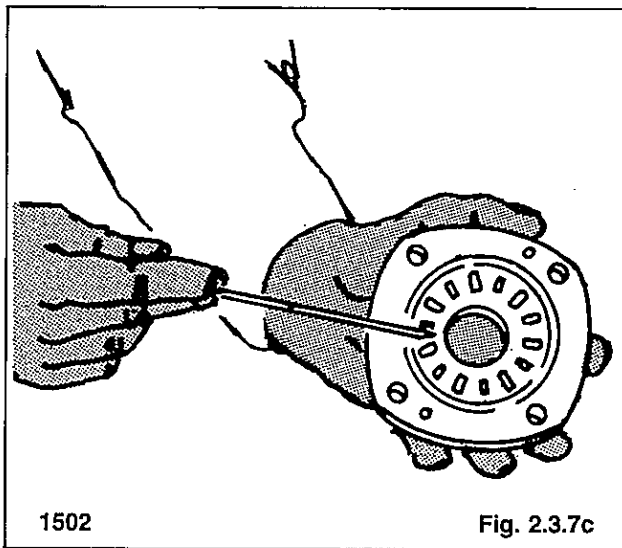
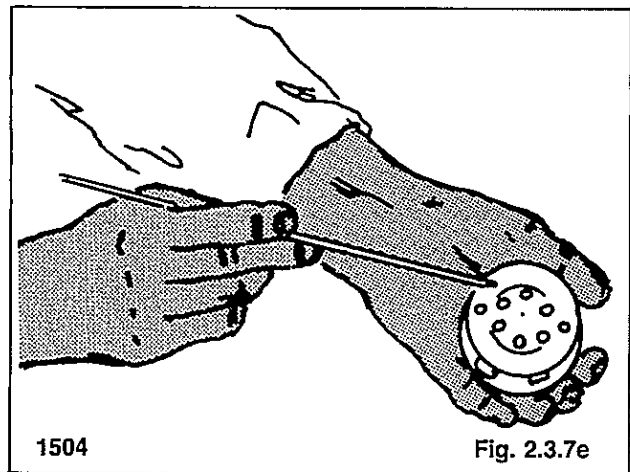
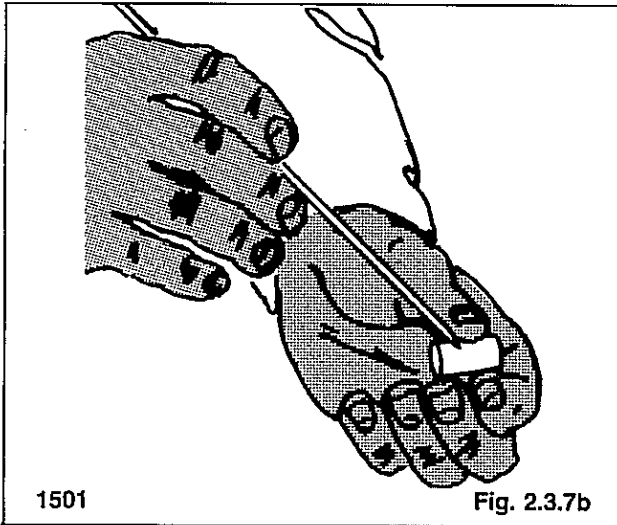


Do not use coarse grit or attempt to file or grind motor parts. Replace any parts that are scratched or have burrs that could cause leakage.

1. Inspect the geroler star (fig. 2.3.7a) for wear or damage.



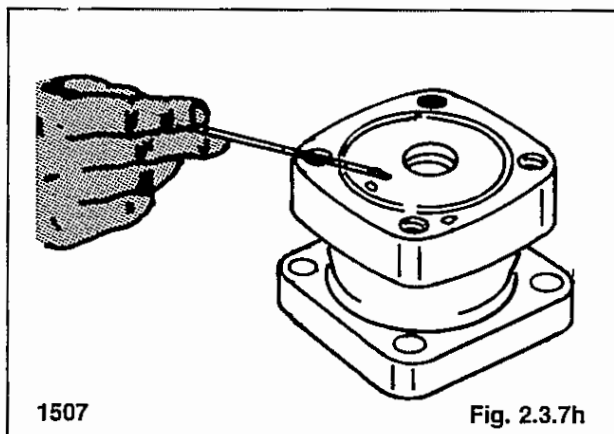
2 HYDROSTATIC DRIVE SYSTEM



2. Inspect the geroler rollers (fig. 2.3.7b) for wear or damage.
3. Inspect the valve plate (fig. 2.3.7c and fig. 2.3.7d) for scratches or wear.

2 HYDROSTATIC DRIVE SYSTEM

4. Inspect the valve (fig. 2.3.7e and fig. 2.3.7f) for scratches or wear.
5. Inspect the balance plate for scratches or wear (fig. 2.3.7g).
7. Inspect the splines on the valve drive and geroler drive for wear.
8. Inspect the keyway and chamfers on the output shaft for sharp edges or burrs which could damage the shaft seal.
9. Inspect the face of the bearing housing (fig. 2.3.7h) for scratches or wear.



2.3.8 Torque Motor Reassembly — T103:

Install new seals when reassembling the torque motor.

Lubricate all seals with petroleum jelly such as vaseline prior to assembly.

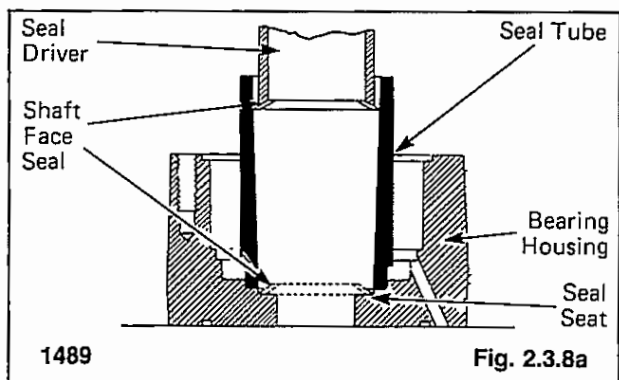
1. Install the shaft face seal in the bearing housing using a suitable tool to seat the seal.

Place the bearing housing on a smooth flat surface with the largest open end of the housing facing upward.

Align the small I.D. end of the seal installation tube with the seal seat in the housing (fig. 2.3.8a).

Apply petroleum jelly to the shaft face seal.

Install the seal in the bore of the installation tube as shown in fig. 2.3.8a.



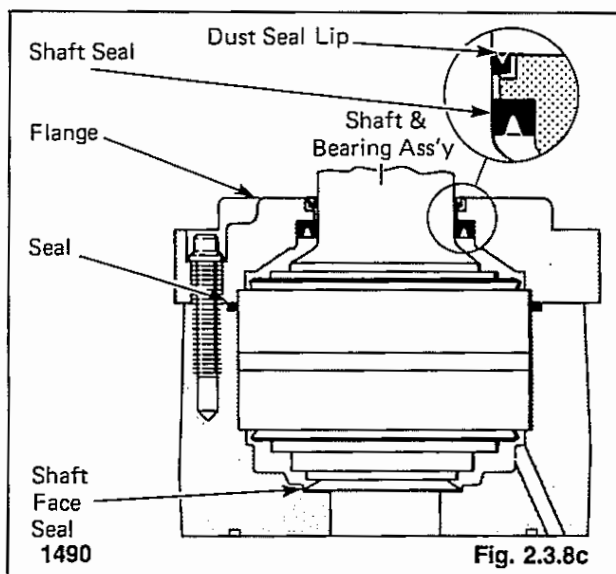
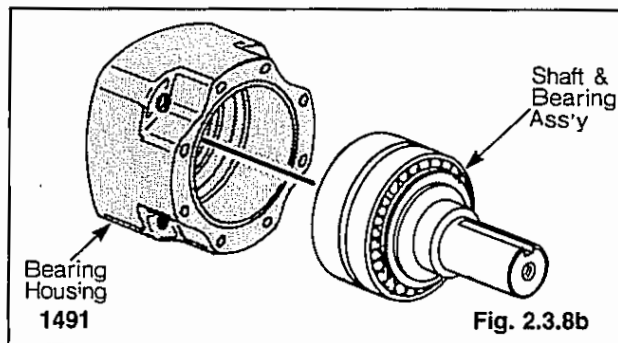
Insert the seal driver in the tube and push the shaft face seal with a rotating action until it is seated.

Check for correct installation. A damaged shaft face seal will cause loss of internal lubrication and result in parts wear.

2. Install the shaft and bearing assembly in the housing (fig. 2.3.8b). A press may be required to install the shaft and bearing assembly.

Do not damage the shaft face seal in the housing.

3. Apply petroleum jelly to the bearing housing seal (fig. 2.3.8c) and install the seal in the outer seal groove of the housing.
4. Install the dust seal in the retainer flange (fig. 2.3.8c). The metal side of the dust seal must face upward.
5. Install the shaft seal in the retainer flange (fig. 2.3.8c). The smooth or flat side of the shaft seal must face toward the retainer flange.
6. Apply petroleum jelly to the inside diameter of both the shaft and dust seal. Install the retainer flange over the shaft with a twisting motion (fig. 2.3.8c). Be careful not to distort or damage the shaft seal during assembly. Damage to the shaft seal will cause external leakage.



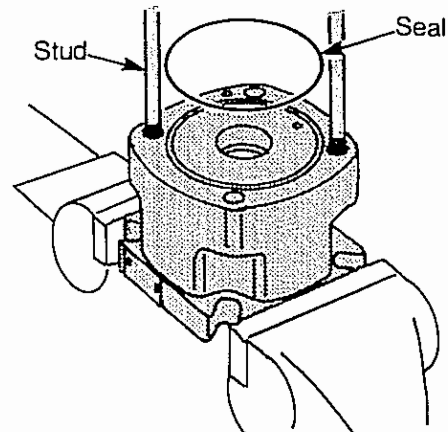
2 HYDROSTATIC DRIVE SYSTEM

7. Lubricate the threads of the eight cap screws and install them finger tight in the retainer flange. Torque the cap screws in sequence (fig. 2.3.8d) to 21 ft. lbs. (28.5 N.M.).
8. Reposition the housing assembly in a vise (fig. 2.3.8e) clamping across the flange.

Pour a small amount of system oil inside the output shaft.
9. If available, install two studs in the housing (fig. 2.3.8f) to assist in alignment of parts during assembly.
10. Apply a light film of petroleum jelly on the housing seal and install the seal in the bearing housing (fig. 2.3.8f).
11. Install the geroler drive in the housing (fig. 2.3.8g). Install the longer splined end of the geroler drive shaft into the housing.
12. Apply petroleum jelly to the two case drain seals and install them on both sides of the geroler assembly (fig. 2.3.8h) in the case drain hole grooves.
13. Align the case drain hole and pressure relief hole in the geroler assembly with the case drain hole and pressure relief hole in the bearing housing (fig. 2.3.8h). Install the geroler assembly on the bearing housing.

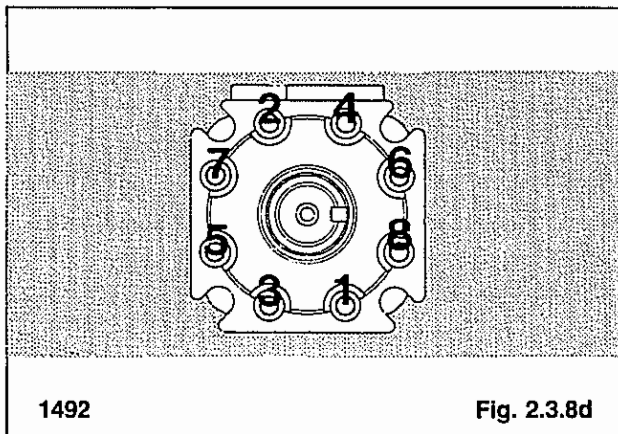
IMPORTANT

To ensure the correct shaft rotation the torque motor must be timed. Refer to instructions.



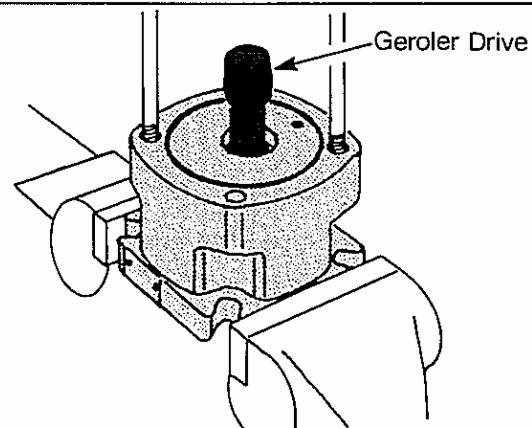
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Fig. 2.3.8f



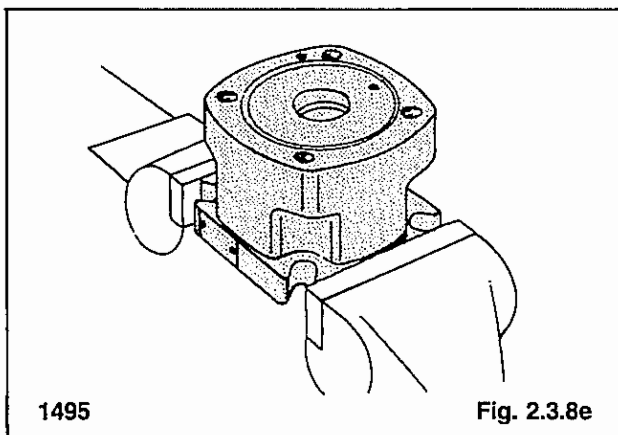
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Fig. 2.3.8d



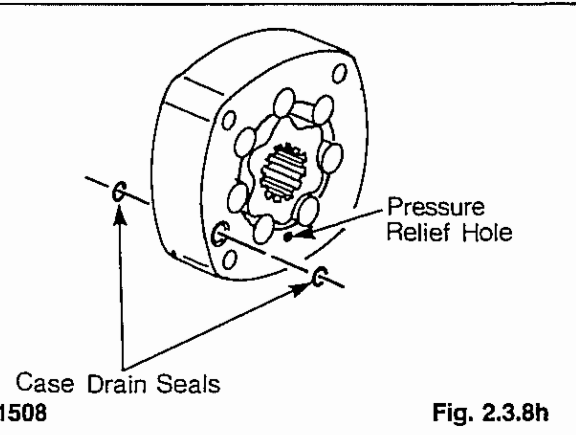
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Fig. 2.3.8g



1495

Fig. 2.3.8e



1508

Fig. 2.3.8h

2 HYDROSTATIC DRIVE SYSTEM

14. TIMING STEP NO. 1

Locate the largest open pocket in the geroler (fig. 2.3.8j). Mark the location of the pocket on the outside edge of the geroler.

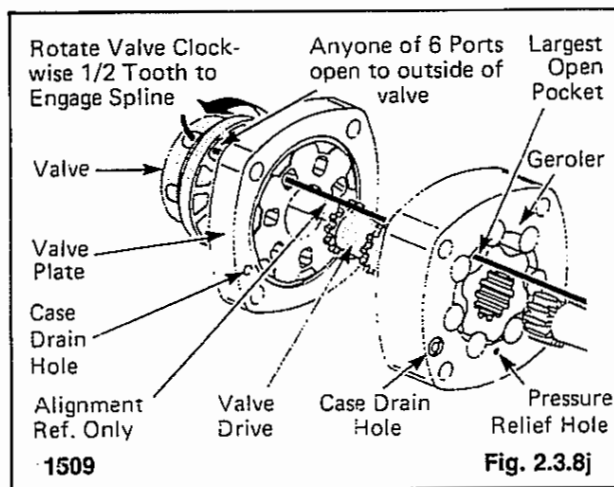
15. Install the valve drive in the geroler.

16. Apply a light film of petroleum jelly on the valve plate seal. Install the valve plate seal in the valve plate.

17. Align the case drain hole in the valve plate with the case drain hole in the geroler. Install the valve plate (seal side toward geroler) on the geroler assembly (fig. 2.3.8j).

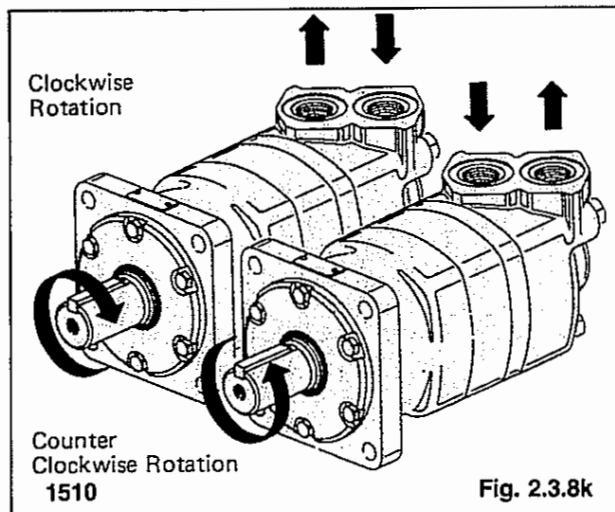
18. TIMING STEP NO. 2

Locate the slot opening in the valve plate which is in line with the largest open pocket of the geroler (fig. 2.3.8j).



19. TIMING STEP NO. 3

Install the valve on the valve plate. Locate any one of the side openings of the valve that goes through to the face of the valve (fig. 2.3.8j). Line up this side opening with the open slot of the valve plate that is in line with the largest open pocket of the geroler.



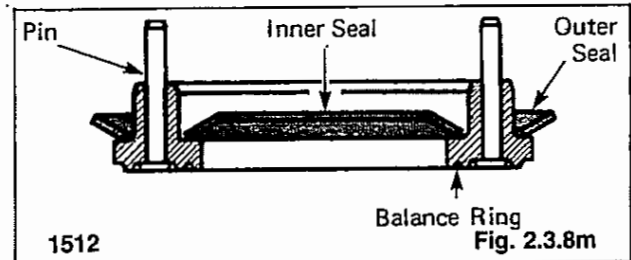
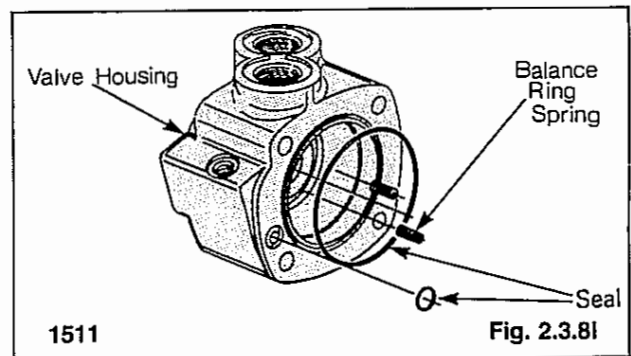
Rotate the valve clockwise (1/2 spline tooth) to engage the spline teeth of the valve drive.

When timed correctly the motor will rotate when pressurized as shown in fig. 2.3.8k.

20. Apply clean grease to the two balance ring assembly springs. Install the two springs in the holes located inside the bore of the valve housing (fig. 2.3.8l).

21. Apply a light film of petroleum jelly on the case drain seal and the valve housing seal. Install the case drain seal and the valve housing seal in the grooves on the valve housing (fig. 2.3.8l).

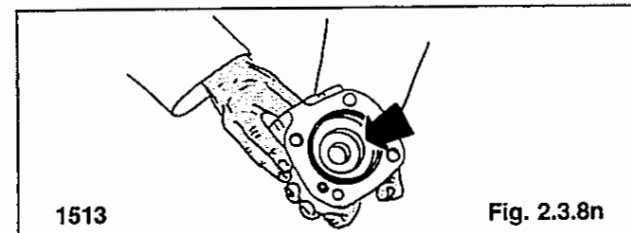
22. Apply petroleum jelly to both the outer and inner face seals. Install the face seals on the balance ring (fig. 2.3.8m).



IMPORTANT

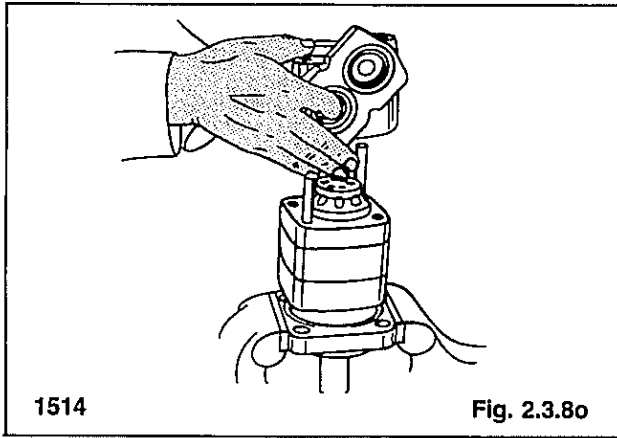
The face seals must be installed as shown on fig. 2.3.8m or the motor will not operate properly.

23. Insert your finger through the port off the valve housing (fig. 2.3.8n). Apply pressure to the side of the balance ring assembly to hold it in place while the valve housing is being installed.



2 HYDROSTATIC DRIVE SYSTEM

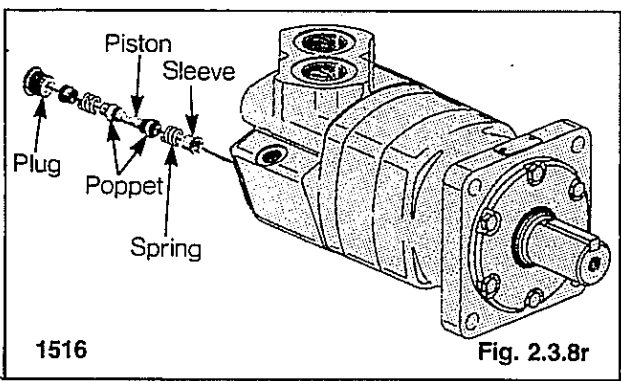
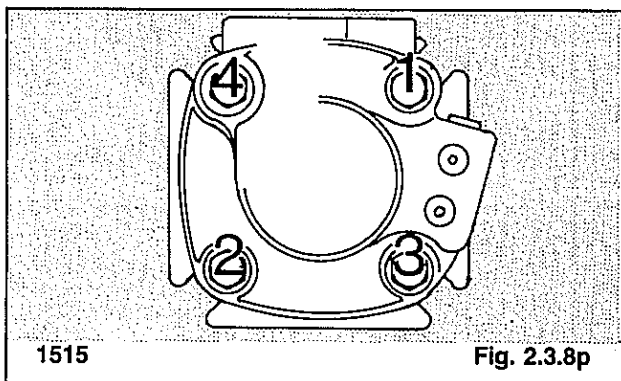
24. Align the case drain hole in the valve housing with the case drain hole in the valve plate (fig. 2.3.8o). Install the valve housing on the valve plate.



IMPORTANT

After installing the valve housing check between the body parts for unseated seals.

25. Install and finger tighten the four bolts. Torque the bolts in sequence (fig. 2.3.8p) to 50 ft. lbs. (67.8 N.M.).
26. Install the shuttle valve assembly in the valve housing (fig. 2.3.8r).



IMPORTANT

For correct motor operation the shuttle valve must be installed in the correct sequence.

2.3.9 Torque Motor Reassembly — T133:

Install new seals when reassembling the torque motor.

Lubricate all seals with petroleum jelly such as vaseline prior to assembly.

1. Install the shaft face seal in the bearing housing using a suitable tool to seat the seal.

Place the bearing housing on a smooth, flat surface with the largest open end of the housing facing upward.

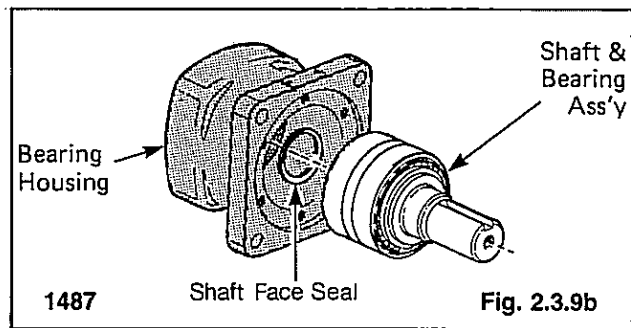
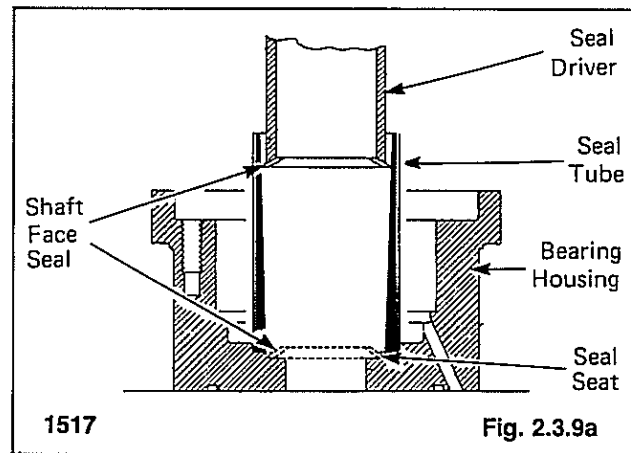
Align the small I.D. end of the seal installation tube with the seal seat in the housing (fig. 2.3.9a).

Apply petroleum jelly to the shaft face seal.

Install the seal in the bore of the installation tube as shown in fig. 2.3.9a.

Insert the seal driver in the tube and push the shaft face seal with a rotating action until it is seated.

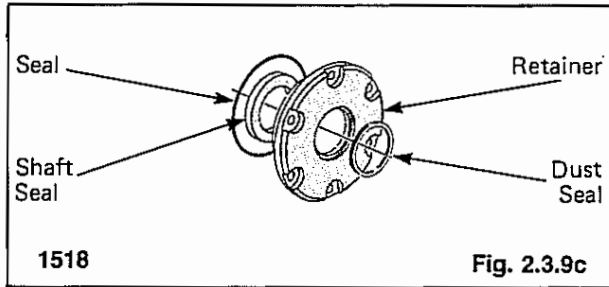
Check for correct installation. A damaged shaft face seal will cause loss of internal lubrication and result in parts wear.



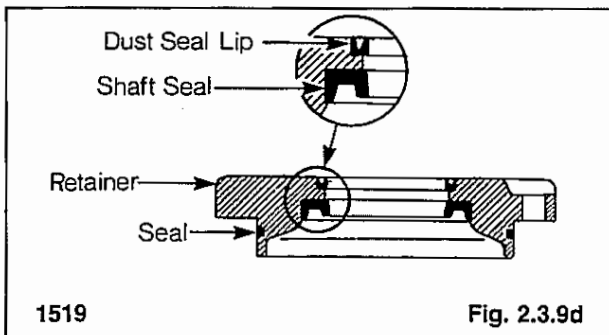
2 HYDROSTATIC DRIVE SYSTEM

2. Install the shaft and bearing assembly in the housing (fig. 2.3.9b). A press may be required to install the shaft and bearing assembly.

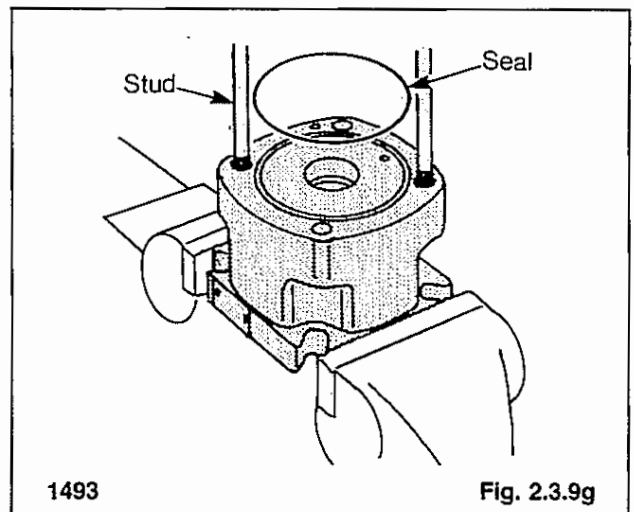
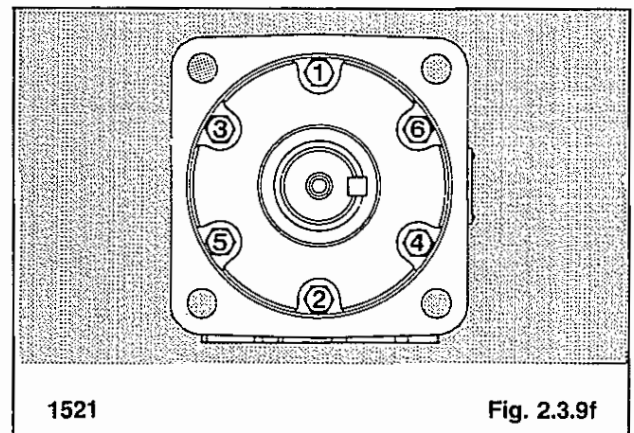
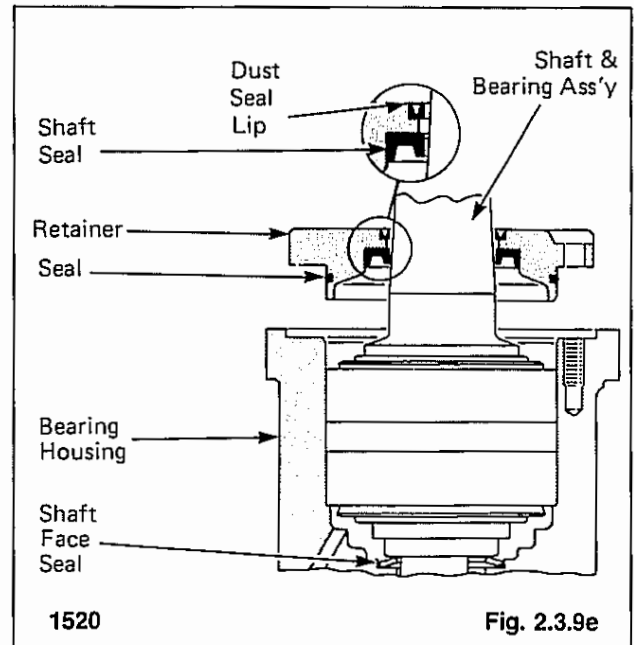
Do not damage the shaft face seal in the bore of the housing.



3. Install the dust seal in the retainer plate (fig. 2.3.9c). The metal side of the dust seal must face upward.
4. Install the retainer seal and the shaft seal (fig. 2.3.9c). The smooth or flat side of the shaft seal must face toward the retainer (fig. 2.3.9d).
5. Apply petroleum jelly to the inside diameter of both the dust seal and shaft seal.
6. Install the retainer cover over the shaft with a twisting motion (fig. 2.3.9e). Be careful not to distort or damage the shaft seal during assembly. Damage to the shaft seal will cause external leakage.



7. Lubricate the threads of the six retainer cover bolts and finger tighten all bolts. Torque the bolts in sequence (fig. 2.3.9f) initially to 4 ft. lbs. (5.4 N.M.). Final torque the six bolts in sequence to 25 ft. lbs. (33.9 N.M.).
8. Reposition the bearing housing in a vise (fig. 2.3.9g) clamping across the edge of the flange.
9. Pour a small amount of system oil inside the output shaft.
10. If available, install two studs in the housing to assist in alignment of parts during assembly (fig. 2.3.9g).
11. Apply a light film of petroleum jelly on the housing seal and install the seal in the bearing housing (fig. 2.3.9g).



2 HYDROSTATIC DRIVE SYSTEM

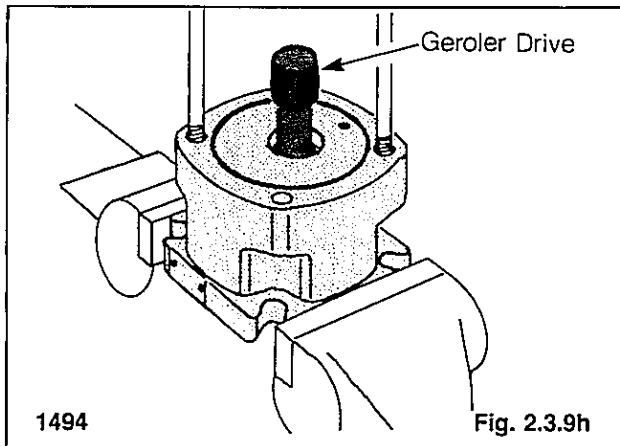


Fig. 2.3.9h

12. Install the geroler drive in the bearing housing (fig. 2.3.9h). Install the longer splined end of the shaft into the bearing housing.
13. Apply petroleum jelly to the two case drain seals and install them on both sides of the geroler assembly (fig. 2.3.9j) in the case drain hole grooves.
14. Align the case drain hole and pressure relief hole in the geroler assembly with the case drain hole and pressure relief hole in the bearing housing (fig. 2.3.9j). Install the geroler assembly on the bearing housing.

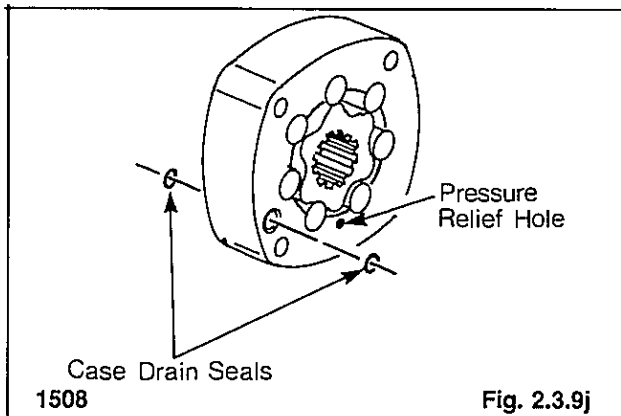


Fig. 2.3.9j

IMPORTANT

To ensure the correct shaft rotation the torque motor must be timed. Refer to instructions.

15. TIMING STEP NO. 1

Locate the largest open pocket in the geroler (fig. 2.3.9k). Mark the location of the pocket on the outside edge of the geroler.

16. Install the valve drive in the geroler.
17. Apply a light film of petroleum jelly on the valve plate seal. Install the valve plate seal in the valve plate.

18. Align the case drain hole in the valve plate with the case drain hole in the geroler. Install the valve plate (seal side toward geroler) on the geroler assembly (fig. 2.3.9k).

19. TIMING STEP NO. 2

Locate the slot opening in the valve plate which is in line with the largest open pocket of the geroler (fig. 2.3.9k).

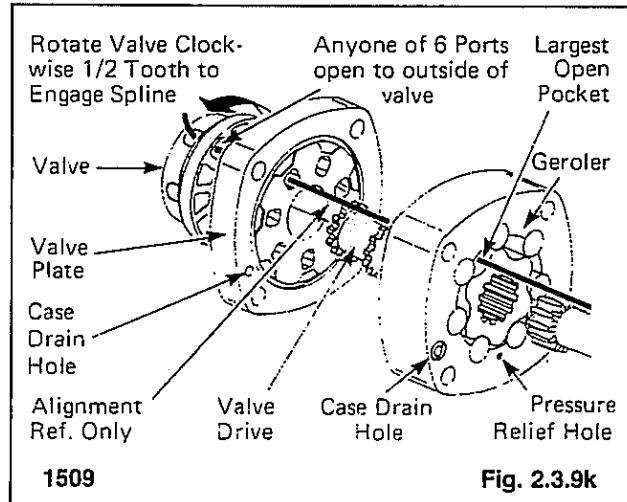


Fig. 2.3.9k

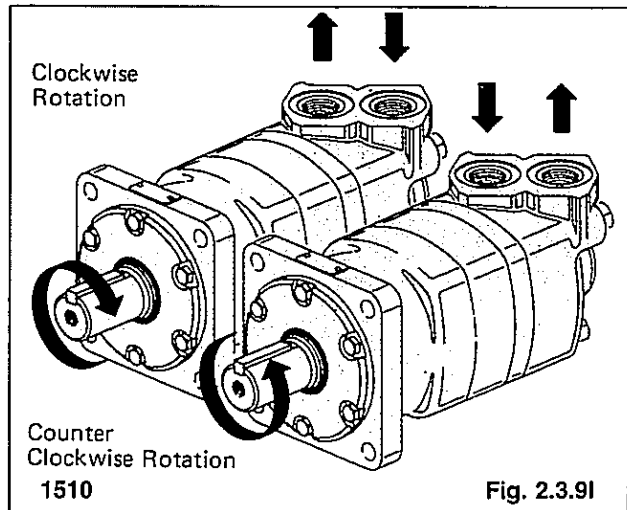


Fig. 2.3.9l

20. TIMING STEP NO. 3

Install the valve on the valve plate. Locate any one of the side openings of the valve that goes through to the face of the valve (fig. 2.3.9k). Line up this side opening with the open slot of the valve plate that is in line with the largest open pocket of the geroler.

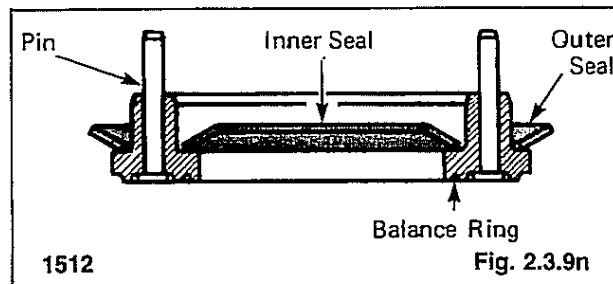
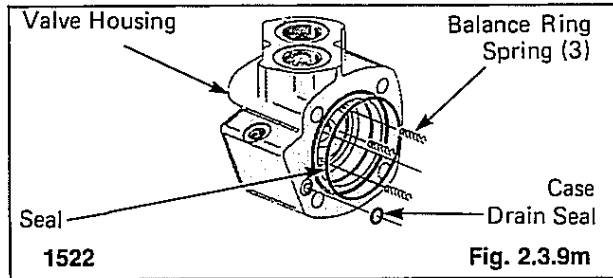
Rotate the valve clockwise (1/2 spline tooth) to engage the spline teeth of the valve drive.

When timed correctly the motor will rotate when pressurized as shown in fig. 2.3.9l.

21. Apply clean grease on the three balance ring assembly springs. Install the three springs in the holes located inside the bore of the valve housing (fig. 2.3.9m).

2 HYDROSTATIC DRIVE SYSTEM

22. Apply a light film of petroleum jelly on the case drain seal. Install the seal in the case drain seal groove on the valve housing (fig. 2.3.9m).
23. Apply a light film of petroleum jelly on the valve housing seal. Install the seal in groove on the valve housing (fig. 2.3.9m).
24. Apply petroleum jelly to both the outer and inner face seals. Install the face seals on the balance ring (fig. 2.3.9n).



IMPORTANT

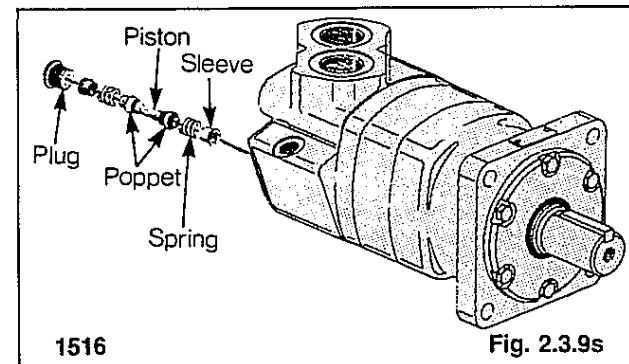
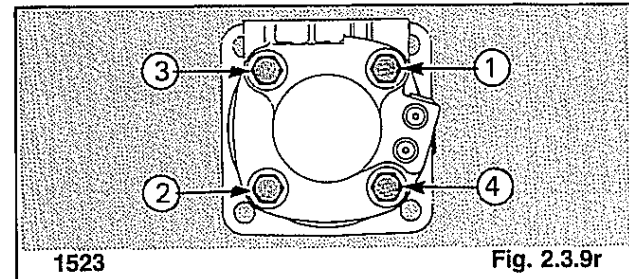
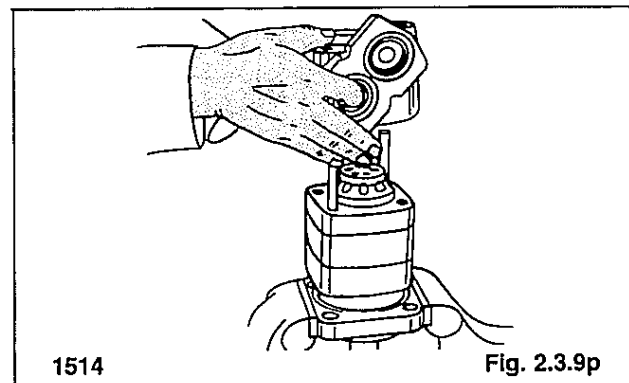
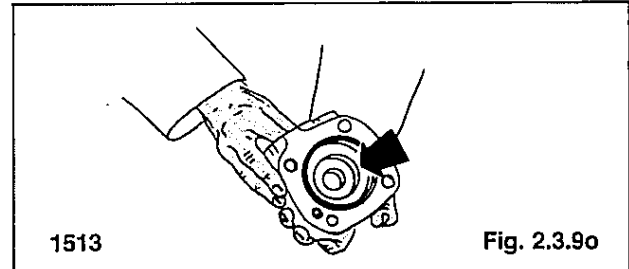
The face seals must be installed as shown on fig. 2.3.9n or the motor will not operate properly.

25. Align the balance ring pins with the two holes in the valve housing. Install the balance ring in the valve housing.
26. Insert your finger through the port of the valve housing (fig. 2.3.9o). Apply pressure to the side of the balance ring assembly to hold it in place while the valve housing is being installed.
27. Align the case drain hole in the valve housing with the case drain hole in the valve plate (fig. 2.3.9p). Install the valve housing on the valve plate.

IMPORTANT

After installing the valve housing check between the body parts for unseated seals.

28. Install and finger tighten the four bolts. Torque the bolts in sequence (fig. 2.3.9r) to 62.5 ft. lbs. (84.7 N.M.).
29. Install the shuttle valve assembly in the valve housing (fig. 2.3.9s).



IMPORTANT

For correct motor operation the shuttle valve must be installed in the correct sequence.

2 HYDROSTATIC DRIVE SYSTEM

2.4 Trouble Shooting — Hydrostatic Drive System:

Problem	Cause	Corrective Action	Refer to Section
Loss of drive power on one side — both directions	Reservoir low on oil	Check for leaks. Fill the reservoir with 10W30 API SE/CD oil.	1.7.3
	Disconnected steering control linkage	Reconnect and adjust steering control linkage	4.1
	Groove pin sheared on pump pintle lever	Replace. Check pintle lever for loose bolt or excessive play.	4.1
	High pressure line failure	Replace line. Check motor and pump mounting bolts.	2.3
	Drive chain failure	Inspect chain and connection link. Replace damaged parts.	3.3
	Drive motor shaft or key failure	Inspect and repair defective parts. Check motor mounting bolts and motor sprocket nut torque.	2.3.5 2.3.6
	Charge pump failure	Inspect and repair defective parts. Drive may initially appear to be lost on one side only but after a few moments running will be lost on both sides.	2.2.8
	Excessive internal leakage or damage in pump and/or drive motor	Inspect and repair defective unit. Flush all lines and reservoir. Replace filter. Check on type of fluid used and engine RPM	2.2.5 2.3.5 2.3.6
Loss of drive power on one side — one direction only	Defective pump relief valve	Replace defective relief valve	2.2.5
	Damaged or seized drive motor shuttle valve	Inspect and replace defective parts	2.3.5 2.3.6
	Damaged pump ball check	Disassemble pump and repair	2.2.5 2.2.6

2 HYDROSTATIC DRIVE SYSTEM

Loss of drive power — both sides (also loss of hydraulic power)	Reservoir low on fluid	Check for leaks. Fill the reservoir with 10W30 API SE/CD oil.	1.7.3
	Universal joint between engine and pump failure	Inspect and repair or replace damaged parts	
	Drive coupling failure between front and rear pump	Inspect coupling and shafts for spline damage. Also check pump bearings.	2.2.7
	Charge pump shaft failure	Inspect and replace damaged parts	2.2.5
Loss of drive power — both sides (full hydraulic power)	Charge pump failure	Inspect and replace damaged parts	2.2.8
	Charge pump relief valve failure	Inspect and replace damaged parts	2.2.5
	Excessive internal leakage or damage in pumps and/or motors	Inspect and repair defective parts	2.2.5 2.3.5 2.3.6
	Drive motor shaft or key failure	Inspect and repair defective parts. Check motor mounting bolts and motor sprocket nut torque.	2.3.5 2.3.6
Gradual loss of power as the machine warms up	Excessive internal leakage in pumps or motors	Inspect and repair defective parts	2.2.5 2.3.5 2.3.6
System erratic and/or noisy	Air in system due to low oil level in reservoir	Fill reservoir with 10W30 API SE/CD oil.	1.7.3
	Air in system due to leaks at suction fitting	Check fittings and tighten	
	Excessive free play in steering linkage	Inspect linkage and tighten or replace worn parts	4.1
	Drive chain out of adjustment	Adjust	3.3.1

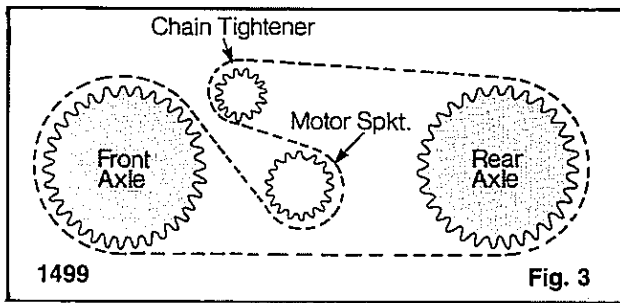
2 HYDROSTATIC DRIVE SYSTEM

Loader will not travel in a straight line	Control levers binding	Check that shields or sound insulation prevents full lever travel. Repair.	
		Check self centering spring for binding. Adjust.	4.1
	Control lever travel stops out of adjustment	Adjust	4.1

SECTION 3 FINAL DRIVE

FINAL DRIVE	3.1
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DRIVE CHAIN	3.3
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AXLE ASSEMBLY	3.4
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TROUBLE SHOOTING	3.6

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3.1.1 Specifications:

	T103	T133
Chain size.....	ANSI 80	ANSI 100
Approved chain manuf.....	TSUBAKI	
Lubricating oil.....	10W30 API classification SE/CD	
Capacity (per housing)	1.5 gal. (5.7 l)	1.5 gal. (5.7 l)
Torque specifications:		
Chain tightener clamp nuts.....	(2)100-110 lbs. ft. (135-149 N.M.)	100-110 lbs. ft. (135-149 N.M.)
Motor sprocket nut.....	350 lbs. ft. (475 N.M.)	350 lbs. ft. (475 N.M.)
Wheel nuts.....	100-110 lbs. ft. (135-149 N.M.)	100-110 lbs. ft. (135-149 N.M.)
Tire pressure, standard	50 PSI (345 KPa)	50 PSI (345 KPa)
flotation.....	30-35 PSI (207-241 KPa)	30-35 PSI (207-241 KPa)

3.1.2 Maintenance Schedule:

	Initial check (hours)	Check every (hours)
Tire pressure	8	8
Wheel nut torque.....	8	8
Lubricating oil	50	150 (1)
Chain tension	50	150
Motor mounting nuts	50	150
Axle bearing preload	50	150

(1) Change every 1000 hours.

(2) On T103 after S/N LC000292 with 5/8 inch chain tightener nuts torque to 150 ft. lbs. (203 N.M.).

3.2 LUBRICATION

3.2.1 Oil Level Check:

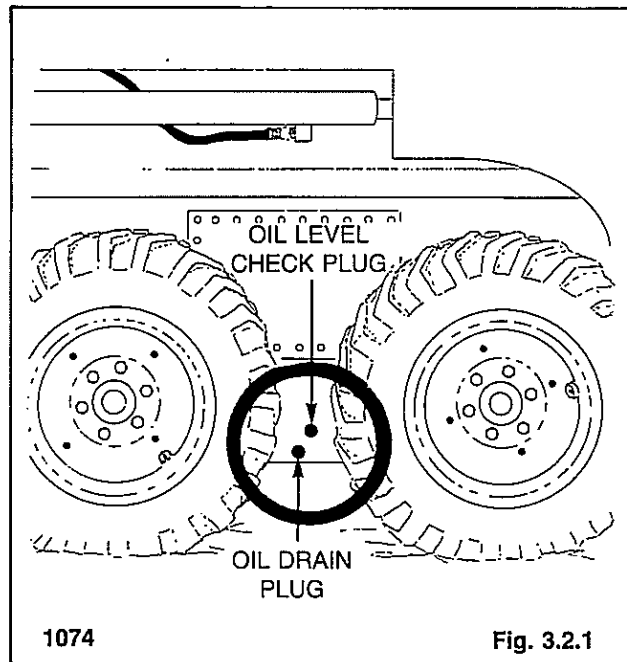
The loader has two independent final drive housings. When checking the oil level ensure the loader is on a level surface.

Remove the top check plug (fig. 3.2.1) located between the two tires. The lubricating oil level should be at the top check plug. To add oil refer to section 3.2.3.

The oil level should be checked after 50 operating hours and every 150 hours thereafter. The oil should be changed after 1000 operating hours or if it shows signs of contamination.

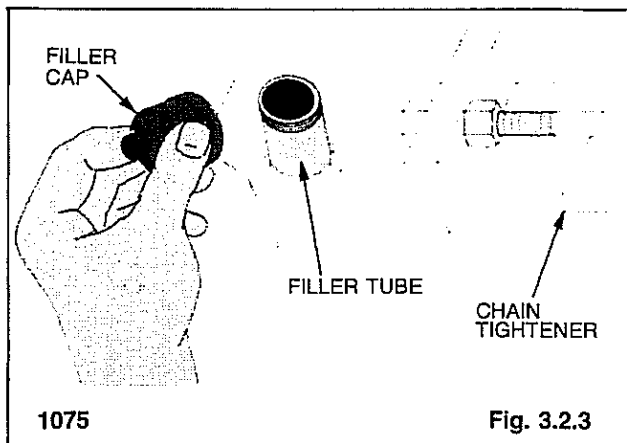
3.2.2 Draining Lubricating Oil:

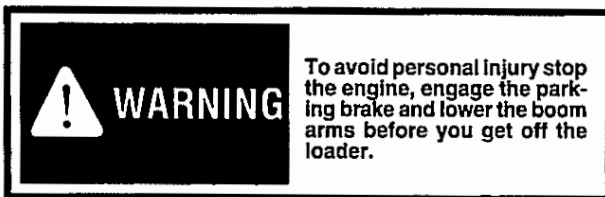
To drain the final drive lubricating oil place the loader on a level surface. Remove the oil drain plug (fig. 3.2.1) located between the two tires. Total capacity per final drive housing is 1.5 gal. (5.7 l).



3.2.3 Adding Oil:

Add oil with the loader on a level surface. Remove the filler cap (fig. 3.2.3) located inside the loader in front of each chain tightener. Remove the oil level check plug (fig. 3.2.1) located between the two tires. Fill with 10W30 API classification SE/CD oil. Total capacity per final drive housing is 1.5 gal. (5.7 l).





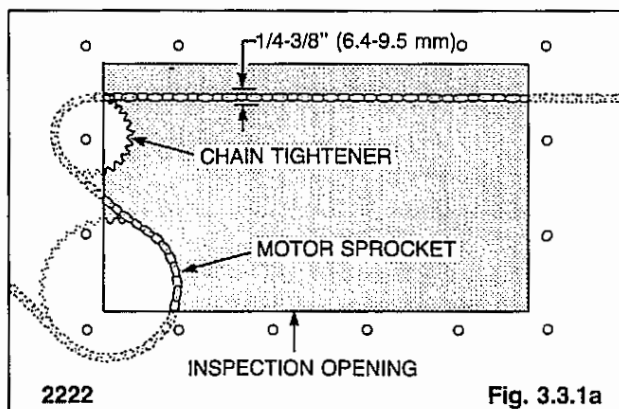
3.3 DRIVE CHAIN

3.3.1 Drive Chain Adjustment:

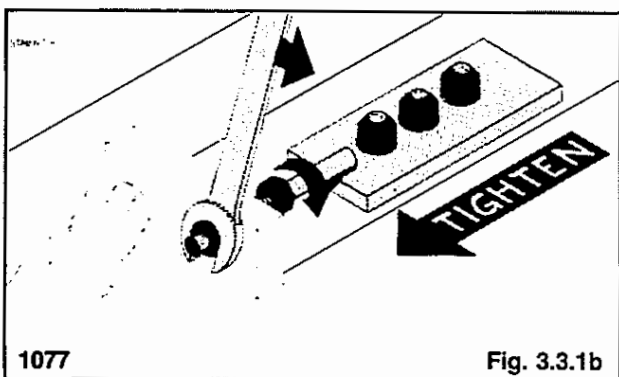
The drive chain must be checked for excessive slack after the first 50 hours of operation and every 150 hours thereafter.

To adjust, remove the wheels. On reassembly torque the wheel nuts to 100-110 ft. lbs. (135-149 N.M.). Check torque hourly until it stabilizes. Remove the final drive inspection cover located between the two axles.

With the parking brake engaged, measure the amount of free play in the chain (fig. 3.3.1a). The chain must be adjusted so there is between 1/4-3/8 inch (6.4-9.5 mm) free play.



Loosen the 3 chain tightener nuts (fig. 3.3.1), until the spring washers just begin to open. Do not overloosen or overtightening of the chain can occur.



Back off the rear adjuster nut (fig. 3.3.1b) and tighten the front adjustment nut until free play measured on the chain is between 1/4-3/8" (6.4-9.5 mm).

Tighten the rear adjuster nut and torque the 3 chain tightener nuts to 150 ft. lbs. (203 N.M.).

Repeat on opposite side of machine.

To adjust, engage the parking brake, loosen the 3 chain tightener nuts (fig. 3.3.1b), until their spring washers just begin to open. Do not overloosen the chain tightener nuts as this will allow the chain tightener inside the final drive housing to drop down and cause overtightening of the chain.

Back off the rear adjuster nut (fig. 3.3.1b) and tighten the front adjustment nut until free play measured at the chain is between 1/4 and 3/8 inch (6.4-9.5 mm).

Tighten the rear adjuster nut and torque the three chain tightener nuts to:

T103 . . . 100-110 ft. lbs. (135-149 N.M.)*

T133 . . . 150 ft. lbs. (203 N.M.)

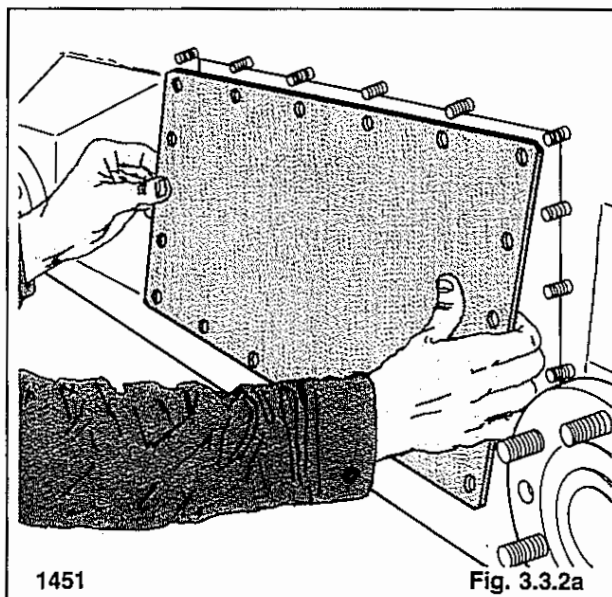
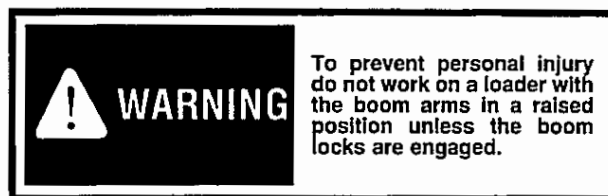
NOTE: On Model T103 prior to serial number LC000293 torque three chain tightener nuts to 100-110 ft. lbs. (135-149 N.M.).

*After S/N LC000292 with 5/8" chain tightener nuts torque to 150 ft. lbs. (203 N.M.).

Repeat the above to check and adjust the opposite side of the machine.

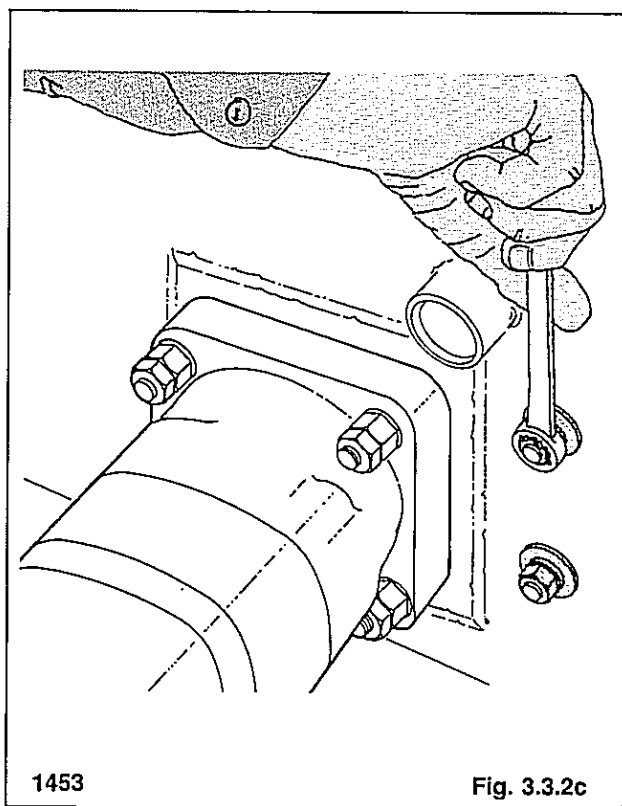
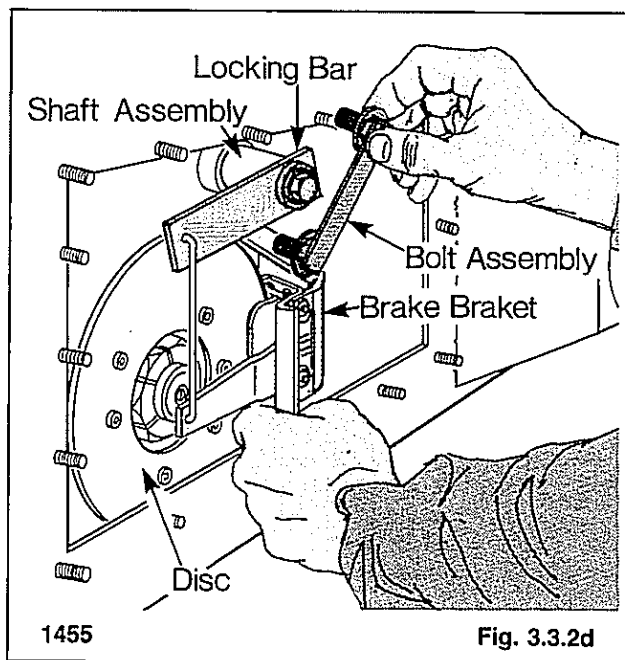
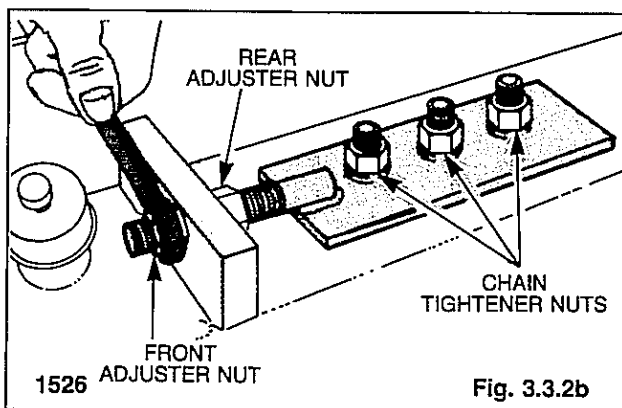
3.3.2 Chain Removal:

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.

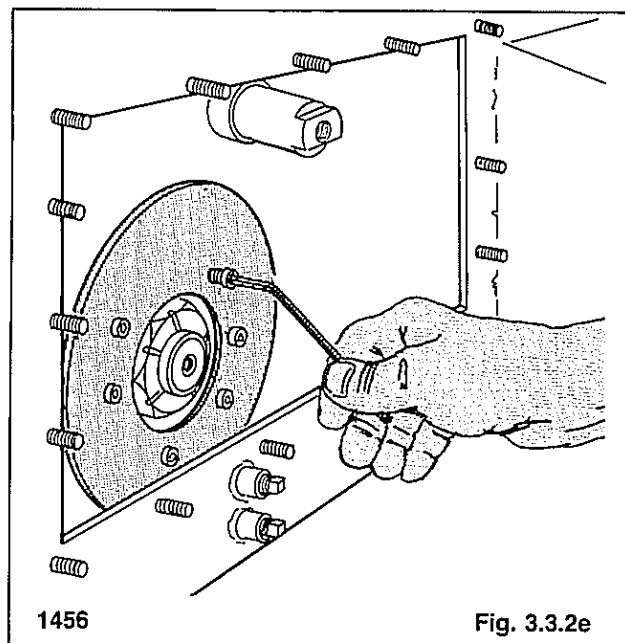


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2. Block the loader securely with all four wheels clear of the ground.
3. Remove the wheels from the side of the machine that the drive chain is to be removed from. On reassembly torque the wheel nuts to 100-110 lbs. ft. (135-149 N.M.).
4. Drain the lubricating oil from the final drive housing. Refer to section 3.2.2 for details. Total housing capacity 1.5 gal. (5.7 l).
5. Remove the final drive inspection cover (fig. 3.3.2a) located between the two axles.
6. Loosen the three chain tightener nuts (fig. 3.3.2b). Back off the front and rear adjustment nuts and move the chain tightener plate back to loosen the chain.
7. Remove two nuts located inside the loader next to the torque motor which secure the parking brake bracket (fig. 3.3.2c).
8. Remove the bolt assembly from the parking brake bracket (fig. 3.3.2d). Remove the bolt which secures the locking bar to the brake shaft. Remove the brake bracket and locking bar assembly from the loader.

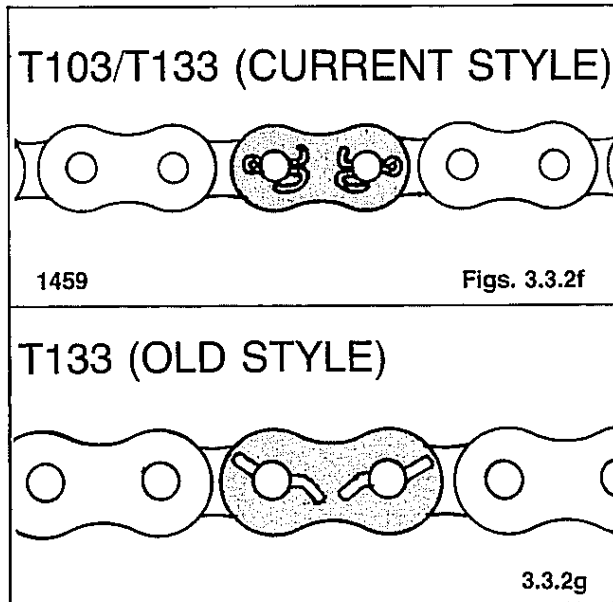


9. Remove the disc from the loader (fig. 3.3.2e). On reassembly apply Loctite RC609 to the threads on the brake disc mounting bolts.



3 FINAL DRIVE

10. Straighten and remove the connection link cotter pins (fig. 3.3.2f and fig. 3.3.2g).



IMPORTANT On reassembly install the connection link with the cotter pins facing the inspection opening of the final drive housing.

On reassembly install a new connection link and cotter pins.

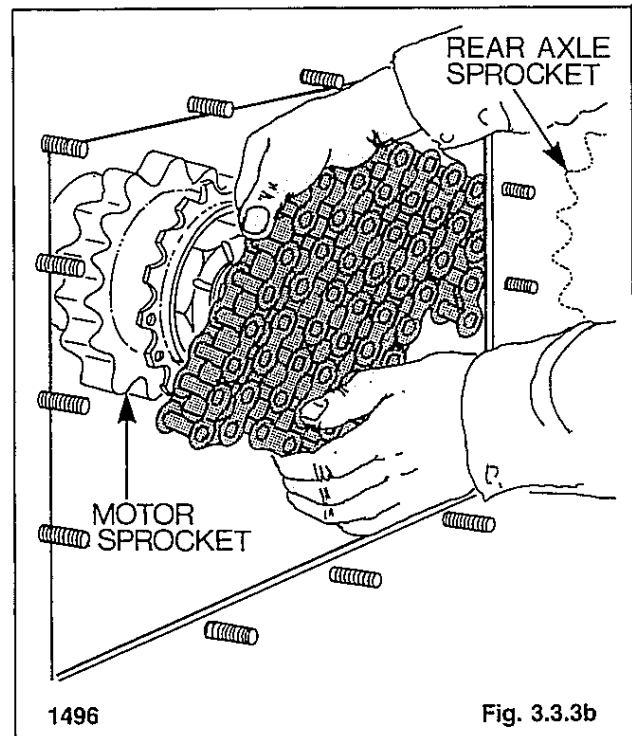
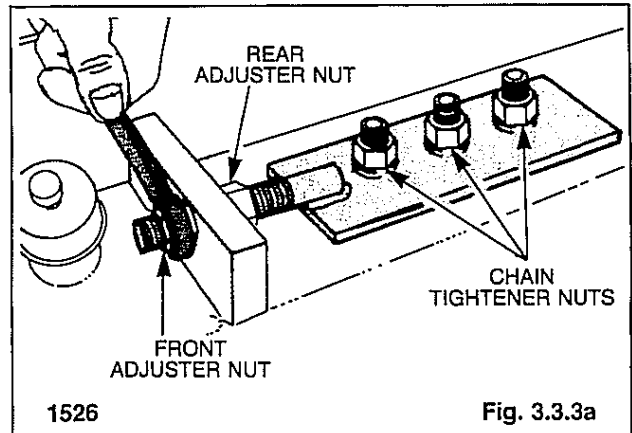
11. Remove the drive chain from the final drive housing.

3.3.3 Chain Installation:

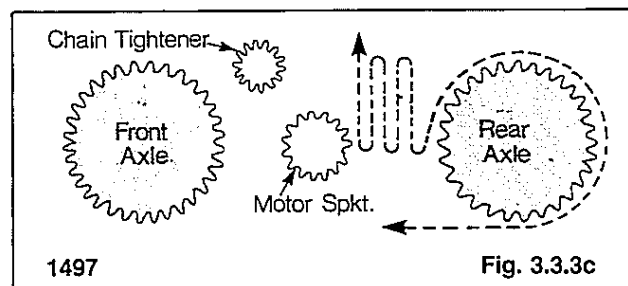
1. Loosen the three chain tightener nuts (fig. 3.3.3a). Back off the front and rear adjustment nuts and move the chain tightener plate back towards the rear of the loader.

IMPORTANT Do not overloosen the chain tightener mounting nuts. This will allow the chain tightener to drop down causing over-tightening of the chain.

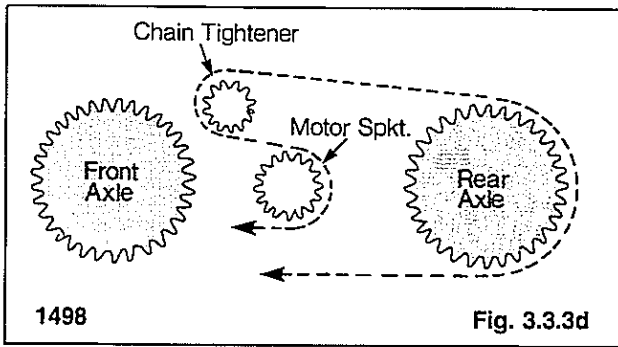
2. Wrap the chain as shown in fig. 3.3.3b and install it in the final drive housing ahead of the rear axle.



3. Wrap one end of the chain over the top of the rear axle (fig. 3.3.3c) and bring the end along the bottom of the final drive housing to approx. the center.



3 FINAL DRIVE

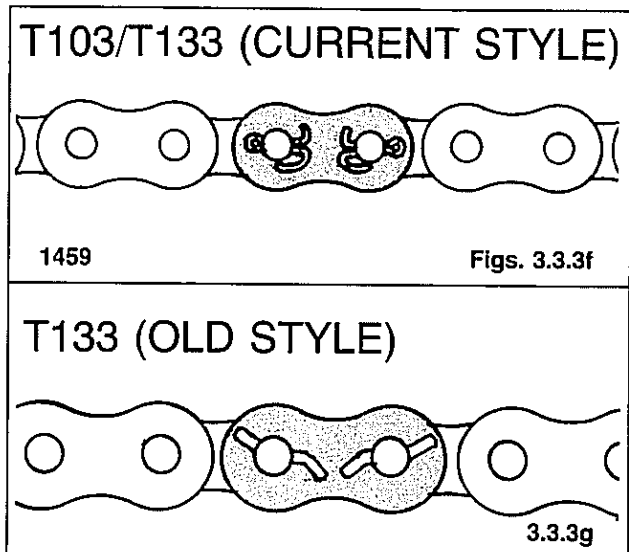
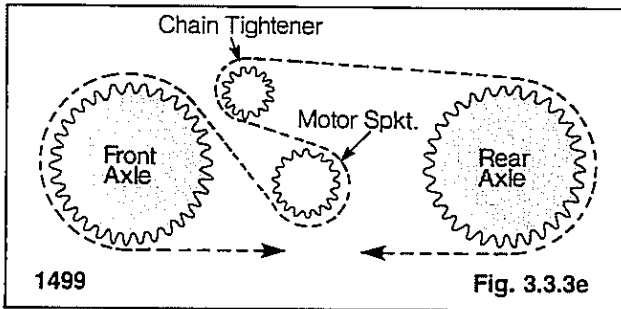


IMPORTANT

On reassembly install the connection link with the cotter pins facing the inspection opening of the final drive housing.

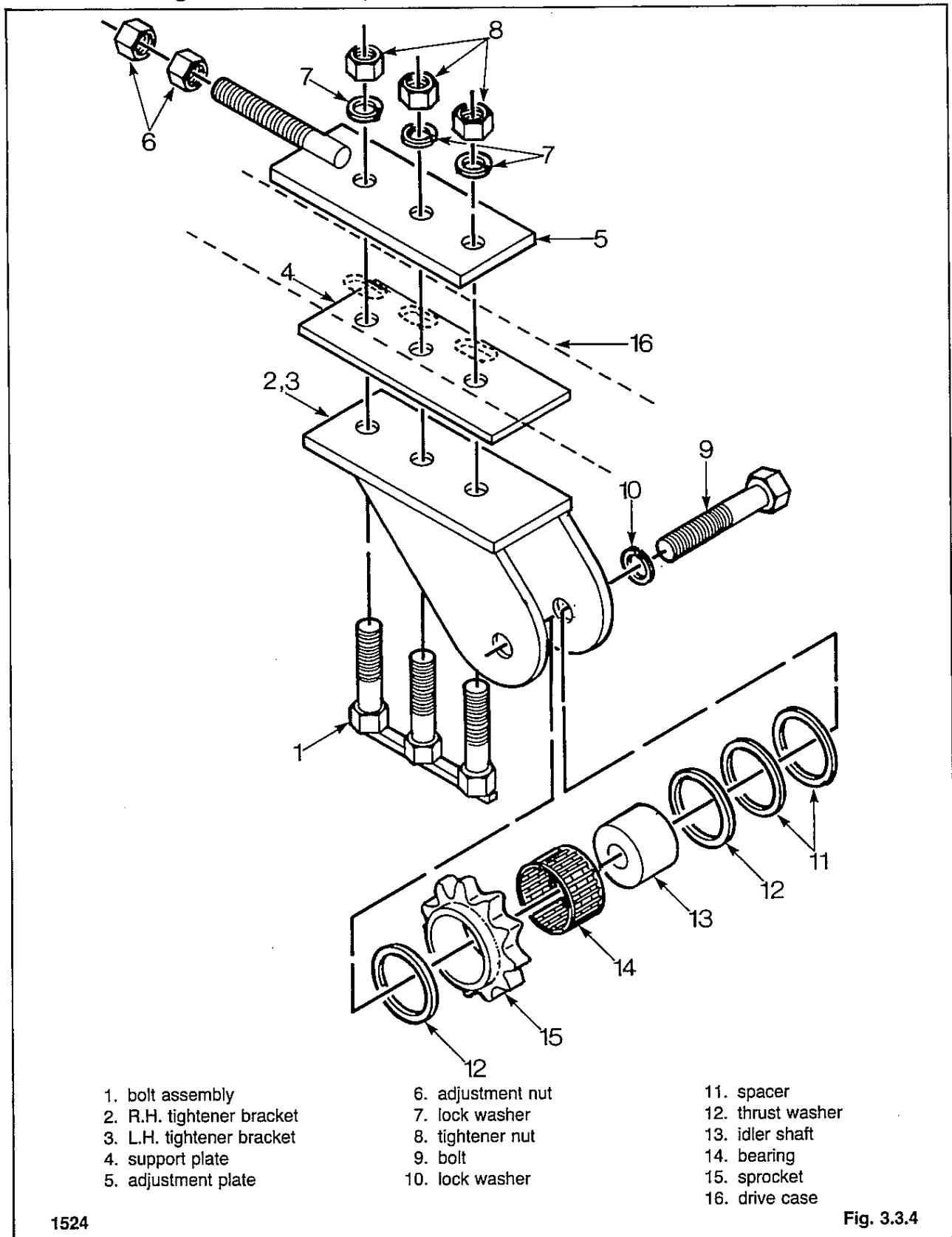
7. Install new cotter pins and lock them in position (fig. 3.3.3f & 3.3.3g).
8. Adjust the drive chain tension. Refer to section 3.3.1 for procedure.
9. Install the parking brake. Refer to section 4.5.4.

4. Wrap the other end of the chain over the top of the chain tightener sprocket and back around the motor sprocket (fig. 3.3.3d).
5. Wrap the chain over the top of the front axle sprocket and bring the end along the bottom of the final drive housing (fig. 3.3.3e).
6. Install a new connection link on the chain so that the cotter pin side of the connection link faces the final drive inspection opening.



3 FINAL DRIVE

3.3.4 Chain Tightener Assembly



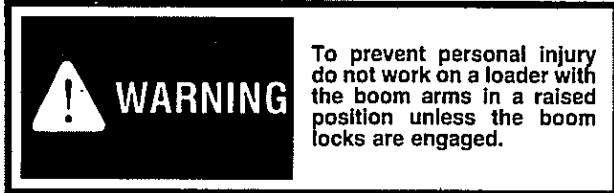
1524

Fig. 3.3.4

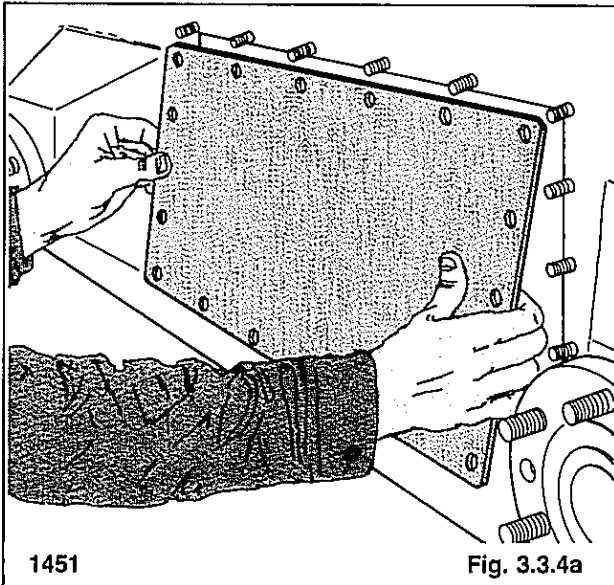
3 FINAL DRIVE

3.3.4 Chain Tightener Removal:

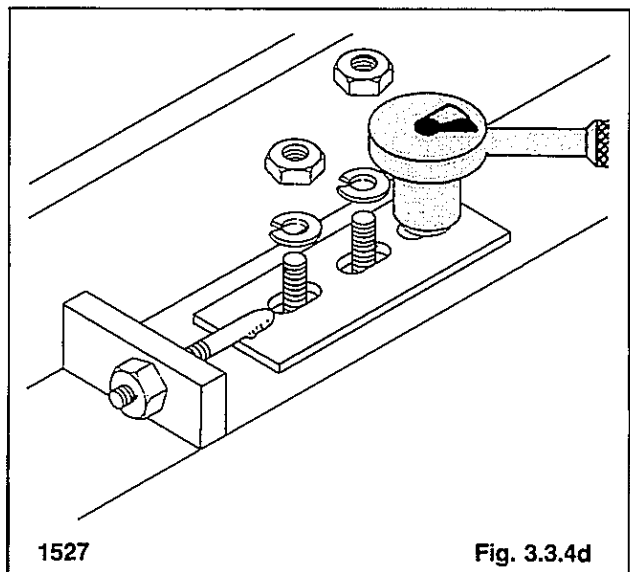
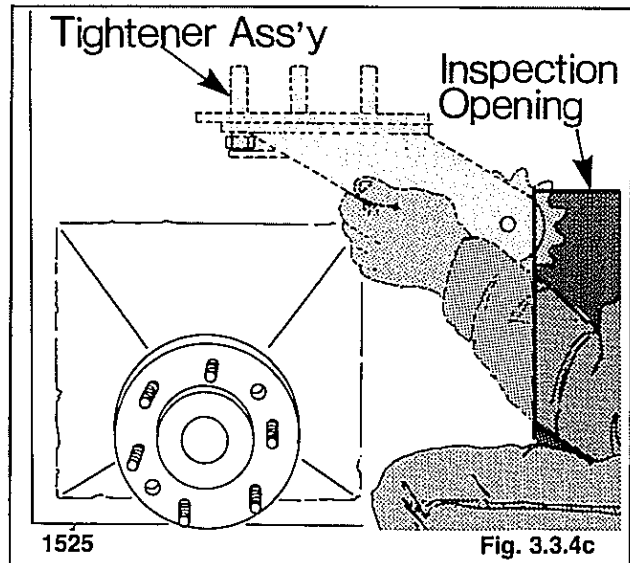
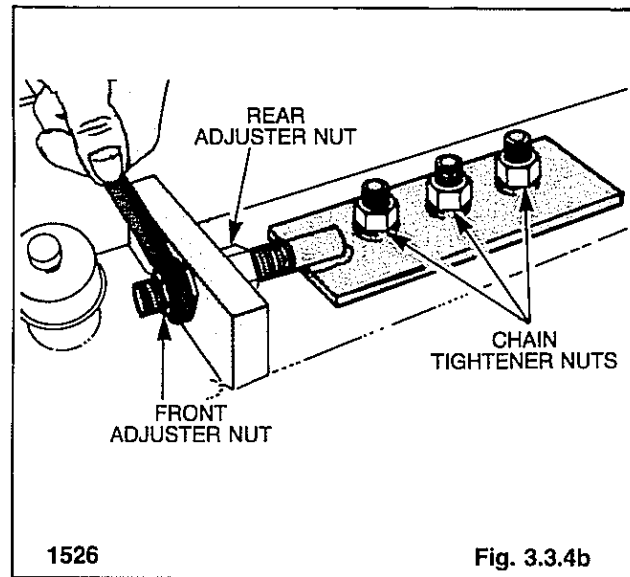
1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



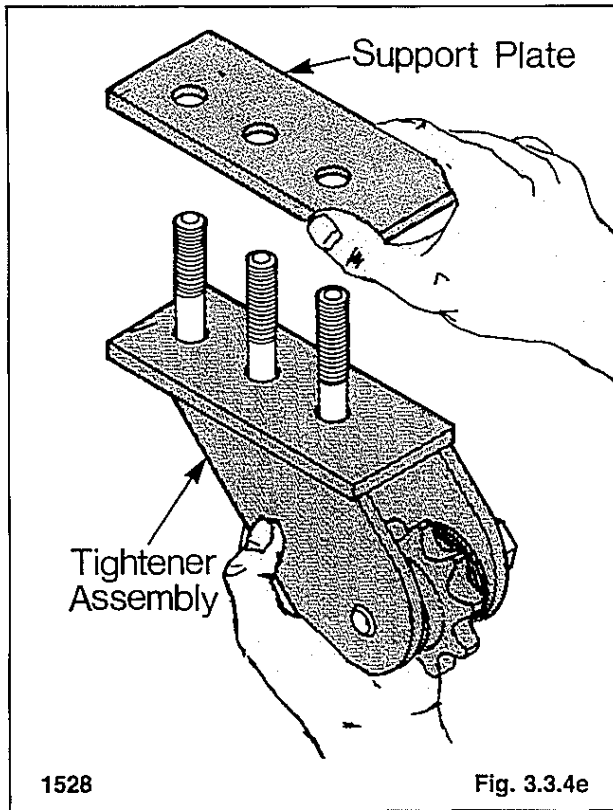
To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.



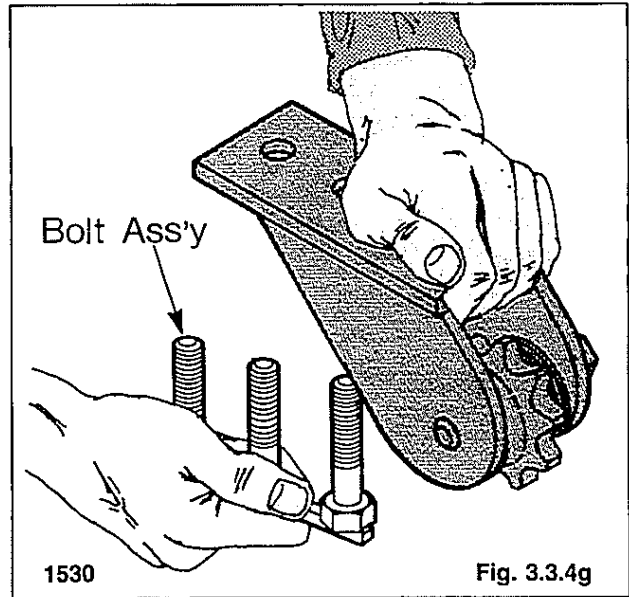
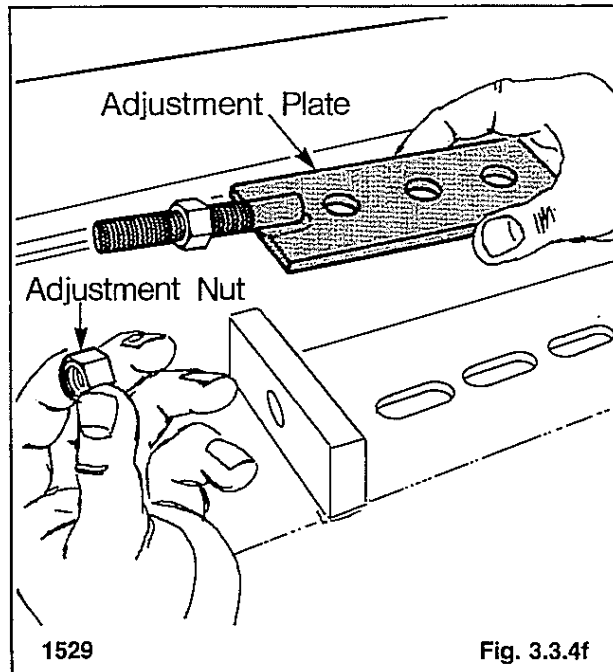
2. Block the loader securely with all four wheels clear of the ground.
3. Remove the wheels from the side of the machine that the chain tightener is to be removed from. On reassembly torque the wheel nuts to 100-110 ft. lbs. (135-149 N.M.).
4. Drain the lubricating oil from the final drive housing. Refer to section 3.2.2 for details. Total housing capacity 1.5 gal. (5.7 l).
5. Remove the final drive inspection cover (fig. 3.3.4a) located between the two axles.
6. Loosen the three chain tightener nuts (fig. 3.3.4b). Back off the front and rear adjustment nuts and move the chain tightener plate back to loosen the chain.
7. Remove the parking brake assembly and drive chain. Refer to section 3.3.2 for procedure.
8. The following procedure requires two people. One person to support the chain tightener assembly (fig. 3.3.4c) while the second person removes the three chain tightener nuts.
9. Remove the three chain tightener nuts and lock washers (fig. 3.3.4d).



3 FINAL DRIVE

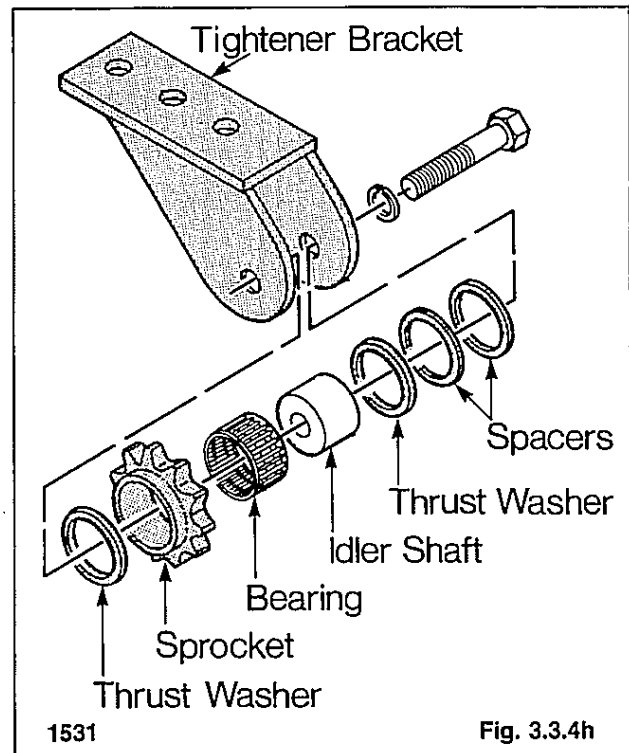


10. Remove the chain tightener assembly and support plate from the final drive housing (fig. 3.3.4e).
11. Remove the front adjustment nut from the adjustment plate and remove the adjustment plate from the loader (fig. 3.3.4f).



12. Remove the bolt assembly from the chain tightener (fig. 3.3.4g).
13. Remove the bolt and spring washer (fig. 3.3.4h) from the tightener bracket. On reassembly apply Locktite No. RC609 to the bolt threads.
14. Remove the sprocket, bearing, idler shaft, thrust washers (2) and spacers (2) from the tightener bracket (fig. 3.3.4h).

NOTE: The chain tightener bearing on the T103 is an oilite bearing.



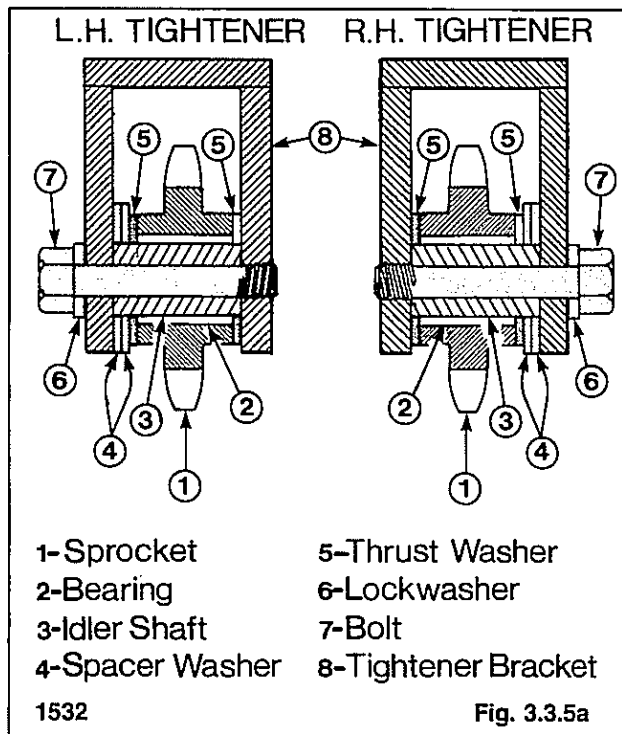
3 FINAL DRIVE

3.3.5 Chain Tightener Installation:

1. Assemble left and right hand chain tightener assemblies as shown in figure 3.3.5a. For correct chain alignment place both spacer washers on the bolt head side of the tightener bracket.

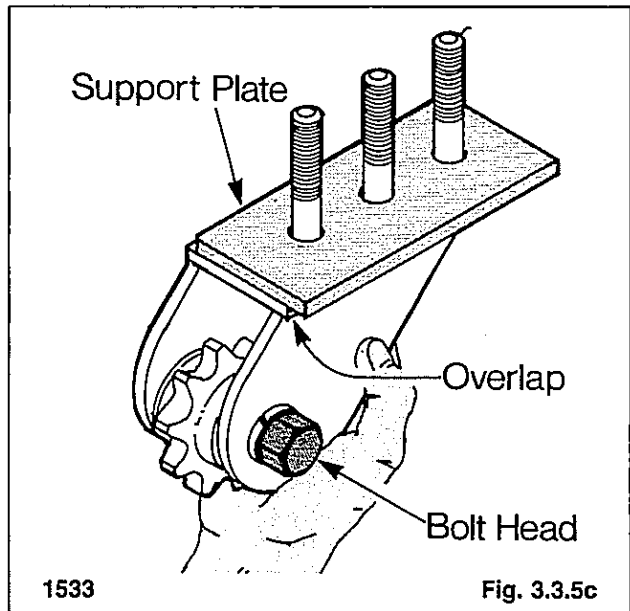
When installed in the loader, the bolt head side of the tightener bracket will face the outside (tire side) of the transmission housing.

NOTE: On reassembly apply Locktite No. RC609 to the threads of the bolt (7) — fig. 3.3.5a.

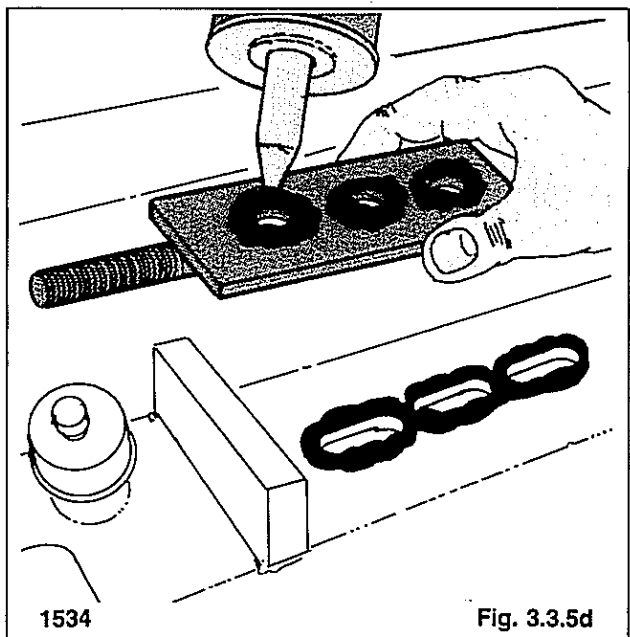
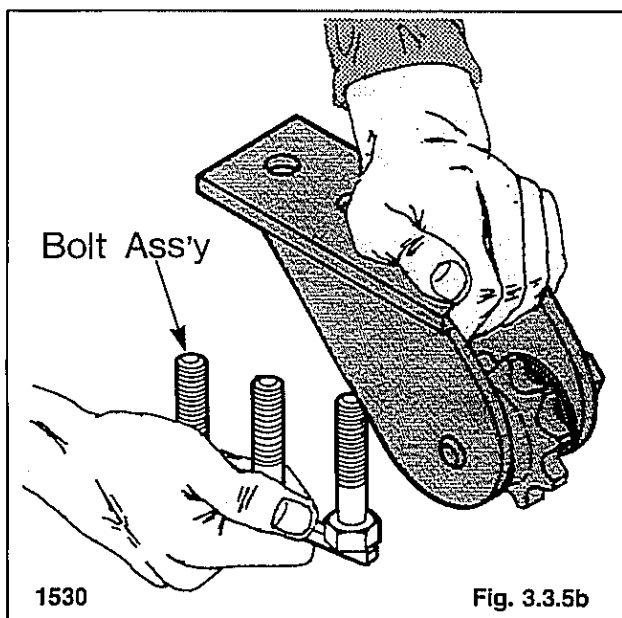


2. Install the bolt assembly in the tightener (fig. 3.3.5b).
3. Install the support plate on the chain tightener. The support plate holes are drilled off center. Install the support plate so that it extends beyond the chain tightener bracket on the bolt head side (fig. 3.3.5c).

If the support plate is installed incorrectly the chain tightener assembly will not sit flat inside the final drive housing.



4. Apply sealant part number TH25252 (or Loctite, Permatex, Form a Gasket #2) around the slots in the main frame and to the bottom of the adjustment plate (fig. 3.3.5d) to prevent water entering the final drive housing around the chain tightener assembly.



3 FINAL DRIVE

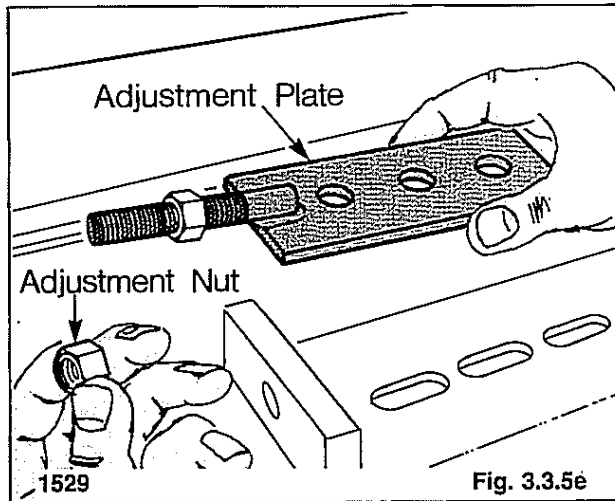


Fig. 3.3.5e

5. Install the adjustment plate and the front and rear adjustment nuts (fig. 3.3.5e).
6. The following procedure requires two people. One to hold the chain tightener assembly in place while the second person installs the three tightener nuts.

Install the chain tightener assembly in the final drive housing (fig. 3.3.5f).

Apply sealant part number TH25252 (Loctite, Permatex, Form a Gasket #2) around the threads of the tightener bolt assembly (fig. 3.3.5g) to prevent water entering the final drive housing.

Install the three lockwashers and nuts (fig. 3.3.5h). Do not tighten enough to flatten the lockwashers.

7. Install the drive chain and parking brake assembly in the final drive housing. Refer to section 3.3.3 for procedure.
8. Install the drain plug in the final drive housing and fill the housing to the check plug level with 10W30 API classification SE, CD oil. Total capacity per housing is 1.5 gal. (5.7 l).
9. Apply silicon sealer to the inspection cover and install the cover on the final drive housing (fig. 3.3.5j).

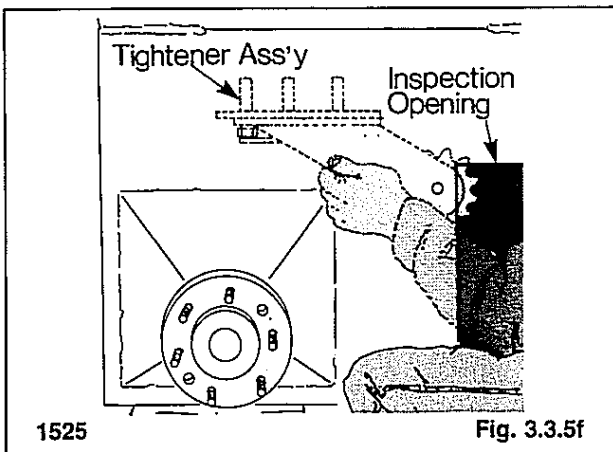


Fig. 3.3.5f

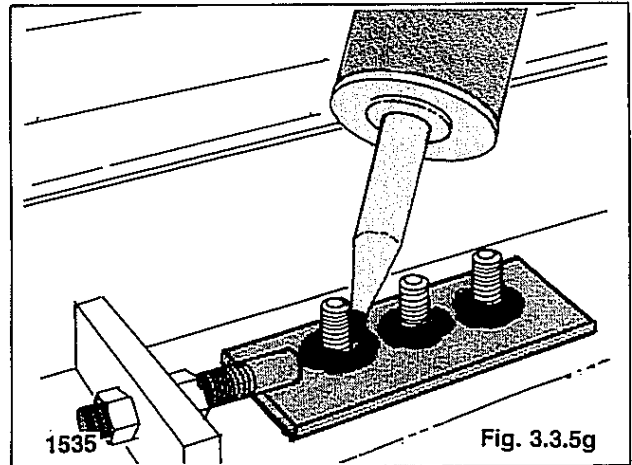


Fig. 3.3.5g

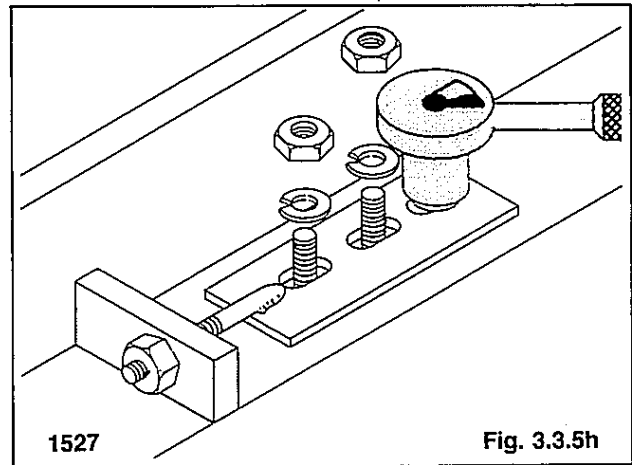


Fig. 3.3.5h

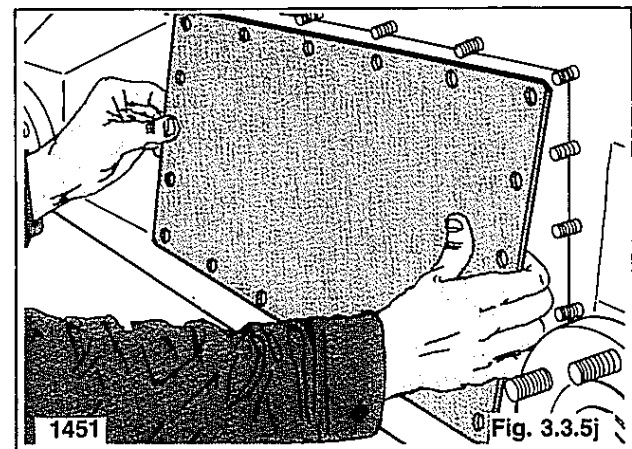


Fig. 3.3.5j

10. Install the wheels. Torque the wheel nuts to 100-110 lbs. ft. (135-149 N.M.).

11. Adjust the chain tension as per section 3.3.1. After adjusting the chain, torque the three chain tightener nuts to:

T103 ... *100-110 ft. lbs. (135-149 N.M.)

T133 ... 150 ft. lbs. (203 N.M.)

*After S/N LC000292 with 5/8" chain tightener nuts torque to 150 ft. lbs. (203 N.M.).

3.4 AXLE ASSEMBLY

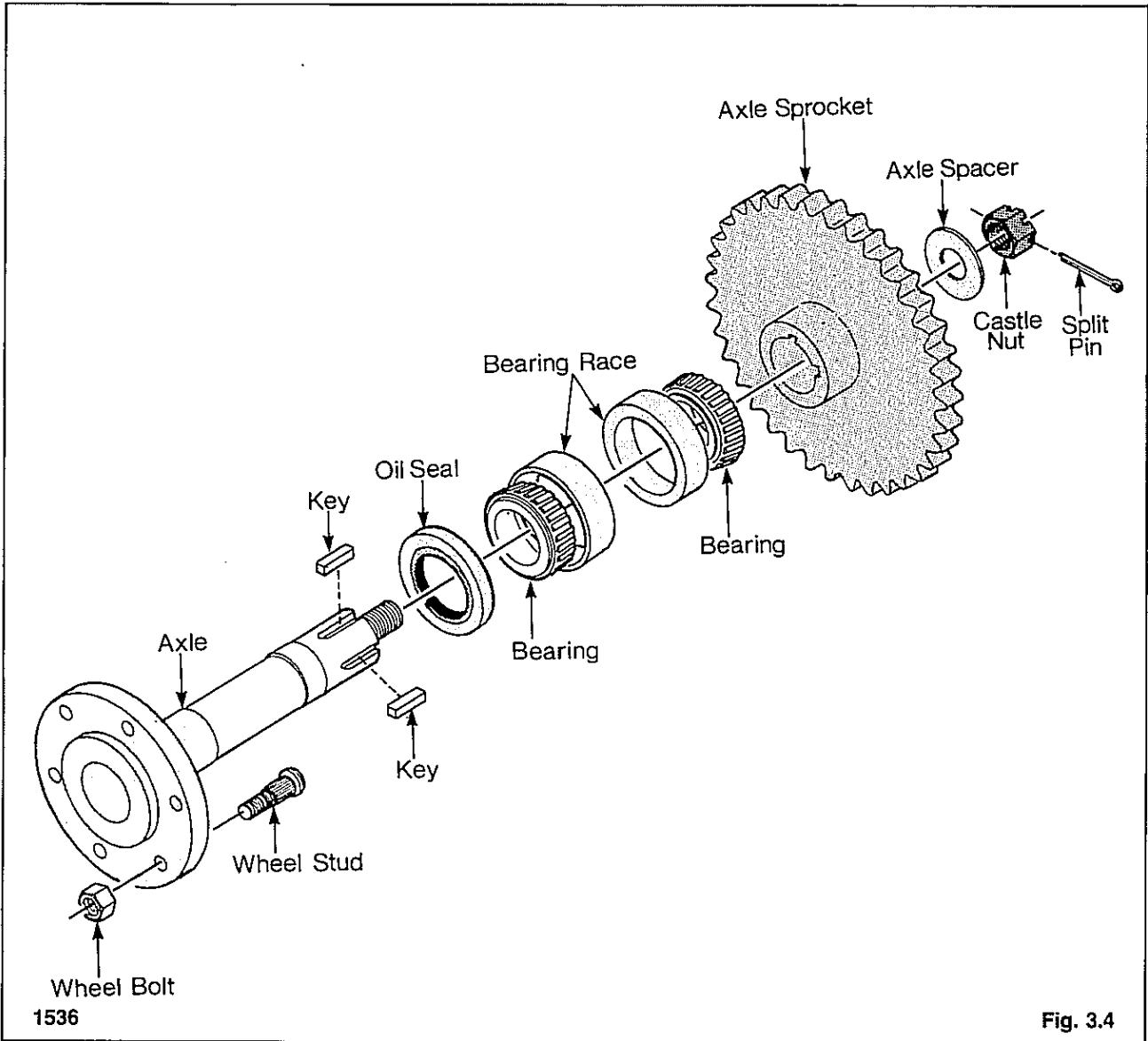
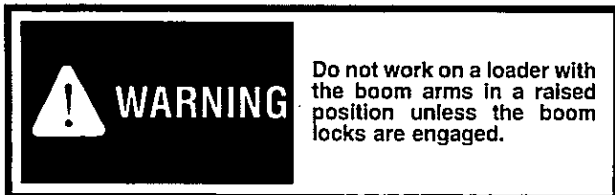


Fig. 3.4

3.4.1 Axle Removal:

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



2. Block the loader securely with all four wheels clear of the ground.

3. Remove the wheels on the side of the loader that the axle is to be removed from.

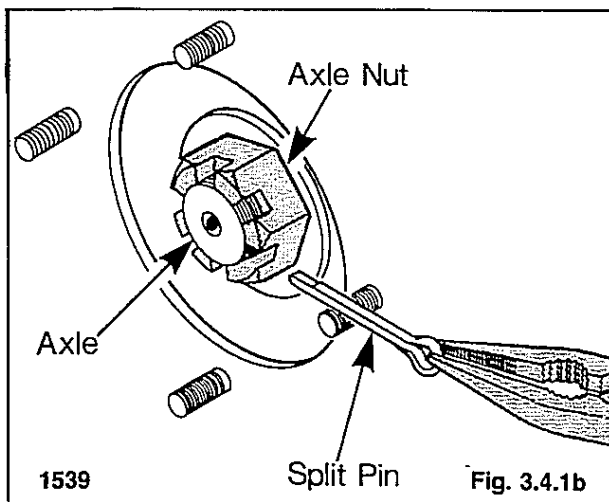
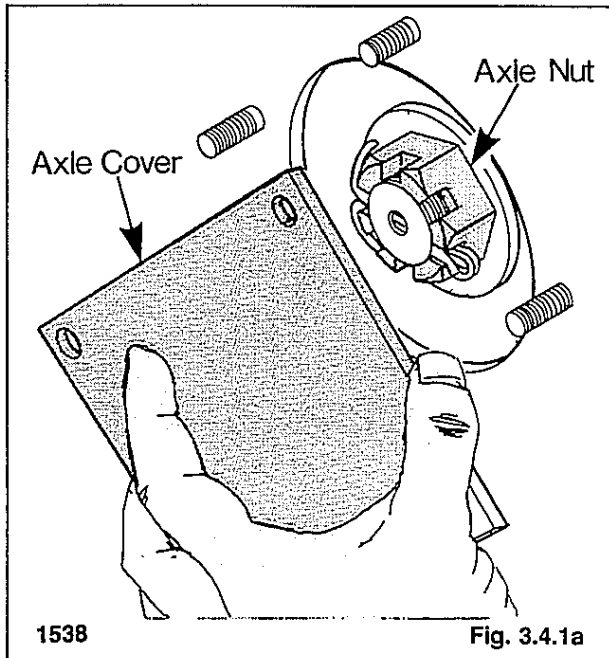
On reassembly torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).

4. Drain the lubricating oil from the final drive housing. Refer to section 3.2.2 for procedure. Total housing capacity 1.5 gal. (5.7 l).
5. Remove the final drive inspection cover located between the two axles.
6. Remove the parking brake assembly and drive chain from the final drive housing. Refer to section 3.3.2 for procedure.

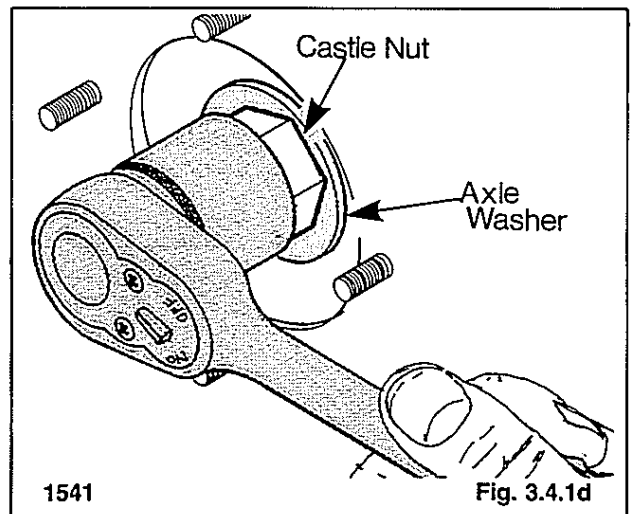
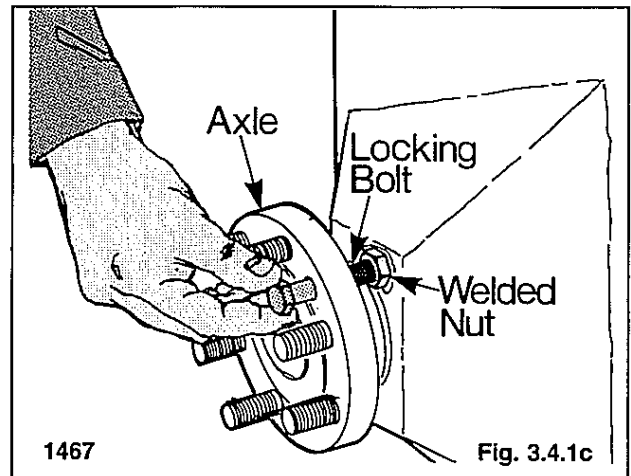
3 FINAL DRIVE

7. FRONT AXLE — remove the foot pedal assembly. Refer to section 4.2 for procedure. Remove the axle cover plate (fig. 3.4.1a) from the inside of the final drive housing.

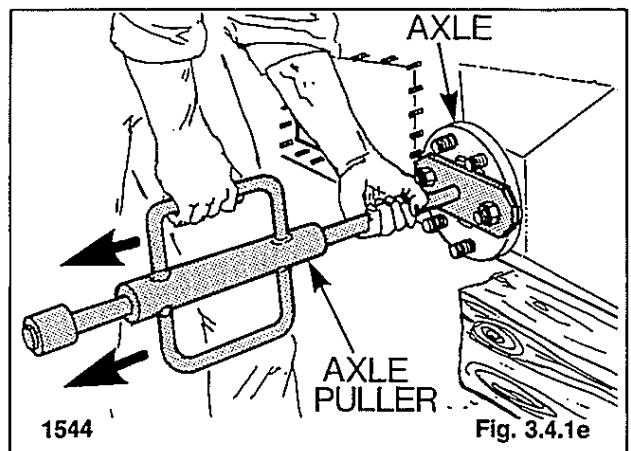
REAR AXLE — remove the axle cover plate (fig. 3.4.1a) from the inside of the final drive housing.



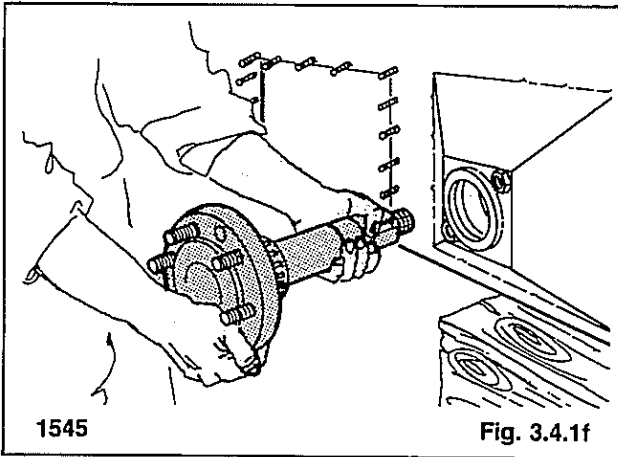
8. Remove the split pin from the castle nut on the end of the axle (fig. 3.4.1b).
9. Install a bolt, 1/2 inch UNC approx. 3 in. long, through the axle flange (fig. 3.4.1c) to prevent the axle from turning as the rear castle nut is removed.
10. Remove the rear castle nut and axle washer (fig. 3.4.1d).
11. Remove the bolt from the axle flange which was installed in step 9.



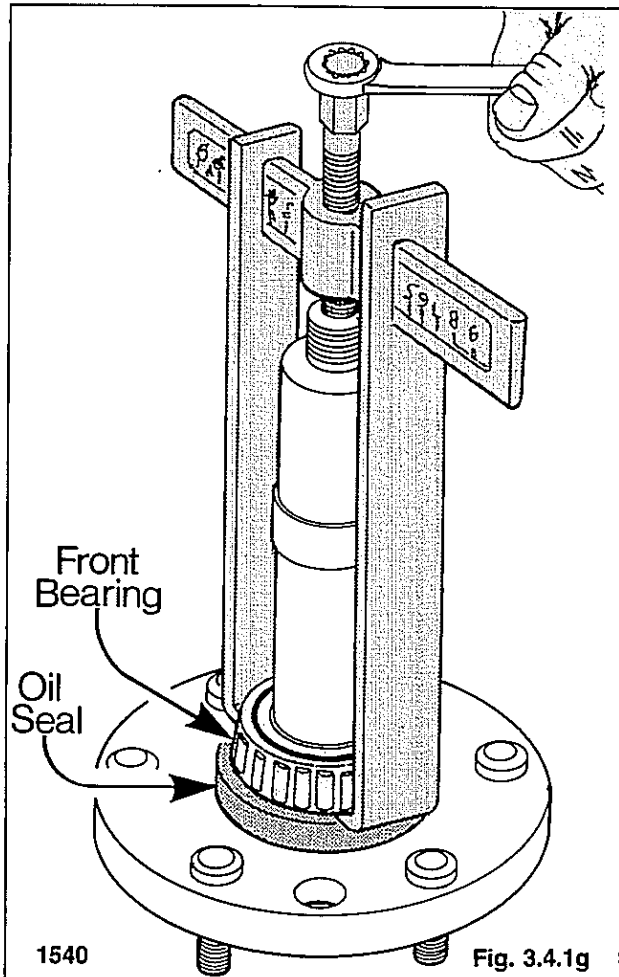
12. Attach special tool TH955283 to the axle flange (fig. 3.4.1e).
13. Using the special axle puller tool (sliding hammer) remove the rear bearing from the end of the axle (fig. 3.4.1e). The rear bearing and axle sprocket will remain inside the final drive housing.



3 FINAL DRIVE

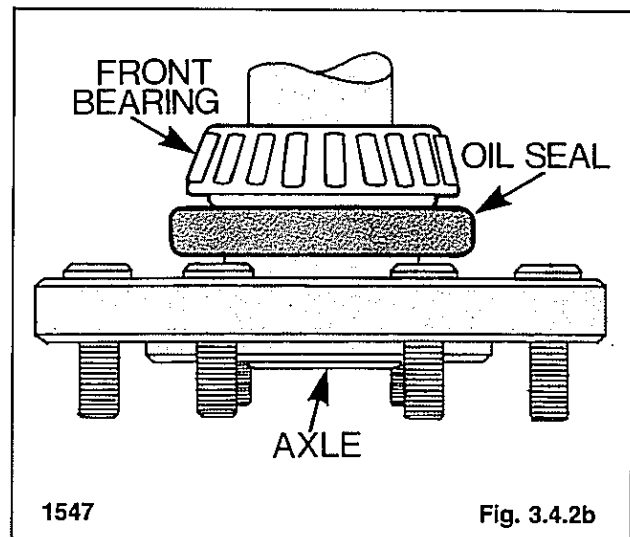
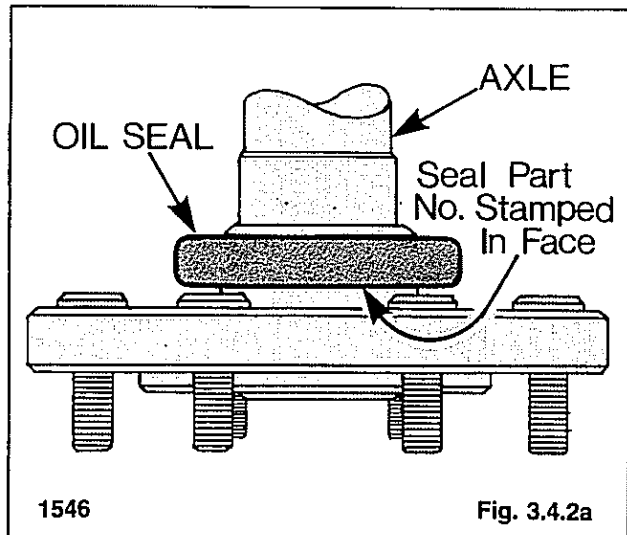


14. Remove the axle assembly from the final drive housing (fig. 3.4.1f).
15. Remove the axle sprocket and rear bearing from the final drive housing through the inspection cover.
16. Using a bearing puller remove the front axle bearing (fig. 3.4.1g) from the axle.
17. Remove and discard the axle oil seal.



3.4.2 Axle Installation:

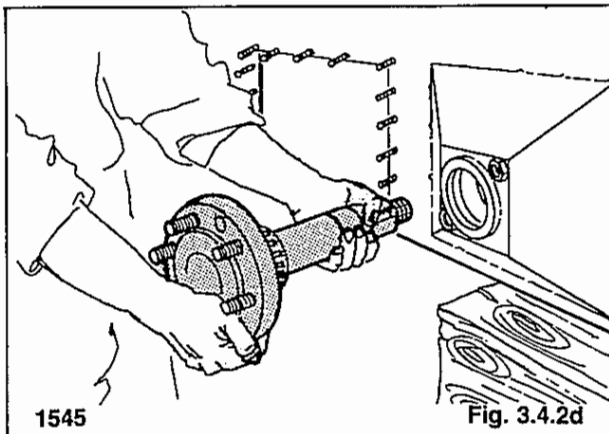
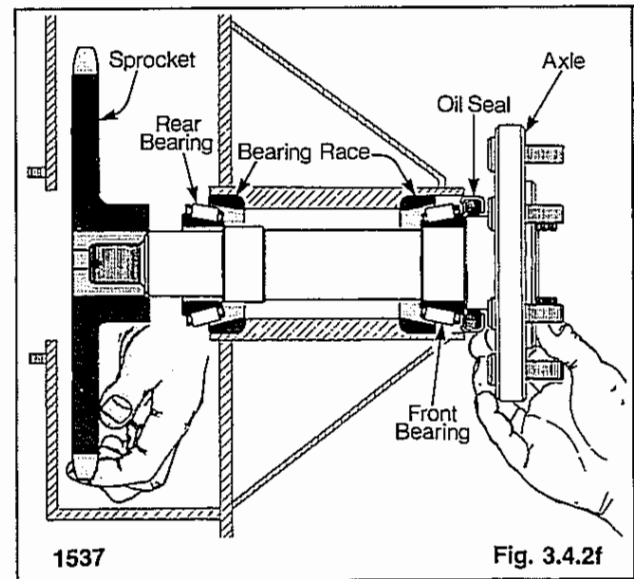
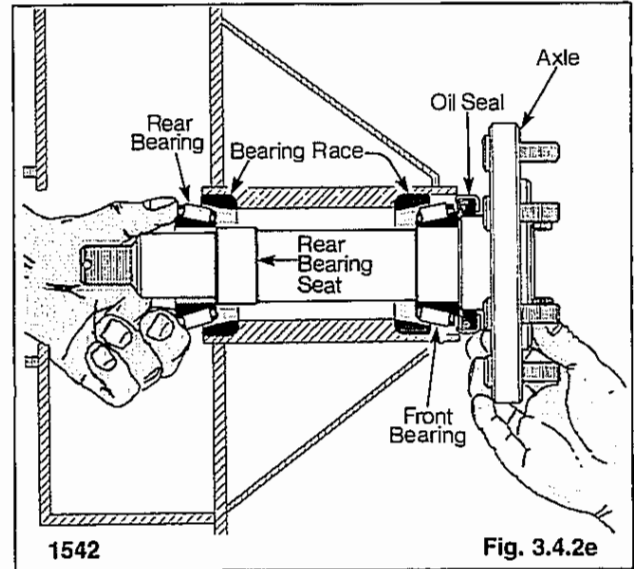
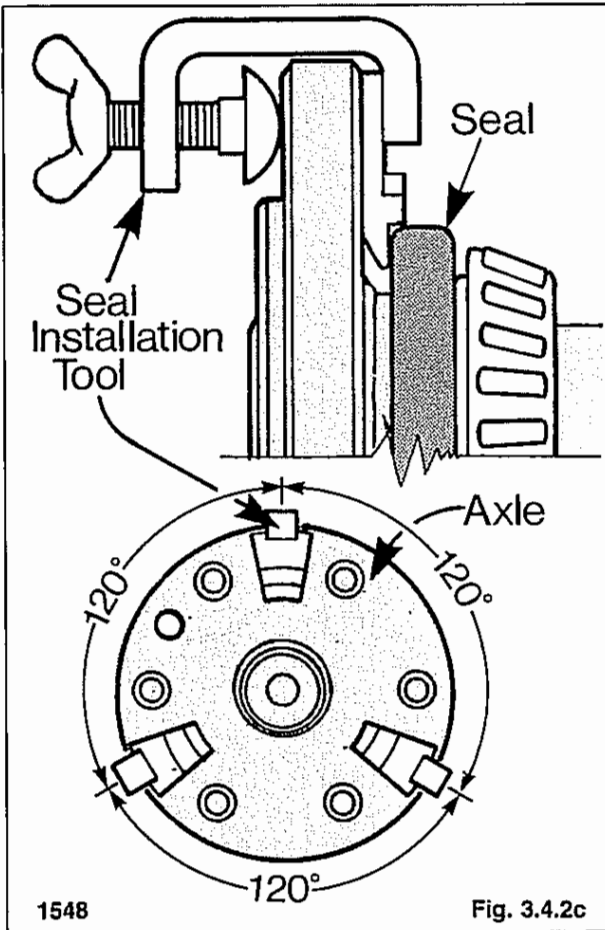
1. Lubricate the axle oil seal and install it on the seal surface of the axle. The seal part number stamped on the face of the seal must face the flange end of the axle (fig. 3.4.2a).



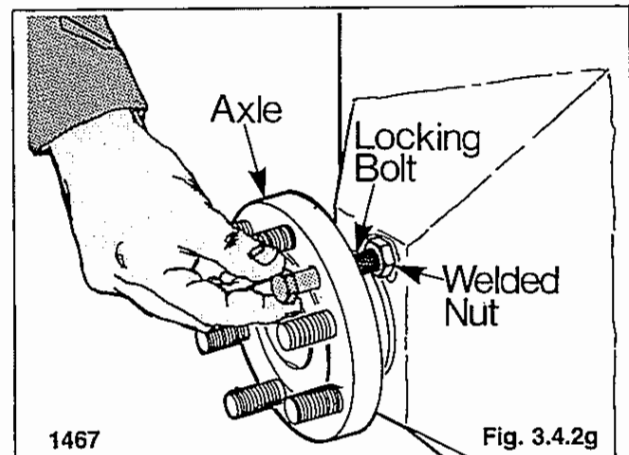
2. Using a bearing heater, heat the front axle bearing and press it on the axle (fig. 3.4.2b). Be sure the bearing is seated.
3. Place 3 seal installation tools (special tool TH955281) 120° apart around the axle flange (fig. 3.4.2c).

The seal installation tools will properly seat the axle seal in the final drive housing as the axle is installed.

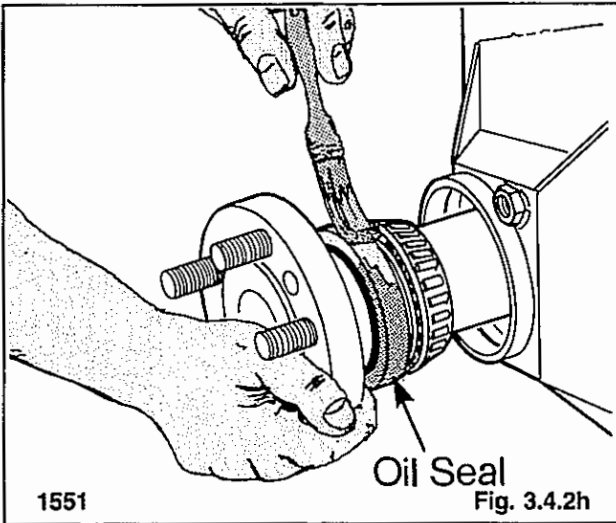
3 FINAL DRIVE



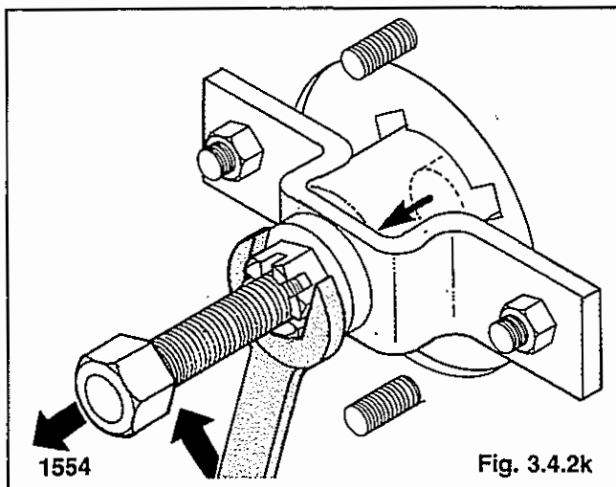
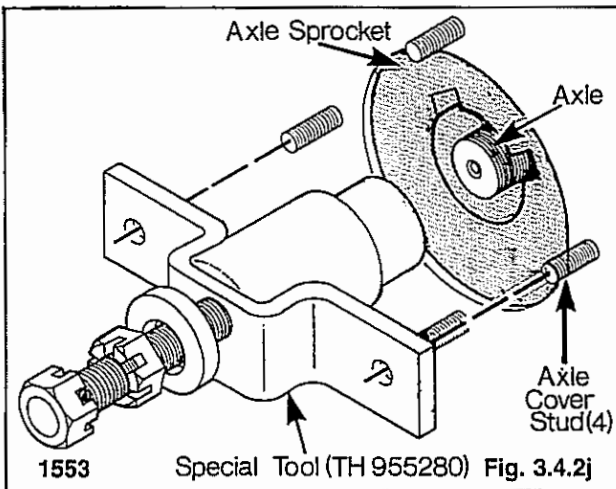
4. Install the axle in the final drive housing (fig. 3.4.2d).
5. Reach in through the inspection opening and install the rear axle bearing on the axle (fig. 3.4.2e). Line the bearing up with the bearing seat on the axle.
6. Reach in through the inspection opening and install the axle sprocket on the axle (fig. 3.4.2f). Make sure the sprocket starts on the axle. The hub end of the sprocket must face the flange end of the axle.
7. Place a bolt through the hole in the axle flange (fig. 3.4.2g) to prevent the axle from turning.



3 FINAL DRIVE

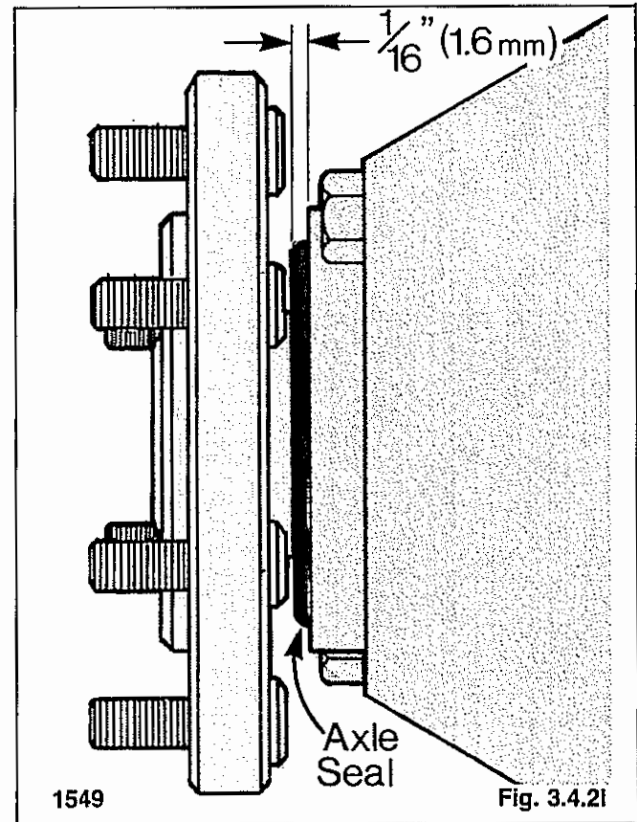


8. Apply a gasket sealing compound to the outside diameter of the axle oil seal (fig. 3.4.2h).
9. Place the legs of the axle installation tool (TH955280) over two of the rear axle cover studs and screw the tool onto the threaded end of the axle protruding through the sprocket bore (fig. 3.4.2j).

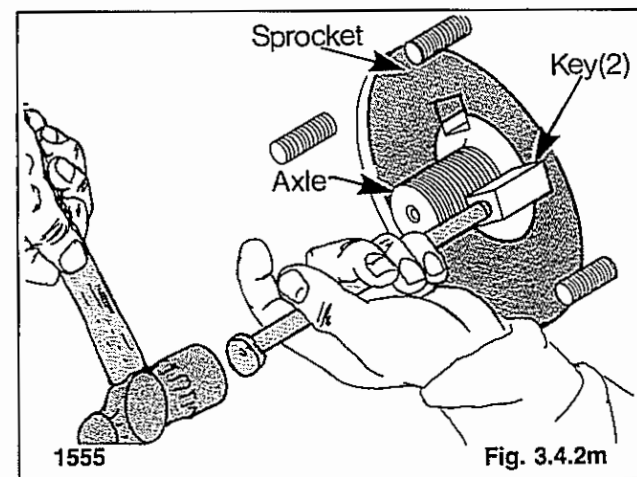


10. Tighten the axle installation tool (fig. 3.4.2k) and draw the axle through the sprocket until the three seal installation tools are touching the front of the housing.
11. Remove the axle installation tool and the three seal installation tools from the axle.

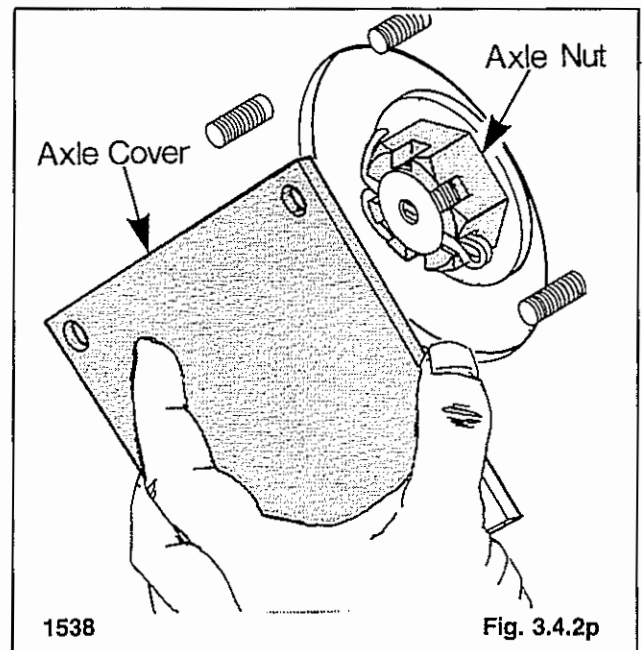
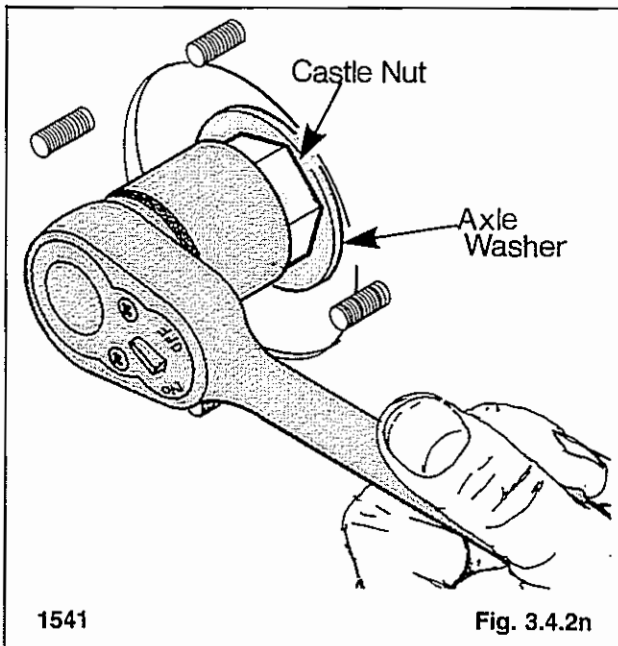
The axle seal will extend approximately 1/16 inch (1.6 mm) beyond the face of the final drive housing (fig. 3.4.2l).



12. Reach in through the final drive inspection opening and turn the sprocket to line up with the key ways on the axle. Install the axle keys (fig. 3.4.2m).

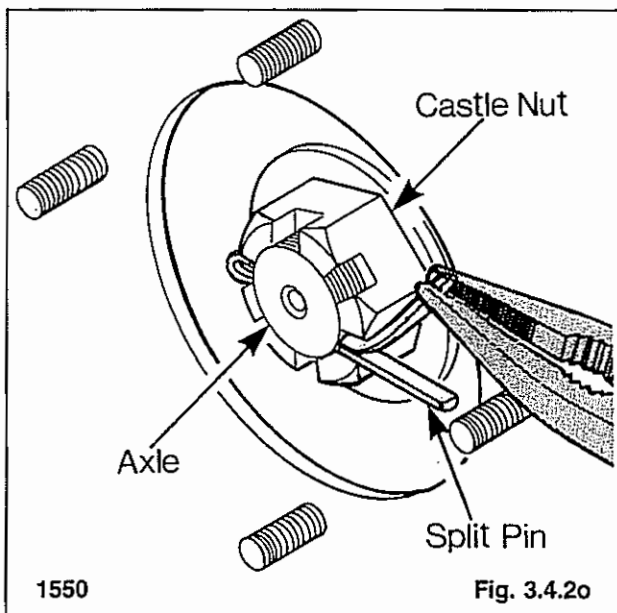


3 FINAL DRIVE



13. Install the axle spacer and castle nut and preload the axle bearings to zero (0) end play (fig. 3.4.2n).
14. Install the split pin through the castle nut (fig. 3.4.2o).

17. Fill the final drive housing to the correct level with 10W30 API SE/CD oil. Refer to section 3.2.3 for procedure. Total capacity per housing 1.5 gal. (5.7 l).
18. Install the final drive inspection cover.
19. Install the wheels. Torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).

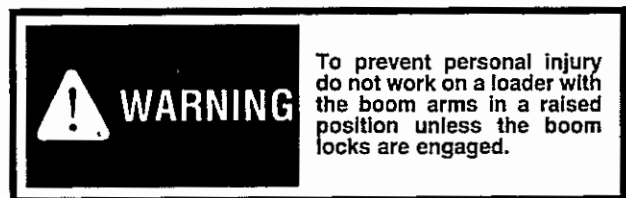


15. REAR AXLE — install the rear axle cover (fig. 3.4.2p).
FRONT AXLE — install the rear axle cover (fig. 3.4.2p). Install the foot pedal assembly. Refer to section 4.2 for procedure.
16. Install the drive chain and parking brake assembly. Refer to section 3.3.3 for procedure.

3.4.3 Axle Stud Replacement:



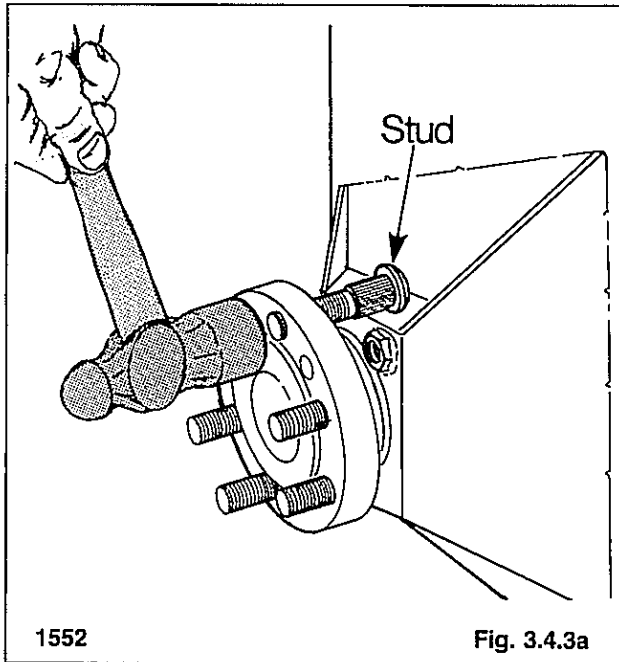
1. Lower the boom arms. Shut off the engine.



2. Raise and block the loader securely with the wheels on the side of the loader that the stud is to be replaced, clear of the ground.

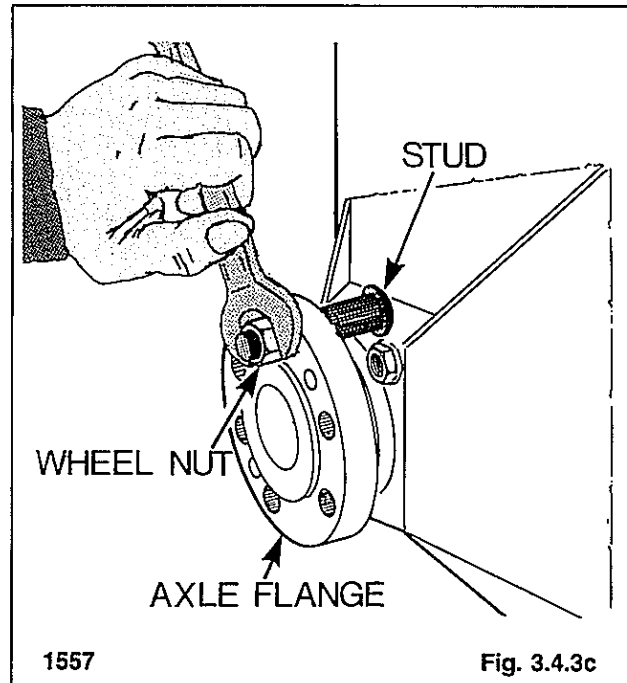
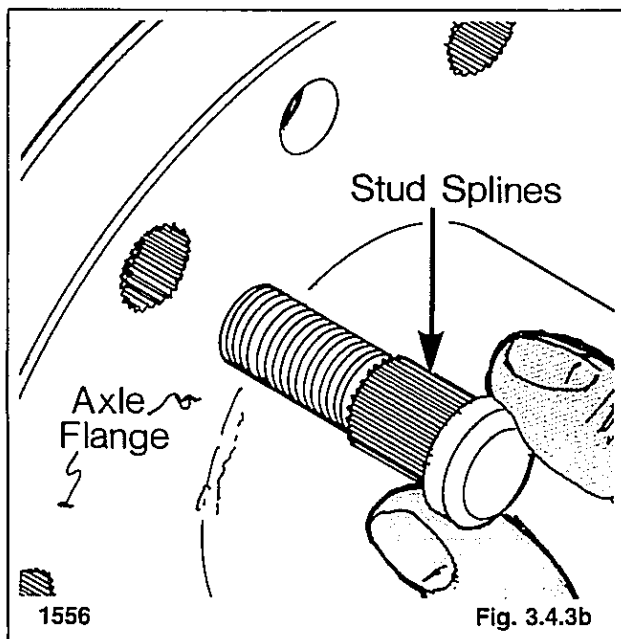
3 FINAL DRIVE

3. Remove the wheel. On reassembly torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).
4. Remove the damaged or broken stud (fig. 3.4.3a).



5. Install a new stud from the back of the axle flange (fig. 3.4.3b). Line up the splines on the stud with the splines cut into the axle flange.

On machines prior to serial number LC000210 or LE000537 it is necessary to remove the axle castle nut and pull the axle out far enough to install the stud.

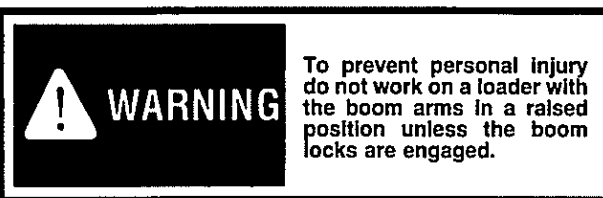


6. Place a nut on the stud and tighten it to draw the stud into the axle flange (fig. 3.4.3c).
7. Replace the wheel and torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).

3.5 DRIVE MOTOR SPROCKET

3.5.1 Sprocket Removal:

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



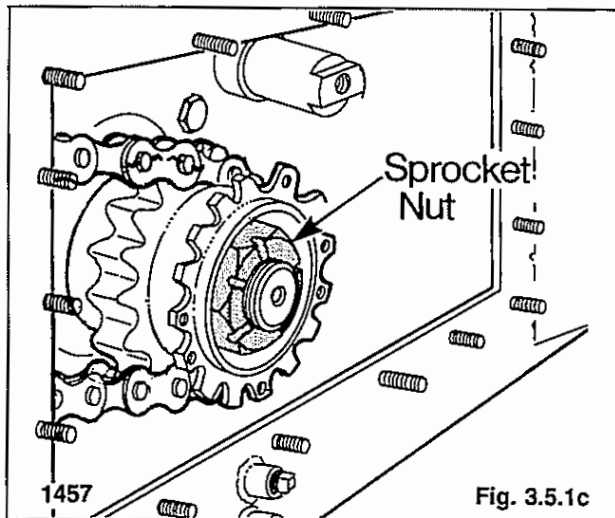
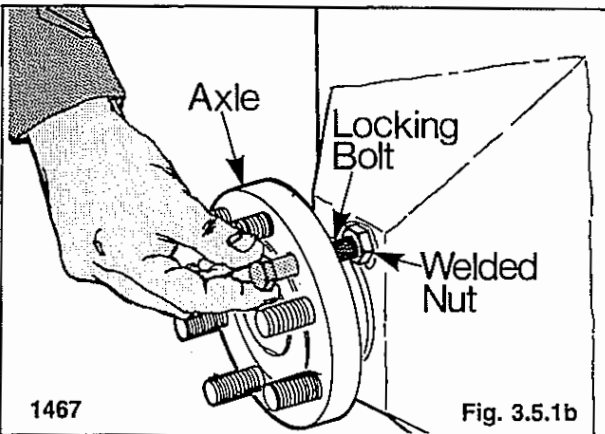
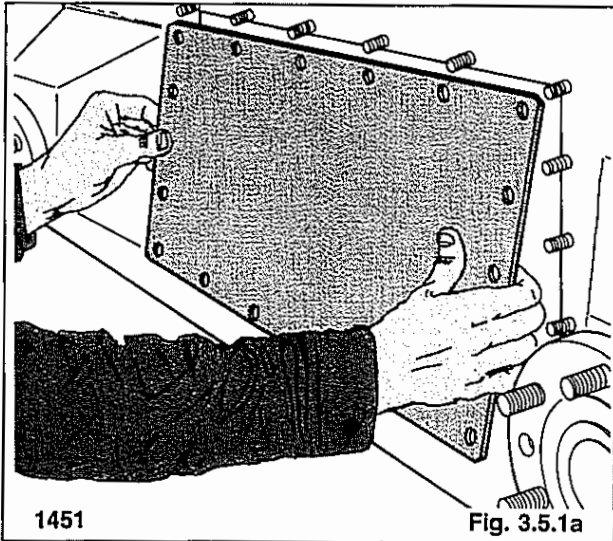
2. Block the loader securely with all four wheels clear of the ground.
3. Remove the wheels on the side of the loader that the drive motor sprocket is to be removed from.

On reassembly torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).

4. Drain the lubricating oil from the final drive housing. Refer to section 3.2.2 for procedure. Total housing capacity 1.5 gal. (5.7 l).

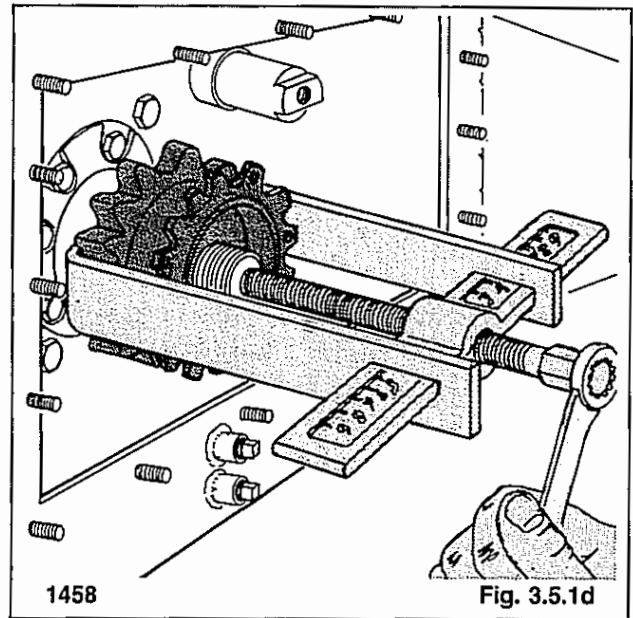
3 FINAL DRIVE

5. Remove the final drive inspection cover plate (fig. 3.5.1a) located between the axles on the final drive housing.
6. Remove the parking brake assembly from the final drive housing. Refer to section 4.5 for procedure.



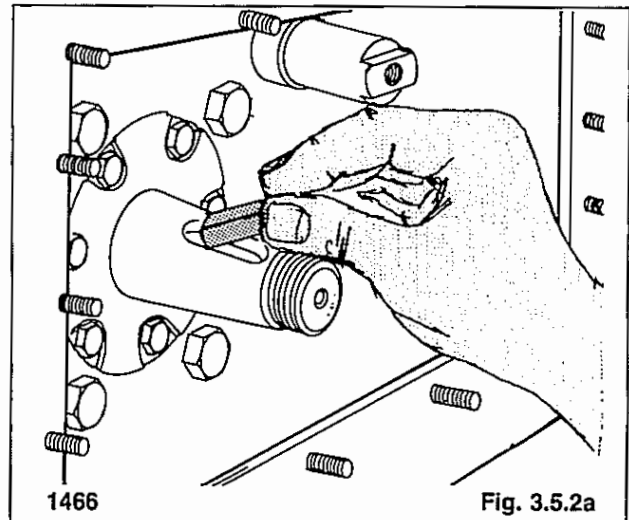
7. Place a bolt through one of the holes in the axle flange to prevent the torque motor shaft from turning as the sprocket nut is removed (fig. 3.5.1b).
8. Remove the torque motor sprocket nut (fig. 3.5.1c).
On reassembly torque to 350 ft. lbs. (474.5 N.M.).
9. Remove the drive chain. Refer to section 3.3.2 for procedure.
10. Using a proper gear puller, remove the sprocket and key from the torque motor shaft (fig. 3.5.1d).

NOTE: The T133 torque motor can be removed from the final drive housing without removing the sprocket.

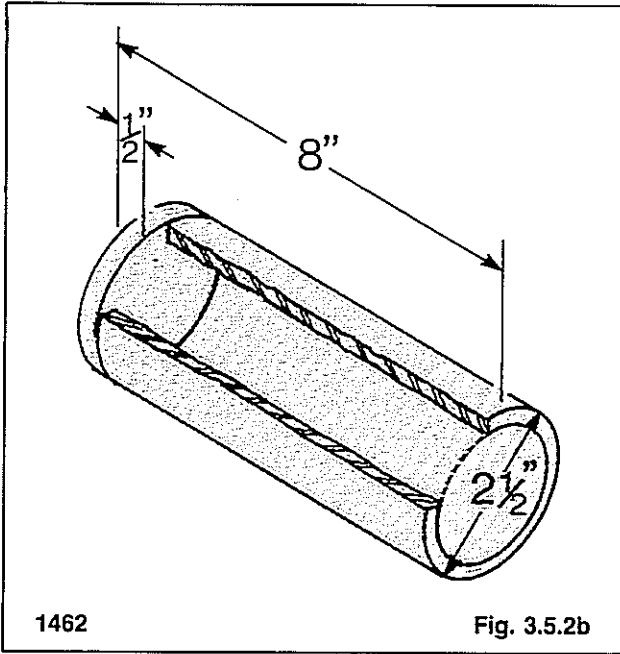


3.5.2 Sprocket Installation:

1. Install the key on the torque motor shaft (fig. 3.5.2a).



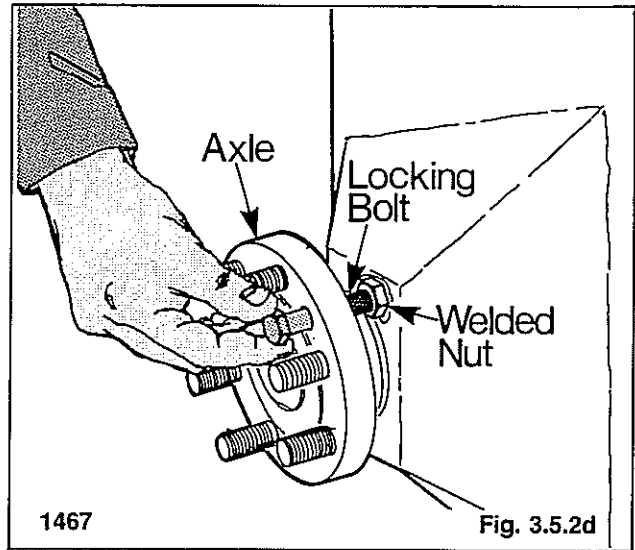
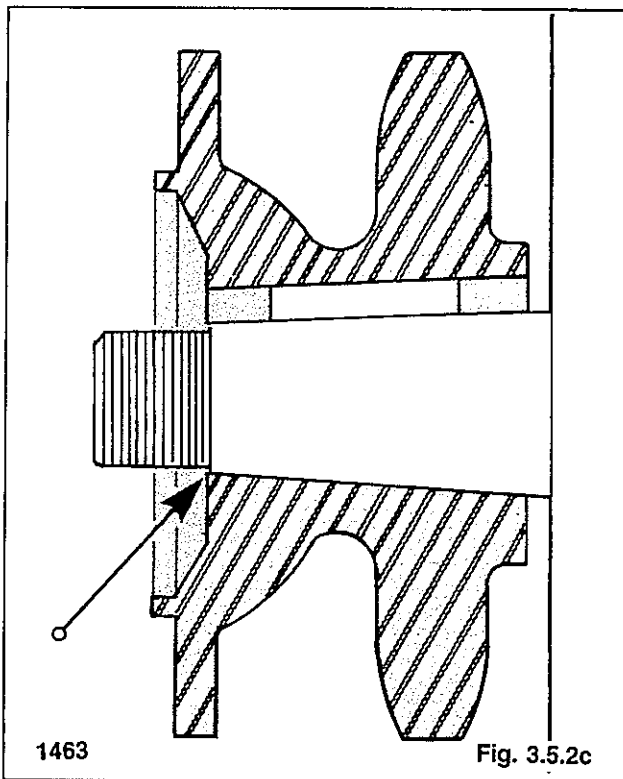
3 FINAL DRIVE



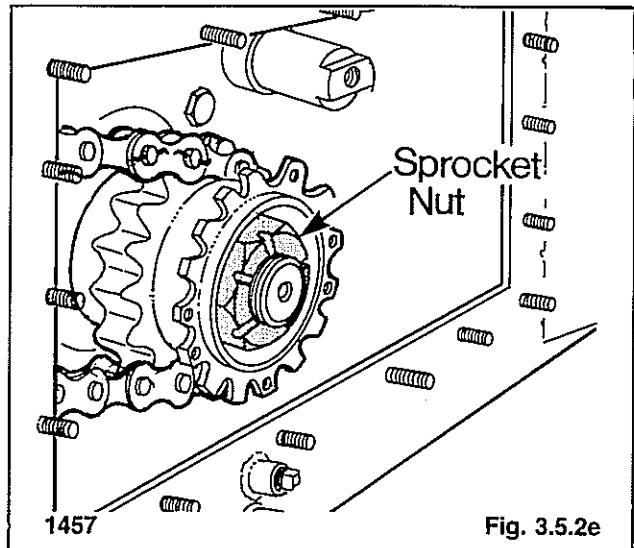
2. T103 — using a sprocket driver (fig. 3.5.2b) install the sprocket on the torque motor shaft until the end of the threaded portion of the shaft is almost flush with the inside face of the sprocket (fig. 3.5.2c).

T133 — line up the sprocket with the key and install the sprocket on the torque motor shaft.

3. Install the drive chain in the final drive housing. Refer to section 3.3.3 for procedure.



4. Place a bolt through one of the holes in the axle flange to prevent the torque motor shaft from turning as the sprocket nut is tightened (fig. 3.5.2d).
5. Install the sprocket nut. Torque the nut to 350 ft. lbs. (474.5 N.M.) (fig. 3.5.2e).
6. Install the brake assembly in the final drive housing. Refer to section 4.5 for procedure.
7. Fill the final drive housing to the correct level with 10W30 API SE/CD oil. Refer to section 3.2.3 for details. Capacity 1.5 gal. (5.7 l).
8. Apply silicon to the inspection cover and install the inspection cover on the final drive housing.
9. Install the wheels. Torque the wheel nuts 100-110 ft. lbs. (135-149 N.M.).
10. Check the chain tension and if necessary adjust. Refer to section 3.3.1 for procedure.



3 FINAL DRIVE

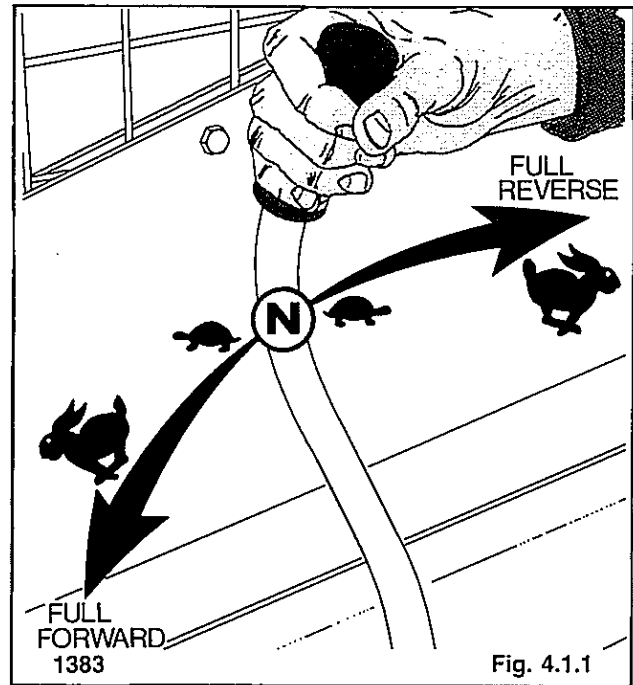
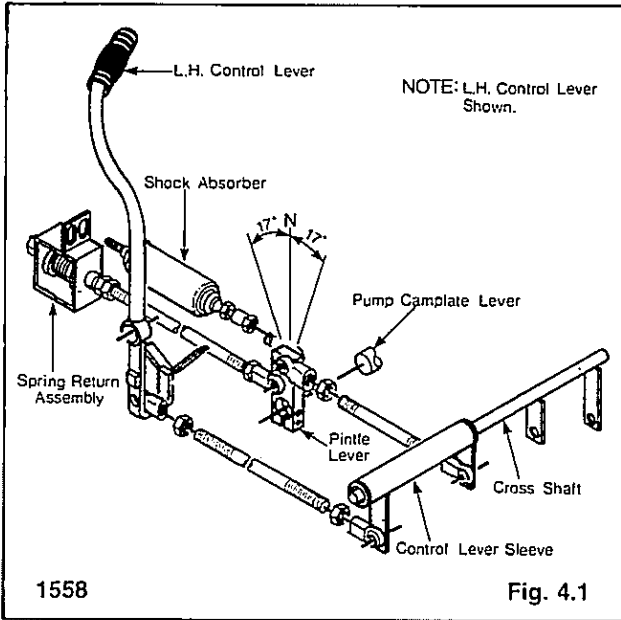
3.6 Trouble Shooting — Final Drive:

Problem	Cause	Corrective Action	Refer to Section
Final drive. Noisy	No lubricating oil	Check oil level. Add 10W30 API SE/CD oil to correct level. Check for leaks.	3.2.3
	Chain loose	Adjust chain tension. Check tension every 150 hours.	3.3.1
	Axles have too much end play	Preload axle bearings removing all end play	3.4.2
	Parking brake engaged, damaged or out of adjustment	Inspect and adjust or replace damaged parts	4.5
No drive on one side	Drive chain failure	Inspect chain and connection link. Replace damaged parts. Check chain tension every 150 hours.	3.3.2 3.3.3
	Drive motor shaft or key failure	Inspect and replace damaged parts	2.3
	Hydrostatic drive system failure	Refer to hydrostatic drive system	2.4
Lubricating oil leaking through filler, breather cap	Lubricating oil level too high	Check oil level	3.2.1
	Drive motor shaft seal leak	Inspect and repair damaged parts	2.3
Wheel studs shearing	Wheel nuts loose	Check wheel nut torque every 8 hours. Torque to 100-110 ft. lbs. (135-149 N.M.).	3.1.2 3.1.2 3.4.3
Wheel stud threads stripped	Wheel nuts over torqued	Torque to 100-110 ft. lbs. (135-149 N.M.). Check torque every 8 hours.	3.1.1 3.1.2 3.4.3

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4.1 STEERING



4.1.1 Operation:

Two steering levers control speed, direction and turning the loader. The steering levers are connected to the two hydrostatic drive pump camplate levers. Moving the camplate levers causes oil to be pumped to the drive motors resulting in drive to the wheels (refer to section 2.2.2 for details on pump operation). The R.H. lever controls the wheels on the R.H. side of the loader and the L.H. lever, the L.H. wheels. Loader speed is controlled by the amount each lever is moved from center or neutral position (fig. 4.1.1). The further away from neutral the faster the travel speed. For maximum power and slow travel speed move the control levers only a small amount.

WARNING

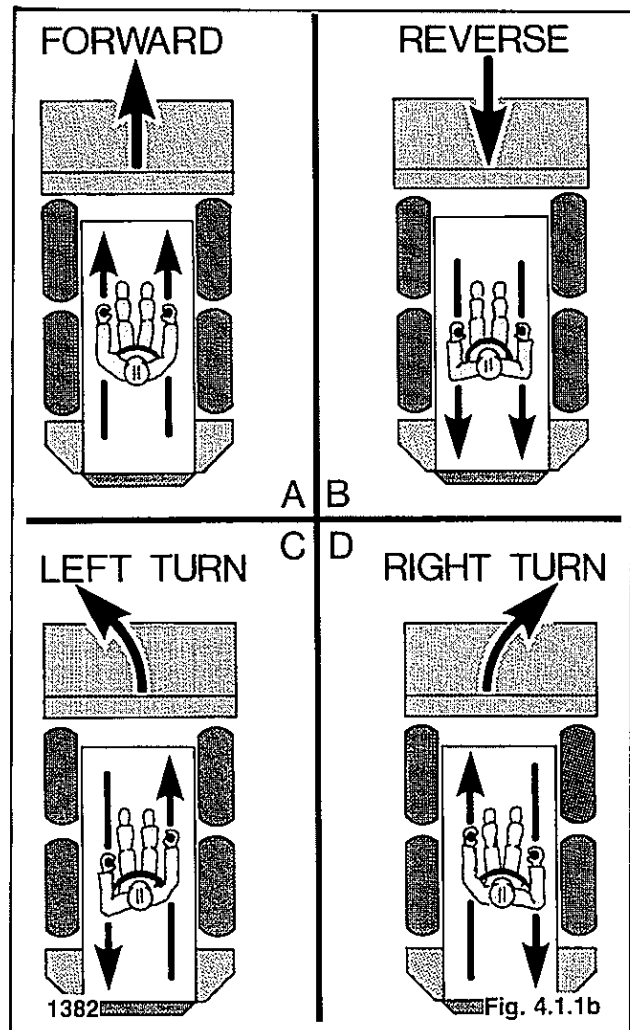
To avoid personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

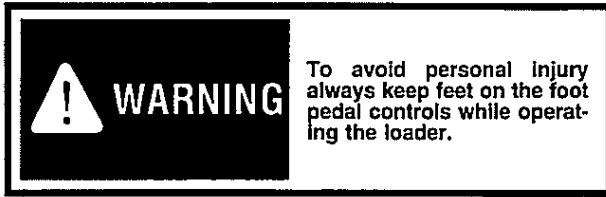
To drive the loader forward in a straight line, move both steering levers forward the same amount (fig. 4.1.1a).

To drive the loader in reverse in a straight line, move both control levers back the same amount (fig. 4.1.1b).

The loader is steered by moving one lever further forward than the other. To turn right move the left lever further than the right lever. To turn left, move the right lever further than the left lever.

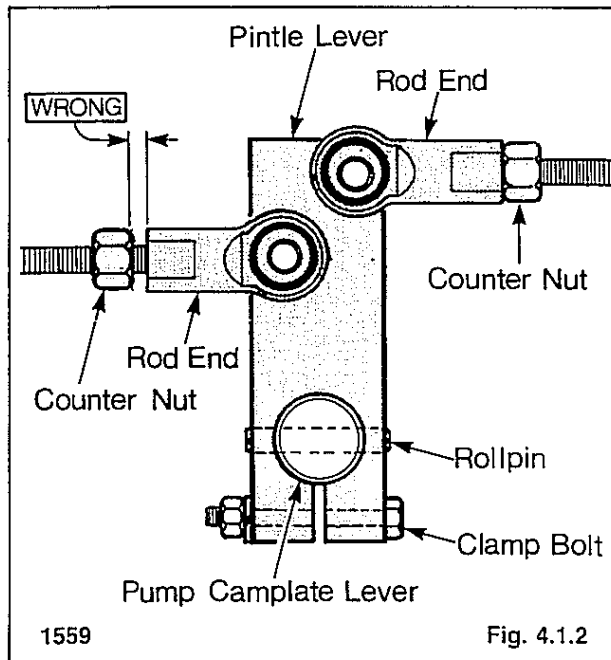
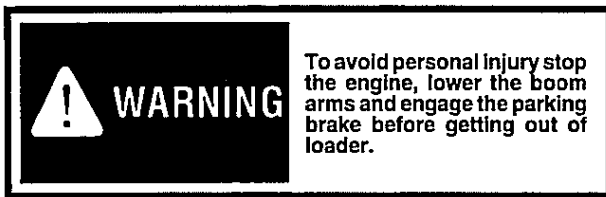
For the loader to turn or "skid-steer" within its own length, one lever is moved forward and the other back. This causes the wheels on one side to turn forward and the wheels on the other side to reverse, turning the loader (fig. 4.1.1c & d).





The steering levers are equipped with a spring centering device which will return the levers to neutral position if released during operation.

For safety on start up the levers automatically are centered in neutral position when the engine is shut off and the seat bar raised.



4.1.2 Neutral Adjustment:

The steering levers are designed to return to neutral position if released during operation.

If the loader creeps with the steering levers in neutral position, the spring return system may require adjustment.

Before making any adjustment on the spring return system check the entire steering linkage for free play. If any free play exists, in the linkage, adjustment of the spring return system will not be possible.

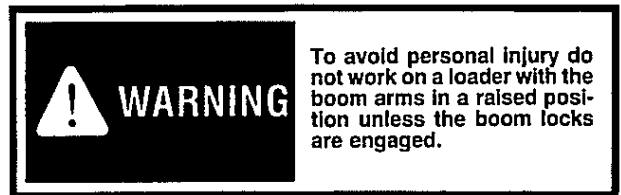
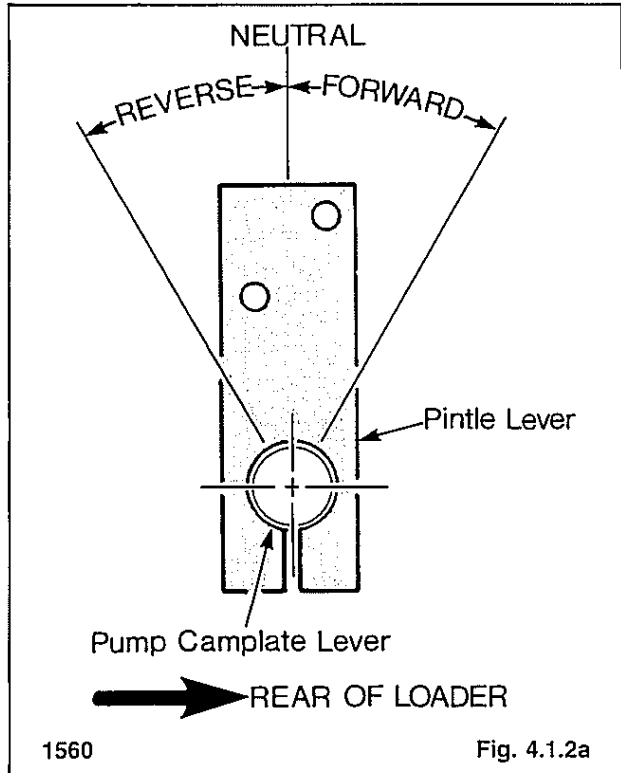
Check the rod ends for bearing wear or looseness (fig. 4.1.2).

Check the counter nuts at each rod end making sure they are tight and there is no wear or free play on the threads (fig. 4.1.2).

Check the pintle lever clamp bolt and roll pin for tightness and wear (fig. 4.1.2).

The following instructions are applicable to either the R.H. or L.H. steering lever spring return system.

1. Remove any attachment, raise the boom arms and engage the boom lock. Shut off the engine.



2. Block the loader securely with all four wheels clear of the ground.
3. Raise the seat assembly and remove the hydrostatic shield.
4. Determine which direction the pump pintle lever must move to place the pump in neutral position (fig. 4.1.2a). If the loader is creeping forward the pump pintle lever must be moved toward the front of the loader. If the machine is creeping backward the pintle lever must be moved toward the rear of the loader.

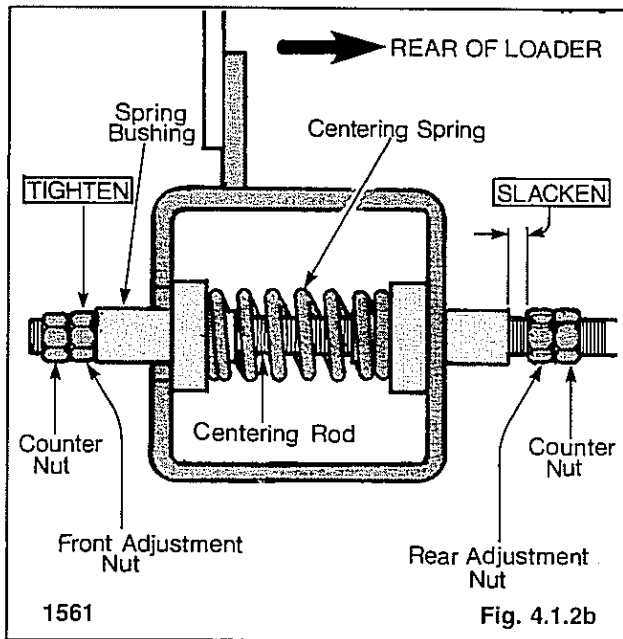
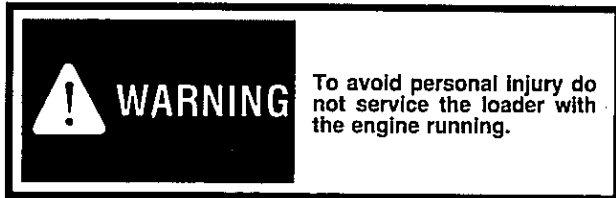
The pintle position should only be adjusted at the spring return assembly.

4 CONTROLS

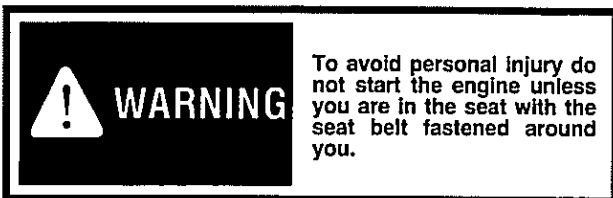
5. Lower the seat bar to release the steering neutral detent linkage.

The following instructions cover adjustment procedures to correct both forward and reverse loader creep.

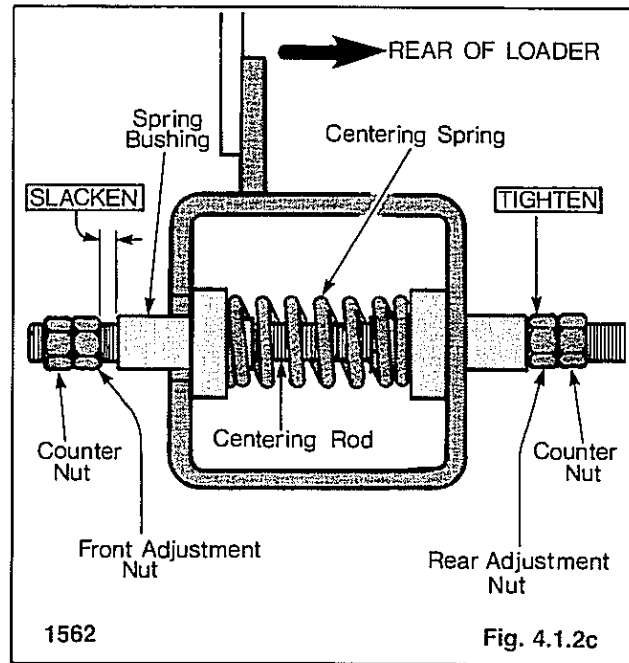
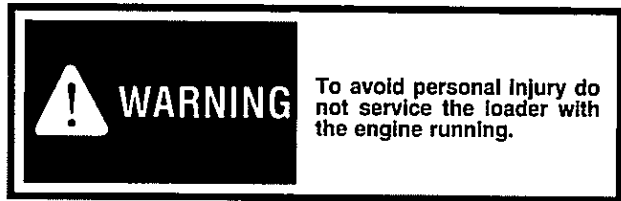
6. LOADER CREEPING FORWARD:



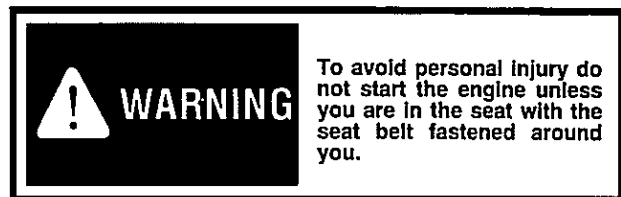
- A. Slacken the rear counter nut and adjustment nut one or two turns (fig. 4.1.2b).
- B. Tighten the front adjustment nut moving the centering rod and pintle lever forward until the rear adjustment nut comes in contact with the spring bushing.
- C. Lower the seat and start the engine and check for wheel creep. If additional adjustment is required shut off the engine and repeat steps A and B.



7. LOADER CREEPING REARWARD:

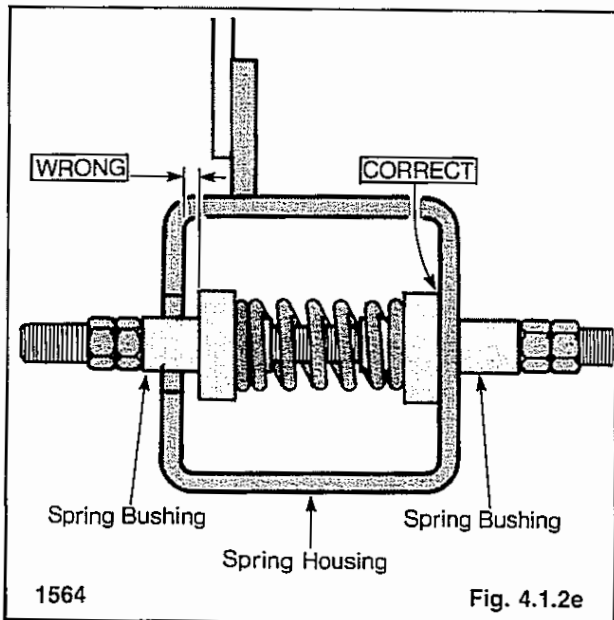
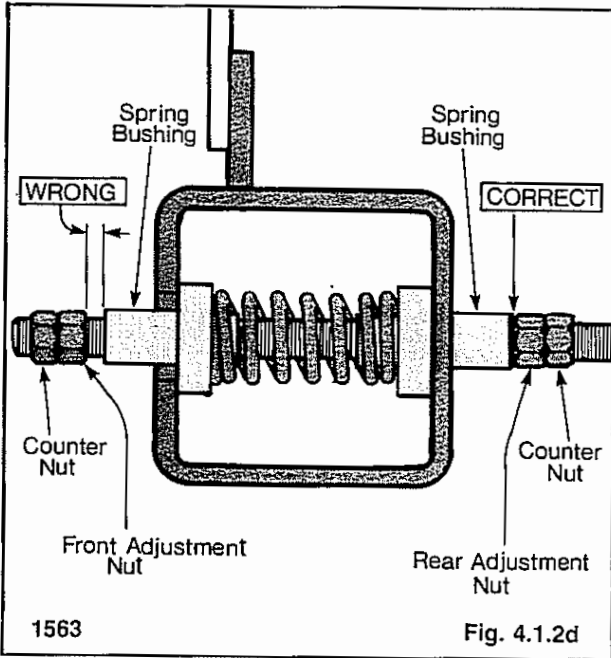


- A. Slacken the front adjustment nut and counter nut one or two turns (fig. 4.1.2c).
- B. Tighten the rear adjustment nut moving the centering rod and pintle lever toward the rear of the loader until the front adjustment nut comes in contact with the spring bushing.
- C. Lower the seat and start the engine and check for wheel creep. If additional adjustment is required shut off the engine and repeat steps A and B.



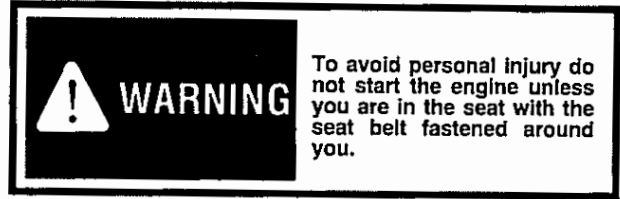
8. Tighten the counter nuts against the front and rear adjustment nuts.

- Check to ensure there is no free play between the adjustment nuts and the spring bushings (fig. 4.1.2d). Free play will cause chatter in the steering levers and incorrect centering action.



- Check to ensure the spring has not been compressed allowing free play between the spring bushings and spring housing (fig. 4.1.2e). When the steering levers are in neutral the spring bushings must be in contact with the inside of the spring housing. Free play will result in steering lever chatter and incorrect centering action.
- After performing the neutral adjustment it may be necessary to adjust the steering lever neutral detent linkage.

Lower the seat and start the engine. With the seat bar up check for wheel creep. If wheel creep is detected refer to section 4.3.2 and 4.3.3 for seat bar and neutral detent adjustment.



4.1.3 Neutral Detent Adjustment:

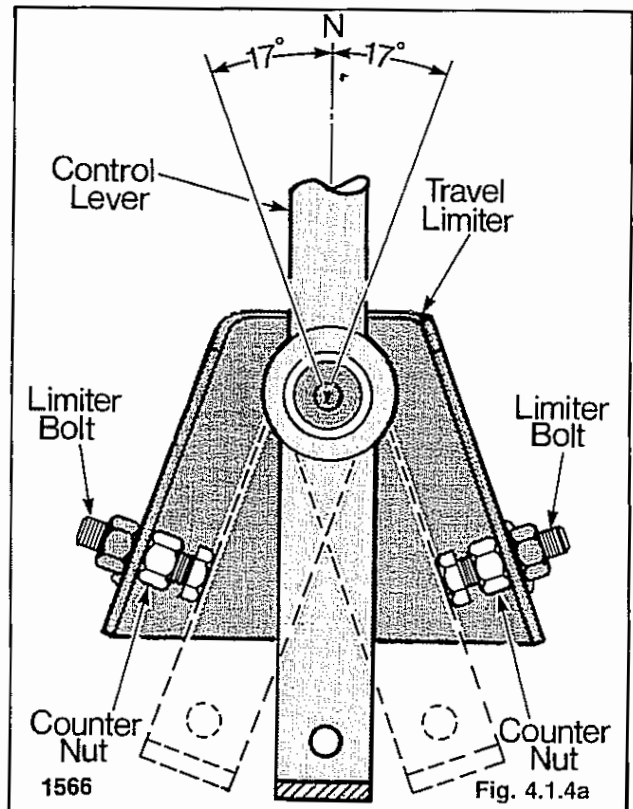
For safety during start up the steering control levers are designed to be automatically centered in neutral when the seat bar is in the up position.

When the seat bar is lowered into the operating position, the steering lever centering or neutral detent linkage is released.

If the loader creeps while the engine is running and the seat bar is in the up position, the detent linkage may require adjustment. For the complete adjustment procedure refer to section 4.3.2 or 4.3.3.

4.1.4 Steering Lever Travel Adjustment:

To prevent excessive force being applied to the pump pintle levers when the steering levers are moved full stroke, the steering levers are equipped with travel limiters (fig. 4.1.4a).

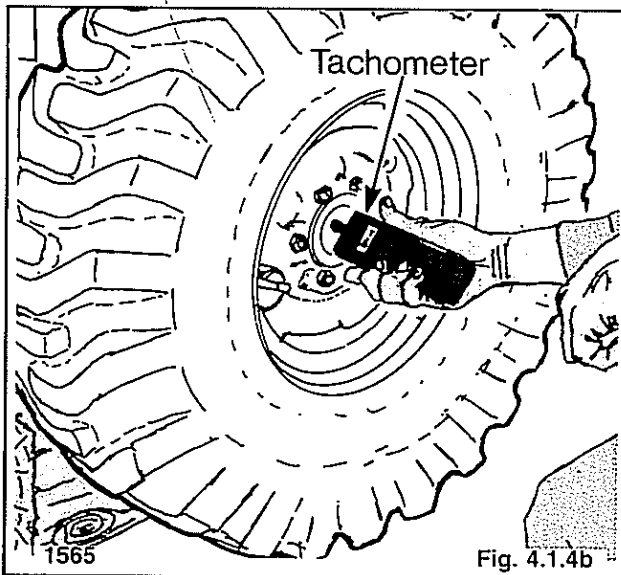
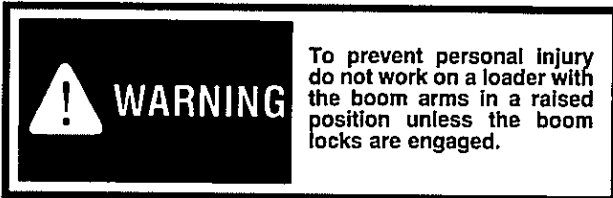


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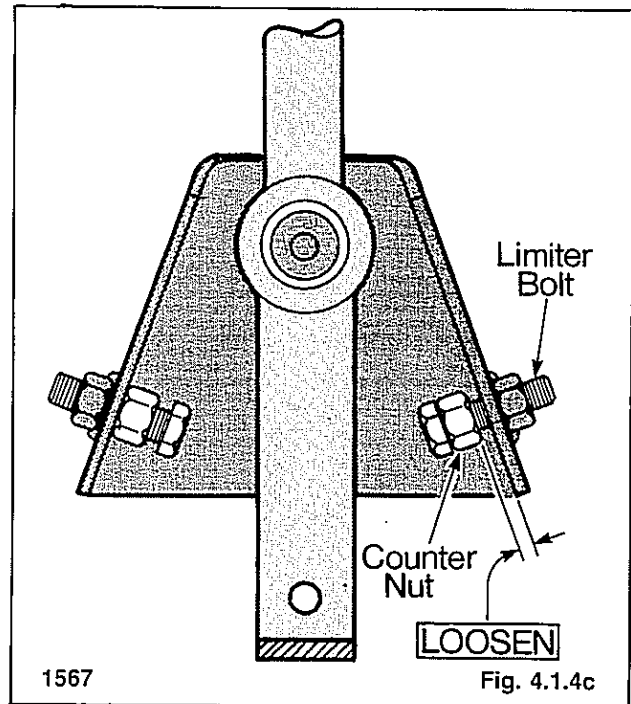
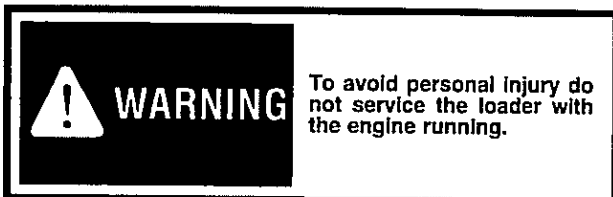
The travel limiters can also be used to adjust loader travel speed on both the left and right hand sides to eliminate tracking.

Two people are required to make the following adjustment to the steering lever limiters:

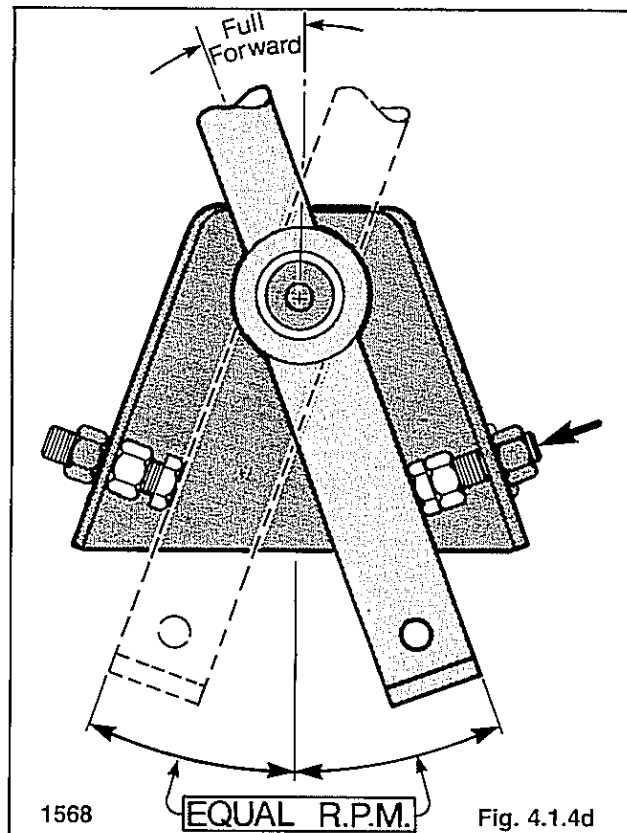
1. Remove any attachment, raise the boom and engage the boom lock. Shut off the engine.



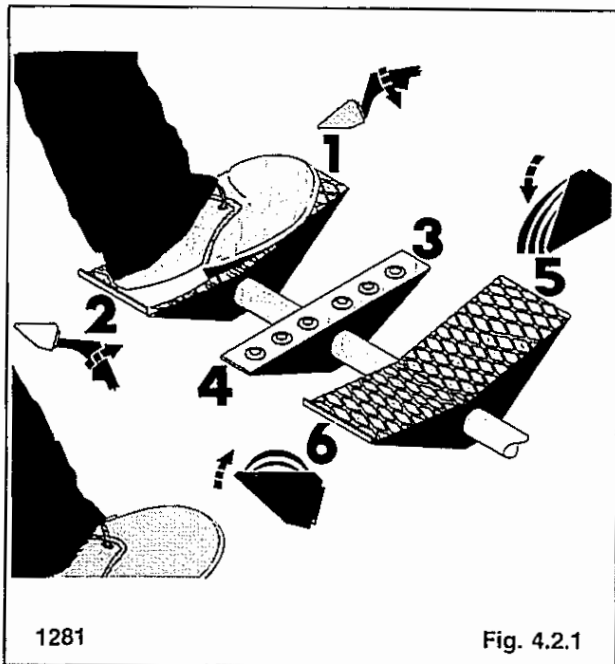
2. Block the wheel securely with all four wheels clear of the ground.
3. Start the engine and place the throttle control at the maximum setting. Move both the L.H. and R.H. steering lever to full forward position.
4. Using a hand held tachometer check the wheel RPM at the center of the axle on both the L.H. and R.H. side of the loader (fig. 4.1.4b). Shut off the engine.
5. Adjust the fast side of the loader. Loosen the back limiter bolt counter nut (fig. 4.1.4c).



6. Back out the rear limiter bolt until the wheel RPM on the fast side of the loader is the same as the slow side (fig. 4.1.4d).
7. Tighten the rear limiter bolt counter nut.



4.2 FOOT PEDALS



4.2.1 Operation:

Operation of the boom lift cylinders, auxiliary hydraulic circuit and bucket tilt cylinders are controlled by three foot pedals (fig. 4.2.1).

The foot pedals are connected through a mechanical linkage to a series type control valve which allows simultaneous use of both the boom lift and bucket tilt circuits.

BUCKET TILT OPERATION:

The R.H. pedal is the bucket tilt (dump) control. Pressing on the toe 5 will dump the bucket. Pressing on the heel 6 of the pedal will roll the bucket back. Releasing pressure on the pedal will cause the control valve to return to neutral position.

BOOM LIFT OPERATION:

The L.H. pedal is the boom lift control (fig. 4.2.1). To raise the boom press on the heel of the pedal 2. To lower the boom, press on the toe of the pedal 1. Firm pressure on the toe 1 will lock the pedal in float position. This allows the bucket to follow the ground as the loader moves backward. Releasing pressure on the pedal will cause the control valve to return to neutral position.

AUXILIARY HYDRAULICS:

The center pedal is used to engage the auxiliary hydraulic circuit to power an attachment such as a back hoe. Pressing on the toe 3 of the pedal provides hydraulic pressure to the female quick-connect coupling located at the front of the boom arms. Firm pressure on the toe 3 of the pedal will lock the pedal in detent position allowing a continuous flow of hydraulic oil to an attachment. Pressing the heel 4 of the pedal provides hydraulic power to the male quick-connect coupling, located at the front of the boom arms, reversing the flow of hydraulic oil. Releasing pressure on the pedal will cause the control valve to return to neutral position unless the pedal is locked in detent position. When the auxiliary hydraulic circuit is not in use return the foot pedal to neutral position by pressing on the heel 4 of the pedal. If the pedal is left in detent position starting the loader may be difficult or impossible and damage to the starter may occur.

IMPORTANT	Return auxiliary hydraulic foot pedal to neutral position when not in use.
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SAFETY EQUIPMENT:

The T103 and T133 loaders have been equipped with two types of foot pedal safety systems to prevent accidental cycling of the foot pedals while entering or exiting the loader.

SERIAL NO. LC000100-LC000209
LE000100-LE000536

The above loaders are equipped with a foot pedal shield which completely covers the pedals when entering or exiting the loader. The shield is operated by the raising and lowering of the seat bar. As the seat bar is raised the foot pedal shield lowers completely covering the foot pedals (fig. 4.2.1a). At the same time the steering levers are returned to and locked in neutral position.

For operator protection during starting the loader starter circuit is designed so that the engine must be started with the seat bar up, foot pedal shield down covering the pedals and the steering levers centered in neutral. A safety start switch activated by the foot pedal shield disengages the starter circuit when the seat bar is in the down position. For emergency starting with the seat bar in the down position the loaders are equipped with an over-ride start switch (refer to section 5).

WARNING	To avoid loader overturn always carry load low.
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WARNING	To avoid personal injury stop the engine, engage the parking brake and lower the boom arms before servicing the loader.
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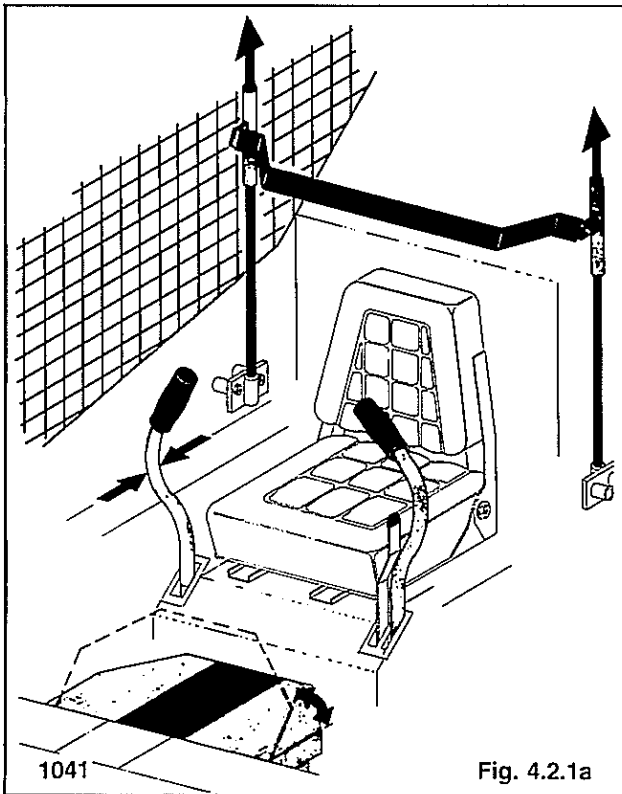


Fig. 4.2.1a


SERIAL NO. LC000210 & LE000537 ONWARD:

The above loaders are equipped with a foot pedal lock which locks the pedals in neutral position when entering or exiting the loader.

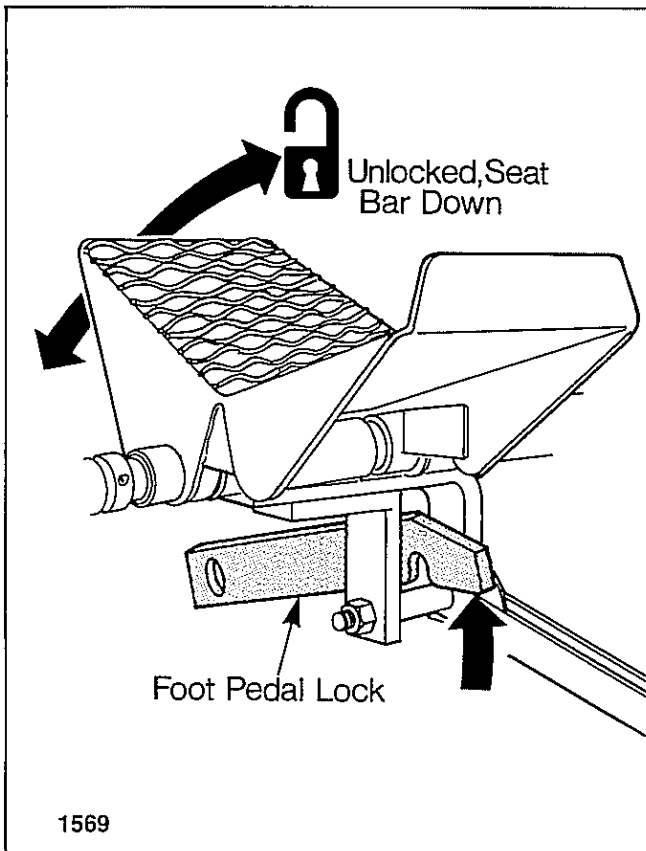
The pedal lock is operated by the raising and lowering of the seat bar. As the seat bar is raised the pedal lock engages locking the pedals in neutral position (fig. 4.2.1b). At the same time the steering levers are returned to neutral position.

For operator protection during start up the loader starting circuit is designed so that the engine must be started with the seat bar up and the foot pedals and steering levers in neutral. A safety start switch activated by the foot pedal lock disengages the starter circuit when the seat bar is in the down position.

For emergency starting with the seat bar in the down position the loaders are equipped with an over-ride start switch (refer to section 5).



WARNING To avoid personal injury stop the engine, lower the boom arms, engage the parking brake and check that the foot pedals are locked before getting out of loader.



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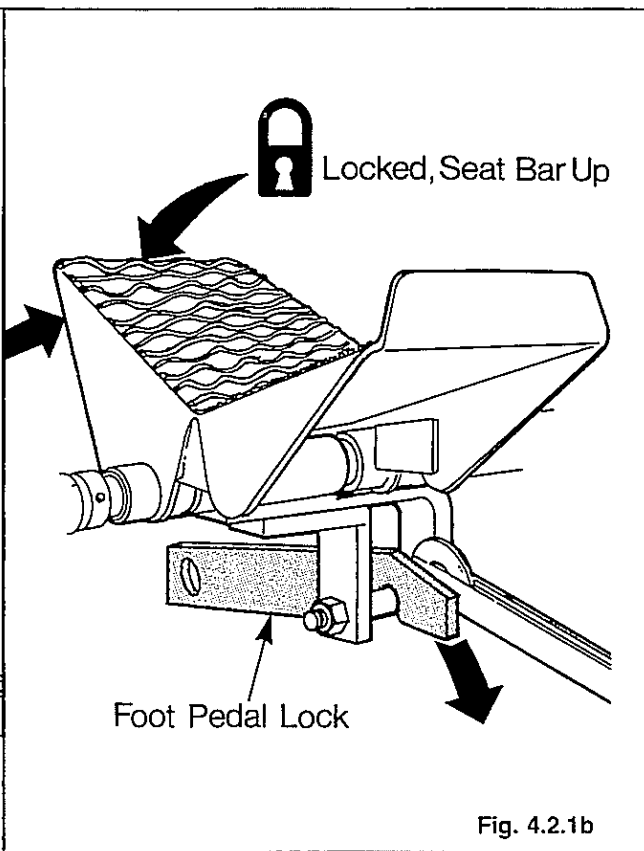
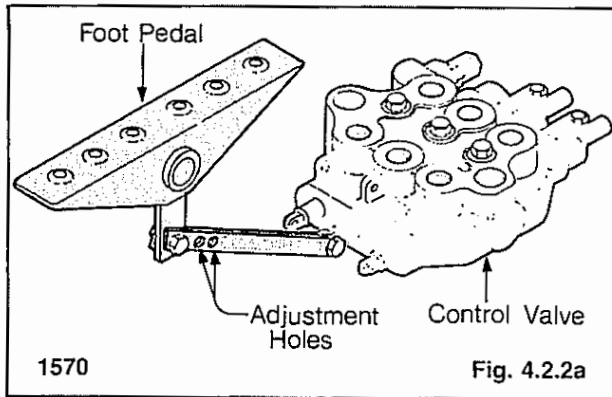


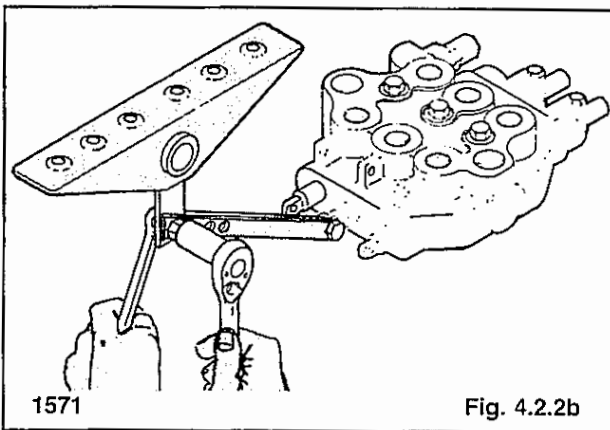
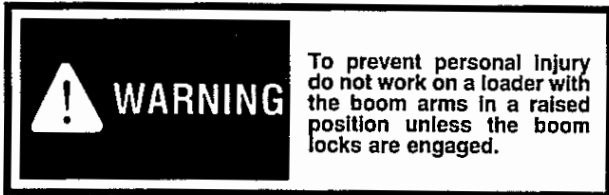
Fig. 4.2.1b

4.2.2 Foot Pedal — Angle Adjustment (S/N LC000100-LC000209 LE000100-LE000536):

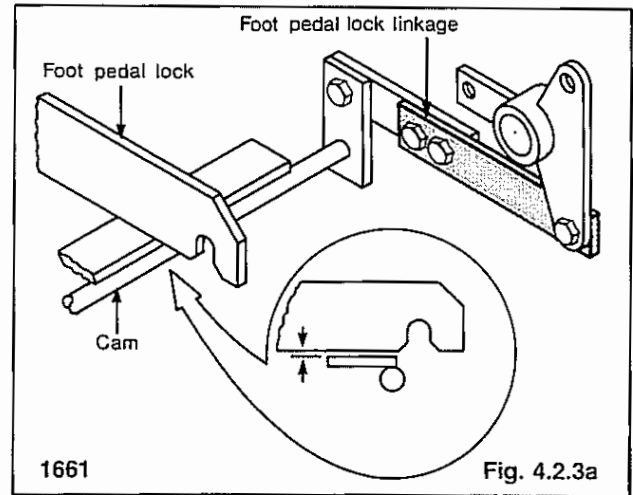


For operator comfort the angle of the foot pedals can be adjusted. Each foot pedal linkage has three adjustment holes (fig. 4.2.2a). Adjust as follows:

1. Remove any attachment. Raise the boom arms and engage the boom locks. Shut off the engine.



2. Raise the seat and remove the hydrostatic shield.
3. Lower the seat bar and raise the foot pedal shield.
4. Remove the bolt and nylok nut from the linkage at the foot pedal (fig. 4.2.2b).
5. Adjust the pedal angle to line up with one of the three adjustment holes in the linkage.
6. Install the bolt and nylok nut on the foot pedal and linkage.



4.2.3 Foot Pedal — Lock Adjustment (S/N LC000210 & LE000537 Onward):

When the seat bar is in the up position the foot pedals must be locked in neutral position.

If the pedals can be moved with the seat bar in the up position adjustment or repair of the linkage may be required.

To adjust, raise the seat bar and lock it in the up position. Ensure the cam, which raises the foot pedal lock arms (fig. 4.2.3a), is in a horizontal position and not applying any lift tension on the foot pedal lock arms.

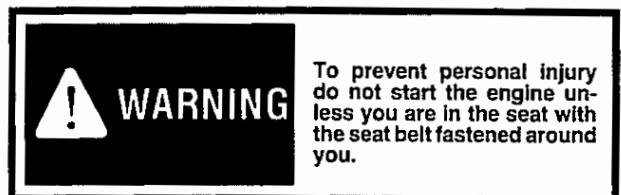
Adjust the foot pedal lock linkage so that no upward tension is applied to the foot pedal lock arms with the seat bar in the up position.

If no upward tension is being applied by the cam but the hydraulic valve can be activated with the seat bar in the up position it may be necessary to adjust the control valve position. Refer to section 4.2.6. Spray foot pedal lock springs and linkage with WD40 to prevent rust buildup.

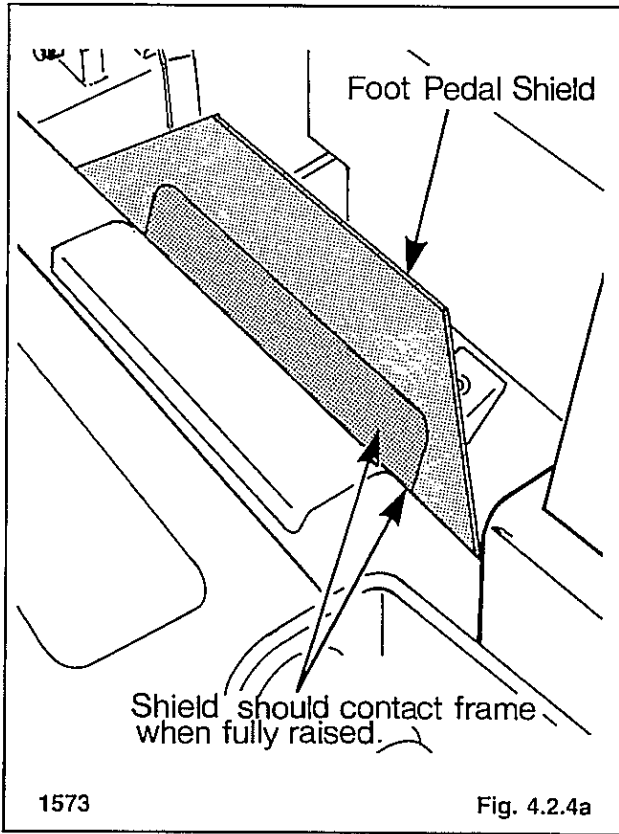
4.2.4 Foot Pedal Shield Adjustment (S/N LC000100-LC000209 LE000100-LE000536):

When the seat bar is in the full down or operating position the foot pedal shield should raise until the shield touches the front of the loader main frame (fig. 4.2.4a) completely uncovering the foot pedals.

Before making any adjustment check that the levers are in neutral position when the seat bar is fully up and the machine does not creep with the engine running.

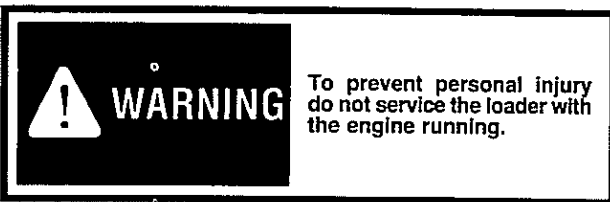


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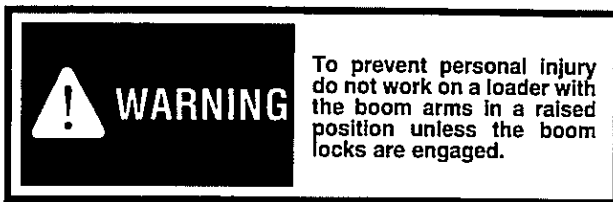


If the loader creeps with the seat bar in the up position the entire seat bar linkage must be adjusted. Refer to section 4.3.2 for procedure.

Adjust the shield raising height as follows:

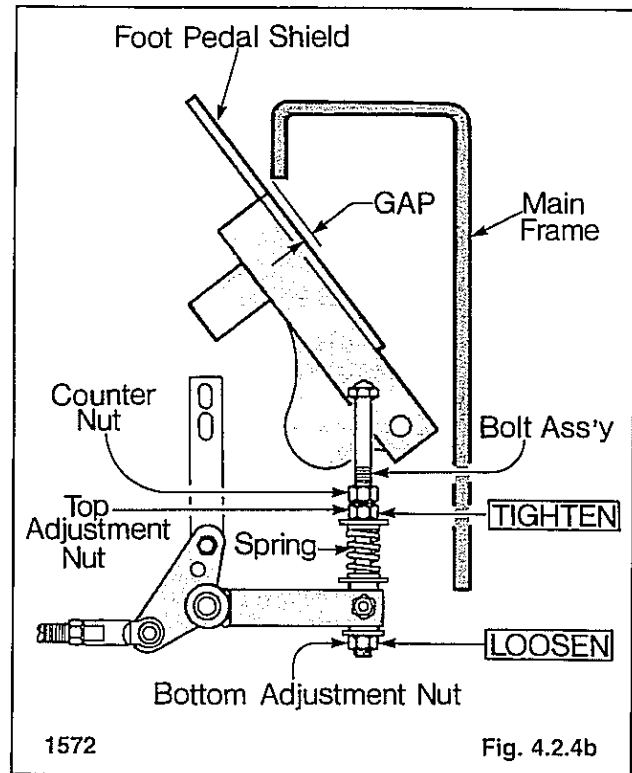


1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



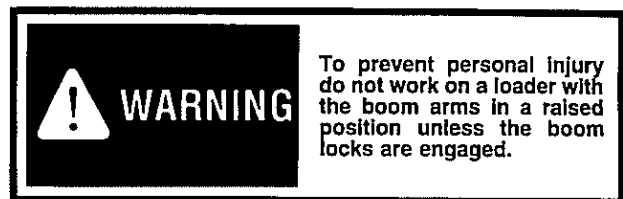
2. Raise the seat and remove the hydrostatic shield.
3. Lower the seat bar to the full down or operating position.

4. Back off the lower adjustment nut on the bolt assembly a few turns (fig. 4.2.4b).
5. Tighten the top adjuster nut until the spring begins to compress.
6. Repeat steps 4 and 5 until the foot pedal shield contacts the main frame.
7. Tighten the counter nut against the top adjustment nut.

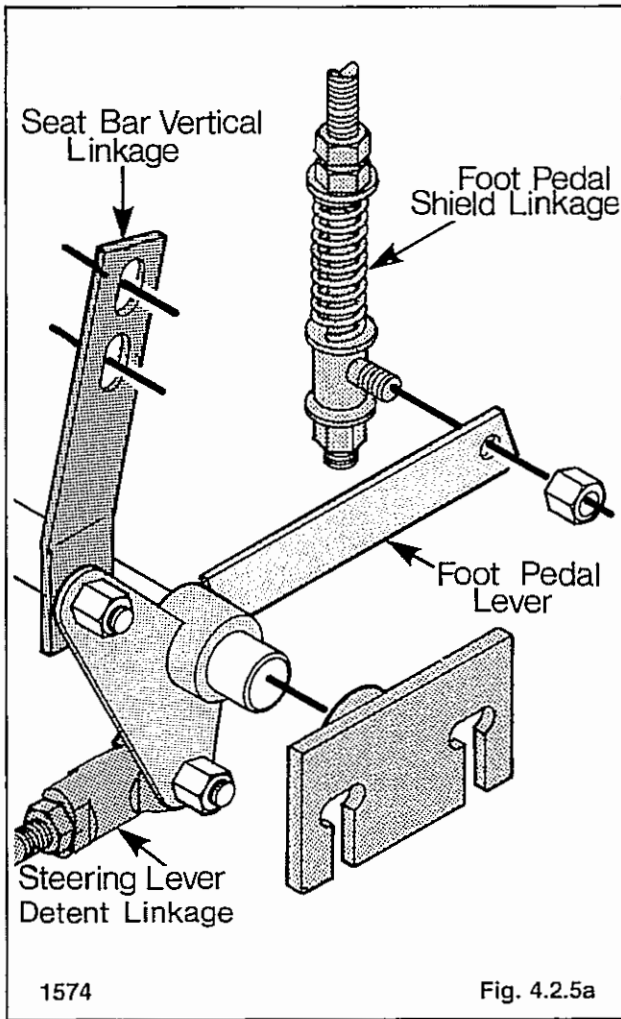


4.2.5 Foot Pedal Assembly Removal (S/N LC000100-LC000209 LE000100-LE000536):

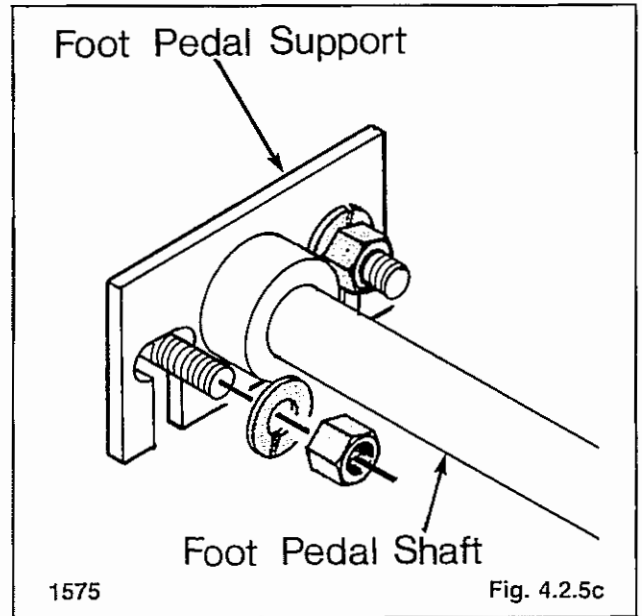
1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



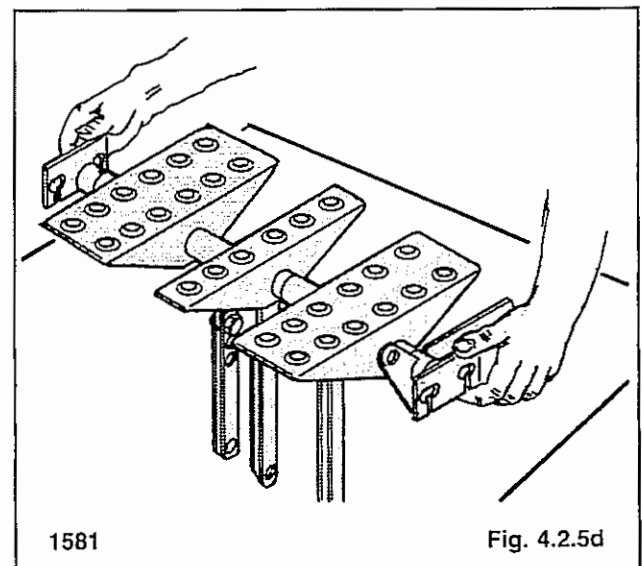
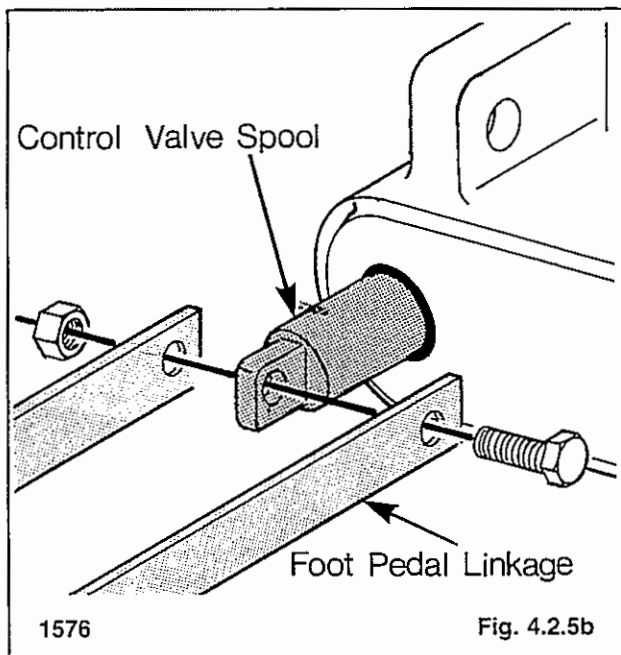
2. Raise the seat and remove the hydrostatic shield.
3. Lower the seat bar to raise the foot pedal shield.



4. Disconnect the seat bar vertical linkage (fig. 4.2.5a), steering lever detent linkage and step shield linkage from the foot pedal lever.
5. Disconnect the foot pedal linkages from the control valve spools (fig. 4.2.5b).

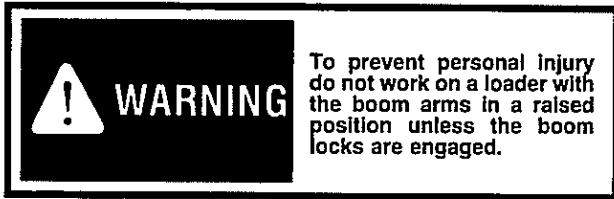


6. Remove the nuts and springwashers from the L.H. and R.H. foot pedal supports (fig. 4.2.5c).
7. Remove the foot pedal assembly from the loader (fig. 4.2.5d).
8. On reassembly it may be necessary to readjust the foot pedal shield, steering lever detent and seat bar linkages. Refer to sections 4.1, 4.2 and 4.3.



4.2.6 Foot Pedal — Lock — Removal (LC000210 & LE000537 Onward):

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.



2. Raise the seat and remove the hydrostatic shield.
3. Disconnect the seat bar linkage (fig. 4.2.6a) from the foot pedal lever.
4. Disconnect the steering lever detent linkage (fig. 4.2.6a) from the foot pedal lever.
5. Disconnect the foot pedal lock linkage from the foot pedal lever (fig. 4.2.6a).

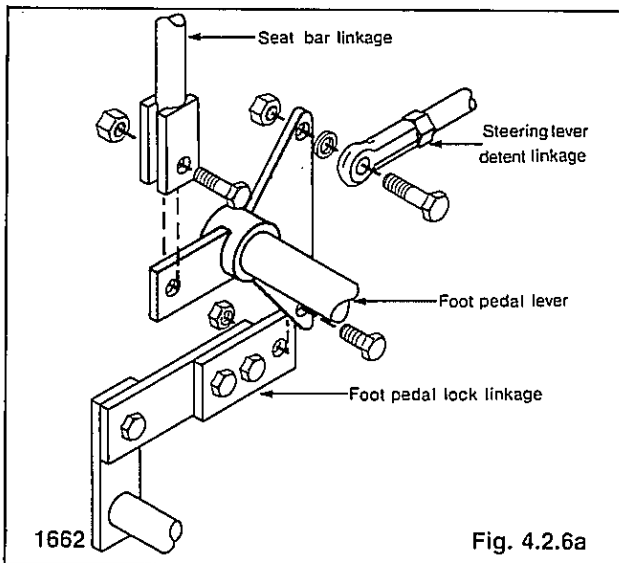


Fig. 4.2.6a

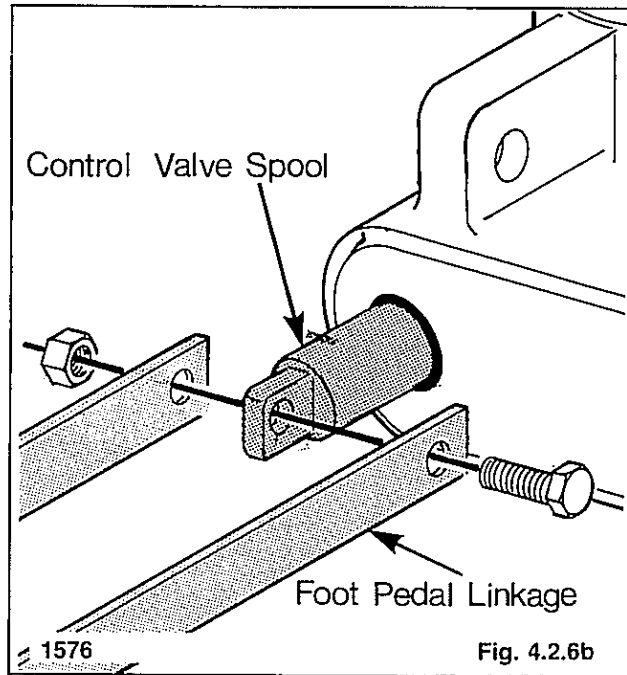


Fig. 4.2.6b

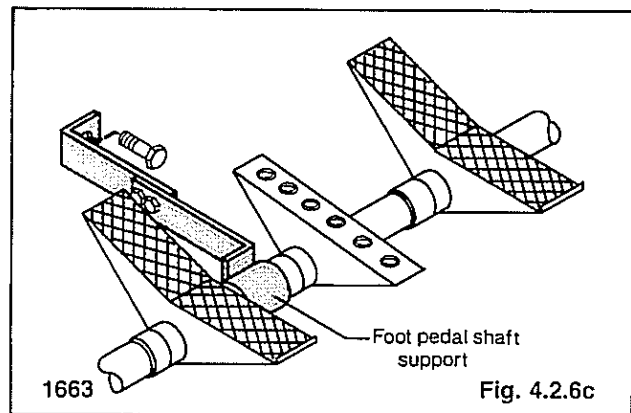


Fig. 4.2.6c

6. Disconnect the foot pedal linkages from the control valve spool (fig. 4.2.6b).
7. Disconnect the foot pedal shaft support from the main frame (fig. 4.2.6c).
8. Remove the nuts and lock washers from the bearings at both ends of the foot pedal shaft.
9. Loosen the allen screw in the set collar located on the L.H. side of the foot pedal shaft.

Slide the set collar and bearing along the shaft until the bearing clears its mounting studs (fig. 4.2.6d).

10. Remove the foot pedals and shaft assembly from the loader.
11. Remove the foot pedal lock assembly from the housing.

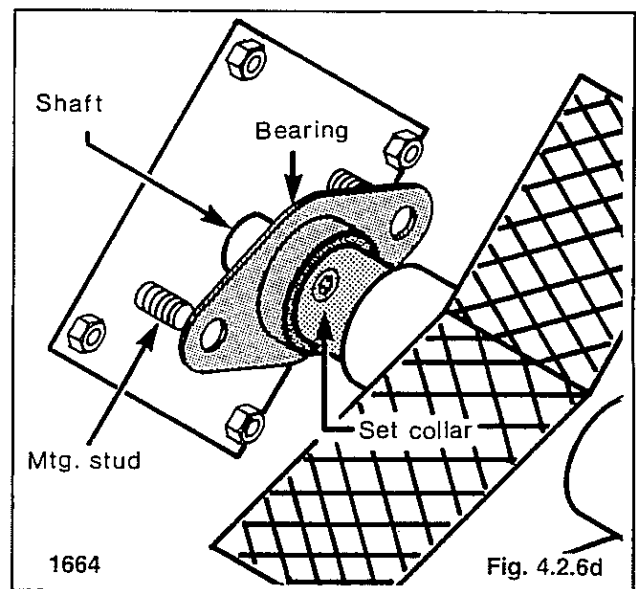


Fig. 4.2.6d

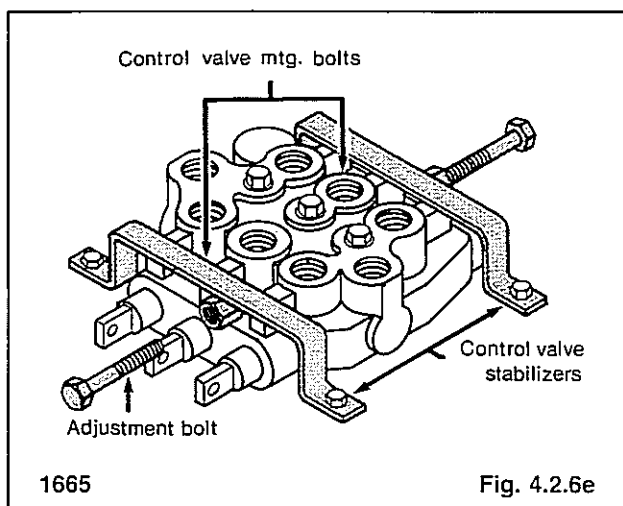
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4.2.6 Foot Pedal — Lock — Installation (LC000210 & LE000537 Onward):

1. If the control valve had been removed, install the control valve and mounting bolts. Do not tighten the mounting bolts.
2. Install the front and rear control valve stabilizers (fig. 4.2.6e). Do not tighten the stabilizer adjustment bolts against the control valve housing.
3. If the control valve has not been removed, drain the hydraulic reservoir and disconnect the hydraulic hoses from the control valve.

Back off the two stabilizer adjustment bolts (fig. 4.2.6e).

Loosen the two control valve mounting bolts.

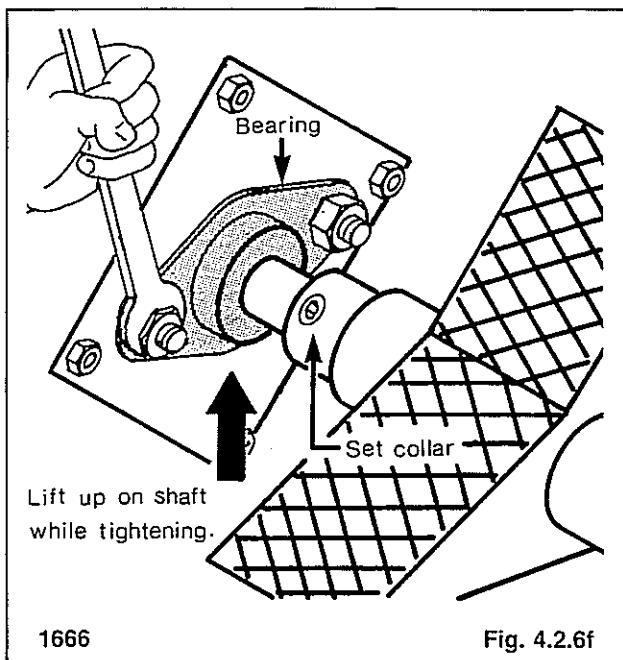
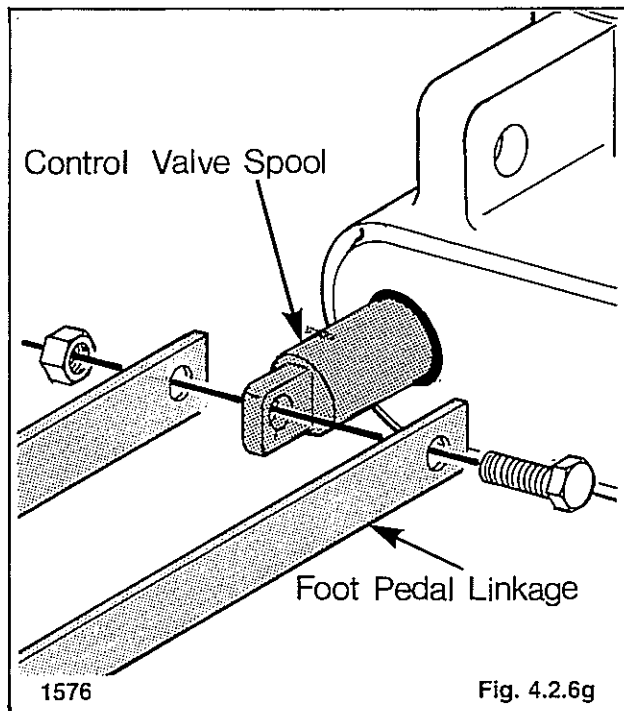


4. Install the complete foot pedal assembly in the loader.

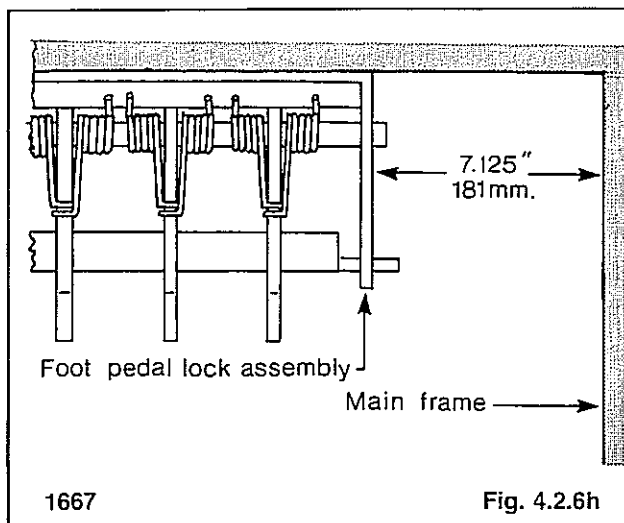
Lift up on the foot pedal shaft as the shaft bearing nuts are tightened (fig. 4.2.6f).

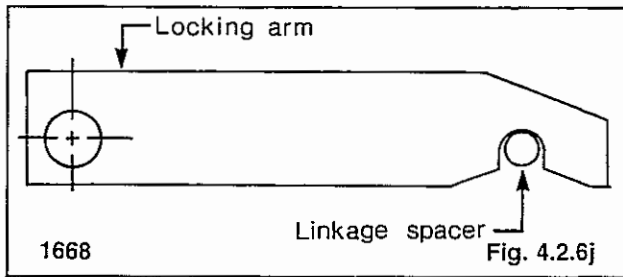
Do not tighten the set collar at this time.

5. Install the foot pedal linkage between the control valve and foot pedals (fig. 4.2.6g).
6. Install the foot pedal lock assembly in the loader.

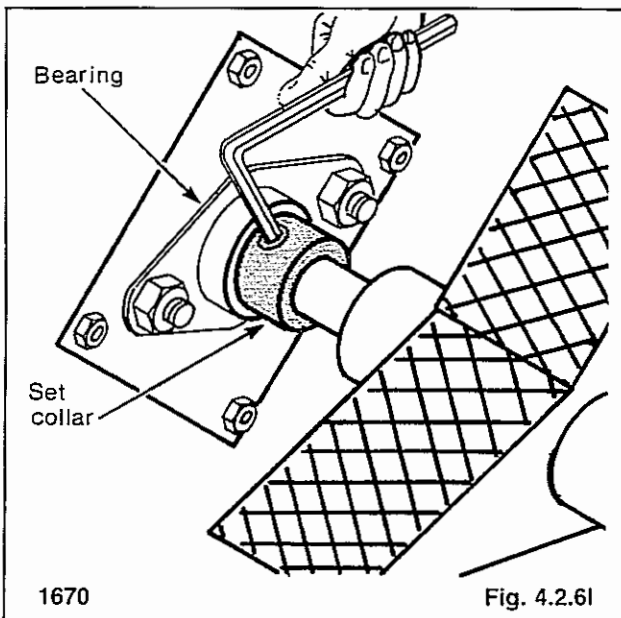
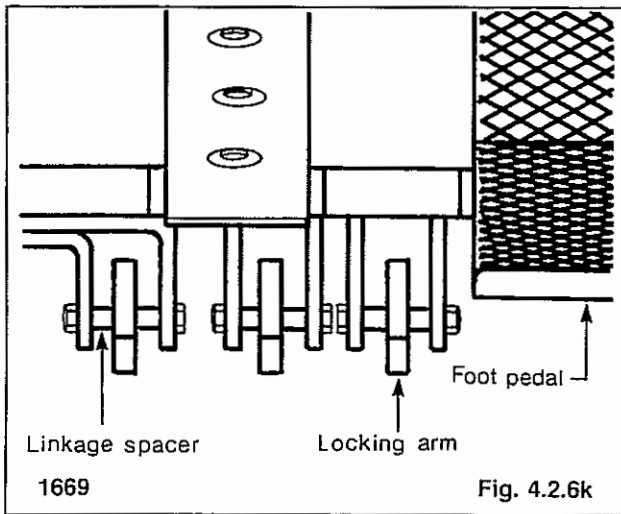


7. Set the foot pedal lock assembly so it is positioned 7.125 in. (181 mm) from the inside of the R.H. frame (fig. 4.2.6h).



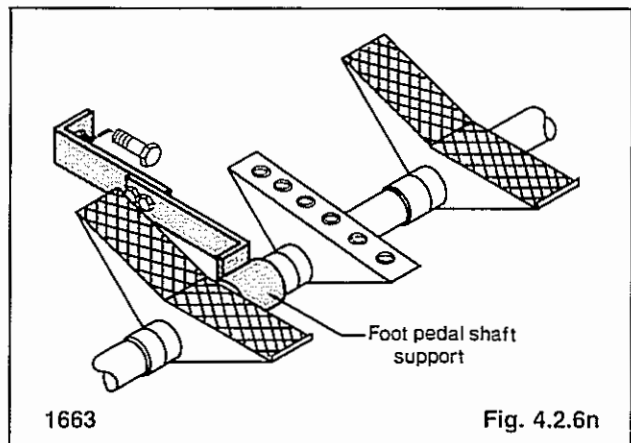
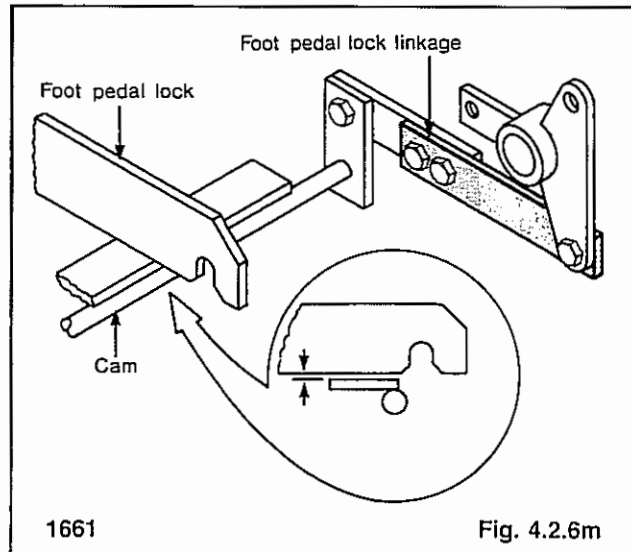


8. Before tightening the foot pedal assembly in place be sure the locking arms of the foot pedal lock assembly are fully engaged on the foot pedal linkage spacers (fig. 4.2.6j).
9. Line up the foot pedal linkage so that the foot pedal lock assembly locking arms are centered on the linkage spacers (fig. 4.2.6k).



10. Slide the set collar against the foot pedal shaft bearing and lock in place with the allen screw (fig. 4.2.6l).
11. Install the foot pedal lock linkage (fig. 4.2.6m).

Ensure that the cam which raises the foot pedal locking arms does not touch the locking arms.



12. Install the foot pedal shaft support (fig. 4.2.6n).
13. The purpose of the foot pedal locking system is to prevent movement of the control valve spool causing accidental activation of the hydraulic system by stepping on the foot pedals when entering or exiting the loader.

The control valve spool must move approximately .110 in. (2.8 mm) either side of neutral position before hydraulic flow occurs (fig. 4.2.6o).

14. To prevent accidental control valve spool movement and accommodate for linkage wear the linkage is adjusted so that there is a maximum of .030 in. (.75 mm) clearance on both sides of the linkage spacer and locking arm (fig. 4.2.6p).

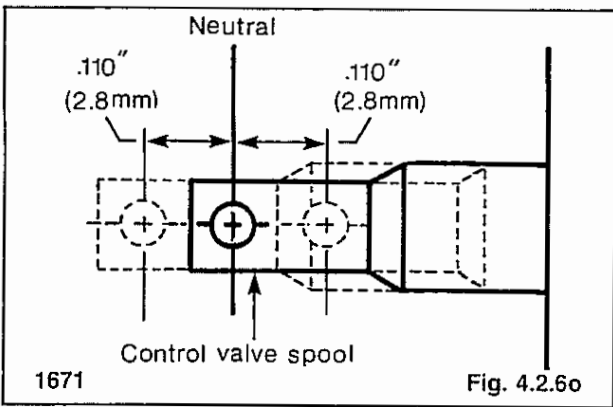


Fig. 4.2.6o

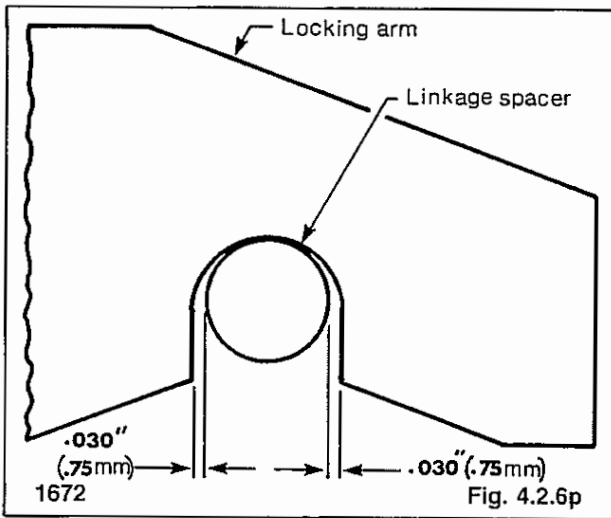


Fig. 4.2.6p

15. This clearance is obtained by the positioning of the hydraulic control valve.

With the lock arms engaged on the foot pedal spacers work the heel of the two outside pedals up and down (fig. 4.2.6q).

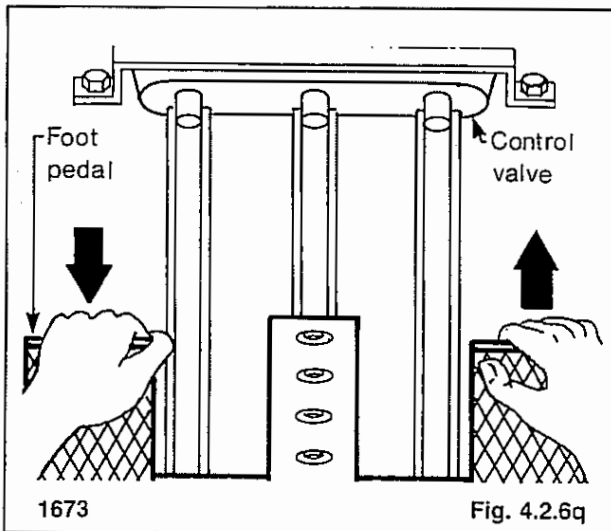


Fig. 4.2.6q

16. With the two control valve mounting bolts loosened, this will allow the valve to move back and forward on its mounting plate.

Observe the maximum forward and backward movement of the valve. Place the valve approximately half way between the two (fig. 4.2.6r).

Tighten the control valve mounting bolts enough so that the valve will not move freely.

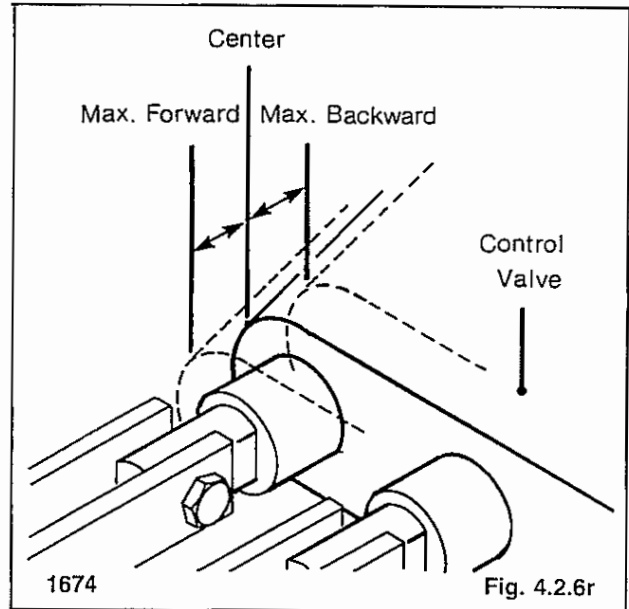


Fig. 4.2.6r

17. Set a dial indicator against the end of the R.H. control valve spool (fig. 4.2.6s).

18. Determine the maximum spool movement in both directions by working the L.H. foot pedal.

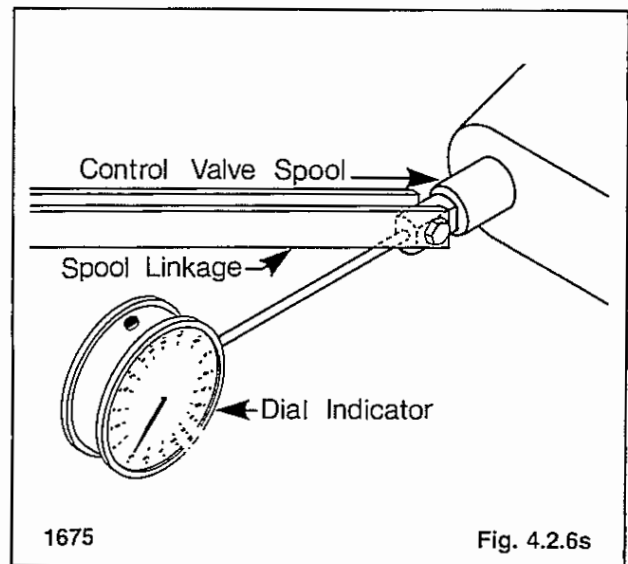
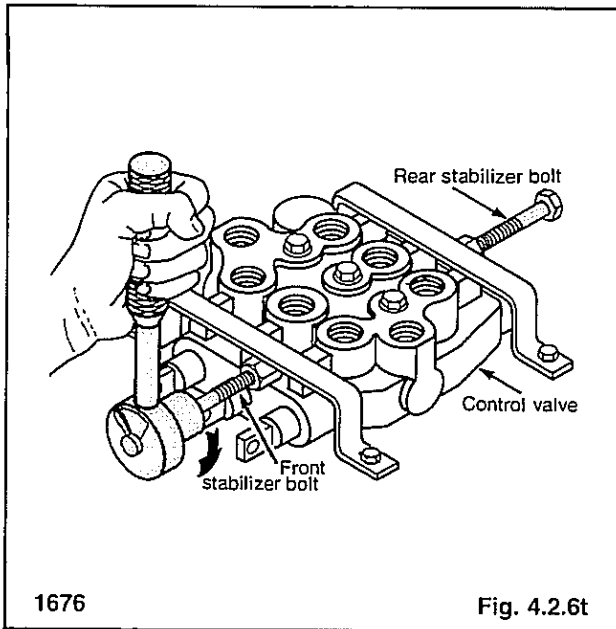


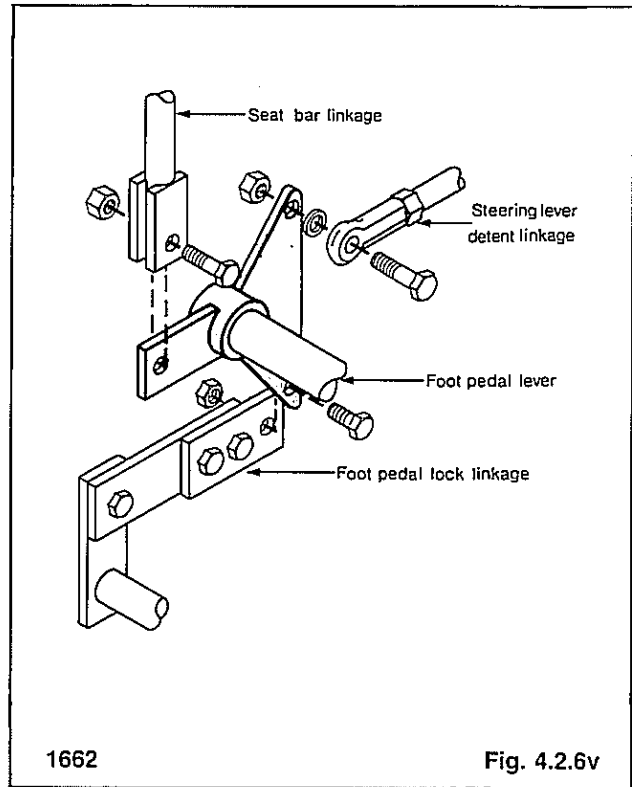
Fig. 4.2.6s

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19. Adjust the position of the control valve with the front or rear stabilizer adjustment bolts (fig. 4.2.6t).
20. Set the control valve so that the valve spool moves a maximum of .040 inches (1.0 mm) in either direction.



27. After adjustment of the foot pedal lock it may be necessary to adjust the seat bar linkage. Refer to section 4.3.3.



21. Check the total control valve spool movement on the L.H. spool.
 22. When the valve has been correctly positioned ensure that both the front and rear stabilizer bolts are against the control valve body.
Tighten the stabilizer adjustment bolt counter nuts.
 23. Torque the two control valve mounting bolts 12-15 ft. lbs. (16-20 N.M.).
- NOTE: Do not over torque the control valve mounting bolts otherwise binding of the valve spools in the valve body may occur.
24. Reconnect the foot pedal lock linkage, steering lever detent linkage and seat bar linkage (fig. 4.2.6v).
 25. Reconnect the hydraulic lines at the control valve and refill the hydraulic reservoir.
 26. Test the foot pedal locks with the engine running and the seat bar up.

If any movement occurs in the hydraulic system, shut off the engine and readjust the foot pedal lock.

Test the foot pedals with the seat bar down to ensure the pedals move freely and do not bind.

4.2.7 Safety Start Switch — Adjustment (S/N LC000100-LC000209 LE000100-LE000536):

For operator safety during start-up the loader is equipped with a safety start switch connected to the loaders starting circuit. The safety start switch is a normally closed switch.

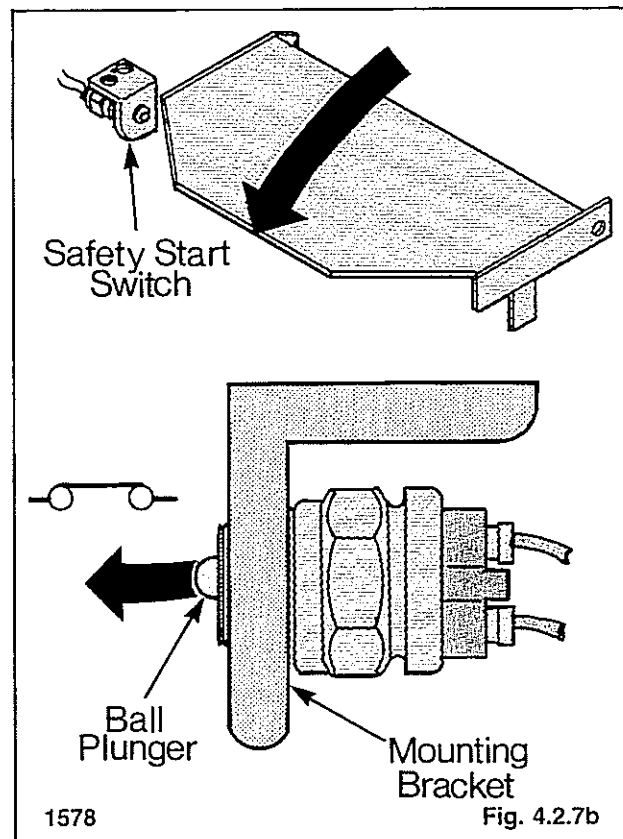
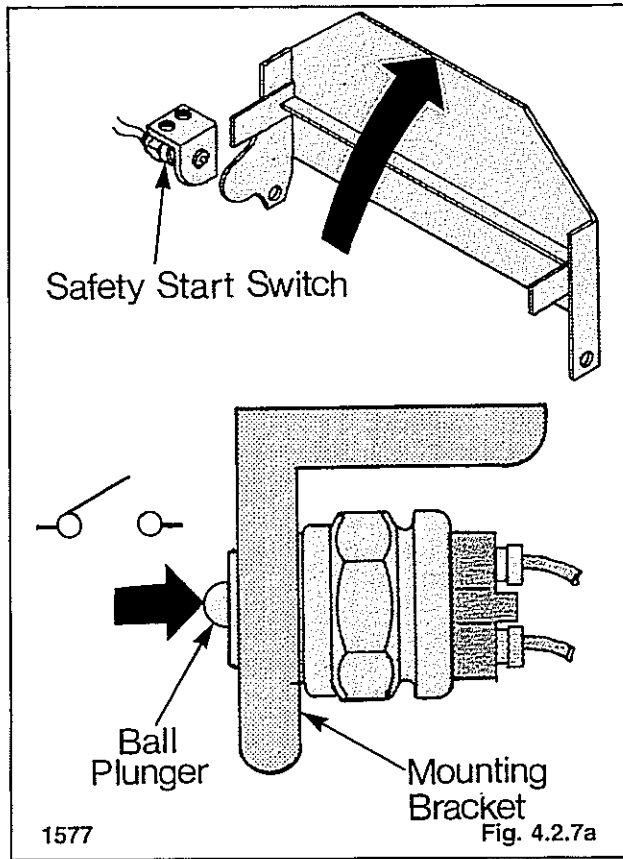
The safety start switch is engaged and disengaged by the foot pedal shield.


When the foot pedal shield is in the up position (fig. 4.2.7a) the ball plunger in the safety start switch moves inward disengaging the starting circuit. The loader must be started with the seat bar up and the foot pedal shield down.

When the foot pedal shield is down (fig. 4.2.7b) the ball plunger on the safety start switch moves outward completing the starting circuit.

Adjust the safety switch as follows:

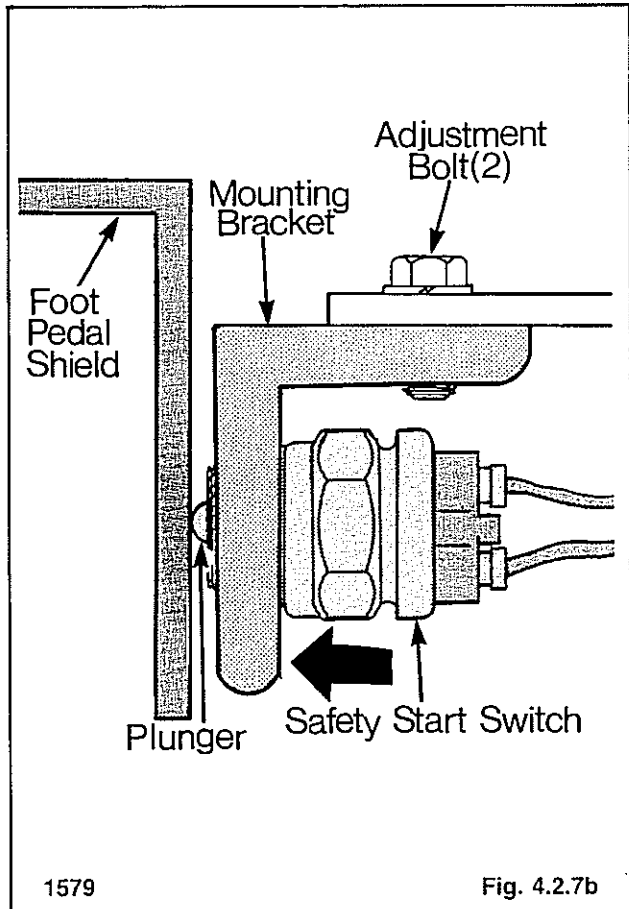
1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.





WARNING

To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.



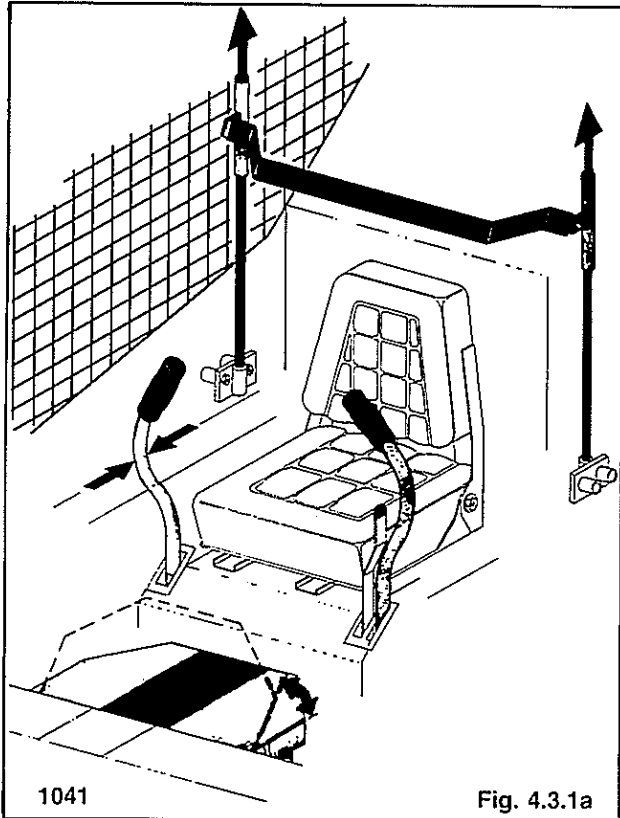
2. Check to ensure the safety start switch is fully screwed into the mounting bracket (fig. 4.2.7c).
3. With the foot pedal shield in the full down position, loosen the two adjustment bolts which secure the safety start switch mounting bracket.
4. Move the mounting bracket toward the foot pedal shield until the plunger on the end of the safety start switch is fully depressed.
5. Tighten the two mounting bracket adjustment bolts.

NOTE: Loaders after S/N LC000210-LE000537 do not require adjustment other than ensuring the safety start switch is fully screwed into the mounting bracket.

4.3 SEAT BAR

4.3.1 Operation (S/N LC000100-LC000209 LE000100-LE000536):

For operator protection the loader is equipped with a seat bar. When the seat bar is in the up position (fig. 4.3.1a) the steering control levers are returned to and restricted in neutral position. The foot pedals are also covered which will prevent accidental cycling of the foot pedals when entering or exiting the loader.

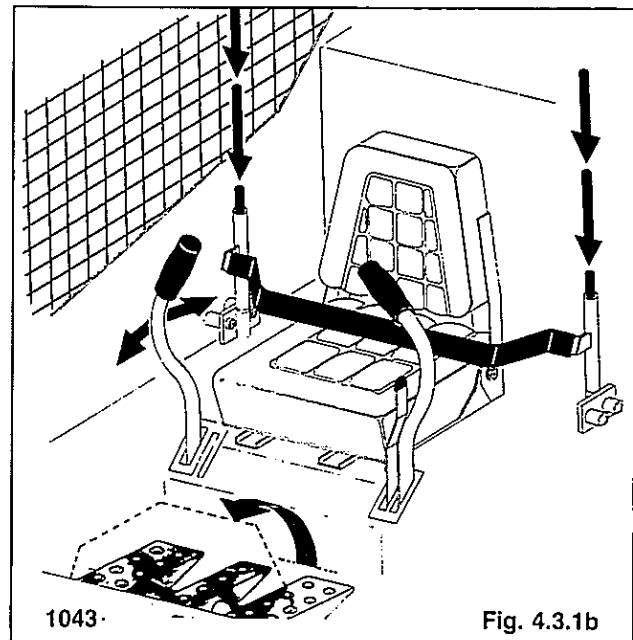


WARNING To prevent personal injury stop the engine, lower the boom arms and engage the parking brake before getting out of loader.

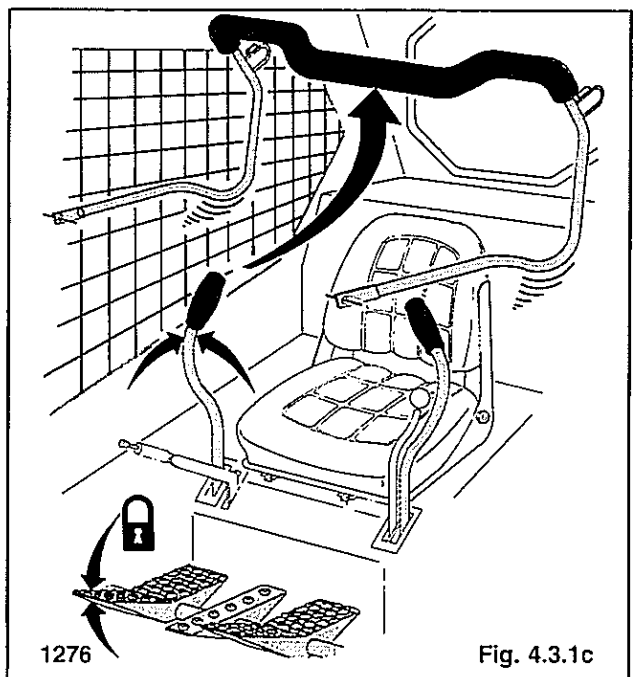
When the seat bar is in the lowered or operating position (fig. 4.3.1b) the foot pedal shield raises to expose the foot pedals and the steering levers are free to move.

A safety start switch activated by the foot pedal shield locks out the loader starting circuit when the seat bar is lowered. The loader must be started with the seat bar in the up position.

For restarting the loader during operation if the engine stalls, the loader is equipped with an over-ride starting switch. The over-ride switch allows the engine to be restarted with the seat bar lowered.



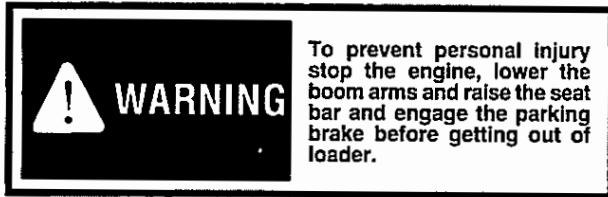
WARNING To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.



Operation (S/N LC000209 & LE000537 Onward):

For operator protection the loader is equipped with a seat bar. When the seat bar is in the up position (fig. 4.3.1c) the steering control levers are returned to and restricted in neutral position. The foot pedals are also locked to prevent

accidental cycling of the foot pedals when entering or exiting the loader.



When the seat bar is in the lowered or operating position (fig. 4.3.1d) the foot pedals and the steering levers unlock.

A safety start switch locks out the loader starting circuit when the seat bar is lowered. The loader must be started with the seat bar in the up position.

For restarting the loader during operation if the engine stalls, the loader is equipped with an over-ride starting switch. The over-ride switch allows the engine to be restarted with the seat bar lowered.

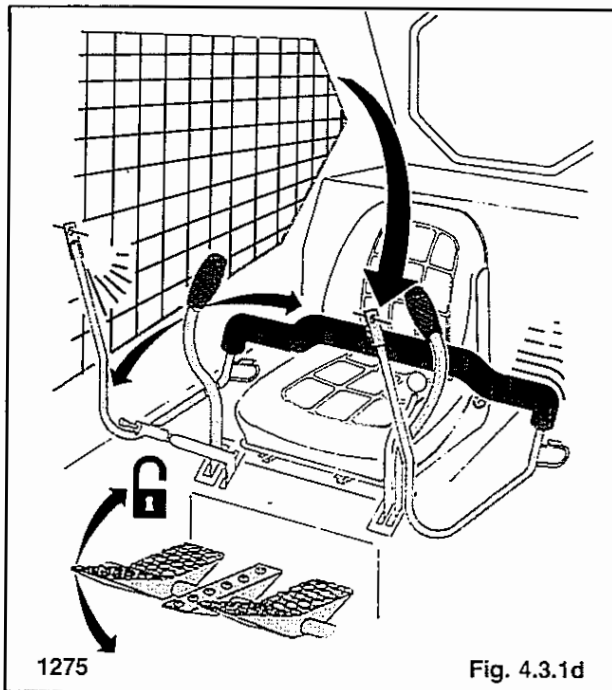
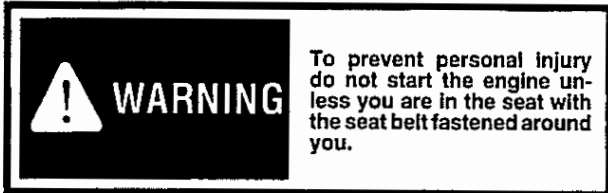
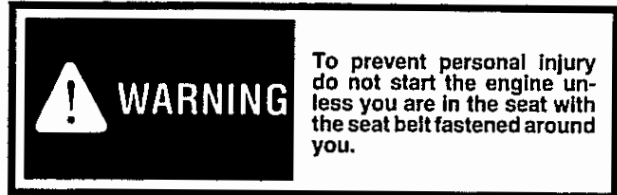


Fig. 4.3.1d

4.3.2 Seat Bar Adjustment
(S/N LC000100-LC000209
LE000100-LE000536):

The following procedure is for the complete adjustment of the seat bar linkage, steering lever detent and foot pedal shield.

Before making any adjustment check that the machine does not creep with the engine running, seat bar in the down position and the steering levers in neutral. If wheel creep is detected, the steering lever neutral adjustment will have to be completed before proceeding to the following adjustment. Refer to section 4.1.2 for procedure.



1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.

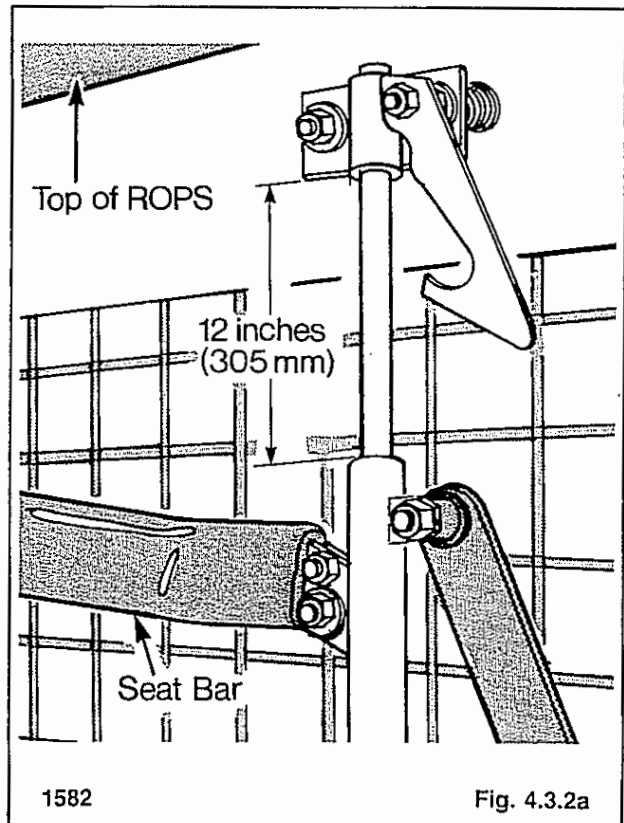
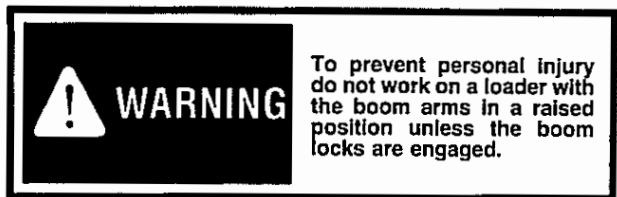
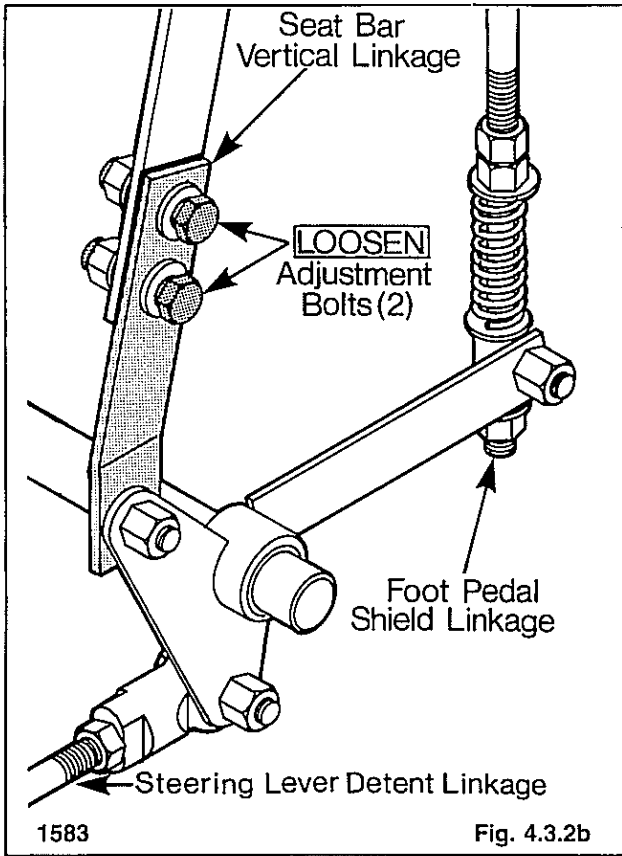
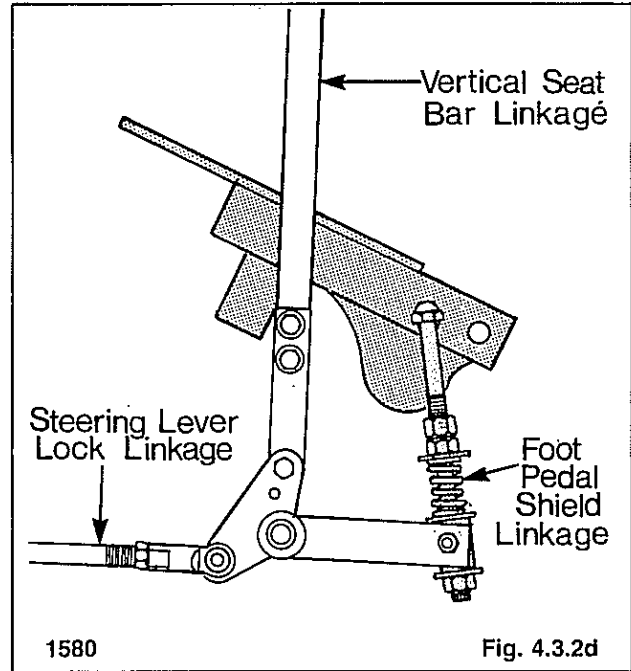
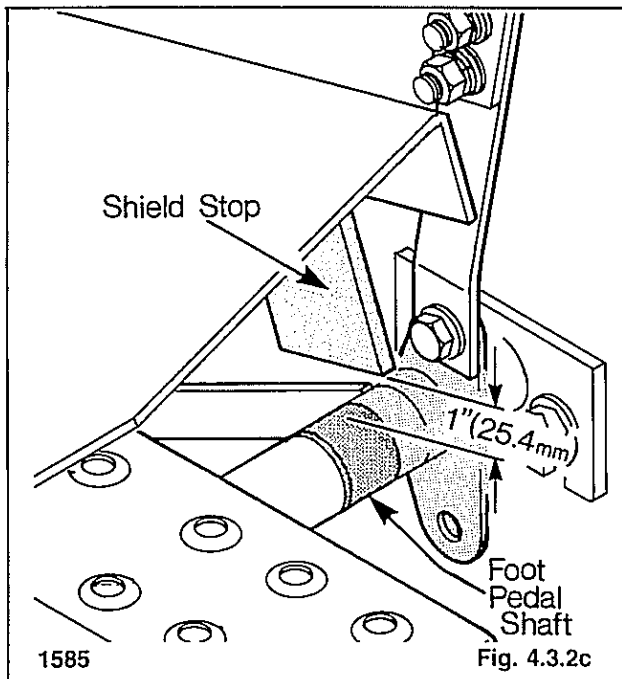


Fig. 4.3.2a

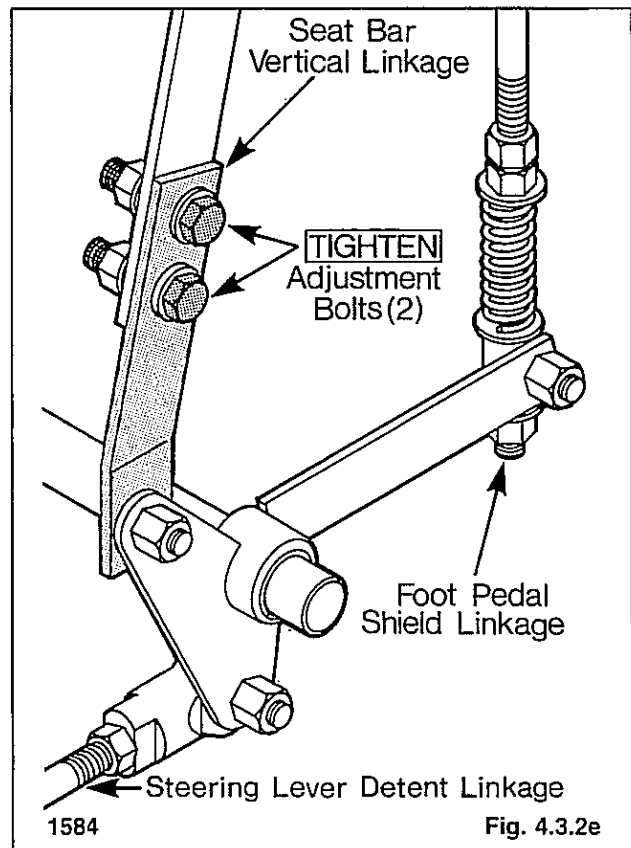
2. Raise the seat and remove the hydrostatic shield.
3. Lower the seat bar 12 inches (305 mm) and clamp it in position (fig. 4.3.2a).

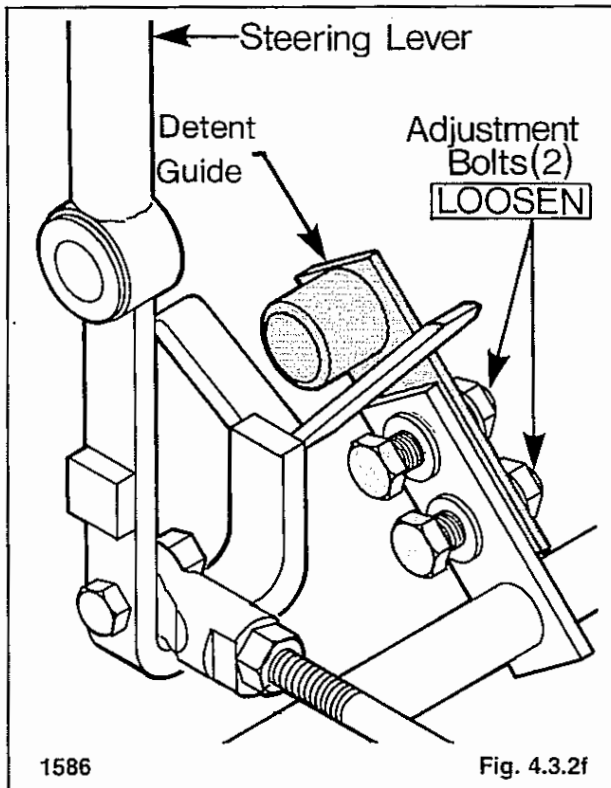


4. Loosen the adjustment bolts on the seat bar vertical linkage (fig. 4.3.2b).
5. Place and clamp the foot pedal shield so that the shield stop is 1 inch (25.4 mm) above the foot pedal shaft (fig. 4.3.2c).

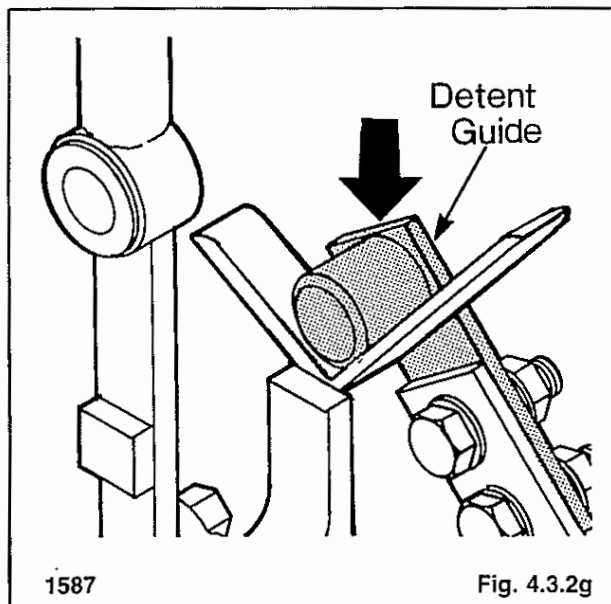


6. Adjust the foot pedal shield linkage so that the spring is just beginning to compress (fig. 4.3.2d).
7. Tighten the adjustment bolts on the seat bar vertical linkage (fig. 4.3.2e).





8. Loosen the adjustment bolts on both the L.H. and R.H. steering lever detent guides (fig. 4.3.2f).
9. With the steering levers in neutral position, adjust the detent guides so they sit tightly in the steering lever 'V' (fig. 4.3.2g).



WARNING To prevent personal injury do not service the loader with the engine running.

10. Tighten the adjustment bolts on the L.H. and R.H. steering lever detent guides.
11. Check that with the engine running and the seat bar in the up position the loader does not creep. If the loader creeps readjust the lock detents, step 7 to 9.

WARNING To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

4.3.3 Seat Bar — Adjustment
(S/N LC000209 & LE000537 Onward):

The following is the complete adjustment procedure for the seat bar linkage, steering lever detent and foot pedal lock.

Before making any adjustment check that the machine does not creep with the engine running, seat bar in the down position and the steering levers in neutral.

If wheel creep is detected, the steering lever neutral adjustment will have to be completed before proceeding to the following adjustment. Refer to section 4.1.2 for procedure.

WARNING To prevent personal injury do not start the engine unless you are in the seat with the seat belt fastened around you.

1. Remove any attachment, raise the boom arms and engage the boom locks. Shut off the engine.

WARNING To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.

2. Raise the seat and remove the hydrostatic shield.
3. Lock the seat bar in the up position.

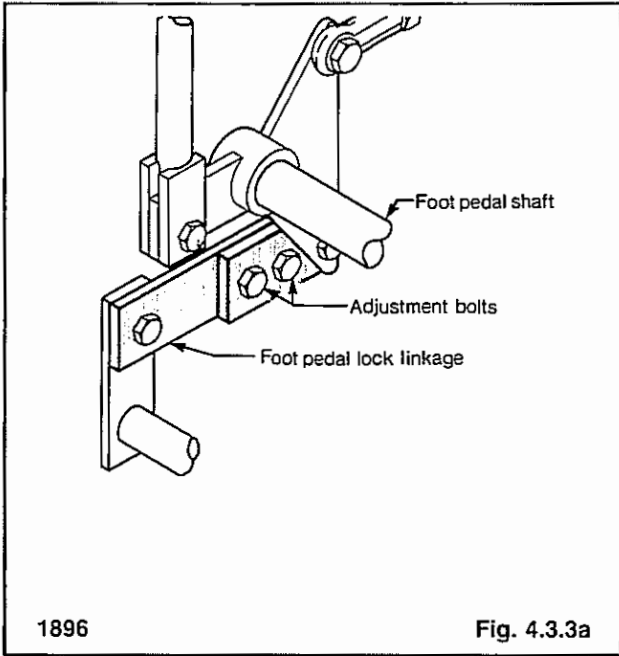


Fig. 4.3.3a

4. Loosen the foot pedal lock linkage adjustment nuts (fig. 4.3.3a).
5. Disconnect the seat bar vertical linkage from the seat bar.

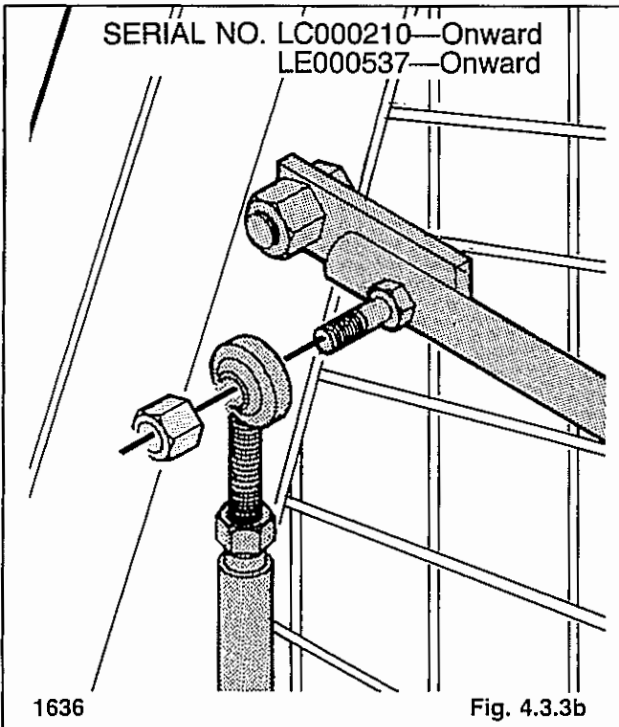


Fig. 4.3.3b

6. Back out the male rod end from the vertical linkage (fig. 4.3.3c).
- Screw the male rod end back into the vertical linkage approximately one thread.

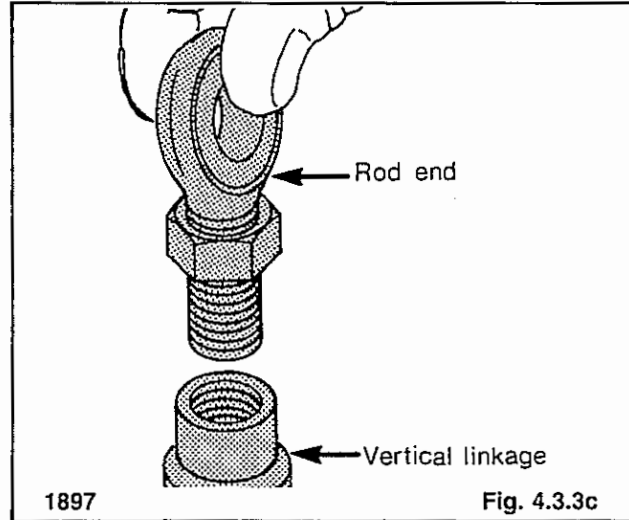


Fig. 4.3.3c

7. Reconnect the vertical linkage to the seat bar.
8. Disconnect the steering lever detent linkage at the foot pedal shaft (fig. 4.3.3d).

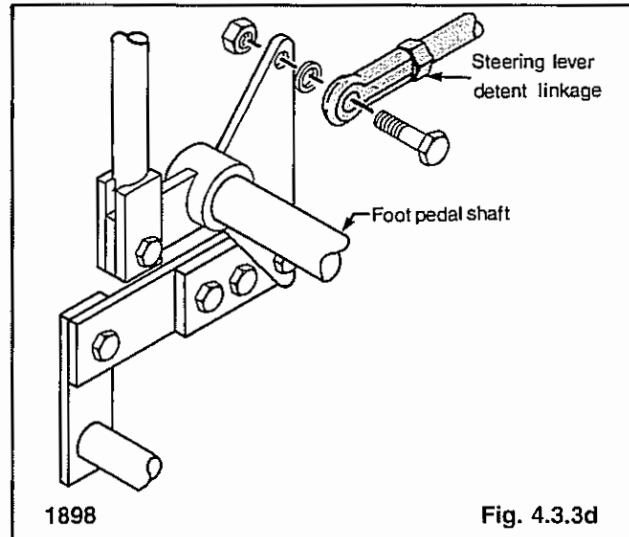


Fig. 4.3.3d

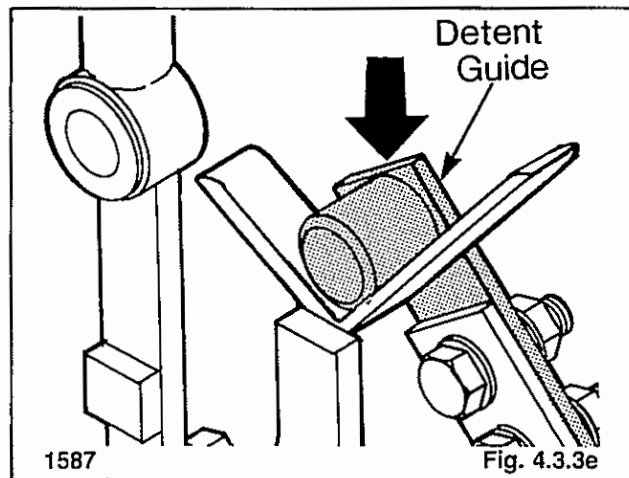


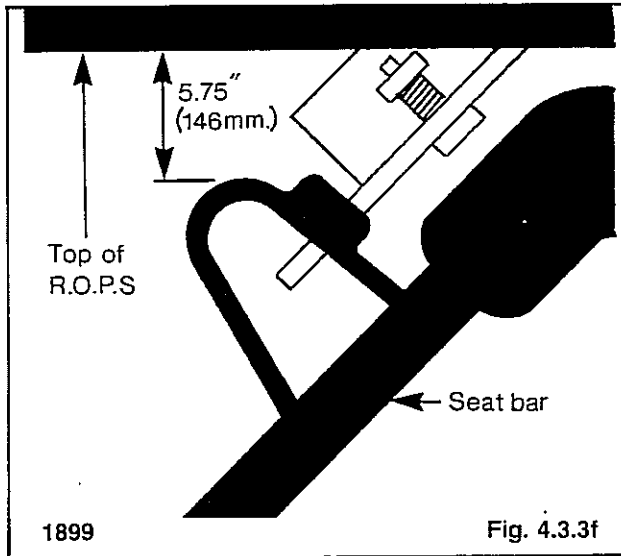
Fig. 4.3.3e

4 CONTROLS

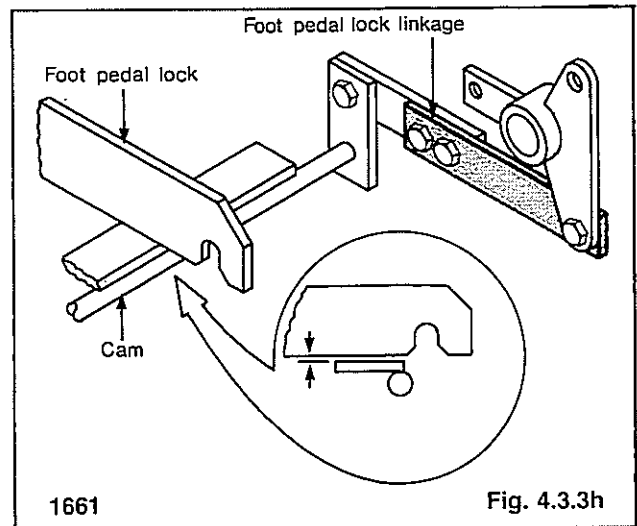
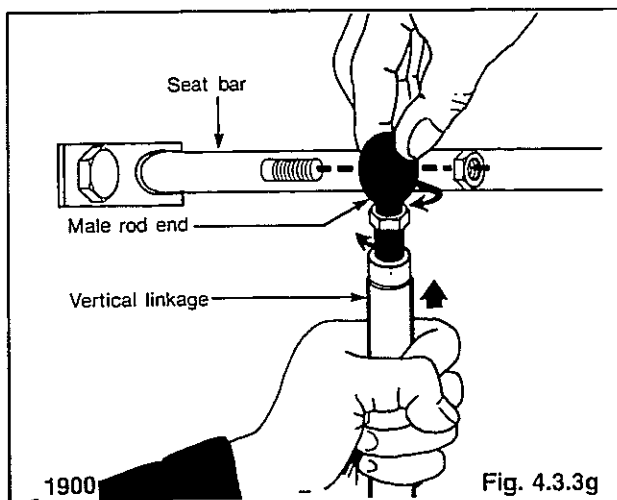
- Adjust the steering lever linkage until the detent guide is sitting fully in the control lever 'V' (fig. 4.3.3e).

Ensure the control lever does not move out of neutral position.

- Reconnect the control lever detent linkage at the foot pedal shaft.
- Lower the seat bar until it is 5.75 in. (146 mm) from the top of the ROPS and clamp it in place (fig. 4.3.3f).



- Disconnect the seat bar vertical linkage from the seat bar (fig. 4.3.3b).
- Pull up on the vertical seat bar until the detent guide is fully seated in the control lever 'V' (fig. 4.3.3e).
Adjust the male rod end on the vertical linkage and reconnect the linkage to the seat bar (fig. 4.3.3g).
Be sure to tighten the counternut on the male rod end of the vertical linkage.
- Raise and lock the seat bar in the up position.

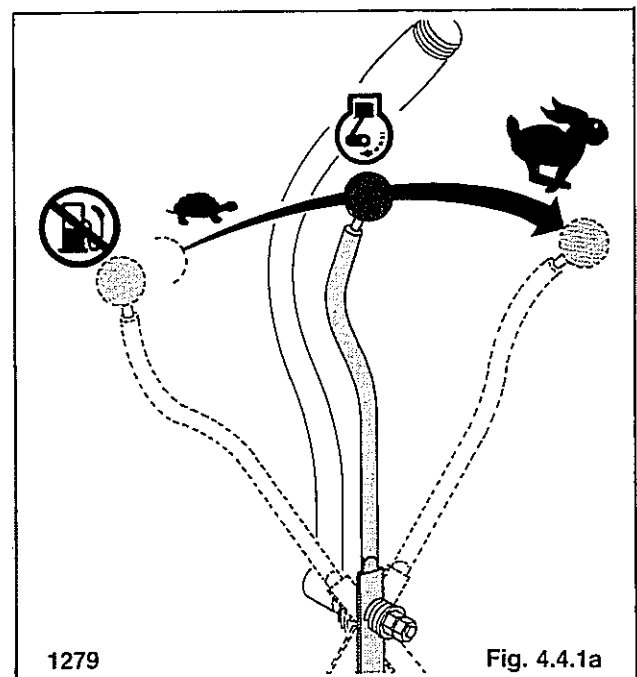


- Adjust and tighten the foot pedal lock linkage (fig. 4.3.3h).
Adjust the linkage so that no upward tension is applied to the foot pedal lock arms.
- Test the loader with the engine running and the seat bar in the up position.
If the loader creeps readjust.

4.4 THROTTLE & STOP CONTROL

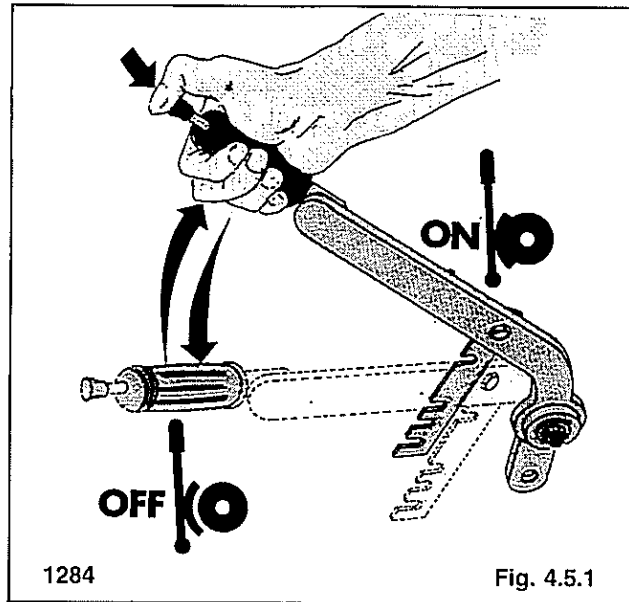
4.4.1 Operation:

The diesel engine throttle and stop control is incorporated in one lever located on the left hand side of the loader next to the steering control lever (fig. 4.4.1a).

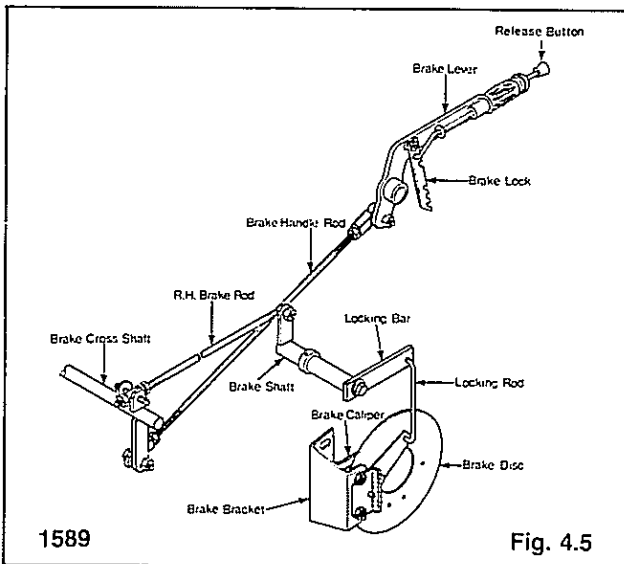


Pushing the lever full forward increases the engine speed to maximum high idle. Pulling the lever back decreases the engine RPM. Pulling full back on the lever will shut off the fuel supply stopping the engine. The engine should always be operated at full speed and the loader travel speed controlled with the steering control levers.

	T103	T133
Low Idle	875 (± 25)	875 (± 25)
Max. High Idle	2800 (± 25)	2550 (± 25)



4.5 PARKING BRAKE

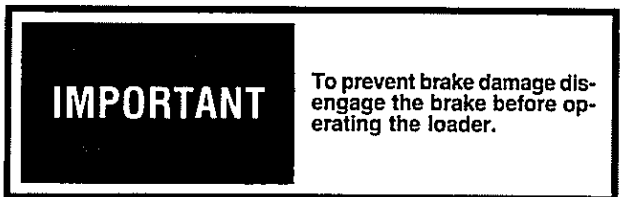
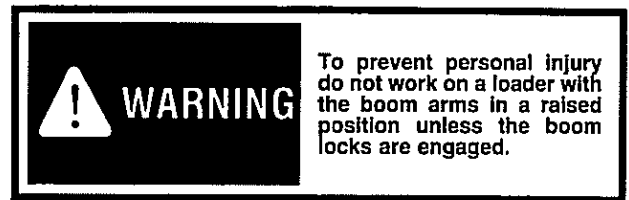


4.5.1 Operation:

The loader is equipped with two mechanical, caliper type disc brakes located inside the final drive housing. Both brakes are activated by one hand lever located on the right hand side of the machine next to the operator's seat (fig. 4.5.1).

To engage the brakes; pull upward on the brake handle until it locks in position. To release the brakes; push the brake release button, lift up on the brake handle until the lock disengages and lower the brake handle completely down.

When in proper working order and correctly adjusted the parking brake will hold the machine, with the engine off, on an 8.5 degree incline.



4.5.2 Adjustment:

To ensure correct parking brake performance the amount of effort required to move the brake lock from the second to the third notch must be measured.

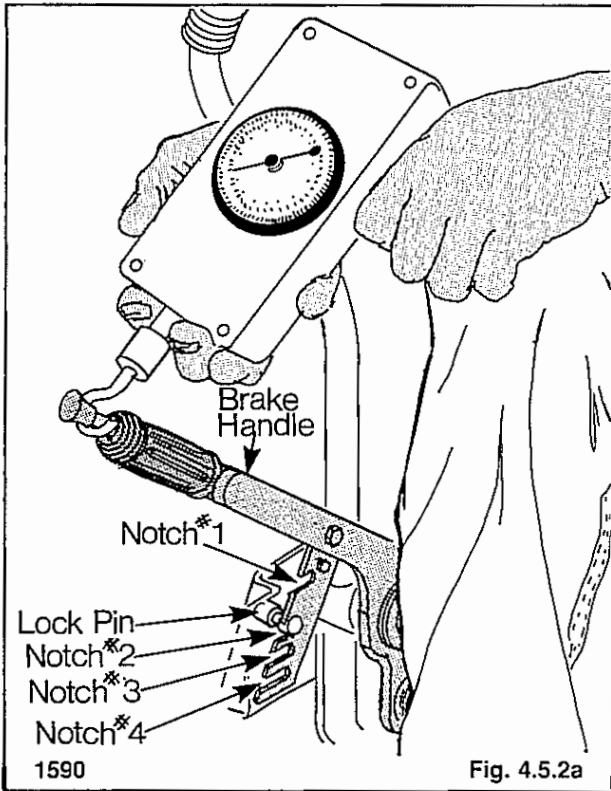
To check the handle effort set the brake lock in the second notch. Place a force gauge at the end of the brake handle on the 1/4" (6 mm) diameter rod next to the rubber handle (fig. 4.5.2a).

With a slow steady pull, move the handle until the brake lock engages the lock pin in the third notch (fig. 4.5.2b). Read the amount of force required to move the handle on the force gauge. The readings should be within the following valves:

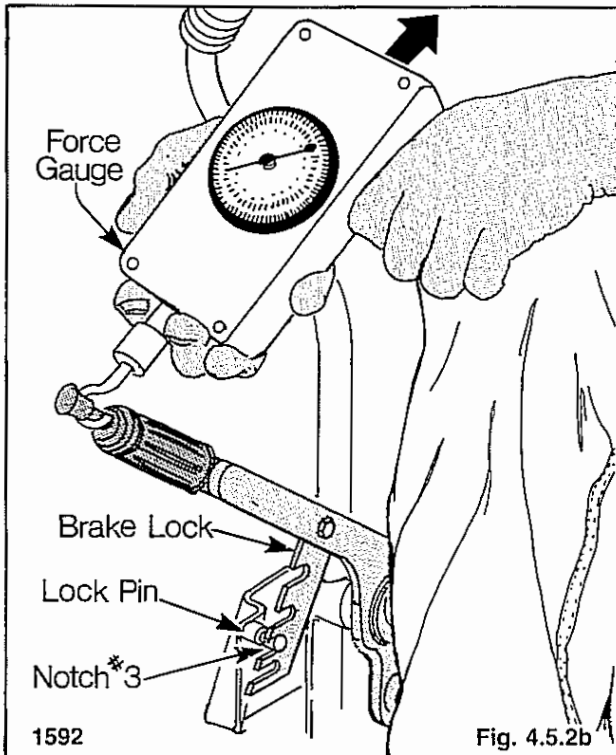
Serial No. LC000100-LC000209
LE000100-LE00052490-95 lbs. (41-43 kg)

Serial No. LC000210-LC000244
LE000525-LE00067885-90 lbs. (39-41 kg)


Serial No. LC000245—Onward
LE000679—Onward75-80 lbs. (34-36 kg)



If the handle effort is within the above specifications and the brakes do not perform correctly check the brake pads and disc for wear or damage. If necessary replace. Refer to section 4.5.5.




If the handle effort is below the above specifications adjust the brake assembly as follows:

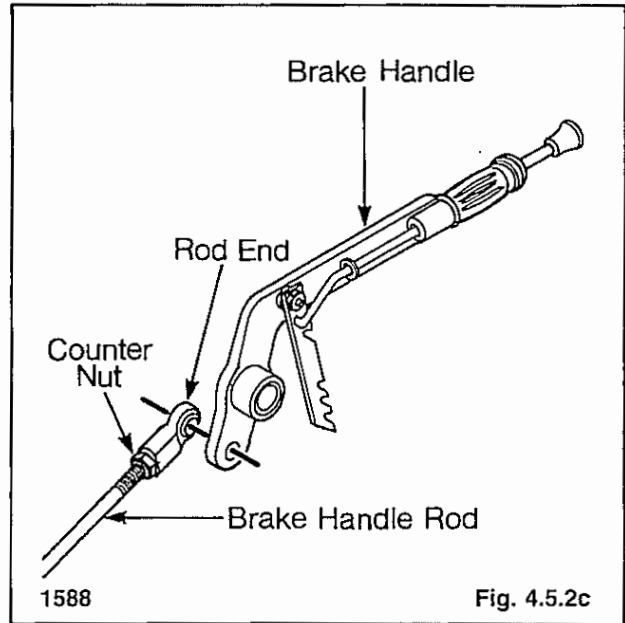


WARNING To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.

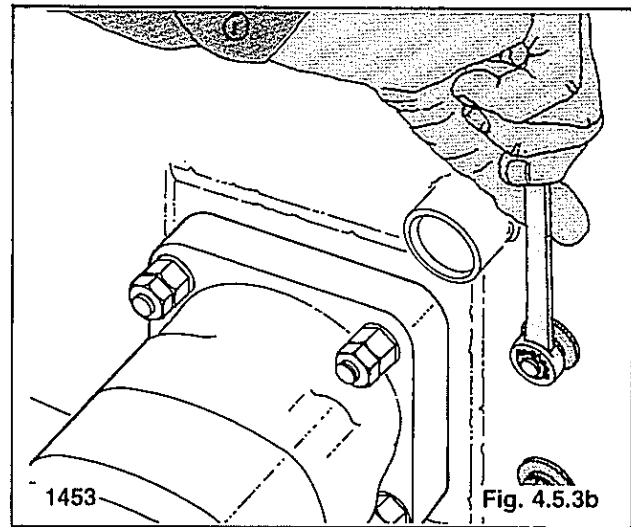
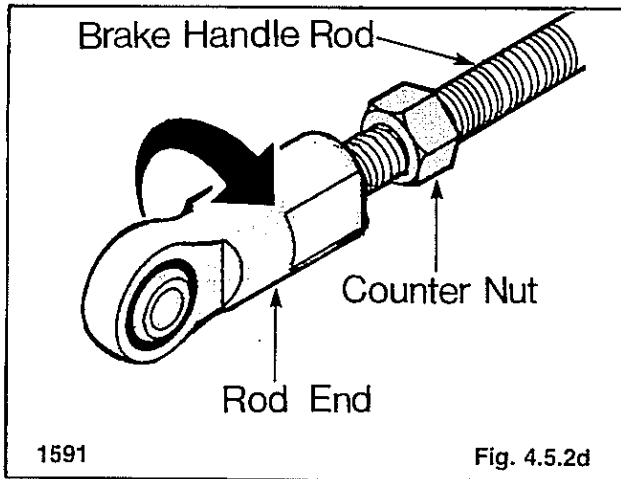
1. Remove any attachment, raise the boom arms and engage the boom lock. Shut off the engine.
2. Remove the hydrostatic shield.




WARNING To prevent personal injury do not service the loader with the engine running.



3. Disengage the brake handle and place it in the off position (fig. 4.5.2c).
4. Disconnect the brake handle rod where it connects to the brake handle (fig. 4.5.2c).
5. To increase the amount of handle force, back-off the rod end counter nut. Turn the rod end clockwise two or three turns (fig. 4.5.2d).
6. Reconnect the brake handle rod to the brake lever and recheck the amount of handle effort required to move the brake lock from the second to the third notch. If necessary repeat steps 3 to 6. When the correct handle effort is achieved tighten the rod end counter nut on the brake handle rod.



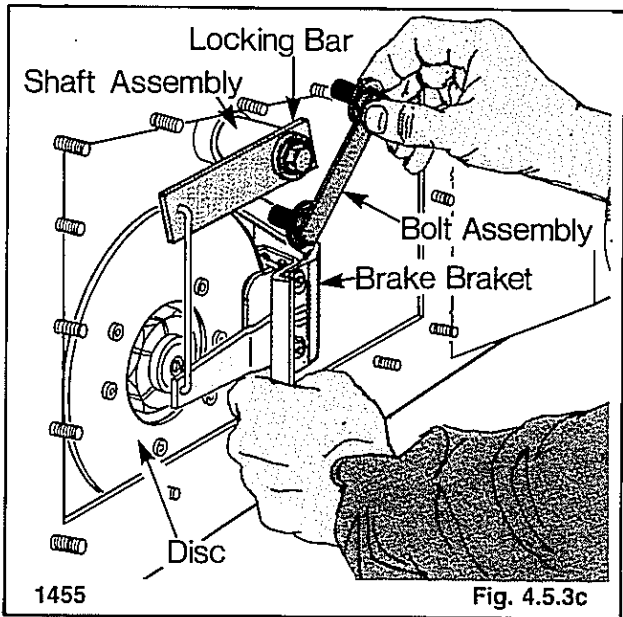
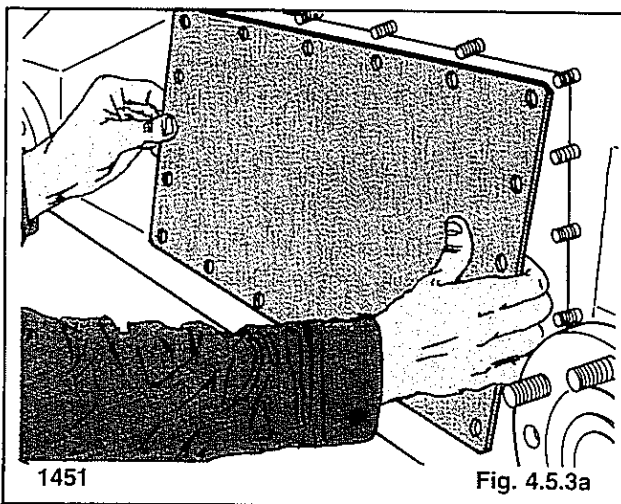
4.5.3 Parking Brake Removal:



WARNING

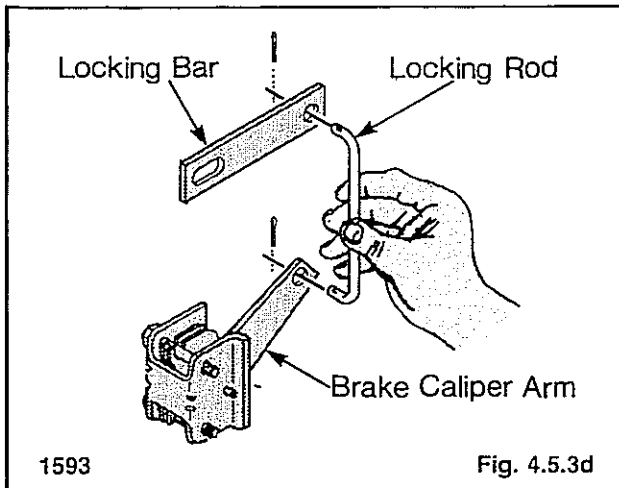
To prevent personal injury do not work on a loader with the boom arms in a raised position unless the boom locks are engaged.

1. Remove any attachment, raise the boom arms and engage the boom lock. Shut off the engine.
2. Raise the seat and remove the hydrostatic shield.
3. Block the loader securely with all four wheels clear of the ground.
4. Remove the wheels. On reassembly torque the wheel nuts 100-110 ft. lbs. (136-149 N.M.).
5. Remove the final drive inspection cover (fig. 4.5.3a) located between the axles on the final drive housing. On reassembly apply silicon to the inspection cover to prevent leakage of the drive lubricating oil.

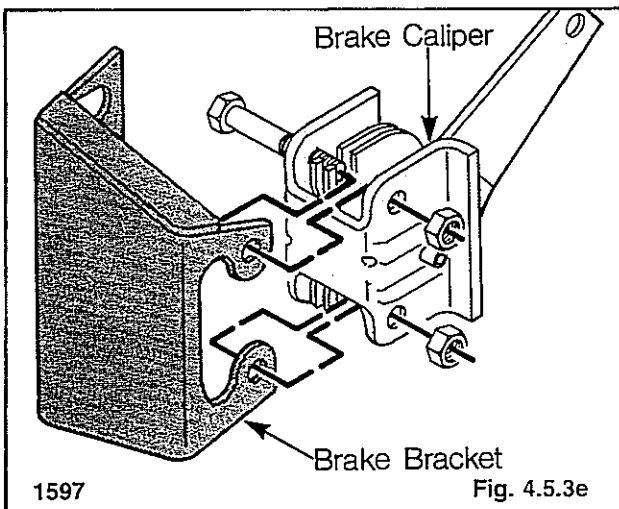


6. Remove two nuts located inside the loader next to the torque motor which secures the parking brake bracket (fig. 4.5.3b).
7. Remove the bolt assembly from the parking brake bracket (fig. 4.5.3c). Remove the bolt which secures the locking bar to the brake shaft. Remove the brake bracket and locking bar assembly from the loader.
8. Remove the locking rod from the locking bar and brake caliper arm (fig. 4.5.3d).
9. Remove the brake caliper from the brake bracket (fig. 4.5.3e).
10. Remove the brake disc from the torque motor sprocket (fig. 4.5.3f).

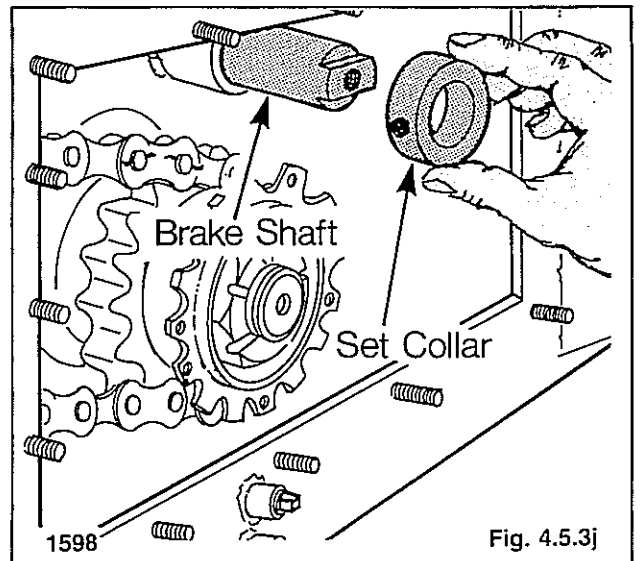
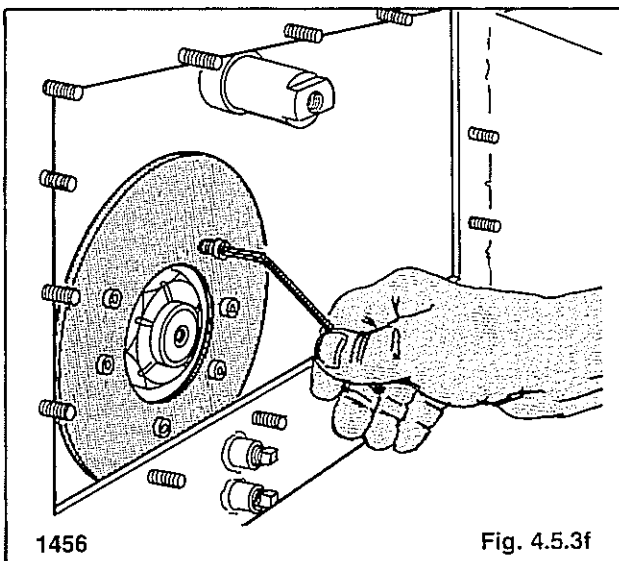
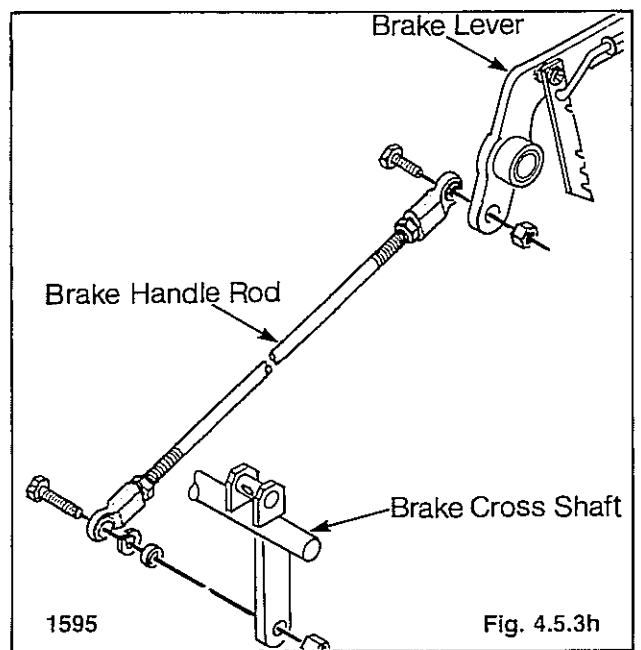
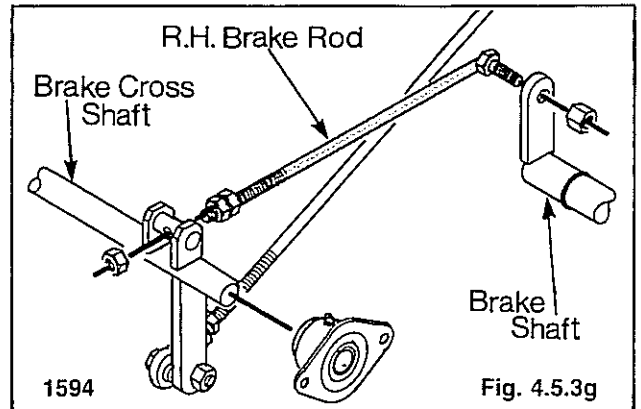
On reassembly apply Loctite RC609 to the brake disc screws.

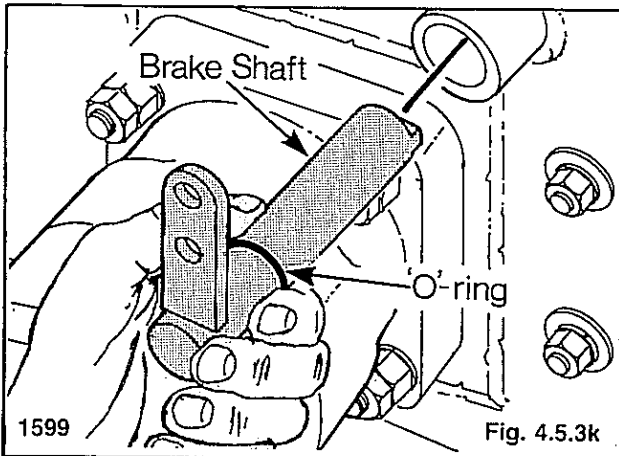


11. Remove the R.H. and L.H. brake rod from the brake shafts and the brake cross shaft (fig. 4.5.3g).
12. Remove the brake handle rod from the brake cross shaft and the brake lever (fig. 4.5.3h).



13. Remove the brake cross shaft assembly.
14. Remove the brake handle assembly.





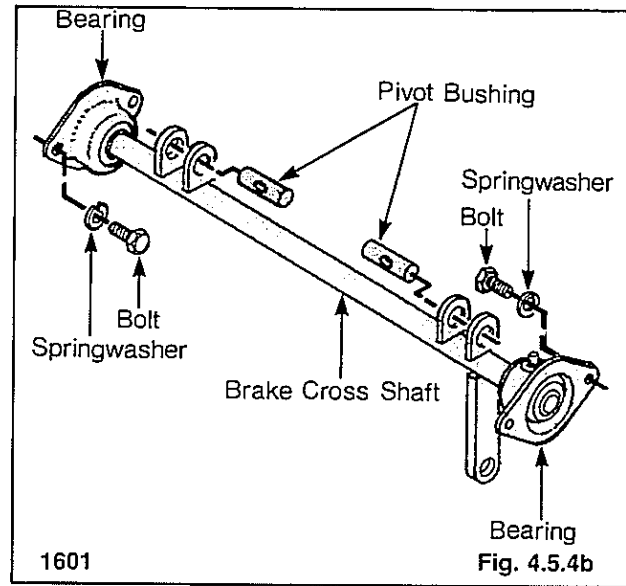
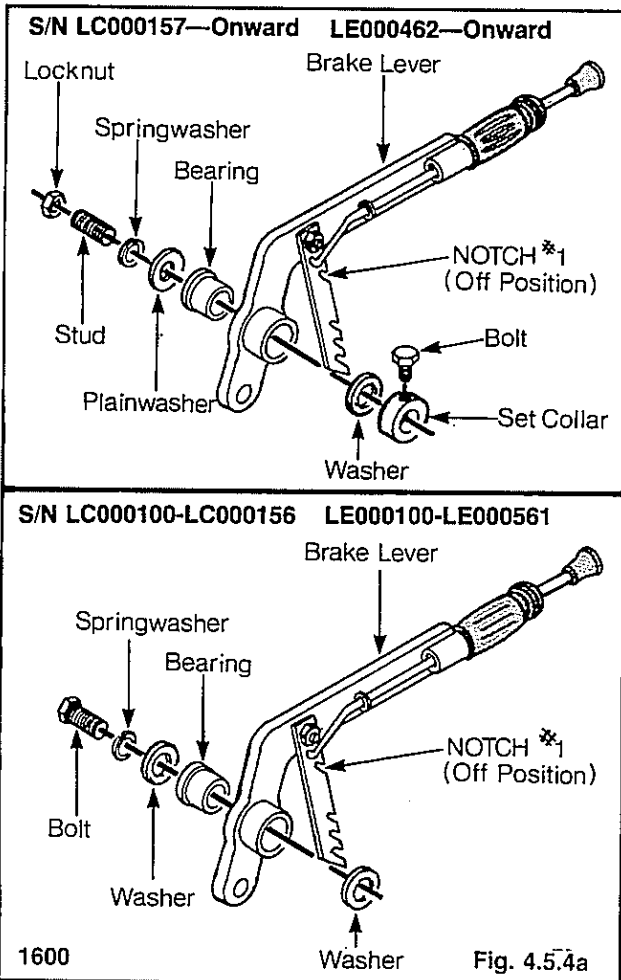
15. Remove the set collar from the brake shaft on the inside of the final drive housing (fig. 4.5.3j).

16. Remove the brake shaft from the final drive housing (fig. 4.5.3k).

On reassembly replace the O-ring.

4.5.4 Parking Brake Installation:

1. Install the brake lever assembly and place the brake lock in the off position or first notch (fig. 4.5.4a).

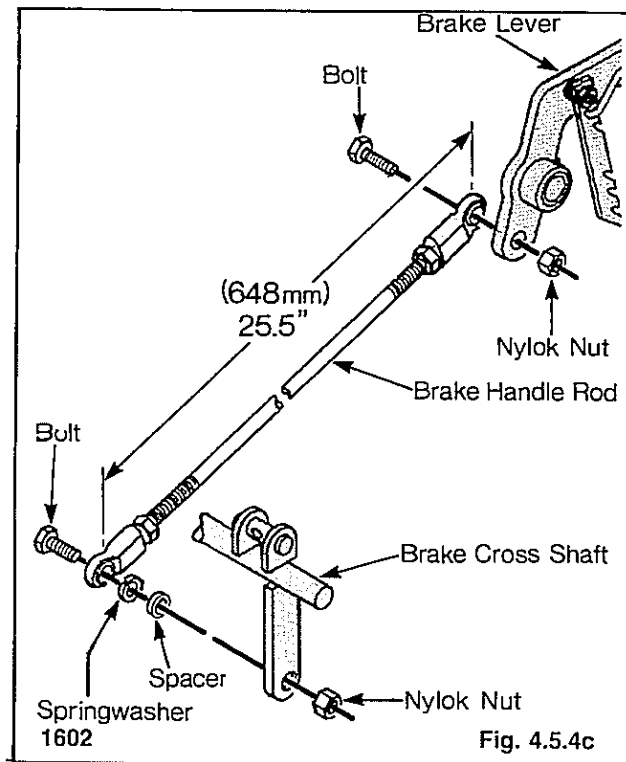


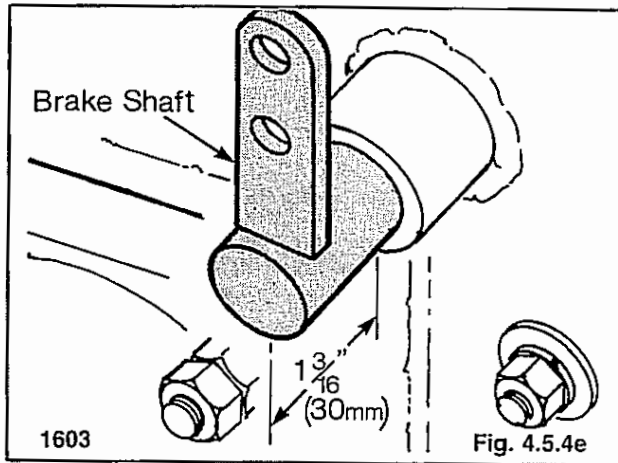
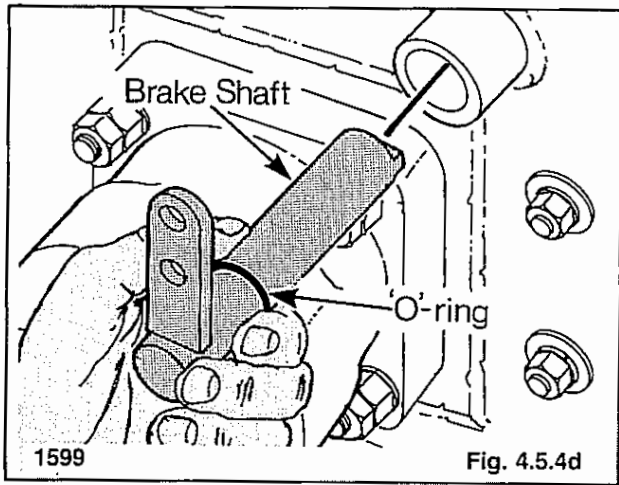
2. Install the brake cross shaft in the loader (fig. 4.5.4b).

3. Connect the brake handle rod between the brake lever and the brake cross shaft (fig. 4.5.4c).

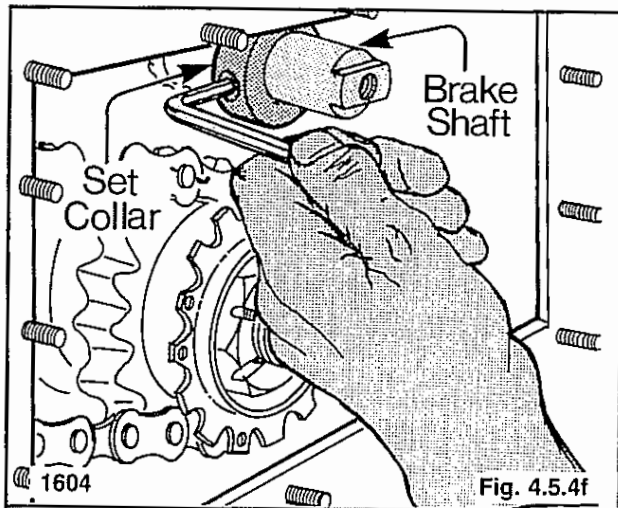
Adjust the rod ends so that the center to center distance between them is 25.5 inches (648 mm).

4. Lubricate a new O-ring with final drive fluid and place it on the brake shaft. Install the brake shaft in the final drive housing (fig. 4.5.4d).

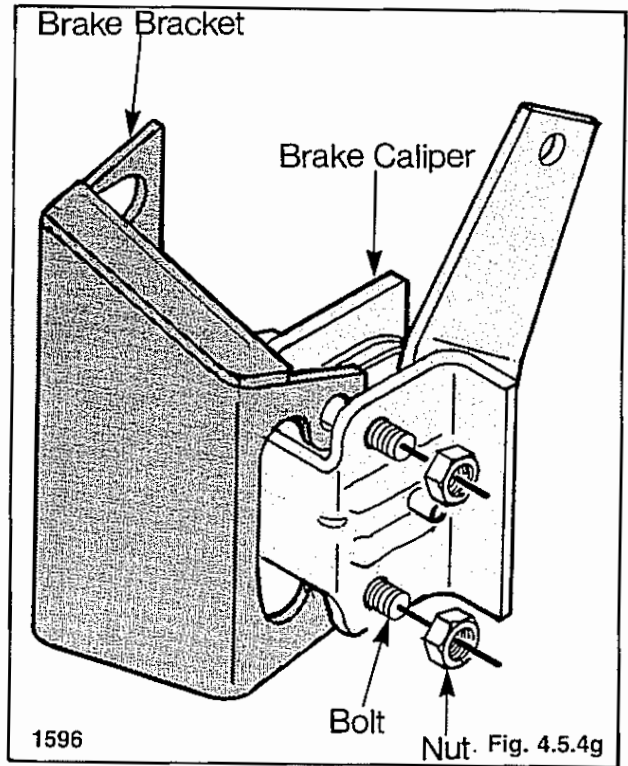




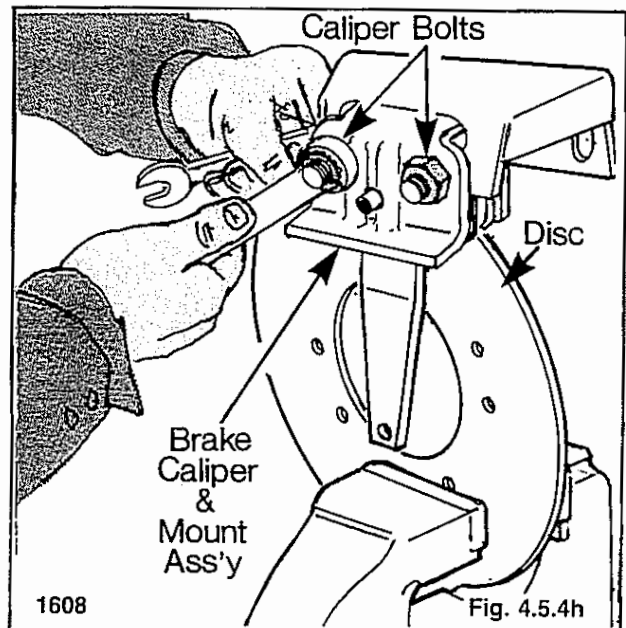
5. Set the brake shaft so that it extends 1 3/16 inch (30 mm) beyond the face of the final drive housing (fig. 4.5.4e).
6. Lock the brake shaft in place with the set collar on the inside of the final drive housing (fig. 4.5.4f).

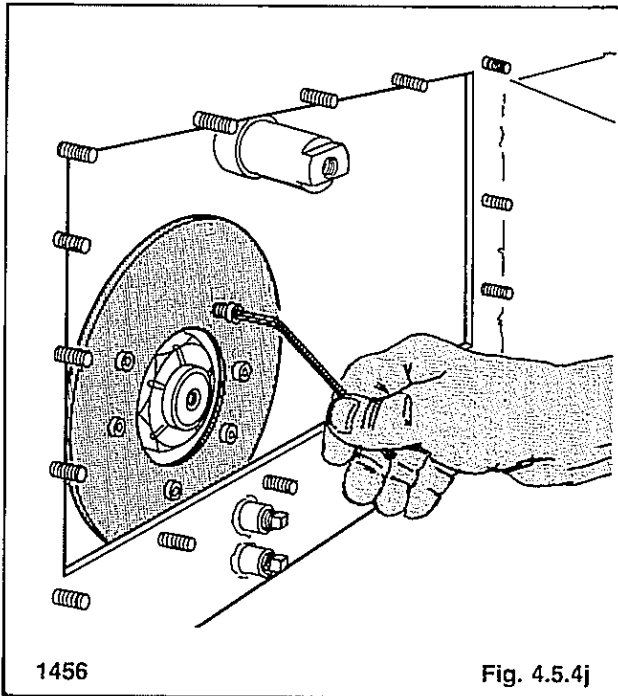


7. Assemble the brake caliper and brake bracket. Ensure the brake bracket is on the inside of the caliper (fig. 4.5.4g).



8. Place the brake disc in a soft sided vise. Place the brake caliper and mount assembly over the disc so that the caliper mounting bolts rest on the edge of the disc (fig. 4.5.4h).



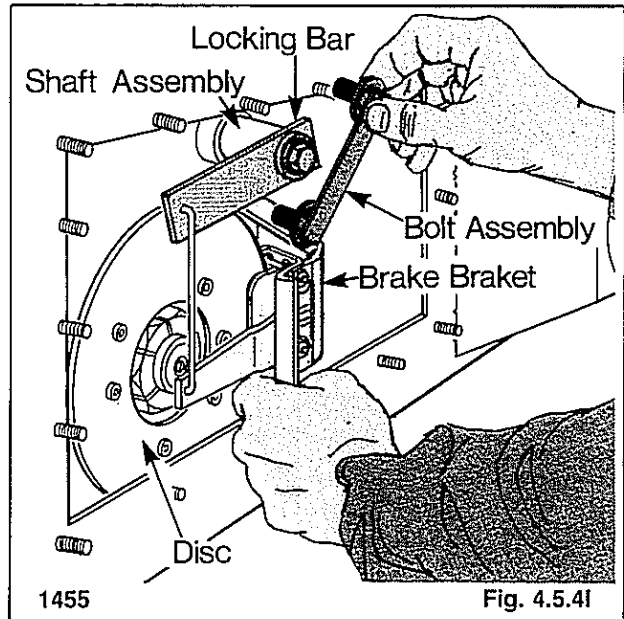
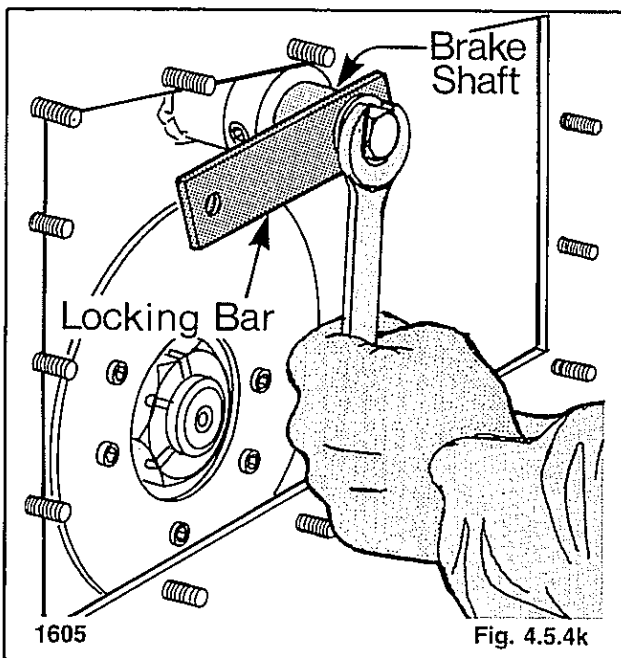


Evenly tighten the two caliper mounting bolts until drag is felt between the disc and the brake pads when the brake caliper assembly is rotated around the disc.

9. Install the brake disc on the torque motor sprocket.

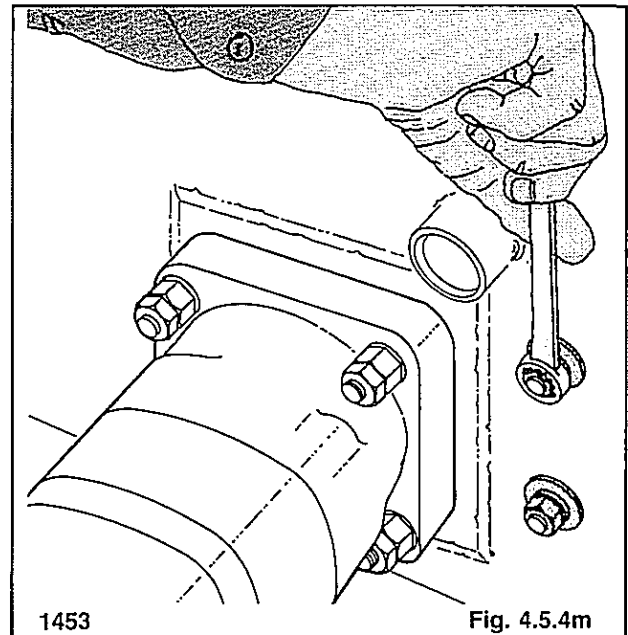
Apply loctite RC609 to the cap screws on assembly (fig. 4.5.4j).

10. Install the locking bar on the end of the shaft assembly (fig. 4.5.4k).



11. Install the brake bracket assembly and secure in place with the bolt assembly (fig. 4.5.4l).

12. Install the plainwashers, lockwashers and nuts on the brake bracket bolt assembly where it protrudes on the inside of the loader next to the torque motor (fig. 4.5.4m).



13. Connect the locking rod to the locking bar and caliper arm and secure in place with split pins (fig. 4.5.4n).

14. Install the R.H. and L.H. brake rods between the brake shaft and the cross shaft.

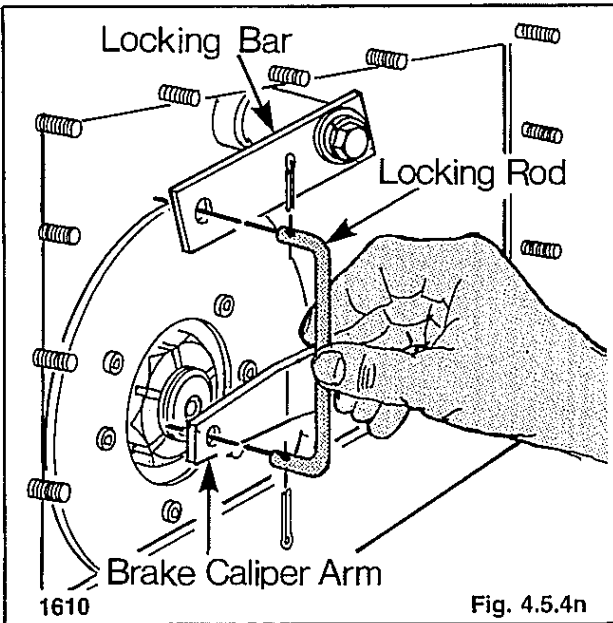


Fig. 4.5.4n

15. Push and hold the brake shaft lever to ward the rear of the loader (fig. 4.5.4o).

Set the adjustment nut on the brake rod so that it is against the pivot bushing on the brake cross shaft (fig. 4.5.4o).

Tighten the counter nut against the adjustment nut.

Tighten the rear adjustment nut on the brake rod against the pivot bushing on the cross shaft.

16. Check the brake handle effort with a force gauge and if necessary adjust. Refer to section 4.5.2.

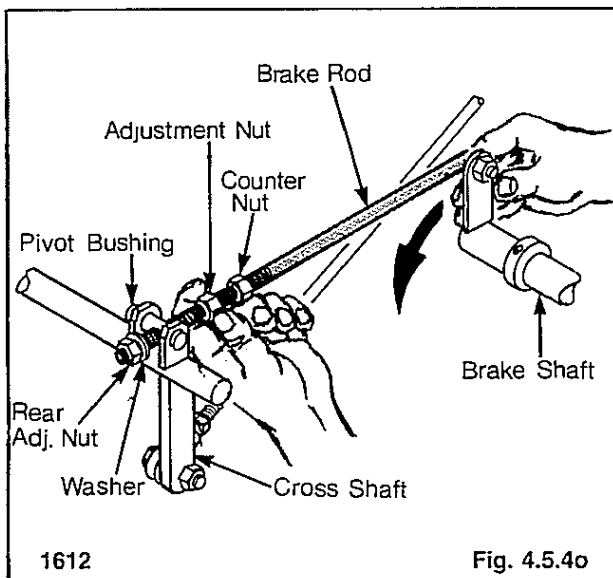


Fig. 4.5.4o

IMPORTANT

To prevent brake damage disengage the brake before operating the loader.

4.5.5 Parking Brake — Pad Replacement:

Instructions for brake pad replacement are for replacement of the pads on the L.H. side of the loader. The procedure is identical for the R.H. side.

! WARNING

To prevent personal injury do not service the loader with the engine running.

1. Block the loader securely with all four wheels clear of the ground.
2. Remove the wheels.

On reassembly torque the wheel nuts 100-110 lbs. ft. (136-149 N.M.).

3. Remove the final drive inspection cover (fig. 4.5.5a) located between the axles on the final drive housing.

On reassembly apply silicon to the inspection cover to prevent leakage of the drive lubricating oil.

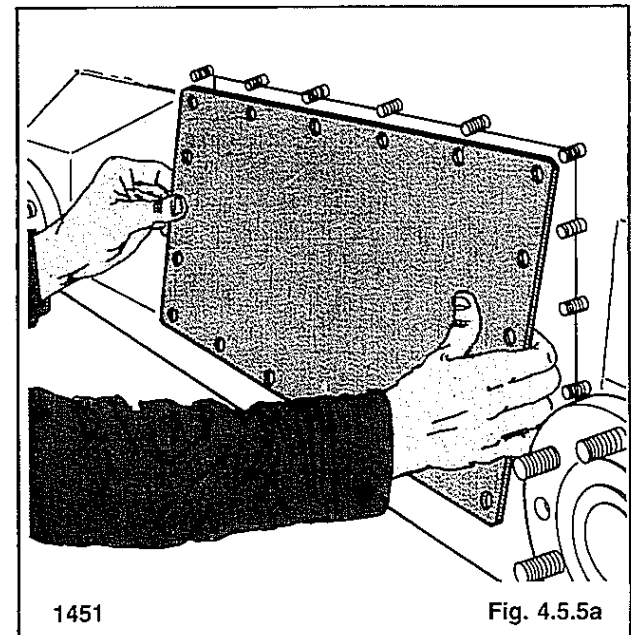
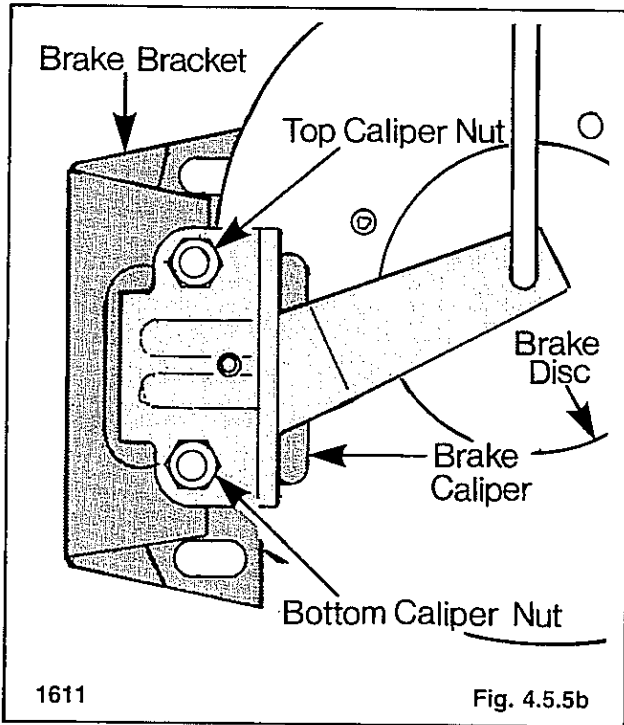
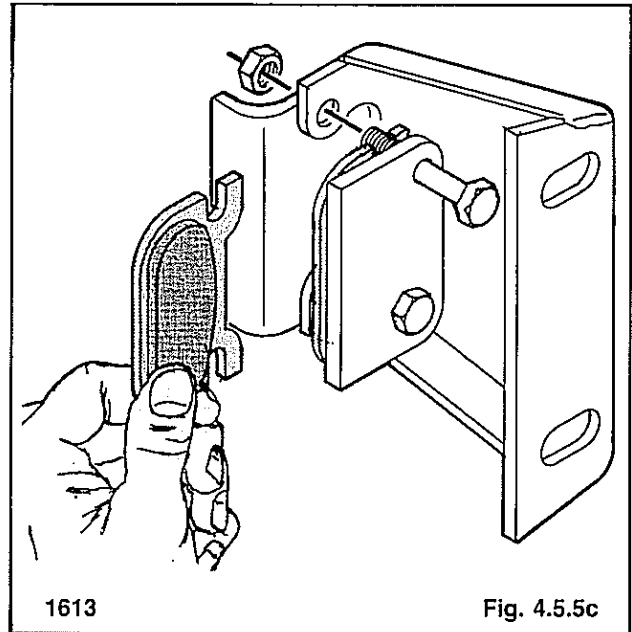


Fig. 4.5.5a

4. Loosen the bottom caliper nut (fig. 4.5.5b).
5. Remove the top caliper nut (fig. 4.5.5b).



6. Move the top caliper bolt inward and remove the inner and outer brake pad (fig. 4.5.5c).
7. Install new brake pads in the brake caliper.



8. With the brake handle in the first notch or off position, evenly tighten the top and bottom caliper nuts until the pads just contact the disc.
9. Check the brake handle effort with a force gauge and if necessary adjust. Refer to section 4.5.2.

4 CONTROLS

4.6 TROUBLE SHOOTING

4.6.1 Steering Levers:

Problem	Cause	Corrective Action	Refer to Section	
Steering levers will not centre	Linkage out of adjustment	Adjust, check for wear at rod ends, loose counter nuts.	4.1.2	
	Linkage disconnected	Reconnect, check for wear at rod ends, loose counter nuts.	4.1.2	
	Centering spring broken	Replace.	4.1.2	
	Linkage binding	Binding of spring bushing in spring box. Align spring box with linkage.		4.1.2
		Control levers binding with safety shields or sound insulation. Adjust.		
		Control lever bearings binding in lever assembly. Inspect, replace or clean as required.		
Neutral detent out of adjustment	Adjust.	4.1.3		
Machine operates erratically	Steering lever linkage loose	Inspect linkage for wear at rod ends, loose counter nuts.	4.1.2	
	Spiral pin in pintle lever worn or broken	Replace pin. Inspect pintle lever for wear at pin hole. Ensure bolt clamping lever to pump shaft is tight.		
		See also trouble shooting hydrostatic system.	2.4	

4 CONTROLS

Problem	Cause	Corrective Action	Refer to Section
Machine loses power while turning	Internal pump and/or motor leakage	See trouble shooting hydrostatic system.	2.4
Machine will not travel in a straight line	Linkage binding	Adjust.	
	Control lever travel out of adjustment	Adjust.	4.1.4
	Internal pump and/or motor leakage	See trouble shooting hydrostatic system.	2.4

4.6.2 Foot Pedals:

Problem	Cause	Corrective Action	Refer to Section
Foot pedals do not lock with bar up	Foot pedal lock out of adjustment	Adjust. Spray lock shaft with WD40	4.2.3
Foot pedal shield does not raise or lower correctly	Foot pedal shield linkage out of adjustment	Adjust	4.2.4
Foot pedals do not return to neutral	Foot pedals or linkage binding	Inspect, clean or repair as required	
	Control valve spool centering spring not functioning correctly	Inspect and repair as required	1.3.5
	Neutral switch binding	Inspect and repair as required.	
Foot pedal action jerky	Wear or damage on foot pedal linkage	Inspect and repair as required	
	Control valve not operating correctly	Inspect and repair as required	1.8

4 CONTROLS

4.6.3 Seat Bar:

Problem	Cause	Corrective Action	Refer to Section
Machine will not start with the seat bar in the up position	Safety start switch defective or out of adjustment	Inspect and repair or adjust as required	4.2.7
Steering levers do not center with seat bar in the up position	Steering lever out of adjustment	Adjust	4.1.3 4.3.2 4.3.3

4.6.4 Throttle and Stop Control:

Problem	Cause	Corrective Action	Refer to Section
Loader will not shut off	Stop control out of adjustment	Adjust	4.4.2

4.6.5 Parking Brake:

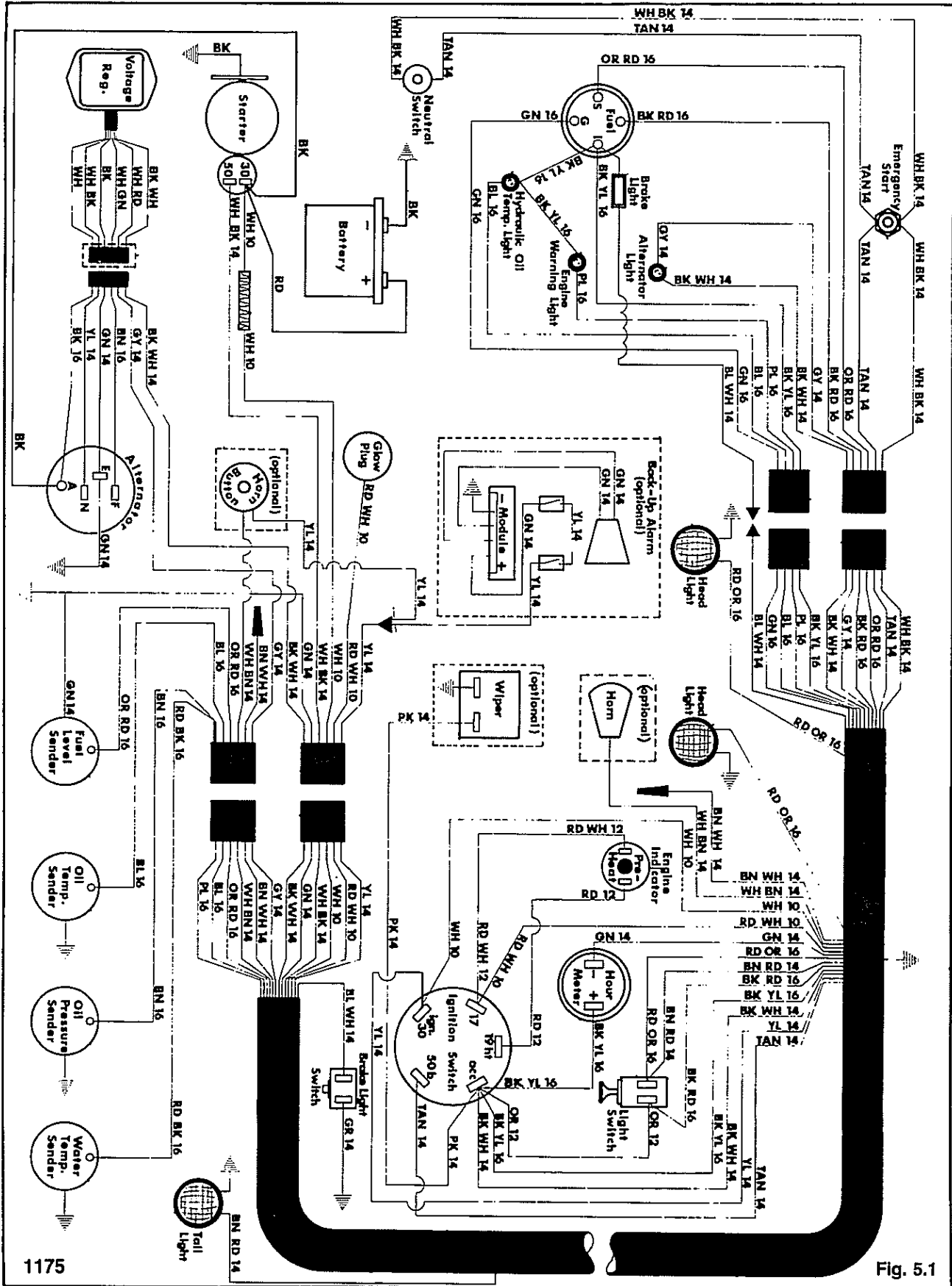
Problem	Cause	Corrective Action	Refer to Section
Brake will not hold loader on an 8.5° incline with the engine off	Brake linkage out of adjustment	Adjust	4.5.2
	Brake pads worn	Replace	4.5.5

5 ELECTRICAL

NOTE: FOR COMPLETE ENGINE SERVICE AND REPAIR PROCEDURES REFER TO THE KUBOTA WORKSHOP MANUAL.

WIRING	5.1
Wiring diagram	5.1.1
Specifications	5.1.2
INSTRUMENTATION	5.2
Fuel gauge	5.2.1
Alternator light	5.2.2
Hydraulic oil temp. light	5.2.3
Engine warning light (hi temp. - low pressure)	5.2.4
Hour meter	5.2.5
Glow plugs and indicator	5.2.6
Light switch	5.2.7
Key switch	5.2.8
Over-ride starting switch	5.2.9
BATTERY	5.3
Operation	5.3.1
Removal and inspection	5.3.2
Testing and maintenance	5.3.3
Jump starting	5.3.4
STARTING SYSTEM	5.4
Safety start switch	5.4.1
Circuit breaker	5.4.2
TROUBLE SHOOTING	5.5

SECTION 5 — WIRING DIAGRAM



1175

Fig. 5.1

5.1.2 Specifications:

FANBELT	T103	T133
Belt sag under load of 13.2 to 15.4 lb. (6 to 7 kgf)	0.2756 to 0.3543 in. (7 to 9 mm)	

ALTERNATOR

Output current	25 A/14 V/4000 rpm	
Total resistance of rotor coil, measured between terminal "F" and "E"	(std.)	6 Ω
	(max.)	10 Ω
Brush length	(std.)	15.5 mm (0.6102 in.)
	(min.)	10.3 mm (0.4055 in.)

REGULATOR

Cut-in voltage	4.5 to 5.8 V
No-load regulating voltage	13.8 to 14.8 V
Resistance between terminals: "IG" and "F" with open contacts	0 Ω
"IG" and "F" with contacts	Approx. 11 Ω
"L" and "E" with open contacts	0 Ω
"L" and "E" with contacts	Approx. 100 Ω
"N" and "E"	Approx. 23 Ω
"B" and "E" with open contacts	Infinity
"B" and "L" with contacts	0 Ω
Point gap	0.0118 to 0.0177 in. (0.3 to 0.45 mm)

STARTER MOTOR

No-load test	Current	90 A or less
	Voltage	11.5 V
	Speed	3500 rpm or more
O.D. of commutator	(std.)	1.1811 in. (30.0 mm)
	(min.)	1.1417 in. (29.0 mm)
Mica undercutting	(std.)	0.0197 to 0.0354 in. (0.5 to 0.9 mm)
	(min.)	0.0079 in. (0.2 mm)
Brush length	(std.)	0.7480 in. (19 mm)
	(min.)	0.5000 in. (12.7 mm)

GLOW PLUG

Resistance	Approx. 1.5 Ω
------------	----------------------

BATTERY

Voltage	12 V
BCI group size	24
Amp. hr. capacity	140
0°F (-17.8°C) cranking amps	455
Ground polarity	Neg.

5.2 INSTRUMENTATION

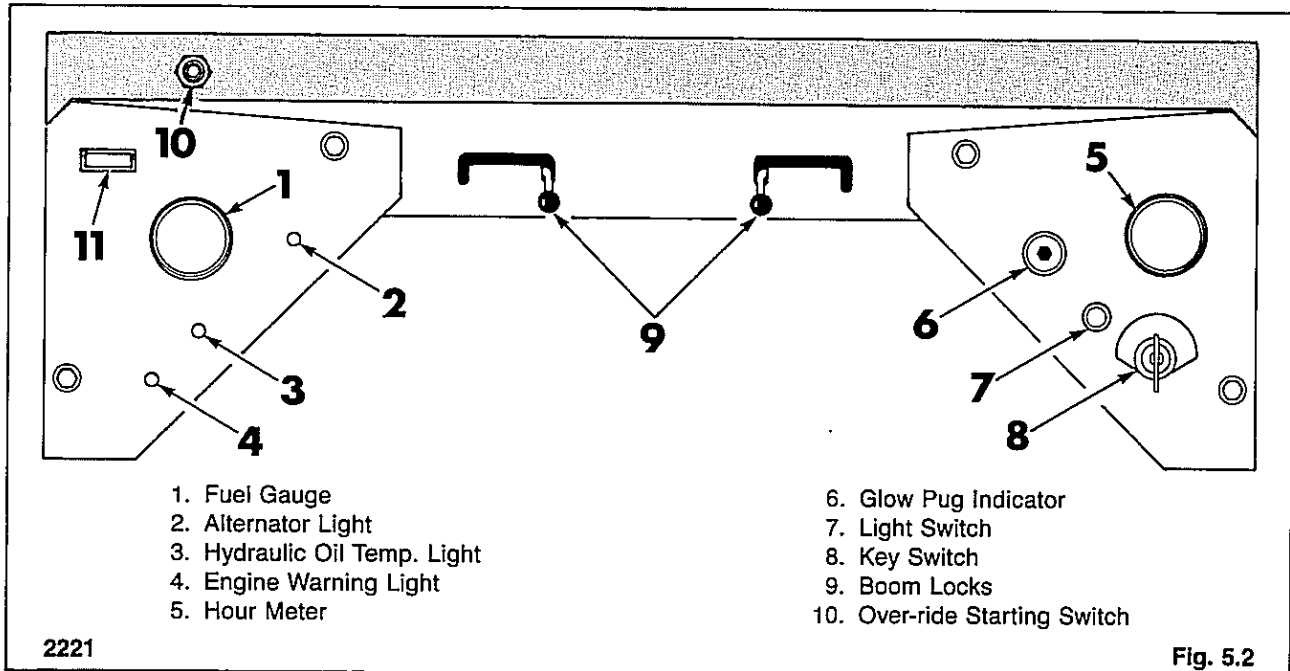


Fig. 5.2

5.2.1 Fuel Gauge:

OPERATION

The fuel gauge indicates the quantity of fuel in the fuel tank (Fig. 5.2). The fuel tank capacity is 16.8 gal. (64 L). The diesel engine must not be allowed to run out of fuel otherwise air will have to be removed from the fuel (Refer to Section 7 — Engine).

TESTING

Fuel Sender

1. With the key switch off, connect one ohmmeter lead to the ground terminal of the fuel sender (Fig. 5.2.1a). Connect the other ohmmeter lead to the positive terminal of the fuel sender.

Test Results

50 — 500 ohm reading = Good fuel sender.

High or low reading = Fuel sender faulty — replace.

Fuel Gauge

2. Remove the left hand instrument panel. With the ignition off, connect one ohmmeter lead to the "I" terminal of the fuel gauge. Connect the other ohmmeter lead to the "S" terminal of the fuel sender (Fig. 5.2.1b)

Test Results

150 — 250 ohm reading = Good fuel gauge.

High or low reading = Fuel gauge faulty — replace.

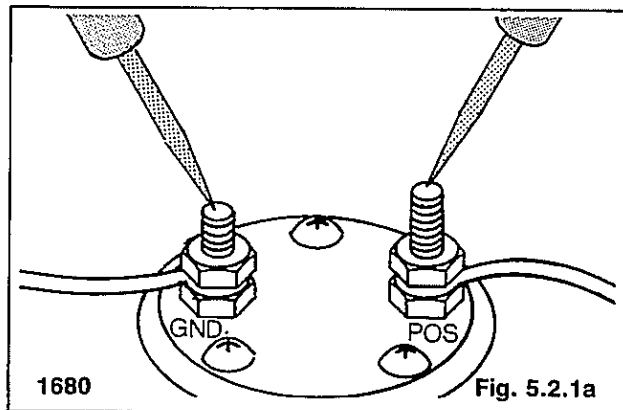


Fig. 5.2.1a

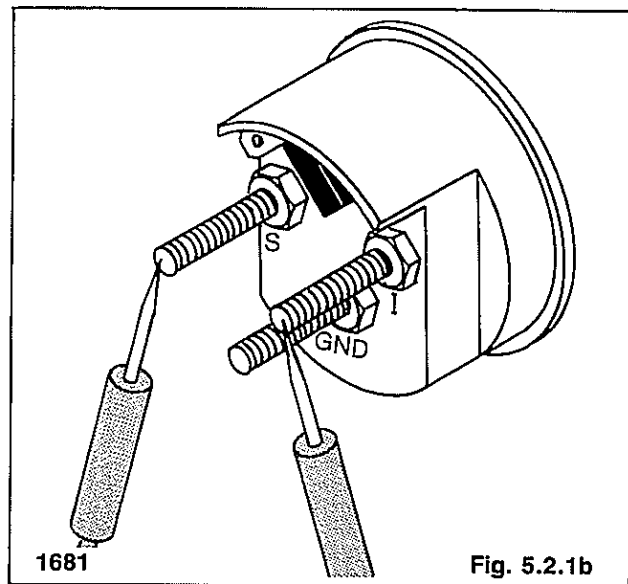


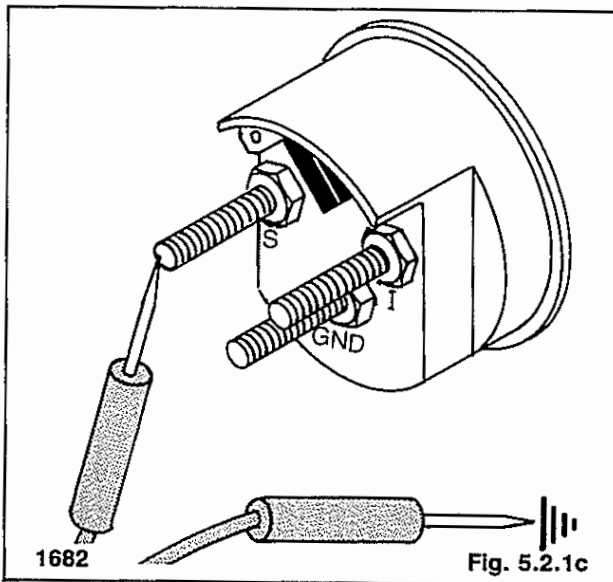
Fig. 5.2.1b

- With the ignition off, connect one ohmmeter lead to the "S" terminal of the fuel gauge (Fig. 5.2.1c). Connect the other ohmmeter lead to a clean ground on the frame.

Test Results

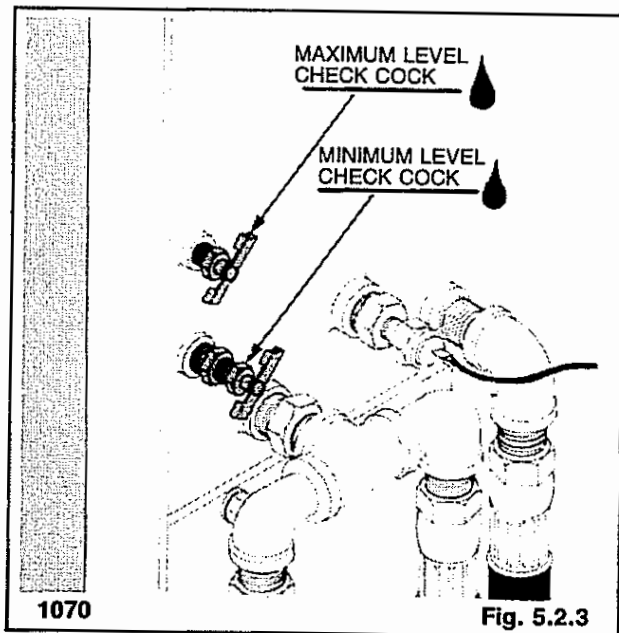
50 — 500 ohm reading = Wire to 'S' terminal good.

High or low reading = Faulty wire to 'S' terminal.



5.2.2 Alternator Light:

The alternator warning light will come on if the alternator is not producing sufficient current (Fig. 5.2 item 2). With the key switch in the ON position the alternator light will be on. When the engine starts the alternator light will go off. For complete operating description and testing of the charging system refer to engine repair manual.



5.2.3 Hydraulic Oil Temperature Light:

The hydraulic oil temperature light (Fig. 5.2) measures the temperature of the hydraulic oil. The temperature sender is located at the hydraulic reservoir (Fig. 5.2.3). If the hydraulic oil temperature light comes on during operation shut off the engine and determine the cause of over heating. Check the radiator and hydraulic oil cooler for air flow restriction first before checking for a malfunction of the sender. Refer to section 1.8 and 2.4 for trouble shooting of the hydraulic and hydrostatic systems.

5.2.4 Engine Warning Light (Hi-temp-low pressure) Operation:

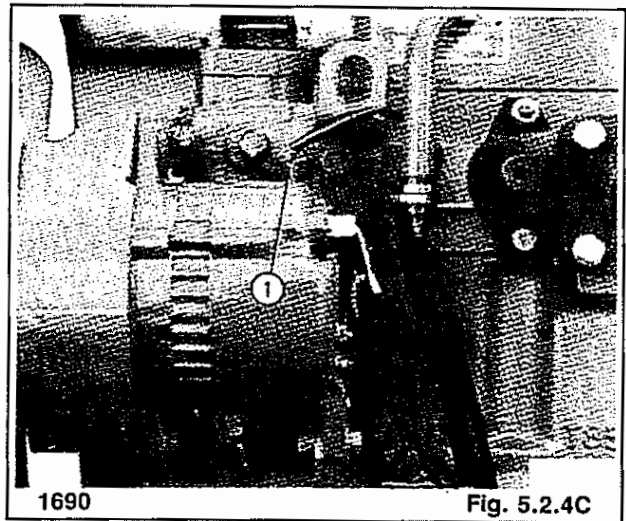
The engine warning light serves the dual function of monitoring both the engine oil pressure and engine coolant temperature (Fig. 5.2 item 4).

The engine oil pressure sender switch is located on the R.H. side of the engine. The switch opens under normal oil pressure and closes at low oil pressure illuminating the warning light.

The engine coolant temperature sender switch is located on the L.H. side of the engine (Fig. 5.2.4C).

The coolant temperature switch senses coolant over heating which closes the switch and illuminates the warning light.

If the engine warning light comes on during operation or fails to go out after engine start up, shut-off the engine immediately and determine the cause.



TESTING — OIL PRESSURE SENDER

- With the engine off, disconnect the wire from the oil pressure sender switch. Turn the key switch to the 'ON' position.

Test Results

If the light remains on go to test 2. If the light goes out, check the engine oil level before checking for a malfunction of the sender switch or oil pump.

TEST — COOLANT TEMPERATURE SENDER

- With the engine off, the oil pressure sender switch disconnected, disconnect the wire from the coolant temperature sender. Turn the key switch to the 'ON' position.

Test Results

If the light remains on check for a short in the wiring to the warning light.

If the light goes out check the sender switch for malfunction. Also refer to section 7 — Engine trouble shooting.

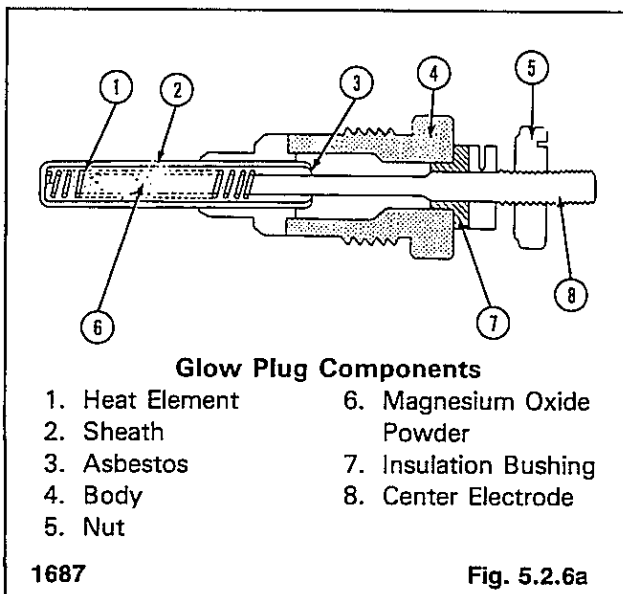
5.2.5 Hour Meter:

The hour meter records the number of engine operating hours and has a total read out of 9999.9 hours (Fig. 5.2 item 5). The meter winds approximately every 12 seconds and will run a short time after the ignition has been shut-off.

5.2.6 Glow Plugs and Indicator:

OPERATION

To assist engine starting in cold weather, each cylinder has a glow plug threaded into the pre-combustion chamber. The glow plug is a resistance type heating element that will generate heat when electrical current flows through the glow plug to ground. The heating element, Fig. 5.2.6a, is encased in a stainless steel sheath filled with magnesium oxide powder. One end of the element is welded to the sheath, which acts as a circuit ground, while the other is welded to the center electrode.



Rotating the key switch counterclockwise to the "heat" position closes the glow plug circuit and battery current

flows through the glow plug heating element. The heat generated by the glow plug element pre-heats the air in the cylinder making it easier for the fuel injected into the cylinder to vaporize and ignite. An indicator on the instrument panel, Fig. 5.2, will glow red when the air in the cylinder has heated to the correct temperature.



TESTING

TEST 1 — Glow Plug Connectors:

Before performing any tests on the glow plug circuit disconnect the negative or ground cable from the battery.

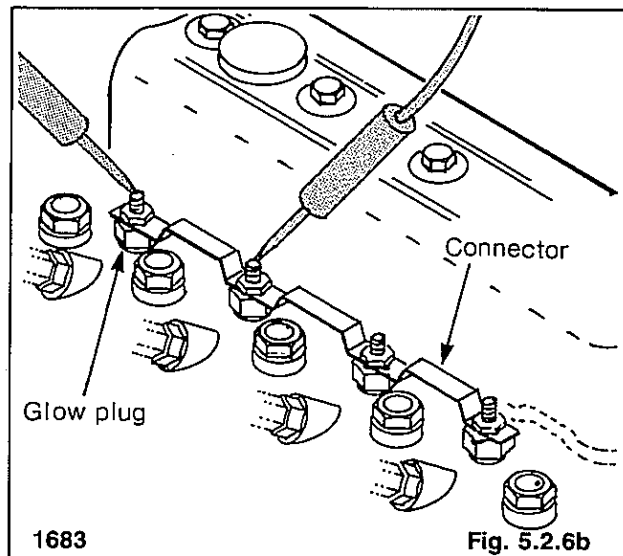
With the key switch off, connect one ohmmeter lead to the first glow plug nut (Fig. 5.2.6b). Connect the other ohmmeter lead to the second glow plug nut.

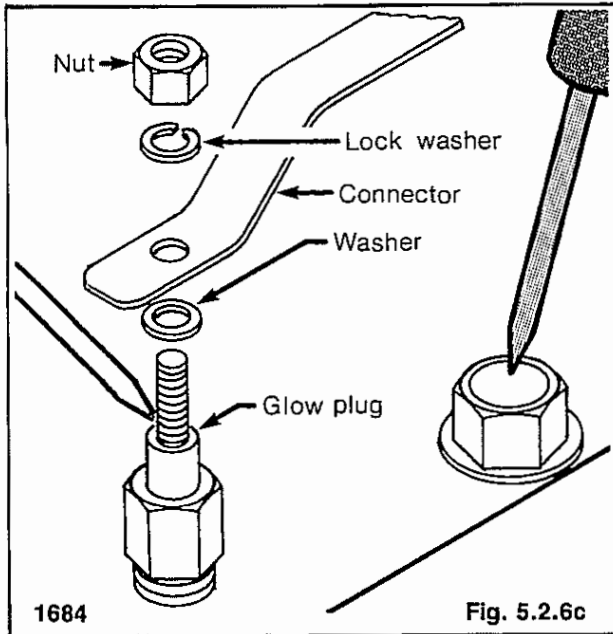
Test Results

Low or zero ohms = Good continuity.

High resistance = Bad connection — remove connector and clean.

Continue and check continuity between second and third glow plugs and on the T133 between the third and fourth glow plugs.





TEST 2 — Glow Plug:

With the ignition off, disconnect the connectors from the glow plugs. Connect one ohmmeter lead to the glow plug terminal (Fig. 5.2.6c). Connect the other ohmmeter lead to a clean ground. Check each glow plug.

Test Results

1.5 ohm reading = Good glow plug.

Infinite or zero reading = Faulty glow plug — replace.

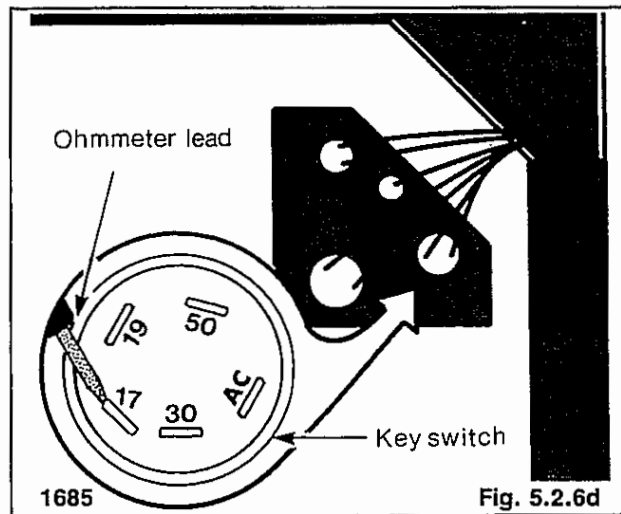
TEST 3 — Key Switch to Glow Plug:

Remove the bolts securing the R.H. instrument panel to the frame. With the key switch off, connect one ohmmeter lead to the key switch at terminal number 17 (Fig. 5.2.6d). Connect the other ohmmeter lead to the glow plug with the wire terminal (Fig. 5.2.6e).

Test Results

Low to zero reading = Good continuity.

High reading = Faulty wire from switch to glow plug — replace.



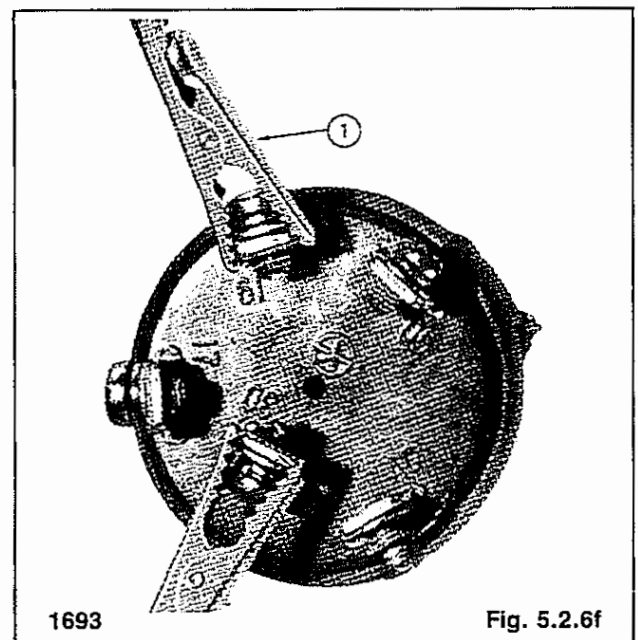
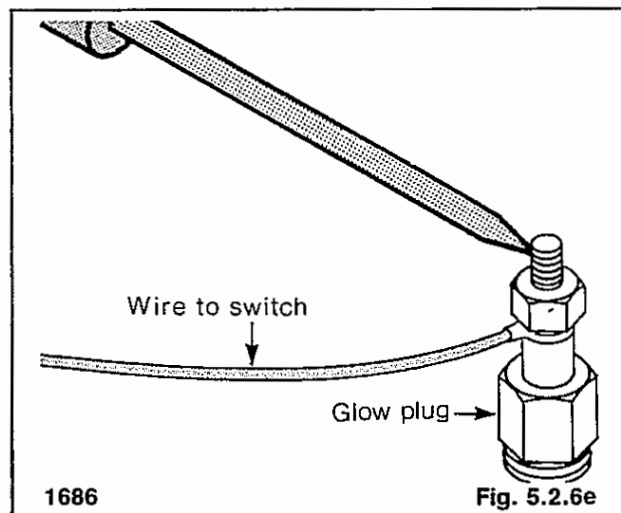
TEST 4 — Key Switch — Heat Position Check:

Connect one ohmmeter lead to the terminal marked 19 on the key switch (Fig. 5.2.6f). Connect the other ohmmeter lead to the terminal marked 30 on the key switch. Rotate the key counterclockwise to the "Heat" position.

Test Results

Low or zero reading = Good contact through switch.

High reading = Faulty switch — replace.



TEST 5 — Key Switch to Indicator:

- (A) Connect one ohmmeter lead to the terminal marked 19 on the key switch (Fig. 5.2.6g). Connect the other ohmmeter lead to terminal on the glow plug indicator.

Test Results

Low or zero reading = Good continuity.

High reading = Faulty wire — replace.

- (B) Connect one ohmmeter lead to the terminal marked 17 on the key switch (Fig. 5.2.6h). Connect the other ohmmeter lead to terminal on the glow plug indicator.

Test Results

Low or zero reading = Good continuity.

High reading = Faulty wire — replace.

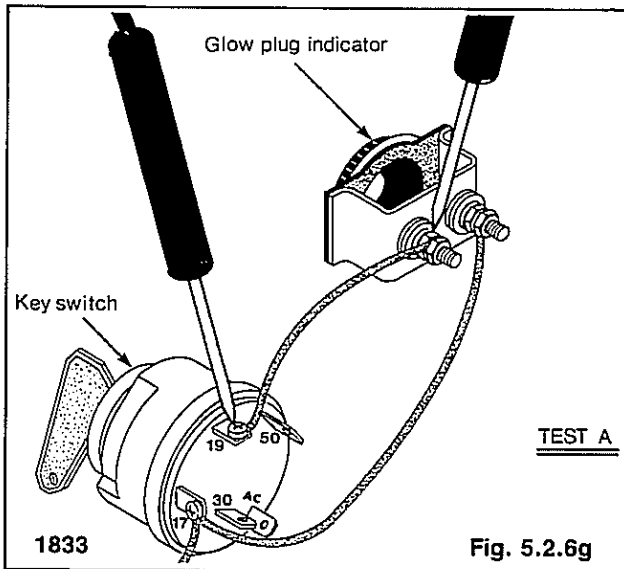


Fig. 5.2.6g

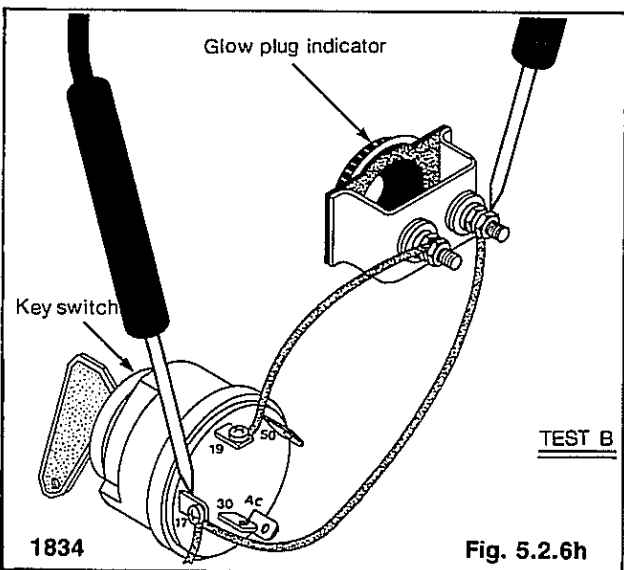


Fig. 5.2.6h

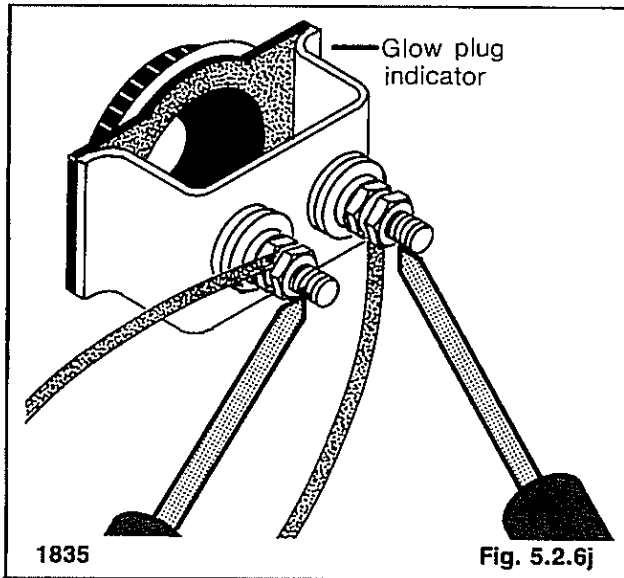
TEST 6 — Glow Plug Indicator:

- Connect one ohmmeter lead to each of the glow plug indicator terminals (Fig. 5.2.6j).

Test Results

Low or zero reading = Good indicator.

High reading = Faulty indicator — replace.



5.2.7 Light Switch:

The light switch (Fig. 5.2) is an on-off switch. Pulling the switch out will turn on the headlights, rear work light and instrument panel lights. Pushing the switch in will shut the lights off.

5.2.8 Key Switch:

The key switch (Fig. 5.2) is a four position switch, off, preheat (diesel only), on and start. Turning the key counterclockwise will engage the engine preheater or glow plugs. To engage the starter turn the key clockwise. When the key is released it will return to the on position.

TESTING

Before performing any tests on the key switch disconnect the negative or ground wire from the battery.

Remove the bolts which secure the R.H. instrument panel to the ROPS.

TEST 1 — "On" Position:

Connect the ohmmeter leads across the key switch terminals marked 30 and AC (Fig. 5.2.8a). Turn the switch to the "ON" position.

Test Results

Low resistance reading = Good.

High resistance reading = Faulty switch — replace.

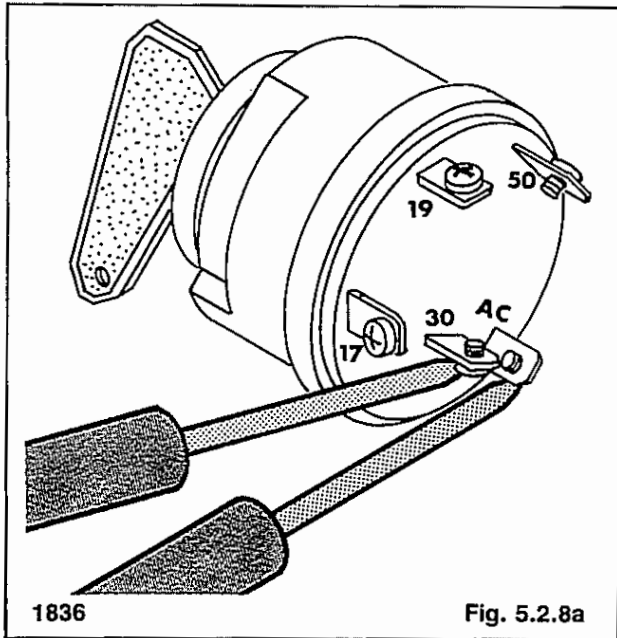


Fig. 5.2.8a

TEST 2 — “Start” Position:

(A) Connect the ohmmeter leads between the terminals marked 30 and 50 on the key switch (Fig. 5.2.8b).

Turn the switch to the “Start” position and observe the ohmmeter reading.

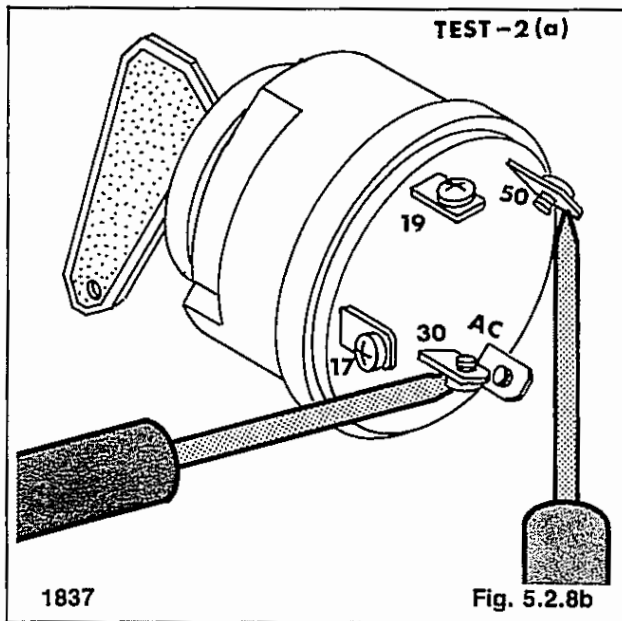


Fig. 5.2.8b

(B) Connect the ohmmeter leads between the terminals marked 30 and 17 on the key switch (Fig. 5.2.8c).

Turn the switch to the “Start” position and observe the ohmmeter reading.

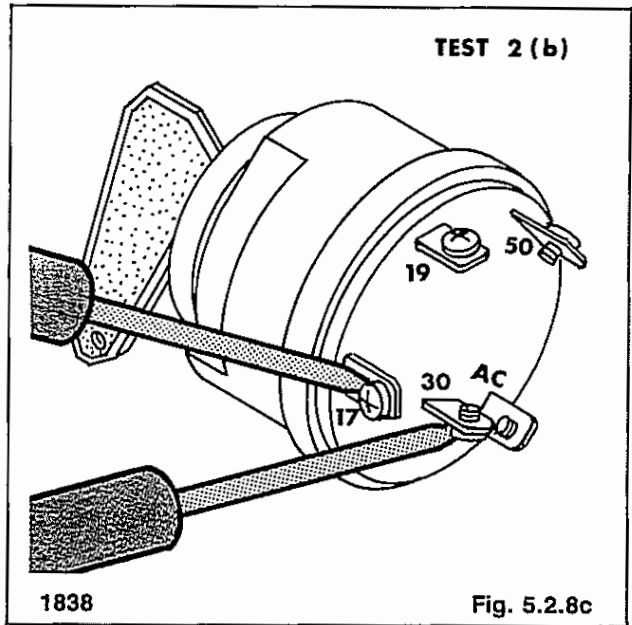


Fig. 5.2.8c

TEST 3 — “Heat” Position:

Connect the ohmmeter leads between the terminals marked 30 and 19 on the key switch (Fig. 5.2.8d).

Turn the switch to the “Heat” position and observe the ohmmeter reading.

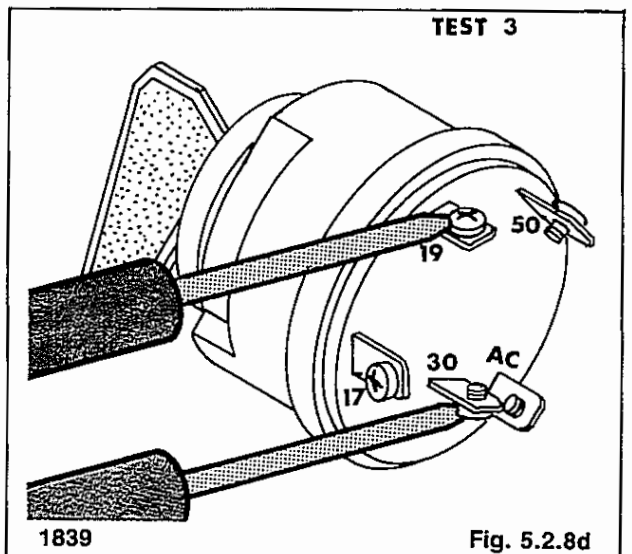


Fig. 5.2.8d

Test Results

Low resistance reading = Good switch.

High resistance reading = Faulty switch — replace.

Test Results

Low resistance reading = Good.

High resistance reading = Faulty switch — replace.

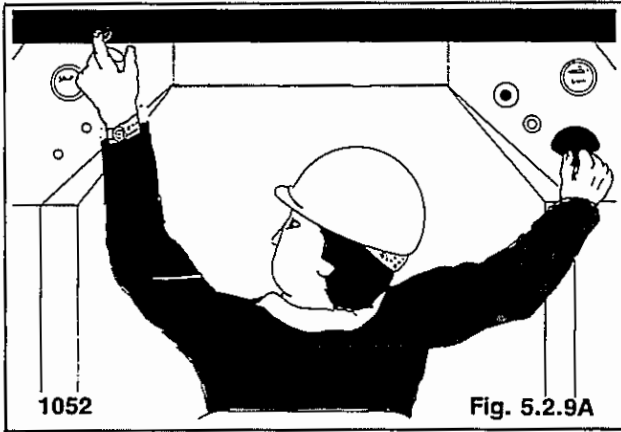
5.2.9 Over-Ride Starting Switch:

The loader starting circuit is designed so that the engine cannot be started unless the seat bar is in the up position, the steering control levers centered in neutral and the foot pedals locked.

The loader is also equipped with an over-ride start switch for use in situations such as the engine stalling.

To restart the engine using the over-ride switch, press the switch (Fig. 5.2.9A) and turn the ignition to start position. When the engine has started release the over-ride switch.

The over-ride switch must not be used for normal starting.



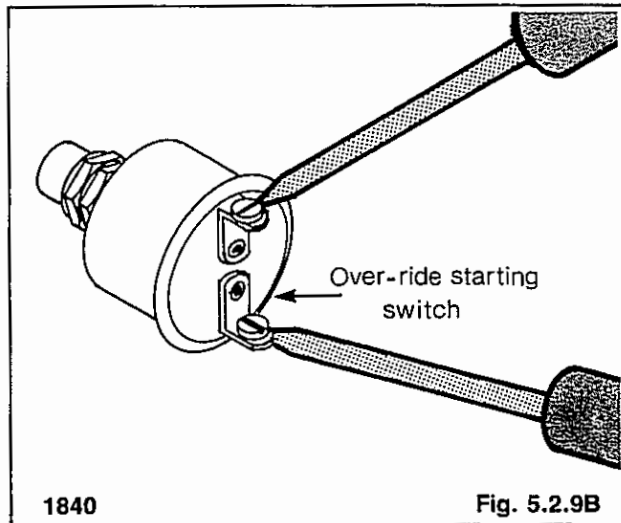
TESTING — OVER-RIDE STARTING SWITCH

Connect one ohmmeter lead to one of the terminals on the over-ride switch (Fig. 5.2.9B). Connect the other ohmmeter lead to the other terminal on the switch. Depress the button.

Test Results

Low resistance reading = Good switch.

High resistance reading = Faulty switch — replace.



5.3 BATTERY

SAFETY PRECAUTIONS:

WARNING

Lead-acid batteries contain sulfuric acid which will damage the eyes or skin on contact. Always wear goggles to avoid acid in the eyes. If acid contacts the eyes, wash immediately with much clean water and get medical attention. Wear rubber gloves and protective clothing to keep acid off the skin. If acid contacts the skin, wash off immediately with clean water.

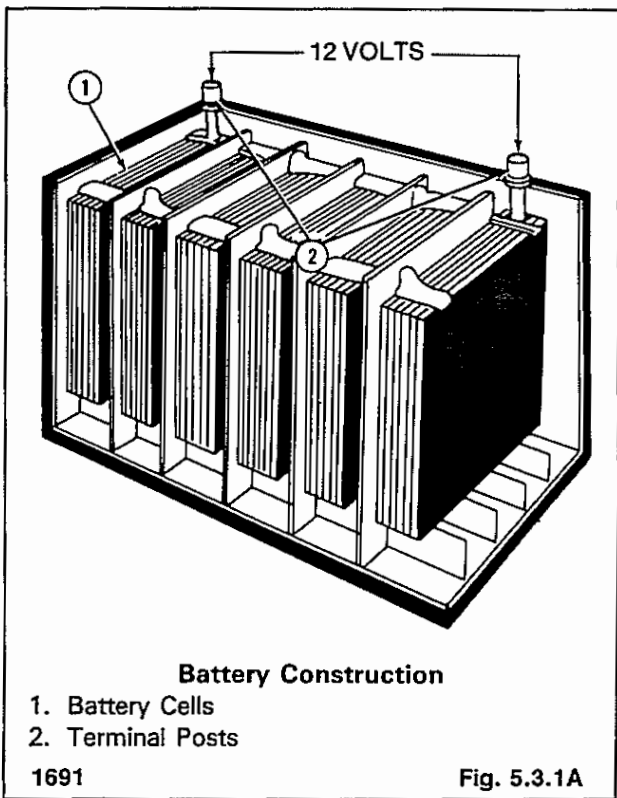
1. When mixing battery electrolyte, it is important to pour the concentrated acid into the water and not the water into the acid.
2. When working with acid, such as filling batteries, splash-proof goggles should be worn. (Additional protective clothing may be advisable if many batteries are handled.)
3. When adding water or electrolyte, non-metallic containers and/or funnels must be used.
4. Acid must not be stored in excessively warm locations or in direct sunlight.
5. In case of acid contact with skin, eyes, or clothing, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIVE MINUTES. Get emergency medical attention for acid burns.
6. Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are brought near the battery. Manufacturer's recommendations should be closely followed to hold the charging rate at a limit that prevents rapid generation of hydrogen gas. When charging or using a battery in an enclosed space, always provide adequate ventilation.
7. Exercise care to avoid tools or metallic objects from falling across the battery terminals.
8. Never break a live circuit at the battery terminals. An arc could occur whenever charger leads or booster cable leads are disconnected. Any arc could ignite the accumulated hydrogen gas! Always disconnect the ground cable first at a point away from the battery terminals.
9. Remove cell caps when charging or using jumper cables.

5.3.1 Operation:

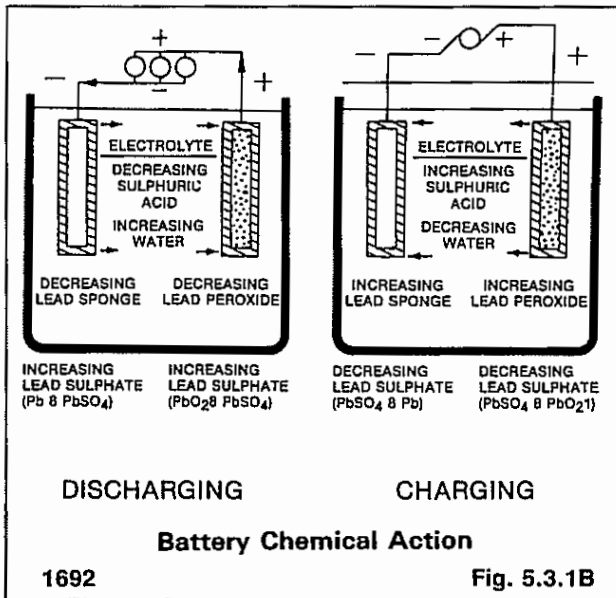
The 12-volt maintenance free battery, Fig. 5.3.1A, is rated at 140 ampere-hours and is negatively grounded. The battery is constructed with six lead acid cells connected in series. Each cell contains positive and negative plates placed alternately next to each other and separated from each other by a insulated separator plate. If any of the positive plates should make contact with a negative plate within a cell a short will develop and cause irreparable damage to the battery. All positive plates are welded together and all negative plates are welded together. The positive plates and negative plates are connected to an external position and negative terminal post.

When the battery cells are submerged in a liquid electrolyte solution of sulphuric acid, Fig. 5.3.2B, the acid and water combines chemically with the lead peroxide on the positive plate and with the sponge lead on the negative plate causing a transfer of electrons between plates. One plate will lose electrons and become positively charged while the other plate will gain electrons and become negatively charged. When the battery is connected to a load the surplus electrons at the negative post flow through the circuit to the positive post. The battery is now converting chemical energy to electrical energy.

This process continues until the greater part of the active material on both plates has been converted to lead sulphate, and much of the acid has been reduced to water. When most of the plate surfaces have reacted with the acid the battery will no longer be able to produce current and is therefore discharged.



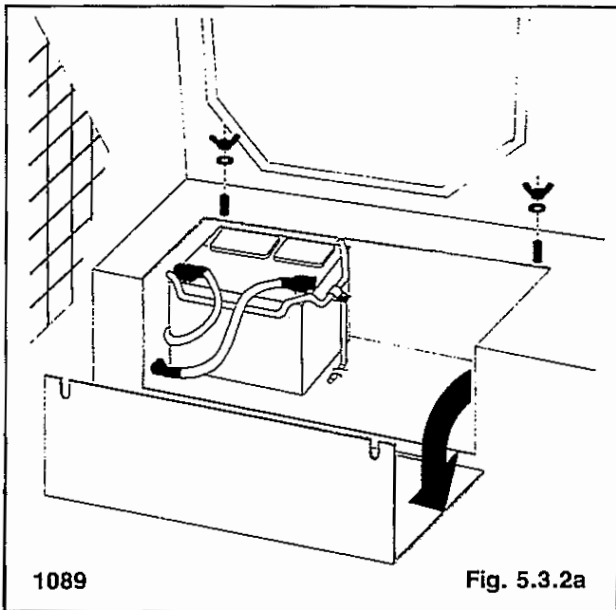
Recharging is accomplished by passing a current from an outside source through the battery in the opposite direction to the current flow during discharge. Reversal of the chemical action, by charging, restores the battery to a fully charged condition.



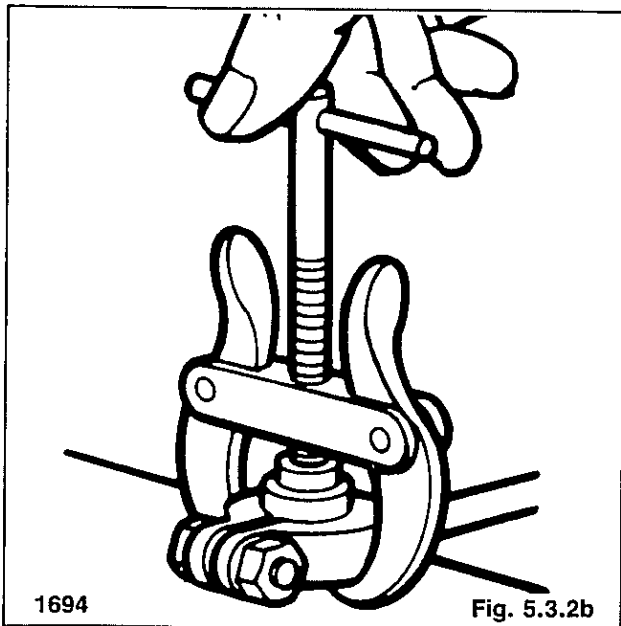
5.3.2 Battery Removal and Inspection:

The battery is located in the ROPS behind the operators seat. Remove the battery as follows:

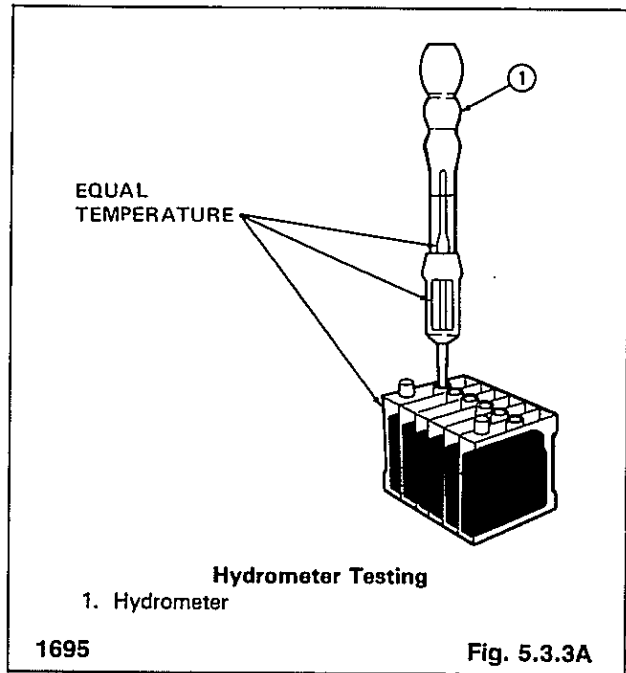
1. Fold the seat back down and remove the two wing nuts which secure the battery compartment cover (Fig. 5.3.2a). Open the cover.
2. Loosen the cable clamps on the positive and negative battery terminals.



3. Use a puller to remove the negative (ground) cable from the battery. Then remove the positive cable (Fig. 5.3.2b).
4. Note the location of the positive and negative terminals so the battery can be properly positioned during installation.
5. Remove the holddowns and battery.
6. Inspect the cables for corrosion and damage. Remove corrosion using a wire brush and soda solution. Replace the cables having damaged or deformed terminals.
7. Inspect the battery holddowns for corrosion. Remove corrosion with a wire brush and soda solution. Paint the exposed bare metal. Replace any damaged components.
8. Clean the outside of battery case if the original battery is to be installed. Flush the top cover with soda solution to remove acid film. Be careful to prevent soda solution from entering the cells. Remove corrosion from the terminals with a wire brush. Inspect the case for cracks or other damage which would result in a leakage of electrolyte.



The hydrometer used for this test should be equipped with a thermometer and the float scale should be graduated to read from 1.160 to 1.320 in graduations of .005 specific gravity. The graduated marking should be accurate within .002 (Fig. 5.3.3A).



1. Check the electrolyte level in each cell. Add water to any low cells and charge the battery for ten minutes at twenty amperes to mix the water with the electrolyte.
2. Draw electrolyte in and out of the hydrometer barrel to equalize the temperature of the float and thermometer to that of the acid in the cell (Fig. 5.3.3A).
3. Draw in enough electrolyte to raise the float in the barrel with the bulb fully floating. Do not draw in so much electrolyte that the float is forced against the top of the barrel.
4. With the hydrometer at eye level, read the float scale at the electrolyte level. Hold the hydrometer straight so that the float does not stick to the side of the barrel (Fig. 5.3.3B).
5. Read the specific gravity of each cell.
6. Correct the specific gravity reading for temperature variations (Fig. 5.3.3C).
 - a. Add .004 points for each 10° above 80°F.
 - b. Subtract .004 points for each 10° below 80°F.

Test Results

1. If the average specific gravity of all cells is above 1.225, but the variation between cells is more than 50 points (.050), the battery is unserviceable. Remove the battery for further testing.

5.3.3 Testing and Maintenance:

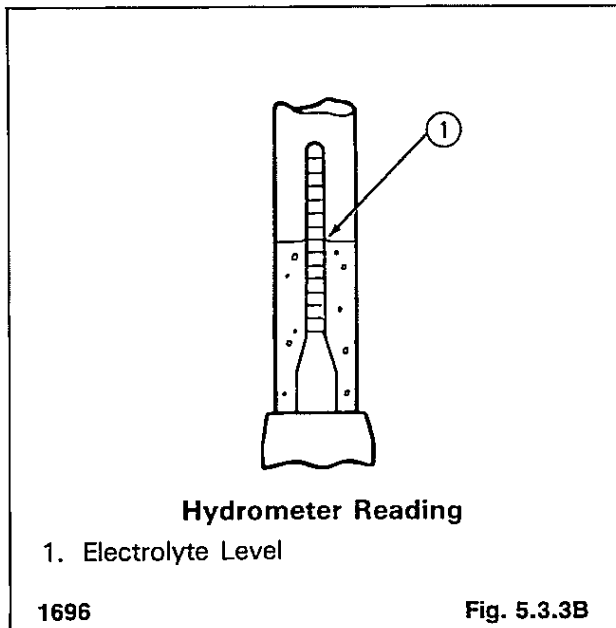
SPECIFIC GRAVITY — HYDROMETER TEST

The hydrometer test indicates the battery state of charge by measuring the specific gravity of the electrolyte in the battery cells. The specific gravity will vary according to the amount of unused sulphuric acid remaining in solution. The quantity of sulphuric acid in solution determines the battery state of charge.

2. If the average specific gravity of one or more cells is less than 1.225, recharge the battery.
3. At the end of the charge period, if the cell variation is more than 50 points (0.050), replace the battery.
4. When the specific gravity of all cells is above 1.225 and variation between cells is less than 50 points, the battery may be tested under load.

WARNING

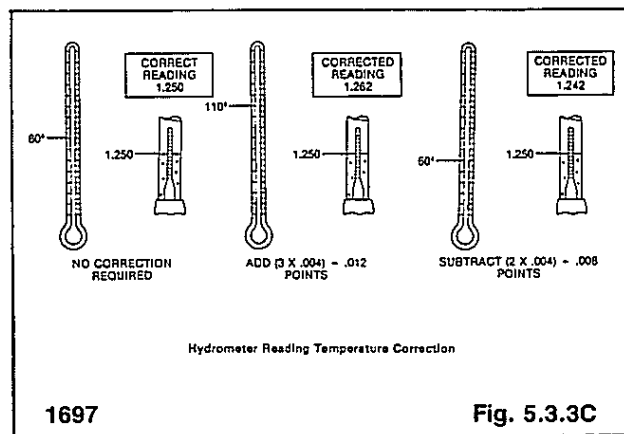
DO NOT charge a frozen battery because it can explode and cause personal injury. Let the battery warm to 60°F. (15.5°C.) before putting on a charger.



1. If the battery is to remain in the vehicle, disconnect the cables at the battery, to prevent damage to the electrical system during charging.
2. Thoroughly clean the battery.
3. Make sure the electrolyte is at the proper level.
4. The battery is to be charged at a rate of seven amps.
5. Battery electrolyte temperature must never exceed 125°F. (52°C.). If this temperature is reached, the battery should be cooled by reducing the charge rate or by disconnecting the battery from the charger.

The average length of time necessary to charge a battery by the slow-charge method at the indicated rates is from 12-16 hours, however, when a battery continues to show an increase in specific gravity, battery charge should be continued even if it takes 24 hours or more.

A battery is in a maximum charged condition when all cells are gassing freely and three corrected specific gravity readings, taken at hourly intervals, indicate no increase in specific gravity.



CAPACITY TEST

The capacity test is performed to determine if the battery has a discharge capability sufficient to meet the high current demands of the starter motor. The battery is connected to a carbon pile rheostat which can duplicate the high discharge rate the battery experiences during engine cranking. While connected to the simulated load for fifteen seconds, the battery must maintain a voltage of 9.6 volts. To obtain satisfactory results the capacity test should be performed only on a battery which is 100% charged. Never perform this test on a battery which is less than 75% charged (1.230 specific gravity).

CHARGING

The maintenance free battery used in the loader should be slow charged only.

There are many types of battery charging equipment available. Be sure to follow the instructions of the equipment manufacturer for the necessary preparations and precautions. However, the following items should be observed when slow-charging the battery with any type of equipment.

1. Connect a carbon pile load tester and voltmeter to the battery.
 - a. Make sure the load control knob is in the "OFF" position before making the connection.
 - b. Connect the red leads to the battery positive post and the black leads to the battery negative post.
 - c. Voltmeter leads must contact the battery posts — not the ammeter leads.
2. Turn the tester load control knob until the current draw is equal to ½ of the battery's cold cranking rate.
3. At the end of 15 seconds, observe the voltmeter reading and turn the load control knob to the off position.

Test Results

Battery must maintain above 9.6 volts for the test period.


9.6 volts or above = Good (serviceable).

Less than 9.6 volts = Faulty battery — replace.

5.3.4 Jump Starting:

JUMP STARTING

1. Set the parking brake.
2. Check the battery condition. Do not attempt to jump start if the battery is damaged, if the electrolyte level is low, or if the electrolyte is frozen.
3. Use only a 12-volt battery with sufficient capacity for jump starting.
4. Check that all electrical switches are off and that the vehicles are not touching one another.
5. Attach the end of one jumper cable to the positive terminal of the booster battery and the other end of the same cable to the positive terminal of the discharged battery.
6. Attach one end of the remaining cable to the negative terminal of the booster battery, and the other end to a solid engine ground at least 12 inches from the battery of the vehicle being started — **DO NOT CONNECT DIRECTLY TO THE NEGATIVE TERMINAL OF THE DEAD BATTERY.**
7. Start the engine of the vehicle that is providing the jump start and turn off all electrical switches.
8. Start the engine in the loader with the discharged battery.
9. Reverse these procedural steps exactly when removing the jumper cables. The first cable to be disconnected should be the negative cable from the ground on the loader that was being jump started.



WARNING Do not start the engine unless you are in the seat with the seat belt fastened around you.

5.4.1 Safety Start Switch:

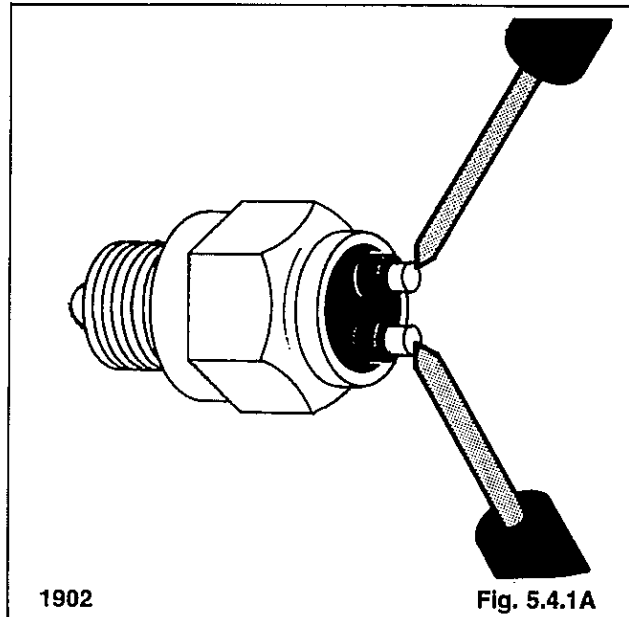
TESTING

1. Connect one ohmmeter lead to one of the terminals on the safety start switch (Fig. 5.4.1a).
2. Connect the other ohmmeter lead to the other terminal on the safety start switch.

Test Results

High resistance reading = Good.

Low resistance reading = Faulty switch — replace.

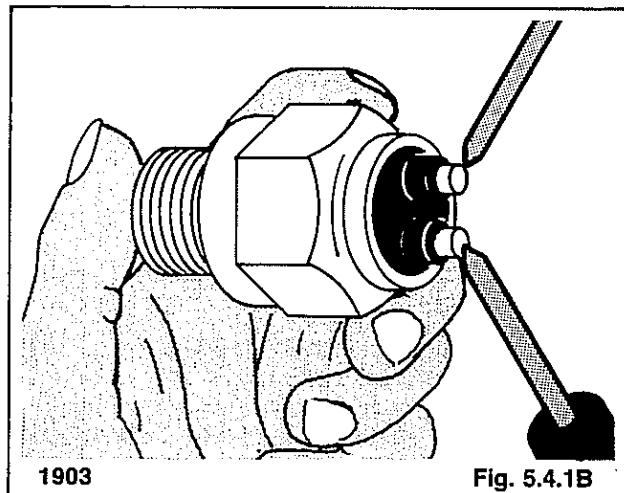


3. With the ohmmeter still connected to the two terminals on the safety start switch (Fig. 5.4.1b), depress the ball plunger on the end of the switch.

Test Results

Low resistance reading = Good.

High resistance reading = Faulty switch — replace.



5.4.7 Circuit Breaker:

For circuit protection a 40 amp. circuit breaker is located on the starting circuit (Fig. 5.4.2a).

The circuit breaker if tripped will automatically reset.

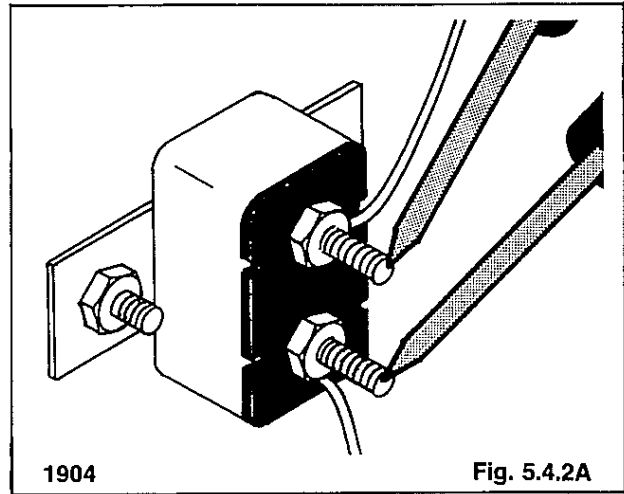
TESTING: CIRCUIT BREAKER

1. With the ignition off connect one ohmmeter lead to one of the terminals on the circuit breaker (Fig. 5.4.2A).
2. Connect the other ohmmeter lead to the other circuit breaker terminal.

Test Results

Low resistance reading = Good.

High resistance reading = Defective circuit breaker
— replace.



5.5 TROUBLE SHOOTING

STARTING SYSTEM

Problem	Cause	Corrective Action	Refer to Section
Starter will not engage.	Seat bar down, safety start switch disengaged.	Raise safety bar to engage safety start switch. If starter still won't engage check safety start switch.	5.4.1
		Press over-ride starting switch.	5.2.9
	Battery discharged.	Check and charge battery or replace.	5.3
	Loose or disconnected wiring.	Check and repair.	
	Defective starter switch.	Check and if necessary replace.	5.2.8
	Defective solenoid.	Check and if necessary replace.	
Starter motor engages but engine does not turn over.	Defective overrunning clutch.	Replace.	
Pinion engages but starter motor does not turn over.	Defective starter.	Check and if necessary repair or replace.	
	Defective solenoid.	Check and if necessary replace.	
Starter motor rotates at full speed before pinion engages.	Defective pinion spring.	Replace.	
Starter does not disengage after engine starts.	Faulty ignition switch.	Check and if necessary replace.	5.2.8
	Defective solenoid.	Check and if necessary replace.	

CHARGING SYSTEM

Battery low in charge or discharged.	Drive belt slipping.	Adjust.	7.3.5
	Defective battery.	Check and if necessary replace.	5.3
	Faulty wiring or connections.	Check and repair.	
	Defective regulator.	Check and if necessary replace.	
	Dirty alternator slip rings or brushes.	Check and repair.	
Alternator overcharging and battery overheats.	Defective battery.	Check and if necessary replace.	5.3
	Defective voltage regulator.	Check and if necessary replace.	
	Defective alternator.	Check and if necessary replace.	

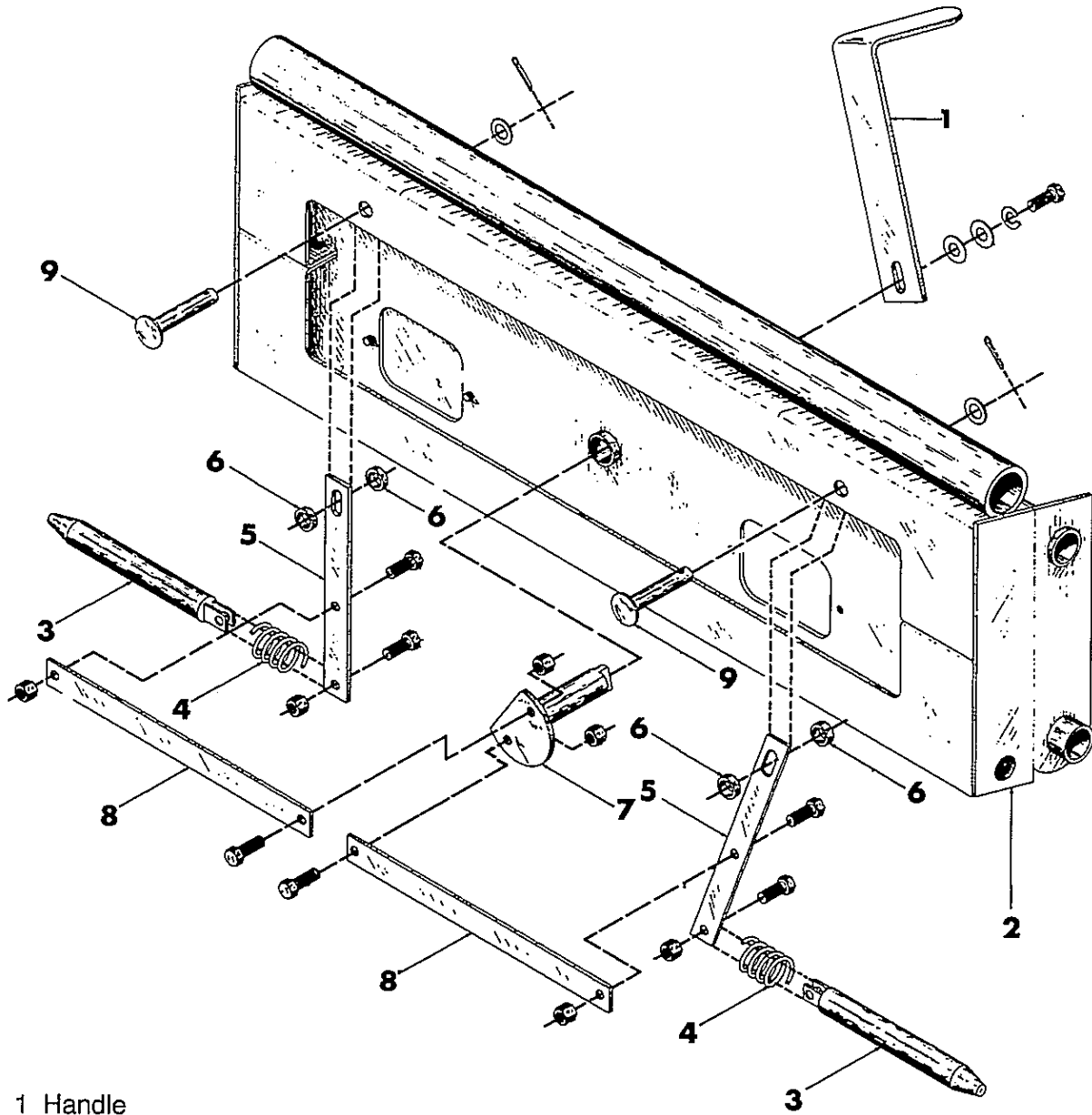
Low or no output from alternator.	Drive belt slipping.	Adjust.	7.3.5	
	Faulty wiring or connections.	Check and repair.		
	Defective voltage regulator.	Check and if necessary replace.	5.2.2	
	Defective alternator.	Check and if necessary repair or replace.	5.2.2	
Charge indicator lamp dims.	Defective rectifier.	Check and if necessary replace.		
	Faulty wiring or connections.	Check and repair.		
Charge indicator goes out but becomes brighter with increased speed.	Dirty slip rings or brushes.	Check and repair.		
	Faulty rectifier.	Check and if necessary replace.		
Charge indicator lamp is "ON" with engine running.	Faulty wiring or connections.	Check and repair.		
	Drive belt slipping.	Adjust.	7.3.5	
	Defective alternator or regulator.	Perform alternator voltage output test.		
		Perform alternator current output test.		
	Defective alternator or regulator.	Perform alternator "N" circuit voltage test.		
		Perform regulator "N" circuit continuity test.		
		Perform alternator "E" circuit continuity test.		
Perform alternator "F" circuit continuity test.				
Perform regulator "F" circuit continuity test.				
Perform alternator "A" circuit continuity test.				
Charge indicator lamp is "OFF" when starter switch is "ON", but engine is not running.	Defective indication lamp.	Check and if necessary replace.		
	Defective wiring.	Check wiring continuity between lamp and ignition switch.		
		Check wiring continuity between lamp and regulator "L" terminal.		
	Check "L" circuit continuity between regulator "L" and "E".			

6 MAIN FRAME

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6 MAIN FRAME

6.1 QUICK-TACH ASSEMBLY



- | | |
|--------------------|--------------------|
| 1 Handle | 6 Bushing |
| 2 Quick-tach frame | 7 Cam pin |
| 3 Lock pin | 8 Lock pin linkage |
| 4 Spring | 9 Support pin |
| 5 Stabilizer bar | |

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Fig. 6.1

6.1.1 Quick-Tach Operation:

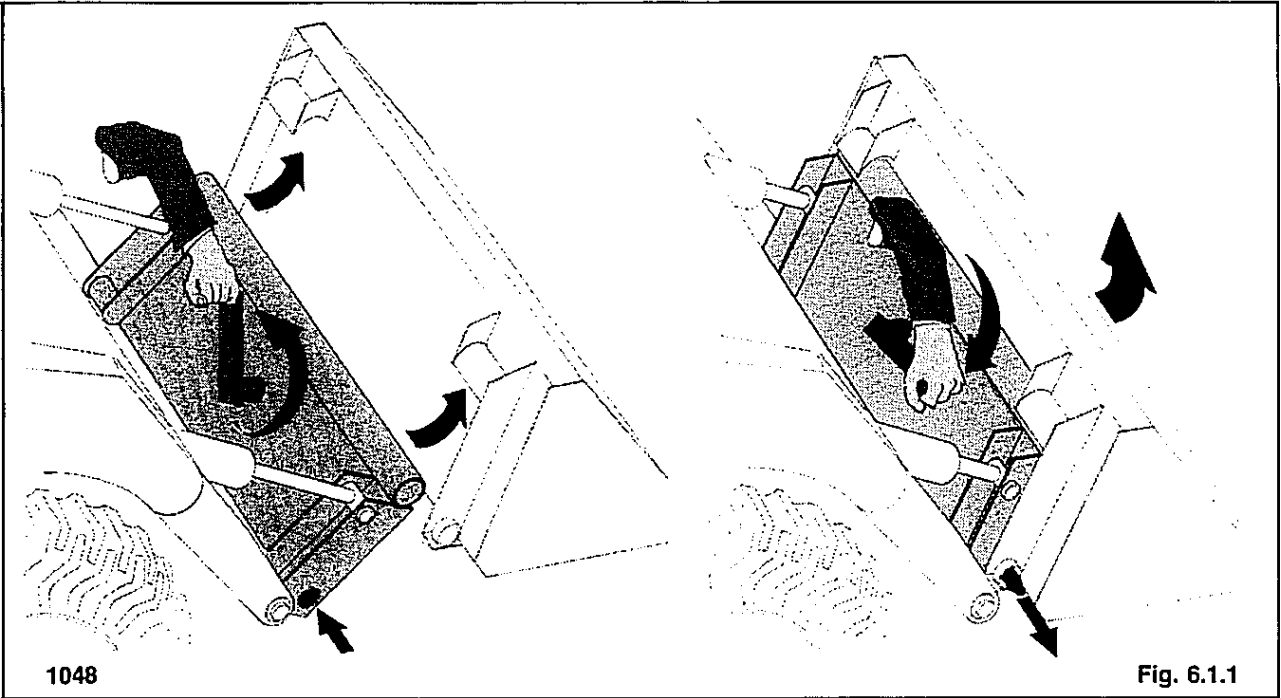


Fig. 6.1.1

The quick-tach which is standard equipment allows changing from one attachment to another quickly without having to remove bolts or pins.

To operate, lift the locking lever (Fig. 6.1.1) up to completely retract the lock pins. Tilt the quick-tach frame forward with the bucket tilt cylinders and drive into the attachment. Retract the bucket tilt cylinders which will line up the bottom of the attachment with the quick-tach lock pins. Push the locking lever down, extending the lock pins and engage the safety lock. Before operating check that the lock pins are fully engaged.

6.1.2 Quick-Tach, Preventive Maintenance:

To keep the quick-tach locking pins and linkage working freely and to prevent pin and bushing wear the quick-tach

must be lubricated every 8 operating hours. More often in dirty applications.

Lubricate the quick-tach as follows:

1. Remove the attachment from the loader quick-tach.
2. Clean any dirt build up around the linkage assembly inside the quick-tach.
3. Lubricate the grease fittings on each of the lock pin bushings with a good quality multi-purpose lithium based grease until excess shows (Fig. 6.1.2A).
4. Lubricate the grease fitting on the quick-tach lock handle bushing (Fig. 6.1.2B).

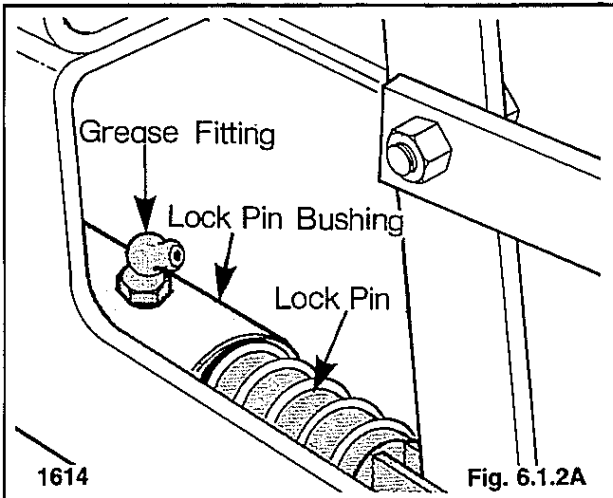


Fig. 6.1.2A

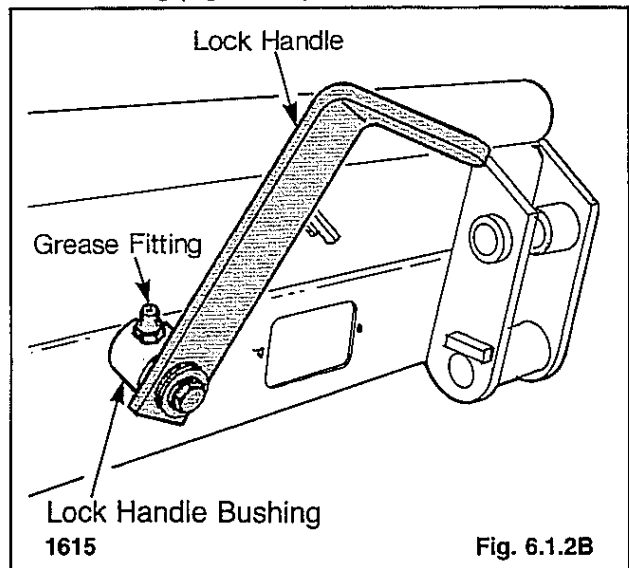
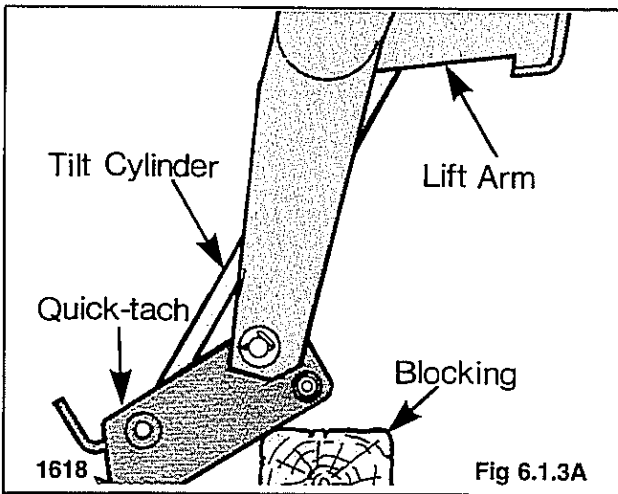


Fig. 6.1.2B

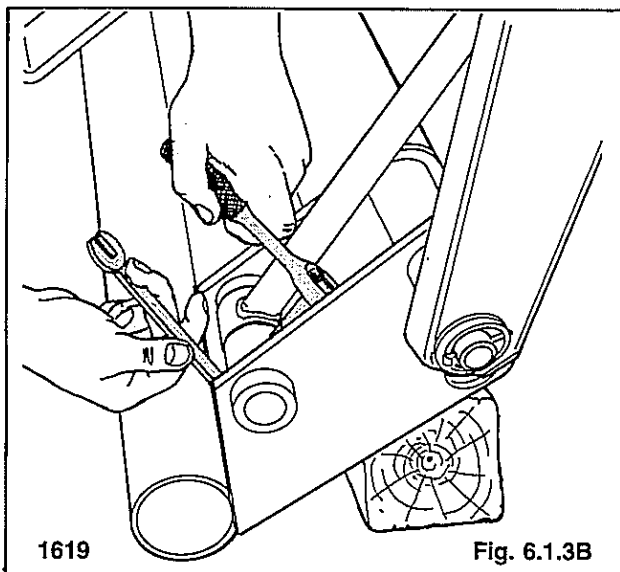
6.1.3 Quick-Tach — Removal:

1. Start the engine. Raise the lift arms. Place blocking under the rear of the quick-tach frame, lower the lift arms until the rear of the quick-tach frame is supported by the blocking (Fig. 6.1.3A).
2. Tilt the quick-tach forward until the front of the frame rests on the ground (Fig. 6.1.3A).



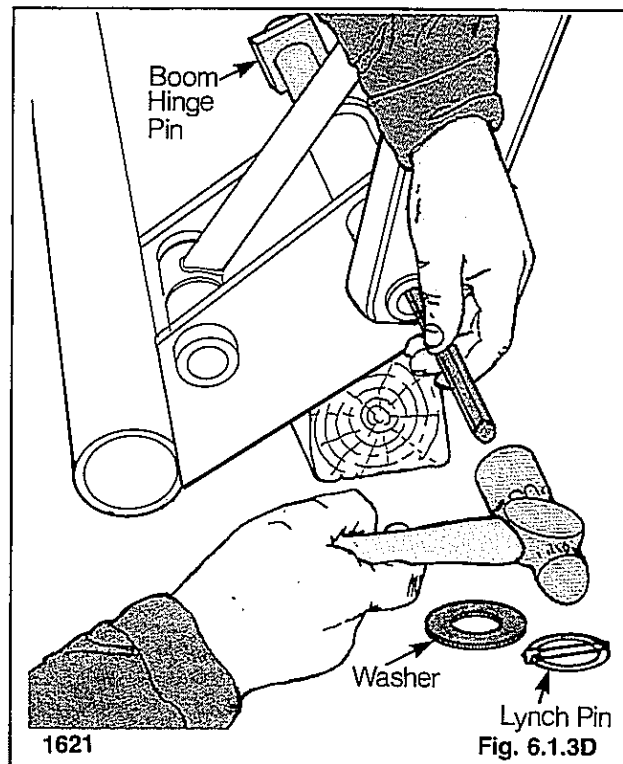
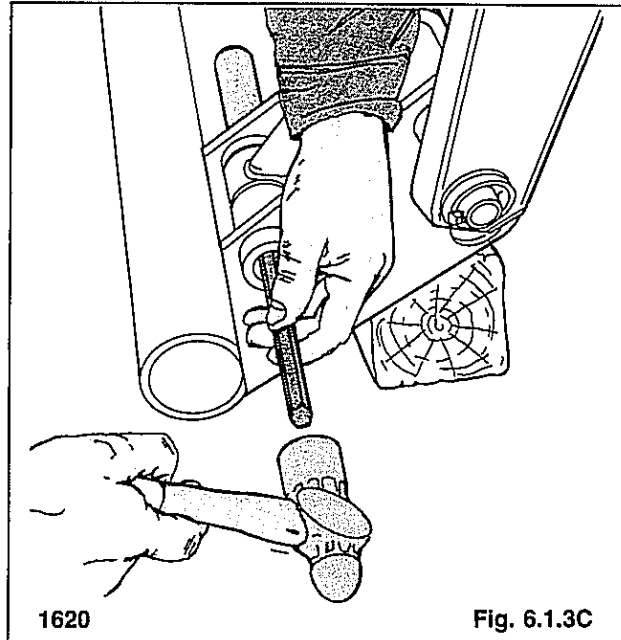
WARNING To prevent personal injury stop the engine, engage the parking brake and lower the boom arms before you get off the loader.

3. Shut off the engine and engage the parking brake. Cycle the foot pedals to relieve any hydraulic pressure in the system.
4. Remove the locknut and lockbolt from the tilt cylinder rod end pins (Fig. 6.1.3B).



WARNING To avoid eye injury wear safety glasses and always use a brass drift and hammer to remove or install pins.

5. Using a hammer and punch (Fig. 6.1.3C), remove the tilt cylinder rod end pivot pins.

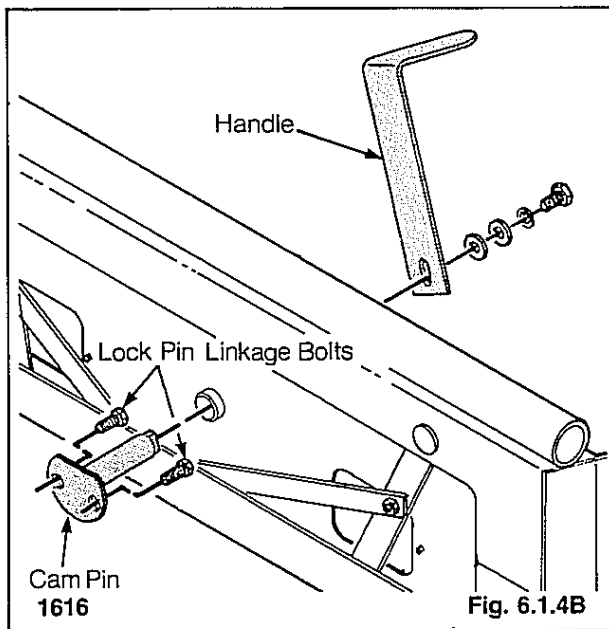
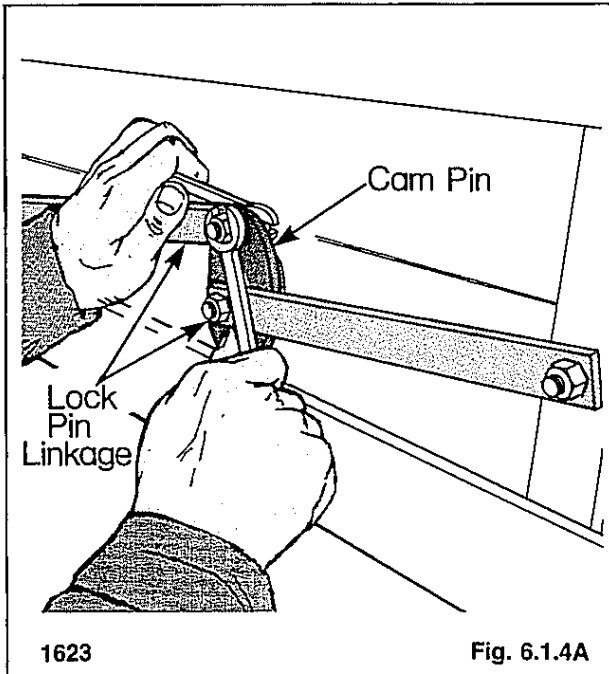


6 MAIN FRAME

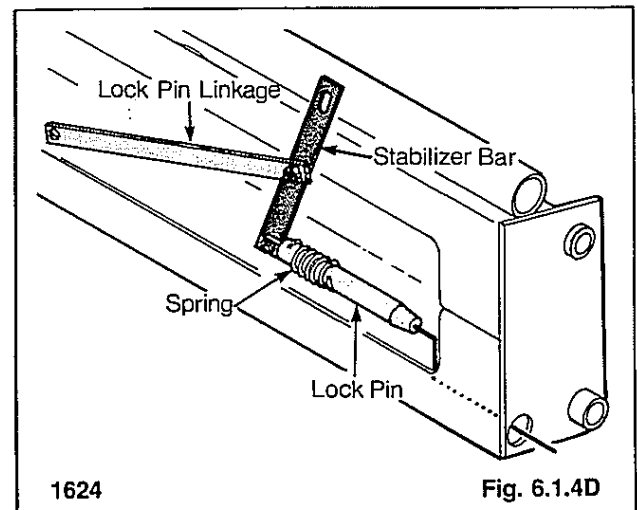
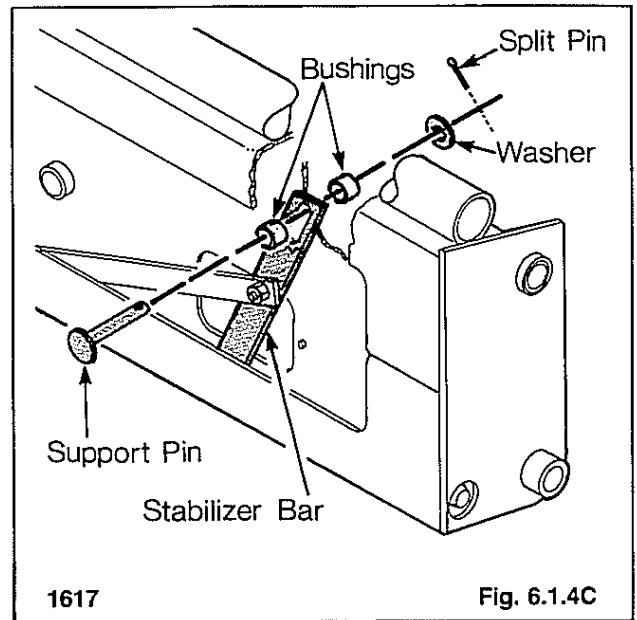
6. Remove the lynch pin and washer from the boom hinge pin (fig. 6.1.3D).
7. Using a hammer and punch remove the boom hinge pin (Fig. 6.1.3D).
8. Remove the quick-tach from the lift arm assembly.

6.1.4 Quick-Tach — Disassembly:

1. Remove the nuts which secure the two lock pin linkages (Fig. 6.1.4A) to the cam pin.



2. Remove the bolt, lockwasher and plain washers which secure the handle (Fig. 6.1.4B) to the cam pin. Remove the handle.
3. Remove the cam pin (Fig. 6.1.4B) and the two lock pin linkage bolts from the quick-tach.
4. Remove the split pin and washer (Fig. 6.1.4C) which secure the stabilizer bar support pin.
5. Remove the stabilizer bar support pin and two bushings (Fig. 6.1.4C) from the quick-tach.

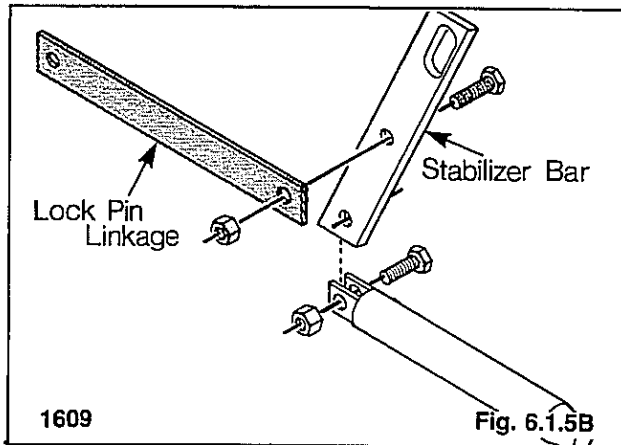
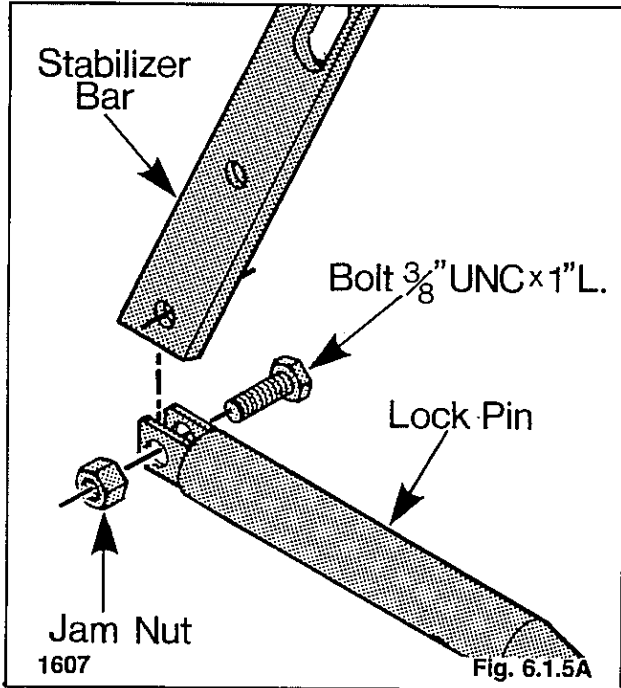


6. Remove the lock pin, spring and linkage assembly (Fig. 6.1.4D) from the quick-tach.
7. Disassemble the stabilizer bar and lock pin linkage from the lock pin (Fig. 6.1.4D).

6 MAIN FRAME

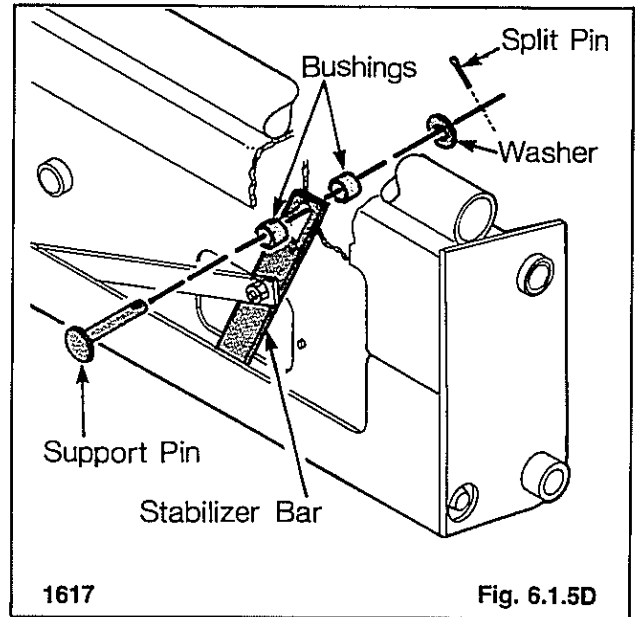
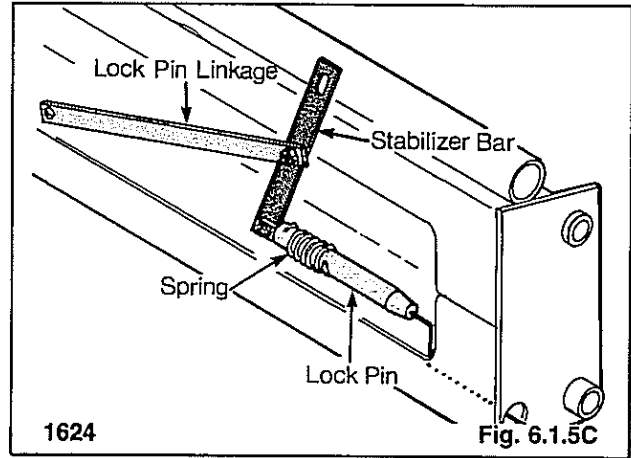
6.1.5 Quick-Tach — Assembly:

1. Install the stabilizer bar on the lock pin (Fig. 6.1.5A).



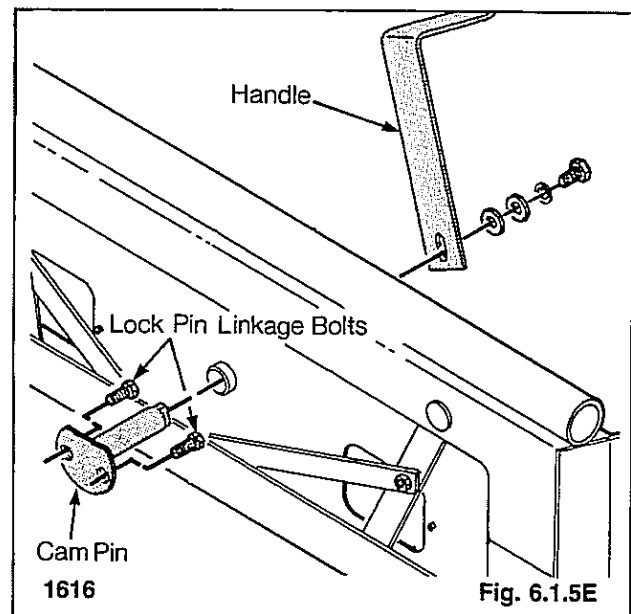
2. Attach the lock pin linkage to the stabilizer bar (Fig. 6.1.5B). Use new nylok nuts during assembly. Do not over tighten. The linkage must pivot freely.

3. Place the spring on the lock pin and install the lock pin and linkage assembly in the quick-tach frame (Fig. 6.1.5C).

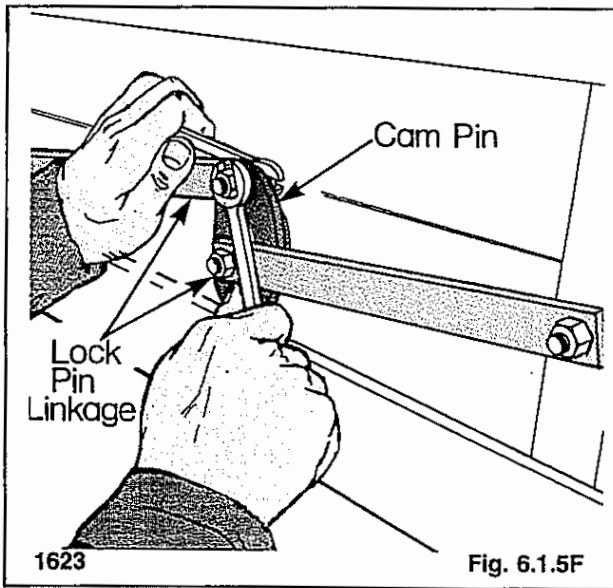


4. Install a bushing on both sides of the stabilizer bar and install the support pin (Fig. 6.1.5D). Secure the support pin with the washer and split pin.

5. Insert the two lock pin linkage bolts through the back side of the cam pin (Fig. 6.1.5E). Install the cam pin in the quick-tach housing.



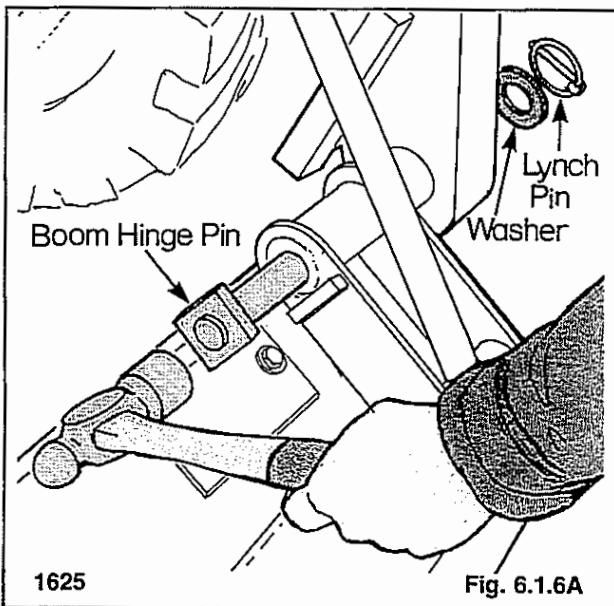
6. Mount the handle on the cam pin (Fig. 6.1.5E) and secure in place with the two washers, lockwasher and bolt.



7. Connect the lock pin linkage to the cam pin (Fig. 6.1.5F). Use new nylock nuts during assembly. Do not over tighten, the linkage must pivot freely.

6.1.6 Quick-Tach — Installation:

1. Put a floor jack under the quick-tach. Position the quick-tach between the lift arms.
2. Raise the quick-tach with the floor jack and line up the boom hinge bushing with the rear quick-tach bushings.
3. Lubricate and install the boom hinge pins (Fig. 6.1.6A).
4. Install the washer and lynch pins in the boom hinge pin (Fig. 6.1.6A).

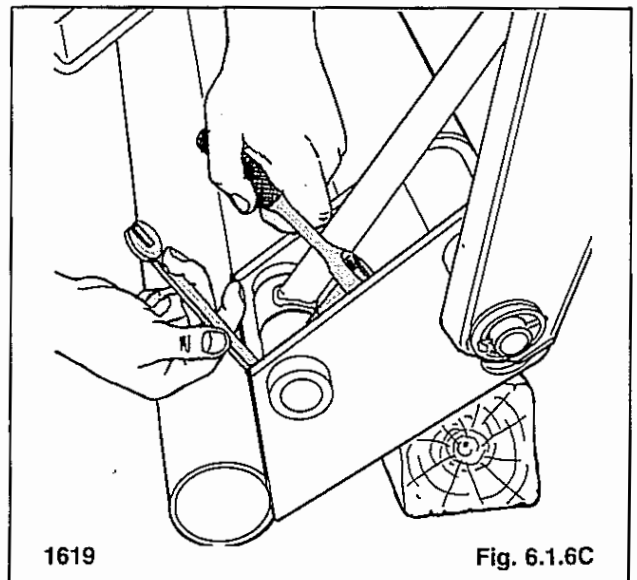
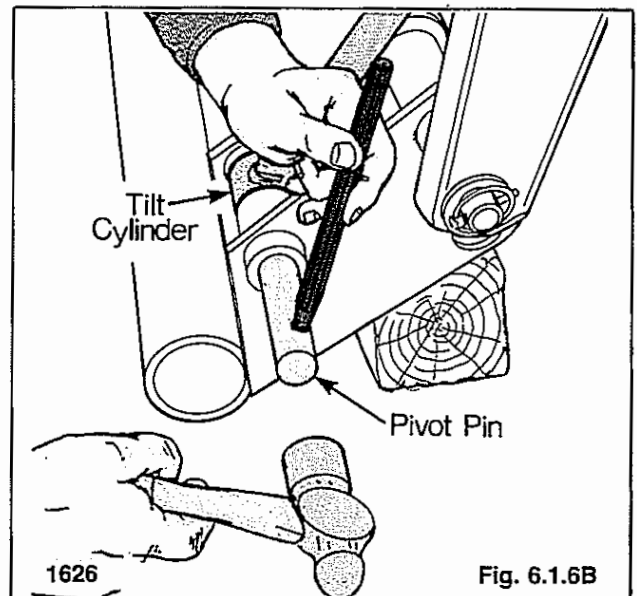




WARNING

To avoid eye injury wear safety glasses and always use a brass drift and hammer to remove or install pins.

5. Extend the tilt cylinders until the cylinder rod end bushings line up with the quick-tach bushings.
6. Install the tilt cylinder rod end pivot pins (Fig. 6.1.6B).

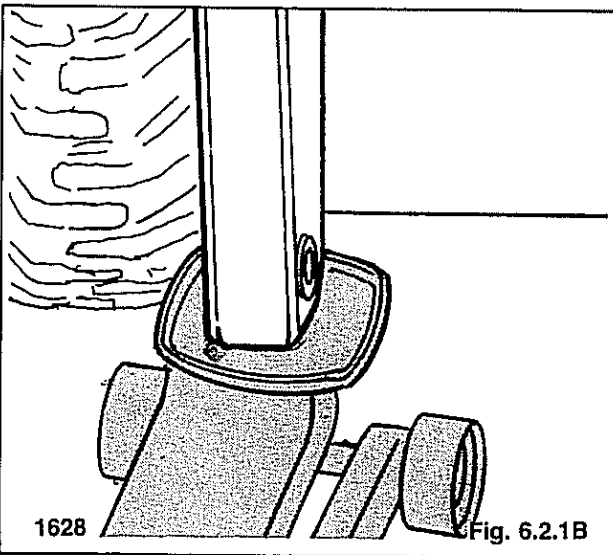
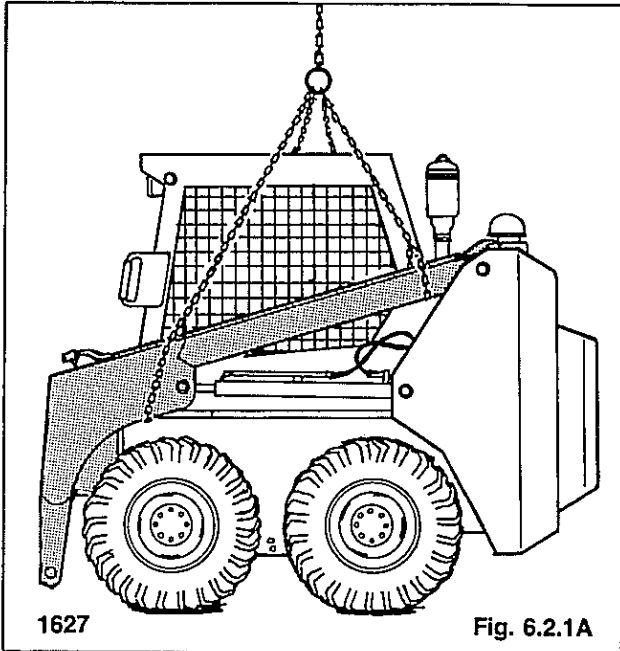


7. Install the pivot pin lock bolts and lock nuts (Fig. 6.1.6C).

6.2 BOOM ARMS

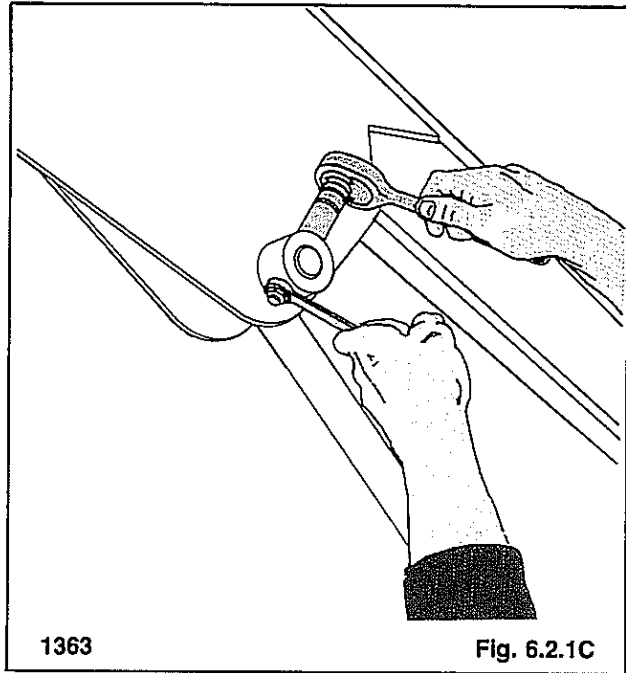
6.2.1 Boom Arms — Removal:

1. Stop the engine and cycle the foot pedals to relieve any hydraulic pressure in the system.
2. Remove the quick-tach assembly from the boom arms (see section 6.1.3).
3. Fasten chains and a chain hoist to the lift arms (Fig. 6.2.1A).

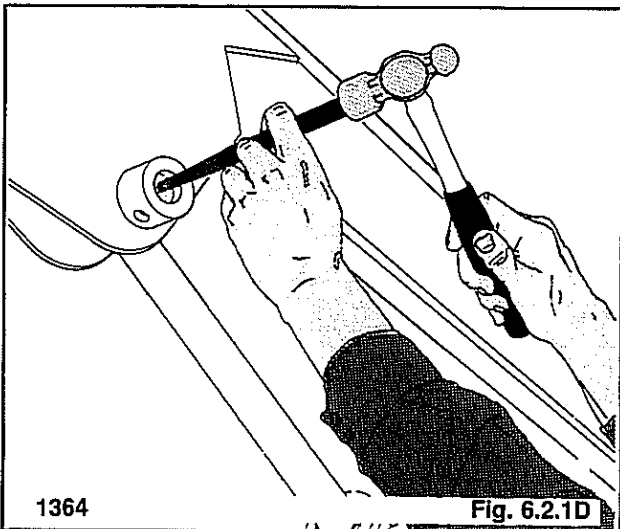


4. Put a floor jack under the boom arms (Fig. 6.2.1B).
5. Lock the boom lift foot pedal in float position (see section 4.2.1).
6. Raise the boom arms until the pivot pins in the rod end of the boom cylinders can be removed.

7. Remove the locknuts and lock bolts from the rod end pivot pins (Fig. 6.2.1C).

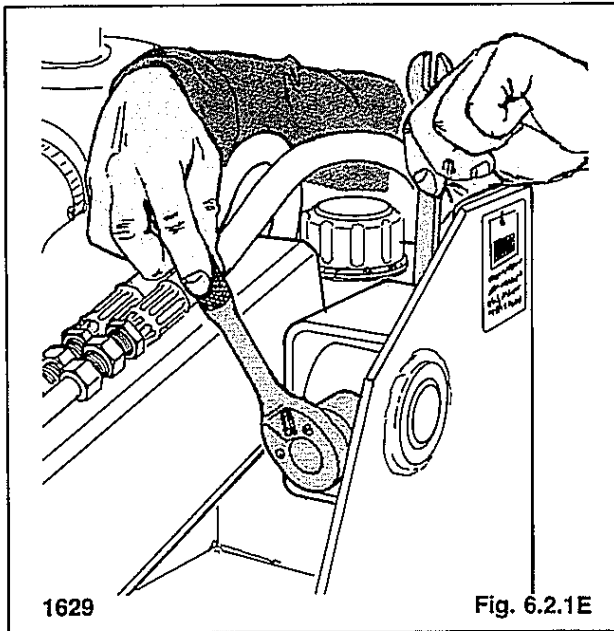


WARNING To avoid eye injury wear safety glasses and always use a brass drift and hammer to remove or install pins.



8. Remove the boom cylinder rod end pivot pin (Fig. 6.2.1D). Place a support under the boom cylinder to prevent the cylinder from falling when the pin is removed.
9. Lower the lift arms and remove the floor jack.

10. Remove the locknuts and lock bolts from the rear boom pivot pins (Fig. 6.2.1E).

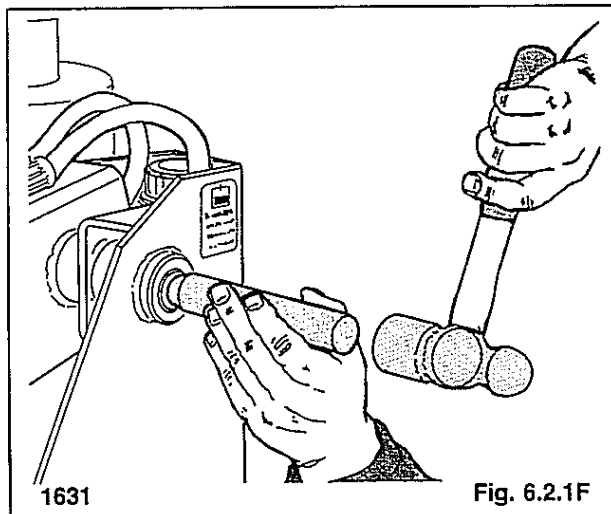
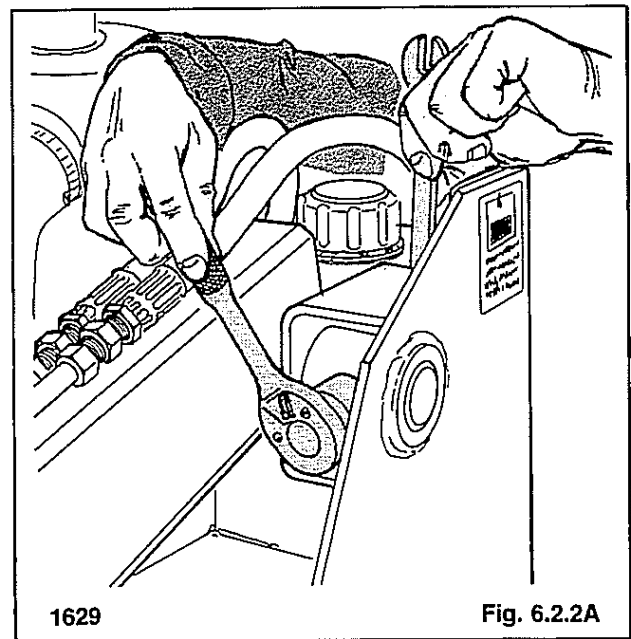


6.2.2 Boom Arms — Installation:

1. With a chain hoist, position the boom arms on the loader and align the boom arm and main frame pivot bushings.



2. Install the pivot pins in the main frame and boom arms.
3. Install the locknuts and bolts (Fig. 6.2.2A) in the boom pivot pins.
4. Lower the boom arms and remove the chain hoist and chains from the boom arms.
5. Align the lift cylinder rod end bushing and the boom arm pivot bushings.



11. Tighten the chain hoist and remove the rear boom pivot pins (Fig. 6.2.1F).
12. Raise the boom arms with the chain hoist and remove from the loader.



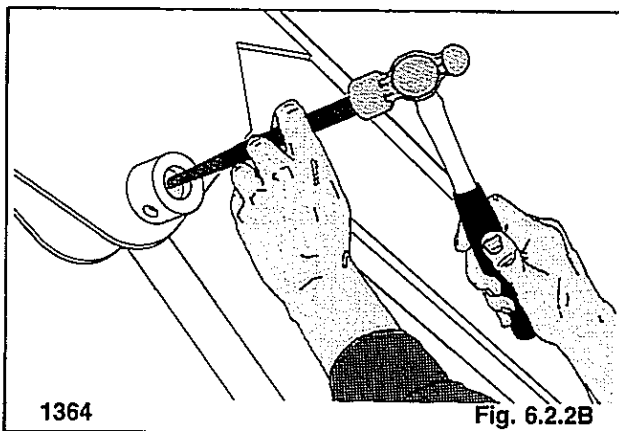


Fig. 6.2.2B

6. Install the pivot pins in the boom arms and lift cylinders (Fig. 6.2.2B).
7. Install the locknuts and lock bolts in the lift cylinder pivot pins (Fig. 6.2.2C).
8. Install the quick-tach assembly on the boom arms (see section 6.1.6)

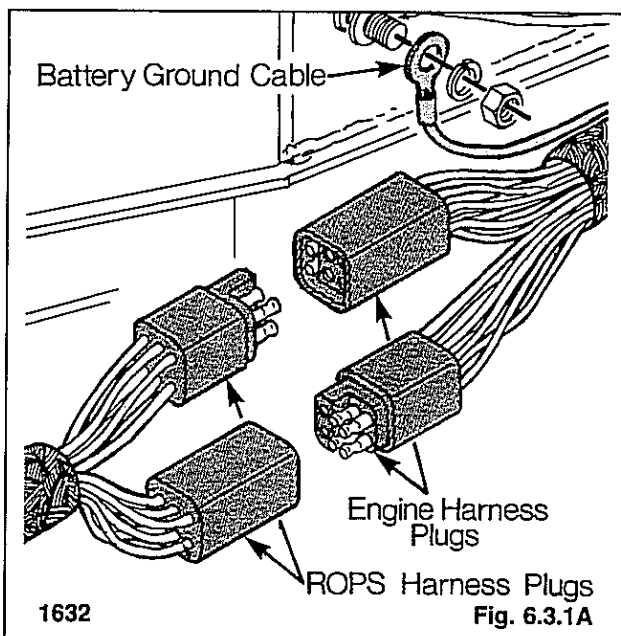


Fig. 6.3.1A

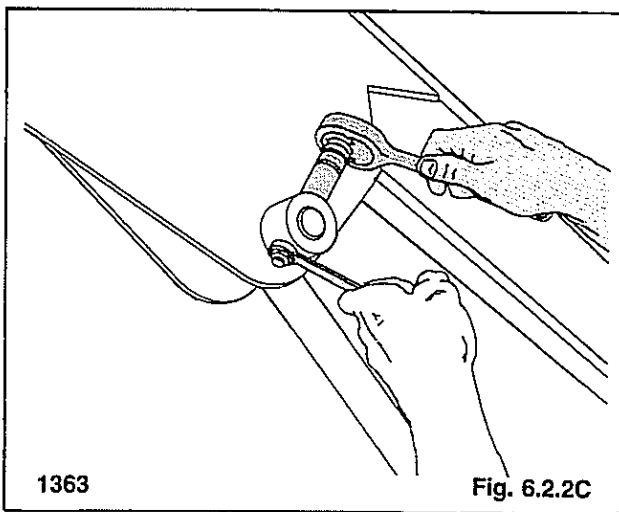


Fig. 6.2.2C

6.3 OPERATOR GUARD (ROPS)

6.3.1 Operator Guard (ROPS) — Removal:

1. Disconnect and remove the battery from the operator guard (ROPS). See section 5.3.2 for procedure.
2. Disconnect the battery cable from the starter motor solenoid. Remove the battery cable from the loader.
3. Disconnect the engine wiring harness from the ROPS wiring harness at the plug connections inside the engine compartment (Fig. 6.3.1A).
4. Disconnect the battery ground cable from the loader main frame (Fig. 6.3.1A). Remove the ground cable from the loader.
5. Remove the exhaust pipe and the exhaust pipe mount (Fig. 6.3.1B).

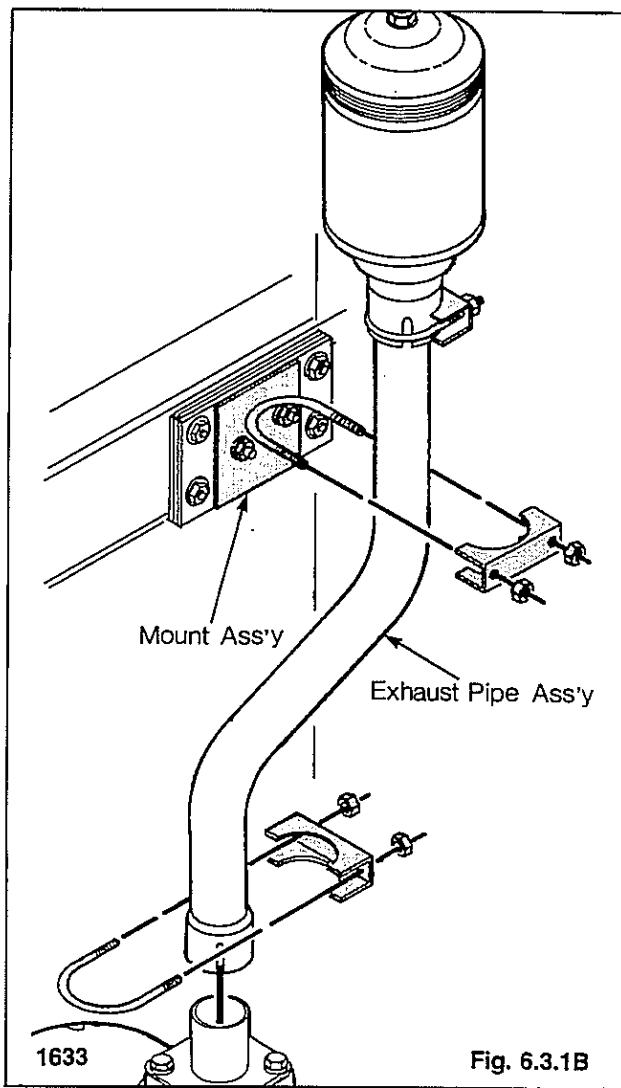
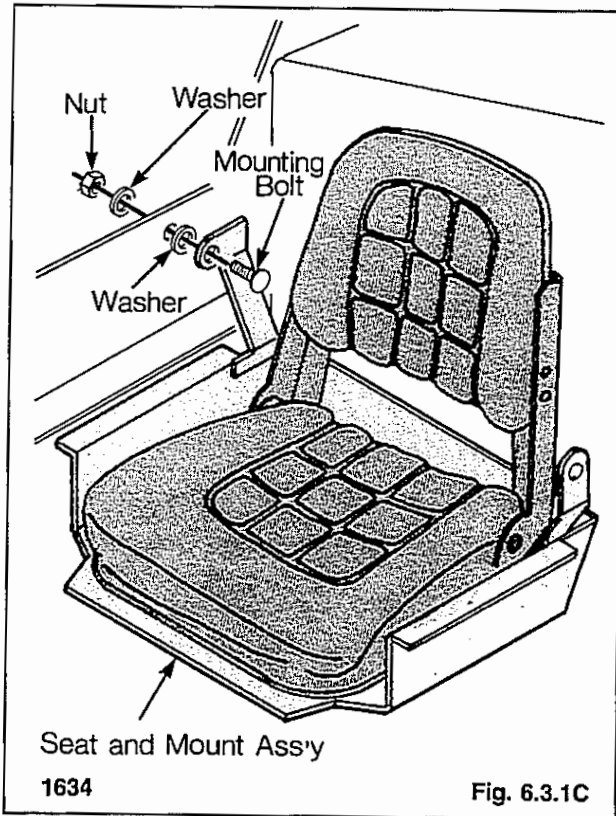
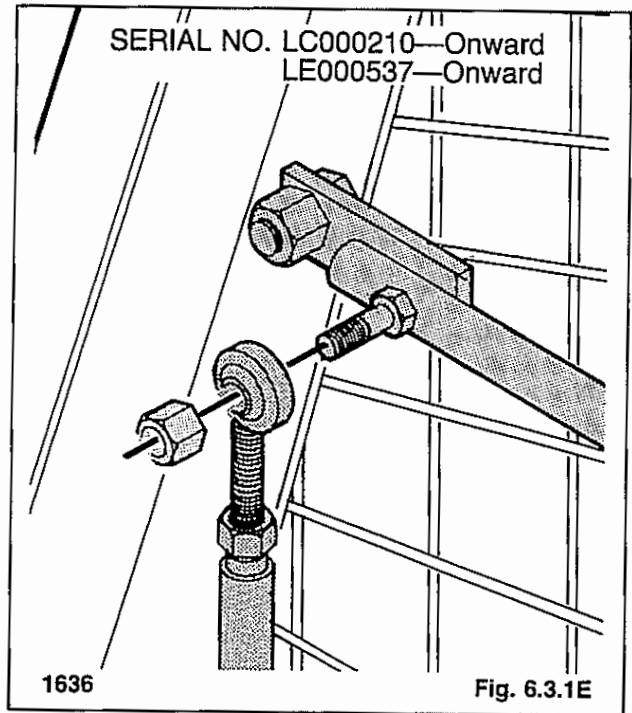


Fig. 6.3.1B

6 MAIN FRAME

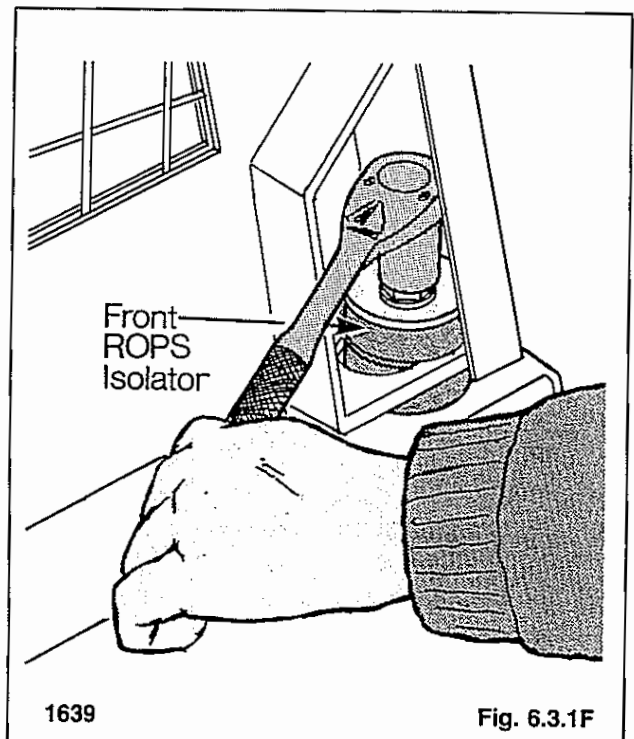
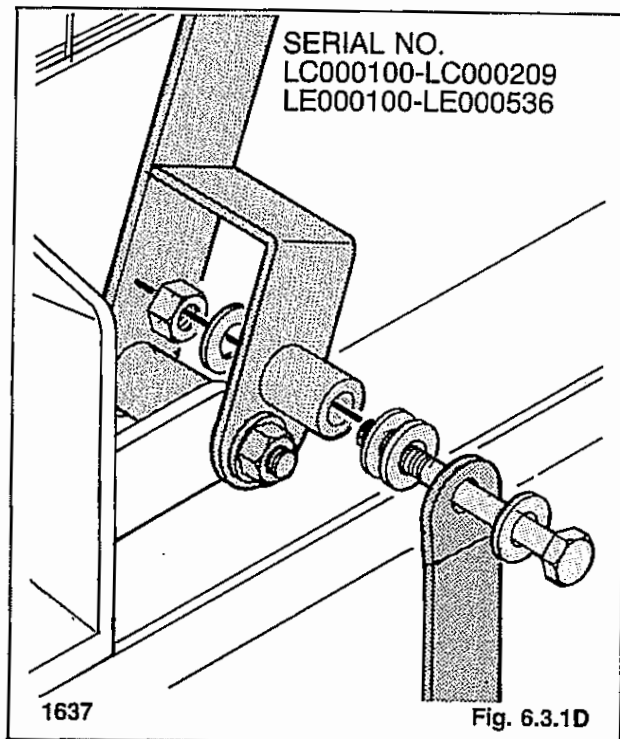


7. Disconnect the seat bar linkage at the front of the ROPS on the R.H. side (Fig. 6.3.1D, 6.3.1E).



6. Remove the seat mount and seat assembly from the loader (Fig. 6.3.1C).

8. Remove the two front ROPS isolators (Fig. 6.3.1F).



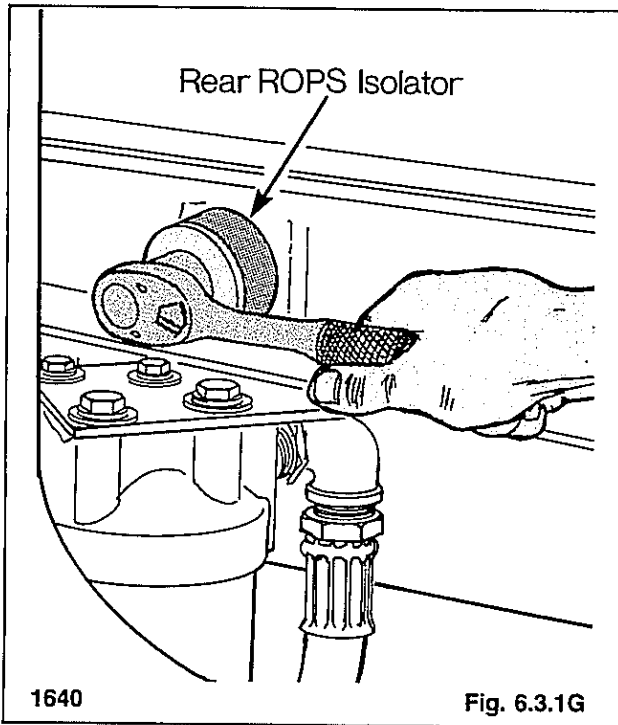


Fig. 6.3.1G

9. Remove the two rear ROPS isolators (Fig. 6.3.1G).
10. Attach chains and a chain hoist to the ROPS as shown in Fig. 6.3.1H. Remove the ROPS from the loader.

rear isolator holes in the ROPS with the mounting holes in the main frame (Fig. 6.3.2A).

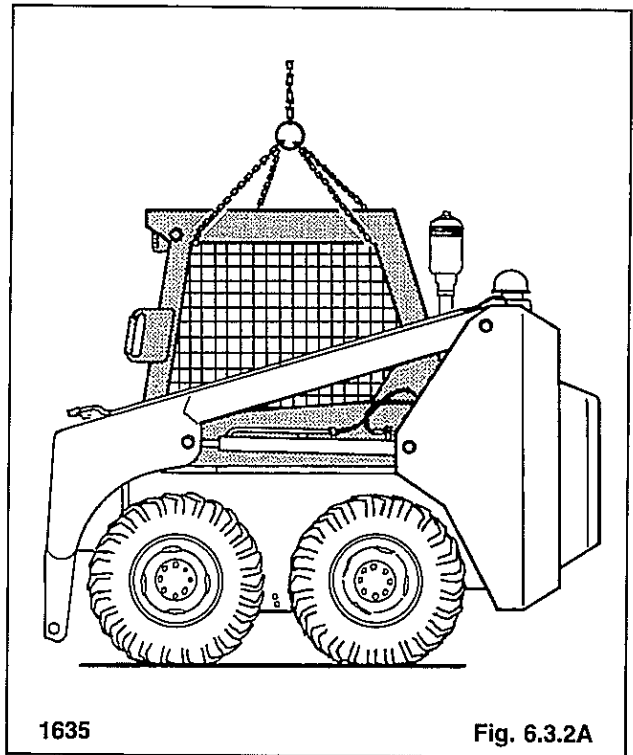


Fig. 6.3.2A

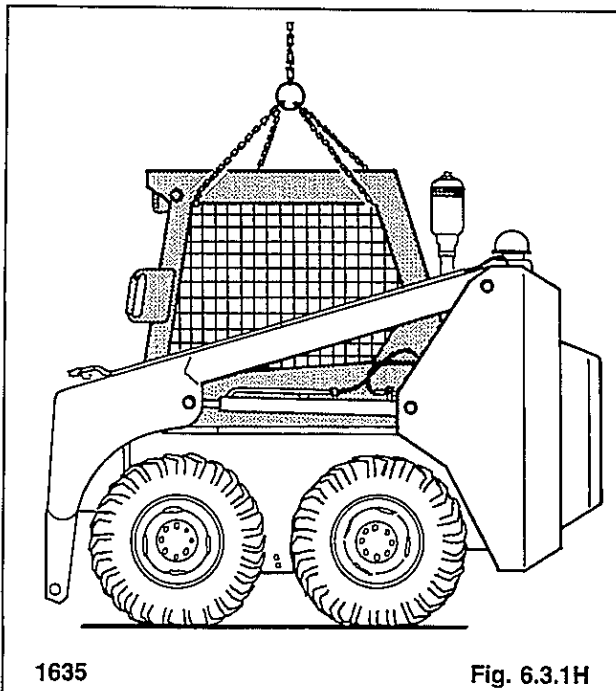


Fig. 6.3.1H

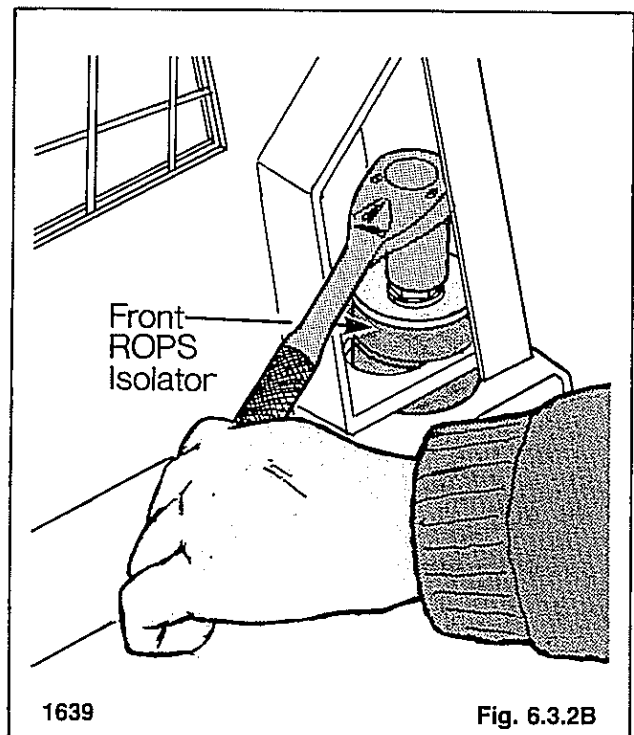
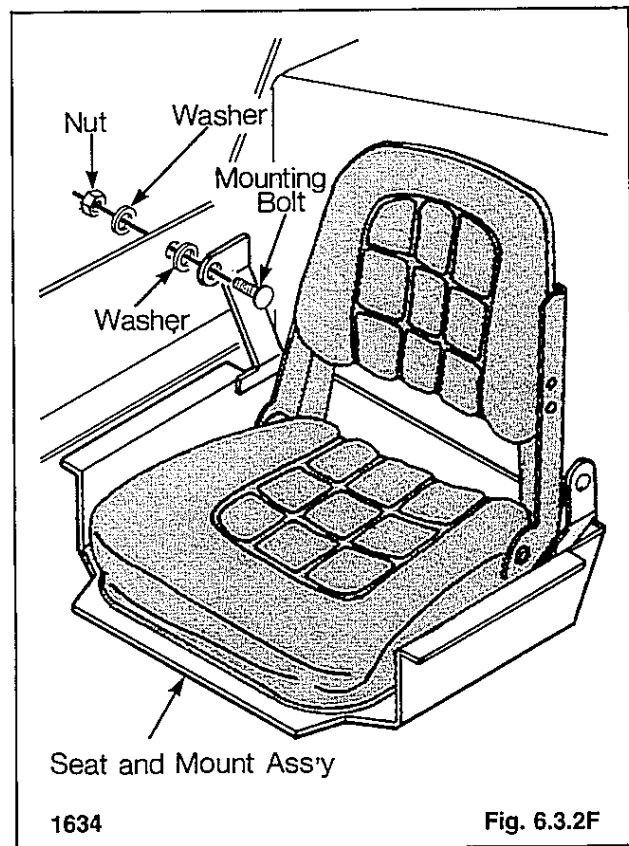
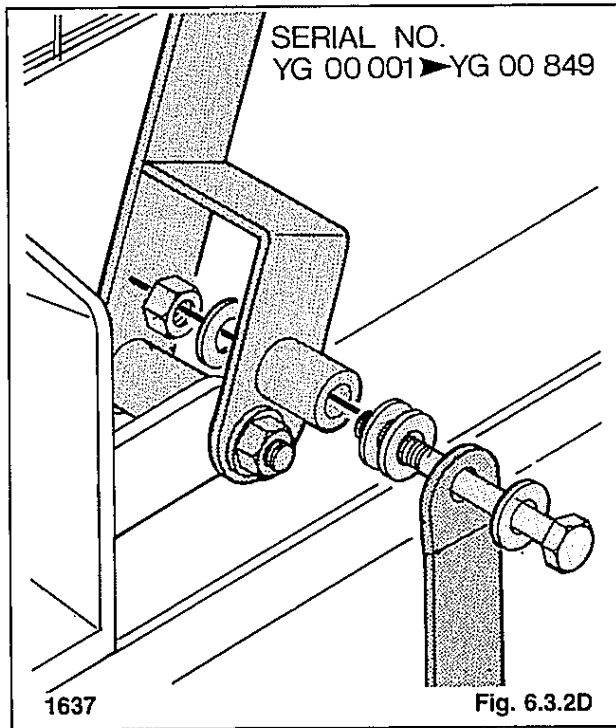
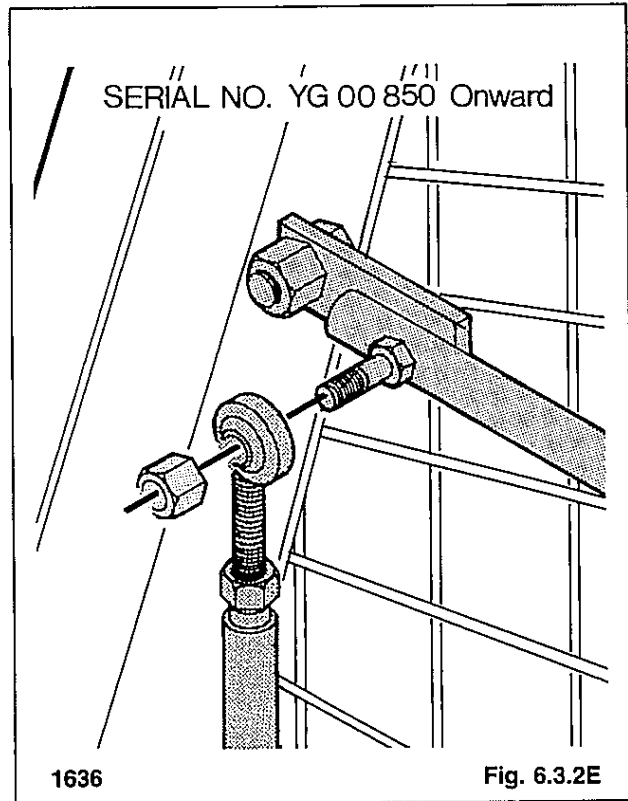
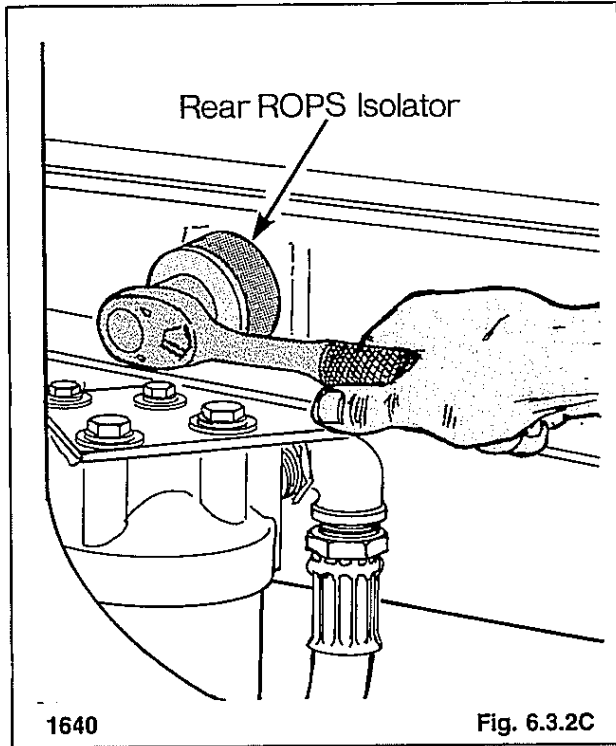


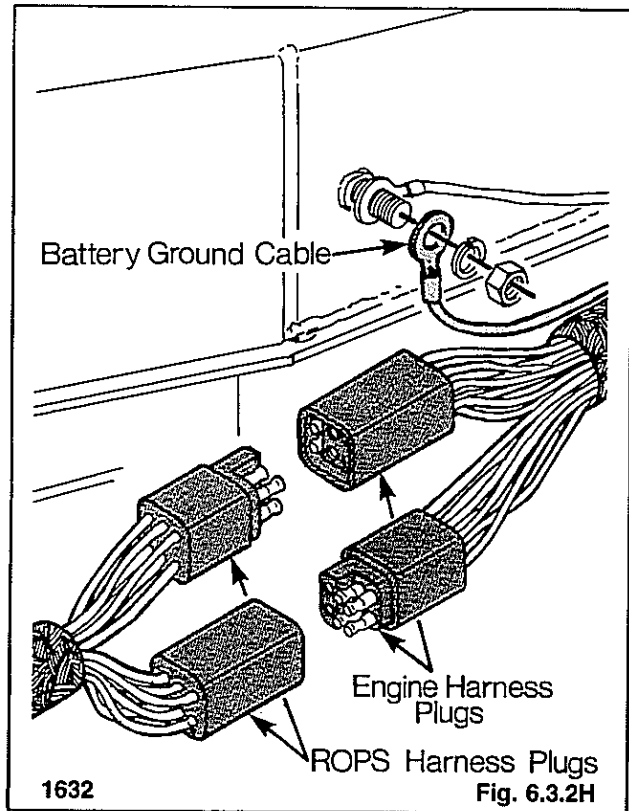
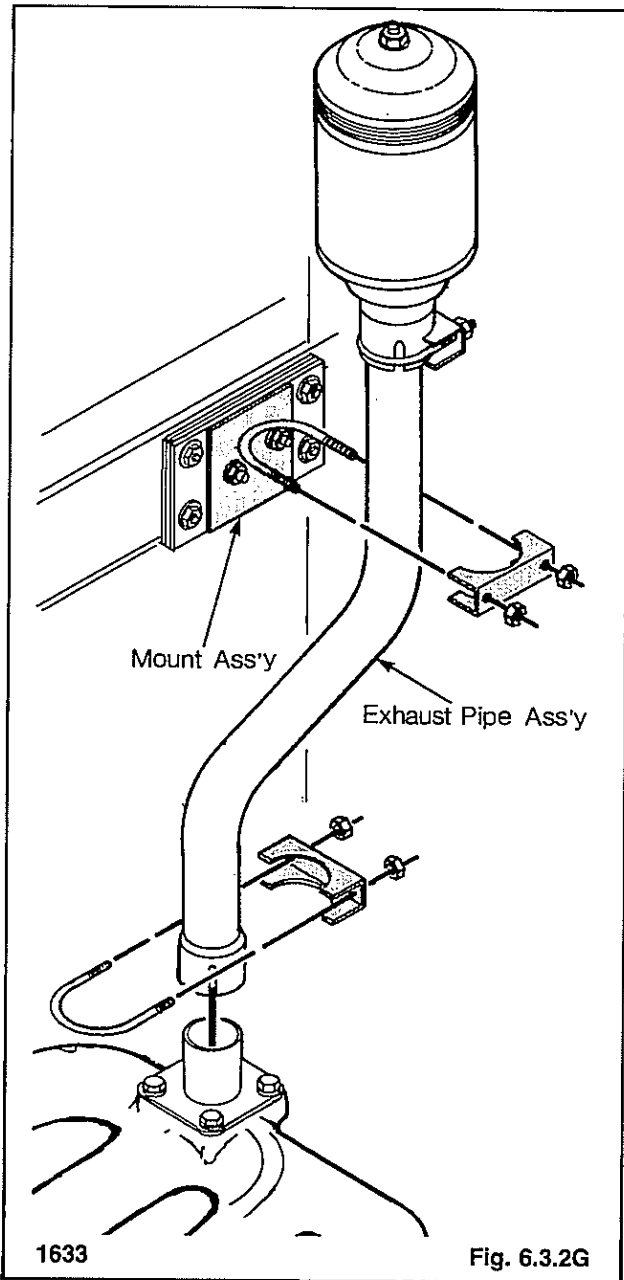
Fig. 6.3.2B

6.3.2 Operator Guard (ROPS) — Installation:

1. Using a chain hoist raise the operators guard (ROPS) and install it on the main frame. Line up the front and rear isolator holes in the ROPS with the mounting holes in the main frame (Fig. 6.3.2A).
2. Install the two front isolators (Fig. 6.3.2B).
3. Install the two rear isolators (Fig. 6.3.2C).

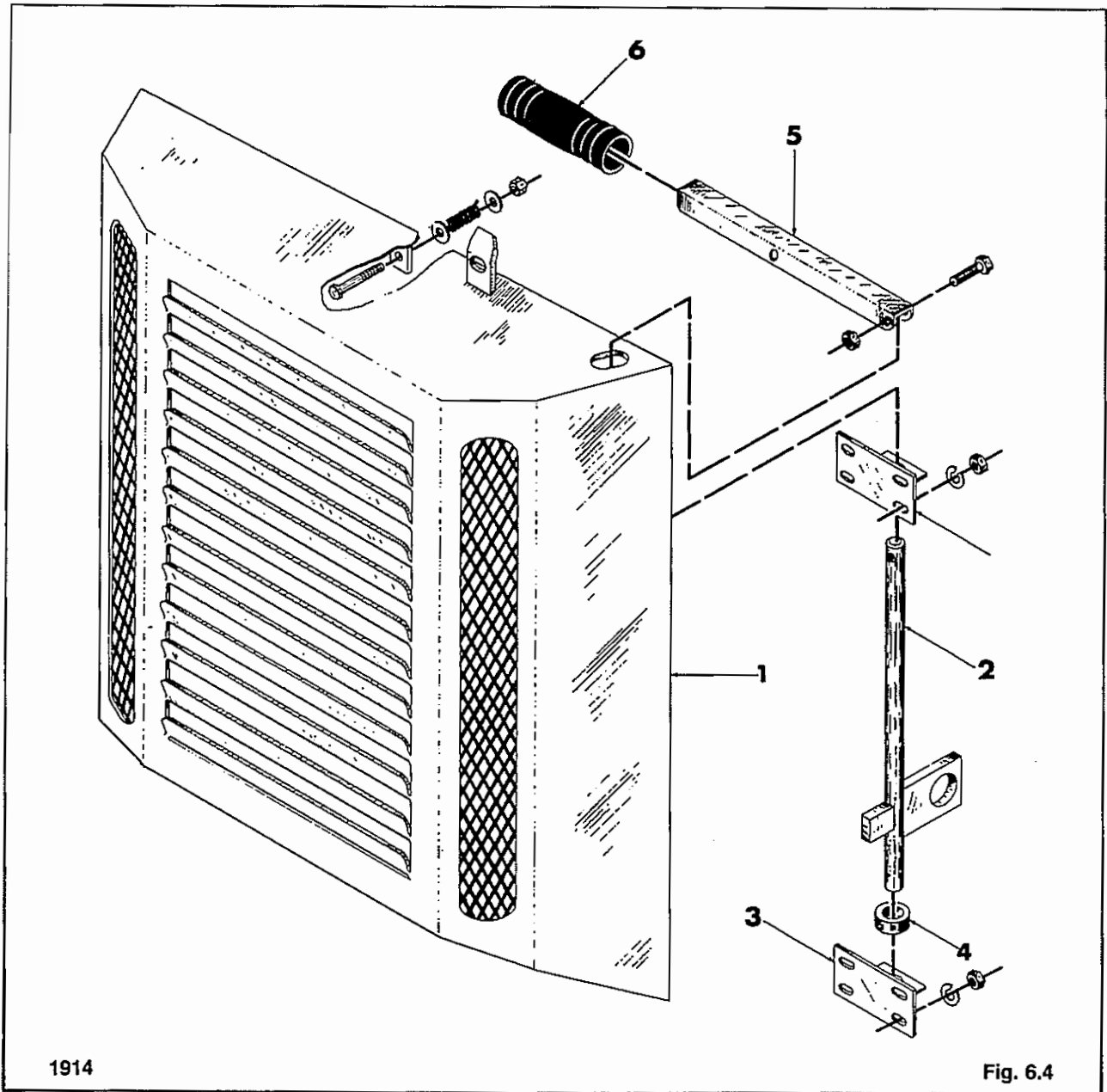


4. Connect the seat bar linkage at the front of the ROPS on the R.H. side (Fig. 6.3.2D, Fig. 6.3.2E).
5. Install the seat and seat mount assembly in the loader (Fig. 6.3.2F).



6. Install the exhaust pipe and exhaust pipe mount (Fig. 6.3.2G).
7. Install the battery ground cable in the ROPS and connect the cable to the ground post on the main frame (Fig. 6.3.2H).
8. Connect the engine wiring harness to the ROPS wiring harness at the plug connectors inside the engine compartment (Fig. 6.3.2H).
9. Install the solenoid cable in the ROPS and connect one end to the starter motor solenoid.
10. Install the battery in the ROPS. When connecting the battery connect the ground cable last. Refer to section 5.3 for proper handling procedures.

6.4 REAR DOOR



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Fig. 6.4

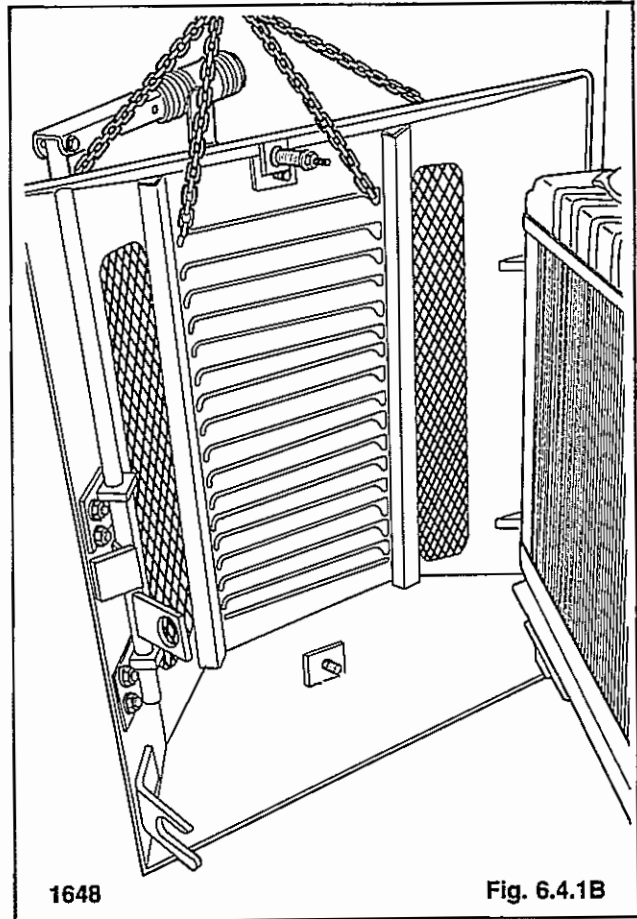
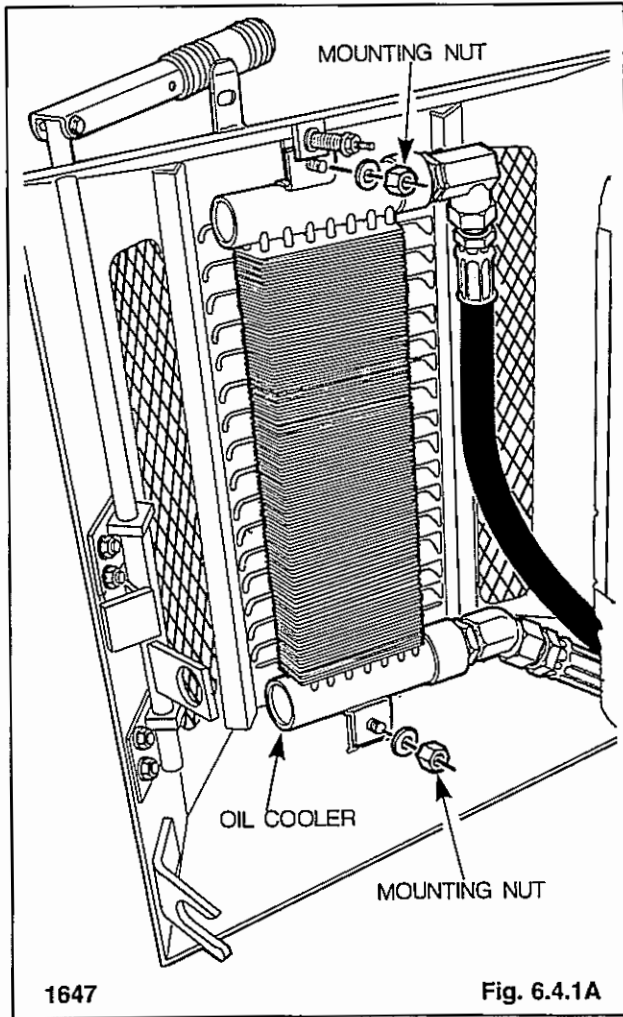
- 1. Rear Door
- 2. Lock Rod
- 3. Lock Adjustment Bracket

- 4. Set Collar
- 5. Handle
- 6. Handle Grip

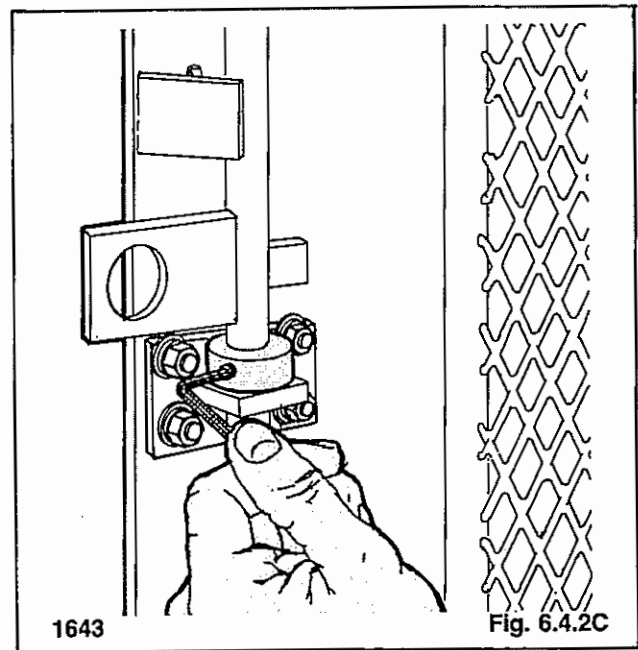
6.4.1 Rear Door — Removal:

1. Remove the two nuts securing the oil cooler to the rear door (Fig. 6.4.1A). Carefully lay the oil cooler with the hoses attached on the ground.

NOTE: If it is necessary to remove the hydraulic oil cooler from the loader the hydraulic oil reservoir must be drained (Refer to section 1.7.3).



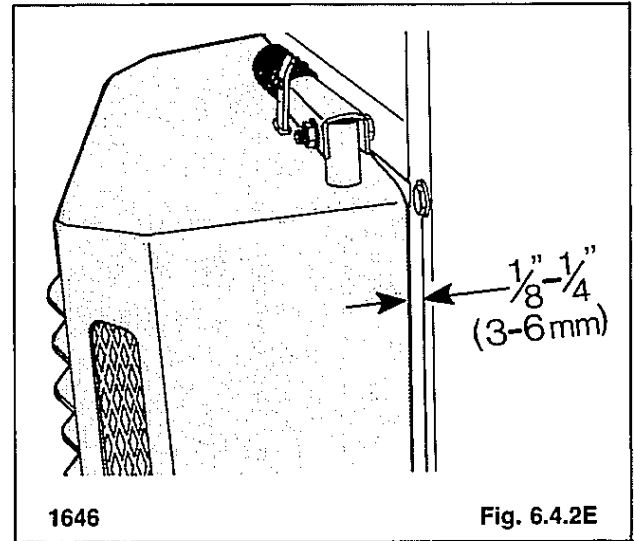
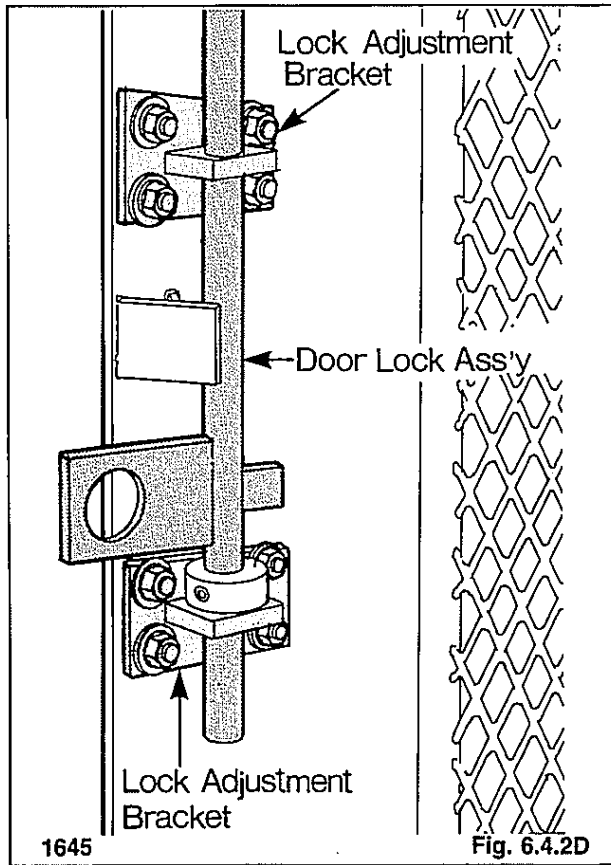
3. Adjust the set collar on the lock rod so that the lock rod lines up with the locking pin on the main frame (Fig. 6.4.2C).



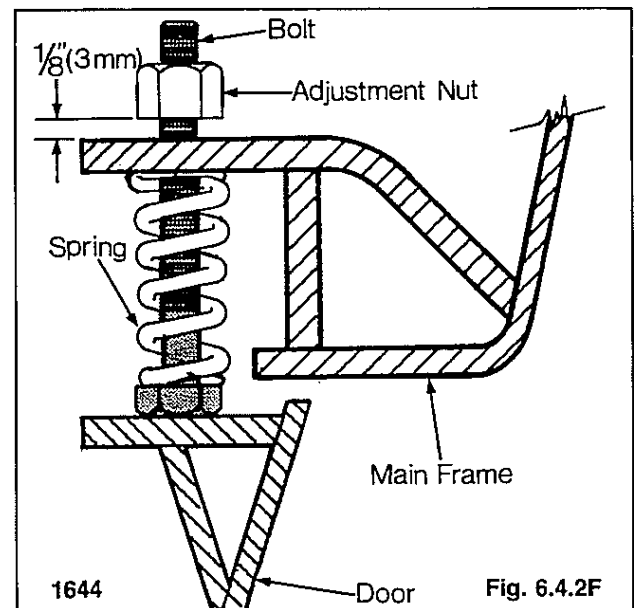
2. Attach chains and a chain hoist to the rear door (Fig. 6.4.1B). Lift the rear door with the chain hoist clear of the hinges. Remove the door from the loader.

6.4.2 Rear Door — Installation & Adjustment:

1. Attach chains and a chain hoist to the rear door (Fig. 6.4.1B). Raise the rear door with a chain hoist and install the rear door on the loader.
2. Install the hydraulic oil cooler on the rear door (Fig. 6.4.1A). Check that the hoses running to the oil cooler are not kinked or interfere when the door is opened and closed.



4. Set the lock adjustment brackets (Fig. 6.4.2D) so that the door when shut has gap between $\frac{1}{8}$ " - $\frac{1}{4}$ " (3-6 mm) (Fig. 6.4.2E).
5. Set the door spring (Fig. 6.4.2F) so that when the door is shut the spring is compressed and there is approximately a $\frac{1}{8}$ " (3 mm) gap between the adjustment nut and mounting bracket.



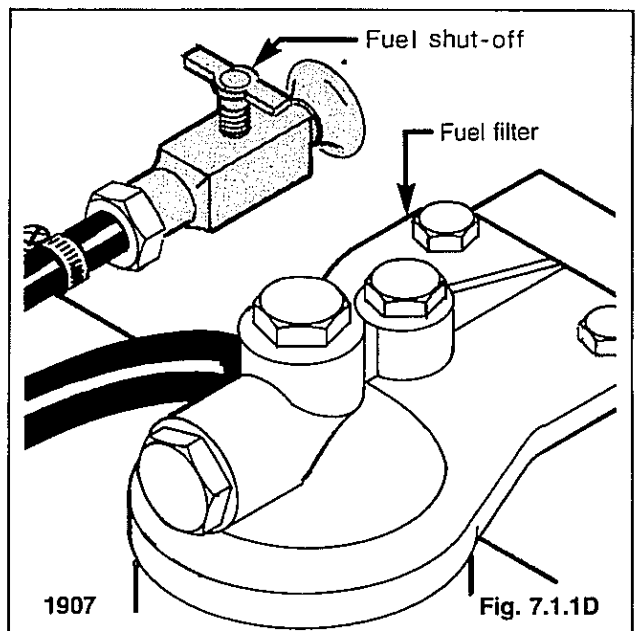
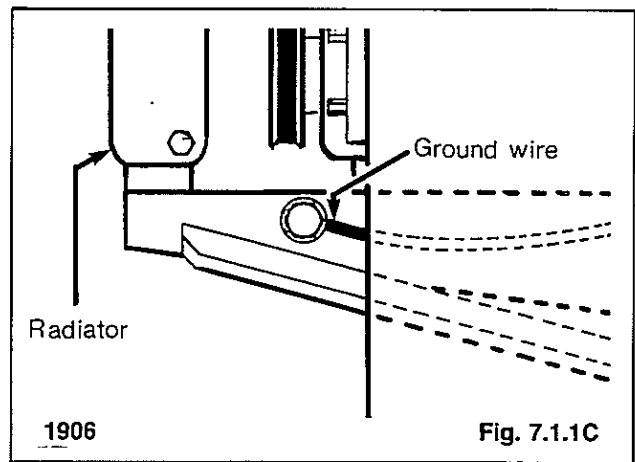
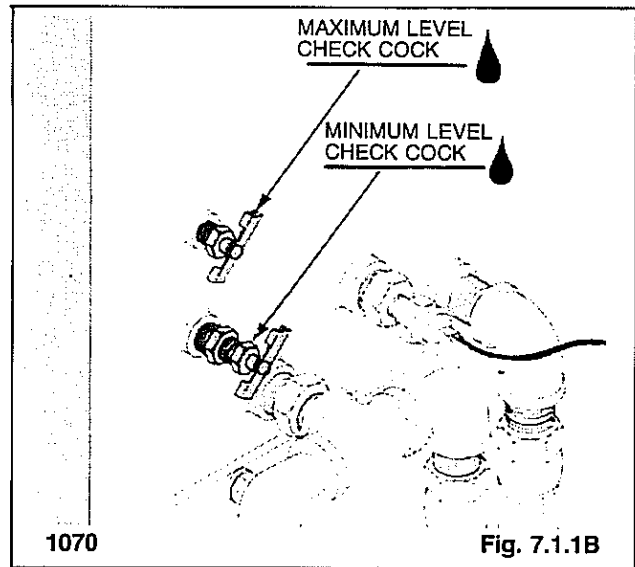
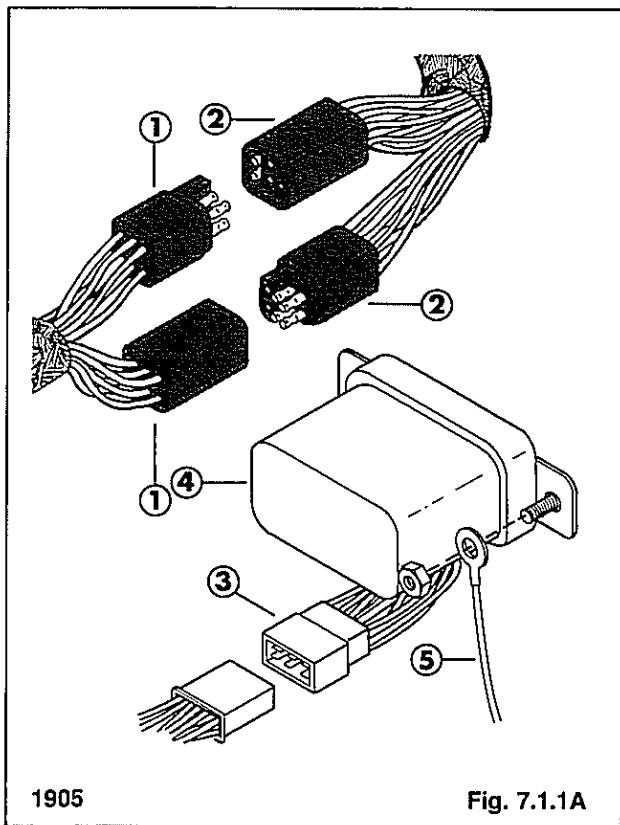
**NOTE: FOR COMPLETE ENGINE SERVICE AND REPAIR PROCEDURES
REFER TO THE KUBOTA WORKSHOP MANUAL**

7 ENGINE

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7.1.1 Engine Removal

1. Disconnect the battery cables at the battery. Remove the negative or ground cable first.
2. Disconnect the battery cable from the starter motor solenoid.
3. Disconnect the engine wiring harness from the ROPS wiring harness at the plug connections inside the engine compartment (Fig. 7.1.1A).
4. Disconnect the voltage regulator harness at the plug connection (Fig. 7.1.1A).
5. Disconnect the ground wire from the voltage regulator mount (Fig. 7.1.1A).



6. Disconnect the hydraulic oil temperature sender wire from the sender on the oil reservoir (Fig. 7.1.1B). Be sure the wire is completely disengaged from the engine.
7. Disconnect the engine ground wire (Fig. 7.1.1C).
8. Shut off the fuel at the fuel tank (Fig. 7.1.1D).
9. Disconnect the fuel line from the fuel lift pump and injection pump.
10. Disconnect the fuel overflow line from the injector.

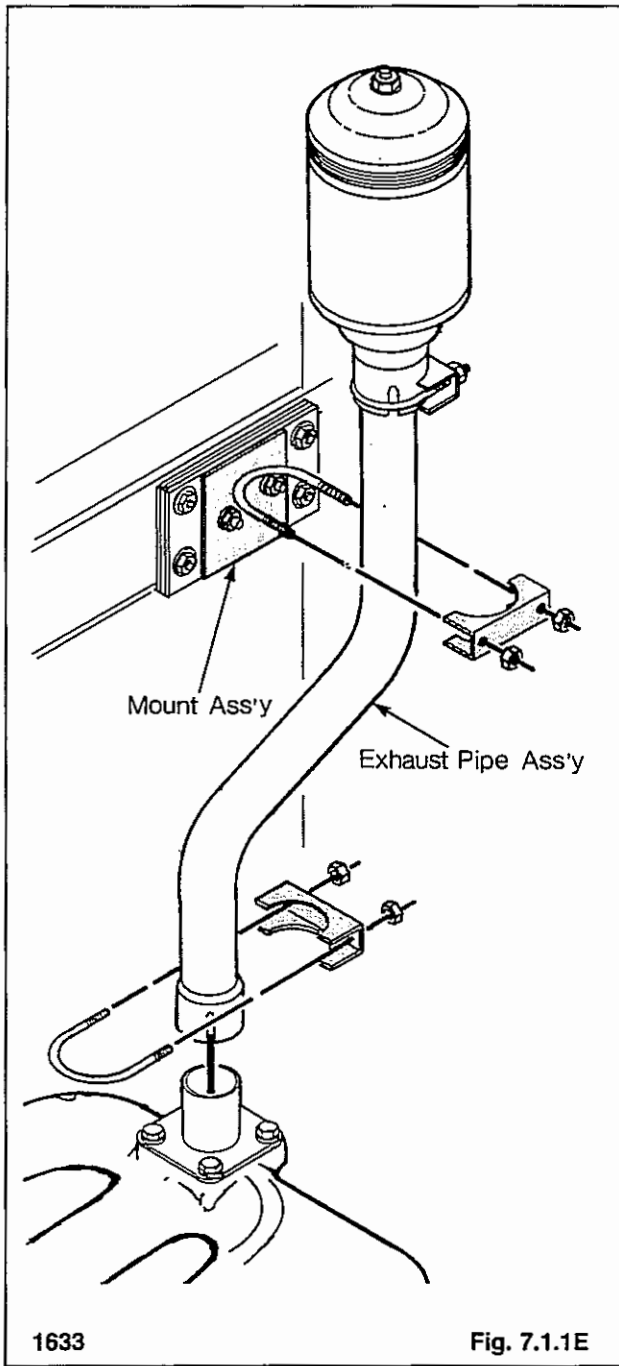


Fig. 7.1.1E

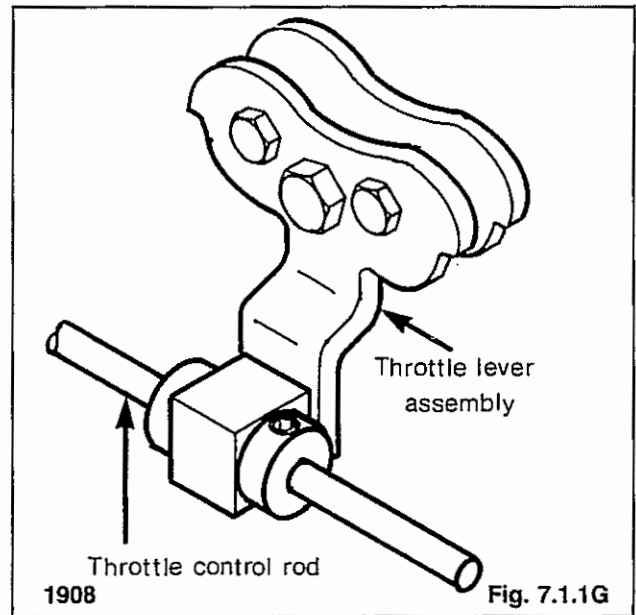


Fig. 7.1.1G

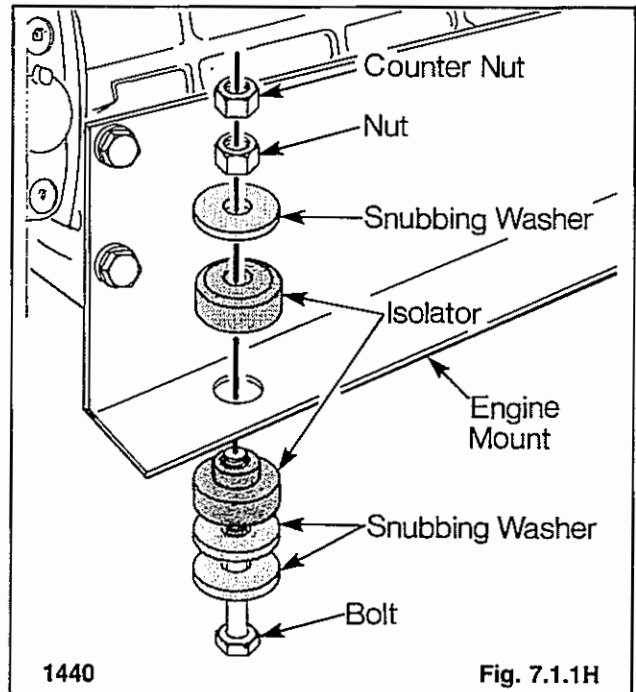


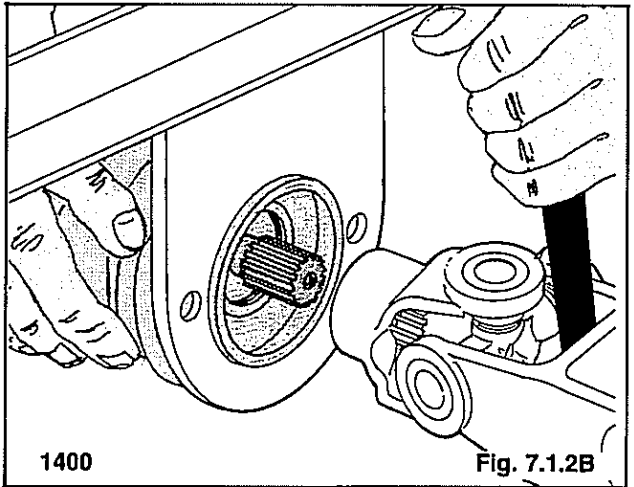
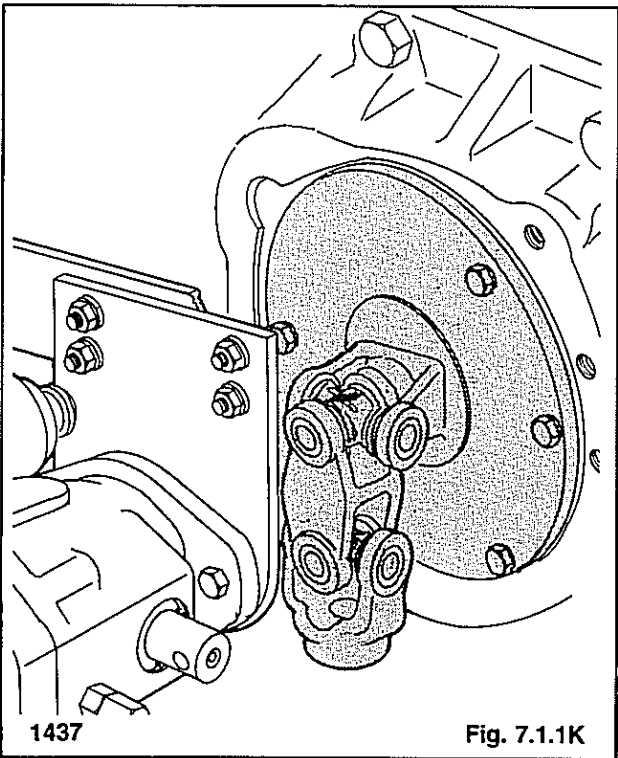
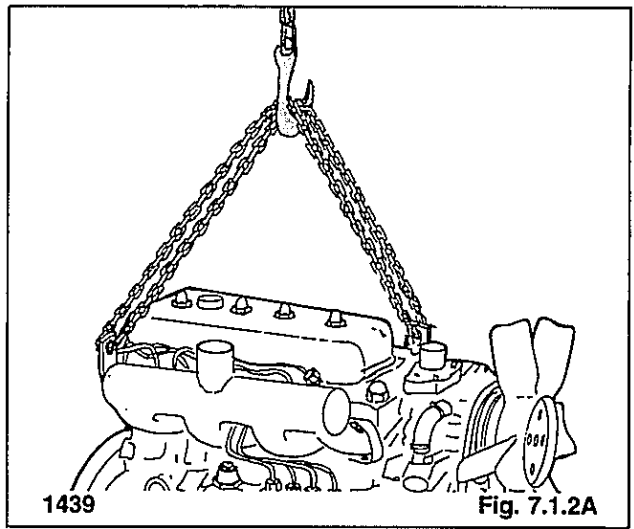
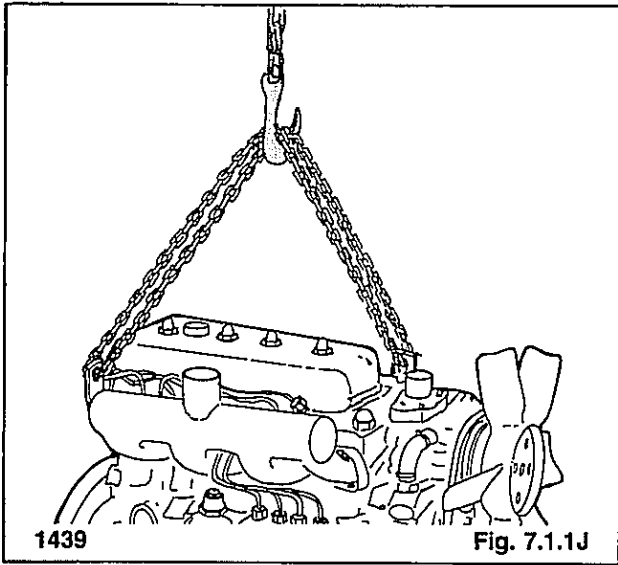
Fig. 7.1.1H

11. Remove the exhaust pipe (Fig. 7.1.1E).
12. Remove the engine compartment shield from the loader.
13. Disconnect the air intake hose from the intake manifold.
14. Disconnect the throttle control rod from the throttle lever assembly on the fuel injection pump (Fig. 7.1.1G).
15. Remove the engine mounting bolts (Fig. 7.1.1H).
On reassembly torque the mounting nuts to 40 ft. lbs. (54 N.m.). Torque the counter nuts against the mounting nuts 80 ft. lbs. (108 N.m.).

16. Connect chains to the lifting lugs located at the front and rear of the engine. Using a chain hoist lift the engine and remove it out through the rear of the loader main frame (Fig. 7.1.1J).

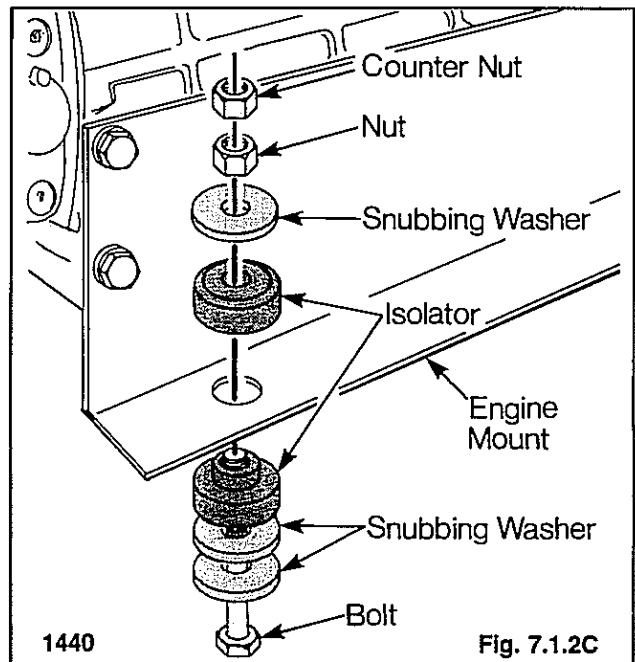
The double universal joint bolted to the engine flywheel is splined at the pump end.

The universal joint will slide off the pump shaft as the engine is removed (Fig. 7.1.1k).



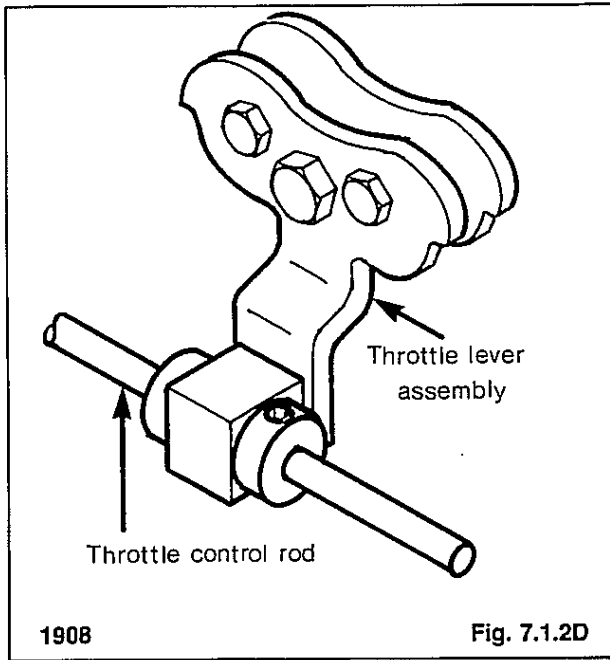
7.1.2 Engine Installation

1. Connect chains to the engine (Fig. 7.1.2A) at the lifting lugs mounted at the front and rear of the engine.
2. Using a chain hoist lift the engine and place it in the loader main frame. Line up the double universal joint with the hydrostatic drive pump as the engine is installed (Fig. 7.1.2B).
3. Install the engine isolators and engine mounting bolts. Torque the mounting nuts to 40 ft. lbs. Torque the counter nut against the mounting nut 80 ft. lbs. (Fig. 7.1.2C).

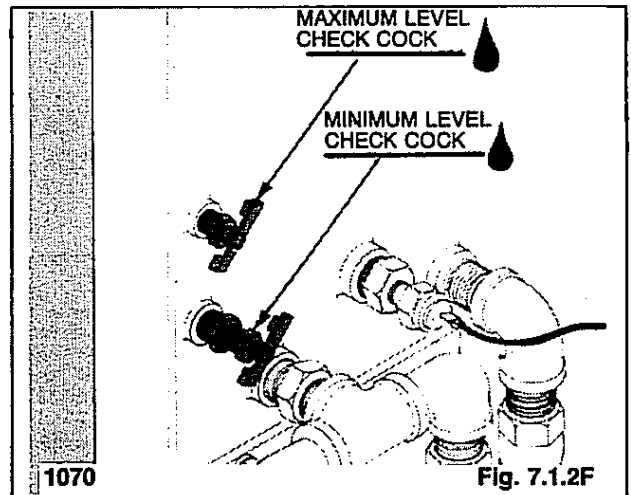
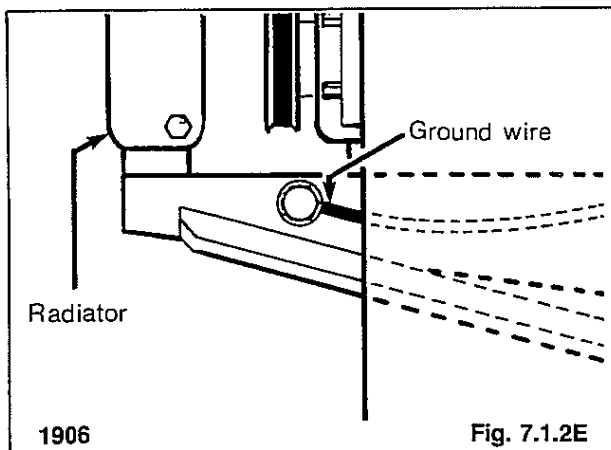


4. Connect the throttle control rod to the throttle lever assembly on the fuel injection pump (Fig. 7.1.2D).

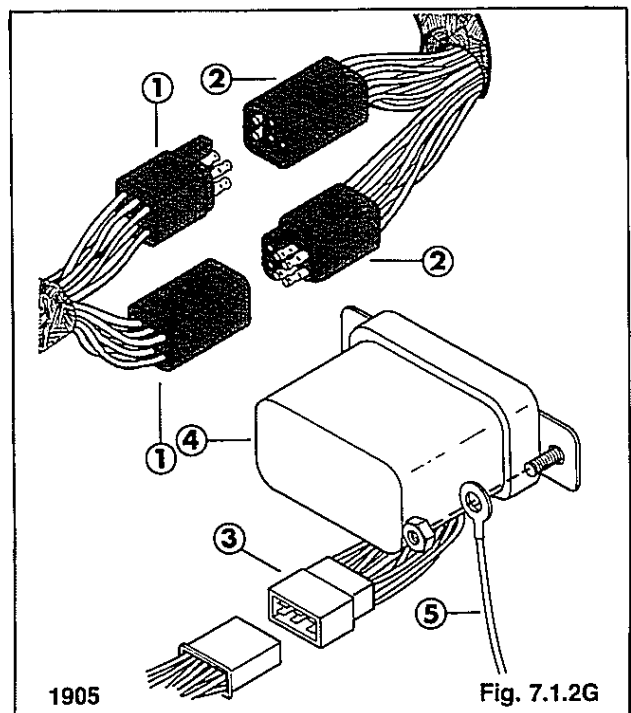
Refer to section 4.4.2 for throttle adjustment procedure.



5. Connect the hose between the air cleaner and the engine intake manifold.
6. Install the engine compartment shield.
7. Install the exhaust pipe.
8. Connect the fuel lines at the lift pump, injection pump and injector overflow.
9. Open the fuel shut off located on the fuel tank. It may be necessary to bleed air from the fuel system prior to starting the engine.
10. Connect the ground wire from the engine to the main frame (Fig. 7.1.2E).



11. Connect the wire to the hydraulic oil temperature sender (Fig. 7.1.2F).
12. Connect the ground wire at the voltage regulator mount (Fig. 7.1.2G).
13. Connect the voltage regulator wiring harness at the connectors (Fig. 7.1.2G).
14. Connect the engine wiring harness with the ROPS wiring harness (Fig. 7.1.2G).
15. Connect the battery cable to the starter motor solenoid.
16. Connect the battery cables to the battery.



7.2 CYLINDER HEAD

7.2.1 Compression Test:

Before performing the compression test ensure that the battery is fully charged and that the valve clearances are correct.

WARNING

This test must be done with engine running. To prevent personal injury block the loader securely with all four wheels clear of the ground.

1. Block the loader securely with all four wheels clear of the ground.
2. Run the engine until warm.
3. Shut off the fuel supply at the tank (Fig. 7.2.1A).

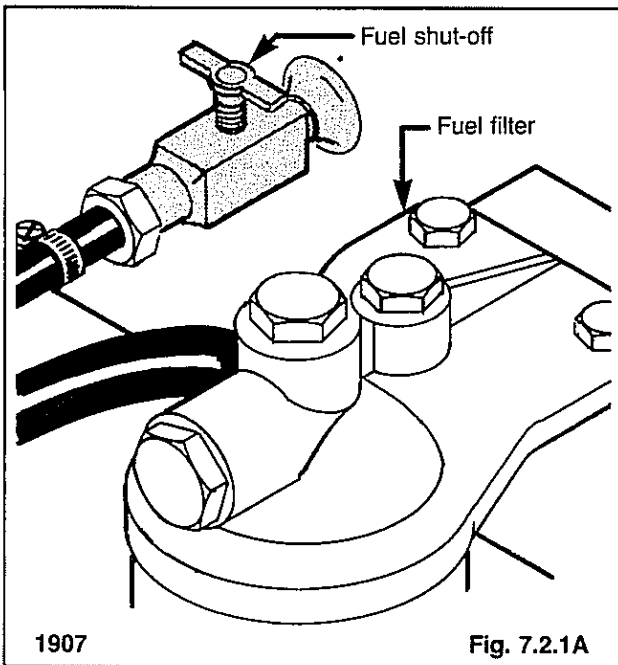


Fig. 7.2.1A

4. Disconnect the air intake and remove the injectors from the engine.
5. Connect a compression tester to the cylinder to be tested (Fig. 7.2.1B).
6. Run the engine with the starter at 200 to 300 RPM and read constant maximum on the tester.
7. Run the test twice for each cylinder running the engine for 5 to 10 seconds for each test.

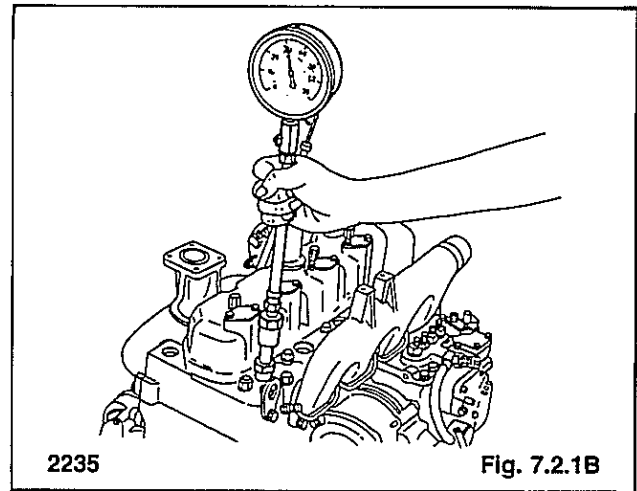


Fig. 7.2.1B

TEST RESULTS	
Reference compression pressure	427-469 lb./sq. in. (30-33 kgf/cm ²)
Minimum allowable pressure — 75% of reference valve	320-352 lb./sq. in. (23-25 kgf/cm ²)
Difference between cylinder pressures	less than 10%

If the compression pressure is low pour a small amount of oil through the injector holes and test again.

- If pressure recovers check for wear on piston rings.
- If pressure does not recover check valves and cylinder head for damage.

7.2.2 Cylinder Head Torque:

Tighten the head bolts and nuts evenly in the correct sequence as shown in fig. 4.7.9. Torque to 54.2 to 57.9 ft. lbs. (73.5 to 78.4 N.M.).

When overhauling the engine, replace the gasket with a new one. Apply engine oil to each nut and bolt and torque in the correct sequence as shown in fig. 7.2.2A. Retighten the nuts after running the engine for 30 minutes.

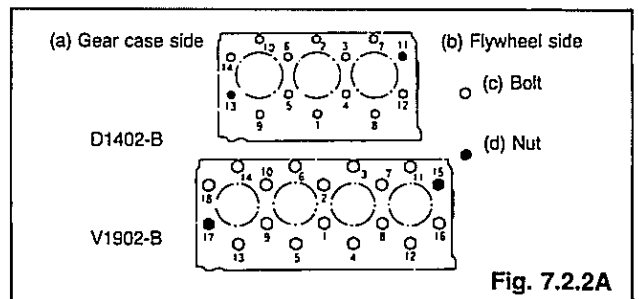
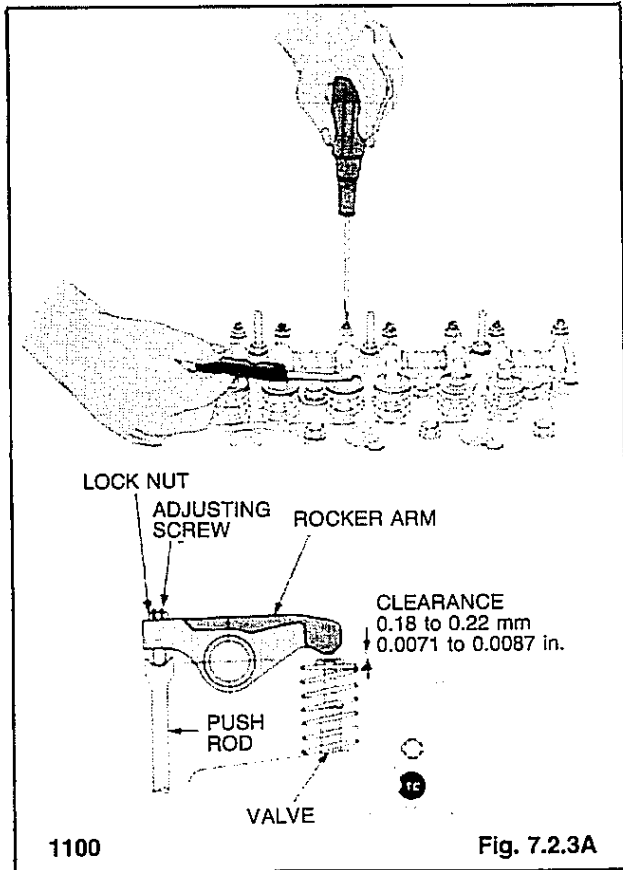


Fig. 7.2.2A

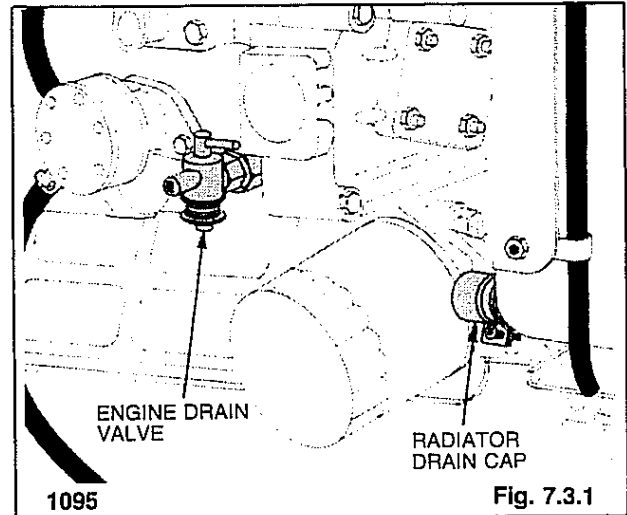
7.2.3 Valve Adjustment:

Measure the clearance with a feeler gauge after aligning each cylinder with top dead center of compression. Align the (TC) mark on the flywheel with the timing check window of the flywheel housing (Fig. 7.2.3A).

Adjust the valves in firing order sequence.



To fill the cooling system; close the drain valve on the engine block (Fig. 7.3.1) and refit the radiator drain plug. Fill the radiator with a 50-50 mixture of ethylene glycol and water. Refit the radiator cap.



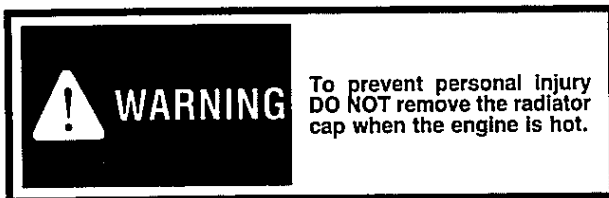
7.3.2 Radiator Inspection — Testing:

The radiator cooling fins must be kept free of debris otherwise overheating of the engine can occur. Inspect the radiator cooling fins for damage or buildup of debris. Repair any damage and if necessary flush the radiator with compressed air to remove dirt buildup.

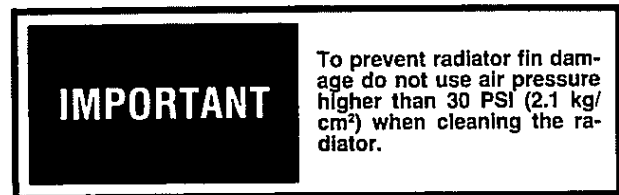
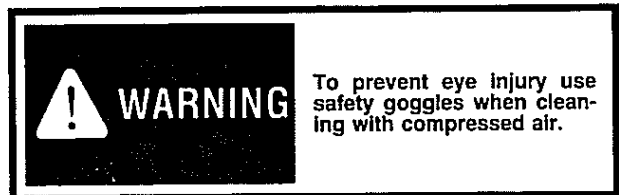
7.3 COOLING SYSTEM

7.3.1 Adding Fluid:

The engine cooling system fluid is a 50-50 mixture of ethylene glycol and water for cold weather protection.




To drain the cooling system; attach a hose to the drain valve located at the engine block (Fig. 7.3.1). Remove the radiator cap. Turn the drain valve handle so that it's toward the valve outlet. To completely drain the radiator remove the rubber drain plug located at the bottom of the radiator (Fig. 7.3.1).



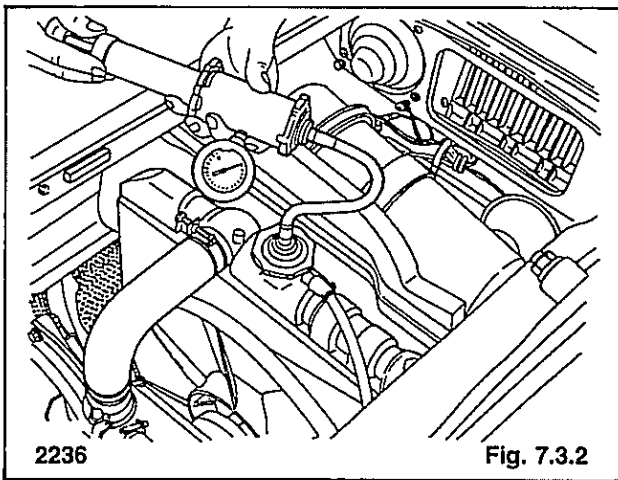
Test the radiator for leaks as follows:

1. Ensure the radiator is full of coolant.
2. Start the engine and run until warm.
3. Shut off the engine and carefully remove the radiator cap.



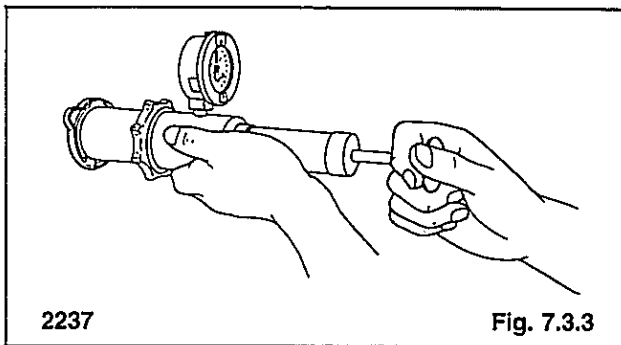
WARNING To prevent personal injury DO NOT remove the radiator cap when the engine is hot.

4. Attach a radiator tester and increase the pressure to 12.8 lbs./in.² (0.9 kg/cm²), Fig. 7.3.2.
5. Check for leaks.



7.3.3 Radiator Cap — Pressure Test:

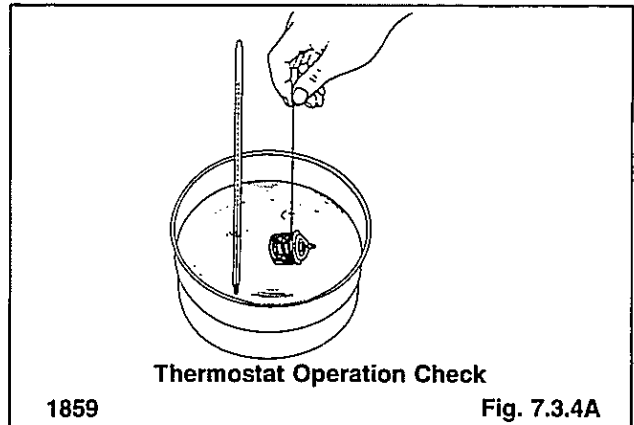
1. Attach a radiator tester to the radiator cap (Fig. 7.3.3).



2. Apply the specified pressure 12.8 lbs./in.² (0.9 kg/cm²).
3. Check that the pressure does not drop by more than 4.3 lbs./in.² (0.3 kg/cm²) in 10 seconds.

7.3.4 Thermostat — Test:

1. Push down the thermostat valve and insert a string between the valve and the valve seat (Fig. 7.3.4A).

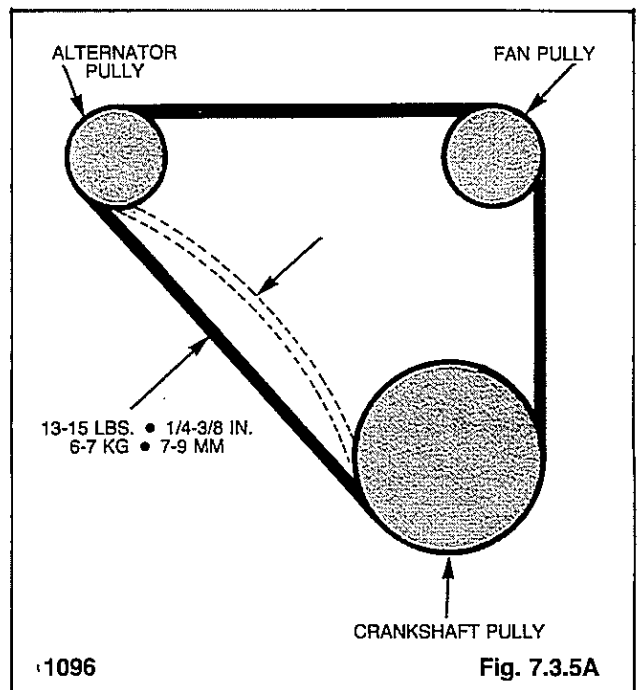


2. Place the thermostat and a thermometer in a container with water and gradually heat the water.
3. Hold the string to suspend the thermostat in the water. When the water temperature rises the valve will open allowing the thermostat to fall from the string.
4. Check the temperature at the point where the thermostat falls. Continue to heat the thermostat and note the temperature when the thermostat is fully open.

Replace the thermostat if it fails to open at the specified temperature.
 Start to open 177-182°F (80.5-83.5°C)
 Fully open 203°F (95°C)

7.3.5 Fan belt — Adjustment:

Check the fan belt tension midway between the fan pulley and alternator pulley (Fig. 7.3.5A). Deflection should be between 1/4 to 3/8 in. (7-9 mm) with a force of 13-15 lbs. (6-7 Kg).

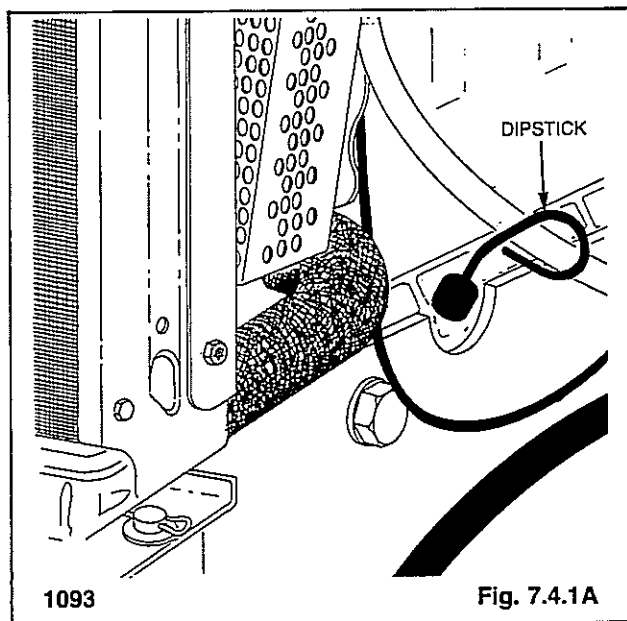


7.4 LUBRICATION SYSTEM

7.4.1 Oil Level Check:

To check the oil level, stop the engine with the loader on level ground, open the rear door and remove the dipstick (Fig. 7.4.1A).

Keep the oil level between the full and low mark on the dipstick (Fig. 7.4.1B). Do not fill above the full mark — use a good quality 10W30 motor oil which meets API classification SE/CD.



7.4.2 Replace Engine Oil and Filter:

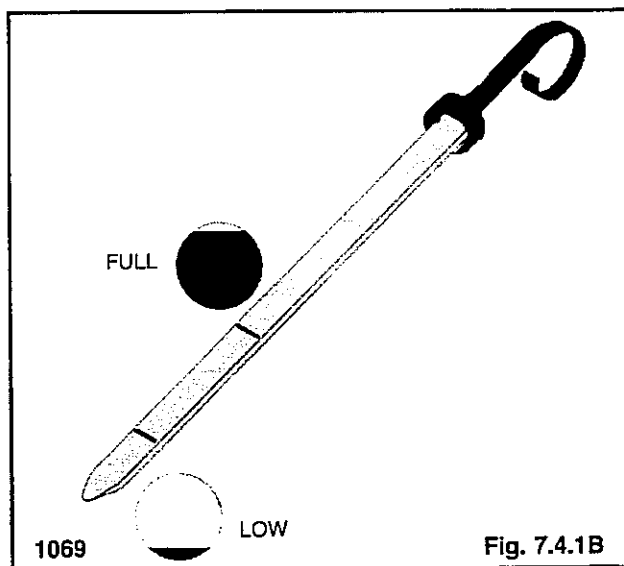
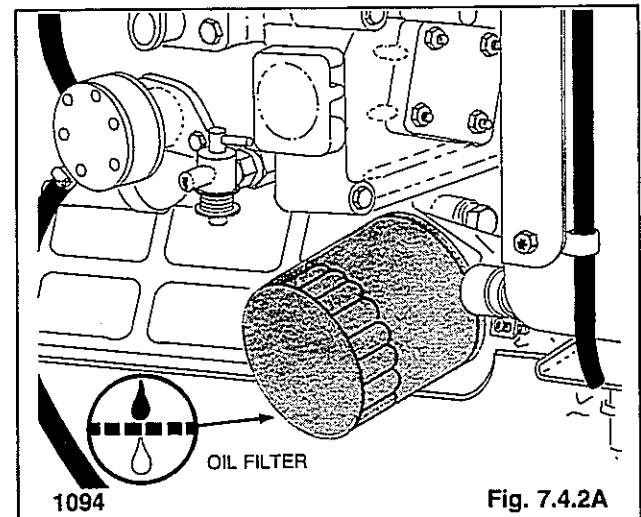
Operate the engine until warm, approx. 5 minutes. Stop the engine.

Remove the oil drain plug located at the bottom of the oil pan.

Remove the oil filter (Fig. 7.4.2A). Clean the filter housing surface. Put clean oil on the seal of the new filter. Install the new filter and tighten hand tight.

Replace the oil drain plug. Remove the filler cap and add 10W30 API classification SE/CD engine oil. Start the engine and run for 5 minutes. Stop the engine and check for leaks at the filter. Recheck the oil level and add oil until level is at top mark on dipstick.

Change the engine oil every 75 hours and the oil filter every 150 hours.

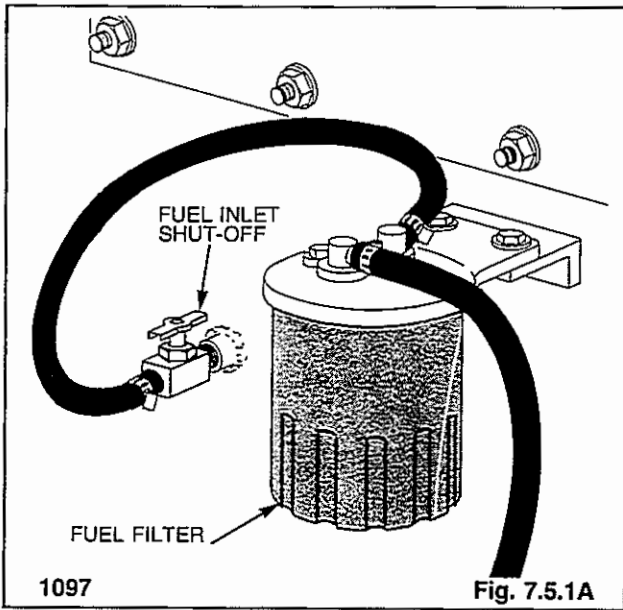


7.5 FUEL SYSTEM

7.5.1 Fuel Filter Replacement:

The fuel filter is located on the R.H. side of the engine in the engine compartment (Fig. 7.5.1A). The filter element should be changed every 400 operating hours.


To replace the filter; close the fuel inlet line shut-off located on the side of the fuel tank (Fig. 7.5.1A). Remove the filter element (Fig. 7.5.1A). Lubricate the seal on the new filter and install the filter hand tight. Open the fuel inlet shut-off. It may be necessary to remove air from the fuel system after changing the filter element.



7.5.2 Removing Air from Fuel System:

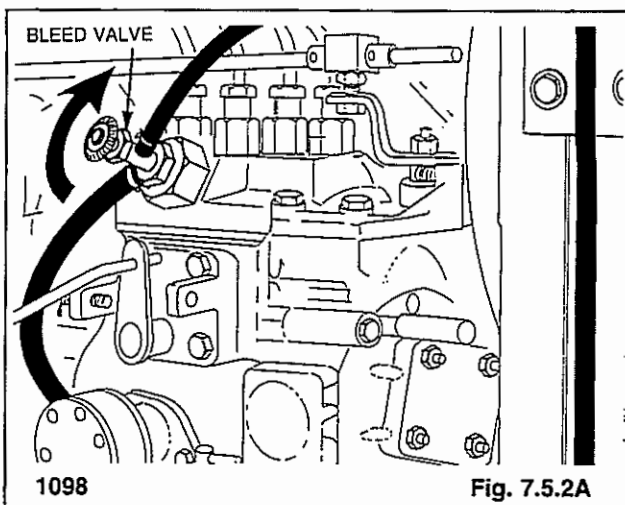
Air must be removed from the fuel, after replacement of the fuel filter element, or when the tank has been run out of fuel, before starting the engine.

To remove air, ensure the fuel inlet shut-off located on the side of the fuel tank is open. Place the throttle at idle and open the bleed valve (Fig. 7.5.2A) on top of the injector pump. Turn the engine over with the starter. When the engine starts and runs smoothly, close the valve.



WARNING

To prevent personal injury never add fuel to the loader when the engine is running or is hot. **NO SMOKING.**



7.6 AIR INTAKE SYSTEM

7.6.1 Air Filter Maintenance:

Daily Maintenance:

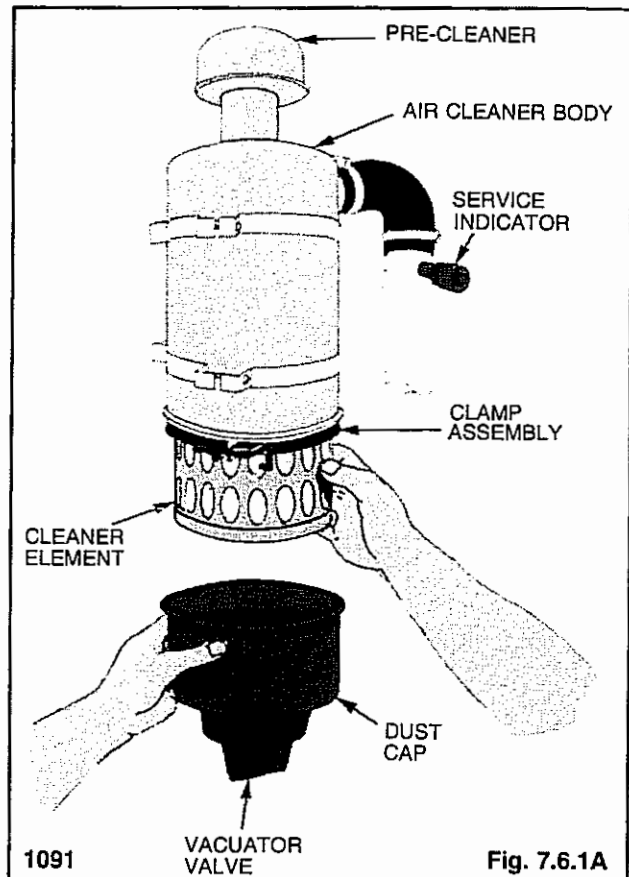
Inspect the air cleaner service indicator (Fig. 7.6.1A) daily. If the indicator element shows red the filter element must be replaced.


Check all hose clamps for tightness and inspect the hoses for damage. Check the vacuator for damage.

Servicing Cleaner Element:

To replace the air filter element; loosen the clamp assembly (Fig. 7.6.1A). Remove the dust cap assembly. Remove the baffle from the cup and empty. Remove the wing nut and filter.

With a damp cloth clean out the inside of the body. Inspect the seal on the new element for damage and install the element in the filter body. Be sure the wing nut securing the element is tight. Reinstall the baffle in the dust cup and install. Be sure the dust cup is sealed 360° around the air cleaner body. Reset the restriction indicator.





WARNING

To prevent personal injury stop, cool and clean the engine of flammable materials before servicing. Never service or adjust machine with the engine running.

7 ENGINE

7.7.1 Specifications

General Specifications:

	T103	T133
Engine model	D1402B	V1902B
Number of cylinders	3	4
Horsepower	31.4 HP (23.4 Kw)	40.5 HP (30.2 Kw)
Bore x stroke	3.35 x 3.23 in. (85 x 82 mm)	3.35 x 3.23 in. (85 x 82 mm)
Displacement	85.2 cu. in. (1395 cc)	113.5 cu. in. (1861 cc)
Max. torque	66.5 ft. lbs. @ 1700 (9.2 kgf.m.)	89.1 ft. lbs. @ 1600 (12.3 kgf.m.)
Compression ratio	21:1	21:1
Engine compression	427-469 PSI (30-33 kgf/cm ²)	427-469 PSI (30-33 kgf/cm ²)
Maximum high idle	2800	2550
Low idle	875 ± 25	875 ± 25
Firing order	1-2-3	1-3-4-2
Cylinder arrangement	In-line vertical	In-line vertical
Valve arrangement	Overhead	Overhead
Muffler	Vertical (spark arrestor)	Vertical (spark arrestor)

Cylinder Liners		T103	T133
I.D. of cylinder liner	standard	3.3465-3.3473 in. (85.000-85.022 mm)	3.3465-3.3473 in. (85.000-85.022 mm)
	maximum	+0.0059 in. (+0.15 mm)	+0.0059 in. (+0.15 mm)

Cylinder Head	T103	T133
Distortion (head warp)	0.0020 in. (0.05 mm) / 3.9370 in. (100 mm)	
Thickness of gasket	0.0512-0.0630 in. (1.3-1.6 mm)	
Thickness of gasket shims	0.0079 in. (0.2 mm)	
Top clearance	0.0276-0.0354 in. (0.7-0.9 mm)	
Cylinder head bolt & nut torque	54.2-57.9 ft. lbs. (73.5-78.4 N.m.)	

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Valves		T103	T133
Valve seat width		0.0827 in. (2.1 mm)	
Valve seat angle		45°	
O.D. of valve stems (intake, exhaust)		0.3134-0.3140 in. (7.960-7.975 mm)	
I.D. of valve guides (intake, exhaust)		0.3156-0.3161 in. (8.015-8.030 mm)	
Clearance between Valve stems and guides	standard	0.0016-0.0028 in. (0.04-0.07 mm)	
	maximum	0.0039 in. (0.1 mm)	
Valve recessing	standard	0.0433-0.0512 in. (1.1-1.3 mm)	
	Maximum	0.0630 in. (1.6 mm)	
Valve clearance (intake, exhaust)	cold	0.0071-0.0087 in. (0.18-0.22 mm)	
Valve Springs		T103	T133
Free length	standard	1.6417-1.6614 in. (41.7-42.2 mm)	
	Minimum	1.6220 in. (41.2 mm)	
Fitted Length		1.3839 in. (35.15 mm)	
Load to compress	standard	26.5 lbs. (12 kgf)	
To fitted length	minimum	22.5 lbs. (10.2 kgf)	
Squareness		0.0394 in. (1.0 mm)	
Valve Rocker Arms		T103	T133
O.D. of rocker arm shafts		0.5501-0.5506 in. (13.973-13.984 mm)	
I.D. of rocker arm bushings		0.5513-0.5529 in. (14.002-14.043 mm)	
Clearance between rocker arm shafts and bushings	standard	0.0007-0.0028 in. (0.018-0.070 mm)	
	maximum	0.0059 in. (0.15 mm)	
Adjustment of compression release		0.0295-0.0443 in. (0.750-1.125 mm)	

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CAMSHAFT		
O.D. of camshaft bearing journal		1.5722-1.5728 in. (39.934-39.950 mm)
I.D. of camshaft bearing		1.5748-1.5758 in. (40.000-40.025 mm)
Clearance between camshaft bearing journals and bearings	standard	0.0020-0.0036 in. (0.050-0.091 mm)
	maximum	0.0059 in. (0.15 mm)
Alignment of camshaft	maximum	0.0020 in. (0.05 mm)
Cam height	standard (intake)	1.3134 in. (33.36 mm)
	minimum	1.3114 in. (33.31 mm)
	Standard (Exhaust)	1.3134 in. (33.36 mm)
	Minimum	1.3114 in. (33.31 mm)
Gear backlash	Standard	0.0017-0.0045 in. (0.042-0.115 mm)
	maximum	0.0059 in. (0.15 mm)
PISTON RINGS		
(Top ring. 2nd ring)	standard	0.0118-0.0177 in. (0.30-0.45 mm)
	maximum	0.0492 in. (1.25 mm)
Ring gap (Oil ring)	standard	0.0098-0.0177 in. (0.25-0.45 mm)
	maximum	0.0492 in. (1.25 mm)
Side clearance of ring in groove	(Top ring)	—
	(2nd ring)	0.0037-0.0047 in. (0.093-0.120 mm)
	(Oil ring)	0.0008-0.0020 in. (0.020-0.052 mm)
Oversizes of piston and ring		0.0197 in. (0.5 mm)
PISTONS		
I.D. of piston bosses	standard	0.9055-0.9060 in. (23.000-23.013 mm)
	maximum	0.9076 in. (23.053 mm)
O.D. of piston pin		0.9056-0.9059 in. (23.002-23.011 mm)
I.D. of connecting rod small end bushings (fitted)		0.9065-0.9071 in. (23.025-23.040 mm)
Clearance between piston pin and small end bushings	std.	0.0006-0.0015 in. (0.014-0.038 mm)
	maximum	0.0059 in. (0.15 mm)
Connecting rod alignment	standard	0.0008 in. (0.02 mm)
	maximum	0.0020 in. (0.05 mm)

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CRANKSHAFT		
Crankshaft alignment	standard	0.008 in. (0.02 mm)
	maximum	0.0031 in. (0.08 mm)
O.D. of crankshaft journals		2.0441-2.0449 in. (51.921-51.940 mm)
I.D. of crankshaft bearing 1		2.0465-2.0488 in. (51.980-52.039 mm)
I.D. of crankshaft bearing 2		2.0465-2.0482 in. (51.980-52.025 mm)
Clearance between crankshaft journal and bearing 1	standard	0.0016-0.0046 in. (0.040-0.118 mm)
	maximum	0.0079 in. (0.20 mm)
Clearance between crankshaft journals and bearing 2	standard	0.0016-0.0041 in. (0.040-0.104 mm)
	maximum	0.0079 in. (0.20 mm)
Undersizes of crankshaft bearing 1		0.0079-0.0157 in. (0.2-0.4 mm)
Undersizes of crankshaft bearing 2		0.0079-0.0157 in. (0.2-0.4 mm)
O.D. of crankpins		1.7307-1.7313 in. (43.959-43.975 mm)
I.D. of crankpin bearings		1.7327-1.7343 in. (44.010-44.052 mm)
Clearance between crankpins and bearings	standard	0.0014-0.0037 in. (0.035-0.093 mm)
	maximum	0.0079 in. (0.20 mm)
Undersizes of crankpin bearings		0.0079 in. (0.2 mm) 0.0157 in. (0.4 mm)
End play of crankshaft	Standard	0.0059-0.0122 in. (0.15-0.31 mm)
	maximum	0.0197 in. (0.5 mm)
Oversizes of crankshaft side metal 1.2		0.0079 in. (0.2 mm) 0.0157 in. (0.4 mm)
FUEL INJECTION NOZZELS		
Opening pressure		1990.8-2133.0 lb./sq. in. (140-150 kgf/cm ²)
Fuel tightness of nozzle valve seat		Dry nozzle at 1848.6-1990.8 lb./sq. in. (130-140 kgf/cm ²)
INJECTION PUMP		
Fuel tightness of plunger	Standard	8 seconds or more; initial pressure from 8532.0-7110.0 lb./sq. in. (600-500 kgf/cm ²)
	minimum	4 seconds or less
Fuel tightness of delivery valve	Standard	10 seconds or more; initial pressure from 1422.0-71.1 lb./sq. in. (100-5 kgf/cm ²)
	minimum	5 seconds or less
Injection timing		23°-25° before TDC

OIL PUMP		
Oil pressure	standard	42.7-64.0 lb./sq. in. (3.0-4.5 kgf/cm ²)
(Normal running)	minimum	35.6 lb./sq. in. (2.5 kgf/cm ²)
Rotor lobe clearance	standard	0.0016-0.0051 in. 0.04-0.13 mm)
	maximum	0.0079 in. (0.20 mm)
ROTOR TYPE		
Radial clearance between outer rotor and pump body	std.	0.0043-0.0075 in. (0.11-0.19 mm)
	max.	0.0098 in. (0.25 mm)
End clearance between rotor and cover	std.	0.0041-0.0059 in. (0.105-0.150 mm)
	max.	0.0079 in. (0.2 mm)
RADIATOR		
Opening pressure of cap		12.8 lb./sq. in. (0.9 kgf/cm ²)
Test pressure		12.8 lb./sq. in. (0.9 kgf/cm ²)
THERMOSTAT		
Opening temperature	(beginning)	176.9°F-182.3°F (80.5°C-83.5°C)
	(full-open)	203°F (95°C)
Distance of lift		0.3150 in. (8 mm)
FANBELT		
Belt sag under load of 13.2-15.4 lb. (6-7 kgf)		0.2756-0.3543 in. (7-9 mm)
ALTERNATOR		
Output current		25 A/14 V/4000 rpm
Total resistance of rotor coil, measured between terminal "F" and "E"	std.	6 Ω
	max.	10 Ω
Brush length	std.	0.6102 in. (15.5 mm)
	min.	0.4055 in. (10.3 mm)

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REGULATOR		
Cut-in voltage		4.5-5.8 V
No-load regulating voltage		13.8-14.8 V
Resistance between terminals: "IG" and "F" with open contacts		0 Ω
"IG" and "F" with contacts		Approx. 11 Ω
"L" and "E" with open contacts		0 Ω
"L" and "E" with contacts		Approx. 100 Ω
"N" and "E"		Approx. 23 Ω
"B" and "E" with open contacts		Infinity
"B" and "L" with contacts		0 Ω
Point gap		0.0118-0.0177 in. (0.3-0.45 mm)
STARTER MOTOR		
No-load test	Current	90 A or less
	Voltage	11.5 V
	Speed	3500 rpm or more
O.D. of commutator	std.	1.1811 in. (30.0 mm)
	min.	1.1417 in. (29.0 mm)
Mica undercutting	std.	0.0197-0.0354 in. (0.5-0.9 mm)
	min.	0.0079 in. (0.2 mm)
Brush length	std.	0.7480 in. (19 mm)
	min.	0.5000 in. (12.7 mm)
GLOW PLUG		
Resistance		Approx. 1.5 Ω

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7.7.2 Torque Specifications:

Bolt Torques

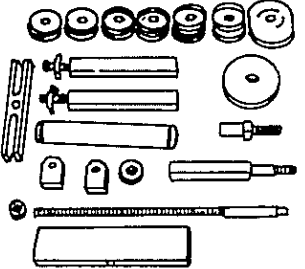
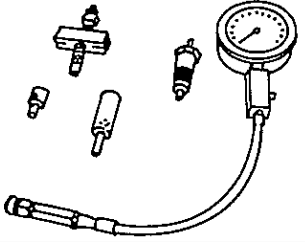
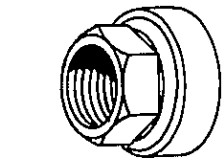
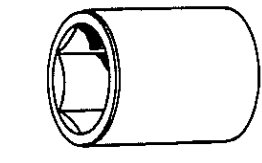

Material Grade	Standard Bolt	Special Bolt	Special Bolt
Nominal Dia.	SS41, S20C	S43C, S48C (Refined)	SCR3, SCM3 (Refined)
M 6	7.8 — 9.3 N.m. 0.80 — 0.95 kgf/m 5.8 — 6.9 lb. ft.	9.8 — 11.3 N.m. 1.00 — 1.15 kgf/m 7.2 — 8.3 lb. ft.	12.3 — 14.2 N.m. 1.25 — 1.45 kgf/m 9.0 — 10.5 lb. ft.
M 8	17.7 — 20.6 N.m. 1.80 — 2.10 kgf/m 13.0 — 15.2 lb. ft.	23.5 — 27.5 N.m. 2.40 — 2.80 kgf/m 17.4 — 20.3 lb. ft.	29.4 — 34.3 lb. ft. 3.00 — 3.50 lb. ft. 21.7 — 25.3 lb. ft.
M10	39.2 — 45.1 N.m. 4.00 — 4.60 kgf/m 28.9 — 33.3 lb. ft.	48.0 — 55.9 N.m. 4.90 — 5.70 kgf/m 35.4 — 41.2 lb. ft.	60.8 — 70.6 N.m. 6.20 — 7.20 kgf/m 44.8 — 52.1 lb. ft.
M12	62.8 — 72.6 N.m. 6.40 — 7.40 kgf/m 46.3 — 53.5 lb. ft.	77.5 — 90.2 N.m. 7.90 — 9.20 kgf/m 57.1 — 66.5 lb. ft.	103.0 — 117.7 lb. ft. 10.50 — 12.00 kgf/m 75.9 — 86.8 lb. ft.
M14	107.9 — 125.5 N.m. 11.00 — 12.80 kgf/m 79.6 — 92.6 lb. ft.	123.6 — 147.1 N.m. 12.60 — 15.00 kgf/m 91.1 — 108.5 lb. ft.	166.7 — 196.1 N.m. 17.00 — 20.00 kgf/m 123.0 — 144.7 lb. ft.
M16	166.7 — 191.2 N.m. 17.00 — 19.50 kgf/m 123.0 — 141.0 lb. ft.	196.1 — 225.5 N.m. 20.00 — 23.00 kgf/m 144.7 — 166.4 lb. ft.	259.9 — 304.0 N.m. 26.50 — 31.00 kgf/m 191.7 — 224.2 lb. ft.
M18	245.2 — 284.4 N.m. 25.00 — 29.00 kgf/m 180.0 — 209.8 lb. ft.	274.6 — 318.7 N.m. 28.00 — 32.50 kgf/m 202.5 — 235.1 lb. ft.	343.2 — 402.0 N.m. 35.00 — 41.00 kgf/m 253.2 — 296.5 lb. ft.
M20	333.4 — 392.2 N.m. 34.00 — 40.00 kgf/m 245.9 — 289.3 lb. ft.	367.7 — 431.5 N.m. 37.50 — 44.00 kgf/m 271.2 — 318.2 lb. ft.	490.3 — 568.7 N.m. 50.00 — 58.00 kgf/m 361.6 — 419.5 lb. ft.

Bolt material grades are shown by numbers punched on the bolt heads. Prior to tightening, be sure to check out the numbers as shown below:

Punched Number	Bolt Material Grade
None	Standard Bolts SS41, S20C
7	Special Bolts S43C, S48C (Refined)
9	Special Bolts SCM3, SCR3 (Refined)

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7.7.3 Special Tools

Order No.	Illustration	Description	Model Usage
07916-30042-01		<p>Dry Liner Puller — Used for removing and installing the dry liner of the engine.</p> <p>Consists of: 304742 (64mm); 304743 (66mm); 304744 (75mm); 304745 (76mm); 304746 82mm); 304747 (105mm); Removing Plates; 304748 Installing Plate.</p>	All Models
07909-30202-01		<p>Diesel Engine Compression Tester — Used to measure diesel engine compression and diagnosis of need for major overhaul.</p>	All Models
07916-30820-01		<p>Crankshaft Nut Socket — Used to take off and fix the crankshaft nut (46mm).</p>	All Models
07916-30840-01		<p>Nozzle Remover Socket — Used to unfasten and to fasten the screw-type nozzle holders.</p>	All Models
70090-01125-01		<p>Nozzle Disassembly Socket — Used in place of a vice for disassembly and repair of nozzles.</p>	All Models

7.7.4 Trouble Shooting:

ENGINE

Condition	Possible Causes
Engine Does Not Develop Full Power	<ol style="list-style-type: none"> 1. Clogged air cleaner. 2. Fuel line obstructed. 3. Improper injection timing. 4. Improper nozzle injection pressure and angle. 5. Low cylinder compression. 6. Insufficient fuel injection. 7. Improper valve lash adjustment. 8. Burned, worn or sticking valves. 9. Blown head gasket. 10. Worn or sticking piston ring.
Low Cylinder Compression	<ol style="list-style-type: none"> 1. Burned, worn or sticking valves. 2. Bent valve stem. 3. Broken or weak valve spring. 4. Blown cylinder head gasket. 5. Worn or sticking piston ring. 6. Scored piston. 7. Improper valve lash adjustment.
Poor Engine Idling	<ol style="list-style-type: none"> 1. Improper injection timing. 2. Air in injection pump. 3. Improper governor adjustment.
Engine Knocks	<ol style="list-style-type: none"> 1. Diluted or thin oil. 2. Insufficient oil supply. 3. Low oil pressure. 4. Worn crankshaft thrust bearing. 5. Excessive flywheel runout. 6. Excessive connecting rod or main bearing clearance. 7. Seized bearing. 8. Clogged oil passages. 9. Bent or twisted connecting rod. 10. Crankshaft journals out-of-round. 11. Excessive piston-to-cylinder bore clearance. 12. Excessive piston ring side clearance. 13. Broken or damaged rings. 14. Excessive piston pin clearance. 15. Seized piston.

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Condition	Possible Causes
Engine Knocks	<ul style="list-style-type: none"> 16. Piston pin retainer loose or missing. 17. Improper valve lash adjustment. 18. Worn valve lifter. 19. Excessive timing gear backlash. 20. Low cylinder compression. 21. Improper injection timing. 22. Improper nozzle injection pressure and angle.
Low Oil Pressure	<ul style="list-style-type: none"> 1. Engine oil level low. 2. Wrong grade of oil. 3. Clogged oil pump filter. 4. Faulty oil pressure relief valve. 5. Worn oil pump drive shaft or gears, or broken oil pipe. 6. Excessive main or connecting rod bearing clearances.
Oil Pressure Warning Light Fails to Operate	<ul style="list-style-type: none"> 1. Bulb burned out. 2. Oil pressure sensor is faulty. 3. Warning light circuit faulty.
Excessive Oil Consumption	<ul style="list-style-type: none"> 1. Engine oil level too high. 2. Leakage in the cylinder head gasket. 3. Oil loss past the pistons and rings. 4. Worn, broken, or sticking piston rings. 5. Clogged return hole of oil ring. 6. Worn valves and/or valve guides or worn seals. 7. Leakage past oil seals and gaskets. 8. External oil leaks from the engine.
Engine Overheats	<ul style="list-style-type: none"> 1. Insufficient amount of coolant in the radiator. 2. Hose connection leaking or collapsed hose. 3. Radiator leakage. 4. Loose, worn, or broken V-belt. 5. Radiator fins bent or clogged. 6. Radiator cap not sealed. 7. Thermostat operating improperly. 8. Insufficient amount of engine oil. 9. Water pump operating improperly. 10. Improper valve clearance. 11. Restriction in the exhaust system.

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Condition	Possible Causes
Engine Overheats	<ol style="list-style-type: none"> 12. Improperly installed cylinder head gasket. 13. Rust and/or scale clogged water ports. 14. Extended engine idling.
Excessive Fuel Consumption	<ol style="list-style-type: none"> 1. Improper injection timing. 2. Leakage at the injection pipe connectors. 3. Leakage at the fuel shut-off valve. 4. Improperly adjusted nozzle.
Temperature Gauge Fails to Reach Normal Operating Temperature	<ol style="list-style-type: none"> 1. Faulty temperature sender. 2. Faulty thermostat. 3. Faulty temperature gauge.
Excessive Exhaust Smoke	<ol style="list-style-type: none"> 1. Air cleaner dirty or restricted. 2. Excessive fuel delivery. 3. Low cylinder pressure.
Excessive Oil Consumption	<ol style="list-style-type: none"> 1. Engine oil level too high. 2. External oil leaks from engine. 3. Worn valves, valve guides or seals. 4. Head gasket not sealing. 5. Oil loss past the pistons and rings.
Engine Stops While Operating	<ol style="list-style-type: none"> 1. Lack of fuel in the fuel tank. 2. Clogged fuel filter. 3. Air mixed in the fuel system. 4. Faulty component.
Undesirable Exhaust (white or pale)	<ol style="list-style-type: none"> 1. Excess engine oil. 2. Improper lubricating oil viscosity. 3. Faulty injection timing.
Undesirable Exhaust Color (black or light grey)	<ol style="list-style-type: none"> 1. Unsuitable fuel. 2. Excess injection. 3. Faulty engine component. 4. Overloading. 5. Clogged air cleaner. 6. Low cylinder pressure. 7. Clogged air cleaner.
Engine Does Not Start	<ol style="list-style-type: none"> 1. Faulty starter switch. 2. Insufficient charging or complete discharging of the battery. 3. Lack of fuel. 4. Air mixed in the fuel system. 5. Clogged fuel filter. 6. Irregular or faulty fuel supply.

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Condition	Possible Causes
ENGINE DOES NOT START	<ol style="list-style-type: none"> 7. Glow plug not heating. 8. Improper lubricating oil viscosity. 9. Clogged air cleaner. 10. Breaking down of fusible link wire. 11. Faulty starter motor. 12. Main shift lever is not in the neutral position.

COOLING SYSTEM

Condition	Possible Causes
HIGH TEMPERATURE INDICATION — OVERHEATING	<ol style="list-style-type: none"> 1. Coolant level low. 2. Fan belt loose. 3. Radiator hose(s) collapsed. 4. Radiator blocked to airflow. 5. Faulty radiator cap. 6. Tractor overloaded. 7. Idle speed low. 8. Air trapped in cooling system. 9. Incorrect cooling system component(s) installed. 10. Faulty thermostat. 11. Water pump shaft broken or impeller loose. 12. Radiator tubes clogged. 13. Cooling system clogged. 14. Casting flash in cooling passages. 15. Brakes dragging. 16. Excessive engine friction. 17. Anti-freeze concentration too high, over 68%. 18. Missing air seals. 19. Faulty gauge or sending unit. 20. Loss of coolant flow caused by leakage or foaming.
LOW TEMPERATURE INDICATION — UNDERCOOLING	<ol style="list-style-type: none"> 1. Thermostat stuck open. 2. Faulty gauge or sending unit.
COOLANT LOSS — BOIL-OVER	<p>Refer to Engine Overheating Causes in addition to the following:</p> <ol style="list-style-type: none"> 1. Overfilled cooling system.

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Condition	Possible Causes
COOLANT LOSS — BOIL OVER	<ol style="list-style-type: none"> 2. Quick shutdown after hard (hot) run. 3. Air in system resulting in occasional “burping” of coolant. 4. Insufficient anti-freeze in mixture allowing coolant boiling point to be too low. 5. Anti-freeze deteriorated because of age or contamination. 6. Leaks due to loose hose clamps, loose nuts, bolts, drain valve, faulty hoses, or defective radiator. 7. Faulty head gasket. 8. Cracked head, manifold, or block.
COOLANT ENTRY INTO CRANKCASE OR CYLINDER	<ol style="list-style-type: none"> 1. Faulty head gasket. 2. Crack in head, manifold, or block. 3. Faulty cylinder liner O-Ring.
NOISE	<ol style="list-style-type: none"> 1. Fan contacting shroud. 2. Loose water pump impeller. 3. Glazed fan belt. 4. Loose fan belt. 5. Rough surface on drive pulley. 6. Water pump bearing worn. 7. Belt alignment.
TEMPERATURE LAMP ON OR GAUGE READS HOT BUT TEMPERATURE IS OK	<ol style="list-style-type: none"> 1. Wrong sending unit. 2. Sending wire shorted to ground.

NOTE: Immediately after shutdown, the engine enters a condition known as heat soak. This is caused by the cooling system being inoperative while the engine temperature is still high. If coolant temperature rises above the boiling point, expansion and pressure may push some coolant out of the radiator overflow tube. If this does not occur frequently, it is considered normal.

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DIESEL FUEL SYSTEMS

CONDITION	CAUSE	REMEDY
Fuel not reaching injection pump	<ol style="list-style-type: none"> 1. Fuel shut-off valve closed 2. Restricted fuel filters 3. Air in system 4. Fuel leakage 	<ol style="list-style-type: none"> 1. Check that the fuel shut-off valve at the fuel tank is on the "ON" position 2. Check and flush the fuel filter clean 3. Bleed the fuel system 4. Check the fuel lines and connectors for damage
Fuel reaching nozzles but engine will not start	<ol style="list-style-type: none"> 1. Low cranking speed 2. Incorrect throttle adjustment 3. Incorrect pump timing 4. Fuel leakage 5. Faulty injectors 6. Low compression 	<ol style="list-style-type: none"> 1. Check the cranking speed 2. Check the throttle control rod travel 3. Check the pump timing 4. Check the fuel lines and connectors for leakage 5. See injector trouble shooting 6. Check the engine compression
Engine hard to start	<ol style="list-style-type: none"> 1. Low cranking speed 2. Incorrect pump timing 3. Restricted fuel filter 4. Contaminated fuel 5. Low compression 6. Air in system 	<ol style="list-style-type: none"> 1. Check the cranking speed 2. Check the pump timing 3. Check and flush the fuel filter clean 4. Check for water in the fuel 5. Check the engine compression 6. Check for air leaks on the suction side of the system
Engine starts and stops	<ol style="list-style-type: none"> 1. Fuel starvation 2. Contaminated fuel 3. Restricted air intake 4. Engine overheating 5. Air in system 	<ol style="list-style-type: none"> 1. Check and flush clean restricted fuel lines or fuel filter 2. Check for water in the fuel 3. Check for restrictions in the air intake 4. Check cooling system 5. Check for air leaks on the suction side of the system
Erratic engine operation (surge, misfiring, poor governor regulation)	<ol style="list-style-type: none"> 1. Fuel leakage 2. Fuel starvation 3. Incorrect pump timing 4. Contaminated fuel 5. Air in system 6. Faulty or sticking injector nozzles 7. Incorrect engine timing 	<ol style="list-style-type: none"> 1. Check the injector lines and connectors for leakage 2. Check and flush clean restricted fuel lines or filters 3. Check the pump timing 4. Check for water in the fuel 5. Bleed the fuel system 6. See injector trouble shooting 7. Check for faulty engine valves

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CONDITION	CAUSE	REMEDY
Engine does not develop full power or speed	<ol style="list-style-type: none"> 1. Incorrect throttle adjustment 2. Incorrect maximum no-load speed 3. Fuel starvation 4. Air in system 5. Incorrect timing 6. Low compression 7. Incorrect engine timing 	<ol style="list-style-type: none"> 1. Check for insufficient throttle control movement 2. Check maximum no-load speed adjustment 3. Check and flush clean restricted fuel lines and filters 4. Check for air leaks on the suction side of the system 5. Check pump timing 6. Check engine compression 7. Check for improper valve adjustment or faulty valves
Engine emits black smoke	<ol style="list-style-type: none"> 1. Restricted air intake 2. Engine overheating 3. Incorrect timing 4. Faulty injectors 5. Low compression 6. Incorrect engine timing 	<ol style="list-style-type: none"> 1. Check for a restricted air intake 2. Check cooling system 3. Check the pump timing 4. See injector trouble shooting 5. Check the engine compression 6. Check the engine valves
Pump fails to deliver fuel to all injectors	<ol style="list-style-type: none"> 1. Blocked fuel lines to pump 2. Air in fuel lines to injectors 3. Control rod seized in OFF position 	<ol style="list-style-type: none"> 1. Remove fuel lines and flush or replace 2. Bleed fuel lines 3. Repair or replace control rod
Pump fails to deliver fuel to one injector	<ol style="list-style-type: none"> 1. Air in fuel line to injector 2. Plunger spring broken 3. Plunger seized 4. Delivery valve seized 5. Badly scored plunger and barrel 	<ol style="list-style-type: none"> 1. Bleed fuel line 2. Replace spring 3. Repair or replace barrel and plunger assembly 4. Repair or replace delivery valve 5. Replace barrel and plunger assembly
Governor fails to maintain maximum or minimum no-load fuel delivery	<ol style="list-style-type: none"> 1. Control spring broken 2. Governor weights seized 3. Governor weight carrier broken 4. Thrust pad seized 5. Cross-shaft bolt broken or missing 6. Pump link spring broken 	<ol style="list-style-type: none"> 1. Replace control spring 2. Repair or replace weight assembly and/or camshaft 3. Replace weight assembly 4. Replace thrust pad and/or camshaft 5. Replace bolt 6. Replace spring

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FUEL INJECTORS

CONDITION	CAUSE	REMEDY
Nozzle does not "buzz" while injecting	<ol style="list-style-type: none"> 1. Needle valve stuck 2. Leakage 3. Nozzle damaged 	<ol style="list-style-type: none"> 1. Check needle valve is clean and not binding 2. Check valve seat is not leaking 3. Examine nozzle retaining cap for damage
Nozzle leak-back	<ol style="list-style-type: none"> 1. Needle valve worn 2. Blocked nozzle assembly 3. Loose nozzle retaining nut 	<ol style="list-style-type: none"> 1. Replace nozzle assembly 2. Check for carbon or foreign matter on faces of nozzle and nozzle holder. Flush clean or replace 3. Inspect faces and tighten nozzle retaining nut
Nozzle opening pressure incorrect	<ol style="list-style-type: none"> 1. Incorrectly adjusted nozzle retaining nut 2. Damaged nozzle or seized needle valve 3. Blocked nozzle orifice 	<ol style="list-style-type: none"> 1. Check adjusting nut for looseness and re-set 2. Replace nozzle assembly 3. Check nozzle orifice for carbon or foreign matter. Flush clean or replace
Nozzle seat leakage	<ol style="list-style-type: none"> 1. Nozzle incorrectly seated 2. Sticking or binding needle valve 	<ol style="list-style-type: none"> 1. Check for carbon or foreign matter on faces of nozzle or nozzle holder 2. Repair or replace nozzle assembly
Spray pattern distorted	<ol style="list-style-type: none"> 1. Obstructed needle valve 2. Obstructed needle valve orifice 3. Damaged nozzle or needle valve 	<ol style="list-style-type: none"> 1. Check for carbon or foreign matter on needle valve tip. Flush clean or replace nozzle assembly 2. Check for carbon in orifice. Flush clean or replace nozzle assembly 3. Replace nozzle assembly

MAINTENANCE/SPECIFICATIONS 8

- 8.1 Preventative Maintenance Schedule
- 8.2 50 Hour Service Check
- 8.3 Specifications
- 8.4 Torque Specifications
- 8.5 Decals

MAINTENANCE/SPECIFICATIONS 8

8.1 PREVENTATIVE MAINTENANCE SCHEDULE

ITEM	SERVICE REQUIRED	8 HOURS	50 HOURS	150 HOURS	400 HOURS	1000 HOURS
Engine Oil	Check level and add if necessary. Use 10W30 API Classification SE/CD oil only.					
Radiator	Check level and add if necessary. Fill with 50% mixture of ethylene glycol and water. Check cooling fins for dirt. If necessary flush with compressed air.					
Hydraulic Oil	Check level and add if necessary. Use 10W30 API Classification SE/CD only.					
Oil Cooler	Check cooling fins for dirt. If necessary flush with compressed air.					
Air Cleaner	Empty dust cap. Check condition indicator and service or replace element as required.					
Wheel Equipment	Check for low pressure or tire damage. Inflate standard tires 50 PSI (345 KPa), flotation tires 30-35 PSI (207-241 KPa). Check wheel nut torque 100-110 ft. lbs. (136-149 N.M.)					
Safety Equipment	Check all safety equipment for proper operation and condition. Seat belt, boom lock, quick-tach lock, parking brake, steering and foot pedal locks, safety treads. Repair or replace as necessary.					
Decals or Instruction	Check for damaged or missing safety decals (see section 5.5). If necessary replace.					
Lubrication	Grease all fittings until excess shows.					
Engine Oil	Replace engine oil. Fill with 10W30 API Classification SE / CD. Initial change only. Change every 75 hrs.					
Engine Oil Filter	Replace engine oil filter. Initial change only. Change every 150 hrs.					
Hydraulic Oil Filter	Replace hydraulic oil filter element. Initial change only. Replace every 150 hours.					
Drive Chain Tension	Check and if necessary adjust (see 4.5.3). Check every 150 hours.					
Safety System Linkage & Springs	Check and if necessary adjust. Lubricate with a silicon based lubricant. Lubricate foot pedal lock springs and shaft with WD40.					
Neutral Switch Ball	Lubricate every 50 hours with a silicon based lubricant.					
Muffler	Check the muffler for carbon buildup and plugging. If necessary clean. Check every 100 hours.					
50 Hour Service	Perform complete 50 hour service (see 4.2). Repeat every 150 hours.					

MAINTENANCE/SPECIFICATIONS 8

ITEM	SERVICE REQUIRED	8 HOURS	50 HOURS	150 HOURS	400 HOURS	1000 HOURS
Engine Oil	Replace engine oil. Use 10W30 API Classification SE / CD only. See 4.7.3.					
Engine Oil Filter	Replace engine oil filter. See 4.7.5. Replace every 150 hrs.					
Hydraulic Oil Filter	Replace hydraulic oil filter element. See 4.6.3. Replace every 150 hrs.					
Drive Chain Tension	Check and if necessary adjust. See 4.5.3. Check every 150 hrs.					
Preventive Maintenance Service Check	It is recommended as a preventive maintenance procedure that the 50 hour service be repeated every 150 hours. See section 4.2.					
Engine Fuel Filter (Diesel only)	Replace engine fuel filter. See 4.7.6. Replace every 400 hours.					
Hydraulic Oil	Change hydraulic oil. Replace with 10W30 API Classification SE/CD only.					
Final Drive	Change final drive lubricating oil. Use 10W30 API Classification SE/CD only.					
Engine Cooling System	Drain, flush and refill. Use a 50% mixture of ethylene glycol and water.					
Hydraulic Reservoir Filters	Remove and replace the two 100 micron suction elements in the oil reservoir. See 4.6.3.					

NOTE: For complete engine service details refer to the engine manufacturers service manual.

8.2 50 HOUR SERVICE CHECK

The following service check is to be performed by your dealer after the first 50 hours of operation.

1.1 Oil Filter:

Change the engine oil filter. Use only original replacement parts. Refer to section 4.7.3 for installation details. Change the oil filter every 150 hours.

1.2 Engine Oil:

Change the engine oil. Use only 10W30 API classification SE / CD oil. Refer to section 4.7.3 and .4 for procedure. Change engine oil every 75 hours.

1.3 Coolant Level: (Diesel only)

Check that the coolant is to the proper level. The cooling system is filled with a 50% mixture of ethylene glycol and water.

1.4 Radiator for Leakage, Dirt and Damage:

If necessary flush the radiator with compressed air. A dirt buildup on the radiator cooling fins can cause both engine and hydraulic system overheating.

1.5 Fan Belt Tension and Condition:

Check fan belt for cuts or wear, if necessary replace. Check tension and adjust as shown in section 4.7.5.

1.6 Fuel System for Leaks:

Make a visual inspection of fuel system for leaks and potential hazards such as fuel line(s) touching exhaust manifold, flywheel, etc. Replace fuel filter every 400 hours.

1.7 Air Intake and Cleaner System:

Visually inspect the air cleaner system and be sure that all hose clamps are secure. Check that the filter indicator is not indicating that filter service is required.

1.8 Exhaust System:

Visually inspect the exhaust system and ensure all clamps are secure and the manifold bolts / nuts are tight. Check muffler for carbon and soot buildup or plugging, if necessary clean.

1.9 Engine Speed:

Check and if necessary adjust engine R.P.M.

2 Hydraulic/Hydrostatic

2.1 Hydraulic Oil Filter:

Change the hydraulic oil filter. Change the hydraulic filter every 150 hours after the initial change. Lubricate the filter cartridge seal with system fluid — torque the cartridge case 30 ft. lbs. (40 N.M.) or one-half to three quarters turn.

2.2 Hydraulic Oil Level:

Open the bottom shut-off cock on the oil reservoir. If oil is apparent the level is satisfactory.

If additional oil is required use only 10W30 API classification SE/CD. Fill to the top or maximum check point.

2.3 Hoses and Pipes:

Make a visual inspection of all hydraulic lines and fittings for leaks. Check that steel lines do not touch one another.

2.4 Cylinders:

Inspect cylinders for leaks. Extend cylinders and check for rod damage.

2.5 Hydraulic Functions:

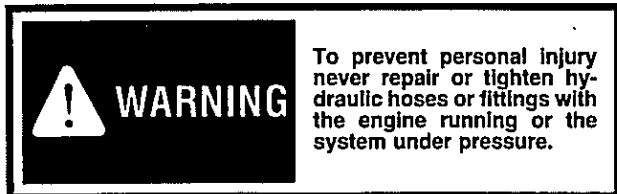
Check that the following operate properly: control valve float position, auxiliary hydraulic detent, hydraulic cylinders.

2.6 Pumps & Motors, Leakage:

Inspect pumps and motors for leakage.

2.7 Oil Cooler:

Inspect the oil cooler for leaks, fin damage or clogged with dirt. If necessary flush fins with compressed air.



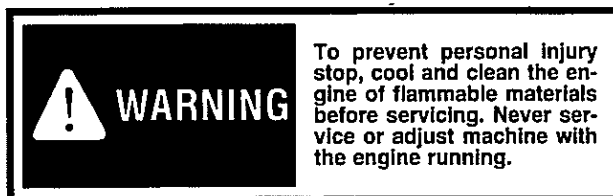
3 Final Drive

3.1 Oil Level:

Check lubricating oil level. If necessary add 10W30 API classification SE/CD oil.

3.2 Drive Chain Tension:

Check and if necessary adjust drive chain tension. Refer to section 4.5.3 for proper service procedure.



- 3.3 Torque Motor Mounting Bolts:
Mounting nuts 85-90 ft. lbs. (115-122 N.M.)
Jam nuts 40-60 ft. lbs. (54-81 N.M.)

- 3.4 Axle Bearing End Play:
Axle bearings are preloaded and must have no end play.
Inspect and adjust if necessary.

4 Controls

- 4.1 Control Levers, Operation and Linkage:
Check that the steering levers operate freely without binding, they return to neutral when released and the machine travels in a straight line with both levers in forward position. Ensure levers lock with seat bar up. Lubricate linkage with silicon based lubricant.

- 4.2 Foot Pedals, Operation and Linkage:
Check that the foot pedals operate freely without binding and lock with seat bar up. Spray springs and lock shaft with silicon lubricant or WD40.

- 4.3 Engine Throttle Control:
Check that the throttle control operates freely without binding or slackening off due to vibration.

- 4.4 Parking Brake:
Check that the parking brake engages and completely disengages.

- 4.5 Boom Lock:
Check that the boom locks operate without binding.

NOTE: Ensure the boom locks are fully retracted before raising or lowering the boom.

- 4.6 Quick-Tach, Operation & Linkage:
Ensure the quick-tach linkage operates smoothly without binding and the safety lock engages completely.

- 4.7 Neutral Start Switch:
Lubricate the ball on the switch with a silicon based lubricant.



5 Electrical

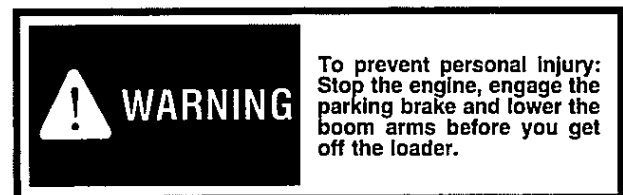
- 5.1 Battery Electrolyte Level:
Check electrolyte level. If necessary add distilled water.
- 5.2 Battery Terminals:
Check battery terminals for corrosion. Clean if necessary.
- 5.3 Operation of Starter:
Engage and disengage the starter several times to ensure it's working properly. To prevent starter damage do not engage for more than 15 seconds. Allow 1 minute between starting attempts for cooling the starter.

- 5.4 Operation of Electrical Equipment:
Make a complete check of all electrical equipment, gauges, warning devices, pre-heat indicator, neutral switch, over-ride start switch and all optional electrical equipment to ensure they are operating correctly.

6 Grease/Lubrication

Lubricate the following points with a good quality grease. Numbers marked () indicate the number of fittings at each location.

- Rear Boom Pivots (2)
- Boom Cylinder Bushings (4)
- Bucket Cylinder Bushings (4)
- Engine Universal Joint (2)
- Boom Locks (2)
- Quick-Tach Pins (2)
- Quick-Tach Handle (1)

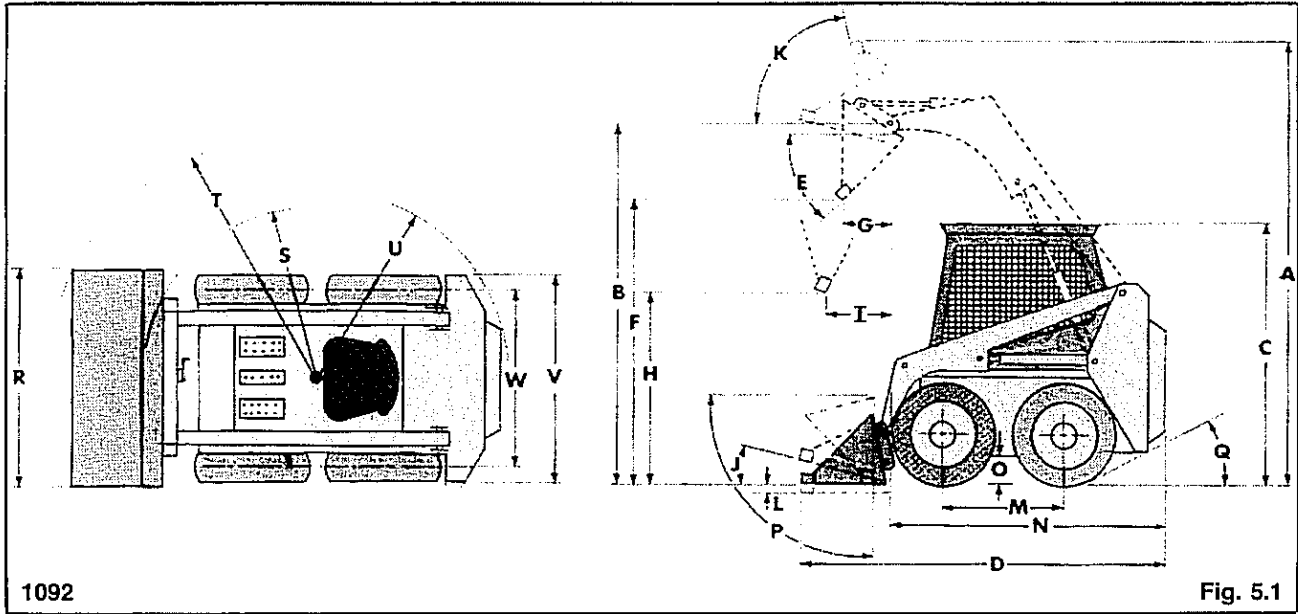


7 General

- 7.1 Tire Pressure:
Check tire pressure and if necessary inflate to the following pressures:
Standard Tires 7.00 x 15 . . . 50 PSI (345 KPa)
Flotation Tires 10.00 x 16.5 . . . 30-35 PSI (207-241 KPa)
- 7.2 Wheel Nut Torque:
Check and torque wheel nuts to 100-110 ft. lbs. (136-149 N.M.).
- 7.3 Condition of Cab:
Inspect both the seat and seat belt. Ensure all safety and instruction decals are in place. Inspect sound insulation, side windows and door operation for machines equipped with cab enclosure kits.
- 7.4 Condition of Shields and Safety Equipment:
Inspect and ensure all shields are in place and securely fastened. Inspect and ensure all safety equipment is working properly, all safety and instruction decals are in place. If necessary replace. If the safety controls are malfunctioning or require adjustment consult your Thomas Equipment Dealer for service.
- 7.5 General Condition:
Make a general inspection of the machine looking for loose or missing parts, oil leaks, etc.

5 SPECIFICATIONS

8.3 LOADER SPECIFICATIONS:



1092

Fig. 5.1

Dimensions — 8.3 Dimensions taken with the machine equipped as follows:

- Tires 7.00 x 15 (U-653)
- Bucket 54" Dirt (U-580)

	T101/103	T133
A. Overall operating height.....	136.25" (3461)	136.25" (3461)
B. Height to hinge pin.....	108.75 (2762)	109" (2769)
C. Overall height of vehicle	72.75" (1848)	73" (1854)
D. Overall length with bucket.....	124.5" (3162)	125.5" (3188)
E. Dump angle.....	36°	34°
F. Dump height.....	87.75" (2229)	88.25" (2242)
G. Reach — fully raised.....	24" (610)	24.25" (597)
H. Height at 45° dump angle	69.75" (1772)	68" (1727)
I. Reach at 45° dump angle	28.75" (730)	28.25" (718)
J. Maximum roll back at ground.....	27°	29°
K. Maximum roll back — fully raised.....	85°	99°
L. Digging depth.....	-1.5 (-38)	-1.25 (-32)
M. Wheel base	35" (889)	35" (889)
N. Overall length — less bucket.....	101.25" (2572)	102.75" (2610)
O. Ground clearance.....	6.5" (165)	6.5" (165)
P. Maximum grading angle — bucket	88°	88°
Q. Angle of departure	28°	27°
R. Bucket width.....	54" (1372)	54" (1372)
S. Clearance circle front — less bucket.....	47.25" (1200)	47.25" (1200)
T. Clearance circle front — with bucket.....	70" (1778)	70" (1778)
U. Clearance circle rear.....	59.25" (1505)	61" (1549)
V. Overall width — less bucket	53" (1346)	53" (1346)
W. Tread.....	46" (1168)	46" (1168)

Operational:

	T103	T133
Rated operating capacity.....	1000 lbs. (454 Kg)	1300 lbs. (590 Kg)
Tipping capacity	2200 lbs. (998 Kg)	2600 lbs. (1180 Kg)
Hydraulic pump capacity	9.0 GPM (34.1 l/m)	14.5 GPM (54.9 l/m)
Operating weight	4500 lbs. (2041 Kg)	4800 lbs. (2177 Kg)
Shipping weight.....	4000 lbs. (1814 Kg)	4300 lbs. (1950 Kg)
Travel speed.....	0-5.4 mph (0-8.7 km/h)	0-6.2 mph (0-10 km/h)

MAINTENANCE/SPECIFICATIONS 8

Controls:

VEHICLE: Steering direction and speed controlled by two hand operated control levers.
 HYDRAULICS: Boom lift, bucket tilt and auxiliary hydraulic functions controlled by separate foot pedals.
 ENGINE: Hand lever throttle, engine stop and key type ignition switch.

Engine:

	T103	T133
Make and Model	Kubota D1402B	Kubota V1902B
Cylinders	3	4
Cooling System.....	Liquid	Liquid
Displacement	85.1 cu. in. (1395 cc)	113.5 cu. in. (1861 cc)
Horsepower.....	31.4 H.P. (23.4 Kw)	40.5 H.P. (30.2 Kw)
Torque.....	66 ft. lbs. (9.2 Kg/m) @ 1700	89.1 ft. lbs. (12.3 Kg/m) @ 1600
Fuel	Diesel, No. 2	Diesel, No. 2
Air Cleaner.....	Replaceable, Dry Cartridge W/ Indicator	
Max. RPM (full load).....	2800	2550

Hydraulic System:

	T103	T133
Pump type	Gear	
Capacity (at rated RPM and Pressure).....	9 GPM (34.1 l/m)	14.5 GPM (55 l/m)
Rated RPM.....	2800	2550
Rated pressure.....	2150 PSI (148.2 bar)	
Filtration.....	10 Micron	
Hydraulic fluid.....	10W30 API Class SE, CD	
Control valve	Series type with float on lift and detent on auxiliary	
Oil cooler	440 BTU	
Cylinders	Lift	Tilt
Type	Double acting	Double acting
Qty. per mach.....	2	2
Bore dia.....	2 in.	2.5 in.
Rod dia.....	1.25 in.	1.125 in.
Stroke.....	27.125 in.	13.375 in.

Hydrostatic Transmission & Final Drive:

	T103	T133
Pump type	Two in line, axial piston pumps	
Pump displacement.....	1.24 cu. in. (20.32 cm ³)	2.48 cu. in. (40.64 cm ³)
Motor type	Geroler	
Motor displacement.....	19.9 cu. in. (326 cm ³)	29.9 cu. in. (489.9 cm ³)
System relief setting.....	3750 PSI (258.5 bar)	3750 PSI (258.5 bar)
Final drive.....	Single roller chain running in oil bath to each axle	
Drive chain size.....	ANSI 80	ANSI 100

Electrical:

	T103	T133
Alternator.....	25 amp	25 amp
Battery.....	12 volt (group 24) 455 cranking amps 140 amps reserve	
Starter	12 volt	
Circuit breaker setting.....	40 amp	

Tires:

Standard . . . 7.00 x 15, 6 ply rating, 50 PSI (345 KPa)
 Flotation . . . 10.00 x 16.5, 6 ply rating, 30-35 PSI (207-241 KPa)

MAINTENANCE/SPECIFICATIONS 8

Fluid Capacities:

Fuel tank	16.8 GPM (64 l)	Diesel, No. 2
Engine lubrication oil —T103	5.3 qts. (5 l)	10W30 API SE, CD
T133	8.5 qts. (8 l)	10W30 API SE, CD
Final drive transmissions (each)	1.5 gal. (5.7 l)	10W30 API SE, CD
Hydraulic reservoir	8 gal. (30.3 l)	10W30 API SE, CD
Engine cooling system	3.2 gal. (12 l)	50/50 water & ethylene glycol

8.4 TORQUE SPECIFICATIONS:

Loader:

Wheel nuts (24)	100-110 ft. lbs. (136-139 N.M.)
Chain tightener adjuster nuts (6) — T103	150 ft. lbs. (203 N.M.)
— T133	150 ft. lbs. (203 N.M.)
Torque motor drive sprocket (2)	350 ft. lbs. (475 N.M.)

Hydraulic/Hydrostatic:

Gear pump section bolts (8)	25-28 ft. lbs. (34-38 N.M.)
Piston pump section bolts (8) — T101/103	17-20 ft. lbs. (23-27 N.M.)
— T133	27-31 ft. lbs. (37-42 N.M.)
Torque motor section bolts (4)	50 ft. lbs. (68 N.M.)
Hydraulic filter case (1)	30 ft. lbs. (41 N.M.)

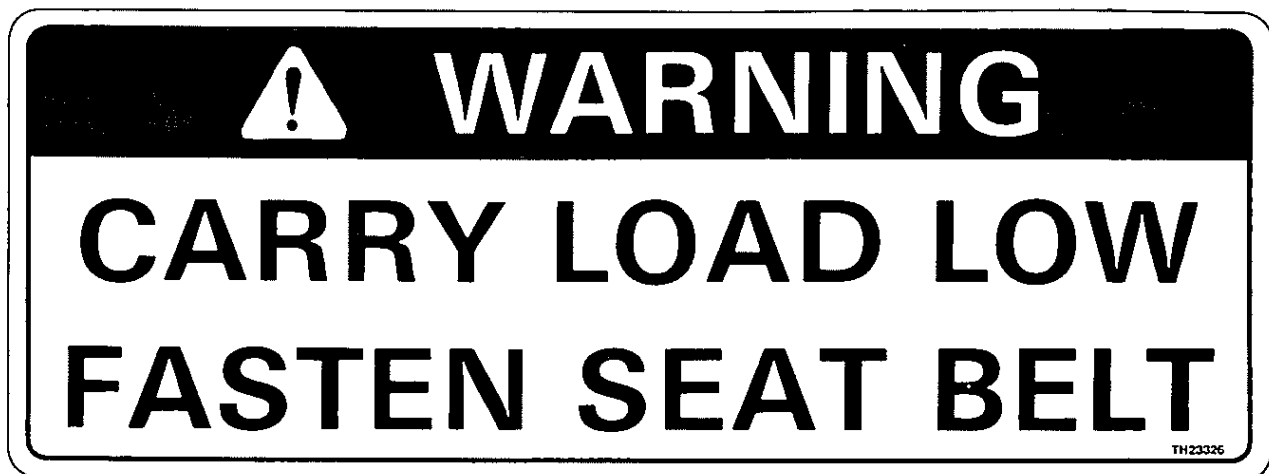
FOR NON-CRITICAL AND NOT OTHERWISE MENTIONED APPLICATIONS, THE FOLLOWING GENERAL ASSEMBLY TORQUES WILL APPLY:

<i>Bolts & Nuts</i>	<i>Torque</i>
	<i>Lbs. ft. (N.M.)</i>
1/4-20	5- 7 (6.7- 9.5)
5/16-18	12- 15 (16- 20)
5/16-24	12- 15 (16- 20)
3/8-16	17- 22 (23- 30)
3/8-24	22- 27 (30- 37)
7/16-14	30- 35 (41- 47)
7/16-20	40- 45 (54- 61)
1/2-13	45- 50 (61- 68)
1/2-20	50- 6 (68- 81)
9/16-12	60- 70 (81- 95)
9/16-18	65- 75 (88-102)
5/8-11	75- 85 (102-115)
5/8-18	100-110 (136-139)

8.5 DECALS



GENERAL INSTRUCTIONS
PART NO. 23327
LOCATION — L.H. ROPS SIDE PANEL
BESIDE OPERATORS SEAT.



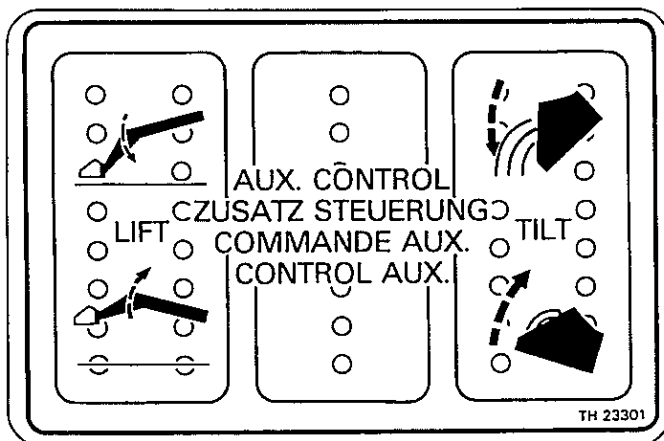
CARRY LOAD LOW
PART NO. 23326
LOCATION — BACK OF LIFT ARMS CROSS
SECTION, FACING OPERATOR.

SERVICE SCHEDULE					
EVERY 10 HOURS 1. ENGINE OIL...CHECK LEVEL... see operators manual for correct oil specification. 2. ENGINE AIR FILTER...CHECK INDICATOR. change element if required, empty dust cap. 3. ENGINE COOLING SYSTEM... CHECK LEVEL. add 50-50 water and ethylene glycol. Clean debris from cooling fins, grill and shrouds. (air cooled). Check fan belt tension and condition. 4. HYDRAULIC OIL...CHECK LEVEL see operators manual for oil specifications. 5. OIL COOLER...Clean debris from cooling fins. 6. TIRES...CHECK PRESSURE Std. tires 50PSI (345 kPa) Flotation 35PSI (240 kPa) 7. LUBRICATION...Grease all fittings with multi purpose lithium based grease. 8. GENERAL... Check for loose wheel nuts and drive chains (if applicable). Check for loose or broken parts. check safety equipment for operation	10				
50 HOUR SERVICE 1. ENGINE OIL...CHANGE* 2. ENGINE OIL FILTER...CHANGE* 3. HYDRAULIC OIL FILTER...CHANGE* 4. PRIMARY CHAIN...TIGHTEN 5. 50 HOUR SERVICE...See operators manual for 50 hour service instructions.	50				
EVERY 150 HOURS 1. SERVICE CHECK. Repeat 50 Hour service.	150		EVERY 1000 HOURS 1. HYDRAULIC OIL...CHANGE 2. CHAIN DRIVE OIL... CHANGE 3. ENGINE COOLING SYSTEM. FLUSH 4. HYDRAULIC FILTERS...CHANGE	1000	
EVERY 400 HOURS 1. FUEL FILTERS...Replace diesel engine Fuel Filters	400				

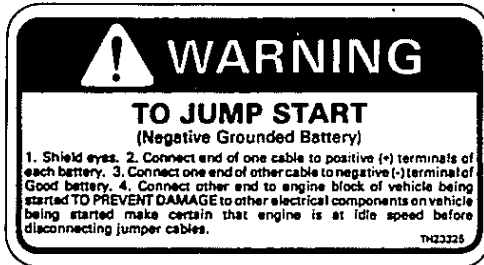
*FIRST CHANGE ONLY. SEE OWNERS AND OPERATORS MANUAL FOR COMPLETE SERVICE PROCEDURES, SPECS, AND CAPACITIES.

TH23321

SERVICE SCHEDULE PART NO. 23321
 LOCATION — ON FUEL TANK SIDE FACING OIL RESERVOIR



FOOT PEDAL
 PART NO. 23301
 LOCATION — LEFT HAND
 LOWER CORNER ON SIDE
 PANEL OF R.O.P.s



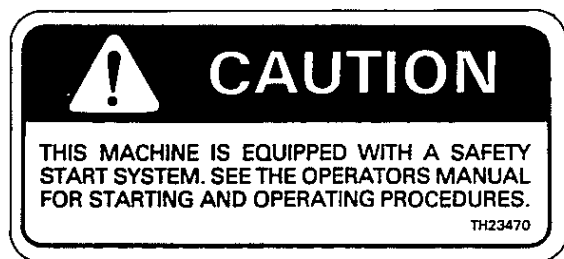
JUMP START
PART NO. 23325
LOCATION — BEHIND SEAT,
LEFT HAND CORNER, AND ON INSIDE
OF ENGINE COVER SHIELD.



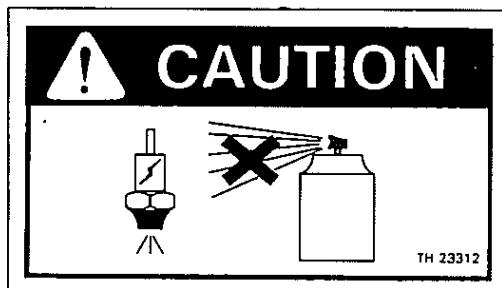
ENGINE
PART NO. 23324
LOCATION — ON RIGHT HAND SIDE
GUSSET OF LIFT ARM.



ROLLOVER PROTECTIVE STRUCTURE
PART NO. 23323
LOCATION — ON INSIDE LEFT HAND
OF LIFT ARM.



SAFETY START
PART NO. 23470
LOCATION — TOP RIGHT HAND CORNER
ABOVE SAFETY BAR.



GLOW PLUG
PART NO. 23312
LOCATION — RIGHT HAND
CONTROL PANEL.



ENTERING AND EXITING
PART NO. 26096
LOCATION — BELOW SEAT, ON
HYDROSTATIC SHIELD.

EMERGENCY START
 PART NO. 23471
 LOCATION — TOP LEFT HAND
 CORNER ABOVE SAFETY BAR,
 NEXT TO EMERGENCY START BUTTON.

EMERGENCY START

DEPRESS AND HOLD BUTTON, TURN
 IGNITION SWITCH TO START.

TH23471

TH 15916

CONTROL LEVER
 PART NO. 15916
 LOCATION — LEFT AND RIGHT
 HAND SIDE PANEL OF R.O.P.s,
 BELOW SCREEN, FACING
 CONTROL LEVERS.

BOOM LOCK
 PART NO. 25460
 LOCATION — LEFT
 HAND CONTROL PANEL.

ATTENTION

BOOM LOCK CONTROL

ENGAGE

↓

DISENGAGE

ENGAGE

↓

DISENGAGE

DO NOT MOVE LIFT ARMS WITH LOCKS ENGAGED.

TH 25460

PARKING BRAKE

ENGAGE

DISENGAGE

17245-379

PARKING BRAKE
 PART NO. 17245
 LOCATION — BELOW RIGHT HAND SIDE PANEL
 OF R.O.P.s, ON MAIN FRAME, FACING
 PARKING BRAKE.

WARNING

KEEP HANDS
 AND CLOTHING
 AWAY FROM
 ROTATING FAN
 AND BELTS TO
 PREVENT
 SERIOUS INJURY

FAN WARNING
 PART NO. — D8NN-8653-AA
 LOCATION — TOP OF FAN SHROUD

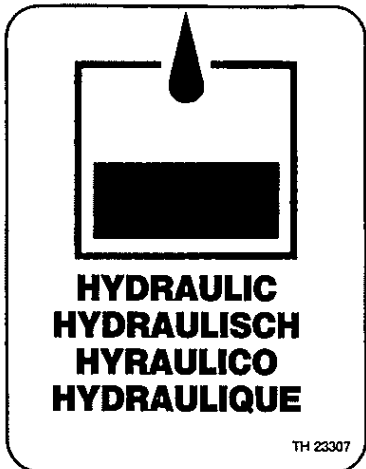
THROTTLE, CONTROL
 LEVERS
 PART NO. 23296
 LOCATION — LEFT HAND
 WALL OF R.O.P.s
 BELOW SCREEN FACING
 L.H. CONTROL LEVERS.

FAST
 SCHNELL
 RAPIDO
 VITE

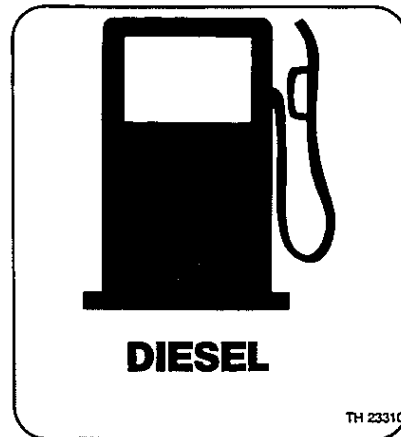
SLOW
 LANGSAM
 LENTO
 LENT

STOP
 HALT
 DETENER
 ARRET

TH23296



HYDRAULIC OIL TANK
PART NO. 23307
LOCATION — ON HYD. OIL RES.
NEXT TO BOOM ARM
PIVOT PIN.



FUEL TANK
PART NO. 23310
LOCATION — FUEL TANK ABOVE
FILLER CAP

ATTENTION

**DO NOT OPERATE MA-
CHINE WITH PARKING
BRAKE ENGAGED or
will cause damage to
Brake System!!!**

BRAKE
PART NO. 25912
LOCATION — R.H. FRAME NEXT TO
BRAKE HANDLE

**MAXIMUM OIL LEVEL
10W30 SE, CC**

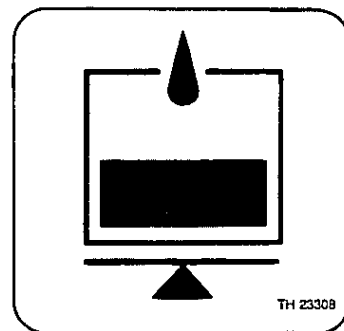
TH 17241

MAX. OIL LEVEL
PART NO. 17241
LOCATION — OIL RESERVOIR,
INSIDE ENGINE COMPARTMENT.

**THIS MACHINE AND ITS COMPONENTS ARE
PROTECTED BY ONE OR MORE OF THE
FOLLOWING PATENTS:**

CANADIAN	U.S.
1 013 265 PENDING	3 730 362 PENDING
454 319	3 810 517 734 352
	4 388 980
	4 391 344
	4 397 371
	TH 25169

PATENTS
PART NO. 25169
LOCATION — R.H. FUEL TANK
FACING OIL RESERVOIR.



OIL LEVEL
PART NO. 23308
LOCATION — OIL RESERVOIR,
INSIDE ENGINE COMPARTMENT.

MINIMUM OIL LEVEL

TH 17242

MIN. OIL LEVEL
PART NO. 17241
LOCATION — OIL RESERVOIR,
INSIDE ENGINE COMPARTMENT.