

REPAIR MANUAL



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THOMAS

THOMAS EQUIPMENT LIABILITY WARRANTY

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THE WARRANTY IS A CONDITION OF SALE OF THE PRODUCT TO PURCHASER AND WILL THEREFORE APPLY EVEN IF PURCHASER ALLEGES THAT THERE IS A TOTAL FAILURE OF THE PRODUCT.

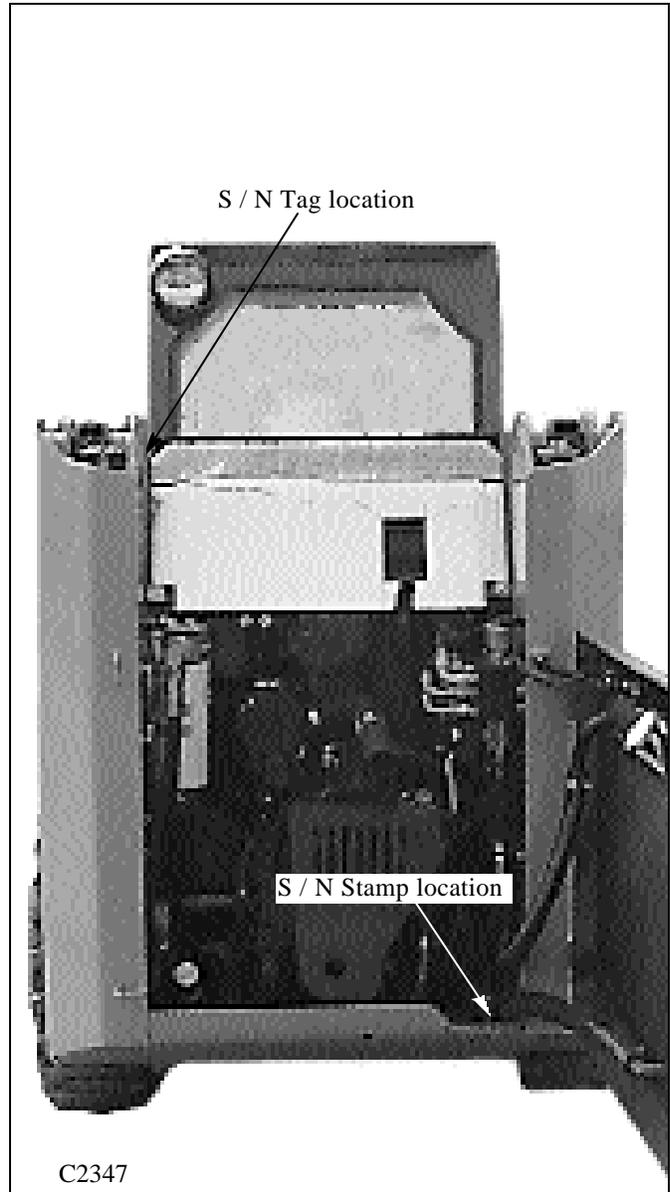
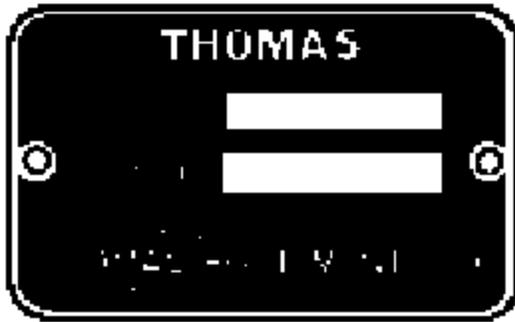
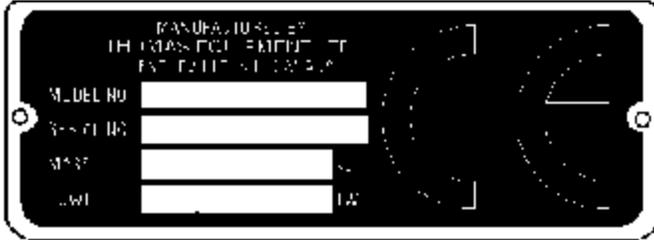
*N.B. Read and practice your **Thomas** operating and servicing instructions. Failure to do this may void your warranty.*

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FOREWORD

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. The serial number plate is located at the rear of the machine on the right hand side fuel tank. In the event that the serial number plate is missing, the model number and serial number are both stamped into the main frame inside the rear door, next to the hydraulic control valve.



SAFETY PRECAUTIONS

Practically all Service work involves the need to drive the loader. The Owner's / Operator's Manual, supplied with each loader, contains safety precautions relating to driving, operating and servicing that loader. These precautions are as applicable to the service technicians 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 the shop facility or "out in the field", may have an effect upon safety, not only upon the mechanic carrying out the work but also upon bystanders.

PERSONAL CONSIDERATIONS

- * **CLOTHING**
The wrong clothing 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 practices that minimize the amount of skin exposed and length of time used oil stays on your skin.
- * **EYE PROTECTION**
The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiseling, grinding, welding, painting and any other task that involves foreign matter.
- * **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 longer the exposure the greater the risks of hearing damage. Always wear hearing protection when working around loud machinery.
- * **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 spirits, paraffin, etc. may harm the skin.

- * **FOOT PROTECTION**
Substantial or protective footwear with reinforced toecaps will protect the feet from falling objects. Additional oil-resistant soles will help to avoid spilling.
- * **SPECIAL CLOTHING**
For certain work it may be necessary to wear flame or acid resistant clothing.

CAUTION

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. 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). 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 and skin.

SAFETY PRECAUTIONS

* HAND TOOLS

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

Never Use:

A hammer with a loose or split handle.

Spanners or wrenches with splayed or worn jaws.

Wrenches or files as hammers; drills or 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 it's 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 ensure 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 materials 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 all the fire extinguishers and ensure all personnel know how to operate them.

- Do not panic, warn those near and sound 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, things such as dirt, grease, fine dust 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 in 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.

* CLEANLINESS

Cleanliness of the loader hydraulic system is essential for optimum performance. When carrying out service and repairs, plug all hose ends and components 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.

SAFETY PRECAUTIONS

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 bypass the safety starting 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 maintenance, 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 the 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 the hoses and connectors on both the loader and on the test machine 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 and telephone lines when travelling. 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 the 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 the engine and relieve pressure before connecting or disconnecting lines. Tighten all connections before starting the engine or pressurizing the lines. If any fluid is injected into the skin, obtain medical attention immediately.
- * Prior to removing wheels and tires from a loader, check to determine whether additional ballast (liquid or weight) 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 will duplicate the sad experiences of others.

SAFETY PRECAUTIONS

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 or she 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.

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.

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

Replace O rings, seals or gaskets whenever they are disturbed. Never mix new and old seals and 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.

C. HOSES AND TUBES

Always replace hoses and tubes if the end connections are damaged. Be sure any hose installed is not kinked or twisted.

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 machines output and productivity will be affected.

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

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 results 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.

D. 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 readings.

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

SAFETY PRECAUTIONS

E. 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 into two (2) ways:

- press fit on rotating parts such as shafts and gears,
- push fit into static locations such as reduction gear houses.

Where possible, always install the bearing onto the rotating components 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 bearing and / or 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 overheating. 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 failure.

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

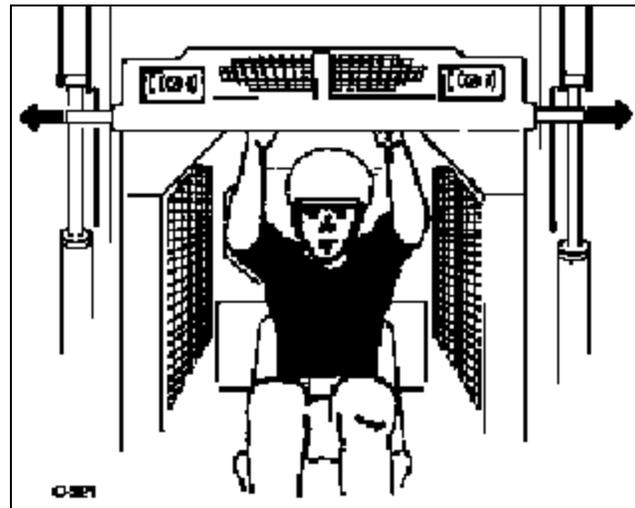
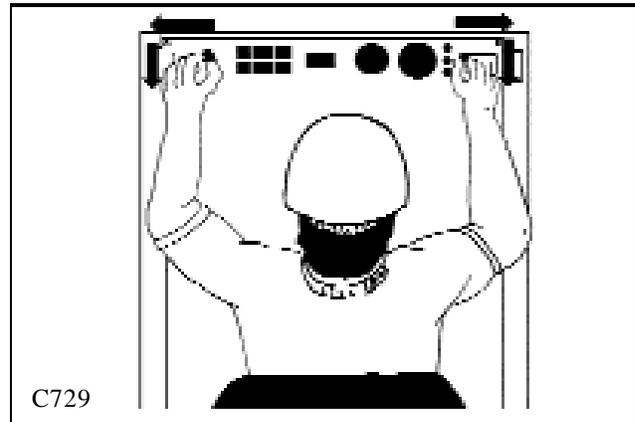
Be sure during normal routine servicing, maintenance or repair that bearings are given the right attention and are installed with care.

F. BOOM SUPPORTS

For safety while performing regular service or maintenance work, the loader is equipped with boom supports.

The boom supports, when extended, prevent the boom arms from dropping if hydraulic pressure is relieved or the foot control pedals are accidentally cycled.

To operate the boom supports, first remove any bucket or attachment from the quick - tach; raise the boom arms to full height and shut off the engine. Raise the boom handles up and push out toward the boom arms to extend the boom supports. (fig. C729, C321)



<p>WARNING</p> <p>To avoid personal injury, service the loader with the boom arms down and the bucket or attachment lowered to the ground. If it is necessary to service the loader with the boom arms raised, be sure to engage the boom supports. Never work under or around a loader with raised boom arms without the boom supports engaged.</p>



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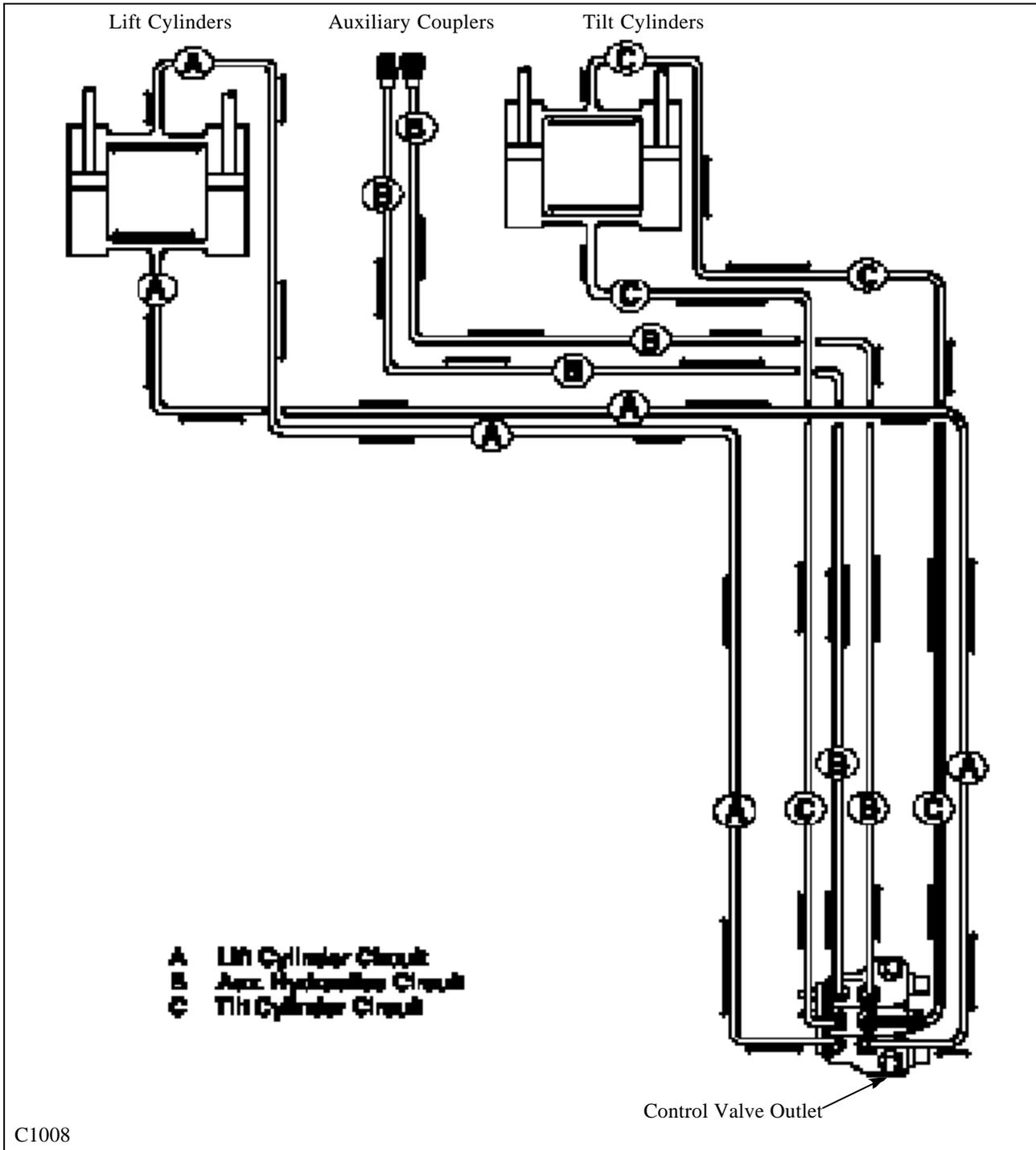
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HYDRAULIC CIRCUIT 1.1

1



NOTE: Foot pedal control operated machine illustrated.

Hydraulic fluid comes out the port closest to the spool end of the valve when the spool is pushed in. Hydraulic fluid received at the fixed end of the cylinder pushes it out. When the hydraulic cylinder receives fluid at the ram (rod) end, it retracts.

SPECIFICATIONS & MAINTENANCE 1.1



Hydraulic Specifications

Pump Type	Gear, 0.61 cu. in. (11cc)
Pump Brand	Sauer Sundstrand
Pump Capacity (theoretical)	8.7 GPM (33 LPM)
Rated Speed	3000 RPM
Control Valve	Parallel Type
Main Relief Pressure, +/- 50PSI (3.5 Bar)	2150 PSI (148 Bar) @ Zero Flow
Reservoir Capacity	34 L (9 gallons)
Fluid Type	10W30 API SE / CD Oil
Reservoir Filtration	100 Micron
System Filtration	5 Micron
Lift Cylinders	(2) 2" Bore Diameter
Lift Cylinder Rods	1.125" Diameter
Tilt Cylinders	(2) 2" Bore Diameter
Tilt Cylinder Rods	1.125" Diameter
Lift Cycle +/- 1.5 seconds (Up / Down)	5.4 / 3.54
Tilt Cycle +/- 1.5 seconds (Up / Down)	2.35 / 3.06
Allowable Drop, Measured at the Cylinder Rod, Engine Off, @ Rated Capacity and Operating Temperature	1.5" (38mm) / 3 Minutes

Maintenance Schedule	First (HRS)	Every (HRS)
Oil level check	8	8
Oil filter change	50	150
General system check (leaks etc.)	8	8
Lubricate (grease pivots)	8	8
Reservoir filter change	1000	1000
Hydraulic oil change	1000	1000

GENERAL INFORMATION 1.1

1 Hydraulic System

Oil is drawn from the hydraulic oil reservoir through a 100 micron element. From there it travels to the main hydraulic pump. (fig. C2353).

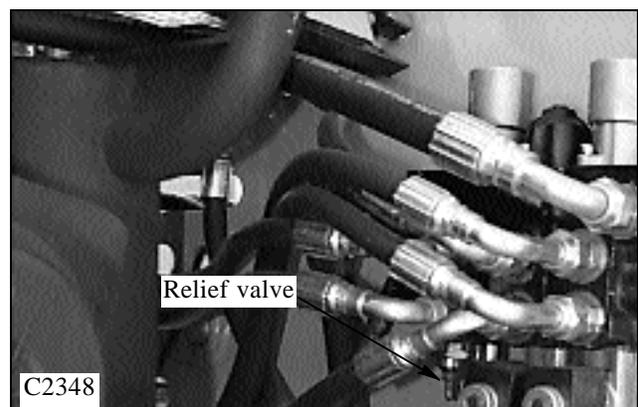
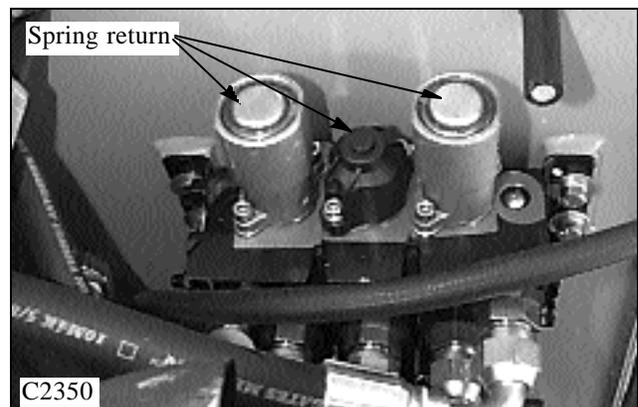
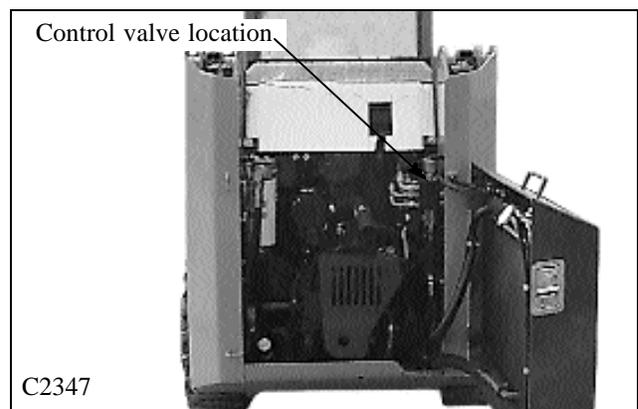
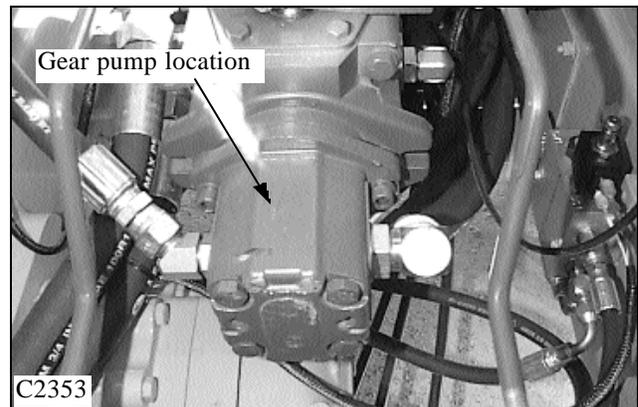
The hydraulic pump is a gear type which is driven by a shaft and coupler through the hydrostatic drive pump at engine speed. The oil then flows from the gear pump to the hydraulic control valve. (fig. C2347).

The hydraulic control valve is equipped with an adjustable relief valve which is adjusted to 2150 PSI (148 Bar). The control valve is a parallel type with 3 spools (banks). The various spools activate the boom, bucket and auxiliary hydraulic functions.

When the spools are in neutral, oil flows from the hydraulic gear pump, through the control valve and returns to the 10 micron hydraulic filter. From the hydraulic filter, the fluid flows to charge the tandem hydrostatic pump and pressurize the hydraulic brake release system and then back to the hydraulic reservoir. Each control valve section spool end contains a centering spring which returns the spool to neutral when the foot pedal, or control handle, is released. (fig. C2350).

The boom section, on foot control operated loaders, has a detent mechanism to hold the spool in the float position. The auxiliary section is operated by foot pedal operation, or may have an optional electrical solenoid operated control, and may be engaged momentarily by the control lever mounted switch, forward or reverse, or by engaging the dash mounted toggle switch for constant power in the forward direction only.

The system relief valve operates whenever a hydraulic function has been restricted or over loaded. (fig. C2248). To protect against excessive pressure build up, the relief valve opens and allows oil to return to the return outlet. The system relief valve is adjustable, and is preset at 2150 PSI. (148 Bar)



GENERAL INFORMATION 1.1

1



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GEAR PUMP 1.2

1

Replacement

Start the gear pump removal procedure by removing any attachment, raising the boom arms and engaging the boom support pins. Shut off the engine.

WARNING

To prevent personal injury, never work under the boom arms without the boom supports engaged.

- 1 Remove the seat and hydrostatic shield. (fig. C2358, C2360)
- 2 Attach a vacuum system to the hydraulic oil reservoir filler location. Or drain the oil reservoir. Seal the threads on the drain plug, if removed, with teflon tape or a liquid form of pipe sealant before installing.
- 3 Disconnect the hydraulic hoses from the gear pump. (fig. C2353) Remove the pump fittings. Cap all open hoses to prevent contamination. After capping ends you may unhook vacuum system from oil reservoir.
- 4 Remove the 2 bolts holding the gear pump to the hydrostatic tandem section. (fig. C2353) Remove the gear pump. Check the seal. Replace if required.

IMPORTANT

If gear pump replacement is being done because of failure, the hydraulic system and oil should be checked for contamination. See section 2.7.

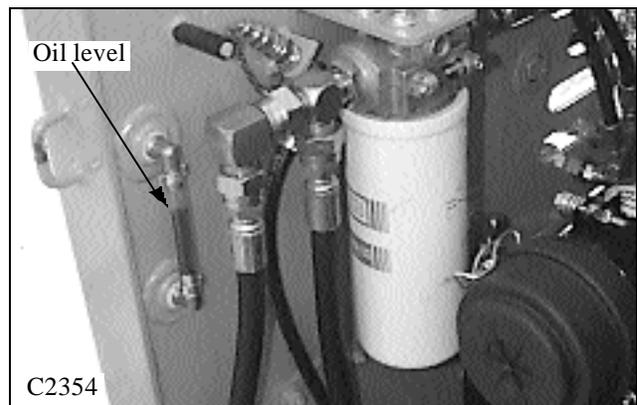
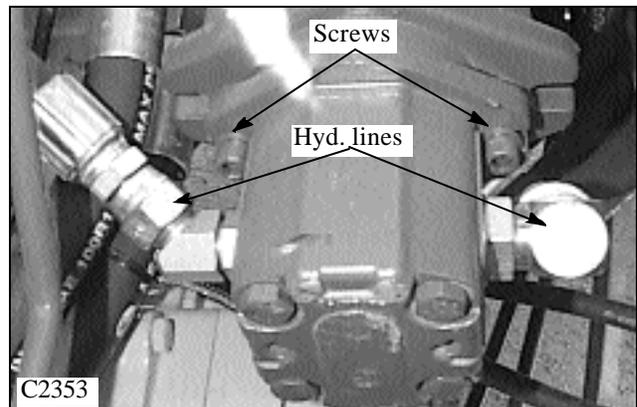
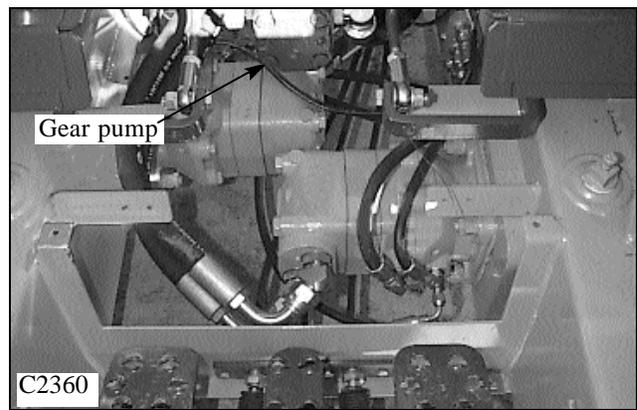
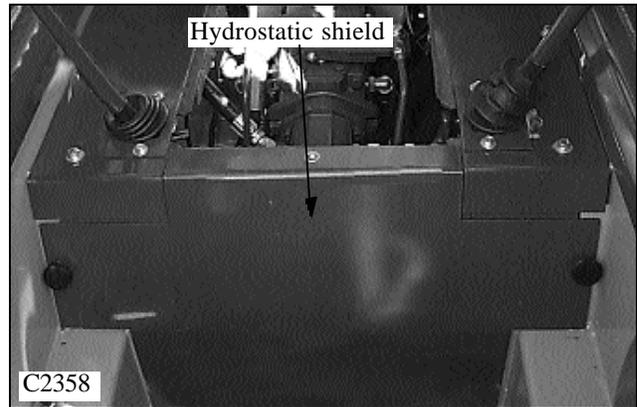
- 5 Replace gear pump in reverse order.
- 6 Start the engine and check for leaks. Do not use your hands to find leaks.
- 7 Check the fluid level in the hydraulic oil reservoir and replenish as required. (fig. C2354)
- 8 Follow the Start Up Procedure upon completing repairs. See next page.

WARNING

Use caution when dealing with fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open lines and ports. Follow the torque chart when tightening lines and fittings.



GEAR PUMP 1.2

Start up Procedure

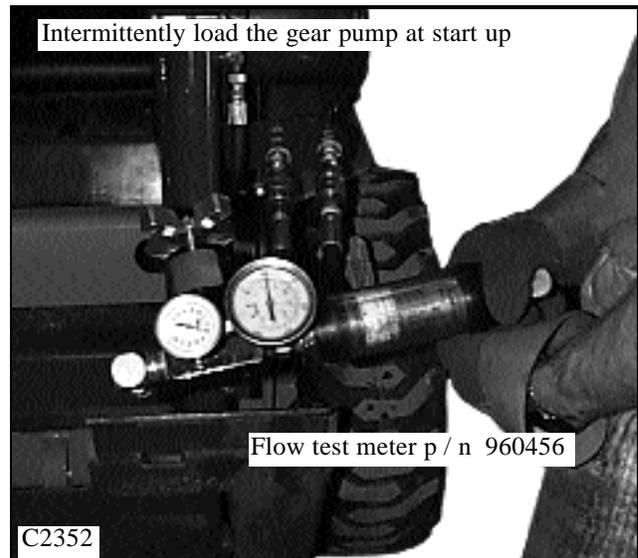
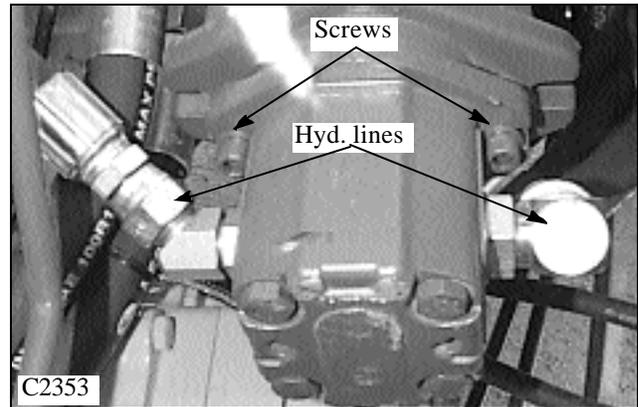
- 1 Mount the gear pump to the loader. (fig. C2353)
- 2 Connect the hydraulic lines. Torque fittings and lines according to the torque chart section 1.8.
- 3 Start the pump and run for 3 minutes each @
 - a. Half speed at zero flow
 - b. Half speed, intermittently loaded to 500 psi (35 bar)
 - c. Full speed, intermittently loaded to 1000 psi (69 bar)
- 4 Check for leaks.
- 5 Check flow and pressure at rated speed as outlined in section 1.3.

WARNING

Use caution when dealing with fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury. Never use your hands to check for system leaks.

IMPORTANT

Be sure the hydraulic oil reservoir is at the proper level before performing test.



CONTROL VALVE 1.3

1 Testing and Adjusting the Relief Valve Pressure

NOTE: This test also checks the status of the gear pump capacities.

Hoses and gauges required for this test must be capable of withstanding 3000 PSI (207 Bar) continuous pressure, and hydraulic flow meter capable of measuring 30 gallons per minute. (113 LPM)

1 The female coupler attached to the loader provides the power out when the auxiliary control is engaged. (fig. C2351) Connect the flow meter and pressure gauge inlet side to match the power out of the female auxiliary coupler to prevent meter and gauge damage. Be sure to connect a return line to the male auxiliary hydraulic quick coupler. Install the flow meter / pressure tester to the auxiliary hydraulic quick couplers. (fig. C2352)

2 Start the engine and engage the auxiliary hydraulic system. Increase the engine speed to full operating RPM. (See Section 7 for checking and adjusting engine speed to 3000 RPM plus or minus 25 RPM)

3 Turn the flow control valve on the flow meter to restrict the oil flow down to 2 GPM. (7.5 LPM) As you are turning the flow control valve, watch the pressure gauge and make sure it does not go over 3000 PSI.(207 Bar) Stop further adjustment immediately if the reading goes over this setting. Shut off the auxiliary hydraulic system and shut off the engine. Move to step 6 to make initial setting.

4 Repeat steps 2 and 3 if necessary. Allow the loader to operate at this setting until the oil temperature has increased to 160° F (71°C), operating temperature.

5 Turn the flow control valve further to restrict the oil flow to no flow. (Zero) Correct pressure setting is 2150 PSI +/- 100 PSI. (148 Bar, +/-6.9 Bar)

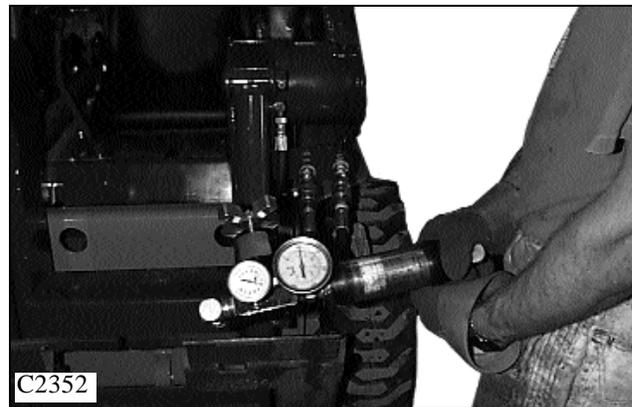
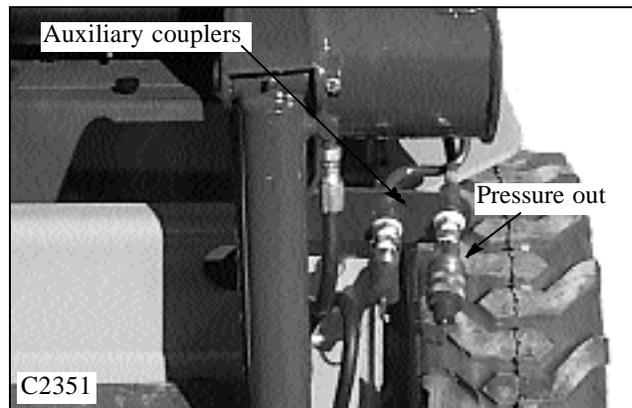
6 If adjustment is necessary, shut down the auxiliary hydraulic system, shut off the engine and return the flow control valve to the open position. Locate the control valve in the engine compartment.

7 Loosen the jam nut on the relief valve adjusting screw and turn the screw clockwise, counting the turns, until the screw bottoms out. (fig. C2348)

8 Turn the screw back out lesser turns than you turned in to increase pressure, or out more turns to decrease pressure.

9 Retake the pressure readings by performing steps 2 through 5. If necessary make further adjustments by repeating steps 6 through 9.

NOTE: If inadequate pressure and / or flow is not available, the gear pump could be failing or the inlet to the gear pump is restricted.

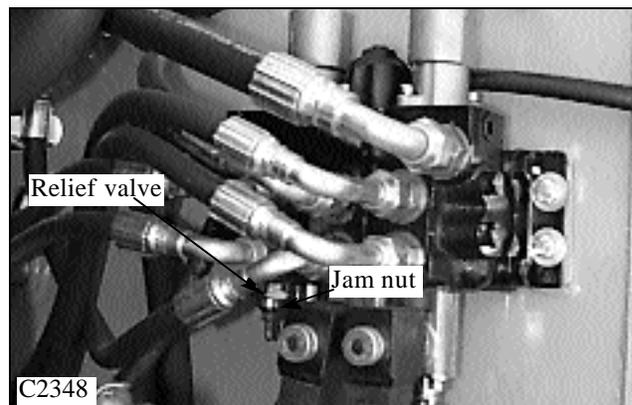


CAUTION

Adjusting the relief valve setting too high may cause damage to the gear pump.

WARNING

To prevent personal injury or damage to the loader, do not adjust the relief valve while the engine is operating.



CONTROL VALVE 1.3

Control Valve Removal

1 Remove any attachment, lower the boom arms, engage the parking brake and shut off the engine

IMPORTANT

Clean the work area prior to repair. Cap all open lines, fittings and ports to prevent contamination.

2 Disconnect the spool locks solenoid, and electrical auxiliary solenoid wiring connectors if equipped. (fig. C2348, C2349)

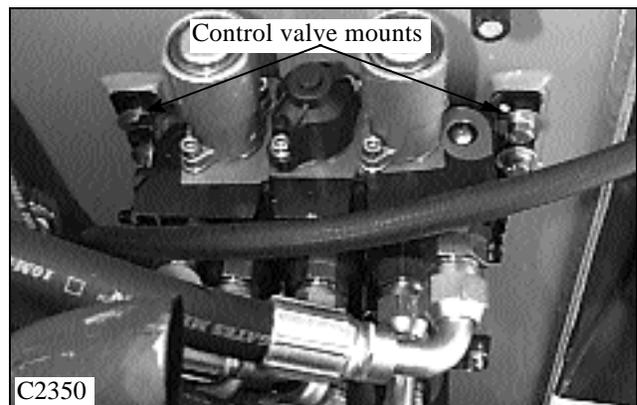
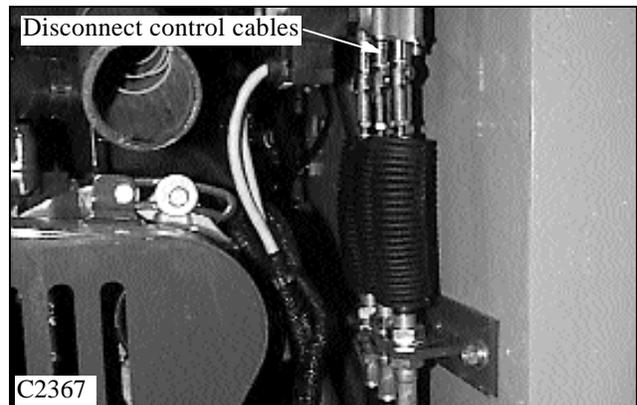
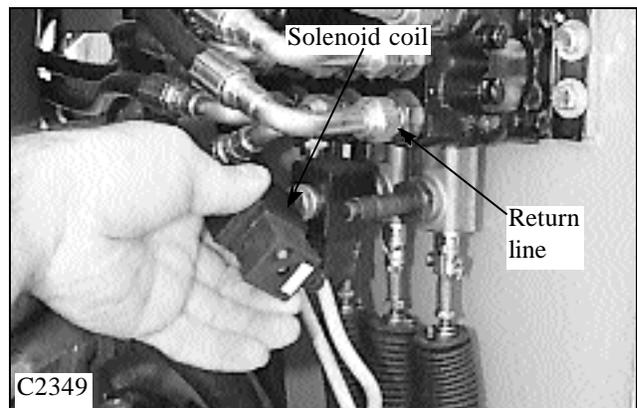
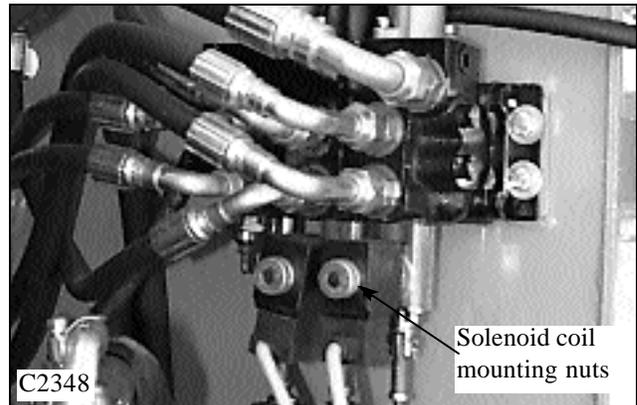
3 Disconnect the control cables. (fig. C2367)

4 Disconnect the return line from the control valve and remove the adapter fitting. Plug and cap all open ports and hose ends.

5 Disconnect the 6 hoses going to the boom, bucket and auxiliary circuits. Marking the hoses as you remove them is recommended for safety and to ease re-assembly and assure the circuits are functioning properly at restart.

6 Disconnect the the inlet hose coming from the gear pump. Cap the hose and fitting and remove the adapter fitting in the control valve.

7 Remove the 4 bolts holding the control valve to the mount and remove the control valve. (fig. C2350)



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CONTROL VALVE 1.3

1

Control Valve Installation

When installing a new control valve, always inspect the exterior for shipping or other damage, such as bent brackets, broken spring return caps or damaged spool lock mechanism. Repair all damaged parts before installation to the loader.

- 1 Mount the control valve to the loader. (fig. C2324a)

IMPORTANT

Follow the hydraulic fitting torque chart in Section 1.10 when connecting fittings and lines.

- 2 Connect the control cables to the spools.
- 3 Connect the various hydraulic lines to their proper ports. (fig. C2324b).

WARNING

Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury.

- 4 Connect the solenoid coils to the control valve locks. Apply a drop of Loctite 242 (blue) to the knurled retaining nut.

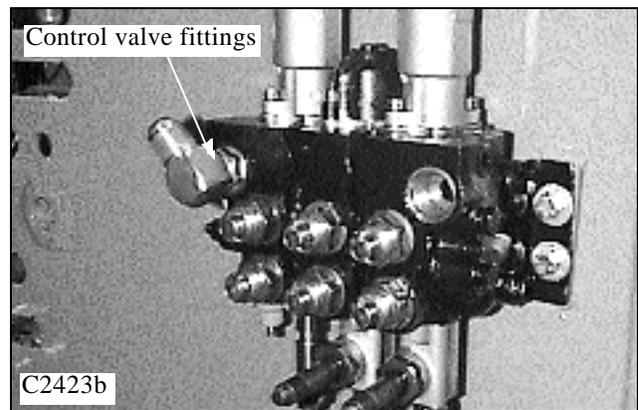
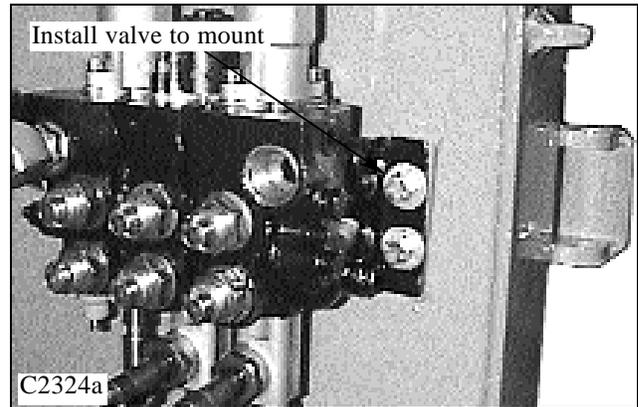
WARNING

All safety switches must be connected and functioning to prevent possible operator injury.

- 5 Verify fluid level in th hydraulic oil reservoir. (fig. C2354). Top off as required to bring oil level to approximately half way in the site gauge.

WARNING

Verify the relief valve pressure setting after replacing or servicing the control valve.

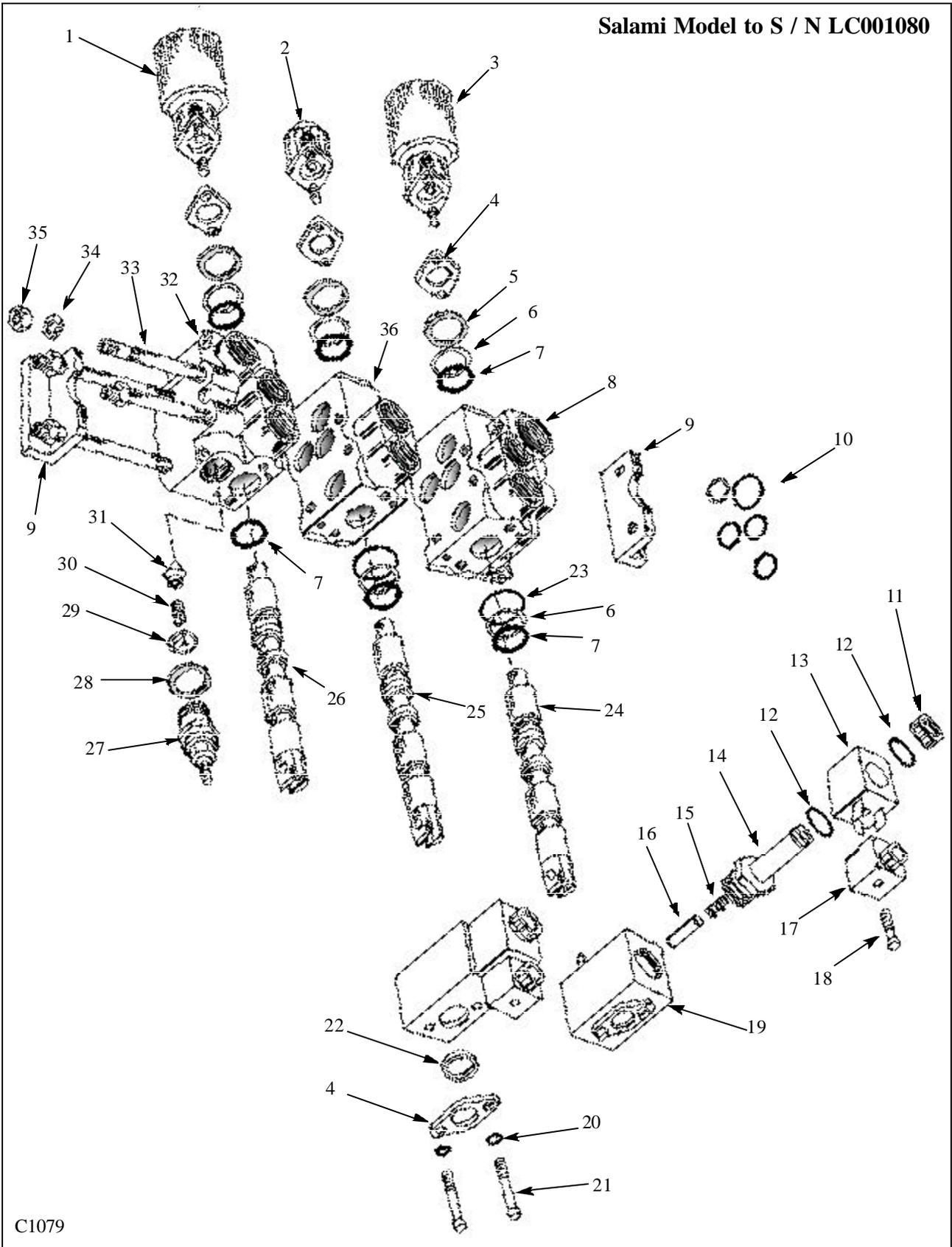




THOMAS

CONTROL VALVE 1.3

1



CONTROL VALVE 1.3a



Diagram C1079 Legend

- 1 Auxiliary spool spring return
- 2 Tilt spool spring return
- 3 Lift spool spring return
- 4 Plate
- 5 Washer
- 6 Seal shim
- 7 Seal
- 8 Outlet / lift section body
- 9 Mounting bracket
- 10 Section seals
- 11 Knurled nut
- 12 Seal
- 13 Solenoid coil
- 14 Spool lock solenoid post
- 15 Spring
- 16 Lock pin
- 17 Electrical connector
- 18 Screw
- 19 Spool lock body
- 20 Lock washer
- 21 Screw
- 22 Scraper seal
- 23 Seal
- 24 Lift spool
- 25 Tilt spool
- 26 Auxiliary spool
- 27 Relief valve body
- 28 Washer seal
- 29 Spring washer
- 30 Spring
- 31 Poppet valve
- 32 Inlet / auxiliary section body
- 33 Tie bolt
- 34 Flat washer
- 35 Nut
- 36 Tilt section body

CONTROL VALVE 1.3

1

Disassembly / Repair

Remove the hydraulic control valve as outlined in the removal section, page 1-7. Ensure all openings are plugged to prevent solvents and dirt from contaminating the control valve assembly. Before disassembling the hydraulic control valve, clean the body with a suitable solvent and dry with compressed air.

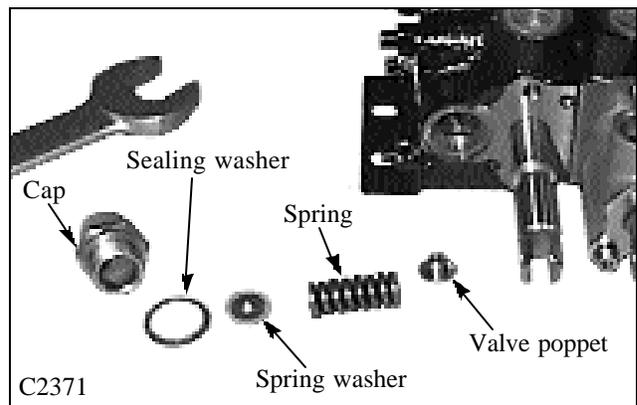
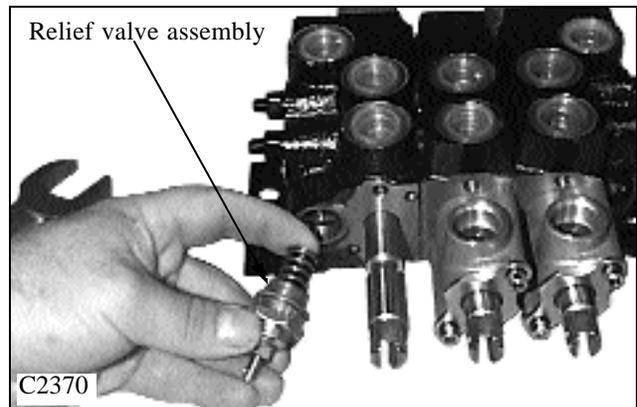
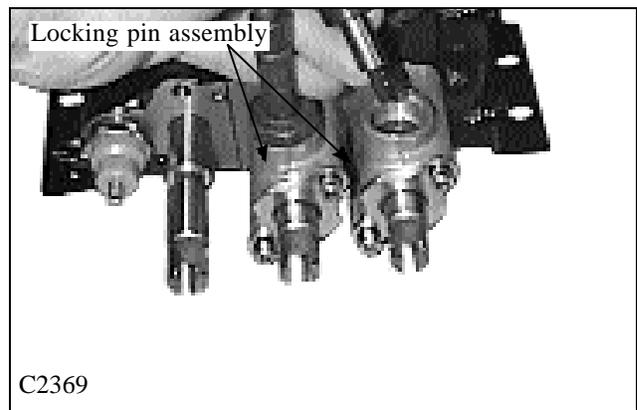
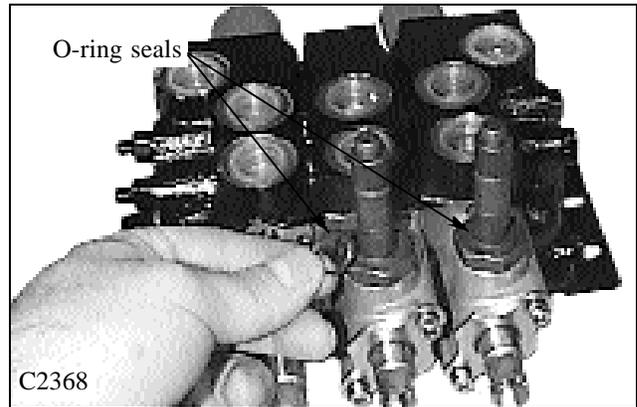
WARNING

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

Refer to diagram C1079, pg. 1-11, to assist in the disassembly of the control valve.

- 1 Remove the solenoid coils and O-ring seals. (fig. C2368).
- 2 Remove the locking pin assembly from the adapter block. (fig. C2369)
- 3 Remove the pressure relief valve. (fig. C2370) Tip the valve down slightly to ensure the valve poppet comes out with the spring.

Note: Figure C2371 shows an exploded view of the relief valve system.

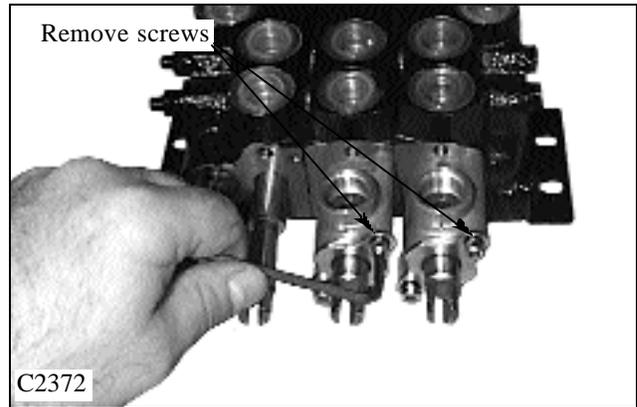


CONTROL VALVE 1.3

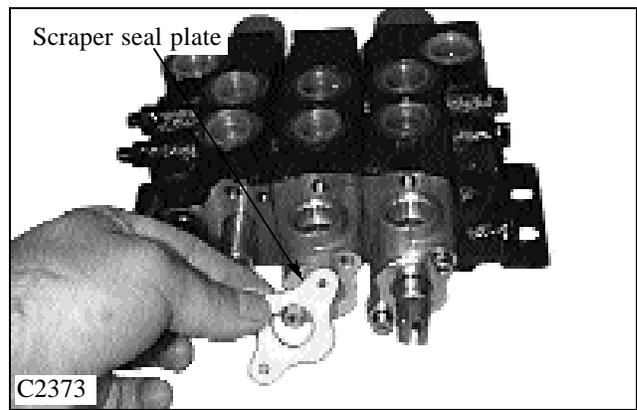
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Disassembly / Repair (cont'd)

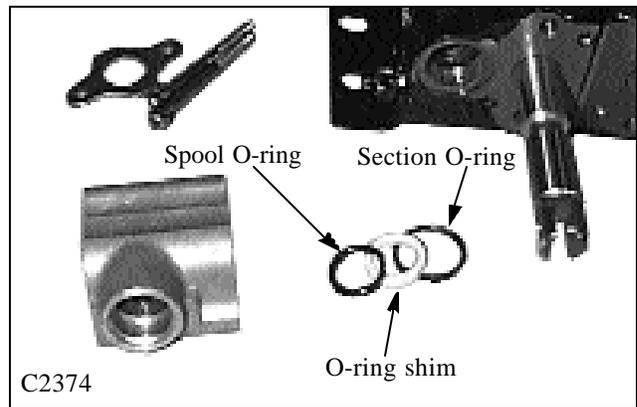
4 Remove the screws retaining the lock adapters to the control valve assembly. (fig. C2372).



5 Remove the plate and adapter from the control valve and spool. (fig. C2373, C2374)

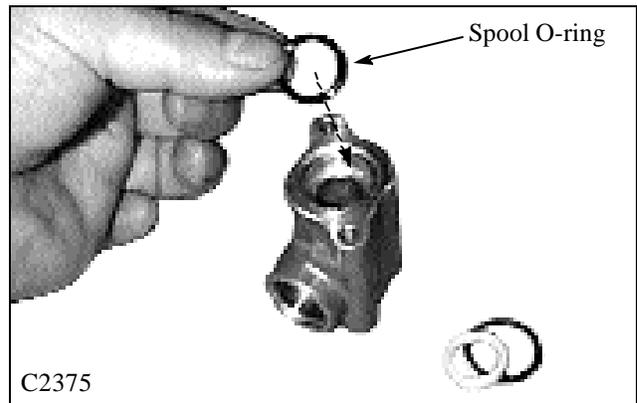


6 Remove the O-ring seals and seal shim. (fig. C2374). Discard the seals and replace with new.



7 Clean the lock adapter with solvent and inspect the inside of the lock adapter for excessive wear such as gouging or chipping. Replace with new if worn.

8 Lubricate a new spool O-ring with system oil and install to the lock adapter. (fig. C2375)

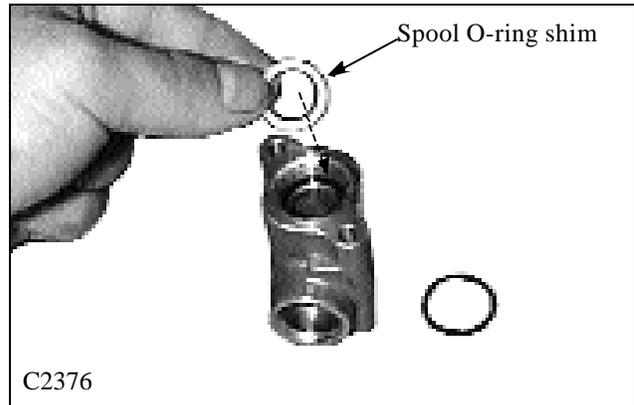


CONTROL VALVE 1.3

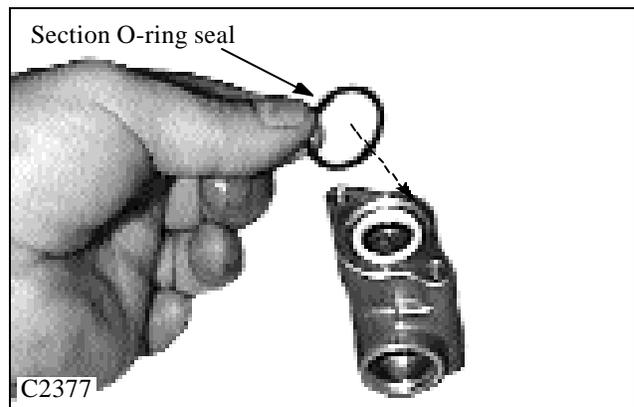
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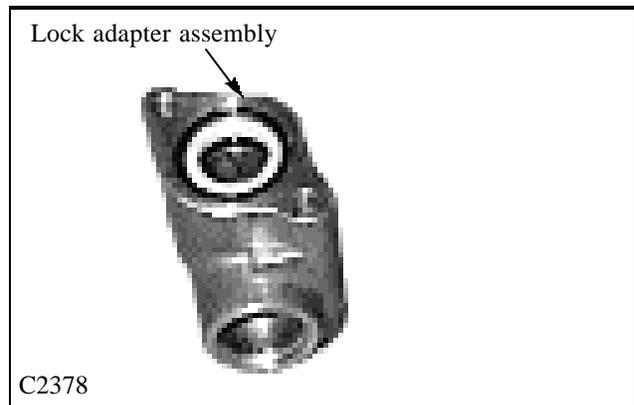
9 Lubricate the spool O-ring shim with system oil and install over spool seal. (fig. C2376).



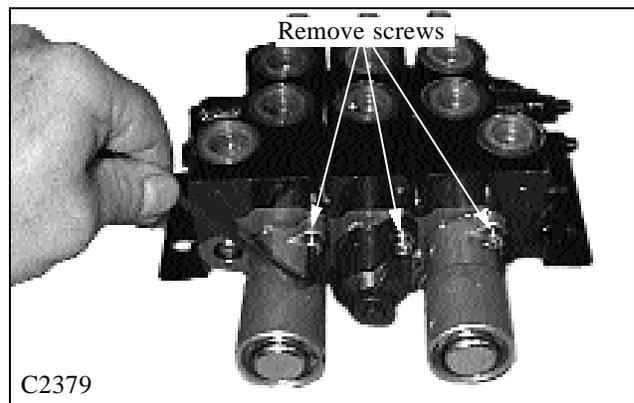
10 Lubricate the section O-ring seal with system oil and install to the lock adapter assembly. (fig. C2377).



11 Figure C2378 shows the completely resealed lock adapter assembly ready to be installed to the control valve assembly.



12 Remove the screws retaining the spring return caps to the control valve assembly. (fig. C2379). Remove the spring return assemblies.

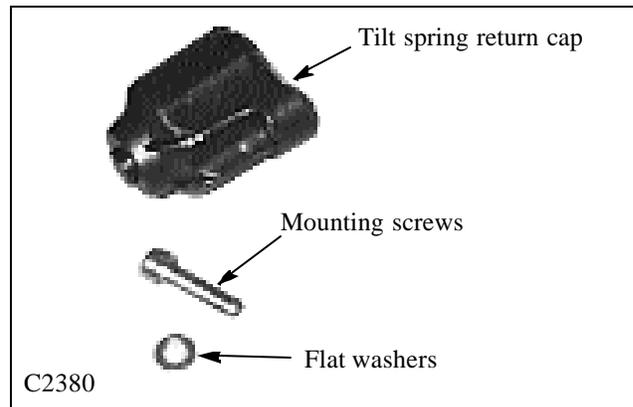


CONTROL VALVE 1.3

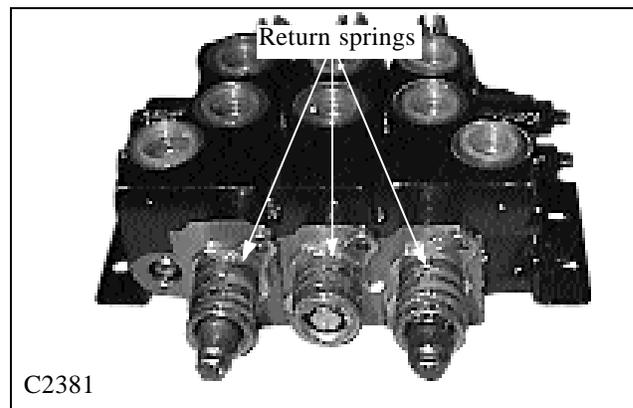
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Disassembly Repair (cont'd)

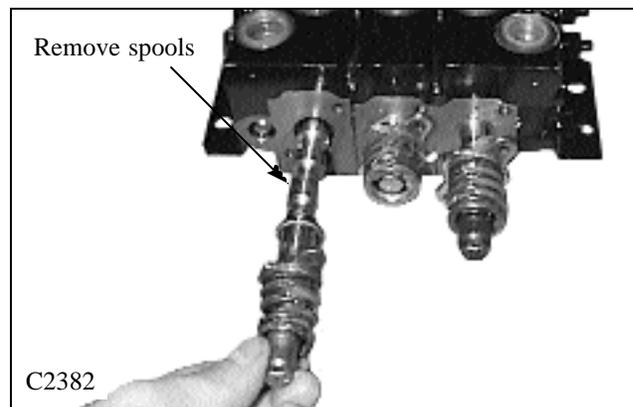
13 **Note:** The plastic cap over the tilt spring has flat washers to distribute the load of the mounting screws to prevent cap damage. (fig. C2380). Be sure to install the flat washers when reassembling to the control valve.



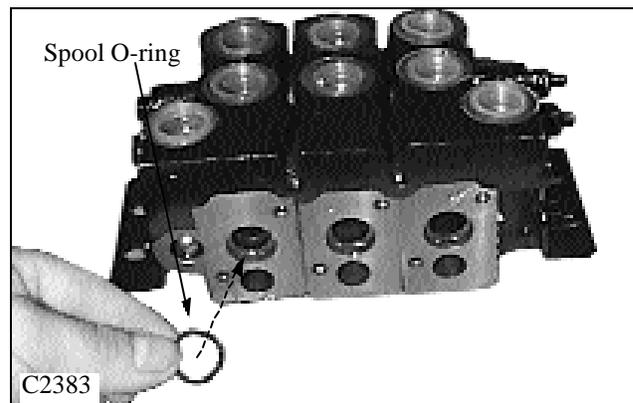
14 Figure C2381 shows spring assemblies and detent mechanisms as viewed with the caps removed.



15 Remove the section spools noting their location to the appropriate bores. (fig. C2382). Do not replace the spools in any other spool bores than the one it came out of. Clean the spools and valve sections with solvent and inspect for gouging or chipping. Replace sections as required. Minor scratches on the spool may be removed with fine emery cloth. Be sure to remove all solvent from the control valve body if no further disassembling of the control valve is to be performed.



16 Install new O-ring seals at time of assembly. (fig. C2383) Lubricate the seal, bore and spool with system oil when reassembling the components.

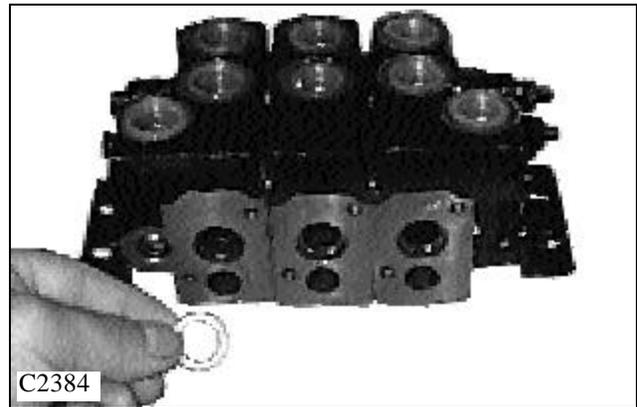


CONTROL VALVE 1.3

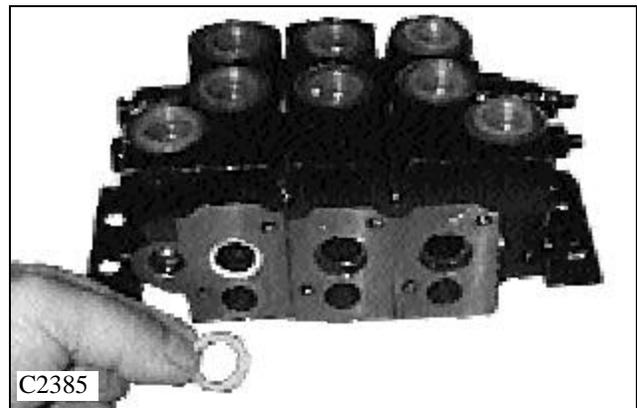
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Disassembly / Repair (cont'd)

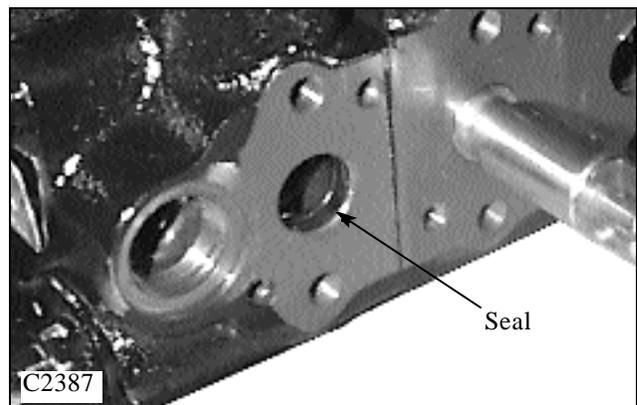
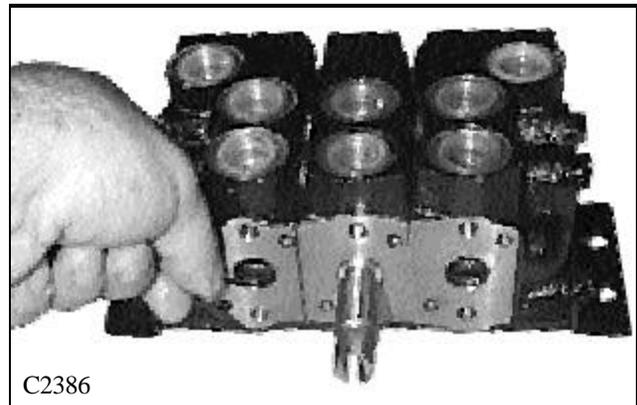
17 Install the O-ring spacer shim to the spool O-ring seal. (fig. C2384).



18 Install the flat washer over the O-ring spacer. (fig. C2385) The spring return side of the control valve is now complete.



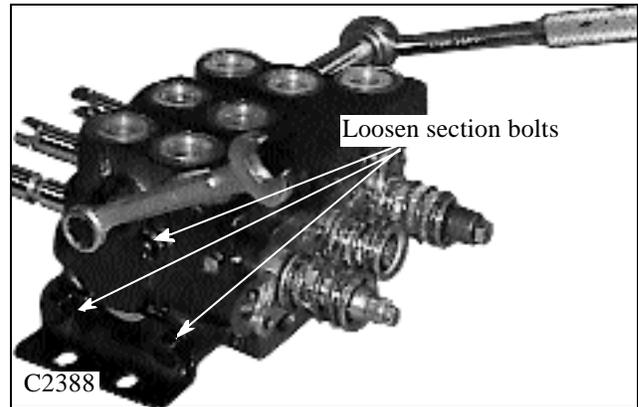
19 The auxiliary section, section without lock adapter, has an O-ring seal located in a machined groove in the section housing. (fig. C2386) Remove the seal using a pick tool and replace with new. Lubricate the O-ring with system oil. Figure C2387 shows the seal installed.



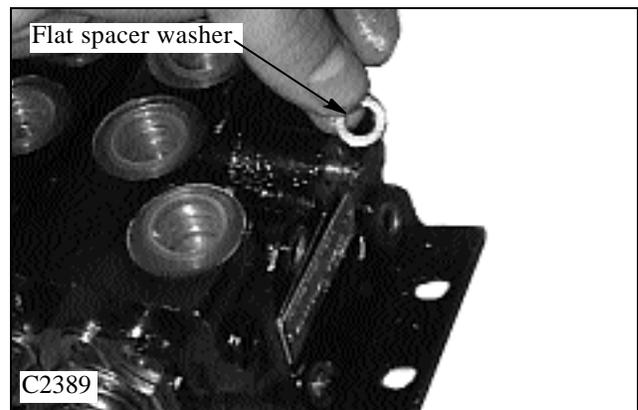
CONTROL VALVE 1.3

Disassembly / Repair (cont'd)

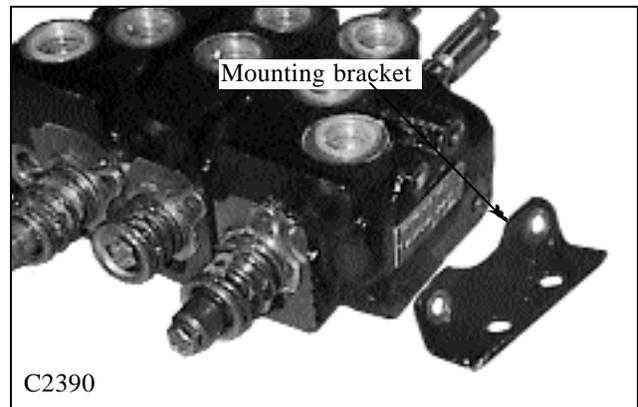
20 Section seals may be replaced without removing spools and spring return mechanisms. Loosen the bolts retaining the control valve sections together. (fig. C2388). Upon assembly follow the torque specifications given Section 8.



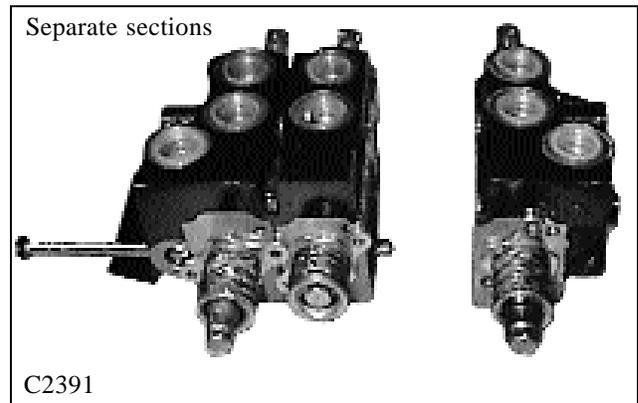
21 Note the flat spacer washers used on the upper bolts. (fig. C2389)



22 Remove the bolts and mounting brackets. (fig. C2390)



23 Separate the control valve sections. (fig. C2391)



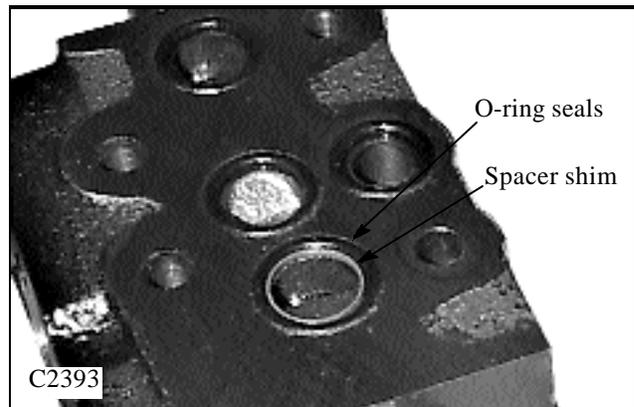
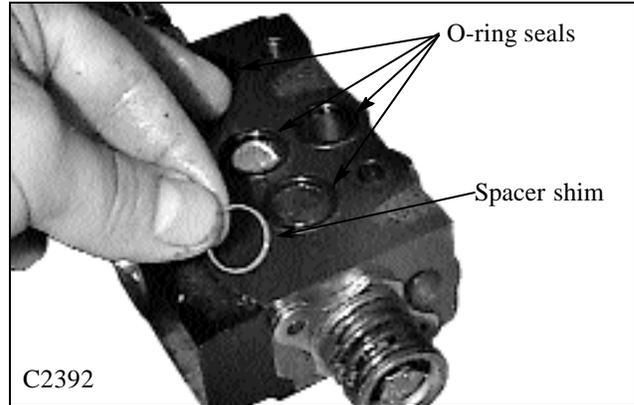
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CONTROL VALVE 1.3

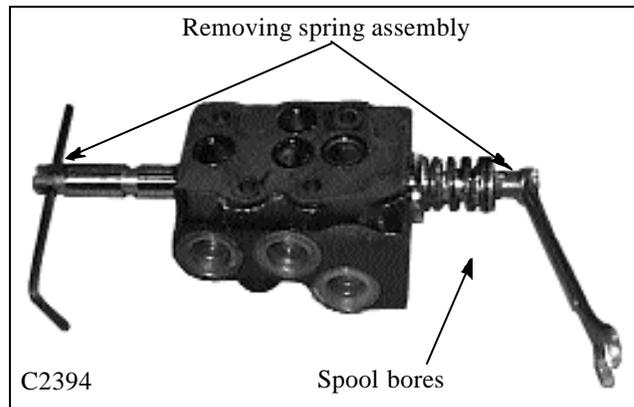
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Disassembly / Repair (cont'd)

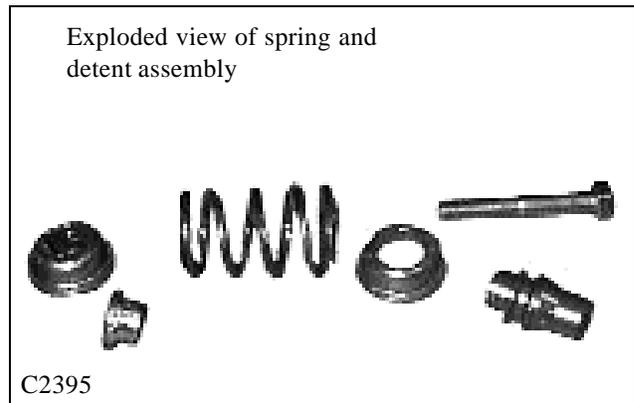
24 Remove and discard the O-ring seals between the sections. Replace with new. Be sure to replace the O-ring seal spacer shim upon assembly. (fig. C2392, C2393). Lubricate the seals with system oil upon assembly. When reassembling the control valve sections, follow the torque specifications in Section 8.



25 To remove the detent mechanism and spring from the spool, place an allen wrench or screwdriver blade through the spool eyelet to hold the spool from turning while removing the spring and detent mechanism. (fig. C2394).



26 Remove the mechanism and arrange the parts in order of placement. (fig. C2395) Inspect the detent part and bushings for burrs and wear. Replace if worn.

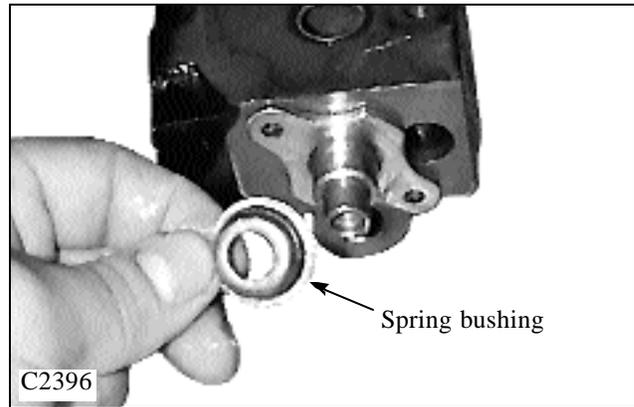


CONTROL VALVE 1.3

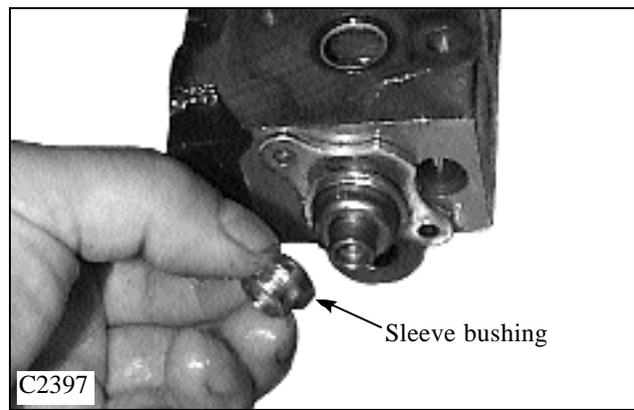
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Disassembly / Repair (cont'd)

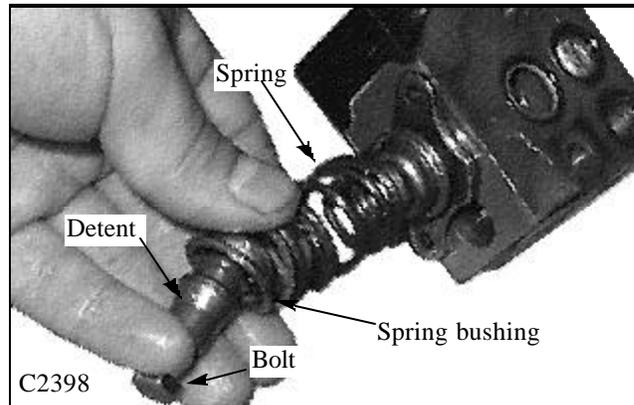
27 Replace the spring and detent mechanism in the reverse order. (fig. C2396). Install spring bushing. Lubricate the spring bushings with Castrol Spheerol grease or equivalent.



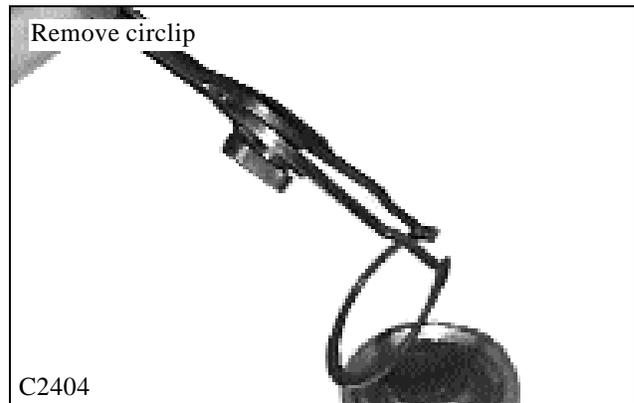
28 Install sleeve bushing. (fig. C2397). Lubricate the bushing with Castrol Spheerol grease or equivalent.



29 Install the spring, spring bushing and detent. (fig. C2398) Install the bolt. Apply Loctite 242 (blue) to the threads and tighten to specifications given in Section 8.



30 To service the spring return mechanism in the cover, remove the circlip retaining the cover. (fig. C2404).

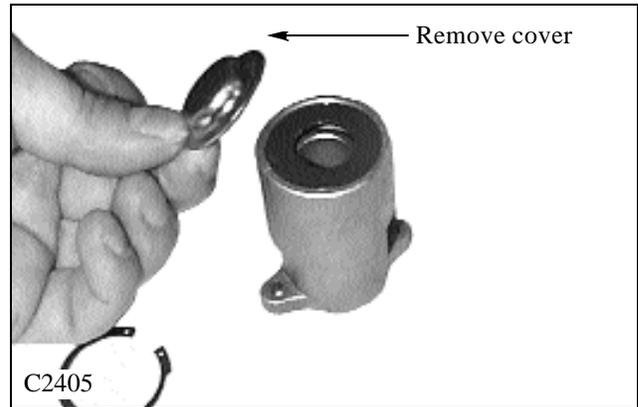


CONTROL VALVE 1.3

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Disassembly / Repair (cont'd)

31 Remove the cover. (fig. C2405).



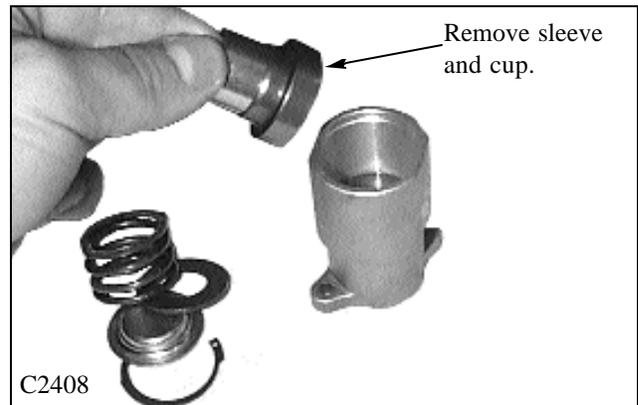
32 Remove the spring washer. (fig. C2406).



33 Remove the spring. (fig. C2407). Inspect the spring for broken or sacked coils. Replace the detent spring return with a new kit if spring damage is apparent.



34 Remove the detent ball sleeve and cup. (fig. C2408).

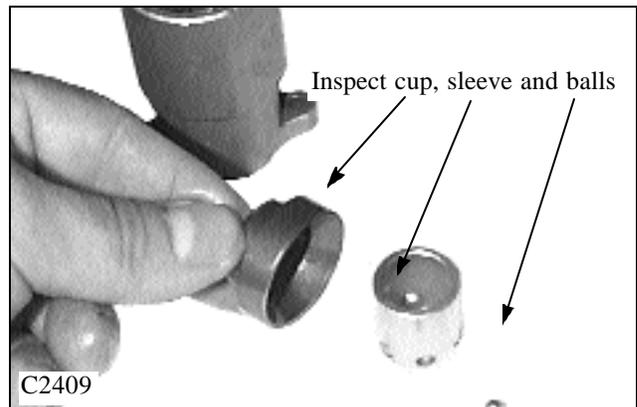


CONTROL VALVE 1.3

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Disassembly / Repair (cont'd)

35 Separate the sleeve and cup assembly. (fig. C2409).
Inspect the tapered cup, balls and sleeve for wear.
Replace with new detent kit assembly if wear is evident.

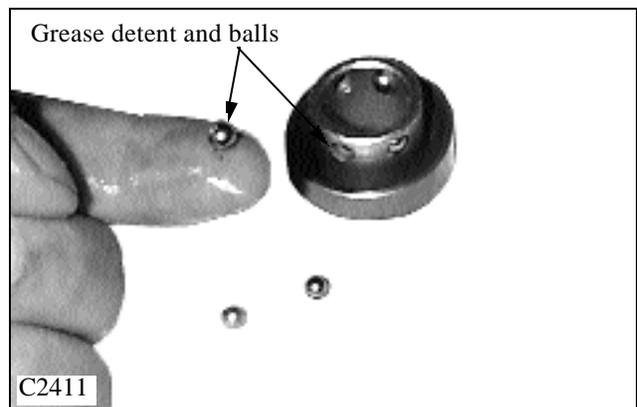


36 Remove the spring washer. (fig. C2410).



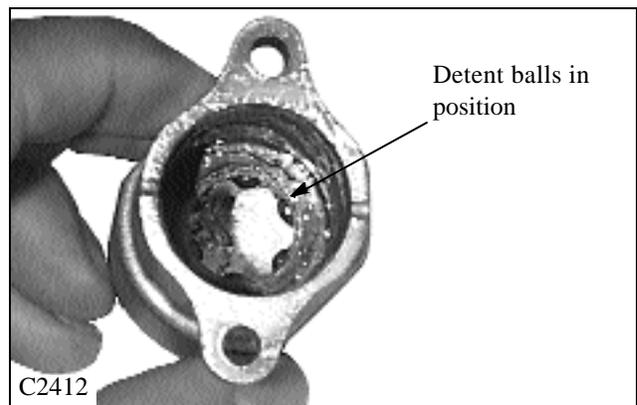
37 Clean all parts with solvent. Lubricate all parts with Castrol Spheerol grease or equivalent.

38 Replace the greased detent balls to the cup and sleeve (fig. C2411) and reassemble the complete spring return mechanism in the reverse order above.



39 The grease holds the detent balls in position during assembly to the control valve and spool. (fig. C2412)

40 Replace the cap assembly to the control valve and tighten the screws evenly.



IMPORTANT

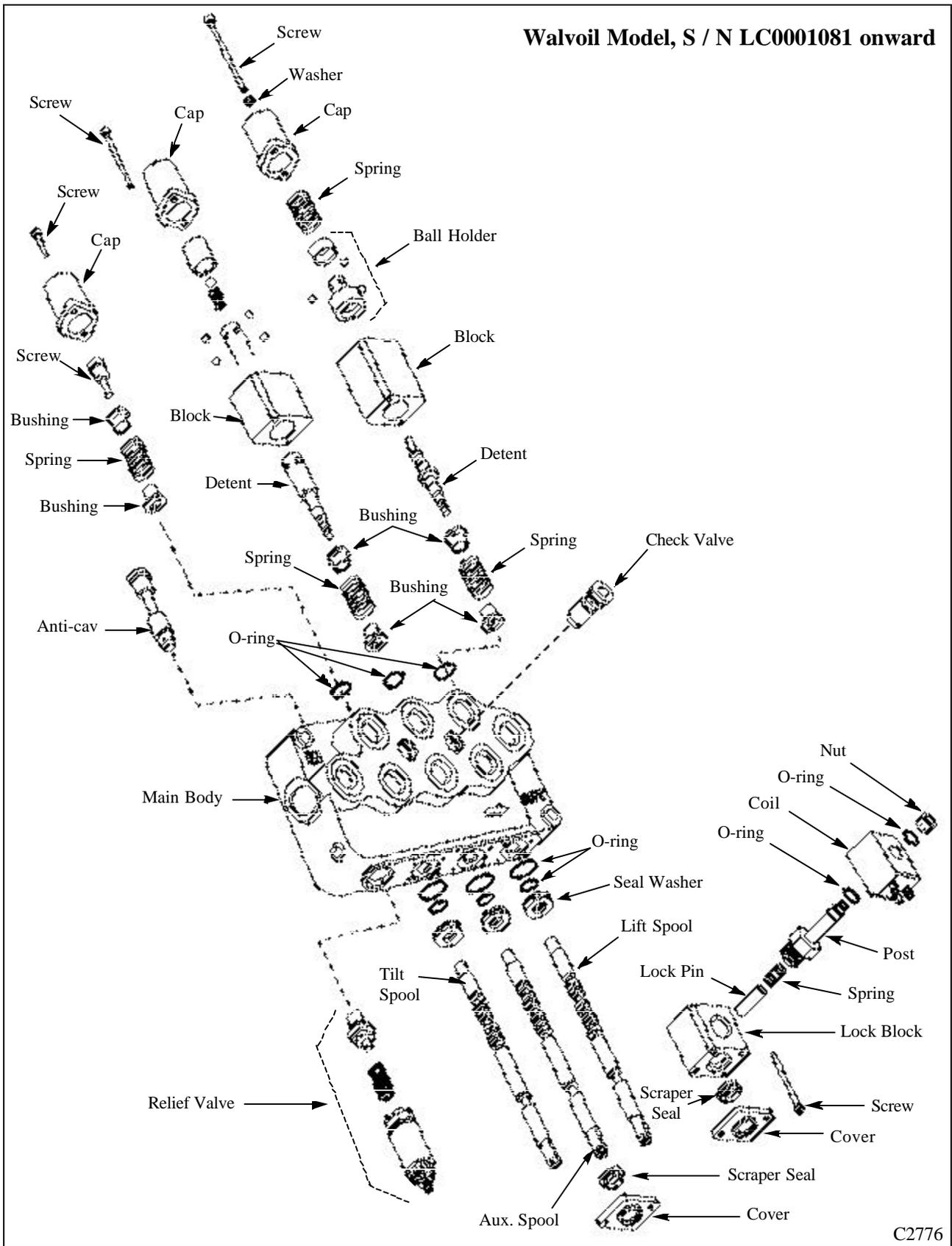
Check to make sure the detent balls are in position before assembling to the control valve to assure proper function of the control spool and detent mechanism.

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THOMAS

CONTROL VALVE 1.3



CONTROL VALVE 1.3

1

Disassembly / Repair

Before disassembling the hydraulic control valve, clean the body with a suitable solvent and dry with compressed air.

WARNING

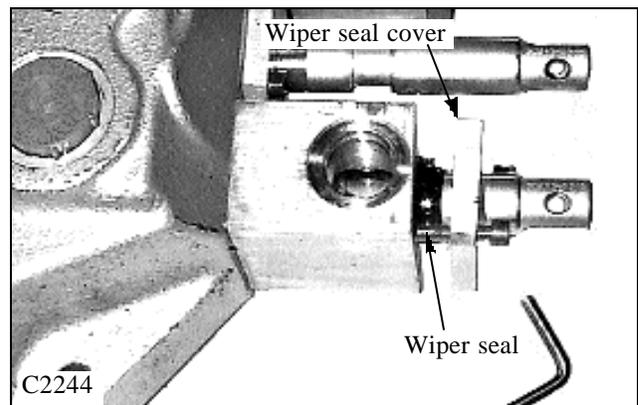
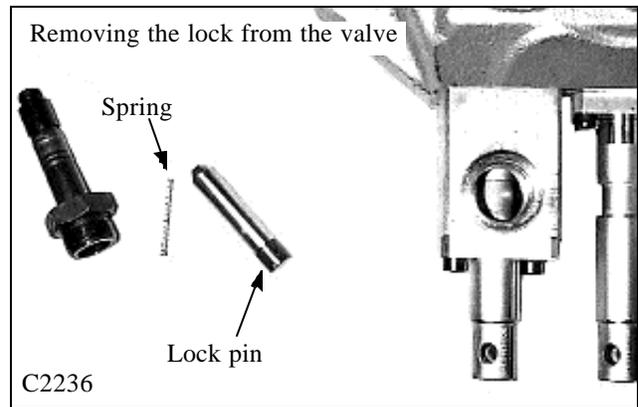
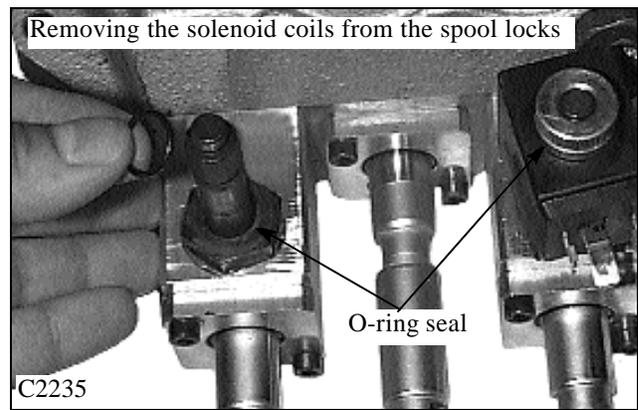
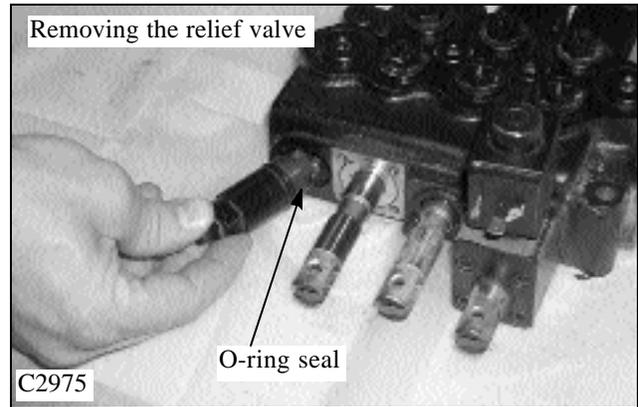
To avoid eye injury, use safety goggles when cleaning with compressed air.

Ensure all openings are plugged to prevent solvents and dirt from contaminating the control valve assembly. Refer to diagram C2776, pg. 1-25, to assist in the disassembly of the control valve.

1 Remove the pressure relief valve. Discard the O-rings (fig. C2975).

2 Remove the solenoid coils and locking pin from the valve lock block. (fig. C2235, C2236) There are 2 O-ring seals located on either side of the solenoid coils.

3 Remove the outer wiper seal cover from the lock block. (fig. C2244)

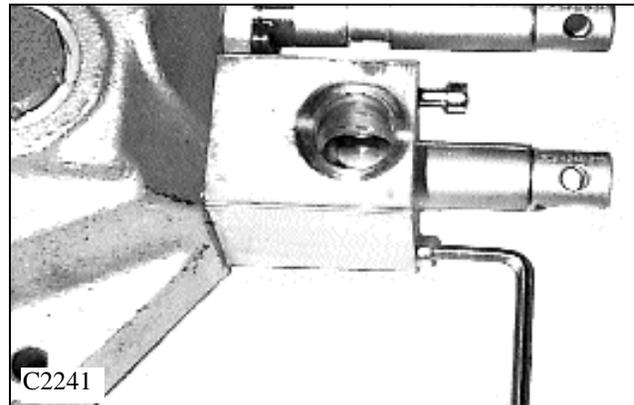


CONTROL VALVE 1.3

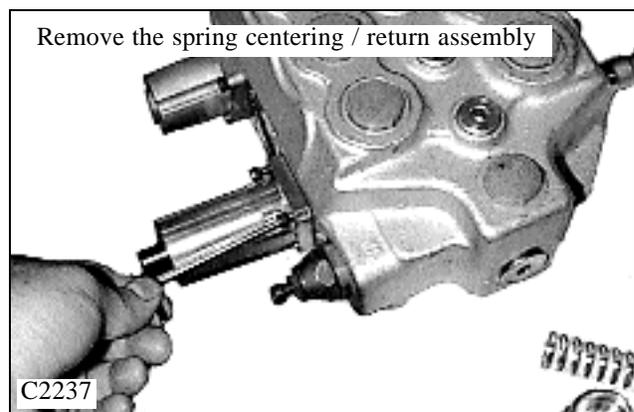
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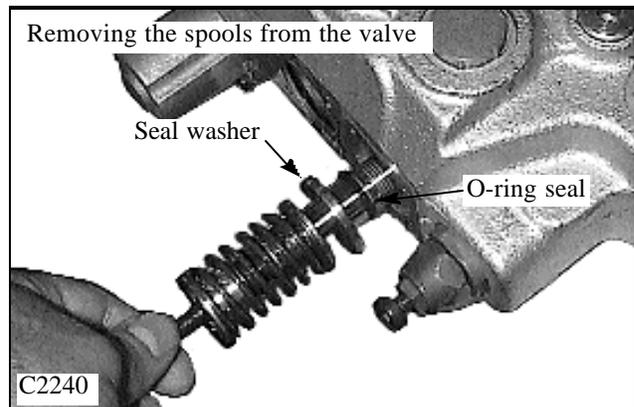
4 Remove the lock block from the valve. (fig. C2241)



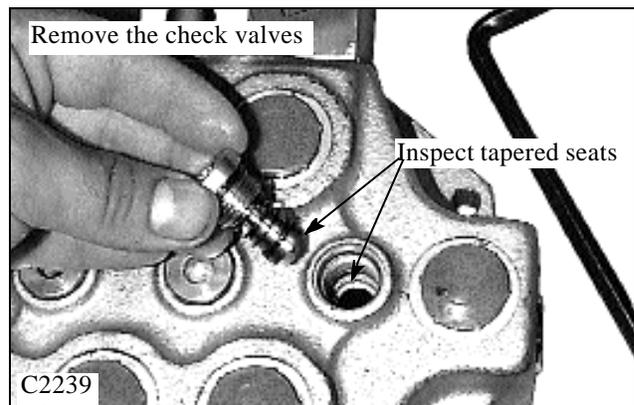
5 Remove the spring return / centering cap from the end of the spool. (fig. C2237)



6 Pull out the spool. (fig. C2240) As you pull out the spool, note it's smooth action as it comes out of the valve body. The spool should move freely and smoothly in the bore of the valve body. Check the control valve spool and bore for scuff marks or abnormal wear. Replace the spool and or control valve if signs of wear are present.



7 Remove the check valves from control valve body. (fig. C2239) They are located between the ports of each section. Check the seat and poppet of the valve body and check valve. Replace the check valve and or the control valve if any signs of wear are present.

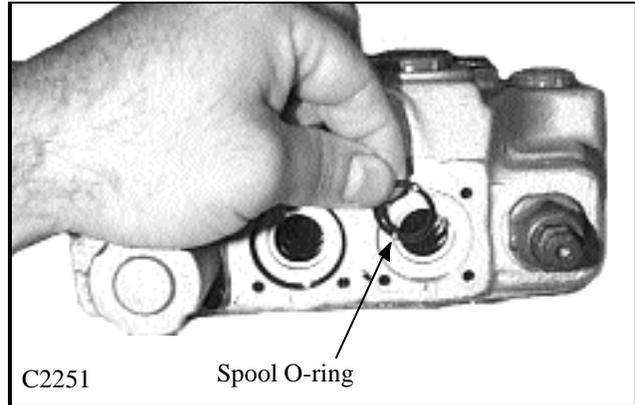


CONTROL VALVE 1.3

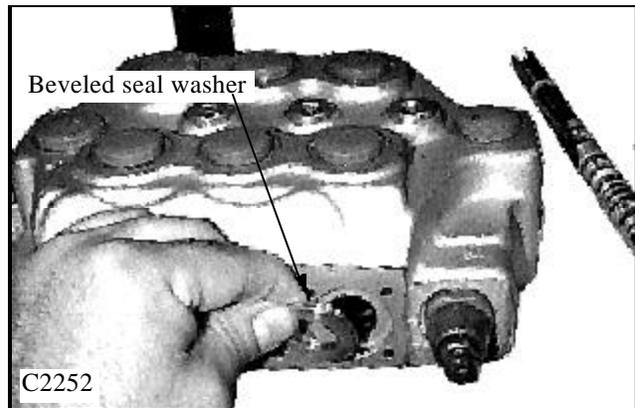
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Disassembly Repair (cont'd)

8 When replacing the spool to the control valve, use new O-ring seals and apply system oil to the O-rings and spools. (fig. C2251).



9 Fit the seal washer to the control valve with the beveled side of the washer facing the control valve. (fig. C2252) Fit the spool to the control valve now if repairs are not needed to the detent or spring return mechanism. Use system oil to lubricate the spool before inserting to the control valve.

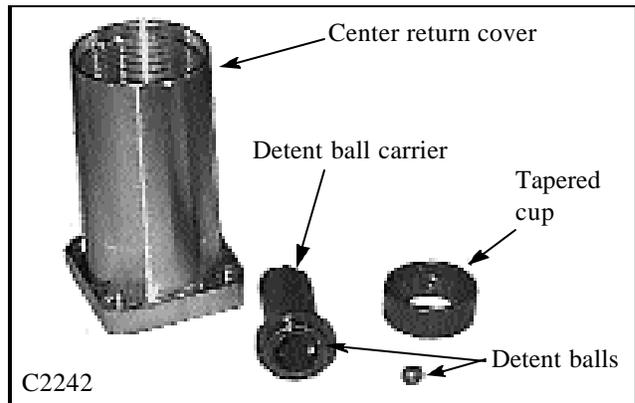
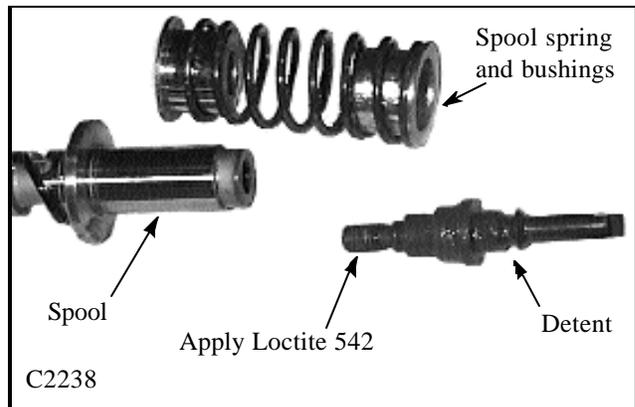


10 Photographs C2238, C2242 are exploded views of the lift spool detent mechanism. Place the cable end of the spool in a vice, or insert a screw driver through the clevis pin holes, to keep it from turning. The detent is threaded to the spool and can be removed for inspection or repairs.

Replace broken springs, worn detents and / or damaged detent balls with a new detent kit.

Apply Loctite 542 to the threads of the detent when installing to the spool.

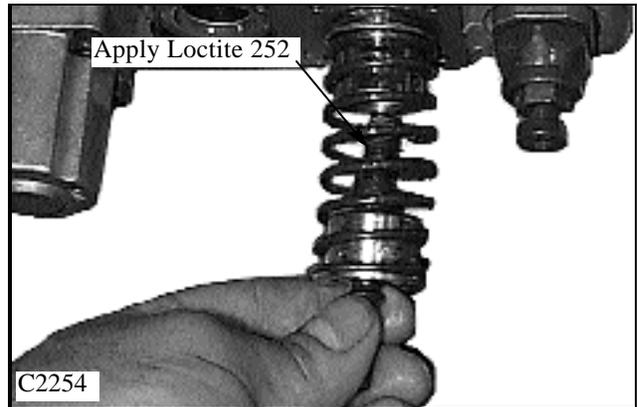
Apply Castrol "Spheerol" TN grease to the inside of the spring cover.



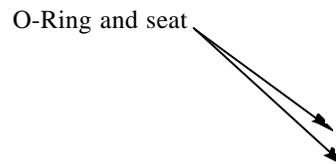
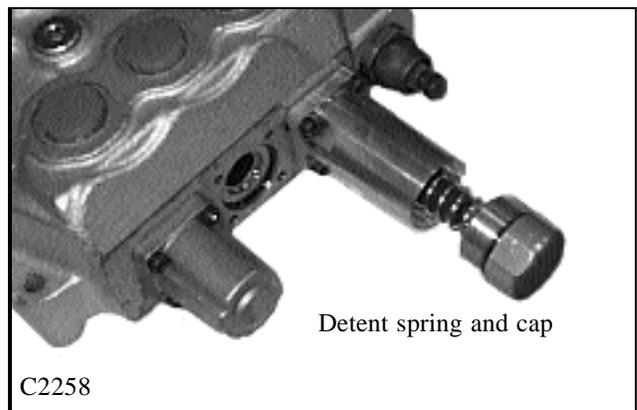
CONTROL VALVE 1.3

Disassembly / Repair (cont'd)

11 When installing the detent to the control valve spool, apply Loctite type 252 to the threads. Tighten the detent to the spool at 24 Nm (17.7 lbs / ft).



12 Install the spring return / centering cover and tighten the mounting screws evenly to 6.6 Nm (4.9 lbs / ft). Install the end cap to the cover and tighten to 9.8 Nm (7.2 lbs / ft).

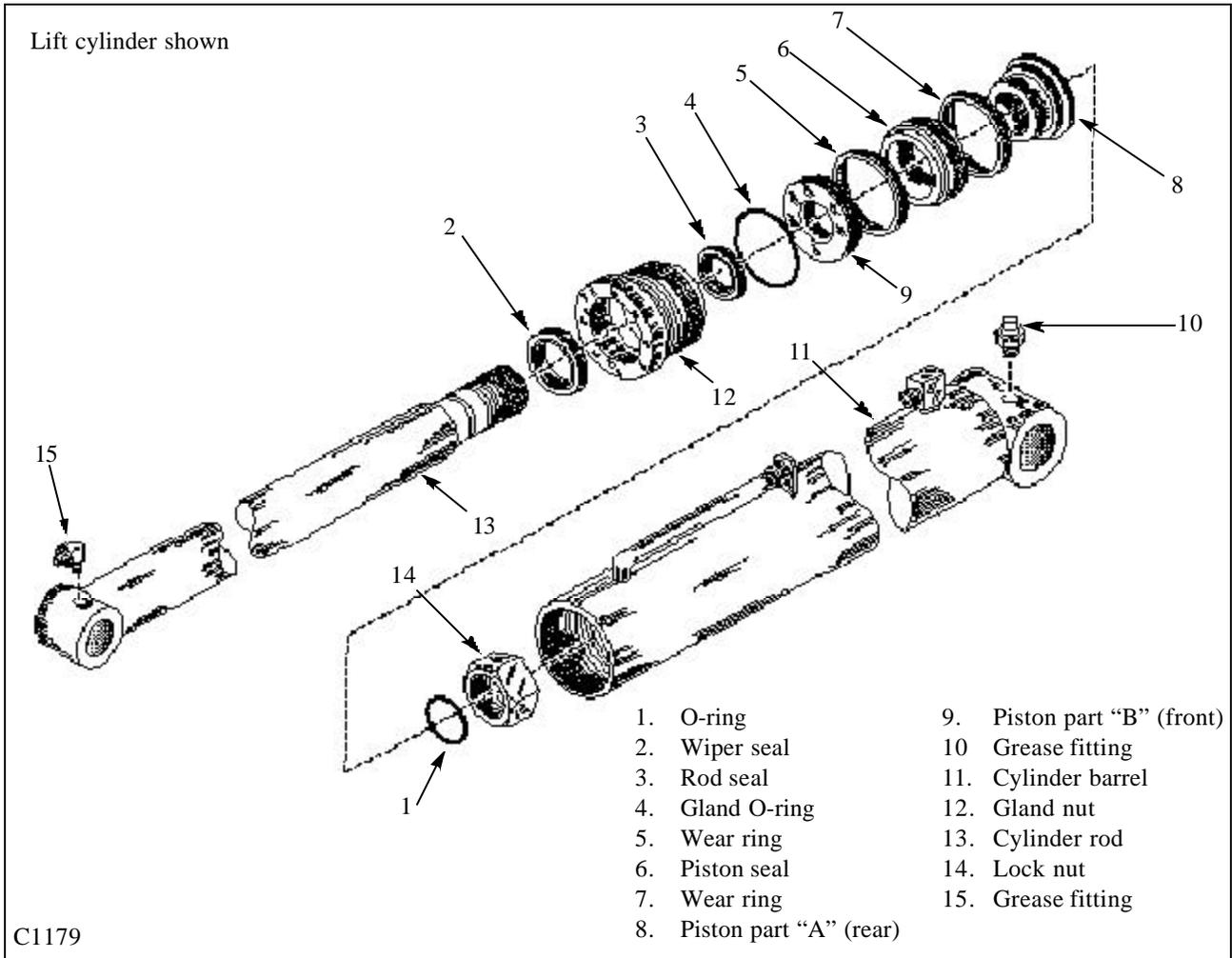


C2250

1

HYDRAULIC CYLINDERS 1.4

1



General Information

All cylinders are a double acting, designed to extend and retract under pressure.

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

All cylinders have a 2 piece piston assembly made of ductile iron and a polypac seal arrangement consisting of a piston seal and 2 wear rings.

The rod seal is a "U" cup design, with the "U" facing the pressurized oil. The rod wiper keeps foreign matter from entering the cylinder by wiping the rod clean as the cylinder retracts.

The gland nut seal is of an "O" - ring design. This seal keeps the oil from leaking around the gland nut and cylinder barrel threads.

Certain cylinders have spacers in them. These spacers are used to limit the stroke of the rod.

Some cylinders also have replaceable hardened bushings in the pivot areas that can be serviced when worn out.

HYDRAULIC CYLINDERS 1.4

1

Testing the Piston Seals

If the boom or bucket cylinders drift down with the control valve spools in the neutral position, and with no external leaks in the hydraulic system, the following test will indicate if oil is leaking by the cylinder piston seals. With the hydraulic oil at operating temperature and a fully loaded attachment, check that the cylinders do not drop more than 1.5 inches every 3 minutes with the engine off. Before performing this test, ensure the control linkages are not binding and the hydraulic control valve spools are centering in the neutral position. If the test has proven excessive leak down the cylinders may be further tested in the following manner.

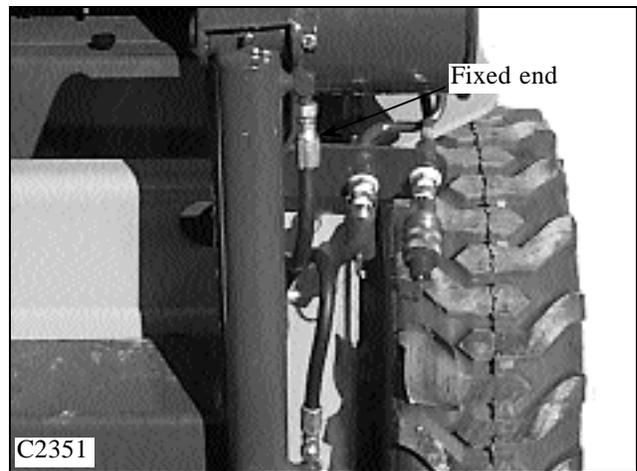
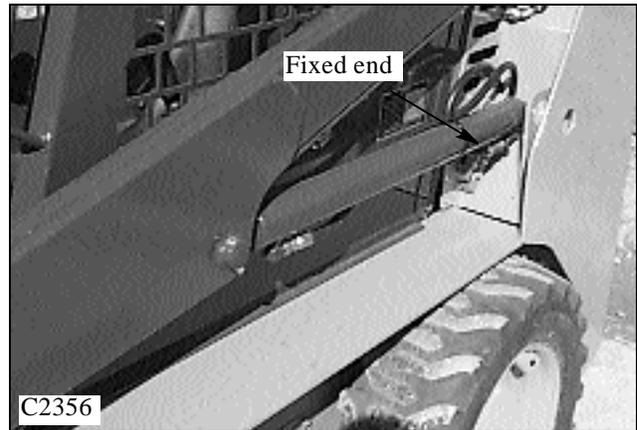
IMPORTANT

Allowable boom or bucket cylinder drop: 1.5" in 3 minutes, @ loaded rating and operating temperature.

WARNING

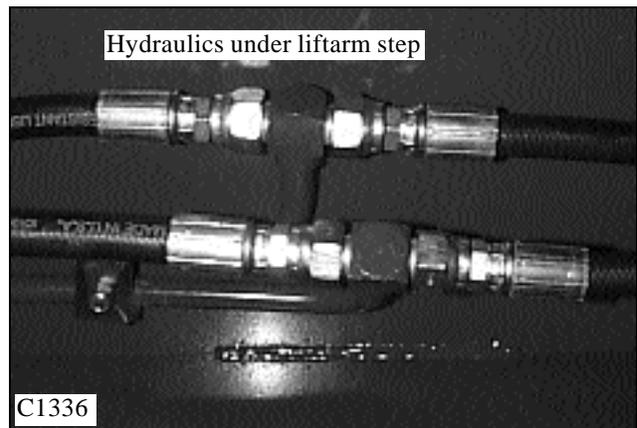
Never repair or tighten hydraulic lines while the engine is operating or the system is under pressure.

- 1 This test must be performed with the engine running. Remove any attachment and block the loader securely with all 4 wheels off the ground.
- 2 Retract the cylinder(s) to be tested. Shut off the engine and cycle the controls to release the hydraulic pressure.
- 3 Disconnect the hose from the fixed end of the cylinder to be tested. Cap the hose with a steel plug to prevent system charge pressure from escaping the open circuit and to prevent contamination.
- 4 Start the engine and cycle the control(s) as to retract the cylinder. Do not over activate the controls as to place in the detent position. Have a container can ready to catch any waste oil to prevent environmental contamination.
- 5 Repeat for all both cylinders.
- 6 If oil leaks from the cylinder port the seals are bad and need replacement. If no oil leaks you may need to check the load check valves or spool wear in the hydraulic control valve.
- 7 Connect the hydraulic hose to the cylinder ports if no further servicing is required.



WARNING

Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury. Never use your hands to check for leaks.



HYDRAULIC CYLINDERS 1.4

1

Lift Cylinder Replacement

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open lines and ports.

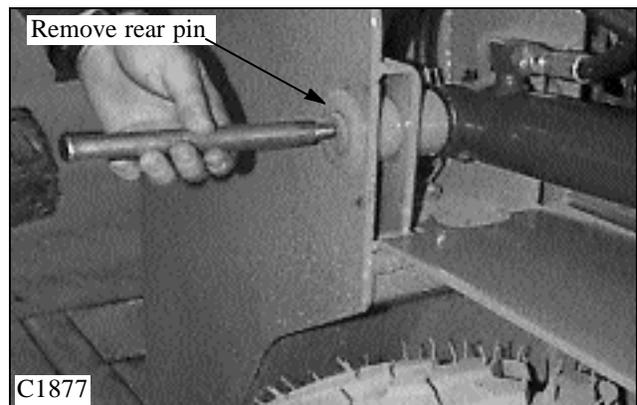
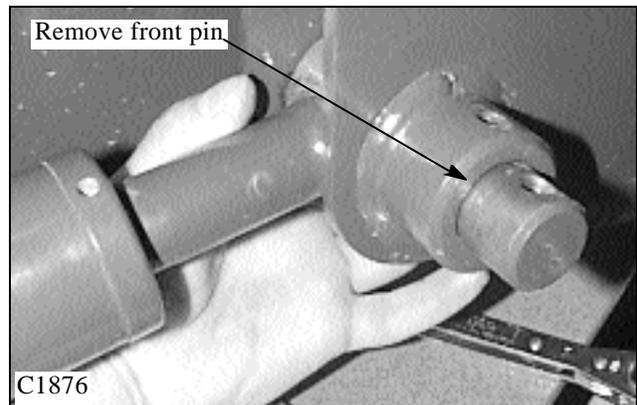
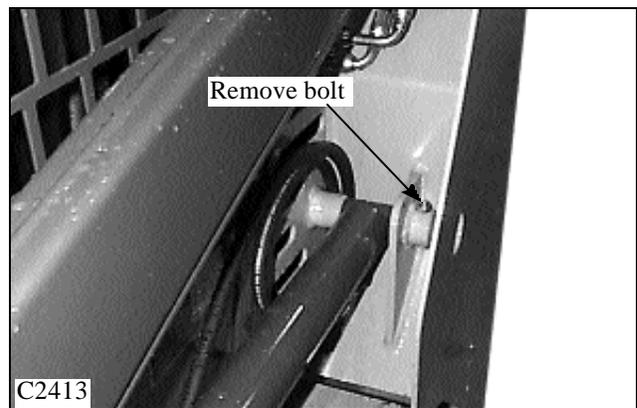
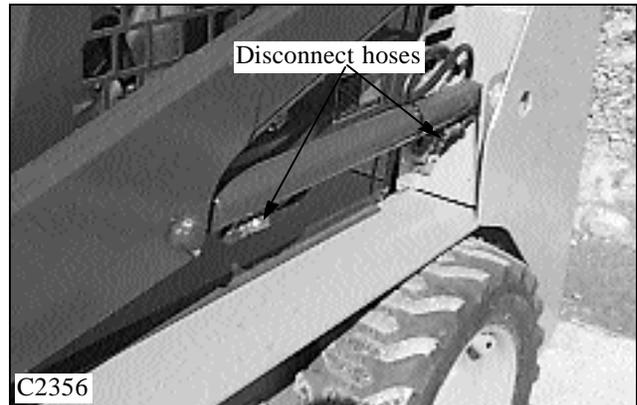
The following procedure will assist you in the cylinder removal.

For removal of the boom cylinders:

- 1 Lower the boom arms, stop the engine and cycle the controls to relieve any hydraulic back pressure in the system. Lock the control in the float or detent position.
- 2 Remove the hydraulic hoses from the cylinder. (fig. C2356) Cap all open ports and lines to prevent contamination.
- 3 Remove the lock nut and bolt from both mounting pins. (fig. C2413, C1864)
- 4 Remove the front pivot pin by pushing the pin out from behind the boom arm, out toward you. (fig. C1876) With an appropriate punch and hammer to prevent brooming of the pin, remove the rear pin. (fig. C1877) Brooming the pin makes it difficult to remove.
- 5 Remove the cylinder from the loader.
- 6 Upon replacement, inspect the pivot pins and cylinder bushings for any wear. Replace if necessary. Reverse order above for installation.
- 7 Upon start up, check for system leaks and replenish the hydraulic reservoir as required.

WARNING

Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury. Never tighten or repair hydraulic lines while the engine is operating.



HYDRAULIC CYLINDERS 1.4

1

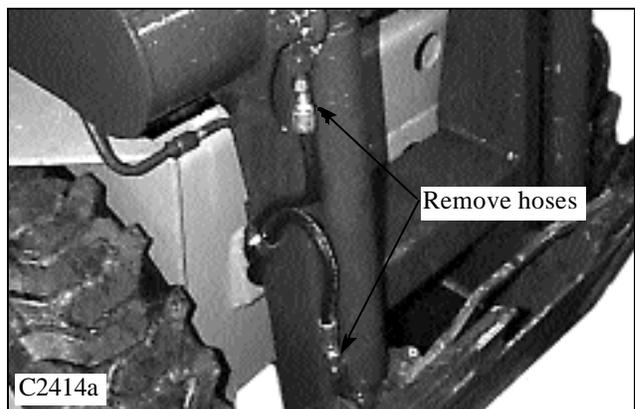
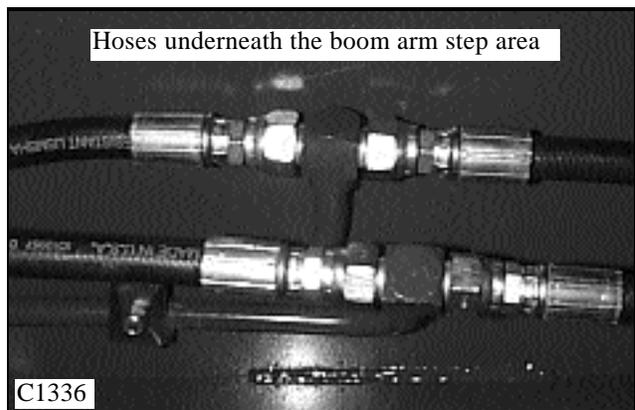
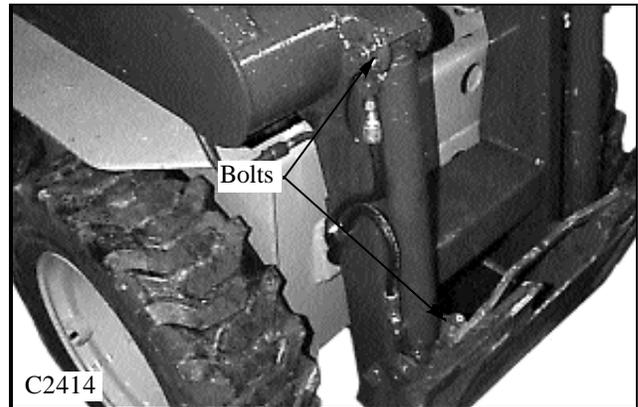
Tilt cylinder Replacement

For tilt cylinder removal:

- 1 Lower the boom arms, remove any attachment and extend the tilt cylinders. Shut off the engine and cycle the controls to relieve excessive back pressure in the hydraulic system.
- 2 Loosen or remove the hydraulic hoses from hydraulic tubing under the boom arm step if you are changing the hoses also. (fig. C1336)
- 3 Remove the hydraulic hoses from the tilt cylinder. Plug and or cap all open ports or lines to prevent contamination. (fig. C2414a)
- 4 Remove the lock nuts from the bolts retaining the pivot pins to the loader and remove the bolts. (fig. C2414)
- 5 Remove the pivot pins.
- 6 Remove the cylinder from the loader.
- 7 Upon reassembly, inspect the pivot pins and bushings for wear and replace as required. Reverse order for cylinder installation.
- 8 Upon start up, check for system leaks and replenish the hydraulic oil reservoir as required.

WARNING

Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury. Never tighten or repair hydraulic lines while the engine is operating.



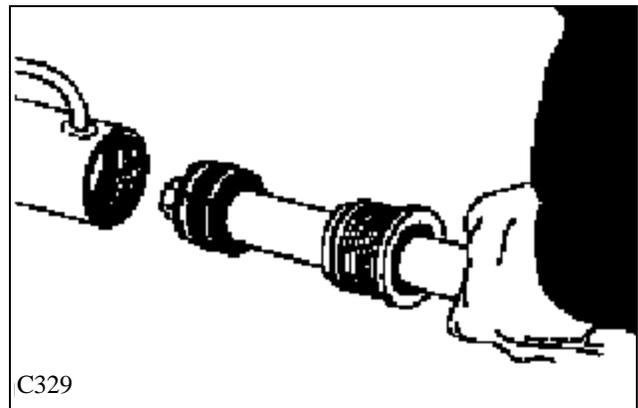
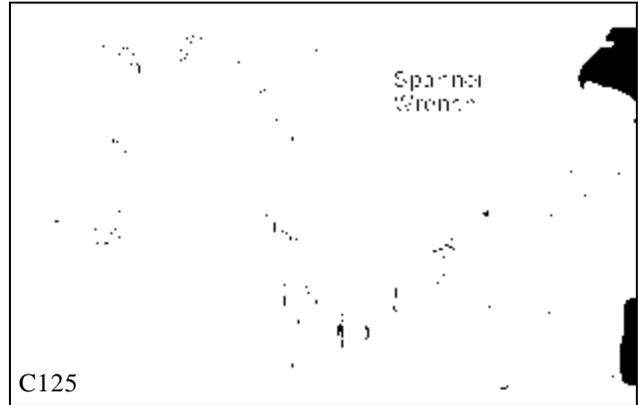
HYDRAULIC CYLINDERS 1.4

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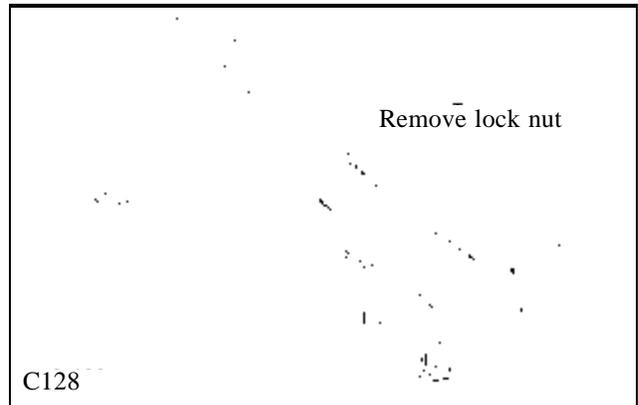
Cylinder Disassembly

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

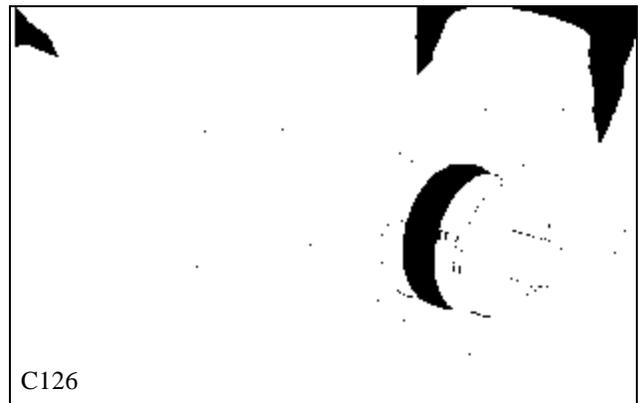
- 1 Remove the cylinder as outlined previously.
- 2 Place the base end of the cylinder in a vise and support the front end of the body. Remove the plugs from the hose ports. (fig. C125)
- 3 Loosen the gland nut from the cylinder barrel using a spanner wrench. The gland nut threads are coated with loctite bonding agent at time of assembly. It may be necessary to apply heat to the gland nut and cylinder barrel threaded area, with a torch, to ease removal. (fig. C125)
- 4 Remove the gland nut, rod and piston seal assembly from the barrel. (fig. C329)



- 5 Place the cylinder rod bushing end in a vise and remove the lock nut from the rod. (fig. C128)



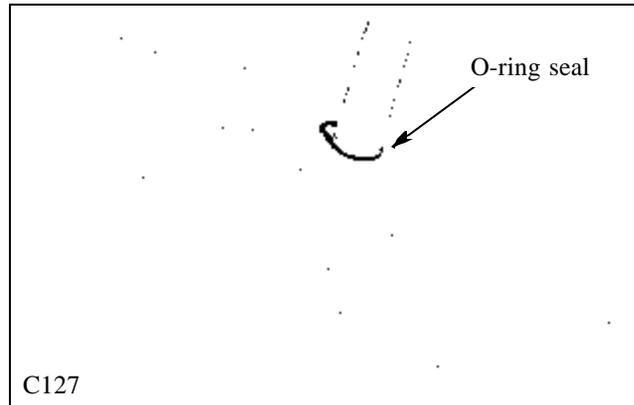
- 6 Remove the 2 piece piston assembly from the rod. (fig. C126)
- 7 **NOTE:** Some piston assemblies rear piston parts are threaded onto the rod. You will need to use a spanner wrench to remove this type of rear piston.



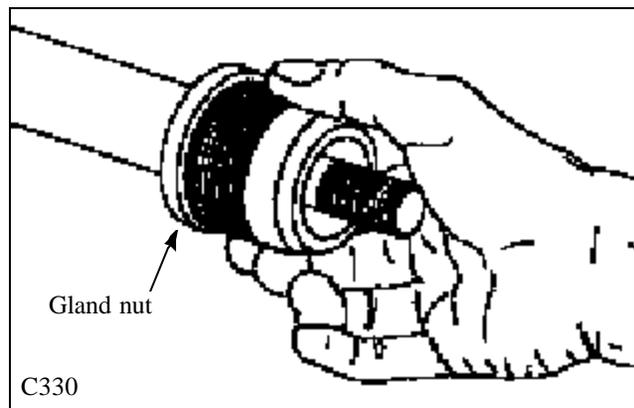
HYDRAULIC CYLINDERS 1.4

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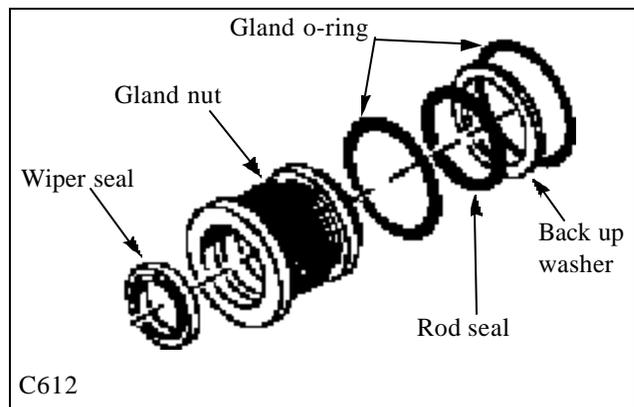
8 Depending on the design of the rear piston, non threaded type, remove and discard the o-ring seal from the end of the cylinder rod. (fig. C127)



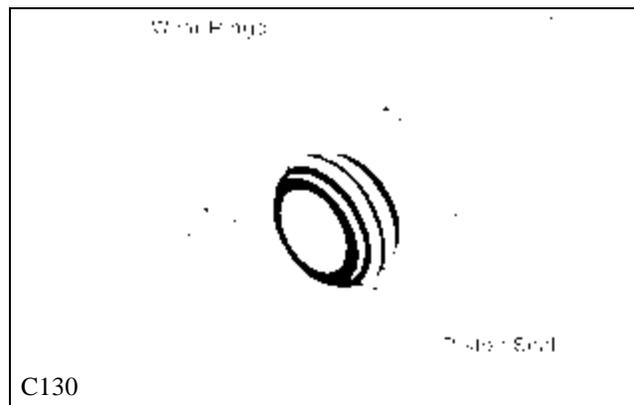
9 Remove the gland nut assembly from the cylinder rod. (fig. C330)



10 Remove and discard the wiper seal, rod seal and o-ring seals and teflon back up washer, (if used), from the gland nut assembly. (fig. C612) NOTE: Some seal designs may vary from illustration



11 Remove and discard the wear rings and piston seal from the piston assembly. (fig. C130)



HYDRAULIC CYLINDERS 1.4

1 Cylinder 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 must 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 to withstand the high torque required to secure the piston assembly to the rod.
- 3 Inspect the gland nut for nicks, burrs or other damage. Minor damage may be repaired using a fine abrasive.

Smooth down edges that could damage seals and cause leakage.

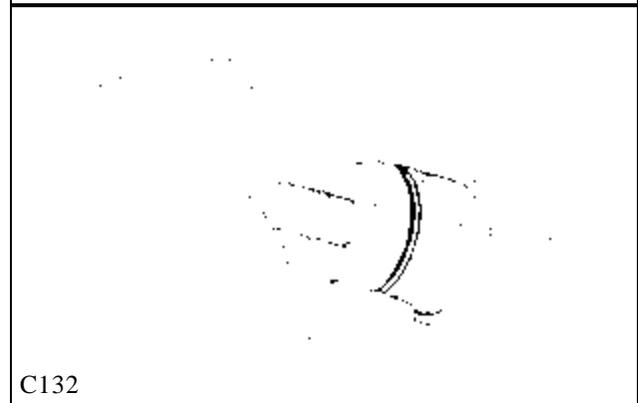
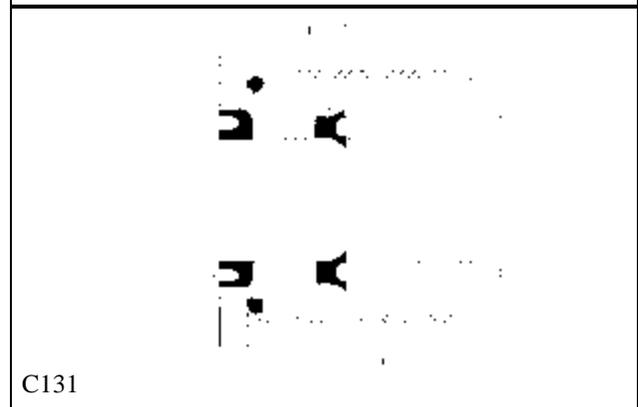
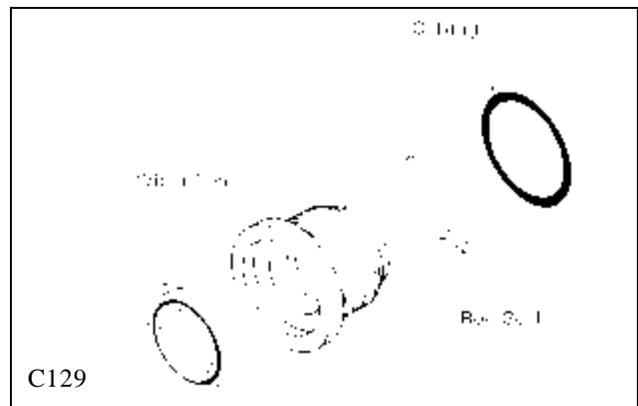
- 4 Inspect the gland nut threads for damage.
- 5 Inspect the piston assembly for damage. Remove minor scratches or damage with a fine abrasive.
- 6 Using a suitable light, inspect the cylinder barrel bore for scratches, dents, burrs or any other damage. Replace the cylinder barrel if there is any evidence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

Cylinder Assembly

1 Install a new gland nut rod seal. Form the seal into an oval shape and place it into the gland nut, with the “U” side of the seal facing the barrel end, and slip the seal into the groove. (fig. C129, C131)

- 2 Install a new wiper seal in the gland nut. (fig. C129, C131)
- 3 Install a new gland nut o-ring seal. (fig. C129, C131)

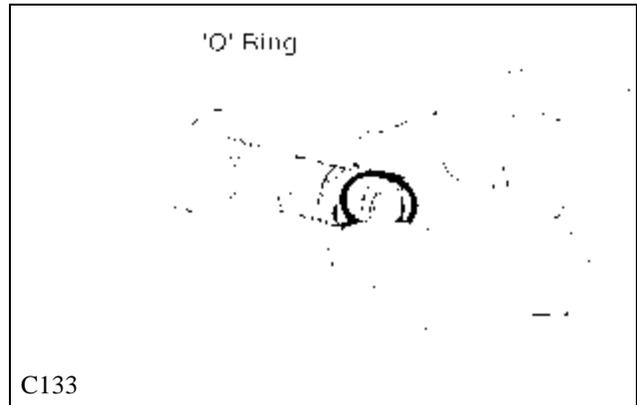
4 Apply system oil to the cylinder rod and assemble the gland nut assembly to the rod. (fig. C132)



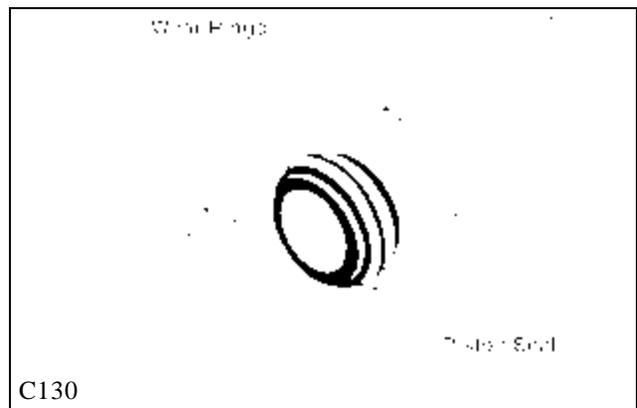
HYDRAULIC CYLINDERS 1.4

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5 Install a new o-ring seal on the cylinder rod if used. Some cylinder rod are fully threaded here to accommodate a threaded type rear piston part. (fig. C133)

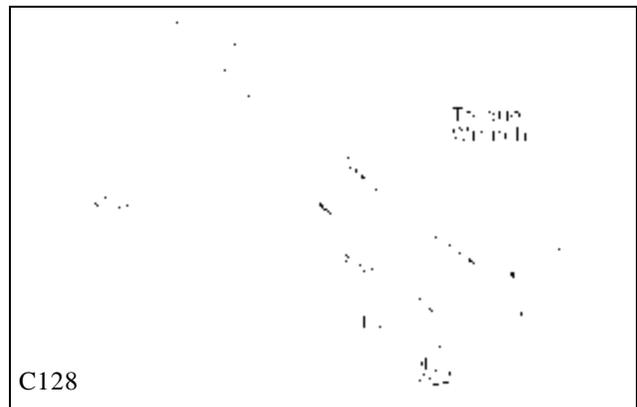


6 Install new wear rings and piston seal to the the 2 piece piston assembly. (fig. C130)



7 Install the piston assembly to the cylinder rod. Some rear piston assemblies are threaded onto the cylinder rod. Use a spanner wrench to install the rear piston part to the cylinder rod. Torque the lock nut to the rod at 150 ft / lbs (204 N.m.). (fig. C128)

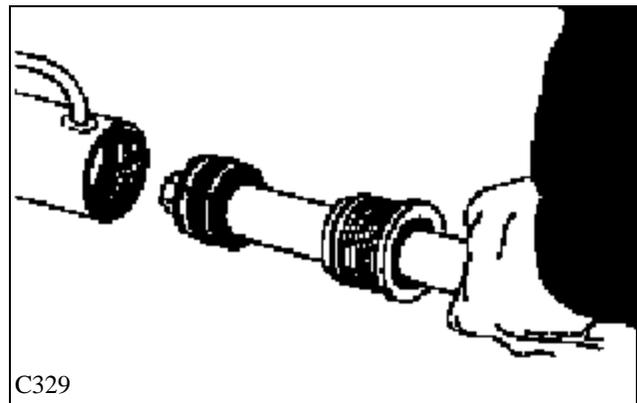
8 Make sure the inside bore of the cylinder barrel is clean. Lubricate the inside of the barrel with system oil. Do not get oil into the threaded area of the barrel.



9 Lubricate the piston seal assembly with system oil and install the cylinder rod and piston assembly to the cylinder barrel. (fig. C329)

10 Apply loctite 242 to the gland nut threads and tighten the gland nut using a spanner wrench. Tighten the gland nut as much as you can using the spanner wrench. Make sure the threaded area of the gland nut and cylinder barrel are free of oil before applying the loctite bonding adhesive.

11 Assemble the cylinder to the loader. Use teflon tape or equivalent on the threads of the hydraulic hose ends, if the hose ends are of the taper pipe thread type.



HYDRAULIC OIL FILTER 1.5

1

General Information

The hydraulic oil filter is located in the engine compartment, accessed by opening the rear door and lifting the engine compartment cover. The filter is mounted on the left side, on the oil reservoir.

All oil returning from the control valve is filtered before being used up by the hydraulic system.

The hydraulic oil filter is a spin on type with a 10 micron rating. The filter material is a resin impregnated cellulose which features an accordion pleated design to provide maximum filtration area. Only Thomas approved filters should be used.

The filter mounting head has a built in bypass valve that diverts oil around the filter when more than 25 psi (34 nm) differential pressure is required to force oil through the filter.

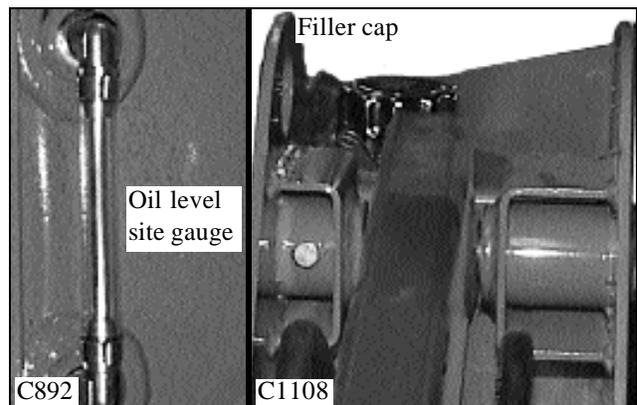
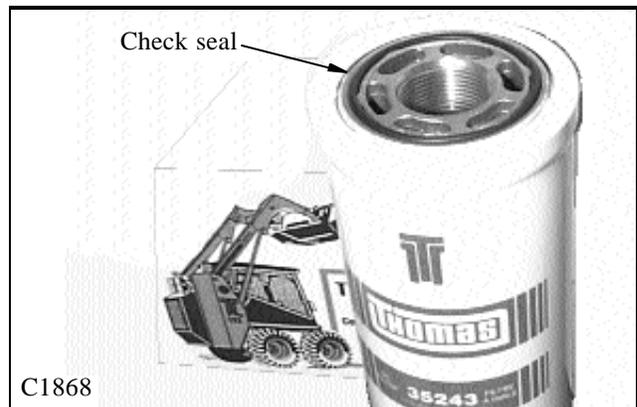
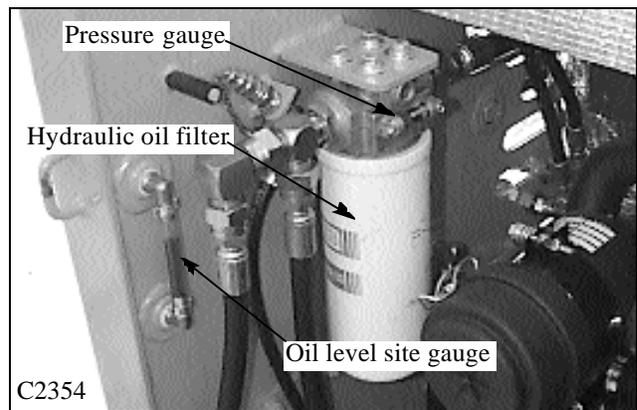
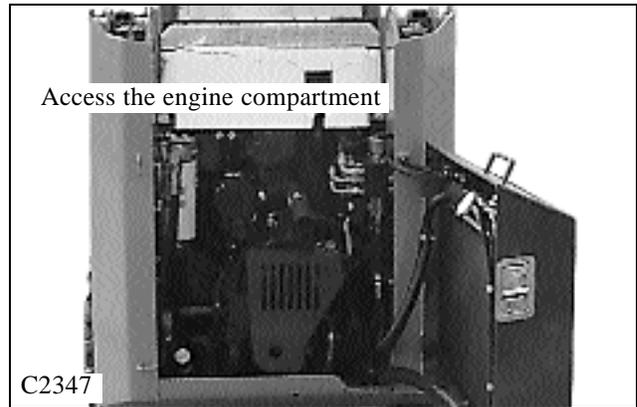
Filter Replacement

The hydraulic oil filter must be changed after the first 50 hours of operation and every 150 hours thereafter, or sooner if the pressure gauge dictates.

- 1 Lower the boom arms, shut off the engine and engage the parking brake.
 - 2 Open the rear door and raise the engine compartment cover to gain access to the hydraulic filter. (fig. C2347, C2354)
 - 3 Clean the area of excess dirt if necessary to prevent contaminating the new filter when installing
 - 4 Remove the hydraulic oil filter using a proper sized filter wrench. Check to make sure the o-ring seal has come off with the used filter. (fig. C1868)
 - 5 Lubricate the new filter seal with clean system oil.
 - 6 Install the filter and fit hand tight.
 - 7 After start up, check the system for oil leaks.
- Replenish the oil reservoir as required with API 10W30 class SE / CD. (fig. C892, C1108)

WARNING

Never repair or tighten hydraulic lines while the engine is operating or the system is under pressure.



HYDRAULIC OIL COOLER 1.6

General Information

The hydraulic oil cooler is mounted to the inside of the rear door. (fig. C2932) Oil returning from the control valve is circulated through the oil cooler before being sent on to other parts of the hydraulic system.

An engine driven cooling fan drives air through the oil cooler when the rear door is closed.

The oil cooler is rated at 250 BTU / minute.

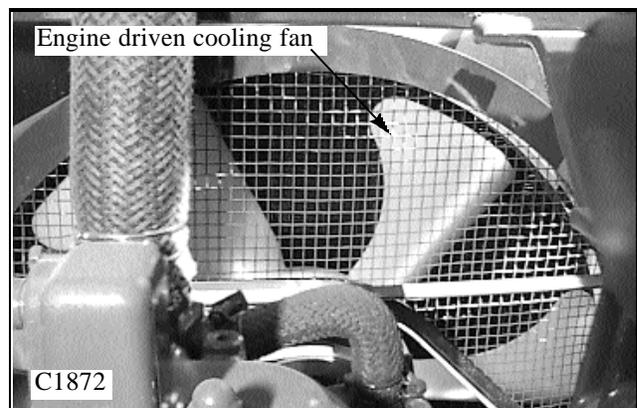
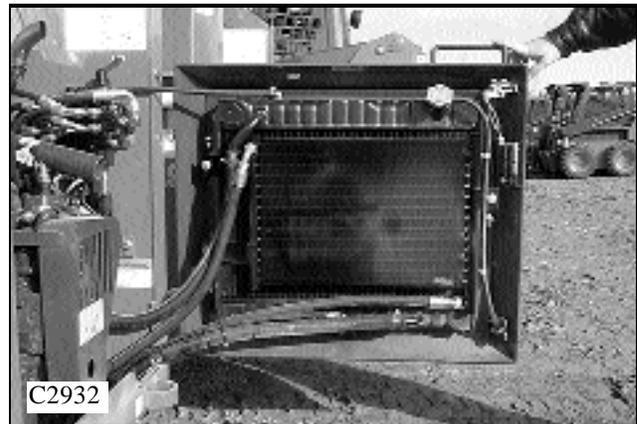
The oil cooler should be checked daily for dirt build up on the cooling fins. If air flow is restricted through the cooling fins, over heating of the hydraulic system may occur. Clean any dirt build up with compressed air. Flush with water if necessary.

WARNING

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

Cooler Replacement

- 1 Lower the boom arms, engage the parking brake and shut off the engine.
- 2 Open the rear door.
- 3 Connect a vacuum system to the oil reservoir filler spout, if available, or drain the hydraulic oil reservoir. Be prepared to contain 34 liters of fluid (9 gal). Use clean containers if the oil is to be reused.
- 4 Remove the cooler hoses. Plug the open hoses and cooler ports to prevent contamination.
- 5 Remove the cooler from the rear door.
- 6 Remove the fittings from the oil cooler.
- 7 Inspect the fitting o-rings for damage and replace if necessary.
- 8 Install the fittings into the new or repaired oil cooler following the torque chart on section 1.10. Be sure to support the cooler as the fittings are tightened to prevent damaging the cooler.
- 9 Replace the cooler & cooler lines. Follow the torque chart on section 1.10 when tightening the hydraulic hoses.
- 10 Replenish the hydraulic fluid as required. Check for system leaks and check the fit of the shroud seal to the engine radiator. Adjust if necessary.



HYDRAULIC OIL RESERVOIR 1.7

1

General Information

The hydraulic oil reservoir is located at the rear of the loader on the left hand side. (fig. C2934) The reservoir is completely separated from all chain and gear drives to eliminate contamination. A magnetic drain plug is installed in the bottom of the reservoir, and a magnet is attached to the 100 micron suction filter, to assist in removing metal particles from the oil.

Oil level is checked through a sight gauge located just inside the engine compartment, left hand side, on the oil reservoir. The proper fill level is marked by a line and should be checked daily. (fig. C2354)

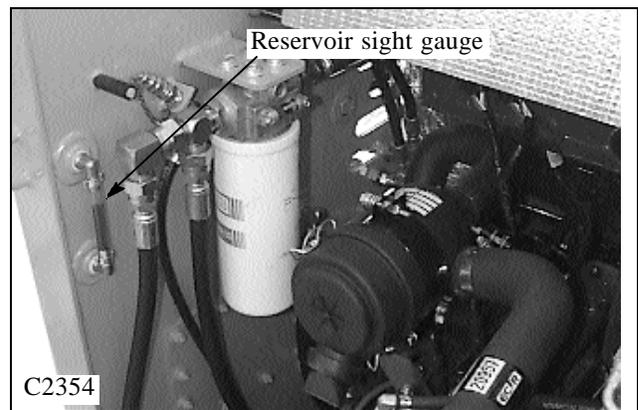
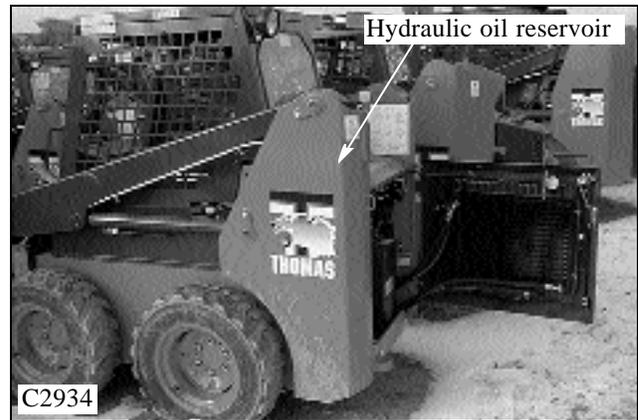
The oil reservoir fill cap is located at the top of the reservoir. (fig. C2355) The oil fill cap assembly has a 30 micron screen to catch larger particles of contaminant before entering the reservoir, but **always use oil filtered through a 10 micron min. filter for replenishing the hydraulic reservoir.** The oil fill cap is also a reservoir vent, or breather, and contains a 10 micron filter to remove air borne particles.

Checking The Oil Level

- 1 Check the reservoir oil level with the loader on level ground.
- 2 Lower the boom arms, retract the cylinders and engage the parking brake. Shut off the engine.
- 3 Open the rear door. (fig. C2934)
- 4 Check the oil level in the sight gauge. (fig. C2354)
- 5 If oil is visible approximately mid way in the sight gauge, the level is correct.

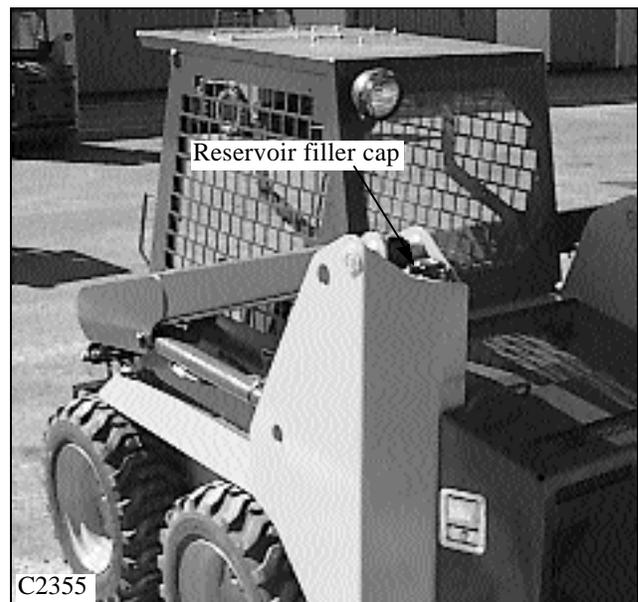
Adding Oil

- 1 Remove the bolt, or lock, on the reservoir filler cap.
- 2 Open the filler cap. (fig. C2355)
- 3 Inspect the filler screen in the filler neck for damage. If the filler screen is damaged, replace it.
- 4 Using a clean container, add 10W30 API class SE / CD oil.
- 5 Replace the filler cap and replace the bolt, or padlock, in the cap to prevent vandalism.



IMPORTANT

Always use filtered oil to replenish the hydraulic system.

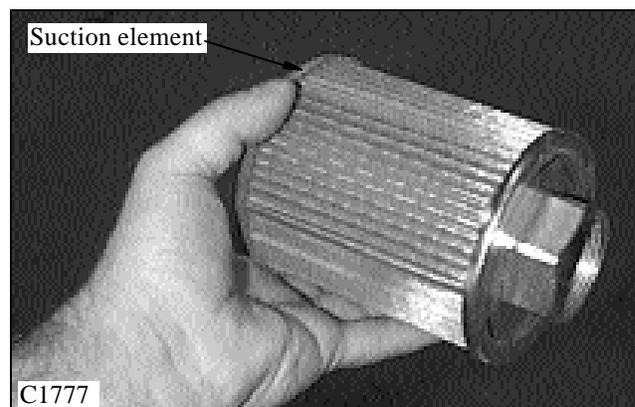
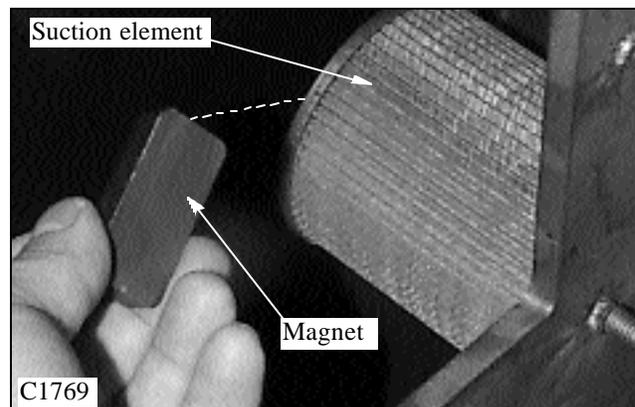
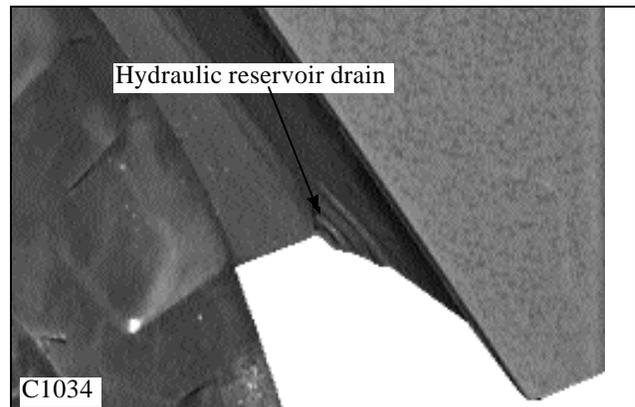


HYDRAULIC OIL RESERVOIR 1.7

Servicing The Oil Reservoir

Change the hydraulic oil, change the suction screen element and clean the magnet in the tank after every 1000 operating hours or if the oil has become contaminated or after any major hydrostatic drive system repair.

- 1 Lower the boom arms, shut off the engine and engage the parking brake.
- 2 Remove the magnetic drain plug located at the bottom of the hydraulic oil reservoir. (fig. C1034) Clean any metal particles that may be attached to the magnet. Have containers ready to hold approximately 10 gallons (45 £) of fluid. Replace the drain plug using teflon sealing tape or liquid type sealant on the plug threads.
- 3 Access the suction screen element in the hydraulic reservoir by removing the inspection cover on the reservoir, located in the engine compartment. (fig. C2357) Clean the excess silicone from the cover and reservoir.
- 4 Remove the suction screen element from the reservoir by turning counter clockwise. (fig. C1769, C1777)
- 5 Remove and clean the magnet attached to the suction element. (fig. C1769)
- 6 Install the magnet onto a new suction element and install the suction element.
- 7 Apply silicone around the inspection hole and install the inspection cover to the reservoir. Do not over tighten the mounting nuts. Maximum torque is 18 ft / lbs (24 N.m.).
- 8 Fill the reservoir to the proper level with 10W30 API classification SE / CD oil, approximately 13 gallons or 50 liters.



TROUBLE SHOOTING 1.8

1

Problem	Cause	Corrective Action	Section
Loss of hydraulic power (no flow from the gear pump).	Reservoir low on oil.	Check for leaks. Fill the reservoir to the proper level.	1.8
	Universal joint between engine and tandem pump failure.	Inspect and replace the damaged parts as required. Check for proper alignment.	7.11
	Gear pump not functioning.	Inspect and replace damaged parts.	1.4 / 2.9
	Splined coupling failure in the hydrostatic pump	See the Sauer Sundstrand Repair Manual BLN 9992.	2.10
Loss of hydraulic power (full flow from gear pump).	Electrical failure.	Check fuse, switches and wiring.	8
	Auxiliary hydraulics engaged.	Disengage the switch.	4.9
	Relief valve failure or out of adjustment.	Check pressure. Adjust or repair as required.	1.4
	Control locks engaged	Check fuse, safety switches and valve lock parts.	1.4 / 8
Hydraulic action jerky.	Reservoir low on oil.	Check for leaks. Fill the reservoir to the proper level.	1.8
	Control linkages loose or worn.	Inspect, adjust or replace parts.	4
	Air in hydraulic system.	Check for leaks between the oil reservoir and pump.	
	Load check valve not functioning.	Inspect and replace damaged parts.	1.4
	Control valve spool spring return mechanism not functioning	Inspect and replace damaged parts.	1.4
Boom raises slowly at full RPM	Reservoir low on oil.	Check for leaks. Fill the reservoir to the proper level.	1.8
	Control linkages loose or worn.	Inspect, adjust or replace parts.	4
	Auxiliary hydraulics engaged.	Disengage the switch.	4.9
	Lifting more than rated capacity.	Reduce the load.	
	Engine RPM too low.	Check engine RPM and reset.	7.11
	Relief valve failure or out of adjustment.	Check pressure. Adjust or repair as required.	1.4
	Cylinder seal(s) failure.	Check seals.	1.5
	Internal leakage in the control valve.	Inspect the control valve and repair as required.	1.4
Hydraulic cylinders will not support a load. (leak down)	Control valve spools not centering.	Check control linkage and control valve spool spring centering devise.	1.4 / 4
	External leak between control valve and cylinders	Inspect and repair.	
	Cylinder seal(s) failure	Check seals.	1.5
	Load check valve not functioning.	Inspect and replace damaged parts.	1.4

TROUBLE SHOOTING 1.8



Problem	Cause	Corrective Action	Section
Hydraulic oil overheating.	Reservoir low on oil.	Check for leaks and replenish as required.	1.7
	Oil cooler plugged or dirty. (if applicable)	Clean the cooling fins.	
	Auxiliary hydraulics engaged.	Disengage.	
	Temperature sender defective.	Replace.	8
	Relief valve failure or out of adjustment.	Check pressure, adjust or replace.	1.4
	Wrong type of hydraulic fluid.	Replace.	1.7

TORQUE CHART 1.9

Hydraulic Hose and Fitting Torque Chart

NOTE: all torques are in lbs. / ft (Multiply by 1.36 = N.m.)

HOSE SIZE	37° JIC FITTINGS	HOSE SIZE	ORB FITTINGS
1/4	9 to 10	1/4	14 to 16
5/16	15 to 16	5/16	18 to 20
3/8	20 to 22	3/8	24 to 26
1/2	30 to 33	1/2	50 to 60
5/8	40 to 44	5/8	72 to 80
3/4	70 to 77	3/4	125 to 135
7/8	82 to 90	7/8	160 to 180
1	55 to 60	1	200 to 220
1 1/4	120 to 132	1 1/4	210 to 280
1 1/2	131 to 144	1 1/2	270 to 360
2	300 to 330		

The following torque specifications are for steel ORB fittings into aluminum.			
HOSE SIZE	ORB FITTINGS	HOSE SIZE	ORB FITTINGS
1/4	5 to 7	3/4	40 to 45
5/16	8 to 10	7/8	50 to 55
3/8	10 to 12	1	90 to 99
1/2	21 to 24	1 1/4	80to 90
5/8	27 to 30		

NOTES



THOMAS

SECTION 2

HYDROSTATIC DRIVE SYSTEM

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Parts Illustration	pg. 2-32 ~ 33
Disassembly	pg. 2-34
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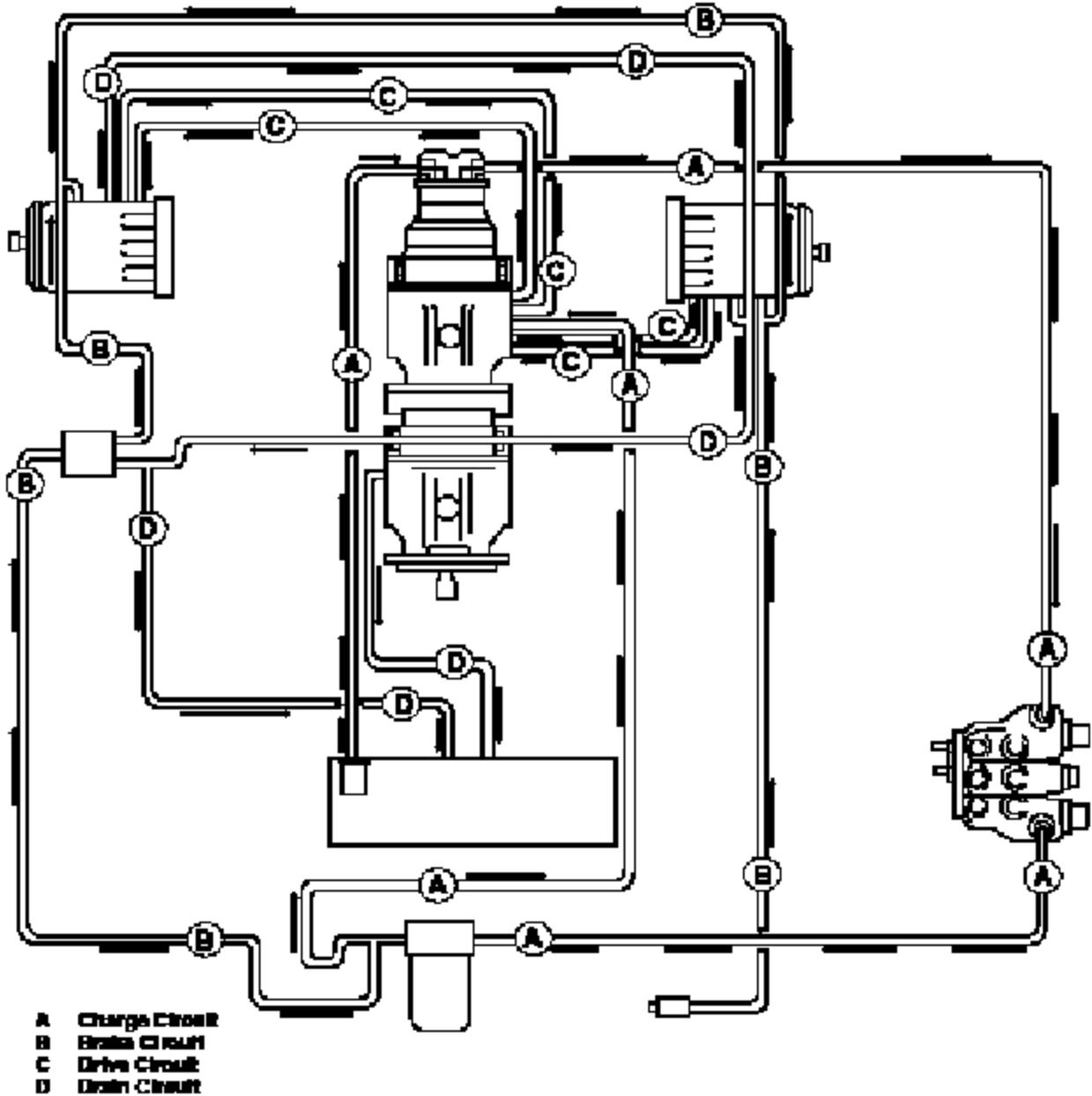


HYDROSTATIC CIRCUIT 2.1

2

Hydrostatic Circuit Schematic

C1007



SPECIFICATIONS 2.2

Hydrostatic Tandem Pump

Pump Type	Variable Displacement, Reversible Piston
Brand Name of Pump	Sauer Sundstrand
Series / Model Type	40 / M25 PT
No. Of Drive Pumps	2 (TWO)
Mounting	Tandem
Rotation (viewed from shaft end)	Clockwise
Operating Speed	3000 RPM (+ / - 50 RPM)
Pump Displacement	1.5 cu. in. (25cc)
Minimum Pump Output (flow)	9.5 gal. (36L) / Minute @ 1800RPM @ 2000 PSI (137.8 Bar) Over Measured Charge Pressure
No. Of Relief Valves	2 (TWO)
Relief Valve Setting	250 Bar (3625 PSI)
Max. Allowable Case Pressure	25 PSI (1.7 Bar)
Charge Pump Type	N / A
Charge Pressure	200 PSI Min. (13.8 Bar)
Hydrostatic Repair Manual	Thomas P / N 44232 Sauer Sundstrand P / N BLN-9992

Hydraulic Drive Motor

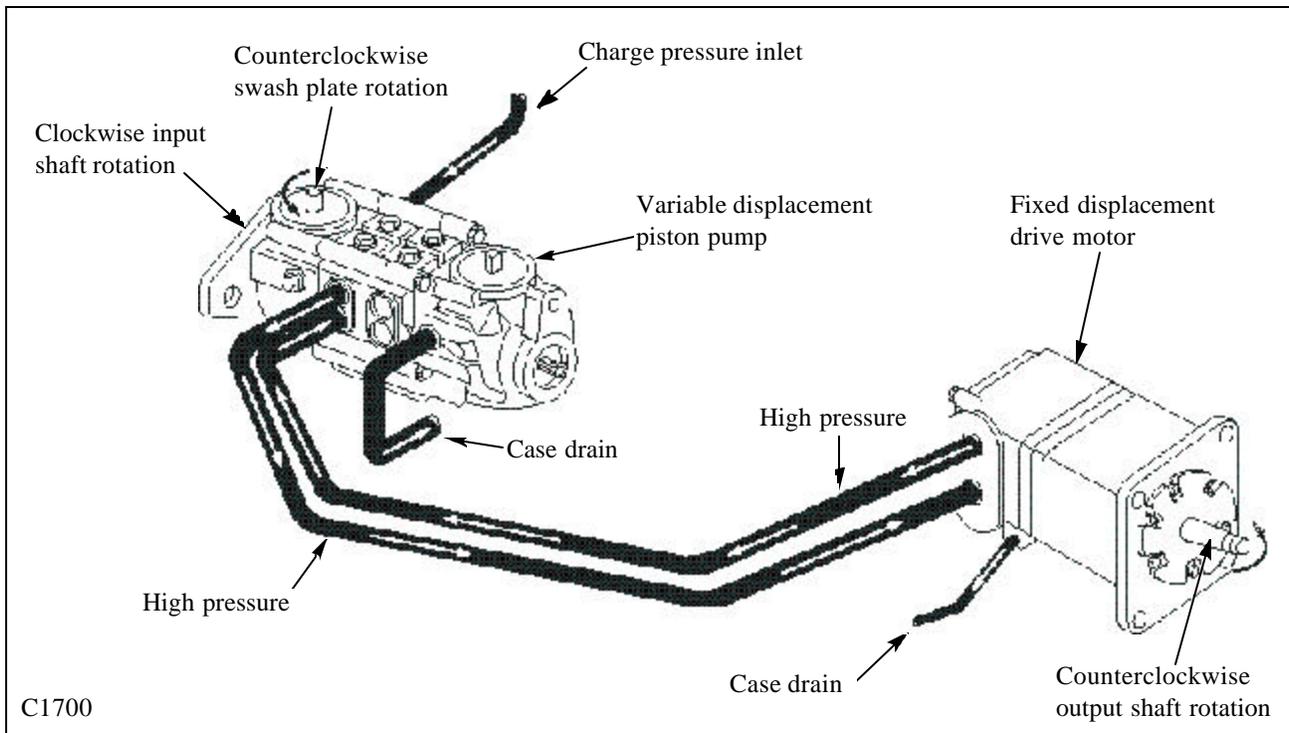
Drive Motor Type	Geroler Torque Motor With Brake
Brand Name	Danfoss
Series Type	OMT 315 FLV
Rotation	Dual
No. Of Drive Motors	2 (TWO)
Drive Motor Displacement	19.9 cu. in. (326.3cm ³)
Max. Case Pressure	25 PSI (1.7 Bar)

Reservoir

Fluid Type	10w30 API Class SE / CD Oil
Capacity	11.3 gal (43L)
Reservoir Filtration	One 100 Micron Screen Element
Hydraulic Oil Filtration	One 10 Micron Element
Hydraulic Element	P / N 35243



GENERAL INFORMATION 2.3



The driveshaft of the piston pump is rotated by the engine. The piston block which is splined to the driveshaft also turns. The piston block, rotating group, consists of 9 piston assemblies which have free swiveling shoes swagged on the ball end of each piston assembly. The shoe end of the piston rides against the smooth machined surface of the swashplate. With the swashplate in the neutral position, the piston assemblies do not reciprocate in the piston block, but are rotating. No oil is drawn into or discharged from the pump. The pump is in a zero displacement position and the loader remains stationary. With the swashplate in the neutral position the pressure of the charge oil, which ranges from 200 to 280 psi (13.8 - 19.3 Bar), is able to unseat both check valves and supply oil to both sides of the pump because of the balance in pressure. Very little charge oil volume is required in the neutral position so the excess oil is bypassed over the charge pressure relief valve and recirculated back to the reservoir. The oil that leaks internally in the pump and motor collects in their body housings and is returned to the reservoir by external case drain in the pump and motors. This leakage oil is the only oil the charge check replenishes. This makes the design a closed loop system. As the steering lever is moved forward, or reverse, the loader starts a directional movement. As the swashplate begins to move, the piston assemblies start to reciprocate in the piston block. As the steering lever continues further movement the cam angle increases, the pistons reciprocate further, more oil is pumped and the speed of the loader is increased.

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

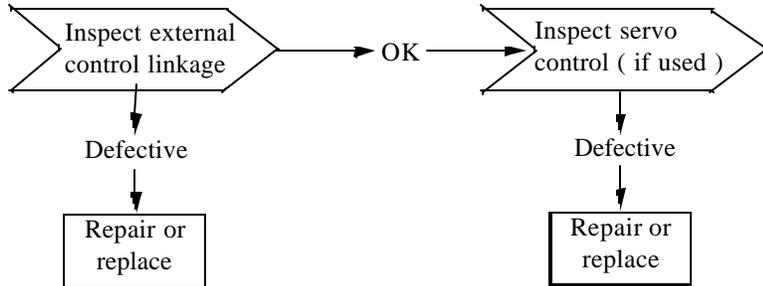
The drive motor, which is a fixed displacement type, delivers a constant output torque for a given pressure throughout the speed range of the motor.

The movement of the pump swashplate, forward or reverse, controls the direction of the drive motor rotation. The function of the pressure 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. When the relief valve senses an over load it unseats, allowing excess pressure and volume to flow into the low pressure side of the pump. 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.

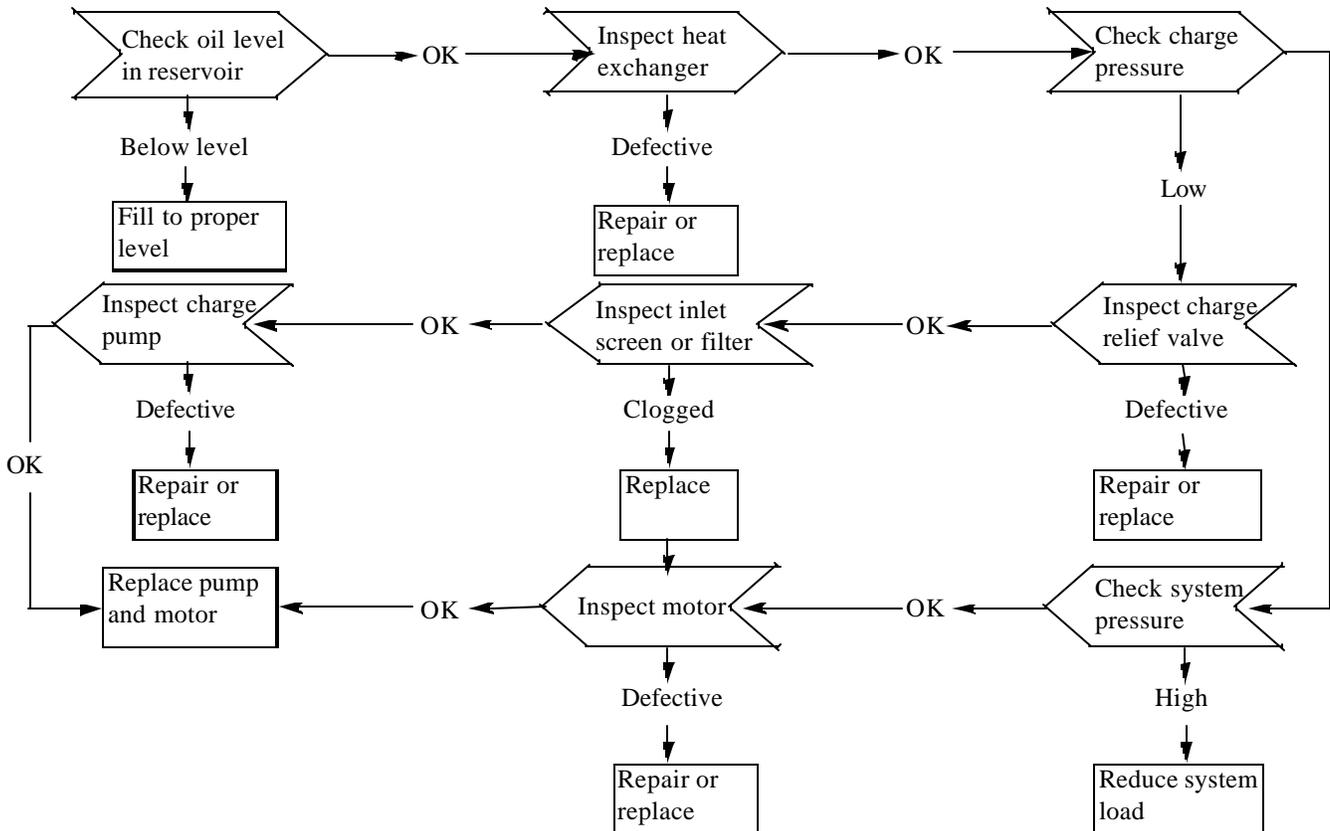
The small volume of oil being bypassed is enough to unseat the relief valve and let it recirculate back into the inlet side of the pump. As the pressure continues to build on the pressure side, a larger volume of oil flows and at a greater speed through the drilled orifice in the relief valve cartridge, 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 reliefs function the same for both sides of the system.

TROUBLE SHOOTING 2.4

Symptom: Neutral Difficult Or Impossible To Find

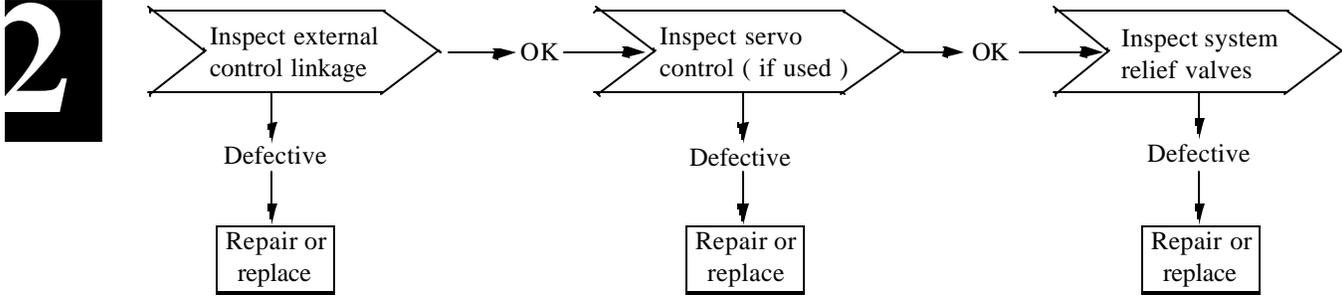


Symptom: System Operating Hot

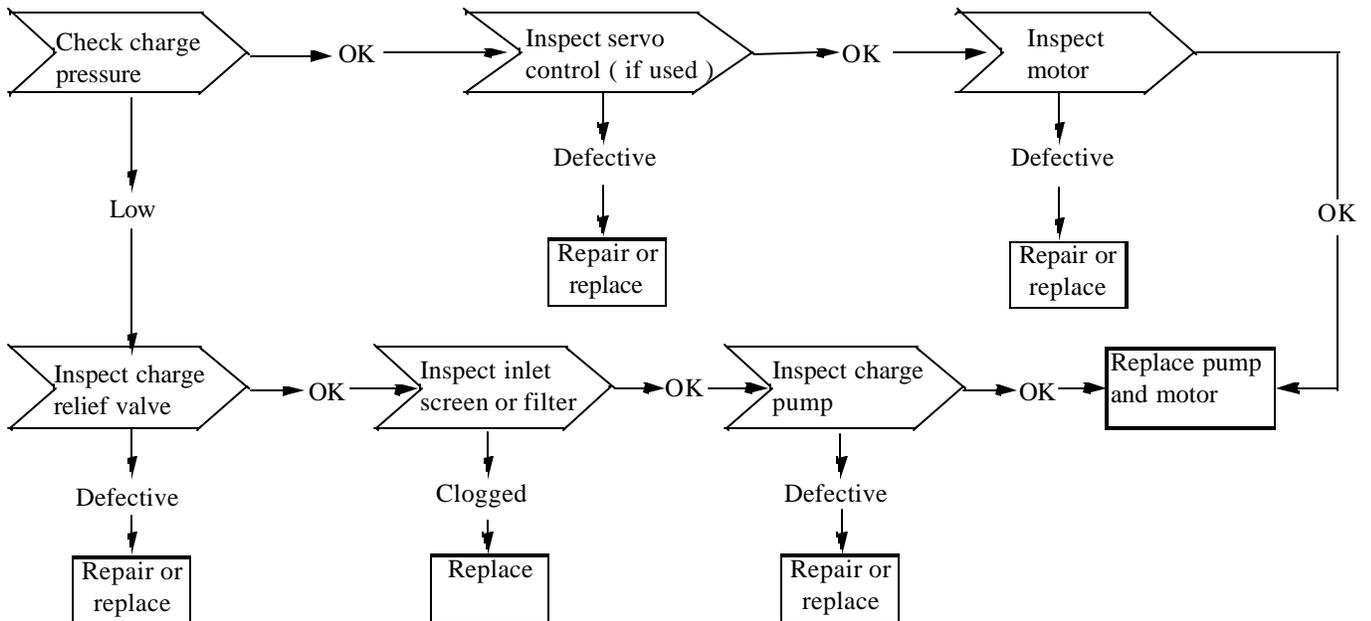


TROUBLE SHOOTING 2.4

Symptom: Operates In One Direction Only

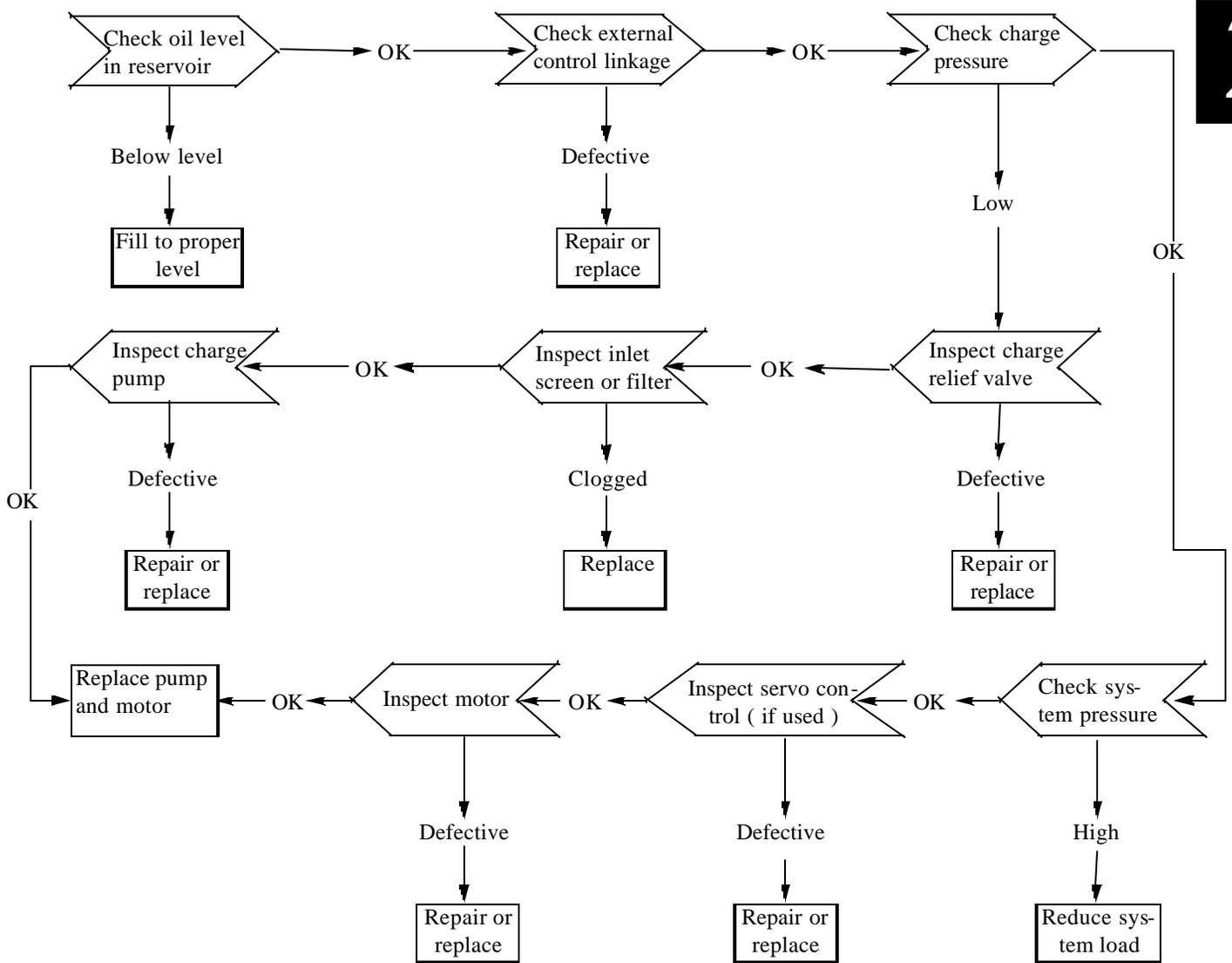


Symptom: System Response Sluggish



TROUBLE SHOOTING 2.4

Symptom: System Will Not Operate In Either Direction

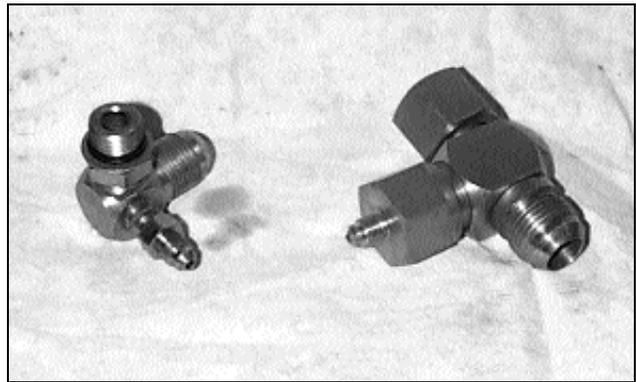
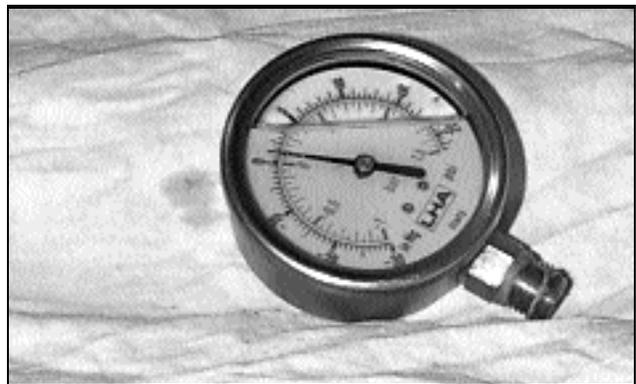
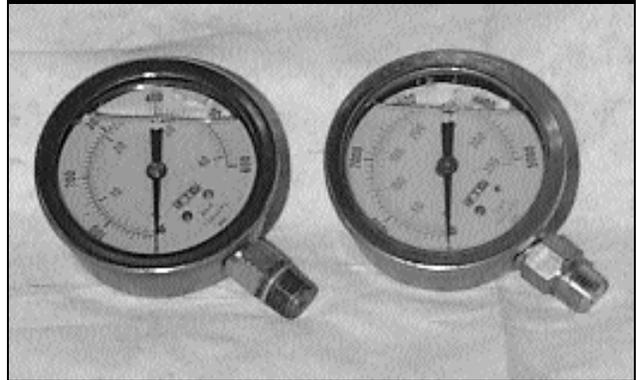


TROUBLE SHOOTING 2.4

System Diagnosing Steps And Special Tools

2

- 1 Check oil level in reservoir:**
 - a. fill to proper level as marked on site tube.
- 2 Inspect external control linkage for:**
 - a. misadjustment or disconnection
 - b. binding, bending or breakage
 - c. misadjusted, damaged or broken hydroback
- 3 Inspect servo control valve for: (if used)**
 - a. proper inlet pressure
 - b. misadjusted or damaged neutral return spring
 - c. galled or stuck control spool
 - d. galled or stuck servo piston
- 4 Inspect heat exchanger for:**
 - a. obstructed air flow
 - b. improper plumbing (inlet to outlet)
 - c. obstructed fluid flow
- 5 Inspect inlet filter or screen for:**
 - a. plugged or clogged screen or filter
 - b. obstructed inlet or outlet
 - c. open inlet to charge pump (open line)
- 6 Check charge pressure:**
 - a. follow test procedures section 2.5
- 7 Inspect charge relief valve for:**
 - a. poppet held of seat
 - b. damaged or broken spring
 - c. damaged valve seat
 - d. improper charge relief setting
- 8 Inspect charge pump for:**
 - a. broken or missing drive coupling
 - b. damaged or missing o-rings
 - c. galled or broken gerotor set
- 9 Inspect system relief valves for:**
 - a. damaged or broken springs
 - b. valve held of seat
 - c. damaged valve seat
 - d. improper pressure relief settings
- 10 Check system pressure:**
 - a. follow test procedures section 2.5
- 11 Inspect hydraulic motor for:**
 - a. disconnected coupling



Caps and plugs

PRESSURE TESTS 2.5

The following photos show the various port locations available on the hydrostatic tandem pump for checking system pressure.

Completing these pressure test will diagnose any mechanical problem in the hydrostatic system.

WARNING

Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.

Installing a gauge into the high pressure port 'A' or 'B', will verify the status of the high pressure relief valves. Checking the pressure at port 'C' will give accurate charge pressure reading.

Checking the pressure at port 'D' will verify case drain pressure.

Measuring the vacuum at the charge pump inlet can help locate in in the inlet lines and filters. It would be necessary to tee into the charge pump line fitting.

Snubbers are recommended to protect the gauges from pressure spikes. Frequent gauge calibration is necessary to insure accuracy.

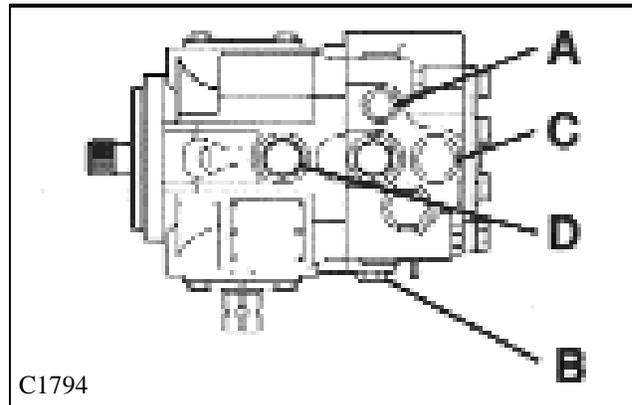
Gauge Information		
A	System Pressure Port 'A'	10,000 PSI Gauge (690 Bar) 9/16 - 18 O-Ring Fitting
B	System Pressure Port 'B'	10,000 PSI Gauge (690 Bar) 9/16 - O-Ring Fitting
C	Charge Pressure Port	500 PSI Gauge (34.5 Bar) Tee Into Charge Filter Outlet Line
D	Case Pressure Port	500 PSI Gauge (34.5 Bar) 1 - 1/16 - 12 O-Ring Fitting
E	Charge Pump Inlet Vacuum	Vacuum Gauge (30 in. Hg) Tee Into Charge Pump Inlet

Tandem pump flow can also measure pump performance.

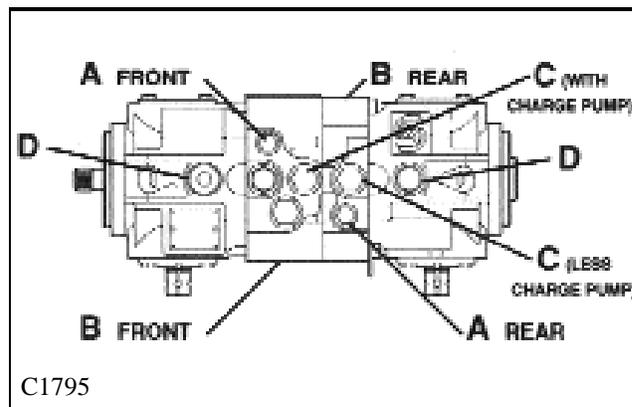
- 1 Connect a flow meter between the high pressure ports, one section at a time.
- 2 Start the engine and increase operating speed between 1775 ~ 1800 RPM.
- 3 Restrict the flow to show 2000 PSI (137.8 Bar) over charge inlet pressure.

Example: Charge pressure = 220 PSI (15.2 Bar) Gauge pressure reading would need to be 2220 PSI (153 Bar).

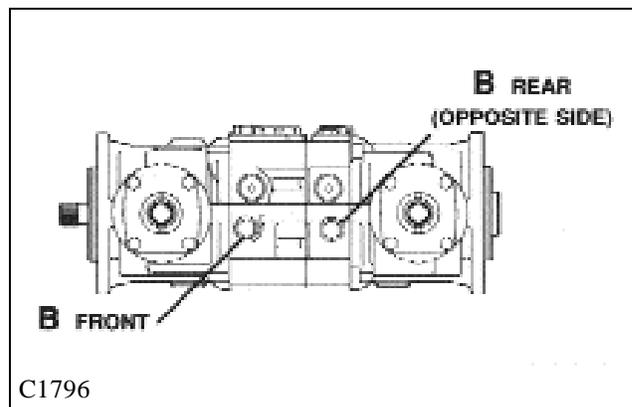
- 4 Minimum flow reading should be 9.5gal / min. (36L / min).



C1794



C1795



C1796

Illustrations are of an internal charge pump model. Actual model in machine may vary.

WARNING

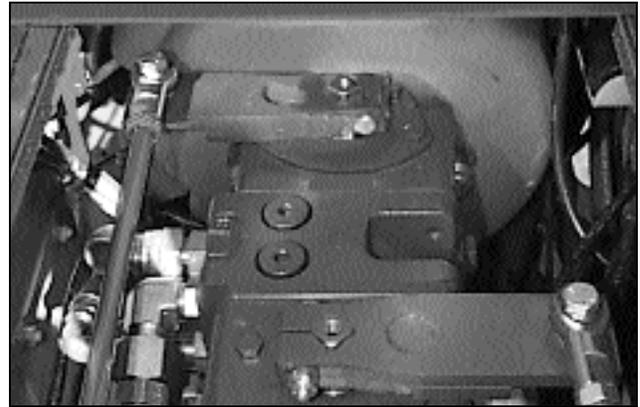
Raise the machine securely from the ground before performing system checks to prevent sudden movement.

A complete testing kit is available from Thomas, p/n 44365, that contains gauges, hoses and adapters for Sauer Sundstrand model pumps.

TOWING 2.6

In an event the loader has malfunctioned or failed, the loader may be moved a short distance by following the procedure:

2



Brake release plunger

Brake valve

C2362

FLUSHING THE HYDRAULIC SYSTEM 2.7

General Information

Contamination in the hydraulic system is a major cause of component failure. Contamination can enter the hydraulic system in any of the following ways.

- 1 When draining the hydraulic system.
- 2 When disassembling components.
- 3 Making auxiliary connections with dirty couplers.
- 4 Normal component wear.
- 5 Component failure

The best way to remove contaminants from the hydrostatic drive system is to disassemble each component and flush and clean thoroughly.

The hydraulic control circuits may be cleaned by attaching a suitable hydraulic filter to the auxiliary couplings and circulating the fluid through it.



Contamination Types

There are 2 types of contamination, microscopic, or non visible, and visible. Microscopic contamination is suspended in the fluid and moves freely through the hydraulic circuits. Examples of problems caused by microscopic contaminants include the following:

- 1 Cylinder rod seal leaks.
- 2 Control valve spools do not return to neutral.
- 3 Hydraulic system has a high operating temperature.
- 4 Components wear rapidly.

Visible contamination is foreign material that can be found by sight, touch or odor. Some examples of visible contamination include the following:

- 1 Particles of metal or dirt in the oil.
- 2 Air in the oil.
- 3 Odor of burned oil.
- 4 Water in the oil.

FLUSHING THE HYDRAULIC SYSTEM 2.7

Cleaning The System

The first step in cleaning the hydraulic system is to determine if you have visible or microscopic contamination. If the contamination is visible, do the following steps:

- 1 Change the hydraulic oil by removing the drain plug in the bottom of the hydraulic oil reservoir. (fig. C1034) Be prepared to contain approximately 30 litres of fluid.
- 2 Check the extent of the contamination by disassembling 1 each of the hydraulic cylinders. Check the cylinders for damage. Repair or replace the cylinders as required. If you determine the damage was caused by severe contamination and is not the result of normal wear, it will be necessary to remove, clean and repair all valves, pumps, lines, cylinders, etc.
- 3 Replace all hydraulic filters.

If the contamination is determined to be microscopic, perform the following steps:

- 1 Change the hydraulic oil by removing the plug in the bottom of the oil reservoir. (fig. C1034) Be prepared to contain approximately 30 litres of fluid.
- 2 Connect an external 10 micron filtering system, capable of sustaining minimum of 2000 PSI (138 Bar) and has a back pressure gauge, to the auxiliary couplings. (fig. C2351, C1688)
- 3 Start the engine and let it idle at approximately half throttle.

WARNING

Be sure to use a filtering system capable of handling the pressure of the hydraulic system.

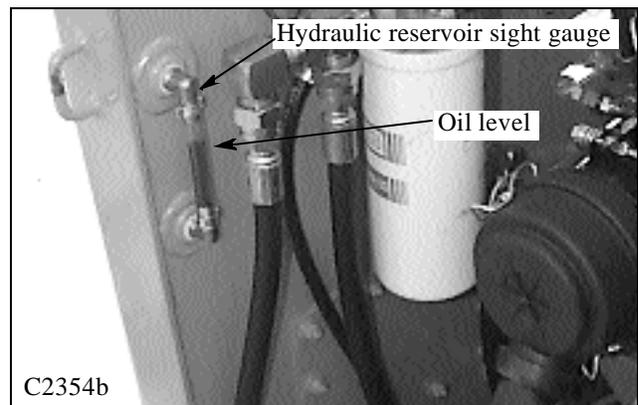
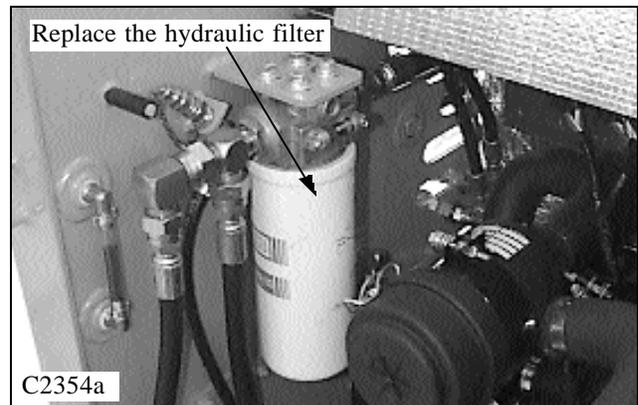
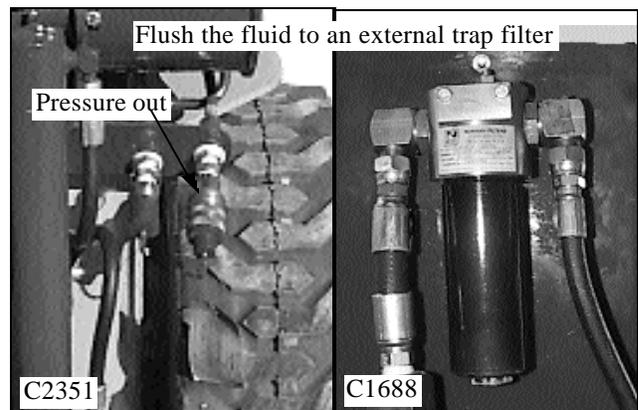
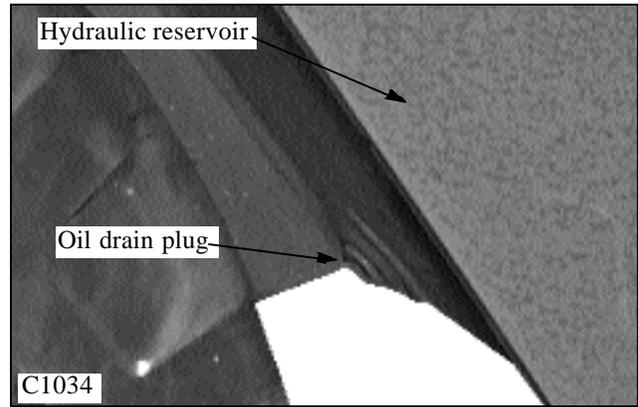
4 Engage the auxiliary circuit. Check to make sure the filtering system is not over taxed by the loaders hydraulic system pressure. Adjust engine idle accordingly to match the filtering systems capacity. This may vary as the filter becomes dirty, you may need to decrease engine RPM. Circulate the oil through filter for 30 minutes.

5 As the oil is being circulated through the auxiliary circuit, raise the liftarms up and down in full stroke cycles. Repeat this exercise for 15 minutes.

6 Cycle the bucket tilt cylinders in the same manner as above. Repeat the exercise, in full extension and retraction, for 15 minutes.

7 Install new hydraulic oil filters. (fig. C2354a)

8 Start the engine and check for leaks. Replenish the hydraulic oil reservoir as required. (fig. C2354b)



2

FLUSHING THE HYDRAULIC SYSTEM 2.7

For flushing water from the hydraulic system, perform the following procedures:

WARNING

Be sure attachments are removed and liftarms are in the lowered position.

- 1 Remove any attachment.
- 2 Make sure all cylinders are fully retracted.
- 3 Change the hydraulic fluid. (fig. C1034)
- 4 Change the hydraulic filter. (fig. C2354)
- 5 Disconnect the hydraulic lines from one set of cylinders. (fig. C2356, C1336)
- 6 Start the engine and set to the lowest idle.
- 7 Have someone hold the open hydraulic lines into a container. Stroke the foot pedals, or hand operated, controls slowly. Continue to repeat this cycle until the oil comes out clear. Repeat for opposite set of cylinders.

WARNING

Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.

- 8 Attach a hose and couplings to the auxiliary circuit. Engage the auxiliary hydraulics, forward and reverse, until the oil flows clear.

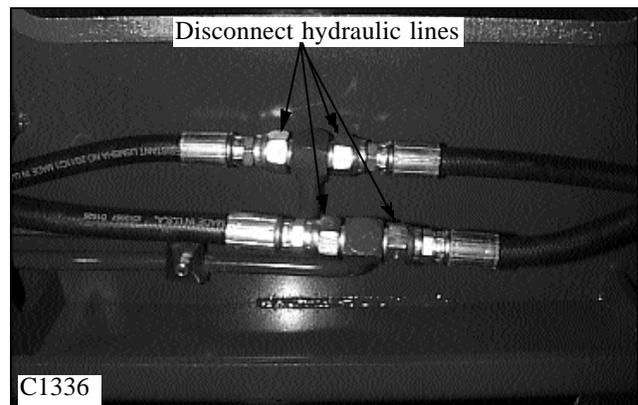
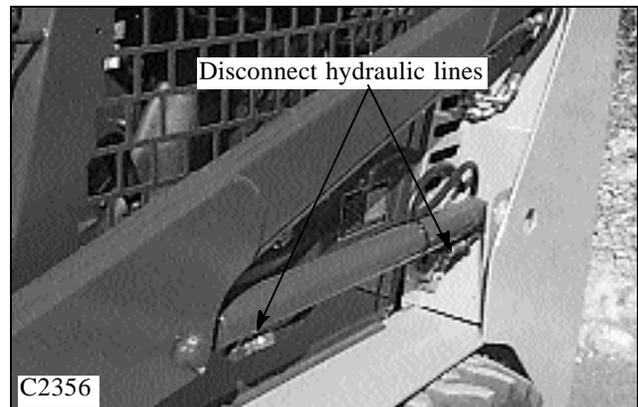
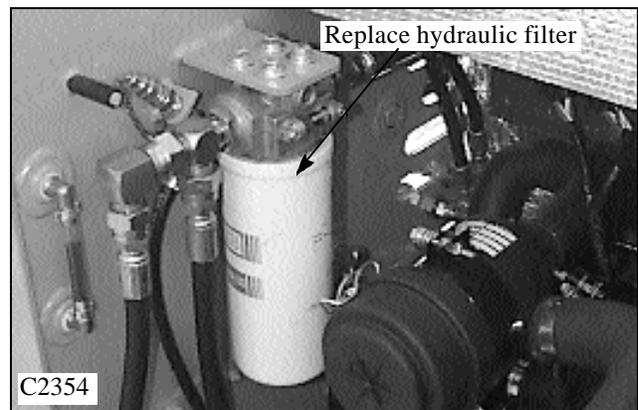
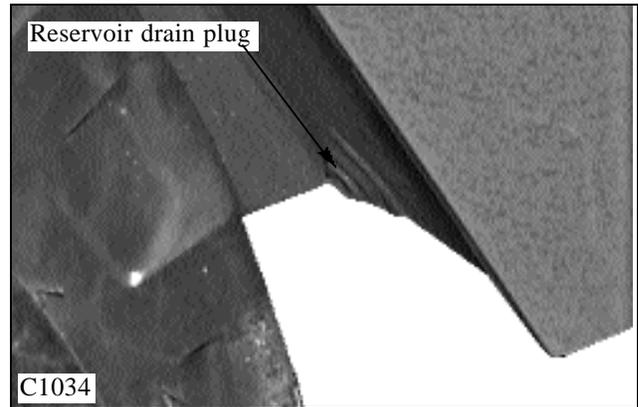
IMPORTANT

Check the hydraulic oil frequently during this procedure. Replenish as required.

- 9 Connect 1 hose each, on each cylinder, to the fixed end of the cylinder barrel.
- 10 Move the foot pedal or control lever to extend the cylinder rods. This will flush the oil from inside the cylinder barrels. Be prepared to contain the waste oil.
- 11 Stop the engine.
- 12 Connect the hydraulic hoses to the rod end of the cylinder barrel.
- 13 Replenish the hydraulic oil as required.
- 14 Replace the hydraulic filter.

IMPORTANT

Please contain and dispose of waste oil in an environmentally friendly manner.



2

START-UP PROCEDURE 2.8

The following start-up procedure should always be adhered to when starting up a new installation or when restarting after pump repairs have been made.

1 Fill the hydraulic oil reservoir to the proper level. (fig. C2354)

2

2 The inlet hose from the oil reservoir to the charge should be filled with oil prior to starting.

3 Check inlet and pressure hose fittings for proper tightness prior to starting.

4 The pump must be filled prior to start-up with filtered oil. Fill the pump by pouring oil into the side case drain port. (fig. C1795 location "D")

5 Disconnect the engine stop solenoid wiring connector. (fig. C2607)

6 Turn the engine over by engaging the starter. Repeat this step, turning the engine over in 15 second interval, 5 or 6 times. This will fill the rest of the hydraulic hoses.

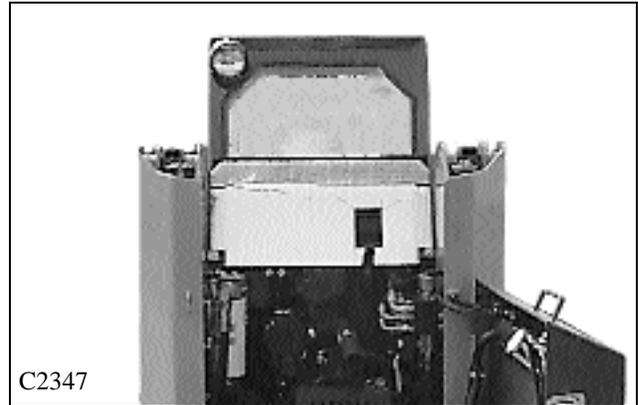
7 Reconnect the engine stop solenoid.

8 Start the engine and let it idle at lowest possible setting.

9 Check for leaks and make adjustments as required. Do not use your hands to check for leaks while the engine is operating.

10 Replenish the hydraulic oil reservoir as required.

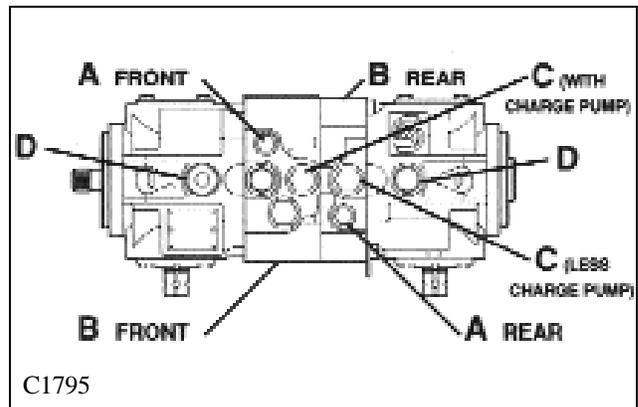
11 Start the engine and increase the RPM's to half throttle. Bring the hydraulic fluid up to operating temperature and make control adjustments as outline in Section 4.



C2347

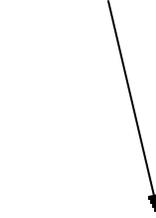


C2354



C1795

Solenoid wire connector



C2607

GEAR PUMP REPLACEMENT 2.9

Start the gear pump removal procedure by removing any attachment, raising the boom arms and engaging the boom support pins. Shut off the engine.

1 Remove the seat and hydrostatic shield.

2 Attach a vacuum system to the hydraulic oil reservoir filler location. (fig. C1689) Or drain the oil reservoir. Seal the threads on the drain plug, if removed, with teflon tape or a liquid form of pipe sealant before installing.

3 Disconnect the hydraulic hoses from the gear pump. (fig. C2353a) Remove the pump fittings. Cap all open hoses to prevent contamination. After capping ends you may unhook vacuum system from oil reservoir.

4 Remove the 2 bolts holding the gear pump to the hydrostatic tandem section. (fig. C2353b) Remove the gear pump.

5 Replace gear pump in reverse order.

6 If the hydraulic system has been contaminated by pump or other failure you must follow the cleaning procedure outlined in section 2.7.

7 Start the engine and check for leaks. Never use your hands to find leaks.

8 Check the fluid level in the hydraulic oil reservoir and replenish as required. (fig. C2354).

Reservoir filler spout 

Vacuum 

C1689



TANDEM PUMP REPLACEMENT 2.10

Removal

Begin the pump removal by removing any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.

1 Remove the seat and hydrostatic shield.

2 Remove the steering lever linkage. Refer to section 4 for removal and replacement information.

3 Remove the gear pump as outlined in section 2.9.

4 Disconnect all the hydraulic hoses. (fig. C2359, C2610) Marking the hose and fitting location is recommended to ease re-assembly. Upon re-assembly, torque the hydraulic fittings and hoses as outlined in the Torque Chart in Section 8. Cap all open lines and ports.

5 Remove the hydraulic fittings from the tandem pump to prevent damage while removing pump. Plug all open ports and keep the fittings in a clean area. Inspect fittings and o-rings for damage, replace as required.

6 Loosen the mounting bolts retaining the tandem pump to the engine bellhousing. (fig. C2608, C2609).

7 Attach a lifting device to the tandem pump. The pump is fairly heavy, approximately 80 lbs. (36 Kg) It is highly recommended to use a mechanical lifting device to assist removal of the tandem pump.

8 Remove the 2 rear mounting bolts. (fig. C2608, C2609) Remove the tandem pump from the loader.

Refer to the Sauer Sundstrand Repair Manual, (Thomas p / n 44232 or Sauer Sundstrand p /n BLN - 9992), for complete pump servicing.

Thomas does not cover or handle warranty processing or repair work performed on the Sauer Sundstrand product. Warranty work can only be approved and performed by an authorized Sauer Sundstrand dealer.

High pressure hoses



Tandem case drain hose



C2359

2

TANDEM PUMP REPLACEMENT 2.10

Installation

Upon reassembly, inspect the outside area of the tandem pump housing for damage that may have occurred in transit or handling.

- 1 Attach a lifting device to the tandem pump.
- 2 Apply lithium type grease to the tandem pump input shaft and the flywheel coupling splines. (fig. C2616).

CAUTION

To prevent personal injury, do not attempt to lift heavy objects without assistance.

- 3 Install the tandem pump to the engine bellhousing lining up the input shaft splines with the flywheel coupler. (fig. C2617)
- 4 Install the 2 mounting bolts. Torque the 2 mounting bolts to 60 ft/lbs. (82 nm.) Remove the lifting device.

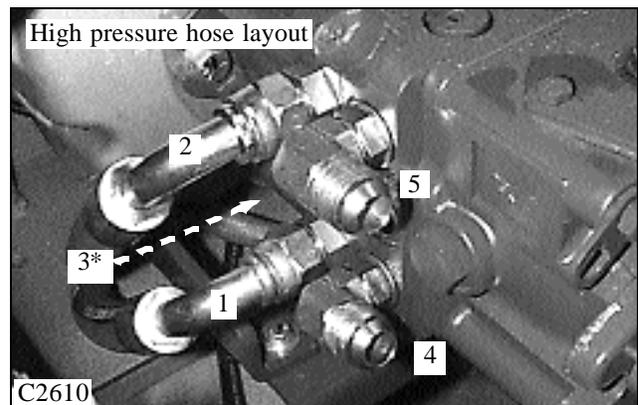
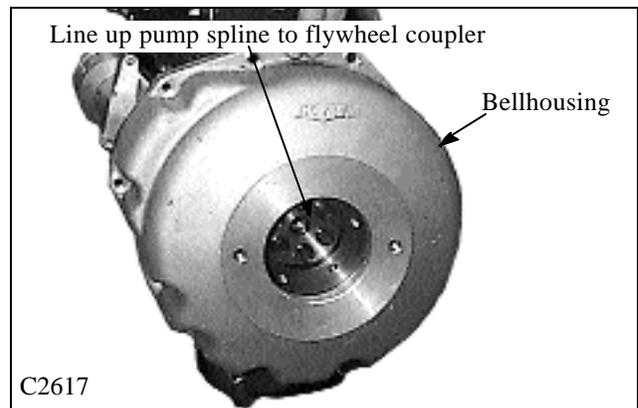
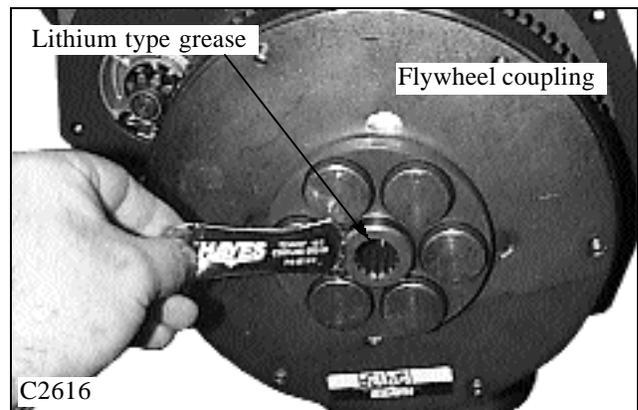
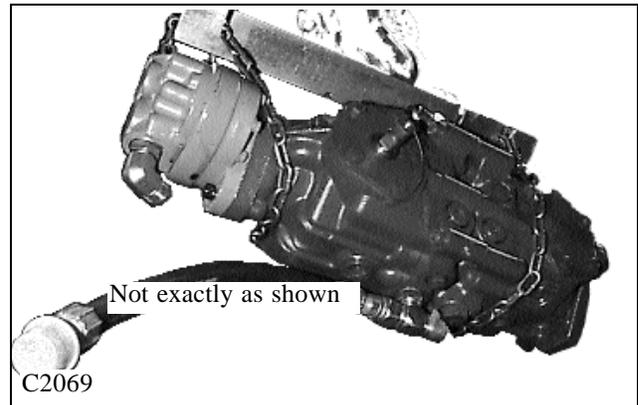
5 Connecting the 4 high pressure drive hoses and fittings to the tandem pump can only be accomplished in a specific sequence. (fig. C2610). Install the bottom 90° connector to the tandem pump first, then the bottom straight connector.

- A Hose no. 1 connects to the top port of the left hand drive motor.
- B Hose no. 2 connects to the bottom port of the left hand drive motor.
- C* Hose no. 3 is the charge pressure line, connect to the hose from the hydraulic filter. This fitting must be installed before connecting hose no. 4 and 5. See fig. C2611 next page.
- D Hose no. 4 connects to the bottom port of the right hand drive motor.
- E Hose no. 5 connects to the top port of the right hand drive motor.

Torque the fittings and hoses according to the Torque Chart in Section 8.

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open line and ports.



2

TANDEM PUMP REPLACEMENT 2.10

Installation (continued)

6 Connect the tandem pump case drain fitting and hose. (fig. C2608) Torque the fittings and hose to the specifications listed in the Torque Chart in Section 8.

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open line and ports.

7 Connect the auxiliary gear pump outlet fittings and hoses to the gear pump. (fig. C2353) Follow the Torque Chart in Section 8 when tightening fittings and hoses.

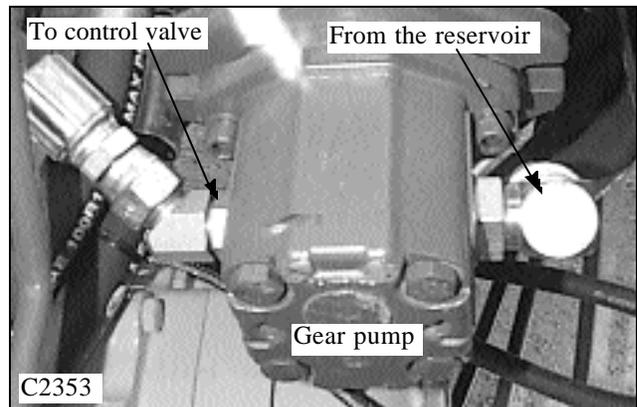
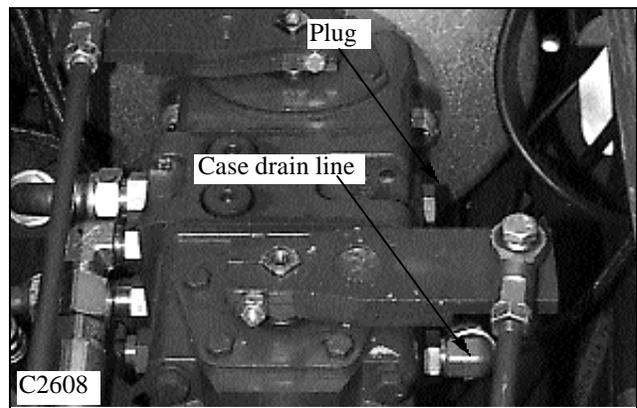
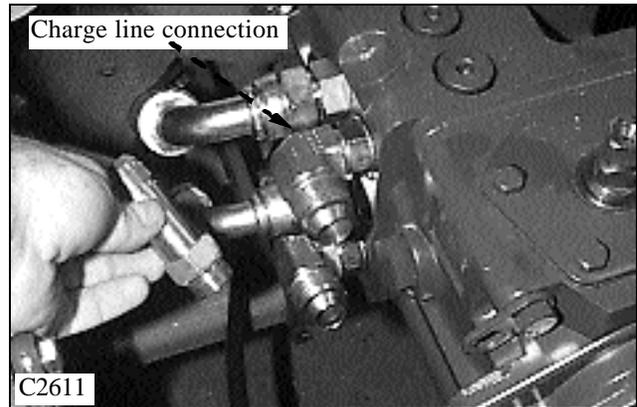
IMPORTANT

Inspect hydraulic fitting o-rings and flares for marks or damage. Replace if necessary.

8 Remove the plug on the side of the tandem pump and fill the tandem pump with filtered. (fig. C2608)

IMPORTANT

Follow the Torque Chart In Section 8 when tightening fittings and hoses.



TANDEM PUMP REPLACEMENT 2.10

Installation (continued)

9 Reinstall the steering control linkages as outlined in Section 4. (fig. C2443).

10 Fill the hydraulic oil reservoir to the proper level.

11 Follow the start up procedure outlined in section 2.8 before attempting to start the loader.

IMPORTANT

Follow the start up procedure outlined in section 2.8 upon restarting after pump repairs or replacement.

WARNING

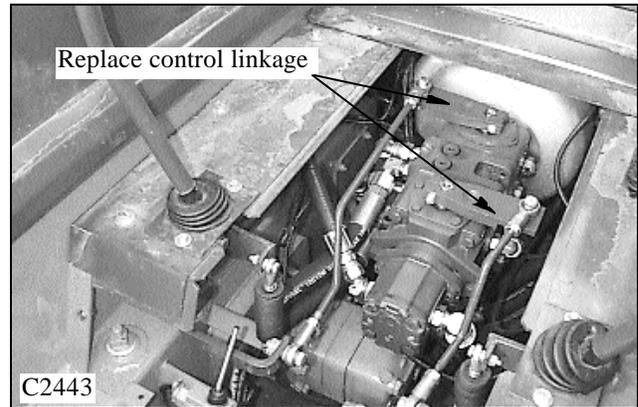
This start-up procedure must be made with the loader securely raised off the ground. Changing the pumps and the steering control linkages has affected the neutral adjustment. Failure to raise the loader clear of the ground may result in the loader engaging in motion and possibly causing serious injury.

12 Start the loader and check for leaks. Make repairs as necessary and replenish the hydraulic oil reservoir. Never use your hands to check for hydraulic leaks.

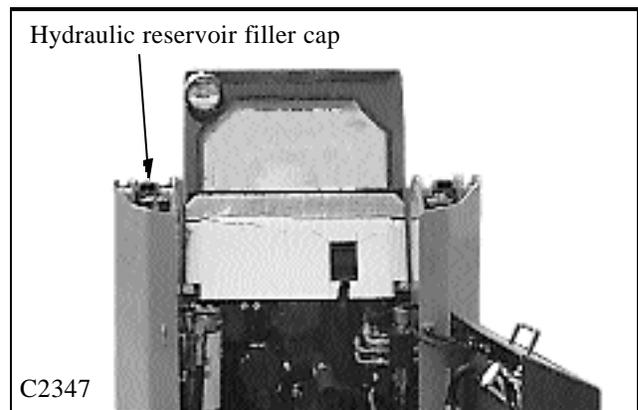
WARNING

To prevent personal injury never make repairs to the hydraulic system while the engine is operating. Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.

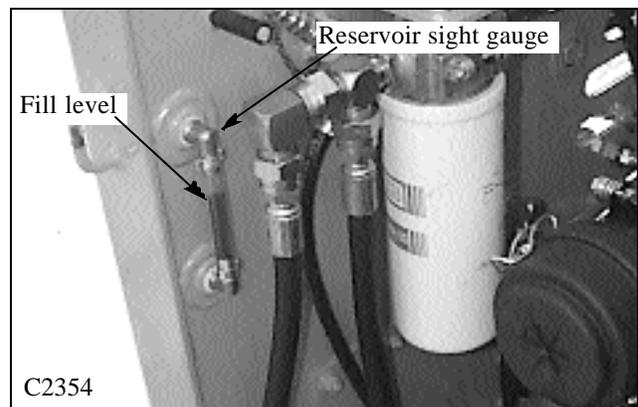
13 Make adjustments to the steering controls as required. Follow the procedures for control adjustments in Section 4.



C2443



C2347

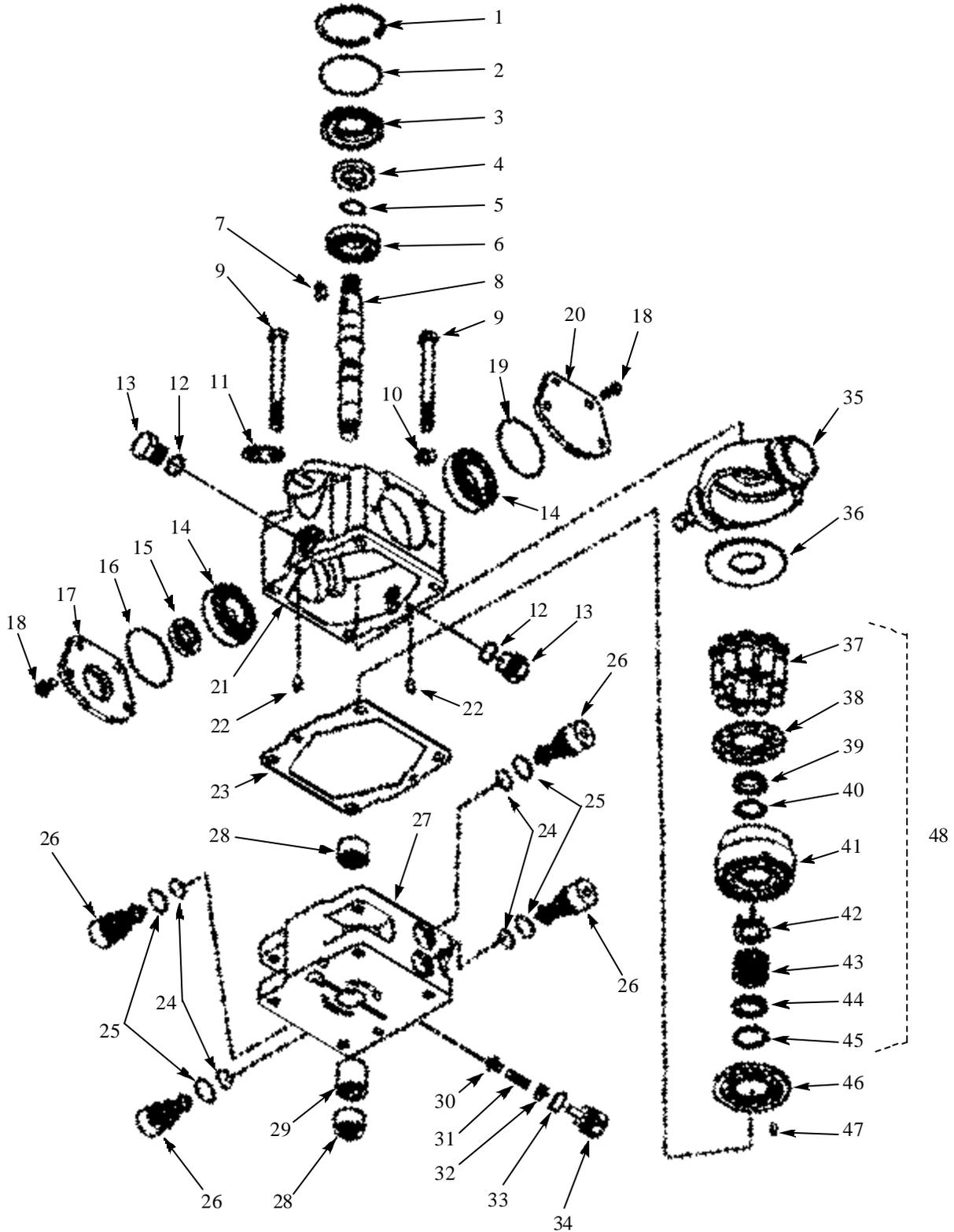


C2354

TANDEM PUMP PARTS DIAGRAM 2.11

2

Sauer Sundstrand Series M25 PT Rear Pump (as located in machine)



C2621

TANDEM PUMP PARTS DIAGRAM 2.11

Rear Pump Diagram C2621 Index

- | | |
|----------------------------|---------------------------------------|
| 1. Retaining ring | 25. O-ring seal |
| 2. O-ring seal | 26. Relief valve, items 24 ~ 26 |
| 3. Seal carrier | 27. Center section |
| 4. Input seal | 28. Bearing |
| 5. Retaining ring | 29. Coupler |
| 6. Bearing | 30. Charge relief poppet |
| 7. Key (or splined shaft) | 31. Charge relief spring |
| 8. Drive shaft | 32. Charge relief shims |
| 9. Bolt | 33. O-ring seal |
| 10. Washer | 34. Charge relief, items 30 ~ 33 |
| 11. Lifting bracket | 35. Swashplate |
| 12. O-ring seal | 36. Thrust plate |
| 13. Plug, includes item 12 | 37. Piston assembly |
| 14. Bearing | 38. Slipper retainer |
| 15. Seal | 39. Slipper retainer guide |
| 16. O-ring seal | 40. Thrust washer |
| 17. Trunnion cover | 41. Cylinder block |
| 18. Bolt | 42. Washer assembly |
| 19. O-ring seal | 43. Spring |
| 20. Trunnion cover | 44. Special washer |
| 21. Housing | 45. Retaining ring |
| 22. Dowel pin | 46. Valve plate, clockwise |
| 23. Gasket | 47. Spring pin |
| 24. O-ring seal | 48. Cylinder block kit, items 37 ~ 45 |

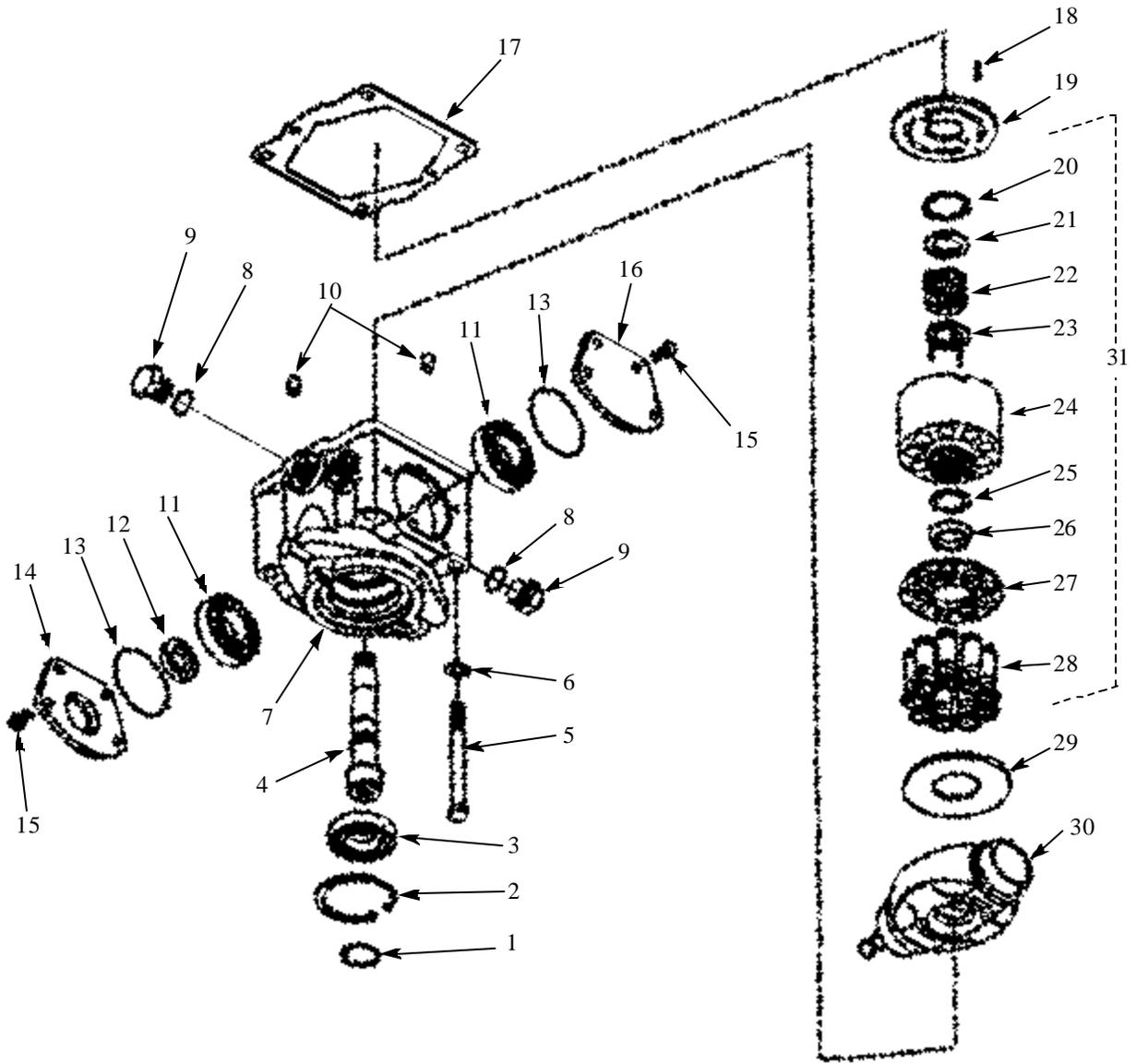
For further service instructions refer to a Sauer Sundstrand Dealer and request Service / Repair Manual Part Number BLN 9992 or order P / N 44232 from a local Thomas Dealer.



TANDEM PUMP PARTS DIAGRAM 2.11

2

Sauer Sundstrand Series M25 PT Front Pump (as located in machine)



C2622

TANDEM PUMP PARTS DIAGRAM 2.11



Front Pump Diagram C2622 Index

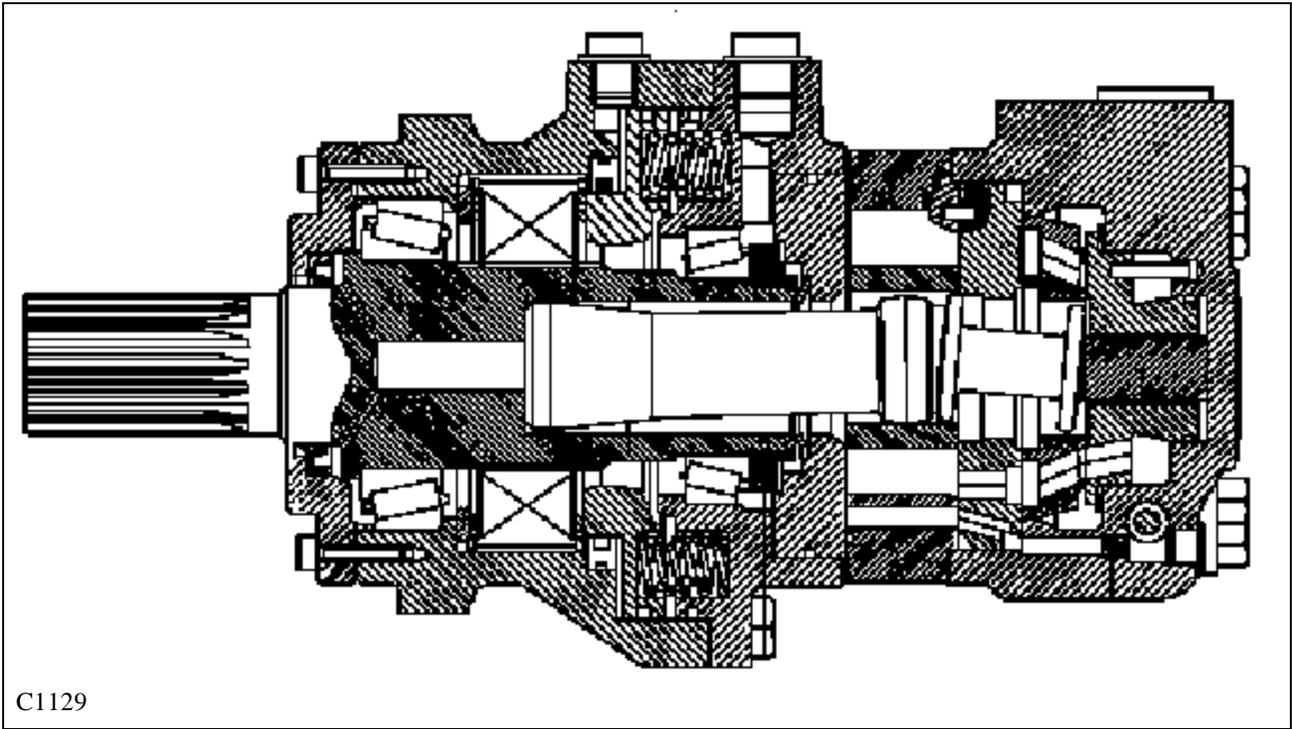
- | | |
|--------------------------|---------------------------------------|
| 1. Retaining ring | 17. Gasket |
| 2. Retaining ring | 18. Pin |
| 3. Bearing | 19. Valve plate, counter clockwise |
| 4. Drive shaft | 20. Retaining ring |
| 5. Bolt | 21. Special washer |
| 6. Washer | 22. Spring |
| 7. Housing | 23. Washer assembly |
| 8. O-ring seal | 24. Cylinder block |
| 9. Plug, includes item 8 | 25. Thrust washer |
| 10. Dowel pin | 26. Slipper retainer guide |
| 11. Bearing | 27. Slipper retainer |
| 12. Seal | 28. Piston assembly |
| 13. O-ring seal | 29. Thrust plate |
| 14. Trunnion cover | 30. Swash plate |
| 15. Bolt | 31. Cylinder block kit, items 20 ~ 28 |
| 16. Trunnion cover | |

For further service instructions refer to a Sauer Sundstrand Dealer and request Service / Repair Manual Part Number BLN 9992 or order P / N 44232 from a local Thomas Dealer.

DRIVE MOTOR 2.12

General Information

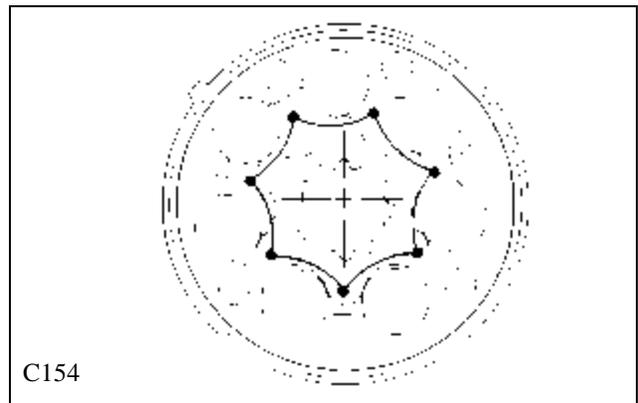
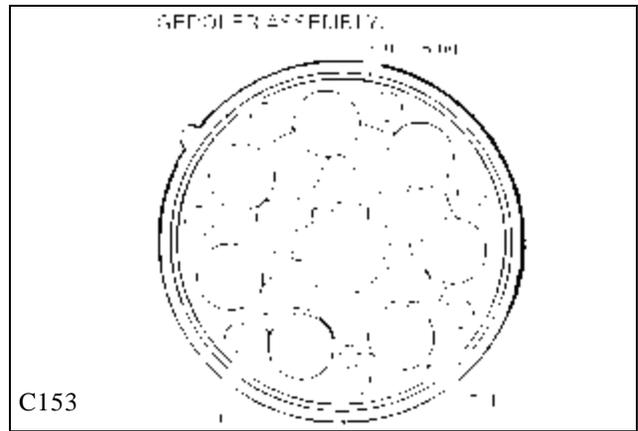
2



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

The outer ring (fig. C153) of the gerotor 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. C154).

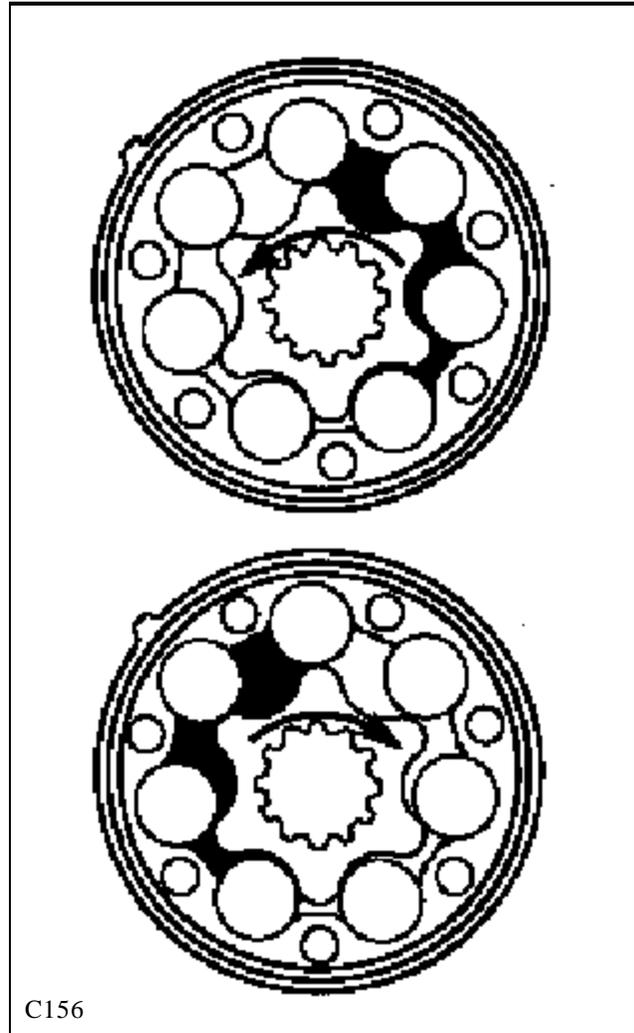


DRIVE MOTOR 2.12

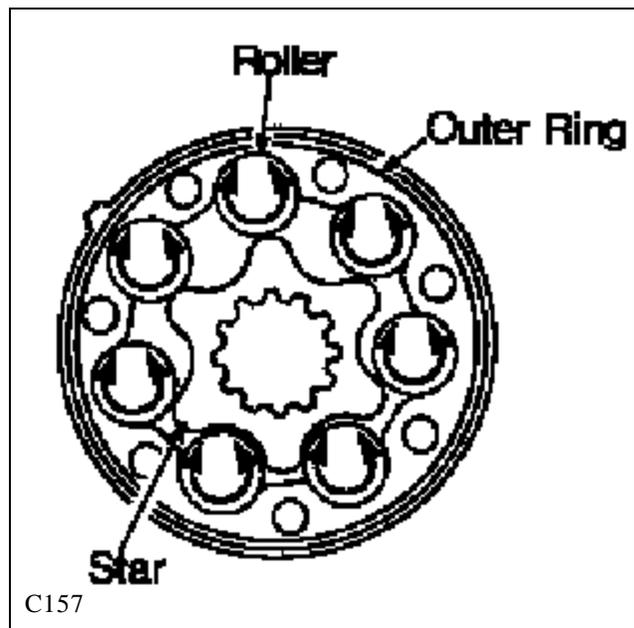
A drive shaft is used to transmit the rotation of the star to the output shaft. The drive shaft has crowned external splines to match the internal splines in the star and output shaft. This type of drive is used because the star center line continuously changes during rotation.

As the star orbits, 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 the return line.

When pressure is introduced into the fluid pockets on the right side of the star (fig. C156) the output rotation will be counterclockwise. When the fluid pockets on the left side of the star are pressurized the output shaft rotation will be clockwise.



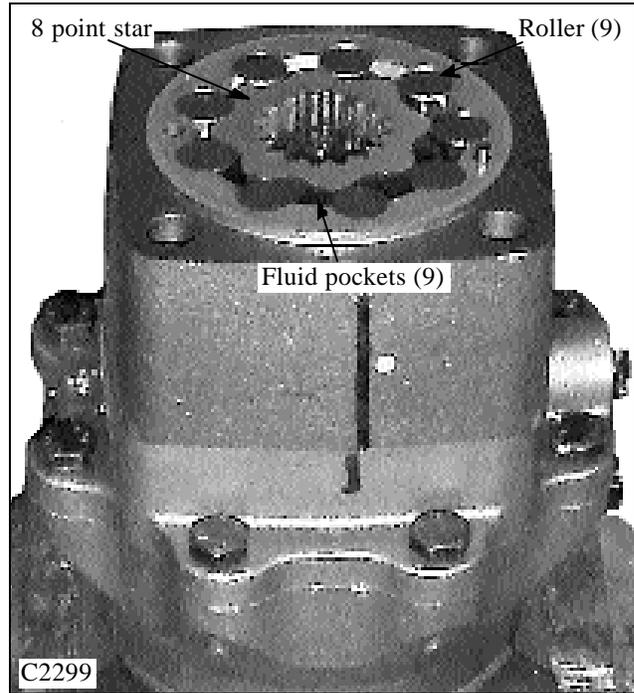
To seal the fluid pockets the torque motor incorporates a rotating roller type seal. (fig. C157) This type of a rolling seal reduces friction at the star points providing increased efficiency and reduced component wear.



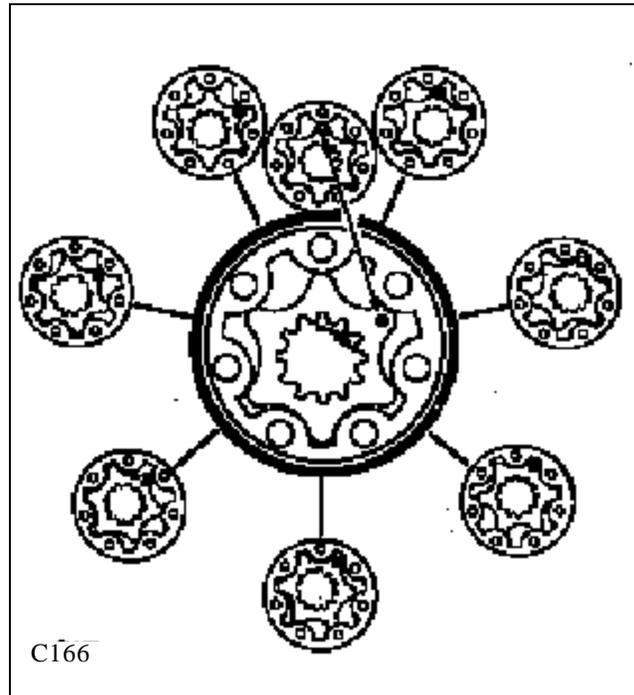
DRIVE MOTOR 2.12

2

The geroler (fig. C2299), is both a fluid displacement motor and a gear reducer. It provides 8 times (the number of star points) greater power per revolution than a gear, vane or piston type motor. This means that 8 times the greater torque can be developed at one eighth the speed without further gear reduction.



Example shown in fig. C166 is one complete star orbit, or one sixth of the output shaft rotation. The star must travel through 6 complete orbits for each single rotation of the output shaft creating a speed reduction of 6 to 1. The use of 7 fluid power pockets with the 6 to 1 ratio provides 42 fluid power cycles per each complete shaft revolution. **NOTE: Actual star point count is 8. This is only an example.**

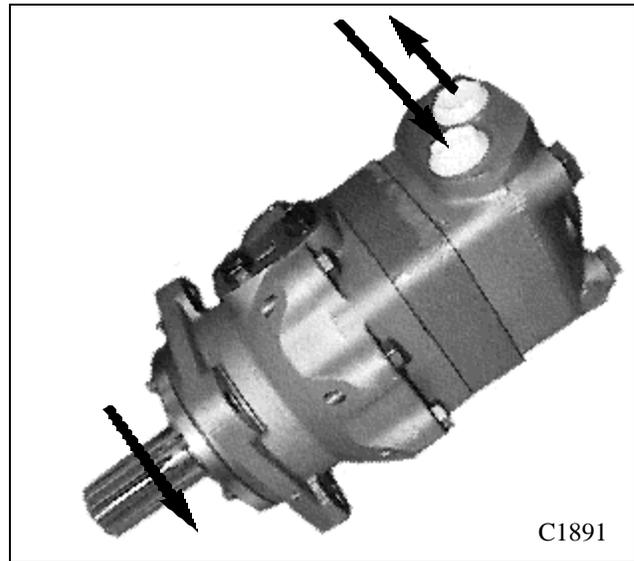


DRIVE MOTOR 2.12

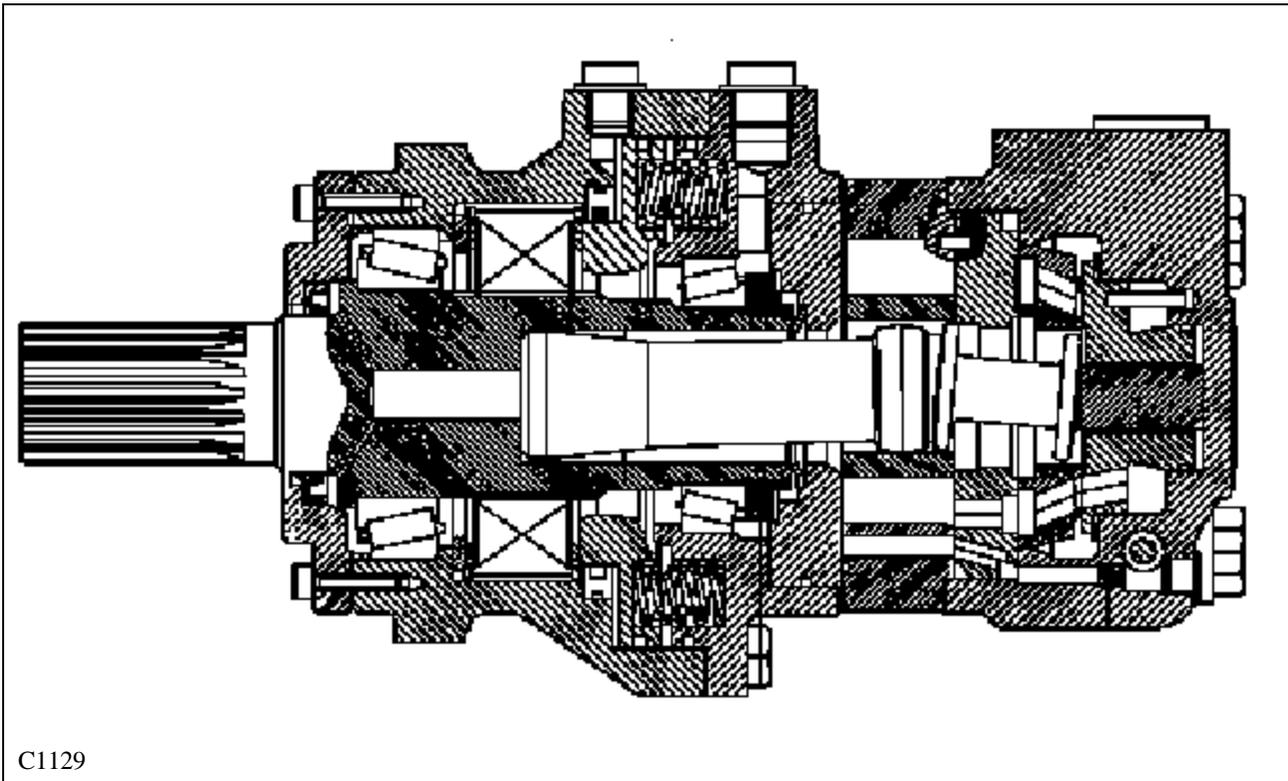
For smooth and continuous motor output rotation, the torque motor utilizes a disc valve which operates in synchronization with the geroler star. The disc valve arrangement consist of a stationary balance plate, rotating disc valve and a stationary valve plate.

The disc valve contains an inlet fluid passage port for each star valley and a return fluid passage point.

A separate crowned driveshaft is used to synchronize the disc valve and the 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.



2



Fluid enters the housing through the inlet port and is directed to the balance plate. The balance ring 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 the 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 are 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 the inlet fluid flow to the output shaft rotation. If the timing of the disc valve to the geroler star is off one tooth, the relationship of input fluid flow to output motor shaft rotation will be reversed.

DRIVE MOTOR 2.12

Removal

1 Remove any attachment, raise the boom arms and engage the boom support pins.

WARNING

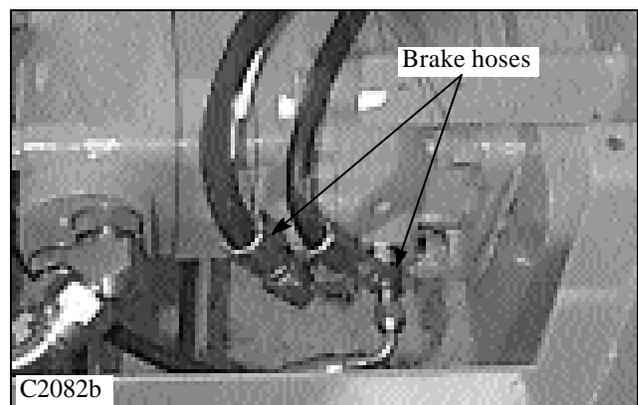
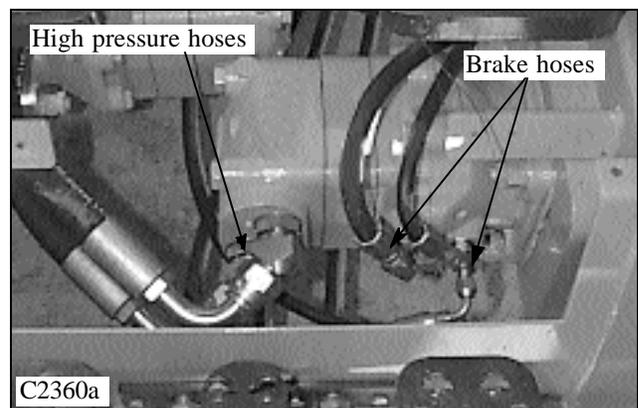
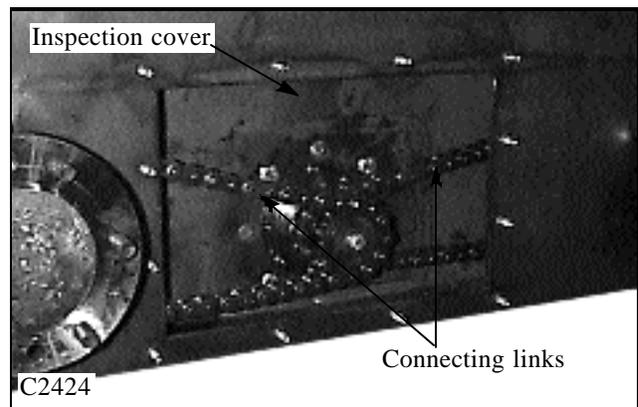
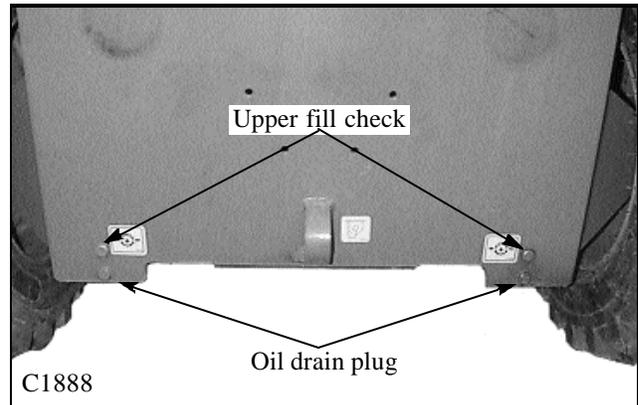
To prevent personal injury do not work under the boom arms without the boom supports engaged.

- 2 Raise the loader securely off the ground.
- 3 Remove the wheels on the side to be repaired.
- 4 Drain the oil from the final drive housing. Be prepared to contain approximately 7 litres (1.9 gal) of fluid. (fig. C1888)
- 5 Remove the seat and hydrostatic shield.
- 6 Remove the final drive inspection cover located between the axles of the final drive housing. (fig. C2424)
- 7 Disconnect the chain as outlined in Section 3. (fig. C2424).
- 8 Remove the 2 high pressure hoses from the drive motor. (fig. C2360a) Cap the open hose ends and fittings to prevent contamination.

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open line and ports.

- 9 Disconnect the 2 brake line hoses and cap the hoses and adapter fittings in the drive motor. (fig. C2360b)
- 10 Remove the adapter fittings from the drive motor. Plug the open ports in the drive motor to prevent contamination.



DRIVE MOTOR 2.12

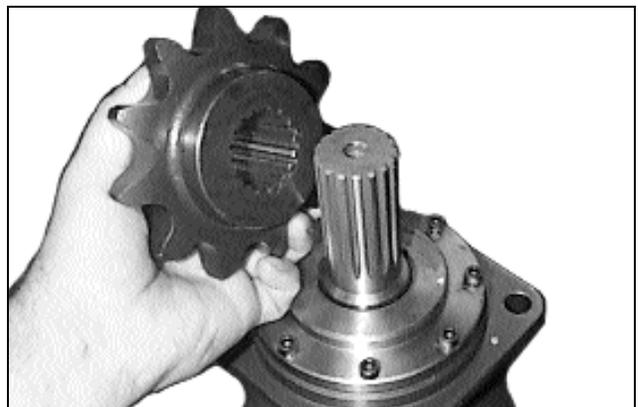
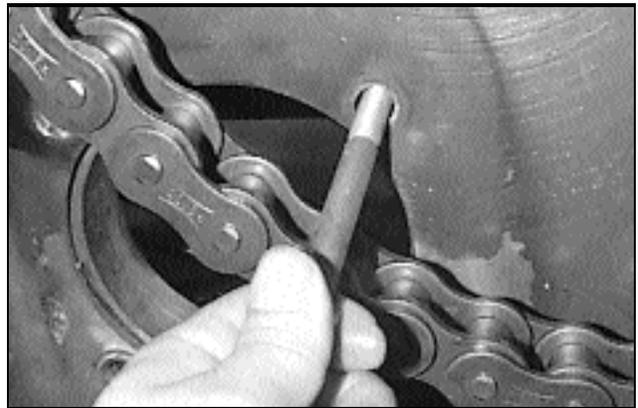
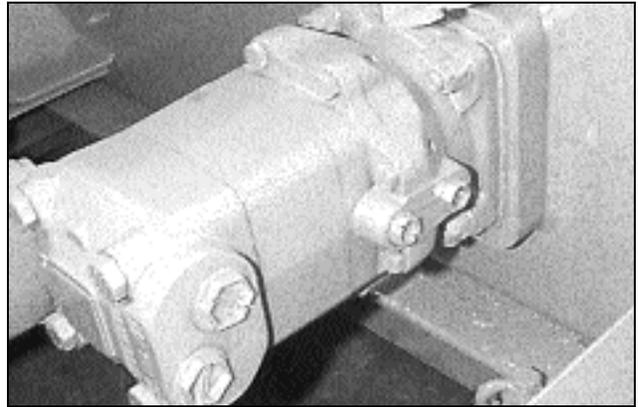
Removal

12 Remove the jam nuts, mounting nuts and lock washers from the 4 mounting bolts retaining the drive motor to the final drive housing. (fig. C2081) Hold the head of the bolts from inside the final drive housing. (fig. C2077)

13 Remove the drive motor. Seal the drive motor with silicone upon reassembly.

14 Upon reassembly torque the 4 mounting nuts to 80 lbs / ft.

15 If the drive motor replacement is being performed because of major parts failure, such as geroler damage, the hydraulic system must be checked for contamination and flushed if necessary as outlined in Section 2.7.

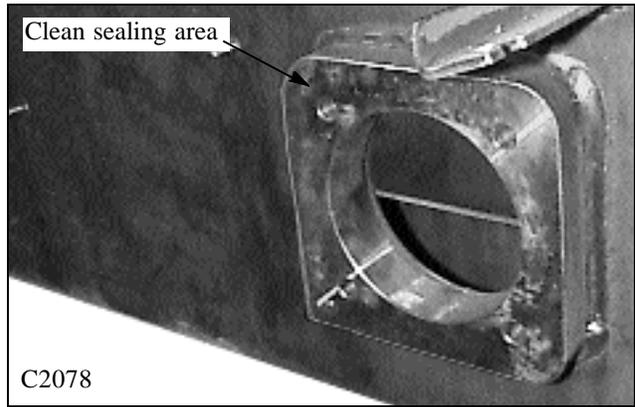


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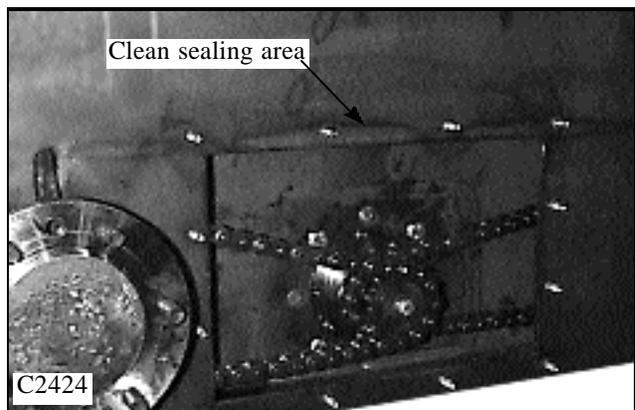
DRIVE MOTOR 2.12

Replacement

1 Clean the mounting areas thoroughly that need to be sealed with silicone. (fig. C2078, C2424)

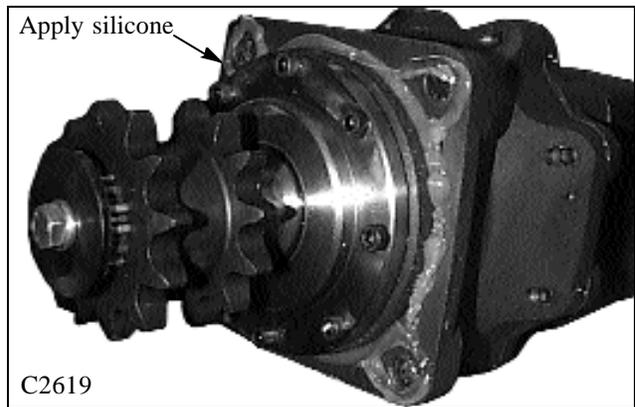


2 Apply a bead 1 / 4 of an inch thick around the drive motor bearing retainer and around each mounting hole. (fig. C2619)



3 Install the drive motor and sprocket assembly to the final drive housing.

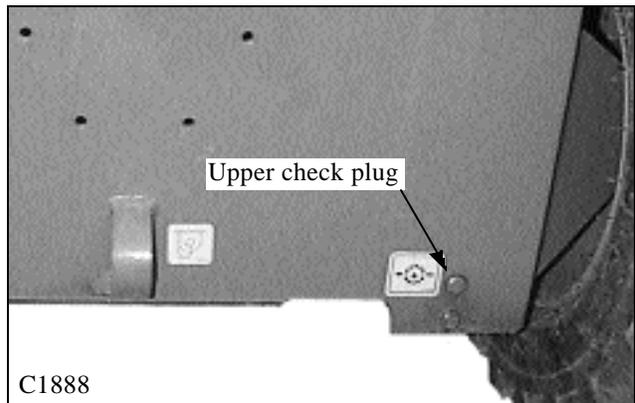
4 Install the 4 bolts, lockwashers and mounting nuts and torque to 80 lbs / ft. (115 nm.)



5 Install the 4 jam nuts. Torque the jam nuts to 40 ~ 60 lbs / ft. (54 ~ 81 nm.)

6 Replace the master link in the dive chain. Section 3. shows chain replacement procedure.

7 Add oil to the final drive housing unit it trickles out the upper check plug hole. This will require approximately 7 litres (1.9 gal) of 10w30 API SE/ CD oil. (fig. C1888)



2

DRIVE MOTOR 2.12

IMPORTANT

Refer to the torque chart in Section 8 when tightening hydraulic hoses and fittings

IMPORTANT

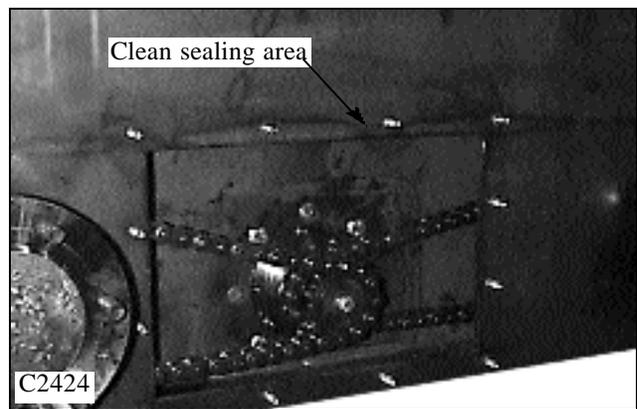
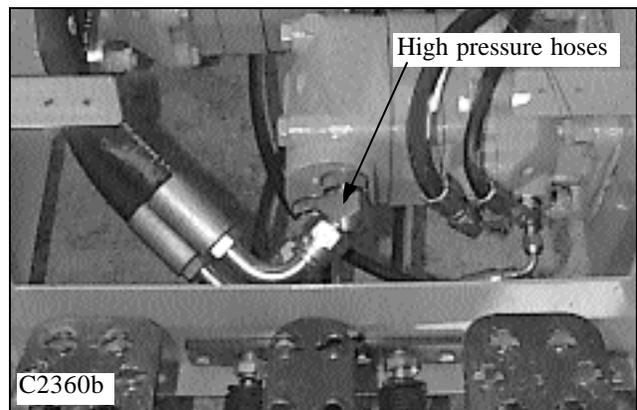
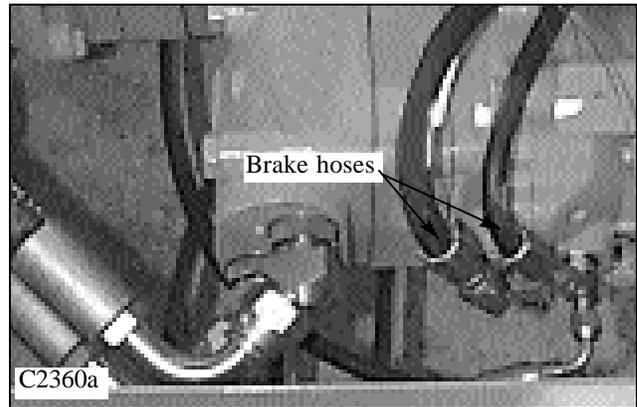
Inspect fitting o-rings and flares for marks or damage. Replace if necessary.

- 8 Install the adapter fittings to the drive motor.
- 9 Install the brake lines to the drive motor. (fig. C2360a)
- 10 Install the high pressure drive hoses. (fig. C2360b)
- 11 Clean the final drive housing and inspection cover thoroughly before applying silicone sealant. (fig. C2424)
- 12 Install the inspection cover. When installing the nuts, do not over tighten. The mounting torque should not exceed 11 lbs / ft. (15 N.m.)
- 14 Start the engine and check for hydraulic leaks. Do not use your hands to trace hydraulic leaks. Shut off the engine and inspect each fitting for proper torque.

WARNING

To prevent personal injury never make repairs to the hydraulic system while the engine is operating. Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.

- 15 Install the wheels and torque the nuts at 100 to 110 lbs / ft. (136 to 149 nm.)
- 16 Install shields and seat, let loader down to ground and test drive to check performance.



2

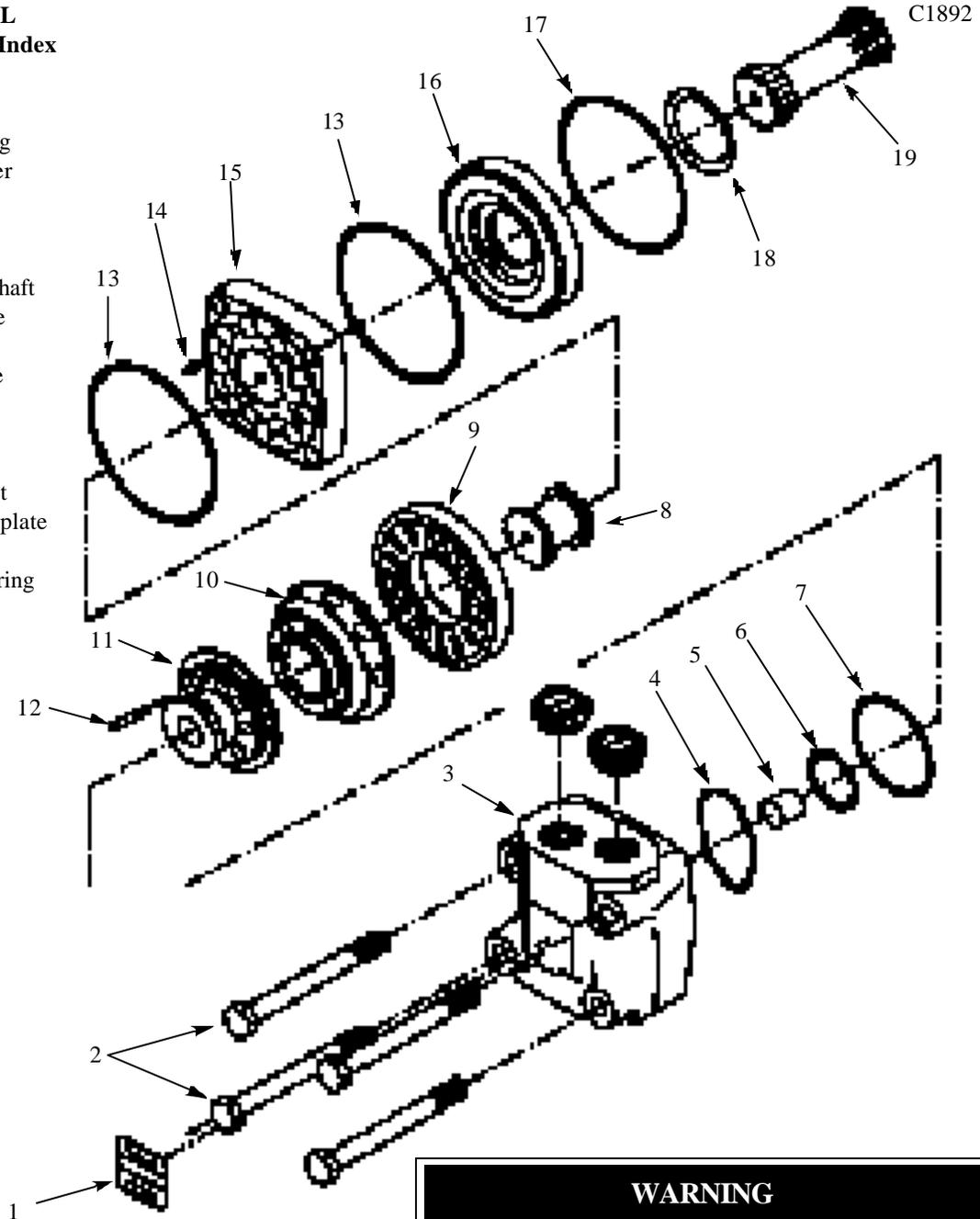
DRIVE MOTOR 2.12

Parts Illustration

2

Danfoss OMT FL Diagram C1892 Index

1. Name plate
2. Bolts
3. Valve housing
4. Spring washer
5. Spacer
6. O-ring seal
7. O-ring seal
8. Valve drive shaft
9. Channel plate
10. Disc valve
11. Balance plate
12. Guide pin
13. O-ring seal
14. Guide pin
15. Gearwheel set
16. Intermediate plate
17. O-ring seal
18. Conical seal ring
19. Cardan shaft



WARNING

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

IMPORTANT

When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open line and ports.

Fig. C1892 shows an exploded view of the hydraulic torque motor. Before disassembling the torque motor, clean the outer surface of all loose dirt and grease and dry with compressed air. Be sure all openings are plugged to prevent solvent or soap entering the torque motor.

DRIVE MOTOR 2.12

Parts Illustration

Danfoss OMT FL Brake Diagram C1893 Index

1. Bearing nut
2. Bearing, small
3. Screw
4. Bearing housing
5. O-ring seal
6. Spring
7. Spring
8. Piston
9. O-ring seal
10. Ring
11. O-ring seal
12. O-ring seal
13. Inner brake disc
14. Outer brake disc
15. Spacer disc
16. Bearing housing
17. Bearing
18. Splined shaft
19. O-ring seal
20. Shaft seal
21. Front cover
22. Dust seal ring
23. Screws

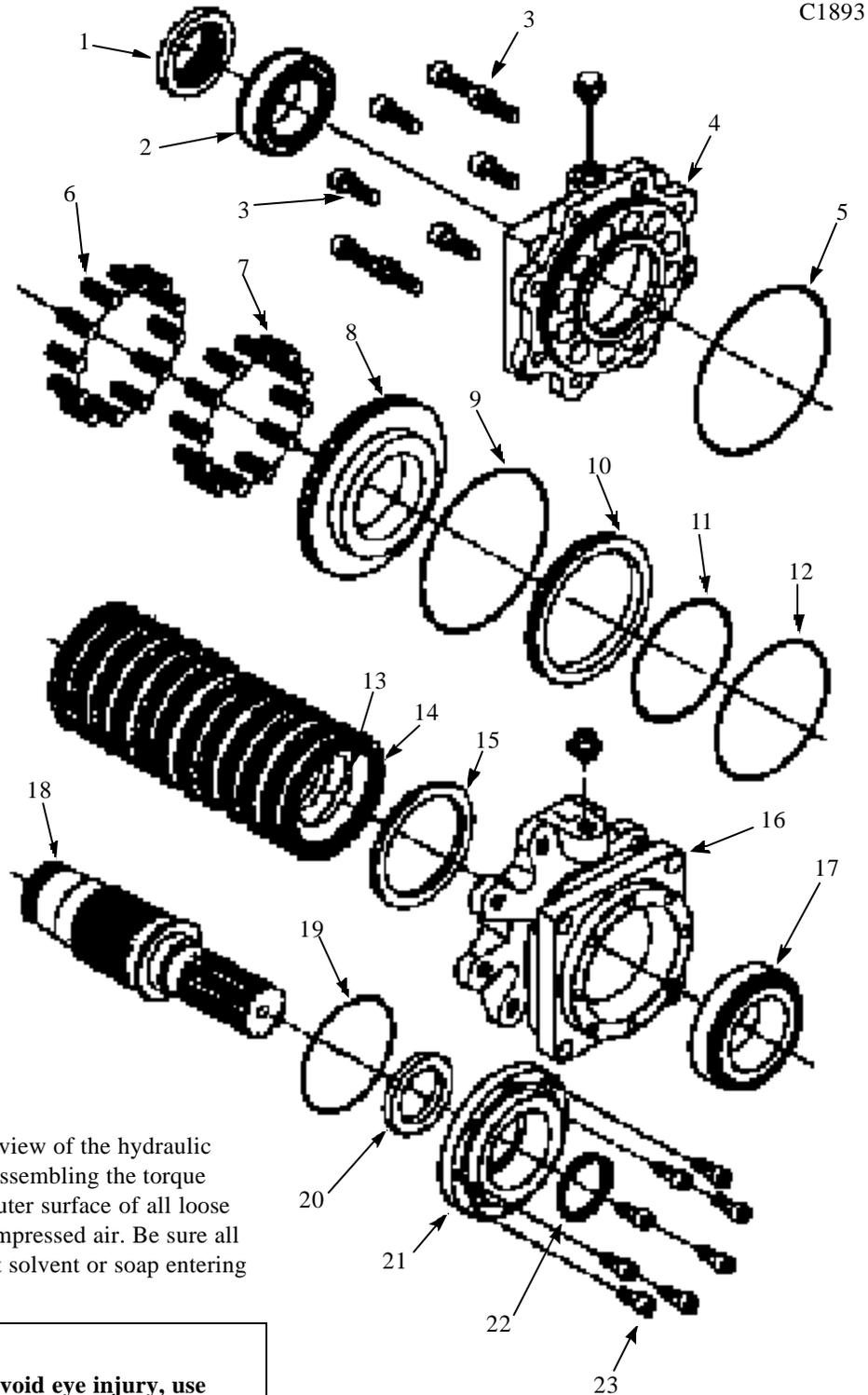


Fig. C1893 shows an exploded view of the hydraulic torque motor brake. Before disassembling the torque motor and or brake, clean the outer surface of all loose dirt and grease and dry with compressed air. Be sure all openings are plugged to prevent solvent or soap entering the torque motor.



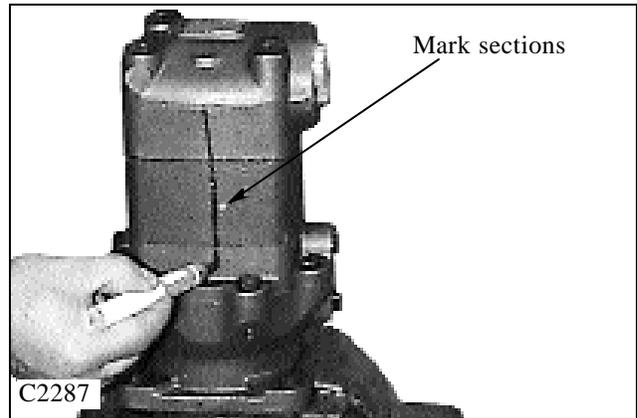
To avoid eye injury, use safety goggles when cleaning with compressed air.

DRIVE MOTOR 2.12

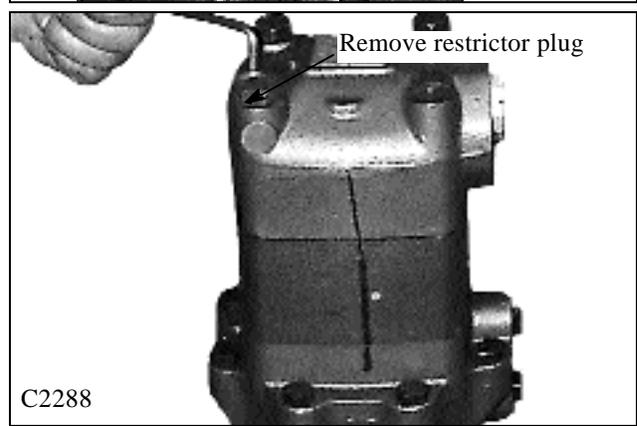
Disassembly

2

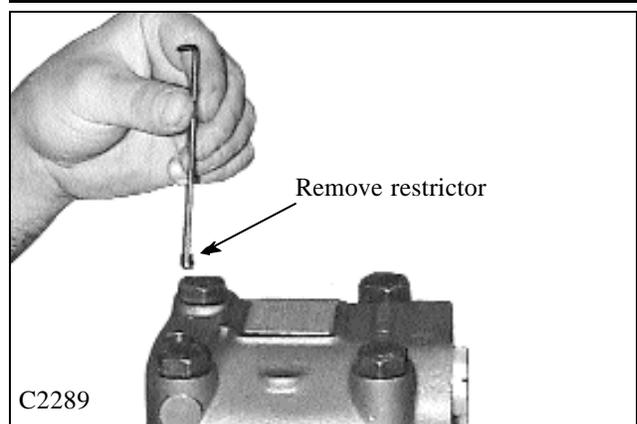
- 1 Place the drive motor in a vise with the output shaft facing down. Clamp the motor to the vise, holding it by the mounting flange area. Do not clamp the motor on the housing as excessive pressure will cause distortion.
- 2 Mark a line across the various sections of the drive motor to assist in reassembly. (fig. C2287)



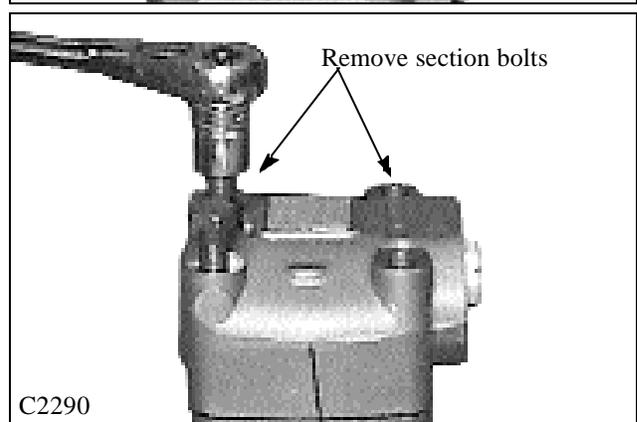
- 3 Remove the small allen head socket plug located between two of the section bolts. (fig. C2288)



- 4 Insert an allen wrench into the open hole and remove the set screw restrictor. (fig. C2289)



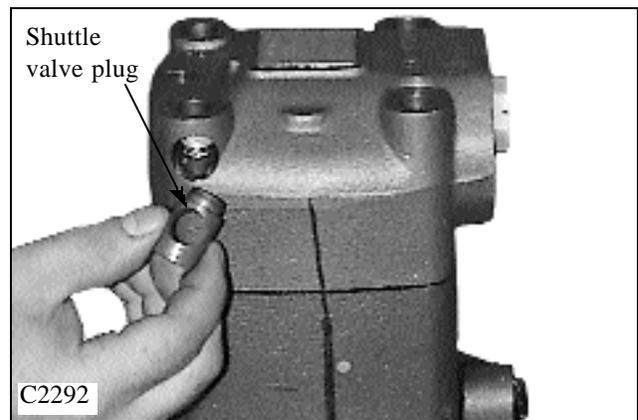
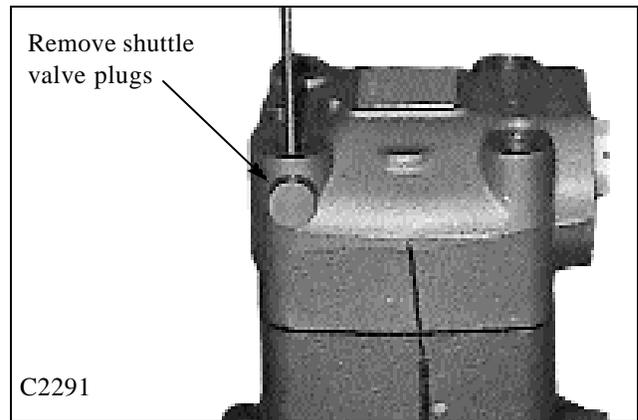
- 5 Remove the 4 bolts from the drive motor valve housing. (fig. C2290) Upon reassembly, torque the bolts in a criss cross pattern at 130 ~ 135 ft/lbs. (177 ~ 183.5 N.m.)



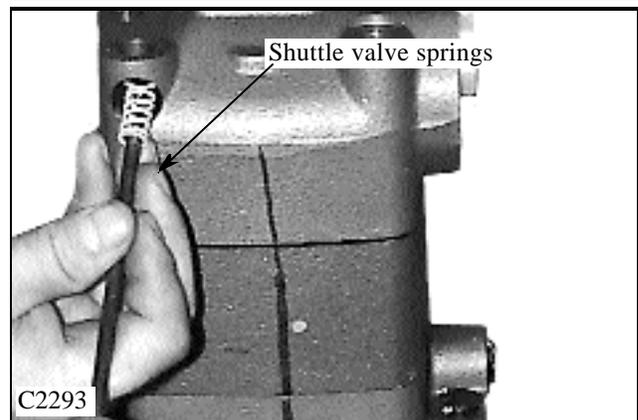
DRIVE MOTOR 2.12

Disassembly (cont'd)

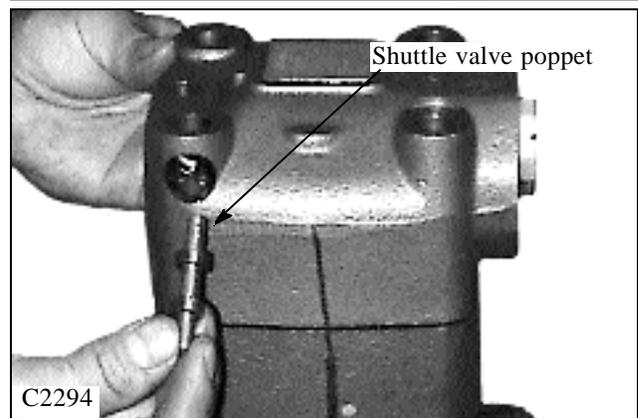
6 Insert a small screwdriver into the mounting holes of the valve housing assembly and remove the 2 shuttle valve plugs, one each side. (fig. C2291, 2293)



7 Insert a small screwdriver into the shuttle valve plug hole and retrieve the springs. (fig. C2293) There is one on either side.



8 Push out the shuttle valve poppet using the screwdriver. (fig. C2294)



2

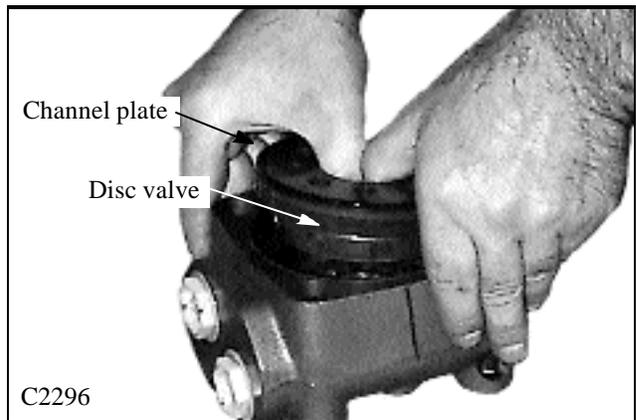
DRIVE MOTOR 2.12

Disassembly (cont'd)

9 Carefully lift the valve housing straight up. (fig. C2295) Place your fingers under the valve housing to hold the channel plate in place.

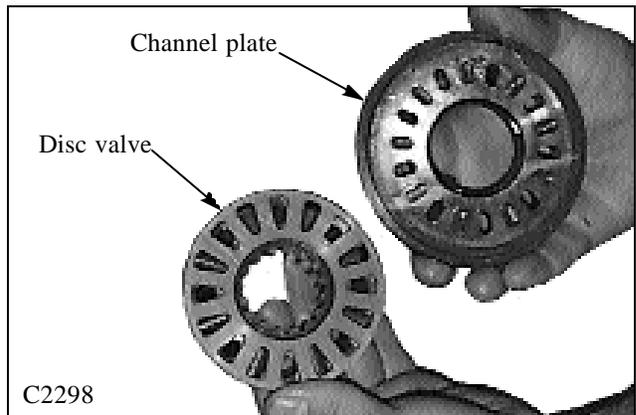
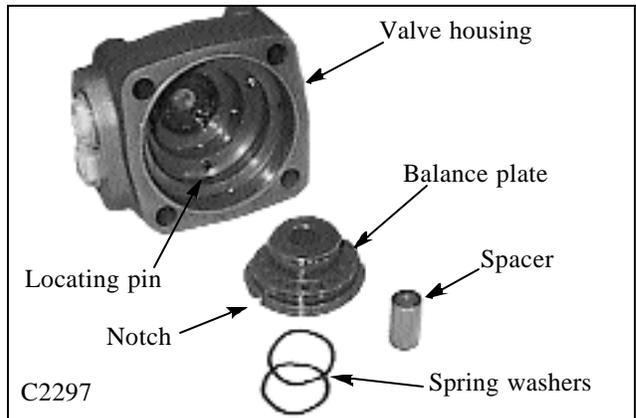


10 Remove the channel plate. (fig. C2296)



11 Remove the disc valve and balance plate from the valve housing section. (fig. C2297, C2298)

12 Inspect the parts for wear and replace as required. Replace all seals with new when assembling the drive motor.



2

DRIVE MOTOR 2.12



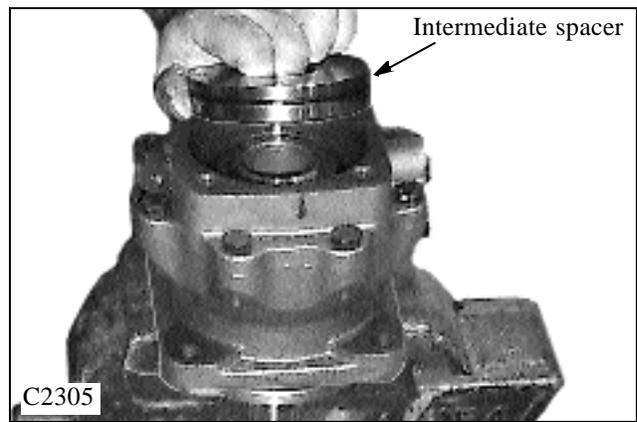
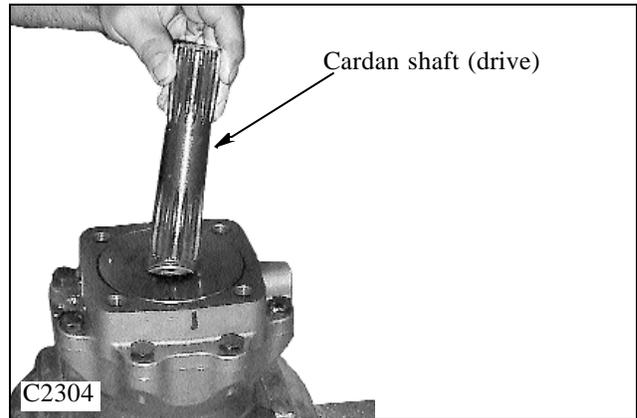
C2303

DRIVE MOTOR 2.12

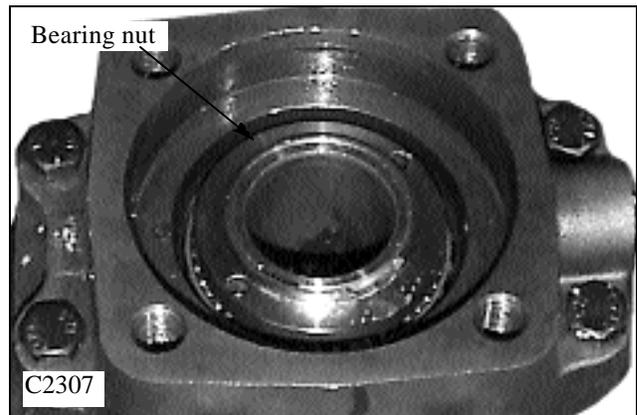
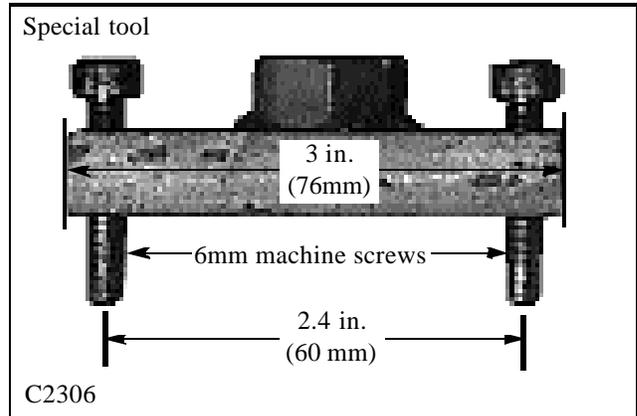
Disassembly (cont'd)

- 15 Remove the cardan (drive) shaft (fig. C2304).
- 16 Remove the intermediate spacer (fig. C2305) .
Replace the seal with new item at time of assembly.

2



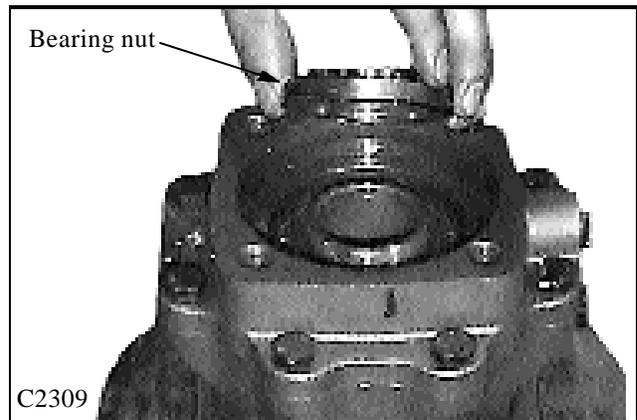
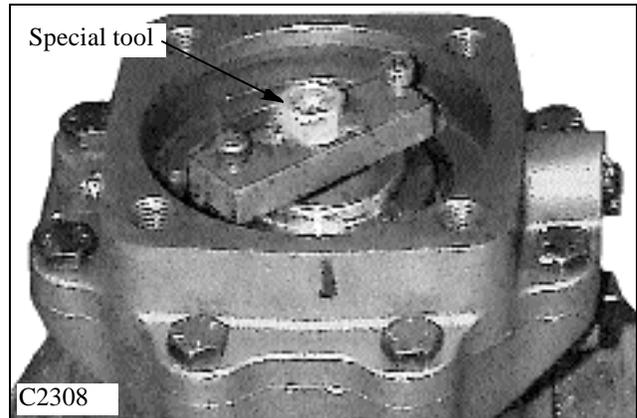
- 17 A special tool will be required as shown in fig. C2306 to remove the bearing nut (fig. C2307). Tool shown was made using 1/2 in. X 1 in. X 3 in. long (12mm x 25mm x 76mm L) material. Two holes were drilled and tap 60mm apart, to accept 6mm X 30mm machine screws.



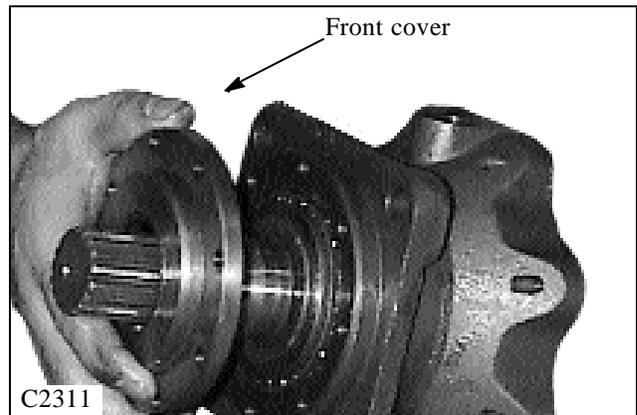
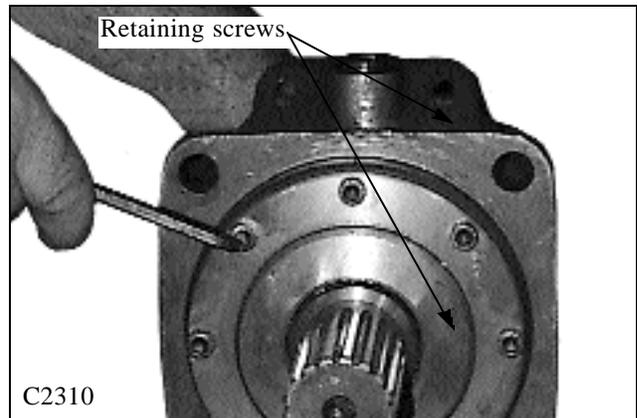
DRIVE MOTOR 2.12

Disassembly (cont'd)

18 Place the special tool on the bearing nut and remove the bearing nut. (fig. C2308, C2309).



19 Remove the drive motor from the vise and remove the screws retaining the front cover to the bearing housing. (fig. C2310, C2311). Replace the seals with new at time of assembly.

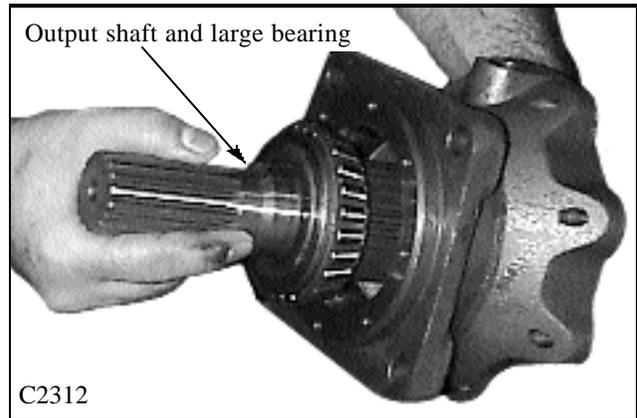


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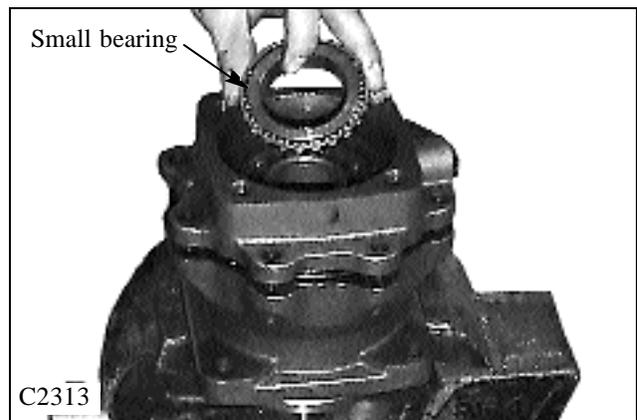
DRIVE MOTOR 2.12

Disassembly (cont'd)

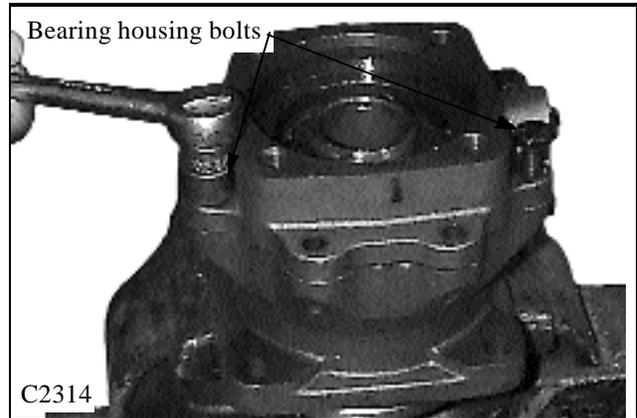
20 Use a press and appropriate sized arbor to push the output shaft from the bearings. (fig. C2312).



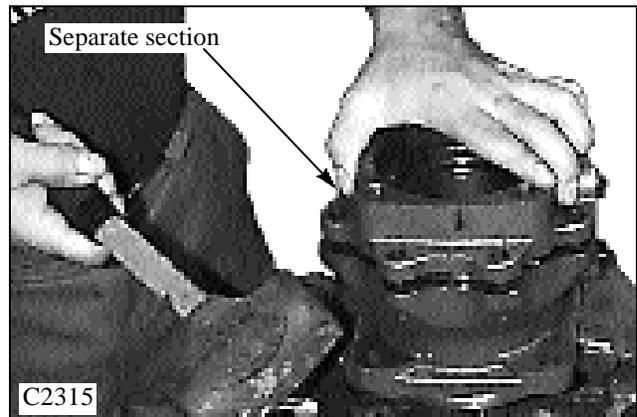
21 Remove the small bearing from the housing. (fig. C2313). Inspect both bearings and races. Replace as required.



22 Remove the bolts from the around the bearing housing. (fig. C2314).



23 Separate the bearing housing sections. (fig. C2315) A mallet may be required to assist removal.

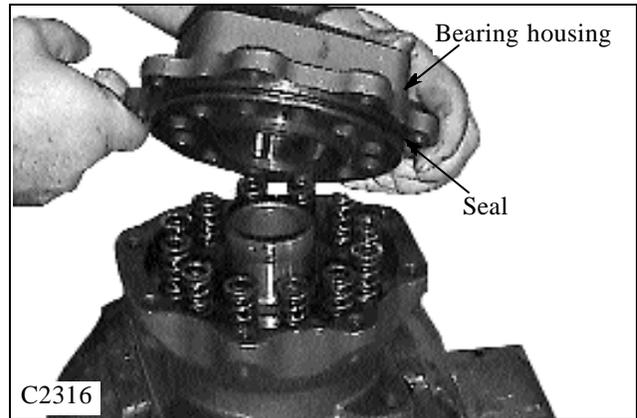


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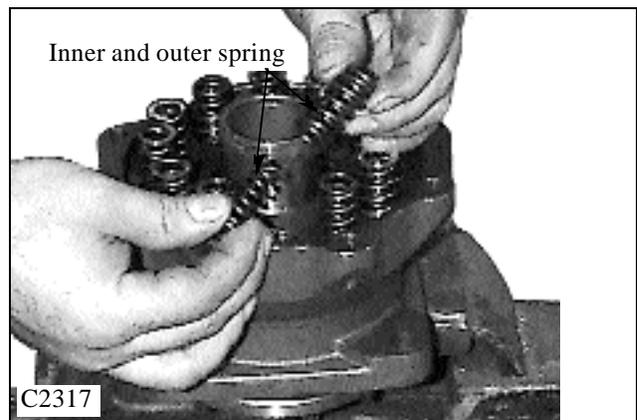
DRIVE MOTOR 2.12

Disassembly (cont'd)

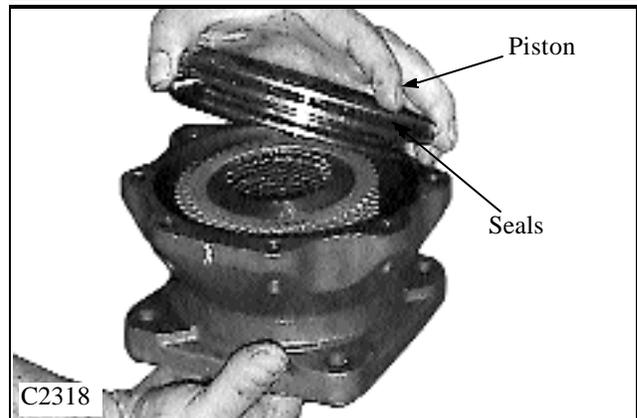
24 Remove the bearing housing (fig. C2316).



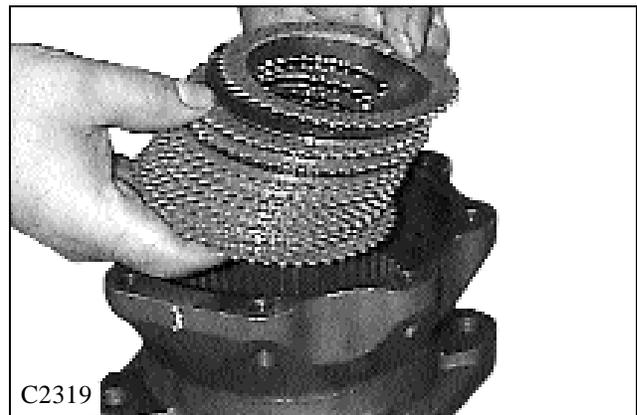
25 Remove the brake springs from the brake piston. (fig. C2317) There are inner and outer springs.



26 Remove the piston from the housing by pushing through from the output shaft side. (fig. C2318)



27 Remove the brake disc assemblies. Note the positions of the steel and fibre plates. (fig. C2319). Check the plates for wear and replace as required.

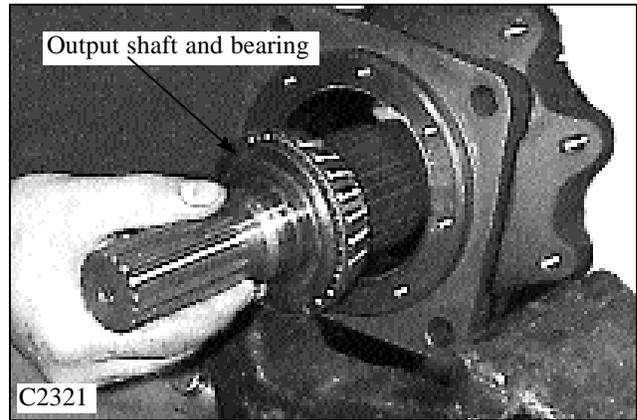


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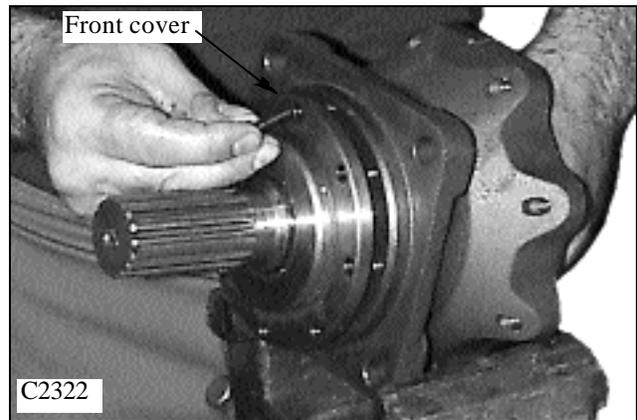
DRIVE MOTOR 2.12

Assembly

1 Install the output shaft to the housing. (fig. C2321)



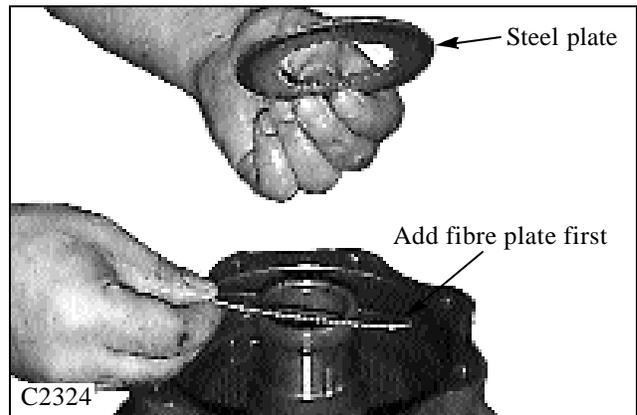
2 Install the front cover to the housing and torque the screws to 12 Nm. (8.9 lbs / ft) (fig. C2322). Use new seals when assembling the motor.



3 Install the brake disc spacer ring to the housing. (fig. C2320)



4 Install the brake disc plates. (fig. C2323, C2324, C2319) Start with a fibre plate, add a steel plate, then fibre and so on until the last plate to be installed is a fibre plate.



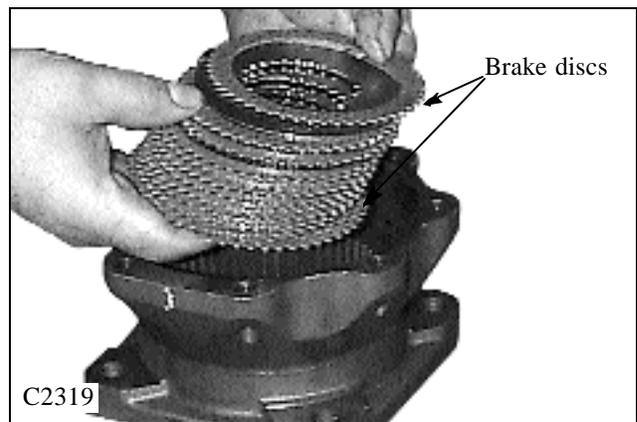
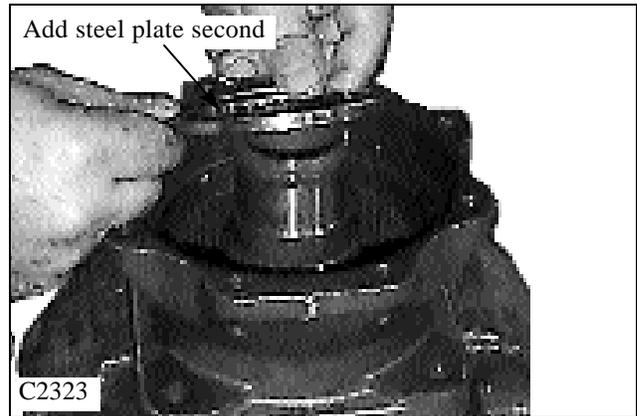
IMPORTANT

NOTE: The fibre plates are also called outer plates due to the “teeth” outside of the plate.

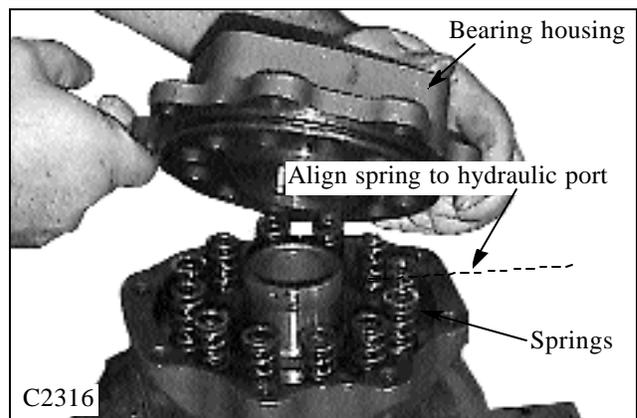
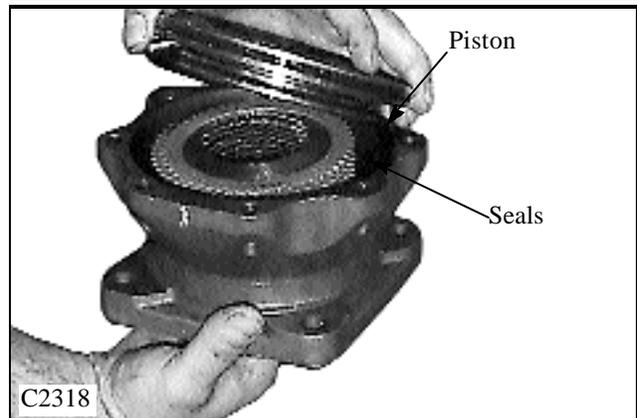
DRIVE MOTOR 2.12

Assembly

5 Continue adding plates, 12 fibre, 11 steel plates, to the housing. (fig. C2323, C2319)



6 Install the piston to the housing, over the brake discs. (fig. C2318) Use new seals when assembling the motor. Align one of the piston spring pockets with the hydraulic inlet port opening in the housing. (fig. C2316)

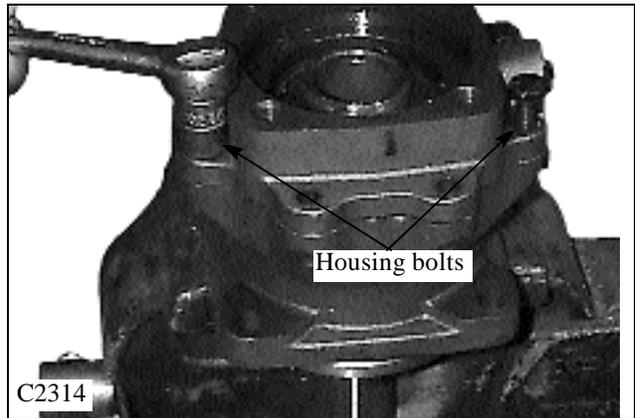


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DRIVE MOTOR 2.12

Assembly (cont'd)

7 Install the bearing housing bolts and torque to 46.5 lbs / ft. +/- 2 lbs / ft. (63 Nm +/- 3 Nm) (fig. C2314)



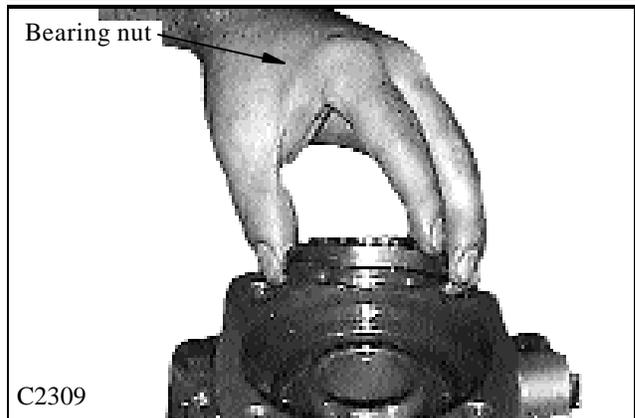
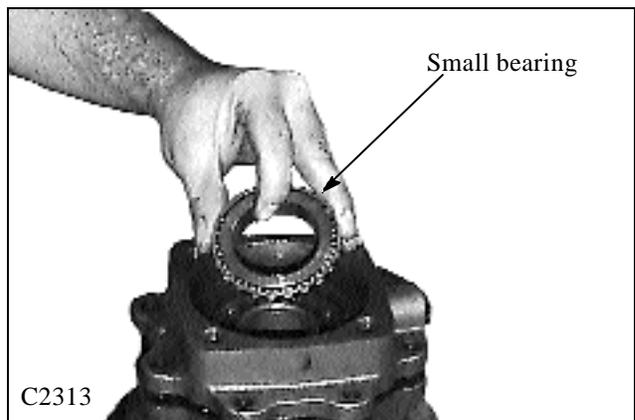
8 Install the small bearing to the output shaft (fig. C2313) in the following sequence:

a. Apply pressure, 12 bar (175 psi), to the brake ports to release the brakes.

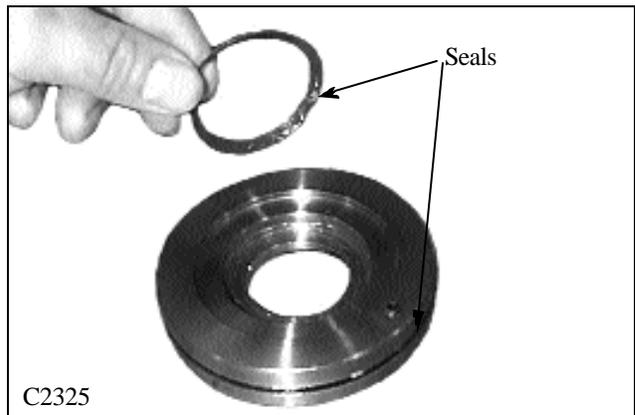
b. Press the bearing onto the output shaft with a force of 350 daN (780 pounds of force), while rotating the housing back and forth. Be sure to press only on the inner race of the bearing.

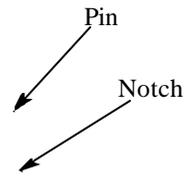
c. Remove the brake release pressure before removing the force acting on the bearing.

d. Install the bearing nut and torque to 45 lbs / ft. (60 Nm) Strike the nut with blows from a mandrel and hammer to prevent the nut from loosening.



9 Install a new seals to the intermediate plate. (fig. C2325). Apply petroleum jelly to the cup seal to retain in position.





C2326

DRIVE MOTOR 2.12

Assembly (cont'd)

14 Install the geroler section the housing. (fig. C2330)
Place a hand under the geroler to prevent the pieces from falling out.

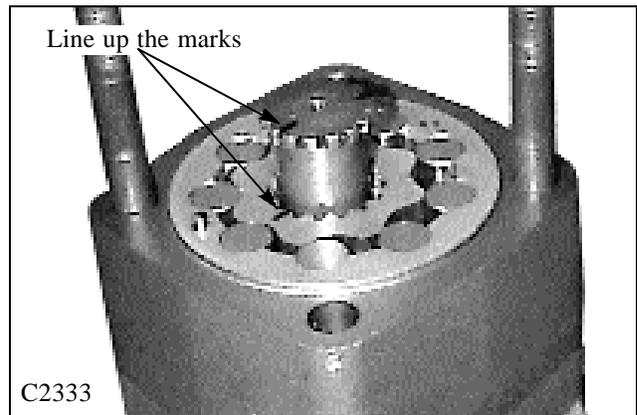
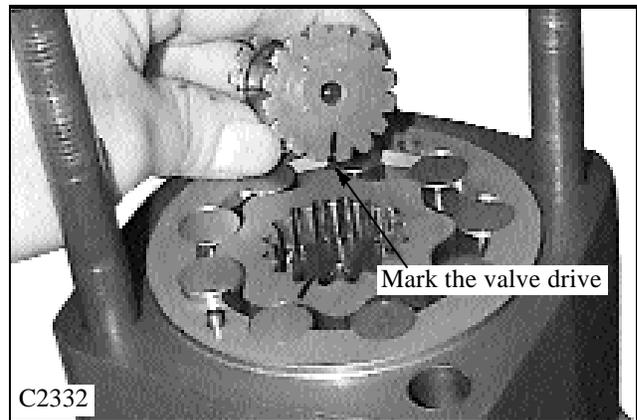
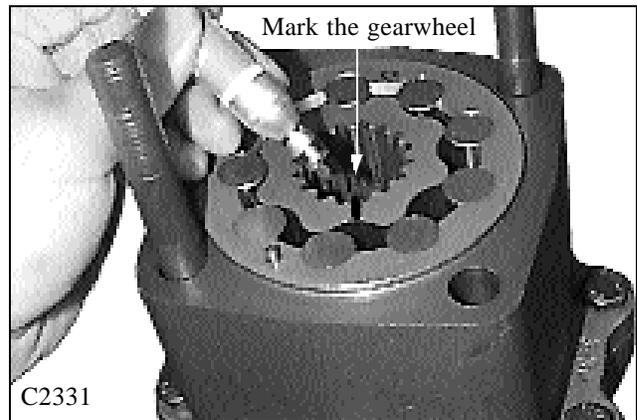
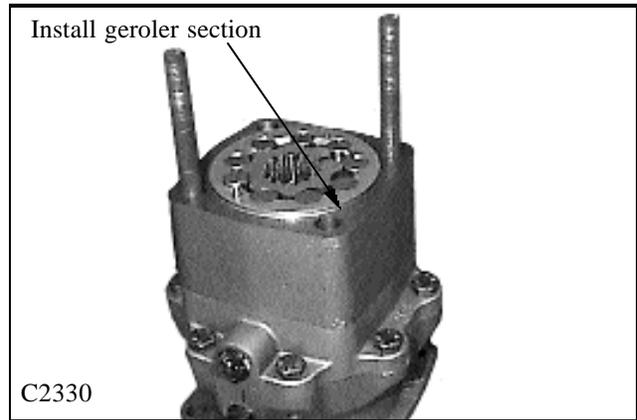
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The following procedures must be followed closely for proper motor rotation.

15 Mark the gearwheel set rotor at the point where the top of a spline tooth is opposite the bottom of a tooth in the external rotor teeth. (fig. C2331).

16 Mark the bottom of a spline tooth on the valve drive. (fig. C2332).

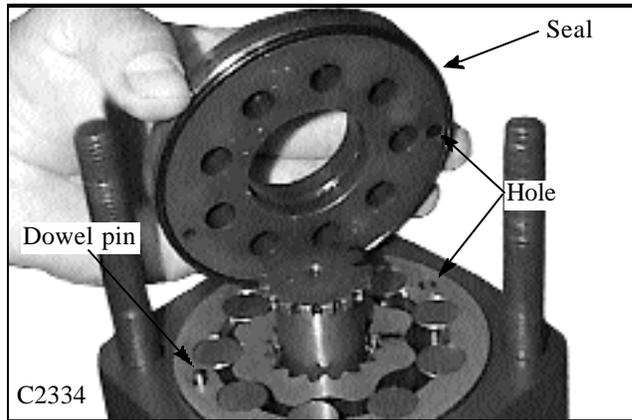
17 Install the valve drive lining up the marks on the valve drive to the gearwheel set. (fig. C2333).



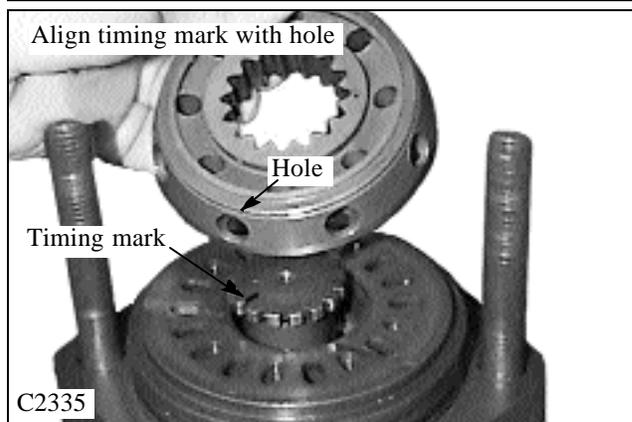
DRIVE MOTOR 2.12

Assembly (cont'd)

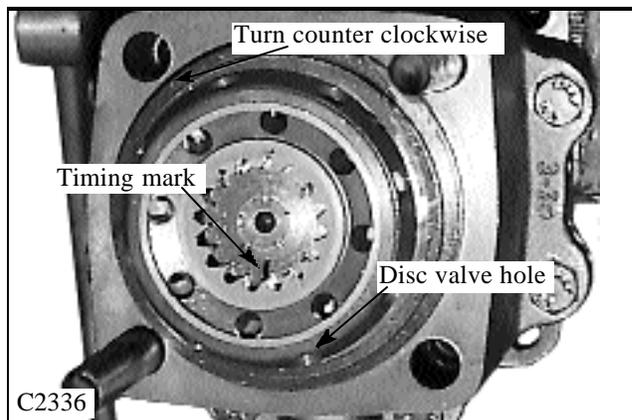
18 Install the channel plate to the geroler section. Install new seals when assembling the motor. (fig.C2334) Note the alignment dowel pin and oil passage hole.



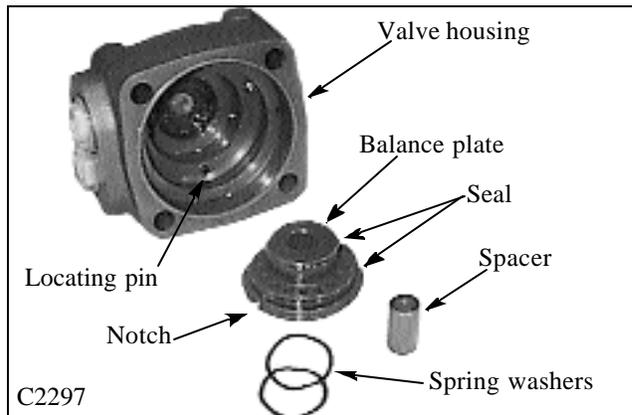
19 Install the disc valve to the valve drive. (fig. C2335) Align the mark on the valve drive with a hole in the outer rim.



20 Turn the disc valve counter clockwise until the two parts engage. (fig. C2336).



21 Install new seals to the balance plate, install the springs and install the balance plate to valve housing. (fig. C2297). Note the locating pin in the valve housing and the notch in the balance plate.

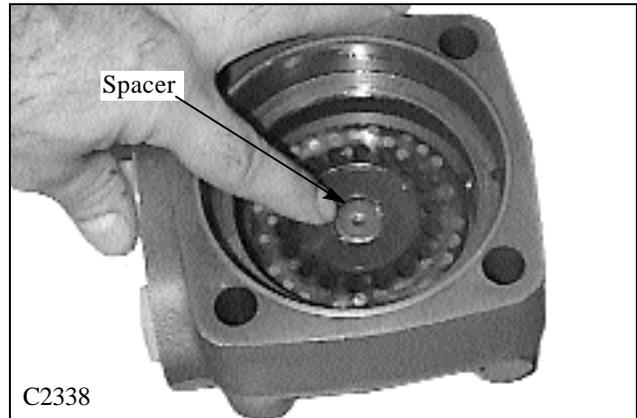
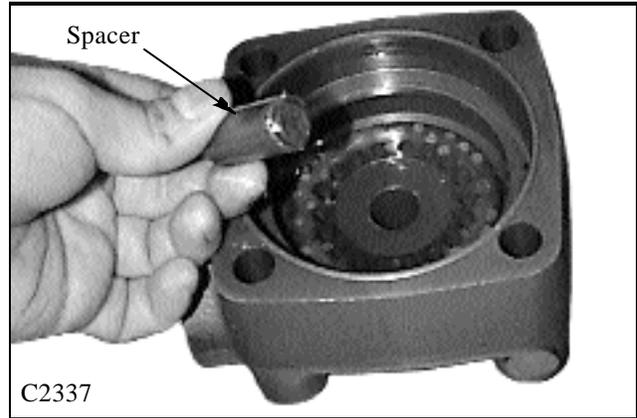


DRIVE MOTOR 2.12

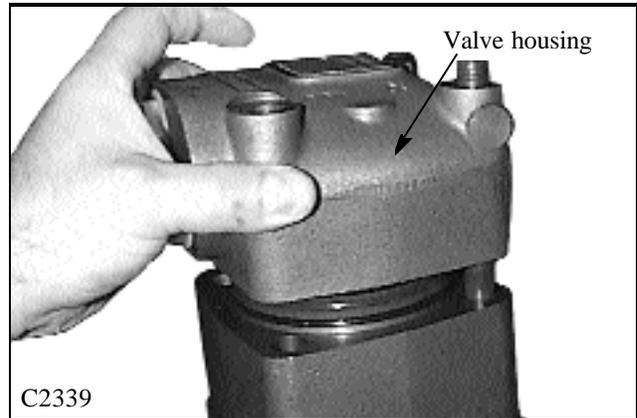
Assembly (cont'd)

- 22 Apply petroleum jelly to the spacer. (fig. C2337)
Install the spacer to the valve housing. (fig. C2338)

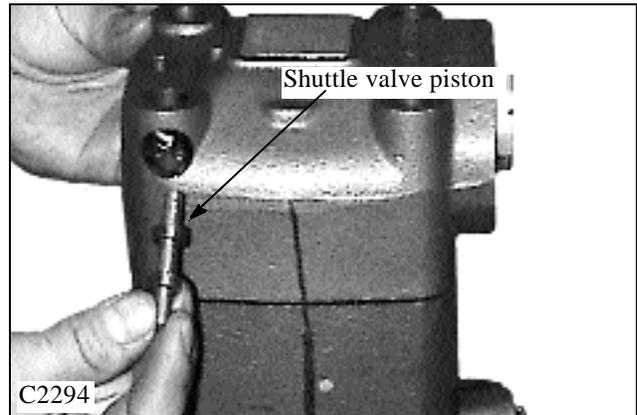
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- 23 Install the valve housing to the drive motor. (fig. C2339).



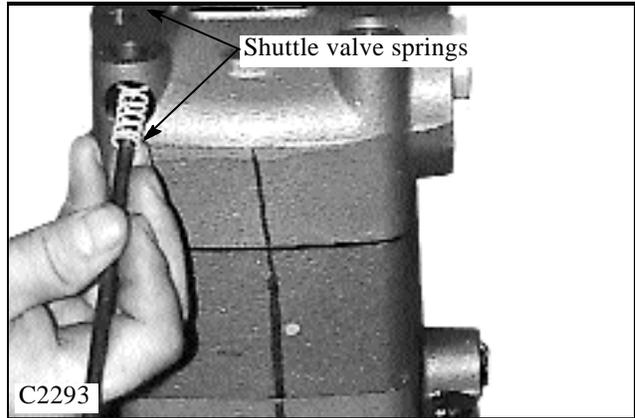
- 24 Install the shuttle valve piston. (fig. C2294).



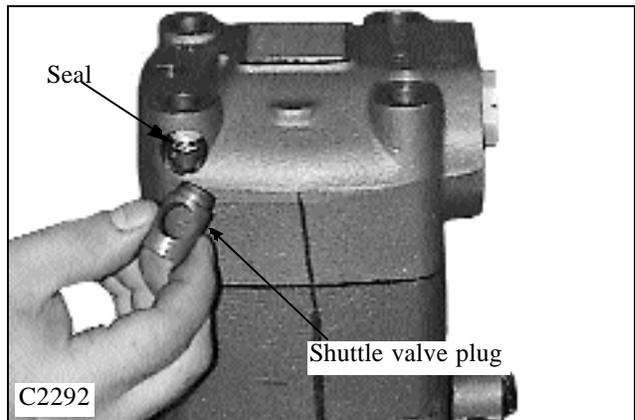
DRIVE MOTOR 2.12

Assembly (cont'd)

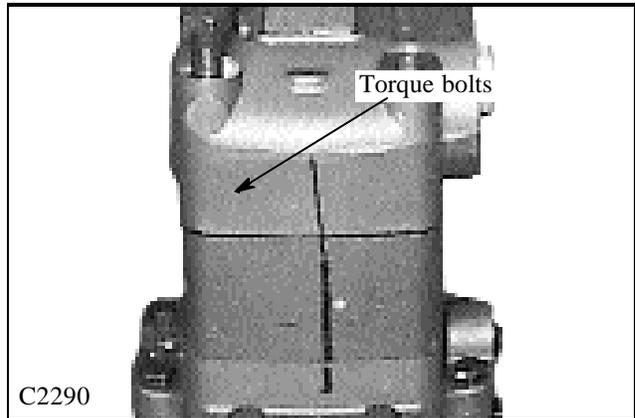
25 Install the shuttle valve springs to either side of the piston. (fig. C2293).



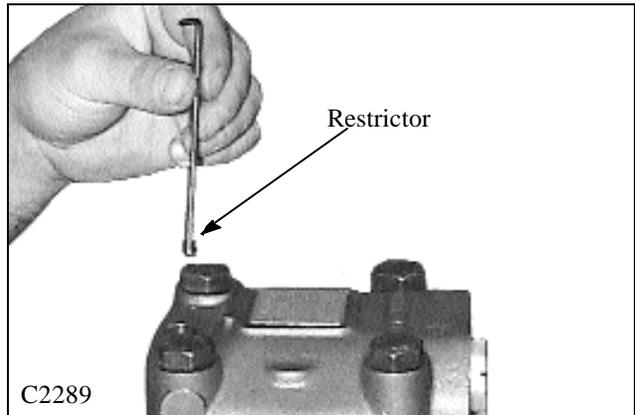
26 Install the shuttle valve plugs. (fig. C2292) Be sure to use new seals when assembling the motor.



27 Install the bolts to the drive motor and torque in a criss cross pattern to 135 lbs / ft. (183 Nm).(fig. C2290).



28 Install the restrictor and replace the plug. (fig. C2289).



2

2



THOMAS

SECTION 3 FINAL DRIVE

Specifications & Maintenance 3.1

Chart pg. 3-2

Lubrication 3.2

Checking the Oil pg. 3-3

Adding Oil pg. 3-3

Changing the Oil pg. 3-3

Drive Chain 3.3

Checking pg. 3-4

Removal pg. 3-5

Installation pg. 3-6

Drive Motor Sprocket 3.4

Replacement pg. 3-7

Axle Assembly 3.5

Illustration pg. 3-9

Removal pg. 3-10

Inspection pg. 3-11

Installation pg. 3-12

Stud Replacement pg. 3-15

Trouble Shooting 3.6

Chart pg. 3-16



SPECIFICATIONS & MAINTENANCE 3.1

Specifications

Chain Size ANSI 60HT
 Approved Chain Manufacturer Tsubaki
 Lubricating Oil 10W30 API Classification SE/CD
 Oil Capacity (each)..... 7 Liters. (1.9 gal)



Torque Specifications:

Motor Sprocket Bolt..... 25 lbs /ft (34 nm)
 Wheel Nuts..... 100 - 110 lbs /ft (135 - 149 nm)
 Inspection Cover Nuts.....12 lbs /ft (16.5 nm)

Tire Pressure 50 psi (345 Kpa)

Maintenance	Initial Check (hrs)	Check Every (hrs)
--------------------	----------------------------	--------------------------

Tire Pressure.....	8.....	8
Wheel Nut Torque.....	8.....	8
Lubrication Oil.....	50.....	150 (*)
Chain Tension.....	50.....	150
Motor Mounting Nuts	50.....	150
Axle Bearing Pre-load.....	50.....	150

(*) Change every 1000 hours.

LUBRICATION 3.2

Checking The Oil Level

The loader has 2 independent final drive housings. When checking the oil level, ensure the loader is on a level surface.

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Remove the top (upper) check plug located between the 2 tires at the very front of the loader. (fig. C597)
The oil level should be at the top of the check hole with a little to trickle out.

WARNING

Never work under a raised boom arm without the boom supports engaged and the engine shut off.

Adding Oil

Oil should be added with the loader on a level surface.

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Remove the seat and hydrostatic shield (fig. C2358).
- 3 Remove the vented oil filler plug (fig. C2360).
- 4 Add 10W30 API classification SE/CD oil until it begins to flow out the upper check hole. Total final drive housing capacity per side is 7 liters (1.9 gal).
- 6 Replace all plugs. Apply thread sealant to vented filler plug (fig. C2279).

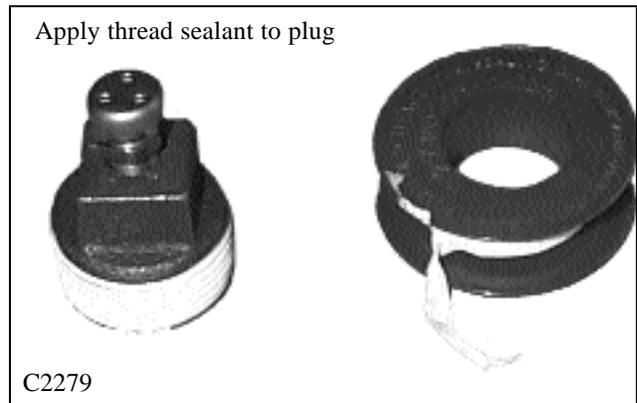
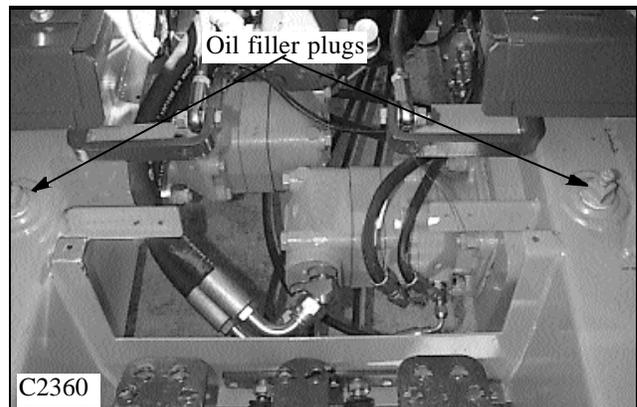
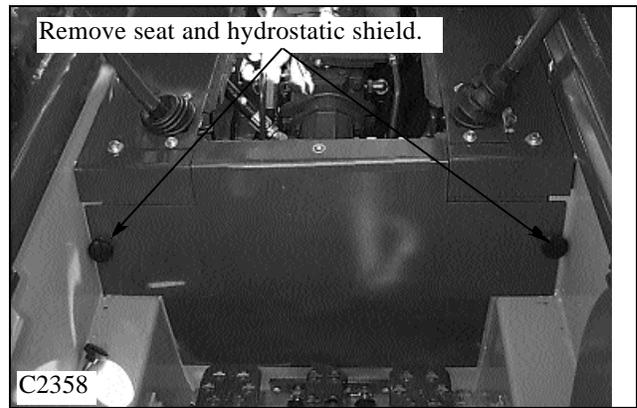
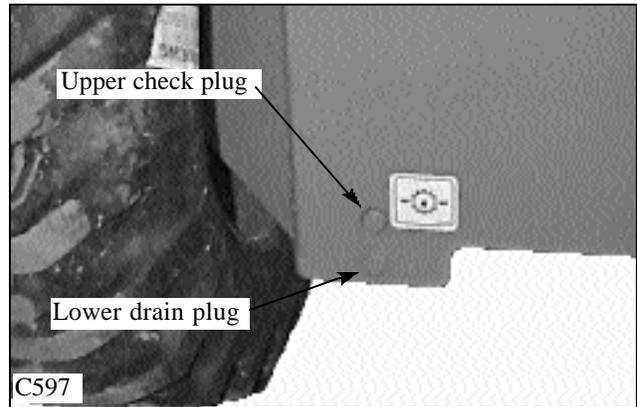
WARNING

Check the final drives closely for damaged seals or other leaks if the oil level is excessively low.

Changing The Oil

Ensure the loader is on a level surface before changing the oil.

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Slide a drain pan under one of the lower drain plugs located at the front of the loader, between the 2 front wheels. (fig. C597) Be prepared to contain 7 liters (1.9 gal) of oil.
- 3 Remove the drain plug. Allow the oil to drip completely out of the final drive housing. Replace the drain plug. Dispose of the waste oil in an environmentally friendly manner. If the oil is contaminated, remove the side inspection cover to flush the housing.
- 4 Replenish the oil as outlined above in Adding Oil with 10W30 API classification SE/CD oil.



3

DRIVE CHAIN 3.3

Checking The Drive Chain

The drive chain must be checked for adjustment after the first 50 hours of service and every 150 hours thereafter. Correct chain tension is measured at 1/4 ~ 2 inches (6 to 50 mm) free play.

1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine. Raise the loader securely with tires off the ground.

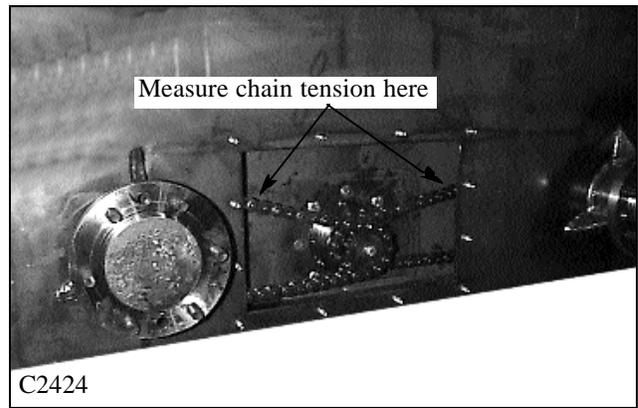
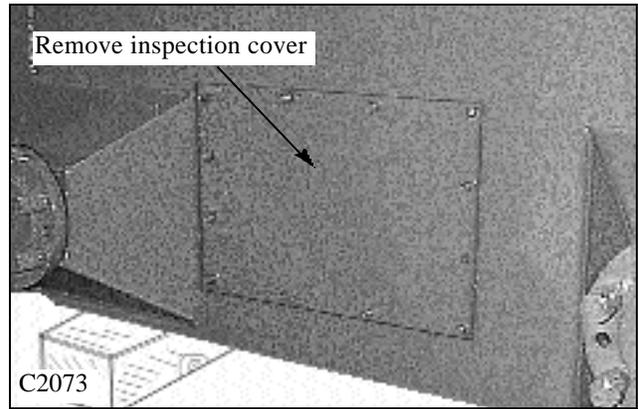
3

2 Remove the wheels and inspection cover located between the axle assemblies. (fig. C2073, C2424).

3 Using a ruler or tape measure, check the chain tension at the mid point (fig. C2425, C2426) between the drive motor and axle sprockets. Correct free play should be 1/4 ~ 2 inches of free play. (6 to 50 mm).

4 If chain tension measures with in specifications, reseal the inspection cover area with silicone. Be sure to clean the surface thoroughly before application.

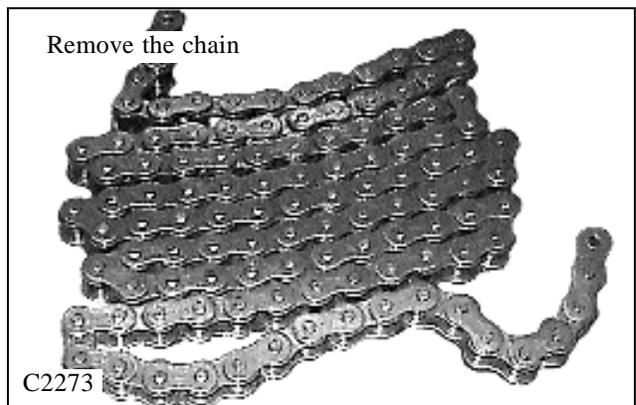
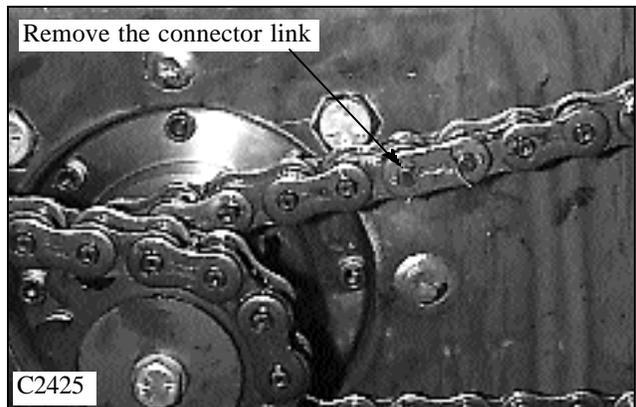
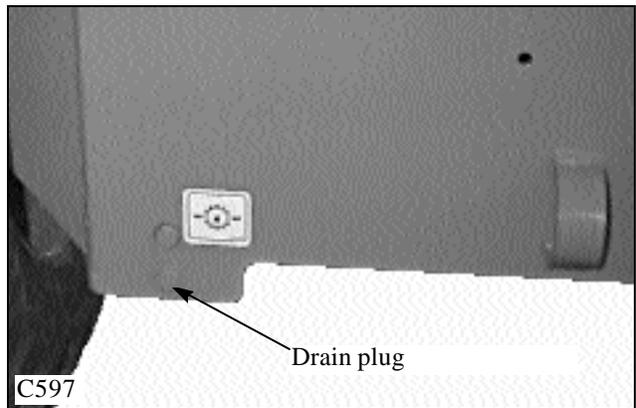
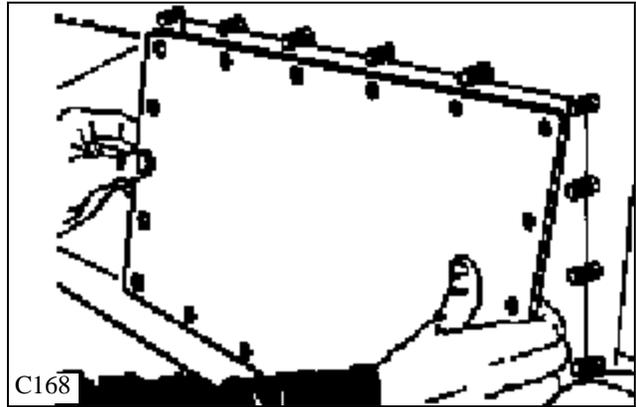
If the chain tension is not with in specification, then the drive chain must be replaced. Be sure to inspect the drive sprockets for wear at this time also.



DRIVE CHAIN 3.3

Chain Removal

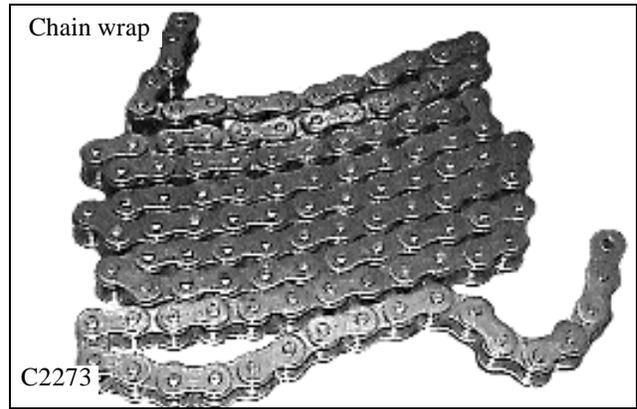
- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Block the loader securely with all 4 wheels clear of the ground.
- 3 Remove the wheels from the side of the loader the chain is to be removed.
- 4 Clean the excess dirt from the final drive housing drain plug area and the inspection cover area located between the 2 axle towers. (fig. C168)
- 5 Remove the lower drain plug and drain the oil. Refer to Section 3.2. (fig. C597)
- 6 Remove the final drive inspection cover. (fig. C168)
- 7 Rotate the chain, if necessary, to locate the master connecting link (fig. C2425) by starting the engine and engaging the steering control. Be sure the loader is securely raised clear of the ground.
- 8 Remove the cotter pins from the master connecting link and remove the connecting link (fig. C2425).
- 9 Remove the chain from the housing by turning the axles by hand and pulling the slack chain out the inspection cover area (fig. C2273). Hold the chain up off the drive sprocket to allow the chain to rotate freely.



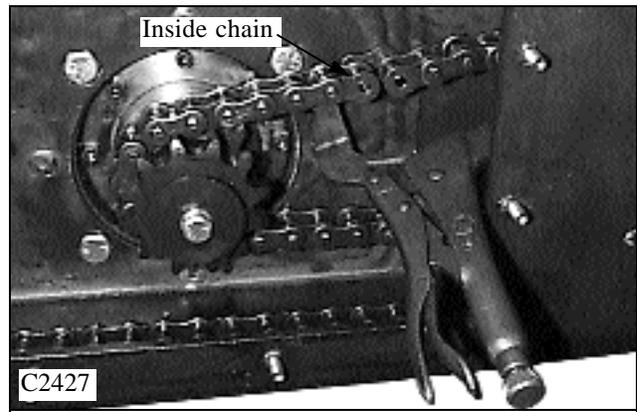
DRIVE CHAIN 3.3

Chain Installation

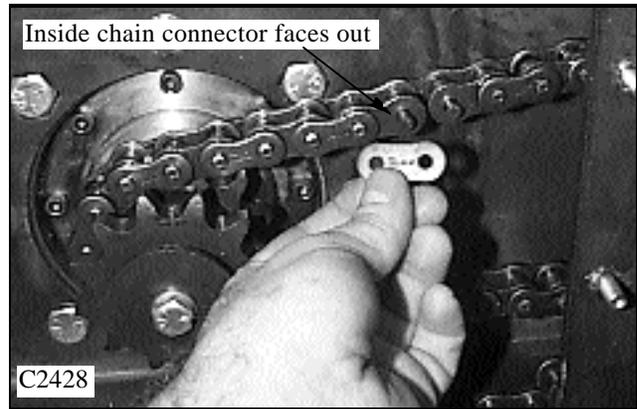
- 1 Wrap the chain in a “Z” pattern (fig. C2273).
- 2 Install the wrapped chain into the final drive housing.
- 3 Place one end of the chain over the top of the axle sprocket. Rotate the axle by hand and bring the chain along the bottom of the final drive housing to approximately the center.



- 4 Wrap the chain around the drive motor sprocket and install a new connecting link (fig. C2427).

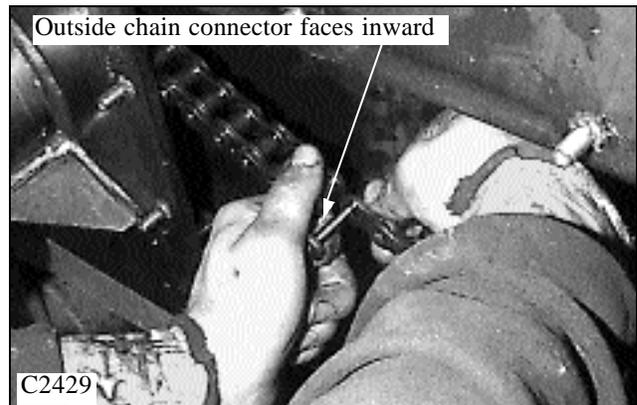


- 5 Place the connecting link into the chain so the inside chains connecting link has cotter pins face the inspection cover hole (fig. C2428). The connecting link on the outside chain, closest to the inspection cover opening, faces inward, (fig. C2429) toward the other chain. Bend the ends of the cotter pins at least 90° apart.



- 6 Check the chain tension as outlined on Section 3.3.

- 7 Replace the inspection cover using silicone. Do not over tighten the inspection cover nuts, 12 lbs / ft maximum. (16.5 nm). Be sure to clean sealing surfaces before silicone application.



- 8 Replace the wheels and torque the wheel nuts to 100 to 110 lbs/ft. (136 to 149 nm).

3

DRIVE MOTOR SPROCKET 3.4

Replacement

The torque motor drive sprocket can be removed from the loader without removing the drive motor from the final drive housing.

1 Place the loader on a level surface, engage the parking brake and shut off the engine.

2 Raise the loader securely from the ground and remove the wheels on the side to be worked on.

3 Remove the inspection cover located between the axle assemblies. (fig. C2424)

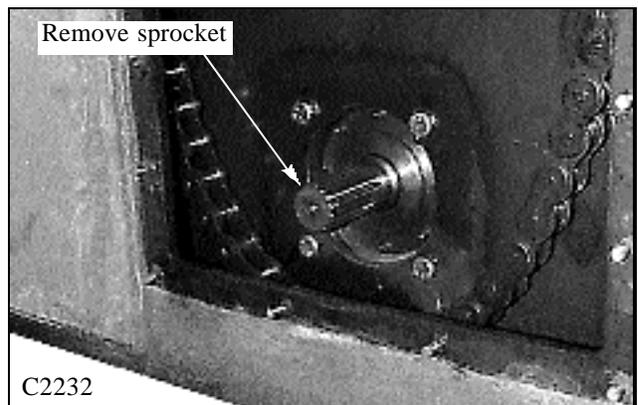
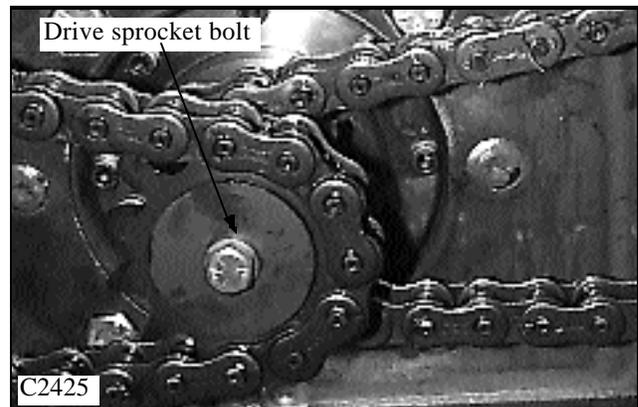
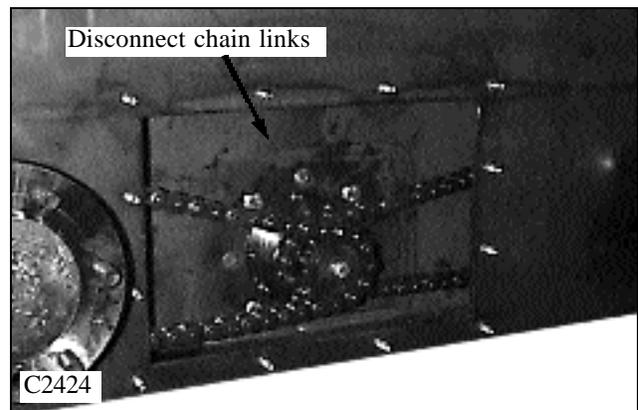
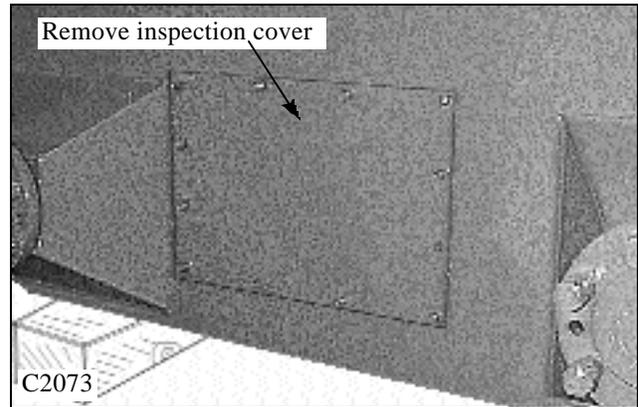
4 Disconnect both the front and rear drive chain connector links.

5 Remove the bolt retaining the drive sprocket to the drive motor. (fig. C2425)

6 Pull the drive motor sprocket from the shaft. Inspect the motor shaft for wear and replace motor parts if required. (See Section 2.)

7 Replace the drive sprocket in the reverse order above. Apply Loctite 242 (blue) to the drive sprocket bolt and torque the bolt to 28 lbs / ft (38 nm).

8 Replace the connecting links with new, reseal the inspection cover with silicone, and replenish the lubricating oil if needed.

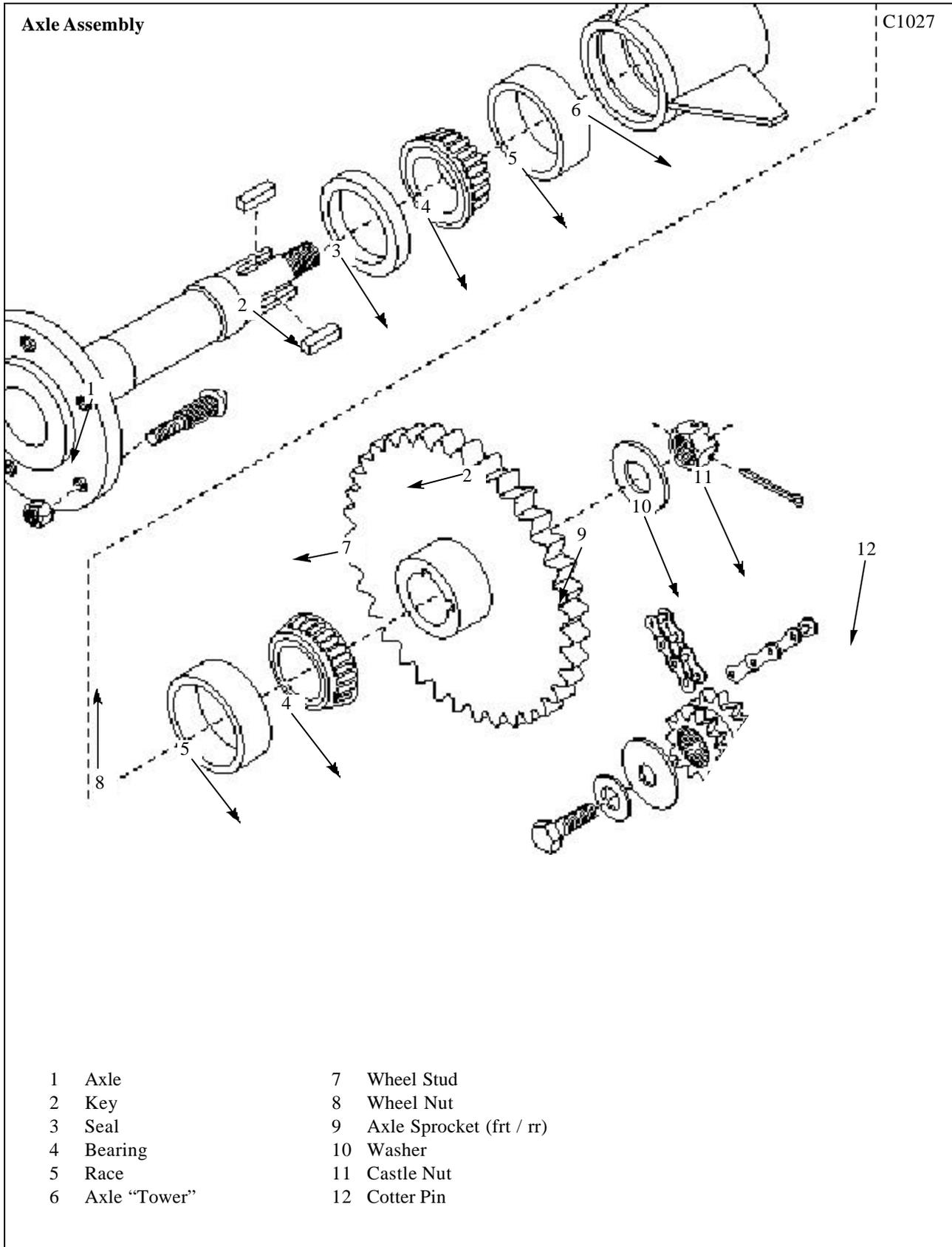


3



THOMAS

AXLE ASSEMBLY 3.5

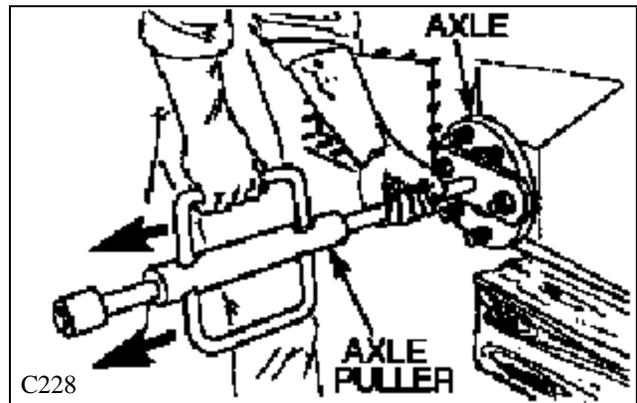
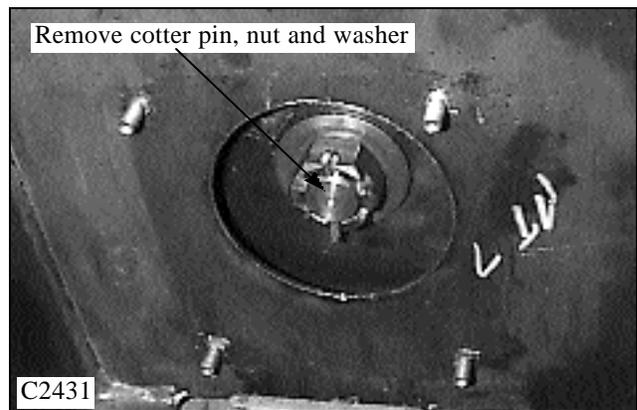
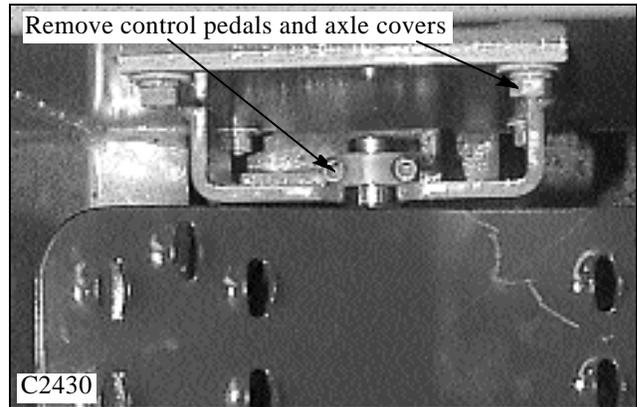


AXLE ASSEMBLY 3.5

Axle Removal

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Block the loader securely with all 4 wheels clear of the ground.
- 3 Remove the wheels from the side of the loader the axle is to be removed.
- 4 Clean the excess dirt from the final drive housing drain plug area and the inspection cover area located between the 2 axle towers.
- 5 Drain the lubricating oil from the final drive housing. Refer to Section 3.2.
- 6 Remove the final drive inspection cover located between the 2 axles.
- 7 Remove the drive chain from the axle to be replaced.
- 8 **FRONT AXLE:** Remove the foot pedal assembly if so equipped. (Refer to Section 4).
- 9 Remove the inner axle cover plate from the final drive housing. (fig. C2430)
- 10 **REAR AXLE:** Remove the inner axle cover plate from the final drive housing.
- 11 Remove the split pin from the castle nut on the end of the axle. (fig. C2431)
- 12 Remove the castle nut and axle washer. The axle will need to be held stationary.
- 13 Using a special slide hammer type axle puller tool, (fig. C502) remove the axle assembly (fig. C228). (See special tools, Section 8).

3



AXLE ASSEMBLY 3.5

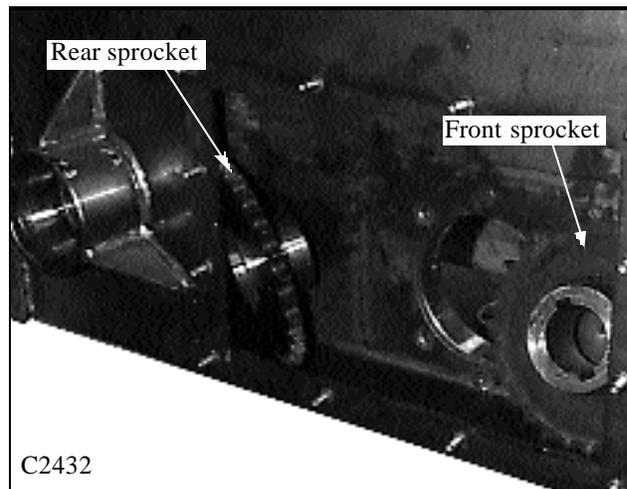
Axle Removal

14 Retrieve the inside bearing, sprocket and axle sprocket keys from inside the final drive housing.

Please note the orientation of the axle sprocket on the axle and in the housing. Front and rear sprockets have a different offset.

15 Using a bearing puller, remove the bearing still pressed in place on the axle. (fig. C221)

16 Remove and discard the axle oil seal.



Inspection

1 Inspect the seal surface area for scarring, pitting or nicks. Minor scratches may be removed using fine emery cloth. Replace the axle if worn excessively.

2 Inspect the axle threads for damage. Replace axle if the threads are non serviceable.

3 Inspect the axle keys for wear. Replace as required.

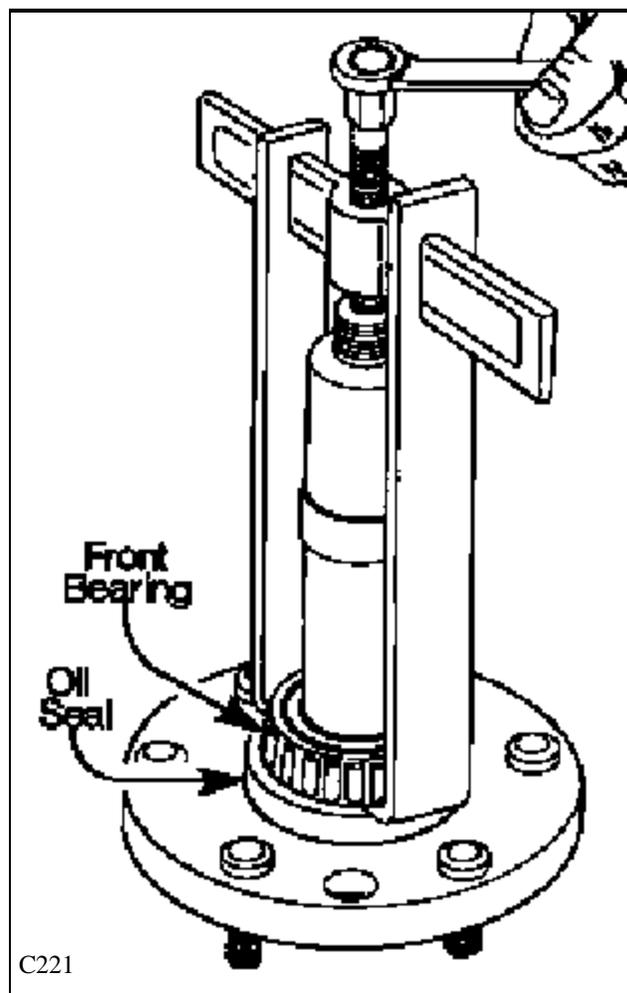
4 Inspect the key way slots for wear. Replace the axle and keys if the keys do not fit tightly into the key ways.

5 Replace any axle studs as required.

6 Inspect the axle sprocket for abnormal tooth wear and the fit of the axle key in the sprocket key ways. Replace the sprocket if necessary.

7 Inspect the bearing races in the final drive housing. Replace them if necessary using a brass drift punch and hammer. Cooling the races in a freezer will aid in easing this procedure.

8 Replace the bearings if new races are installed or if they are pitted or damaged.

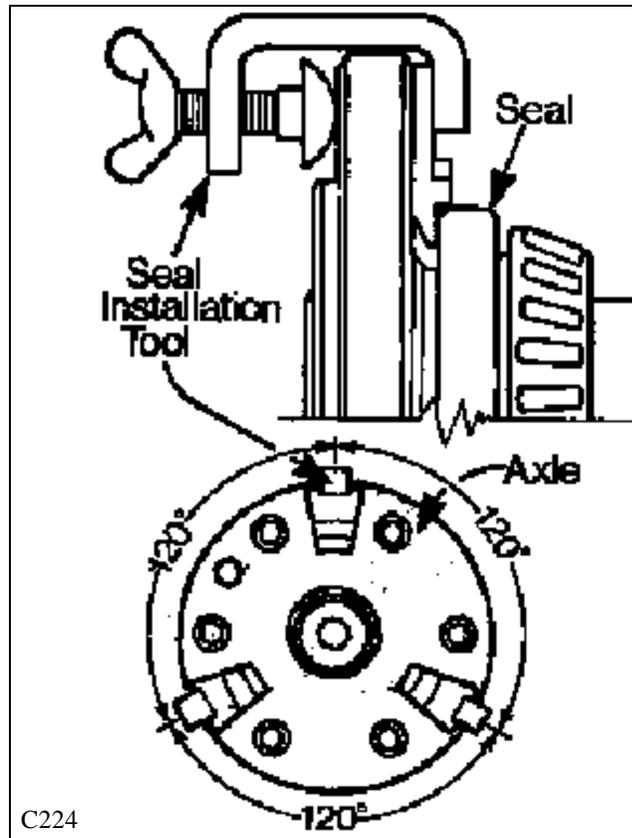
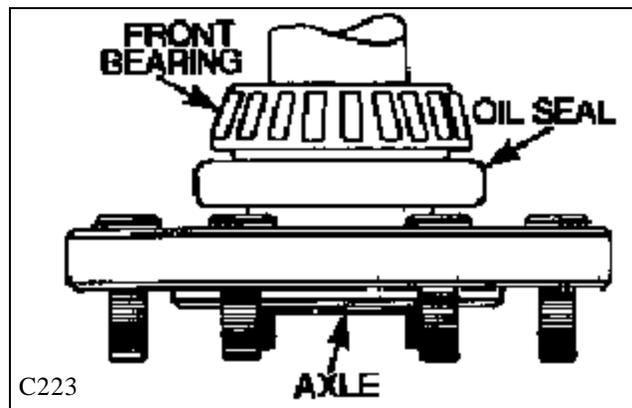
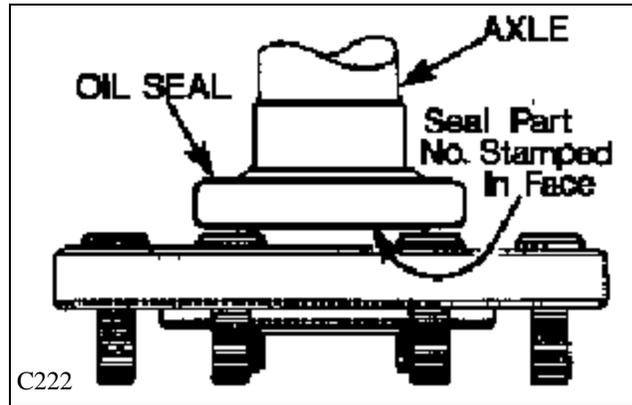


AXLE ASSEMBLY 3.5

Axle Installation

- 1 Check the axle seal surface area for damage. Minor scratches may be repaired using fine emery cloth.
- 2 Inspect the axle threads for damage. Replace axle if the threads are non serviceable.
- 3 Inspect the key way slots for wear. Replace the axle and keys if the keys do not fit tightly into the key ways.
- 4 Replace any axle studs as required.
- 5 Lubricate the axle oil seal with light grease.
- 6 Install the seal onto the axle. The seal part number stamping must face the flange side of the axle. (fig. C222)
- 7 Using a press, install the front, or outer, bearing onto the axle. Be sure to support the axle up off the wheel studs to prevent damaging the wheel studs. (fig. C223)

- 8 Place 3 seal installation tools, (See Special Tools, Section 8), equally spaced around the axle flange, behind the seal as shown in fig. C224. (approximately 120° increments). These special tools must be used to properly locate the seal into the final drive housing.



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AXLE ASSEMBLY 3.5

Axle Installation (cont'd)

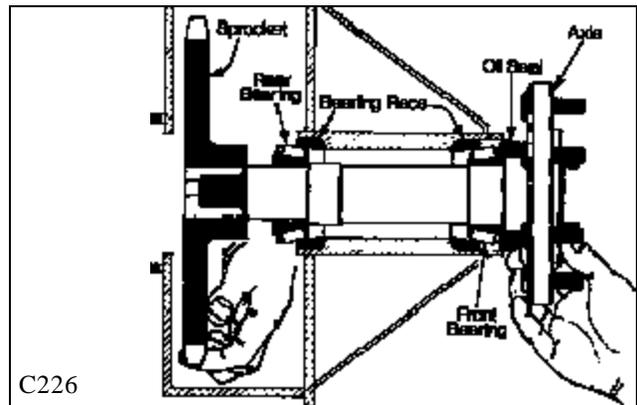
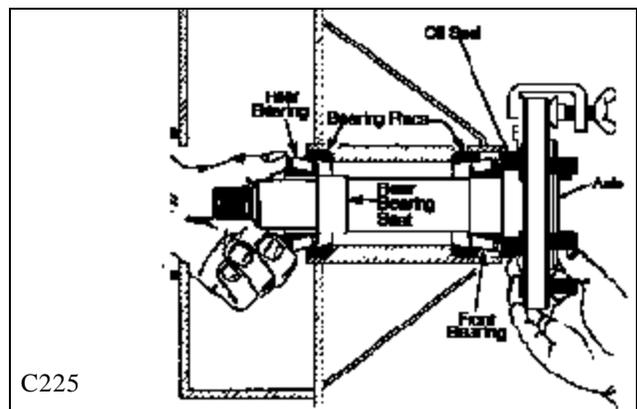
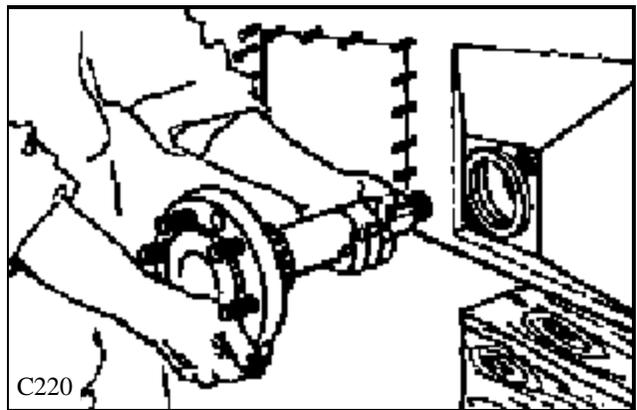
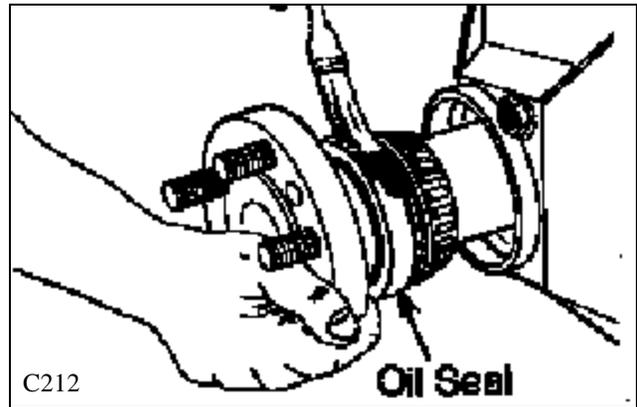
9 Place the axle sprocket into the final drive housing, make sure the hub offset is facing the proper way to align the chain with the drive motor sprocket.

10 Apply gasket sealant to the outer edge of the axle oil seal. (fig. C212) Take care, make sure none gets on the bearing surface.

11 Guide the axle into the final drive housing. (fig. C220).

12 Start the rear (inside) axle bearing onto the axle. (fig. C225).

13 Start the axle into the drive sprocket. (fig. C226).



AXLE ASSEMBLY 3.5

Axle Installation (cont'd)

14 Place the axle washer and castle nut onto the threaded end of the axle. (fig. C2434) Lightly tap the face of the axle flange, while holding the sprocket in position, if necessary to get the axle washer on and the castle nut started.

15 Hold the axle from rotating and tighten the castle nut and guide the axle into the final drive housing as straight as possible to prevent damaging the seal. Tap the axle flange with a hammer if necessary to assist the installation.

As the castle nut is being tightened the rear (inside) bearing is being pressed into place and the axle oil seal is simultaneously pulled into the proper location into the final drive housing.

16 When the castle nut will not turn on any further tap the face of the axle flange with a hammer to ensure the seal, bearings and races have seated into place.

17 Remove the castle nut, axle washer and remove the axle oil seal installation tools.

18 Line up the axle and sprocket key ways and install the keys into the key way slots. (fig. C2435) Use a brass drift punch and hammer if necessary to install the keys into the key way slots. (fig. C2436).

19 Install the axle washer and castle nut. Tighten the castle nut to remove all axle bearing end play. (Zero preload). Continue tightening until the split pin hole in the axle will align with the castle nut slot.

20 Install the split pin. Bend both ends of the split pin straight back against the axle washer. (fig. C2431).

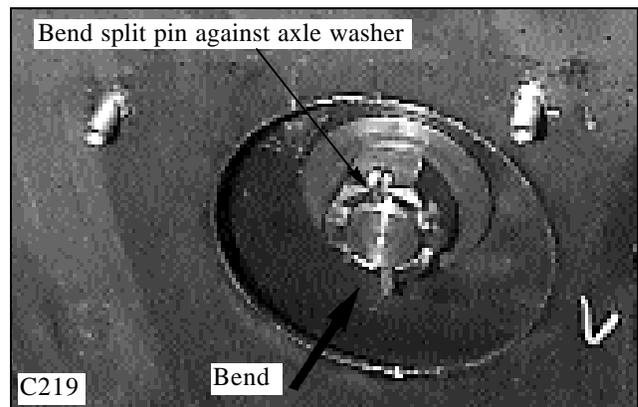
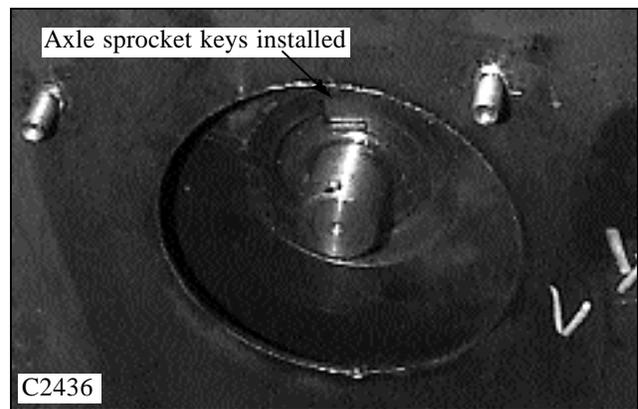
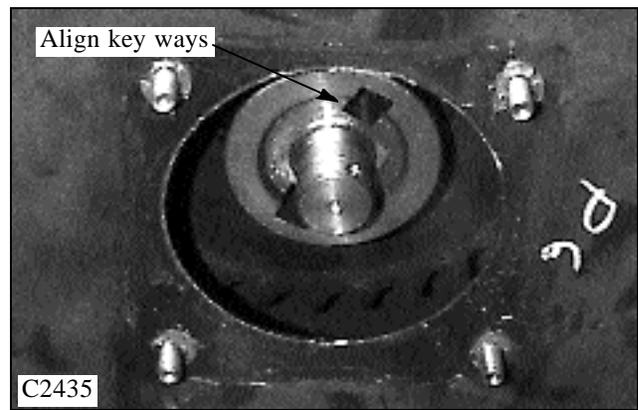
21 Install the axle cover using silicone to seal the matting surfaces. Do not over tighten the retaining nuts. 12 lbs/ft maximum. (16.5 nm).

22 Install the drive chain. Refer to Section 3.3.

23 Fill the final drive housing to the correct level using 10W30 API classification SE/ CD oil. Refer to Section 3.2 for procedure.

24 Install the inspection cover using silicone to seal the matting surfaces. Do not over tighten the retaining nuts. 12 lbs/ft maximum. (16.5 nm).

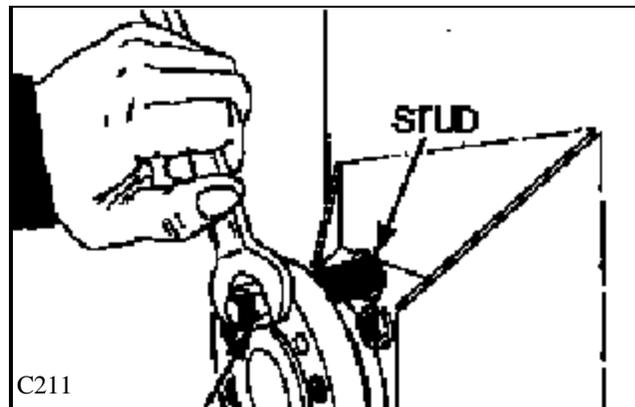
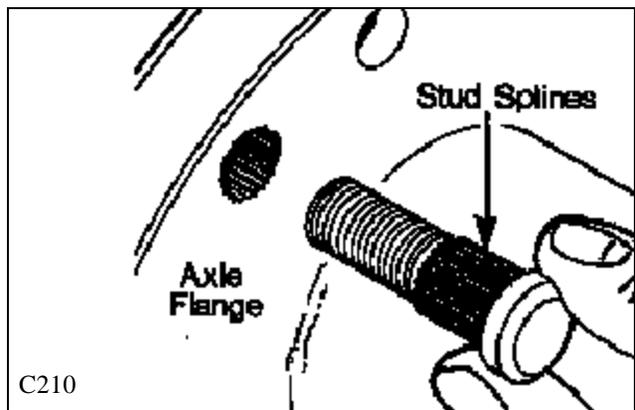
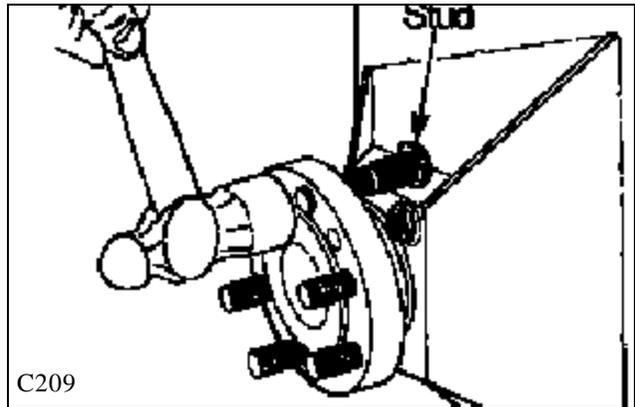
25 Install the wheels. Torque the wheel nuts to 100 to 110 lbs/ft. (135 to 149 nm).



AXLE ASSEMBLY 3.5

Axle Stud Replacement

- 1 Lower the boom arms and shut off the engine.
- 2 Raise and block clear of the surface the loader side of the loader the wheel studs are to be changed on.
- 3 Remove the wheel the studs are to be replaced on.
- 4 Remove the damaged or broken stud by rotating the axle so the damaged stud is at the 12:00 o'clock position as shown in fig. C209. The axle "tower" is relieved, or notch, in this location to allow stud removal without removing the axle assembly.
- 2 Strike the stud with a hammer to remove from the axle flange. (fig. C209).
- 3 Place a new stud in position behind the axle flange. Line up the splines on the stud with the splines cut into the axle flange. (fig. C210).
- 4 Place a wheel nut on the stud and use it to draw the stud into place in the axle flange as you tighten it. (fig. C211)
- 5 Replace the wheel and torque the wheel nuts to 100 to 110 lbs/ft. (135 to 149 nm)



IMPORTANT

Torque the wheel nuts daily to prevent stud and/ or wheel damage.



TROUBLE SHOOTING 3.6

3

Problem	Cause	Corrective Action	Section
Final drive noisy.	No lubricating oil.	Check oil level. Add 10W30 SE/CD oil to correct level.	3.2
	Chain is loose.	Adjust the chain tension. Check chain tension every 150 hours.	3.3
	Axle has too much end play. (Bearing pre-load)	Check and adjust the bearing pe-load on the axle bearings	3.6
	Chain tightener damage or failure.	Inspect the chain tightener and repair if necessary.	3.4
No drive on one side.	Drive chain failure.	Inspect the drive chain and connecting link. Replace damaged parts. Check the chain tension every 150 hours.	3.3
	Drive motor sprocket failure	Inspect the drive sprocket and splines. Replace parts as required.	3.5 2
	Drive motor or hydrostatic system failure	Refer to the hydrostatic drive section. Diagnose and make repairs as required.	2
Lubrication oil leaking through the filler / breather cap.	Lubricating oil level too high.	Check the oil level.	3.2
	Drive motor shaft seal leakage.	Inspect and repair damaged parts.	2
Wheel studs shearing off.	Wheel nuts loose.	Replace the wheel studs. Check wheel nut torque daily. Torque wheel nuts at 100 to 110 lbs/ft. (135 to 149 nm)	3.6
Wheel stud threads stripped.	Wheel nuts over tightened.	Replace the wheel studs. Check wheel nut torque daily. Torque wheel nuts at 100 to 110 lbs/ft. (135 to 149 nm)	3.6