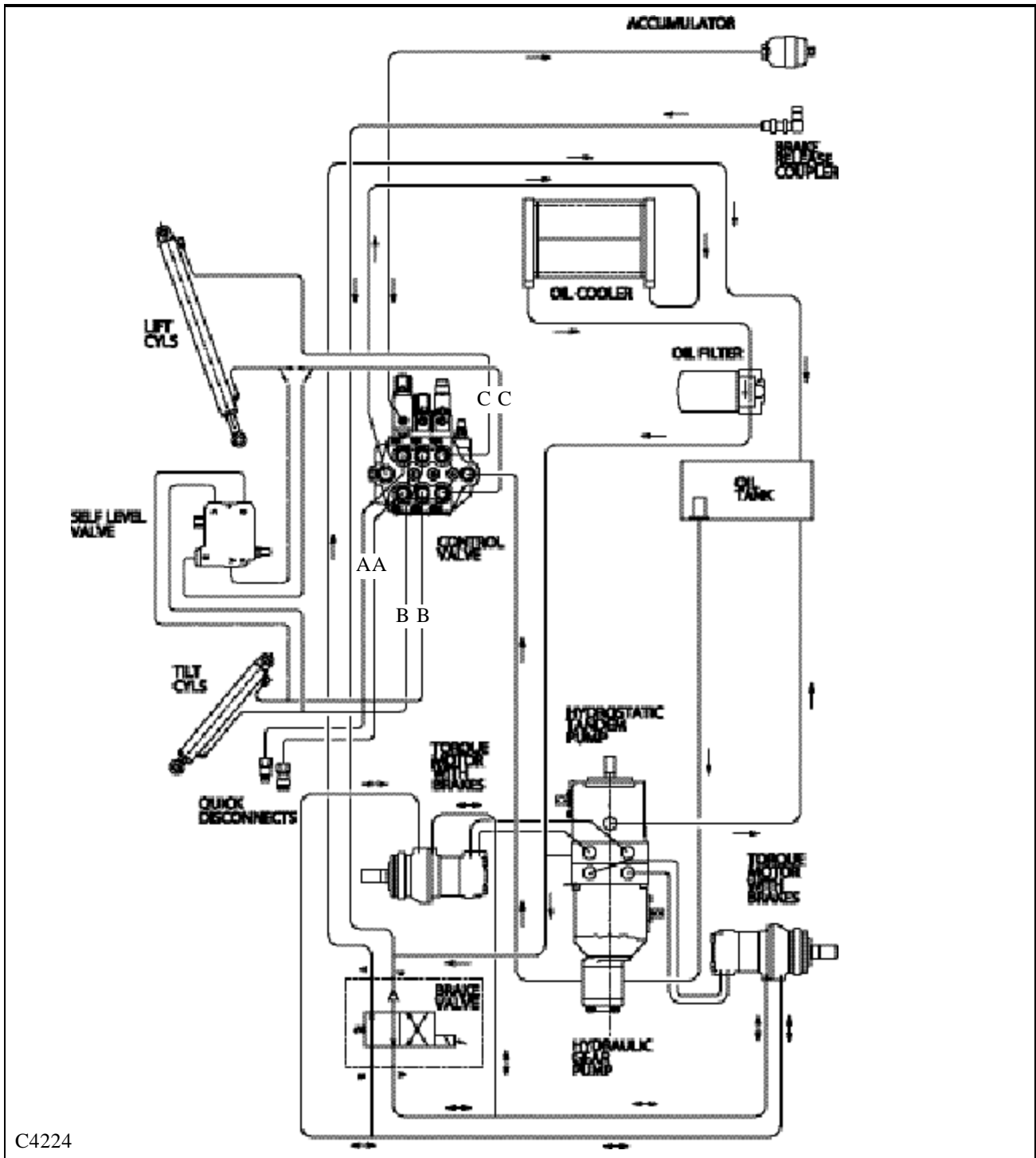


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# 1

## HYDRAULIC LAYOUT 1.1



C4224

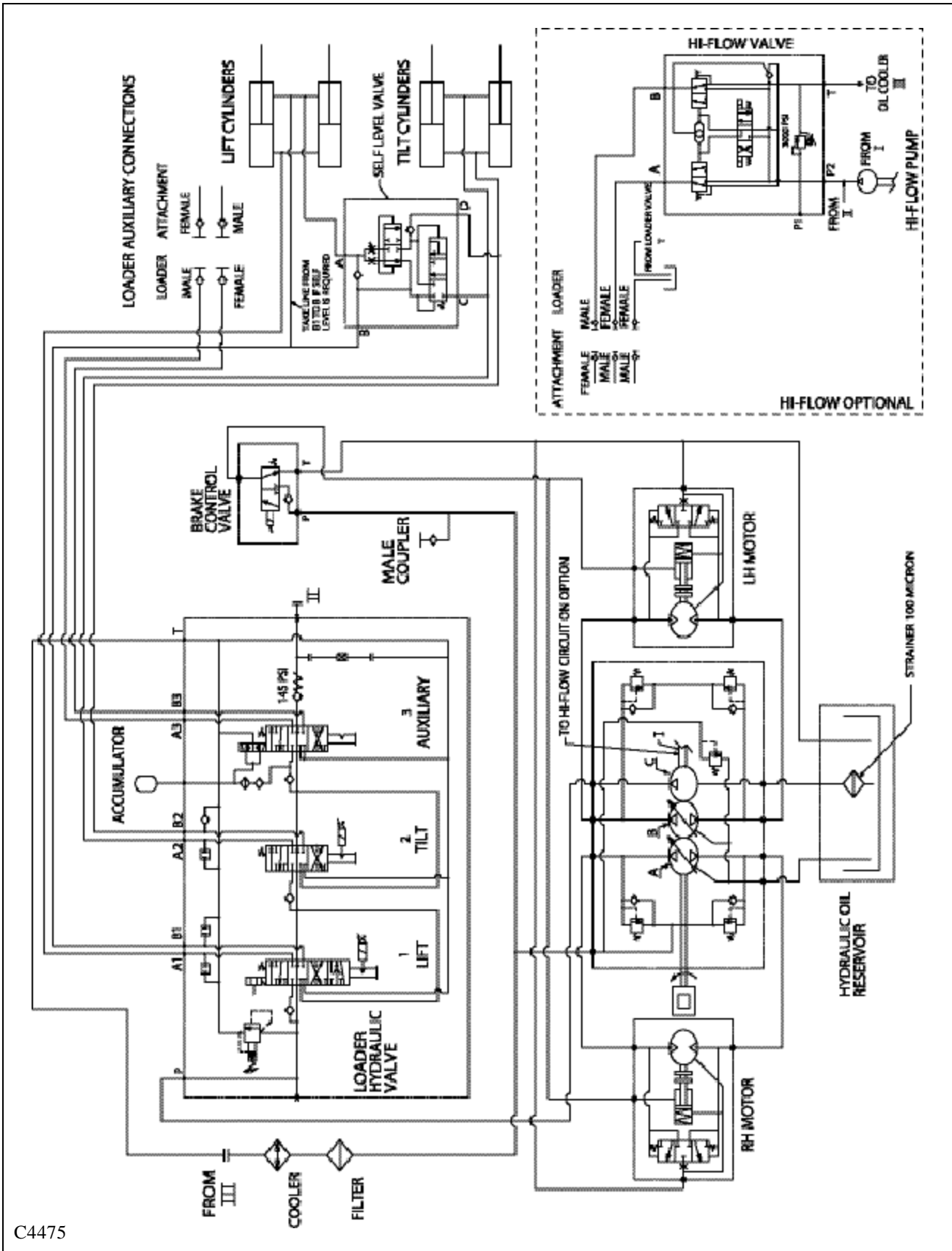
- A Auxiliary Circuit
- B Tilt Circuit
- C Lift Circuit

NOTE: Foot pedal control operated machine illustrated. Items (A3 / B3) are reversed for hand control operated machines.

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.

# HYDRAULIC SCHEMATIC 1.1

1



C4475

# 1

## – SPECIFICATIONS & MAINTENANCE 1.1 –

### Hydraulic Specifications

Pump Type	.....137/153 (Sauer-Danfoss) Gear, 1.37 cu in (22.5cc)
	..... 1300/135 (Eaton) / 1.2 cu in (19.7cc)
Pump Brand	..... Sauer Danfoss / Eaton
Pump Capacity	.....137/153 16.6 gal/min (62.8 l/min)
	.....1300/135 14.5 gal/min (54.9 l/min)
Control Valve	..... Series Type
Main Relief Pressure	..... 2400 psi (165.5 bar) @ Zero Flow
Reservoir Capacity	..... 8 US gallons (30.3 liters)
Fluid Type	..... 10W30 API SJ Oil
Reservoir Filtration	..... 100 Micron
System Filtration	..... 5 Micron
Oil Cooler	.....137/153 674 BTU
	.....1300/135 440 BTU
Lift Cylinders 153	..... (2) 2.5” Bore Diameter
Lift Cylinder Rods 153	..... 1.5” Diameter
Lift Cylinders 137/135/1300	..... (2) 2” Bore Diameter
Lift Cylinder Rods 137/135/1300	..... 1.25” Diameter
Tilt Cylinders	..... (2) 2 1/2” Bore Diameter
Tilt Cylinder Rods	..... 1.125” Diameter
Lift Cycle HD 135/153 Cyl. + / - 1.5 seconds (Up / Down)	..... 4.39 / 3.25
Lift Cycle STD 1300 Cyl. + / - 1.5 seconds (Up / Down)	..... 3.19 / 2.05
Tilt Cycle + / - 1.5 seconds (Up / Down)	..... 2.20 / 2.50

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
Oil cooler clean	..... 8	..... 8
General system check		
( leaks etc. )	..... 8	..... 8
Cylinders, lubricate	..... 8	..... 8
Control valve relief filter	..... 500	..... 1000
Reservoir filters change	..... 1000	..... 1000
Hydraulic oil change	..... 1000	..... 1000

# GENERAL INFORMATION 1.1

1

Refer to figure C2018 on page 1-2.

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

- 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.

- The hydraulic control valve is equipped with an adjustable relief valve which is adjusted to 2400 psi (165.5 bar). The control valve is a series type with 3 spools (banks). The various spools activate the boom, bucket and auxiliary hydraulic functions.

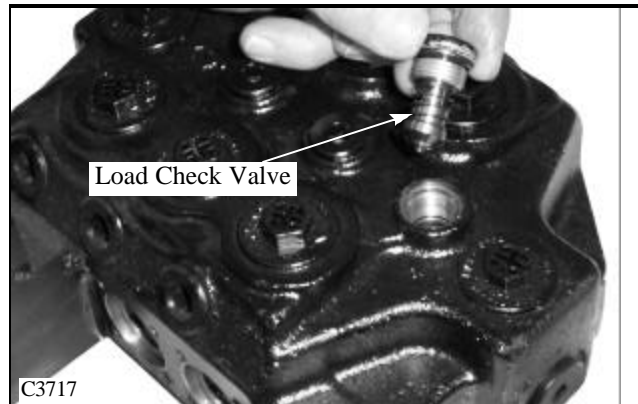
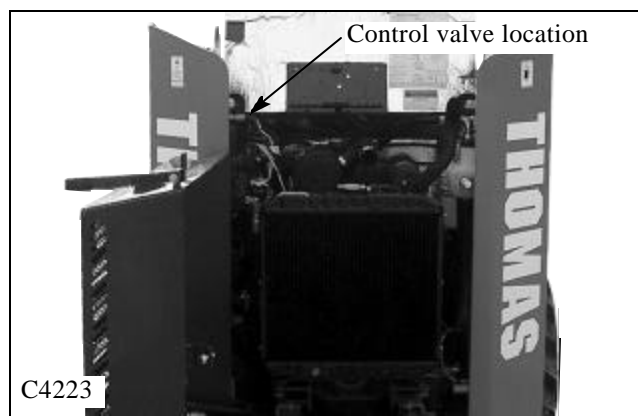
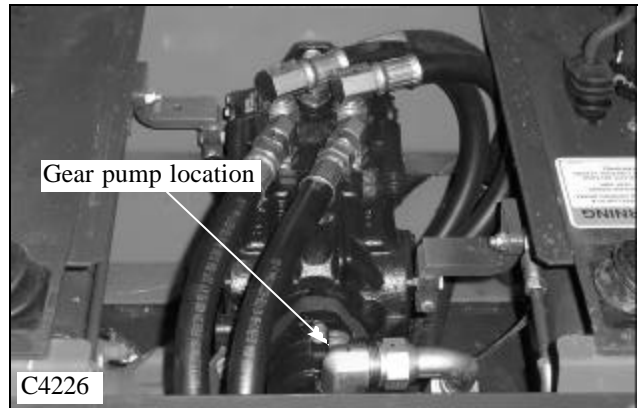
When the spools are in neutral, oil flows from the hydraulic gear pump, through the control valve and returns to the hydraulic cooler, to the 5 micron hydraulic filter. From the hydraulic filter, the fluid flows to charge the tandem hydrostatic pump and pressurize the hydraulic brake release system and then back to the hydraulic reservoir. As a spool is moved, oil is directed to one of the valve ports and oil flows out to operate a function. The return oil coming back from this operation is ported to the next valve section which allows operation of more than 1 function at the same time. This is a series type valve function.

Each spool end contains a centering spring which returns the spool to neutral when the foot pedal, or control handle, is released.

- 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 when ever a hydraulic function has been restricted or overloaded (fig. C3746). To protect against excessive pressure build up, the relief valve opens and allows oil to return to the valve outlet. The system relief valve is adjustable, and is preset at 2400 psi (165.5 bar).

- Load check valves are located between the ports of each spool circuit. The function of the load check valve is to hold the boom arms or bucket in position during initial spool movement (fig. C3717).



# 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 do not work under the boom arms without the boom supports engaged.**

- 1 Remove the seat and hydrostatic shield.
- 2 Attach a vacuum system to the hydraulic oil reservoir filler location. ( fig. C4227 ) 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 re - installing.
- 3 Disconnect the hydraulic hoses from the gear pump. ( fig. C4228 ) 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. C4228b) Remove the gear pump.
- 5 Replace gear pump in reverse order.

### IMPORTANT

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

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



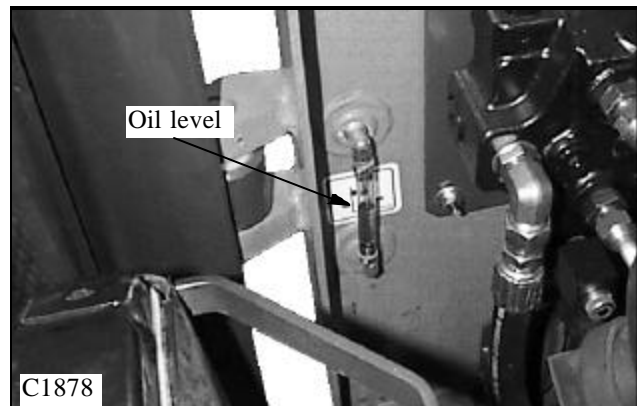
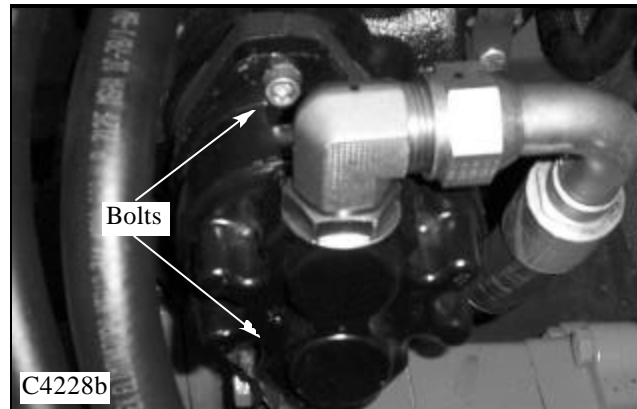
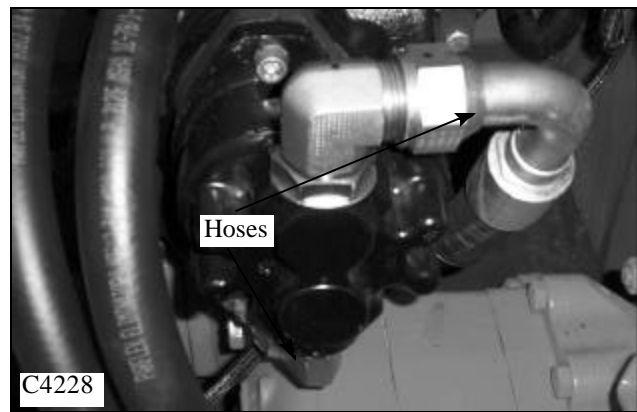
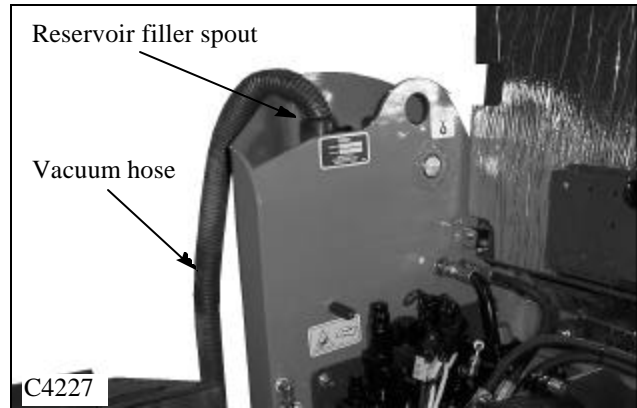
### WARNING

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

- 7 Start the engine and check for leaks. Do not use your hands to find leaks.
- 8 Check the fluid level in the hydraulic oil reservoir and replenish as required. (fig. C1878)

### 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.**



---

# GEAR PUMP 1.2

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1

## Disassembly

### 1. General

The following is a detailed procedure for disassembly and assembly of the D series hydraulic gear pump. Prior to proceeding it may be necessary to prepare some sub-assemblies separately. The details for preparing each subassembly are given in the following section, as well as some general recommendations.

### 2. Cleanliness

Cleanliness is the primary factor for reliable pump performance. Wash the outside of the pump thoroughly before disassembly and all pieces prior to assembly. Cleaning parts with clean shop solvent and air drying is usually adequate.

### 3. Lubrication Of Moving Parts

During assembly, it is imperative to provide lubrication with clean hydraulic oil to all the running parts of the pump. It is also necessary to coat the seals with grease. The absence of lubrication during assembly can cause the unit to seize after a few minutes of running.

### 4. Care Of Surface Treatment

Be careful when handling all the internal surfaces, especially bearings, gears, and body faces. Do not touch or score them with metal tools or cutting edges.

### 5. Marking The Parts

Mark the parts before completely disassembling a pump. The marks allow components to be reassembled in the same relative position. This action should be applied to the body, bearings, and gears. Scribing, bluing, or using a felt pen to mark the outside of the body on the inlet side is suggested to indicate the relative position of the front flange and the rear cover to the body. Mark the bearing blocks also on the inlet side and the gears position relative to each other. DO NOT scribe internal surfaces.

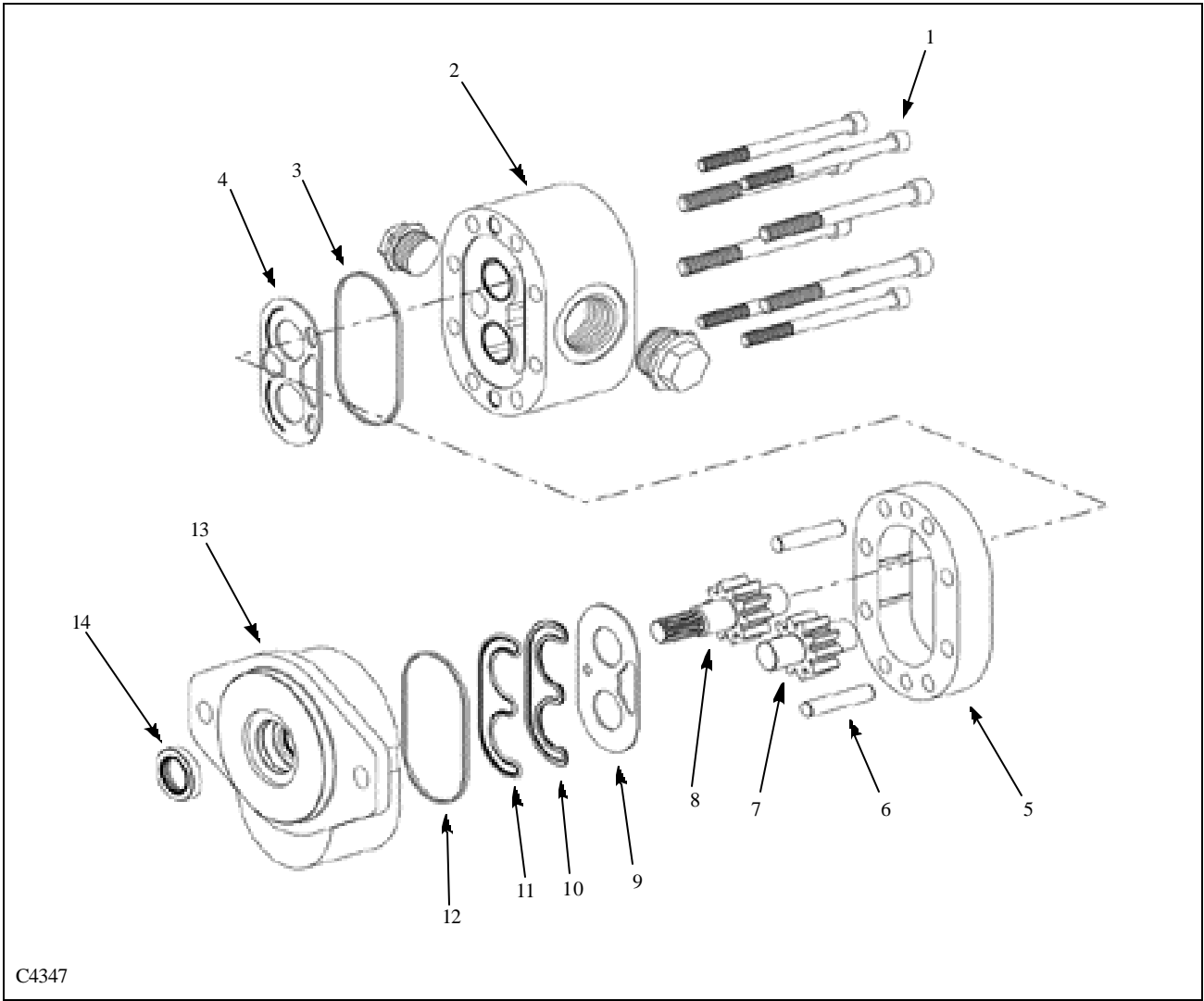
#### **IMPORTANT**

**Mark all pieces during disassembly so that the unit can be reassembled correctly. Installing components incorrectly could severely damage the unit and/or cause it to not function properly.**

# GEAR PUMP 1.2

# 1

Disassembly 137/153



- |                   |                   |
|-------------------|-------------------|
| 1. Screws         | 8. Drive Shaft    |
| 2. Cover Assembly | 9. Wear Plate     |
| 3. Seal Ring      | 10. Load Ring     |
| 4. Wear Plate     | 11. Preload Ring  |
| 5. Gear Plate     | 12. Seal Ring     |
| 6. Dowel Pin      | 13. Body Assembly |
| 7. Idler Shaft    | 14. Shaft Seal    |



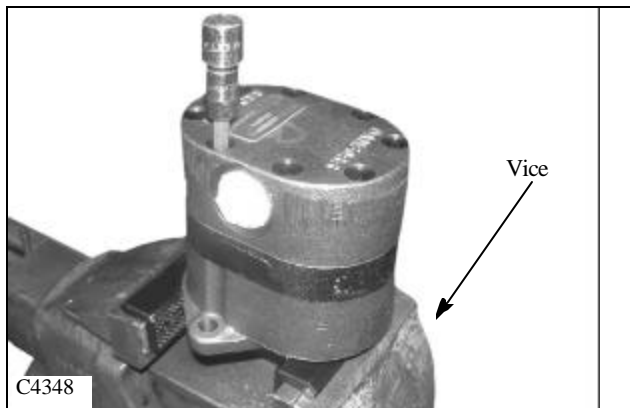
# GEAR PUMP 1.2

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## Disassembly 137/153

### 6. Procedure

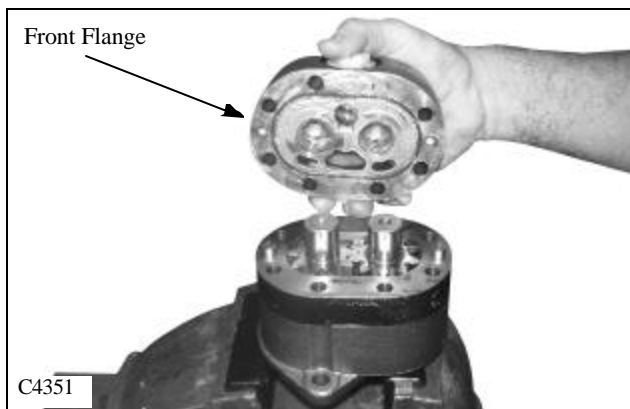
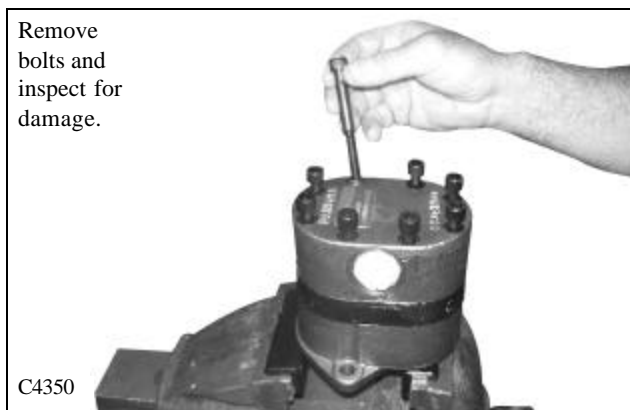
1. Clamp the unit in a vice from the flange side (fig. C4348). Make sure the vice jaws are clean and have smooth surfaces to prevent damage to the pump. Caution must be used when using a vice to avoid distorting any parts or damaging the mounting pilot.



2. Use a Allen head socket wrench to loosen the bolts on the cover assembly (fig. C4349). Next completely unscrew the bolts and remove them. Inspect the threads for damage (fig. C4350).



3. Slowly remove the cover assembly (fig. C4351). Note, some units have a shaft seal and others do not. Should your unit have the shaft seal, be careful not to damage it when removing the cover assembly.



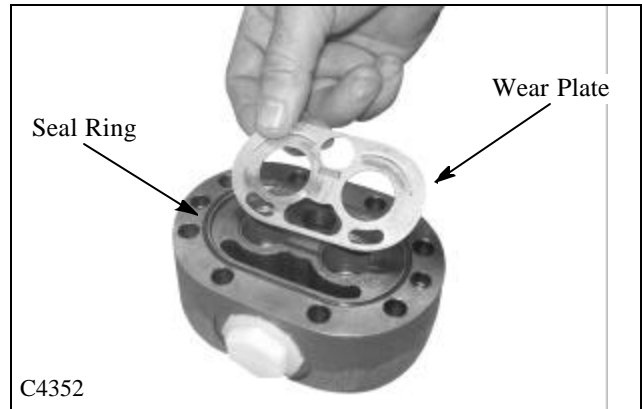
# GEAR PUMP 1.2

## 1

### Disassembly 137/153 (cont'd)

#### 6. Procedure

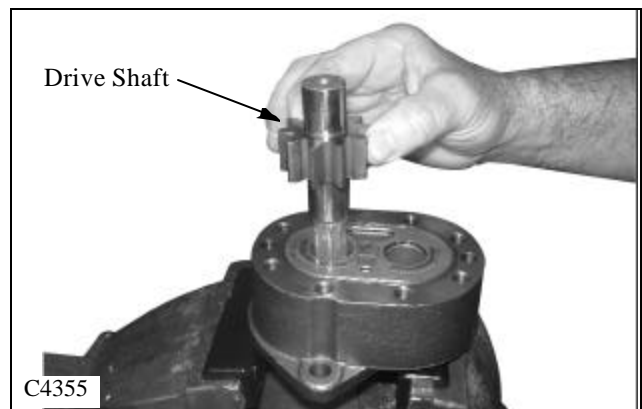
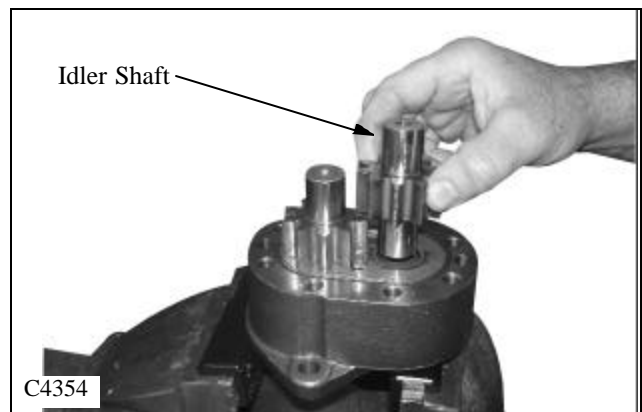
4. Place the cover assembly on the work bench (fig. C4352). Inspect the wear plate for evidence of extrusion or marks caused by overheating. Replace if necessary. Remove the wear plate and seal ring on the cover assembly. Do not use tools with sharp edges to remove the seal, as damage to the housing may result.



5. While disassembling the unit, you need to mark the relative positions of the gear mesh (drive gear tooth and idler gear tooth) and the body so they can be reassembled in the same position. Carefully remove the gear plate (fig. C4353). Remove the dowel pins and place in the gear plate.



6. Remove the idler shaft and drive shaft from its bearing bore. Inspect the journals and the flat faces top and bottom of the gears. Ensure these surfaces are free from burrs or scratches. If scratches are found, clean them with a flat stone and/or a very fine emery cloth. Rewash the gears with light oil after this operation.



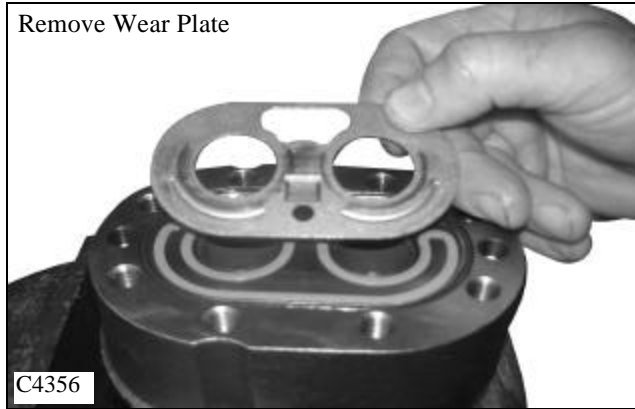
# GEAR PUMP 1.2

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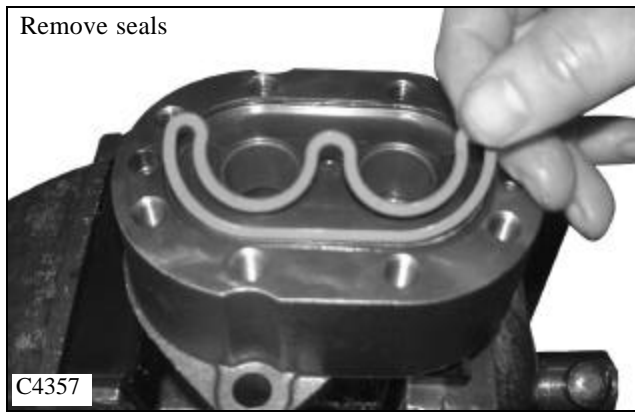
## Disassembly 137/153 (cont'd)

### 6. Procedure

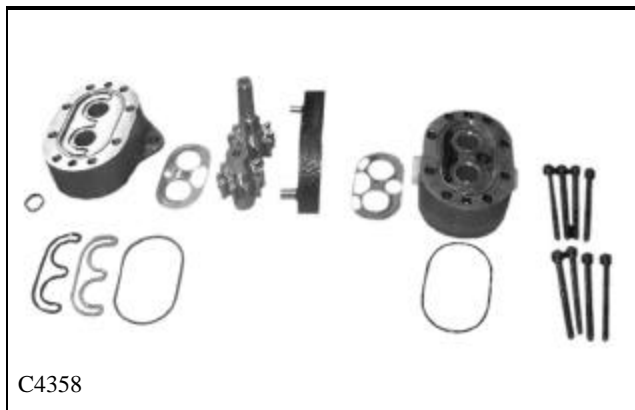
8. Inspect the wear plate for evidence of extrusion, or marks caused by overheating. Remove the wear plate from the body assembly. (fig C4356) Replace if necessary. Remove the load ring, pre-load ring and seal ring. (fig C4357) Do not use tools with sharp edges to remove the seals, as damage to the housing may result. Dispose of any damaged seals.



9. Remove the shaft seal in the body assembly (if applicable). Place the flange on the work surface. Using internal snap ring pliers, remove the snap ring. Check the seal quality and remove it if necessary. To remove, pry the bottom of the shaft seal and force it out while rotating the flange to lift it out evenly. Do not use the flange pilot to gain leverage as damage may result. Use a plastic rod or wooden dowel as a fulcrum. After removal, dispose of the damaged seal.



10. Complete disassembled unit. (fig C4358)



# GEAR PUMP 1.2

## 1

### Assembly 137/153

1. Have the entire seal kit available and lay out neatly on the table (fig. C3980). Compare the old seal kit to the new one to ensure you have the correct one. Lightly coat all seals with seal grease. The grease is needed to adhere the seals in their grooves. **DO NOT INSTALL DRY SEALS!**

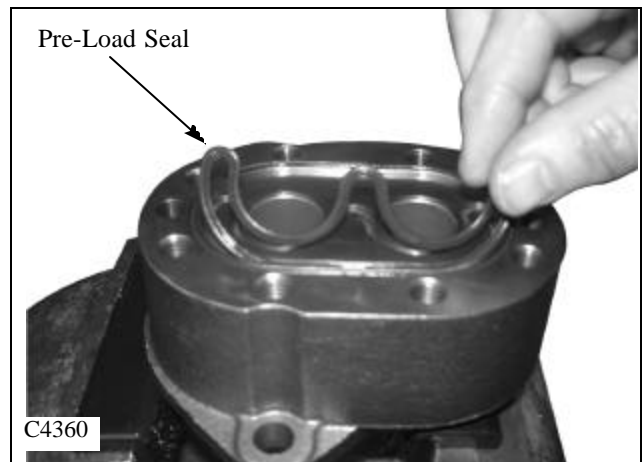
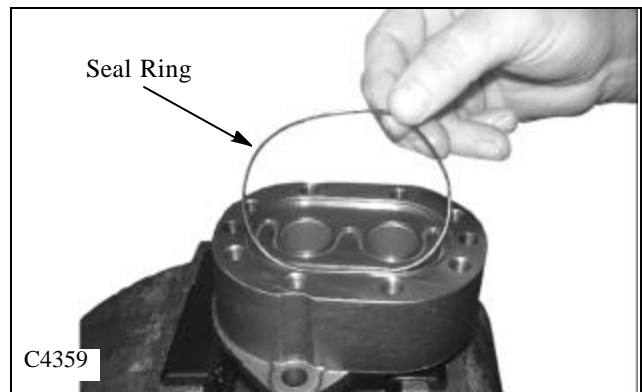
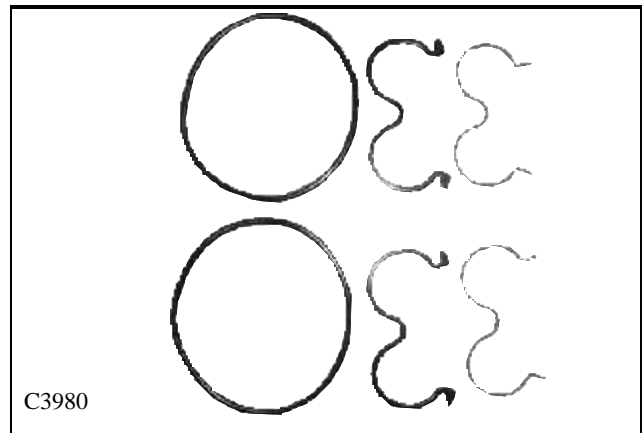
2. Prepare the body by cleaning it. Inspect the internal and mating surfaces. Ensure the surfaces are free of burrs and scratches.

3. Install the shaft seal into the body assembly (if applicable). Prepare the body and shaft seal by lightly lubricating with grease. Seat the seal in the body assembly by hand. Then, using a shaft seal installation tool press the seal until the tool stops on the flange. This will insure the seal is inserted to the proper depth.

3. Place the body assembly, with the E- ring seal grooves facing up, into a vice with soft jaws. Caution must be used when using a vice to avoid distorting or damaging the mounting pilot.

4. Place the rubber seal ring in the body groove. (fig. C4359)

5. Place the pre-load seal (black rubber E-ring) into the body E-ring groove. (fig. C4360)



# GEAR PUMP 1.2

## Assembly 137/153 (cont'd)

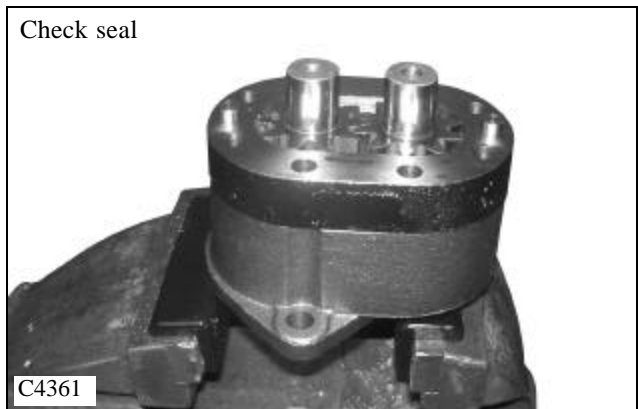
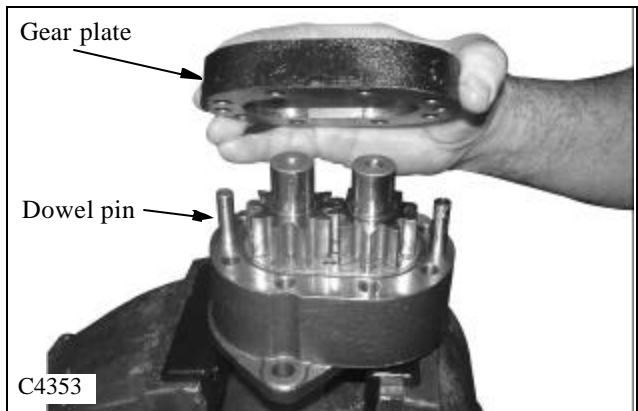
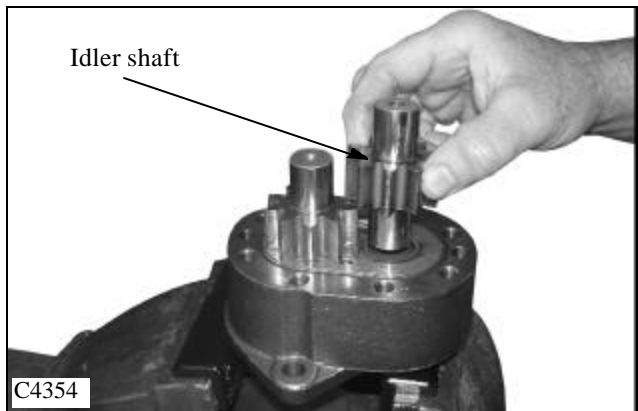
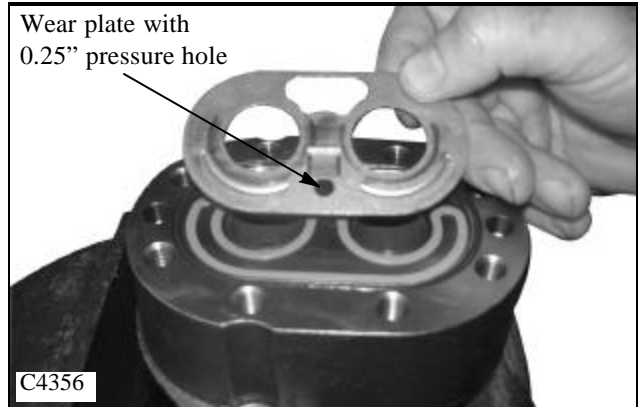
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6. Place the load seal directly on top of the pre-load seal (blue E-ring).

7. Find the wear plate with a 0.25" diameter pressure hole and no oblong holes on the inlet side. Place the wear plate on top of the load ring with the bronze side facing up towards the gear. The 0.25" pressure hole is to be positioned on the E-ring side of the body. (fig C4356)

8. Lubricate the spline end of the drive shaft with Aerolube grease. Insert the drive shaft in the correct bearing bore. Align the idler shaft with the assembly marks to ensure assembly is installed with the same orientation as before assembly. Place the idler shaft in the correct bearing bore into the body (fig. C4354). Inspect gear teeth for alignment. Misaligned gear teeth may increase operating noise. Lubricate the complete gearset using clean light oil.

9. Insert the two dowel pins into the body assembly. Place the gear plate over the dowel pins and lightly tap making sure it contacts the body. (fig. C4353) Check to make sure the gear plate is seated properly with no foreign pinched between these surfaces.



# GEAR PUMP 1.2

## 1

### Assembly 137/153 (cont'd)

10. Place the cover assembly on a bench with the machined surface facing up. Place the rubber seal ring in the cover seal ring groove. (fig C4362)

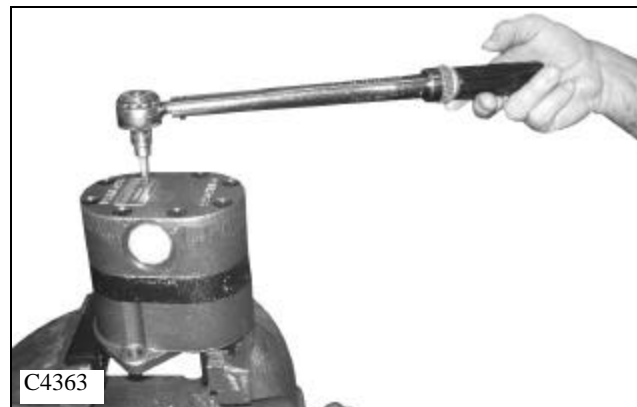
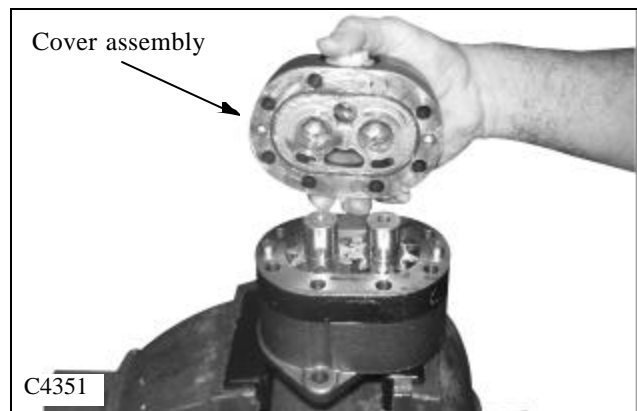
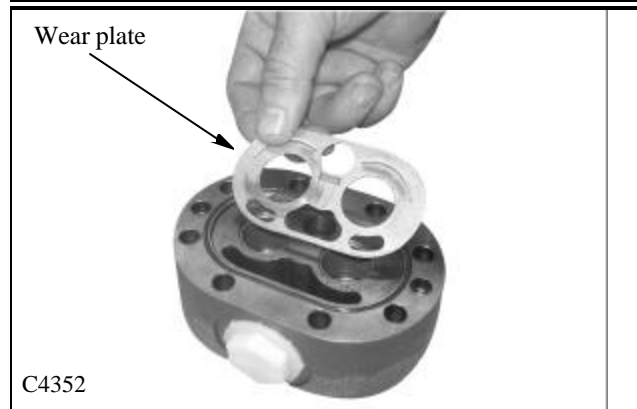
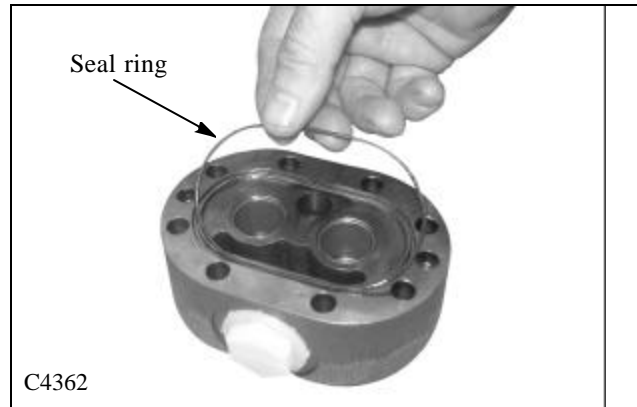
11. Find the wear plate with the 0.625" diameter pressure hole and two oblong holes on the inlet side. Position the wear plate in the cover with the bronze side facing up (towards gears) and the 0.625" pressure hole located over the circular holes in the cover. (fig. C4352)

12. Line up the cover assembly with the shaft journals and dowel pins (fig. C4351). Lightly tap the back of the cover until dowel pins are completely engaged. Check the seal making sure it is seated properly with no foreign material pinched between the surfaces.

13. Place the screws in the cover holes and turn until the treads engage. Use care so that cross threading does not occur.

14. Torque the four bolts in a crossing pattern a little at a time until you reach the final torque of 47 ft lbs. (65 Nm) (fig. C4363)

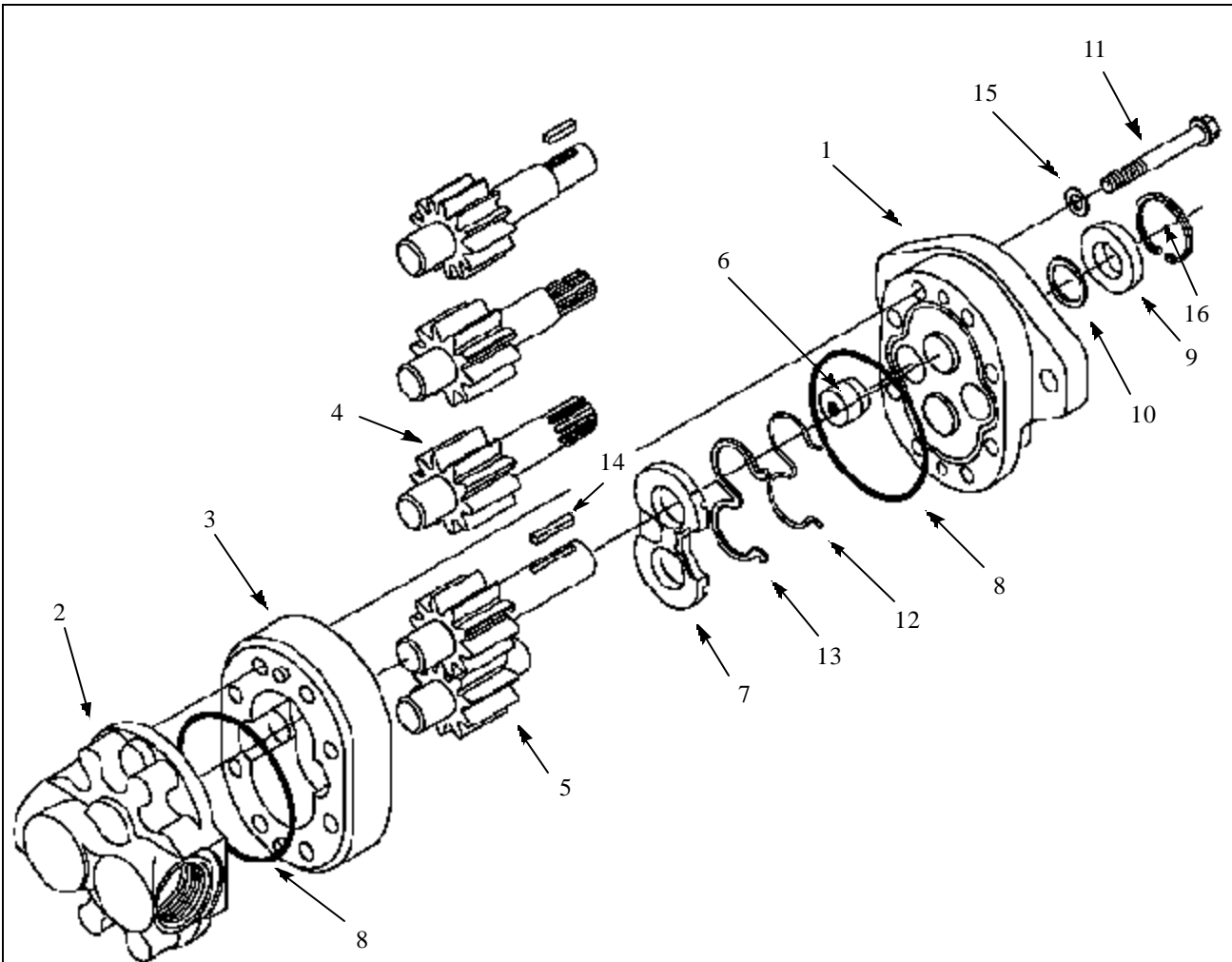
15. After the pump has been disassembled and reassembled it is suggested that the pump be run in and tested on an appropriate test stand. This is done to verify the volumetric efficiency and the integrity of the unit.



# GEAR PUMP 1.2

Disassembly 1300/135

1



- 1. Front Plate Assembly
- 2. Back Plate
- 3. Body Assembly
- 4. Drive Gear
- 5. Idler Gear
- 6. Plug
- 7. Wear Plate
- 8. O - Ring Seal

- 9. Shaft Seal
- 10. Washer
- 11. Cap Screw
- 12. Back up Gasket
- 13. Seal
- 14. Key for Straight Shaft Models
- 15. Washer
- 16. Retaining Ring (optional)

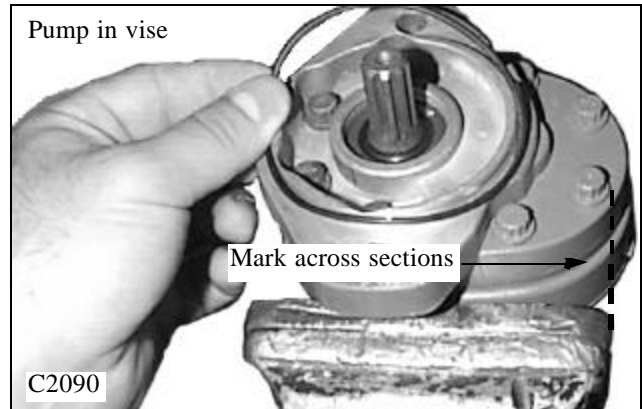
# GEAR PUMP 1.2

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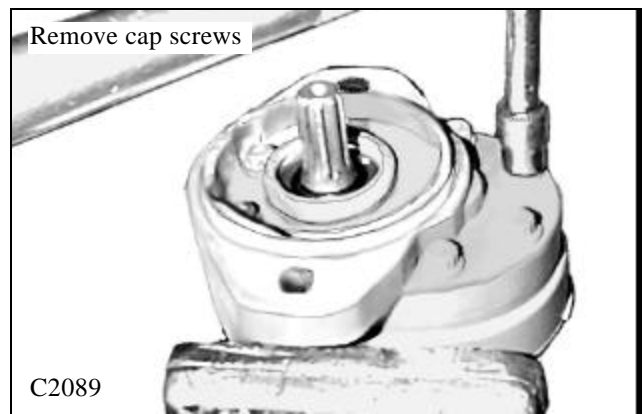
### Disassembly 1300/135

Remove the gear pump as outlined on page 1-6. Work in a clean area. Thoroughly clean the outside of the gear pump before disassembly. Remove the adapter fittings from the gear pump and drain the oil.

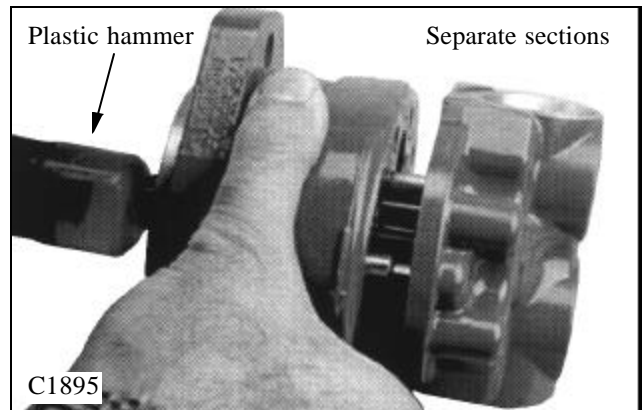
- 1 Remove the key from the drive gear if so equipped.
- 2 Using a grease pencil or equivalent, place a mark across the front plate, body and back plate to assure proper alignment when reassembling.
- 3 Place the gear pump in a vise with the shaft side up. (fig. C2090)



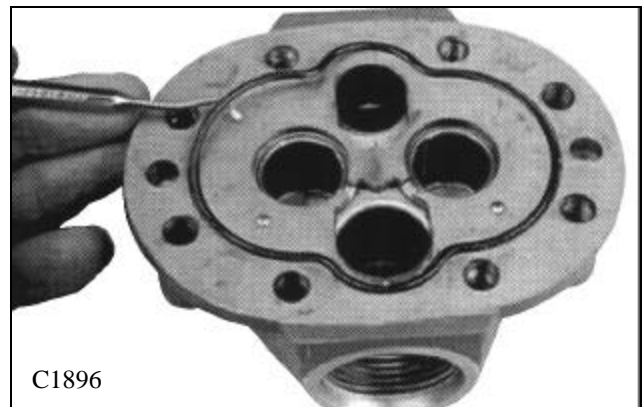
- 4 Remove the cap screws and washers retaining the pump sections together. (fig. C2089)



- 5 Remove the gear pump from the vise. Tap the shaft using a plastic hammer to separate the front plate from the back plate. The body will remain intact with one of the plates. (fig. C1895)



- 6 Remove the O - Ring seal from the back plate. (fig. C1896)



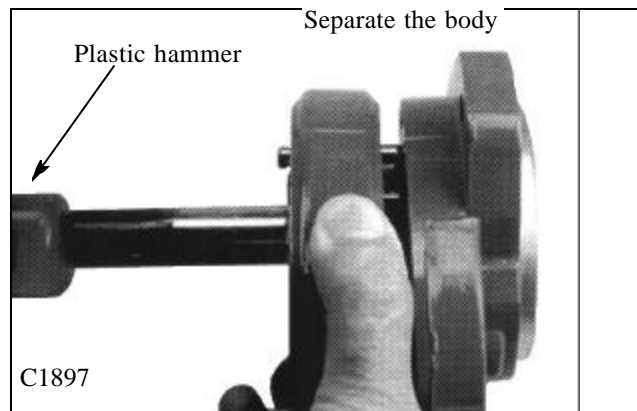


# GEAR PUMP 1.2

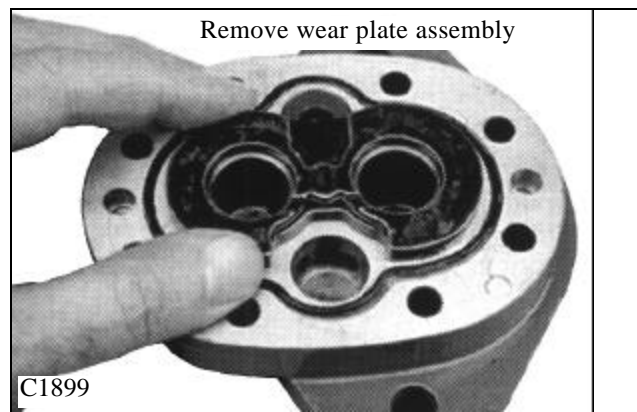
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## Disassembly 1300/135 (cont'd)

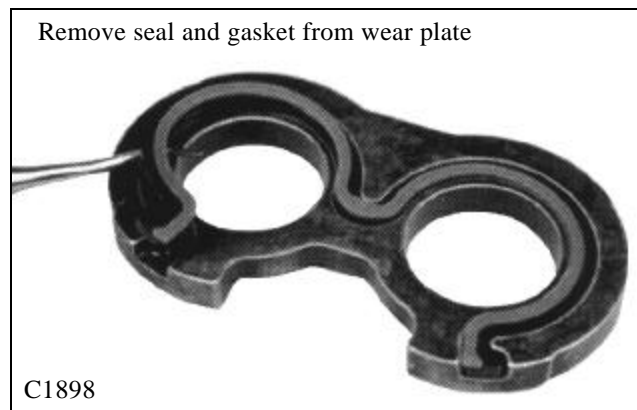
- 7 Remove the idler gear assembly from the body.
- 8 To separate the body from the plate, replace the drive gear assembly in the gear pocket and tap the protruding end with a plastic hammer. (fig. C1897)



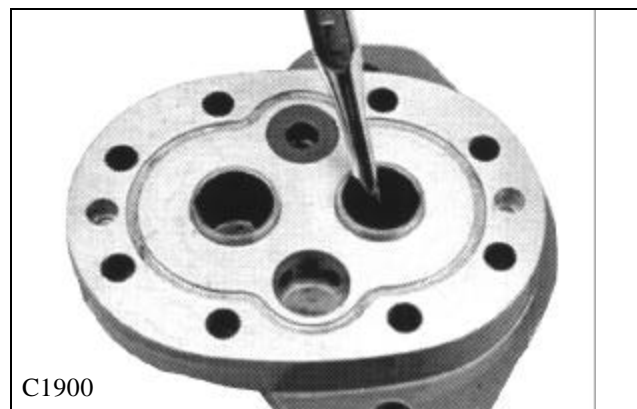
- 9 Remove the wear plate and O - ring seal, noting the position of the open side of the wear plate. (fig. C1899)



- 10 Remove the back up gasket and seal from the wear plate by extracting with an O - ring tool. (fig. C1898)
- 11 Remove the snap ring, if used, from the front of the front plate shaft seal area.



- 12 Remove the shaft seal and washer from the front plate using a blunt punch from the back side. (fig. C1900)



# GEAR PUMP 1.2

## 1

### Assembly 1300/135

It is important that the relationship of the back plate, body, wear plate and front plate is correct upon reassembly. Note the 2 (two) half moon shaped cavities in the body. The smaller half moon port cavity must be on the pressure side of the gear pump. The side of the wear plate with the mid section cut out must be on the suction side of the gear pump. The suction side of the back plate is always the side with the larger port boss.

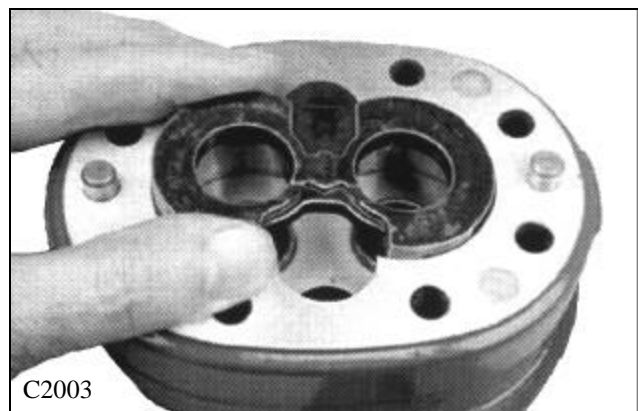
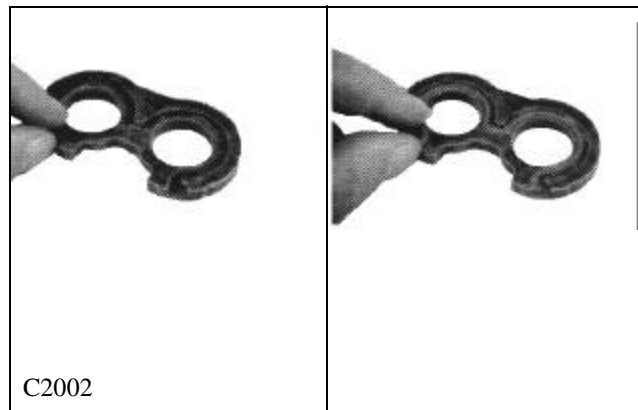
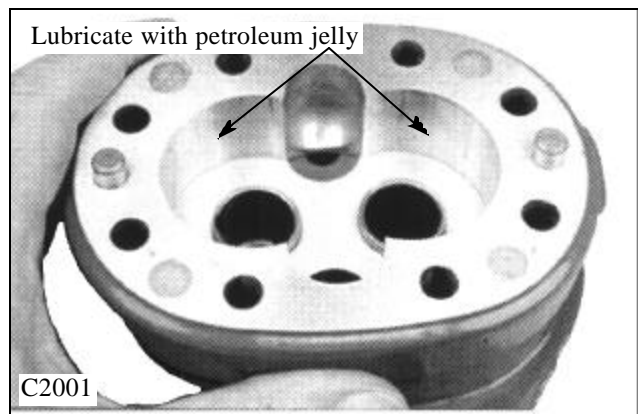
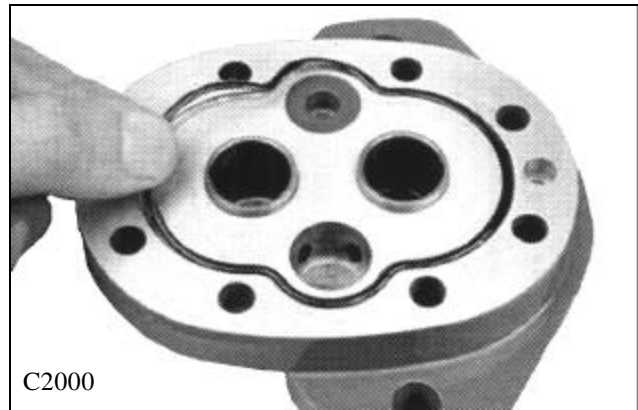
1 During reassembly replace the wear plate, seal back up gasket, shaft seal and O - rings with new parts.

2 Install the O - ring in the groove of the front plate. (fig. C2000)

3 Apply a thin coat of petroleum jelly to the machined gear pockets of the body. (fig. C2001) Install the body to the front plate. Make sure the small half moon shaped cavity in the body faces the pressure side (plugged side) of the pump.

4 Install a new seal and back up gasket to the wear plate. (fig. C2002) Note in the middle of the back up gasket a flat section or support. This area must face away from the wear plate, inside the seal.

5 Place the new wear plate, seal and back up gasket into the gear pocket with the seal and back up gasket next to the front plate. (fig. C2003) The side of the wear plate with the mid section cut away must be on the suction side of the pump.

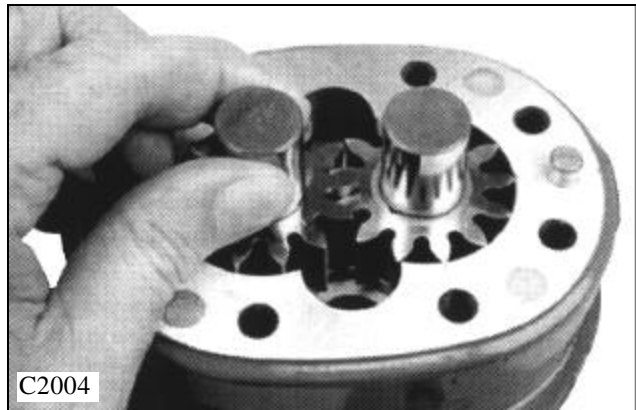


# GEAR PUMP 1.2

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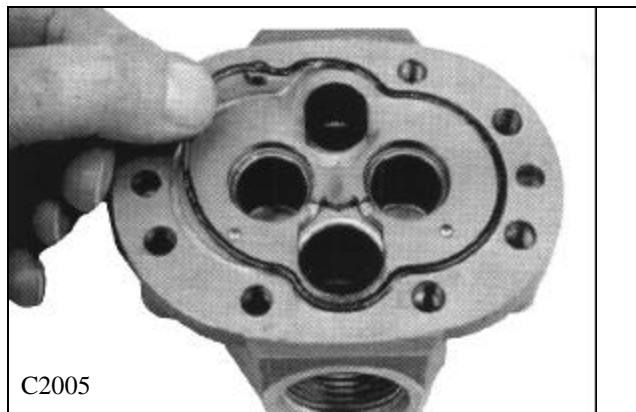
## Assembly 1300/135(cont'd)

6 Dip the gear assemblies with system oil and slip the gears into the front plate bushing and body. (fig. C2004)



7 Install a new O - ring in the groove of the back up plate. (fig. C2005)

8 Make sure the port orientation is correct and then slide the back plate over the gear shafts until it is down over the dowel pins. The large port opening in the back plate is the inlet side.

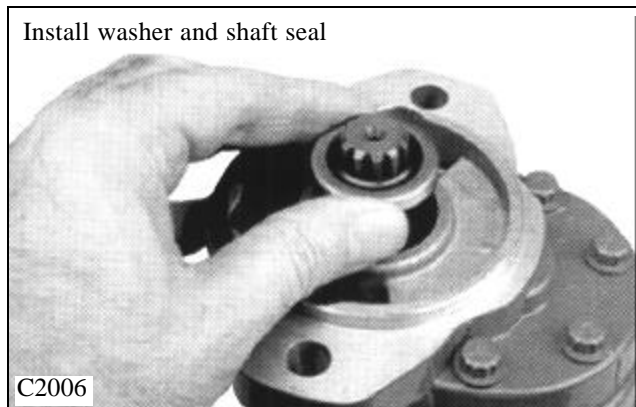


9 Install the cap screws and washers. (fig. C2089)  
Torque the evenly in a crisscross pattern to 25 ~ 28 ft lbs (34 ~ 38 Nm).



10 Place the washer over the drive shaft into the housing. Lubricate the seal liberally with system oil and install over the drive shaft. (fig. C2006) Use caution to avoid cutting the seal lips while installing the seal over the drive splines.

11 Place a 1- 5/16'' O.D. sleeve over the shaft and press the shaft seal into the housing until flush with the front surface of the front plate. Note: If so equipped, some models may require a retaining clip (snap ring) installed.

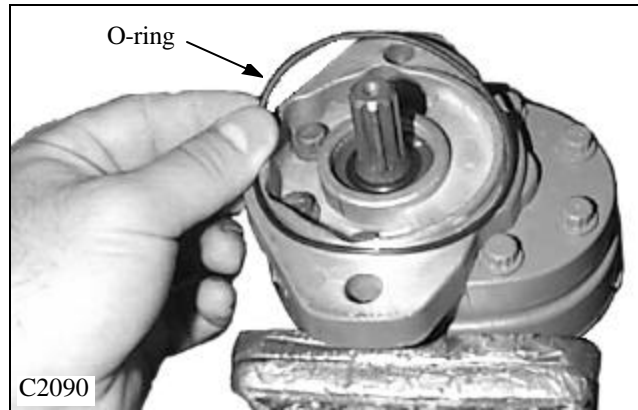


# GEAR PUMP 1.2

# 1

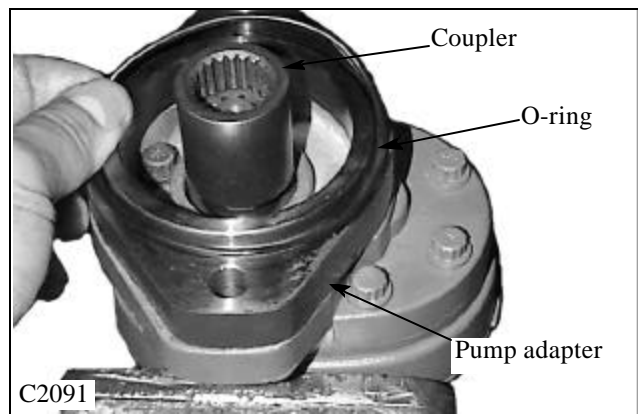
## Assembly 1300/135 (cont'd)

12 Install a new O - ring onto the gear pump mounting surface. (fig. C2090)



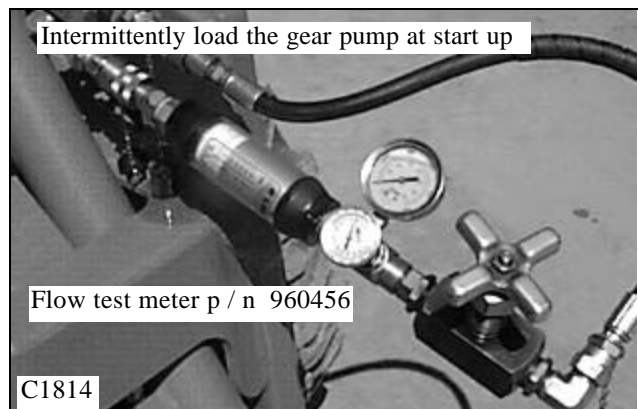
13 Install the adapter plate, new O - ring and shaft coupler. (fig. C2091)

14 Install the gear pump to the loader as outlined on page 1-6.



## Start up Procedure

- 1 Mount the gear pump to the loader. (fig. C4228)
- 2 Connect the hydraulic lines.
- 3 Start the pump and run for 3 minutes each @ zero flow.
  - 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.



# CONTROL VALVE 1.3

## Testing and Adjusting the Relief Valve Pressure

Hoses and gauges required for this test must be capable of withstanding 5000 psi (345 bar) continuous pressure, and hydraulic flow meter capable of measuring 30 gallons per minute. (113 l/min) (fig. C3432) **This test also checks the status of the gear pump capacities.**

Pressure fluctuations may be caused by restricted oil flow through the relief valve. The relief valve may need replacing when its filter is contaminated.

1 Install the flow meter / pressure tester to the auxiliary hydraulic quick couplers. The female coupler attached to the loader provides the power out when the auxiliary control is engaged. (fig. C4229) 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. (fig. C4230)

2 Start the engine and engage the auxiliary hydraulic system. Increase the engine speed to full operating prm. (See Section 7 for checking and adjusting engine speed)



### CAUTION

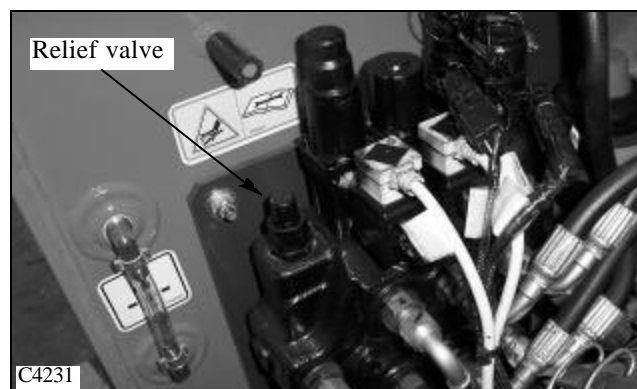
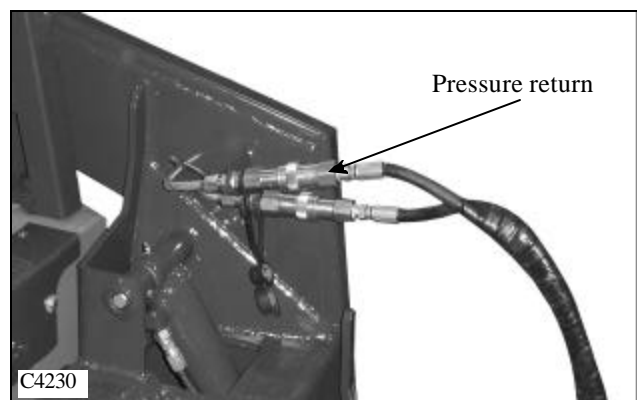
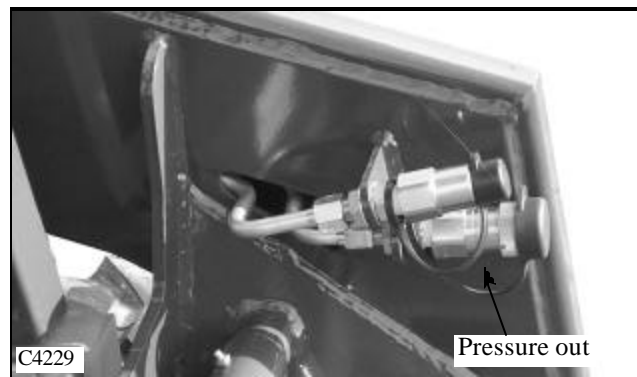
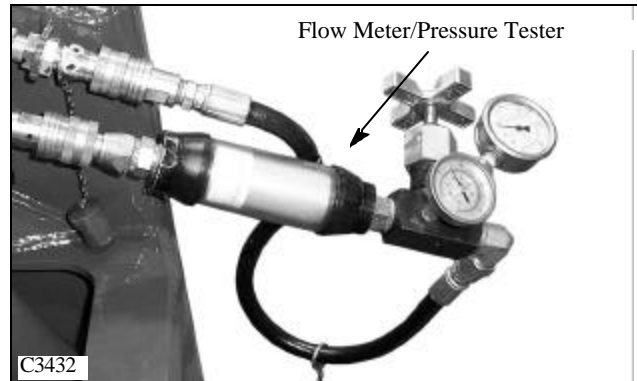
Adjusting the relief valve setting too high may cause damage to the gear pump.

3 Turn the flow control valve on the flow meter to restrict the oil flow down to 2 gal /min. (7.5 l/min ) As you are turning the flow control valve, watch the pressure gauge and make sure it does not go over 5000 psi (345 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.



### WARNING

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



# 1

## CONTROL VALVE 1.3

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 2400 psi +/- 100 psi (165 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. C4233)

8 Turn the screw back. Reduce the number of turns that you turned in to increase the pressure, increase the number of turns to decrease the 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 adequate pressure and / or flow is not available, the gear pump could be failing, the intake to the gear pump is restricted, or the filter in the relief valve is clogged.**

### Control Valve Replacement

1 Remove any attachment and shut off the engine. Turn the key on with the safety devices activated so the pedals can be moved. Slowly jog both pedals and press the electric auxiliary switch. This will take any pressure out of the system.

#### IMPORTANT

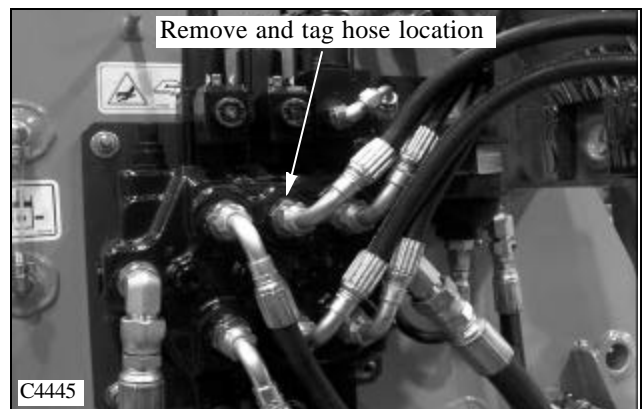
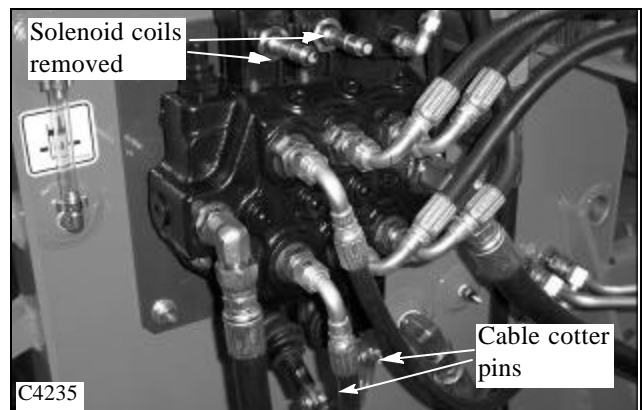
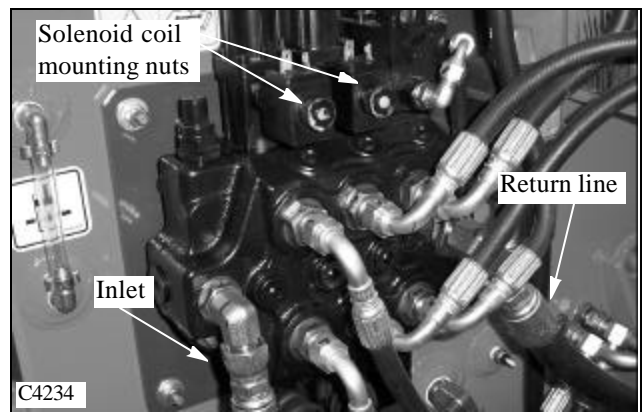
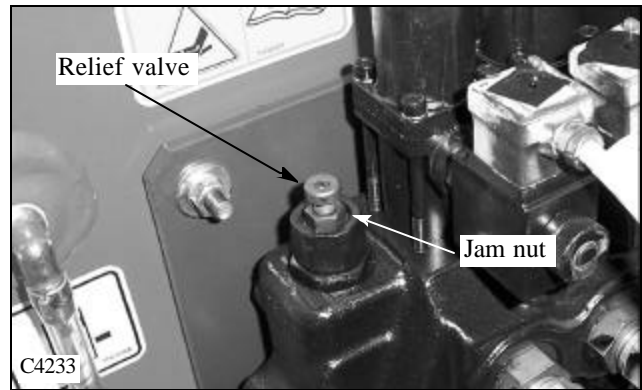
**Clean the work area prior to repair. Cap all open lines, fittings and ports to prevent contamination.**

2 Disconnect the control cables, electrical solenoid spool locks, and electrical auxiliary solenoid wiring connectors if equipped. (fig. C4234, C4235)

3 Disconnect the the inlet hose coming from the gear pump. Cap the hose and fitting and remove the adapter fitting in the control valve. (fig. C4234)

4 Disconnect the 6 hoses going to the boom, bucket and auxiliary circuits. Marking the hoses as you remove them is recommended to ease re-assembly and assure the circuits are functioning properly at restart.(fig. C4445)

5 Disconnect the accumulator line from the electric auxiliary circuit and remove the adapter fitting. Plug and cap all open ports and hose ends.



# CONTROL VALVE 1.3

1

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

7 Remove the 3 nuts holding the control valve to the mount and remove the control valve.

8 Remove any fittings left in the control valve. Cap all open ports to prevent contamination. Place these fittings in the new or repaired control valve. Be sure to check all fitting flares and o-rings for damage and replace as required.

## IMPORTANT

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

9 Assemble the control valve to the loader in the reverse order above. Torque the bolts holding the control valve to the mount at 15 ft lbs. (20.4 Nm)

10 After all connections have been made, including the control valve electrical connections, check the oil level in the hydraulic reservoir and top off if necessary.



## WARNING

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

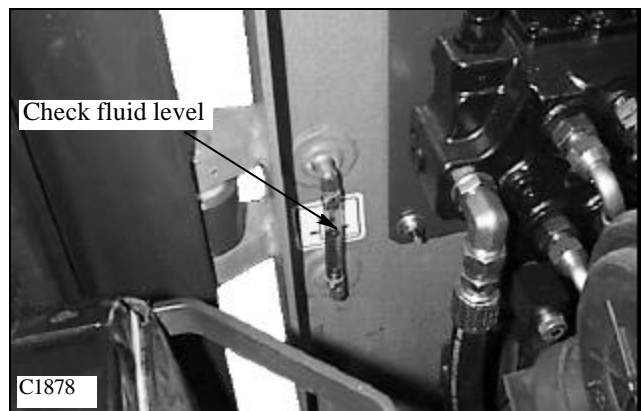
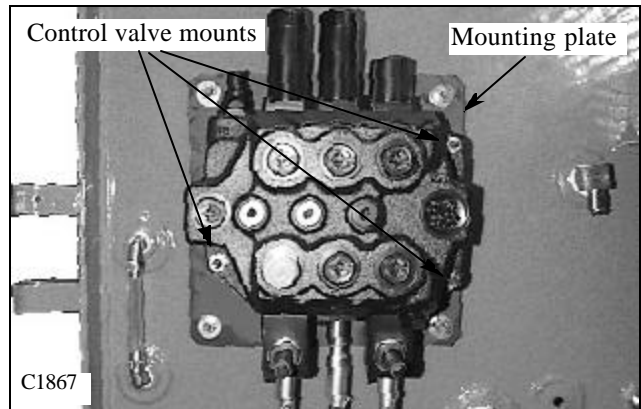
11 Start the engine and cycle the various hydraulic functions to check for leaks. Make sure the control valve lock system is functioning properly. Do not use your hands to check for leak locations, fluid under operating pressure can penetrate the skin and cause serious personal injury.



## WARNING

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

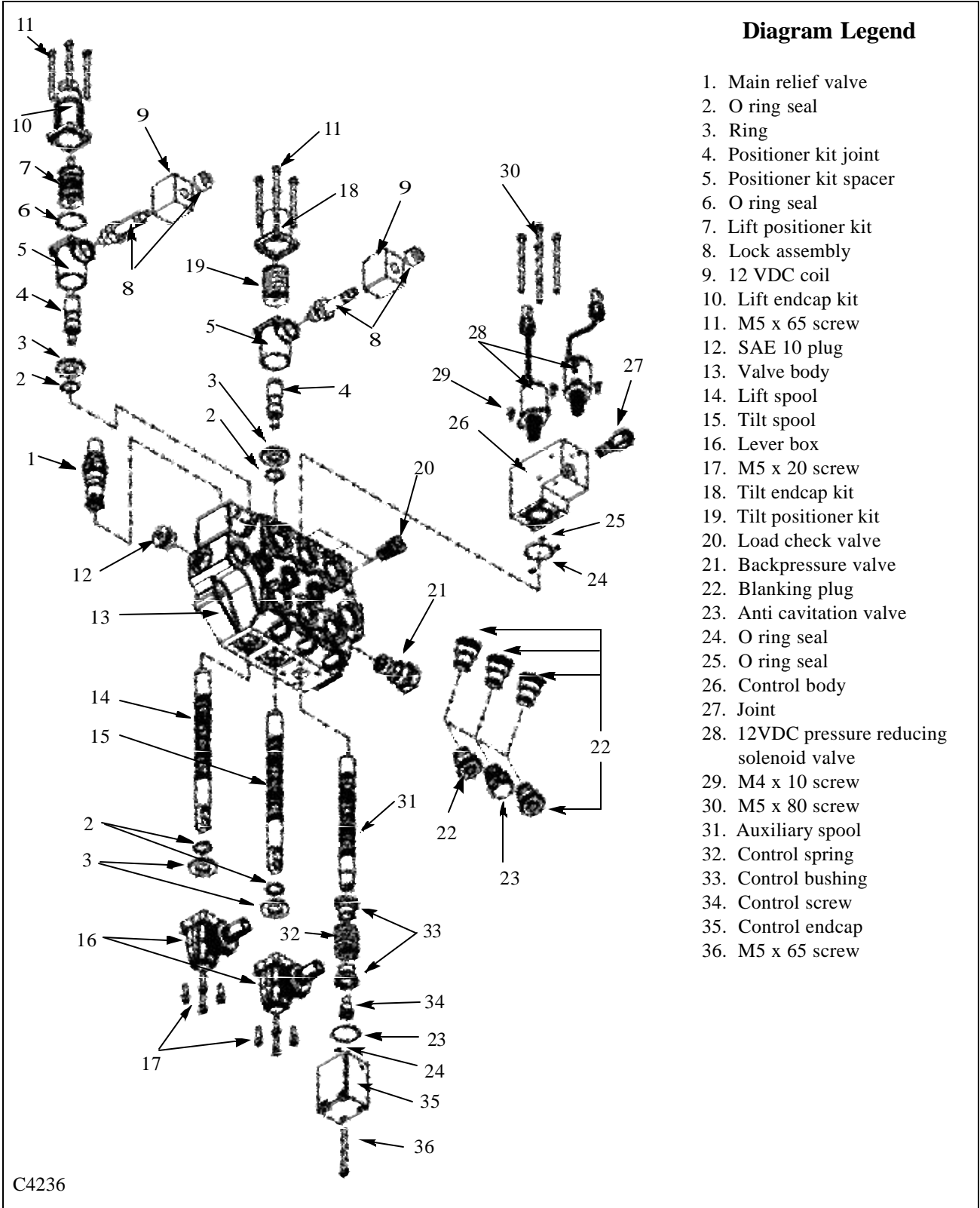
12 After checking for leaks, you must retest the relief valve setting as outlined on page 1-6 Testing and adjusting.



# 1

## CONTROL VALVE 1.3

### Control Valve Disassembly 137/153

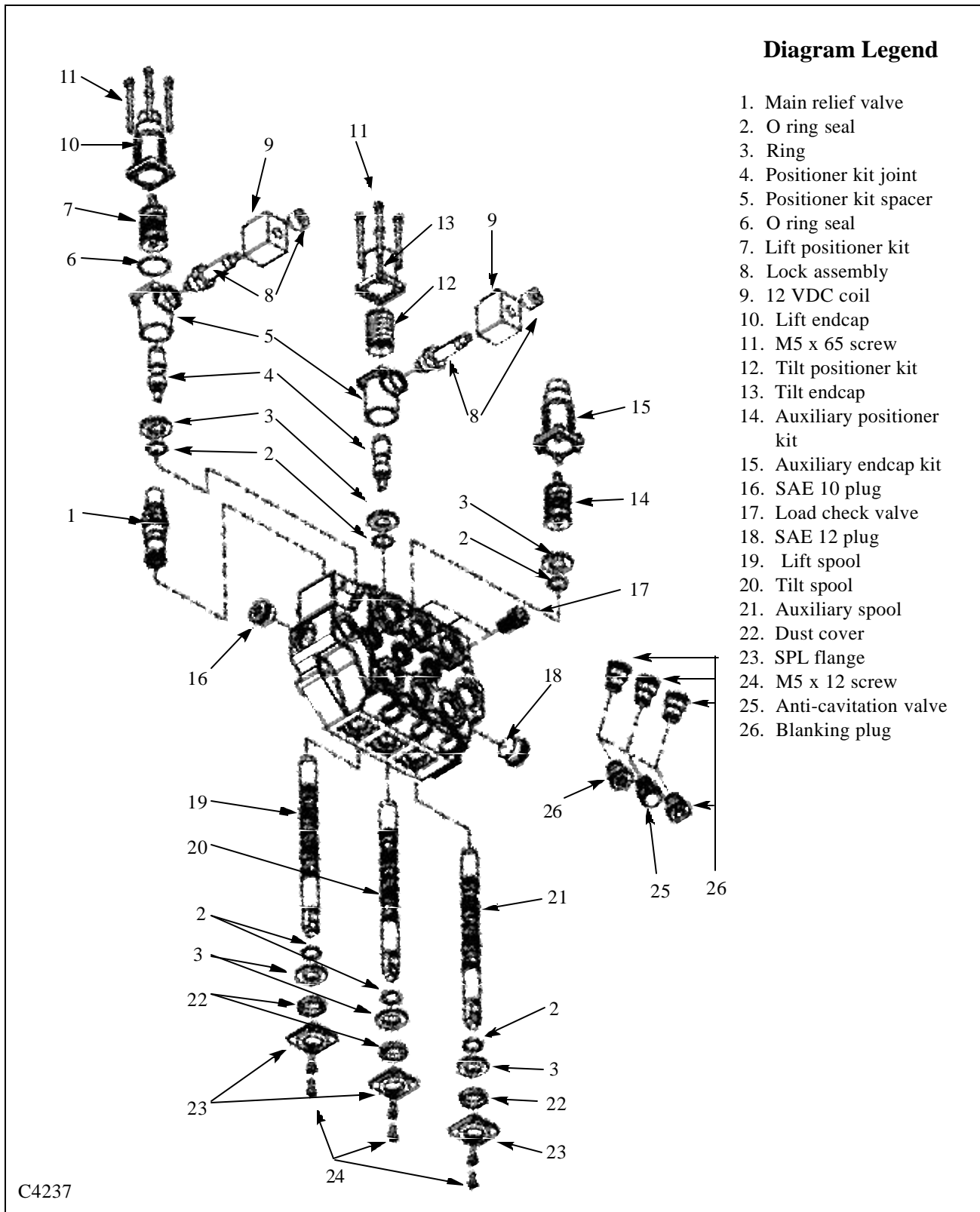




# CONTROL VALVE 1.3

## Control Valve Disassembly 1300/135

1



# CONTROL VALVE 1.3

# 1

## Disassembly / Repair 137/153

Before disassembling the hydraulic control valve, clean the body with a suitable solvent and dry with compressed air. (fig. C3696)



### 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.

1. Remove the pressure relief valve. Discard the O-rings. (fig. C3698)

2. Remove the solenoid coils and locking pin from the valve lock block. (fig. C3699 ) There are 2 O-ring seals located on either side of the solenoid coils (fig C805).

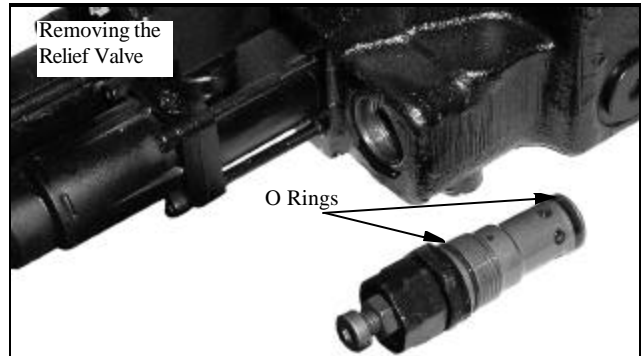
3. Remove the spring return detent kit and spring center cap locks. (fig. C3704, C3706)

Control Valve



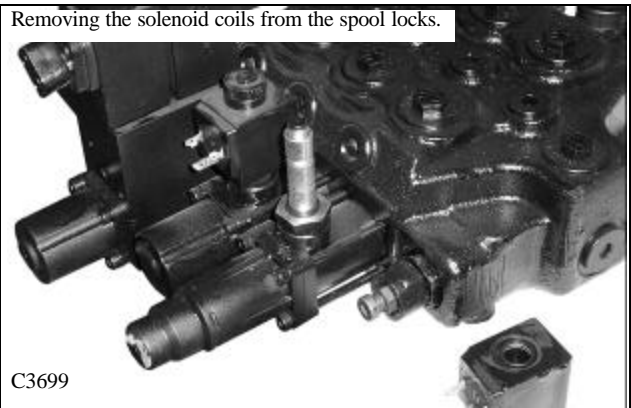
C4254

Removing the Relief Valve

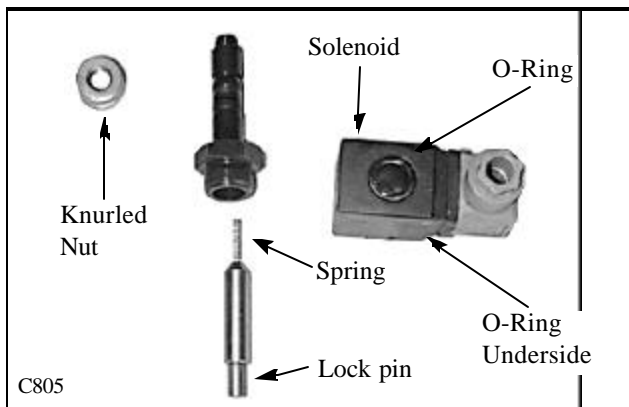


C3698

Removing the solenoid coils from the spool locks.



C3699



C805



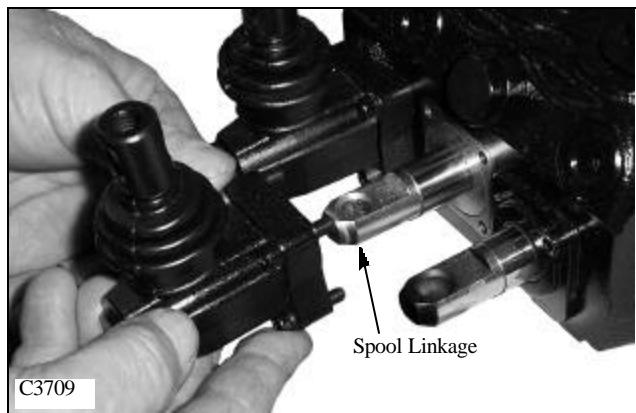
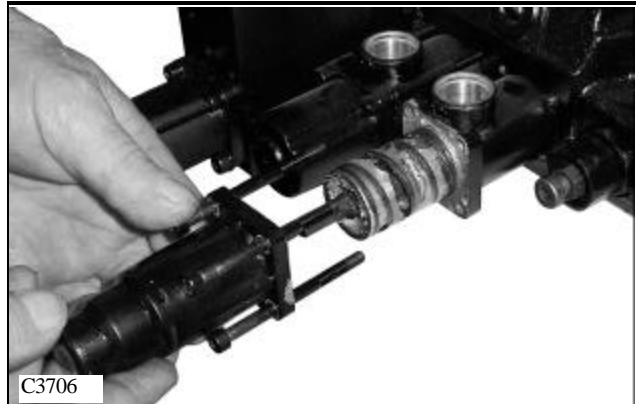
C3704

# CONTROL VALVE 1.3

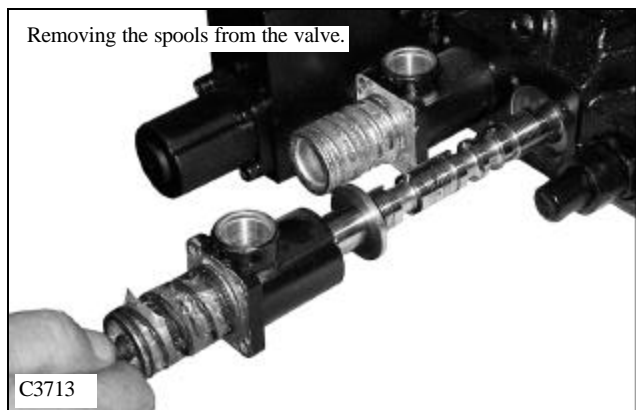
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## Disassembly / Repair 137/153 (cont'd)

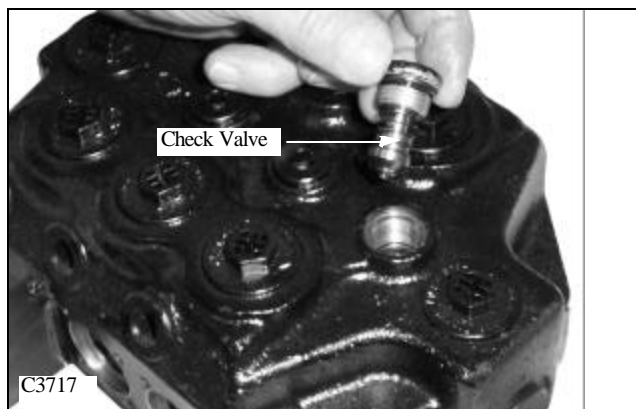
4 Remove the control box from the spool linkage end. (fig. C3709) The box needs to be tilted upward towards the valve to release the hardened ball from the hole in the spool end, and then pull away from the valve.



5 Pull out the spool. (fig. C3713) 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.



6 Remove the check valves from control valve body. (fig. C3717) They are located between the ports of each section. Check the seat and poppet of the valve body and check valve.

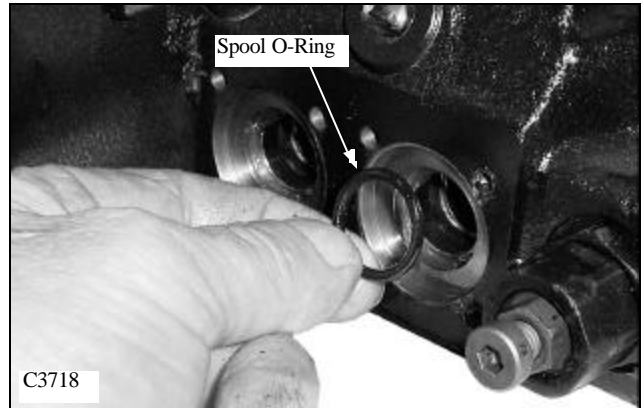


# CONTROL VALVE 1.3

## 1

### Disassembly Repair 137/153 (cont'd)

7 When replacing the spool to the control valve, use new O-ring seals and apply oil to the O-rings and spools. (fig. C3718).



8 Fit the seal washer to the control valve with the beveled side of the washer facing the control valve. (fig. C3719) Fit the spool to the control valve now if repairs are not needed to the detent or spring return mechanism. Use oil to lubricate the spool before inserting to the control valve.



9 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.(fig. C3724)

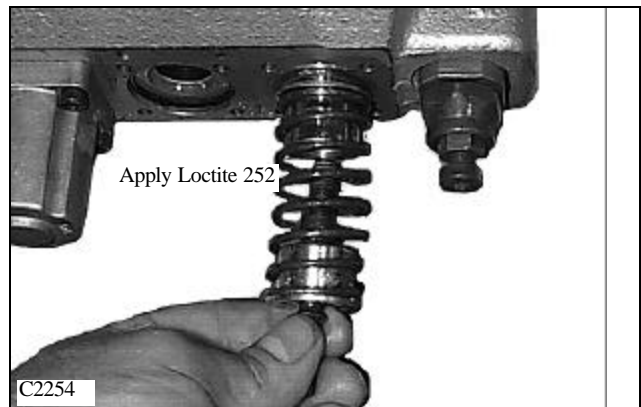
Replace broken springs, worn detents and / or damaged detent balls with a new detent kit.

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.



10 When installing the detent to the control valve spool, apply Loctite type (542) to the threads. Tighten the detent to the spool at 17.7 ft lbs (24 Nm). (fig. C2254)

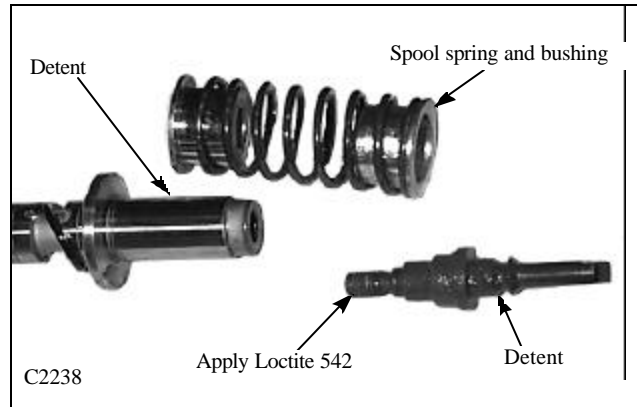


# CONTROL VALVE 1.3

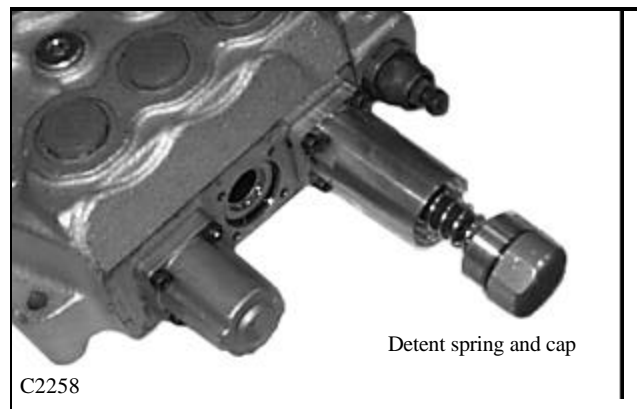
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## Disassembly / Repair 137/153 (cont'd)

11 Install the spring return / centering cover and tighten the mounting screws evenly to 4.9 ft lbs (6.6 Nm). Install the end cap to the cover and tighten to 7.2 ft lbs (9.8 Nm) . (fig. C2258)



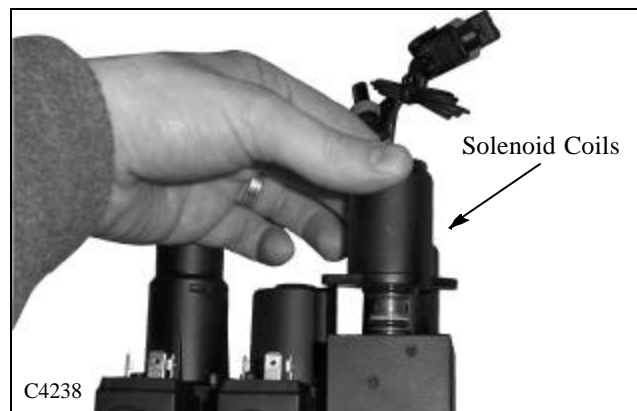
12 Install the spring return / centering cover and tighten the mounting screws evenly to 4.9 ft lbs (6.6 Nm). Install the end cap to the cover and tighten to 7.2 ft lbs (9.8 Nm) . (fig. C2258)



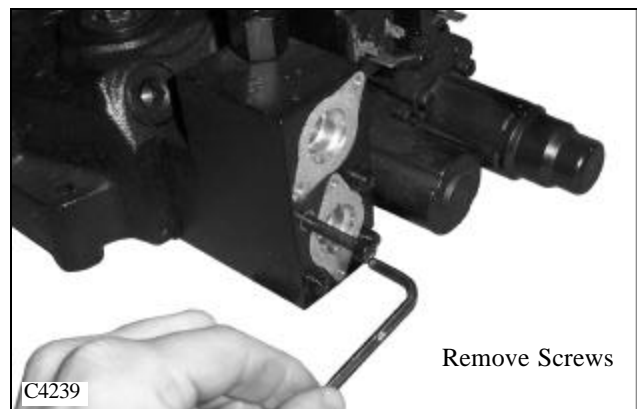
## Solenoid Controlled Auxiliary

1 Remove the screws retaining the solenoid coil. Remove the 12 VDT solenoid coils. (fig. C4238)

2 Inspect the O ring on the solenoid coils for damage. Replace if necessary.



3 Remove the screws retaining the solenoid assembly to the control valve. (fig. C4239). Upon assembly tighten the screws to 4.9 ft lbs (6.6 Nm).



# CONTROL VALVE 1.3

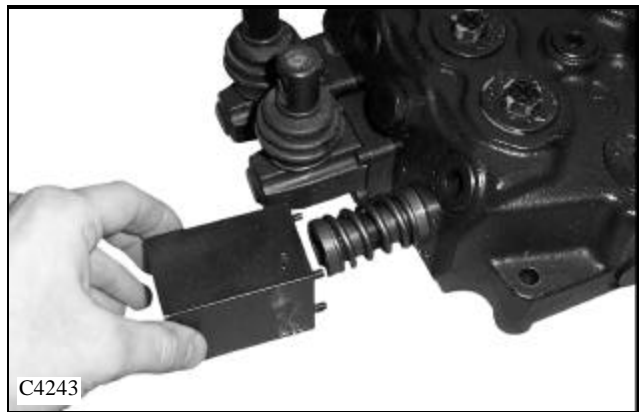
## 1

### Disassembly / Repair 137/153 (cont'd)

4 Remove the solenoid assembly from the control valve. (fig. C4242)



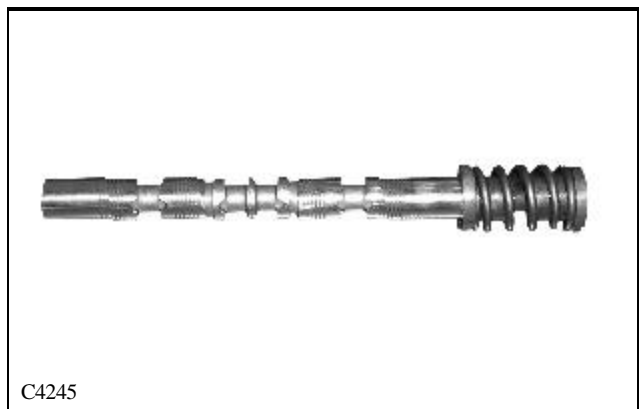
5 Remove the screws and the bottom end cap from auxiliary section.(fig.4243)



6 Remove the solenoid spool assembly from the control valve. (fig. C4244) Note the effort required to remove the spool from the spool bore. It should come out smoothly without binding or “snagging” throughout it’s travel.



7 Inspect the spool and spool bore for abnormal wear. (fig. C4245) Replace the spool and / or the control valve if large scratches or indentations are present in the spool or spool bore. Minor scratches can be removed from the spool with extra fine emery cloth.

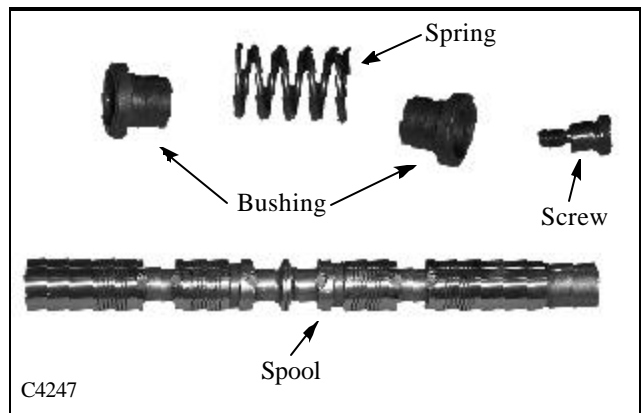
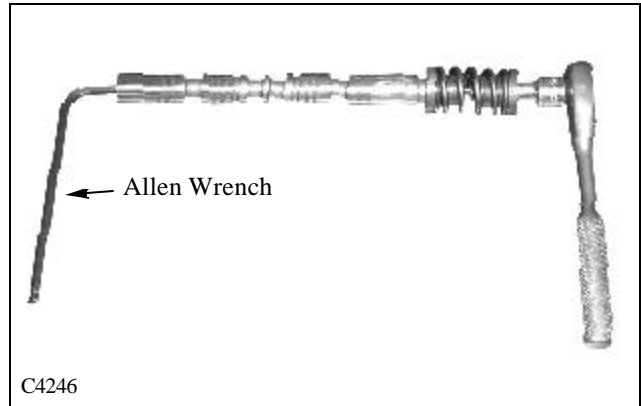


# CONTROL VALVE 1.3

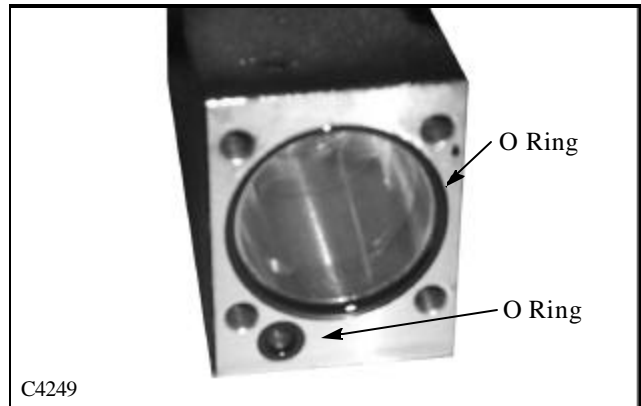
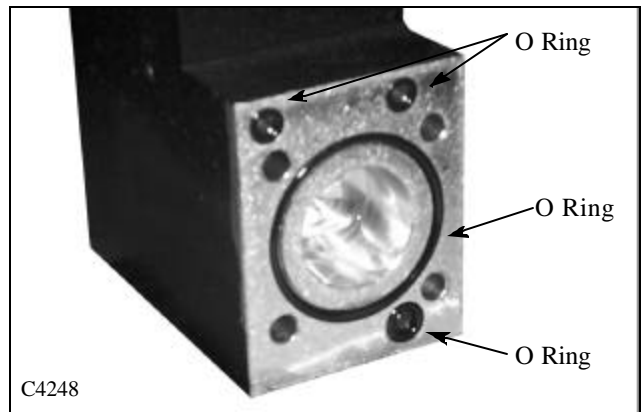
# 1

## Disassembly / Repair 137/153 (cont'd)

8 Hold the spool with a Hex allen wrench while removing retaining screw. (fig. C4246) Remove the spring and spring bushing from the spool assembly. (fig. C4247) When installing the spring assembly to the spool, apply Loctite 542 to the threads and tighten the screw to 17.7 ft lbs (24 Nm).



9 Upon assembly, use new O-ring seals. (fig. C4248) Don't overlook the small O-ring seal between the cylinder and valve body. (fig. C4249) Lubricate the spool O-ring seals with system oil. Apply Castrol "Sphero" grease to the inside of the spring covers.



# 1

# CONTROL VALVE 1.3

# 1

## Disassembly / Repair 1300/135

Before disassembling the hydraulic control valve, clean the body with a suitable solvent and dry with compressed air. (fig. C3744)



### WARNING

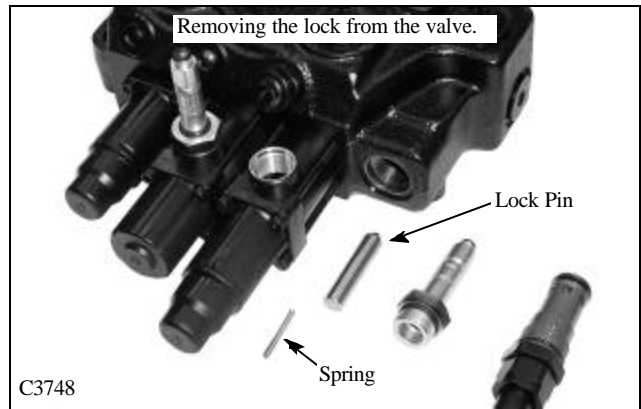
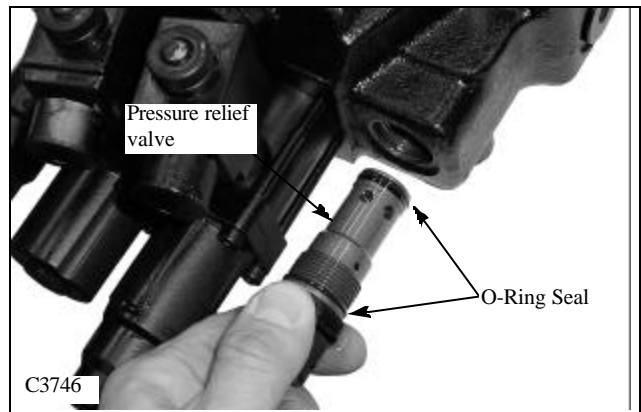
To avoid eye injury, use safety goggles when cleaning with compressed air.

Ensure all openings are plugged to prevent solvents and dirt from contaminating the control valve assembly.

1. Remove the pressure relief valve. Discard the O-rings. (fig. C3746)

2. Remove the solenoid coils and locking pin from the valve lock block. (fig. C3748) There are 2 O-ring seals located on either side of the solenoid coils.

3. Remove the spring return detent kit and spring center cap locks. (fig. C3749)





# CONTROL VALVE 1.3

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## Disassembly / Repair 1300/135 (con't)

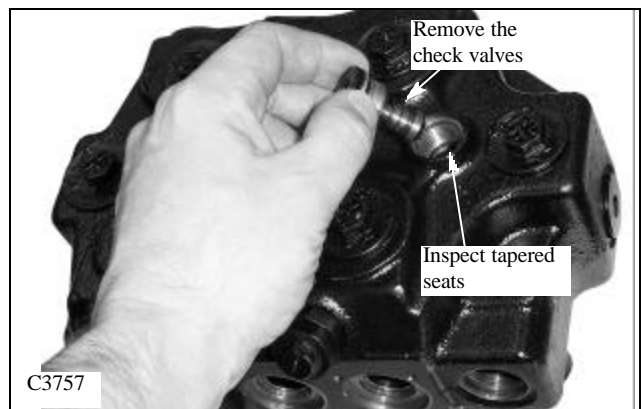
4 Remove the control box from the spool linkage end. The box needs to be tilted up towards the valve to release the hardened ball on the control box pin from the hole in the spool end and pull it away from the valve. (fig. C3752).



5 Pull out the spool. (fig. C3754) 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.



6 Remove the check valves from the control valve body (fig. C3757). 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.

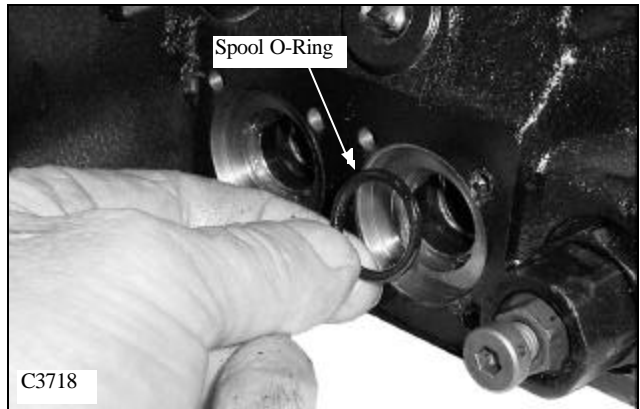


# CONTROL VALVE 1.3

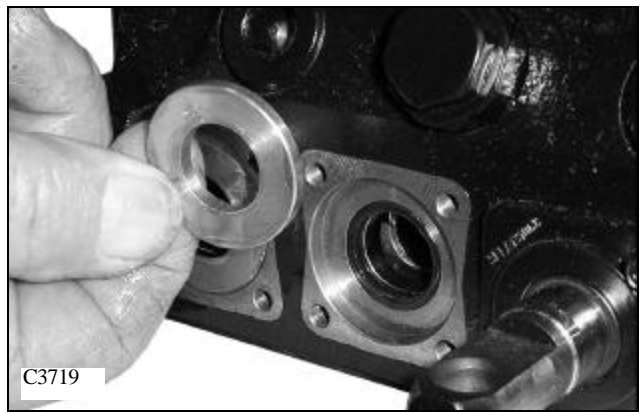
## 1

### Disassembly / Repair 1300/135 (con't)

7 When replacing the spool to the control valve, use new O-ring seals and apply oil to the O-rings and spools. (fig. C3718).



8 Fit the seal washer to the control valve with the beveled side of the washer facing the control valve. (fig. C3719) Fit the spool to the control valve now if repairs are not needed to the detent or spring return mechanism. Use oil to lubricate the spool before inserting to the control valve.

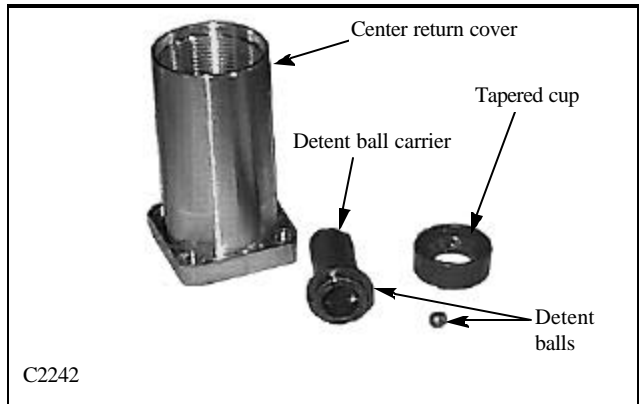
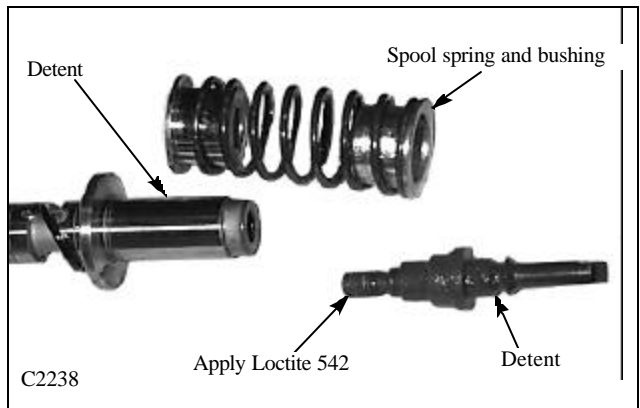


19 Place the cable end of the spool in a vice, or insert a screw driver through the clevis pin holes, to keep it from turning. The detent is threaded to the spool and can be removed for inspection or repairs. (fig. C2238, C2242)

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 "Sphaerol" TN grease to the inside of the spring cover.

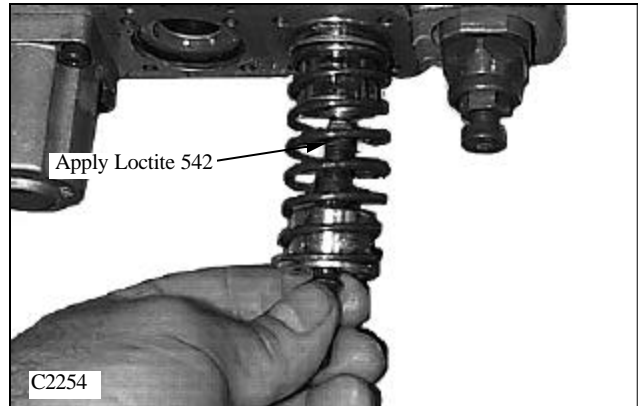


# CONTROL VALVE 1.3

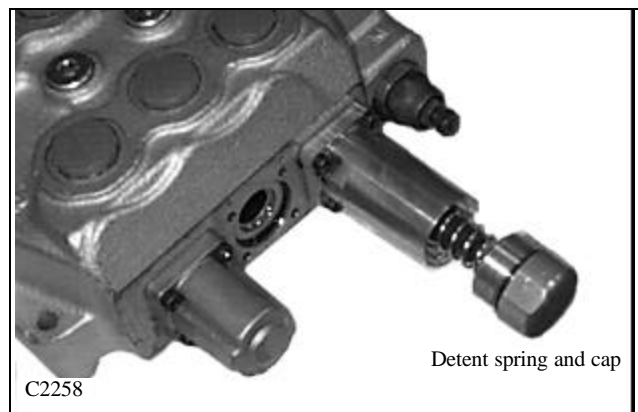
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## Disassembly / Repair 1300/135 (con't)

10 When installing the detent to the control valve spool, apply Loctite type 542 to the threads. Tighten the detent to the spool at 17.7 ft lbs (24 Nm). (fig. C2254)



11 Install the spring return / centering cover and tighten the mounting screws evenly to 4.9 ft lbs (6.6 Nm). Install the end cap to the cover and tighten to 7.2 ft lbs (9.8 Nm) (fig. C2258).

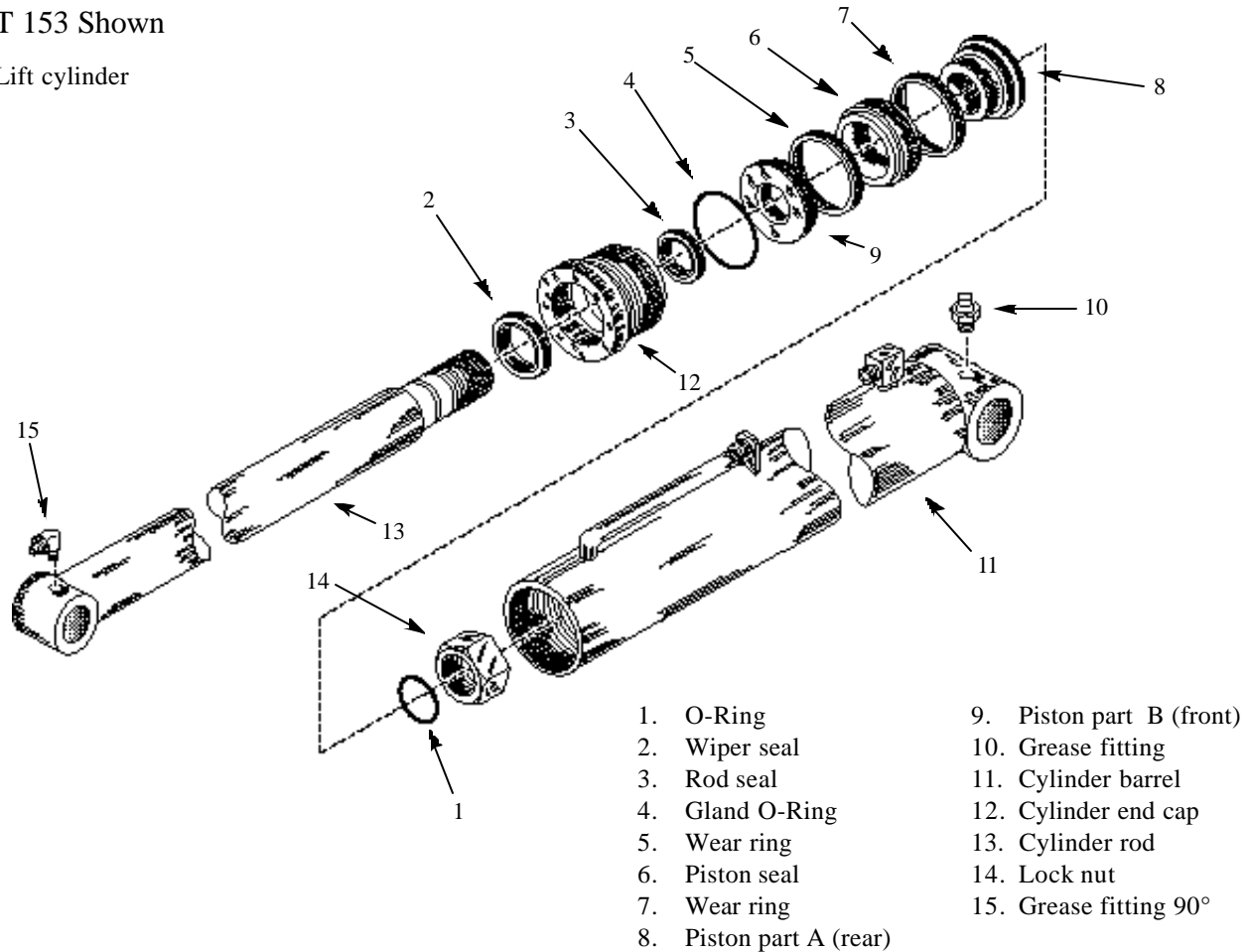


# HYDRAULIC CYLINDERS 1.4

# 1

T 153 Shown

Lift cylinder



C1179

## 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 cylinder 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 bushing in the pivot areas that can be serviced when worn out.

# HYDRAULIC CYLINDERS 1.4

1

## Testing the Piston Seals

Before performing this test, ensure the control linkages are not binding and the hydraulic control valve spools are centering in the neutral position. Check the hydraulic circuit for external leaks. These conditions will give the same symptoms as a worn piston seal. If the cylinders under pressure are sluggish or stop functioning, these would indicate that oil is leaking by the cylinder piston seal. The following test can be performed to check the cylinder piston seal.

### IMPORTANT

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



### WARNING

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

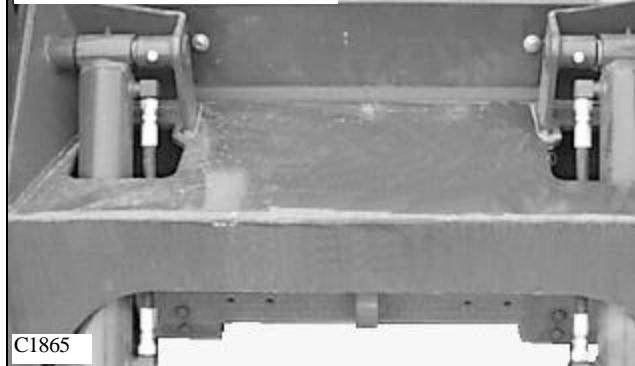
1. Retract the cylinder(s) to be tested. Shut off the engine and cycle the controls to release the hydraulic pressure. Have a container ready to catch any waste oil to prevent environmental contamination.
2. Disconnect the hoses from the cylinder to be tested. Cap the hose with a plug to prevent contamination.
3. Disconnect the cylinder to be tested as outline on page 1-38 or 1-39.
4. Place the base or fixed end of the cylinder in a vice or support to hold the cylinder.
5. Extend the cylinder ram about 6 ~ 8". Fill the fixed end cylinder port with hydraulic oil using a funnel.
6. Cap both ports with a 3/4 JIC steel cap to prevent system pressure from escaping.
7. Apply pressure using your hand to the ram.
6. Monitor the movement of the ram. If the ram slowly retract back to it original position, then the seals are bad and need replacement. If the cylinder stays extended then you may need to check the load check valves or spool wear in the hydraulic control valve.
7. Repeat for all both pairs of cylinders.
8. If the cylinder passed the piston seal test then assemble the cylinder to the loader.

Remove cylinder to be tested



C4250

Remove cylinder to be tested



C1865

Extend cylinder 6 ~8"



C4476

Slowly retract the ram



C4477

# HYDRAULIC CYLINDERS 1.4

## 1

### Lift Cylinder Replacement



#### WARNING

To prevent personal injury never repair or tighten hydraulic hoses while the engine is operating or the system is under pressure.

The following procedure will assist you in cylinder removal.

For removal of the boom cylinders:

#### IMPORTANT

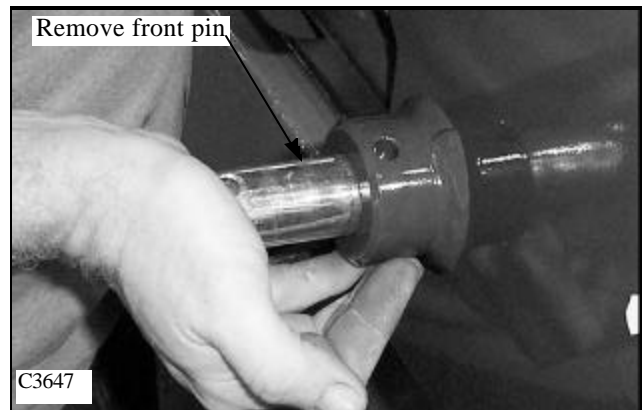
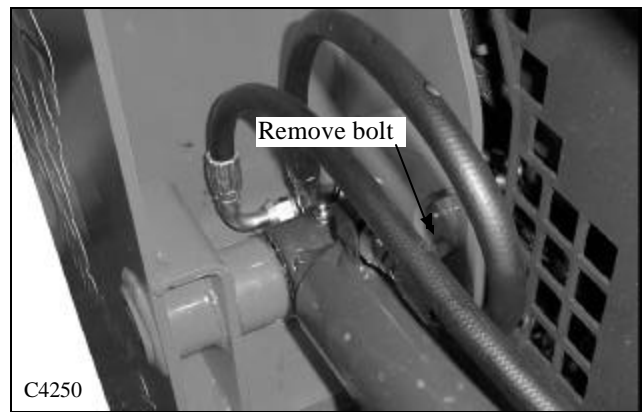
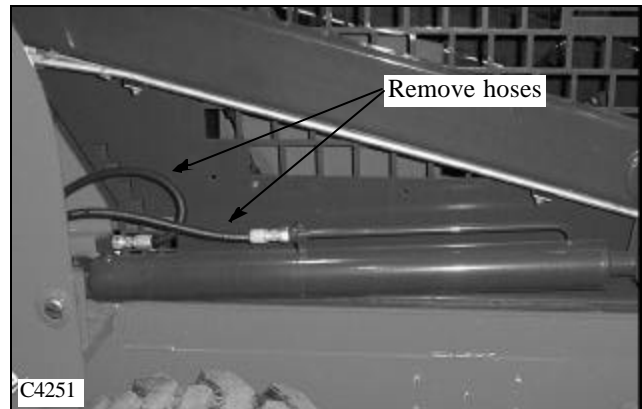
Cap all open lines and ports to prevent contamination.

- 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. C4251) Cap all open ports and lines to prevent contamination.
- 3 Remove the lock nut and bolt from both mounting pins. (fig. C4250)
- 4 Remove the front pivot pin by pushing the pin out from behind the boom arm, out toward you. (fig. C3647) With an appropriate punch and hammer to prevent brooming of the pin, remove the rear pin. (fig. C4253) Brooming the pin makes it difficult to remove.
- 5 Remove the cylinder from the loader.
- 6 Upon replacement, inspect the pivot pins and cylinder bushing 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.



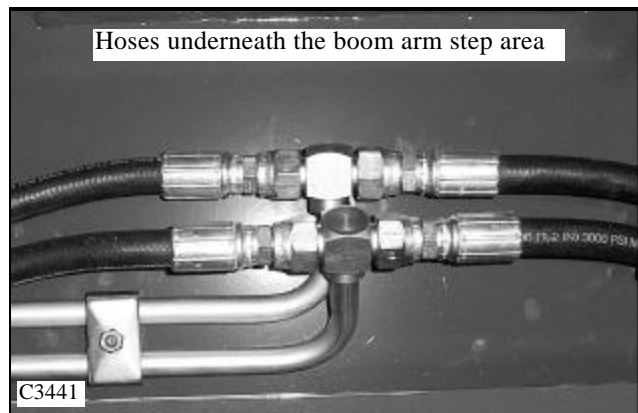
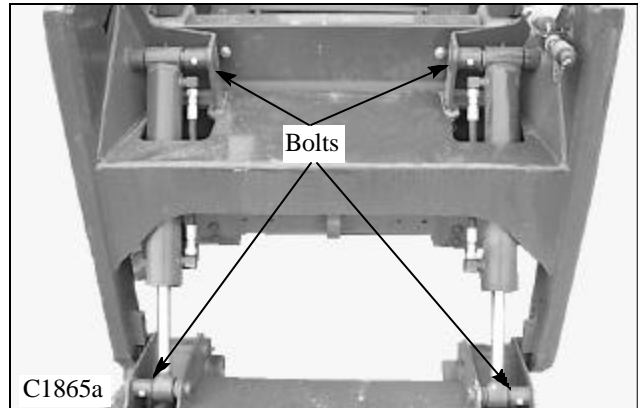
# HYDRAULIC CYLINDERS 1.4


1

## Tilt cylinder Replacement

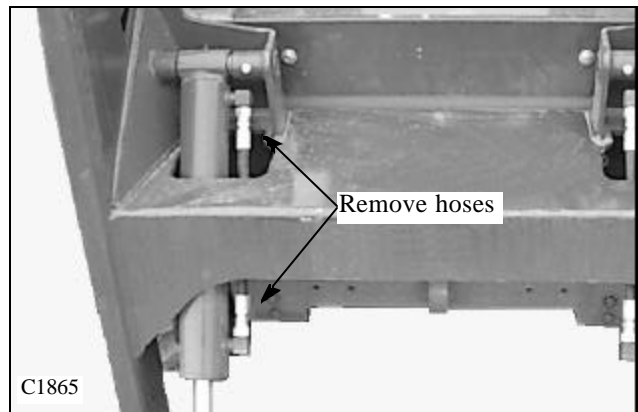
For tilt cylinder removal:

- 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.(fig. C3649)
- 2 Loosen or remove the hydraulic hoses from hydraulic tubing under the boom arm step if you are changing the hoses also. (fig. C3441)
- 3 Remove the hydraulic hoses from the tilt cylinder. Plug and or cap all open ports or lines to prevent contamination. (fig. C3439)
- 4 Remove the lock nuts from the bolts retaining the pivot pins to the loader and remove the bolts. (fig. C3649)
- 5 Remove the pivot pins by tapping out with a brass drift pin. (fig. C4252)
- 6 Remove the cylinder from the loader.
- 7 Upon reassembly, inspect the pivot pins and bushing 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.



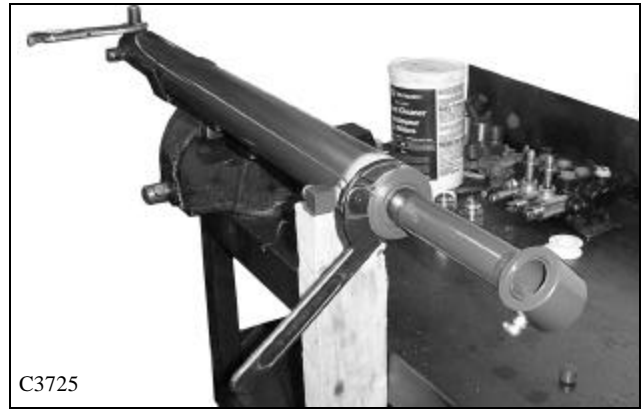
# HYDRAULIC CYLINDERS 1.4

## 1

### 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 or on a pin held in the vise and support the front end of the body. Remove the plugs from the hose ports. (fig. C3725)
- 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. C3725)
- 4 Remove the gland nut, rod and piston seal assembly from the barrel. (fig. C3726)

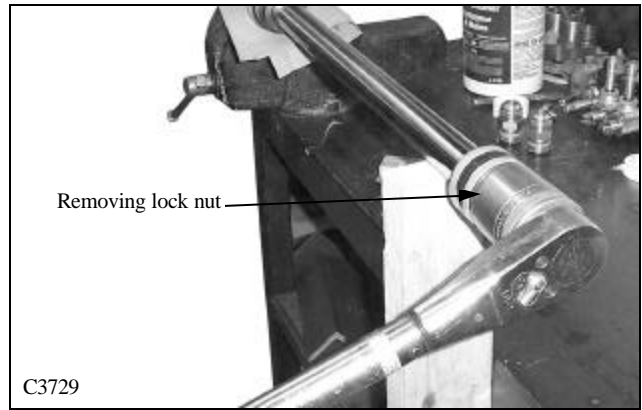


C3725



C3726

- 5 Place the cylinder rod bushing end in a vise or on a pin held in a vise and remove the lock nut from the rod. (fig. C3729)



C3729

- 6 Remove the 2 piece piston assembly from the rod. (fig. C3731)
- 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.



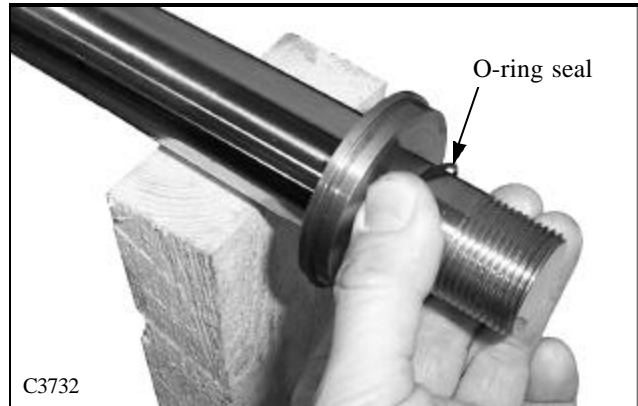
C3731



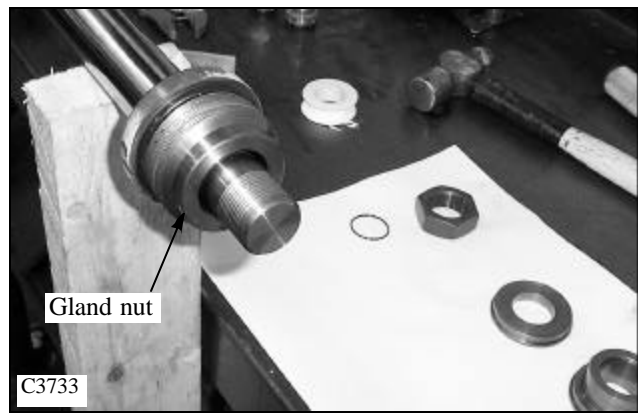
# HYDRAULIC CYLINDERS 1.4

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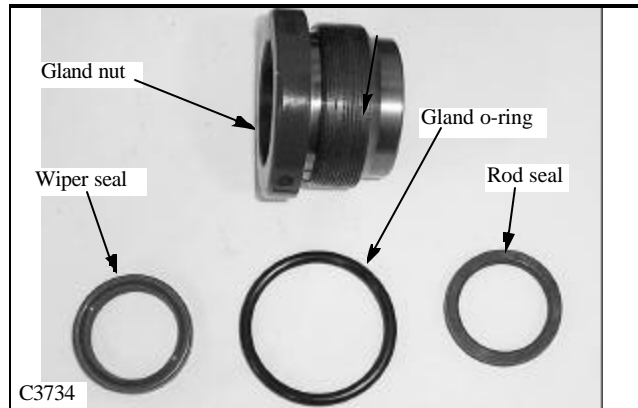
8 Depending on the design of the rear piston, non threaded type, remove and discard the o-ring seal from the end of the cylinder rod. (fig. C3732)



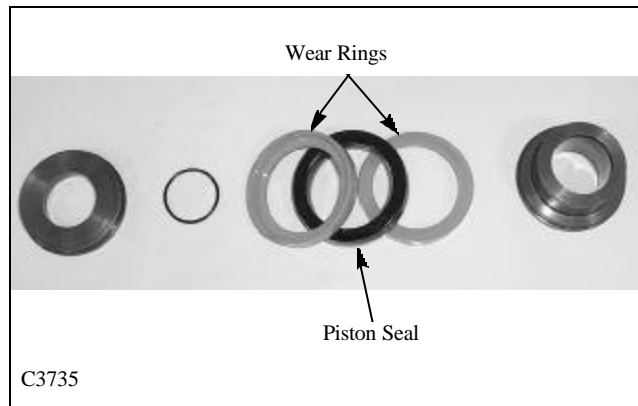
9 Remove the gland nut assembly from the cylinder rod. (fig. C3733)



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. C3734) NOTE: Some seal designs may vary from illustration



11 Remove and discard the wear rings and piston seal from the piston assembly. (fig. C3735)



# 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.

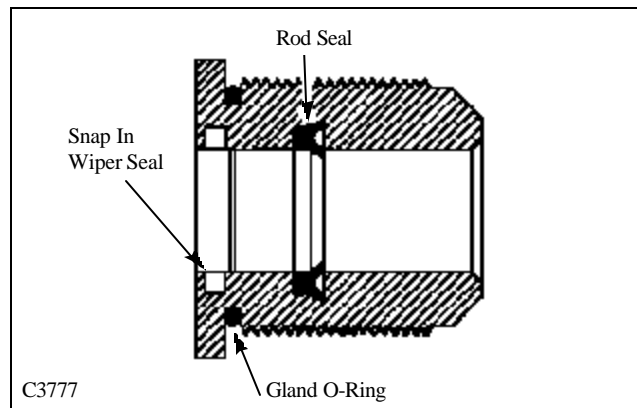
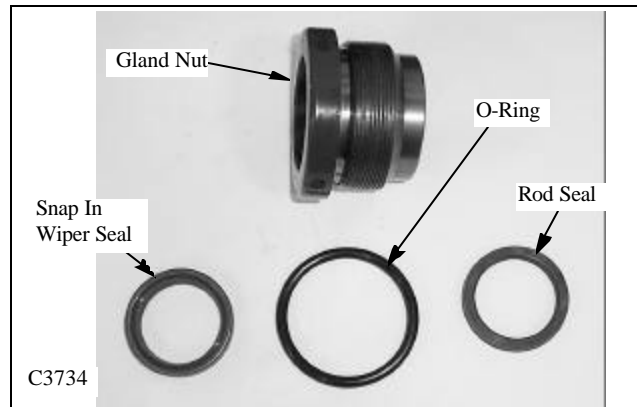
Smooth down edges that could damage seals and cause leakage.

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. C3734,C3777)

2 Install a new wiper seal in the gland nut. (fig. C3734, C3777)

3 Install a new gland nut o-ring seal. (fig. C3734, C3777)

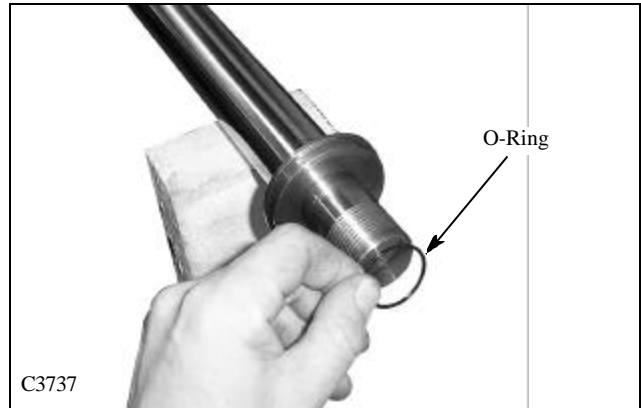
4 Apply system oil to the cylinder rod and assemble the gland nut assembly to the rod. (fig. C3736)



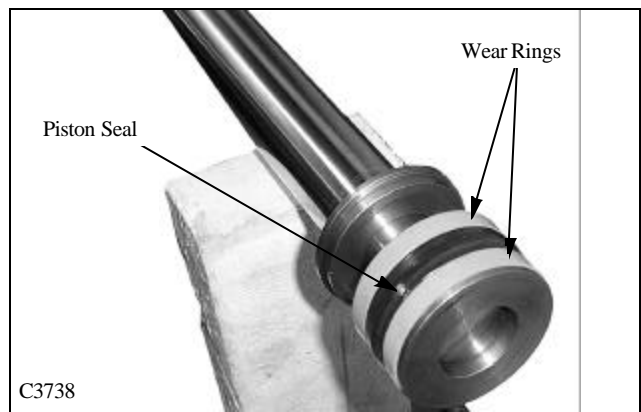
# HYDRAULIC CYLINDERS 1.4

1

5 Install a new o-ring seal on the cylinder rod (if used). Some cylinder rods are fully threaded to accommodate a threaded type rear piston part. (fig. C3737)

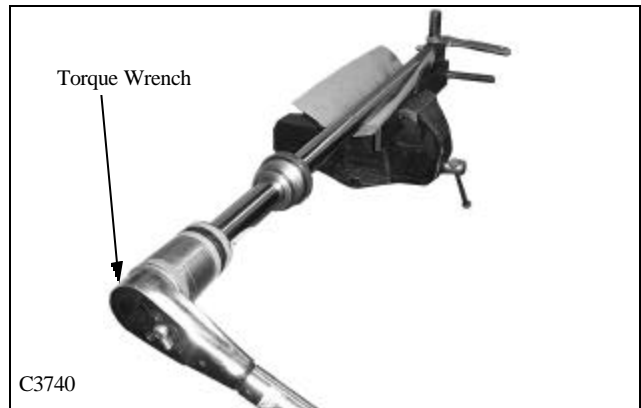


6 Install new wear rings and piston seal to the the 2 piece piston assembly. (fig. C3738)



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 250-275 ft lbs (339-373 N.m.). (fig. C3740)

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. C3741)

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 Test the cylinder as outlined in page 1-37. If the cylinder passes the piston seal test then, assemble the cylinder to the loader.



# 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 right side, on the fuel reservoir. All oil returning from the control valve is cooled and then filtered before being used up by the hydraulic system. The hydraulic oil filter is a spin on type with a 5 micron rating. The filter material is a synthetic media 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

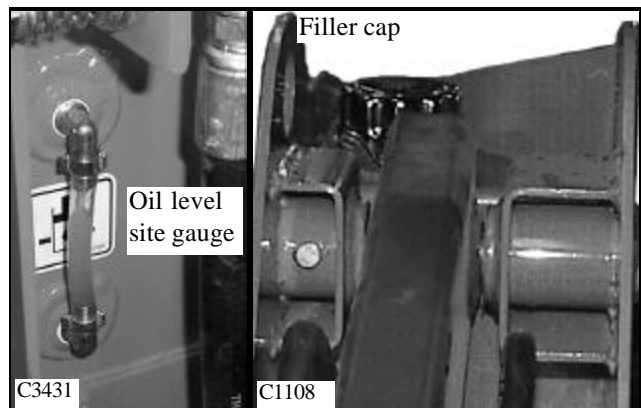
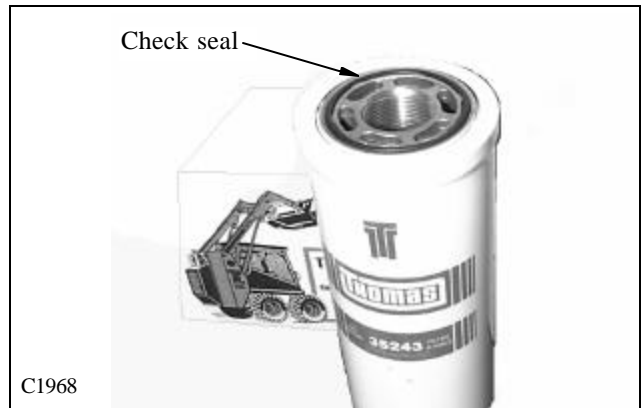
The hydraulic oil filter must be changed after the first 50 hours of operation and every 150 hours thereafter.



#### WARNING

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

- 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. C4223, C1472)
  - 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. C1968)
  - 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 SJ. (fig. C3431, C1108)



# HYDRAULIC OIL COOLER 1.6

1

## General Information

The hydraulic oil cooler is mounted to the inside of the rear door. (fig. C4255) 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.



### WARNING

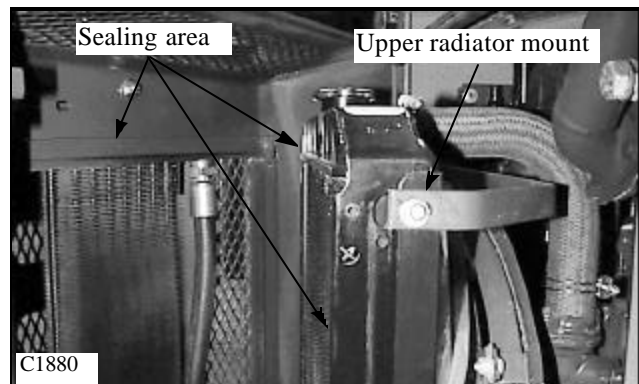
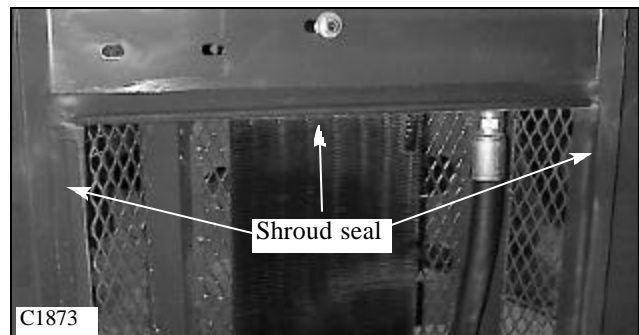
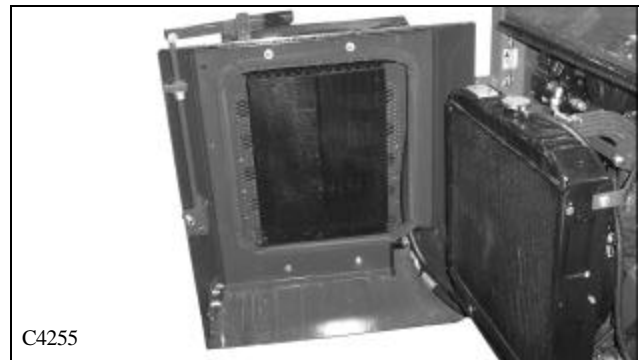
To avoid eye injury, always use safety goggles when cleaning with compressed air.

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. The oil cooler is surrounded by a shroud. The outer edge of the shroud holds a layer of sealing foam that presses against the engine radiator when the rear door is closed. This directs the air, driven by the engine cooling fan (C1872), through the hydraulic oil cooler. The sealing foam and adjustment should be checked at every service interval. The shroud seal (C1873) to radiator adjustment can be made by loosening the upper radiator mounting brace and moving the radiator back or forward. (fig. C1880) If necessary the whole engine may need to be moved if adjustment cannot be made by moving the radiator.

## Cooler Replacement

- 1 Lower the boom arms, engage the parking brake and shut off the engine.
- 2 Open the rear door and remove the cooler shroud.
- 3 Connect a vacuum system to the oil reservoir filler spout, if available, or drain the hydraulic oil reservoir. Be prepared to contain 56 liters of fluid (14.8 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 and cooler shroud. 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. C4214) 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 site 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. C1878)

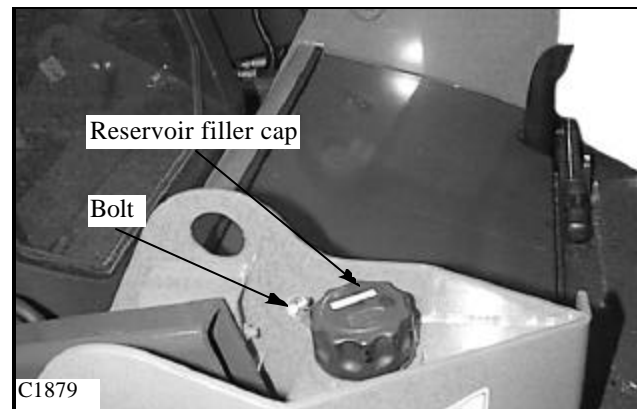
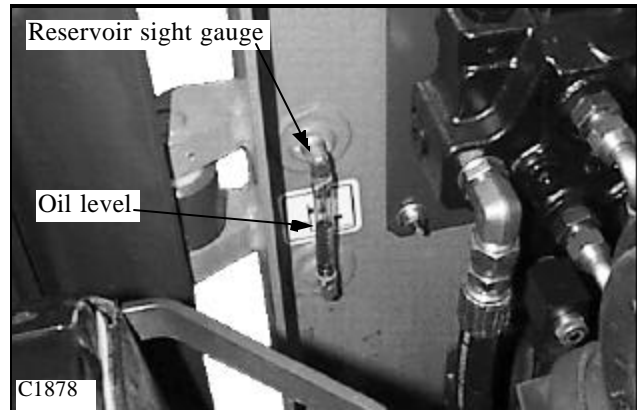
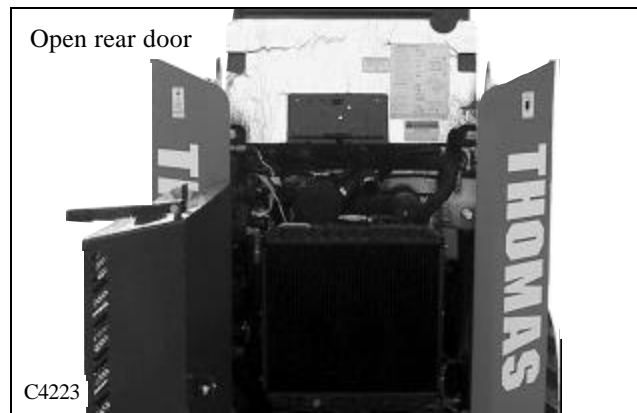
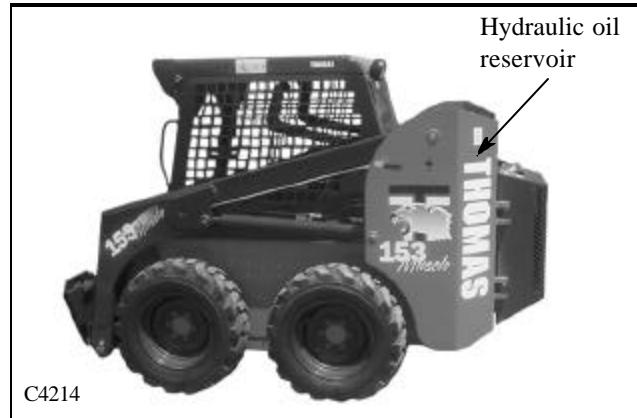
The oil reservoir fill cap is located at the top of the reservoir. (fig. C1879) The oil fill cap assembly has a 30 micron screen to catch larger particles of contaminant before entering the reservoir, but **always use oil filtered through a 5 micron min. filter for replenishing the hydraulic reservoir.** 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. C4223)
- 4 Check the oil level in the sight gauge. (fig. C1878)
- 5 If oil is visible approximately mid way in the sight gauge, the level is correct. The correct level is marked with a line from the factory.

### Adding Oil

- 1 Remove the bolt, or lock, on the reservoir filler cap.
- 2 Open the filler cap. (fig. C1879)
- 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 SJ.
- 5 Replace the filler cap and replace the bolt, or padlock, in the cap to prevent vandalism.



# HYDRAULIC OIL RESERVOIR 1.7

1

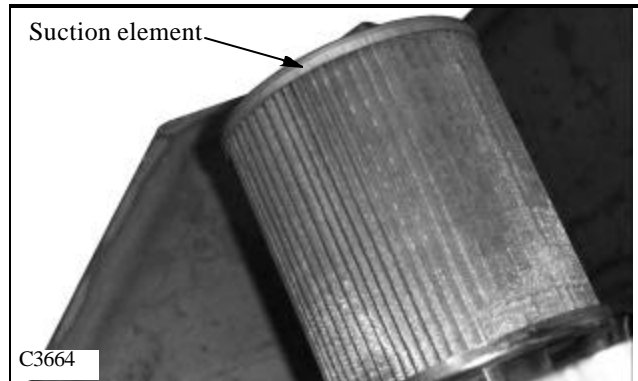
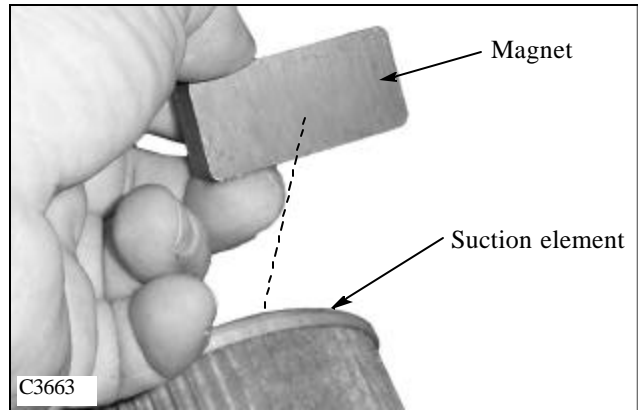
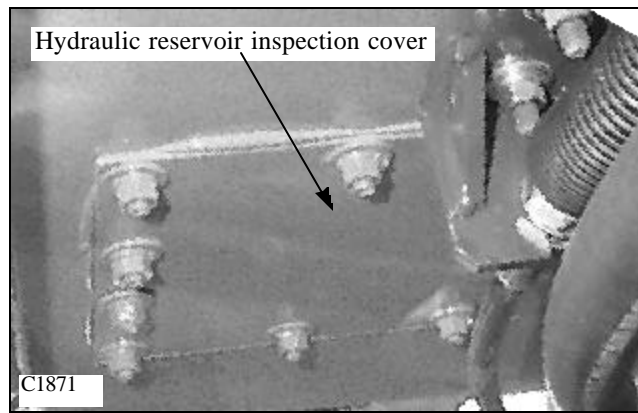
## Servicing The Oil Reservoir

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. Clean any metal particles that may be attached to the magnet. (fig. C4446) Have containers ready to hold approximately 8 gallons (30 liters) 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. C1871) Clean the excess silicone from the cover and reservoir.

NOTE: You may need to remove the control cables and hydraulic hoses to gain access to the inspection cover nuts.

- 4 Remove the suction screen element from the reservoir by turning counter clockwise. (fig. C3663, C3664)
- 5 Remove and clean the magnet attached to the suction element. (fig. C3663)
- 6 Install the magnet onto a new suction element and install the suction element.
- 7 Seal the inspection hole and install the inspection cover to the reservoir. Do not over tighten the mounting nuts. Maximum torque is 15 ft lbs (20.3 N.m.).
- 8 Fill the reservoir to the proper level with 10W30 API classification SJ oil, approximately 8 gallons or 30 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

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Problem	Cause	Corrective Action	Section
Hydraulic oil overheating.	Reservoir low on oil.	Check for leaks and replenish as required.	1.8
	Oil cooler plugged or dirty.	Clean the cooling fins.	1.7
	Auxiliary hydraulics engaged.	Disengage.	4.9
	Cooling fan damaged or inoperative	Check fan and drive belt	1.7
	Engine rpm too low.	Check engine rpm and reset.	7.11
	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.	1.8

## TORQUE CHART 1.9

**Torque Chart** NOTE: all torques are in ft lbs. (Multiply by 1.36 = Nm)

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		

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## CONVERSION CHART 1.10

### CONVERSION FACTORS

#### U.S. To Metric

	MULTIPLY	BY	TO OBTAIN
Area:	sq. foot	0.092 903	square meter
Force:	pound force	4.448 222	Newton
Length:	inch	25.4	millimeter
	foot	0.304 8	meter
	mile	1.609 344	kilometer
Mass:	pound	0.453 592	kilogram
	ounce	28.35	gram
Mass/Energy:	lb/hp-hr	608.277 4	g/kW-hr
Mass/Volume:	lb/cubic ft.	16.0185	kg/cubic meter
Power:	horsepower	0.745 700	kilowatt
Pressure:	lbs/sq.in.	6.894 757	kilopascal
	lbs/sq.in.	0.069	bar
	lbs/sq.in.	0.070 303	kg/sq.cm
Temperature:	degree F	1.8 F - 32	degree C
Torque:	inch pound	0.112 985	Newton meter
	foot pound	1.355 818	Newton meter
Velocity:	miles/hr.	1.609 344	kilometer/hr.
Volume:	cubic inch	16.387 06	cubic centimeter
	cubic foot	0.028 317	cubic meter
	cubic yard	0.764 555	cubic meter
	ounce (U.S. fluid)	29.573 53	milliliter
	quart (U.S. liquid)	0.946 353	litre
	quart (Imperial)	1.136 523	litre
	gallon (U.S.)	3.785 412	litre
	gallons (Imperial)	4.546 092	litre
Volume/Time:	gallon/min.	3.785 412	litre/min.

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# NOTES

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