

# REPAIR MANUAL



Thomas 85 loader

Publication No. 53322/1  
March, 2009

## THOMAS EQUIPMENT LIABILITY WARRANTY

**THE WARRANTY IS THE ONLY OBLIGATION OF THOMAS OR A THOMAS DEALER TO THE PURCHASER OR ANYONE ELSE CONCERNING A PRODUCT, ITS SERVICE, ITS USE OR PERFORMANCE OR ITS LOSS OF USE OR FAILURE TO PERFORM. NEITHER THOMAS NOR A THOMAS DEALER HAVE MADE AND NEITHER WILL MAKE ANY OTHER EXPRESSED OR IMPLIED REPRESENTATION, WARRANTY OR AGREEMENT CONCERNING A PRODUCT. NEITHER THOMAS NOR A THOMAS DEALER HAVE MADE OR WILL MAKE ANY REPRESENTATION, WARRANTY OR AGREEMENT CONCERNING A PRODUCTS MERCHANTABILITY OR OTHER QUALITY, ITS SUITABILITY FOR PURCHASER'S PURPOSE (EVEN IF A PURCHASER HAS INFORMED THOMAS OR A THOMAS DEALER OF THAT PURPOSE), ITS DURABILITY, PERFORMANCE OR OTHER CONDITION.**

**EVEN IF THOMAS OR A THOMAS DEALER WAS ADVISE OF THE POSSIBILITY OF SUCH LOSS, NEITHER THOMAS NOR A THOMAS DEALER WILL BE LIABLE TO PURCHASER OR ANYONE ELSE FOR ANY INDIRECT, INCIDENTAL CONSEQUENTIAL, PUNITIVE, ECONOMIC, COMMERCIAL, OR SPECIAL LOSS WHICH IS IN ANY WAY ASSOCIATED WITH A PRODUCT. THIS INCLUDES ANY LOSS OF USE OR NON-PERFORMANCE OF A PRODUCT, ANY REPLACEMENT RENTAL OR ACQUISITION COST, ANY LOSS OF REVENUE OR PROFITS, ANY FAILURE TO REALIZE EXPECTED SAVINGS, ANY INTEREST COSTS, ANY IMPAIRMENT OF OTHER GOODS, ANY INCONVENIENCE OR ANY LIABILITY OF PURCHASER TO ANY OTHER PERSON.**

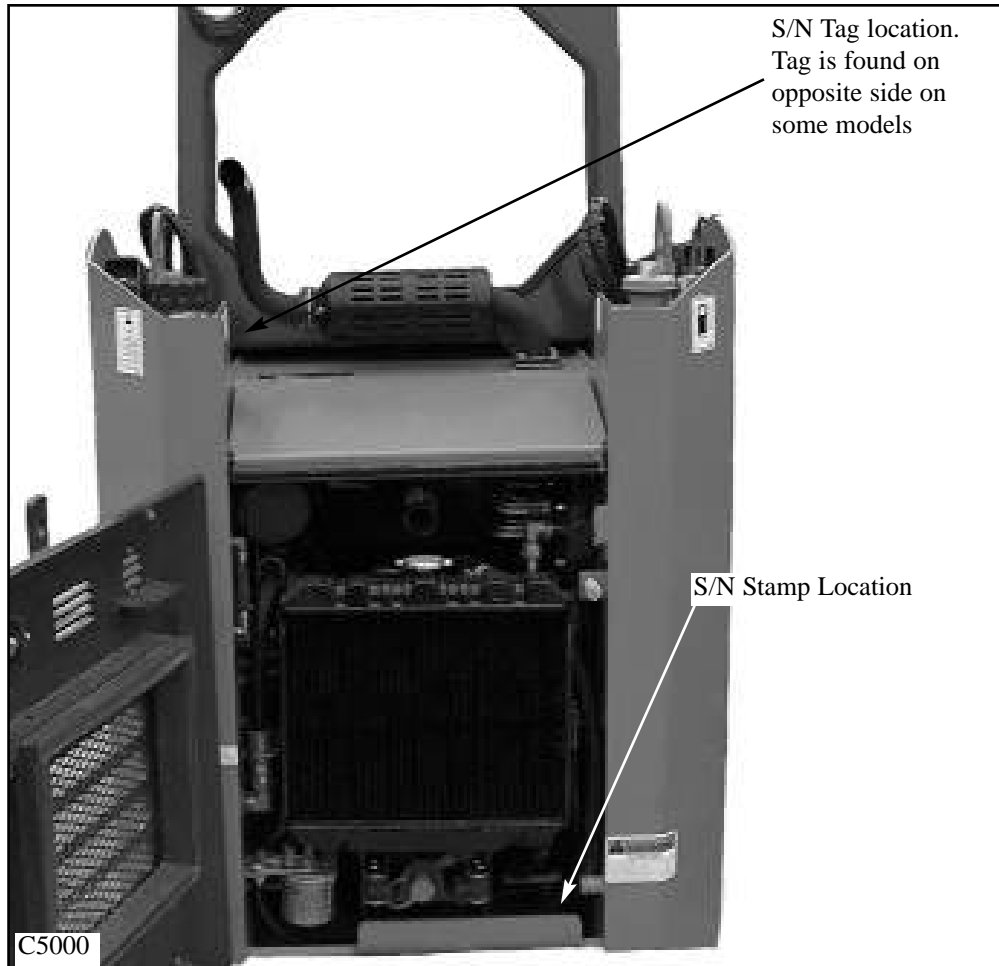
**PURCHASER MAY NOT ATTEMPT TO ENLARGE ITS RIGHTS UNDER THE WARRANTY BY MAKING A CLAIM FOR INDEMNITY, FOR BREACH OF CONTRACT, FOR BREACH OF COLLATERAL WARRANTY, FOR A TORT (INCLUDING NEGLIGENCE, MISREPRESENTATION OR STRICT LIABILITY) OR BY CLAIMING ANY OTHER CAUSE OF ACTION.**

**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.*

# 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 left hand side hydraulic oil tank. In the event that the serial number plate is missing, the serial number is stamped on under the engine.



# SAFETY PRECAUTIONS

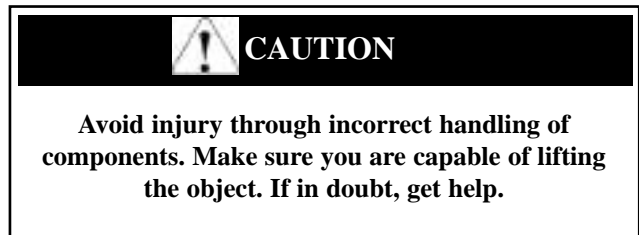
Practically all Service work involves the need to drive the loader. The Owner's / Operator's Manual, supplied with each loader, contains safety precautions relating to driving, operating and servicing that loader. These precautions are as applicable to the service technician as they are to the operator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

Prior to undertaking any maintenance or repair operations, make the necessary safety precautions to prevent possible personal injury to yourself, or to 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**  
Avoid long term contact with used motor oil. Follow work practices that minimize the amount of skin exposed and length of time used oil stays on your skin.
- \* **EYE PROTECTION**  
Injury can be avoided by wearing eye protection when engaged in chiseling, grinding, welding, painting and any other task that involves airborne 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 risk 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.



## 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 injury or to a poor job done.

Never Use:

A hammer with a loose or split handle.

Spanners or wrenches with spread or worn jaws.

Wrenches or files as hammers, drills, clevis pins or bolts as punches.

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

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**

- 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 (such as jackstands that have a rated capacity greater than the loader weight) 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.
- \* To avoid personal injury, service the loader with the arms down and the bucket or attachment on 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 boom support engaged.
- \* 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 someones 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 overhauled 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 may 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.

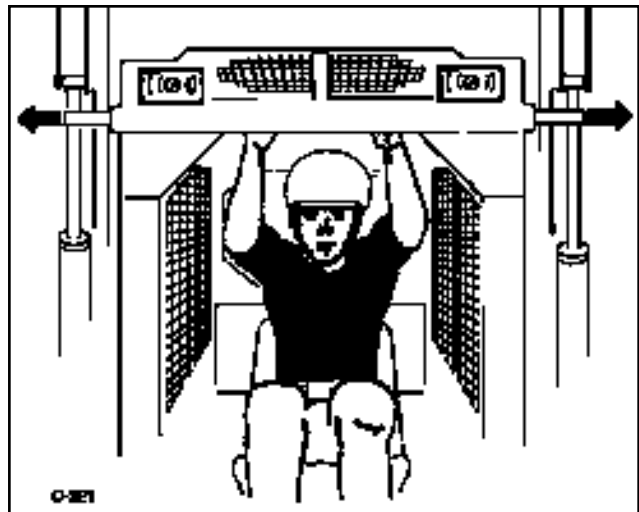
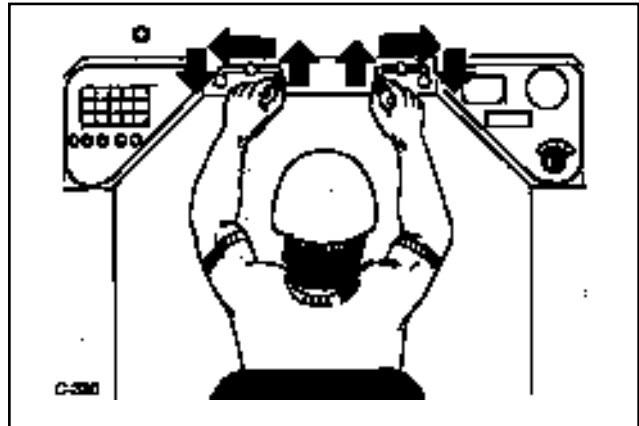
Where possible, always install the bearing onto the rotating components first. Use the correct tools or a press to install a bearing or bushing. In the absence of the correct tools or press, heat the bearing and / or casing in hot oil to assist the installation of the bearing.

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. C320, C321)



### WARNING

**To avoid personal injury, service the loader with the arms down and the bucket or attachment on 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 boom supports engaged.**



---

# TABLE OF CONTENTS

---

<b>Section 1</b>	<b>Hydraulic System</b>
Hydraulic Circuit .....	1.1
Gear Pump .....	1.2
Control Valve .....	1.3
Hydraulic Cylinders .....	1.4
Hydraulic Oil Filter .....	1.5
Hydraulic Oil Reservoir .....	1.6
Trouble Shooting .....	1.7
Torque Chart .....	1.8
Conversion Chart .....	1.9
<b>Section 2</b>	<b>Hydrostatic Drive System</b>
Hydrostatic Drive Circuit .....	2.1
Specifications .....	2.2
General Information .....	2.3
Trouble Shooting .....	2.4
Pressure Tests .....	2.5
Towing Procedure .....	2.6
Flushing The Hydraulic System .....	2.7
Start - up Procedure .....	2.8
Gear Pump Replacement .....	2.9
Tandem Pump Replacement .....	2.10
Tandem Pump Parts Diagram .....	2.11
Drive Motor .....	2.12
Torque Specs .....	2.13
<b>Section 3</b>	<b>Final Drive</b>
Specifications and Maintenance .....	3.1
Lubrication .....	3.2
Drive Chain .....	3.3
Drive Motor Sprocket .....	3.4
Axle Assembly .....	3.5
Parking Brake .....	3.6
Trouble Shooting .....	3.7
<b>Section 4</b>	<b>Controls</b>
Steering .....	4.1
Foot Pedals .....	4.2
Hand Controls .....	4.3
Throttle .....	4.4
Restraint Bar .....	4.5
Parking Brake .....	4.6
Trouble Shooting .....	4.7

---

# TABLE OF CONTENTS

---

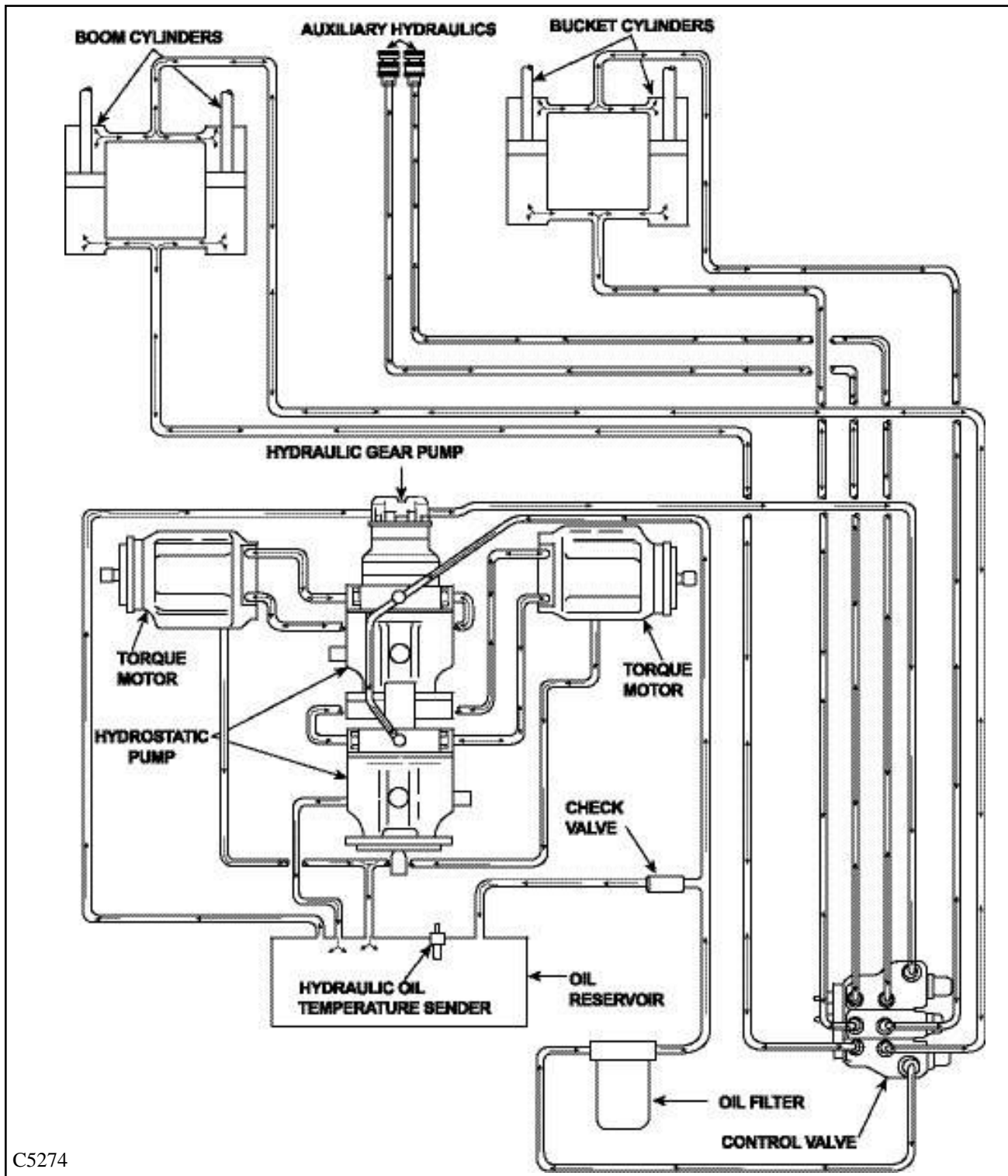
<b>Section 5</b>	<b>Electrical</b>
General Information .....	5.1
Wiring Schematics .....	5.2
Instrumentation .....	5.3
Ignition Switch .....	5.4
Engine Glow Plugs .....	5.5
Battery .....	5.6
Electrical Panel .....	5.7
Starter Circuit .....	5.8
Charging Circuit .....	5.9
Safety Circuit .....	5.10
Auxiliary Circuit .....	5.11
Accessory Circuit .....	5.12
Trouble Shooting .....	5.13
<b>Section 6</b>	<b>Main Frame</b>
Quick - Tach.....	6.1
Boom Arms .....	6.2
Boom Support.....	6.3
ROPS .....	6.4
Rear Door.....	6.5
<b>Section 7</b>	<b>Engine</b>
Maintenance.....	7.1
Cylinder Head.....	7.2
Replacement.....	7.3
Specifications.....	7.4
Trouble Shooting .....	7.5
<b>Section 8</b>	<b>Maintenance &amp; Specifications</b>
Maintenance.....	8.1
Trouble Shooting .....	8.2
Special Tools .....	8.3
Specifications.....	8.4
Conversion Charts.....	8.5

# SECTION 1 HYDRAULIC SYSTEM

<b>Hydraulic Circuit</b>	<b>1.1</b>
Layout .....	pg.1-2
Schematic .....	pg. 1-3
Specifications .....	pg. 1-4
Maintenance Schedule .....	pg. 1-4
General Information .....	pg. 1-5
<b>Gear Pump</b>	<b>1.2</b>
Replacing the Gear Pump .....	pg. 1-6
Gear Pump Disassembly .....	pg. 1-7 ~ 8
Start Up Procedure .....	pg. 1-9
<b>Control Valve</b>	<b>1.3</b>
Testing / Adjusting the Relief Valve .....	pg. 1-10 ~ 11
Control Valve Replacement .....	pg. 1-11 ~ 12
Exploded Illustration Diagram .....	pg. 1-13 ~ 14
Control Valve Disassembly / Repair .....	pg. 1-15 ~ 24
Exploded Illustration Diagram .....	pg. 1- 25 ~ 28
Control Valve Disassembly/Repair .....	pg. 1-29 ~ 32
<b>Hydraulic Cylinders</b>	<b>1.4</b>
General Information .....	pg. 1-33
Testing Piston Seals .....	pg. 1-34
Lift Cylinder Replacement .....	pg. 1-35
Tilt Cylinder Replacement .....	pg. 1-36
Cylinder Disassembly .....	pg. 1-37 ~ 38
Cylinder Inspection .....	pg. 1-39
Cylinder Assembly .....	pg. 1-39 ~ 40
<b>Hydraulic Oil Filter</b>	<b>1.5</b>
General Information .....	pg. 1-41
Filter Replacement .....	pg. 1-41
<b>Hydraulic Oil Reservoir</b>	<b>1.6</b>
General Information .....	pg. 1-42
Checking the Oil Level .....	pg. 1-42
Adding Oil .....	pg. 1-42
Servicing the Reservoir .....	pg. 1-43
<b>Trouble Shooting</b>	<b>1.7</b>
Trouble Shooting Chart .....	pg. 1-44 ~ 45
<b>Torque Chart</b>	<b>1.8</b>
Torque Chart .....	pg. 1-45
<b>Conversion Charts</b>	<b>1.9</b>
Conversion Charts .....	pg. 1-46

# HYDRAULIC CIRCUIT 1.1

1

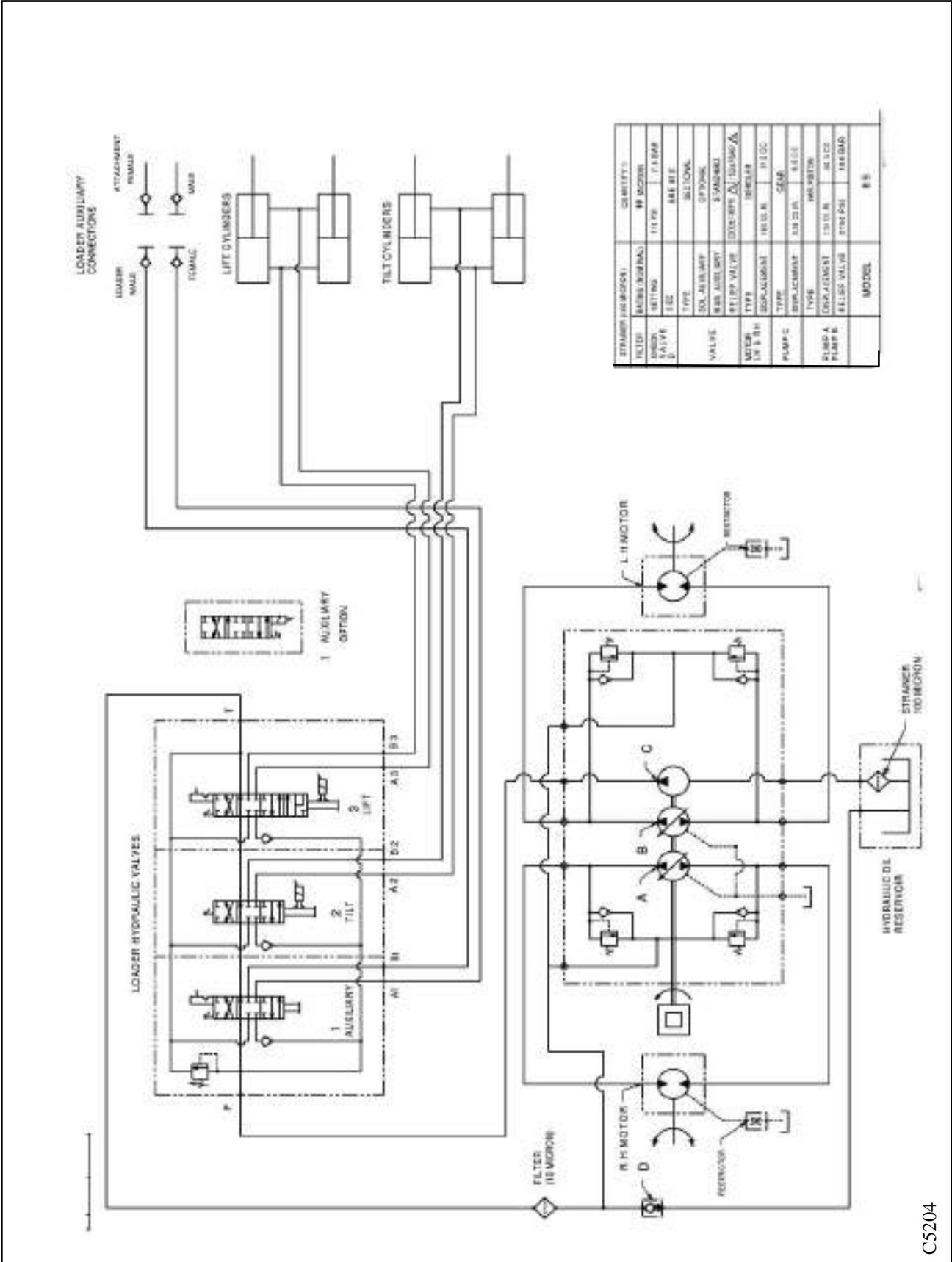


C5274

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.

# HYDRAULIC SCHEMATIC 1.1



C5204

# – SPECIFICATIONS & MAINTENANCE 1.1 –

## 1

### Hydraulic Specifications

Pump Type	.....	Gear
Pump Capacity (theoretical)	.....	6.3GPM(23.9l/m)
Rated speed	.....	.3140
Control Valve	.....	Series type with float on boom and .....detent on auxiliary
Main Relief Pressure, +/- 50PSI (3.5 Bar)	.....	.2200 psi
Reservoir Capacity	.....	.10Gal.(38 L)
Fluid Type	.....	.10W30 API CF
Filtration	.....	.10 micron
Lift Cylinders	.....	.2 per loader
Lift Cylinder Bore Diameter	.....	.2 in. (5 cm.)
Lift Cylinder Rod Diameter	.....	.1.125 in. (2.86cm.)
Tilt Cylinders	.....	.2 per loader
Tilt Cylinder Bore Diameter	.....	.2 in. (5 cm.)
Tilt Cylinder Rods	.....	.1.125 in. (2.86 cm.)
Lift Cycle +/- 1.5 seconds (Up / Down)	.....	.6/4
Tilt Cycle +/- 1.5 seconds (Up / Down)	.....	.2.5/3

### 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
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. C5003).

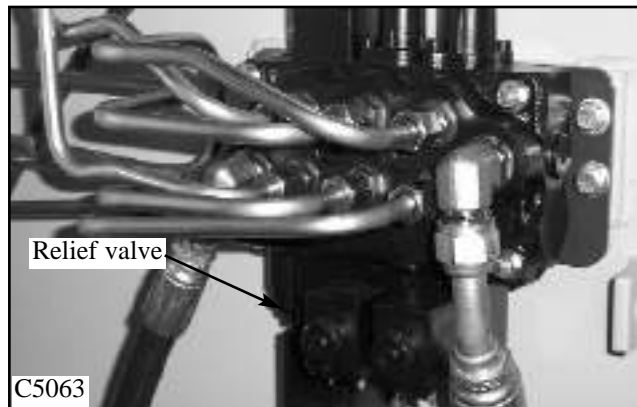
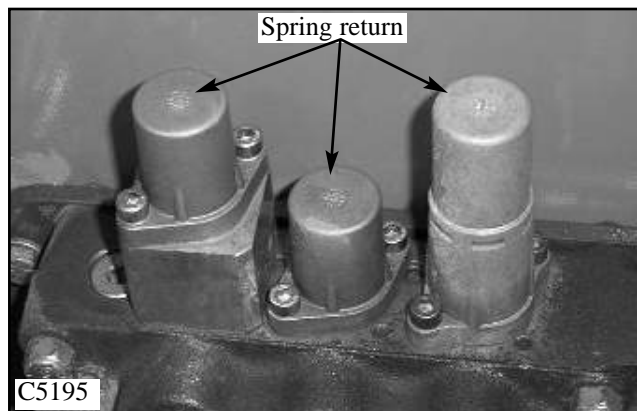
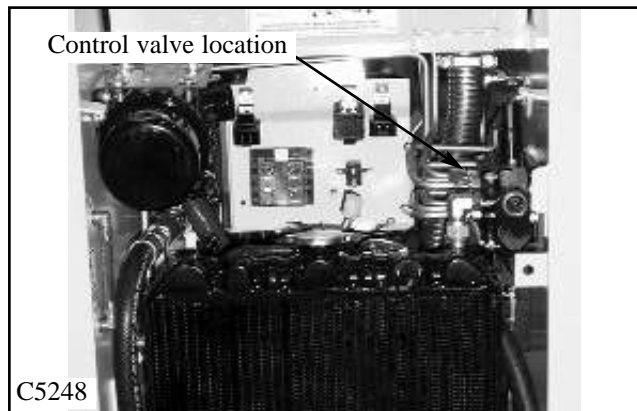
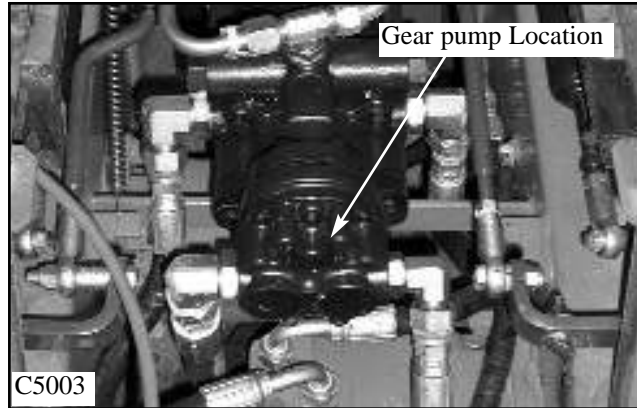
- The hydraulic pump is a gear type which is driven by a shaft and coupler through the hydrostatic drive pump at engine speed. The oil then flows from the gear pump to the hydraulic control valve. (C5248).
- The hydraulic control valve is equipped with an adjustable relief valve which is adjusted to 2200 psi (148 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 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.C5195).

- 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. C5063). 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 2200 psi (148 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.



# 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. (fig. C5017)
- 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 re - installing.
- 3 Disconnect the hydraulic hoses from the gear pump. ( fig. C5114 ) 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 bolts holding the gear pump to the hydrostatic tandem section. ( fig. C5003) 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.



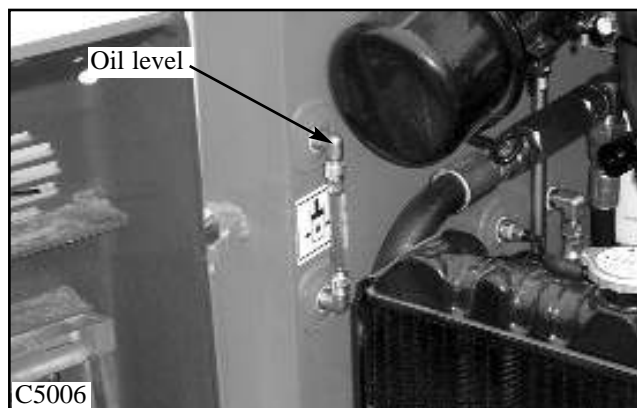
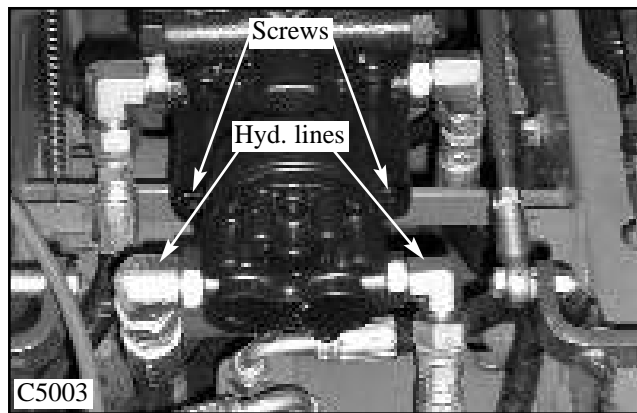
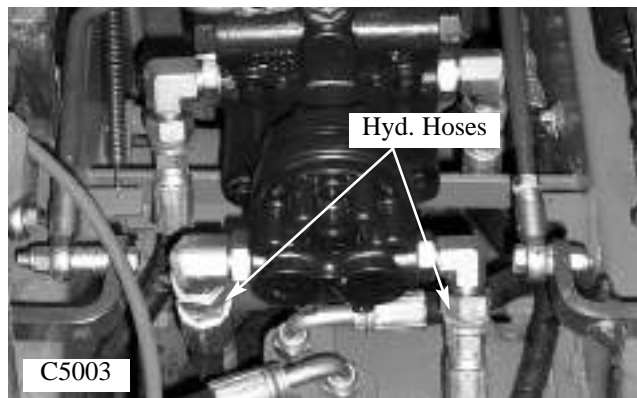
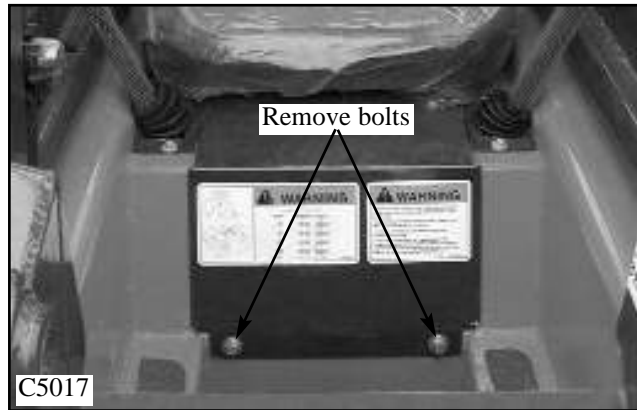
#### WARNING

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. C5006)

#### 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

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

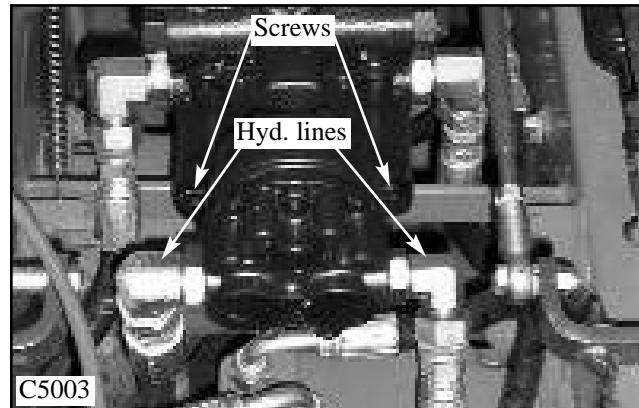
During assembly, it is imperative to provide lubrication with clean hydraulic oil to all the running parts of the pump. It is also necessary to coat the seals with grease. The absence of lubrication during assembly can cause the unit to seize after a few minutes of running.

### 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.



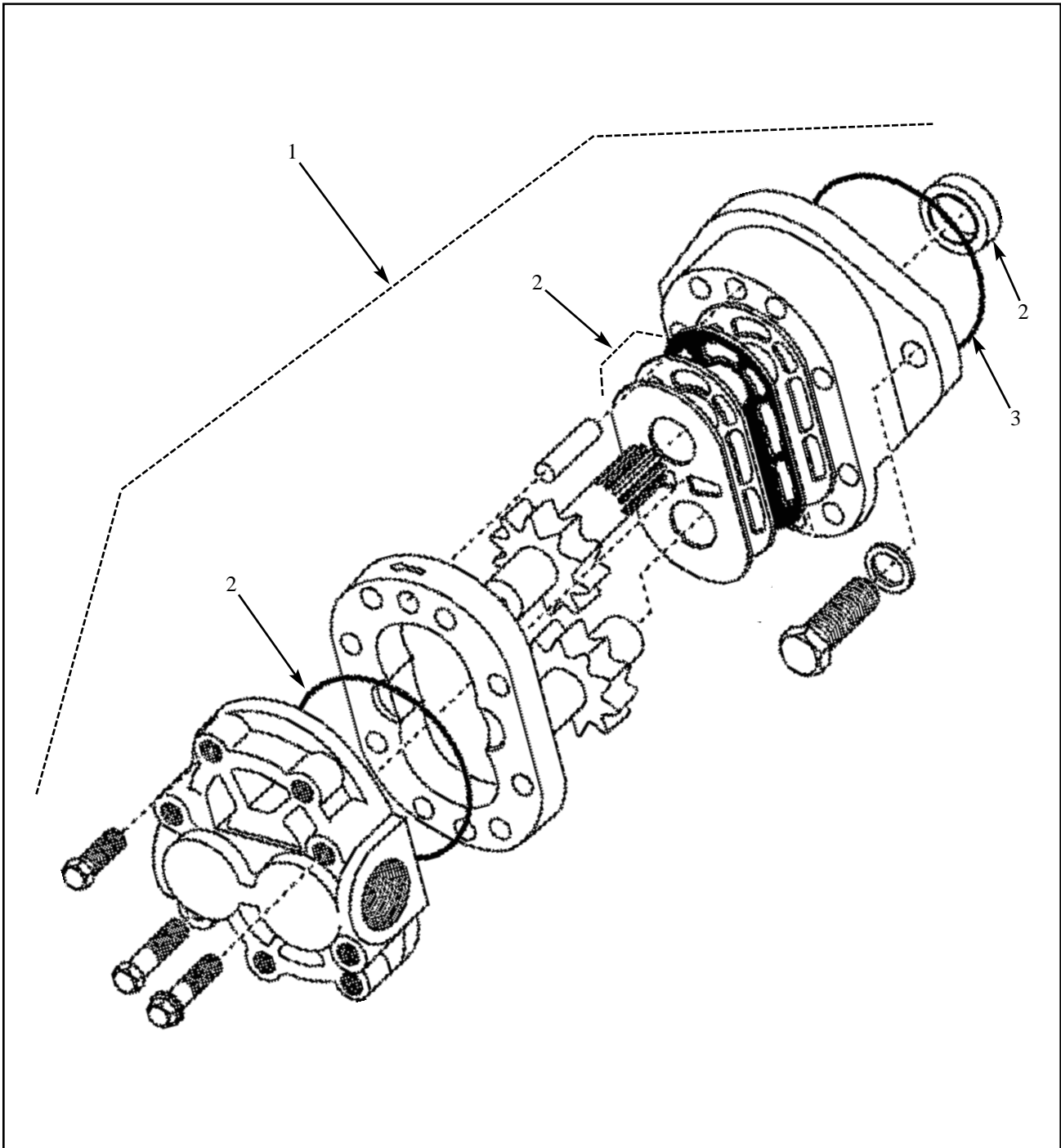
## IMPORTANT

**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 85



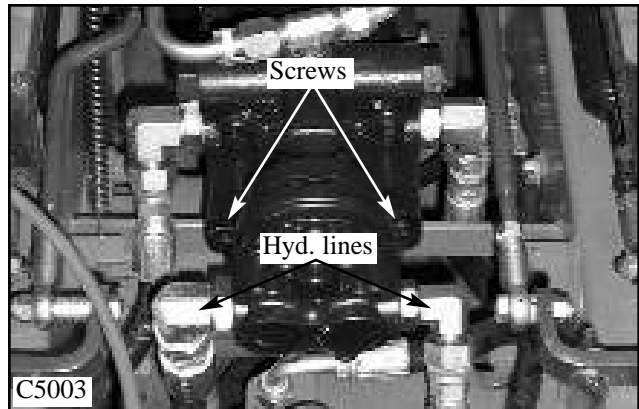
1. Gear Pump Assembly
2. Seal Kit
3. O-ring


# GEAR PUMP 1.2

1

## Start up Procedure

- 1 Mount the gear pump to the loader. (fig. C5003)
- 2 Connect the hydraulic lines.
- 3 Start the engine and idle for 3 minutes @ zero pressure, (auxiliary not engaged). Engage auxiliary.
  - a. Half speed at zero restriction.
  - 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.

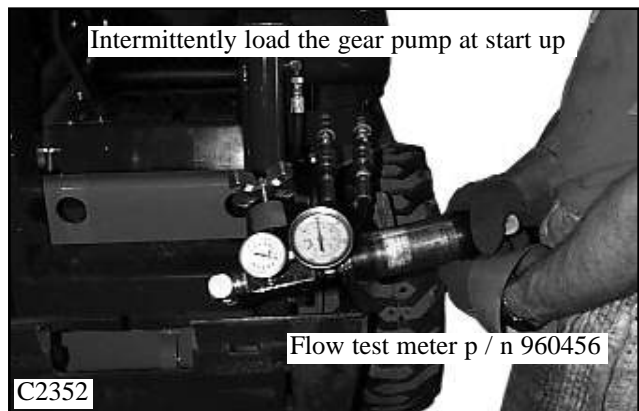


 **WARNING**

Use caution when dealing with hydraulic 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.



# CONTROL VALVE 1.3

## 1 Testing and Adjusting the Relief Valve Pressure

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 l/min) (fig. C5004) **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. C5004) 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. 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)



### CAUTION

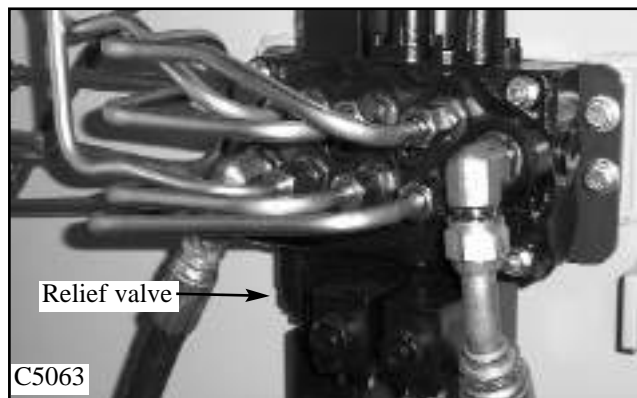
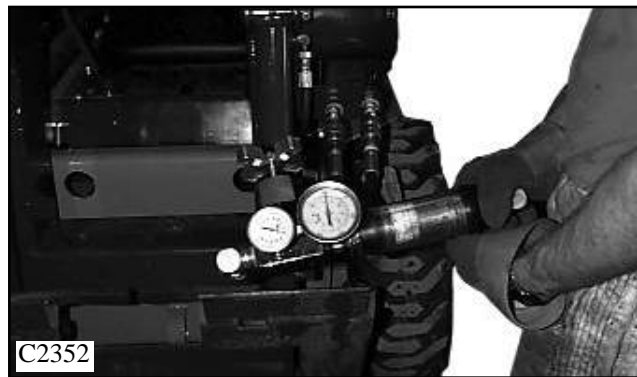
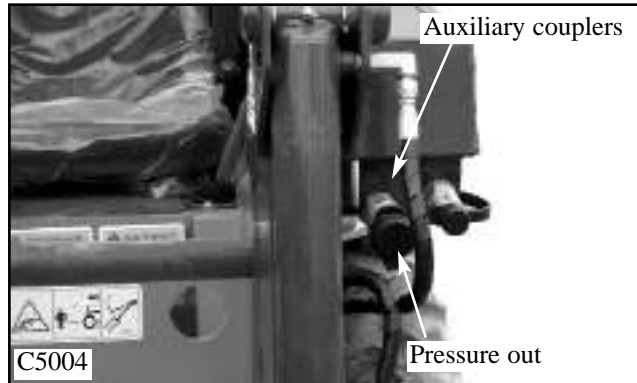
Adjusting the relief valve setting too high may cause damage to the gear pump.

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 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.



### 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

1

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 2100 psi +/- 100 psi (148 bar +/- 6.9 bar).

6 If adjustment is necessary, return the flow control valve to the open position, shut down the auxiliary hydraulic system and shut off the engine. 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. C5063)

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

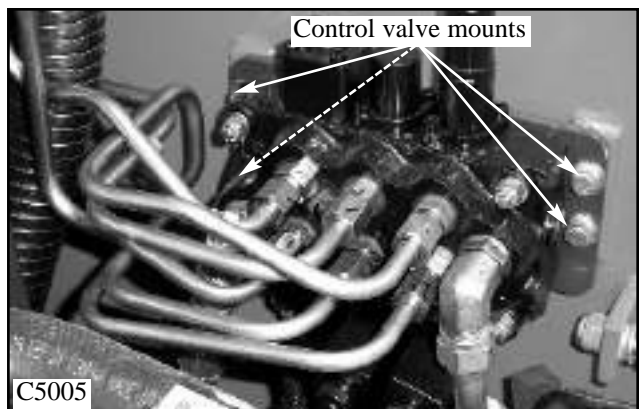
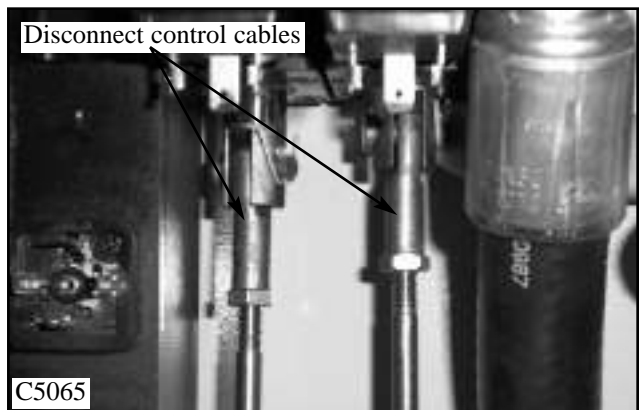
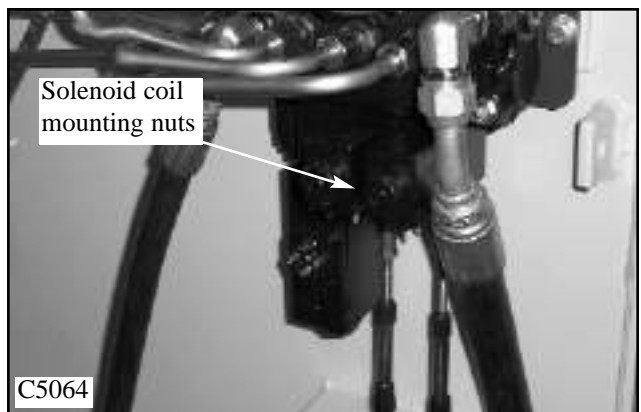
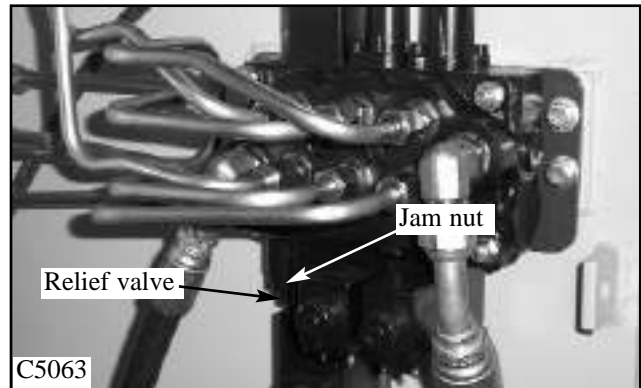
**Clean the work area prior to repair. Cap all open lines, fittings and ports to prevent contamination.**

2 Disconnect the control cables, electrical solenoid spool locks, and electrical auxiliary solenoid wiring connectors if equipped. (fig. C5064, C5065)

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.

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. C5005)

5 Disconnect the accumulator line from the electric auxiliary circuit and remove the adapter fitting( if so equipped). 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.**

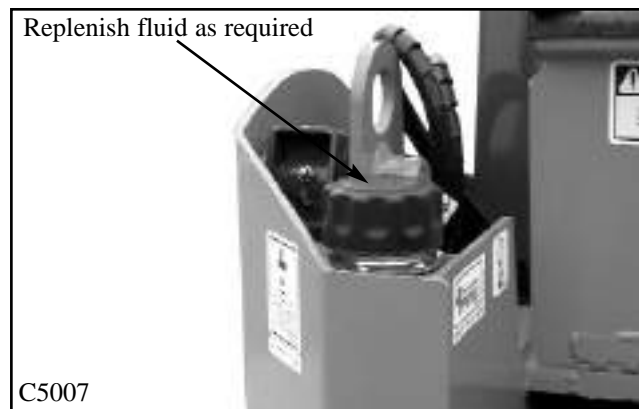
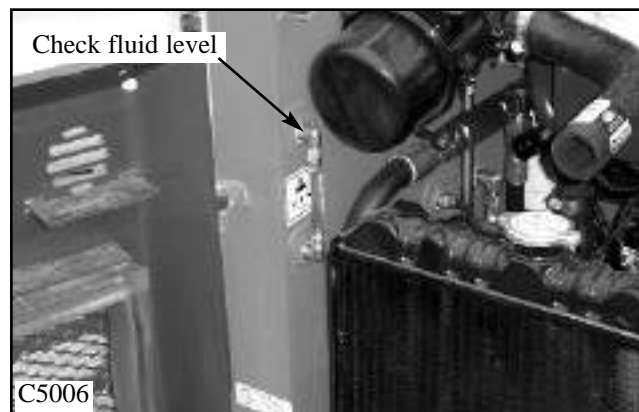
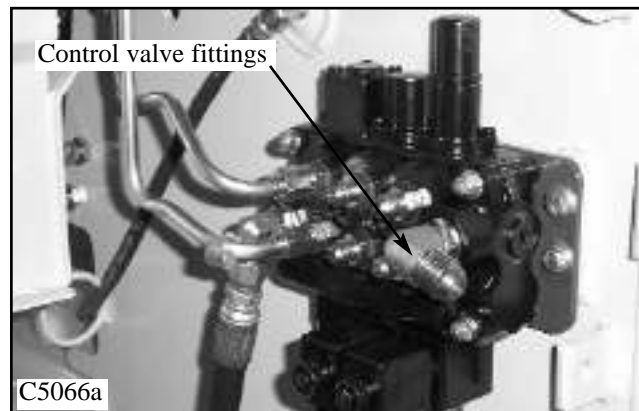
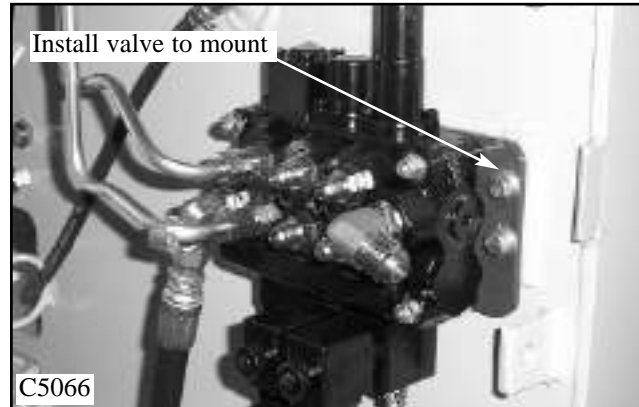
11 Start the engine and cycle the various hydraulic functions to check for leaks. Make sure the control valve lock system is functioning properly. Do not use your hands to check for leak locations, fluid under operating pressure can penetrate the skin and cause serious personal injury.



## 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.



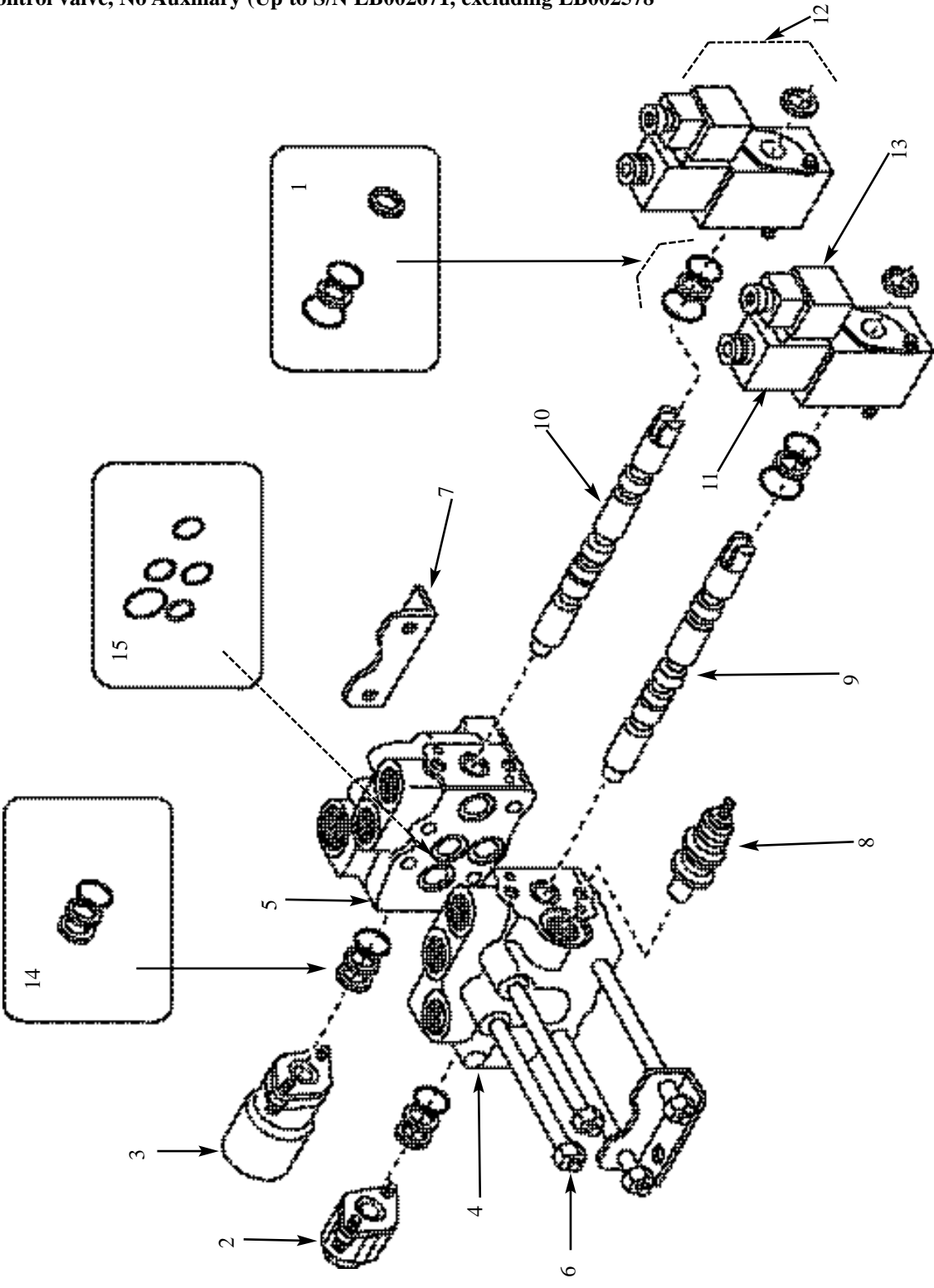
# CONTROL VALVE 1.3

## Control Valve Disassembly 85

1

Control valve, No Auxiliary (Up to S/N LB002671, excluding LB002578)

C3287



---

# CONTROL VALVE 1.3

---

1

## Control Valve Disassembly 85

### Diagram Legend

1. Seal kit
2. Control, spring return
3. Detent, spring return kit
4. Section, inlet
5. Section, outlet
6. Bolt
7. Mount
8. Relief valve
9. Spool, tilt
10. Spool, lift
11. Solenoid, coil
12. Solenoid and lock kit
13. Connector
14. Seal kit, spring return side
15. Seal kit, section



# CONTROL VALVE 1.3

1

## Disassembly / Repair 85

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.



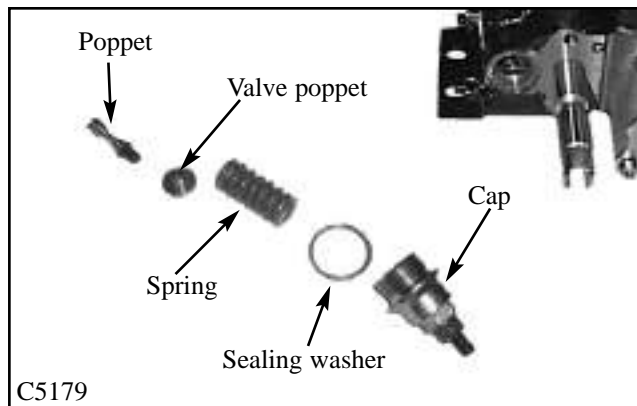
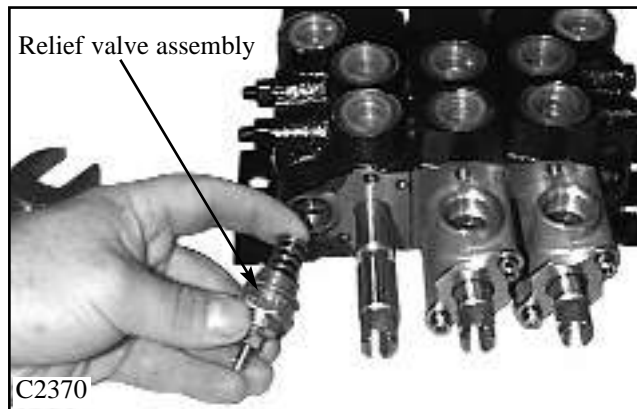
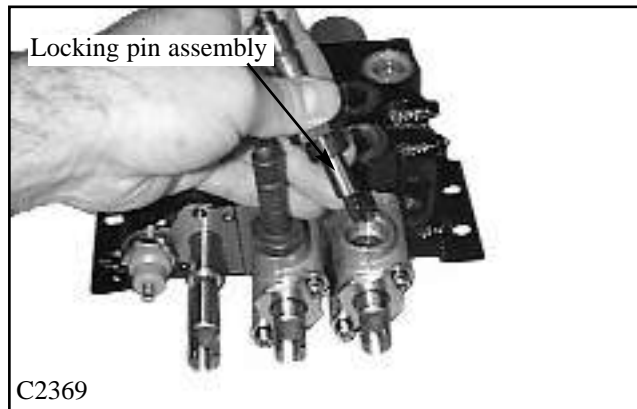
### WARNING

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

Refer to diagram C3287, pg. 1-13 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 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 C5179 shows an exploded view of the relief valve system.**

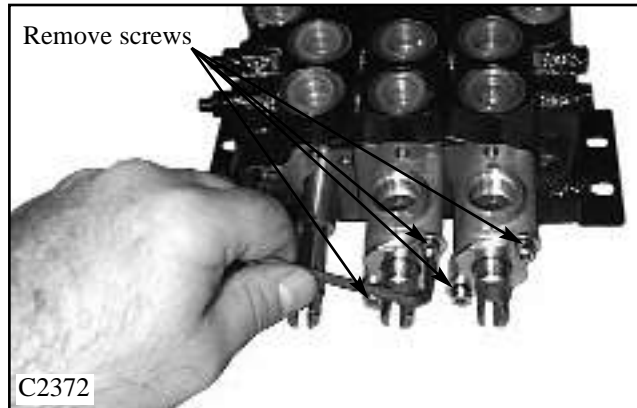


# CONTROL VALVE 1.3

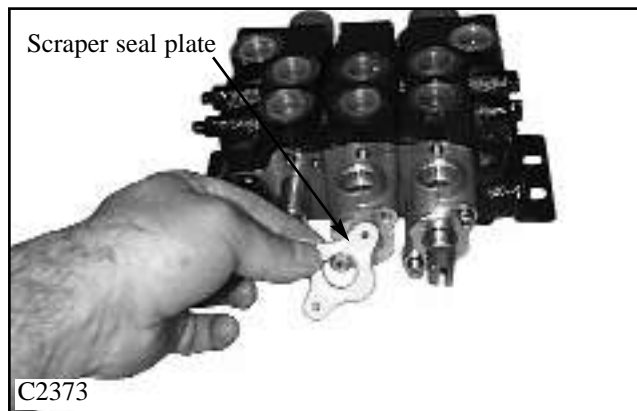
# 1

## Disassembly / Repair 85 (cont'd)

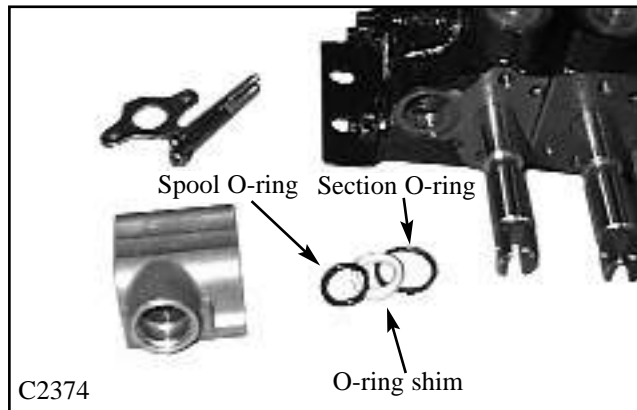
4. Remove the screws retaining the lock adapters to the control valve assembly. (fig. C2372).



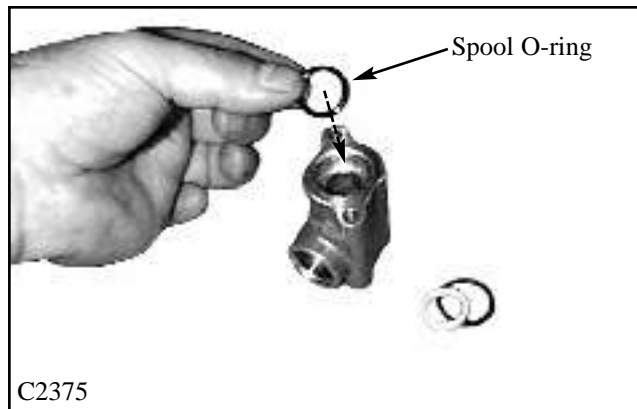
5. Remove the plate and adapter from the control valve and spool. fig. C2373, C2374)



6. Remove the O-ring seals and seal shim. (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.



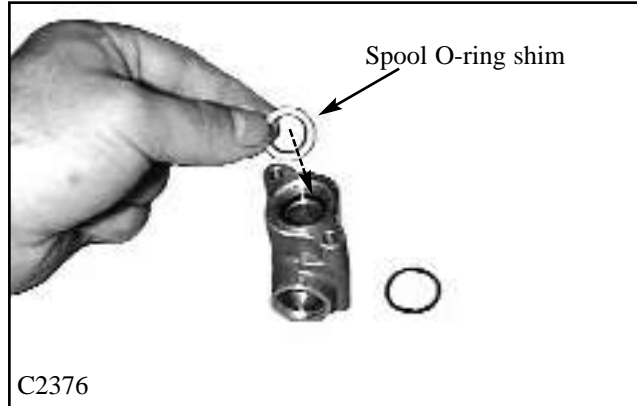
8. Lubricate a new spool O-ring with system oil and install to the lock adapter. (fig. C2375)

# CONTROL VALVE 1.3

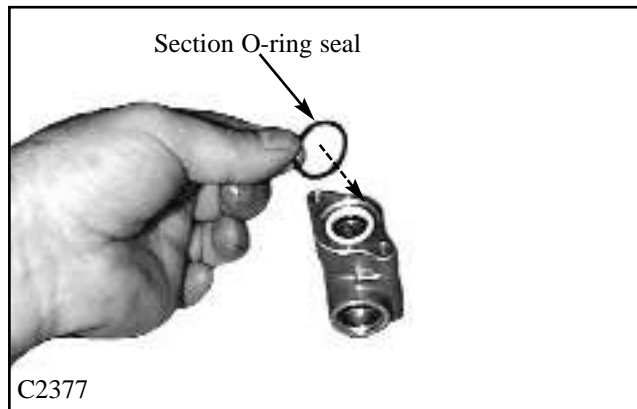
1

## Disassembly Repair 85 (cont'd)

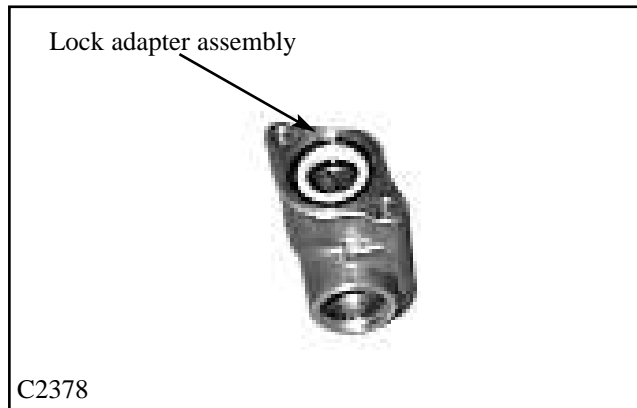
9. Lubricate the spool O-ring shim with system oil and install over spool seal. (fig. C2376).



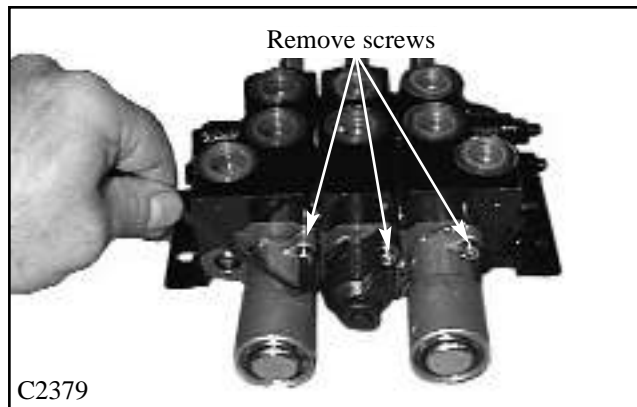
10. Lubricate the section O-ring seal with system oil and install to the lock adapter assembly. (fig. C2377).



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.

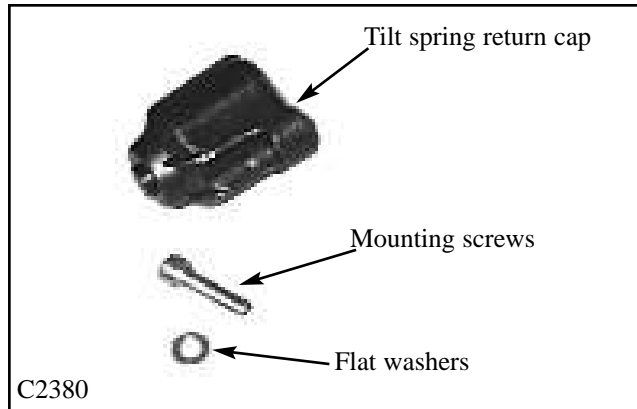


# CONTROL VALVE 1.3

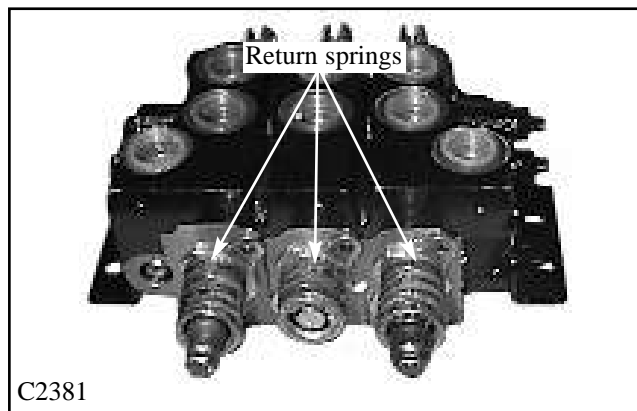
# 1

## Disassembly / Repair 85 (cont'd)

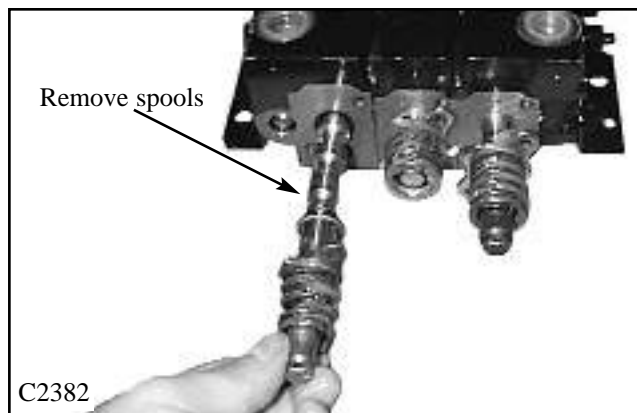
13. **Note:** The plastic cap over the tilt spring has flat washers to distribute the load of the mounting screws to prevent cap damage. (fig. C2380). Be sure to install the flat washers when reassembling to the control valve.



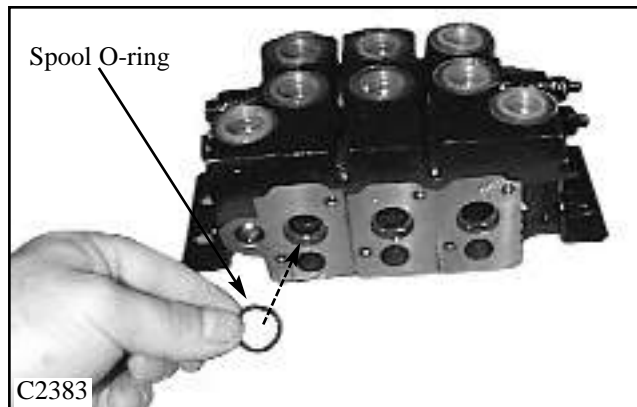
14. Figure C2381 shows spring assemblies and detent mechanisms as viewed with the caps removed.



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 preformed.



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

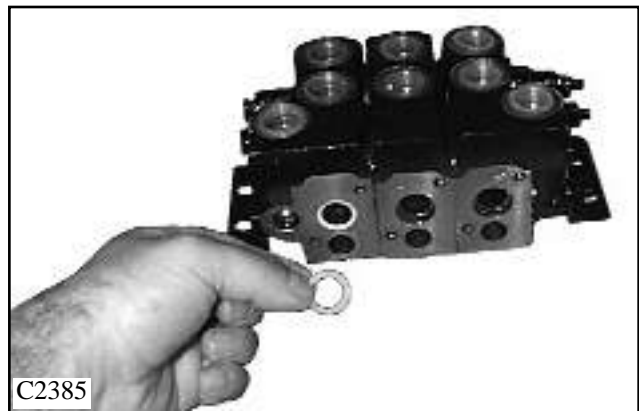
1

## Disassembly / Repair 85 (cont'd)

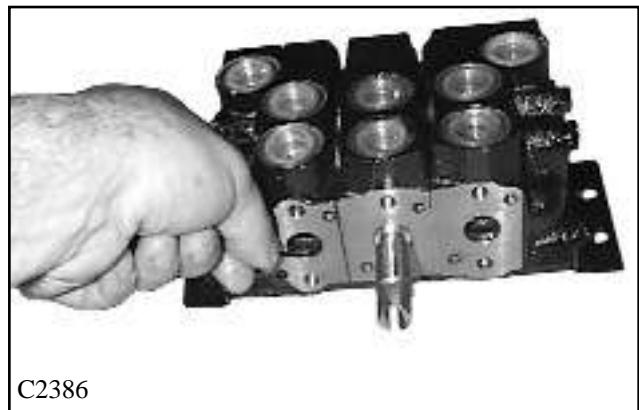
17. Install the O-ring spacer shim to the spool O-ring seal. (fig. C2384).



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.

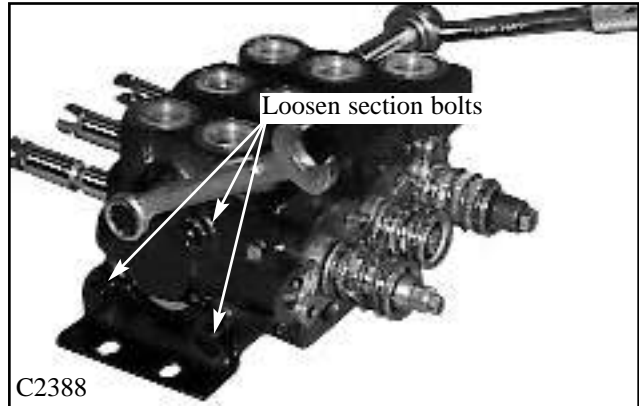


# CONTROL VALVE 1.3

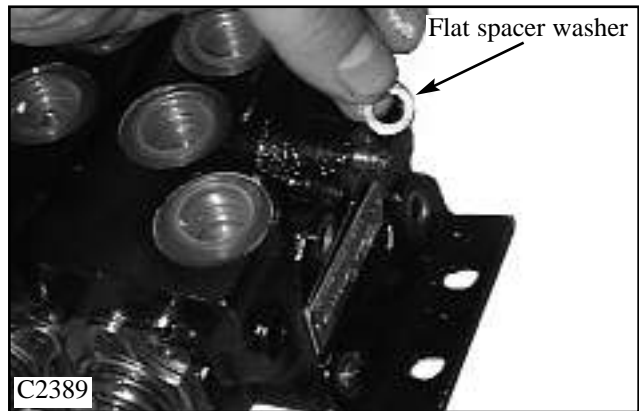
# 1

## Disassembly / Repair 85 (cont'd)

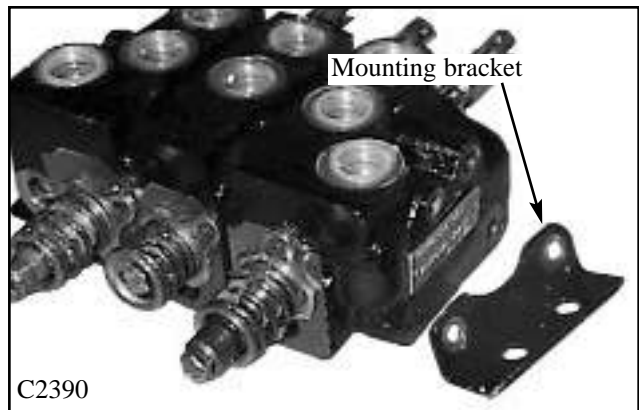
20. Section seals may be replaced without removing spools and spring return mechanisms. Loosen the bolts retaining the control valve sections together. (fig. C2388). Upon assembly follow the torque specifications given Section 8.



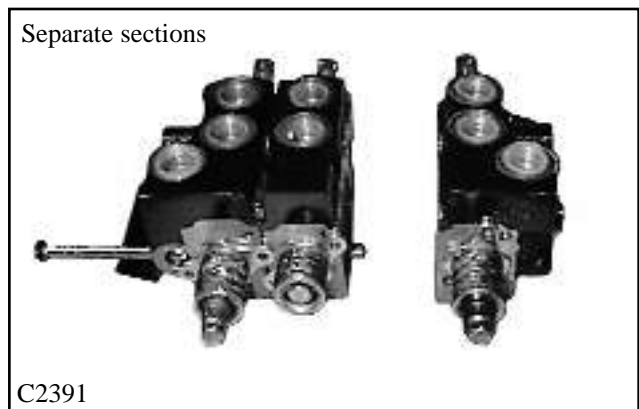
21. Note the flat spacer washers used on the upper bolts. (fig. C2389)



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



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

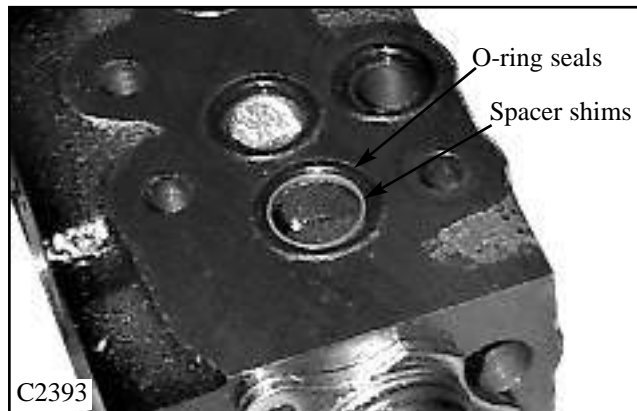
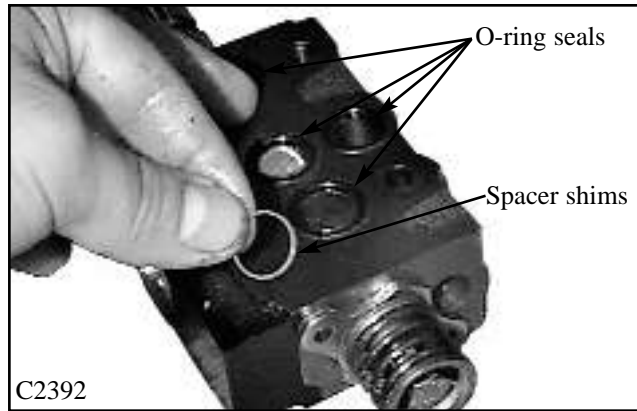


# CONTROL VALVE 1.3

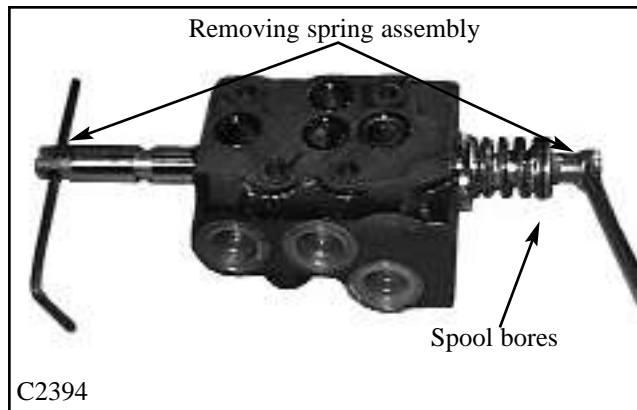
1

## Disassembly / Repair 85

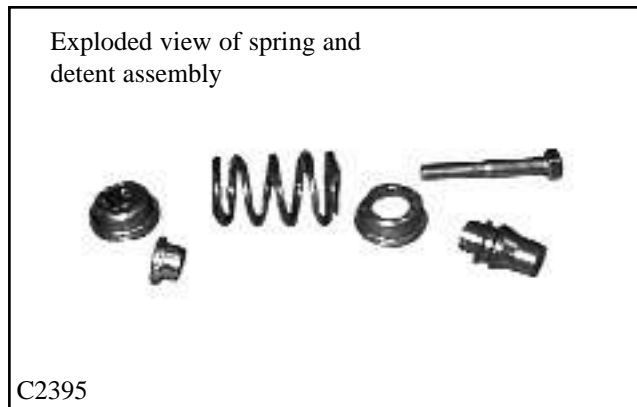
24. Remove and discard the O-ring seals between the sections. Replace with new. Be sure to replace the O-ring seal spacer shim upon assembly. (fig. C2392, C2393). Lubricate the seals with system oil upon assembly. When reassembling the control valve sections, follow the torque specifications in section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

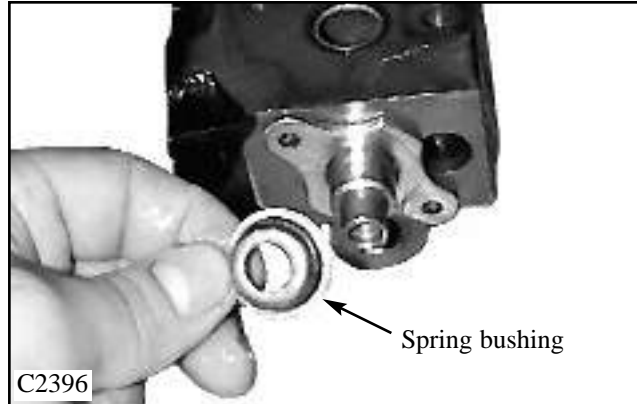


# CONTROL VALVE 1.3

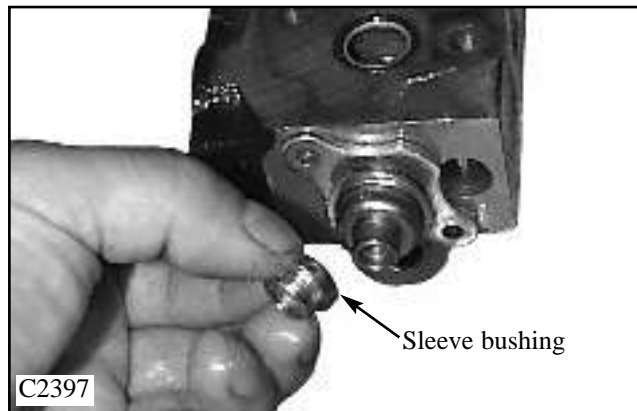
# 1

## Disassembly / Repair 85 (con't)

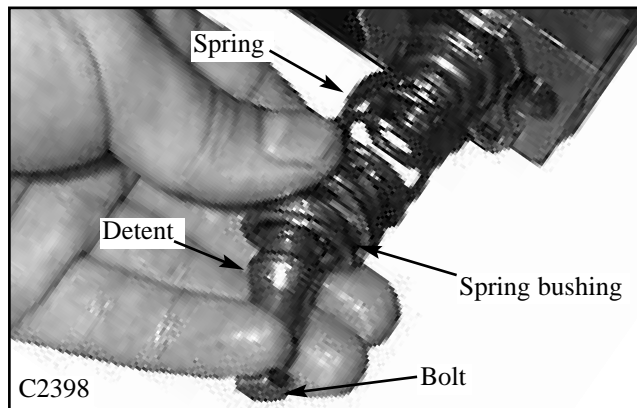
27. Replace the spring and detent mechanism in the reverse order. (fig. C2396). Install spring bushing. Lubricate the spring bushings with Castrol Spherol grease or equivalent.



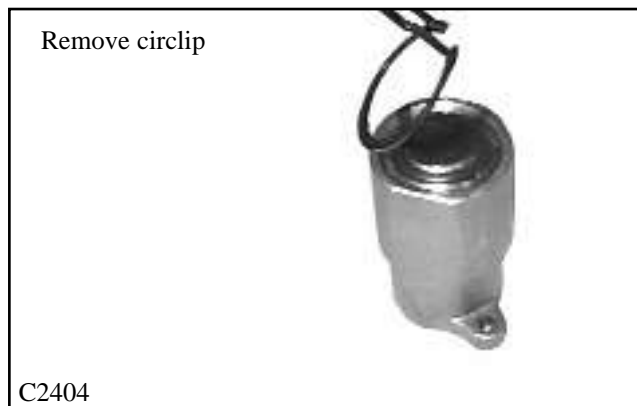
28. Install sleeve bushing. (fig. C2397). Lubricate the bushing with Castrol Spherol grease or equivalent.



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(circlip may be sealed with silicone). (fig. C2404).





# CONTROL VALVE 1.3

1

## Disassembly / Repair 85 (con't)

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).

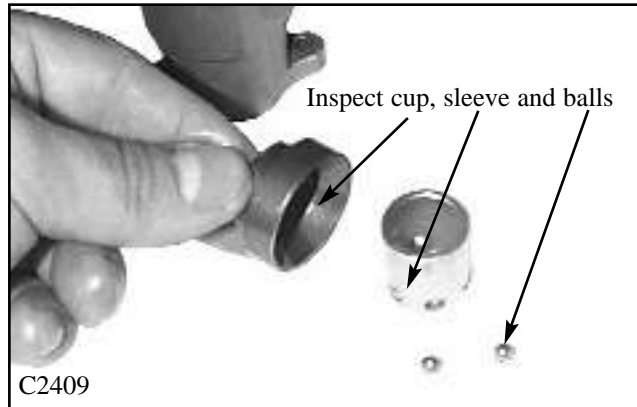


# CONTROL VALVE 1.3

# 1

## Disassembly / Repair 85 (con't)

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.

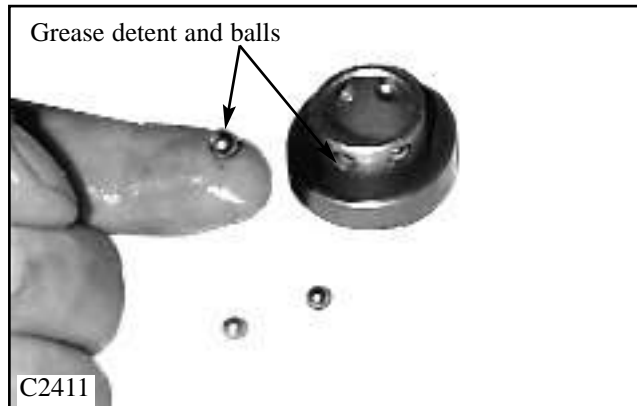


36. Remove the spring washer. (fig. C2410).

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

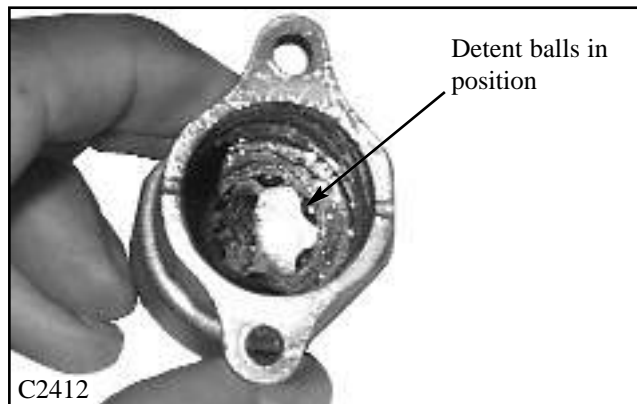


38. Replace the greased detent balls to the cup and sleeve (fig. C2411) and reassemble the complete spring return mechanism in the reverse order above.



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.(seal circlip wdith silicone)



### IMPORTANT

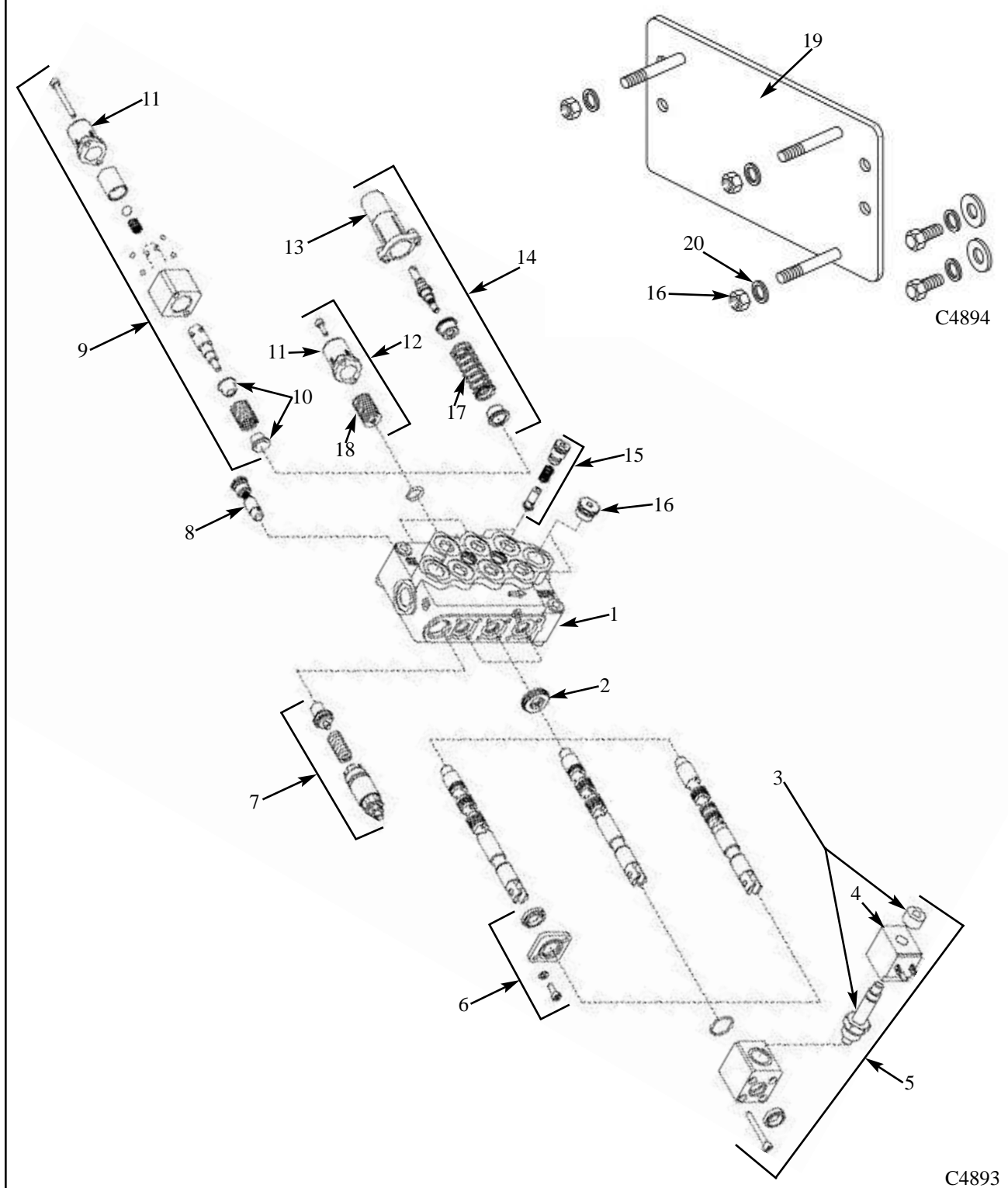
**Check and make sure the detent balls are in position before assembling to the control valve to assure proper function of the control spool and detent mechanism.**

# CONTROL VALVE 1.3

## Control Valve Disassembly 85

1

Control Valve, Manual Auxiliary (S/N LB002672 onward & S/N LB002578)



---

# CONTROL VALVE 1.3

---

1

## Control Valve Disassembly 85

### Diagram Legend

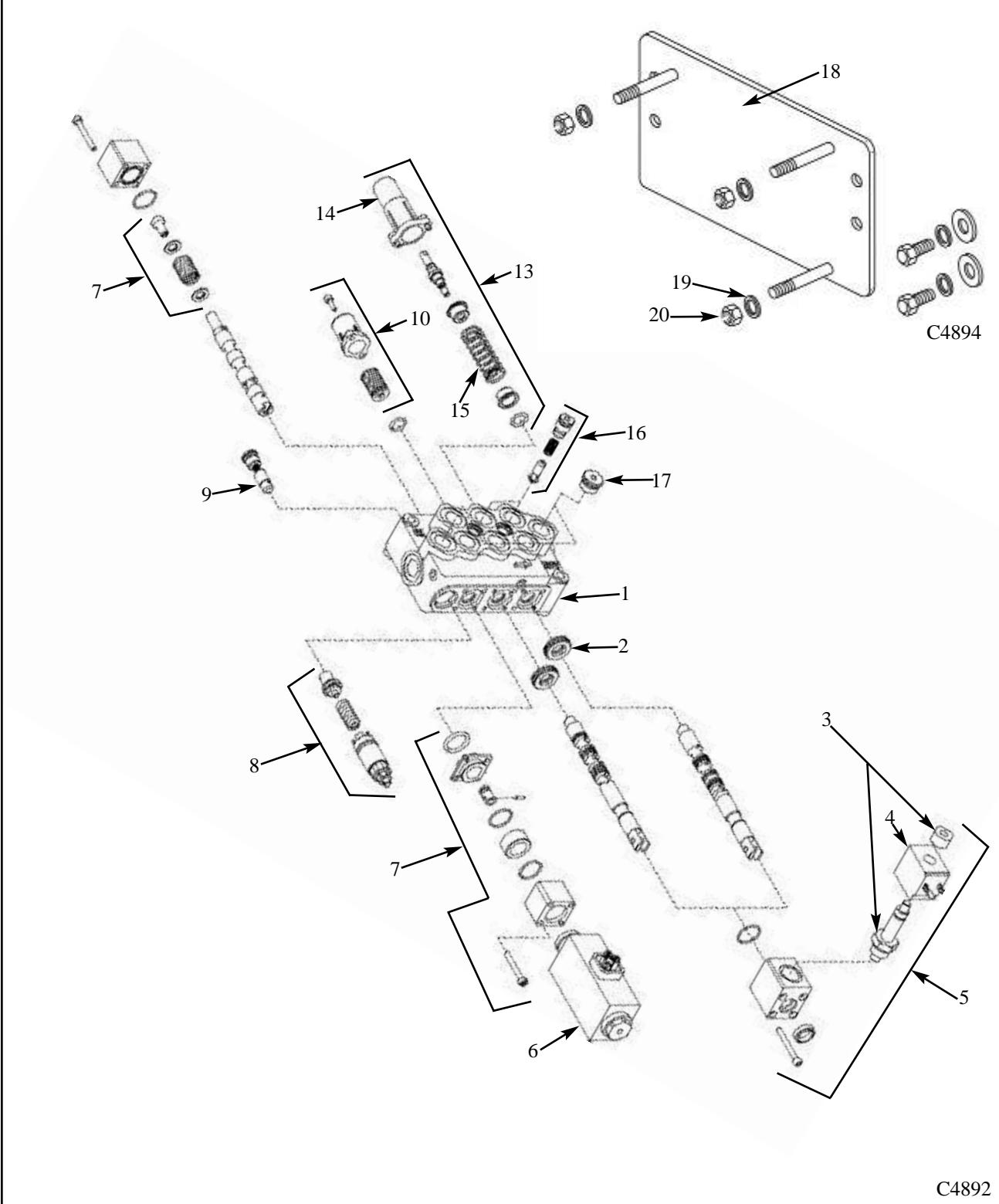
1. Valve Assy. Manual Auxiliary
2. Spool ring
3. Spool lock assy.
4. Solenoid lock assy.
5. Spool lock kit
6. Flange w/ seal
7. Relief valve complete
8. Check valve
9. Centering manual auxiliary kit
10. Aux spool spring
11. Tilt spool end cap
12. Centering tilt spool
13. Lift spool end cap
14. Detent lift spool
15. Check valve
16. Plug
17. Lift spool kit
18. Tilt spool
19. Valve mount assy.
20. Washer
21. Nut

# CONTROL VALVE 1.3

## Control Valve Disassembly 85

1

Control Valve, Electric Auxiliary (S/N LB002672 onward & S/N LB002578)



# CONTROL VALVE 1.3

1

## Control Valve Disassembly 85

### Diagram Legend

1. Valve Assy. Manual Auxiliary
2. Spool ring
3. Spool lock assy.
4. Solenoid lock assy.
5. Spool lock kit
6. Solenoid Assy.
7. Auxiliary solenoid
8. Relief valve
9. Check valve
10. Tilt spool
11. Tilt spool end cap
12. Tilt spool spring
13. Detent lift spool
14. Lift spool end cap
15. Lift spool cap and spring
16. Check valve
17. Plug
18. Valve mount assy.
19. Washer
20. Nut

# CONTROL VALVE 1.3

1

## Disassembly / Repair 85

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

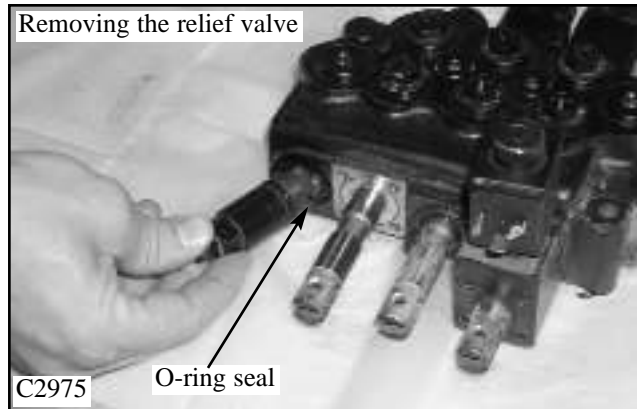


### WARNING

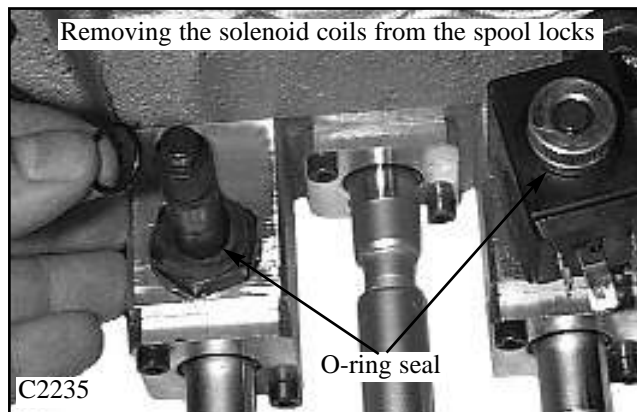
To avoid eye injury, use safety goggles when cleaning with compressed air.

Ensure all openings are plugged to prevent solvents and dirt from contaminating the control valve assembly. Refer to diagram C4892, pg. 1-27, to assist in the disassembly of the control valve.

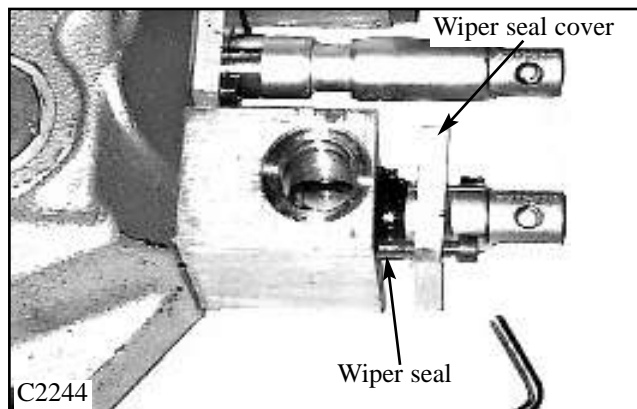
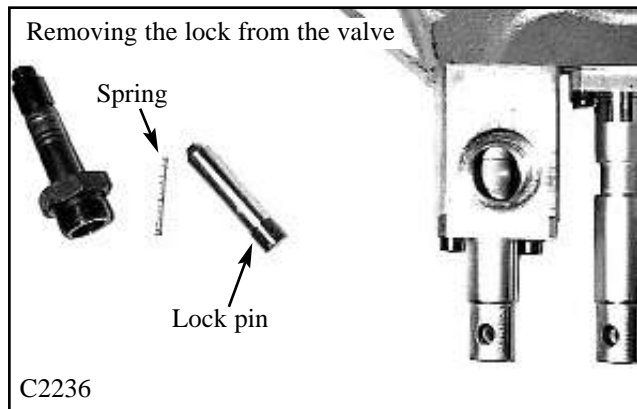
1. Remove the pressure relief valve. Discard the O-rings (fig. C2975).



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)

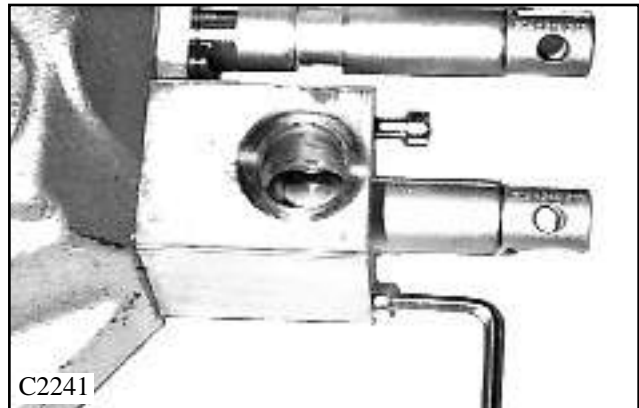


# CONTROL VALVE 1.3

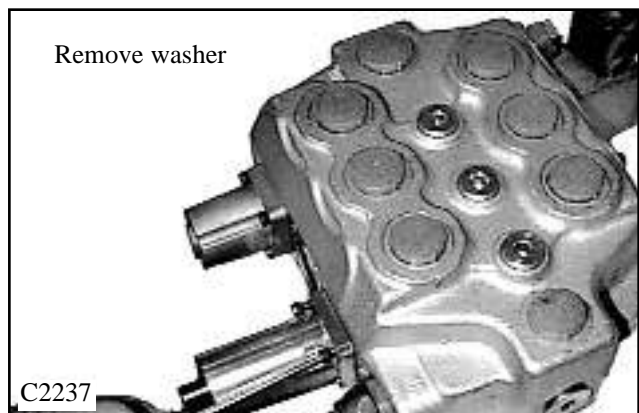
# 1

## Disassembly / Repair 85 (con't)

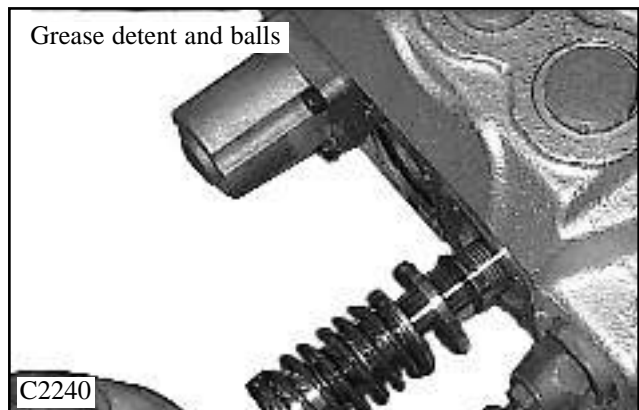
4. Remove the lock block from the valve. (fig. C2241)



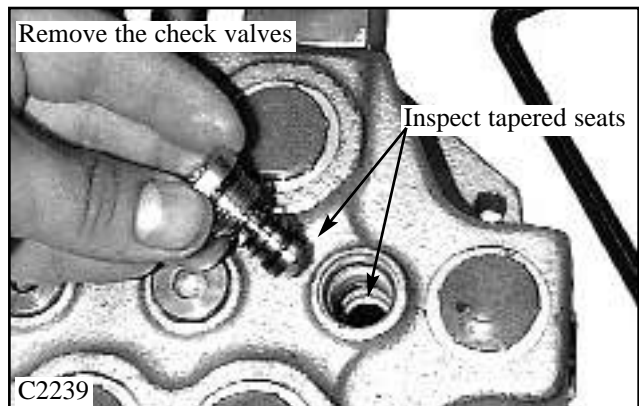
5. Remove the spring return / centering cap from the end of the spool. (fig. C2237)



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 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.



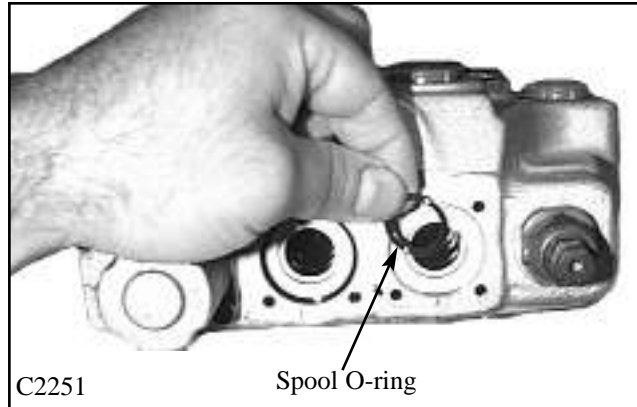


# CONTROL VALVE 1.3

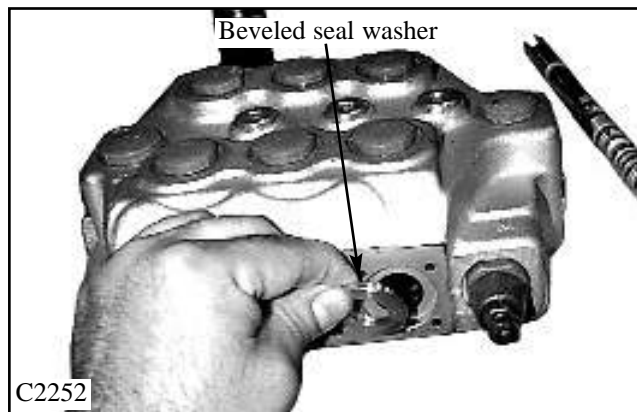
1

## Disassembly / Repair 85

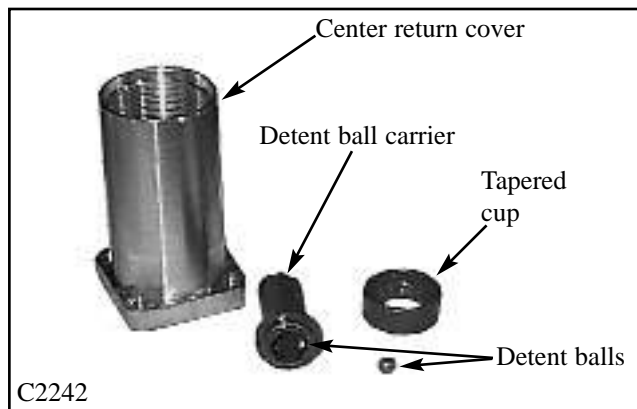
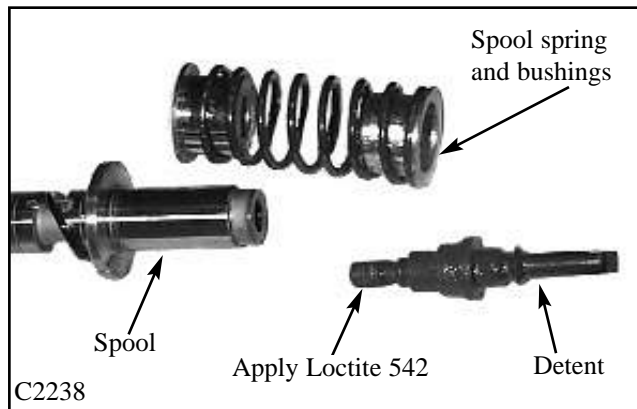
8. When replacing the spool to the control valve, use new O-ring seals and apply system oil to the O-rings and spools. (fig. C2251).



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

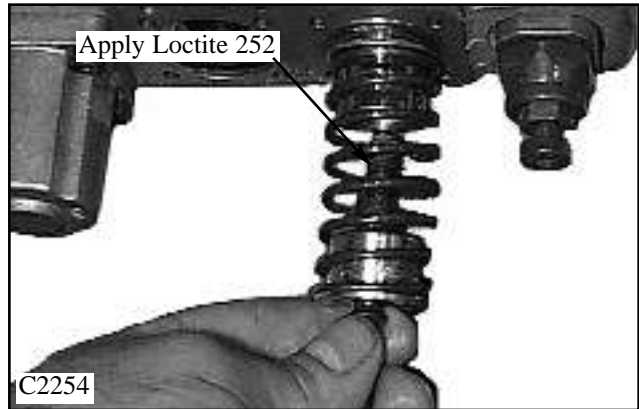


# CONTROL VALVE 1.3

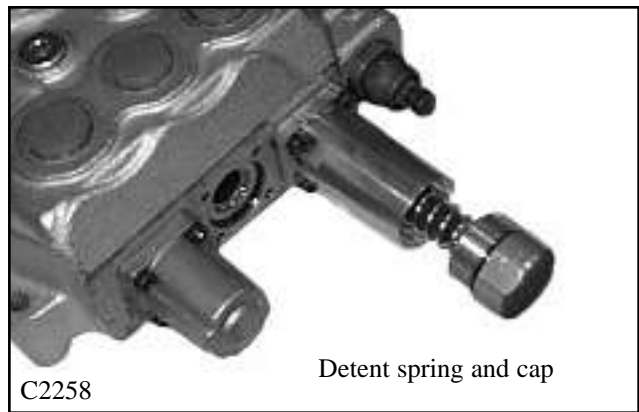
# 1

## Disassembly / Repair 85 (con't)

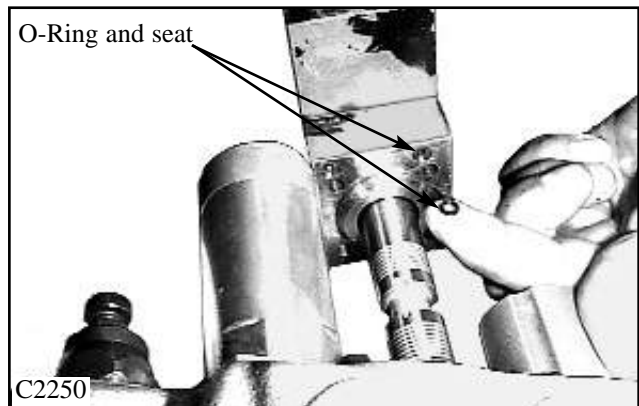
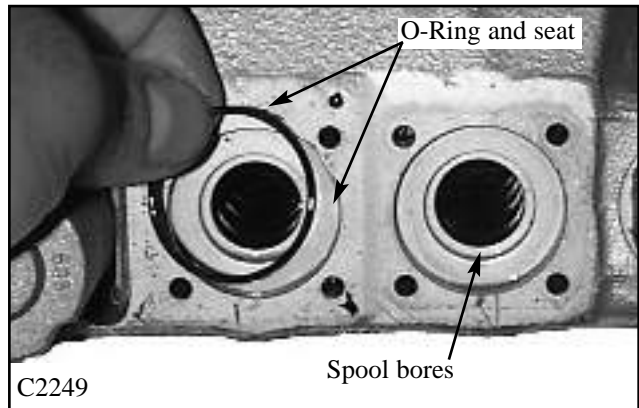
11. When installing the detent to the control valve spool, apply Loctite type 252 to the threads. Tighten the detent to the spool at 24 Nm (17.7 lbs / ft).



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).

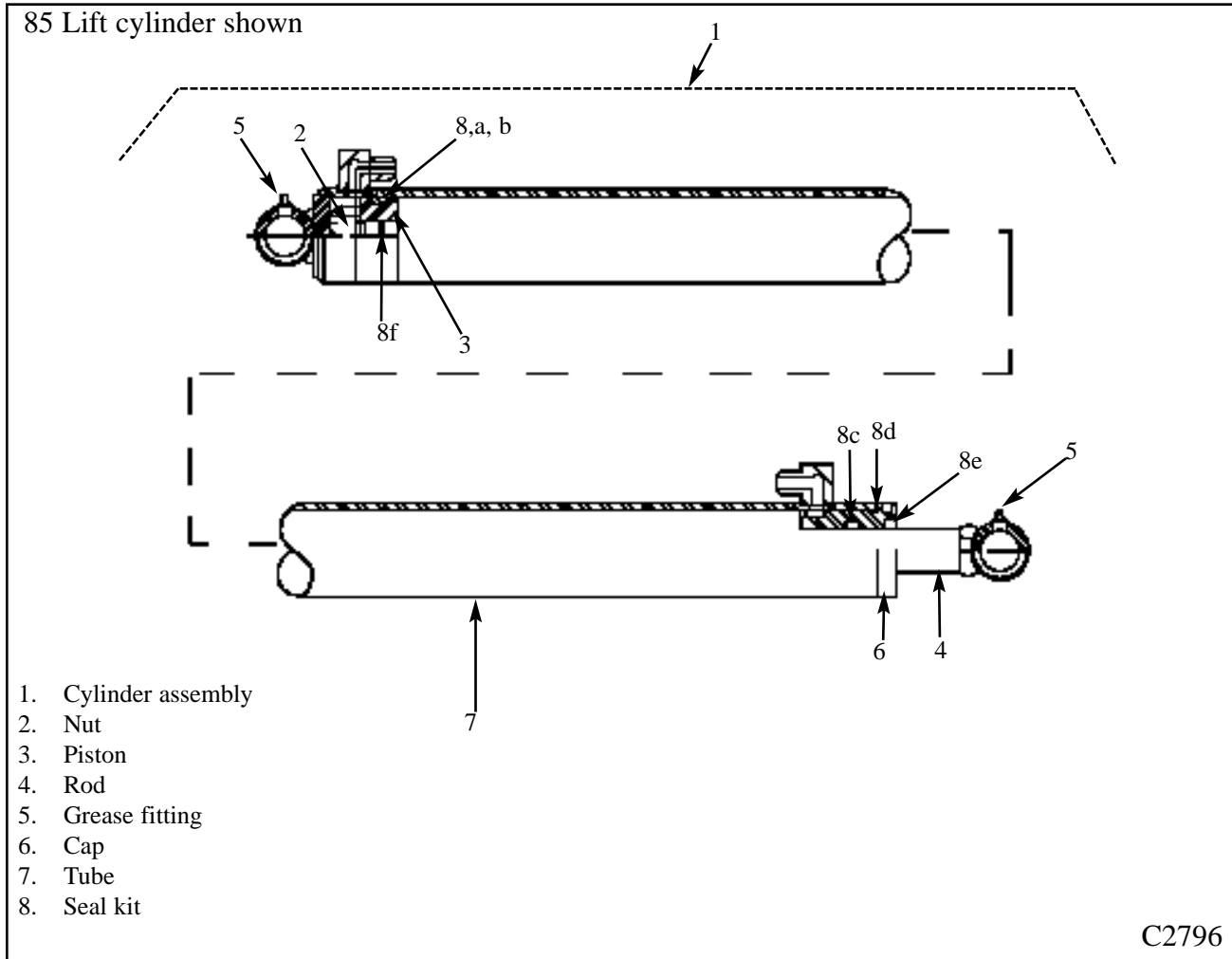


Upon assembly, use new O-ring seals. Don't overlook the small O-ring seal between the cylinder and valve body. (fig. C2250) Lubricate the spool O-ring seals with system oil. Apply Castrol "Spheerol" grease to the inside of the spring covers.



# 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 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

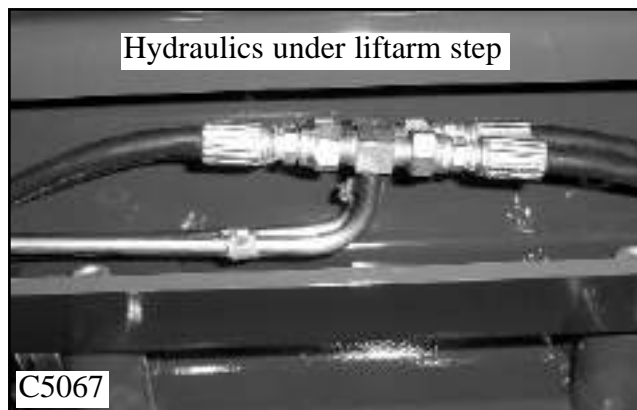
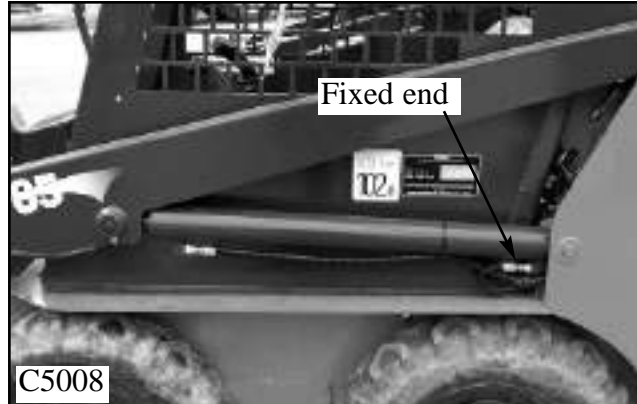
**Allowable boom or bucket cylinder drop: 1.5" in 3 minutes, @ loaded rating and operating temperature.**



#### WARNING

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

1. Remove any attachment and block the loader securely with all 4 wheels off the ground using appropriate jack and stands.
2. Retract the cylinder(s) to be tested. Shut off the engine and cycle the controls to release the hydraulic pressure. Have a container can ready to catch any waste oil to prevent environmental contamination.
3. Disconnect the fixed end hose from the cylinder to be tested. Cap the hose with a plug 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 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

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

# 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

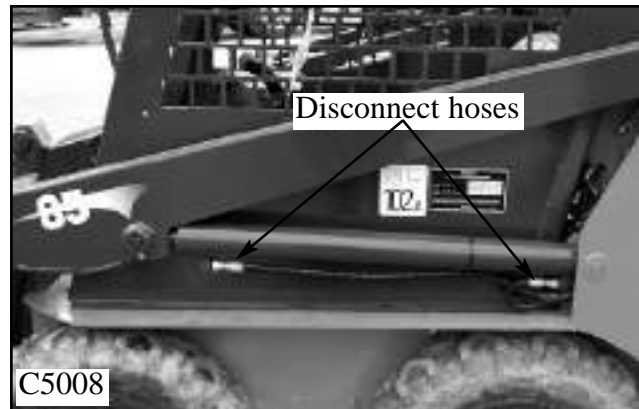
Cap all open lines and ports to prevent contamination.

- 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. C5008) Cap all open ports and lines to prevent contamination.
- 3 Remove the lock nut and bolt from both mounting pins. (fig. C5011)
- 4 Remove the front pivot pin by pushing the pin out from behind the boom arm, out toward you. (fig. C5203) With an appropriate punch and hammer to prevent brooming of the pin, remove the rear pin. (fig. C5011a) 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.

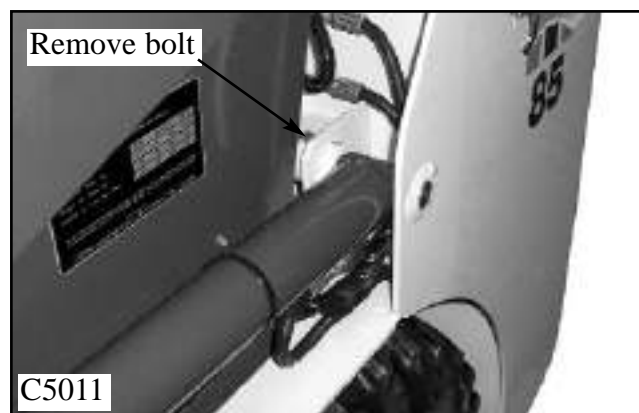


### WARNING

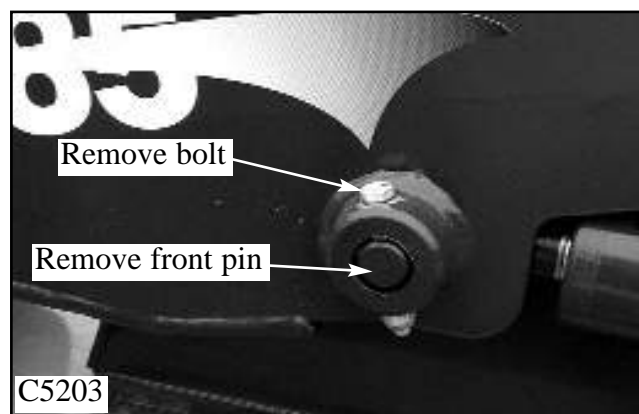
Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury.



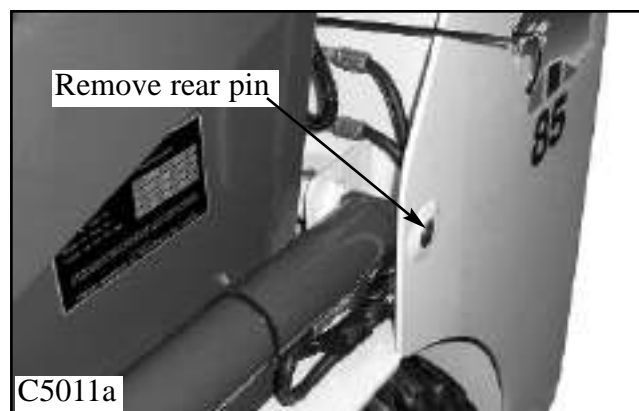
C5008



C5011



C5203



C5011a

# 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. C5067)

3 Remove the hydraulic hoses from the tilt cylinder. Plug and or cap all open ports or lines to prevent contamination. (fig. C5010a)

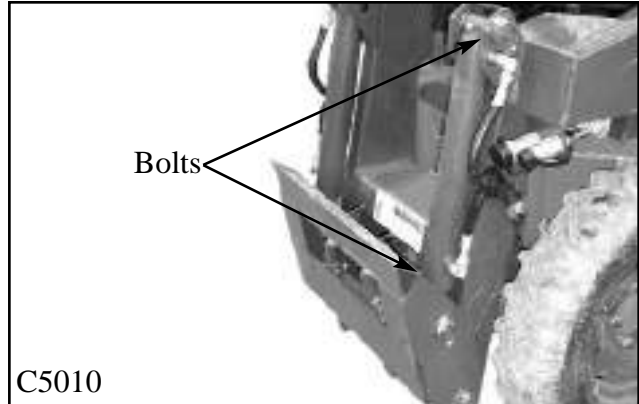
4 Remove the lock nuts from the bolts retaining the pivot pins to the loader and remove the bolts. (fig. C5010)

5 Remove the pivot pins by tapping out with a brass drift pin. (fig. C5010)

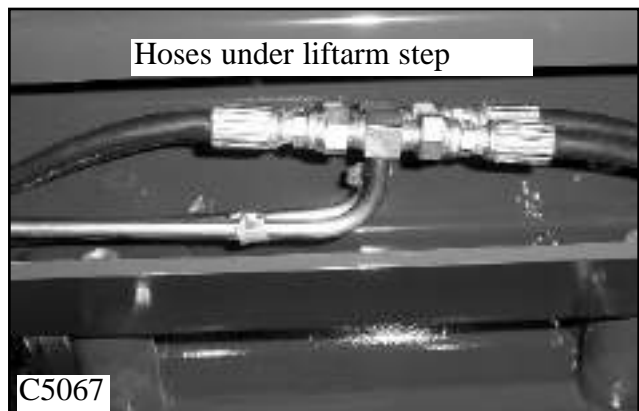
6 Remove the cylinder from the loader.

7 Upon reassembly, inspect the pivot pins and bushing for wear and replace as required. Reverse order for cylinder installation.

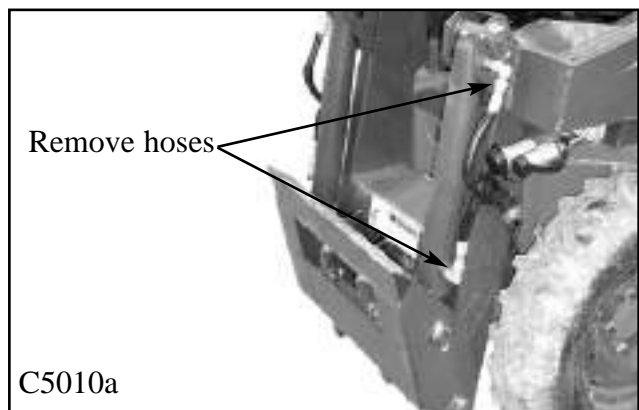
8 Upon start up, check for system leaks and replenish the hydraulic oil reservoir as required.



C5010



C5067



C5010a



#### 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.

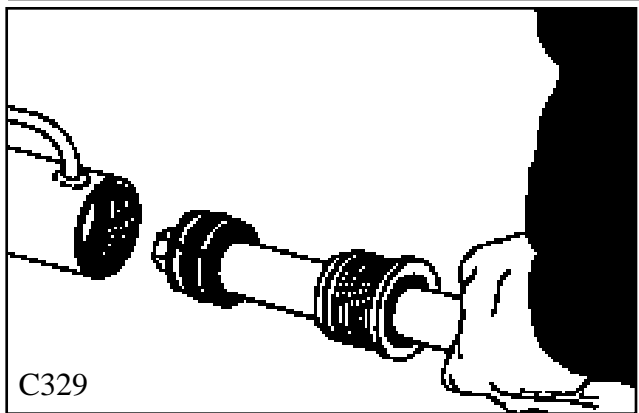
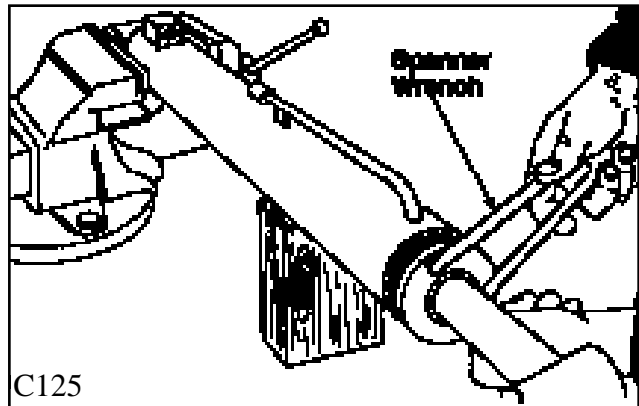
# HYDRAULIC CYLINDERS 1.4

1

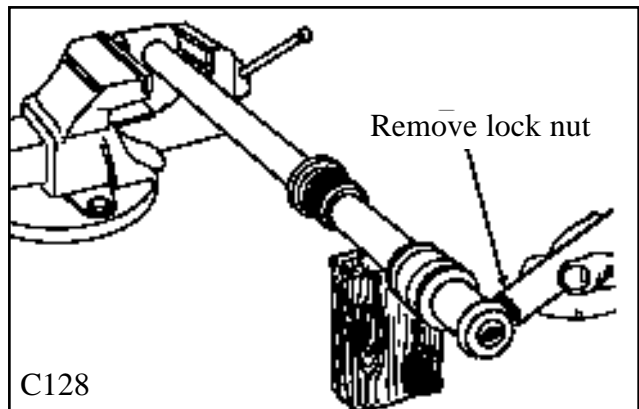
## Cylinder Disassembly

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.

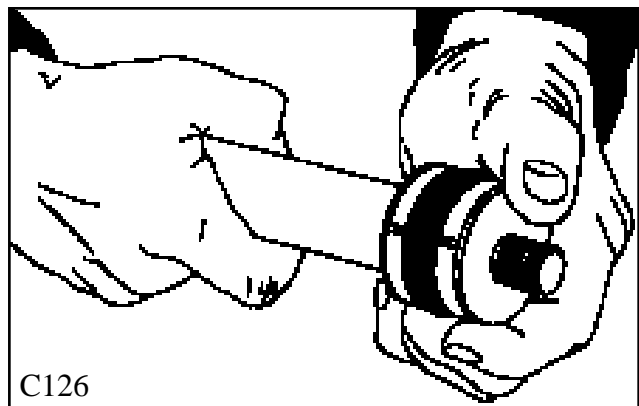
- 1 Remove the cylinder as outlined previously.
- 2 Place the base end of the cylinder in a vise or on a pin held in the vise and support the front end of the body. Remove the plugs from the hose ports. (fig. C125)
- 3 Loosen the gland nut from the cylinder barrel using a spanner wrench. The gland nut 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 or on a pin held in a vise and remove the lock nut from the rod. (fig. C128)



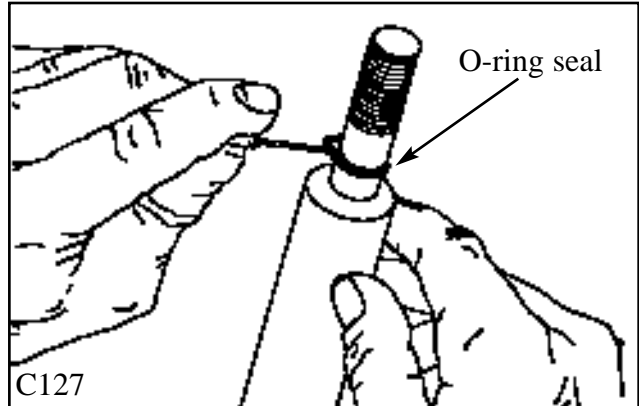
- 6 Remove the 2 piece piston assembly from the rod. (fig. C126)
- 7 NOTE: Some piston assemblies rear piston parts are threaded onto the rod. You will need to use a spanner wrench to remove this type of rear piston.



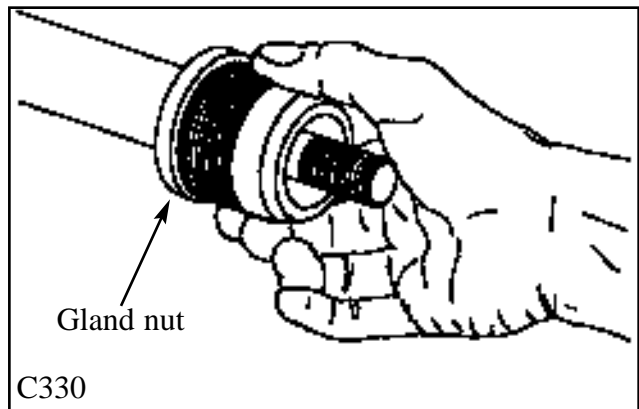
# HYDRAULIC CYLINDERS 1.4

1

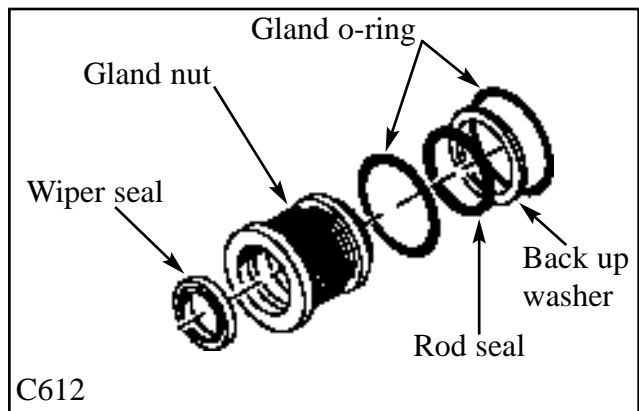
8 Depending on the design of the rear piston, non threaded type, remove and discard the o-ring seal from the end of the cylinder rod. (fig. C127)



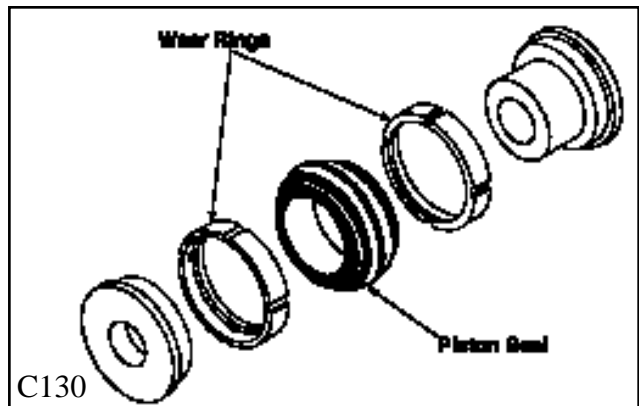
9 Remove the gland nut assembly from the cylinder rod. (fig. C330)



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.

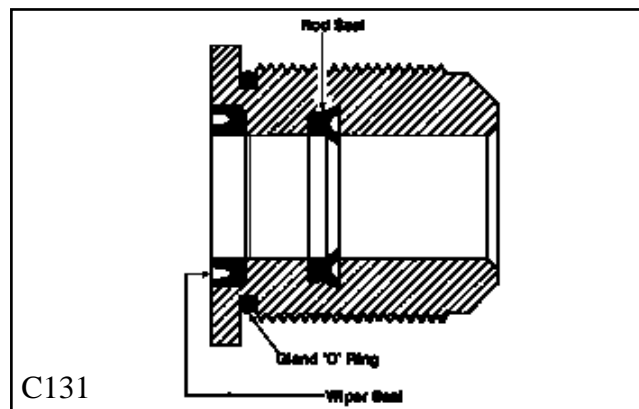
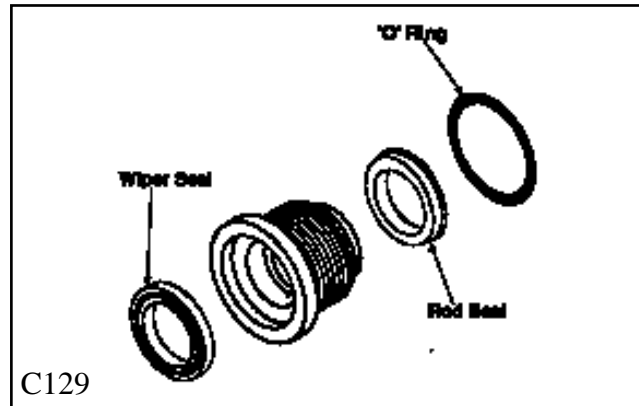
Smooth down edges that could damage seals and cause leakage.

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.



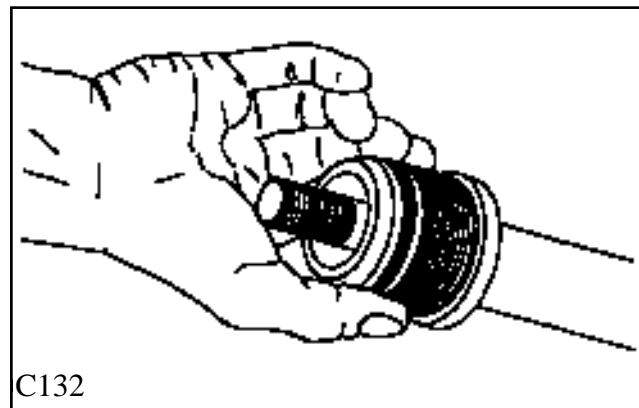
## Cylinder Assembly

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)

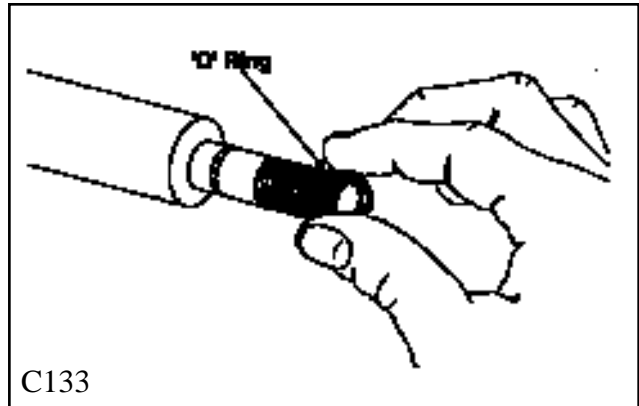
4 Apply system oil to the cylinder rod and assemble the gland nut assembly to the rod. (fig. C132)



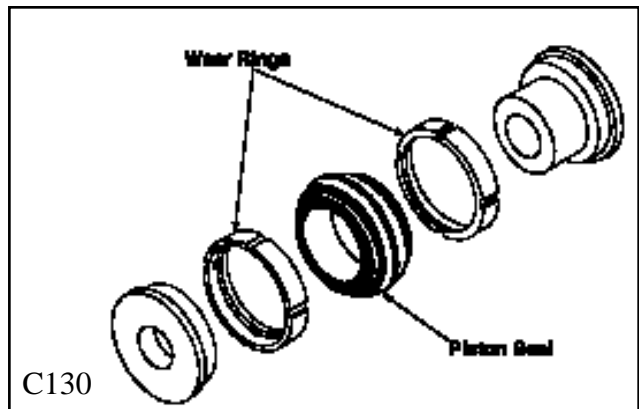
# HYDRAULIC CYLINDERS 1.4

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. C133)

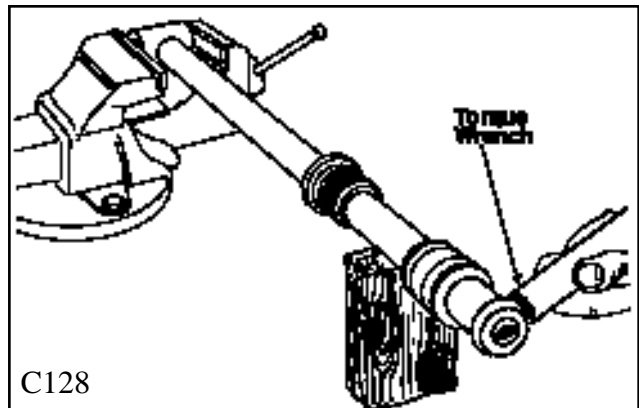


6 Install new wear rings and piston seal to the the 2 piece piston assembly. (fig. C130)



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 250-275 ft lbs (339-373 N.m.). (fig. C128)

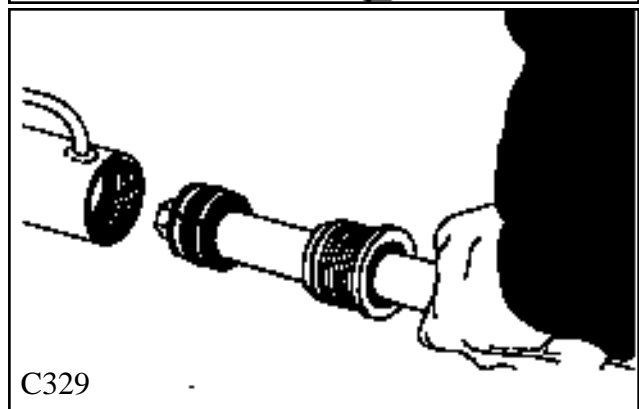
8 Make sure the inside bore of the cylinder barrel is clean. Lubricate the inside of the barrel with system oil. Do not get oil into the threaded area of the barrel.



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 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

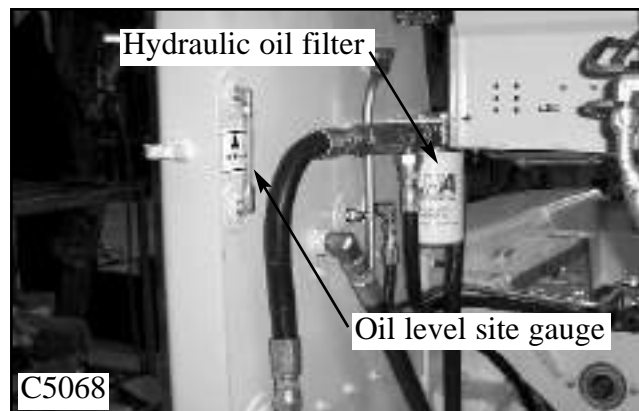
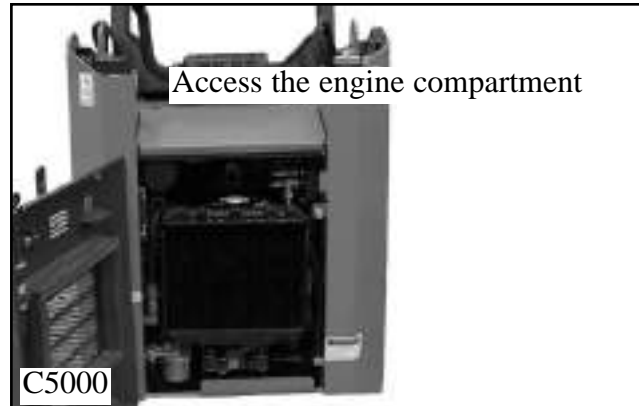
1

## 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 left side, on the oil 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. C5000, C5068)
  - 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. C5069)
  - 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. C5006, C5007)



# HYDRAULIC OIL RESERVOIR 1.6

## 1

### General Information

The hydraulic oil reservoir is located at the rear of the loader on the left hand side. (fig. C5012) 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. C5068)

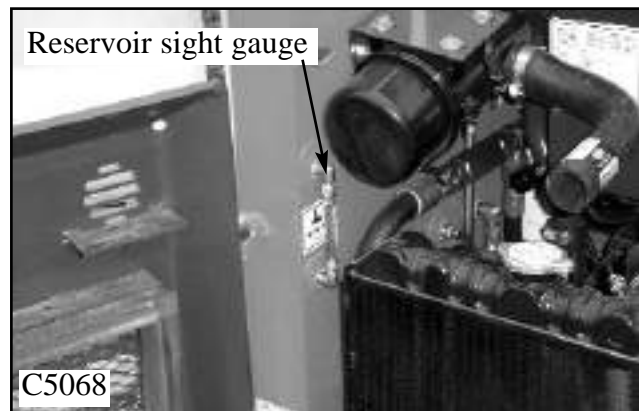
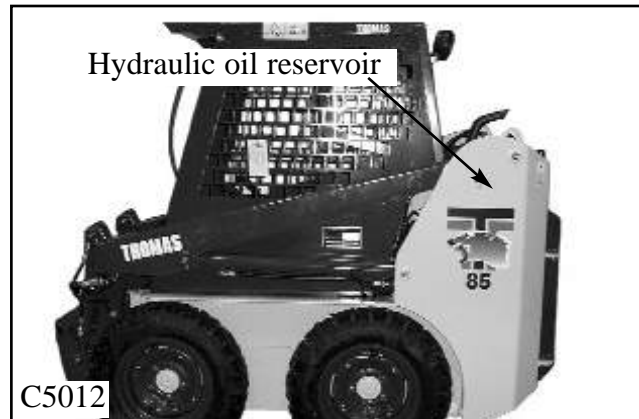
The oil reservoir fill cap is located at the top of the reservoir. (fig. C5007) The oil fill cap assembly has a 30 micron screen to catch larger particles of contaminant before entering the reservoir, but **always use oil filtered through a 5 micron min. filter for replenishing the hydraulic reservoir.** 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.
- 4 Check the oil level in the sight gauge. (fig. C5068)
- 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. C5007)
- 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 or better, pre-filtered at 10 micron.
- 5 Replace the filler cap and replace the bolt, or padlock, in the cap to prevent vandalism.



# HYDRAULIC OIL RESERVOIR 1.6

1

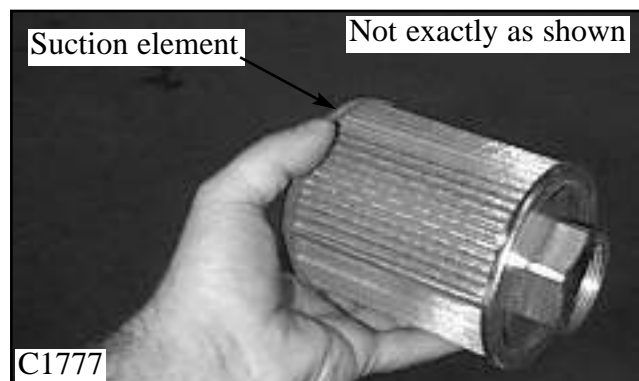
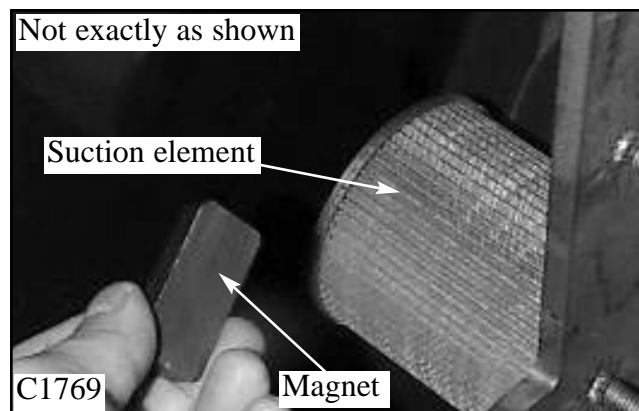
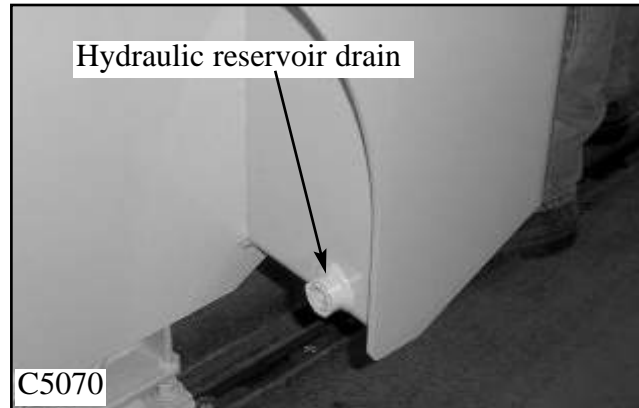
## Servicing The Oil Reservoir

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. C5070) 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. C5013) Clean the excess silicone from the cover and reservoir.

**NOTE:** Removal of the radiator may be necessary to access the inspection cover.

- 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 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 or better oil, pre-filtered to 10 micron, approximately 10 gallons or 38 liters.



# TROUBLE SHOOTING 1.7

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.	1.6
	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.	1.2 / 2.9
Loss of hydraulic power (full flow from gear pump).	Splined coupling failure in the hydrostatic pump	See the Sauer Sundstrand Repair Manual BLN 9992.	2.10
	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.	1.3
	Control locks engaged	Check fuse, safety switches and valve lock parts.	1.3 / 8
Hydraulic action jerky.	Reservoir low on oil.	Check for leaks. Fill the reservoir to the proper level.	1.6
	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.	1.3
	Control valve spool spring return mechanism not functioning	Inspect and replace damaged parts.	1.3
	Tank suction element blocked	Inspect and replace	1.6
	Kinked Suction hose	Replace.	
Boom raises slowly at full rpm	Reservoir low on oil.	Check for leaks. Fill the reservoir to the proper level.	1.6
	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.	1.3
	Cylinder seal(s) failure.	Check seals.	1.4
	Internal leakage in the control valve.	Inspect the control valve and repair as required.	1.3

# TROUBLE SHOOTING 1.7

1

Problem	Cause	Corrective Action	Section
Hydraulic cylinders will not support a load. (leak down)	Control valve spools not centering.	Check control linkage and control valve spool spring centering devise.	1.3/4
	External leak between control valve and cylinders	Inspect and repair.	
	Cylinder seal(s) failure	Check seals.	1.4
	Load check valve not functioning.	Inspect and replace damaged parts.	1.3
Hydraulic oil overheating.	Reservoir low on oil.	Check for leaks and replenish as required.	1.7
	Auxiliary hydraulics engaged.	Disengage.	4.9
	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.	1.3
	Wrong type of hydraulic fluid.	Replace.	1.7

## TORQUE CHART 1.8

**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		

# CONVERSION CHART 1.9

## 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.



# SECTION 2

## HYDROSTATIC DRIVE SYSTEM

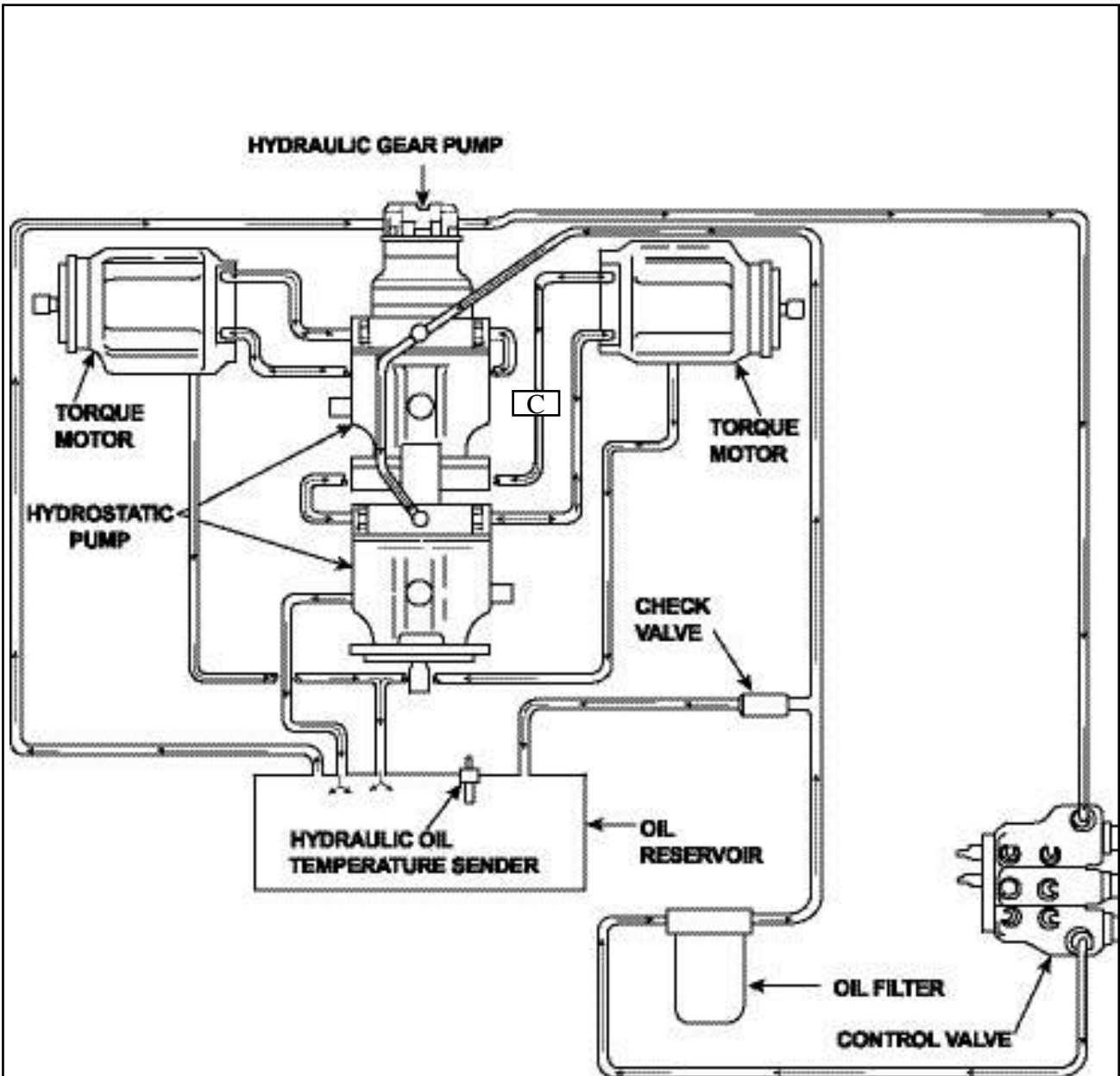
Hydrostatic Drive Circuit	2.1
Schematic .....	pg. 2-2
Specifications	2.2
Chart .....	pg. 2-3
General Information	2.3
Introduction .....	pg. 2-4
Trouble Shooting	2.4
Chart .....	pg. 2-5 ~ 7
Diagnose Steps .....	pg. 2-8
Pressure Tests	2.5
Procedure .....	pg. 2-9
Towing Procedure	2.6
Procedure .....	pg. 2-10
Flushing The Hydraulic System	2.7
General Information .....	pg. 2-11
Cleaning .....	pg. 2-12 ~ 13
Start-up Procedure	2.8
Procedure .....	pg. 2-14
Gear Pump Replacement	2.9
Procedure .....	pg. 2-15
Tandem Pump Replacement	2.10
Procedure .....	pg. 2-16 ~ 19
Tandem Pump Parts Diagram	2.11
Parts Illustrations .....	pg. 2-20 ~ 21
Drive Motor	2.12
General Information .....	pg. 2-22 ~ 25
Removal .....	pg. 2-26 ~ 27
Replacement .....	pg. 2-28 ~ 29
Parts Illustration .....	pg. 2-28 ~ 29
Disassembly .....	pg. 2-30 ~ 32
Inspection .....	pg. 2-32 ~ 34
Assembly .....	pg. 2-34 ~ 39
Torque Specifications	2.13
Torque Chart .....	pg. 2-39



# HYDROSTATIC CIRCUIT 2.1

## Hydrostatic Circuit and System Pressure Schematic

- A High Pressure Relieved at 5000 psi (345 bar)
- B Aux. Press. Relief Set at 2400 psi (165.5 bar)
- C System Charge Pressure 200 psi Minimum (13.8 bar)
- D Return Pressure
- E Suction Line (Vacuum) 4 - 6 Hg @ 160°F (71°C)



C5275

---

## SPECIFICATIONS 2.2

---

### Hydrostatic Tandem Pump

Pump Type	Variable Displacement, Reversible Piston
Brand Name of Pump	Eaton
Series Type	40
No. Of Drive Pumps	2 (two)
Mounting	Tandem
Rotation (viewed from shaft end)	Clockwise
Operating Speed	3140 rpm (+ / - 25 rpm)
Pump Displacement	1.24 cu in (20.3cc)
Minimum Pump Output (flow)	9.64 gal (36.54 l) / Min @ 1800 rpm @ 2000 psi (137.8 bar) Over Measured Charge Pressure
No. Of Relief Valves	2 (two)
Relief Valve Setting	2750 psi (189.6 bar)
Max. Allowable Case Pressure	25 psi (1.7 bar)
Charge Pump Type	External: Gear Pump / Eaton
Charge Pressure	100-110 psi Min. (6.89-7.58 bar)

2

### Hydraulic Drive Motor

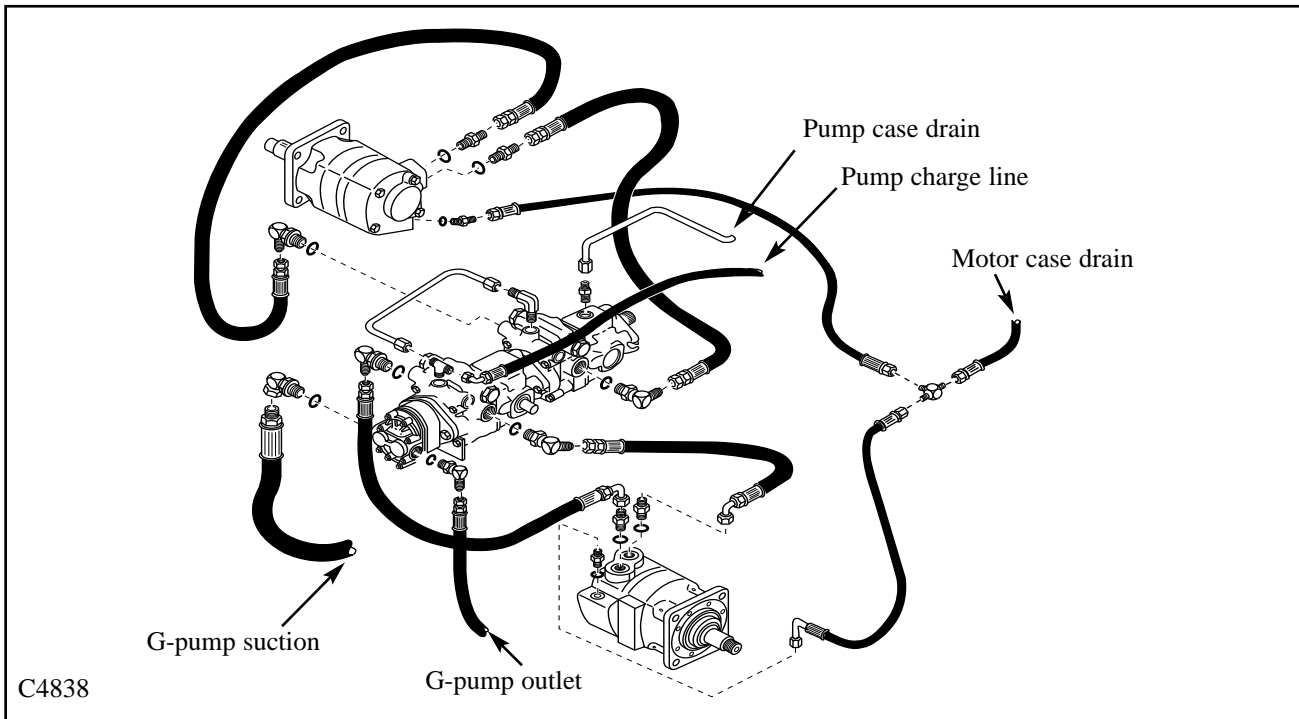
Drive Motor Type	Geroler Torque Motor
Brand Name	Eaton
Series Type	Series 4000
Rotation	Dual
No. Of Drive Motors	2 (two)
Drive Motor Displacement	19.0 cu in (312cc)

### Reservoir

Fluid Type	10w30 API Class SJ or Better Oil
Reservoir Filtration	One 100 micron Screen Element
Hydraulic Oil Filtration	One 10 micron Element

## GENERAL INFORMATION 2.3

2

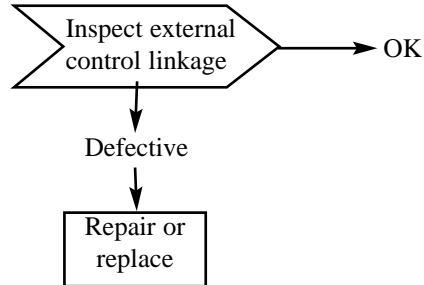


The driveshaft of the piston pump is rotated by the engine. The piston block which is splined to the drive-shaft also turns. The piston block, rotating group, consists of 9 piston assemblies which have free swiveling shoes swagged on the ball end of each piston assembly. The shoe end of the piston rides 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 leader 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 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.

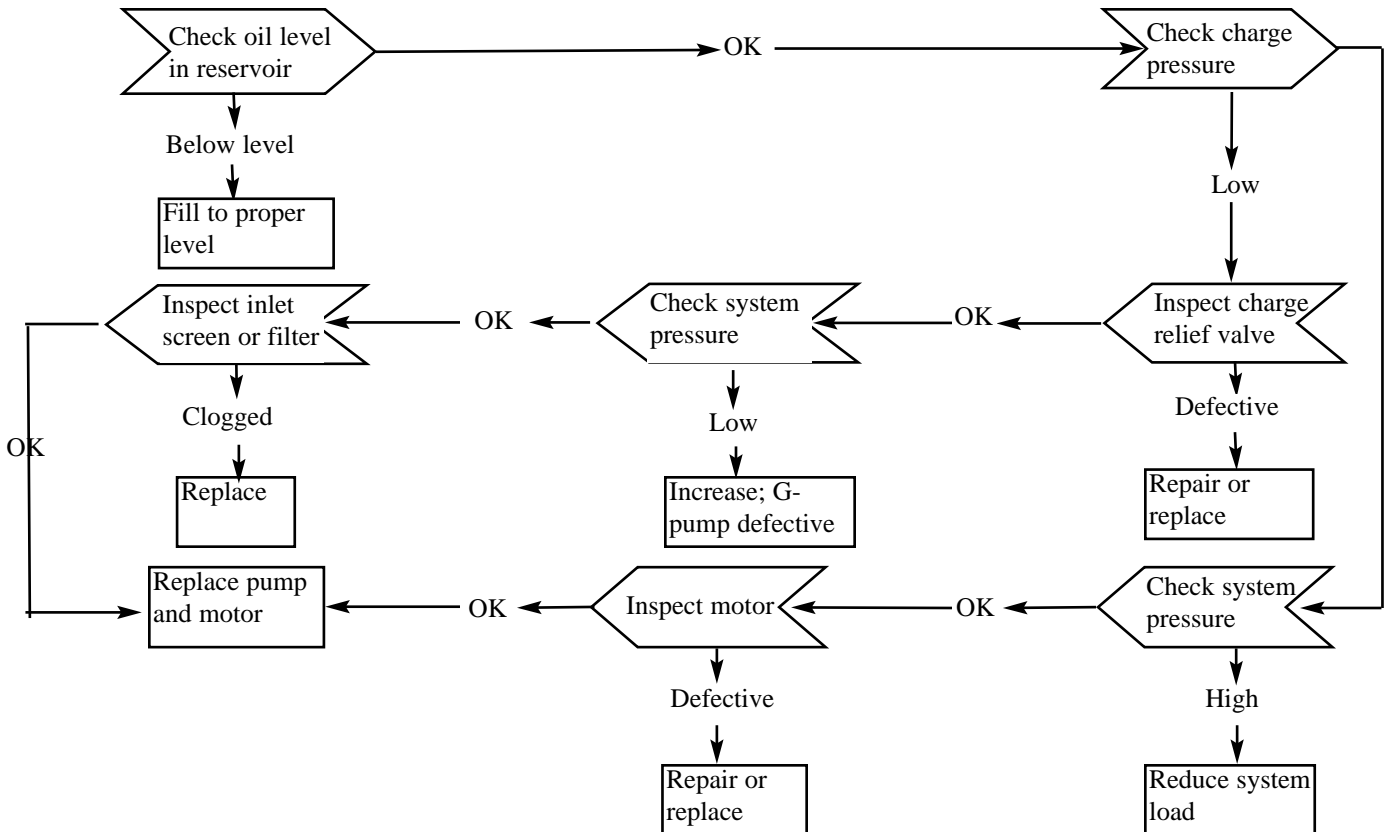
# TROUBLE SHOOTING 2.4

Symptom: Neutral Difficult Or Impossible To Find



2

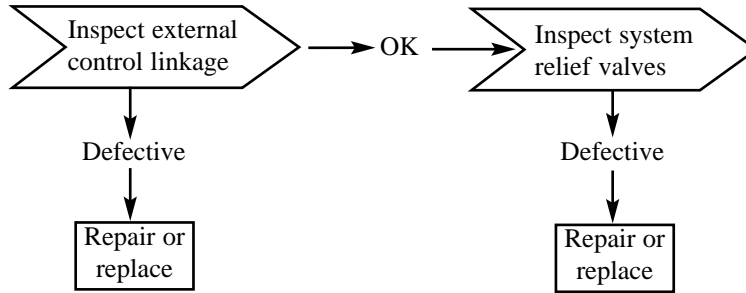
Symptom: System Operating Hot



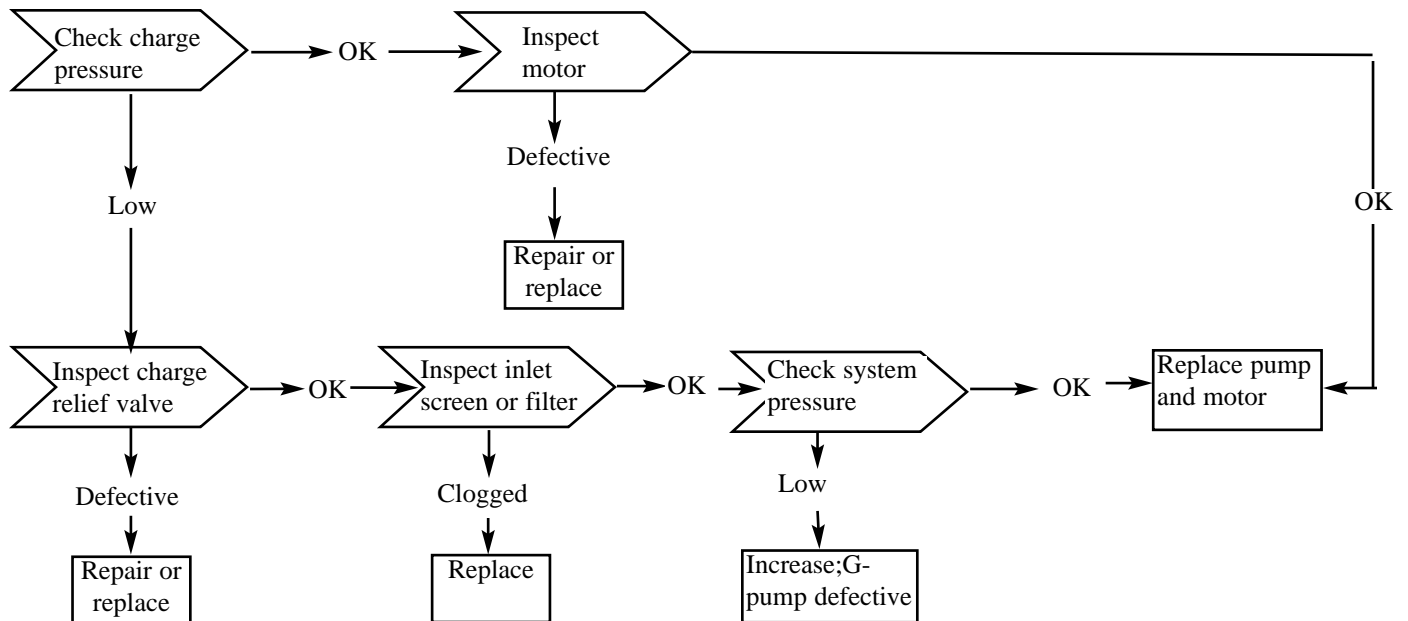
# — TROUBLE SHOOTING 2.4 —

Symptom: Operates In One Direction Only

2

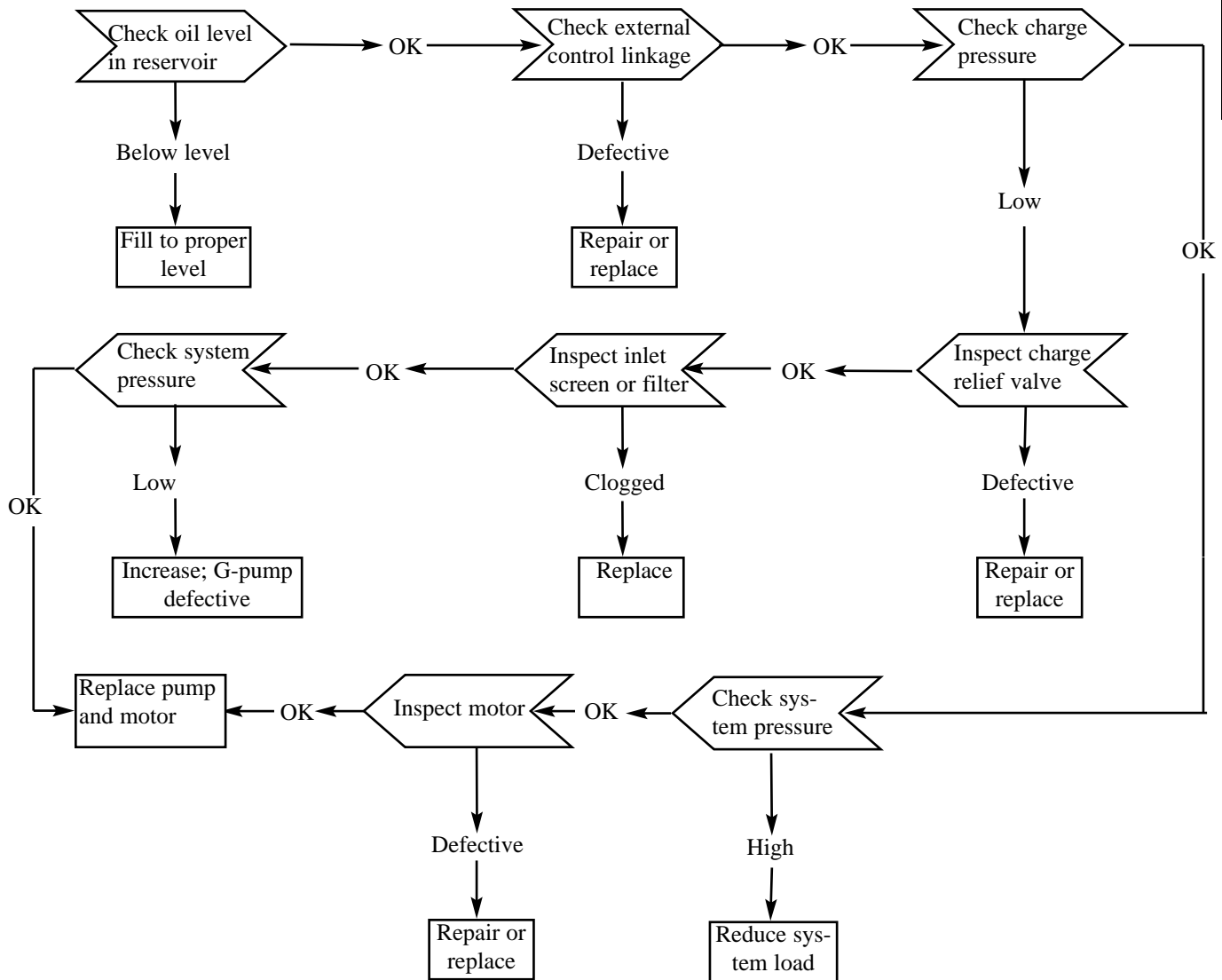


Symptom: System Response Sluggish



# TROUBLE SHOOTING 2.4

Symptom: System Will Not Operate In Either Direction



2

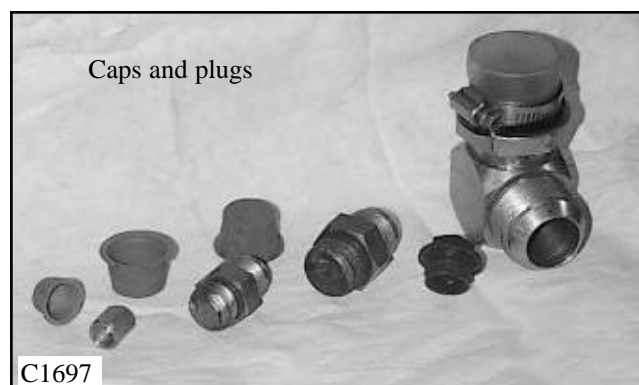
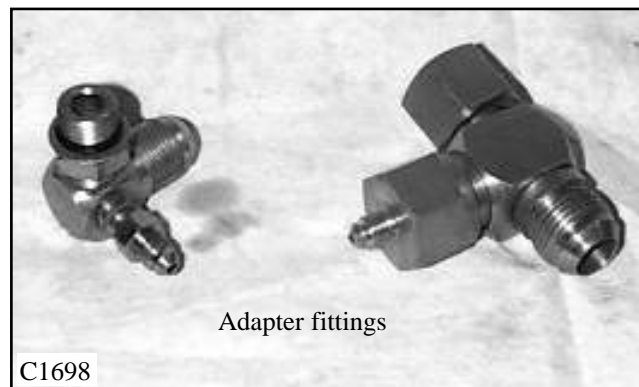
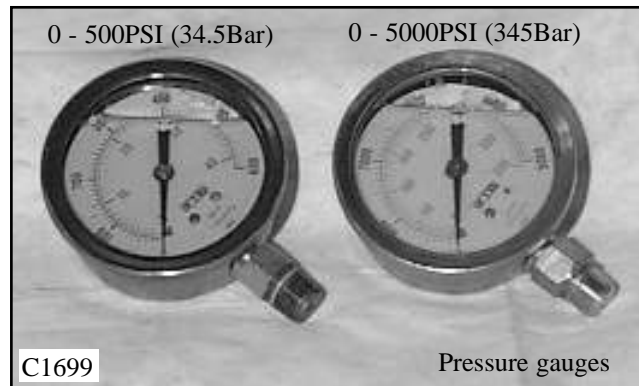
# — TROUBLE SHOOTING 2.4 —

## 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: (if used)**
  - 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 off seat
  - b. damaged or broken spring
  - c. damaged valve seat
  - d. improper charge relief setting
- 8 Inspect gear pump for:**
  - a. broken or missing drive coupling
  - b. damaged or missing o-rings
  - c. galled or broken gear 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

Photographs in the right hand column show some of the special tools that may be required to diagnose and repair the hydrostatic system.





# 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 tests will diagnose any mechanical problem in the hydrostatic system.

**WARNING**

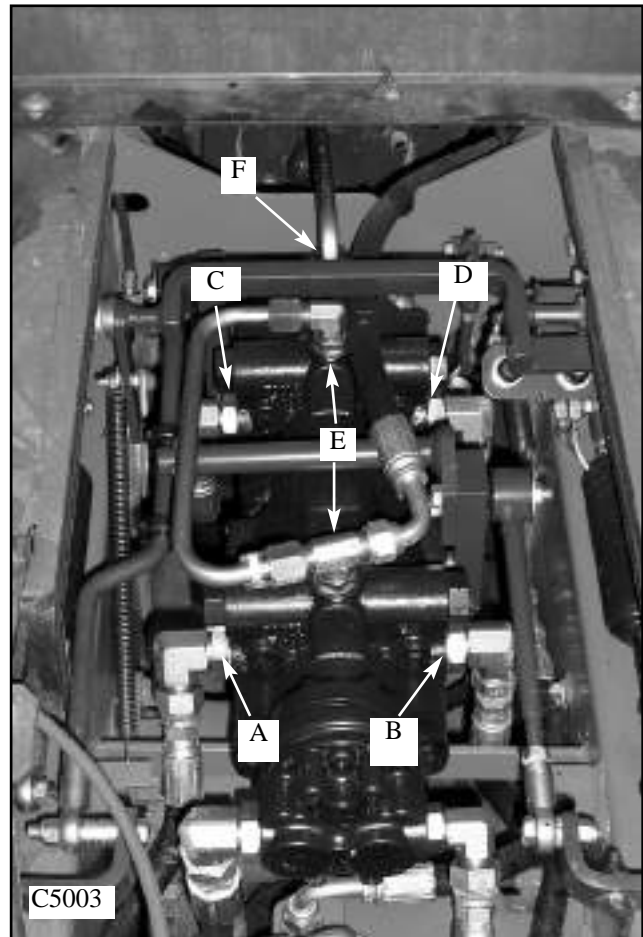
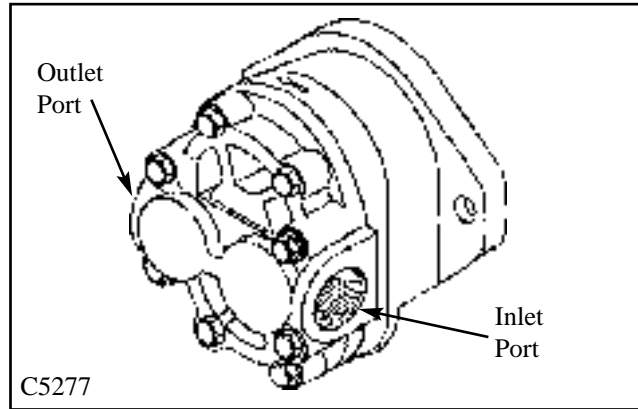
**Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.**

**WARNING**

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

Check pressures at pump inlets/outlets as shown in Figure C5003.

Gauge Information		
A	System Pressure	2750psi (189.6 bar)
B	Gauge	
C	System Pressure	2750psi (189.6 bar)
D	Gauge	
E	Charge Pressure Inlet Port	100-110psi (6.9-7.6 bar)
F	Case Drain Port	25psi (1.7 bar) maximum



# TOWING 2.6

## Towing Procedure

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

2



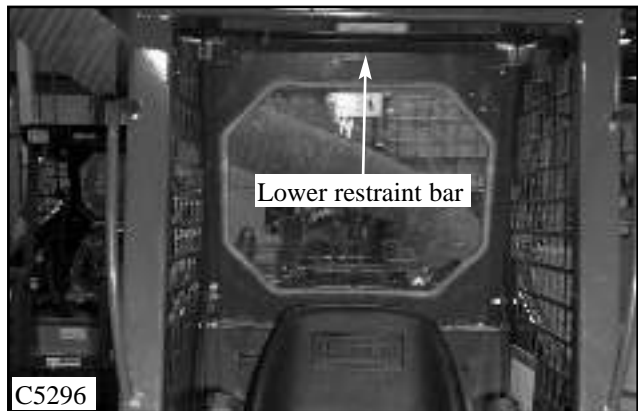
### WARNING

**Failure to follow the proper towing procedure may cause damage to the hydrostatic drive system.**

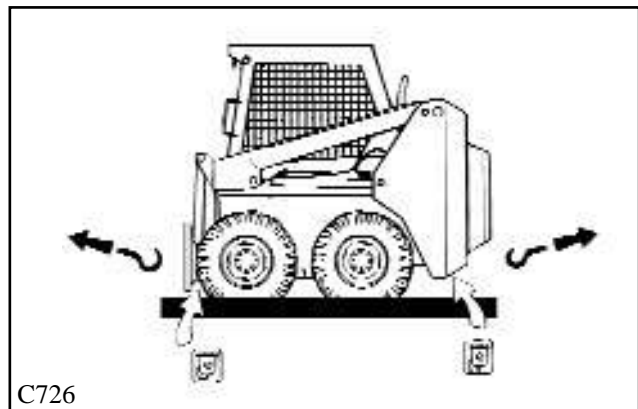
- 1 Park the loader on level ground. If it is necessary to park on a slope, position the machine at right angles to the slope.
- 2 Lower the lift arms and ground the attachment.
- 3 Return the throttle control to idle position. If the engine is hot, allow it to idle until cool, at least 2 minutes.
- 4 When the engine is cool, turn the ignition key to the OFF position and remove the key.
- 5 Place the auxiliary foot pedal in neutral position. If the auxiliary foot pedal is left in detent, restarting the machine may be impossible. If equipped with electro solenoid, make sure the switch is in the OFF position.
- 6 Raise the seat bar to apply the park brake. Turn the ignition switch to the OFF position, unfasten the seat belt, and ensure the pedals are locked by rocking them and ensure the steering levers are locked in neutral.
- 7 Attach a properly rated chain, cable or towing strap to the towing point provided. The point was designed to accommodate a chain, but a cable or strap with sufficiently large hook to prevent jamming in the chain slot may be used.
- 8 Lower the restraint bar to unlock the brake system. (Fig. 5296) Towing with the restraint bar up could result in damage to the braking system. If towing from the front, remove the blocks supporting the attachment prior to engaging tow equipment.
- 9 The attachment point on the towing or winching equipment should be kept as low as possible and in as direct a line as possible with the stuck loader. A steep tow line angle or side pull could result in upsetting the stuck loader.
- 10 When done towing, raise the restraint bar to activate the brakes before disconnecting tow chain.



C1697



C5296



C726



### CAUTION

**To prevent damage to the drive motors, do not exceed speed of 1 MPH.**



### WARNING

**Use chains or cables rated a minimum of 1 and 1/2 times the gross vehicle weight.**

# -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. C5070)

Be prepared to contain approximately 38 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. C5070) Be prepared to contain approximately 38 litres of fluid. Re-install the drain plug using a proper thread sealant and refill the oil reservoir using 10W30 API CJ or better oil.

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. C5004, C1688)



### WARNING

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

3 Start the engine and let it idle at approximately half throttle.

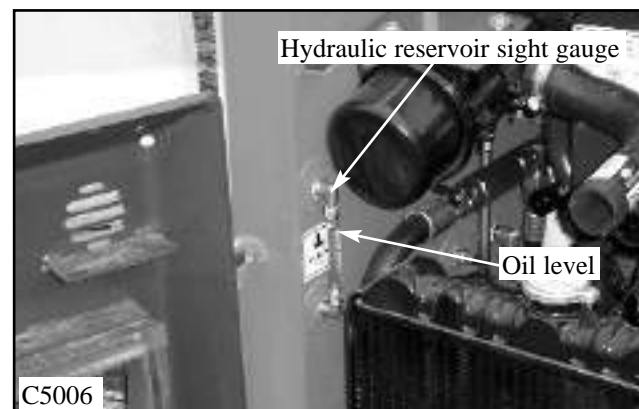
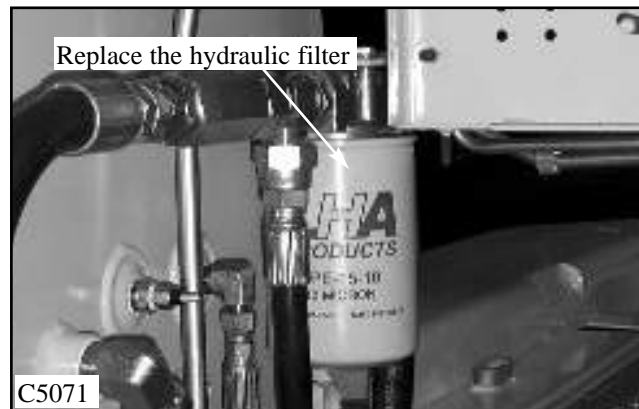
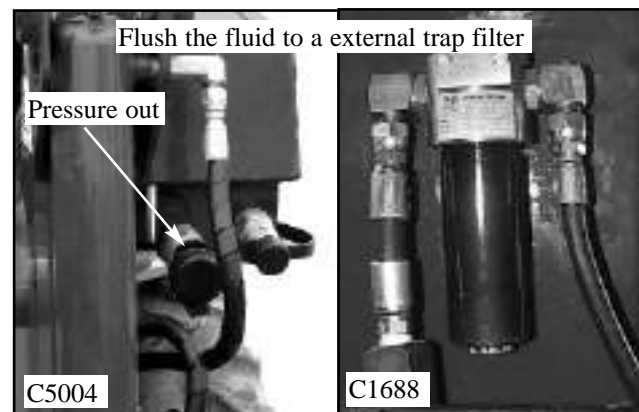
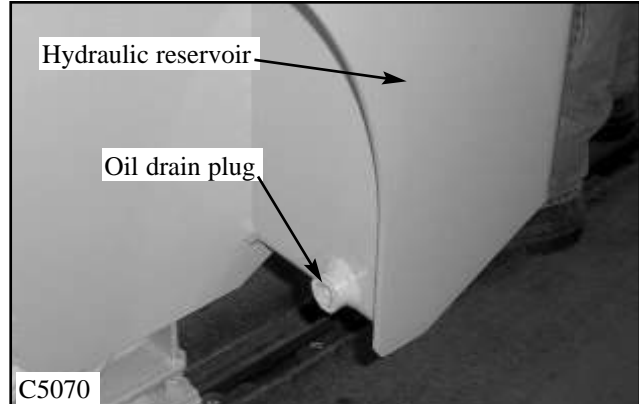
4 Engage the auxiliary circuit. Check to make sure the filtering system is not over taxed by the loaders hydraulic system pressure. Adjust engine idle accordingly to match the filtering systems capacity. This may vary as the filter becomes dirty, you may need to decrease engine rpm. Circulate the oil 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. C5071)

8 Start the engine and check for leaks. Replenish the hydraulic oil reservoir as required. (fig. C5006)



# FLUSHING THE HYDRAULIC SYSTEM 2.7

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

## IMPORTANT

**Be sure attachments are removed and liftarm are in the lowered position.**

- 1 Remove any attachment.
- 2 Make sure all cylinders are fully retracted.
- 3 Change the hydraulic fluid. (fig. C5070)
- 4 Change the hydraulic filter. (fig. C5071)
- 5 Disconnect the hydraulic lines from one set of cylinders. (fig. C5008, C5009)
- 6 Start the engine and set to the lowest idle.



## WARNING

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

- 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. Replenish hydraulic oil as necessary to maintain reservoir level. Do not let the pumps draw air.

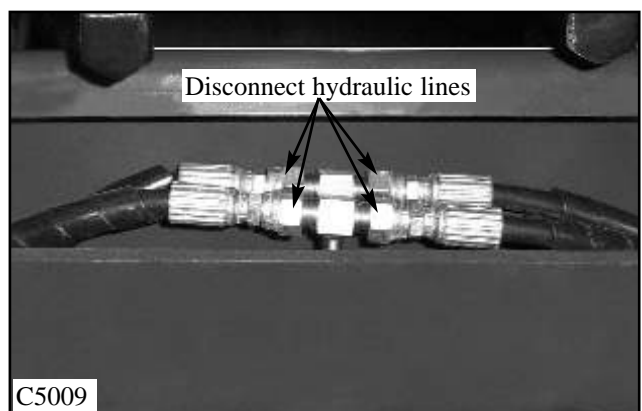
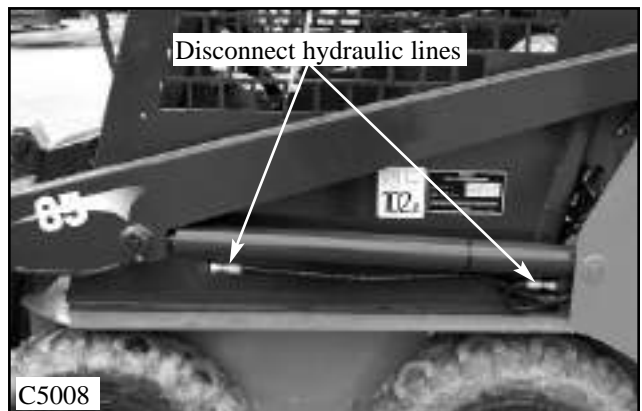
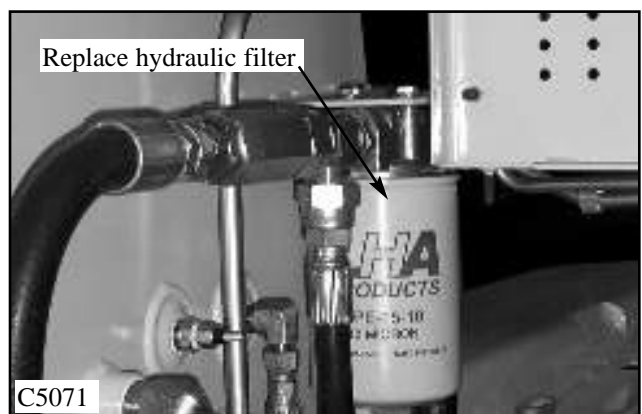
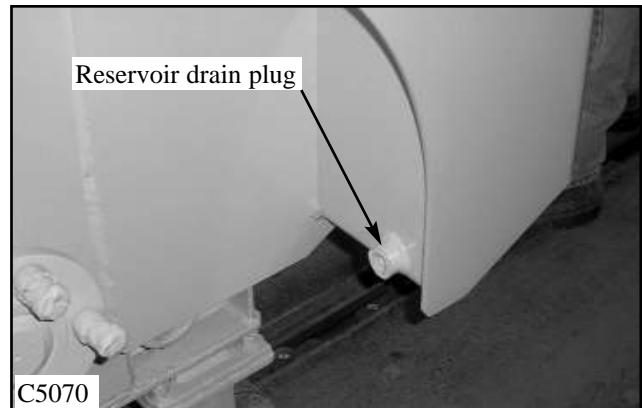
## IMPORTANT

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

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

## 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. C5006 )



## WARNING

**This start-up procedure must be made with the loader securely raised off the ground.**

2 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 case drain port. (fig. C5207)

5 Have an assistant pull out on manual stop rod to prevent engine from starting.. (fig. C5085)

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 Release the stop rod.

8 Start the engine and let 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.

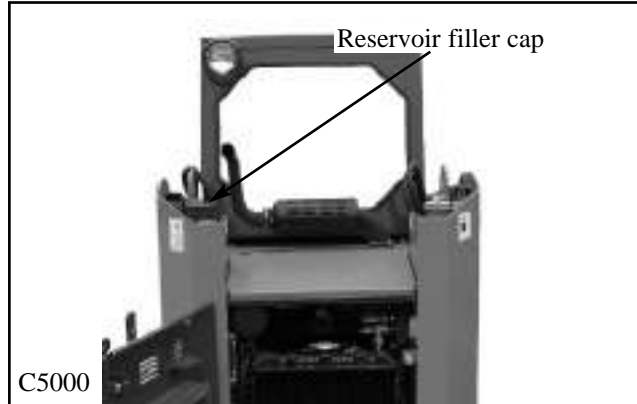


## WARNING

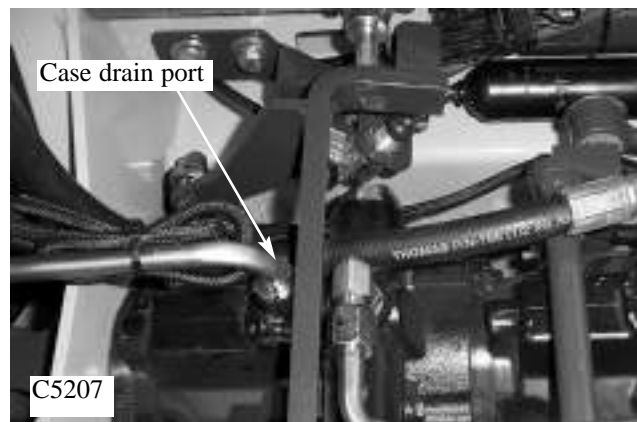
**Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.**

10 Replenish the hydraulic oil reservoir as required.

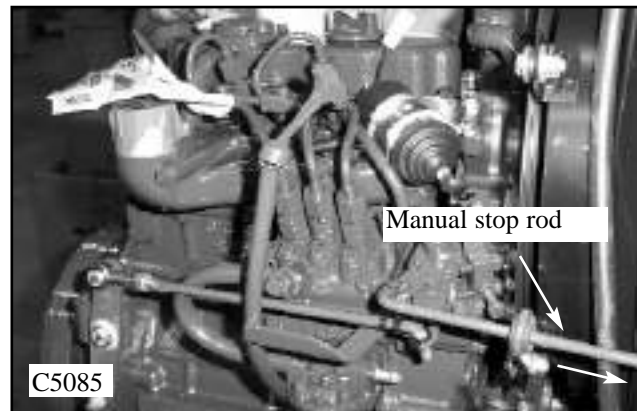
11 Start the engine and increase the rpm to half throttle. Bring the hydraulic fluid up to operating temperature and make control adjustments as outlined in Section 4.



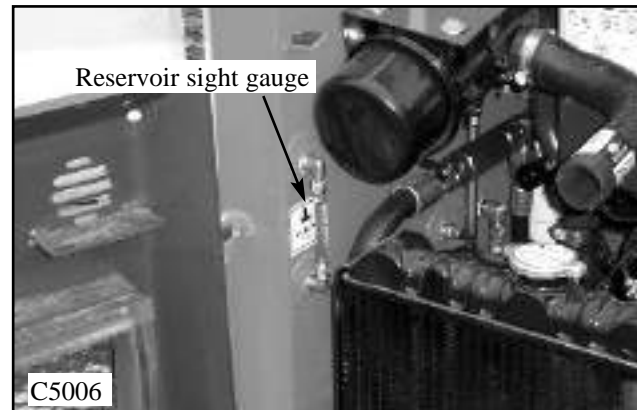
C5000



C5207



C5085



C5006

# 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.



## WARNING

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

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 re - installing.

3 Disconnect the hydraulic hoses from the gear pump. ( fig. C5003a ) 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. C5003 ) 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.

7 Start the engine and check for leaks. Do not use your hands to find leaks.



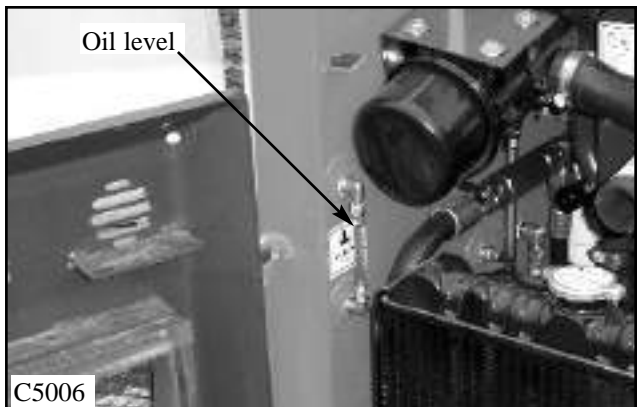
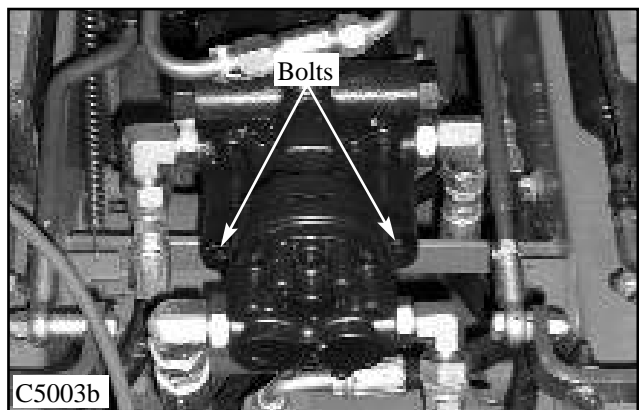
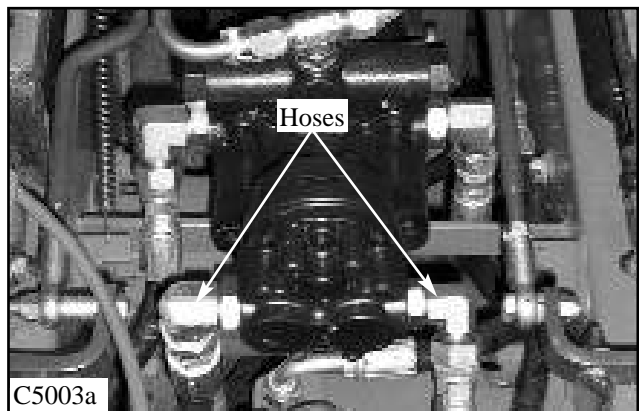
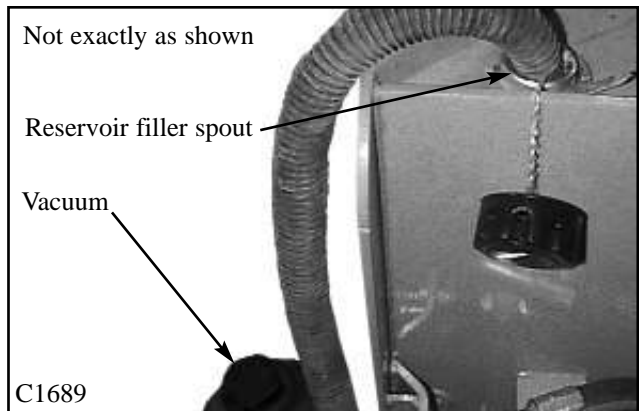
## WARNING

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

8 Check the fluid level in the hydraulic oil reservoir and replenish as required. (fig. C5006)

## 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.**



2

# TANDEM PUMP REPLACEMENT 2.10

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, the rear filler shield and the battery access panel.(fig. C5100)

# 2



## WARNING

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

2 Remove the steering lever linkages, brake shaft, control limiter and switch mount.(fig. C5207) Carefully mark the switch mount and the brake shaft positions so that they can be re-installed as close as possible to their original position.

4 Disconnect all the hydraulic hoses. (fig. C5206) Mark hose and fitting location if necessary to ease re-assembly. Upon re-assembly, torque the hydraulic fittings and hoses as outlined in the Torque Chart in Section 2.13 Cap all open lines and ports.

5 Remove 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.

7 Remove the rear mounting bolts. (fig. C5208) Remove the front mounting bolt located under the gear pump. Remove the tandem pump from the loader, slide the u-joint off of the spline while doing so. When pump is out of the loader remove the pintle levers.

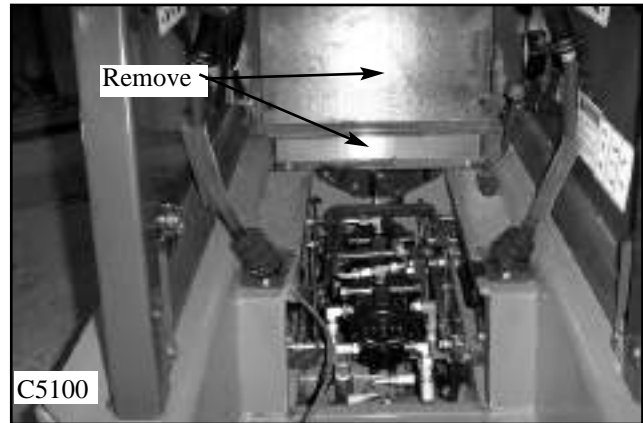
## IMPORTANT

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

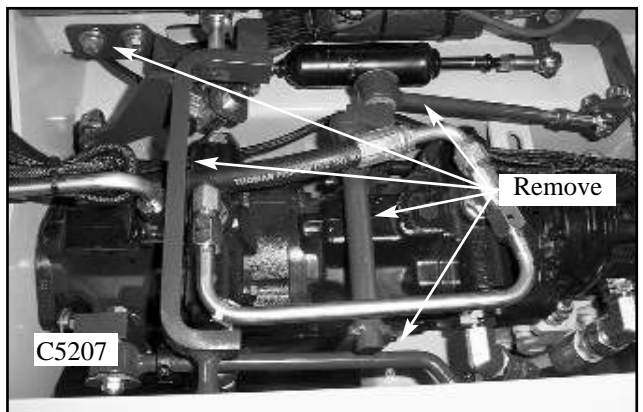


## CAUTION

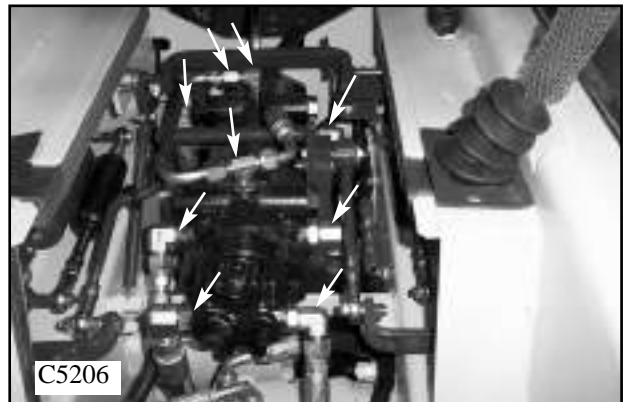
**To prevent possible personal injury, do not attempt to lift heavy objects without assistance.**



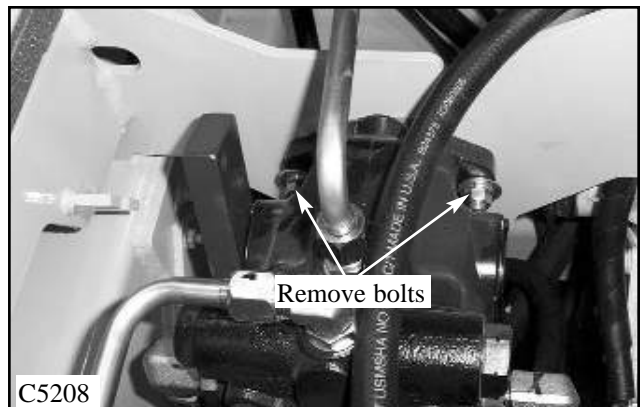
C5100



C5207



C5206



C5208



# TANDEM PUMP REPLACEMENT 2.10

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 Install the pintle levers onto the pump, grease the rear spline.
- 3 Place the pump into the loader, slide the u-joint onto the spline while guiding the pump into its mounting location. Insert mounting bolts and tighten to 20-25 ftlbs torque. Remove lifting device.



## WARNING

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

5 Install the fittings removed from the old pump into the new pump. Reconnect the hoses.(fig. 4838 page 2-4) Torque the fittings and hoses according to Torque Chart in Section 2.13 page 2.53.

6 Before connecting drain tubing,(fig. C5207a) fill pump case with hydraulic oil.

7 Install brake shaft and switch mount. Adjust switch mount so that switches make contact with brake shaft when the restraint bar is down. Check to make sure switches are closed.

When the restraint bar is up, there should be a gap between the switches and the brake bar. The switches should now be open. (C5207b)

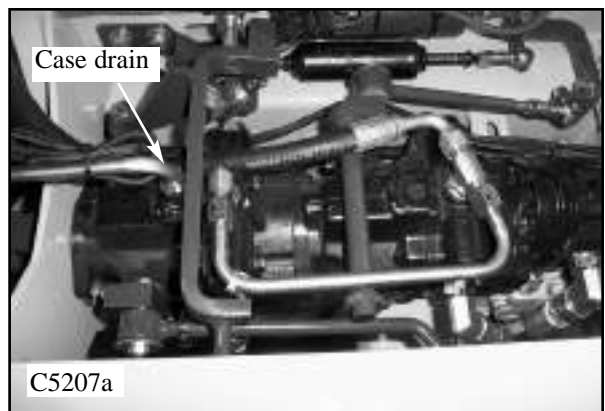
8 Install the control lever linkages and the limiter bar.

9 Follow the start-up procedure in section 2-8 for proper start-up with a new pump.

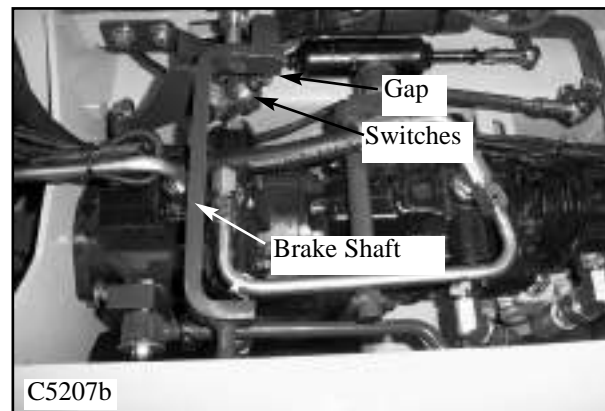
10 Once loader is started, follow the procedures in Chapter 4 for proper Neutral Adjustment, Tracking Adjustment and Limiter adjustment.



C5072



C5207a



C5207b

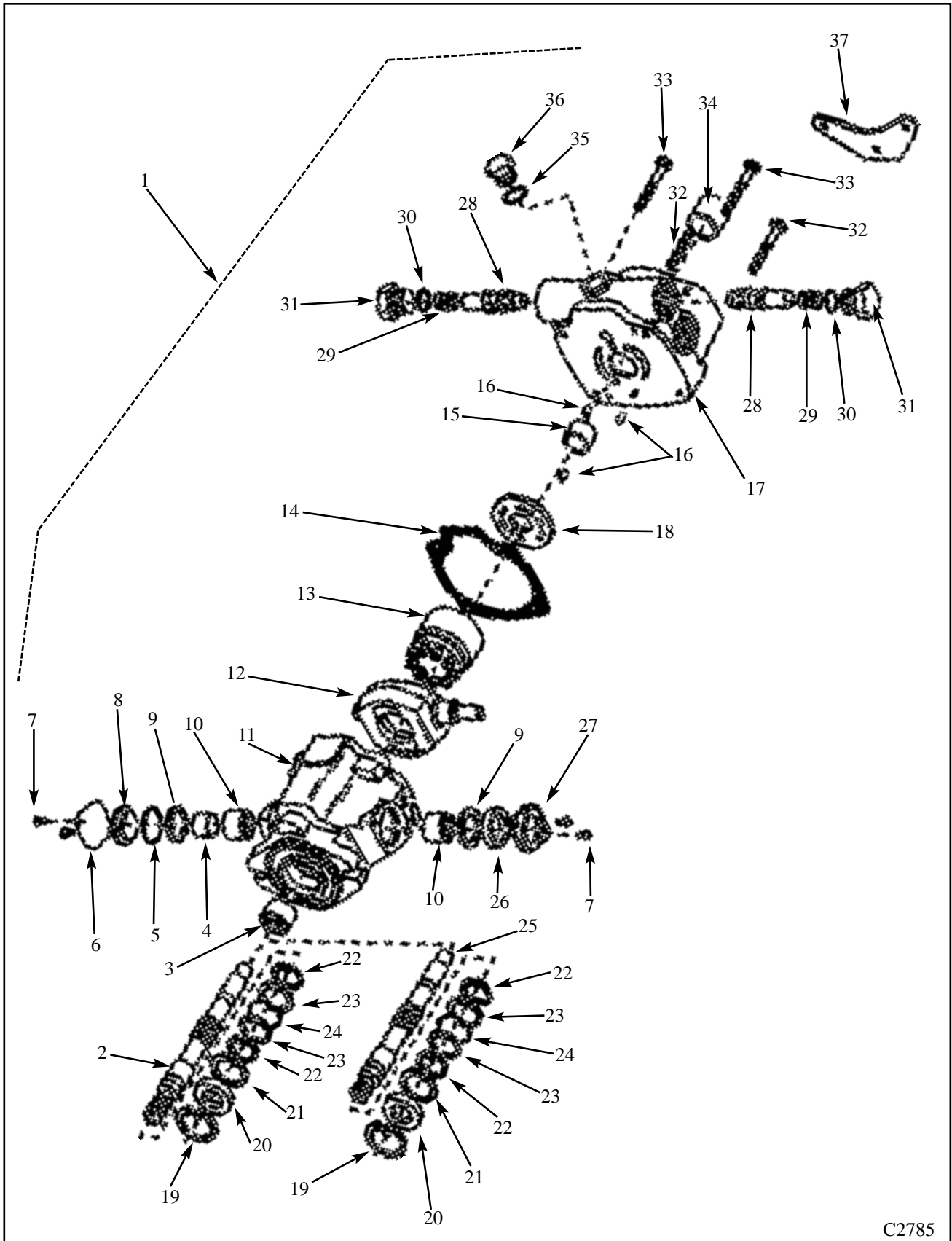
## IMPORTANT

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 PARTS DIAGRAM 2.11

2



C2785

# —TANDEM PUMP PARTS DIAGRAM 2.11—

## Rear Pump Diagram C1881 Index

1. Tandem pump assembly
2. Drive shaft
3. Bearing
4. Inner race
5. O- Ring
6. Trunnion cover
7. Screw
8. O- ring cover
9. Washer
10. Bearing
11. Housing assembly
12. Cam plate
13. Rotating group
14. Gasket
15. Bearing
16. Pin
17. Backplate assembly
18. Valve plate
19. Snap ring
20. seal
21. Washer
22. Snap ring
23. Thrust race
24. Bearing
25. Drive shaft
26. Seal
27. Seal cover
28. Relief valve
29. Spring
30. O-Ring
31. Plug assembly
32. Cap screw
33. Cap screw
34. Coupler
35. O-ring
36. Plug assembly
37. Mounting bracket

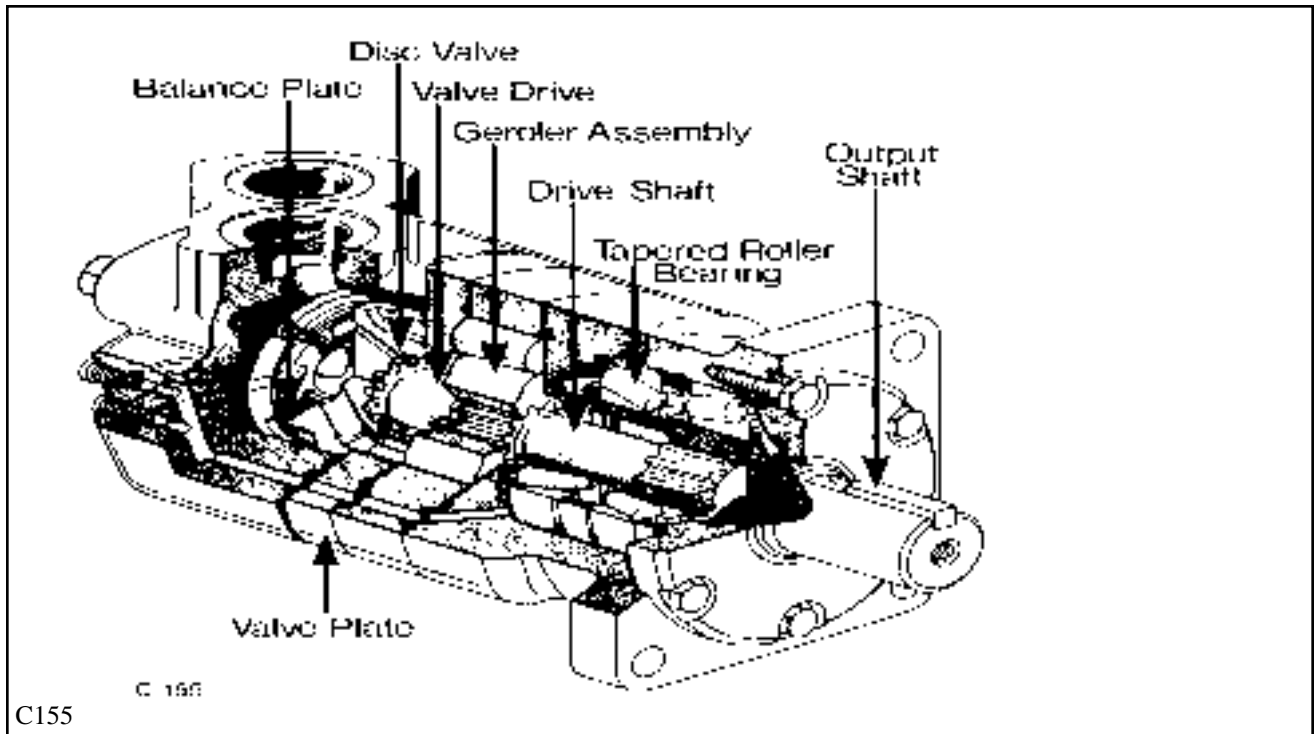
**For further service instructions refer to an Eaton Dealer and request Service / Repair Manual Part Number , or order P / N 44232 from a local Thomas Dealer.**



# DRIVE MOTOR 2.12

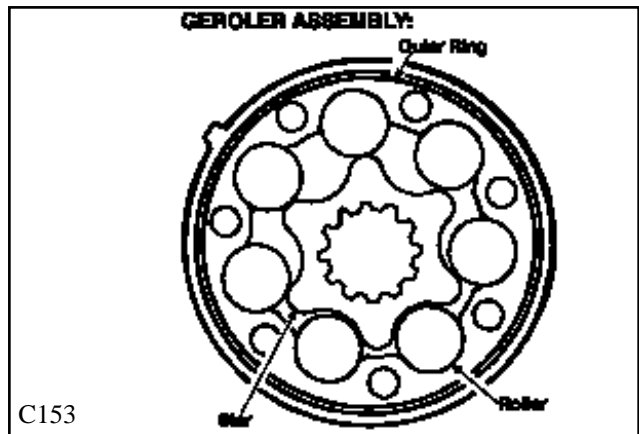
## General Information

2

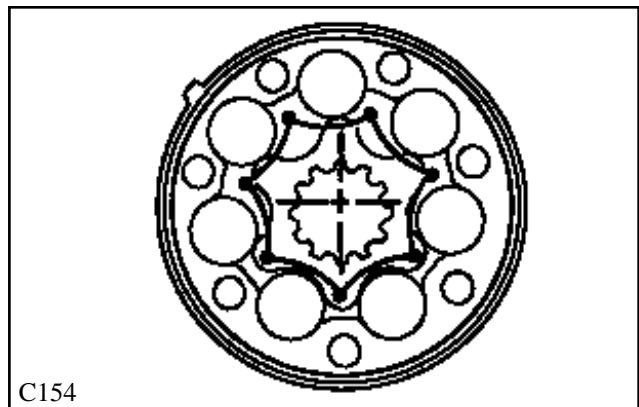


The basic geroler design uses a combination of mechanical and hydraulic principles that are utilized in the high torque, low speed motors.

The outer ring ( fig. C153 ) of the geroler assembly is similar to an internal gear that is held in a fixed position by securing it to the motor housing. The rotating inner gear, called a star, orbits inside the secured outer ring.



Because of the different number of teeth on the star and outer ring, the star rotates in an eccentric circular orbiting motion from the housing center line. ( fig. C154 )

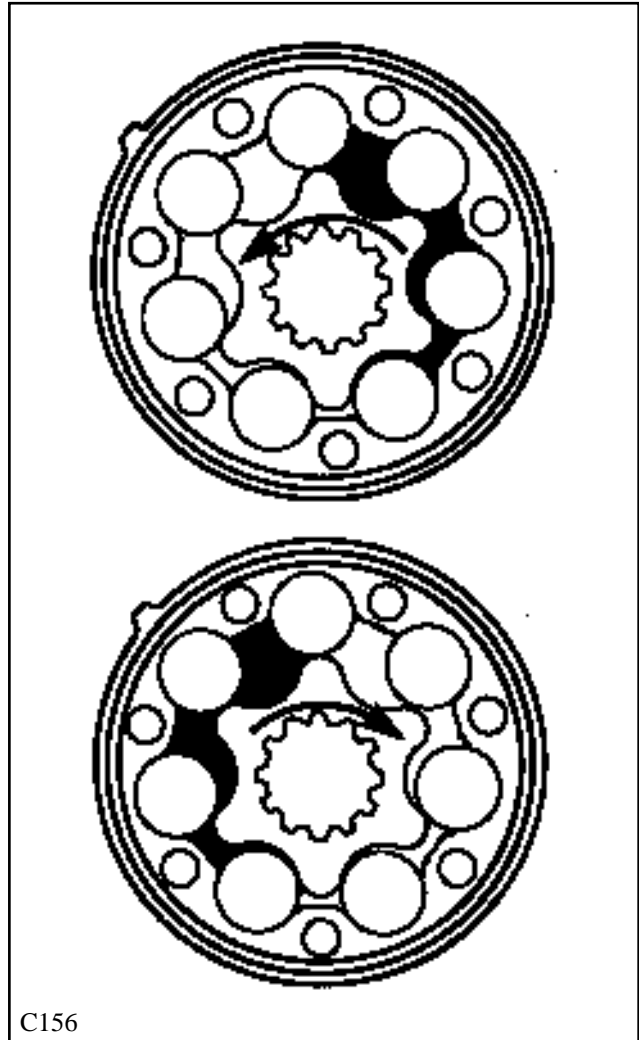


## DRIVE MOTOR 2.12

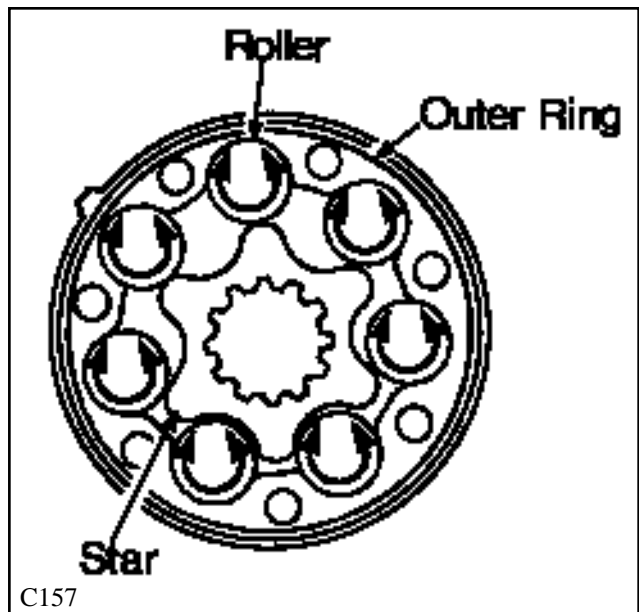
A drive shaft is used to transmit the rotation of the star to the output shaft. The drive shaft has crowned external splines to match the internal splines in the star and output shaft. This type of drive is used because the star center line continuously changes during rotation.

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.

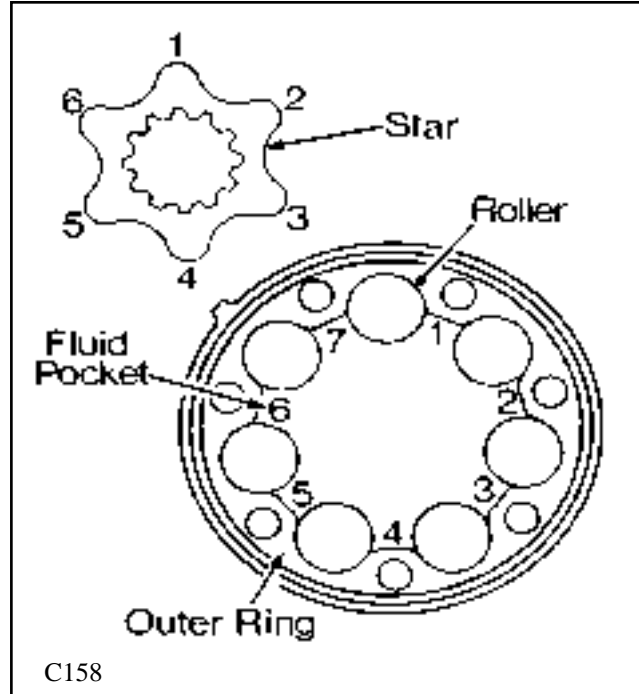


2

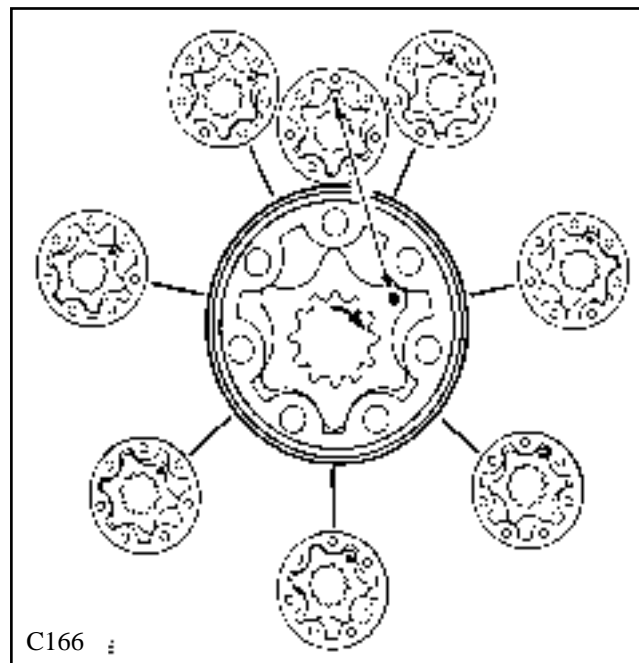
## DRIVE MOTOR 2.12

The geroler (fig. C2299), is both a fluid displacement motor and a gear reducer. It provides 6 times (the number of star points) greater power per revolution than a gear, vane or piston type motor. This means that 6 times the greater torque can be developed at one eighth the speed without further gear reduction.

2



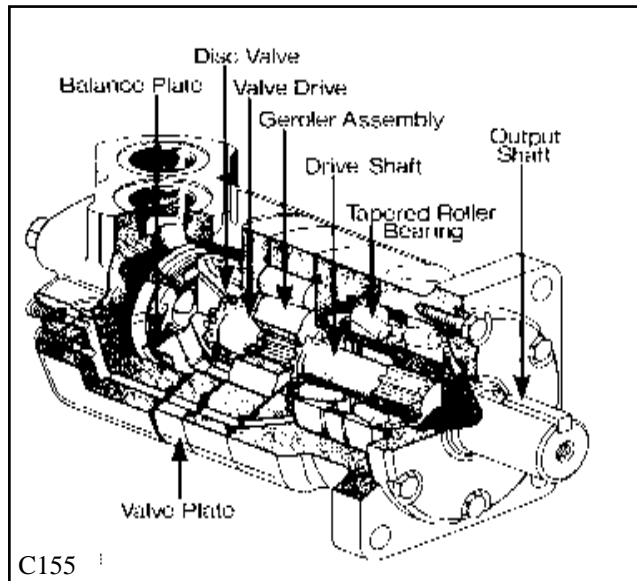
Example shown in fig. C166 is one complete star orbit, or one sixth of the output shaft rotation. The star must travel through 6 complete orbits for each single rotation of the output shaft creating a speed reduction of 6 to 1. The use of 7 fluid power pockets with the 6 to 1 ratio provides 42 fluid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



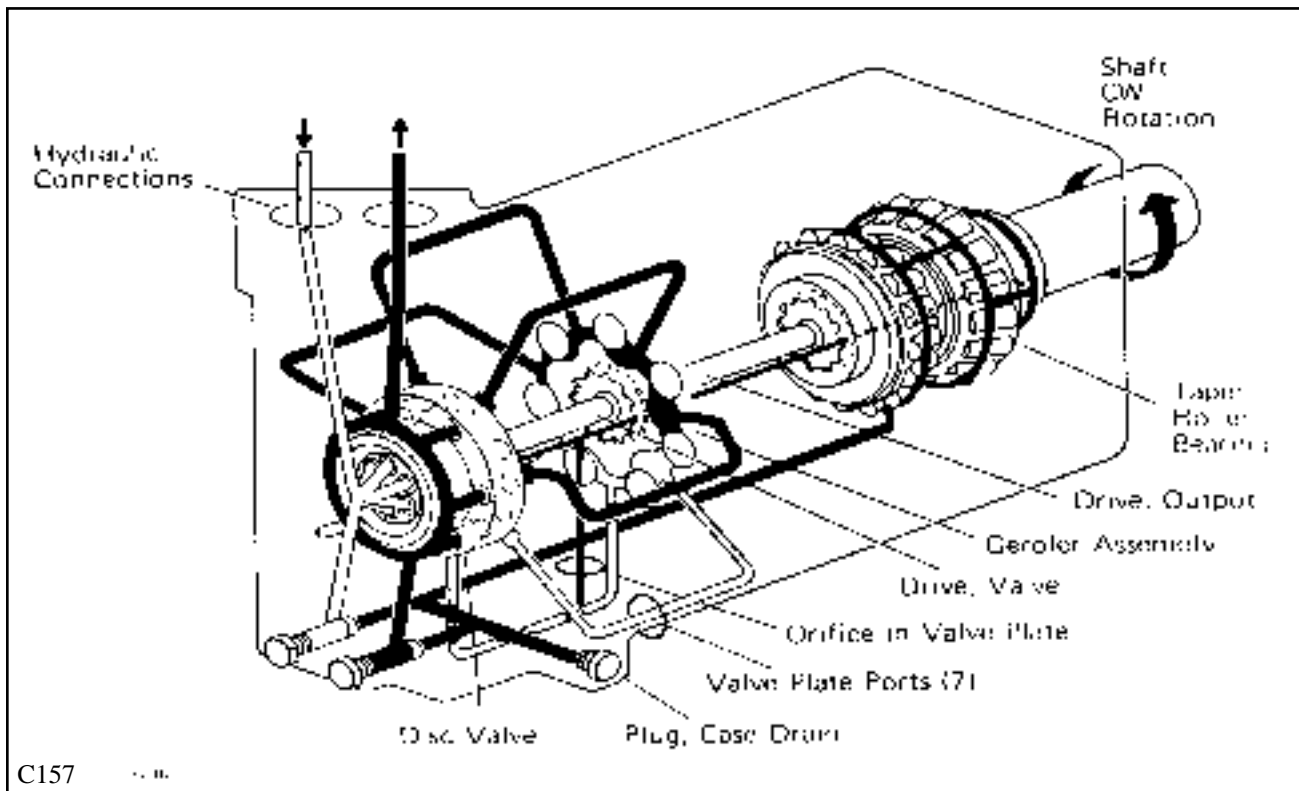
# DRIVE MOTOR 2.12

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

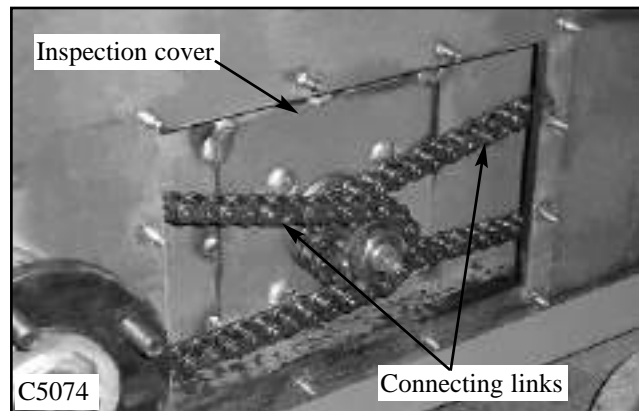
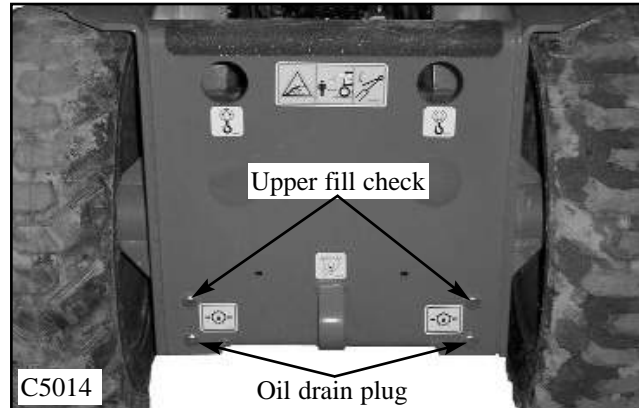
1 Remove any attachment, raise the boom arms and engage the boom support pins.



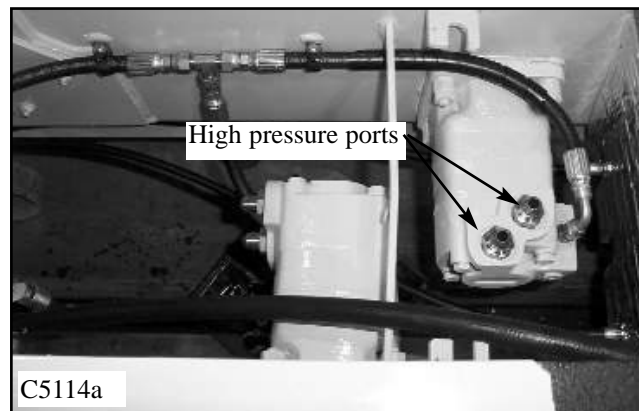
### WARNING

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

- 2 Raise the loader securely off the ground using properly rated jack and stands.
- 3 Remove the wheels on the side to be repaired.
- 4 Drain the oil from the final drive housing. Be prepared to contain approximately 1.9 gal (7 l) of fluid. (fig. C5014)
- 5 Remove the seat.
- 6 Remove the final drive inspection cover located between the axles of the final drive housing.(fig. C5074)
- 7 Disconnect the chain as outlined in Section 3.

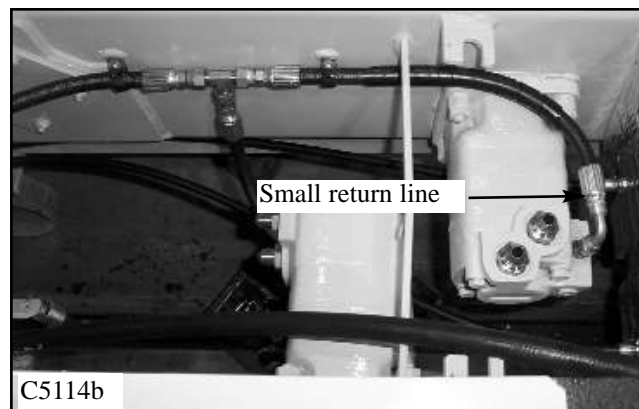


8 Remove the 2 high pressure hoses from the drive motor. ( fig. C5114 ) Cap the open hose ends and fittings to prevent contamination.



**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 Remove the small return line.(C5114b)
- 10 Remove the adapter fittings from the drive motor. Plug the open ports in the drive motor to prevent contamination.





# DRIVE MOTOR 2.12

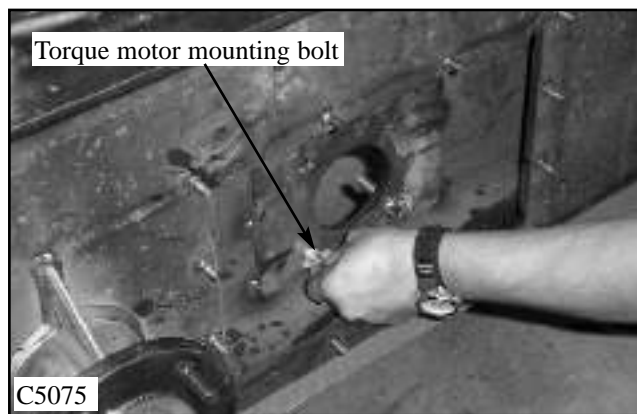
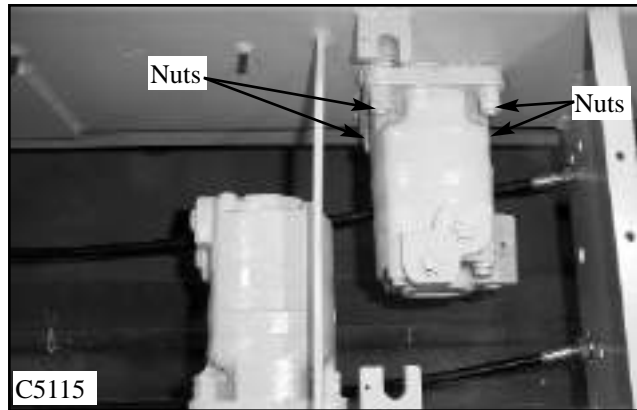
## Removal

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. C5115) Hold the head of the bolts from inside the final drive housing. (fig. C5075)

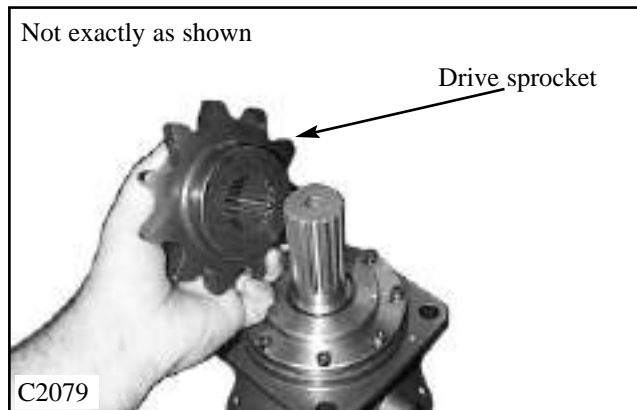
13 Remove the drive motor. Seal the drive motor with silicone upon reassembly.

14 Upon reassembly torque the 4 mounting nuts to 80 ft lbs (110.4 N m).

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.



16 Remove the drive motor sprocket and bolt. Visually inspect the drive motor sprocket. Check for worn or damaged teeth on both the outside of the sprocket, and the inside spline (fig. C2079).



17 Install the key, sprocket and nut. Apply Loctite 609 (blue) to the threads of the shaft before torquing (fig. C5062) and torque the nut to 275 ft lbs. (373 Nm).



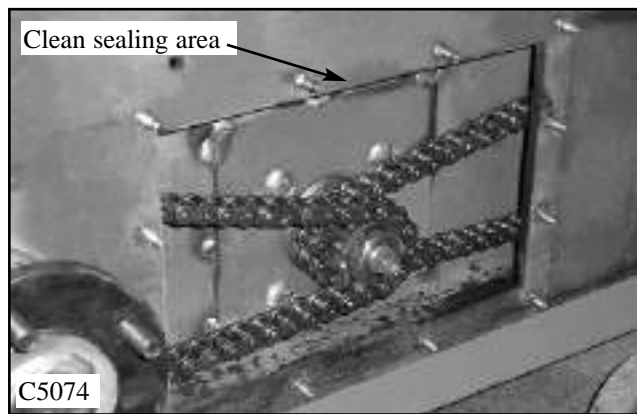
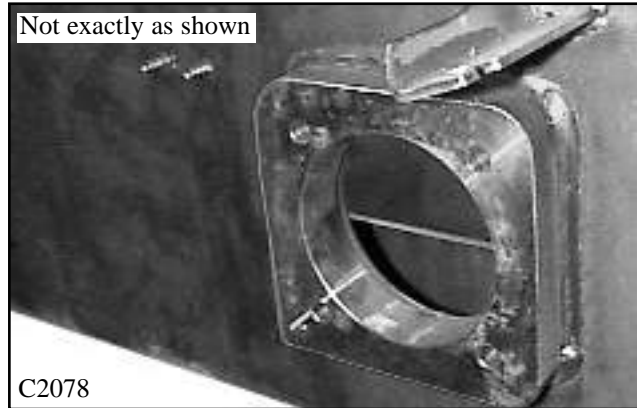
2

# DRIVE MOTOR 2.12

## Replacement

1 Clean the mounting areas thoroughly that need to be sealed with silicone. (fig. C2079, C5074)

2

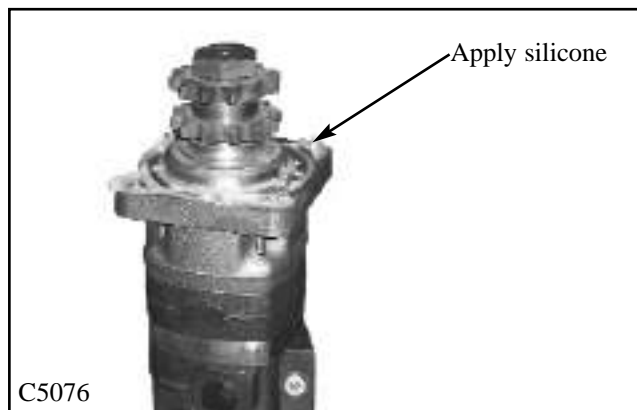


2 Apply a bead 1 / 4 of an inch thick around the drive motor bearing retainer and around each mounting hole. (fig. C5076)

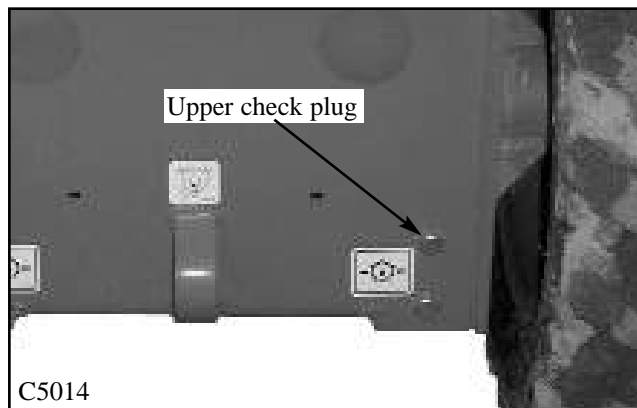
3 Install the drive motor and sprocket assembly to the final drive housing.

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

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



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



# DRIVE MOTOR 2.12

## 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.

## IMPORTANT

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

- 7 Install the adapter fittings to the drive motor.
- 8 Install the drain line to the drive motor. (fig. C5114)



## WARNING

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

- 9 Install the high pressure drive hoses. (fig. C5114a)
- 10 Clean the final drive housing and inspection cover thoroughly before sealing the transmission. Apply the gasket Seal to the transmission. (fig. C5074)



## WARNING

To prevent personal injury never make repairs to the hydraulic system while the engine is operating.

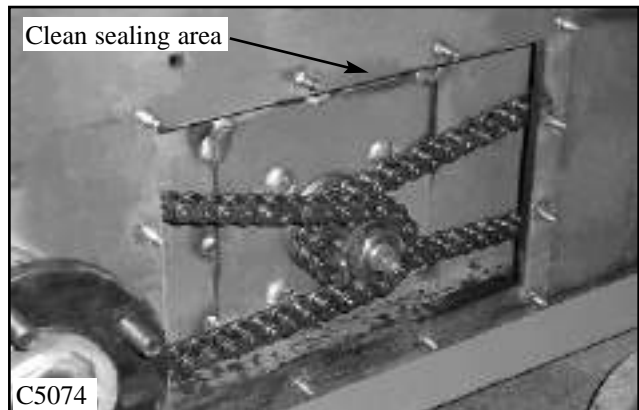
- 11 Install the inspection cover. When installing the nuts, do not over tighten. The mounting torque should not exceed 15 lbs ft. (15 Nm)
- 12 Add oil to the final drive housing unit it trickles out the upper check plug hole. This will require approximately 1.9 gal (7 litres) of 10w30 API SJ oil. (fig. C1888)
- 13 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.
- 14 Install the wheels and torque the nuts at 100 to 110 ft lbs. (136 to 149 Nm.)
- 15 Install shields and seat, let loader down to ground and test drive to check performance.



C5114



C5114a



C5074



C1658

2

# DRIVE MOTOR 2.12

## Parts Illustration

2

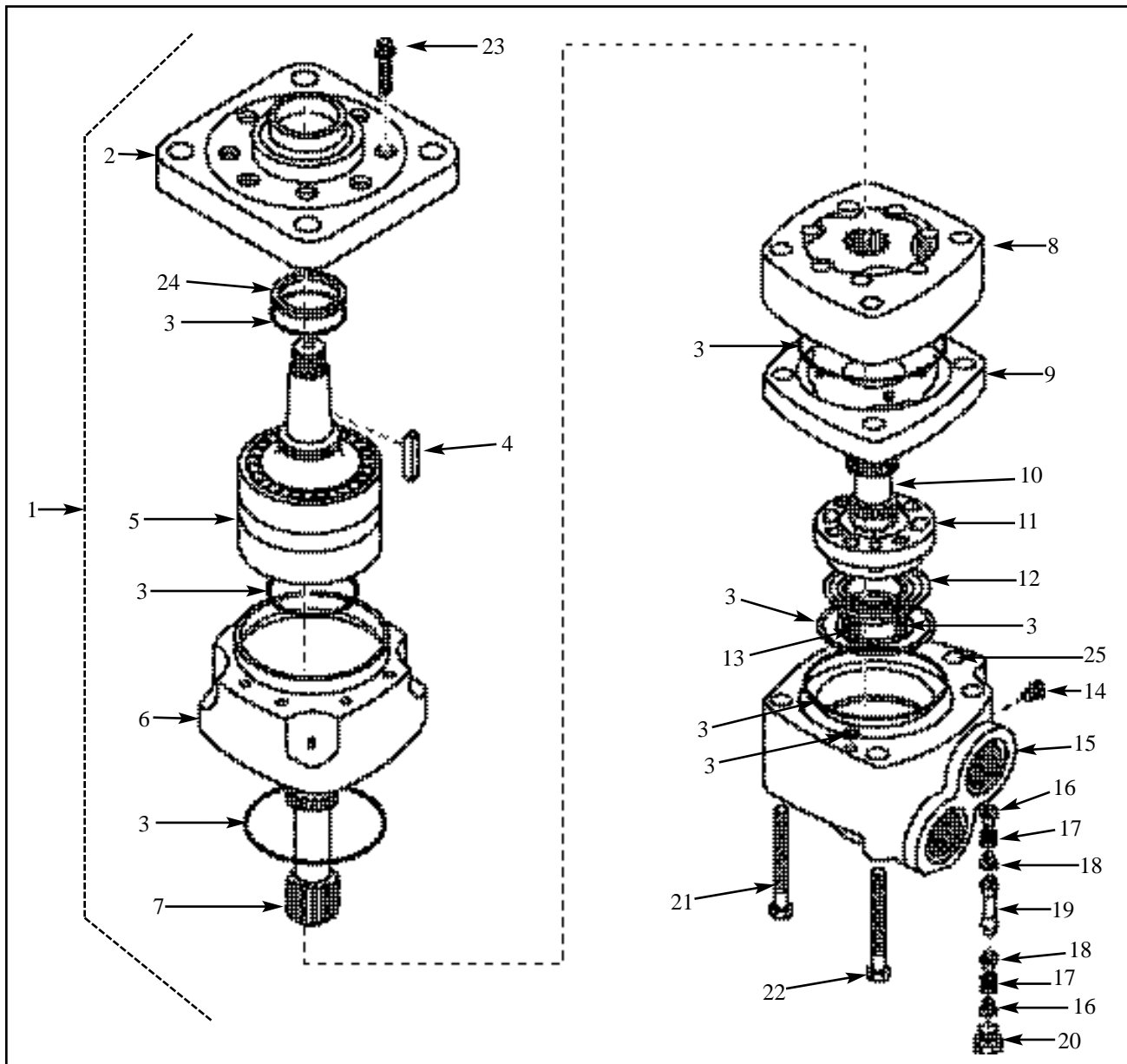


Fig. C1892 shows an exploded view of the hydraulic torque motor. Before disassembling the torque motor, clean the outer surface of all loose dirt and grease and dry with compressed air. Be sure all openings are plugged to prevent solvent or soap entering the torque motor.

C2786

**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.

# DRIVE MOTOR 2.12

## Parts Illustration

### Eaton 4000 series motor

1. Torque motor
2. Front retainer
3. Seal kit
4. Key
5. Shaft and bearing assembly
6. Bearing housing
7. Main drive shaft
8. Geroler sub assembly
9. Valve plate
10. Valve drive shaft
11. Valve
12. Balance ring
13. Spring
14. Plug
15. Valve housing
16. Sleeve
17. Spring
18. Poppet
19. Piston
20. Plug
21. Bolt
22. Bolt
23. Cap screw
24. Back-up ring
25. Plug

Fig. C2786 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.



### WARNING

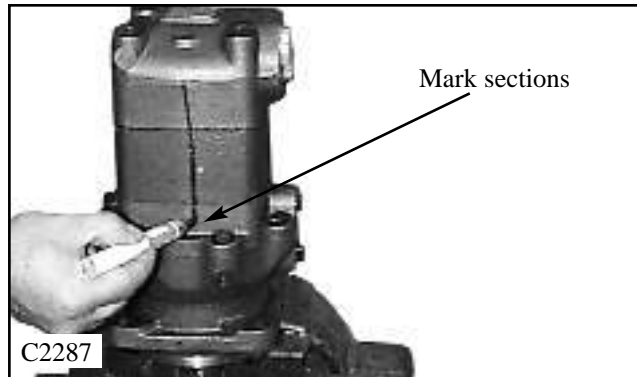
To avoid eye injury, use safety goggles when cleaning with compressed air.

2

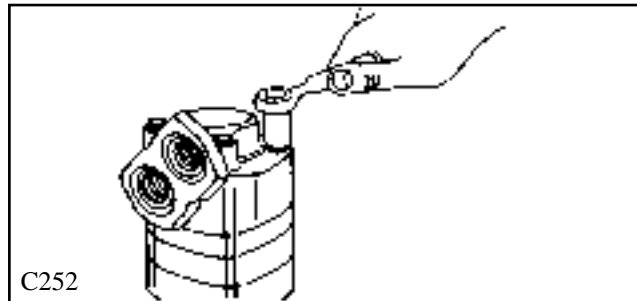
# DRIVE MOTOR 2.12

## Disassembly

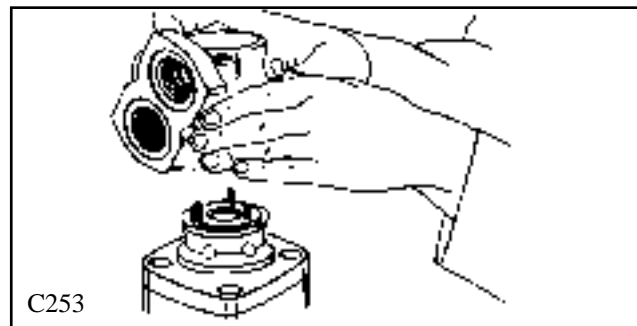
- 1 Place the drive motor in a vise with the output shaft facing down. Clamp the motor to the vise, holding it by the mounting flange area. Do not clamp the motor on the housing as excessive pressure will cause distortion.
- 2 Mark a line across the various sections of the drive motor to assist in reassembly.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



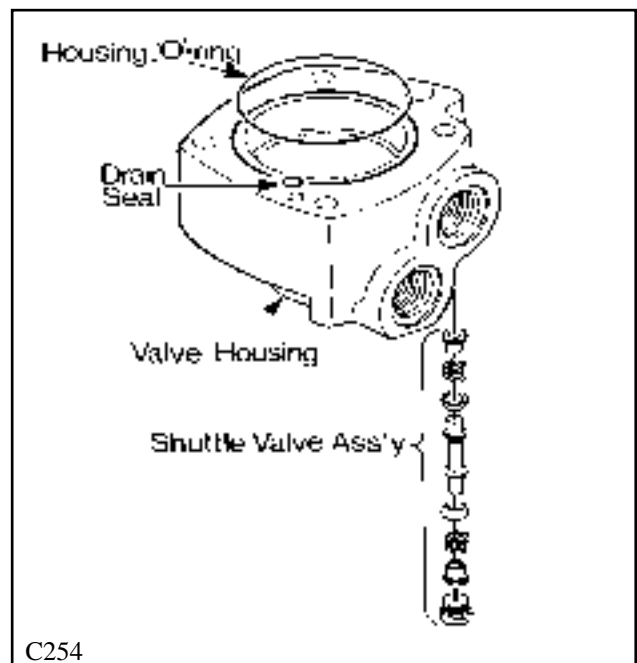
- 3 Remove the four bolts from the valve housing.( fig. C252)



- 4 Carefully remove valve housing straight up.. (fig. C253)



- 5 Remove the following from the valve housing assembly: (fig. C254)
  - 1-Housing seal
  - 1-Drain seal
  - 1-Shuttle Valve Assembly

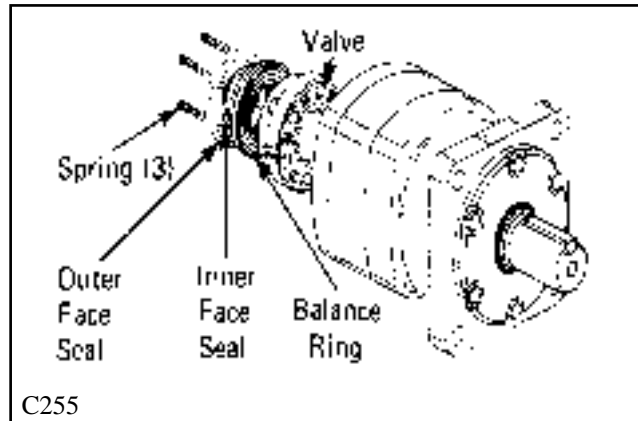


# DRIVE MOTOR 2.12

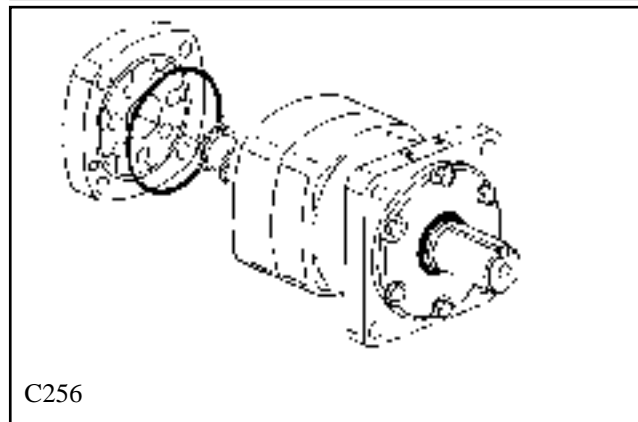
2

## Disassembly (cont'd)

6 Remove the two balance springs, balance ring and the valve (fig. C255). Remove the inner and outer face seal from the balance ring.

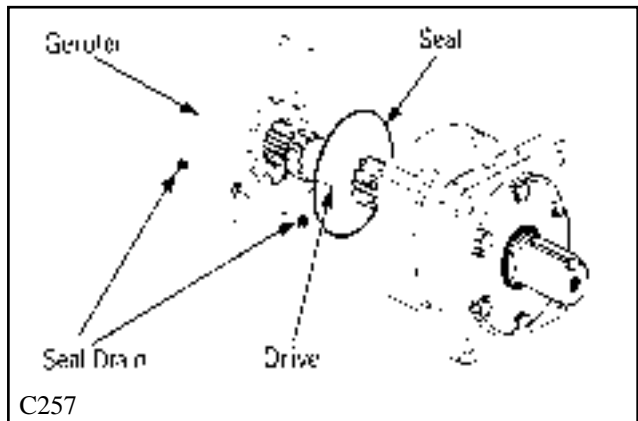


7 Remove the valve plate, seal and the valve drive (fig. C256).



8 remove the geroler and lock assembly (fig. C257). Keep the rollers and linner geroler in the outer geroler ring.

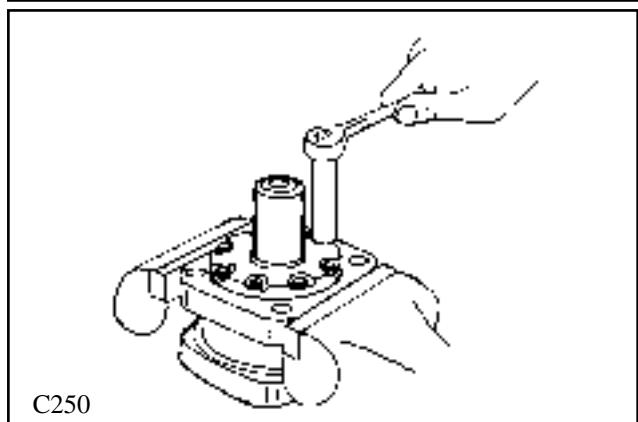
9 Remove the drain seals from each side of the geroler assembly. (fig. C257)



10 Remove the geroler drive and seal from the bearing housing (fig. C250)

11 Turn the bearing housing over in the vise and remove the cap screws (fig. C250) On re-assembly, torque the cap screws 21ft/lbs. (28.5 NM)

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

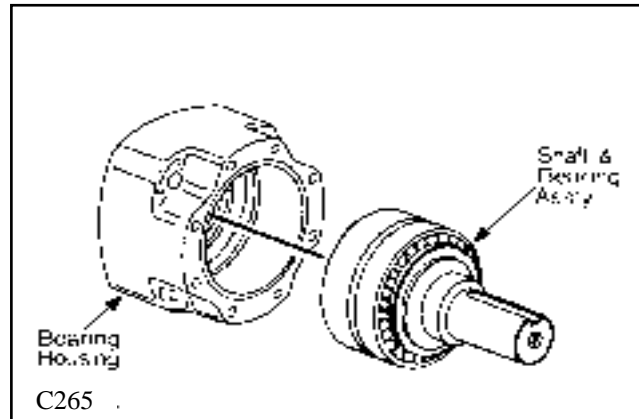


# DRIVE MOTOR 2.12

## Disassembly (cont'd)

13 Remove the shaft and bearing assembly from the housing (fig. C265). The shaft may have to be pressed out.

Remove the shaft face seal from the bore of the bearing housing. Be careful not to damage the bore of the bearing housing.

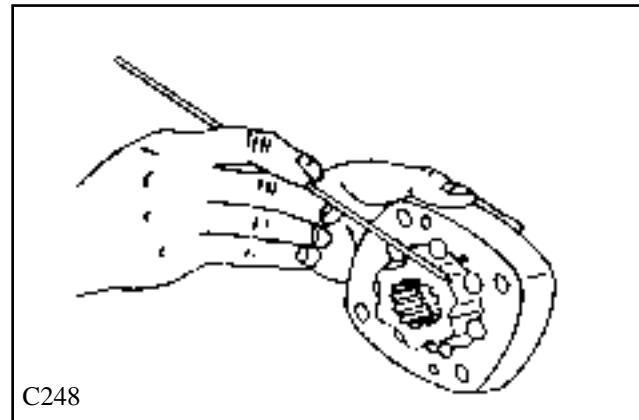


## Inspection

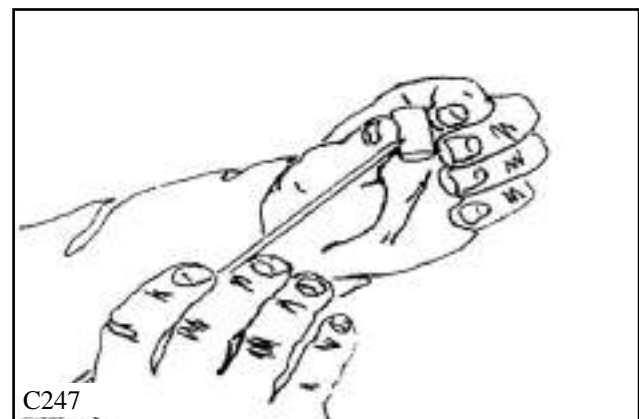
Clean all parts in a suitable solvent and blow dry with air. (Do not wipe dry.) Use caution when using compressed air to dry parts.

DO NOT use emery cloth or sand paper or attempt to file or grind motor parts. Replace any parts that are scratched or have burrs that could cause leakage.

- 1 Inspect the geroler star (fig. C248) for wear or damage.



- 2 Inspect the geroler rollers (fig. C247) for wear or damage.

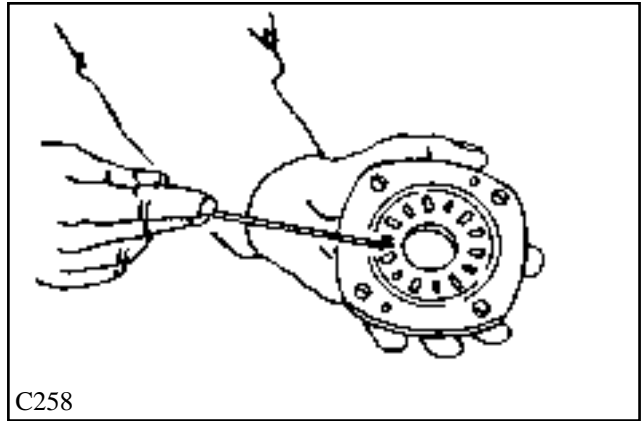




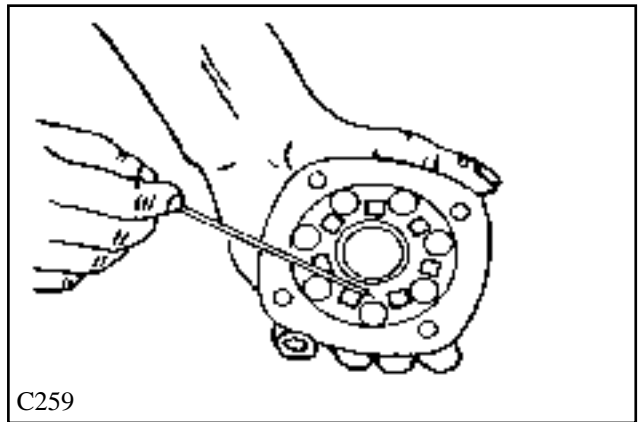
# DRIVE MOTOR 2.12

## Inspection (cont'd)

3 Inspect the valve plate (fig. C258 and fig. C259) for scratches or wear.

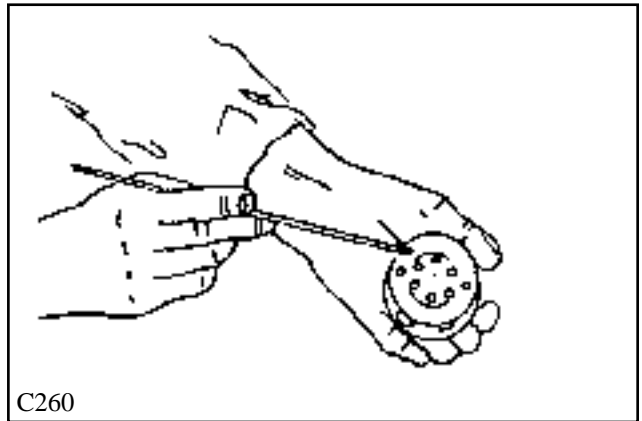


C258

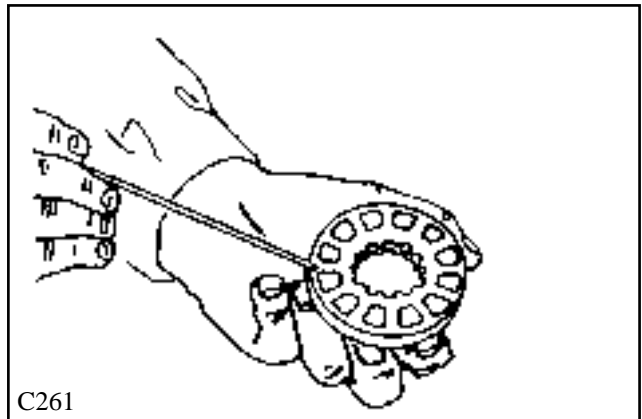


C259

4 Inspect the valve (fig. C260 and C261) for scratches or wear.



C260



C261

2

## DRIVE MOTOR 2.12

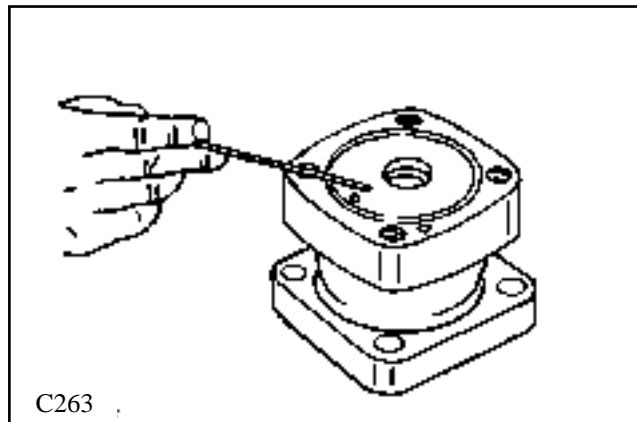
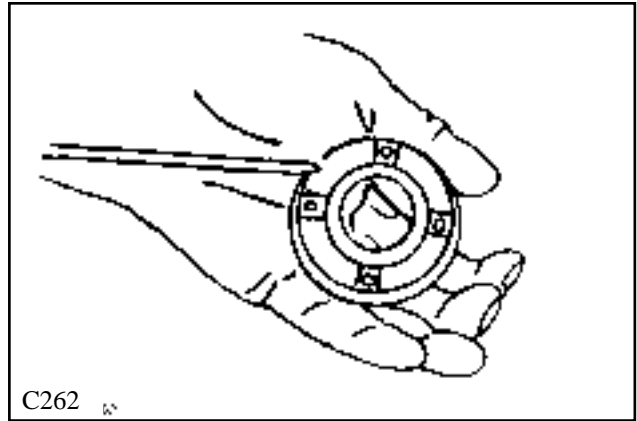
### Inspection (cont'd)

5 Inspect the balance plate for scratches or wear (fig. C262).

6 Inspect the splines on the valve drive and geroler drive for wear.

7 Inspect the keyway and chamfers on the output shaft for sharp edges or burrs which could damage the shaft seal.

8 Inspect the face of the bearing housing (fig. C263) for scratches or wear.



### Assembly

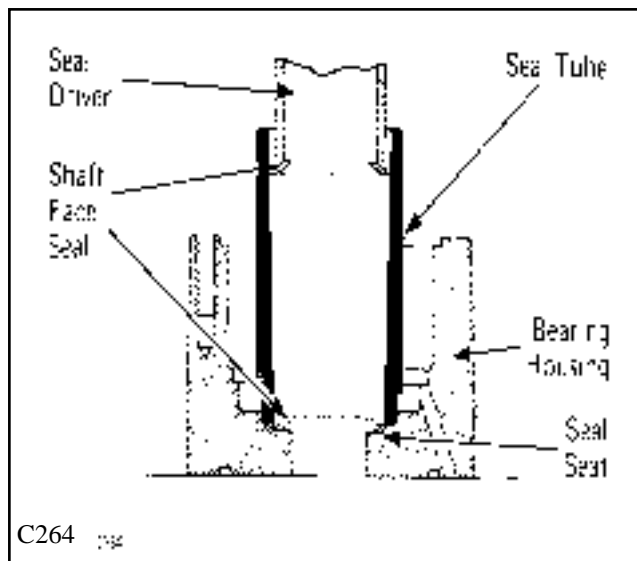
Install new seals when reassembling the torque motor.

Lubricate the seals a light grease such as petroleum jelly prior to assembly.

1 Install the shaft face seal in the bearing housing using a suitable tool to seat the seal (fig. C264)

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

Align the small I.D. end of the seal installation tube with the seal seat in the housing (fig. C264). Apply light grease to the seal. Install the seal in the bore of the installation tube as shown. Insert the seal driver in the tube and push the shaft seal with a rotating action until it is seated.



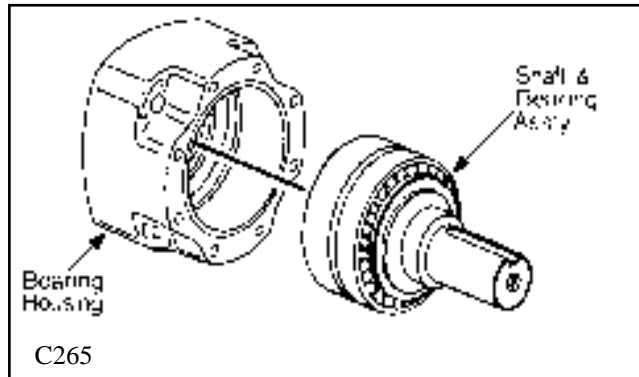
Check for correct installation. A damaged shaft face seal will cause loss of internal lubrication and result in parts wear.

# DRIVE MOTOR 2.12

## Assembly (cont'd)

2 Install the shaft and bearing assembly in the housing. (fig. C265)

A press may be required to install the shaft and bearing assembly. Do not damage the shaft face seal.

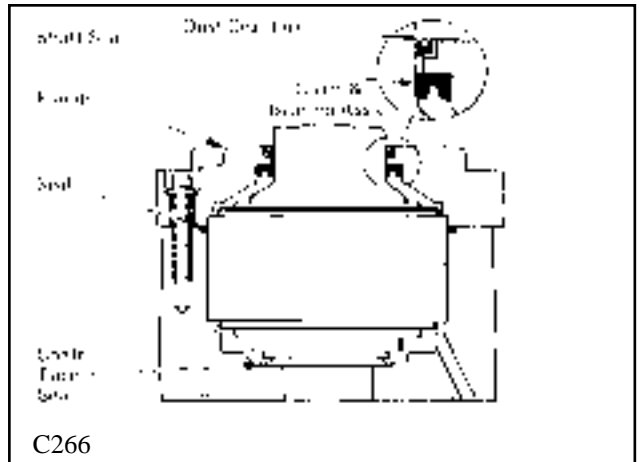


3 Apply light grease to the bearing housing seal (fig. C266). Install the seal in the outer groove of the housing.

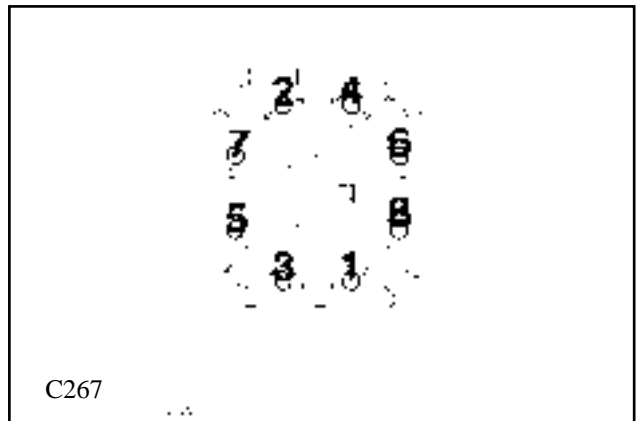
4 Install the dust seal on the retainer flange (fig. C266). The metal side of the dust seal must face upward.

5 Install the shaft seal in the retainer flange (fig. C266). The smooth or flat side of the shaft seal must face toward the retainer flange.

6 Apply light grease to the inside diameter of both the shaft and dust seal. Install the retainer flange over the shaft with a twisting motion. Be careful not to damage the shaft seal or external leakage will occur.

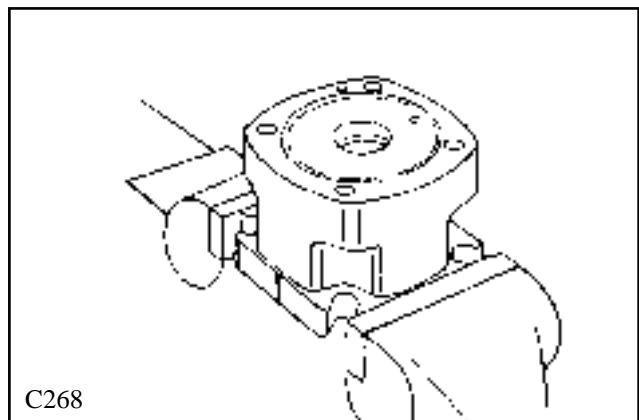


7 Lubricate the threads of the cap screws and install them finger tight. Torque the cap screws in sequence (fig. C267) to 21 ft/lbs (28.5 NM).



8 Reposition the housing assembly in the vise, shaft side down (fig. C268), clamping across the flange.

Pour a small amount of system oil inside the output shaft.



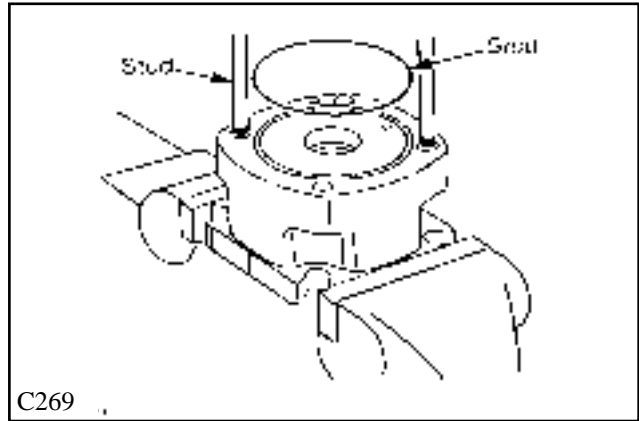
2

# DRIVE MOTOR 2.12

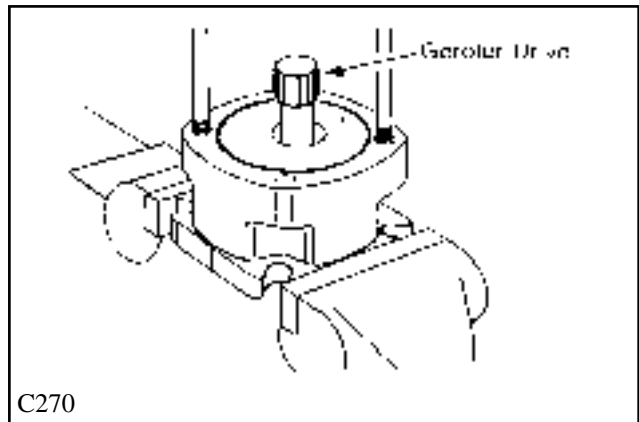
## Assembly (cont'd)

9 If available, install two studs in the housing (fig. C269) to assist in alignment of parts during assembly.

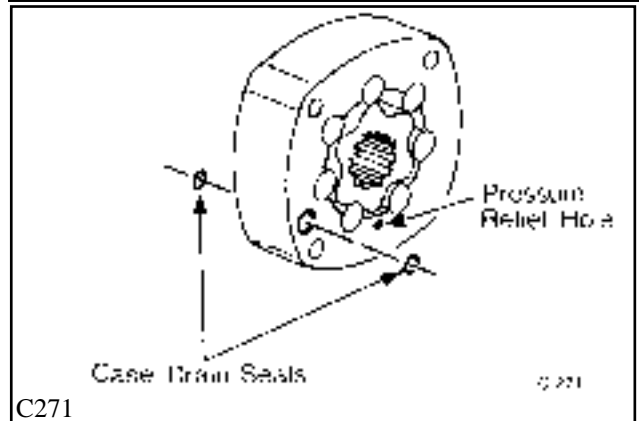
10 Apply a light film of light grease on the housing seal and install the seal in the housing. (fig. C269)



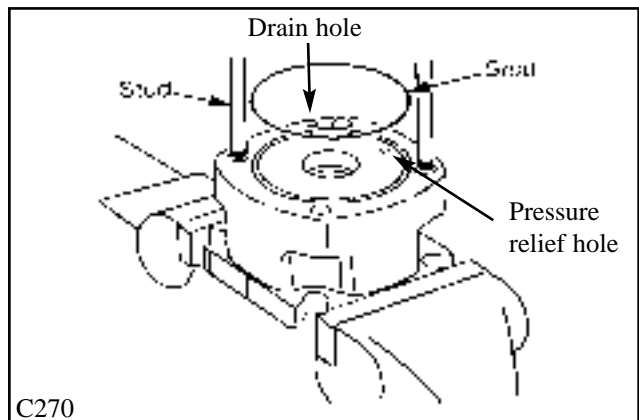
11 Install the geroler drive shaft in the housing (fig. C270). Install the longer splined end of the drive shaft in the housing.



12 Apply light grease to the two case drain seals and install the seals on both sides of the geroler assembly (fig. C271) in the drain hole grooves.



13 Align the case drain and pressure relief hole in the geroler assembly with the matching holes in the bearing housing (fig. C271, C270). Install the geroler assembly on the bearing housing.



# DRIVE MOTOR 2.12

2

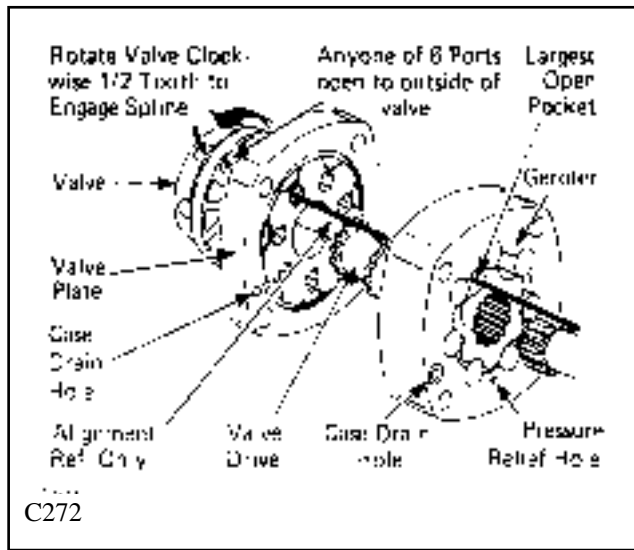
## TIMING STEP NO. 1

14 Locate the largest open pocket in the geroler (fig. C272). Mark the location of the pocket on the outside edge of the geroler.

15 Install the valve drive shaft in the geroler (fig. C272)

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

17 Align the case drain in the valve plate with the matching hole in the geroler. Install the valve plate, seal side towards the geroler, on the geroler assembly (fig. C272).



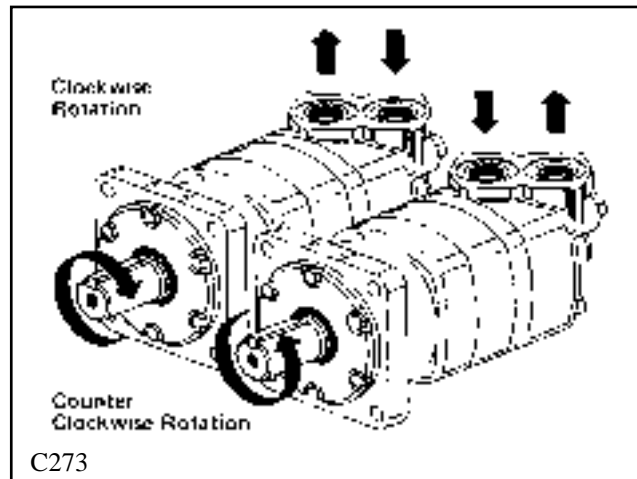
## TIMING STEP NO. 2

18 Locate the slot opening in the valve plate which is in line with the largest open pocket of the geroler (fig. C272)

## TIMING STEP NO. 3

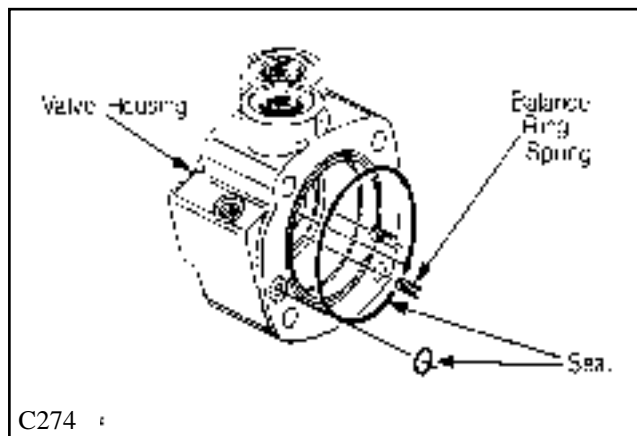
19 Install the valve on the valve plate. Locate any one of the side openings on the valve that goes through to the face of the valve (fig. C272). Line up this side opening with the largest open pocket of the geroler.

20 Rotate the valve clockwise 1/2 spline tooth to engage the spline teeth of the valve drive shaft. When correctly timed, the motor will rotate when pressurized as shown (fig. C273)



21 Apply clean grease to the two balancing ring assembly springs. Install the two springs in the holes located inside the bore of the valve housing (fig. C274).

22 Apply a light film of grease on the case drain seal and the valve housing seal. Install the seals in the grooves on the valve housing (fig. C274).



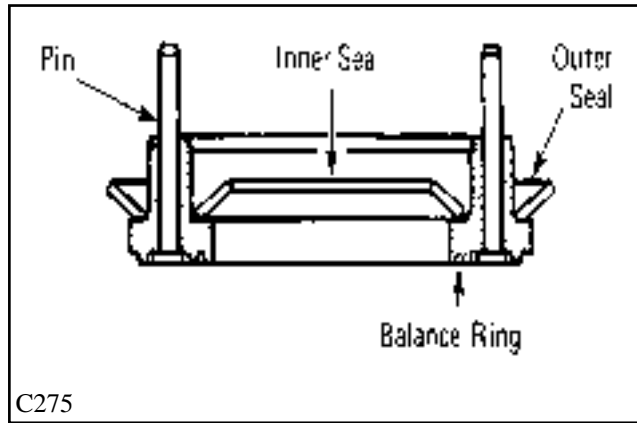
# DRIVE MOTOR 2.12

## Assembly cont'd.

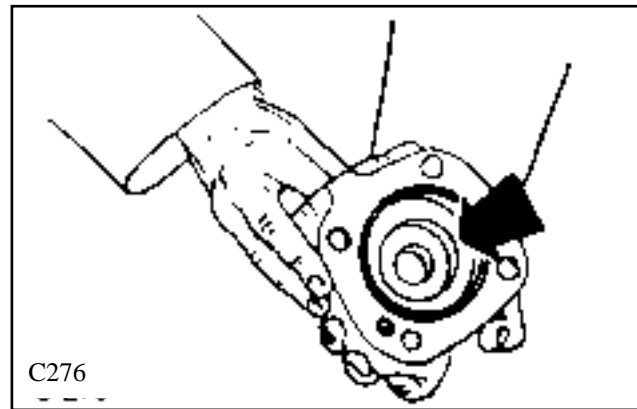
23 Apply light grease to both the outer and inner face seals. Install the face seals on the balance ring (fig. C275).

### IMPOTRTANT

The face seal must be installed as shown in figure C275 or the motor will not op0perate properly.



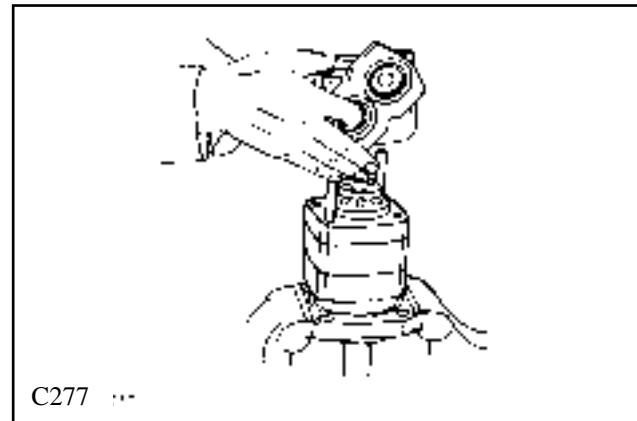
24 Insert your finger through the port of the valve housing (fig. C276). Apply pressure to the side of the balance ring to hold it in place while the valve housing is being installed.



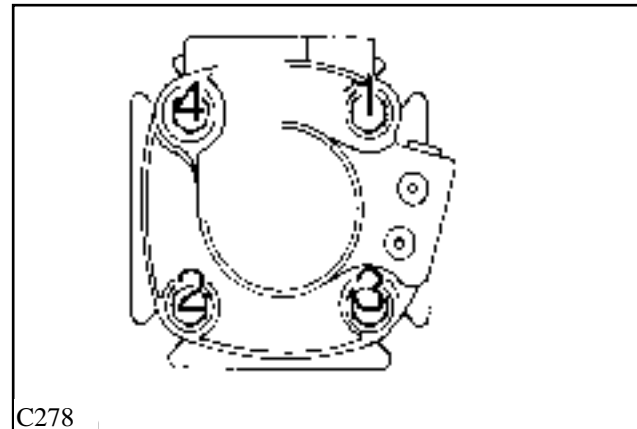
25 Align the case drain hole in the valve housing with the matching hole in the valve plate. Install the valve housing on the valve plate (fig. C277)

### IMPORTANT

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



26 Install the four bolts fingertight in the valve housing (fig. C278). Torque the bolts in the sequence shown to 50 ft/lbs. (67.8 nm)

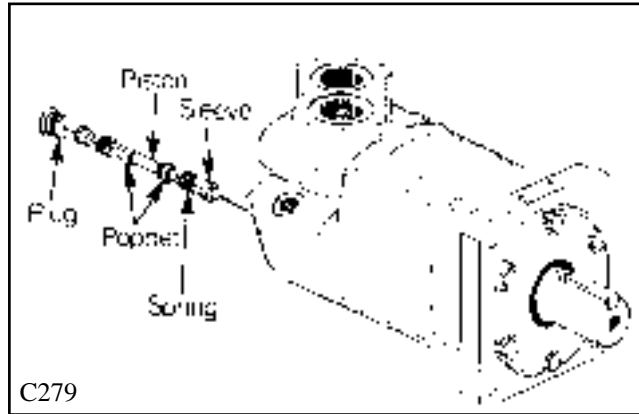


## DRIVE MOTOR 2.12

### Assembly (cont'd)

27 Install the shuttle valve assembly in the valve housing (fig. C279).

**For correct motor operation the shuttle valve must be assembled in the proper sequence.**



2

## TORQUE CHART 2.13

**NOTE: all torque specifications are in ft lbs. (Multiply by 1.36 = Nm)**

### Hydraulic Fittings

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





# 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. 3-8
Removal .....	pg. 3-9 ~ 10
Inspection .....	pg. 3-10
Installation .....	pg. 3-11 ~ 13
Stud Replacement .....	pg. 3-14
Park Brake	3.6
Operation .....	pg. 3-15
Brake Pin Replacement .....	pg. 3-15~3-16
Brake Cable Replacement .....	pg. 3-17
Trouble Shooting	3.7
Chart .....	pg. 3-17



# –SPECIFICATIONS & MAINTENANCE 3.1–

## Specifications

Chain Size.....	ANSI 60
Approved Chain Manufacturer .....	Tsubaki
Lubricating Oil .....	10W30 API Classification SJ
Oil Capacity (each).....	1.9 gal (7 Liters)
Torque Specifications:	
Motor Sprocket Nut.....	240 ft lbs (325 Nm)
Wheel Nuts .....	100 - 110 ft lbs (135 - 149 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. C5014)  
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 small inspection cover located to the rear of the steering lever. (fig. C5017)
- 3 Remove the oil level check plug as outlined above. (fig. C5014)
- 4 Remove the vented filler plug. (fig. C5077)
- 5 Add 10W30 API classification SJ oil until it begins to flow out the upper check hole. Total final drive housing capacity per side is 1.9 gal (7 liters).
- 6 Replace all plugs.

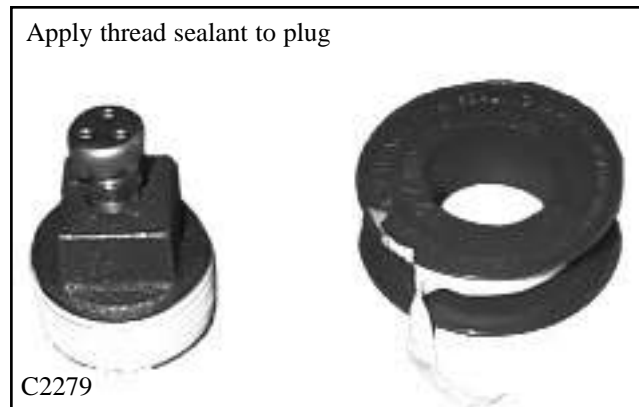
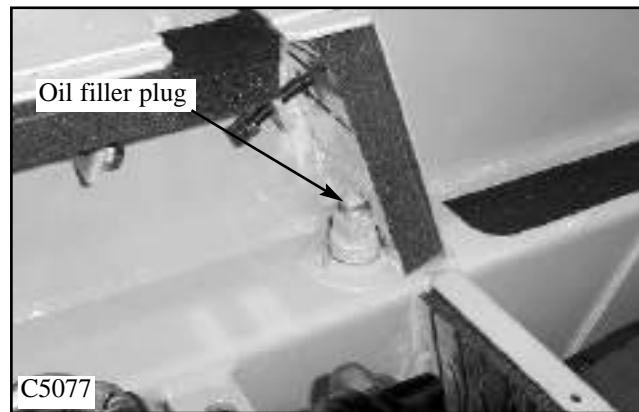
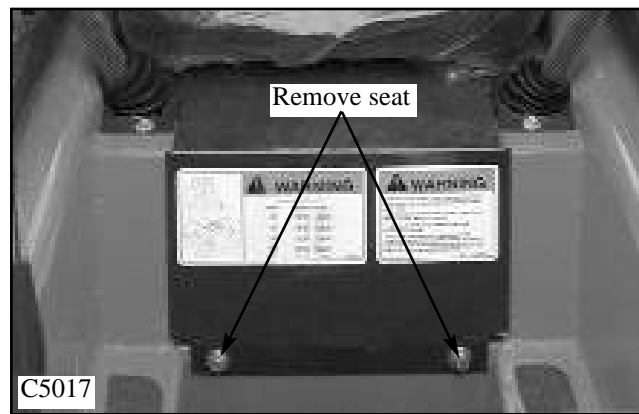
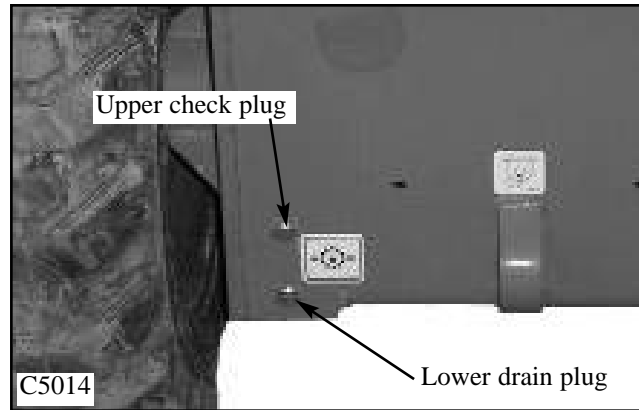
### IMPORTANT

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. C5014) Be prepared to contain 1.9 gal (7 liters) of oil per side.
- 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 SJ oil.



# 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 must be set to 1/4 to 3/8 inches (6 to 9mm) free play.

1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine. Using properly rated jack and stands, raise loader until wheels are clear of the ground.

2 Remove the inspection cover located between the wheels. (fig. C5078)

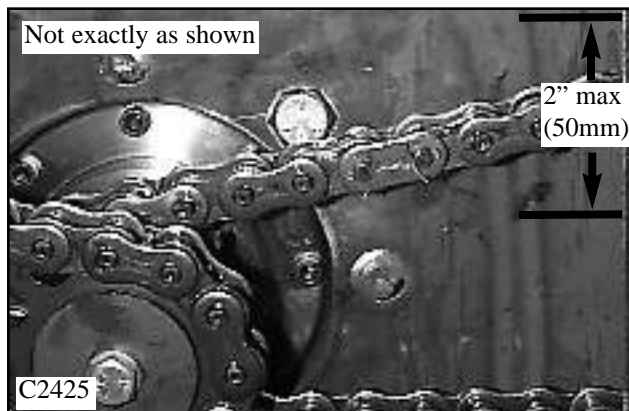
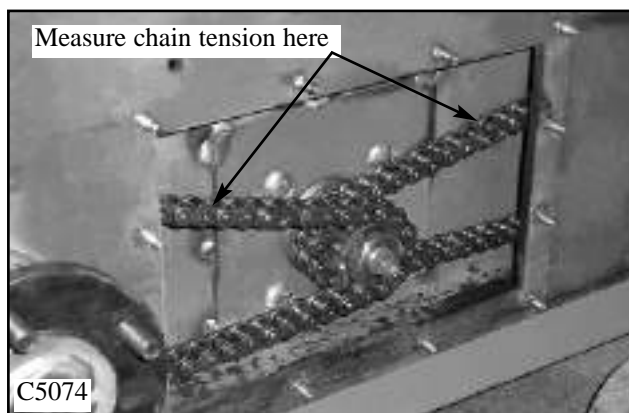
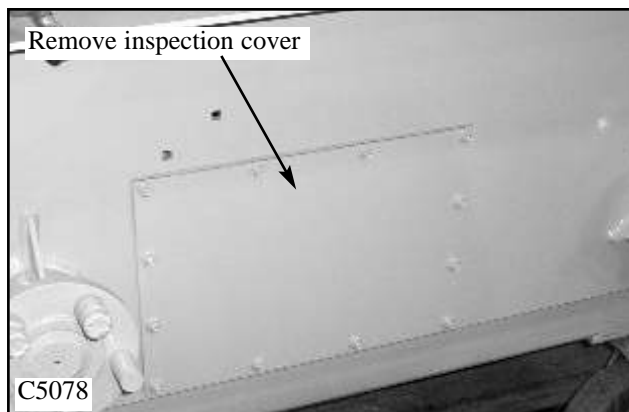
3 Check the chain tension at the points shown. (Fig. C5074)

5 Chains should be measured visually with a tape measure. (Fig.C5061) Push down on chain with one finger, note tape measure reading at top of chain. Lift up on chain with one finger, note tape measure reading at top of chain. The difference is the amount of slack in the chain.

This should not exceed 2 in. (50mm) (Fig.C2425)  
Measure all 4 chains ( 2 in each side).

6 Install gasket seal, cover and nuts. Do not over-tighten nuts, 15 ft/lb maximum.

7 Re-install wheels and nuts. Torque nuts to 100-110ft/lb. Lower loader to the ground.

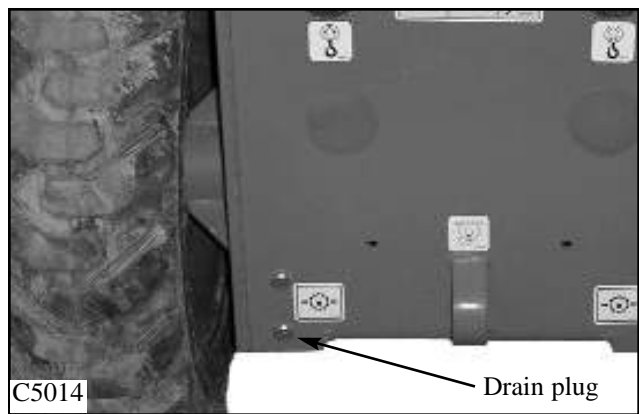
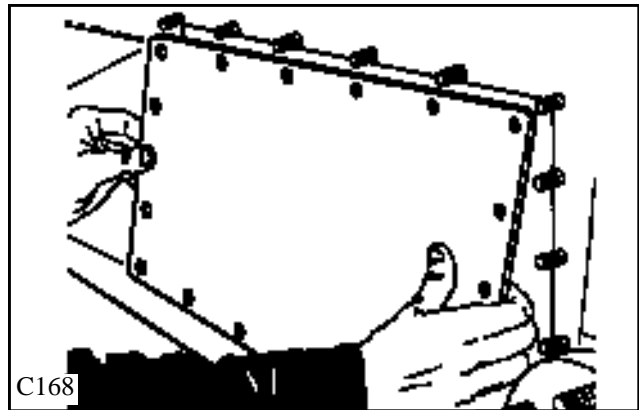


3

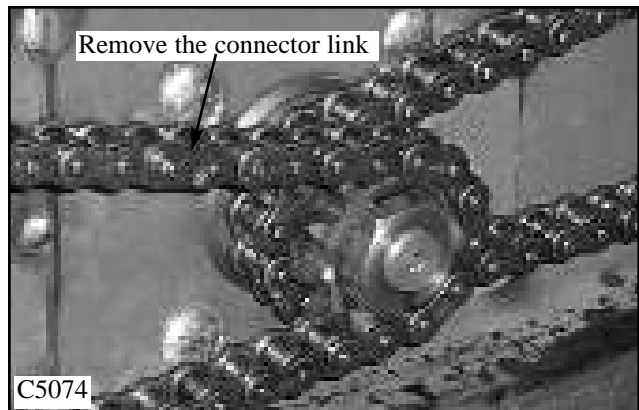
## DRIVE CHAIN 3.3

### Chain Removal

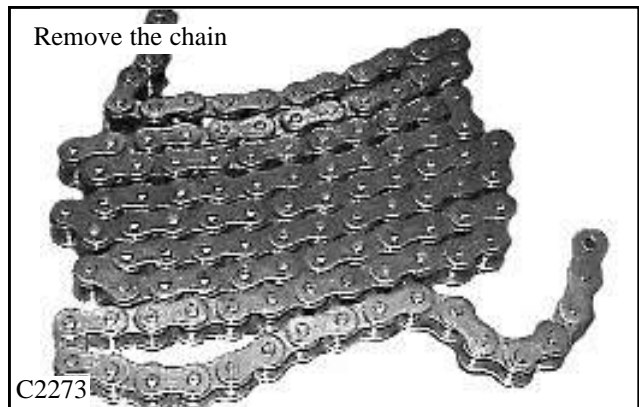
- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Block the loader securely with all 4 wheels clear of the ground.
- 3 Remove the wheels from the side of the loader the chain is to be removed.
- 4 Clean the excess dirt from the final drive drain plug area located in the front of the loader. Clean the excess dirt from 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 page 3-3.
- 6 Remove the final drive inspection cover. (fig. C168)
- 7 Rotate the chain, if necessary, to locate the master connecting link by starting the engine and engaging the steering control. Be sure the loader is securely raised clear of the ground.



- 9 Remove the cotter pins from the master connecting link and remove the connecting link. (fig. C5074) The connecting link is a press fit type and will need to be supported as you drive the link pins through the link plate.



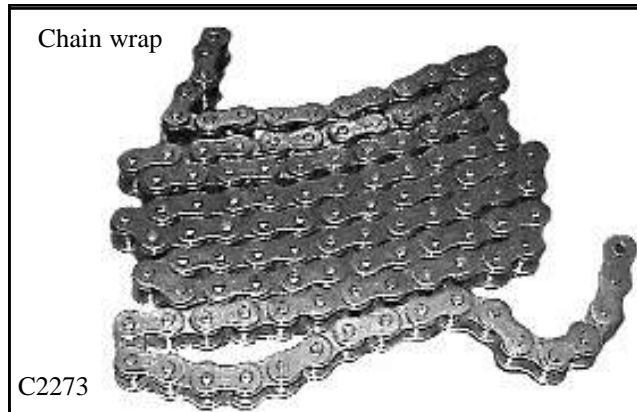
- 10 Remove the chain from the housing by turning the axles by hand and pulling the slack chain out the inspection cover area. (fig. C2273) Hold the chain up off the drive sprocket to allow the chain to rotate freely.



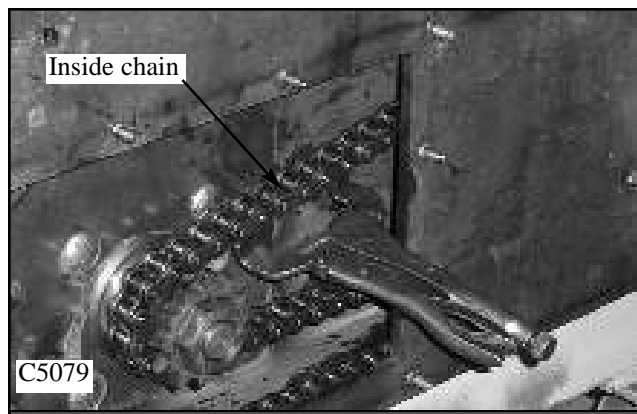
## DRIVE CHAIN 3.3

### Chain Installation

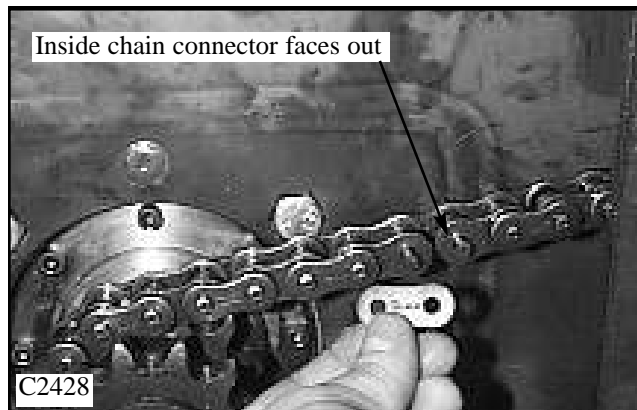
- 1 Wrap the chain in a “Z” pattern as shown in fig. C2273.
- 2 Install the wrapped chain into the final drive housing.



- 3 Place one end of the chain over the top of the axle sprocket. Rotate the axle and bring the chain along the bottom of the final drive housing so that the upper end of the chain is halfway between the drive sprocket and the edge of the transmission opening.



- 4 Wrap the chain over the drive sprocket. Rotate the axle until the ends of the chain meet together. (fig. C5079)



- 5 Install a new connecting link. When installing a front chain, place the connecting link into the chain so the cotter pins face the inspection cover hole (fig. C2428). When installing a rear chain, place the connecting link so that the pins face inward. (fig. C2429) Bend the ends of the cotter pins at least 90 ° apart.

- 6 Replace the inspection cover. Do not over tighten the inspection cover nuts. 15 ft lbs maximum. (20.3 Nm)

- 7 Replace the wheels and torque the wheel nuts to 100 to 110 ft lbs. (136 to 149 Nm).

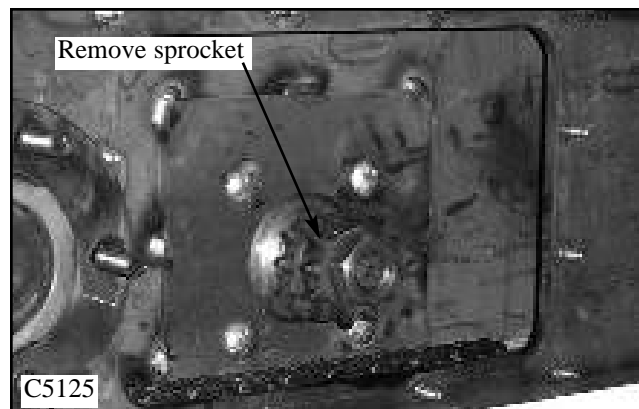
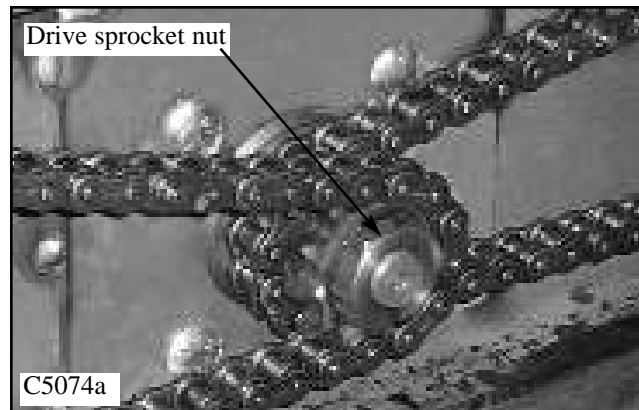
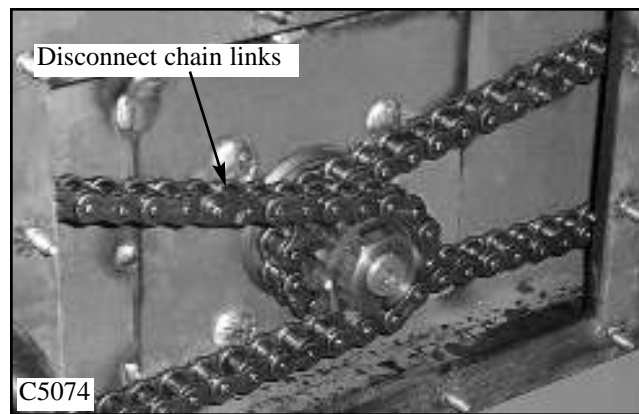
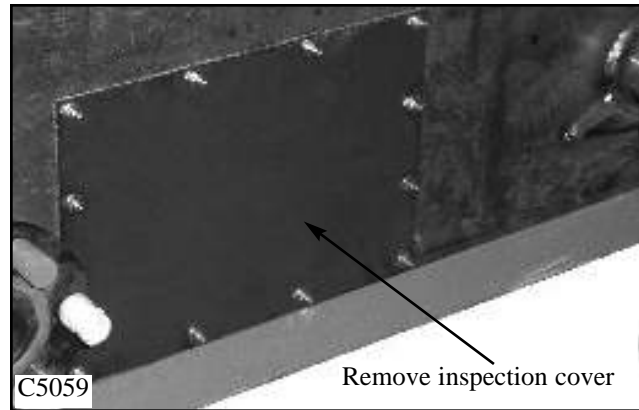


# DRIVE MOTOR SPROCKET 3.4

## Replacement

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

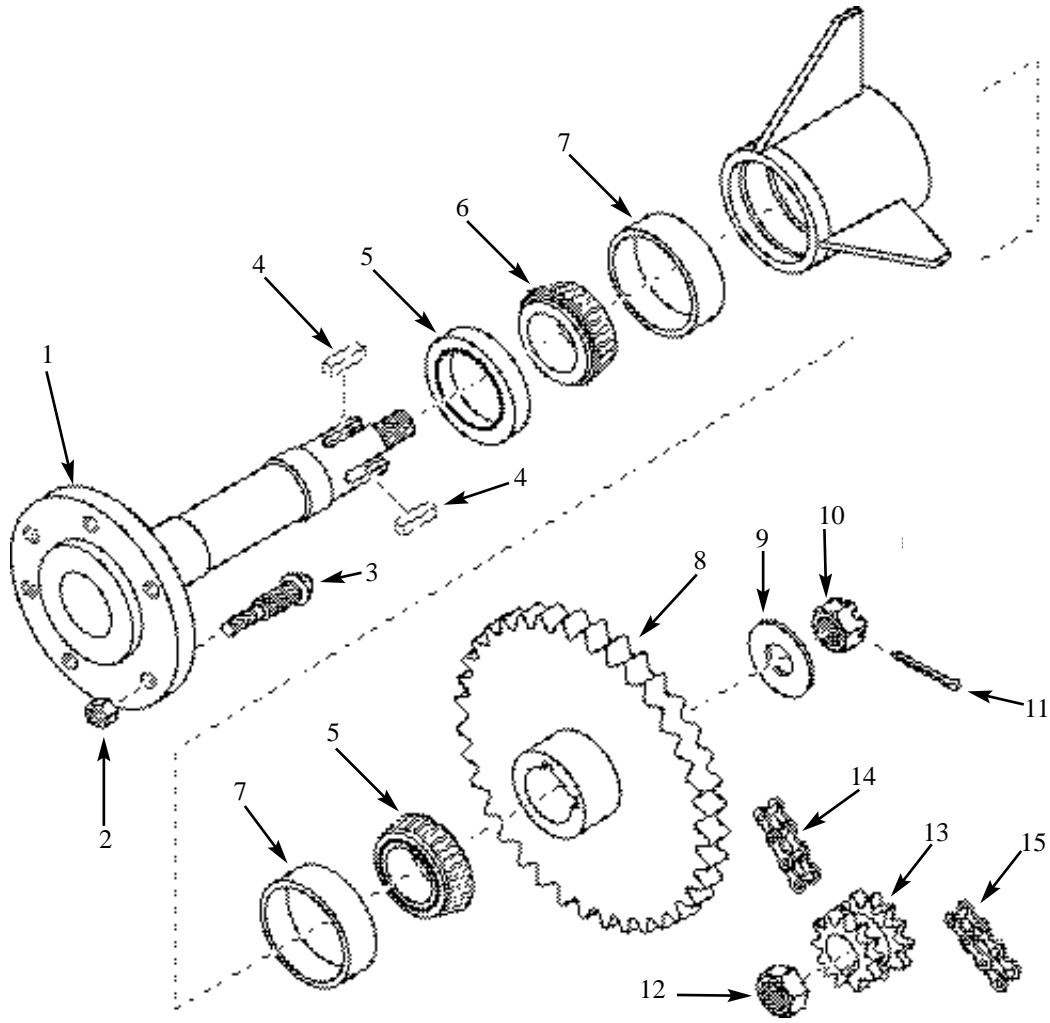
- 1 Place the loader on a level surface, engage the parking brake and shut off the engine.
- 2 Raise the loader securely from the ground and remove the wheels on the side to be worked on.
- 3 Remove the inspection cover located between the axle assemblies. (fig. C5059)
- 4 Disconnect the drive chains. Section 3-3, page 3-5
- 5 Remove the nut retaining the drive sprocket to the drive motor. (fig. C5074a)
- 6 Using a puller, remove the sprocket from the drive motor shaft. (fig. C5125)
- 7 Replace the drive sprocket in the reverse order above. Apply Loctite 242 (blue) to the drive sprocket bolt and torque the bolt to 275 ft lbs (373 Nm)



3

# AXLE ASSEMBLY 3.5

Axle Assembly 85



- |           |                       |                    |
|-----------|-----------------------|--------------------|
| 1 Axle    | 7 Bearing             | 13. Drive sprocket |
| 2 Nut     | 8 Sprocket            | 14. Chain          |
| 3 Stud    | 9 Axle spacer         | 15. Chain          |
| 4 Key     | 10 Nut                |                    |
| 5 Seal    | 11 Cotter pin         |                    |
| 6 Bearing | 12 Drive sprocket nut |                    |

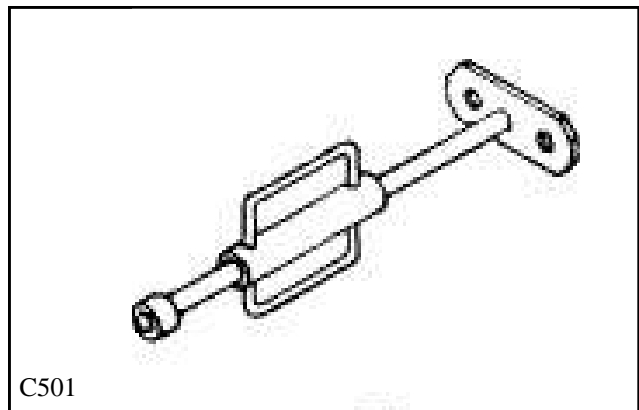
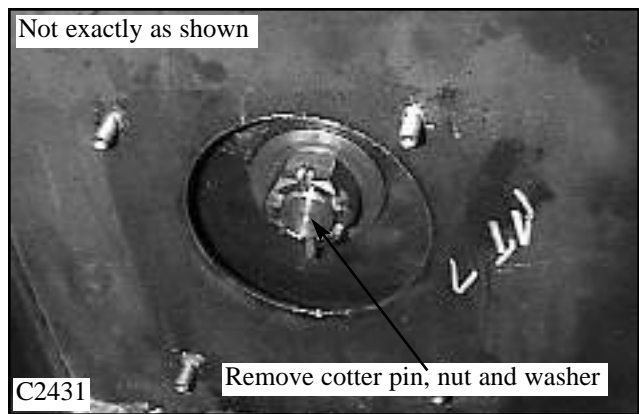
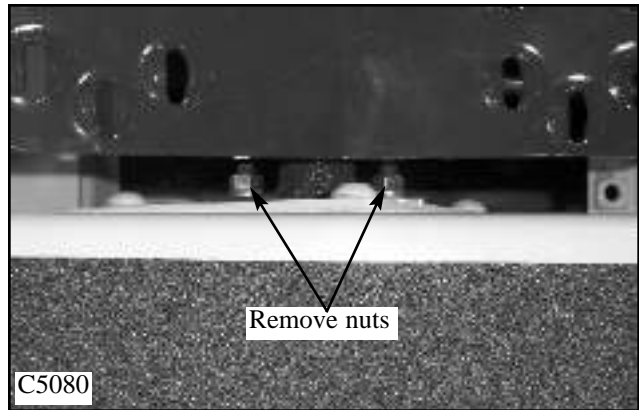
C5126



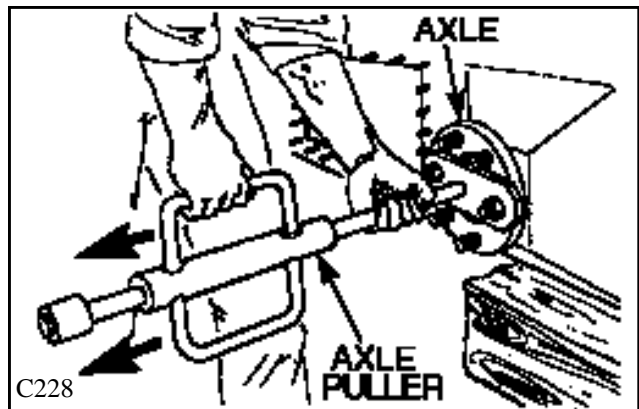
# AXLE ASSEMBLY 3.5

## 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. Lower the restraint bar to retract brake pins from rear axle sprockets.
- 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 drain plug area located in the front of the loader. Clean the excess dirt from 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 page 3-3.
- 6 Remove the final drive inspection cover located between the 2 axles.
- 7 Remove the drive chain from the final drive housing. Refer to Section 3.3 page 3-5.
- 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. C5080)
- 10 **REAR AXLE:** Remove the inner axle cover plate from the final drive housing.
  
- 11 The axle may be held stationary by inserting a bar between the wheel studs.



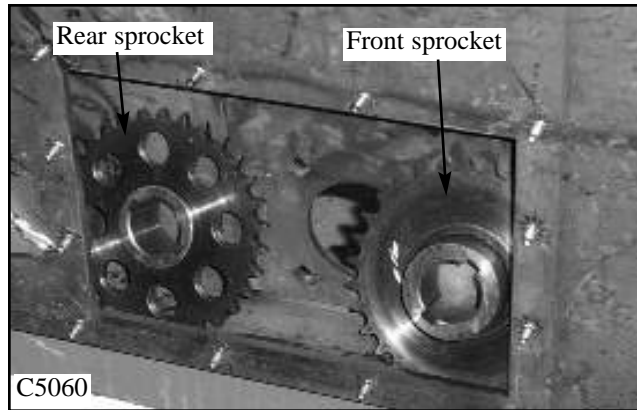
- 12 Remove the castle nut and axle washers.



3

## AXLE ASSEMBLY 3.5

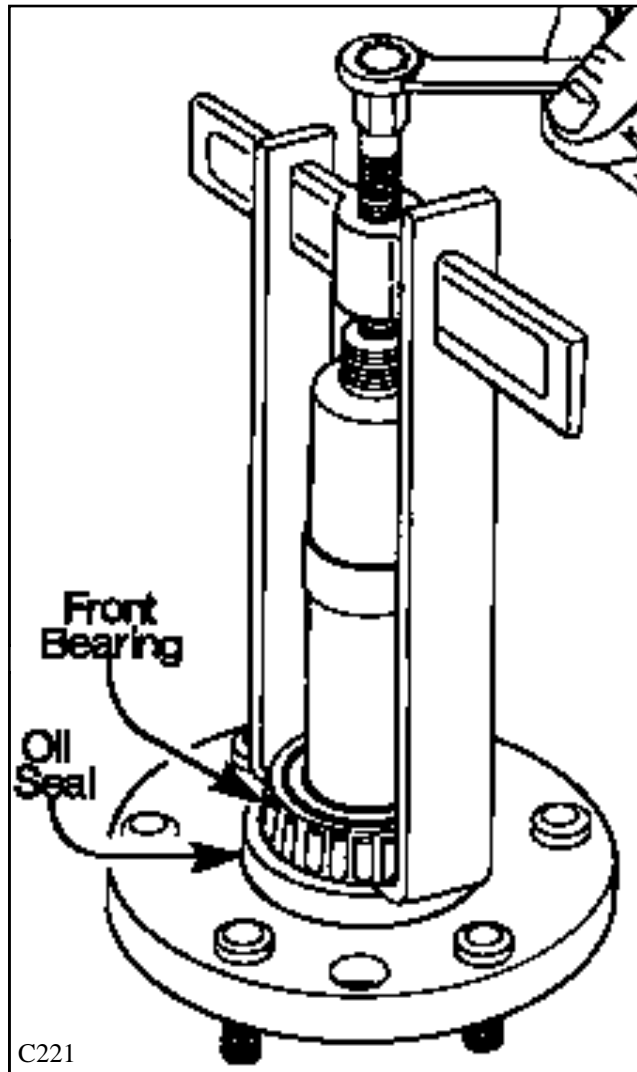
- 13 Attach a special axle puller tool, Thomas P/N 955283, to the axle flange wheel studs using the wheel nuts that are on the loader. (fig. C501)
- 14 Using the slide hammer action of the special puller, remove the axle. The rear bearing and axle sprocket will remain in the final drive housing.
- 15 Remove the axle sprocket and bearing from the final drive housing through the inspection cover area.



- 16 Using a bearing puller, remove the bearing still pressed in place on the axle. (fig. C221)
- 17 Remove and discard the axle oil seal.

### Inspection

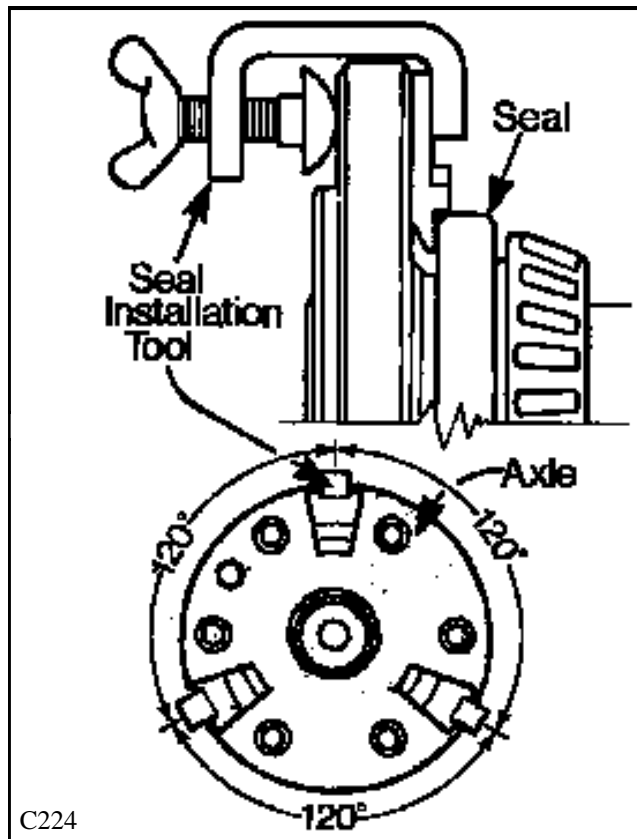
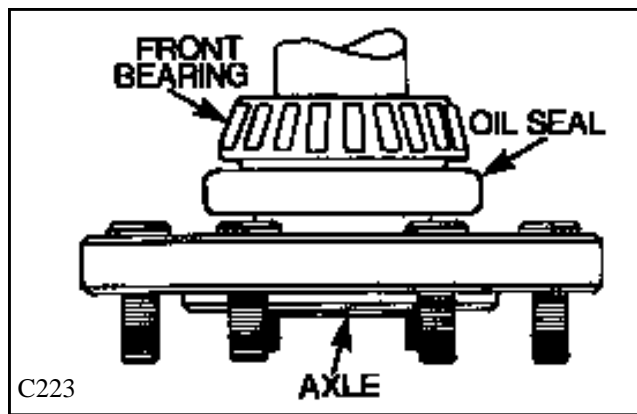
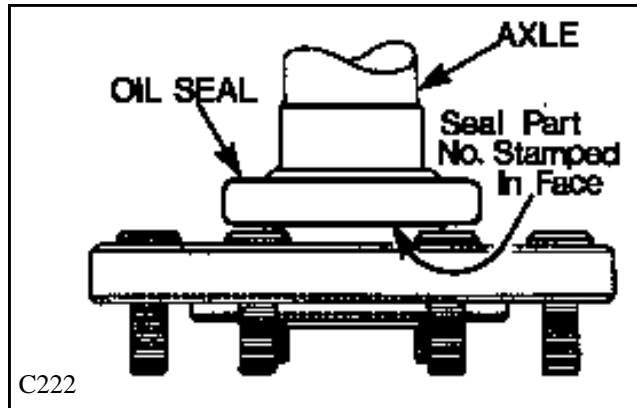
- 1 Inspect the seal surface area for scaring, pitting or nicks. Minor scratches may be removed using fine emery cloth. Replace the axle if worn excessively.
- 2 Inspect the axle threads for damage. Replace axle if the threads are non serviceable.
- 3 Inspect the axle keys for wear. Replace as required.
- 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 replacement races will aid 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, Thomas P/N 955281, Equally spaced around the axle flange, behind the seal as shown in (fig. C4275). (approximately 120° increments). These special tools must be used to properly locate the seal into the final drive housing.

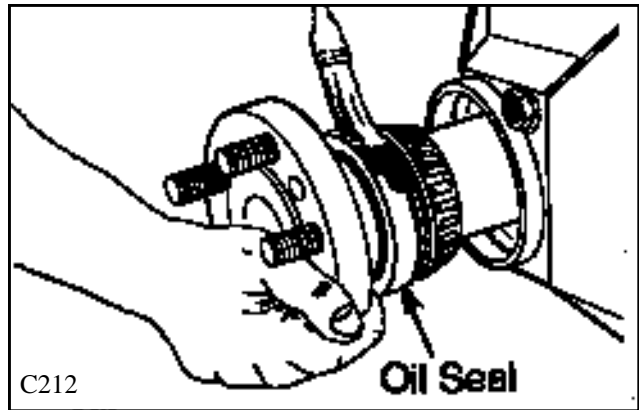


3

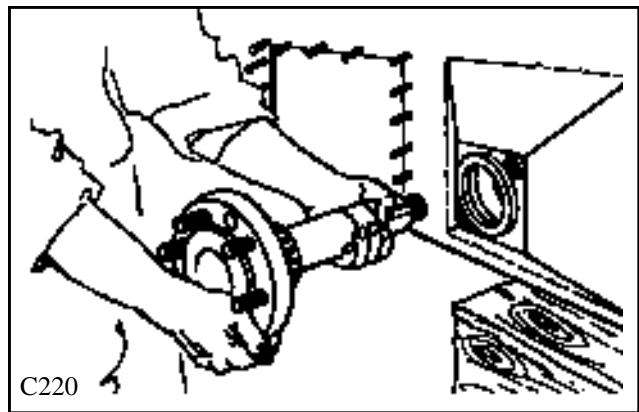
# AXLE ASSEMBLY 3.5

9 Place the axle sprocket into the final drive housing with the hub facing toward the bearing race area. (outside)

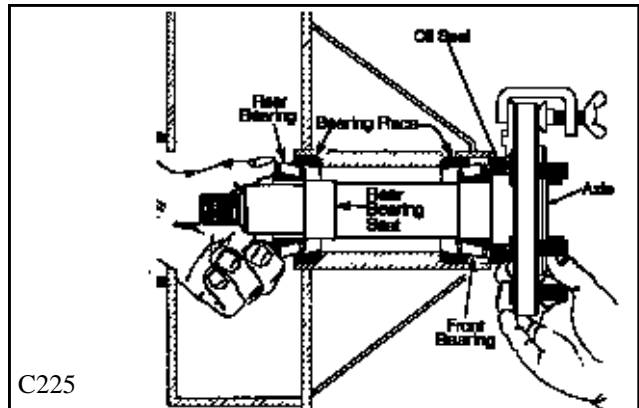
10 Apply gasket sealant to the outer edge of the bearing housing. (fig. C212) Take care, make sure none gets on the bearing surface.



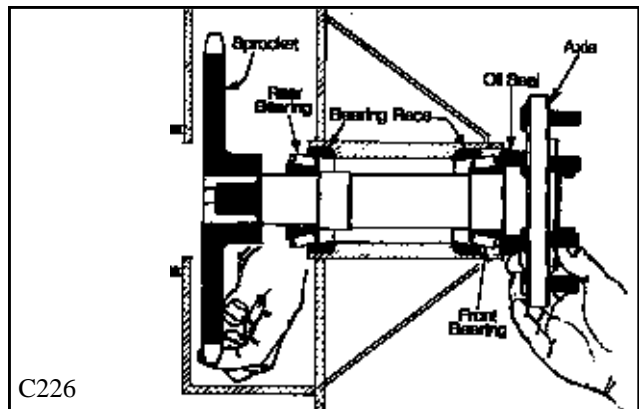
11 Guide the axle into the final drive housing. (fig. C220)



11 Place the rear (inside) axle bearing onto the axle. (fig C225)



12 Start the axle into the drive sprocket. (fig C3814)



3

## AXLE ASSEMBLY 3.5

13 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.

14 When the castle nut will not turn on any further tap the face of the flange with a hammer to ensure the seal and bearing has seated into place.

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

16 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.

17 Install the axle washer and castle nut. (fig. 3818) Tighten the castle nut to remove all axle bearing end play. (Zero pre-load) Continue tightening until the split pin hole in the axle will align with the castle nut.

18 Install the split pin. (fig. C3819) Bend the end of the split pin straight back against the axle washer.

19 When installing rear axle, verify proper adjustment of brake pins. Refer to section page .

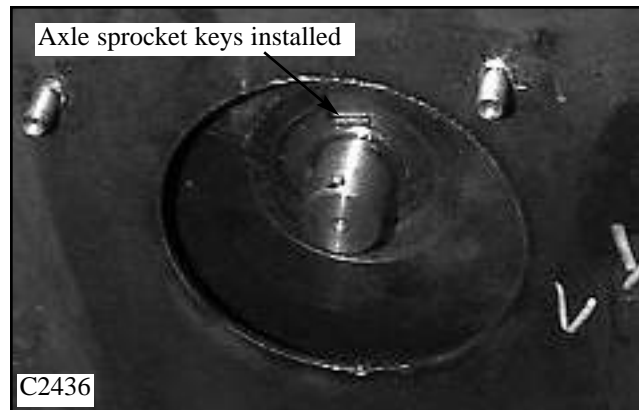
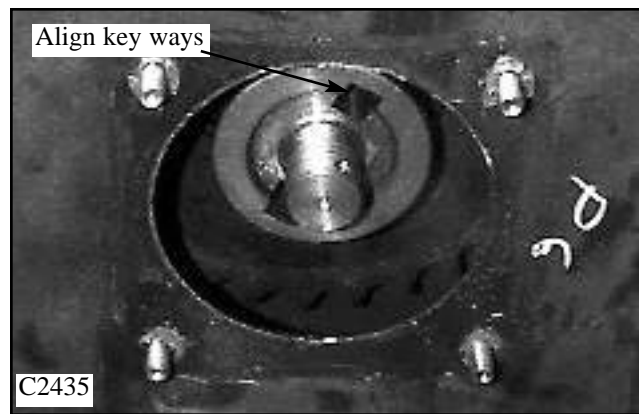
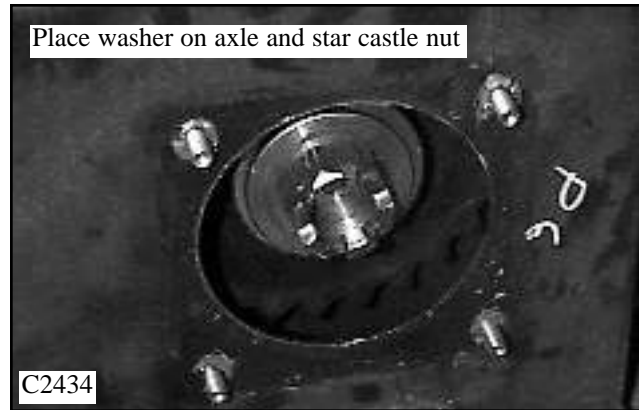
20 Clean the seal surface and install the axle cover using a gasket to seal the matting surfaces. Do not over tighten the retaining nuts. 15 ft lbs maximum. (20 Nm)

21 Install the drive chain. Refer to Section 3.3 page 3-7

22 Fill the final drive housing to the correct level using 10W30 API classification SJ oil. Refer to Section 3.2 page 3-3 for procedure.

23 Install the inspection cover using a gasket to seal the matting surfaces. Do not over tighten the retaining nuts. 15 ft lbs maximum. (20 Nm)

24 Install the wheels. Torque the wheel nuts to 100 to 110 ft lbs. (135 to 149 Nm).



3

# AXLE ASSEMBLY 3.5

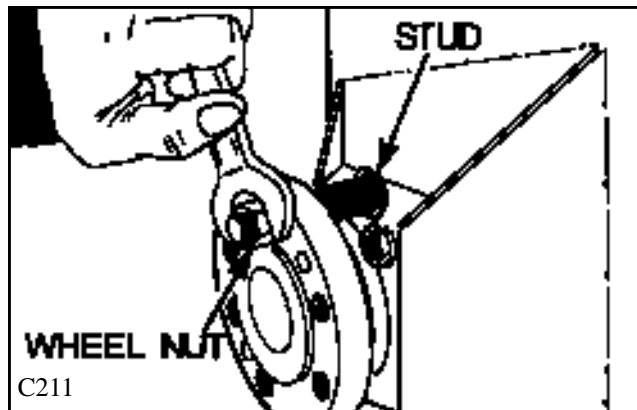
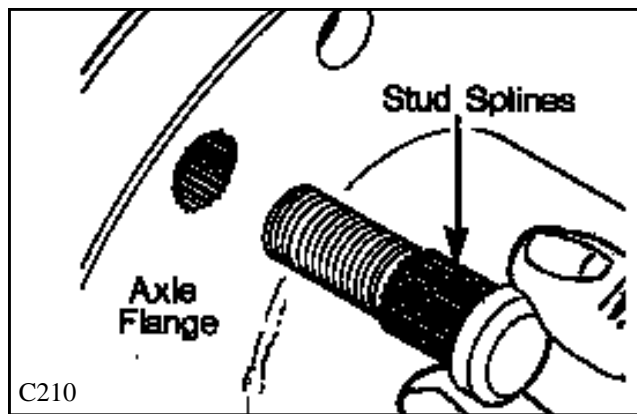
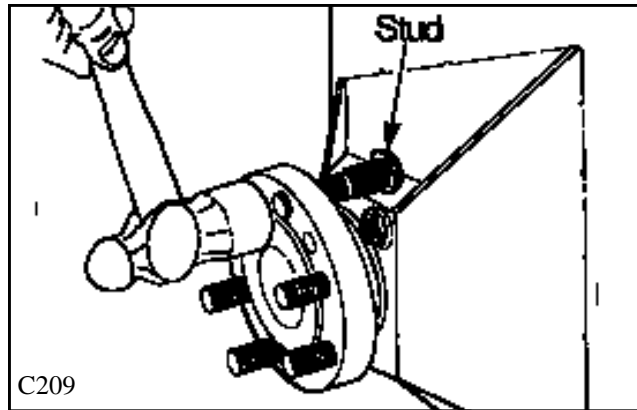
## Axle Stud Replacement

- 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 ft lbs. (135 to 149 Nm)

### IMPORTANT

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



# PARKING BRAKE 3.6

## General Information

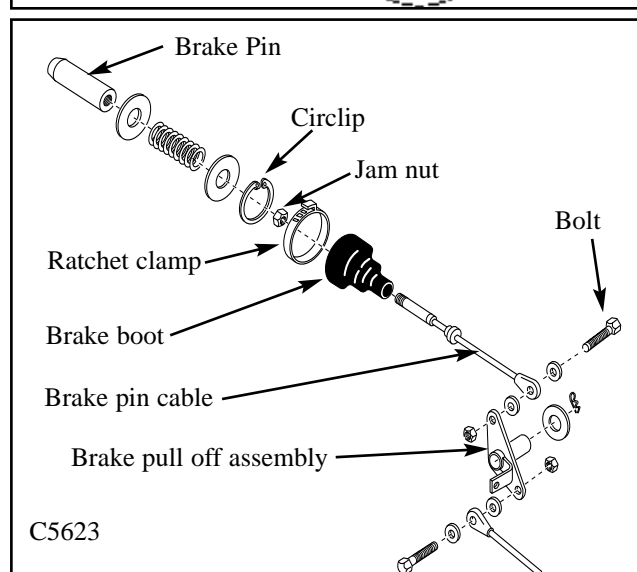
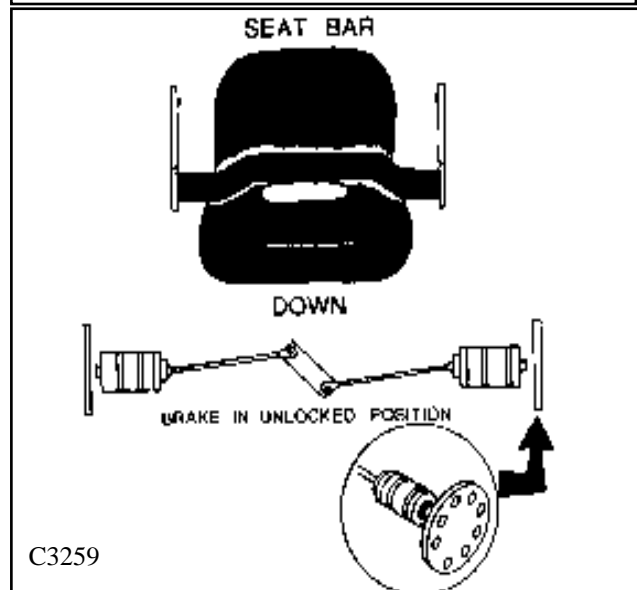
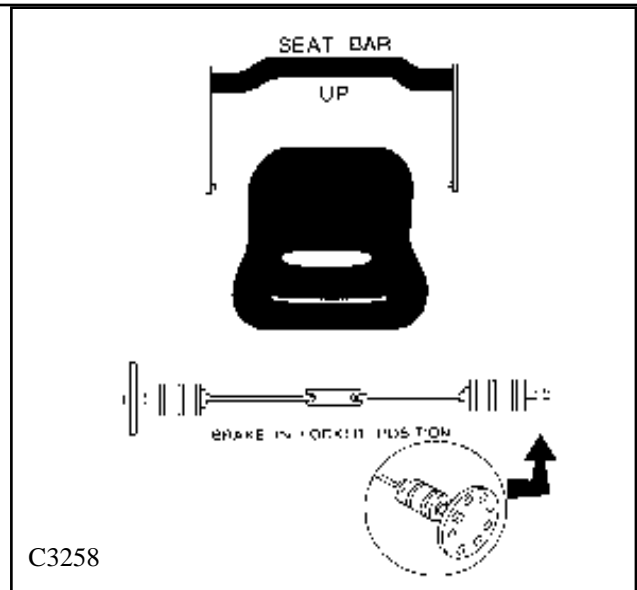
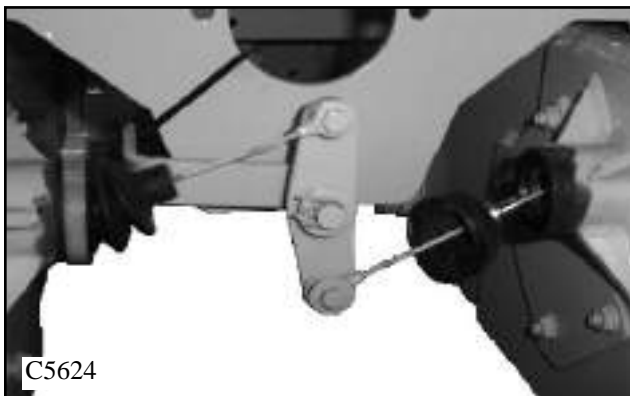
The parking brake is a mechanical system that uses spring loaded pins engaging axle sprockets to prevent the wheels from turning.

When the restraint bar is up, pins are engaged into holes in the rear axle sprockets, this prevents the loader from moving. (fig. C3258)

When the restraint bar is lowered, the pins are pulled free of the sprockets, allowing the wheels to turn.(fig.3259)

## Brake Pin Replacement

- 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 pin is to be removed.
- 4 Remove the transmission inspection cover. Rotate axles so that brake pins line up with a hole in the sprocket. This will make removal and re-assembly easier.
- 5 Remove the rear belly pan to gain access to the brake pin bushings.
- 6 Remove the bolt that connects pin cable to brake pull off assembly. (fig. C5623)
- 7 Remove ratchet clamp from brake boot. Roll boot off of bushing. (fig. C5624)
- 8 Remove circlip from bushing mount, cable and pin should pull out of transmission.
- 9 Loosen cable jam nut and remove pin from cable.



3

## Brake Pin Replacement, con'td.

10 Apply locktite 242 (blue) to threads and screw pin onto cable. Adjust to the initial length and tighten the jam nut.. (fig. C5625) Insert this assembly into the transmission bushing pushing the pin into the hole in the axle sprocket.

12 Place washer, spring and washer over the cable and into the bushing, press into place and insert circlip into groove. (fig. C5626)

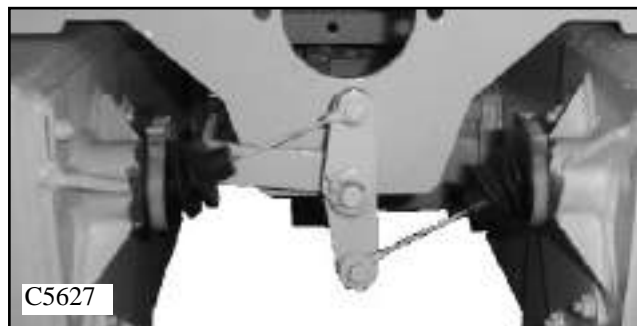
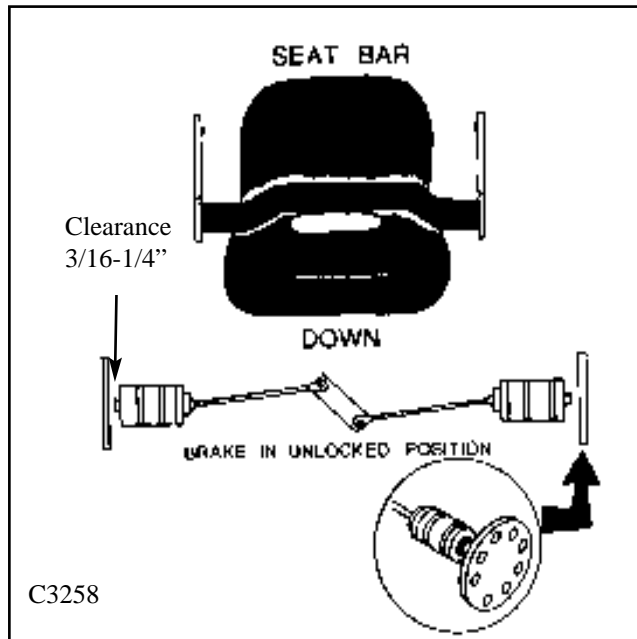
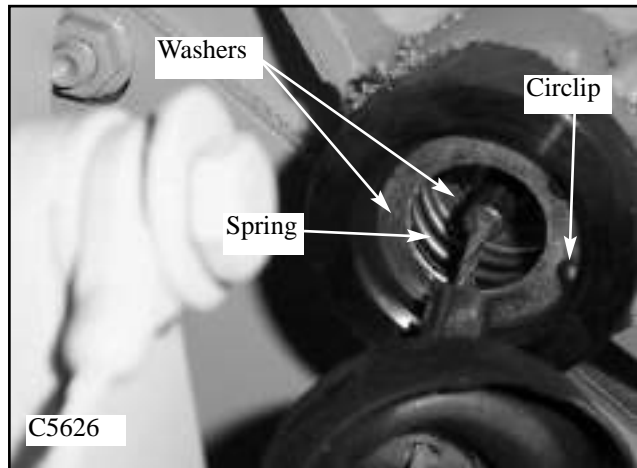
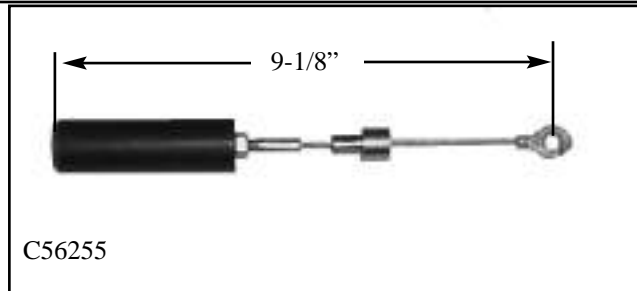
13 Connect the cable eyelet to the brake pull off assembly. Lower the restraint bar to release the brakes. Check the clearance between the brake pin and the axle sprocket. This clearance is  $\frac{3}{16}$ "- $\frac{1}{4}$ ". If the clearance is incorrect, the pin assembly has to be removed and an adjustment made at the connection between the pin and the cable. Always ensure that the cable is inserted at least  $\frac{5}{16}$ " into the pin.

14 When the correct pin to sprocket clearance is set, dis-connect the cable eyelet from the brake pull off assembly. Slide the brake boot over the cable end, gluing the small boot end to the cable with Loctite prism 480 or equivalent.. Install the large boot end over the transmission bushing and use a ratchet clamp to hold it in place.

15 Re-connect the cable eyelet to the brake pull off assembly. (fig. 5627) Do not over tighten, the eyelet should be snug, but loose enough to pivot easily as the brake is operated. Note that the brake cables must be re-installed in the same pattern as shown in fig. C5627, right hand cable to the bottom of the pull off, left hand cable to the top of the pull off.

## Brake Cable Replacement

To change a brake cable, follow the same procedure as changing a brake pin. When changing a cable, a new boot will be required. Use Loctite Prism 480 adhesive or equivalent to glue the small end of the boot to the cable.





## TROUBLE SHOOTING 3.7

3

Problem	Cause	Corrective Action	Section
Final drive noisy.	No lubricating oil.	Check oil level. Add 10W30 SJ oil to correct level.	3.2
	Chain is loose.	Check chain and sprockets for wear. Replace as needed.	3.3
	Axle has too much end play. (Bearing pre-load)	Check and adjust the bearing pre-load on the axle bearings	3.6
	Brake pins rubbing axle sprockets	Check and adjust clearance	3.7
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 ft lbs. (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 ft lbs. (135 to 149 Nm)	3.6

NOTES

3



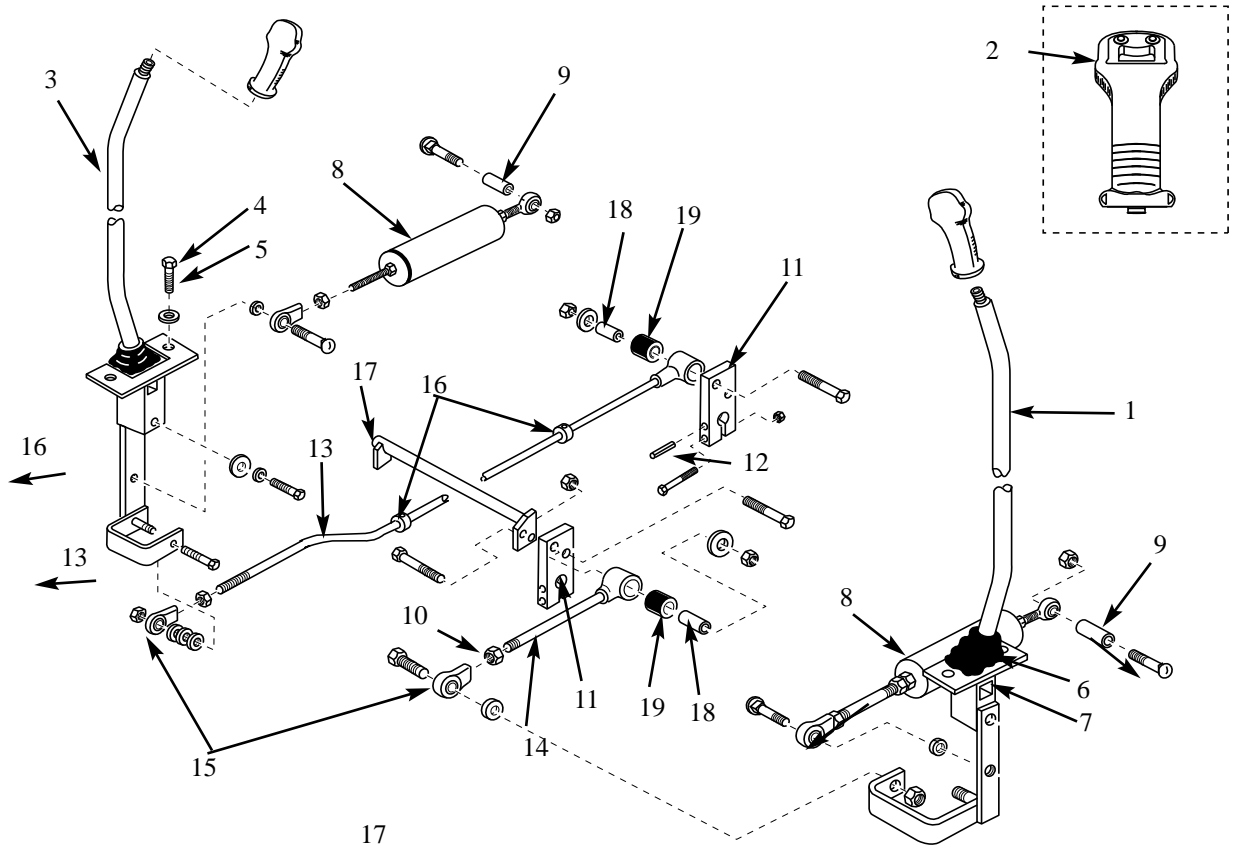
# SECTION 4 CONTROLS

<b>Steering</b>	<b>4.1</b>
Steering Control System Illustrations . . . . .	pg. 4-2 ~ 4-3
Neutral Adjustment . . . . .	pg. 4-4 ~ 4-6
Hydroback Replacement . . . . .	pg.4-5
Tracking Adjustment (Speed) . . . . .	pg. 4-7
Control Lever Replacement . . . . .	pg. 4-8
Control Rate Limiter Adjustment . . . . .	pg. 4-9
<b>Foot Pedals</b>	<b>4.2</b>
Foot Pedal System Illustration . . . . .	pg. 4-10
Cable Replacement . . . . .	pg. 4-11
Angle Adjustment . . . . .	pg. 4-12
Pedal Replacement . . . . .	pg. 4-13
<b>Hand Controls</b>	<b>4.3</b>
Hand Control System Illustration . . . . .	pg. 4-14
Angle Adjustment . . . . .	pg. 4-15
Control Lever Replacement . . . . .	pg. 4-16
<b>Throttle</b>	<b>4.4</b>
Throttle System Illustration . . . . .	pg. 4-17
Adjustment . . . . .	pg. 4-18
Throttle Rod Replacement . . . . .	pg. 4-19
<b>Restraint Bar</b>	<b>4.5</b>
Restraint Bar System Illustration . . . . .	pg. 4-20
Gas Spring Replacement . . . . .	pg. 4-21
Restraint Bar Replacement . . . . .	pg. 4-22
<b>Parking Brake</b>	<b>4.6</b>
General Information . . . . .	pg. 4-23
Restraint Bar Cable Replacement & Adjustment . . . . .	pg. 4-24
<b>Trouble Shooting</b>	<b>4.7</b>
Steering Controls . . . . .	pg. 4-28
Foot Pedals . . . . .	pg. 4-28
Hand Controls . . . . .	pg. 4-28
Restraint Bar . . . . .	pg. 4-28



# STEERING 4.1

Up To LB003362

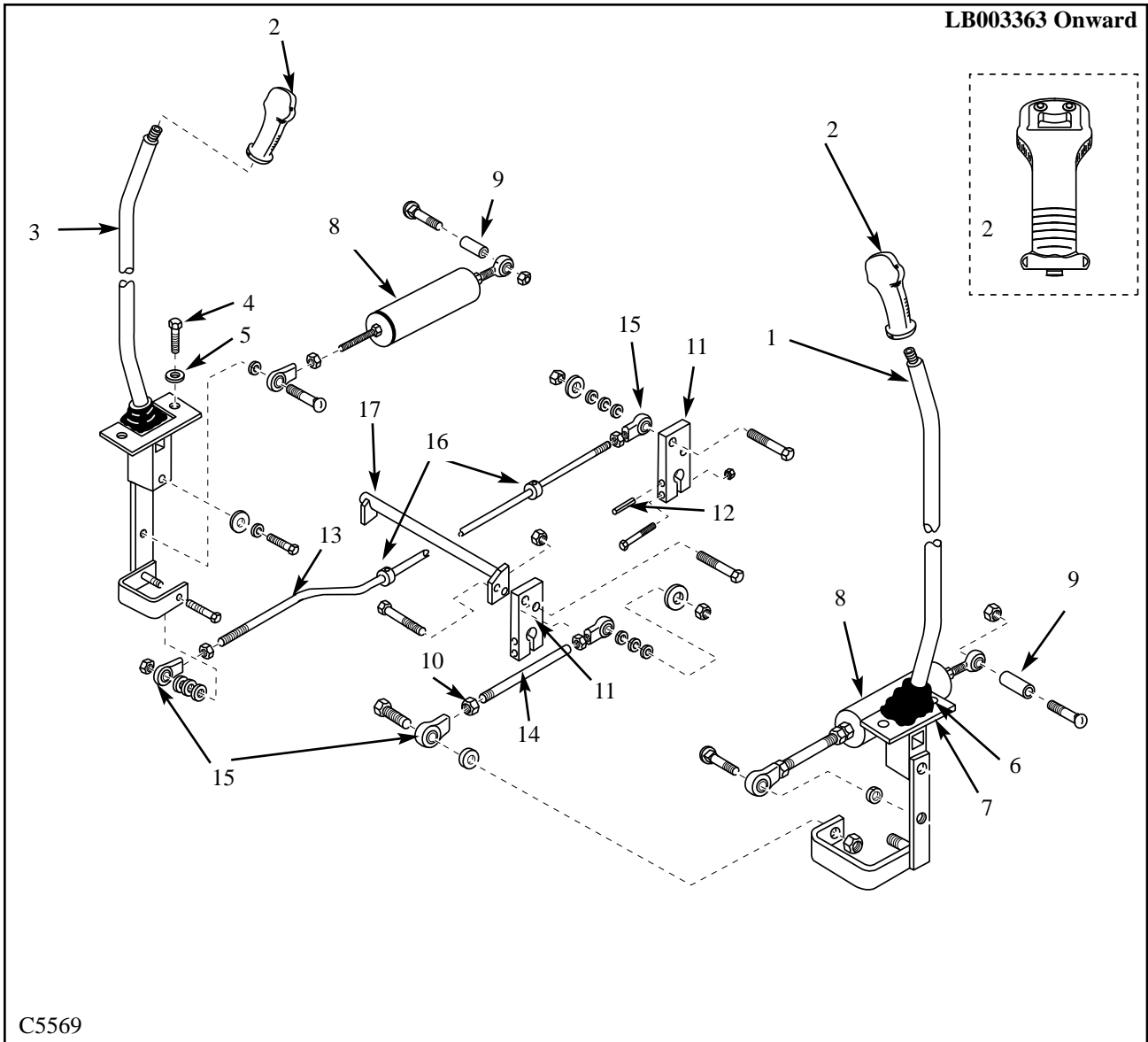


C5568

- |                       |                         |
|-----------------------|-------------------------|
| 1 Left Control Lever  | 17 Control Rate Limiter |
| 2 Handle              | 18 Bushing, Isolator    |
| 3 Right Control Lever | 19 Isolator             |
| 4 Bolt                |                         |
| 5 Washer              |                         |
| 6 Boot                |                         |
| 7 Plate               |                         |
| 8 Hydroback Assembly  |                         |
| 9 Bushing Spacer      |                         |
| 10 Nut                |                         |
| 11 Pintle Lever       |                         |
| 12 Split Pin          |                         |
| 13 Right Control Rod  |                         |
| 14 Left Control Rod   |                         |
| 15 Rod End            |                         |
| 16 Set Collars        |                         |

# STEERING 4.1

LB003363 Onward



C5569

- 1 Left Control Lever
- 2 Handle
- 3 Right Control Lever
- 4 Bolt
- 5 Washer
- 6 Boot
- 7 Plate
- 8 Hydroback Assembly
- 9 Bushing Spacer
- 10 Nut
- 11 Pintle Lever
- 12 Split Pin
- 13 Right Control Rod
- 14 Left Control Rod
- 15 Rod End
- 16 Set Collars
- 17 Control Rate Limiter

4

# STEERING 4.1

## Neutral Adjustment

### IMPORTANT

If you are unfamiliar with the control operations of the loader, read the Owner's / Operator's Manual beforehand.

The steering levers are equipped with a spring centering device called a hydroback. The hydroback returns the steering lever to neutral position when the steering levers are not being operated.

This feature automatically keeps the loader in neutral whenever the engine is started, or when the control levers are released.

If the loader creeps (not in neutral) when the engine is started or when the steering lever is released from forward or reverse position, the hydroback device may need to be adjusted, repaired or replaced.

1 Raise the boom arms, engage the boom support pins and shut off the engine. Raise and block the loader securely off the ground.



### WARNING

Never work under the boom arms without the boom supports engaged.

2 Remove the seat (fig. C5097) and hydrostatic shield.(fig. C5017) Note the location of the hydroback. (fig. C5015)

3 Cycle the control lever while watching the hydroback action. The hydroback should have a positive feel to it as the lever is in the neutral position.

4 Check the rod ends on each end of the hydroback. They must be free of any play. Replace the rod ends if any play or slack is noticed. (fig. C1638)

5 If the control lever is able to move slightly without spring tension returning it to neutral, the hydroback needs adjustment.

### IMPORTANT

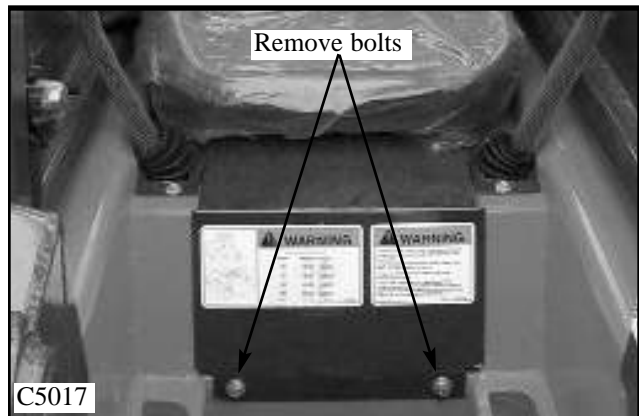
Repairs or adjustment to the control lever system may change the loader neutral position. Make sure the loader is raised securely off the ground before restarting the engine.

Remove seat assembly



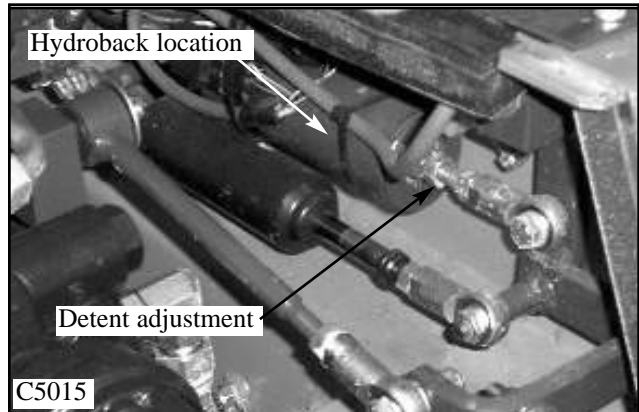
C5097

Remove bolts



C5017

Hydroback location

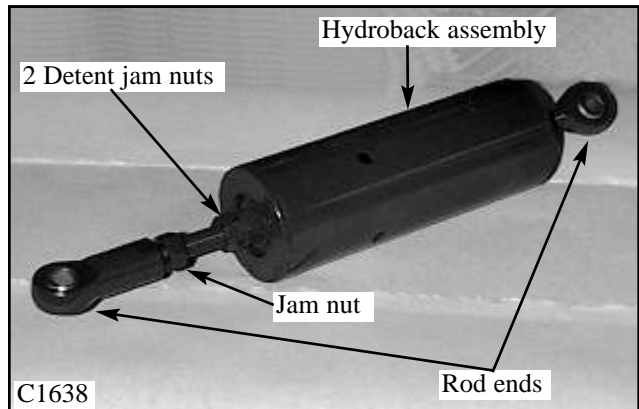


Detent adjustment

C5015

Hydroback assembly

2 Detent jam nuts



Jam nut

Rod ends

C1638

# STEERING 4.1

## Neutral Adjustment (con't.)

- 6 Loosen the 2 jam nuts next to the main body. (fig. C1638, 5015)
- 7 Turn the 2 nuts away from the main body of the hydroback.
- 8 Cycle the control lever several times.
- 9 Push the control lever rearward until you feel resistance. Stop.
- 10 Turn the 2 jam nuts back toward the main body of the hydroback until the nut just touches the flat washer.
- 11 Cycle the control lever again checking for a positive feel. If you now have a positive neutral, tighten the 2 jam nuts together and proceed to step 12, pg. 4-6. If the hydroback still does not center, the hydroback has internal damage or wear. Replace the hydroback assembly with a new one.

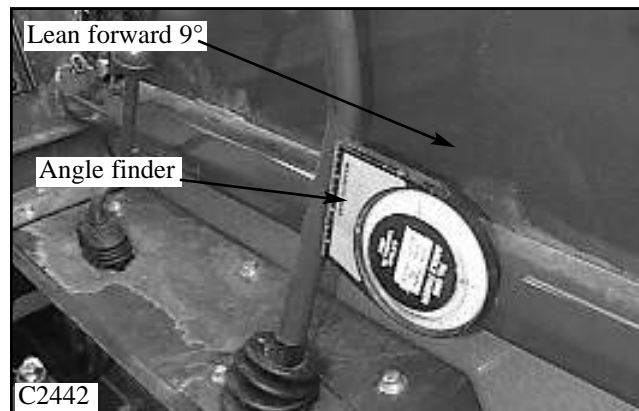
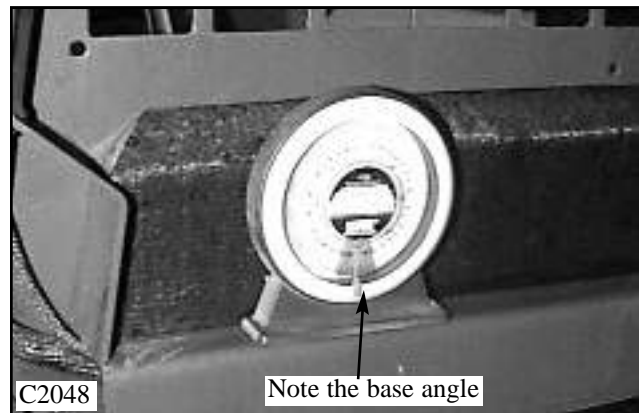
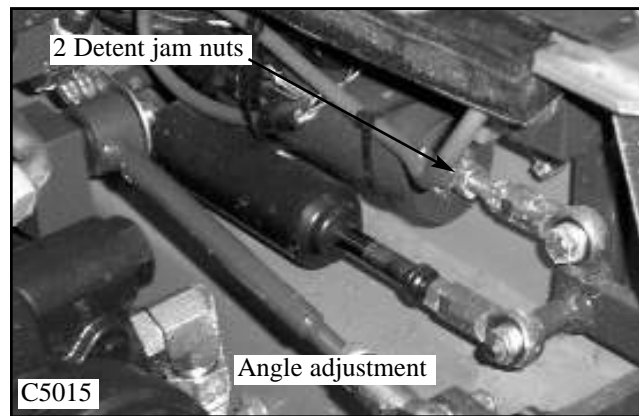
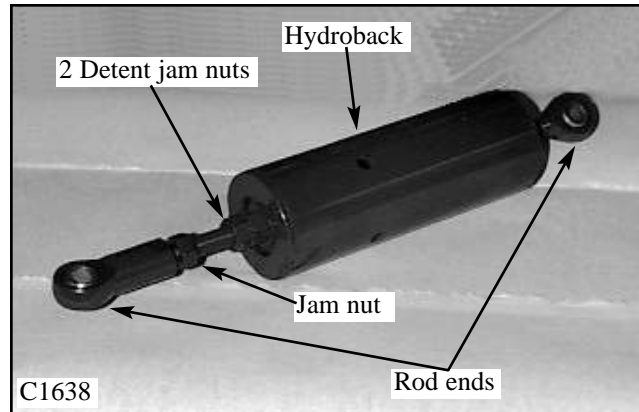
### IMPORTANT

Repairs or adjustment to the control lever system may change the loader neutral position. Make sure the loader is raised securely off the ground before restarting the engine.

## Hydro Back Replacement

Replacing the hydroback changes the steering control lever angle and the neutral position. To correctly set the angle after the hydro back has been installed:

- 1 Replace the hydroback by removing the 2 bolts located at either end of the hydro back assembly.
- 2 Install the hydroback in the reverse order. Check the steering control rod ends and replace them now if they are worn.
- 3 Use an angle finder to check the base measurement angle the loader is sitting at. (fig. C2048) Note the angle the loader is sitting at. This measurement will have to be added or subtracted to the next measurement to give the most accurate adjustment.
- 4 Attach an angle finder to the most vertical part of the control lever. (fig. C2442)
- 5 Turn the hydroback threaded rod (fig. C5015) in or out of the female rod end to move the control lever to a reading of  $12^\circ$  leaning forward. Be sure to allow for angle the loader is sitting at. (Base angle) Jam the nut against the rod end when completed. Make sure there is a minimum of  $3/8''$  (6mm) of thread holding the female rod end to the threaded rod.
- 6 Proceed to neutral adjustments, step 12, pg. 4-6.



# STEERING 4.1

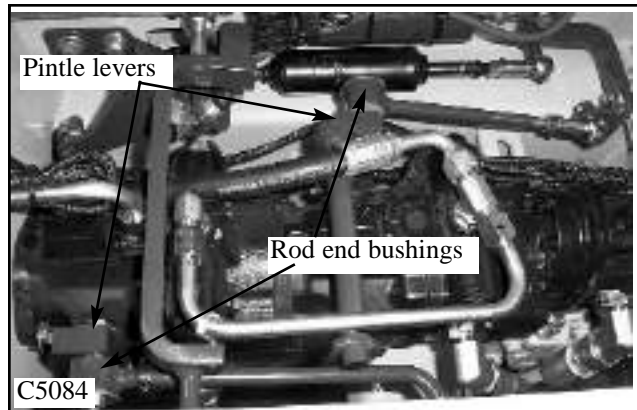
## Neutral Adjustment

Before performing the neutral adjustment make sure the hydro back is functioning and adjusted properly. Refer to page 4-5.

### IMPORTANT

If you are unfamiliar with the control operations of the loader, read the Owner's / Operator's Manual beforehand.

12 Note the location of the steering control linkage. (fig. C5084, 5081)



### WARNING

Never work under the boom arms without the boom supports engaged.

13 Check the control rod end bushings for wear (fig. 5084). If any play is present between the bushings and the bolts replace the rod ends.

14 Check the pintle levers for tightness on the swash plate shaft. Tighten the clamping bolts or replace the pintle lever if required. (fig. C5084)

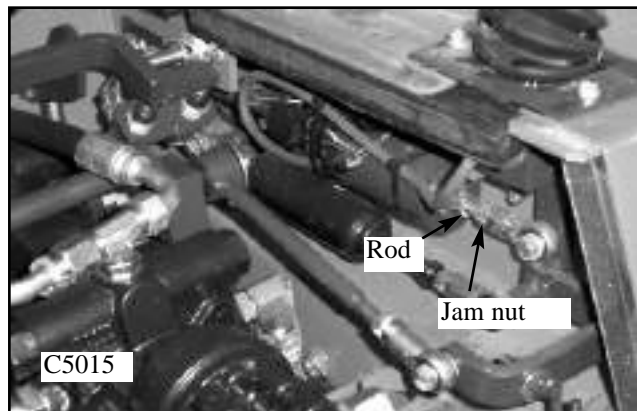
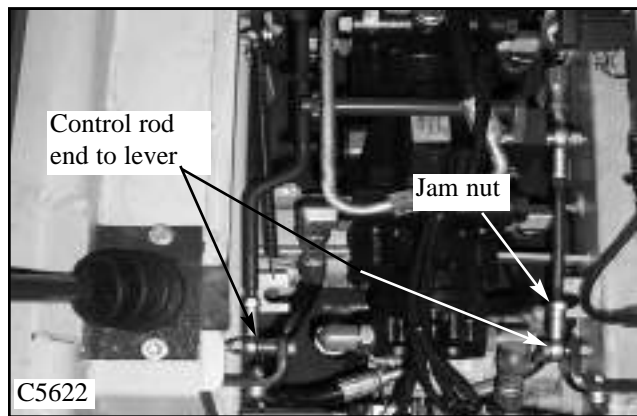
15 If and when all rod bushings and pivot points have been checked for wear or binding, proceed with the neutral adjustment.

16 Start the engine and release the parking brake. Cycle the control levers through forward and reverse.

17 If the wheels are turning, remove the control rod from the lever base (fig. C5622), loosen the jam nut and adjust the rod end in or out to find neutral. Repeat for the other side. Tighten the rod ends to levers and the jam nuts against the rod ends and recheck the neutral adjustment. Always ensure that the control rod has 1/2" thread engagement into the rod end.

18 Very fine adjustment can be made at the hydro back threaded rod. Adjustment here affects the control lever angle. Loosen the jam nut and turn the hydroback rod in or out to find a precise neutral. (fig. C5015) Tighten the jam nut and recheck for neutral. Repeat if required. **Only make minor adjustments using this method.**

19 Replace the seat and hydrostatic shield.



### WARNING

Repairs or adjustment to the control lever system may change the loader neutral position. Make sure the loader is raised securely off the ground before restarting the engine.

4



# STEERING 4.1

## Tracking Adjustment (Speed)

Tracking adjustment, or wheel speed, is set individually for LH and RH sides. If the operator complains the loader does not go in a straight line when the levers are pushed clear forward the limiter stops may need adjustment.

- 1 Raise the boom arms, engage the boom support pins and shut off the engine. Raise and block the loader securely off the ground.
- 2 Remove the seat and hydrostatic shield. Note the



### WARNING

**Never work under the boom arms without the boom supports engaged.**

location of the steering control limiter bolts located front and rear of each steering control lever, just below the pivot point.. (fig. C2364)

- 3 Make sure the neutral adjustment are adjusted correctly. Refer to pages 4- 4 ~ 4-7.
- 4 If and when all rod bushings and pivot points have been check for wear or binding, proceed with the wheel speed adjustment.
- 5 Start the engine and release the parking brake. Adjust



### WARNING

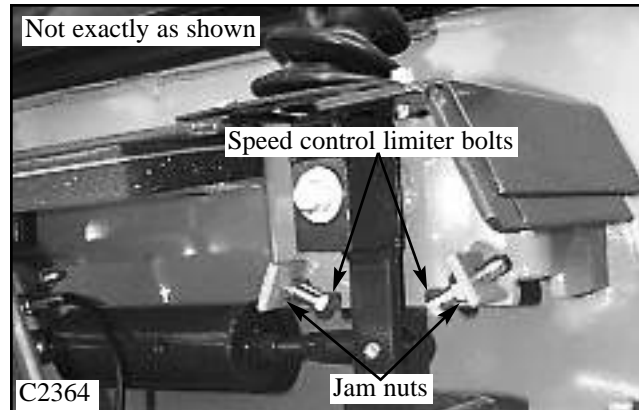
**Raise the loader securely off the ground before starting the engine.**

the engine rpm to the full high idle position. Refer to Section 7 to verify engine rpm.

- 6 Using an rpm measuring tool ( fig. C1837 Thomas P/N 43981) check wheel speed on side in the forward and reverse direction. Repeat for opposite side. (fig. C2445)
- 7 Correct wheel speed is set at 69 rpm forward and 60 rpm. reverse for the 85 models.
- 8 If adjustment is necessary, loosen the jam nut and turn the limiter bolt in to increase wheel speed or out to decrease wheel speed.
- 9 Tighten the jam nut and retest the speed adjustment. Repeat if necessary. Check Control Rate Limiter Adjustment, page 4-9.
- 10 Replace the seat and hydrostatic shield.

**Note:** If the wheel speed can not be adjusted to meet the above specification, check the engine rpm. Refer to Section 7.

If the engine rpm is acceptable, check for hydrostatic problems such as drive motor seal leakage, etc. Refer to Section 2 for testing procedures.



# 4

Combination wheel speed and photo - sensor tachometer. Thomas P/N 43981



# STEERING 4.1

## Control Lever Replacement

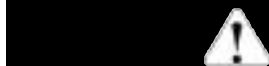
1 Raise the boom arms, engage the boom supports and shut off the engine. Raise the loader securely off the ground to prevent accidental engagement of the drive functions upon restarting the engine.



### WARNING

**Never work under the boom arms without the boom supports engaged.**

- 2 Remove the seat and hydrostatic shield.  
3 Remove the screws holding the bellows cover down. (fig. C5016)  
5 Remove the bolts connecting the lever to the control rod, the hydro back linkage and the hand control cable if equipped. (fig. C5621) Remove the nut connecting the shock absorber to the lever. (fig C5082)  
6 Remove the bolt and washers mounting the control lever to its pivot point. (fig.C5621) The control lever is now free to be removed. Un-plug lever harness and cut wire ties that bind harness to hydroback.(C5082)  
7 Replace the control lever in the reverse order. Lightly lubricate the pivot shaft with white grease when assembling the control lever to the pivot shaft.

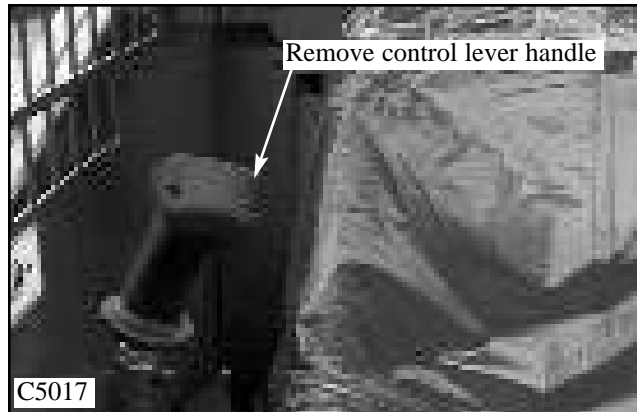


### WARNING

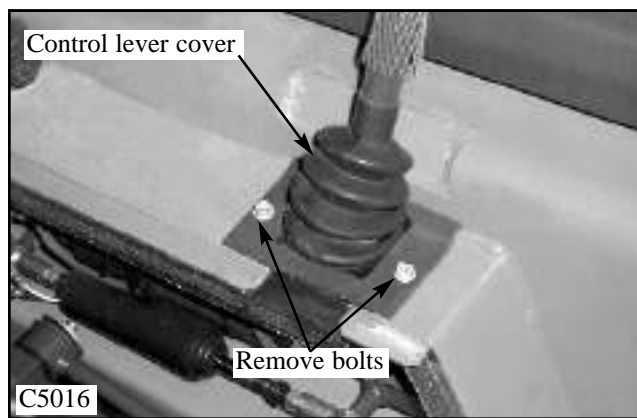
**Repairs or adjustment to the control lever system may change the loader neutral position. Make sure the loader is raised securely off the ground before restarting the engine.**

8 If necessary, make adjustments to the neutral centering and wheel speed as required. Refer to pages 4 - 5 ~ 4 - 8.

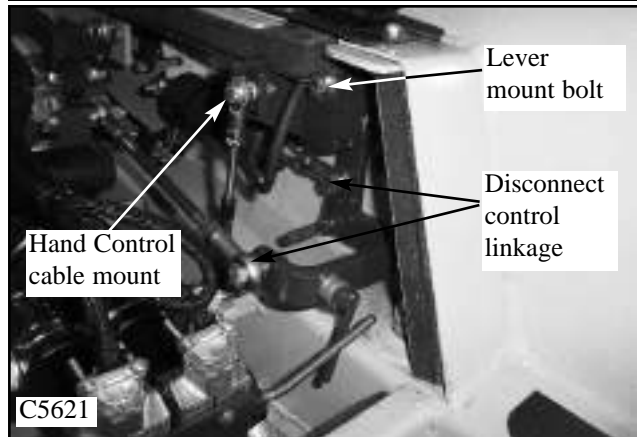
**Note:** If the loader is equipped with optional electrical accessories operated by control handle mounted switches, the control handle switch wiring will need to be disconnected and transferred to the new steering lever.



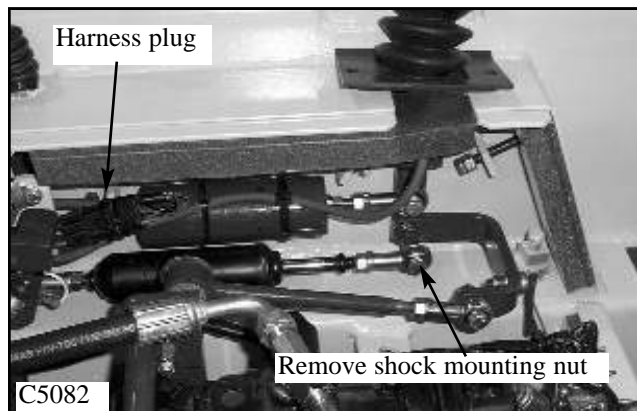
C5017



C5016



C5621



C5082

4

# STEERING 4.1

## Control Rate Limiter Adjustment

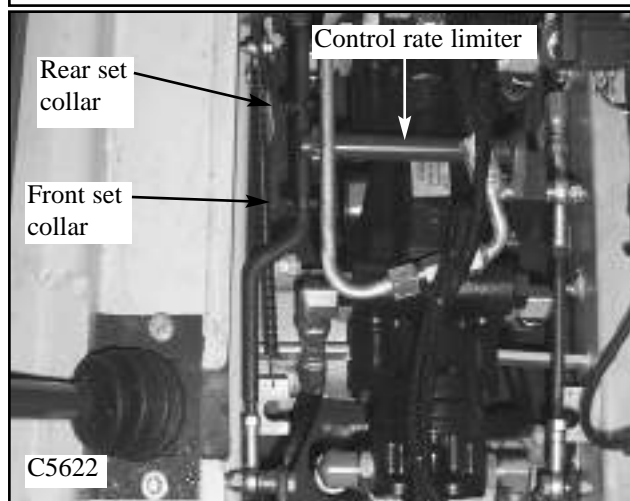
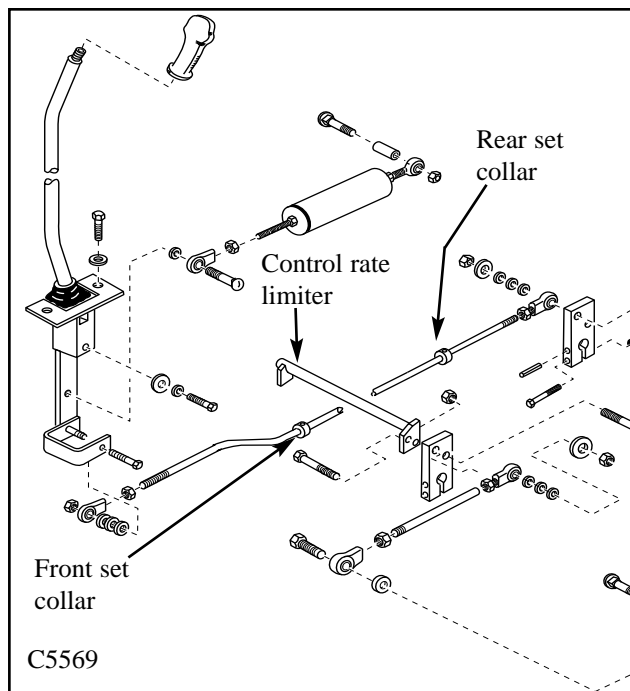
- 1 Raise the boom arms, engage the boom supports and shut off the engine.
- 2 Remove the seat.



### WARNING

Never work under the boom arms without the boom supports engaged.

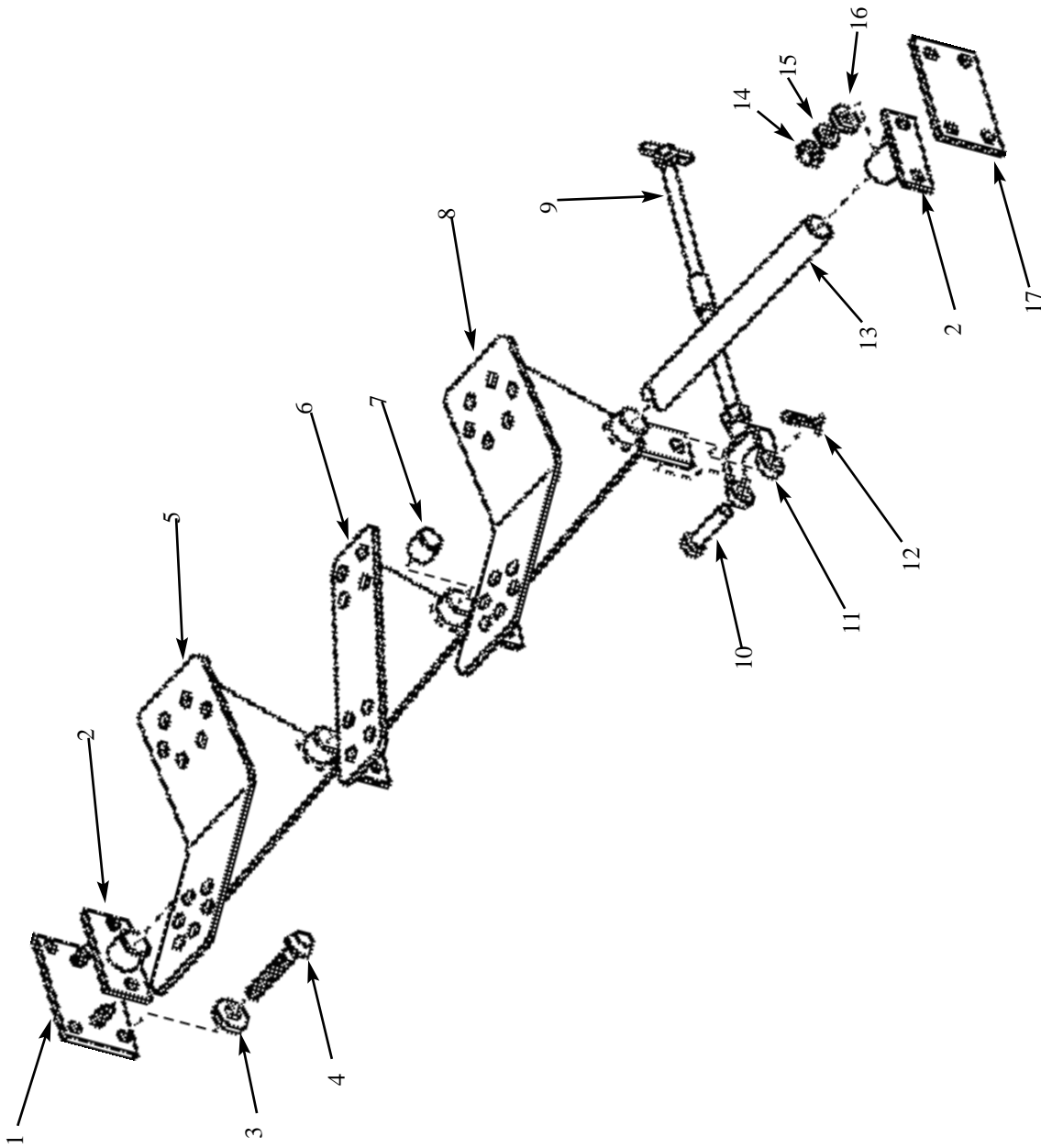
- 3 Loosen front and rear set collars on right hand control rod.(fig. C5569, C5522)
- 4 Pull left hand lever to full forward position and slide rear set collar forward to touch control rate limiter. Tighten rear set collar. Release lever to neutral position.
- 5 Pull right hand lever to full forward position and slide front set collar back to touch control rate limiter. Tighten front set collar. Release lever to neutral position.
- 6 Re-install the seat.



# 4

# FOOT PEDALS 4.2

85



- |                             |                 |
|-----------------------------|-----------------|
| 1. Cover                    | 12. Pin         |
| 2. Foot pedal support assy. | 13. Bar         |
| 3. Weather seal washer      | 14. Nut         |
| 4. Screw                    | 15. Washer      |
| 5. Foot pedal assy.         | 16. Flat washer |
| 6. Auxiliary pedal          | 17. Cover       |
| 7. Pipe                     |                 |
| 8. Foot pedal assy.         |                 |
| 9. Cable                    |                 |
| 10. Pin                     |                 |
| 11. Clevis                  |                 |

C1583

# FOOT PEDALS 4.2

## Cable Replacement 85

Check cable ends, eyelets or rod ends, and mounting pins for wear before removing the cable. Replace worn parts when replacing new cables. Cable ends should be inspected every 150 hours of operation.

1 Raise the boom arms, engage the boom supports and shut off the engine.

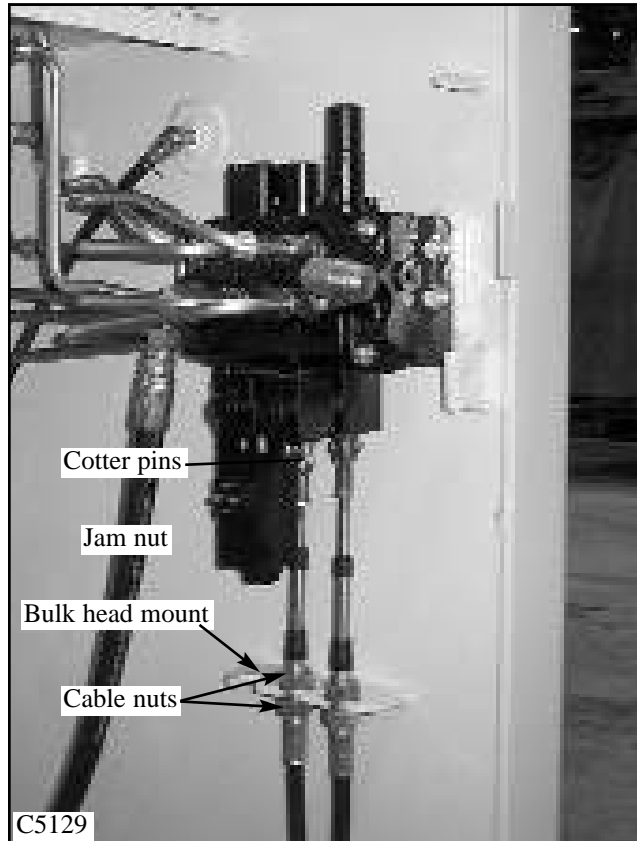
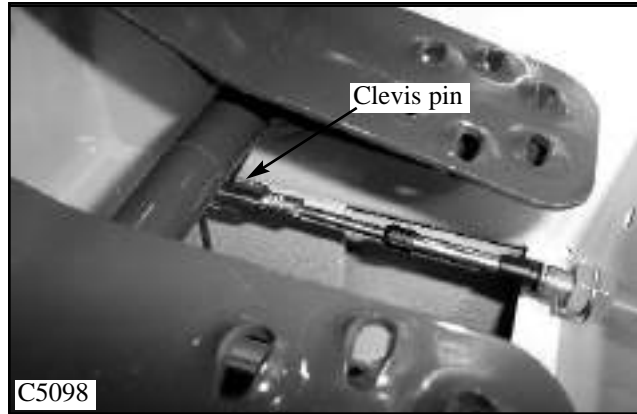


### WARNING

Never work under the boom arms without the boom supports engaged.

- 2 Remove the seat and hydrostatic shield.
- 3 Remove the cotter pin and clevis pin connecting the cable clevis to the foot pedal assy. (fig. C5098)
- 4 Remove the clevis, clevis jam nut, cable mount nut and washer from the cable. (fig. C5086)
- 5 Access engine compartment and loosen the cable mount nuts. (fig. C5129)
- 6 Remove the cotter pins from the valve end of the cables and remove the clevis pins. (fig. C5129)
- 7 Remove the cable.
- 8 Remove the clevis and eyelet ends of the cable and reuse them if still serviceable.
- 9 Install the new cable in the reverse order above. There must be a minimum of 3/8" (6mm) of thread engagement into the cable clevis and eyelet ends.

**Note:** After installation of a new cable, the foot pedal angle will need to be verified and adjusted if necessary. Refer to page 4-14 ~4-15.



## FOOT PEDALS 4.2

### Angle Adjustment 85

After changing the control cable the foot pedal angle will need to be verified and / or adjusted to provide operator comfort and proper pedal travel clearance.

**Note:** If the operator feels discomfort due to current pedal angles, they may be adjusted to their preference. Be sure to check for pedal travel clearance afterward. Always maintain a minimum of 3/8" (6mm) of thread into the eyelet ends. (fig. C5098)

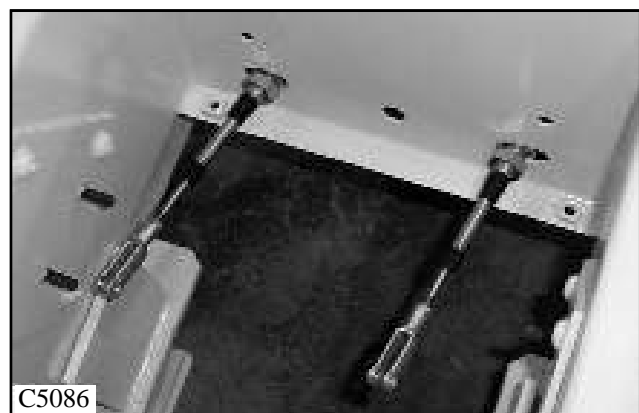
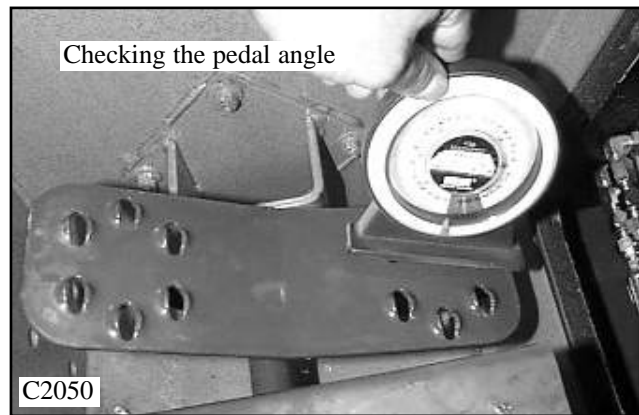
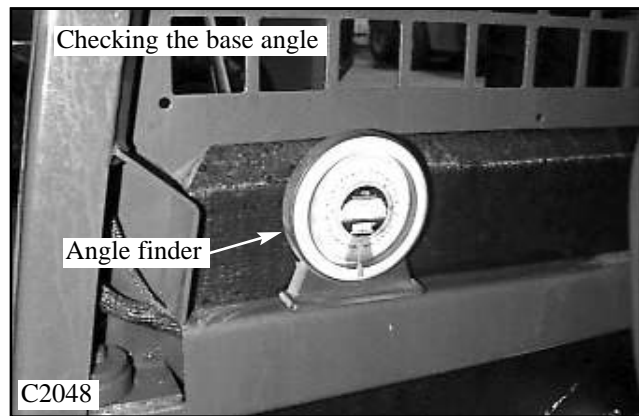
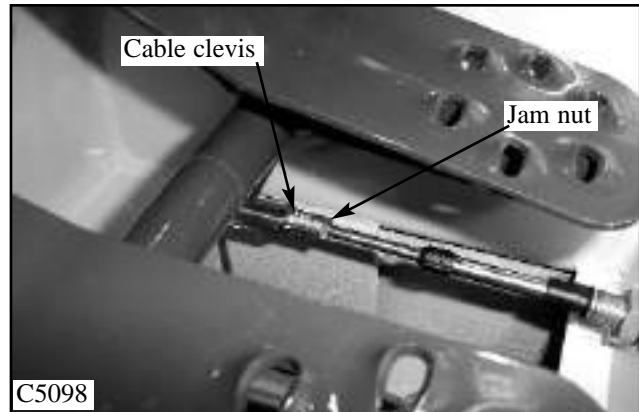
1 Make sure the clevis ends are screwed into the cable threads a minimum of 3/8" (6mm). (fig. C5098)

2 Place an angle finder on the inner fender of the loader to find the base measurement. Note the reading. (fig. C2048)

3 Place the angle finder on the heel of the pedal to be checked or adjusted. (fig. C2050) Note the reading.

4 Adjust the pedal angles by turning the clevis end on the cable and by adjusting the mount nuts. (fig. C5086). Adjust the lift and tilt pedal angle to 13°. Be sure to allow for the base angle measurement taken previously. Example: If the base angle measured 3°, add or subtract that angle from the angle measured on the pedal.

5 Check the operation by cycling the pedals. Operation should be smooth and the pedal should have unrestricted travel when heeled and toed. If binding is occurring the control valve spools or electric lock system may need servicing.



# FOOT PEDALS 4.2

## Foot Pedal Replacement 85

If the foot pedals or shaft need replacement due to damage or wear:

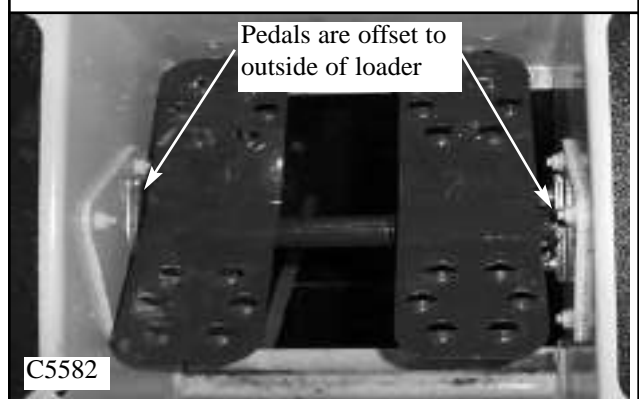
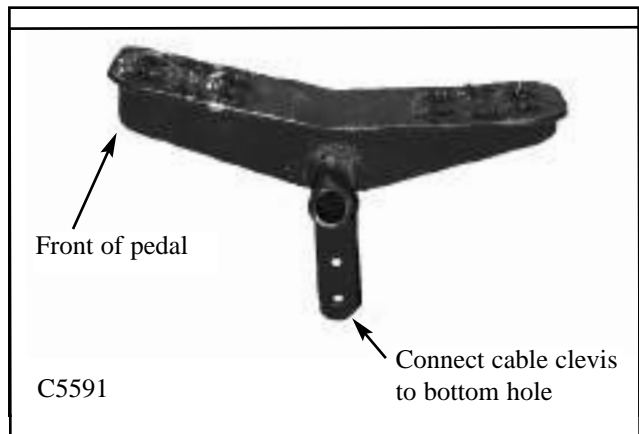
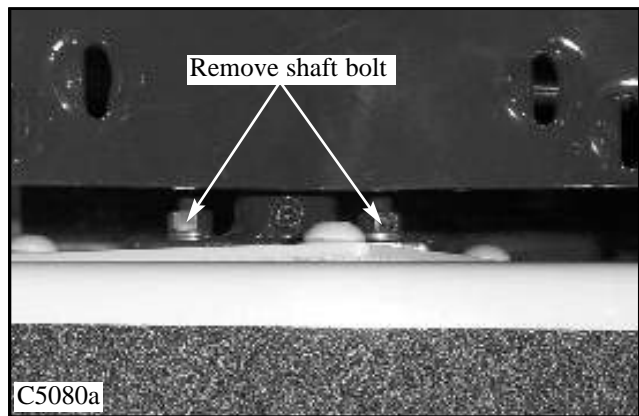
1 Raise the boom arms, engage the boom supports and shut off the engine.



### WARNING

**Never work under the boom arms without the boom supports engaged.**

- 2 Remove the seat and hydrostatic shield.
- 3 Remove the cables from the foot petals. (fig.C5098)
- 5 Remove the nuts retaining the foot pedal shaft mounts. (fig. C5080a)
- 6 Remove the complete pedal and shaft assembly together. Note the orientation of the foot pedals.
- 7 Replace worn parts as required. The foot pedals are equipped with bronze oillite bushings that are pressed into place and machined to size afterward. They are not serviceable separately. The complete pedal must be replaced.
- 8 Reinstall pedals in the reverse order. Be sure to add nylon washers as required to either end of the foot pedal shaft to align the pedals with the linkages. Failure to align the pedal and linkages properly will cause stiffness, binding and / or premature wear. Total pedal movement side to side, end play, should not exceed 1 / 8". When installing foot pedals, note the proper orientation of the pedals. (fig. C5591, fig. C5582)

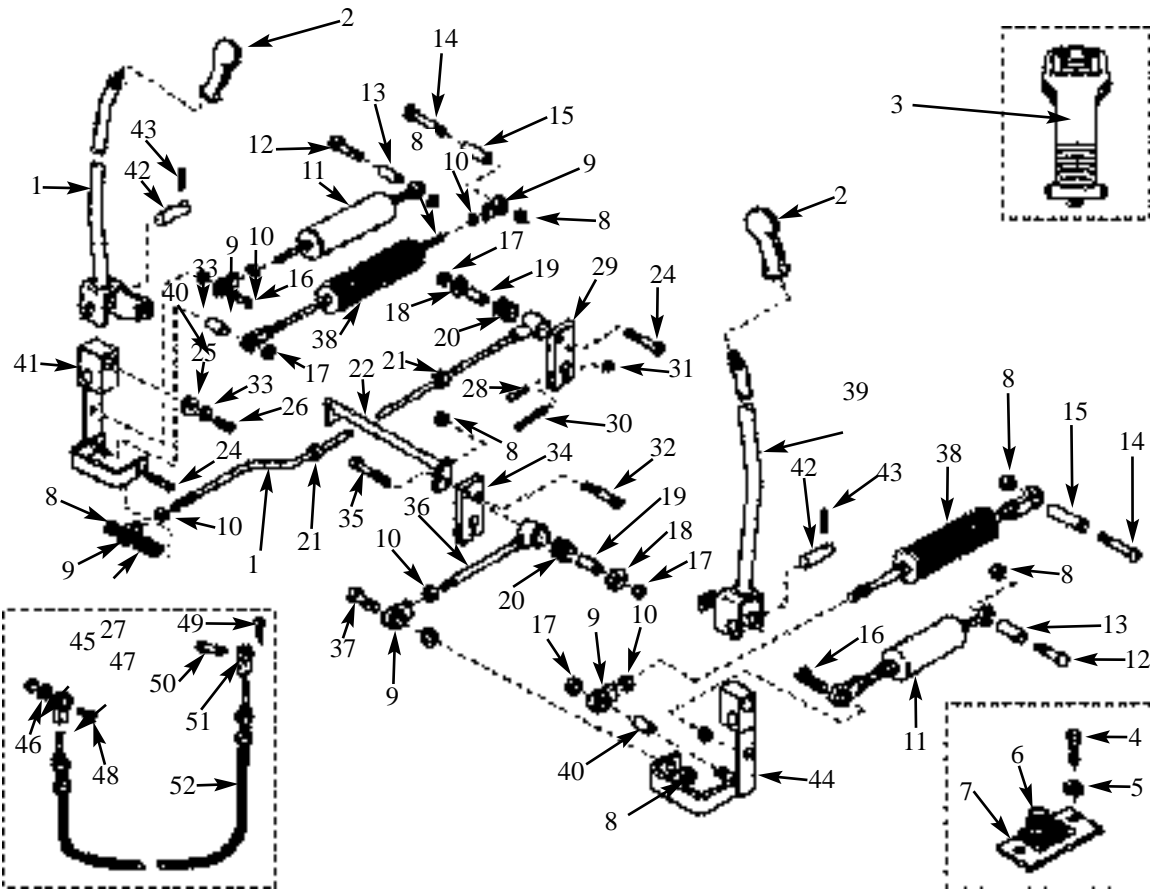


4

# HAND CONTROLS 4.3

## Hand Operated Control Lever 85

Optional electric control handle



C3274

- |     |                        |     |                      |     |               |
|-----|------------------------|-----|----------------------|-----|---------------|
| 1.  | Control lever assembly | 20. | Isolator             | 39. | Control lever |
| 2.  | Handle                 | 21. | Collar               | 40. | Spacer        |
| 3.  | Handle                 | 22. | Control rate limiter | 41. | Swivel block  |
| 4.  | Screw                  | 23. | Linkage              | 42. | Control lever |
| 5.  | Washer                 | 24. | Bolt                 | 43. | Pin           |
| 6.  | Boot                   | 25. | Washer               | 44. | Swivel block  |
| 7.  | Lever boot cover       | 26. | Bolt                 | 45. | Nut           |
| 8.  | Nut                    | 27. | Washer               | 46. | Washer        |
| 9.  | Rod end                | 28. | Pin                  | 47. | Rod end       |
| 10. | Nut                    | 29. | Bar                  | 48. | Bolt          |
| 11. | Hydroback              | 30. | Bolt                 | 49. | Cotter pin    |
| 12. | Bolt                   | 31. | Nut                  | 50. | Clevis pin    |
| 13. | Spacer                 | 32. | Bolt                 | 51. | Bar           |
| 14. | Bolt                   | 33. | Washer               | 52. | Cable         |
| 15. | Spacer                 | 34. | Pintle lever bar     | 53. | Axle cover    |
| 16. | Bolt                   | 35. | Bolt                 |     |               |
| 17. | Jam nut                | 36. | Linkage              |     |               |
| 18. | Washer                 | 37. | Bolt                 |     |               |
| 19. | Spacer                 | 38. | Shock absorber       |     |               |

4

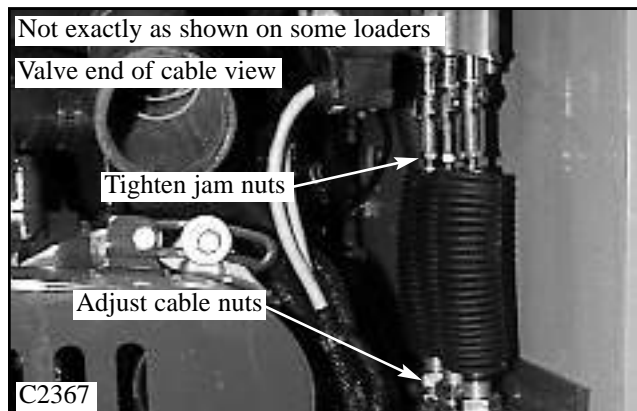
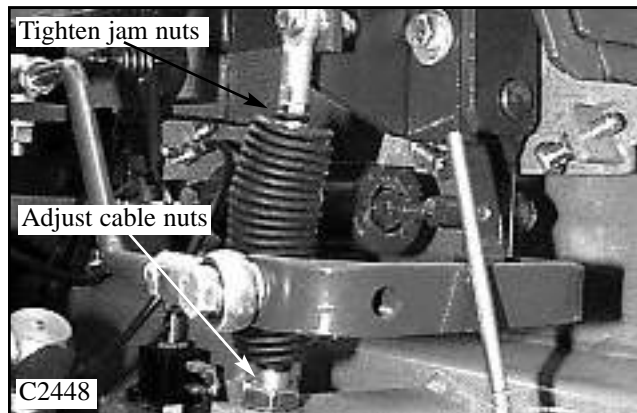
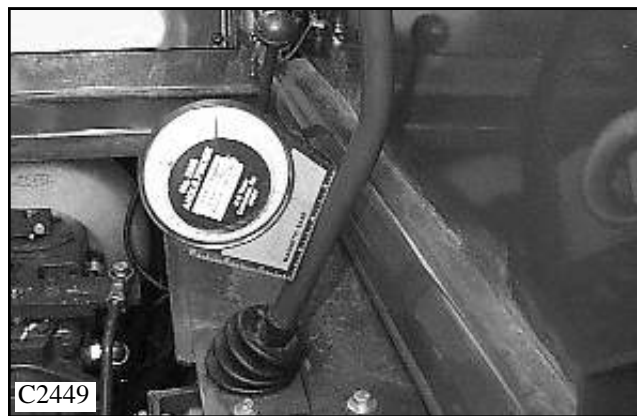
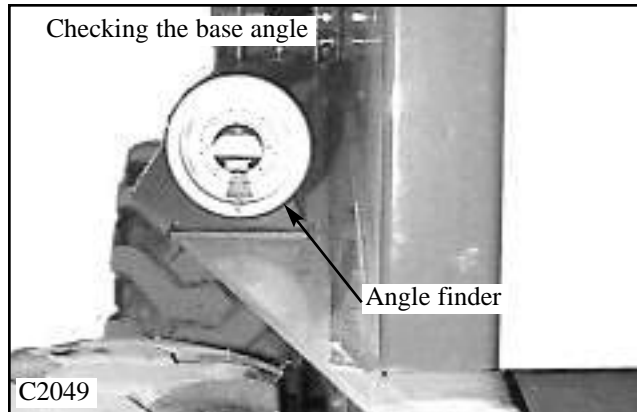


# HAND CONTROLS 4.3

## Angle Adjustment

After changing the control cable the control lever angle will need to be verified and / or adjusted to provide operator comfort and proper travel clearance.

- 1 Make sure the rod ends are screwed onto the rod threads a minimum of 3/8" (6mm).
- 2 Place an angle finder on the front shield of the loader to find the base measurement. Note the reading. (fig. C2049)
- 3 Place the angle finder on the control lever as shown in (fig. C2449). Note the reading. The correct angle is  $8^{\circ} \pm 1^{\circ}$ .
- 4 Adjust the angle by adjusting the cable mount nuts to move the cable up or down on its mount. (fig. C2448) Be sure to allow for the base angle, the angle the loader may be leaning at while measuring. Add or subtract this measurement as necessary.
- 5 If you are not able to achieve proper control lever angle, adjustment of cable mount nuts at the valve may be required. Also the cable end at the lever may need to be adjusted in or out.
- 6 Cycle the control levers to check for travel clearance.
- 7 Replace the seat and hydrostatic shields.



4

# HAND CONTROLS 4.3

## Control Lever Replacement

1 Raise the boom arms, engage the boom supports and shut off the engine.



### WARNING

Never work under the boom arms without the boom supports engaged.

2 Remove the seat.

3 Remove the control handle from the steering lever by removing the retaining bolt and dis-connecting the handle transfer rod. (fig. C5017) The handle may be reused on the new or repaired control lever.

4 Remove the bellows cover screws (fig.C5017a) and remove the bellows.

5 Remove the bolt from the control rod linkage to the control lever assembly. ( fig. C2447 )

6 Remove the mounting bolt from the control lever and remove the control lever assembly. (fig. C2047)

**Note:** If the loader is equipped with optional electrical accessories operated by control handle mounted switches, the control handle switch wiring will need to be disconnected and transferred to the new steering lever. If the control lever functions are sloppy due to excessive wear of the swivel bushing, the swivel assembly may be replaced.

**See fig. C3274 page 4-14 for exploded view of control lever assembly.**

7 Save any spacer washers that may have been used.

8 Replace the control lever assembly.

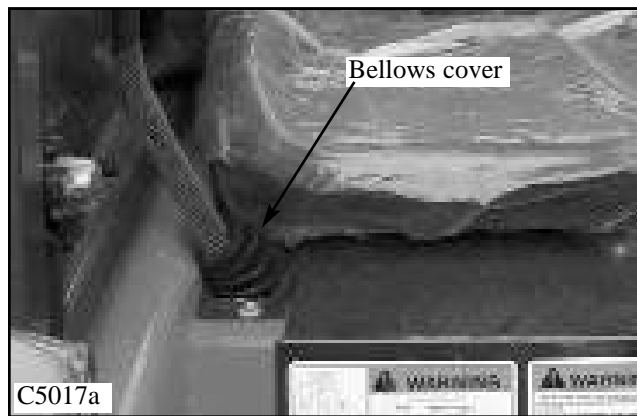
Replace all parts in the reverse order. Use the spacer washers to remove the movement of the steering lever. Cycle the control lever after installation to check for binding and travel clearance.

Check the control lever angles. Page 4-19.

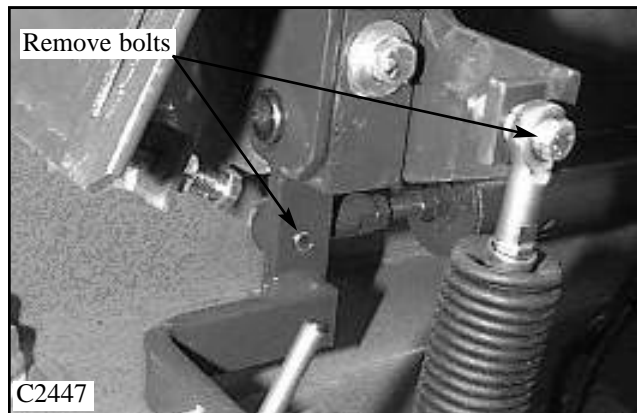
Check the wheel speed, or tracking, to assure optimum performance. Page 4-8.



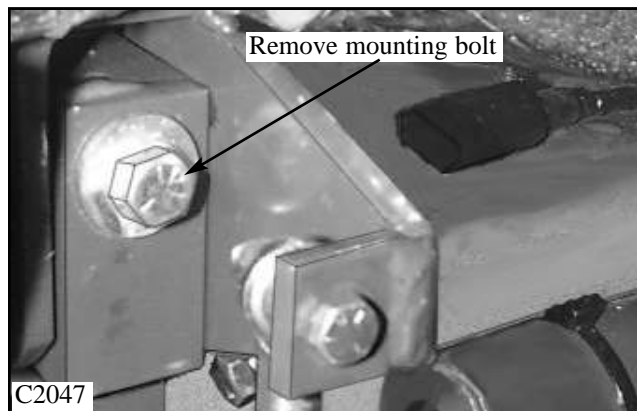
C5017



C5017a



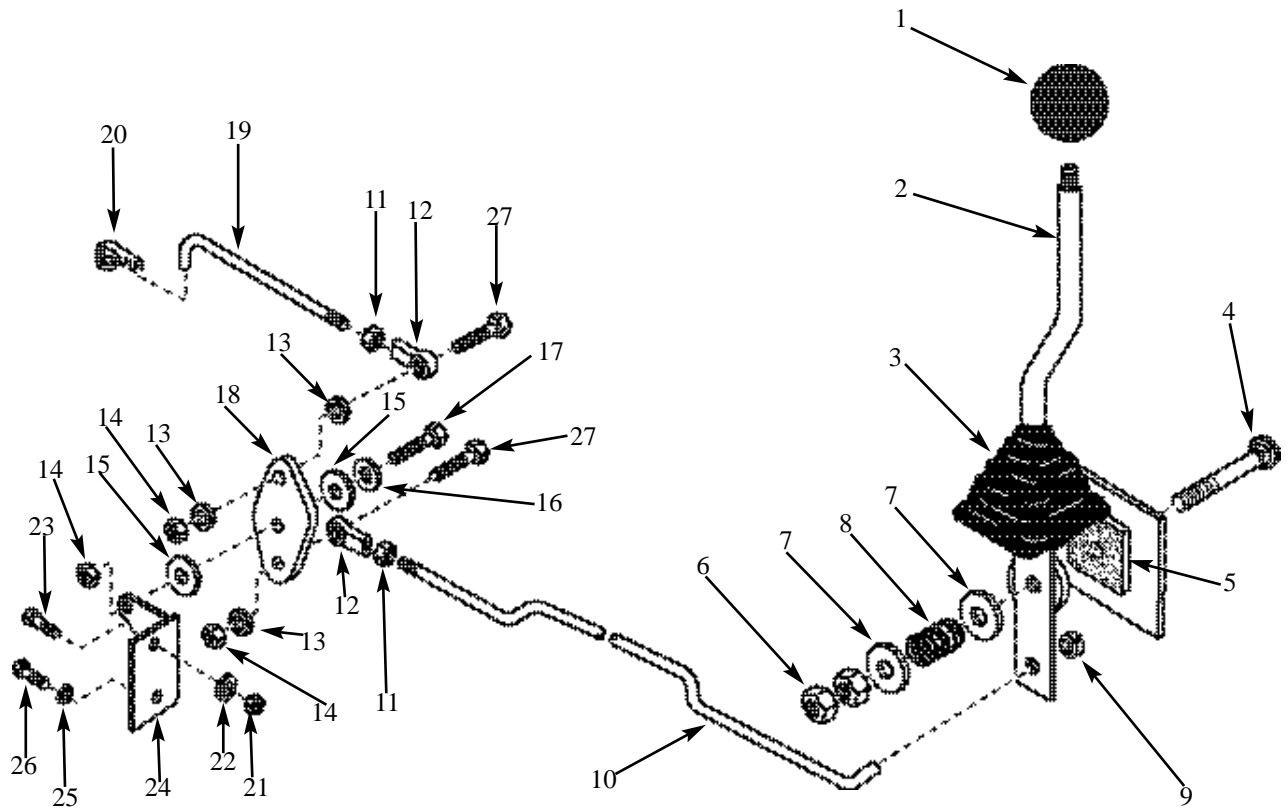
C2447



C2047

4

# THROTTLE 4.4



- |                    |                             |
|--------------------|-----------------------------|
| 1. Throttle knob   | 15. Washer                  |
| 2. Throttle handle | 16. Flat washer             |
| 3. Boot            | 17. Bolt                    |
| 4. Bolt            | 18. Throttle crank sheet    |
| 5. Friction pad    | 19. Throttle rod engine bar |
| 6. Nut             | 20. Clip                    |
| 7. Flat washer     | 21. Nut                     |
| 8. Spring          | 22. Flat washer             |
| 9. Collar          | 23. Bolt                    |
| 10. Throttle rod   | 24. Throttle bracket plate  |
| 11. Nut            | 25. Lock washer             |
| 12. Rod end assy.  | 26. Bolt                    |
| 13. Lock washer    | 27. Bolt                    |
| 14. Nut            |                             |

4

C2797

# THROTTLE 4.4

## Adjustments

The throttle system can be adjusted for tension and total travel. (stroke)

If the throttle system can not maintain a constant, steady, engine speed then the throttle handle tension spring may need to be adjusted.

1 Raise the boom arms, engage the boom supports and shut off the engine.



### WARNING

Never work under the boom arms without the boom supports engaged.

2 Remove the seat.

3 Locate the throttle handle pivot and tension spring under the left hand cover plate. (fig. C5100, C5130)

4 Tighten the nut on the tension spring clock wise to increase the spring tension to gain clamping force against the friction pad.

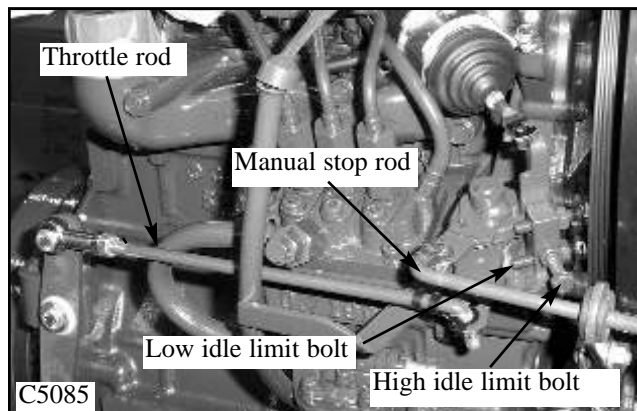
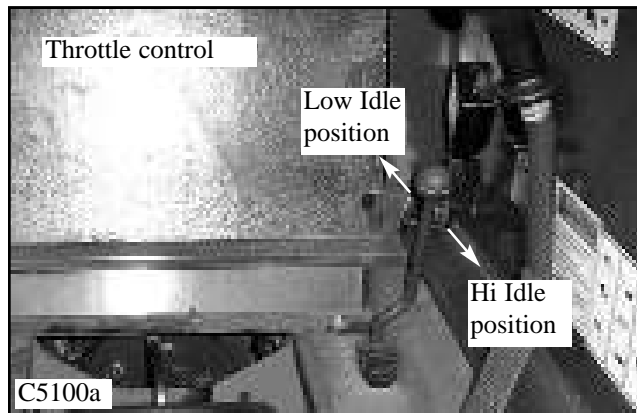
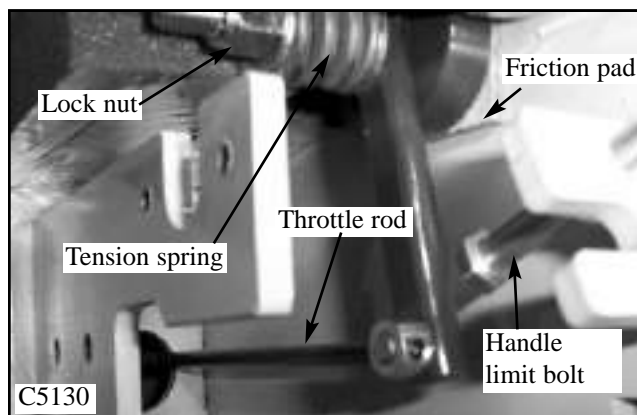
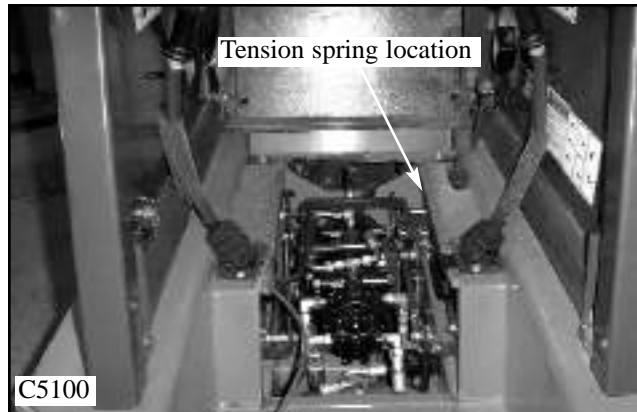
If this fails to repair the problem then the friction pad may need to be replaced.

To check the throttle travel:

1 Open the rear door and locate the engine lever and throttle rod linkage.

2 Stroke the throttle lever in the full forward position. The engine lever must touch the high idle limit bolt stops to acquire full engine speed. (fig. C5085)

3 Stroke the throttle lever rearward until it stops. The engine lever should touch the low idle limit bolt to acquire the engines proper low idle speed. (fig. C5085) Throttle handle should touch handle limit bolt, if not , adjust handle limit bolt. Do not adjust engine low idle limit bolt.



4

# THROTTLE 4.4

## Throttle Rod Replacement

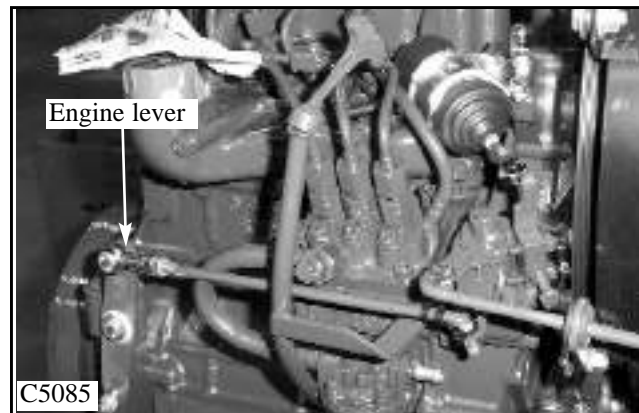
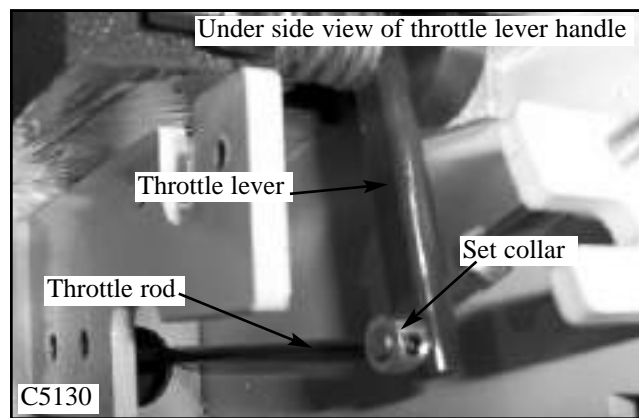
1 Raise the boom arms, engage the boom supports and shut off the engine.



**WARNING**

**Never work under the boom arms without the boom supports engaged.**

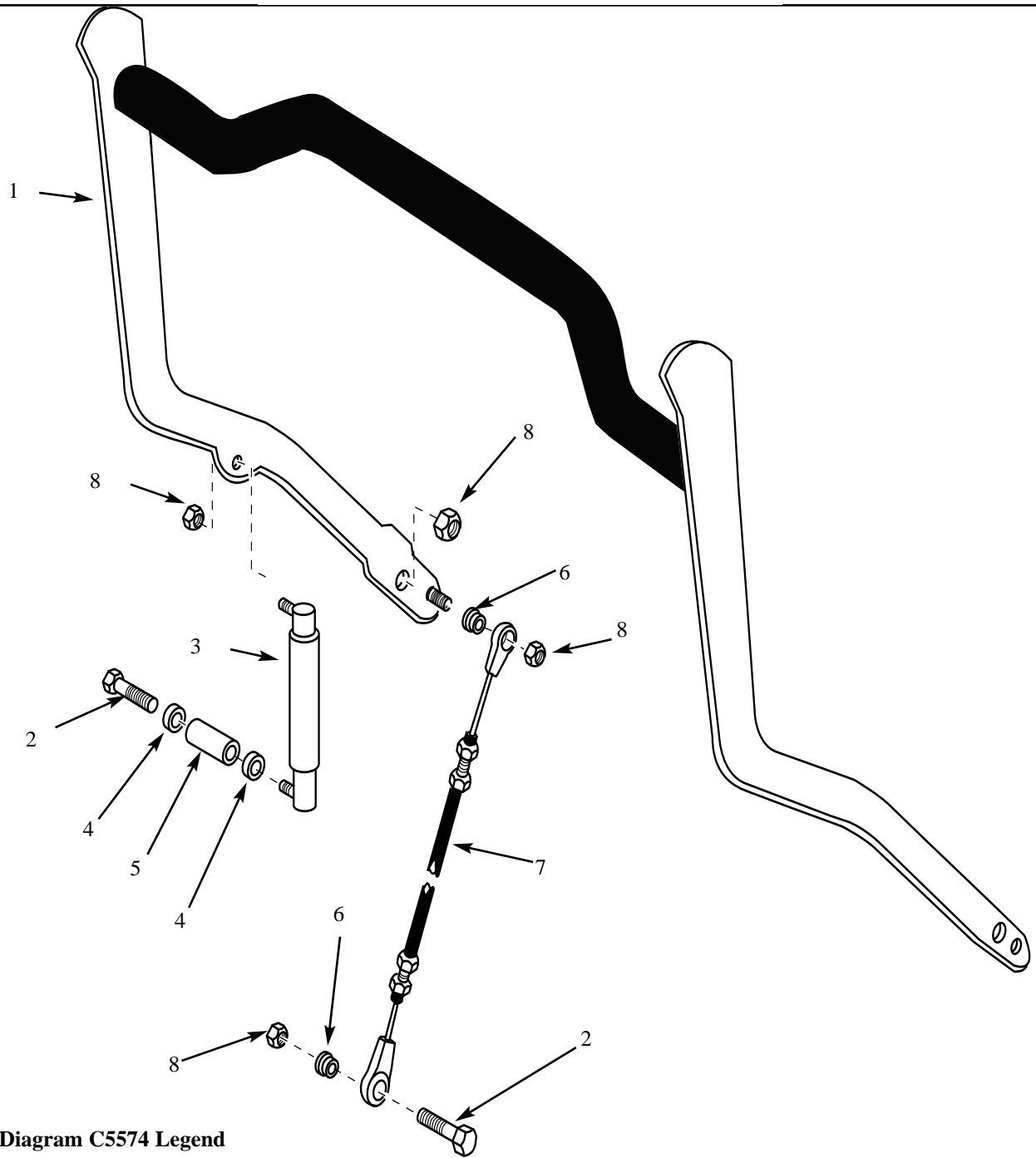
- 2 Remove the seat.
- 3 Remove the set collar connecting the throttle rod to the throttle handle. (fig. C5130) Push the rod out of the lever.
- 4 Open the rear door and remove the rear most set collar from the throttle rod.
- 5 Undo the pivot bolt and remove the throttle rod from the engine lever pivot.
- 6 Pull the throttle rod out toward the rear of the loader past the radiator.
- 7 Remove the set collar left on the throttle control rod and transfer it to the new control rod. Remove the rod end and jam nut from the old rod and install them on to the new rod.
- 8 Replace the throttle control rod in the reverse order above.



4

# RESTRAINT BAR 4.5

4



**Diagram C5574 Legend**

- 1. Restraint bar assembly
- 2. Bolt
- 3. Gas strut
- 4. Lock washer
- 5. Bushing
- 6. Insulator
- 7. Cable
- 8. Nut

C5574

# RESTRAINT BAR 4.5

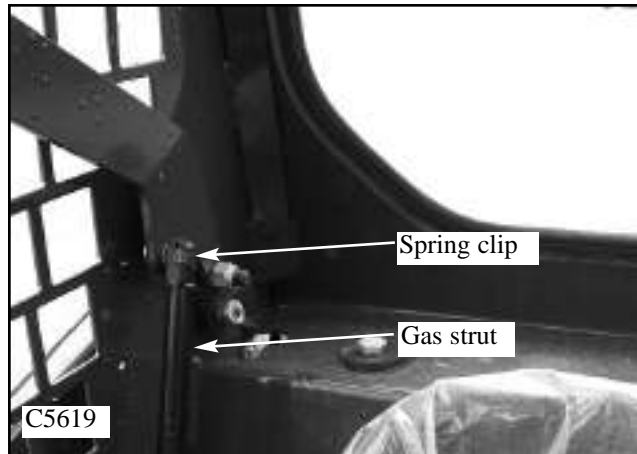
## Restraint Bar Strut

The restraint bar is held up, over head, by means of a gas pressurized strut.

If the seal in the strut has deteriorated and failed, or the strut rod has been damaged, the restraint bar will not stay in the upright position due to gas pressure loss.

To replace the gas strut assembly:

- 1 Lower the liftarms and park the loader on a level surface. Shut off the engine.
- 2 Insert a small flat bladed screwdriver behind the spring clips (fig. C5619) on either end of the gas spring. Twist the screw driver while pulling out on the gas spring. Repeat for the opposite end.



- 3 Check the ball pivot mounts for wear or damage. (fig. C2043) Replace them if necessary.



- 4 The new gas spring is fully charged and is extended to full length when installed. (fig. C2044)
- 5 Push one end of the gas spring onto the ball pivot mount.
- 6 Raise the restraint bar and attach the opposite end.
- 7 Cycle the restraint bar to verify the new gas spring will hold the restraint bar in the upright position.



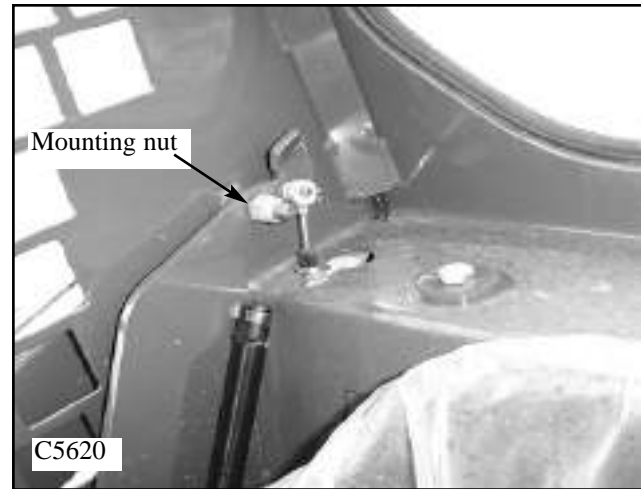
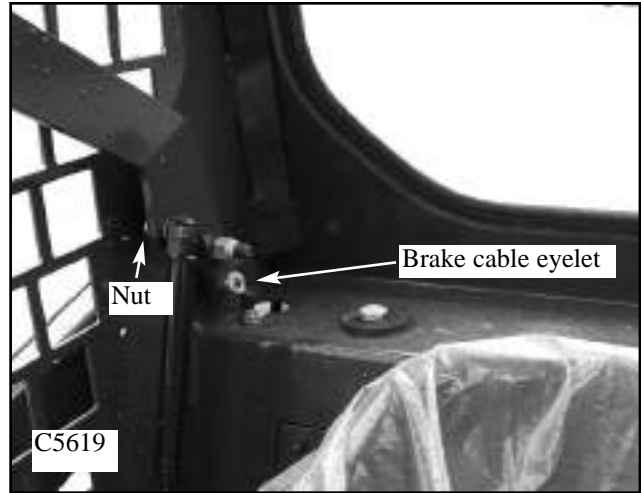
4

# RESTRAINT BAR 4.5

## Restraint Bar Replacement

- 1 Raise the boom arms, engage the boom supports and shut off the engine.
- 2 Remove cotter pin and brake cable eyelet along with nylon bushings from resstraint bar. (fig. C5619)
- 3 Remove the nut from the upper gas spring pivot ball. (fig. C5620, fig C5018) Remove the mount and gas spring together allowing the restraint bar to lower.
- 4 Remove the 2 restraint bar mounting nuts. (fig. C5620, fig C5018) There is one on either side of the restraint bar.
- 5 Squeeze the restraint bar ends inward and remove each side from it's pivot / mounting bolt. Use caution, do not damage the safety switch located to the right rear of the restraint bar.
- 6 Replace the restraint bar in the reverse order. Use new lock nuts on the restraint bar mounts. Tighten to remove slack between the restraint bar and spacer bushings. Do not over tighten. The restraint bar should cycle freely up and down without binding.
- 7 Re- attach the upper ball pivot mount to the restraint bar. Re-connect the brake cable to the restraint bar. Cycle the restraint bar to check for proper operation.

4



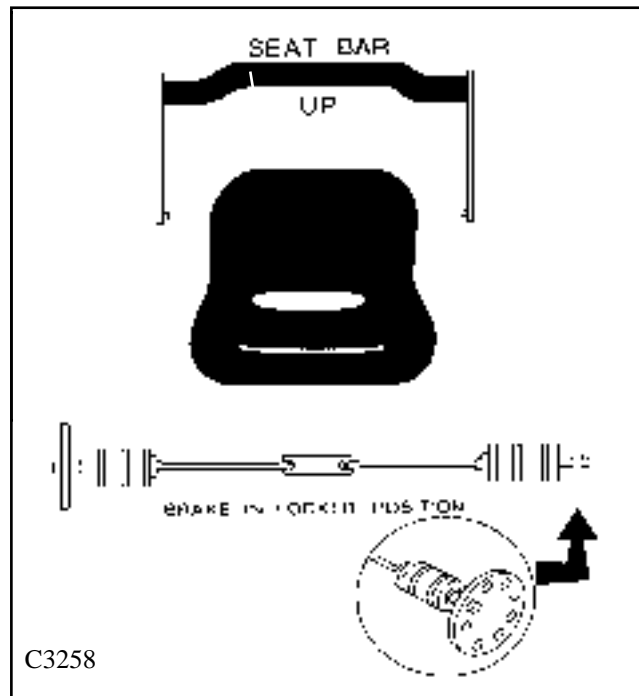


# PARKING BRAKE 4.6

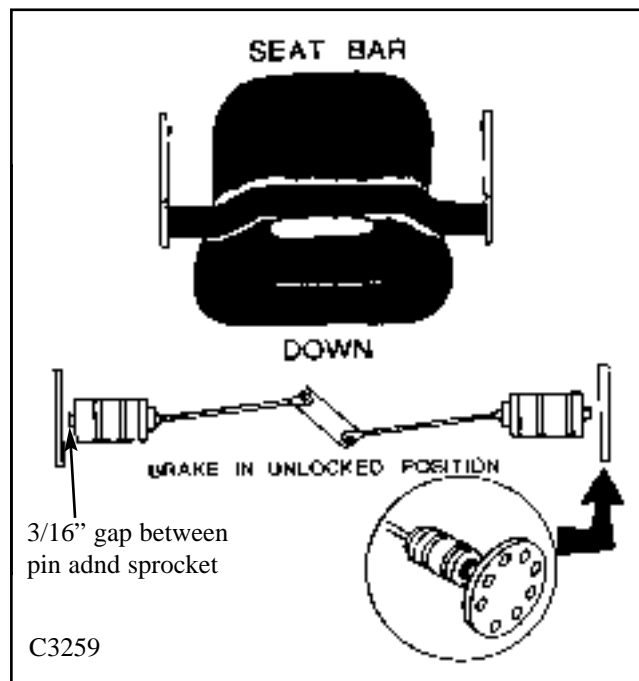
## General Information

The parking brake is a mechanical system that uses spring loaded pins engaging axle sprockets to prevent the wheels from turning.

When the restraint bar is up, pins are engaged into holes in the rear axle sprockets, this prevents the loader from moving. (fig. C3258)



When the restraint bar is lowered, the pins are pulled free of the sprockets, allowing the wheels to turn. (fig. 3259)

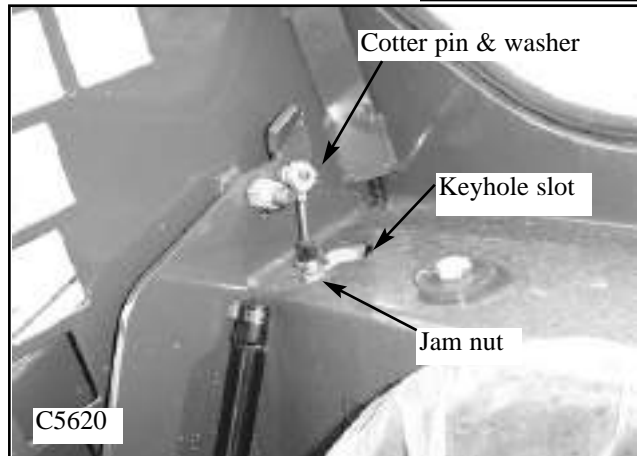


4

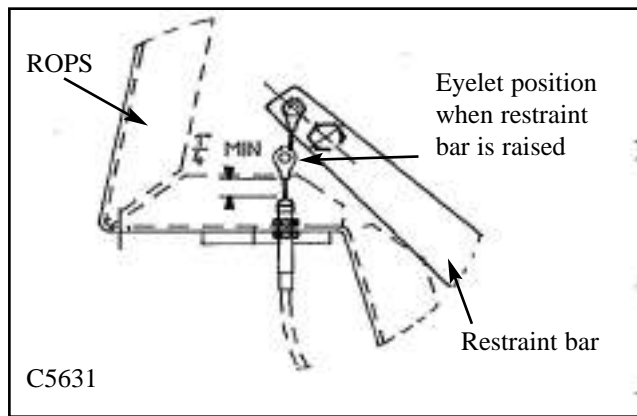
# PARKING BRAKE 4.6

## Cable Replacement & Adjustment

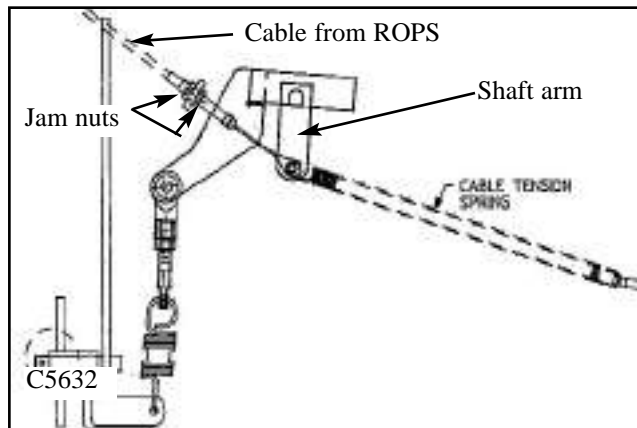
- 1 Raise the boom arms, engage the boom supports and shut off the engine.
- 2 Remove the seat and the battery access panel.
- 3 With the restraint bar in the raised position, remove cotter pin and washer that hold cable eyelet in place. Loosen the cable bulkhead jam nuts, slide the cable back to release through the keyhole slot, then remove eyelet from restraint bar. (fig. C5620)
- 4 Loosen bolt holding cable eyelet to brake shaft assy and unhook the cable tension spring. Remove bolt, nylon bushing and washers from the shaft assembly. Loosen cable bulkhead jam nuts and remove cable from loader.



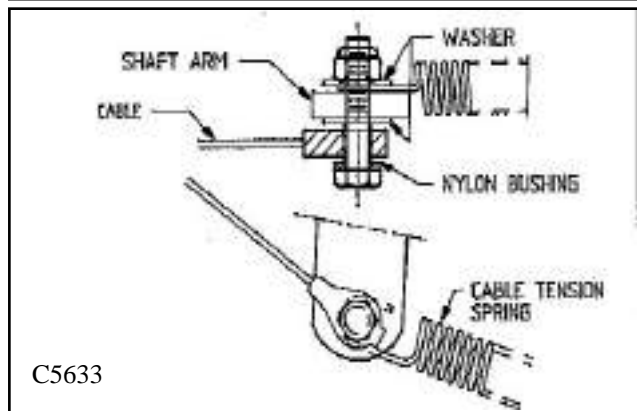
- 4**
- 5 Install the new cable, starting at the restraint bar, hook the cable eyelet onto the restraint bar, then slide the cable into position in the keyhole slot. Ensure cable alignment is correct by lowering and raising restraint bar. Tighten the cable bulkhead nuts. There should be at least 1/4" of cable exposed when the restraint bar is up. (fig. C5631)



- 6 Insert cable into the frame mounting bracket and connect it to the brake pull off shaft (without spring). Adjust the cable until it is taut with the restraint bar up. Ensure the cable is well aligned and that the eyelets swivel freely. Connect the cable tension spring. (fig. C5632, C5633)



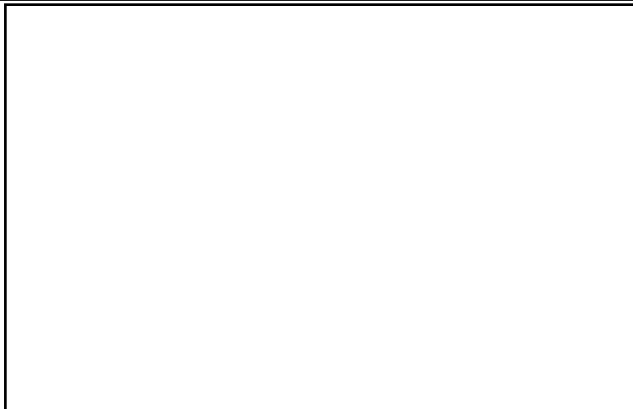
- 7 Cycle the restraint bar up and down several times and observe that the system functions smoothly.
- 8 Install the battery access panel and the seat



# TROUBLE SHOOTING 4.7



Symptom	Cause	Corrective Action	Section
Loader creeps, won't center	Neutral adjustment	Adjust linkage	4.1
	Worn, loose linkage	Replace, tighten parts	4.1
	Binding, dragging parts	Repair, replace	4.1
Steering jerky	Worn, loose linkage	Replace	4.1
	Binding linkage	Repair, replace	4.1
	Linkage adjustment	Adjust	4.1
	Low charge pressure	Repair, replace	2
Loader doesn't track straight	Limiter stops	Adjust	4.1
	Binding linkage	Repair, replace	4.1
	Hydrostatic failure	Repair, replace	2
Boom controls inoperative	Damaged cables, linkage	Replace	4.2, 4.3
	Safety switch ( s )	Adjust, replace	5
	Bad electrical ground	Repair	5
	Blown fuse	Replace	5
	Valve lock malfunction	Replace parts	1, 5
	Low hydraulic oil	Replenish	1
	No oil pressure	Make repairs	1
Boom operation slow	Cable linkage	Replace, adjust	4.2, 4.3
	Aux. hydraulics engaged	Disengage	
	Engine rpm low	Adjust	7
	Control valve relief	Adjust, replace	1
	Cylinder seal, damage	Repair, replace	1
Boom controls stiff	Cable wear	Replace	4.2, 4.3
	Pivot wear	Replace parts	4.2, 4.3
	Control valve wear	Repair, replace	1
Auxiliary hyd. inoperative (solenoid control type)	Blown fuse	Replace	5
	Switch ( s ) failure	Replace	5
	Aux. valve malfunction	Repair, replace	1
	Electrical short	Repair	5
	Bad electrical ground	Repair	5
Brake won't hold	Pins and or linkage binding	Inspect and service	
	Pins worn	Replace	
Brake won't release	Pins binding, broken cable	Repair or replace	



---

# NOTES

---

4



# SECTION 5 ELECTRICAL

Specifications	5.1
General Information.....	pg. 5-2
Wiring Schematic	5.2
ROPS Harness .....	pg. 5-3 ~ 4
Engine Harness.....	pg. 5-5 ~ 6
Instrumentation	5.3
Left Hand Dash Panel.....	pg. 5-7
Switch and Bulb Replacement .....	pg. 5-7 ~ 8
Fuel Gauge.....	pg. 5-8
Fuel Sender .....	pg. 5-9
Hour Meter.....	pg. 5-9
Ignition Switch	5.4
Ignition Switch Test.....	pg 5-10
Engine Glow Plugs	5.5
Glow Plug Test.....	pg. 5-11
Indicator Test.....	pg. 5-11
Battery	5.6
Removal & Inspection.....	pg. 5-12 ~ 13
Boosting .....	pg. 5-13
Circuit Breaker.....	pg. 5-13
Electrical Panel	5.7
Fuse & Relay Replacement .....	pg. 5-14
Starter Circuit	5.8
Schematic.....	pg. 5-15
Charging Circuit	5.9
Schematic.....	pg. 5-16
Safety Circuit	5.10
Schematic.....	pg. 5-17
General Information.....	pg. 5-18
Safety Switch Replacement, Adjustment.....	pg. 5-19
Auxiliary Circuit	5.11
Schematic.....	pg. 5-20
Auxiliary Control Handle .....	pg. 5-21
Accessory Circuit	5.12
Schematic.....	pg. 5-22
Trouble Shooting	5.13
Guide .....	pg. 5-23 ~ 24

---

## SPECIFICATIONS 5.1

---

Ignition .....	12 Volts
Grounding .....	Negative
Alternator Brand .....	Nippondenso
Alternator Rating .....	40 Amp
Alternator Type .....	Internal Regulator
Battery (std) .....	One (1)
Battery Rating .....	730 CCA, ..... 125 Reserve Minutes (each)
Battery Type .....	SERV 3478
Starter Brand .....	Nippondenso
Pre - Heater .....	Four (4) Glow plugs
Glow Plug Location.....	Cylinder Head ..... (Pre - combustion chamber)
Circuit Breaker .....	30 Amp
Fuse Rating:	
Engine Shut Off Solenoid.....	15 Amp
Alternator.....	10 Amp
Safety Circuit.....	10 Amp
Horn .....	10 Amp
Aux. Hydraulics.....	10 Amp
Cab Heater .....	10 Amp
Back up Alarm.....	10 Amp
Dome Light.....	10 Amp
Starter .....	40 Amp Relay
Glow Plugs .....	40 Amp Relay

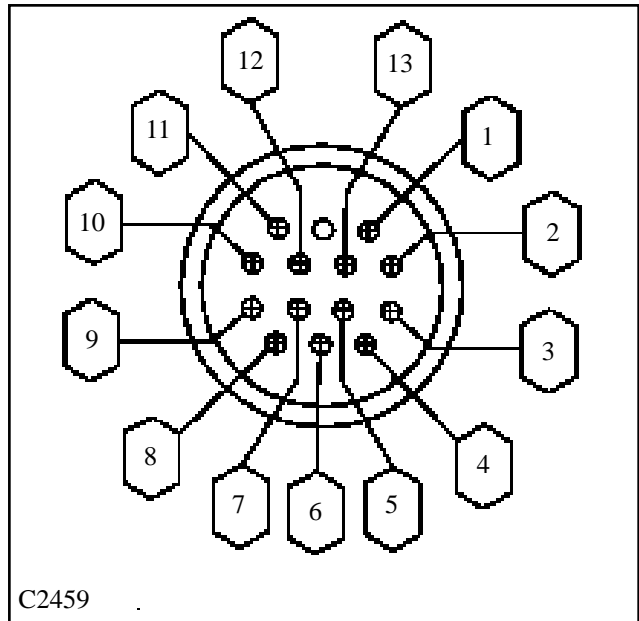
5

# WIRING SCHEMATIC 5.2

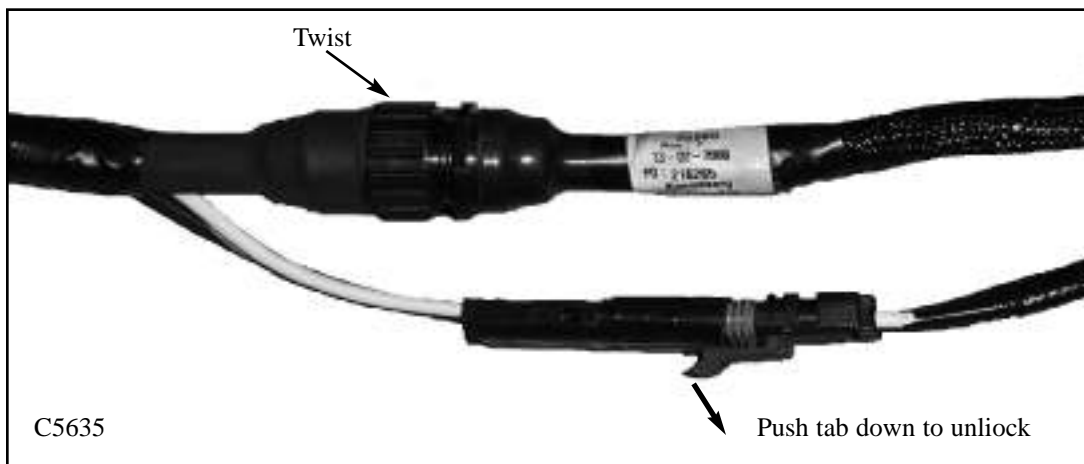
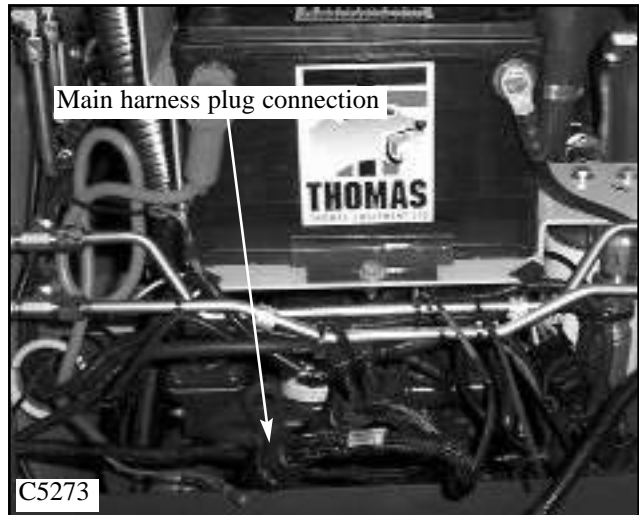
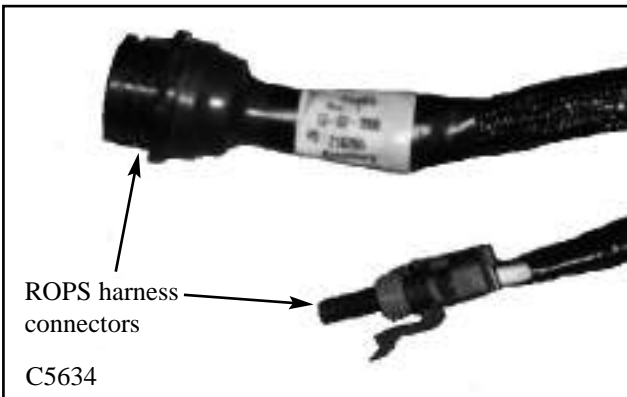
## ROPS Harness Connector

Diagram C2459 Legend. Shown is the wire color and function of each pin terminal in the connector plug.

PIN	WIRE COLOR	FUNCTION
1	Purple	Eng. Oil pressure sender
2	Orn / Blue	Fuel level sender
3	Grey	Alternator
4	Grey / Wht	Brake switch to light
5	Blue	Hyd. oil temp. switch
6	Yl / Red	Spare
7	Wht / Brn	Button to horn
8	Brown	Aux. solenoid
9	Wht / Ppl	Spare
10	Red	Seat belt switch
11	Tan	Starter relay
12	Red / Wht	Glow plug relay
13	Pple / Wht	Engine water temp. sender



The photographs below and at right show the actual ROPS harness plug connection. This is a view with the seat removed and the battery access panel removed. To separate the main electrical harness connection, push the locking tab in the direction of the arrow (fig. 5316) and twist the collar clockwise to release.



5

# WIRING SCHEMATIC 5.2

## ROPS Electrical Wiring 85

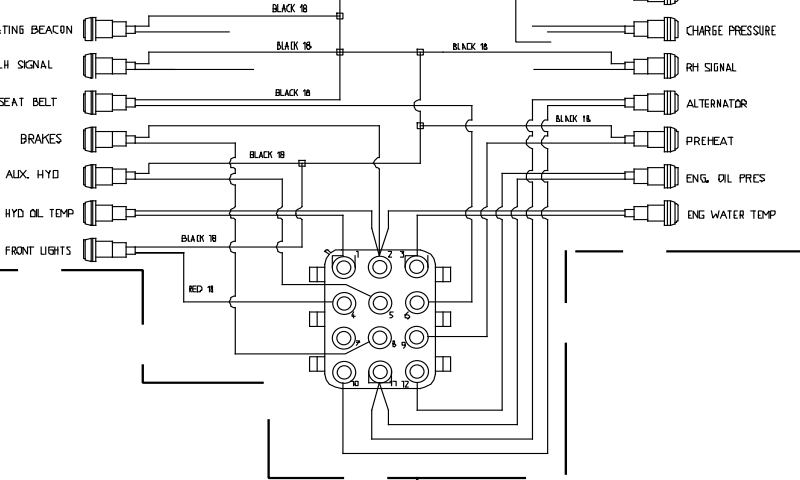
DETAIL OF INDICATOR DISPLAY

ROTATING BEACON  
LH SIGNAL  
SEAT BELT  
BRAKES  
AUX. HYD  
HYD OIL TEMP  
FRONT LIGHTS

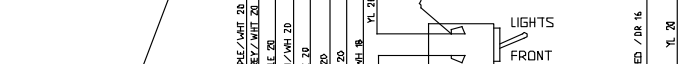
1/8" DIA MALE  
DNZ TYPICAL

LOOSE WIRE ENDS

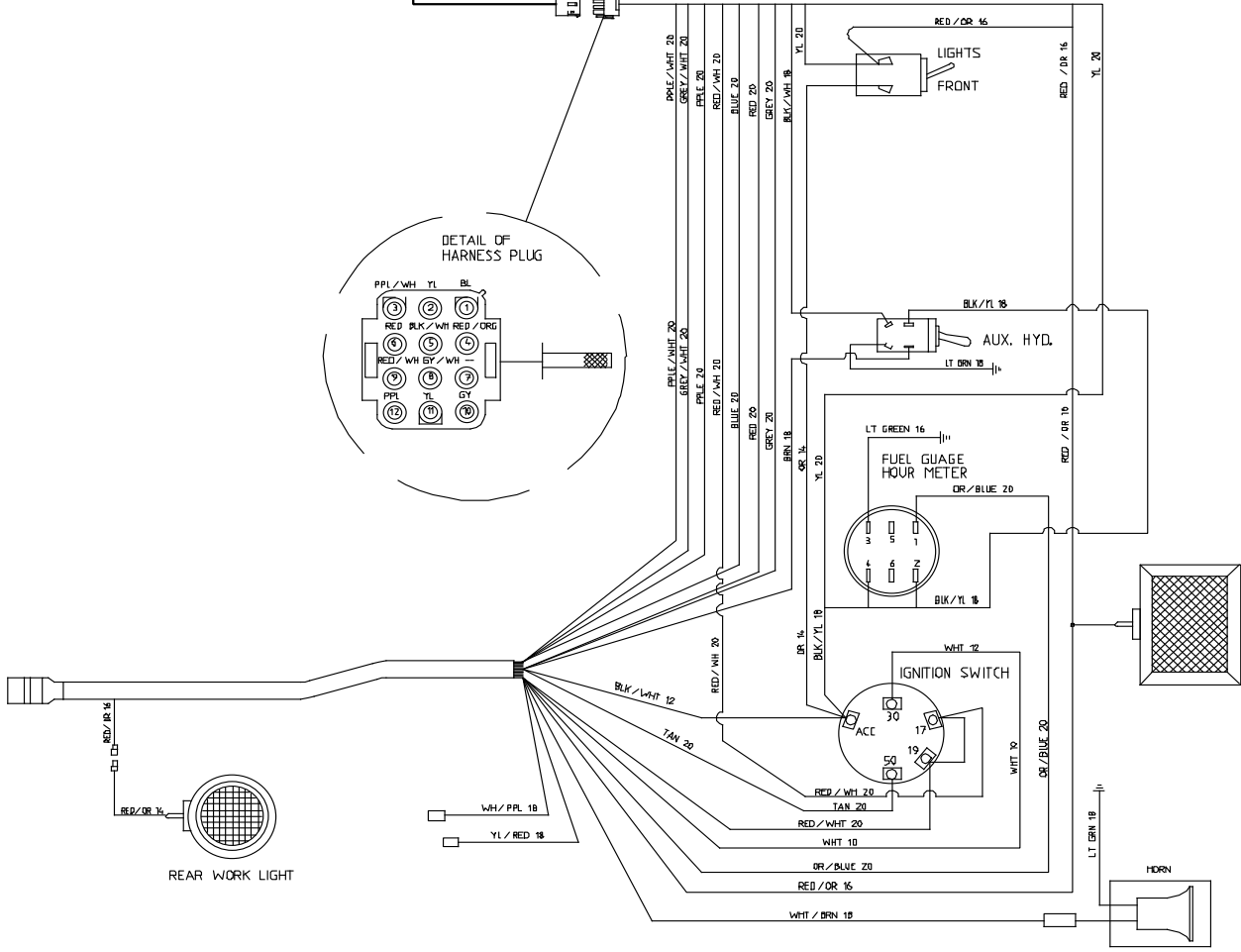
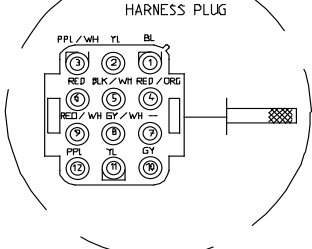
HI-FLOW  
AIR FILTER  
CHARGE PRESSURE  
RH SIGNAL  
ALTERNATOR  
PREHEAT  
ENG OIL PRES  
ENG WATER TEMP



BLK



DETAIL OF HARNESS PLUG



C3257

C3257

5

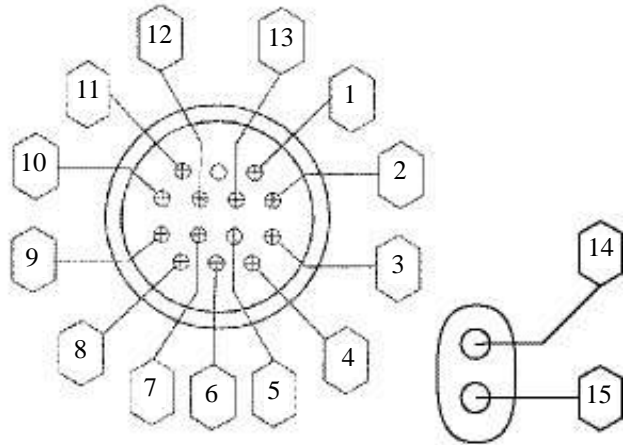


# WIRING SCHEMATIC 5.2

## Engine Harness Connector

Diagram C1741a Legend. Shown is the wire color and function of each pin terminal in the connector plug.

PIN	WIRE COLOR	FUNCTION
1	Tan	Starter relay
2	Red	Seat belt
3	Wht / Ppl	Spare
4	Brown	Sol aux. switch
5	Wht / Brn	Horn
6	Yl / Red	Spare
7	Blue	Warning light
8	Grey / Wht	Brake light switch
9	Grey	Charge light
10	Org / Blue	Fuel gauge
11	Purple	Warning light
12	Ppl / Wht	Warning light
13	Red / Wht	Glow plug
14	White	Key to circuit breaker
15	Blk / Wht	Key to fuse block



C5312

The photographs below and at right show the actual Engine harness plug connection. To separate the main electrical harness connection, refer to pg. 5-3.

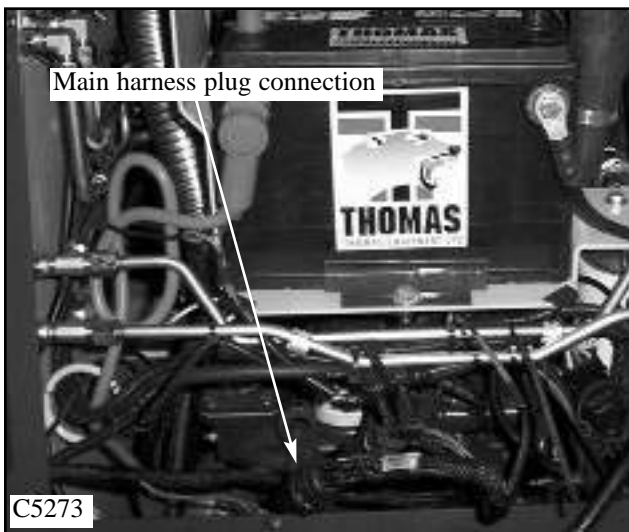
Engine Plug



C5317



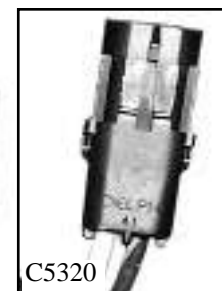
C5318



C5273



C5316

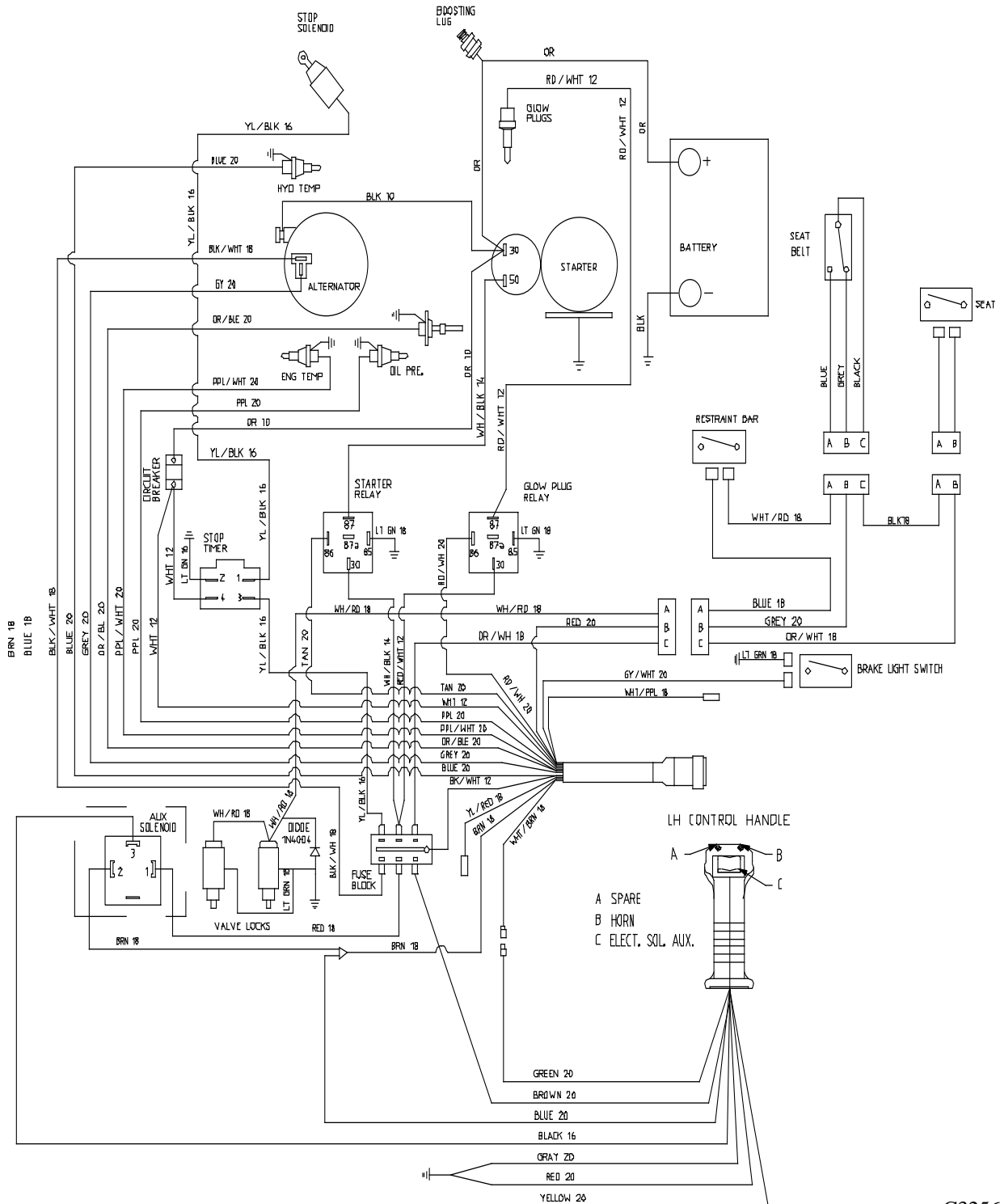


C5320

5

# WIRING SCHEMATIC 5.2

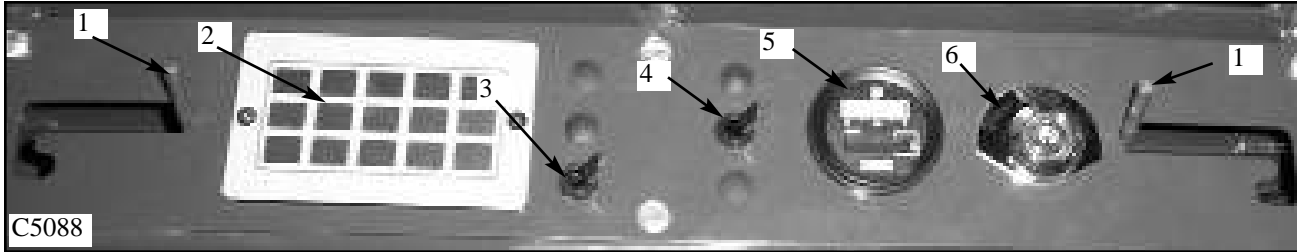
## Engine Electrical Wiring 85



5

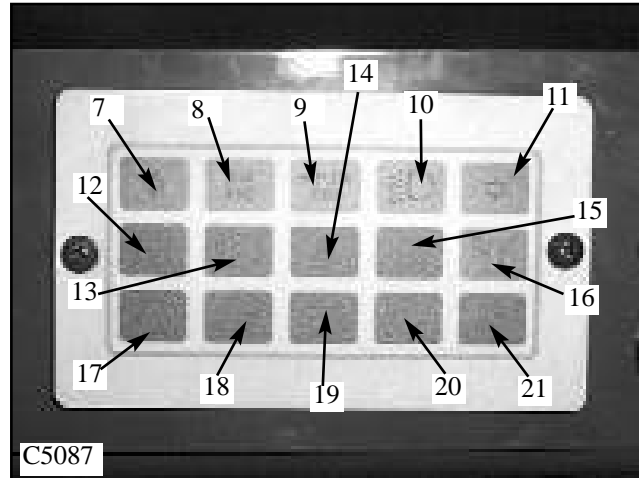
C3256

# INSTRUMENTATION 5.3



Legend for fig. C5088, C5087

- 1 Boom Support Pin Rods
- 2 Indicator Panel
- 3 Work Light Switch
- 4 Electric Auxiliary
- 5 Fuel gauge / Hour meter
- 6 Ignition Switch
- 7 LH Directional Signal
- 8 Electric Auxiliary Engaged
- 9 -Not used-
- 10 Work Light Indicator
- 11 RH Directional Signal Indicator
- 12 Hydraulic Oil Temperature High Indicator
- 13 Parking Brake On Indicator
- 14 Seat Belt Unfastened Indicator
- 15 -Not used-
- 16 Rotating Beacon On Indicator
- 17 Engine Oil Pressure Low Indicator
- 18 Engine Coolant Temperature High Indicator
- 19 Alternator Not Charging Indicator
- 20 -Not used-
- 21 Preheat On Indicator



5

## Switch & Bulb Replacement

To replace a malfunctioning switch or indicator light:

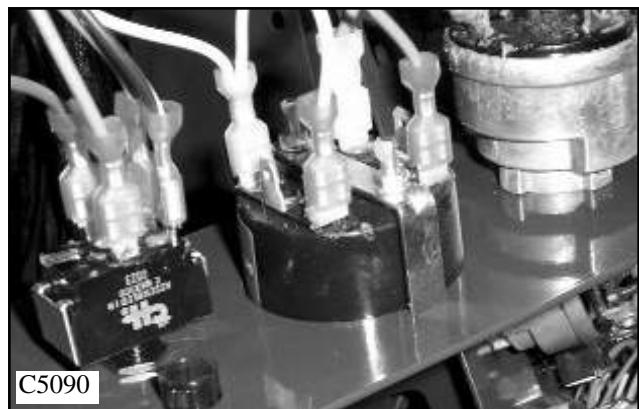
- 1 Remove the seat and the battery access panel.  
Disconnect the negative cable from the battery.
- 2 Remove the 6 screws retaining the electrical panel to the dash pod. (fig. C5088)
- 3 Disconnect the spade terminals on the rear of the switch.
- 4 Remove the switch by loosening the hex nut on the back, then unscrewing the knurled nut on the front of the electrical panel.
- 5 Replace an indicator bulb by turning out the socket and pull bulb out.
- 6 Replace the switch, indicator light and panel in the reverse order.

# INSTRUMENTATION 5.3

## Replacement

To replace a faulty gauge, meter or switch in the dash panel:

- 1 Disconnect the battery cable connection. (fig. C5105)
- 2 Remove the 6 screws retaining the dash panel to the dash pod.
- 3 Access the rear of the dash panel. (fig. C5090)
- 4 Remove the wiring from the effected part.
- 5 Both the fuel gauge and the combined fuel gauge/hour meter are retained by a bracket and 2 mounting nuts. Remove the nuts and the gauge can be replaced.
- 6 The ignition switch is retained by the knurled nut on the outside of the dash panel. Remove the nut and the switch can be replaced.
- 7 Up to LB002499, the hour meter is retained in the dash panel with molded in tabs. Pull the tabs outward and the hour meter can be replaced.

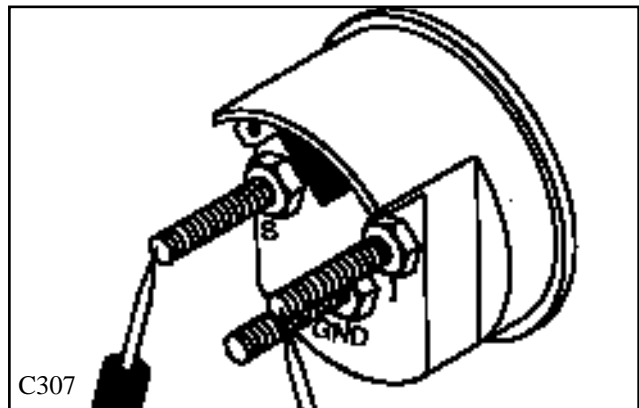


## Testing the Fuel Gauge

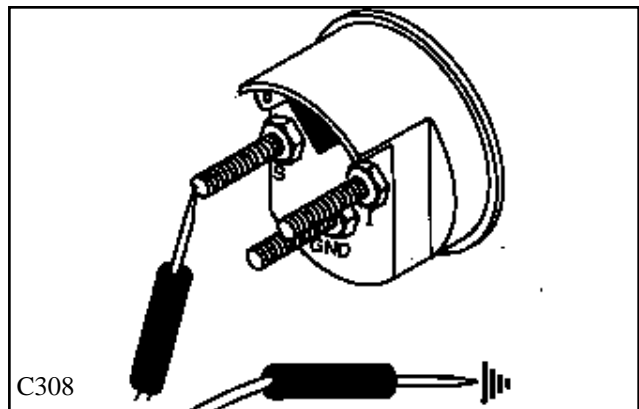
Up to serial number LB002499

- 1 Remove the dash panel to access the gauge. (fig. C5090)

- 2 With the ignition switch off, connect an ohmmeter between the "S" terminal and the "P" terminal. (fig. C307)
  - 3 An ohmmeter reading of 150 to 250 ohms is normal. A higher or lower reading means the gauge is faulty and needs to be replaced.
- NOTE: If the fuel gauge test results were good and the gauge still fails to function do the following test.



- 1 With the ignition switch off, connect an ohmmeter between the "S" terminal and the other end to ground.
  - 2 An ohmmeter reading of 50 to 500 ohms is normal. A higher or lower reading means the wire going to the "S" terminal is faulty.
- NOTE: If the test is good, check the fuel sending unit in the fuel tank for failure.



5

## INSTRUMENTATION 5.3

### Testing the Fuel Sender

- 1 With the ignition switch off, connect an ohmmeter between the positive and negative terminals of the fuel sending unit. (fig. C306)
- 2 An ohmmeter reading of 50 to 500 is normal. A reading higher or lower means a faulty sender and will need replaced.

### Replacement

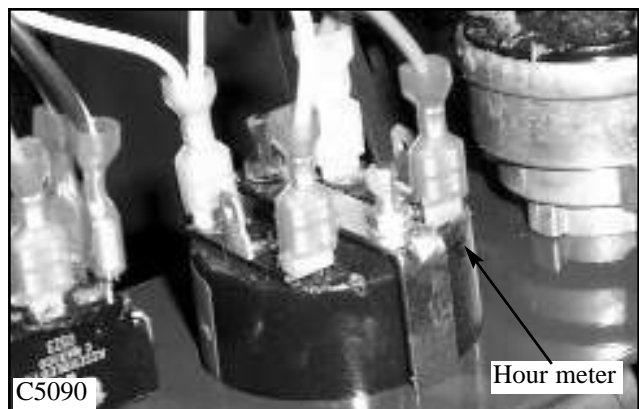
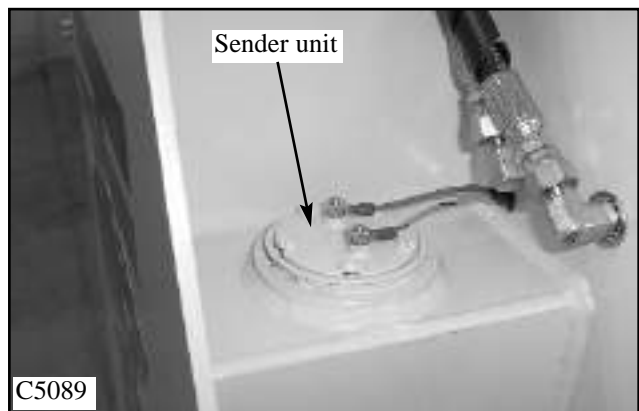
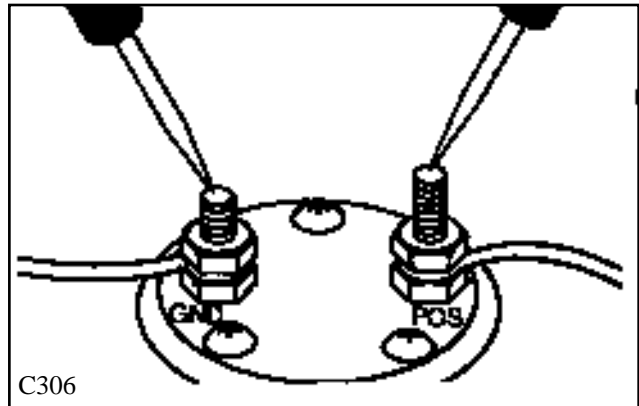
- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine and engage the parking brake.
- 2 Remove the 2 wires connected to the fuel sending unit. The fuel sender is located just below the lift cylinder, right hand side, on the fuel tank. (fig. C5089)
- 3 Remove the 5 screws retaining the sender to the fuel tank.
- 4 Remove the sending unit and discard the gasket.
- 5 Install a new sending unit and gasket. Use gasket sealant on both sides of the gasket.
- 6 Use thread sealant on the screws and torque the screws to 20 inch lbs.
- 7 Connect the sender wires taking care not to over tighten the nuts and stripping the studs. Green wire is ground.

### Testing the Fuel Sender/Hour Meter LB002500 Onward

The hour meter records the number of engine operating hours.

LB002500 Onward

- 1 To check the fuel sender, remove the dash panel.
  - 2 With the ignition switch off, connect an ohmmeter between the #1 and the #3 terminals.
  - 3 An ohmmeter reading of 150 to 200ohms is normal. A higher or lower reading means the gauge is faulty and needs to be replaced.
- NOTE: If the fuel gauge test results were good and the gauge still fails to function, do the following test.
- 1 With the ignition switch off, connect an ohmmeter between the #1 terminal and the other end to ground.
  - 2 An ohmmeter reading of 50 to 500 ohms is normal. A higher or lower reading means the wire going to the #1 terminal is faulty.
- NOTE: If test is good, check the fuel level sender.



# IGNITION SWITCH 5.4

## Ignition Switch Testing

The ignition switch is a 4 position switch. OFF, PRE-HEAT, RUN and START. Turning the key counterclockwise will engage the PREHEAT. To activate the starter, turn the key clockwise. When the key is released it will return to the RUN position.

Before performing any test to the ignition switch, disconnect the negative or ground wire from the battery terminal. Remove the 6 screws retaining the dash panel to the ROPS to access the ignition switch.

**TEST 1: "RUN" POSITION.**

Connect an ohmmeter across the terminals marked 30 and ACC. (fig. C297) Turn the ignition switch to the run position.

A low resistance reading is normal. High resistance reading means you will have to replace the ignition switch.

**TEST 2: "START" POSITION.**

(a) Connect an ohmmeter between the terminals marked 30 and 50 on the ignition switch. (fig. C298) Turn the ignition switch to the "START" position and observe the ohm readings.

(b) Connect the ohmmeter leads across terminals marked 30 and 17 on the ignition switch. (fig. C299) Turn the ignition switch to the "START" position and observe the ohmmeter reading.

Low resistance reading is normal.

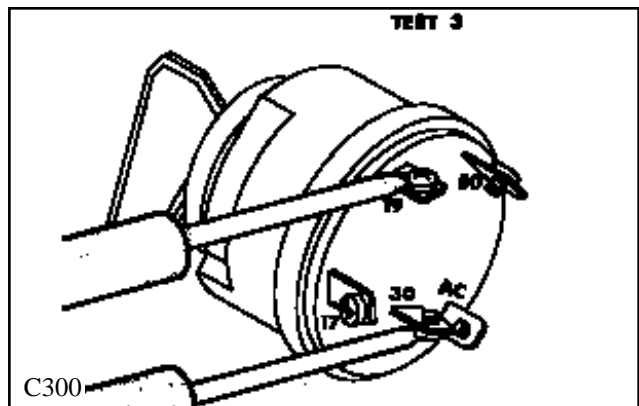
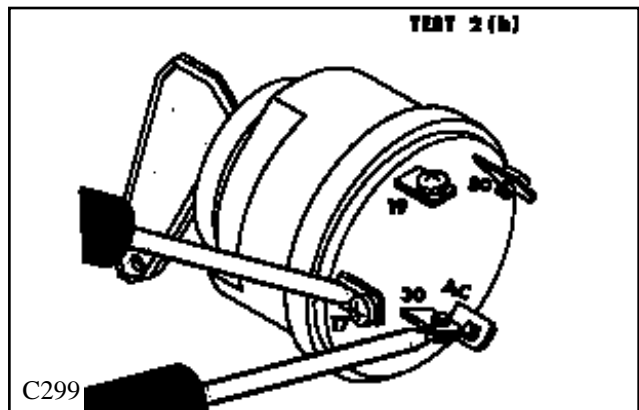
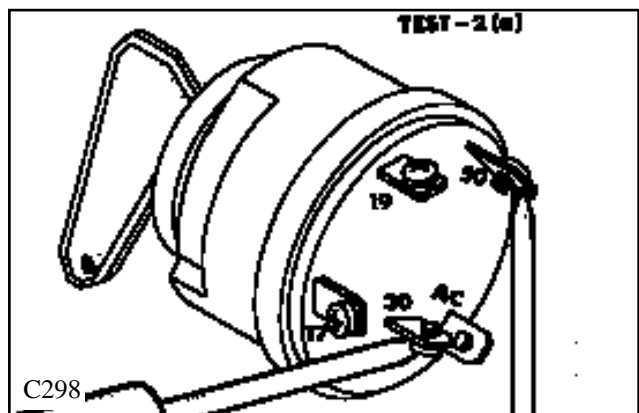
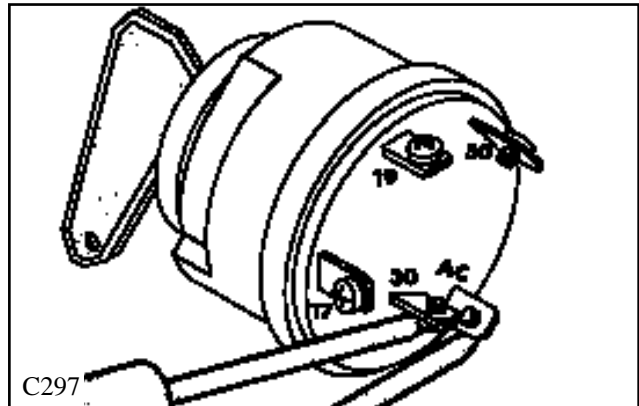
High resistance reading means the ignition switch needs replacement.

**TEST 3: "HEAT" POSITION.**

Connect the ohmmeter leads between the terminals marked 30 and 19 on the ignition switch. (fig. C300) Turn the ignition switch to the "HEAT" position and observe the ohmmeter readings.

Low resistance reading normal.

High resistance reading, replace the ignition switch.



# ENGINE GLOW PLUGS 5.5

## Testing the Glow Plugs

Before performing any test on the glow plugs, disconnect the ground wire from the battery.

### TEST 1: GLOW PLUGS.

With the ignition switch off, connect one end of the ohmmeter lead to the manifold heater terminal and the other lead end to a clean ground.(fig. C5092)

A reading of 1.5 ohms is normal.

An infinite or 0 reading means the heater is defective.

### TEST 2: IGNITION SWITCH to GLOW PLUGS.

Remove the 6 screws retaining the dash panel to the ROPS (fig. C5088) With the ignition switch off, disconnect the red / white wire from ignition terminal 19.

Connect one ohmmeter lead to the terminal marked 19 on the ignition switch and the other lead to the red / white wire.

Low to 0 reading means good continuity.

High reading means the red / white wire from the ignition switch to the manifold heater is defective.

### TEST 3 IGNITION SWITCH “HEAT” POSITION.

Connect the ohmmeter leads between the terminals marked 30 and 19 on the ignition switch. (fig. C300) Turn the ignition switch to the “HEAT” position and observe the ohmmeter readings.

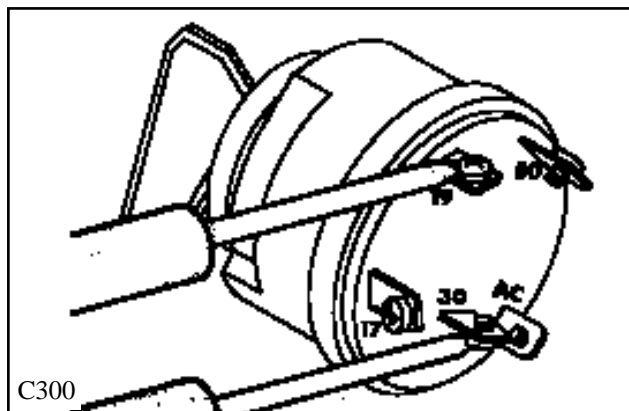
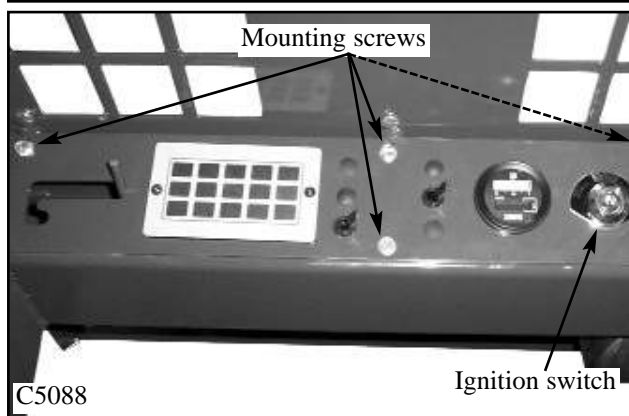
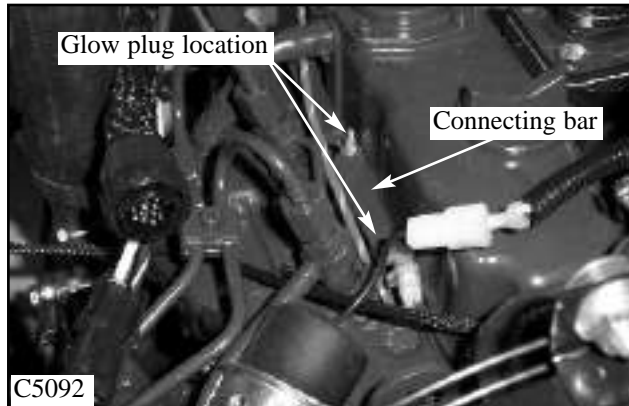
Low resistance reading normal.

High resistance reading, replace the ignition switch.

## Pre-Heat Indicator

Check the ignition switch terminals 17 and 19 with an ohmmeter. If there is good continuity between the two terminals the bulb or wiring is bad on the pre-heat indicator light.

To change the indicator bulb, remove the 6 screws retaining the left hand dash panel to the dash pod. Select the proper bulb, twist and pull the bulb from the dash panel. Disconnect the wires and replace the bulb in reverse order.



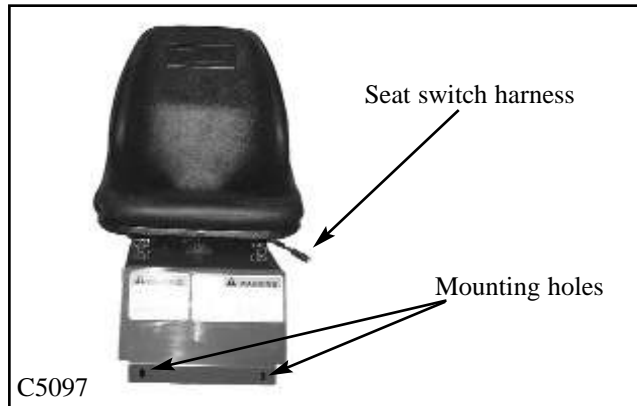
5

# BATTERY 5.6

## Removal and Inspection

The batteries are located in the ROPS behind the operators seat. To remove the battery:

- 1 Remove the seat mount retaining bolts and disconnect the seat switch wiring harness. (fig. C5097)
- 2 Pull up and toward the front of the loader and remove the seat. Be careful to not catch any electrical wiring while removing.

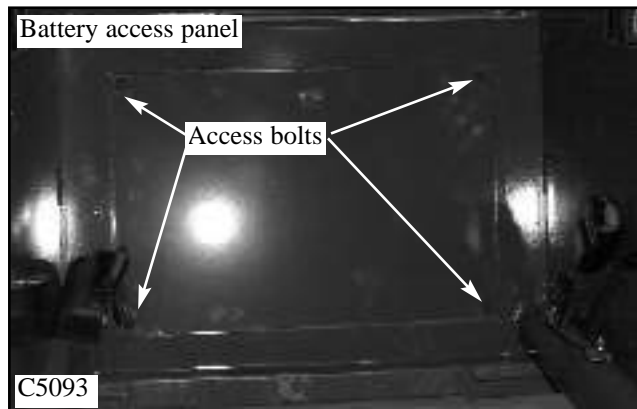


- 3 Remove the access bolts from the battery compartment cover. (fig. C5093)

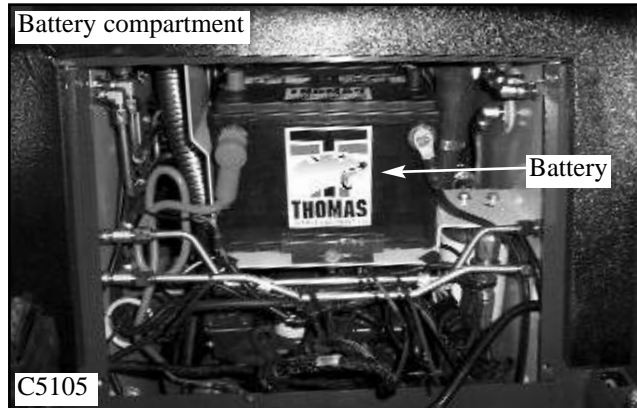
**5**

**WARNING**

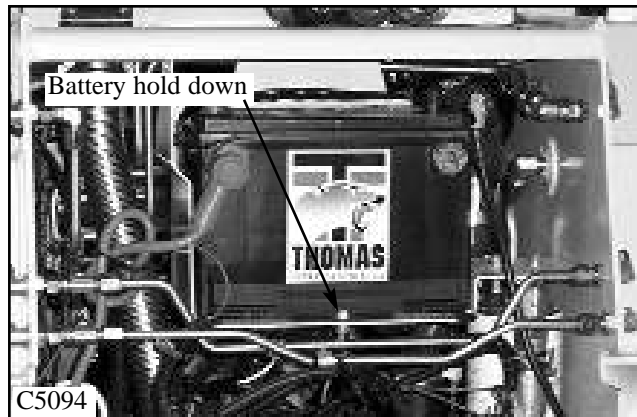
Batteries contain sulfuric acid which can harm the eyes and skin on contact. Always wear goggles and protective clothing while servicing the battery. Flush skin or eyes with water upon contact. Consult a physician.



- 4 Disconnect both battery ground terminals first. Then disconnect the positive cables from the battery. (fig. C5105)



- 5 Remove the bolt securing the battery hold down bracket. (fig. C5094)
- 6 Carefully remove the battery from the compartment.
- 7 Inspect the battery cables for corrosion and damage. Remove any corrosion using a wire brush and a soda solution. Replace the cables having damaged or deformed ends.
- 8 Clean the outside of the battery case if the battery is to be reused. Flush the terminal areas with a soda solution taking care not to allow the solution into the battery cells. Remove corrosion from the battery terminals with a wire brush..

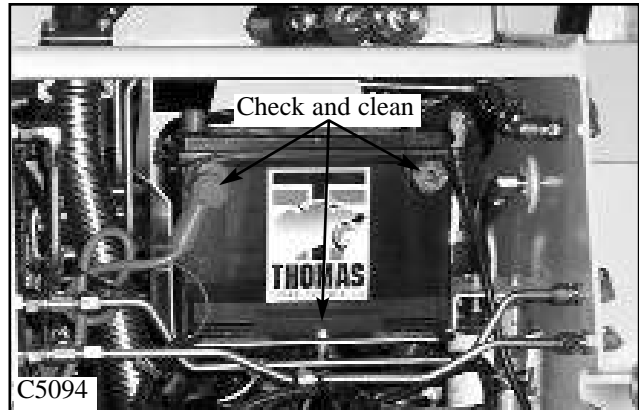




# BATTERY 5.6

## Removal and Inspection

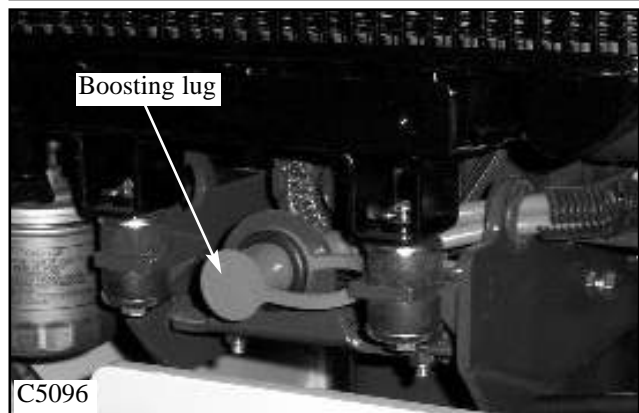
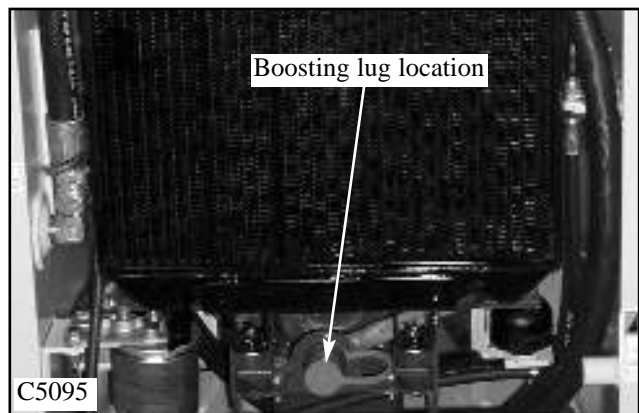
9 Inspect the battery case for cracks that may allow electrolyte to leak into the environment. Inspect the battery on a regular basis for damage such as cracks or a broken case. Inspect the battery cables for tightness and corrosion. Remove any corrosion and coat the terminals with a dielectric grease. Check the battery hold downs to be sure they are properly retaining the battery in the compartment. (fig. C5094)



## Boosting

In the event the loader has failed to start and requires boosting, a boosting lug or post is located in the engine compartment. (fig. C5095)

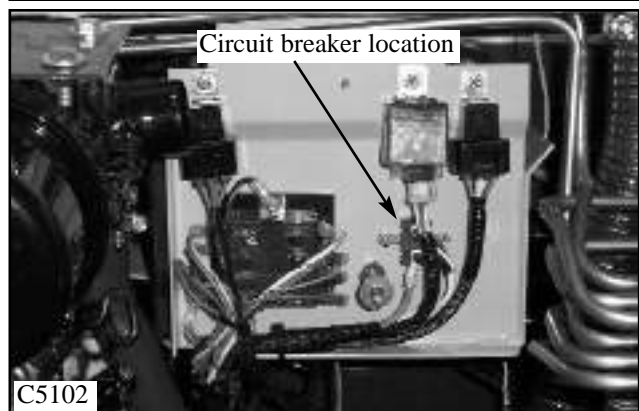
- 1 Open the rear door and raise the engine compartment cover.
- 2 Remove the red rubber protective cover from the boosting lug. (fig. C5096)
- 3 The ignition must be in the off position.
- 4 Connect the positive cable from the 12 volt boosting supply to the boosting lug on the loader, ensure that it is not grounding out on any metal parts.
- 5 Connect the negative ground cable to the boosting supply first, and then to a clean ground on the loader engine. Keep the cables away from any moving parts.
- 6 Start the engine.
- 7 Remove the negative ground cable from the engine first and then the boosting supply. Remove the positive cable from the boosting lug.



## Circuit Breaker

The circuit breaker is located in the engine compartment, mounted on the fuse, circuit breaker panel.(fig. C5102)  
To test the circuit breaker:

- 1 Disconnect the battery grounds before testing or replacing the circuit breaker.
- 2 Remove the knob holding the cover on the fuse panel, remove the cover.
- 3 Remove the 2 nuts retaining the wires to the circuit breaker.
- 4 Using an ohmmeter, connect a lead to each of the stud terminals and take a reading.  
Low resistance is normal.  
High resistance means the circuit breaker is defective and must be replaced.



5

# ELECTRICAL PANEL 5.7

The loader is equipped with a 12 volt, negative ground electrical system. The fuse and relay panels are located in the engine compartment, attached to the back of the battery box, over the engine cover. (fig. C5214)

To access the electrical panel:

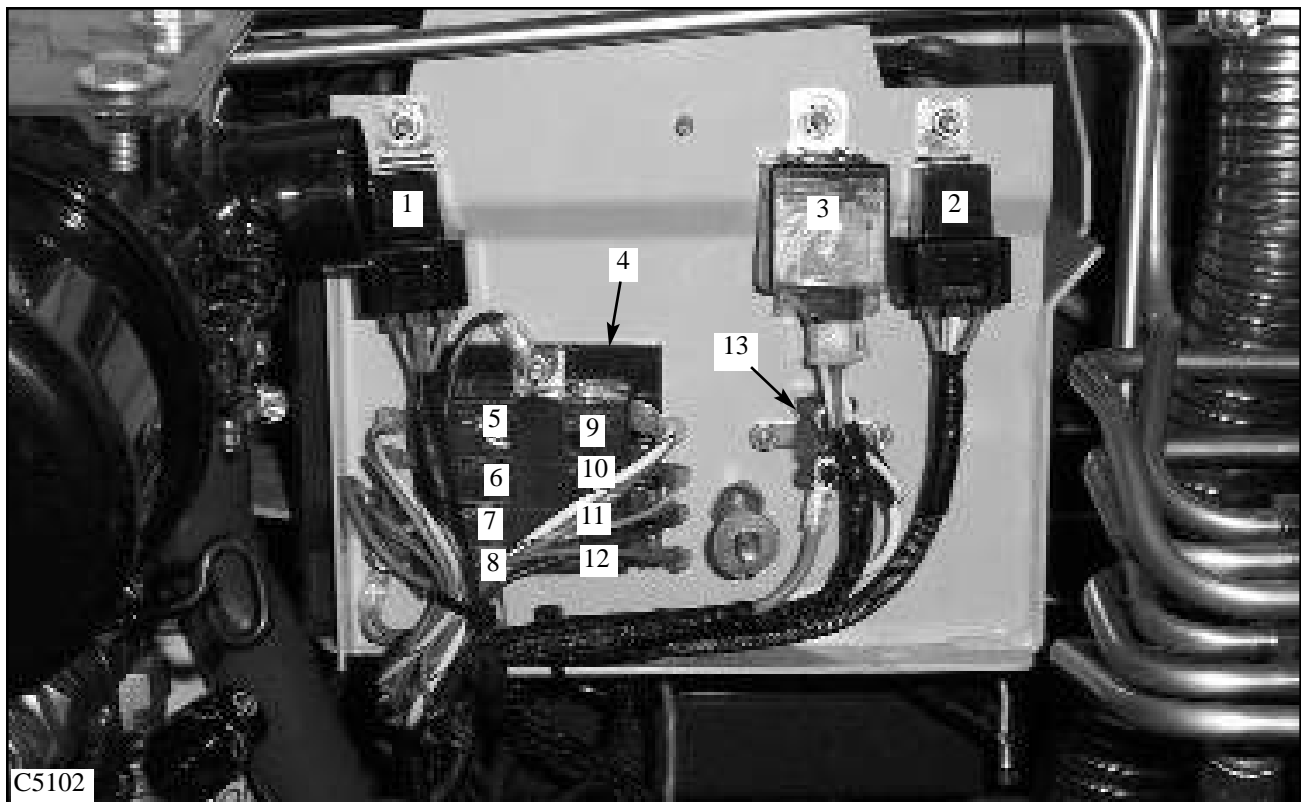
- 1 Open the rear door and raise the engine cover.
- 2 Remove the knob holding the electrical panel cover closed. (fig. C5214)
- 3 Open the cover and all fuses and relays will be exposed. (fig. C5102)

Visually check the fuses for burnt contacts.

The ground bolt should be checked occasionally for corrosion and cleaned if necessary. Use a dielectric grease to protect the ground point from the elements.



C5214

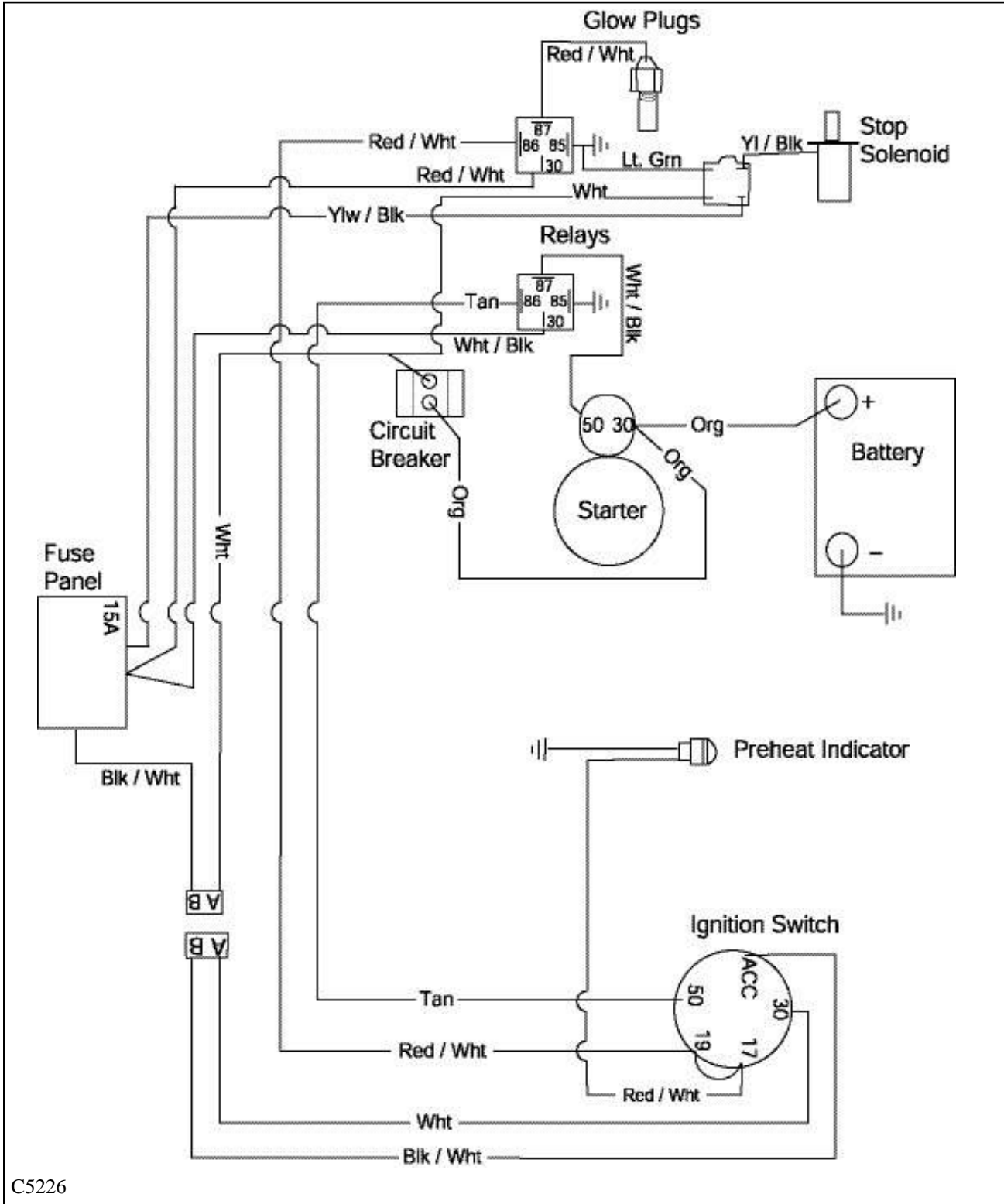


C5102

ELECTRICAL PANEL LEGEND.(fig. C2052)

- |                          |                                      |
|--------------------------|--------------------------------------|
| 1 Glow plug Relay        | 7 Electric Auxiliary Fuse            |
| 2 Starter Relay          | 8 Spare Fuse                         |
| 3 Engine Fuel Stop Timer | 9 Starter(W/B), Glow Plug Fuse (R/W) |
| 4 Fuse Panel             | 10 Valve Locks Fuse(Or/W)            |
| 5 Stop Timer Fuse (Y/B)  | 11 Horn Fuse                         |
| 6 Alternator Fuse (B/W)  | 12 Spare Fuse                        |
|                          | 13 Circuit Breaker, 30 amp.          |

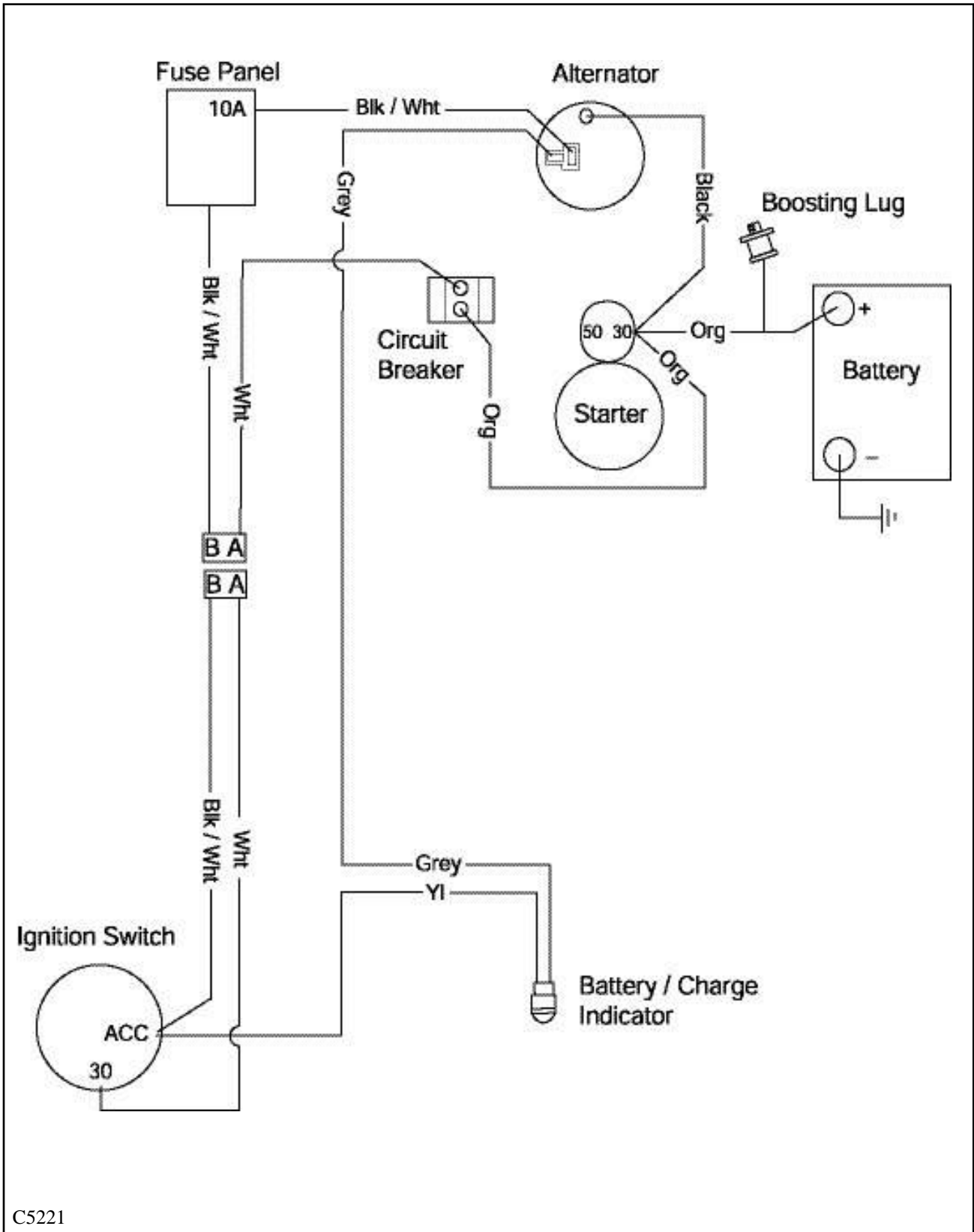
# STARTING CIRCUIT 5.8



C5226

5

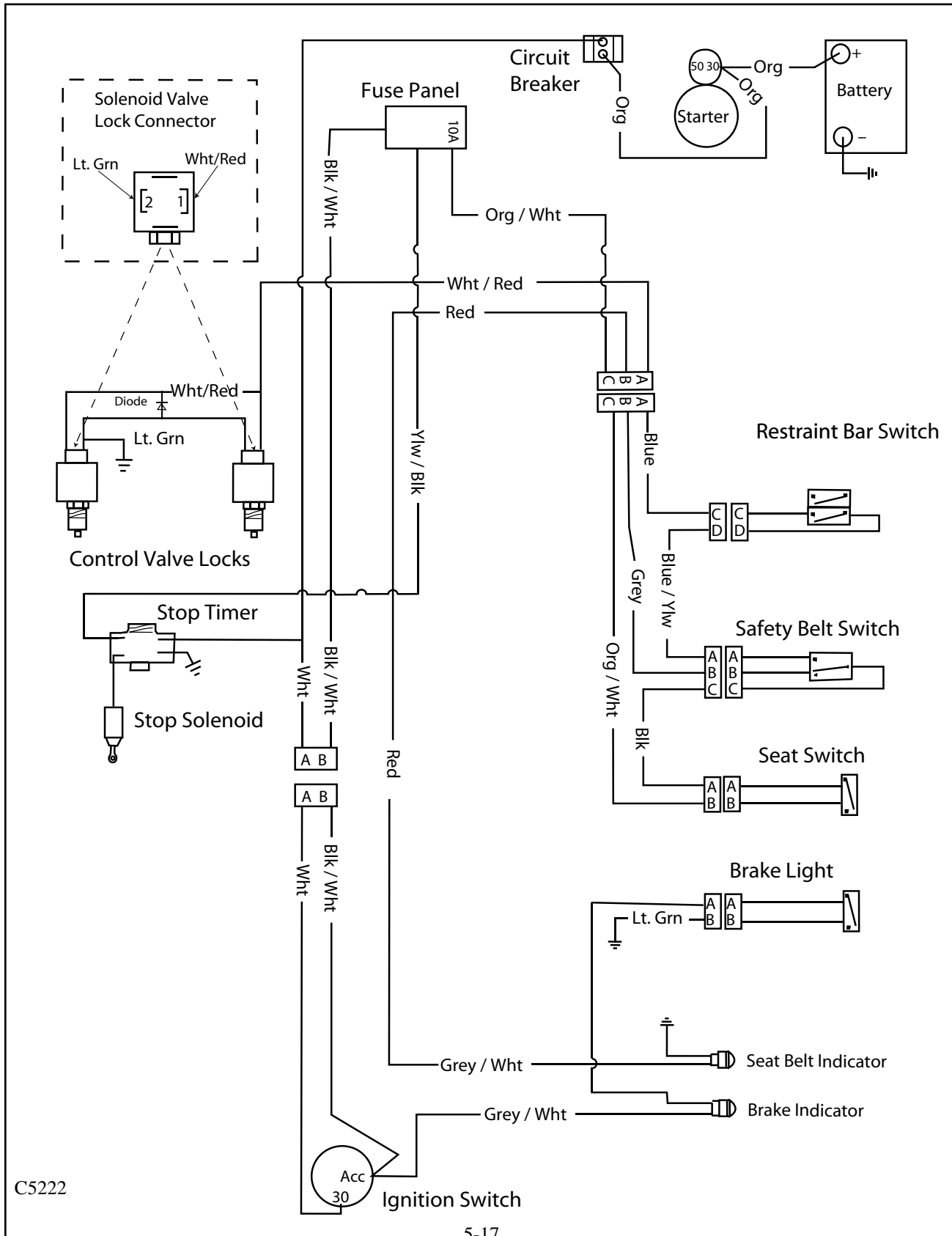
# CHARGING CIRCUIT 5.9



C5221

5

# SAFETY CIRCUIT 5.10



C5222

# SAFETY CIRCUIT 5.10

## General Information

The loader is equipped with 3 inter - connected safety switches. These switches operate 2 electric solenoid controlled lock devices and a starter interlock system. One (1) pair of solenoid coils on the hydraulic control valve . The operation of the solenoid coils and loader functions will be prevented if one of these safety switches are open. For proper operation of the solenoid coils and loader functions, all 3 must be hooked up, functioning and, if applicable, adjusted correctly. There is also a switch that controls the dash panel brake warning light.

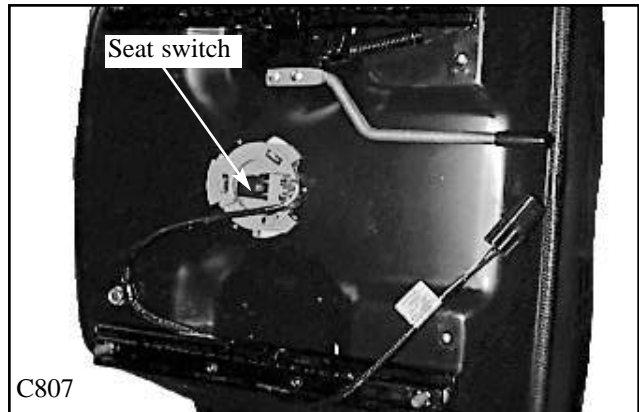
The bottom of the operators seat is equipped with a pressure sensitive switch.(fig. C807) The operator must be in the seat to close the switch and release the parking brake and unlock the control valve functions. No adjustments required. When removing and replacing the seat, be sure not to pinch the wires under the seat plate.

The seat belt assembly is equipped with a safety switch. The operator must have the seat belt fastened around them in order to close the switch and allow the parking brake to release and the control valve to function. (fig. C5020) No adjustments required.

The restraint bar controls two safety switches (fig. C5628) located under the operators seat assembly. With the restraint bar in the raised position, the parking brake is activated, the control valve functions are locked and the activation indicator lights are illuminated on the dash panel. (fig C5629)

Lowering the restraint bar releases the parking brake, turns off the indicator lights in the dash panel and releases the locks in the control valve. (fig. C5630)

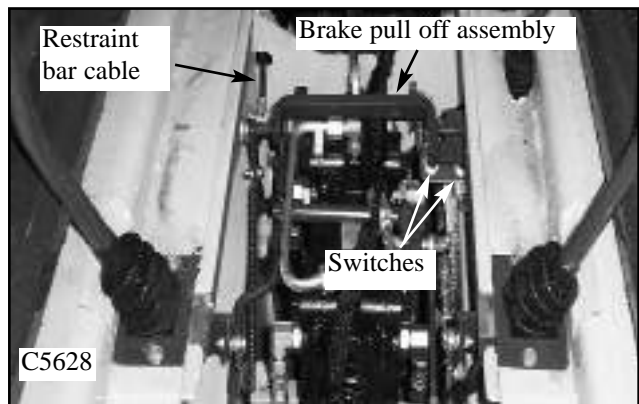
The restraint bar must be in the lowered position for the control functions to operate.



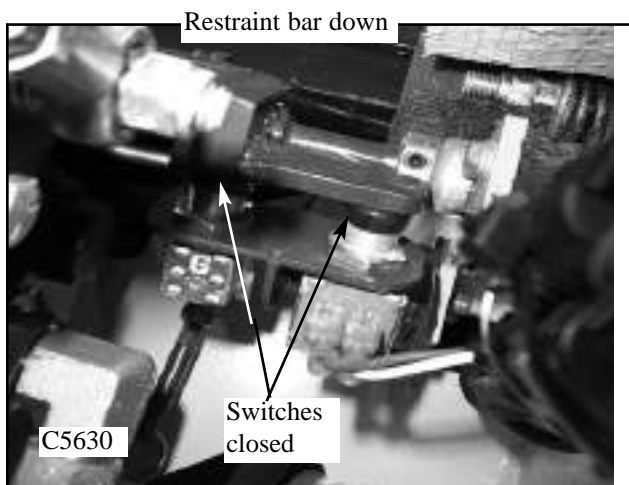
C807



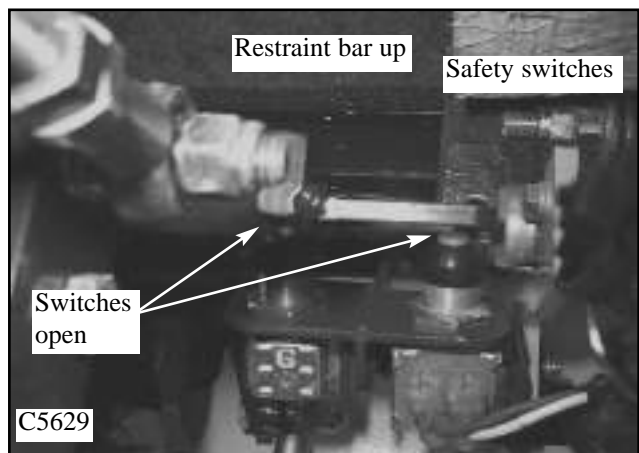
C5020



C5628



C5630



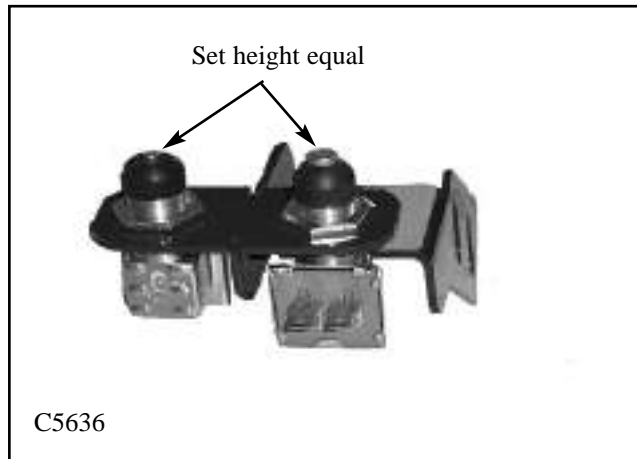
C5629

5

# SAFETY CIRCUIT 5.10

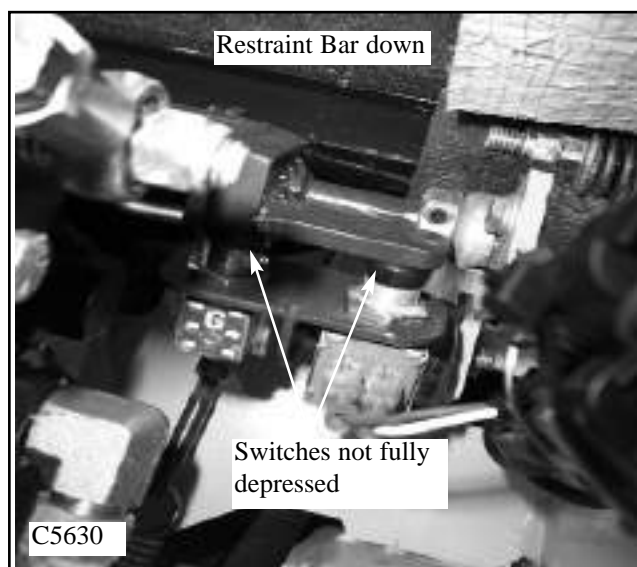
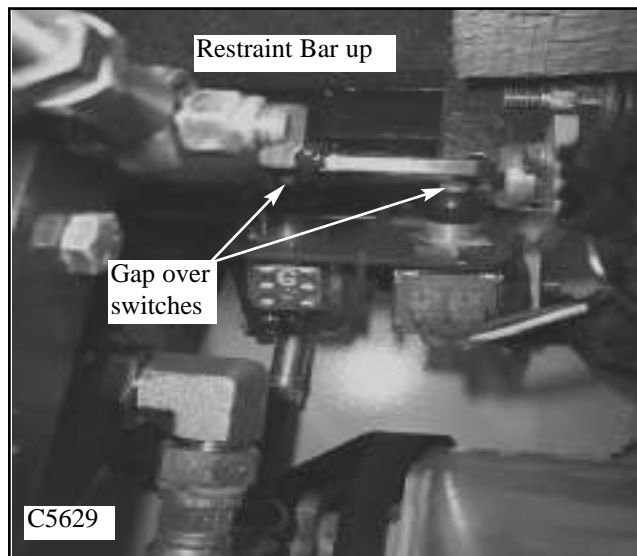
## Switch Replacement

- 1 Remove the seat. Raise the restraint bar.
- 2 Remove wires from the switch to be replaced.
- 3 Remove the rubber boot from the switch.
- 4 Remove the upper nut, and drop the switch out of the bracket mount.
- 5 Prepare the new switch for installation by removing boot and the top nut. Adjust the lower nut to the same height as the lower nut on the old switch.
- 6 Insert the switch into the bracket mount and start the top nut onto the switch. Tighten the top nut and check that the new switch is set at the same height as the other switch..(fig. C5636)
- 7 Slowly cycle the restraint bar down and up to check that the switch is not bottoming out. Readjust if necessary to obtain proper operation of the switch.
- 8 Install the rubber boot and connect the wires to the switch.

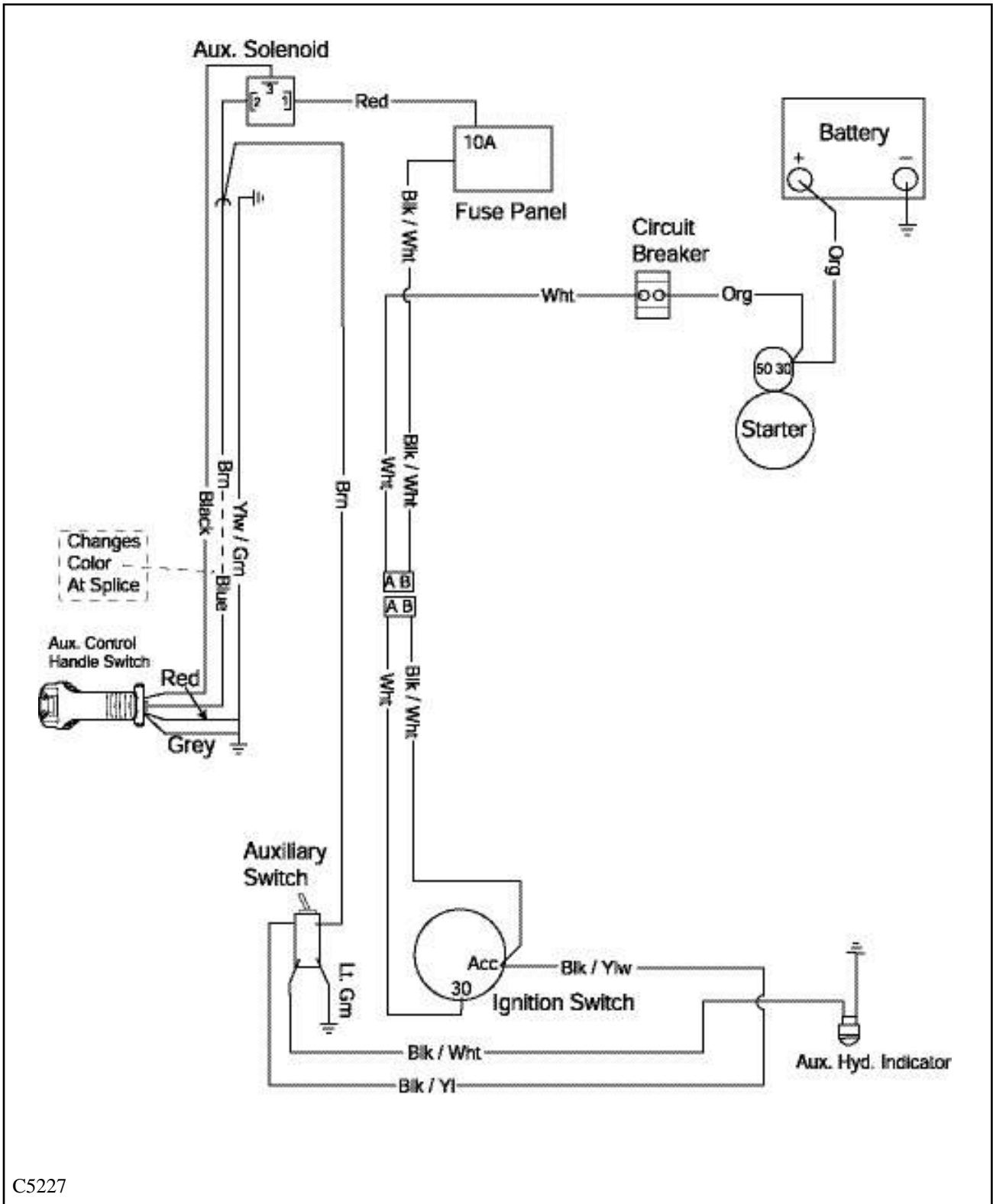


## Switch Adjustment

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Remove the seat. Visually check to ensure that both switches have the same gap to the brake arm shaft tab.(fig, C5629)If they are not the same, adjust the gaps so that they are even using the switch mounting nuts.
- 3 Locate the switch mount bracket under the left side of the brake pull off assembly. Loosen the two mounting bolts that hold the switch bracket.
- 4 Lower the restraint bar.
- 5 Lift up on the switch assembly until the the switches are fully depressed, then lower the assembly 1/8" (3mm). This ensures that the switches do not bottom out and break during normal operation. Tighten the mounting bolts until snug. (fig. C5630)
- 6 Carefully cycle the restraint bar up and down while observing switch function. Check for a gap between switches and brake shaft tab when the resrtraint bar is fully raised.



# — ELECTRIC AUXILIARY CIRCUIT 5.11 —



C5227

5



# —ELECTRIC AUXILIARY CIRCUIT 5.11—

## THE ERGONOMIC HANDLE CONTROL:

The Ergonomic Handle contains 3 switches: 1 rocker switch and 2 push button switches. (fig. 2945)

The handle is normally installed only on the left hand control lever for the 85 loader.

When installed on the LH lever:

1. The rocker switch controls the electric aux. functions. Pushing down on the left side of the rocker switch is the forward direction and pushing down on the right side is the reverse direction.
2. The LH push button is a spare to be used if adding an option.
3. The RH push button is for the horn.

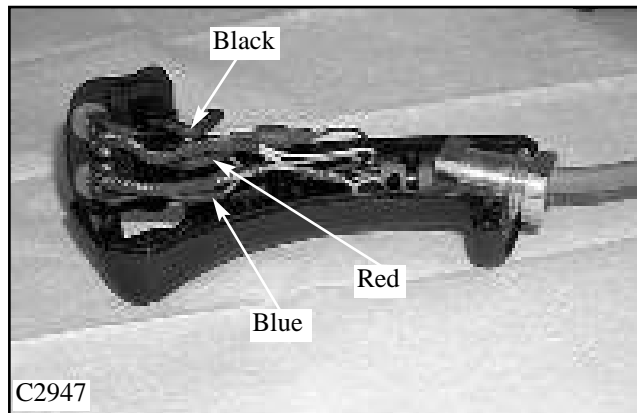
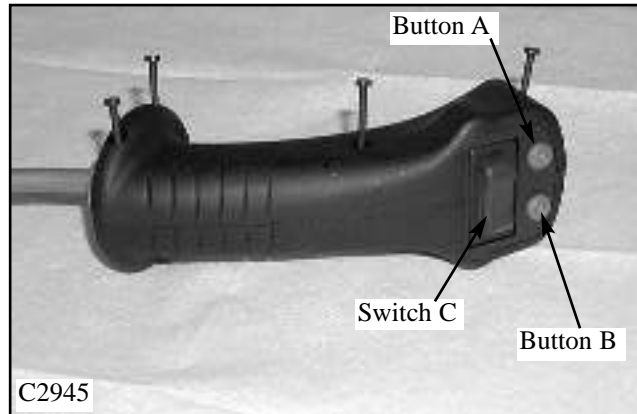
When installed on the RH lever:

1. The rocker switch is used to control the Hi-Flow option. Pushing down on the left side of the rocker switch is the forward direction and pushing down on the right side of the rocker switch is the reverse direction.
2. The LH and RH buttons are used to turn the signal lights on when the light kit option is installed.

To replace a defective switch:

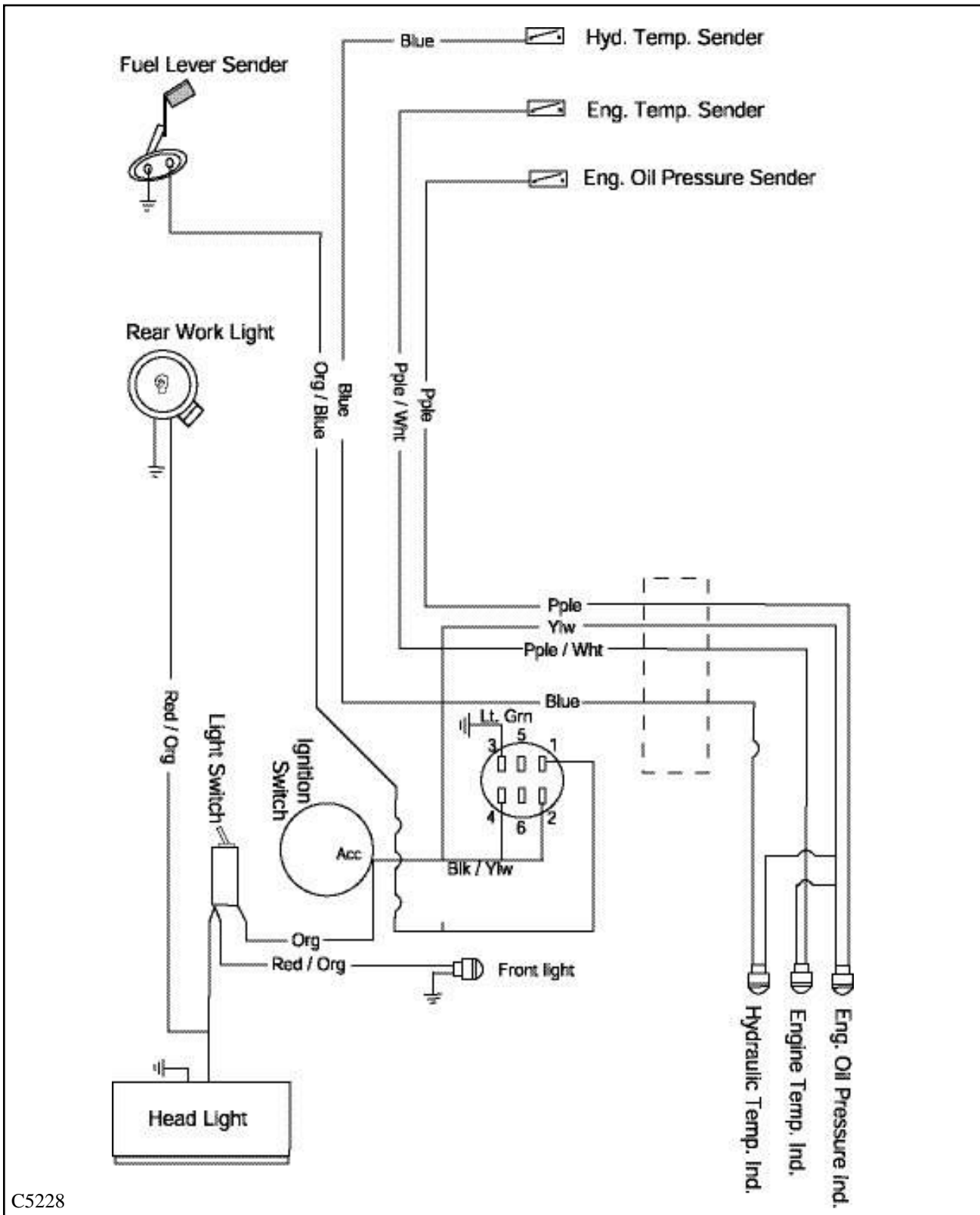
1. Ensure the ignition switch is in the OFF position.
2. Remove the 4 screws that hold the 2 handle pieces together. (fig. C2946)
3. Remove the LH handle piece and pull the switch/wire assembly out of the RH handle piece.
4. The original rocker switch has the wires soldered to the terminals of the switch. Take note of the wire color attached to each terminal before removing the wires.
5. The rocker switch has a tab on each end of the switch which needs to be depressed before removing the switch.
6. The rubber rocker cover can be replaced or reused on the replacement rocker switch at this time.
7. Replace the switch and reattach the wires. Proper female spade terminals may be soldered to the wires.

After servicing the control handle be sure the hydraulic flow is circulating in the proper direction. Pushing on the LH side of the switch should engage the hydraulic system in the forward direction. The female quick coupling must always be the power out when engaging the control mounted switch in this direction.



5

# ACCESSORIES CIRCUIT 5.12



C5228

5

# TROUBLE SHOOTING 5.13

## STARTING SYSTEM

Problem	Cause	Corrective Action	Section
Starter will not engage.	Battery discharged.	Check the battery and charge or replace.	5.6
	Loose or disconnected wiring.	Verify continuity of starting circuit. Check and repair.	
	Defective ignition switch.	Check the switch and replace if necessary.	5.4
	Defective starter solenoid.	Check and replace if necessary. Kubota repair manual P / N 40916.	Kubota repair manual
	Defective relay.	Check and replace.	5.7
	Defective starter.	Check and replace if necessary.	Kubota repair manual
Starter motor turns but does not engage.	Defective overrunning clutch or low battery charge.	Replace starter or parts. Check the battery and charging system. Kubota repair manual P / N 40916.	Kubota repair manual
Pinion engages but engine does not turn over.	Defective starter.	Check and replace. Kubota repair manual P / N 40916.	Kubota repair manual
	Low battery charge.	Check and repair.	5.6
	Engine seizure.	Check and replace.	7
	Hydrostatic pump failure.	Check and replace.	2
Starter motor rotates a full speed before pinion engages.	Defective pinion spring.	Check and replace. Kubota repair manual P / N 40916.	Kubota repair manual
Starter remains engaged after the engine has started.	Faulty ignition switch.	Check and replace.	5.4
	Defective solenoid.	Check and replace. Kubota repair manual P / N 40916.	Kubota repair manual

5

## SAFETY LOCKING MECHANISM

Problem	Cause	Corrective Action	Section
Control locks will not release.	Blown fuse.	Check fuse and replace with 15 Amp.	5.7
	Safety switches out of adjustment or defective.	Remove the seat, check and adjust or replace.	5.10
	Defective lock solenoid	Check and replace.	5.10
	Defective lock mechanism.	Check and replace.	1.3 / 5.10
	Short in wiring harness.	Check for proper grounding, repair or replace harness.	

# TROUBLE SHOOTING 5.13

## CHARGING SYSTEM

Problem	Cause	Corrective Action	Section
Battery low in charge.	Faulty wiring or connections.	Check and repair or replace.	
	Drive belt slipping.	Check and adjust.	7
	Defective battery.	Test battery and replace if necessary.	5.6
	Defective alternator or regulator.	Check charging output. Repair or replace if necessary. (see Kubota manual Thomas p / n 40916)	Kubota repair manual
Alternator overcharging and battery overheats.	Defective battery.	Test battery and replace if necessary.	
	Defective regulator	Check charging output. Replace if necessary. (see Kubota repair manual Thomas p / n 40916)	Kubota repair manual
Low or no output voltage from alternator.	Drive belt slipping.	Check and adjust.	7
	Faulty wiring or connections.	Check and repair or replace.	
	Defective alternator or regulator.	Check charging output. Replace if necessary. (see Kubota repair manual Thomas p / n 40916)	Kubota repair manual
Charge indicator light flickers or runs dim.	Faulty wiring or connections.	Check and repair or replace.	
	Dirty alternator slip rings or brushes.	Check and repair or replace. (see Kubota repair manual Thomas p / n 40916)	Kubota repair manual
Charge indicator goes out but becomes brighter as the engine rpm increases.	Faulty wiring or connections.	Check and repair or replace.	
Charge indicator light is on while the engine is operating.	Drive belt slipping.	Check and adjust.	7
	Defective alternator or regulator.	Check charging output. Replace if necessary. (see Kubota repair manual Thomas p / n 40916)	Kubota repair manual

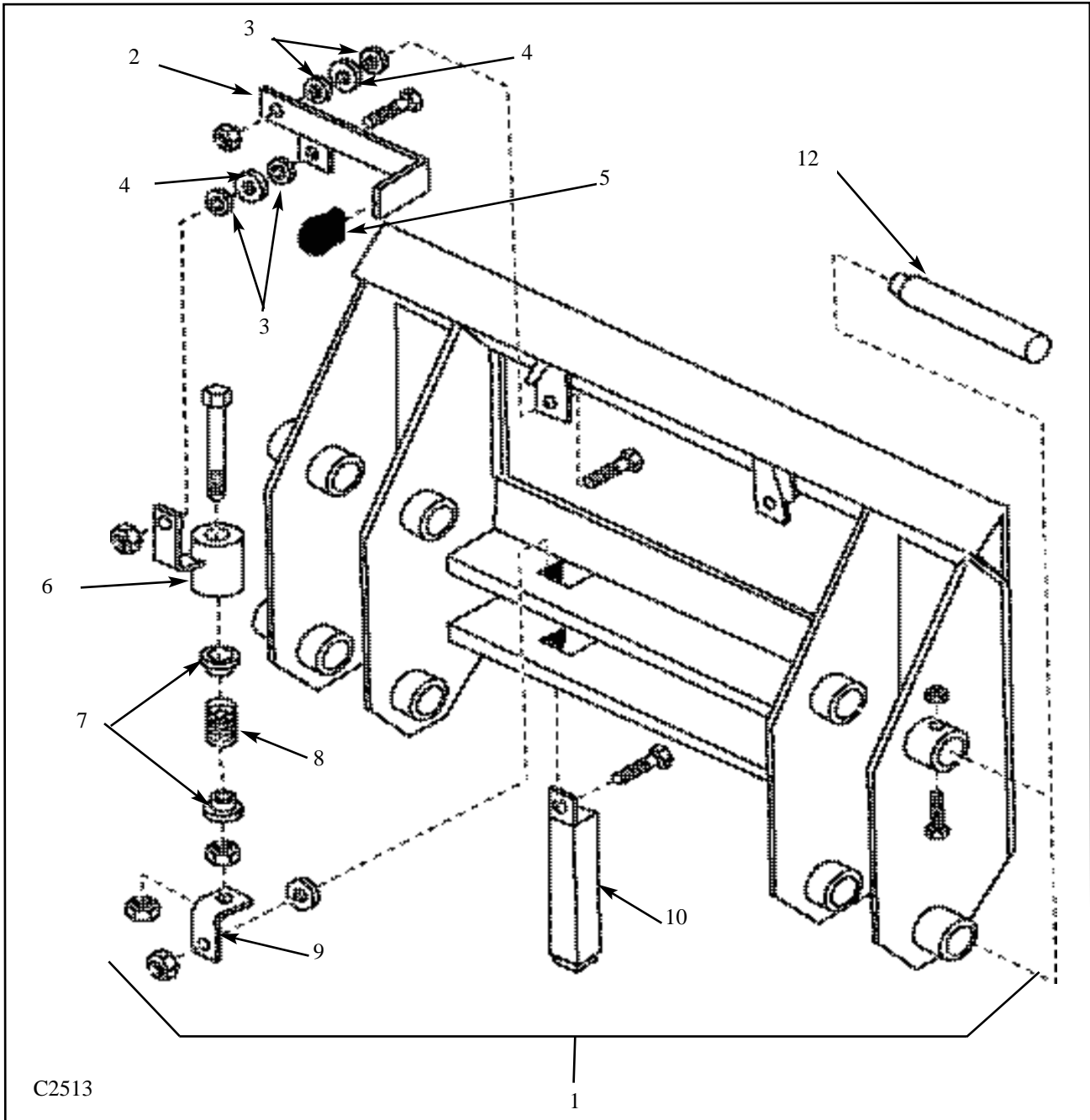
5

# SECTION 6 MAIN FRAME

<b>Quick - Tach</b>	<b>6.1</b>
Illustration, Universal Type.....	pg. 6-2
Preventative Maintenance .....	pg. 6-3
Removal.....	pg. 6-4
Installation .....	pg. 6-4
Disassembly.....	pg. 6-5
Assembly .....	pg. 6-5
<b>Boom Arms</b>	<b>6.2</b>
Removal.....	pg. 6-6
Installation .....	pg. 6-6
<b>Boom Support</b>	<b>6.3</b>
Boom Arm Supports.....	pg. 6-7
<b>ROPS (Cab)</b>	<b>6.4</b>
Removal.....	pg. 6-8
Installation .....	pg. 6-8
<b>Rear Door</b>	<b>6.5</b>
Removal.....	pg. 6-9
Installation .....	pg. 6-9



# QUICK - TACH 6.1



C2513

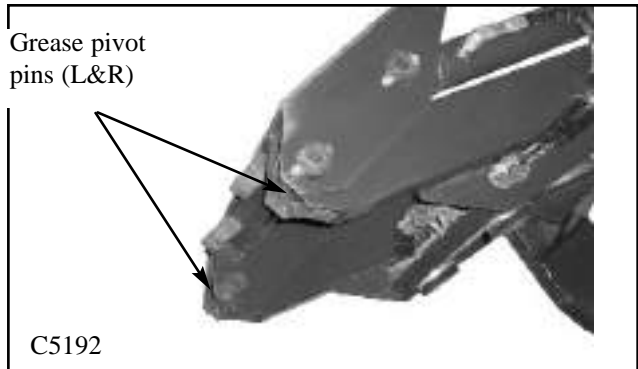
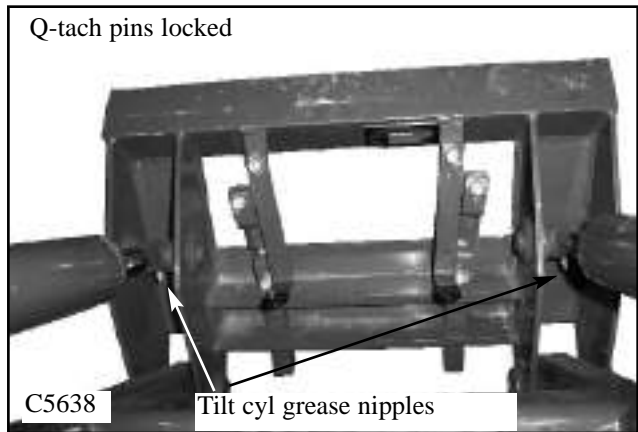
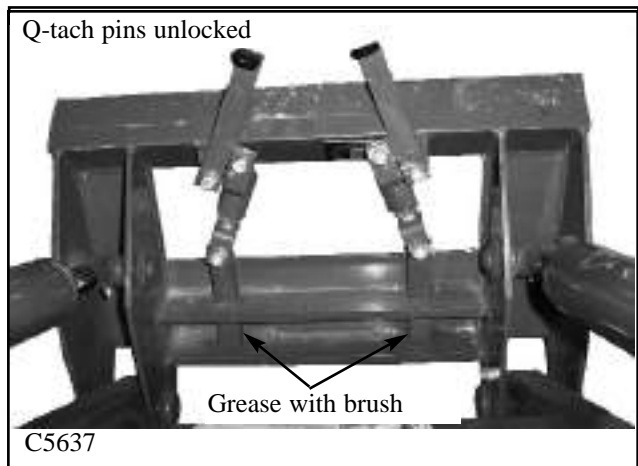
- |    |                         |     |              |
|----|-------------------------|-----|--------------|
| 1. | Quick - Tach Assembly   | 8.  | Spring       |
| 2. | Pin, Lever Assembly     | 9.  | Hinge        |
| 3. | Washer, Tension         | 10. | Pin Assembly |
| 4. | Washer, Nylon           | 11. | Pin          |
| 5. | Tip, Vinyl Plastisol    |     |              |
| 6. | Spring Housing Assembly |     |              |
| 7. | Collar, Spring          |     |              |

6

# QUICK TACH 6.1

## Preventative Maintenance

- 1 Remove any attachment from the loader, lower the liftarms, roll the q-tach out to the position shown, engage the parking brake and shut off the engine.(fig. C5639)
- 2 Clean any dirt build up around the linkages.
- 3 Inspect the linkages for loose nuts or bolts.
- 4 Inspect the springs and lock pin assemblies for damage.
- 5 Check that the locking linkage works smoothly without binding. If lock pin assemblies need lubrication, use a small brush to apply grease to the sides of the pins. (fig. C5637)
- 6 Lubricate the lower boom arm pivot pins and tilt cylinder pins daily. Use a good quality, multi-purpose lithium based grease.
- 7 Check the boom arm and tilt cylinder pins for wear and if necessary replace.



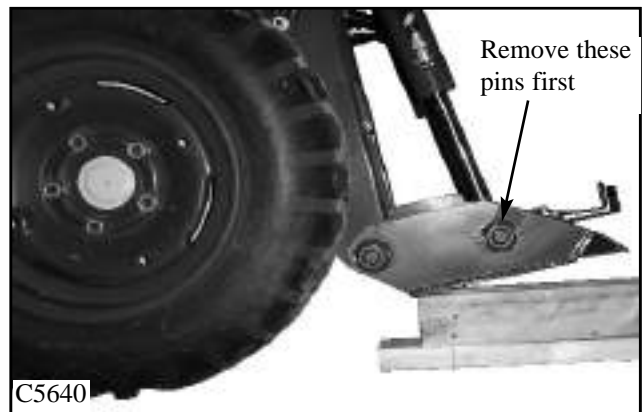
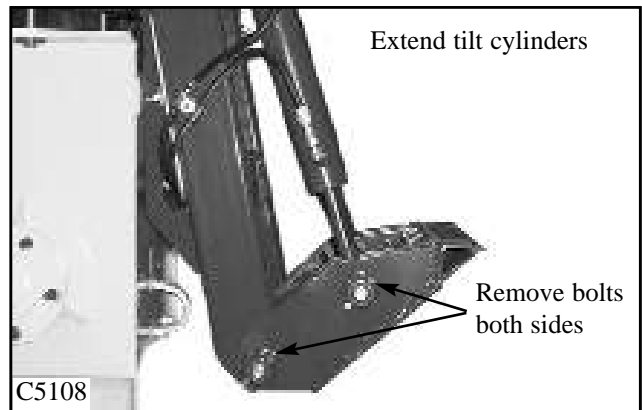
C5192

6

# QUICK - TACH 6.1

## Removal

- 1 Remove any attachment and lower the boom arms.
- 2 Start the engine and extend the hydraulic tilt cylinders approximately 12 inches. (fig. C5108)
- 3 Shut off the engine and engage the parking brake.
- 4 Remove the bolts retaining the upper pivot pins to the quick - tach frame. (fig. C5108)
- 5 Place wood blocking under the quick - attach. (fig.C5640)
- 6 The wood blocking is used to relieve the weight on the 2 (two) lower pivot pins. Remove the upper pivot pins. (fig. C5640)
- 7 Remove the nuts and or bolts retaining the 2 (two) lower quick - tach pivot pins to the quick - tack or boom arms. (fig. C5108)
- 8 Remove the pivot pins using a brass drift punch and hammer.
- 9 Remove the quick - tach from the loader boom arms.



## Installation

Upon installing the quick - tach to the loader boom arms:

- 1 Make sure all pivot pins and bushings are good condition. Do not reuse worn parts. Replace pins and hardened bushings as required.
- 2 Use wood blocking to assist in installing the q-tach to the liftarms (fig. C5640)
- 3 Raise the bottom of the quick - tach up to align the boom arm pivot holes and the lower quick - tach pivot bushings. Install the 2 lower pivot pins, retaining bolts and or lock nuts.
- 4 Swing the quick - tach up and align the 2 tilt cylinder pivot bushings with the quick - tach bushings and install the pins and retaining bolts and lock nuts.
- 5 Lubricate all pivots until excess grease can be seen flowing out around the bushings and pins.

6



# QUICK - TACH 6.1

## Disassembly

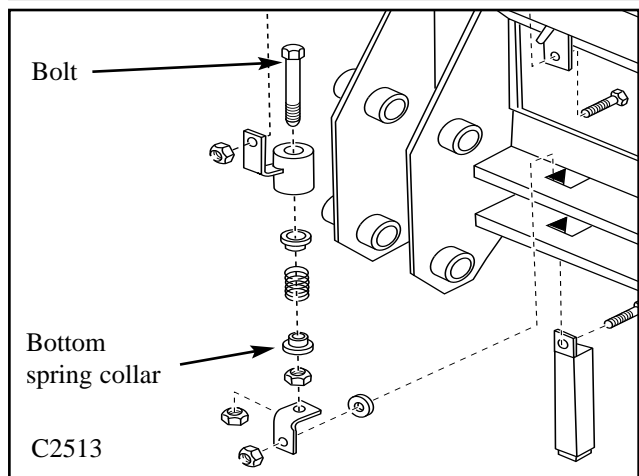
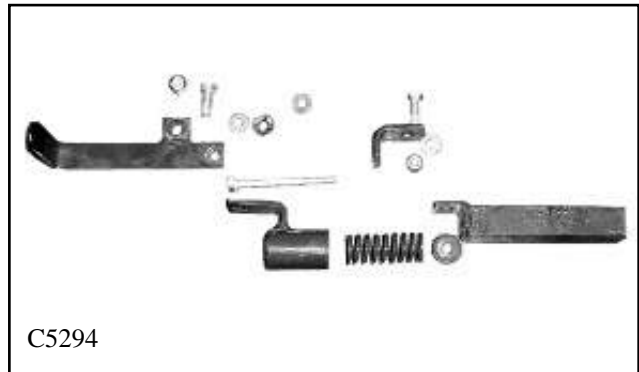
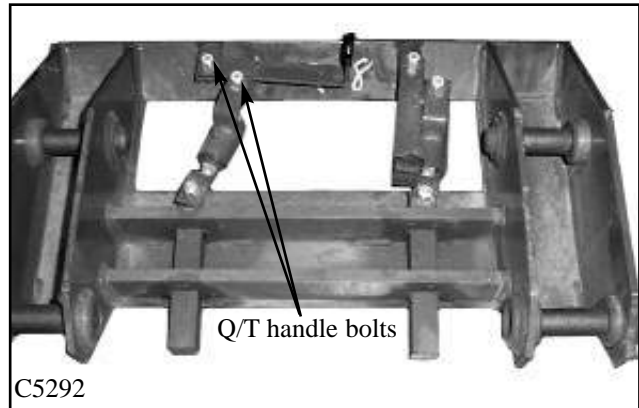
Follow the exploded schematic on the 2nd page of this section to assist in taking apart the locking mechanism, and to assemble the system back together. Please note that the quick - tach does not have to be removed to service or replace locking mechanism parts.

- 1 Remove the bolt retaining the lock handle to the lock linkage. (fig. C5292)
- 2 Remove the bolt retaining the lock handle to the quick - tach frame. (fig. C5292)
- 3 Pull the locking pin and linkage out of the guide bushing. (fig. C5293)
- 4 Remove the spring assembly from the pin hinge.
- 5 Separate the parts and inspect the spring for broken or sacking (compressed) coils. (fig. C5294) Replace parts as required.
- 6 Inspect the locking pin for wear. Make sure the end of the pin is not worn or broken off. Check the fit of the pin in the quick - tach guides. If the pin or the guides are excessively worn replace the pin or complete quick - tach assembly.
- 7 Inspect the lock handle mounting holes for fit. Replace the handles or bolts as required if the fit is sloppy. (fig. C5294)
- 8 Check the fit of the lower pivot pins in the quick - tach. Discard worn pins and replace the hardened bushings in the quick - tach if so equipped.
- 9 Check and replace any grease fittings that are damaged or defective.

## Assembly

Upon assembling the locking mechanism to the quick - tach, use 242 Loctite (blue) on all the mounting nuts and bolts.

- 1 When assembling the spring in to the spring housing, tighten the nut to obtain a length of 2-3/8". This is measured from under the head of the bolt to the bottom of the spring collar. (fig. C2513) **This is very crucial for lock pin engagement to the attachment.**
- 2 Replace the rest of the lock mechanism in the reverse order above.
- 3 Lubricate all pins and bushings.
- 4 Check the lock mechanism by cycling the lock levers to ensure correct engagement through the attachment and sufficient pressure to hold the lock system down in the over - center position. (Engages and stays in the locked position)



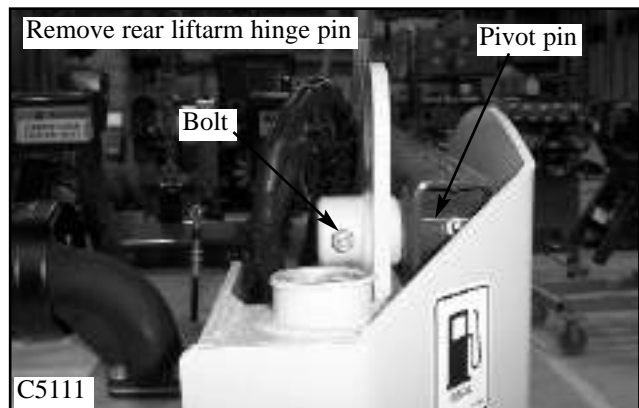
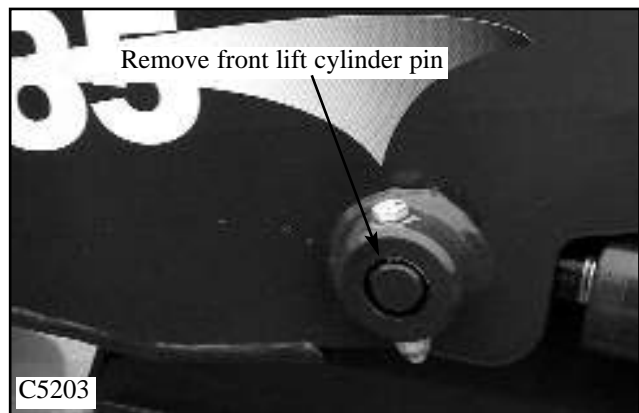
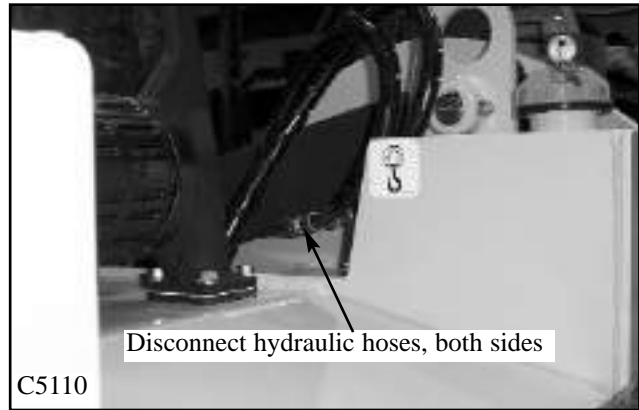
# BOOM ARMS 6.2

## Removal

- 1 Lower the boom arms and shut off the engine. Turn the ignition key to the "RUN" position and cycle the boom and tilt controls to relieve hydraulic backpressure. Lock the boom lift control in the float position.
- 2 Return the key to the "OFF" position and engage the parking brake. (raise the restraint bar)
- 3 Remove the quick - tach assembly from the boom arms. (See Section 6.1)
- 4 Disconnect the hydraulic hoses between the boom arm and reservoir tanks. Cap the open hose ends to prevent contamination. (fig. C5110)
- 5 Fasten chains or lifting straps with an adequate capacity to sustain the weight of the boom arms. Most of the weight is at the front of the boom arms. Attach one set of straps as close as possible to the front, (fig. C1844), and the other set approximately half way toward the rear.
- 6 Raise the boom arms, with an over head hoist, enough to take the weight of the lift cylinders. Remove the bolts from the pivot pins in the lift cylinders that are mounted in the boom arms. (fig. C5203)
- 7 Remove the pins by reaching between the ROPS and the boom arm and pushing the pin out toward you. Take care not to let the lift cylinder fall on your hand.
- 8 Remove the bolts from the upper rear boom arm pivot pins mounted through the main frame. (fig. C5111)
- 9 Remove the pivot pins using an appropriate drift punch and hammer. Use care, do not broom up the end of the pins.
- 10 Raise the boom arms enough to free from the loader and remove them.

## Installation

- 1 Upon installation follow the above procedure in the reverse order.
- 2 Replace any worn or gouged pins and bushings
- 3 All stationary bushings should be coated with anti - seize compound to assist ease of future disassembly. Do not get the anti - seize compound on moving or pivoting parts. The compounds contain abrasives that may cause premature wear of pivot pins and bushings.
- 4 Torque the hydraulic hose fittings as outlined in the Section 1 Hydraulics torque chart page 1-45.



# BOOM SUPPORTS 6.3

## Boom Arm Supports

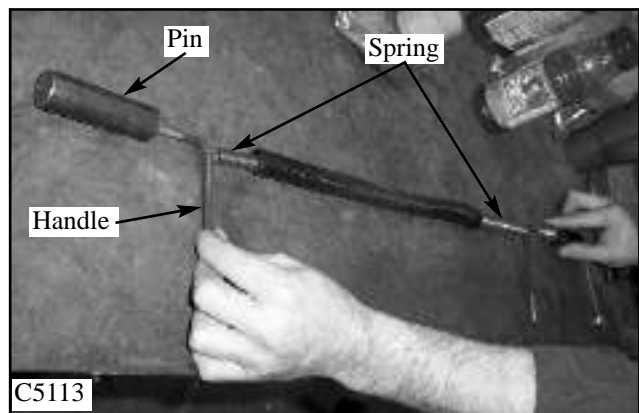
For safety while performing regular service or maintenance work, the loader is equipped with boom supports. (fig. C1823) The boom supports, when extended, prevent the boom arm from lowering when servicing the hydraulic system, controls or other repair work while the engine is not operating.

The boom supports should be greased every 8 hours of use and engagement depth should be checked every time the supports are used.

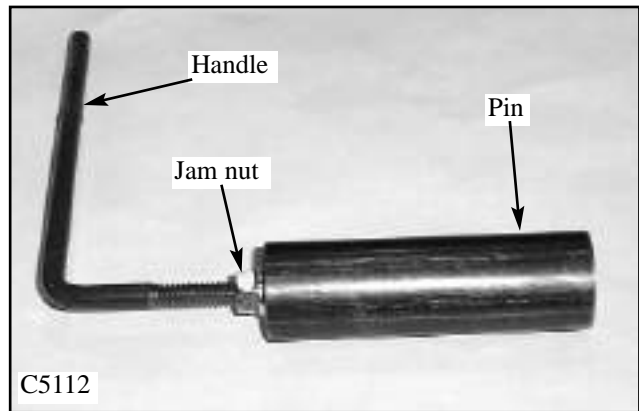
- 1 Raise the boom arms, extend the boom supports and allow the boom arms to lower onto the supports. Do not pressure the hydraulic system against the boom supports.
- 2 Shut off the engine and engage the parking brake.
- 3 Measure the distance the boom support pins are protruding past the inner boom arm plate. Proper adjustment should have the support pin protruding past the inner boom arm plate by 1/4 of an inch. (6.5mm) (fig. C1823)
- 4 Adjust the engagement depth by lowering the lift-arms completely. Remove the the red knobs from the pin handles. Remove the 6 self-threaded screws that fasten the dash panel in place, lower the dash panel to expose the pin linkages.
- 5 Loosen the jam nut on the support pin linkage to be adjusted. (fig. C5112)
- 6 Screw the pin in or out the amount necessary to get the proper adjustment for support pin engagement on the boom arms.
- 7 To remove the support pins and spring, slide pins to the inside until they are clear of the bushings, then remove handles from the spring.
- 8 Apply 242 Loctite (blue) to the nut and tighten it against the support pin when installing.
- 9 Lubricate the boom support pins and replace the dash panels.



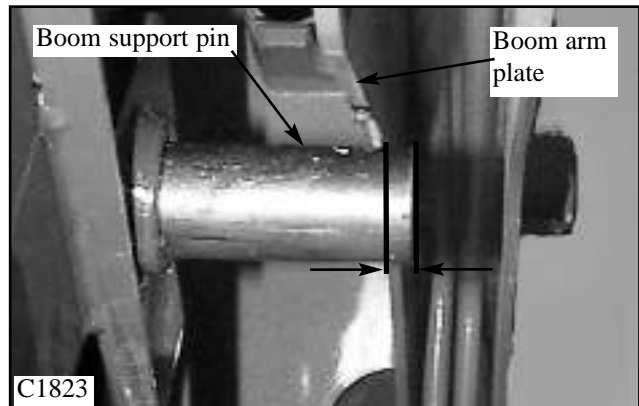
C5088



C5113



C5112

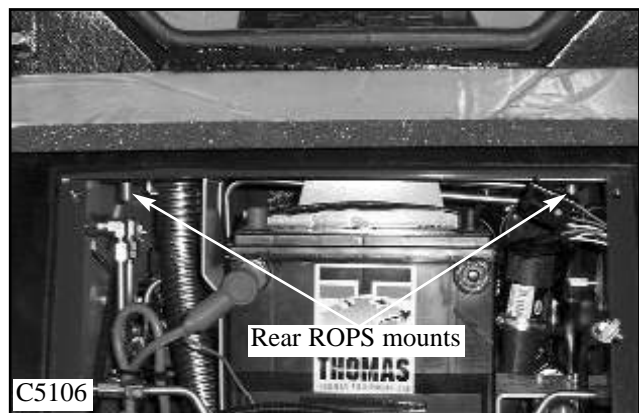
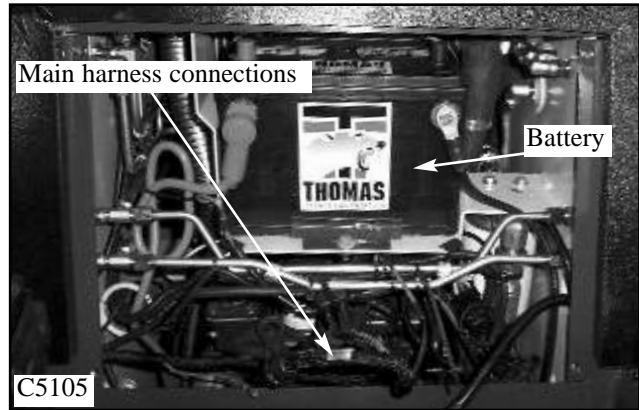


C1823

# ROPS 6.4

## Removal

- 1 Lower the boom arms, shut off the engine and engage the parking brake.
- 2 Remove the seat assembly and the battery access cover and disconnect the battery terminals as outlined in Section 5.
- 3 Disconnect the ground cable from the ROPS.
- 4 Disconnect the main wiring harness plugs. (fig. C5105)
- 5 Remove any cable ties that may be used to tie wiring and hoses to the ROPS. Check the engine compartment and the hydrostatic pump area for wiring connections and ties that will need to be disconnected from accessory circuits.
- 6 Disconnect the restraint bar from the restraint bar and from the mount inside the ROPS.
- 7 Disconnect the seat belt switch wiring.
- 8 Remove the nuts and washers on the ROPS isolator mounts. There are 2 in the front (fig. C2630) and 2 in the rear. (fig. C5106)
- 9 Attach chains or straps with a sufficient load rating to safely raise the ROPS from the frame. (fig. C5103)
- 10 Raise the ROPS using an over head hoist. Check for wiring that may still be connected and remove as required.



### IMPORTANT

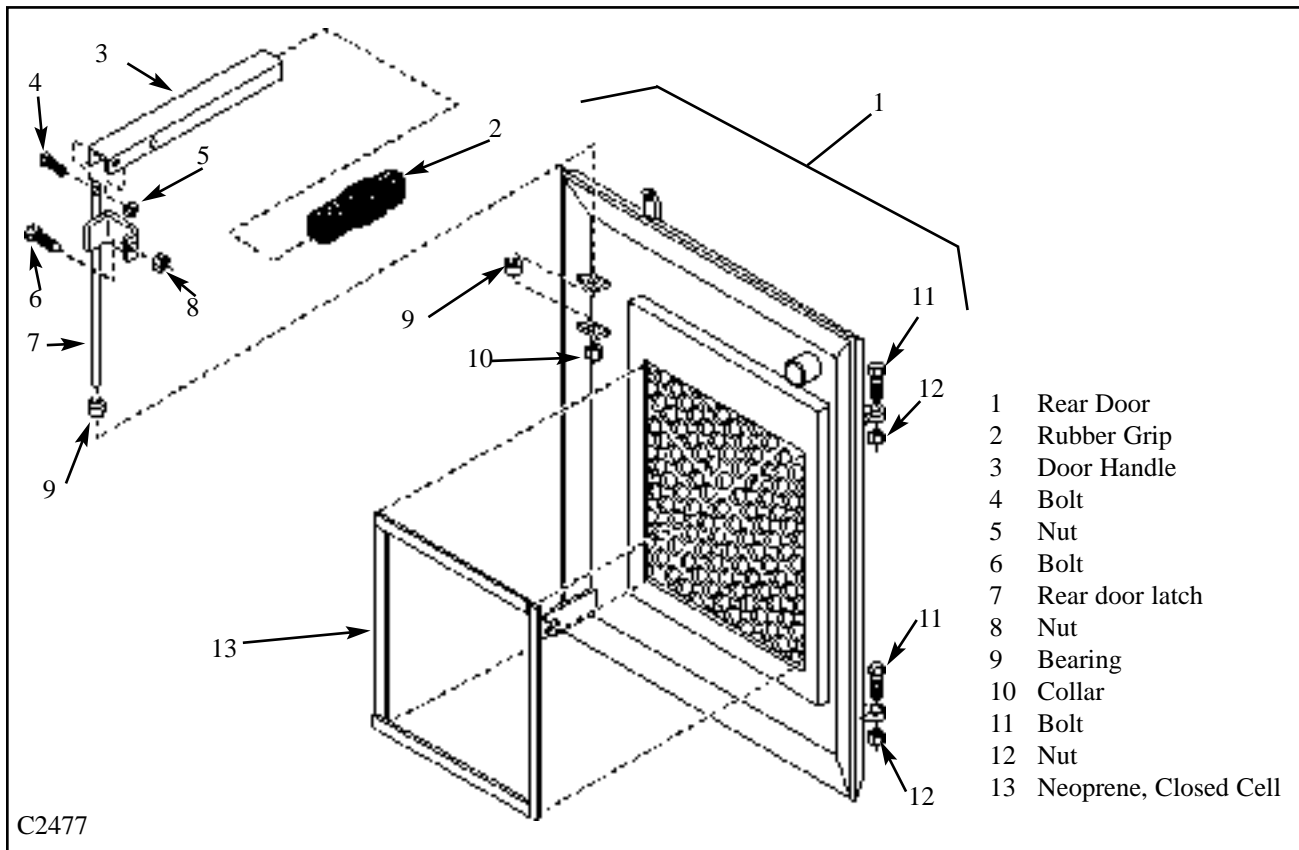
**Check the ROPS mounting isolators every 150 hours for deterioration to prevent unwanted vibration and movement.**

## 6

## Installation

- 1 Upon assembling the ROPS to the loader mainframe, ensure the mounting isolators are in serviceable condition. Replace any worn, damaged or weathered isolators.
- 2 Reverse the removal procedure taking care not to pinch any wiring and connections.
- 3 Torque the ROPS mounting isolator nuts at 60 ft lbs. (81.5 Nm)

# REAR DOOR 6.5



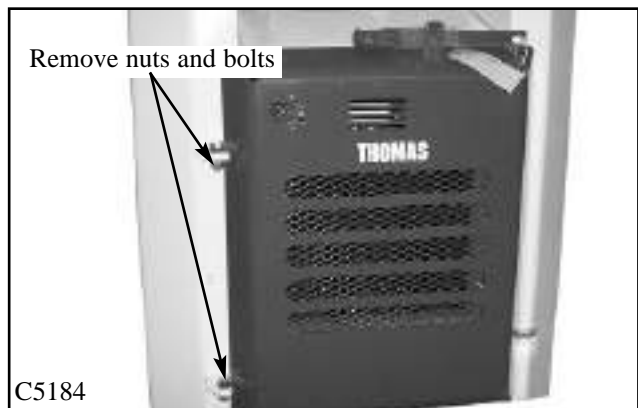
## Removal

- 1 Open the rear door and using a hoist, take the weight of the door off the mounting bolts. (fig. C5182)
- 2 Remove the mounting nuts and bolts. (fig. C5183)
- 3 Replace any worn mounting bolts as required.



## Installation

- 1 Replace the door to the frame in the reverse order above.
- 2 Adjust the door guide plate so the rear door looks level with the engine compartment cover, and the door slides freely into the closed position.
- 3 Adjust the door latch linkage bolt to provide an even fit around the outside of the door.



6

# SECTION 7 ENGINE

<b>Maintenance</b>	<b>7.1</b>
Lubrication System .....	pg. 7-2 ~ 3
Fuel System .....	pg. 7-4 ~ 5
Air Filter .....	pg. 7-6 ~ 7
Cooling System .....	pg. 7-8 ~ 9
Fan Belt .....	pg. 7-10
Universal Joint .....	pg. 7-11
<b>Cylinder Head</b>	<b>7.2</b>
Valve Adjustment .....	pg. 7-12
Compression Test .....	pg. 7-12
Cylinder Head Torque .....	pg. 7-12
<b>Replacement</b>	<b>7.3</b>
Engine Removal .....	pg. 7-13 ~ 15
Engine Installation .....	pg. 7-16 ~ 17
Stop Solenoid .....	pg. 7-18
<b>Specifications</b>	<b>7.4</b>
Dimensions, Capacities, Service Limits & Clearances .....	pg. 7-19
<b>Trouble Shooting</b>	<b>7.5</b>
Guide .....	pg. 7-20 ~ 21



# ENGINE MAINTENANCE 7.1

## Lubrication System

### Engine Oil and Filter:

Engine oil and filter changes should be made with the engine warm. Change the engine oil and filter initially at 50 hours and then every 100 hours of operation. Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

1 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C5000)

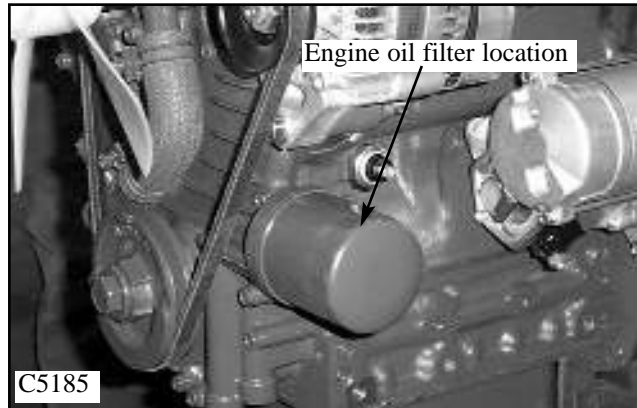


2 Remove the oil pan drain plug located at the bottom of the engine oil pan to drain the oil. Have a catch container ready to contain approximately 4.0 qts (4 liters) of fluid. (fig. C5178)



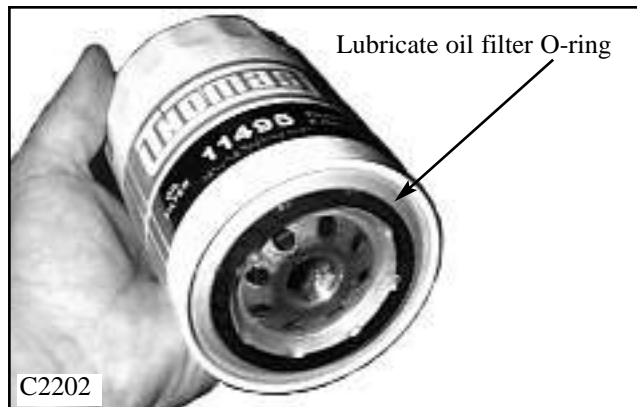
3 Remove the oil filter using an appropriate filter wrench. If the oil filter area is excessively dirty, clean around the filter area before removing the oil filter to prevent contaminant's reaching the engine lubricating system. (fig. C5185)

4 Check the oil filter mounting adapter area after removing the oil filter and check for dirt on the sealing surface and to make sure the oil filter O-ring seal has not stuck to the oil filter adapter.



5 Lubricate the new oil filter O-ring seal with engine oil and install to the engine hand tightened. (fig. C2202)

6 Replace the oil pan drain plug. Make sure the seal is still in place and in good condition. Tighten the oil pan drain plug not exceeding 33 ft lbs (45 Nm).



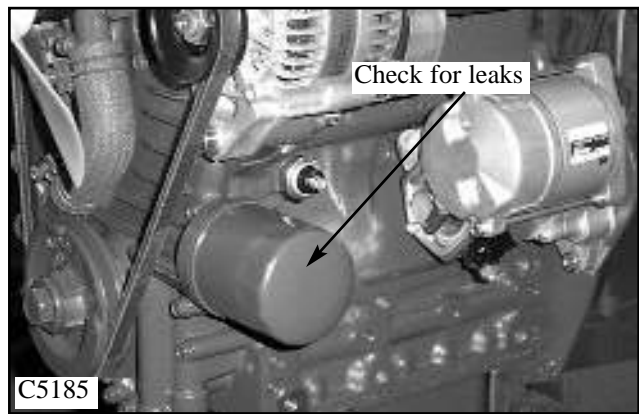
# ENGINE MAINTENANCE 7.1

## Lubrication System (cont'd)

7 Remove the oil fill cap located in the engine rocker arm cover. (fig. C5116) Add 3.75 qts (3.5 liters) of 5W40 API classification CG-4 or better engine oil. Replace the fill cap in the rocker arm cover.

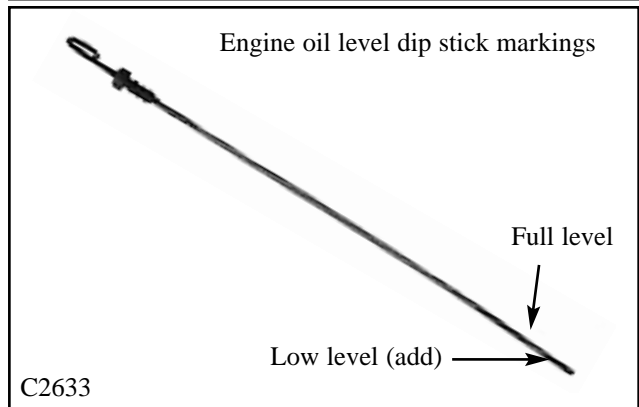


8 Start the engine and check for leaks around the oil filter and oil pan drain plug. (fig. C5185) Allow the engine to operate for approximately 5 minutes and then shut it off.



9 Check the level of the engine oil. (fig. C5641) Add oil as required to bring the oil to the top mark of the engine oil dip stick. (fig. C2633) Do not over fill.

Change the engine oil and filter initially at 50 hours and then every 100 hours.





# ENGINE MAINTENANCE 7.1

## Fuel System

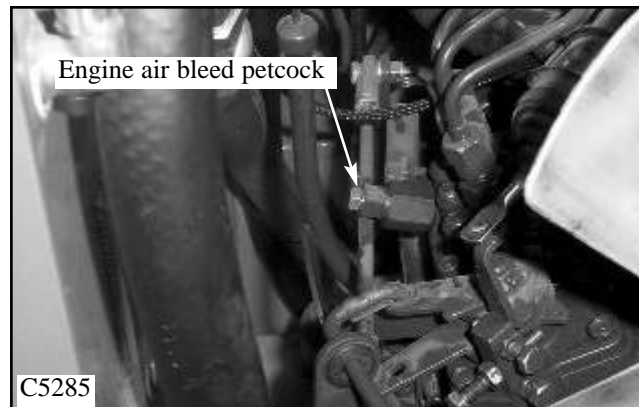
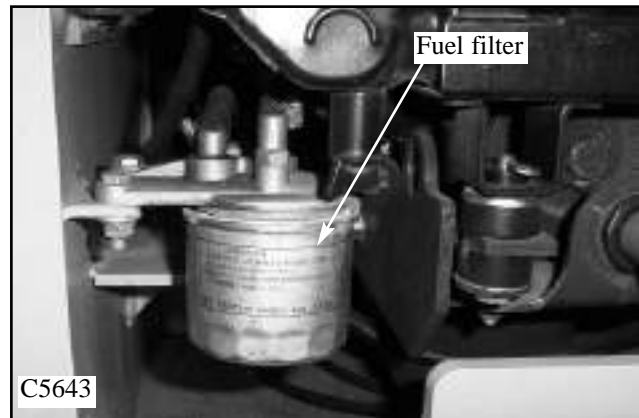
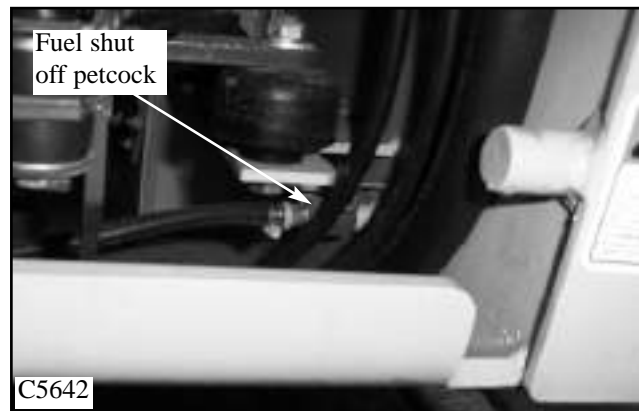
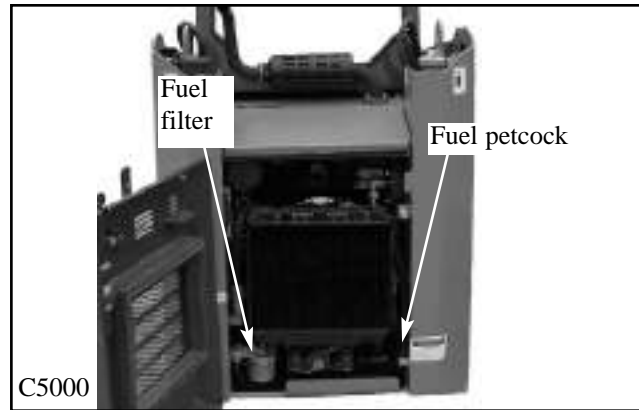
### Fuel Filter:

The fuel filter is a spin on type and is located in the engine compartment on the left side of the engine mounted to a frame bracket.

Change the fuel filter every 400 operating hours.

To change the fuel filter: Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

- 1 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C5000)
- 2 Close the fuel line shut off petcock located on the lower right hand side of the fuel tank. (fig. C5642) This will prevent fuel loss due to siphoning.
- 3 Remove the fuel filter (fig. C5643) using a filter wrench. Check to make sure the fuel filter O-ring seal has not stuck to the filter adapter mount.
- 4 Lubricate the new fuel filter O-ring seal with light oil. Tighten the filter to the adapter mount hand tight.
- 5 Open the fuel line shut off petcock.



- 6 Open the engine fuel line / air bleed petcock located just to the left of the fuel injection pump. (fig. C5285) Start the engine and allow to idle for 5 minutes. Close the fuel line / air bleed petcock.

If the engine fails to continue operating, it may be necessary to bleed the fuel system of air after changing the fuel filter or running out of fuel. See Bleeding the Fuel System, next page.

# ENGINE MAINTENANCE 7.1

## Fuel System (cont'd)

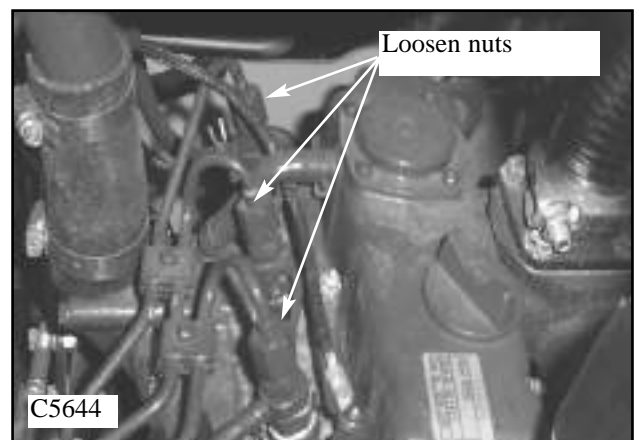
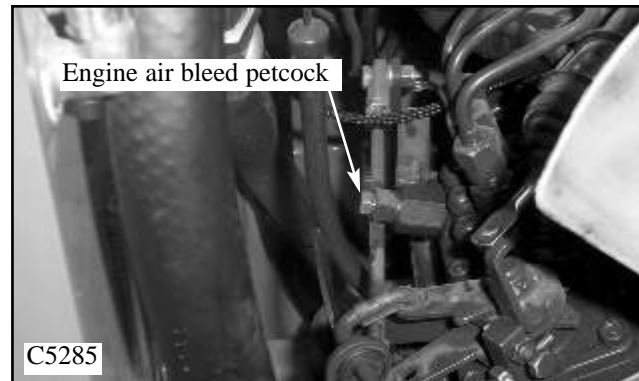
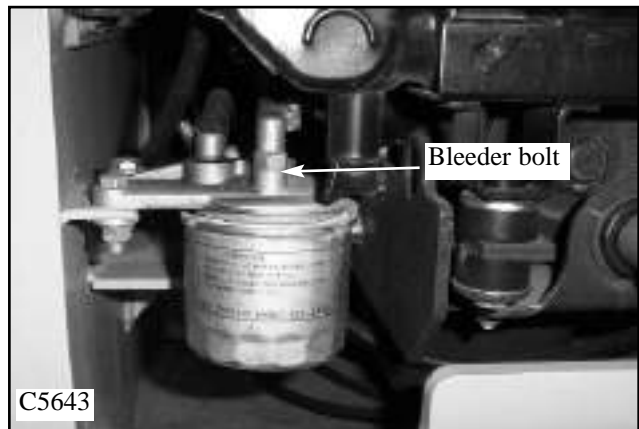
### Bleeding the Fuel System:

If the loader has been run dry of fuel, or the fuel filter has been changed, it may be necessary to bleed the air from the fuel lines.

- 1 Replenish the fuel reservoir (tank) with a minimum of 10 gallons (45 liters) of fuel.
- 2 Make sure the fuel line shut off petcock is fully open. (fig. C5186)
- 3 Loosen the fuel filter bleeder bolt and allow the fuel to siphon through the fuel line and filter. (fig. C5643) Tighten the fuel filter bleeder bolt.
- 4 Loosen the air bleed petcock located to the left of the fuel injection pump. (fig. C5285)
- 5 Turn the engine over with the starter until the engine starts to smoke. Do not engage the starter for more than 15 second intervals. Allow the starter to cool between starting attempts for 1 (one) minute.
- 6 Pre- heat the and start engine. (If engine fails to start, proceed to step 7.) Allow the engine to operate at an idle speed for 5 minutes. Shut off the engine.
- 7 Close the air bleed petcock.

If the engine still will not start, the injector lines will have to be bled.

- 8 Using a wrench to steady the injector, loosen the injector lines at each injector one half turn.
- 9 Turn the engine over until fuel seeps out around the nuts.
- 10 Tighten the injector nuts. Pre-heat and start the engine.



7

# ENGINE MAINTENANCE 7.1

## Air Filter

The loader is equipped with a dry cartridge, radial seal type filter element. (fig. C5279)

The loader is equipped with an locking air restriction indicator (fig. 5118) that functions while the engine is operating. The indicator normally is green. When the indicator has changed to red, the air filter element requires servicing and/or changing.

**Over servicing the air filter can damage the seal and the pleated filter material. When the air restriction indicator has changed to red, replace the air filter element with a new one.**

To service the air filters, park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

## Daily Checks

### Checking the Restriction Sensor:

- 1 The air filter restriction indicator should be visually checked daily. (fig. C5118)
- 2 With the engine operating, place your hand over the air intake inlet to restrict air flow to the engine. The indicator should change from green to red. Remove your hand and reset the indicator (fig. C5118)
- 3 Air cleaner hoses and clamps should be inspected daily for proper tightness and verify air inlet hose integrity. Replace any worn or cracked inlet hoses immediately.

### Servicing the Air Filter Elements:

- 1 Loosen the band clamp holding the air cleaner cover to the canister body. (fig. C2054) Remove the cover.
- 2 Remove the wing nut. (fig. C5281)
- 3 Pull straight out on the element to remove from the

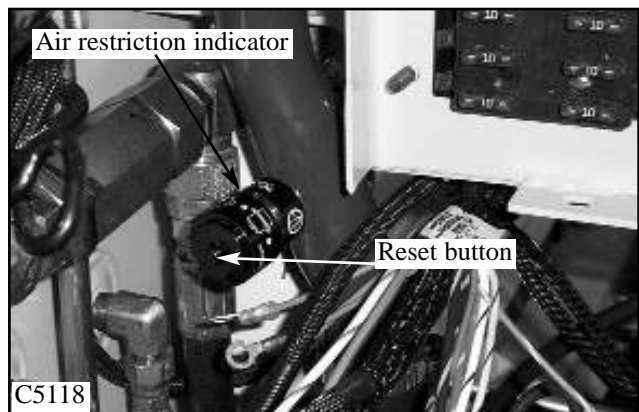
### IMPORTANT

**Air filter service recommended only when the service indicator changes to red.**

air cleaner housing. (fig. C2056) Do not twist or force the filter. This may damage the sealing area around the end of the air filter element.



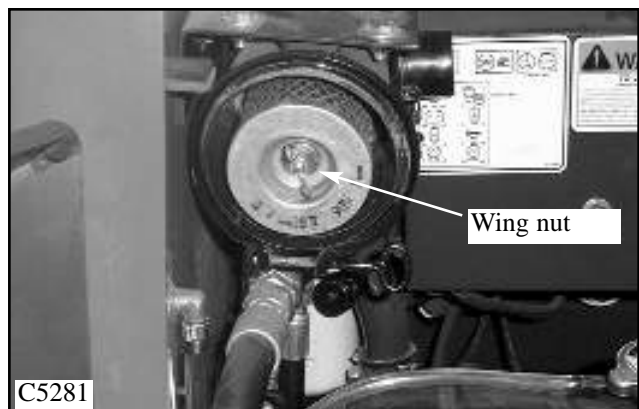
C5279



C5118



C5176



C5281

# ENGINE MAINTENANCE 7.1

## Air Filter (cont'd)

4 After removing the air filter element, carefully wipe out any excess dirt from the air cleaner housing. (fig. C5286)

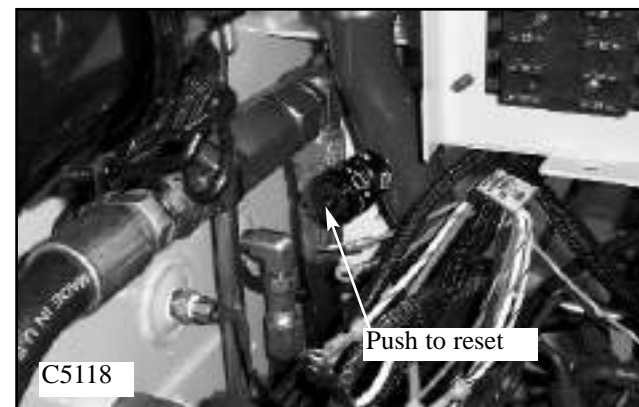
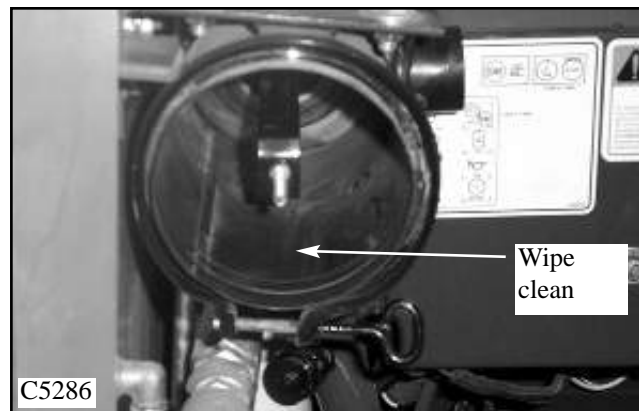
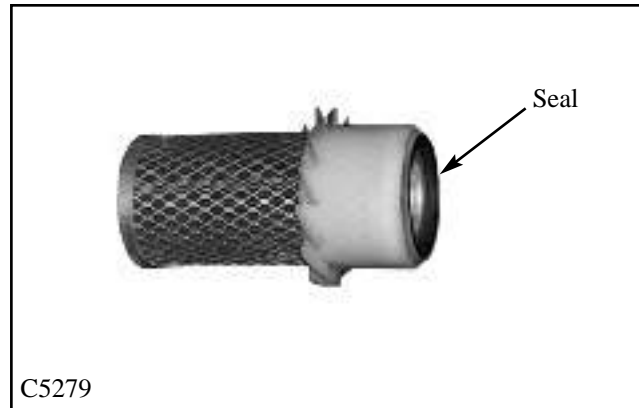
5 Check the air filter element seal before installing to the air cleaner housing. (fig. C5279) Be sure the seal is not damaged, torn or gouged. Do not use a filter with a damaged seal.

6 When installing the air filter element to the air cleaner housing, support the back of housing with one hand and push the air filter element into position as gently as possible.

7 Install wing nut. **Do not use the wing nut to pull the filter element into place.**

8 Install the air cleaner cover onto the housing, tighten band clamp.

9 **Reset the service indicator. (fig. C5118)**



# ENGINE MAINTENANCE 7.1

## Cooling System

### Daily Checks:

The loader is equipped with a liquid cooled diesel engine that requires daily coolant level checks and radiator service if necessary.

The cooling system should always be checked when the engine is cool.

Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

1 Access the engine compartment by opening the rear door and lifting the engine compartment cover.

2 Visually inspect the radiator cooling fins for broken or bent fins, dirt or debris build up that may be blocking air flow through the radiator. Blow any dirt or debris out with compressed air and / or water. Do not exceed 40 psi (2.7 kg / cm<sup>2</sup>) Any bent cooling fins should be carefully straightened to prevent core damage.

3 Remove the rad cap to check the coolant level. Coolant level should be no more than 1/2 inch below the seat for the rad cap.

**Always use a 50/50 ethylene glycol/water mixture to top up the cooling system.**

4 If the coolant level constantly falls below the upper part of the radiator tank, then either the radiator cap is defective allowing coolant to escape under pressure, or there is a coolant leak in the cooling system. Perform a pressure test of the cooling system.

### Testing the Cooling System:

1 Ensure the radiator is full of coolant.

2 Start the engine operate until warm, **NOT HOT!**

3 Shut off the engine and carefully remove the radiator cap. Use extreme caution.

**When pressure testing the cooling system, do not exceed 12.8 psi.(0.9 kg/cm<sup>2</sup>)**



### WARNING

To prevent eye injury, wear safety goggles when cleaning with compressed air



### CAUTION

To prevent radiator fin damage, do not use air pressure higher than 40 psi (2.7 kg / cm<sup>2</sup>)



### WARNING

Do not remove the radiator cap when the engine is hot.



### WARNING

Always use a pre - mixed or diluted coolant to prevent engine over heating, freezing and proper water pump lubrication

# ENGINE MAINTENANCE 7.1

## Cooling System (cont'd)

4 Attach a radiator tester and increase the pressure to 12.8 psi (0.9 kg / cm<sup>2</sup>). (fig. C172) Inspect the radiator, hoses and engine block for external leaks. Repair as required.

5 Attach a radiator tester to the radiator cap. (fig. C173) Apply 12.8 psi (0.9 kg / cm<sup>2</sup>) pressure to the radiator cap. The pressure should not drop more than 4.3 psi (0.3kg / cm<sup>2</sup>) in 10 seconds. Replace the radiator cap if required.

If no external leaks are found, and the radiator cap tests good, there may be an internal problem with the engine such as a gasket, cylinder head or block defect. Consult a Kubota Repair Manual P / N 40916 (Kubota P / N 97897-0109-5) to assist in engine disassembly and inspection.



### WARNING

**Do not remove the radiator cap when the engine is hot.**

### Coolant Replacement:

The engine coolant should be changed every 1000 hours of operation. To change the coolant:

Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

1 Make sure the engine is not hot to touch. Remove the radiator cap.

2 Remove the radiator drain plug located on the bottom of the radiator. (fig. C5645, C5646) Be prepared to contain 1.8 gal (7 liters) of fluid.

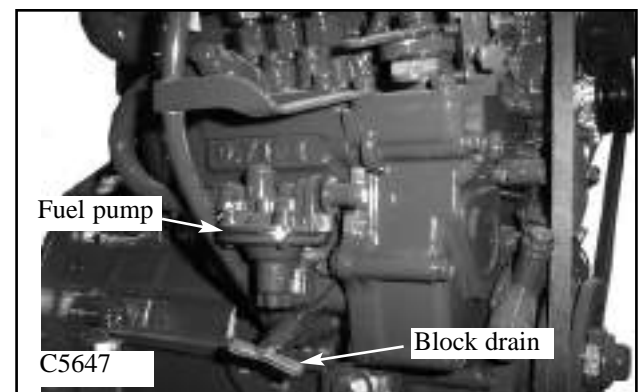
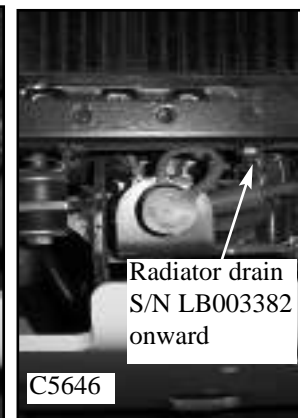
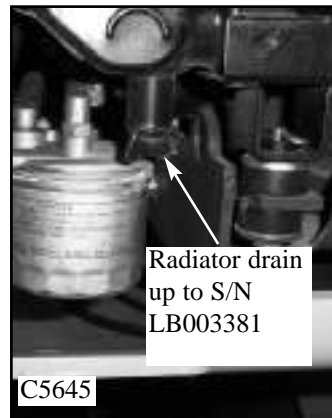
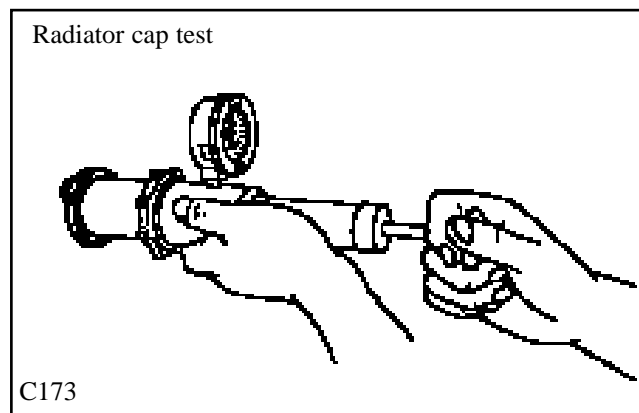
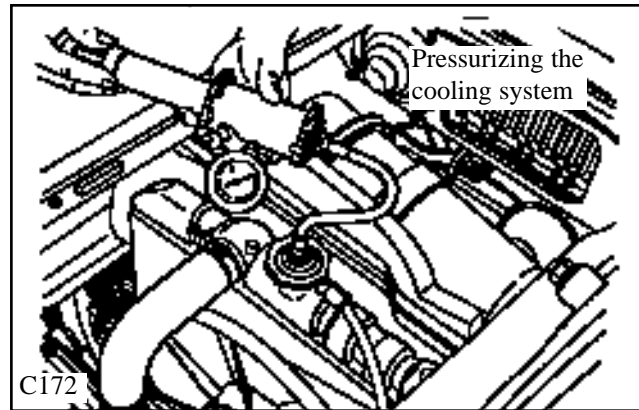
3 Open the engine drain petcock located under the fuel pump. (fig. C5647) To access this drain petcock, you may have to remove the bolts that fasten the fuel filter to the frame and hold the filter to one side as you reach in to open the petcock.

Close the drain petcock after the engine is completely drained. Re-fasten the filter to the frame.

**Note:** Attaching a piece of 5 / 16" (8mm) hose to the drain petcock and routing to a container, lessens waste and fluid clean up. Please dispose of waste fluid in an environmentally friendly manner.

4 Close the radiator drain.

5 Pre - mix the engine coolant, ethylene glycol, to equal parts of water. (50 / 50 ratio) Add the mixed coolant to the engine radiator. The cooling system will hold approximately 1.8 gal (7 liter) for the 85. Never use coolant undiluted. Pure coolant does not absorb and pass heat efficiently. It will also gel in cold weather.



# 7

# MAINTENANCE 7.7

## Fan Belt Adjustment

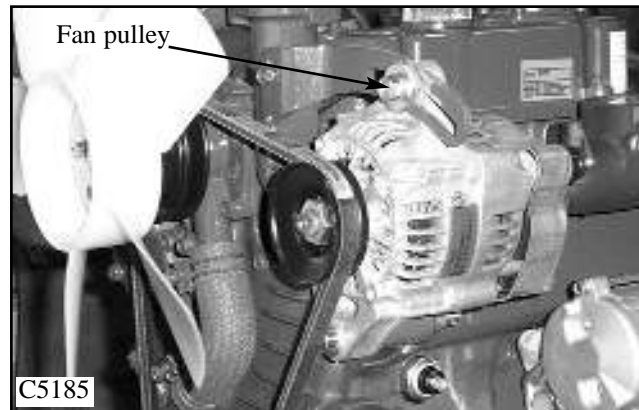
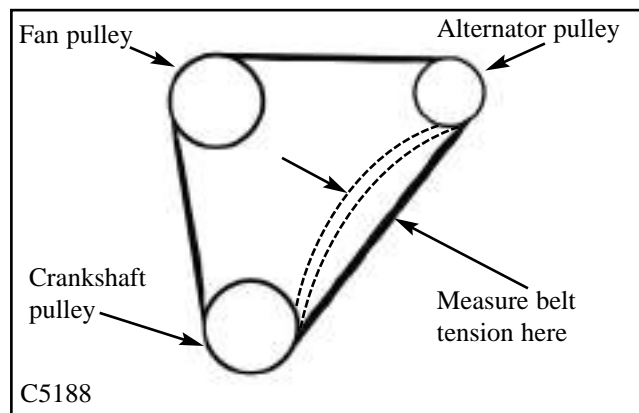
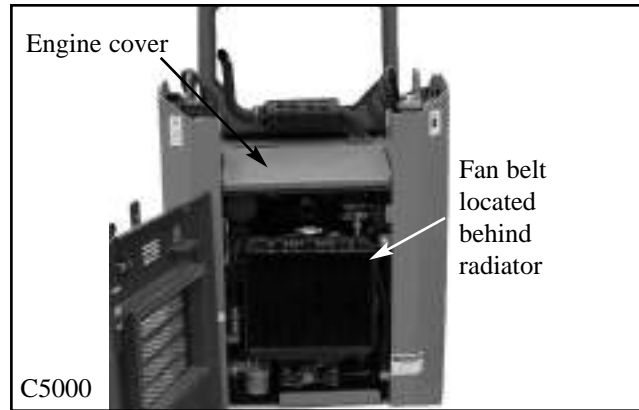
The fan (alternator) drive belt should be checked daily for tension and wear. The drive belt should be replaced promptly when fraying of the belt cords or cracks in the rubber are observed. Failure to replace the drive belt could lead to slippage or complete failure, causing the engine to over heat and lead to extensive repairs.

### To Adjust the Fan Belt:

- 1 Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.
- 2 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C5000)
- 3 Locate the drive belt. Fig. C5188 shows the drive belt without the radiator obstructing the view.
- 4 Check the drive belt tension midway between the alternator and crankshaft drive pulley. (fig. C5188)  
Correct tension is  $3/8 \sim 1/2$ " deflection @ 22 lbs force (10 ~ 12mm deflection @ 98 newtons force).

### Fan Belt Replacement:

- 1 Loosen the bolt on the alternator and allow the belt tension to loosen off. (fig. C5185)
- 2 Remove the bolts retaining the fan guard to the radiator shroud.
- 3 Pull the drive belt off the alternator pulley, crankshaft pulley and remove from around the fan.
- 4 Replace in reverse order and adjust belt tension as described above.



# ENGINE MAINTENANCE 7.1

## Universal Joint

The engine drive universal is located and accessed by removing the operators seat, and removing the service access cover. The universal joint should be serviced every 50 hours. Check the universal joint for wear and lubricate with a standard grade of multi purpose grease.

### To Service the U- Joint:

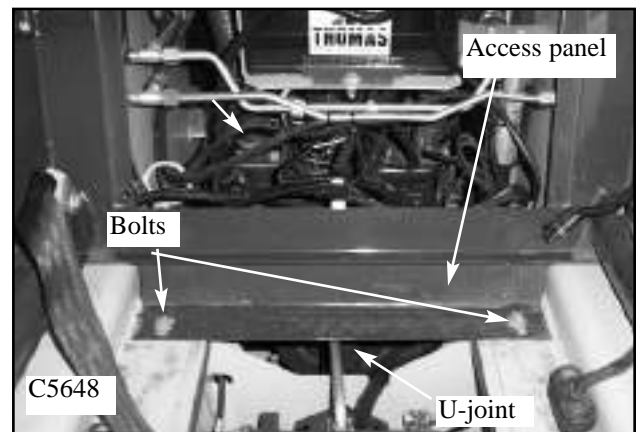
- 1 Remove any attachment, raise the boom arms, engage the boom supports, engage the parking brake and shut off the engine. Remove the ignition key.
- 2 Remove the seat assembly. Be sure to disconnect the electrical plug on the seat switch, left hand side.(fig.C5017)



 **WARNING**

**Never work under the boom arms without the boom supports engaged**

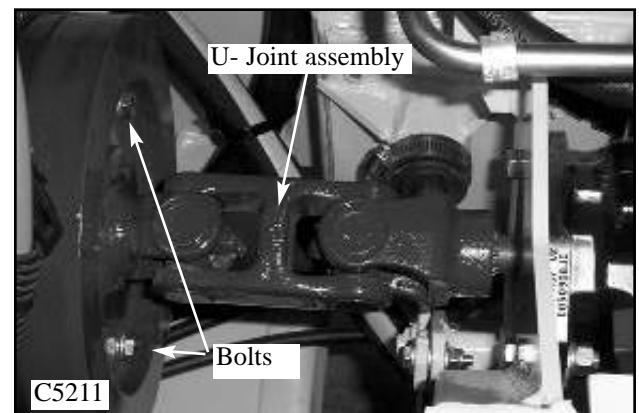
- 3 Remove the service access panel, located below the battery compartment cover, by removing the 2 bolts and pushing rearward on the top part of the cover, lifting and pulling forward from the bottom.(fig. C5648) Removal of the battery access panel will make servicing the u-joint easier.



- 4 Grasp the U- Joint assembly with your hands and rotate the joint left and right, forward and back to check U- Joint wear.

- 5 Check the condition of the splined yoke and spline on the hydrostatic pump input shaft.

- 4 Rotate the U- Joint if necessary to locate the grease fittings on the U- Joint crosses. Apply 2 ~ 3 pumps of multi purpose grease to each U- Joint cross.



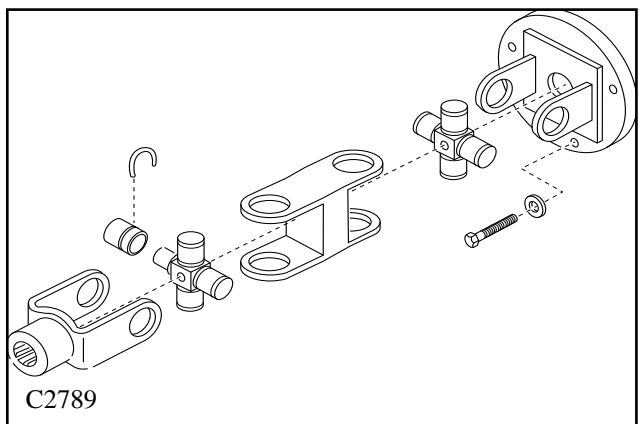
**NOTE:** Remove the U- Joint assembly from the loader to replace worn u- joint crosses. (fig. C2789) The crosses are retained by internal snap ring clips.

### To remove the u-joint assembly.

- 1 Remove the 5 bolts that attach the assembly's drive plate to the engine flywheel. (fig. C5211)
- 2 Slide the u-joint ahead on the pump spline while supporting the drive plate. Lift the drive plate away from the engine folding the u-joint. Slide the yoke off of the pump spline.

**Before installing U-joint assembly, check that the flywheel surface and the mating surface of the drive plate are clean and smooth. No nicks, burrs, paint, etc.**

To install the u-joint, grease the pump spline, then reverse the previous steps. Torque the drive plate bolts to 20ft/lbs. (27.2 Nm)





# CYLINDER HEAD 7.2

## Valve Adjustment

Refer to Kubota Workshop Manual 97897-0116-5,  
Thomas P/N 040913SP, for instructions.

## Compression Testing

Refer to Kubota Workshop Manual 97897-0116-5,  
Thomas P/N 040913SP, for instructions.

## NOTES



7

# ENGINE REPLACEMENT 7.3

## Removal

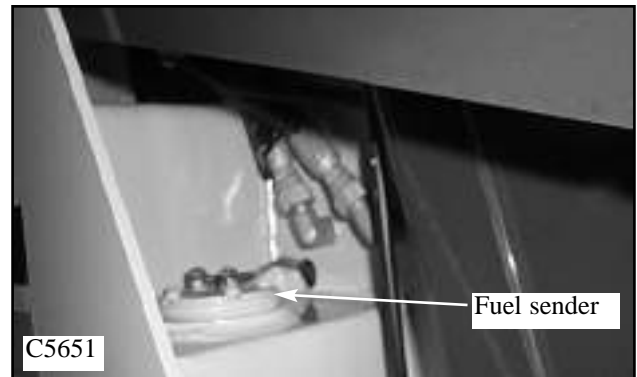
- 1 Move the loader to a level surface. Raise the boom arms, engage the boom supports, apply the parking brake, shut off the engine and remove the ignition key.
- 2 Remove the seat, U- Joint service access panel and the battery access panel.. (fig. C5648)



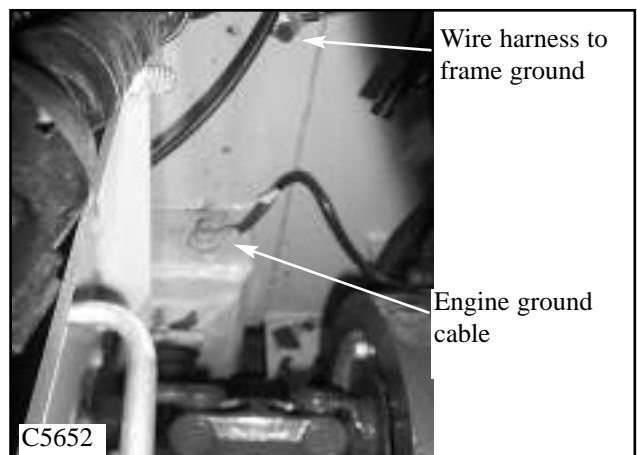
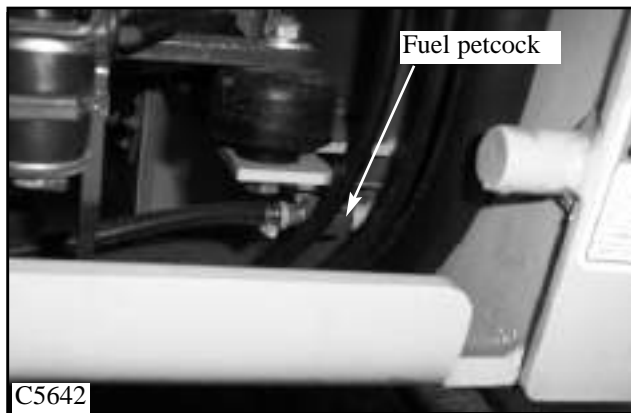
- 3 Disconnect the battery cables from the battery terminals. ( fig. C5105, Ground cable first) Remove any wire ties holding wires to the frame or tubing. Tie up the positive battery cable to the top of the engine. Unplug the ROPS harness from the engine harness, remove the wire clip holding the harness to the rops.



- 4 Disconnect fuel sender wires from sender. (fig. C5651)
- 5 Disconnect engine ground strap from stud on top rear of right hand transmission box(accessible through battery access hole). Disconnect ground wires to frame.(fig. C5652)



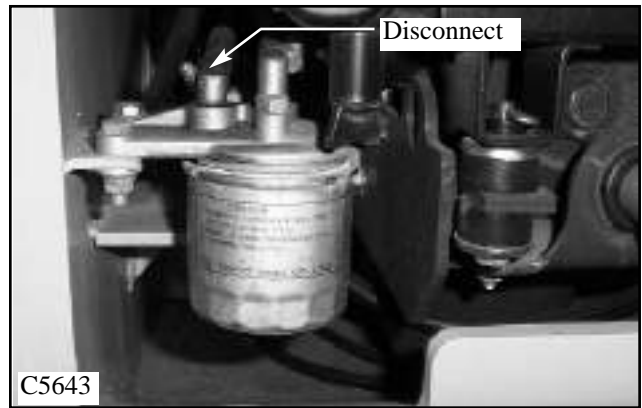
- 6 Shut off the fuel petcock located at the bottom of the right hand fuel tank, inside the engine compartment. (fig. C5642)



# ENGINE REPLACEMENT 7.3

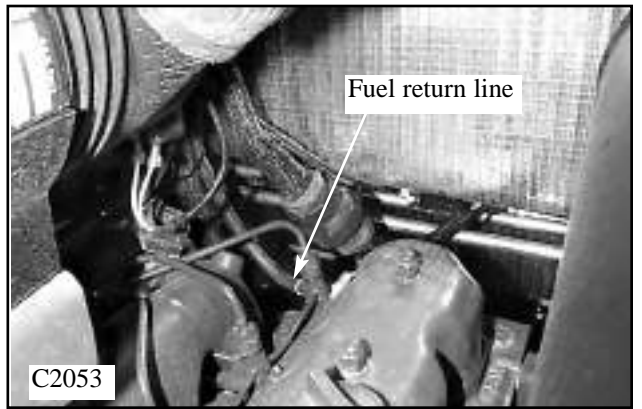
## Removal (cont'd)

7 At the fuel filter assembly loosen the fuel line clamp and disconnect the fuel line coming from the tank. Plug the fuel line. Undo the fuel filter assembly bolts so the filter can be moved to access engine mount nuts.(fig. C5643)



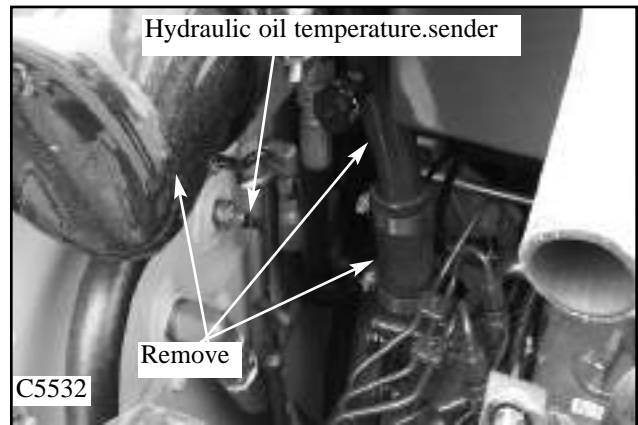
8 Disconnect the fuel return line from the behind the rear fuel injector. (fig. C2053)

9 Drain the engine oil and coolant. See Section 7.1 Lubrication system and Cooling System.



10 Disconnect the the air filter cannister, tube, hoses and mount bracket. Plug the intake manifold so that no foreign objects can go into the intake. (fig. C5532)

11 Remove the exhaust flange and flex tube from the loader. Cover or plug any open exhaust ports to the engine.



12 Disconnect Hydraulic oil temperature sender wire.(fig. 5532)

13 Disconnect valve solenoid locks wires by removing solenoid block from valve. Remove nut and o-ring and slide solenoid block off of valve. (fig. C5653)

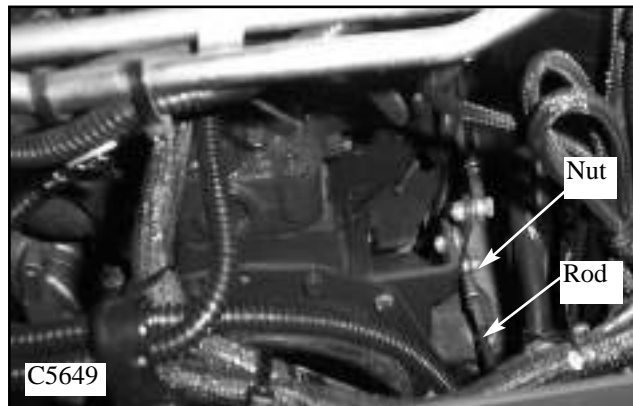


7

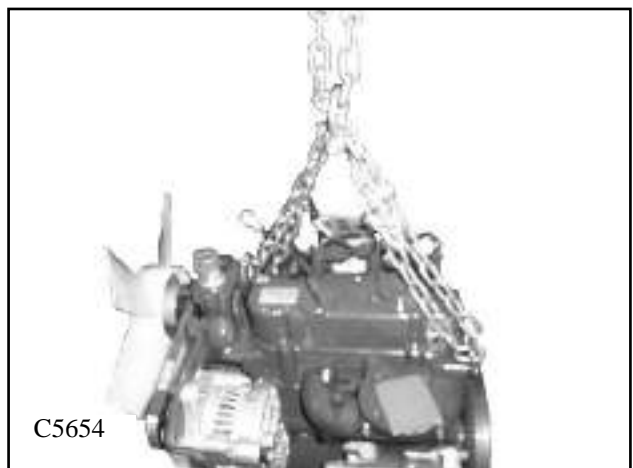
# ENGINE REPLACEMENT 7.3

## Removal (cont'd)

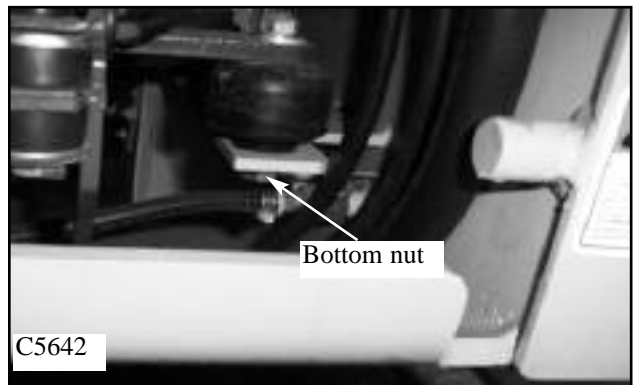
14 Disconnect the throttle handle rod at the engine swivel by removing nylok nut and bolt from the swivel rod end. (fig. C5649) Tie the throttle rod off to one side so that it will not interfere with engine installation.



15 Attach a hoist chain to the engine through the lifting lugs on the engine. Raise the hoist high enough to take the slack out of the chain. (fig. C5654)



16 Remove nuts and lockwashers from the bottom of the 4 engine isolators. (fig. C5642)



17 Slowly raise the engine until the isolators are clear of the frame mounts. Carefully pull the engine back out of the loader frame, the u-joint should slide off of the pump spline, while checking for any hoses or wires that may not have been disconnected. Also be careful not to let the engine swing against the valve, as this could damage valve components.

18 Set the engine down on an appropriate cradle that will properly and safely support it while working on it or stripping the parts off to be used on a replacement.

# ENGINE REPLACEMENT 7.3

## Installation

If the engine is being replaced with a new assembly, the engine will require some preparation.

1 Remove the protective rust preventative coating from the flywheel. Use a solvent to remove. The flywheel must be clean with no nicks or burrs.

2 Install the engine U- Joint adapter. There are 5 bolts holding the adapter to the engine flywheel. Torque the adapter bolts 20 ft lbs. (27.2 Nm)

3 Paint must be removed from the starter mount plate where the engine ground strap is attach to the bottom starter bolt. This will provide proper grounding of the engine with the loader chassis. (fig. C5655)

4 Install the engine mounts. Apply Loctite 242 (blue) to the threads of the mounting bolts. Torque the mounting bolts to 35 ft lbs. (47.5 Nm). (fig. 5121)

5 Install the isolators into the engine mounts. (fig. 5121) Make sure the isolators are not separating or the rubber is not deteriorated in any way. Replace isolators as required.

6 Install the boosting lug mount and the boosting lug.

7 Install the engine temperature sender.

8 Install the engine wire harness and the positive battery cable to the starter motor and the boosting lug.(fig. C5162, fig. C5121)

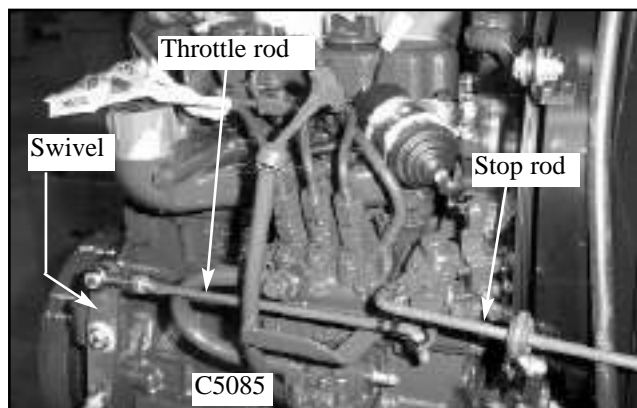
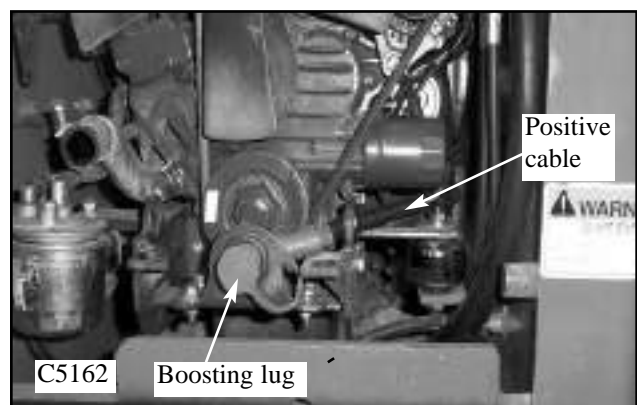
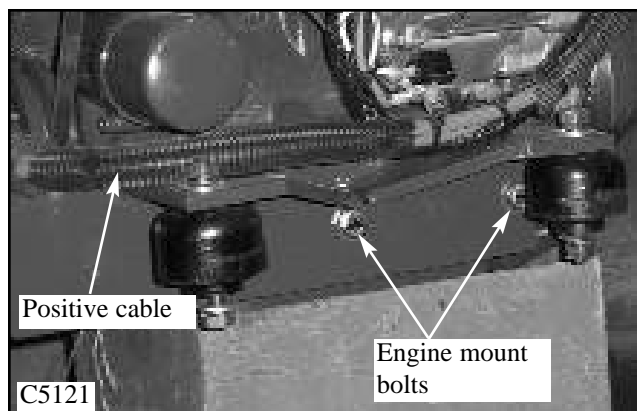
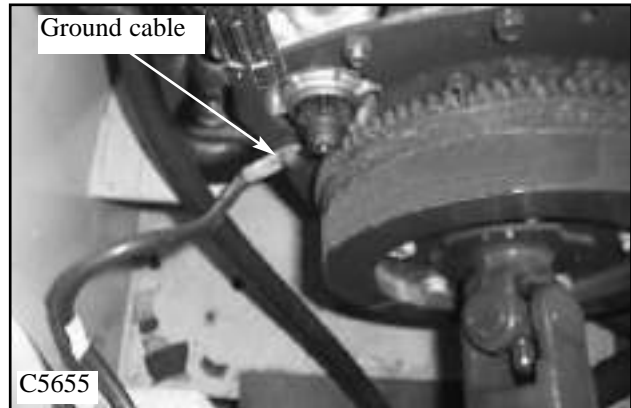
9 Install the radiator to the engine mounts and install the radiator hoses.

10 Install the fan guard to the radiator shroud.

11 Install the upper radiator mounting bracket.(LB003382 Onward)

12 Add engine oil and coolant.

13 Install the engine throttle rod and the swivel to the engine. Install the manual stop rod.(fig. C5085)

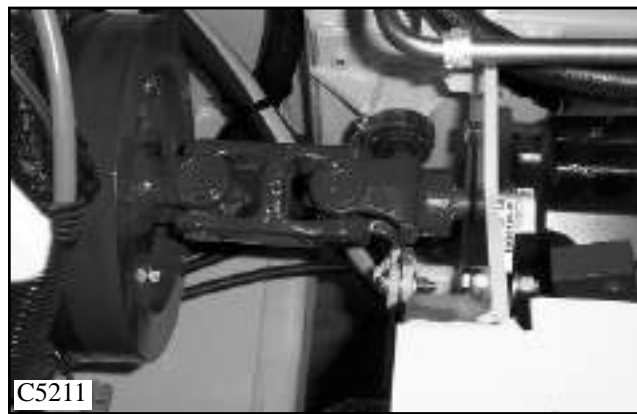
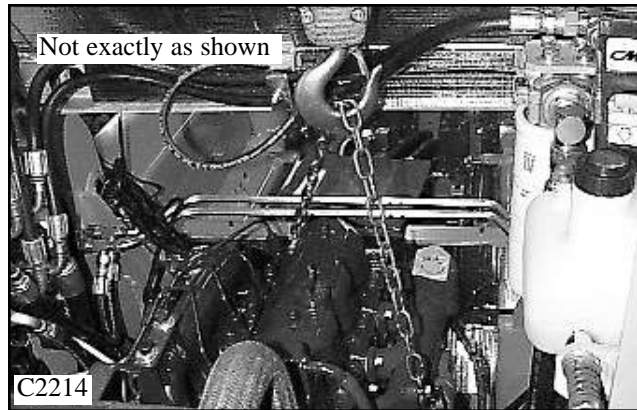


7

# ENGINE REPLACEMENT 7.3

## Installation

14 Using a hoist, set the engine into the loader through the rear door opening.. (fig. C2214) Have a helper inside the cab to line up the engine U- Joint to the hydrostatic pump input shaft. (fig. C5211) Align the engine U-Joint in a straight line with the hydrostatic pump. Failure to align the U- Joint properly will cause premature U- Joint failure.



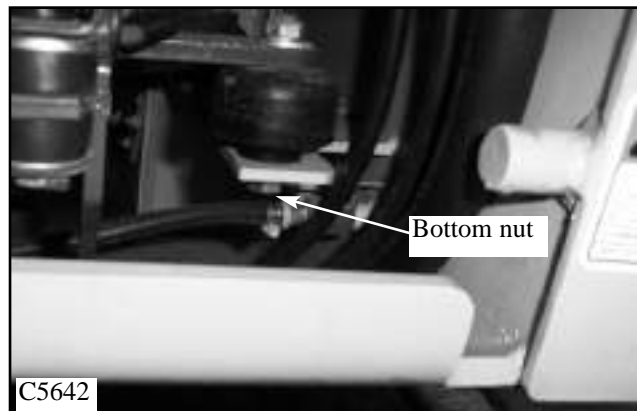
15 Install the bottom nuts to the isolators. Torque the nuts to 35 ft lbs. (47.5 Nm).(fig. C5642) Recheck the alignment of the u-joint once the engine is torqued into place. Re-adjust the engine position if required to maintain proper u-joint alignment.

16 Connect the various electrical connections, routing wires carefully to prevent chaffing. Tie the wires with zip ties as required. Be sure all ground points are clean.

17 Connect the throttle rod to the throttle swivel.

(Adjustment- Section 4.4)

18 Install the intake and exhaust systems.



18 Bolt the fuel filter to the frame and connect the fuel hoses.

19 Connect the fuel supply and turn on the fuel tank petcock.

20 Bleed the air from the fuel lines.(section 7.1)

20 Check the engine oil and coolant level.

21 Check again for any loose wires that may be dangling free.

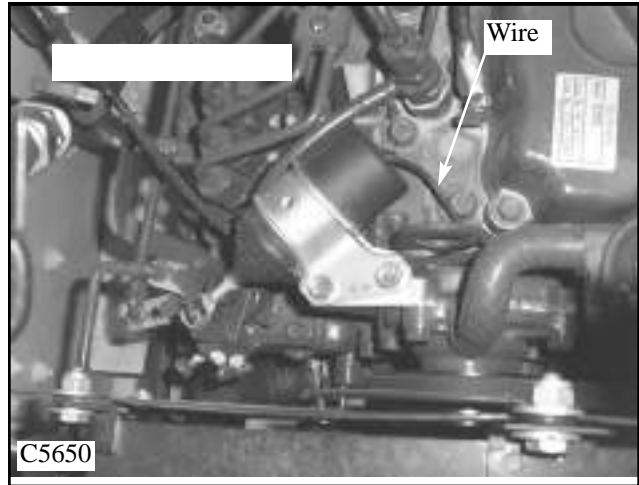
22 Test fire the engine.

# ENGINE REPLACEMENT 7.3

## Stop Solenoid

The stop solenoid is energized only when the loader engine is being stopped. When the ignition key is turned from the run position to the stop position, the timer relay supplies power to the stop solenoid for 15 seconds. The stop solenoid pulls on the engine stop lever, stopping the engine. After 15 seconds the stop solenoid returns to a position of rest.

- 1 Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.
- 2 Access the engine compartment by opening the rear door and lifting the engine cover. Latch the engine cover in place.
- 3 Unplug the stop solenoid wire from the engine harness.



- 4 Remove the two bolts that fasten the stop solenoid to the engine. Lift the solenoid off. The solenoid should pull freely out of the engine stop lever.
- 5 Check that the manual stop lever moves freely. Lubricate and adjust if necessary.
- 6 Slide the new stop solenoid pin into the slot in the engine stop lever. Fasten the solenoid to the engine using two bolts.
- 7 Check that the engine stop lever rotates freely in the solenoid linkage.
- 8 Connect the wire plug to the engine harness.
- 9 Start and stop the engine to check operation of new solenoid.



# — ENGINE SPECIFICATIONS 85 7.4 —

Make and model .....	Kubota D722
Type.....	Vertical , In Line, 4 Cycle
Number of cylinders.....	3
Displacement .....	719cc(43.89cu.in.)
Maximum engine speed (no load) .....	3140 rpm
Low idle setting.....	1100 rpm
Cooling system .....	Liquid
Cold starting aid.....	Glow plug in combustion chamber
Horsepower (Gross).....	16.9 @ 3200 rpm
Max Torque.....	34ft/lbs@ 2600rpm.
Fuel injection pump.....	Bosch type mini pump (PFR 4M)
Direction of rotation (viewed from flywheel end) .....	Counter - clockwise
Fuel type .....	Low Sulphur Diesel
Fuel filter .....	Single spin on type
Air cleaner .....	Dry cartridge with restriction indicator
Oil filter .....	Single spin on type
Engine oil pressure.....	@ Idle speed 14 psi (98 kPa) minimum
.....	@ Rated speed 42.7 psi (294 kPa) minimum
Oil pressure switch .....	Closes @ 7 psi (49 kPa)
Engine oil capacity with filter.....	3.75 qts (3.5 liters).
Oil type.....	5W40 API CF-4
Cooling system capacity.....	1.8 gal (7 liters).
Radiator cap pressure setting .....	12. 8 psi (88kPa)
Thermostat rating .....	Fully open 185°F (85°C)

**For complete engine service repair manual: Order P / N 97897-0116-5 from your nearest Kubota dealer, or order P / N 040913sp from your local Thomas dealer.**



# —ENGINE TROUBLE SHOOTING 7.5—

Symptom	Cause	Remedy
Engine does not start	No fuel	Replenish fuel
	Air in the fuel	Vent air
	Water in the fuel	Change fuel and repair or replace fuel system
	Fuel pipe clogged	Clean
	Fuel filter clogged	Clean or change
	Excessively high viscosity of fuel or engine oil at low temperature	Use the specified fuel or engine oil
	Fuel with low octane number	Use the specified fuel
	Fuel leak due to loose injection pipe retaining nut	Tighten nut
	Incorrect injection timing	Adjust
	Fuel cam shaft worn	Replace
	Injection nozzle clogged	Clean
	Injection pump malfunctioning	Repair or replace
	Seizure of crankshaft, camshaft, piston, cylinder liner or bearing	Repair or replace
	Compression leak from cylinder	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder
	Improper valve timing	Correct or replace timing gear
	Piston ring and liner worn	Replace
Excessive valve clearance	Adjust	
Manual stop rod stuck in off position	Correct and adjust/lubricate	
Starter does not run	Battery discharged	Charge
	Starter malfunctioning	Repair or replace
	Key switch malfunctioning	Repair or replace
	Wiring disconnected	Connect
Engine revolution is not smooth	Fuel filter clogged or dirty	Clean or change
	Air cleaner clogged	Clean or change
	Fuel leak due to loose injection pipe retaining nut	Tighten nut
	Injection pump malfunctioning	Repair or replace
	Incorrect nozzle opening pressure	Adjust
	Injection nozzle stuck or clogged	Repair or replace
	Fuel overflow pipe clogged	Clean
Governor malfunctioning	Repair	
Either white or blue exhaust gas is observed	Excessive engine oil	Reduce to the specified level
	Low grade fuel used	Repair or replace
	Fuel filter clogged	Clean or change
	Air cleaner clogged	Clean or change
Either black or dark gray exhaust gas is observed	Overload	Lessen the load
	Low grade fuel used	Use the specified fuel
	fuel filter clogged	Clean or change
	Air cleaner clogged	Clean or change

7

# —ENGINE TROUBLE SHOOTING 7.5—

SYMPTOM	PROBABLE CAUSE	SOLUTION
Excessive lubricant oil consumption	Piston rings gap facing the same direction	Shift gap direction
	Oil ring worn or stuck	Replace
	Piston ring groove worn	Replace
	Valve stem and guide worn	Replace
	Crankshaft bearing and crank pin bearing worn	Replace
Fuel mixed into lubricant oil	Injection pump's plunger worn	Replace pump element or pump
	Injection pump broken	Replace
Water mixed into lubricant oil	Head gasket defective	Replace
	Cylinder block or cylinder head flawed	Replace
Low oil pressure	Engine oil insufficient	Replenish
	Oil strainer clogged	Clean
	Relief valve stuck with dirt	Clean
	Relief valve spring weakened or broken	Replace
	Excessive oil clearance of crankshaft bearing	Replace
	Excessive oil clearance of crank pin bearing	Replace
	Excessive oil clearance of rocker arm bearing	Replace
	Oil passage clogged	Clean
	Oil pump defective	Replace
Different type of oil	Use the specified oil type	
High oil pressure	Relief valve defective	Replace
	Engine oil insufficient	Replenish
Engine overheated	Fan belt broken or elongated	Change or adjust
	Cooling water insufficient	Replenish
	Radiator net and radiator fin clogged with dust	Clean
	Inside of radiator corroded	Clean or replace
	Cooling water flow route corroded	Clean or replace
	Radiator cap defective	Replace
	Overload running	Loosen the load
	Head gasket defective	Replace
	Incorrect injection timing	Adjust
Deficient output	Unsuitable fuel used	Use the specified fuel
	Incorrect injection timing	Adjust
	Engine's moving parts seem to be seizing	Repair or replace
	Uneven fuel injection	Repair or replace injection pump
	Deficient nozzle injection	Repair or replace nozzle
Battery quickly discharges	Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder
	Battery electrolyte insufficient	Replenish distilled water
	Fan belt slips	Adjust belt tension or change
	Wiring disconnected	Connect
	Alternator defective	Replace
Battery defective	Change	

7

# SECTION 8

## MAINTENANCE & SPECIFICATIONS

### Maintenance 8.1

Preventative Maintenance Schedule.....	pg. 8-2
Service Access.....	pg. 8-3 ~ 5
Daily Service .....	pg. 8-6
50 Hour Service .....	pg. 8-7 ~ 8

### Trouble Shooting 8.2

Hydrostatic Drive .....	pg. 8-9
Hydraulic System .....	pg. 8-10
Final Drive.....	pg. 8-9
Parking Brake .....	pg. 8-9
Control Levers .....	pg. 8-11
Electrical .....	pg. 8-11
Diesel Engine.....	pg. 8-12

### Special Tools 8.3

Descriptions & P / N's .....	pg. 8-13 ~ 15
------------------------------	---------------

### Specifications 8.4

Loader Specifications.....	pg. 8-17 ~ 18
Torque Chart / Specifications .....	pg. 8-19

### Decals 8.5

Locations & P / N's.....	pg. 8-20 ~ 23
--------------------------	---------------

# MAINTENANCE 8.1

## 8.1 Preventative Maintenance Service Schedule

ITEM	SERVICE REQUIRED	8 HOURS	50 HOURS	100 HOURS	300 HOURS	1000 HOURS
Engine Oil	Check level. If necessary add 5W40 API Classification CF-4 or better oil.					
Radiator (Water cooled only)	Check level. If necessary fill with 50 / 50 mixture of ethylene glycol and water. Check for leaks, dirt build up and bent cooling fins. If necessary, straighten cooling fins and clean radiator with compressed air (40psi [ 27Kpa] max) or flush with water.					
Hydraulic Oil	Check level. If necessary add 10W30 API Classification SJ oil.					
Oil Cooler	Check cooling fins for obstruction. Clean with compressed air or water.					
Air Cleaner	Check air restriction sensor wiring connection. Replace filter elements as required when the air restriction indicator illuminates on the dash panel.					
Tires and Wheels	Check tires for pressure and damage. Inflate standard tires to 50 psi (345 kPa), flotation tires to 40 ~ 45 psi (276 ~ 310 kPa). Torque wheel nuts to 100 ~ 110 ft lbs (136 ~ 149 Nm).					
Safety Equipment	Check the following safety equipment for proper operation and condition: Seat belt, restraint bar, hydraulic control locks, parking brake, boom supports, quick-tach locks, side screens, glass, shields and safety treads. Repair or replace as needed.					
Decals	Check for damaged or missing safety and instruction decals. See Section 8.5. Replace decals as required.					
Lubrication	Grease all hinge pin fittings until excess shows.					
50 Hour Service	Perform complete 50 hour service. See Section 8.2, pg. 8-8.					
Preventative Maintenance	It is recommended as a preventative maintenance that the 50 hour service be repeated every 100 hours after the initial 50 hour service. See 8.2, pg. 8-8.					
Engine Fuel Filter	Replace the engine fuel filter. See Section 7.1.					
Hydraulic Reservoir	Change the hydraulic oil and replace the suction element. Replenish reservoir with 10W30 API Classification SJ oil. See Section 1.7.					
Final Drive	Change the final drive lubricating oil. See Section 3.2.					
Engine Cooling System	Drain, flush and replenish the engine coolant. See Section 7.1.					

**Note:** For complete engine service details refer to Section 7 of this manual. If further information is required refer to the engine manufacturers service manual.

# MAINTENANCE 8.1



## WARNING

To avoid personal injury, service repairs must be performed by an authorized Thomas dealer.

### 8.1.2 SERVICE ACCESS

#### 1. 2A Boom Support

For safety while performing regular service or maintenance work, the loader is equipped with boom support pins. The boom support pins when extended prevent the boom arms from dropping if hydraulic pressure is relieved or the hydraulic controls are accidentally cycled.

## IMPORTANT

Fully retract boom support pins before raising or lowering boom arms.

To operate the boom support, first remove any bucket or attachment from the quick - tach; raise the boom arms to full height. Raise the boom support handle (fig. C693) up and push out toward boom arms to extend the boom support pins (fig. C694) Slowly lower the boom arms down on to the pins.



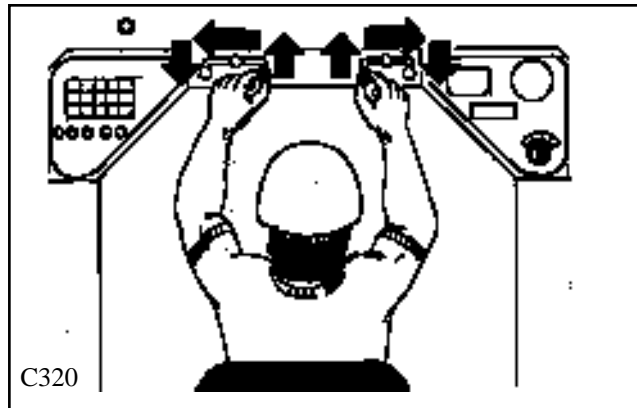
## WARNING

To avoid personal injury: Do not leave boom arms up unless the boom supports are engaged.

#### 1. 2B Seat Removal

The seat and seat plate can be removed to provide access to the controls, hydraulic and hydrostatic components. To remove the seat assembly, remove the fasteners located at the front of the seat. **DISCONNECT THE ELECTRICAL PLUG!** Lift the seat assembly out of the machine. When installing the seat, be sure the seat plate is locked in place at the rear (fig. C5097).

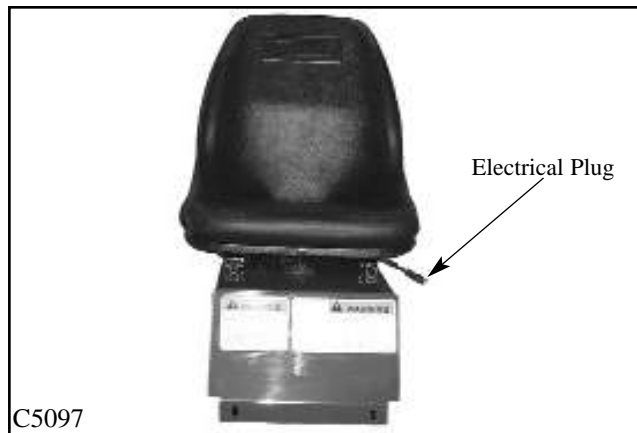
The hydrostatic shield can be by removing the four (4) fasteners (fig.C5017).



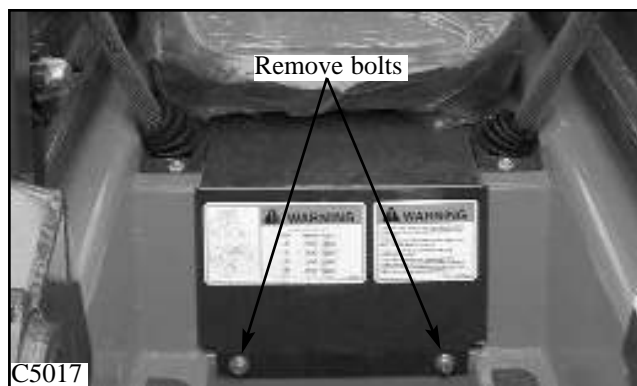
C320



C321



C5097



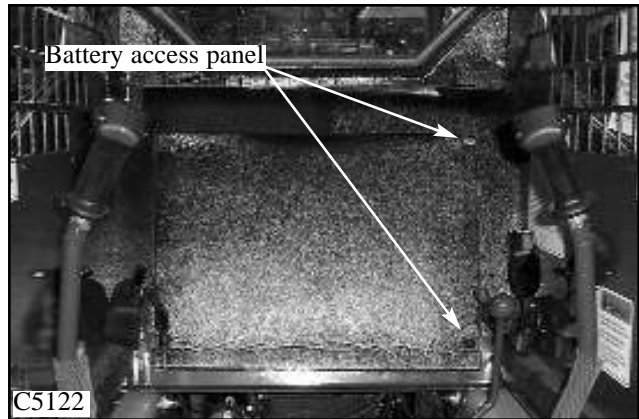
C5017

# MAINTENANCE 8.1

## 8.1.2 Service Access

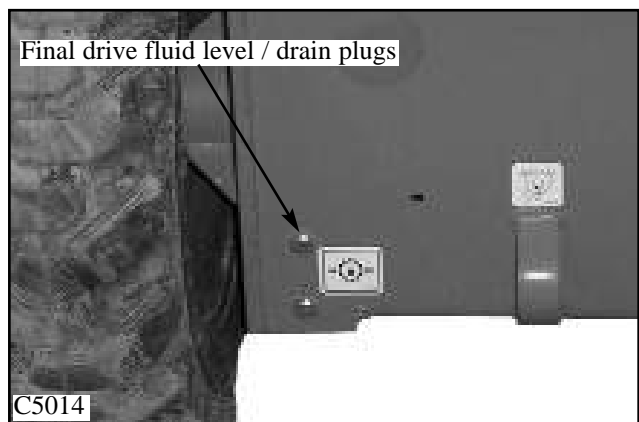
### 1. 2C Battery Compartment

The battery may be accessed by first removing the seat from the loader, removing the retaining screws and opening the access panel. (C5122)



### 1.2D Final Drive Fluid

The final drive housing has an upper level and lower level, check and drain plug, located at the bottom front of the loader, next to each front tire. (C5014)



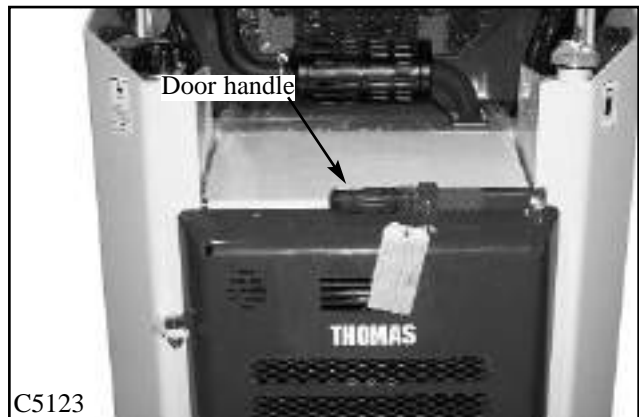
### 1.2E Final Drive Fill

The final drive fill location is accessed by removing the seat and hydrostatic shield. The fill plugs may then be removed to replenish fluid. (C5077).



### 1.2F Engine Compartment

The engine compartment is completely enclosed for component protection and lockable to discourage vandalism. For servicing, the rear door swings open and the engine cover hinges up. To open; raise the door handle, and pull up and outward. (C5123).



### IMPORTANT

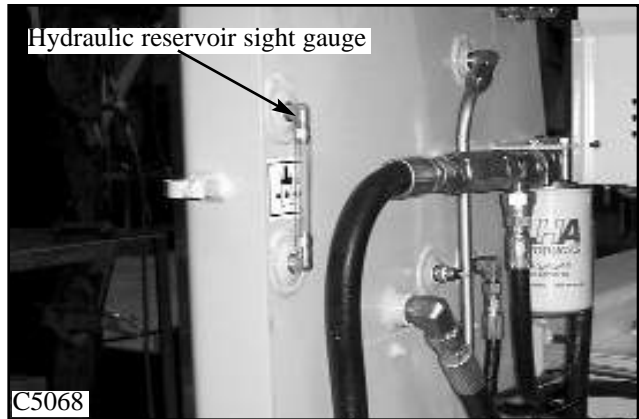
**Keep the rear door closed except for servicing. Make sure the door is closed and latched before operating the loader.**

# MAINTENANCE 8.1

## 8.1.2 Service Access

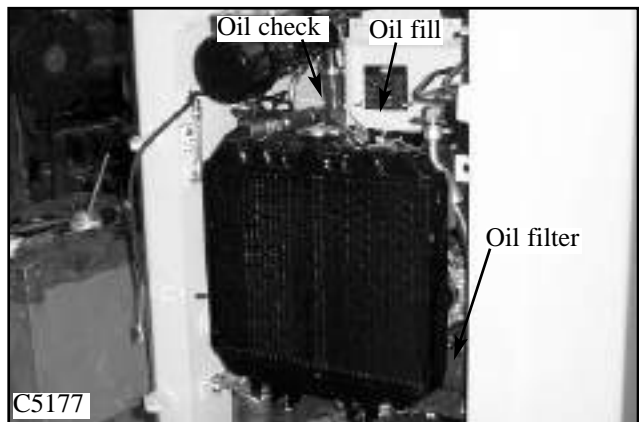
### 1. 2G Oil Reservoir

The oil reservoir is located at the rear, left side of the loader. It is part of the mainframe structure. The reservoir level is accessed by opening the rear door and visually checking the sight gauge. (C5068). The reservoir fill is located at the top of the reservoir. The hydraulic filter is also located here.



### 1.2H Engine

The engine is accessed by opening the rear door and raising the engine compartment cover. (C5177). The oil level dipstick is located on the left of the engine. Oil fill is located on top of the engine rocker arm cover. The oil drain plug is located on the bottom of engine compartment. (C5178) The oil filter and fuel filter is located to the lower right of the engine assembly. The fuel filter is located to the lower left of the engine.



### 1.2E Fuse Panel

The fuse panel is located in the engine compartment. Open the rear door and raise the engine compartment cover. (Open the panel by removing the retaining bolt or nut.) A decal is located on the outside of the panel showing proper fuse size and use.



# MAINTENANCE 8.1

## 8.1.3 DAILY SERVICE CHECK

### 1.3A Radiator Service

With the engine cool remove the radiator cap and check the coolant level. If adding coolant is required fill with a 50% mixture of ethylene glycol and water for cold weather protection.

The radiator cooling fins must be kept free of debris otherwise overheating of the engine will occur. Inspect the radiator cooling fins for damage or buildup of debris. Repair any damage and if necessary clean the radiator cooling fins with compressed air to remove debris.

### 1.3B Hydraulic Oil Level

Check the oil level with the machine on a level surface with the lift arms down and the bucket flat on the ground. Open the rear door and check the oil level sight glass (See Section 1). If oil is apparent the oil level is satisfactory.

If necessary to add oil, remove the reservoir cap located at the top of the oil reservoir and add oil until oil appears in the oil level sight glass.

Use a good quality 10W30 oil which meets the API classification SJ only.

### 1.3C Air Cleaner

The loader is equipped with a locking air cleaner restriction indicator.

Should this indicator show red, service the air cleaner assembly and filter element.

Check that all hose clamps are tight and the hose is undamaged. Check the vacuator valve for damage.

### 1.3D Tires and Wheel Nuts

Inspect tires for wear or damage. Check and inflate tires to correct pressure:

8.5 x 15	.....	40 - 45 psi
5.9 x 15	.....	50 - 55 psi

To prevent shearing of the wheel studs and rim damage check wheel nuts for proper torque 100 -110 ft lbs(136 - 149 Nm), and wheel bolts 80-85 ft lbs (108-115Nm) daily. After changing a rim, check wheel nuts/bolts hourly, until the reading stabilizes.

### 1.3E Safety Equipment

Check all safety equipment for proper operation and condition - seat belt, boom support, seat bar, foot pedal lock, parking brake, quick tach lock, shields and safety treads. Lubricate all linkages, springs and pivot points with a silicone based lubricant. Repair or replace if necessary.

### 1.3F Decals

Check the condition of all safety and instruction decals. Replace any damaged or missing decals. Refer to section 8.3 for decal description and locations.

### 1.3G Lubrication

There are fourteen grease fittings located in the loader that require lubrication every eight hours. (See Section 6) Lubricate with a good quality multi-purpose lithium based grease. apply grease until excess shows.

Refer to the service schedule for complete service details. the fourteen lubrication points are:

- Rear Boom Pivots (2)
- Boom Cylinder Bushings (4)
- Bucket Cylinder Bushings (4)
- Engine U-joint (2)
- Quick - Tach Pivot (2)

Also lubricate the Boom support pins and the Q-tach locking pins. These are easily greased using a small brush.

### 1.3H Engine Oil Level

To check the oil level, stop the engine with the loader on level ground, open the rear door and remove the dipstick.

Keep the oil level between the full and low mark o the dipstick (See Section 7). Do not fill above the full mark – use 10W30 API classification CF oil up to LB003381. Use 5W40 API CF-4 oil for LB003382 onward.



# MAINTENANCE 8.1

## 8.1.4 50 HOUR SERVICE CHECK

The following service check is to be performed by your dealer after the first 50 hours of operation.

### 1 Engine

#### 1.1 Oil Filter:

Change the engine oil filter. Use only original replacement parts. Refer to section 7.1 for installation details. Change the oil filter every 100 hours thereafter.

#### 1.2 Engine Oil:

Change the engine oil. Use only 5W40 API classification CF-4 oil LB003381 onward. Use 10W30 API CF up to LB003381. Refer to section 7 for procedure. Change engine oil every 100 hours thereafter.

#### 1.3 Coolant Level:

Check that the coolant is to the proper level. The cooling system is filled with a 50% mixture of ethylene glycol and water.

#### 1.4 Radiator for Leakage and Dirt:

If necessary clean the radiator cooling fins with compressed air and / or water. (40 psi [27 kPa] max) Dirt buildup on the radiator cooling fins can cause both engine and hydraulic system overheating.

#### 1.5 Fan Belt Tension and Condition:

Check fan belt for cuts or wear, if necessary replace. Check tension and adjust as shown in section 7.1.

#### 1.6 Fuel System for Leaks:

Make a visual inspection of fuel system for leaks and potential hazards such as fuel line(s) touching exhaust manifold, flywheel, etc. Replace fuel filter every 500 hours. Section 7.1.

#### 1.7 Air Intake and Cleaner System:

Follow the manufacturers inspection procedures. Check that the filter indicator is not indicating that filter service is required. Section 7.1.

#### 1.8 Exhaust System:

Visually inspect the exhaust system and ensure all clamps are secure and the manifold bolts/nuts are tight. Check muffler for carbon and soot build up and plugging. If necessary clean. Inspect for exhaust leaks.

#### 1.9 Engine Speed:

Check and if necessary adjust engine rpm Maximum no load high idle: 3140 rpm.

#### 1.10 Universal Joint:

Check the condition of the engine universal joints and splines. Lubricate the u-joints with 2 ~ 3 pumps of multi purpose grease. Section 7.1

### 2 Hydraulic/Hydrostatic

#### 2.1 Hydraulic Oil Filter:

Change the hydraulic oil filter. Change the hydraulic filter every 100 hours after the initial change. Lubricate the filter cartridge seal with system fluid.

#### 2.2 Hydraulic Oil Level:

If oil is visible in the oil level sight glass the level is satisfactory.

If additional oil is required use only 10W30 API classification SJ oil. Fill to the line marked next to the sight gauge.

#### 2.3 Hoses and Pipes:

Make a visual inspection of all hydraulic lines and fittings for leaks. Check that steel lines do not touch one another and clamps are tight.

#### 2.4 Cylinders:

Inspect cylinders for leaks. Extend cylinders and check for rod damage.

#### 2.5 Hydraulic Functions:

Check that the following operate properly: control valve float position, auxiliary hydraulic detent, hydraulic cylinders.

#### 2.6 Pumps & Motors, Leakage:

Inspect pumps and motors for leaks.



### WARNING

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

### Final Drive

#### 3.1 Oil Level:

Check lubricating oil level. If necessary add 10W30 API classification SJ- oil.

#### 3.2 Drive Chain Condition:

Check drive chains for any sign of wear or damage. Check lubrication oil in housing for signs of contamination.

#### 3.3 Hydrostatic Motor Mounting Bolts:

Check torque 80 ft lbs (108.2 Nm)

#### 3.4 Axle Bearing End Play:

Axle bearings are pre - loaded and must have no end play. Inspect and adjust if necessary.

# MAINTENANCE 8.1

## 4 Controls and Safety Equipment

- 4.1 Control Levers, Operation and Linkage:  
Check that the steering levers operate freely without binding, they return to neutral when released and the machine travels in a straight line with both levers in forward position.
- 4.2 Hydraulic Controls, Operation and Linkage:  
Check that the hydraulic controls operate freely without binding. Before leaving the operator's seat, ensure the controls are locked, raise the safety bar and unbuckle the seat belt. Lubricate or replace as necessary linkage.
- 4.3 Engine Throttle Control:  
Check that the throttle control operates freely without binding or slackening off due to vibration. Check throttle travel to ensure full engagement of high and low engine idle settings.
- 4.4 Parking Brake:  
Check that the parking brake engages and completely disengages. The park brake automatically engages with seat bar up.
- 4.5 Boom Supports:  
Check that the boom supports operate without binding.
- 4.6 Quick - Tach, Operation & Linkage:  
Ensure the quick - tach linkage operates smoothly without binding and the safety locks engage the attachments completely.
- 4.7 Seat Belt:  
Check seat belt condition. If necessary replace.  
For your safety, the loader is equipped with electrically activated safety devices through the seat and seat belt. See Section 5.

## 5 Electrical

- 5.1 Battery:  
Maintenance Free.
- 5.2 Battery Terminals:  
Check battery terminals for corrosion. If necessary, clean.
- 5.3 Operation of Starter:  
Engage and disengage the starter several times to ensure it's working properly. To prevent starter damage do not engage for more than 15 seconds. Allow 1 minute between starting attempts for cooling the starter.
- 5.4 Operation of Electrical Equipment:  
Make a complete check of all electrical equipment, gauges, warning devices, pre-heat indicator, work lights, seat switch and belt and all optional equipment to ensure they are operating correctly.

## 6 Grease / Lubrication

Lubricate the following points with a good quality grease. Numbers marked ( ) indicate the number of fittings at each location.

- Rear Boom Pivots (2)
- Boom Cylinder Bushings (4)
- Bucket Cylinder Bushings (4)
- Engine Universal Joint (2)
- Boom Supports (2)
- Quick - Tach Pivot (2)

Also lubricate the Boom support pins and the Q-tach locking pins. These are easily greased using a small brush

## 7 General

- 7.1 Tire Pressure:  
Check the tire pressure and if necessary inflate to the following pressures: 5.90 x 15 @ 50 psi (345 kPa), 8.00 x 15 @ 40 - 45 psi (276 - 310 kPa). Flotation tires may be inflated to 50 psi (345 kPa) on hard flat surfaces.
- 7.2 Wheel Bolt Torque: Check and Torque wheel bolts to 80-85 ft lbs (108-115 Nm)  
For loaders with wheel nuts, check and torque wheel nuts to 100 - 110 ft lbs (136 - 149 Nm).
- 7.3 Condition of Cab:  
Inspect the condition of the ROPS mounting isolators. Replace isolators if deteriorated. Inspect both the seat and seat belt. Ensure all safety and instruction decals are in place. Inspect sound insulation, side windows and door operation for machines equipped with cab enclosure kits.
- 7.4 Condition of Shields and Safety Equipment:  
Inspect and ensure all shields are in place and securely fastened. Inspect and ensure all safety equipment is working properly. Ensure owners and operators manual, safety manual and all safety and instruction decals are in place. If necessary, replace. If the safety controls are malfunctioning or require adjustment consult your **Thomas** Equipment Dealer for service.
- 7.5 General Condition:  
Make a general inspection of the machine looking for loose or missing parts, oil leaks, etc.

# TROUBLESHOOTING 8.2

## 8. 2A Hydrostatic Drive

## 8.2A Hydrostatic Drive

Symptom	Cause	Remedy
No power on one side (both directions)	Reservoir low on oil	Replenish with 10W30 API SJ oil. Check for hose or fitting leak.
	Disconnected control linkage	Reconnect and adjust linkage.
	Groove pin sheared on pump pintle lever	Replace. Check pintle lever for loose bolt or excessive play.
	High pressure line failure	Replace line. Ensure new line fits without being forced. If necessary stress relieve.
	Drive chain failure	Replace chain or connection link.
	Motor shaft or key failure Check mounting bolts.	Inspect and repair defective parts. motor
	Excessive internal leakage in and/or motor pump	Inspect and repair defective unit. Flush all lines and tank. Replace filter. Check on type of fluid used and engine rpm.
No power on one side (one direction only)	Defective relief valve	Replace defective valve.
	Damaged ball check	Disassemble and repair.
No power on both sides (also loss of hydraulic power)	Reservoir low on oil	Replenish with 10W30 API SJ. Check for hose or fitting leaks
	Universal Joint failure between engine and pump	Inspect and repair damaged parts.
	Damaged ball check	Disassemble and repair
Gradual loss of power as machine warms up	Excessive internal leakage in pump and/or motor	Consult dealer or <b>Thomas</b> Service Dept.

Symptom	Cause	Remedy
System erratic and/or noisy reservoir	Air in system due to low oil level in oil.	Replenish with 10W30 API SJ
	Air in system due to leak at suction fitting	Check fittings and tighten.
	Internal pump or motor wear caused by over speeding	Consult your dealer or <b>Thomas</b> Service Dept.
	Excessive play in linkage or pintle lever	Adjust linkage and tighten or replace pintle lever.
Machine will not travel in a straight line in high range	Control levers binding	Check that shields are not stopping lever from full travel.
		Check for linkage binding at spring mount. Adjust tracking.

## 8.2B Final Drive Transmission

Symptom	Cause	Remedy
Final drive transmission noisy	No lubricating oil	Check and bring oil to the proper level. Use 10W30 SJ engine oil
	Parking brake damaged or out of adjustment	Inspect and adjust or replace damaged parts
	Axles have too much end play	Pre-load axle bearings removing all end play
	Chain loose	Replace chain

## 8.2C Park Brake

Symptom	Cause	Remedy
Brake will not hold machine	Brake parts damaged or worn	Consult your Dealer or <b>Thomas</b> Service Dept.
	Brakes are disengaged	Engage parking brake
Brake will not release machine	Brake pins holding in sprocket	With restraint bar down, jog control levers back and forth. If not releasing consult Dealer or <b>Thomas</b> service dept.
	Brake parts damaged or worn	Consult your Dealer or <b>Thomas</b> service Dept.

# TROUBLESHOOTING 8.2

## 8.2D Hydraulic System

## 8.2D Hydraulic System

Symptom	Cause	Remedy
Hydraulic action jerky	Reservoir low on oil	Replenish with 10W30 API SJ oil.
	Air in hydraulic system	Check for leak between reservoir and pump. Bleed System by extending and retracting lift cylinders several times.
	Anti-cavitation check valve not functioning	Inspect and repair or replace
Boom raises slowly at full engine rpm	Reservoir low on oil	Replenish with 10W30 API SJ oil
	Foot pedal linkage binding	Inspect and adjust
	Auxiliary foot pedal engaged	Disengage
	Engine rpm too slow	Check rpm and reset
	Anti-cavitation check valve spring broken	Replace
	Pressure relief valve in control valve faulty	Check pressure if necessary - adjust
	Internal leakage in pump due to wear	Check pump flow and repair or replace as necessary
	Oil bypassing one or both lift cylinder piston seals	Install new piston seal kits
Lift or tilt cylinders will not support a load	External leak between or at control valve and cylinders	Check for leaks and correct
	Control valve spool not centering	Check for sticking foot pedal linkage
		Check for broken or stuck return spring on valve spool
	Oil leaking by one or both cylinder piston seals	Install new piston seal kits

Symptom	Cause	Remedy
Loss of hydraulic power (no flow from gear pump)	Reservoir low on fluid hose or fitting leak.	Replenish with 10W30 SJ oil. Check for leaks.
	Universal Joint between engine and pump failure	Inspect and replace damaged parts. Check for misalignment between engine and pumps.
	Spline coupling failure between front and rear hydrostatic pump	Inspect coupling for sheared splines. Also check pump shaft bearings.
	Hydraulic gear pump not functioning	Inspect and repair.
	Reservoir low on fluid	Replenish with 10W30 SJ oil
Loss of hydraulic power (flow from gear pump)	Foot pedal linkage disconnected or binding	Inspect and adjust.
	Auxiliary foot pedal engaged	Disengage
	Relief valve failure in control valve	Check pressure and adjust.
Hydraulic oil overheating	Auxiliary foot pedal engaged	Disengage
	Engine rpm too slow	Check rpm and adjust
	Incorrect temperature sensor	Replace
	Reservoir low on fluid.	Replenish with 10W30 SJ oil.
Foot pedals do not operate smoothly	Foot pedal linkage out of adjustment	Adjust foot pedal linkages
	Foot pedal linkages need lubrication	Lubricate with a silicone based lubricant
	Cable Binding	Check routing for kinks etc.
	Foot pedal bushings worn.	Inspect and replace.

# TROUBLESHOOTING 8.2

## 8.2E Control Levers

Symptom	Cause	Remedy
Control levers will not center	Linkage out of adjustment	Adjust, check for wear at rod ends, loose counter nuts
	Linkage disconnected	Reconnect, check for wear at rod ends, loose counter nuts
	Centering spring broken	Replace
	Linkage binding	Control levers binding with safety shields or sound insulation Adjust Control lever bearings binding in lever assy. Inspect replace or clean as required
Machine operates erratically	Control lever linkage loose	Inspect linkage for wear at rod ends, loose counter nuts
	Bolt in pintle lever loose or broken	Replace bolt. Ensure bolt clamping lever to pump shaft is tight
		See troubleshooting hydrostatic system
Machine loses power while turning		See troubleshooting hydrostatic system
Machine will not travel in straight line	Linkage binding	Adjust
	Control lever travel out of adjustment	Adjust
Control levers do not operate smoothly	Internal pump and / or motor leakage	See troubleshooting hydrostatic system
	Control lever linkage out of adjustment	Adjust control lever linkages
	Control lever linkages need lubrication	Lubricate

## 8.2F Electrical



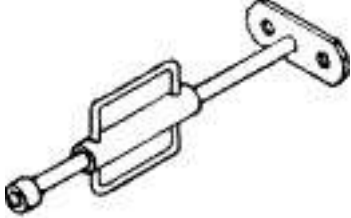



Symptom	Cause	Remedy	
Engine will not crank over	Battery failure	Check battery, charge or replace	
	Battery cable failure	Check for loose or corroded connectors. Tighten and clean as required. Use dielectric grease to prevent corrosion. Check continuity of cables and replace if defective	
		Starter failure	Repair or replace
		Fuse burnt	Check and replace
	Defective relay	Check relay continuity if defective, replace	
	Ignition switch failure	Check continuity and if defective, replace	
Engine cranks over, but will not start	Auxiliary hydraulics engaged	Engine will smoke but not run unassisted by starter. Disengage aux. hydraulics	
	Defective glow plug relay	Check continuity and if defective, replace	
	Defective glow plugs	Check continuity and if defective, replace	
	Broken connection or defective wire	Check continuity of the circuit not functioning properly in both engine and ROPS harness.	
	No fuel	Check fuel levels and system	
Loader starts, but hyd. controls will not release	Electric solenoid not releasing valve spools	Defective solenoid or binding solenoid lock. Check continuity of connectors and wire.	
Engine will not stop when the key is turned OFF	Defective ignition switch	Check and replace	
	Mechanical damage of the governor	Check and repair or replace	
	Manual stop rod binding	Adjust and lubricate.	
	Defective stop timer	Inspect and replace.	

# TROUBLESHOOTING 8.2

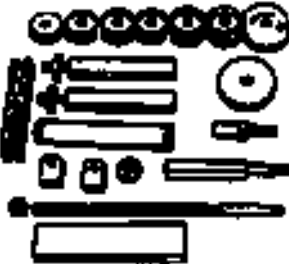





## 8.2G Diesel Engine

Symptom	Cause	Remedy
Engine does not start	No fuel	Replenish fuel
	Air in the fuel	Vent air
	Water in the fuel	Change fuel and repair or replace fuel system
	Fuel pipe clogged	Clean
	Fuel filter clogged	Clean or change
	Excessively high viscosity of fuel or engine oil at low temperature	Use the specified fuel or engine oil
	Fuel with low octane number	Use the specified fuel
	Fuel leak due to loose injection pipe retaining nut	Tighten nut
	Incorrect injection timing	Adjust
	Fuel cam shaft worn	Replace
	Injection nozzle clogged	Clean
	Injection pump malfunctioning	Repair or replace
	Seizure of crankshaft, camshaft, piston, cylinder liner or bearing	Repair or replace
	Compression leak from cylinder	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder
	Improper valve timing	Correct or replace timing gear
	Piston ring and liner worn	Replace
Excessive valve clearance	Adjust	
Starter does not run	Battery discharged	Charge
	Starter malfunctioning	Repair or replace
	Key switch malfunctioning	Repair or replace
	Wiring disconnected	Connect
Engine revolution is not smooth	Fuel filter clogged or dirty	Clean or change
	Air cleaner clogged	Clean or change
	Fuel leak due to loose injection pipe retaining nut	Tighten nut
	Injection pump malfunctioning	Repair or replace
	Incorrect nozzle opening pressure	Adjust
	Injection nozzle stuck or clogged	Repair or replace
	Fuel overflow pipe clogged	Clean
Governor malfunctioning	Repair	
Either white or blue exhaust gas is observed	Excessive engine oil	Reduce to the specified level
	Low grade fuel used	Repair or replace
	Fuel filter clogged	Clean or change
	Air cleaner clogged	Clean or change
Either black or dark gray exhaust gas is observed	Overload	Lessen the load
	Low grade fuel used	Use the specified fuel
	fuel filter clogged	Clean or change
	Air cleaner clogged	Clean or change

## SPECIAL TOOLS 8.3


P / N	Illustration	Description	Model
955280		AXLE INSTALLATION TOOL - To install axle in final drive housing. Quantity - 1	T103 T135 T133'S' T137'S' T153'S'
955281		SEAL INSTALLATION TOOL - To install axle seal in final drive housing.  Quantity - 3 required	T103 T135 T133'S' T137'S' T153'S'
955283 (6 Bolt)  960475 (8 Bolt)		AXLE EXTRACTOR TOOLS - To remove axle from final drive housing.  Quantity - 1	ALL MODELS
955287		SEAL INSTALLATION TOOL - To install axle seal in final drive housing.  Quantity - 1	T173 T233
957189		SEAL INSTALLATION TOOL - To install axle seal in final drive housing.  Quantity - 1	T173HL T173HLS' T173HL'S'II T203HD T233HD T243HD'S
960997		CHAIN TENSION TOOL - To test chain tension.	T103 T135 T133'S' T137'S' T153'S'

## SPECIAL TOOLS 8.3

P / N	Illustration	Description	Model
916-30042-01 25197		<p>DRY LINER PULLER - Used for removing and installing the dry liner of the engine.</p> <p>Consists of:            304742 (64mm); 304743 (68mm); 30744 (75mm)            304745 (76mm); 304746 (82mm); 304747 (105mm); Removing Plates; 304748 Installing Plate</p>	Kubota
07909-30202-01 25198		<p>DIESEL ENGINE COMPRESSION TESTER - Used to measure diesel engine compression and diagnosis of need for major overhaul.</p>	Kubota
07916-30820-01 25199		<p>CRANKSHAFT NUT SOCKET - Used to take off and fix the crankshaft nut. (46 mm).</p>	Kubota
07916-30840-01 25200		<p>NOZZLE REMOVER SOCKET - Used to unfasten the screw type nozzle holders.</p>	Kubota
70090-01125-01 25201		<p>NOZZLE DISASSEMBLY SOCKET - Used in place of a vice for disassembly and repair of nozzles.</p>	Kubota
960456		<p>HYDRAULIC FLOW AND PRESSURE GAUGE ASSEMBLY.</p>	All Loaders



## SPECIAL TOOLS 8.3

P/N	Illustration	Description	Model
43979	 <p>C1840</p>	CHAIN PULLER	ALL MODELS
43980	 <p>C1841</p>	SPANNER WRENCH 2" - 4 3/4" To repair hydraulic cylinders	ALL MODELS
43981	 <p>C1837</p>	PHOTO SENSOR / WHEEL SPEED TACHOMETER (Dual Function)	ALL MODELS
	 <p>C1839</p>	FORCE GAUGE, PUSH PULL For measuring restraint bar brake cable adjustment. Special order only	T173HLS T173HLS II T243HDS T245HDS
	 <p>C2342</p>	MULTI METER For measuring continuity, voltage, etc.	ALL MODELS
	 <p>C2343</p>	ANGLE FINDER For measuring control angles, U-joint and chassis angles etc.	ALL MODELS

---

**NOTES**

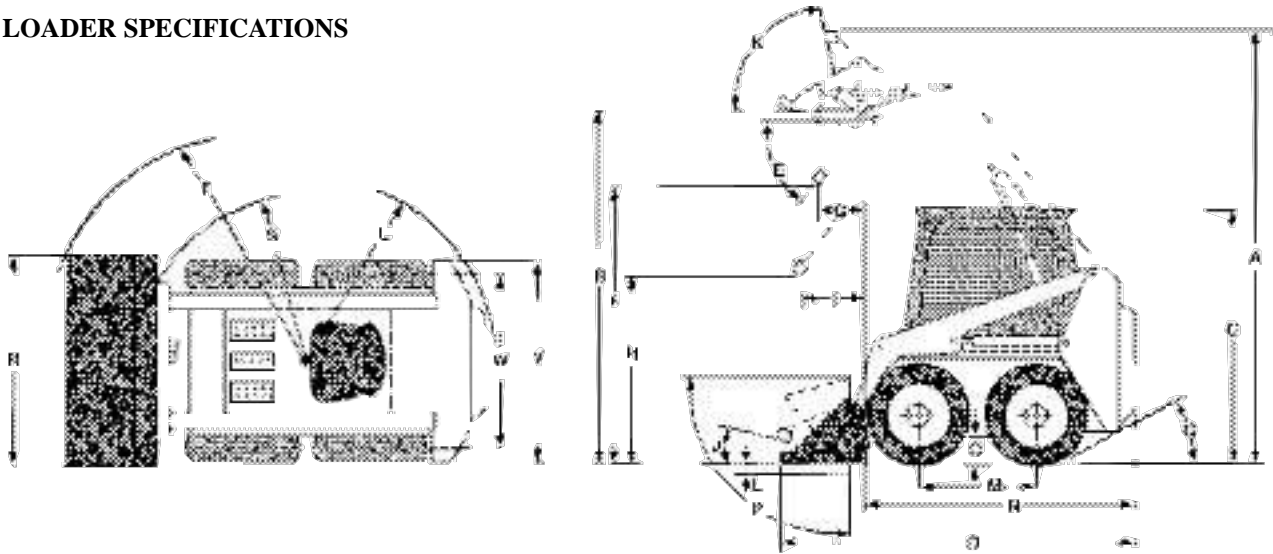
---



**8**

# SPECIFICATIONS 8.4

## LOADER SPECIFICATIONS



C-291

**Dimensions : (With Standard Tires & Dirt Bucket)**

A. Overall operating height	<b>85</b> 124.25" (3156mm)
B. Height to hinge pin	93.875" (2384.5mm)
C. Overall vehicle height	71.375" (1813mm)
D. Overall length with bucket	105.25" (2674mm)
E. Dump angle	32°
F. Dump height	71.375" (1813mm)
G. Reach — fully raised	21.875" (556mm)
H. Height at 45° dump angle	73.5" (1867mm)
I. Reach at 45° dump angle	28" (711.2mm)
J. Maximum roll back at ground	29°
K. Maximum roll back fully raised	92°
M. Wheel base	33" (839mm)
N. Overall length less bucket	84.875" (2156mm)
O. Ground clearance	8.0" (204mm)
P. Maximum grading angle – bucket	90°
Q. Angle of departure	23°
R. Bucket width	41.50" (1054mm)
S. Clearance circle – front – less bucket	40.625" (1032mm)
T. Clearance circle – front – with bucket	64.432" (1637mm)
U. Clearance circle – rear	48.629" (1236mm)
V. Overall width – less bucket	40.25" (1023m)
W. Tread	31.50"(800mm)
<b>Operational:</b>	
Tipping capacity SAE	1796.3 lbs. (816.5 kg)
Rated operating capacity	898.1 lbs. (408.2 kg)
Operating weight	2943.6 lbs. (1338 kg)
Shipping weight	2677.4 lbs. (1217 kg)
Travel speed forward	0-5.3 mph (0-8.5 km/h)
Travel speed reverse	0-4.6 mph (0-7.4 km/h)

# SPECIFICATIONS 8.4

## Controls

- Vehicle: Steering direction and speed controlled by two hand operated control levers.
- Hydraulics: Lift and bucket tilt are controlled by separate foot or hand controls. Auxiliary hydraulics controlled by foot pedal or electric solenoid.
- Engine: Hand throttle, key type ignition switch and shutoff.

## Engine

Make and model .....	Kubota D722B
Cylinders .....	3
Cooling system .....	Liquid
Displacement .....	43.8 cu in (722cc)
Horsepower (Gross).....	16.9
Max Torque.....	34 ft lbs (15.9 kg/m)
Fuel type .....	Low Sulphur Diesel
Air cleaner.....	Replaceable dry cartridge w / Indicator
High Idle rpm .....	3140

## Hydraulic System

Pump type .....	Gear
Pump Capacity (theoretical).....	7.6 gpm (29 l/min)@2200psi(152bar)
Control valve .....	Series type with float on lift and detent on auxiliary
Filtration .....	10 micron
Hydraulic fluid .....	10W30 API Class, SJ
Control valve .....	Series type with float on lift and detent on auxiliary
Cylinders.....	Lift..... Tilt.....
Type.....	Double acting.....Double acting
Qty per loader .....	2.....2.....
Bore diameter .....	2 in.....2 in.....
Rod diameter .....	1.125 in.....1.125 in....
Stroke .....	26 in.....14 in..

## Hydrostatic Transmission & Final Drive

Pump type .....	Two in line, axial piston pumps
Pump displacement .....	1.24 cu in (20.3 cm <sup>3</sup> )
Motor type .....	Geroler
Motor displacement .....	19 cu in (312 cm <sup>3</sup> )
System relief setting .....	2750 psi (190 Bar)
Final drive .....	Single roller chain running in oil bath to each axle
Drive chain size .....	ASA 60

## Electrical

Alternator .....	40 A
Battery .....	1 x 12V
Type (BCI GROUP) .....	V3478-5
Cranking Amps .....	550
Starter .....	12 V (1.2 kW)
Circuit breaker rating .....	30 A

# SPECIFICATIONS 8.4

## Torque Specifications

### Loader

Wheel nuts (24) .....	100 - 110 ft lbs. (136 - 139 Nm)
Chain tightener adjuster nuts (6) .....	150 ft lbs. (203 Nm.)
Motor mount isolators (4) .....	.60 ft lbs (81.6 Nm)

FOR NON-CRITICAL AND NOT OTHERWISE MENTIONED APPLICATIONS. THE FOLLOWING GENERAL ASSEMBLY TORQUES WILL APPLY:

<b>Bolts &amp; Nuts</b>	<b>Torque ft. lbs (Nm.)</b>		
1/4 - 20	5 - 7 (6.7 - 9.5)	7/16 - 20	40 - 45 (54 - 61)
5/16 - 18	12 - 15 (16 - 20)	1/2 - 13	45 - 50 (61 - 68)
5/16 - 24	12 - 15 (16 - 20)	1/2 - 20	50 - 60 (68 - 81)
3/8 - 16	17 - 22 (23 - 30)	9/16 - 12	60 - 70 (81 - 95)
3/8 - 24	22 - 27 (30 - 37)	9/16 - 18	65 - 75 (88 - 102)
7/16 - 14	30 - 35 (41 - 47)	5/8 - 11	75 - 85 (102 - 115)
		5/8 - 18	100 - 110 (136 - 150)

### Hydraulic Fittings: Specifications listed in ft lbs. Multiply by 1.36 for 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		

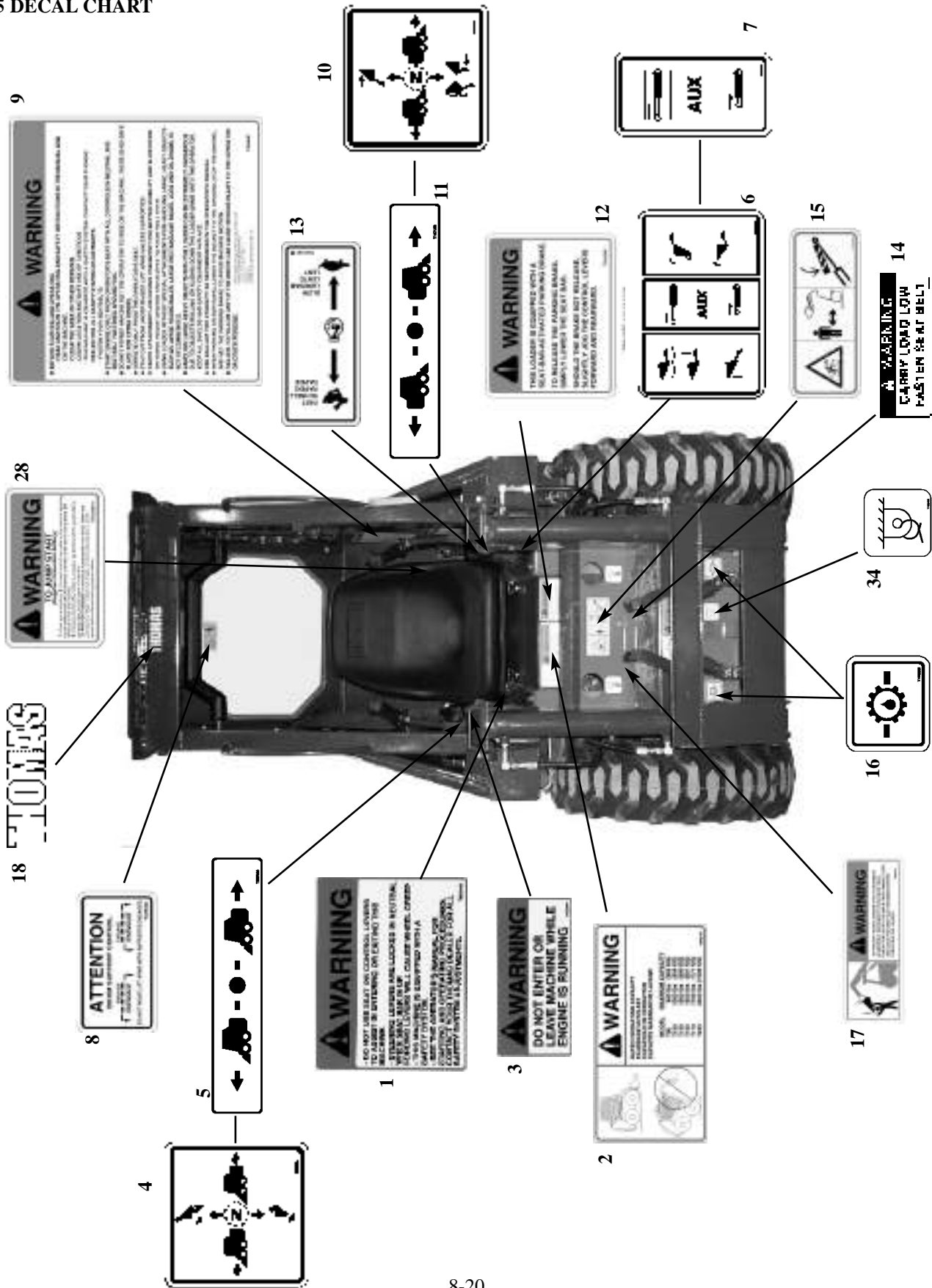
<b>Tandem Pump</b>		
Description	Qty.	Specification
Front Support	1	50 (+/- 2)
Rear Mounting	2	60 (+/- 2)
Trunion Seal Carrier	4	20 (+/- 2)
Trunion Seal Cover	4	20 (+/- 2)
Relief Valve	4	40 (+/- 10)
Charge Relief Cap	1	40 ~ 100
Tandem Section	4	40 (+/- 5)
Gear Pump	2	25 (+/- 2)

<b>Torque Motor</b>		
Description	Qty.	Specification
Valve Housing	4	130
Bearing Housing	8	46.5
Front Cover	8	10.7
Bearing Nut	1	45
Mounting	4	80



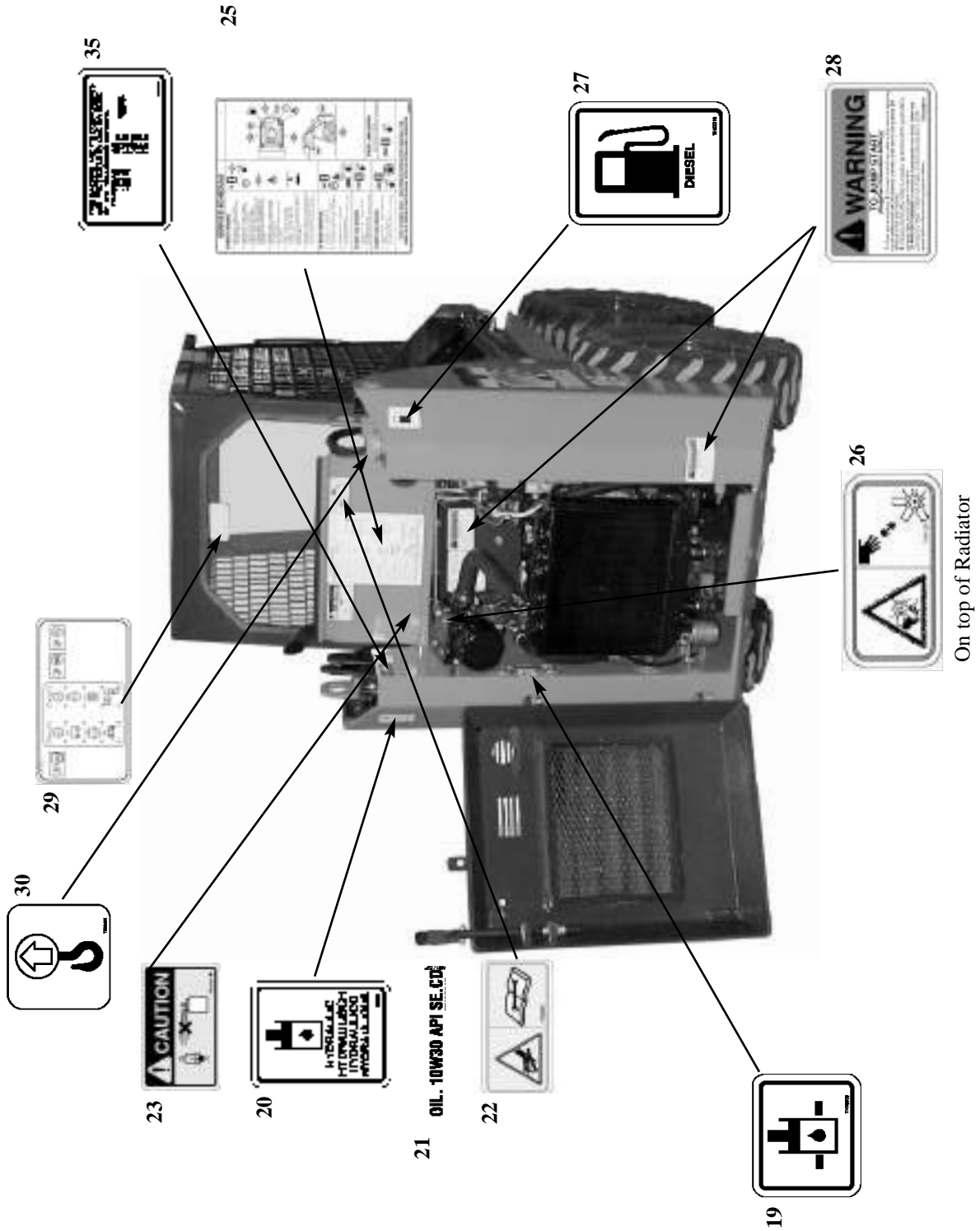
# DECALS 8.5

## 85 DECAL CHART



# DECALS 8.5

## 85 DECAL CHART





18 **TOMAS**

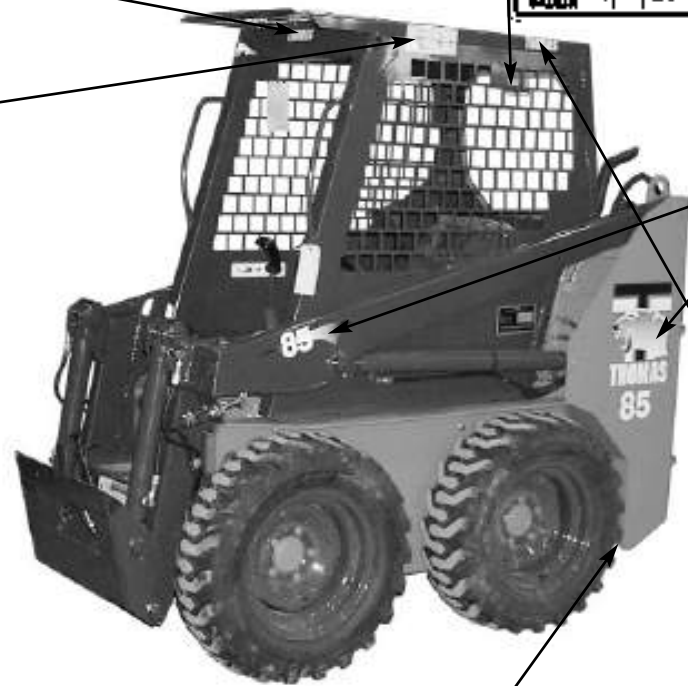


24

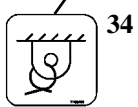


31

33  
85 Designation



**TOMAS** 18



34

85 DECAL CHART

**DECALS 8.5**

8-22

T85 SERIES DECAL PARTS LIST

49273 Common Decals	10.	35885	19.	23308	28.	23325
1. 39196	11.	37059	20.	23307	29.	43776
2. 42107	12.	41045	21.	38043	30.	39191
3. 23324	13.	31291	22.	46301	31.	41065
4. 35886	14.	23326	23.	23312	33.	85 (Kit)
5. 37060	15.	41066	24.	36841	33.	85 (Kit)
6. 23301	16.	23309	25.	23321	34.	39192
7. 35935	17.	32275	26.	41064	35.	37010
8. 38796 (comp. panel)	18.	44615	27.	23310		
9. 36598						