

REPAIR MANUAL

T175/1700



Publication No. 49012

THOMAS

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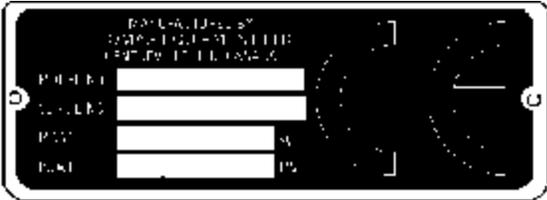
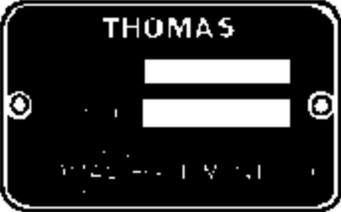
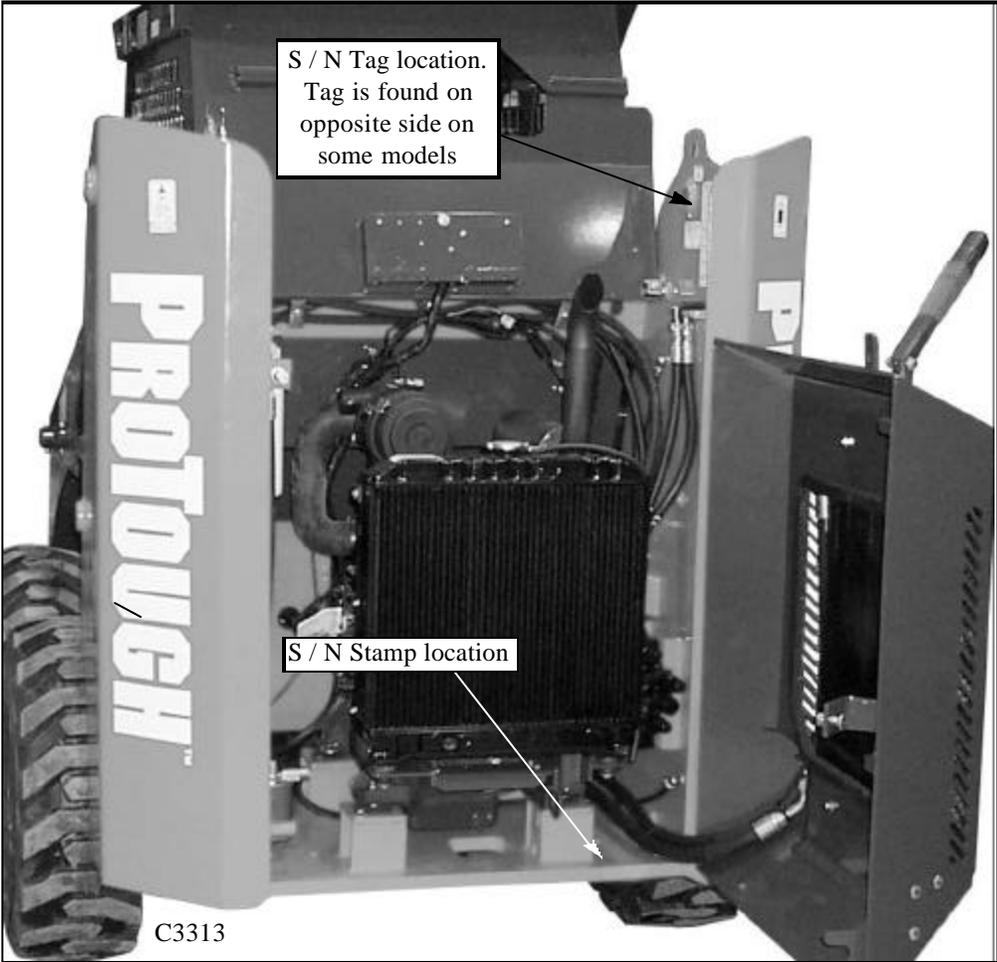
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THE WARRANTY IS A CONDITION OF SALE OF THE PRODUCT TO PURCHASER AND WILL THEREFORE APPLY EVEN IF PURCHASER ALLEGES THAT THERE IS A TOTAL FAILURE OF THE PRODUCT.

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

FOREWORD

It is important when ordering replacement parts or making a service inquiry to provide both the model number and serial number of your Thomas loader. The serial number plate is located at the rear of the machine on the right hand side fuel tank. In the event that the serial number plate is missing, the model number and serial number are both stamped into the main frame inside the rear door, next to the hydraulic control valve.



SAFETY PRECAUTIONS

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

Prior to undertaking any maintenance or repair operations, make the necessary safety precautions to prevent possible personal injury to yourself, or to bystanders.

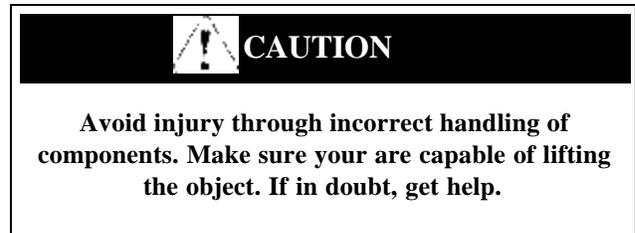
PERSONAL CONSIDERATIONS

- * **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.

- * **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.

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**

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

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

* **FIRST AID**

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

* **CLEANLINESS**

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

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

SAFETY PRECAUTIONS

OPERATIONAL CONSIDERATIONS

- * Stop the engine, if at all possible, before performing any service.
- * Place a warning sign on loaders which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended.
- * Do not attempt to start the engine while standing beside the loader or attempt to bypass the safety starting system.
- * Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.
- * Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.
- * Never work beneath a loader which is on soft ground. Always take the unit to an area which has a hard working surface, preferably concrete.
- * If it is found necessary to raise the loader for ease of maintenance, make sure that safe and stable supports are installed beneath the main frame before commencing work.
- * Use footsteps or working platforms when servicing those areas of the loader that are not within easy reach.
- * Before loosening any hoses or tubes, switch off the engine, remove all pressure in the lines by operating the foot pedals several times. This will remove the danger of personal injury by oil pressure.
- * Prior to pressure testing, make sure all the hoses and connectors on both the loader and on the test machine are in good condition and tightly sealed. Pressure readings must be taken with the gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment and to eliminate the possibility of personal injury.
- * Always lower equipment to the ground when leaving the loader.
- * If high lift attachments are installed on a loader, beware of overhead power and telephone lines when travelling. Drop attachment near to ground level to increase stability and minimize risks.
- * Do not park or attempt to service a loader on an incline. If unavoidable, take extra care and block the wheels.
- * Escaping hydraulic / diesel fluid under pressure can penetrate the skin causing serious injury. Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Stop the engine and relieve pressure before connecting or disconnecting lines. Tighten all connections before starting the engine or pressurizing the lines. If any fluid is injected into the skin, obtain medical attention immediately.
- * Prior to removing wheels and tires from a loader, check to determine whether additional ballast (liquid or weight) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.
- * When inflating tires beware of over inflation; constantly check the pressure. Over inflation can cause tires to burst and result in personal injury.
- * Safety precautions are very seldom the figment of someone's imagination. They are the result of sad experience where most likely someone has paid dearly through personal injury.
- * Heed these precautions and you will protect yourself accordingly. Disregard them and you will duplicate the sad experiences of others.

SAFETY PRECAUTIONS

SERVICE TECHNIQUES

A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This shop manual provides general directions for accomplishing service and repair work with tested effective techniques. Following them will help assure reliability. There are numerous variations in procedures, techniques, tools and parts for servicing vehicles as well as in the skill of the individual doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this manual must first establish that he or she compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

B. SERVICE TECHNIQUES

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

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

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in 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.

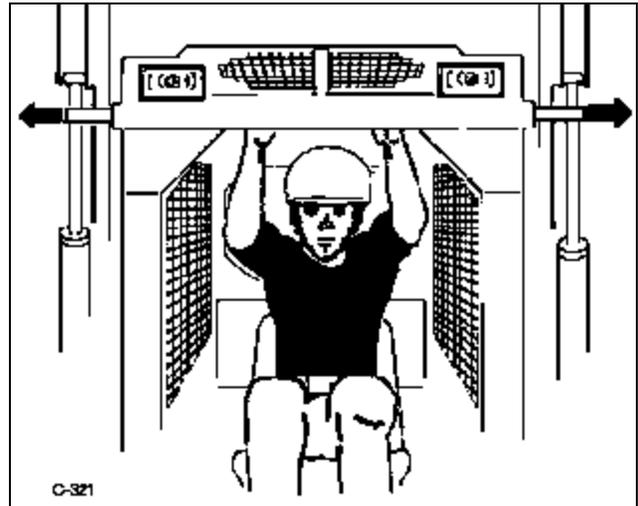
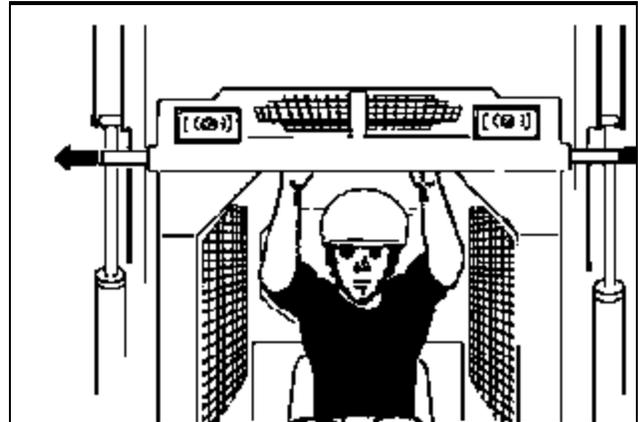
Be sure during normal routine servicing, maintenance or repair that bearings are given the right attention and are installed with care.

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.



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.

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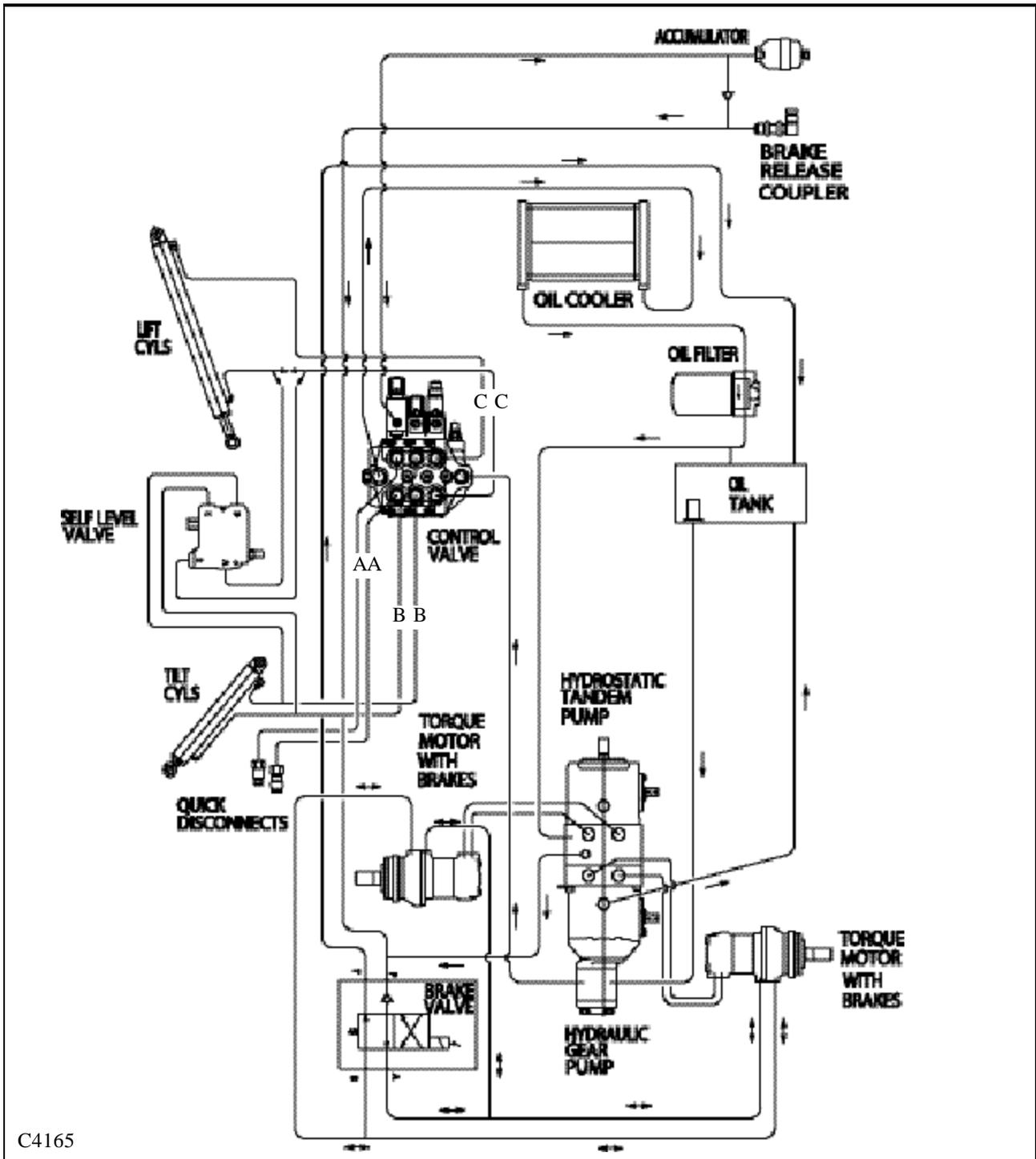
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HYDRAULIC LAYOUT 1.1



C4165

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

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

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

1

– SPECIFICATIONS & MAINTENANCE 1.1 –

Hydraulic Specifications

Pump Type	Gear, 1.37 cu. in. (22.4cc)
Pump Brand	Sauer Sundstrand
Pump Capacity	16.6 GPM (62.8 LPM)
Rated Speed	2800 RPM
Control Valve	Series Type
Main Relief Pressure	2400 PSI (165.5 Bar) @ Zero Flow
Reservoir Capacity	14.8 US Gallons (56 Liters)
Fluid Type	10W30 API SJ Oil
Reservoir Filtration	100 Micron
System Filtration	5 Micron
Oil Cooler	650 BTU
Lift Cylinders (STD)	(2) 2.5" Bore Diameter
Lift Cylinder Rods (STD)	1.5" Diameter
Tilt Cylinders	(2) 2 1/2" Bore Diameter
Tilt Cylinder Rods	1.5" Diameter
Lift Cycle Cyl. +/- 1.5 seconds (Up / Down) T175	5.50 / 3.56
Lift Cycle Cyl. +/- 1.5 seconds (Up / Down) 1700	4.6 / 3.0
Tilt Cycle +/- 1.5 seconds (Up / Down) T175	1.84 / 2.61
Tilt Cycle +/- 1.5 seconds (Up / Down) 1700	1.73 / 2.28
Lift & Tilt Cycle Cyl., +/- 1.5 seconds (Up & Out)	5.25
Lift & Tilt Cycle Cyl., +/- 1.5 seconds (Down & In)	4.55
Allowable Drop, Measured at the Cylinder Rod, Engine Off, @ Rated Capacity and Operating Temperature	1.5" (38mm) / 3 Minutes

Maintenance Schedule First (HRS) Every (HRS)

Oil level check	8	8
Oil filter change	50	150
Oil cooler clean	8	8
General system check (leaks etc.)	8	8
Cylinders, lubricate	8	8
Control valve relief filter	500	1000
Reservoir filters change	1000	1000
Hydraulic oil change	1000	1000

GENERAL INFORMATION 1.2

Refer to figure C2018 on page 1-2.

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

- The hydraulic pump is a gear type which is driven by a shaft and coupler through the hydrostatic drive pump at engine speed. The oil then flows from the gear pump to the hydraulic control valve.
- The hydraulic control valve is equipped with an adjustable relief valve which is adjusted to 2400 PSI (165.5 Bar). The control valve is a series type with 3 spools (banks). The various spools activate the boom, bucket and auxiliary hydraulic functions.

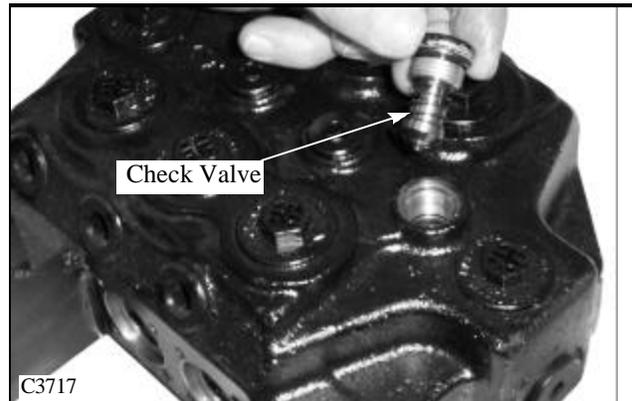
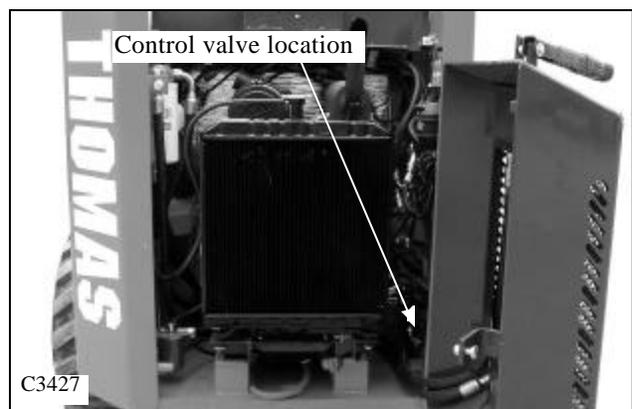
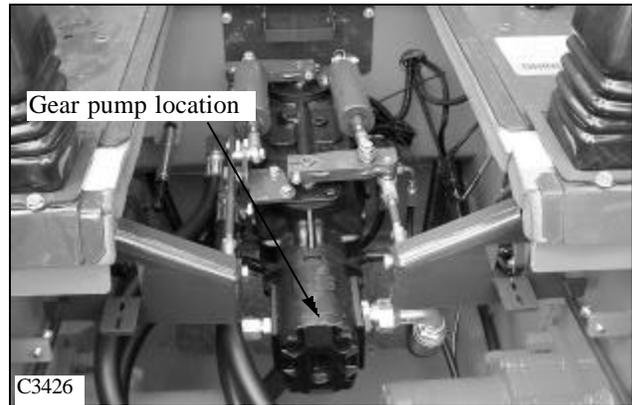
When the spools are in neutral, oil flows from the hydraulic gear pump, through the control valve and returns to the hydraulic cooler, to the 5 micron hydraulic filter. From the hydraulic filter, the fluid flows to charge the tandem hydrostatic pump and pressurize the hydraulic brake release system and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

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

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

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

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



GEAR PUMP 1.2

1

Replacement

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



WARNING

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

- 1 Remove the seat and hydrostatic shield.
- 2 Attach a vacuum system to the hydraulic oil reservoir filler location. (fig. C3428) 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. C3429) 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. C3430) 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.



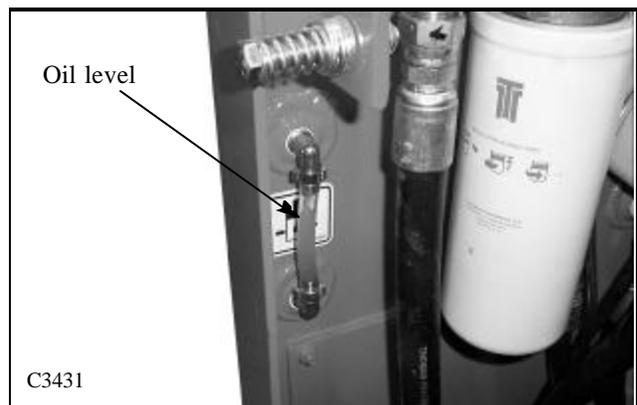
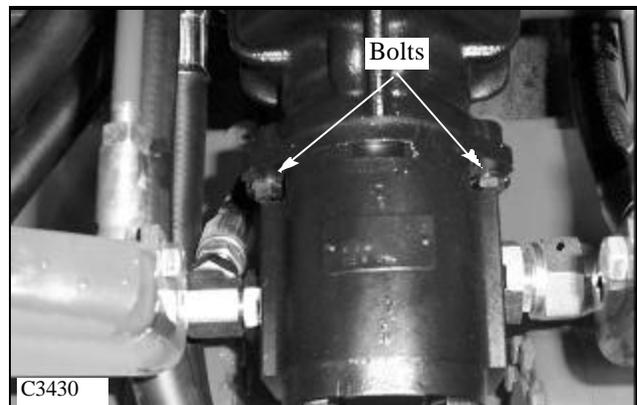
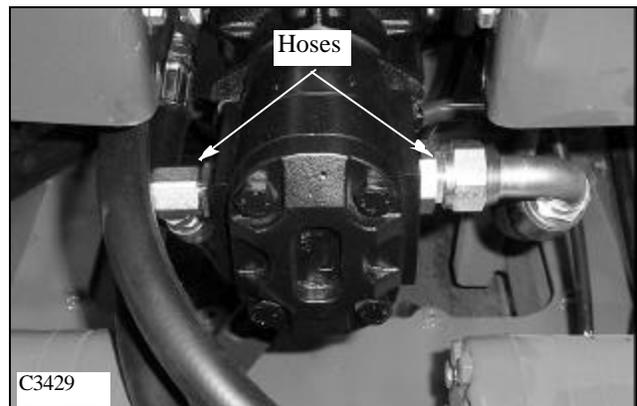
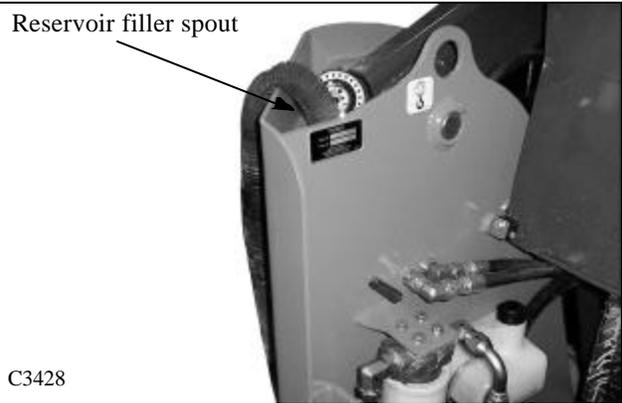
WARNING

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. C3431)

IMPORTANT

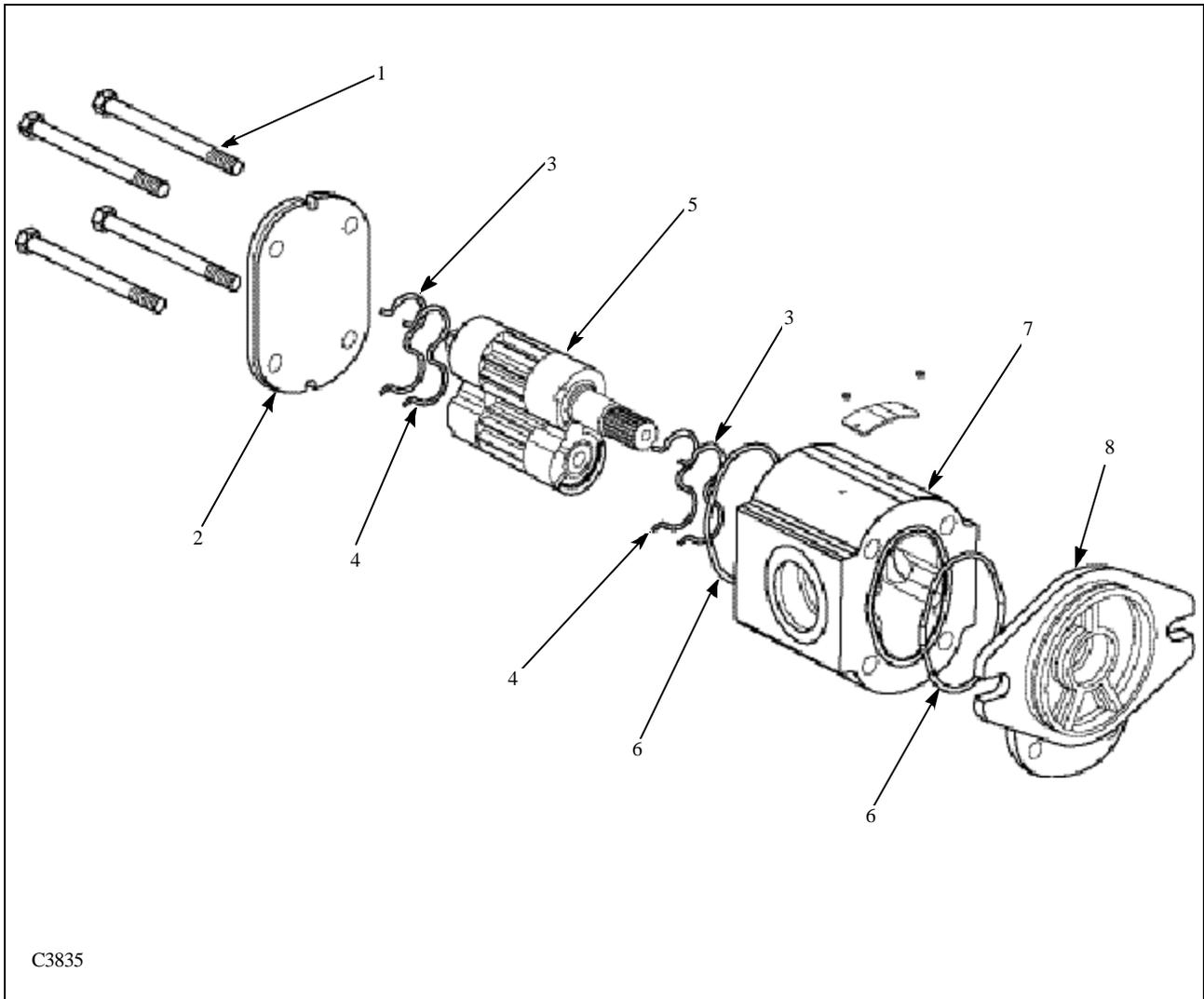
When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open lines and ports.



GEAR PUMP 1.2

Disassembly

1



1. Screws
2. Rear Cover
3. Backing Strip
4. Moulded Seal
5. Drive Gear
6. O-Ring Seal
7. Body
8. Front Plate

GEAR PUMP 1.2

1

Disassembly (continued)

1. General

The following is a detailed procedure for disassembly and assembly of the SP2.5 pumps. Prior to proceeding it may be necessary to prepare some subassemblies 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

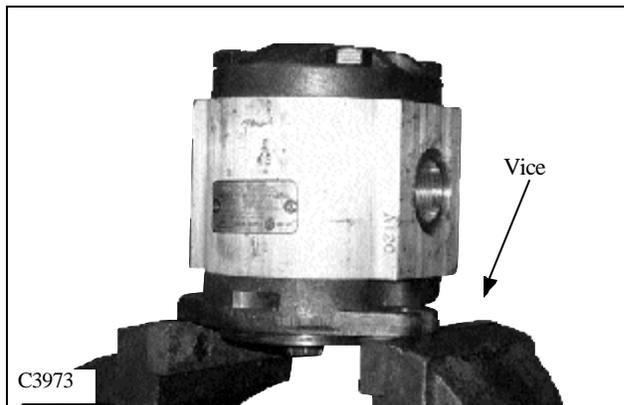
Mark all pieces during disassembly so that the unit can be reassembled correctly. Installing components incorrectly could severely damage the unit and/or cause it to not function properly.

GEAR PUMP 1.2

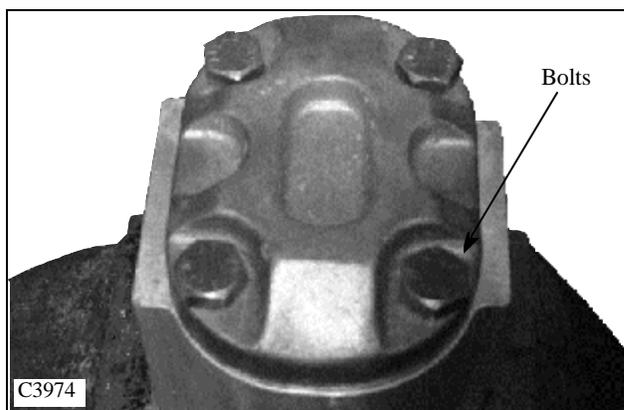
Disassembly (continued)

6. Procedure

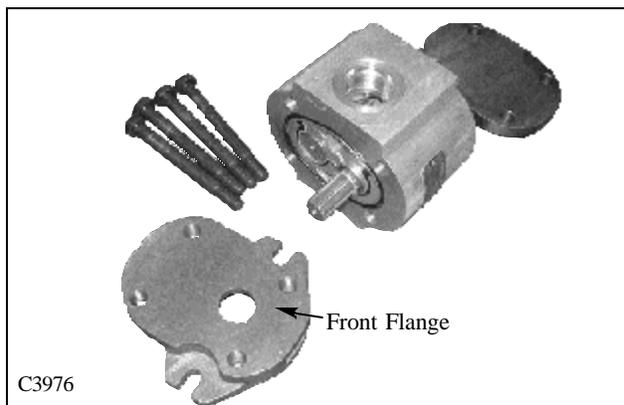
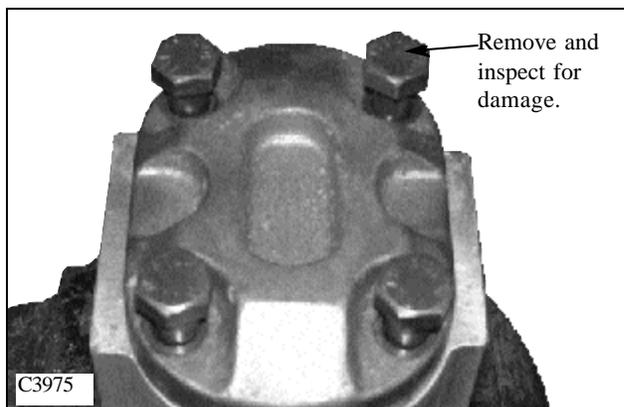
1. Clamp the unit in a vice from the flange side (fig. C3973). Make sure the vice jaws are clean and have smooth surfaces to prevent damage to the pump. Clamping the pump body is not recommended because serious damage to the surfaces, on which the ports are located, may occur.



2. Use a 19mm socket wrench to loosen the four bolts on the rear cover (fig. C3974). Next completely unscrew the bolts and remove them. Inspect the threads for damage (fig. C3975).



3. Place the pump on the table and slowly remove the front flange (fig. C3976). Note, some units have a shaft seal and others do not. Should your unit have the shaft seal, be careful not to damage it when removing the front flange. Inspect the front flange and seal area.



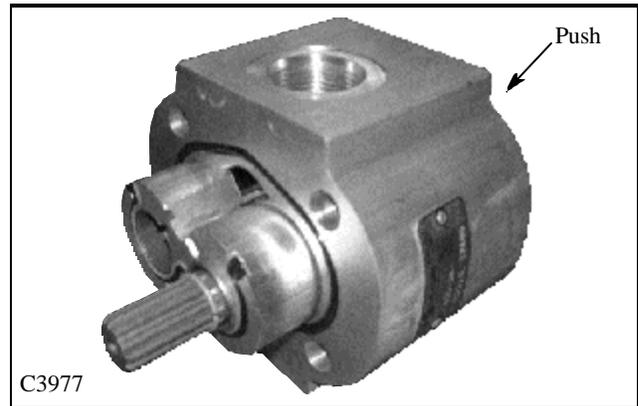
GEAR PUMP 1.2

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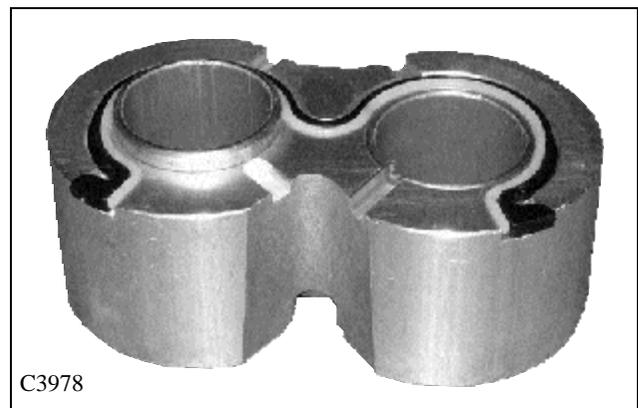
Disassembly (continued)

6. Procedure

4. Place the pump on it's side. While disassembling the unit, you need to mark the relative positions of the gear mesh (drive gear tooth and idler gear tooth) and the bearing blocks to the body so they can be reassembled in the same position. Carefully remove the bearing block and gear set (fig. C3977). To accomplish this, hold the pump body and push with your fingers on the rear bearing block.

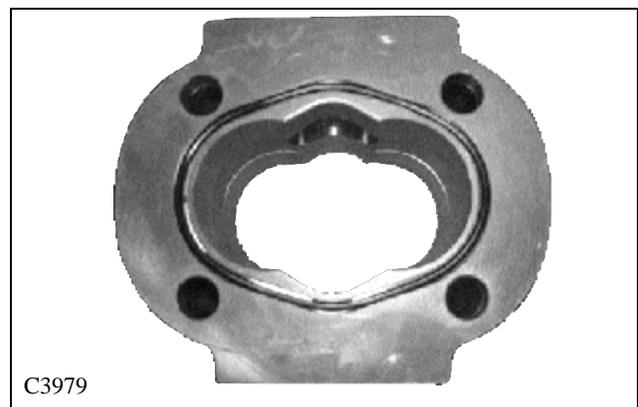


5. Remove the pressure seals taking note how the pressure seals and teflon back up ring are installed (fig. C3978). Check the seal quality. Replacement is recommended whenever there are burrs, evidence of extrusion, or marks caused by overheating. Carefully remove the seals from the bearing blocks beginning with the back up ring then the pressure seal (fig. C3979). Do not use tools with sharpe edges to remove the seals, as damage to the bearing blocks can result. Dispose of any damaged seals.



6. Removal of the outer o-ring seals. Check the quality of these two seals. If necessary, replace. Do not use tools with sharp edges to remove the seals, as damage to the housing may result. Discard any damaged seals.

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

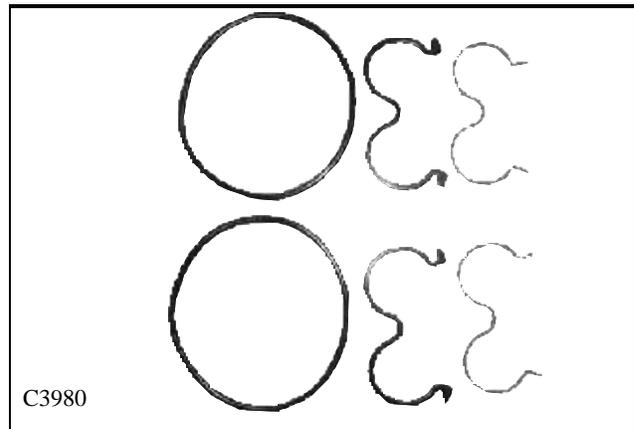


GEAR PUMP 1.2

Assembly

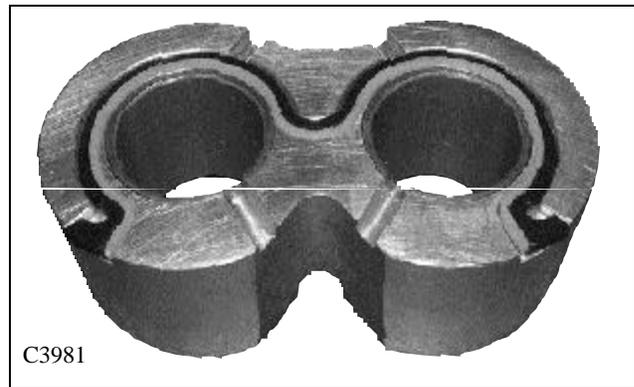
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1. Have the entire seal kit available and laid out neatly on the table (fig. C3980). Compare the old seal kit to the new one to ensure you have the correct one. Lightly coat all seals with seal grease. The grease is needed to adhere the seals in their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



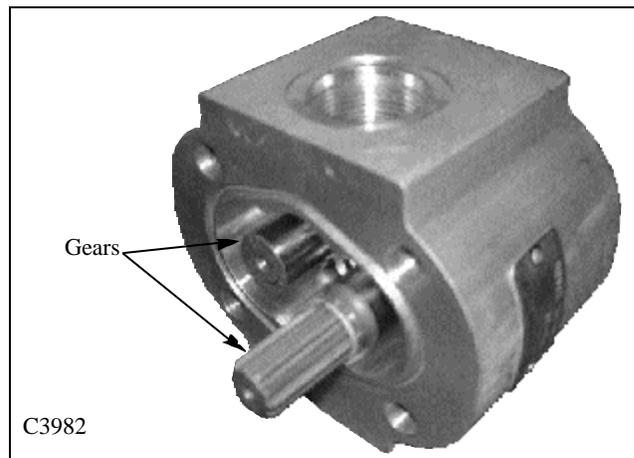
2. Install the shaft seal into the front flange (if applicable). Prepare the flange and shaft seal by lightly lubricating with grease. Seat the seal in the flange by hand. Then, using a shaft seal installation tool press the seal until the tool stops on the flange. This will insure the seal is inserted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

3. Install the snap ring using internal snap ring pliers (fig. 3981). Ensure the snap ring fits securely in its groove. This is necessary to retain the shaft seal.



4. Prepare the body by cleaning it. Inspect the internal and mating surfaces. Ensure the surfaces are free of burrs and scratches. Check both the bearing block mating surface and the cut-in path.

5. Prepare the gears (fig. C3982). Caution, the gear surfaces are superfinished. Residue on hands and fingers may be corrosive to this surface. **DO NOT TOUCH.** Carefully clean the two gears. Inspect the journals and the flat faces on the top and bottom of the gears. Ensure these surfaces are free from burrs or scratches. If scratches are found, clean them with a flat stone and/or very fine emery paper. Rewash the gears after this operation.



GEAR PUMP 1.2

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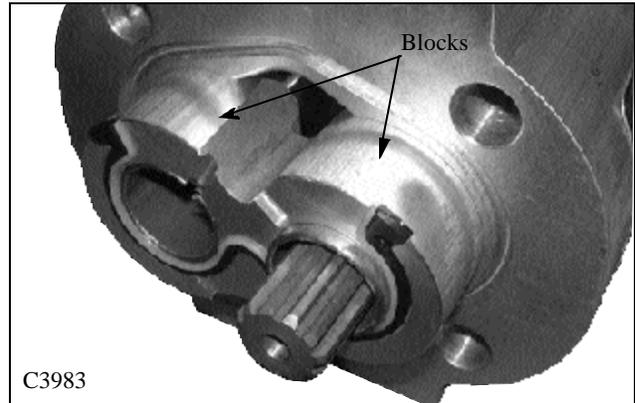
Assembly

6. Prepare the bearing blocks by cleaning both blocks (fig. C3983). Inspect the flat surfaces of the bearing blocks for burrs or scratches on the edges. If necessary, remove burrs with very fine emery paper. Then rewash the bearings. Inspect the DU bushings for wear. There should be no bronze showing. Using clean hydraulic oil, lubricate the internal and external surfaces of your blocks.

7. Assemble the bearing blocks and gears. Lubricate the journals and gear faces. Assemble the bearing blocks and gears in the same orientation that it was disassembled. Align all marks made during disassembly. Ensure the front and rear block occupy the same location with respect to the housing as they did before disassembly. Misalignment of the gear teeth may increase operating noise.

8. Install the gear and block assembly into the body of the cavity. Align the assembly marks to ensure that the gear block assembly is installed with the same orientation as before assembly.

9. Once the gears and the bearing blocks are installed into the housing, clean the mating surfaces. Remove any excess lubrication and grease from the mating surfaces of the pump body. Ensure that these surfaces are dry and free of contamination before moving on to the next step. Install the o-rings and back-up rings on both the bearing blocks and the housing (fig. C3984).



GEAR PUMP 1.2

Assembly

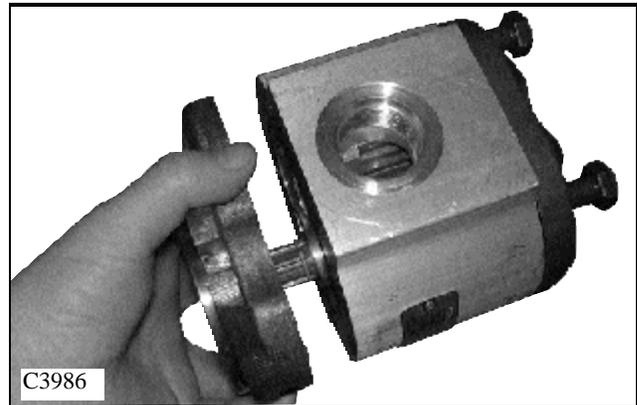
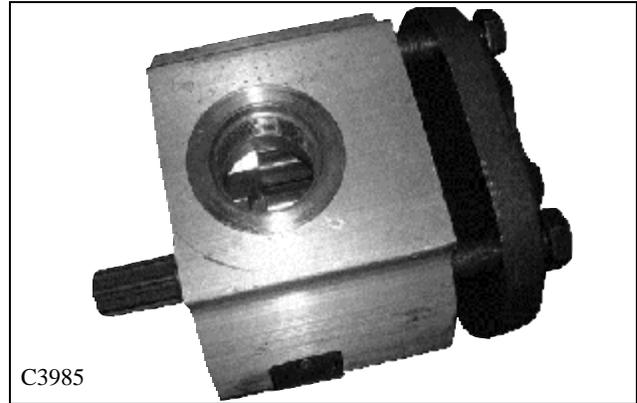
10. Remove any excess lubrication and grease from the mating surfaces of the front flange and rear cover. Ensure that these surfaces are dry and free of contamination before moving on to the next step.

11. Install the four bolts through the rear cover then slide the assembly onto the rear of the housing (fig. C3985). Before you slide the cover against the housing, check to make sure all o-rings and the back-up seal are seated properly with no foreign material on them. If they get pinched or there is foreign material on an o-ring, you may get internal or external leakage.

12. Install the front cover (fig. C3986). While keeping pressure on the front flange and the rear cover so the o-rings won't move out of place, set the unit in a vise with the front in the jaws.

13. Torque the four bolts by criss crossing back and forth a little at a time until you reach the final torque.

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



1

CONTROL VALVE 1.3

Testing and Adjusting the Relief Valve Pressure

Hoses and gauges required for this test must be capable of withstanding 5000 PSI (207 Bar) continuous pressure, and hydraulic flow meter capable of measuring 30 gallons per minute. (113 LPM) (fig. C3432) **This test also checks the status of the gear pump capacities.**

Pressure fluctuations may be caused by restricted oil flow through the relief valve. The relief valve filter may need serviced as outlined in the control valve disassembly section on pages 1-9 through 1-13.

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. C3646) 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. C3433)

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 2800 RPM plus or minus 25 RPM)

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



CAUTION

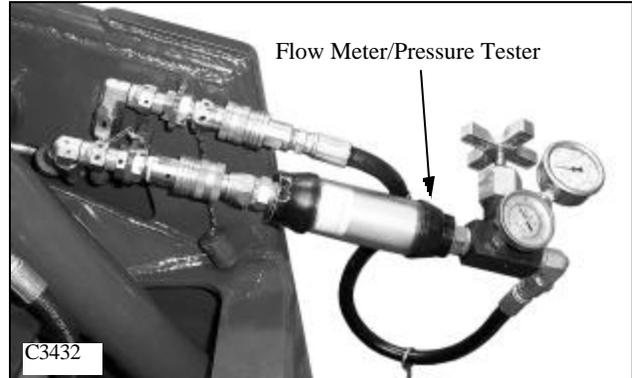
Adjusting the relief valve setting too high may cause damage to the gear pump.

system and shut off the engine. Move to step 6 to make initial setting.



WARNING

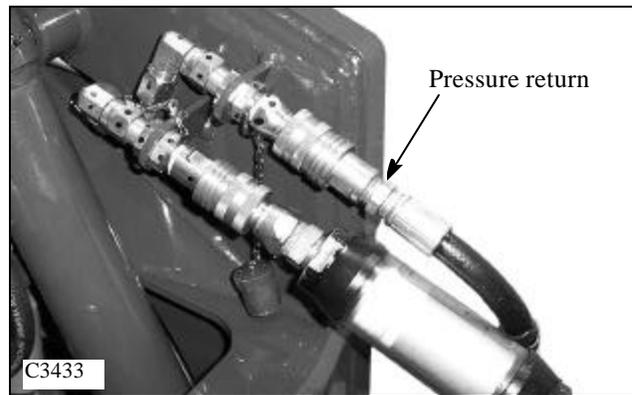
To prevent personal injury or damage to the loader, do not adjust the relief valve while the engine is operating.



C3432



C3646



C3433



C3434

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 2400 PSI +/- 100 PSI. (165 Bar, +/-6.9 Bar)

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

7 Loosen the jam nut on the relief valve adjusting screw and turn the screw clockwise, counting the turns, until the screw bottoms out. (fig. C3435)

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

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

NOTE: If inadequate pressure and / or flow is not available, the gear pump could be failing, the intake to the gear pump is restricted, or the filter in the relief valve is clogged. (See pg. 25 for filter replacement).

Control Valve Replacement

1 Remove any attachment and shut off the engine

IMPORTANT

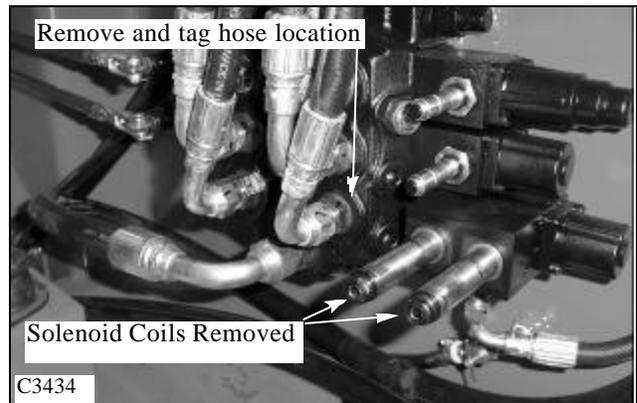
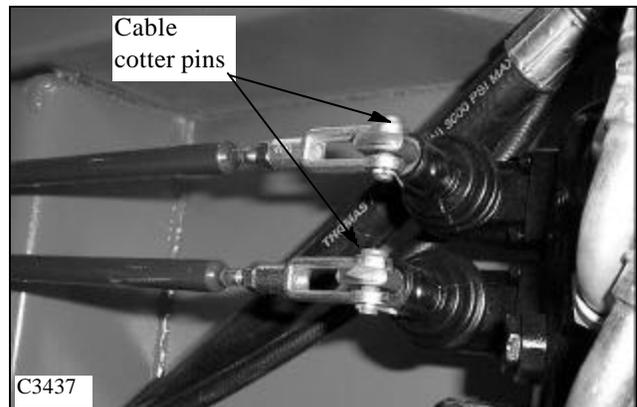
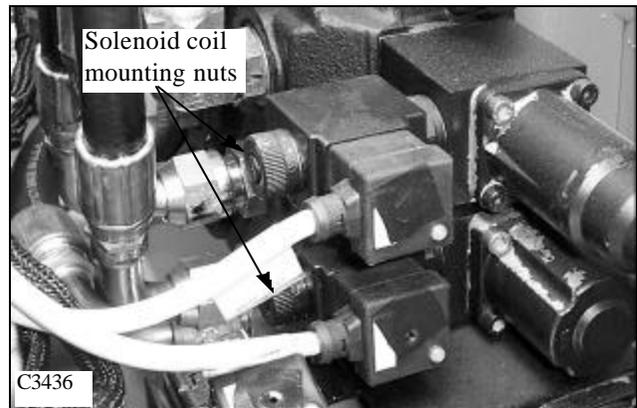
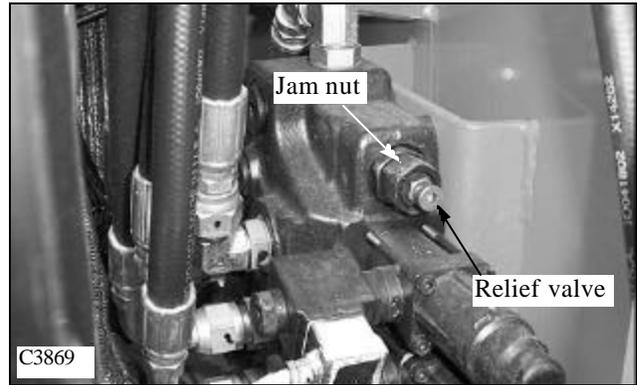
Clean the work area prior to repair. Cap all open lines, fittings and ports to prevent contamination.

2 Disconnect the control cables, electrical solenoid spool locks, and electrical auxiliary solenoid wiring connectors if equipped. (fig. C3436, C3437)

3 Disconnect the the inlet hose coming from the gear pump. Cap the hose and fitting and remove the adapter fitting in the control valve. (fig. C3436)

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. C3434)

5 Disconnect the return line from the control valve and remove the adapter fitting. Plug and cap all open ports and hose ends. (fig. C3436)



1

CONTROL VALVE 1.3

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

7 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.

8 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 N.m.)

11 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.

12 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

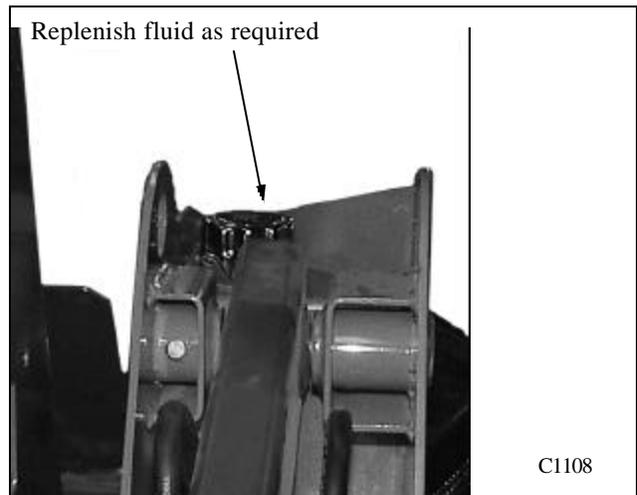
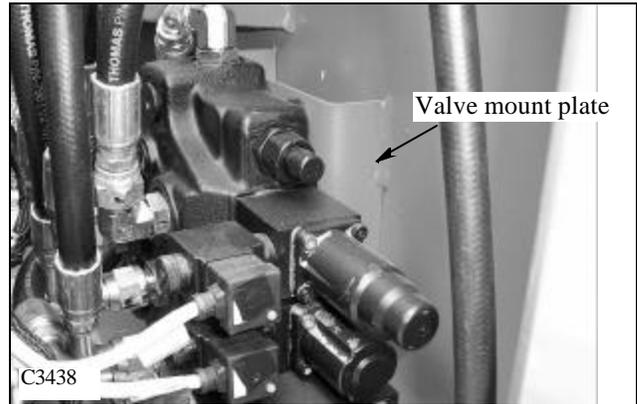
Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury.

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



WARNING

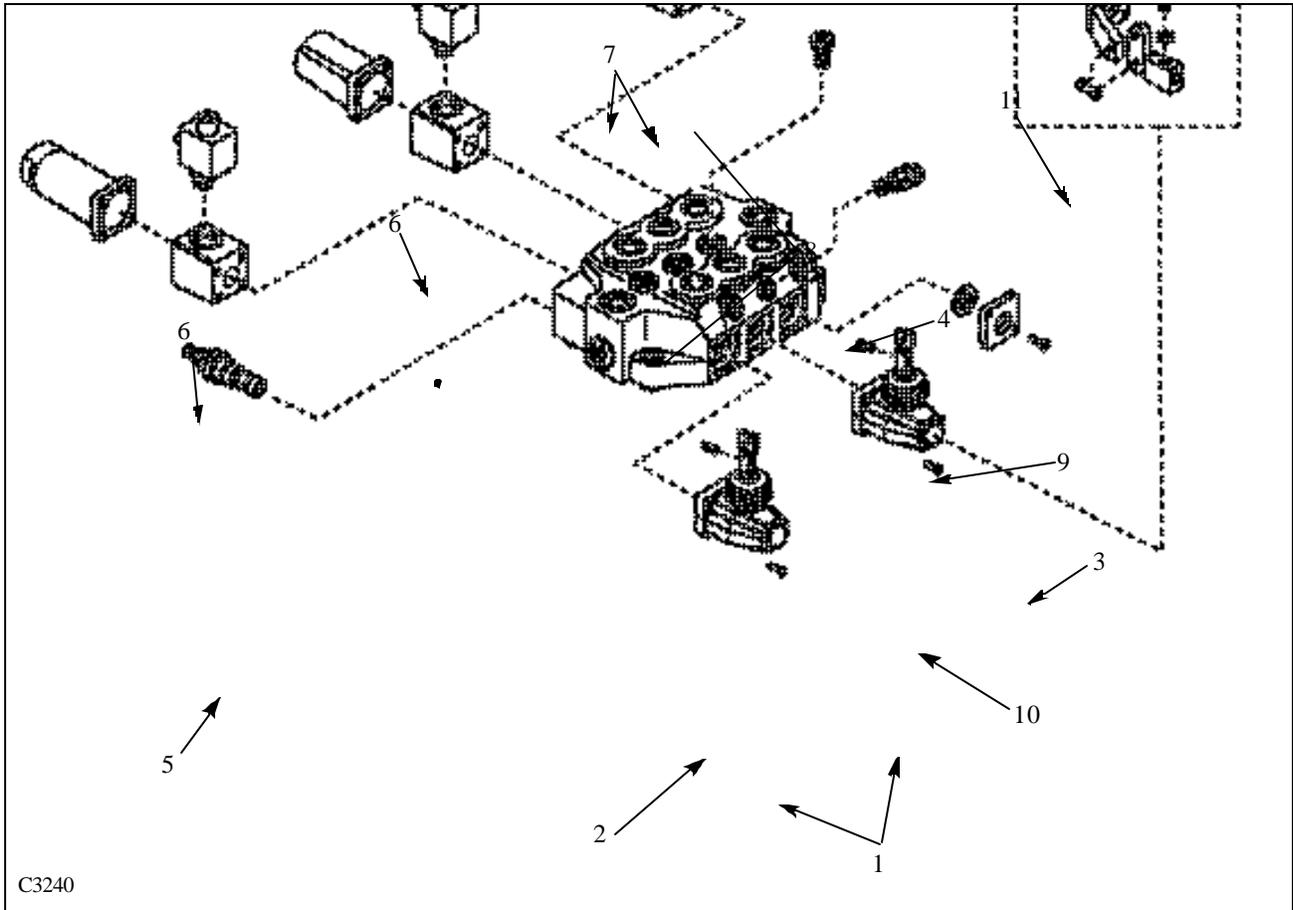
All safety switches must be connected and functioning to prevent possible operator injury.



CONTROL VALVE 1.3

Control Valve Disassembly (175)

1



C3240

Diagram Legend

1. Control Box
2. Set Screws
3. Dust Cap Ass'y Kit
4. Check Valve
5. Main relief Valve
6. Lock Solenoid Coil
7. Auxiliary Solenoid Coil
8. Auxiliary Control With Coils
9. Port Relief Valve
10. Bar
11. Dust Cap With Connector For Hand Controls

CONTROL VALVE 1.3

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Control Valve Disassembly (1700)

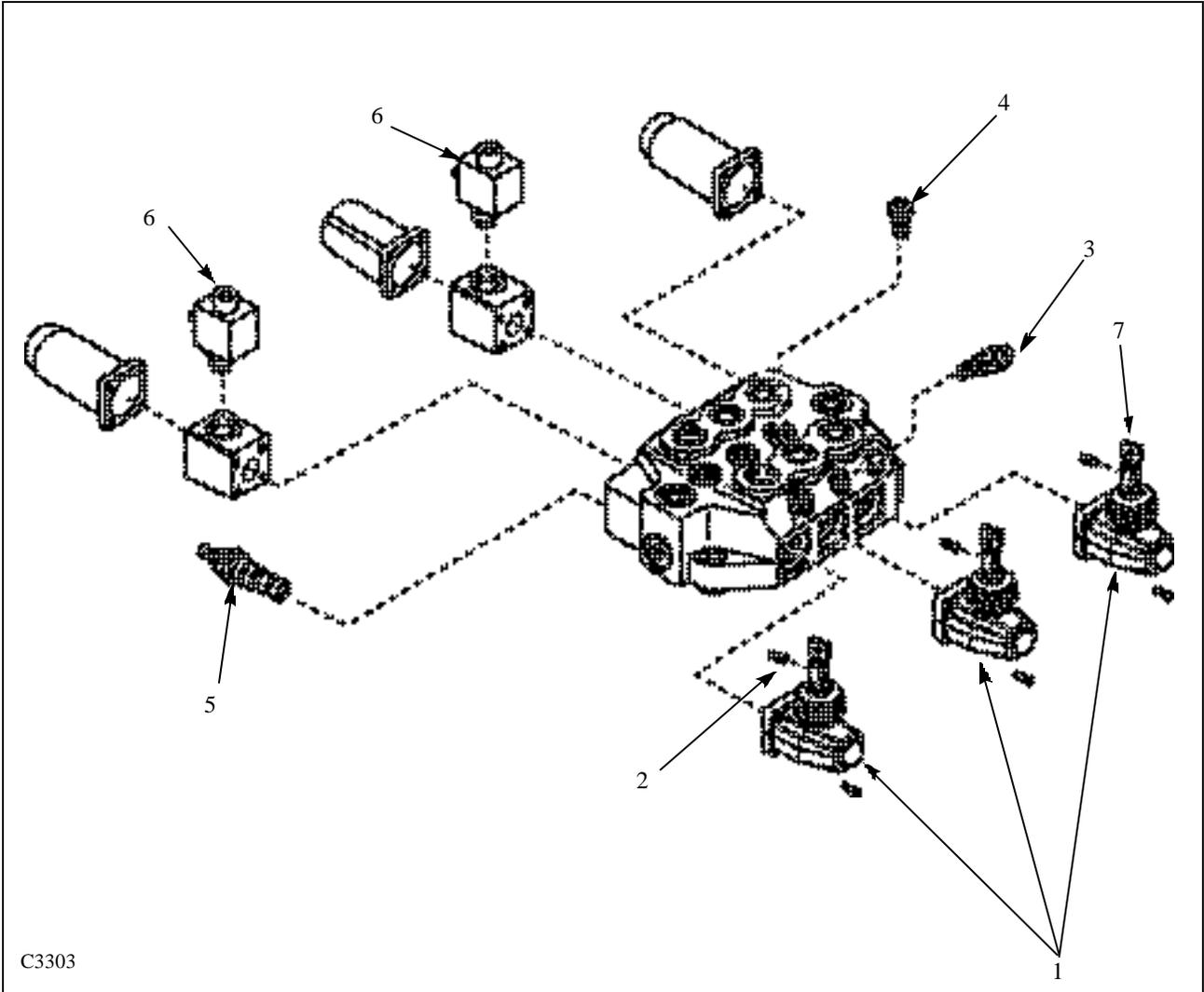


Diagram Legend

1. Control Box
2. Set Screws
3. Port Relief Valve
4. Check Valve
5. Main Relief Valve
6. Lock Solenoid Coil
7. Bar

CONTROL VALVE 1.3

Disassembly / Repair (175)

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



WARNING

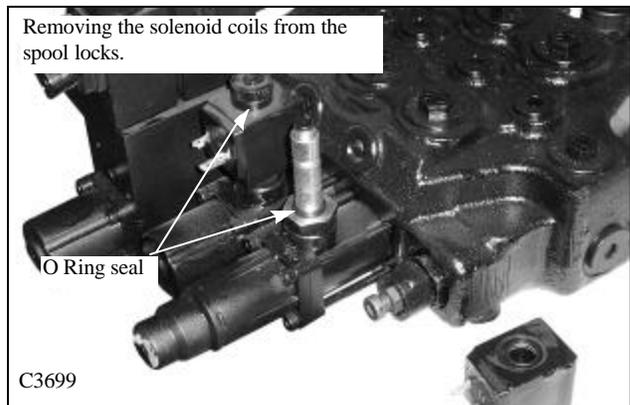
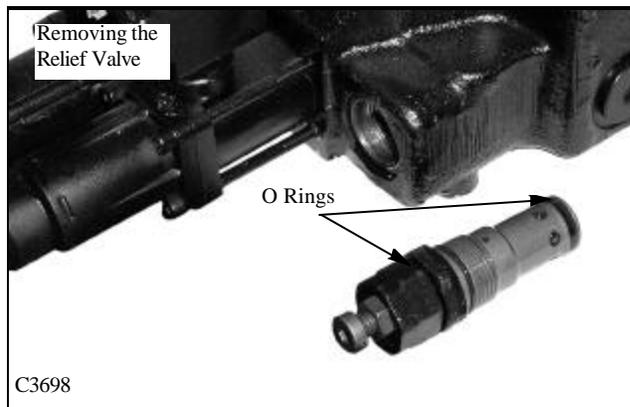
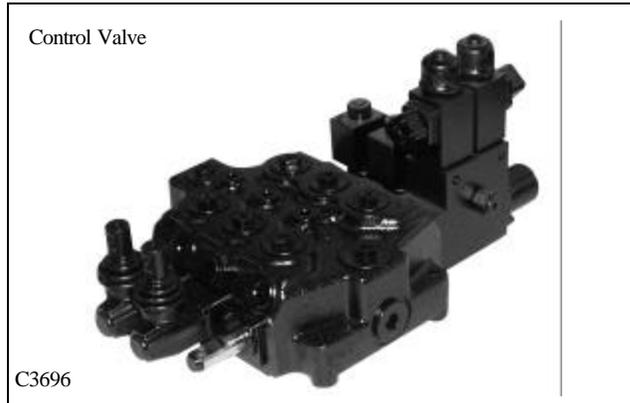
To avoid eye injury, use safety goggles when cleaning with compressed air.

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

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

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

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

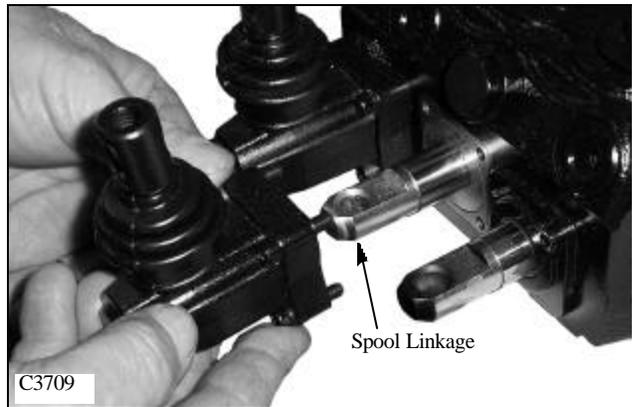


CONTROL VALVE 1.3

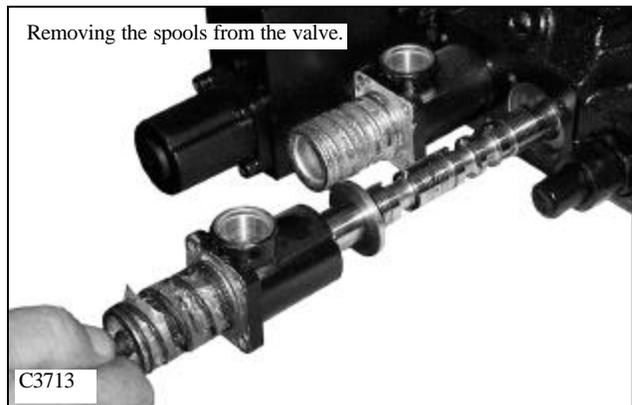
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Disassembly / Repair 175 (cont'd)

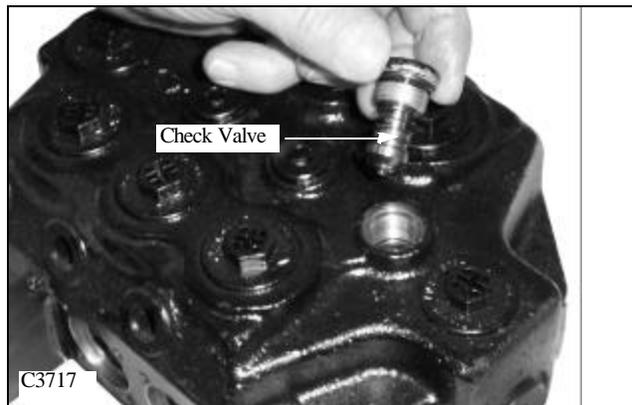
4 Remove the control box from the spool linkage end. (fig. C3709) The box needs to be tilted upward towards the valve to release the hardened ball from the hole in the spool end, and then pull away from the valve.



5 Pull out the spool. (fig. C3713) As you pull out the spool, note it's smooth action as it comes out of the valve body. The spool should move freely and smoothly in the bore of the valve body. Check the control valve spool and bore for scuff marks or abnormal wear. Replace the spool and or control valve if signs of wear are present.



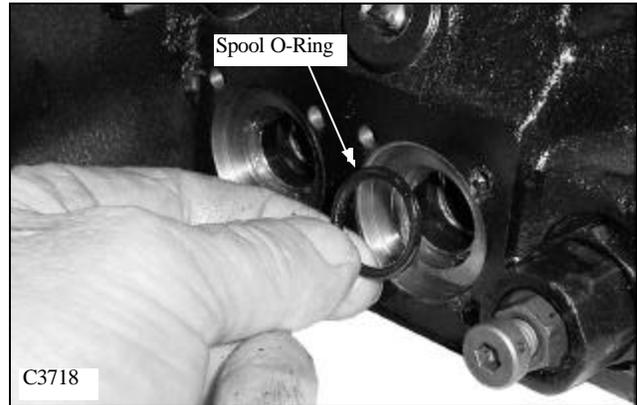
6 Remove the check valves from control valve body. (fig. C3717) They are located between the ports of each section. Check the seat and poppet of the valve body and check valve. Replace the check valve and or the control valve if any signs of wear are present.



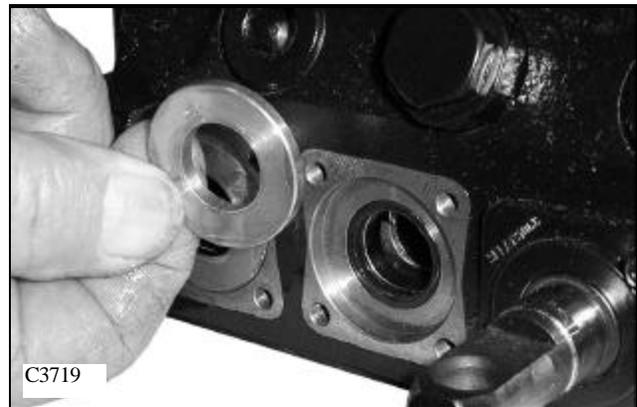
CONTROL VALVE 1.3

Disassembly Repair 175 (cont'd)

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



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



9 Place the cable end of the spool in a vice, or insert a screw driver through the clevis pin holes, to keep it from turning. The detent is threaded to the spool and can be removed for inspection or repairs.(fig. C3724)

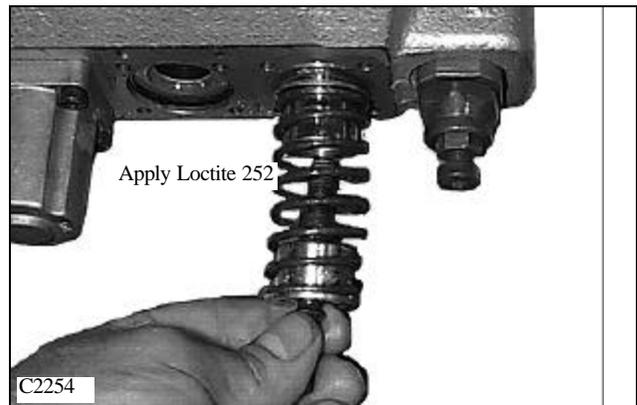
Replace broken springs, worn detents and / or damaged detent balls with a new detent kit.

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

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



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

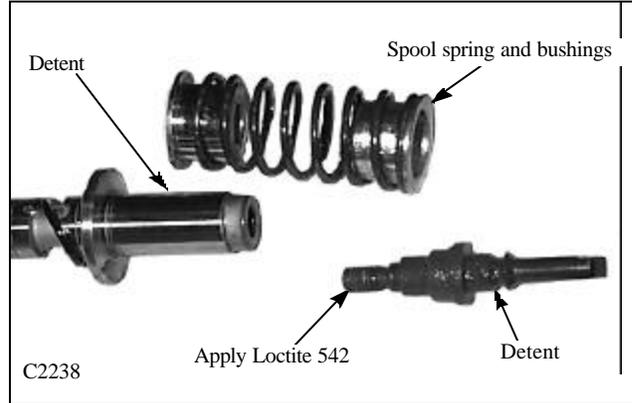


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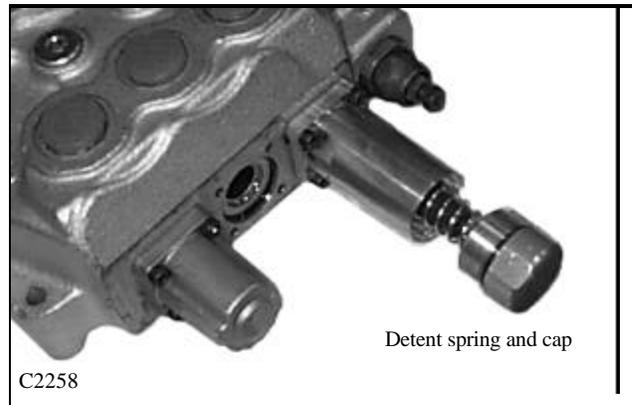
CONTROL VALVE 1.3

Disassembly / Repair 175 (cont'd)

11 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). (fig. C2258)

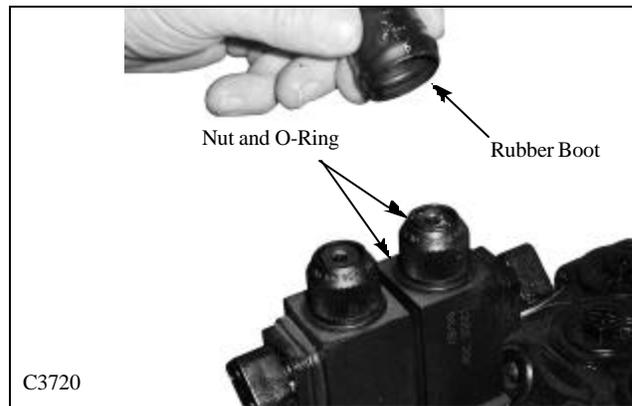


12 Install the spring return / centering cover and tighten the mounting screws evenly to 6.6 Nm (4.9 lbs / ft). Install the end cap to the cover and tighten to 9.8 Nm (7.2 lbs / ft). (fig. C2258)

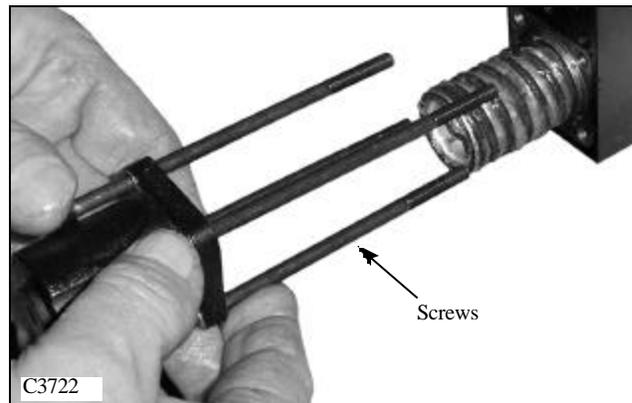


Solenoid Controlled Auxiliary

- 1 Remove the rubber boot covering the retaining nut on top of each solenoid coil.
- 2 Remove the nut and O-ring and pull off the solenoid coil (s). (fig. C3720)



3 Remove the screws retaining the solenoid assembly to the control valve. (fig. C3722). Upon assembly tighten the screws to 6.6 Nm (4.9lbs / ft).

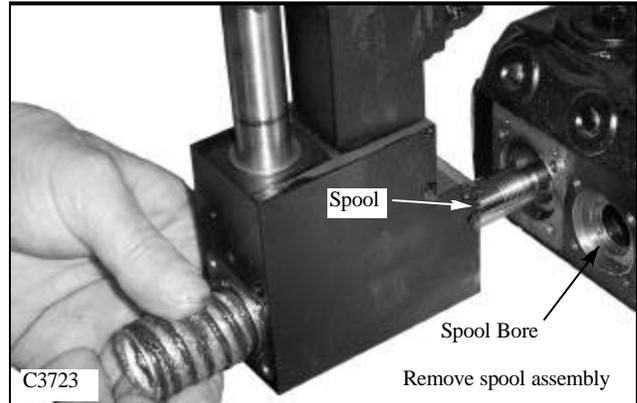


CONTROL VALVE 1.3

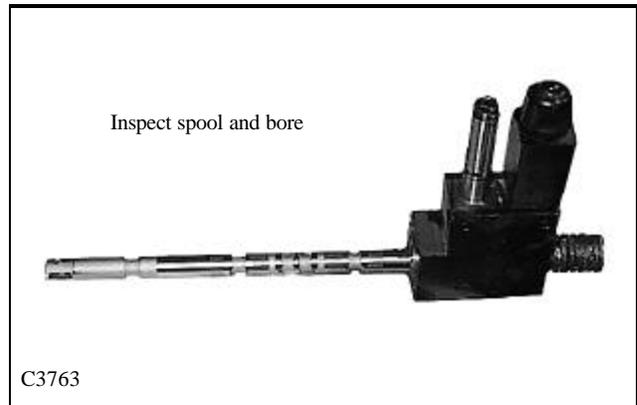
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Disassembly / Repair 175 (cont'd)

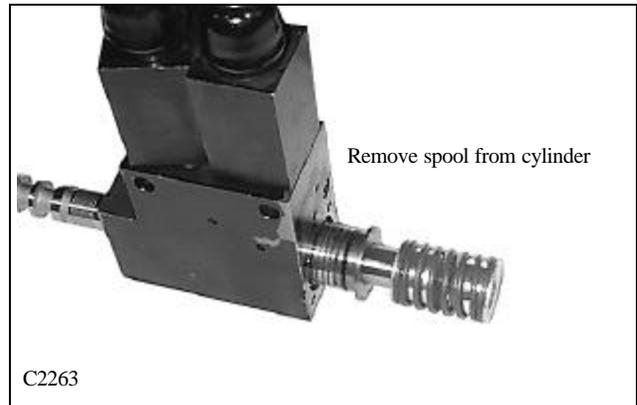
4 Remove the solenoid spool assembly from the control valve. (fig. C3723) Note the effort required to remove the spool from the spool bore. It should come out smoothly without binding or “snagging” throughout it’s travel.



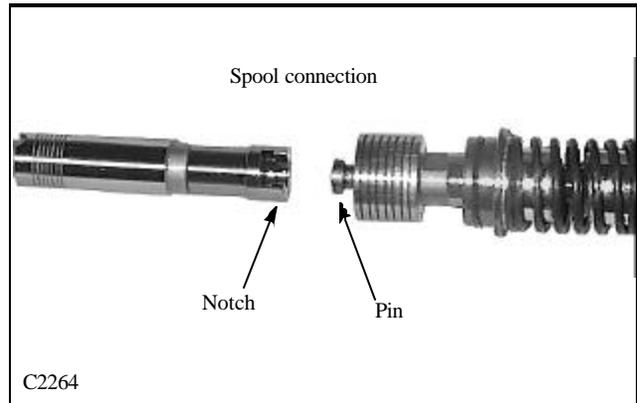
5 Inspect the spool and spool bore for abnormal wear. (fig. C3763) Replace the spool and / or the control valve if large scratches or indentations are present in the spool or spool bore. Minor scratches can be removed from the spool with extra fine emery cloth.



6 Remove the spool from the cylinder assembly by pushing the spool rearward through the cylinder. (fig. C2263) The spool will not pull through the front.



7 The piston part is machined with a nail head type pin that fits to a machined notch in the spool. (fig. C2264) Separate the spool from the piston and spring assembly.



CONTROL VALVE 1.3

1

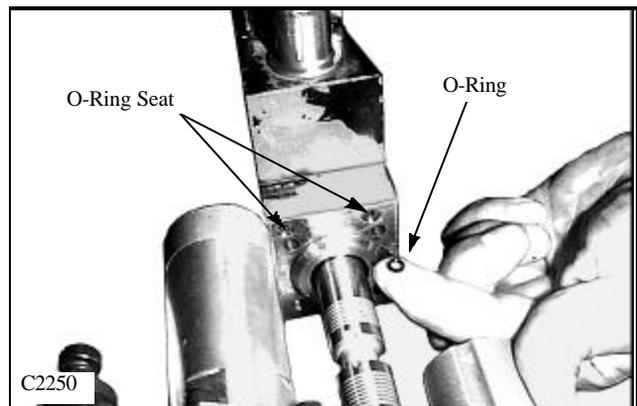
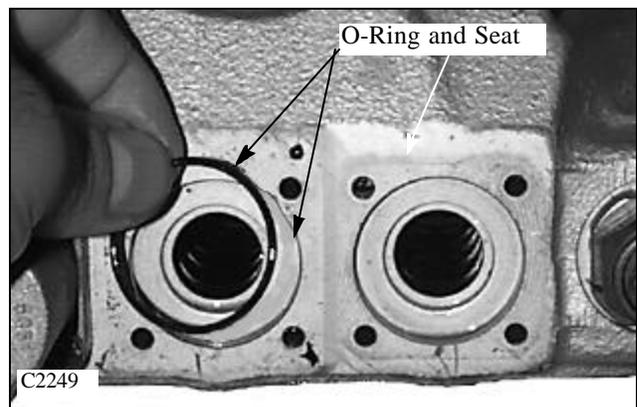
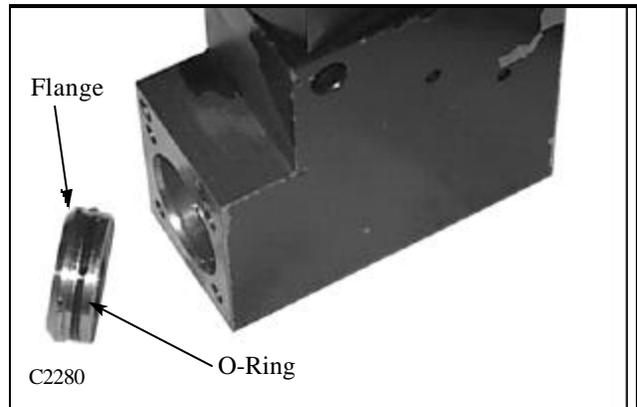
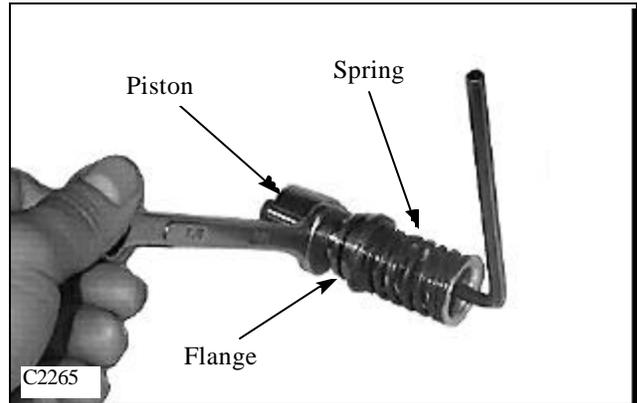
Disassembly / Repair 175 (cont'd)

8 Pull the flange and O-ring seal back toward the spring to expose the machined hex of the piston. Hold the hex with a wrench while removing the spring and spring bushings from the piston assembly. (fig. 2265) When installing the spring assembly to the piston, apply Loctite 542 to the threads and tighten the screw to 24 Nm (17.7 lbs / ft).

NOTE: The rest of the parts in the cylinder assembly are deemed non serviceable, replacement only.

9 The O-ring in the front part of the cylinder, next to the valve body, is mounted to a flange and is removed by inserting a brass punch through the rear of the cylinder and gently tapping it out. (fig. C2280)

10 Upon assembly, use new O-ring seals. (fig. C3718) Don't over look 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.



CONTROL VALVE 1.3

Disassembly / Repair 1700

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

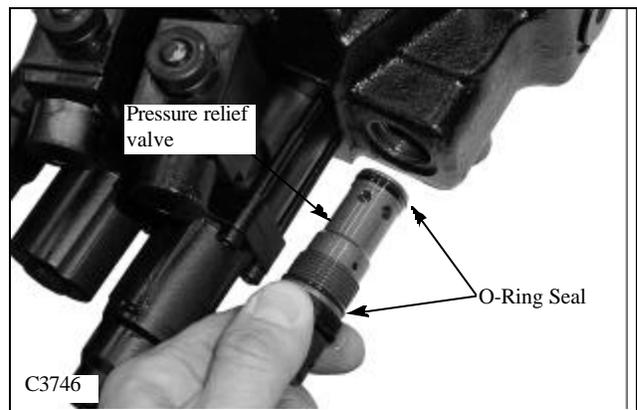


WARNING

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

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

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



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



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



CONTROL VALVE 1.3

1

Disassembly / Repair 1700 (con't)

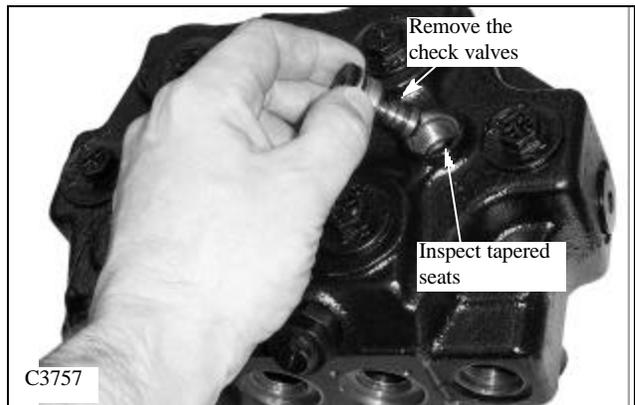
4 Remove the control box from the spool linkage end. The box needs to be tilted up towards the valve to release the hardened ball on the control box pin from the hole in the spool end and pull it away from the valve. (fig. C3752).



5 Pull out the spool. (fig. C3754) As you pull out the spool, note it's smooth action as it comes out of the valve body. The spool should move freely and smoothly in the bore of the valve body. Check the control valve spool and bore for scuff marks or abnormal wear. Replace the spool and or control valve if signs of wear are present.



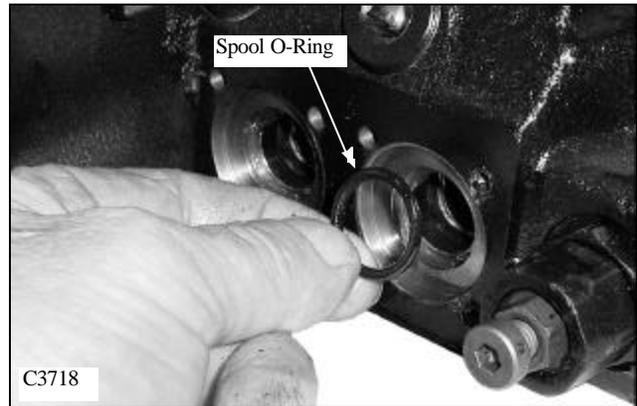
6 Remove the check valves from the control valve body (fig. C3757). They are located between the ports of each section. Check the seat and poppet of the valve body and check valve. Replace the check valve and/or the control valve if any signs of wear are present.



CONTROL VALVE 1.3

Disassembly / Repair 1700 (con't)

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



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

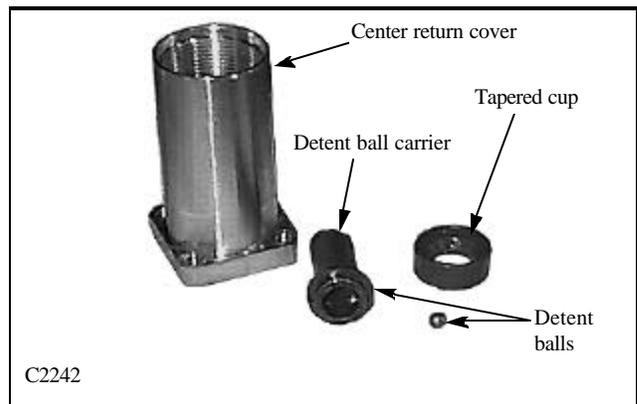
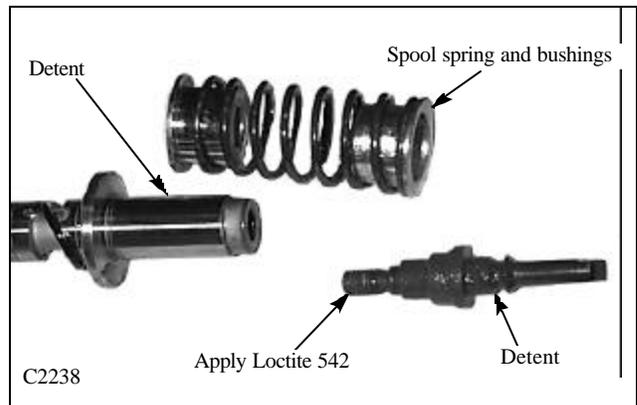


19 Place the cable end of the spool in a vice, or insert a screw driver through the clevis pin holes, to keep it from turning. The detent is threaded to the spool and can be removed for inspection or repairs. (fig. C2238, C2242)

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

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

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

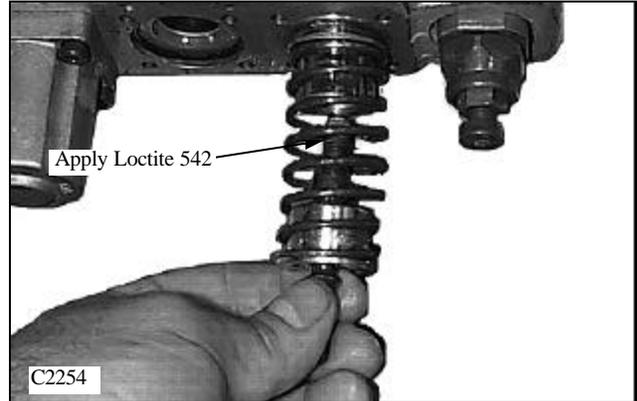


CONTROL VALVE 1.3

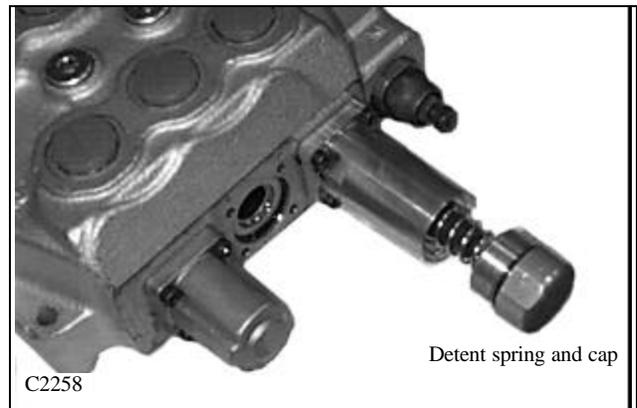
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Disassembly / Repair 1700 (con't)

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

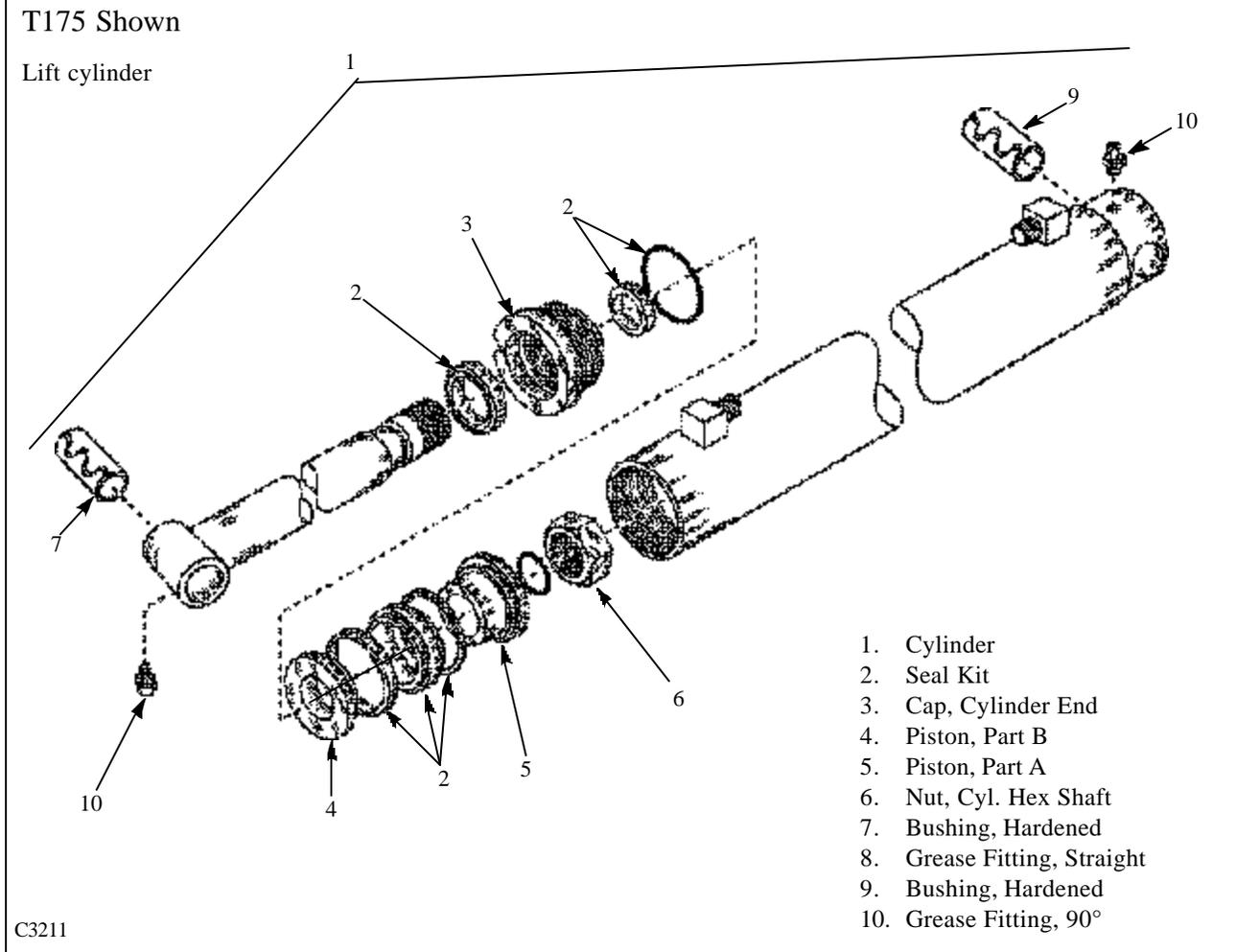


11 Install the spring return / centering cover and tighten the mounting screws evenly to 6.6 Nm (4.9 lbs / ft). Install the end cap to the cover and tighten to 9.8 Nm (7.2 lbs / ft). (fig. C2258)



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 bushings in the pivot areas that can be serviced when worn out.

HYDRAULIC CYLINDERS 1.4

1

Testing the Piston Seals

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

IMPORTANT

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



WARNING

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

1 This test must be performed with the engine running. Remove any attachment and block the loader securely with all 4 wheels off the ground.

2 Retract the cylinder(s) to be tested. Shut off the engine and cycle the controls to release the hydraulic pressure.

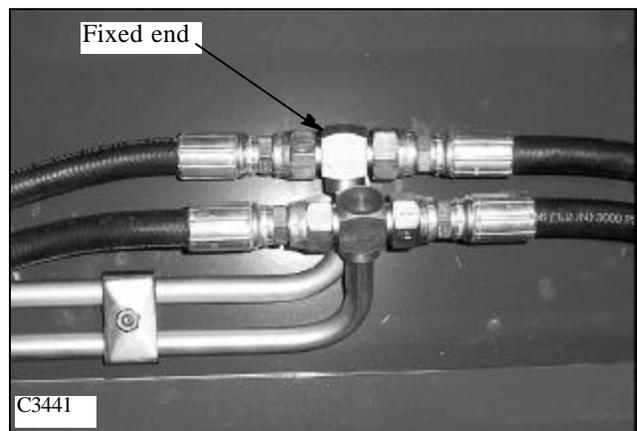
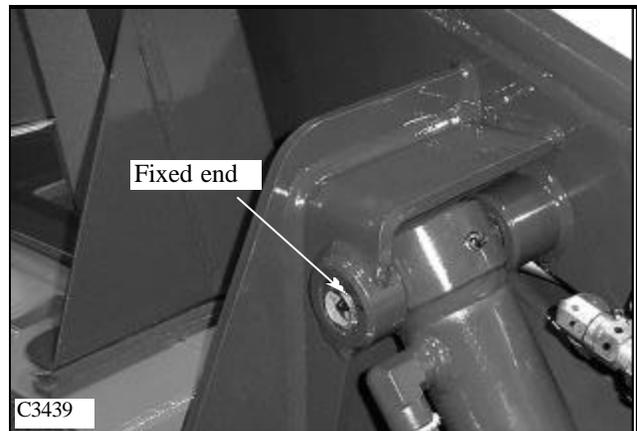
3 Disconnect the hose from the fixed end of the cylinder to be tested. Cap the hose with a steel plug to prevent system charge pressure from escaping the open circuit and to prevent contamination. (fig. C3440, C3441)

4 Start the engine and cycle the control(s) as to retract the cylinder. Do not over activate the controls as to place in the detent position. Have a container can ready to catch any waste oil to prevent environmental contamination.

5 Repeat for all both pairs of 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.



HYDRAULIC CYLINDERS 1.4

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

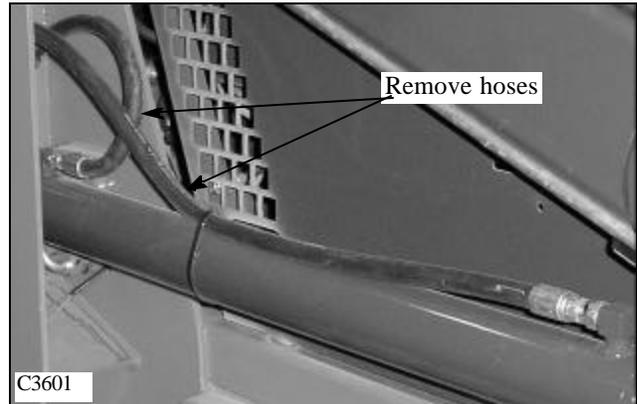
Cap all open lines and ports to prevent contamination.

- 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. C3601) Cap all open ports and lines to prevent contamination.
- 3 Remove the lock nut and bolt from both mounting pins. (fig. C3601, C1864)
- 4 Remove the front pivot pin by pushing the pin out from behind the boom arm, out toward you. (fig. C3647) With an appropriate punch and hammer to prevent brooming of the pin, remove the rear pin. (fig. C3648) Brooming the pin makes it difficult to remove.
- 5 Remove the cylinder from the loader.
- 6 Upon replacement, inspect the pivot pins and cylinder bushings for any wear. Replace if necessary. Reverse order above for installation.
- 7 Upon start up, check for system leaks and replenish the hydraulic reservoir as required.

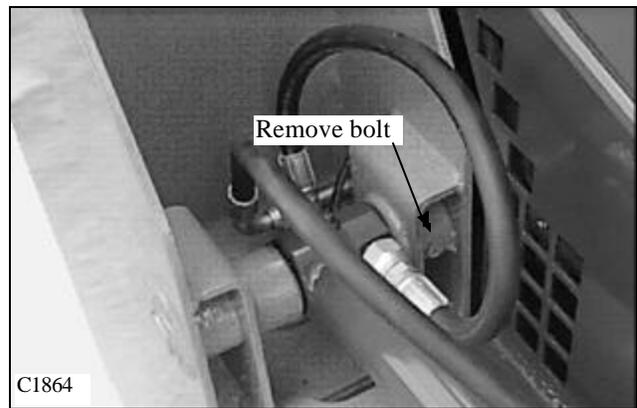


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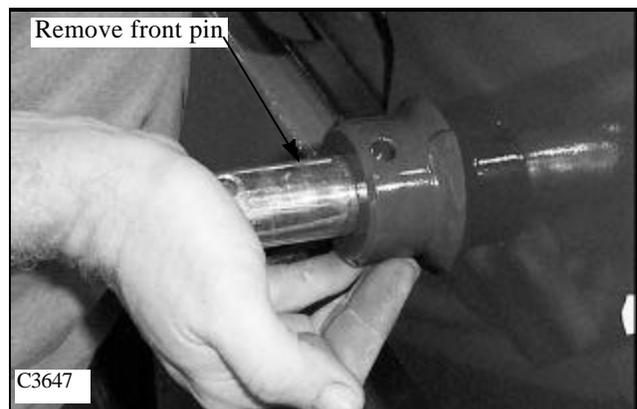
Use extreme caution when checking the hydraulic system for leaks. Fluid under pressure can penetrate the skin and cause serious injury.



C3601



C1864



C3647



C3648

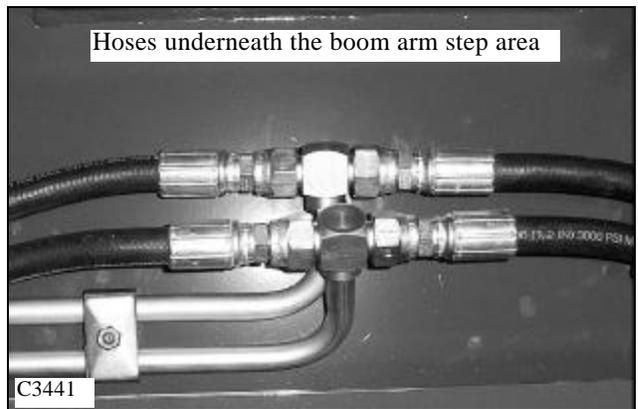
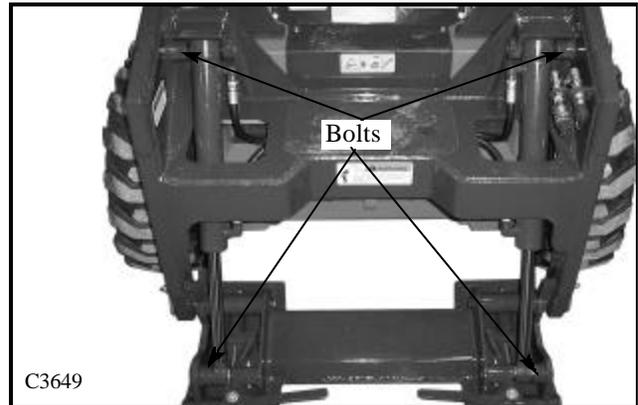
HYDRAULIC CYLINDERS 1.4

1

Tilt cylinder Replacement

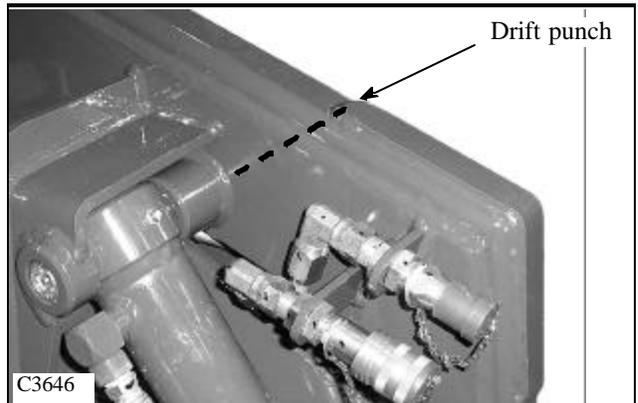
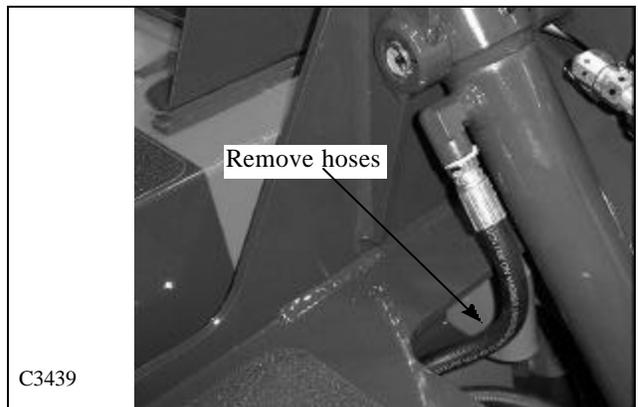
For tilt cylinder removal:

- 1 Lower the boom arms, remove any attachment and extend the tilt cylinders. Shut off the engine and cycle the controls to relieve excessive back pressure in the hydraulic system.(fig. C3649)
- 2 Loosen or remove the hydraulic hoses from hydraulic tubing under the boom arm step if you are changing the hoses also. (fig. C3441)
- 3 Remove the hydraulic hoses from the tilt cylinder. Plug and or cap all open ports or lines to prevent contamination. (fig. C3439)
- 4 Remove the lock nuts from the bolts retaining the pivot pins to the loader and remove the bolts. (fig. C3649)
- 5 Remove the pivot pins by tapping out with a brass drift pin. (fig. C3646)
- 6 Remove the cylinder from the loader.
- 7 Upon reassembly, inspect the pivot pins and bushings for wear and replace as required. Reverse order for cylinder installation.
- 8 Upon start up, check for system leaks and replenish the hydraulic oil reservoir as required.



 **WARNING**

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



HYDRAULIC CYLINDERS 1.4

1

Cylinder Disassembly

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

- 1 Remove the cylinder as outlined previously.
- 2 Place the base end of the cylinder in a vise or on a pin held in the vise and support the front end of the body. Remove the plugs from the hose ports. (fig. C3725)
- 3 Loosen the gland nut from the cylinder barrel using a spanner wrench. The gland nut threads are coated with loctite bonding agent at time of assembly. It may be necessary to apply heat to the gland nut and cylinder barrel threaded area, with a torch, to ease removal. (fig. C3725)
- 4 Remove the gland nut, rod and piston seal assembly from the barrel. (fig. C3726)

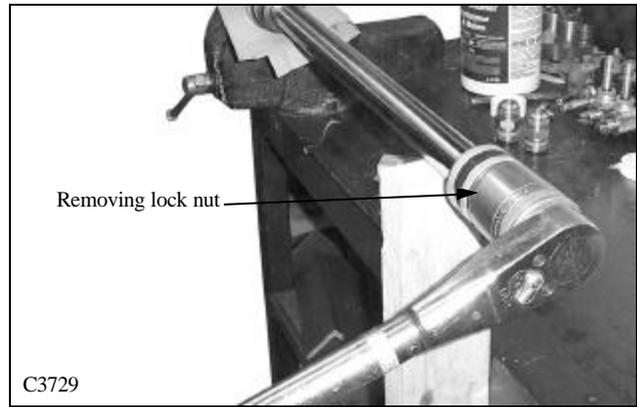


C3725



C3726

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



C3729

- 6 Remove the 2 piece piston assembly from the rod. (fig. C3731)
- 7 NOTE: Some piston assemblies rear piston parts are threaded onto the rod. You will need to use a spanner wrench to remove this type of rear piston.

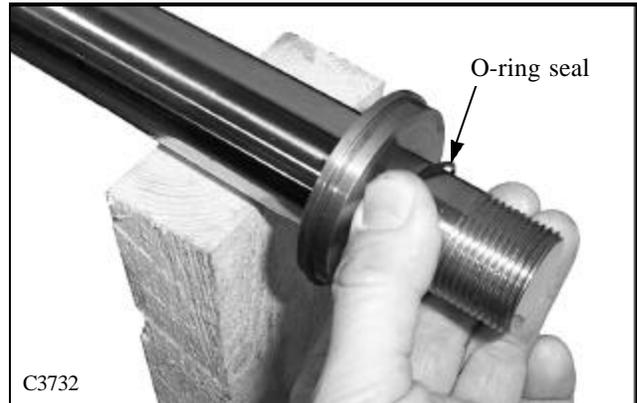


C3731

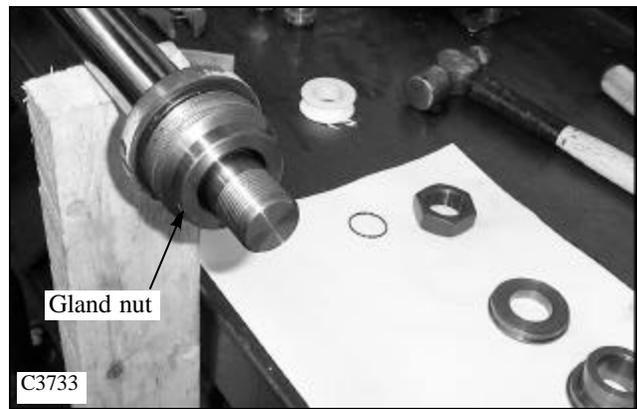
HYDRAULIC CYLINDERS 1.4

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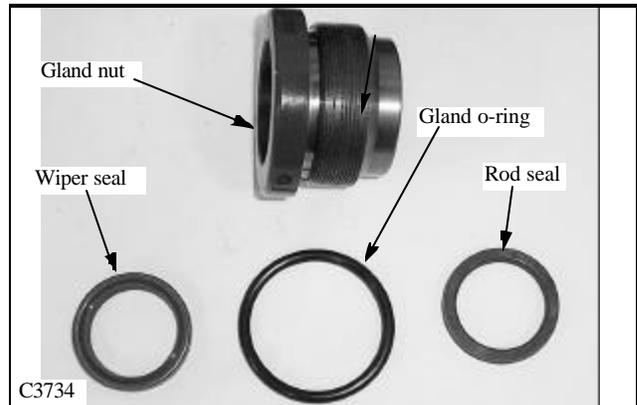
8 Depending on the design of the rear piston, non threaded type, remove and discard the o-ring seal from the end of the cylinder rod. (fig. C3732)



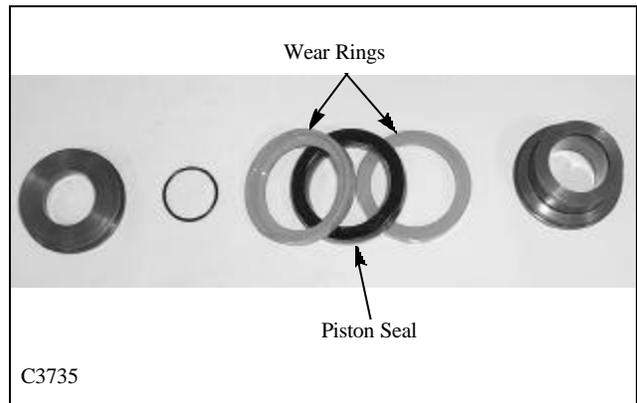
9 Remove the gland nut assembly from the cylinder rod. (fig. C3733)



10 Remove and discard the wiper seal, rod seal and o-ring seals and teflon back up washer, (if used), from the gland nut assembly. (fig. C3734) NOTE: Some seal designs may vary from illustration



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



HYDRAULIC CYLINDERS 1.4

1

Cylinder Inspection

1 Inspect the cylinder rod for scratches, dents and other damage. Minor rod damage may be repaired using a fine abrasive. Major scratches or dents are not repairable and the rod must be replaced. The chrome surface must be intact to provide a rust resistant surface. Blemishes on the rod will damage the rod seal and wiper and will cause leaking after a short period of use.

2 Inspect the cylinder rod threads. The threads must be in good condition to withstand the high torque required to secure the piston assembly to the rod.

3 Inspect the gland nut for nicks, burrs or other damage. Minor damage may be repaired using a fine abrasive.

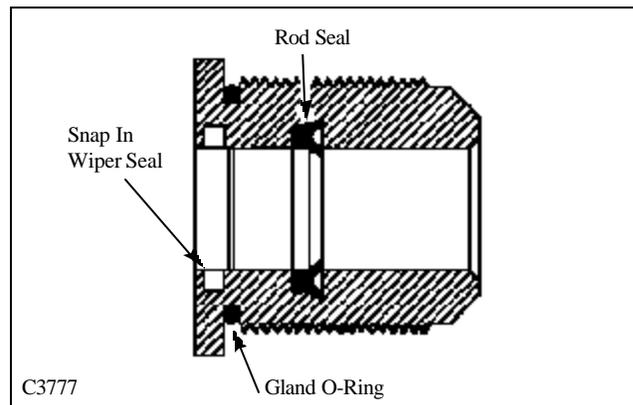
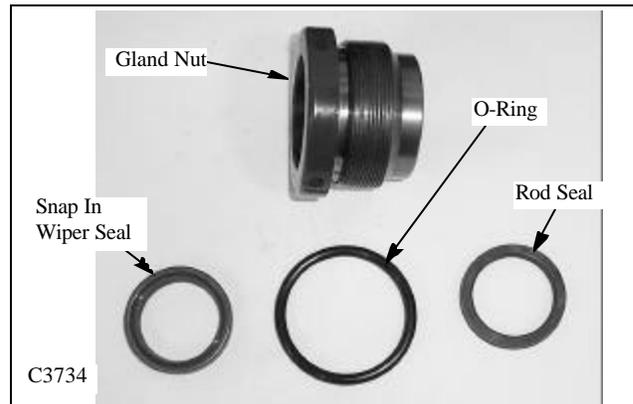
Smooth down edges that could damage seals and cause leakage.

4 Inspect the gland nut threads for damage.

5 Inspect the piston assembly for damage. Remove minor scratches or damage with a fine abrasive.

6 Using a suitable light, inspect the cylinder barrel bore for scratches, dents, burrs or any other damage. Replace the cylinder barrel if there is any evidence of damage.

7 Inspect the cylinder barrel threads for damage. The threads must be in good condition to withstand the high torque required to secure the gland nut assembly to the cylinder barrel.



Cylinder Assembly

1 Install a new gland nut rod seal. Form the seal into an oval shape and place it into the gland nut, with the “U” side of the seal facing the barrel end, and slip the seal into the groove. (fig. C3734)

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

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

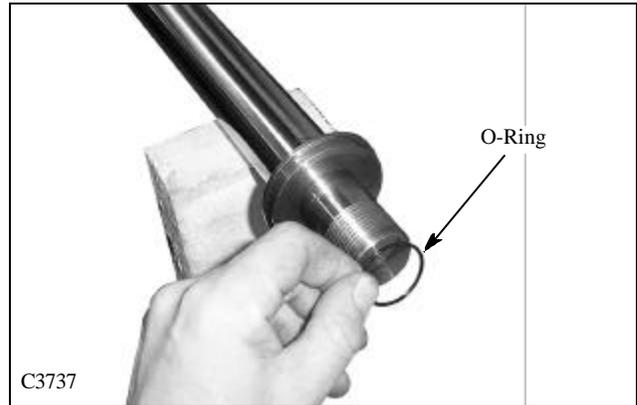
4 Apply system oil to the cylinder rod and assemble the gland nut assembly to the rod. (fig. C3736)



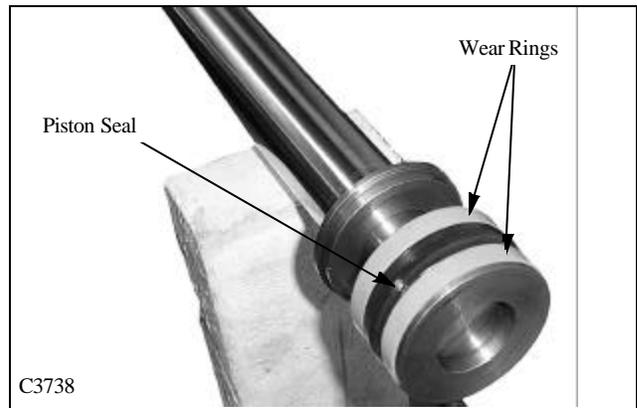
HYDRAULIC CYLINDERS 1.4

1

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

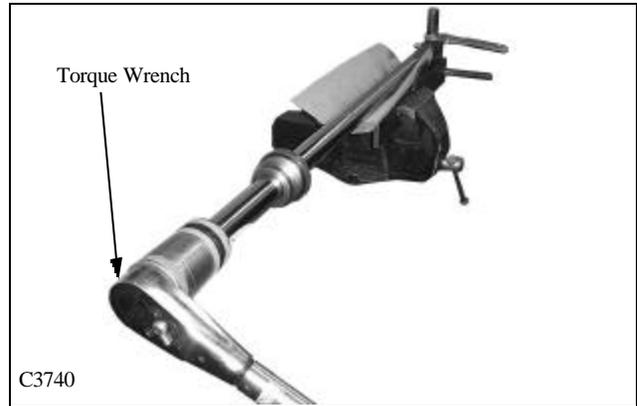


6 Install new wear rings and piston seal to the the 2 piece piston assembly. (fig. C3738)



7 Install the piston assembly to the cylinder rod. Some rear piston assemblies are threaded onto the cylinder rod. Use a spanner wrench to install the rear piston part to the cylinder rod. Torque the lock nut to the rod at 250-275 ft / lbs (339-373 N.m.). (fig. C3740)

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



9 Lubricate the piston seal assembly with system oil and install the cylinder rod and piston assembly to the cylinder barrel. (fig. C3741)

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

11 Assemble the cylinder to the loader.



HYDRAULIC OIL FILTER 1.5

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.



C3442



C3650

Filter Replacement

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



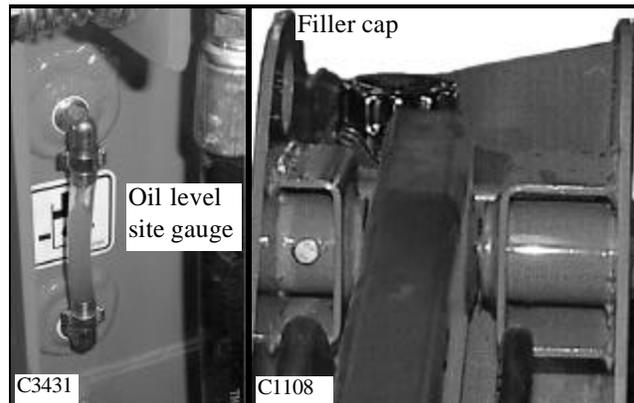
WARNING

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



C1968

- 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. C3442, C3650)
- 3 Clean the area of excess dirt if necessary to prevent contaminating the new filter when installing
- 4 Remove the hydraulic oil filter using a proper sized filter wrench. Check to make sure the o-ring seal has come off with the used filter. (fig. C1968)
- 5 Lubricate the new filter seal with clean system oil.
- 6 Install the filter and fit hand tight.
- 7 After start up, check the system for oil leaks. Replenish the oil reservoir as required with API 10W30 class SJ. (fig. C3431, C1108)



C3431

C1108

HYDRAULIC OIL COOLER 1.6

1

General Information

The hydraulic oil cooler is mounted to the inside of the rear door. (fig. C3443) Oil returning from the control valve is circulated through the oil cooler before being sent on to other parts of the hydraulic system.

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

The oil cooler is rated at 650 BTU / minute.

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



WARNING

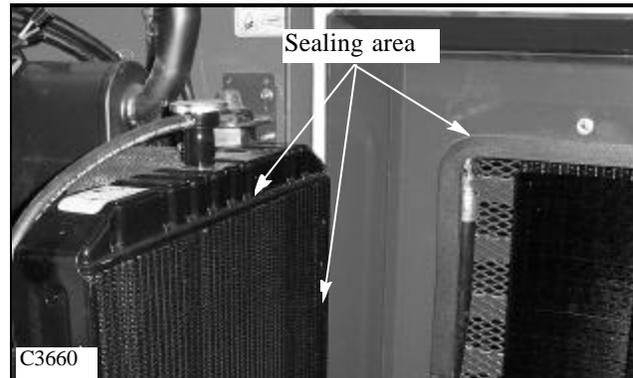
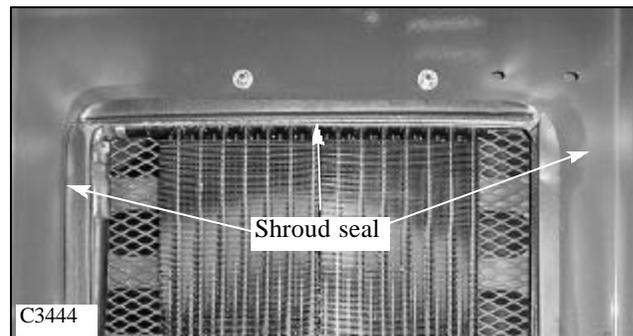
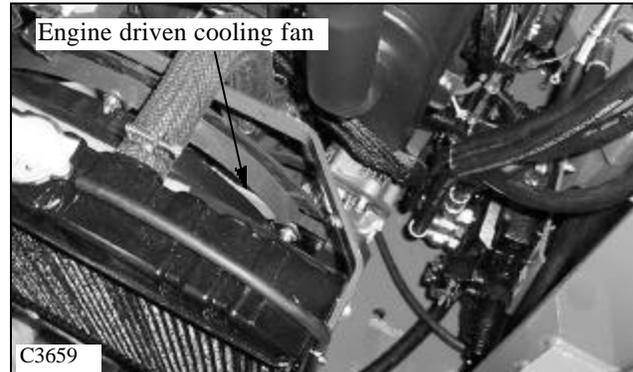
To avoid eye injury, always use safety goggles when cleaning with compressed air.

shroud. The outer edge of the shroud holds a layer of sealing foam that presses against the engine radiator when the rear door is closed. This directs the air, driven by the engine cooling fan (C3659), through the hydraulic oil cooler. The sealing foam and adjustment should be checked at every service interval. The shroud seal (C3444) to radiator adjustment can be made by loosening the upper radiator mounting brace and moving the radiator back or forward. (fig. C3660) If necessary the whole engine may need to be moved if adjustment cannot be made by moving the radiator.

Cooler Replacement

- 1 Lower the boom arms, engage the parking brake and shut off the engine.
- 2 Open the rear door and remove the cooler shroud.
- 3 Connect a vacuum system to the oil reservoir filler spout, if available, or drain the hydraulic oil reservoir. Be prepared to contain 56 liters of fluid (14.8 gal). Use clean containers if the oil is to be reused.
- 4 Remove the cooler hoses. Plug the open hoses and cooler ports to prevent contamination.
- 5 Remove the cooler from the rear door.
- 6 Remove the fittings from the oil cooler.
- 7 Inspect the fitting o-rings for damage and replace if necessary.
- 8 Install the fittings into the new or repaired oil cooler following the torque chart on section 1.10. Be sure to support the cooler as the fittings are tightened to prevent damaging the cooler.
- 9 Replace the cooler, cooler lines and cooler shroud. Follow the torque chart on section 1.10 when tightening the hydraulic hoses.

- 10 Replenish the hydraulic fluid as required. Check for system leaks and check the fit of the shroud seal to the engine radiator. Adjust if necessary.



HYDRAULIC OIL RESERVOIR 1.7

General Information

The hydraulic oil reservoir is located at the rear of the loader on the left hand side. (fig. C3445) The reservoir is completely separated from all chain and gear drives to eliminate contamination. A magnetic drain plug is installed in the bottom of the reservoir, and a magnet is attached to the 100 micron suction filter, to assist in removing metal particles from the oil.

Oil level is checked through a site gauge located just inside the engine compartment, left hand side, on the oil reservoir. The proper fill level is marked by a line and should be checked daily. (fig. C3431)

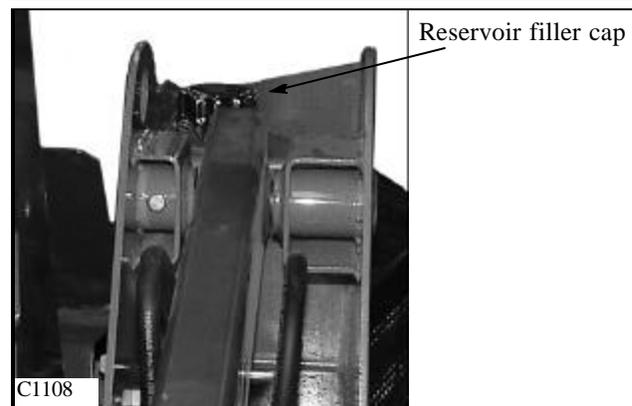
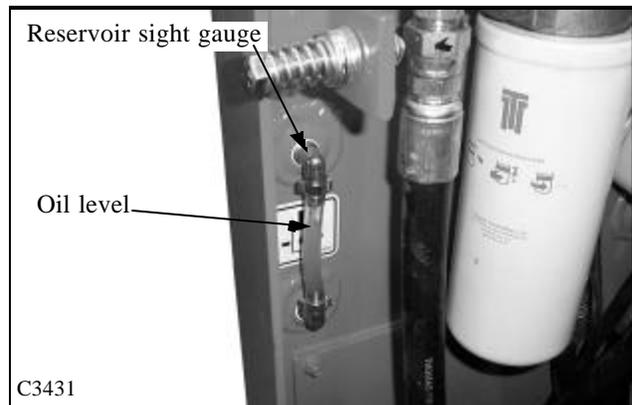
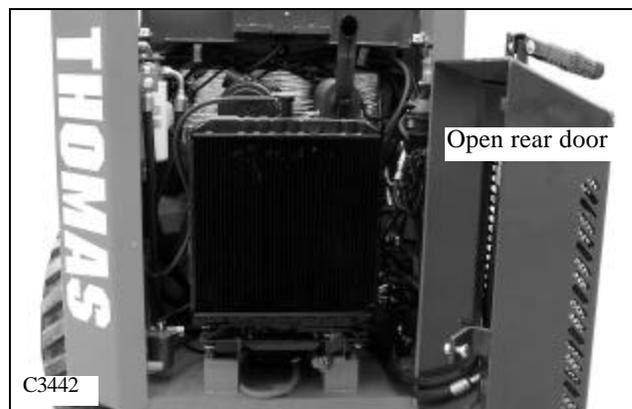
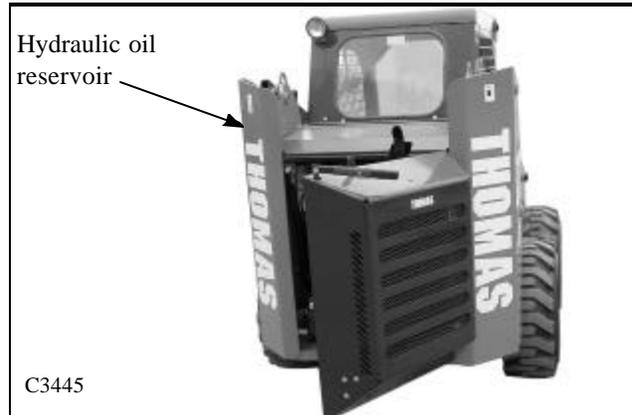
The oil reservoir fill cap is located at the top of the reservoir. (fig. C1108) The oil fill cap assembly has a 30 micron screen to catch larger particles of contaminant before entering the reservoir, but **always use oil filtered through a 5 micron min. filter for replenishing the hydraulic reservoir.** The oil fill cap is also a reservoir vent, or breather, and contains a 10 micron filter to remove air borne particles.

Checking The Oil Level

- 1 Check the reservoir oil level with the loader on level ground.
- 2 Lower the boom arms, retract the cylinders and engage the parking brake. Shut off the engine.
- 3 Open the rear door. (fig. C3442)
- 4 Check the oil level in the sight gauge. (fig. C3431)
- 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. C1108)
- 3 Inspect the filler screen in the filler neck for damage. If the filler screen is damaged, replace it.
- 4 Using a clean container, add 10W30 API class SJ.
- 5 Replace the filler cap and replace the bolt, or padlock, in the cap to prevent vandalism.



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HYDRAULIC OIL RESERVOIR 1.7

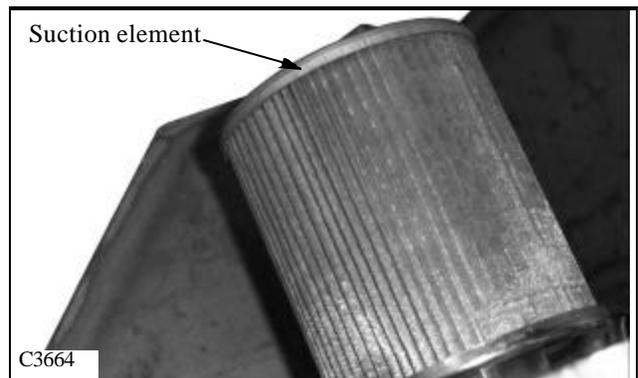
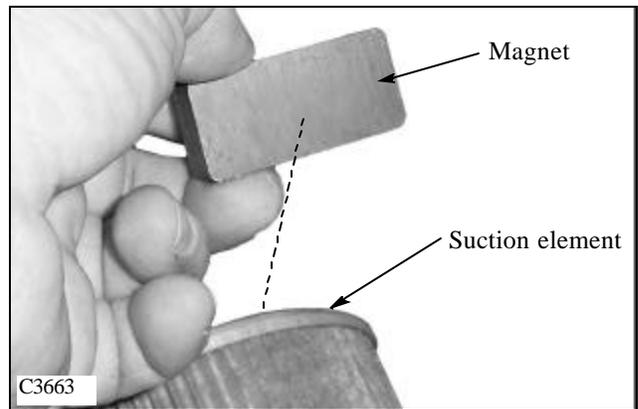
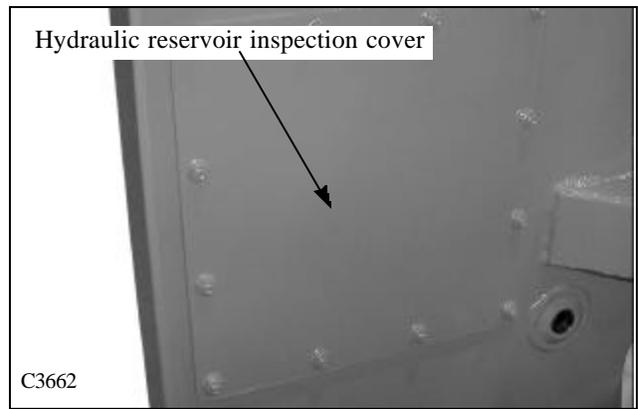
Servicing The Oil Reservoir

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

- 1 Lower the boom arms, shut off the engine and engage the parking brake.
- 2 Remove the magnetic drain plug located at the bottom of the hydraulic oil reservoir. Clean any metal particles that may be attached to the magnet. (fig. C3661) Have containers ready to hold approximately 14.8 gallons (56 £) 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. C3662) Clean the excess silicone from the cover and reservoir.

NOTE: You may need to remove the hydraulic oil filter, or possibly some hoses, to gain access to the inspection cover nuts.

- 4 Remove the suction screen element from the reservoir by turning counter clockwise. (fig. C3663, C3664)
- 5 Remove and clean the magnet attached to the suction element. (fig. C3663)
- 6 Install the magnet onto a new suction element and install the suction element.
- 7 Apply silicone around the inspection hole and install the inspection cover to the reservoir. Do not over tighten the mounting nuts. Maximum torque is 11 ft / lbs (15 N.m.).
- 8 Fill the reservoir to the proper level with 10W30 API classification SJ oil, approximately 14.8 gallons or 56 liters.



TROUBLE SHOOTING 1.8



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

TROUBLE SHOOTING 1.8

1

Problem	Cause	Corrective Action	Section
Hydraulic oil overheating.	Reservoir low on oil.	Check for leaks and replenish as required.	1.8
	Oil cooler plugged or dirty.	Clean the cooling fins.	1.7
	Auxiliary hydraulics engaged.	Disengage.	4.9
	Cooling fan damaged or inoperative	Check fan and drive belt	1.7
	Engine RPM too low.	Check engine RPM and reset.	7.11
	Temperature sender defective.	Replace.	8
	Relief valve failure or out of adjustment.	Check pressure, adjust or replace.	1.4
	Wrong type of hydraulic fluid.	Replace.	1.8

TORQUE CHART 1.9

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

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

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

CONVERSION CHART 1.10

CONVERSION FACTORS

Metric To U.S.



	MULTIPLY	BY	TO OBTAIN
Area:	sq. meter	10.763 91	square foot
	hectare	2.471 05	acre
Force:	newton	3.596 942	ounce force
	newton	0.224 809	pound force
Length:	millimeter	0.039 370	inch
	meter	3.280 840	foot
	kilometer	0.621 371	mile
Mass:	kilogram	2.204 622	pound
Mass/Area:	kilogram/hectare	0.000466	ton/acre
Mass/Energy:	gr/kW/hr.	0.001 644	lbs/hp/hr.
Mass/Volume:	kg/cubic meter	1.685 555	lb/cubic yd.
Power:	kilowatt	1.341 02	horsepower
Pressure:	kilopascal	0.145 038	lb/sq.inch
	bar	14.50385	lb/sq.inch
Temperature:	degree C	$1.8 \times C + 32$	degree F
Torque:	newton meter	8.850 748	lb/inch
	newton meter	0.737 562	lb/foot
Velocity:	kilometer/hr.	0.621 371	miles/hr.
Volume:	cubic centimeter	0.061 024	cubic inch
	cubic meter	35.314 66	cubic foot
	cubic meter	1.307 950	cubic yd.
	millimeter	0.033 814	ounce (US fluid)
	litre	1.056 814	quart (US liquid)
	litre	0.879 877	quart (Imperial)
	litre	0.264 172	gallon (US liquid)
	litre	0.219 969	gallon (Imperial)
Volume/Time:	litre/min.	0.264 172	gallon/min. (US liquid)
	litre/min.	0.219 969	gallon/min. (Imperial)

CONVERSION CHART 1.10

CONVERSION FACTORS

U.S. To Metric

	MULTIPLY	BY	TO OBTAIN
Area:	sq. foot	0.092 903	square meter
	acre	0.404 686	hectare
Force:	ounce force	0.278 014	newton
	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/Area:	ton/acre	2241 702	kilogram/hectare
Mass/Energy:	lb/hp/hr	608.277 4	gr/kW/hr
Mass/Volume:	lb/cubic yd.	0.5930276	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:	pound/inch	0.112 985	newton meter
	pound/foot	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.

NOTES

1



SECTION 2

HYDROSTATIC DRIVE SYSTEM

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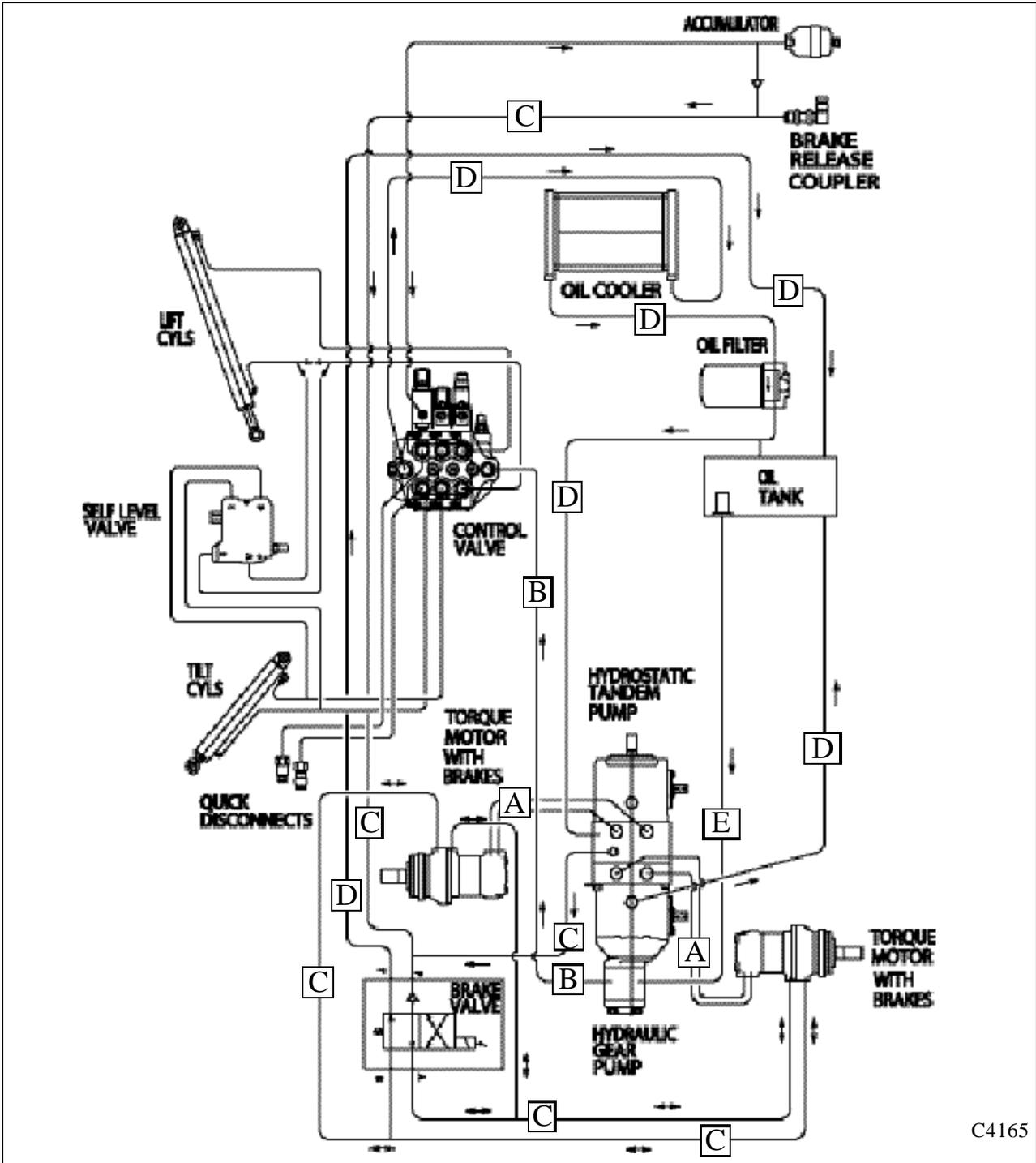


HYDROSTATIC CIRCUIT 2.1

Hydrostatic Circuit and System Pressure Schematic

- A** High Pressure Relieved at 345 Bar (5000PSI)
- B** Aux. Press. Relief Set at 2400 PSI (207 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)

2



C4165

SPECIFICATIONS 2.1

Hydrostatic Tandem Pump

Pump Type	Variable Displacement, Reversible Piston
Brand Name of Pump	Sauer-Danfoss
Series Type	40 / M44
No. Of Drive Pumps	2 (TWO)
Mounting	Tandem
Rotation (viewed from shaft end)	Clockwise
Operating Speed	2800 RPM (+ / - 50 RPM)
Pump Displacement	2.65 cu. in. (44cc)
Minimum Pump Output (flow)	17.1 gal. (64.7L) / Minute @ 1800RPM @ 2000 PSI (136.1 Bar) Over Measured Charge Pressure
No. Of Relief Valves	2 (TWO)
Relief Valve Setting	345 Bar (5000 PSI)
Max. Allowable Case Pressure	25 PSI (1.7 Bar)
Charge Pump Type	14.6cc/rev. Geroter Style
Charge Pressure	200 PSI Min. (13.8 Bar)
Hydrostatic Repair Manual	Thomas P / N 44232 Sauer Sundstrand P / N BLN-9992



Hydraulic Drive Motor

Drive Motor Type	Geroter Torque Motor With Brake
Brand Name	Sauer-Danfoss
Series Type	TMT 500 FLV
Rotation	Dual
No. Of Drive Motors	2 (TWO)
Drive Motor Displacement	31.9 cu. in. (523cc)
Max. Case Pressure	250 PSI (17.3 Bar)

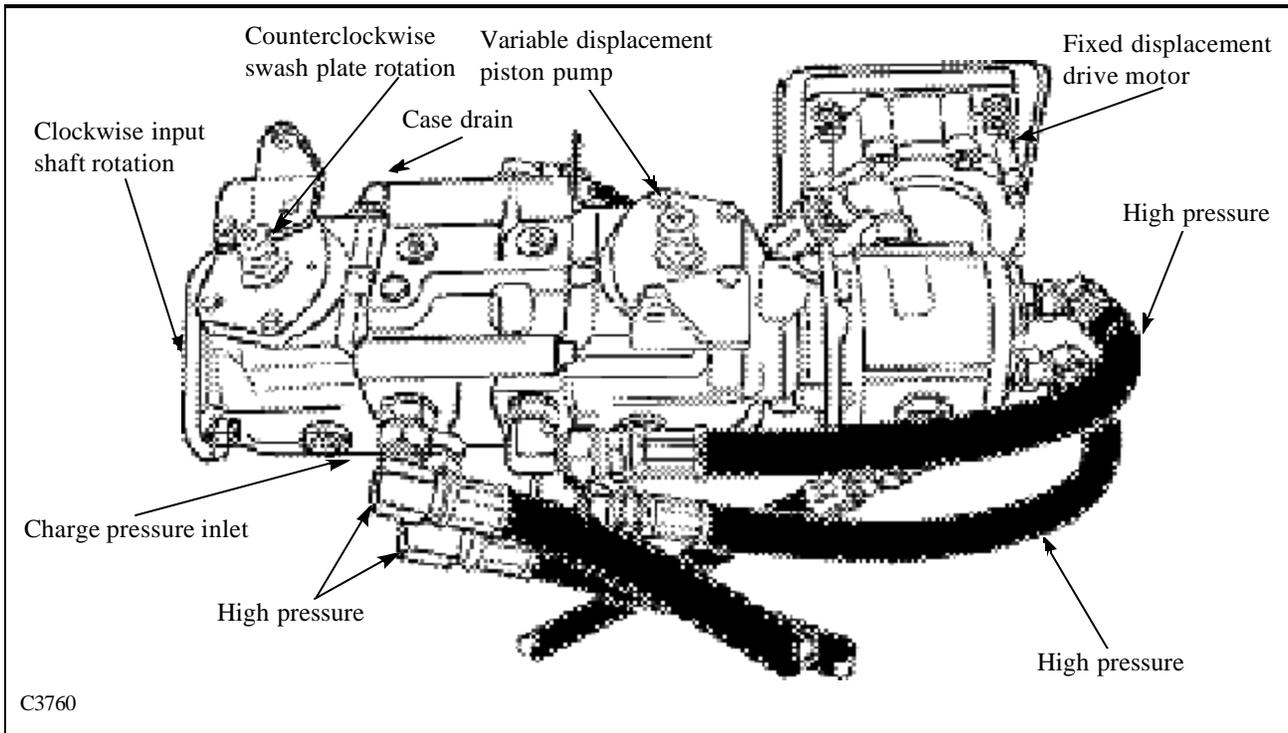
Reservoir

Fluid Type	10w30 API Class SJ Oil
Reservoir Filtration	One 100 Micron Screen Element
Hydraulic Oil Filtration	One 5 Micron Element
Hydraulic Element	P / N 35243

GENERAL INFORMATION 2.2

Introduction:

2



The driveshaft of the piston pump is rotated by the engine. The piston block which is splined to the driveshaft also turns. The piston block, rotating group, consists of 9 piston assemblies which have free swiveling shoes swagged on the ball end of each piston assembly. The shoe end of the piston rides against the smooth machined surface of the swashplate. With the swashplate in the neutral position, the piston assemblies do not reciprocate in the piston block, but are rotating. No oil is drawn into or discharged from the pump. The pump is in a zero displacement position and the loader remains stationary.

With the swashplate in the neutral position, the pressure of the charge oil, which ranges from 200 psi (13.8 Bar), is able to unseat both check valves and supply oil to both sides of the pump because of the balance in pressure. Very little charge oil volume is required in the neutral position so the excess oil is bypassed over the charge pressure relief valve and recirculated back to the reservoir. The oil that leaks internally in the pump and motor collects in their body housings and is returned to the reservoir by external case drain in the pump and motors. This leakage oil is the only oil the charge check replenishes. This makes the design a closed loop system.

As the steering lever is moved forward, or reverse, the loader starts a directional movement. As the swashplate begins to move, the piston assemblies start to reciprocate in the piston block. As the steering lever continues further movement the cam angle increases, the pistons reciprocate further, more oil is pumped and the speed of the loader is increased.

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

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

The movement of the pump swashplate, forward or reverse, controls the direction of the drive motor rotation.

The function of the pressure relief valve is to relieve the pressure side of the system of excessive high pressure when the loader encounters a heavy load or stalls out.

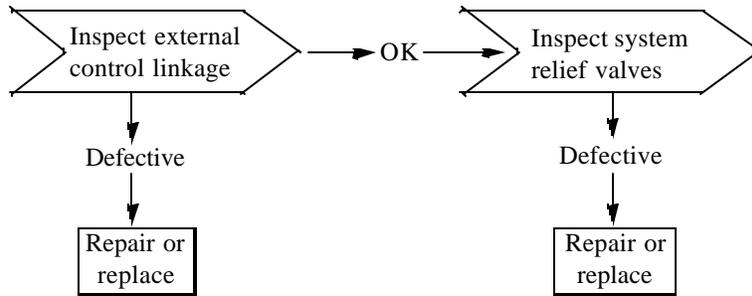
When the relief valve senses an over load it unseats, allowing excess pressure and volume to flow into the low pressure side of the pump. A small volume of oil starts to flow across to the other relief valve. This relief valve is exposed to the low pressure on the intake side of the pump and is seated by the spring tension within the relief valve body.

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

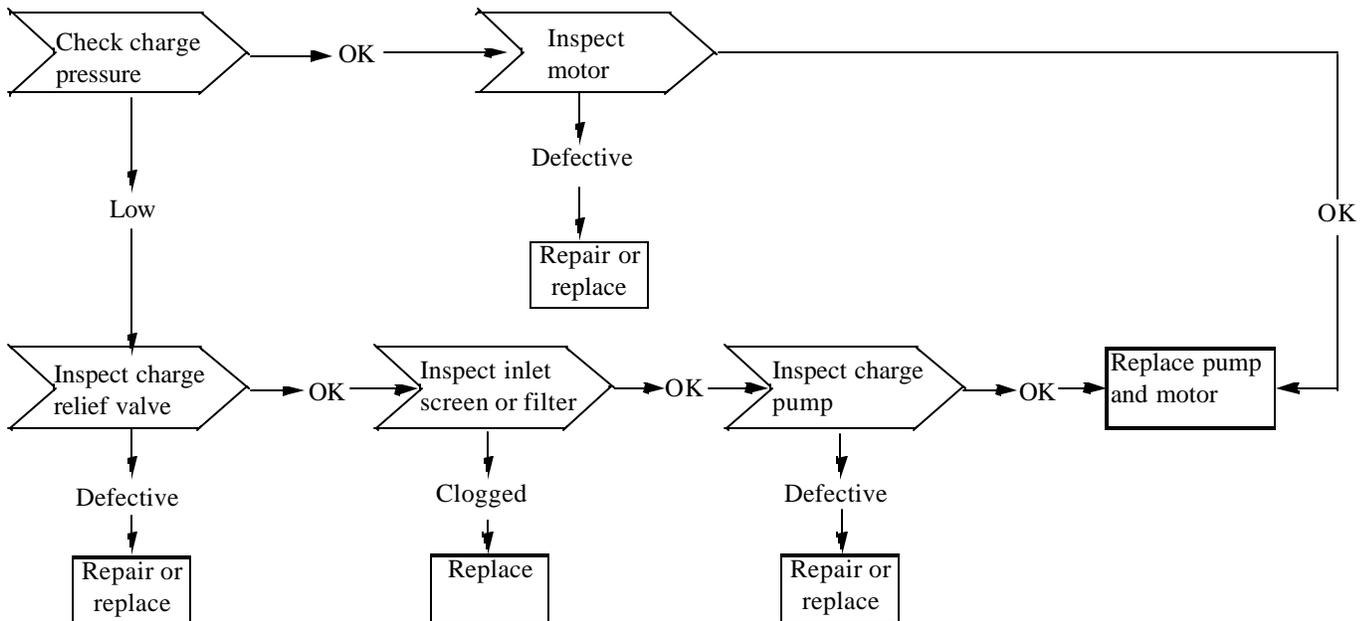
TROUBLE SHOOTING 2.3

Symptom: Operates In One Direction Only

2

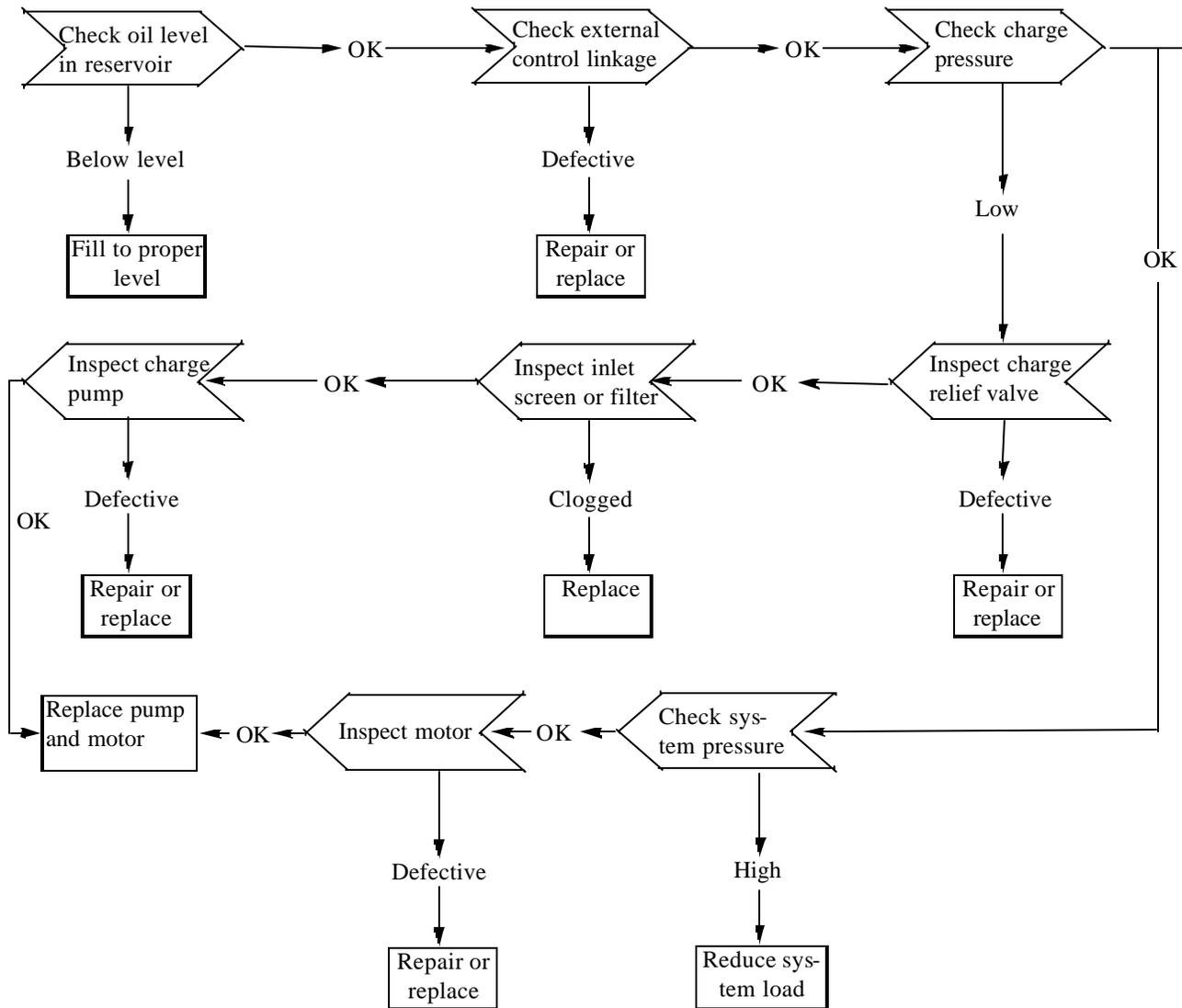


Symptom: System Response Sluggish



TROUBLE SHOOTING 2.3

Symptom: System Will Not Operate In Either Direction



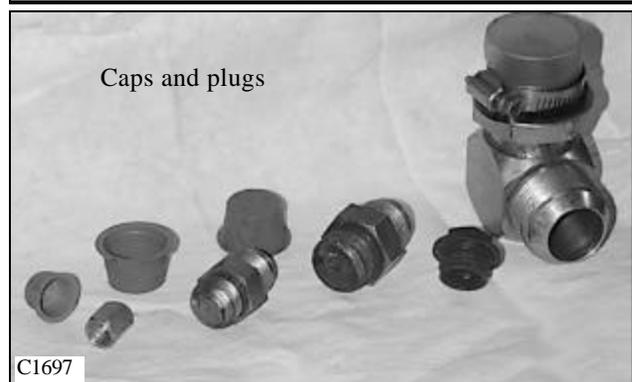
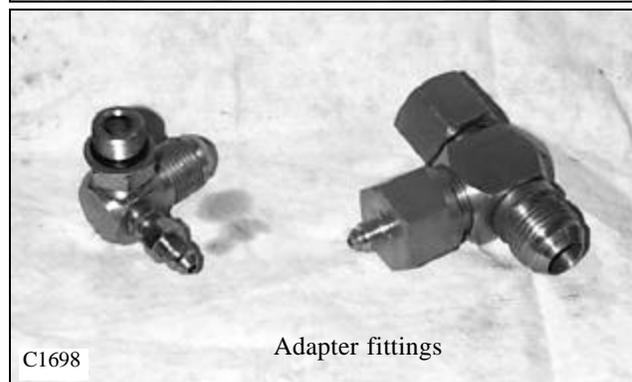
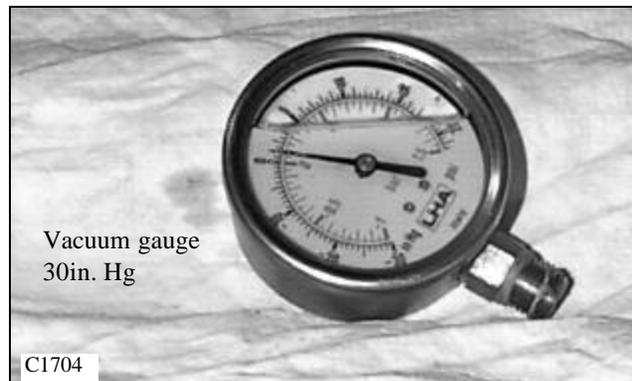
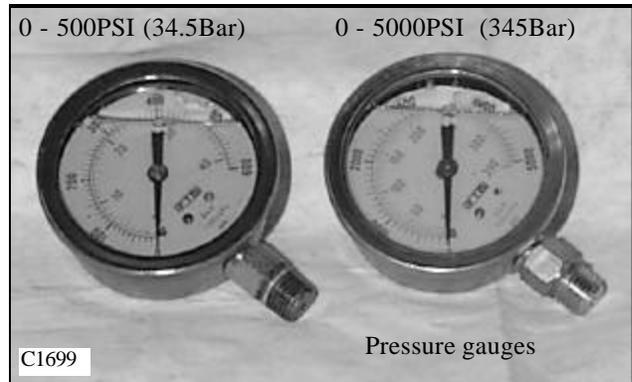
TRUBLE SHOOTING 2.3

System Diagnosing Steps And Special Tools

2

- 1 Check oil level in reservoir:**
 - a. fill to proper level as marked on site tube.
- 2 Inspect external control linkage for:**
 - a. misadjustment or disconnection
 - b. binding, bending or breakage
 - c. misadjusted, damaged or broken hydroback
- 3 Inspect servo control valve for: (if used)**
 - a. proper inlet pressure
 - b. misadjusted or damaged neutral return spring
 - c. galled or stuck control spool
 - d. galled or stuck servo piston
- 4 Inspect heat exchanger for:**
 - a. obstructed air flow
 - b. improper plumbing (inlet to outlet)
 - c. obstructed fluid flow
- 5 Inspect inlet filter or screen for:**
 - a. plugged or clogged screen or filter
 - b. obstructed inlet or outlet
 - c. open inlet to charge pump (open line)
- 6 Check charge pressure:**
 - a. follow test procedures section 2.5
- 7 Inspect charge relief valve for:**
 - a. poppet held of seat
 - b. damaged or broken spring
 - c. damaged valve seat
 - d. improper charge relief setting
- 8 Inspect charge pump for:**
 - a. broken or missing drive coupling
 - b. damaged or missing o-rings
 - c. galled or broken geroter 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 2.4

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

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

WARNING

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

Installing a gauge into the high pressure gauge ports 'A', 'B', 'C', or 'D' will verify the status of the high pressure relief valves.

Checking the pressure at port 'E' will give accurate charge pressure reading.

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

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

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

Gauge Information		
A	System Pressure Gauge	10,000 PSI Gauge (690 Bar) 9/16 - 18 O-Ring Fitting
B	System Pressure Gauge	10,000 PSI Gauge (690 Bar) 9/16 - O-Ring Fitting
C	System Pressure Gauge	10,000 PSI Gauge (690 Bar) 9/16 - O-Ring Fitting
D	System Pressure Gauge	10,000 PSI Gauge (690 Bar) 9/16 - O-Ring Fitting
E	Charge Pressure Gauge Port	500 PSI Gauge (34.5 Bar) 7/8 - 14 O- Ring Fitting
F	Case Drain Port	500 PSI Gauge (34.5 Bar) 1 - 1/16 - 12 O-Ring Fitting
G	Charge Pump Inlet Vacuum	Vacuum Gauge (30 in. Hg) Tee Into Charge Pump Inlet

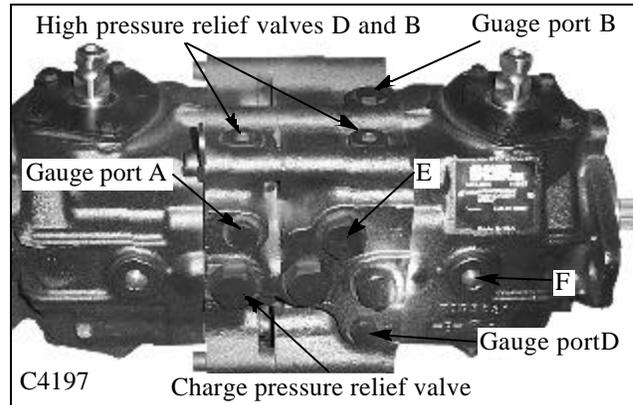
Tandem pump flow can also measure pump performance.

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

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

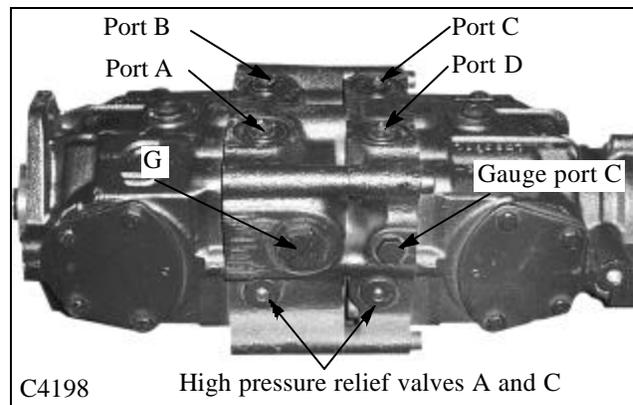
- 4 Minimum flow reading should be 17.1 gal / min. (64.7 L / min).

LH side and top view



NOTE: Internal charge pump model shown

RH side and bottom view



WARNING

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

TOWING 2.5

Towing Procedure

In the 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 Remove the seat and hydrostatic shield.
- 2 Loosen the high pressure relief valve caps 4 complete turns. There are 4 high pressure relief valves, 2 on the top side, and 2 on the bottom side of the tandem pump. Be sure to loosen all 4. (fig. C3665) Torque caps 30 to 50 ft / lbs (41 to 68 N.m.) upon reassembly.
- 3 The loader parking brake system is released by hydrostatic pressure. To release the parking brake when the unit has failed you must pressurize the brake system manually. A service override for the brake valve has been incorporated for use by Thomas Dealers. The normal position of the plunger is down and turned into the locked position. To release the brake, turn the release plunger counter clockwise. (fig. C3666) Access of the small quick connector for the 175 in the engine compartment. (fiq.C3870) Access the small quick connector for the 1700 in the tandem compartment (fiq. C3871) Use a port -a - power to pressurize this line to 200 psi (13.8 bar). The brakes are now released.



WARNING

Be sure to return the brake valve plunger to the normal position after servicing the loader.



CAUTION

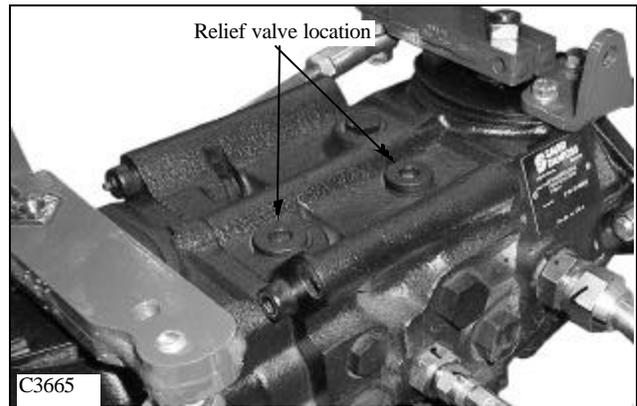
To prevent damage to the drive motors, do not exceed speed of 1 MPH.

- 4 Use the front frame mounted tie downs to attach pulling devise. (fig. C3447) Use the rear tie downs to pull the loader backwards. (fig. C3446)

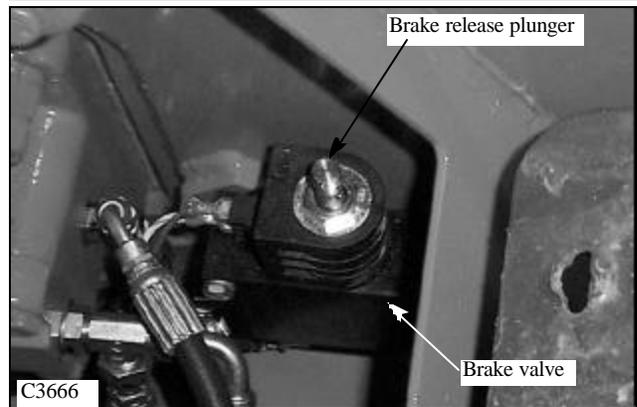


WARNING

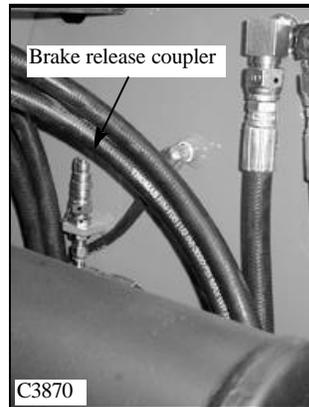
Use chains or cables rated a minimum of 1 and 1/2 times the gross vehicle weight.



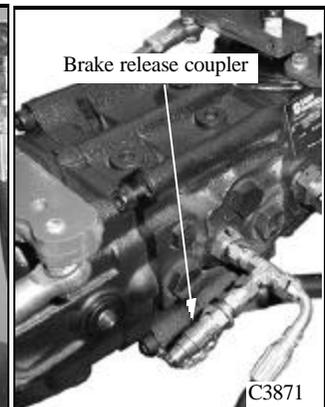
C3665



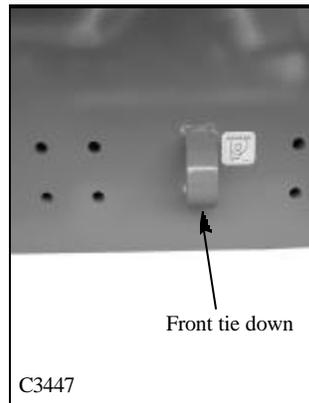
C3666



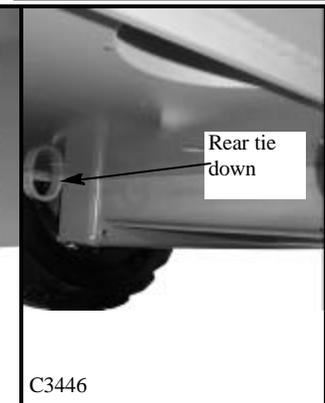
C3870



C3871



C3447



C3446

FLUSHING THE HYDRAULIC SYSTEM 2.6

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 2.6

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. C3661) Be prepared to contain approximately 56 litres(14.8 gal) 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. C3661) Be prepared to contain approximately 56 litres (14.8 gal) of fluid.

2 Connect an external 5 micron filtering system, capable of sustaining minimum of 2000 PSI (138 Bar) and has a back pressure gauge, to the auxiliary couplings. (fig. C3646)

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



WARNING

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

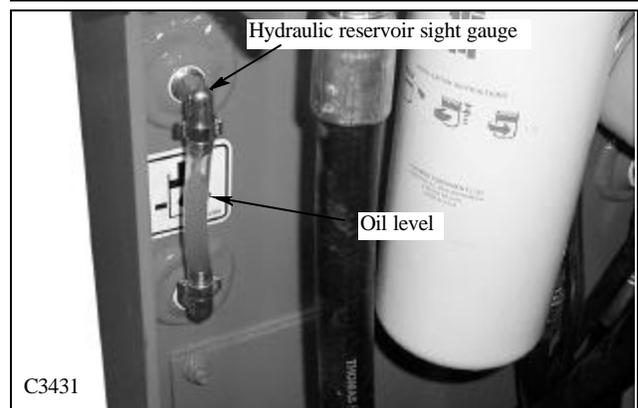
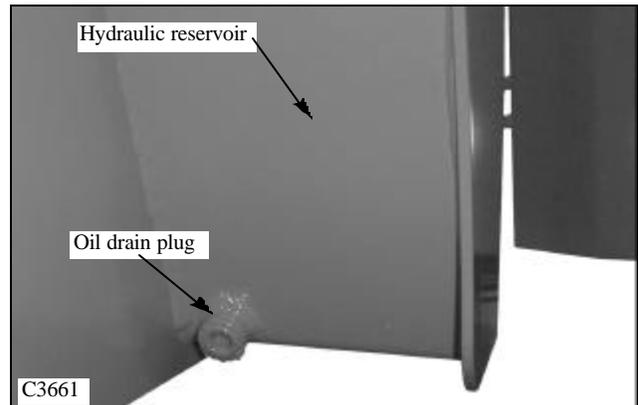
4 Engage the auxiliary circuit. Check to make sure the filtering system is not over taxed by the loaders hydraulic system pressure. Adjust engine idle accordingly to match the filtering systems capacity. This may vary as the filter becomes dirty, you may need to decrease engine RPM. Circulate the oil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

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

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

7 Install new hydraulic oil filters. (fig. C3650)

8 Start the engine and check for leaks. Replenish the hydraulic oil reservoir as required. (fig. C3431)



FLUSHING THE HYDRAULIC SYSTEM 2.6

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

- 1 Remove any attachment.
- 2 Make sure all cylinders are fully retracted.

IMPORTANT

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

- 3 Change the hydraulic fluid. (fig. C3661)
- 4 Change the hydraulic filter. (fig. C3650)
- 5 Disconnect the hydraulic lines from one set of cylinders. (fig. C3601, C3441)
- 6 Start the engine and set to the lowest idle.
- 7 Have someone hold the open hydraulic lines into a container. Stroke the foot pedals, or hand operated, controls slowly. Continue to repeat this cycle until the oil comes out clear. Repeat for opposite set of cylinders.



WARNING

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

- 8 Attach a hose and couplings to the auxiliary circuit. Engage the auxiliary hydraulics, forward and reverse, until the oil flows clear.
- 9 Connect 1 hose each, on each cylinder, to the fixed end of the cylinder barrel.

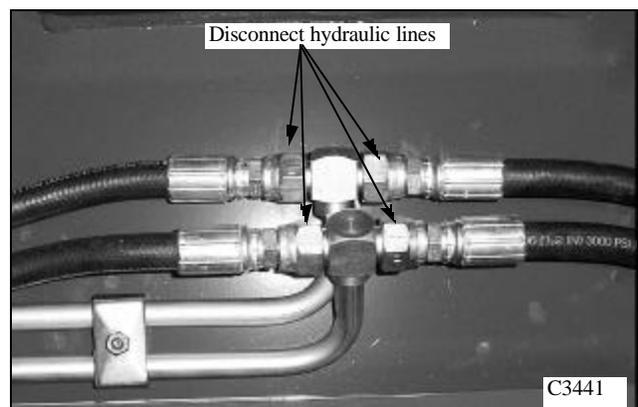
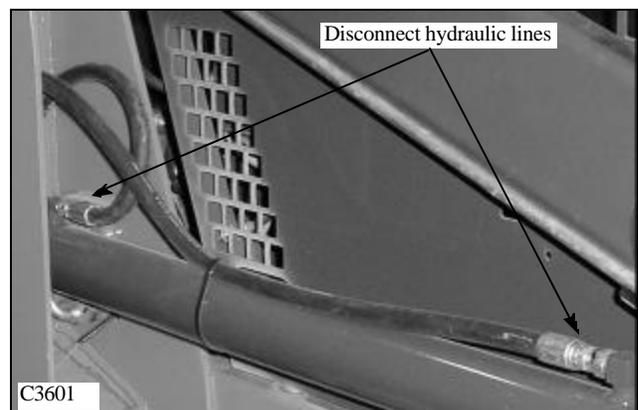
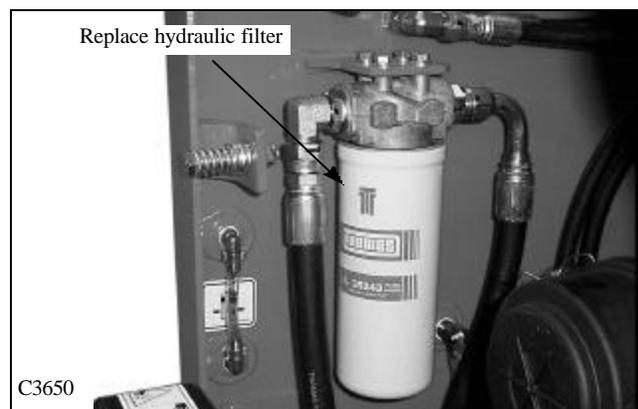
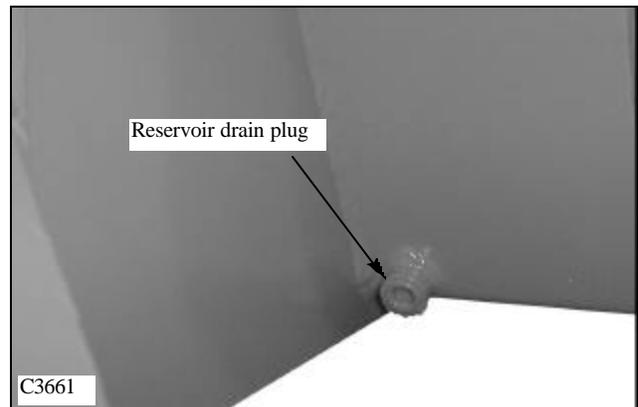
IMPORTANT

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

- 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 2.7

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. C3431)
- 2 The inlet hose from the oil reservoir to the charge should be filled with oil prior to starting.
- 3 Check inlet and pressure hose fittings for proper tightness prior to starting.
- 4 The pump must be filled prior to start-up with filtered oil. Fill the pump by pouring oil into the side case drain port. (fig. C4197 location “D”)



WARNING

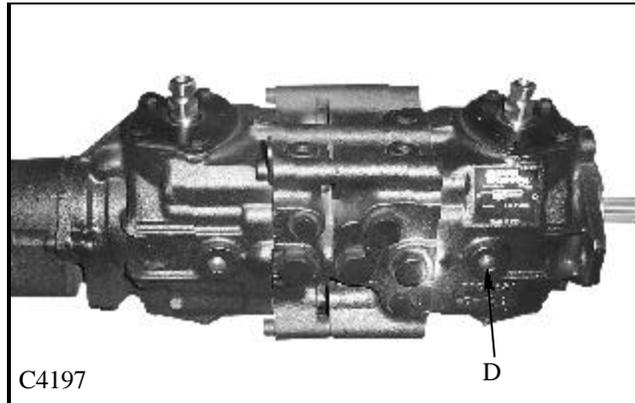
This start-up procedure must be made with the loader securely raised off the ground.

- 5 Disconnect the engine stop solenoid wiring, or remove the fuse connected to the red wire. (fig. C3872)
- 6 Turn the engine over by engaging the starter. Repeat this step, turning the engine over in 15 second interval, 5 or 6 times. This will fill the rest of the hydraulic hoses.
- 7 Reconnect the engine stop solenoid or replace the fuse.
- 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.
- 10 Replenish the hydraulic oil reservoir as required.
- 11 Start the engine and increase the RPM's to half throttle. Bring the hydraulic fluid up to operating temperature and make control adjustments as outline in Section 4.



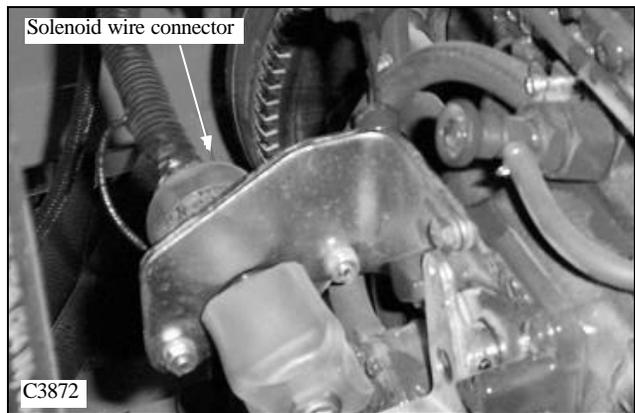
WARNING

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

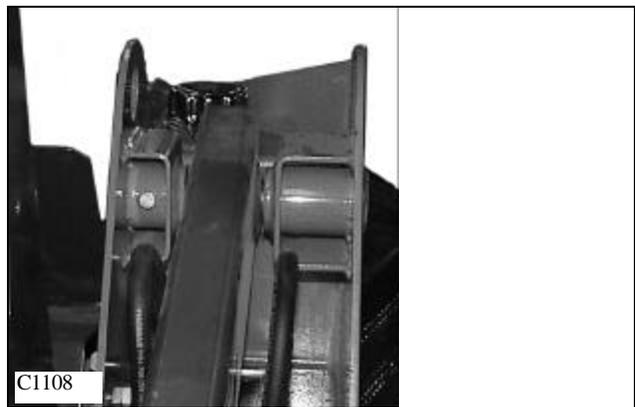


C4197

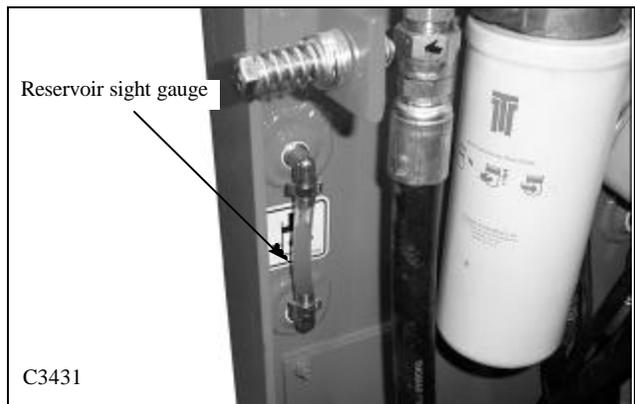
D



C3872



C1108



C3431

2

GEAR PUMP REPLACEMENT 2.8

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. C3428) 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 reinstalling.

3 Disconnect the hydraulic hoses from the gear pump. (fig. C3448) 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. C3449) 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.

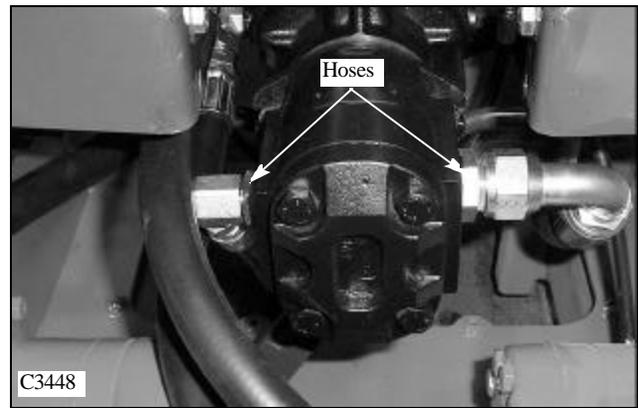
8 Check the fluid level in the hydraulic oil reservoir and replenish as required. (fig. C3431)

IMPORTANT

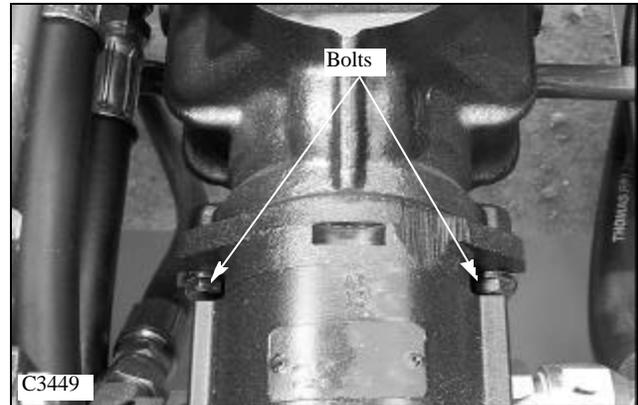
When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open lines and ports.



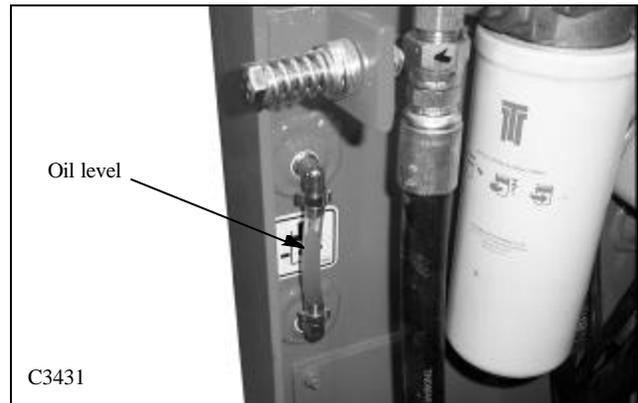
C3428



C3448



C3449



C3431

2

TANDEM PUMP REPLACEMENT 2.9

Begin the pump removal by removing 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

Shut off the engine.

- 1 Remove the seat and hydrostatic shield.
- 2 Remove the steering lever linkage. Refer to section 4 for removal and replacement information.
- 3 Remove the gear pump as outlined in section 2.9.
- 4 Disconnect all the hydraulic hoses. (fig. C3450)

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.

6 Loosen the forward lower mounting bolt on the tandem pump mounting bracket. (fig. C3451)

7 Remove the 2 bolts on the u-joint access panel (fig. C3453) to gain access to the rear mounting bolts for the tandem pump. Tip the top of the panel rearward and pull the panel forward to remove.

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.

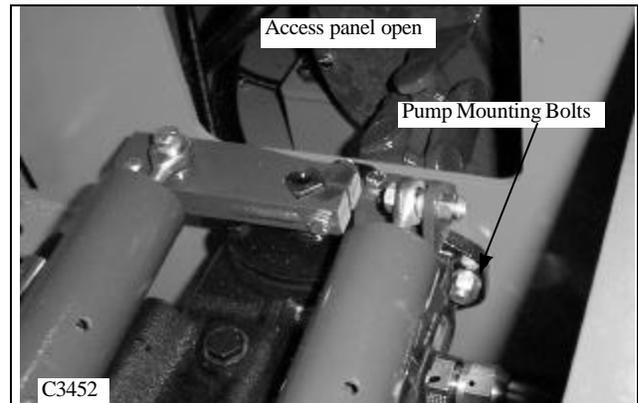
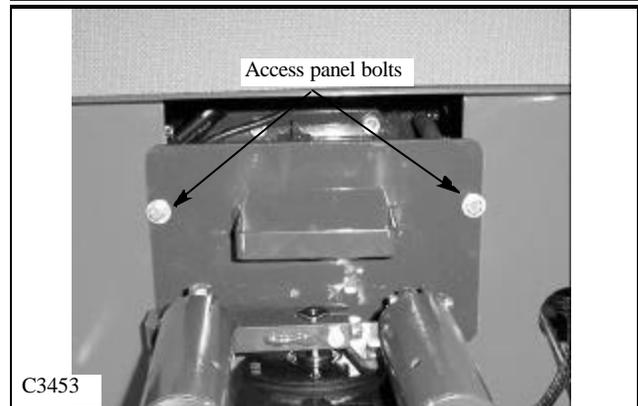
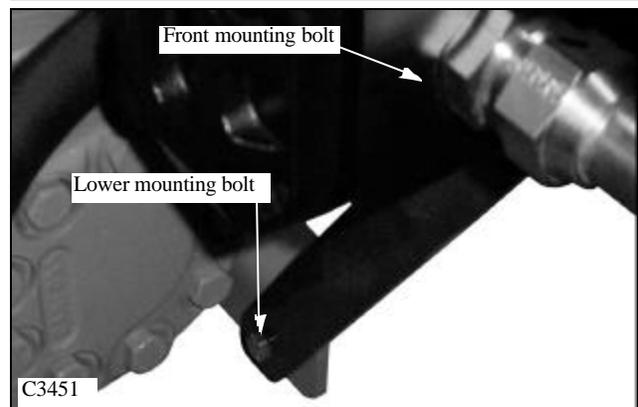
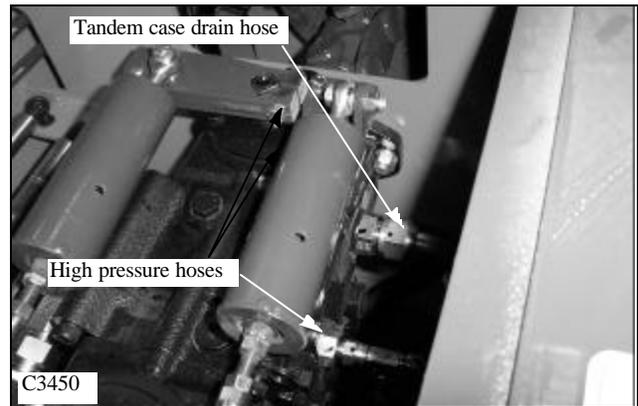
8 Attach a lifting device to the tandem pump. The pump is fairly heavy, approximately 80 lbs. (36 Kg) It is highly recommended to use a mechanical lifting device to assist removal of the tandem pump.

9 Remove the 2 rear mounting bolts by access through the u-joint access panel and remove the front mounting bracket. Remove tandem pump from the loader. (fig. C3452)



CAUTION

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



TANDEM PUMP REPLACEMENT 2.9

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 lower charge pressure inlet fitting to the tandem pump and attach the brake valve hose. (fig. C3478) Follow the torque chart on page 2 - 43.
- 3 Install the tandem pump to the loader.



WARNING

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

- 4 Line up the u-joint to the tandem pump input splined shaft as you guide the pump into it's mounting location. (fig. C3479)
- 5 Install the 2 rear mounting bolts.
- 6 Line up the front mounting brace holes and install the bolt. (fig. C3451)
- 7 Torque the 2 rear mounting bolts to 60 ft/lbs. (82 N.m.) Torque the front pump bracket mounting bolt to 50. (68 N.m.) Torque the front lower mounting bracket bolt to 20 to 25 ft/lbs. (32 N.m.) Remove the lifting device.

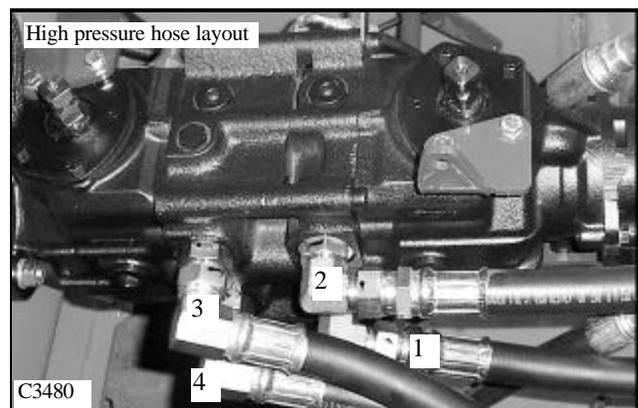
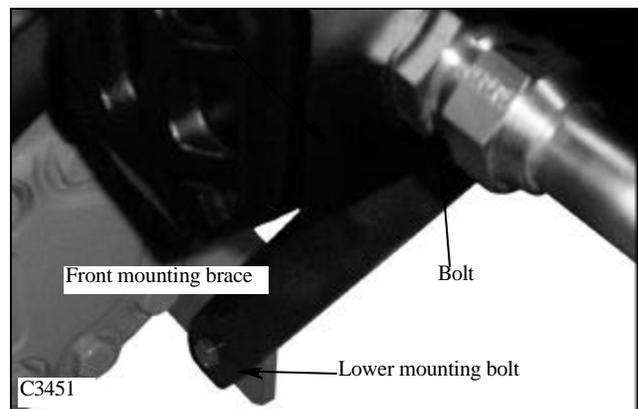
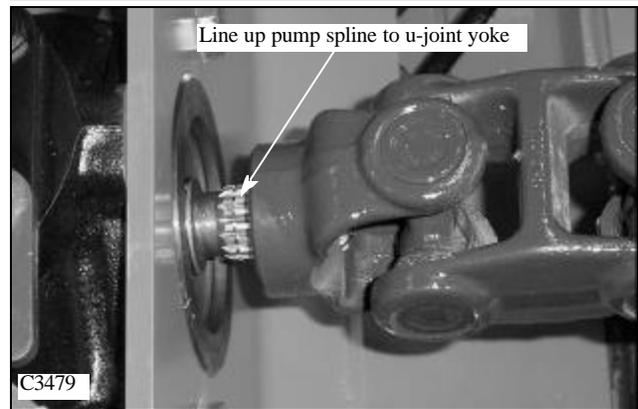
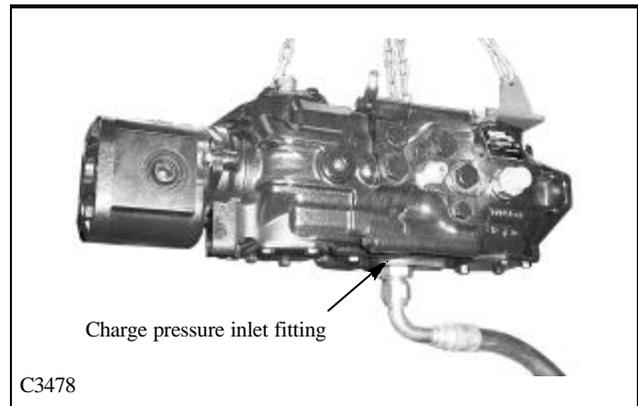
8 Connecting the 4 high pressure drive hoses and fittings to the tandem pump can only be accomplished in a certain sequence. (fig. C3480) Follow the Torque Chart in Section 2.13, page 2 - 43 when tightening fittings and hoses. If you have removed the hoses completely use the following pattern to reconnect:

- A Hose no. 4 connects to the bottom port of the right hand drive motor.
- B Hose no. 1 connects to the bottom port of the left hand drive motor.
- C Hose no. 2 connects to the top port of the left hand drive motor.
- D. Hose no. 3 connects to the top port of the right hand drive motor.

9 Connect the charge inlet hose from the oil filter to the tandem pump. Torque the fittings and hoses according to the Torque Chart in Section 2.13 page 2 - 43.

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



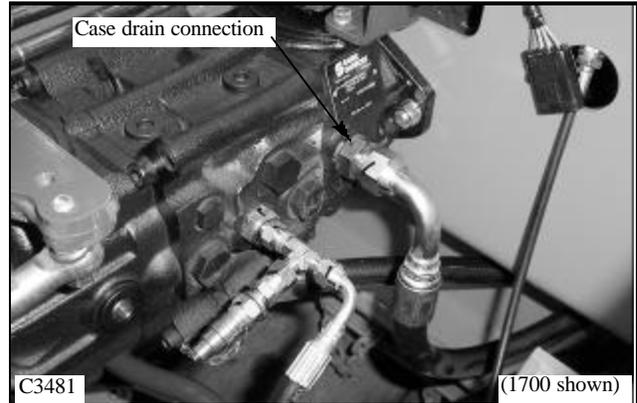
TANDEM PUMP REPLACEMENT 2.9

10 Connect the tandem pump case drain fitting and hose. Torque the fittings and hoses to the specifications listed in the Torque Chart in Section 2.13 page 2 - 43.

2

IMPORTANT

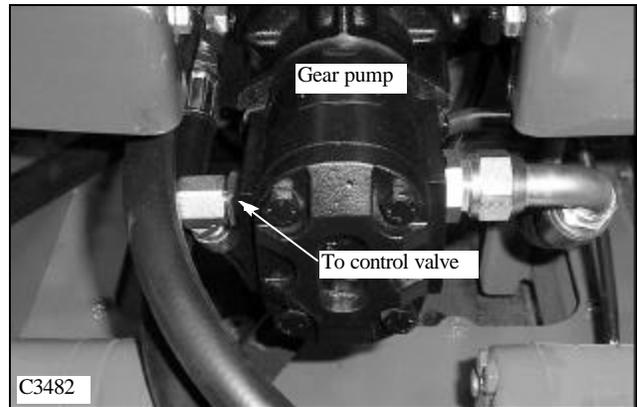
When making repairs to the hydraulic system, keep the work area and parts clean. Use caps and plugs on all open line and ports.



11 Connect the auxiliary gear pump outlet fittings and hoses to the gear pump. (fig. C3482) Follow the Torque Chart in Section 2.13 page 2 - 43 when tightening fittings and hoses.

IMPORTANT

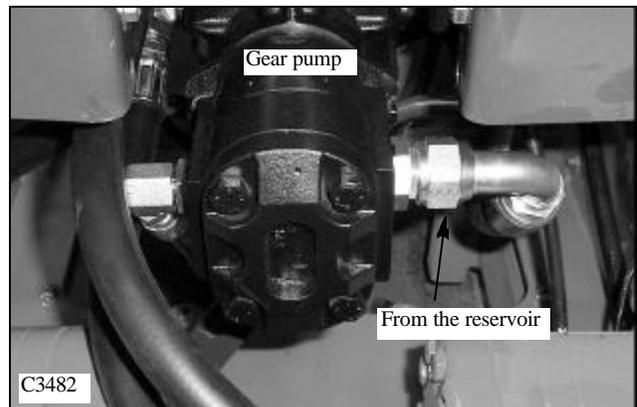
Inspect fitting o-rings and flares for marks or damage. Replace if necessary.



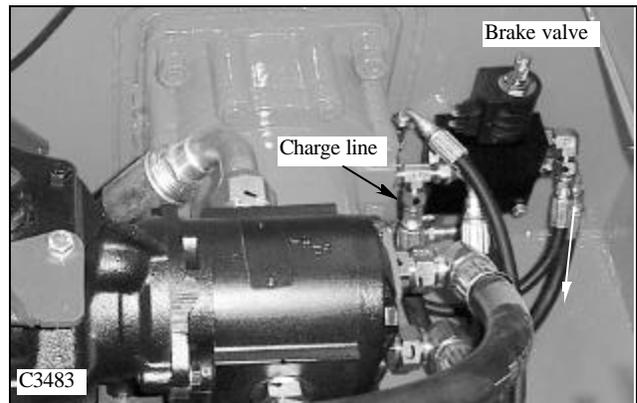
12 Connect the inlet fitting and hose to the auxiliary gear pump. (fig. C3482) Torque the fittings and hoses to the specifications listed in the Torque Chart Section 2.13.

IMPORTANT

Follow the Torque Chart In Section 2.13 when tightening fittings and hoses.



13 Connect the charge pressure outlet line from the tandem pump to the hydraulic brake valve. (fig. C3483)



TANDEM PUMP REPLACEMENT 2.9

14 Reinstall the steering control linkages and locks as outlined in Section 4. and install access cover with 2 bolts. (fig. C3485)

IMPORTANT

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

- 15 Fill the hydraulic oil reservoir to the proper level.
16 Follow the start up procedure outlined in section 2.8 before attempting to start the loader.
17 The start up must be made with the loader raised securely from the ground. Changing the pumps and the steering control linkages has affected the neutral adjustment. Failure to raise the loader clear of the ground may result in the loader engaging in motion and possibly causing serious injury.



WARNING

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

18 Start the loader and check for leaks. Make repairs as necessary and replenish the hydraulic oil reservoir (fig. C1108, C3431). Never use your hands to check for hydraulic leaks.



WARNING

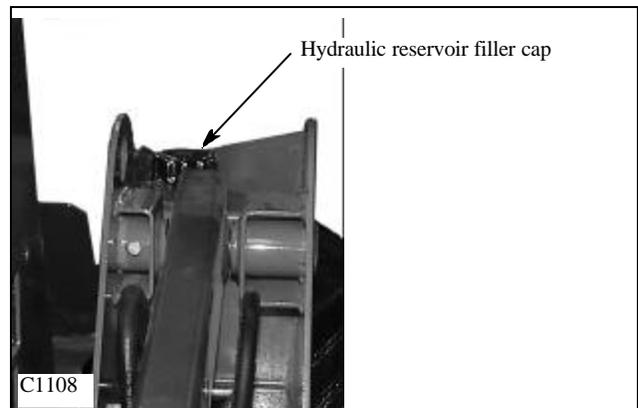
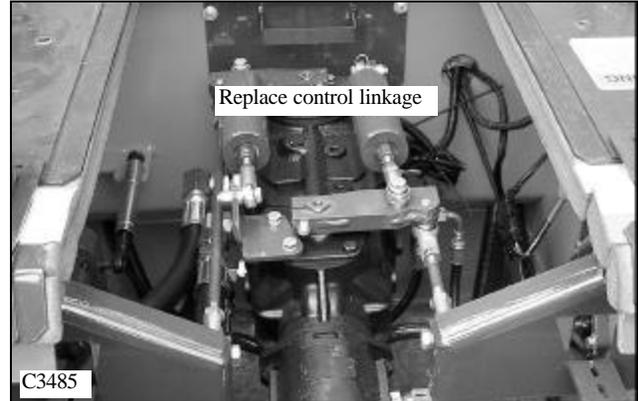
To prevent personal injury never make repairs to the hydraulic system while the engine is operating.

19 Make adjustments to the steering controls, steering locks, and restraint bar cables as required. Follow the procedures for control adjustments in Section 4



WARNING

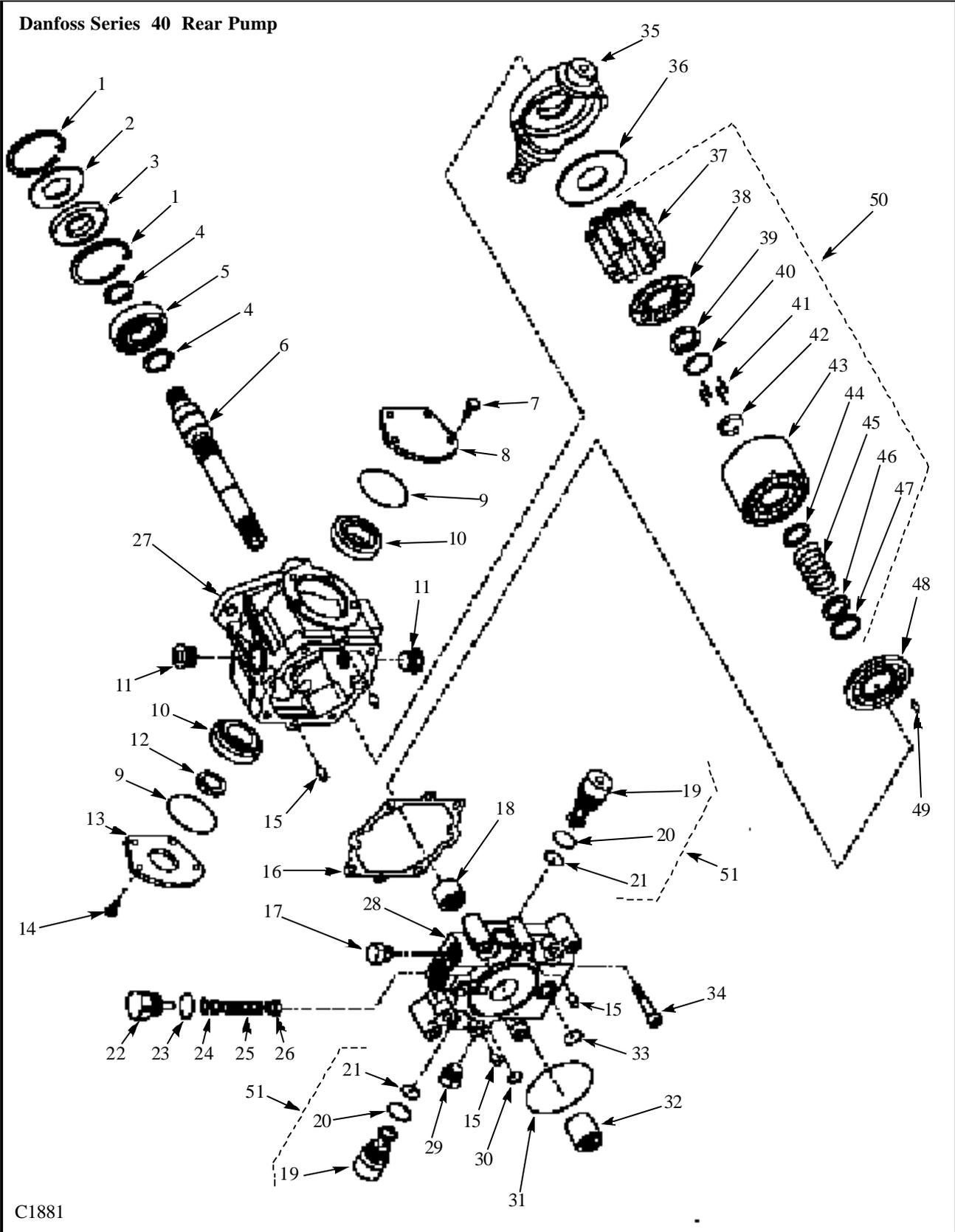
Use caution when dealing with hydraulic fluid under pressure. Escaping fluid under pressure can penetrate the skin and cause serious injury.



2

TANDEM PUMP PARTS DIAGRAM 2.10

2



—TANDEM PUMP PARTS DIAGRAM 2.11—

Rear Pump Diagram C1881 Index

1. Retaining ring
2. Seal support washer
3. Input seal
4. Retaining ring
5. Bearing
6. Drive shaft
7. Bolt
8. Cover
9. O-ring seal
10. Bearing
11. Plug
12. Swashplate seal
13. Swashplate cover
14. Bolt
15. Dowel pin
16. Gasket
17. Plug
18. Bearing
19. Relief valve
20. O-ring seal
21. O-ring seal
22. Charge relief plug
23. O-ring seal
24. Charge relief shims
25. Charge relief spring
26. Charge relief poppet
27. Pump housing
28. End cap
29. Plug
30. O-ring seal
31. O-ring seal
32. Coupler
33. O-ring seal
34. Screw
35. Swashplate
36. Thrust plate
37. Piston assembly
38. Slipper retainer
39. Slipper retainer guide
40. Special washer
41. Slipper hold down pins
42. Hold down pin retainer
43. Cylinder block
44. Washer
45. Spring
46. Washer
47. Retaining ring
48. Valve plate
49. Spring pin
50. Cylinder block kit
51. Relief valve kit

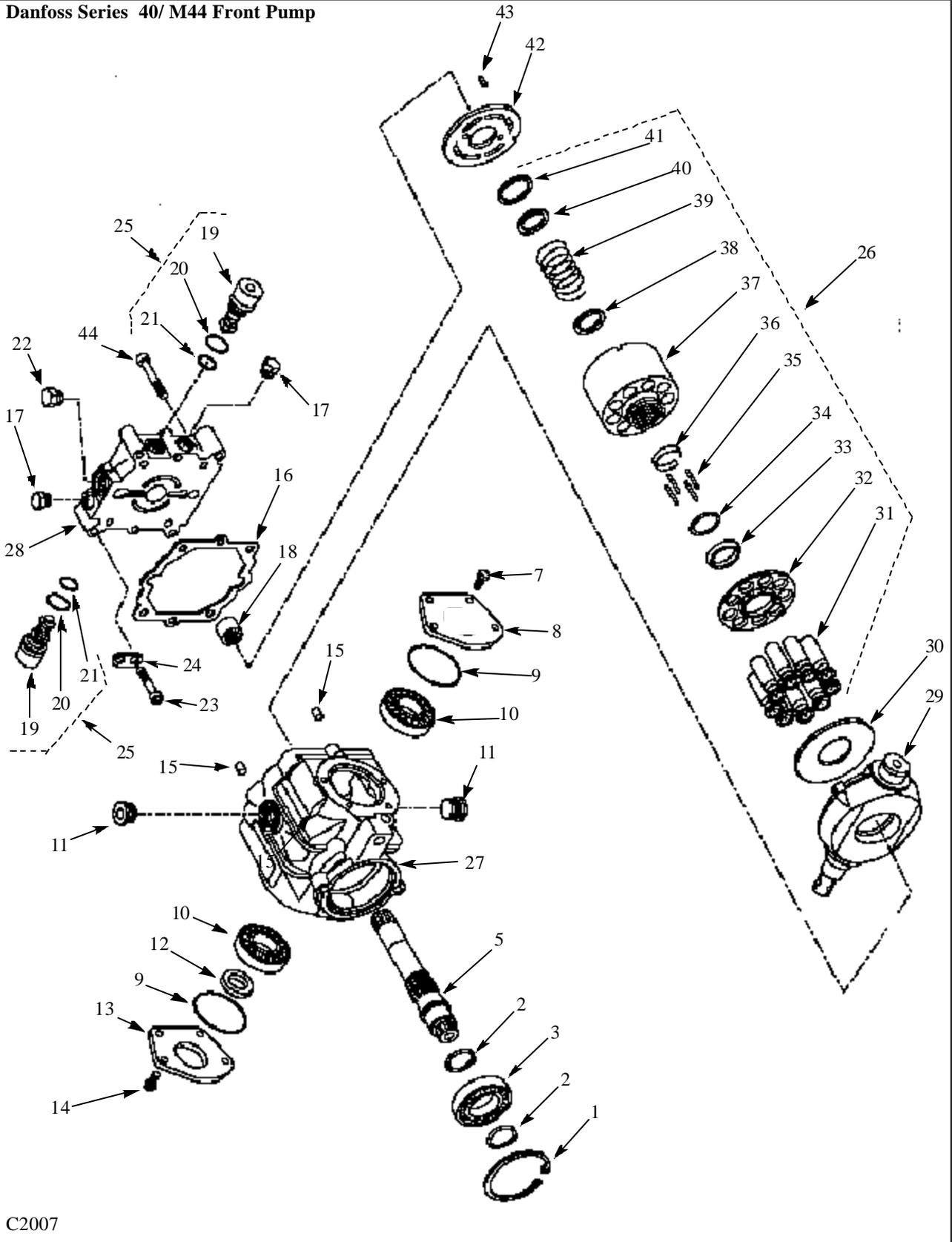
**For further service instructions refer to a Sauer
Danfoss Dealer and request a Service / Repair Manual
#BLN 9992**



TANDEM PUMP PARTS DIAGRAM 2.10

2

Danfoss Series 40/ M44 Front Pump



C2007

—TANDEM PUMP PARTS DIAGRAM 2.10—

Front Pump Diagram C2007 Index

1. Retaining ring
2. Seal support washer
3. Input seal
4. Retaining ring
5. Bearing
6. Drive shaft
7. Bolt
8. Cover
9. O-ring seal
10. Bearing
11. Plug
12. Swashplate seal
13. Swashplate cover
14. Bolt
15. Dowel pin
16. Gasket
17. Plug
18. Bearing
19. Relief valve
20. O-ring seal
21. O-ring seal
22. Plug
23. Screw
24. Bracket
25. Relief valve kit
26. Cylinder block kit
27. Pump housing
28. End cap
29. Swashplate
30. Thrust plate
31. Piston assembly
32. Slipper retainer
33. Slipper retainer guide
34. Special washer
35. Slipper hold down pins
36. Hold down pin retainer
37. Cylinder block
38. Washer
39. Spring
40. Washer
41. Retaining ring
42. Valve plate
43. Spring pin

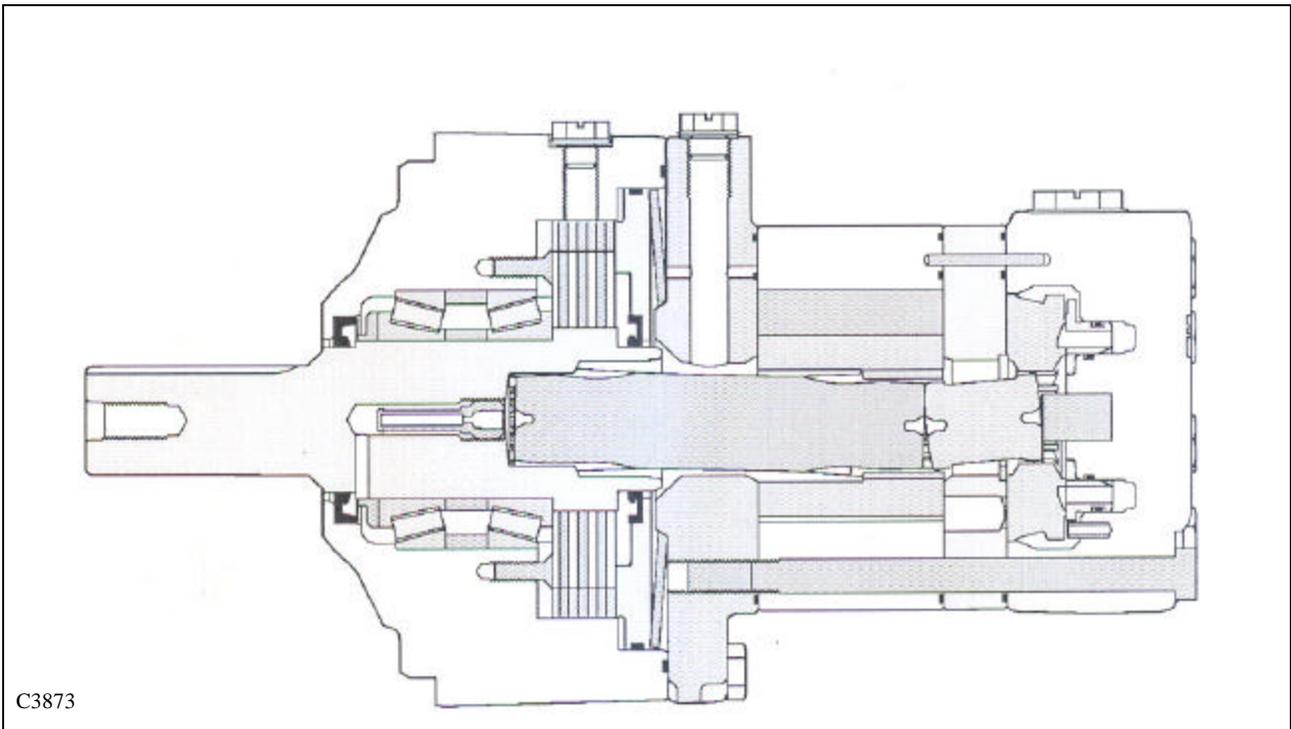
**For further service instructions refer to a Sauer
Danfoss Dealer and request a Service / Repair Manual
#9992**



DRIVE MOTOR 2.11

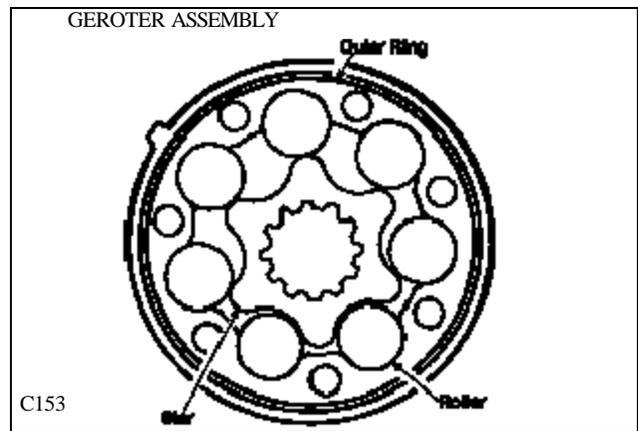
General Information

2

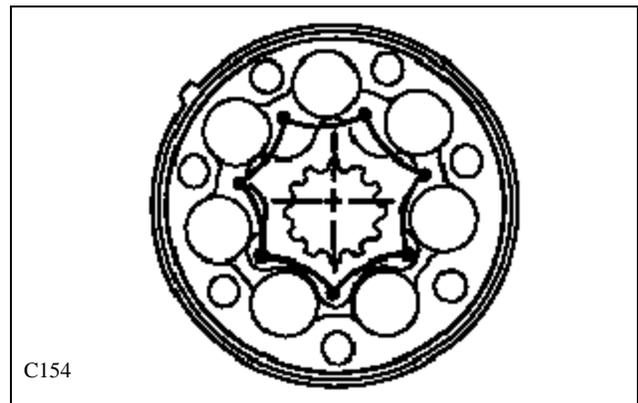


The basic geroter design uses a combination of mechanical and hydraulic principles that are utilized in the high torque, low speed motors.

The outer ring (fig. C153) of the geroter 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)

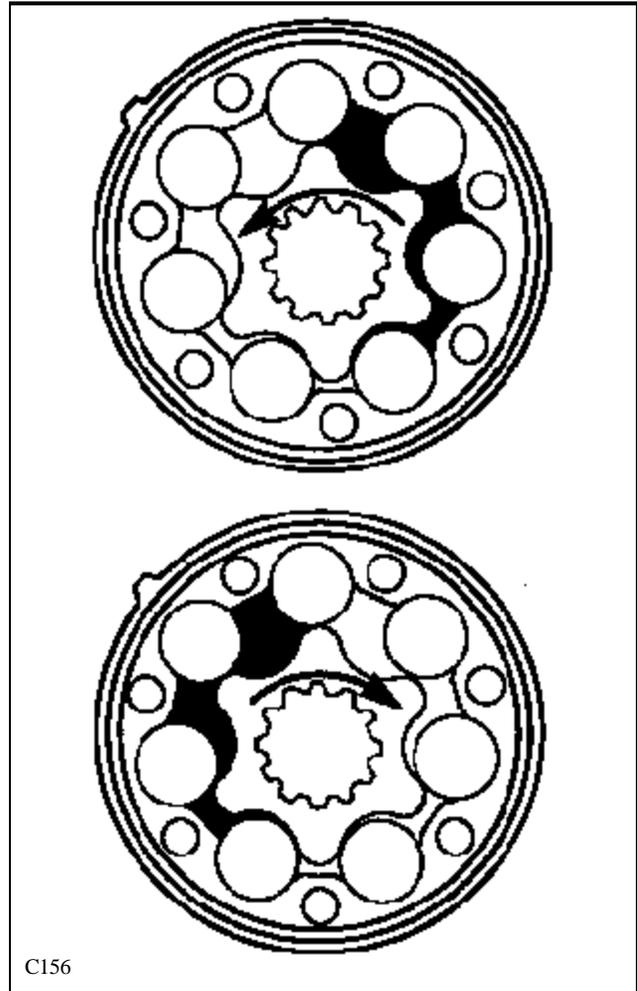


DRIVE MOTOR 2.11

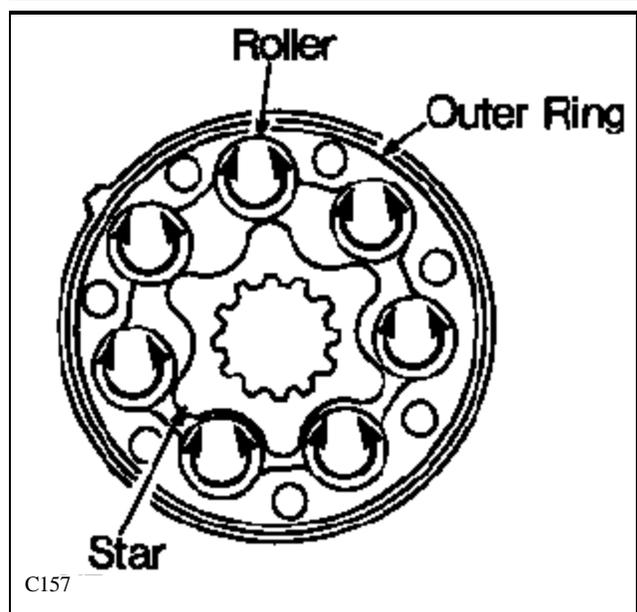
A drive shaft is used to transmit the rotation of the star to the output shaft. The drive shaft has crowned external splines to match the internal splines in the star and output shaft. This type of drive is used because the star center line continuously changes during rotation.

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.

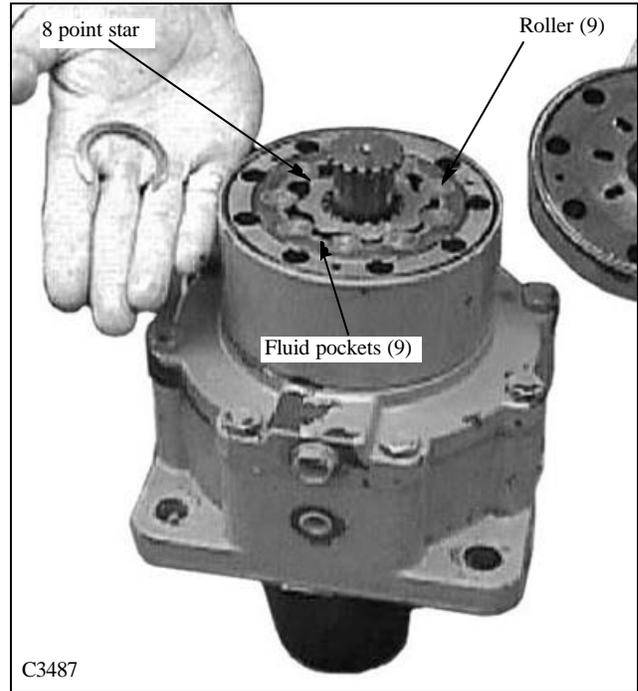


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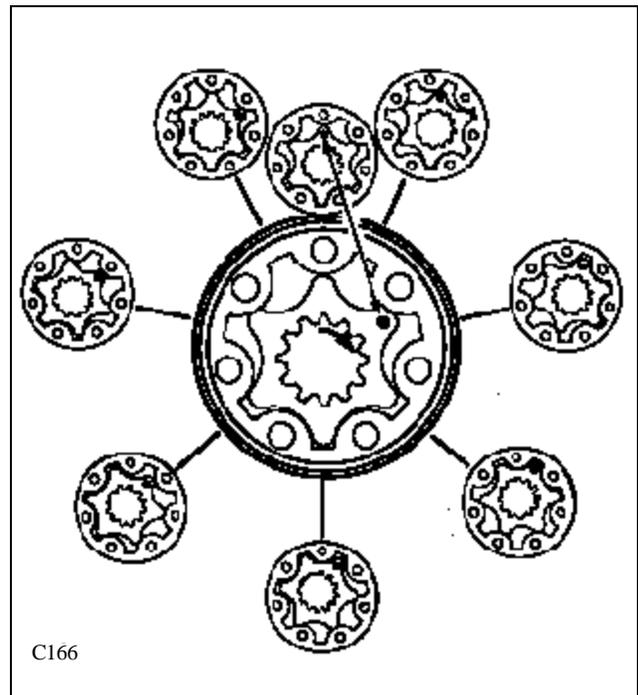
DRIVE MOTOR 2.11

The geroter (fig. C3487), is both a fluid displacement motor and a gear reducer. It provides 8 times (the number of star points) greater power per revolution than a gear, vane or piston type motor. This means that 8 times the greater torque can be developed at one eighth the speed without further gear reduction.

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.**

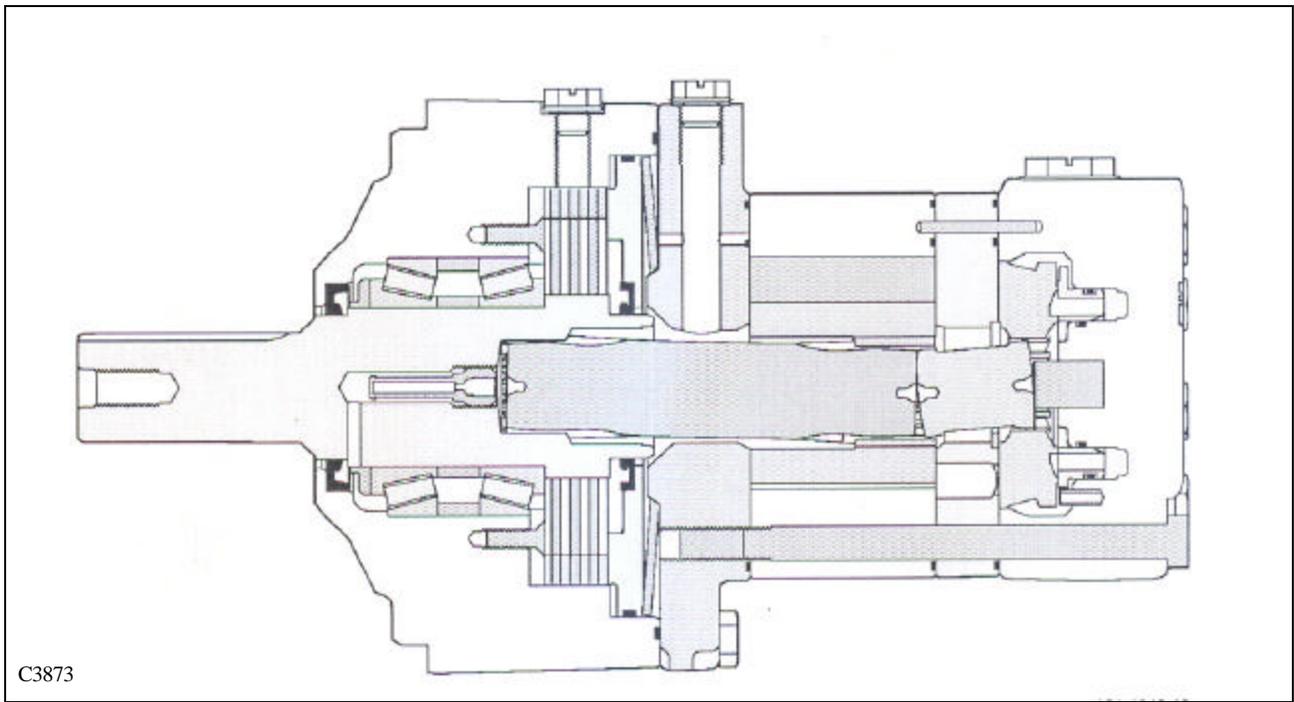
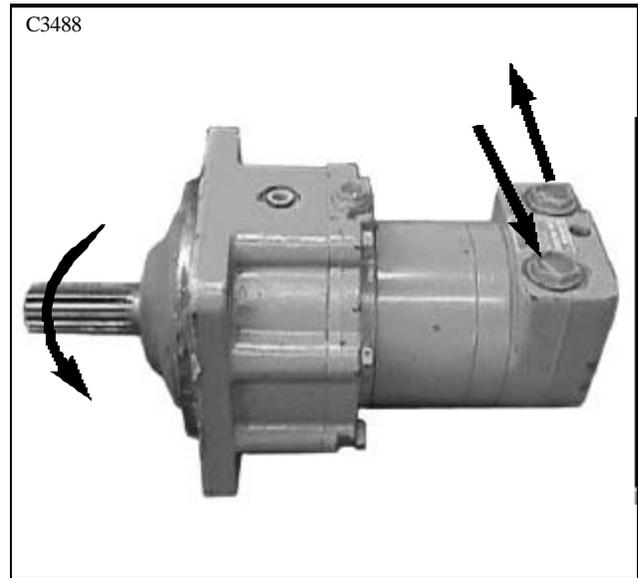


DRIVE MOTOR 2.11

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.



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 geroter pockets causing the rotor star to turn.

As the rotor star rotates, and each fluid pocket reaches its full open position, the return porting in the rotating disc

valve opens to allow the fluid in the pocket area to pass back through the valve plate, disc valve, balance plate and out through the housing return port, as the pocket closes.

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

DRIVE MOTOR 2.11

Removal

2

- 1 Remove any attachment, raise the boom arms and engage the boom support pins.
- 2 Raise the loader securely off the ground.
- 3 Remove the wheels on the side to be repaired.
- 4 Drain the oil from the final drive housing. Be prepared to contain approximately 17 litres (4.5 gal) of fluid. (fig. C1888)



WARNING

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

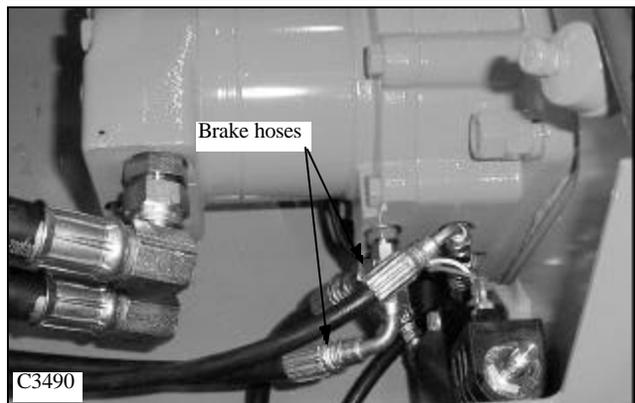
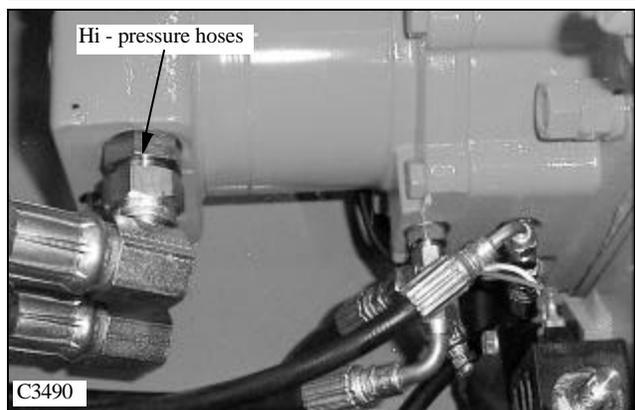
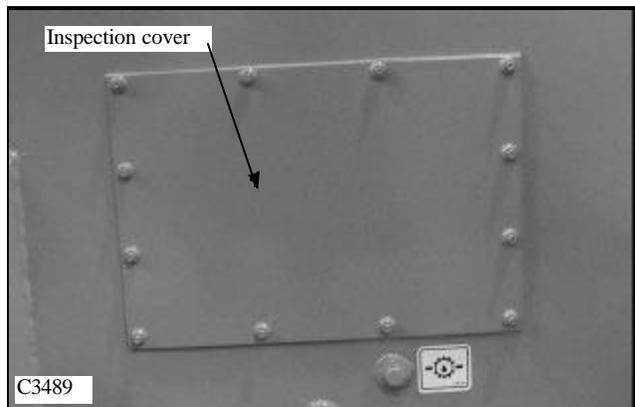
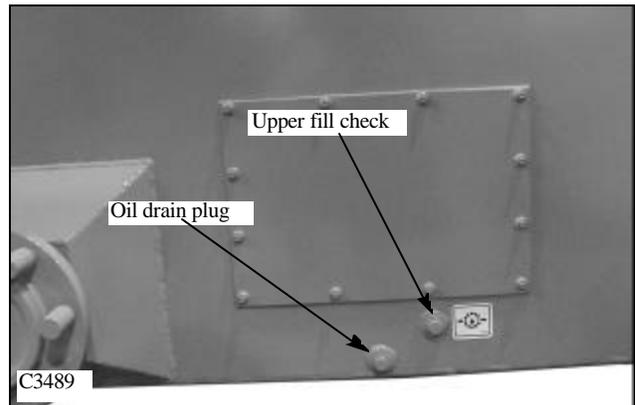
- 5 Remove the seat and hydrostatic shield.
- 6 Remove the final drive inspection cover located between the axles of the final drive housing.(fig. C3489)
- 7 Disconnect the chain as outlined in Section 3.

- 8 Remove the 2 high pressure hoses from the drive motor. (fig. C3490) Cap the open hose ends and fittings to prevent contamination.

IMPORTANT

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

- 9 Disconnect the 2 brake line hoses and cap the hoses and adapter fittings in the drive motor. (fig. C3490)
- 10 Remove the adapter fittings from the drive motor. Plug the open ports in the drive motor to prevent contamination.



DRIVE MOTOR 2.11

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. C3491) Hold the head of the bolts from inside the final drive housing. (fig. C3492)

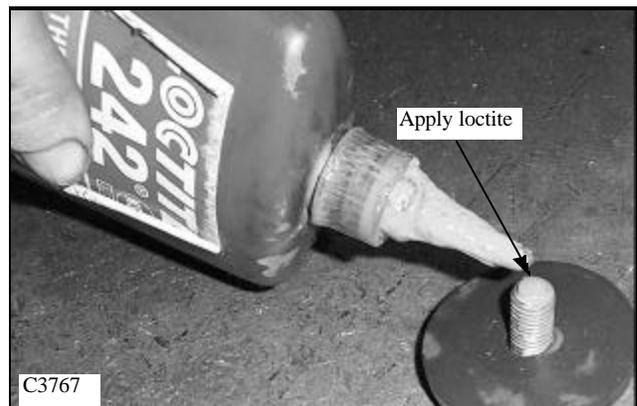
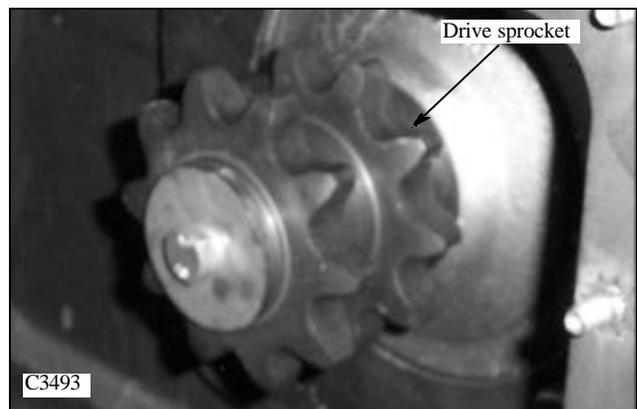
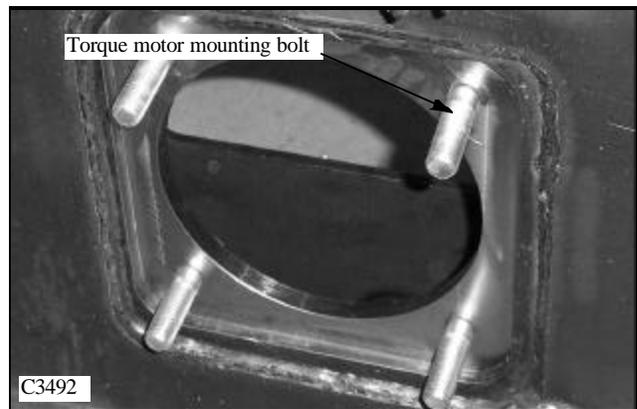
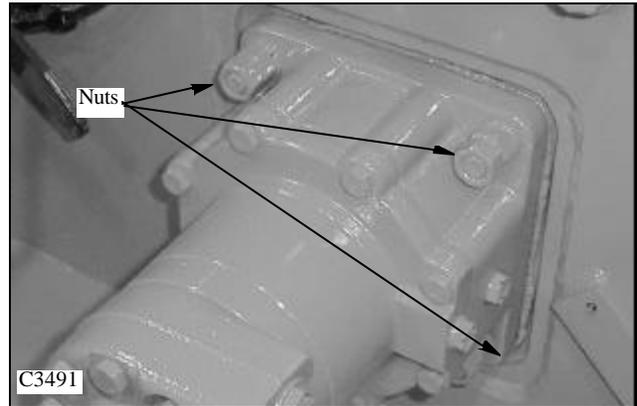
13 Remove the drive motor. Seal the drive motor with silicone upon reassembly.

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

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

16 If you are installing a new drive motor, remove the drive motor sprocket and bolt if you wish to reuse the sprocket. (fig. C3493)

17 Install the sprocket, machined washer, lock washer and bolt. Apply Loctite 242 (blue) to the threads of the bolt before torquing (fig. C3767) and torque the bolt to 40 lbs / ft. (54 nm).



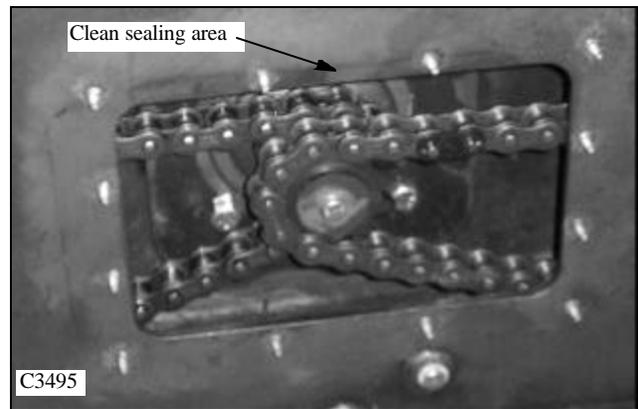
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DRIVE MOTOR 2.11

Replacement

1 Clean the mounting areas thoroughly that need to be sealed with silicone. (fig. C3494, C3495)

2

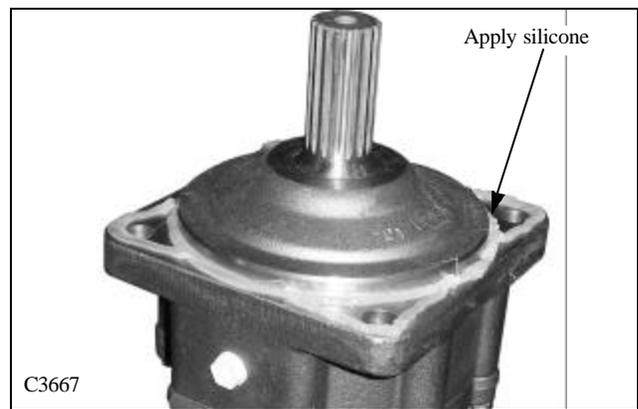


2 Apply a bead 1/4 of an inch thick around the drive motor bearing retainer and around each mounting hole. (fig. C3667)

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

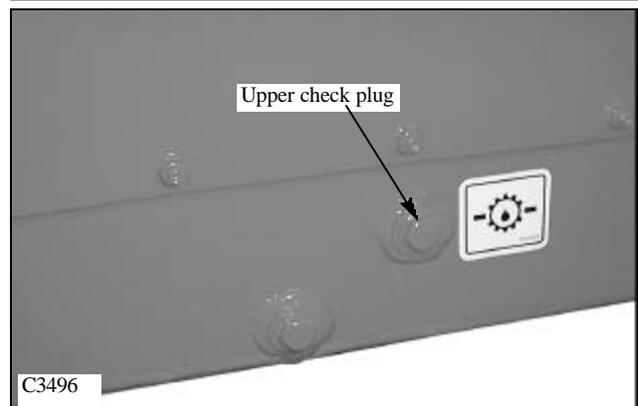
4 Install the 4 bolts, lockwashers and mounting nuts and torque to 80 lbs / ft. (115 nm.)

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



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

7 Add oil to the final drive housing until it trickles out the upper check plug hole. This will require approximately 17 litres (4.5 gal) of 10w30 API SJ (fig. C3496)



DRIVE MOTOR 2.11

IMPORTANT

Refer to the torque chart in Section 2.13 when tightening hydraulic hoses and fittings

IMPORTANT

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

- 8 Install the adapter fittings to the drive motor.
- 9 Install the brake lines to the drive motor. (fig. C3490)



WARNING

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

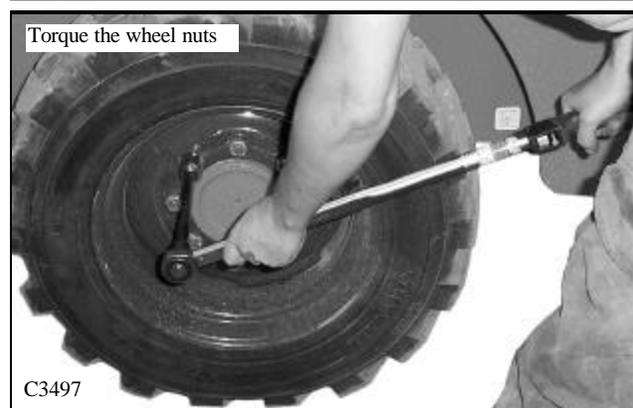
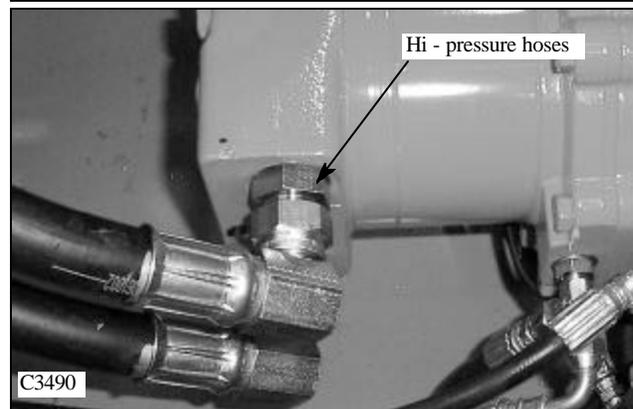
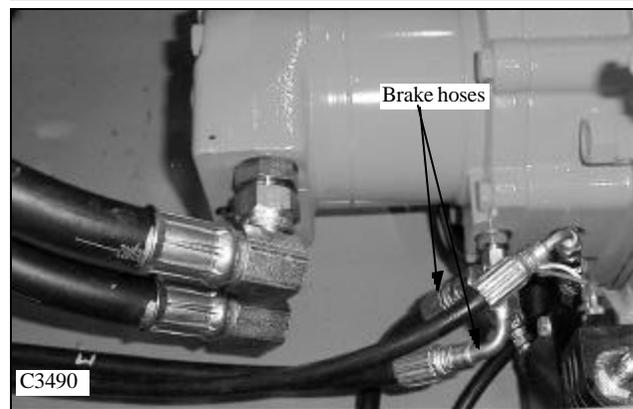
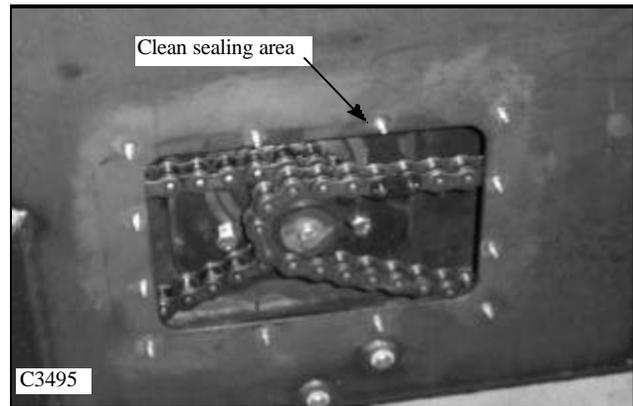
- 10 Install the high pressure drive hoses. (fig. C3490)
- 11 Clean the final drive housing and inspection cover thoroughly before applying silicone sealant. (fig. C3495)
- 12 Install the inspection cover. When installing the nuts, do not over tighten. The mounting torque should not exceed 11 lbs / ft. (15 N.m.)
- 14 Start the engine and check for hydraulic leaks. Do not use your hands to trace hydraulic leaks. Shut off the engine and inspect each fitting for proper torque.



WARNING

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

- 15 Install the wheels and torque the nuts at 100 to 110 lbs / ft. (136 to 149 nm.)(fig. C3497)
- 16 Install shields and seat, let loader down to ground and test drive to check performance.



2

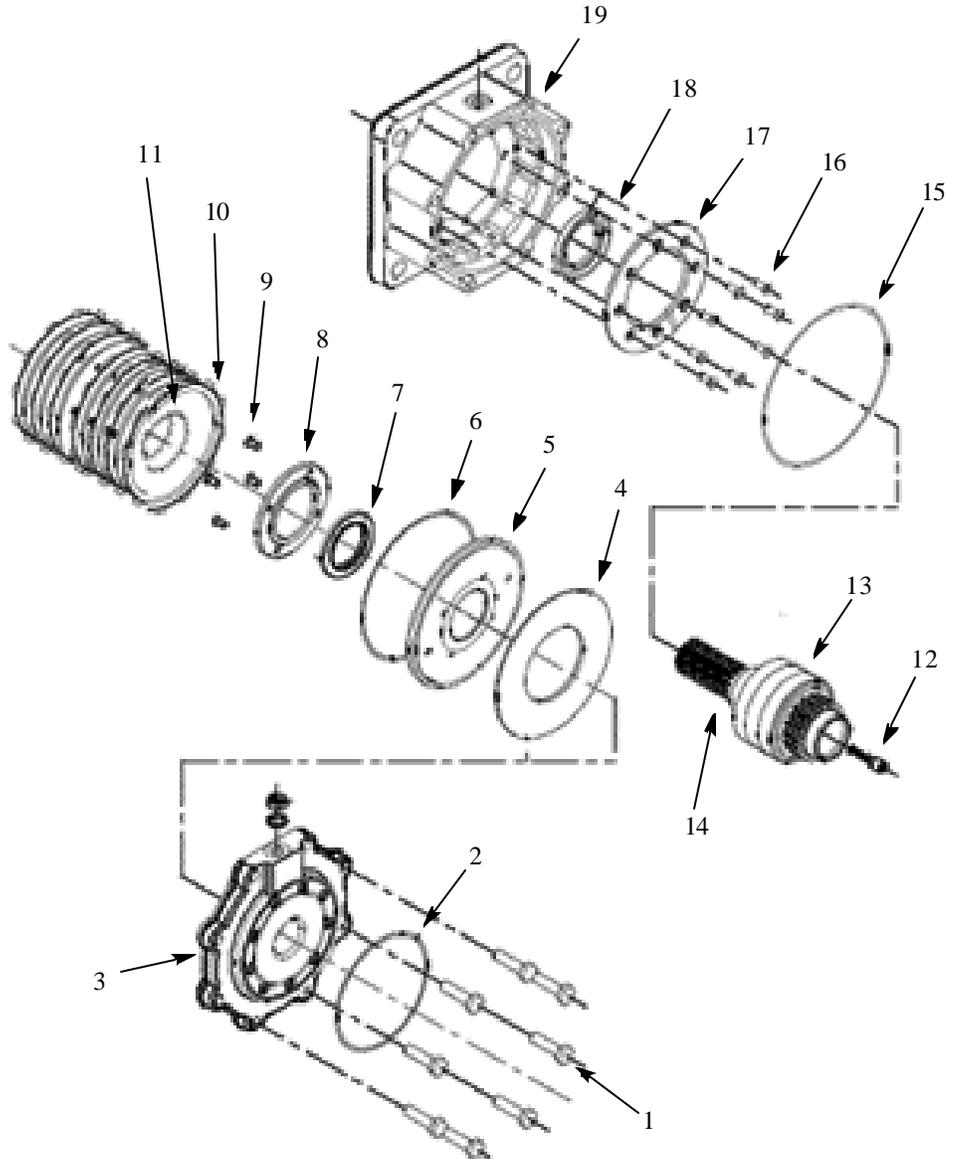
DRIVE MOTOR 2.12

Parts Illustration

C4169

TMT 500 FLV

1. Screws
2. O Ring
3. Bearing Housing
4. Spring Plate
5. Piston
6. O Ring
7. Spacer Disc
8. Shaft Bearing Retainer
9. Screws
10. Outer Brake Disc
11. Inner Brake Disc
12. Screw
13. Bearing
14. Splined shaft
15. O ring
16. Screws
17. Retaining ring
18. Shaft Seal
19. Bearing Housing



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 2.11

Disassembly

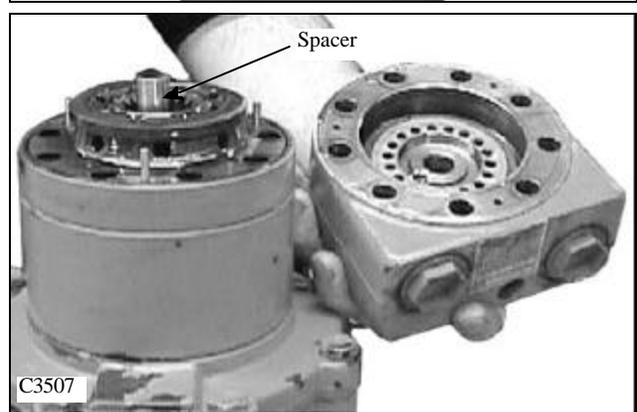
1 Stand unit on end and use a collar or vice to support shaft. (fig. C3505)

2

2 Alternate the removal of each bolt (9) as the balance plate will un-spring when the final bolt is removed. (fig. C3506)

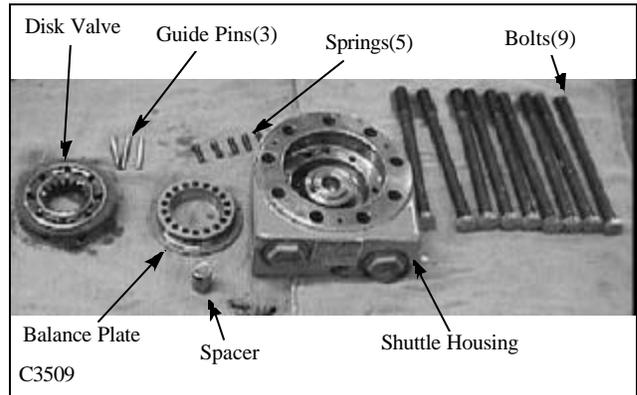
3 Lift off the end cover and note that the spacer may still be in the balance plate or on top of the drive shaft. (fig. C3507)

4 On a metal surface, hit the valve housing on the side to release the balance plate and springs. (fig. C3508)

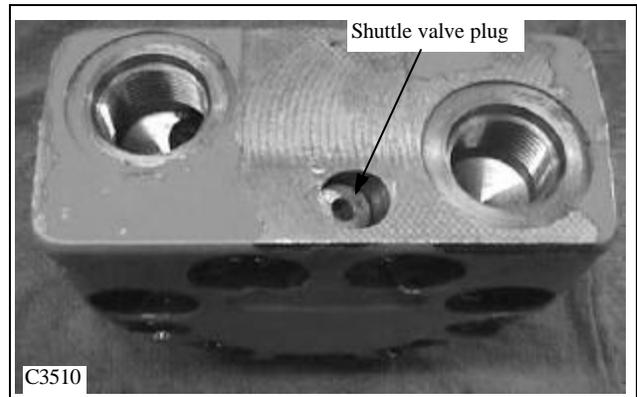


DRIVE MOTOR 2.11

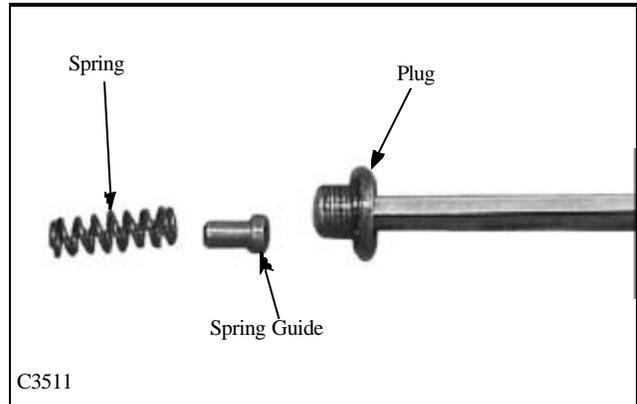
Disassembly (cont'd)



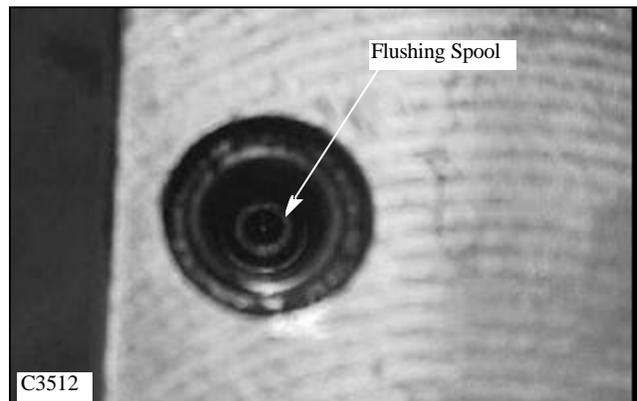
5 Use a 6mm Allen key to remove the flushing valve plug. (fig. C3510)



6 Below the plug, the spring guide and the spring are easily removed. (fig. C3511)



7 The flushing spool is deep within the housing and is very difficult to remove with a magnet. A pair of long thin pliers works much better. (fig. C3512)



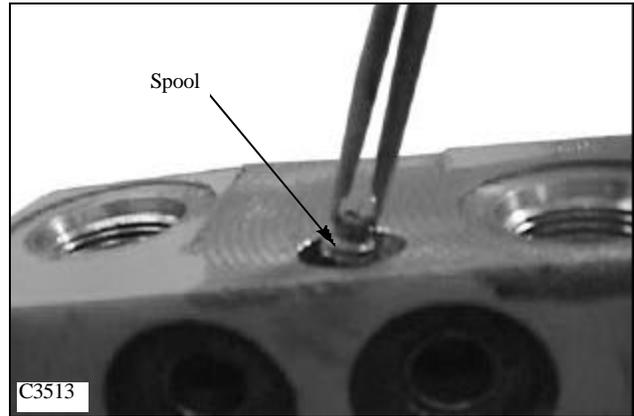
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DRIVE MOTOR 2.11

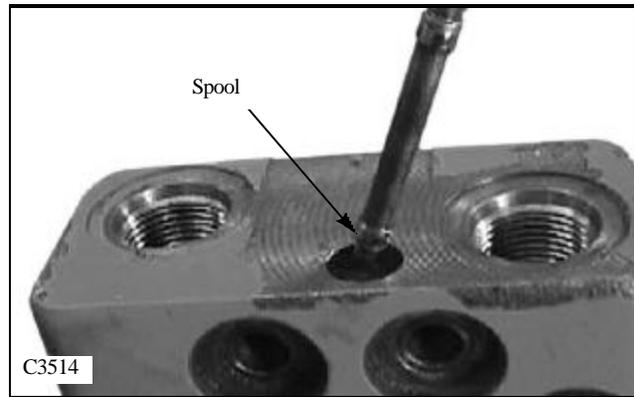
Disassembly (cont'd)

8 Carefully remove spool from the housing to avoid scoring. (fig. C3513)

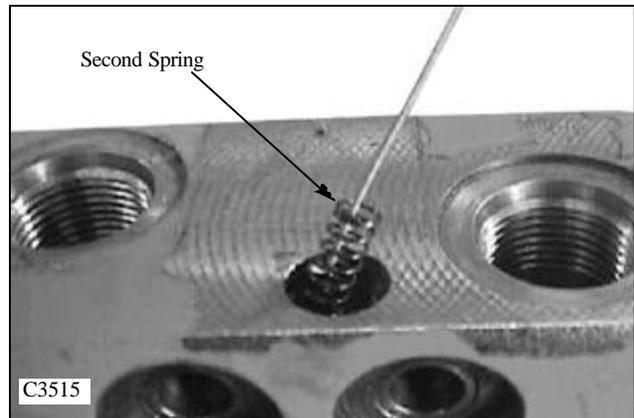
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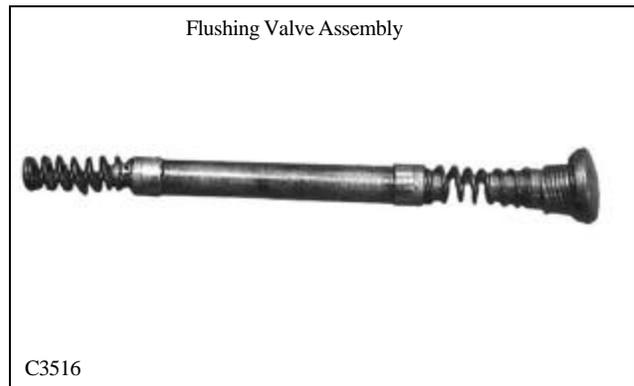
9 Remember that the spool is set at an angle within the housing. (fig. C3514)



10 The second spring is deep within the housing. It is not necessary to remove this spring unless it is suspected of failure. (fig. C3515)



11 The complete flushing valve assembly. Carefully examine prior to reinstalling into housing. (fig. C3516)

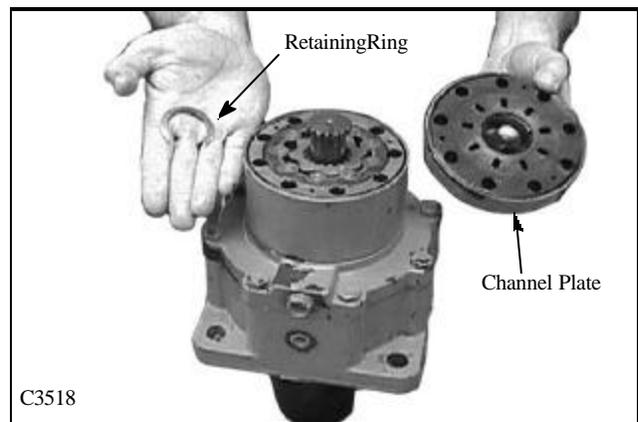
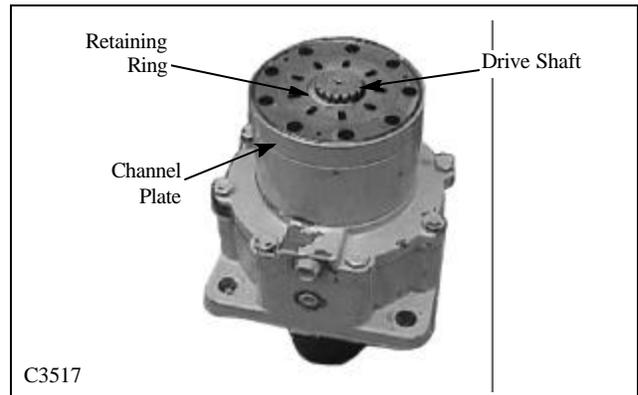


DRIVE MOTOR 2.11

Disassembly (cont'd)

12 Remove the retaining ring, then the channel plate, and then lift off the drive shaft which will then expose the gearwheel and the Cardon shaft. (fig. C3518)

13 With the drive section removed, loosen the eight (8) brake cover screws and lift off the housing to expose the "spring" plate. (fig. C3525, C3526)



2

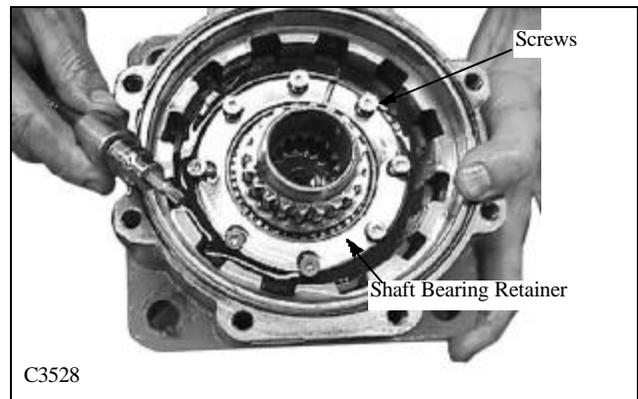
DRIVE MOTOR 2.11

Disassembly (cont'd)

14 With the piston removed, the unit can be turned upside-down to remove the excess oil and the brake disks (inner and outer). (fig. C3527)



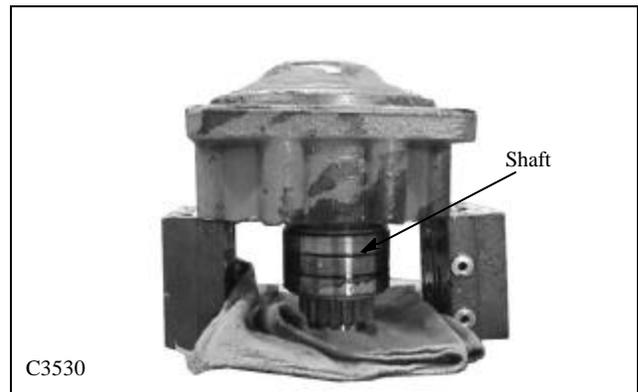
15 With the brake disks removed it exposes the shaft bearing retainer. Remove the eight (8) screws with a Torx driver. (fig. C3528)



16 Turn the bearing housing and shaft upside-down and hammer out the output shaft. (fig. C3529)



17 At this point the shaft should drop straight downwards. The shaft seal can now be removed and replaced. It can not be removed in any other way. (fig. C3530)

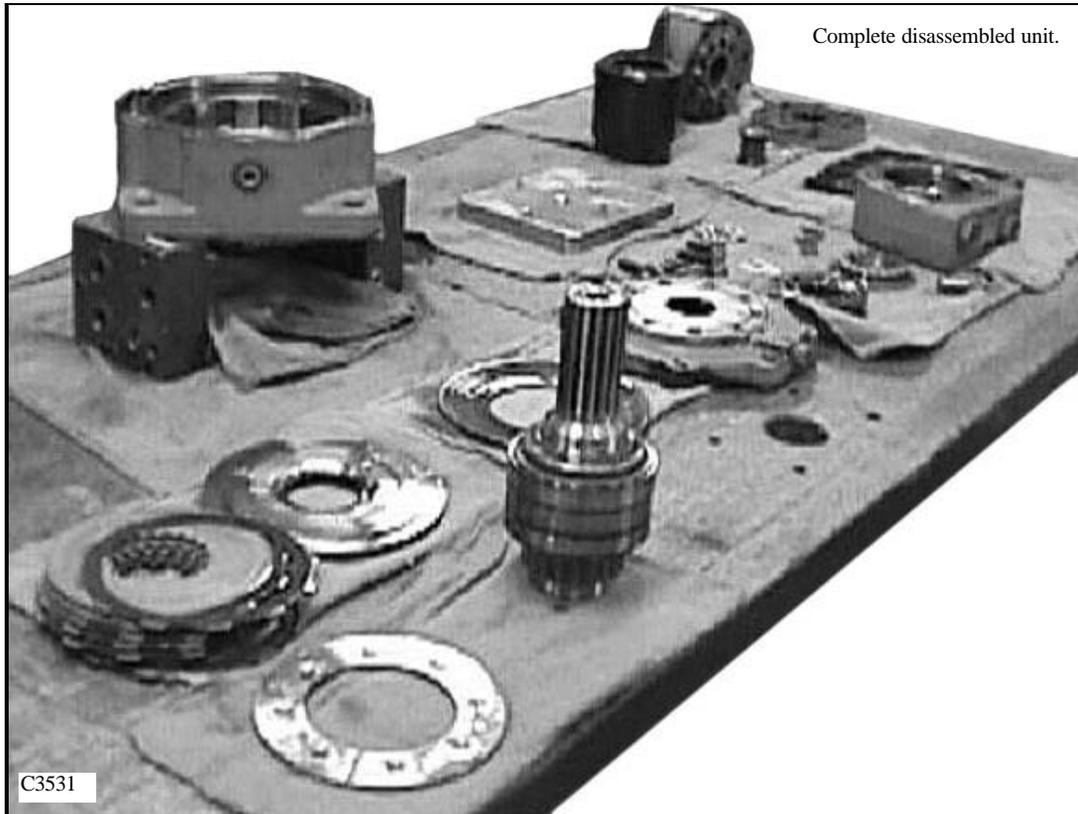


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DRIVE MOTOR 2.11

Disassembly (cont'd)

18 Complete disassembled unit. (fig. C3531)



2

DRIVE MOTOR 2.11

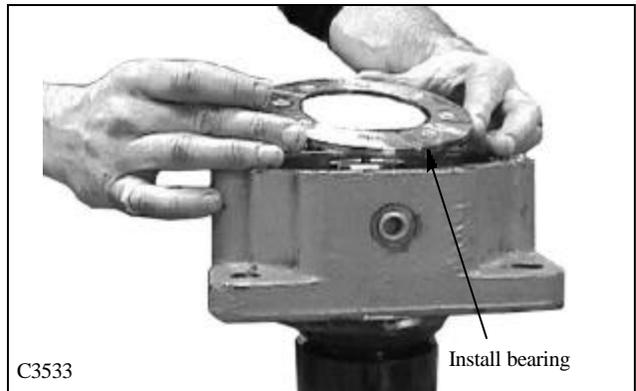
Assembly

2

1 The re-assembly of the motor is done opposite of the disassembly. Support the housing and install the output shaft and bearing assembly. (fig. C3532).



2 Install bearing retaining ring and tighten with Torx drive to 7ft/lbs. (fig. C3533)



3 Alternate installation of brake disks, first putting in the outer disk (golden color) and then the inner disk (silver color). (fig. 3534)



4 Install the piston after all of the disks have been inserted. There will be air trapped, but this will escape when the spring and cover are installed. (fig. C3535)

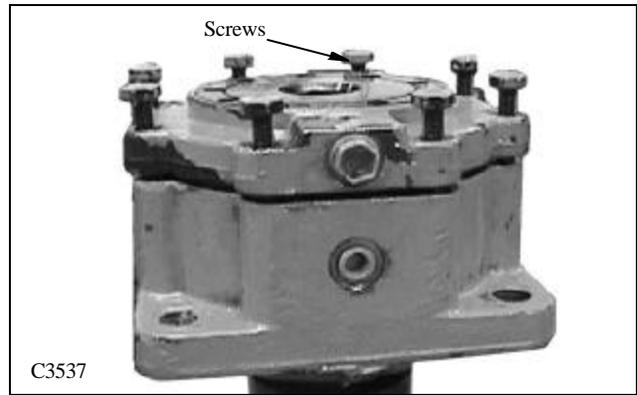


DRIVE MOTOR 2.11

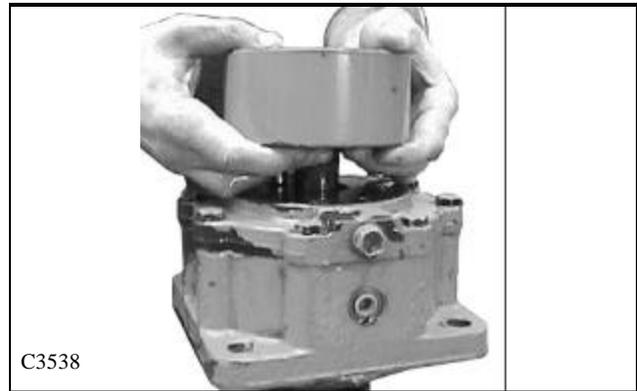
5 Install spring plate (fig. C3536)



6 Install brake cover and cross tighten all screws to final torque specification of 65ft/lbs. (fig. C3537)

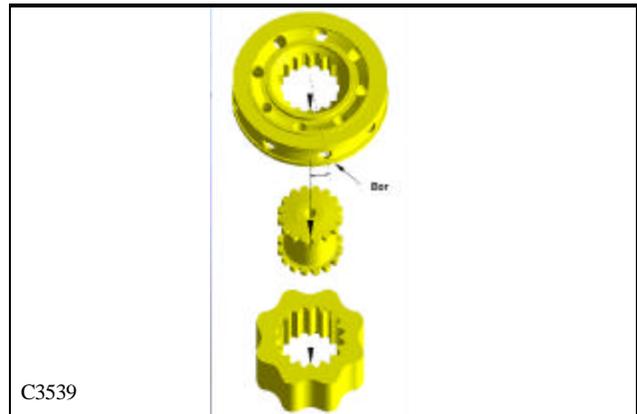


7 Install Cardon shaft and gearwheel. (fig. C3538)



8 With the gearwheel mounted and the cardon shaft in place, place the drive gear valley to valley with the gear-wheel. Mount the channel plate (ensuring the drain holes are aligned) and then valve drive it 15° counter clockwise (one tooth). Then mount the valve housing and re-install the bolts. (fig. C3539).

Incorrect timing will result in the motor operating in reverse.



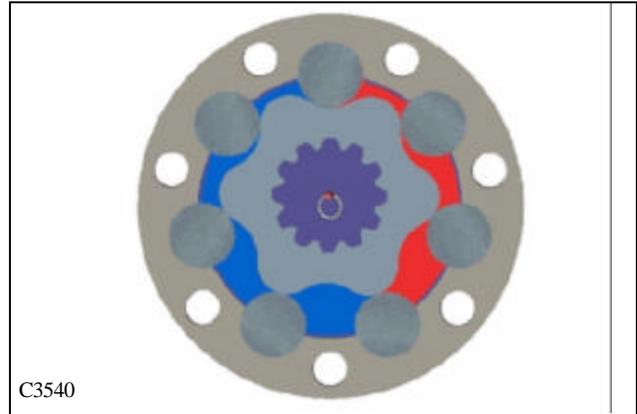
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DRIVE MOTOR 2.11

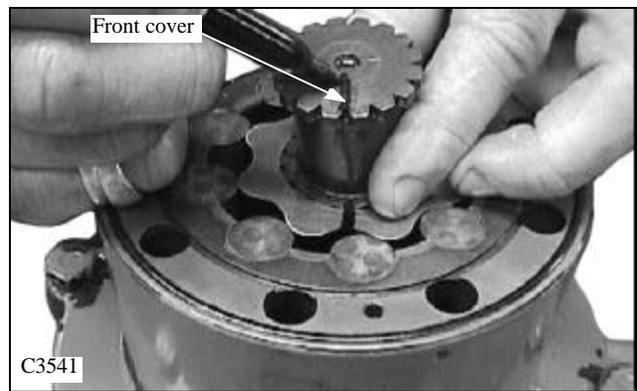
Assembly

2

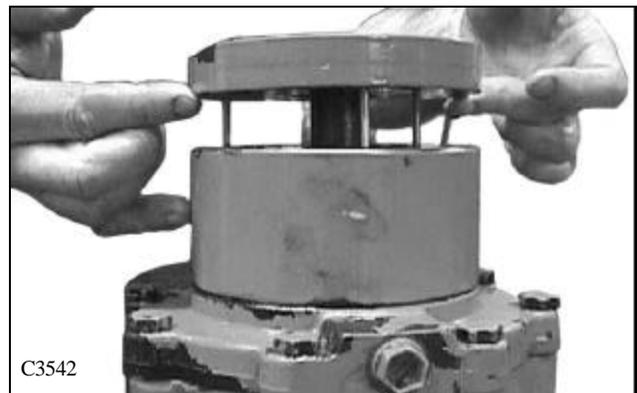
9 Gear-roller stage of motor.
Timing is important to ensure oil pressure/flow enters the correct chamber for proper drive/rotation. (fig. C3540)



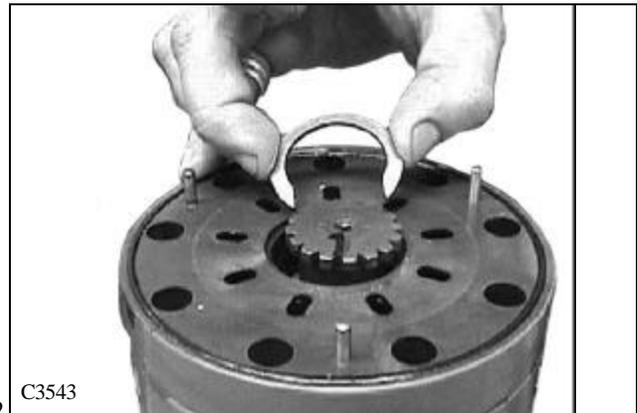
10 When preparing for timing, marker valley to valley in any location on shaft as shown (fig. C3541).



11 Install guide pins on gearwheel (3) and fix channel plate onto gearwheel (fig. C3542)



12 Use securing ring and install onto groove on channel plate (fig. C3543).

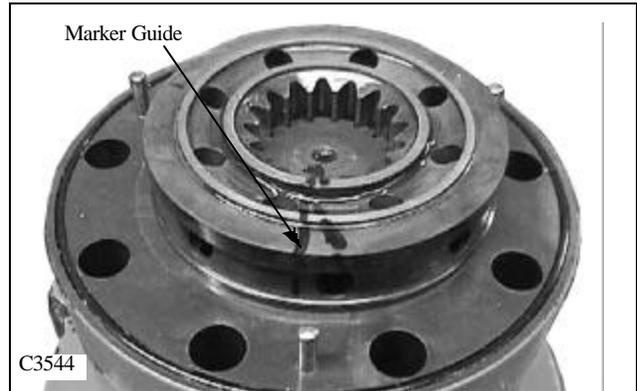


IMPORTANT

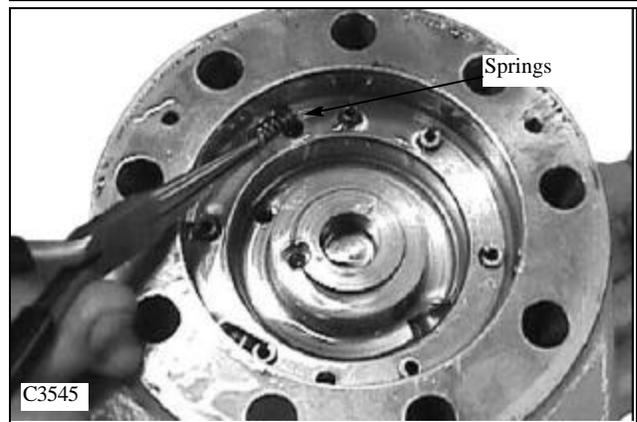
NOTE: The fibre plates are also called outer plates due to the "teeth" outside of the plate.

DRIVE MOTOR 2.11

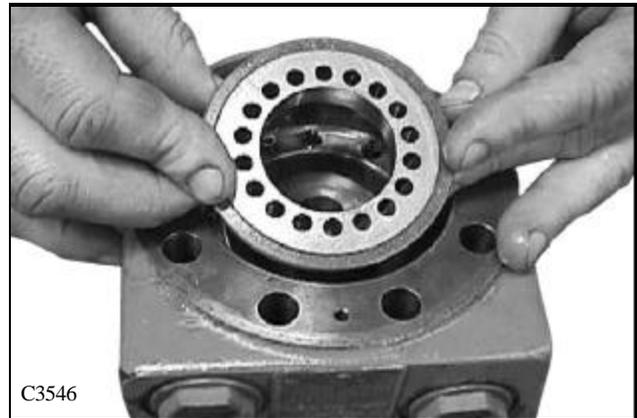
13 The timing is critical as the gearwheel valley cannot be seen. Use a marker point as a guide to offset 1 tooth counter-clockwise to the disk valve (fig. C3544).



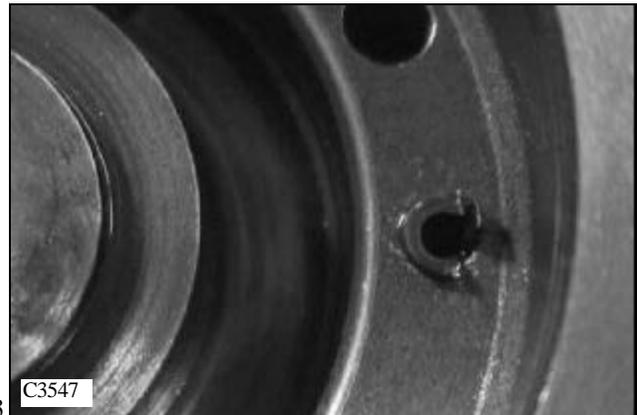
14 In the valve housing, install the 6 springs in the drilled holes (fig. C3545).



15 Inspect the O-ring seals, and if needed, replace. Install the balance plate and use guide pin for alignment (fig. C3546).



16 Example of an incorrectly installed balance plate. The guide pin becomes damaged and the balance plate is not locked into position. This can cause it to spin and render the motor non-functional (fig. C3547).



2

DRIVE MOTOR 2.11

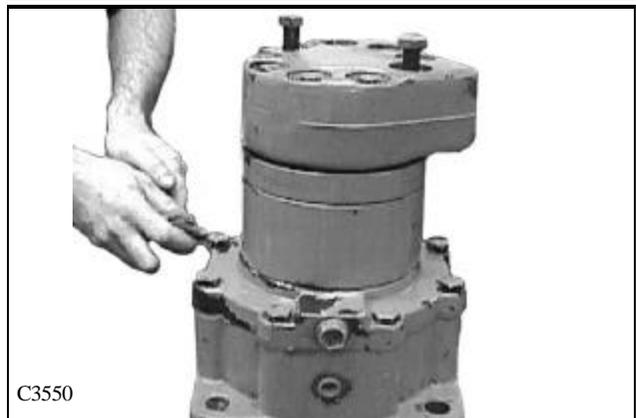
17 With a balance plate incorrectly installed other problems such as a break in the valve housing may occur and damage other hydraulic components (fig. C3548).



18 With the balance plate in the proper position and tapped down to seat, apply some vaseline or grease to prevent the spacer from falling out when installed onto the motor (fig. C3549).



19 Since the motor has been disassembled, the guide pins will locate ports in the offset position. To align with the drain and brake ports, turn the section until correct port alignment is made (fig. C3550).



20 With ports all aligned, install balance of screws and tighten in a cross pattern, then final torque all bolts to 81 ft/lbs (fig. C3551).



2

TORQUE CHART 2.12

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

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		

Tandem Pump

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)

Torque Motor

Description	Qty.	Specification
Valve Housing	8	81 ft/lb
Bearing Housing	8	65 ft/lb
Bearing, Retaining Ring	8 bolts	7 ft/lb
Mounting	4	80ft/lb



CONVERSION CHART 2.13

CONVERSION FACTORS

Metric To U.S.

2

	MULTIPLY	BY	TO OBTAIN
Area:	sq. meter	10.763 91	square foot
	hectare	2.471 05	acre
Force:	newton	3.596 942	ounce force
	newton	0.224 809	pound force
Length:	millimeter	0.039 370	inch
	meter	3.280 840	foot
	kilometer	0.621 371	mile
Mass:	kilogram	2.204 622	pound
Mass/Area:	kilogram/hectare	0.000466	ton/acre
Mass/Energy:	gr/kW/hr.	0.001 644	lbs/hp/hr.
Mass/Volume:	kg/cubic meter	1.685 555	lb/cubic yd.
Power:	kilowatt	1.341 02	horsepower
Pressure:	kilopascal	0.145 038	lb/sq.inch
	bar	14.50385	lb/sq.inch
Temperature:	degree C	1.8 x C + 32	degree F
Torque:	newton meter	8.850 748	lb/inch
	newton meter	0.737 562	lb/foot
Velocity:	kilometer/hr.	0.621 371	miles/hr.
Volume:	cubic centimeter	0.061 024	cubic inch
	cubic meter	35.314 66	cubic foot
	cubic meter	1.307 950	cubic yd.
	millimeter	0.033 814	ounce (US fluid)
	litre	1.056 814	quart (US liquid)
	litre	0.879 877	quart (Imperial)
	litre	0.264 172	gallon (US liquid)
	litre	0.219 969	gallon (Imperial)
	Volume/Time:	litre/min.	0.264 172
litre/min.		0.219 969	gallon/min. (Imperial)

CONVERSION CHART 2.13

CONVERSION FACTORS

U.S. To Metric

	MULTIPLY	BY	TO OBTAIN
Area:	sq. foot	0.092 903	square meter
	acre	0.404 686	hectare
Force:	ounce force	0.278 014	newton
	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/Area:	ton/acre	2241 702	kilogram/hectare
Mass/Energy:	lb/hp/hr	608.277 4	gr/kW/hr
Mass/Volume:	lb/cubic yd.	0.5930276	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:	pound/inch	0.112 985	newton meter
	pound/foot	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 3 FINAL DRIVE

Specifications & Maintenance	3.1
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Changing the Oil	pg. 3-3
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Removal	pg. 3-5
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Trouble Shooting	3.6
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SPECIFICATIONS & MAINTENANCE 3.1

Specifications

Chain Size ANSI 100
 Approved Chain Manufacturer Tsubaki
 Lubricating Oil 10W30 API Classification SJ
 Oil Capacity (each) 17 Liters. (4.5 gal)
 Torque Specifications:
 Motor Sprocket Bolt 25 lbs /ft (34 nm)
 Wheel Nuts..... 100 - 110 lbs /ft (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 (*)
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 the top (upper) check plug located between the 2 tires at the side of the loader. (fig. C3496)
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 oil level check plug as outlined above. (fig. C3496)
- 3 Remove the seat plate and front bulkhead assembly.
- 4 Remove the vented filler plug. (fig. C3845)
- 5 Add 10W30 API classification SE/CD oil until it begins to flow out the upper check hole. Total final drive housing capacity per side is 17 liters (4.5 gal).
- 6 Replace all plugs.

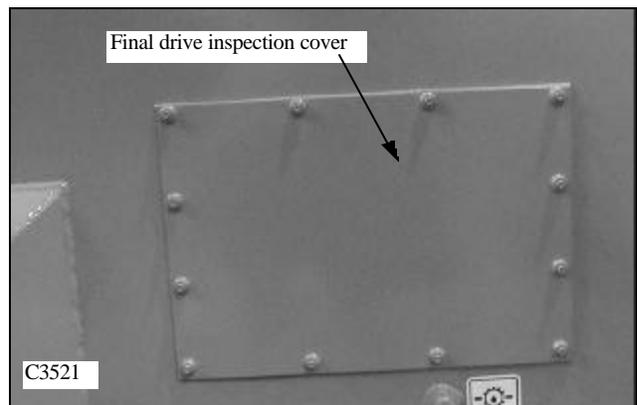
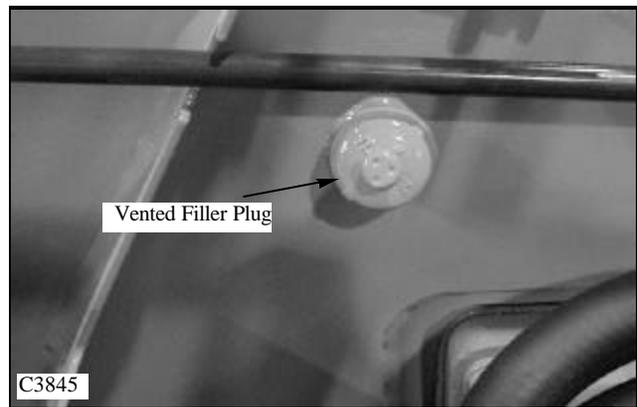
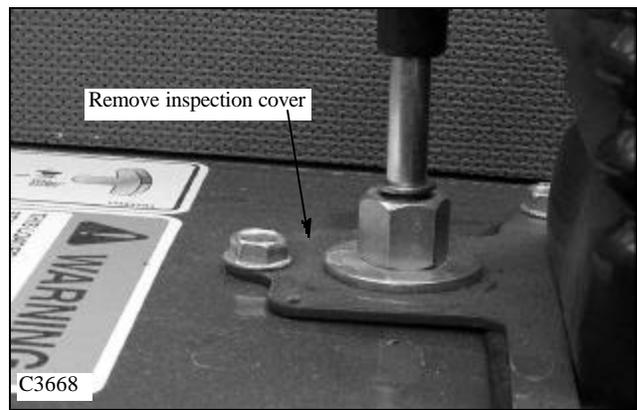
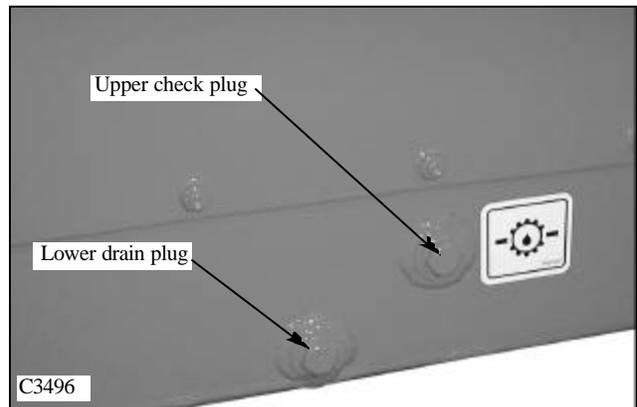
IMPORTANT

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 Shut off the engine.
- 2 Slide a drain pan under one of the lower drain plugs located at the side of the loader, between the wheels. (fig. C3496) Be prepared to contain 17 liters (4.5 gal) of oil.
- 3 Remove the drain plug. Allow the oil to drip completely out of the final drive housing. Replace the drain plug. Dispose of the waste oil in an environmentally friendly manner. If the oil is contaminated, remove the side inspection cover to flush the housing. (fig. C3521)
- 4 Replenish the oil as outlined above in Adding Oil with 10W30 API classification SJ oil.

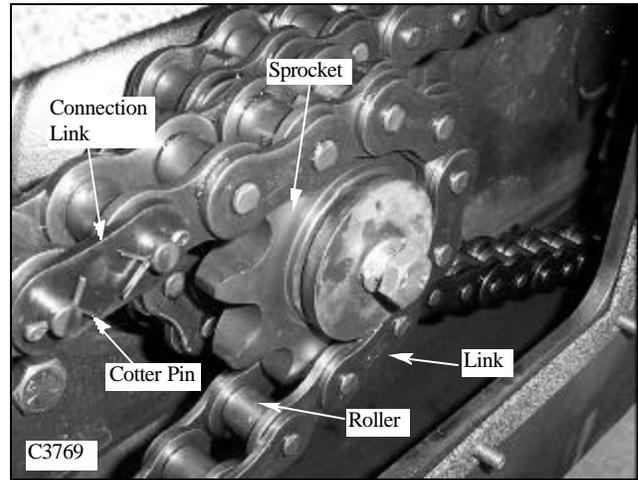


DRIVE CHAIN 3.3

Chain Inspection

The drive chains should be inspected for wear or damage after the first 50 hours of operation and every 150 hours thereafter, or at any time the final drive inspection cover is removed. If the chain shows any sign of wear or damage replace it. (fig. C3769) Inspect as follows:

1. Inspect the chain for excessive roller wear
2. Inspect the chain for excessive wear on the link plates
3. Inspect the connection link cotter pins for wear or damage caused by interference.
4. Check the sprocket for excessive wear or damage such as broken teeth or sharp/rounded teeth.
5. If the chain is removed from the loader, check for stiffness caused by wear between the pins and bushings.
6. If the chain is removed from the loader, check that when laid out it runs straight and not to one side, indicating misalignment.

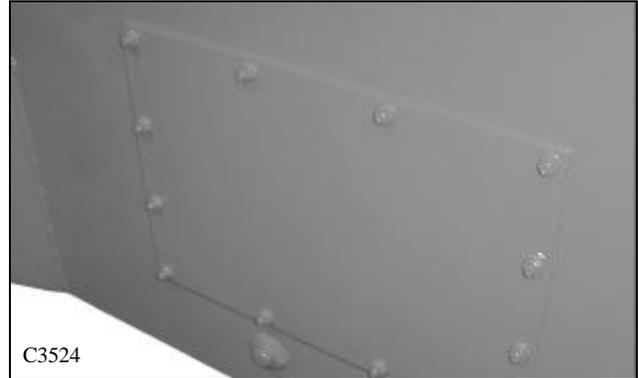


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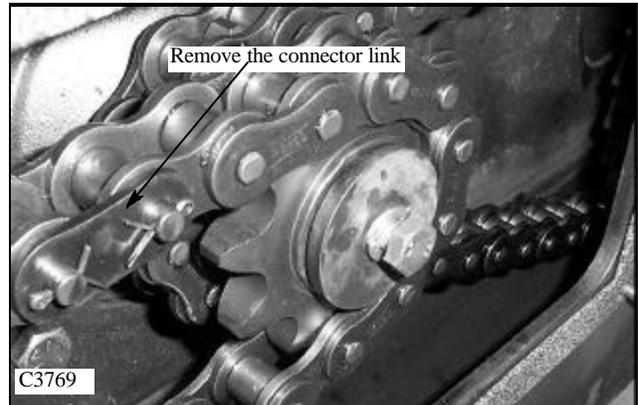
DRIVE CHAIN 3.3

Chain Removal

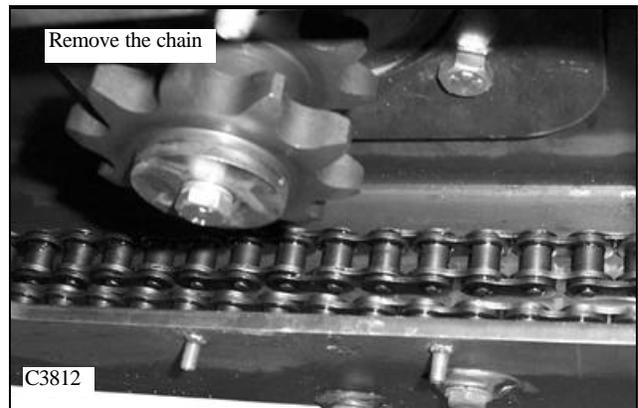
- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Block the loader securely with all 4 wheels clear of the ground.
- 3 Remove the wheels from the side of the loader the chain is to be removed.
- 4 Clean the excess dirt from the final drive housing. Drain the plug area and the inspection cover area located between the 2 axle towers. (fig. C3524)
- 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. C3524)
- 7 Rotate the chains, 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. Shut off the engine.



- 8 Remove the cotter pins from the master connecting link and remove the connecting link. (fig. C3769) The connecting link is a press fit type and will need to be supported as you drive the link pins through the link plate.



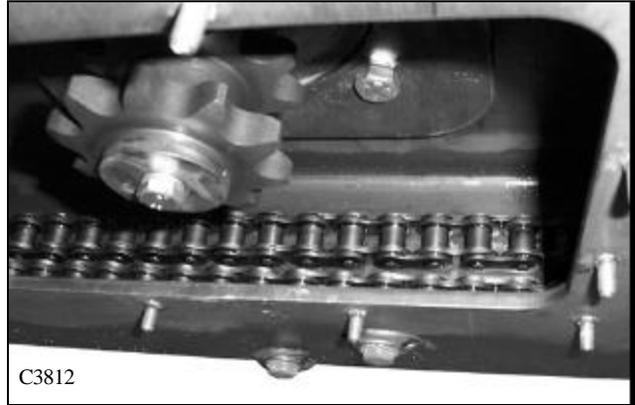
- 9 Remove the front or rear chain from the housing by turning the axles by hand and pulling the slack chain out the inspection cover area. (fig. C3812)



DRIVE CHAIN 3.3

Chain Installation

1 Install the wrapped chain into the final drive housing. (fig. C3812)



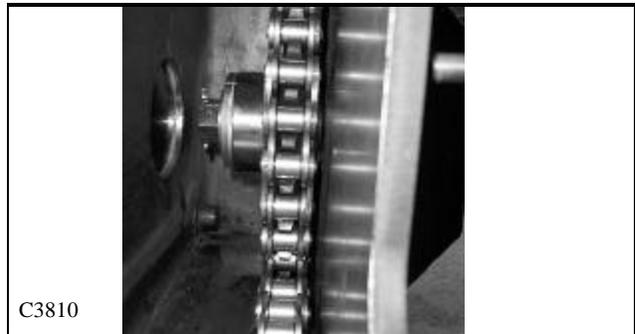
C3812

2 Place one end of the front chain over the top of the front axle sprocket. Rotate the axle and bring the chain along the bottom of the final drive housing to approximately the center. (fig. C3809) Wrap the other end of the chain around the motor sprocket teeth closest to the motor.



C3809

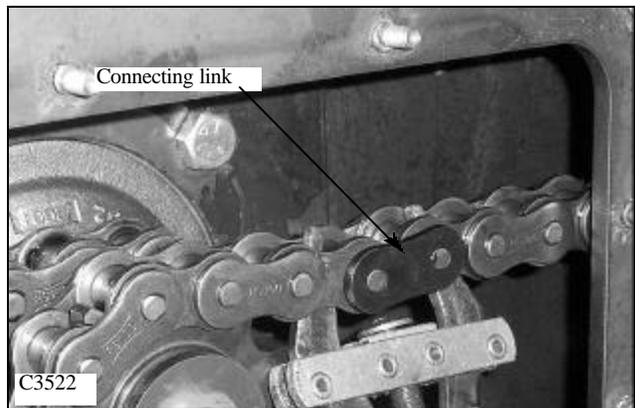
3 Place the ends together and install the new connecting link so that the cotter pins face away from the inspection cover. (fig. C3810). Bend the ends of the cotter pins at least 90 degrees.



C3810

4 Wrap the rear chain over the rear axle sprocket. Rotate the axle and chain around the bottom of the final drive housing and around the bottom of the motor sprocket closest to the inspection cover opening until the ends of the chain meet together.

5 Install a new connecting link. (fig. C3522) Place the connecting link into the chain so the cotter pins face the inspection cover hole. Bend the ends of the cotter pins at least 90° apart.



C3522

6 Replace the inspection cover using the gasket. Do not over tighten the inspection cover nuts. 11 lbs / ft maximum. (15.0 nm)

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

3

DRIVE MOTOR SPROCKET 3.4

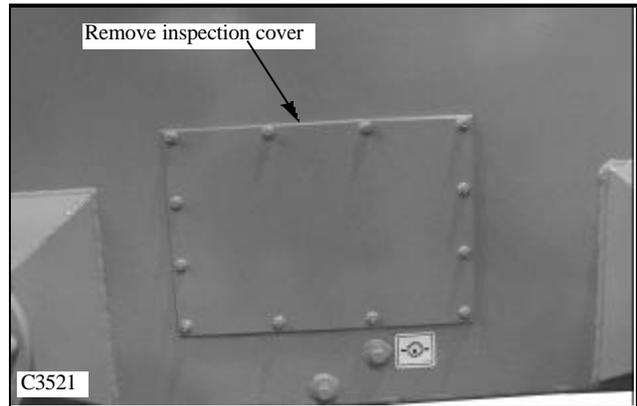
Replacement

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

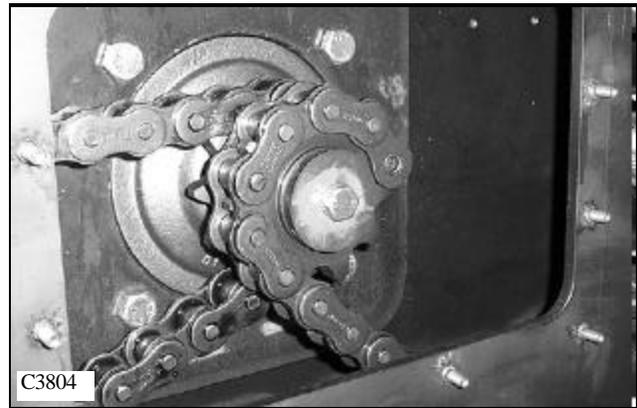
1 Place the loader on a level surface, engage the parking brake and shut off the engine.

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

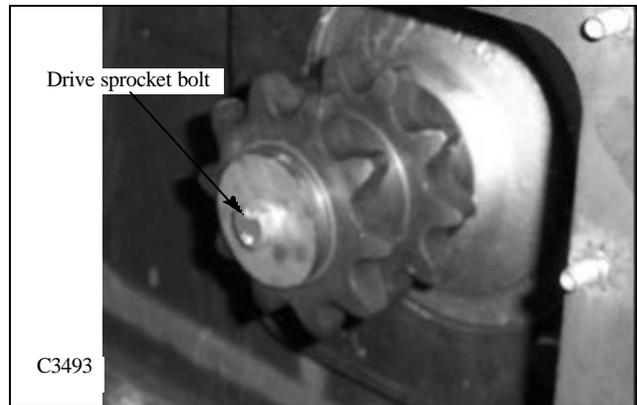
3 Remove the inspection cover located between the axle assemblies. (fig. C3521)



4 Remove the connector link from the front and rear chains. (fig. C3804)



5 Remove the bolt retaining the drive sprocket to the drive motor. (fig. C3493)



6 Slide the sprocket off the drive motor shaft. (fig. C3493 & C3802)

7 Replace the drive sprocket in the reverse order above. Apply Loctite 242 (blue) to the drive sprocket bolt and torque the bolt to 40 lbs / ft (54 Nm)

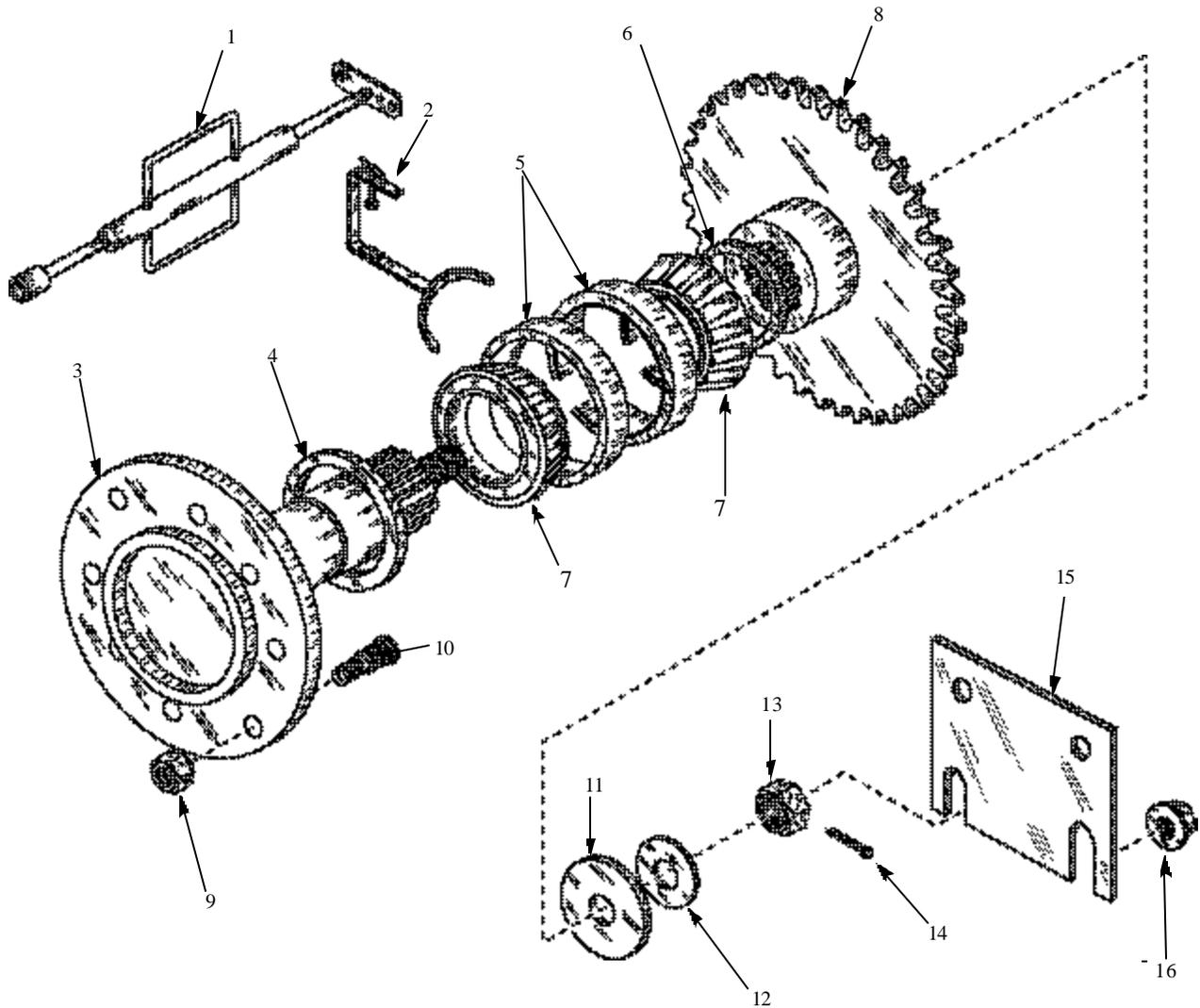


AXLE ASSEMBLY 3.5

3

Axle Assembly

C3235

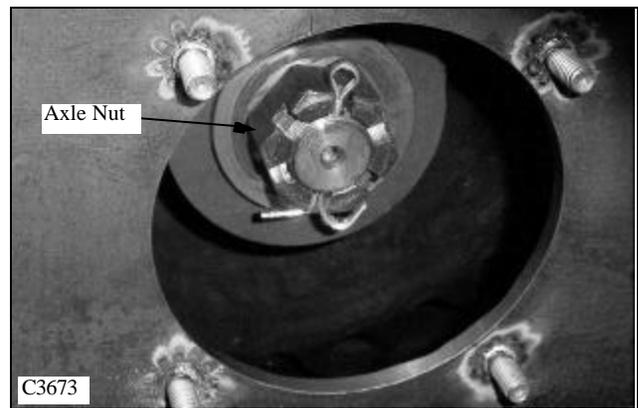
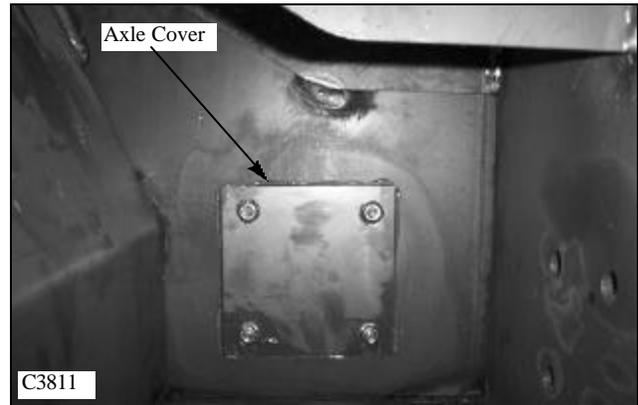


- | | |
|-------------------------------|------------------------|
| 1. Axle Puller | 10. Wheel Stud |
| 2. Seal Installation Tool (2) | 11. Plate, Axle Washer |
| 3. Axle Ass'y | 12. Washer, Axle |
| 4. Seal | 13. Castle Nut |
| 5. Bearing, Cup | 14. Cotter Pin |
| 6. Plate, Axle Spacer | 15. Sheet, Rear Cap |
| 7. Bearing, Cone | 16. Nut, Hex Flange |
| 8. Sprocket | |
| 9. Wheel Nut | |

AXLE ASSEMBLY 3.5

Axle Removal

- 1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine.
- 2 Block the loader securely with all 4 wheels clear of the ground.
- 3 Remove the wheels from the side of the loader the chain is to be removed.
- 4 Clean the excess dirt from the final drive housing drain plug area and the inspection cover area located between the 2 axle towers.
- 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 sprocket of the axle being replaced. Refer to Section 3.3 page 3-6.
- 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. C3811)
- 10 **REAR AXLE:** Remove the inner axle cover plate from the final drive housing.
- 11 Remove the split pin from the castle nut on the end of the axle. (fig. C3673)



- 12 The axle may be held stationary by inserting a bar between the wheel studs.

- 13 Remove the rear castle nut and axle washer. (fig. C3674)



AXLE ASSEMBLY 3.5

- 14 Attach a special axle puller tool, Thomas P/N 957372, to the axle flange wheel studs using the wheel nuts that are on the loader. (fig. C3807)
- 15 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.
- 16 Remove the axle sprocket and bearing from the final drive housing through the inspection cover area.

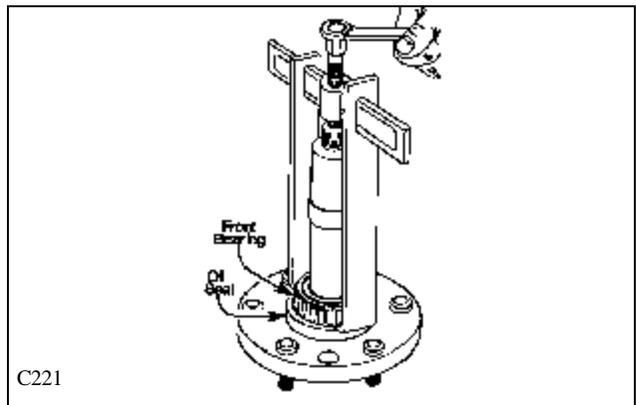


- 17 Using a bearing puller, remove the bearing still pressed in place on the axle. (fig. C3842, C3669)
- 18 Remove and discard the axle oil seal.



Inspection

- 1 Inspect the seal surface area for scarring, pitting or nicks. Minor scratches may be removed using fine emery cloth. Replace the axle if worn excessively.
- 2 Inspect the axle threads for damage. Replace axle if the threads are non serviceable.
- 3 Inspect axle spline for wear and replace if necessary.
- 4 Replace any axle studs as required (page 3-13)
- 5 Inspect the axle sprocket for abnormal tooth wear and inspect sprocket spline for wear. Replace the sprocket if necessary.
- 6 Inspect the bearing races in the final drive housing. Replace them if necessary using a brass drift punch and hammer. Cooling the replacement races in a freezer will aid in using this procedure.
- 7 Replace the bearings if new races are installed or if they are pitted or damaged.



3

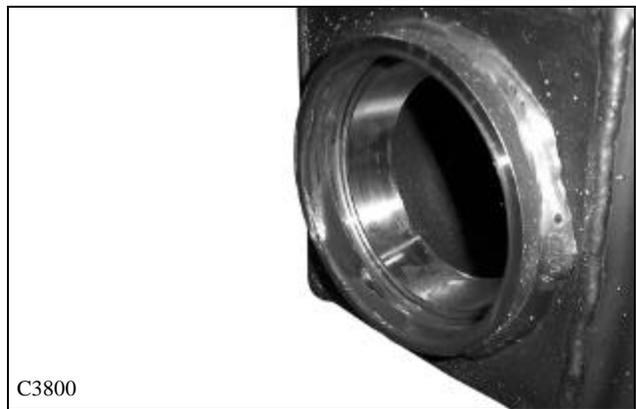
AXLE ASSEMBLY 3.5

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.(fig. C3799)
- 3 Inspect the splined teeth for wear. Replace the axle if the splined teeth do not fit tightly into the sprocket spline.
- 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. C3699)
- 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. C3800)

8 Place the front axle sprocket into the final drive housing with the hub facing toward the bearing race area. (outside) Note: The rear axle hub faces inside.

9 Apply gasket sealant to the outer edge of the final ass'y oil seal surface. (fig. C3800) Take care, make sure none gets on the bearing surface.



AXLE ASSEMBLY 3.5

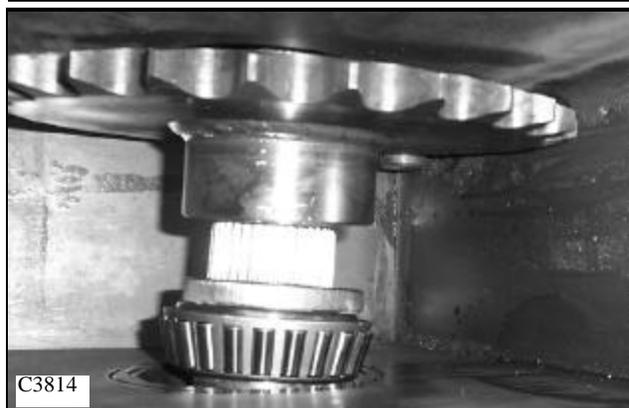
10 Guide the axle into the final drive housing.

11 Place 2 seal installation tools, Thomas P/N 958674, equally spaced around the axle flange, behind the seal. (fig. C3671). This special tool must be used to properly locate the seal into the final drive housing.

3



12 Place the rear (inside) axle bearing onto the axle. (fig. C3813 & fig. C3814)



13 Start the axle into the drive sprocket. Place the small axle washer and castle nut onto the threaded end of the axle. (fig. C3815)



AXLE ASSEMBLY 3.5

14 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.

15 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.

16 Remove the castle nut, remove the small washer and add the large axle washer..

17 Install the axle washer and castle nut. 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. Bend the end of the split pin straight back against the axle washer.

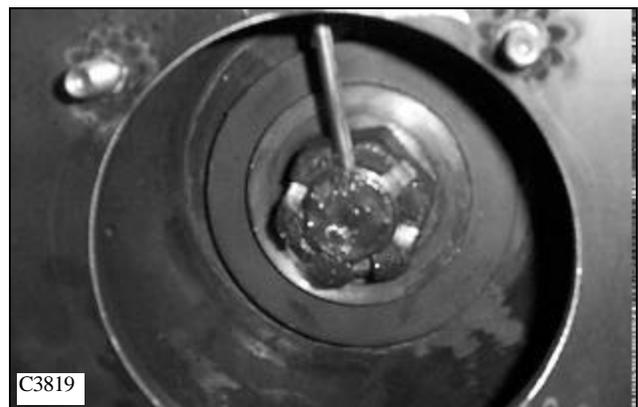
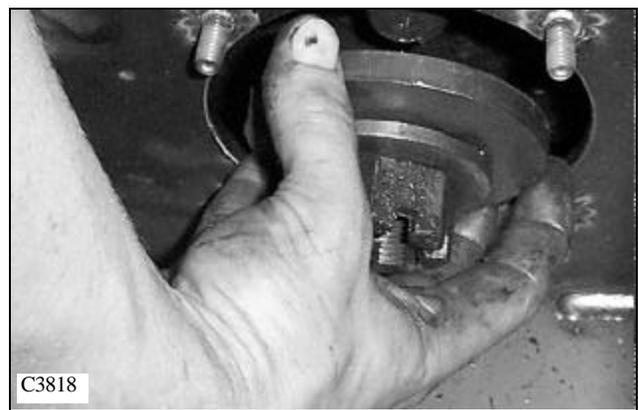
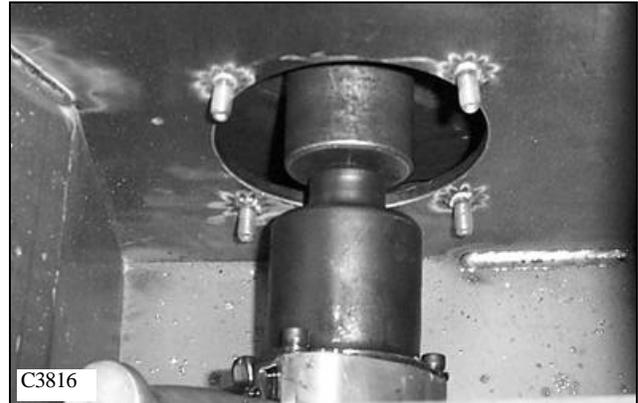
19 Install the axle cover using silicone to seal the matting surfaces. Do not over tighten the retaining nuts. 11 lbs/ft maximum. (15 nm)

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

21 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.

22 Install the inspection cover using silicone to seal the matting surfaces. Do not over tighten the retaining nuts. 11 lbs/ft maximum. (15 nm)

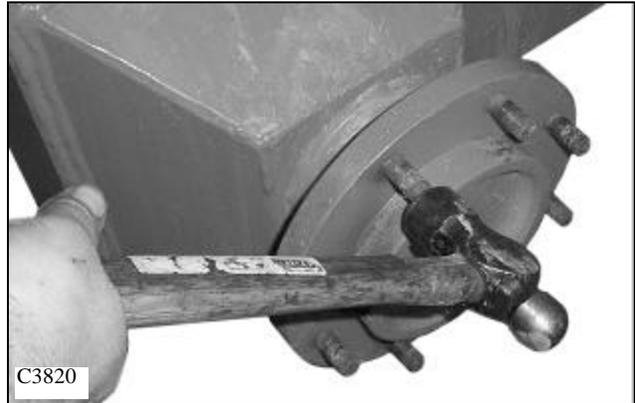
23 Install the wheels. Torque the wheel nuts to 100 to 110 lbs/ft. (135 to 149 nm).



AXLE ASSEMBLY 3.5

Axle Stud Replacement

- 1 Remove any attachment, raise the boom arms and engage the boom locks.
- 2 Raise and block. Clear the side of the loader the wheel studs are to be changed on.
- 3 Remove the wheel the studs are to be replaced on.
- 4 Strike the stud with a hammer to remove from the axle flange. (fig. C3820)
- 5 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. C3822)
- 6 Put a few drops of light oil on the stud spline. (fig. C3823)
- 7 Place a wheel nut inverted on the stud and use it to draw the stud into place in the axle flange as you tighten it, (fig. C3824 & C3821) while tapping end of stud with hammer.
- 8 Remove the wheel nut and discard. Replace with new wheel nut. (fig. C3497)
- 9 Replace the wheel and torque the wheel nuts to 100 to 110 lbs/ft. (135 to 149 nm)



IMPORTANT

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



TROUBLE SHOOTING 3.6

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



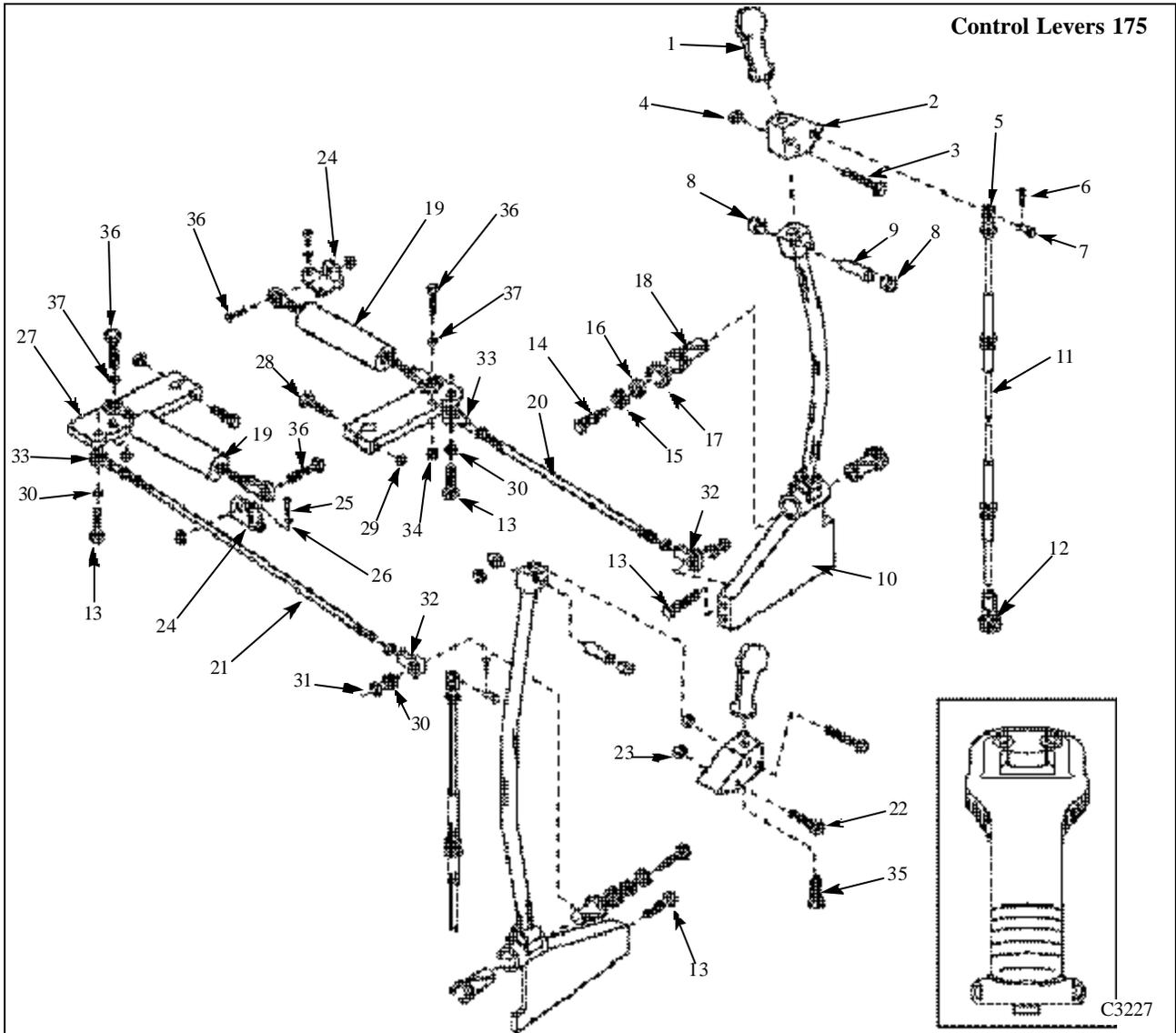
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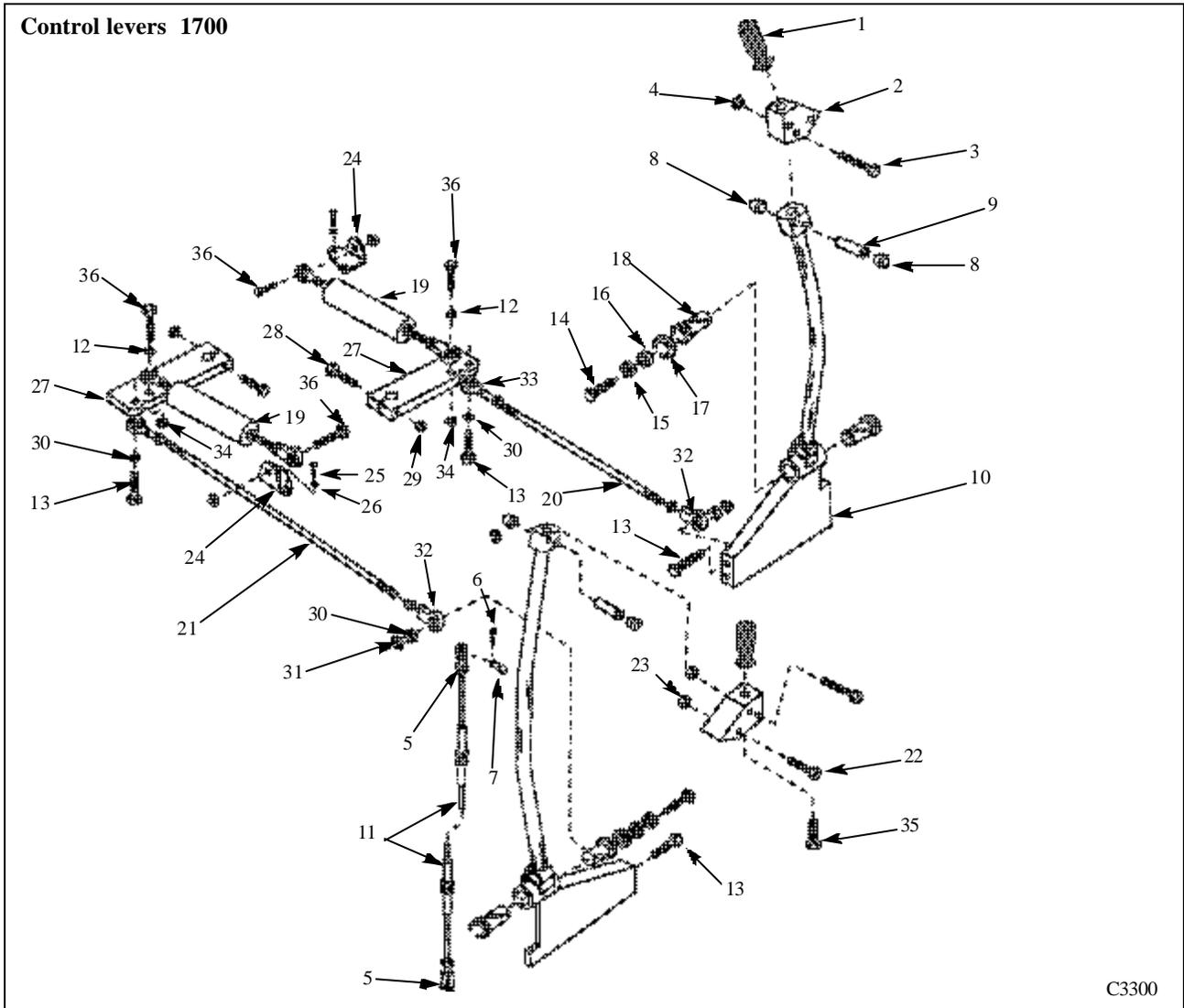
STEERING 4.1

4



- | | | | | | |
|----|--|----|--------------------------|----|---|
| 1 | Handle, Ergonomic Plain
Handle, Ergonomic w/Rocker Switch | 15 | Washer, Lock | 32 | Rod End Ass'y, Female |
| 2 | Lever Base Welded Ass'y | 16 | Washer, Flat | 33 | Rod End Ass'y, Female |
| 3 | Bolt, Hex. | 17 | Washer, Fender | 34 | Nut, Nylok |
| 4 | Jam Nut, Locking | 18 | Flange Bushing | 35 | Bolt, Ergonomic Handle (w/Hole)
Bolt, Ergonomic Handle (No Hole) |
| 5 | Clevis (Hand Control Loaders) | 19 | Hydroback Ass'y | 36 | Bolt, Hex |
| 6 | Cotter Pin (Hand Control Loaders) | 20 | Bar, Pintle Linkage L.H. | 37 | Washer |
| 7 | Clevis Pin (Hand Control Loaders) | 21 | Bar, Pintle Linkage R.H. | | |
| 8 | Flange Bushing | 22 | Bolt, Hex | | |
| 9 | Tube, Handle Spacer | 23 | Hex Nut, Nylok | | |
| 10 | Control Lever, L.H.
Control Lever, R.H. | 24 | Hydroback Mount | | |
| 11 | Cable, Push-Pull (Hand control Loaders) | 25 | Bolt | | |
| 12 | Rod End Ass'y (Hand Control Loaders) | 26 | Washer | | |
| 13 | Bolt, Hex | 27 | Pintle Lever Ass'y | | |
| 14 | Bolt | 28 | Bolt | | |
| | | 29 | Nut | | |
| | | 30 | Washer, Lock | | |
| | | 31 | Nut, Nylok | | |

STEERING 4.1



- | | | | | | |
|----|--|----|--------------------------|----|-----------------------|
| 1 | Handle, Control | 15 | Washer, Lock | 32 | Rod End Ass'y, Female |
| 2 | Lever Base Welded Ass'y | 16 | Washer, Flat | 33 | Rod End Ass'y, Female |
| 3 | Bolt, Hex. | 17 | Washer, Fender | 34 | Nut, Nylok |
| 4 | Jam Nut, Locking | 18 | Flange Bushing | 35 | Bolt, Hex |
| 5 | Clevis | 19 | Hydroback Ass'y | 36 | Washer |
| 6 | Cotter Pin | 20 | Bar, Pintle Linkage L.H. | | |
| 7 | Clevis Pin | 21 | Bar, Pintle Linkage R.H. | | |
| 8 | Flange Bushing | 22 | Bolt, Hex | | |
| 9 | Tube, Handle Spacer | 23 | Hex Nut, Nylok | | |
| 10 | Control Lever, L.H.
Control Lever, R.H. | 24 | Hydroback Mount | | |
| 11 | Cable, Push-Pull | 25 | Bolt | | |
| 12 | Washer | 26 | Washer | | |
| 13 | Bolt, Hex | 27 | Pintle Lever Ass'y | | |
| 14 | Bolt | 28 | Bolt | | |
| | | 29 | Nut | | |
| | | 30 | Washer, Lock | | |
| | | 31 | Nut, Nylok | | |

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, or is not in neutral, when the engine is started or 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.

2 Remove the seat and hydrostatic shield.(fig. C3557)
Note the location of the hydroback. (fig. C3556)

3 Cycle the control lever while watching the hydroback action. The hydroback should return the lever to a 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. C3555)

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

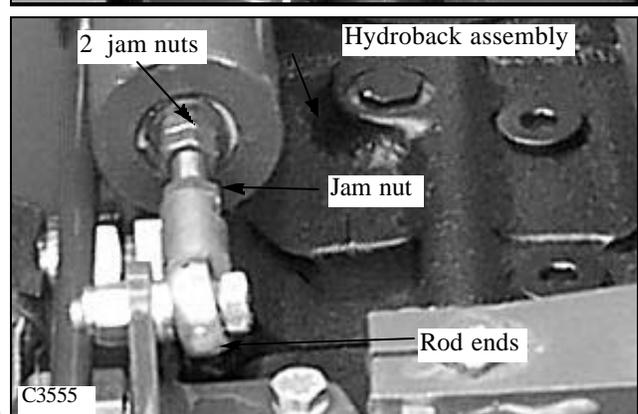
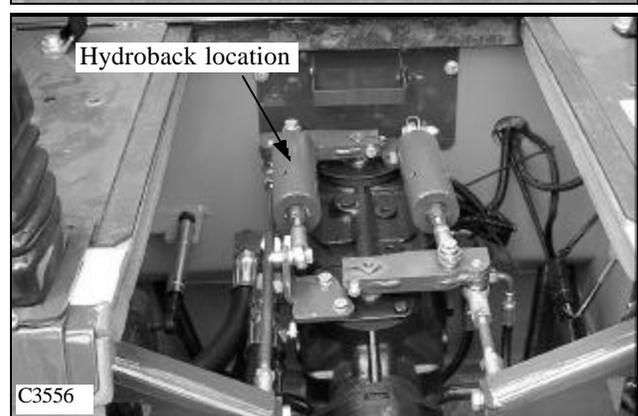


WARNING

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

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.



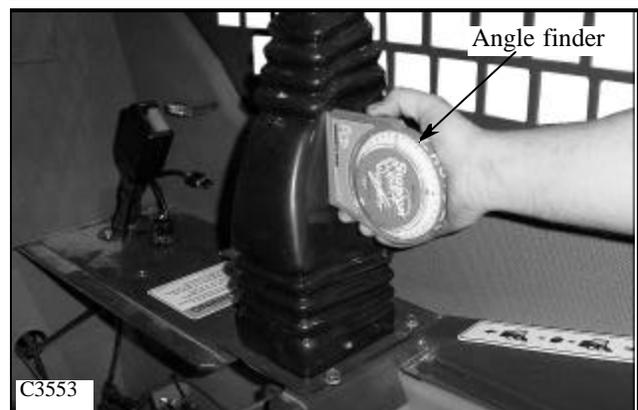
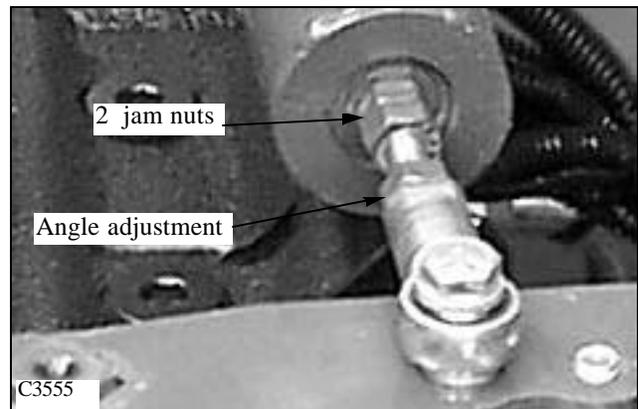
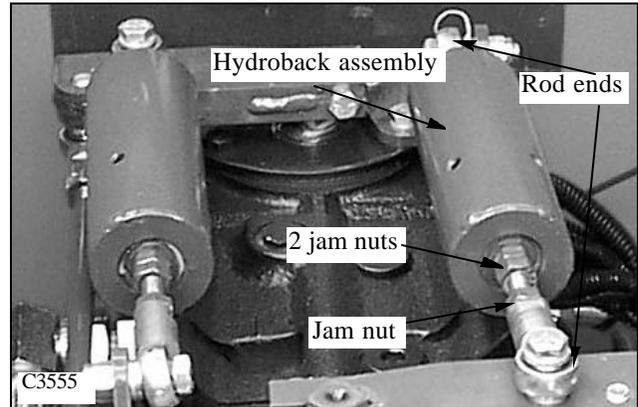
STEERING 4.1

Neutral Adjustment (con't.)

- 6 Loosen the 2 jam nuts next to the main body. (fig. C3555)
- 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 neutral position. If the lever returns to neutral, tighten the 2 jam nuts together. 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 hydro back changes the steering control lever angle. To correctly set the angle after the hydro back has been installed:

- 1 Replace the hydro back by removing the 2 bolts located at either end of the hydro back assembly.
- 2 Install the hydro back 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. C3552) 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. C3553)
- 5 Turn the hydro back threaded rod (fig. C3555) in or out of the female rod end to move the control lever to a reading of 0°. 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.

STEERING 4.1

Neutral Adjustment

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

IMPORTANT

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

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 and hydrostatic shield. Note the location of the steering control linkage. (fig. C3554)

3 Check the control rod end bushings for wear. If any play is present between the bushings and the bolts replace the rod ends.

4 Check the pintle lever for tightness on the swash plate shaft. Tighten the clamping bolt or replace the pintle lever if required. (fig. C3558)

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

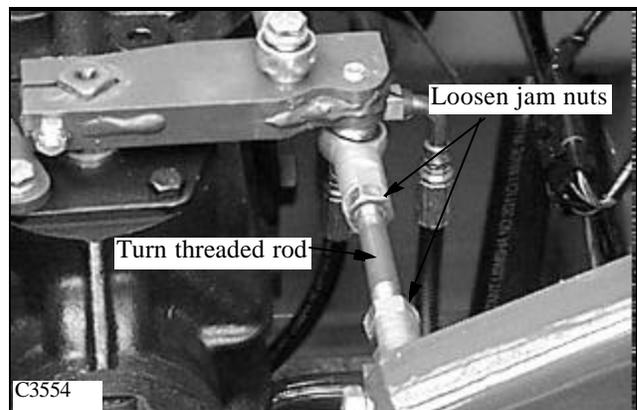
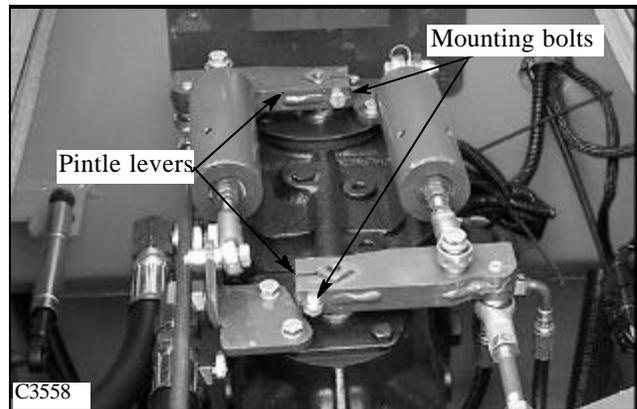
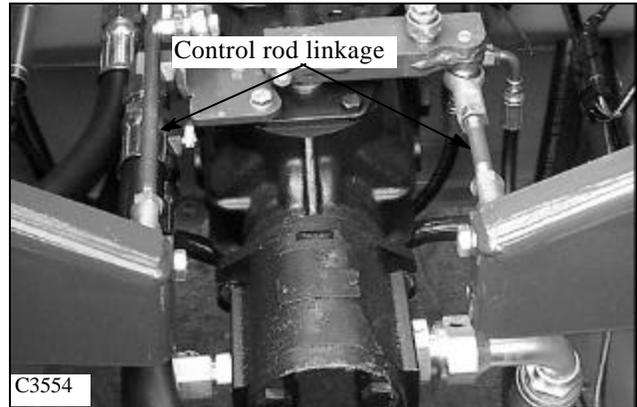
6 Loosen the jam nuts on the control rod linkage. (fig. C3554) One end of the control rod is R.H. threads, the opposite end has L.H. threads.

7 Start the engine and release the parking brake.

8 Turn the control rod linkage and visually watch the wheels as they turn. Stop turning the control rod linkage when the wheels are in neutral. Tighten the jam nuts against the rod ends and recheck the neutral adjustment.

9 Very fine adjustment can be made at the hydro back threaded rod. Adjustment here affects the control lever angle. **Only make minor adjustments using this method.**

10 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 L.H. and R.H. 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.



WARNING

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

2 Remove the seat and hydrostatic shield. Note the location of the steering control limiter bolts located front and rear of each steering control lever, just below the pivot point.. (fig. C3559)

3 Make sure the neutral adjustments are adjusted correctly. Refer to pages 4- 4 ~ 4-6.

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



WARNING

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

6 Using an RPM surface speed measuring tool (Thomas P/N 43981) check each wheel speed in the forward and reverse direction. Repeat for opposite side. (fig. C3560)

7 Correct wheel speed is set evenly at 83 RPM forward and reverse for both sides.

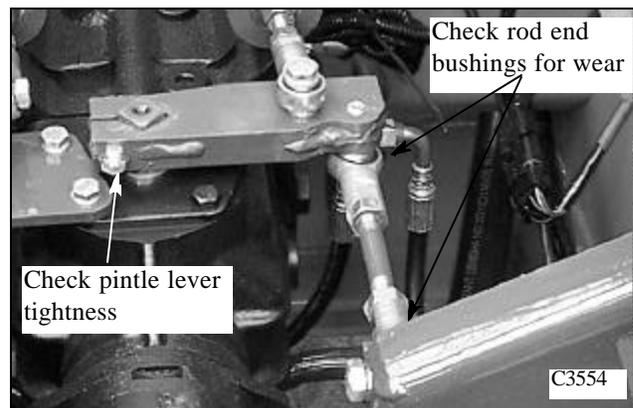
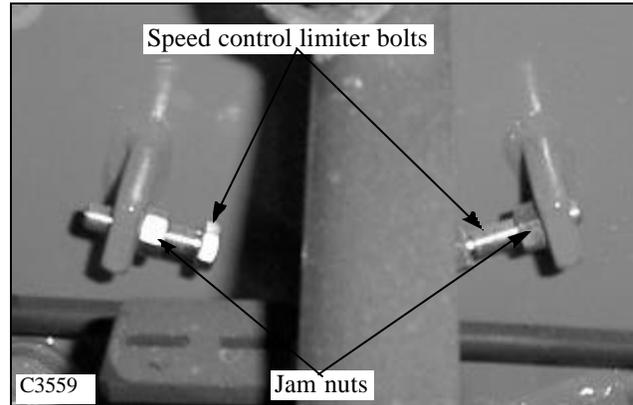
8 If adjustment is necessary, loosen the jam nut (fig. C3559) and turn the limiter bolt in to increase wheel speed or out to slow it down.

9 Tighten the jam nut and retest the speed adjustment. Repeat if necessary.

10 Replace the seat and hydrostatic shield.

Note: If the wheel speed does not meet the above specification, check the engine RPM. Refer to Section 7.

If the engine RPM checks out good you may need to check for hydrostatic problems such as drive motor seal leakage etc. Refer to Section 2 for testing procedures.



4

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.

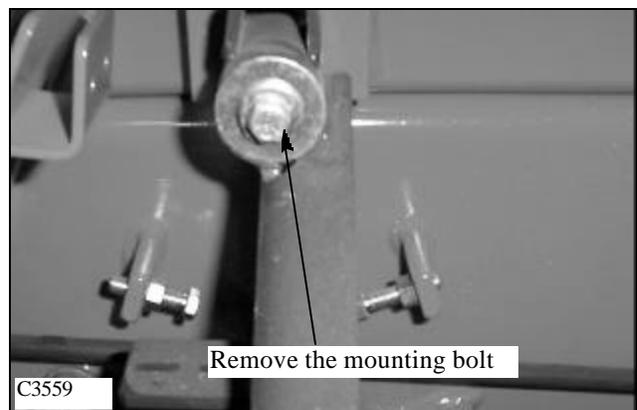
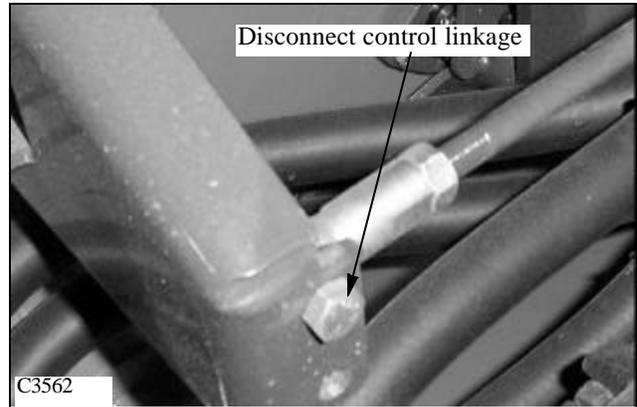
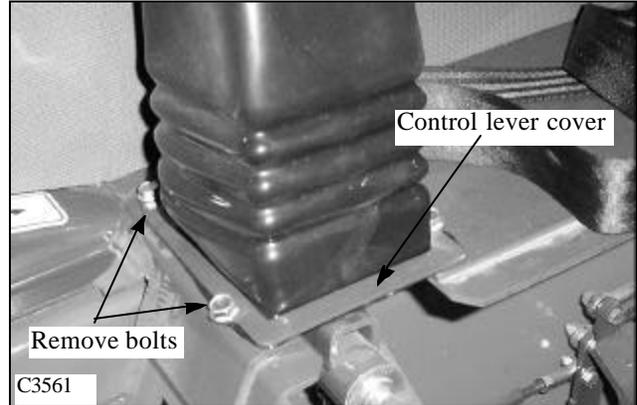
- 2 Remove the seat and hydrostatic shield.
- 3 Remove the two bolts from the lever base.
- 4 Remove the control handle by turning counter clockwise.
- 5 Remove the screws holding the bellows cover down. (fig. C3561)
- 6 Remove the bolt going through the control rod and hydro back linkage. (fig. C3562)
- 7 Remove the bolt and washers mounting the control lever to its pivot point. (fig.C3559) The control lever is now free to be removed.
- 8 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.
- 9 If necessary, make adjustments to the neutral centering and wheel speed as required. Refer to pages 4 - 4 ~ 4 - 7.

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.



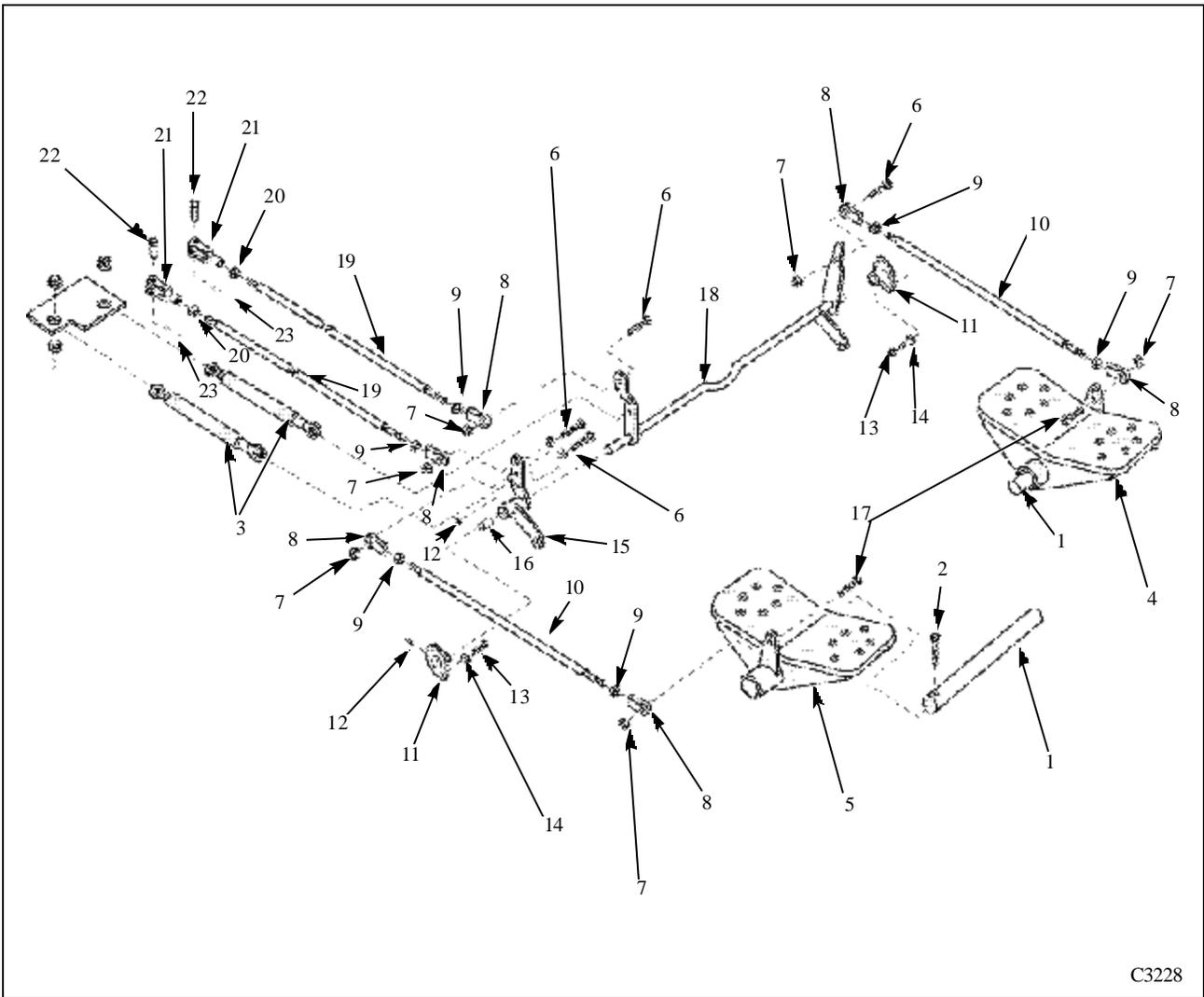
WARNING

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

FOOT PEDALS 4.2



C3228

- | | |
|---|-------------------------------|
| 1. Bar, Foot Pedal Shaft | 13. Bolt, Hex |
| 2. Screw, Cap, Hex Socket head, Stainless | 14. Washer, Lock |
| 3. Dampener, Self-Centering, 9 lbs. | 15. Activator, R.H. Ass'y |
| 4. Pedal, Lift Ass'y (L.H.) | 16. Bearing |
| 5. Pedal, Lift Ass'y (R.H.) | 17. Bolt, Carriage |
| 6. Bolt, Hex | 18. Control Cross Shaft Ass'y |
| 7. Nut, Nylok, Hex | 19. Bar, Valve Control, Rear |
| 8. Rod End Ass'y | 20. Nut, Hex |
| 9. Nut, Hex | 21. Clevis |
| 10. Bar, Valve Control Front | 22. Clevis Pin |
| 11. Bearing, Flanged, 2-Bolt | 23. Cotter Pin |
| 12. Grease Fitting | |



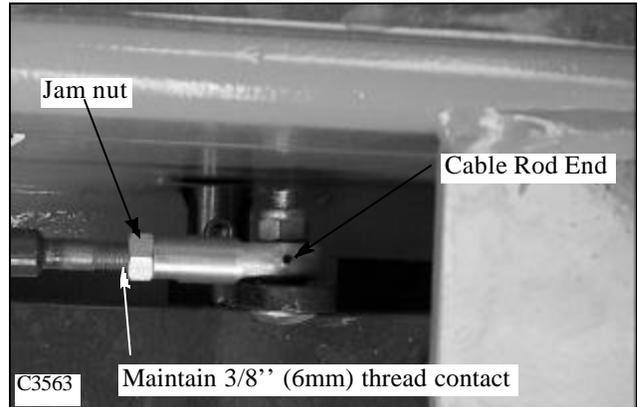
FOOT PEDALS 4.2

Angle Adjustment

The foot pedal angle can be verified and / or adjusted to provide operator comfort and proper pedal travel clearance.

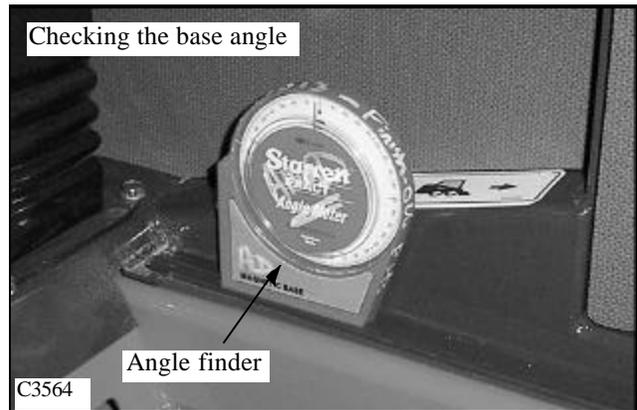
Note: If the operator feels discomfort due to current pedal angles, they may be adjusted to their preference. Be sure to check for pedal travel clearance afterward. Always maintain a minimum of 3/8" (6mm) of thread into the cable clevis and eyelet cable ends. (fig. C3563)

- 1 Make sure the cable ends are screwed onto the cable threads a minimum of 3/8" (6mm). (fig. C3563)
- 2 Place an angle finder on the inner ROPS frame bottom of the loader to find the base measurement. Note the reading. (fig. C3564)

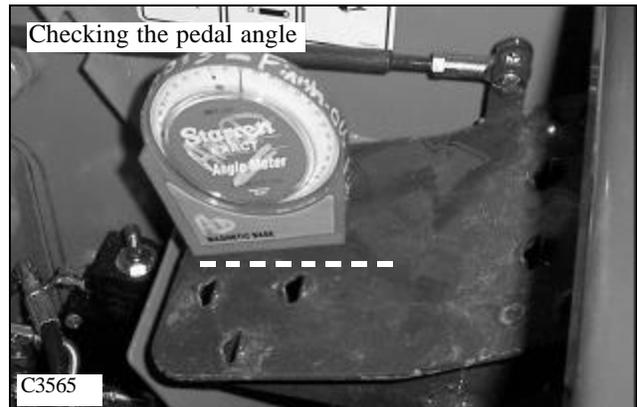


4

- 3 Place the angle finder on the heel of the pedal to be checked or adjusted. (fig. C3565) Note the reading.



- 4 Adjust the pedal angles by turning the rod ends on the end of the linkage attached to the pedals. Adjust the lift and tilt pedal angle to 20°. 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.



FOOT PEDALS 4.2

Foot Pedal Replacement

If the foot pedals or shaft need replacement due to damage or wear. Each pedal has its own shaft.

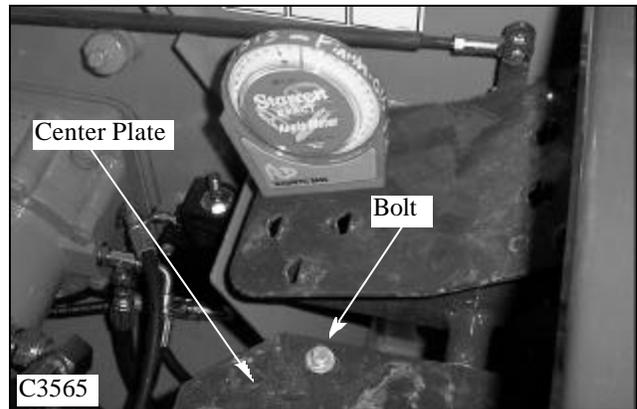
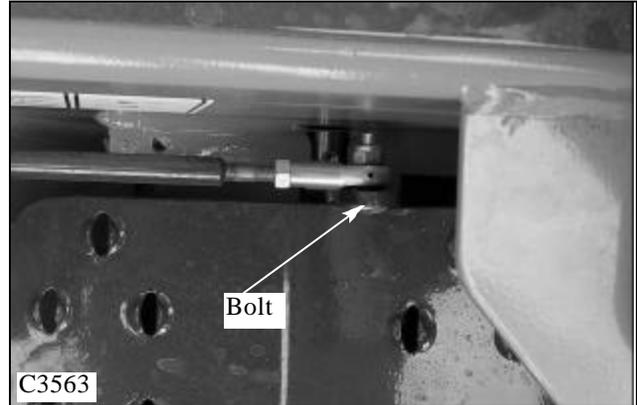
1 Raise the boom arms, engage the boom supports and shut off the engine.



WARNING

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

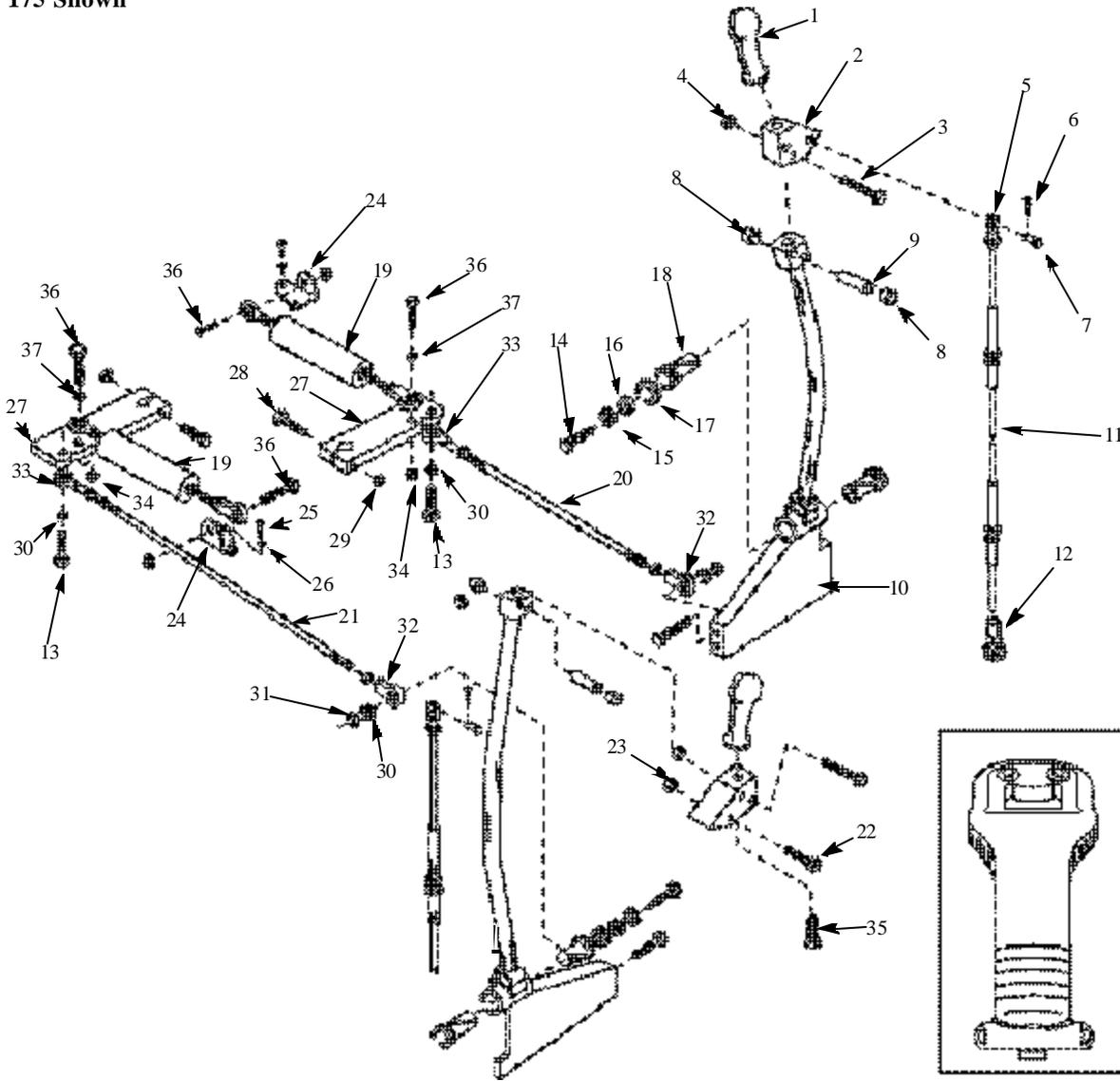
- 2 Remove the seat and hydrostatic shield.
- 3 Remove the bolt holding the linkage rod end to the pedal. (fig. C3563)
- 4 Remove bolts holding the center plate in place and remove the plate. (fig. C3565)
- 5 Remove the cap screw bolt retaining the foot pedal shaft to the side mount.
- 6 Remove and save any spacer washer if present.
- 7 Tip the inside end of the shaft up and remove the complete pedal and shaft assembly together. Keep count of the spacer washer used if present.
- 8 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.
- 9 Reinstall pedals in the reverse order. Total pedal movement side to side, end play, should not exceed 1/8".



4

HAND CONTROLS 4.3

175 Shown



4

- | | | |
|---|----------------------------|---------------------------|
| 1. Ergonomic Handle | 13. Hex Bolt | 30. Lock Washer |
| 2. Lever Base | 14. Bolt | 31. Nylok Nut |
| 3. Hex Bolt | 15. Lock Washer | 32. Female Rod End |
| 4. Locking Jam Nut | 16. Flat Washer | 33. Female Rod End |
| 5. Clevis (Hand Control Loaders Only) | 17. Fender Washer | 34. Nylok Nut |
| 6. Cotter Pin (Hand Control Loaders Only) | 18. Flange Bushing | 35. Ergonomic Handle Bolt |
| 7. Clevis Pin (Hand Control Loaders Only) | 19. Hydroback | 36. Hex Bolt |
| 8. Flange Bushing | 20. Pintle Linkage Bar, LH | 37. Washer |
| 9. Handle Spacer Tube | 21. Pintle Linkage Bar, RH | |
| 10. Control Lever | 22. Hex Bolt | |
| 11. Push-Pull Cable (Hand Control Loaders Only) | 23. Nylok Hex Nut | |
| 12. Rod End (Hand Control Loaders Only) | 24. Hydroback Mount | |
| | 25. Bolt | |
| | 26. Washer | |
| | 27. Pintle Lever Ass'y | |
| | 28. Bolt | |
| | 29. Nut | |

C3227

HAND CONTROLS 4.3

Cable Replacement

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. Unfasten control lever plates and disconnect the throttle. Slide boots over the handles so that the control levers are easily accessible. (fig. C3876 and fig. 3848)

3 Loosen jam nuts on the cable rod end and eyelet end. (fig. C3847 and fig. C3849)

4 Loosen the cable nuts on the control lever and the trans plate. (fig. C3847 and fig. C3848)

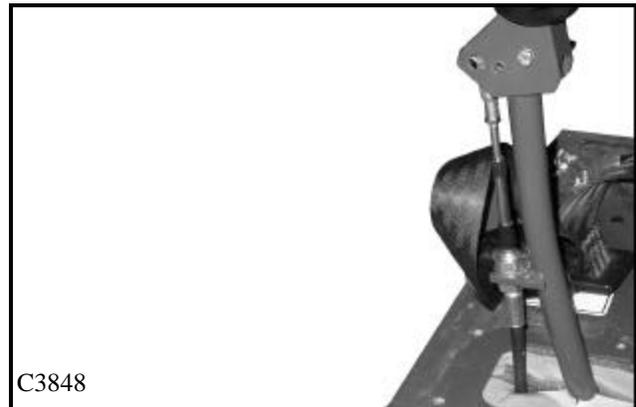
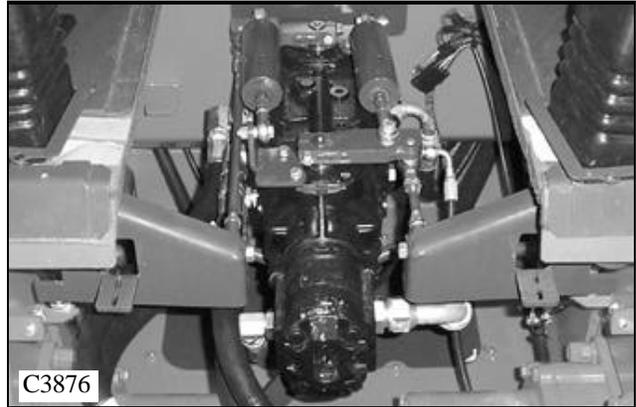
5 Remove cotter pins from lever base assembly end of the cable and remove the clevis pins. (fig. C3848)

6 Unbolt eyelet end of the cable, then remove the cable.

7 Remove the clevis and eyelet ends of the cable and reuse them if still serviceable.

8 Install the new cable in the reverse order above. There must be a minimum of 3/8" (6mm) of thread engagement into the cable rod end and eyelet ends.

Note: After installation of a new cable, the control lever angle will need to be verified and adjusted if necessary. Refer to page 4-15.



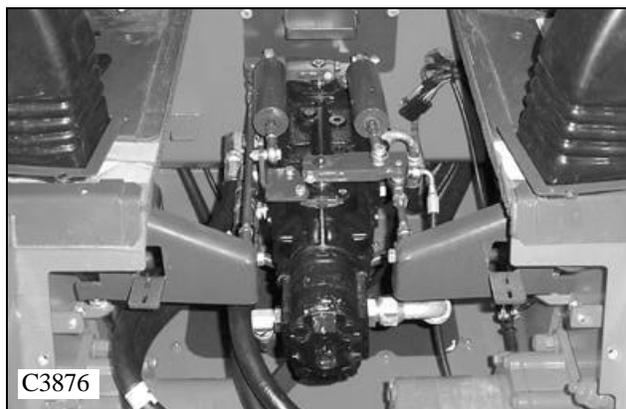
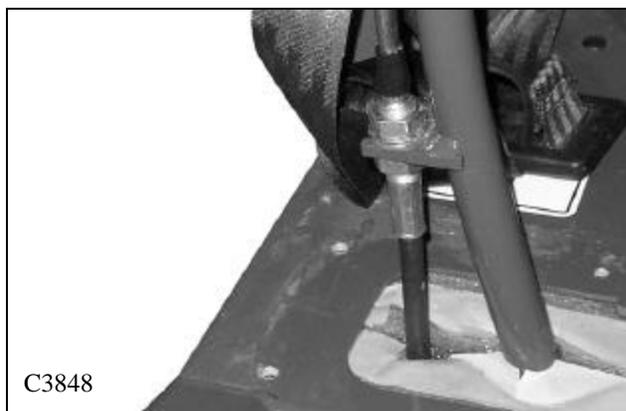
4

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 pedal travel clearance. Ensure the loader is parked on a level surface.

- 1 Make sure the cable ends are screwed onto the cable threads a minimum of 3/8" (6mm).
- 2 Place an angle finder on the top of the main tubing to find the base measurement. Take note of the reading.
- 3 Place the angle finder on the control lever as shown (fig. C3877). Note the reading. The correct angle is $8^{\circ} + / - 1^{\circ}$.
- 4 Adjust the angle by moving the cable nuts up or down on their mount. Adjustment may be made at the front and / or the rear of the cable. (fig. C3848 and fig. C3877)
- 5 Tighten all cable nuts and jam nuts on the cable ends. (fig. C3833 and fig. C3848)
- 6 Cycle the control levers to check for travel clearance.
- 7 Reconnect the throttle to the control lever plate. Fasten the control lever boots to the cab. Replace seat and hydro-static shield. (fig. C3876)



4

HAND CONTROLS 4.3

Control Lever Replacement

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



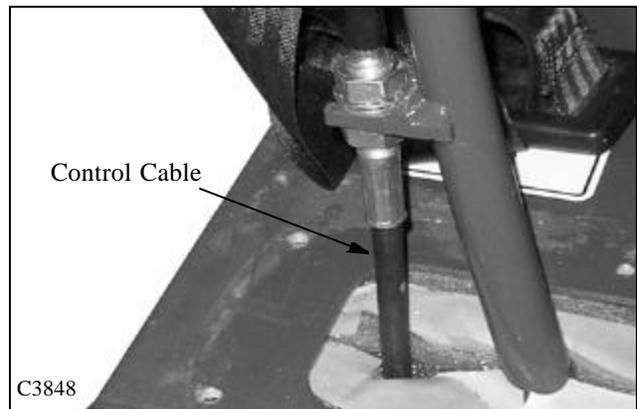
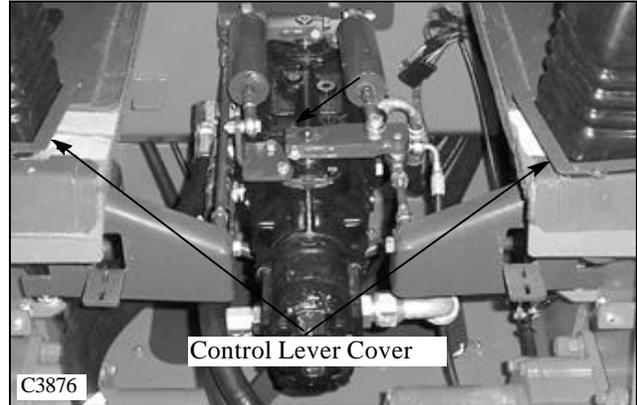
WARNING

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

- 2 Remove the seat and hydrostatic shield.
- 3 Remove control lever plates and boots. Disconnect throttle if necessary. (fig. C3876, C3832)
- 4 Remove cotter pins from the lever base ass'y and cable and remove the clevis pin. (fig. C3848)
- 5 Loosen the cable nuts and remove cable from mount on control lever.
- 6 Remove bolts from control rod.
- 7 Remove mounting bolts for control lever. (fig. C3847)
- 8 Remove control lever saving the plastic sleeve. Replace if necessary.
- 9 Replace all parts in reverse order. Cycle the control lever after installation to check for binding and travel clearance. Check control angles, wheel speed and tracking to ensure optimum performance.

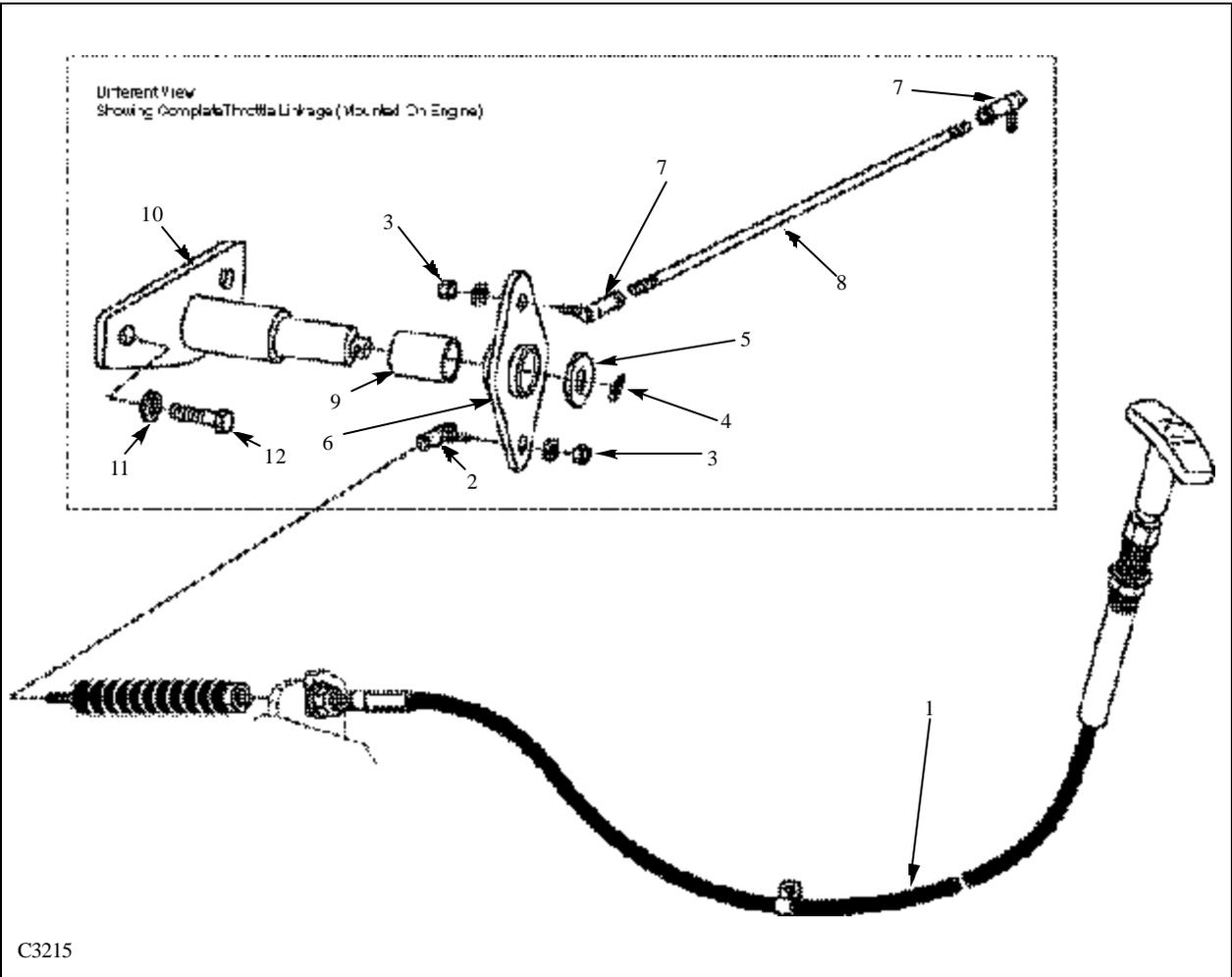
NOTE: If the loader is equipped with optional electronic accessories operated by control handle mounted switches, the control handle switch wiring will need to be disconnected and transferred to the new steering lever.

If the control lever functions are sloppy due to excessive wearing of the swivel bushing, the swivel assembly may need replaced.



4

THROTTLE 4.4



C3215

1. 56" Cable, Turn To Lock
2. Joint, Ball Socket
3. Nut, Hex
4. Pin, Spring
5. Washer, Flat
6. Linkage, Reverse Ass'y.
7. Joint, Ball Socket
8. Bar, Throttle Linkage
9. Bushing
10. Pivot, Throttle Ass'y
11. Washer, Lock
12. Bolt, Hex

THROTTLE 4.4

Adjustments

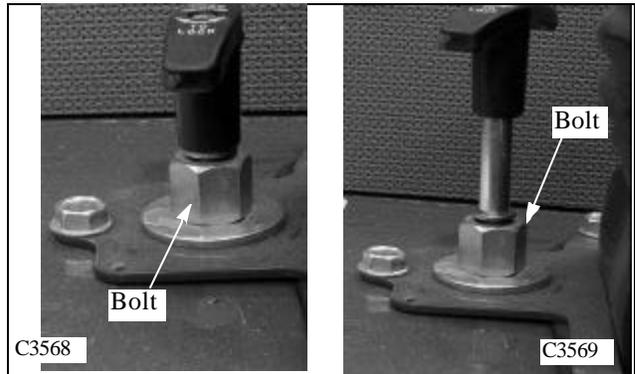
The throttle system can be adjusted for total travel (stroke).

The throttle cable can be set and locked in the full throttle position.



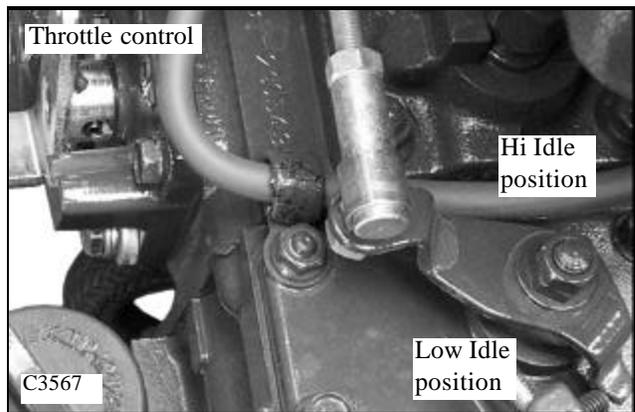
WARNING

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



TO CHECK THE THROTTLE TRAVEL:

- 1 Raise the boom arms, engage the boom supports and shut off the engine.
- 2 Open the rear door and locate the engine lever and throttle rod linkage.
- 3 Stroke the throttle lever in the full forward position. The engine lever must touch the limiter bolt stops to acquire full engine speed.
- 4 Stroke the throttle lever rearward until it stops. The engine lever should touch the limiter bolt to acquire the engines proper low idle speed.
- 5 Adjust the rod end of the engine lever and throttle linkage to get the full range of required travel for the engine lever to touch the limiter bolts.



THROTTLE 4.4

Throttle Cable 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 and hydrostatic shield.(fig. C3557)

3 Remove the tee handle, nut and washer holding the assembly in place.

4 Open the rear door and unhook the throttle rod end from the throttle pivot assembly.(fig. C3567)

5 Pull the throttle cable out toward the front of the loader. (fig. C3570)

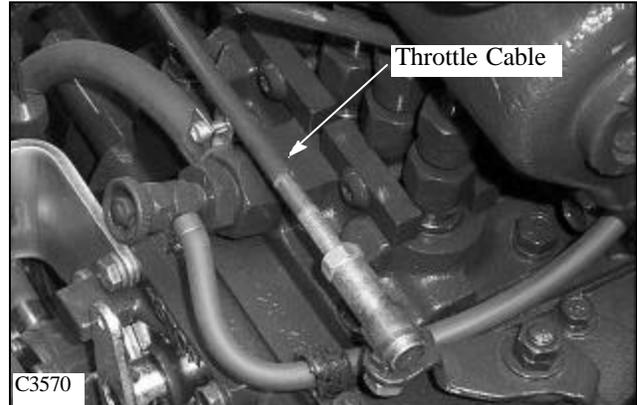
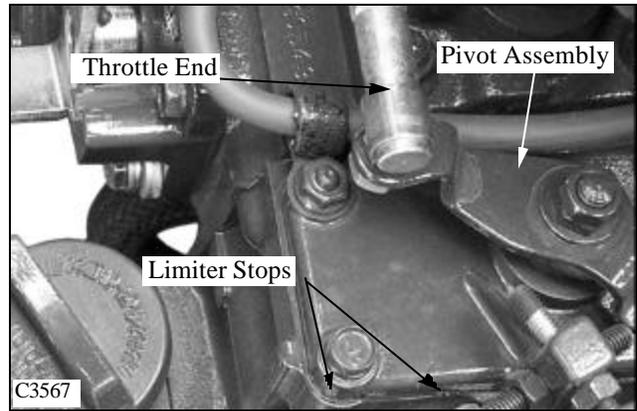
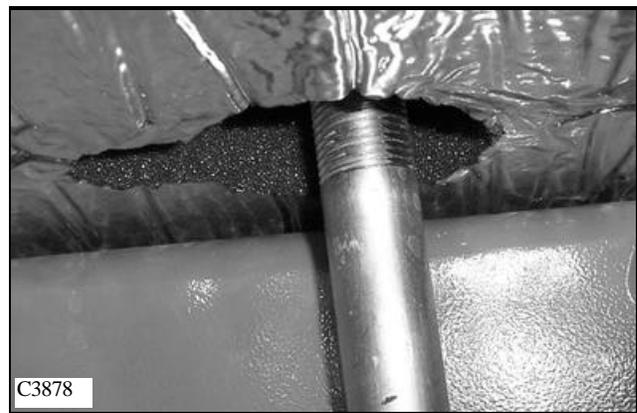
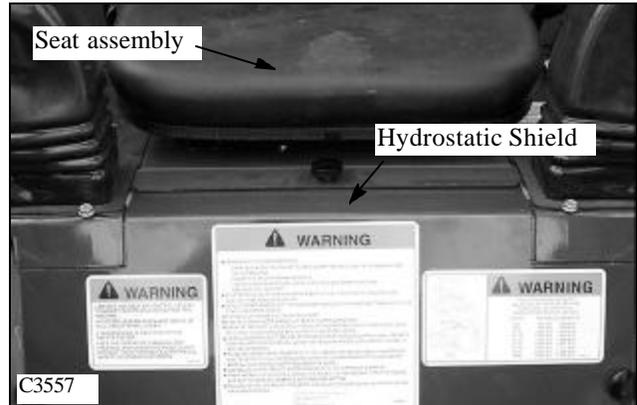
6 Remove the rod end left on the old throttle control cable and transfer it to the new control cable.

7 Replace the throttle control cable in the reverse order of above. Adjust the lock nut and tighten against the L.H. seat support on the underside of the deck.

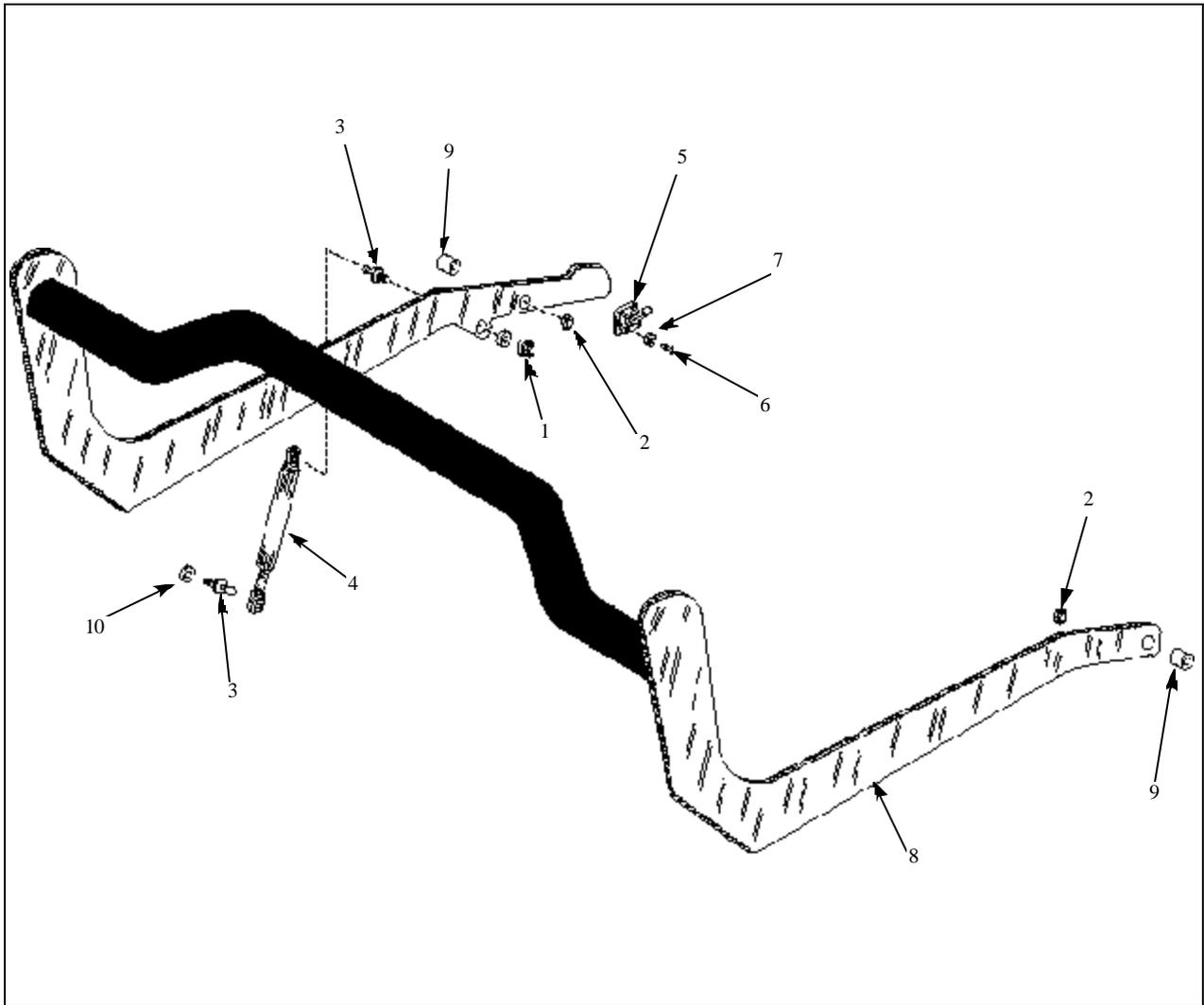
8 Adjust the rod end on the throttle cable to obtain full travel.(fig. C3570)

NOTE: The throttle rod may need to be adjusted to ensure contact of the engine lever and the limiter bolts for highflow speed settings (up and down). (fig. C3567)

4



RESTRAINT BAR 4.5



1. Nut, Jam
2. Nut, Nylok
3. Stud. Ball
4. Gas Spring
5. Switch, Dual
6. Screw, Self Tapping
7. Washer, Lock
8. Restraint Bar Ass'y
9. Spacer
10. Lockwasher

4

RESTRAINT BAR 4.5

Gas Spring Replacement

The restraint bar is held up, over head, by means of a gas assist type strut. (gas spring) (fig. C3571)

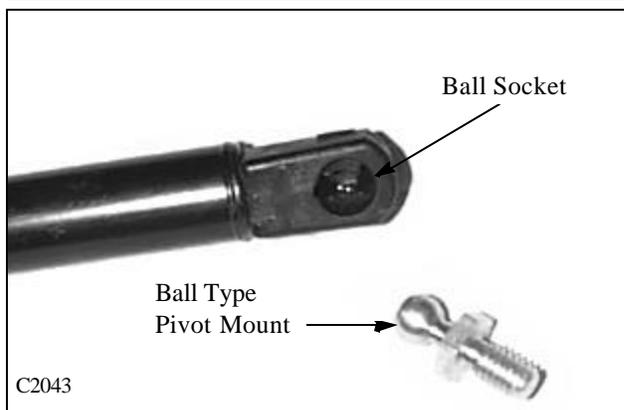
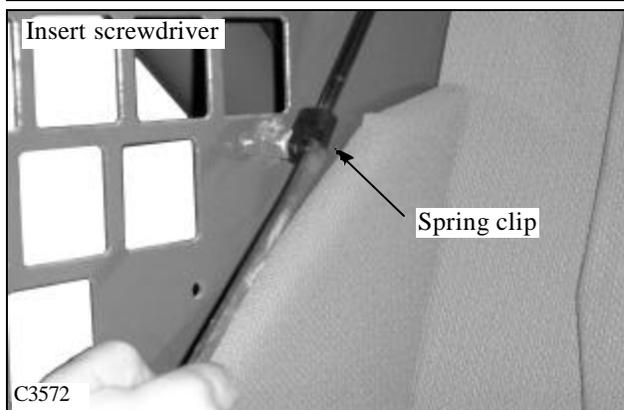
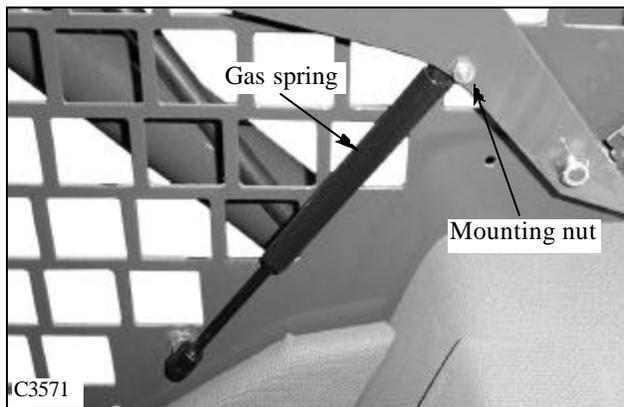
If the seal in the strut has deteriorated and failed, or the strut rod has been damaged, the restraint bar will not stay in the upright position due to gas pressure loss.

To replace the gas spring 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. C3572) 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.

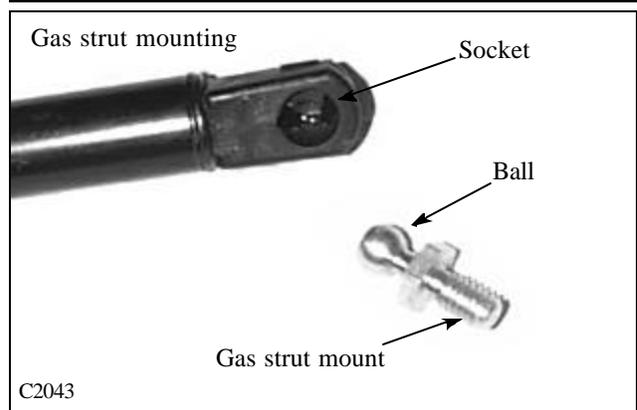
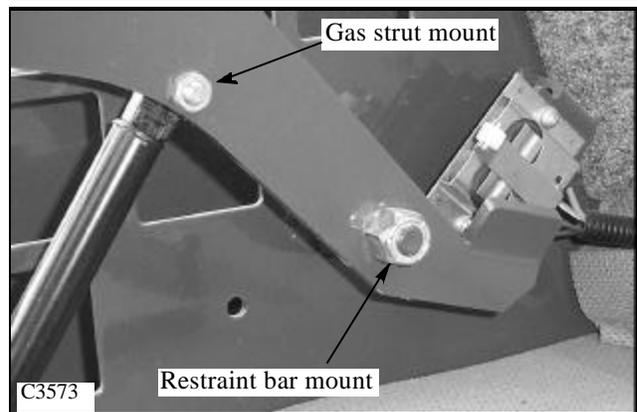
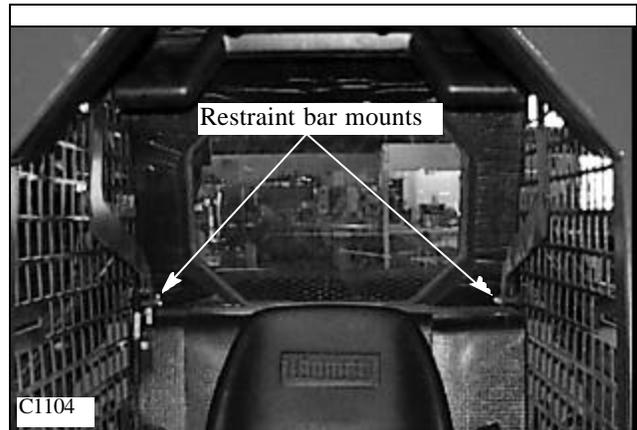


4

RESTRAINT BAR 4.5

Restraint Bar Replacement

- 1 Lower the liftarms and park the loader on a level surface. Shut off the engine.
- 2 Remove the nut from the upper gas spring pivot ball. (fig. C1105, C3573) Remove the mount and gas spring together allowing the restraint bar to lower.
- 3 Remove the 2 restraint bar mounting nuts. (fig. C1104) There is one on either side of the restraint bar.
- 4 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.
- 5 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.
- 6 Re- attach the upper ball pivot mount to the restraint bar. Cycle the restraint bar to check proper operation.
- 7 Check to make sure the safety switch is contacting the restraint bar, and functioning properly. This safety switch activates the parking brake when the engine is operating, the operator is seated with the seat belt fastened, and the restraint bar is in the raised position. Lower the restraint bar to release the parking brake.



4

PARKING BRAKE 4.6

General Information

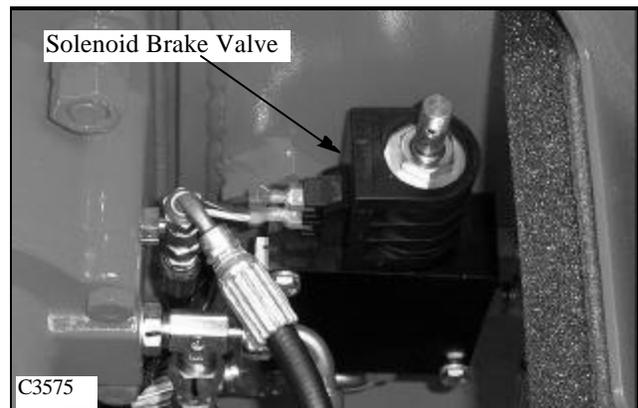
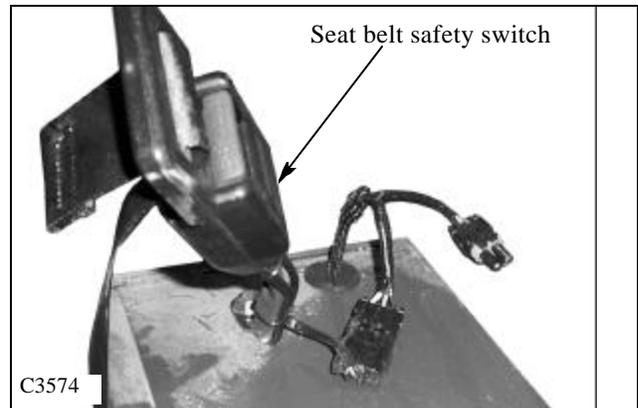
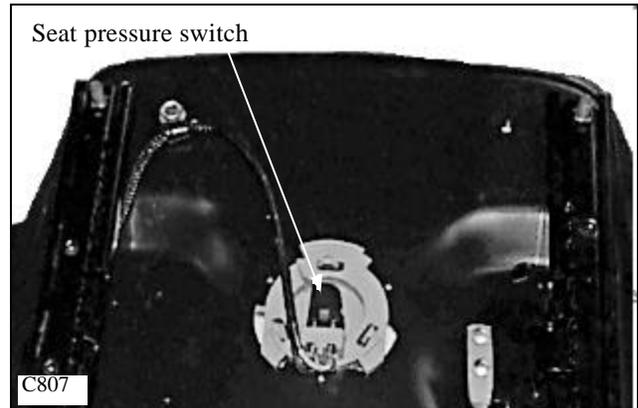
Each drive motor contains a set of clutch pack type friction discs that are spring loaded in the engaged position.

The parking brake is inter locked with various safety switches. (fig. C807, C3573, C3574, C3575) The parking brake will only release when the engine is operating, the operator is seated with the seat belt fastened and the restraint bar is in the lowered position.

The parking brake system requires 200 psi (13.78 bar) hydraulic pressure to release or separate the clutch packs in the drive motors. The hydraulic pressure is provided by the charge pressure relief valve in the hydrostatic tandem pump.

When the engine is operating and all safety switches are functioning and in the closed position, the hydraulic / electric solenoid brake valve (fig. C3575) will allow charge pressure to release the parking brake in the drive motors.

4



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	Service plunger on brake valve open	Inspect and service	2
	Brake disc wear or damage	Repair, replace	2
Brake won't release	Blown fuse	Replace	5
	Safety switch malfunction	Adjust, replace	5
	Lack of hydrostatic charge pressure	Test, repair	2
	Brake valve failure	Repair, replace	2



NOTES

4



THOMAS

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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	40 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

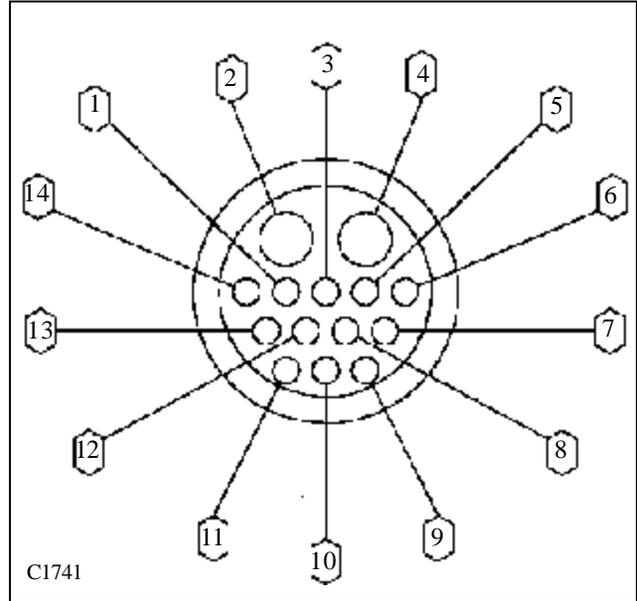


WIRING SCHEMATIC 5.2

ROPS Harness Connector

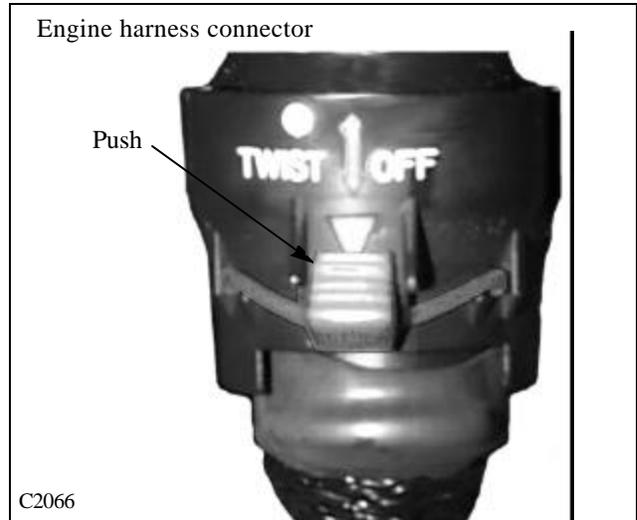
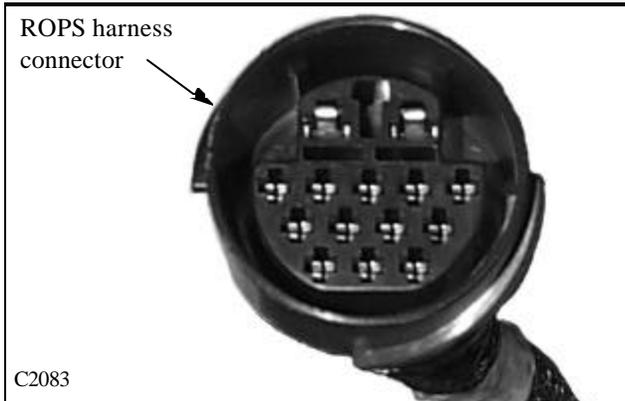
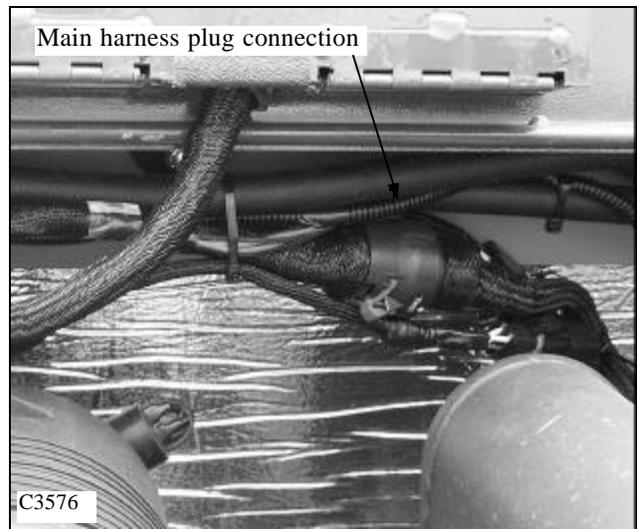
Diagram C1741 Legend. Shown is the wire color and function of each pin terminal in the connector plug.

PIN	WIRE COLOR	FUNCTION
1	Purple	Eng. oil press. indicator
2	White	Ignition (30)
3	Red / Wht	Ignition (19)
4	Blk / Wht	Ignition (acc)
5	Tan	Ignition (50)
6	Grey	Seat belt indicator
7	Grey / Wht	Charge (L) indicator
8	Blue / Wht	Hyd. temp. indicator
9	Org / Blue	Fuel level (+) gauge
10	Red / Org	Headlight
11	Brn / Wht	Brake light
12	Wht / Brn	Horn
13	Pple / Wht	Coolant temp. indicator
14	Pink	Air filter indicator



The photographs below and at right show the actual ROPS harness plug connection.

To separate the main electrical harness connection, push the locking tab in the direction of the arrow (fig. C2066) and twist the collar clockwise to release.

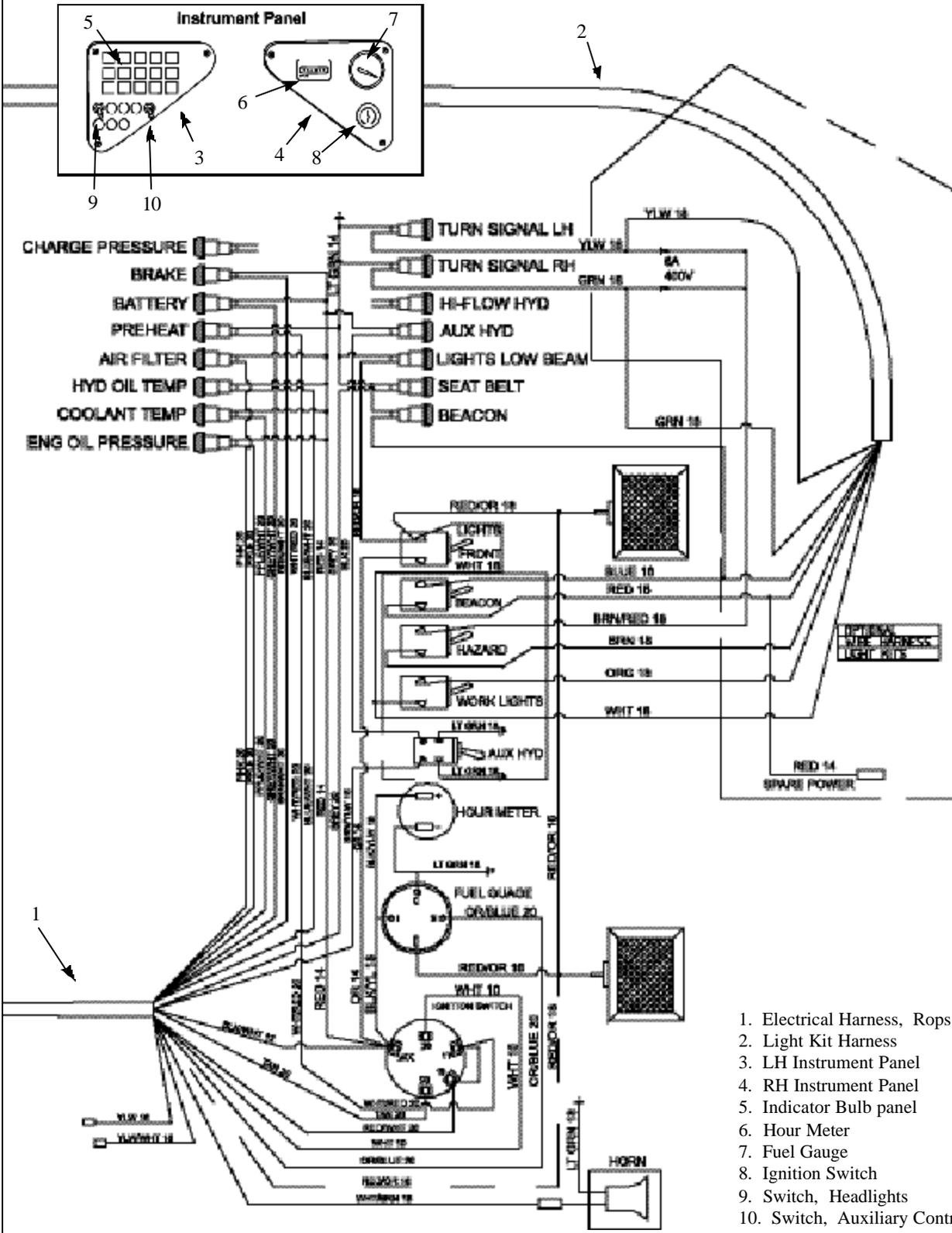


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WIRING SCHEMATIC 5.2

ROPS Electrical Wiring 175

C4187



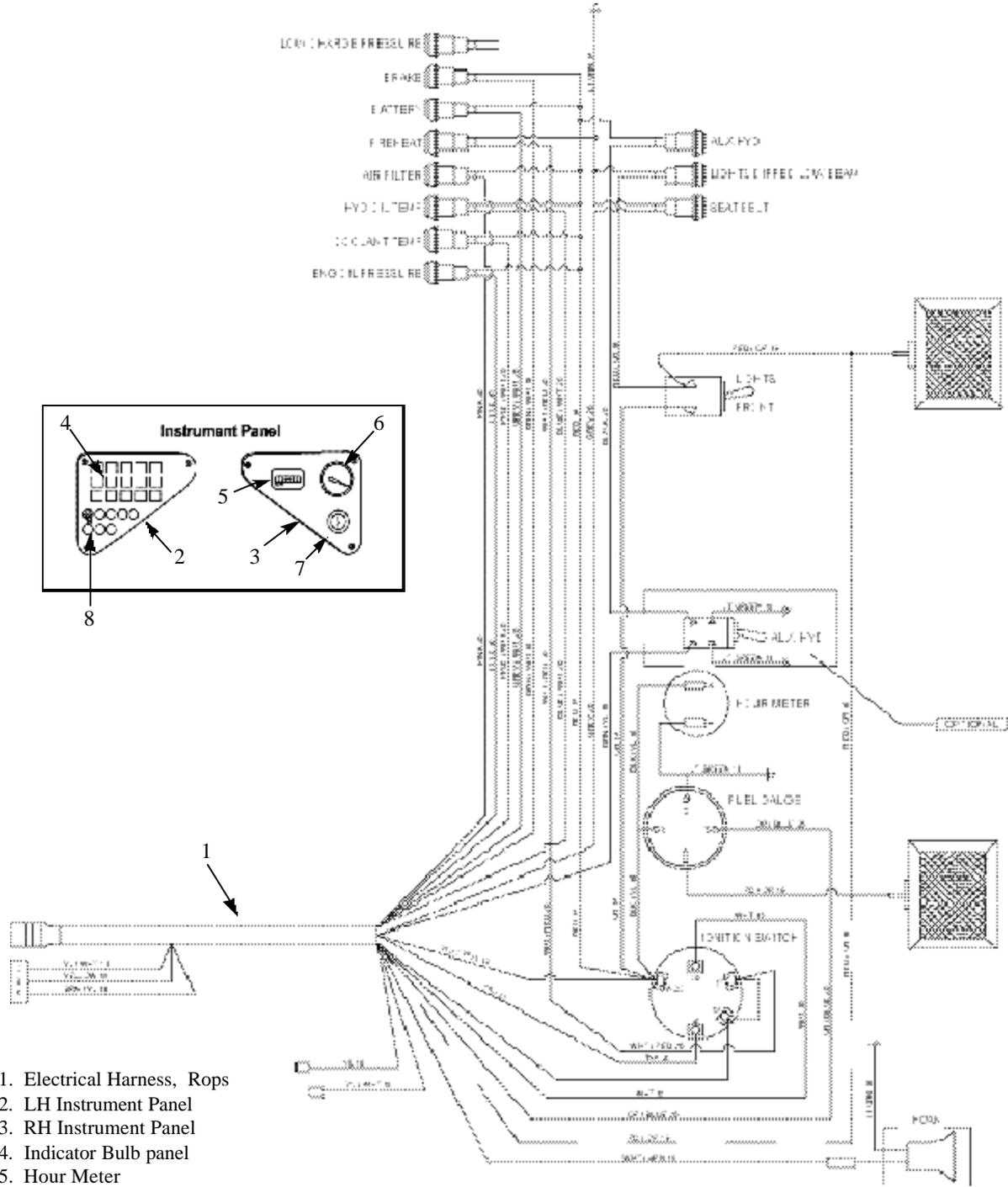
1. Electrical Harness, Rops
2. Light Kit Harness
3. LH Instrument Panel
4. RH Instrument Panel
5. Indicator Bulb panel
6. Hour Meter
7. Fuel Gauge
8. Ignition Switch
9. Switch, Headlights
10. Switch, Auxiliary Control

5

WIRING SCHEMATIC 5.2

ROPS Electrical Wiring 1700

C3688



1. Electrical Harness, Rops
2. LH Instrument Panel
3. RH Instrument Panel
4. Indicator Bulb panel
5. Hour Meter
6. Fuel Gauge
7. Ignition Switch
8. Switch, Headlights

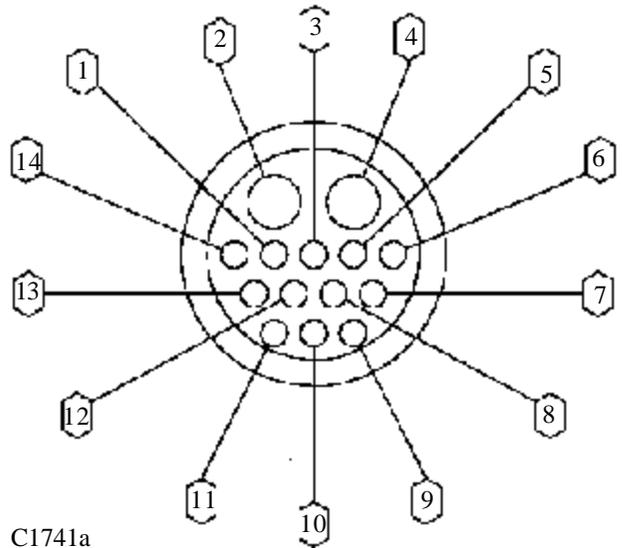
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WIRING SCHEMATIC 5.2

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	Blk / Wht	Fuse block
3	Red / Wht	Glow plug relay
4	White	Circuit breaker
5	Purple	Engine oil pressure
6	Pink	Air filter
7	Pple / Wht	Coolant temperature
8	Wht / Brn	Horn button
9	Brn / Wht	Brake light switch
10	Red / Org	Rear light
11	Org / Blue	Fuel level (+)
12	Blue / Wht	Hydraulic temperature
13	Grey / Wht	Alternator (L)
14	Grey	Seat Belt



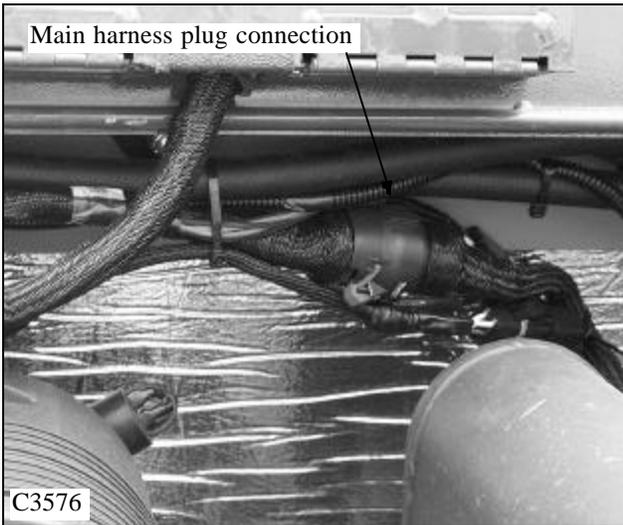
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The photographs below and at right show the actual Engine harness plug connection. To separate the main electrical harness connection, push the locking tab in the direction of the arrow (fig. C2066) and twist the collar clockwise to release.

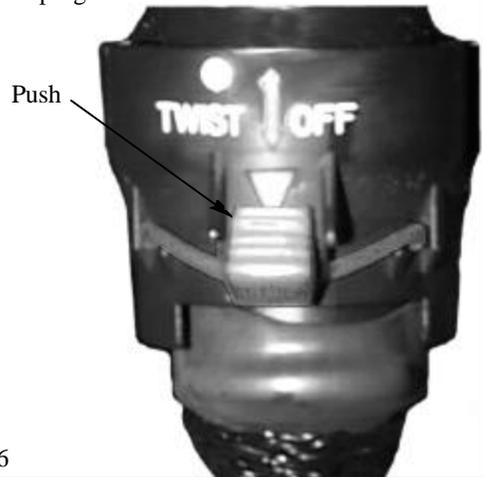
Engine plug



Main harness plug connection



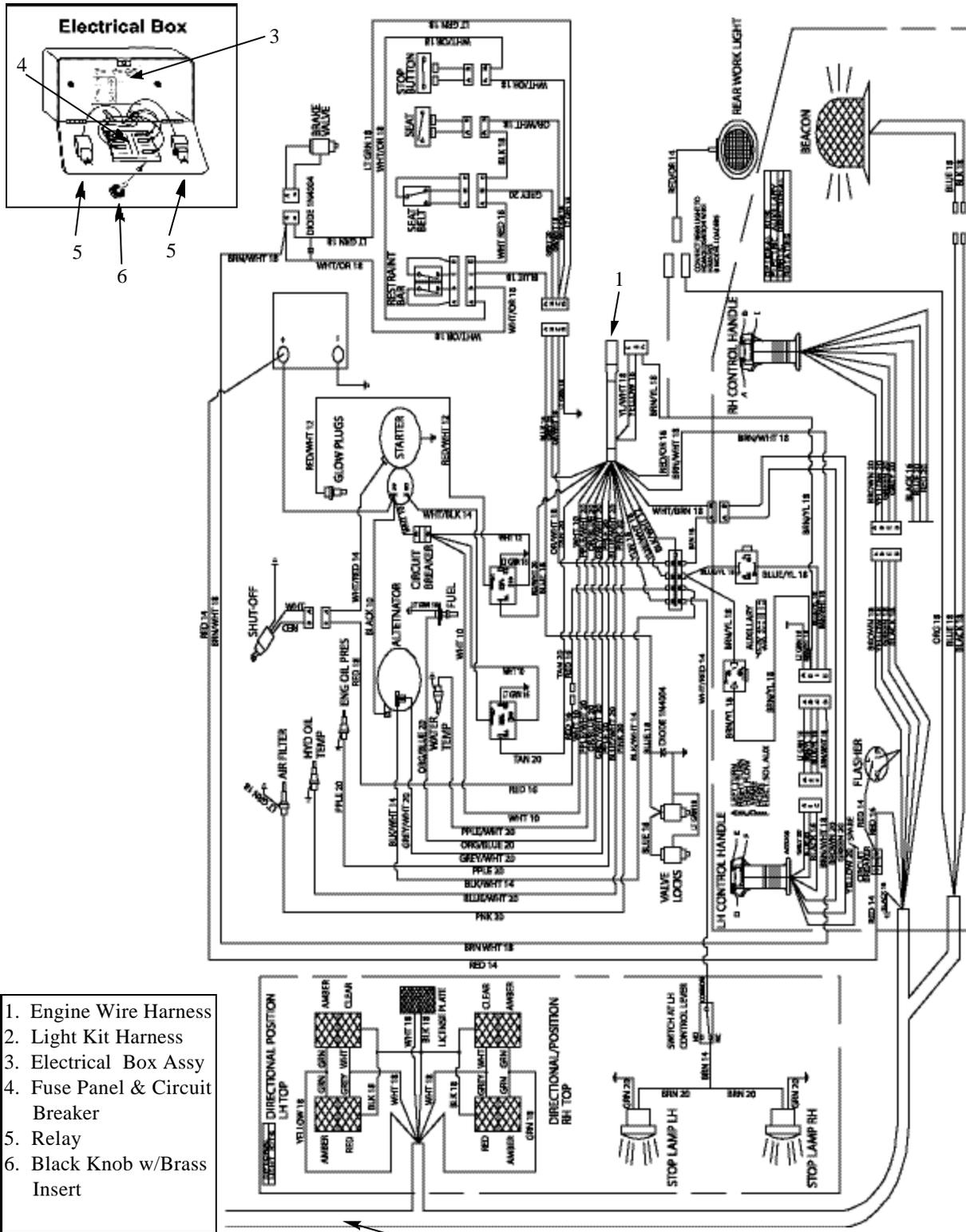
Engine plug



WIRING SCHEMATIC 5.2

Engine Electrical Wiring 175

C4188



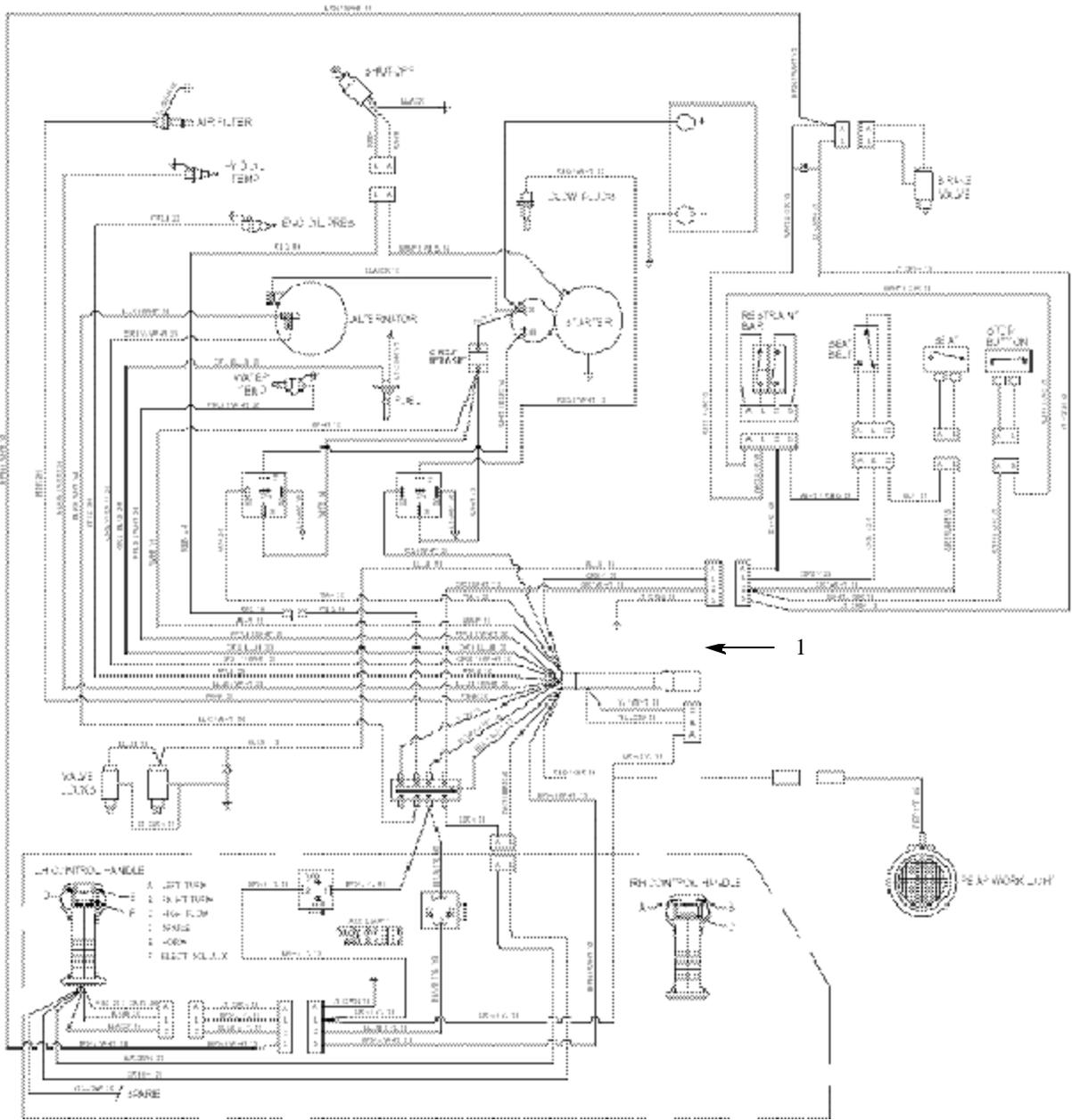
1. Engine Wire Harness
2. Light Kit Harness
3. Electrical Box Assy
4. Fuse Panel & Circuit Breaker
5. Relay
6. Black Knob w/Brass Insert



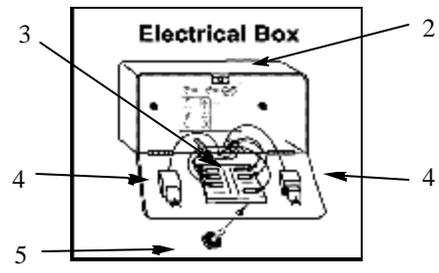
WIRING SCHEMATIC 5.2

Engine Electrical Wiring 175

C3690



1. Engine Wire Harness
2. Electrical Box Assy & Circuit Breaker
3. Fuse Panel
4. Relay
5. Black Knob w/Brass Insert



INSTRUMENTATION 5.3

Legend for fig. C3577

- 1 LH Turn Signal
- 2 Aux. Hydraulic Indicator
- 3 Hi-Flow Hydraulic Indicator
- 4 Headlight Indicator
- 5 RH Turn Signal
- 6 Hyd. Oil Temperature Indicator
- 7 Parking Brake Indicator
- 8 Seat Belt Indicator
- 9 Hyd. Charge Pressure Indicator
- 10 Strobe Light Indicator
- 11 Engine Oil Pressure
- 12 Engine Coolant Temperature
- 13 Alternator Indicator
- 14 Air Filter Restriction Indicator
- 15 Engine Preheat Indicator
- 16 Headlight Switch
- 17 Strobe Light Switch
- 18 Four Way Flasher Switch
- 19 Work light Switch
- 20 Aux. Hydraulics Switch
- 21 Hi-Flow Hydraulic Switch
- 22 Spare Switch Hole
- 23 Spare Switch Hole

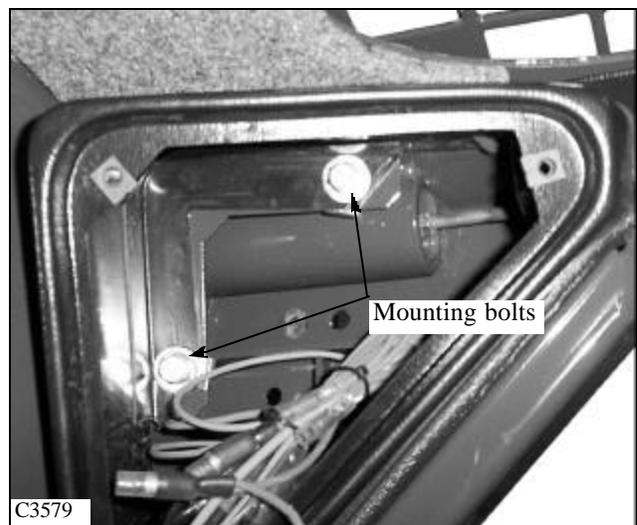
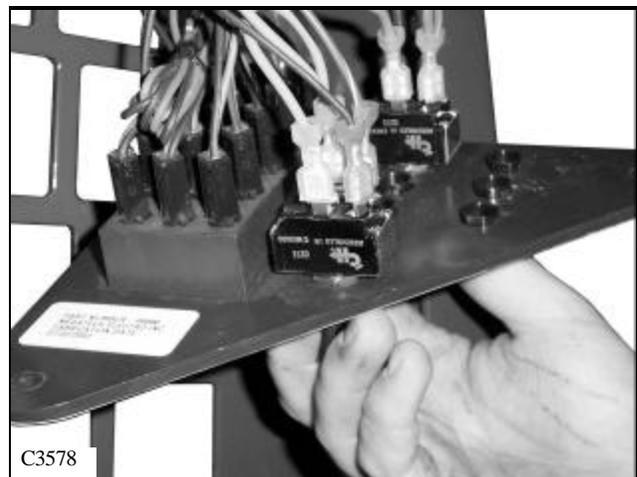
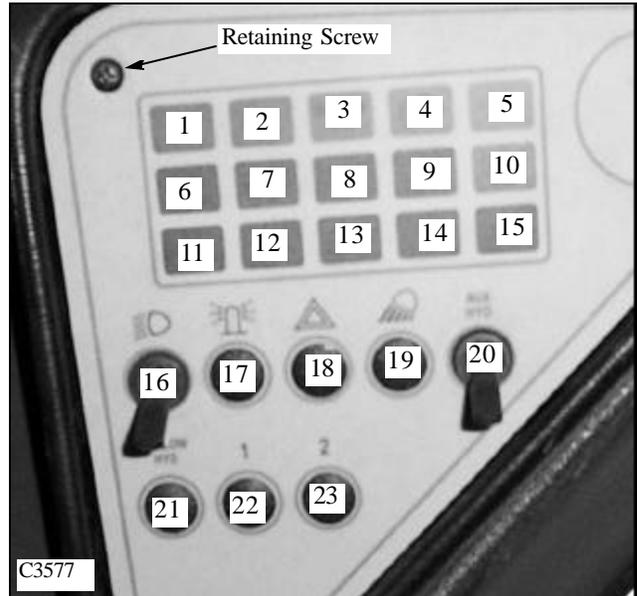
Switch & Bulb Replacement

To replace a malfunctioning switch or indicator light:

- 1 Remove the 3 screws retaining the electrical panel to the dash pod. (fig. C3577, C3578)
- 2 Disconnect the spade terminals on the rear of the switch. (fig. C3578)
- 3 Remove the switch by loosening the hex nut on the back, then unscrewing the knurled nut on the front of the electrical panel.
- 4 Replace an indicator bulb by turning out the socket and pull bulb out.
- 5 Replace the switch, indicator light and panel in the reverse order.

If the dash pod is damaged, remove the 2 mounting bolts and slip over the dash panel. (fig. C3579)

Disconnect all panel wiring if replacing the complete unit. Replace the parts in reverse order. Follow the wiring schematic to properly locate the switches and wiring in position.

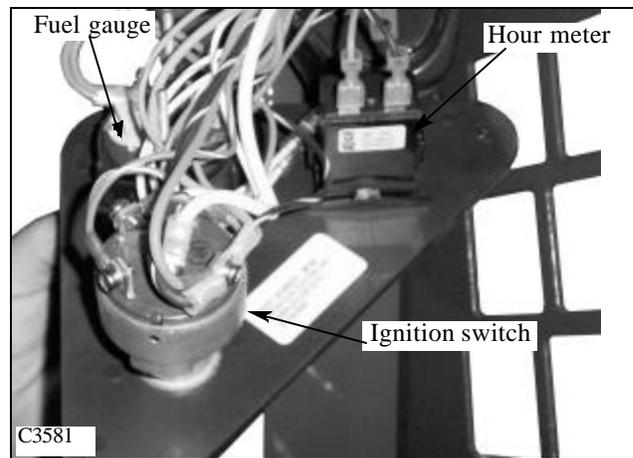
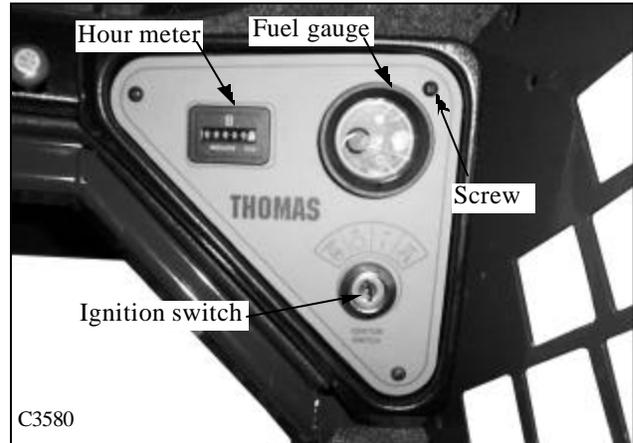


INSTRUMENTATION 5.3

Replacement

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

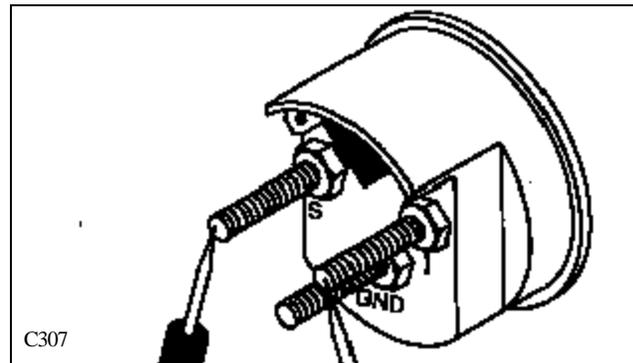
- 1 Disconnect the battery cable connection.
- 2 Remove the 3 screws retaining the dash panel to the dash pod. (fig. C3580)
- 3 Access the rear of the dash panel.
- 4 Remove the wiring from the effected part.
- 5 The fuel gauge is retained by a bracket and 2 mounting nuts. Remove the nuts and the gauge 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 The hour meter is retained in the dash panel with molded in tabs. Pull the tabs outward and the hour meter can be replaced.



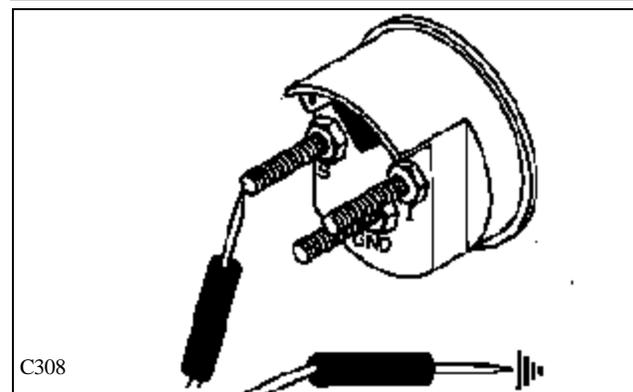
Testing the Fuel Gauge

- 1 Remove the right hand dash panel to access the gauge. (fig. C3581)

- 2 With the ignition switch off, connect an ohmmeter between the “S” terminal and the “I” 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.

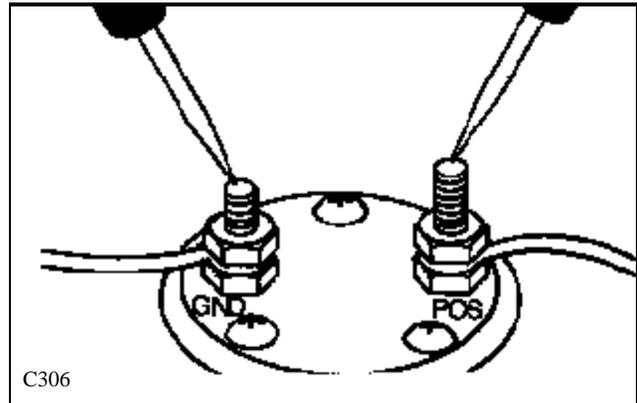


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INSTRUMENTATION 5.3

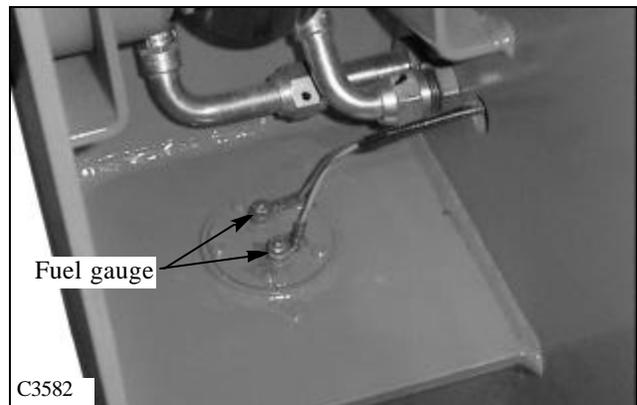
Testing the Fuel Sender

- 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.
- 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. (fig. C3582)
- 7 Connect the sender wires taking care not to over tighten the nuts and stripping the studs. Green wire is ground.



Testing the Hour Meter

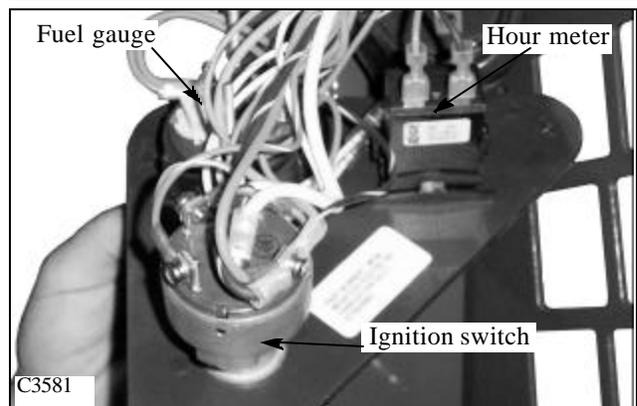
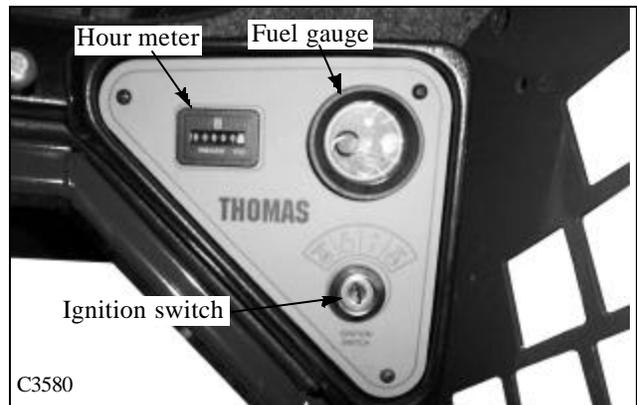
The hour meter records the number of engine operating hours.

To check the hour meter, remove the 3 screws retaining the right hand dash panel to the dash pod. (fig. C3580, C3581)

Using a 12 volt test meter, connect the positive lead to the positive terminal of the hour meter and the ground lead of the tester to a good ground. Turn the ignition switch to the "RUN" position.

A reading of 12 volts means the hour meter is operating properly.

No voltage reading means there could be a problem in the wire running from the "ACC" terminal on the ignition switch to the positive side of the hour meter or a defective ignition switch.



5

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 3 screws retaining the right hand dash panel to the dash pod 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.

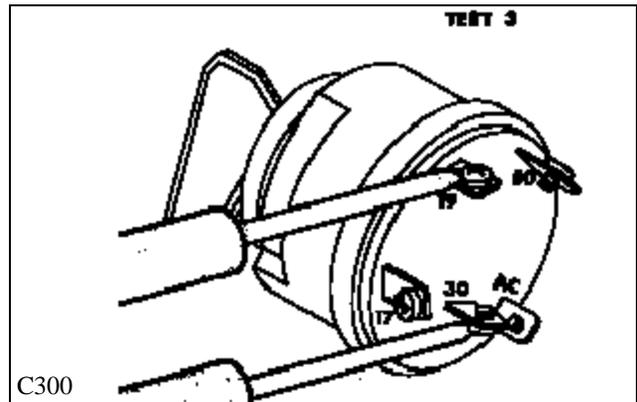
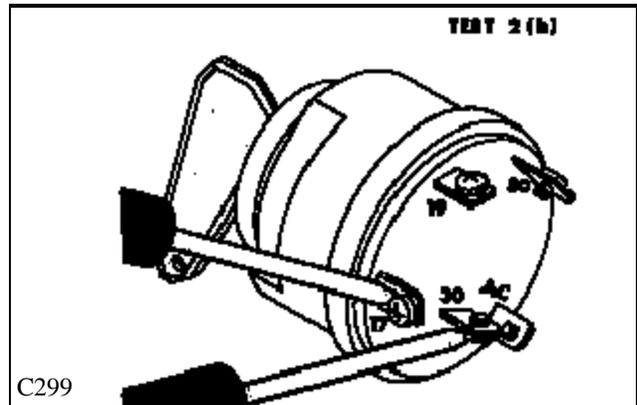
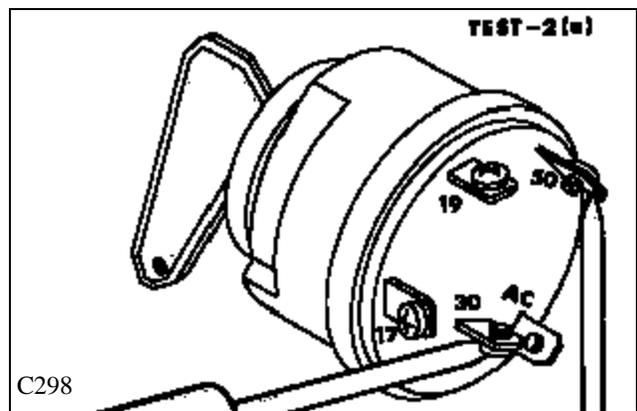
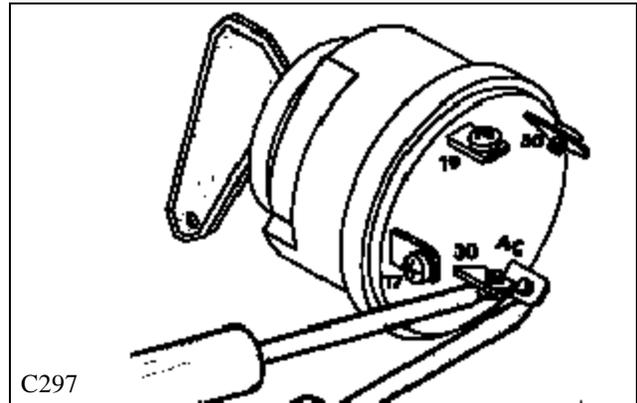
High resistance reading means the ignition switch needs replacement.

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.

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 3 screws retaining the right hand dash panel to the dash pod. (fig. C3580, C3581) 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.

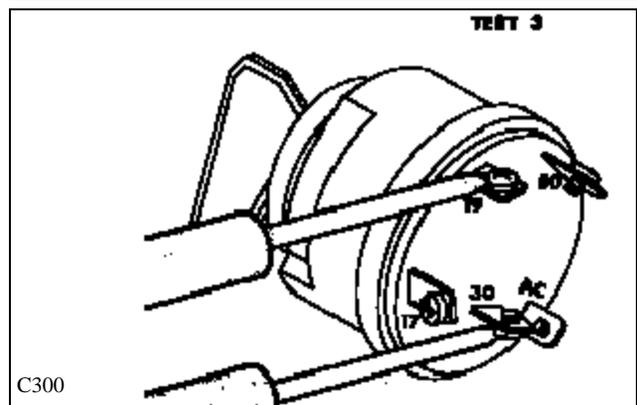
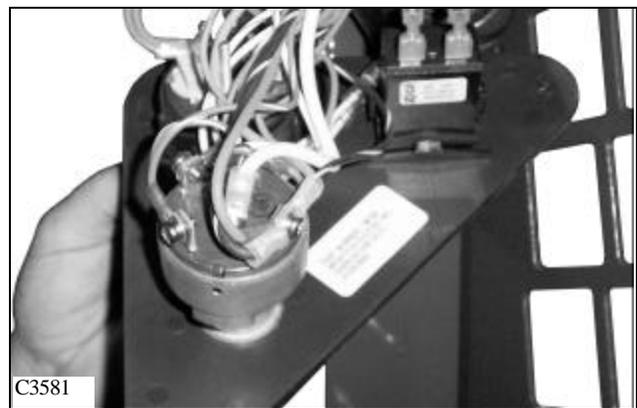
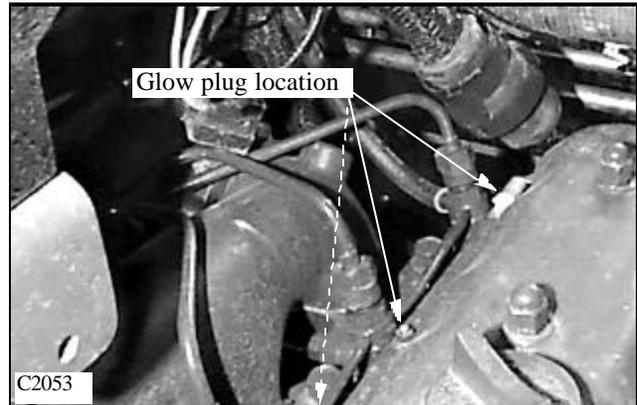
Low resistance reading normal.

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 3 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.



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. C3557)
- 2 Pull up and toward the front of the loader and remove the seat. Be careful to not catch any electrical wiring while removing.

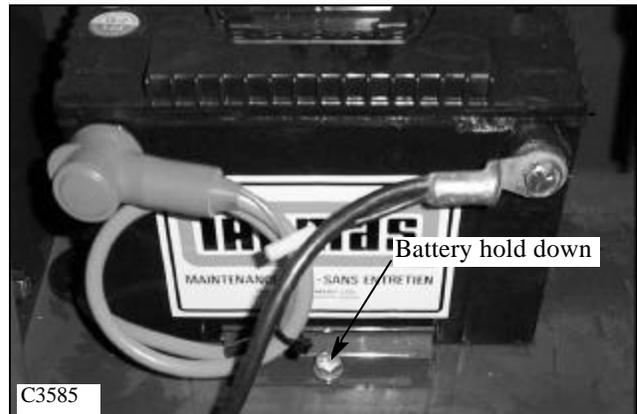
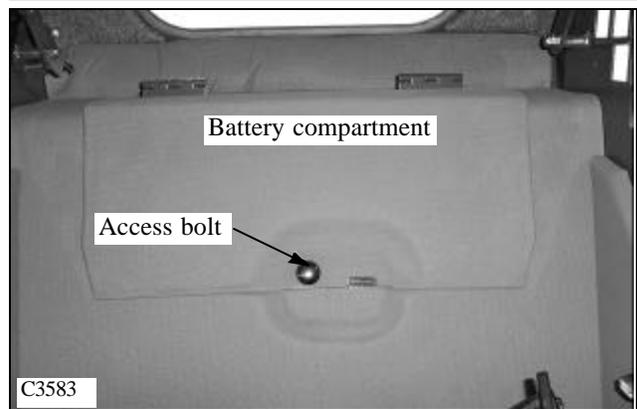
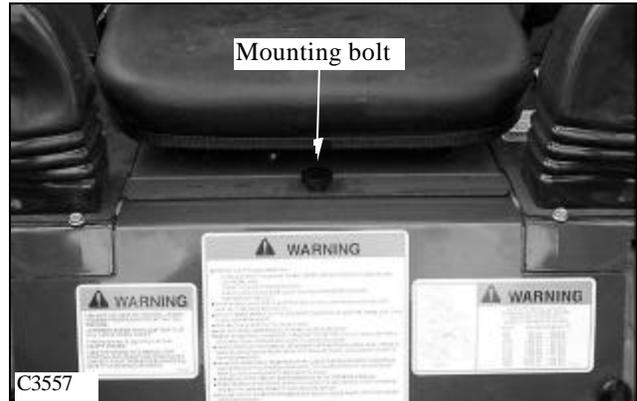
- 3 Remove the access bolt from the battery compartment cover. (fig. C3583)

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 Raise the battery compartment cover and latch the prop bar in place. (fig. C3584)
- 5 Disconnect both battery ground terminals first. Then disconnect the positive cables from the battery. (fig. C3585)

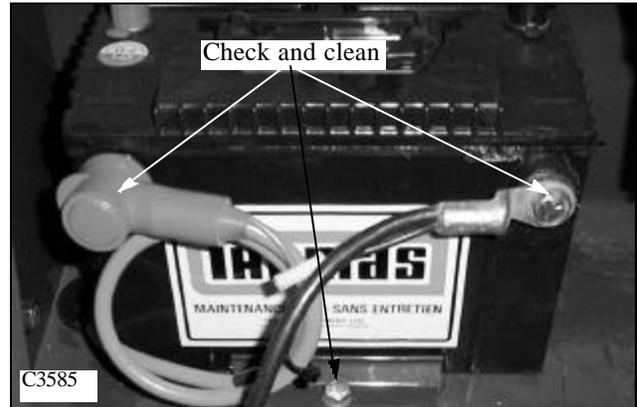
- 6 Remove the bolt securing the battery hold down bracket. (fig. C3585)
- 7 Carefully remove the battery from the compartment.
- 8 Inspect the battery cables for corrosion and damage. Remove any corrosion using a wire brush and a soda solution. Replace the cables having damaged or deformed ends.
- 9 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

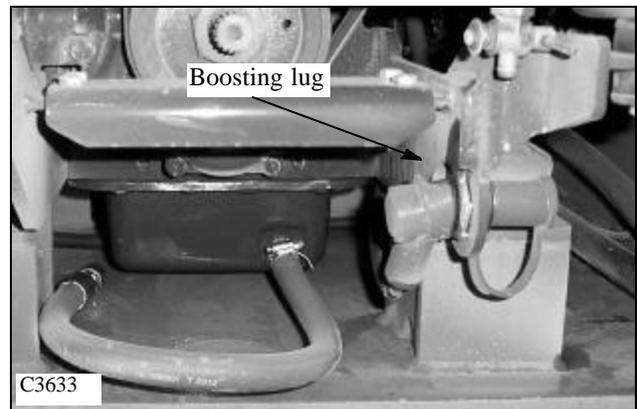
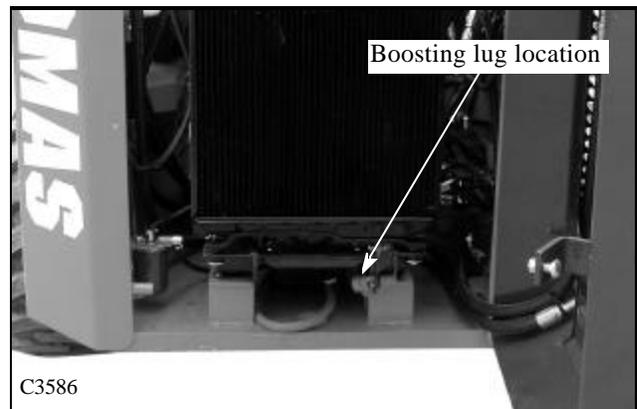
10 Inspect the battery case for cracks that may allow electrolyte to leak into the environment. Inspect the batteries on a regular basis for damage such as cracks or a broken case. Inspect the battery cables for tightness and corrosion. Remove any corrosion and coat the terminals with a dielectric grease. Check the battery hold downs to be sure they are properly retaining the battery in the compartment. (fig. C3585)



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. C3586)

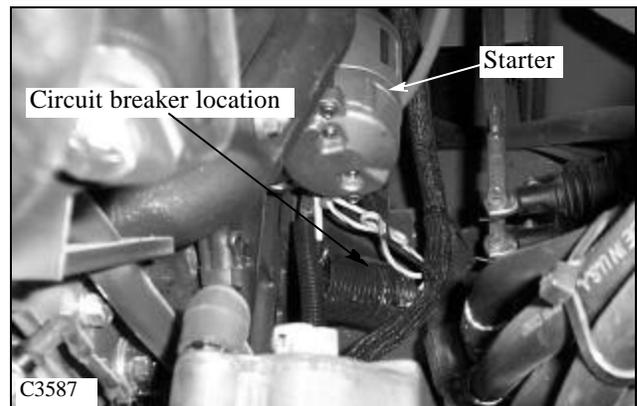
- 1 Open the rear door and raise the engine compartment cover.
- 2 Remove the red rubber protective cover from the boosting lug. (fig. C1029)
- 3 The ignition must be in the off position.
- 4 Connect the positive cable from the 12 volt boosting supply to the boosting lug on the loader.
- 5 Connect the 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 harness, right hand side of engine. (fig. C3587) The circuit breaker is covered by loom and is not immediately visible to the eye.

- 1 Disconnect the battery grounds before testing or replacing the circuit breaker.
- 2 Strip the loom covering back to access the circuit breaker.
- 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.



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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 underneath of the engine cover. (fig. C3588)

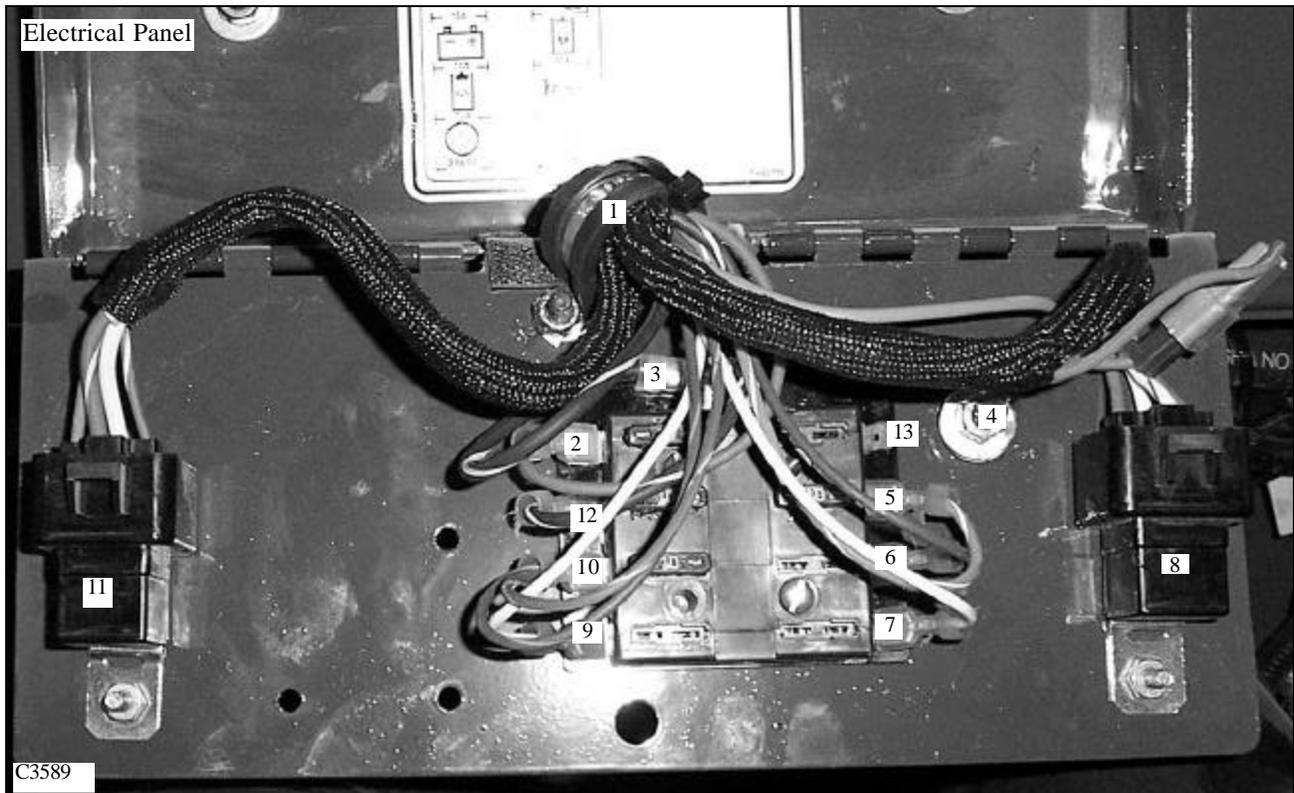
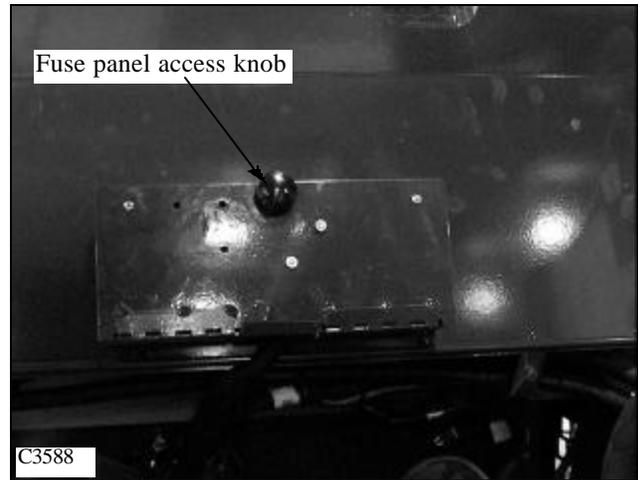
To access the electrical panel:

- 1 Open the rear door and raise the engine cover.
- 2 Remove the bolt holding the electrical panel cover closed. (fig. C3588)
- 3 Open the cover and all fuses and relays will be exposed. (fig. C3589)

Visually check the fuses for burnt contacts.

The relays are identical and may be checked by swapping one for the other to trace a malfunction. If changing the relays around does not repair the problem, the problem is somewhere else.

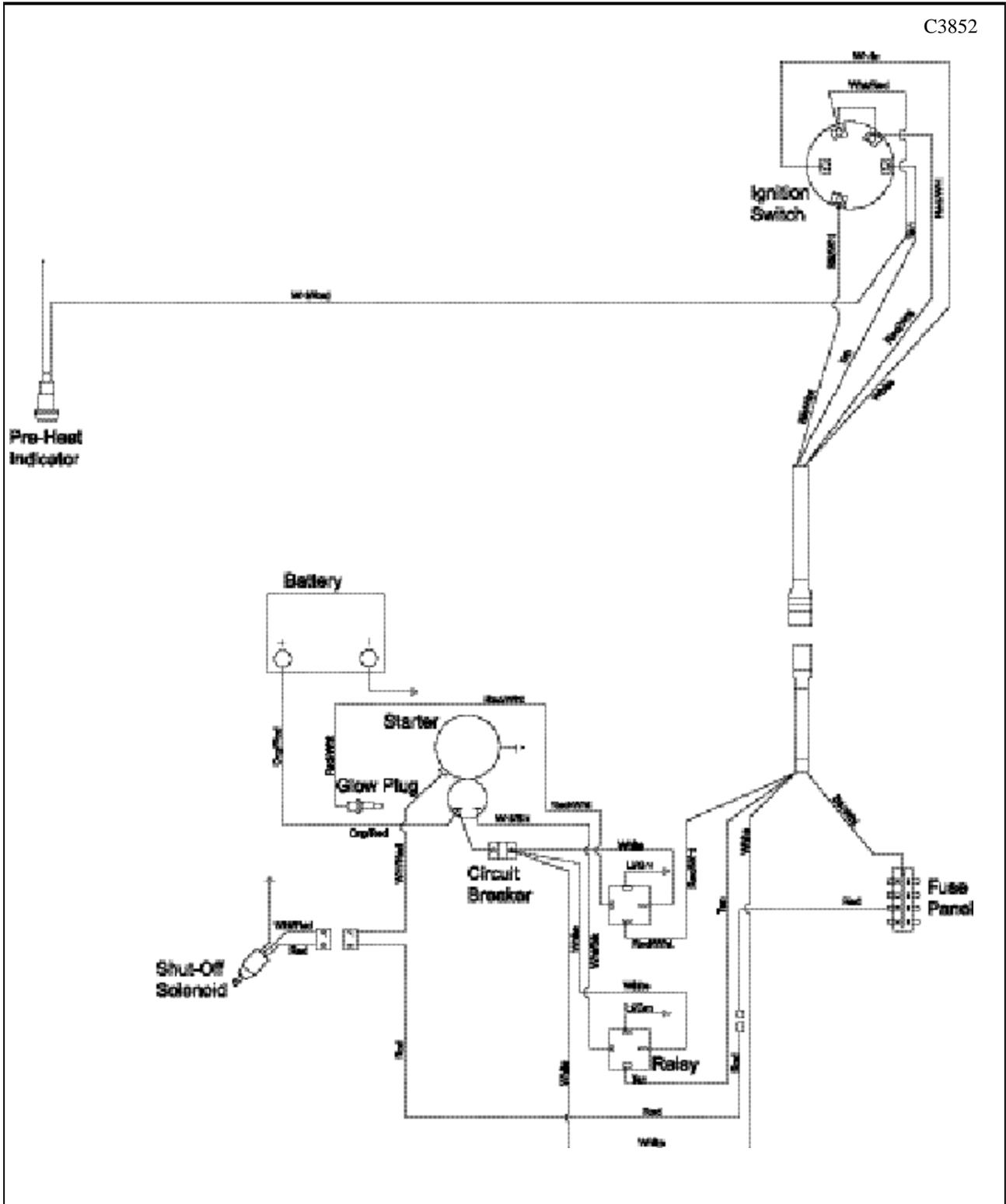
The ground bolt should be checked occasionally for corrosion and cleaned if necessary. Use a dielectric grease to protect the ground point from the elements.



ELECTRICAL PANEL LEGEND.(fig. C2052)

- | | |
|---|--|
| 1 Engine harness | 7 Option (10Amp, YL / WH) |
| 2 Engine Shut Off (15 Amp, RED) | 8 Manifold Heater Relay (40 Amp) |
| 3 Power Inlet From Ignition Switch Acc (BLK / WH) | 9 Option (10 Amp YL) |
| 4 Grounding Point (LT GRN) | 10 Auxiliary Solenoid (10 Amp, RED / YL) |
| 5 Safety Switches (15 Amp, OR / WH) | 11 Starter Relay (40 Amp) |
| 6 Horn / Option (10 Amp, BRN) | 12 Alternator (10Amp, BLK / WH) |
| | 13 Option (10Amp) |

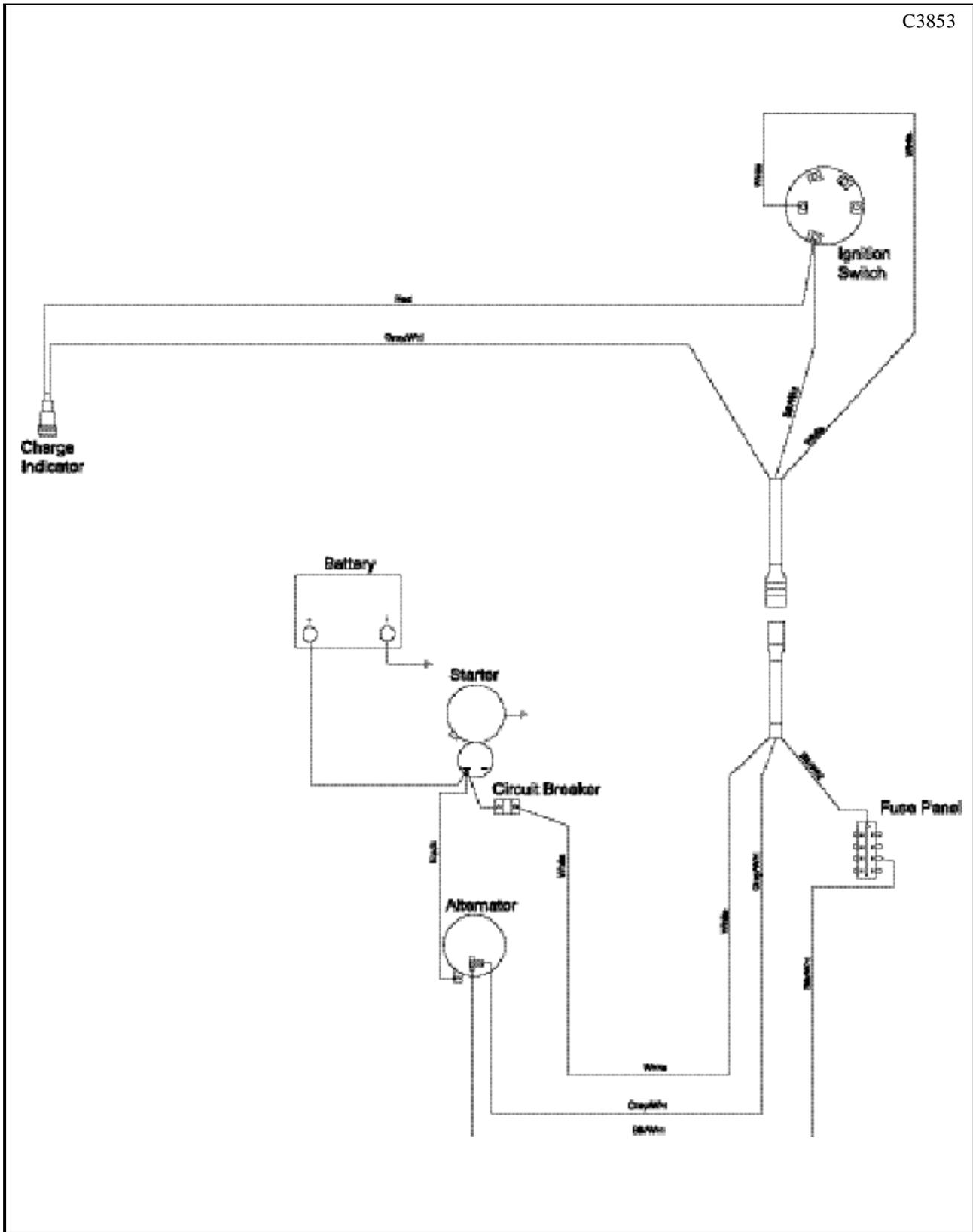
STARTING CIRCUIT 5.8



5

CHARGING CIRCUIT 5.9

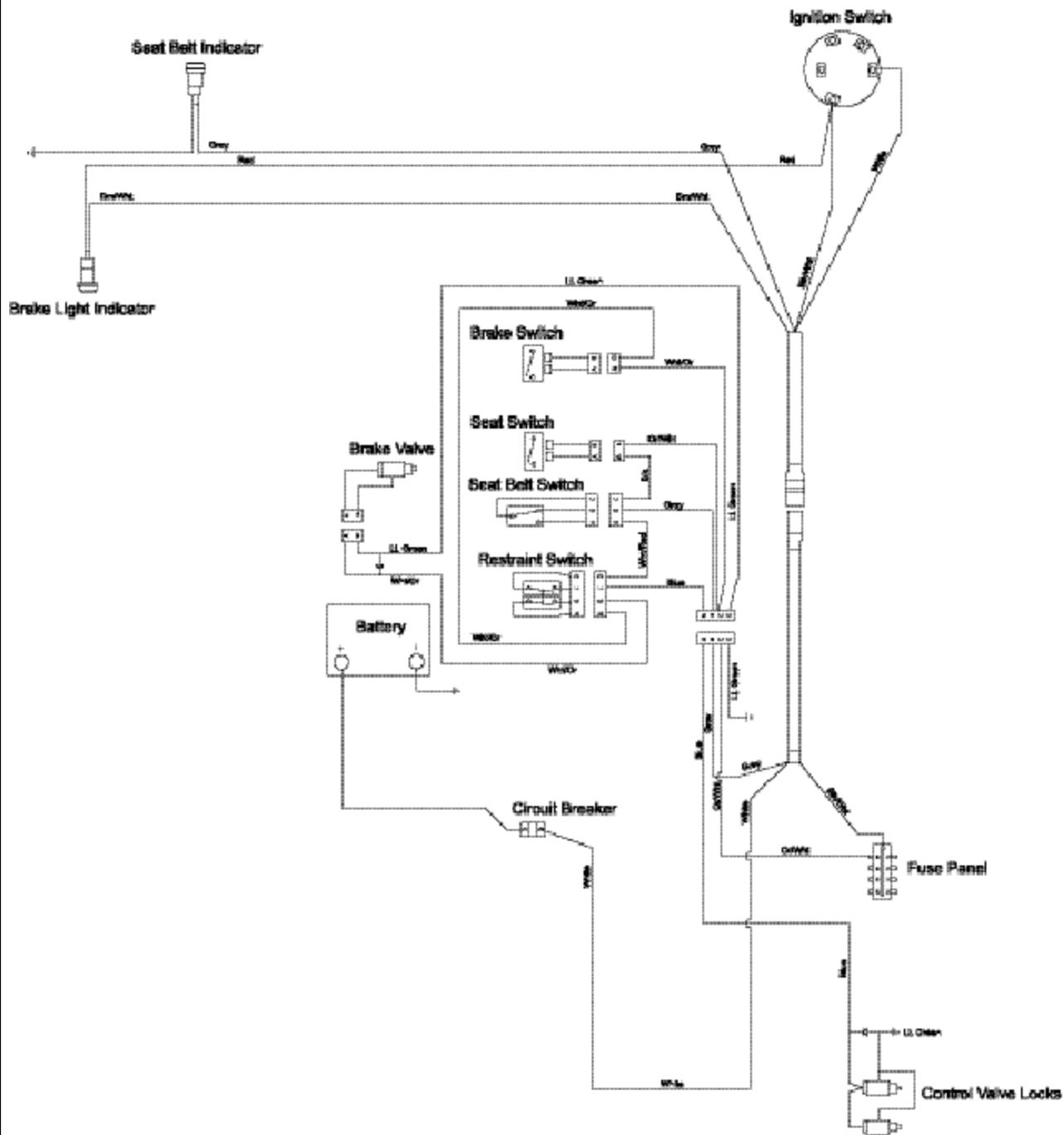
C3853



5

SAFETY CIRCUIT 5.10

1700
175



C3855

5

SAFETY CIRCUIT 5.10

General Information

The loader is equipped with 3 inter - connected safety switches. These 3 switches operate 2 electric solenoid controlled lock devices. One (1) solenoid coil on the hydraulic brake valve (fig. C3575), one (1) pair of solenoid coils on the hydraulic control valve (fig. C1514) Failure of any one (1) of these switches will prevent the operation of the solenoid coils and loader functions. All 3 must be hooked up, functioning and, if applicable, adjusted correctly.

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

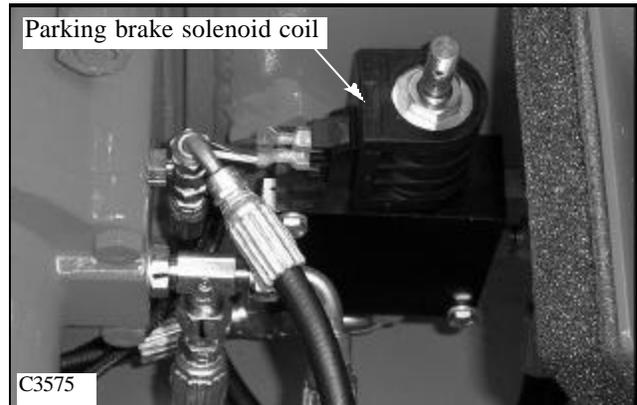
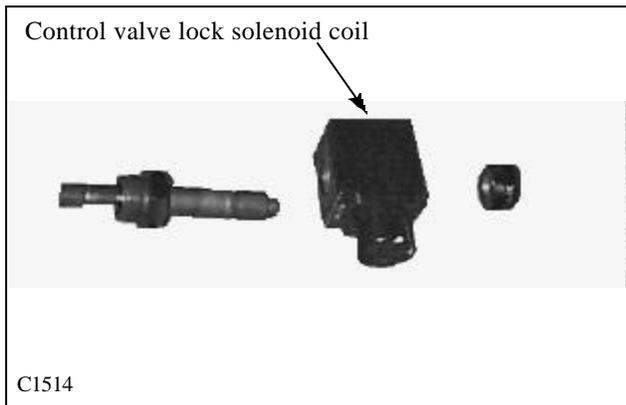
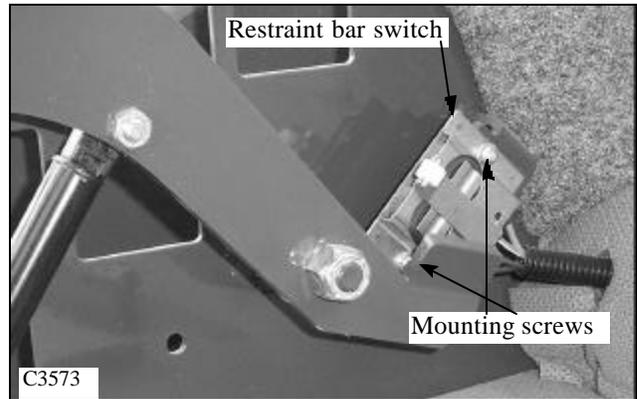
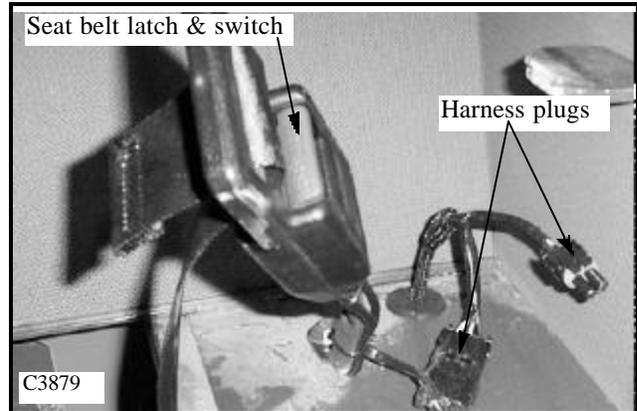
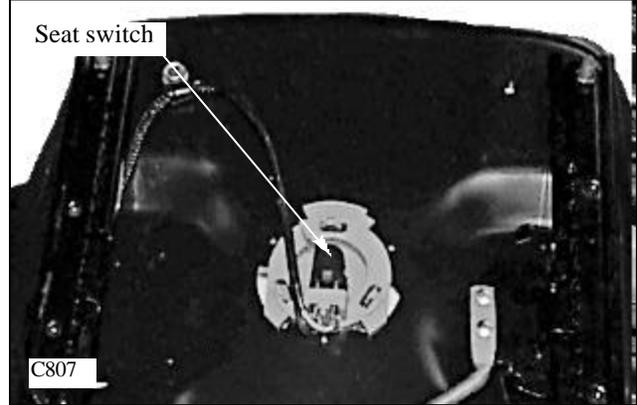
The seat belt assembly is equipped with a safety switch. The operator must have the seat belt fastened around them in order to close the switch and allow the parking brake to release and the control valve to function. (fig. C3879) No adjustments required.

The restraint bar is equipped with a dual function safety switch. (fig. C3573) 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.

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.

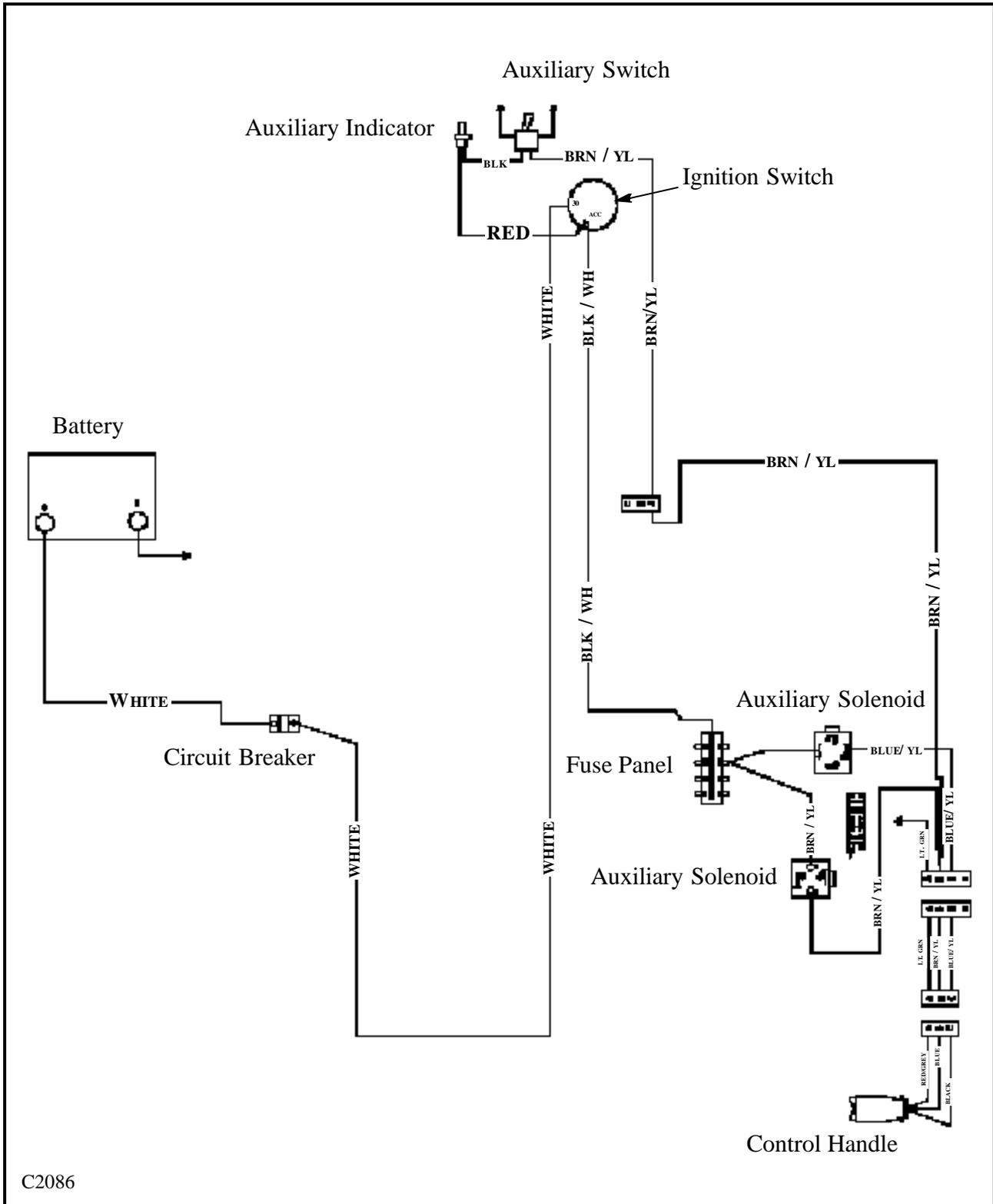
The restraint bar must be in the lowered position for the control functions to operate.

The switch must contact the restraint bar when in the lowered position.



5

— ELECTRIC AUXILIARY CIRCUIT 5.11 —



C2086



ELECTRIC AUXILIARY CIRCUIT 5.11

THE ERGONOMIC HANDLE CONTROL:

The Ergonomic Handle contains 3 switches: 1 rocker switch (fig. C3861) and 2 push button switches. (fig. 3860)

The handle is normally installed only on the left hand control lever for the 175 loader.

When installed on the L.H. 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. L.H. push button is a spare to be used if adding an option.
3. R.H. push button is for the horn.

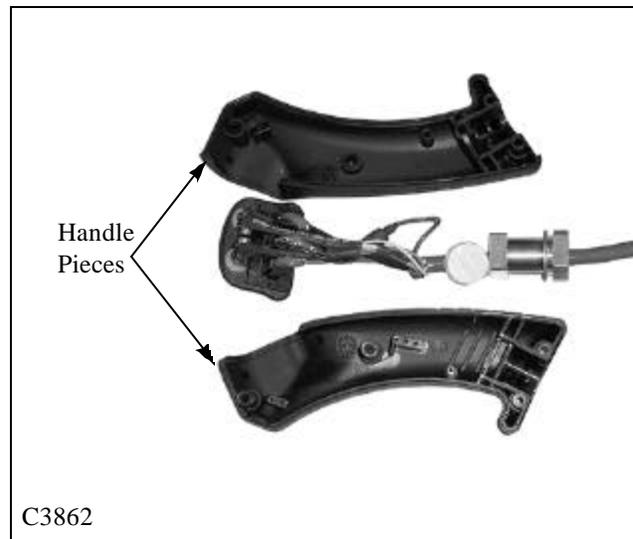
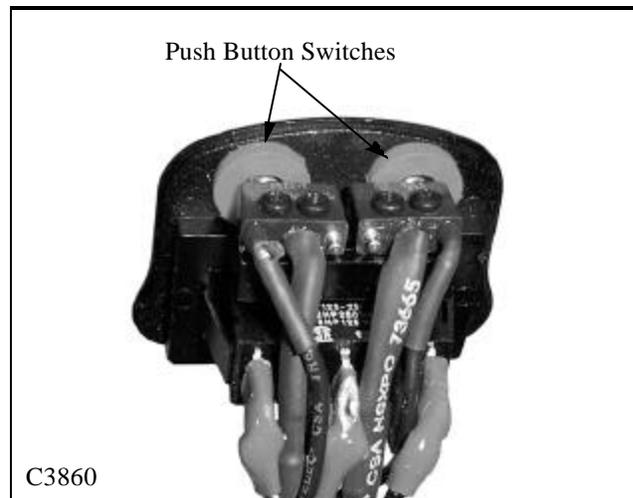
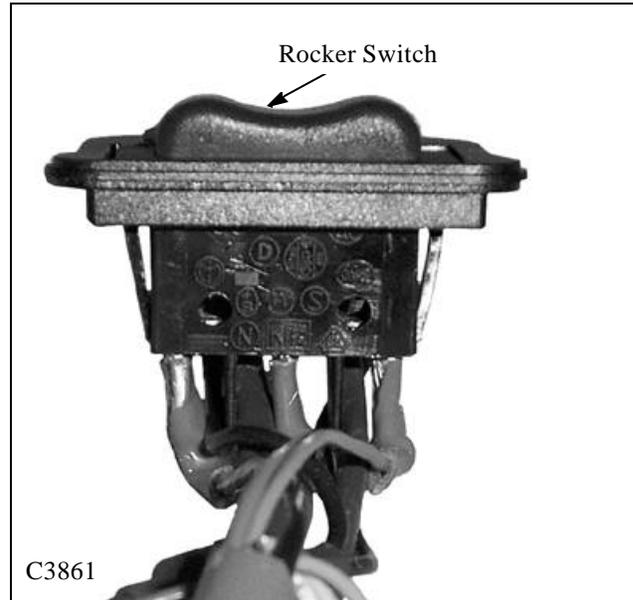
When installed on the R.H. lever:

1. The rocker switch is used to control the Hi-Flo 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 L.H. and R.H. buttons are used to turn the signal lights on when the light kit option is installed.

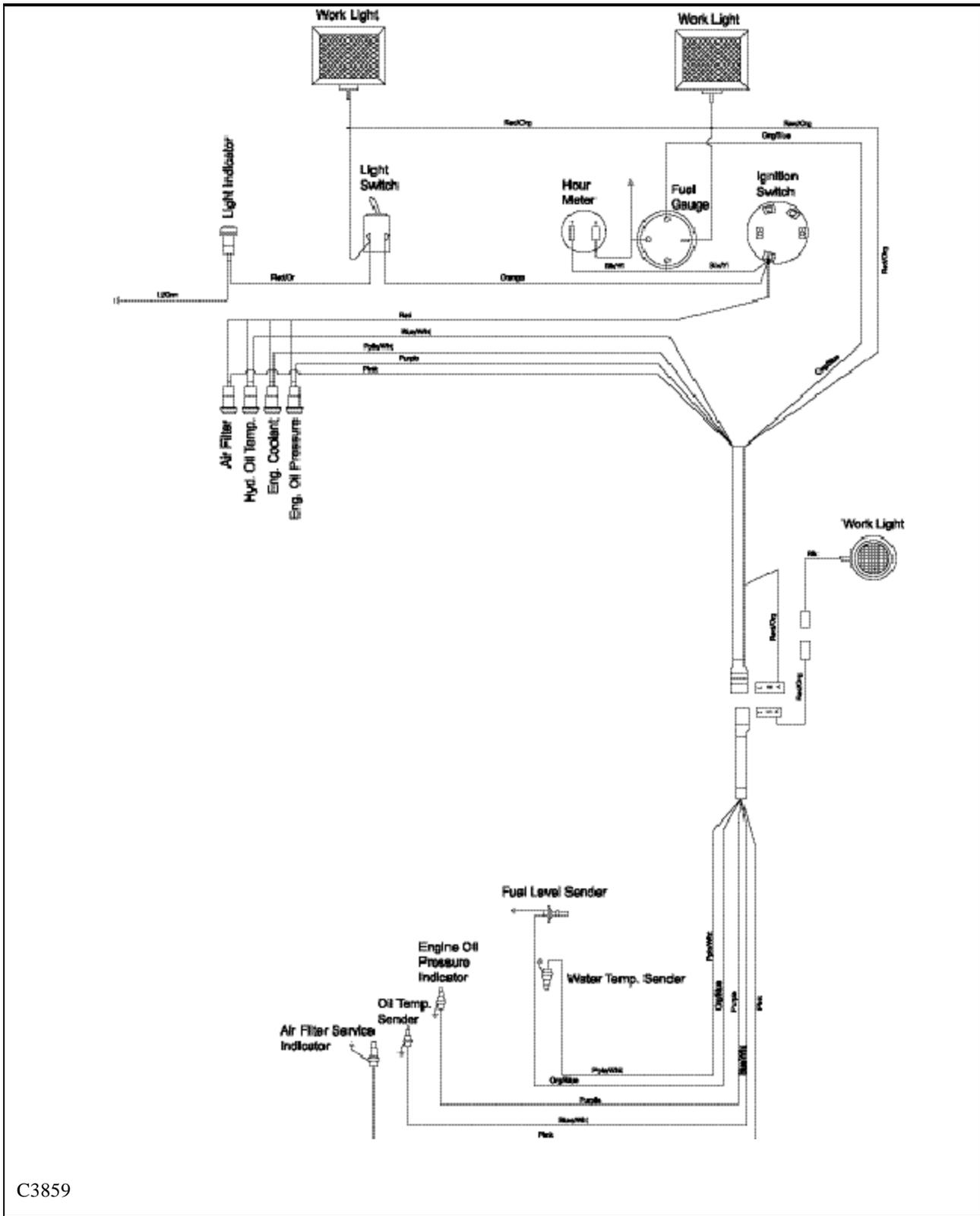
To replace a defective switch:

1. Ensure the ignition switch is in the OFF position.
2. Remove the 4 screws that hold the 2 handle pieces together. (fig. C3862)
3. Remove the L.H. handle piece and pull the switch/wire assembly out of the R.H. 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 L.H. 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.



ACCESSORIES CIRCUIT 5.12



C3859

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

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 switch out of adjustment or defective.	Remove the seat, check and adjust or replace.	5.10
	Defective lock solenoid.	Check and replace.	2 / 5.10
	Defective lock mechanism.	Check and replace.	1.4 / 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



SECTION 6 MAIN FRAME

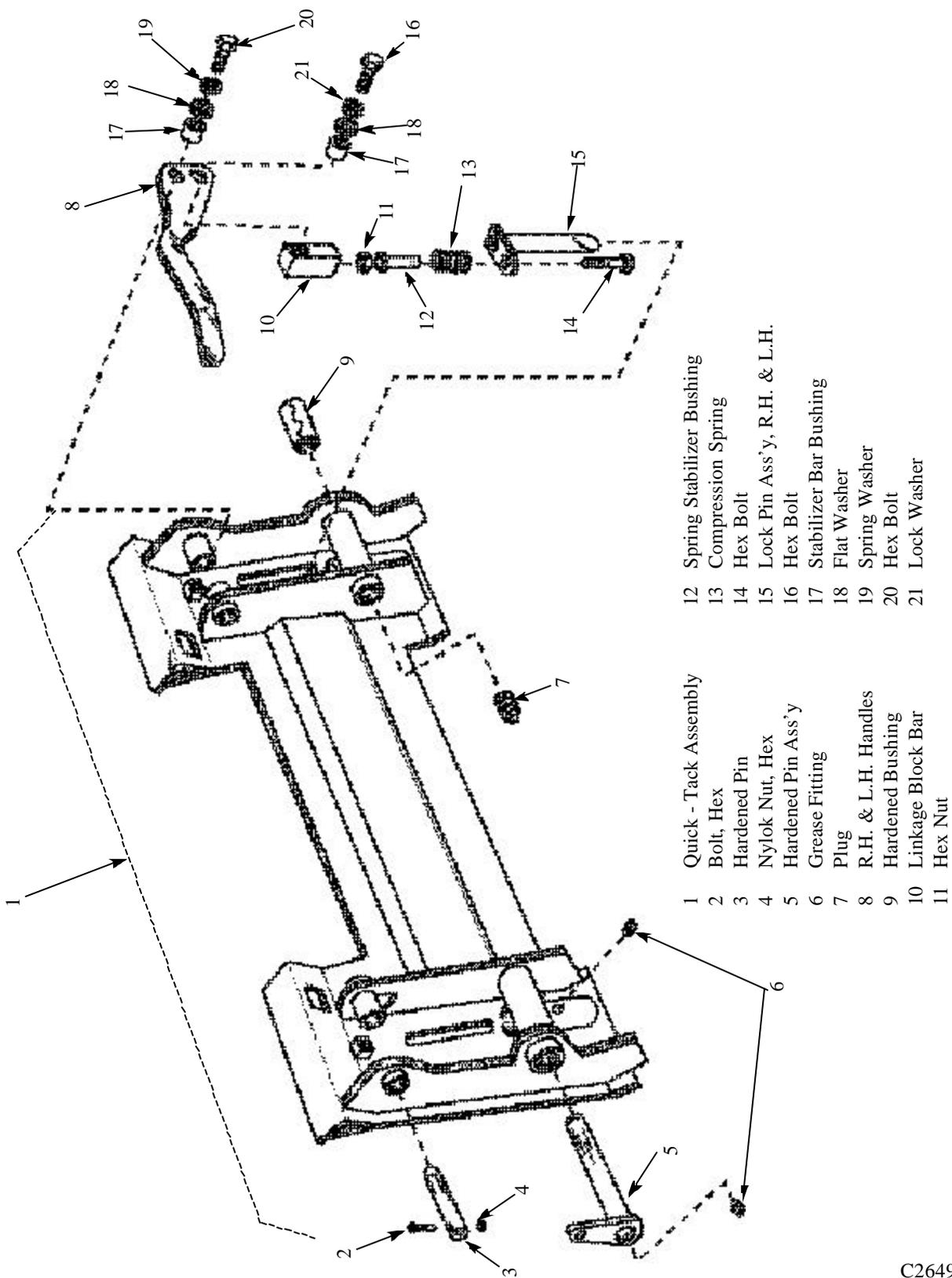
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QUICK - TACH 6.1

Universal Quick - Tach Assembly



C2649

QUICK - TACH 6.1

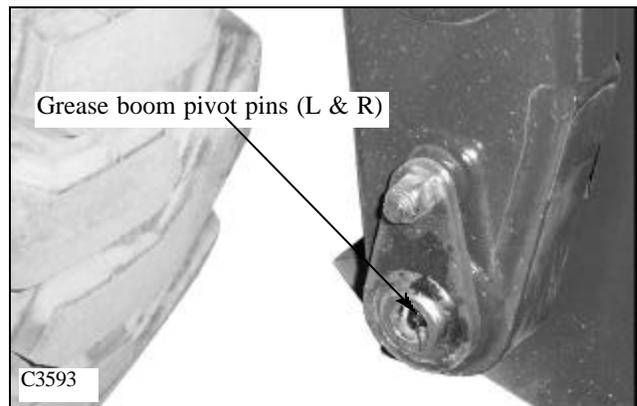
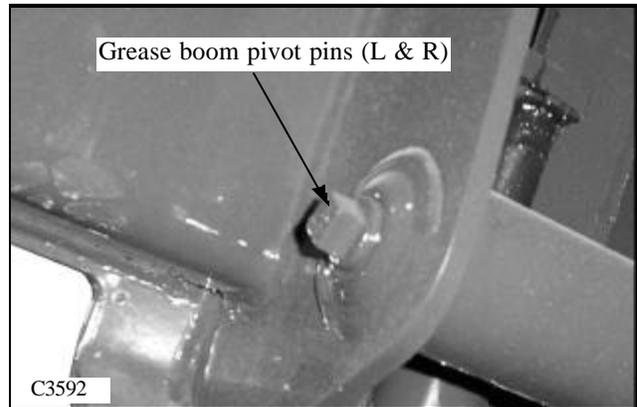
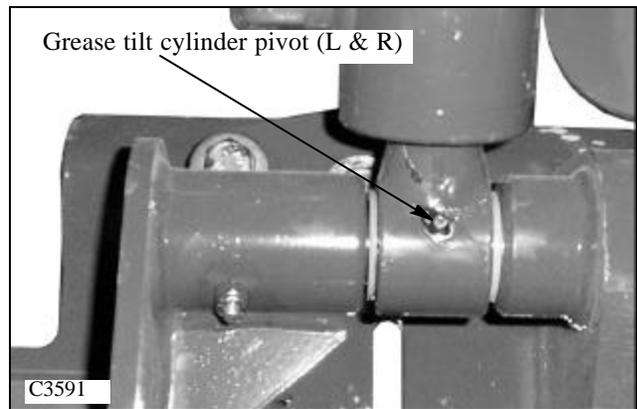
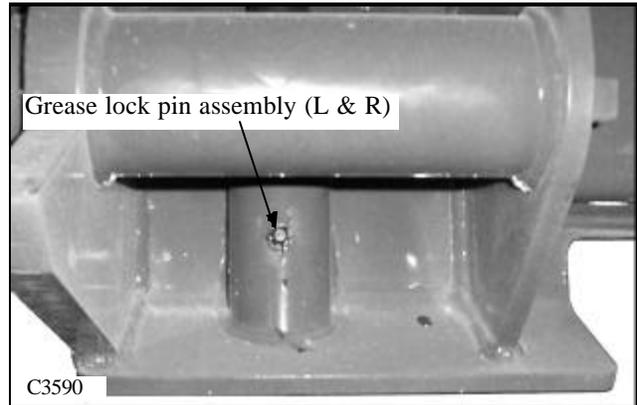
Preventative Maintenance

To keep the quick - tach locking pins and mechanism working freely, and to prevent pin and bushing wear, the quick tach must be lubricated every 8 hours of operations. More often in dirty applications.

Lubricate the quick - tach as follows:

- 1 Remove any attachment from the loader, raise the boom arms, engage the boom supports, engage the parking brake and shut off the engine.
- 2 Clean any dirt build up around the linkages.
- 3 Lubricate the grease fittings on each of the lock pin bushings with a good quality multi purpose lithium based grease until excess shows. (fig. C3590)
- 4 Lubricate the tilt cylinder pivot pins. (fig. C3591)

- 5 Lubricate the lower boom pivot pins. (fig. C3592 and C3593)



QUICK - TACH 6.1

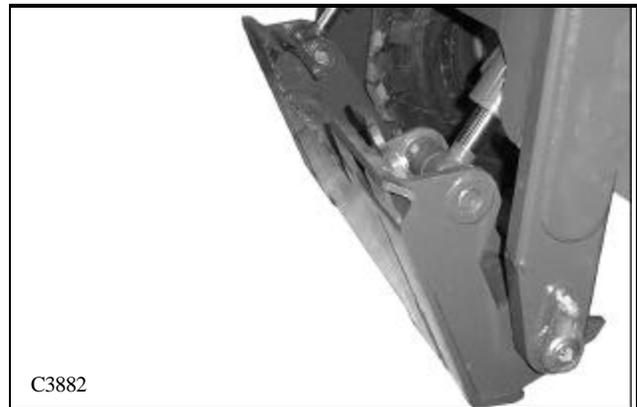
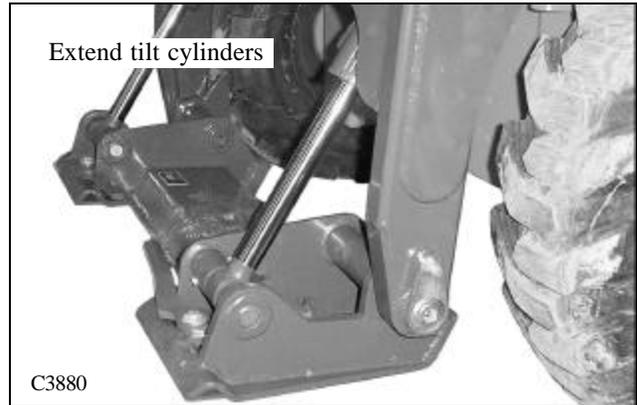
Removal

- 1 Remove any attachment and lower the boom arms.
- 2 Start the engine and extend the hydraulic tilt cylinders approximately 12 inches. (fig. C3880)
- 3 Shut off the engine and engage the parking brake.
- 4 Remove the bolts retaining the upper pivot pins to the quick - tach frame until the quick-tach is level and the pins removed. (fig. C3880)
- 5 If this repair is being performed in a proper work shop, a portable floor jack works excellent for this next step. Place the floor jack under the quick - tach. (fig. C3881)
- 6 The floor jack is used to relieve the weight on the 2 (two) lower pivot pins. Remove the upper pivot pins.
- 7 Remove the nuts and or bolts retaining the 2 (two) lower quick - tach pivot pins to the quick - tach or boom arms. (There are two different types). (fig. C3882)
- 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 in good condition. Do not reuse worn parts. Replace pins and hardened bushings as required.
- 2 Use the floor jack to assist installing the quick - tach to the loader boom arms. (Or lay it down on a piece of wood. (fig. C3881)
- 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 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.



QUICK - TACH 6.1

Disassembly

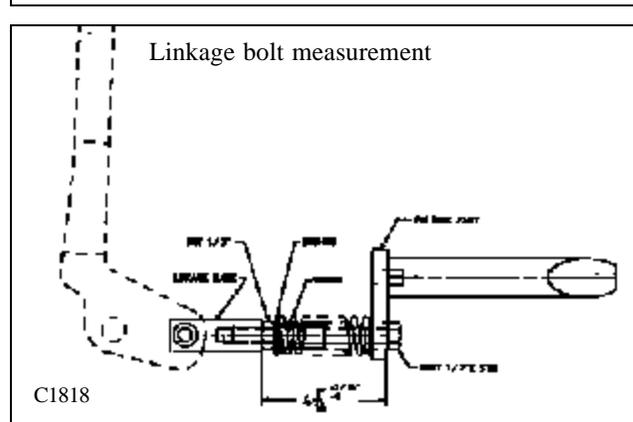
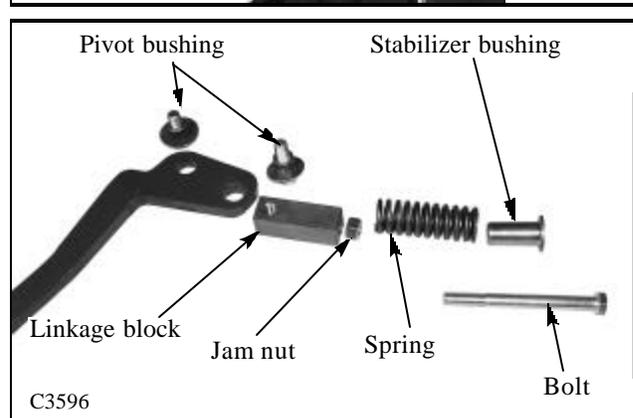
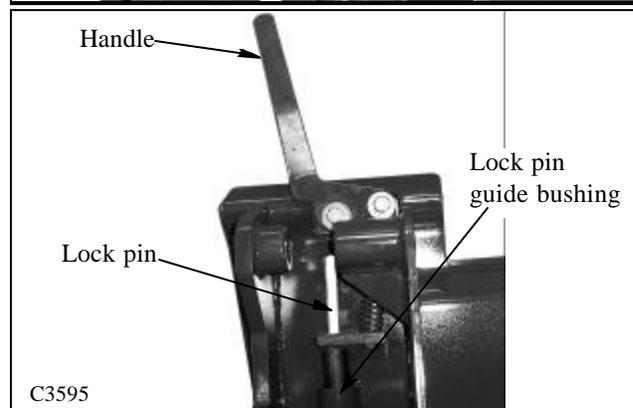
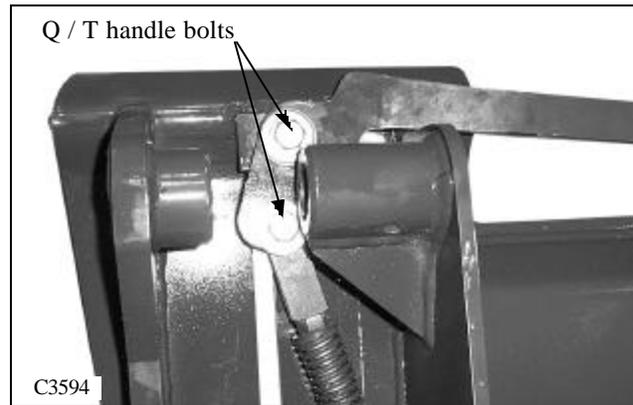
Follow the exploded schematic on the 2nd page of this section to assist in taking apart the locking mechanism and to assemble the system back together. Please note that the quick - tach does not have to be removed to service or replace locking mechanism parts.

- 1 Remove the bolt retaining the lock handle to the lock linkage. (fig. C3594)
- 2 Remove the bolt retaining the lock handle to the quick - tach frame. (fig. C3594)
- 3 Pull the locking pin and linkage out of the guide bushing. (fig. C3595)
- 4 Loosen the jam nut on the linkage block. Remove the bolt holding locking pin to the lock linkage block. (fig. C3596)
- 5 Separate the parts and inspect the spring for broken or sacking (compressed) coils. (fig. C3596) Replace parts as required.
- 6 Inspect the locking pin for wear. Make sure the beveled end of the pin is not worn or broken off the opposite side of the bevel. Check the fit of the pin in the quick - tach guide bushing. If the pin or bushing is excessively worn replace the pin or complete quick - tach assembly.
- 7 Inspect the lock handle mounting holes for fit against the handle pivot bushings. Replace the handle or pivot bushings as required if the fit is sloppy. (fig. C3596)
- 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 locking pin to the spring, bushing and linkage block, adjust the length of the bolt to 4 1/16 inches. (103mm). This is measured from under the head of the bolt up to, and against the linkage block. (fig. C1818) **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 stay in the locked position)



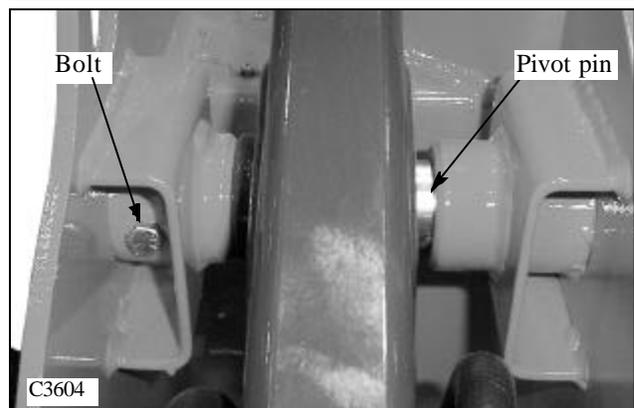
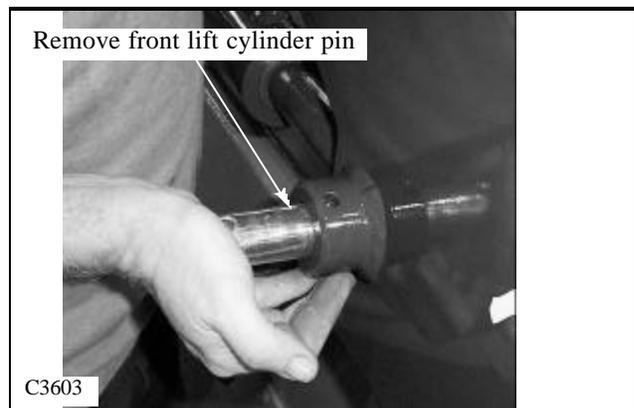
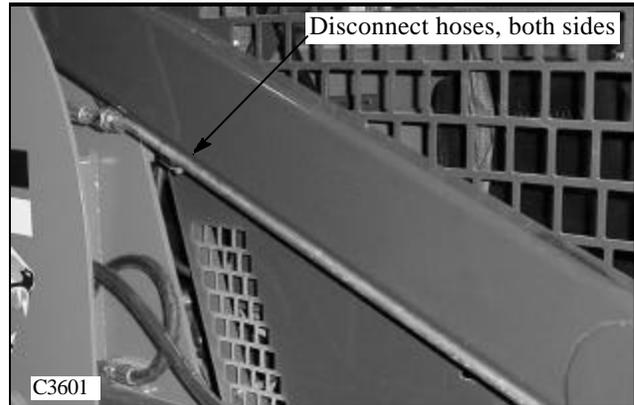
BOOM ARMS 6.2

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. C3601)
- 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 Using an overhead hoist, raise the boom arms enough to take the weight off of the lift cylinders. Remove the bolts from the pivot pins in the lift cylinders that are mounted in the boom arms. (fig. C3603)
- 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. C3604)
- 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 1-35.



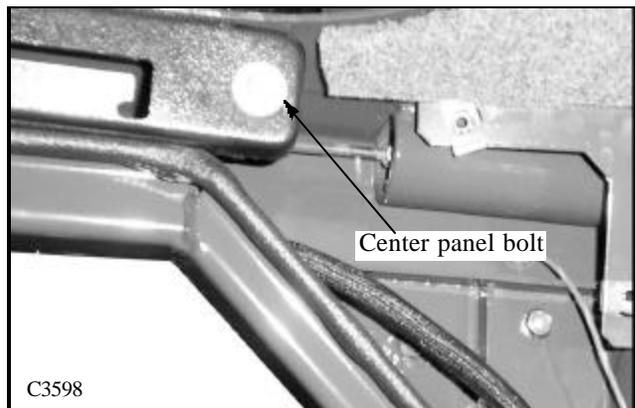
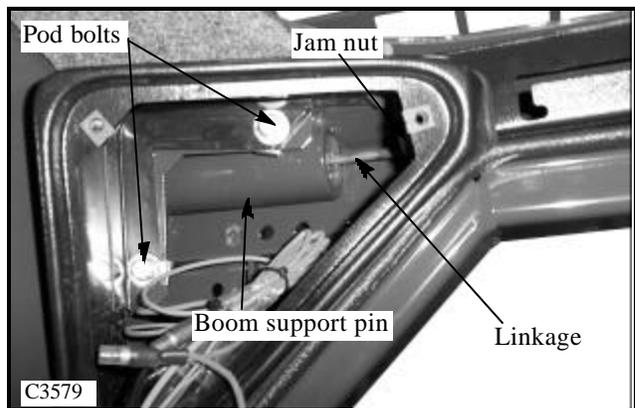
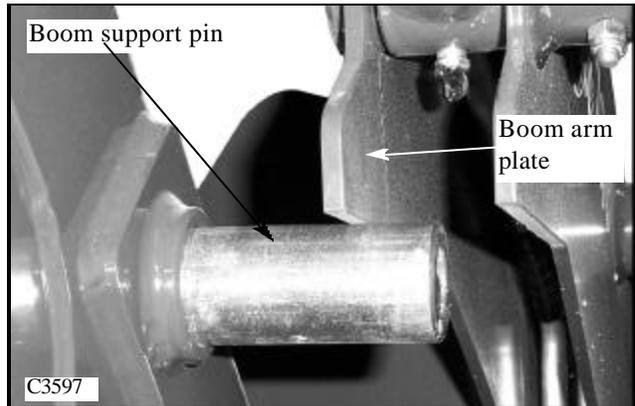
BOOM ARMS 6.2

Boom Arm Supports

For safety while performing regular service or maintenance work, the loader is equipped with boom supports. (fig. C3597) 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. C3597)
- 4 Adjust the engagement depth by removing the 3 screws each on the left and right dash panels to access the support pins and linkage. (fig. C3577) Only remove one side if there is only one side to be adjusted.
- 5 Loosen the jam nut on the support pin linkage. (fig. C3579) Use care to not damage the plastic center dash panel.
- 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 linkage, remove both dash panels and pods to access the center boom support panel bolts. (fig. C3598)
- 8 Remove the bolts and center panel and the support pins and linkage may be removed, serviced or repaired.
- 9 Apply 242 Loctite (blue) to the nut and tighten it against the support pin when installing.
- 10 Lubricate the boom support pins and replace the dash panels.



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 hydrostatic shield and disconnect the battery terminals as outlined in Section 5.
- 3 Disconnect the ground cable from the mainframe and engine.
- 4 Disconnect the positive cable from the starter.
- 5 Disconnect the main wiring harness plug. (fig. C3885)
- 6 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.
- 7 Disconnect the restraint bar safety switch wiring.
- 8 Remove the nuts and washers on the ROPS isolator mounts. There are 2 in the front (fig. C3606) and 1 in the rear. (fig. C3605)
- 9 Attach chains or straps with a sufficient load rating to safely raise the ROPS from the frame. (fig. C3607)
- 10 Raise the ROPS using an over head hoist. Check for wiring that may still be connected and remove as required.

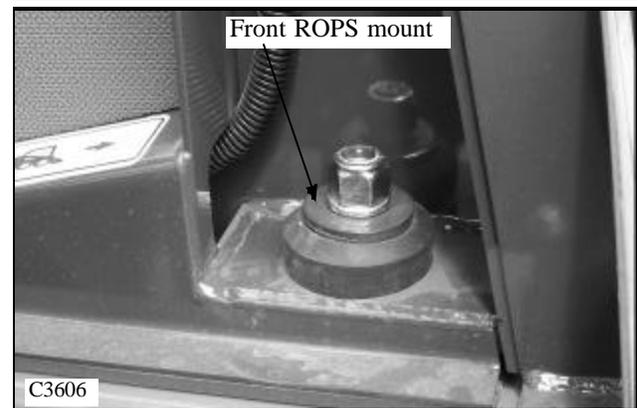
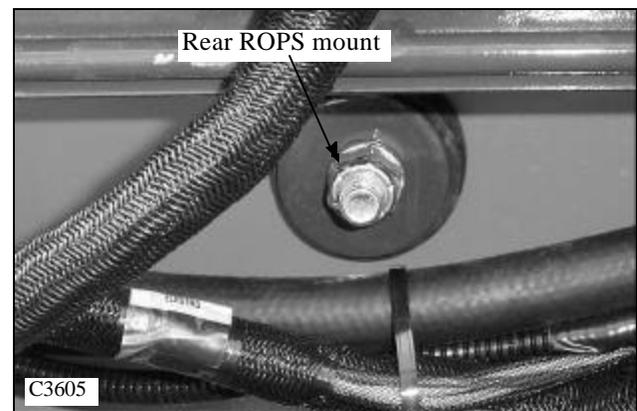
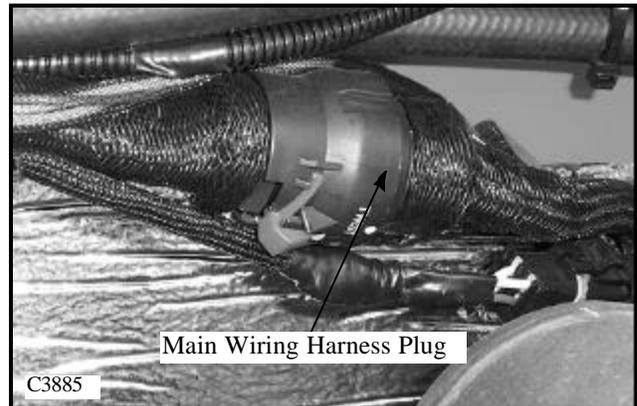
IMPORTANT

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

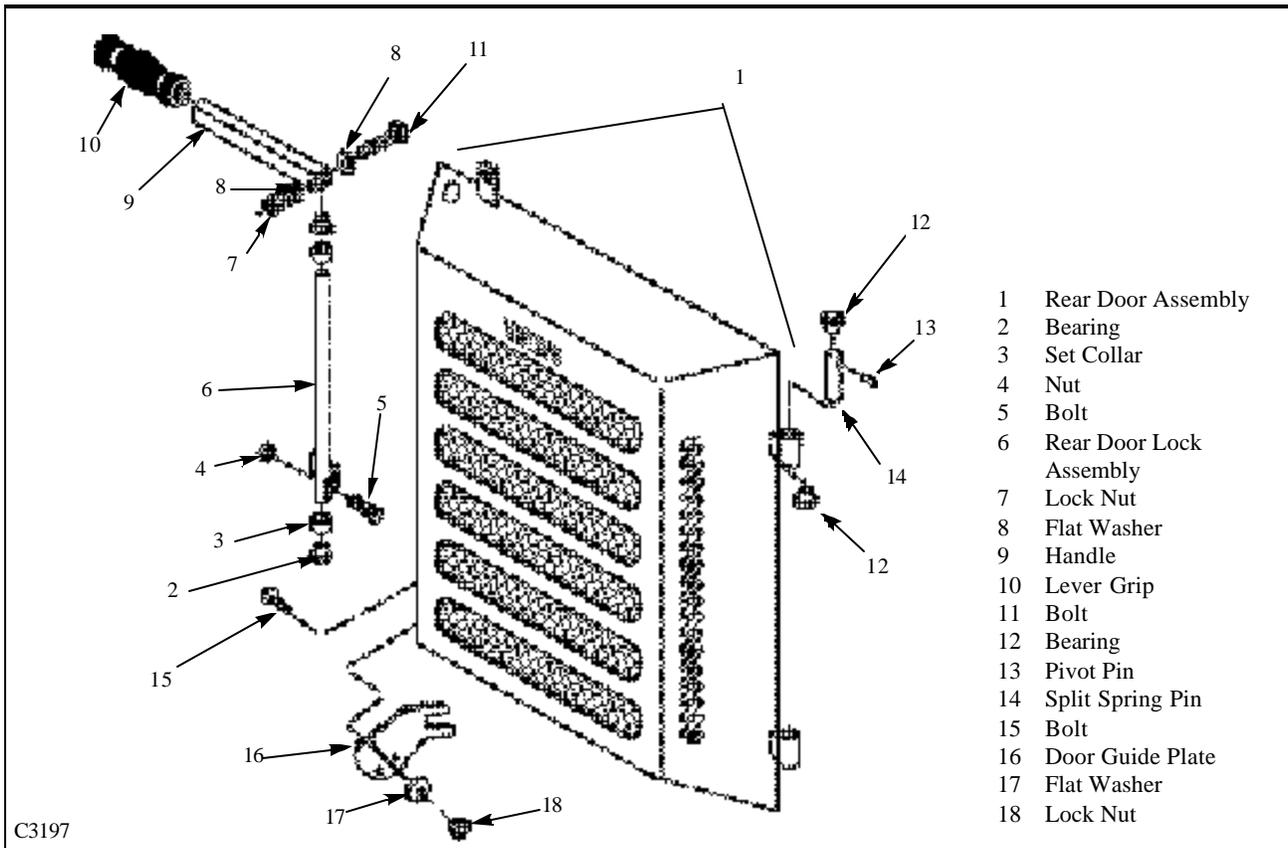
6

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 55 lbs / ft. (75 Nm)
- 4 See Section 4 for proper adjustment of the steering, controls and throttle.

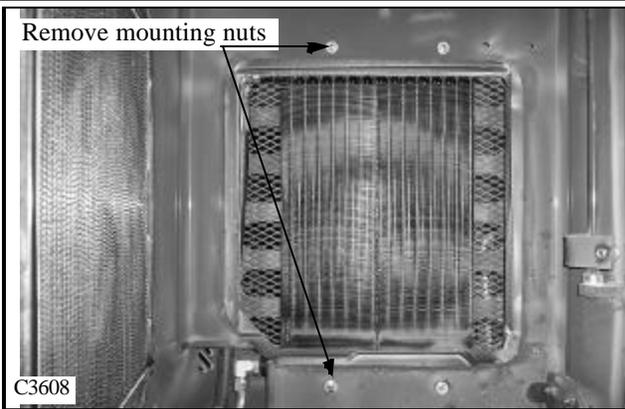


REAR DOOR 6.5



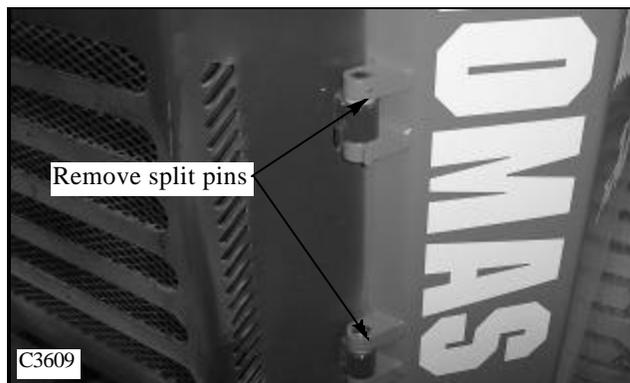
Removal

- 1 Open the rear door and remove the 4 nuts retaining the door baffle and hydraulic oil cooler to the door. (fig. C3608)
- 2 Attach chains to the rear door.
- 3 Using a hoist, raise the chains to take the weight of the door off the pivot pins.
- 4 Remove the split pins in the door pivot pins. (fig. C3609) Remove the pivot pins from the frame.
- 5 Replace any worn pivot bushings or pins 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.



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ENGINE MAINTENANCE 7.1

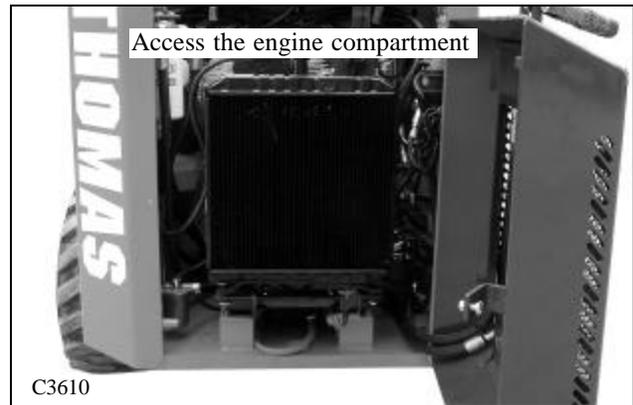
Lubrication System

Engine Oil and Filter:

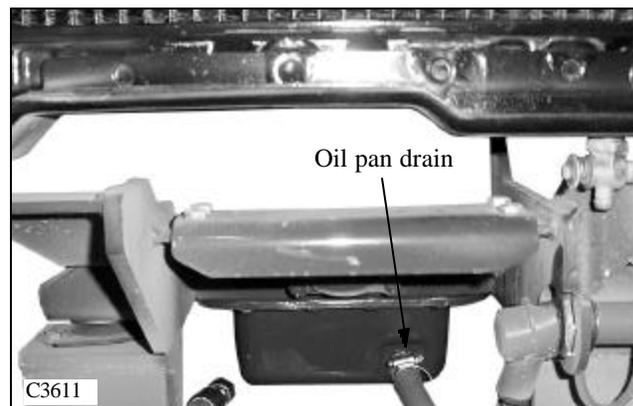
Engine oil and filter changes should be made with the engine warm. Change the engine oil every 75 hours and the oil filter every 150 hours of operation.

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. C3610)



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 8 liters (8.5 qts) of fluid. (fig. C3611)



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. C3612)

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.

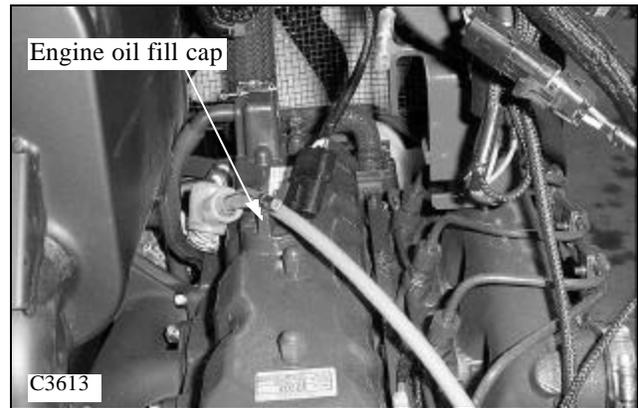
6 Replace the oil pan drain plug. Make sure the seal is still in place and in good condition. Tighten the oil pan drain plug not exceeding 25 ft/lbs (34 Nm.)

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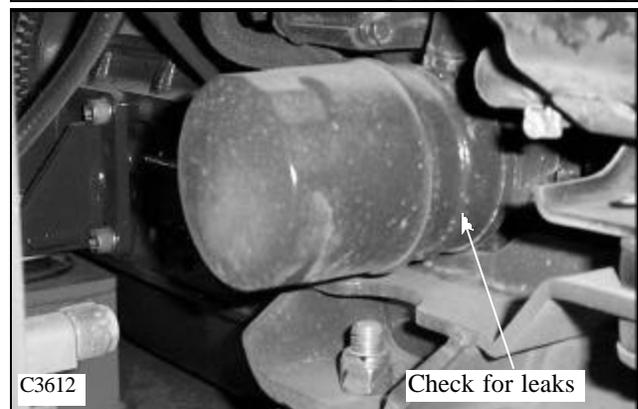
ENGINE MAINTENANCE 7.1

Lubrication System (cont'd)

7 Remove the oil fill cap located in the engine rocker arm cover. (fig. C3613) Add 7.5 liters (8qts) of 10W30 API classification SE / CD engine oil. Replace the fill cap in the rocker arm cover.

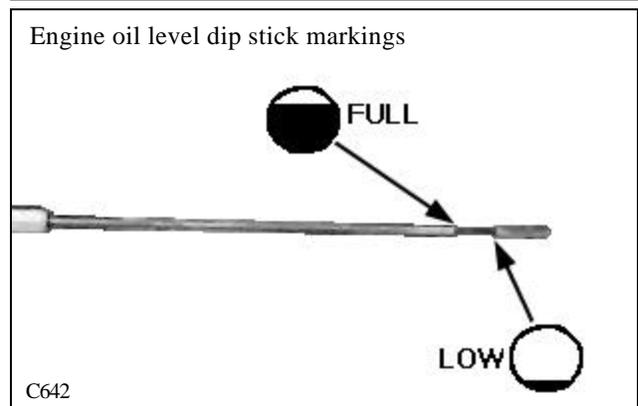
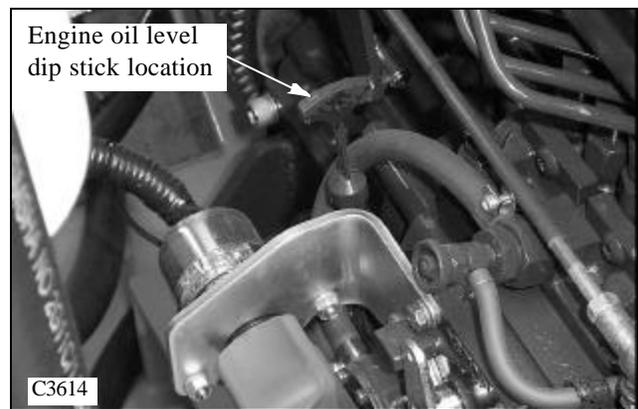


8 Start the engine and check for leaks around the oil filter and oil pan drain plug. (fig. C3612) Allow the engine to operate for approximately 5 minutes and then shut it off.



9 Check the level of the engine oil. (fig. C3614) Add oil as required to bring the oil to the top mark of the engine oil dip stick. (fig. C642) Do not over fill.

Change the engine oil every 75 hours and the engine oil filter every 150 hours.



ENGINE MAINTENANCE 7.1

Fuel System

Fuel Filter:

The fuel filter is a spin on type on the inner side of the oil tank attached to a bracket and is located in the engine compartment on the engine mounting bracket. Change the fuel filter every 400 operating hours.

Loader S / N's LE008500 ~ 8799 have the filter mounted to the left hand side of the engine. S / N's LE008800 onward are mounted to the right hand side of the engine.

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.

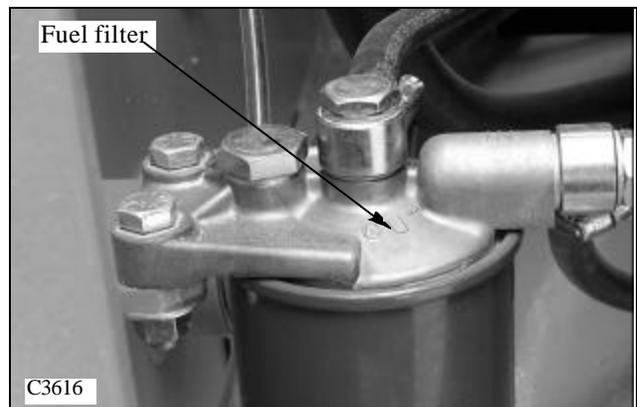
- 1 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C3610)
- 2 Close the fuel line shut off petcock located on the lower right hand side of the fuel tank. (fig. C3615) This will prevent fuel loss due to siphoning.
- 3 Remove the fuel filter using a filter wrench. (fig. C3616) 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.



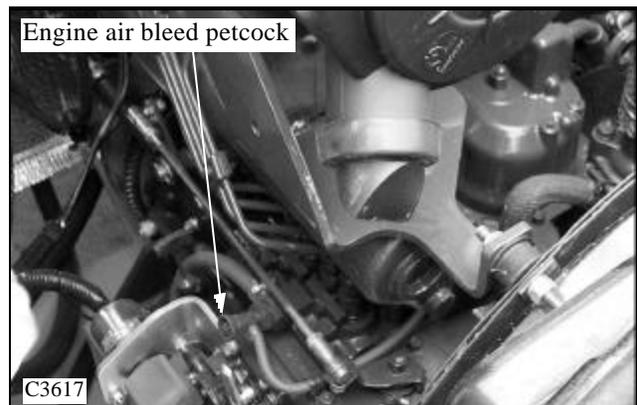
C3610



C3615



C3616



C3617

- 6 Open the engine fuel line / air bleed petcock located just to the left of the fuel injection pump. (fig. C3617) 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.

 **WARNING**

When servicing the fuel system, stay away from open flame and sparks. No smoking

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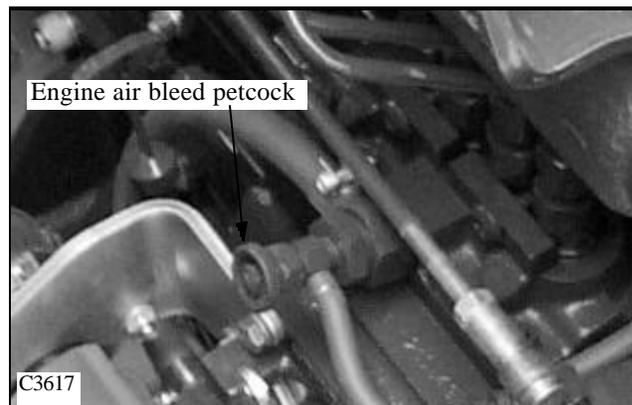
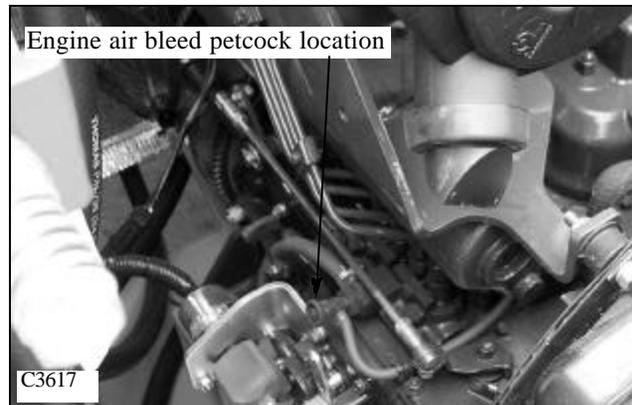
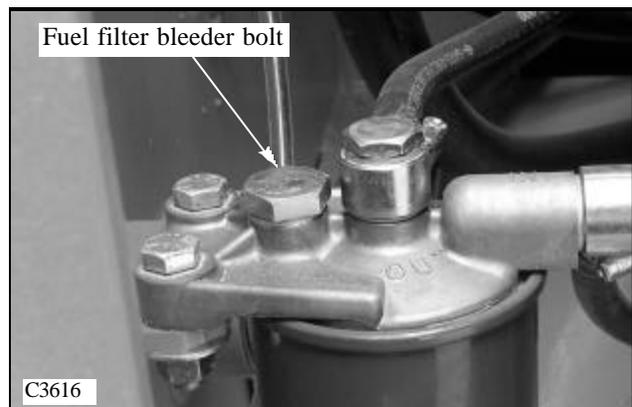
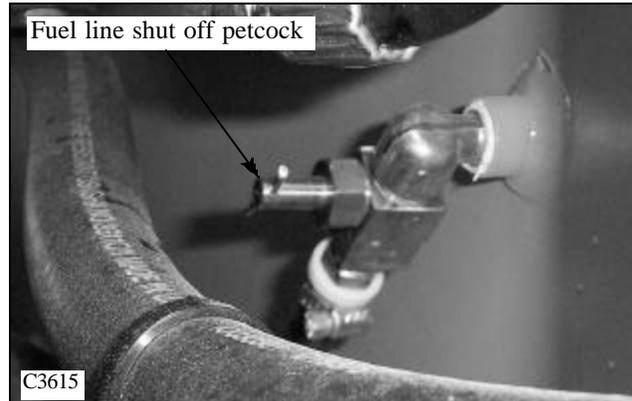
ENGINE MAINTENANCE 7.1

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 £) of fuel.
- 2 Make sure the fuel line shut off petcock is fully open. (fig. C3615)
- 3 Loosen the fuel filter bleeder bolt and allow the fuel to siphon through the fuel line and filter. (fig. C3616) Tighten the fuel filter bleeder bolt.
- 4 Loosen the air bleed petcock located to the left of the fuel injection pump. (fig. C3617)
- 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 and start engine. Allow to operate at idle speed for 5 minutes. Shut off the engine.
- 7 Close the air bleed petcock.



ENGINE MAINTENANCE 7.1

Air Filter

The loader is equipped with dual dry cartridge, radial seal type filter elements. The larger outside element is called a primary and the one inside of the primary is referred to as a safety element. (fig. C653)

The loader is equipped with an air restriction indicator that functions while the engine is operating. When the air filter elements require servicing the indicator light on the dash panel will illuminate.

Over servicing the air filters can damage the seals and pleated filter material. When the air restriction indicator light illuminates in the dash panel, replace the primary air filter element with a new one. On average, the safety air filter element will be replaced once for every three (3) primary air filter element changes, if the primary filter hasn't been damaged due to over servicing.

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 sender wires should be visually checked daily for breaks and proper connection. (fig. C3618)

2 With the engine operating, place your hand over the air intake inlet to restrict air flow to the engine. The indicator light on the dash panel should illuminate promptly. Do not hold your hand over the air intake excessively, just long enough for the indicator light to illuminate then quickly release your hand from the intake.

NOTE: If the indicator light fails to function replace the restriction sender or check for shorts in the wiring circuit.

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.

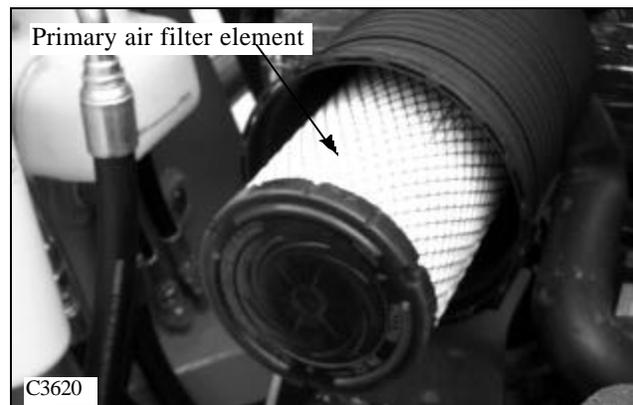
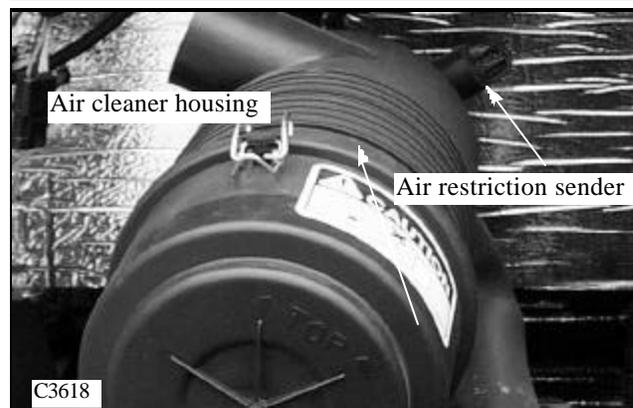
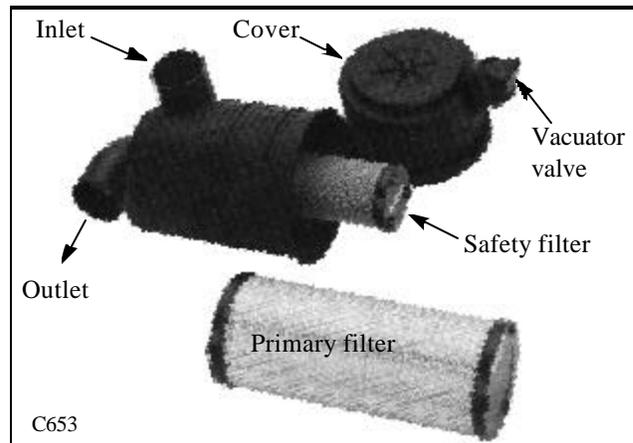
IMPORTANT

Air filter service recommended only when the service indicator light illuminates.

Servicing the Air Filter Elements:

1 Release the latches holding the air cleaner cover to the canister body. (fig. C3619)

2 Pull straight out on the primary element to remove from the air cleaner housing. (fig. C3620) Do not twist or force the filter. This may damage the sealing area around the end of the air filter element.



ENGINE MAINTENANCE 7.1

Air Filter (cont'd)

3 If required, remove the safety air filter element by pulling straight out of the air cleaner housing. (fig. C3621)

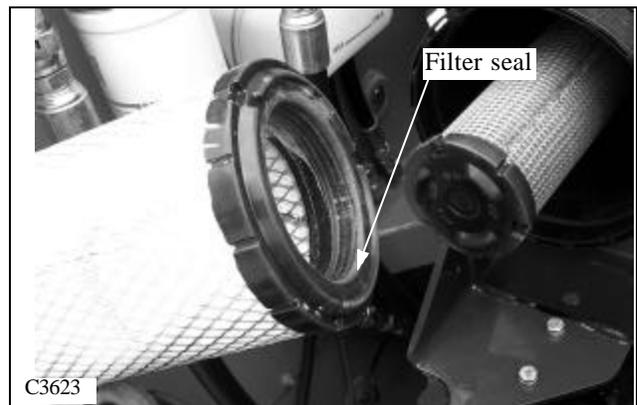
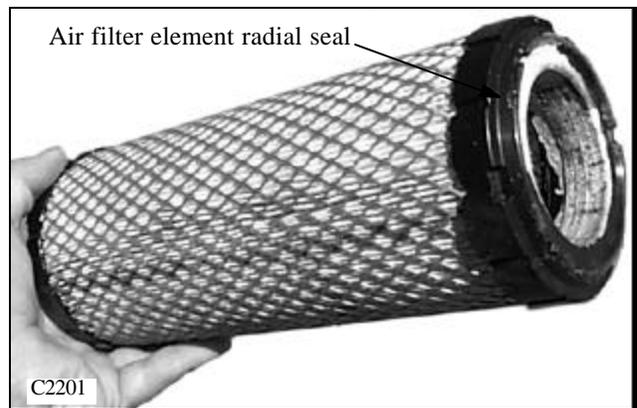
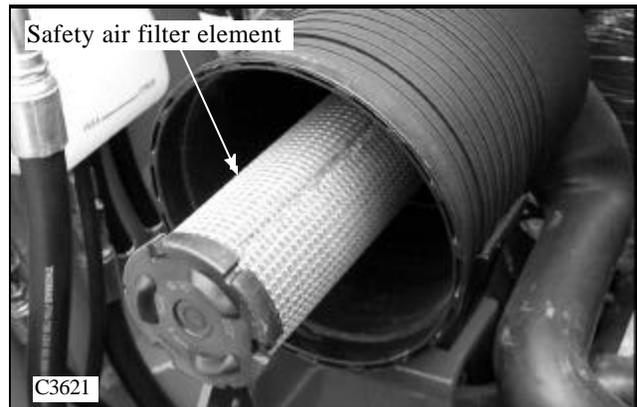
4 After removing the air filter elements, carefully wipe out any excess dirt from the air cleaner housing. (fig. C3622)

5 Check the air filter element seal before installing to the air cleaner housing. (fig. C2201) 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 elements 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. (fig. C3623)

7 Install the air cleaner cover onto the housing. Be sure to align the latch hooks with the notches in the air cleaner housing.

Do not use the latches to push the air filter elements into position.



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.

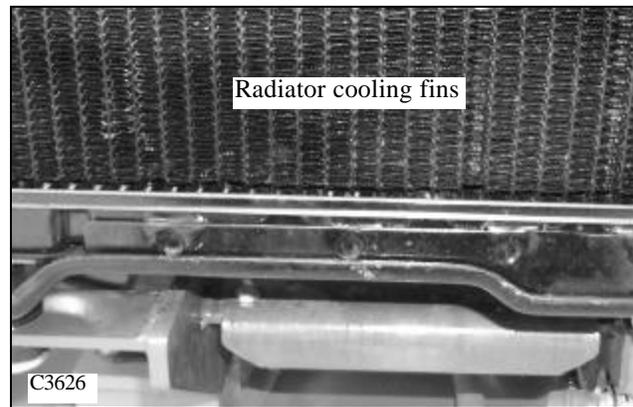
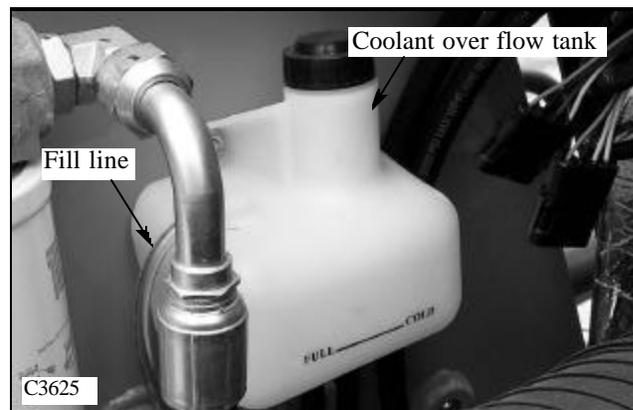
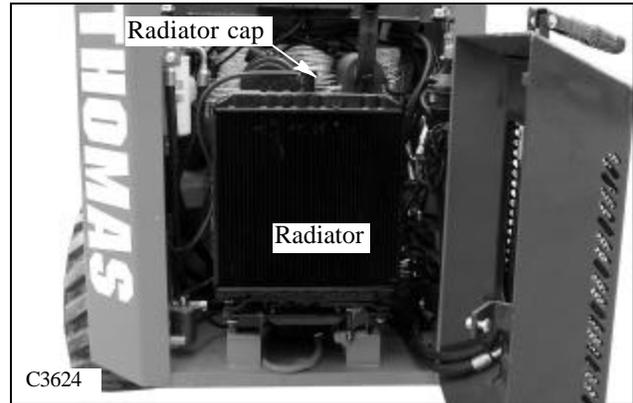
The cooling system should always be checked when the engine is cool.

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 dirt or debris build up that may be blocking air flow through the radiator. (fig. C3626) Blow any dirt or debris out with compressed air and / or water. Do not exceed 40 psi (2.7 Kg / cm²) Any bent cooling fins should be carefully straightened to prevent core damage.

3 Visually inspect the coolant overflow tank for the proper coolant level marked on the tank. (fig. C3625)



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 / cm²)

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

7

Add a 50 / 50 mixture of ethylene glycol and water as required.

4 Remove the radiator cap to verify the coolant level in the radiator. If the coolant level is below the upper part of the radiator tank, and the coolant bottle is still full, then either the radiator cap is defective 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.

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 0.9 kg / cm² (12.8 psi). (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 0.9 kg / cm² (12.8 psi) pressure to the radiator cap. The pressure should not drop more than 0.3 kg / cm² (4.3 psi) 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.

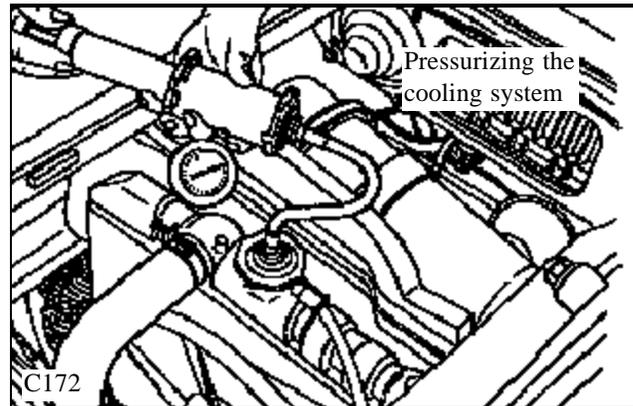
2 Remove the radiator drain plug located lower left corner of radiator. (fig. C3626) Be prepared to contain 7 liters (1.8 gal) of fluid.

3 Open the engine drain petcock located next to the engine fuel pump, just below the engine solenoid shut off. Close the drain petcock after the engine is completely drained.

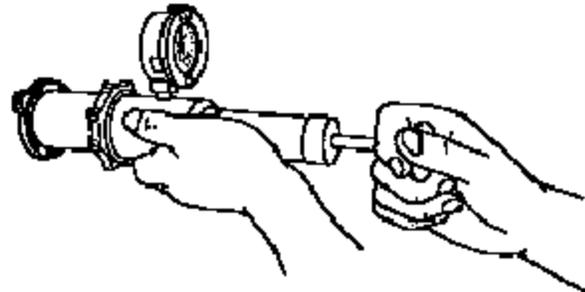
Note: Attaching a piece of 5 / 16" (8mm) hose to the drain petcock and routing to a container lessens waste fluid clean up. Please dispose of waste fluid in an environmentally friendly manner.

4 Replace the radiator drain plug using teflon tape or equivalent on the threads. Be sure to tighten the drain plug so it does not protrude past the radiator's lower mount. This will prevent interference with the hydraulic oil cooler.

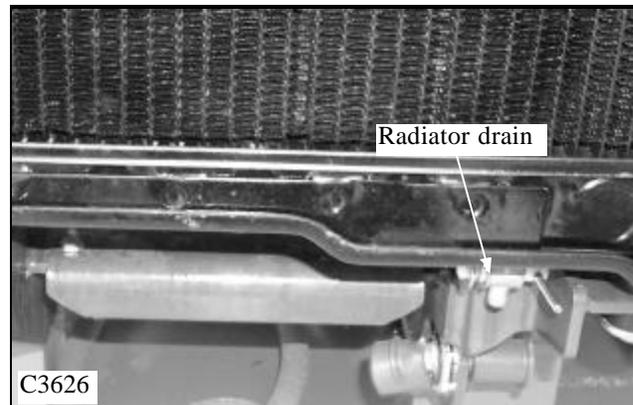
5 Pre - mix the engine coolant, ethylene glycol, to equal parts of water. (50 / 50 ratio) Add the mixed coolant to the engine radiator. The cooling system will hold approximately 7 liters (1.8 gal) of coolant. Never use coolant undiluted. Pure coolant does not absorb and pass heat efficiently. It will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



Radiator cap test



C173



C3626

MAINTENANCE 7.7

Fan Belt Adjustment

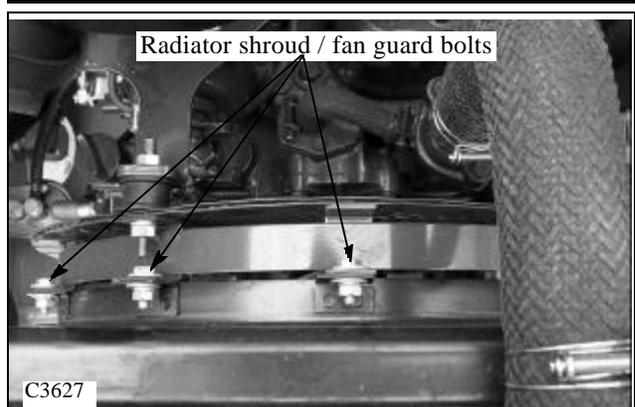
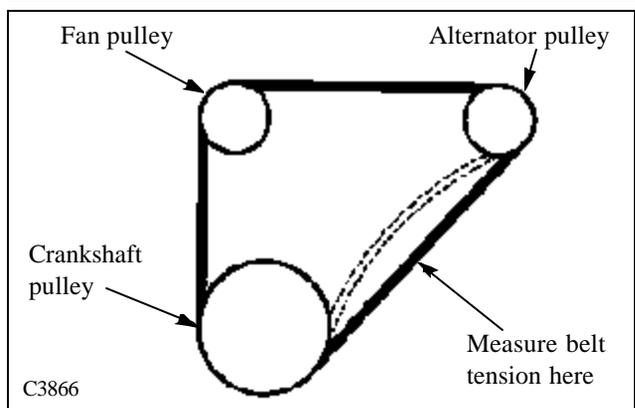
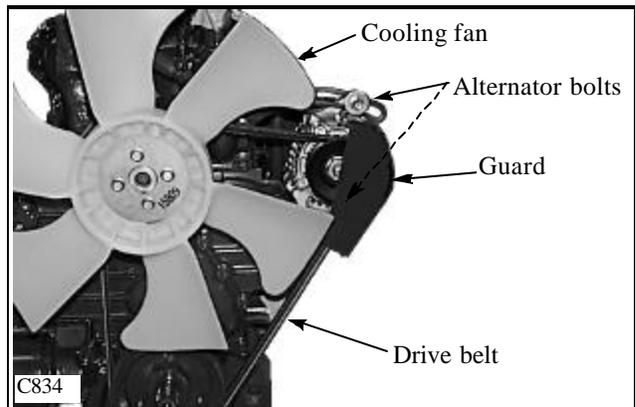
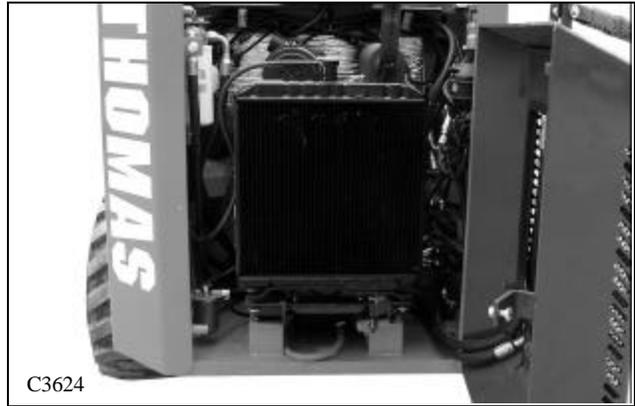
The fan (alternator) drive belt should be checked daily for tension and wear. The drive belt should be replaced promptly when fraying of the belt cords or cracks in the rubber are observed. Failure to replace the drive belt could lead to slippage or complete failure, causing the engine to over heat and 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. C3624)
- 3 Locate the drive belt. Fig. C834 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. C3866)
Correct tension is 10 ~ 12mm deflection @ 98 newtons force. (3 / 8 ~ 1 / 2" deflection @ 22 lbs force).

Fan Belt Replacement:

- 1 Loosen the 2 bolts on the alternator and allow the belt tension to loosen off. (fig. C834)
- 2 Remove the bolts retaining the fan guard to the radiator shroud. (fig.C3627)
- 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.



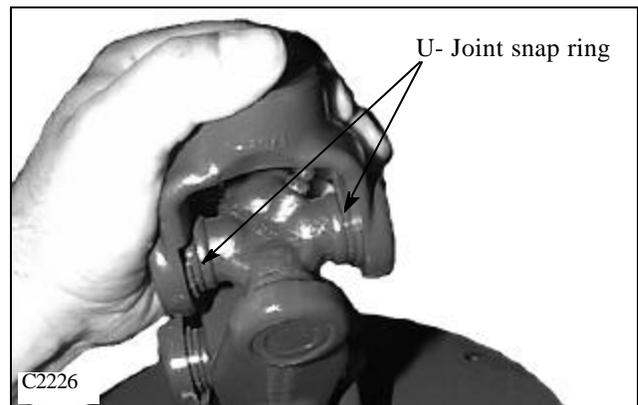
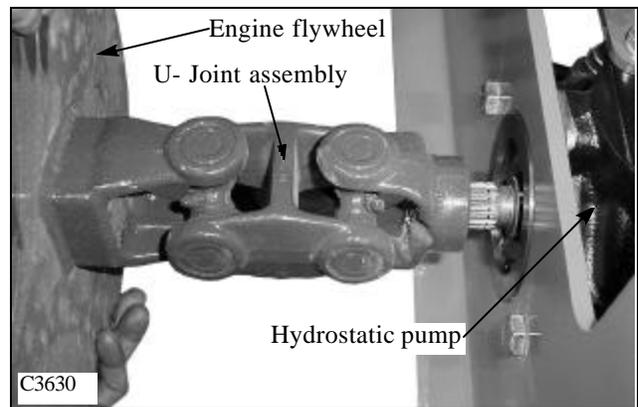
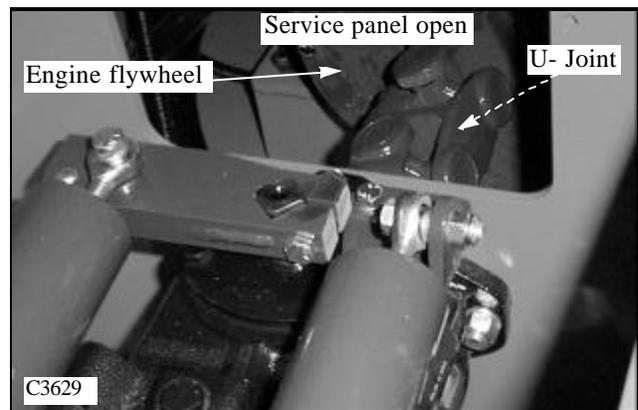
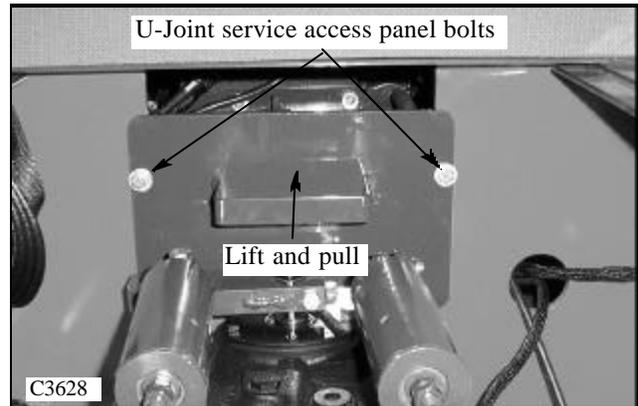
WARNING

Never work under the boom arms without the boom supports engaged

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.
- 3 Remove the service access panel, located below the battery compartment cover, by removing the 2 bolts and lifting and pulling forward from the top. (fig. C3628)
- 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- Joints. (fig. C2226) The U- Joints are retained by internal snap ring clips. Loosen the engine mounting isolators to move the engine rearward enough to allow the engine U-joint to come off the hydraulic tandem pump splined shaft.



CYLINDER HEAD 7.2

Valve Adjustment

The engine used in this application uses a solid lifter (tappet) design that requires periodic maintenance of the rocker arm to valve clearance. (Valve lash)

Valve clearance should be checked every 500 hours of operation. Always check the valve clearance while the engine is cold. **Correct valve clearance is 0.18 ~ 0.22mm (0.0071 ~ 0.0087in).**

Procedure to Check / Adjust the Valve Clearance:

- 1 Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine. Remove the ignition key for safety.
- 2 Allow the engine to cool to room temperature.



WARNING

Do not adjust the valve clearance while the engine is hot. Clearances provided are for cold engine adjustment only.

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

4 Remove the 4 nuts and washers retaining the valve cover to the engine cylinder head and remove the cover. (fig. C3613)

NOTE: The crankshaft pairs pistons # 1 and # 4, and pistons # 2 and # 3 to rise and fall at the same time. The camshaft valve timing though, has the cylinder pairs on different cycles of operation.

Example: If both pistons on # 1 and # 4 were at top dead center (TDC), one of the cylinders would be on the compression stroke (both valves closed) the other cylinder would be starting the intake stroke. (Intake valve starting to open).

5 Turn the engine over until the intake valve is just starting to open on number 1 (one) cylinder. (Cylinder closest to radiator) This valve action means that cylinder number 4 (next to flywheel) is on the compression stroke, with both valves closed. This is the proper point to check and / or adjust the intake and exhaust valves on cylinder number 4.

6 Insert a feeler gauge between the rocker arm and the intake or exhaust valve on cylinder number 4. (fig. C551) If necessary, loosen the jam nut on top of the rocker arm and turn the adjustment screw to acquire correct valve clearance. **Correct valve clearance is 0.18 ~ 0.22mm (0.0071 ~ 0.0087in).**

7 Rotate the engine after checking / setting cylinder number 4 valves, until cylinder number 4 intake valve start to open. This position means that cylinder number 1 (one) is on the compression stroke and can have the intake and exhaust valves checked and / or adjusted.

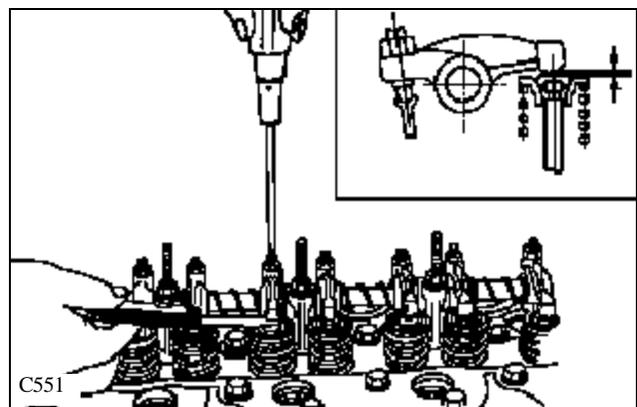
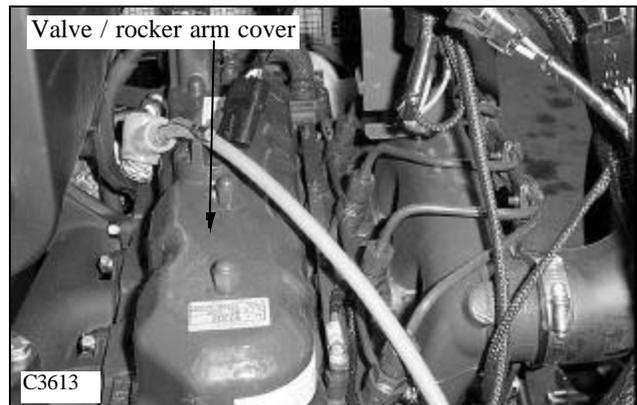
Correct valve clearance is 0.18 ~ 0.22mm (0.0071 ~ 0.0087in).

8 Repeat the procedure for cylinder pairs 2 and 3. As one of the cylinders intake valves are just starting to open the opposite cylinder is on the compression stroke and can have it's valves adjusted.

Correct valve clearance is 0.18 ~ 0.22mm (0.0071 ~ 0.0087in).

9 Rotate the engine 2 ~ 3 complete revolutions and recheck the valve clearances by repeating the procedure above.

10 Replace the valve cover. Tighten the mounting nuts to 6.9 ~ 8.8 Nm (5.1 ~ 6.6 ft / lbs).



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CYLINDER HEAD 7.2

Compression Testing

Testing the engine for compression is not a normal part of a scheduled maintenance procedure, but is important when trying to diagnose engine power or unusual performance related problems with the engine.

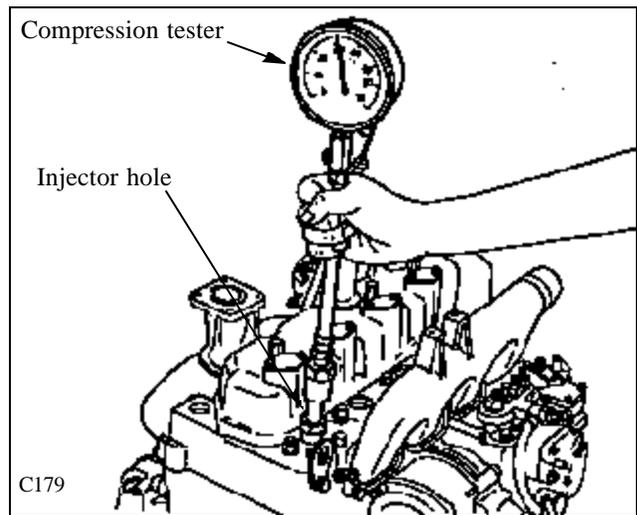
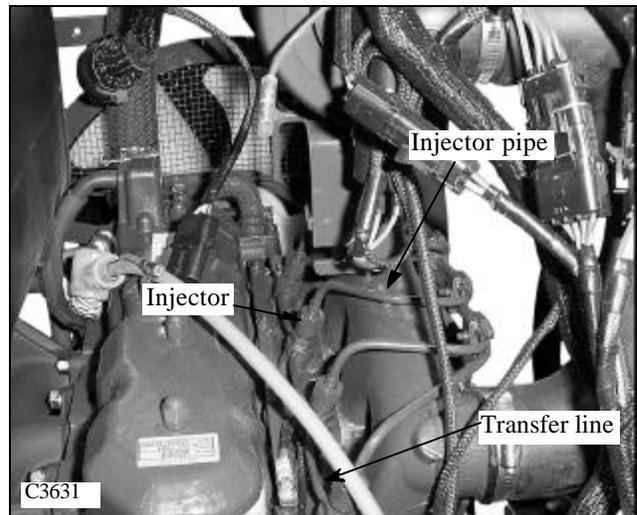
Before performing a compression test, be sure the battery is fully charged and valve clearances are correctly adjusted. See page 7-12. Be sure the air cleaner and exhaust systems are free of obstructions, to prevent a false or low reading

The engine should be warmed up for approximately 5 minutes prior to compression testing.

To Perform Compression Test:

- 1 Move the loader to a level surface, lower the boom arms, engage the parking brake and shut off the engine. Remove the ignition key for safety.
- 2 Access the engine by opening the rear door and raising the engine compartment cover.
- 3 Disconnect the wiring plug connection on the engine stop solenoid. This will prevent fuel flowing to the engine when the engine is turning over.
- 4 Clean dirt from the top of the engine area to prevent contaminants entering the engine.
- 5 Remove the fuel injection pipes from the fuel injectors. (fig. C3631) If the injector pipes are corroded or the pipes twist with the nut when loosening, replace the injection pipe before putting the loader back into service. Cap the open lines and injectors to prevent contamination entering the fuel injection system.
- 6 Remove the fuel transfer lines from the injectors.
- 7 Remove the fuel injectors from each cylinder. Use caution. Do not damage the injector while removing from the cylinder head.
- 8 Connect a compression tester (see Special Tools in Section 8) to the cylinder to be tested. (fig. C179) Be sure to use the correct thread on the adapter screwed into the injector hole.
- 9 Rotate the engine with the starter (200 ~ 300 RPM) 2 ~ 3 complete revolutions. Note the compression reading on the gauge. Repeat the process again to verify the first test reading.
- 10 Continue the compression test on the remaining cylinders keeping written notes of all the registered test readings.
- 11 Compare the compression test readings with the specifications given in Section 7.4, pg. 7-24, Engine Specifications.

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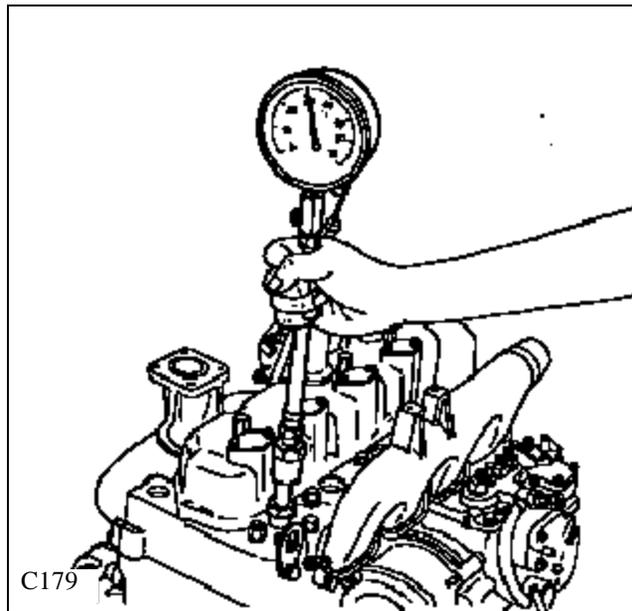


CYLINDER HEAD 7.2

Compression Testing (cont'd)

If the compression test reading are low, add a small amount of oil, through the injector hole, to the affected cylinder (s). Recheck the compression test readings. If the readings improve from the first test then the piston rings or cylinder bores are likely worn.

If the compression reading does not improve the problem is likely a cylinder head related problem such as valve train, cylinder head gasket, or a bad piston. The cylinder head should be removed for further inspection. See the Kubota Service / Repair Manual P / N 97897-109-5 or Thomas P / N 40916.



Cylinder Head

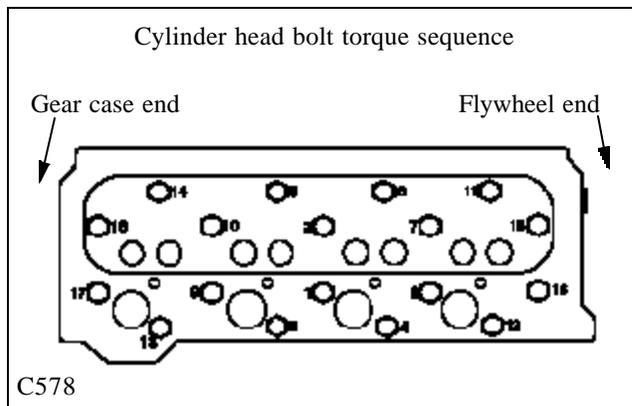
After replacement of the engine cylinder head, the proper bolt torquing sequence must be followed. (fig. C578)

Torque the bolts in 3 separate steps, increasing tightness to the specified 93.1 ~ 98 Nm (68.7 ~ 72.3 ft / lbs)

Apply oil to the threads of the bolt and to the heads of the bolt where they contact the cylinder head casting.

Always install a new head gasket and oil gallery O- ring when replacing the cylinder head.

After installation, operate the engine for half an hour to bring to full operating temperature. Allow the engine to fully cool and retorque the cylinder head bolts.



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, hydrostatic shield and U- Joint service access panel. (fig. C3453)

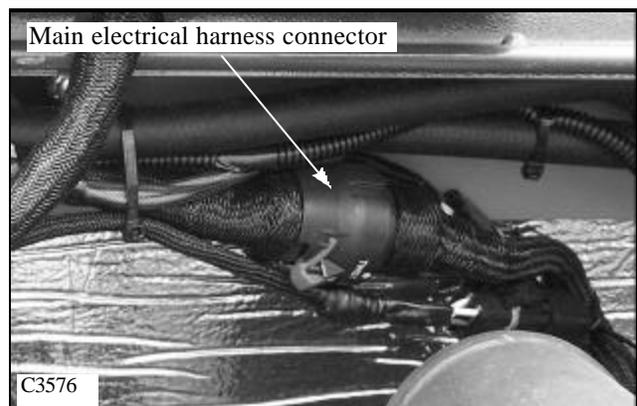
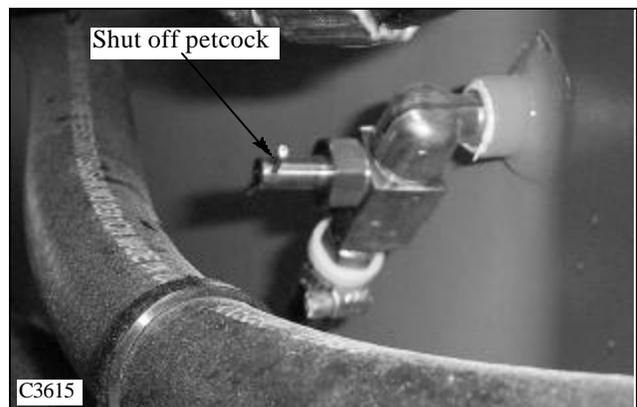
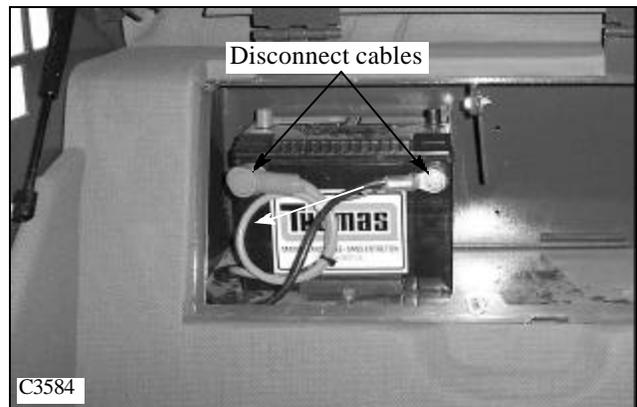
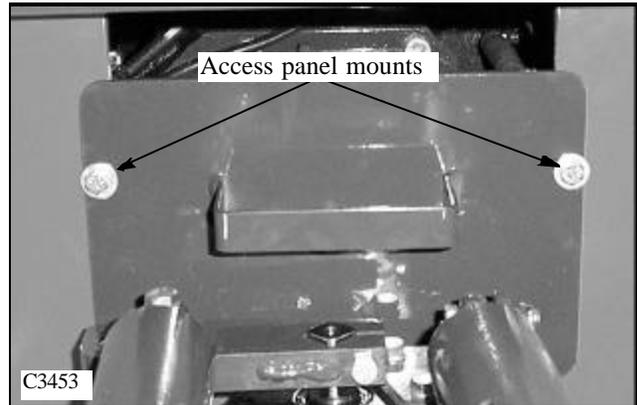
3 Access the battery compartment and disconnect the battery cables from the battery terminals. (fig. C3584)
Ground cable first.

4 Shut off the fuel petcock located at the bottom of the right hand fuel tank, inside the engine compartment. (fig. C3615)

5 Loosen the fuel line clamp and disconnect the fuel line.

6 Disconnect the fuel return line from behind the rear fuel injector. Disconnect the main Engine harness / ROPS harness plug connector. (fig. C3576)

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



ENGINE REPLACEMENT 7.3

Removal (cont'd)

8 Disconnect the air filter restrictor sensor wires located at the rear of the air cleaner canister.

9 Remove the exhaust system from the loader. Cover or plug any open exhaust ports to the engine.

10 Remove the air cleaner canister assembly. (fig. C3632). Plug or cover any open air lines to prevent contamination.

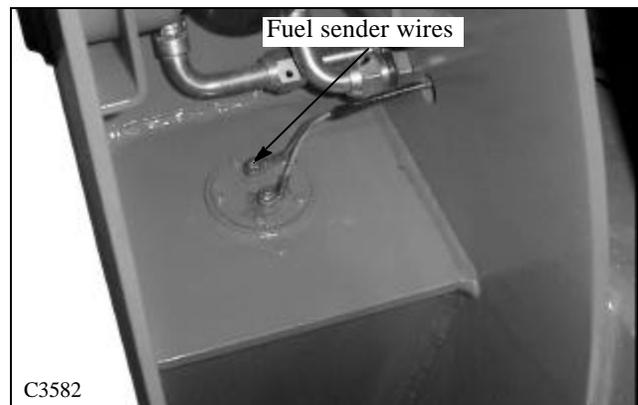


11 Disconnect the hoses going to the coolant over flow tank, or remove the bolts holding the tank to the loader frame. (fig. C3625)



12 Remove the ground wires from the chassis ground bolt. Disconnect the wires going to the fuel level sender in the fuel tank. (fig. C3582)

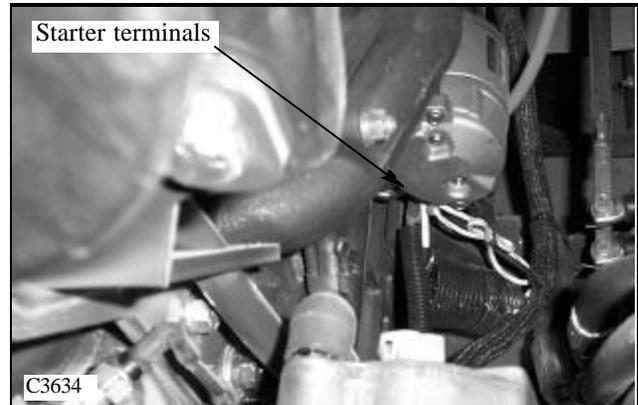
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ENGINE REPLACEMENT 7.3

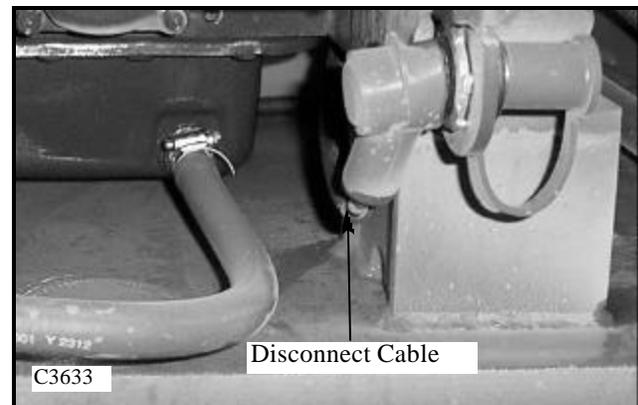
Removal (cont'd)

13 Disconnect the ground straps (cables) mounted from the engine to the loader frame.

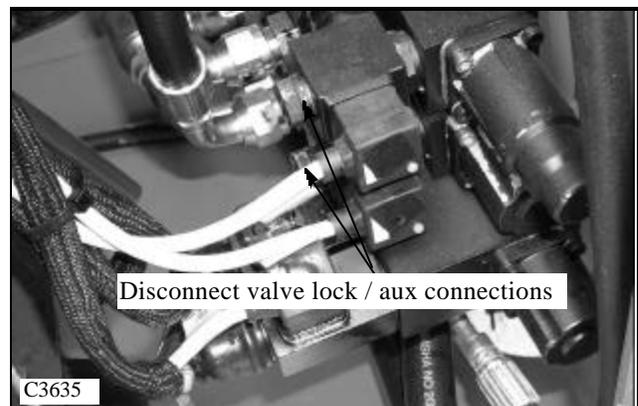


14 Disconnect the engine starter cable coming from the positive terminal of the battery. (fig. C3634)

15 Disconnect the electrical cable from the boosting lug terminal. (fig. C3633)



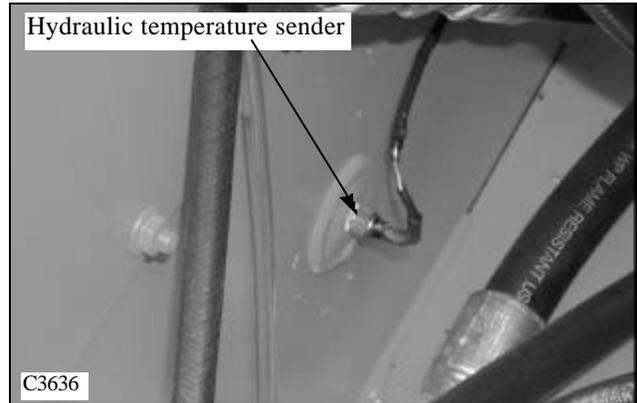
16 Disconnect the hydraulic control valve electrical connections. (fig. C3635) Tag the connections for location to prevent mixing up upon engine replacement.



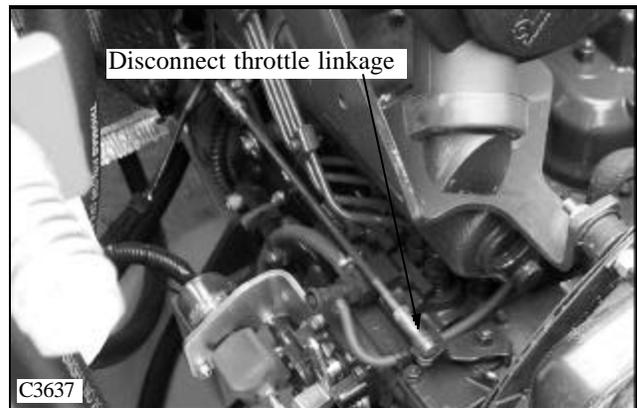
ENGINE REPLACEMENT 7.3

Removal (cont'd)

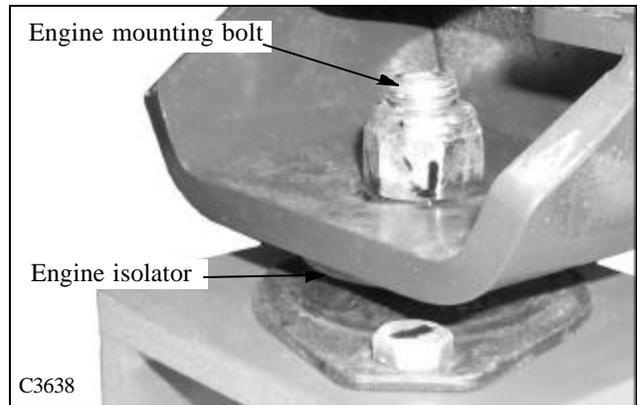
17 Disconnect the hydraulic oil temperature sender located on the left hand oil tank, inside the engine compartment. (fig. C3636)



18 Disconnect the throttle linkage. (fig. C3637)



19 Remove the 4 bolts retaining the engine to its rubber composite mounting isolators. (fig. C3638)



20 Using a suitable lift point, raise the engine slightly and pull rearward slowly. (fig. C3639) Check frequently for wires or hoses that may still be connected or tied to the engine and frame. Remove the engine.



CAUTION

Use a chain size of 3/8" grade 40 minimum when replacing the engine

ENGINE REPLACEMENT 7.3

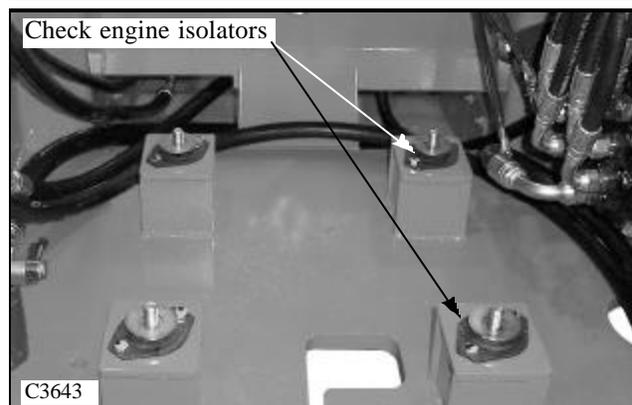
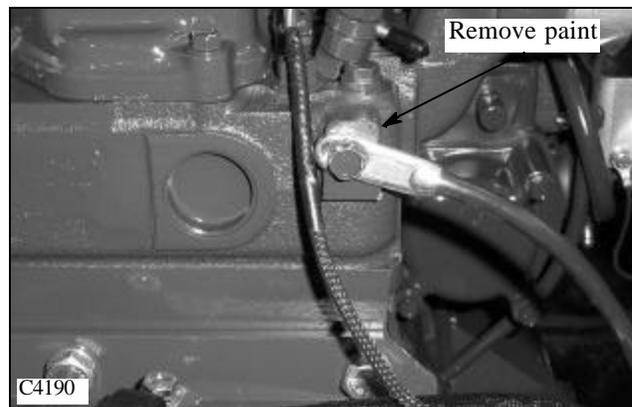
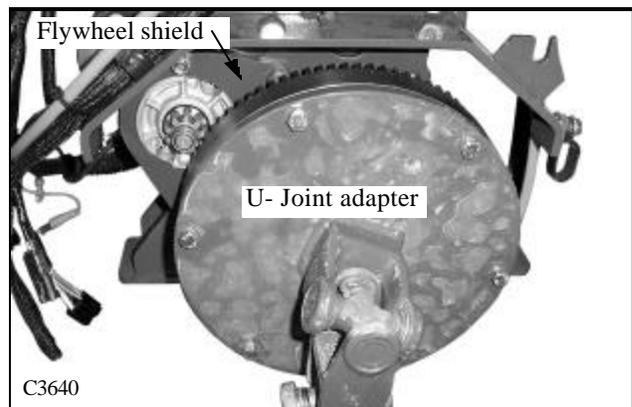
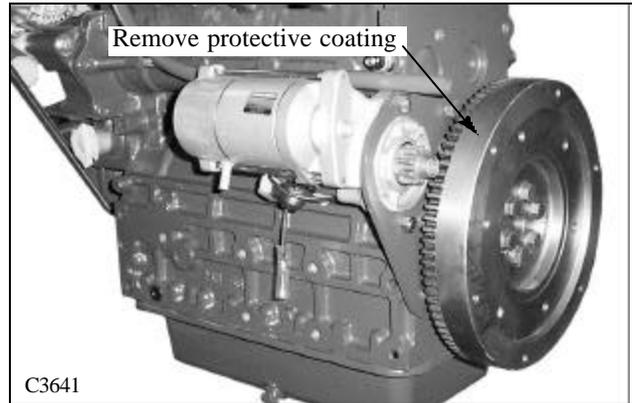
Installation

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. (fig. C3641) Use a solvent to remove. The flywheel must be cleaned to the surface metal.
- 2 Install the engine U- Joint adapter. (fig. C3640) There are 6 bolts holding the adapter to the engine flywheel. Note that 2 of the bolts are longer than the rest. These 2 bolts must be used in the counter sunk holes in the engine flywheel. Torque the adapter bolts 20 ft / lbs. (27.2 Nm)
- 3 Install the flywheel shield to the rear of the engine block. (fig. C3640)
- 4 Paint must be removed from the engine block where the ground strap is attach to the front of the engine. This will provide proper grounding of the engine with the loader chassis. (fig. C4190)
- 5 Install the engine mounts. Apply Loctite 242 (blue) to the threads of the mounting bolts. Torque the mounting bolts to 80 ft / lbs. (108.8 Nm).
- 6 Install the engine temperature sender.
- 7 Install the engine shut off solenoid. See Section 7.3 for special installation instructions of the engine stop solenoid.
- 8 Install the engine wire harness.
- 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.
- 12 Add engine oil and coolant.
- 13 Check the engine mounting isolators in the loader frame. (fig. C3643) Make sure the isolators are not separating or the rubber is deteriorated in any way. Replace engine isolators as required.

IMPORTANT

The engine shut off solenoid requires proper adjustment. Improper adjustment will lead to premature solenoid failure.



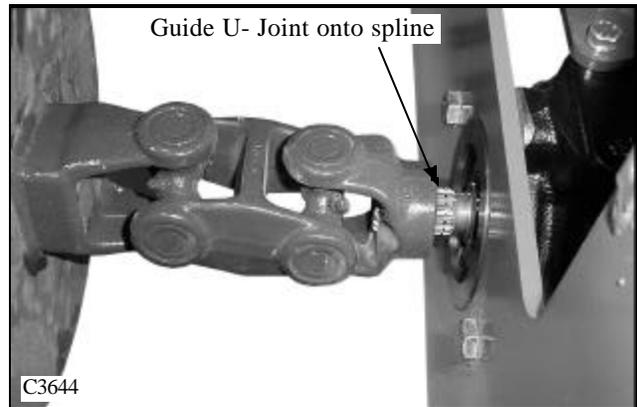
ENGINE REPLACEMENT 7.3

Installation

14 Install the engine to the loader. (fig. C3639) Have a helper inside the cab to line up the engine U- Joint to the hydrostatic pump input shaft. (fig. C3644) 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.

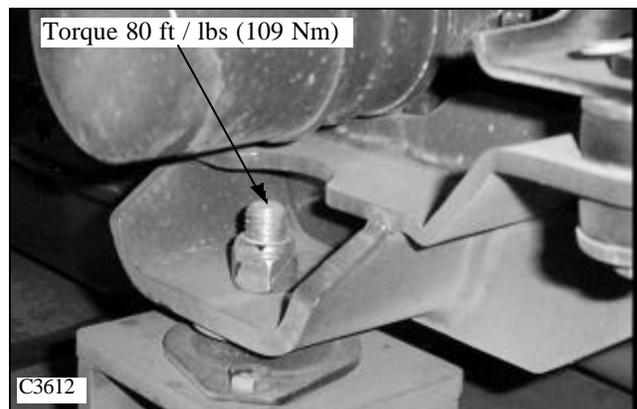


C3639



C3644

- 15 Install the engine mounting bolts to the isolators. Torque the bolts to 80 ft / lbs. (109 Nm).(fig. C3612)
- 16 Connect the various electrical connections, routing wires carefully to prevent chaffing. Tie the wires with Zip ties as required. Be sure all ground point are clean.
- 17 Install the intake and exhaust systems.



C3612

- 18 Install the coolant over flow tank and hoses. (fig. C3625)
- 19 Connect the fuel supply and turn on the fuel tank petcock.
- 20 Bleed the air from the fuel lines.
- 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.



C3625

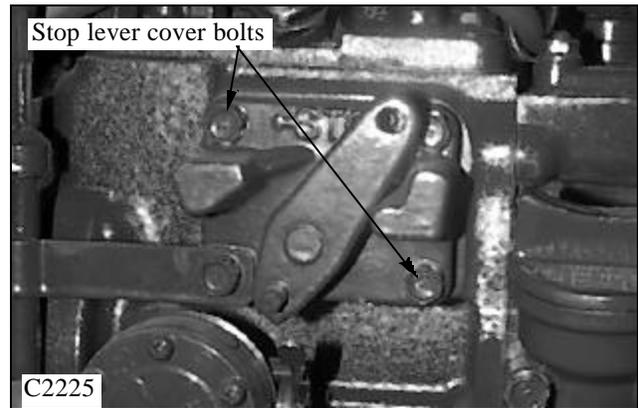
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ENGINE REPLACEMENT 7.3

Stop Solenoid

The engine stop solenoid requires special attention when replacing. If not properly adjusted, the stop solenoid will fail prematurely.

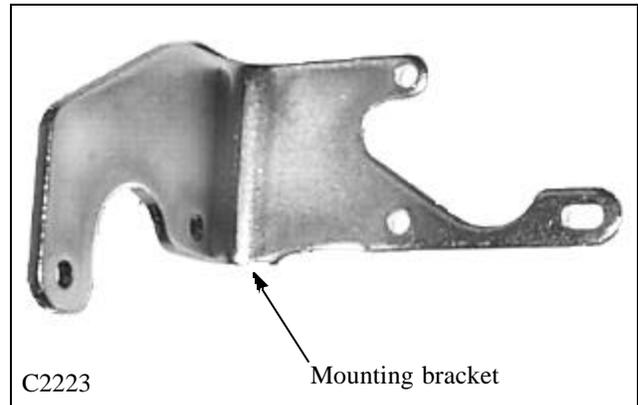
- 1 Remove the 4 bolts retaining the engine stop cover and lever assembly. (fig. C2225) Remove the cover.
- 2 Knock out the roll pin retaining the stop lever to the stop cover.
- 3 Replace the stop lever with the new stop lever and roll pin provided in the stop solenoid kit. (fig. C2275) Attach the stop lever so the end with the protruding pin is on the bottom of the stop cover as installed to the engine.
- 4 Replace the stop cover to the engine using the new gasket provided in the stop solenoid kit.



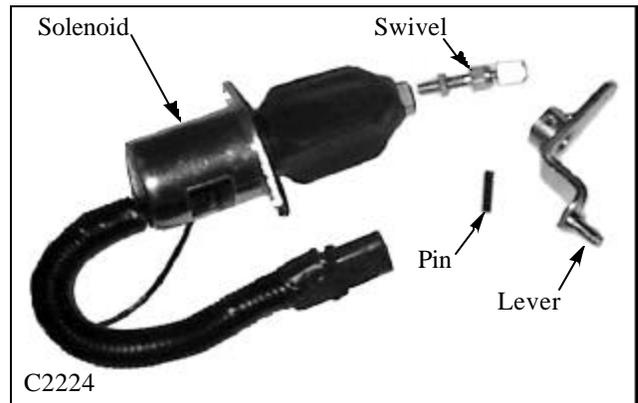
Install new stop lever and roll pin



- 5 Using the washers and bolts provided in the kit, attach the solenoid mounting bracket and stop cover to the engine. (fig. C2223, C2276) Flat washers are provided to space the solenoid mounting bracket away from the stop cover and provide a "square" and level point for the stop solenoid to mount. Do not bend the mounting bracket to fit.



- 6 Install the jam nut and lock washer to the swivel, and screw the swivel into the solenoid. (fig. C2224)



ENGINE REPLACEMENT 7.3

Stop Solenoid (cont'd)

7 Attach the stop solenoid to the shut off lever making sure the cable tie around the solenoid dust boot is facing down, away from the mounting bracket. (fig. C2277) Failure to do so may cause the solenoid to bind and fail prematurely. Use the cotter pin provided to secure the solenoid to the stop lever.

8 Bolt the stop solenoid to the mounting bracket. (fig. C2220)

IMPORTANT

The boot cable tie clamp must face away from the mounting bracket to prevent binding

9 Pull the stop lever and solenoid by hand to initially adjust the clearance between the stop lever and the stop cover lever limiter. (fig. C2221) Adjust stop lever clearance to 1 / 16 in. (1.5mm) by turning the swivel.

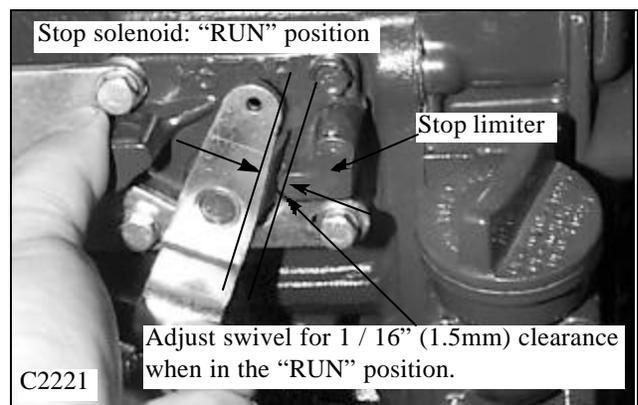
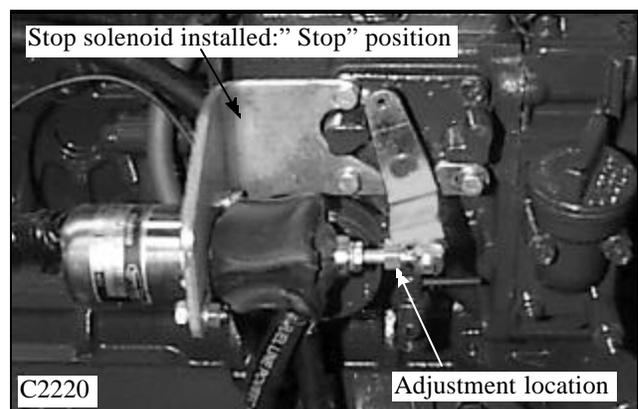
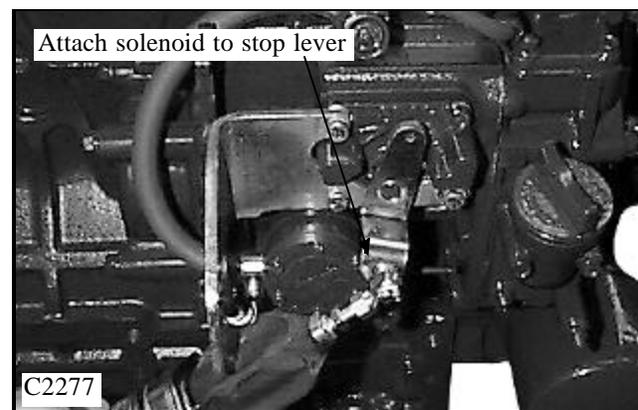
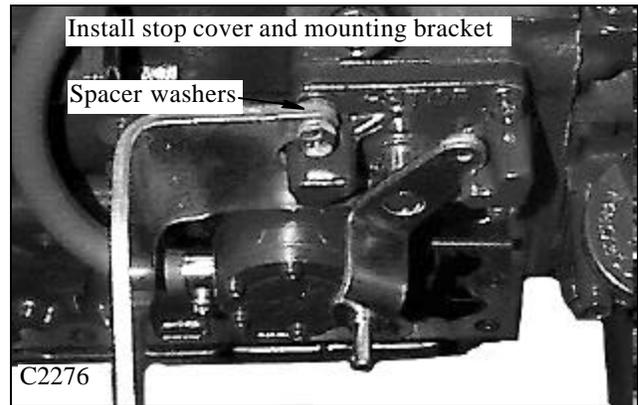
10 Plug in the solenoid connector to the engine electrical harness.

11 Turn on the ignition key but do not start the engine.

12 Manually push the stop solenoid to the run position. Check for smooth engagement, no binding should occur. The solenoid must remain in the "RUN" position now, without holding by hand.

13 Check the stop lever clearance again as the solenoid is engaged. Adjust to 1 / 16 in. (1.5mm).

14 Apply Loctite 242 (blue) to the swivel and jam nut and turn the jam nut against the end of the solenoid plunger. Be sure to support the solenoid as the jam nut is tightened.



To prevent premature failure of the engine stop solenoid, follow the recommended starting procedure. Maximum energizing of the pull coil must not exceed three 30 second cranking attempts with 2 minutes rest between each attempt. After the third 30 second cranking attempt, the stop solenoid must be allowed to cool to ambient 25 ° C (77 ° F) before further cranking attempts.

ENGINE SPECIFICATIONS T175 7.3

Make and model	Kubota V2003-T-B
Type.....	Vertical , In Line, 4 Cycle
Number of cylinders.....	4
Displacement	19.99 cu. in.(122.12cc)
Cylinder bore.....	83 mm (3.27 inches)
Allowable limit: 80 ~ 80.034mm. (3.1496 ~ 3.1563 inches)	
Stroke.....	92.4 mm (3.64 inches)
Bearing clearance.....Main journals: 0.04 ~ 0.118mm (0.0006 ~ 0.0015 in) < 0.2 mm (0.0079 in) allowable limit >Rod journals: 0.025 ~ 0.087 mm (0.0009 ~ 0.0034 in)< 0.2 mm (0.0079 in) allowable limit >Thrust bearing end play: 0.15 ~ 0.31 mm (0.0059 ~ 0.0122 in) < 0.5 mm (0.0197 in) allowable limit >	
Maximum engine speed (no load)	2950 RPM
Low idle setting.....	1000 RPM
Cooling system	Liquid
Cold starting aid.....	Glow plug in combustion chamber
Horsepower (Gross).....	60.5 @ 2800 RPM
Power (ISO 9249 Net Power).....	41.8Kw (56 hp) @ 2800 RPM
Torque (ISO 9249 Net Power).....	165 N.m. (122 lbs / ft.) @ 1600 RPM
Compression ratio	22.0: 1
Engine compression.....	36 - 38 kgf / cm ² (512 - 540 psi)
.....Service limit: 24.5 kgf / cm ³ (355 psi) 10 % variance among cylinders	
Firing order (viewed from gear case end).....	1 - 3 - 4 - 2
Fuel injection pump	Bosch type mini pump (PFR 4M)
Fuel injection timing	18° BTDC (0.314 Rad)
Injector working pressure.....	140 - 150 kgf / cm ² (1990 - 2133 psi)
Direction of rotation (viewed from flywheel end)	Counter - clockwise
Location of timing marks	N / A
Valve clearance, (cold)	0.18 - 0.22 mm (0.0071 - 0.0087 in)
Valve seat angle	Intake 1.047 Rad (60°)
.....	Exhaust 0.785 Rad (45°)
Valve seat width.....	Intake 2.12mm (0.0835 in)
.....	Exhaust 2.12mm (0.0835 in)
Valve face angle	Intake 1.047 Rad (60°)
.....	Exhaust 0.785 Rad (45°)
Valve recessing.....	Protrusion 0.05mm (0.0020 in)
.....	Recess 0.15mm (0.0059 in)
Fuel type	Diesel No. 2
Fuel filter.....	Single spin on type
Air cleaner	Dual dry cartridge elements (primary and secondary) with restriction indicator
Oil filter.....	Single spin on type
Engine oil pressure	@ Idle speed 98 Kpa (14 psi) minimum
.....	@ Rated speed 245 Kpa (36 psi) minimum
Oil pressure switch.....	Closes @ 49 Kpa (7 psi)
Engine oil capacity with filter	7.9. (8. 3 qts)
Oil type	10W30API CF
Cooling system capacity	7 l (1.8 gal.)
Radiator cap pressure setting	88 KPa (12. 8 psi)
Thermostat rating.....	Fully open 85°C (185°F)

**For complete engine service repair manual:
Order P / N 97897-01670 from your nearest Kubota dealer.**



— ENGINE SPECIFICATIONS PT1700 7.4 —

Make and model	Kubota V2203
Type	Vertical , In Line, 4 Cycle
Number of cylinders.....	4
Displacement	134.08 cu. in.(2197cc)
Cylinder bore.....	87 mm (3.43 inches)
Allowable limit: 80 ~ 80.034mm. (3.1496 ~ 3.1563 inches)	
Stroke.....	92.4 mm (3.64 inches)
<i>Maximum engine speed (no load)</i>	<i>2950 RPM</i>
<i>Low idle setting</i>	<i>1000 RPM</i>
Cooling system	Liquid
Cold starting aid	Glow plug in combustion chamber
Horsepower (Gross).....	51 @ 2800 RPM
Power (ISO 9249 Net Power)	34.3Kw (46 hp) @ 2800 RPM
Torque (ISO 9249 Net Power).....	155 N.m. (115 lbs / ft.) @ 1600 RPM
Compression ratio	23.0: 1
Engine compression.....	30 - 33 kgf / cm ² (427 - 469 psi)
.....	Service limit: 26 kgf / cm ³ (355 psi) 10 % variance among cylinders
Firing order (viewed from gear case end).....	1 - 3 - 4 - 2
Fuel injection pump.....	Bosch type mini pump (PFR 4M)
Fuel injection timing	18° BTDC (0.314 Rad)
Injector working pressure	140 - 150 kgf / cm ³ (1990 - 2133 psi)
Direction of rotation (viewed from flywheel end).....	Counter - clockwise
Location of timing marks	N / A
Valve clearance, (cold)	0.18 - 0.22 mm (0.0071 - 0.0087 in)
Valve seat angle.....	Intake 1.047 Rad (60°)
.....	Exhaust 0.785 Rad (45°)
Valve seat width.....	Intake 2.12mm (0.0835 in)
.....	Exhaust 2.12mm (0.0835 in)
Valve face angle	Intake 1.047 Rad (60°)
.....	Exhaust 0.785 Rad (45°)
Valve recessing.....	Protrusion 0.05mm (0.0020 in)
.....	Recess 0.15mm (0.0059 in)
Fuel type	Diesel No. 2
Fuel filter	Single spin on type
Air cleaner	Dual dry cartridge elements (primary and secondary) with restriction indicator
Oil filter	Single spin on type
Engine oil pressure.....	@ Idle speed 98 Kpa (14 psi) minimum
.....	@ Rated speed 245 Kpa (36 psi) minimum
Oil pressure switch.....	Closes @ 49 Kpa (7 psi)
Engine oil capacity with filter.....	8 l. (8. 5 qts)
Oil type	10W30API CF
Cooling system capacity	14.5 l (3.2 gal.)
Radiator cap pressure setting	88 KPa (12. 8 psi)
Thermostat rating.....	Fully open 85°C (185°F)



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	
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	Used the specified fuel
	Fuel filter clogged	Adjust
	Air cleaner clogged	Adjust top clearance
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



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
	Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder
Battery quickly discharges	Battery electrolyte insufficient	Replenish distilled water
	Fan belt slips	Adjust belt tension or change
	Wiring disconnected	Connect
	Rectifier defective	Replace
	Alternator defective	Replace
	Battery defective	Change

7

SECTION 8

MAINTENANCE & SPECIFICATIONS

Maintenance 8.1

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MAINTENANCE 8.1

8.1 Preventative Maintenance Service Schedule

ITEM	SERVICE REQUIRED	8 HOURS	50 HOURS	150 HOURS	300 HOURS	1000 HOURS
Engine Oil	Check level. If necessary add 10W30 API Classification CF oil.					
Radiator	Check level and add if necessary. Fill with 50% mixture of ethylene glycol and water. Check cooling fins for dirt. If necessary blow out with compressed air. Check rubber seal around radiator baffle.					
Hydraulic Oil	Check level and add if necessary add 10W30 API Classification SJ (-20°C to 35°C) or 20W50 API Classification SJ (-10°C to 45°C) oil.					
Oil Cooler	Check cooling fins for obstruction. Clean with compressed air or water.					
Air Cleaner	Empty dust cap. Check condition indicator and service or replace element as required.					
Tires and Wheels	Check for low pressure or tire damage. Inflate 10.00 x 16.5 to 40-45 PSI (276-310 KPa). Check wheel nut torque 100-110 ft.lbs. (136-149 N.M.)					
Safety Equipment	Check all safety equipment for proper operation and condition (seat belt, lift arm supports, seat bar, parking brake, quick-tach lock, shields, safety treads, front shield, cab side screens). Repair or replace safety treads if necessary.					
Final Drive	Check chain and sprocket condition. Check every 150 hrs.					
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.					
Engine Oil	Replace engine oil. Use 10W30 API Classification CF oil. Initial change only.					
Engine Oil Filter	Change engine oil filter element. Initial change only.					
Hydraulic Oil	Change hydraulic oil filter elements. Initial change only.					
Muffler	Check the muffler for carbon buildup and plugging. Clean if necessary. Check every 100 hours.					
Safety System Linkages And Springs	Check and if necessary adjust. Lubricate lock springs, shaft and linkage.					
50 Hour Service	Perform complete 50 hour service.					
Engine Oil	Replace engine oil (initial change already made). Use 10W30 API Classification CF oil. Replace every 150 hours.					
Engine Oil Filter	Replace engine oil filter. Replace every 150 hours.					
Hydraulic Oil Filter	Replace hydraulic oil filter elements					
Preventative Maintenance Service Check	It is recommended as a preventative maintenance that the 50 hour service be repeated every 150 hours after the initial 50 hour service.					



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.



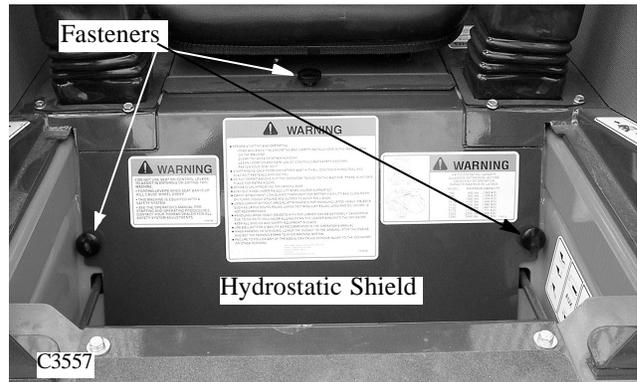
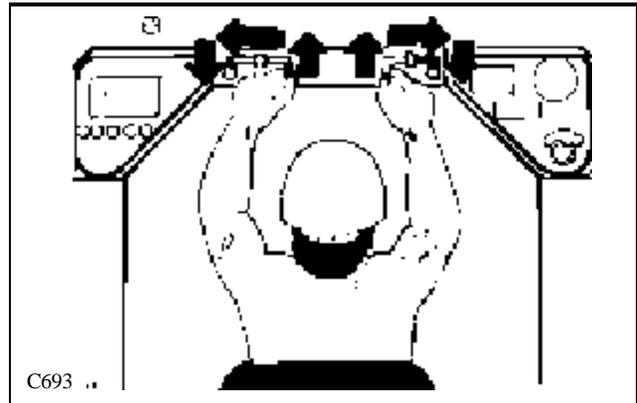
WARNING

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.

The hydrostatic shield can be by removing the fasteners (fig.C3557).



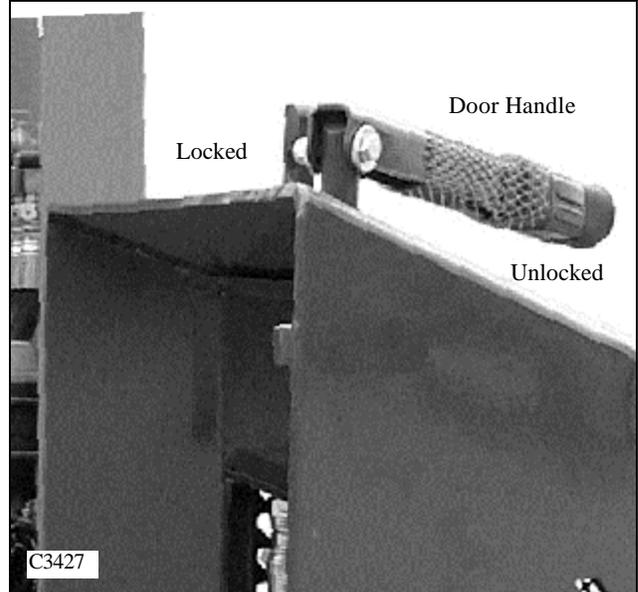
MAINTENANCE 8.1

IMPORTANT

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



C3427

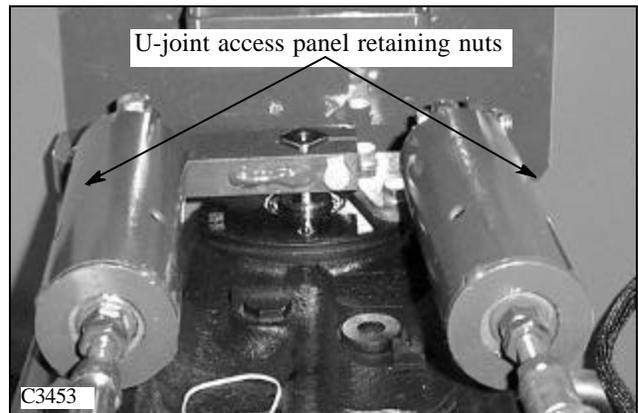


C3427

1.2D Universal Joint Access

8

After removal of the operators seat, the U-joint service / inspection panel can be accessed. (fig. C3453) Remove the 2 bolts retaining the panel to the frame, push toward the rear of the loader at the top of the panel, and pull the panel forward and out by the bottom.



C3453

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 flush the radiator 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 it 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 an air cleaner restriction warning lamp.

Should this lamp illuminate, shut off the engine and determine the cause. Possible plugged air filter.

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:

12.5 x 16.5 . . . 40-45 P.S.I. (276-310 KPa)

10.00 x 16.5 . . . 40-45 P.S.I. (276-310 KPa)

To prevent shearing of the wheel studs and rim damage check wheel nuts for proper torque 100 -110 lbs. ft. (136 - 149 N.M.) daily. After changing a rim, check wheel nuts 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 sixteen grease fittings located on 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 sixteen lubrication points are:

Rear Boom Pivots (2)

Boom Cylinder Bushings (4)

Bucket Cylinder Bushings (4)

Boom Supports (2)

Quick - Tach Pivot and Lock Pins (4)

1.3H Oil Cooler Service

The oil cooler fins must be kept free of debris otherwise over heating of the hydraulic oil will occur. Check the cooler and if necessary remove debris by flushing with compressed air and / or water.

1.3J 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 of the dipstick (See Section 7). Do not fill above the full mark – use 10W30 API classification CF oil.



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 for installation details. Change the oil filter every 150 hours thereafter.

1.2 Engine Oil:

Change the engine oil. Use only 10W30 API classification CF oil. Refer to section 7 for procedure. Change engine oil every 150 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 flush the radiator 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. Check rubber gasket on radiator to door baffle.

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.

1.6 Fuel System for Leaks:

Make a visual inspection of fuel system for leaks and potential hazards such as fuel line(s) touching exhaust manifold, flywheel, etc. Replace fuel filter every 400 hours.

1.7 Air Intake and Cleaner System:

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

1.8 Exhaust System:

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

1.9 Engine Speed:

Check and if necessary adjust engine R.P.M. Maximum no load high idle: 2800 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.

2 Hydraulic/Hydrostatic

2.1 Hydraulic Oil Filter:

Change the hydraulic oil filter. Change the hydraulic filter every 150 hours after the initial change. Lubricate the filter cartridge seal with system fluid.

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.

2.7 Oil Cooler:

Inspect the oil cooler for leaks, fin damage or clogged with dirt. If necessary flush fins with compressed air and / or water.



WARNING

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

MAINTENANCE 8.1

3 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 N.M.)
- 3.4 Axle Bearing End Play:
Axle bearings are pre - loaded and must have no end play. Inspect and adjust if necessary.

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 and Lock Pin (4)

7 General

- 7.1 Tire Pressure:
Check the tire pressure and if necessary inflate to the following pressures: 12.00 x 16.5 @ 40-45 PSI (270-310 KPa), 10.00 x 16.5 @ 40 - 45 PSI (276 - 310 KPa). Flotation tires may be inflated to 50 PSI (345 KPa) on hard flat surfaces.
- 7.2 Wheel Nut Torque:
Check and torque wheel nuts to 100 - 110 ft. lbs. (136 - 149 N.M.).
- 7.3 Condition of Cab:
Inspect 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

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 Adjust tightener tension.	Replace chain or connection link.
	Motor shaft failure Check mounting bolts.	Inspect and repair defective parts. motor
	Excessive internal leakage in pump and/or motor	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 Flush all lines and tank, change filter. Check on type of fluid used and engine RPM
	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 Thomas Service Dept.

8.2A Hydrostatic Drive

Symptom	Cause	Remedy
System erratic and/or noisy	Air in system due to low oil level in reservoir	Replenish with 10W30 API SJ oil.
	Air in system due to leak at suction fitting	Check fittings and tighten.
	Internal pump or motor wear caused by overspeeding	Consult your dealer or Thomas 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 API SJ 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 the chain

8.2C Park Brake

Symptom	Cause	Remedy
Brake will not hold machine	Brake valve will not release pressure	Verify position of over-ride
	Brake parts damaged or worn	Consult your Dealer or Thomas Service Dept.
	Brakes are disengaged	Engage parking brake
Brake will not release machine	No power to brake valve solenoid	Check fuse, If fine, consult Dealer or Thomas Service Dept.
	No pressure in supply line to brake valve	Consult your Dealer or Thomas service Dept.
	Brakes are engaged	Release brake

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 or 20W50 SF 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 or 20W50 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	
Hydraulic oil overheating	Reservoir low on fluid	Replenish with 10W30 or 20W50 API SJ oil
	Oil cooler plugged or dirty (also check engine radiator)	Clean cooling fins

Symptom	Cause	Remedy
Loss of hydraulic power (no flow from gear pump)	Reservoir low on fluid. Hose or fitting leak.	Replenish with 10W30 or 20W50 API 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.
Loss of hydraulic power (flow from gear pump)	Reservoir low on fluid	Replenish with 10W30 or 20W50 API SJ oil
	Foot pedal linkage disconnected or binding	Inspect and adjust.
	Auxiliary foot pedal engaged	Disengage
Hydraulic oil overheating	Relief valve failure in control valve	Check pressure and adjust.
	Auxiliary foot pedal engaged	Disengage
	Engine RPM too slow	Check RPM and adjust
Foot pedals do not operate smoothly	Incorrect temperature sensor	Replace
	Foot pedal linkage out of adjustment	Adjust foot pedal linkages
Foot pedals do not operate smoothly	Foot pedal linkages need lubrication	Lubricate with a silicone based lubricant



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 Control lever linkage out of adjustment	See troubleshooting hydrostatic system 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	Electro 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

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 smoke is observed	Excessive engine oil	Reduce to the specified level
	Low grade fuel used	Repair or replace
	Fuel filter clogged	Adjust
	Air cleaner clogged	Adjust top clearance
Either black or dark gray exhaust smoke 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



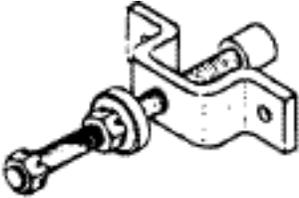
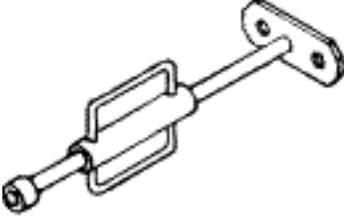
TROUBLESHOOTING 8.2

8.2G Diesel Engine

Symptom	Cause	Remedy
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 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
	Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder
Battery quickly discharges	Battery electrolyte insufficient	Replenish distilled water
	Fan belt slips	Adjust belt tension or change
	Wiring disconnected	Connect
	Rectifier defective	Replace
	Alternator defective	Replace
	Battery defective	Change

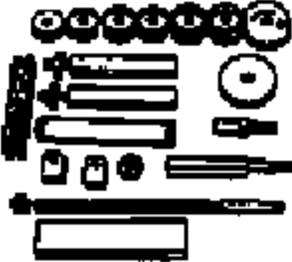
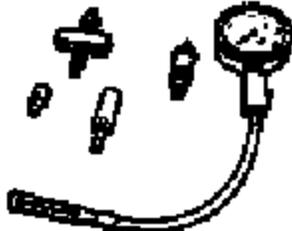


SPECIAL TOOLS 8.3

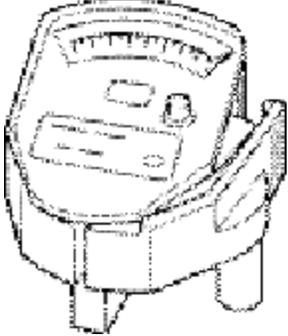
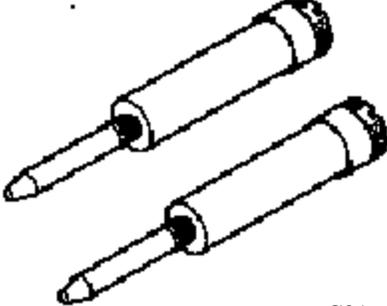
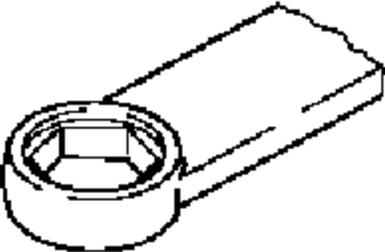
P / N	Illustration	Description	Model
955280		AXLE INSTALLATION TOOL - To install axle in final drive housing. Quantity - 1	T103 T135 T133'S'
960849 955281		SEAL INSTALLATION TOOL - To install axle seal in final drive housing. Quantity - 3 required	T103 T135 T133'S'
955283		AXLE EXTRACTOR TOOLS - To remove axle from final drive housing. Quantity - 2	T103 T135 T173HLS' T173HL'S'II T175/1700 T203HD T233HD T243HDS
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 T175/1700 T203HD T233HD T243HD'S
960997		CHAIN TENSION TOOL - To test chain tension.	T103 T135 T133'S'
U-1288	Universal Tool Kit	1 each. Combination wrench 7/16", 1/2", 9/16", 11/16" 3/4", 1 1/16", 1 1/4". Sockets, 1", 1/2" drive, 7/8", 1/2" drive, tool pouch, allen wrench 5/32" and 1/8"	ALL MODELS



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
42530	 <p style="text-align: right;">C754</p>	<p>TOOTHED BELT TENSION GAUGE For adjusting the timing belt to proper tension.</p>	<p>DEUTZ T243HDS T245HDS</p>
42531	 <p style="text-align: right;">C816</p>	<p>LOCATING PINS For locating crankshaft and camshaft when changing / adjusting timing belt.</p>	<p>DEUTZ T243HDS T245HDS</p>
42535	 <p style="text-align: right;">C1843</p>	<p>CAMSHAFT DOLLY Used to assist tightening of camshaft pulley bolt.</p>	<p>DEUTZ T243HDS T245HDS</p>



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

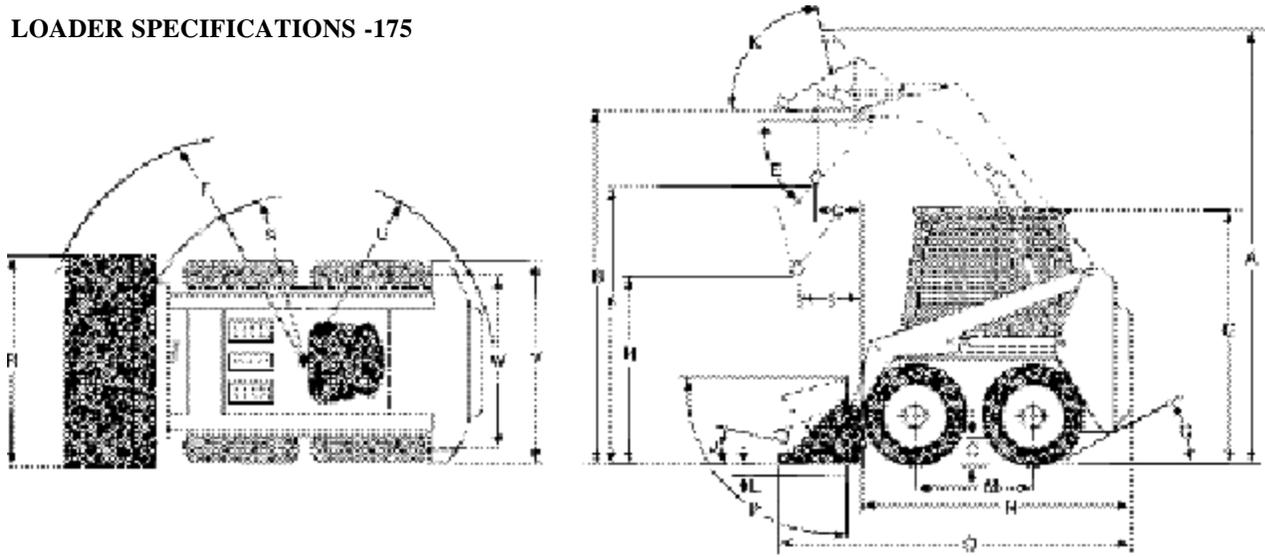


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SPECIFICATIONS 8.4

LOADER SPECIFICATIONS -175



175

175

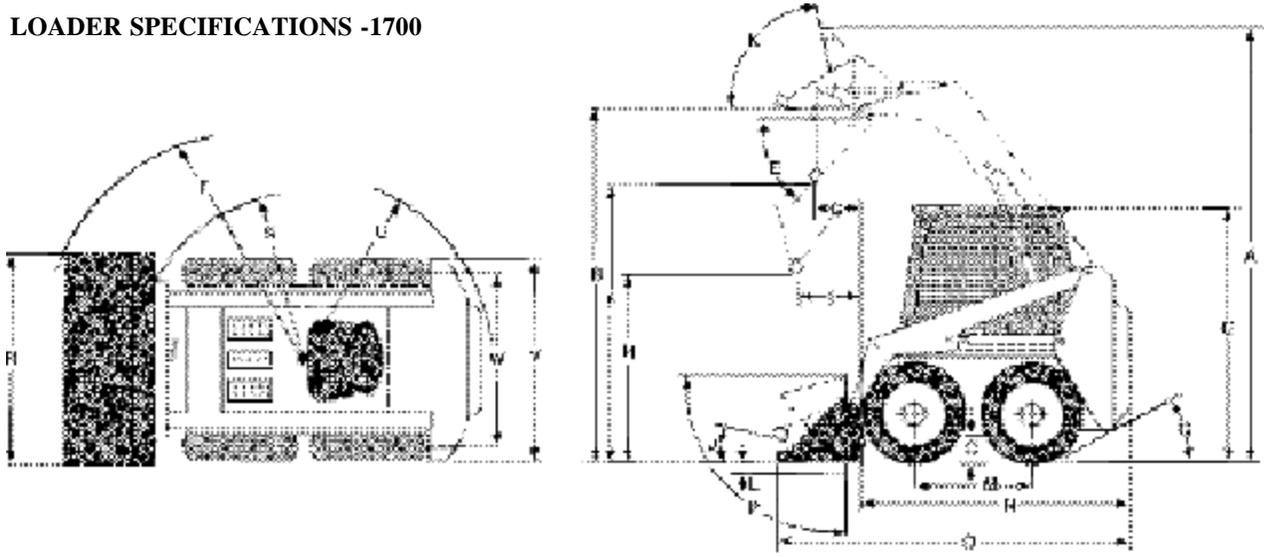
Dimensions

A. Overall operating height	168" (4267mm)
B. Height to hinge pin	133.25" (3385)
C. Overall vehicle height	83" (2108)
D. Overall length with bucket	139.3" (3538)
E. Dump angle	26°
F. Dump height	110.75" (2813)
G. Reach — fully raised	21.25" (540)
H. Height at 45° dump angle	75.5" (1918)
I. Reach at 45° dump angle	29.5" (749)
J. Maximum roll back at ground	20°
K. Maximum roll back fully raised	96°
M. Wheel base	39.5" (1003)
N. Overall length less bucket	110.25" (2800)
O. Ground clearance	8.75" (222)
P. Maximum grading angle – bucket	86°
Q. Angle of departure	28°
R. Bucket width	68.75" (1746)
S. Clearance circle – front – less bucket	51" (1295)
T. Clearance circle – front – with bucket	82.5" (2095)
U. Clearance circle – rear	65.5" (1664)
V. Overall width – less bucket	68" (1727)
W. Tread	55.25" (1403)



SPECIFICATIONS 8.4

LOADER SPECIFICATIONS -1700



1700

1700

Dimensions

A. Overall operating height	168" (4267mm)
B. Height to hinge pin	133.25" (3385)
C. Overall vehicle height	83" (2108)
D. Overall length with bucket	139.3" (3538)
E. Dump angle	26°
F. Dump height	110.75" (2813)
G. Reach — fully raised	21.25" (540)
H. Height at 45° dump angle	75.5" (1918)
I. Reach at 45° dump angle	29.5" (749)
J. Maximum roll back at ground	20°
K. Maximum roll back fully raised	96°
M. Wheel base	39.5" (1003)
N. Overall length less bucket	110.25" (2800)
O. Ground clearance	8.75" (222)
P. Maximum grading angle – bucket	86°
Q. Angle of departure	28°
R. Bucket width	68.75" (1746)
S. Clearance circle – front – less bucket	51" (1295)
T. Clearance circle – front – with bucket	82.5" (2095)
U. Clearance circle – rear	65.5" (1664)
V. Overall width – less bucket	68" (1727)
W. Tread	55.25" (1403)



SPECIFICATIONS 8.4

175

Engine

Make and model.....	Kubota V2003T-B	
Type.....	Verticle , In Line, 4 Cycle	
Number of cylinders	4	
Cylinder bore	83 mm (3.27 inches)	
Stroke.....	92.4 mm (3.64 inches)	
Displacement	122.12 cu. in.(1999cc)	
Maximum engine speed (no load)	2950 RPM	
Low idle setting.....	1000 RPM	
Cooling system	Liquid	
Horsepower (Gross)58 @ 2800 RPM	
Power (ISO 9249 Net Power).....	.41.8Kw (56 hp) @ 2800 RPM	
Torque (ISO 9249 Net Power)	165 N.m. (122 lbs / ft.) @ 1600 RPM	
Compression ratio.....	22.0: 1	
Firing order (viewed from gear case end).....	1 - 3 - 4 - 2	
Fuel injection timing	18° BTDC.	
Injector working pressure	137 bar (1990 P.S.I.)	
Direction of rotation (viewed from flywheel end)	Counter - clockwise	
Location of timing marks	N / A	
Valve clearance, (cold).....	.0071 - .0087 in (0 - .18 - 0.22 mm)	
Fuel type	Diesel No. 2	
Air cleaner	Replaceable dry cartridge w/indicator	
Engine oil capacity with filter	7.9 litre (8.3 qts.)	
Oil type.....	10W30API CF	
Cooling system capacity	8.2 liter (2.17 gal.)	
Radiator cap pressure setting.....	12. 8 PSI (88 KPa)	
Thermostat rating	Fully open 185°F (85°C)	

Hydraulic System

Pump type	Gear, 1.37 cu. in.	
Capacity (at rated RPM and Pressure)	14.5 GPM (54.8 l/m)	
Rated RPM	2800	
Rated pressure	2400 (Zero Flow) PSI (165.5 bar)	
Filtration	5 Micron	
Hydraulic fluid	10W30 API Class, SJ	
Control valve	Series type with float on lift and electric auxiliary	
Oil cooler	674 Btu/min. (711 kJ)	
Cylinders.	Lift	Tilt.....
Type.....	Double acting	Double acting
Qty per loader	2	2.....
Bore diameter	2.5 in.	2.5 in.
Rod diameter	1.5 in.	1.5 in.
Stroke	32 in.	15.5 in.



SPECIFICATIONS 8.4

1700

Engine

Make and model.....	Kubota V2203
Type.....	Verticle , In Line, 4 Cycle
Number of cylinders	4
Cylinder bore	87 mm (3.43 inches)
Stroke.....	92.4 mm (3.64 inches)
Displacement	134 cu. in.(2197cc)
Maximum engine speed (no load)	2950 RPM
Low idle setting.....	1000 RPM
Cooling system	Liquid
Horsepower (Gross)	49.5 @ 2800 RPM
Power (ISO 9249 Net Power).....	34.3 Kw (46 hp) @ 2800 RPM
Torque (ISO 9249 Net Power)	155 N.m. (115 lbs / ft.) @ 1600 RPM
Compression ratio.....	23.0: 1
Firing order (viewed from gear case end).....	1 - 3 - 4 - 2
Fuel injection timing	18° BTDC
Injector working pressure.....	1990 - 2133 PSI (137 - 147 Kgf / cm ²)
Direction of rotation (viewed from flywheel end)	Counter - clockwise
Location of timing marks	N / A
Valve clearance, (cold).....	.0071 - .0087 in (0 - .18 - 0.22 mm)
Fuel type	Diesel No. 2
Air cleaner	Replaceable dry cartridge w/indicator
Engine oil capacity with filter	8. 5 qts. (8 l)
Oil type.....	10W30API CF
Cooling system capacity	2.17 gal. (8.2 L)
Radiator cap pressure setting.....	12. 8 PSI (88 KPa)
Thermostat rating	Fully open 185°F (85°C)

Hydraulic System

Pump type	Gear, 1.37 cu. in.	
Capacity (at rated RPM and Pressure)	14.5 GPM (54.8 l/m)	
Rated RPM	2800	
Rated pressure	2400 (Zero Flow) PSI (165.5 bar)	
Filtration	5 Micron	
Hydraulic fluid	10W30 API Class, SJ	
Control valve	Series type with float on lift and detent on auxiliary	
Oil cooler674 BTU. (711 KCal)	
Cylinders.	Lift	Tilt.....
Type.....	Double acting	Double acting
Qty per loader	2	2.....
Bore diameter	2.5 in.	2.5 in.
Rod diameter	1.5 in.	1.5 in.
Stroke	32 in.	15.5 in.



SPECIFICATIONS 8.4

Hydrostatic Transmission & Final Drive

Pump type	Two in line, axial piston pumps
Pump displacement	2.65 cu. in. (44 cm ³)
Motor type	Geroter
Motor displacement	31.9 cu. in. (523.6 cm ³)
System relief setting	5000 PSI (345 bar)
Final drive	(2 of) Single roller chain running in oil bath to each axle
Drive chain size	ASA 100

Electrical

Alternator	40 amp
Battery	730 cranking amps
Starter	12 volt
Circuit breaker rating	40 amp

Tires

Standard (1700)	10.00 x 16.5, 6 ply rating, 40-45 PSI (276-310 Kpa)
Standard (175)	12.00 x 16.5, 8 ply rating, 40 - 45 PSI (276 - 310 KPa)
Optional (175)	12.00 x 16.5, 10 ply rating, 40 - 45 PSI (276 - 310 KPa)

Fluid Capacities

Fuel tank	73.0 litre. (19.0 gal.)	Diesel No. 2
Engine lubrication (175)	7.9 litre (8.3 qtrs.)	10W30 API CF
Engine lubrication (1700)	7.6 litre (8.0 qtrs.)	10W30 API CF
Final drive transmissions (each)	17.0 litre (4.5 gal.)	10W30 API SJ
Hydraulic reservoir	56.0 litre (14.8 gal.)	10W30 API SJ
Engine cooling system	8.2 litre (2.17 gal.)	50 / 50 water & ethylene



SOUND POWER LEVEL

LWA Adjusted sound level at 10m (32.8ft). 104 DbA

SPECIFICATIONS 8.4

Torque Specifications

Loader

Wheel nuts (24) 100 - 110 ft lbs. (136 - 139 Nm)
 Motor mount isolators (4)80 ft / lbs (109 Nm)

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

Bolts & Nuts Torque ft. lbs (Nm.)

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		

Tandem Pump

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)

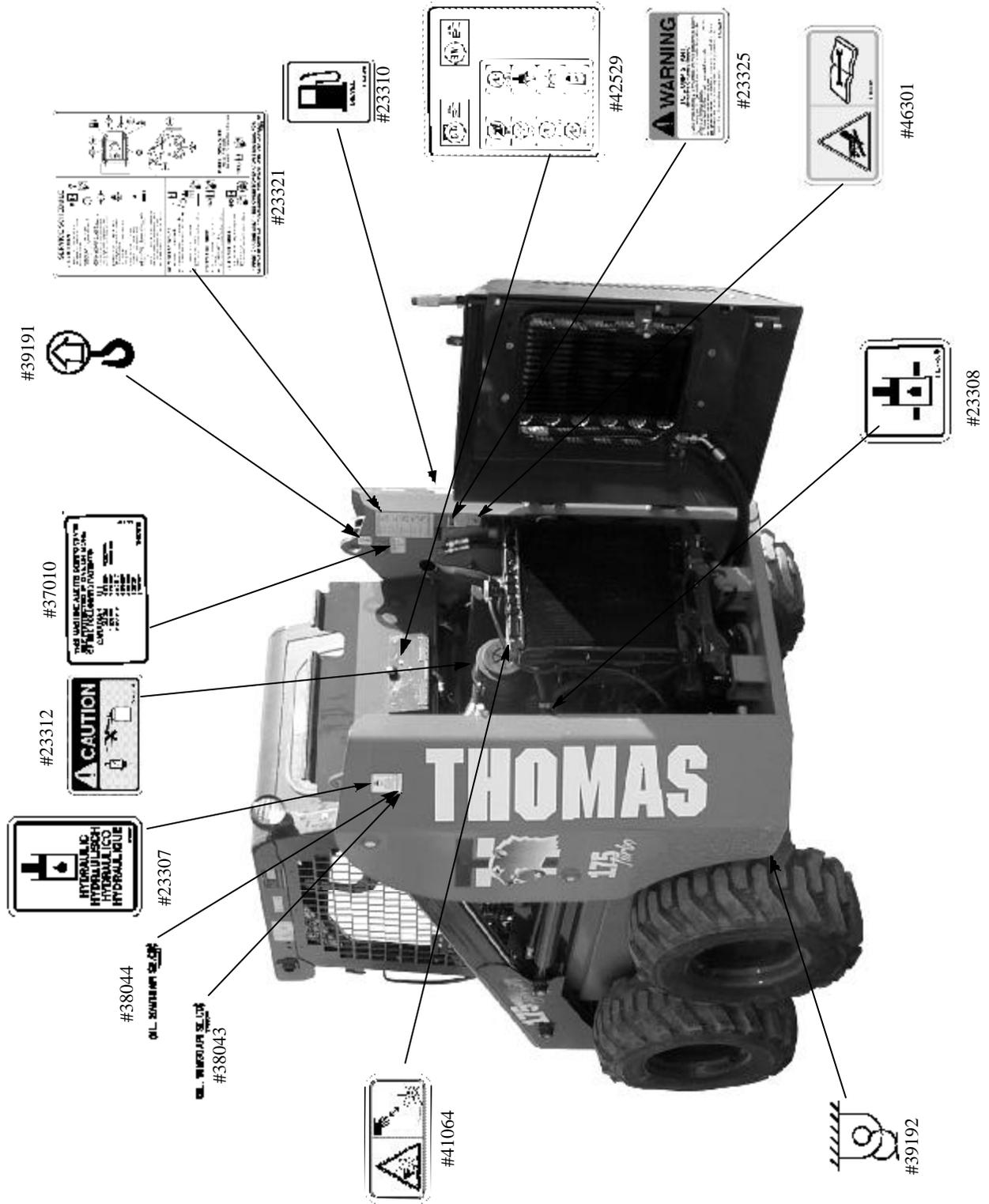
Torque Motor

Description	Qty.	Specification
Valve Housing	8	81 ft/lb
Bearing Housing	8	65 ft/lb
Bearing, Retaining Ring	8 Bolts	7 ft/lb
Mounting	4	80



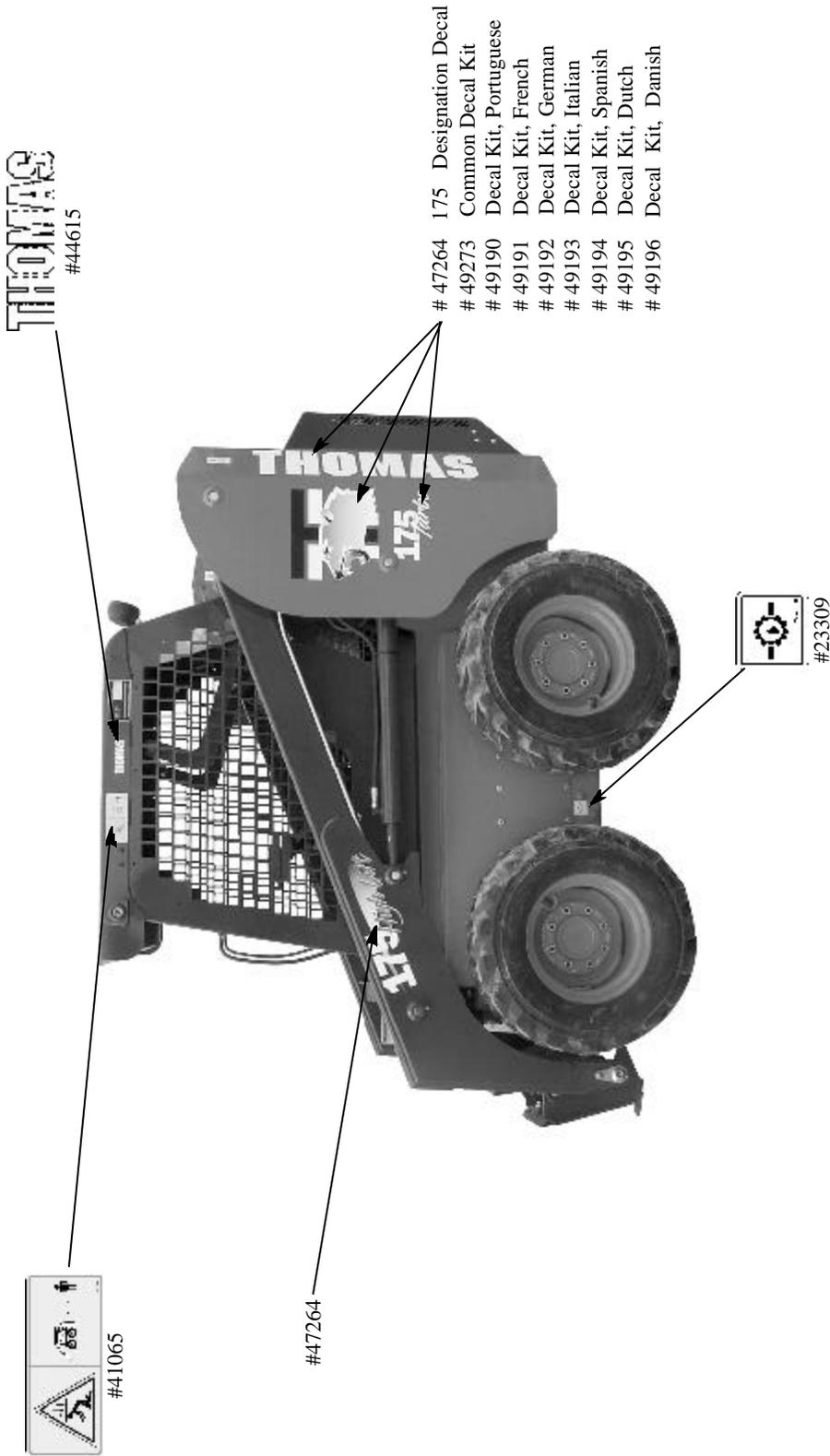
DECALS 8.5

175 DECAL CHART



DECALS 8.5

175 DECAL CHART

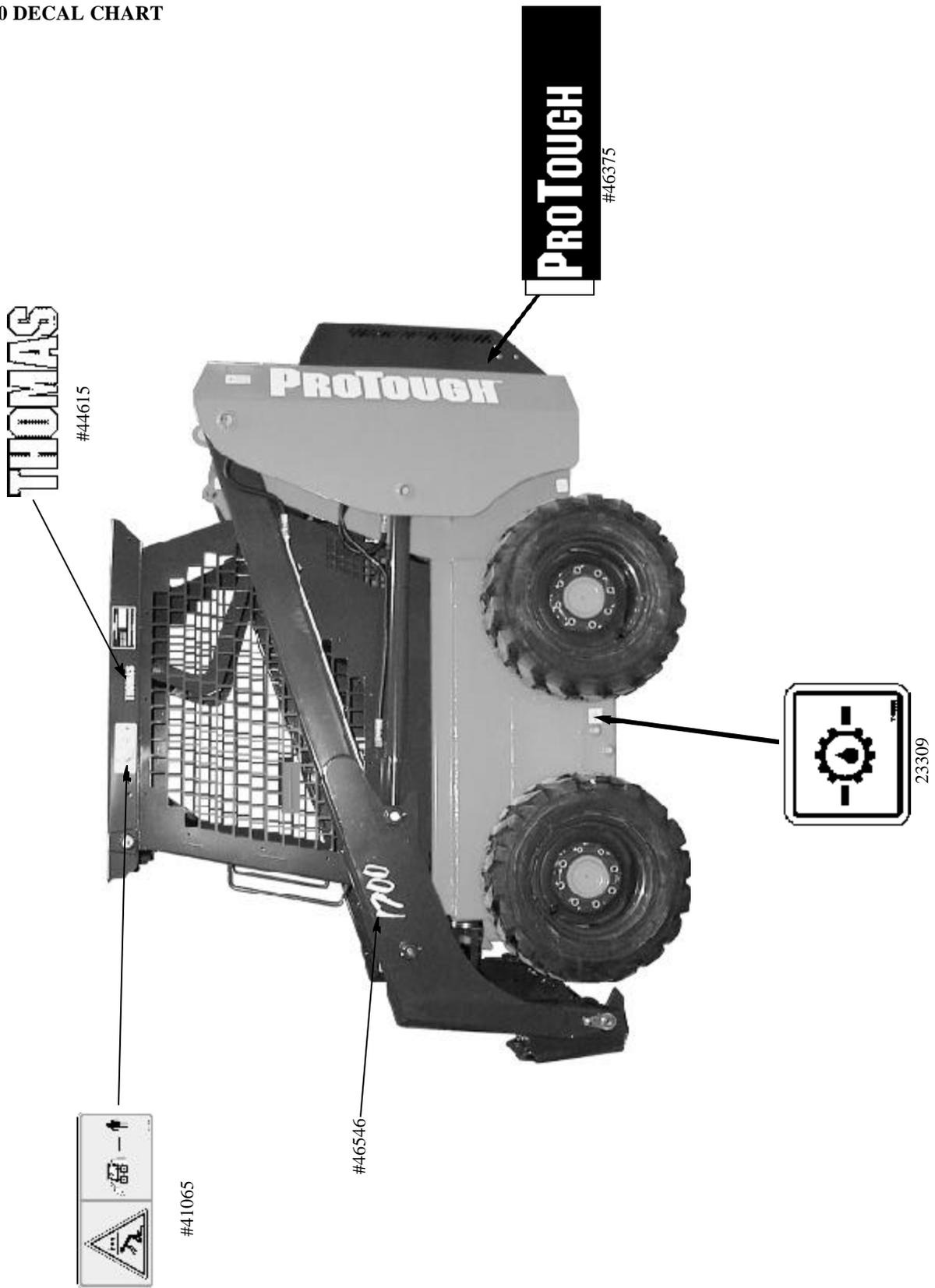


- # 47264 175 Designation Decal
- # 49273 Common Decal Kit
- # 49190 Decal Kit, Portuguese
- # 49191 Decal Kit, French
- # 49192 Decal Kit, German
- # 49193 Decal Kit, Italian
- # 49194 Decal Kit, Spanish
- # 49195 Decal Kit, Dutch
- # 49196 Decal Kit, Danish

- # 49039 Tag, ROPS/FOPS Approval
- # 43145 Decal, Park Brake
- # 47858 Decal, LWA 104, Noise Output (CE Loaders Only)
- # 40970 Orange Paint, Aerosol
- # 41123 Grey Paint, Aerosol
- # 41778 Orange Paint, Pre-mixed, Per Liter
- # 41738 Grey Paint, Pre-mixed, Per Liter

DECALS 8.5

1700 DECAL CHART



NOTES



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