# REPAIR MANUAL


**135**
**137**
**153**
**1300 ProTough**

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**September , 2004**

**THOMAS**

## THOMAS EQUIPMENT LIABILITY WARRANTY

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

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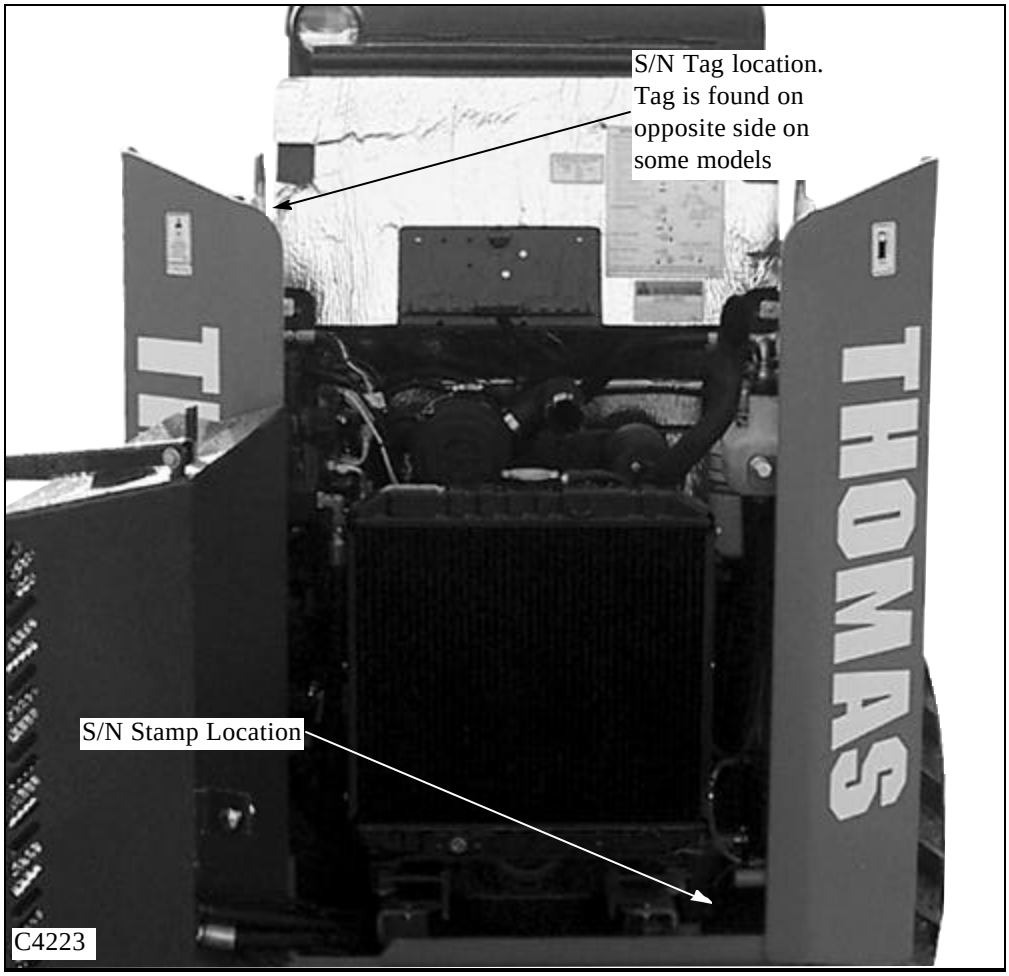
**THE WARRANTY IS A CONDITION OF SALE OF THE PRODUCT TO PURCHASER AND WILL THEREFORE APPLY EVEN IF PURCHASER ALLEGES THAT THERE IS A TOTAL FAILURE OF THE PRODUCT.**

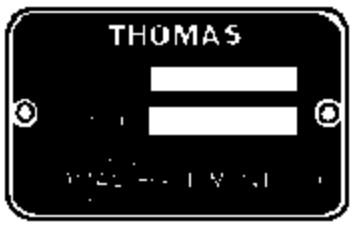
*N.B. Read and practice your **Thomas** operating and servicing instructions. Failure to do this may void your warranty.*

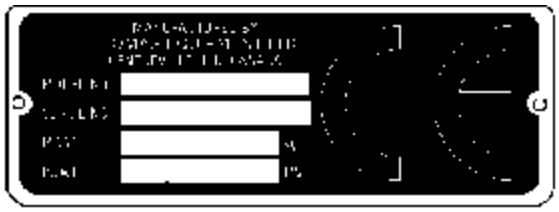
*Publication Number 49702*

# FOREWORD

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



# SAFETY PRECAUTIONS

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

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

## PERSONAL CONSIDERATIONS

* CLOTHING
  The wrong clothing or carelessness in dress can cause accidents. Check to see that you are suitably clothed. Some jobs require special protective equipment.

* SKIN PROTECTION
  Avoid long term contact with used motor oil. Follow work practices that minimize the amount of skin exposed and length of time used oil stays on your skin.

* EYE PROTECTION
  Injury can be avoided by wearing eye protection when engaged in chiseling, grinding, welding, painting and any other task that involves airborne matter.

* BREATHING PROTECTION
  Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.

* HEARING PROTECTION
  Loud noise may damage your hearing and the longer the exposure the greater the risk of hearing damage. Always wear hearing protection when working around loud machinery.

* HAND PROTECTION
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work, clean your hands with soap and water. Solvents such as white spirits, paraffin, etc. may harm the skin.

* FOOT PROTECTION
  Substantial or protective footwear with reinforced toecaps will protect the feet from falling objects.

* SPECIAL CLOTHING
  For certain work it may be necessary to wear flame or acid resistant clothing.

## EQUIPMENT CONSIDERATIONS

**CAUTION**

**Avoid injury through incorrect handling of components. Make sure you are capable of lifting the object. If in doubt, get help.**

* 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

- 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.

* 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.

* To avoid personal injury, service the loader with the arms down and the bucket or attachment on the ground. If it is necessary to service the loader with the boom arms raised, be sure to engage the boom supports. Never work under or around a loader with raised boom arms without boom support engaged.

* If high lift attachments are installed on a loader, beware of overhead power and telephone lines when travelling. Drop attachment near to ground level to increase stability and minimize risks.

* Do not park or attempt to service a loader on an incline. If unavoidable, take extra care and block the wheels.

* Escaping hydraulic / diesel fluid under pressure can penetrate the skin causing serious injury. Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Stop the engine and relieve pressure before connecting or disconnecting lines. Tighten all connections before starting the engine or pressurizing the lines. If any fluid is injected into the skin, obtain medical attention immediately.

* Prior to removing wheels and tires from a loader, check to determine whether additional ballast (liquid or weight) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.

* When inflating tires beware of over inflation; constantly check the pressure. Over inflation can cause tires to burst and result in personal injury.

# SAFETY PRECAUTIONS

## 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

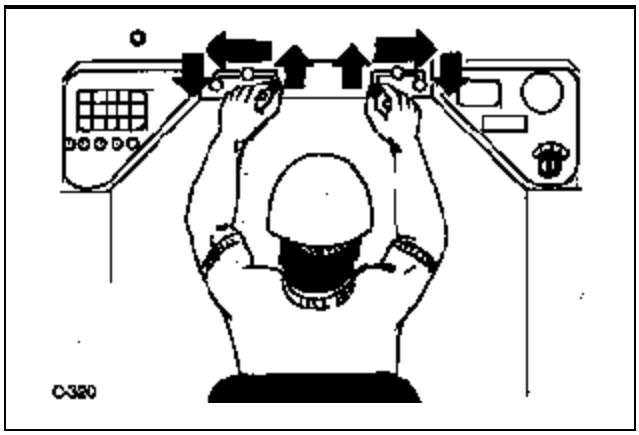
Prior to pressure testing, be sure all hoses are in good condition and all connections tight. Pressure readings must be taken with gauges of specified pressure readings.

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.

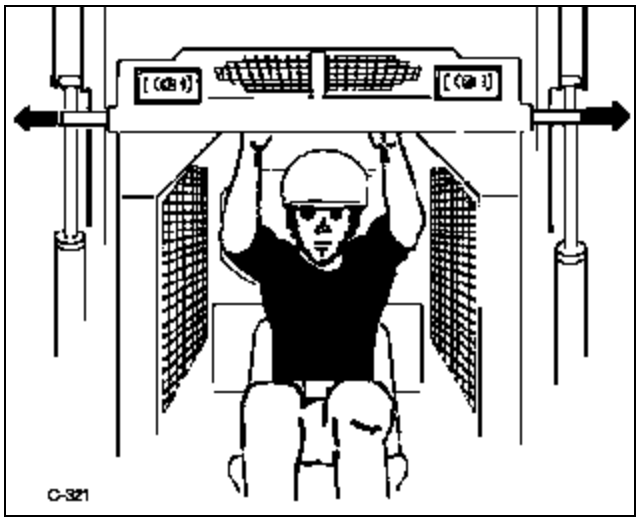



Installation of a bearing can be classified into two (2) ways:

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.**

# TABLE OF CONTENTS

## Section 1 Hydraulic System



## Section 2 Hydrostatic Drive System



## Section 3 Final Drive

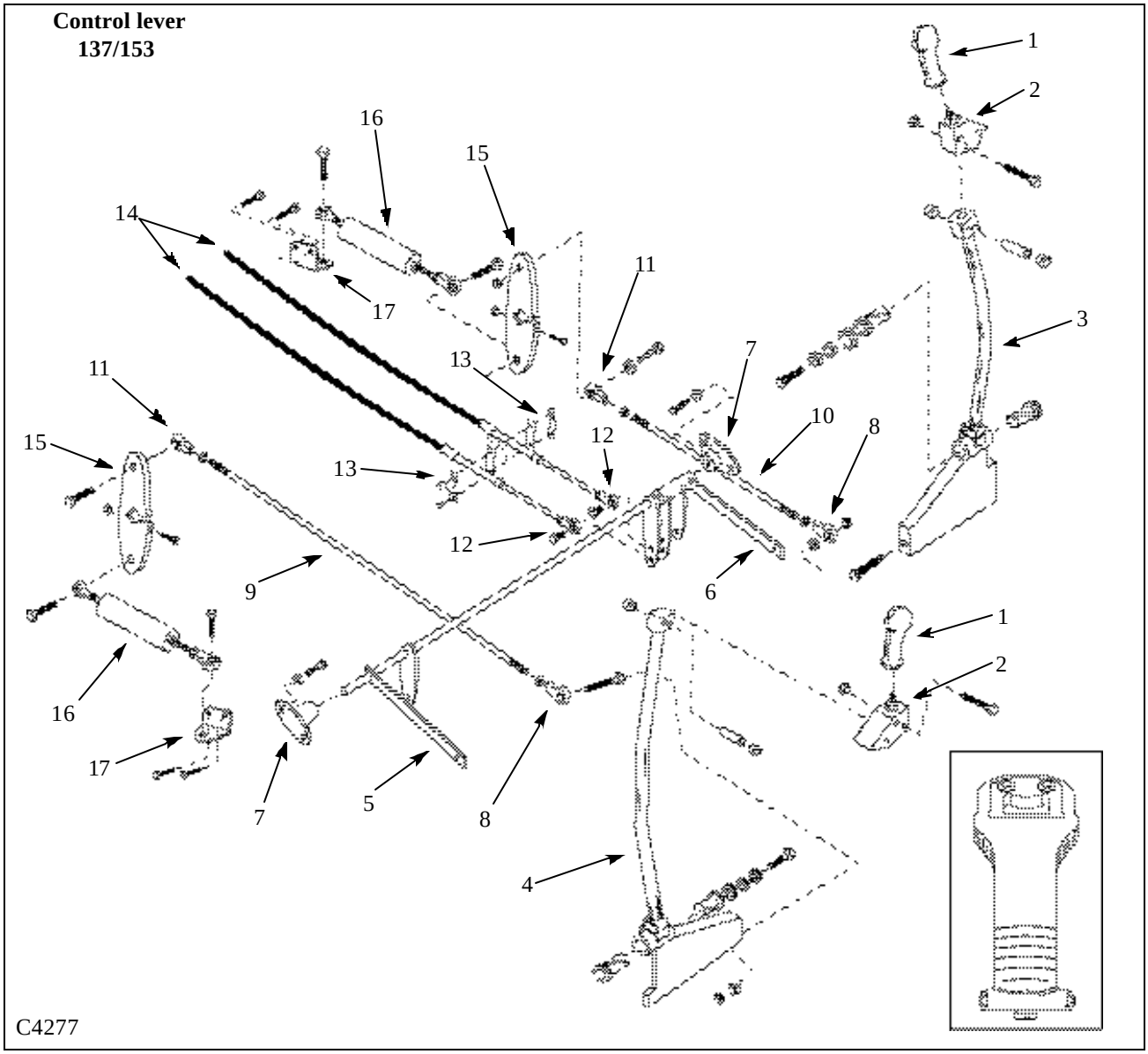


## Section 4 Controls

# TABLE OF CONTENTS

# SECTION 4 CONTROLS

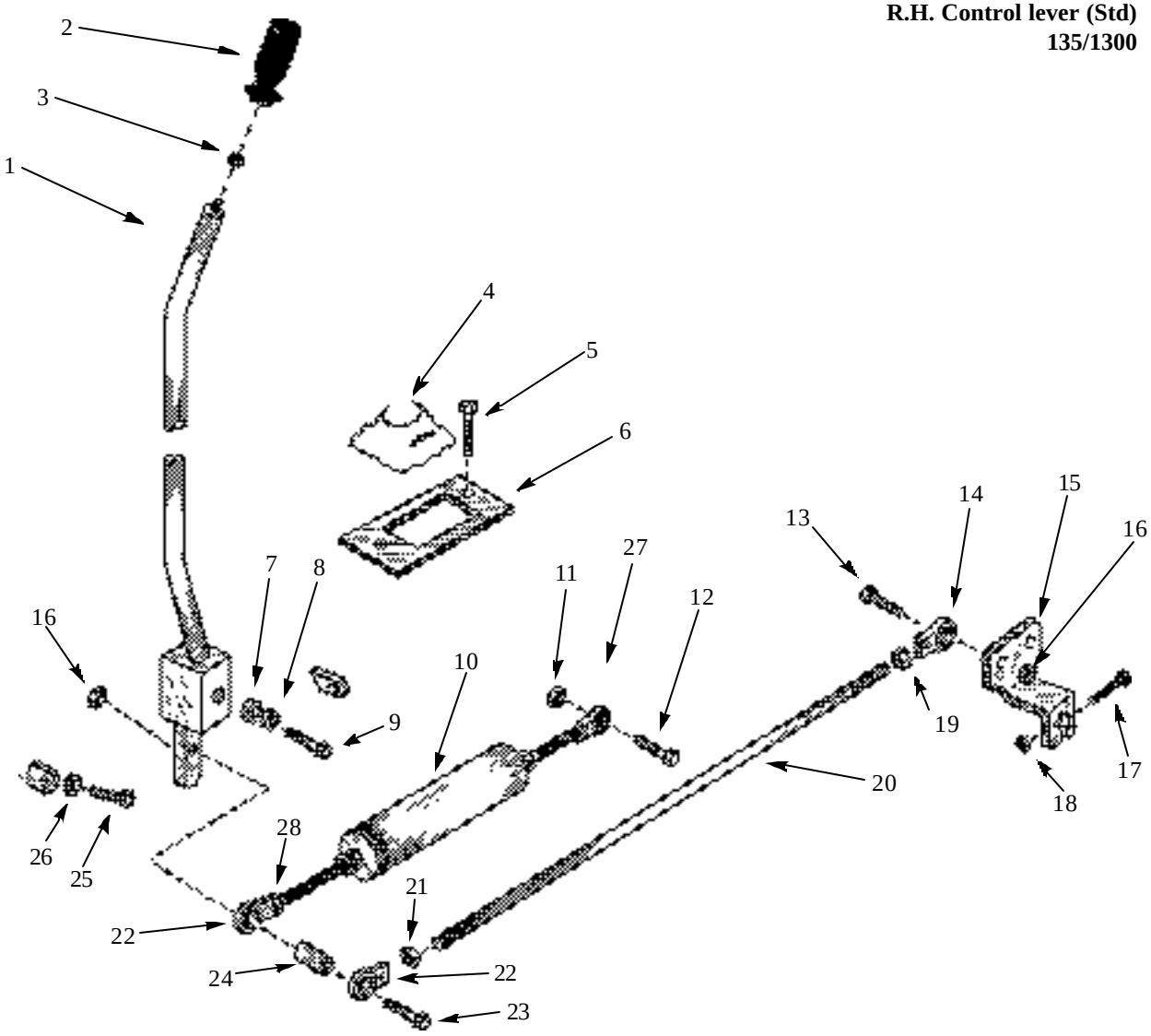
# STEERING 4.1




1. Ergonomic Handle
2. Lever, Handle Base
3. LH Control Lever
4. RH Control Lever
5. Cross Shaft Assy.
6. LH Activator Assy
7. Flange Bearing
8. Rod End Assy, Female
9. Bar, CF RD Pintle Linkage RH
10. Bar, CF RD Pintle Linkage LH
11. Rod End Assy, Female
12. Rod End Assy
13. Clamp, Cable series 40
14. Cable, Push Pull
15. Pintle Lever Plate
16. Hydroback
17. Plate, Hydroback Mount

# STEERING 4.1

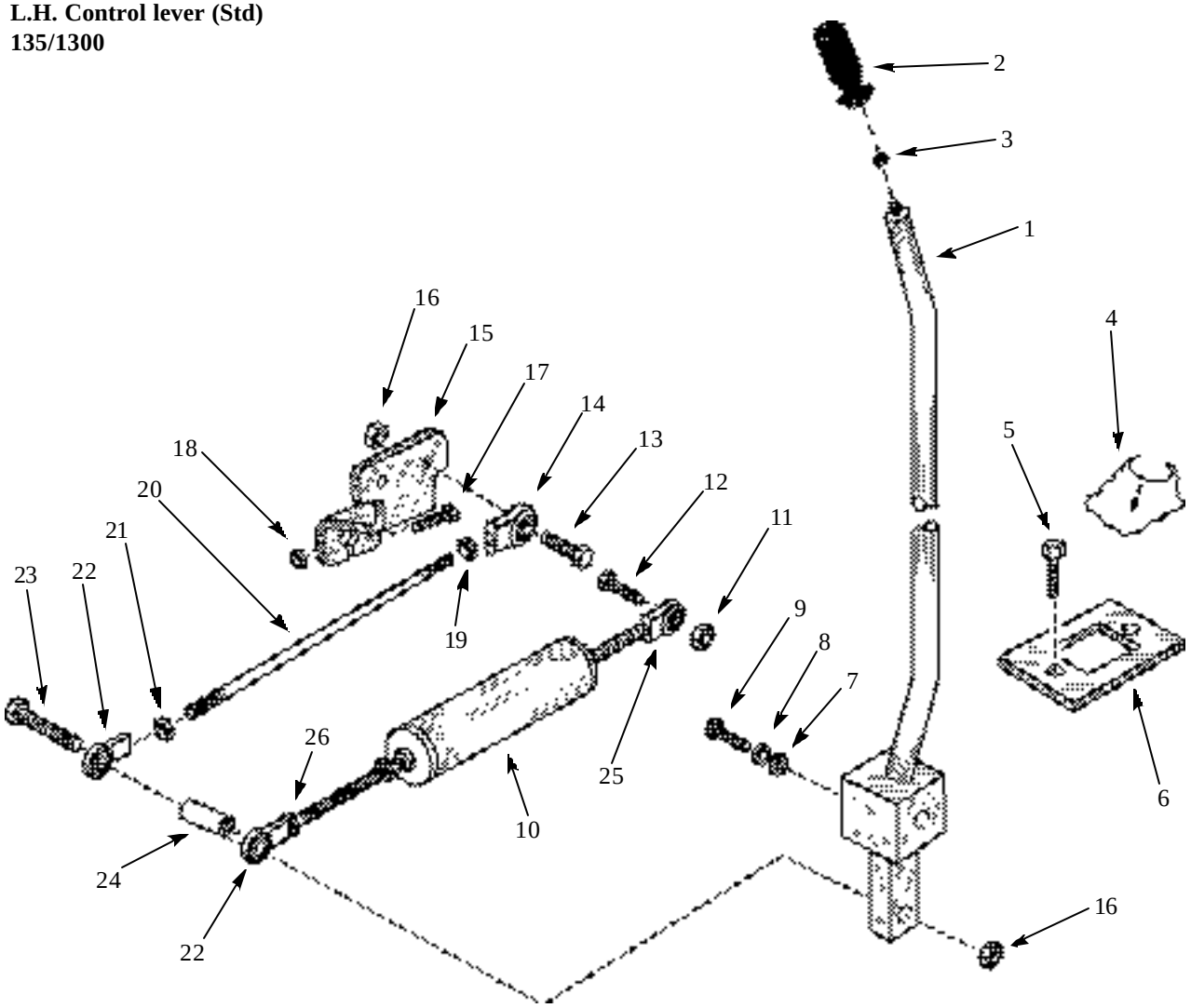
**R.H. Control lever (Std)**
**135/1300**




| | | | |
|---|---|---|---|
| 1 | Control lever | 16 | Lock nut |
| 2 | Control handle | 17 | Bolt |
| 3 | Jam nut | 18 | Lock nut |
| 4 | Bellows | 19 | Nut, L.H. |
| 5 | Screw | 20 | Control rod |
| 6 | Cover | 21 | Nut |
| 7 | Flat  washer | 22 | Rod end |
| 8 | Lock washer | 23 | Bolt |
| 9 | Bolt | 24 | Spacer |
| 10 | Hydro back (*) | 25 | Bolt |
| 11 | Lock nut | 26 | Nut |
| 12 | Bolt | 27 | Rod end, male |
| 13 | Bolt | 28 | Nut, jam |
| 14 | Rod end, L.H. female | (*) | Includes items 10, 22, 27 & 28 |
| 15 | Pintle lever | | |

C4278

**L.H. Control lever (Std)**
**135/1300**




1 Control lever
2 Control handle
3 Jam nut
4 Bellows
5 Screw
6 Cover
7 Flat washer
8 Lock washer
9 Bolt
10 Hydro back (*)
11 Lock nut
12 Bolt
13 Bolt
14 Rod end, L.H. female
15 Pintle lever
16 Lock nut
17 Bolt
18 Lock nut
19 Nut, L.H.
20 Control rod
21 Nut
22 Rod end
23 Bolt
24 Spacer
25 Rod end, male
26 Nut, jam
(*) Includes items 10, 22, 25 & 26

C4279

# Neutral Adjustment

**IMPORTANT**

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

The steering levers are equipped with a spring centering device called a hydroback. The hydroback returns the steering lever to neutral position when the steering levers are not being operated.
This feature automatically keeps the loader in neutral whenever the engine is started, or when the control levers are released.
If the loader creeps (not in neutral) when the engine is started or when the steering lever is released from forward or reverse position, the hydroback device may need to be adjusted, repaired or replaced.
1 Raise the boom arms, engage the boom support pins and shut off the engine. Raise and block the loader securely off the ground.

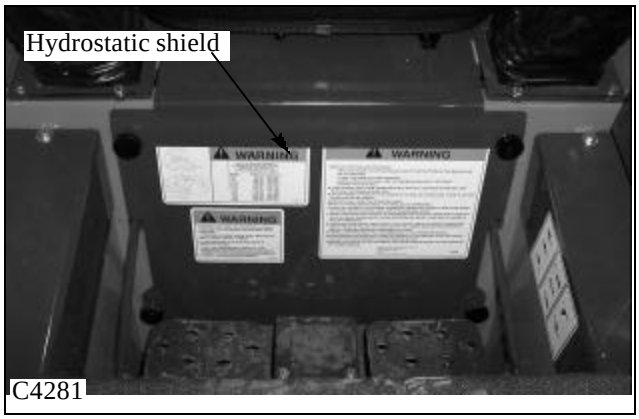
**WARNING**

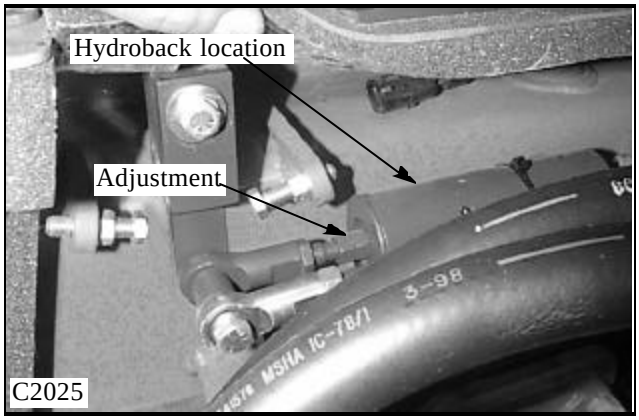
**Never work under the boom arms without the boom supports engaged.**

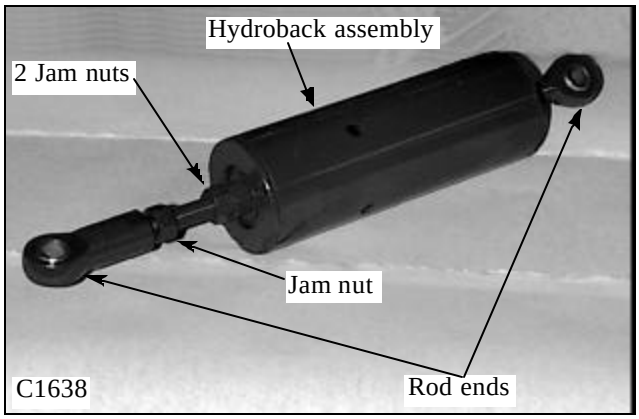
2 Remove the seat (fig. C4280) and hydrostatic shield.(fig. C4281) Note the location of the hydroback. (fig. C2025)
3 Cycle the control lever while watching the hydroback action. The hydroback should have a positive feel to it as the lever is in the neutral position.
4 Check the rod ends on each end of the hydroback. They must be free of any play. Replace the rod ends if any play or slack is noticed. (fig. C1638)
5 If the control lever is able to move slightly without spring tension returning it to neutral, the hydroback needs adjustment.

**IMPORTANT**

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

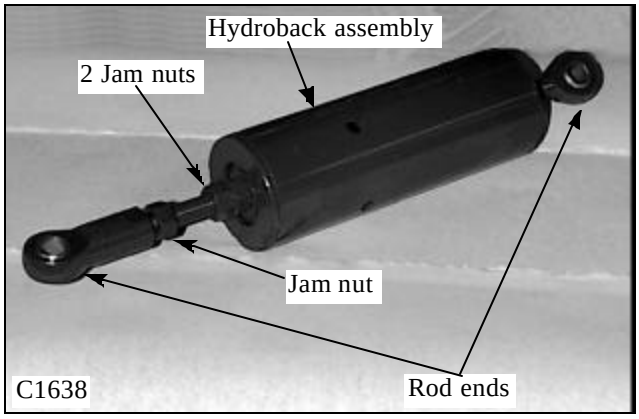



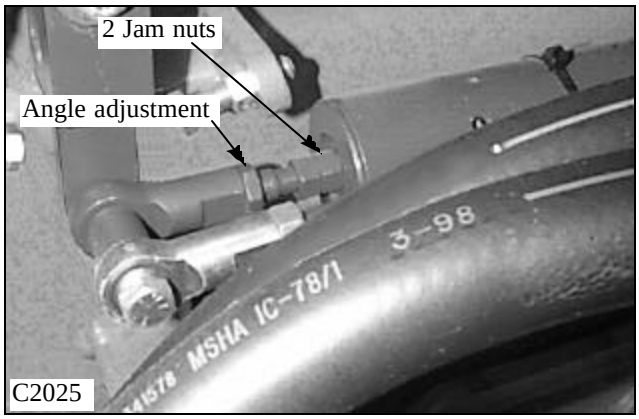



## Neutral Adjustment (con't.)

6 Loosen the 2 jam nuts next to the main body. (fig. C1638, 2025)
7 Turn the 2 nuts away from the main body of the hydroback.
8 Cycle the control lever several times.
9 Push the control lever rearward until you feel resistance. Stop.
10 Turn the 2 jam nuts back toward the main body of the hydroback until the nut just touches the flat washer.
11 Cycle the control lever again checking for a positive feel. If you now have a positive neutral, tighten the 2 jam nuts together. If the hydroback still does not center, the hydroback has internal damage or wear. Replace the hydroback assembly with a new one.

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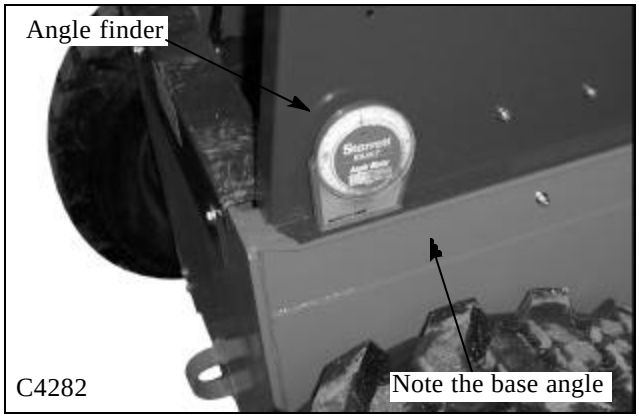
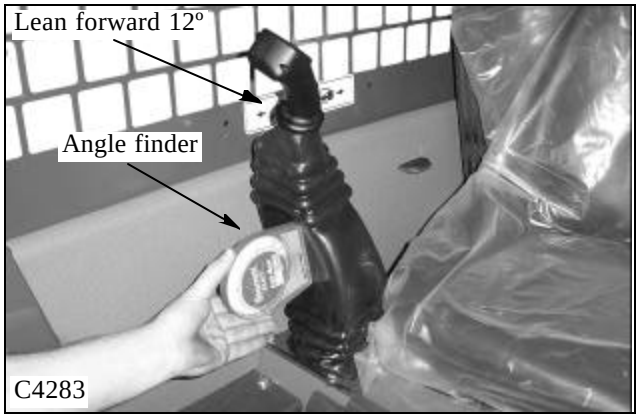
**IMPORTANT**

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

## Hydro Back Replacement

Replacing the hydroback changes the steering control lever angle and the neutral position. To correctly set the angle after the hydro back has been installed:
1 Replace the hydroback by removing the 2 bolts located at either end of the hydro back assembly.
2 Install the hydroback in the reverse order. Check the steering control rod ends and replace them now if they are worn.
3 Use an angle finder to check the base measurement angle the loader is sitting at. (fig. C4282) 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. C4283)
5 Turn the hydroback threaded rod (fig. C2025) in or out of the female rod end to move the control lever to a reading of 12º leaning forward. Be sure to allow for angle the loader is sitting at. (Base angle) Jam the nut against the rod end when completed.
Make sure there is a minimum of 3/8'' (6mm) of thread holding the female rod end to the threaded rod.
6. Proceed to neutral adjustments



# Neutral Adjustment

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

**IMPORTANT**

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

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. C2028, 2030a)

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. C1885)

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

6 Loosen the jam nuts on the control rod linkage. (fig. C2030b) One end of the control rod is RH threads, the opposite end has LH threads.

7 Start the engine and release the parking brake.

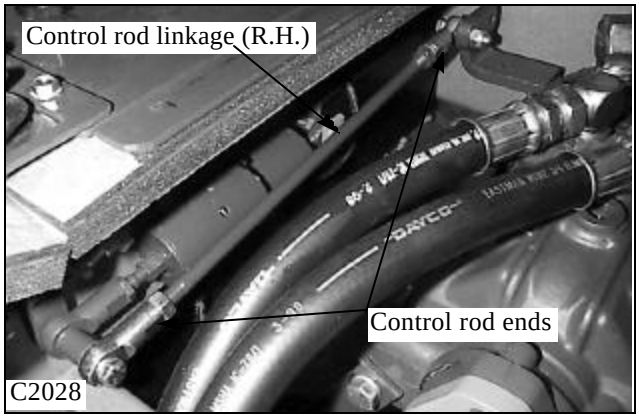
8 Turn the control rod linkage and visually watch the wheels as they turn. Stop turning the control rod linkage when the wheels are in neutral. Tighten the jam nuts against the rod ends and recheck the neutral adjustment.

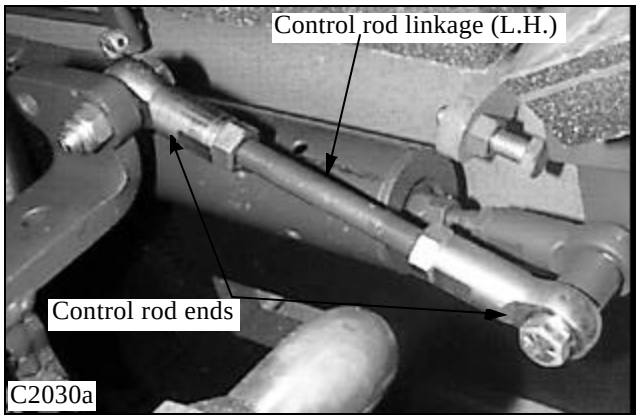
9 Very fine adjustment can be made at the hydro back threaded rod. Adjustment here affects the control lever angle. **Only make minor adjustments using this method.**

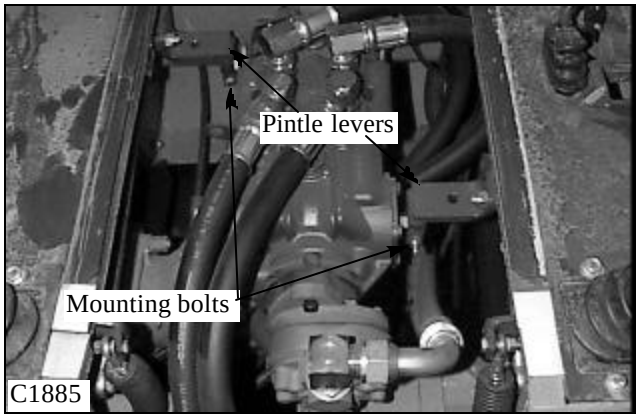
10 Replace the seat and hydrostatic shield.

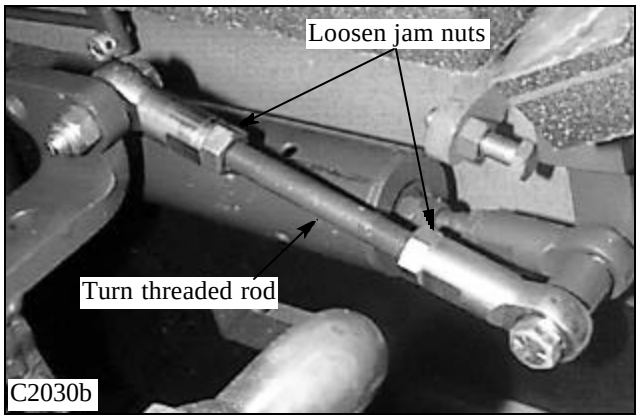
**WARNING**

**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.**



# Tracking Adjustment (Speed)

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

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

2 Remove the seat and hydrostatic shield. Note the location of the steering control limiter bolts located front and rear of each steering control lever, just below the pivot point.. (fig. C2025)

**WARNING**

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

3 Make sure the neutral adjustment are adjusted correctly. Refer to pages 4- 5 ~ 4-7.

4 If and when all rod bushings and pivot points have been check for wear or binding, proceed with the wheel speed adjustment.

5 Start the engine and release the parking brake. Adjust 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 ( fig. C1837 Thomas P/N 43981) check each wheel speed in the forward and reverse direction. Repeat for opposite side. (fig. C4284)

7 Correct wheel speed is set evenly at 72 rpm forward and reverse for both sides on the 137/153 modes. 1300/135 are set at 70 rpms forward and reverse for both sides.

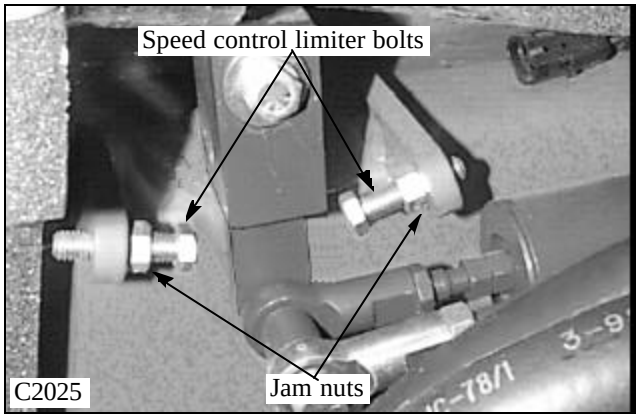
8 If adjustment is necessary, loosen the jam nut (fig. C2025) and turn the limiter bolt in to increase wheel speed or out to slow it down.

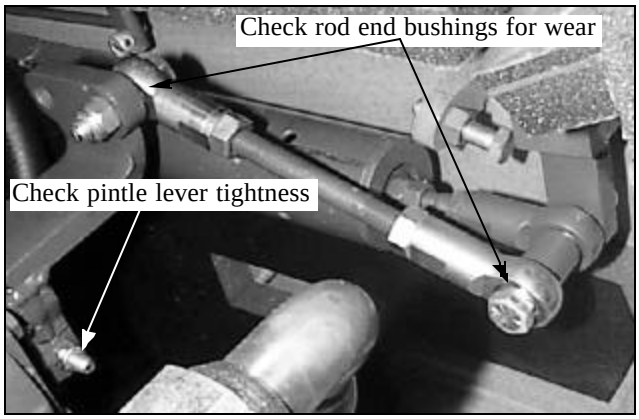
9 Tighten the jam nut and retest the speed adjustment. Repeat if necessary.

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




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


# 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.**

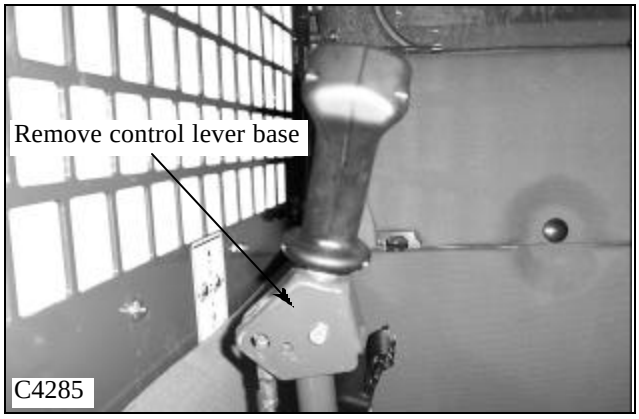
2 Remove the seat and hydrostatic shield.
3 Remove the control lever base by removing the mounting bolt in control lever. (fig. C4285)
4 Remove the screws holding the bellows cover down. (fig. C4286)
5 Remove the bolt going through the control rod and hydro back linkage. (fig. C4287)
6 Remove the bolt and washers mounting the control lever to it's pivot point. (fig.C4288) The control lever is now free to be removed.
7 Replace the control lever in the reverse order. Lightly lubricate the pivot shaft with white grease when assembling the control lever to the pivot shaft.

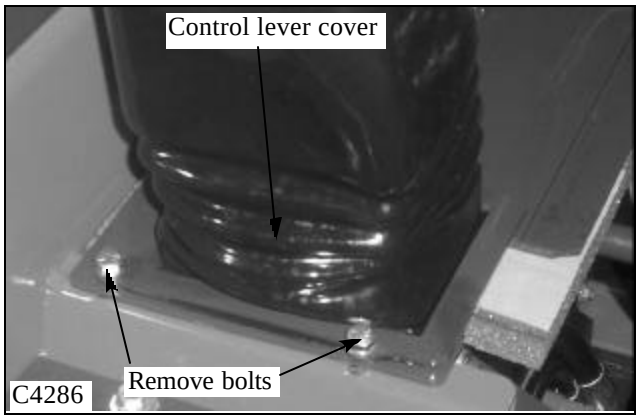
**WARNING**

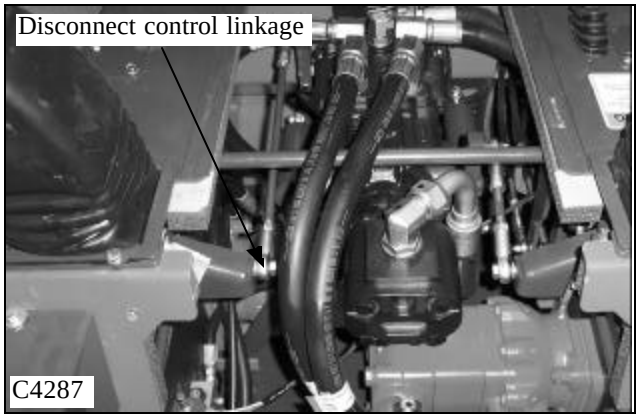
**Repairs or adjustment to the control lever system may change the loader neutral position. Make sure the loader is raised securely off the ground before restarting the engine.**

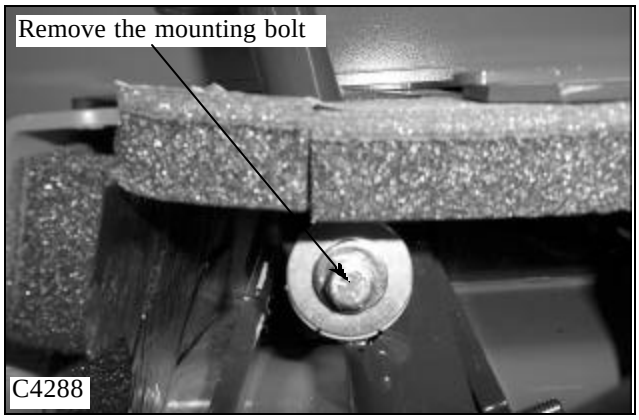
8 If necessary, make adjustments to the neutral centering and wheel speed as required. Refer to pages 4 - 5 ~ 4 - 8.

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



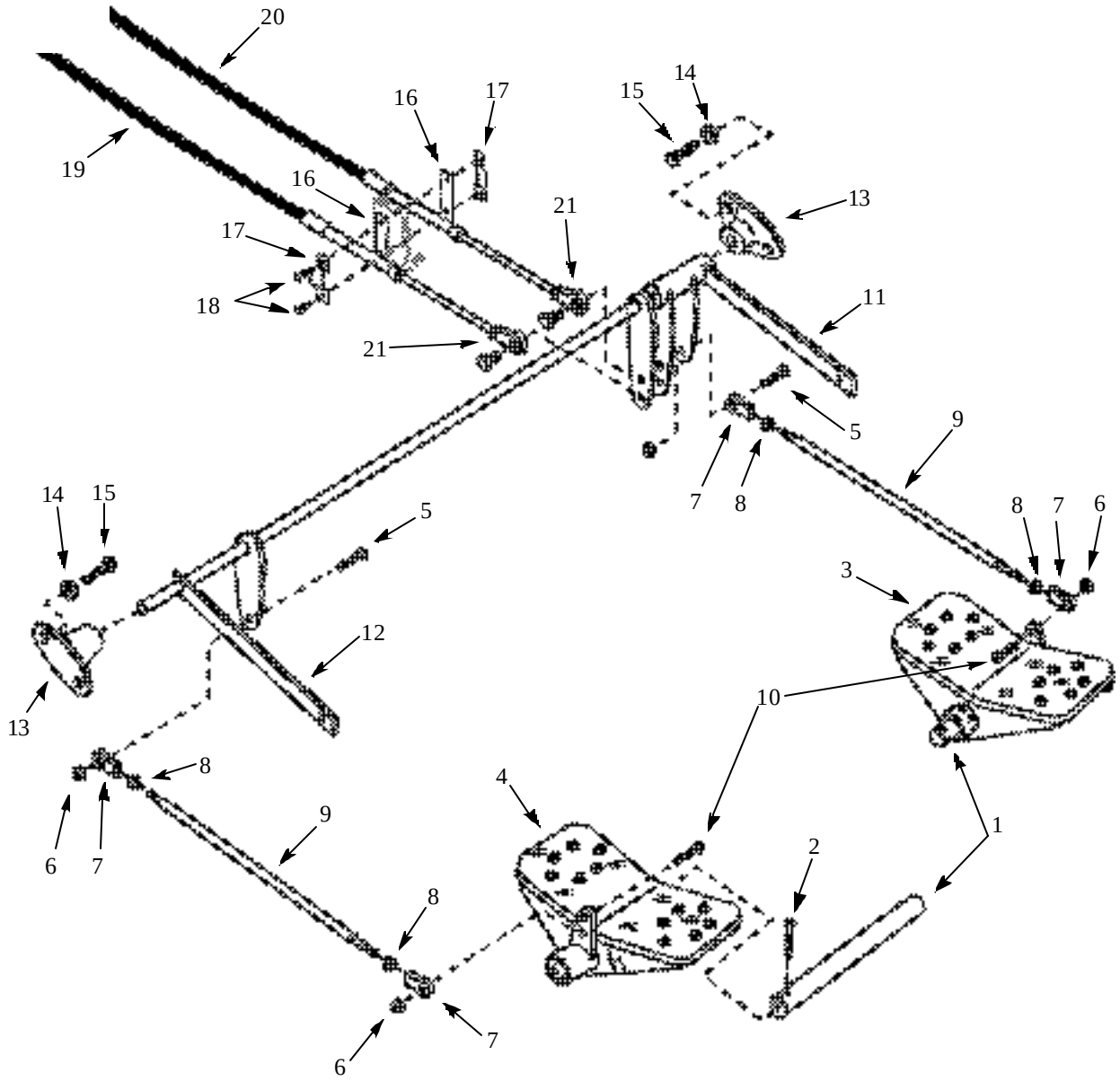



# FOOT PEDALS 4.2

137/153




C3144

1. Shaft, Pedal
2. Bolt
3. Pedal, Lift
4. Pedal, Tilt
5. Bolt
6. Lock Nut
7. Rod End
8. Nut
9. Bar, Front Control Rod
10. Carriage Bolt
11. LH Activator Assy
12. Cross Shaft Assy
13. Flange Bearing
14. Washer, Lock
15. Bolt
16. Shim, Cable Series 40
17. Clamp, Cable Series 40
18. Screw, Cap
19. Cable, Push 49.5”
20. Cable, Push 53”
21. Rod End Assy

# FOOT PEDALS 4.2

1300/135

C1197

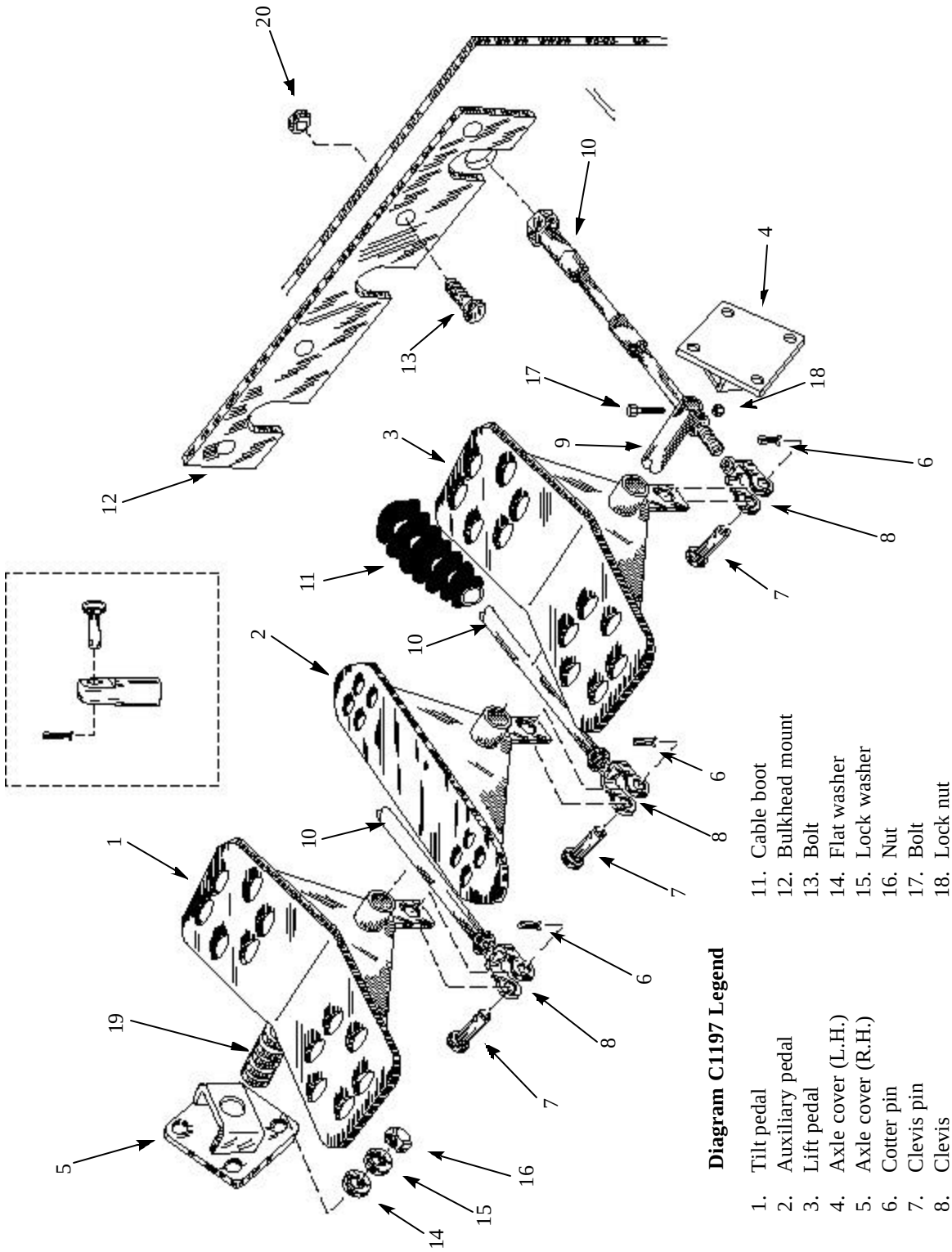


**Diagram C1197 Legend**

1. Tilt pedal
2. Auxiliary pedal
3. Lift pedal
4. Axle cover (L.H.)
5. Axle cover (R.H.)
6. Cotter pin
7. Clevis pin
8. Clevis
9. Pivot shaft
10. Control cable
11. Cable boot
12. Bulkhead mount
13. Bolt
14. Flat washer
15. Lock washer
16. Nut
17. Bolt
18. Lock nut
19. Flat washer
20. Lock nut

# FOOT PEDALS 4.2

## Cable Replacement 137/153

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

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

**WARNING**

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

2 Remove the seat and hydrostatic shield.

3 Remove the bolts connecting the cable to the cross shaft Assy. (fig. C4287b)

4 Remove the screws retaining the cable clamp to the frame. (fig. C4289)

5. Remove the screws retaining the cable clamps to the valve mount (fig.C4290)

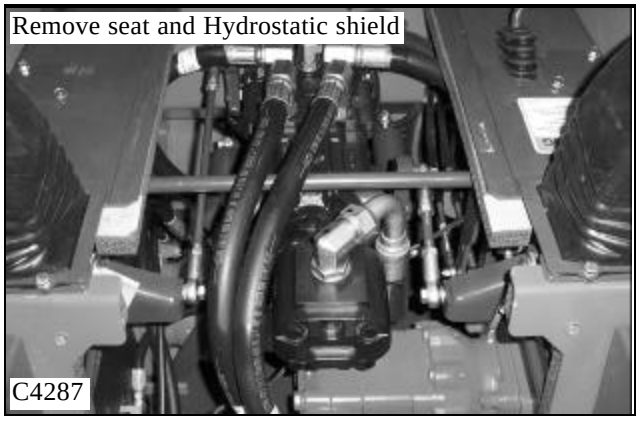
6. Remove the cotter pins from the valve end of the cables and remove the clevis pins. (fig. C4290)

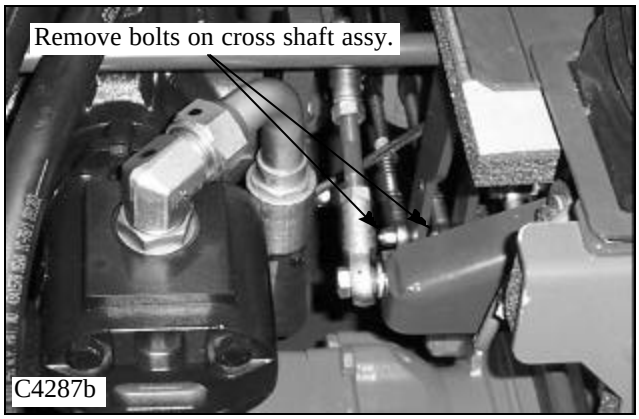
7 Remove the cable.

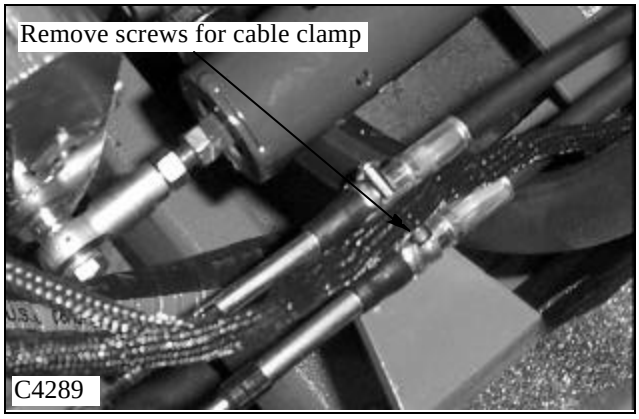
8 Remove the clevis and eyelet ends of the cable and reuse them if still serviceable.

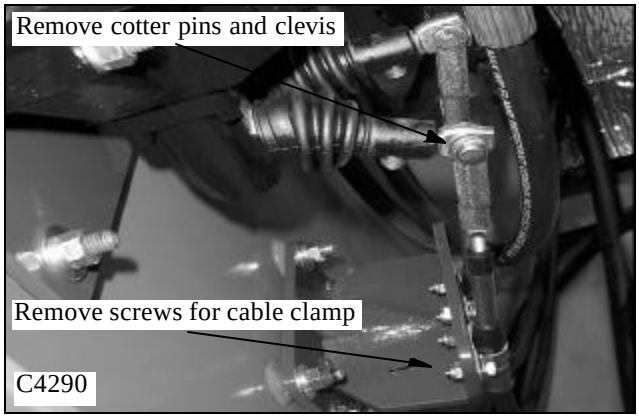
9 Install the new cable in the reverse order above. There must be a minimum of 3/8'' (6mm) of thread engagement into the cable clevis and eyelet ends.

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



# FOOT PEDALS 4.2

## Cable Replacement 1300/135

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

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

**WARNING**

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

2 Remove the seat and hydrostatic shield.

3 Loosen the jam nuts on the cable clevis ends. (fig. C2010, C2015)

4 Loosen the cable nuts. (fig. C2012, C2015)

5 Remove the bolts retaining the bulk head mount to the frame plate. (fig. C2012)

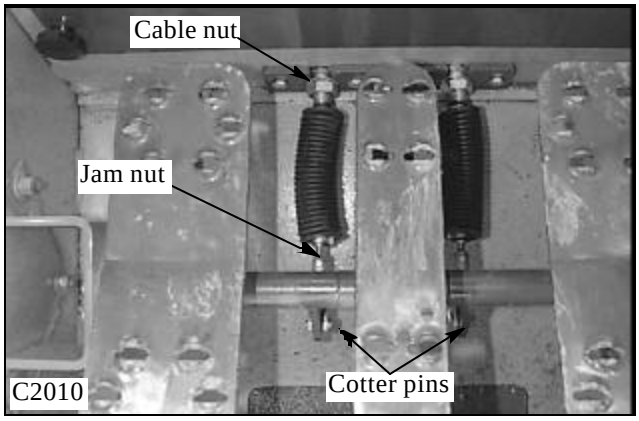
6 Remove the cotter pins from both ends of the cables and remove the clevis pins. (fig. C2010, C2015)

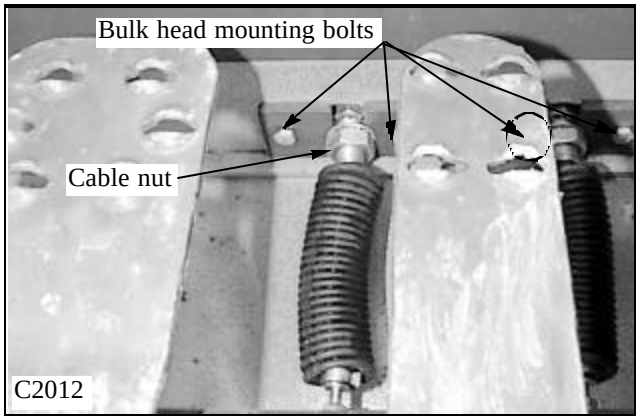
7 Remove the cable.

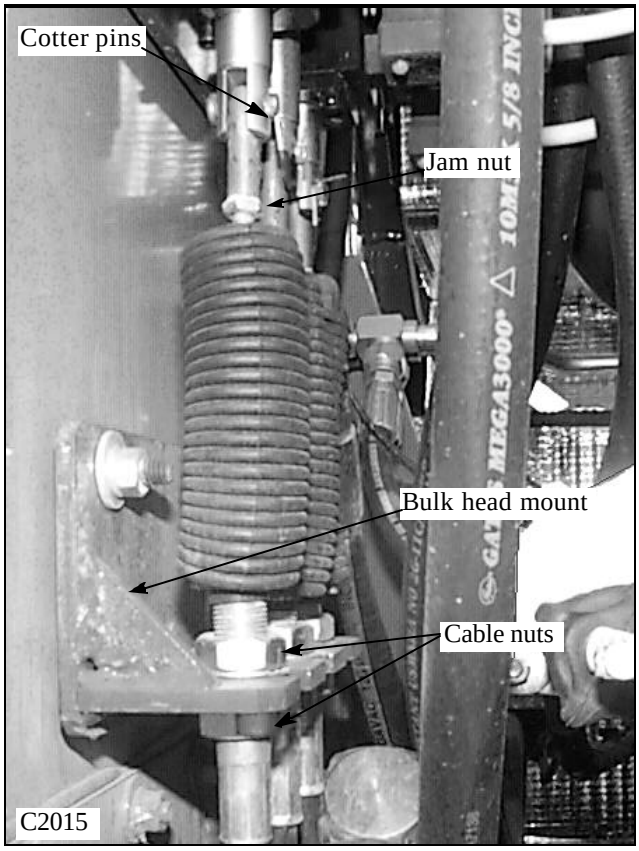
8 Remove the clevis and eyelet ends of the cable and reuse them if still serviceable.

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

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



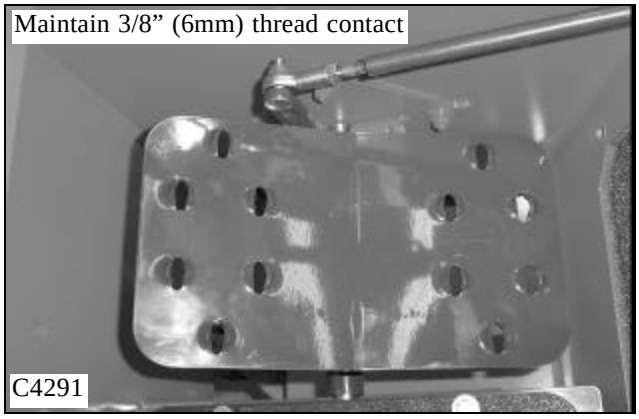
## Angle Adjustment 137/153

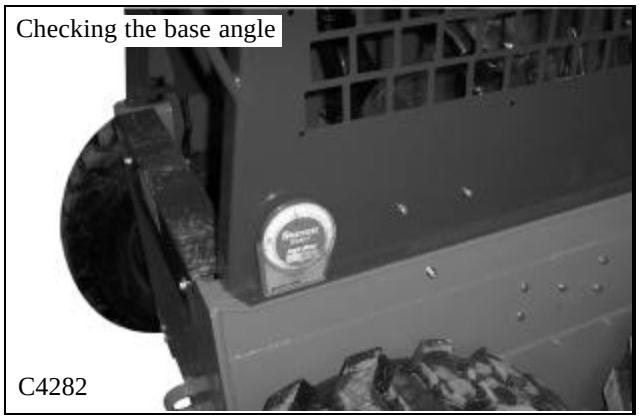
After changing the control cable the foot pedal angle will need to be verified and / or adjusted to provide operator comfort and proper pedal travel clearance.

**Note:** If the operator feels discomfort due to current pedal angles, they may be adjusted to their preference. Be sure to check for pedal travel clearance afterward. Always maintain a minimum of 3/8'' (6mm) of thread into the eyelet ends. (fig. C4291)

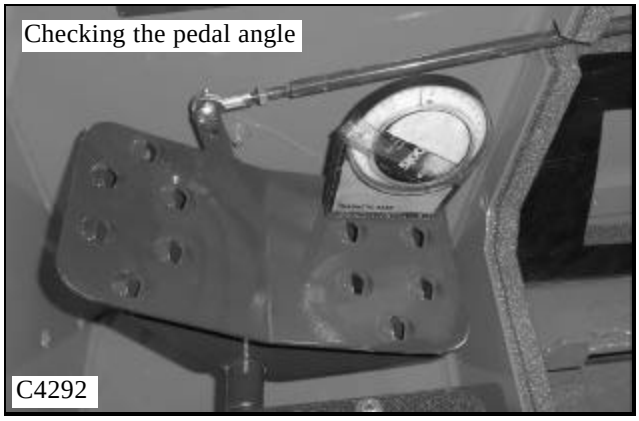
1 Make sure the eyelet ends are screwed into the front control rod threads a minimum of 3/8'' (6mm). (fig. C617)

2 Place an angle finder on the inner fender of the loader to find the base measurement. Note the reading. (fig. C4282)



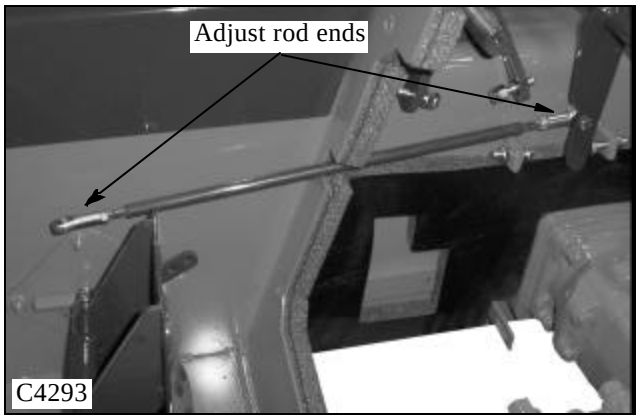




3 Place the angle finder on the heel of the pedal to be checked or adjusted. (fig. C4292) Note the reading.




4 Adjust the pedal angles by turning the rod ends on either side of the front control rod (fig. C4293). Adjust the lift and tilt pedal angle to 15º. Be sure to allow for the base angle measurement taken previously. Example: If the base angle measured 3º, add or subtract that angle from the angle measured on the pedal.

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



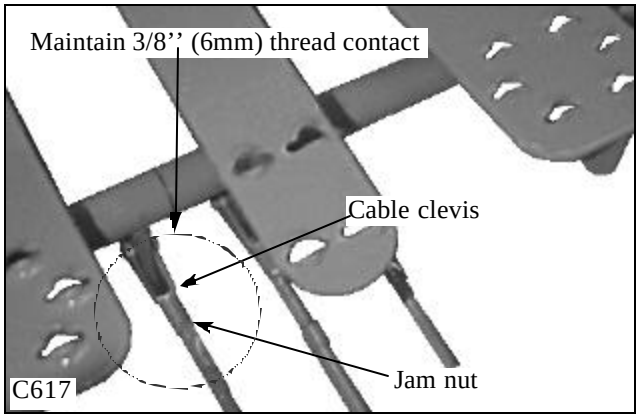
## Angle Adjustment 1300/135

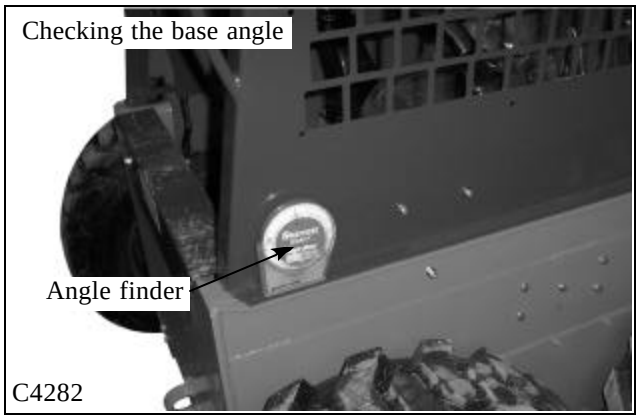
After changing the control cable the foot pedal angle will need to be verified and / or adjusted to provide operator comfort and proper pedal travel clearance.

**Note:** If the operator feels discomfort due to current pedal angles, they may be adjusted to their preference. Be sure to check for pedal travel clearance afterward. Always maintain a minimum of 3/8'' (6mm) of thread into the cable clevis and eyelet cable ends. (fig. C617)

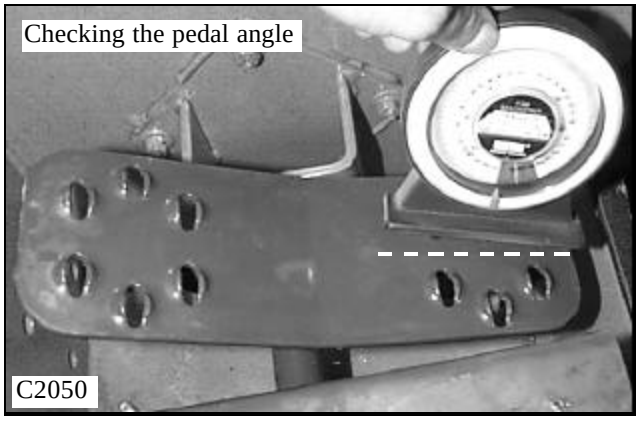
1 Make sure the cable ends are screwed onto the cable threads a minimum of 3/8'' (6mm). (fig. C617)

2 Place an angle finder on the inner fender of the loader to find the base measurement. Note the reading. (fig. C4282)



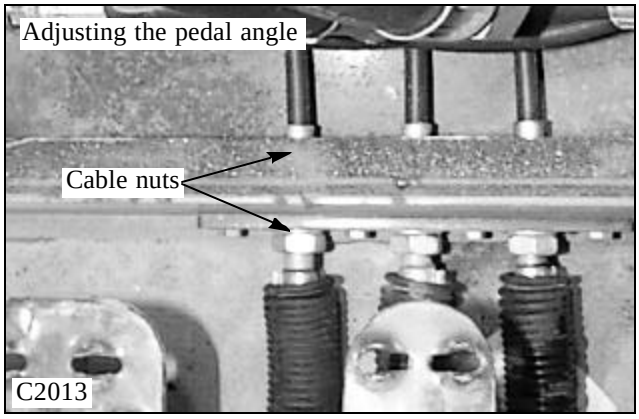




3 Place the angle finder on the heel of the pedal to be checked or adjusted. (fig. C2050) Note the reading.




4 Adjust the pedal angles by turning the cable nuts on either side of the bulk heads, front and / or rear. Adjust the lift and tilt pedal angle to 15º. The auxiliary pedal angle is factory set at 20 º. Be sure to allow for the base angle measurement taken previously. Example: If the base angle measured 3º, add or subtract that angle from the angle measured on the pedal.

5 Tighten the cable nuts against the bulk heads, front and rear. tighten the jam nuts on the cable ends if not already done. Check the control cable operation by cycling the pedals. Operation should be smooth and the pedal should have unrestricted travel when heeled and toed. If binding is occurring the control valve spools or electric lock system may need servicing.



# FOOT PEDALS 4.2

## Foot Pedal Replacement 137/153

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

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

**WARNING**

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

2 Remove the seat and hydrostatic shield.

3 Remove the carriage head bolt retaining the front control rod to the foot petal. (fig.C4291)

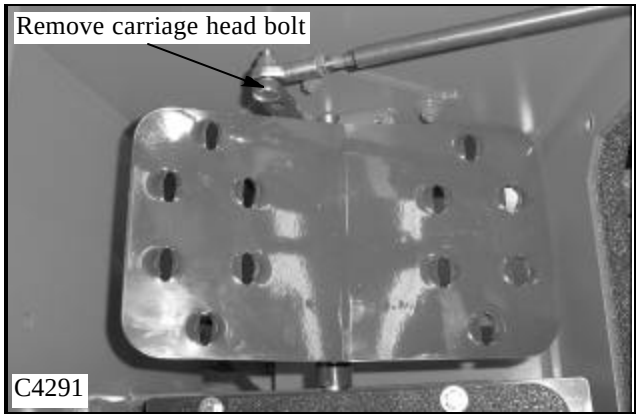
4 Remove the4 bolt retaining the foot shield to the mount. (fig. C4294) Remove the shield.

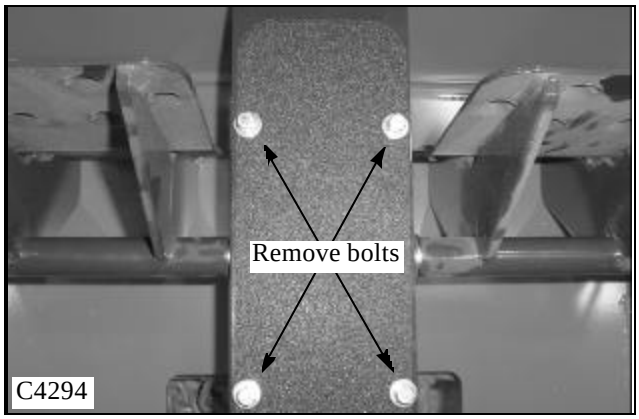
5 Remove the bolt retaining the foot petal shaft. (fig. C4295) Keep count of the spacer washer used if present. They are used to align the pedals with the linkage.

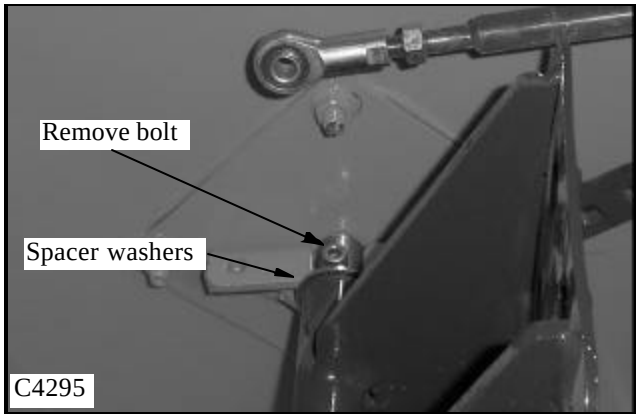
6 Save any spacer washer if present. Remove the complete pedal and shaft assembly together. (fig. 4296)

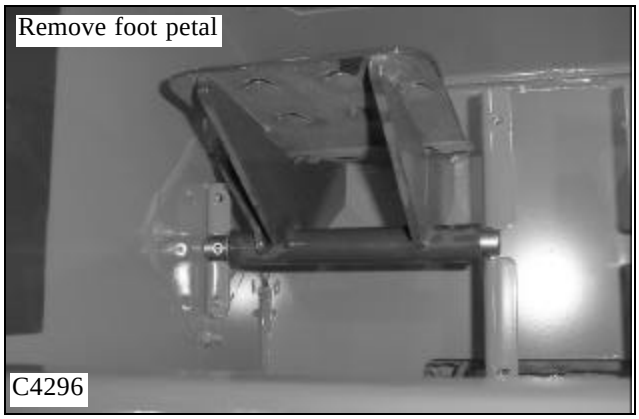
7 Replace worn parts as required. The foot pedals are equipped with bronze oillite bushings that are pressed into place and machined to size afterward. They are not serviceable separately. The complete pedal must be replaced.

8 Reinstall pedals in the reverse order. Be sure to add spacer washers as required to either end of the foot pedal shaft to align the pedals with the linkages. Failure to align the pedal and linkages properly will cause stiffness, binding and / or premature wear. Total pedal movement side to side, end play, should not exceed 1 / 8".



# FOOT PEDALS 4.2

## Foot Pedal Replacement 1300/135

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

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

**WARNING**

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

2 Remove the seat and hydrostatic shield.

3 Remove the cable clevis cotter pins. (fig. C2010)

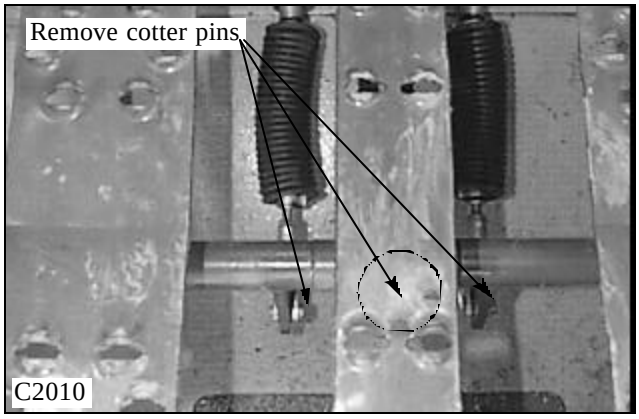
4 Remove the bolt retaining the foot pedal shaft to the side mount. (fig. C2016)

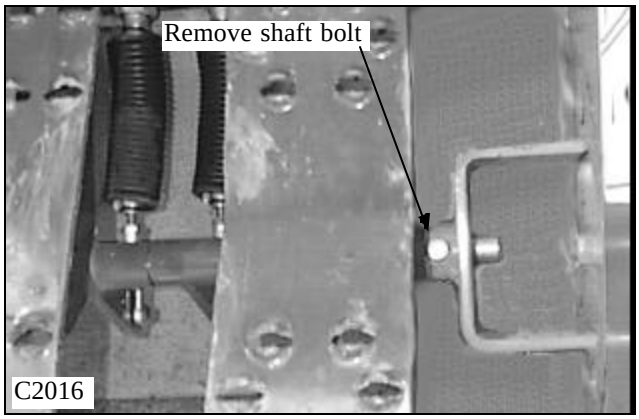
5 Slide the shaft clear over to right hand side and remove and save any spacer washer if present.

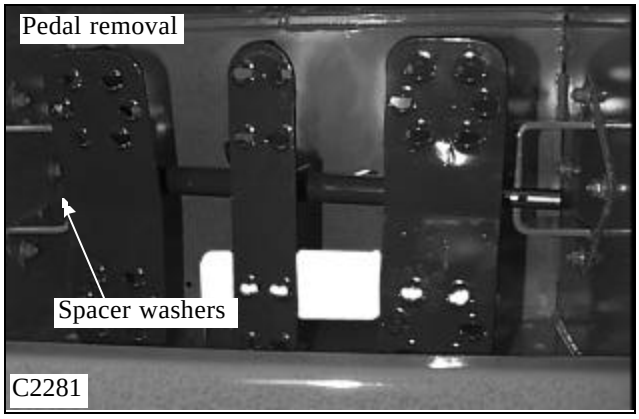
6 Tip the loose end of the shaft up and remove the complete pedal and shaft assembly together. Keep count of the spacer washer used if present. They are used to align the pedals with the cables.

7 Replace worn parts as required. The foot pedals are equipped with bronze oillite bushings that are pressed into place and machined to size afterward. They are not serviceable separately. The complete pedal must be replaced.

8 Reinstall pedals in the reverse order. Be sure to add spacer washers as required to either end of the foot pedal shaft to align the pedals with the cables. Failure to align the pedal and cables properly will cause stiffness, binding and / or premature cable wear. Total pedal movement side to side, end play, should not exceed 1 / 8".

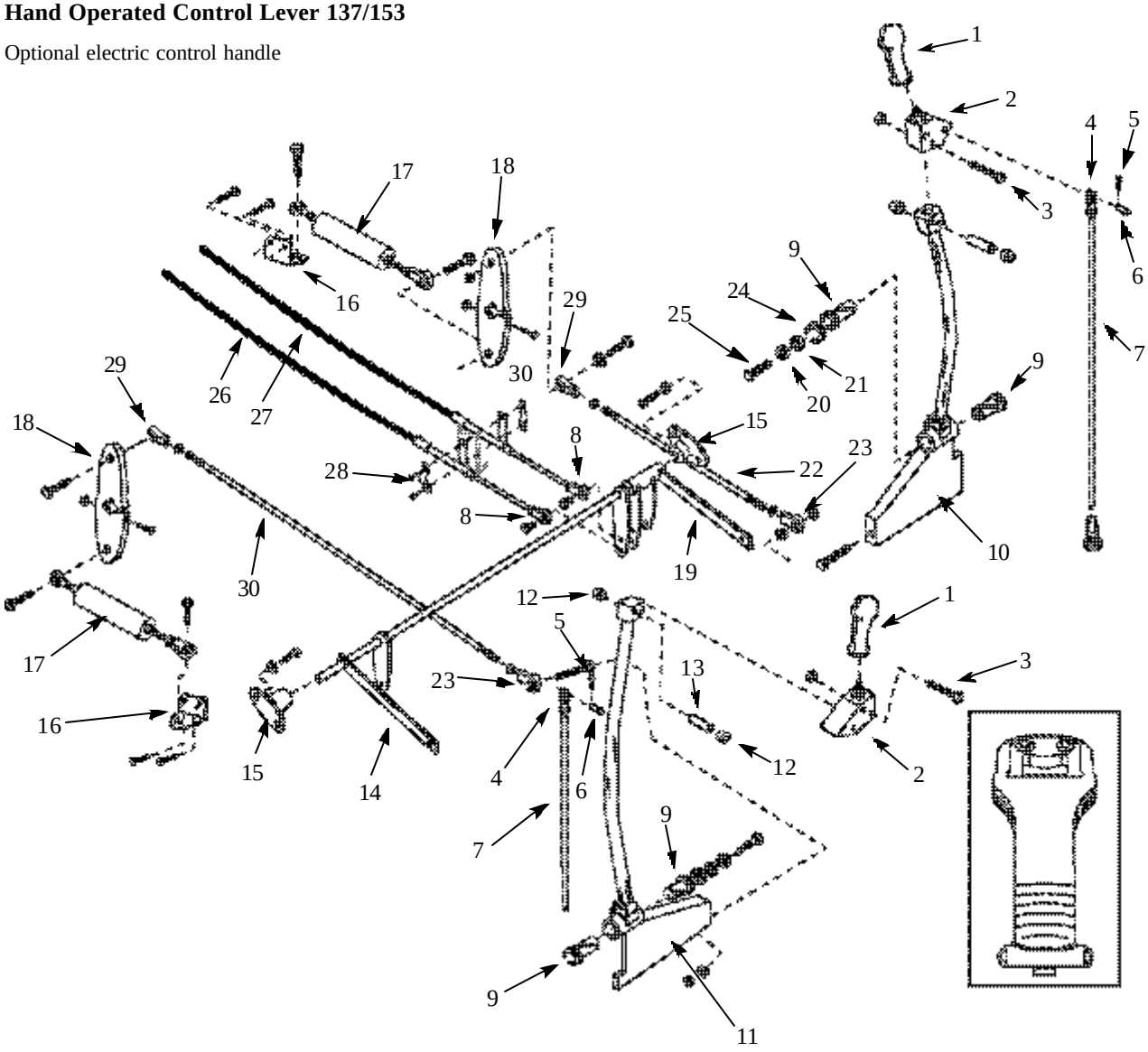


**Hand Operated Control Lever 137/153**

Optional electric control handle



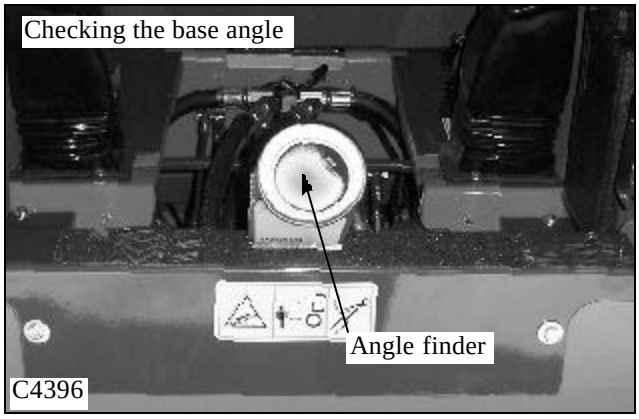

1. Handle grip
2. Lever Handle Base
3. Bolt
4. Clevis
5. Cotter Pin
6. Clevis Pin
7. Handle Transfer Bar
8. Rod End Assy
9. Flange Bushing
10. LH Control Lever
11. RH Control Lever
12. Brass Bushing
13. Handle Spacer Tube
14. Cross Shaft Assy
15. Flange Bearing
16. Hydroback mount
17. Hydroback
18. Pintle Lever Plate
19. LH Activator Assy
20. Lock Washer
21. Flat Washer
22. LH Pintle Linkage
23. Rod End Assy, Female
24. Fender Washer
25. Bolt
26. Cable, Push-Pull 49.5”
27. Cable, Push-Pull 53”
28. Cable Clamp
29. Rod End Assy, Female
30. RH Pintle Linkage

C3134

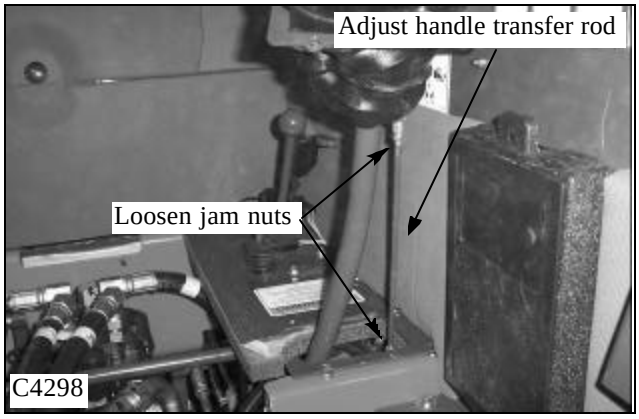
## Angle Adjustment

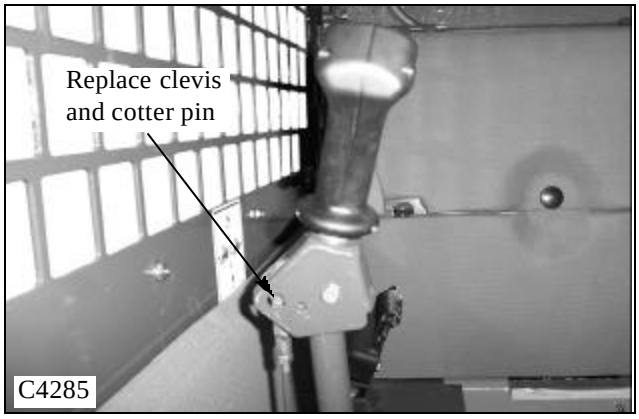
After changing the control cable the control lever angle will need to be verified and / or adjusted to provide operator comfort and proper travel clearance.

1 Make sure the rod ends are screwed onto the rod threads a minimum of 3/8'' (6mm).
2 Place an angle finder on the front shield of the loader to find the base measurement. Note the reading. (fig. C4396)
3 Place the angle finder on the control lever as shown in (fig. C4297). Note the reading. The correct angle is 8º + / - 1º.
4 Adjust the angle by moving the handle transfer rod ends up or down on their mount. (fig. C4298) Be sure to allow for the base angle, the angle the loader may be leaning at while measuring. Add or subtract this measurement as necessary. Remove the cotter and clevis pin from the lever handle base. Loosen the jam nuts for the rod end on the handle transfer rod. Adjust the angle as required.
5 Tighten all jam nuts on the handle transfer ends. (fig. C4298, C4285) Reconnect clevis and cotter pins to the handle base.
6 Cycle the control levers to check for travel clearance.
7 Replace the seat and hydrostatic shields.







## Control Lever Replacement

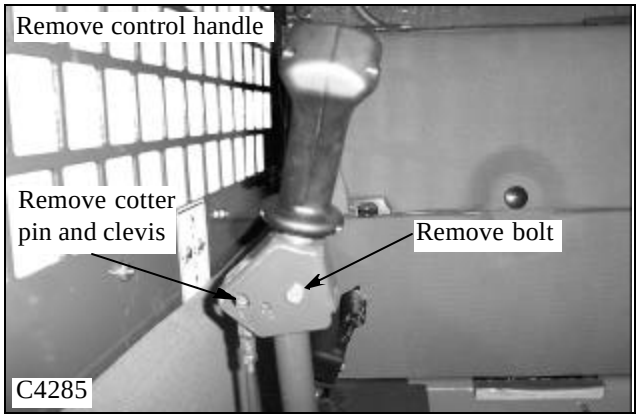
1 Raise the boom arms, engage the boom supports and shut off the engine.

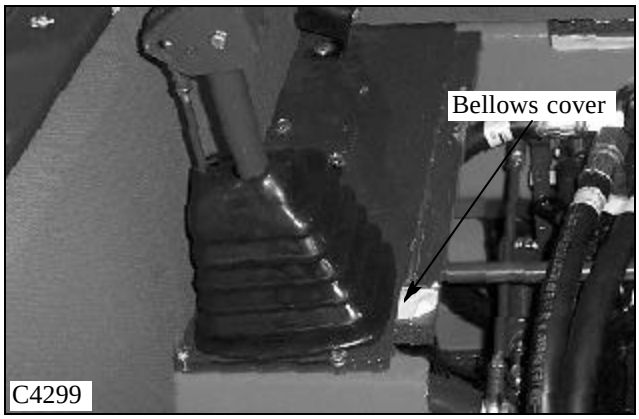
**WARNING**

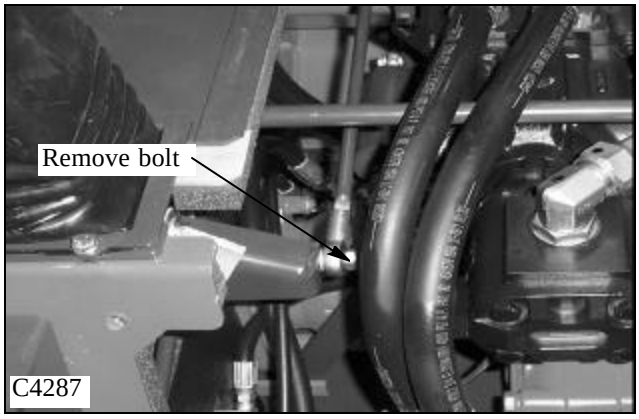
**Never work under the boom arms without the boom supports engaged.**

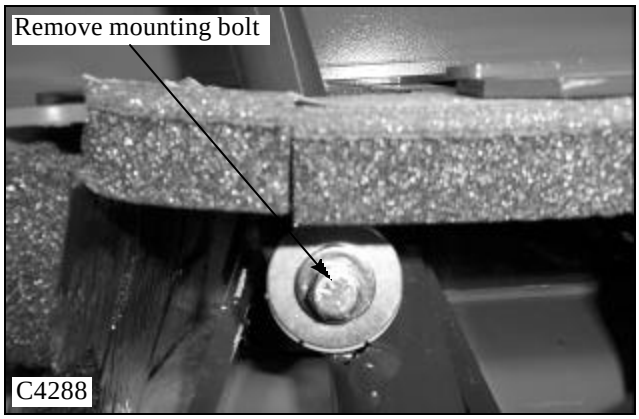
2 Remove the seat and hydrostatic shield.
3 Remove the control handle from the steering lever by removing the retaining bolt and dis-connecting the handle transfer rod. (fig. C4285) The handle may be reused on the new or repaired control lever.
4 Remove the bellows cover screws (fig.C4299) and remove the bellows.
5 Remove the bolt from the control rod linkage to the control lever assembly. ( fig. C4287)
6 Remove the mounting bolt from the control lever and remove the control lever assembly. (fig. C4288)

**Note:** If the loader is equipped with optional electrical accessories operated by control handle mounted switches, the control handle switch wiring will need to be disconnected and transferred to the new steering lever.
If the control lever functions are sloppy due to excessive wear of the swivel bushing, the swivel assembly may be replaced.
**See fig. C3134 page 4-18 for exploded view of control lever assembly.**
7 Save any spacer washers that may have been used.
8 Replace the control lever assembly.
Replace all parts in the reverse order. Use the spacer washers to remove the movement of the steering lever. Cycle the control lever after installation to check for binding and travel clearance.
Check the control lever angles. Page 4-19.
Check the wheel speed, or tracking, to assure optimum performance. Page 4-8.

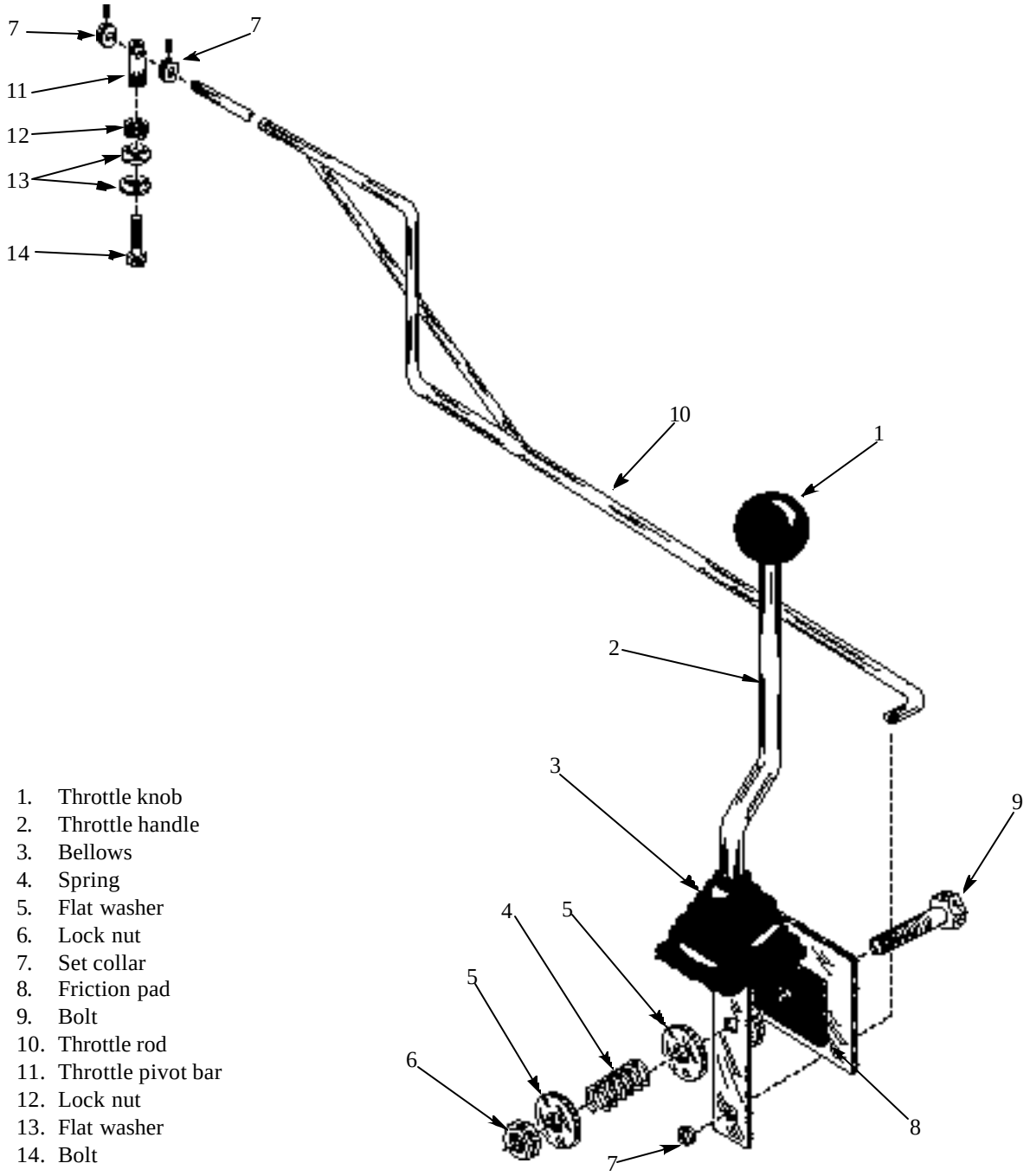


# THROTTLE 4.4




1. Throttle knob
2. Throttle handle
3. Bellows
4. Spring
5. Flat washer
6. Lock nut
7. Set collar
8. Friction pad
9. Bolt
10. Throttle rod
11. Throttle pivot bar
12. Lock nut
13. Flat washer
14. Bolt

C1204

## Adjustments

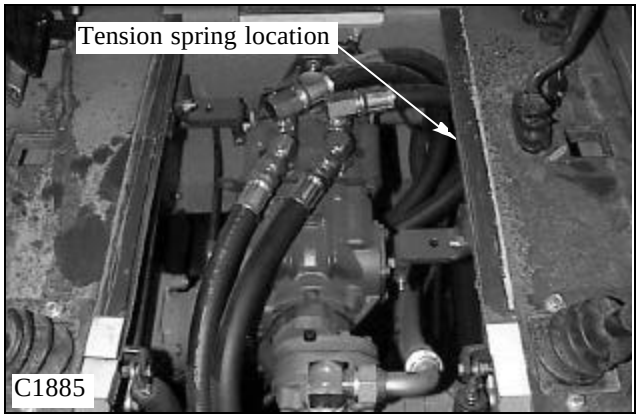
The throttle system can be adjusted for tension and total travel. (stroke)
If the throttle system can not maintain a constant, steady, engine speed then the throttle handle tension spring may need to be adjusted.
1 Raise the boom arms, engage the boom supports and shut off the engine.

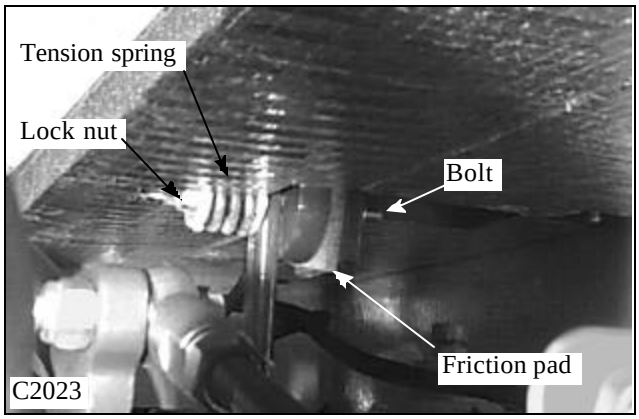
**WARNING**

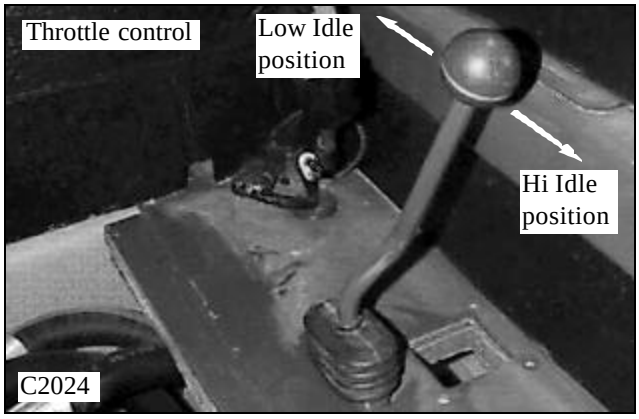
**Never work under the boom arms without the boom supports engaged.**

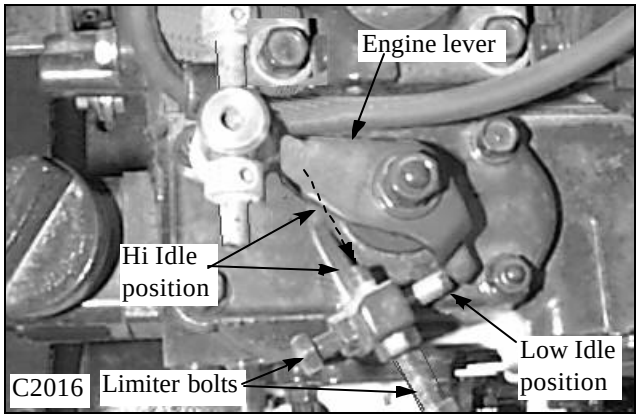
2 Remove the seat and hydrostatic shield.
3 Locate the throttle handle pivot and tension spring under the left hand cover plate. (fig. C1885, C2023)
4 Tighten the nut on the tension spring clock wise to increase the spring tension to gain clamping force against the friction pad.
If this fails to repair the problem then the friction pad may need to be replaced.

To check the throttle travel:
1 Open the rear door and locate the engine lever and throttle rod linkage.
2 Stroke the throttle lever in the full forward position. The engine lever must touch the limiter bolt stops to acquire full engine speed.
3 Stroke the throttle lever rearward until it stops. The engine lever should touch the limiter bolt to acquire the engines proper low idle speed.
4 Adjust the set collars an either side of the engine lever and throttle linkage to get the full range of required travel for the engine lever to touch the limiter bolts.



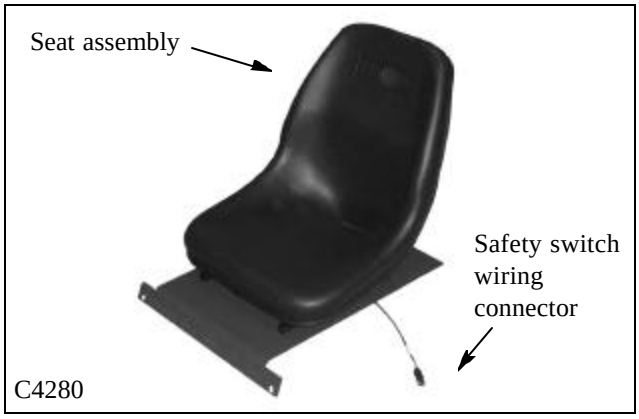
## Throttle Rod Replacement

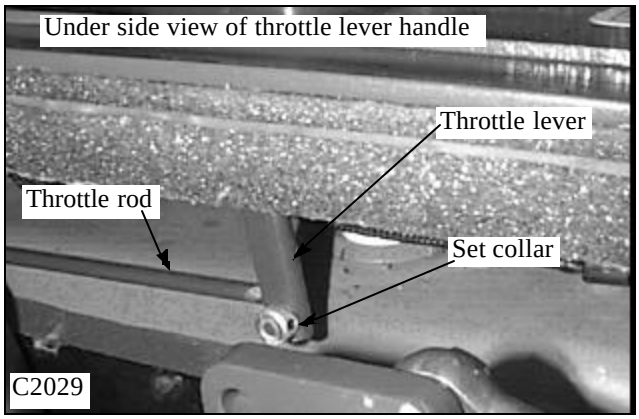
1 Raise the boom arms, engage the boom supports and shut off the engine.

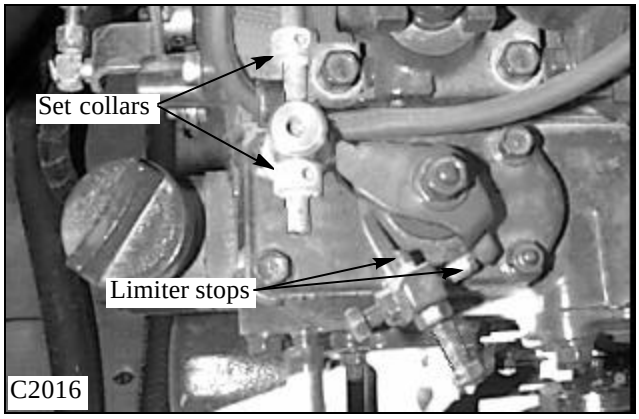
**WARNING**

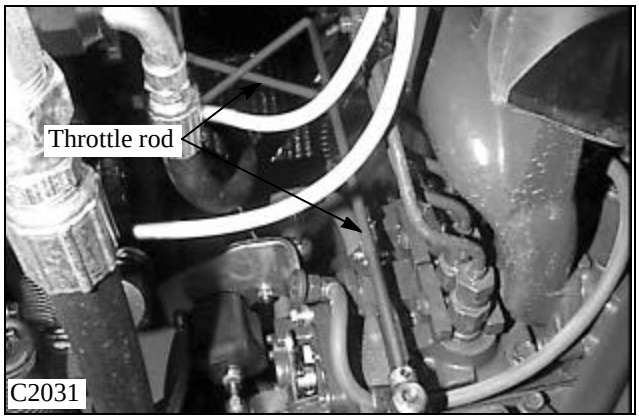
**Never work under the boom arms without the boom supports engaged.**

2 Remove the seat and hydrostatic shield.
3 Remove the set collar connecting the throttle rod to the throttle handle. (fig. C2029) Push the rod out of the lever.
4 Open the rear door and remove the rear most set collar from the throttle rod. (fig. C2016)
5 Remove the throttle rod from the engine lever pivot.
6 Pull the throttle rod out toward the rear of the loader past the radiator. (fig. C2031)
7 Remove the set collar left on the throttle control rod and transfer it to the new control rod.
8 Replace the throttle control rod in the reverse order above.
9 Adjust the 2 set collars, on either side of the engine lever pivot, so the engine lever contacts the limiter bolts when the throttle handle is stroked in the low idle and high speed settings. (forward and back). (fig. C2016)



# RESTRAINT BAR 4.5

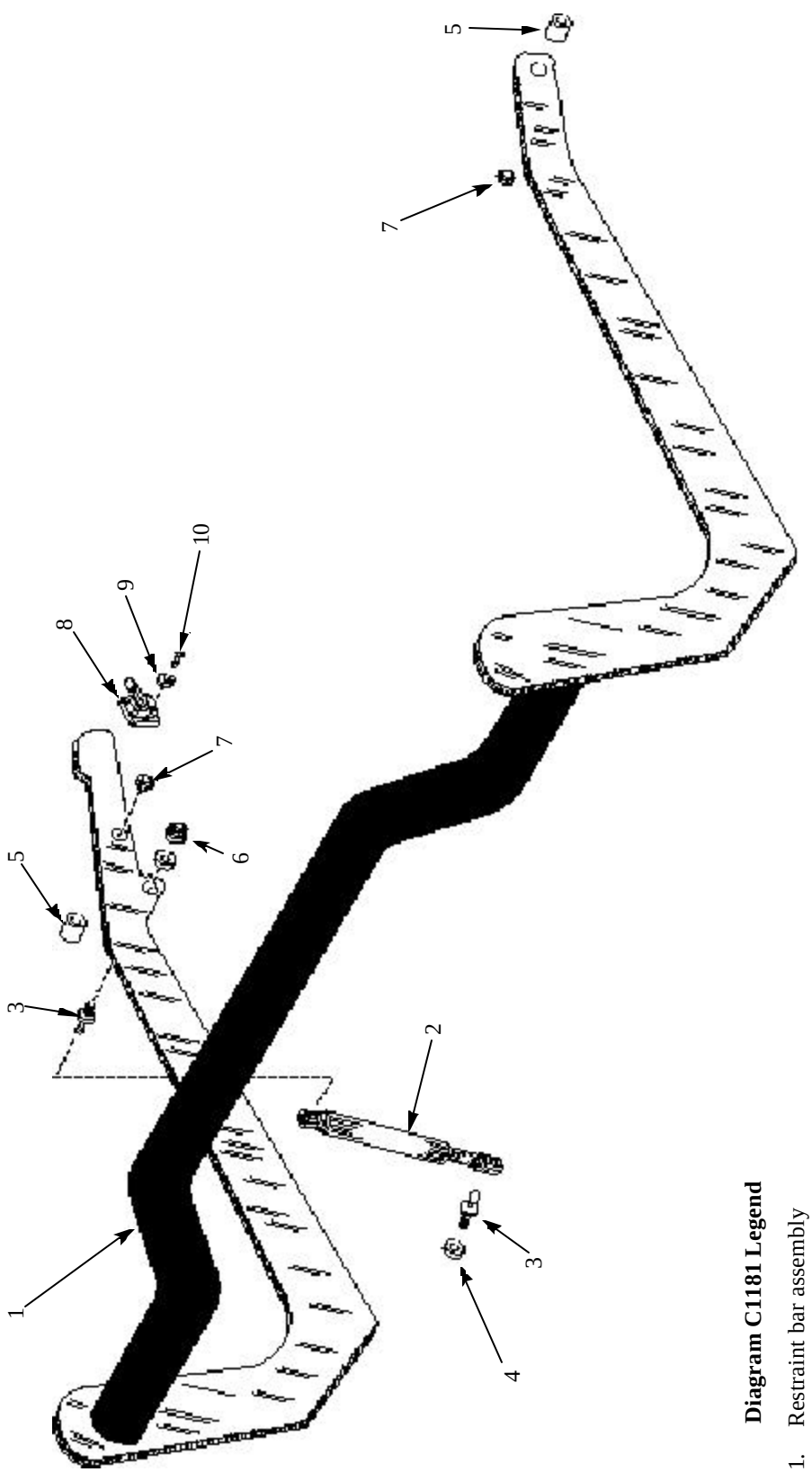



**Diagram C1181 Legend**

1. Restraint bar assembly
2. Gas spring
3. Ball stud
4. Lock washer
5 Spacer
6. Jam nut
7. Lock nut
8. Safety switch
9. Lock washer
10. Screw

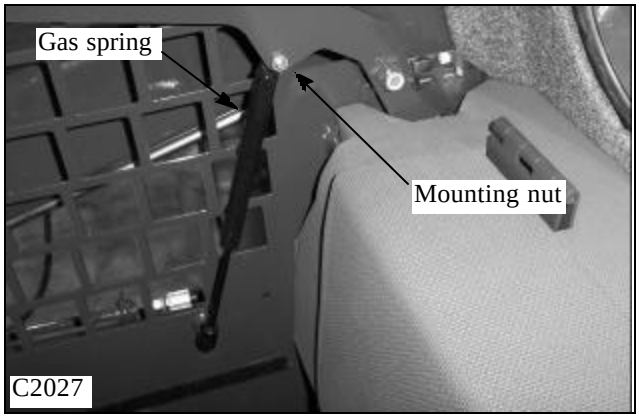
# RESTRAINT BAR 4.5

## Gas Spring Replacement

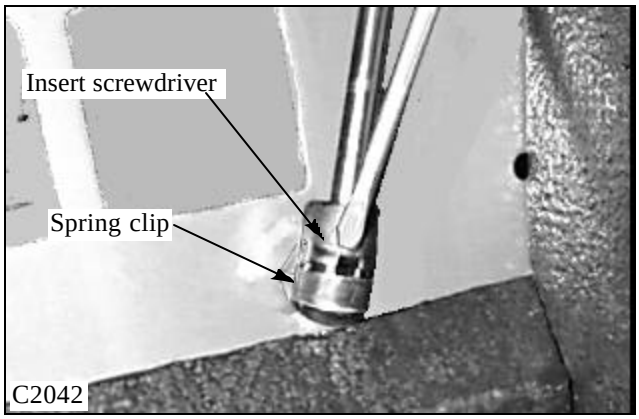
The restraint bar is held up, over head, by means of a gas assist type strut. (gas spring)
If the seal in the strut has deteriorated and failed, or the strut rod has been damaged, the restraint bar will not stay in the upright position due to gas pressure loss.

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. C2042) on either end of the gas spring. Twist the screw driver while pulling out on the gas spring. Repeat for the opposite end.

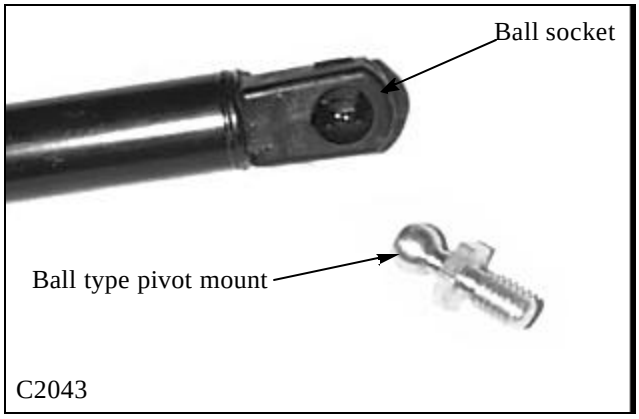


C2027



C2042

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



C2043

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.


C2044

# 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. C4301b) Remove the mount and gas spring together allowing the restraint bar to lower.

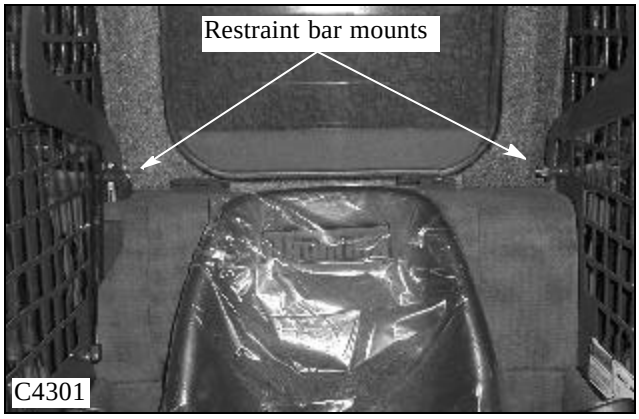
3 Remove the 2 restraint bar mounting nuts. (fig. C4301) There is one on either side of the restraint bar.

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.

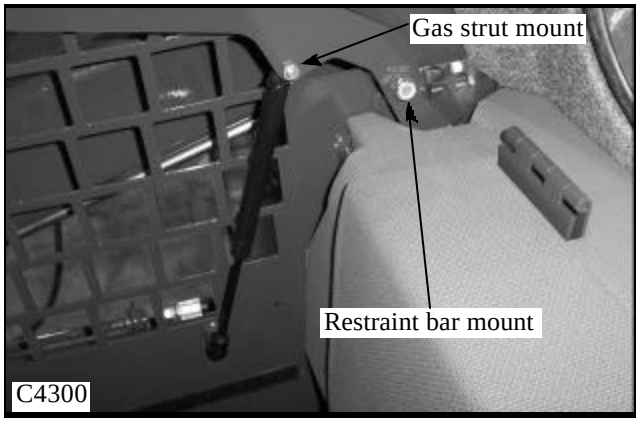
5 Replace the restraint bar in the reverse order. Use new lock nuts on the restraint bar mounts. Tighten to remove slack between the restraint bar and spacer bushings. Do not over tighten. The restraint bar should cycle freely up and down without binding.

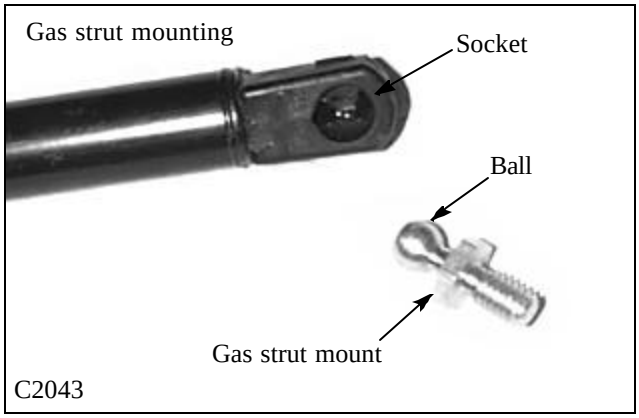
6 Re- attach the upper ball pivot mount to the restraint bar. Cycle the restraint bar to check proper operation.

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.







# PARKING BRAKE 4.6

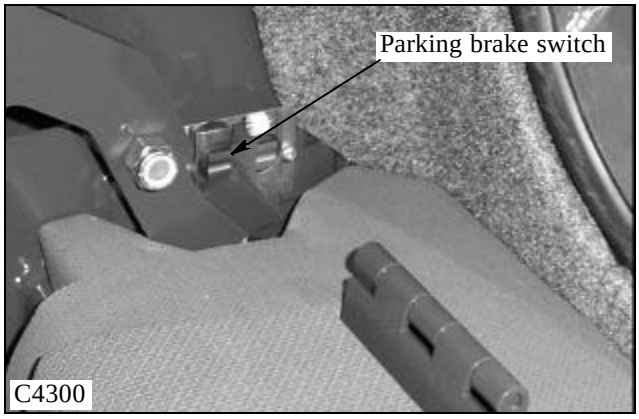
## General Information

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

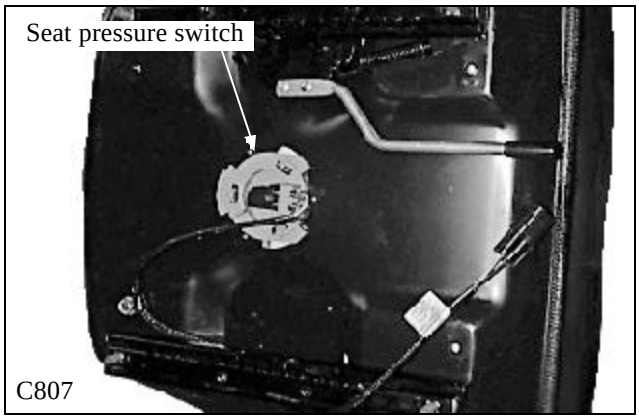
The parking brake is inter locked with various safety switches. (fig. C4300, C807, C4302, C1884) The parking brake will only release when the engine is operating, the operator is seated with the seat belt fastened and the restraint bar is in the lowered position.

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.

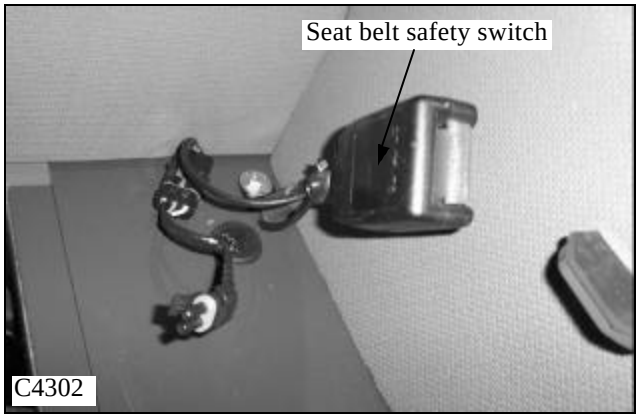
When the engine is operating and all safety switches are functioning and in the closed position, the hydraulic / electric solenoid brake valve (fig. C1884) will allow charge pressure to release the parking brake in the drive motors.



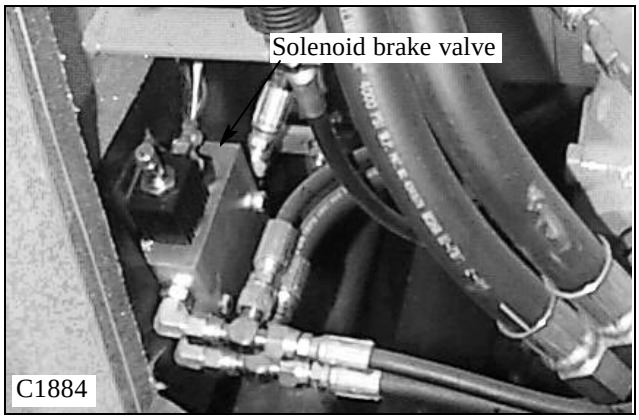
C4300



C807



C4302



C1884

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

# SECTION 5 ELECTRICAL

# SPECIFICATIONS 5.1

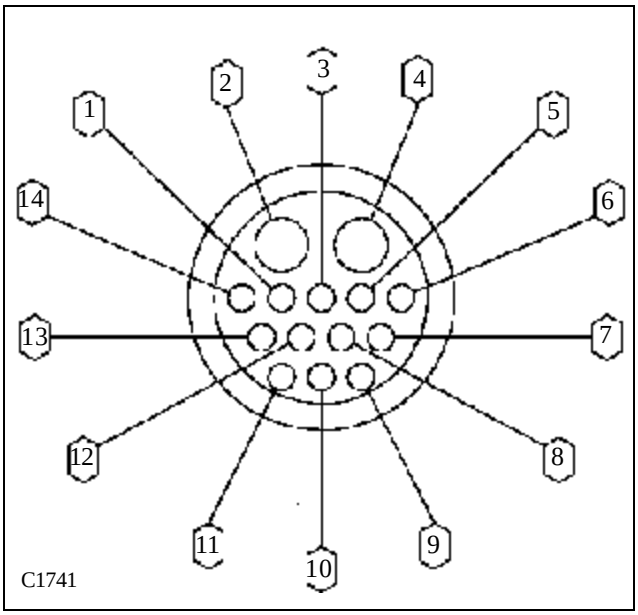
Ignition ..... 12 Volts
Grounding ..... Negative
Alternator Brand ..... Nippondenso
Alternator Rating ..... 40 Amp
Alternator Type ..... Internal Regulator
Battery (std) ..... One (1)
Battery Rating ..... 730 CCA,
..... 125 Reserve Minutes (each)
Battery Type ..... SERV 3478
Starter Brand ..... Nippondenso
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

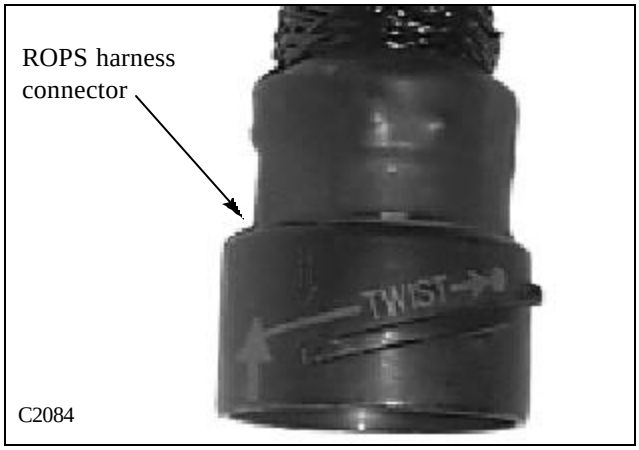
Diagram C1741 Legend. Shown is the wire color and function of each pin terminal in the connector plug.

| 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 |

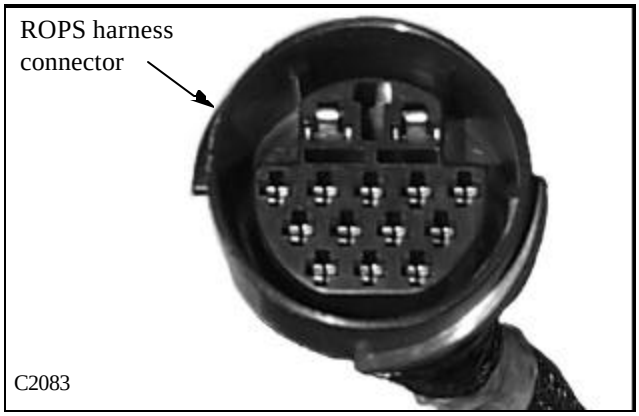


C1741

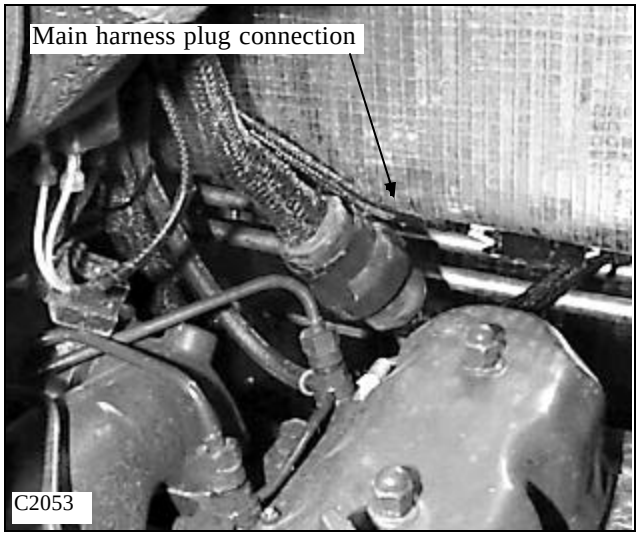
The photographs below and at right show the actual ROPS harness plug connection.
To separate the main electrical harness connection, push the locking tab in the direction of the arrow (fig. C2066) and twist the collar clockwise to release.



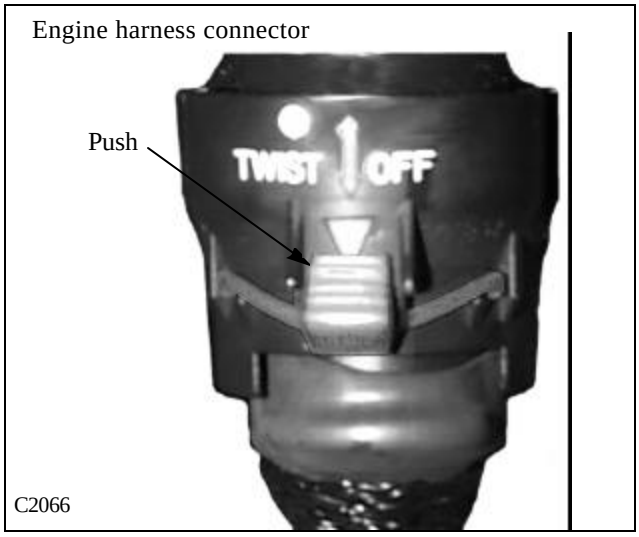
C2084



C2083



C2053



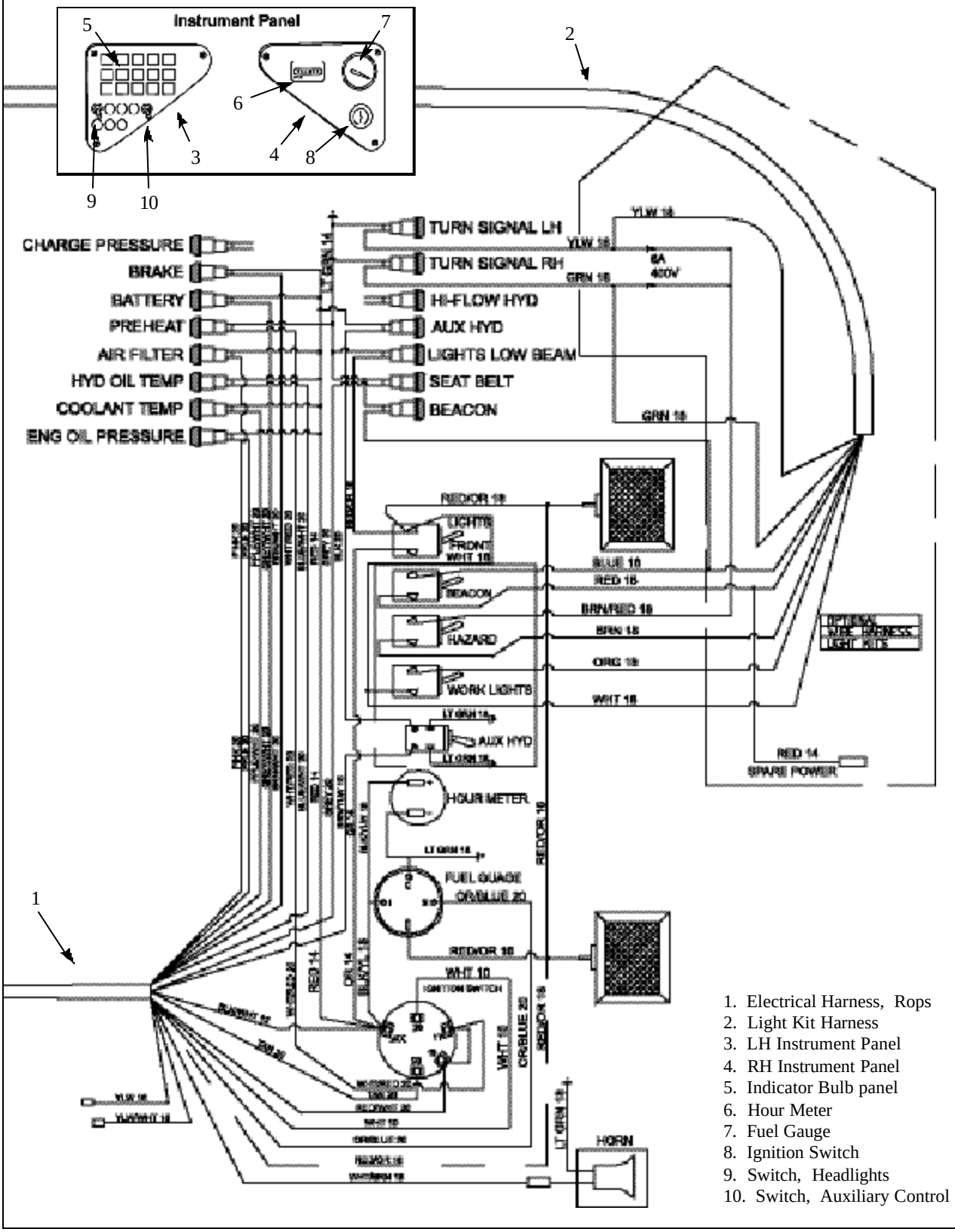
C2066

5

# WIRING SCHEMATIC 5.2

ROPS Electrical Wiring 137/153

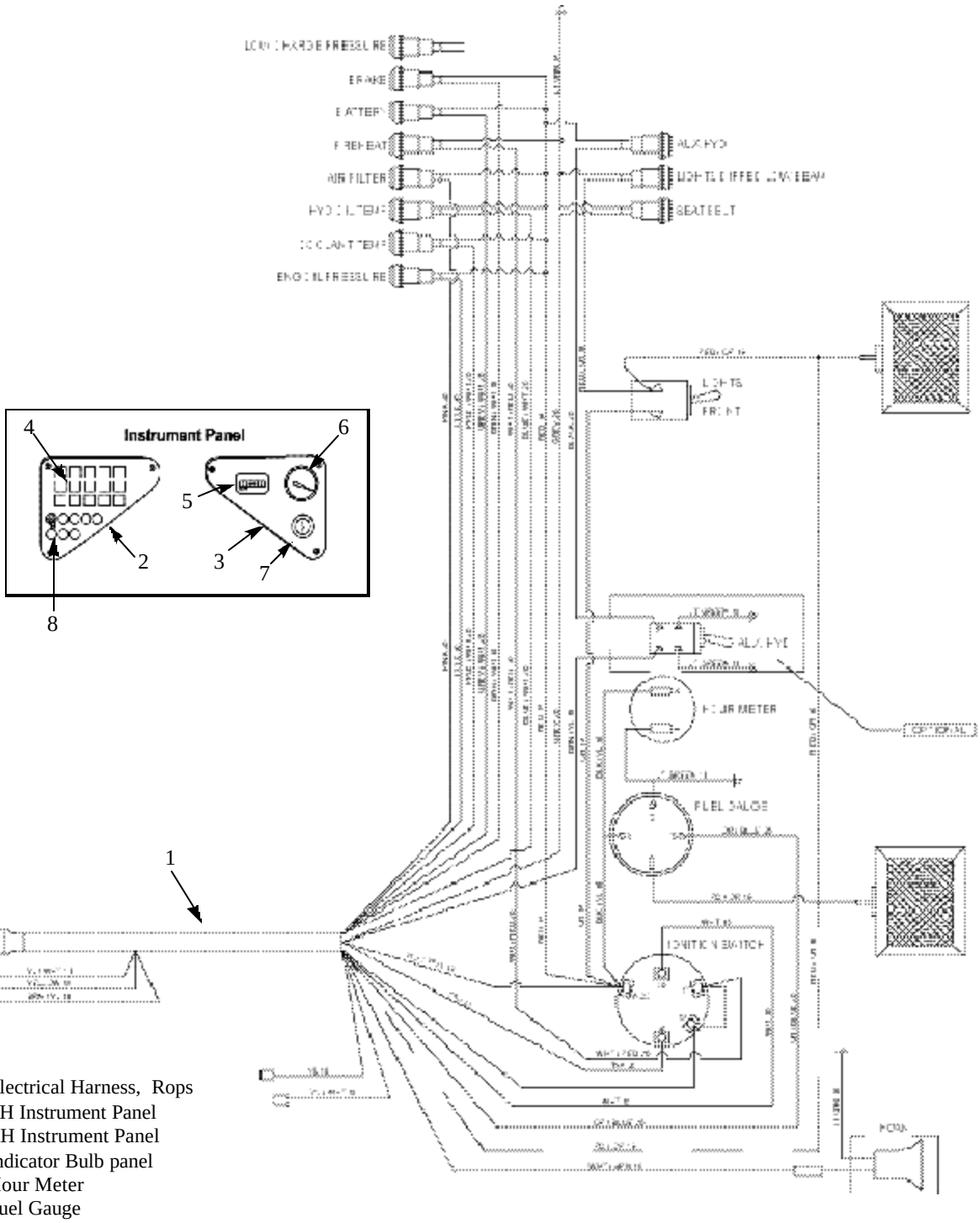
C4187




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

# WIRING SCHEMATIC 5.2

ROPS Electrical Wiring 1300/135 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

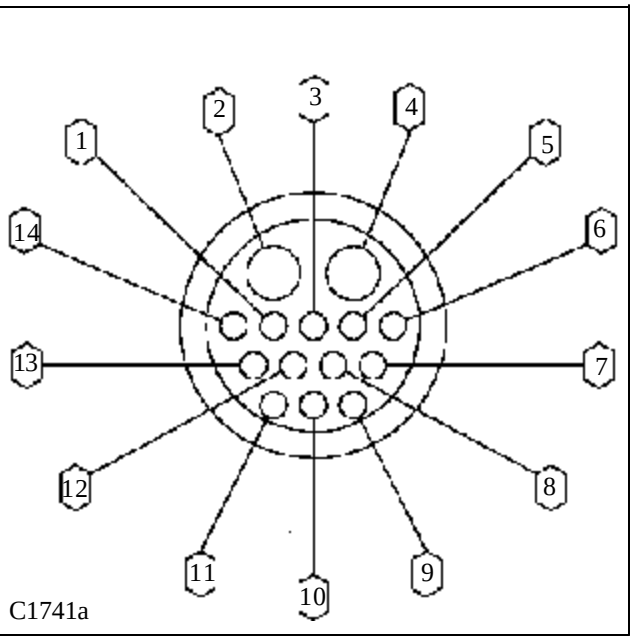
5

# WIRING SCHEMATIC 5.2

## Engine Harness Connector

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

| PIN | WIRE COLOR | FUNCTION |
|---|---|---|
| 1 | Tan | Starter relay |
| 2 | 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 |



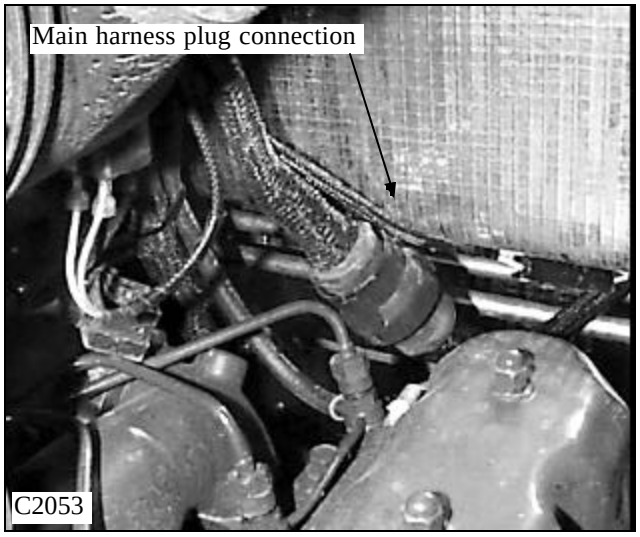
C1741a

5

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


C2065



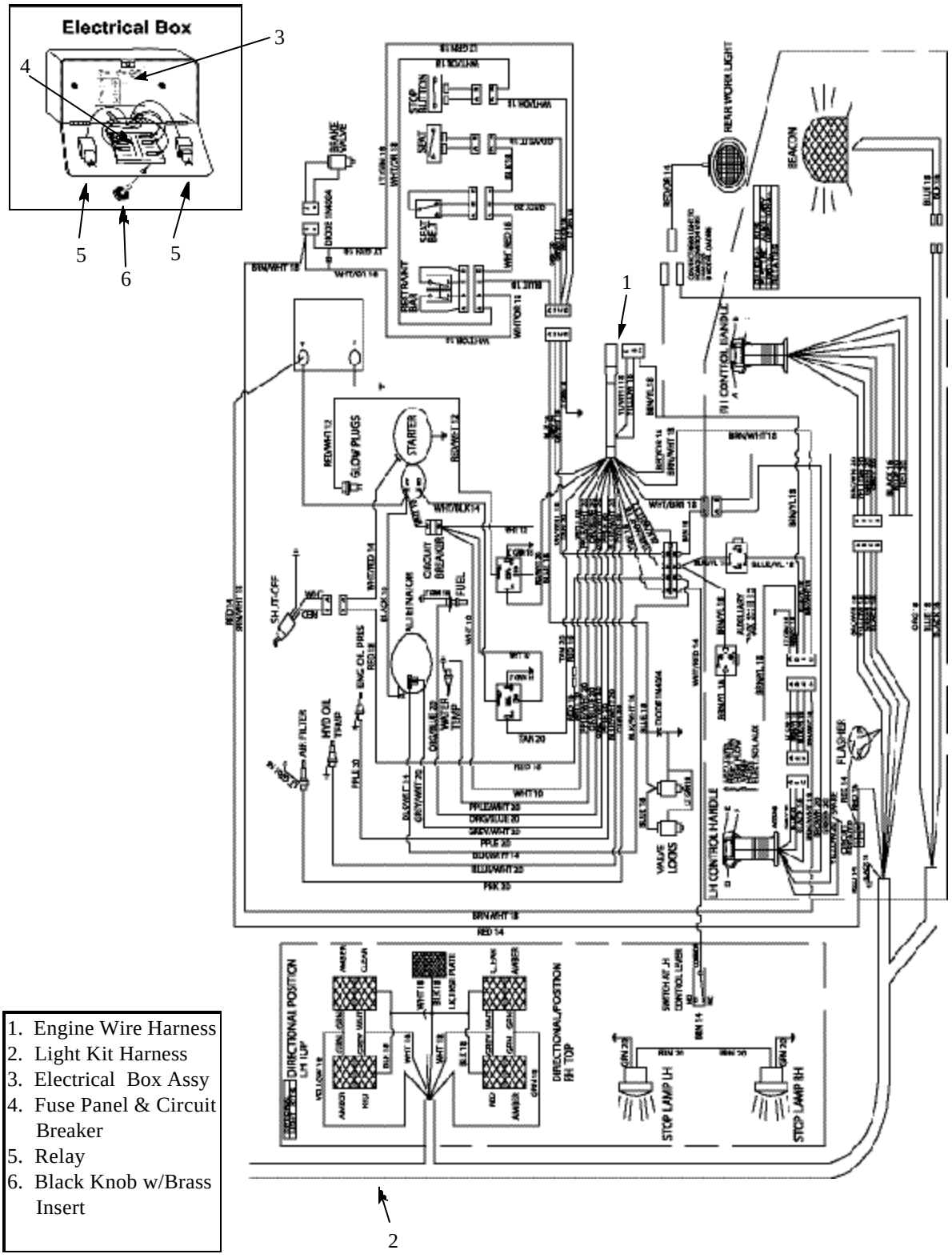
C2053

Engine plug

C2066

# WIRING SCHEMATIC 5.2

Engine Electrical Wiring 137/153 C4188

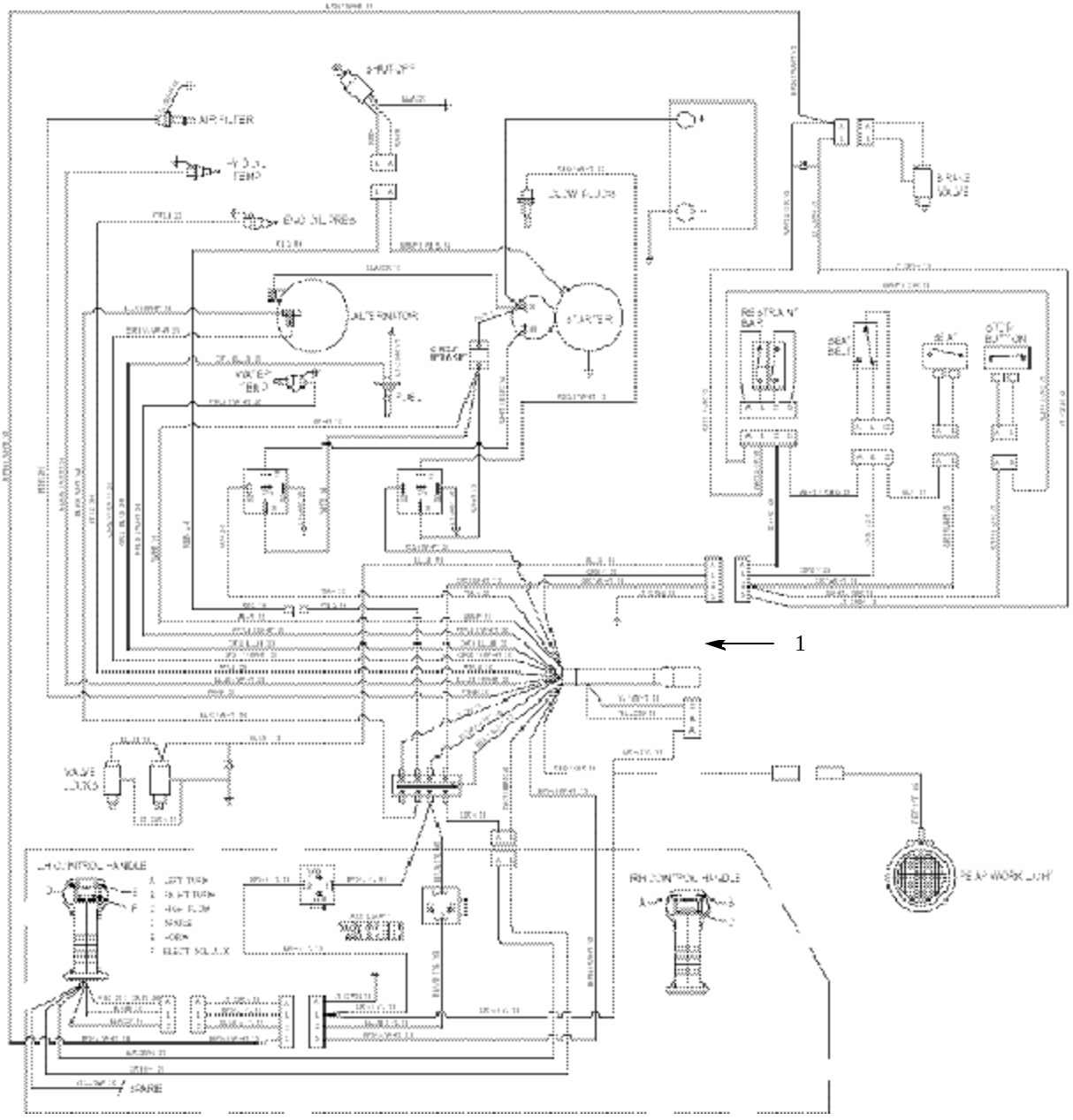



1. Engine Wire Harness
2. Light Kit Harness
3. Electrical Box Assy
4. Fuse Panel & Circuit Breaker
5. Relay
6. Black Knob w/Brass Insert

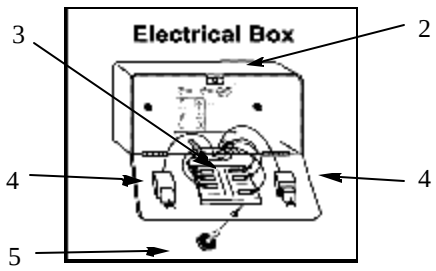
5

# WIRING SCHEMATIC 5.2

Engine Electrical Wiring 1300/135 C3690

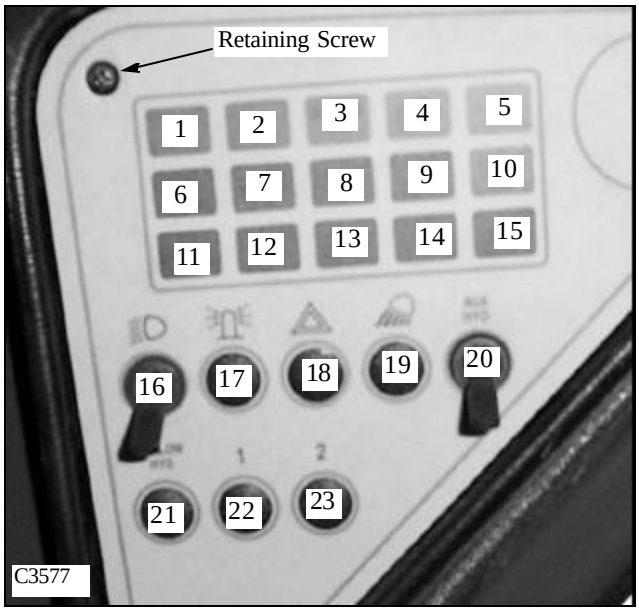


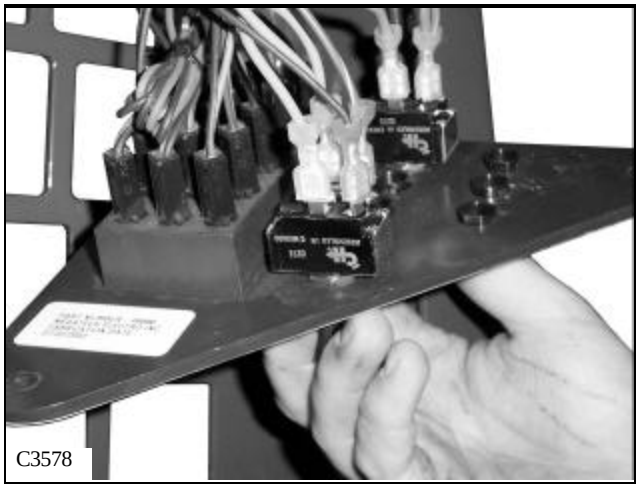

1. Engine Wire Harness
2. Electrical Box Assy & Circuit Breaker
3. Fuse Panel
4. Relay
5. Black Knob w/Brass Insert



## 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

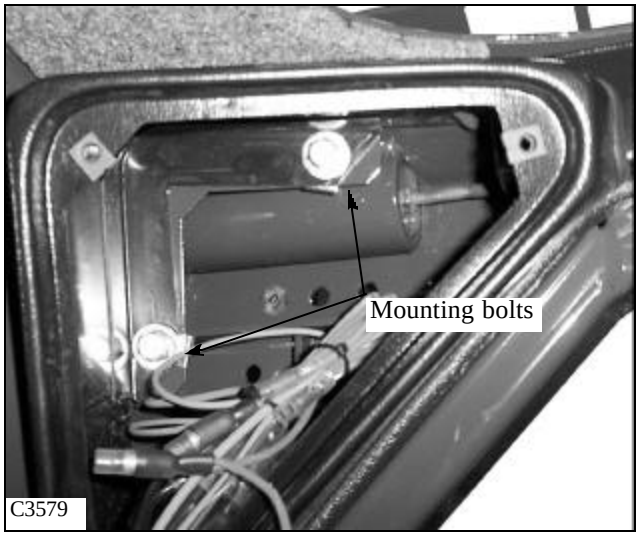



## Switch & Bulb Replacement

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.



## 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)

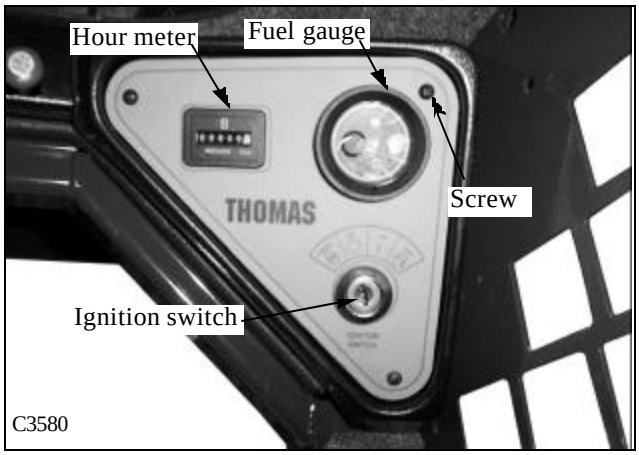
3 Access the rear of the dash panel.

4 Remove the wiring from the effected part.

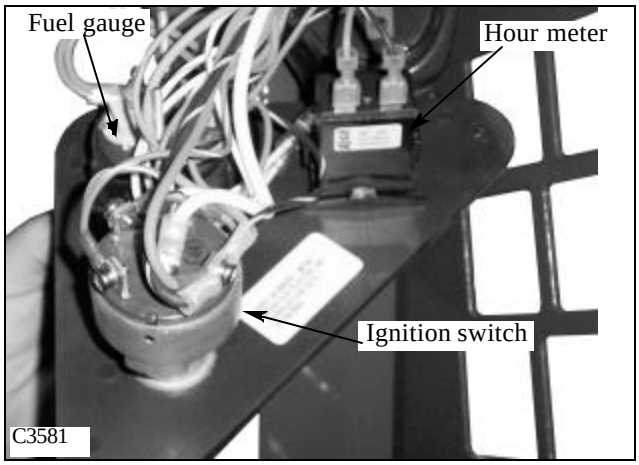
5 The fuel gauge is retained by a bracket and 2 mounting nuts. Remove the nuts and the gauge can be replaced.

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.



C3580



C3581

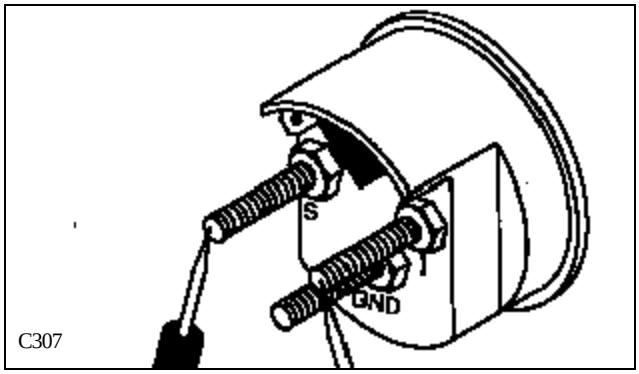
## Testing the Fuel Gauge

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.

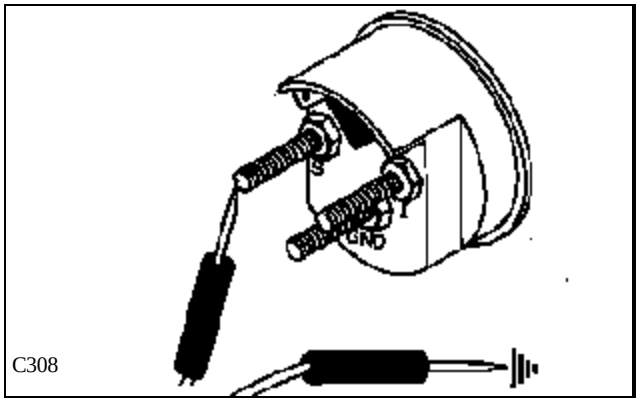


C307

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.

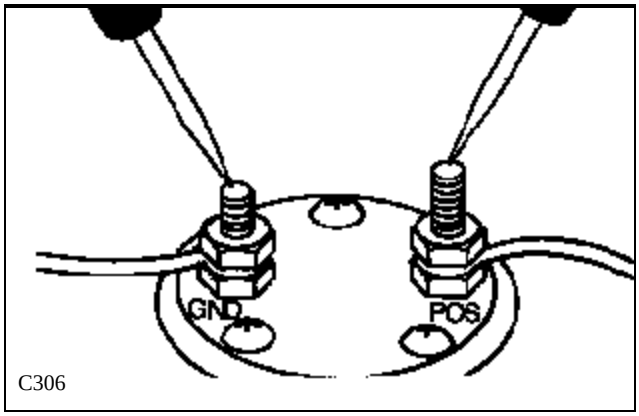
NOTE: If the test is good, check the fuel sending unit in the fuel tank for failure.



C308

## Testing the Fuel Sender

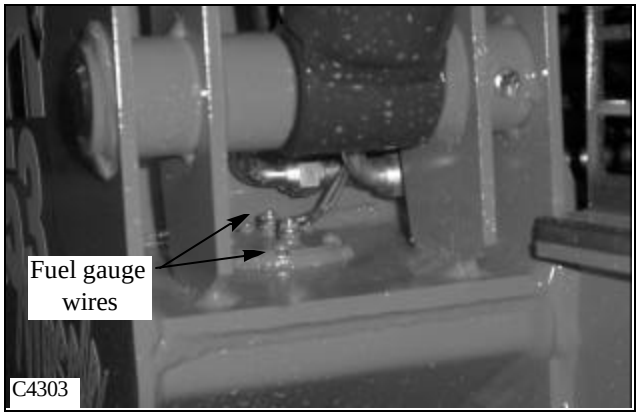
1 With the ignition switch off, connect an ohmmeter between the positive and negative terminals of the fuel sending unit. (fig. C306)
2 An ohmmeter reading of 50 to 500 is normal. A reading higher or lower means a faulty sender and will need replaced.



C306

## Replacement

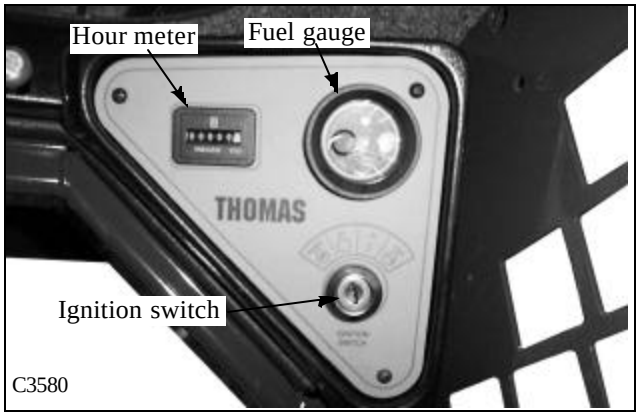
1 Remove any attachment, raise the boom arms and engage the boom support pins. Shut off the engine and engage the parking brake.
2 Remove the 2 wires connected to the fuel sending unit. The fuel sender is located just below the lift cylinder, right hand side, on the fuel tank. (fig. C4303)
3 Remove the 5 screws retaining the sender to the fuel tank.
4 Remove the sending unit and discard the gasket.
5 Install a new sending unit and gasket. Use gasket sealant on both sides of the gasket.
6 Use thread sealant on the screws and torque the screws to 20 inch lbs.
7 Connect the sender wires taking care not to over tighten the nuts and stripping the studs. Green wire is ground.



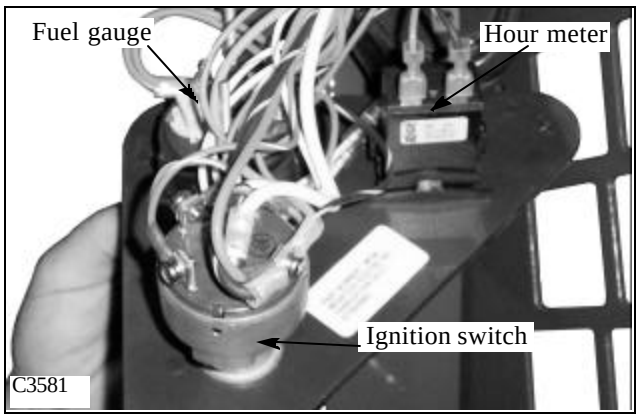
C4303

## 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.



C3580



C3581

# IGNITION SWITCH 5.4

## Ignition Switch Testing

The ignition switch is a 4 position switch. OFF, PREHEAT, 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.

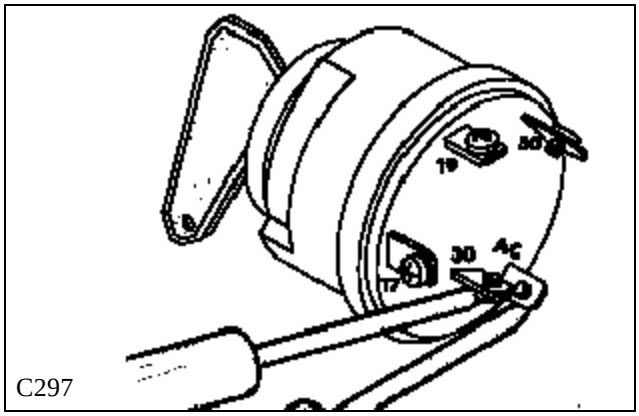
TEST 1: "RUN" POSITION.

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

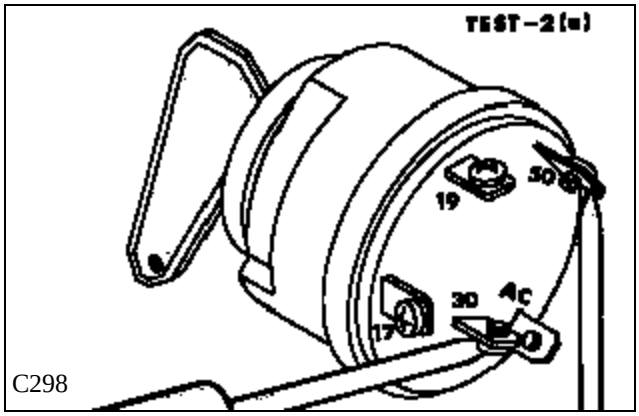
A low resistance reading is normal. High resistance reading means you will have to replace the ignition switch.

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.



C297

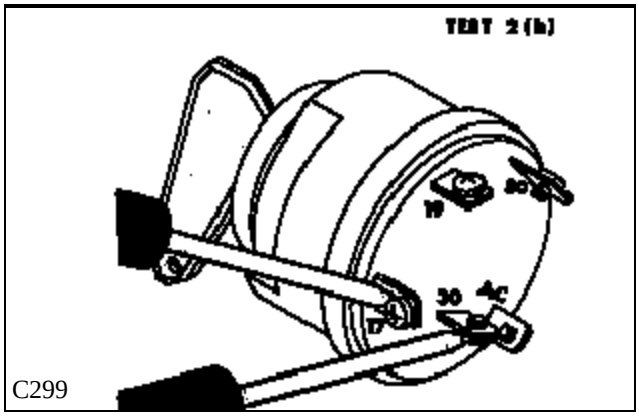


C298

(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.



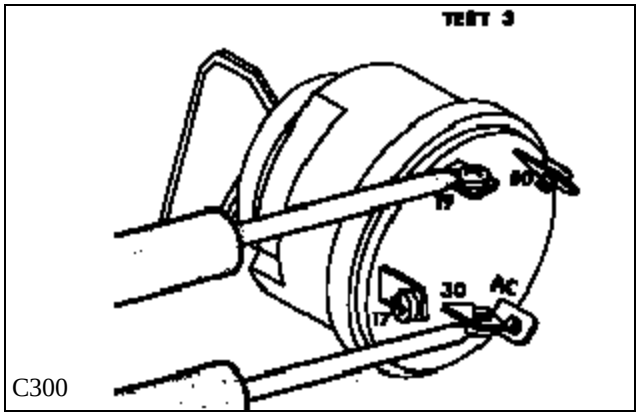
C299

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.



C300

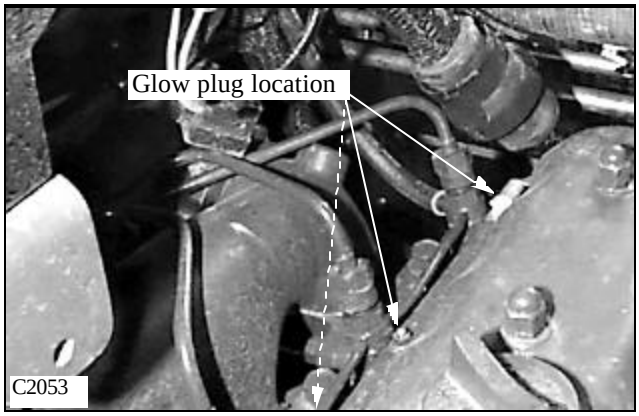
# ENGINE GLOW PLUGS 5.5

## 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

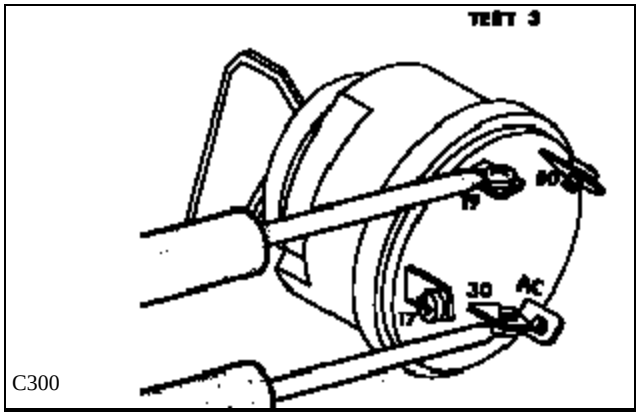
Check the ignition switch terminals 17 and 19 with an ohmmeter. If there is good continuity between the two terminals the bulb or wiring is bad on the pre-heat indicator light.
To change the indicator bulb, remove the 3 screws retaining the left hand dash panel to the dash pod. Select the proper bulb, twist and pull the bulb from the dash panel. Disconnect the wires and replace the bulb in reverse order.



C2053

C3580


C3581



C300

5

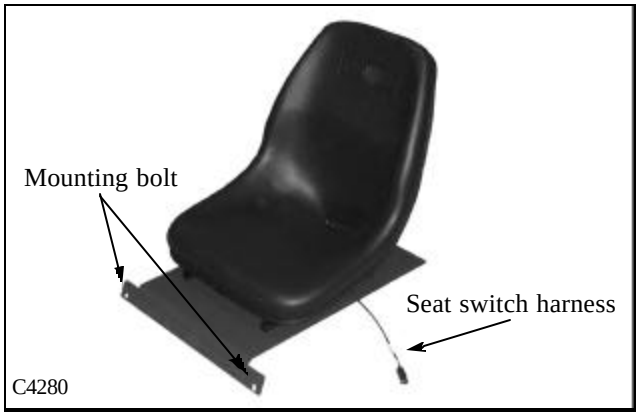
# BATTERY 5.6

## Removal and Inspection

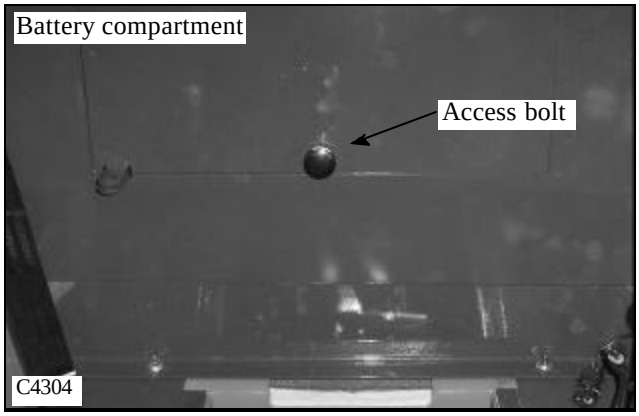
The batteries are located in the ROPS behind the operators seat. To remove the battery:

1 Remove the seat mount retaining bolts and disconnect the seat switch wiring harness. (fig. C4280)

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. C4304)

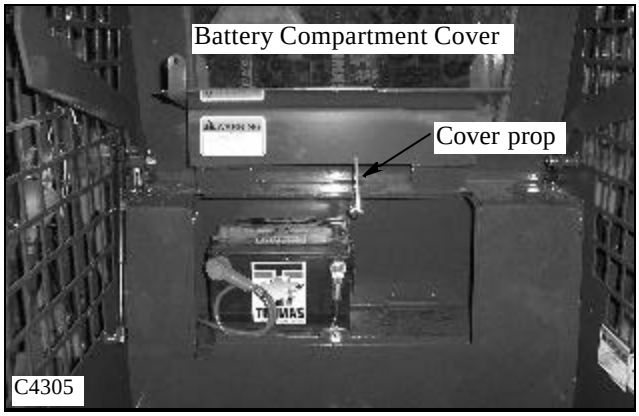



**WARNING**

**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. C4305)

5 Disconnect both battery ground terminals first. Then disconnect the positive cables from the battery. (fig. C3585)

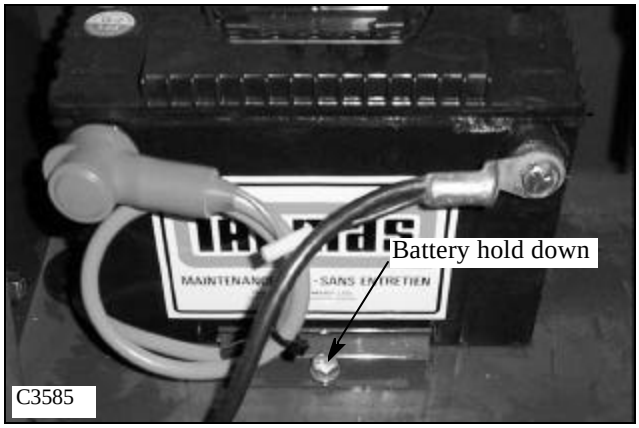



6 Remove the bolt securing the battery hold down bracket. (fig. C3585)

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.

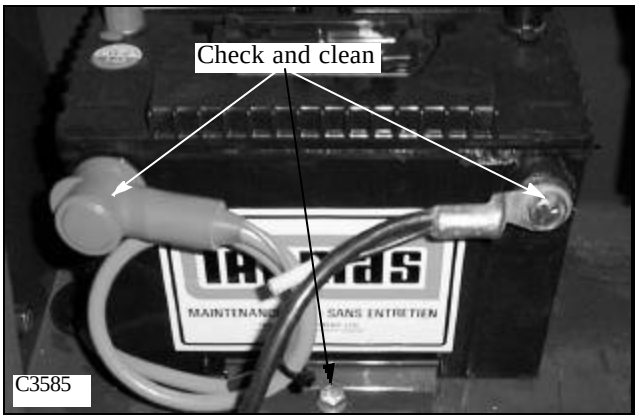
9 Clean the outside of the battery case if the battery is to be reused. Flush the terminal areas with a soda solution taking care not to allow the solution into the battery cells. Remove corrosion from the battery terminals with a wire brush..



# BATTERY 5.6

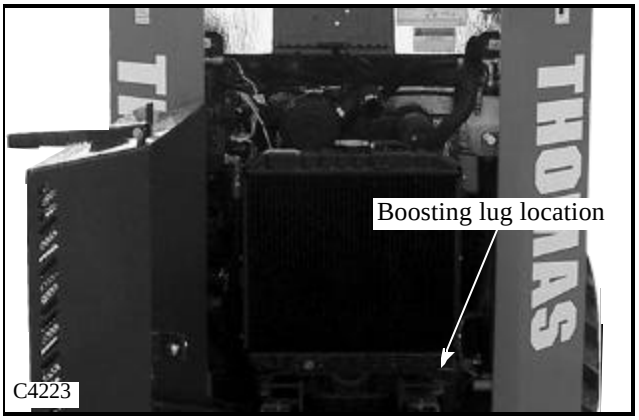
## Removal and Inspection

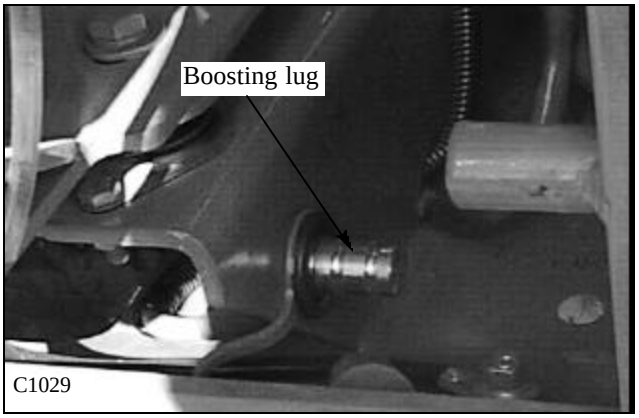
10 Inspect the battery case for cracks that may allow electrolyte to leak into the environment.
Inspect the batteries on a regular basis for damage such as cracks or a broken case.
Inspect the battery cables for tightness and corrosion. Remove any corrosion and coat the terminals with a dielectric grease.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




## Boosting

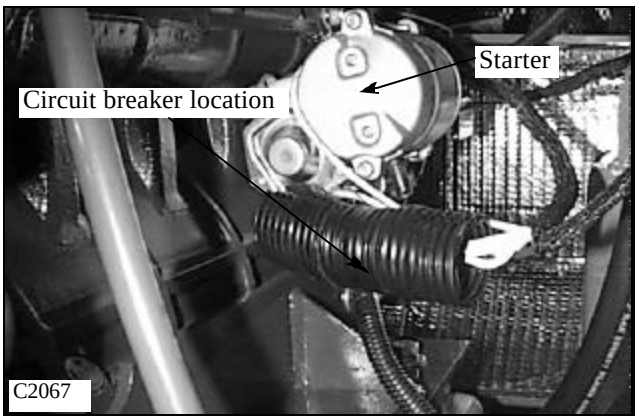
In the event the loader has failed to start and requires boosting, a boosting lug or post is located in the engine compartment. (fig. C4223)
1 Open the rear door and raise the engine compartment cover.
2 Remove the red rubber protective cover from the boosting lug. (fig. C1029)
3 The ignition must be 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.




5

# ELECTRICAL PANEL 5.7

The loader is equipped with a 12 volt, negative ground electrical system. The fuse and relay panels are located in the engine compartment, attached to the underneath of the engine cover. (fig. C3588)

To access the electrical panel:

1 Open the rear door and raise the engine cover.

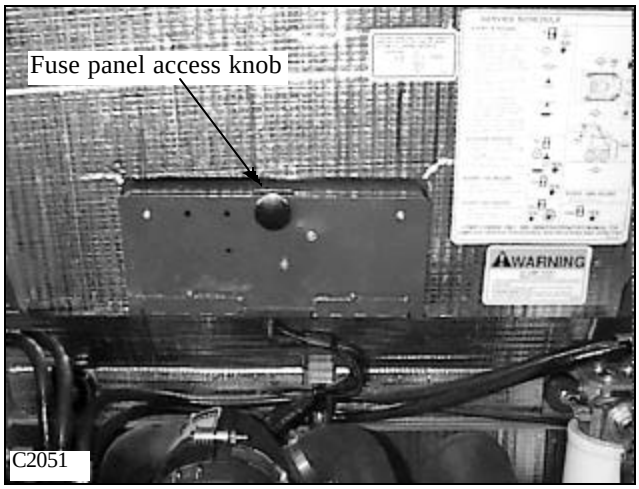
2 Remove the bolt holding the electrical panel cover closed. (fig. C3588)

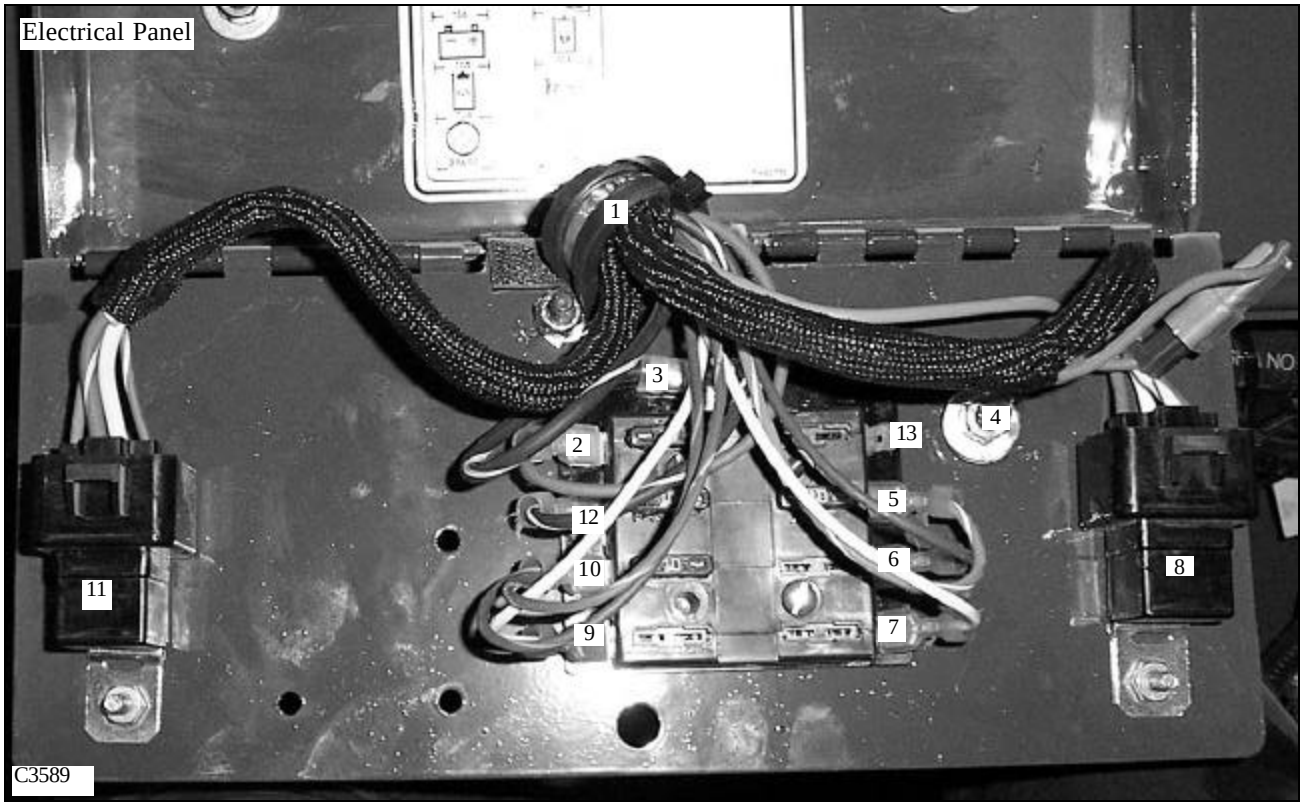
3 Open the cover and all fuses and relays will be exposed. (fig. C3589)

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.



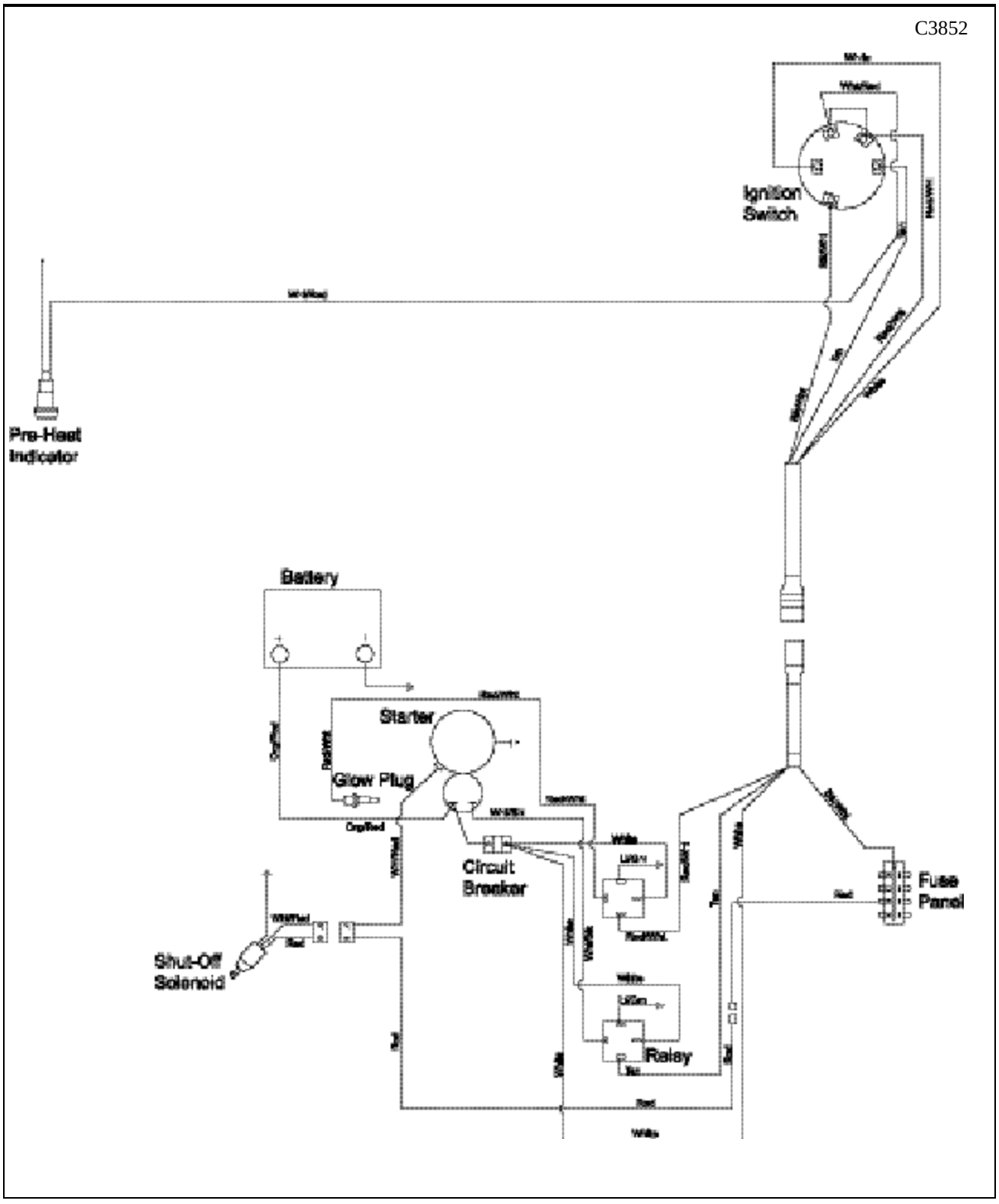




ELECTRICAL PANEL LEGEND.(fig. C2052)

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

# STARTING CIRCUIT 5.8

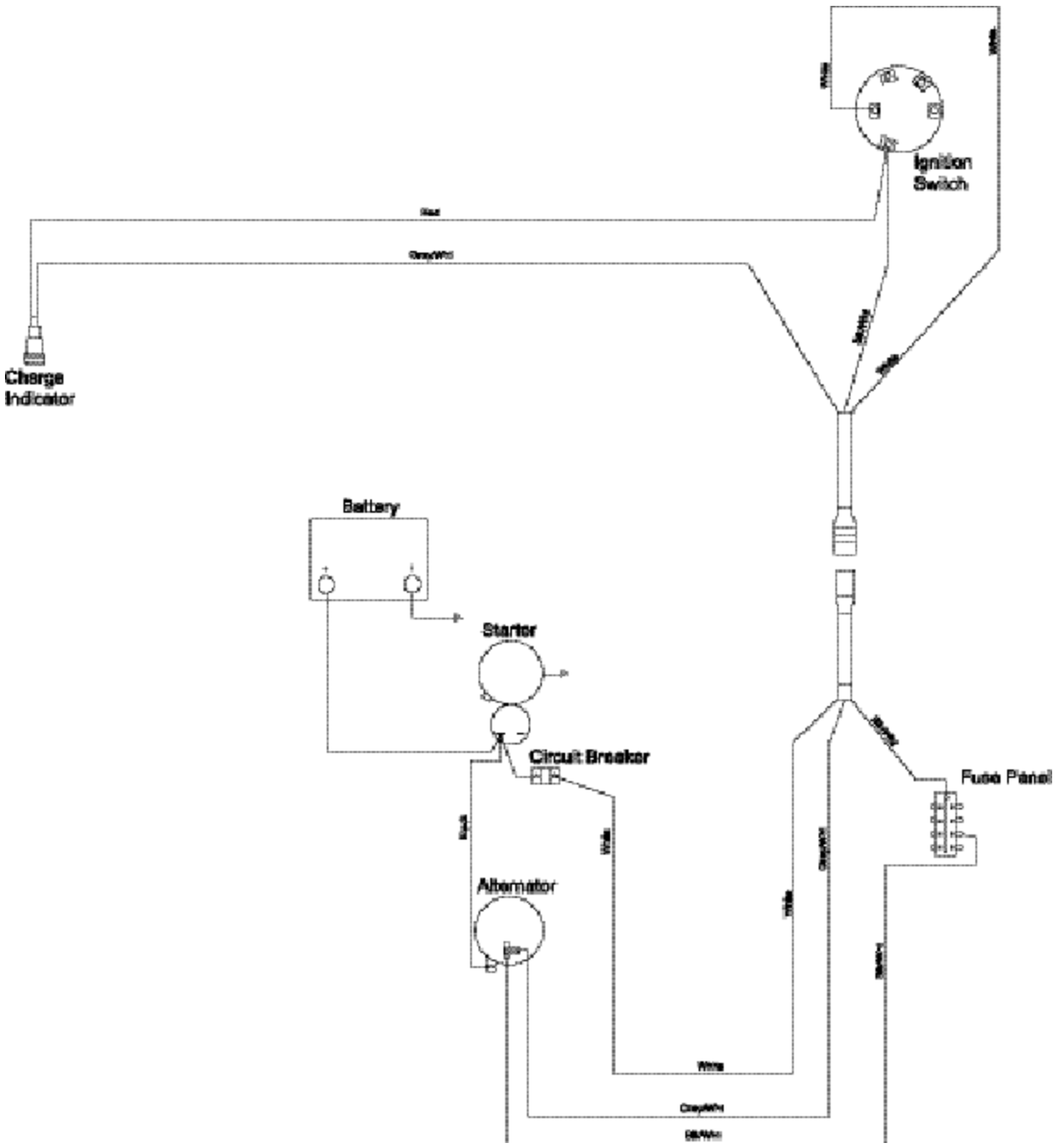
C3852



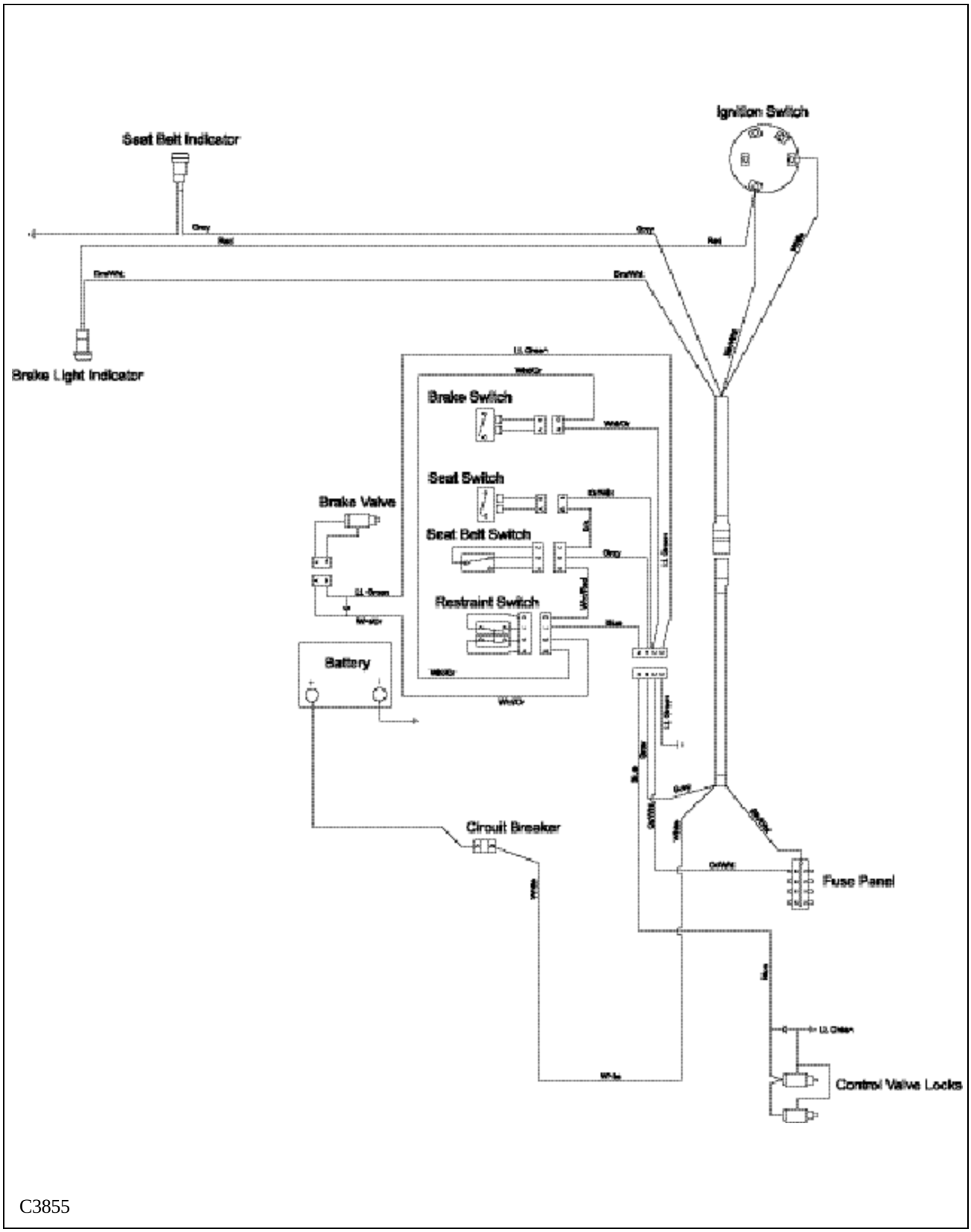

5

# CHARGING CIRCUIT 5.9

C3853



# SAFETY CIRCUIT 5.10




5

# SAFETY CIRCUIT 5.10

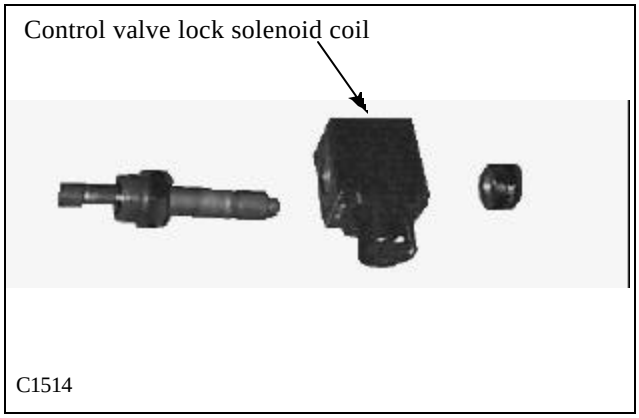
## General Information

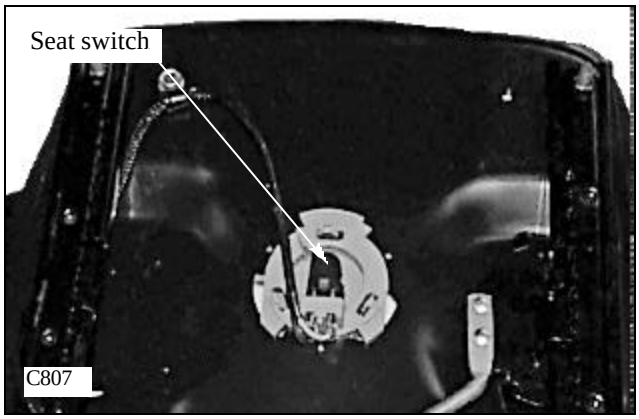
The loader is equipped with 3 inter - connected safety switches. These 3 switches operate 2 electric solenoid controlled lock devices. One (1) solenoid coil on the hydraulic brake valve (fig. C1884), one (1) pair of solenoid coils on the hydraulic control valve (fig. C1514) The operation of the solenoid coils and loader functions will be prevented if one of these safety switches are open. The operation of the solenoid coils and loader functions. All 3 must be hooked up, functioning and, if applicable, adjusted correctly.

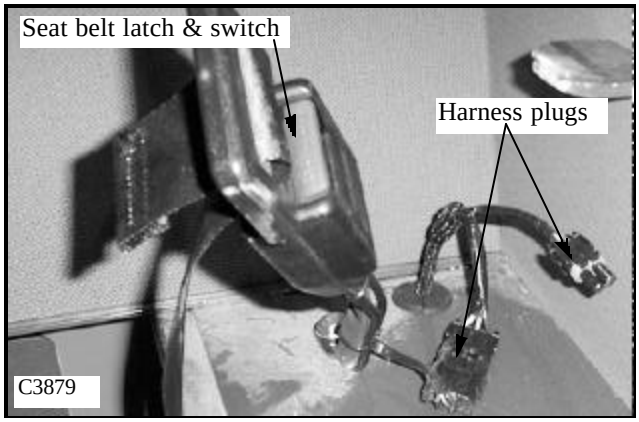
The bottom of the operators seat is equipped with a pressure sensitive switch. The operator must be in the seat to close the switch and release the parking brake and unlock the control valve functions. (fig. C807) No adjustments required. When removing and replacing the seat, be sure not to pinch the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

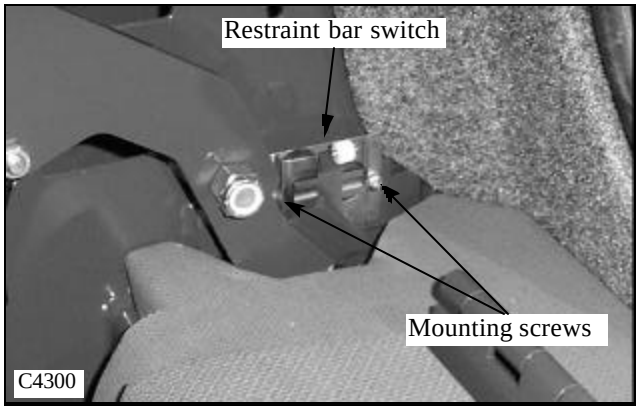
The seat belt assembly is equipped with a safety switch. The operator must have the seat belt fastened around them in order to close the switch and allow the parking brake to release and the control valve to function. (fig. C3879) No adjustments required.

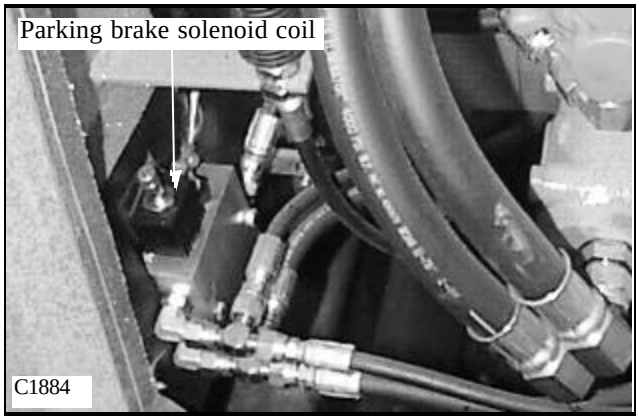
The restraint bar is equipped with a dual function safety switch. (fig. C4300) With the restraint bar in the raised position, the parking brake is activated, the control valve functions are locked and the activation indicator lights are illuminated on the dash panel.
Lowering the restraint bar releases 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.



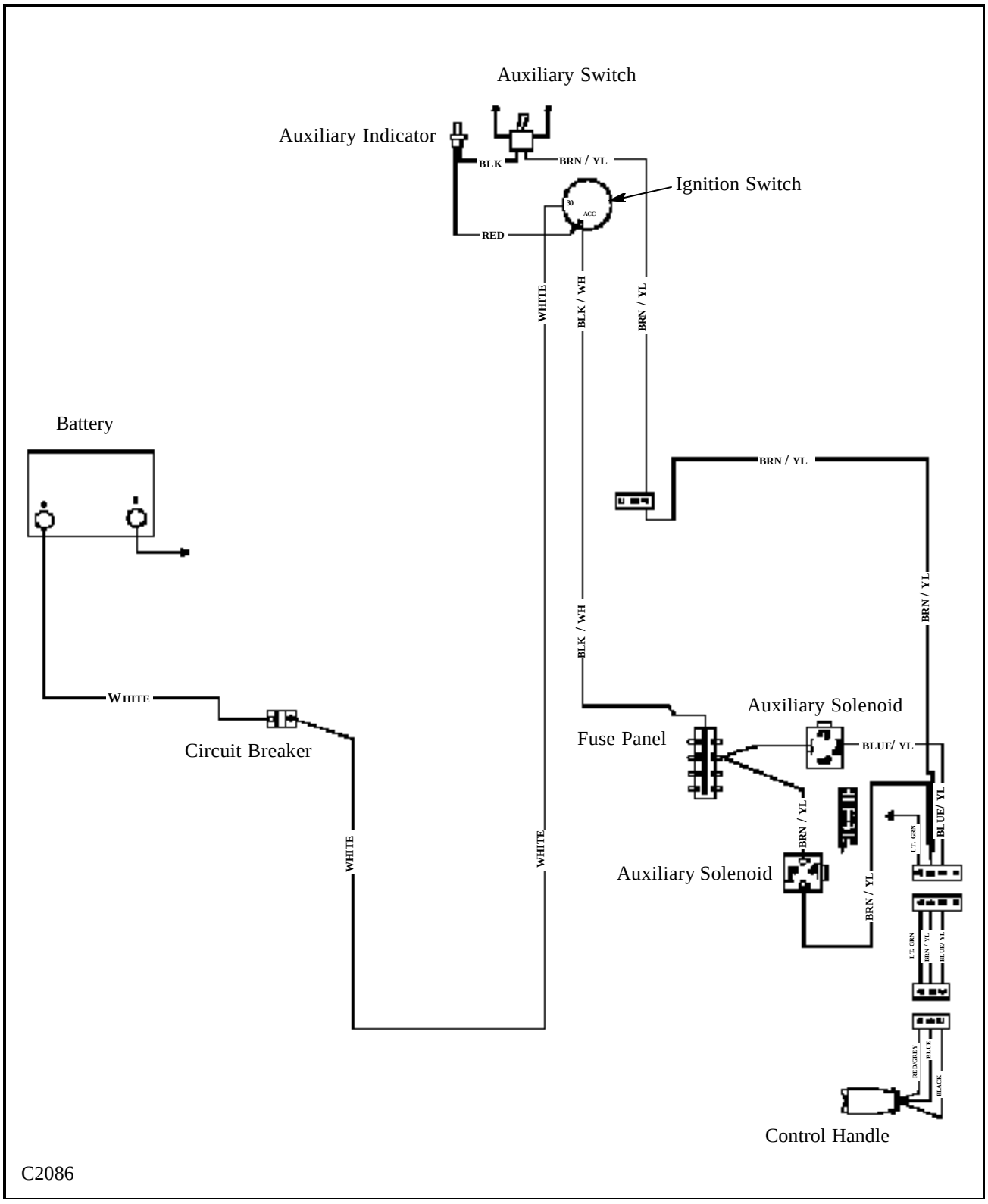



# ELECTRIC AUXILIARY CIRCUIT 5.11



# 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 137 / 153 loader.

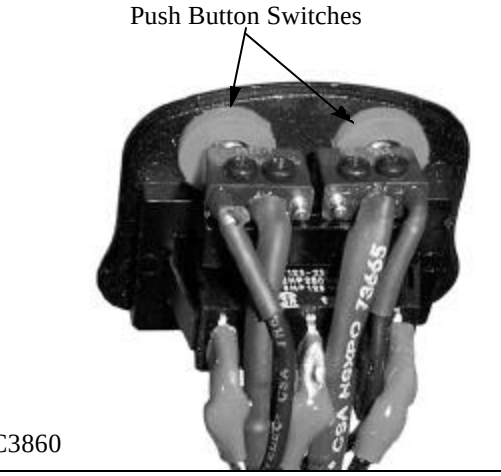
When installed on the LH lever:
1. The rocker switch controls the electric aux. functions. Pushing down on the left side of the rocker switch is the forward direction and pushing down on the right side is the reverse direction.
2. LH push button is a spare to be used if adding an option.
3. RH push button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

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

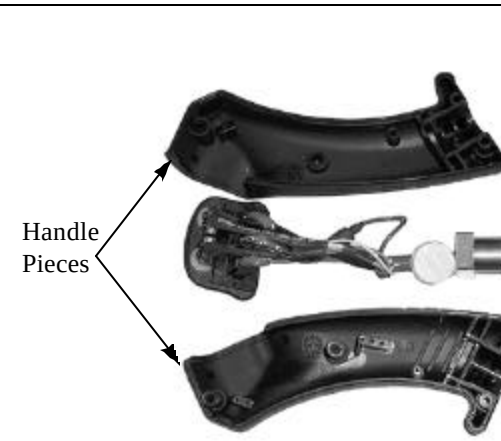
To replace a defective switch:
1. Ensure the ignition switch is in the OFF position.
2. Remove the 4 screws that hold the 2 handle pieces together. (fig. C3862)
3. Remove the LH handle piece and pull the switch/wire assembly out of the RH handle piece.
4. The original rocker switch has the wires soldered to the terminals of the switch. Take note of the wire color attached to each terminal before removing the wires.
5. The rocker switch has a tab on each end of the switch which needs to be depressed before removing the switch.
6. The rubber rocker cover can be replaced or reused on the replacement rocker switch at this time.
7. Replace the switch and reattach the wires. Proper female spade terminals may be soldered to the wires.

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

C3861

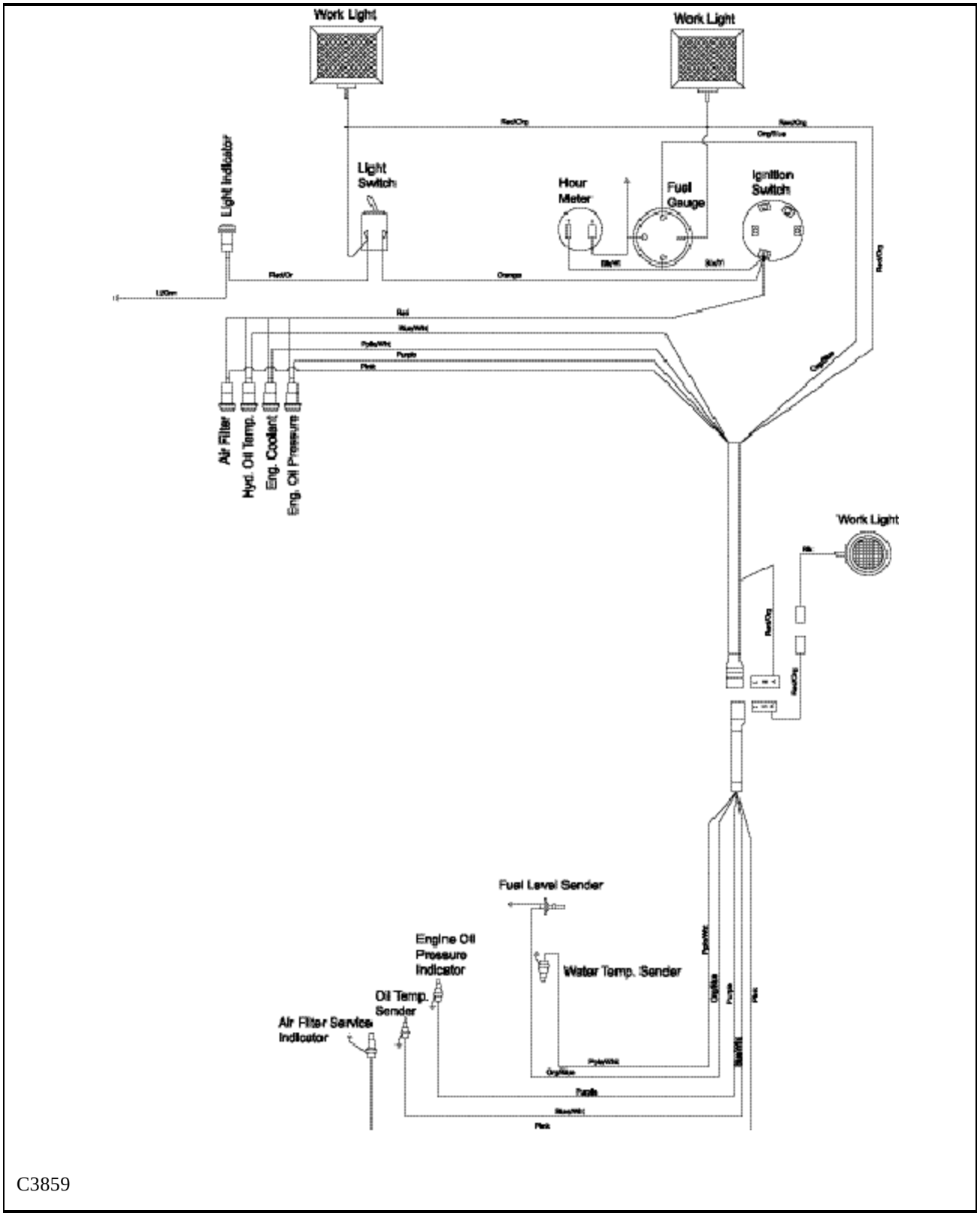


C3860



C3862

# ACCESSORIES CIRCUIT 5.12




C3859

5

# TROUBLE SHOOTING 5.13

## STARTING SYSTEM

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

## SAFETY LOCKING MECHANISM

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

# TROUBLE SHOOTING 5.13

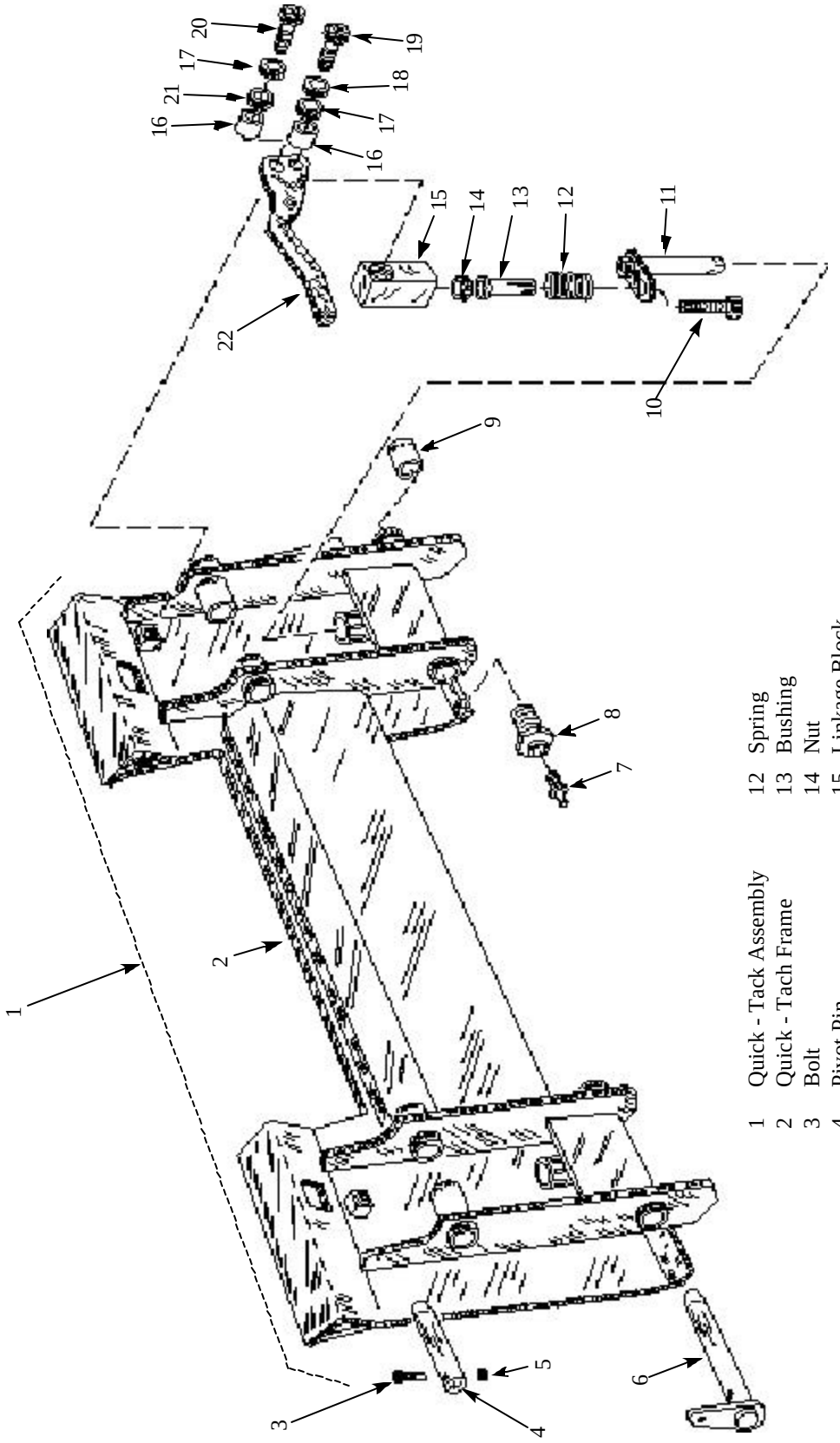
## CHARGING SYSTEM

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

# SECTION 6 MAIN FRAME

# QUICK - TACH 6.1

**Universal Quick - Tach Assembly**




| | | | |
|---|---|---|---|
| 1 | Quick - Tack Assembly | 12 | Spring |
| 2 | Quick - Tach Frame | 13 | Bushing |
| 3 | Bolt | 14 | Nut |
| 4 | Pivot Pin | 15 | Linkage Block |
| 5 | Lock Nut | 16 | Pivot Bushing |
| 6 | Pivot Pin | 17 | Flat Washer |
| 7 | Grease Fitting | 18 | Lock Washer |
| 8 | Reducer Bushing | 19 | Bolt |
| 9 | Hardened Bushing | 20 | Bolt |
| 10 | Bolt | 21 | Belleville Spring |
| 11 | Lock Pin Assembly (L & R) | 22 | Lock Handle (L & R) |

C1207

# 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 tack must be lubricated every 8 hours of operations. More often in dirty applications.

Lubricate the quick - tach as follows:

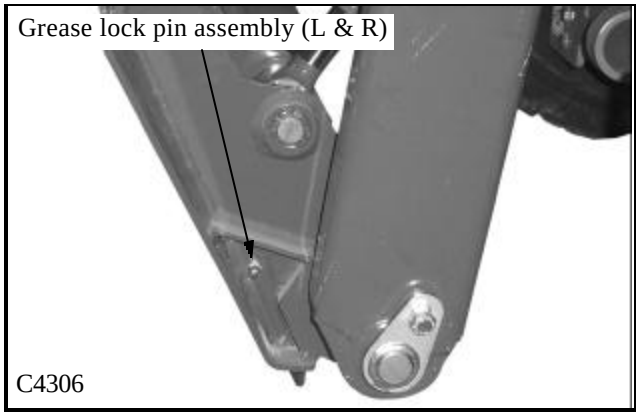
1 Remove any attachment from the loader, raise the boom arms, engage the boom supports, engage the parking brake and shut off the engine.

2 Clean any dirt build up around the linkages.

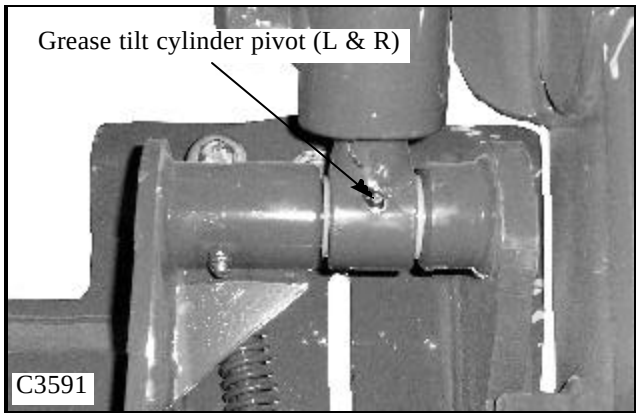
3 Lubricate the grease fittings on each of the lock pin bushings with a good quality multi purpose lithium based grease until excess shows. (fig. C4306)

4 Lubricate the tilt cylinder pivot pins. (fig. C3591)

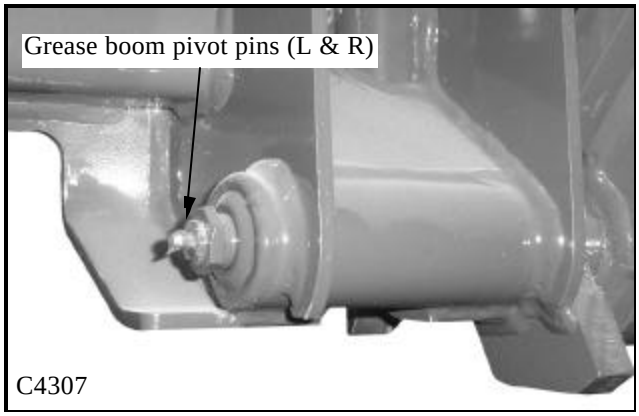
5 Lubricate the lower boom pivot pins. (fig. C4307)



C4306



C3591



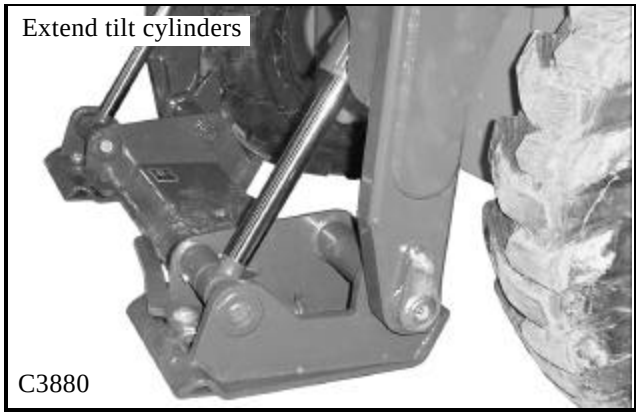
C4307

6

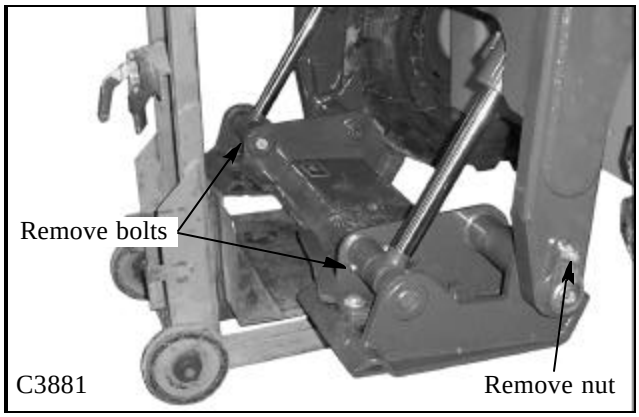
# QUICK - TACH 6.1

## Removal

1 Remove any attachment and lower the boom arms.
2 Start the engine and extend the hydraulic tilt cylinders approximately 12 inches. (fig. 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. (fig. C3881)
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 - attach. (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 - tack or boom arms. (There are two different types). (fig. C3881)
8 Remove the pivot pins using a brass drift punch and hammer.
9 Remove the quick - tach from the loader boom arms.



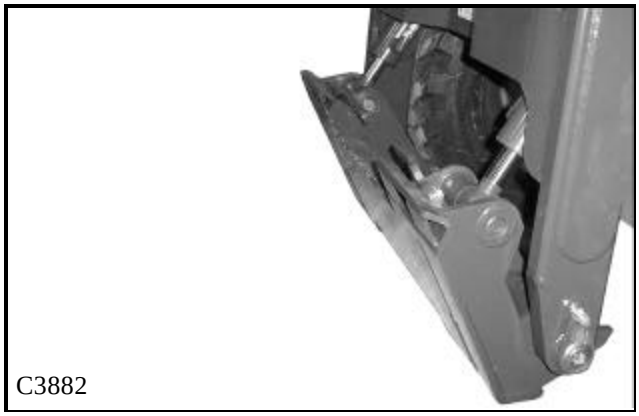
C3880



C3881

## Installation

Upon installing the quick - tach to the loader boom arms:
1 Make sure all pivot pins and bushings are good condition. Do not reuse worn parts. Replace pins and hardened bushings as required.
2 Use the floor jack to assist installing the quick - tach to the loader boom arms. (Or lay it down on your 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 Swing the quick - tach up and align the 2 tilt cylinder pivot bushings with the quick - tach bushings and install the pins and retaining bolts and lock nuts.
5 Lubricate all pivots until excess grease can be seen flowing out around the bushings and pins.


C3882


C4214

# 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. C1829)

2 Remove the bolt retaining the lock handle to the quick - tach frame. (fig. C1829)

3 Pull the locking pin and linkage out of the guide bushing. (fig. C1836)

4 Loosen the jam nut on the linkage block. Remove the bolt holding locking pin to the lock linkage block.

5 Separate the parts and inspect the spring for broken or sacking (compressed) coils. (fig. C1830) 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. C1830)

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

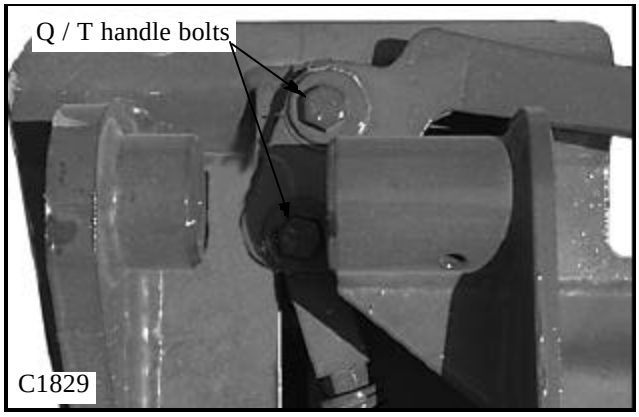
Upon assembling the locking mechanism to the quick - tach, use 242 Loctite (blue) on all the mounting nuts and bolts.

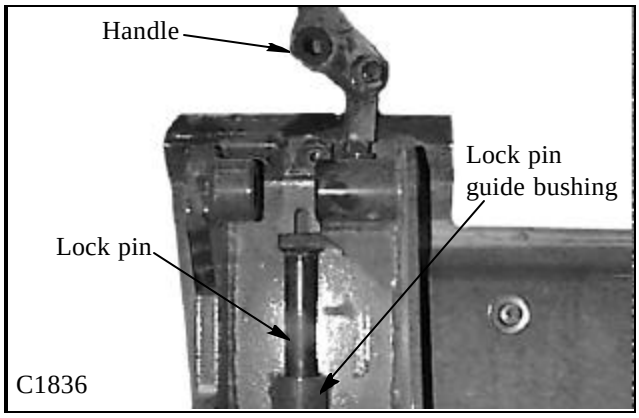
1 When assembling the locking pin to the spring, bushing and linkage block, adjust the length of the bolt to 4 1/16 inches. (103mm). This is measured from under the head of the bolt up to, and against the linkage block. (fig. C1818) **This is very crucial for lock pin engagement to the attachment.**

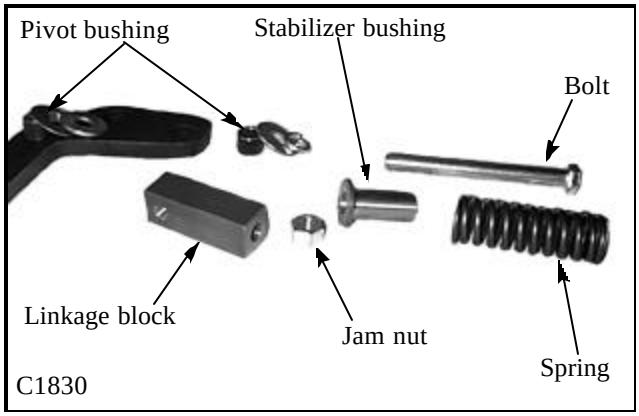
2 Replace the rest of the lock mechanism in the reverse order above.

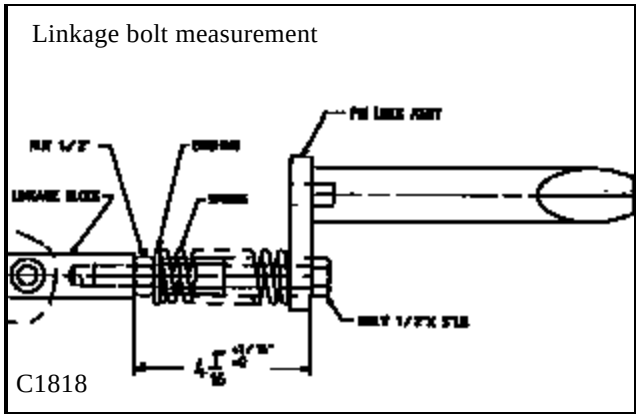
3 Lubricate all pins and bushings.

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)



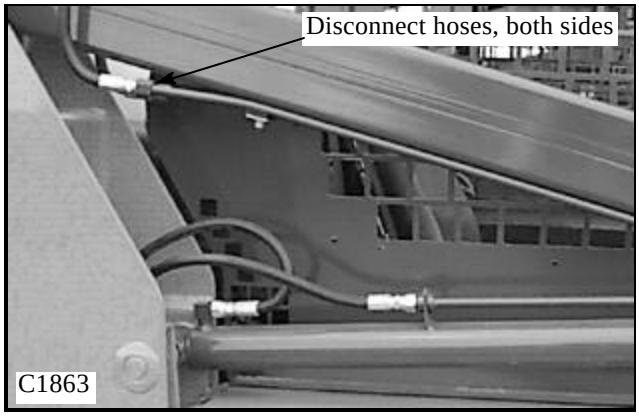



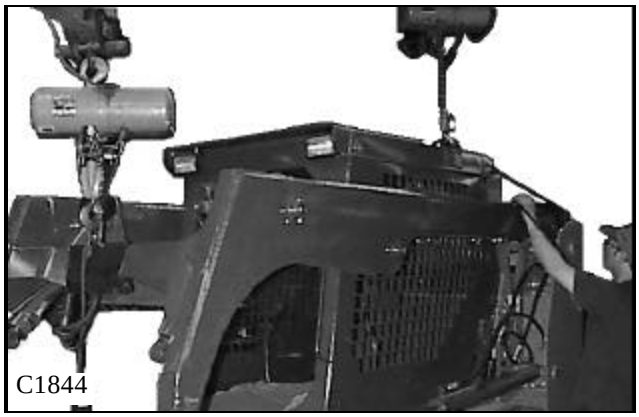

6

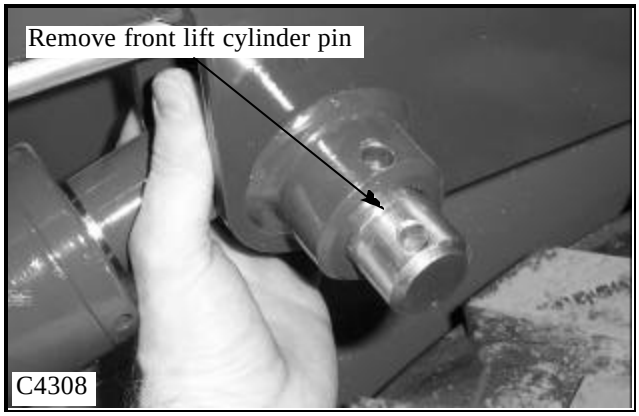
# BOOM ARMS 6.2

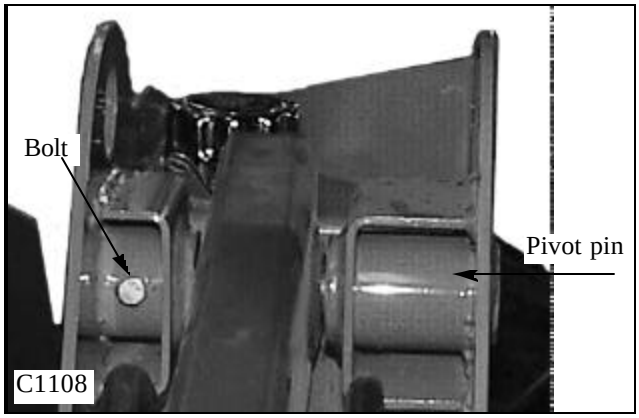
## Removal

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. C1863)
5 Fasten chains or lifting straps with an adequate capacity to sustain the weight of the boom arms. Most of the weight is at the front of the boom arms. Attach one set of straps as close as possible to the front, (fig. C1844), and the other set approximately half way toward the rear.
6 Raise the boom arms, with an over head hoist, enough to take the weight of the lift cylinders. Remove the bolts from the pivot pins in the lift cylinders that are mounted in the boom arms. (fig. C4308)
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. C1108)
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 SUPPORTS 6.3

## Boom Arm Supports

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

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

1 Raise the boom arms, extent the boom supports and allow the boom arms to lower onto the supports. Do not pressure the hydraulic system against the boom supports.

2 Shut off the engine and engage the parking brake.

3 Measure the distance the boom support pins are protruding past the inner boom arm plate. Proper adjustment should have the support pin protruding past the inner boom arm plate by 1/4 of an inch. (6.5mm) (fig. C1823)

4 Adjust the engagement depth by removing the 3 screws each on the left and right dash panels to access the support pins and linkage. (fig. C1397) Only remove one side if there is only one side to be adjusted.

5 Loosen the jam nut on the support pin linkage. (fig. C1637) Use care to not damage the plastic center dash panel.

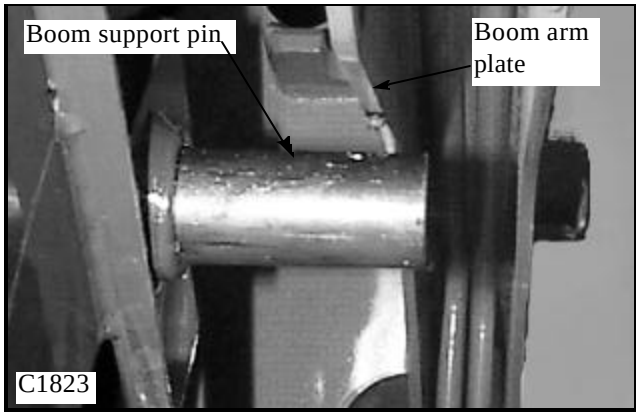
6 Screw the pin in or out the amount necessary to get the proper adjustment for support pin engagement on the boom arms.

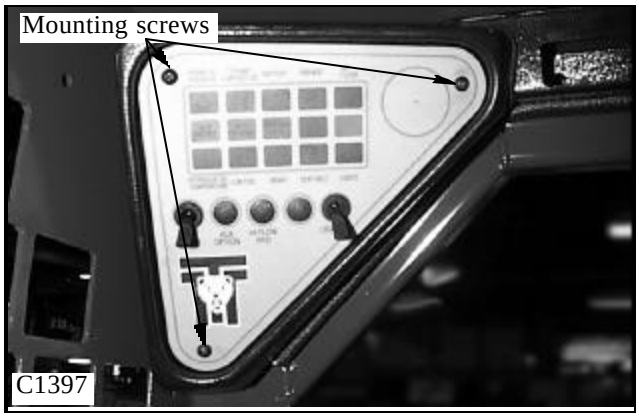
7 To remove the support pins and linkage, remove both dash panels and pods to access the center boom support panel bolts. (fig. C1647)

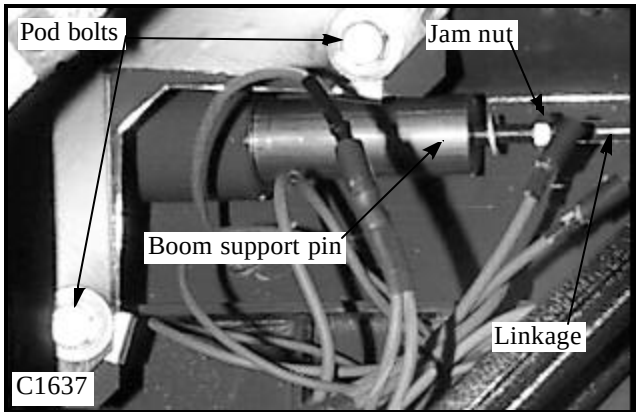
8 Remove the bolts and center panel and the support pins and linkage may be removed, serviced or repaired.

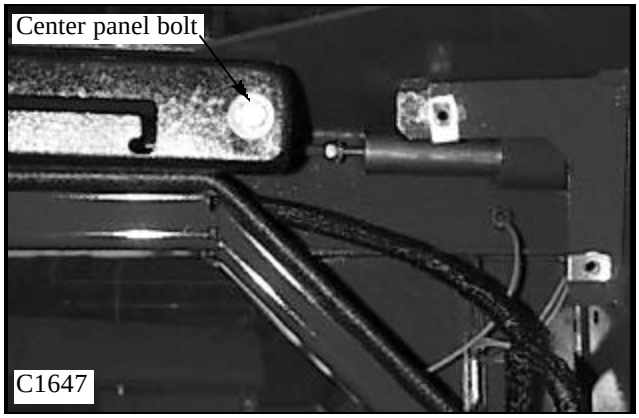
9 Apply 242 Loctite (blue) to the nut and tighten it against the support pin when installing.

10 Lubricate the boom support pins and replace the dash panels.



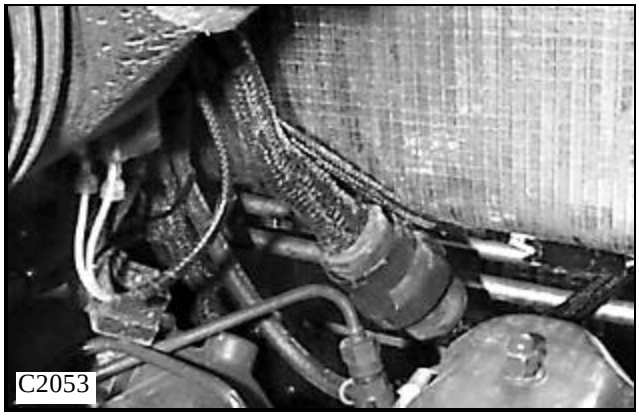



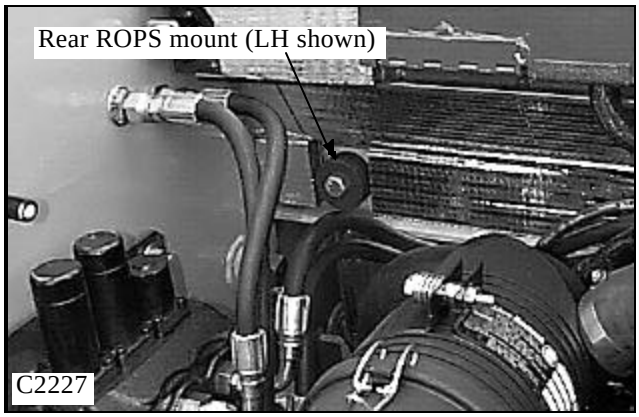




6

## 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. C2053)
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. C2228) and 2 in the rear. (fig. C2227)
9 Attach chains or straps with a sufficient load rating to safely raise the ROPS from the frame. (fig. C2231)
10 Raise the ROPS using an over head hoist. Check for wiring that may still be connected and remove as required.


C2053



C2227

**IMPORTANT**

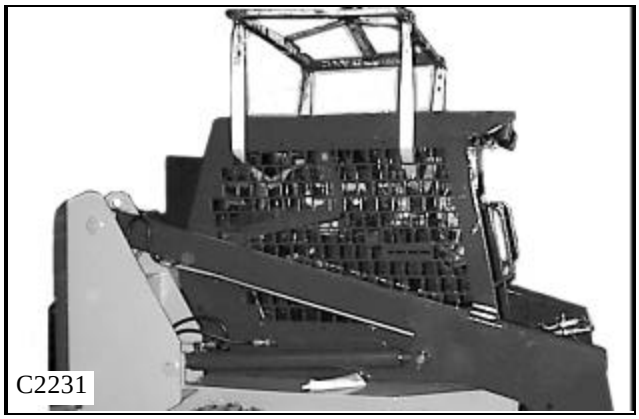
**Check the ROPS mounting isolators every 150 hours for deterioration to prevent unwanted vibration and movement.**

C2228

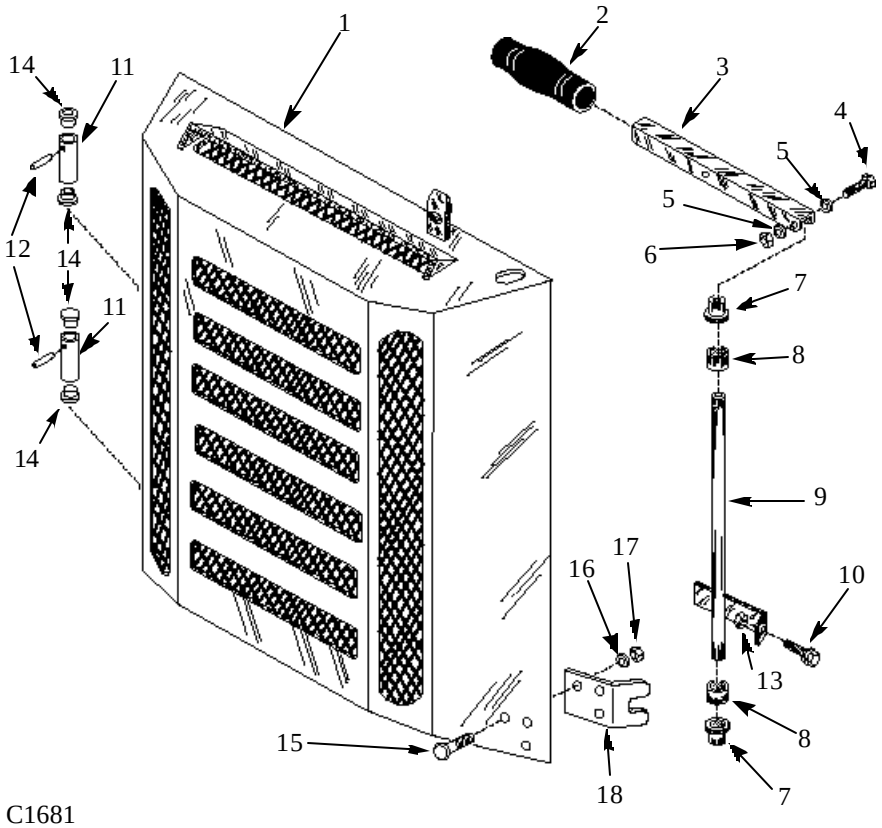
6

## Installation

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


C2231

# REAR DOOR 6.5

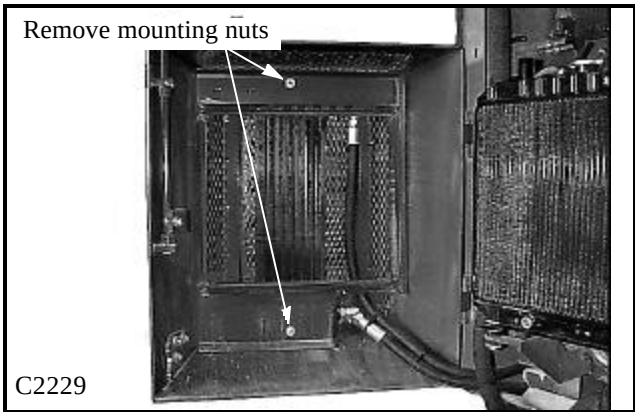



C1681

1 Rear Door
2 Rubber Grip
3 Door Handle
4 Bolt
5 Washer
6 Nut
7 Bearing
8 Set Collar
9 Lock Assembly
10 Bolt
11 Pivot Pin
12 Split Pin
13 Nut
14 Bearing
15 Bolt
16 Lock Washer
17 Nut
18 Door Guide

## Removal

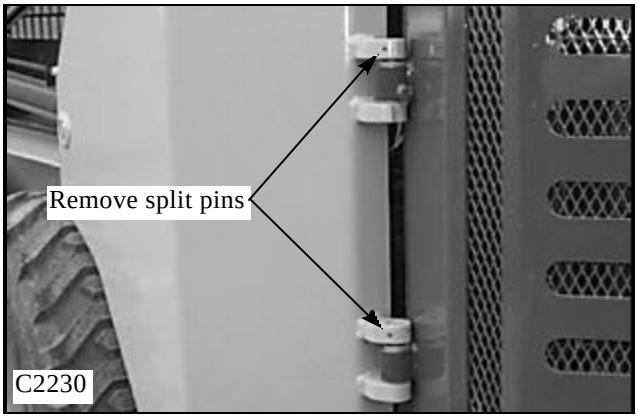
1 Open the rear door and remove the 2 nuts retaining the door baffle and hydraulic oil cooler to the door. (fig. C2229)
2 Attach chains to the rear door.
3 Using a hoist, raise the chains to take the weight of the door off the pivot pins.
4 Remove the split pins in the door pivot pins. (fig. C2230) Remove the pivot pins from the frame.
5 Replace any worn pivot bushings or pins as required.




C2229

## 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.
4. Adjust the oil cooler shroud so that it presses against the engine radiator when the rear door is closed. See section 1-6




C2230

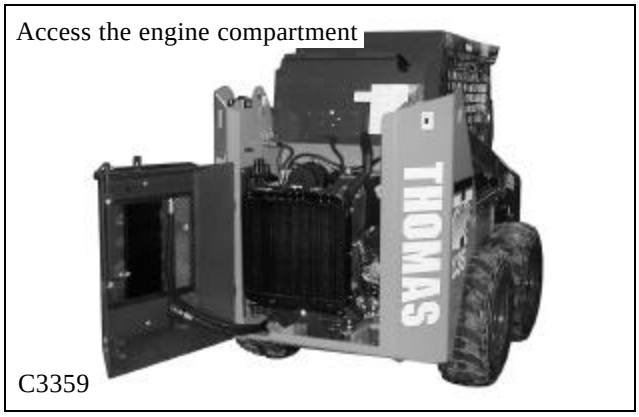
# SECTION 7 ENGINE

# ENGINE MAINTENANCE 7.1

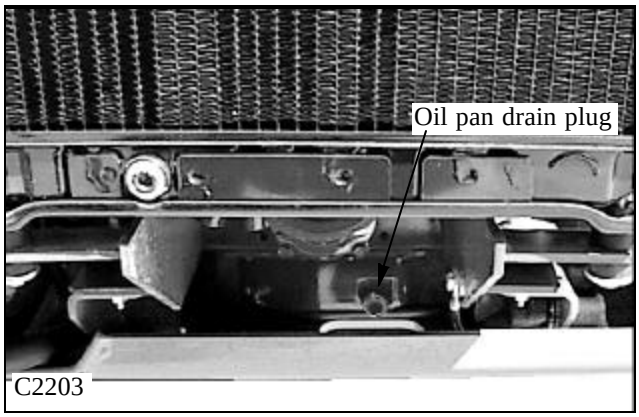
## Lubrication System

**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.

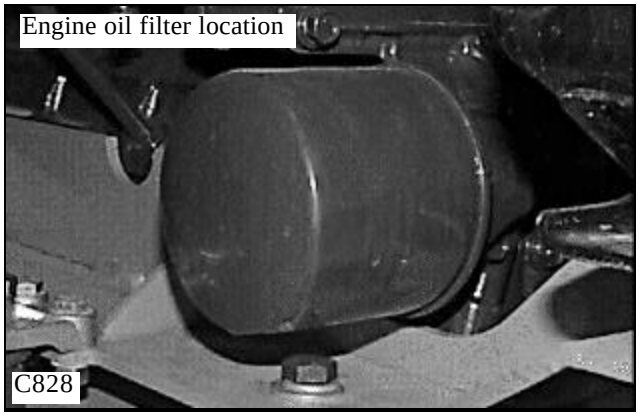
1 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C3359)



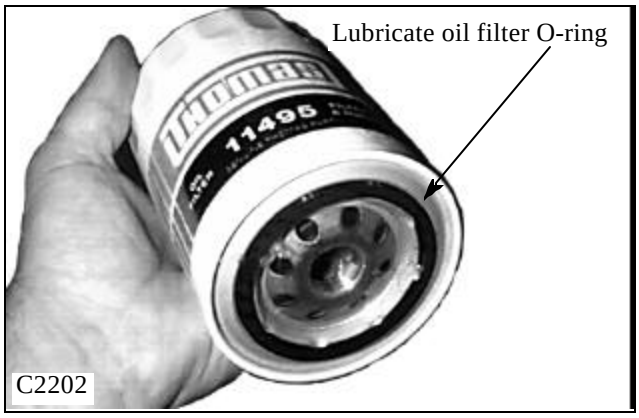

2 Remove the oil pan drain plug located at the bottom of the engine oil pan to drain the oil. Have a catch container ready to contain approximately 8.5 qts (8 liters) of fluid. (fig. C2203)




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. C828)
4 Check the oil filter mounting adapter area after removing the oil filter and check for dirt on the sealing surface and to make sure the oil filter O-ring seal has not stuck to the oil filter adapter.

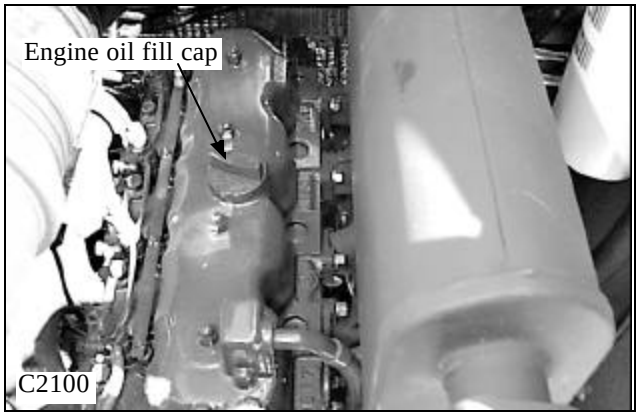



5 Lubricate the new oil filter O-ring seal with engine oil and install to the engine hand tightened. (fig. C2202)
6 Replace the oil pan drain plug. Make sure the seal is still in place and in good condition. Tighten the oil pan drain plug not exceeding 33 ft lbs (45 Nm).

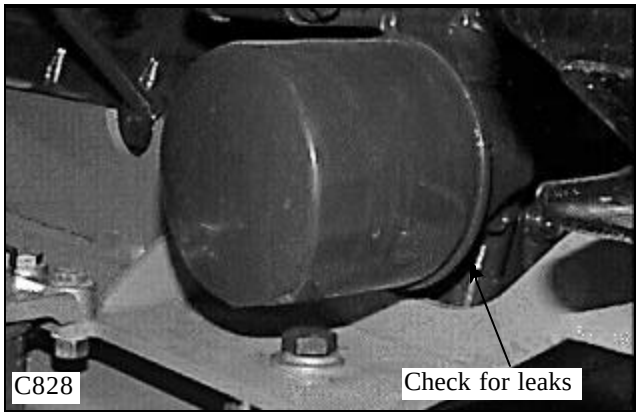


## Lubrication System (cont'd)

7 Remove the oil fill cap located in the engine rocker arm cover. (fig. C2100) Add 8 qts (7.5 liters) of 10W30 API classification CF engine oil. Replace the fill cap in the rocker arm cover.

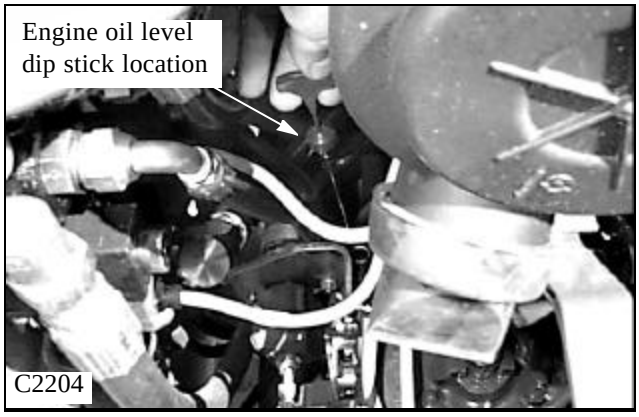


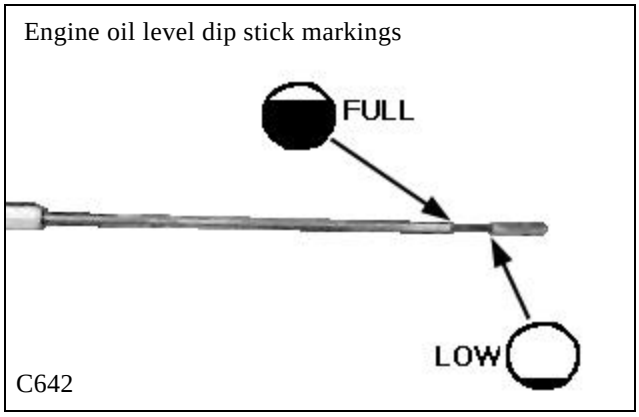

8 Start the engine and check for leaks around the oil filter and oil pan drain plug. (fig. C828) Allow the engine to operate for approximately 5 minutes and then shut it off.




9 Check the level of the engine oil. (fig. C2204) Add oil as required to bring the oil to the top mark of the engine oil dip stick. (fig. C642) Do not over fill.

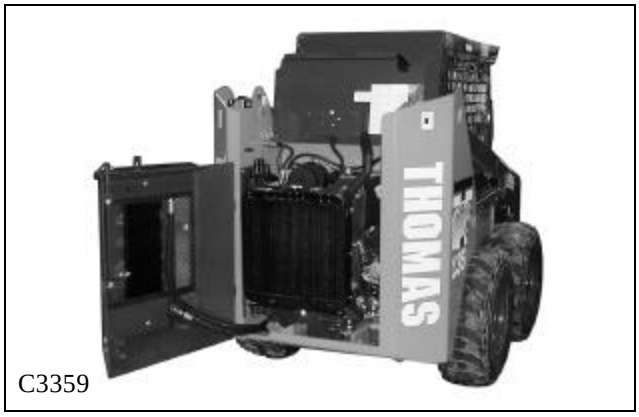
Change the engine oil every 75 hours and the engine oil filter every 150 hours.



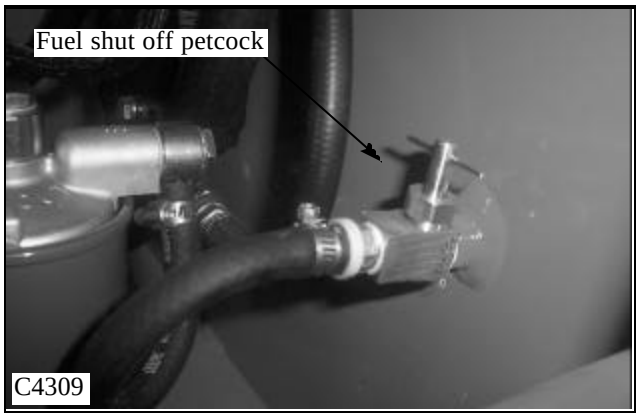
# Fuel System

**Fuel Filter:**
The fuel filter is a spin on type 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.

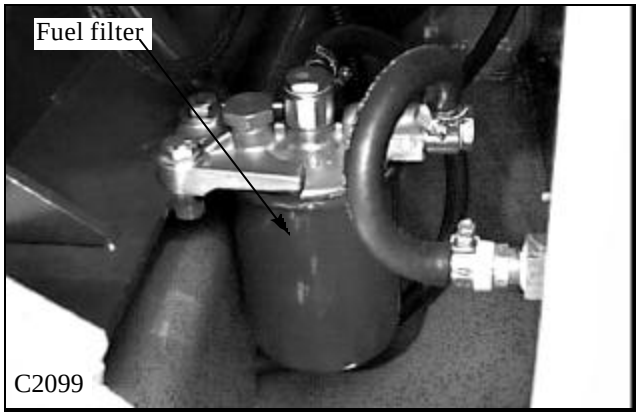


C3359

1 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C3359)
2 Close the fuel line shut off petcock located on the lower right hand side of the fuel tank. (fig. C4309) This will prevent fuel loss due to siphoning.
3 Remove the fuel filter using a filter wrench. (fig. C2099) 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.



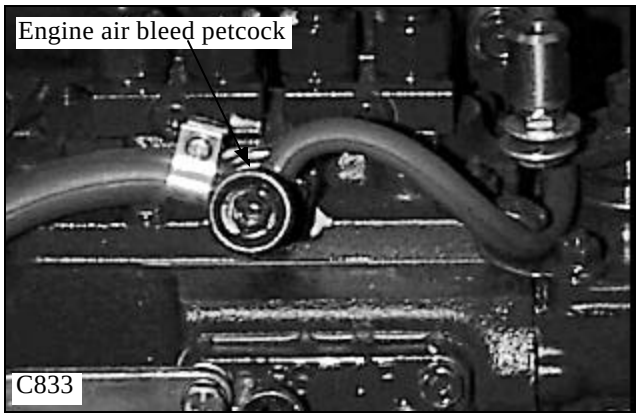
C4309



C2099

6 Open the engine fuel line / air bleed petcock located just to the left of the fuel injection pump. (fig. C833) 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.

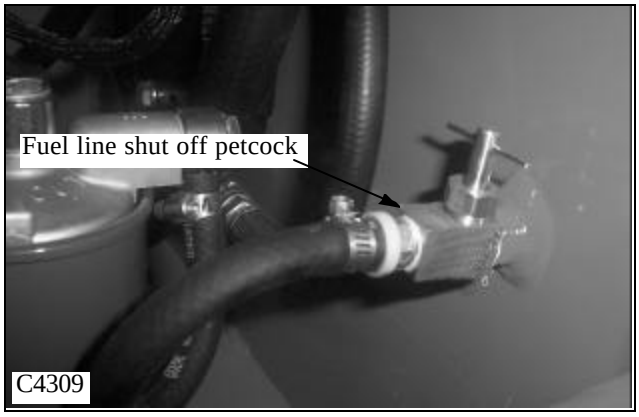


C833

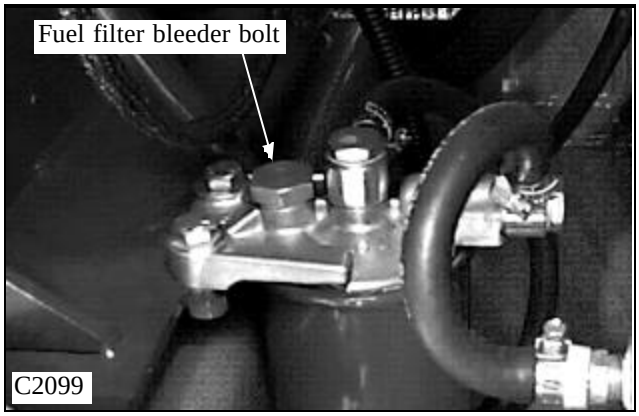
## Fuel System (cont'd)

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

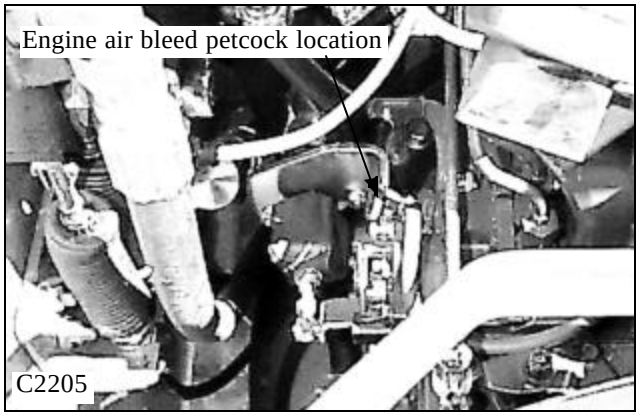
1 Replenish the fuel reservoir (tank) with a minimum of 10 gallons (45 liters) of fuel.
2 Make sure the fuel line shut off petcock is fully open. (fig. C4309)

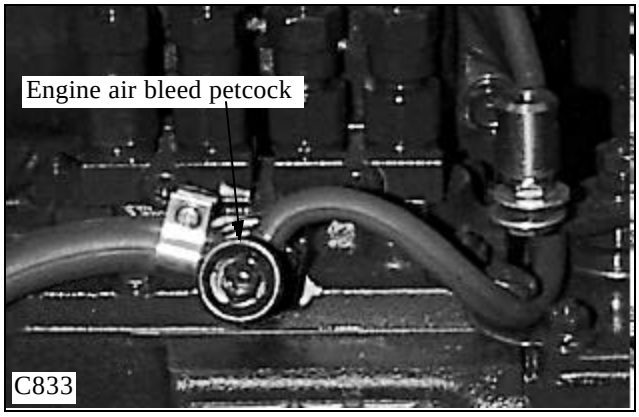



3 Loosen the fuel filter bleeder bolt and allow the fuel to siphon through the fuel line and filter. (fig. C2099) Tighten the fuel filter bleeder bolt.




4 Loosen the air bleed petcock located to the left of the fuel injection pump. (fig. C2205, C833)
5 Turn the engine over with the starter until the engine starts to smoke. Do not engage the starter for more than 15 second intervals. Allow the starter to cool between starting attempts for 1 (one) minute.
6 Pre- heat the and start engine. Allow to operate at idle speed for 5 minutes. Shut off the engine.
7 Close the air bleed petcock.



# ENGINE MAINTENANCE 7.1

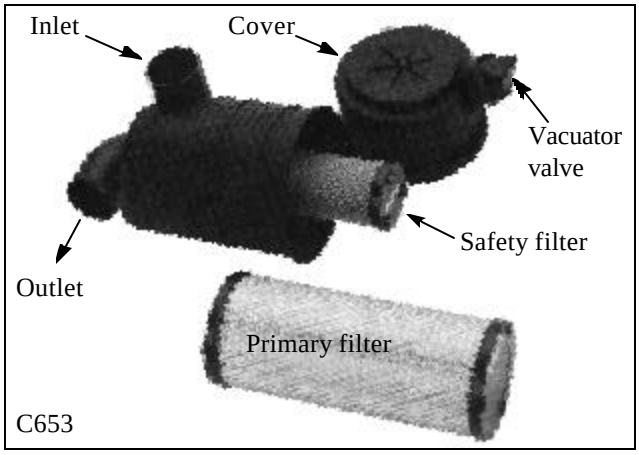
## Air Filter

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 the 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

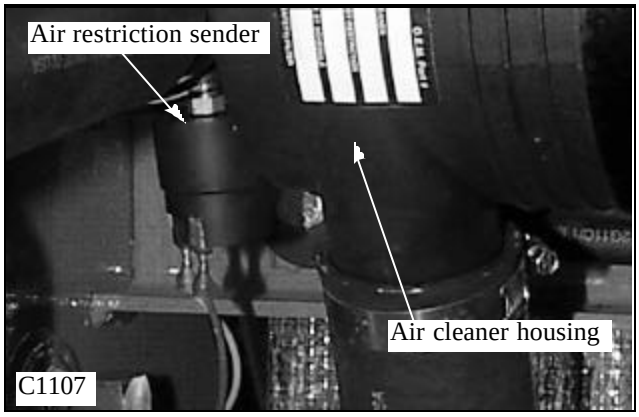
**Checking the Restriction Sensor:**

1 The air filter restriction sender wires should be visually checked daily for breaks and proper connection. (fig. C1107)

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.





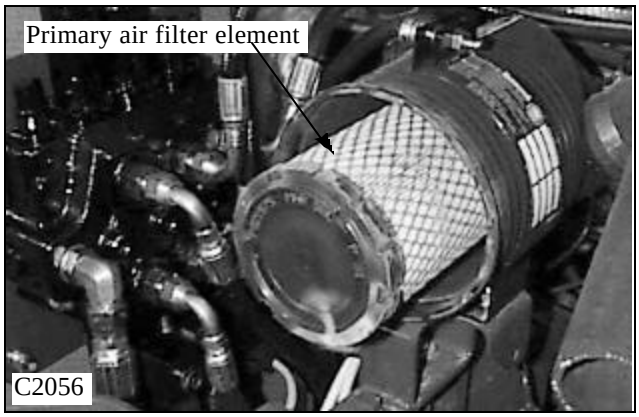
**IMPORTANT**

**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. C2054)

2 Pull straight out on the primary element to remove from the air cleaner housing. (fig. C2056) Do not twist or force the filter. This may damage the sealing area around the end of the air filter element.



## Air Filter (cont'd)

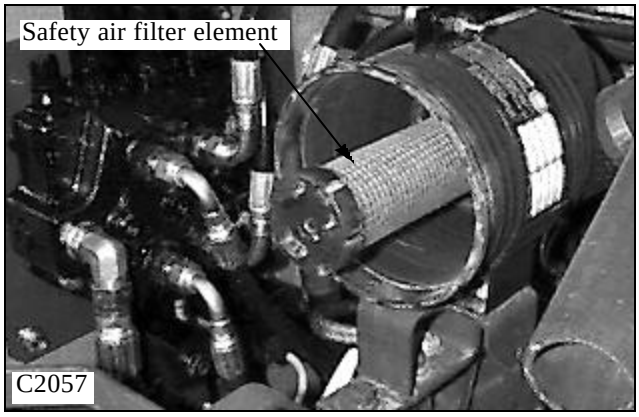
3 If required, remove the safety air filter element by pulling straight out of the air cleaner housing. (fig. C2057)

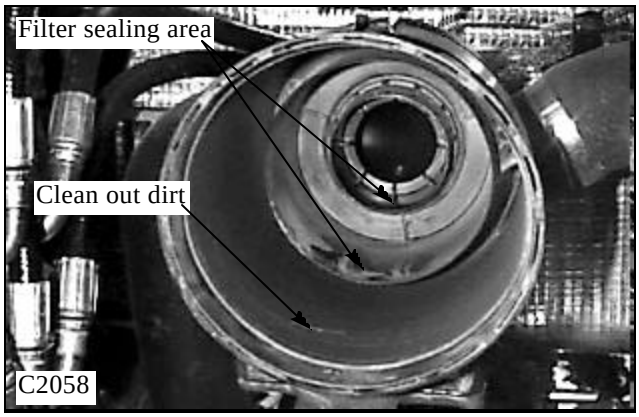
4 After removing the air filter elements, carefully wipe out any excess dirt from the air cleaner housing. (fig. C2058)

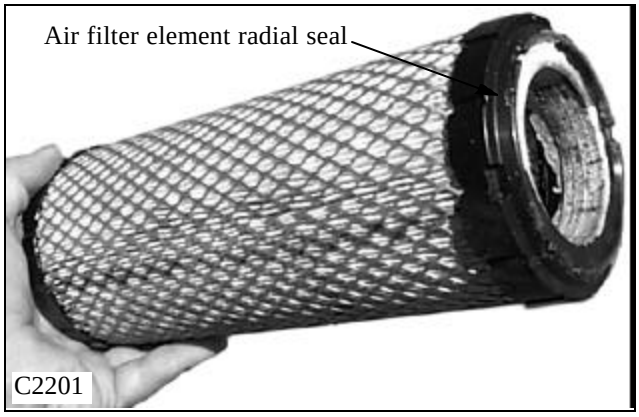
5 Check the air filter element seal before installing to the air cleaner housing. (fig. C2201) Be sure the seal is not damaged, torn or gouged. Do not use a filter with a damaged seal.

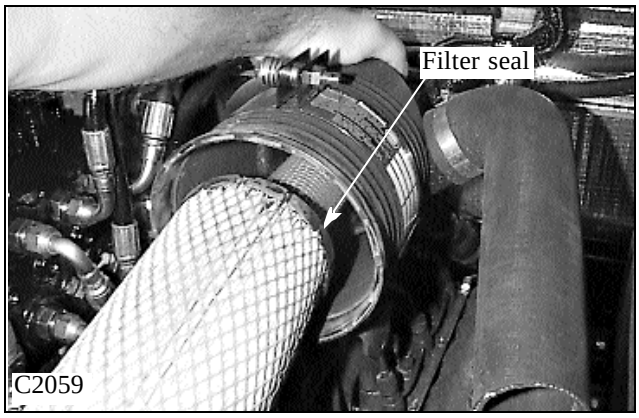
6 When installing the air filter elements to the air cleaner housing. support the back of housing with one hand and push the air filter element into position as gently as possible. (fig. C2059)

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.**



# 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.

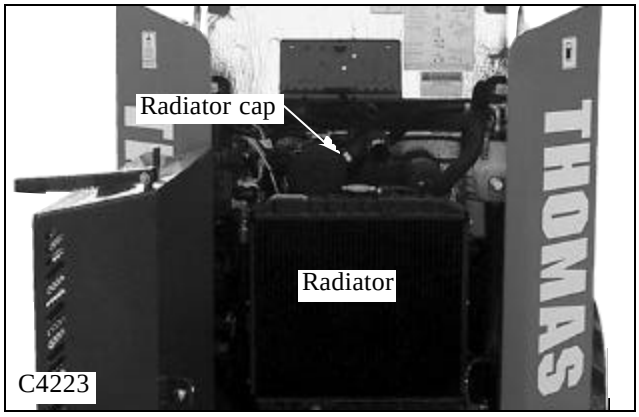
The cooling system should always be checked when the engine is cool.

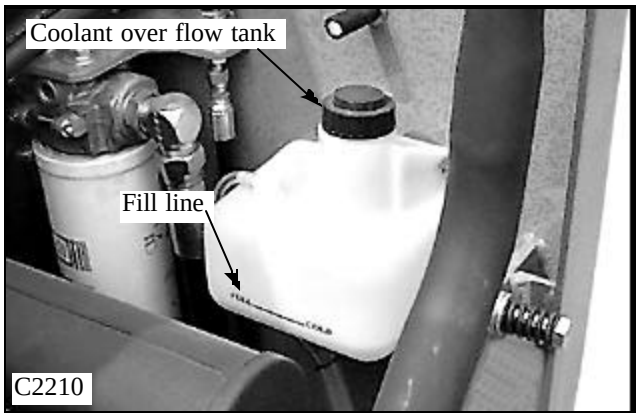
Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.

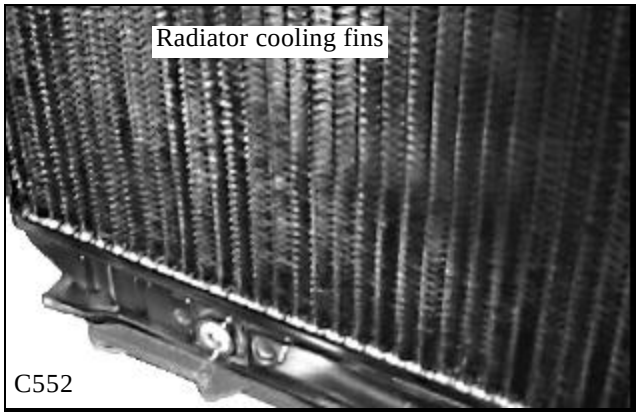
1 Access the engine compartment by opening the rear door and lifting the engine compartment cover.

2 Visually inspect the radiator cooling fins for dirt or debris build up that may be blocking air flow through the radiator. (fig. C552) Blow any dirt or debris out with compressed air and / or water. Do not exceed 40 psi (2.7 kg / $cm^2$) 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. C2210) Add a 50 / 50 mixture of ethylene glycol and water as required.




**WARNING**

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

**CAUTION**

**To prevent radiator fin damage, do not use air pressure higher than 40 psi (2.7 kg / $cm^2$)**

**WARNING**

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

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**

## Cooling System (cont'd)

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

5 Attach a radiator tester to the radiator cap. (fig. C173) Apply 12.8 psi (0.9 kg / $cm^2$ ) pressure to the radiator cap. The pressure should not drop more than 4.3 psi (0.3kg / $cm^2$ ) 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.

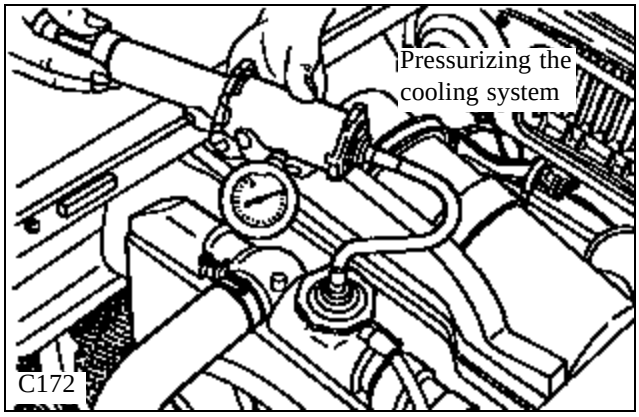
2 Remove the radiator drain plug located lower left corner of radiator. (fig. C2203) Be prepared to contain 3.2 gal (12 liters) of fluid.

3 Open the engine drain petcock located next to the engine fuel pump, just below the engine solenoid shut off. (fig. C1060) Close the drain petcock after the engine is completely drained.

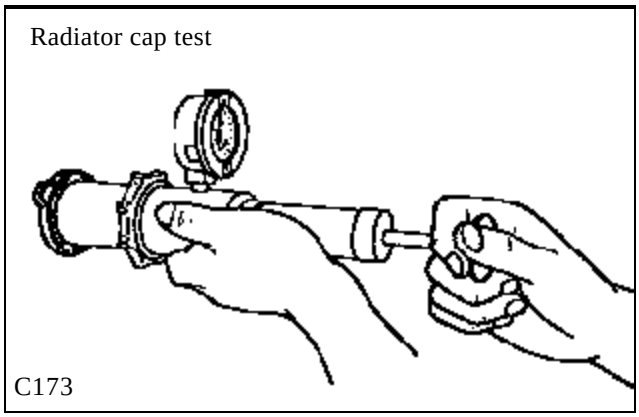
**Note:** Attaching a piece of 5 / 16" (8mm) hose to the drain petcock and routing to a container, lessens waste and fluid clean up. Please dispose of waste fluid in an environmentally friendly manner.

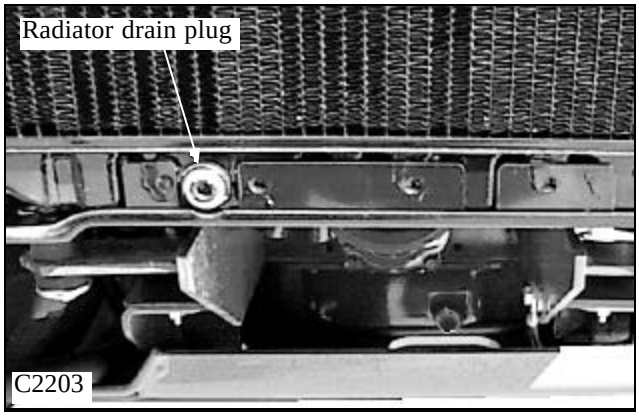
4 Replace the radiator drain plug using teflon tape or equivalent on the threads. Be sure to tighten the drain plug so it does not protrude past the radiators lower mount. This will prevent interference with the hydraulic oil cooler.

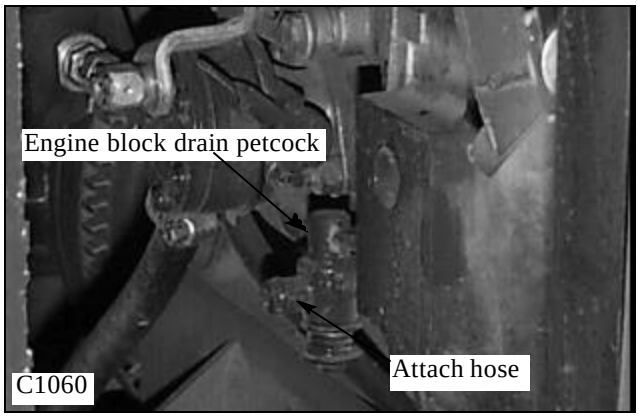
5 Pre - mix the engine coolant, ethylene glycol, to equal parts of water. (50 / 50 ratio) Add the mixed coolant to the engine radiator.The cooling system will hold approximately 3.2 gal (12 liters) of coolant for the 137 / 153 and 1.8 gal (7 liter) for the 1300 /135. Never use coolant undiluted. Pure coolant does not absorb and pass heat efficiently. It will also gel in cold weather.




Radiator cap test




7

# Fan Belt Adjustment

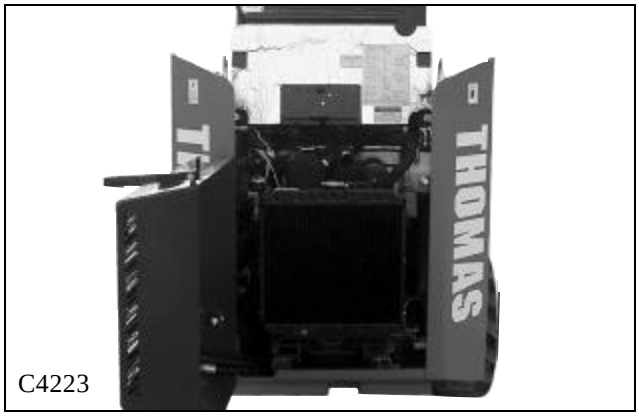
The fan (alternator) drive belt should be checked daily for tension and wear. The drive belt should be replaced promptly when fraying of the belt cords or cracks in the rubber are observed. Failure to replace the drive belt could lead to slippage or complete failure, causing the engine to over heat and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

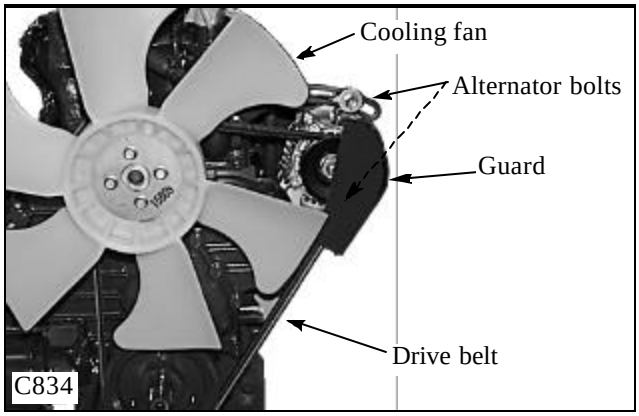
**To Adjust the Fan Belt:**

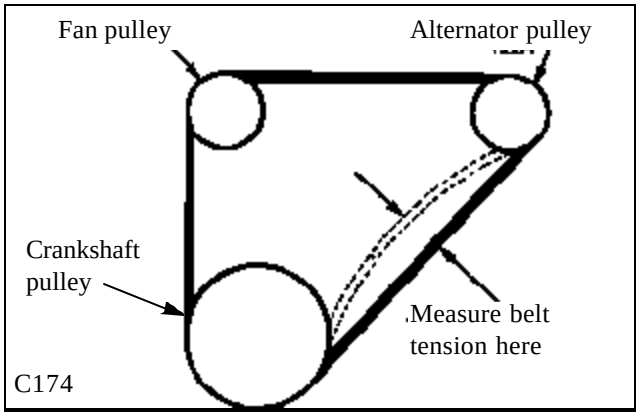
1 Park the loader on a level surface, lower the boom arms, engage the parking brake and shut off the engine.
2 Access the engine compartment by opening the rear door and lifting the engine cover. (fig. C4223)
3 Locate the drive belt. Fig. C834 shows the drive belt without the radiator obstructing the view.
4 Check the drive belt tension midway between the alternator and crankshaft drive pulley. (fig. C174) Correct tension is 3 / 8 ~ 1 / 2'' deflection @ 22 lbs force (10 ~ 12mm deflection @ 98 newtons force).

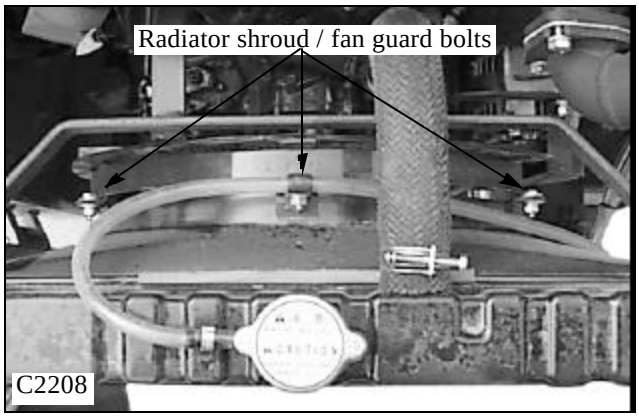
**Fan Belt Replacement:**

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.C2208)
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.



# Universal Joint

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

**To Service the U- Joint:**

1 Remove any attachment, raise the boom arms, engage the boom supports, engage the parking brake and shut off the engine. Remove the ignition key.

2 Remove the seat assembly. Be sure to disconnect the electrical plug on the seat switch, left hand side.

**WARNING**

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

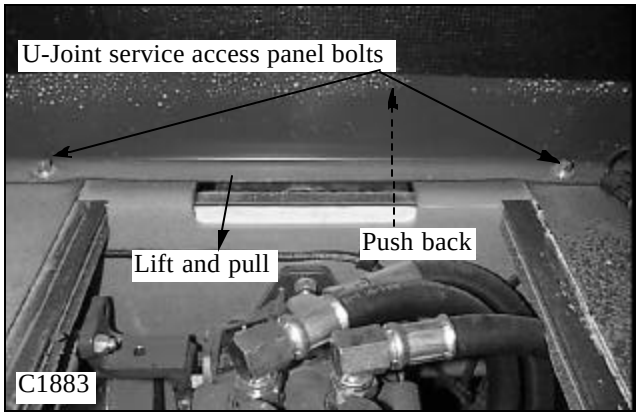
3 Remove the service access panel, located below the battery compartment cover, by removing the 2 bolts and pushing rearward on the top part of the cover, lifting and pulling forward from the bottom. (fig. C1883)

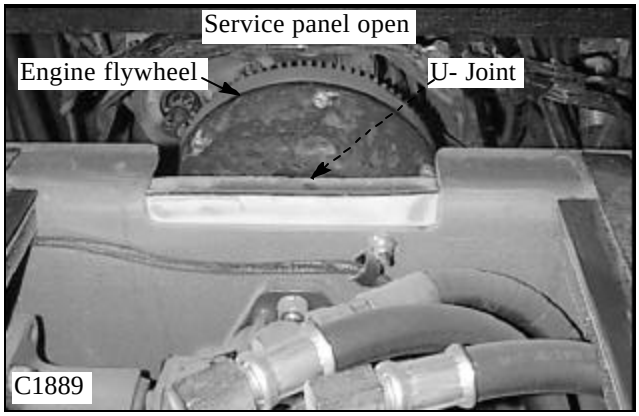
4 Grasp the U- Joint assembly with your hands and rotate the joint left and right, forward and back to check U- Joint wear.

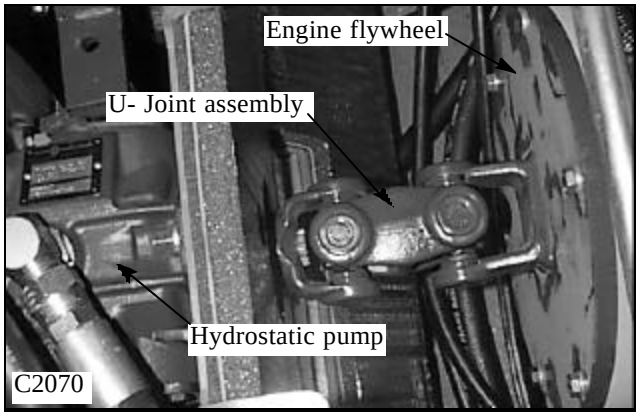
5 Check the condition of the splined yoke and spline on the hydrostatic pump input shaft.

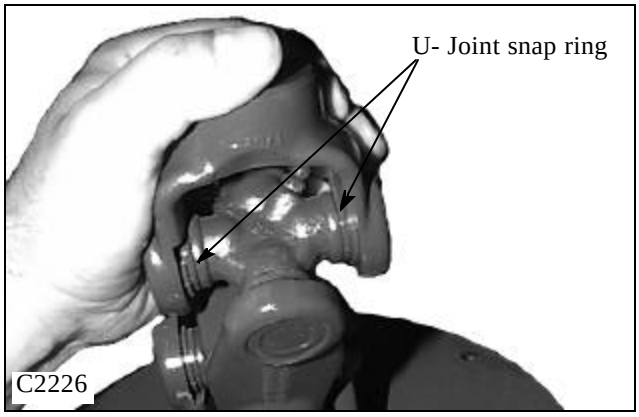
4 Rotate the U- Joint if necessary to locate the grease fittings on the U- Joint crosses. Apply 2 ~ 3 pumps of multi purpose grease to each U- Joint cross.

**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.




7

## 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 0.0071 ~ 0.0087 in (0.18 ~ 0.22mm).**

**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. C2100)

**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 opening 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.

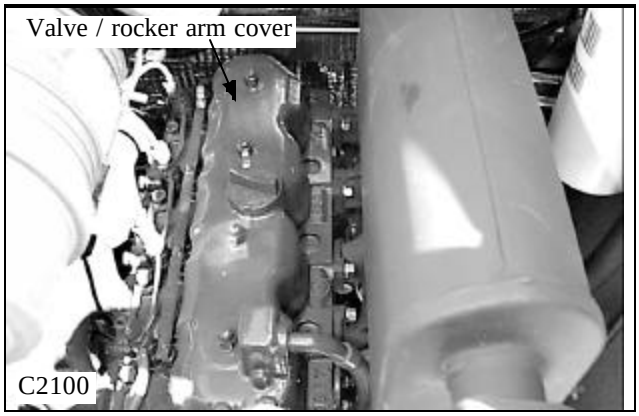
6 Insert a feeler gauge between the rocker arm and the intake or exhaust valve on cylinder number 4. (fig. C551) If necessary, loosen the jam nut on top of the rocker arm and turn the adjustment screw to acquire correct valve clearance. **Correct valve clearance is 0.0071 ~ 0.0087 in (0.18 ~ 0.22mm).**

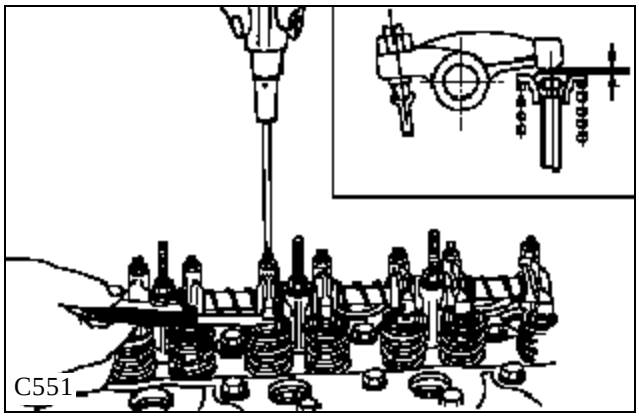
7 Rotate the engine after checking / setting cylinder number 4 valves, until cylinder number 4 intake valve start to open. This position means that cylinder number 1 (one) is on the compression stroke and can have the intake and exhaust valves checked and / or adjusted. **Correct valve clearance is 0.0071 ~ 0.0087 in (0.18 ~ 0.22mm).**

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 0.0071 ~ 0.0087 in (0.18 ~ 0.22mm).**

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 5.1 ~ 6.6 ft lbs (6.9 ~ 8.8 Nm).



## 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 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. (fig. C1887)(fig. C1692) 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. C2211) 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.

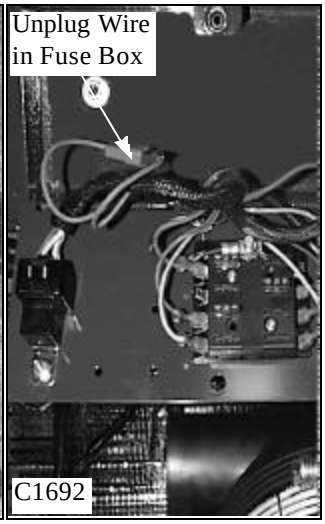
8 Connect a compression tester (see Special Tools in Section 8) to the cylinder to be tested. (fig. C179) Be sure to use the correct thread on the adapter screwed into the injector hole.

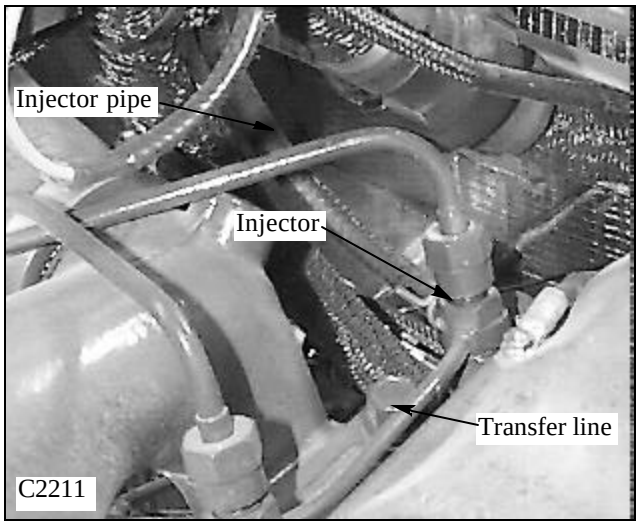
9 Rotate the engine with the starter (200 ~ 300 rpm) 2 ~ 3 complete revolutions. Note the compression reading on the gauge. Repeat the process again to verify the first test reading.

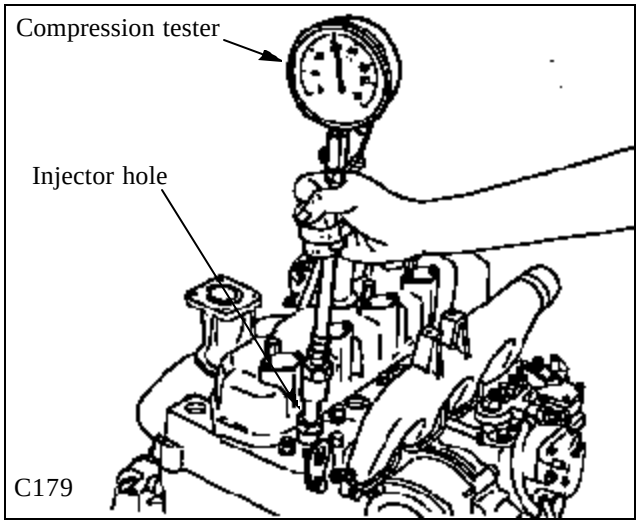
10 Continue the compression test and the remaining cylinders keeping written notes of all the registered test readings.

11 Compare the compression test readings with the specifications given in Section 7.4, pg. 7-24, Engine Specifications.

continued...

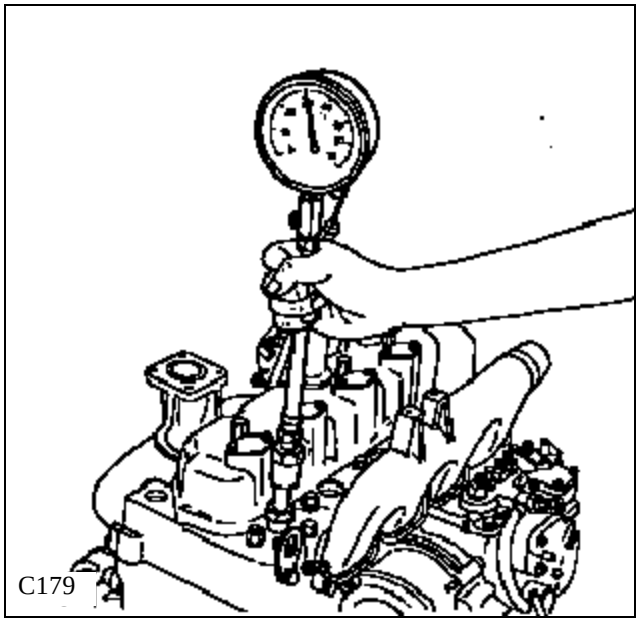



## Compression Testing (cont'd)

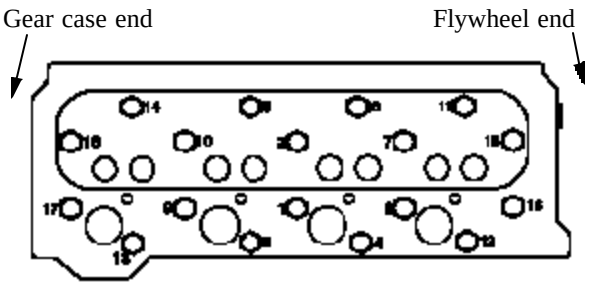
If the compression test reading are low, add a small amount of oil, through the injector hole, to the affected cylinder (s). Recheck the compression test readings. If the readings improve from the first test then the piston rings or cylinder bores are likely worn.
If the compression reading does not 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.


C179

## 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 68.7 ~ 72.3 ft lbs (93.1 ~ 98 Nm).
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.

Cylinder head bolt torque sequence

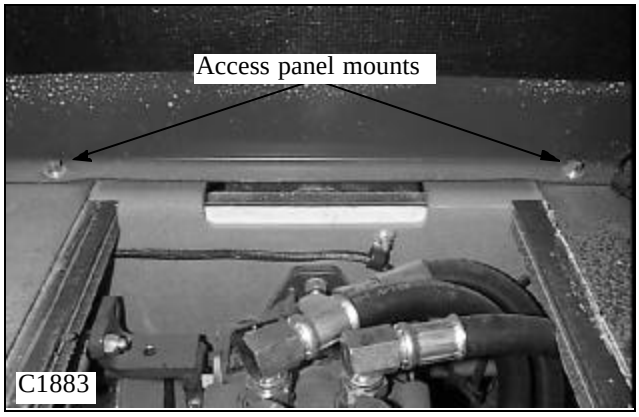


C578

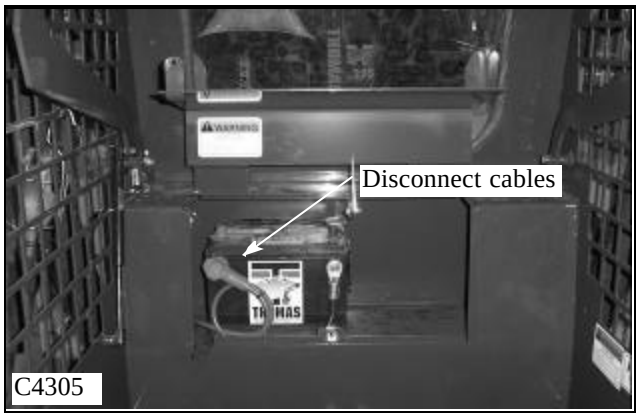
# ENGINE REPLACEMENT 7.3

## Removal

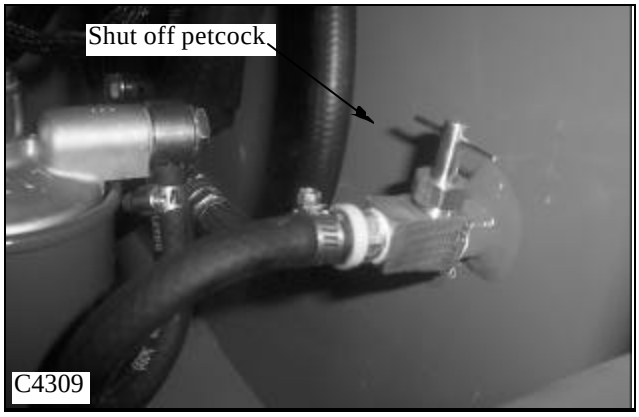
1 Move the loader to a level surface. Raise the boom arms, engage the boom supports, apply the parking brake, shut off the engine and remove the ignition key.
2 Remove the seat, hydrostatic shield and U- Joint service access panel. (fig. C1883)



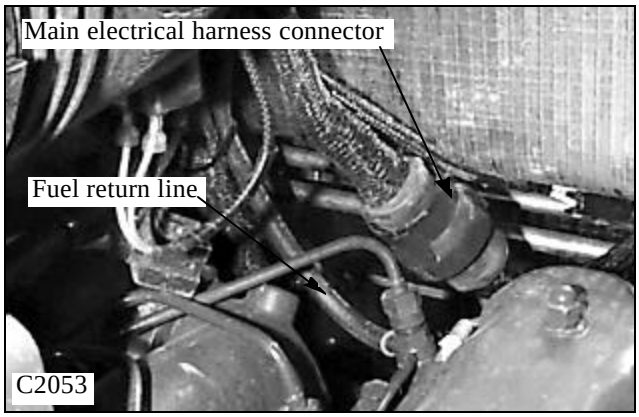

3 Access the battery compartment and disconnect the battery cables from the battery terminals. ( fig. C4305, Ground cable first)




4 Shut off the fuel petcock located at the bottom of the right hand fuel tank, inside the engine compartment.
5 Loosen the fuel line clamp and disconnect the fuel line.




6 Disconnect the fuel return line from the behind the rear fuel injector. (fig. C2053) Disconnect the main Engine harness / ROPS harness plug connector.
7 Drain the engine oil and coolant. See Section 7.1 Lubrication system and Cooling System.

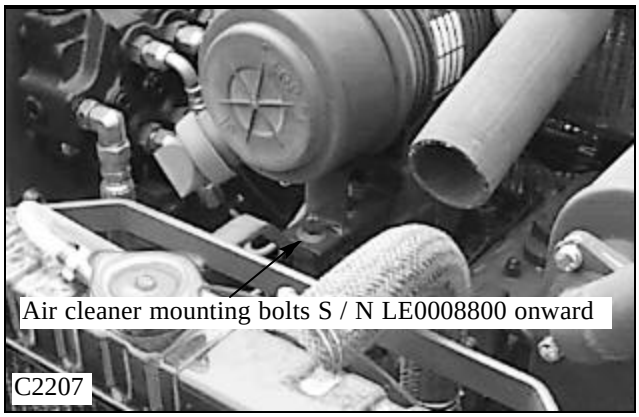


## Removal (cont'd)

8 Disconnect the air filter sensor wires located at the rear of the air cleaner canister. Loader S / N's LE008500 ~ 8799 will need to have the compartment cover / air cleaner assembly removed. (fig. C1055)

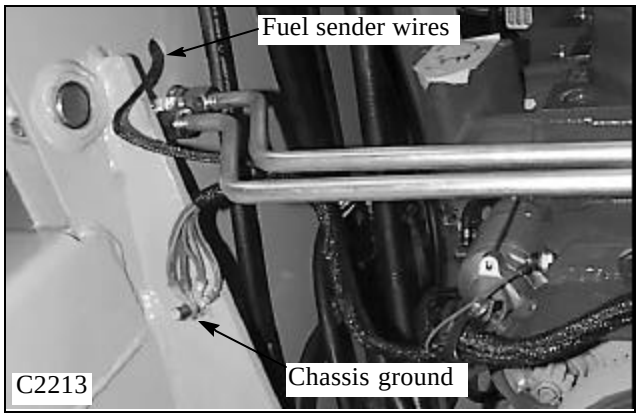

9 Remove the exhaust system from the loader. Cover or plug any open exhaust ports to the engine.

11 Remove the air cleaner canister assembly. (fig. C2207) S / N LE0008800 onward shown. Plug or cover any open air lines to prevent contamination.



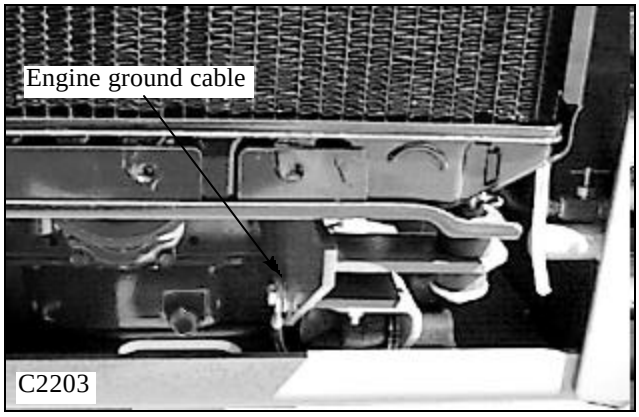

10 Disconnect the hoses going to the coolant over flow tank, or remove the bolts holding the tank to the loader frame. (fig. C2210)


12 Remove the ground wires from the chassis ground bolt. (fig. C2213) Disconnect the wires going to the fuel level sender in the fuel tank.

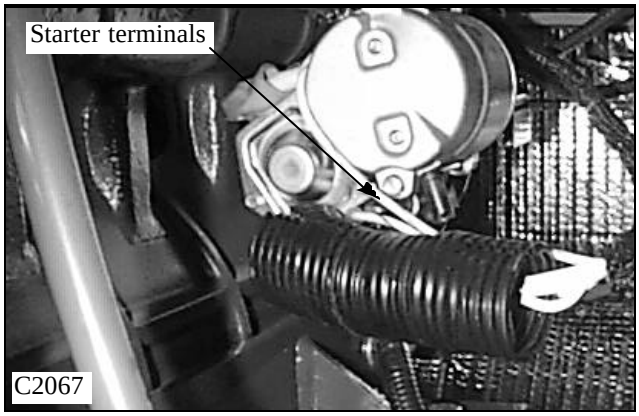


## Removal (cont'd)

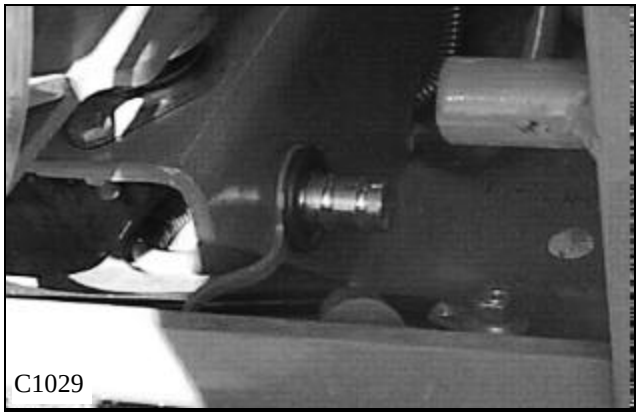
13 Disconnect the ground straps (cables) mounted from the engine to the loader frame. (fig. C2203)



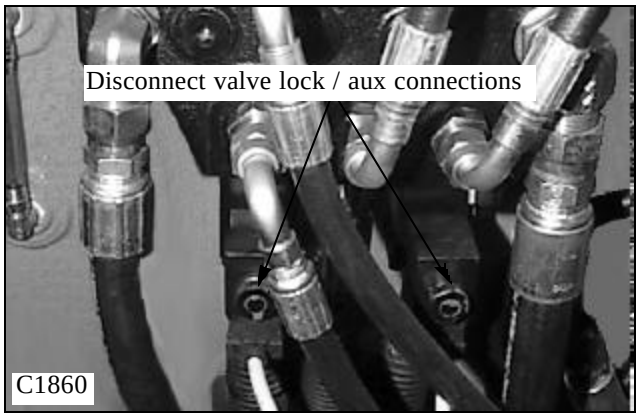

14 Disconnect the engine starter cable coming from the positive terminal of the battery. (fig. C2067)




15 Disconnect the electrical cable from the boosting lug terminal. (fig. C1029)

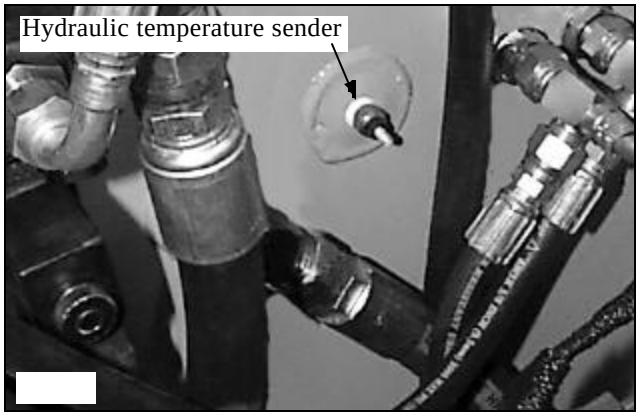



16 Disconnect the hydraulic control valve electrical connections. (fig. C1860) Tag the connections for location to prevent mixing up upon engine replacement.

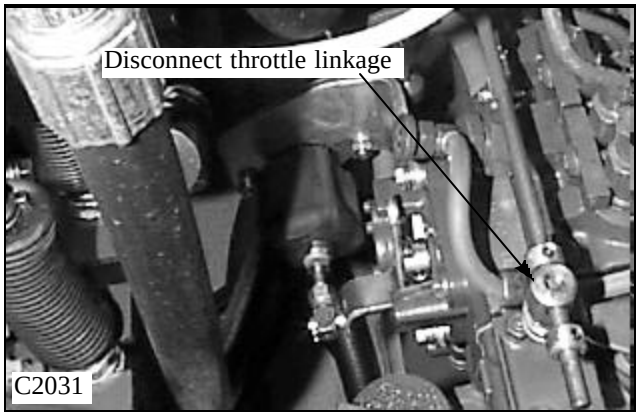


## Removal (cont'd)

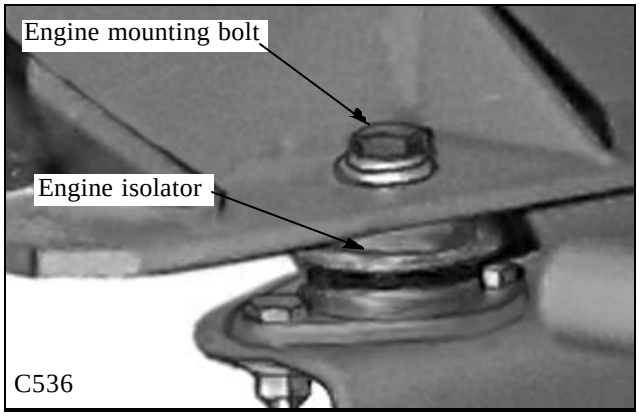
17 Disconnect the hydraulic oil temperature sender located on the left hand oil tank, inside the engine compartment.




18 Disconnect the throttle linkage. (fig. C2031)



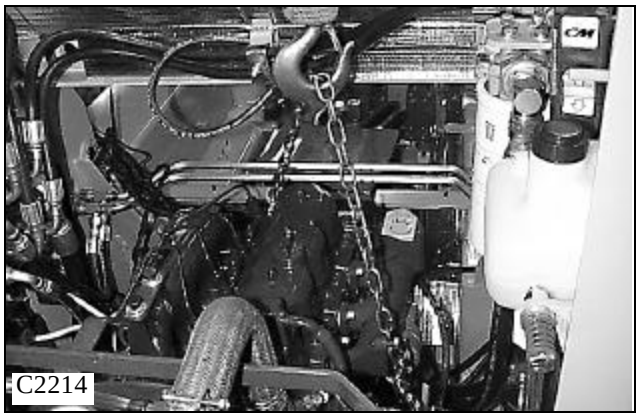

19 Remove the 4 bolts retaining the engine to it's rubber composite mounting isolators. (fig. C536)




20 Using a suitable lift point, raise the engine slightly and pull rearward slowly. (fig. C2214) 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**



## Installation

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

1 Remove the protective rust preventative coating from the flywheel. Use a solvent to remove. The flywheel must be cleaned to the surface metal.

2 Install the engine U- Joint adapter. (fig. C2216) There are 6 bolts holing 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. C2216)

4 Paint must be removed from the engine block where the engine ground strap is attach to the front of the engine. This will provide proper grounding of the engine with the loader chassis. (fig. C2217)

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.

**IMPORTANT**

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

8 Install the engine wire harness.

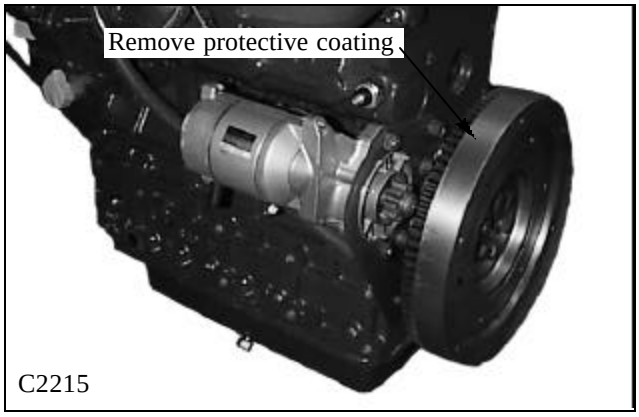
9 Install the radiator to the engine mounts and install the radiator hoses.

10 Install the fan guard to the radiator shroud.

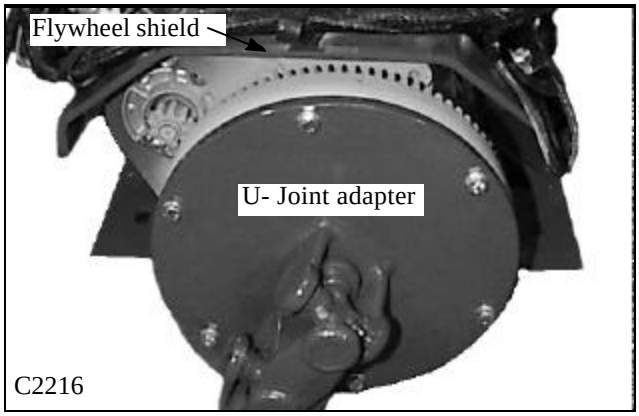
11 Install the upper radiator mounting bracket.

12 Add engine oil and coolant.

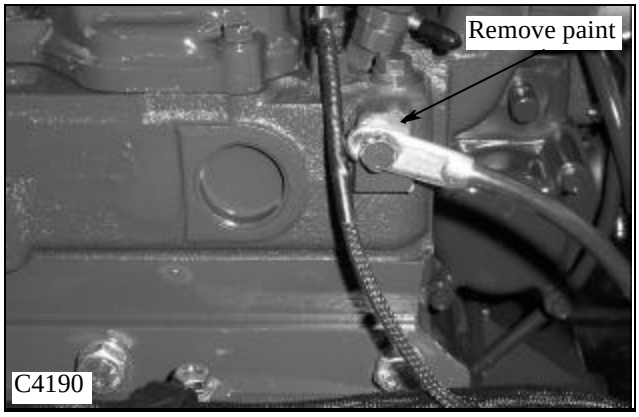
13 Check the engine mounting isolators in the loader frame. (fig. C2218) Make sure the isolators are not separating or the rubber is deteriorated in any way. Replace engine isolators as required.



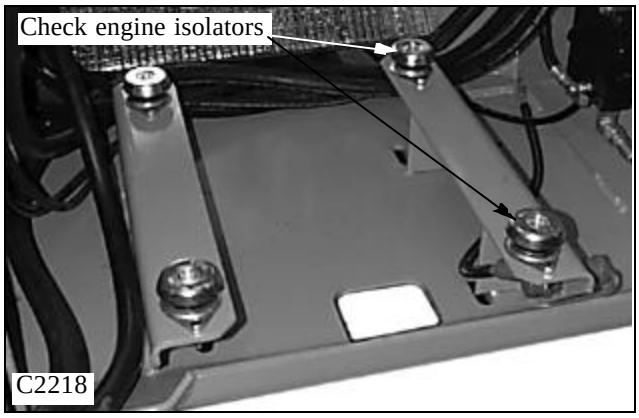
C2215



C2216



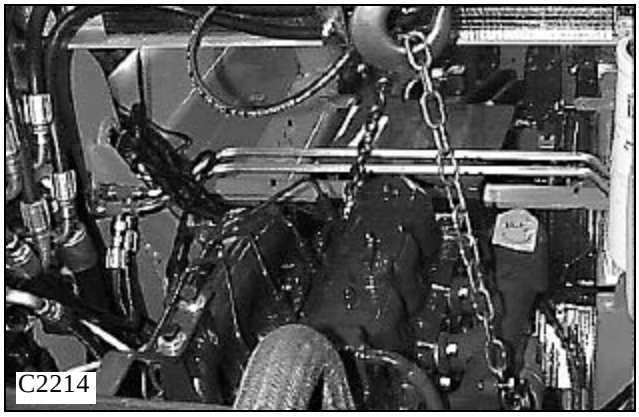
C4190

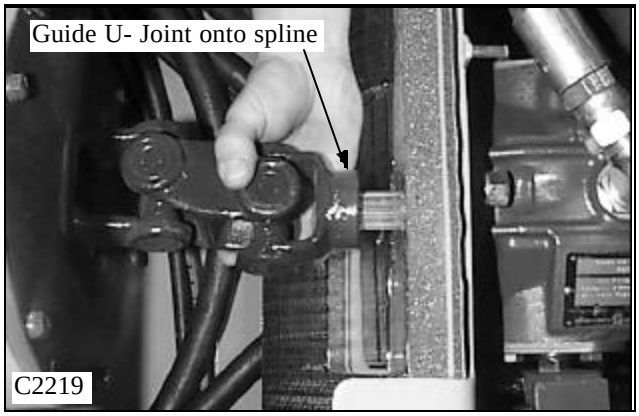


C2218

## Installation

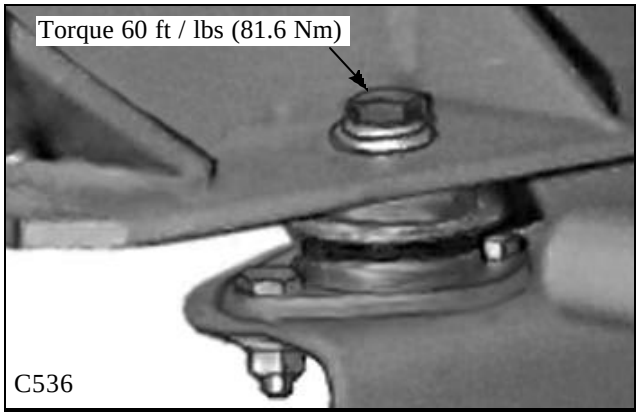
14 Install the engine to the loader. (fig. C2214) Have a helper inside the cab to line up the engine U- Joint to the hydrostatic pump input shaft. (fig. C2219) Align the engine U-Joint in a straight line with the hydrostatic pump. Failure to align the U- Joint properly will cause premature U- Joint failure.


C2214



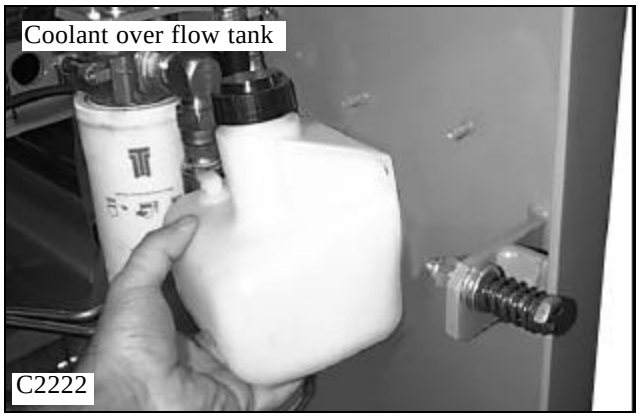
C2219

15 Install the engine mounting bolts to the isolators. Torque the bolts to 60 ft lbs. (81.6 Nm).(fig. C536)
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.



C536

18 Install the coolant over flow tank and hoses. (fig. C2222)
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.
23 Check the oil cooler shroud to make sure presses against the engine radiator. See section 1-6.

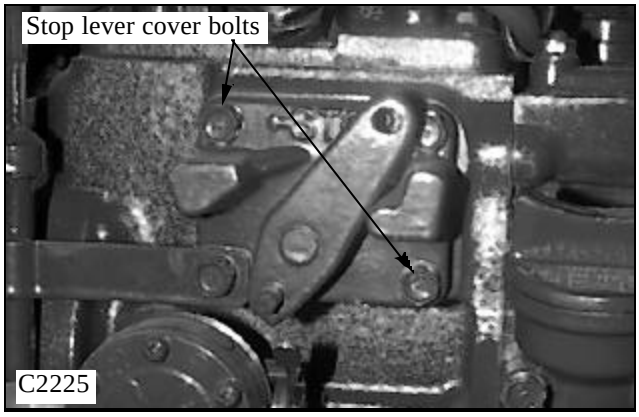


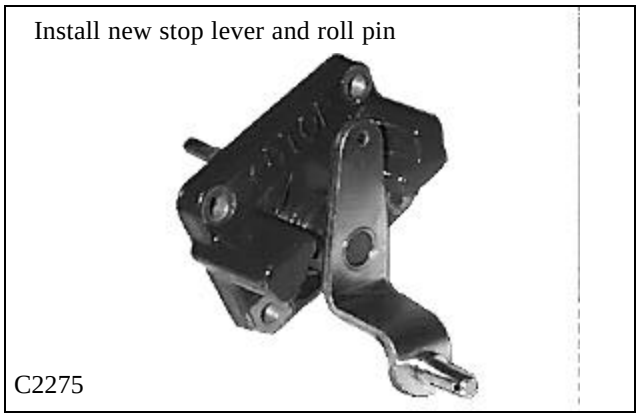
C2222

## Stop Solenoid

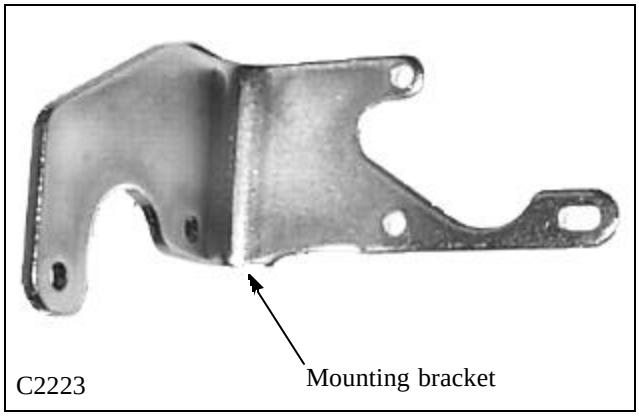
**The engine stop solenoid requires special attention when replacing. If not properly adjusted, the stop solenoid will fail prematurely.**

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.

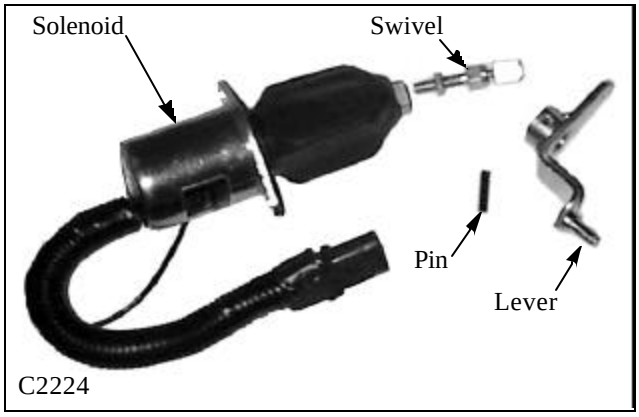



5 Using the washers and bolts provided in the kit, attach the solenoid mounting bracket and stop cover to the engine. (fig. C2223, C2276) Flat washers are provided to space the solenoid mounting bracket away from the stop cover and provide a “square” and level point for the stop solenoid to mount. Do 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)



## 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.

**IMPORTANT**

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

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

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.

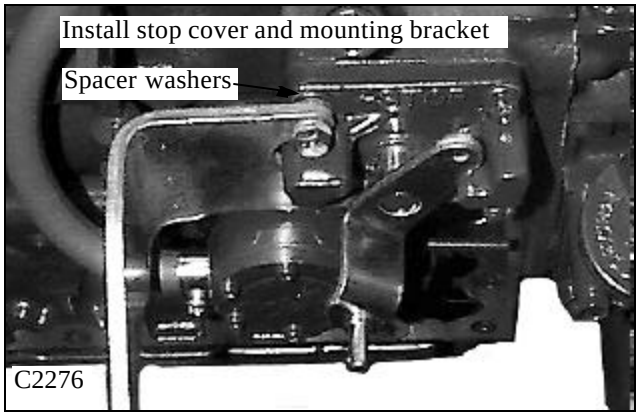
10 Plug in the solenoid connector to the engine electrical harness.

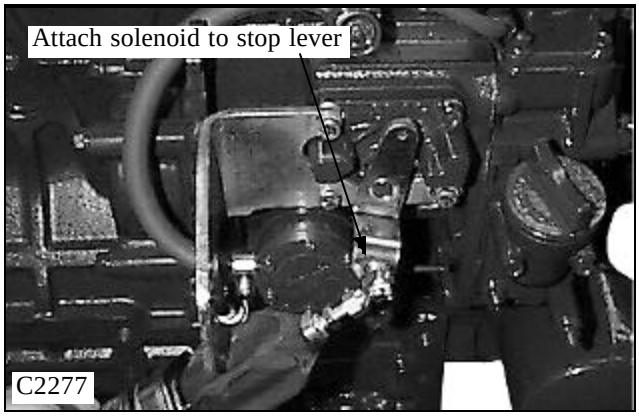
11 Turn on the ignition key but do not start the engine.

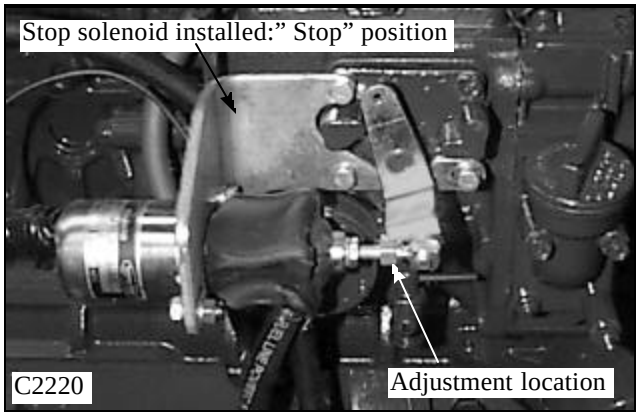
12 Manually push the stop solenoid to the run position. Check for smooth engagement, no binding should occur. The solenoid must remain in the "RUN" position now, without holding by hand.

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.



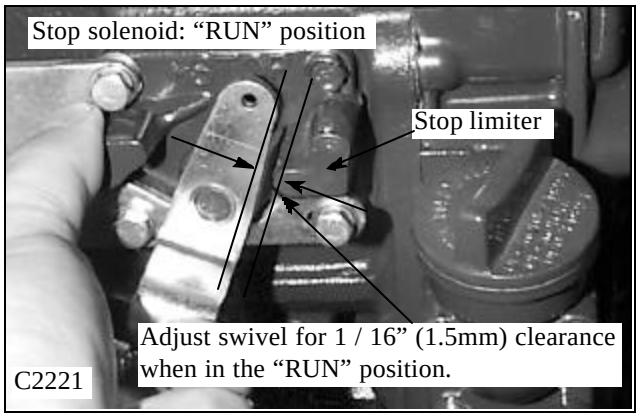






**IMPORTANT**

**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 77 ° F (25 ° C) before further cranking attempts.**



# ENGINE SPECIFICATIONS 153 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.....3.43 inches (87 mm)
Allowable limit: 3.4252 ~ 3.432 inches (87 ~ 87.037mm).
Stroke..... 3.64 inches (92.4 mm)
Maximum engine speed (no load) .....2950 rpm
Low idle setting.....1300 rpm
Cooling system .....Liquid
Cold starting aid.....Glow plug in combustion chamber
Horsepower (Gross).....50 @ 2800 rpm
Power (ISO 9249 Net Power).....34.3 kW (46 hp) @ 2800 rpm
Power (ISO 9249 Net Power) CE.....33.8 kW (45.3 hp) @ 2600 rpm
Max Torque.....115 ft lbs (15.9 kg/m)
Compression ratio .....23.0: 1
Engine compression.....427 - 469 psi (30 - 33 kgf / $cm^2$ )
.....Service limit: 355 psi (26 kgf / $cm^3$) 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 .....1990 - 2133 psi (140 - 150 kgf / $cm^3$ )
Direction of rotation (viewed from flywheel end) .....Counter - clockwise
Location of timing marks .....N / A
Valve clearance, (cold).....0.0071 - 0.0087 in (0.18 - 0.22 mm)
Valve seat angle.....Intake 1.047 rad (60º)
.....Exhaust 0.785 rad (45º)
Valve seat width .....Intake 0.0835 in (2.12mm)
.....Exhaust 0.0835 in (2.12mm)
Valve face angle .....Intake 1.047 rad (60º)
.....Exhaust 0.785 Rad (45º)
Valve recessing .....Protrusion 0.0020 in (0.05mm)
.....Recess 0.0059 in (0.15mm)
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 14 psi (98 kPa) minimum
.....@ Rated speed 42.7 psi (294 kPa) minimum
Oil pressure switch .....Closes @ 7 psi (49 kPa)
Engine oil capacity with filter.....8. 5 qts (8 liters).
Oil type.....10W30 API CF
Cooling system capacity .....3.2 gal (14.5 liters).
Radiator cap pressure setting.....12. 8 psi (88kPa)
Thermostat rating .....Fully open 185°F (85°C)

**For complete engine service repair manual: Order P / N 97897-0109-5 from your nearest Kubota dealer, or order P / N 40916 from your local Thomas dealer.**

# ENGINE SPECIFICATIONS 137/135/1300 7.4

Make and model .....Kubota V1903E
Type .....Vertical , In Line, 4 Cycle
Number of cylinders.....4
Displacement .....113.3 cu in (1857cc)
Cylinder bore.....3.15 inches (80 mm)
Allowable limit: 3.1496 ~ 3.1563 inches (80 ~ 80.034 mm).
Stroke.....3.64 inches (92.4 mm)
Maximum engine speed (no load) .....2950 rpm
Low idle setting.....1300 rpm
Cooling system .....Liquid
Cold starting aid.....Glow plug in combustion chamber
Horsepower (Gross).....42 @ 2800 rpm
Power (ISO 9249 Net Power) .....29.1 kW (39 hp) @ 2800 rpm
Power (ISO 9249 Net Power) CE.....28.9 kW (38.8 hp) @ 2600 rpm
Max Torque .....96 ft.lbs (13.25 kg/m)
Compression ratio .....23.0: 1
Engine compression.....512 - 540 psi (36 - 38 kgf / $cm^2$ )
.....Service limit: 355 psi (26 kgf / $cm^3$ )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 .....1990 - 2133 psi (140 - 150 kgf / $cm^3$ )
Direction of rotation (viewed from flywheel end) .....Counter - clockwise
Location of timing marks .....N / A
Valve clearance, (cold) .....0.0071 - 0.0087 in (0.18 - 0.22 mm)
Valve seat angle .....Intake 1.047 rad (60º)
.....Exhaust 0.785 rad (45º)
Valve seat width.....Intake 0.0835 in (2.12mm)
.....Exhaust 0.0835 in (2.12mm)
Valve face angle .....Intake 1.047 rad (60º)
.....Exhaust 0.785 rad (45º)
Valve recessing.....Protrusion 0.0020 in (0.05mm)
.....Recess 0.0059 in (0.15mm)
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 14 psi (98 kPa) minimum
.....@ Rated speed 42.7 psi (294 kPa) minimum
Oil pressure switch.....Closes @ 7 psi (49 Kpa)
Engine oil capacity with filter .....8. 5 qts (8 liters)
Oil type .....10W30 API CF
Cooling system capacity .....1.8 gal (7 liters)
Radiator cap pressure setting .....12.8 psi (88 kPa)
Thermostat rating .....Fully open 185°F (85°C)

**For complete engine service repair manual: Order P / N 97897-0109-5 from your nearest Kubota dealer, or order P / N 40916 from your local Thomas dealer.**

# ENGINE TROUBLE SHOOTING 7.5

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

# 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 |

# SECTION 8
# MAINTENANCE & SPECIFICATIONS

# 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 (Water cooled only) | Check level. If necessary fill with 50 / 50 mixture of ethylene glycol and water. Check for leaks, dirt build up and bent cooling fins. If necessary, straighten cooling fins and clean radiator with compressed air (40psi [ 27Kpa] max) or flush with water. | ■ | | | | |
| Hydraulic Oil | Check level. If necessary add 10W30 API Classification SJ oil. | ■ | | | | |
| Oil Cooler | Check cooling fins for obstruction. Clean with compressed air or water. | ■ | | | | |
| Air Cleaner | Check air restriction sensor wiring connection. Replace filter elements as required when the air restriction indicator illuminates on the dash panel. | ■ | | | | |
| Tires and Wheels | Check tires for pressure and damage. Inflate standard tires to 50 psi (345 kPa), flotation tires to 40 ~ 45 psi (276 ~ 310 kPa). Torque wheel nuts to 100 ~ 110 ft lbs (136 ~ 149 Nm). | ■ | | | | |
| Safety Equipment | Check the following safety equipment for proper operation and condition: Seat belt. restraint bar, hydraulic control locks, parking brake, boom supports, quick-tach locks, side screens, glass, shields and safety treads. Repair or replace as needed. | ■ | | | | |
| Decals | Check for damaged or missing safety and instruction decals. See Section 8.5. Replace decals as required. | ■ | | | | |
| Lubrication | Grease all hinge pin fittings until excess shows. | ■ | | | | |
| 50 Hour Service | Perform complete 50 hour service. See Section 8.2, pg. 8-8. | | ■ | | | |
| Preventative Maintenance | It is recommended as a preventative maintenance that the 50 hour service be repeated every 150 hours after the initial 50 hour service. See 8.2, pg. 8-8. | | | ■ | | |
| Engine Fuel Filter | Replace the engine fuel filter. See Section 7.1. | | | | ■ | |
| Hydraulic Reservoir | Change the hydraulic oil and replace the suction element. Replenish reservoir with 10W30 API Classification SJ oil. See Section 1.7. | | | | | ■ |
| Final Drive | Change the final drive lubricating oil. See Section 3.2. | | | | | ■ |
| Engine Cooling System | Drain, flush and replenish the engine coolant. See Section 7.1. | | | | | ■ |

8

**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.

**WARNING**

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

## 8.1.2 SERVICE ACCESS

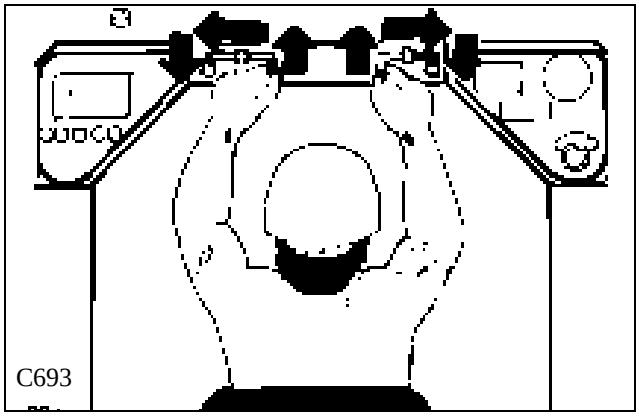
### 1. 2A Boom Support

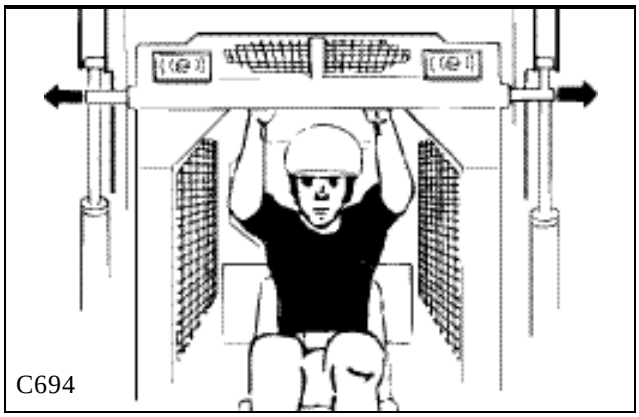
For safety while performing regular service or maintenance work, the loader is equipped with boom support pins. The boom support pins when extended prevent the boom arms from dropping if hydraulic pressure is relieved or the hydraulic controls are accidentally cycled.

**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.


C693


C694

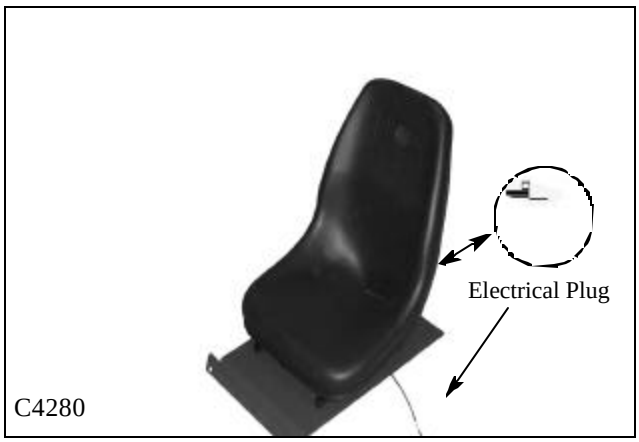
**WARNING**

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

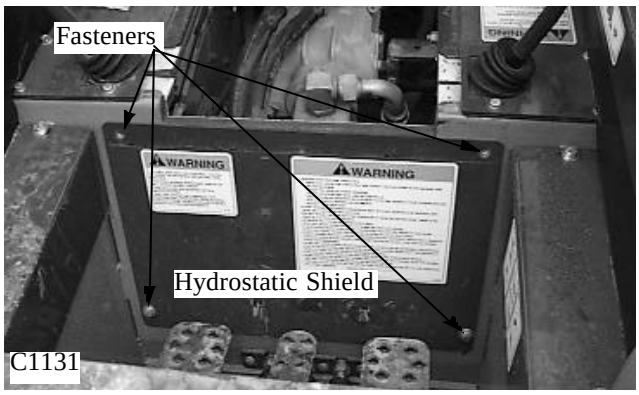
### 1. 2B Seat Removal

The seat and seat plate can be removed to provide access to the controls, hydraulic and hydrostatic components. To remove the seat assembly, remove the fasteners located at the front of the seat. DISCONNECT THE ELECTRICAL PLUG! Lift the seat assembly out of the machine. When installing the seat, be sure the seat plate is locked in place at the rear (fig. C4280).

The hydrostatic shield can be by removing the four (4) fasteners (fig.C1131).



C4280



C1131

8

## 8.1.2 Service Access

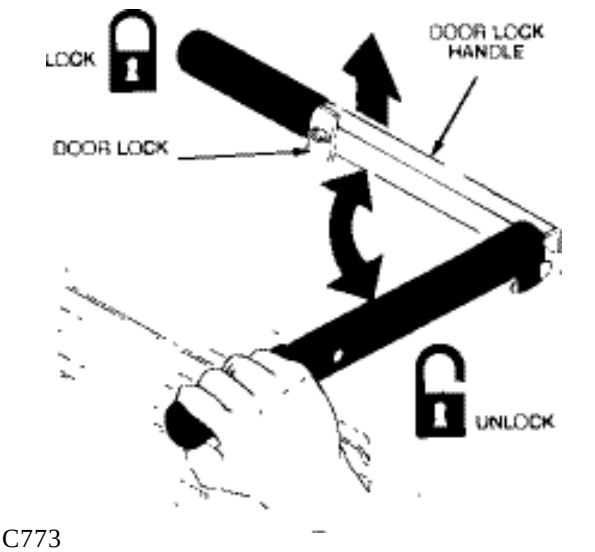
**1. 2C Engine Compartment**

The engine compartment is completely enclosed for component protection and lockable to discourage vandalism. For servicing the rear door swings open and the engine cover hinges up. To open; raise the door lock handle up clear of the lock plate (fig. C773); pull outward releasing the door catch and swing the door open (fig. C3359). Lower the engine cover before closing the rear door.


C3359

**IMPORTANT**

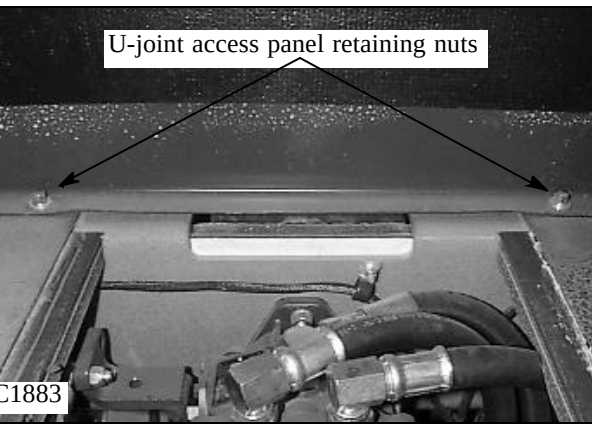
**Keep the rear door closed except for servicing. Make sure the door is closed and latched before operating the loader.**




C773

**1.2D Universal Joint Access**

After removal of the operators seat, the U-joint service / inspection panel can be accessed. (fig. C1883) Remove the 2 nuts 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.




C1883

## 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 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:

7.00 X 15.00 . . . . . 50 psi. (345 kPa)
10.00 x 16.5 . . . 40 - 45 psi (276 - 310 kPa)

To prevent shearing of the wheel studs and rim damage check wheel nuts for proper torque 100 -110 ft lbs(136 - 149 Nm) 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 in the loader that require lubrication every eight hours. (See Section 6) Lubricate with a good quality multi-purpose lithium based grease. apply grease until excess shows.

Refer to the service schedule for complete service details. the 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 o the dipstick (See Section 7). Do not fill above the full mark – use 10W30 API classification CF oil.

## 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 rpm Maximum no load high idle: 2950 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.**

**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 Nm)

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: 7.00 x 15 @ 50 psi (345 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 Nm).

7.3 Condition of Cab:

Inspect the condition of the ROPS mounting isolators. Replace isolators if deteriorated. Inspect both the seat and seat belt. Ensure all safety and instruction decals are in place. Inspect sound insulation, side windows and door operation for machines equipped with cab enclosure kits.

7.4 Condition of Shields and Safety Equipment:

Inspect and ensure all shields are in place and securely fastened. Inspect and ensure all safety equipment is working properly. Ensure owners and operators manual, safety manual and all safety and instruction decals are in place. If necessary, replace. If the safety controls are malfunctioning or require adjustment consult your **Thomas** Equipment Dealer for service.

7.5 General Condition:

Make a general inspection of the machine looking for loose or missing parts, oil leaks, etc.

# TROUBLESHOOTING 8.2

### *8. 2A Hydrostatic Drive*

| 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 or key failure Check mounting bolts. | Inspect and repair defective parts. motor |
| | Excessive internal leakage in and/or motor pump | Inspect and repair defective unit. Flush al 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 **Thoma**s Service Dept. |

### *8.2A Hydrostatic Drive*

| Symptom | Cause | Remedy |
|---|---|---|
| System erratic and/or noisy reservoir | Air in system due to low oil level in oil. | Replenish with 10W30 API SJ |
| | Air in system due to leak at suction fitting | Check fittings and tighten. |
| | Internal pump or motor wear caused by over speeding | Consult your dealer or **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 SJ engine oil |
| | Parking brake damaged or out of adjustment | Inspect and adjust or replace damaged parts |
| | Axles have too much end play | Pre-load axle bearings removing all end play |
| | Chain loose | Adjust or replace chain |

### *8.2C Park Brake*

| Symptom | Cause | Remedy |
|---|---|---|
| Brake will not hold machine | Brake valve will not release pressure | Verify position of override |
| | 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 |

8

### *8.2D Hydraulic System*

| Symptom | Cause | Remedy |
|---|---|---|
| Hydraulic action jerky | Reservoir low on oil | Replenish with 10W30 API or 20W50 SJ oil. |
| | Air in hydraulic system | Check for leak between reservoir and pump. Bleed System by extending and retracting lift cylinders several times. |
| | Anti-cavitation check valve not functioning | Inspect and repair or replace |
| Boom raises slowly at full engine rpm | Reservoir low on oil | Replenish with 10W30 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 |

*8.2D Hydraulic System*

| 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. |
| | Reservoir low on fluid | Replenish with 10W30 or 20W50 API SJ oil |
| Loss of hydraulic power (flow from gear pump) | Foot pedal linkage disconnected or binding | Inspect and adjust. |
| | Auxiliary foot pedal engaged | Disengage |
| | Relief valve failure in control valve | Check pressure and adjust. |
| Hydraulic oil overheating | Auxiliary foot pedal engaged | Disengage |
| | Engine rpm too slow | Check rpm and adjust |
| | Incorrect temperature sensor | Replace |
| Foot pedals do not operate smoothly | Foot pedal linkage out of adjustment | Adjust foot pedal linkages |
| | Foot pedal linkages need lubrication | Lubricate with a silicone based lubricant |
| | Cable Binding | Check routing for kinks etc. |

# TROUBLESHOOTING 8.2

### *8.2E Control Levers*

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

### *8.2F Electrical*

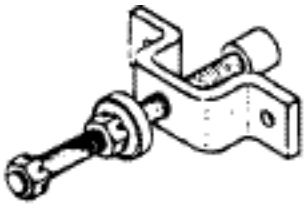
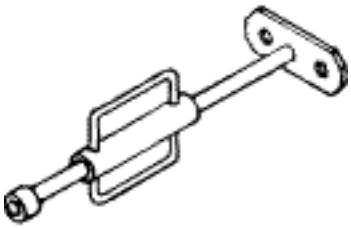
| Symptom | Cause | Remedy |
|---|---|---|
| Engine will not crank over | Battery failure | Check battery, charge or replace |
| | Battery cable failure | Check for loose or corroded connectors. tighten and clean as required. Use di-electric grease to prevent corrosion. Check continuity of cables and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

8

### *8.2G Diesel Engine*

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

# SPECIAL TOOLS 8.3

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

8

# SPECIAL TOOLS 8.3

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

# SPECIAL TOOLS 8.3

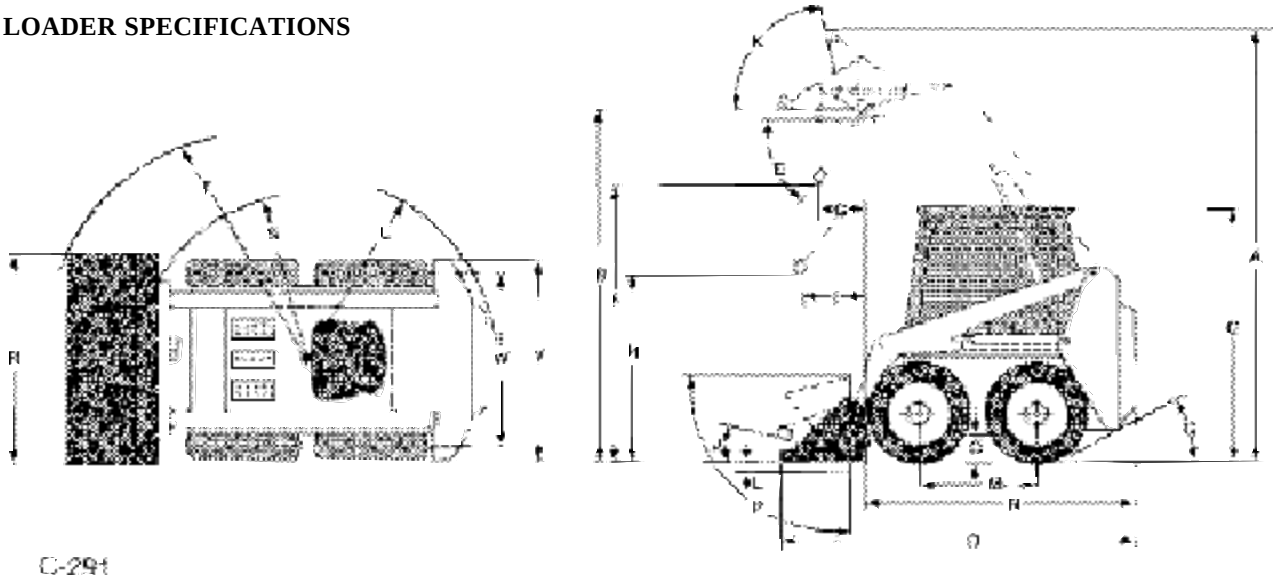
| P/N | Illustration | Description | Model |
|---|---|---|---|
| 43979 |  C1840 | CHAIN PULLER | ALL MODELS |
| 43980 |  C1841 | SPANNER WRENCH 2'' - 4 3/4''<br>To repair hydraulic cylinders | ALL MODELS |
| 43981 |  C1837 | PHOTO SENSOR / WHEEL SPEED TACHOMETER (Dual Function) | ALL MODELS |
| |  C1839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

8

# NOTES

# SPECIFICATIONS 8.4

**LOADER SPECIFICATIONS**



C-291

| **Dimensions : (With Standard Tires & Dirt Bucket)** | **153** | **137/135/1300** |
|---|---|---|
| A. Overall operating height | 138” (3505.2) | 137 3/4” (3498.9) |
| B. Height to hinge pin | 110” (2781) | 110” (2794) |
| C. Overall vehicle height | 73.5” (1867) | 73.5” (1867) |
| D. Overall length with bucket | 127.8” (3246.1) | 127.8” (3246.1) |
| E. Dump angle | 35° | 35° |
| F. Dump height | 89.8” (2280.9) | 89.8” (2280.9) |
| G. Reach — fully raised | 23.8” (604.5) | 23.8” (604.5) |
| H. Height at 45° dump angle | 73.5” (1866.9) | 73.5” (1866.9) |
| I. Reach at 45° dump angle | 28” (711.2) | 28” (711.2) |
| J. Maximum roll back at ground | 27° | 27° |
| K. Maximum roll back fully raised | 96° | 97° |
| M. Wheel base | 35” (889) | 35” (889) |
| N. Overall length less bucket | 104.4” (2651.8) | 104.4” (2651.8) |
| O. Ground clearance | 7.5” (190.5) | 7.5” (190.5) |
| P. Maximum grading angle – bucket | 90° | 90° |
| Q. Angle of departure | 23° | 28° |
| R. Bucket width | 60” (1524) | 60” (1524) |
| S. Clearance circle – front – less bucket | 48” (1219.2) | 48” (1219.2) |
| T. Clearance circle – front – with bucket | 72.6” (1844) | 72.6” (1844) |
| U. Clearance circle – rear | 61.9” (1572.3) | 61.9” (1572.3) |
| V. Overall width – less bucket | 57.5” (1460.5) | 57.5” (1460.5) |
| W. Tread | 46.6”(1183.64) | 46.6”(1183.64) |
| **Operational:** | | |
| Tipping capacity SAE | 3000 lbs. (1360.7 kg) | 2600 lbs. (1180 kg) |
| Rated operating capacity | 1500 lbs. (682 kg) | 1300 lbs. (590 kg) |
| Operating weight | 5700 lbs. (2585 kg) | 5350 lbs. (2477 kg) |
| Shipping weight | 5350 lbs. (2427 kg) | 4830 lbs. (2191 kg) |
| Travel speed | 0-6.2 mph (0-9.9 km/h) | 0-6.2 mph (0-9.9 km/h) |

# SPECIFICATIONS 8.4

**Controls**

Vehicle: Steering direction and speed controlled by two hand operated control levers.

Hydraulics: Lift and bucket tilt are controlled by separate foot or hand controls. Auxiliary hydraulics controlled by foot pedal.

Engine: Hand throttle, key type ignition switch and shutoff.

| **Engine** | **153** | **137/135/1300** |
|---|---|---|
| Make and model | Kubota V2203E | Kubota V1903E |
| Cylinders | 4 | 4 |
| Cooling system | Liquid | Liquid |
| Displacement | 134 cu in (2197cc) | 113.3 cu in (1857cc) |
| Horsepower (Gross) | 50 | 42 |
| Power (ISO 9249 Net Power) | 34.3 kW (46 hp) | 29 kW (39 hp) |
| Power (ISO 9249 Net Power) CE | 34.3 kW (46 hp) | 29 kW (39 hp) |
| Max Torque | 115 ft lbs (15.9 kg/m) | 96 ft lbs. (13.25 kg/m) |
| Fuel type | | Diesel No. 2 |
| Air cleaner | | Replaceable dry cartridge w / Indicator |
| High Idle rpm | 2800 | 2800 |
| High Idle rpm, CE | 2600 | 2600 |

**Hydraulic System**

| | | | |
|---|---|---|---|
| Pump type | | | Gear |
| Pump Capacity (theoretical) | @2800 16.6 gpm (75.5 l/min) | @2600 15.4 gpm (70 l/min) | |
| Control valve | | | Series type with float on lift and detent on auxiliary |
| Filtration | | | 5 micron |
| Hydraulic fluid | | | 10W30 API Class, SJ |
| Control valve | | | Series type with float on lift and detent on auxiliary |
| Oil cooler | | | 674 BTU (711 kCal) |
| Cylinders. | Lift (153) | Lift (137/135/1300) | Tilt (All) |
| Type | Double acting | Double acting | Double acting |
| Qty per loader | 2 | 2 | 2 |
| Bore diameter | 2.5 in | 2 in | 2.5 in |
| Rod diameter | 1.5 in | 1.25 in | 1.125 in |
| Stroke | 27.125 in | 27.125 in | 13.375 in |

**Hydrostatic Transmission & Final Drive**

| | |
|---|---|
| Pump type | Two in line, axial piston pumps |
| Pump displacement | 2. 65 cu in (43.5 $cm^3$) |
| Motor type | Geroler |
| Motor displacement | 31.9 cu in (523.6 $cm^3$) |
| System relief setting | 5000 psi (345 Bar) |
| Final drive | Single roller chain running in oil bath to each axle |
| Drive chain size | ASA 100 |

**Electrical** **153/137/135/1300**

| | |
|---|---|
| Alternator | 40 A |
| Battery | 1 x 12V |
| Type (BCI GROUP) | 34/78 |
| Cranking Amps | 730 |
| Starter | 12 V (1.4 kW) |
| Circuit breaker rating | 40 A |

# SPECIFICATIONS 8.4

## Torque Specifications

**Loader**

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

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

| ***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 | 37º 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 | | |

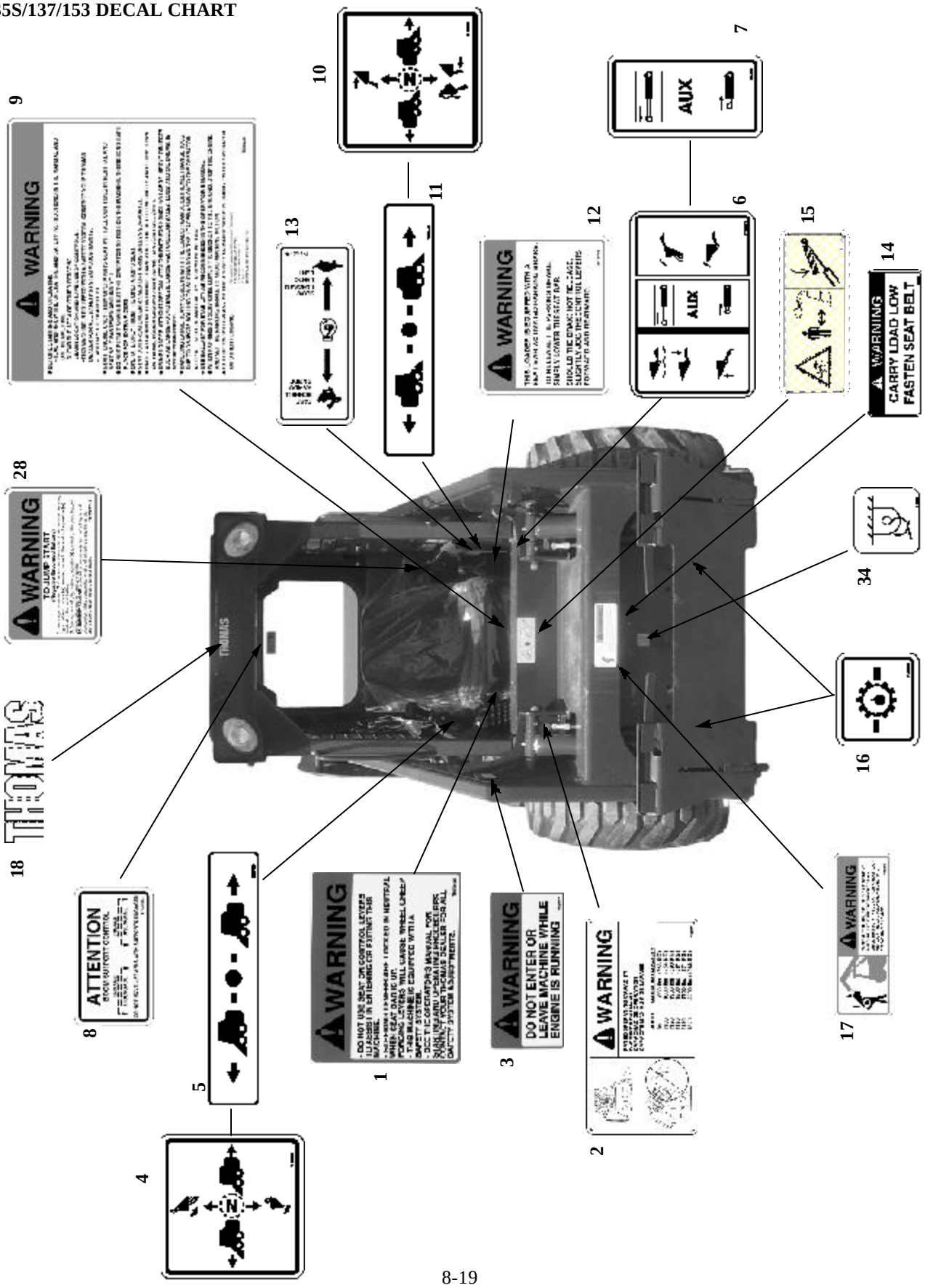
8

| ***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 | 4 | 130 |
| Bearing Housing | 8 | 46.5 |
| Front Cover | 8 | 10.7 |
| Bearing Nut | 1 | 45 |
| Mounting | 4 | 80 |

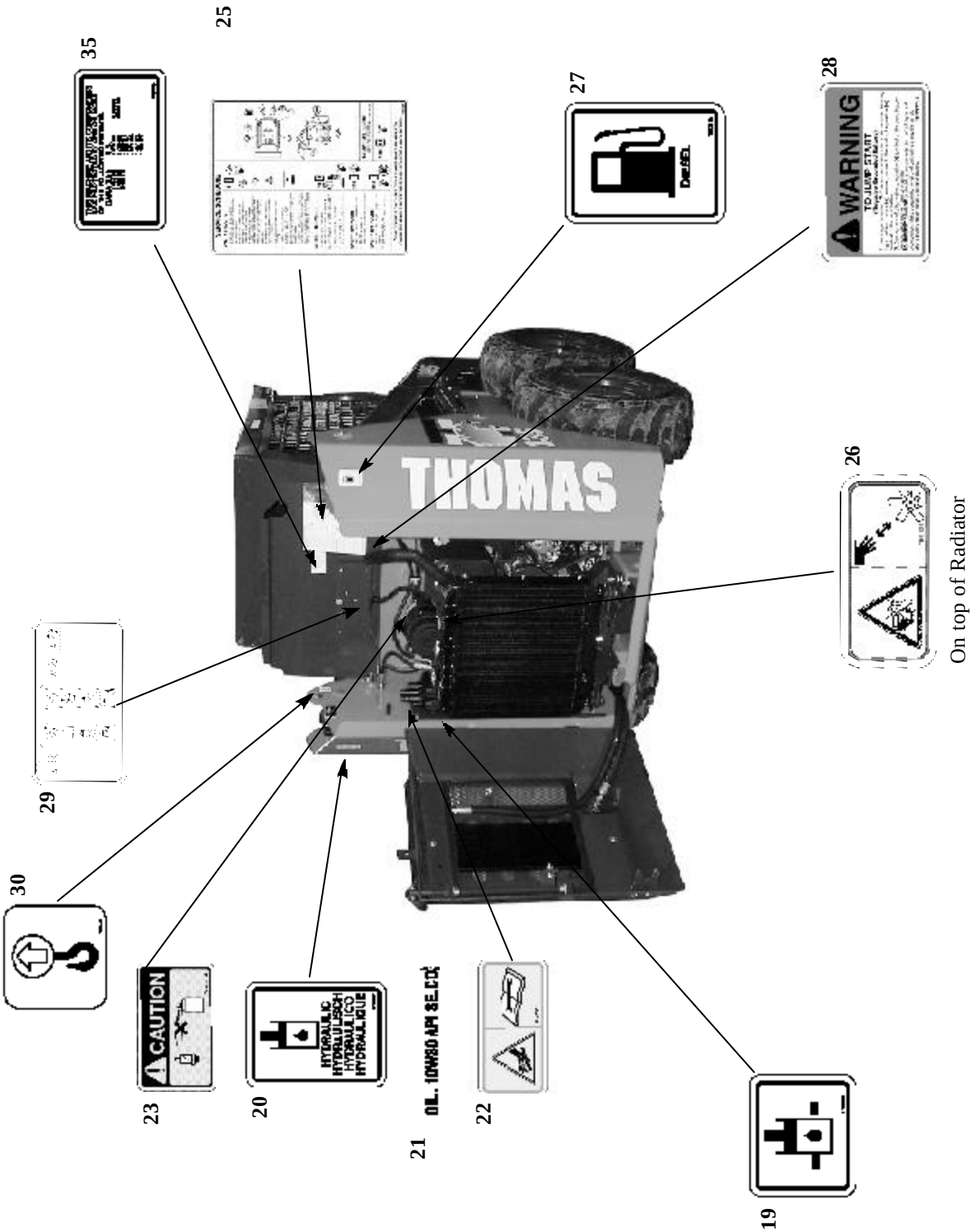
# DECALS 8.5

**135S/137/153 DECAL CHART**

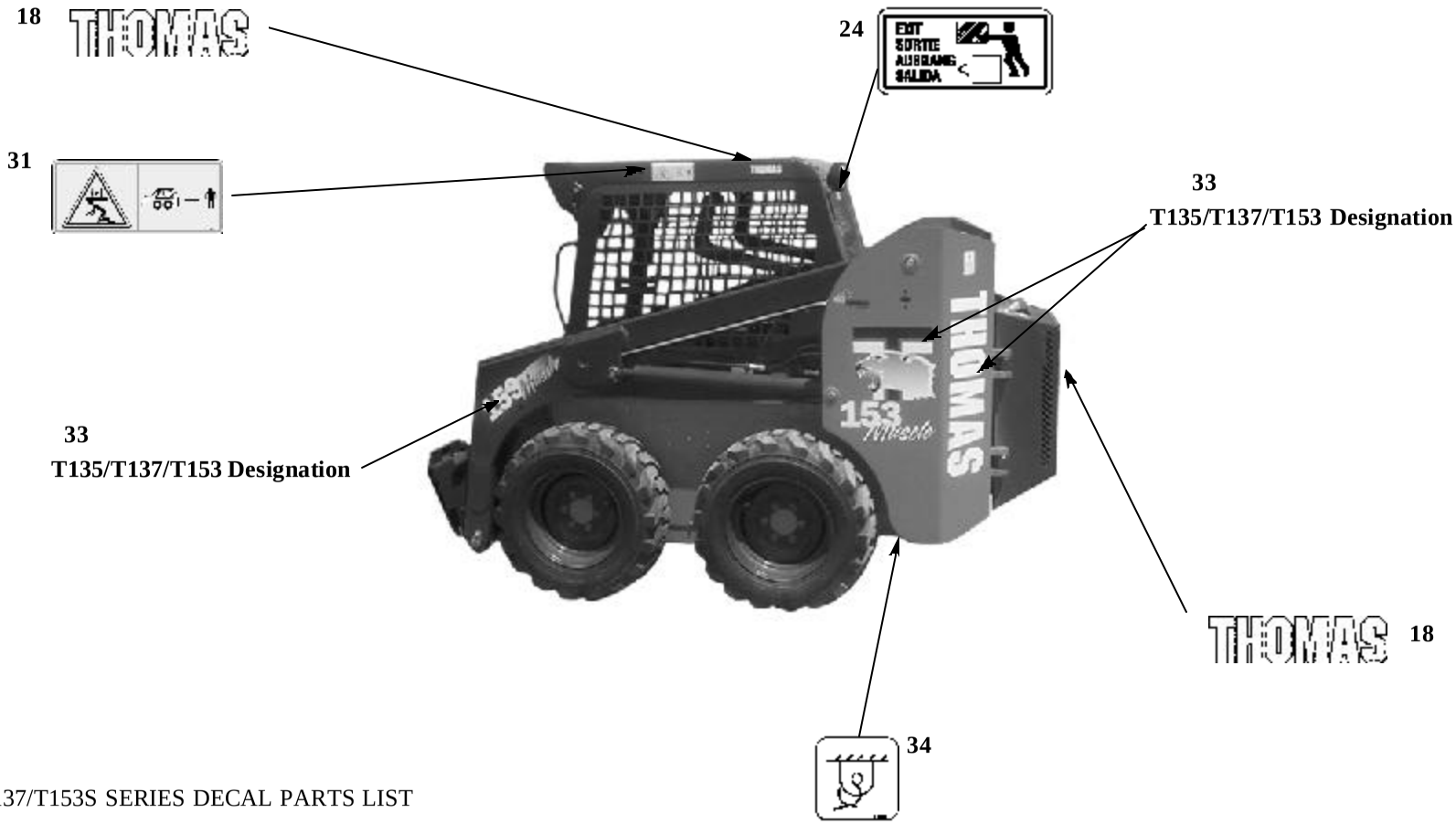


# DECALS 8.5

**135S/137/153 DECAL CHART**



# DECALS 8.5




T135S/T137/T153S SERIES DECAL PARTS LIST

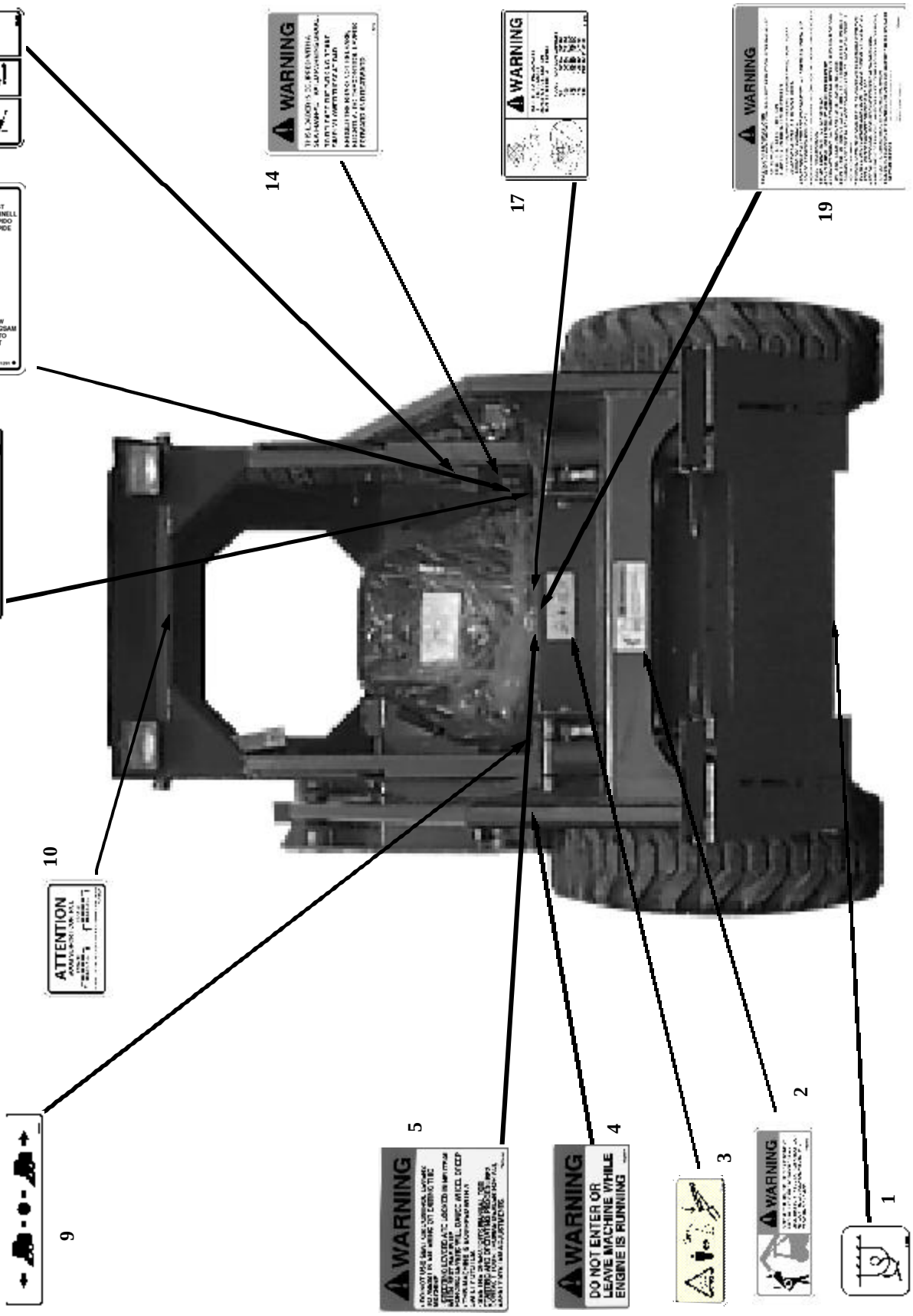
49273 Common Decals

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 39196 | 10. | 35885 | 19. | 23308 | 28. | 23325 |
| 2. | 42107 | 11. | 37059 | 20. | 23307 | 29. | 43776 |
| 3. | 23324 | 12. | 41045 | 21. | 38043 | 30. | 39191 |
| 4. | 35886 | 13. | 31291 | 22. | 46301 | 31. | 41065 |
| 5. | 37060 | 14. | 23326 | 23. | 23312 | 33. | 153 47263 (Kit) |
| 6. | 23301 | 15. | 41066 | 24. | 36841 | | 135 48087 (Kit) |
| 7. | 35935 | 16. | 23309 | 25. | 23321 | 34. | 39192 |
| 8. | 38796 (comp. panel) | 17. | 32275 | 26. | 41064 | 35. | 37010 |
| 9. | 36598 | 18. | 44615 | 27. | 23310 | | |

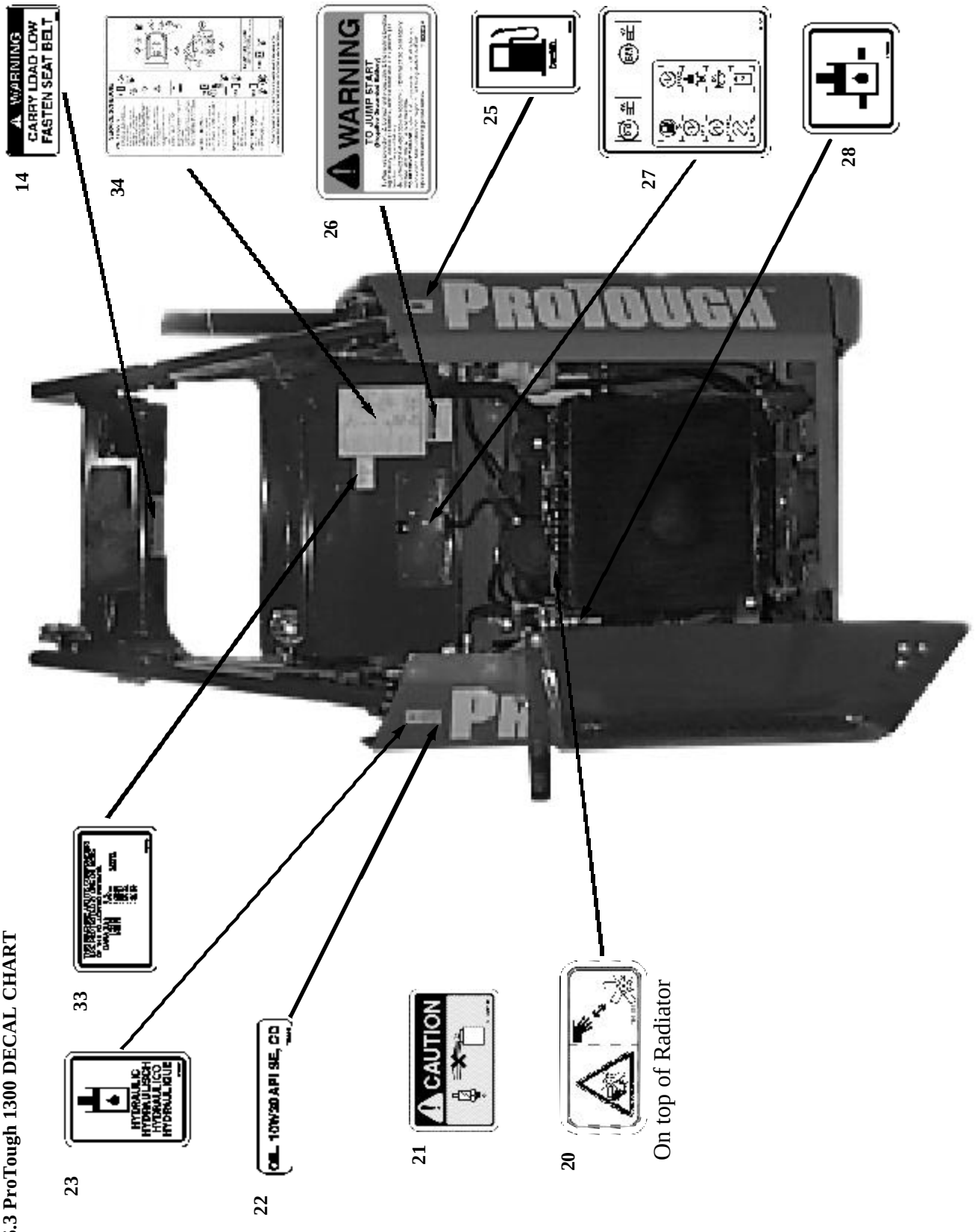
# NOTES

# DECALS 8.5

**5.3 ProTough 1300 DECAL CHART**

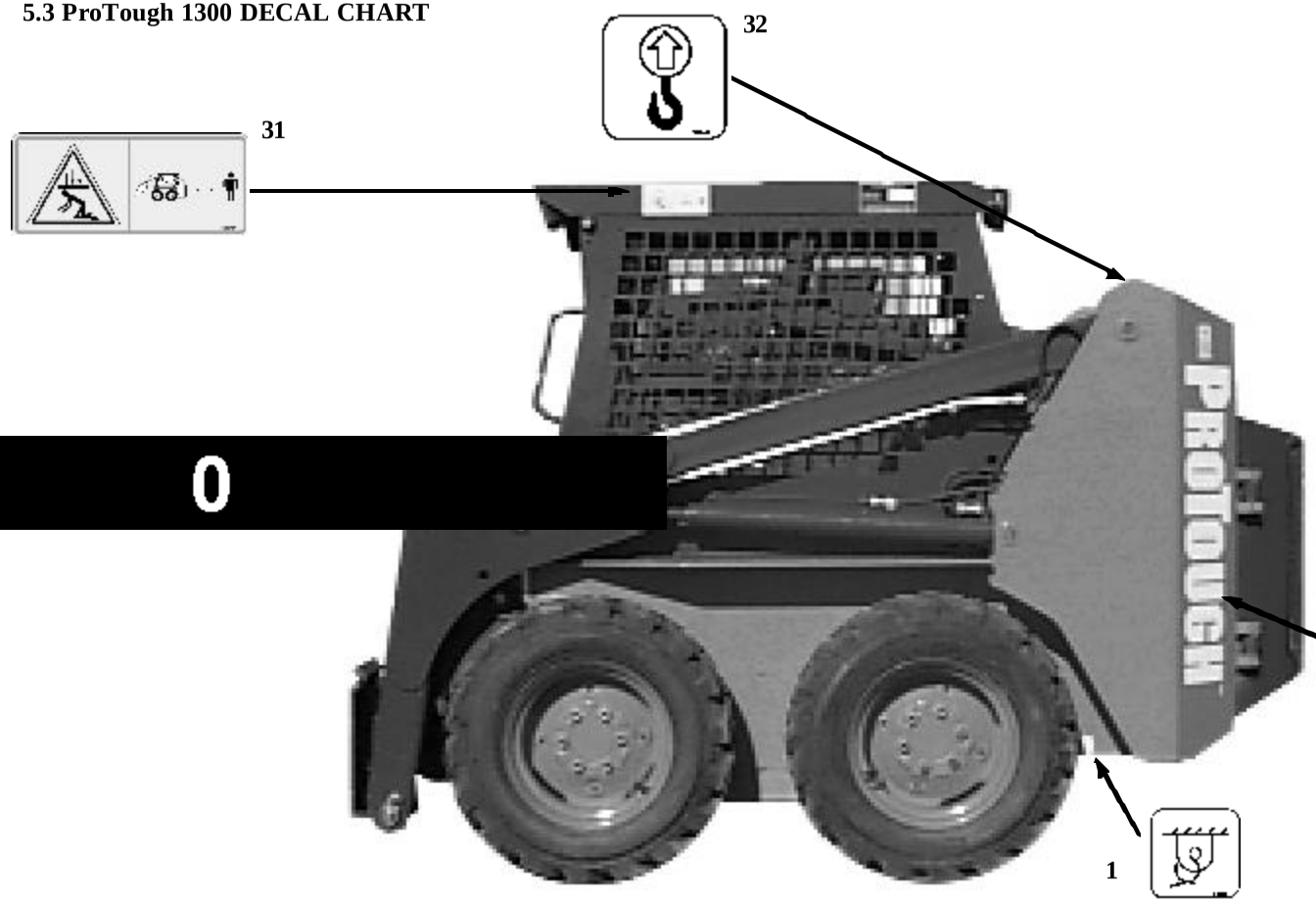


# DECALS 8.5




5.3 ProTough 1300 DECAL CHART

**5.3 ProTough 1300 DECAL CHART**




| | | | | |
|---|---|---|---|---|
| 1. 39192 (4) | 9. 37060 | 17. 36473 | 25. 23310 | 37010 |
| 2. 32275 | 10. 25460 | 18. 39191 | 26. 23325 | 23321 |
| 3. 41066 | 11. 37059 | 19. 36598 | 27. 39197 | 46375 |
| 4. 23324 | 12. N/A | 20. 41064 | 28. 23308 | |
| 5. 39196 | 13. 31291 | 21. 23312 | 29. 23309 | |
| 6. 39191 | 14. 41045 | 22. 38043 | 30. 46376 | |
| 7. 33859 | 15. 23301 | 23. 23307 | 31. 41065 | |
| 8. 43264 | 16. N/A | 24. 36841 | 32. 39191 (2) | |

# NOTES



8