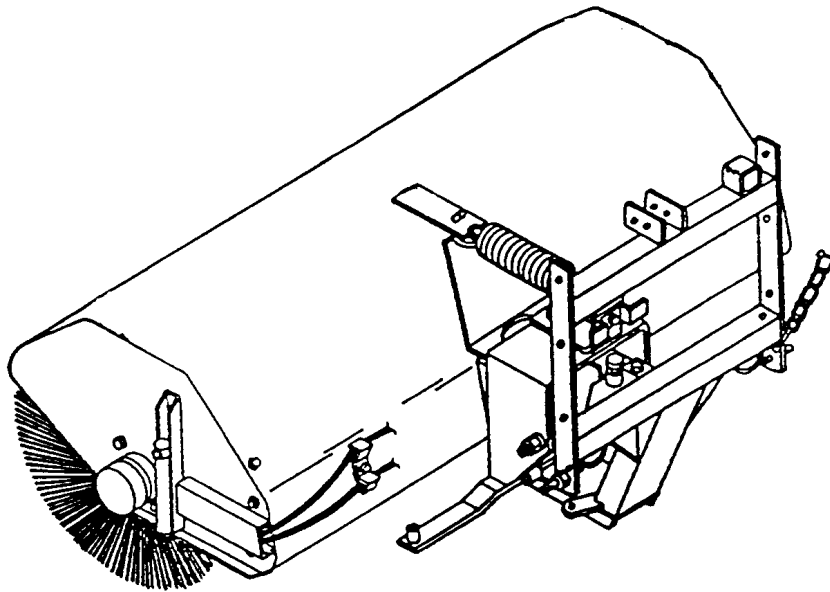


OPERATOR'S AND PARTS MANUAL



HYDRAULIC ROTARY BROOM

60" – 9393A Model

72" – 9394A Model

SERIAL NO. : 2017755 AND UP

**OM 0174-A
05/01**



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INTRODUCTION

TO THE PURCHASER

All products are designed to give safe, dependable service if they are operated and maintained according to instructions. **Read and understand this manual before operation.**

This manual has been prepared to assist the owner and operators in the safe operation and suitable maintenance of the implements. The information was applicable to products at the time of manufacture and does not include modifications made afterwards.

Read and understand this operator's manual before attempting to put an implement into service. Familiarise yourself with the operating instructions and all the safety recommendations contained in this manual and those labelled on the implements and on the tractor. Follow the safety recommendations and make sure that they are followed by those with whom you work.

To assist your dealer in handling your needs, please record hereafter the model number and serial number of your implement and tractor. It is also advisable to supply them to your insurance company. It will be helpful in the event that an implement or tractor is lost or stolen.

Illustrations

The illustrations may not necessarily reproduce the full detail and the exact shape of the parts or depict the actual models, but are intended for reference only

Direction Reference

Right Hand and Left Hand are determined by those seen by the conductor looking at the machine while operating

MODEL :

SERIAL NUMBER :


DATE OF PURCHASE :


SAFETY PRECAUTIONS




SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

 **DANGER :** Indicates an immediately hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING :** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION :** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

NOTE : Gives helpful information.

All products are designed to give safe, dependable service if they are operated and maintained according to instructions. **Read and understand this manual before operation.** It is the owner's responsibility to be certain anyone operating this product reads this manual, and all other applicable manuals, to become familiar with this equipment and all safety precautions. Failure to do so could result in serious personal injury or equipment damage. If you have any questions, consult your dealer.

BEFORE OPERATION

Children

Tragic accidents can occur if the operator is not alert to the presence of children. Children are generally attracted to machines and the work being done. Never assume children will remain where you last saw them.

1. Keep children out of the operating area and under the watchful eye of another responsible adult.
2. Be alert and turn machine off if children enter the work area.
3. Before and when backing, look behind for small children.
4. Never carry children while operating the machine. They may fall off and be seriously injured or interfere with the safe operation of the machine.
5. Never allow children to play on the machine or attachment even when they are turned off.
6. Never allow children to operate the machine even under adult supervision.
7. Use extra care when approaching blind corners, shrubs, trees, or other obstructions that might hide children from sight.

SAFETY PRECAUTIONS - continued

NOTICE

A safe operator is the best assurance against accidents. All operators, no matter how experienced they may be, should read this operator's manual and all other related manuals before attempting to operate an implement. Please read the following section and pay particular attention to all safety recommendations contained in this manual and those labelled on the implements and on the tractor.

THE ROTARY BROOM

Before Operation

1. Read and understand this operator's manual and tractor operator's manual. Know how to operate all controls and how to stop the unit and disengage the controls quickly.
2. Never wear loose, torn, or bulky clothing around the tractor and rotary broom. It may catch on moving parts or controls, leading to the risk of accident.
3. Thoroughly inspect the area where the equipment is to be used and remove all objects which may damage the equipment. Keep area of operation clear of people, animals and debris.
4. Disengage clutch and shift into neutral before starting the engine.
5. Do not operate equipment in wintertime without wearing adequate winter garments.
6. Never attempt to make any adjustments while engine is running. Read this manual carefully to acquaint yourself with the equipment as well as the tractor operator's manual. Working with unfamiliar equipment can lead to accidents. Be thoroughly familiar with the controls and proper use of the equipment.
7. Replace all missing, illegible, or damaged safety and warning decals. See list of decals in the operator's manual.
8. Do not modify or alter this equipment or any of its components, or any equipment function without first consulting your dealer.
9. Keep safety decals clean of dirt and grime.

SAFETY PRECAUTIONS - continued

Rotary broom Operation

1. Never operate the rotary broom without good visibility and lighting.
2. Do not make mechanical adjustments while the unit is in motion, the rotary broom is raised, or the engine is running.
3. Never allow anyone to sit or stand on the rotary broom at any time.
4. Make sure the belt drive is removed from the tractor's output pulley.
5. Before leaving the tractor unattended, take all necessary precautions. Stop the engine and remove the ignition key.
6. Exercise extreme caution when operating on or crossing a gravel drive, walks, or roads. Stay alert for hidden hazards or traffic. Do not carry passengers.
7. Do not run the engine indoors except when starting engine and transporting attachment in or out of building. Carbon monoxide gas is colorless, odorless and deadly.
8. Exercise extreme caution when changing direction on slopes. Do not attempt to operate on steep slopes or near embankments.
9. Never operate machine at high transport speeds on a slippery surface.
10. Use extra caution when backing up.
11. Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable noises.
12. Always wear eye protection during operation (face shield, etc.)
13. Never allow anyone to operate the equipment until they are thoroughly familiar with basic tractor and rotary broom operation.
14. Make sure the tractor is counterweighted as recommended by your dealer. Weights provide the necessary balance to prevent tip-over or loss of traction or steering.
15. Always make sure all rotary broom components are properly installed and securely fastened BEFORE operating.

SAFETY PRECAUTIONS - continued

THE TRACTOR

General Information

1. Read the operator's manual carefully before using tractor. Lack of operating knowledge can lead to accidents.
2. Do not permit anyone but the operator to ride on the tractor. There is no safe place for extra riders.

Operating the Tractor

1. Never run the tractor engine in a closed building without adequate ventilation as the exhaust fumes are very dangerous.
2. Never allow an open flame near the fuel tank or battery.
3. Always bring the tractor to a complete stop, shut off the engine, lower the implement to the ground and remove the ignition key before leaving the tractor.
4. Never park the tractor on a steep slope.
5. Do not attempt to operate on steep slopes.
6. Use of rear counterweights for better traction and stability is recommended.
7. Always drive the tractor at speeds compatible with safety, especially when operating over rough ground, crossing ditches, or when turning.
8. Handle fuel with care, as it is highly flammable.
9. Use approved fuel container.
10. Never add fuel to a running engine or a hot engine.

11. Fill fuel tank outdoors with extreme care. Never fill fuel tank indoors. Replace fuel cap securely and wipe up spilled fuel.
12. Never allow anyone to operate the rotary broom until they are thoroughly familiar with basic tractor and rotary broom operation.
13. Make sure the tractor is counterweighted as recommended by your dealer. Weights provide the necessary balance to prevent tip-over or loss of traction or steering.
14. Always make sure all components are properly installed and securely fastened BEFORE operation.

During Operation

1. Do not allow anyone to ride on the tractor/equipment at any time. There is no safe place for passengers on this equipment. The operator MUST sit in the tractor seat.
2. Eye and hearing protection is recommended when operating the equipment.
3. Operate only during daylight hours, or when the area is well lit with bright artificial light.
4. Set the parking brake, lower the implement to the ground, shut off the engine and remove the key BEFORE leaving the operator's seat.
5. Inspect the equipment after striking any foreign object to assure that all equipment parts are safe and secure and not damaged.

SAFETY PRECAUTIONS - continued

MAINTENANCE

ALWAYS USE GENUINE PARTS WHEN REPLACEMENT PARTS ARE REQUIRED

1. Park the tractor/equipment on level ground, set the parking brake, shut off the engine, remove the key, and lower the implement to the ground BEFORE making any equipment adjustments.
2. Provide adequate blocking before working under the rotary broom when in raised position.
3. Never park the tractor with fuel in the fuel tank inside a building where an open flame or sparks are present. Allow the engine to cool down before leaving it in any enclosure.
4. Keep the tractor/equipment clean. environmental build-up can lead to malfunction or serious personal injury.
5. Always wear eye protection when cleaning or servicing the equipment.
6. Do not modify or alter this equipment or any of its components or operating functions. If you have questions concerning modifications, consult your dealer.

TRANSPORTING

1. If the tractor/equipment is to be driven on public roads, it must be equipped with an SMV (Slow Moving Vehicle) sign. Check local traffic codes that may apply to unit usage on public roads and highways in your area.
2. Be alert for all other traffic when driving the tractor/equipment on public roads or highways.

STORAGE

Before storing the rotary broom, certain precautions should be taken to protect it from deterioration:

1. Clean the rotary broom thoroughly.
2. Make all the necessary repairs.
3. Replace all Safety Signs that are damaged, lost, or otherwise become illegible. If a part to be replaced has a sign on it, obtain a new safety sign from your dealer and install it in the same place as on the removed part.
4. Repaint all parts from which paint has worn or peeled.
5. When the rotary broom is dry, oil all moving parts. Apply oil liberally to all surfaces to protect against rust.
6. Store in a dry place.

DECALS

Replace Immediately if Damaged

MISE EN GARDE

NEGLIGER DE SUIVRE LES PROCÉDURES SÉCURITAIRES D'UTILISATION PEUT ENTRAÎNER DES BLESSURES.

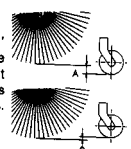
- POUR UNE UTILISATION SÉCURITAIRE, SUIVRE TOUTES LES INSTRUCTIONS D'UTILISATION ET PRÉCAUTIONS SÉCURITAIRES DANS LE MANUEL DE L'OPÉRATEUR.
- PORTER DES LUNETTES DE SÉCURITÉ EN TOUT TEMPS.
- GARDER MAINS, PIEDS ET VÊTEMENTS ÉLOIGNÉS DES PIÈCES MOTRICES.
- ARRÊTER LE MOTEUR AVANT DE QUITTER LA POSITION DE L'OPÉRATEUR.
- ATTENDRE QUE TOUTS LES MOUVEMENTS SOIENT ARRÊTÉS AVANT D'AJUSTER, LUBRIFIER, NETTOYER OU DÉBLOQUER LA MACHINE.
- GARDER L'ENDROIT D'UTILISATION DÉGAGÉ DE TOUTES PERSONNES ET ANIMAUX.
- GARDER TOUS LES ÉCRANS PROTECTEURS EN PLACE.
- JAMAIS DIRIGER L'ÉVACUATION VERS DES PIÉTONS, BÂTIMENTS, AUTOMOBILES, ETC.
- TOUJOURS UTILISER UN MASQUE À POUSSIÈRE DANS UN ENVIRONNEMENT POUSSIÉREUX.
- GARDER TOUTES LES MATIÈRES PLASTIQUES ÉLOIGNÉES DE LA CHALEUR INTENSE ET DES FLAMMES.
- NE JAMAIS PERMETTRE DE PASSAGERS SUR CETTE MACHINE.

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IMPORTANT

AJUSTEMENT DES BROSSES
Régler à la hauteur A 1" à 1 1/4" (25-32mm) au dessus de la roue pour l'utilisation sur gazon, et B 1/32" à 3/16" (1-5mm) en bas de la roue pour les surfaces dures.



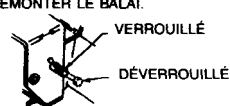
BRUSH HEIGHT ADJUSTMENT
Set brush height A 1" to 1 1/4" (25-32mm) above wheel for lawn work and B 1/32" to 3/16" (1-5mm) below wheel for hard surfaces.

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IMPORTANT

- POUR ÉVITER DES DOMMAGES AU BALAI, TOUJOURS OPÉRER LE BALAI AVEC LA GOUPILLE EN POSITION DÉVERROUILLÉE.
- UTILISER LA POSITION VERROUILLÉE SEULEMENT POUR MONTER OU DÉMONTER LE BALAI.



VERROUILLÉ
DÉVERROUILLÉ

VOIR LE MANUEL DE L'OPÉRATEUR

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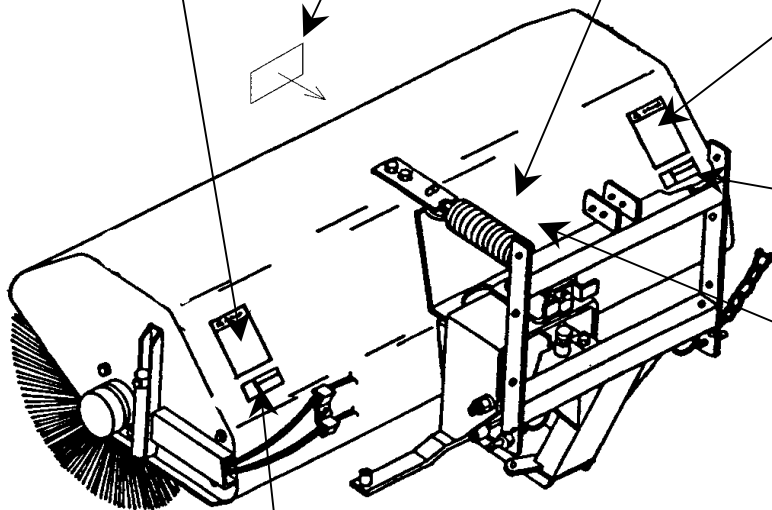
WARNING

FAILURE TO FOLLOW SAFE OPERATING PROCEDURES MAY RESULT IN INJURY.

- FOR SAFE OPERATION FOLLOW ALL OPERATING INSTRUCTIONS AND SAFETY PRECAUTIONS IN OPERATOR'S MANUAL.
- EYE PROTECTION MUST BE WORN AT ALL TIMES.
- KEEP HANDS, FEET AND CLOTHING AWAY FROM POWER DRIVEN PARTS.
- STOP ENGINE BEFORE LEAVING OPERATOR POSITION.
- WAIT FOR ALL MOVEMENTS TO STOP BEFORE STARTING TO ADJUST, LUBRICATE, CLEAN OR UNCLG THE MACHINE.
- KEEP THE AREA OF OPERATION CLEAR OF ALL PERSONS AND ANIMALS.
- KEEP ALL GUARDS AND SHIELDS IN PLACE.
- NEVER DIRECT DISCHARGE TOWARD BYSTANDERS, BUILDINGS, CARS ETC.
- ALWAYS USE A DUST MASK WHEN WORKING IN DUSTY CONDITIONS.
- KEEP PLASTIC MATERIALS AWAY FROM INTENSE HEAT AND OPEN FLAME.
- NEVER ALLOW PASSENGERS ON THE ATTACHMENT.

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WARNING

PINCH POINT
AVOID INJURY FROM FRAME PIVOT AND STOPS:

- Keep hands and feet away.

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MISE EN GARDE

POINT DE PINCEMENT
CHÂSSIS PIVOTANT. PEUT PROVOQUER DES BLESSURES:

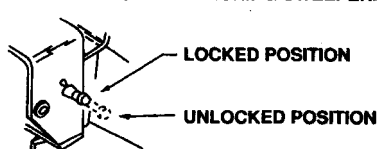
- Garder mains et pieds éloignés.

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IMPORTANT

- TO AVOID DAMAGE TO THE SWEEPER, ALWAYS OPERATE SWEEPER WITH PIN IN UNLOCKED POSITION.
- USE LUCKED POSITION ONLY FOR ATTACHING OR DETACHING SWEEPER.



LOCKED POSITION
UNLOCKED POSITION

SEE OPERATOR'S MANUAL

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ASSEMBLY

ROTARY BROOM ASSEMBLY

The rotary broom is assembled at the factory, however, parts contained in the bag must be installed. Use the present manual and lay out all parts for assembly. Separate bolts and nuts into various sizes. After assembly, torque all the bolts according to the "*Torque Specification Table*" enclosed at the end of the manual.

Step 1: Broom Preparation

1. Insert a parking stand (fig.1, item 1) in each stand support (fig.1, item 2) from the underside and install a 5/32" x 1 1/4" cotter pin (fig.1, item 3) in upper hole of parking stands. Set parking stands in most extended position and secure with two 4mm x 80mm hairpins (fig.1, item 4) on underside of supports.
2. Assemble frame (fig.2, item 5) to rotary broom using the two 1/2" x 1 3/4" bolts, bushings, 9/16" hole flat washers and 1/2"NC nylon lock nuts.
3. Insert threaded end of upper spring assembly (fig.2, item 6) through weldment (fig.2,item 7), and secure with the handle (fig.2, item 8).
4. Install both caster wheels (fig.1, item 9) to broom using eight 5/16" x 1/2" flange bolts and nuts.(fig.1, item 10) on each side [five on the right side and three on the left side].
5. Using threaded sealant, connect the rotary broom hoses
 - to the 20" extension hoses (supplied with the broom), for *Rear Mounting*.
 - OR to the 198" extension hoses (supplied with the Front Loader Mount package), for *Front Mounting*.
6. Connect the two broom motor hoses.

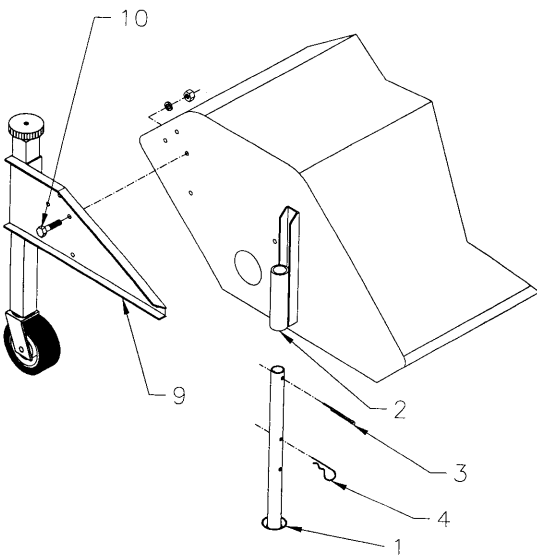


Figure 1

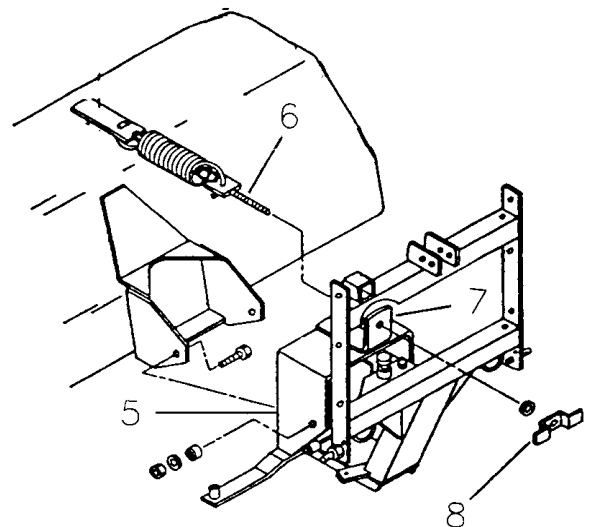


Figure 2

ASSEMBLY

Step 2: 3 point Hitch or Rear Carrier Frame Preparation

IMPORTANT If your tractor is not equipped with a minimum hydraulic power of 10-12 GPM at a minimum of 2000 PSI, **AN INDEPENDENT HYDRAULIC PACKAGE (PUMP & TANK) MUST BE INSTALLED on the 3 point hitch or on a REAR CARRIER FRAME (9399)** in case of a *Front Mounting*.

REAR OR FRONT MOUNTING

1. Attach chains (fig.3, item 1) to 3 point hitch or Rear Carrier (fig.3, item 2) using the clevises (fig.3, item 3) in small holes at bottom of frame.
2. Install threaded end of hitch pins (fig.3, item 4) in bottom holes of 3 point hitch or Rear Carrier (fig.3, item 2) and secure with hitch pins lockwashers and nuts.

FRONT MOUNTING

1. Assemble loader arm adapters (fig.4, item 1) to 3 point hitch using two 7/8" x 2" bolts (fig.4, item 2), lockwashers and nuts in lower holes, and six 5/8" x 1 1/2" bolts (fig.4, item 3), lockwashers and nuts in other holes.
2. Install one caster wheel assembly (fig.5, item 1) on each loader arm adapters (fig.5, item 2) using four 5/8" x 3" x 4 1/2" U-bolts (fig.5, item 3), eight lockwashers & nuts. Adjust caster wheel assemblies as close as possible to frame, and tighten securely.
3. Inflate caster wheel tires to 60-65 psi.
4. Attach adapter angles (fig.6, item 1) to loader arm adapters (fig.6, item 2) using four 5/8" x 3" x 4 1/2" U-bolts (fig.11, item 3), eight lockwashers and nuts. Do not tighten.

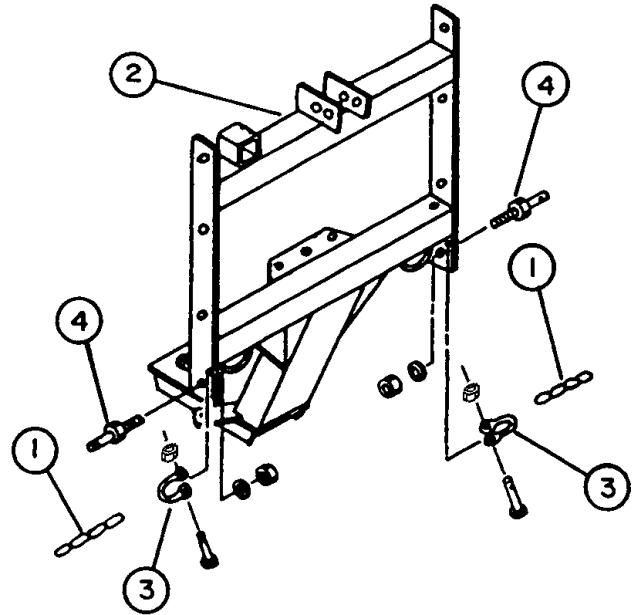


Figure 3

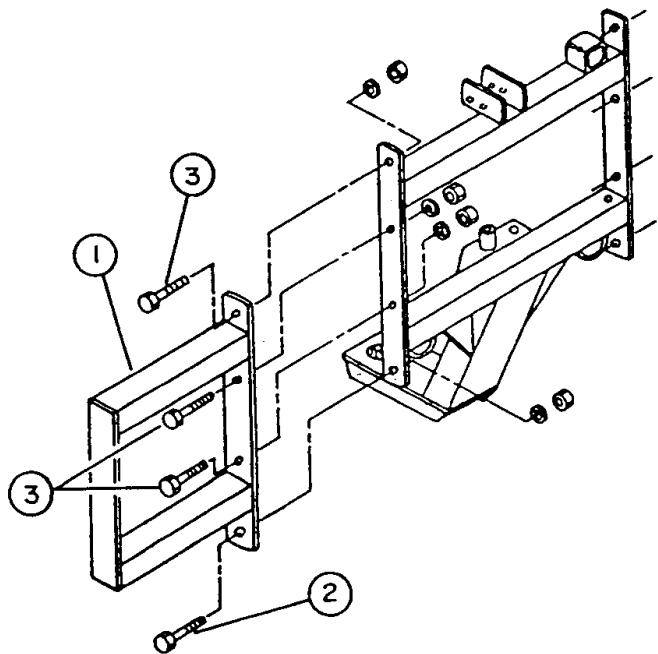


Figure 4

ASSEMBLY

Step 2: 3 Point Hitch or Rear Carrier Frame Preparation (continued)

NOTE :

- In few cases, adapter angles (fig.6, item 1) may not fit perfectly; in this case modify or make new adapter angles.
- The extra hardware (fig.6, item 4) may be used as needed. If using adapter bushings, you must weld them to the angles (fig.6, item 1) to stabilize the pins.

REAR OR FRONT MOUNTING

➡ **Go to Step 3**, if using an independent hydraulic package PUMP & TANK (9395).

➡ **OR ELSE** - Connect the broom hoses assembly to two quick couplers (that you must provide) then to the tractor hydraulic outlet.

➡ **Go to Step 4**, if using HYDRAULIC POWER ANGLE (9397) option.

➡ **OR ELSE** – **Go to Step 6** for broom installation to the tractor.

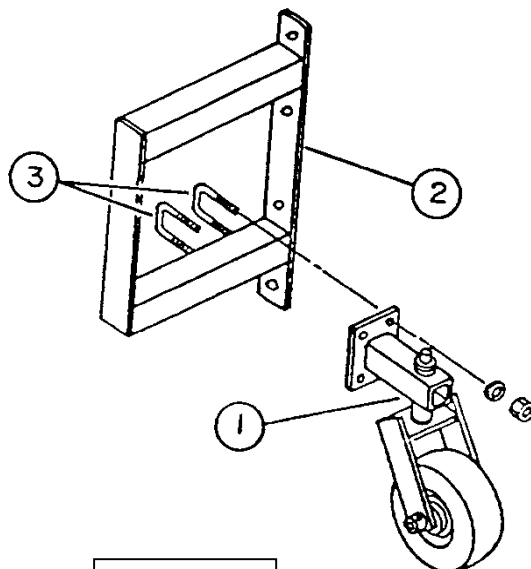
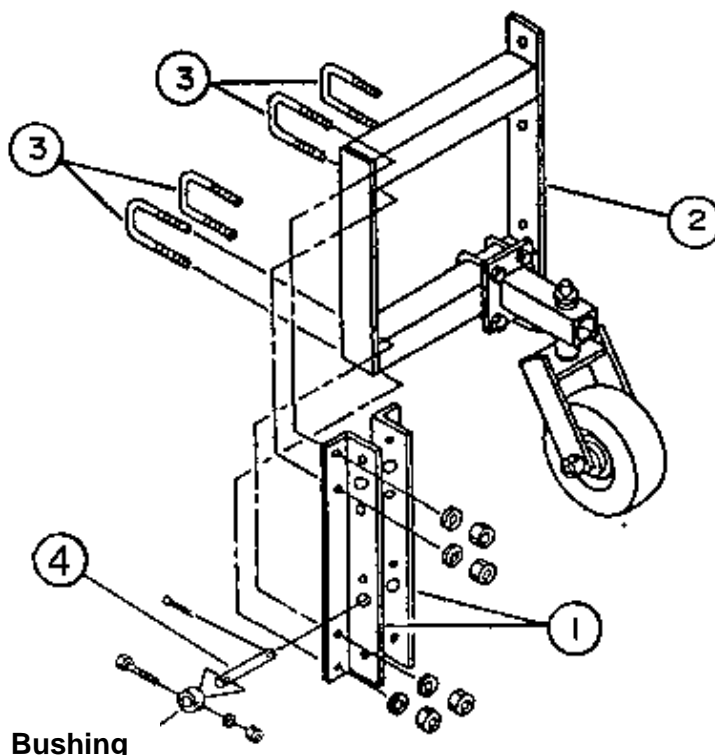


Figure 5



Bushing

Figure 6

ASSEMBLY

Step 3: Hydraulic Pump & Tank Installation (9395 Option)

1. Install pump (fig.7, item 1) and reservoir (fig.7, item 2) either on attaching frame or on rear carrier frame, using four 3/8" x 3 3/4" bolts (fig.7, item 5), lockwashers and nuts.

☞ **Go to Step 4**, if using HYDRAULIC POWER ANGLE (9397) option.

☞ **OR ELSE**, continue to the following point.

2. Using thread sealant, connect one broom motor hose assembly to pump outlet (fig.7, item 6) using a 3/4"NPT à 1/2"NPT restrictor.
3. Connect the other broom motor hose assembly to filter on reservoir (fig.7, item 7).
4. Fill reservoir (fig.7, item 2) with 7 U.S. gallons (26.5 litres) of SAE 10W30 motor oil.

NOTE Brush rotation direction can be changed simply by interchanging hose location.

☞ **Go to Step 6** for broom installation to the tractor.

⚠ CAUTION: Escaping hydraulic/ diesel fluid under pressure can penetrate the skin causing serious injury.

- Do not use your hands to check for leaks. Use a piece of cardboard or paper to search for leaks.
- Stop engine and relieve pressure before connecting or disconnecting lines.
- Tighten all connections before starting engine or pressurizing lines.
- If any fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

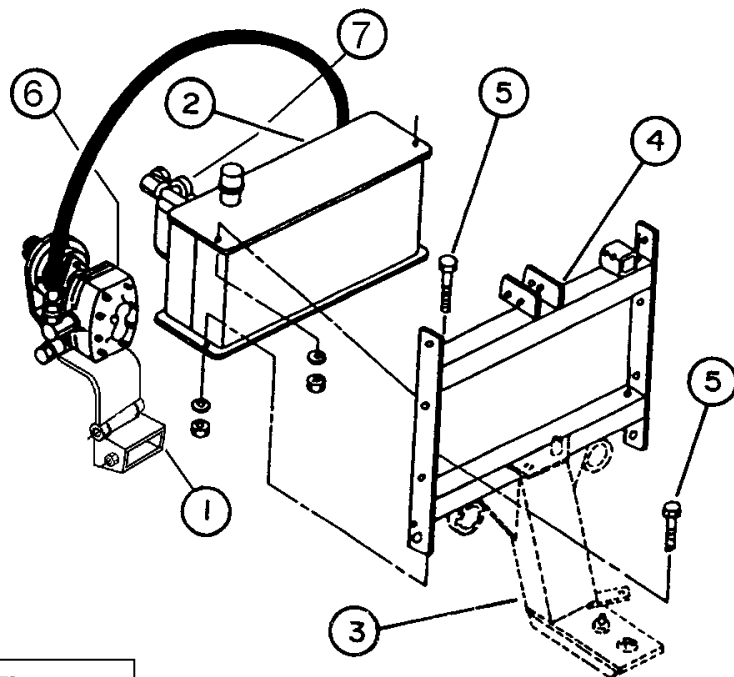


Figure 7

ASSEMBLY

Step 4: Hydraulic Power Angle Installation (9397 Option)

1. Remove manual angle adjustment lever (fig. 8, item 1) and broom plate (fig. 8, item 2) by removing the 3/16" x 1" roll pin and the spring.
2. With the cylinder ports facing you, install the cylinder base end on the pivot arm. Secure from under the pivot arm with a 5/8"NC x 3 1/2" carriage bolt and 5/8"NC stover nut (fig.9, items 6-8).
3. Install the cylinder rod end to 3 point frame using a 5/8"NC x 2 1/2" hex. bolt and 5/8"NC stover nut (fig.9, items 7-8).
4. Using thread sealant, install a 90° elbow (fig.9, item 5) in each cylinder port. Set both elbow at an appropriate angle to facilitate the routing of the hoses under the tension adjustment spring (approximately 2 o'clock).
5. Using thread sealant, install a flow restrictor (fig.9, item 9) in the two 90° elbows and connect the 3/8" x 47" hose (fig.9, item 3) to the cylinder base end elbow and the other 3/8" x 42" hose (fig.9, item 2) to the other cylinder end.
6. Connect the other cylinder hoses ends to the extension hoses (fig.9, item 4):
 - 20" hoses (supplied with the power hydraulic angle) for *Rear Mounting*
 - **OR** 210" hoses (supplied with the front loader mount package) for *Front Mounting*.

👉 **Go to step 5, if using PUMP & TANK, for HYDRAULIC VALVE (9396) installation.**

👉 **OR ELSE** - Connect the cylinder hoses assembly to two quick couplers (that you must provide) then to the tractor hydraulic outlet.

👉 **Go to Step 6** for broom installation to the tractor.

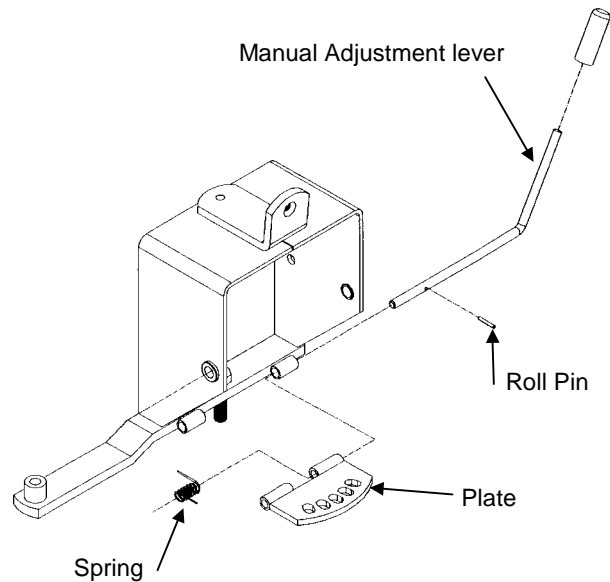


Figure 8

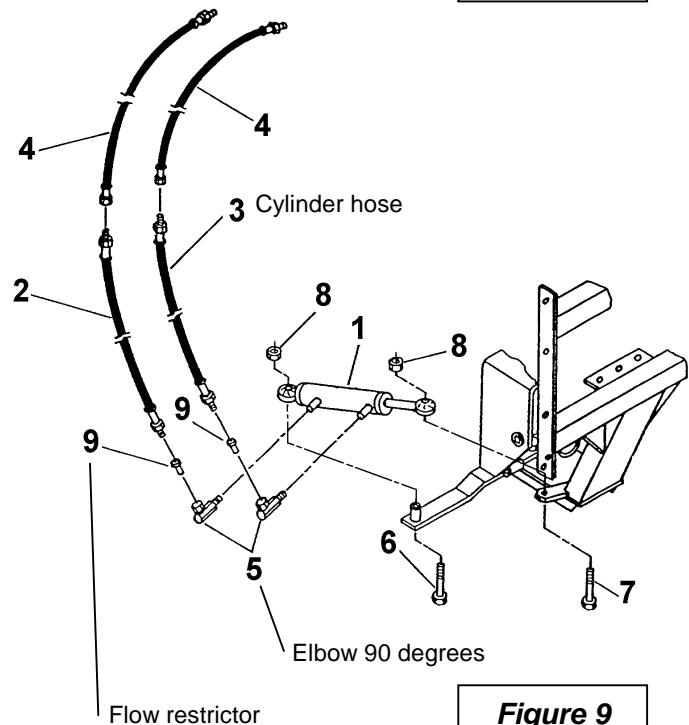


Figure 9

ASSEMBLY

Step 5: Two Spool Valve Installation (9396 Option)

1. Install valve (fig.10, item 2) on underside of valve support bracket (fig.10, item 1) using three 5/16" x 2 1/4" bolts (fig.10, item 3), lockwashers and nuts. Tighten securely.
2. Install valve support bracket assembly in welded square tube either on 3 point hitch frame or on rear carrier. Secure with two 5/16" x 3/8" allen set screw (fig.10, item 7).
3. Install a 3/4"ORB x 1/2"NPT swivel adapter (fig.10, item 6) in the outlet and inlet spool ports.
4. Install 1/2" x 42" hose (fig.11, item 1) from the inlet valve port to the outlet hydraulic pump port.
5. Connect 1/2" x 30" hose (fig.11 item 2) from the outlet valve port to the tank filter port.
6. Install a 3/4"ORB x 3/8"NPT swivel adapter (fig.10, item 5) in two of the remaining spool ports on valve, and connect broom hoses assembly male ends.
7. Install a 3/4"ORB x 3/8"NPT swivel adapter (fig.10, item 4) in the two of the remaining spool ports on valve, and connect cylinder hoses assembly.

➔ **Go to Step 6** for broom installation to the tractor.

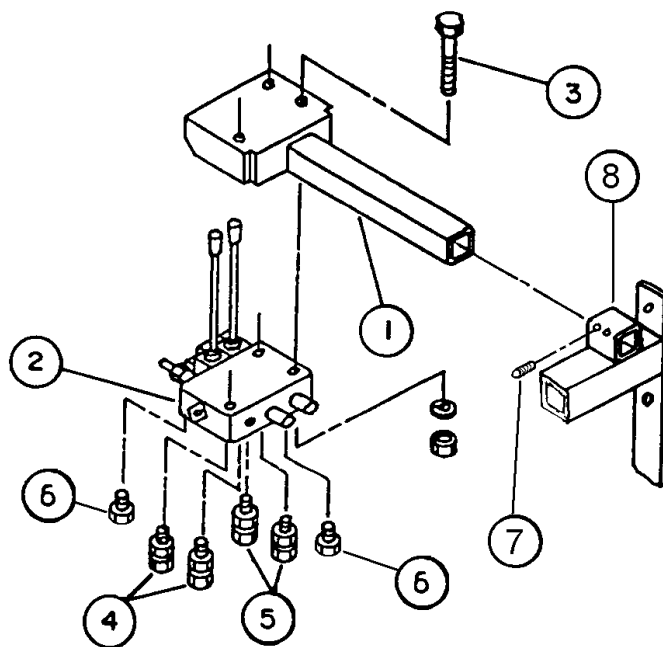


Figure 10

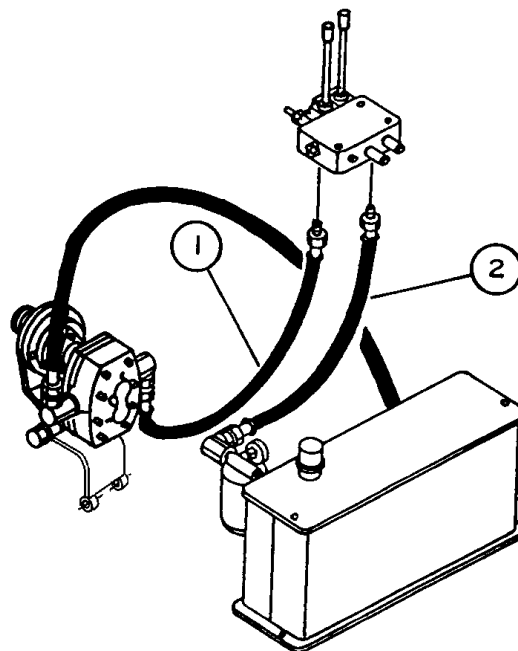


Figure 11

ASSEMBLY

Step 6: Installation on the Tractor

REAR OR FRONT MOUNTING

1. Install one chain support plate (fig.12, item 4) on each side of tractor upper hitch point. Secure to tractor pin with tractor linch pin.
2. Attach tractor lower links to hitch pins of 3 point hitch frame or rear carrier frame using tractor linch pins.
3. Install tractor top link adjustable arm (fig.12, item 5) to 3 point hitch frame or rear carrier frame (fig.12, item 2) in front hole position. Adjust top link so that attaching frame is perpendicular to ground level.
4. Attach depth control chains (fig.12, item 3) in chain support plates (fig.12, item 4). Adjust chain so that bottom of attaching frame stops at 3" to 3 1/2" from ground, in case of a *Rear Mounting*.

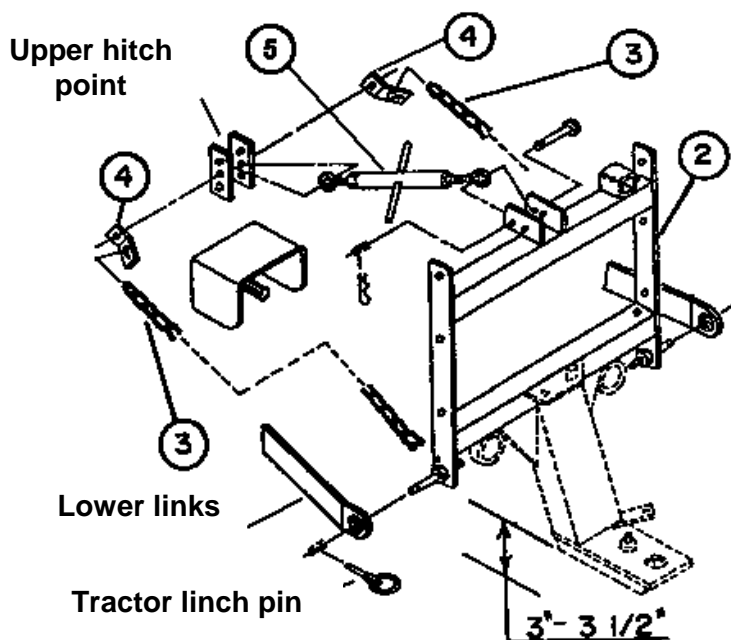
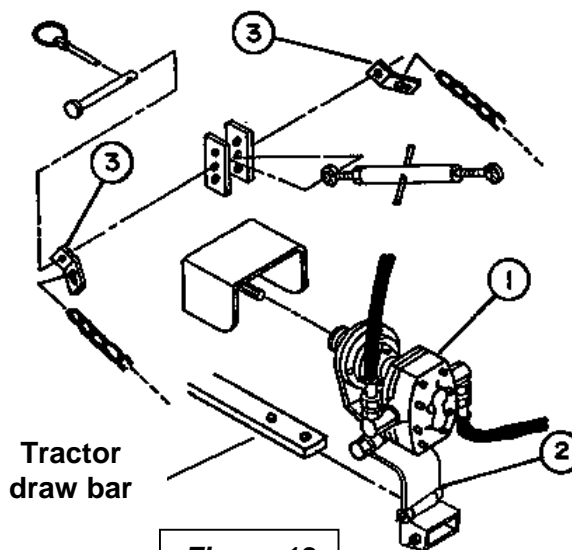


Figure 12

☞ If using an independent hydraulic package **PUMP & TANK (9395)**:

5. Attach hydraulic pump assembly (fig.13, item 1) to tractor PTO shaft, making sure to place tractor draw bar inside hinge portion (fig.13, item 2) of assembly. Make sure locking collar securely locks pump assembly in place.



FRONT MOUNTING

1. Retract bucket cylinders completely.
2. Install broom on loader arms using pins from bucket or the supplied pins (with bushings, hex. bolts, lockwashers, nuts and cotter pins).

IMPORTANT : Broom attaching frame must be 90° with ground level, and lower point on broom frame is 3" to 3 1/2" from ground level; if bucket cylinders are not retracted completely to obtain this, a stopper must be installed on each cylinder to be convenient for the operator.

OPERATION

GENERAL PREPARATION

The rotary broom is driven from the tractor PTO. Refer to tractor operating manual for driving mechanism instructions.

1. Check drive shaft tightening.
2. Make sure that the broom operates freely.
3. Adjust side caster wheels.



WARNING

- **Do not allow bystanders near working area.**
- **Do not allow anyone to ride on rotary broom or quick hitch.**
- **Before cleaning, adjusting or repairing the rotary broom : bring the tractor to a complete stop, wait for all movement to stop, apply parking brake, shut off the engine and remove the ignition key.**
- **Never put any part of your body under the rotary broom while making adjustments.**

Up & Down Control

- **Front Mounting:** See loader operating controls.
- **Rear Mounting:** Use tractor 3 point hitch control lever.

PTO Operation

- **With independent hydraulic package:** Use rear PTO control lever.
- **With two spool valve :** Ball detent spool handle will reverse brush rotation if placed at either end position.
- **Without hydraulic package :** Refer to tractor rear remote valve operating instructions.

ADJUSTMENTS



WARNING: To avoid personal injury, be sure tractor engine is off, parking brake is set and all movement has stopped before making any adjustment.

Side Caster Wheels

Required for lawn work and heavy loads.

- Turning the ground contact wing nut in a clockwise direction decreases brush ground contact.
- Turning ground contact handle counter-clockwise increases brush ground contact and must be used only to compensate brush wear.
- For hard surfaces, set casters 1/16" to 1/4" above brush tips.
- On grass, set casters 1" to 1 1/4" below brush tips.

Side to side level adjustment

Raise broom off the ground. Using the nuts on the eye bolts located under ground contact threaded rods, set both spring tension so that broom is level.

Height Adjustment

- **Rear Mounting:** Adjust chain length so that when hitch is supported by chain, hitch is at 3" to 3 1/2" from ground.
- **Front Mounting:** Block loader bucket cylinders so that when broom is supported by caster wheels, attaching frame lowest point is 3" to 3 1/2" from ground.

OPERATION

Brush-to-Ground Contact (fig. below ↓)

1. Adjust spring tension using the adjustment knob (item 2) so the broom head weighs approximately 30 to 50 pounds when lifted by the front. More than this will cause premature brush wear and hydraulic overheating.
2. Turn the adjustment knob (item 2) clockwise to decrease brush ground contact, and counter-clockwise to increase ground contact.

NOTE: Further adjustment will be necessary only to compensate for brush wear.

Parking Stands

Always use stands when broom is not in use to prevent brush deformation.

Angle Adjustment

Manual

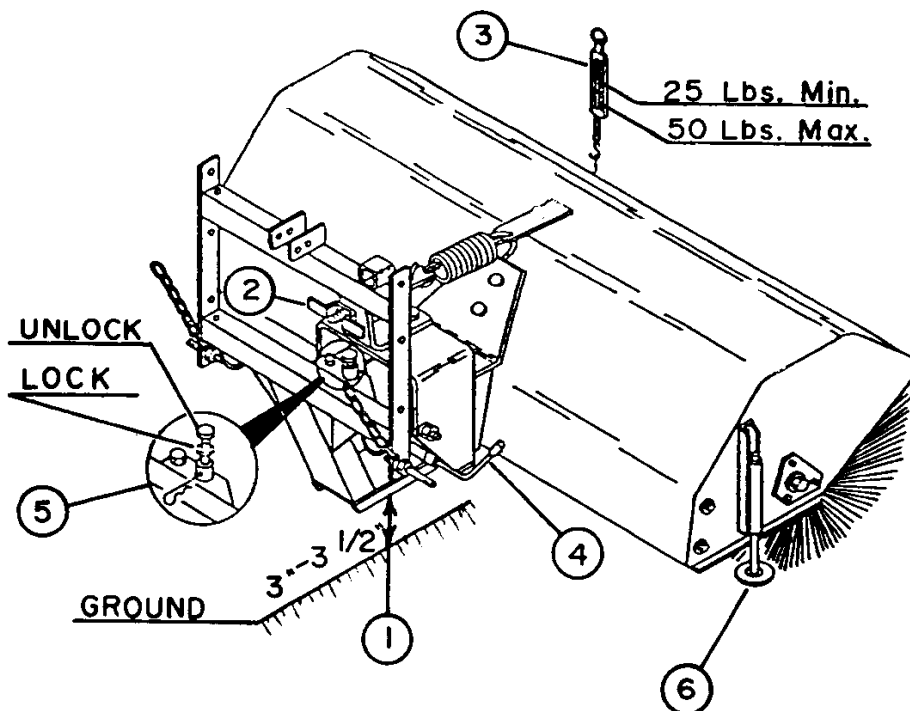
Keep broom slightly off the ground, lift lever, select angle and release lever. Make sure lever locks angle completely.

Hydraulic

- **Two spool valve :** Use the right lever.
- **Without two spool valve :** Refer to tractor rear remote valve operating instructions.

Lateral Oscillation Lock-out

To prevent uneven brush wear, unlock pin only for light duty work on uneven ground, or when using side caster wheels.



OPERATION

OPERATION


General Sweeping

1. Minimise dust by reducing brush speed and by sweeping on days with high moisture.
2. For light material, angle broom 12,5° right or left rather than fully angled to obtain a wider sweeping path.
3. Prevent damage to the broom by removing large foreign objects.
4. Never operate broom on any kind of carpet.
5. Remember to sweep with the tips of the bristles, like a broom - not with the sides of bristles, like a mop.

Increasing Traction and Stability

The use of tire chains and/or rear weight are recommended for extra traction and stability.

Snow Removal

 **WARNING:** Foreign objects in snow may be thrown farther than the snow itself. Use slowest brush speed that will perform the job. Stay aware of broom discharge direction.

1. This broom works best on snow depth of 6" or less. Large amounts of snow can be moved if ground speed is reduced.
2. To avoid snow being blown back on the tractor or operator, sweep with the wind blowing in the discharge direction.

Lawn Thatching and Leaf Raking



CAUTION: Caster wheels must be installed to perform these types of operation in order to limit excessive ground contact.

1. Bristles should barely touch the ground for lawn thatching and leaf raking operations.
2. Slower brush speed and ground speed are more adequate for lawn thatching. This will avoid bouncing which could damage the lawn due to excessive ground contact.
3. Minimise dust by sweeping when moisture is high (but not wet) whenever possible.
4. Set caster wheels at 1/16" to 1/4" above brush tips for hard surfaces, and 1" to 1 1/4" below brush tips for lawn work.
5. For light material, angle broom 12 to 15° right or left rather than fully angled to obtain wider sweeping path.
6. Prevent damage to broom by removing large foreign objects.

MAINTENANCE

MAINTENANCE

ALWAYS USE GENUINE PARTS WHEN REPLACEMENT PARTS ARE REQUIRED.

1. Do not alter or modify the broom. If you have any questions, contact your dealer.
2. Provide adequate blocking before working under the broom.
3. Avoid exposing broom bristles to direct sunlight for long periods. Long exposure to direct sunlight will damage the bristles.
4. Because of dust raised when sweeping (other than snow), the tractor air cleaner should be checked daily and replaced when necessary.
5. Remove any accumulation of snow, ice, dirt or mud from inside and outside broom hood and from in between bristles regularly; excess weight will unbalance broom causing premature and/or uneven wear of bristles.

Hardware

Check and tighten all hardware, including factory installed hardware, before operating the rotary broom and every 8 hours of operation.

Lubrication

Using a good quality multi-purpose lubricant, lubricate all pivot points and brush ground contact adjustment threads every 24 hours of operation.

Independent Hydraulic System

- Check oil level by cap make sure level is approximately 2" (50mm) below reservoir top cover before initial operation and every 8 hours of operation.
- Change oil filter every 100 hours of operation. Use part # 660499 or 25 micron equivalent filter.
- Replace reservoir oil every 250 hours of operation. Use 7 gallons (US) (26.5 litres) of 10W30 motor oil.

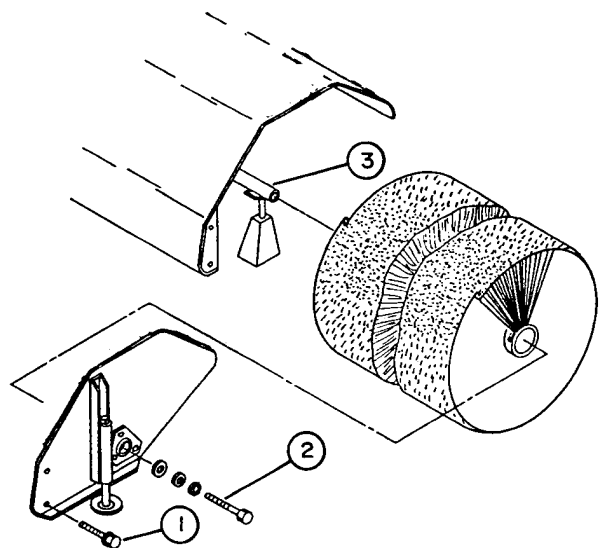
Side Caster Wheels

Grease swivel bushings every 4 hours of operation.

Brush Replacement (figure below ↴)

1. Shut off the tractor engine, wait for all movement to stop, apply parking brake and remove the ignition key.
2. Lift the rotary broom approximately 7 to 8 inches off the ground and stabilize with two blocks placing them on each back sides.
3. Remove the broom.
4. Remove the eight 5/16" x 1/2" bolts (item 1), one 1/2" bolt (item 2) from left hand broom end and remove broom side plate and retainer cup.
5. Install new brush over shaft being careful to keep the shaft well supported.
6. Apply anti-seize compound on the 1/2" bolt (fig.1, item 2) and place it through side plate and thread bolt into shaft ends, aligning side plate holes with broom housing holes. Tighten securely.
7. Reinstall the eight 5/16" x 1/2" bolts into side plate. Tighten securely.

IMPORTANT : While installing the new brush, take care to push the cap tightly against the bearing. Line up the sprocket with idler sprocket when installing the chain.



MAINTENANCE

BROOM DISMOUNTING

1. Extend broom parking stands placing hair pins on underside of stands supports.
2. Set lift in float position, turn engine off, set parking brake, remove ignition key and relieve hydraulic pressure by moving valve handles back and forth.
3. Disconnect from tractor (or two spool valve, or pump & tank, if so equipped), the broom hydraulic hoses (and cylinder angling hoses if so equipped).

FRONT MOUNTING

4. Remove the loader pins and remove the broom.

REAR OR FRONT MOUNTING

5. Unhook depth limiting chains from tractor upper hitch.
6. If equipped with Independent hydraulic package, disconnect pump from tractor PTO shaft.
7. Lower tractor 3 point hitch, and carefully remove either broom or rear carrier.

STORAGE

Before storing the rotary broom, certain precautions should be taken to protect it from deterioration.

1. Install a rubber dust cap on each hose quick coupler.
2. Clean the rotary broom thoroughly.
3. Make all the necessary repairs.
4. Repaint all parts from which paint has worn or peeled.
5. Lubricate the rotary broom as instructed under Lubrication.
6. Replace all decals that are damaged, lost, or otherwise become illegible. If a part to be replaced has a sign on it, obtain a new decal from your dealer and install it in the same place as on the removed part.
7. When the rotary broom is dry, oil all moving parts. Apply oil liberally to all surfaces to protect against rust.



CAUTION: Do not allow oil or grease on broom bristles.

8. Store broom on storage stands so that the bristles do not touch the ground.
9. Store in a dry place.

IMPORTANT: If broom bristles are exposed to direct sunlight, protect bristles with a tarp.

PARTS

INTRODUCTION

All parts are illustrated in "exploded views" which show the individual parts in their normal relationship to each other. Reference numbers are used in the illustrations. These numbers correspond to those in the "Reference Number" (REF) column, and are followed by the description and quantity required.

O/L - "Obtain Locally" in the part number column indicates common hardware that is available at your local hardware supply.

All reference to right and left, forward or rearward, are from the operator's seat, facing the steering wheel.

Orders must give the complete description, correct part number, the total amount required, the serial number, the method of shipment and the shipping address.

The manufacturer reserves the rights to change, modify, or eliminate from time to time, for technical or other reasons, certain or all data, specifications, or the product or products themselves, without any liability or obligation.

PARTS

ROTARY BROOM – 9393A & 9394A



PARTS

ROTARY BROOM - 9393A & 9394A

REF.	DESCRIPTION	QTY	PART NUMBER
1	Frame 60" Model – 9393A	1	662112
	72" Model – 9394A	1	662314
2	Hydraulic motor	1	660437
3	Hydraulic support adaptor	1	660425
4	Hex. bolt 1/2" NC X 2 1/4"	4	O/L
5	Hex. nut 1/2" NC	5	O/L
6	Lockwasher 1/2" dia.	6	O/L
7	Socket head capscrew 5/16" NC x 2"	6	O/L
8	Key 8mm x 7mm x 25mm	1	660063
9	Drive shaft 60" Model – 9393A	1	660420
	72" Model – 9394A	1	660540
10	Allen setscrew 5/16" NC x 1/2"	2	O/L
11	Bearing without locking collar	1	654170
12	Bearing flange	2	657893
13	Cotter pin 5/32" X 2"	1	O/L
14	Flange bolt 5/16" NC x 3/4"	2	O/L
15	Hex. bolt 3/8" NC X 1 1/2"	2	O/L
16	Flat washer 7/16"	2	O/L
17	Brush ground contact adjustment	1	661018
18	Spring	1	660641
19	Handle	1	659828
20	Carriage bolt 3/8" NC x 3/4"	3	O/L
21	Flange nut 3/8" NC	3	O/L
22	Brush 22" dia. 60" Model – 9393A	1	9415
	72" Model – 9394A	1	9416
23	Brush support plug	1	663674
24	Side plate R.H.	1	662111
25	Nylon hex. nut 3/8"	2	O/L
26	Hex. bolt 1/2" NC X 1 3/4"	1	O/L
27	Allen setscrew 3/8" x 3/8"	1	O/L
28	Stabilisation ring	1	661049
29	Hose 1/2" x 20"	2	660449
30	Flange bolt 5/16" NC x 1/2"	7	O/L
31	Bushing	1	663673
32	Hex. bolt 1/2" NC X 1 3/4"	2	O/L
33	Hex. bolt 1/2" NC X 1 3/4"	1	O/L
34	Flat washer 9/16" dia.	4	O/L
35	Hex. bolt 1/2" NC X 1 1/2"	1	O/L
36	Pivot Bracket	1	659821
37	Hex. bolt 5/16" NC x 1 1/2"	1	O/L
38	Pivot bushing	2	658532
39	Nylon hex. nut 1/2" NC	3	O/L
40	Upper Coupler	1	661002

PARTS

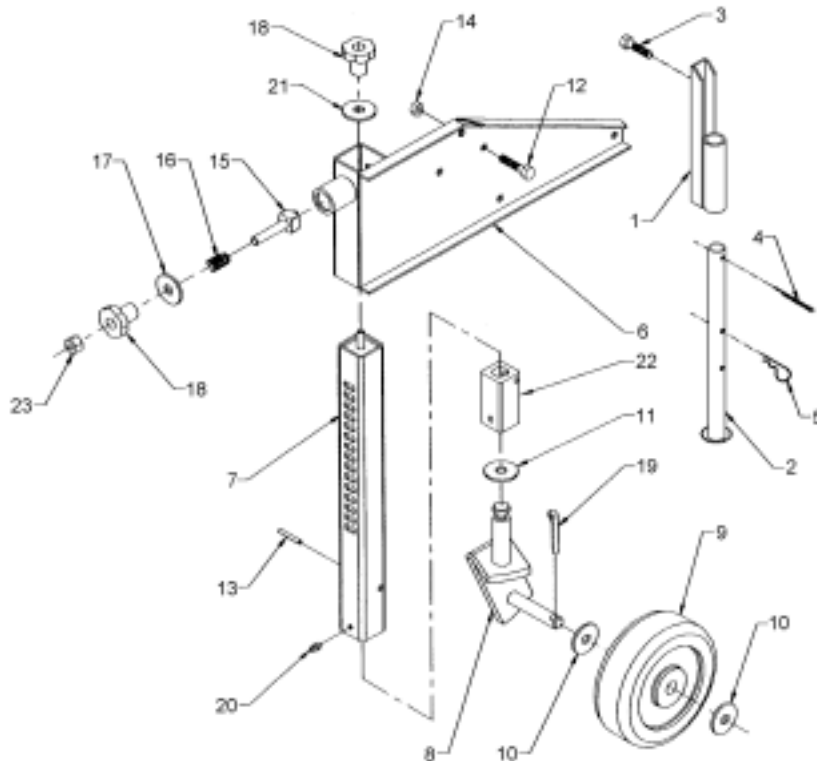
ROTARY BROOM - 9393A & 9394A

REF.	DESCRIPTION	QTY	PART NUMBER
41	Upper bushing	1	659824
42	Hose support bracket	1	660440
43	Locking pin	1	659825
44	Hair pin 3mm x 65mm	1	O/L
45	Fixation chain	2	660488
46	Pin CAT #1, with lockwasher and nut	2	654196
47	Hose 1/2" x 72" – 60" model	2	660448
	1/2" x 78" – 72" model	2	660544
48	3 point hitch	1	661001
49	Stover nut 3/4" NC	1	O/L
50	Lockwasher 5/16"	1	O/L
51	Hex. nut 5/16" NC	1	O/L
52	Stopper chain	2	660508
53	Clevis assembly	2	663963
54	Flat washer 11/16" dia. hole	1	O/L
55	Handle grip	1	656797
56	Handle	1	659651
57	Angle adjustment	1	659641
58	Torsion spring	1	657989
59	Roll pin 3/16" dia. X 1"	1	O/L

PARTS

BROOM SIDE CASTER WHEELS

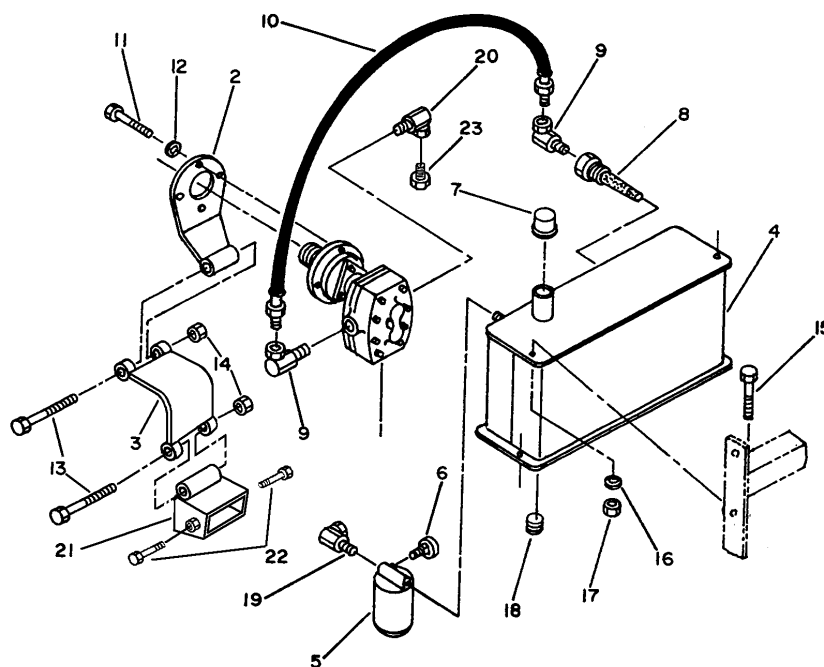
REF.	DESCRIPTION	QTY		PART #
		LEFT	RIGHT	
1	Stand support	1	1	659819
2	Parking stand	1	1	659820
3	Flange bolt 5/16" NC x 1/2"	3	3	O/L
4	Cotter pin 5/32" NC x 1 1/4"	1	1	O/L
5	Hair pin 4mm x 80mm	1	1	O/L
6	Caster wheel support - L.H.	1	-	662038
	- R.H.	-	1	662039
7	Height adjustment tube	1	1	661292
8	Wheel pivot - L.H.	1	-	661297
	- R.H.	-	1	661298
9	Wheel	1	1	661306
10	Flat washer 11/16" dia.	2	2	O/L
11	Flat washer 13/16" dia.	1	1	O/L
12	Flange bolt 5/16"NC x 1/2"	5	3	O/L
13	Roll pin 1/4" x 1 1/2"	1	1	O/L
14	Hex. nut 5/16"NC	5	3	O/L
15	Adjustment pin	1	1	661022
16	Compression spring	1	1	657658
17	Flat washer 7/16" dia.	1	1	O/L
18	Handle 5/16"NC	2	2	657309
19	Cotter pin 1/4" NC x 1 1/2"	1	1	O/L
20	Grease fitting 1/4"NF	1	1	654106
21	Flat washer 1/2" dia.	1	1	O/L
22	Wheel bushing	1	1	660948
23	Hex. nut 5/16" NC-18NC	1	1	O/L



PARTS

INDEPENDENT HYDRAULIC PACKAGE (9395)

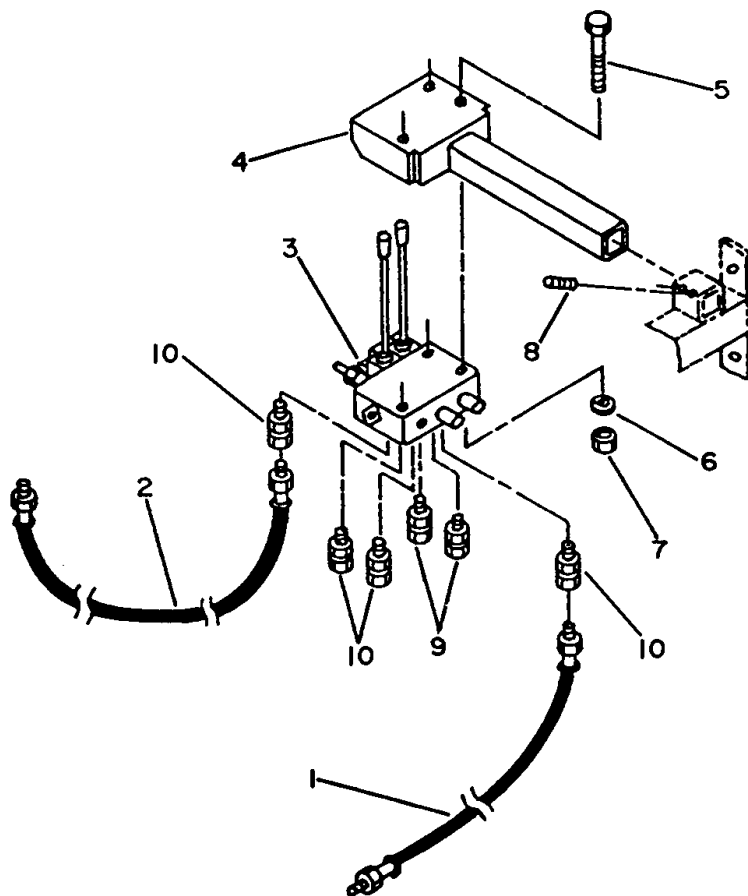
REF.	DESCRIPTION	QTY	PART NUMBER
1	Hydraulic pump	1	662620
2	Hydraulic pump support	1	662559
3	Hydraulic pump support attachment	1	662564
4	Hydraulic tank	1	660434
5	Filter	1	660499
6	Pressure indicator	1	660498
7	Filter plug	1	660501
8	Strainer	1	660470
9	Elbow 90 degrees	2	660441
10	Hose 1" X 38"	1	660450
11	Hex. bolt 10mm X 30mm	4	O/L
12	Lockwasher 7/16"	4	O/L
13	Hex. bolt 1/2" NC X 5 1/2" lg.	2	O/L
14	Stover nut 1/2" NC	2	O/L
15	Hex. bolt 3/8" NC X 3 3/4" lg.	4	O/L
16	Lockwasher 3/8"	4	O/L
17	Hex. nut 3/8" NC	4	O/L
18	Plug 1/2" NPT	1	660443
19	Elbow 90 degrees	1	655271
20	Elbow 90 degrees	1	660442
21	Hydraulic pump support attachment	1	662566
22	Square head setscrew 1/2" NC x 1 1/4"	2	O/L
23	Restrictor 3/4"NPT à 1/2"NPT	1	654846



PARTS

TWO SPOOL AUXILIARY VALVE (9396)

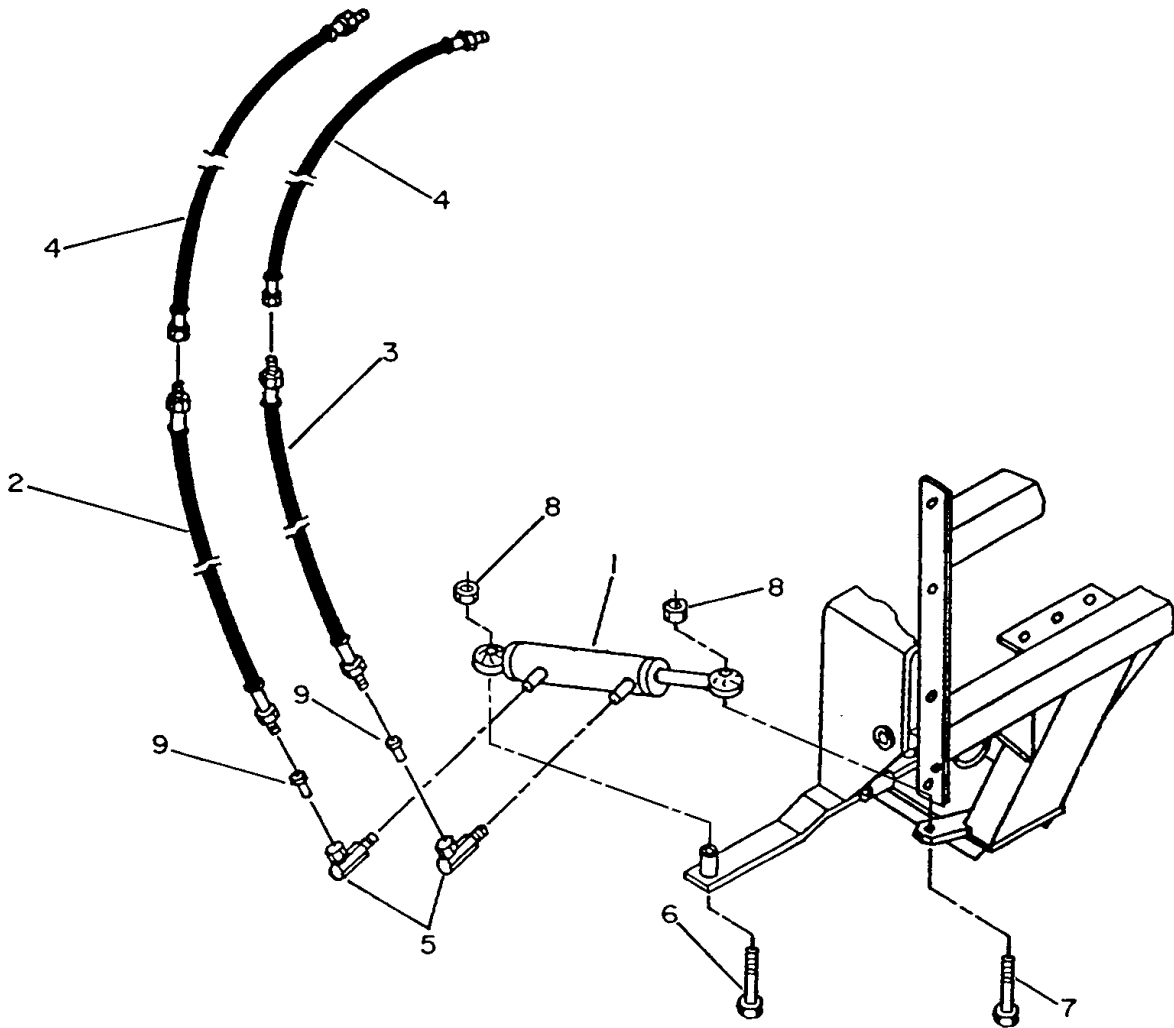
REF.	DESCRIPTION	QTY	PART NUMBER
1	Hose 1/2" x 30"	1	661624
2	Hose 1/2" x 42"	1	661625
3	Hydraulic Valve	1	660500
4	Valve Support bracket	1	660459
5	Hex. bolt 5/16" NC x 2 1/4" lg,	3	O/L
6	Lockwasher 5/16"	3	O/L
7	Hex. nut 5/16" NC	3	O/L
8	Allen setscrew 5/16" x 3/8"	2	O/L
9	Adaptor 3/4" ORB male x 3/8" NPT female	2	656103
10	Adaptor 3/4" ORB male x 1/2" NPT female	4	654592



PIÈCES

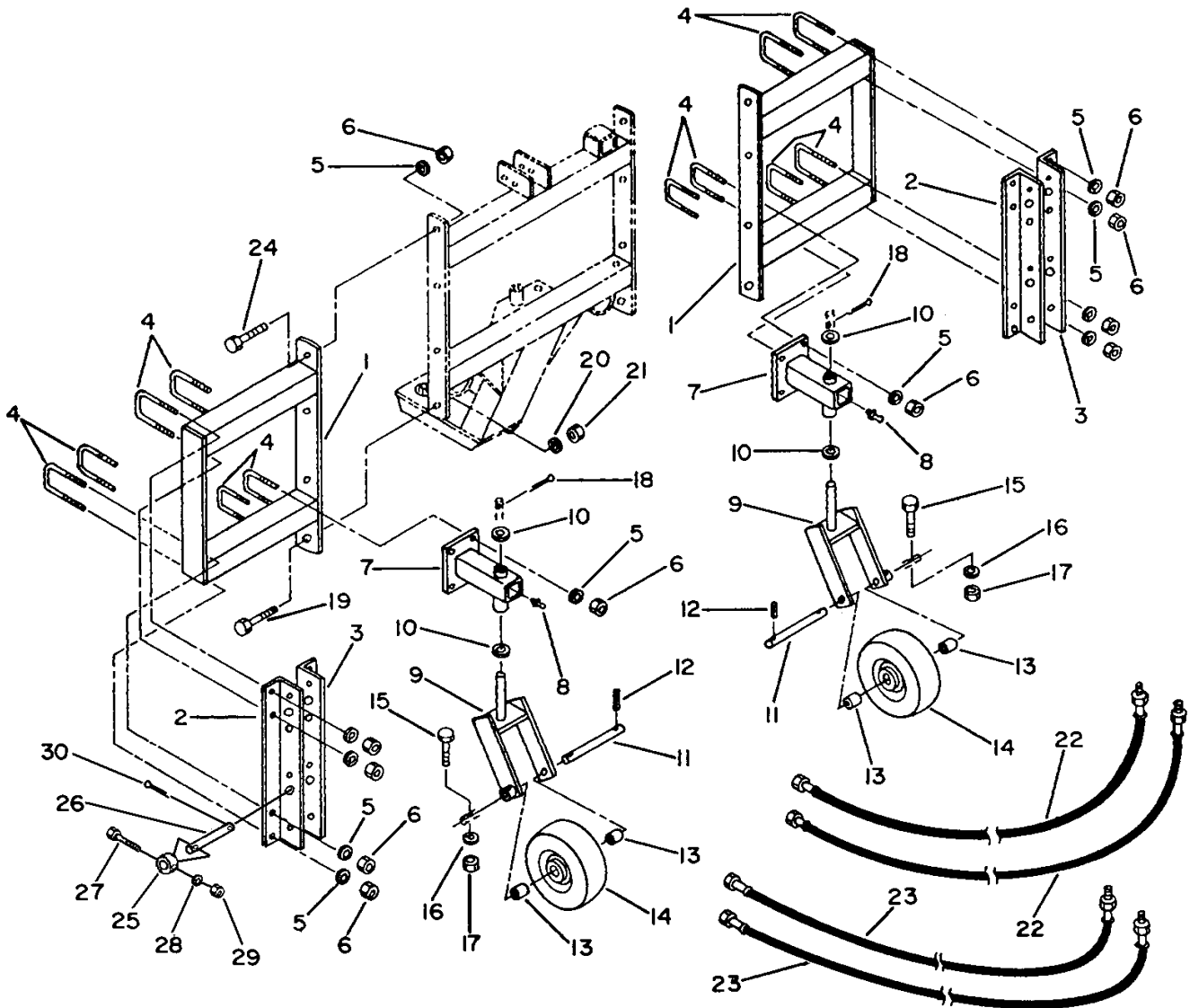
HYDRAULIC ANGLING (9397)

REF.	DESCRIPTION	QTY	PART NUMBER
1	Cylinder	1	658676
2	Hose 3/8" x 42"	1	660445
3	Hose 3/8" x 47"	1	660446
4	Extension hose 3/8" x 20" (for 9393A & 9394A only)	2	660447
5	Elbow 90 degrees	2	654557
6	Carriage bolt 5/8"NC x 3 1/2" lg.	1	O/L
7	Hex. bolt 5/8"NC x 2 1/2" lg.	1	O/L
8	Stover nut 5/8"NC	2	O/L
9	Flow restrictor	2	657756



PIÈCES

FRONT LOADER MOUNT PACKAGE (9398)



PIÈCES

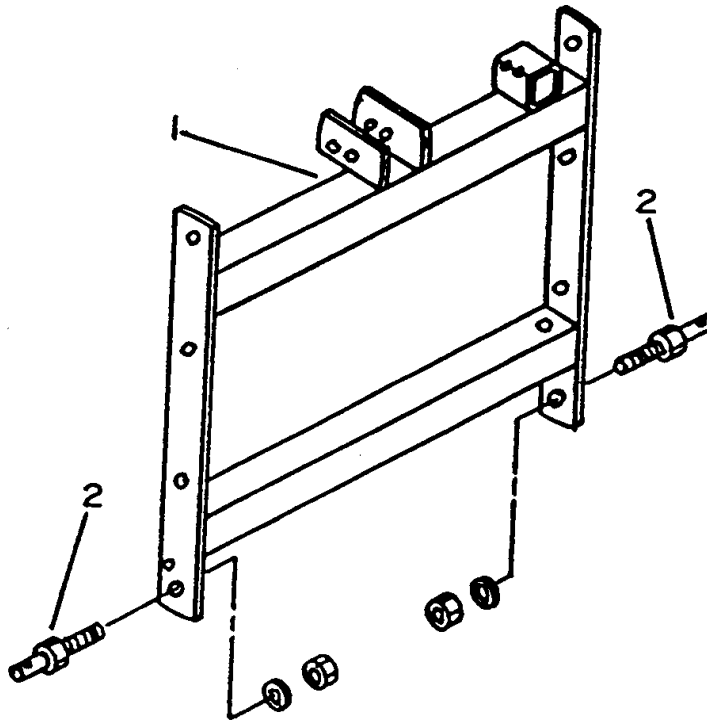
FRONT LOADER MOUNT PACKAGE (9398)

REF.	DESCRIPTION	QTY	PART NUMBER
1	Loader fixation bracket	2	660485
2	Angle fixation R.H.	2	660489
3	Angle fixation L.H.	2	660559
4	U-bolt 5/8" NC x 3" x 4 1/2"	12	30883
5	Lockwasher 5/8"	30	O/L
6	Hex. nut 5/8" NC	30	O/L
7	Wheel support	2	660492
8	Grease fitting 1/4" NF	2	654106
9	Wheel bracket	2	660483
10	Wheel washer	4	660486
11	Pin Ø 1" x 7 3/8" lg.	2	660484
12	Roll pin 1/4" x 1 1/2"	2	O/L
13	Wheel bushing	4	660487
14	Tire and wheel ass'y	2	660658
15	Hex. bolt 1/4" NC x 2" lg.	2	O/L
16	Lockwasher 1/4"	2	O/L
17	Hex. nut 1/4"	2	O/L
18	Cotter pin Ø1/4" x 2"	2	O/L
19	Hex. bolt 7/8" NC X 2"	2	O/L
20	Lockwasher 7/8"	2	O/L
21	Hex. nut 7/8"	2	O/L
22	Hose 1/2" x 198" lg. (use with rear carrier 9399 only)	2	660451
23	Hose 3/8" x 210" lg. (use with rear carrier 9399 only)	2	660452
24	Hex. bolt 5/8" NC x 1 1/2" lg.	6	O/L
25	Loader bushing	4	660847
26	Loader pin	4	660845
27	Hex. bolt 1/4" NC x 2"	1	O/L
28	Lockwasher 1/4"	4	O/L
29	Hex. nut 1/4"	4	O/L
30	Cotter pin Ø1/4" x 1 1/2"	4	O/L

PIÈCES

REAR CARRIER FRAME (9399)

REF.	DESCRIPTION	QTY	PART NUMBER
1	Rear carrier frame	1	660555
2	Pin cat. #1 ass'y	2	654196



WARRANTY



RAD TECHNOLOGIES INC.

RAD TECHNOLOGIES INC. warrants to the original buyer that the equipment is free from defects in material and workmanship. RAD TECHNOLOGIES INC.'s obligation, under this warranty, will be limited to the repair or replacement of any non-wear part or component, which RAD TECHNOLOGIES INC. finds to be defective within **one year** from the date of original purchase (unless otherwise-specified). The applicable warranty period for commercial or rental use shall be ninety (90) days from the date of purchase

In no event shall RAD TECHNOLOGIES INC. be liable for consequential, special, direct or indirect damages incurred by the buyer/user.

All components not manufactured by RAD TECHNOLOGIES INC. (such as motors, actuators, hydraulic components, tires, ...etc.) are covered by the original manufacturer's warranty in conjunction with RAD TECHNOLOGIES INC.

RAD's obligation under this warranty shall be limited to repairing or replacing, free of charge to the original purchaser, any part that, in RAD's judgment, shall show evidence of such defect, provided the **distributor** returns the part prepaid within thirty (30) days from date of failure.

This warranty shall not be interpreted to render RAD TECHNOLOGIES INC. liable for injuries or damages of any kind or nature to person or property. This warranty does not extend to losses because of delays, or to any expenses or losses incurred for labor, substitute machinery, rental or for any other reason.

Except as set forth above, RAD TECHNOLOGIES INC. shall have no obligation or liability of any kind on account of any of its equipment and shall not be liable for special or consequential damages. RAD TECHNOLOGIES INC. makes no other warranty, expressed or implied, and specifically, RAD TECHNOLOGIES INC. disclaims any implied warranty or merchantability or fitness for a particular purpose. **Some states or provinces do not permit limitations or exclusions of implied warranties or incidental or consequential damages, so the limitations or exclusions in this warranty may not apply.**

This warranty is subject to any existing conditions of supply, which may directly affect our ability to obtain materials or manufacture replacement parts. RAD TECHNOLOGIES INC. reserves the right to make improvements in design or changes in specifications at any time, without incurring any obligation to owners of units previously sold.

No one is authorized to alter, modify or enlarge this warranty nor the exclusions, limitations and reservations.

2835 Chemin de l'Aéroport, Thetford Mines (Québec) G6G 5R7

Tél.: (418) 338-4499 Fax: (418) 388-6090








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TORQUE SPECIFICATION TABLE

























GENERAL SPECIFICATION TABLE

Use the following torques when special torques are not given

NOTE: These values apply to fasteners as received from supplier, dry, or when lubricated with normal engine oil. They do not apply if special graphited or moly sulphide greases or other extreme pressure lubricants are used. This applies to both UNF and UNC threads.

SEE Grade No.		2				5				8			
BOLT HEAD IDENTIFICATION MARKS AS PER GRADE NOTE: MANUFACTURING MARKS WILL VARY.						  				  			
		Torque		Torque		Torque							
BOLT SIZES		Pounds-Foot		Newtons-Meter		Pounds-Foot		Newtons-Meter		Pounds-Foot		Newtons-Meter	
Inches	Millimeters	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
1/4	6.35	5	6	6.8	8.13	9	11.0	12.2	14.9	12	15	16.3	30.3
5/16	7.94	10	12	13.6	16.3	17	20.5	23.1	27.8	24	29	32.5	39.3
3/8	9.53	20	23	27.1	31.2	35	42.0	47.5	57.0	45	54	61.0	73.2
7/16	11.11	25	30	40.7	47.4	54	64.0	73.2	86.8	70	84	94.9	113.9
1/2	12.70	45	52	61.0	70.5	80	96.0	108.5	130.2	110	132	149.2	179.0
9/16	14.29	65	75	88.1	101.6	110	132.0	149.2	179.0	160	192	217.0	260.4
5/8	15.88	95	105	128.7	142.3	150	180	203.4	244.1	220	264	298.3	358.0
3/4	19.05	150	185	203.3	250.7	270	324	366.1	439.3	380	456	515.3	618.3
7/8	22.23	160	200	216.8	271.0	400	480	542.4	650.9	600	720	813.6	976.3
1	25.40	250	300	338.8	406.5	580	696	786.5	943.8	900	1080	1220.4	1464.5
1 1/8	25.58	-	-	-	-	800	880	1084.8	1193.3	1280	1440	1735.7	1952.6
1 1/4	31.75	-	-	-	-	1120	1240	1518.7	1681.4	1820	2000	2467.9	2712.0
1 3/8	34.93	-	-	-	-	1460	1680	1979.8	2278.1	2380	2720	3227.3	3688.3
1 1/2	38.10	-	-	-	-	1940	2200	2630.6	2983.2	3160	3560	4285.0	4827.4

METRIC BOLT TORQUE SPECIFICATIONS

Size of screw	Grade No.	Pitch (mm)	Coarse thread				Fine Thread				
			Pounds-Foot		Newtons-Meter		Pitch (mm)	Pounds-Foot		Newtons-Meter	
			MIN.	MAX.	MIN.	MAX.		MIN.	MAX.	MIN.	MAX.
M6	4T 	1.0	3.6	5.8	4.9	7.9	-	-	-	-	-
	7T 		5.8	9.4	7.9	12.7		-	-	-	-
	8T 		7.2	10	9.8	13.6		-	-	-	-
M8	4T 	1.25	7.2	14	9.8	19.0	1.0	12	17	16.3	23.0
	7T 		17	22	23	29.8		19	27	25.7	36.6
	8T 		20	26	27.1	35.2		22	31	29.8	42
M10	4T 	1.5	20	25	27.1	33.9	1.25	20	29	27.1	39.3
	7T 		34	40	46.1	54.2		35	47	47.4	63.7
	8T 		38	46	51.5	62.3		40	52	54.2	70.5
M12	4T 	1.75	28	34	37.9	46.1	1.25	31	41	42	55.6
	7T 		51	59	69.1	79.9		56	68	75.9	92.1
	8T 		57	66	77.2	89.4		62	75	84	101.6
M14	4T 	2.0	49	56	66.4	75.9	1.5	52	64	70.5	86.7
	7T 		81	93	109.8	126		90	106	122	143.6
	8T 		96	109	130.1	147.7		107	124	145	168
M16	4T 	2.0	67	77	90.8	104.3	1.5	69	83	93.5	112.5
	7T 		116	130	157.2	176.2		120	138	162.6	187
	8T 		129	145	174.8	196.5		140	158	189.7	214.1
M18	4T 	2.0	88	100	119.2	136	1.5	100	117	136	158.5
	7T 		150	168	203.3	227.6		177	199	239.8	269.6
	8T 		175	194	237.1	262.9		202	231	273.7	313
M20	4T 	2.5	108	130	146.3	176.2	1.5	132	150	178.9	203.3
	7T 		186	205	252	277.8		206	242	279.1	327.9
	8T 		213	249	288.6	337.4		246	289	333.3	391.6

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