SWEEPSTER BY PALADIN

OPERATOR'S MANUAL

ANGLE SWEEPER - HIGH RAISE
HR Series

FOR UTILITY TRACTORS

SERIAL NUMBER: _____

MODEL NUMBER: _____

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Rev. 3

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PREFACE

GENERAL COMMENTS

Congratulations on the purchase of your new product! This product was carefully designed and manufactured to give you many years of dependable service. Only minor maintenance (such as cleaning and lubricating) is required to keep it in top working condition. Be sure to observe all maintenance procedures and safety precautions in this manual and on any safety decals located on the product and on any equipment on which the attachment is mounted.

This manual has been designed to help you do a better, safer job. Read this manual carefully and become familiar with its contents.

WARNING! Never let anyone operate this unit without reading the "Safety Precautions" and "Operating Instructions" sections of this manual.
Always choose hard, level ground to park the vehicle on and set the brake so the unit cannot roll.

Unless noted otherwise, right and left sides are determined from the operator's control position when facing forward.

NOTE: The illustrations and data used in this manual were current (according to the information available to us) at the time of printing, however, we reserve the right to redesign and change the attachment as may be necessary without notification.

BEFORE OPERATION

The primary responsibility for safety with this equipment falls to the operator. Make sure the equipment is operated only by trained individuals that have read and understand this manual. If there is any portion of this manual or function you do not understand, contact your local authorized dealer or the manufacturer to obtain further assistance. Keep this manual available for reference. Provide the manual to any new owners and/or operators.

SAFETY ALERT SYMBOL

This is the "Safety Alert Symbol" used by this industry. This symbol is used to warn of possible injury. Be sure to read all warnings carefully. They are included for your safety and for the safety of others working with you.

SERVICE

Use only manufacturer replacement parts. Substitute parts may not meet the required standards.

Record the model and serial number of your unit on the cover of this manual. The parts department needs this information to insure that you receive the correct parts.

SOUND AND VIBRATION

Sound pressure levels and vibration data for this attachment are influenced by many different parameters: some items are listed below (not inclusive):

- prime mover type, age, condition, with or without cab enclosure and configuration
- operator training, behavior, stress level
- job site organization, working material condition, environment

Based on the uncertainty of the prime mover, operator, and job site, it is not possible to get precise machine and operator sound pressure levels or vibration levels for this attachment.

NOTE: A list of all Paladin Patents can be found at http://www.paladinattachments.com/patents.asp.

SAFETY STATEMENTS

THIS SYMBOL BY ITSELF OR WITH A WARNING WORD THROUGHOUT THIS MANUAL IS USED TO CALL YOUR ATTENTION TO INSTRUCTIONS INVOLVING YOUR PERSONAL SAFETY OR THE SAFETY OF OTHERS. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.

DANGER — **THIS SIGNAL WORD INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.**

WARNING — **THIS SIGNAL WORD INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.**

CAUTION — **THIS SIGNAL WORD INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN MINOR OR MODERATE INJURY.**

NOTICE — **NOTICE IS USED TO ADDRESS PRACTICES NOT RELATED TO PHYSICAL INJURY.**

GENERAL SAFETY PRECAUTIONS

WARNING! READ MANUAL PRIOR TO INSTALLATION

Improper installation, operation, or maintenance of this equipment could result in serious injury or death. Operators and maintenance personnel should read this manual, as well as all manuals related to this equipment and the prime mover thoroughly before beginning installation, operation, or maintenance. **FOLLOW ALL SAFETY INSTRUCTIONS IN THIS MANUAL AND THE PRIME MOVER'S MANUAL(S).**

READ AND UNDERSTAND ALL SAFETY STATEMENTS

Read all safety decals and safety statements in all manuals prior to operating or working on this equipment. Know and obey all OSHA regulations, local laws, and other professional guidelines for your operation. Know and follow good work practices when assembling, maintaining, repairing, mounting, removing, or operating this equipment.

KNOW YOUR EQUIPMENT

Know your equipment's capabilities, dimensions, and operations before operating. Visually inspect your equipment before you start, and never operate equipment that is not in proper working order with all safety devices intact. Check all hardware to ensure it is tight. Make certain that all locking pins, latches, and connection devices are properly installed and secured. Remove and replace any damaged, fatigued, or excessively worn parts. Make certain all safety decals are in place and are legible. Keep decals clean, and replace them if they become worn or hard to read.

GENERAL SAFETY PRECAUTIONS

WARNING! PROTECT AGAINST FLYING DEBRIS

Always wear proper safety glasses, goggles, or a face shield when driving pins in or out, or when any operation causes dust, flying debris, or any other hazardous material.

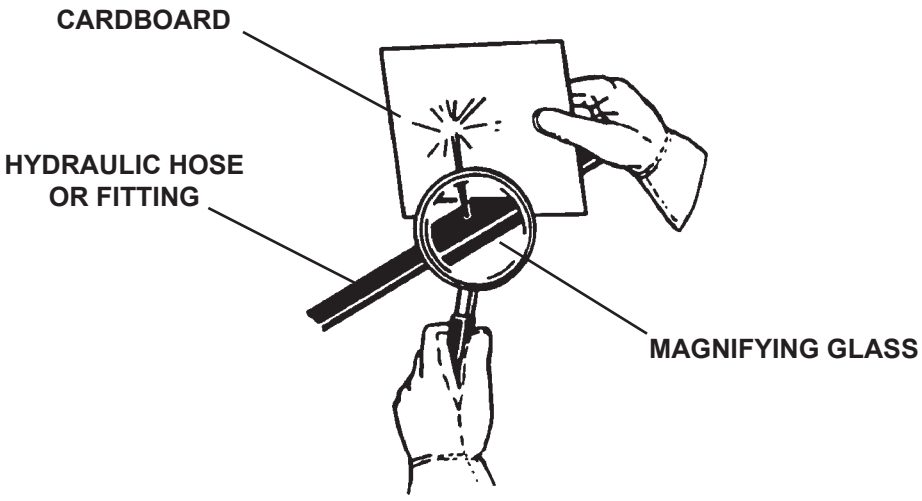
WARNING! LOWER OR SUPPORT RAISED EQUIPMENT

Do not work under raised booms without supporting them. Do not use support material made of concrete blocks, logs, buckets, barrels, or any other material that could suddenly collapse or shift positions. Make sure support material is solid, not decayed, warped, twisted, or tapered. Lower booms to ground level or on blocks. Lower booms and attachments to the ground before leaving the cab or operator's station.

WARNING! USE CARE WITH HYDRAULIC FLUID PRESSURE

Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Hydraulic leaks under pressure may not be visible. Before connecting or disconnecting hydraulic hoses, read your prime mover's operator's manual for detailed instructions on connecting and disconnecting hydraulic hoses or fittings.

- Keep unprotected body parts, such as face, eyes, and arms as far away as possible from a suspected leak. Flesh injected with hydraulic fluid may develop gangrene or other permanent disabilities.
- If injured by injected fluid, see a doctor at once. If your doctor is not familiar with this type of injury, ask him to research it immediately to determine proper treatment.
- Wear safety glasses, protective clothing, and use a piece of cardboard or wood when searching for hydraulic leaks. **DO NOT USE YOUR HANDS! SEE ILLUSTRATION.**



GENERAL SAFETY PRECAUTIONS

WARNING!

DO NOT MODIFY MACHINE OR ATTACHMENTS

Modifications may weaken the integrity of the attachment and may impair the function, safety, life, and performance of the attachment. When making repairs, use only the manufacturer's genuine parts, following authorized instructions. Other parts may be substandard in fit and quality. Never modify any ROPS (Roll Over Protective Structure) or FOPS (Falling Object Protective Structure) equipment or device. Any modifications must be authorized in writing by the manufacturer.

WARNING!

SAFELY MAINTAIN AND REPAIR EQUIPMENT

- Do not wear loose clothing or any accessories that can catch in moving parts. If you have long hair, cover or secure it so that it does not become entangled in the equipment.
- Work on a level surface in a well-lit area.
- Use properly grounded electrical outlets and tools.
- Use the correct tools for the job at hand. Make sure they are in good condition for the task required.
- Wear the protective equipment specified by the tool manufacturer.

SAFELY OPERATE EQUIPMENT

Do not operate equipment until you are completely trained by a qualified operator in how to use the controls, know its capabilities, dimensions, and all safety requirements. See your machine's manual for these instructions.

- Keep all step plates, grab bars, pedals, and controls free of dirt, grease, debris, and oil.
- Never allow anyone to be around the equipment when it is operating.
- Do not allow riders on the attachment or the prime mover.
- Do not operate the equipment from anywhere other than the correct operator's position.
- Never leave equipment unattended with the engine running, or with this attachment in a raised position.
- Do not alter or remove any safety feature from the prime mover or this attachment.
- Know your work site safety rules as well as traffic rules and flow. When in doubt on any safety issue, contact your supervisor or safety coordinator for an explanation.

WARNING!

CALIFORNIA PROPOSITION 65 WARNING

This product may contain a chemical known to the state of California to cause cancer, or birth defects or other reproductive harm. www.P65Warnings.ca.gov

EQUIPMENT SAFETY PRECAUTIONS

WARNING!

KNOW WHERE UTILITIES ARE

Observe overhead electrical and other utility lines. Be sure equipment will clear them. When digging, call your local utilities for location of buried utility lines, gas, water, and sewer, as well as any other hazard you may encounter.

WARNING!

EXPOSURE TO RESPIRABLE CRYSTALLINE SILICA DUST ALONG WITH OTHER HAZARDOUS DUSTS MAY CAUSE SERIOUS OR FATAL RESPIRATORY DISEASE.

It is recommended to use dust suppression, dust collection and if necessary personal protective equipment during the operation of any attachment that may cause high levels of dust.

WARNING!

REMOVE PAINT BEFORE WELDING OR HEATING

Hazardous fumes/dust can be generated when paint is heated by welding, soldering or using a torch. Do all work outside or in a well ventilated area and dispose of paint and solvent properly. Remove paint before welding or heating.

When sanding or grinding paint, avoid breathing the dust. Wear an approved respirator. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

WARNING!

END OF LIFE DISPOSAL

At the completion of the useful life of the unit, drain all fluids and dismantle by separating the different materials (rubber, steel, plastic, etc.). Follow all federal, state and local regulations for recycling and disposal of the fluid and components.

OPERATING THE ATTACHMENT

- Do not exceed the lifting capacity of your prime mover.
- Operate only from the operator's station.
- When operating on slopes, drive up and down, not across. Avoid steep hillside operation, which could cause the prime mover to overturn.
- Reduce speed when driving over rough terrain, on a slope, or turning, to avoid overturning the vehicle.
- An operator must not use drugs or alcohol, which can change his or her alertness or coordination. An operator taking prescription or over-the-counter drugs should seek medical advice on whether or not he or she can safely operate equipment.
- Before exiting the prime mover, lower the attachment to the ground, apply the brakes, disengage the PTO (if so equipped), turn off the prime mover's engine and remove the key.
- Remove any large objects from the work area that could harm operator or others if thrown by sweeper.

EQUIPMENT SAFETY PRECAUTIONS

TRANSPORTING THE ATTACHMENT

- Travel only with the attachment in a safe transport position to prevent uncontrolled movement. Drive slowly over rough ground and on slopes.
- When transporting on a trailer: Secure attachment at recommended tie down locations using tie down accessories that are capable of maintaining attachment stability.
- When driving on public roads use safety lights, reflectors, Slow Moving Vehicle signs etc., to prevent accidents. Check local government regulations that may affect you.
- Do not drive close to ditches, excavations, etc., cave in could result.
- Do not smoke when refueling the prime mover. Allow room in the fuel tank for expansion. Wipe up any spilled fuel. Secure cap tightly when done.

MAINTAINING THE ATTACHMENT

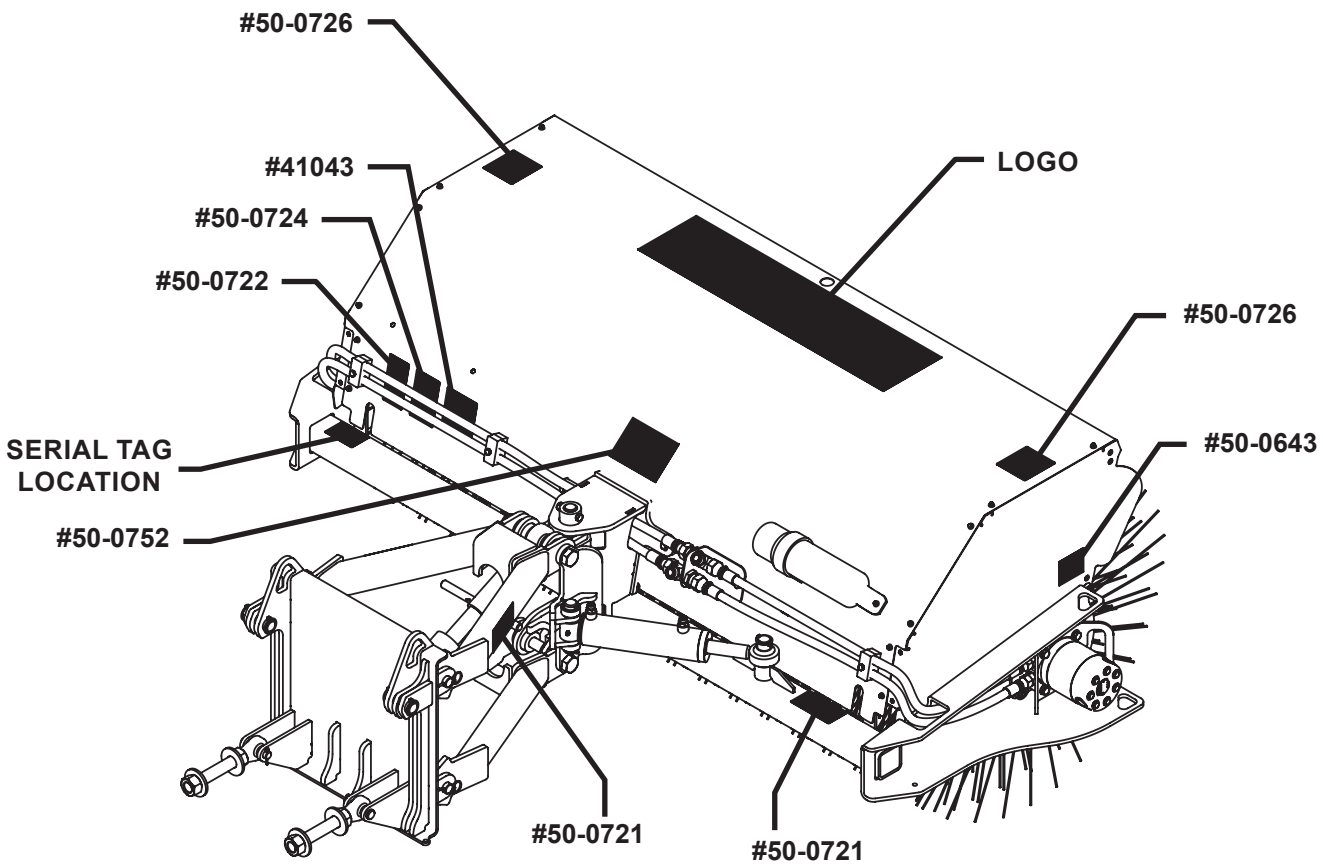
- Before performing maintenance lower the attachment to the ground, apply the brakes, disengage PTO (if so equipped), turn off the engine and remove the key.
- Never perform any work on the attachment unless you are authorized and qualified to do so. Always read the operator service manuals before any repair is made. After completing maintenance or repair, check for correct functioning of the attachment. If not functioning properly, always tag “DO NOT OPERATE” until all problems are corrected.
- Worn, damaged, or illegible safety decals must be replaced. New safety decals can be ordered from Paladin.
- Never make hydraulic repairs while the system is under pressure. Serious personal injury or death could result.
- Never work under a raised attachment.

DECALS

DECAL PLACEMENT

GENERAL INFORMATION

The diagram on this page shows the location of the decals used on your attachment. The decals are identified by their part numbers, with reductions of the actual decals located on the following page. Use this information to order replacements for lost or damaged decals. Be sure to read all decals before operating the attachment. They contain information you need to know for both safety and product longevity.

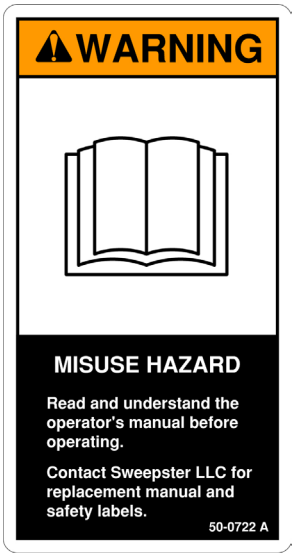


IMPORTANT: Keep all safety decals clean and legible. Replace all missing, illegible, or damaged safety decals. When replacing parts with safety decals attached, the safety decals must also be replaced. Safety decals are available, free of charge, from your local dealer or Paladin.

REPLACING SAFETY DECALS: Clean the area of application with nonflammable solvent, then wash the same area with soap and water. Allow the surface to fully dry. Remove the backing from the safety decal, exposing the adhesive surface. Apply the safety decal to the position shown in the diagram above and smooth out any bubbles.

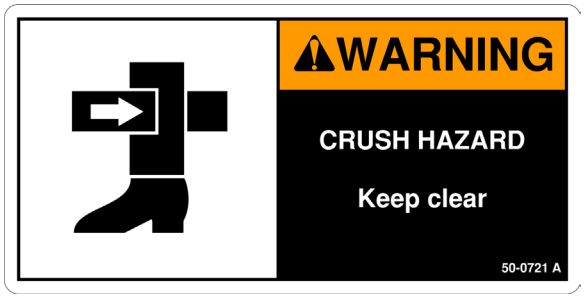
DECALS

#41043 WARNING! HAZARDOUS DUST

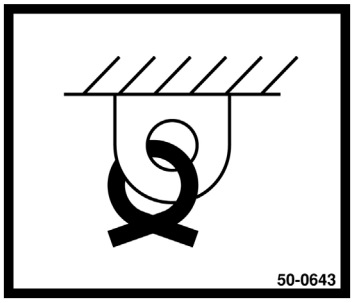


#50-0722 WARNING! MISUSE HAZARD

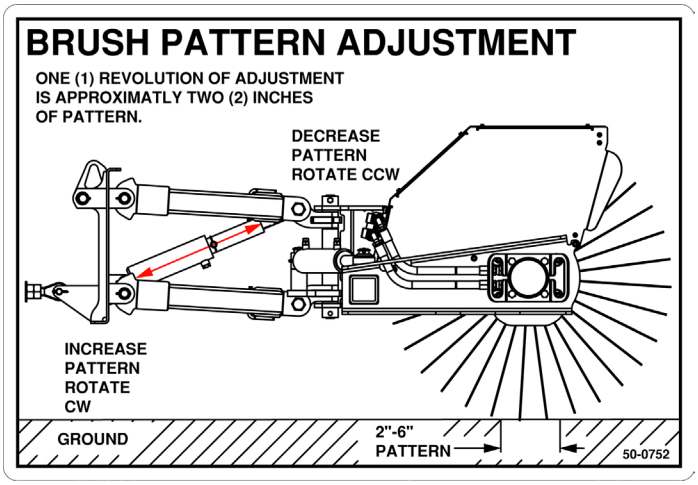
#50-0724 WARNING! HIGH PRESSURE FLUID HAZARD



#50-0721 WARNING! CRUSH HAZARD



#50-0643 TIE DOWN POINT



#50-0752 BRUSH PATTERN ADJUSTMENT

#50-0726 WARNING! FLYING OBJECTS & ENTANGLEMENT

NOTE: CONTACT YOUR LOCAL DEALER FOR MODEL NUMBER AND LOGO DECALS

INSTALLATION

GENERAL INFORMATION

The following instructions will help you to mount your to the front of your tractor. There are numerous tractor mounting assemblies that will operate your broom using various pump, tank and valve options. Follow the instructions provided with your mounting assembly.

Remember to read all safety warnings, decals and operating instructions before operating the attachment. If there is any portion of this manual that you do not understand, contact your dealer.

INSTALLATION

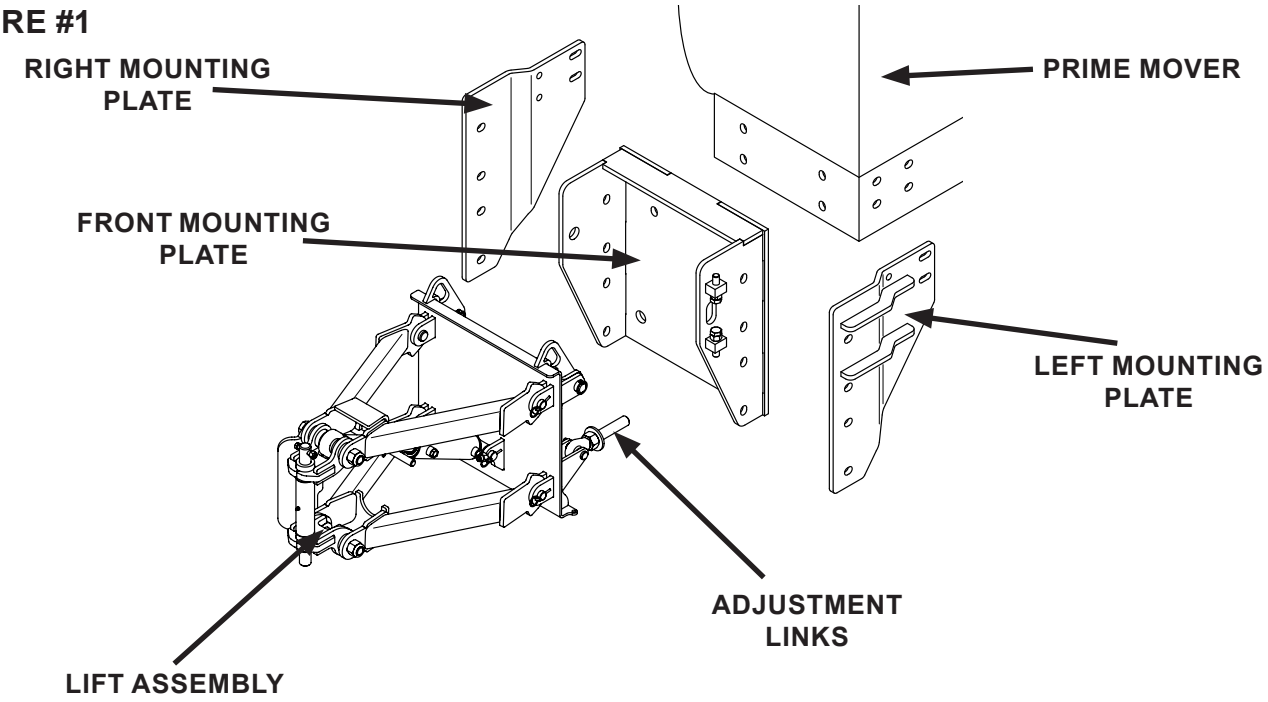
Due to the various different combinations of prime movers, options and applications available for this sweeper, most of the instructions are provided with the individual mounting kits, drive kits and options selected when purchased. This section will cover some of the basic instructions for setting up your prime mover and sweeper.

NOTICE! It will be necessary to have a lifting device or additional help while installing the sweeper. The sweeper weighs more than 80 lbs.

NOTICE! Lubricate all grease fittings before connecting this product to your prime mover's hydraulic system. Refer to Lubrication section.

1. Remove any attachment and loader mounts from the front of the prime mover.
2. Install the front mounting plate loosely to the front of the tractor using hardware provided. See Figure #1

FIGURE #1



3. Loosely attach the left & right mounting plate to the prime mover's front casting and front mounting plate using hardware provided.

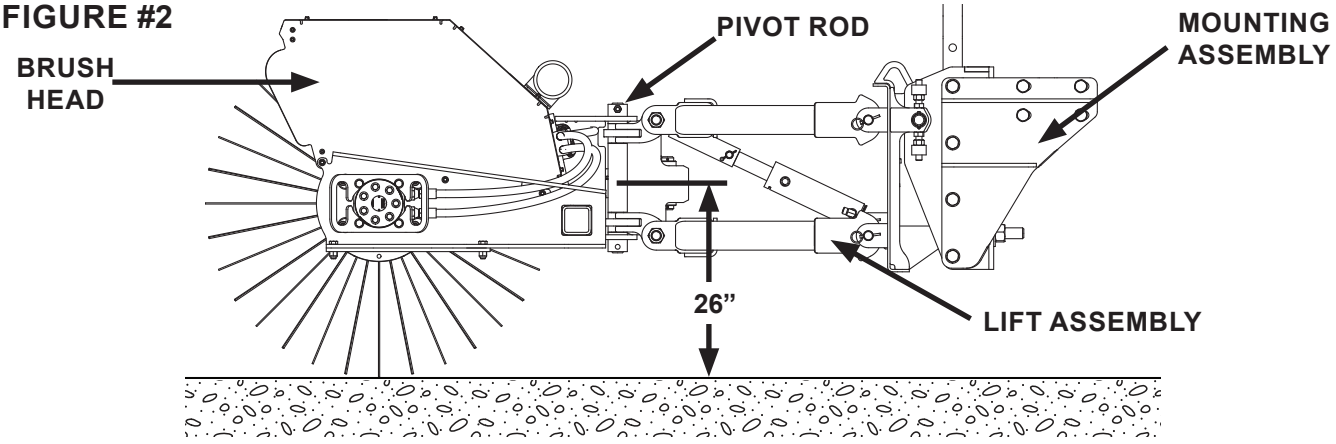
NOTE: Right-hand, left-hand, forward and rear are determined from the perspective of the operator's seat.

INSTALLATION

4. Torque on front mounting plate first, then side mounting plates. See “Bolt Torque Specifications”.
5. Attach hydraulic tank, if so equipped, to the mounting assembly using the hardware provided.
6. Using a hoist raise the brush head & lift assembly to the mounting assembly.
7. Insert the bottom adjustment links into the mounting assembly and loosely install hardware. Refer to Figure #1
8. Tilt the brush head & lift assembly up until the upper holes align with the holes on the mounting assembly. Pin in place.
9. Tighten hardware on the adjustment links.

NOTE: When installing the lift/swing assembly, make sure there is a 26” (66 cm) dimension between the ground and the center of the pivot rod. See Figure #2

FIGURE #2



WARNING! To avoid serious personal injury, make sure the attachment is securely latched to the attachment mechanism of your unit. Failure to do so could result in separation of the attachment from the prime mover.

10. Connect hydraulic hoses to the sweeper:
    - Valve port A to the rod end of the swing cylinder
    - Valve port B to the barrel end of the swing cylinder
    - Valve port C to motor
    - Valve port D to the barrel end of the lift cylinder
    - Valve bypass to tank filter
    - Motor return to tank filter.
11. Following the standard start up procedure for your prime mover, start the prime mover and run all cylinders on the attachment to purge any air from the system. Check for proper hydraulic connection, hose routing and hose length.
12. Level the brush head. See “Leveling”
13. Attachment installation is complete.

INSTALLATION

DETACHING

NOTICE! It will be necessary to have a lifting device or additional help while detaching the sweeper. The sweeper weighs more than 80 lbs.

1. Before exiting the prime mover, lower the attachment to the ground, disengage PTO (if so equipped), apply the brakes, turn off the prime mover's engine and remove the key.
2. Relieve pressure in the hydraulic lines (if so equipped).
3. If hydraulic tank is not mounted on the sweeper, disconnect the sweeper hydraulics.
4. Using a hoist, support the mounting end of the lift assembly.
5. Loosen the hardware on the adjustment links to allow the two assemblies to move.
6. Unpin the top of the lift assembly from the mounting assembly.
7. Unbolt the adjustment links and lower the lift assembly to the ground.
8. Install caps to prevent contaminants from entering the hydraulic system. Store hoses off of the ground to help prevent damage.

OPERATION
CONTROLS

STARTING AND STOPPING THE SWEEPER

Starting The Sweeper

The sweeper uses hydraulic flow to operate.

1. Start the prime mover at idle and raise the brush.
2. Engage the hydraulics.
3. Lower sweeper to the ground and increase engine RPM to desired sweeping speed.

Stopping The Sweeper

1. Decrease engine RPM to idle.
2. Raise brush off the ground.
3. Disengage hydraulics.

TRAVEL DIRECTION

Travel should be in the forward direction and brush rotation always away from the operator.

BRUSH SPEED

To increase brush speed, increase engine RPM. Use the LOWEST speed needed to complete the job at hand. In general, half throttle provides the necessary engine speed. Vary brush, engine and travel speeds to match sweeping conditions.

ANGLING THE SWEEPER

Use the swing/angle function to control the direction debris exits the sweeper. Angling the brush head the same direction as the wind also helps reduce the amount of material that blows onto the operator and the surface swept.

1. Start the prime mover.
2. Engage the hydraulic controls.
3. Position the brush head at the desired angle by using the valve control for the swing function.

OPERATION

INTENDED USE

This sweeper is designed solely for use in construction cleanup, road maintenance and similar operations. Use in any other way is considered contrary to intended use. Compliance with and strict adherence to operation, service and repair conditions, as specified by the manufacturer, are essential elements of intended use.

BEFORE OPERATING SWEEPER:

- Learn sweeper and prime mover controls in an off-road location.
- Run prime mover and sweeper at low idle.
- Before exiting the prime mover, lower the attachment to the ground, disengage PTO (if so equipped), apply the brakes, turn off the prime mover's engine and remove the key.
- Only operate the sweeper from the primer mover operator's station. Only operate controls while the engine is running. Protective glasses must be worn while you operate prime mover and sweeper.

OPERATION

Before operating level the sweeper, set the angle, and adjust the brush pattern according to the instructions in this manual.

Carry the sweeper low to the ground so the operator has good visibility and stability. Avoid any sudden movements.

Avoid excessive downward pressure on the brush sections to prevent excessive wear. A 2"- 4" (51-102 mm) wide pattern is sufficient for most applications. Verify the brush head is level to prevent an uneven wear pattern. See "Leveling". To adjust pattern see "Brush Pattern Adjustment".

Observe wind direction. Sweeping with the wind makes sweeping more effective and helps keep debris off the operator.

WARNING! **AVOID SERIOUS INJURY.** Check for objects that could harm the operator or others if thrown by the sweeper. Remove items before sweeping.

The terms *swing* and *angle* are used interchangeably.

1. Start the prime mover at idle and raise the brush.
2. Start brush rotation by engaging hydraulics.
3. Swing the brush head assembly the direction that you want to direct debris.
4. Lower sweeper to the ground and increase prime mover engine RPM to the desired sweeping speed for your application.
5. Travel forward, do not exceed 5 MPH.

NOTICE! When approaching obstacles, like utility poles or fire hydrants, slow engine and travel speed to avoid hitting these hazards.

OPERATION

OPERATING TIPS

Vary brush, engine and travel speeds to match sweeping conditions.

NOTICE! Do not ram into piles. Use a dozer blade for this type of job.

LARGE AREAS

When sweeping a large area, such as a parking lot, make a path down the middle and sweep to both sides. This reduces the amount of debris that the sweeper must sweep to one side.

SNOW

Fast brush speeds and slow travel speeds are needed to sweep snow effectively. Start at ¾ throttle and the lowest gear of the prime mover. For wet and/or deep snow, increase to almost full throttle. This helps keep snow from packing up inside the brush hood.

- In deep snow you may need to make multiple passes to get down to a clean surface.
- Always sweep with the wind at your back.

DIRT & GRAVEL

To keep dust at a minimum, plan sweeping for days when it is overcast and humid or after it has rained.

Low brush speeds and moderate travel speeds work best for cleaning debris from hard surfaces. Brush speeds that are too fast tend to raise dust.

To sweep gravel, use just enough brush speed to “roll” the gravel, not throw it.

HEAVY DEBRIS

- Travel slowly 2-3 MPH (3-5 kph).
- Sweep a path less than the full width of the sweeper.
- Increase engine speed if debris becomes very heavy.

THATCH

NOTE: Brushes containing wire are not recommended for lawn thatching.

Low brush speeds and low prime mover speeds do the best thatching job.

To prevent the brush from pulling itself into the ground, adjust the lift so the bristle tips barely touch the grass.

If the brush pulls into the grass and stalls while sweeping, use the lift to raise the brush. Do not increase throttle to override a stall out.

Use a combination of brush speed and ground speed that rolls up a neat windrow.

To keep thatch from blowing back onto a swept area, sweep with the wind at your back or in the direction the brush is angled.

OPERATION

BRUSH PATTERN ADJUSTMENT

A properly adjusted brush offers the best sweeper performance. To check brush pattern:

1. Move the sweeper to a dusty, flat surface.
2. Set the prime mover's parking brake and leave the engine running.
3. Start the sweeper at a slow speed; then, lower it so bristle tips touch the ground. Run the sweeper in a stationary position for 10-30 seconds.
4. Raise the sweeper and back away; switch off the sweeper and engine and remove the key. The brush pattern left in the dust should be 2"-4" (51-102mm) wide, running the length of the brush. See Figure #1
5. Lower the sweeper to the ground.
6. Rotate the cylinder rod on the lift rod assembly. See Figure #2
   - Turning the rod counterclockwise will lessen brush pressure and decrease the width of the brush pattern.
   - Turning the rod clockwise will increase pressure on the brush and widen brush pattern.
   - To relieve pressure from the rod assembly, lower the brush head completely.

FIGURE #1

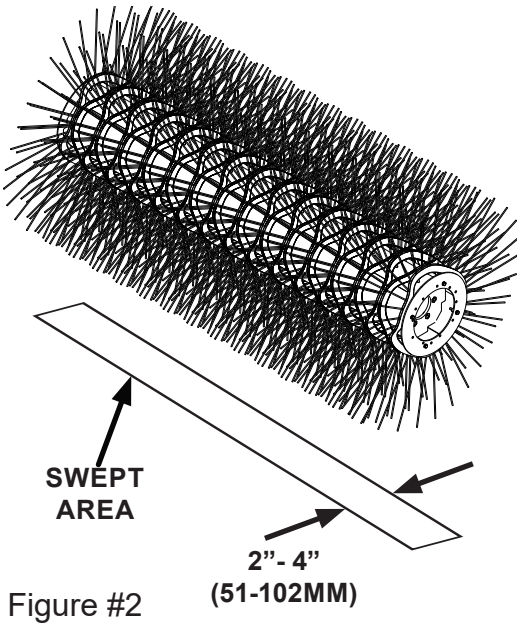
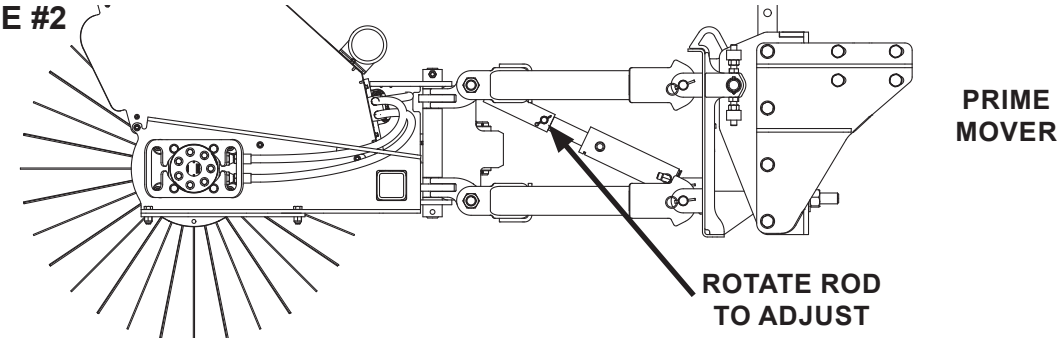


FIGURE #2



STORAGE

The following storage procedure will help you to keep your product in top condition. It will also help you get off to a good start the next time your attachment is needed. We therefore strongly recommend that you take the extra time to follow these procedures whenever your unit will not be used for an extended period of time.

IMPORTANT: When detaching your unit for short or long term storage be sure to follow the Detaching Instruction in the Installation Section of this manual.

NOTICE! Do not store the sweeper with weight on the brush. Weight will deform the bristles, destroying the sweeping effectiveness. To avoid this problem, place the sweeper on blocks or use storage stands.

NOTICE! Do not store polypropylene brushes in direct sunlight. The material can deteriorate and crumble before the bristles are worn out.

OPERATION

NOTICE! Keep polypropylene brush material away from intense heat or flame.

- Clean the unit thoroughly, removing all mud, dirt, and grease.
- Inspect for visible signs of wear, breakage, or damage. Order any parts required and make the necessary repairs to avoid delays upon removal from storage.
- Tighten loose nuts, capscrews and hydraulic connections.
- Coat exposed portions of the cylinder rods with grease.
- Lubricate grease fittings.
- Seal hydraulic system from contaminants and secure all hydraulic hoses off the ground to help prevent damage.
- Replace decals that are damaged or in unreadable condition.
- Store unit in a dry and protected place. Leaving the unit outside will materially shorten its life.

Additional Precautions for Long Term Storage:

- Touch up all unpainted surfaces with paint to prevent rust.

REMOVAL FROM STORAGE

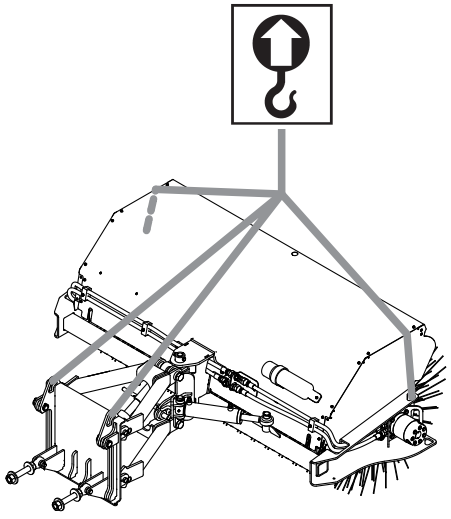
- Wash unit and replace any damaged and/or missing parts.
- Lubricate grease fittings.
- Check hydraulic hoses for damage and replace as necessary.

LIFT POINTS

Lifting points are identified by lifting decals where required. Lifting at other points is unsafe and can damage attachment. Do not attach lifting accessories around cylinders or in any way that may damage hoses or hydraulic components. See Diagram

- Attach lifting accessories to unit at recommended lifting points.
- Bring lifting accessories together to a central lifting point.
- Lift gradually, maintaining the equilibrium of the unit.

WARNING! **Use lifting accessories (chains, slings, ropes, shackles and etc.) that are capable of supporting the size and weight of your attachment. Secure all lifting accessories in such a way to prevent unintended disengagement. Failure to do so could result in the attachment falling and causing serious personal injury or death.**



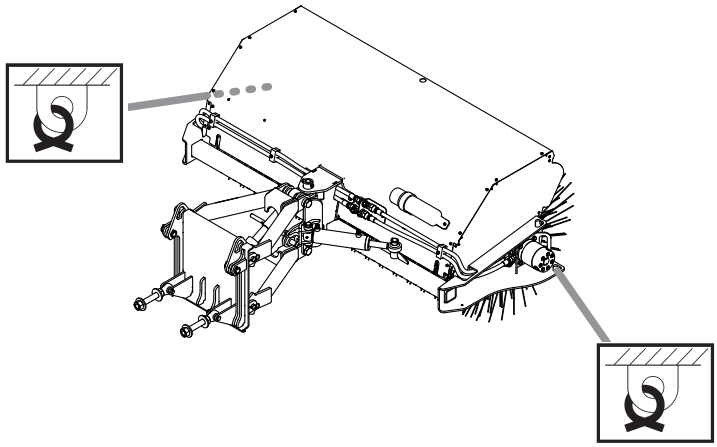
OPERATION

TIE DOWN POINTS

Tie down points are identified by tie down decals where required. Securing to trailer at other points is unsafe and can damage attachment. Do not attach tie down accessories around cylinders or in any way that may damage hoses or hydraulic components. See Diagram

- Attach tie down accessories to unit as recommended.
- Check unit stability before transporting.

WARNING! Verify that all tie down accessories (chains, slings, ropes, shackles and etc.) are capable of maintaining attachment stability during transporting and are attached in such a way to prevent unintended disengagement or shifting of the unit. Failure to do so could result in serious personal injury or death.



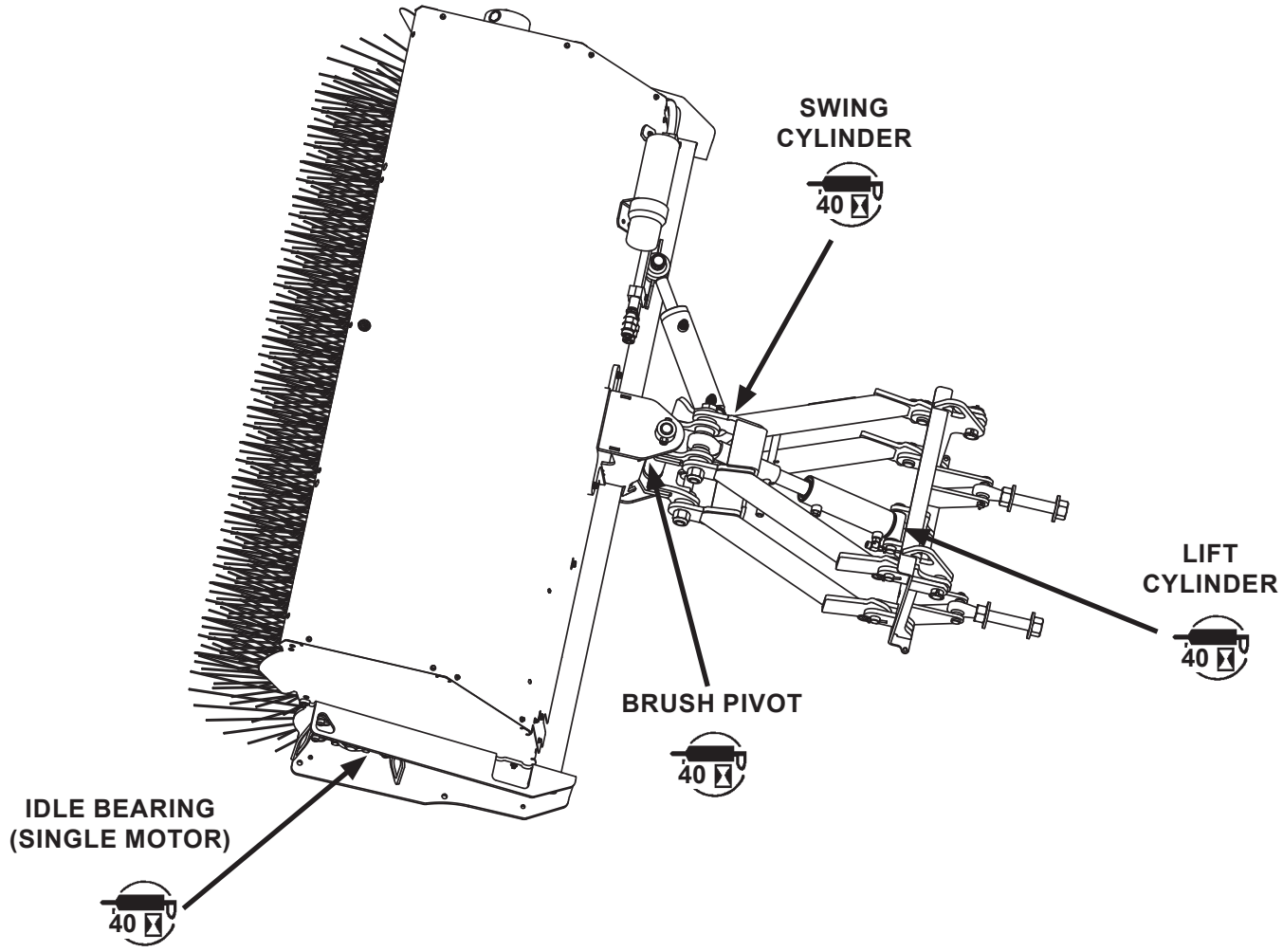
TRANSPORTING

Follow all local government regulations that may apply along with recommended tie down points and any equipment safety precautions at the front of this handbook when transporting your attachment.

LUBRICATION

All parts provided with grease fittings should be lubricated as indicated. If any grease fittings are missing, replace them immediately. Clean all fittings thoroughly before using grease gun.

Lubricate weekly or every 40 hours of operation, whichever comes first, with SAE Multi-Purpose Lubricant or an equivalent SAE Multi-Purpose type grease.



IMPORTANT: Avoid excessive greasing. Dirt collects on exposed grease and greatly increases wear. After greasing, wipe off excessive grease from fittings.

MAINTENANCE

GENERAL INFORMATION

Regular maintenance is the key to long equipment life and safe operation. Maintenance requirements have been reduced to an absolute minimum. However it is very important that these maintenance functions be performed as described below.

Procedure	Every 8 Hours (Daily)	Every 40 Hours (Weekly)
Check prime mover hydraulic system to ensure an adequate level and cleanliness of hydraulic oil.	✔	
Check brush pattern. See “Brush Pattern Adjustment”	✔	
Check for missing or loose hardware. Replace or tighten as necessary. See “Bolt Torque Specifications”	✔	
Check hydraulic system for leaks and tighten as necessary. Check for damage and replace as needed.	✔	
Check for missing or damaged safety decals and replace as necessary.	✔	
Inspect attachment for any worn parts or cracked welds. Repair as required.	✔	
Lubricate & retract cylinder rods.	✔	
Lubricate grease fittings.		✔

WARNING! **Escaping hydraulic / diesel fluid under pressure can penetrate the skin causing serious injury. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands to search for suspected leaks.**

Keep unprotected body parts, such as face, eyes, and arms as far away as possible from a suspected leak. Flesh injected with hydraulic fluid may develop gangrene or other permanent disabilities. If injured by injected fluid, see a doctor at once.

Stop the engine and relieve pressure before connecting or disconnecting lines. Tighten all connections before starting engine or pressurizing lines.

NOTICE! When replacing parts use only factory approved replacement parts. Manufacturer will not claim responsibility for use of unapproved parts or accessories and/or other damages as a result of their use.

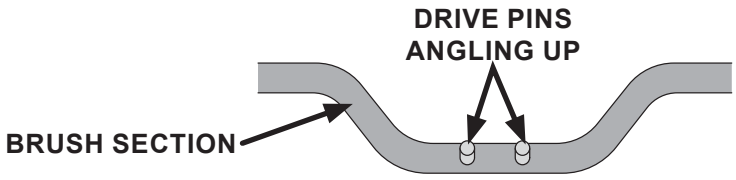
MAINTENANCE

REPLACING BRUSH SECTIONS

1. Remove motor mount retainer pins. Retain hardware for reinstallation. Remove motor mount(s).
2. **Single Motor Units ONLY:** Remove idler bearing shaft mounting plate retainer pins from side. Retain hardware for reinstallation.
3. Remove core from brush head assembly.
4. Remove retaining plate from core assembly.
5. Remove old sections.
6. Install new sections by doing the following:

Note: Drive pin direction can be difficult to determine. Inspect your sections to determine up and down directions. See Figure #1

FIGURE #1



a. Slide the first section onto the core with the drive pins on each side of a tube. Make sure that the drive pins angle up. See Figure #2
b. Install a second section with drive pins rotated 180° from those on the first section. See Figure #3
c. Continue installing sections, rotating each section 180° until the core is full.

FIGURE #2

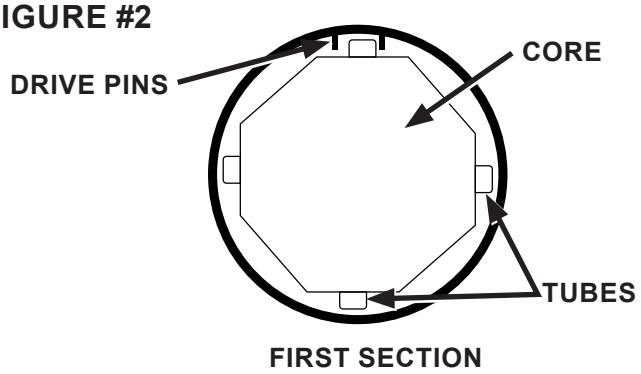
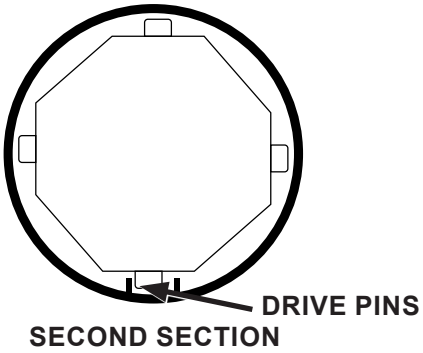


FIGURE #3



7. Re-attach the section retainer with previously removed hardware.
8. Lay core on the ground and lower frame over core.
9. **Single Motor Units ONLY:** Re-attach bearing mounting plate with previously removed hardware.
10. Re-attach motor mounts with hardware removed in first step.

Worn Section Standard				**Reference Information**	
Section OD, New	Ring ID	Section OD, Worn	Exposed Bristle, Worn	Bristle Length	Exposed Bristle, New
24	6.38	17	3.8	8.50	7.5
26	8.00	18	4.0	9.00	8.0
32	10.00	22	5.0	11.00	10.0
36	10.00	24	6.0	13.00	12.0
36	10.63	25	6.0	12.69	11.4
46	19.38	34	6.0	13.31	12.1

MAINTENANCE

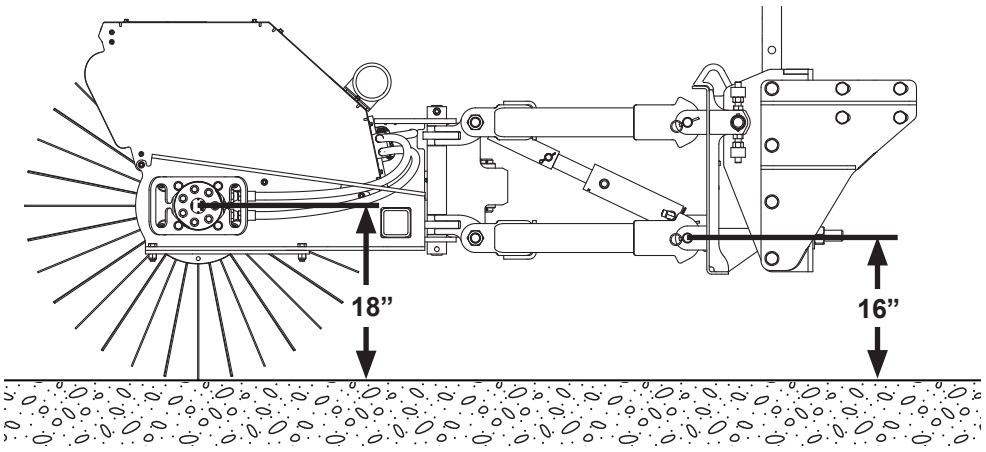
LEVELING

Level the sweeper for even brush wear and effective use.

CAUTION! **Avoid Injury. Before adjusting the sweeper, always disengage PTO (if so equipped), apply the brakes, turn off the prime mover engine and remove the key.**

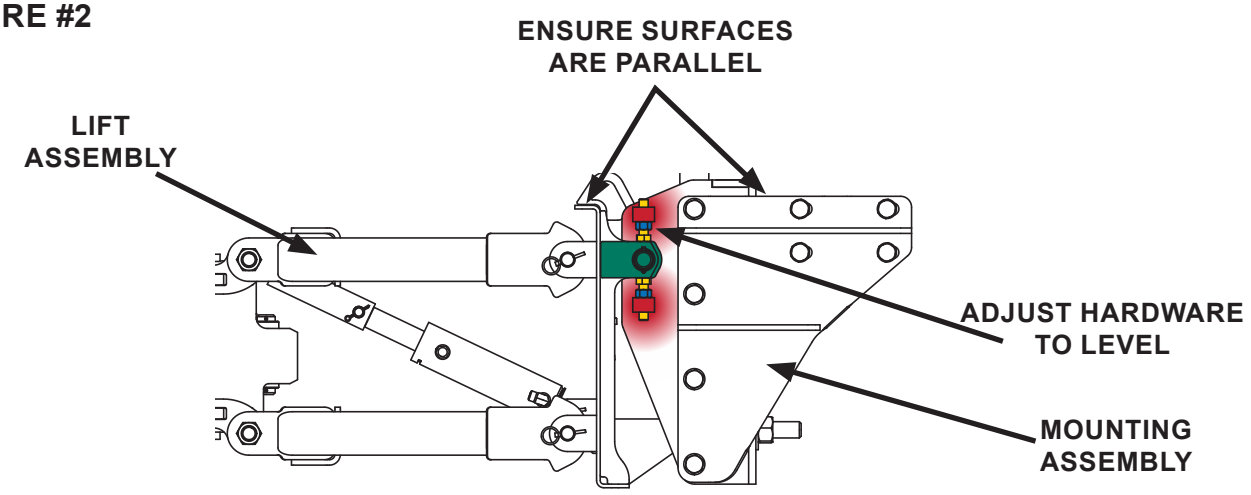
1. Move the unit to a dusty, paved surface.
2. Lower the brush head assembly so the bristle tips are 2” (51 mm) above the ground.
3. Before exiting the prime mover, lower the attachment to the ground, disengage PTO (if so equipped), apply the brakes, turn off the prime mover’s engine and remove the key.
4. At each end of the brush head, measure from the center of the core shaft to the ground. See Figure #1

FIGURE #1



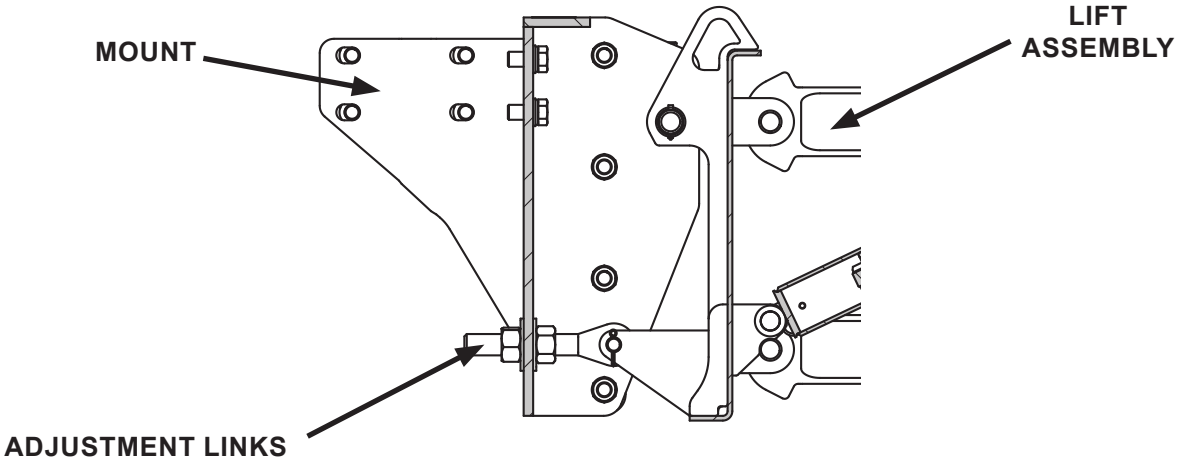
- If measurements are the same, go to step #5.
- If measurements are not equal, make sure the top edges of the mounting assembly and lift assembly are parallel. Adjust, if necessary, and tighten the hardware. Repeat until measurements are equal. See Figure #2

FIGURE #2



5. Swing the sweeper to the right. Take measurements as in step #4. Swing sweeper to the left and measure again.
   - If all measurements are equal, the sweeper is level.
   - If measurements are not equal, level the mounting assembly with adjustment links. Follow instructions below, repeat until the sweeper is level. See Figure #3

FIGURE #3



a. If measurements resemble Figure #4, turn the adjustment links towards the prime mover.

b. If measurements resemble Figure #5, turn the adjustment links away from the prime mover.

FIGURE #4

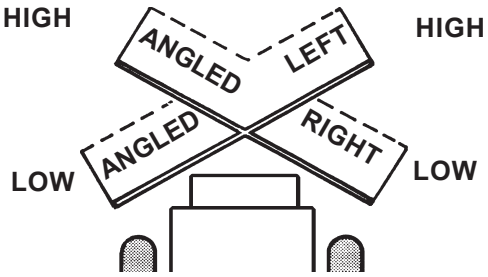
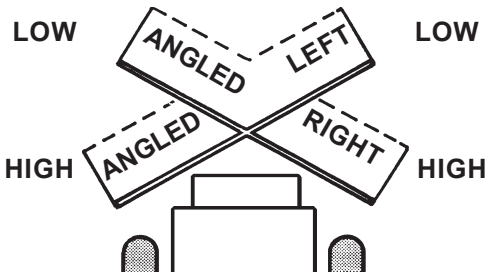


FIGURE #5



6. Verify brush pattern. See “Brush Pattern Adjustment”

MAINTENANCE

Threaded Cylinders

CYLINDER SEAL REPLACEMENT

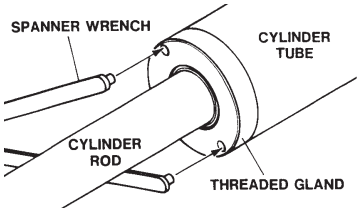
The following information is provided to assist you in the event you should need to repair or rebuild a hydraulic cylinder. When working on hydraulic cylinders, make sure that the work area and tools are clean and free of dirt to prevent contamination of the hydraulic system and damage to the hydraulic cylinders. Always protect the active part of the cylinder rod (the chrome section). Nicks or scratches on the surface of the rod could result in cylinder failure. Clean all parts thoroughly with a cleaning solvent before reassembly.

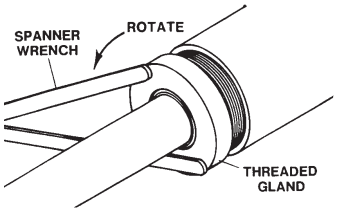
DISASSEMBLY PROCEDURE

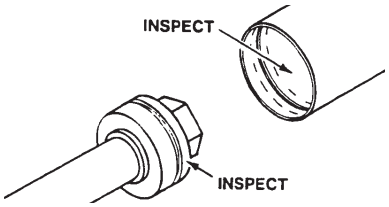
IMPORTANT: Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

THREADED TYPE GLAND

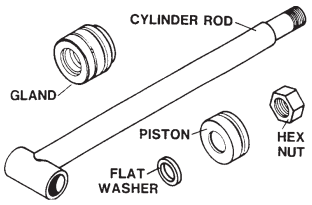
1. Rotate the gland with a spanner wrench counterclockwise until the gland is free of the cylinder tube.
2. Pull the cylinder rod from the cylinder tube and inspect the piston and the bore of the cylinder tube for deep scratches or galling. If damaged, the piston AND the cylinder tube must be replaced.

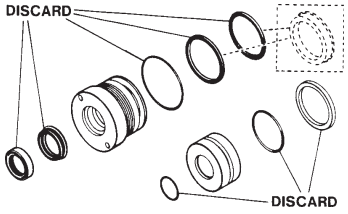






3. Remove the hex nut, piston, flat washer or spacer tube (if so equipped), and gland from the cylinder rod. If the cylinder rod is rusty, scratched, or bent, it must be replaced.
4. Remove and discard all the old seals.



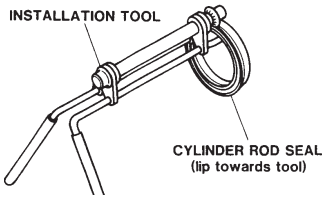


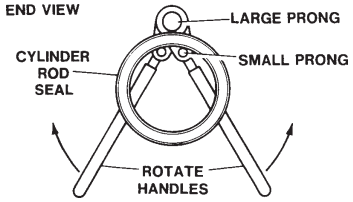
ASSEMBLY PROCEDURE

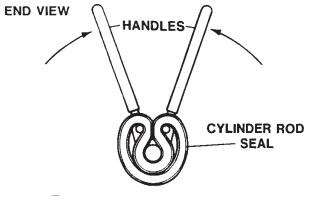
IMPORTANT: Replace all seals even if they do not appear to be damaged. Failure to replace all seals may result in premature cylinder failure. NOTE: Seal kits will service most cylinders of similar bore size and rod diameter.

1. Install the cylinder rod seal in the gland first. Be careful not to damage the seal in the process, as it is somewhat difficult to install.

NOTE: A special installation tool (Part #65349) is available to help with installing the seal. Simply fit the end of the tool over the seal so that the large prong of the tool is on the outside of the seal, and the two smaller prongs on the inside. The lip of the seal should be facing towards the tool. Rotate the handles on the tool around to wrap the seal around the end of the tool.





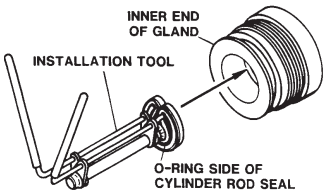


Rotate the handles on the tool around to wrap the seal around the end of the tool.

MAINTENANCE

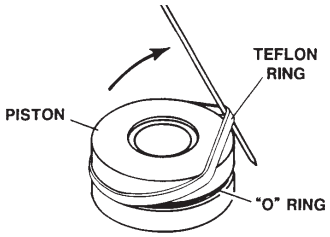
Threaded Cylinders

Now insert the seal into the gland from the inner end. Position the seal in its groove, and release and remove the tool. Press the seal into its seat the rest of the way by hand.



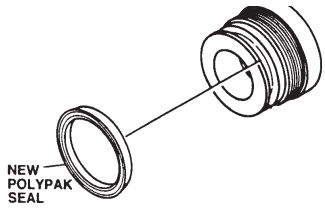
2. Install the new piston ring, rod wiper, O-rings and backup washers, if applicable, on the piston.

   Be careful not to damage the seals. Caution must be used when installing the piston ring. The ring must be stretched carefully over the piston with a smooth, round, pointed tool.



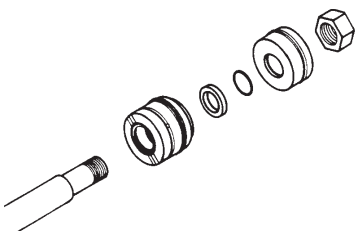
3. After installing the rod seal inside the gland, as shown in step #1, install the external seal.

NOTE: Threaded glands may have been equipped with a separate O-ring and backup washer system or a polypak (all in one) type seal. Current seal kits contain a polypak (all in one) type seal to replace the discarded seal types on ALL THREADED GLANDS.



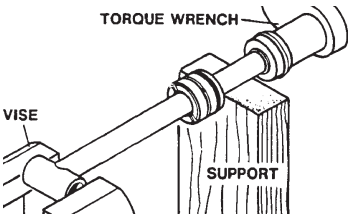
4. Slide the gland onto the cylinder rod, being careful not to damage the rod wiper. Then install the spacer, or flat washer (if so equipped), small o-ring, piston, and hex nut onto the end of the cylinder rod.

5. Secure the cylinder rod (mounting end) in a vise with a support at its center. Torque the nut to the amount shown for the thread diameter of the cylinder rod (see chart).



Thread Diameter	POUNDS - FEET
7/8"	150-200
*1"	230-325
1-1/8"	350-480
1-1/4"	490-670
1-3/8"	670-900

*** 1" Thread Diameter WITH 1.25" Rod Diameter**
Min. 230 ft. lbs. Max. 250 ft. lbs.



IMPORTANT: Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

6. Apply a lubricant (such as Lubriplate #105) to the piston and teflon ring. Insert the cylinder rod assembly into the cylinder tube.

IMPORTANT: Ensure that the piston ring fits squarely into the cylinder tube and piston groove, otherwise the ring may be damaged and a leak will occur.

7. Use a spanner wrench to rotate the gland clockwise into the cylinder. Continue to rotate the gland with the spanner wrench until it is tight.

WARNING! **Cylinders serviced in the field are to be tested for leakage prior to the attachment being placed in work. Failure to test rebuilt cylinders could result in damage to the cylinder and/or the attachment, cause severe personal injury or even death.**

MAINTENANCE

Retaining Ring Cylinders

CYLINDER SEAL REPLACEMENT

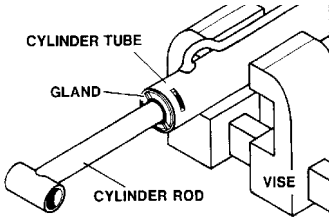
The following information is provided to assist you in the event you should need to repair or rebuild a hydraulic cylinder. When working on hydraulic cylinders, make sure that the work area and tools are clean and free of dirt to prevent contamination of the hydraulic system and damage to the hydraulic cylinders. Always protect the active part of the cylinder rod (the chrome section). Nicks or scratches on the surface of the rod could result in cylinder failure. Clean all parts thoroughly with a cleaning solvent before reassembly.

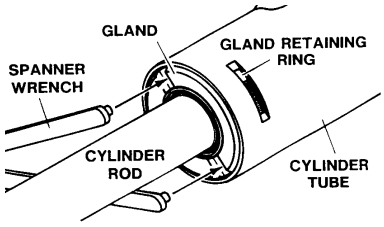
DISASSEMBLY PROCEDURE

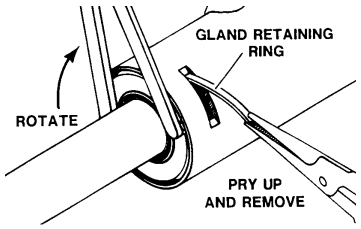
IMPORTANT: Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

RETAINING RING TYPE GLAND

1. Mount the cylinder tube securely in a vise. **NOTICE:** Do not clamp too tight and distort the tube.
2. Rotate the gland with a spanner wrench (available from your dealer), until the gland retaining ring appears in the milled slot.

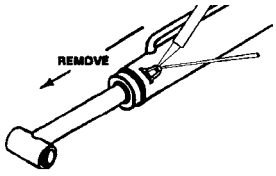


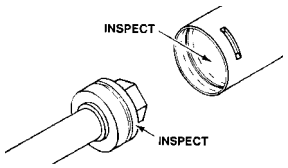


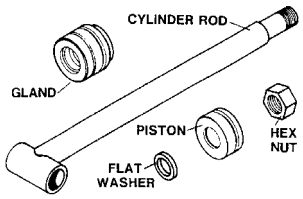


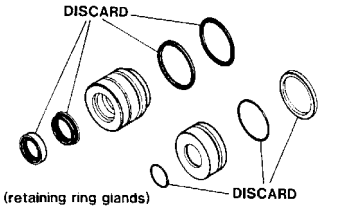
Pry up the end of the gland retaining ring with a pointed tool. Rotate the gland with a spanner wrench while removing the retaining ring. **NOTE: The gland and piston seal(s) can be pulled out and cut as they appear in the milled slot during disassembly. After cutting, pull them on out through the milled slot.**

3. Pull the cylinder rod from the cylinder tube.







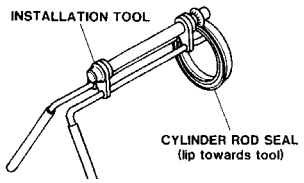


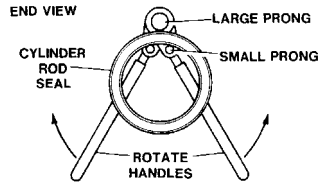
4. Inspect the piston and the bore of the cylinder tube for deep scratches or galling. If damaged, the piston and cylinder tube must be replaced.
5. Remove the hex nut, piston, flat washer or spacer tube (if so equipped), and gland from the cylinder rod. If the cylinder rod is rusty, scratched, or bent, it must be replaced.
6. Remove and discard all old seals.

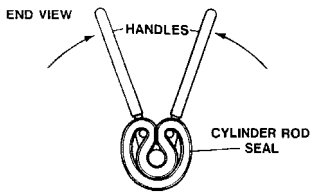
ASSEMBLY PROCEDURE

IMPORTANT: Replace all seals even if they do not appear to be damaged. Failure to replace all seals may result in premature cylinder failure.

1. Install the cylinder rod seal in the gland first. Be carefull not to damage the seal in the process as it is somewhat difficult to install. A special installation tool is available to help with installing the seal. Simply fit the end of the tool over the seal so that the large prong of the tool is on the outside of the seal, and the two smaller prongs on the inside. The lip of the seal should be facing towards the tool. Rotate the handles on the tool around to wrap the seal around the end of the tool.







MAINTENANCE

Retaining Ring Cylinders

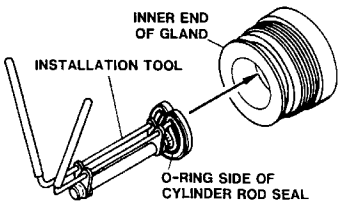
Now insert the seal into the gland from the inner end. Position the seal in its groove, and release and remove the tool. Press the seal into its seat the rest of the way by hand.

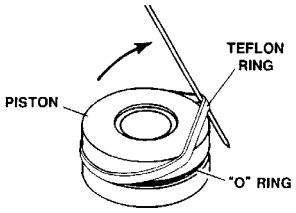
NOTE: Threaded gland is shown in diagram for reference only.

2. Install the new piston ring, rod wiper, O-rings, and backup washers, if applicable, on the piston. Be careful not to damage the seals. Caution must be used when installing the piston ring. The ring must be stretched carefully over the piston with a smooth, round, pointed tool.

3. Slide the gland onto the cylinder rod being careful not to damage the rod wiper. Then install the spacer, or flat washer (if so equipped), small O-ring, piston, and hex nut onto the end of the cylinder rod.

4. Secure the cylinder rod (mounting end) in a vise, with a support at its center. Torque the nut to the value shown on the chart for the thread diameter of the cylinder rod.





Thread Diameter	POUNDS - FEET
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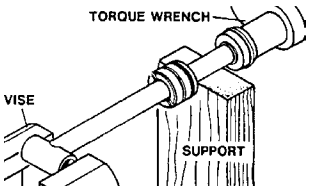
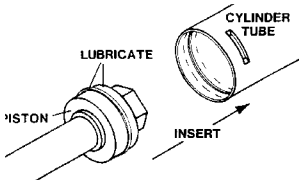
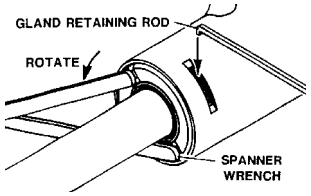
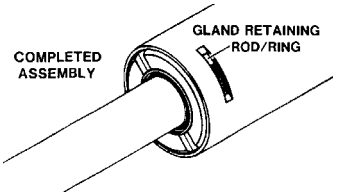
*** 1" Thread Diameter WITH 1.25" Rod Diameter**
Min. 230 ft. lbs. Max. 250 ft. lbs.









IMPORTANT: Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

IMPORTANT: Ensure that the piston ring fits squarely into the cylinder tube and piston groove, otherwise the ring may be damaged and a leak will occur.

5. Apply a lubricant (such as Lubriplate #105) to the piston and teflon ring. Insert the cylinder rod assembly into the cylinder tube.

6. Rotate the gland with a spanner wrench until the hole (drilled into the retaining slot of the gland) appears in the milled slot of the cylinder tube. Insert the hooked end of the gland retaining rod into the hole.

Rotate the gland until the gland retaining rod forms a ring between the gland and the cylinder tube. When complete, the bent end of the gland retainer ring should be hidden (not turned so it is exposed in the slot) to prevent it from popping out.

WARNING! **Cylinders serviced in the field are to be tested for leakage prior to the attachment being placed in work. Failure to test rebuilt cylinders could result in damage to the cylinder and/or the attachment, causing severe personal injury or even death.**

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TROUBLESHOOTING

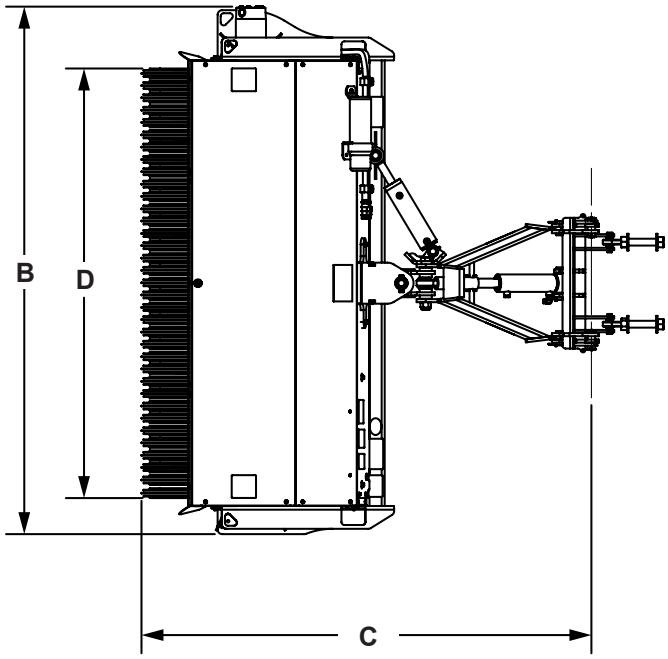
PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
BRUSH ROTATES WRONG DIRECTION	Hoses installed incorrectly.	Switch hoses at brush head tubes.
BRUSH SLOWS OR STOPS WHEN SWEEPING	Brush pattern too wide.	Adjust brush pattern. See “Brush Pattern Adjustment”
	Travel speed too fast.	Reduce travel speed.
	Trying to sweep too much material at once.	Make several passes with sweeper.
	Relief pressure set too low.	Set relief pressure to 2000 PSI (138 bar).
	Hydraulic filter plugged.	Change or clean filter.
	Pump has failed.	Contact Paladin or replace.
	Hydraulic motor is failing.	Test hydraulic system, replace motor.
BRUSH HEAD ASSEMBLY “BOUNCES” DURING SWEEPING	Travel speed too fast and/or brush speed too slow.	Adjust travel speed.
	Core is bent.	Replace core.
BRUSH WEARS INTO CONE SHAPE	Sweeper is not level.	Level sweeper. See “Leveling”
	Tires on prime mover at different pressures or are different sizes.	Check tire sizes and rating: make corrections as necessary.
BRUSH WEARS VERY QUICKLY	Brush pattern too wide.	Adjust brush pattern. See “Brush Pattern Adjustment”
HYDRAULIC CYLINDER NEITHER EXTENDS NOR RETRACTS	Tank hydraulic controls are not responding.	Contact Paladin or replace.
	Hydraulic oil level too low.	Fill tank to 2”-3” (51-76 mm) from top of tank with ISO VG-46 oil.
	Hoses or fittings loose or disconnected.	Tighten hoses and fittings.
	Restriction in hoses.	Remove bends in hoses, remove obstructions inside hoses.
HYDRAULIC CYLINDER ONLY EXTENDS OR ONLY RETRACTS	Dirt or debris in spools.	Contact Paladin or replace.
HYDRAULIC CYLINDER EXTENDS OR RETRACTS TOO QUICKLY	Flow too high.	Reinstall restrictor fitting on barrel end of cylinder.

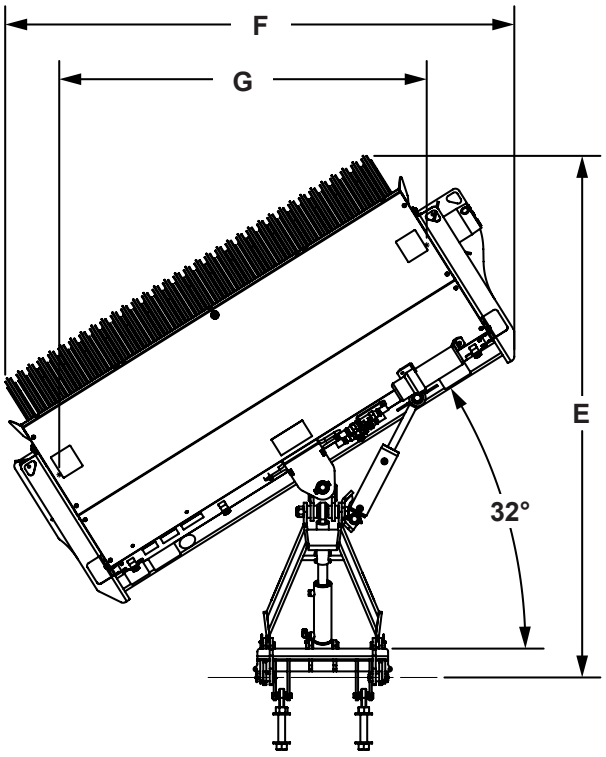
TROUBLESHOOTING

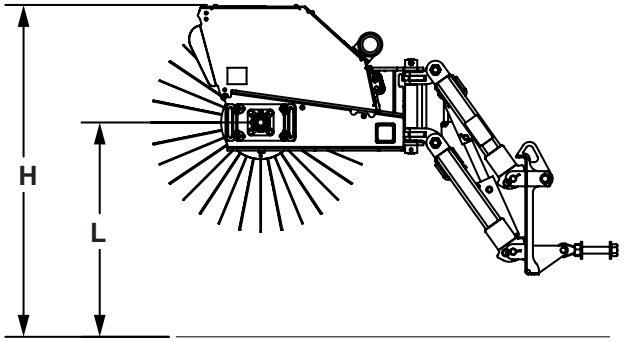
PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
HYDRAULIC SYSTEM OVERHEATS	Hydraulic oil level too low.	Fill tank to 2”-3” (51-76 mm) from top of tank with ISO VG-46 oil.
	Restriction in hoses.	Remove bends in hoses; remove any obstructions inside hoses.
	Host pump flow rate exceeds maximum GPM rating for broom.	Contact prime mover manufacture.
HYDRAULIC OIL LEAK	Flow rate exceeds maximum GPM rating for broom. Hydraulic pressure exceeds maximum PSI rating for broom.	Contact Paladin.
	Motor seals damaged.	Contact Paladin or replace.
HYDRAULIC OIL FLOWS FROM BREATHER CAP ON HYDRAULIC TANK	Hydraulic tank too full.	Drain hydraulic tank until level is 2” (51mm) from top.

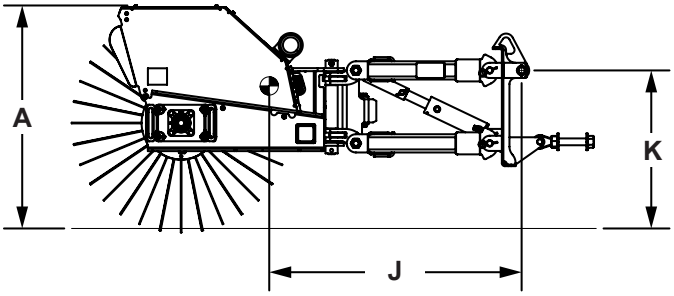
SPECIFICATIONS

HR Sweeper









SPECIFICATIONS AND DESIGN ARE SUBJECT TO CHANGE WITHOUT NOTICE AND WITHOUT LIABILITY THEREFOR.

SPECIFICATIONS

HR Sweeper

DESCRIPTION	6’	7’	8’
A. Overall Height	36.70”	36.70”	36.70”
B. Overall Width	86.80”	98.80”	110.80”
C. Overall Length	74.00”	74.00”	74.00”
D. Sweeping Width	72.00”	84.00”	96.00”
E. Overall Length @ 30°	85.80”	89.00”	92.20”
F. Overall Width @ 30°	83.70”	93.90”	104.10”
G. Sweeping Width @ 30°	60.50”	71.00”	81.00”
H. Maximum Raised Height	54.60”	54.60”	54.60”
J. Center of Gravity - Horizontal	40.30”	41.20”	41.90”
K. Center of Gravity - Vertical	26.00”	26.00”	26.00”
L. Center of Gravity - Vertical Raised	35.25”	35.25”	35.25”
Weight - Single 28.3 CID Motor (lbs)	826#	886#	946#
Weight - Dual 18.3 CID Motor (lbs)	864#	925#	985#

Maximum Hydraulic Pressure	3000 PSI
Hydraulic Flow - Single 28.3 CID Motor	14-25 GPM
Hydraulic Flow - Dual 18.3 CID Motor	22-35 GPM

BOLT TORQUE SPECIFICATION

GENERAL TORQUE SPECIFICATION TABLES

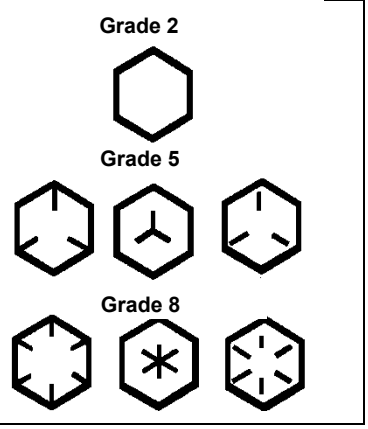
Use the following charts when determining bolt torque specifications, when special torques are not given. Always use grade 5 or better when replacing bolts.

SAE BOLT TORQUE SPECIFICATIONS

Note: The following torque values are for use with extreme pressure lubricants, plating or hard washer applications. Increase torque 15% when using hardware that is unplated and either dry or lubricated with engine oil.

Bolt Size		SAE GRADE 5 TORQUE				SAE GRADE 8 TORQUE			
		Ft-lbs		Newton-Meter		Ft-lbs		Newton-Meter	
Inches	mm	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF
1/4	6,35	8	9	11	12	10	13	14	18
5/16	7,94	14	17	19	23	20	25	27	34
3/8	9,53	30	36	41	49	38	46	52	62
7/16	11,11	46	54	62	73	60	71	81	96
1/2	12,70	68	82	92	111	94	112	127	152
9/16	14,29	94	112	127	152	136	163	184	221
5/8	15,88	128	153	174	207	187	224	254	304
3/4	19,05	230	275	312	373	323	395	438	536
7/8	22,23	340	408	461	553	510	612	691	830
1	25,40	493	592	668	803	765	918	1037	1245
1-1/8	25,58	680	748	922	1014	1088	1224	1475	1660
1-1/4	31,75	952	1054	1291	1429	1547	1700	2097	2305
1-3/8	34,93	1241	1428	1683	1936	2023	2312	2743	3135
1-1/2	38,10	1649	1870	2236	2535	2686	3026	3642	4103

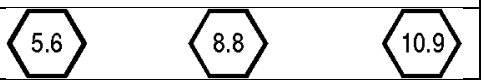
Bolt head identification marks as per grade.
NOTE: Manufacturing Marks Will Vary



METRIC BOLT TORQUE SPECIFICATIONS

NOTE: The following torque values are for use with metric hardware that is unplated and either dry or lubricated with engine oil. Reduce torque 15% when using hardware that has extreme pressure lubricants, plating or hard washer applications.

Bolt head identification marks as per grade.



Bolt Size	Grade No.	Pitch (mm)	Ft-lbs	Newton-Meter	Pitch (mm)	Ft-lbs	Newton-Meter
M6	5.6	1,0	3.6-5.8	4,9-7,9	-	-	-
	8.8		5.8-.4	7,9-12,7		-	-
	10.9		7.2-10	9,8-13,6		-	-
M8	5.6	1,25	7.2-14	9,8-19	1,0	12-17	16,3-23
	8.8		17-22	23-29,8		19-27	25,7-36,6
	10.9		20-26	27,1-35,2		22-31	29,8-42
M10	5.6	1,5	20-25	27,1-33,9	1,25	20-29	27,1-39,3
	8.8		34-40	46,1-54,2		35-47	47,4-63,7
	10.9		38-46	51,5-62,3		40-52	54,2-70,5
M12	5.6	1,75	28-34	37,9-46,1	1,25	31-41	42-55,6
	8.8		51-59	69,1-79,9		56-68	75,9-92,1
	10.9		57-66	77,2-89,4		62-75	84-101,6
M14	5.6	2,0	49-56	66,4-75,9	1,5	52-64	70,5-86,7
	8.8		81-93	109,8-126		90-106	122-143,6
	10.9		96-109	130,1-147,7		107-124	145-168
M16	5.6	2,0	67-77	90,8-104,3	1,5	69-83	93,5-112,5
	8.8		116-130	157,2-176,2		120-138	162,6-187
	10.9		129-145	174,8-196,5		140-158	189,7-214,1
M18	5.6	2,0	88-100	119,2-136	1,5	100-117	136-158,5
	8.8		150-168	203,3-227,6		177-199	239,8-269,6
	10.9		175-194	237,1-262,9		202-231	273,7-313
M20	5.6	2,5	108-130	146,3-176,2	1,5	132-150	178,9-203,3
	8.8		186-205	252-277,8		206-242	279,1-327,9
	10.9		213-249	288,6-337,4		246-289	333,3-391,6

PARTS

In order to provide you with the most UP-TO-DATE part information, all parts for this attachment have been moved to our website at ***www.paladinattachments.com/Manuals***. Please use these diagrams and parts lists to locate replacement parts.

When servicing your attachment, remember to use only original manufacturer replacement parts. Substitute parts may not meet the standards required for safe, dependable operation.

To facilitate parts ordering when contacting the factory, please have the product control number (PCN or C/N) or model and serial number of your product ready to ensure that you receive the correct parts for your specific attachment.

The product control number, model and serial number for your attachment should be recorded in the space provided on the cover of this manual. This information may be obtained from the serial number identification plate located on your attachment.

NOTE: Most daily and emergency parts orders (in stock) received by 10:30 A.M. (Eastern Standard Time) will be shipped UPS Ground the same day received. UPS Next Day orders must be received by 1:30 PM (Eastern Standard Time.)

SERVICE DEPARTMENT
(734) 996-9116
(800) 456-7100

For Fax and E-mail Orders
PLC_Sales@paladinattachments.com
(734) 996-9014

WARRANTY

In order to provide you with the most UP-TO-DATE Warranty information, Paladin Warranty Statement and Warranty Procedures along with Warranty Registration and Claim Forms have been moved to our website at ***www.paladinattachments.com***.