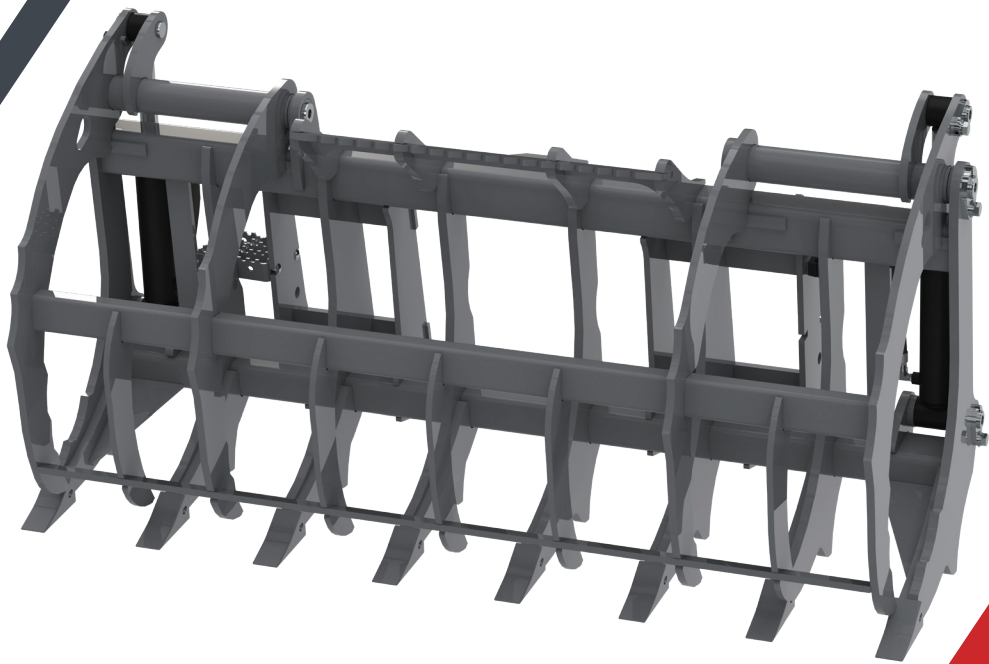




PALADIN®

OPERATOR'S MANUAL



ROOT RAKE

72", 78", 84"

for Skid Steer Loaders

SERIAL NUMBER: _____

MODEL NUMBER: _____

Manual Number: 75611

Date: April 2025

Rev. 7

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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.

IMPORTANT

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!

INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY



WARNING!

INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY



CAUTION!

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 AND UNDERSTAND MANUAL

- ▶ Read and understand this manual and other safety information provided with this equipment and base machine (prime mover) and be sure all controls and instructions are understood before attempting to install, operate or maintain this equipment.
- ▶ Read and follow all safety warnings and instructions.
- ▶ Do not discard safety instructions. Give to the operator.
- ▶ Improper installation, operation or maintenance of this equipment could result in serious injury, death or property damage.

READ AND UNDERSTAND ALL SAFETY STATEMENTS

- ▶ Read all safety statements in this manual and on your equipment safety decals.
- ▶ Keep safety decals in good condition. Replace missing or damaged safety decals.
- ▶ Because the manufacturer cannot foresee all hazardous circumstances, the precautions listed in this manual and on the equipment are not all-inclusive. If a procedure, method, tool or part is not specifically recommended by the manufacturer, determine whether it is safe for you and others, and that the equipment will not be damaged or made unsafe as a result of your decision to implement it.



PERSONAL PROTECTIVE EQUIPMENT (PPE)

- ▶ Always wear personal protective equipment (PPE) appropriate for the job, such as eye protection, ear protection, gloves, head protection, breathing protection and safety shoes. PPE should be worn at all times when operating, maintaining or observing the tool.
- ▶ Use PPE that conforms to standards ANSI Z87.1 (Eye and Face Protection), ANSI Z89.1 (Head Protection), ANSI Z41.1 (Foot Protection) and ANSI S12.6 (S3.19) (Hearing Protection).
- ▶ Do not wear loose fitting clothing, jewelry, long hair or gloves with cut or frayed fingers. These items can become entangled in the equipment causing hazards such as choking, scalping, lacerations, severed or broken appendages.



M003
Wear Ear
Protection



M004
Wear Eye
Protection



M016
Wear a Mask

KNOW YOUR EQUIPMENT

- ▶ Know your equipment's capabilities, dimensions, and controls before operating.
- ▶ Do not operate a damaged, improperly adjusted, modified or incompletely assembled tool.
- ▶ Make sure all safety guards and devices are installed.
- ▶ 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.
- ▶ Inspect the tool before each use and ensure all safety decals are in place and legible. Contact manufacturer if replacement decals are needed.
- ▶ Know and follow good work practices when assembling, maintaining, repairing, mounting, removing or operating this equipment.

SAFELY OPERATE EQUIPMENT

- ▶ Establish a training program for all operators to ensure safe operation.
- ▶ Do not operate the tool unless thoroughly trained or under the supervision of a qualified operator or instructor.
- ▶ Know and obey all OSHA regulations, local laws, and other professional guidelines for your operation.
- ▶ Know your work site safety rules. When in doubt on any safety issue, contact your supervisor or safety coordinator.
- ▶ Assess hazards to yourself and others around you before operating the tool. Start in a work area without bystanders. A hazard to bystanders can include, but is not limited to, the risk of serious injury or death caused by the tool or accessories being dropped from an elevated height. Keep children out of the work area.
- ▶ Do not operate the equipment from anywhere other than the correct operator's position.
- ▶ Do not alter or remove any safety feature from the prime mover or tool.
- ▶ Stay alert, watch what you are doing and use common sense when operating the tool. Do not operate the tool if you are tired or under the influence of drugs, alcohol or medication. A moment of inattention while operating the tool may result in serious injury.

General Safety Precautions



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

DUST AND FUMES

- ▶ **WARNING:** Dust created by power sanding, sawing, grinding, drilling, and other job site activities may contain chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:
 - Lead from lead-based paints
 - Crystalline silica from quartz, bricks, cement and other masonry products
 - Arsenic and chromium from chemically-treated lumber
- ▶ To reduce your exposure to these chemicals: work in a well ventilated area and work with approved safety equipment, such as dust masks that are specially designed to filter out microscopic particles. Protect yourself and those around you.
- ▶ Research and understand materials you are working with.
- ▶ Follow correct safety procedures and comply with all applicable national, state or provisional health and safety regulations relating to them, including, if appropriate, arranging for the safe disposal of the materials by a qualified person.
- ▶ Use dust suppression or dust collection methods when using a tool that may cause high levels of dust.
 - Control dust or fumes at the point of emission.
 - Direct tool exhaust to minimize disturbance of dust.
 - Operate and maintain the tool as recommended in this manual to minimize dust.
 - Use respiratory protection in accordance with employers instruction or as required by occupational health and safety regulations.
 - Avoid prolonged contact with dust. Allowing dust to get into your mouth, eyes or on the skin may promote absorption of harmful chemicals.



SAFELY MAINTAIN AND REPAIR EQUIPMENT

- ▶ Work in a clean and dry area.
- ▶ Keep the work area well lit.
- ▶ Work on a level surface.
- ▶ Use properly grounded electrical outlets and tools.
- ▶ Use the correct tools for the job at hand.
- ▶ Ensure tools are working properly and safely by performing preventative maintenance procedures.
- ▶ Wear protective equipment specified by the tool manufacturer.
- ▶ Do not perform any work on the tool 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, remove all maintenance tools and unused parts from equipment.

- ▶ Check for correct operation of the tool. If not operating properly, shut down the prime mover, follow proper Lock-Out / Tag-Out procedures and tag “DO NOT OPERATE” until all problems are corrected.

USE CARE WITH HYDRAULIC FLUID PRESSURE

- ▶ **DO NOT** attempt to make repairs to hydraulic lines or components while the system is pressurized. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Follow proper procedures for relieving pressure from hydraulic system before connecting or disconnecting hydraulic lines or components.
- ▶ Wear personal protective equipment (PPE) such as safety glasses, gloves and protective clothing at all times.
- ▶ Hydraulic leaks under pressure may not be easily visible. Keep hands and other body parts away from a suspected leak. Flesh injected with hydraulic fluid may develop gangrene or other permanent disabilities. Use a piece of cardboard or wood when searching for hydraulic leaks.
- ▶ If injured by injected fluid, seek immediate medical attention.
- ▶ Hydraulic fluid can become hot during operation. **DO NOT** come in contact with hot hydraulic fluid as it could cause severe burns.
- ▶ If exposed to hydraulic fluid, wash hands immediately.
- ▶ Inspect and clean couplers before use. Replace damaged couplers immediately.
- ▶ Ensure the couplers are properly connected and are tight.
- ▶ Do not smoke while working on the hydraulic system.



DO NOT MISUSE OR MODIFY EQUIPMENT

- ▶ Use and maintain the tool as stated in this manual. Misuse of the tool can cause serious injury.
- ▶ Do not modify the tool in any way. Modifications may weaken its integrity and may impair its function, safety, life and performance. When making repairs use only factory recommended replacement parts, following authorized instructions. Use of parts that are not factory approved may be substandard in fit and quality and may cause damage and void the warranty.
- ▶ Do not 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.

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.

Equipment Safety Precautions



WARNING!

READ THE ATTACHMENT MANUAL



- ▶ **WARNING:** Read all safety warnings and instructions. Failure to follow warnings and instructions may result in attachment damage and/or serious injury.
- ▶ Always observe safety symbols. They are included for your safety and for the protection of the tool.
- ▶ **WARNING:** To reduce the risk of injury, read the instruction manual.
- ▶ This attachment will provide dependable service if operated in accordance with the instructions given in this manual. Read and understand this manual and any stickers and tags attached to the tool and hoses before operation. Failure to do so could result in personal injury or equipment damage.

OPERATING THE ATTACHMENT

- ▶ 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 prime mover manual for these instructions.
- ▶ Keep all step plates, grab bars, pedals, and controls free of dirt, grease, debris, and oil.
- ▶ Do not allow bystanders around the equipment when it is operating.
- ▶ Do not allow riders on the attachment or the prime mover.
- ▶ Do not 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.
- ▶ Do not operate without good visibility or light.
- ▶ Do not exceed the lifting capacity of your prime mover.
- ▶ Operate only from the operator's station.
- ▶ Secure the load properly. Unsecured loads can fall unexpectedly.
- ▶ When handling a load, keep the grapple as close to the ground as possible.
- ▶ Be sure the load does not stick out too far in front of the attachment. A light load sticking out too far can have the same tipping effect as a heavy load carried in close.
- ▶ Avoid steep hillside operation, which could cause the prime mover to overturn.
- ▶ When on a slope, keep the load low and proceed with extreme caution. Do not drive ACROSS a steep slope - drive straight up and down.
 - With a LOADED attachment - face the attachment and load uphill.
 - With an EMPTY attachment - face the attachment downhill.
- ▶ Reduce speed when driving over rough terrain, on a slope, or turning, to avoid overturning the prime mover.
- ▶ Do not operator equipment if tired or under the influence of drugs or alcohol, which can impair alertness or coordination. A person taking prescription or over-the-counter medications should seek medical advice before he or she can safely operate equipment.



- 
- ▶ Do not lift, move or swing a loaded grapple over anyone.
 - ▶ Do not obstruct your vision when traveling or working. Carry the grapple low for maximum stability and visibility.
 - ▶ When using the grapple, lift the load slightly and make sure that the load is secure. If the load appears to be unstable, lower the load, open the grapple and reposition the load to attain full stability.
 - ▶ Before exiting the prime mover, lower the attachment to the ground, apply the brakes, turn off the prime mover's engine and remove the key.
 - ▶ In spite of the application of relevant safety regulations and the implementation of safety devices, certain residual risks cannot be avoided. These risks are pinching or severing hazard due to bystanders being in the area during operation.

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.

MAINTAINING THE ATTACHMENT

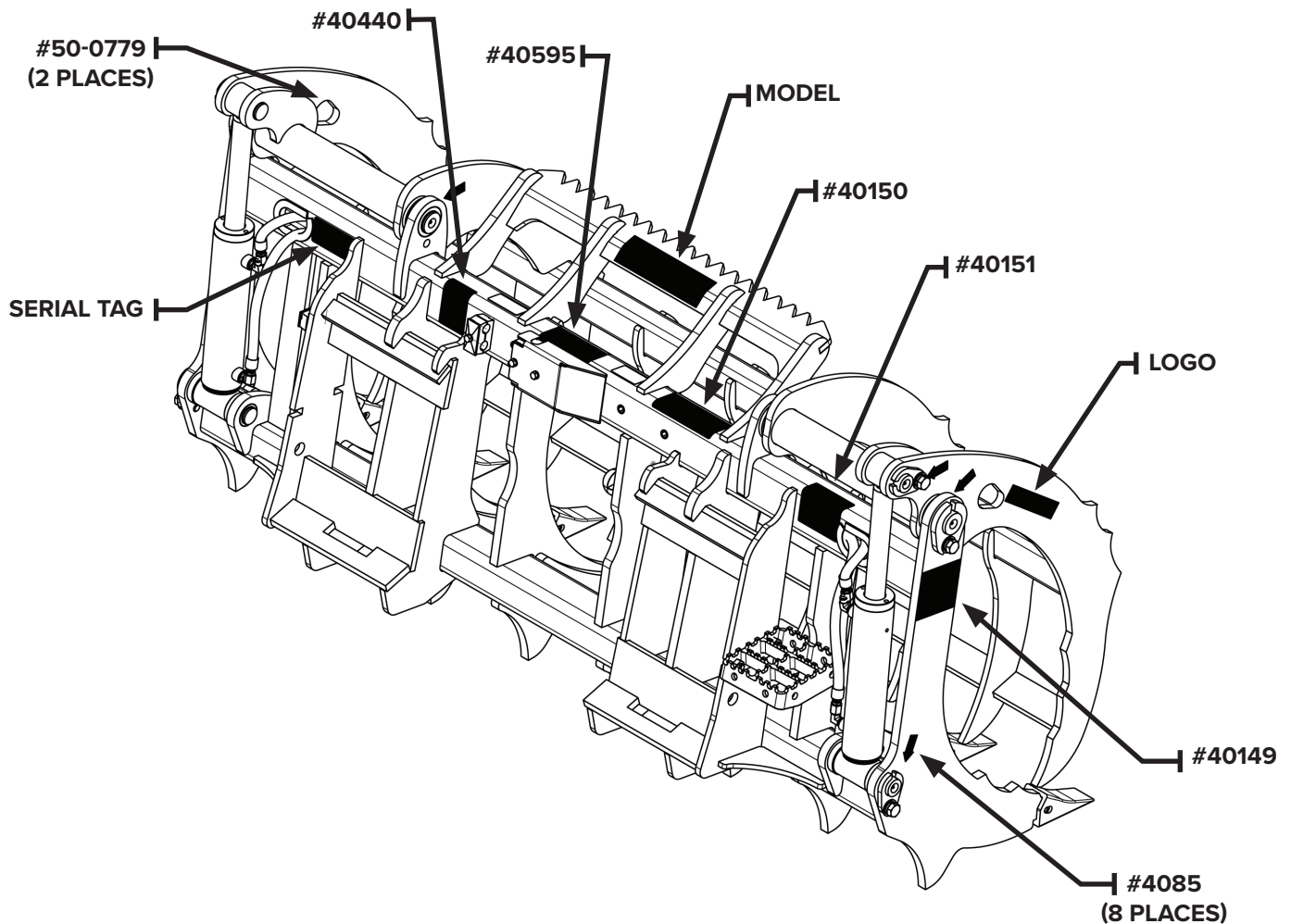
- ▶ Do not perform any work on the attachment unless you are authorized and qualified to do so. Always read the operator service manuals before any repair is made. After completing maintenance or repair, check for correct functioning of the attachment. If not functioning properly, shut down the machine, follow proper Lock-Out / Tag-Out procedures and tag "DO NOT OPERATE" until all problems are corrected.
- ▶ Before performing maintenance lower the attachment to the ground, apply the brakes, turn off the engine and remove the key.
- ▶ 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 attachment to the ground before leaving the cab or operator's station.
- ▶ Do not work under a raised attachment.
- ▶ 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.
- ▶ Worn, damaged, or illegible safety decals must be replaced. New safety decals can be ordered from Paladin.
- ▶ Do not make hydraulic repairs while the system is under pressure. Serious personal injury or death could result.
- ▶ Stop the prime mover engine and cycle control levers to release hydraulic pressure before servicing or adjusting attachment hydraulic systems.

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 next 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.



! DANGER!
40149 - PINCH POINT



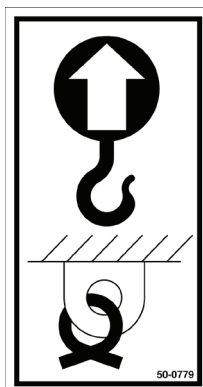
! WARNING!
40151 - HIGH PRESSURE FLUID



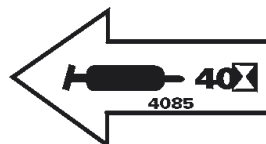
! WARNING!
40150 - READ MANUAL



! WARNING!
40440 - CALL BEFORE YOU DIG



50-0779 - LIFT AND TIE DOWN POINT



4085 - GREASE POINT
(EVERY 40 HOURS)



! WARNING!
40595 - FALLING LOAD

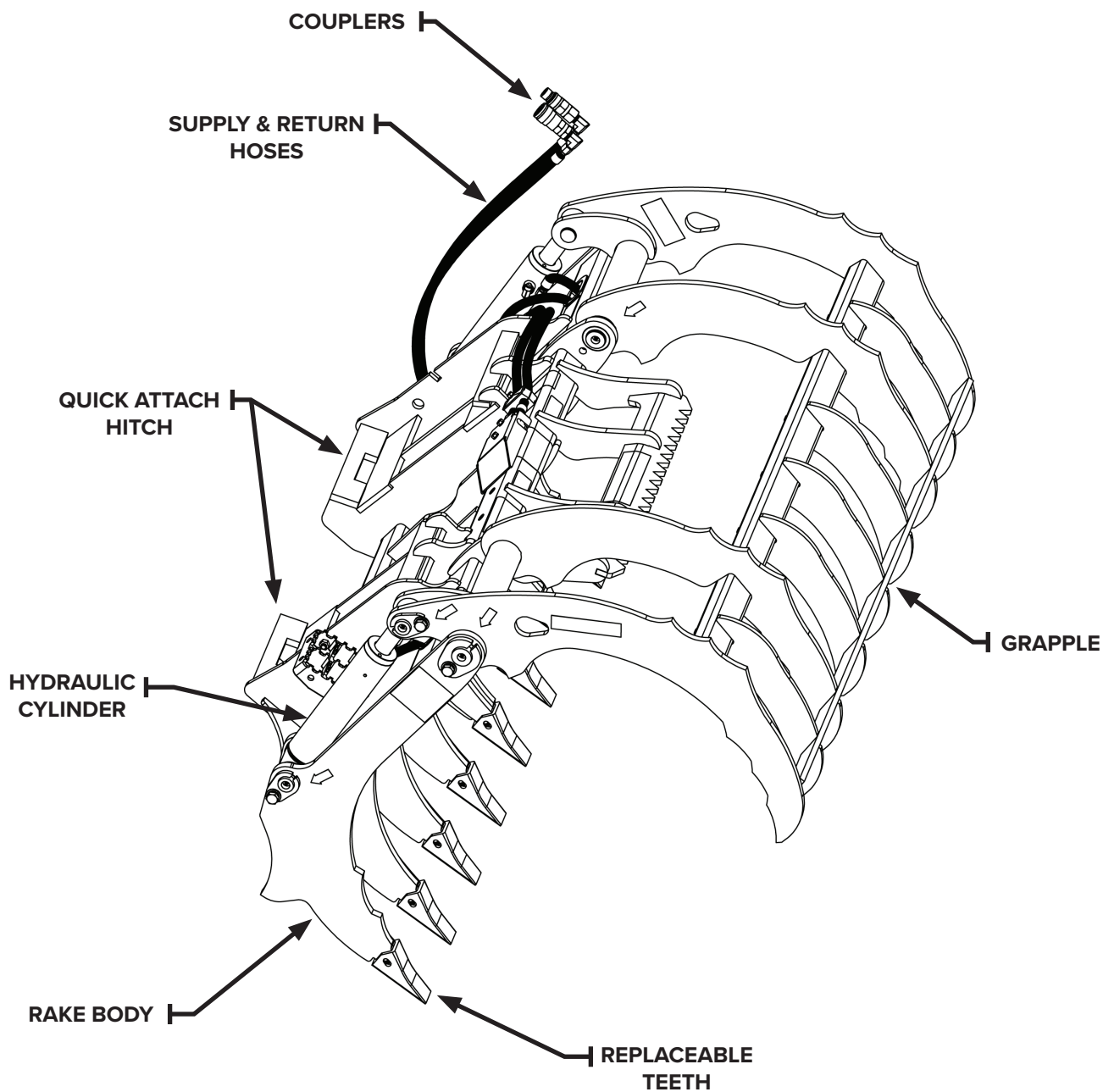
NOTE

Contact your local dealer for model number and logo decals



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Nomenclature



Installation



GENERAL INFORMATION

This root rake attachment was designed to be used on skid steer prime movers. The attachment is shipped complete with hoses and couplers installed. Call your nearest dealer if different hoses or couplers are needed for your prime mover.

Operating this attachment on a prime mover that exceeds specifications will cause damage to the attachment and void all warranties.

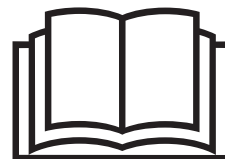
Remember to read all safety warnings, decals and operating instructions before operating the attachment. If there is any portion of this manual that you do not understand, contact your dealer.



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).

PRE-INSTALLATION



WARNING!

CRUSHING HAZARD

Keep bystanders clear of the attachment during installation and operation. Stay clear of all pinch points and the entire clamping range of motion of the attachment..

SERIOUS INJURY OR DEATH CAN OCCUR.

PALLET BANDING CAN BE SHARP

Always wear Personal Protective Equipment (PPE) when unpacking, installing, using, or maintaining attachment.

LACERATIONS AND OTHER PERSONAL INJURY CAN OCCUR.

1. Carefully remove the pallet banding.
2. Remove the attachment from the shipping pallet. Place on level, hard ground (e.g. concrete floor). Use wood blocking if necessary.
3. Lubricate all grease fittings on the attachment.





NOTICE!

Lubricate all grease fittings before connecting this product to your prime mover's hydraulic system. Refer to Lubrication page and follow the instructions.

MOUNT TO PRIME MOVER

1. Move the prime mover to the rear of the attachment.
2. Follow all standard safety practices and your prime mover operator's manual to install the attachment onto your prime mover.
3. Follow the safety shut down procedure for your prime mover and relieve hydraulic pressure as described in the prime mover manual.
4. Before exiting the prime mover, lower the attachment to firm level ground, apply the brakes of the prime mover, turn off the prime mover's engine, and remove the key.



WARNING!

AN IMPROPERLY INSTALLED ATTACHMENT CAN DISCONNECT FROM PRIME MOVER DURING OPERATION

Make sure the attachment is properly installed and secure on the prime mover. If you are unsure, **DO NOT** use the attachment. Refer to your prime mover's owner manual for proper installation procedure.

SERIOUS INJURY OR DEATH CAN OCCUR.

CONNECT HYDRAULIC LINES



WARNING!

ACCIDENTAL ACTIVATION

Do not install, change attachment accessories, clean, or perform maintenance on the attachment while connected to hydraulic power. Remove hydraulic power from the attachment before performing installation or maintenance.

SERIOUS INJURY OR DEATH CAN OCCUR.

NOTE

Make sure the prime mover's auxiliary hydraulic circuit does not exceed the maximum pressure for the attachment. See "Specifications" section. Use a calibrated pressure gauge to check the prime mover output before installation.

Installation



1. Lower the attachment to the ground and relieve pressure to the auxiliary hydraulic lines.
2. Follow the safety shut down procedure for your prime mover to shut down and exit the prime mover.
3. Make sure that the hose couplers are free from any foreign material or contaminants. Wipe hose couplers with a clean, lint free cloth.
4. Make sure the supply and return hoses are routed so that they will not become tight, stretched, pinched or damaged.
5. Connect the supply hose to the power connection on the prime mover auxiliary circuit.
6. Connect the return hose to the return connection on the prime mover auxiliary circuit.
7. Make sure all hydraulic connections are tight.
8. Follow the standard start up procedure for your prime mover to start the prime mover.
9. Pressurize hydraulics as prime mover manufacturer suggests.
10. Cycle all cylinders on the attachment to purge any air from the system. Check for proper hydraulic connection, hose routing and hose length.

IMPORTANT

Supply and return hoses must be long enough to accommodate complete rollout of the attachment.



WARNING!

HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE THE SKIN

Wear safety glasses, protective clothing, and use a piece of cardboard or wood when searching for hydraulic leaks. 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. DO NOT USE YOUR HANDS!

SERIOUS INJURY OR DEATH CAN OCCUR.

11. Visually check for hydraulic oil leaks. Fix leaks before using the attachment.
12. Attachment installation is complete.





DETACHING



WARNING!

CRUSHING HAZARD

Keep bystanders clear of the attachment during installation and operation. Stay clear of all pinch points and the entire clamping range of motion of the attachment..

SERIOUS INJURY OR DEATH CAN OCCUR.

1. Close the grapple.
2. Lower the attachment to firm level ground, apply the brakes of the prime mover, turn off the prime mover's engine, and remove the key.
3. Follow prime mover operator's manual to relieve pressure in the hydraulic lines.
4. Disconnect power and return hoses from the auxiliary hydraulics.
5. Follow your prime mover operator's manual for detaching (removing) an attachment.
6. Connect hydraulic couplers together or install caps to prevent contaminants from entering the hydraulic system. Store hoses off of the ground to help prevent damage.

Operation



INTENDED USE

This root rake is designed to pick up bulky, unusually shaped or long materials that will not stay in an ordinary bucket. In addition, the root rake is designed to rake large debris into a pile for easy pick up while leaving the soil and small rocks etc. Use in any other way is considered contrary to the intended use. Compliance with and strict adherence to operation, service and repair conditions as specified by the manufacturer, are also essential elements of the intended use.

USING THE ROOT RAKE



WARNING!

CRUSHING HAZARD

Keep bystanders clear of the attachment during installation and operation. Stay clear of all pinch points and the entire clamping range of motion of the attachment..

SERIOUS INJURY OR DEATH CAN OCCUR.

1. Before using the attachment, see your prime mover's operator's manual for instruction on operating the auxiliary hydraulic controls and function.

NOTICE

DO NOT lock the auxiliary hydraulics of the prime mover in the "ON" position. Continued operation of the attachment can cause excessive heat build up.

EQUIPMENT DAMAGE CAN OCCUR.

2. Approach the load in such a fashion that the weight will be centered in the grapple.
3. Close the grapple to its fullest extent possible and lift the attachment slightly to be certain that the load is secure.

NOTE

If the load appears to be unstable, lower the attachment to the ground, open the grapple and reposition the load to attain full stability. Repeat until full stability is achieved.



WARNING!

CRUSHING HAZARD

Lift loads only as high as required for transport given the terrain. **DO NOT** lift or transport over people.

SERIOUS INJURY OR DEATH CAN OCCUR.





During Material Handling:

- ▶ Do not exceed the lift capacity of your prime mover. See prime mover specifications.
 - ▶ Be sure the load does not stick out too far in front of the attachment. A light load sticking out too far can have the same tipping effect as a heavy load carried in close.
 - ▶ Stop and start the prime mover gradually, slow down before turning and avoid obstacles, bumps, or holes.
 - ▶ Avoid side slope travel whenever possible. Drive up the slope to pick up a load. Drive in reverse to go down the slope. Carry loads as close to the ground as possible.
 - ▶ Check load frequently to make sure it is stable.
 - ▶ Transport the load to its destination. Follow all of the prime mover manufacturers recommended safe driving practices.
 - ▶ Before exiting the prime mover, lower the attachment to firm level ground, apply the brakes of the prime mover, turn off the prime mover's engine, and remove the key.
4. When using the grapple body to gather debris or a load for pick up, THE GRAPPLE MUST BE COMPLETELY OPEN.

NOTICE

Do not use the grapple as a rake to drag material into position for pick up. Applying a raking-type force to an open grapple can greatly magnify the fluid pressure in the hydraulic hoses, fittings, and cylinder and may cause component failure.

IF THE ATTACHMENT LOSES HYDRAULIC PRESSURE DURING OPERATION:

- ▶ Stop the prime mover and lower the load to the ground.
- ▶ Turn off the prime mover, remove the key, and set the parking brake.
- ▶ De-pressurize the hydraulic system as the prime mover manufacturer recommends.
- ▶ Put the auxiliary hydraulic circuit used to power the attachment in a neutral position.

Operation



STORAGE

- ▶ Clean the unit thoroughly, removing all debris, 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. **DO NOT** operate a damaged, improperly adjusted, modified, or incompletely assembled attachment.
- ▶ Tighten loose nuts, cap screws 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. **DO NOT** operate a damaged, improperly adjusted, modified, or incompletely assembled attachment.
- ▶ Lubricate grease fittings.
- ▶ Check hydraulic hoses for damage and replace as necessary.

LIFT POINTS

Lifting points are identified by lifting decals where required. Examples of recommended lift points are shown. Use only designated lift points on your specific attachment. Lifting at other points may be unsafe and can damage the attachment. Do not attach lifting accessories around cylinders or in any way that may damage hoses or hydraulic components.



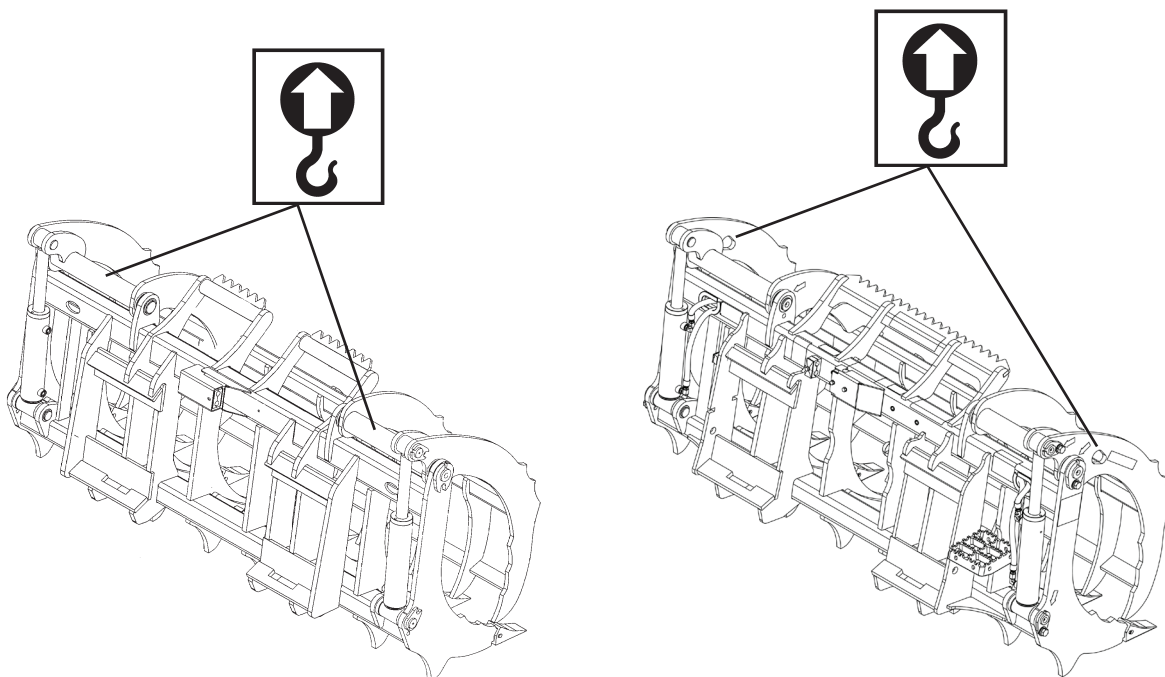
WARNING!

CRUSHING HAZARD

Verify that all lifting accessories (chains, slings, ropes, shackles and etc.) are capable of supporting the weight of the attachment and will maintain attachment stability. Make sure any lifting devices are attached in a way to prevent unintended disengagement.

SERIOUS INJURY OR DEATH CAN OCCUR.

- ▶ 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.



Operation



TIE DOWN POINTS

Tie down points are identified by decals where required. Recommended tie down points are shown below. Follow any designated tie down points on your specific attachment. Securing the attachment at other points may be unsafe and can damage the attachment. Do not attach tie down accessories around cylinders or in any way that may damage hoses or hydraulic components.

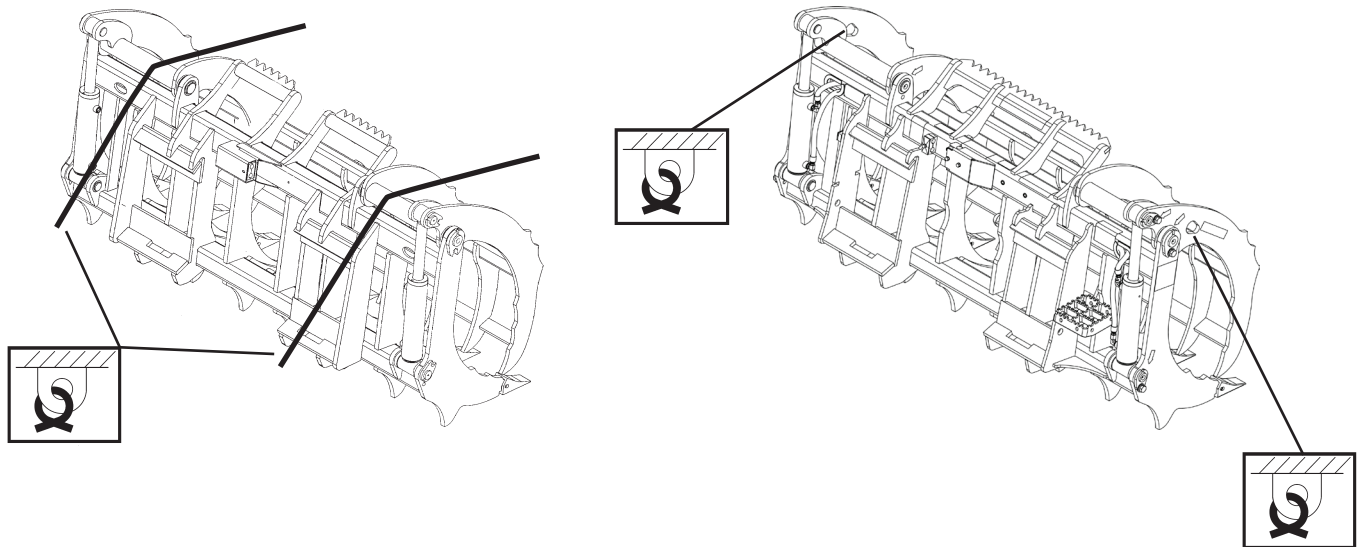
WARNING!

CRUSHING HAZARD

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.

SERIOUS INJURY OR DEATH CAN OCCUR.

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



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 manual when transporting your attachment.

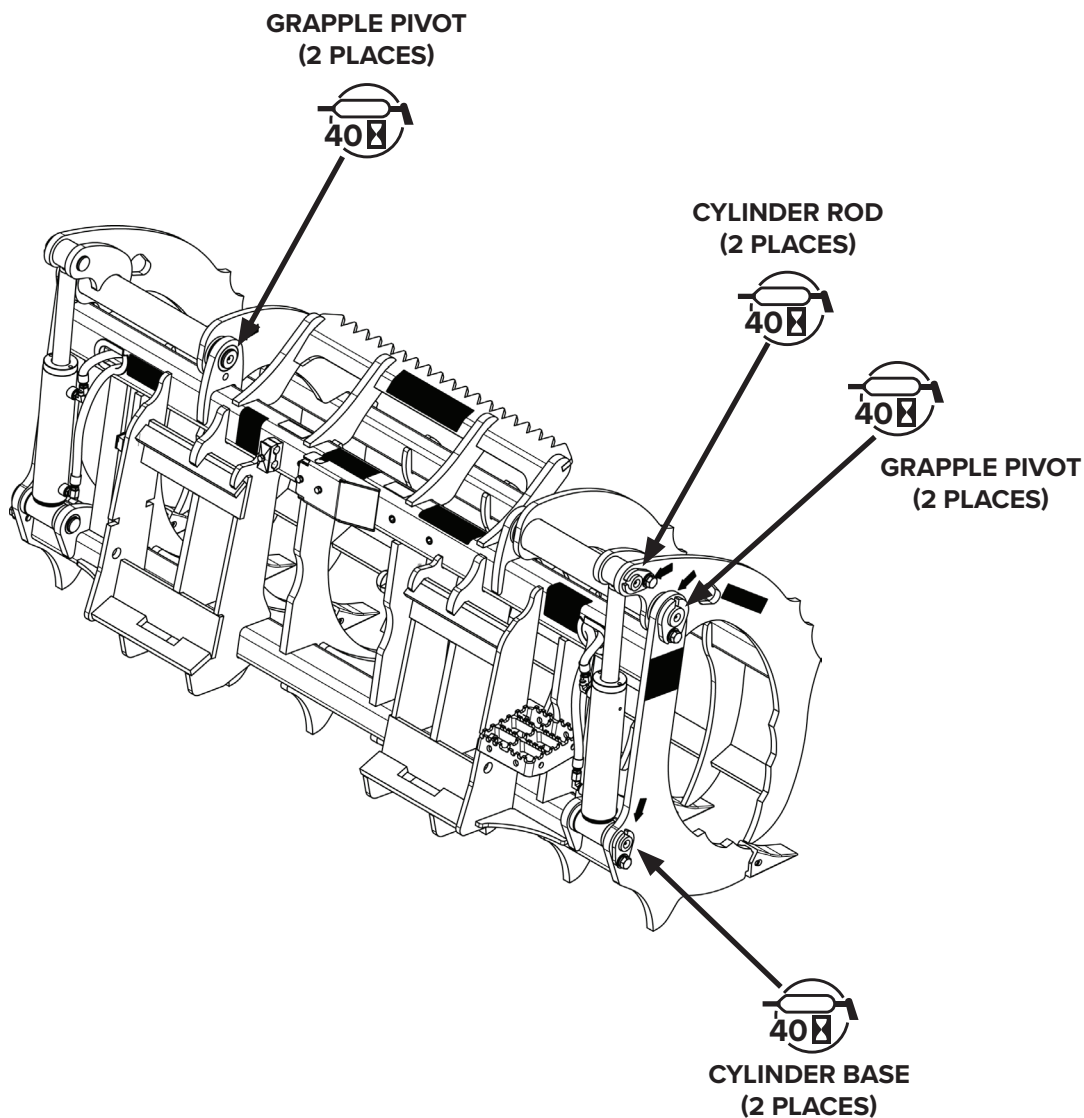
Lubrication

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.



WARNING!

CRUSHING HAZARD

Keep bystanders clear of the attachment while performing maintenance . Stay clear of all pinch points and the entire clamping range of motion of the attachment..

SERIOUS INJURY OR DEATH CAN OCCUR.

1. Lower the attachment to the ground and lower the grapple to it's fully closed position.
2. Lock out / Tag out the prime mover and relieve hydraulic pressure as described in the prime mover's manual.



WARNING!

ACCIDENTAL ACTIVATION

Do not clean or perform maintenance on the attachment while connected to hydraulic power. Remove hydraulic power from the attachment before performing maintenance.

ACCIDENTAL ENGAGEMENT OF THE ATTACHMENT CAN CAUSE SERIOUS INJURY.

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!**



NOTE

Always wear personal protective equipment (PPE) appropriate for the job, such as eye protection, ear protection, gloves, head protection, breathing protection and safety shoes. PPE should be worn at all times when operating, maintaining or observing the tool.

PROCEDURE	EVERY 8 HOURS (DAILY)	EVERY 40 HOURS (WEEKLY)
Check prime mover hydraulic system to make sure adequate level and cleanliness of hydraulic oil.	✓	
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 all grease fittings.		✓

IMPORTANT

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

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.

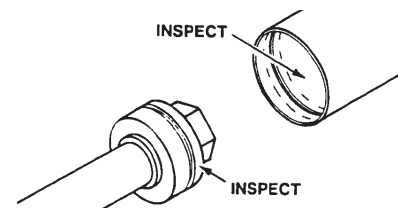
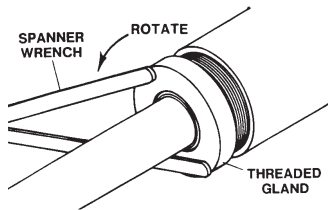
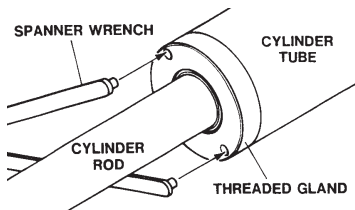
DISASSEMBLY PROCEDURE

IMPORTANT

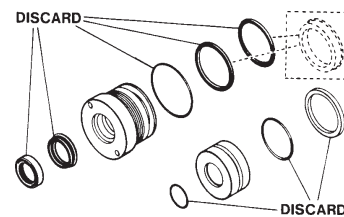
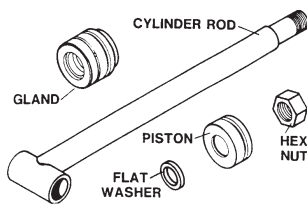
Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

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

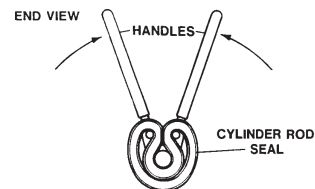
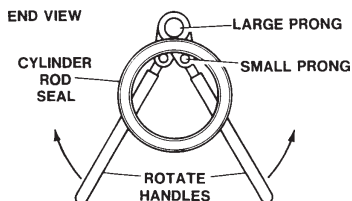
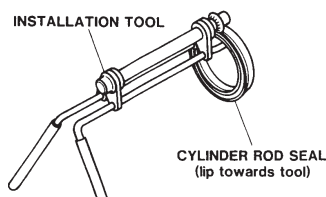
IMPORTANT

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.



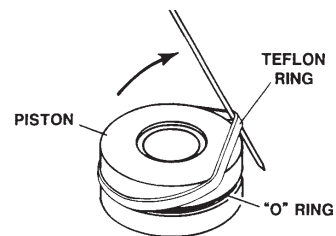
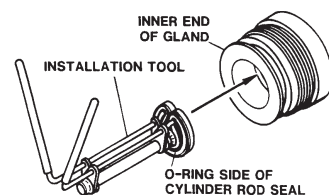
Rotate the handles on the tool around to wrap the seal around the end of the tool.

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.

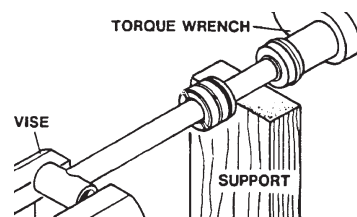
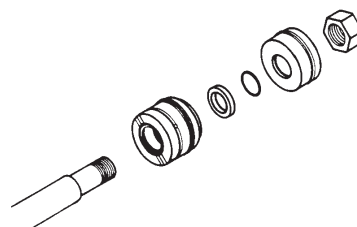
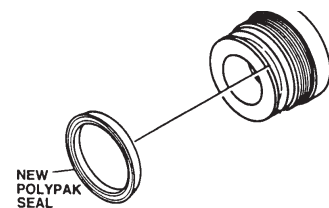
3. After installing the rod seal inside the gland, as shown in step #1, install the external seal.



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).



Maintenance



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. 252 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.



Tool Disposal



Hydraulic Oil

Hydraulic oil can contaminate the air, ground and water if not properly recycled. Recycle hydraulic oil in accordance with all State, Federal and local laws, at your local oil recycling facility.

Hydraulic Hoses

Hang hydraulic hoses to drain. Collect the oil for recycling. Contact your local municipal recycling authorities for an approved hydraulic hose recycling site.

Tool Body

Disassemble the tool and dispose of all non-metal parts. Recycle the metal components. Contact your local municipal recycling authorities for recycling instructions.

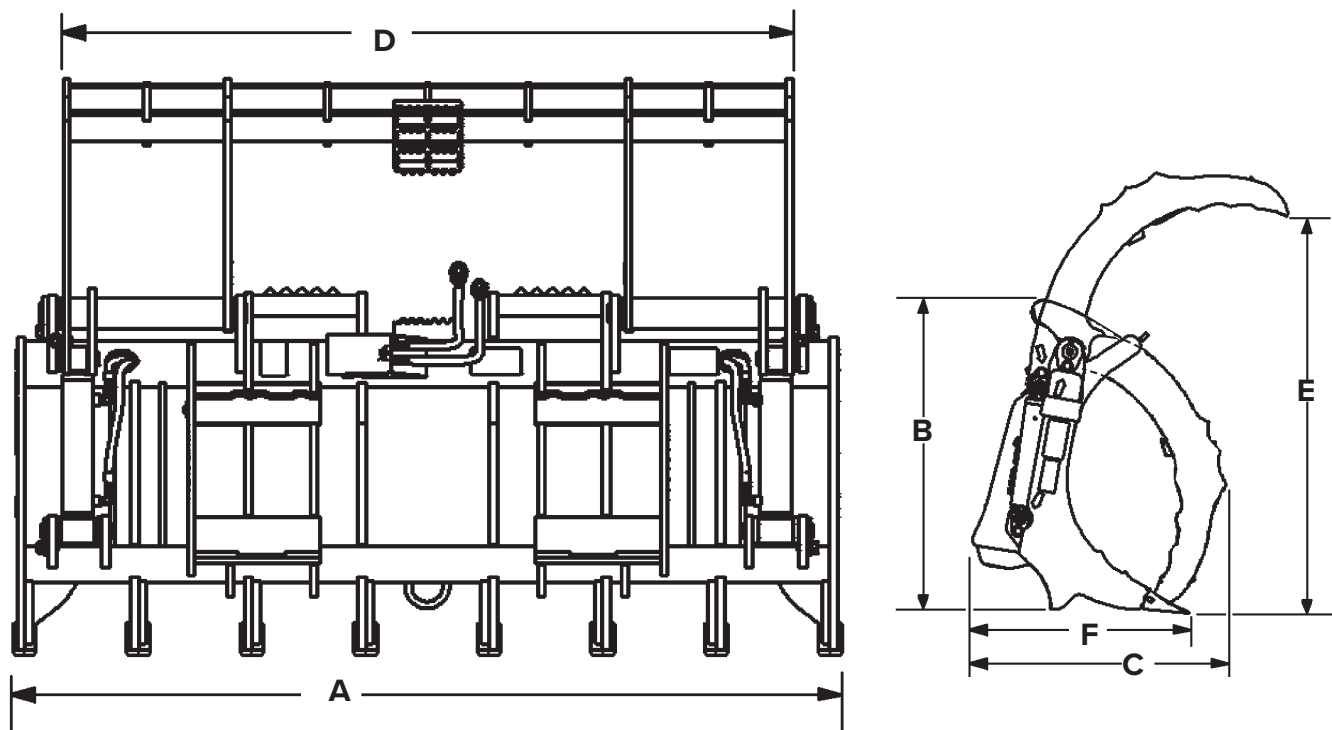
Troubleshooting



PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
GRAPPLE WILL NOT OPEN OR CLOSE CORRECTLY	Hoses installed incorrectly.	Switch quick coupler fittings.
	Hydraulic valve on prime mover not engaged.	See prime mover operator's manual.
	Insufficient hydraulic oil in system.	See prime mover operator's manual.
	Hose ends not completely engaged.	Check hose couplings and engage properly.
	Air in hydraulic lines.	Cycle prime mover auxiliary system several times to remove air from lines.
	Obstruction in hydraulic lines.	Replace obstructed or damaged line.
HYDRAULIC OIL LEAKS	Loose or damaged hoses.	Replace damaged hoses and tighten loose hoses.
	Loose or damaged connections.	Replace damaged connectors and tighten loose fittings.
EXCESSIVE HYDRAULIC OIL TEMPERATURE	Hydraulic oil level too low	Refer to your prime mover's operator's manual.
	Obstruction in hydraulic lines	Remove obstruction and replace if necessary.
	Couplers not engaged correctly	Remove and re-engage couplers.
	Hydraulic system overloaded and system relief open	Reduce load



Specifications



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

ROOT RAKE			
DESCRIPTION	72"	78"	84"
A. Overall Width	72.50"	78.50"	84.00"
B. Overall Height	38.76"	38.76"	38.76"
C. Overall Length	31.72"	31.72"	31.72"
D. Grapple Width	70.00"	70.00"	70.00"
E. Grapple Opening	51.00"	51.00"	51.00"
F. Tooth Position	27.00"	27.00"	27.00"
Tine Spacing	10.14"	10.14"	10.14"
Weight (lbs)	1110#	1130#	1225#
Cylinder Bore	2.50"	2.50"	2.50"
Cylinder Stroke	9.00"	9.00"	9.00"
Cylinder Rod Diameter	1.50"	1.50"	1.50"

Bolt Torque Specifications

GENERAL TORQUE SPECIFICATION TABLES

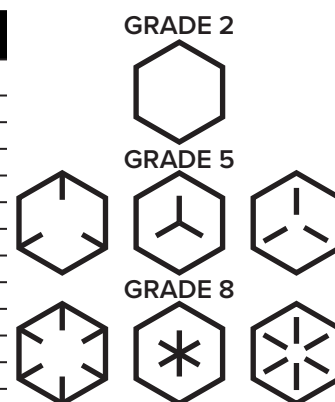
Use the following charts when determining bolt torque specifications when special torques are not given. Always use grade 5 or better when replacing bolts.

SAE BOLT TORQUE SPECIFICATIONS

IMPORTANT

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			
		POUNDS FEET		NEWTON-METERS		POUNDS FEET		NEWTON-METERS	
Inches	Millimeters	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.

Size of Bolt	Grade No.	Pitch (mm)	Pounds Feet	Newton-Meters	Pitch (mm)	Pounds Feet	Newton-Meters
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. 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 make sure 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.

IMPORTANT

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.



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