



PALADIN™
POWERFUL ATTACHMENT TOOLS

OPERATOR'S HANDBOOK

ROCK SAW



SERIAL NUMBER: _____

MODEL NUMBER: _____

Original
Part Number: 75659
Rev.

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PREFACE

GENERAL INFORMATION

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.

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 the attachment.

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 operator's

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 move, 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>.

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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 IS USED WHERE SERIOUS INJURY OR DEATH WILL RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.



WARNING

THIS SIGNAL WORD IS USED WHERE SERIOUS INJURY OR DEATH COULD RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.



CAUTION

THIS SIGNAL WORD IS USED WHERE MINOR INJURY COULD RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.

NOTICE

NOTICE INDICATES A PROPERTY DAMAGE MESSAGE.

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.

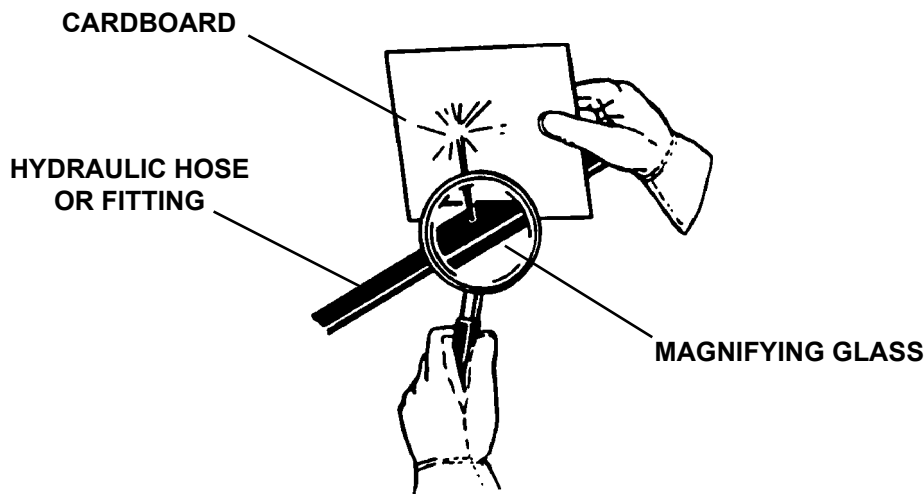
WARNING!



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 Protection 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.

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.

This attachment is designed to saw rock, concrete and asphalt, causing high levels of dust. It is recommended to use dust suppression, dust collection and if necessary personal protective equipment during the operation of the rock saw or 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 ROCK SAW

- Block off work area from bystanders, livestock, etc.
- Operate only from the operator's station.
- 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 parking brakes, turn off the prime mover's engine, and remove the key.
- Be sure all doors, guards and shields are in their proper position and securely attached before operating the rock saw.
- Do not attempt to move the rock saw sideways while it is in the ground.

EQUIPMENT SAFETY PRECAUTIONS



TRANSPORTING THE ROCK SAW

- 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 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 ROCK SAW

- Before performing maintenance, lower the attachment to the ground, turn off the engine, remove the key and apply the brakes.
- Never perform any work on the attachment unless you are authorized and qualified to do so. Always read the operator service manual's 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.

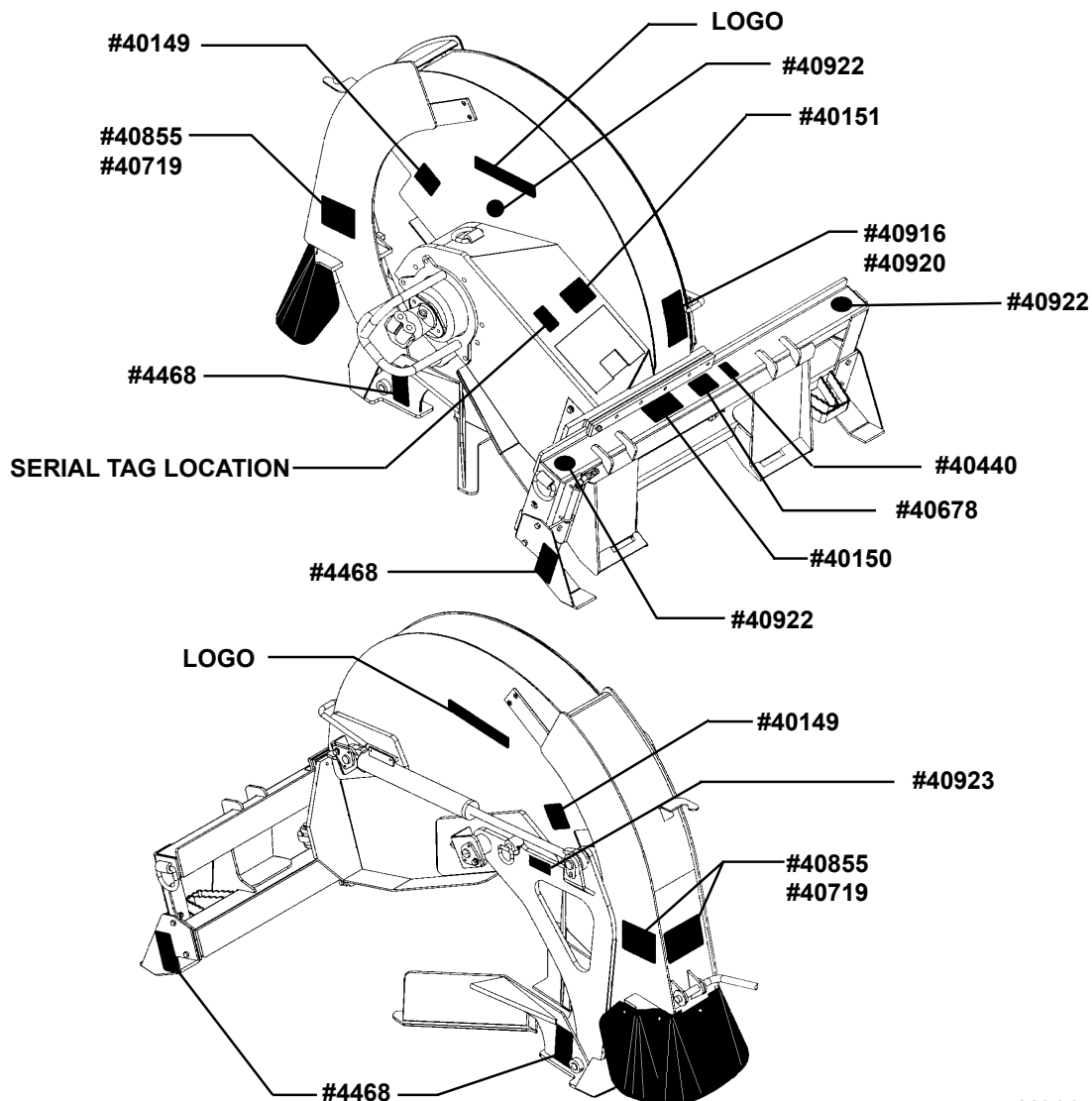
DECAL PLACEMENT

GENERAL INFORMATION

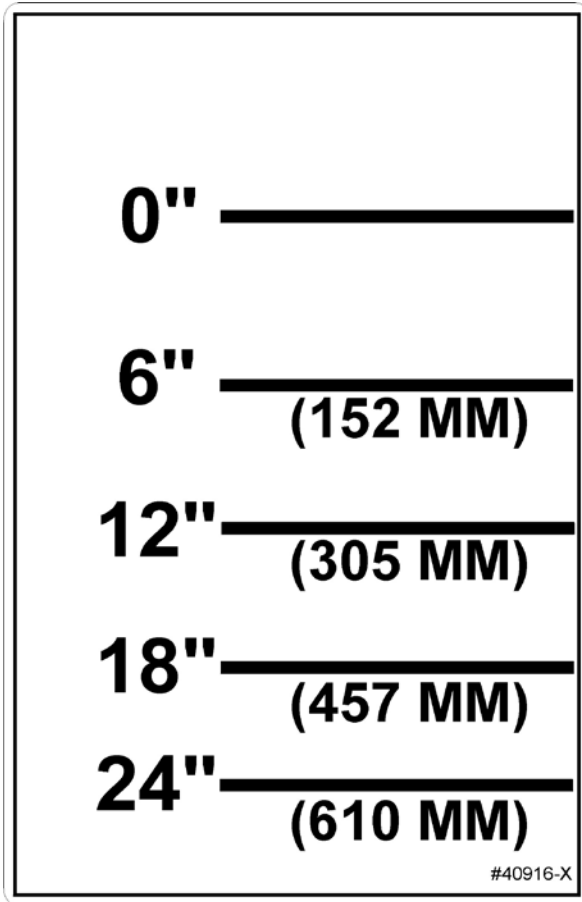
The following diagrams show the location of all the decals used on your attachment. The decals are identified by their part numbers, with the reductions of the actual decals shown on the following pages. Use this information to order replacements for lost or damaged decals. Be sure to read all decals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

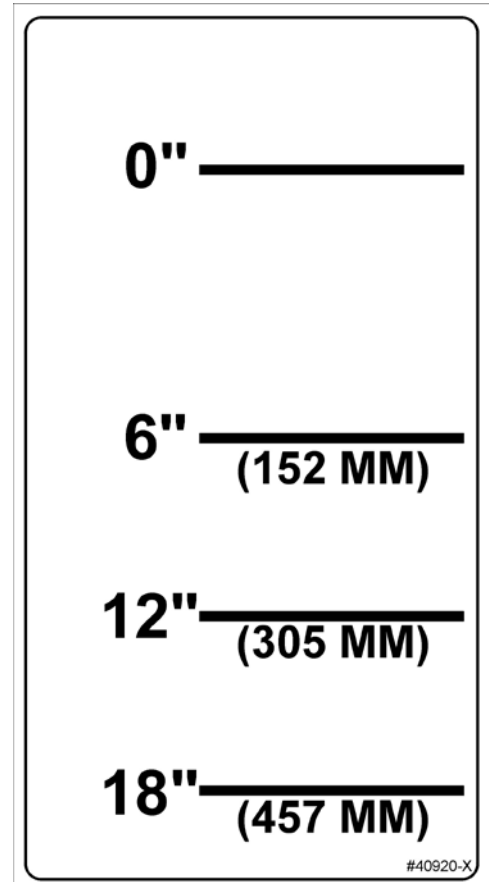
REPLACING SAFETY DECALS: Clean the area of application with a nonflammable solvent, then wash the same area with soap and water. Allow the surface to dry. Remove the backing from the safety decal, exposing the adhesive surface. Apply the safety decal to the position shown in the diagram, and smooth out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



DECALS



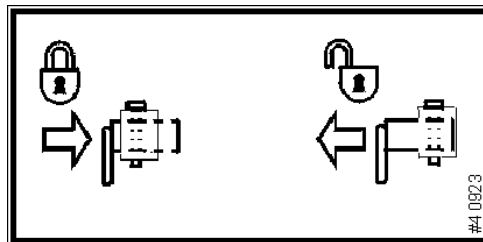
DEPTH CONTROL
PART #40916-X (24" ROCK SAW)



DEPTH CONTROL
PART #40920-X (18" ROCK SAW)



CALL BEFORE YOU DIG
PART #40440



LOCKING PIN /UNLOCK FOR OPERATION
PART #40923-X



LIFT HOOK
PART #40922

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

DECALS



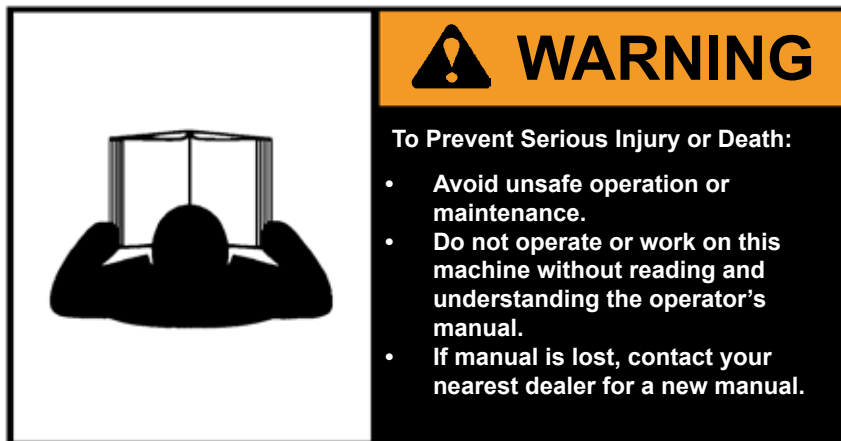
PART #40151

WARNING! HIGH PRESSURE FLUID



PART #40149

DANGER! PINCH POINT



PART #40150

WARNING! READ OPERATOR'S MANUAL



PART #40678

WARNING! BEFORE LEAVING OPERATOR'S SEAT

DECALS



PART #4468
WARNING! FOOT CRUSH



PART #41043
WARNING! HAZARDOUS DUST



PART #40719 (LARGE) / PART #40855 (SMALL)
DANGER! FLYING DEBRIS

PREOPERATION

SKID STEER

Skid-steers **MUST** be equipped with optional high flow, auxiliary boom hydraulics, case drain and a multi-function electric control kit to run the rock saw. Rock saw and skid-steer compatibility is determined by the recommended lifting capacity and hydraulic output of your skid-steer.

WARNING! Do NOT attach or operate any attachment that exceeds the recommended lifting capacity of your skid-steer.



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



This attachment is designed to saw rock, concrete and asphalt, causing high levels of dust. It is recommended to use dust suppression, dust collection and if necessary personal protective equipment during the operation of the rock saw or of any attachment that may cause high levels of dust!

IMPORTANT

Concrete and masonry products contain silica sand. Quartz, which is a form of silica and the most common mineral in the earth's crust, is associated with many types of rock.

Some activities that silica dust may be present in the air include demolition, sweeping, loading, sawing, hammering, drilling or planing of rock, concrete or masonry.

It is recommended to use dust suppression (such as water), dust collection (such as a vacuum) along with personal protective equipment if necessary during the operation of any attachment that may cause high levels of silica dust.

OPTIONS

2.5" (64 mm) Wide General Purpose Pick Kit for RS18 Rock Saw	#106681
4.0" (102 mm) Wide General Purpose Pick Kit for RS18 Rock Saw	#106682
2.5" (64 mm) Wide General Purpose Pick Kit for RS24 Rock Saw	#106684
4.0" (102 mm) Wide General Purpose Pick Kit for RS24 Rock Saw	#106685

INSTALLATION

GENERAL INFORMATION

The following instructions will help you to mount your rock saw onto your skid steer loader. The rock saw uses the quick-attach system for ease of installation.

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! THE ROCK SAWS ARE DESIGNED FOR USE ON HIGH FLOW HYDRAULIC SYSTEMS.



DO NOT ATTACH OR OPERATE ANY ATTACHMENT THAT EXCEEDS THE RECOMMENDED LIFTING CAPACITY OF YOUR SKID STEER.

INSTALLATION INSTRUCTIONS

1. Remove the shipping banding.
2. Remove any existing attachment from the loader.
3. Following all standard safety practices and the instructions for installing an attachment in your skid steer operator's manual, install the rock saw onto your skid steer.

NOTE: It is important to make sure the locking mechanism on your quick attach is engaged, therefore locking the attachment onto the skid steer.

4. Lower the unit to the ground and remove the key.
5. Relieve any pressure from the auxiliary hydraulic system. After making sure that there is not any foreign matter on the hydraulic couplers connect the case drain coupler to the case drain on your skid steer loader. NOTE: The case drain line must be connected first, then the power and return hoses. When disconnecting the hoses, it is recommended to disconnect the case drain line last.
6. Connect the power and return couplers to the high flow auxiliary hydraulic system of your skid steer loader. Route the hoses in such a fashion as to avoid pinching or chafing.

NOTICE! BE SURE CASE DRAIN COUPLER IS COMPLETELY ENGAGED. IMMEDIATE HYDRAULIC MOTOR SEAL FAILURE AND PLANETARY DAMAGE WILL OCCUR IF CASE DRAIN IS NOT SUCCESSFULLY CONNECTED.

7. Connect the electrical wire harness from the rock saw to the auxiliary electrical connector on the front of the skid steer (if so equipped). If your skid steer is not equipped with an electrical connector and you are using the Paladin control handle, connect the wiring harness to the control handle and place the control handle inside of the skid steer operator's station.

WARNING! Do not operate the rock saw from outside of the skid steer operator's station.



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INSTALLATION

8. Following all standard safety practices, start the skid steer and run all cylinders through their full cycle to purge any air from the system. Check that all controls function in accordance with the operating controls described in the operating instructions section of this manual.
9. If your rock saw is equipped with the optional water kit, install the female coupler supplied to your existing water line coming from the water tank on the skid steer. Connect the female coupler to the male coupler on the rock saw water nozzle kit.

Your rock saw is now installed and ready for operation.

DISCONNECT INSTRUCTIONS

1. Center the rock saw on the sideshift frame.
2. Adjust depth setting to "0" and engage the locking pin on the right side of the rock saw.
3. Set attachment on a firm level surface.
4. Following Safety Shut Down Procedures; stop the engine and set the parking brake. Relieve any pressure in the hydraulic lines.
5. Disconnect the power and return hoses from the auxiliary hydraulics. Disconnect the case drain line. NOTE: It is recommended to disconnect the case drain line last.
6. Disconnect the electrical wire harness from the auxiliary electrical connector or the Paladin control handle and after turning the ball valve to the shut off position disconnect the water line at the couplers.
7. Following all standard safety practices and the instructions for disconnecting an attachment in your skid steer operator's manual, disconnect the rock saw from your skid steer allowing the mounting bracket to lower toward the ground as the skid steer is disengaged.
8. Connect the hydraulic couplers on the attachment together to prevent contaminants from entering the hydraulic system.

OPERATING INSTRUCTIONS

CONTROLS

The rock saw is controlled by either the Paladin control handle or the electric control handle for your specific skid steer and an electric valve assembly. The Paladin control handle moves the attachment left and right and also up and down according to the arrows on the handle. These instruction will cover the New Holland and the Case Multi-Function control handles.

WARNING! DO NOT OPERATE THE ROCK SAW FROM OUTSIDE OF THE SKID STEER OPERATOR'S STATION. SERIOUS INJURY OR DEATH COULD OCCUR.



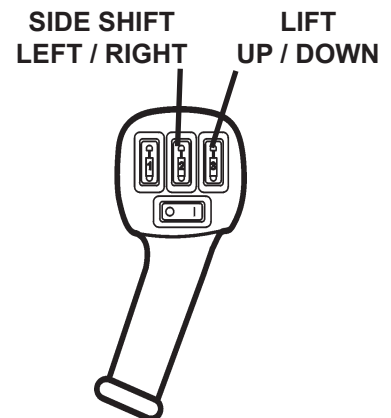
NEW HOLLAND CONTROL HANDLE

SIDE SHIFT CONTROL

Side shifting the rock saw is achieved by activating the middle rocker switch on the left multi-function control handle.

LIFT CONTROL

Raising and lowering the rock saw is achieved by activating the right rocker switch on the left multi-function control handle.



CASE CONTROL HANDLE

SIDE SHIFT CONTROL

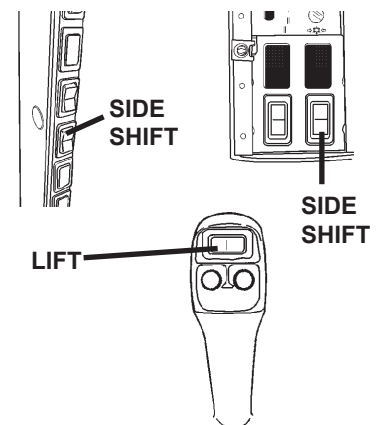
Sideshifting the rock saw varies according to the Case operating skid steer. On 40XT - 70XT loaders with pillar controls the lower rocker switch activates the side shift function. On 75XT - 95XT loaders with right console controls the right lower rocker switch activates side shift function.

LIFT CONTROL

Raising and lowering the rock saw is achieved by activating the rocker switch on the Case control handle.

40XT - 70XT
"A" PILLAR
CONTROLS

75XT - 95XT
RIGHT CONSOLE
CONTROLS



PALADIN CONTROL HANDLE

SIDE SHIFT CONTROL

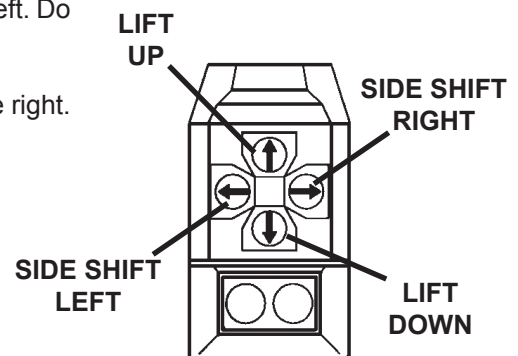
Pushing the left arrow switch will side shift the rock saw to the left. Do not side shift during operation.

Pushing the right arrow switch will side shift the rock saw to the right. Do not side shift during operation.

LIFT CONTROL

Pushing the top arrow switch will raise the rock saw.

Pushing the bottom arrow switch will lower the rock saw.



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OPERATING INSTRUCTIONS

INTENDED USE: This unit is designed to cut through horizontal surfaces consisting of rock, concrete and asphalt. Use in any other way is considered contrary to the intended use.

GENERAL INFORMATION

Read and understand your skid steer operator's manual for information regarding skid steer operation before attempting to use the attachment.

Check the operating surface. The standard all purpose picks can be used to saw both asphalt and concrete. The optional concrete picks are recommended if the rock saw is to be used extensively for concrete. NOTE: These picks do not perform as well when sawing through asphalt, especially in warmer weather.

Review the job at hand and determine the required depth and the side shift position of the rock saw. Best performance is obtained when the rock saw is in the center position. Side shift should be used when visibility is a determining factor such as sawing next to an obstacle such as a building.

NOTICE: The wheel/planetary nuts (#10003) must be torqued to 220-260 ft. lbs (298-353 N-m) after the first four hours of operation and every 40 hours thereafter.

ROCK SAW OPERATION

WARNING! CHECK THE WORK AREA AND KNOW WHERE ALL UTILITY LINES ARE BEFORE OPERATING THE ROCK SAW.



OPERATE THE ROCK SAW FROM INSIDE THE OPERATOR'S STATION OF YOUR SKID STEER LOADER ONLY.

1. Clear area of all bystanders.

NOTE: There is a control valve that can be manually set to change the speed of the lift cylinder. Before operation, place the locking pin in the UNLOCK (operating) position and run the lift cylinder through a complete cycle, noting the speed. For maximum production it is recommended that the harder the material the slower the cylinder speed.

2. Determine the desired depth and side shift location. Position the rock saw at the starting point of the cut. Place the locking pin in the UNLOCK (operating) position.
3. With the skid shoe in the "0" position, place the skid shoe on the ground and roll out the loader bucket cylinder until the front tires of the skid steer are off the ground
4. With cutting wheel off the ground, start wheel rotation. (Picks at the bottom of the wheel must be moving in the same forward direction that the rock saw travels. If they are not, change the power and return hoses at the motor end.)

OPERATING INSTRUCTIONS

5. Increase engine to full RPM. Start the sawing operation by retracting the skid shoe using the lift cylinder. This must be done slowly. If the rock saw stalls you are retracting the skid shoe faster than the saw is cutting. Lower the skid shoe (which will lift the cutting wheel) until the wheel restarts.
6. Retract the skid shoe until the desired depth is achieved. If the rock saw continues to stall, shut down and reset the control valve to slow down cylinder speed.

NOTE: When the skid shoe begins to come off the ground and the front tires of the skid steer have reached the ground, stop retracting the lift cylinder and roll the loader bucket cylinder out to get the front tires off the ground.

7. Advance forward. If the rock saw stalls, you are traveling faster than the saw is cutting. Back out of the cut until wheel restarts and then advance slowly.

NOTE: Do NOT side shift the rock saw while the wheel is in the cut. The cutting wheel will not cut in a side to side direction.

OPERATING TIPS

- For optimal cutting and reduced vibration, operate the rock saw with the rear tires of the loader and the rock saw rollers on the ground and enough down pressure on the skid shoe to prevent the saw from plunging into the ground and stalling. **NOTE: This is not possible with some skid steer applications.**
- If the rock saw is stalling out you are either traveling too fast or retracting the skid shoe faster than the saw is cutting. Back out of the cut or lower the skid shoe until the wheel restarts.
- When the skid shoe begins to come off the ground and the front tires of the skid steer have reached the ground, stop retracting the lift cylinder and roll the loader bucket cylinder out to lift the front tires off the ground.

ENDING THE CUT

To end the cutting operation:

1. Stop all forward movement and raise the cutting wheel out of the cut by lowering the skid shoe to the "0" position.
2. Idle the loader engine and turn the rock saw off. **DO NOT TRANSPORT THE ROCK SAW WHILE THE CUTTING WHEEL IS IN MOTION.**
3. Move the unit away from the cut.
4. Lower the attachment to the ground and turn off the loader engine.

OPERATING INSTRUCTIONS

5. Apply the brakes and remove the key before leaving the operator's station.
6. Install the locking pin in the LOCK (park / transport) position.

NOTICE: *Periodic observation must be made of the transmission oil temperature indicator when sawing with the high flow hydraulic systems. Depending on the ambient temperature and the duty cycle of the machine hydraulic oil may overheat. If indicator comes on, shut off the rock saw and allow the skid steer to idle until the temperature falls below 160° Fahrenheit (71°C). If the system continues running hot it may be necessary to clean any debris from the oil cooler and radiator. Check engine air filter and also the hydraulic oil level. Continuous or excessive overheating may cause machine damage.*

STORAGE

- 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.
- Check for missing or worn picks. Replace as required.
- 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:

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

TRANSPORTING

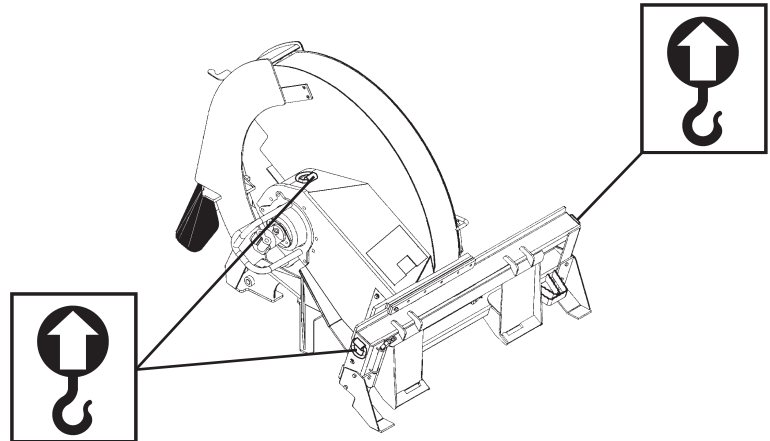
- Check that the Locking Pin is in the LOCK (Transport) position.
- Use extra care when loading and unloading the machine onto a truck or trailer.
- Follow all local government regulations that may apply along with recommended tiedown points and any equipment safety precautions at the front of this handbook when transporting your attachment.

OPERATING INSTRUCTIONS

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.

- 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.



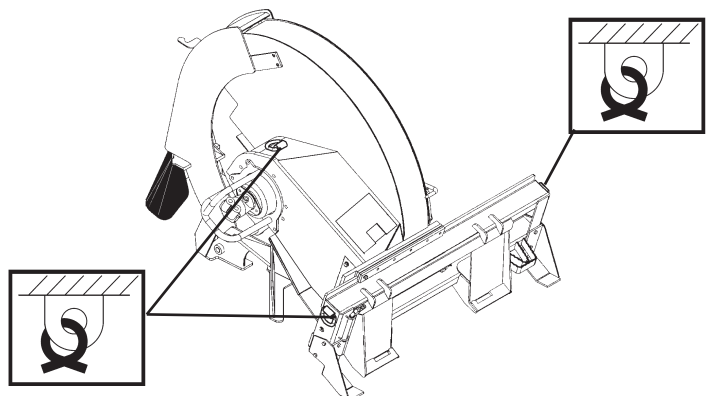
WARNING! Use lifting accessories (chains, slings, ropes, shackles and etc.) that are capable of supporting the size and weight of your attachment. Secure all lifting accessories in such a way to prevent unintended disengagement. Failure to do so could result in the attachment falling and causing serious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



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.

- 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.



MAINTENANCE AND SERVICE

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!  **Never do any maintenance to this attachment while it is running. Exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE BEFORE working on or around the attachment.**

AFTER FIRST 4 HOURS (BREAK IN PERIOD)

- Torque the wheel/planetary nuts (#10003) to 220-260 ft. lbs. (298-353 N·m).

Procedure	Daily	Every 40 Hours	2500 Hours or 12 Months
Case Drain Coupler - Check for complete engagement of coupler.	✓		
Hydraulic Oil - Check prime mover hydraulic system for adequate oil levels.	✓		
Hardware - Check for tightness (see Bolt Torque Specifications)	✓		
Hydraulic System - Check for leaks and tighten as necessary. Check for damage and replace as needed.	✓		
Decals - Check for missing or damaged safety decals and replace as necessary.	✓		
Picks - Check for freedom of rotation, flat spots and wear. Replace worn or missing picks or any picks that are not rotating freely or have flat spots.	✓		
Inspect attachment for any worn parts or cracked welds. Repair as required.	✓		
Lubricate grease fittings on the lift arm pin and the pivot pins on the left and right stand.	✓		
Lubricate grease fittings on cylinder ends.		✓	
Torque the wheel/planetary nuts (#10003) to 220-260 ft. lbs. (298-353 N·m).		✓	
Change gear oil (Castrol SP320) in planetary. See Maintenance and Service			✓

WARNING!  **Escaping fluid under pressure can have sufficient force to penetrate the skin causing serious personal 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. If your doctor is not familiar with this type of injury, ask him to research it immediately to determine proper treatment.

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MAINTENANCE AND SERVICE

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.

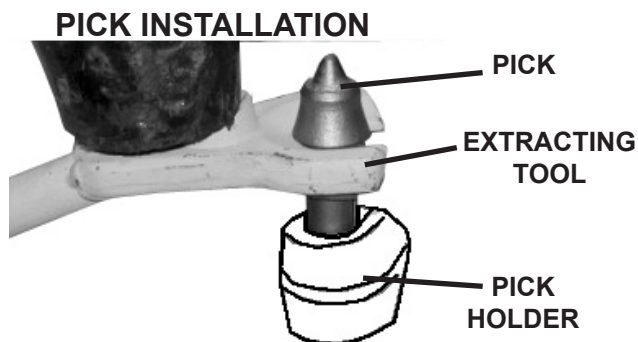
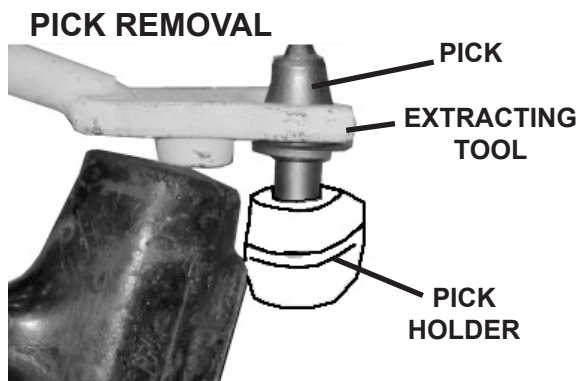
PICK REPLACEMENT

Picks should be replaced if you are changing to a different application pick, they are broken, worn, flat spot or are seized in the pick holder and do not rotate freely.

WARNING! Always wear safety glasses with side shields when striking metal. Failure to heed could result in serious injury to the eyes or other parts of the body. **DO NOT** attempt to check the picks with the rock saw in a raised and unsupported position.



1. Raise the skid shoe / lift arm by retracting the lift cylinder and installing the locking pin to prevent the lift arm from accidentally lowering.
2. Support the rock saw by attaching a lift hook on the left side of the mainframe in the "D" ring provided.
3. Hold the extracting tool (pick puller) in one hand and place the jaws in the groove of the pick, with the offset handle pointing away from the pick holder.
4. Using a lead hammer or rubber-headed mallet, hit the raised pad on the tool until the pick starts to move. Continue tapping until the pick is removed.
5. Insert the new pick into the jaws of the extracting tool (pick puller) so that the raised pad of the tool is pointing in the same direction as the pick point.
6. Position the new pick in the pick holder on the wheel and with a lead hammer or rubber-headed mallet, hit the raised pad of the tool to start the pick into the pick holder. (Clean out any foreign material from the pick holder before installing the new pick.)
7. Once the pick is started into the pick holder strike the tool pad one strong blow to pop the pick into the holder.



NOTE: The pick is properly seated when its shoulder is against the face of the pick holder. Check to be sure the pick rotates freely.

MAINTENANCE AND SERVICE

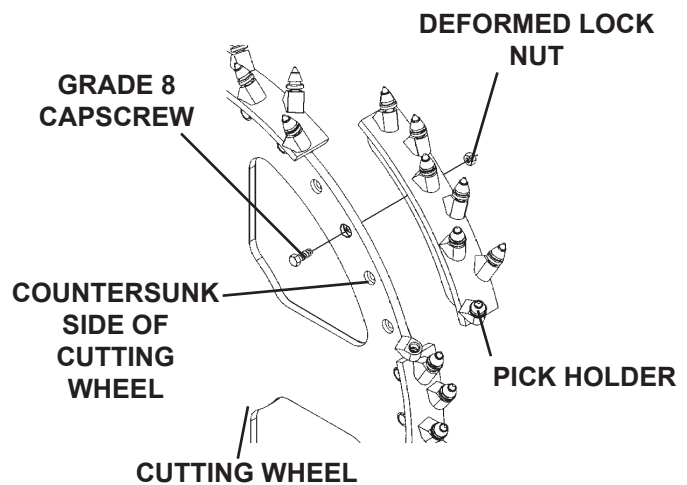
- When all accessible picks have been changed, clear the area of bystanders and start the loader. Slowly rotate the cutting wheel approximately 1/4 turn to access more picks.
- Repeat Steps #3 through #8 until all picks have been replaced.

PICK AND HOLDER REPLACEMENT.

It will be necessary to change the complete bolt-on pick holder if the holder is damaged or when changing the width of cut.

- Raise the skid shoe / lift arm by retracting the lift cylinder and installing the locking pin to prevent the lift arm from accidentally lowering.
- Support the rock saw by attaching a lift hook on the left side of the mainframe in the “D” ring provided.
- Replace the desired pick holders with new hardware. Torque to specification. See Bolt Torque Specification

NOTE: You must have all 2.5” (64 mm) cut holders or all 4.00” (102 mm) cut holders to maintain the balance on the cutting wheel. Different size holders will cause the rock saw to vibrate and bounce and greatly reduce the performance. The pick holders must all be mounted on the same side of the cutting wheel as the planetary with the mounting bolts going into the countersunk hole on the wheel and the lock nuts on the outside of the holder.



HYDRAULIC MOTOR REPLACEMENT OR REPAIR

IMPORTANT: Replacing INTERNAL motor seals or disassembly of the motor will void warranty.

NOTICE: *Damage to the motor shaft seal may be caused by excessive case drain pressure due to unconnected or malfunctioning drain line.*

- Tag and disconnect the power and return hoses along with the case drain hose from the hydraulic motor. Cap or plug hose ends and motor ports to prevent contaminants from entering the hydraulic system.
- Remove the capscrews securing the motor to the planetary.

MAINTENANCE AND SERVICE

3. Clean all mating surfaces of the planetary to prepare it for the new motor.

NOTE: If not bolting new motor on immediately, cover planetary to prevent contaminants from entering the hydraulic system.

NOTE: If replacing shaft seals: Replace seals and gasket and continue with Step #4 to reinstall existing motor.

4. Replace the motor gasket #102594 between the motor and the planetary.
5. Bolt the new or repaired motor onto the planetary using the existing hardware. (Check to make sure the motor is in the correct position with the ports turned up.) Torque to specification. See Bolt Torque Specification
6. Reconnect the hydraulic hoses and fittings to the motor.
9. Refill planetary with Gear Oil (Castrol SP 320) through the fill plug located on the top of the planetary.
10. Check for leaks and tighten as required.

PLANETARY REPLACEMENT OR REPAIR

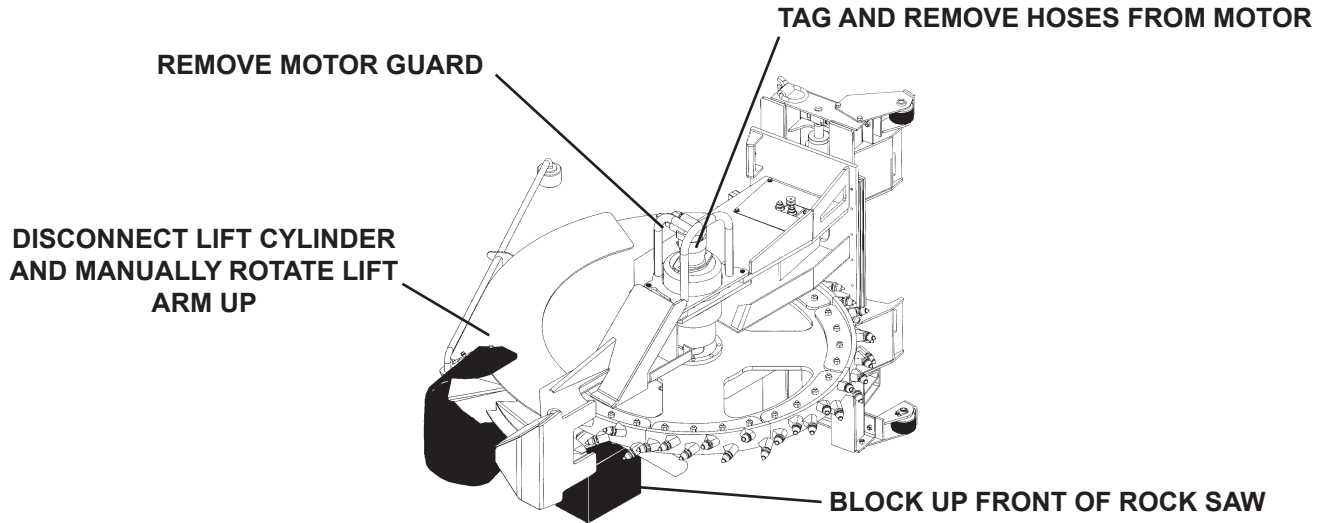
A hoist with at least a 3000 lb. (1361 kg) capacity is required when removing the planetary or shaft seal.

NOTE: Leaking planetary shaft seal can be caused by a damaged motor seal leaking oil into the planetary. Check motor seal first if planetary is leaking. If motor seal is damaged go to “HYDRAULIC MOTOR REPLACEMENT OR REPAIR” and change motor seal.

IMPORTANT: Replacing internal motor seals or disassembly of the planetary will void warranty.

1. Disconnect the rock saw from the skid steer loader by following the “Disconnect Instructions” in the Installation section of this manual.
2. Attach the hoist to both lift hook locations on the left side of the rock saw (mainframe and side shift frame).
3. Slowly and very carefully lift the rock saw and remove the rod end lift cylinder pin and locking pin. Lay the rock saw on its side with the planetary up and manually position the lift arm and skid shoe in the up position. (Blocking up the front of the attachment to keep it fairly level is recommended but not required.)
4. Tag and disconnect the power and return hoses along with the case drain hose from the hydraulic motor. Cap or plug hose ends and motor ports to prevent contaminants from entering the hydraulic system.
5. Remove the motor guard.

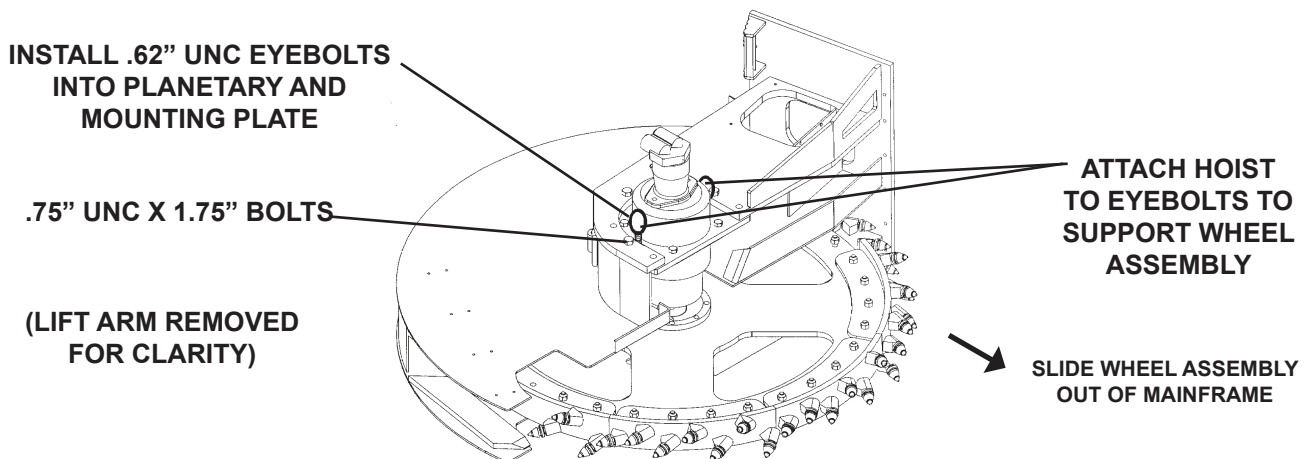
MAINTENANCE AND SERVICE



NOTE: The planetary and wheel assembly will need to be supported for removal. It is recommended that you have two .62" UNC eyebolts for this purpose.

6. Remove two of the .62" X 2.50" bolts securing the planetary to the planetary mounting plate and install two .62" UNC eyebolts. Attach hoist to eyebolts to support wheel assembly for removal.

CAUTION! Be sure the wheel and planetary assembly is securely supported before removal of the bolts in step #7. Failure to properly support the assembly will allow the wheel to drop and may cause machine damage or injury.



7. Remove the four .75" UNC X 1.75" bolts securing the planetary mounting plate to the mainframe. (This will free the wheel assembly from the mainframe. Be sure the assembly is sufficiently supported.)
8. Using the hoist to support the wheel and planetary assembly, slide it out of the mainframe.

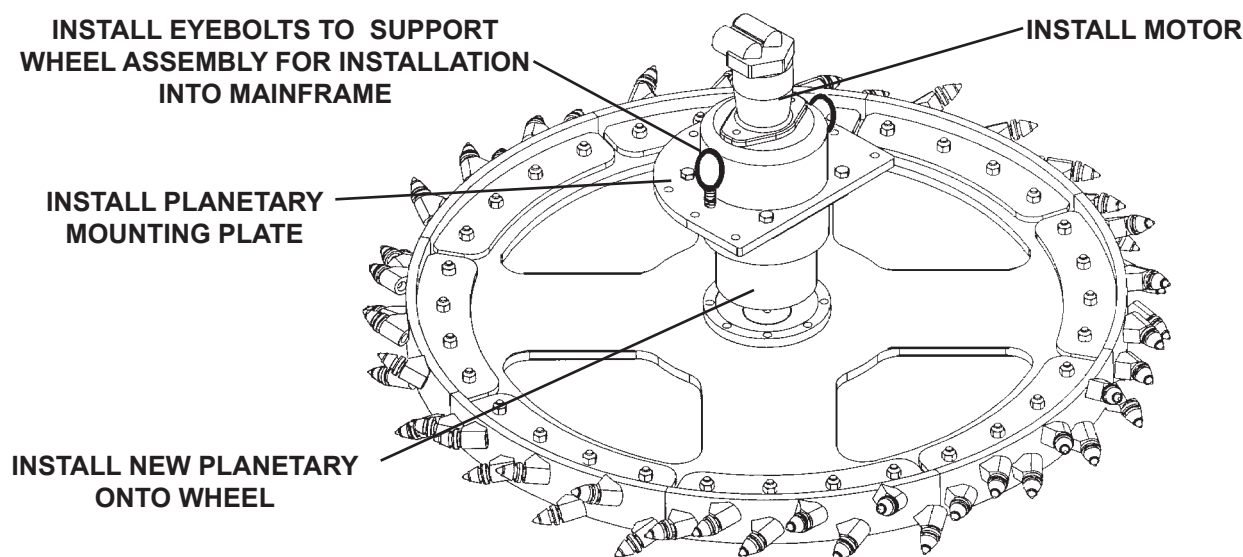
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MAINTENANCE AND SERVICE

9. Support the cutting wheel securely off the ground and remove the eight .62" lock nuts securing the planetary to the cutting wheel.

NOTE: Make sure the cutting wheel is properly supported. When the lock nuts are removed the cutting wheel is no longer supported with the eyebolts.

10. Install the new planetary to the cutting wheel using the existing hardware.
11. Remove the eyebolts and the remaining .62" bolts securing the planetary to the mounting plate. Remove the mounting plate.



12. Install the mounting plate onto the new planetary using the existing hardware and the two eyebolts for installing into the mainframe.
13. Remove the capscrews securing the motor to the old planetary.
14. Clean the mating surface of the motor to prepare it for the installation onto the new planetary.

NOTE: If replacing shaft seals: Replace seals and continue with Step #12 to reinstall existing components. NOTE: Leaking planetary shaft seal can be caused by a damaged motor seal leaking oil into the planetary. Check motor seal first if planetary is leaking.

15. Install a new motor gasket #102594 between the motor and the new planetary. Bolt the motor onto the new planetary using the existing hardware. (Check to make sure the motor is in the correct position with the ports turned up.) Torque to specification.

MAINTENANCE AND SERVICE

NOTE: It is recommended that all picks be inspected and replaced if necessary and that the pick holder hardware be checked and tightened while the wheel is removed.

16. Connect the hoist to the eyebolts and reinstall the wheel and planetary assembly into the mainframe. Secure to the mainframe by installing the existing .75" hardware. Be sure to use the three 2.00" (51 mm) long bolts for reinstalling the motor guard.
17. Remove the eyebolts and install the last two .62" bolts.
18. Reconnect the hydraulic hoses and fittings to the motor.
19. Clear the area of any bystanders and slowly lift the rock saw (using the hoist) to an upright position. Position the lift cylinder and install the rod end cylinder pin and locking pin in the "Park" position.
20. Remove lift hooks and attach rock saw to your skid steer by following the "Installation Instructions" in the installation section of this manual.
21. Check for leaks and tighten as required.

CHANGING PLANETARY OIL

NOTICE: Disassembly of the planetary will void warranty.

The planetary is a sealed unit. If there is any sign of oil leaks please contact your nearest Paladin dealer before carrying out any repairs. There can be other causes for seal leaks. The planetary uses the Gear Oil (Castrol SP 320 for lubrication of gears and bearings. The unit holds approximately 2 quarts (1.9 liters) of gear oil. There is a drain plug located on the underneath side of the planetary and a fill plug located on the top. **NOTE: When filling be sure all air is out of the planetary.**

The planetary oil should be drained and replaced after the first 8 months of use and every 12 months or 2500 hours thereafter, which ever comes first.

MAINTENANCE AND SERVICE

CYLINDER SEAL REPLACEMENT

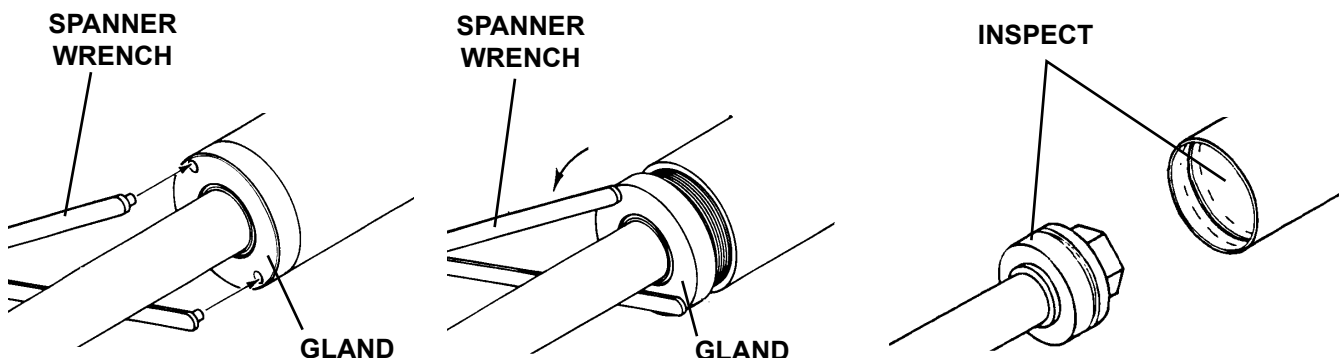
The following information is provided to assist you in the event you should need to repair or rebuild a hydraulic cylinder. When working on hydraulic cylinders, make sure that the work area and tools are clean and free of dirt to prevent contamination of the hydraulic system and damage to the hydraulic 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

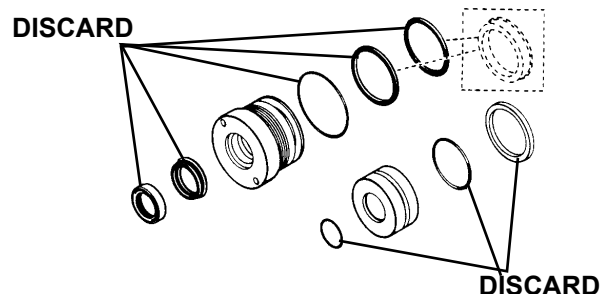
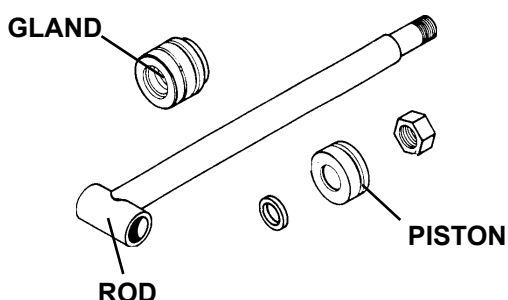
IMPORTANT: Do not contact the active surface of the cylinder rod with the vise. Damage to the rod could result.

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.



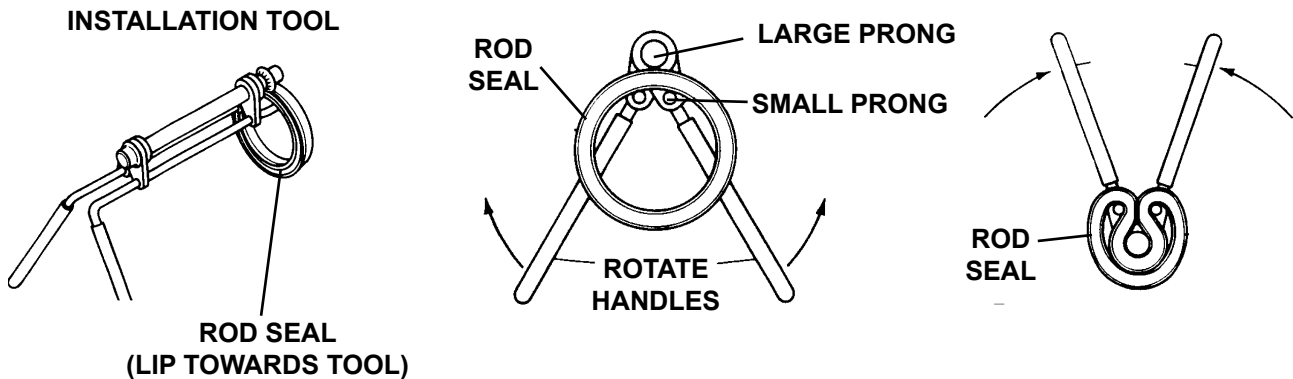
MAINTENANCE AND SERVICE

ASSEMBLY PROCEDURE

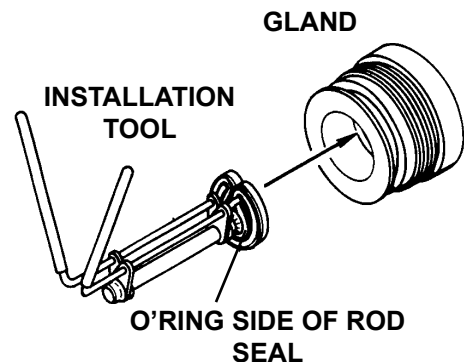
IMPORTANT: Replace all seals even if they do not appear to be damaged. Failure to replace all seals may result in premature cylinder failure. **NOTE:** Seal kits will service most cylinders of similar bore size and rod diameter.

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.

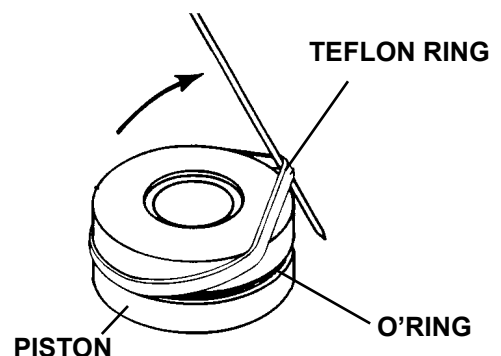


Now insert the seal into the gland from the inner end. Position the seal in its groove, and release and remove the tool. Press the seal into its seat the rest of the way by hand.



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.

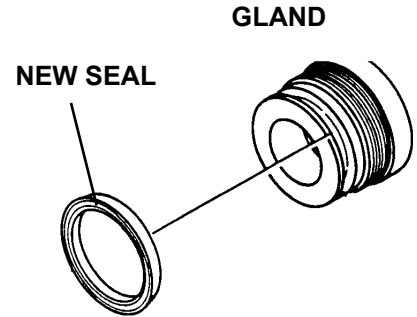


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MAINTENANCE AND SERVICE

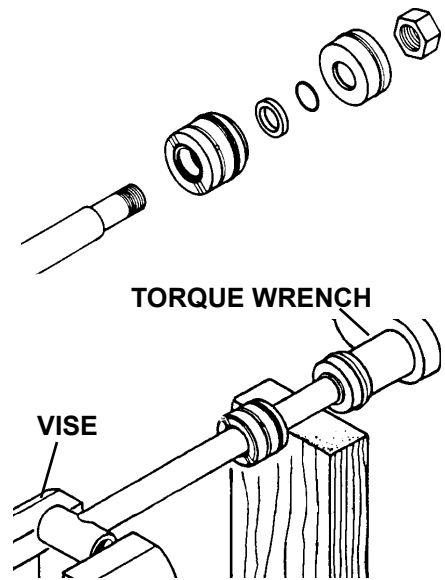
- After installing the rod seal inside the gland, as shown in step #1, install the external seal.

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.



- 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.
- 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	NEWTON-METERS
7/8"	150-200	203.4-271.2
*1"	230-325	311.8-440.6
1-1/8"	350-480	474.5-650.8
1-1/4"	490-670	664.4-908.4
1-3/8"	670-900	908.4-1 220.2
* 1" Thread Diameter WITH 1-1/4" Rod Diameter		
Min. 230 ft. lbs. (311.8 N·m) Max. 250 ft. lbs. (339.0 N·m)		



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

- 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.

- 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.



TROUBLESHOOTING

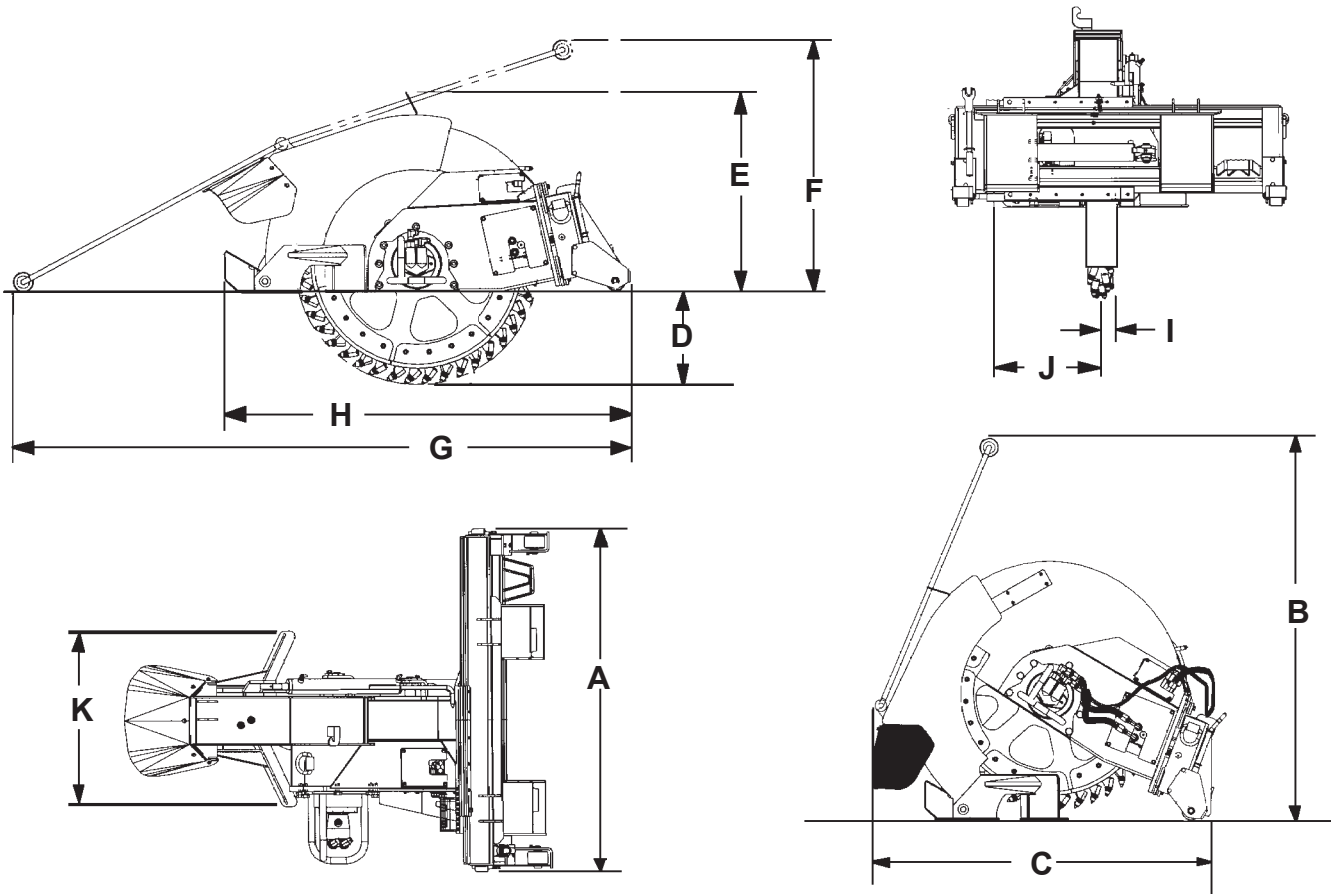
<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>POSSIBLE SOLUTION</u>
Motor will not operate.	Auxiliary hoses not hooked up to the skid steer.	Engage Couplers
	Obstruction in hydraulic lines.	Remove obstruction and replace if necessary.
	Hydraulic motor damaged or seals blown.	Call Paladin service department for instructions.
	Skid steer auxiliary valve not engaged.	Engage auxiliary valve.
	Rocks and debris caught between wheel and mainframe.	Remove debris.
Wheel rotates sluggishly.	Insufficient hydraulic flow from the skid steer.	Refer to skid steer's owners manual.
	Damaged quick coupler.	Replace if necessary.
	Hydraulic motor damaged or seals blown.	Call Paladin service department for instructions.
	Oil filter on skid steer is dirty.	Refer to skid steer's owners manual.
Leaking Oil.	Loose or damaged hydraulic line.	Tighten or replace.
	O-Rings on fittings damaged.	Replace if necessary.
	Hydraulic motor damaged or seals blown.	Call Paladin service department for instructions.
	Fittings loose or damaged.	Tighten or replace.
	Cylinder seals damaged.	Replace cylinder seals.
Insufficient power.	Insufficient hydraulic flow from the skid steer.	Refer to skid steer's owners manual.
	Relief valve setting adjusted too low.	Refer to skid steer's owners manual.
	Hydraulic motor damaged or seals blown.	Call Paladin service department for instructions.
	Oil filter on skid steer is dirty.	Refer to skid steer's owners manual.
Excessive vibration during operation.	Picks are worn or broken.	Visually inspect picks and replace as necessary.
	Picks contain flat spots or are not rotating freely.	Visually inspect picks and replace as necessary.
	Two different size cutting pick holders.	Verify wheel contains all 2.5" (64 mm) or all 4.00" (102 mm) cutting width holders.
	Insufficient down force due to incorrect operating procedure.	Refer to the Operating section of this manual.

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TROUBLESHOOTING

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>POSSIBLE SOLUTION</u>
Wheel rotates in the wrong direction.	Hoses from the valve to the motor incorrectly connected.	Switch hoses at the motor end.
Excessive oil temperature.	Hydraulic oil level too low.	Refer to skid steer's owners manual
	Obstruction in hydraulic lines.	Remove obstruction and replace if necessary.
	Hydraulic oil or oil filter in skid steer is dirty.	Refer to skid steer's owners manual.
	Relief valve setting adjusted too low.	Refer to skid steer's owners manual.
	Couplers not engaged.	Engage couplers.
A Hydraulic cylinder not operating.	Insufficient hydraulic flow from the skid-steer.	Refer to skid steer's owners manual.
	Cylinder rod bent.	Visually inspect the cylinder for damage.
	Cylinder seals damaged.	Replace cylinder seals.
	Obstruction in hydraulic lines.	Remove obstruction and replace if necessary.
All hydraulic cylinders not functioning.	Blown fuse on skid steer.	Refer to skid steer's owners manual.
	Damaged electrical wiring.	Test and replace if necessary.
	Solenoid valve spool bent.	Replace spool.
	Faulty switch or electrical connection.	Repair or replace as necessary.
	Faulty control valve coil.	Replace coil.
Hydraulic cylinders only operating in one direction.	Contaminants in the hydraulic system and solenoid valve.	Remove spool from solenoid valve and check for foreign material. Clean or replace.
		Remove spool from solenoid valve and check seals for damage. Replace if necessary.
	Damaged electrical wiring.	Test and replace if necessary.
	Solenoid valve spool bent.	Replace spool.
	Nut on Solenoid valve too tight	Loosen nut.

SPECIFICATIONS



DESCRIPTION	RS18	RS24
A. Overall Width	67.00" (1702 mm)	67.00" (1702 mm)
B. Overall Transport Height.....	79.00" (2007 mm)	81.00" (2057 mm)
C. Overall Transport Length	76.00" (1930 mm)	86.00" (2184 mm)
D. Maximum Cutting Depth	18.00" (457 mm)	24.00" (610 mm)
E. Operating Height (guide arm down)	39.50" (1003 mm)	44.00" (1118 mm)
F. Operating Height (guide arm up)	49.75" (1264 mm)	58.00" (1473 mm)
G. Operating Length (guide arm down).....	119.00" (3023 mm)	132.00" (3353 mm)
H. Operating Length (guide arm up)	77.00" (1956 mm)	89.00" (2261 mm)
I. Side Shift (center to left)	2.72" (69 mm)	2.72" (69 mm)
J. Side Shift (center to right).....	24.00" (610 mm)	24.00" (610 mm)
K. Spoil Removal Path	34.00" (864 mm)	34.00" (864 mm)
Wheel Diameter	48.00" (1219 mm)	60.00" (1524 mm)
Number of Picks	42	56
Hydraulic Flow Requirement (GPM).....	22-44 gpm (83-167 lpm)	30-44 gpm (114-167 lpm)
Operating Pressure (PSI)	2500-3000 psi (172-207 bar)	2500-3000 psi (172-207 bar)
Weight (without picks)	1775 lbs. (805 kg)	2095 lbs. (950 kg)
Operating Weight (with 2.5" (64mm) cutting width)	1995 lbs. (905 kg)	2385 lbs. (1082 kg)
Operating Weight (with 4.0" (102mm) cutting width)	2020 lbs. (916 kg)	2420 lbs. (1098 kg)

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




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




GRADE 2



GRADE 5






GRADE 8



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