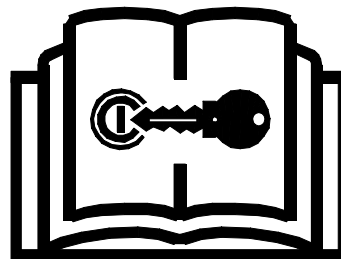


HAMMERHEAD[™]

***7" (180 mm)
and 8" (200 mm)
HAMMERHEAD MOLE®
Pneumatic Boring Tool***

Operator's and Maintenance Manual



mole_7_8_o-m10_04
Serial No. 65511 - Present
Order No. OM1151

Introduction

This manual explains the proper operation of your machine. Study and understand these instructions thoroughly before operating or maintaining the machine. Failure to do so could result in personal injury or equipment damage. Consult your HammerHead dealer if you do not understand the instructions in this manual, or need additional information.

The instructions, illustrations, and specifications in this manual are based on the latest information available at time of publication. Your machine may have product improvements and features not yet contained in this manual.

Earth Tool Company LLC reserves the right to make changes at any time without notice or obligation.

Operation, lubrication, and maintenance instructions are included in the Operator's Manual provided with the machine.

Additional copies of the manuals are available from your dealer. Use the reorder number on the front cover to order additional manuals.

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Earth Tool Company LLC
P.O. Box3
Oconomowoc, Wisconsin 53066

PATENTS

This machine may be covered by one or more of the following patents:

US 5,025,868	US 5,199,151	US 5,487,430	US 5,317,953	US 5,465,797
US 5,440,797	US 5,494,116	US 5,505,270	US 5,603,383	US 5,651,639
US 5,687,803	US 5,782,311	US 6,148,935	US 6,171,026	US 6,260,634
US 6,261,027	US 6,263,983	US 6,269,889	US 6,273,201	US 6,283,229
US 6,302,410	US 6,299,382	US 5,337,837	US 6,321,858	US 6,390,207
US 6,371,223	US 6,390,087			

(Other U.S. and foreign patents pending.)

HAMMERHEAD EQUIPMENT LIMITED WARRANTY

EARTH TOOL COMPANY LLC, hereinafter sometimes referred to as ETC warrants each new industrial product of its own manufacture to be free from defects in material and workmanship, under normal use and service for one full year after delivery to the owner or 1000 operating hours, whichever occurs first. During the warranty period, the authorized selling HammerHead Dealer shall furnish parts without charge for any HammerHead product that fails because of defects in material and workmanship. Warranty is void unless warranty registration card is returned within ten days from the date of purchase. This warranty and any possible liability of Earth Tool Company LLC hereunder is in lieu of all other warranties, express, implied, or statutory, including, but not limited to any warranties of merchantability or fitness for a particular purpose.

The parties agree that the Buyer's SOLE AND EXCLUSIVE REMEDY against ETC, whether in contract or arising out of warranties, representations, or defects shall be for the replacement or repair of defective parts as provided herein. In no event shall ETC's liability exceed the purchase price of the product. The Buyer agrees that no other remedy (including, but not limited to, incidental or consequential loss) shall be available to him. If, during the warranty period, any product becomes defective by reason of material or workmanship and Buyer immediately notifies ETC of such defect, ETC shall, at its option, supply a replacement part or request the return of the product to its plant in Oconomowoc, Wisconsin. No part shall be returned without prior written authorization from ETC, and this warranty does not obligate ETC to bear any transportation charges in connection with the repair or replacement of defective parts. Earth Tool Company LLC will not accept any charges for labor and/or parts incidental to the removal or remounting of parts repaired or replaced under this Warranty.

This Warranty shall not apply to any part or product which shall have been installed or operated in a manner not recommended by ETC nor to any part or product which shall have been neglected, or used in any way which, in ETC's opinion, adversely affects its performance; nor negligence of proper maintenance or other negligence, fire or other accident; nor with respect to wear items; nor if the unit has been repaired or altered outside of an ETC authorized dealership in a manner of which, in the sole judgment of ETC affects its performance, stability or reliability; nor with respect to batteries which are covered under a separate adjustment warranty; nor to any product in which parts not manufactured or approved by ETC have been used, nor to normal maintenance services or replacement of normal service items. Equipment and accessories not of our manufacture are warranted only to the extent of the original Manufacturer's Warranty and subject to their allowance to us, if found defective by them.

ETC reserves the right to modify, alter, and improve any products or parts without incurring any obligation to replace any product or parts previously sold with such modified, altered, or improved product or part.

No person is authorized to give any other Warranty, or to assume any additional obligation on ETC's behalf unless made in writing, and signed by an officer of ETC.

**EARTH TOOL COMPANY LLC
Oconomowoc, Wisconsin**

7" (180 mm) and 8" (200 mm) Hammerhead Mole

HAMMERHEAD MOLE® is a trademarks of	Earth Tool Company, LLC, Oconomowoc, Wisconsin.
SCOTCH-BRITE is a trademark of	3M Corporation, aka Minnesota Mining and Manufacturing Co.

7" (180 mm) and 8" (200 mm) Hammerhead Mole

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Receiving and Delivery Report

DEALER PREP

Check or perform the following:

- ___ Check tailcone. Torque to 35 ft-lb (47 Nm) for screw reverse model or 120 ft-lb (163 Nm) for air reverse model.
- ___ Check for foreign material around the hose connection at the tool and exhaust ports.
- ___ Check for foreign material in the hose and around the hose coupler.
- ___ Check forward and reverse valve for proper function (screw reverse only).
- ___ Check the condition of the decals.
- ___ Check that two lifting slings are supplied with tool.
- ___ Check that shipping rod is tight (it must be removed prior to operation).
- ___ Check internal striker by rocking tool back and forth. The striker should slide freely.

Review of Operation

Review and demonstrate with the customer the various aspects of tool operation:

- ___ Overall explanation of how the Hammerhead Mole pneumatic boring tool works
- ___ Hammerhead Mole safety measures
- ___ Preparing the Hammerhead Mole boring tool for operation

DEALER/CUSTOMER INFORMATION

dealer

address

city

state / province

zip / postal code

country

owner

address

city

state / province

zip / postal code

country

IDENTIFICATION NUMBERS - RECORD

Machine Model Number _____

Machine Serial Number _____



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Section 10: Safety Messages

UNDERSTAND SAFETY ALERT SYMBOL

This is the safety alert symbol. This symbol placed on your tool or in the manual is used to alert you to the potential for bodily injury or death.



UNDERSTAND SIGNAL WORDS

A signal word “**DANGER**”, “**WARNING**”, or “**CAUTION**” is used with the safety alert symbol.

Safety signs with signal word **DANGER**, **WARNING**, or **CAUTION** are located near specific hazards.

DANGER - Imminent hazards which, if not avoided, will result in serious personal injury or death.

WARNING - Potential hazards or unsafe practices which, if not avoided, could result in serious personal injury or death.

CAUTION - Potential hazards or unsafe practices which, if not avoided, could result in minor personal injury or product or property damage.



READ MANUALS

Do not operate the tool unless the instructions in the following manuals have been carefully read and understood:

- This Hammerhead Mole Operator's Manual
- Air Compressor Manual
- Support Machinery Manuals



CALL YOUR ONE-CALL SYSTEM FIRST



WARNING: Always contact your local One-Call system before the start of your digging project.



ONE-CALL



Locate Utilities
CALL 1-888-258-0808

Before you start any digging project, don't forget to call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority concerned to locate and mark the underground installations. If you don't call, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or experience job delays.

The One-Call representative will notify participating utility companies of your proposed digging activities. If you are in the U.S. or Canada and do not know the number for the local One-Call representative in your area, dial the North American One-Call number, 1-888-258-0808, for this information. Utilities will then mark their underground facilities by using the following international marking codes:

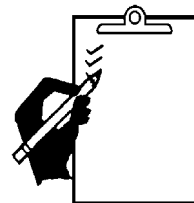
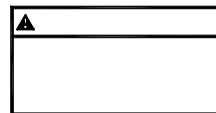
Red	Electric	Green/Brown	Sewer
Yellow	Gas, Oil or Petroleum	White	Proposed Excavation
Orange	Communication, Telephone, TV	Pink	Surveying
Blue	Potable Water		

FOLLOW INSTRUCTIONS

Carefully read and understand all safety messages in this manual and on your tool safety decals.

Safety decals located on your tool contain important information that will help you operate your equipment safely. Keep safety decals in good condition. Replace missing or damaged safety decals.

Allow only responsible, properly instructed individuals to operate the tool. Carefully supervise inexperienced operators.



KEEP MACHINE IN GOOD CONDITION

Be sure the machine is in good operating condition and that all safety devices are installed and functioning properly.

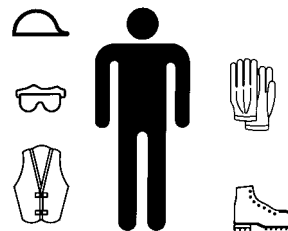
Visually inspect the tool daily before starting the tool. Refer to the daily pre-starting inspection section.

Make no modifications to your equipment unless specifically recommended or requested by Earth Tool Company LLC.

PERSONAL PROTECTION

Wear required personal protective equipment including:

- hard hat
- safety shoes
- safety glasses
- hearing protection
- high visibility clothing when working near traffic



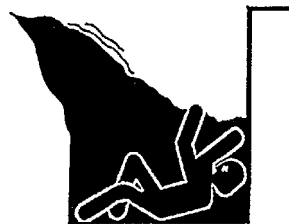
Wear close-fitting clothing and confine long hair.

Avoid wearing jewelry, such as rings, wristwatches, necklaces, or bracelets.

Hearing protection may be removed once the Hammerhead Mole has entered the ground. Hearing protection should be removed when working near moving traffic.

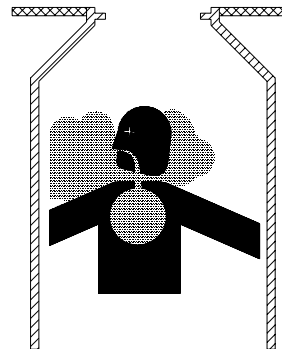
DO NOT WORK IN TRENCH

Do not work in trench with unstable sides which could cave in. Specific requirements for shoring or sloping trench walls are available from several sources including federal and state O.S.H.A. offices. Be sure to contact suitable authorities for these requirements before working in the trench. Federal O.S.H.A. regulations can be obtained by contacting the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402. State O.S.H.A. regulations are available at your local state O.S.H.A. office.



CONFINED SPACE REGULATION

Do not work in a confined space, such as a sewer, until requirements are met to ensure a hazard-free environment. Specific requirements for confined space entry are available from federal and state OSHA offices.

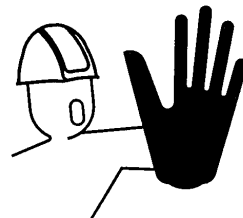


KEEP SPECTATORS AWAY FROM BORING TOOL

Keep all spectators and other workers away from the tool and work area while in operation.

CLEAR WORK AREA

Clear the work area of all objects that might interfere with the proper operation of the tool or hoses. Avoid placing tools or other objects where they can fall into the boring pit.



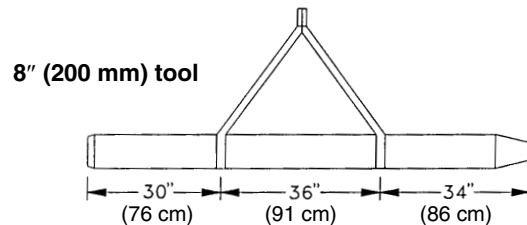
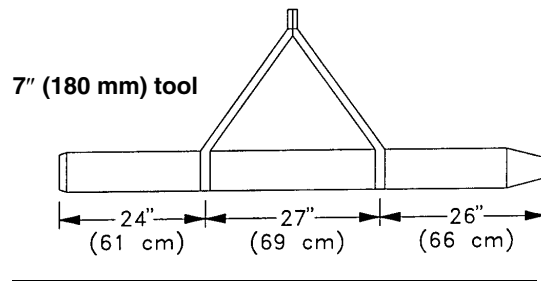
HANDLING THE BORING TOOL

To avoid back injury, use proper lifting technique. Lift with your legs - not your back!

LIFTING THE TOOL

The 7" (180 mm) tool weighs approximately 500 lb (227 kg). The 8" (200 mm) tool weighs approximately 900 lb (408 kg). Attempting to lift the tool by hand can result in back strain and injury.

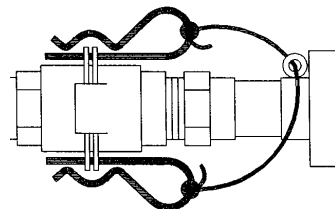
- Attach the lifting slings to the tool using a choker hitch to prevent the tool from sliding out of the slings.
- Securely attach the lifting slings to lift hook.
- Use lifting equipment designed and equipped specifically to lift objects with slings.
- Do not stand under raised tool or lifting equipment.
- Do not launch tool from lifting straps.



CHECK HARDWARE

Ensure all air line couplings are tightened and secured to eliminate the chance of accidental uncoupling. Use hose connection retaining devices such as locking rings, clips, pins, chains, or cables.

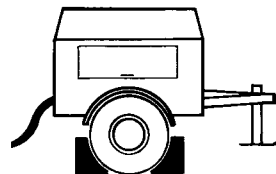
Check the tightness of the 8 tailcone bolts before use. Tailcone bolts should be torqued to 35 ft-lb (47 Nm) in a cross pattern. Air Reverse tailbolt torque is 120 ft lb (162nM).



CHECK AIR COMPRESSOR

Be sure the air compressor is securely parked at a safe distance from the excavation pit to prevent pit cave-in. Chock the wheels to prevent the compressor from rolling or falling into the pit.

Maximum air pressure that can be delivered to the tool is 110 psi (760 kPa). Do not exceed this pressure or damage to the tool or personal injury may result.



PRECAUTIONS DURING OPERATION

Two people are required to operate the boring tool. One person should always be outside the excavation pit and in control of the air supply to the tool in case of an emergency. The boring tool operator must monitor the tool to be sure that the air hose does not cause an unsafe condition around the pit.

Eye protection is necessary when using the boring tool. Avoid looking into the bore hole while the boring tool is in use. High pressure exhaust can eject dirt, stones, or other materials. Be careful when blowing out the hose. Aim the hose away from yourself and other persons.



If the tool runs but does not move forward, turn off the air supply. Check to ensure tool is not in contact with a gas line, water line, electrical line, or some other underground obstruction that can be damaged or cause personal injury.

Do not override any safety controls on the tool or any support machinery.

Shut down the unit at the first sign of malfunction or hazardous condition.

Do not disconnect the air supply without first shutting off the air valve. Serious injury may result from the air under high pressure or from uncontrolled hose movement.



DURING SERVICE

Read and follow the service instructions in this manual before servicing the tool.

Shut off the air supply valve and disconnect the air line before servicing the tool.

Use only authorized parts for repair or replacement. These replacement parts, including bolts, are specified in this manual.

Check the air supply hose periodically for damage to the hose or fittings. Never use the boring tool with damaged or worn air lines or fittings. This will minimize chances of air line breakage while in use.

Check and tighten loose hose clamps and clamp bolts regularly.

Do not use a torch or welder on the boring tool. Applying heat may damage critical parts of the tool. Heating parts of the tool may alter the component's strength and result in premature failure or personal injury.

When the tailcone and rear anvil are removed, be careful when elevating the front of the tool. The heavy striker inside the tool body may slide out.



WARNING: Failure to follow any of the preceding safety instructions or those that follow within this manual, could result in serious injury or death. This machine is to be used only for those purposes for which it was intended as explained in this Operator's Manual.

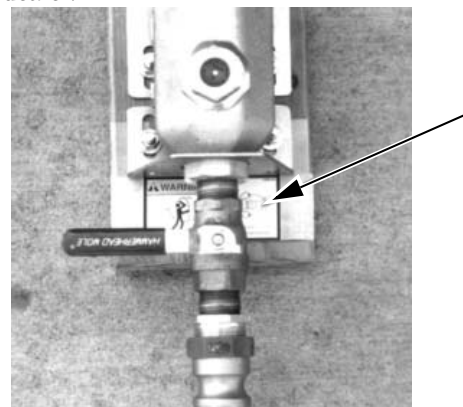
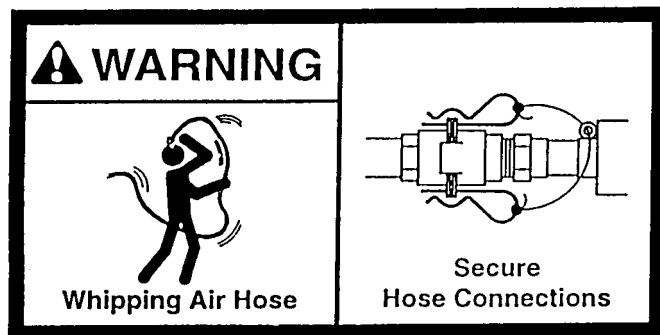
Section 11: Safety Decals

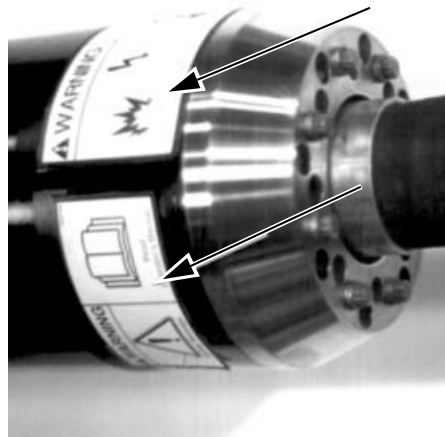
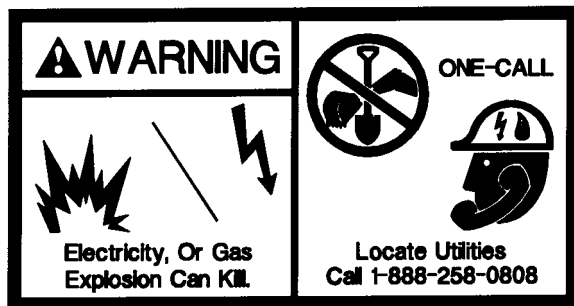
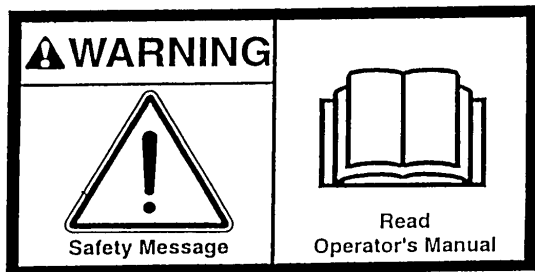
SAFETY DECAL MAINTENANCE


Safety decals located on your machine contain important and useful information that will help you operate your equipment safely.

To assure that all decals remain in place and in good condition, follow the instructions given below:

- Keep decals clean. Use soap and water - not mineral spirits, abrasive cleaners, or other similar cleaners that will damage the decal.
- Replace any damaged or missing decals except the decal located on the tool body. When attaching decals, the temperature of the mounting surface must be at least 40° F (5° C). The surface must also be clean and dry.
- When replacing a tool component with a decal attached, replace the decal also.
- Replacement decals can be purchased from your HammerHead equipment dealer.








HIGH PRESSURE AIR IN HOSE

- Serious injury could occur if struck by hose if uncoupled under pressure.
- Vent air pressure before disconnecting hose.

WARNING





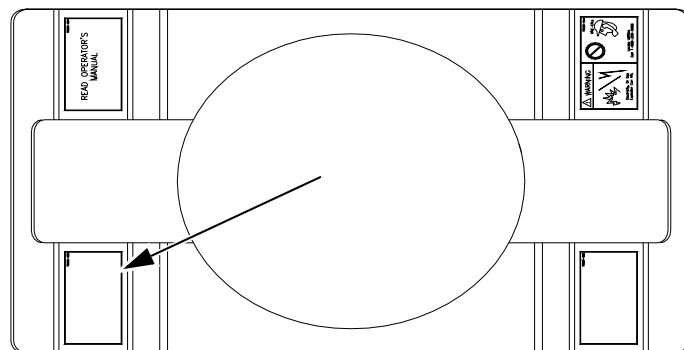
WARNING

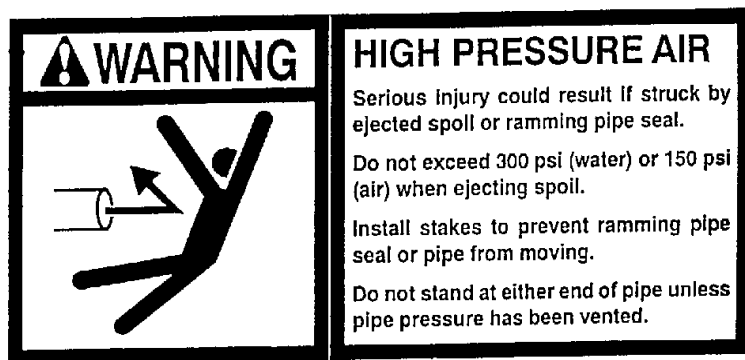
HAMMERHEADMOLE LAYFLAT HOSE IS ONLY INTENDED FOR USE;

1. BETWEEN MOLE AND OILER
2. IN PIPEBURSTING APPLICATIONS

AVOID PUNCTURE OF EXPOSED HOSE BY SHARP OBJECTS OR ABRASION

ET1518





Section 20: Controls and Adjustments

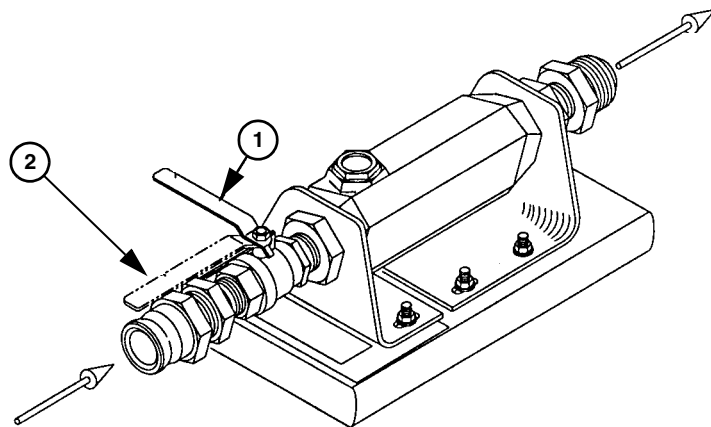
AIR VALVE -SCREW REVERSE MODEL

Handle position (1) (perpendicular to valve body) off

Handle position (2) (parallel to valve body) on

Tool speed is variable; the farther the handle is turned toward (2), the faster the speed.

NOTE: Arrows show direction of air flow.



TOOL OILER

During operation, the oiler lubricates the air-powered tool.

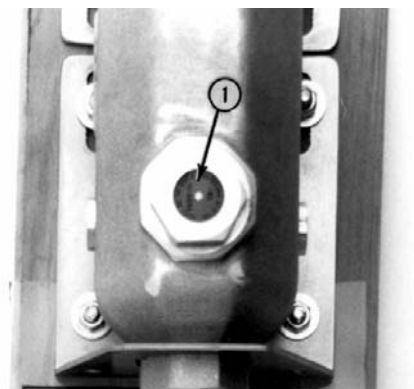
IMPORTANT: For the initial operation of a tool, add 8 - 10 oz. (240 - 270 cc) of oil to the tool whip hose. Always use recommended HammerHead Mole Oil. Failure to do so may cause internal damage to the tool and void warranty.

Pressure Relief

Push button (1) to relieve pressure.

Relieve pressure from oiler:

- at the end of each use - high pressure air, trapped inside the oiler, will force the remaining oil into the air line.
- before adding oil to the reservoir
- before disconnecting hoses



Check and Add Oil

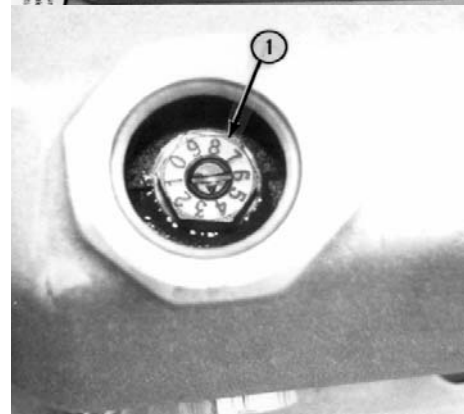
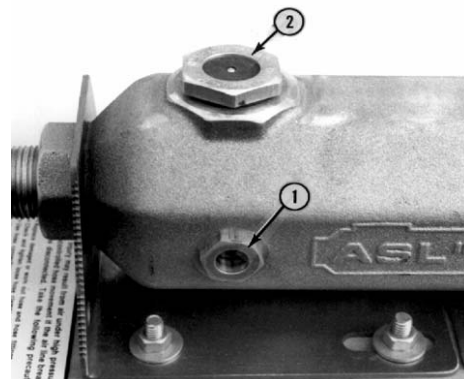
Always ensure oil is visible on sight gauge (1).

To add oil:

Step 1: Turn off air supply.

Step 2: Relieve air pressure.

Step 3: Remove fill plug (2) and check/add oil (refer to *Specifications, page 50-1.*)



Oiler - Adjust

Adjustments are made due to changes in air pressure and oil viscosity.

If the external whip hoses are wet with oil, then the tool is receiving adequate lubrication.

To adjust oiling rate:

Step 1: Turn off air supply.

Step 2: Relieve air pressure (see previous page).

Step 3: Remove fill plug and use a screwdriver to turn screw (1), which controls the amount of oil supplied to the tool.

"0" lowest rate

"4" **lowest recommended rate**

"9" highest rate

To ensure adequate tool lubrication, start on “9” and then lower until consumption is 1-2 oz. (30-60 cc) per hour. At this rate, add oil every 3-4 hours.

NOTE: It may take up to an hour before a setting change is noticed in the tool.

TOOL OILER - BURSTING, SCREW REVERSE

During operation, the oiler lubricates the air-powered tool.

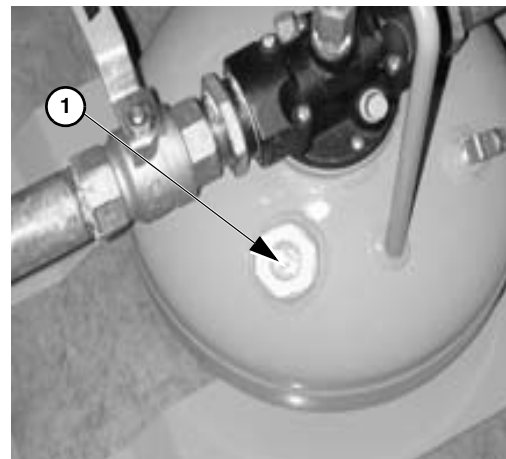
IMPORTANT: For the initial operation of a tool, add 8 - 10 oz. (240 - 270 cc) of oil to the tool whip hose. Always use recommended HammerHead Mole Oil. Failure to do so may cause internal damage to the tool and void warranty.

Pressure Relief

Push button (1) to relieve pressure.

Relieve pressure from oiler:

- at the end of each use - high pressure air, trapped inside the oiler, will force the remaining oil into the air line.
- before adding oil to the reservoir
- before disconnecting hoses



Check and Add Oil - Hoses not connected or Air supply shut off

Always ensure oil is visible in sight tube (2).

To add oil:

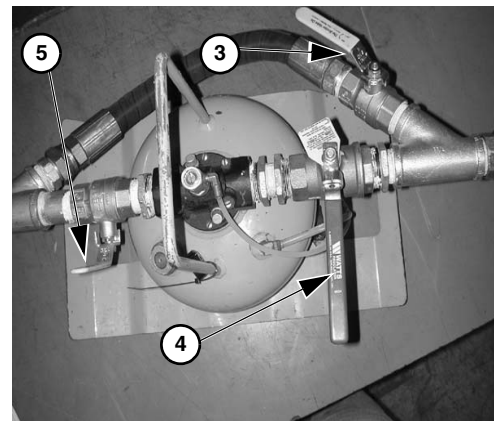
- Step 1: Turn off air supply.
- Step 2: Relieve air pressure.
- Step 3: Remove fill plug and add oil (refer to “Lubricants,” page 50-1)



Adding Oil - Tool in Operation

The burst oiler is equipped with a bypass system that allows for the adding of oil without shutting down the operation of the tool.

- Step 1: Open bypass valve (3).
- Step 2: Close oiler air supply valve (4). Tool will continue to run.
- Step 3: Close valve on tool side of oiler (5).
- Step 4: Relieve air pressure (refer to “Pressure Relief,” page 20-4)
- Step 5: Remove fill plug and add oil.
- Step 6: Replace fill plug.



REAR WHIP HOSE

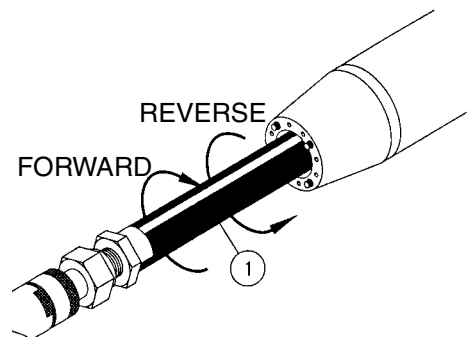
Turning the whip hose (1) controls which direction the tool moves.

Completely clockwise forward travel

Completely counterclockwise reverse travel

It takes approximately 9 complete turns to go from one direction to the other.

IMPORTANT: Use full REVERSE only when piercing. When removing the tool from pushing collets, reverse hose 6 turns only and throttle back air supply.



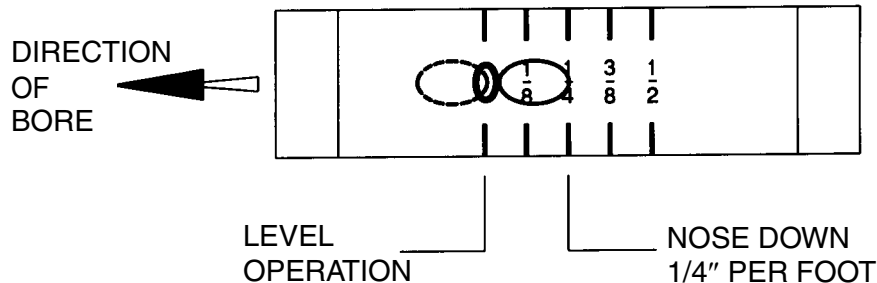
VARI-PITCH LEVEL

Use the level to set the boring angle of the tool.



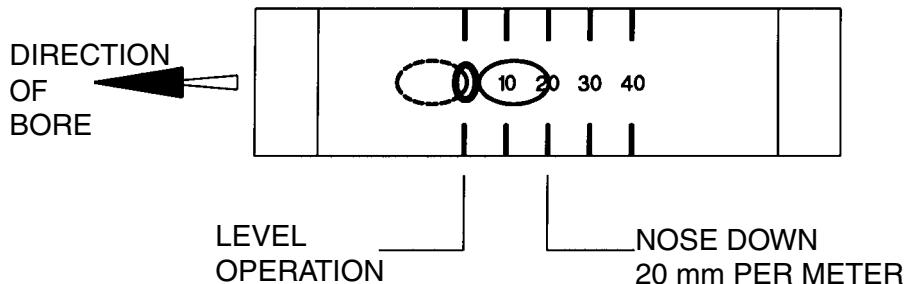
SAE

The right edge of the bubble indicates the slope or pitch in “inches per foot.” The dashed line bubble indicates “level.” The solid bubble indicates a 1/4 in per foot pitch, down.



Metric

The right edge of the bubble indicates the slope or pitch in “millimeters per meter.” The dashed line bubble indicates “level.” The solid bubble indicates a 20 mm per meter pitch, down.



AIR VALVE - AIR REVERSE MODEL

During operation, the oiler supplies lubrication to the air-powered tool.

IMPORTANT: For initial operation of the tool, add oil to the forward whip hose:

- 8" and 7" Tool - 8 to 10 oz. (240 - 300 cc)

Pressure Relief

Push button (1) to relieve pressure

Relieve pressure from oiler:

- at the end of each use - high pressure air, trapped inside the oiler will force the remaining oil into the airline.
- before adding oil to the reservoir.
- before disconnecting hoses.

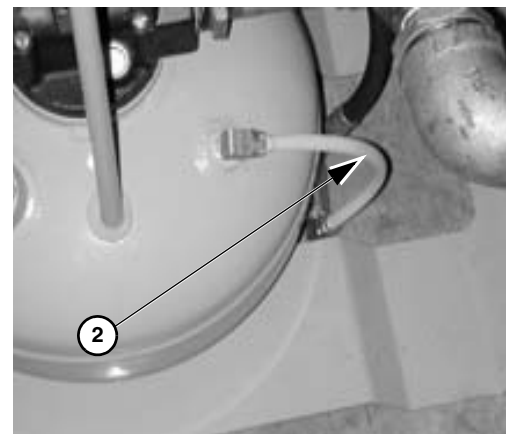
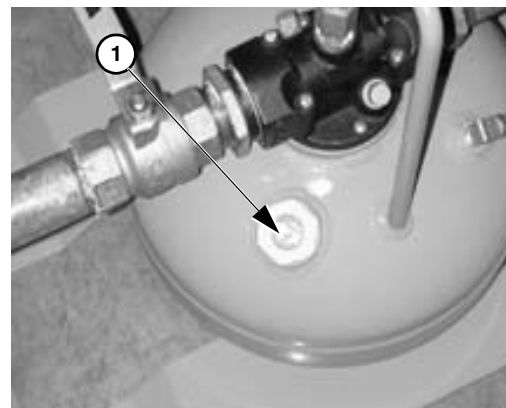
Check and add oil

To add oil:

Step 1: Turn off air supply.

Step 2: Relieve air pressure.

Step 3: Remove fill plug (1) and check/add oil. Always ensure oil is visible on site tube (2).



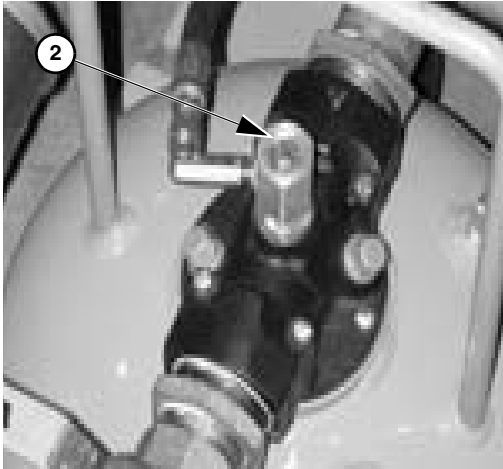
Oiler - Adjust

Adjustments are made due to changes in air pressure and oil viscosity. Oiler is adjusted by turning screw (3) in or out. although the adjustment screw will turn several complete revolutions, full oil flow is achieved at approximately 3/4 turn out from closed.

To ensure adequate tool lubrication, adjust the flow of oil to achieve a delivery rate of 1 gal (4 liter) per hour.

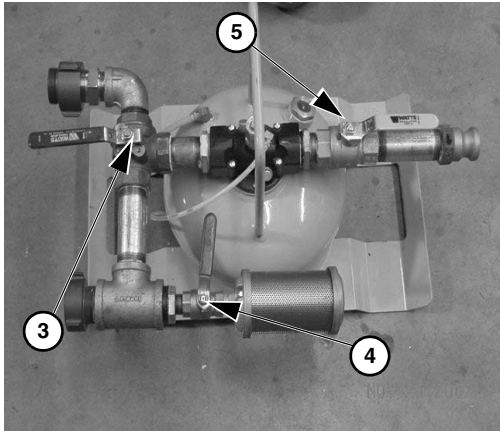
If the external whip hoses are wet with oil, then the tool is receiving adequate lubrication.

NOTE: It may take up to an hour before a setting change is noticed in the tool



OILER CONTROL VALVES - AIR REVERSE

- Forward/Reverse selector (3) controls direction of tool
- Muffler valve (4) tunes tool while running in reverse
- Air supply valve (5) turns on and off air supply to tool



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Section 30: Operating the Tool

CALL YOUR ONE-CALL SYSTEM FIRST



WARNING: Always contact your local One-Call system before the start of your digging project.



ONE-CALL



Locate Utilities
CALL 1-888-258-0808

Before you start any digging project, don't forget to call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority concerned to locate and mark the underground installations. If you don't call, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or experience job delays.

The One-Call representative will notify participating utility companies of your proposed digging activities. If you are in the U.S. or Canada and do not know the number for the local One-Call representative in your area, dial the North American One-Call number, 1-888-258-0808, for this information. Utilities will then mark their underground facilities by using the following international marking codes:

Red	Electric	Green/Brown	Sewer
Yellow	Gas, Oil or Petroleum	White	Proposed Excavation
Orange	Communication, Telephone, TV	Pink	Surveying
Blue	Potable Water		

IMPORTANT: Be sure to review the operating and safety instructions for the air compressor.

LIFTING THE TOOL

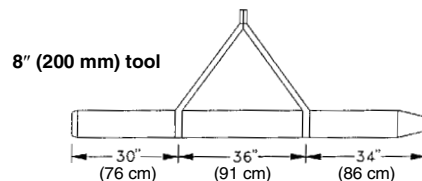
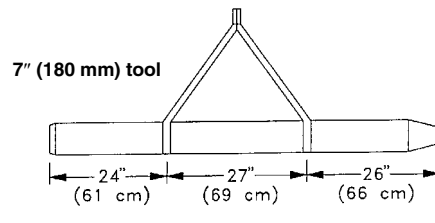


WARNING: The 7" (180 mm) tool weighs approximately 500 lb (227 kg). The 8" (200 mm) tool weighs approximately 900 lb (408 kg). Attempting to lift the tool by hand can result in back strain and injury.



WARNING: Tool or lifting equipment may fall and strike you.

- Attach the lifting slings to the tool using a choker hitch to prevent the tool from sliding out of the slings.
- Securely attach the lifting slings to lift hook.
- Use lifting equipment designed and equipped specifically to lift objects with slings.
- Do not stand under raised tool or lifting equipment.
- Do not launch tool from lifting straps.



ENTRY AND EXIT PITS

The depth of the entry pit should be approximately 10 times the tool diameter.

It should be long enough to keep the service line from kinking during launch.

Dig exit pit at correct location, adding extra width and depth to allow for tool misalignment.

PREPARING TO BORE - SCREW REVERSE

Step 1: Determine the length of the bore.

Step 2: Starting at the tool, wrap tape over the hose every 6 ft (2 m). Do this for the length of the bore.

While boring, keep track of the increments to determine the location of the tool.

Keeping track of the time will also enable you to determine how fast the tool is moving.



WARNING: Keep lifting equipment a safe distance from the entrance pit to prevent it from falling into the pit or causing the pit to cave in.



WARNING: Do not use the lifting slings to launch the tool. The tool could fall on you if:

- Tool breaks loose from the entrance wall after it leaves the lift straps.
- Operating vibrations loosen the chain or cable connection.
- Operating vibrations damage and break the lift straps.

Step 3: Use lifting slings to lower the tool into the entry pit and aim it toward the exit pit. Place the level on the straight surface of the tool. Use a support under the tool to keep the tool aligned.

Consider the type of soil when aligning the mole. Some soils, such as topsoil and sand, will cause a tool to rise. Pitching the nose of the tool slightly downward will provide a more accurate bore. The amount of downward pitch required depends upon the soil type and length of the bore.

IMPORTANT: Do not allow dirt or other material into the air hose.

Step 4: Connect the hose to a compressed air supply.

Step 5: Remove any oil or debris that may make the hose slippery.



WARNING: To prevent the hose from whipping, do not fully open the compressor valve. Be sure to aim the hose away from yourself and other persons.

Step 6: Hold the other end of the hose tightly and partially open the compressor valve to blow the air hose clean.

Step 7: Close the compressor valve.

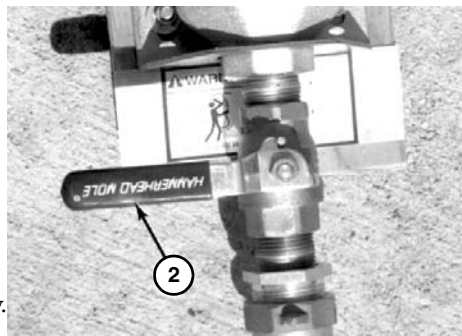
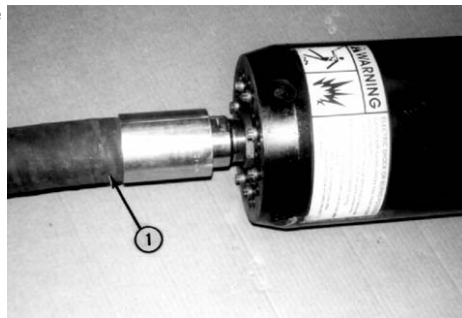
Step 8: Turn whip hose (1) fully clockwise to FORWARD.

Step 9: Ensure air valve control handle (2) is OFF.

Step 10: Fill oiler with Hammerhead Mole oil (refer to the *Controls and Adjustments* section, "Tool Oiler," page 20-2).

Step 11: Connect air supply hose to the oiler and the Mole supply hose to the tool.

Step 12: To avoid accidental uncoupling, tighten all hose locking collars against fittings or install any hose fitting retaining devices such as locking rings, clips, pins, chains, or cables.



BORING

Step 1: Fully open the air supply valve to start the striker moving. Do this quickly, then slow it down. This will make it easier to start the bore.

NOTE: Launching the tool at reduced power provides time for the operator to accurately aim the tool.

Step 2: Stop the tool periodically as it enters the ground. Use bubble level to check angle and aim. Adjust the direction of the tool by pushing or pulling tool body.

Step 3: When tool reaches exit pit, shut it OFF.

If tool does not reach exit pit at length marked off on air hose:

Step 4: Turn air hose counterclockwise until tool is in NEUTRAL - neither moving forward nor backward.

IMPORTANT: When using NEUTRAL for an extended time, slow the tool by reducing air flow at the valve.

Step 5: Locate tool by sound and vibration.

AFTER THE BORE

Disconnect the air hose from the tool and remove the tool from the exit pit. Cap the inlet fitting or cover it with tape to prevent dirt and sand from entering the tool.

REVERSING DIRECTION

Reverse direction of the tool if it becomes stuck or is deflected off course.

To reverse direction:

Step 1: Shut the tool OFF.

Step 2: Disconnect the air supply hose from the oiler.

Step 3: Turn the hose fully counterclockwise to REVERSE.

Step 4: Clean the connectors, then connect the air supply hose.

Step 5: Turn the tool ON.

Step 6: During operation, be sure the tool stays in REVERSE by checking that the air supply hose is turned fully counterclockwise.

Step 7: Keep pulling on the air supply hose as the tool is reversing. This will keep the tool from backing over the air supply hose.

IMPORTANT: Use extra care when piercing in unstable soils, gravel, sand, or under trees. The tool cable should be used in these conditions because the probability of a tunnel collapsing or of the tool oscillating is increased.

Prior to piercing in unstable conditions, connect the tool cable to the back of the tool, then attach ample cable or chain to the tool cable to reach across the entire length of the shot. When reversing the tool in these conditions, use the cable or chain to assist in pulling the tool back.

ACCESSORIES

Shackle Mount

Use the shackle mount to attach a looped cable to the front of the tool. Slide the cable loop over the clevis, then attach the clevis to the front of the tool with a left-hand thread bolt and nut. Torque to 600 ft-lb (814 Nm).

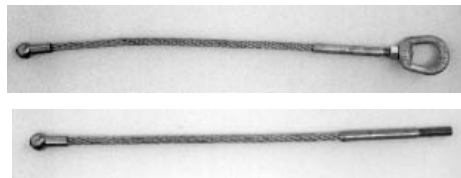
Expanders - 10.62, 12.75, and 14" (27, 32, and 35 cm) - for 8" (200 mm) Tool Only

When a larger bore is needed, use an expander. Three sizes are available to enlarge the bore diameter.



Tool Cable - for 8" (200 mm) Tool Only

The tool cable provides additional versatility. It is attached to the tool through an exhaust port and allows the operator to pull a cable, chain, or pulling carrot with the tool. It can be used in combination with the pilot to pull plastic pipe through the bore.



PREPARING TO BORE - AIR REVERSE

Step 1: Determine the length of the bore.

Step 2: Starting at the tool, wrap tape over the hose every 6 ft (2 m). Do this for the length of the bore.

While boring, keep track of the increments to determine the location of the tool.

Keep track of the time will also enable you to determine how fast the tool is moving.



WARNING: Keep lifting equipment a safe distance from the entrance pit to prevent it from falling into the pit or causing the pit to cave in.



WARNING: Do not use the lifting slings to launch the tool. The tool could fall on you if:

- Tool breaks loose from the entrance wall after it leaves the lift straps.
- Operating vibrations loosen the chain or cable connection.
- Operating vibrations damage and break the lift straps.

Step 3: Use lifting slings to lower the tool into the entry pit and aim it toward the exit pit. Place the level on the straight surface of the tool. Use a support under the tool to keep it aligned.

Consider the type of soil when aligning the mole. Some soils such as topsoil and sand will cause the tool to rise. Pitching the nose of the tool slightly downward will provide a more accurate bore. The amount of downward pitch required depends upon the soil type and length of the bore.

IMPORTANT: Do not allow dirt or other material into the air hose.

Step 4: connect the oiler supply hose to a compressed air supply

Step 5: Remove any oil or debris that may make the hose slippery.



WARNING: To prevent the hose from whipping, do not fully open the compressor valve. Be sure to aim the hose away from yourself and other persons.

CAUTION: The Hammerhead Mole Layflat Hose is designed for use between the tool and oiler in bursting applications only. Do not use layflat hose when using the tool for boring. Extreme care should be used to protect the exposed hose from sharp objects, abrasions and abuse. Failure to do so may result in hose failure.

Step 6: Hold the other end of the hose tightly and partially open the compressor valve to blow the air hose clean.

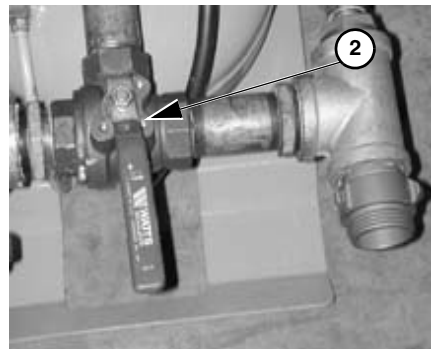
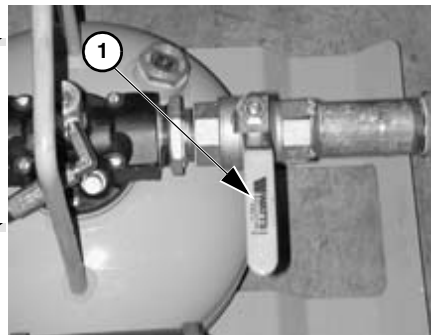
Step 7: Close the compressor valve.

Step 8: Close the air supply valve (1) on the oiler.

Step 9: Fill oiler with HammerHead Mole oil (refer to the *Controls and Adjustments* section, *Oiler control valves - Air Reverse*, page -9).

Step 10: Connect air supply hose to the oiler and the Mole supply hoses to the tool.

Step 11: To avoid accidental uncoupling, tighten all hose locking collars against fittings or install any hose fitting retaining devices such as lock rings, clips, pins, chains, or cables.



Boring

- Step 1: Place the direction selector **(2)** in the forward position.
- Step 2: Fully open the air supply valve **(1)** to start the striker moving. Do this quickly, then slow it down. This will make it easier to start the bore. Adjust the direction valve toward reverse slightly to “clean up” the sound of the tool.
- NOTE:** Launching the tool at reduced power provides time for the operator to accurately aim the tool.
- Step 3: Stop the tool periodically as it enters the ground. Use a bubble level to check angle and aim. Adjust the direction of the tool by pushing or pulling tool body.
- Step 4: When the tool reaches the exit pit, shut down the tool by closing the air supply valve.

AFTER THE BORE

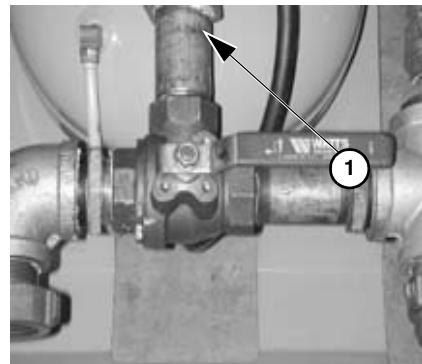
Disconnect the air hoses from the tool and remove the tool from the exit pit. Cap the forward and reverse hoses to prevent contaminants from entering the tool. Use caution to prevent rear of tool from scooping up dirt in the tailcone.

REVERSING DIRECTION

Reverse direction of the tool if it becomes stuck or is deflected off course.

To reverse direction:

- Step 1: Shut the tool OFF.
- Step 2: Place the direction selector **(1)** in the reverse position.
- Step 3: Quickly open the air supply valve to start the tool.
- Step 4: Open the muffler valve to reduce back pressure inside the tool.
- Step 5: Keep pulling on the mole air supply hoses as the tool is reversing. This will prevent the tool from backing over the hoses.



IMPORTANT: Use extra care when piercing in unstable soils, gravel, sand, or under trees. The tool cable should be used in these conditions because the probability of a tunnel collapsing or of the tool oscillating is increased.

Section 31: Pipe Ramming

CALL YOUR ONE-CALL SYSTEM FIRST



WARNING: Always contact your local One-Call system before the start of your digging project.



ONE-CALL



Locate Utilities
CALL 1-888-258-0808

Before you start any digging project, don't forget to call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority concerned to locate and mark the underground installations. If you don't call, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or experience job delays.

The One-Call representative will notify participating utility companies of your proposed digging activities. If you are in the U.S. or Canada and do not know the number for the local One-Call representative in your area, dial the North American One-Call number, 1-888-258-0808, for this information. Utilities will then mark their underground facilities by using the following international marking codes:

Red	Electric	Green/Brown	Sewer
Yellow	Gas, Oil or Petroleum	White	Proposed Excavation
Orange	Communication, Telephone, TV	Pink	Surveying
Blue	Potable Water		

IMPORTANT: Be sure to review the operating and safety instructions for the air compressor.

PREPARING THE SITE



DANGER: Pit cave-in possible. Death from suffocation may occur. Never enter a pit where cave-in and suffocation are possible. Follow OSHA regulations for shoring or sloping of pit.



WARNING: Before ramming, check with qualified sources to properly locate all buried utilities in and around ramming path. Contact with buried utilities may cause serious injury or death.

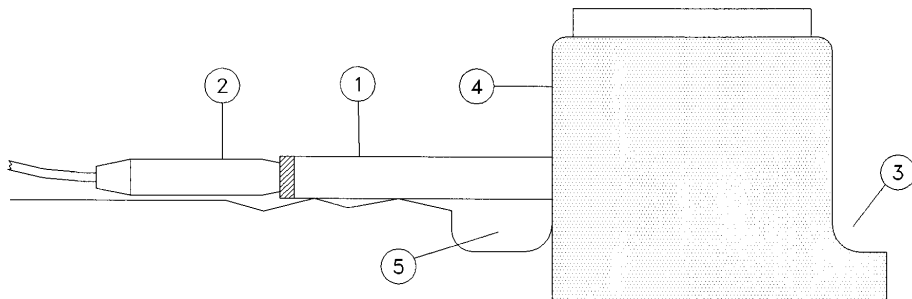


ONE-CALL



Locate Utilities
CALL 1-888-258-0808

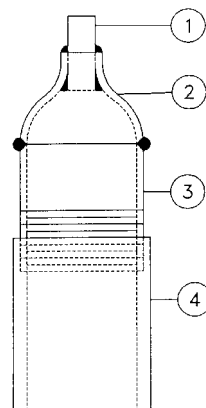
- Step 1: Dig the entry site long enough for the length of pipe (1) and tool (2).
- Step 2: To allow for tool misalignment, dig exit pit (3) deeper than entry site.
- Step 3: Square the trench face (4) and dig an undercut (5) so the pipe will start true and remain at a level grade without riding up.
- Step 4: Level bottom of trench to level the pipe. Do not use stacked wood to level pipe. The stacks will collapse from the pipe oscillating back and forth.



PUSHING CLOSED PIPE

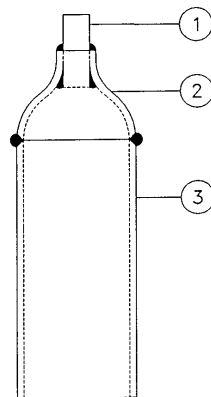
Threaded Pipe

- Step 1: Weld a piece of steel bar (1) to the smaller end of the pipe reducer (2). Weld the steel bar to the pipe reducer on both the inside and outside of the pipe reducer.
- Step 2: Weld a short section of threaded pipe (3) to the larger end of the pipe reducer.
- Step 3: Thread the pipe reducer to the pipe with a threaded collar (4). The pipe reducer will make the front of the pipe more streamlined and easier to start the push.



Welded Pipe

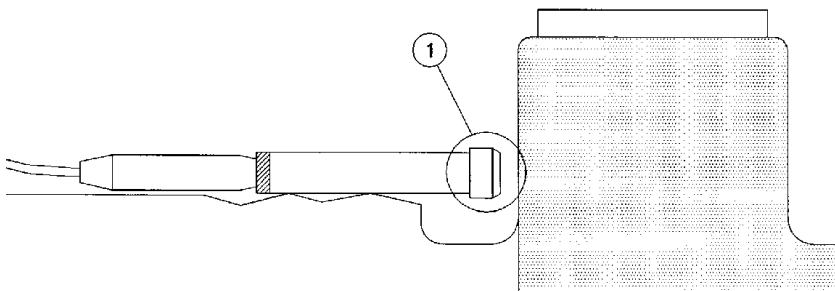
- Step 1: Weld a piece of steel bar (1) to the smaller end of the pipe reducer (2). Weld on both the inside and outside of the reducer.
- Step 2: Weld the pipe reducer (2) to the front of the pipe (3). The pipe reducer can be used again. Cut the pipe reducer off the pipe when the push is completed and use it again on the next push.



PUSHING OPEN PIPE

Use a soil shoe when pushing open pipe. It will reduce friction on the pipe and make spoil removal easier.

Slip appropriate soil shoe (1) over the front end of pipe.

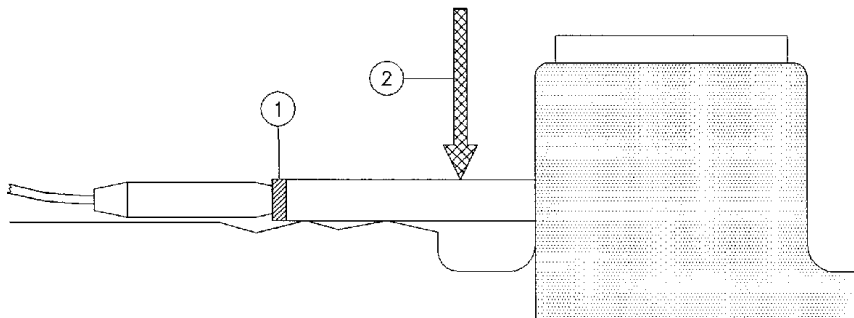


STARTING THE PUSH

Step 1: Check grade and level the pipe.

NOTE: When starting the push, it may be necessary to place weight (indicated by arrow (2)) on the pipe to keep it from oscillating instead of advancing.

Step 2: Insert the three collet segments (1) in the back end of the pipe. Push the collets in until the lip of the collet contacts the pipe edge.



WARNING: Keep lifting equipment at a safe distance from the entrance pit to prevent it from falling into the pit.



WARNING: Tool or lifting equipment may fall and strike you.

- Attach the lifting slings to the tool using a choker hitch to prevent the tool from sliding out of the slings.
- Securely attach the lifting slings to lift hook.
- Use lifting equipment designed and equipped specifically to lift objects with slings.
- Do not stand under raised tool or lifting equipment.
- Do not launch tool from the lifting straps.



WARNING: Use of pipe schedules other than those listed in the Specifications Section may cause unsafe conditions during ramming or spoil removal.

- Step 3: Use lifting slings to position the nose of the tool into the collets.
- Step 4: Run the tool slowly until the taper of the nose locks into the taper on the collets.
- Step 5: Remove the slings from the tool.
- Step 6: Push the pipe slowly for the first 6-8 ft (2-2.5 m) to help maintain grade. Apply weight on the pipe as necessary and use a level on the front of the pipe to monitor the grade.

Completing the Push

IMPORTANT: Use full REVERSE only when piercing.

Step 1: To remove the tool from the pipe pushing collets, turn the tool OFF, then turn the supply hose only counterclockwise, five turns for the 7" (180 mm) tool, six turns for the 8" (200 mm) tool for the screw reverse models. For the air reverse models, follow directions in Operating the Tool section See "Reversing Direction" on page 5.

Step 2: Quickly turn tool on and off to unlock tool from collets. Remove the collets.

IMPORTANT: Ensure pipe sections are welded together straight for a more accurate push.

Step 3: If adding more pipe:

- a. Position and weld the next pipe section.
- b. Insert the collets and resume pushing.

Step 4: When finished, remove the tool, collets, and pipe reducer(s).

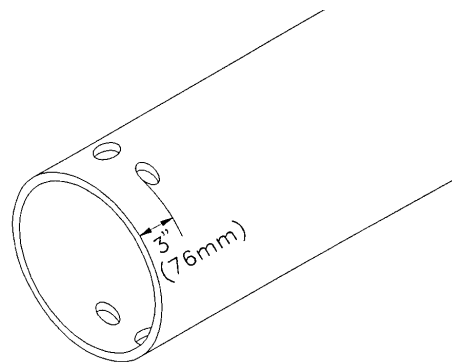
CLEANING OUT OPEN PIPE

Step 1: Use a torch to cut two holes all the way through the pipe for the safety stakes.

- For 14" (35 cm) or smaller pipe seals: Cut 1-1/2" (4 cm) diameter holes.
- For 16" (40 cm) or larger pipe seals: Cut 2" (5 cm) diameter holes.

Step 2: Remove slag from the inside of the pipe.

Step 3: Before installing the ramming pipe seal, allow pipe to cool to prevent damaging the rubber seal.





WARNING: If anchor stakes are not firmly secured in ground, pipe may recoil and cause severe injury or death.

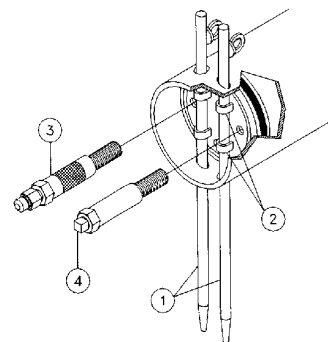
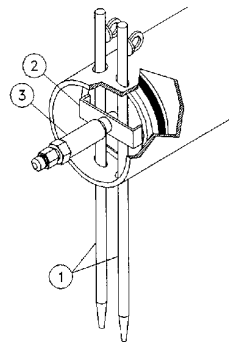
IMPORTANT: Ensure stakes (1) pass through the U-clamp(s) (2) on the pipe seal assembly.

Step 4: Insert the ramming pipe seal assembly into the pipe and secure with stakes (1). Tighten pipe stem(s) (3) to seal the pipe.

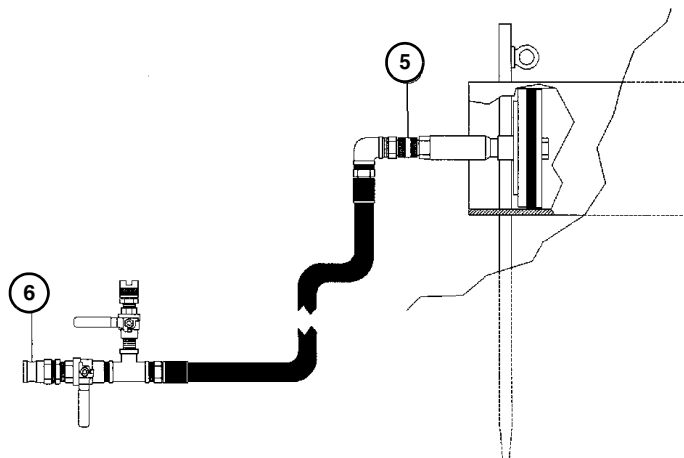
IMPORTANT: Use only HammerHead-approved high-strength alloy steel stakes.

Step 5: Insert stakes through pipe and into ground to prevent pipe from recoiling when removing spoil.

NOTE: Three plugs (4) are used for 16-24" pipe.



- Step 6: Attach quick connect (5) of spoil removal line to ramming pipe seal.
- Step 7: Attach air supply line to other end (6) of spoil removal line.



WARNING: Spoil can be ejected at high speed. Pipe may recoil out of bore when spoil ejects. Stay away from the ends of the pipe when ejecting spoil. Serious injury or death may result if struck by ejected spoil or recoiling pipe.



WARNING: Do not add water to a pressurized pipe seal. Always vent pressure before adding water. Failure to relieve pressure may result in serious injury.

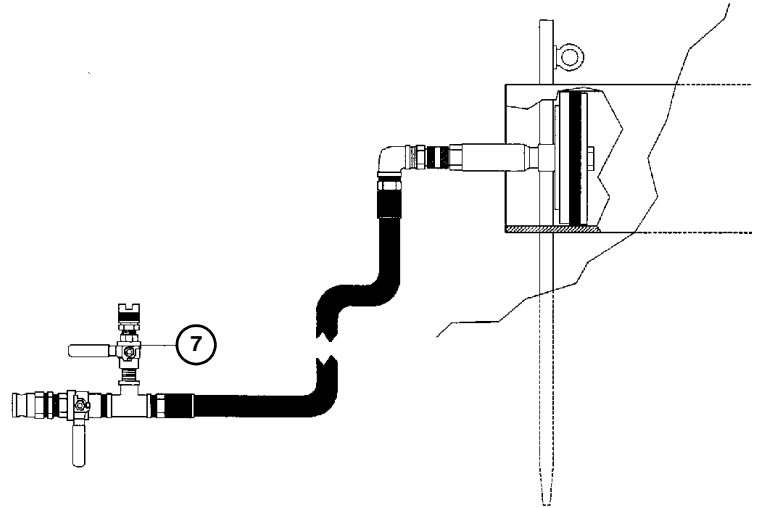
Step 8: With pressure set at 110 psi (760 kPa), turn on air. Maintain pressure for 6-10 minutes. If spoil does not move:



WARNING: Vent air pressure before disconnecting the air hose. Serious injury could occur if struck by hose uncoupled under pressure.

- a. Turn off air and slowly open valve (7) to bleed off pressure.
- b. Add water through valve (7) to lubricate the pipe and help create a seal.
- c. Repeat Step 8.

Step 9: Decrease airflow when spoil begins to move to prevent violent spoil discharge.

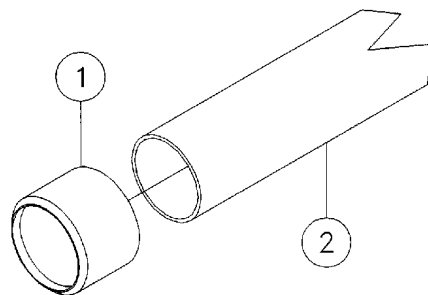


ACCESSORIES

Soil Shoes: 6-12" (15-30 cm) in 2" (5 cm) Increments

When ramming steel pipe, the use of soil shoes will reduce friction on both the outside and inside of the pipe. With reduced friction, longer lengths of pipe can be installed and spoil removal will be easier.

The soil shoe (1) fits over end of pipe (2) and can be used on all pipe schedules.



Pushing Collets - 6-24" (15-60 cm) in 2" (5 cm) Increments

When pushing steel pipe, use a pushing collet to couple the tool to the pipe. The tool locks onto the collet, which fits inside of the pipe. Tool impact is transferred to the pipe more effectively, resulting in more efficient pipe ramming.

Refer to *Specifications, page 50-1*, for recommended pipe schedules.

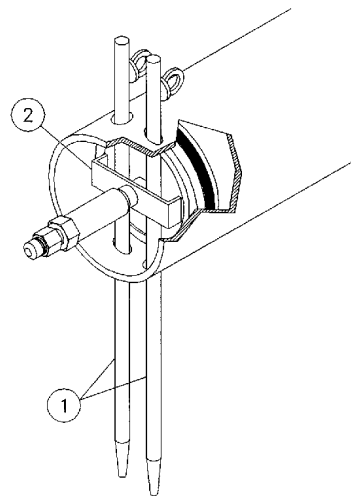


Pipe Seals - 6-24" (15-60 cm) in 2" (5 cm) Increments

After ramming open pipe, use a HammerHead-approved ramming pipe seal to seal the pipe for removing spoil from the pipe.

Stakes (1) hold the ramming pipe seal assembly (2) in the pipe. Pressurized air is applied through the ramming pipe seal to remove the spoil.

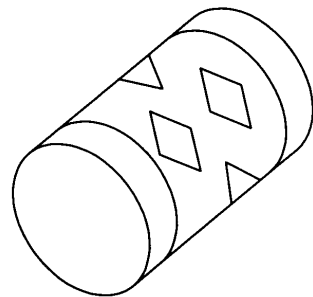
Refer to *Specifications, page 50-1*, for recommended pipe schedules.



Pipe Pigs - 6-24" (15-60 cm) in 2" (5 cm) Increments

Use a pipe pig to remove all dirt from the inside of an installed pipe.

NOTE: These pipe pigs fit standard schedule pipe. Special sizes are available. If interested, contact your dealer.



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Section 40: Maintenance - 30 Service Hours

STRIKER WEAR RINGS - CHECK

VALVE WEAR RING - CHECK

Instructions for checking the wear rings are included in the *Maintenance - 150 Service Hours or Yearly*, page 41-1.

- Follow instructions in “A. Screw Reverse Model - Disassemble,” page 41-1.
- Proceed to “B. Striker - Inspect,” page 41-3, and “C. Valve - Inspect,” page 41-4, instructions to check the wear rings and O-ring.
- Follow the applicable instructions in “F. Tool - Assemble,” page 41-8.

NOTE: New tail bolts are not necessary at this time unless the bolts are damaged.

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Section 41: Maintenance - 150 Service Hours or Yearly

A. SCREW REVERSE MODEL - DISASSEMBLE



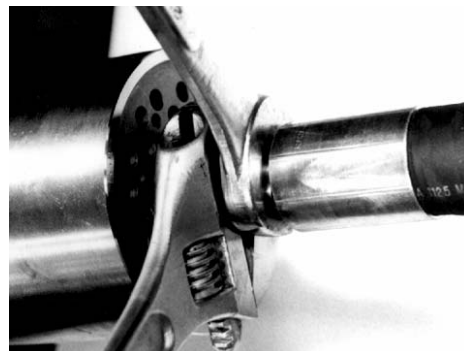
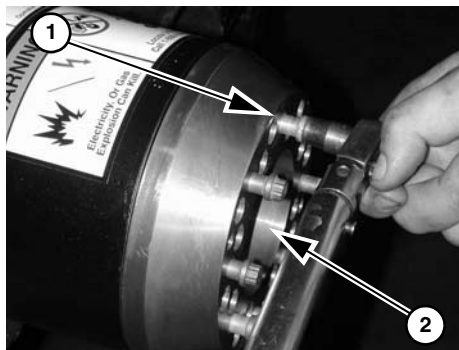
WARNING: The 7" (180 mm) Mole weighs approximately 500 lb. (227 kg); the striker weighs 200 lb. (91 kg). The 8" (200 mm) Mole weighs approximately 900 lb. (408 kg); the striker weighs 400 lb. (181 kg). Attempting to lift the tool or striker by hand can result in back strain and injury.



WARNING: Tool or lifting equipment may fall and strike you.

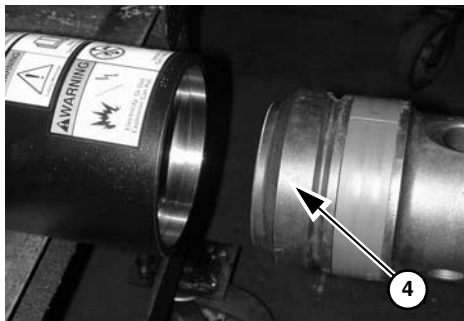
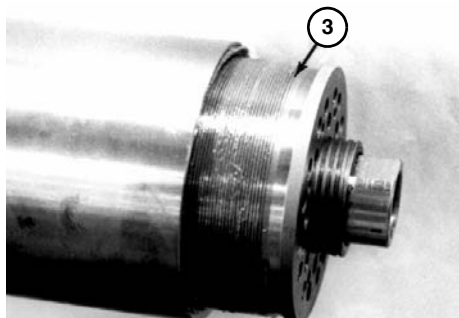
- Attach the lifting slings to the tool using a choker hitch to prevent the tool from sliding out of the slings.
- Securely attach the lifting slings to lift hook.
- Use lifting equipment designed and equipped specifically to lift objects with slings.
- Do not stand under raised tool or lifting equipment.

- Step 1: Thoroughly clean the tool.
- Step 2: Use lifting straps to place tool on a clean surface. Lay it flat or with the nose down slightly to prevent the striker from falling out when the inner assembly is removed.
- Step 3: Use a 3/8" (9.5 mm) 12-point socket to remove tail bolts (1).
- Step 4: Remove tailcone (2) from inner assembly.



IMPORTANT: Failure to use two wrenches when removing rear whip hose can result in internal damage to the adjuster screw.

- Step 5: Turn rear whip hose fully counterclockwise to **REVERSE**. Use two wrenches to remove hose; one to hold fitting and one to turn hose fitting. Plug fittings to prevent debris from entering hoses.
- Step 6: Using the rear anvil tool, rotate rear anvil (3) counterclockwise to unthread the inner assembly from the body. It will take approximately 40 full turns.
- Step 7: Remove rear anvil and inner assembly from the body.
- Step 8: To remove striker (4), lift the front of the tool slightly. This will cause the 200-lb. (90-kg) striker to begin to slide. Use a long handle to prevent the striker from rapidly exiting the body and causing injury.



B. STRIKER - INSPECT

Step 1: Inspect the front (1) and rear impact surfaces of the striker. If more than 50% of either surface is heavily chipped or cracked, replace the striker.

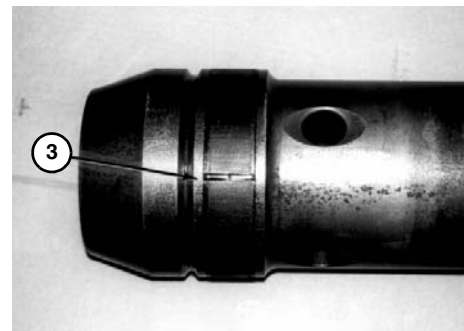
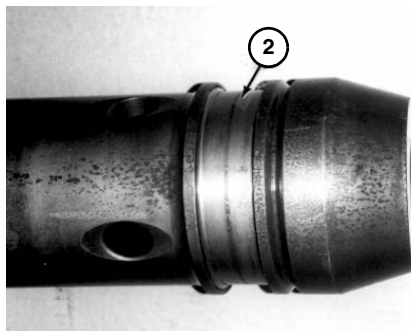
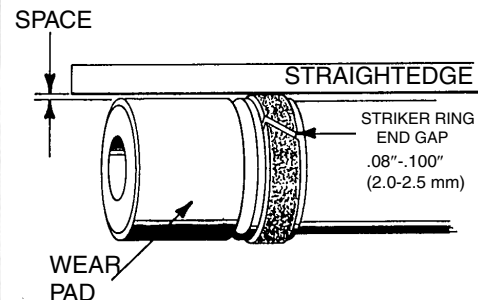
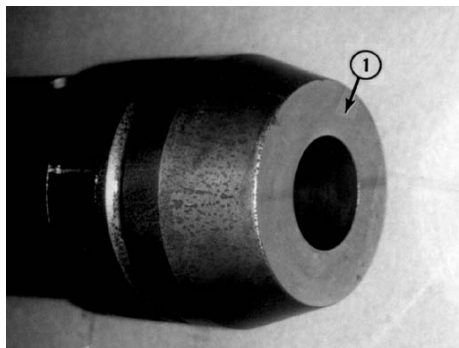
Step 2: Check striker ring wear with a straightedge. If there is no space between the straightedge and the wear pad, replace the rings.

To replace a ring:

- Clean the ring groove (2).
- Oil all surfaces of the ring with Hammerhead Mole Oil.
- Install the ring. If the ring is overexpanded, take the ring off, overlap the ends to make a tighter diameter, and then reinstall.

NOTE: The striker wear pads have been designed so the tool will operate with worn out rings. Although the tool will run, steel to steel contact will result in increased friction and internal wear, as well as shortened body and striker life.

Step 3: Check the end gap (3) of each ring with the ring fully seated in the striker ring groove. The gap should be .240-.260" (6.1-6.6 mm) for the front ring and .140-.160" (3.6-4.1 mm) for the rear ring. Ring gap for both tools is the same. If it is less, remove the ring and trim enough off one end to ensure proper gap.



IMPORTANT: Wear rings should be checked after the first 30 hours of use. First clean the ring and ring groove. Check ring gap and wear.

Step 4: Use a flashlight to inspect the striker valve bore for rust, debris, and burrs. If needed, clean the bore with a soft abrasive, such as a Scotch Brite scouring pad on a drill extension.

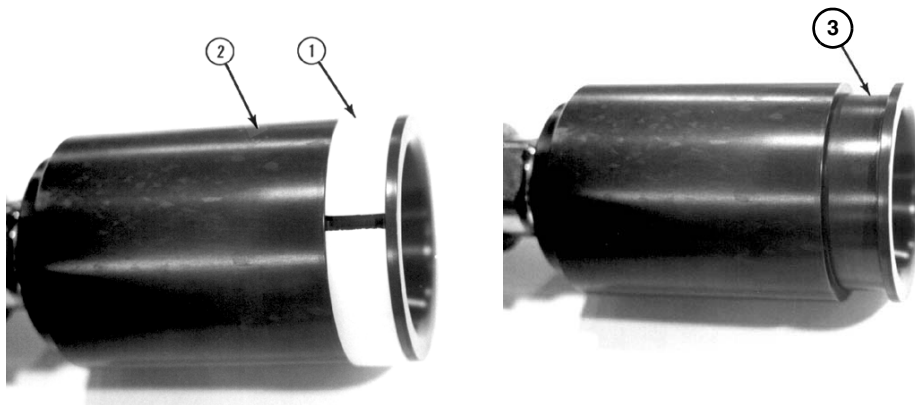
IMPORTANT: The use of hard abrasives, such as a wire brush or emery cloth, can damage the bore by removing metal, creating a rough surface.

Step 5: Inspect the bore again for burrs. Burrs and nicks can accelerate valve skirt wear. If burrs are still there, replace the striker.

Step 6: Check the valve bore of the striker with a snap gauge. Take measurements 2" (5 cm) into the bore at the 12 o'clock and 3 o'clock positions. If the average bore diameter is more than 4.69" (119 mm), replacement of the striker will improve power.

C. VALVE - INSPECT

- Step 1: Remove valve ring (1) by expanding it and sliding it over valve (2).
- Step 2: Check for sand embedded in the ring. If you find any, replace the ring.
- Step 3: The inside surface has a groove designed to collect debris. Remove all debris or particles from the ring.



Step 4: Check the rings for scratches. Light scratching on the ring is acceptable. Replace a heavily scratched or scored ring.

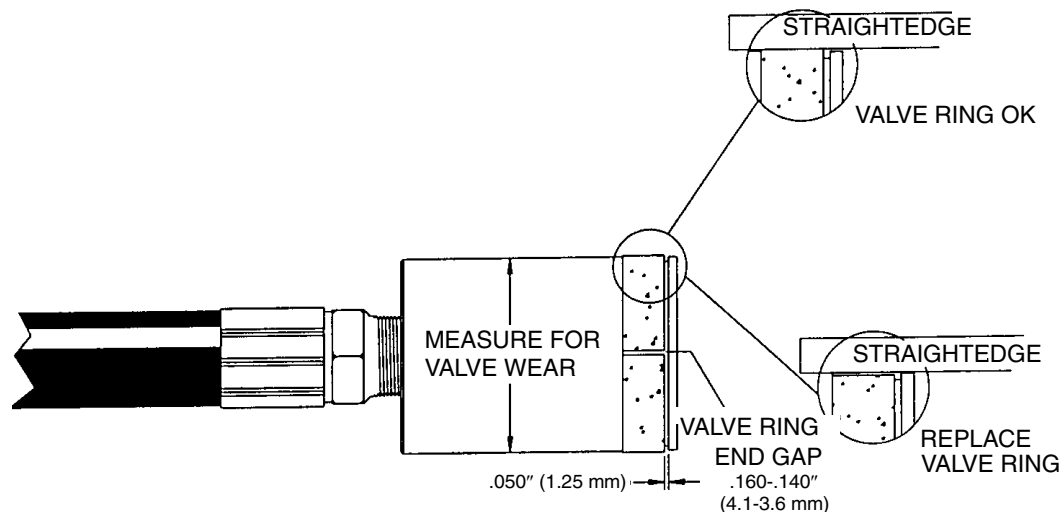
To replace a ring:

- a. Clean the ring grooves (3).
- b. Oil all surfaces of the ring with Hammerhead Mole Oil.
- c. Install the ring. If the ring is overexpanded, take the ring off, overlap the ends to make a tighter diameter, and then reinstall.

Step 5: Check valve ring wear with a straightedge. If there isn't any space between the straightedge and the front edge (**Inset**), replace the ring.

Step 6: Check the valve ring end gap with the ring fully seated in the ring groove. The gap should be .140-.160" (3.6-4.1 mm). If it is less, remove the ring and trim enough off one end to get the proper gap.

IMPORTANT: Valve ring wear should be checked initially after 30 hours of use. First clean the ring and ring groove. Check ring gap and wear.



Step 7: Install a new valve ring and check valve ring groove width. Measure the gap between the ring and groove. If it is more than .050" (1.25 mm), replace the valve.

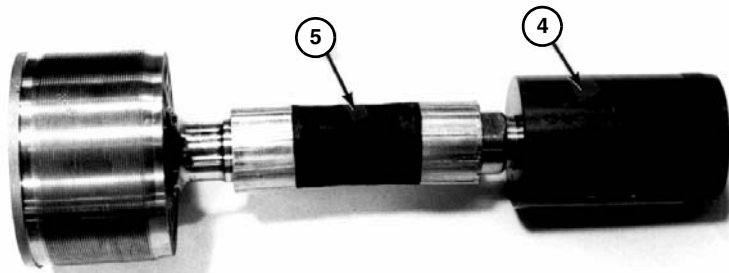
NOTE: Valve groove wear will accelerate if the tool is run dirty or without oil, or if the valve ring does not have the correct end gap.

Step 8: Measure valve skirt wear. Replace a valve with a diameter less than 1.49" (37.8 mm).

To remove the valve:

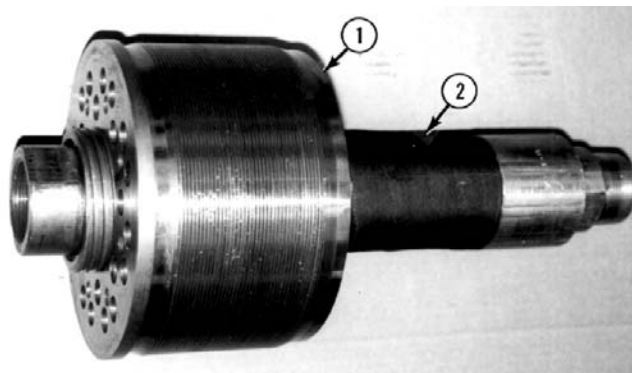
IMPORTANT: The valve is covered with a hard ceramic coating. Be careful not to chip the coating.

- a. Slip a piece of hose over the valve or wrap the valve in a cloth to prevent damaging the valve surface.
- b. Secure the valve (4) in a vise.
- c. Using 2" open end wrench, remove internal whip hose (5) from valve.



D. VALVE END HOSE WHIP - INSPECT

Step 1: Unscrew hose whip (2) and remove it from rear anvil (1).

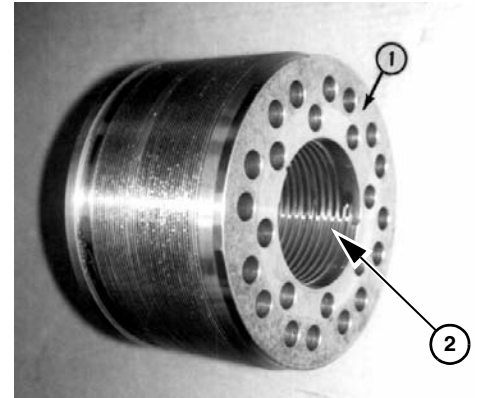


- Step 2: Inspect threads **(3)**. They should be flat on top. If threads are sharp, replace the hose whip.
- Step 3: Inspect the bond between the screw and the tubular shaft. Replace hose whip assembly if needed.



E. REAR ANVIL - INSPECT

- Step 1: Inspect the face **(1)** which contacts the striker. If more than 50% of the surface is heavily chipped or cracked, replace the anvil.
- Step 2: Thoroughly clean the rear anvil. Use an approved air nozzle and carefully blow out the exhaust ports and bore.
- Step 3: Check the front stops on the screw thread **(2)** for damage. Stops should be .060" - .080" wide on top. If stops are less, the rear anvil should be replaced.
- Step 4: Inspect the rear anvil inner screw threads. Threads should be flat on top. If threads are sharp, replace anvil.

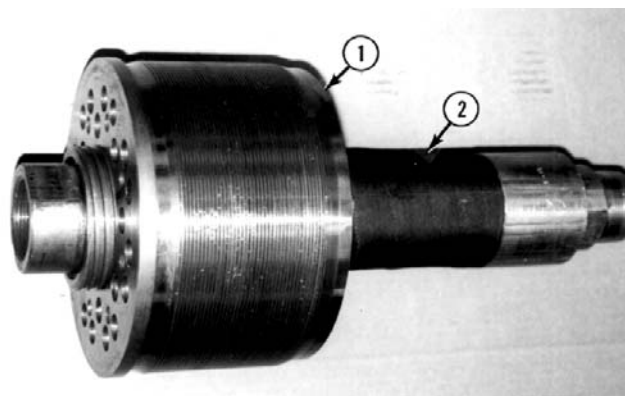


F. TOOL - ASSEMBLE

Step 1: Using anti-seize or grease, lubricate rear anvil inner threads.

Step 2: Thread the valve end hose whip (2) into the rear anvil (1).

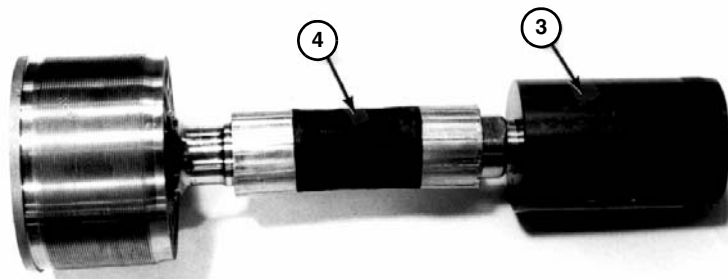
IMPORTANT: The valve is covered with a hard ceramic coating. Be careful not to chip the coating.



Step 3: Slip a piece of hose over the valve or wrap the valve in a cloth to prevent damaging the valve surface.

Step 4: Secure the valve (3) in a vise.

Step 5: Install internal whip hose (4) and torque to 200 ft-lb. (274 Nm).



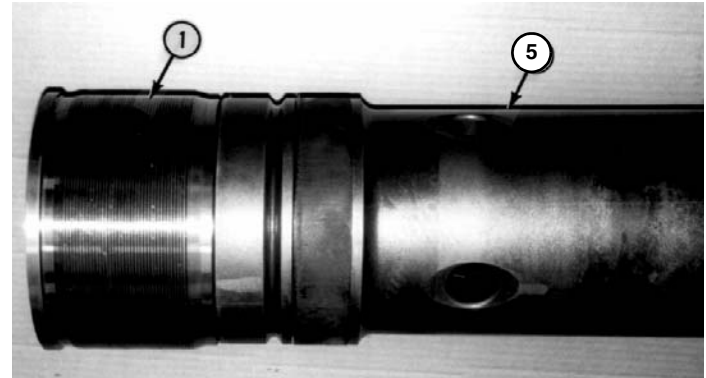
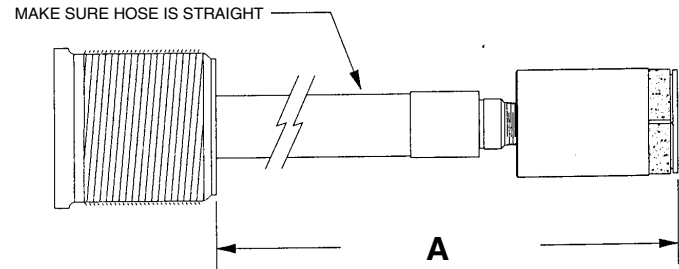
Step 6: Turn the valve assembly fully clockwise against the stops.

Step 7: Check the valve assembly's overall length. Dimension (A) should be:

- **7" (180 mm) tool:**
16-5/16" $\pm 1/16$ " (141 mm ± 2 mm)
- **8" (200 mm) tool:**
18-15/16" $\pm 1/16$ " (479 mm ± 2 mm)

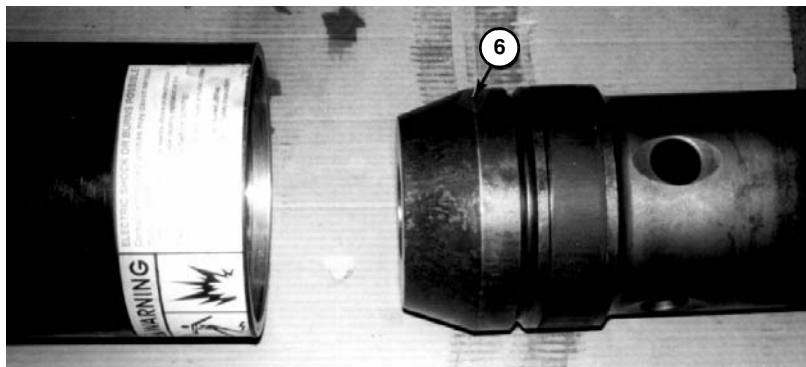
Step 8: Check for full range of motion in adjustment thread.

Step 9: With rear anvil/hose whip assembly adjusted to full forward position, test fit the valve in the striker bore. The valve should slide freely into the striker until the rear anvil (1) contacts the striker (5). If it does not, determine the reason for the obstruction before assembling the tool.



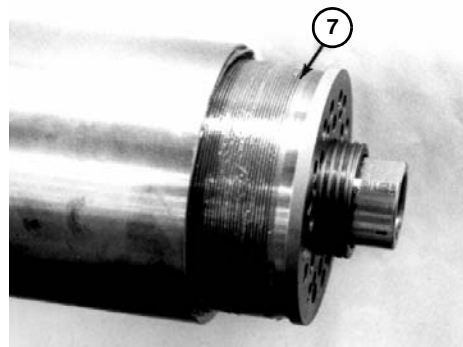
Step 10: Clean the body bore thoroughly. Oil inside of the body and the striker.

Step 11: With the tool body horizontal or slightly nose down, carefully slide the striker into the body. The end (6) with the smaller hole goes into the body first.

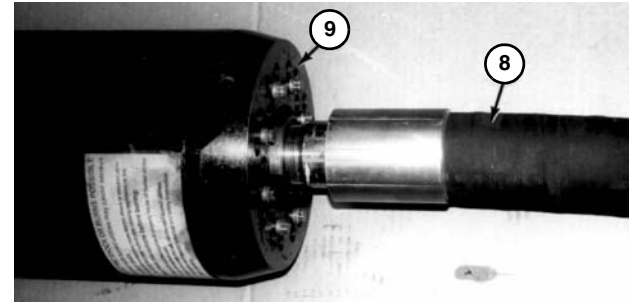


Step 12: Coat the rear anvil's external threads (7) with anti-seize or grease lubricant.

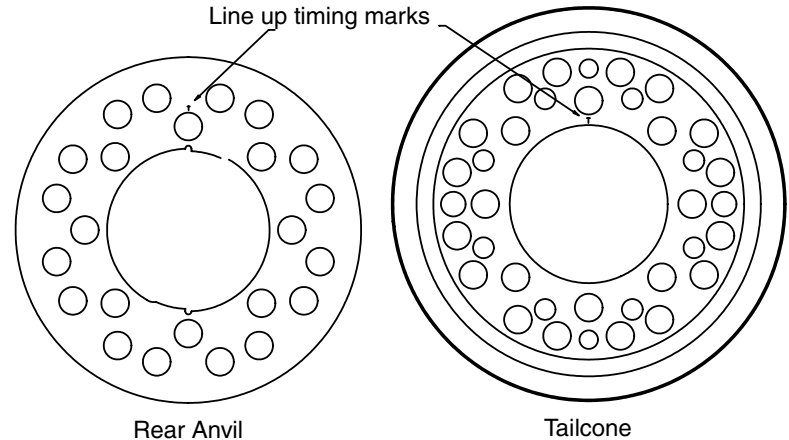
Step 13: Slide the inner assembly into the striker. Be careful not to cross thread the rear anvil into the body. Tighten the rear anvil until it bottoms against the body, then loosen it 1/8 turn. Do not apply torque to rear anvil.



- Step 14: Rotate valve end hose whip fully counterclockwise.
- Step 15: Inspect the surface of the rear hose whip (8). Replace a torn or peeling hose whip to prevent reversing problems.
- Step 16: Install and tighten rear hose whip to 150 ft-lb. (205 Nm).
- Step 17: Place tailcone (9) over valve end hose whip.



NOTE: 7" and 8" tools built after April 2001 may have a timing mark on the back of the rear anvil. When installing the tailcone, line up the tab stop on the tailcone with the timing mark.



IMPORTANT: Install new bolts when assembling the tailcone. The tail bolts are engineered and specially designed for the Hammerhead Mole. Do not substitute other types of bolts.

Step 18: Coat the threads of the tail bolts (10) with anti-seize or grease. Start the bolts.

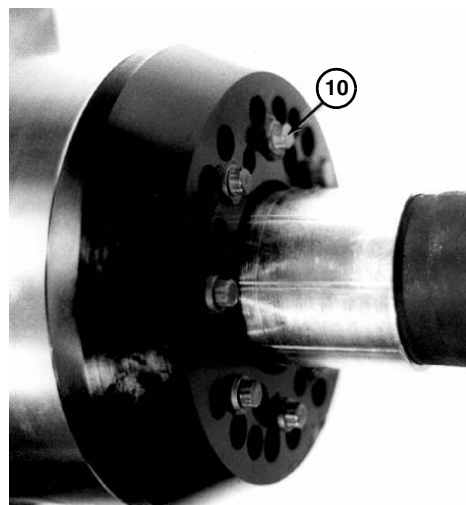
IMPORTANT: Do not tighten the tail bolts with the hose whip in reverse adjustment position. The tailcone and hose whip adjuster screw will be damaged.

Step 19: Check that the hose whip is rotated fully clockwise (FORWARD).

Step 20: Use a cross pattern sequence and tighten tail bolts to 35 ft-lb. (47 Nm).

Step 21: Check that the tool freely shifts from FORWARD to REVERSE.

Step 22: Place the adjuster screw in the forward position.



AIR REVERSE MODEL - DISASSEMBLE



WARNING: The 7" (180 mm) Mole weighs approximately 500 lb. (227 kg); the striker weighs 200 lb. (91 kg). The 8" (200 mm) Mole weighs approximately 900 lb. (408 kg); the striker weighs 400 lb. (181 kg). Attempting to lift the tool or striker by hand can result in back strain and injury.



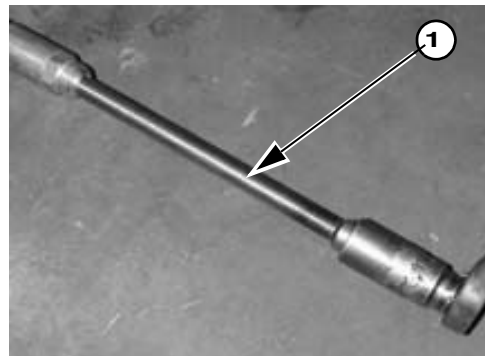
WARNING: Tool or lifting equipment may fall and strike you.

- Attach the lifting slings to the tool using a choker hitch to prevent the tool from sliding out of the slings.
- Securely attach the lifting slings to lift hook.
- Use lifting equipment designed and equipped specifically to lift objects with slings.
- Do not stand under raised tool or lifting equipment.

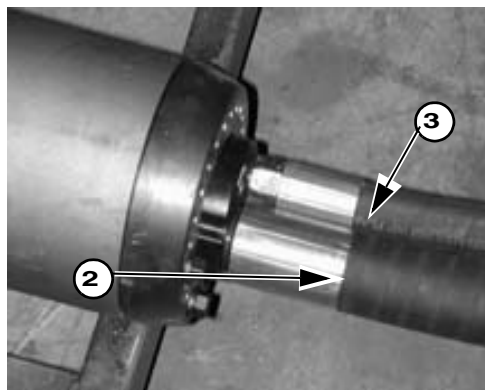
Step 1: Thoroughly clean the tool.

Step 2: Use lifting straps to place tool on a clean surface. Lay it flat or with the nose down slightly to prevent the striker from falling out when the inner assembly is removed.

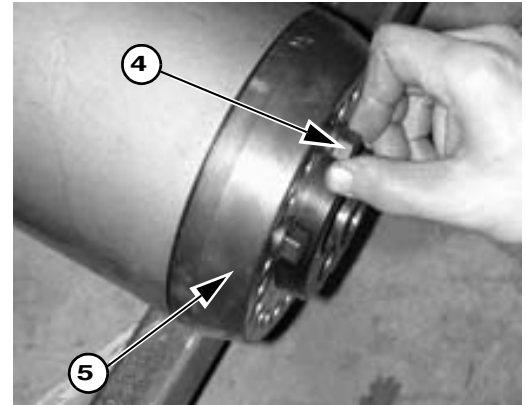
Step 3: Use the forward hose installation/removal tool (1) to remove the forward hose (2).



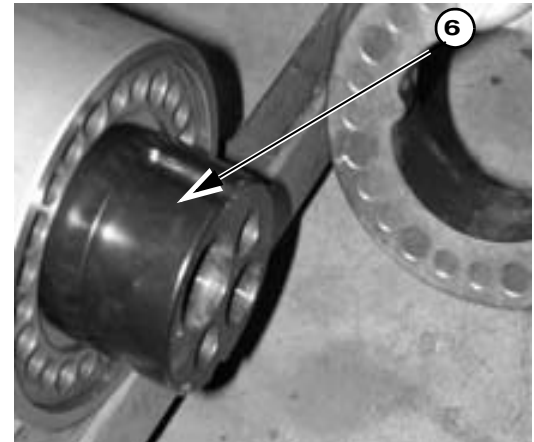
Step 4: Remove the reverse hose (3) using an open end wrench.



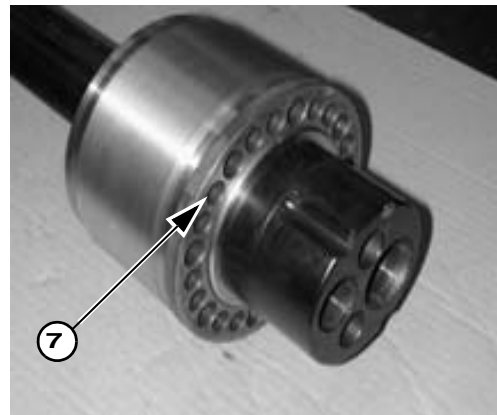
Step 5: Remove tailbolts (4) using a 5/8" 6 point socket.



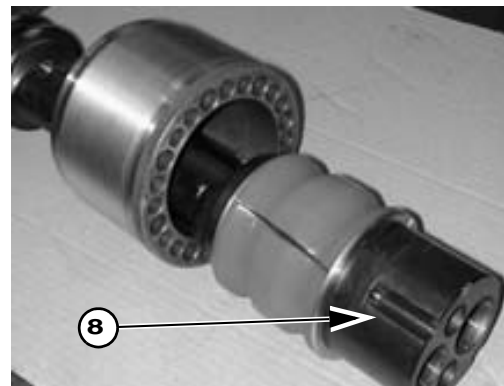
Step 6: Slide the tailcone (5) off valve assembly (6).



Step 7: Reinstall two tailcone bolts into rear anvil and unthread the rear anvil/valve assembly (7).



Step 8: Remove valve assembly (8) from inside rear anvil.



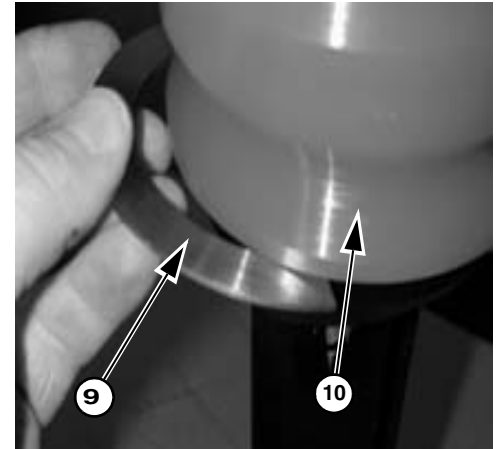
Step 9: Remove shims (9) on either side of isolator (10).

Step 10: Remove isolator from valve assembly. Check isolator for cuts, nicks, cracks and wear. Replace if necessary.

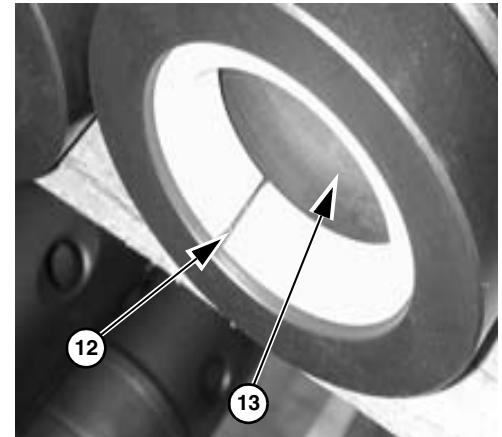
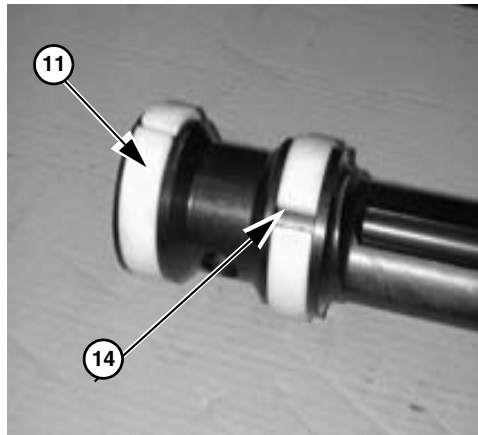
Step 11: Remove valve rings (11) and inspect for embedded debris and wear. Clean rings to remove any contaminants. Check valve ring gap (12) by sliding rings into valve bore of striker (13) as shown. Ring gap should be .145" - .155" (3.7 mm - 4.0 mm). If it is less, the rings may be trimmed to adjust the ring gap. If the gap is larger than the specifications, then the rings must be replaced.

Step 12: Check valve ring groove (14) for wear. Remove any debris that may have accumulated under the rings during use.

NOTE: When valve rings are installed on the valve, there will be no end gap.

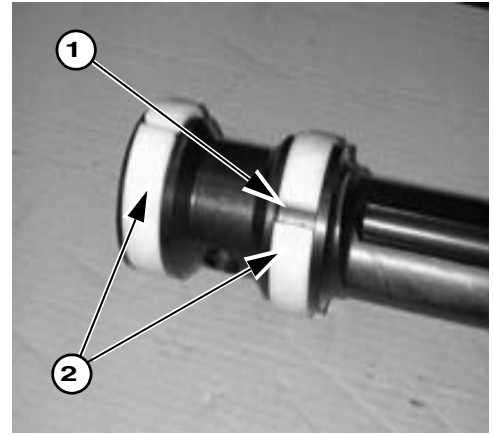


Step 13: Follow steps in the "B. Striker - Inspect," *page 41-3* for the remaining steps for disassembly.

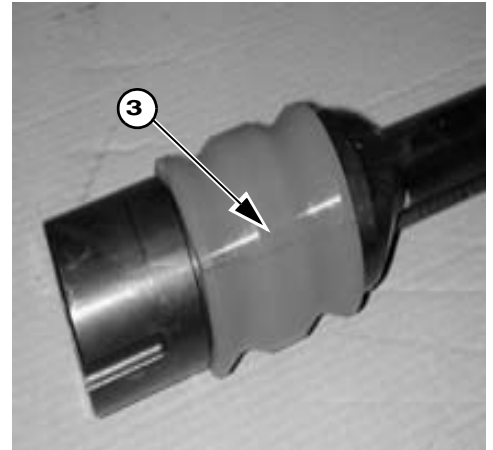


AIR REVERSE MODEL - ASSEMBLE

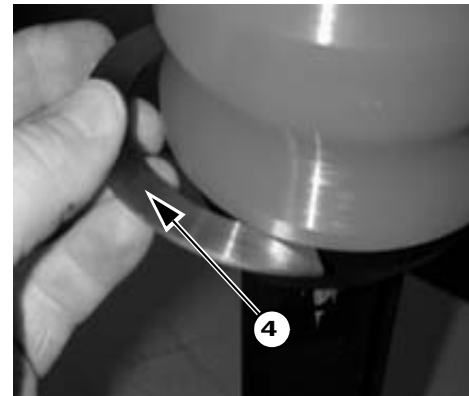
Step 1: Apply a light coating of oil to the valve ring grooves (1) and install the valve rings (2).



Step 2: Apply a thin coating of anti-seez to the inside and outside of the isolator (3).

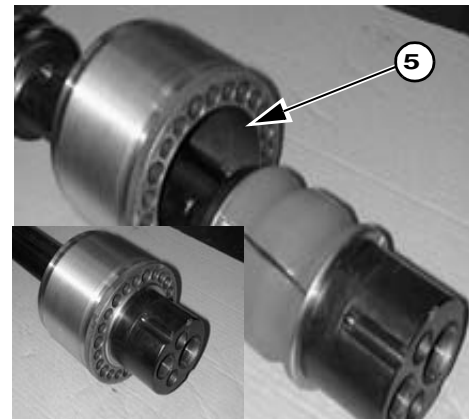


Step 3: Install 4 spacer halves (4) on either side of the isolator. Chamfered edge is oriented away from isolator. Position gap in spacer halves 90 degrees away from gap in isolator.



Step 4: Coat the bore of the rear anvil (5) with anti-seez. Slide the valve end of the valve shaft through the rear anvil. Continue to slide the spacer/isolator section of the valve inside the rear anvil.

NOTE: The isolator will be a snug fit to the inside of the rear anvil. Make sure spacers do not fall out during assembly.



Step 5: Clean the body bore thoroughly. Oil the inside of the body and striker.

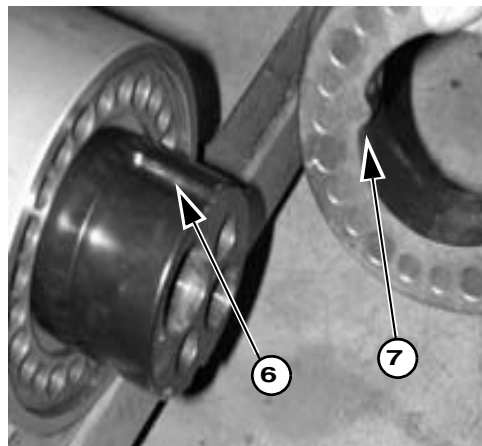
Step 6: With the tool body horizontal or slightly nose down, carefully slide the striker into the body. Note the orientation of the striker refer to "F. Tool - Assemble," *page 41-8*.

Step 7: Apply anti-seez to the outer threads of the rear anvil and to the internal threads of the tool body.

Step 8: Thread rear assembly into body.

IMPORTANT: Thread anvil into body completely and stop, **DO NOT BACKOFF REAR ANVIL 1/8 TURN.**

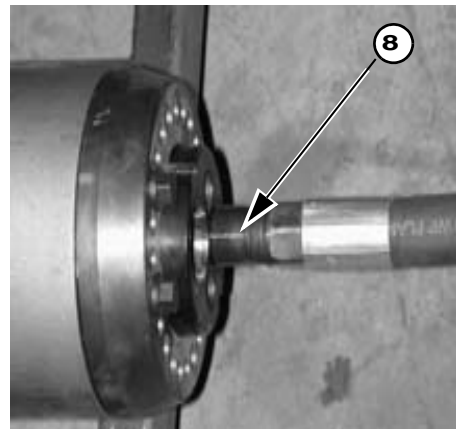
Step 9: Line up keyway (6) on valve assembly with key (7) on tailcone and install tailcone.



Step 10: Apply a small amount of anti-seez to threads of tailbolts and torque using a cross pattern to 120 ft lb. (162 Nm).

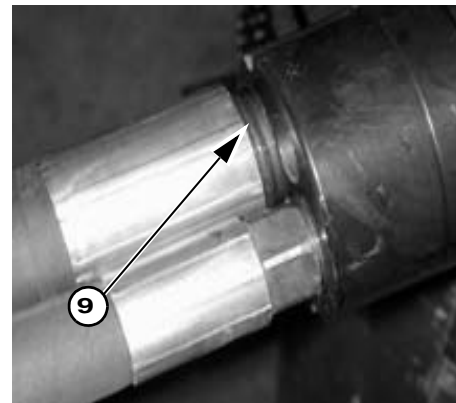


Step 11: Coat taper threads on reverse hose (8), install into valve shaft end and torque to 120 ft lb. (162 Nm).



Step 12: Coat taper threads on forward hose (9), install into valve shaft end. Using the supplied hex wrench, and torque to 240 ft lb. (324 Nm).

Step 13: Pour 8 oz (.2 l) HammerHead Mole Oil into the forward hose. Tilt the back end of the tool up so that the oil flows to the striker.



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Section 42: Maintenance - As Required

MAINTENANCE AS REQUIRED

Nose Disassembly

The nose assembly of the 7" and 8" *Hammerhead Mole Pneumatic Boring Tool* is designed to be trouble-free and does not require maintenance. Should you feel that maintenance is required, please contact your local HammerHead dealer.

Storage

With the nose of the tool down, pour 16 oz (1 L) of Hammerhead Anti-Rust Storage Oil into the air line. Wait 30 seconds for the oil to get into the tool. Tape or cap the tool whip hoses to prevent dirt and sand from entering the tool.

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Section 43: Troubleshooting

TOOL WILL NOT START

- Step 1: Check the compressor for proper air output (90-110 psi or 620-760 kPa). Improper or low air pressure setting can cause starting problems.
- Step 2: Check that full pressure air is available at the tool and that hoses and fittings are of the proper diameter, 1-1/4" or larger.



WARNING: High pressure air can forcefully eject dirt or other materials. Be careful when blowing out the hose. Aim the hose away from yourself and other persons.

- Step 3: Follow these restart procedures while tool is in the ground:
- Remove the air supply hose from the oiler to the tool and inject 16 oz (.5l) of oil directly into the hose.
 - Turn air supply hose one turn into reverse if in forward, or one turn into forward if in reverse.
 - Connect the supply line to the oiler and snap open the air control valve.
 - If tool does not restart, repeat steps a, b, and c.
- Step 4: Take the tool apart and clean it (Refer to *Maintenance - 150 Service Hours or Yearly*, page 41-1).
- Step 5: If the tool fails to start after the above steps have been performed, return the tool to your HammerHead dealer for inspection.

TOOL WILL NOT REVERSE DIRECTION

Rotate the air hose fully clockwise to FORWARD and then rotate the air hose fully counterclockwise back to REVERSE.

Step 1: If the air supply hose will not turn into the reverse position while in the ground, the tunnel may have collapsed on the air supply hose. Turn the air supply hose while the tool is running. The impact action of the tool will help loosen stuck supply line.

Step 2: Reversing in unstable soil conditions, such as gravel, sand, under trees, or watery slick clays, may cause a tool to oscillate or “swim”. A reciprocating hose indicates the tool may be swimming. Reduce air flow at the control valve until traction is regained.

IMPORTANT: Ensure all air line couplings are tight and lock collars in place so they don’t come loose while reversing.

Step 3: Check air supply lines for possible obstructions.

TOOL RUNS BUT WILL NOT MOVE IN HOLE

Step 1: Check to see if the hose is in FORWARD.

Step 2: If the tool is oscillating back and forth, partially reduce the air flow at the oiler valve. Soft or wet ground conditions can cause a tool to lose traction and oscillate.

Step 3: Put a mark on the hose for reference to determine if the tool is moving. If the tool has hit an obstruction, the screw reverse feature allows you to maximize impact force. Rotate the hose counterclockwise 2 to 3 turns until the tone of the impact changes. Turning the hose in the clockwise (forward) direction slightly, until this tone is gone, will provide the most impact force available to break through an obstruction.

Step 4: If the tool is unable to break through, reverse the tool and start a new hole away from the obstruction.

IMPORTANT: When reshooting a new bore, the operator should move over a distance of 10 times the diameter of the tool or the tool may cross into the other bore.

TOOL CYCLES FAST AND SEEMS LOW ON POWER

- Step 1: Check the valve assembly overall length, an excessively short dimension will cause “fast” cycling with poor progress. Striker stroke is controlled by the valve overall length (Refer to the *Maintenance - 150 Service Hours or Yearly* section, “F. Tool - Assemble,” page 41-8).
- Step 2: Soil conditions are important to tool operation. Dry soil may slow a tool's progress. Wet soil will reduce body friction allowing a tool to oscillate, lose traction, or swim. Avoid losing traction by reducing air flow at the control valve during the entire operation.

TOOL SLOWS DOWN DURING LONG BORES

- Step 1: Perform the striker tip test as follows: The striker should slide from front to back when the body is tipped from horizontal to approximately 22°. A tool with high striker friction may have ingested dirt and should be taken apart before being shot again.
- Step 2: The tunnel behind the tool may be collapsed and restricting air flow.

TOOL RUNS BUT IS LOW ON POWER

- Step 1: Check the compressor for proper air output and pressure.
- Step 2: Check that the tool is using oil (refer to *30-Operating the Tool*, page 30-1).
- Step 3: Turn or adjust mole air service line while the tool is moving forward or reversing.
- Step 4: Check that supply lines and fittings are properly sized (refer to *Specifications*, page 50-1).
- Step 5: Perform striker tip test (refer to “Tool Slows Down During Long Bores,” page 43-3).
- Step 6: Check striker wear ring end gap (refer to the *Maintenance - 150 Service Hours or Yearly* section, “B. Striker - Inspect,” page 41-3).
- Step 7: Check valve assembly overall length (refer to the *Maintenance - 150 Service Hours or Yearly* section, “F. Tool - Assemble,” page 41-8).

Step 8: Check valve rings end gap (refer to the *Maintenance - 150 Service Hours or Yearly* section, “C. Valve - Inspect,” *page 41-4*).

VALVE WHIP HOSE WILL NOT THREAD INTO REAR ANVIL

Step 1: Check adjuster screw for damage, burr, or nicks.

Step 2: If screw threads easily except for the last two threads, these threads may be bent. Bent threads are caused by improper rear anvil assembly (refer to the *Maintenance - 150 Service Hours or Yearly* section, “F. Tool - Assemble,” *page 41-8*).

Section 50: Specifications

LUBRICANTS

Hammerhead Mole Summer Oil

Summer oil with a zinc and paraffin hydraulic air line additive to reduce friction and inhibit rust (SAE-10W/ISO-22) is recommended for most applications.

Hammerhead Mole Winter Oil

Winter oil contains a fully synthetic base of ISO Propanol and additives that reduce corrosion, evaporation, and make it compatible with the summer oil. Winter oil at full strength will prevent freeze up at temperatures as low as -10°F (-23°C) (ISO-46).

Hammerhead Mole Anti-Rust Oil

Anti-Rust oil is a paraffin-based product that contains additives to inhibit rust and corrosion (SAE 20W/ISO 68). It is recommended during maintenance or between jobs.

Specification	7"	8"
Mist Oiler	P/N 210777001	
Diameter	7" (18 cm)	8" (20 cm)

Specification	7"	8"
Length	77" (196 cm)	101" (256 cm)
Weight	500 lb (227 kg)	900 lb (408 kg)
Air Consumption	235 cfm (6.7 m ³ /mn)	308 cfm (8.7 m ³ /mn)
Internal Access	Via 8 tail bolts	Via 8 tail bolts
Tail Bolt Torque	35 ft-lb (47 Nm)SR 102 ft-lb (163Nm) AR	35 ft-lb (47 Nm) 102 ft-lb (163Nm) AR
Operating Pressure (max)	110 psi (760 kPa)	110 psi (760 kPa)
Rear Anvil Clamp Load	40,000 lb (18,144 kg)	40,000 lb (18,144 kg)
Reversible (Screw Reverse Model)	In 6-1/2 turns	In 9 turns
Blows Per Minute	295	223
Accessories		
Pulling Clevis	Yes	Yes
Pushing Collets	6-24" (15-60 cm) in increments of 2" (5 cm)	6-24" (15-60 cm) in increments of 2" (5 cm)
Soil Shoes	6-12" (15-30 cm) in increments of 2" (5 cm)	6-24" (15-60 cm) in increments of 2" (5 cm)
Pipe Seals	6-24" (15-60 cm) in increments of 2" (5 cm)	6-24" (15-60 cm) in increments of 2" (5 cm)
Expanders	No	10.62, 12.75, and 14" (27, 32, and 35 cm)

STEEL PIPE REFERENCE SCHEDULE

Pipe Size	Outside Diameter Inches (Centimeters)	Standard Wall Thickness Inches (Millimeters)	Weight Per Foot Pounds (Kilograms)
4	4.500 (11.43)	.237 (6.2)	10.79 (4.9)
4-1/2	5.000 (12.7)	.247 (6.3)	12.53 (5.7)
5	5.563 (14.13)	.258 (6.6)	14.62 (6.6)
6	6.625 (16.83)	.280 (7.1)	18.97 (8.6)
7	7.625 (19.37)	.301 (7.6)	25.37 (11.5)
8	8.625 (21.91)	.322 (8.2)	28.55 (13.0)
9	9.625 (24.45)	.342 (8.7)	33.90 (15.4)
10	10.750 (27.31)	.365 (9.3)	40.48 (18.4)
11	11.750 (29.85)	.375 (9.5)	45.55 (20.7)
12	12.750 (32.39)	.375 (9.5)	49.56 (22.5)
14	14.000 (35.56)	.375 (9.5)	54.57 (24.8)
16	16.000 (40.64)	.375 (9.5)	62.58 (28.4)
(Page 1 of 2)			

Pipe Size	Outside Diameter Inches (Centimeters)	Standard Wall Thickness Inches (Millimeters)	Weight Per Foot Pounds (Kilograms)
18	18.000 (45.72)	.375 (9.5)	70.59 (32.0)
20	20.000 (50.8)	.375 (9.5)	78.60 (35.7)
22	22.000 (55.88)	.375 (9.5)	87.00 (39.5)
24	24.000 (60.96)	.375 (9.5)	94.62 (42.9)
Additional sizes for 8" (200 mm) tool			
30	30.00 (76.2)	.375 (9.5)	118.65 (53.8)
32	32.00 (81.28)	.375 (9.5)	126.66 (57.6)
36	36.00 (91.44)	.375 (9.5)	142.68 (64.7)
42	42.00 (106.68)	.375 (9.5)	166.71 (75.6)
48	48.00 (121.92)	.375 (9.5)	190.74 (86.5)
(Page 2 of 2)			

RECOMMENDED PIPE SCHEDULES FOR SOIL SEALS

Pipe Size	Recommended Schedules		Recommended Pipe I.D.s		Minimum Wall Inches (Millimeters)
	Standard O-ring Seal	Oversized O-ring Seal	Standard O-ring Seal Inches (Centimeters)	Oversize O-ring Seal Inches (Centimeters)	
6	STD (40)	10, 5	6.07/6.19 (15.4/15.7)	6.32/6.44 (16.1/16.4)	.109 (2.8)
8	20, 30, STD (40), 60*	10, 5	7.98/8.10 (20.3/20.6)	8.23/8.36 (21/21.2)	.148 (3.8)
10	30, STD (40)	20, 10	10.02/10.14 (25.5/25.8)	10.27/10.40 (26.1/26.4)	.250 (6.4)
12	30, STD (40)	20	11.94/12.06 (30.33/30.7)	12.19/12.32 (31/31.3)	.250 (6.4)
14	STD (30), 40	20, 10	13.125/13.25 (33.3/33.7)	13.375/13.50 (34/34.3)	.250 (6.4)
16	STD (30)	20, 10	15.125/15.25 (38.4/38.7)	15.375/15.50 (39.1/39.4)	.250 (6.4)
18	STD (30)	20, 10	17.125/17.25 (43.5/43.8)	17.375/17.50 (44.1/44.5)	.250 (6.4)
20	STD (20)	10	19.125/19.25 (48.6/48.9)	19.375/19.50 (49.2/49.5)	.250 (6.4)
22	STD (20)	10	21.125/21.25 (53.7/54)	21.375/21.50 (54.3/54.6)	.250 (6.4)
24	STD (20)	10	23.125/23.25 (58.7/59.1)	23.375/23.50 (59.4/59.7)	.250 (6.4)

* HammerHead pushing collets will not ram this schedule pipe.

RECOMMENDED RAMMING SCHEDULES

Collet Size	Tool	Schedules	Pipe Inside Diameter Inches (Centimeters)		Minimum Wall Inches (Millimeters)
4"	4"	STD (40)	3.97 (10.1)	4.13 (10.5)	.188 (4.8)
	5 1/8"	STD (40)	3.97 (10.1)	4.13 (10.5)	.188 (4.8)
	5 3/4"*	STD (40)	3.97 (10.1)	4.13 (10.5)	.188 (4.8)
6"	4"	STD (40)	5.95 (15.1)	6.25 (15.9)	.188 (4.8)
	5 1/8"	STD (40)	5.95 (15.1)	6.25 (15.9)	.188 (4.8)
	5 3/4"	STD (40)	5.95 (15.1)	6.25 (15.9)	.188 (4.8)
	7";8"	STD (40)	5.95 (15.1)	6.25 (15.9)	.188 (4.8)
8"	5 3/4"	20, 30, STD (40)	7.87 (20.0)	8.13 (20.7)	.250 (6.4)
	7"; 8"; 12"; 16"	20, 30, STD (40)	8.03 (20.4)	8.13 (20.7)	.250 (6.4)
10"	5 3/4"	20, 30, STD (40)	9.87 (25.1)	10.25 (26.0)	.250 (6.4)
	7"; 8"; 12"; 16"	20, 30, STD (40)	9.87 (25.1)	10.25 (26.0)	.250 (6.4)
12"	5 3/4"	20, 30, STD, 40	11.85 (30.1)	12.25 (31.3)	.250 (6.4)
	7"; 8"; 12"; 16"	20, 30, STD, 40	11.85 (30.1)	12.25 (31.1)	.250 (6.4)
14"	7"; 8"; 12"; 16"	20, STD (30), 40, EH**	13.00 (33.0)	13.38 (34.0)	.312 (7.9)
16"	7"; 8"; 12"; 16"	20, STD (30), EH 40**	15.00 (38.1)	15.38 (39.1)	.312 (7.9)
18"	7"; 8"; 12"; 16"	20, STD, 30, EH**	17.00 (43.2)	17.38 (44.1)	.312 (7.9)
20"	8"; 12"; 16"	STD (20), EH (30)**	19.00 (48.3)	19.25 (48.9)	.375 (9.5)
22"	8"; 12"; 16"	STD (20), EH (30)**	21.00 (53.3)	21.25 (54.0)	.375 (9.5)
24"	8"; 12"; 16"	STD (20), EH**	23.00 (58.4)	23.25 (59.1)	.375 (9.5)

* Must be used with pushing adaptor.

** Although these schedules can be installed, HammerHead pipe seals are not recommended for spoil removal.

PVC PIPE TYPE I SCHEDULE 40 NSF

Nominal Pipe Size (In.)	O.D.	Average I.D.	Nominal Wt./ft. Type I	Bell or Connecting Sleeve Min. O.D.
1/8	.405	.261	.045	.541
1/4	.540	.354	.081	.716
3/8	.675	.483	.620	.857
1/2	.840	.608	.161	1.058
3/4	1.050	.810	.214	1.276
1	1.315	1.033	.315	1.581
1 1/4	1.660	1.304	.426	1.94
1 1/2	1.900	1.592	.509	2.19
2	2.375	2.049	.687	2.70
2 1/2	2.875	2.446	1.076	3.281
3	3.500	3.042	1.409	3.94
3 1/2	4.000	3.520	1.697	4.452
4	4.500	3.998	2.006	4.974
5	5.563	5.017	2.776	6.07
6	6.625	6.031	3.536	7.185
8	8.625	7.943	5.305	9.269
10	10.750	9.976	7.532	11.480
12	12.750	11.890	9.949	13.562
14	14.000	13.072	11.810	14.87

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7" (180 mm) and 8" (200 mm) Hammerhead Mole

Revision History

Revision	Date	Page(s)	Description
OMJL96-1	07/96	7" (180 mm) book	First edition book released
OMSE96-1R1	09/96	8: (200 mm) book	First edition, first revision released
o-m2_00	011/01	All; 30-6; 42-1	7" and 8" books combined and reformatted; new accessory; nose assembly no longer field serviceable
0-m2_01	09/02	'cover, patents, warranty	Books reformatted to HammerHead format
0-m3_01	03/03	Layflat Hose, Air Reverse Models	Added instructions for air reverse models.
O-m10_04	10/04	Reformatted all pages	Updated instructions for air reverse tools

