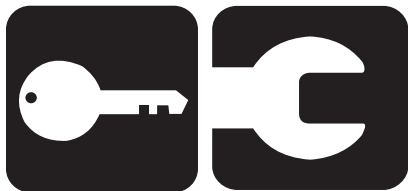


Piercing Tools

PT20 and PT30

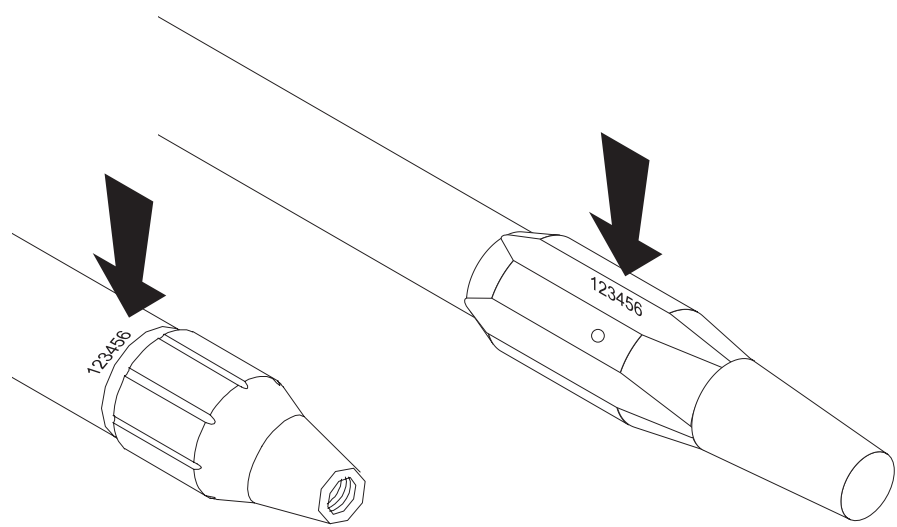
Operation & Repair Manual



Overview

Serial Number

Record the serial numbers and date of purchase of your equipment in the spaces below. Serial number is located as shown.



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Date of Manufacture:	
Date of Purchase:	
Unit Serial Number:	

Intended Use

The Ditch Witch PT20 and PT30 piercing tools are used to pneumatically pierce ground or to push pipe through the ground and under existing structures such as roads, driveways, railroad tracks, sidewalks, and cart paths. Additionally, lightweight materials can be pulled back through a bore made by the tool. The PT30 model can be fitted with optional tool heads designed for varying soil conditions. Listed below are features that make Ditch Witch piercing tools productive and easy to use:

- patented quick-reverse mechanism on the oiler system that changes tool direction without stopping work
- simplified maintenance due to fewer parts
- optional screw-on heads to pierce through varying soil conditions (PT30 only)
- optional beacon housing to track tool progress with a Ditch Witch locator (PT30 only)
- optional bolt-on reversible expanders to pierce larger diameter holes (PT30 only)

The piercing tool is operated by an oiler that controls air flow and tool direction. The oiler also regulates the tool's internal temperature by providing an even oil flow through the piercing tool's twin air hose to the striker. This reduces wear on moving parts and keeps moisture from freezing and blocking the tool. Use of the oiler also helps prevent introduction of foreign substances into hoses and tool.

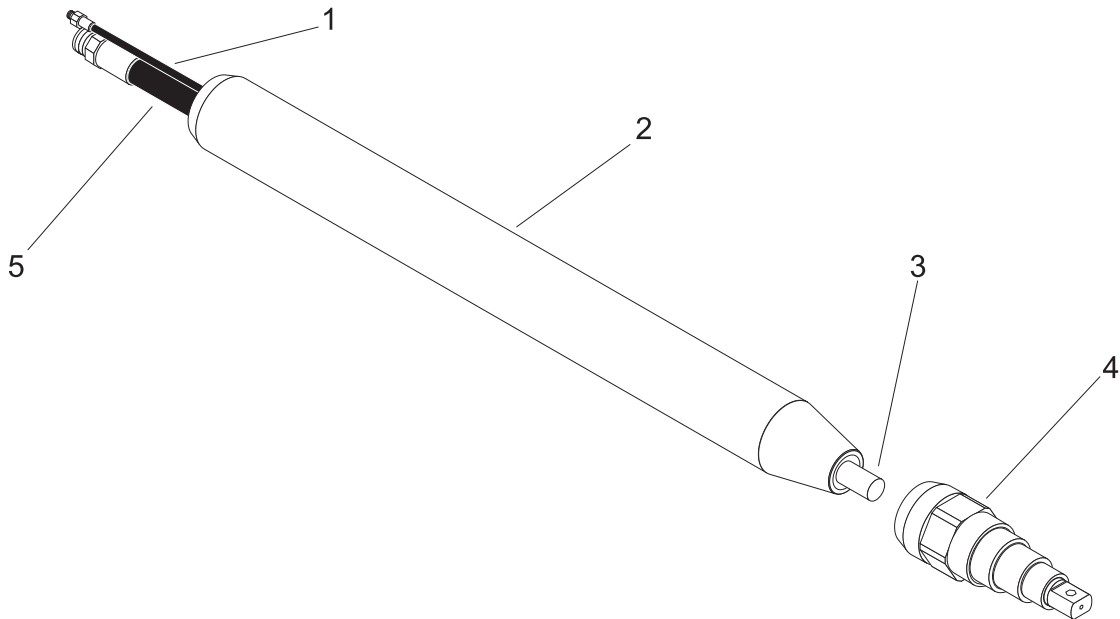
To enhance the control of the tool's pitch and direction, an optional tool launcher can be used to start the piercing tool on course. Additionally, an optional aiming sight, along with a highly visible target marker (rod or post set at the target spot), can be used to set the direction of the bore. These items can be obtained from your Ditch Witch dealer.

Equipment Modification

This equipment was designed and built in accordance with applicable standards and regulations. Modification of equipment could mean that it will no longer meet regulations and may not function properly or in accordance with the operating instructions. Modification of equipment should only be made by competent personnel possessing knowledge of applicable standards, regulations, equipment design functionality/requirements and any required specialized testing.

Unit Components

Basic Piercing Tool

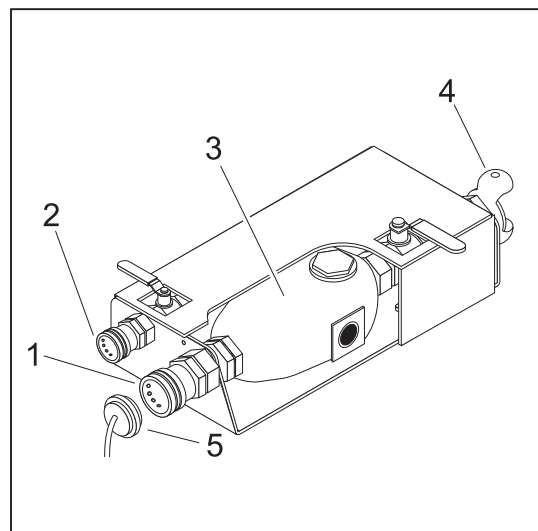


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- | | |
|----------------------|---|
| 1. Reverse hose whip | 4. Optional tool head
(stepped head shown) |
| 2. Body | 5. Forward hose whip |
| 3. Head adaptor | |

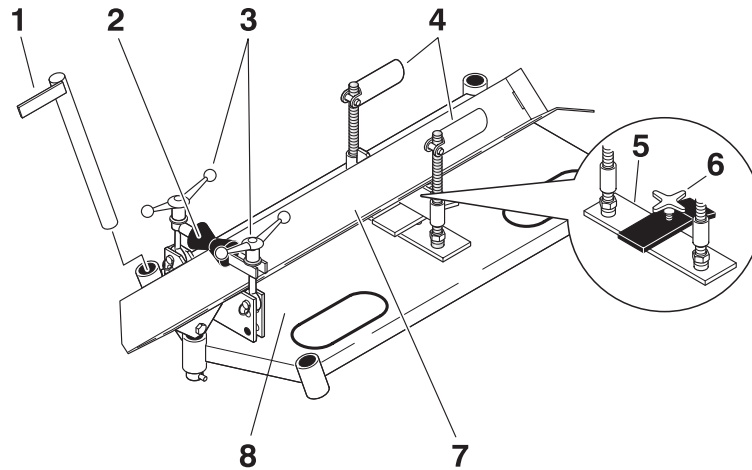
Oiler

1. Quick disconnect coupler (QDC) body (forward air hose)
2. QDC body (reverse air hose)
3. Oil reservoir
4. Claw coupler
5. Dust plug



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Piercing Tool Launcher



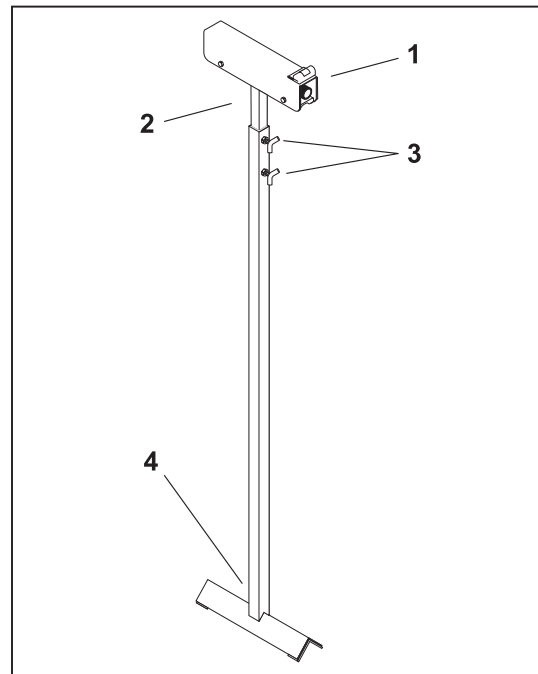
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- | | |
|----------------------------|--------------------------------|
| 1. Hold down stake | 5. Left/right adjustment plate |
| 2. Roller | 6. Adjustment knob |
| 3. Wing knobs | 7. Launcher guide |
| 4. Tilt adjustment handles | 8. Launcher pad |

Aiming Sight

1. Scope assembly
2. Top extension
3. Wing nuts
4. Bottom extension

IMPORTANT: For information on how to adjust the aiming sight, see page 26.



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Foreword



This manual is an important part of your equipment. It provides safety information, operation instructions and information on how to repair and maintain your Ditch Witch equipment. Operating instructions are found in the front of the manual and repair instructions are found in the back of the manual.

Read this manual before using your equipment. Keep it with the equipment at all times for future reference. If you sell your equipment, be sure to give this manual to the new owner.

If you need a replacement copy, contact your Ditch Witch dealer. If you need assistance in locating a dealer, visit our website at **www.ditchwitch.com** or write to the following address:

The Charles Machine Works, Inc.
Attn: Marketing Department
PO Box 66
Perry, OK 73077-0066
USA

The descriptions and specifications in this manual are subject to change without notice. The Charles Machine Works, Inc. reserves the right to improve equipment. Some product improvements may have taken place after this manual was published. For the latest information on Ditch Witch equipment, see your Ditch Witch dealer.

Thank you for buying and using Ditch Witch equipment.

**Piercing Tools
(PT20 and PT30)
Operation and Repair Manual**

Issue number 4.0/OM-7/09

Part number 054-075

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This product is covered by one or more of the following patents:

U.S. 5,172,771; 5,327,636; 5,553,676; 6,467,554; 6,644,417; **Germany** 69124461.

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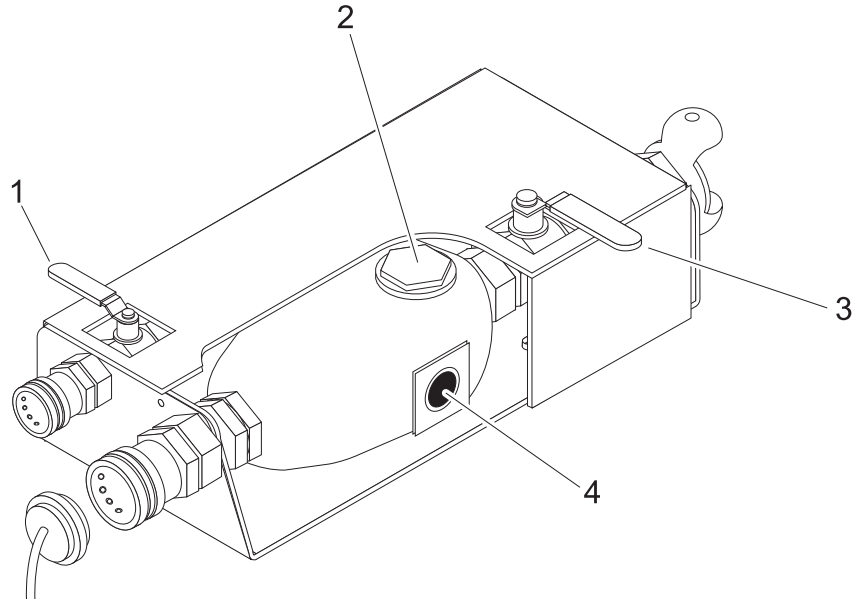
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Controls

Oiler Overview



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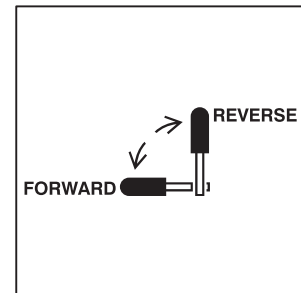
- | | |
|---|----------------------------------|
| 1. Direction control valve
(forward and reverse) | 3. Air supply valve (on and off) |
| 2. Plug | 4. Sight glass |

Oiler Descriptions

Direction Control Valve

This yellow valve controls the direction the tool moves. When moved between FORWARD and REVERSE, it can also be used to discharge air from the tool and twin air hoses.

- Move valve perpendicular to edge of oiler cover to REVERSE to move tool backward.
- Move valve parallel to edge of oiler cover to FORWARD to move tool forward.

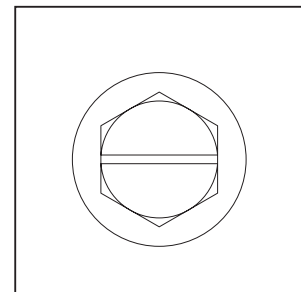


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Fill Plug

Remove fill plug from the oiler with a flat head screwdriver in order to add oil.

- Firmly turn fill plug counterclockwise to remove from oiler.
- Add Pierce Arrow oil.
- Place fill plug on oiler and turn clockwise firmly.

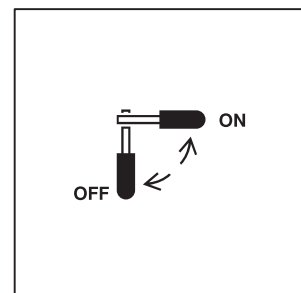


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Air Supply Valve

This green valve controls the amount of air flow that passes through the oiler.

- Move valve perpendicular to edge of oiler cover to OFF to close air supply and stop tool.
- Move valve parallel to edge of oiler cover to ON to open air supply and turn tool on.

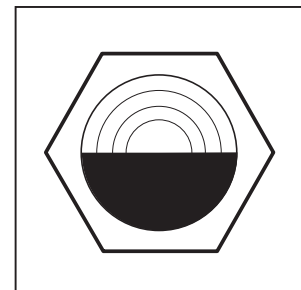


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Sight Glass

This glass is used to monitor the amount of oil remaining in the oiler. When oil level drops below the middle of the glass, stop and fill oiler.

NOTICE: Discharge air from oiler before opening fill plug. For instructions on how to discharge air from the oiler, see “Optimize Oil Flow Rate” on page 56.



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Safety

Follow these guidelines before operating any jobsite equipment:

- Complete proper training and read operator's manual before using equipment.
- Contact One-Call (888-258-0808) and any utility companies which do not subscribe to One-Call. Have all underground pipes and cables located and marked before operating equipment. If you damage a utility, contact utility company.
- Classify jobsite based on its hazards and use correct tools and machinery, safety equipment, and work methods for jobsite.
- Mark jobsite clearly and keep spectators away.
- Wear personal protective equipment. It is highly recommended that electrically insulating boots and gloves be worn on all jobsites.
- Review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins. Safety videos are available from your Ditch Witch dealer.
- Use equipment carefully. Stop operation and investigate anything that does not look or feel right.
- Do not operate unit where flammable gas is present.
- Contact your Ditch Witch dealer if you have any question about operation, maintenance, or equipment use.



When you see this safety alert sign, carefully read and follow all instructions.

YOUR SAFETY IS AT STAKE. Read this entire section before using your equipment.

Underground Hazards

Striking underground hazards can cause explosion, electrocution, fire, and exposure to hazardous materials.

Hazards include:

- Electric lines
- Natural gas lines
- Fiber optic cables
- Water lines
- Sewer lines
- Pipes carrying other chemicals, liquids, or gases
- Storage tanks

Electric Strike Description

When working near electric cables, remember the following:

- Electricity follows all paths to ground, not just path of least resistance.
- Pipes, hoses, and cables will conduct electricity back to all equipment.
- Low voltage current can injure or kill. Most work-related electrocutions result from contact with less than 440 volts.

Most electric strikes are not noticeable, but indications of a strike include:

- Power outage
- Smoke
- Explosion
- Popping noises
- Arcing electricity

NOTICE: If any of these occur, assume an electric strike has occurred.

Emergency Procedures

Before operating any equipment, review emergency procedures and check that all safety precautions have been taken.

If an Electric Line is Damaged

1. **DO NOT MOVE.** Stay where you are.
2. **DO NOT TOUCH ANY EQUIPMENT.**
3. Warn others that an electric line has been hit and that they should stay away.
4. Have someone contact the utility company.
5. Do not resume drilling or allow anyone into area until given permission by electric company.

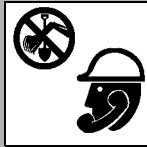
If a Gas Line is Damaged

1. Immediately shut off compressor and remove any ignition sources.
2. **LEAVE AREA** as quickly as possible.
3. Warn others that a gas line has been cut and that they should leave area.
4. Contact emergency personnel.
5. Contact utility company.
6. Do not return to area until given permission by utility company.

If a Fiber Optic Cable is Damaged

Do not look into cut ends of fiber optic or unidentified cable. Vision damage can occur.

Jobsite Classification

**⚠ WARNING**

Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

Inspecting Jobsite

- Follow U.S. Department of Labor regulations on excavating and trenching (Part 1926, Subpart P), and other similar regulations.
- Contact One-Call (888-258-0808) and any utility companies which do not subscribe to One-Call.
- Inspect jobsite and perimeter for evidence of underground hazards, such as:
 - “Buried utility” notices
 - Utility facilities without overhead lines
 - Gas or water meters
 - Junction boxes
 - Drop boxes
 - Light poles
 - Manhole covers
 - Sunken ground
- Have an experienced locating equipment operator sweep area within 20 ft (6 m) to each side of bore path. Verify previously marked line and cable locations.
- Mark location of all buried utilities and obstructions.
- Classify jobsite.

Selecting a Classification

Jobsites are classified according to underground hazards present.

If working . . .	then classify jobsite as . . .
within 10' (3 m) of a buried electric line	electric
within 10' (3 m) of a natural gas line	natural gas
within 10' (3 m) of any other hazard	other

IMPORTANT: If you have any doubt about jobsite classification, or if jobsite might contain unmarked hazards, take steps outlined previously to identify hazards and classify jobsite before working.

NOTICE: This tool is not to be used on jobsites where flammable gas is present.

Applying Precautions

Once classified, precautions appropriate for jobsite must be taken.

NOTICE: The Ditch Witch piercing tool is **NOT** a directional drilling system and has **NO** electric strike system.

Electric Jobsite Precautions

Do not use Ditch Witch piercing tools on an electric jobsite.

Natural Gas Jobsite Precautions

Do not use Ditch Witch piercing tools on a gas jobsite.

Other Jobsite Precautions

You can use a variety of methods to safely avoid other underground hazards. Talk with those knowledgeable about hazards to determine which precautions should be taken or if job should be attempted.

Safety Alert Classifications

These classifications and the icons defined on the following pages work together to alert you to situations which could be harmful to you, jobsite bystanders, or your equipment. When you see these words and icons in the book or on the machine, carefully read and follow all instructions. **YOUR SAFETY IS AT STAKE.**

Watch for the three safety alert levels: **DANGER**, **WARNING** and **CAUTION**. Learn what each level means.



indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



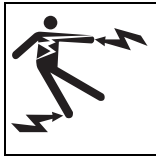
indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Watch for two other words: **NOTICE** and **IMPORTANT**.

NOTICE can keep you from doing something that might damage the machine or someone's property. It can also alert you against unsafe practices.

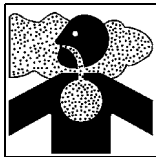
IMPORTANT can help you do a better job or make your job easier in some way.

Safety Alerts



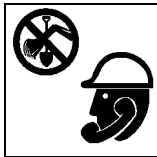
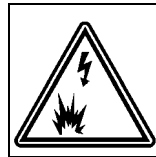
⚠ DANGER

Electric shock. Contacting electric lines will cause death or serious injury. Know location of lines and stay away.



⚠ DANGER

Deadly gases. Lack of oxygen or presence of gas will cause sickness or death. Provide ventilation.



⚠ WARNING

Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.



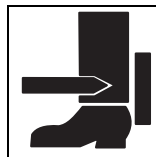
⚠ WARNING

Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.



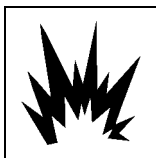
⚠ CAUTION

Fall possible. Slips or trips may result in injury.



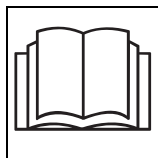
⚠ WARNING

Moving parts could cut off hand or foot. Stay away.

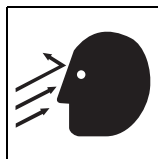


⚠ WARNING

Explosion possible. Serious injury or equipment damage could occur. Follow directions carefully.

**⚠ WARNING**

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

**⚠ WARNING**

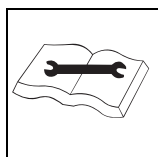
Looking into fiber optic cable could result in permanent vision damage. Do not look into ends of fiber optic or unidentified cable.

**⚠ WARNING**

Fluid or air pressure could pierce skin and cause injury or death. Stay away.

**⚠ WARNING**

Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.

**⚠ WARNING**

Improper control function could cause death or serious injury. If control does not work as described in instructions, stop machine and have it serviced.

**⚠ CAUTION**

Flying objects may cause injury. Wear hard hat and safety glasses.

**⚠ CAUTION**

Exposure to high noise levels may cause hearing loss. Wear hearing protection.

**⚠ CAUTION**

Improper handling or use of chemicals may result in illness, injury, or equipment damage. Follow instructions on labels and in material safety data sheets (MSDS).

Preparation

Gather Information

A successful job begins before the bore. The first step in planning is reviewing information already available about the job and jobsite.

Job Plan

Review blueprints or other plans and make sure you have taken bore enlargement into account. Check for information about existing or planned structures, elevations, or proposed work that may be taking place at the same time.

One-Call Services

Contact your local One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before digging. Also contact any utilities that do not participate in the One-Call service.

Pullback Material

Ask for a sample of the material you will be pushing or pulling back. Check its weight and stiffness. Check that you have appropriate pulling devices.

Traffic Control

If working near a road or other traffic area, contact local authorities about safety procedures and regulations.

Emergency Services

Have the telephone numbers for local emergency and medical facilities on hand. Check that you will have access to a telephone.

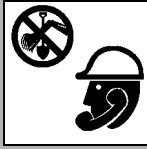
Inspect Site

Inspect jobsite before transporting equipment. Check for the following:

- Overall grade or slope
- Changes in elevation such as hills or open trenches
- Obstacles such as buildings, railroad crossings, or streams
- Signs of utilities (See “Jobsite Classification” on page 16.)
- Traffic
- Access
- Soil type and condition
- Sources of locator interference (rebar, railroad tracks, etc.)

Identify Hazards

Identify safety hazards and classify jobsite (see “Jobsite Classification” on page 16).



⚠ WARNING

Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

NOTICE:

- Wear personal protective equipment including hard hat, safety eye wear, steel-toed boots, and hearing protection.
- Wear electrically insulating boots on all jobsites. Wear high-top boots with legs of pants tucked completely inside. Boots must meet the electric hazard protection requirements of ANSI Z-41, 1991, when tested at 14,000 volts.
- Wear electrically insulating gloves on all jobsites. Gloves must have 17,000 AC maximum use voltage, according to ASTM specification D120-87.
- Do not wear jewelry or loose clothing.
- Notify One-Call and companies which do not subscribe to One-Call.
- Comply with all utility notification regulations before digging or drilling.
- Verify location of previously marked underground hazards.
- Mark jobsite clearly and keep spectators away.
- If jobsite classification is in question or if the possibility of unmarked electric utilities exists, classify jobsite as electric.
- Cutting high voltage cable can cause electrocution. Expose lines by hand before using tool.

Remember, jobsite is classified by hazards in place -- not by line being installed.

Check Supplies

Check to make sure you have the following supplies:

- Receiver/transmitter or tracker with two sets charged batteries (when using the PT30 with optional beacon head)
- Beacons with new and spare batteries (when using the PT30 with optional beacon head)
- Special wrenches for your size of tool (see “Special Service Tools Required” on page 75)
- Optional tool heads (when using the PT30)
- Expanders (when using the PT30)
- Loctite® 242 thread locking compound
- Pullback device
- Product to be installed
- Marking flags or paint
- Highly visible target marker
- Pierce Arrow Summer Oil (p/n 256-611) or Winter Oil (p/n 256-614)
- Duct tape
- Black or red spray paint
- Spray lubricant
- Pipe joint compound and brush (if pushing or pulling back pipe)
- Electrically insulating boots and gloves
- Notepad and pencil

Prepare Equipment



CAUTION

Improper handling or use of chemicals may result in illness, injury, or equipment damage. Follow instructions on labels and in material safety data sheets (MSDS).

Check Fluid Levels

- Fuel in compressor
- Oil in oiler

NOTICE: Do not use ATF or other lubricants. Use only Pierce Arrow Summer Oil (p/n 256-611) or Winter Oil (p/n 256-614).

Check Condition and Function

- Hoses and valves
- Connectors
- Oiler plug
- Launcher
- Pipe stand
- Aiming sight

Check Tailpiece

Be sure to check that tailpiece is tight. If loose, see “Install Tailpiece” on page 92.

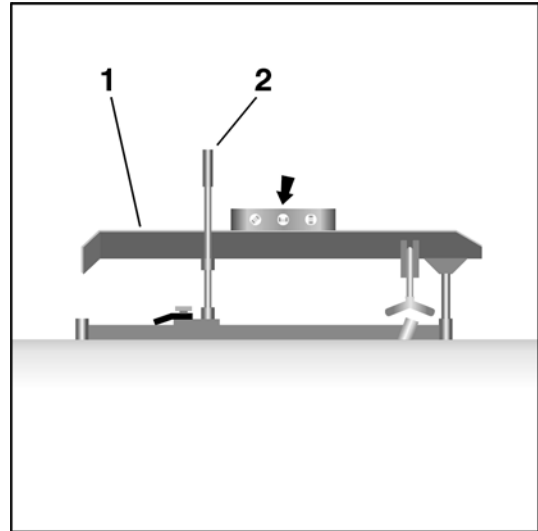
Adjust Optional Aiming Sight

This procedure should be done before the first use of the aiming sight and again only as needed.

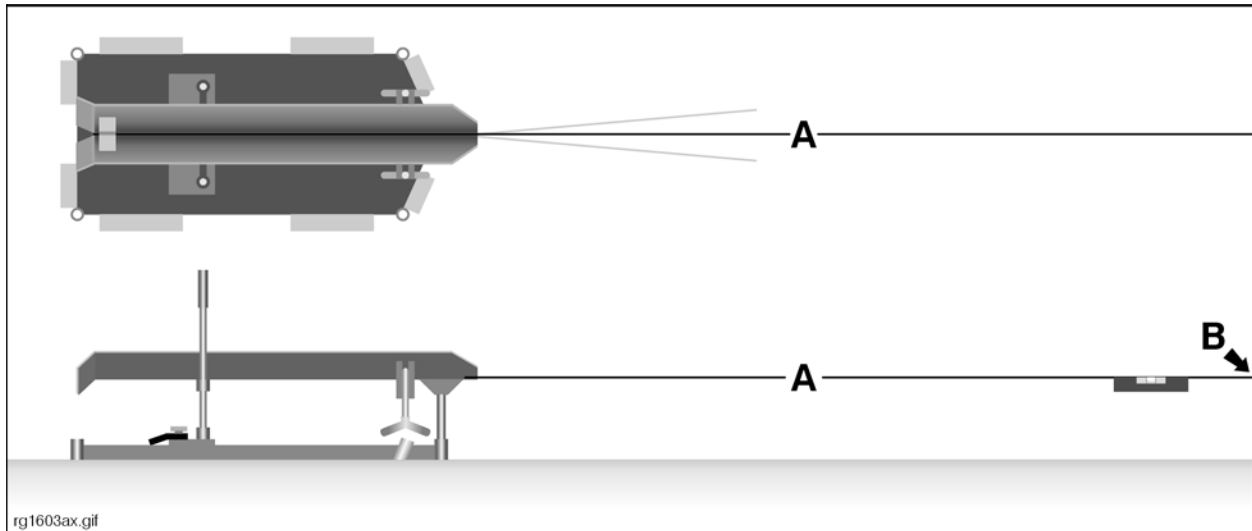
1. Position tool launcher perpendicular to a wall at a distance of at least 20' (7 m).

IMPORTANT: Mark the position of launcher base with tape to ensure that it stays lined up.

2. Place a torpedo level (p/n 259-131) on top of the launcher guide (1).
3. Adjust and level the launcher guide using the tilt adjustment handles (2).
4. When launcher guide is level, tighten tilt adjustment handles to hold launcher guide in position.



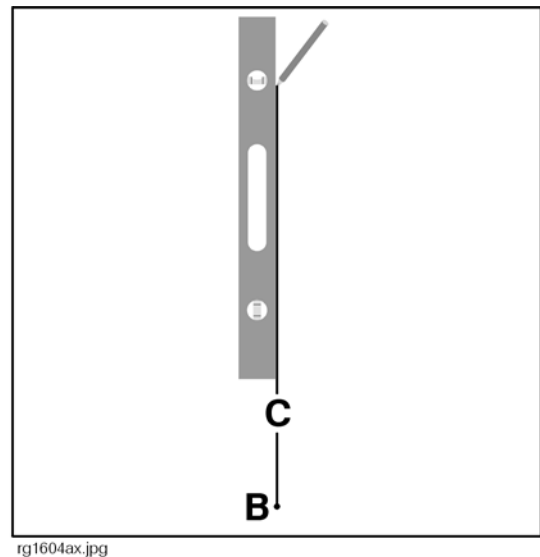
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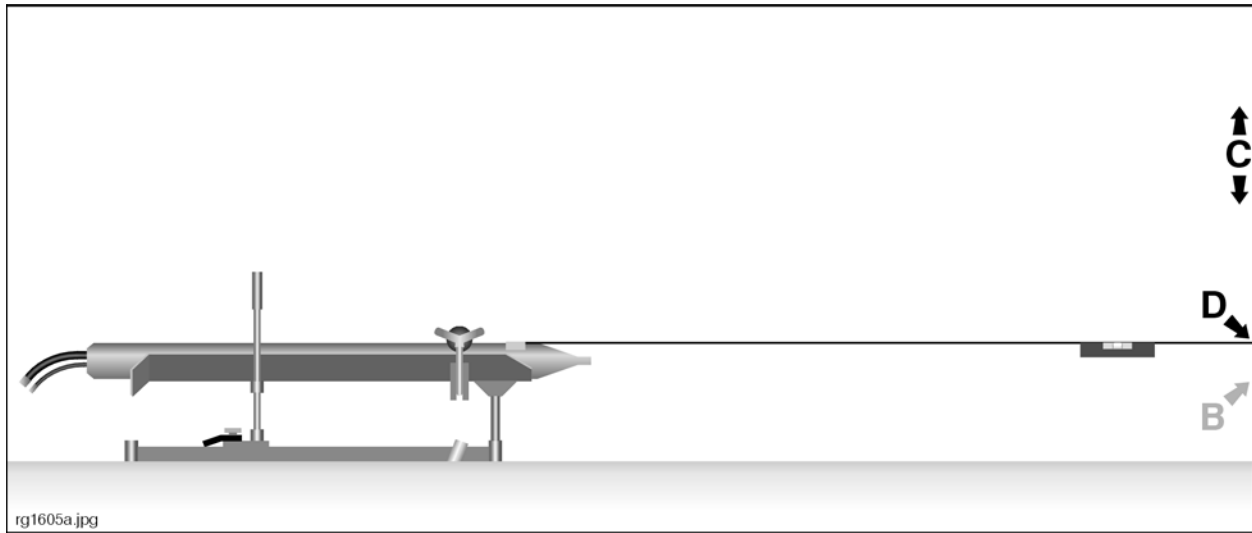


5. Center and tape a string (A) to inside rear of launcher guide.
6. Extend string (A) to the wall and use level to make sure string is level.

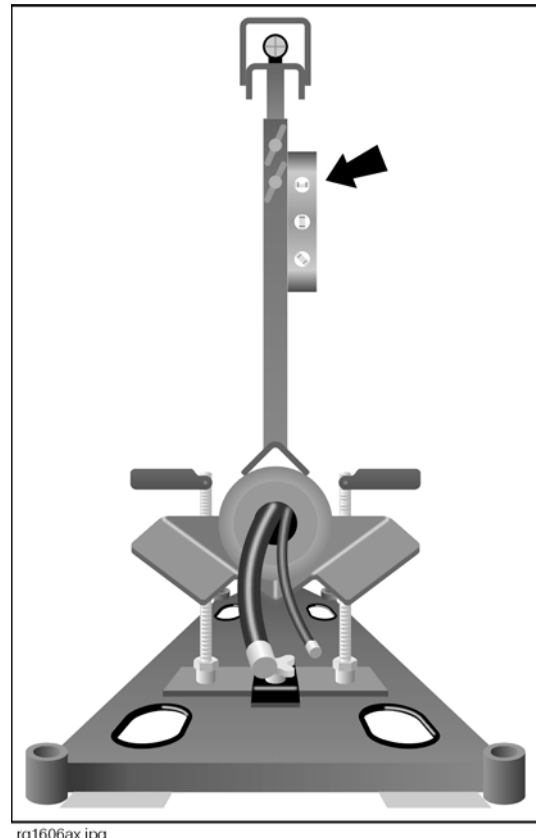
IMPORTANT: Make sure string extends in a straight line as shown and **not** at an angle or settings will be off.

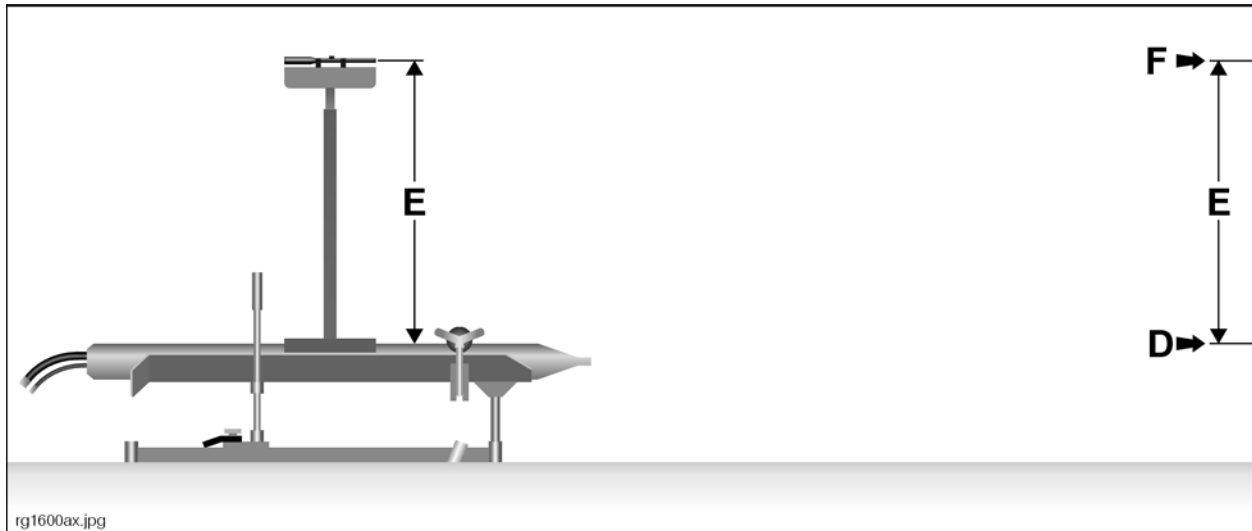
7. Mark a reference point (B) where string contacts wall.
8. Remove string.
9. Use a level to draw a vertical line (C) approximately 6' (1.8 m) upward from reference mark (B).



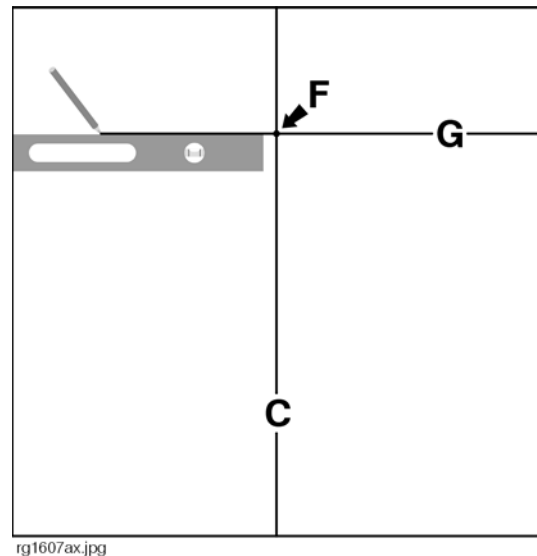


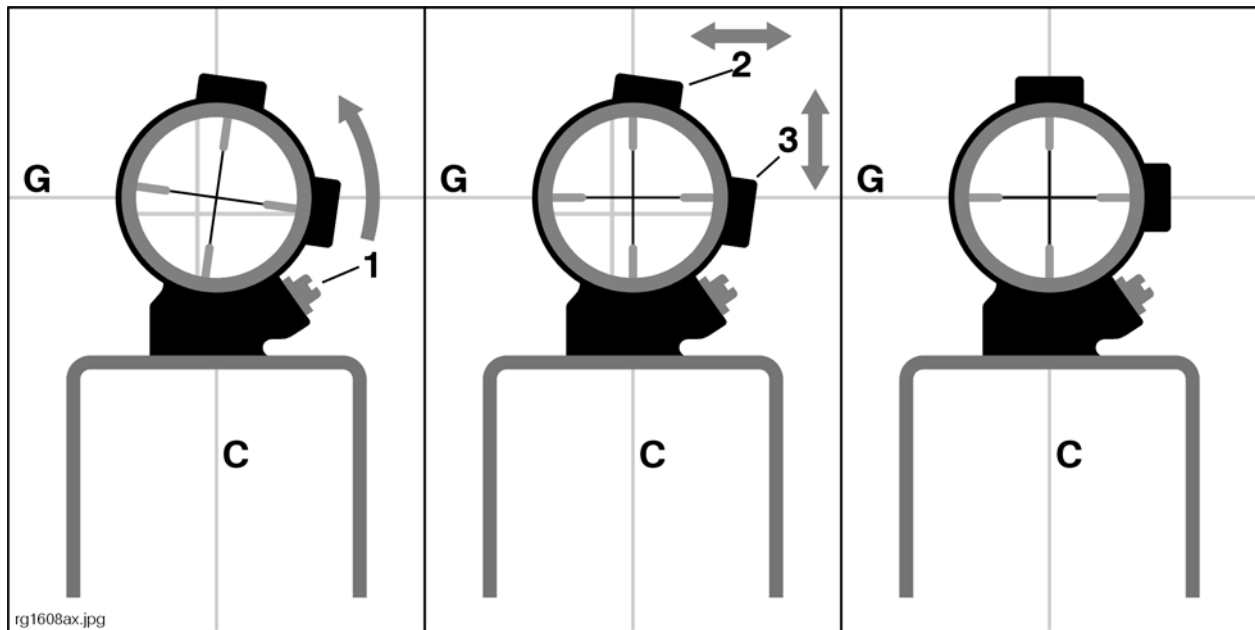
10. Place tool in launcher.
11. Attach a string to top center, front end of tool.
12. Extend string to line (C).
13. Use a level to make sure string is level.
14. Mark point (D) where string meets line (C).
15. Place aiming sight on tool body, loosen wingnuts, and use top extension to adjust scope to comfortable eye level.
16. Tighten wing nuts.
17. Use torpedo level to ensure that aiming sight is level and exactly vertical.





18. Remove scope cover.
19. Measure distance (E) from top of tool to center of aiming sight scope.
20. Remove aiming sight from top of tool.
21. Transfer measurement (E) to vertical line on wall starting at (D) and mark reference point (F) at top of measurement (E).
22. Use a level to draw a horizontal line (G) through the top reference mark (F).
23. Extend line (G) approximately 2' (600 mm) either side of line (C).





24. Place aiming sight on top of tool.
25. Use torpedo level to make sure aiming sight is vertical.

IMPORTANT: Aiming sight uses a rifle scope. Keep your eye a short distance back from scope for proper eye relief.

26. View reference lines (C) and (G) through scope. Scope crosshair intersection may not line up with intersection of reference lines (C) and (G) as shown on left. If not, follow steps 27 through 29 to correct.
27. Loosen two scope clamp screws (1) to rotate scope and align scope crosshair lines and reference lines (C) and (G). Turn scope slightly until vertical crosshair is parallel with vertical line on wall. Knurled eyepiece lock ring may be loosened to adjust focus if necessary.

Note: Be sure to keep aiming sight vertical and level during this procedure.

28. Use set screw (2) to move scope crosshair intersection left or right until vertical crosshair aligns with line C.
29. Use set screw (3) to move scope crosshair intersection up or down until horizontal crosshair aligns with line G.
30. Replace dust caps and scope cover.
31. Tighten two scope clamp screws. Ensure that knurled eyepiece lock ring is loose enough to allow future focus adjustments without having to remove scope cover.

IMPORTANT: Once the initial adjustment procedures are performed, only minor focus adjustments should be needed to view target markers for each bore path. Leave scope cover attached to aiming sight to prevent damage to scope.

Select Start and End Points



WARNING Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, and post appropriate warning signs.

NOTICE: Vehicle and pedestrian traffic must be a safe distance from jobsite. Allow at least 10' (3 m) buffer zone around equipment.

Select one end to use as a starting point. Consider the following when selecting a starting point:

- Slope
Consider how slope will affect setup of piercing tool. Remember that tool tends to rise during a bore. See "Determine Bore Depth" on page 32 to calculate amount of rise.
- Traffic
- Space
Check that starting and ending points allow enough space for changes in tool direction.
Check that there is enough space for operator to maneuver around tool. See "Excavate Pits" on page 41 for recommended width of pit.
- Comfort
Consider shade, wind, fumes, and other site features.

Plan and Mark Bore Path

Plan the bore path from planned entry pit to planned exit pit before starting bore. Bore path can be marked on ground with spray paint or flags, or written on paper for operator reference. End of bore path should be marked with a highly visible stake or post that will be used as a target marker for the aiming sight, tool, and launcher.

For complicated bores, consult an engineer. Have jobsite surveyed and bore path calculated. Be sure engineer knows minimum entry pitch, pipe lengths, and location of all underground utilities.

For less complicated paths, the bore will be limited by entry pitch, location of all underground utilities, and minimum depth.

Determine Bore Depth

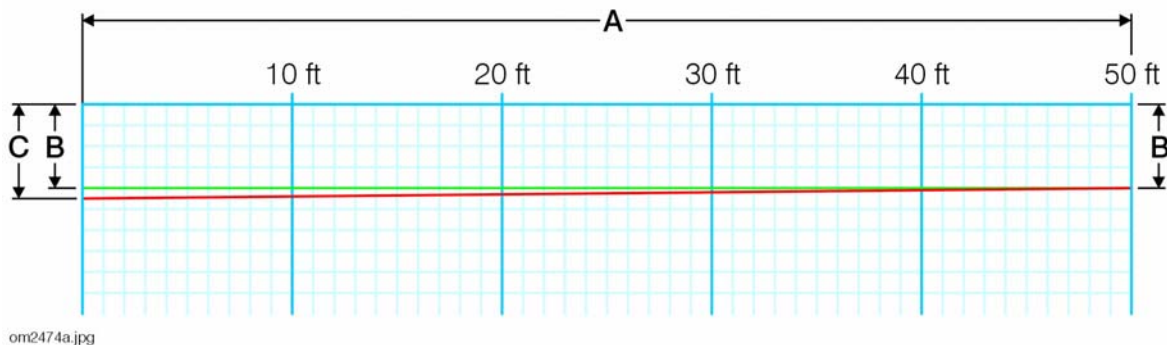
Starting depth of tool is affected by rise, tool size, and soil type.

According to Rise

The piercing tool rises in most soils. To allow for rise in most soil conditions, start tool in entry pit below planned target pit depth. Starting depth of tool should be lowered 1/8-1/4 in for each foot or 10-20 mm for each meter of compaction bore.

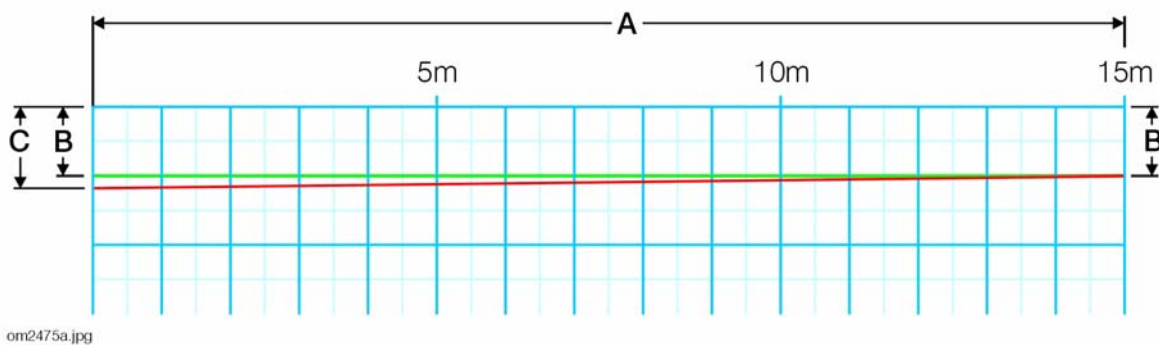
EXAMPLE:

US: If the bore needs to be 4' deep at the target pit (B) and is 50' long (A), then multiply 50 by 1/8 (.125), add the result to 4' and start tool at 4' plus 6-1/4 in (C). (Convert fractions to decimals if using calculator.)



$$50 \times .125 \text{ in} + 4' = 4' 6.25 \text{ in}$$

METRIC: If the bore needs to be 1 m deep at the target pit (B) and is 15 m long (A), then multiply 15 m X 10 mm or 15 X 10, convert to meter (.15), add the result to 1 m, and start tool at 1.15 m (C).



$$15 \times 10 \text{ mm} + 1 \text{ m} = 1.15 \text{ m}$$

Note: Experience will help you determine appropriate starting depths for various soil types.

According to Tool Size

When using a piercing tool, bore depth should be at least ten times the tool's diameter to prevent soil mounding. Measure bore clearance from lowest point of any structure or surface that soil movement may damage.

EXAMPLE:

If you are using the PT30 (3 in or 76 mm) tool . . .

Multiply 10 X 3 in (76 mm) and start initial compaction bore depth at least 30 in (760 mm) deep.

Note: If using an expander, calculate bore depth using diameter of expander at widest point.

According to Soil Type

When boring in hard soil, launch tool deeper to prevent soil mounding. For information on soil types, see "Evaluate Soil Type" on page 35.

Note: Experience will help you determine appropriate starting depths and clearances for various soil types and conditions.

Record Bore Path

As job is completed, record actual bore path. If initially you are only doing a bore, list pitch and depth of bore at regular intervals (1 yd or 1 m). In addition, draw a simple sketch of the site and record depth and rough location of any materials pulled back.

Setup



⚠ WARNING

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.



⚠ WARNING

Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.



⚠ WARNING

Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.

Evaluate Soil Type

Carefully select and prepare jobsite. Take soil samples from several locations along bore path to determine the best head for soil conditions. The following soil types and conditions will affect the tool's operation and help you determine if the Ditch Witch piercing tool is suitable for the job.

Soil type	Suitability of tool
soft, compressible soil	excellent
porous soil (coral, sandstone)	poor
sand	not suitable
solid rock	not suitable

NOTICE: Extremely wet conditions can cause loss of performance due to decreased friction on the tool body. Extremely cold conditions may cause the exhaust ports to plug with ice. Operators should use their best judgment in these situations.

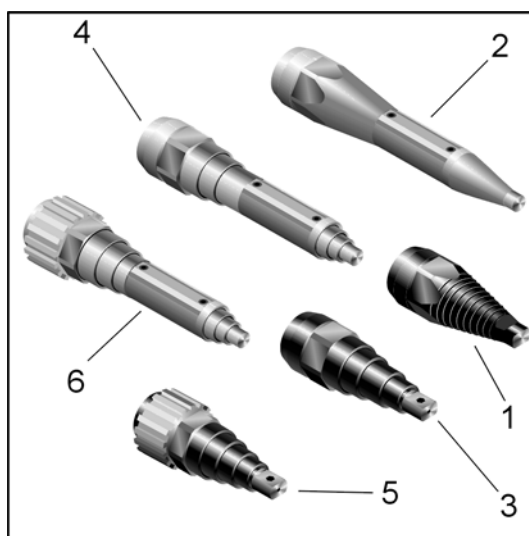
Once you have determined the soil type, use the following table to determine which head is most suitable for soil conditions.

Head type	Suitable for
tapered	wet, spongy, or loose soil conditions with no anticipated obstructions
stepped head	hard, dry, compacted soil conditions
splined stepped head	compacted soil conditions where small obstructions are likely to be encountered

Optional Tool Heads

Optional tool heads are available for the PT30. Optional heads come in a variety of styles for different soils or uses.

- | | |
|------------------------|--------------------------------|
| 1. tapered | 4. stepped side beacon |
| 2. tapered side beacon | 5. splined stepped |
| 3. stepped | 6. splined stepped side beacon |



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Optional Beacon Head

For greater efficiency, the Ditch Witch Trac Management System (TMS) is available for plotting and tracking your bore path. It utilizes a Ditch Witch tracker, display, a tracking beacon, and special software. The system can be run in the field using a laptop computer equipped with the Windows® 95 or higher operating system.

Note: Tapered, stepped, and splined stepped beacon heads are available for PT30 tools. For further information about TMS, see your Ditch Witch dealer.



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Install Optional Tool Head

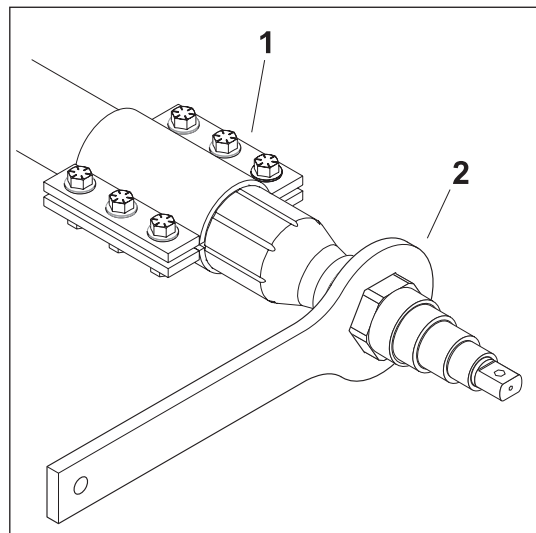
(PT30 models only)

NOTICE:

- Always clean mud and dirt from outside of tool before installing expanders. When removing or installing any tool accessory, do not use pipe wrenches or other tools that could cause damage to tool body.
- Before beginning, see “Special Service Tools Required” on page 75. Use clamp wrench to hold tool body in vise and prevent tool body damage.

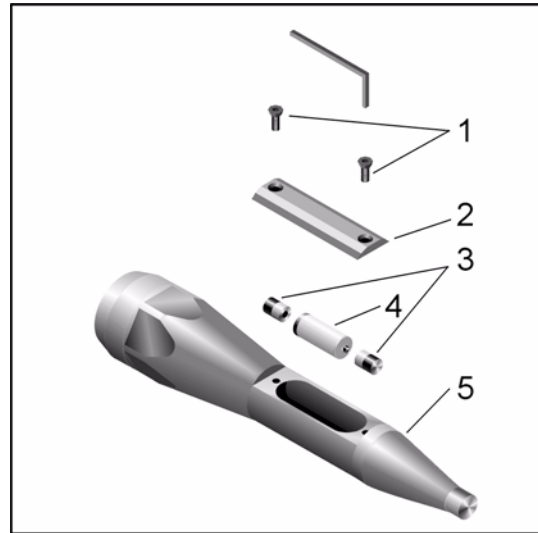
1. Place tool on work surface and remove anvil cover.
2. Install special clamp on tool body near nose end (1). Orient clamp so that bolts are aligned with flats.
3. Install 6 bolts, washers and nuts and hand tighten.
4. Tighten bolts in crossing pattern to 20 ft•lb (27 N•m).
5. Place clamp in vise and use tool head wrench (2) to remove/install tool heads.

NOTICE: Grip directly behind the splined section of tool body.



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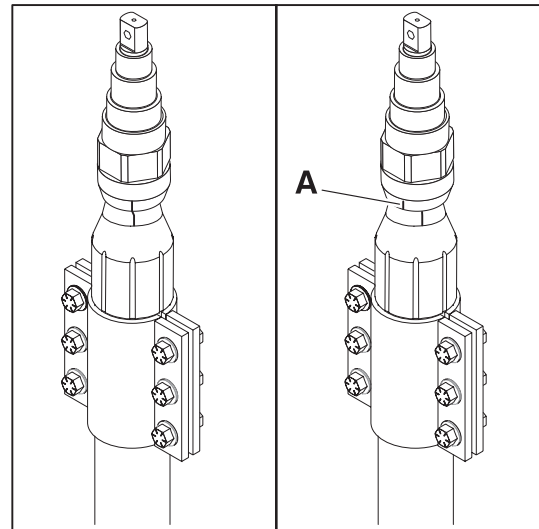
6. If installing a beacon head, place beacon (4) and padding (3) into clean beacon head housing.
7. Use Loctite® 242 on cap screws (1) to attach beacon cover (2).
8. Tighten cap screws to 300-400 ft•lb (407-542 N•m) using hex wrench supplied with beacon head.



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9. Apply Loctite® 242 to cleaned threads of tool head or beacon head.
10. Install tool head or beacon head and tighten using tool head wrench.
11. Mark a scribe line across both tool head and tool body.
12. Strike tool head wrench with sledge until scribe lines (A) are separated 1/2 to 5/8 in (13 to 16 mm).

IMPORTANT: If clamp bolts are fully torqued, tool will not be damaged.



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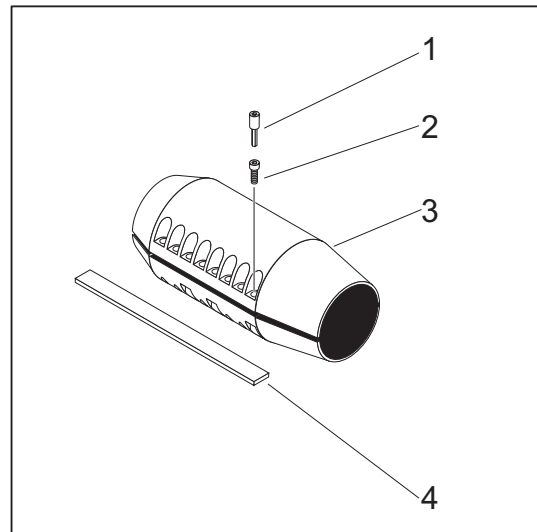
Install Optional Expander

(PT30 only)

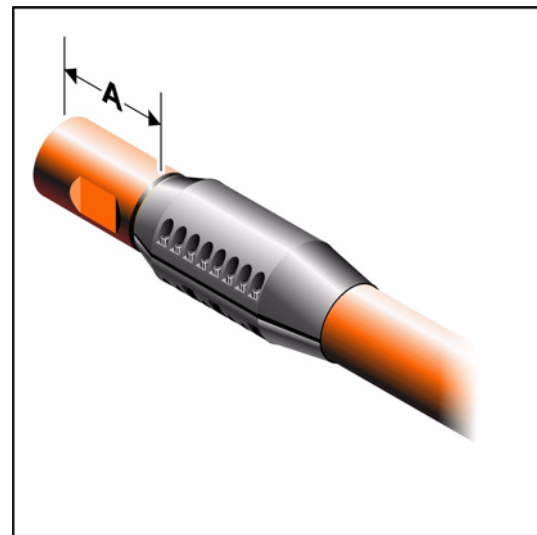
Bolt-on expanders are available for the PT30. Expanders can accomplish a larger diameter bore in a single pass.

NOTICE: Always clean mud and dirt from outside of tool before installing expanders. When removing or installing any tool accessory, do not use pipe wrenches or other tools that could cause damage to tool body.

1. Remove tailpiece (see “Remove Tailpiece” on page 79).
2. Remove bolts (2) from expander using hex socket (1) supplied with expander and start four bolts into deep threaded holes on bottom side of expander.
3. Place clamp strip (4) into expander slot. Strip is used to spread the expander to ease installation and should not protrude into body bore of expander.
4. Finger tighten bolts against clamp strip to hold strip in place.
5. Tighten bolts alternately to spread expander.
6. Slide expander over tool body from the tailpiece end.
7. Slide expander forward 7 in (178 mm) for clearance (A) to install tailpiece.
8. Install tailpiece. See “Install Tailpiece” on page 92.
9. Once expander is positioned, remove bolts and clamp strip. Save the clamp strip for future use.



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om0618h.jpg

10. Apply Loctite® 242 to expander bolt threads.
11. Install all bolts into the top holes of expander.

NOTICE: Do not over-tighten bolts.

12. Use hex socket to tighten bolts evenly in alternating pattern until each bolt is torqued to 32 ft•lb (43 N•m).
13. Strike expander several times with ballpeen hammer on side opposite slot. Check fastener torque and tighten again if necessary.
14. Repeat striking and tightening procedure until fasteners do not loosen when expander is struck.
15. After tightening bolts, ensure that striker moves freely inside tool body.

NOTICE: Tighten fasteners to correct torque to prevent fasteners from working loose during tool operation. Check fastener torque before and after each use of tool.

Excavate Pits



⚠ WARNING

Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.



⚠ CAUTION

Fall possible. Slips or trips may result in injury.



⚠ WARNING

Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.



⚠ WARNING

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

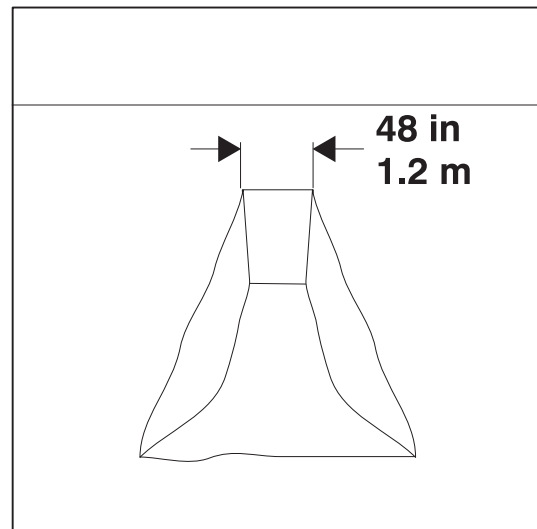
NOTICE: Read, understand, and follow U.S. Department of Labor regulations on confined spaces, excavating, and trenching.

Entry Pit

Dig an entry pit long enough to house launching tool and piercing tool.

Pit must be wide enough for operator to maneuver around tool. A width of at least 48 in (1.2 m) is recommended.

Pit must also be deep enough to launch tool at appropriate depth. See “Determine Bore Depth” on page 32.

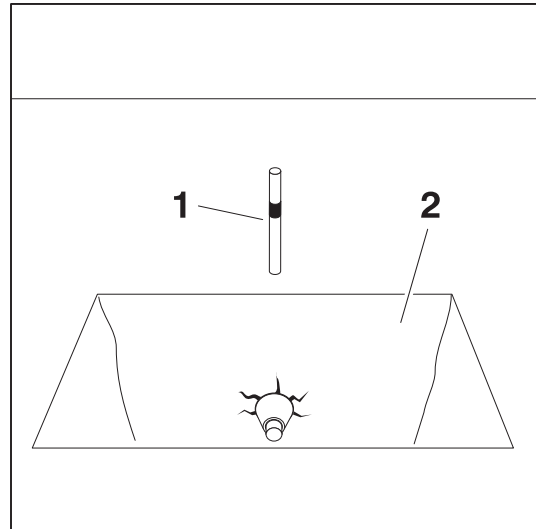


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Target Pit

Most bores require a target pit (2) to verify that the target is reached. Using a beacon head and tracking system will allow you to dig just before the bore is complete and keep the target pit small.

1. Mark end of bore path with a highly visible target marker (1). This will be used as a target for the aiming sight, tool, and launcher.
2. If a beacon is not used, dig a target pit deep and wide enough to allow 2' (600 mm) below and on either side of the target.



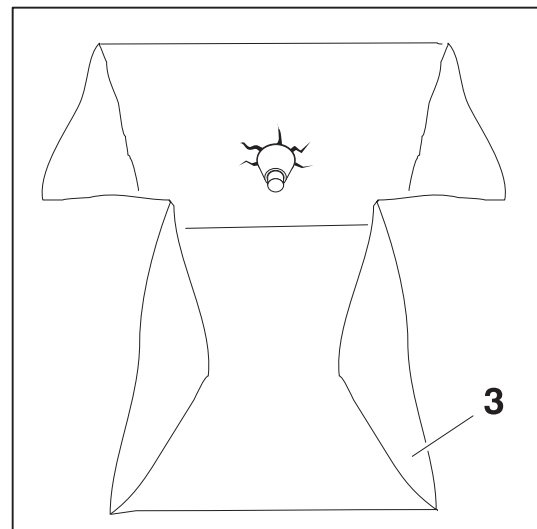
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Exit Pit

For most bores, an exit pit (3) is needed to remove the tool.

IMPORTANT: No exit pit is needed if tool will be reversed and backed out of bore.

1. Dig exit pit after tool enters target pit.
2. If material will be pulled back, dig exit pit to accommodate length and flexibility of pullback material.



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Set Oil Flow Valve

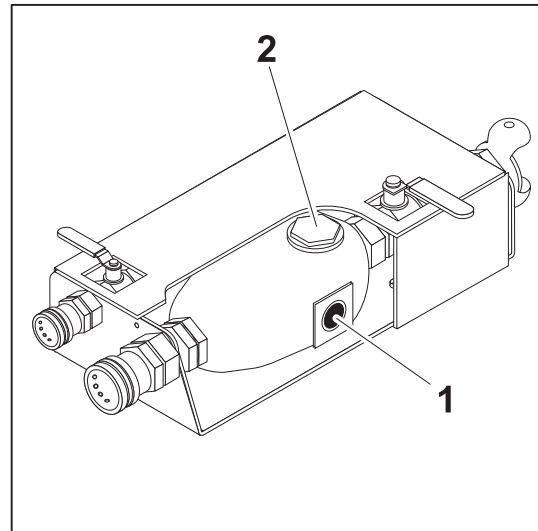


CAUTION

Improper handling or use of chemicals may result in illness, injury, or equipment damage. Follow instructions on labels and in material safety data sheets (MSDS).

1. Before connecting the oiler to the hoses, remove fill plug (2).

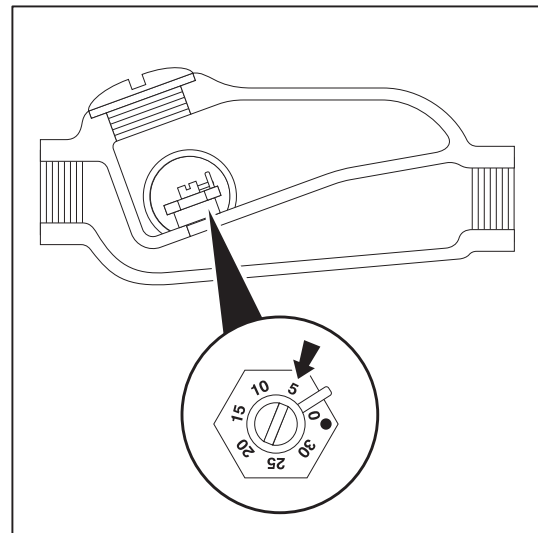
IMPORTANT: Set oiler on a flat, level area.



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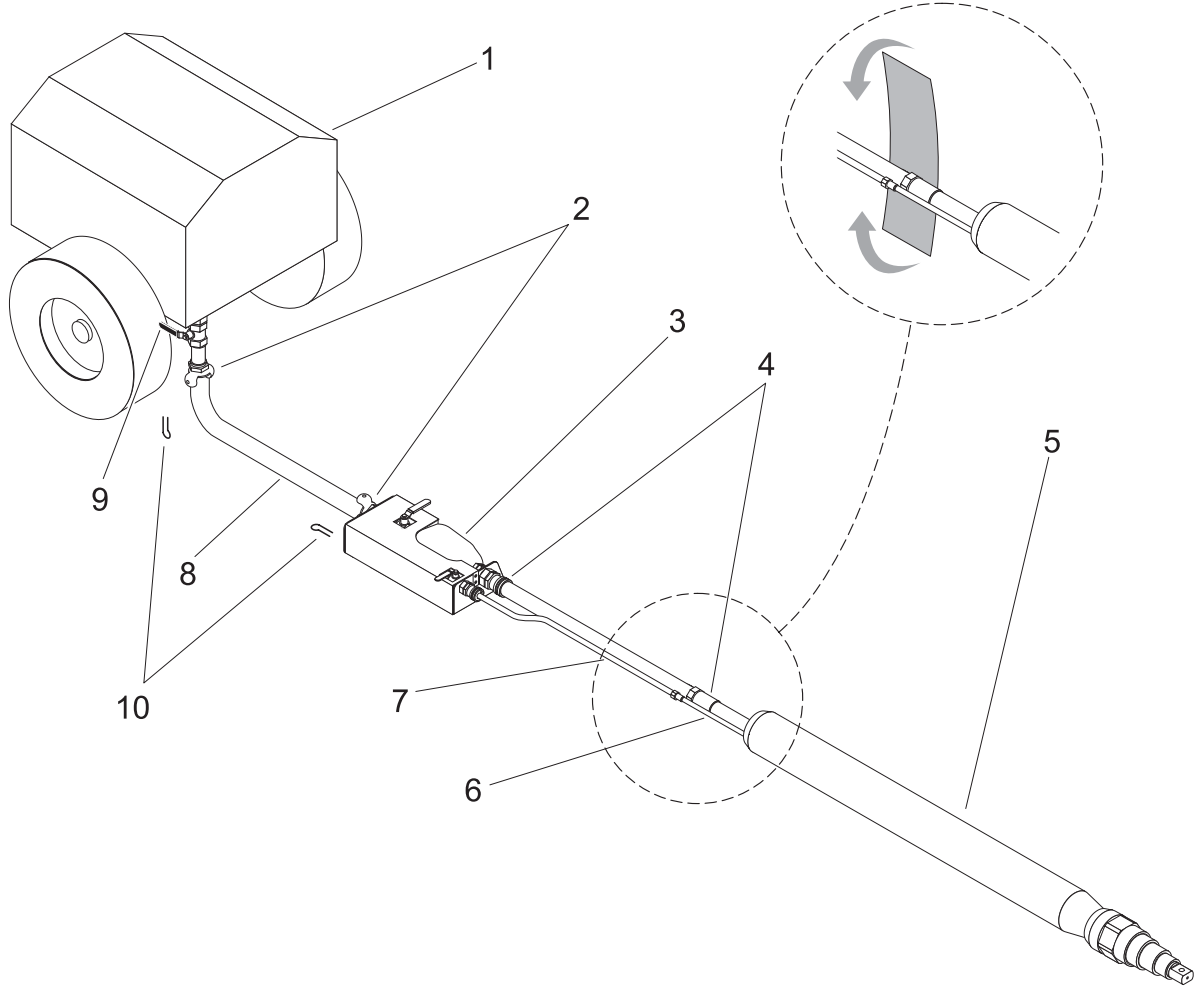
2. Locate internal flow valve and use a flat blade screwdriver to turn adjustment screw slot to 5.
3. Securely replace fill plug.

IMPORTANT: For more oil flow adjustments see “Adjust Oil Flow” on page 54 and “Optimize Oil Flow Rate” on page 56.



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Equipment Setup Overview



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- | | |
|------------------------------------|--|
| 1. Compressor | 6. Hose whips (wrap couplings with tape) |
| 2. Two-claw couplers | 7. Twin air hose |
| 3. Oiler | 8. Compressor hose |
| 4. QDC (quick disconnect coupling) | 9. Compressor control valve |
| 5. Tool body | 10. Coupling clips |

Connect Hoses

Compressor Hose

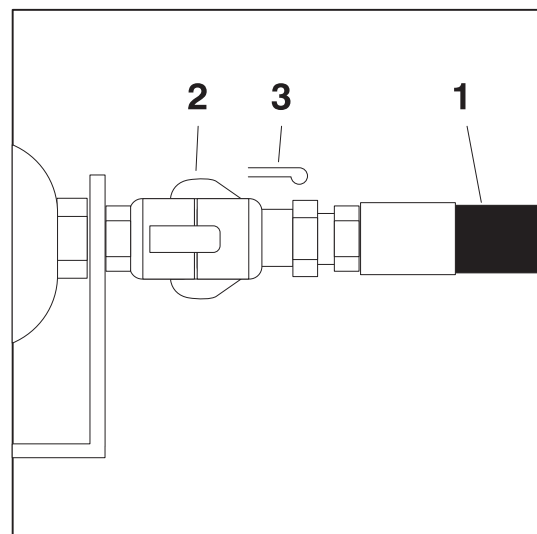


CAUTION

High pressure. Flying objects may cause injury. Wear hard hat and safety glasses. If couplings are not securely connected, air hoses could come loose and cause serious injury.

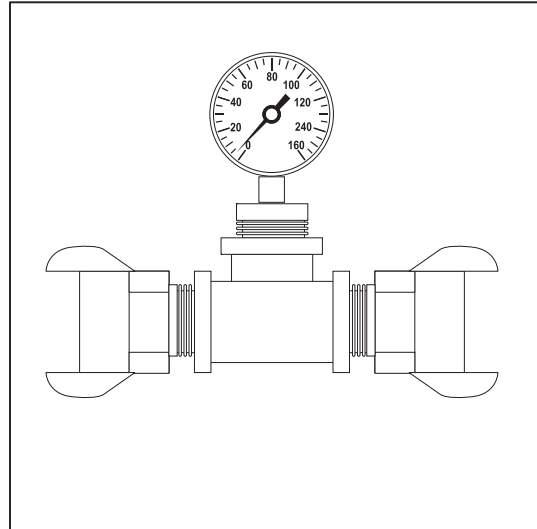
1. Check couplings. Make sure all gaskets are securely seated.
2. Connect compressor hose to compressor.
3. Install coupling clip (3).
4. Turn compressor on and blow air through the compressor hose to flush out possible debris.
5. Turn off compressor.
6. Connect compressor hose (1) to oiler using coupling clip at two-claw coupler (2).
7. Check that air supply valve on oiler is closed.
8. Turn compressor on again.

IMPORTANT: Pressure at tool should be 110 psi (7.5 bar) for proper operation.



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To determine pressure more easily, use inline pressure gauge (p/n 217-542) installed between oiler and compressor hose to determine pressure.

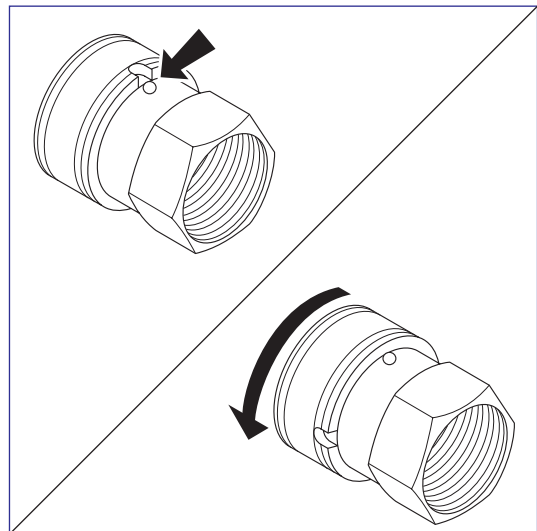


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Hoses With QDC Couplers

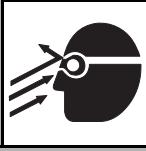
1. After connecting hoses using QDC couplers, turn outer collar notch 180 degrees opposite the positioning ball.
2. To disconnect, align notch and ball (arrow) and slide collar back.

IMPORTANT: Turning collar so that notch is opposite the ball prevents accidental disconnection.



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Oiler Hoses



⚠ WARNING

Fluid or air pressure could pierce skin and cause injury or death. Stay away.



⚠ CAUTION

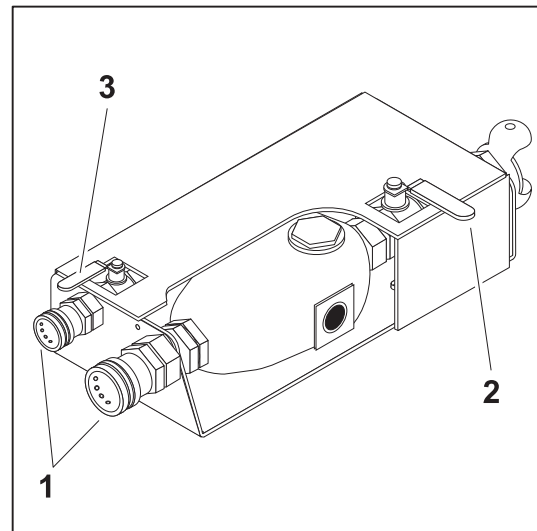
Flying objects may cause injury. Wear hard hat and safety glasses.

IMPORTANT: Monitor the progression of the tool through the bore by marking the twin air hose in equal increments. For additional accuracy, measure length of bore. Measure the same distance from front of tool along hose. Mark distance of bore on hose.

1. Check twin air hose couplings. Make sure all gas-kets are securely seated.
2. If the hose is new, pour 2 oz (60 ml) of Pierce Arrow oil into hose at oiler end to coat lining.
3. Connect twin air hose to oiler at QDCs (1).
4. Slowly move air supply valve (2) to ON.
5. Move direction control valve (3) to FORWARD to flush possible debris out of both twin air hoses.

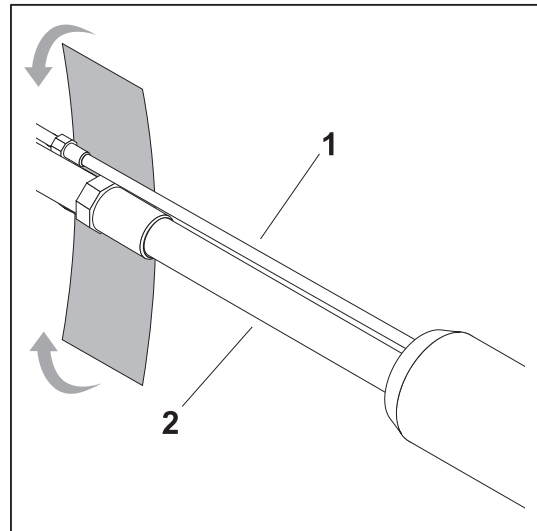
NOTICE: Secure hose ends firmly. Loose hoses can whip and cause injury or become contaminated by dirt.

6. After flushing debris, move air supply valve to OFF.
7. Check connections again and tighten if necessary.



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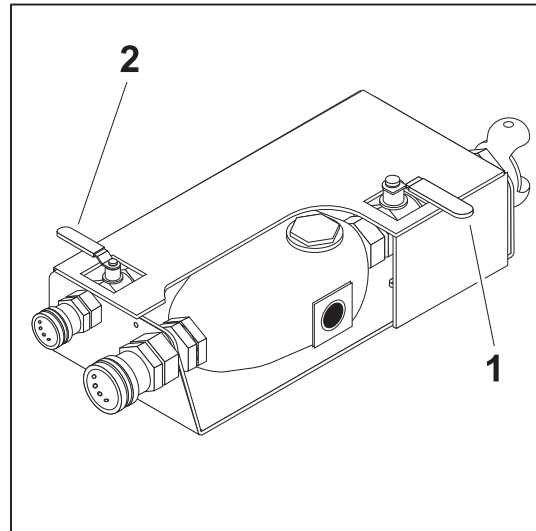
8. Connect twin air hose to tool hose whips (1,2).
9. Tape couplings to keep dirt and other contaminants out.



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Start and Test Tool

1. Ensure that air supply valve (1) on oiler is in OFF position.
2. Start compressor.
3. Move air supply valve to ON in one quick motion.
4. Once tool starts operating, slowly move air supply valve toward OFF until tool operates slowly.
5. Move direction control valve (2) to FORWARD. Tool should move forward.
6. Move direction control valve (2) to REVERSE. Tool should move backward.
7. Move direction control valve back to FORWARD.
8. Move air supply valve to OFF. Tool should stop moving.



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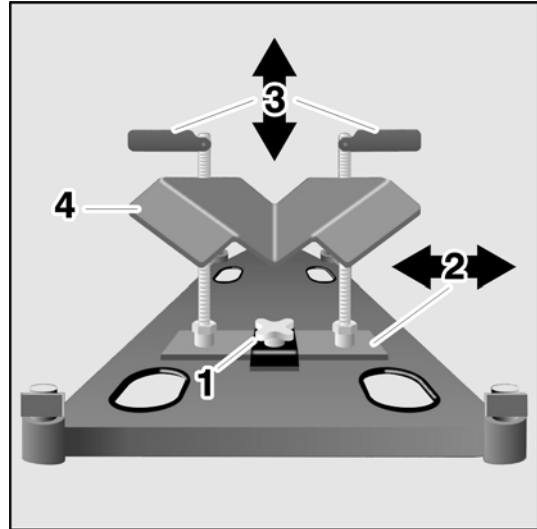
If tool does not work as indicated, see “Troubleshooting” on page 69.

NOTICE: When reversing the tool in a bore, keep tension on the twin air hoses to prevent tool from backing up over the hoses, kinking them, and restricting the air supply to the tool. If air supply is cut off, tool will stop and have to be dug up.

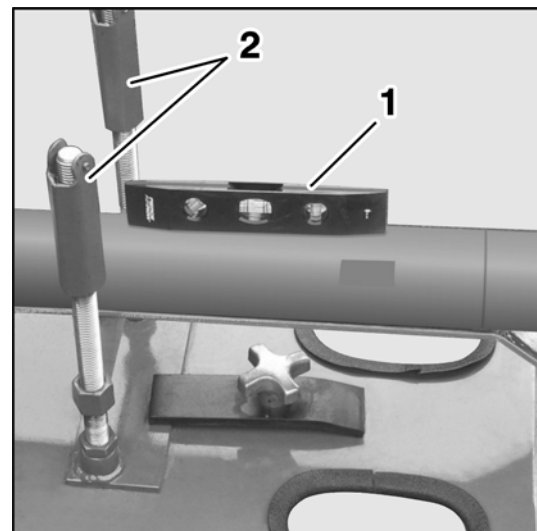
Set Up Launcher and Tool

IMPORTANT: Remember to start tool below target 1/8-1/4 in for each foot (10-20 mm for each meter) of bore. See "Determine Bore Depth" on page 32.

1. Place launcher in pit with roller end of launcher guide as near to the entry point as possible.
2. Closely align launcher with bore path.
3. Stake down launcher pad being careful to keep launcher guide aligned with bore path.
4. Loosen adjustment knob (1).
5. Set tool on top of launcher guide (4) with tool nose toward the entry point.
6. Set aiming sight on top of tool and hold in place.
7. Loosen wingnuts on aiming sight and extend aiming sight to needed height.
8. Tighten wingnuts.
9. Move left/right adjustment plate (2) until crosshairs of the aiming sight are centered on the target marker.
10. Tighten adjustment knob (1) securely.
11. Once launcher and tool are correctly aligned with target marker, remove aiming sight from launcher.
12. Place torpedo level (1) on top of tool.
13. Adjust pitch of tool by turning tilt adjustment handles (2) until tool is at desired pitch.
14. Remove level from tool.

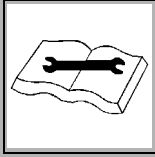


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Operation

**⚠ WARNING**

Improper control function could cause death or serious injury. If control does not work as described in instructions, stop machine and have it serviced.

**⚠ WARNING**

Crushing weight. If load falls or moves, it could kill or crush you. Use proper procedures and equipment or stay away.

**⚠ WARNING**

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

**⚠ CAUTION**

Exposure to high noise levels may cause hearing loss. Wear hearing protection.

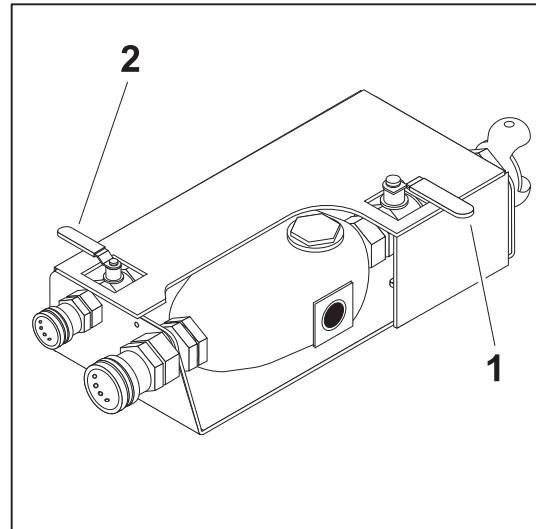
NOTICE: When reversing the tool, keep tension on the twin air hoses to prevent tool from backing up over the hoses, kinking them, and restricting the air supply to the tool. If air supply is cut off, tool will stop and have to be dug up.

IMPORTANT: Monitor sight glass frequently to ensure oiler does not run out of oil.

Execute Bore

Verify Oil Flow

1. Move direction control valve (2) on oiler to FORWARD.
2. Move air supply valve (1) to ON in one quick motion.
3. After tool starts operating, slowly move air supply valve toward OFF until tool operates slowly.



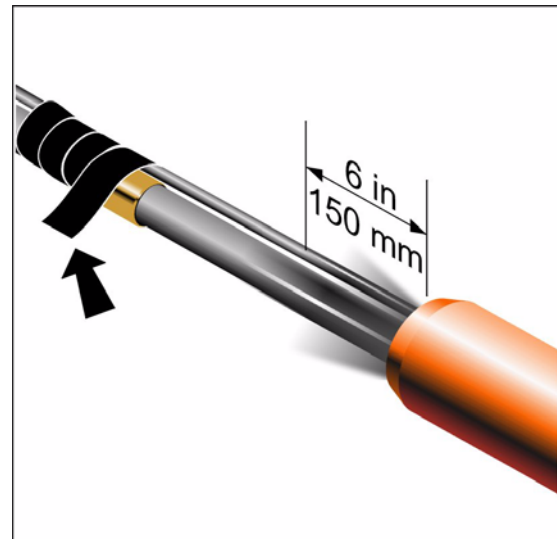
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4. Inspect hose whips at rear of tool after operating tool for a short time.

When oil flow is correct, oiler should use 4 to 6 oz (120 to 180 ml) of oil per hour and 6 to 8 in (150 to 200 mm) of the hose whips should be lightly coated with oil as shown.

NOTICE: If hose whips are not coated as shown or oiler is not using correct amount of oil, see "Adjust Oil Flow" on page 54.

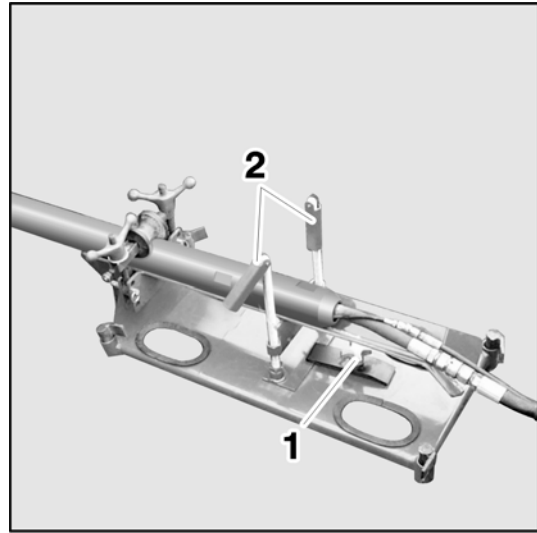
IMPORTANT: Wrap hose couplings with tape to keep dirt and other contaminants out.



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Bore

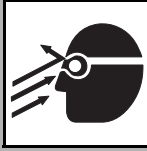
1. Ensure that tool stays firmly against pit wall until tool is at least 1' (300 mm) in ground.
2. Move air supply valve to OFF to stop tool.
3. Check direction with aiming sight and pitch with level.
4. If direction adjustment is needed, loosen adjustment knob (1) and move left/right adjustment plate underneath to adjust tool direction.
5. If pitch adjustment is needed, turn tilt adjustment handles (2) on launcher until tool is at desired pitch.
6. Repeat check as needed until tool is completely in ground (at least every 1' or 300 mm).
7. When tool is in the ground and aimed correctly, move air supply valve all the way to ON.
8. If tool is completely in the ground and is deflected away from bore path or stops making progress, move direction control valve to REVERSE and back tool completely out of bore.



NOTICE: When reversing the tool in a bore, keep tension on the twin air hoses to prevent tool from backing up over the hoses, kinking them, and restricting the air supply to the tool. If air supply is cut off, tool will stop and have to be dug up.

9. Once tool is completely out of bore, move launcher a short distance to vary the entry point and repeat steps in "Set Up Launcher and Tool" on page 50. Repeat steps 1-8 above.

Adjust Oil Flow

**WARNING**

Fluid or air pressure could pierce skin and cause injury or death.

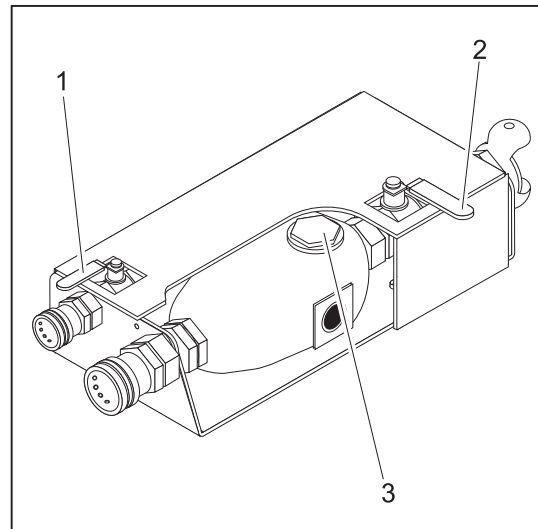
NOTICE: To prevent serious injury, do not attempt to remove fill plug with oiler under pressure. If pressure in oiler is not discharged before fill cap is opened, cap could cause injury or death.

**CAUTION**

Flying objects may cause injury. Wear hard hat and safety glasses.

NOTICE: Even after discharging air pressure, oiler reservoir may still be pressurized. Keep face and upper body away from oiler as fill plug is removed.

1. Close air supply valve at compressor and move air supply valve (2) on oiler to OFF.
2. Discharge air pressure by turning direction control valve (1) to halfway between REVERSE and FORWARD as shown.
3. Once pressure is discharged, carefully remove fill plug (3) from oiler reservoir.



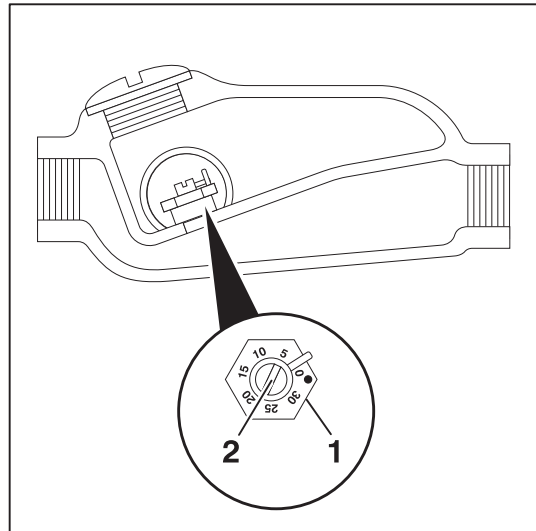
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4. Visually locate oil flow valve (1) and adjustment screw (2) inside oiler reservoir.
5. To adjust oil flow, use flat blade screwdriver to turn adjustment screw (2) on valve. Turn adjustment screw slot to higher number for more oil flow or lower number for less flow.

NOTE: Flow rate adjustment markings are from 0 to 30.

6. Replace fill plug before opening air supply valves at oiler and compressor.

NOTICE: Monitor oil level to ensure that oil flow is 4-6 oz/hr (120-180 mL/hr). If this adjustment corrects oil flow, see page 53. If this adjustment does not correct oil flow, see "Optimize Oil Flow Rate" on page 56.



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Optimize Oil Flow Rate

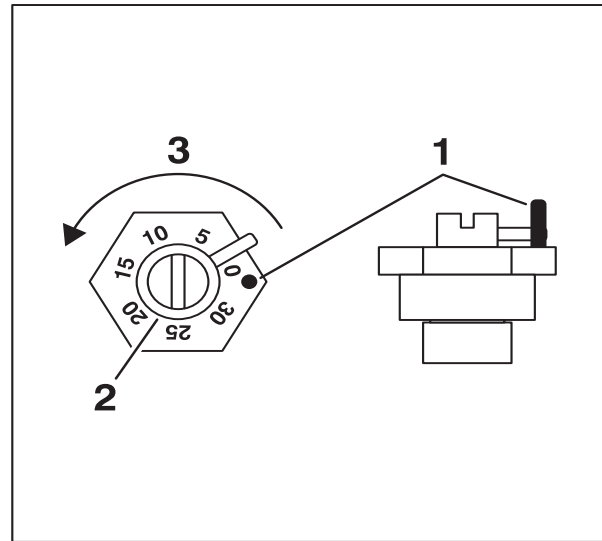
The oil flow rate can be increased beyond normal adjustments by removing the oil flow valve from the oiler and relocating the stop pin in relation to the adjusting screw. Increasing the adjustment limit in this way allows greater oil flow.

To optimize oil flow:

1. Discharge air pressure from oiler and remove fill plug.

NOTICE: See "Adjust Oil Flow" on page 54 for correct procedure in removing fill plug.

2. Remove oil flow valve from inside oiler reservoir using a 3/4-in (19-mm) thin wall socket.
3. Remove stop pin (1) from valve by pulling straight up with pliers. Be careful not to bend or damage pin.
4. Loosen adjustment screw (2) one full turn counterclockwise (3) past stop pin (1).
5. Replace stop pin and install oil flow valve into oiler.
6. Replace fill plug before opening air supply valves at oiler and compressor.



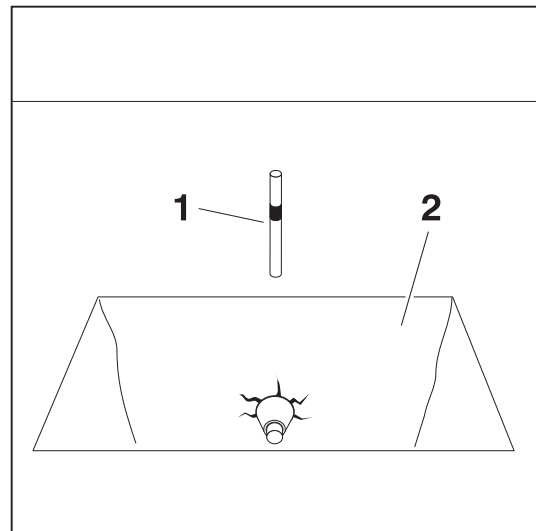
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Exit Bore



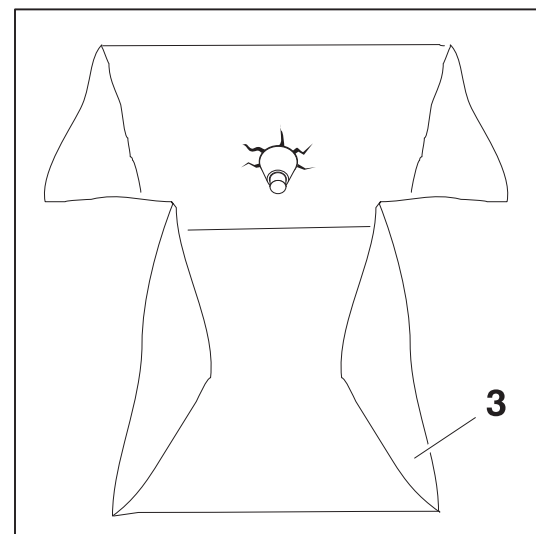
WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

1. When nose of tool appears in target pit (2), move air supply valve to OFF to stop tool.
2. Remove target marker (1).



om2477ax.eps

3. Dig exit pit (3).
4. Move air supply valve to ON and restart tool.
5. Support tool as it exits the bore. Protect hose whips.
6. Move air supply valve to OFF and turn compressor off.
7. Move direction control valve halfway between FORWARD and REVERSE and completely discharge air from oiler.
8. Disconnect hose whips from twin hose and install dust caps or tape ends.
9. Lift tool out of pit using sling and backhoe, if necessary. Do not lift by hose whips.
10. Return to entry pit and pull twin hose back through bore.



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IMPORTANT: If twin air hose will be used to pull a cable or other pullback device through the bore, do not remove from bore until device is properly attached (see "Pull Back Material" on page 58).

Pull Back Material

You can use the twin air hose to install a pullback device such as a cable through the bore. The pullback device can then be used to pull heavier material back through the bore.

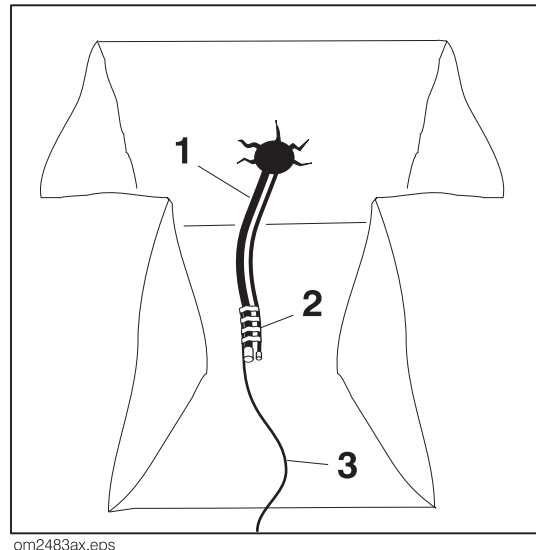
Install Pullback Device

1. Align at least 12 in (300 mm) of the end of twin air hose (1) with 12 in (300 mm) of the beginning of the pullback device (3).

IMPORTANT: Cap or tape over twin air hose ends to prevent contamination.

2. Securely connect (2) the pullback device (3) to the twin air hose (1).
3. Return to entry pit and pull twin air hose and pullback device through bore.

NOTICE: If air hose and pullback device become lodged in bore, do not jerk or use excessive force. Return to target pit, remove pullback device and air hose out of exit hole and start over.



Attach Pullback Material

NOTICE: This method is recommended for pulling back lightweight material only.

1. In target pit securely attach pullback material to pullback device.
2. Return to entry pit and pull pullback device until pullback material appears in entry pit.
3. If pulling pipe, stop as the end of each section nears the bore hole in the entry pit. Return to the target pit and attach next pipe section according to the manufacturer's instructions.

IMPORTANT: Be certain that each section is securely connected before you pull it into the bore.

4. After pullback is complete, remove pullback device from pullback material and store properly.

Push Pipe

Pipe pushing drives steel pipes directly into the ground. It installs pipe in one single operation. Ditch Witch piercing tools can push large diameter pipe from 6 to 14 in (150 mm to 350 mm).

Use the optional tool launcher when pushing pipe. Plastic and cast iron pipe cannot be pushed. Materials that cannot be pushed can be pulled back through the completed bore. See "Pull Back Material" on page 58.

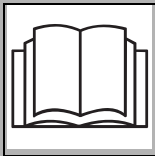
There are two methods of pipe pushing:

Pushing Method	Description
Closed push (end of pipe covered)	Push point covers entry end of first pipe. Used with small diameter pipes.
Open push (end of pipe open)	Cutting edge adapter installed on entry end of first pipe. Soil enters open end of pipe. Used with larger pipes. Used to make shallow, accurate bores.



⚠ DANGER

Electric shock. Contacting electric lines will cause death or serious injury. Know location of lines and stay away.



⚠ WARNING

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

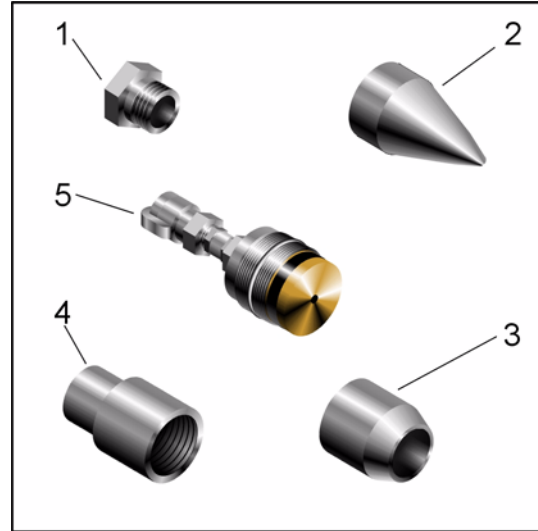
NOTICE:

- Do not use Ditch Witch piercing tools on an electric jobsite.
- Use supporting devices such as pipe stands (p/n 352-450) to support weight when elevated.
- Always have at least two support devices on elevated tool and pipe.
- Make sure that supporting devices are serviced and capable of supporting tool and pipe weight.

Pipe Pushing Accessories

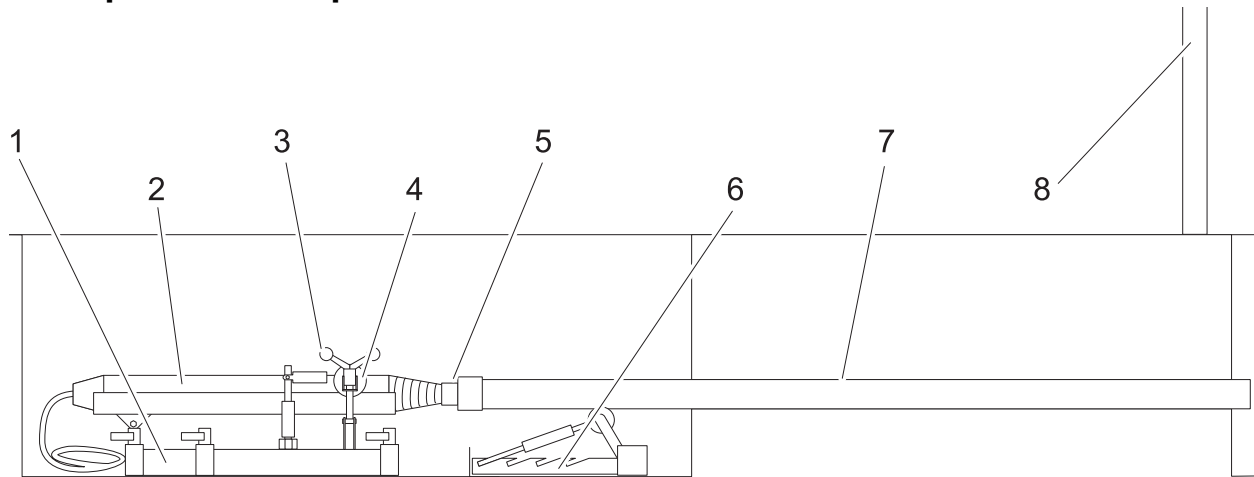
A variety of accessories are available to make pipe pushing easier and more efficient. For more information, contact your Ditch Witch dealer.

1. **Pipe bushing:** Insert into front of the first pipe to prevent mushrooming as the pipe is pushed through the bore.
2. **Pipe push point:** Install on front of first pipe for closed-end push. Recommended for pushing smaller pipe.
3. **Cutting edge adapter:** Install onto the front of the first pipe for an open-end pipe push to create an air pocket in the pipe and prevent spoils from compacting in pipe.
4. **Pusher cone:** Install large end on end of pipe being pushed and insert nose of tool into smaller tapered end.
5. **Blowout sealing plug:** Use to seal end of last pipe and blow air through full length of installed pipe to remove spoils from inside the pipe.



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Set Up To Push Pipe



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IMPORTANT: Entry pit must be large enough for pipe joints. If necessary, cut pipe into sections. Entry pit must be wide enough to work along full length of pipe.

1. Set first joint of pipe (7) and pipe stand (6) into pit.
2. Measure depth of bore and mark entry point.
3. Install cutting edge adapter on entry end of first pipe for an open push or a pipe push point for a closed push. See "Pipe Pushing Accessories" on page 60.
4. Manually push entry end of pipe into ground at entry point.
5. Set other end of pipe on pipe stand (6). Place level on pipe and adjust pipe until pipe is level.
6. Screw pipe pusher cone (5) onto rear of pipe section (if used).

IMPORTANT: If pipe is smaller than pipe pusher thread size, use high pressure bushing with an ANSI rating of at least 600 lb to reduce female thread to correct size.

7. Set optional aiming site on pipe. See "Set Up Launcher and Tool" on page 50.
8. Move pipe stand as needed to align pipe until crosshairs of aiming sight are centered on the target marker (8) and pipe, and stake into place.
9. Place launcher into pit, align with target marker (8) and pipe, and stake into place.
10. Place tool (2) in launcher and insert nose of tool into tapered end of pipe pusher cone (5).
11. Use wing knobs (3) to tighten roller (4) on top of tool.
12. Check alignment of tool with aiming sight. If adjustment is needed, loosen the adjustment knob and move left/right adjustment plate (1) underneath left or right until crosshairs of aiming sight are centered on the target marker.
13. Securely tighten adjustment knob.
14. Place level on tool and adjust launcher guide (if needed) with tilt adjustment handles until tool is level.

Push and Install Pipe .



Exposure to high noise levels may cause hearing loss. Wear hearing protection.

NOTICE: To prevent pipe threads from breaking, use tool launcher and pipe stands in entry pit to support tool and pipe throughout the push. Ensure that tool remains in pipe pusher cone.

Push First Pipe Section

1. Move direction control valve on oiler to FORWARD. Move air supply valve to ON in one quick movement.

NOTICE: Ensure that tool remains in pipe pusher cone.

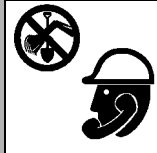
2. Quickly move air supply valve halfway between ON and OFF to slow tool.
3. When 2-3' (.5-1 m) of pipe has entered soil, move air supply valve to OFF.
4. Check pipe alignment with aiming sight. If necessary, push pipe in needed direction.
5. Move air supply valve to 3/4 open.
6. When end of pipe section nears the bore hole, move air supply valve to OFF and stop tool.
7. Move direction control valve to REVERSE.
8. Move air supply valve to ON and operate tool until it releases from pipe pusher cone.
9. Move air supply valve to OFF and remove tool from pipe stand and launcher.
10. Remove pipe pusher cone and high pressure bushing (if used) from pipe.

Push Subsequent Pipe Sections

1. Connect next pipe joint according to manufacturer's instructions.
2. Use aiming sight to check alignment with target marker and make needed adjustments.
3. Install pipe pusher cone onto rear of added pipe section.
4. Place tool on launcher and insert tool into tapered end of pipe pusher cone.
5. Move direction control valve to FORWARD and move air supply valve to halfway between ON and OFF to start tool.
6. Once tool is started, move air supply valve to ON and begin the bore.
7. When end of pipe section nears the bore hole, move air supply valve to OFF and stop tool.
8. Move direction control valve to REVERSE.
9. Move air supply valve to ON and operate tool until it releases from pipe pusher cone.
10. Move air supply valve to OFF and remove tool from pipe stand and launcher.
11. Repeat steps 1-10 to complete bore and install pipe.
12. Move air supply valve to OFF when first pipe reaches target pit.
13. Move direction control valve to REVERSE and air supply valve to ON to release tool from pipe pusher cone.
14. Move air supply valve to OFF and remove pipe pusher cone and high pressure bushing (if used).
15. In target pit, remove cutting edge or push point from pipe. If open push, remove spoil.

Remove Spoil

The most common means of spoil removal is air pressure or water methods. If these methods fail, mechanical augers or hydraulic pushers can be used. The “pig” method is used to remove any remaining spoil. .

**⚠ WARNING**

Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

**⚠ WARNING**

Fluid or air pressure could pierce skin and cause injury or death. Stay away.

**⚠ CAUTION**

Flying objects may cause injury. Wear hard hat and safety glasses.

NOTICE: While pipe is being pressurized, stay at least 100' (30 m) from both ends of pipe and 10' (3 m) from exposed sides of pipe. Designate personnel to control access to entry pit and target pit. Erect barriers to keep people away.

Air Pressure Method

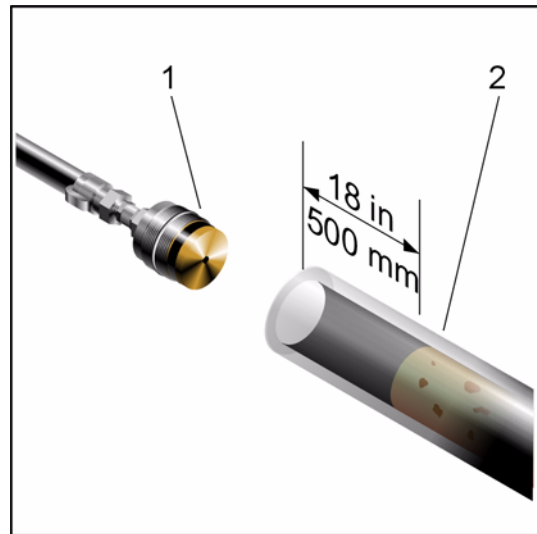
1. Remove pipe pusher cone and other equipment from both ends of pipe.
2. Remove spoil from inside the first 12-18 in (300-500 mm) of last pipe (2).

NOTICE: If the compressor does not have a discharge valve, install one inline away from the pit.

3. Install blowout sealing plug (1) into end of pipe and tighten by turning large adjustment nut clockwise until plug fits snugly.

IMPORTANT: Any plug used for spoil removal should have at least an ANSI 150-lb rating.

4. When plug is sealed, attach compressor air hose and pressurize pipe. Do not exceed 100 psi (7 bar).
5. Keep pipe pressurized for up to 30 minutes.
6. If spoil does not clear with air pressure, discharge air pressure from pipe and use water method.



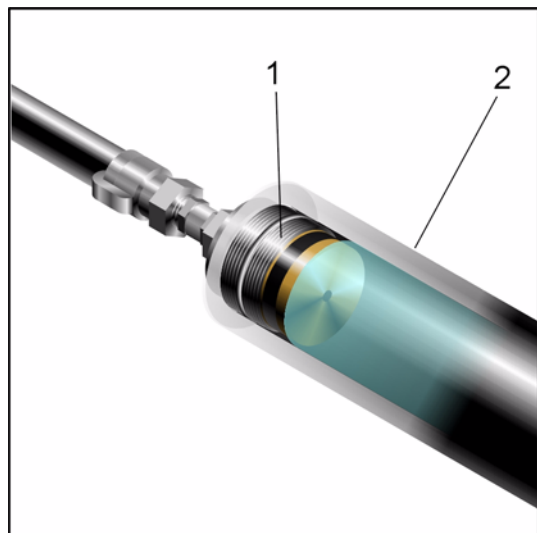
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Water Method

1. After air pressure has been discharged from pipe (2), remove two-claw coupler and connect water line to end of plug.
2. Fill empty section of pipe with water.
3. Close and disconnect water line.
4. Replace two-claw coupler on the blowout sealing plug (1).
5. Connect air compressor hose to blowout sealing plug (1) and open air valve to pressurized pipe.

NOTICE: Do not exceed 100 psi (7 bar).

NOTICE: If these methods do not work, or if air leaks around spoil without clearing spoil from pipe, discharge air from pipe and contact your Ditch Witch dealer for information on mechanical augers and hydraulic pushers.

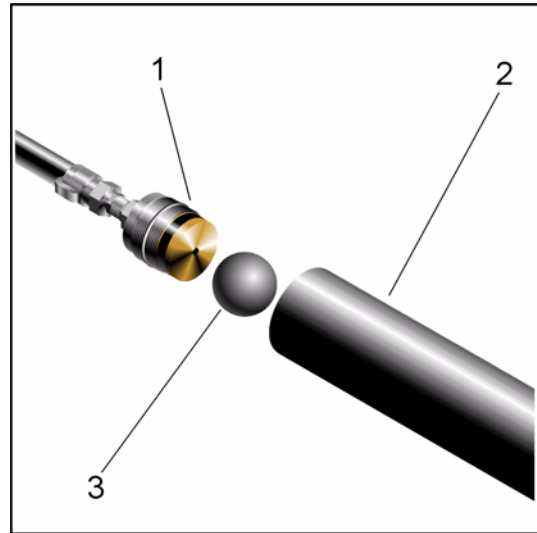


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Pig Method

Pigs are plastic-coated foam balls or shapes that seal and clean the pipe after most of the spoil has been blown or washed out. Contact your Ditch Witch dealer for information on where to obtain pigs.

1. After air pressure has been discharged from pipe (2), remove blowout sealing plug (1) and disconnect air hose.
2. Clear spoil and water from inside pipe (2) and insert pig (3).
3. Reinstall plug (1) and air hose.
4. Pressurize pipe. Air or water pressure will cause pig to force remaining spoil through pipe.



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Storage

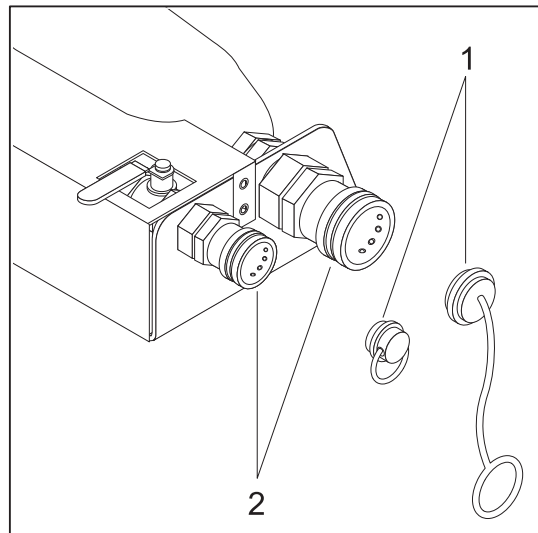
When the job is complete, the tool should be given proper care in order to extend its life. Additionally, the tool must be rebuilt after every 100 hours of operation. For information on rebuild kits, see your Ditch Witch dealer.

Maintain Tool Body and Hoses

1. Remove tool from the exit pit or entry pit and remove tape and coupling clips.
2. Uncouple hose whips from twin air hose.
3. Carefully remove any dirt and oil residue from hose whips.
4. Pour a generous amount of Pierce Arrow oil into the supply hose whip.
5. Install dust caps or tape hose whip ends.
6. Store tool in a dry area to prevent condensation inside tool.

Oiler

1. Carefully remove any dirt or residue from oiler surfaces.
2. Tape over 2-claw coupler and install dust plugs (1) into QDC bodies (2).
3. Store oiler on a flat area to prevent oil from leaking.



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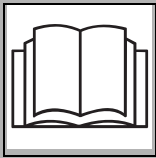
Troubleshooting

Symptom: Tool Does Not Operate

Possible cause #1: low air pressure or volume

Test

Troubleshooting Tip: If hose restrictions are suspected, close air supply valves and disconnect hoses at hose whip QDC connectors. Secure hose ends. Slowly open air supply valves and flush hoses. If air flow still seems restricted, repeat flushing operation at each connection working back toward air compressor.

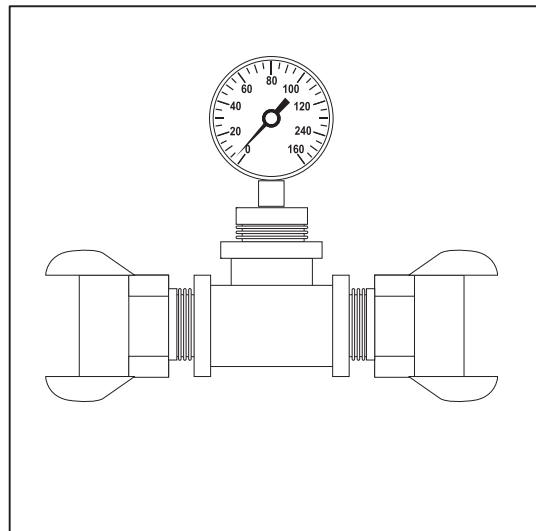


WARNING

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

NOTICE: Secure hose ends firmly. Loose hoses can whip and cause injury or become contaminated by dirt.

1. Check supply air pressure at compressor or at optional air pressure gauge. Normal operating pressure is 110 psi (7.6 bar) at tool. See air volume requirements in "Specifications" on page 95.
2. Ensure that air supply valves at compressor and oiler are in open position.
3. Ensure that all hoses are connected properly and are not kinked, leaking or restricted.



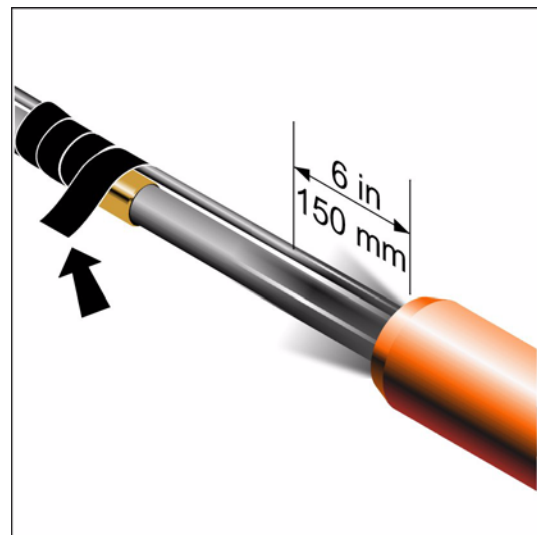
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Possible cause #2: striker stuck in tool body**Test****Troubleshooting Tips:**

- If striker does not operate, striker may be stuck in tool body due to lack of lubrication
- In cold weather, condensation can freeze inside the tool causing ice to jam the striker. If icing is suspected, move tool to a heated area for thawing
- Dirt or other debris entering hoses may also cause tool striker to jam. If debris contamination is suspected, retrieve tool and disassemble for service

1. Check oil level at oiler sight glass.
2. Check for oil spray residue on hose whips at rear of tool. If no oil spray or residue is visible, check flow valve adjustment inside oiler assembly. See "Adjust Oil Flow" on page 54.
3. If necessary, strike piercing tool with a rubber mallet to attempt to loosen striker.
4. If striker cannot be loosened, tool will have to be disassembled and serviced.

NOTICE: Do **not** heat piercing tool with torch or other direct heat.



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Symptom: Tool Operates But Seems Sluggish or Underpowered

Possible cause #1: low air pressure or volume

Test

Troubleshooting Tip: If hose restrictions are suspected, close air supply valves and disconnect hoses at hose whip QDC connectors. Secure hose ends. Slowly open air supply valves and flush hoses. If air flow still seems restricted, repeat flushing operation at each connection working back toward air compressor.

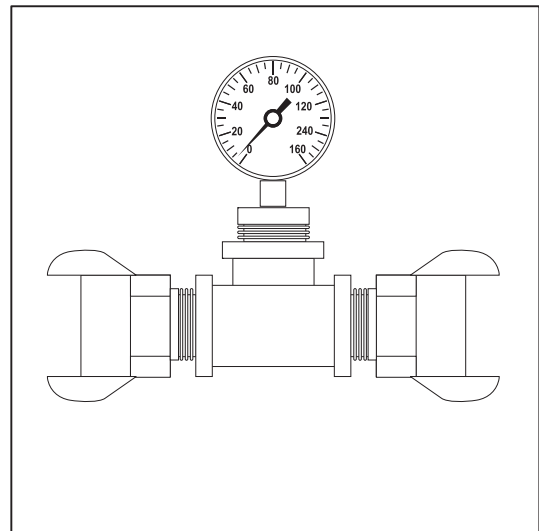


WARNING

Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

NOTICE: Secure hose ends firmly. Loose hoses can whip and cause injury or become contaminated by dirt.

1. Check supply air pressure at compressor or at optional air pressure gauge. Normal operating pressure is 110 psi (7.6 bar) at tool. See air volume requirements in "Specifications" on page 95.
2. Ensure that air supply valves at compressor and oiler are in open position.
3. Ensure that all hoses are connected properly and are not kinked, leaking or restricted.



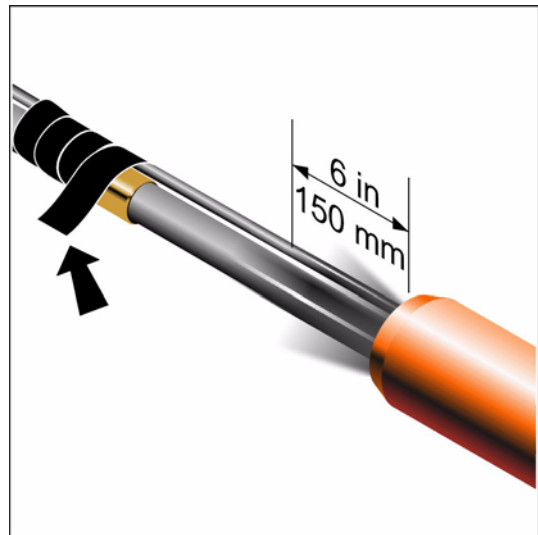
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Possible cause #2: insufficient tool lubrication**Test**

Troubleshooting Tip: Worn internal seals will also result in poor performance. Rebuild tool **every 100 hours** of operation.

1. Ensure that supply air pressure and volume are adequate.
2. Check oil level at oiler sight glass. Oil level should be visible.
3. Check for oil spray residue on hose whips at rear of piercing tool.

NOTICE: Hose whips should have light oil spray residue for 6 to 8 inches (150 mm to 200 mm) behind tailpiece. If not, adjust oil flow adjustment screw inside oiler assembly. Correct oil consumption rate is 4 to 6 oz (120 to 180 mL) of oil per hour. See "Adjust Oil Flow" on page 54.



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Symptom: Tool Unexpectedly Reverses

Possible cause: no air flow in small hose

Test

Troubleshooting Tip: If small hose becomes disconnected, kinked or restricted tool will immediately begin to operate in reverse direction.

1. Check for kinked hose.
2. Check for internal restriction in small hose, direction valve, or QDC connector.

Symptom: Tool Operates But Stops Penetrating

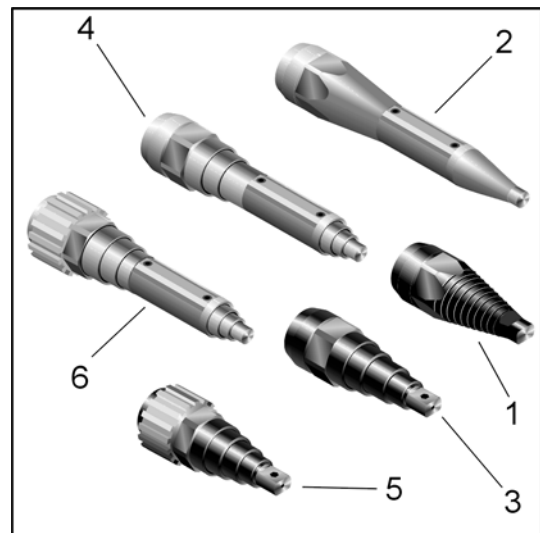
Possible cause #1: loose soil type

Possible cause #2: obstruction in bore path

Test

Reverse tool and start bore in new location. For more information, see “Execute Bore” on page 52.

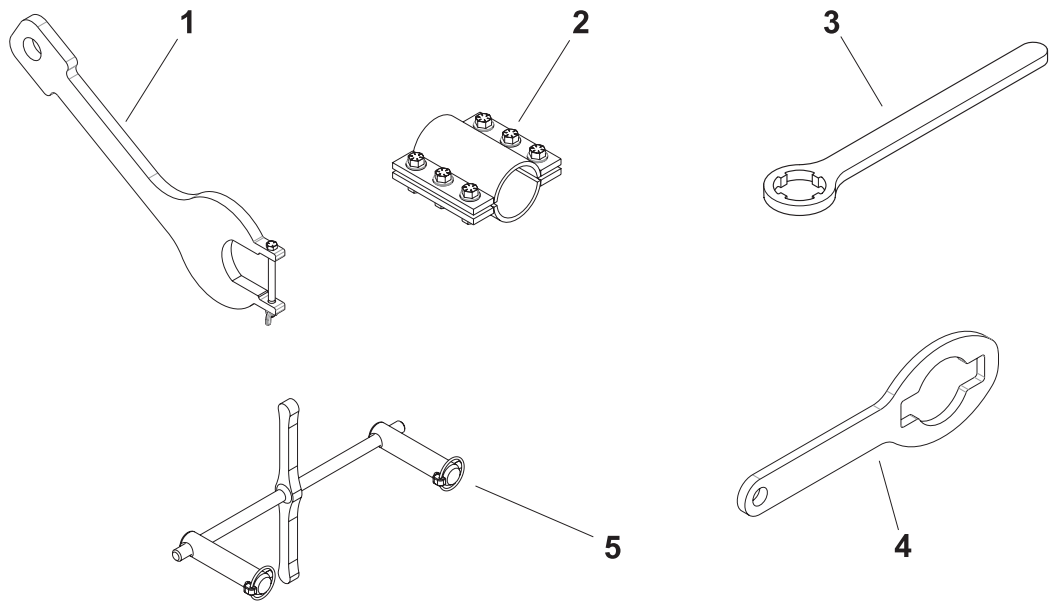
Troubleshooting Tip: On PT30 piercing tools it may be necessary to install an optional tool head that is better suited for specific soil conditions. See “Determine Optional Head Type” on page 36.



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Service

Special Service Tools Required



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Item	Description	For Use With	P/N
1	tailpiece wrench assembly	PT20	120-189
		PT30	120-190
2	clamp assembly	PT20	120-187
		PT30	120-185
3	spanner wrench	PT20	120-118
		PT30	120-119
4	clamp wrench	PT20	120-192
		PT30	120-193
5	screw drive assembly	all models	120-195

100 Hour Service

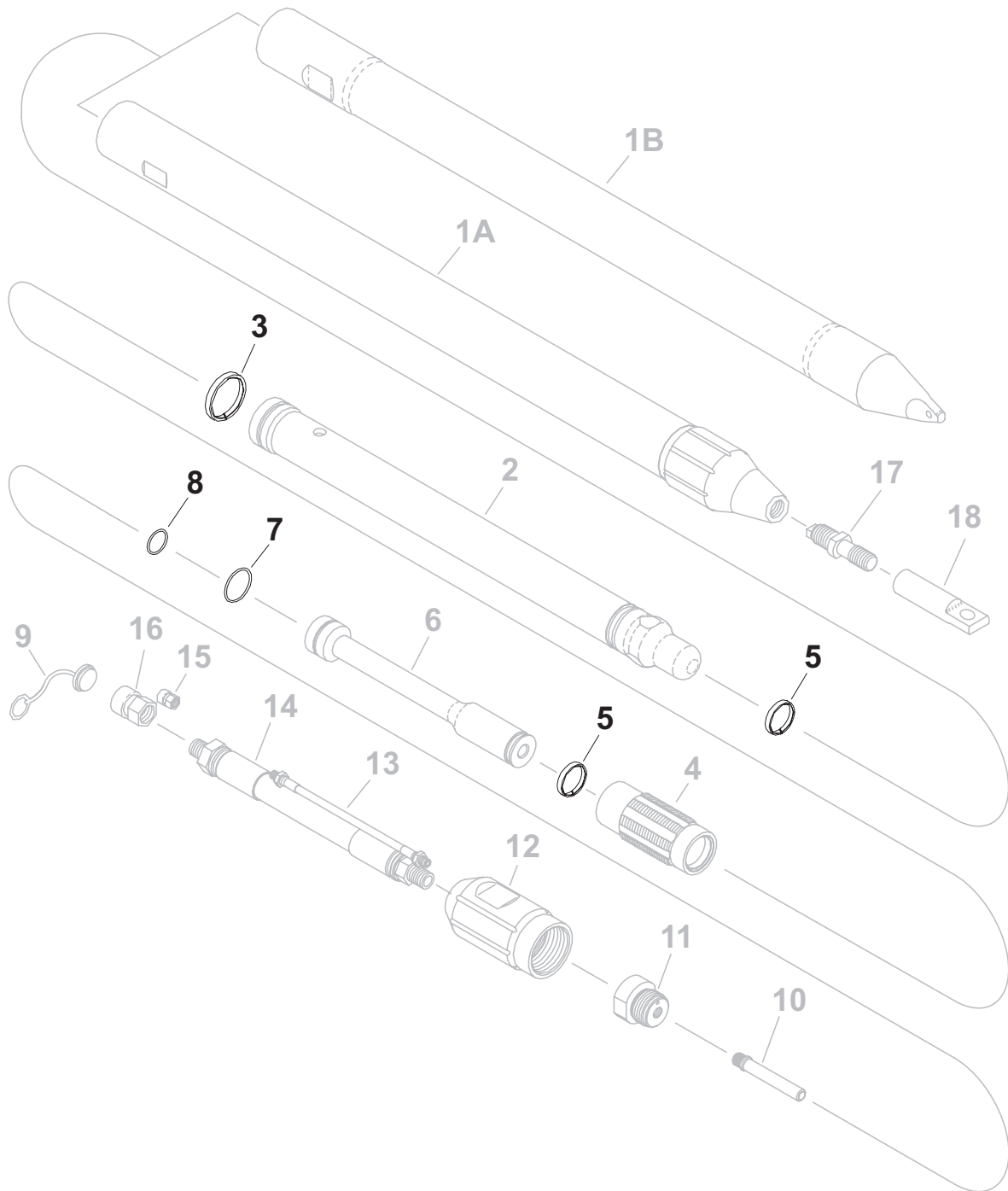
Rebuild Tool

Rebuild tool after every **100 hours** of operation. All necessary replacement parts for normal rebuilds are included in service kits listed below. Gather necessary tools and supplies before beginning rebuild.

Tool Model	Service Kit P/N
PT20	191-231
PT30	191-232

Description	P/N
Pierce Airrow grease, 1/2 ounce	256-617
Loctite® 242 thread locking compound	N/A
anti-seize compound	N/A
pipe joint thread sealing compound	N/A
piercing tool oil, quart	256-611

PT20 and PT30 Piercing Tools



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Ref No.	PT20 P/N	PT30 P/N	Description
1A	120-126	309-289	threaded tool body
1B	120-126	N/A	threaded tool body
2	120-127	120-204	striker
3	120-200	178-548	striker wear ring*
4	120-128	149-992	body coupling
5	178-379	179-448	valve wear ring*
6	149-555	149-993	valve
7	155-741	153-149	o-ring*
8	153-044	155-745	o-ring*
9	156-053	156-053	dust plug
10	120-141	309-392	air tube
11	306-516	309-300	manifold
12	306-517	309-290	tailpiece
13	120-539	120-532	hose
14	120-161	120-500	hose
15	153-234	153-234	QDC body
16	120-058	120-058	QDC body
17	N/A	120-107	head adapter
18	N/A	352-746	anvil cover

* Included in service repair kits.

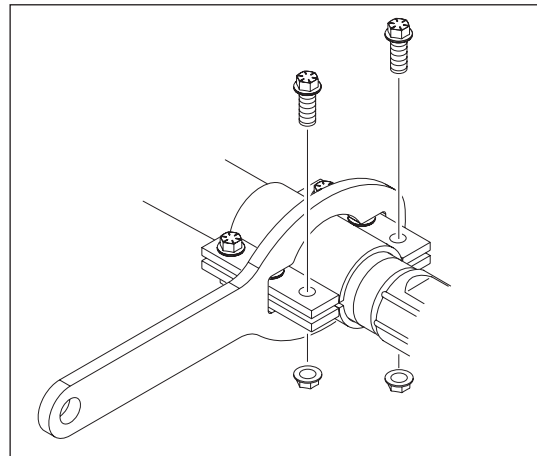
IMPORTANT:

- Installation sleeve (p/n 179-426) is also included in service repair kits.
- Refer to Parts Manual (p/n 053-080) for more information on parts.

Remove Tailpiece

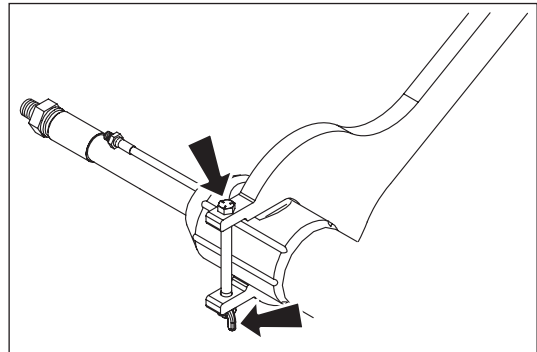
NOTICE: Always clean mud and dirt from outside of tool before disassembly. When removing or installing tailpiece, do not use pipe wrenches or other tools that could cause damage to tailpiece or tool body. See "Special Service Tools Required" on page 75.

1. Place tool on work surface.
2. Install clamp 1/2 in (13 mm) away from tailpiece.
3. Install 4 bolts, washers and nuts farthest from the tailpiece.
4. Place clamp wrench onto clamp, install remaining bolts, washers and nuts.
5. Do not tighten bolts.



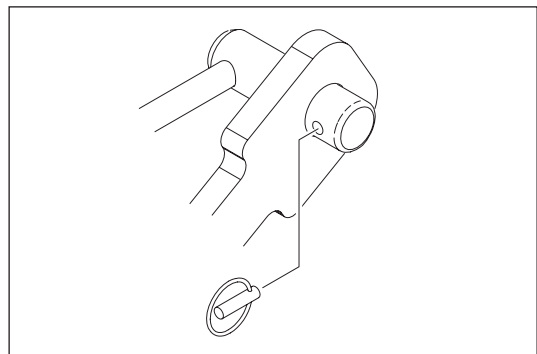
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6. Install tailpiece wrench using bolt and wing nut.



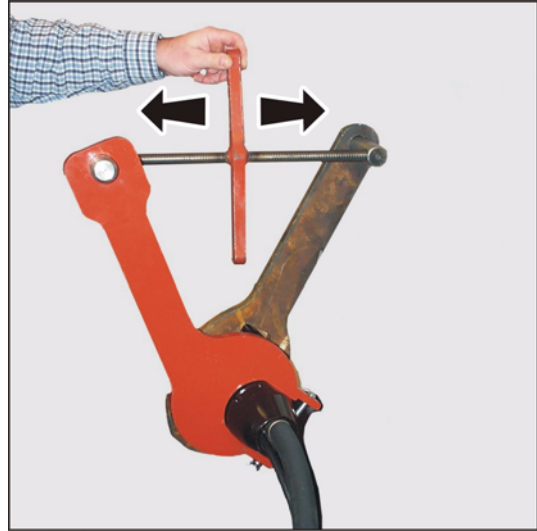
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7. Install screw drive assembly and secure handles with lynch pins.
8. Tighten clamp bolts in crossing pattern to 20 ft•lb (27 N•m).



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9. Turn screw drive to pull wrenches apart and loosen tailpiece.

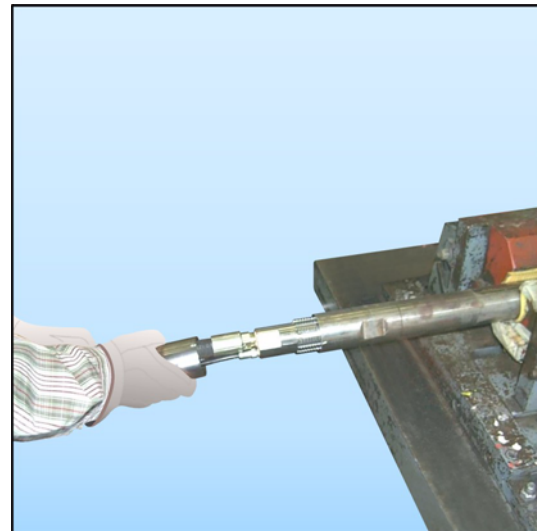


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Remove Valve Assembly

1. With tailpiece removed, use special spanner wrench to unscrew body coupling and valve assembly from tool body.

IMPORTANT: Use shop towel or gloves to protect hands while handling parts.

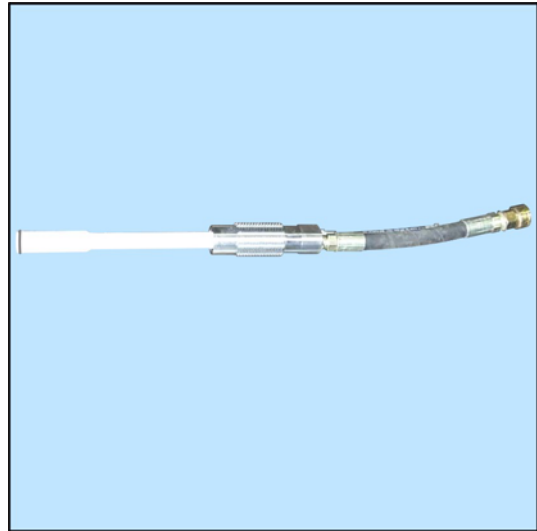


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2. Remove valve and body coupling assembly from tool body.
3. Clean parts and threads as necessary.

IMPORTANT: Petroleum-based solvents can be used to clean tool body and metal parts only. Do not expose replacement wear rings, o-rings or plastic parts to solvent products.

4. Place valve and body coupling assembly to one side.



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Remove Striker

1. Once the body coupling and valve assembly are removed, the striker can be removed. Using a hooked wire or similar tool, pull the striker far enough out of the tool body to grasp by hand.
2. Clean and dry all parts and inspect tool body bore for damage or wear.



rg0716c.jpg

Install Striker

1. Lubricate tip of striker and install striker partially into tool body.

Note: Use Pierce Arrow grease to lubricate components.



rg0717c.jpg

2. Install new wear ring in rear striker groove and lubricate wear ring.
3. Install striker fully into tool body, being careful not to dislodge wear ring.
4. Cover open end of tool body with shop towel to keep tool body clean.
5. Place tool body to one side.

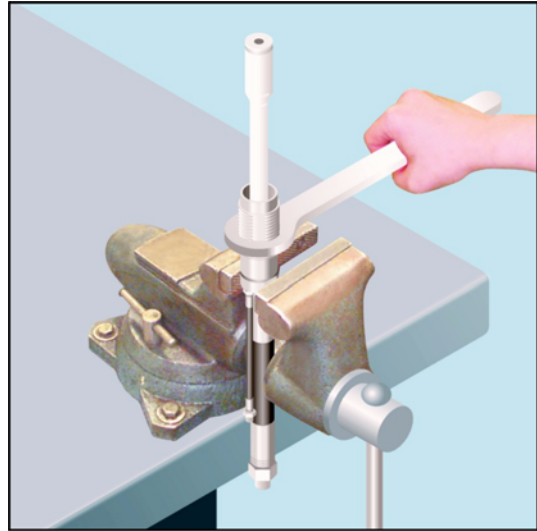


rg0718c.jpg

Remove Internal Components

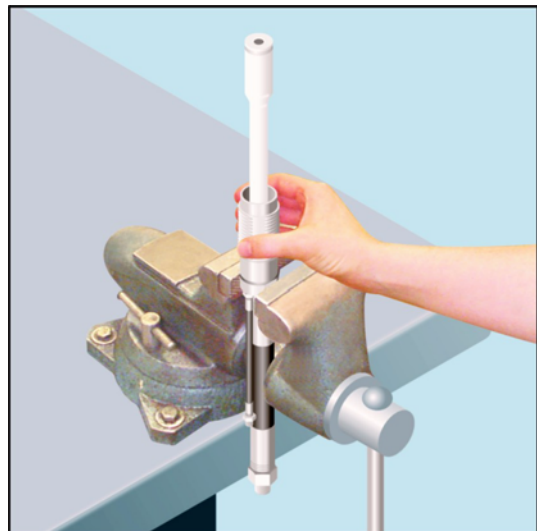
1. Place valve and body coupling assembly in bench vise with valve end facing up, gripping on the manifold flats.
2. Use special spanner wrench to loosen the assembly by turning the body coupling. Grip the body coupling only on end nearest the manifold.

NOTICE: Use special spanner wrench to avoid damage to external threads on the body coupling. See "Special Service Tools Required" on page 75.



rg1609a.jpg

3. Once loosened, remove assembly by hand.



rg1610a.jpg

4. Lift body coupling and valve together as an assembly and remove from the air tube shaft and manifold. Some resistance will be felt due to the internal o-ring between valve and air tube shaft.
5. Set valve and body coupling assembly aside.



rg0719c.jpg

6. Remove manifold and air tube from vise.
7. Clean manifold threads with wire brush.



rg0720c.jpg

8. Use groove joint pliers to remove old air tube from manifold and clean internal threads.
9. Apply Loctite 242® to threaded end of new air tube supplied in service kit.
10. Install new air tube into manifold.
11. Use groove joint pliers to grip air tube on shoulder, and tighten.

IMPORTANT: Allow Loctite to cure 24 hours before operating tool.



rg0721c.jpg

12. While holding body coupling with a shop towel, rest valve end against work bench surface and push downward. Valve will be pushed through the top threaded end of body coupling.

NOTICE: Removing the valve will damage external o-ring, so be sure to replace it with a new one from the service kit.

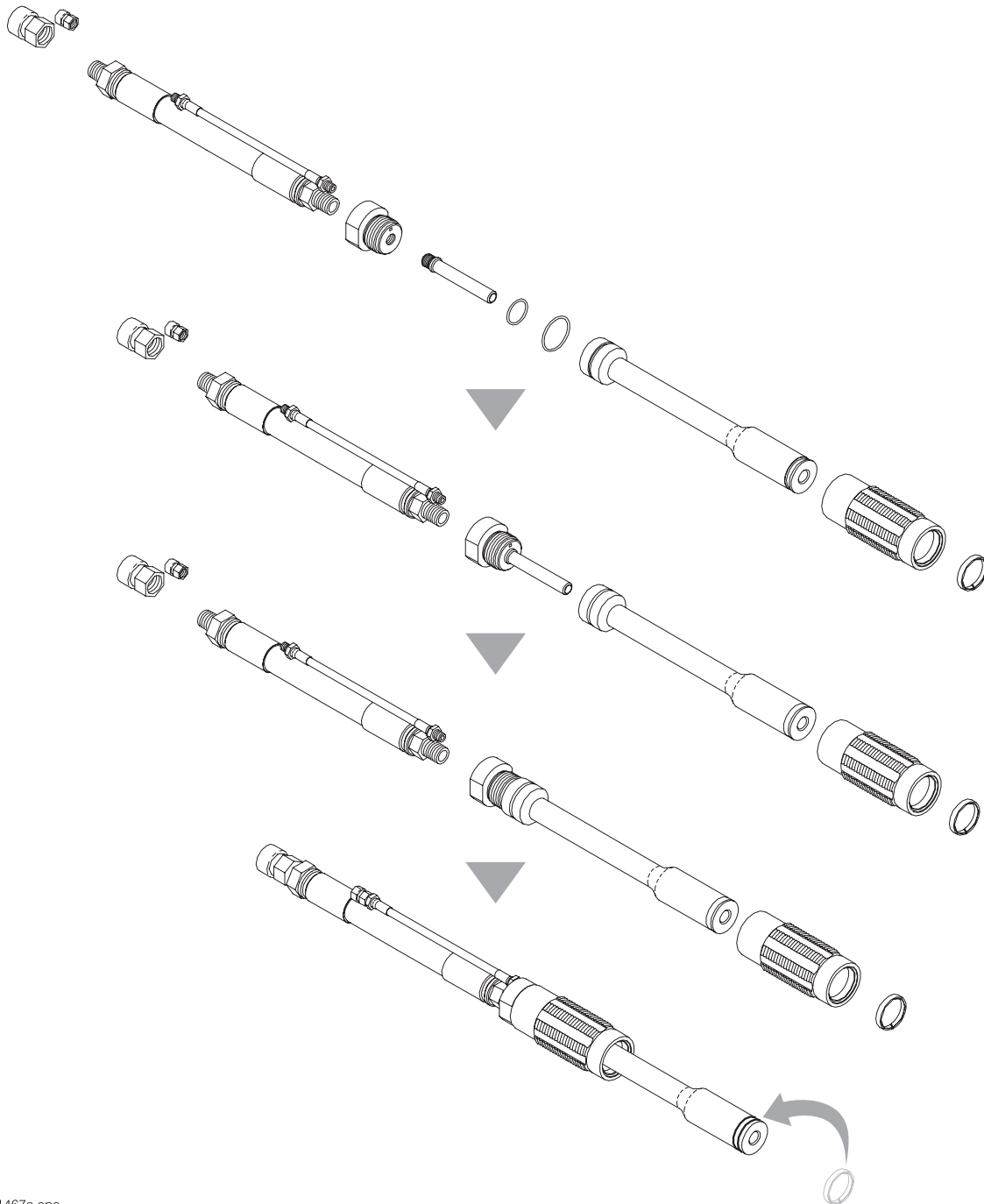
13. Clean, inspect and dry all parts.

IMPORTANT: Replace both the internal and external o-rings and the wear rings after every 100 hours of use.



rg0722c.jpg

Internal Components Assembly Overview



rg1467a.eps

Assemble Valve and Body Coupling

Note: Use Pierce Arrow grease to lubricate components.

1. Clean and dry all parts and inspect for damage or wear.
2. Lubricate and install new o-ring in external valve groove.
3. Lubricate and install new o-ring in internal valve groove.
4. Lubricate air tube shaft exterior surface.
5. Lubricate inside surface of body coupling and exterior surface of valve.
6. Lubricate the installation sleeve supplied in service kit.
7. Wrap sleeve around the valve to protect the o-ring from being damaged by body coupling threads while pulling the valve back into the body coupling.

NOTICE: Body coupling threads will damage new o-ring if sleeve is not used, and tool may not operate properly.



rg0723c.jpg



rg0724c.jpg

8. Hold body coupling with a shop towel and carefully install the wear ring end of valve through threaded end of body coupling.
9. Apply anti-seize compound to cleaned external threads of manifold.
10. Lubricate new valve wear ring and install in external valve groove.
11. Carefully slide body coupling and valve assemblies over air tube and manifold assembly.



rg0725c.jpg

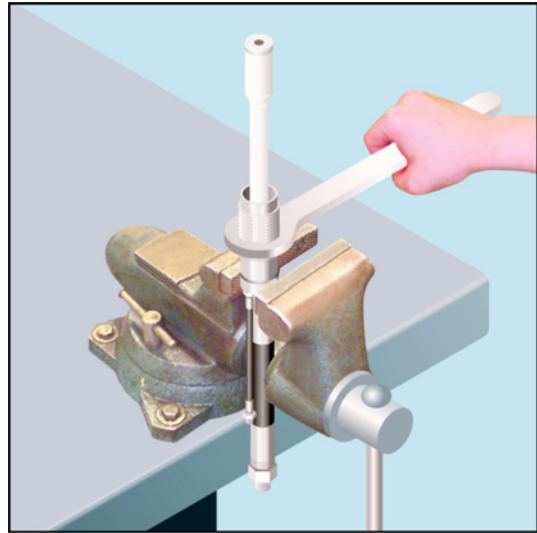
12. Carefully thread manifold and body coupling together and hand tighten.



rg0727c.jpg

13. Place valve and body coupling assembly vertically in bench vise, gripping only on the manifold flats.

NOTICE: To avoid damage to threads during assembly use special spanner wrench and do not overtighten.



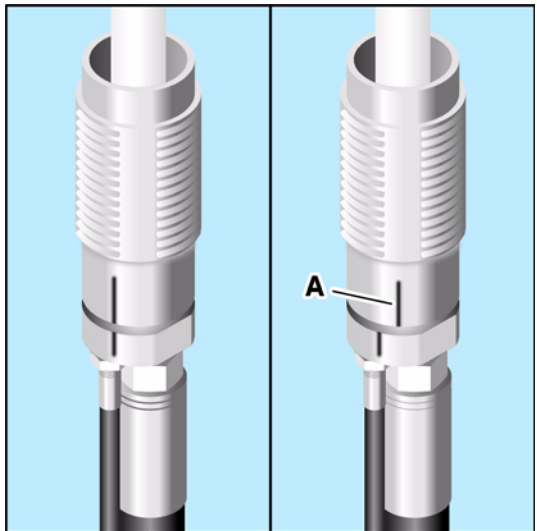
rg1609a.jpg

14. Use special spanner wrench (grip body coupling only on the end nearest manifold) to snug body coupling.
- Scribe straight line on body coupling and manifold.
 - Use spanner wrench to tighten until lines on body coupling and manifold are $\frac{3}{8}$ in (10 mm) apart (A).

IMPORTANT: Take care not to damage body coupling external threads.

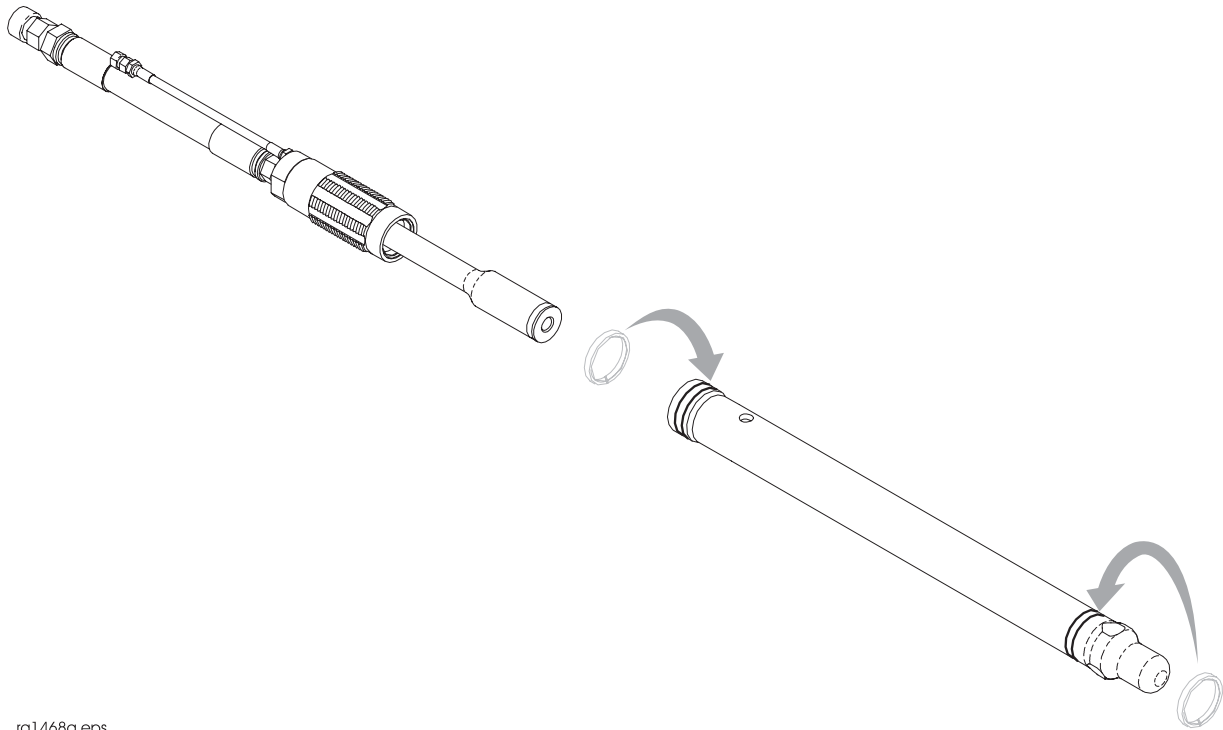
15. After tightening, check to ensure that the valve moves freely inside the body coupling.

IMPORTANT: To check for damage to newly installed o-ring, apply 110 psi (7.6 bar) maximum air pressure to small hose. A small amount of leakage between manifold and body coupling is normal. Excessive air leakage indicates a damaged o-ring.



rg1611a.jpg

Valve and Striker Assembly Overview



rg1468a.eps

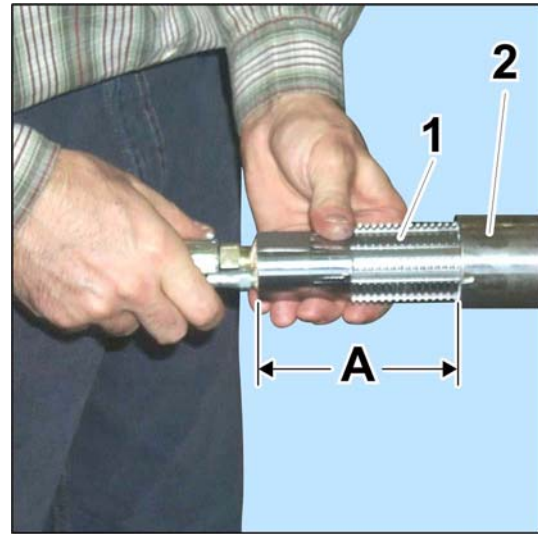
Install Valve Assembly

1. Ensure that striker is installed in tool body (2).
2. Insert valve and body coupling assembly (1) into the striker bore.
3. Screw valve and body coupling assembly (1) into the tool body (2).

NOTICE:

- Use spanner wrench to tighten body coupling in tool body.
- Coupling assembly should bottom out on internal body shoulder. Use the estimates in the table below to determine if coupling is properly seated. If dimension A is not close to the value listed, separate joint, inspect both sets of threads for burrs, correct burrs, and reassemble.
- The table below shows estimates for proper clearance between tool body shoulder and hose side of valve and body coupling assembly (dimension A). Overtightening will damage assembly/body threads.

Tool	Distance A
PT20	3.30 in (83.82 mm)
PT30	4.00 in (101.60 mm)



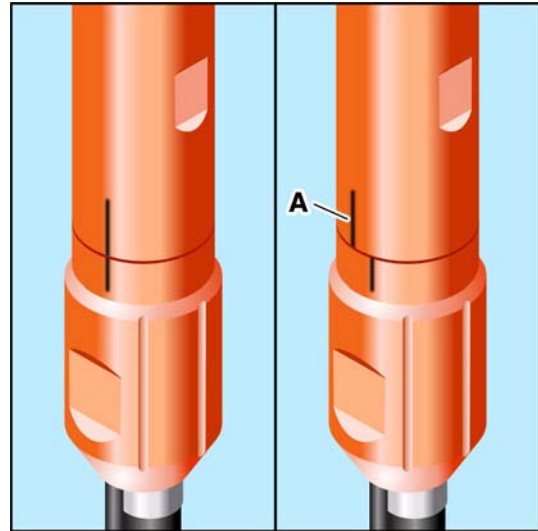
rg1597a.jpg

Install Tailpiece

Note: If hose whips are being replaced and have not been previously installed, install them into manifold before installing tailpiece. Refer to "Replace Hose Whips" on page 93.

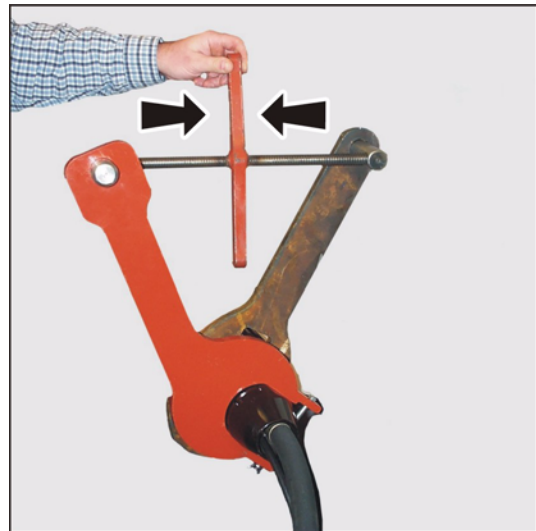
1. Clean threads of tailpiece and tool body.
2. Tighten the tailpiece onto tool body snugly with wrench.
3. Scribe straight line across joint from tailpiece to tool body.
4. Tighten using screw drive assembly, tailpiece wrench, clamp wrench and clamp.

IMPORTANT: See "Remove Tailpiece" on page 79 for details on wrench setup.



rg1612a.jpg

5. Tighten tailpiece by turning screw drive handle to pull wrenches together.
6. Tighten joint until lines are 3/8 to 1/2 in (9 to 13 mm) apart (A).
7. Connect air and test tool operation before returning to field.



Rg0740c.jpg

Replace Hose Whips

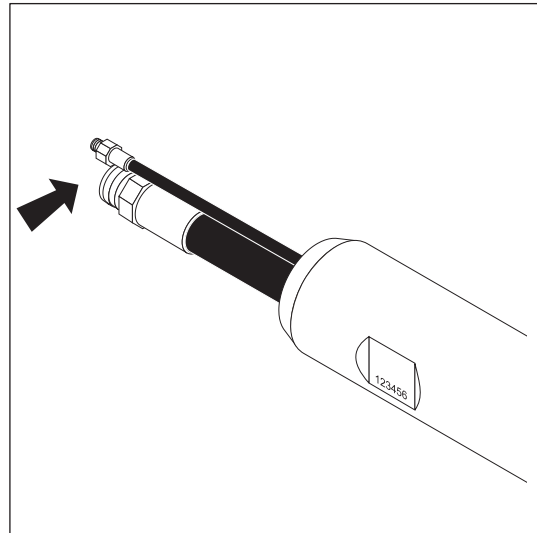
1. Remove tailpiece as described under "Remove Tailpiece" on page 79.
2. With tailpiece removed and hose manifold accessible, hold backup on manifold flats with an adjustable wrench. Use flare nut wrench to remove hose whips.
3. Due to interference between fittings, remove large hose first, then small hose.
4. Remove quick-connect fittings from hose whips.
5. Clean and dry all components and threads as needed.
6. Use pipe sealant on threads at both ends of hose whips.

NOTICE: Do not allow pipe thread sealant or other material inside hoses. Debris inside hoses can lead to tool failure.

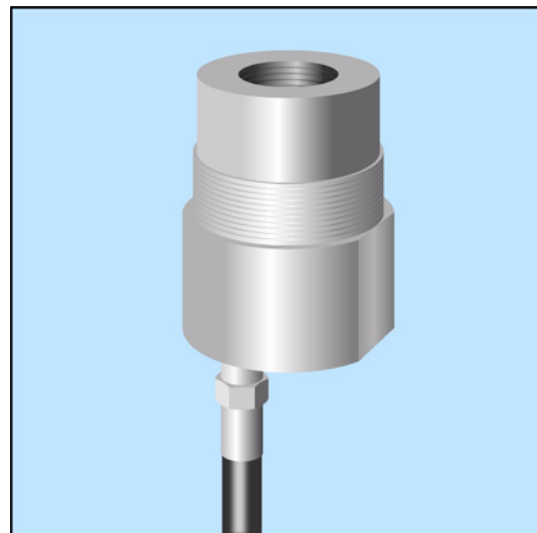
7. Install quick-connect fittings on new hoses.
8. Install small hose into manifold first, as shown.
9. Tighten hoses to engage 1 to 3 complete threads.

NOTICE: To prevent damage to manifold and hoses, do not overtighten.

Note: Tailpiece can be installed once hose whips are replaced, following procedures under "Install Tailpiece" on page 92.

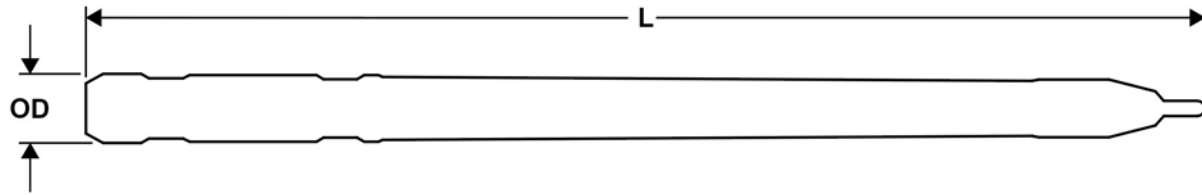


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rg1598a.jpg

Specifications



rg1599a.eps

PT20

		U.S.	METRIC
OD	Outside diameter	2.25 in	57 mm
	Weight	31 lb	14 kg
L	Length	42.5 in	1.1 m
	Operating pressure	110 psi	7.6 bar
	Operating air flow	30 cfm	0.9 m ³ /min

PT30

		U.S.	METRIC
OD	Outside diameter	3.25 in	83 mm
	Weight	68 lb	31 kg
L	Length	57 in	1.5 m
	Operating pressure	110 psi	7.6 bar
	Operating air flow	50 cfm	1.4 m ³ /min

Support

Procedure

Notify your dealer immediately of any malfunction or failure of Ditch Witch equipment.

Always give model, serial number, and approximate date of your equipment purchase. This information should be recorded and placed on file by the owner at the time of purchase.

Return damaged parts to dealer for inspection and warranty consideration if in warranty time frame.

Order genuine Ditch Witch replacement or repair parts from your authorized Ditch Witch dealer. Use of another manufacturer's parts may void warranty consideration.

Resources

Publications

Contact your Ditch Witch dealer for publications and videos covering safety, operation, service, and repair of your equipment.

Ditch Witch Training

For information about on-site, individualized training, contact your Ditch Witch dealer.

Warranty

Ditch Witch Equipment and Replacement Parts Limited Warranty Policy

Subject to the limitation and exclusions herein, free replacement parts will be provided at any authorized Ditch Witch dealership for any Ditch Witch equipment or parts manufactured by The Charles Machine Works, Inc. (CMW) that fail due to a defect in material or workmanship within one (1) year of first commercial use (Exception: 2 years for all SK5 attachments). Free labor will be provided at any authorized Ditch Witch dealership for installation of parts under this warranty during the first year following "initial commercial" use of the serial-numbered Ditch Witch equipment on which it is installed. The customer is responsible for transporting their equipment to an authorized Ditch Witch dealership for all warranty work.

Exclusions from Product Warranty

- All incidental or consequential damages.
- All defects, damages, or injuries caused by misuse, abuse, improper installation, alteration, neglect, or uses other than those for which products were intended.
- All defects, damages, or injuries caused by improper training, operation, or servicing of products in a manner inconsistent with manufacturer's recommendations.
- All engines and engine accessories (these are covered by original manufacturer's warranty).
- Tires, belts, and other parts which may be subject to another manufacturer's warranty (such warranty will be available to purchaser).
- ALL IMPLIED WARRANTIES NOT EXPRESSLY STATED HEREIN, INCLUDING ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY.

IF THE PRODUCTS ARE PURCHASED FOR COMMERCIAL PURPOSES, AS DEFINED BY THE UNIFORM COMMERCIAL CODE, THEN THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE FACE HEREOF AND THERE ARE NO IMPLIED WARRANTIES OF ANY KIND WHICH EXTEND TO A COMMERCIAL BUYER. ALL OTHER PROVISIONS OF THIS LIMITED WARRANTY APPLY INCLUDING THE DUTIES IMPOSED.

Ditch Witch products have been tested to deliver acceptable performance in most conditions. This does not imply they will deliver acceptable performance in all conditions. Therefore, to assure suitability, products should be operated under anticipated working conditions prior to purchase.

Defects will be determined by an inspection within thirty (30) days of the date of failure of the product or part by CMW or its authorized dealer. CMW will provide the location of its inspection facilities or its nearest authorized dealer upon inquiry. CMW reserves the right to supply remanufactured replacement parts under this warranty as it deems appropriate.

Extended warranties are available upon request from your local Ditch Witch dealer or CMW.

Some states do not allow exclusion or limitation of incidental or consequential damages, so above limitation of exclusion may not apply. Further, some states do not allow exclusion of or limitation of how long an implied warranty lasts, so the above limitation may not apply. This limited warranty gives product owner specific legal rights and the product owner may also have other rights which vary from state to state.

For information regarding this limited warranty, contact CMW's Product Support department, P.O. Box 66, Perry, OK 73077-0066, or contact your local Ditch Witch dealer.

First version: 1/91; Latest version: 7/05

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However, if you purchased from any other source, please fill out the form on the reverse side and return it to us.

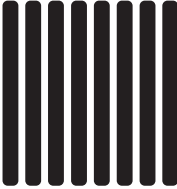
This will enable you to receive updates on this equipment as well as information on new products of interest.

Thanks for using Ditch Witch equipment.

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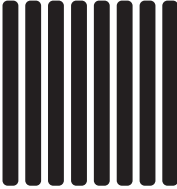
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