Heavy Duty Split Frame
User's Manual

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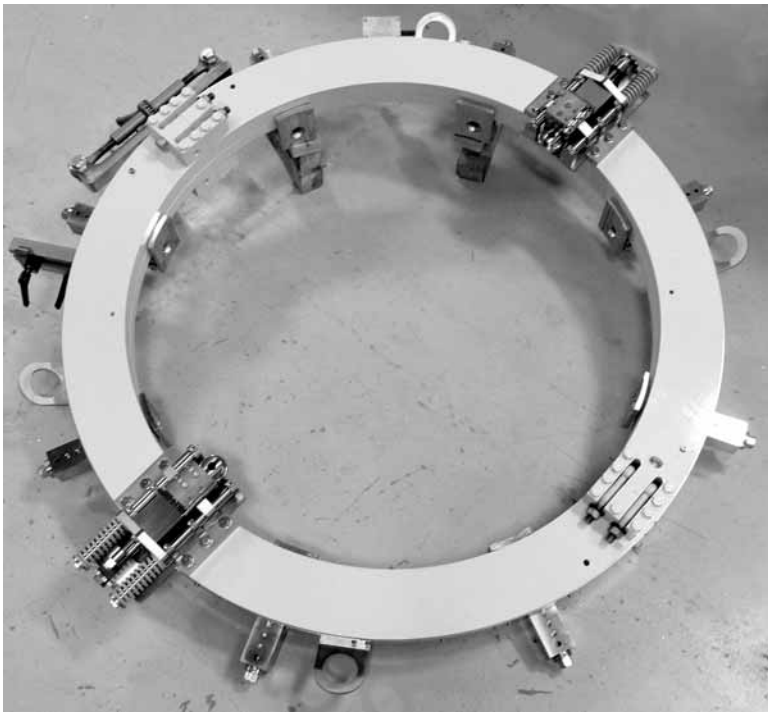

E.H. Wachs Part No. 03-010-MAN
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Revision History:

Original	August 2006
Revision 1	April 2009
Revision 2	June 2009
Revision 3	October 2009

EU DECLARATION OF CONFORMITY
WITH
COUNCIL DIRECTIVE 2006/42/EC

Issue Details:	Date: 1/1/2011	Place: E.H. Wachs, Lincolnshire, IL USA
Directives:	Machinery Safety Directive 2006/42/EC	
Conforming Machinery:	Heavy Duty Split Frame Machine	
Model Number:	P03-010-4xx	
Serial Number:		
Manufacturer:	**E.H. Wachs Company** 600 Knightsbridge Parkway Lincolnshire IL 60069 USA	
Responsible Representative:	Orbitalum Tools GmbH Josef-Schüttler-Str. 17, 78224 Singen Germany Tel. +49 (0) 7731 - 792 872 Fax +49 (0) 7731 - 792 566	
Harmonised Standards & Other Technical Standards/Specifications Applied or Referenced:	EN ISO 12100-1:2003 + A1:2009, EN ISO 12100-2:2003 + A1:2009, EN ISO 13857:2008, EN 982:1996 + A1:2008 (E), EN 983:1996 + A1:2008 (E), EN 13732-1:2006, EN ISO 14121-1:2007, EN 60204-1:2006 (for electrical machines), EN ISO 13850:2008 (for pneumatic machines)	
Provisions with which Conformity is Declared:	Essential Health and Safety Requirements of Annex 1 of the Machinery Directive	
We hereby certify that the machinery described above conforms to the provisions of Council Directive 2006/42/EC on the approximation of the laws of the Member States relating to the safety of machinery.		
Signed:		
Signatory:	Pete Mullally Quality Manager E.H. Wachs	

Table of Contents

Chapter 1
About This Manual

In This Chapter

PURPOSE OF THIS MANUAL

This manual explains how to operate and maintain the heavy duty split frame (HDSF) with O.D. tracking slides. It includes instructions for set-up, operation, and maintenance. It also contains parts lists and diagrams to help you order replacement parts and perform user-serviceable repairs.

Before operating the HDSF, you should read through this manual and become familiar with all instructions. At a minimum, make sure you read and understand the following chapters:

- Chapter 1, About This Manual
- Chapter 2, Safety
- Chapter 3, Introduction to the Equipment
- Chapter 5, Operating Instructions
- Chapter 9, Accessories

If you will be performing service or repairs, make sure you read and understand these chapters:

- Chapter 1, About This Manual
- Chapter 4, Assembly, Disassembly, and Storage
- Chapter 6, Routine Maintenance
- Chapter 7, Troubleshooting and Repair.

You will also want to refer to Chapter 8, Parts Lists and Drawings.

HOW TO USE THE MANUAL

Throughout this manual, refer to this column for warnings, cautions, and notices with supplementary information.

This manual is organized to help you quickly find the information you need. Each chapter describes a specific topic on using or maintaining your equipment.

Each page is designed with two columns. This large column on the inside of the page contains instructions and illustrations. Use these instructions to operate and maintain the equipment.

The narrower column on the outside contains additional information such as warnings, special notes, and definitions. Refer to it for safety notes and other information.

SYMBOLS AND WARNINGS

The following symbols are used throughout this manual to indicate special notes and warnings. They appear in the outside column of the page, next to the section they refer to. Make sure you understand what each symbol means, and follow all instructions for cautions and warnings.

This is the **safety alert symbol**. It is used to alert you to **potential personal injury hazards**. Obey all safety messages that follow this symbol to avoid possible injury or death.

WARNING

A WARNING alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **serious injury or death**.

CAUTION

A CAUTION alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **minor or moderate injury**.

This is the **equipment damage alert symbol**. It is used to alert you to **potential equipment damage situations**. Obey all messages that follow this symbol to avoid damaging the equipment or workpiece on which it is operating.

CAUTION

A CAUTION alert with the damage alert symbol indicates a situation that **will** result in **damage to the equipment**.

IMPORTANT

An IMPORTANT alert with the damage alert symbol indicates a situation that **may** result in **damage to the equipment**.

NOTE

This symbol indicates a user note. **Notes** provide additional information to supplement the instructions, or tips for easier operation.

NOTE

A NOTE provides supplementary information or operating tips.

MANUAL UPDATES AND REVISION TRACKING

Occasionally, we will update manuals with improved operation or maintenance procedures, or with corrections if necessary. When a manual is revised, we will update the revision history on the title page.

You may have factory service or upgrades performed on the equipment. If this service changes any technical data or operation and maintenance procedures, we will include a revised manual when we return the equipment to you.

Current versions of E.H. Wachs manuals are also available in PDF format. You can request an electronic copy of this manual by emailing customer service at sales@ehwachs.com.

Chapter 2
Safety

E.H. Wachs takes great pride in designing and manufacturing safe, high-quality products. We make user safety a top priority in the design of all our products.

Read this chapter carefully before operating the heavy duty split frame. It contains important safety instructions and recommendations.

In This Chapter

OPERATOR SAFETY

Follow these guidelines for safe operation of the equipment.

- **READ THE OPERATING MANUAL.** Make sure you understand all setup and operating instructions before you begin.
- **INSPECT MACHINE AND ACCESSORIES.** Before starting the machine, look for loose bolts or nuts, leaking lubricant, rusted components, and any other physical conditions that may affect operation. Properly maintaining the machine can greatly decrease the chances for injury.
- **ALWAYS READ PLACARDS AND LABELS.** Make sure all placards, labels, and stickers are clearly legible and in good condition. You can purchase replacement labels from E.H. Wachs Company.
- **KEEP CLEAR OF MOVING PARTS.** Keep hands, arms, and fingers clear of all rotating or moving parts.

Look for this symbol throughout the manual. It indicates a personal injury hazard.

Always turn machine off before doing any adjustments or service.

- **SECURE LOOSE CLOTHING AND JEWELRY.** Secure or remove loose-fitting clothing and jewelry, and securely bind long hair, to prevent them from getting caught in moving parts of the machine.
- **KEEP WORK AREA CLEAR.** Keep all clutter and nonessential materials out of the work area. Only people directly involved with the work being performed should have access to the area.

Safety Symbols

This icon is displayed with any safety alert that indicates a personal injury hazard.

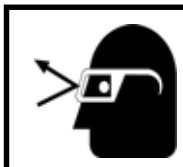
⚠ WARNING

This safety alert indicates a potentially hazardous situation that, if not avoided, **could** result in **death or serious injury**.

⚠ CAUTION

This safety alert, with the personal injury hazard symbol, indicates a potentially hazardous situation that, if not avoided, **could** result in **minor or moderate injury**.

Protective Equipment Requirements



WARNING

Always wear impact resistant eye protection while operating or working near this equipment.

For additional information on eye and face protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection and American National Standards Institute, ANSI Z87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

CAUTION

Personal hearing protection is recommended when operating or working near this tool.

Hearing protectors are required in high noise areas, 85 dBA or greater. The operation of other tools and equipment in the area, reflective surfaces, process noises, and resonant structures can increase the noise level in the area. For additional information on hearing protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure and ANSI S12.6 Hearing Protectors.

SAFETY LABELS

There is no safety labeling on the heavy duty split frame.

Chapter 3

Introduction to the Equipment

Read this chapter carefully to become familiar with the components of the heavy duty split frame.

In This Chapter

USAGE AND APPLICATIONS

The heavy duty split frame is a pipe cutting and beveling machine using outside diameter (O.D.) tracking slides for even, efficient cutting of pipes that are out of round or that are not centered within the frame of the machine. A cantilever slide is also available for single-point turning and flange facing.

The HDSF is designed to be mounted on in-line pipe. The machine splits open at two points, using a hinge and frame jacking system, and will open far enough to fit around pipes up to its maximum machining capacity. The hinge can also be removed to separate the machine into two halves for shipping or storage. Figure 3-1 shows the machine opened for mounting.

The split frame is available in different sizes that will cut pipes ranging from 12 to 60 inches in diameter:

- Model 1224—12” to 24” (305-610 mm)
- Model 2436—24” to 36” (610-914 mm)
- Model 3648—36” to 48” (914-1219 mm)
- Model 4860—48” to 60” (1219-1524 mm)
- Model 6072—60” to 72” (1524-1829 mm)
- Model 7284—72” to 84” (1829-2134 mm)

Figure 3-1. The photo shows the HDSF opened for mounting on inline pipe.

The machine is supplied with a custom storage case to hold all components and accessories. Keep the split frame stored in its case when it is not in use.

MECHANICAL OVERVIEW

The heavy duty split frame (HDSF) consists of two interlocking steel rings onto which the machine's components are mounted. The *stationary ring* is fitted with adjustable clamping legs that are tightened to hold the machine on the outside surface of the pipe. It has an inner track, or raceway, equipped with bearings.

The *rotating ring* travels on the bearing system, moving the tool slides around the pipe to perform the cutting action. A *trip* mounted on the stationary ring turns a starwheel on the slide with each rotation; the starwheel turns a feed screw that advances the tool into the pipe as the machine operates.

The O.D. (outside diameter) tracking slides use a spring mechanism and a surface-tracking wheel to keep the cutting tools in constant contact with the pipe. The tracking wheel on the end of the slide travels along the pipe surface, and the springs allow the slide to adjust itself to any irregularities in

the pipe. (For corrosive environments, a stainless steel tracking wheel is available.)

The O.D. tracking slides feed into the pipe 0.0026" (0.066 mm) per trip. The spring-tensioned tracking mechanism allows radial motion (perpendicular to the side of the pipe) of up to 1/2 inch, keeping the cutting tool on the pipe at all times and compensating for a maximum 1 inch out-of-roundness.

Figure 3-2 and Figure 3-3 illustrate the major components of the HDSF. Figure 3-5 shows one of the tracking slides. Figure 3-6 and Figure 3-7 show two different designs of the machine's clamping legs. Refer to these figures during set-up instructions for identifying the parts of the machine.

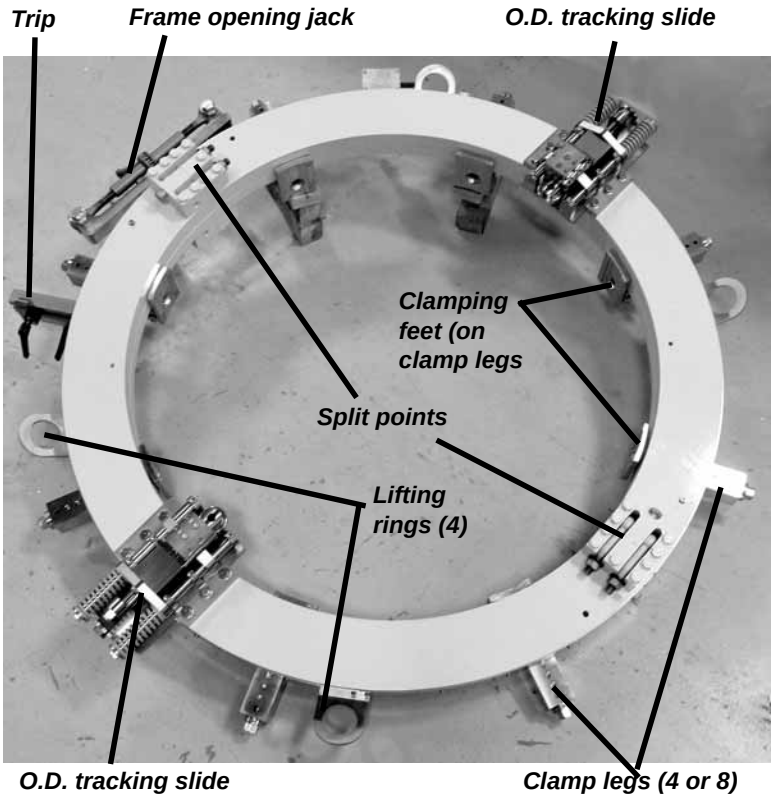


Figure 3-2. The photo shows the rotating ring side of the heavy duty split frame.

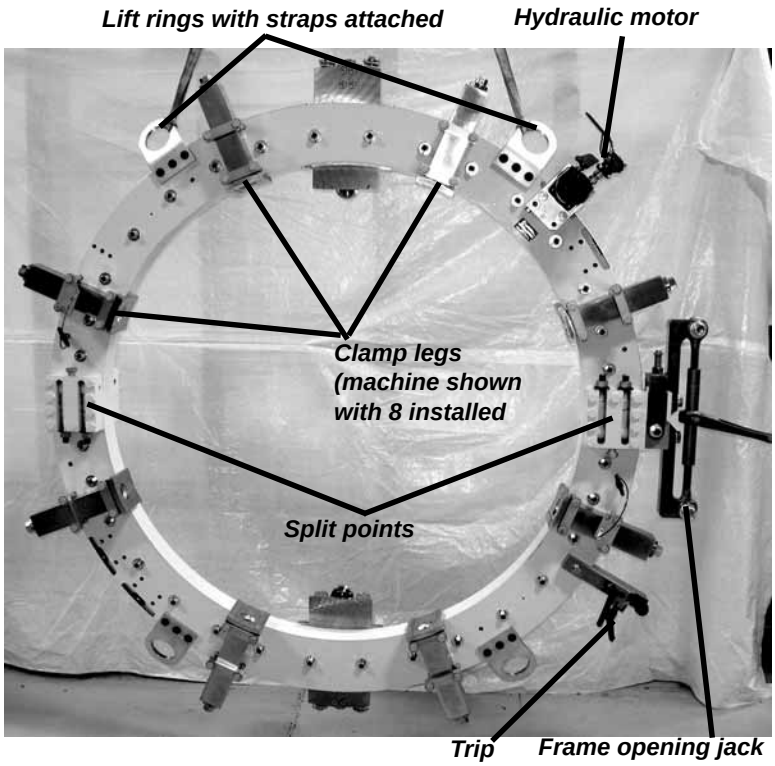


Figure 3-3. The photo shows the stationary ring side of the heavy duty split frame.

NOTE

Some older HDSFs may have frame locking levers rather than pins.

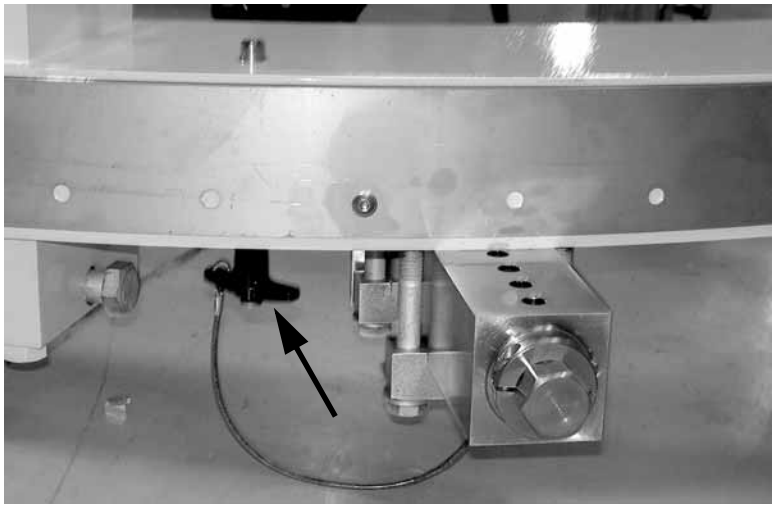


Figure 3-4. Two frame locking pins (one next to each split point) keep the rotating ring from turning when you split the machine for mounting it on a pipe. Remove the pins before operating the HDSF.

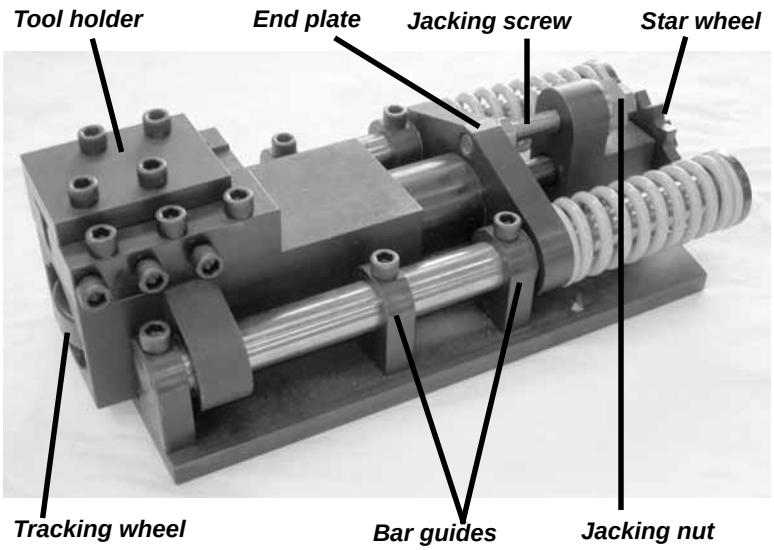


Figure 3-5. The photo shows the components of the O.D. tracking slide.

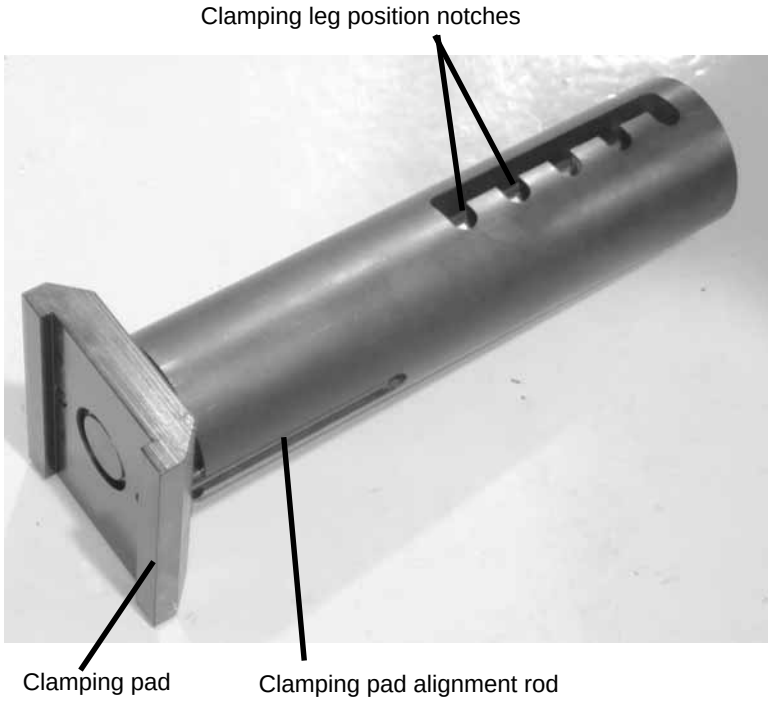


Figure 3-6. The photo illustrates the parts of the clamping leg. Either 4 or 8 legs are used on the HDSF machines.

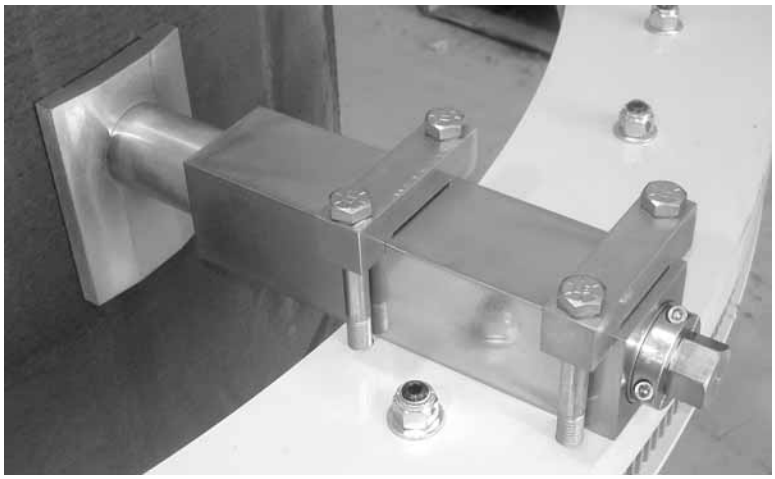


Figure 3-7. The photo shows an alternate design for the HDSF clamping leg.

ACCESSORIES AND OPTIONS

- Optional dual-motor drive for increased torque in low-speed operation. See Figure 3-8.

Figure 3-8. The photo shows the HDSF with dual motor drive configuration.

- Speed control valve (for use with hydraulic power units without built-in flow control). See Figure 3-9.

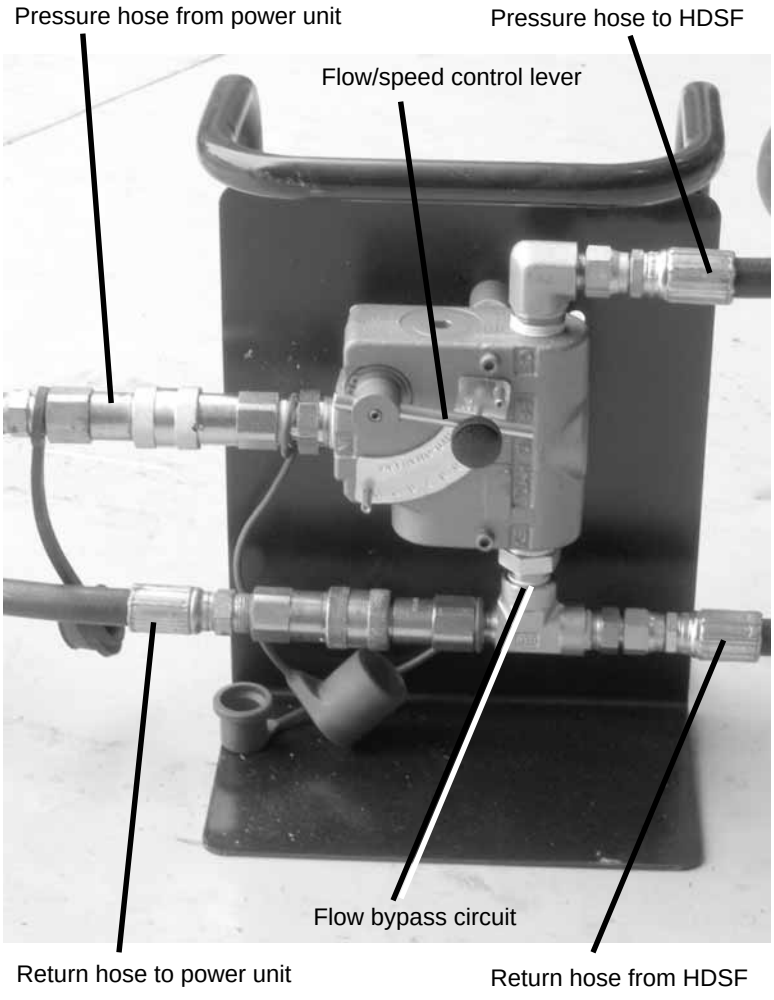
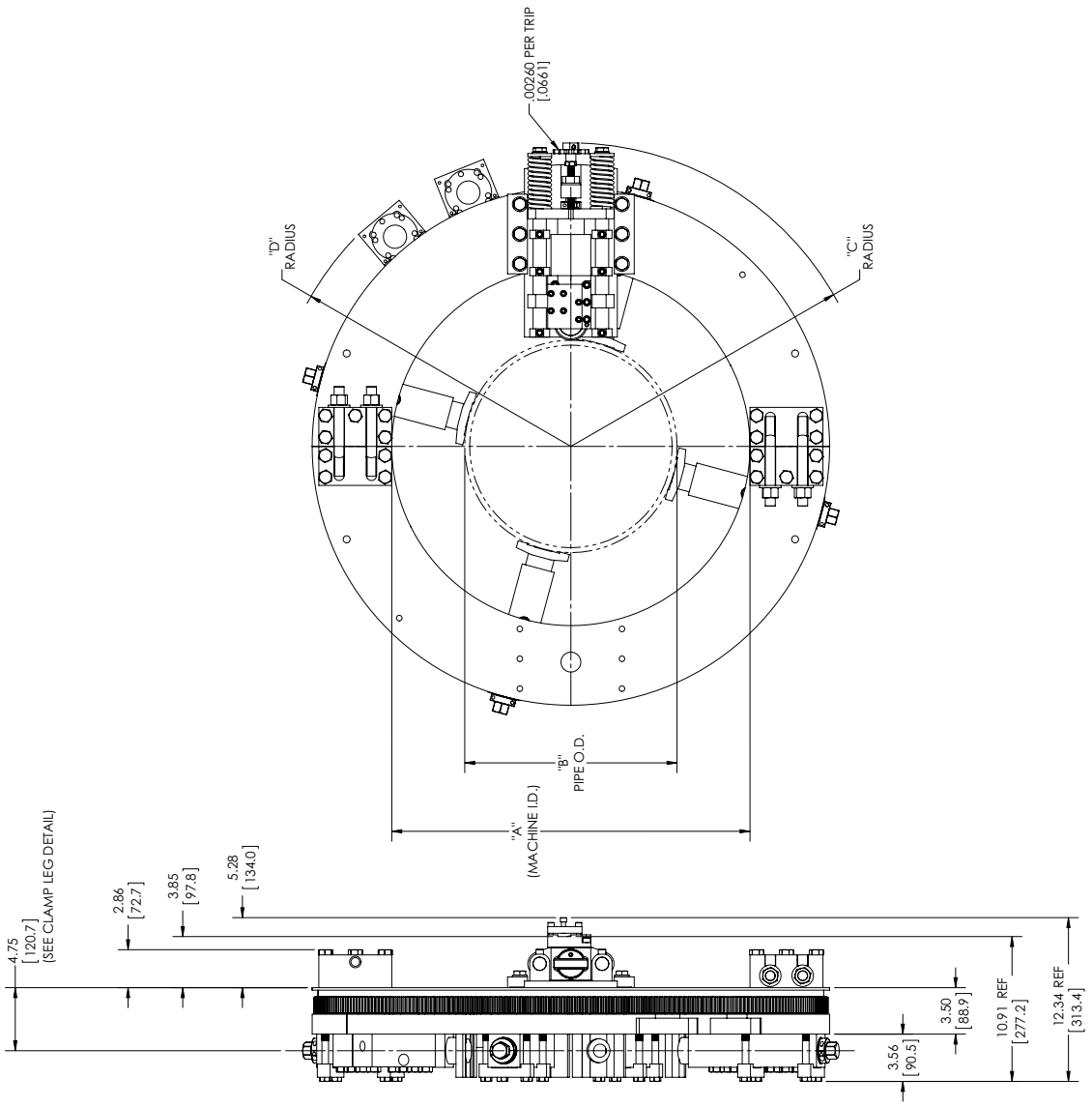


Figure 3-9. The flow control valve is used to set the cutting speed of the HDSF when there is no flow control on the hydraulic power unit.

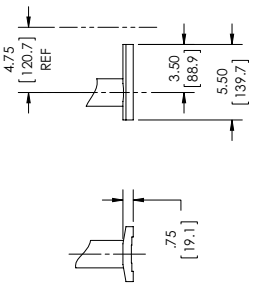
OPERATING ENVELOPE

The drawing and table on the following page describe the dimensions and operating envelope for all HDSF models.



-TABLE-

MODEL	DIM. "A" MACHINE I.D.	DIM. "B" PIPE O.D.	DIM. "C" RADIUS	DIM. "D" RADIUS	WEIGHT LB. [kg]
HDSF 1224	27.00 [685.8]	12.75 [323.9]	21.24 [539.5]	22.61 [574.4]	950 [431]
		24.00 [609.6]	26.86 [682.3]		
HDSF 2436	39.00 [990.6]	24.00 [609.6]	26.86 [682.3]	28.61 [726.8]	1200 [544]
		36.00 [914.4]	32.86 [834.7]		
HDSF 3648	51.00 [1295.4]	36.00 [914.4]	32.86 [834.7]	34.61 [879.2]	1800 [816]
		48.00 [1219.2]	38.86 [987.0]		
HDSF 4860	63.00 [1600.2]	48.00 [1219.2]	38.86 [987.0]	40.61 [1031.6]	2200 [998]
		60.00 [1524.0]	44.86 [1139.4]		
HDSF 6072	75.00 [1905.0]	60.00 [1524.0]	44.86 [1139.4]	46.61 [1184.0]	2600 [1180]
		72.00 [1828.8]	50.86 [1291.8]		
HDSF 7284	87.00 [2209.8]	72.00 [1828.8]	50.86 [1291.8]	52.61 [1336.4]	3000 [1360]
		84.00 [2133.6]	56.86 [1444.2]		



CLAMP LEG DETAIL

Chapter 4

Assembly, Disassembly, and Storage

The major components of the heavy duty split frame are factory assembled and ready for set-up. The machine can be supplied completed assembled or split apart, with a custom case for shipping and storage. Two case options are shown in Figure 4-1 and Figure 4-2.

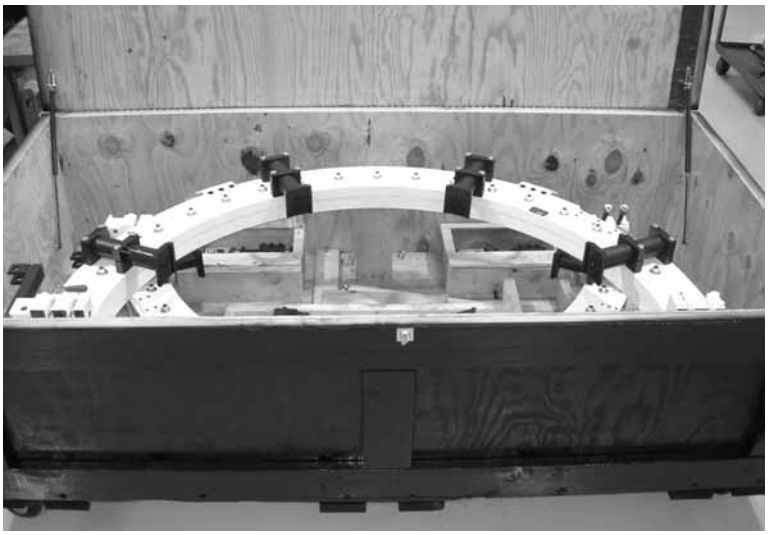


Figure 4-1. The heavy duty split frame is stored and shipped in a custom-built case.

In This Chapter

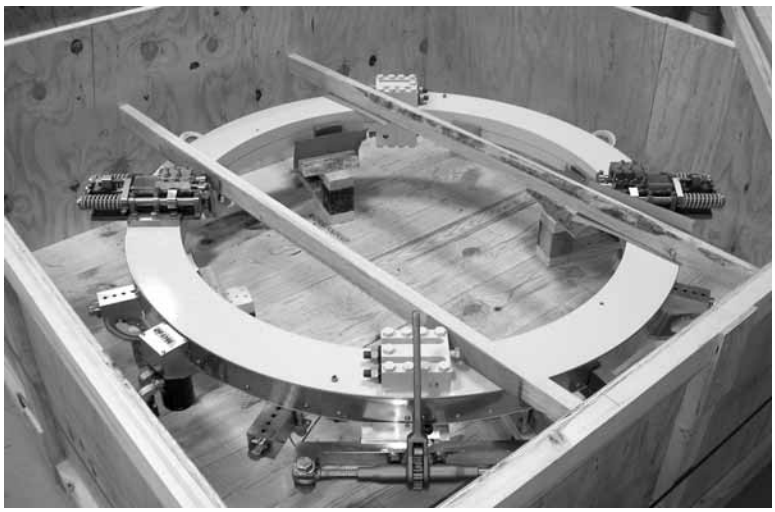


Figure 4-2. An optional larger shipping case allows the HDSF to be shipped fully assembled.

See the Set-Up section of Chapter 5 for instructions on opening the ring for mounting it on a workpiece.

STORING THE HDSF

For the standard shipping case, split the machine into halves before putting it into the storage case. Reverse this procedure to remove the machine from the case.

1. Remove the slides, trip assembly, and hydraulic motor from the machine. Store them in the case as shown in Figure 4-3.

NOTE

Keep the flow control valve assembly out of the crate until you have stored both halves of the HDSF ring.

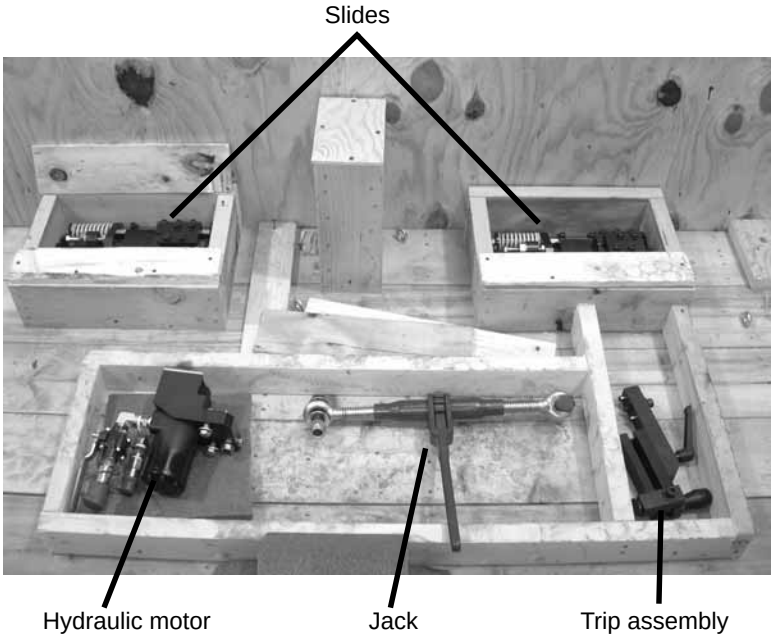


Figure 4-3. Store the smaller components of the machine in the bottom of the storage case.

2. Rotate the rotating ring until the split points on both rings are aligned.

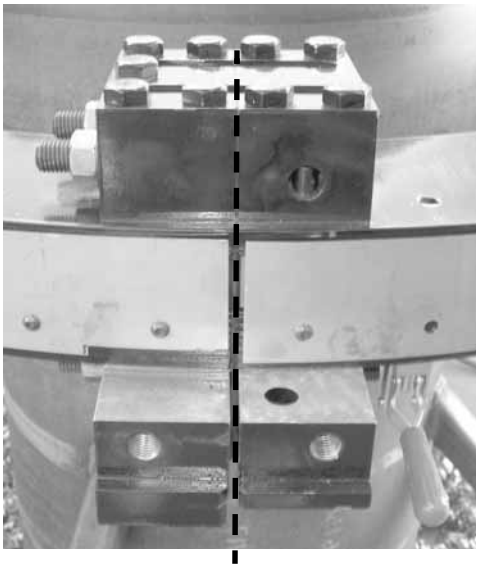


Figure 4-4. Turn the rotating ring so that the split lines on both rings are aligned.

WARNING

Failure to engage the frame locking levers before splitting the machine could allow the rotating ring to rotate partially or fully out of the stationary ring. Serious injury and equipment damage could result.

3. Swivel the frame locking levers in toward the center of the machine to lock the rotating and stationary rings together.

4. Turn the frame jacking screw on each split point in to separate the halves of the ring. Turn the screws until the dowel pins that align the halves are fully out of their holes.

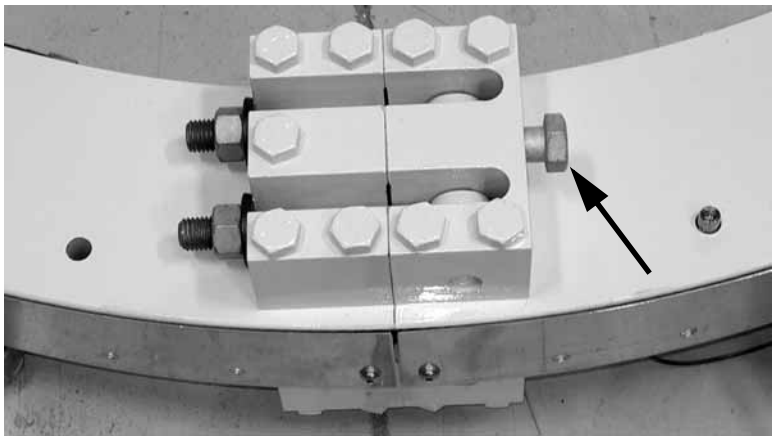


Figure 4-5. Turn the frame jacking screw into the block to separate the frame at the split point.

NOTE

Store the rings in the case with the rotating ring side down.

5. Attach a crane to one half of the ring using lifting straps. Lower the ring half into the crate in the position shown in Figure 4-6.

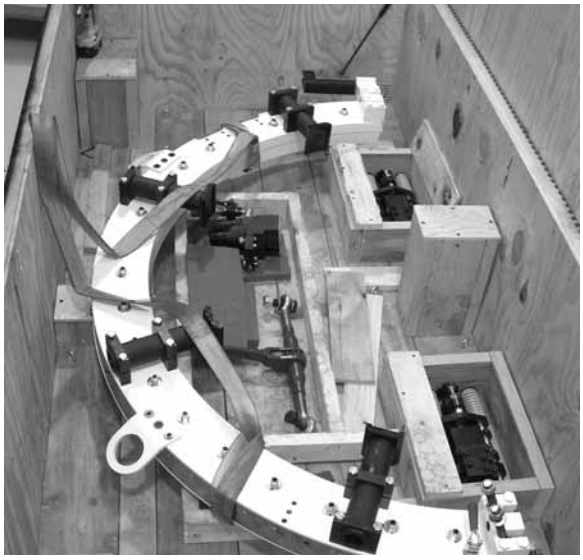


Figure 4-6. Put the first half of the ring into the crate as shown. The ends of the ring should rest on the support blocks in the corners.

6. Attach the crane to the other half of the ring using lifting straps and lower it into the crate as shown in Figure 4-7.

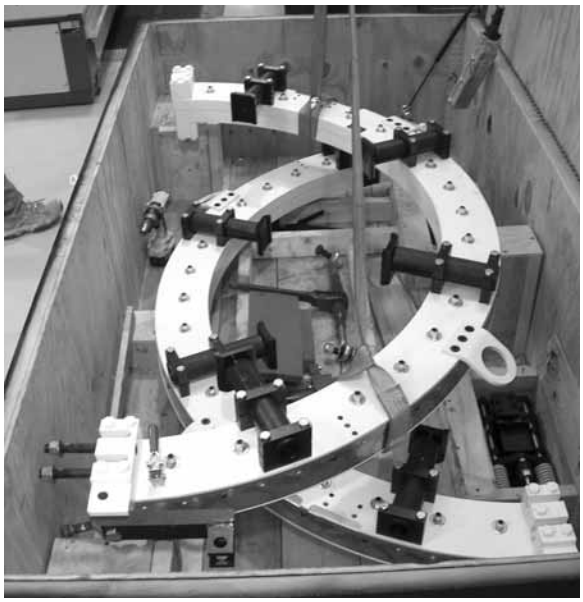


Figure 4-7. Put the second half of the ring into the crate and position it on the taller mounting blocks.

7. Put the flow control assembly in the case alongside the split frame.

Figure 4-8. Put the flow control assembly along the side of the case.

8. Strap the split frame to the eye bolts on the bottom of the crate using the provided straps.

ENVIRONMENTAL REQUIREMENTS

The heavy duty split frame can be used in any industrial environment. The machine can be used for dry cutting or with coolant applied to the workpiece.

If you use the HDSF in a salt-water environment, spray it thoroughly with clean water after use.

LONG-TERM STORAGE

If you will be storing the heavy duty split frame, take the following steps to prepare it:

- Make sure the machine is thoroughly cleaned and cleared of chips and debris.
- Spray the machine with a rust preventative.
- Add a desiccant to the storage case.

- Always store the machine and its accessories in the storage case provided.

SHIPPING

The heavy duty split frame should be shipped in its storage case. Make sure all components are correctly positioned and fastened in the case, and securely fasten the case lid.

Chapter 5

Operating Instructions

In This Chapter

FRAME SET-UP

Splitting and Closing the Frame

1. Align the rotating and stationary rings so that the split points are aligned.

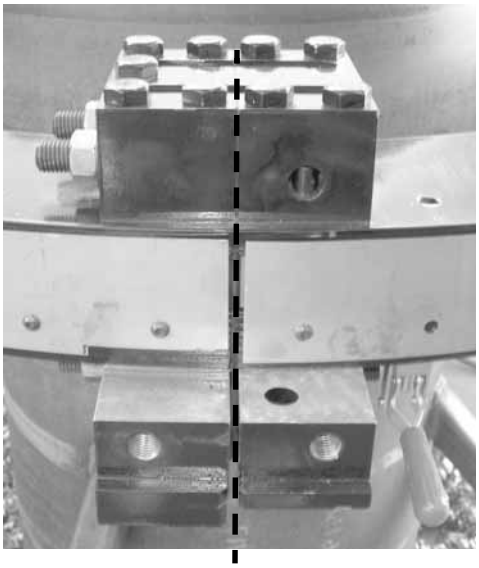


Figure 5-1. Turn the rotating ring so that the split lines on both rings are aligned.

NOTE

Required tools for this procedure: 3/8” hex wrench, 1/2” socket wrench, 3/4” socket wrench, 7/8” socket wrench, 1-1/8” socket wrench, 1-1/8” open end wrench.

WARNING

Failure to insert the frame locking pins before splitting the machine could allow the rotating ring to rotate partially or fully out of the stationary ring. Serious injury and equipment damage could result.

2. Insert the frame locking pins at both locations next to the split points to keep the rotating and stationary rings together.

Figure 5-2. Insert both frame locking pins through the stationary ring and rotating ring. Press the button on the handle of the pin to insert or remove it.

3. Attach the hinge and the jack to the hinge side of the frame. (The hinge side has two threaded holes, as shown in Figure 5-4.)

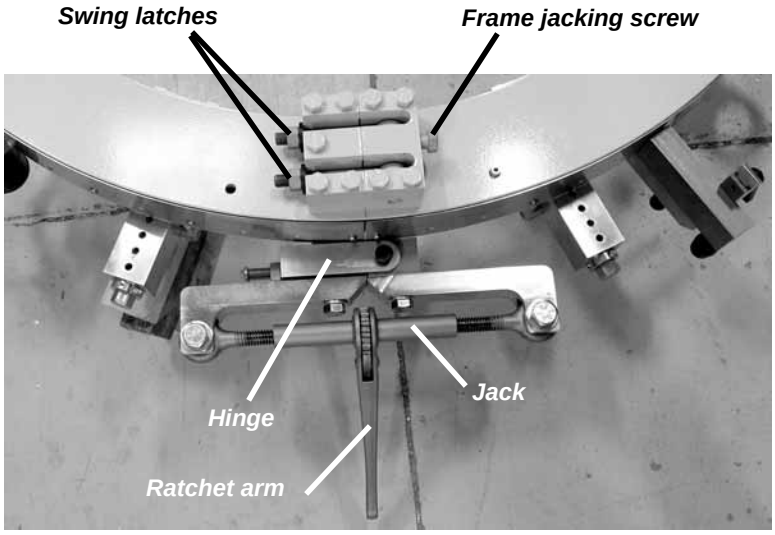


Figure 5-3. Attach the hinge and the jack to the split point.

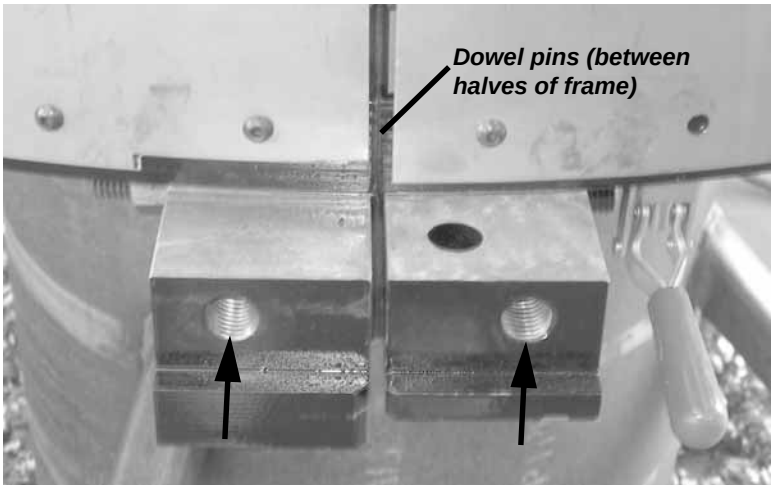


Figure 5-4. The hinge side of the frame has two threaded holes for attaching the hinge.

4. There are four swing latches at each split point, as shown in Figure 5-3—two on the top (rotating) side of the frame, and two on the bottom (stationary) side of the frame. Loosen all eight swing latch nuts and swing the latches out of their channels.

5. Turn the frame jacking screws (see Figure 5-3)on the split point opposite the hinge to separate the two halves of the frame. Make sure the dowel pins are fully retracted from the other side of the frame.

6. Turn the frame jacking screws on the split point with the hinge to separate the frame. Make sure the dowel pins are fully retracted.

NOTE

Use a 1-1/8 inch socket wrench to loosen the swing latch nuts.

NOTE

Use a 3/8 inch hex wrench to turn the frame jacking screws.

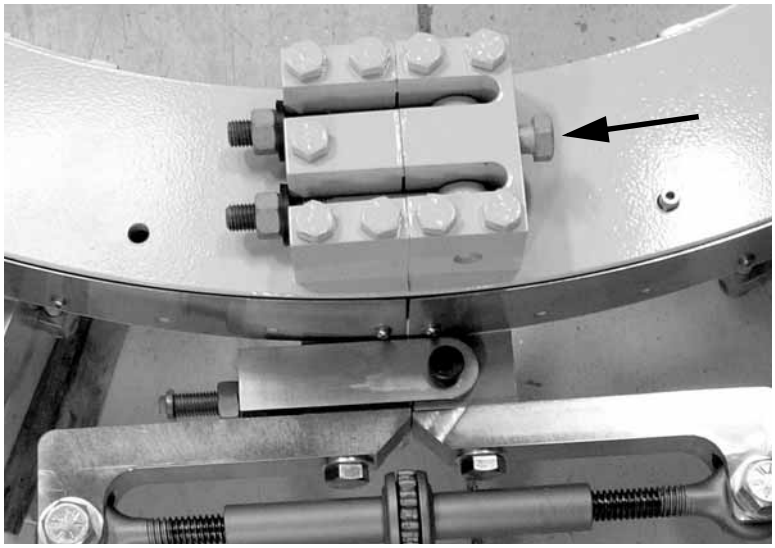


Figure 5-5. Turn the frame jacking screw into the block to separate the frame at the split point.

7. Operate the frame jack to pull the sides of the hinge together. Open the frame as far as necessary to install it on the workpiece.

IMPORTANT

Make sure the halves of the ring do not close again while operating the jack. The dowel pins could bind and break if they are in the alignment holes while you are opening the ring.

Mounting The Frame on the Workpiece

1. Lift the split frame into position over the workpiece.
2. Turn the frame jacking screws back out to allow the split points to close.
3. Reverse the ratchet on the frame jack. Operate the jack to close the hinge.
4. Push the swing latches back into their channels at all four locations and tighten the nuts to secure the split points.
5. Screw the clamping pads all the way into the clamping legs using a socket wrench inserted through the back of each clamping leg.

WARNING

Make sure that no one is near the split frame while operating the lift.

Figure 5-6. Use a 1-1/8" socket inserted through the back of the clamping leg to screw the clamping pads all the way back.

6. Set the clamping leg positions for the size of the pipe you are cutting. With the leg clamping blocks loosened, move the leg to the desired position and rotate it to set the position pin into one of the notches on the leg.

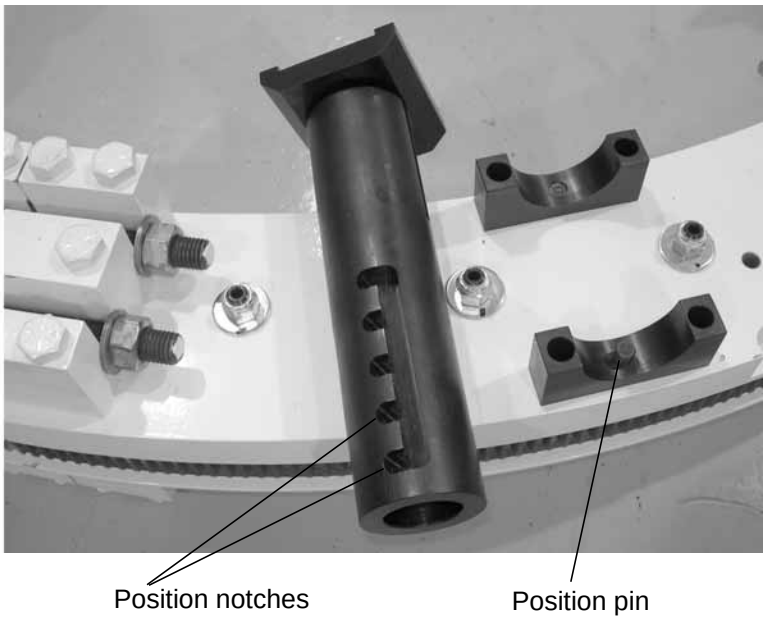


Figure 5-7. The position notches in the leg fit onto the pin in the outside clamping block. The notches are 1" (25 mm) apart.

NOTE

If you have the alternate design clamping legs, see "Alternate Clamping Legs" later in this section.

IMPORTANT

Set all four or eight clamping legs at the same position notch. If all legs are not set the same, the machine will not be centered on the workpiece and will not operate properly.

7. Tighten the screws on the clamping blocks to secure the leg.

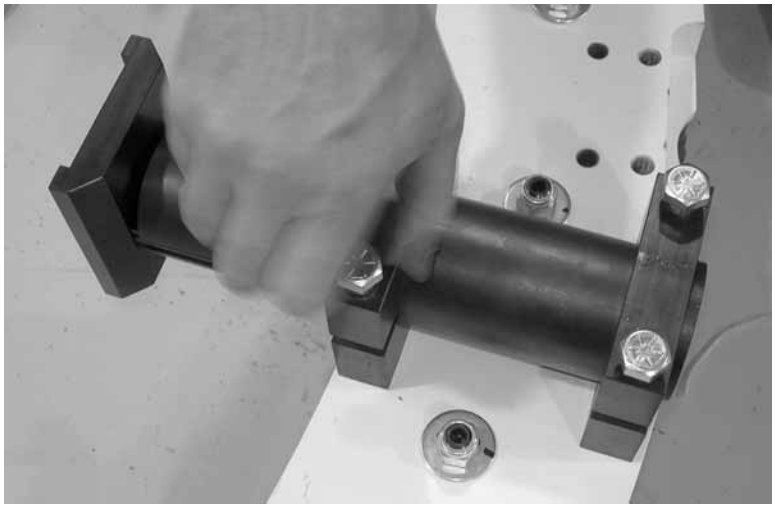


Figure 5-8. After positioning the leg, tighten the clamping block bolts to secure it.

8. Insert a 1-1/8” socket through the back of each clamping leg and adjust them so that the pads are just touching the pipe.

9. Working on two opposite legs at a time, adjust the legs so that each one is extended to the same length, centering the HDSF on the pipe.

Figure 5-9. Tighten the clamping pads using a 1-1/8” socket inserted through the back of the clamping leg.

10. Securely tighten all clamping legs to firmly affix the frame to the pipe.

11. Remove tension on the lift slowly, making sure the ring does not shift. Remove the lift chains or straps.

Alternate Clamping Legs

If your HDSF has the alternate design clamping legs, install and adjust them using the following procedure.

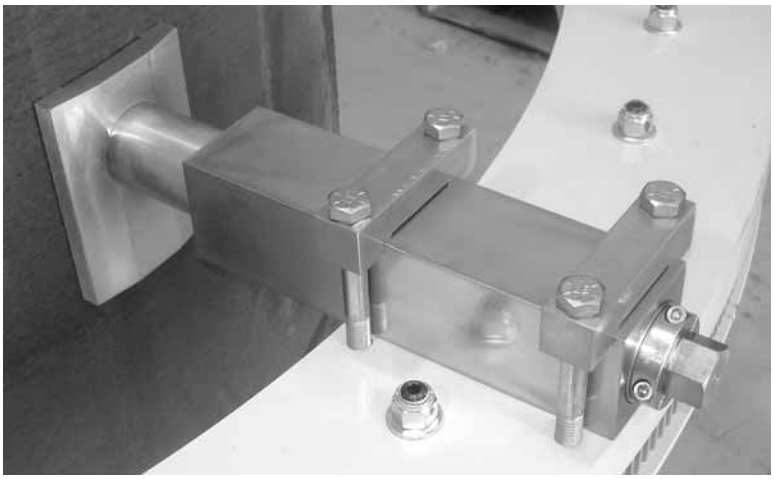


Figure 5-10. Use the procedure in this section if you have the alternate clamping legs shown in the photo.

1. Align one of the holes in the leg with the dowel pin in the HDSF rotating ring. Choose the hole that will mount the leg as close to the workpiece as possible, with enough travel in the clamp screw to tighten and loosen the leg.

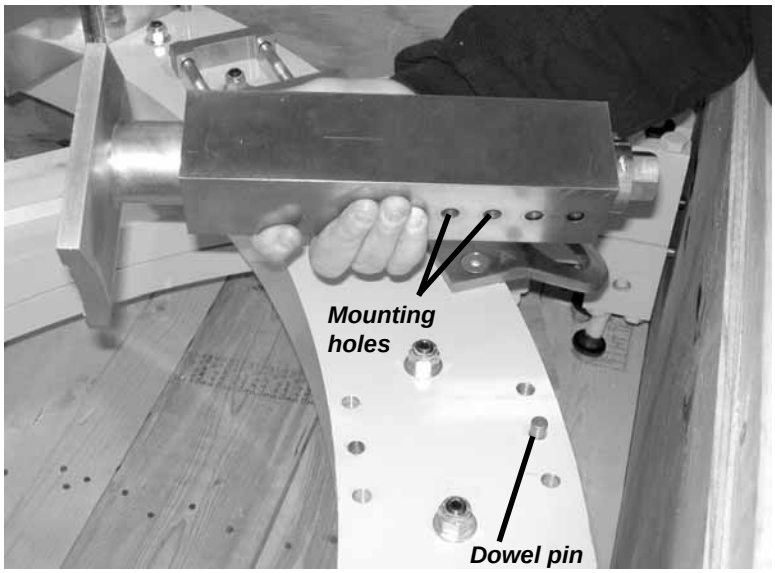


Figure 5-11. Align one of the mounting holes in the leg with the dowel pin on the HDSF rotating ring. Make sure all legs are mounted in the same hole.

2. Install the mounting brackets over the leg and tighten the screws down firmly.

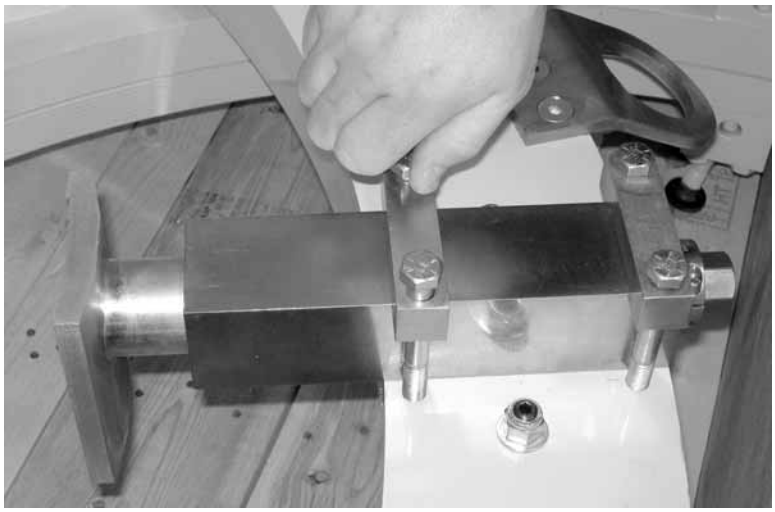


Figure 5-12. Install the leg mounting brackets and tighten the screws.

3. When you have the HDSF in place on the workpiece, turn the adjustment screws on the legs to clamp the machine in place. Center the HDSF as described in the previous section.

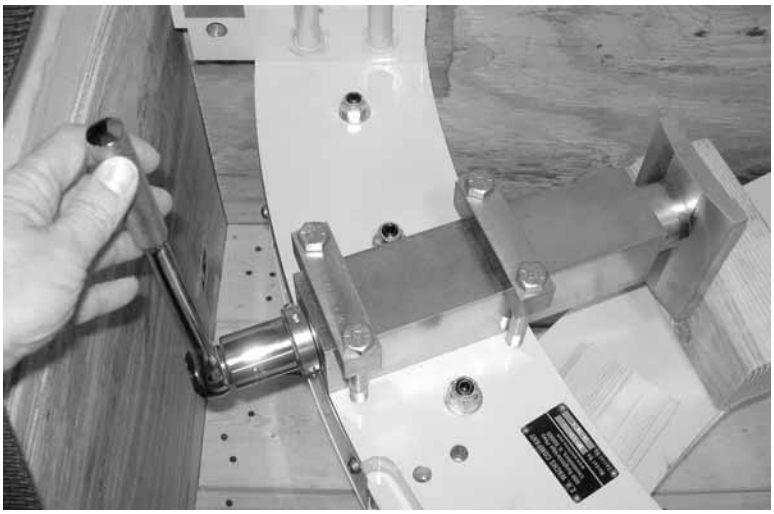


Figure 5-13. Turn the leg adjustment screw to clamp the legs on the workpiece.

INSTALLING AND CONNECTING THE DRIVE MOTOR

Hydraulic Drive

1. Be sure there is no load on the HDSF. Back off any cutting tools and disengage the trip.
2. Remove any cutting debris or chips from the are mounting area on the machine and wipe clean with a rag. Make sure the threaded holes and pivot hole are clean of debris.
3. Check the pinion housing for any debris and wipe clean with a rag.
4. Mount the pinion housing loosely as shown in Figure 5-14. If using more than one drive motor, connect only one at this time.

NOTE

Use the following tools to attach and adjust the hydraulic motor: 3/4” socket to tighten the motor mounting bolts and the pinion clearance set screw; 1/2” socket to turn the pinion clearance adjustment screw.

Figure 5-14. Install the hydraulic motor on the frame at the mounting location.

5. Back out the pinion clearance adjustment screw to allow the pinion the most travel into the machine.

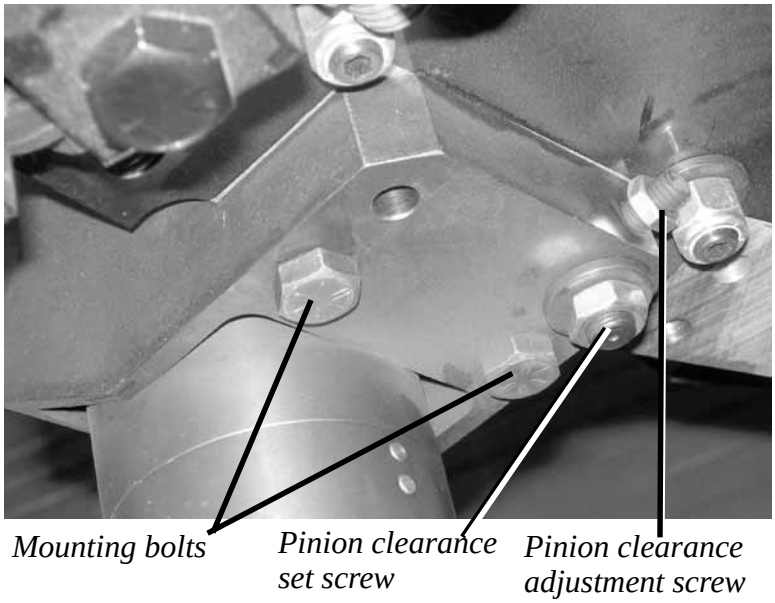


Figure 5-15. The photo shows the screws used to mount and adjust the pinion housing.

6. Press the pinion gear toward the large ring gear until full gear engagement is felt. The housing rotates on the pin next to the mounting bolts.

7. Hand tighten the pinion clearance adjustment screw until it bottoms out. Tighten jam nut with wrench. This prevents the motor from moving out of location.

8. Fully tighten the two mounting bolts with a wrench.

9. Connect the hoses from the hydraulic power unit (HPU) to the flow control valve assembly, as shown in Figure 5-16

10. Connect the hoses from the hydraulic motor on the split frame to the flow control valve assembly as shown in Figure 5-16.

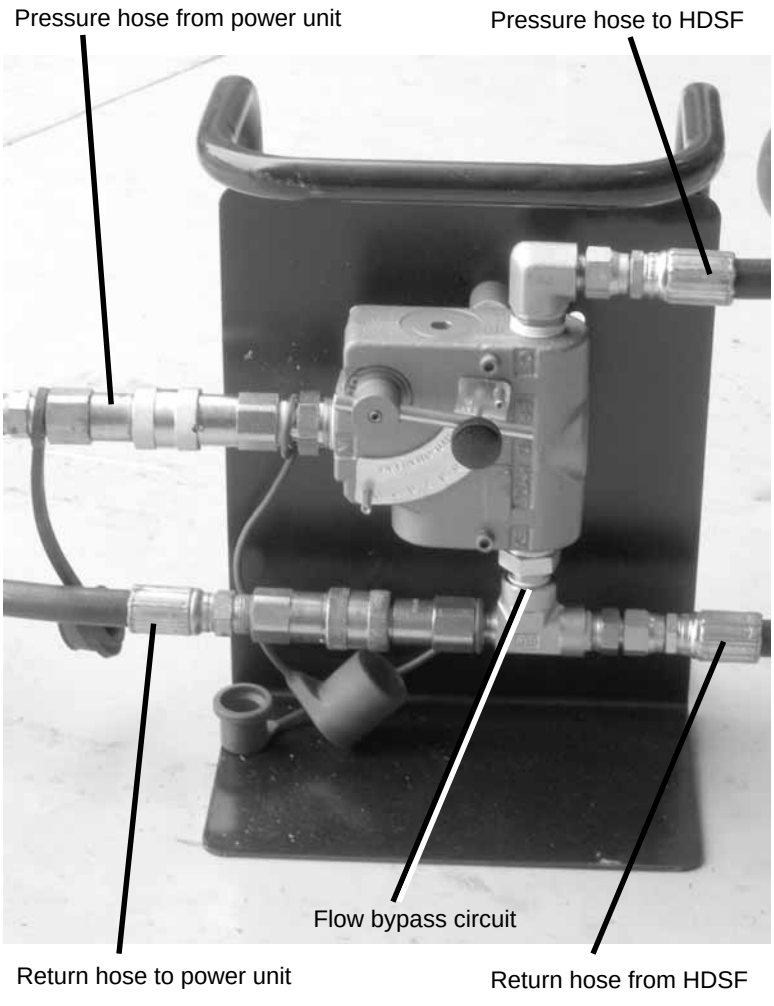


Figure 5-16. Connect the flow control valve as shown between the HPU and the split frame motor.

11. Set the flow lever on the flow control valve to 0, and set the flow lever on the motor to the closed position.

12. To operate the split frame, open the flow valve on the hydraulic motor, then move the flow control lever on the control valve to increase the flow.

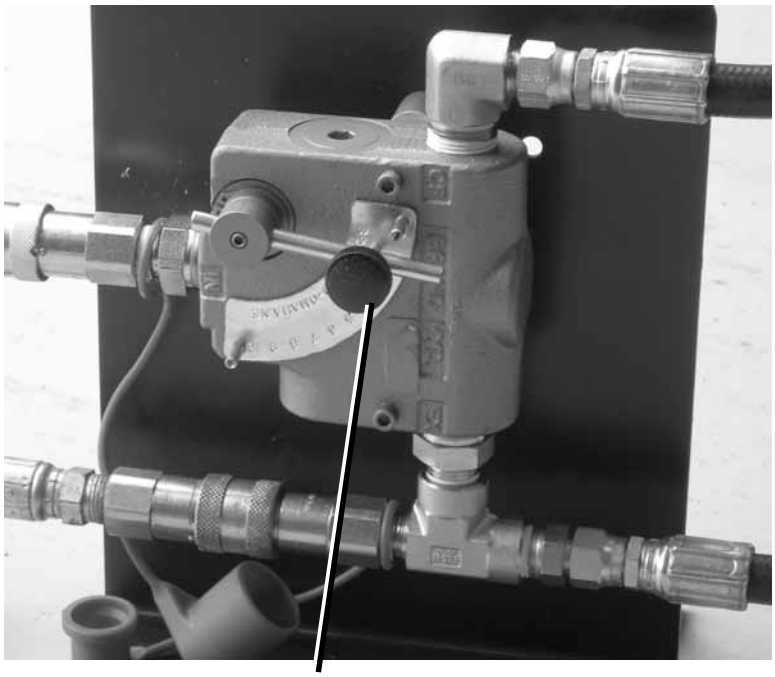


Figure 5-17. Move the flow control lever down to open flow to the hydraulic motor.

13. Run the machine slowly.If any gear binding is felt or heard, stop the machine. Back out the pinion clearance adjustment screw 1/8 turn and lock it in place with the jam nut.

14. Loosen the two mounting bolts and let the pinion housing move back against the pinion clearance adjustment screw.

15. Fully tighten the two mounting bolts with a wrench.

16. Continue this method until the gears sound and feel good.

17. If using two drive motors, install and adjust it following the same procedure used for the first motor. Do not remove or change the first drive motor.

Dual-Motor Drive Option

For HDSF machines equipped with the dual-motor drive, connect the hydraulic hoses as illustrated in Figure 5-18. Note that the dual-motor option has its own on/off flow lever.

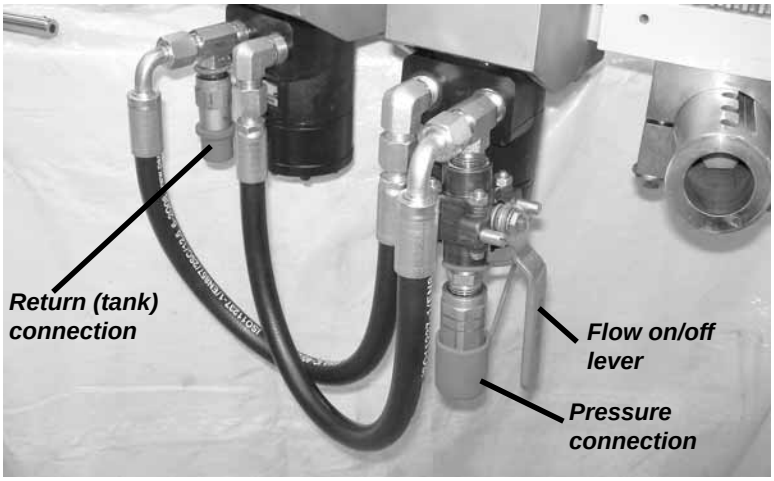


Figure 5-18. Connect the hydraulic hoses to the dual-motor drive as illustrated.

Air Drive

1. Install the air motor on the motor mount, as shown in Figure 5-19.
2. Adjust the clearance between the pinion gear and the rotating frame gear using the pinion clearance adjustment screw (see Figure 5-15). The pinion gear should be as close as possible to the frame gear without binding.

NOTE

The air supply should provide 95 cfm (2690 l/m). Maximum pressure should be no more than 90 psi (1300 bar).

Figure 5-19. Install the air motor on the frame and tighten the two bolts (underneath) that secure it.

Use the following tools to attach and adjust the air motor: 3/4” socket to tighten the motor mounting bolts and the pinion clearance set screw; 1/2” socket to turn the pinion clearance adjustment screw.

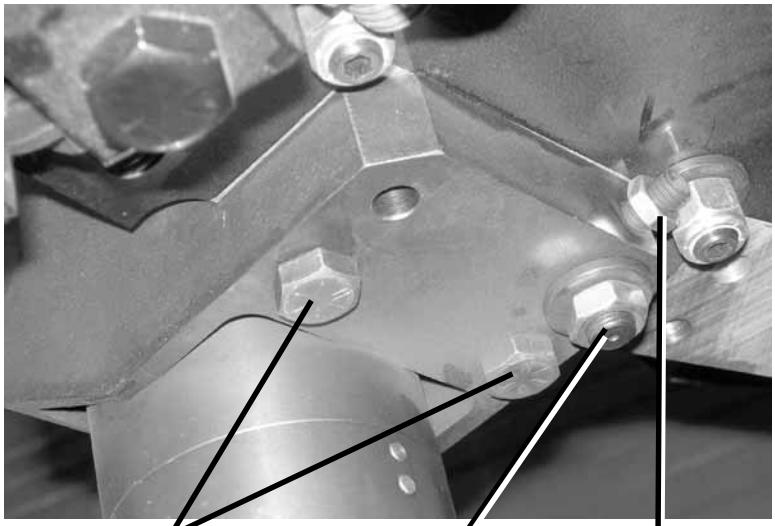


Figure 5-20. Two bolts fasten the air motor mount to the frame. To set the pinion clearance, loosen the set screw and turn the adjustment screw. Re-tighten the set screw.

3. Attach the air supply line to the connector on the drive motor.

TRACKING SLIDE SET-UP

The tracking slides provide uniform cutting and beveling on pipes that are out of round or in situations where the split frame is not centered on the pipe. The spring-tensioned tracking mechanism allows radial motion (perpendicular to the side of the pipe) of up to 1/2 inch, keeping the cutting tool on the pipe at all times and compensating for a maximum 1 inch out-of-roundness.

Two tracking slides are provided. One includes a tool holder for a parting tool; the other can hold either a parting tool or a beveling tool. You can use these slides to perform a cutting and beveling operation, or an offset severing operation with two parting tools.

NOTE

The beveling tool holder is designed for 1/2” wide x 3/4” tall cutting tools. You can order a special tool cover for tools taller than 3/4”.

Slide Set-Up for Cutting and Beveling

1. Position the slide mounting blocks for the parting tool slide on the split frame rotating ring and insert the mounting bolts, as shown in Figure 5-21.

NOTE

Do not tighten the mounting bolts yet. You will tighten them when you finish positioning the slide.

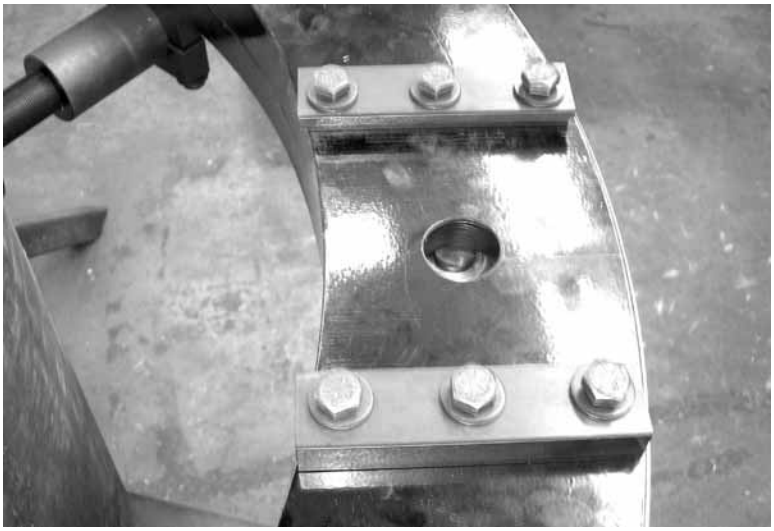


Figure 5-21. Install the slide mounting blocks on the rotating ring. Leave the mounting bolts loose.

2. Turn the star wheel on the parting tool slide to fully

retract the tool mount away from the pipe.

3. Mount the parting tool slide onto the rotating ring by sliding the base plate into the channels on the undersides of the slide mounting blocks. Leave the mounting bolts loose.

NOTE

The parting tool slide can be mounted at either slide position on the frame.

4. Turn the jacking screw on the parting tool slide so that the end plate is all the way forward (toward the bar guides). Turn the nut back one turn.

NOTE

Use a 1-1/8 inch open end wrench to turn the jacking nut.

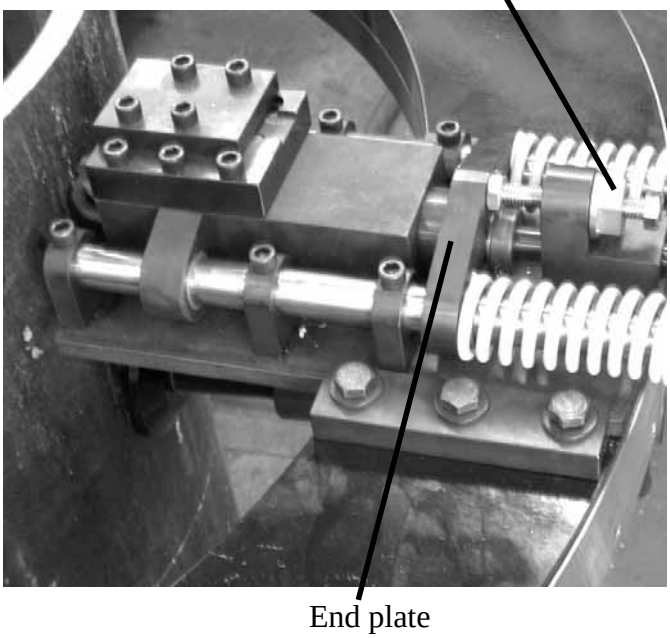


Figure 5-22. Turn the slide jacking nut to retract the end plate all the way back (fully compressing the springs). After fully retracting, turn the nut back one turn.

5. Push the slide all the way toward the pipe until the tracking wheel contacts the pipe surface.

6. Tighten down the bolts on the mounting blocks until they are just snug enough to keep the slide from moving freely. Do not tighten them completely; the slide will need to move when you run the machine to set the high point.

NOTE

Use a 3/4 inch socket wrench to tighten the mounting bolts.

7. Repeat Steps 1-6 for the beveling tool slide.

8. Remove the frame locking pins and put them in the storage holes provided.

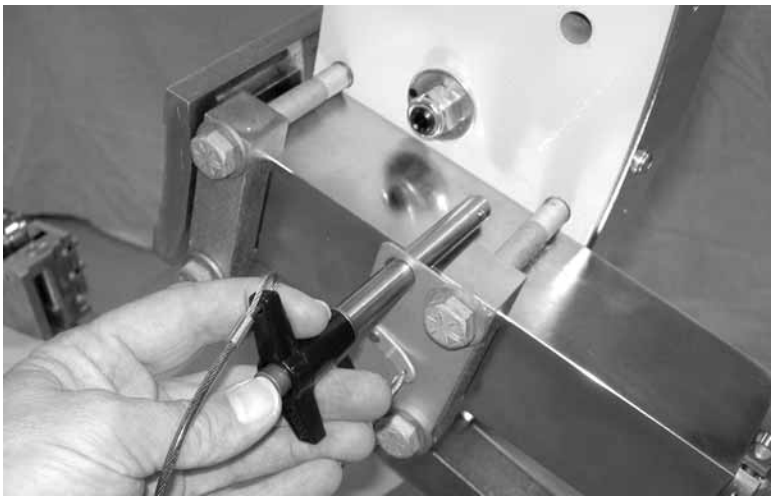


Figure 5-23. Remove the frame locking pins and put them in the holes provided for storing them, as shown.

9. Engage the power and slowly drive the frame around the pipe one complete rotation. As the tracking wheel on each slide travels over the surface of the pipe, it will push the slide back so that it is in position to contact the pipe at the high point (the location where the clearance is least).

10. Without moving the slides, securely tighten the bolts on the slide mounts.

11. Turn the jacking nuts on both slides back until the end plate almost touches the bar guide.

WARNING

Keep hands and clothing clear of the machine while operating it.

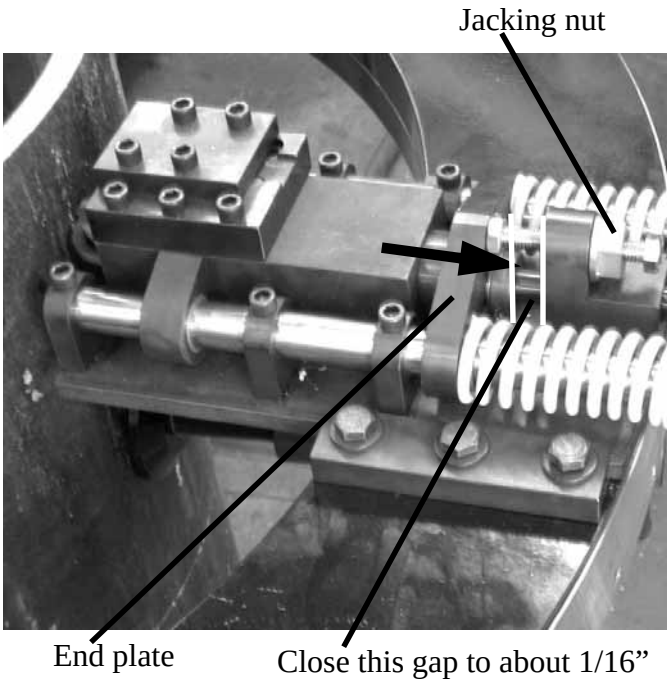


Figure 5-24. Turn the jacking nut back until the end plate is almost fully retracted. There should be about 1/16” clearance between the endplate collar and the jacking nut post.

12. Insert the tool into the tool mount.
13. Turn the star wheel to drive the tool toward the pipe until the blade is 1/16” from the pipe surface.
14. Repeat Steps 2-13 for the beveling tool slide.
15. Install the trip assembly on the stationary frame.
16. Using the drive motor, rotate the frame to position one of the star wheels over the trip assembly.

NOTE

Use a 1-1/8 inch socket wrench to turn the star wheel.

WARNING

Keep hands and clothing clear of the machine while operating it.

17. Loosen the trip locking lever. Using the trip adjustment knob, slide the trip toward or away from the frame to position it beneath the star wheel.

NOTE

The height of the trip is not adjustable. It is fixed in relation to the slide.

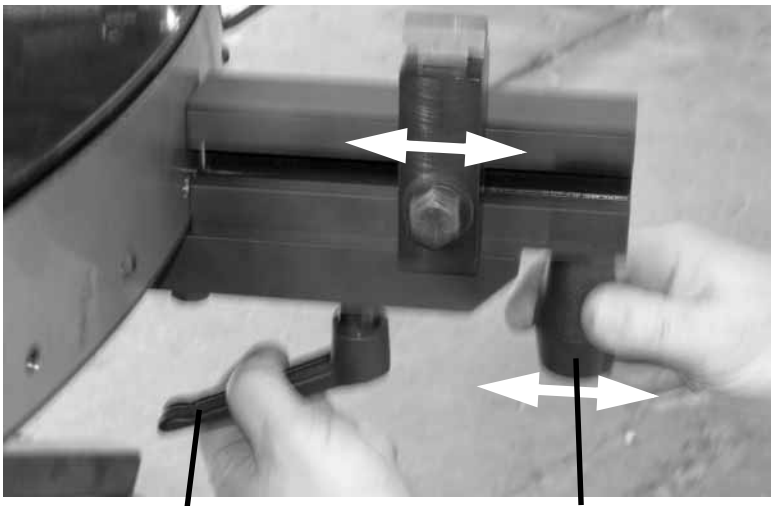


Figure 5-25. Loosen the trip lock lever and slide the trip adjustment knob to position the trip beneath the star wheel on the slide.

Slide Set-Up for Offset Cutting

Follow the same procedure as the previous section for installing both slides. When you install the beveling tool slide, insert a parting tool instead of a beveling tool.

The beveling tool slide is designed to hold a parting tool with a 1/16” offset from the tool in the parting tool slide. This will result in a cut 1/16” wider than the cut made by a single parting tool.

IMPORTANT

Do not operate the split frame with a single parting tool only. A beveling tool or second parting tool is required to keep the parting tool from binding in the cutting groove.

OPERATION

1. Power on the hydraulic power unit, or turn on the compressed air supply.
2. For hydraulic machines, open the flow valve on the hydraulic motor.
3. Slowly increase the hydraulic or air flow to provide power to the motor. For hydraulic machines, a flow of about 15 gpm will rotate the split frame at approximately 8.7 RPM.

WARNING

Keep hands and clothing clear of the machine while operating it.

NOTE

If the beveling blade contacts the pipe before the parting blade, stop the machine and adjust the slides by turning the star wheel.

IMPORTANT

Watch the tracking wheels to make sure that they stay clear of chips.

Use coolant on the cutting surface to improve cutting and extend tool life.

As the tools penetrate the pipe surface, watch to make sure both slides are advancing at the same rate. (Depending on the type of material being cut, the difference in resistance on the two tools may cause one to advance more slowly.) If one slide is advancing too rapidly, slow the machine to the slowest speed possible and retract the slide slightly using a socket on the star wheel.

If you are operating with the split frame horizontal (cutting a vertical pipe), you may have to clear chips from the tracking wheels. Use compressed air to blow the chips out as the slides pass, or stop the machine and brush the chips out of the wheel assembly.

Chapter 6
Routine Maintenance

The heavy duty split frame requires minimal maintenance. Follow the lubrication guidelines in this chapter.

In This Chapter

LUBRICATION

Before each machining operation, lubricate the slide rods on both slides.

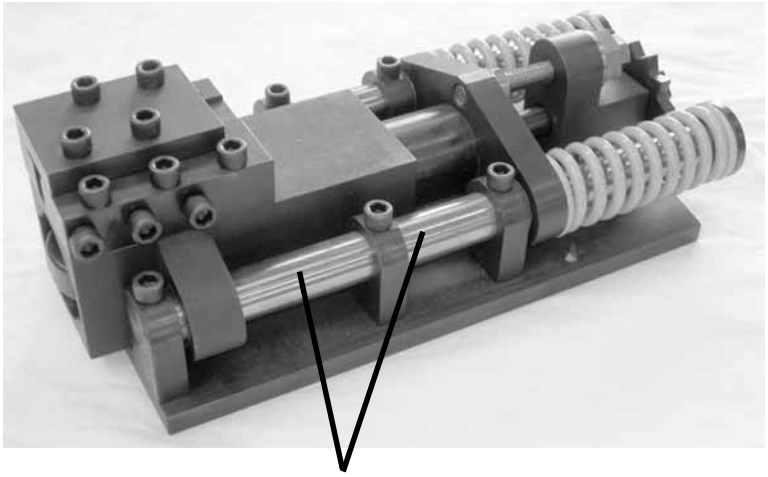


Figure 6-1. Lubricate the slides before each machining operation.

Apply standard grease to all grease fittings on the split frame every time you use the machine.

TOOL INSERTS

Check the sharpness of the tool inserts frequently. Replace dull inserts as necessary.

CLEANING

Clean the slides of all chips and debris after each use. Make sure that all chips are cleared from around the tracking wheel. See instructions for disassembly in Chapter 7.

Every 8 hours of operation, remove and clean the tracking wheel and bearings on both slides.

Chapter 7
Service and Repair

The heavy duty split frame is a durable system with little required maintenance. This chapter contains information on performing machine adjustments and service.

In This Chapter

ADJUSTING THE BEARINGS

You should adjust the bearings in the split frame if you can feel play between the rotating and stationary rings. To check for play, lay the assembled split frame on a work surface with the rotating ring down. Push back and forth on the stationary ring; if it moves, the bearings need to be adjusted according to the following procedure.

1. Lay the split frame on the work surface with the rotating ring up.
2. If the tool slides are installed, remove them.
3. Align the rotating ring with the stationary ring so that the split points are aligned.

NOTE

Required tools:
1/4” hex wrench, 3/8” hex wrench, 7/8” socket wrench, 1-1/8” socket wrench.

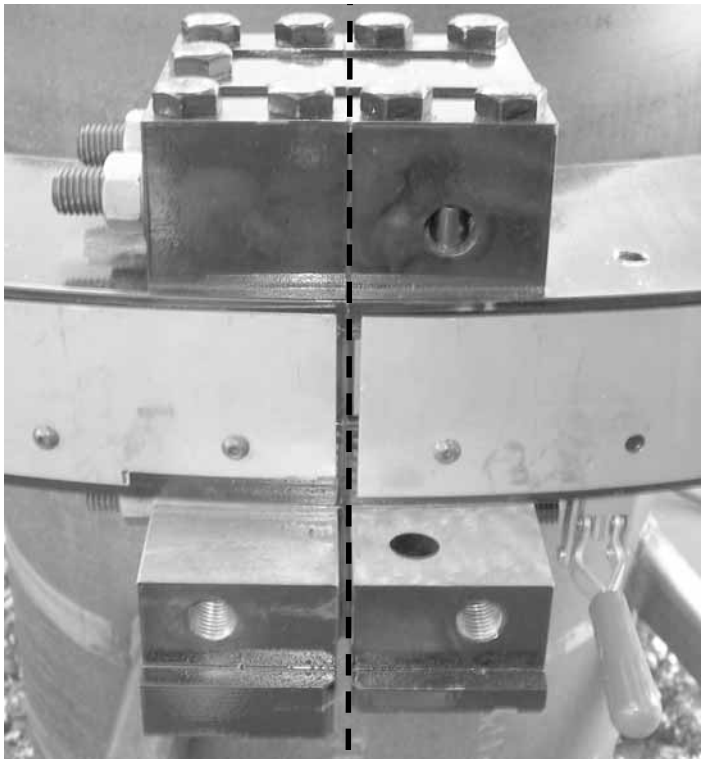


Figure 7-1. Turn the rotating ring so that the split lines on both rings are aligned.

4. Insert the frame locking pins on both sides of the frame.

Figure 7-2. Insert the frame locking pins to lock the stationary and rotating rings together.

5. There are four swing latches at each split point—two on the top (rotating) side of the frame, and two on the bottom (stationary) side of the frame. Loosen all eight swing latch nuts and swing the latches out of their channels.

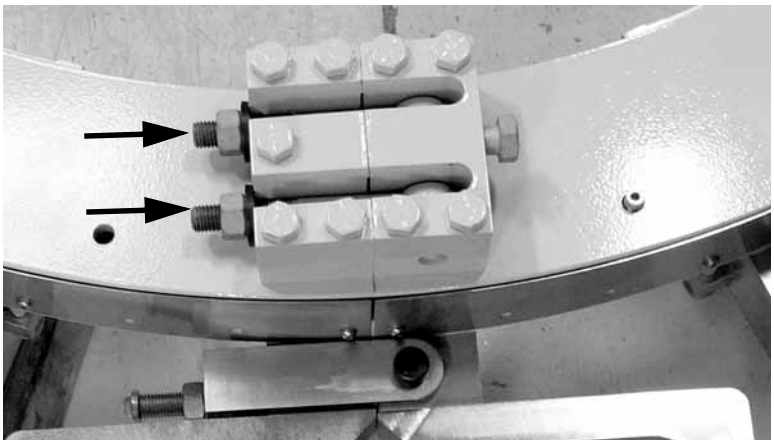


Figure 7-3. The photo shows the swing latches on the stationary ring side of the frame. Loosen the nuts and lift the latches out of their channels.

NOTE

Use a 1-1/8 inch socket wrench to loosen the swing latch nuts.

6. Turn in the frame jacking screws on both split points to separate the two halves of the frame. Once the frame is separated, turn the jacking screws back out all the way.

NOTE

Use a 3/8” hex wrench to turn the frame jacking screws.

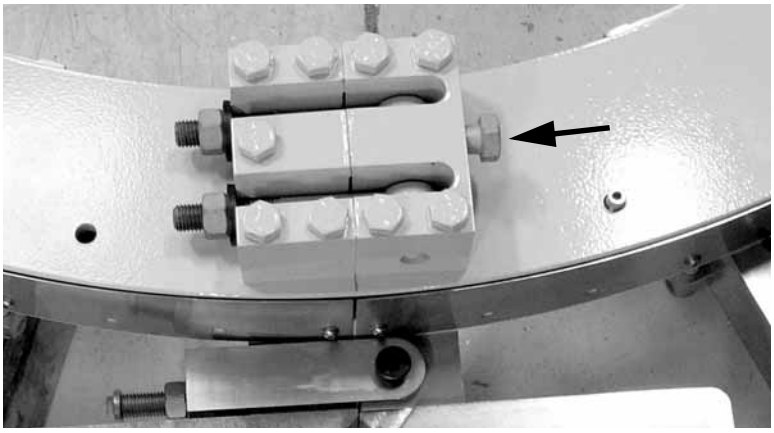


Figure 7-4. Turn the frame jacking screw into the block to separate the frame at the split point.

7. Pull the two halves of the frame apart.

8. Swing the frame locking lever toward the inside of the frame to allow the rotating ring to turn.

NOTE

Perform steps 9-12 for both halves of the ring.

NOTE

Check the condition of all bearings, and replace any components that are worn or damaged.

NOTE

Position the split frame so that the section you are working on hangs over the edge of the work surface. You will need to access the bearing you are adjusting from both sides of the frame.

9. On each half of the frame, turn the rotating ring out of the stationary ring and remove it. Turn the stationary ring over to access the bearing nuts on the back.

10. Using a 7/8” socket, loosen the Nylock hex nut on each bearing just enough to allow the eccentric shafts to rotate smoothly. Turn the ring back over.

11. Rotate all eccentric shafts so that the notch in the bearing surface points toward the inside of the ring.

12. Slide the rotating ring back into the stationary ring and reset the frame locking lever.

13. Reassemble the two halves of the frame, aligning the dowel pins into the corresponding alignment holes.

14. Set all eight swing latches back in their channels and tighten them to secure the frame.

15. Release the frame locking lever to allow the rotating ring to turn.

16. Turn the rotating ring so that you can access bearing #1 (shown in Figure 7-5) through the bearing access hole in the rotating ring. NOTE: depending on the size of the split frame, you may need to use the motor drive to turn the frame.

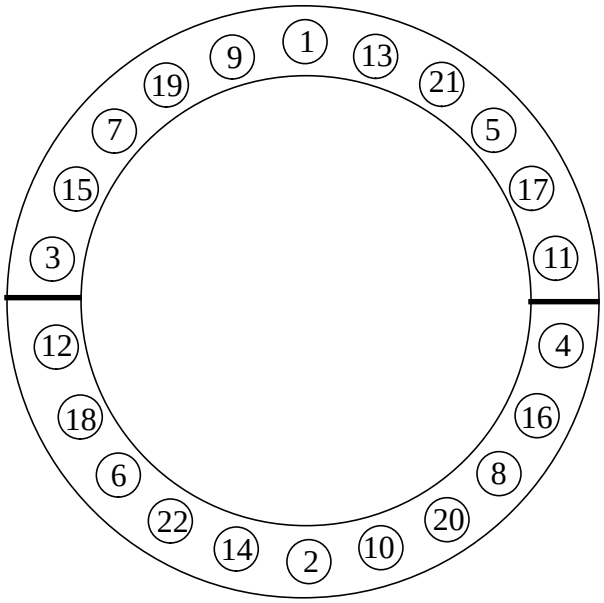


Figure 7-5. The diagram shows the tightening order of bearings in the heavy duty split frame. View is looking down onto rotating ring. (Different sized machines will have different numbers of bearings.)

17. Insert a 1/4” hex wrench through the bearing access hole and turn the eccentric shaft of the bearing **clockwise** until the bearing feels fully seated in the groove. Hold the eccentric shaft at this position with the wrench.

18. On the back of the stationary ring, tighten the Nylock hex nut for bearing #1.

19. Repeat steps 16-18 for bearing #2, then #3 and #4 in order. (See Figure 7-5.)

20. After you tighten these four bearings, turn the rotating ring to re-align the split points.

21. Swivel the frame locking levers to the locked positions. If the levers cannot be fully seated in the locked position, loosen bearings #1-#4 and repeat steps 16-18. Do not proceed until the bearings are adjusted so that the locking levers will seat properly.

22. Swivel the frame locking levers back to the unlocked position before proceeding to the next pair of opposite bearings.

NOTE

Depending on the size of the split frame, there may be a different number of bearings than shown in the diagram. Follow the general pattern of tightening opposite pairs, then moving to another pair approximately 90° around the frame.

NOTE

Use a 7/8” socket to tighten the Nylock nuts.

NOTE

Do NOT force the bearing tight against the groove.

23. Starting with bearing #5, use the 1/4” hex wrench to turn the eccentric shaft **counter-clockwise** until you can feel the bearing just touch the groove. While holding the bearing in this position, tighten the Nylock nut on the back of the stationary ring.

24. Repeat steps 22-23 for the remaining bearings in order. After adjusting each pair of opposite bearings, set the frame locking levers to make sure they fully seat. If the levers do not seat, re-do the adjustment of the pair of bearings just completed.

25. Go back to bearing #1 and turn the eccentric shaft back **counter-clockwise** until it just touches the groove. While holding the bearing in this position, tighten the Nylock nut on the back of the stationary ring.

26. Repeat step 25 for bearings #2 through #4. Check that locking levers seat after each pair of bearings.

27. After adjusting all bearings, check that the rotating ring turns freely on the stationary ring. If it doesn’t, repeat steps 23-26.

28. Looking through the alignment pin hole, turn the rotating ring through one full revolution and make sure each bearing turns with the machine. If they don’t, repeat steps 23-26.

ADJUSTING THE PINION GEAR

1. Be sure there is no load on the HDSF. Back off any cutting tools and disengage the trip.

2. Remove any cutting debris or chips from the gear mounting area on the machine and wipe clean with a rag. Make sure the threaded holes and pivot hole are clean of debris.

3. Check the pinion housing for any debris and wipe clean with a rag.

4. Mount the pinion housing loosely in the desired location. If using more than one drive motor, connect only one at this time.

5. The pinion clearance adjustment screw (it is perpendicular/90-degrees from the mounting bolts and has a jam nut on it) should be backed out to allow the pinion the most travel into the machine.

6. Press the pinion gear towards the large ring gear until full gear engagement is felt. The housing is rotating on the pin that is next to the mounting bolts.

7. Hand tighten the pinion clearance adjustment screw until it bottoms out. Tighten jam nut with wrench. This prevents the motor from moving out of location.

8. Fully tighten the two mounting bolts with a wrench.

9. Run the machine slowly. If any gear binding is felt or heard, stop the machine. Back out the pinion clearance adjustment screw 1/8 turn and lock in place with jam nut.

10. Loosen the two mounting bolts and let the pinion housing move back against the pinion clearance adjustment screw.

11. Fully tighten the two mounting bolts with a wrench.

12. Continue this method until the gears sound and feel smooth as the machine rotates.

13. If using two drive motors, repeat the procedure for the second motor. Do not remove or change the first drive motor.

ADJUSTING THE SLIDES

Slide Inspection

1. After each use, wipe slides down and remove all cutting chips.

2. Inspect the tracking wheel and bearing. Make sure that it turns smoothly. If it binds or turns rough, further inspection of the bearing is required. (See “Tracking Wheel Disassembly” later in this section).

3. The starwheel should turn by hand but not be free spinning. If it spins freely, you may need to adjust the

feed screw split ring lock. (See “Feed Screw Adjustment Procedure” later in this section.)

4. Inspect the starwheel trip for damage or wear. Replace the trip if it is worn or broken.

5. Inspect the tool post to ensure it is in good working order. Using the feed nut on top of the starwheel, move the slide through the full travel range top to bottom. If it binds or has play, further inspection is required. (See “Bushing Inspection and Replacement” later in this section.).

6. The tool post and rods use bushings that need no further lubrication. If play exists at any of these locations, bushing replacement is recommended. (See “Bushing Inspection and Replacement” later in this section.)

Tracking Wheel Disassembly

1. Remove the set screw that retains the tracking wheel shaft.

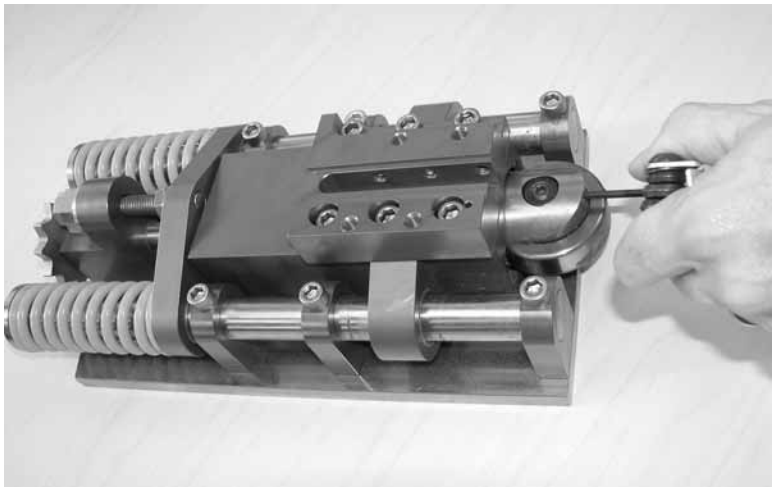


Figure 7-6. Remove the set screw holding the tracking wheel shaft.

2. Remove the shaft from the tool post.

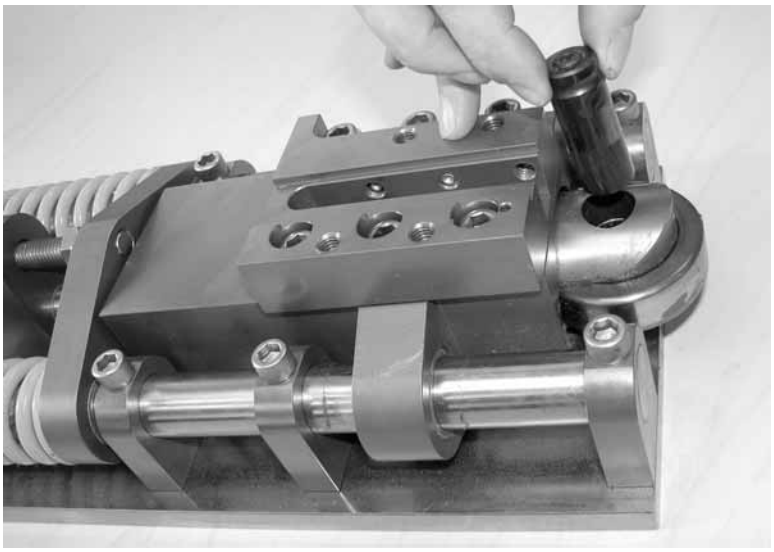


Figure 7-7. Pull out the tracking wheel shaft.

3. Inspect the shaft and bearing. If the shaft is pitted or damaged, replace it before reassembling the tracking wheel. If the bearing shows wear, replace it. Otherwise, clean, re-lubricate, and reassemble the bearing.

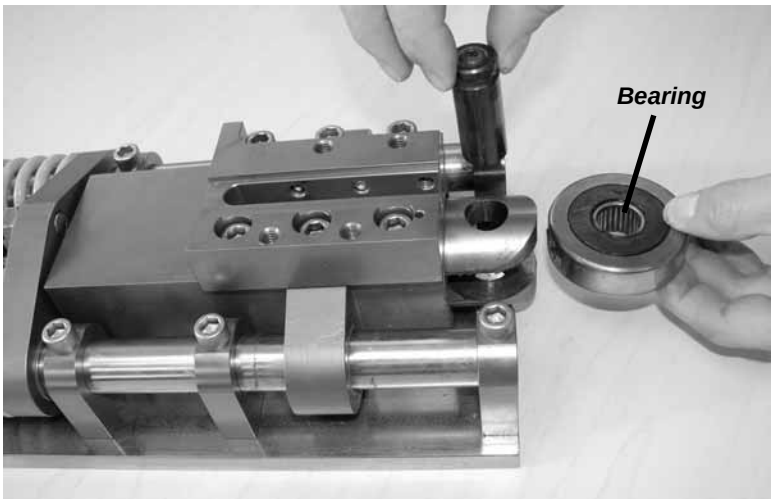


Figure 7-8. Remove the tracking wheel to inspect the bearing for wear.

4. Replace the wheel and insert the shaft into the tool post through the bearing, with the flat on the shaft aligned with the front of the tool post. Replace and tighten the set screw.

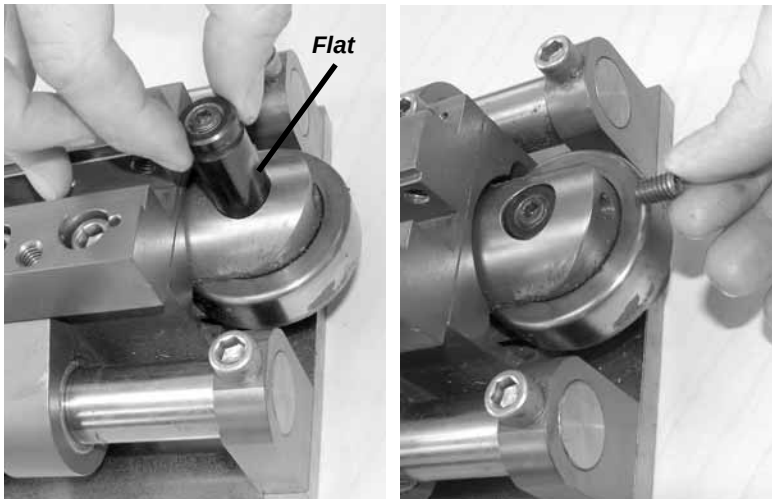


Figure 7-9. Insert the shaft through the wheel, with the flat toward the end of the slide (left photo). Then re-insert and tighten the set screw (right photo).

Feed Screw Adjustment Procedure

If the tool is "diving" into the workpiece (advancing too far when the starwheel trips), you may need to adjust the feed screw tension. Check for a gap between the split ring lock and end plate, as shown in Figure 7-10. The split ring lock should be tight against the end plate.

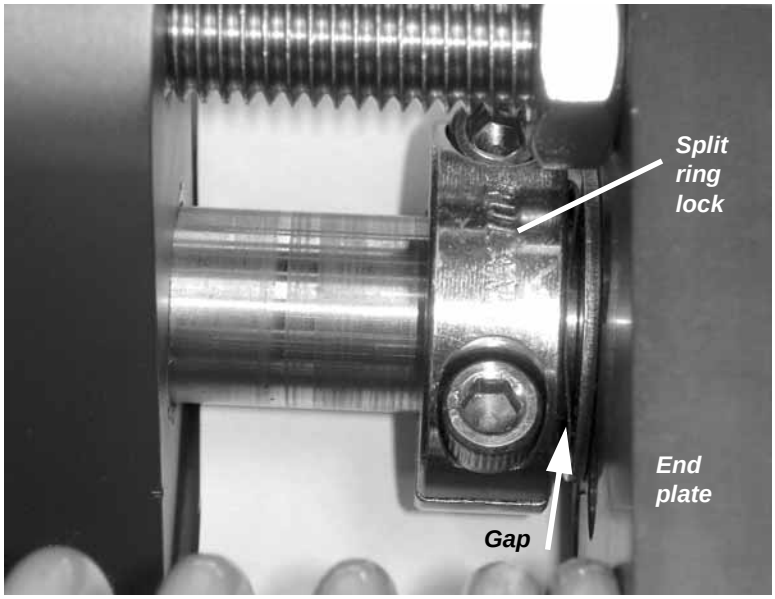


Figure 7-10. If there is a gap between the split ring lock and the end plate, you will need to adjust the slide to close the gap.

1. Set the slide on a workbench or stable work surface.
2. Turn the feed nut on the starwheel counter-clockwise to advance the slide to the end of travel.

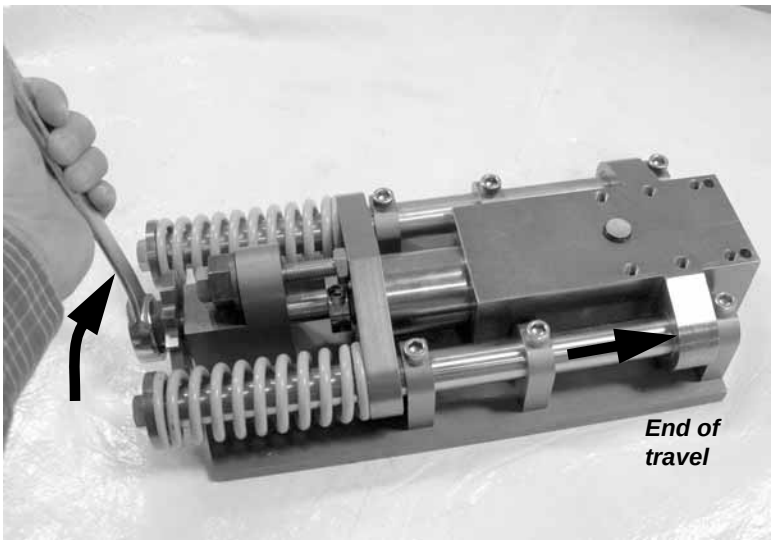


Figure 7-11. Turn the feed nut counter-clockwise to advance the slide to the end of travel.

3. Turn the feed nut so that you can access the screws on the split ring lock. Loosen the screws.

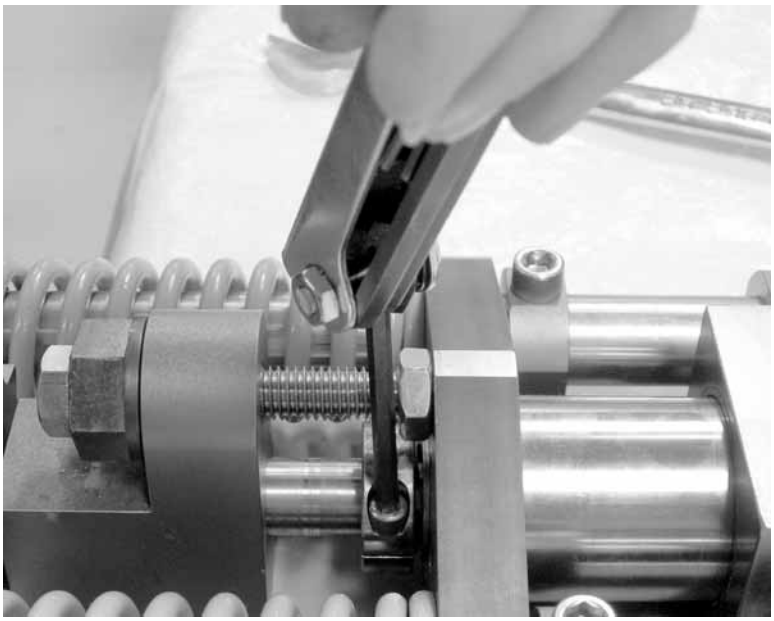


Figure 7-12. Loosen the two screws in the split ring lock.

4. Turn the spring tension nut clockwise until the split ring lock is pressed tight against the end plate.

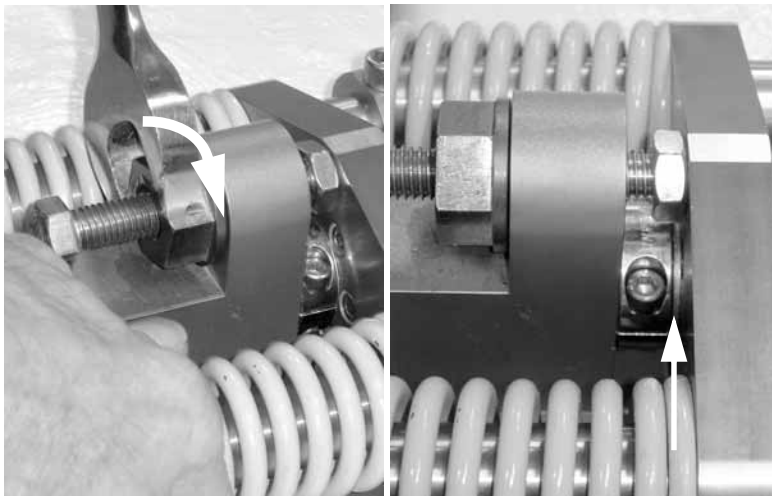


Figure 7-13. Tighten the spring tension nut (left photo) until the split ring lock is tight against the end plate, with no gap (right photo).

5. Securely tighten the screws in the split ring lock.

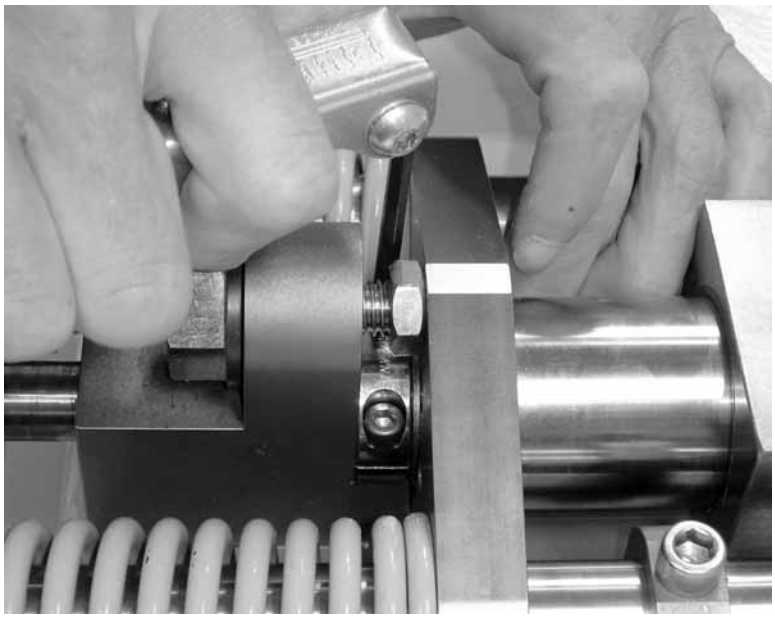


Figure 7-14. With the split ring lock pressed in place, tighten the screws securely.

6. Turn the spring tension nut counter-clockwise all the way.

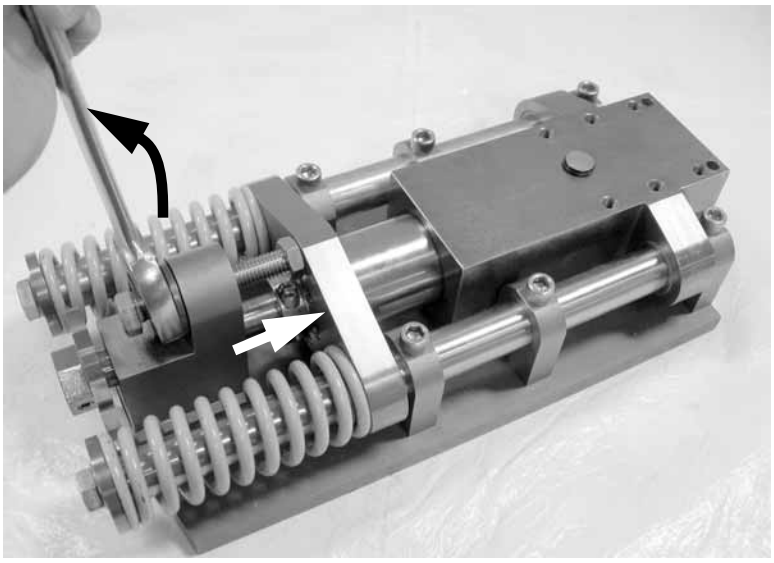


Figure 7-15. Turn the spring tension nut to move the end plate all the way forward.

7. Turn the feed nut on the starwheel clockwise to retract the slide to the center of its travel.

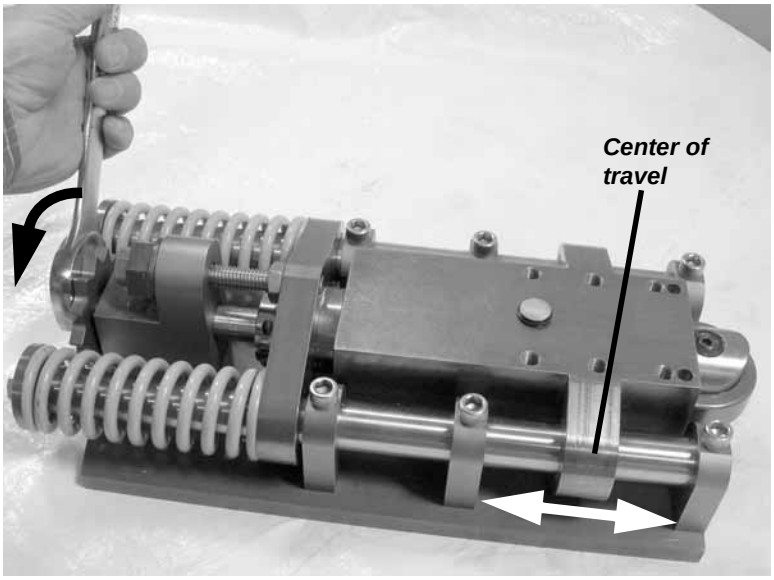


Figure 7-16. Turn the starwheel nut clockwise until the slide is approximately at the center of travel.

Bushing Inspection and Replacement

1. Remove roll pin from the starwheel, and slide the starwheel off of feed shaft.

Figure 7-17. Use a punch to remove the roll pin holding the starwheel in place, then pull the starwheel off the feed shaft.

2. Loosen the screws on the split ring lock and remove it.

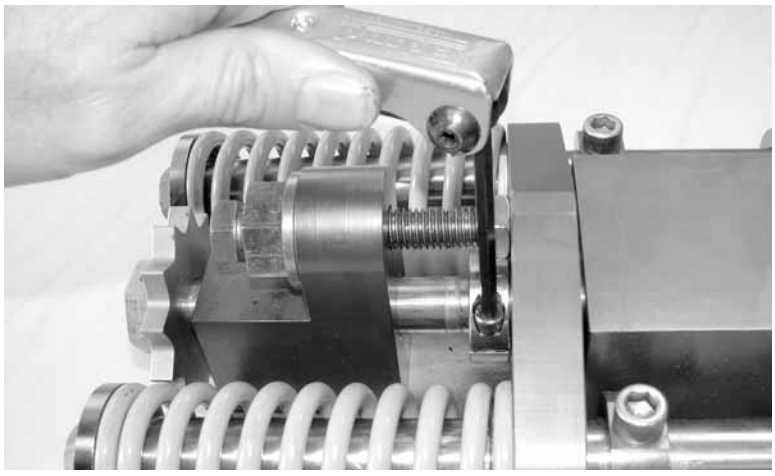


Figure 7-18. Remove the split ring lock from the feed shaft.

3. Remove the set screw in the end of the tool post, and remove tracking wheel shaft and wheel.

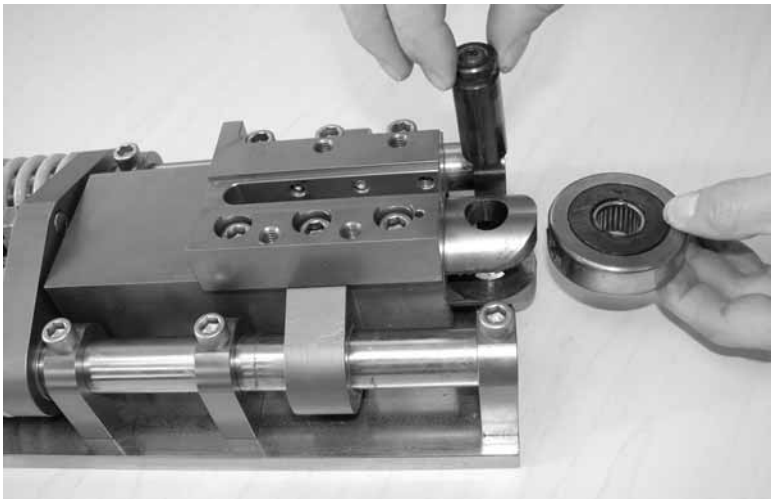


Figure 7-19. Remove the tracking wheel shaft and the tracking wheel.

4. Loosen and remove the screws in the bottom shaft supports.

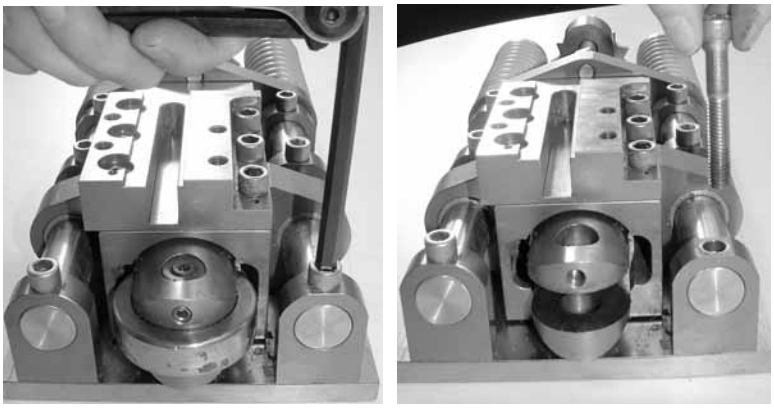


Figure 7-20. Remove the screws holding the shaft supports.

5. Remove the bottom two shaft supports.

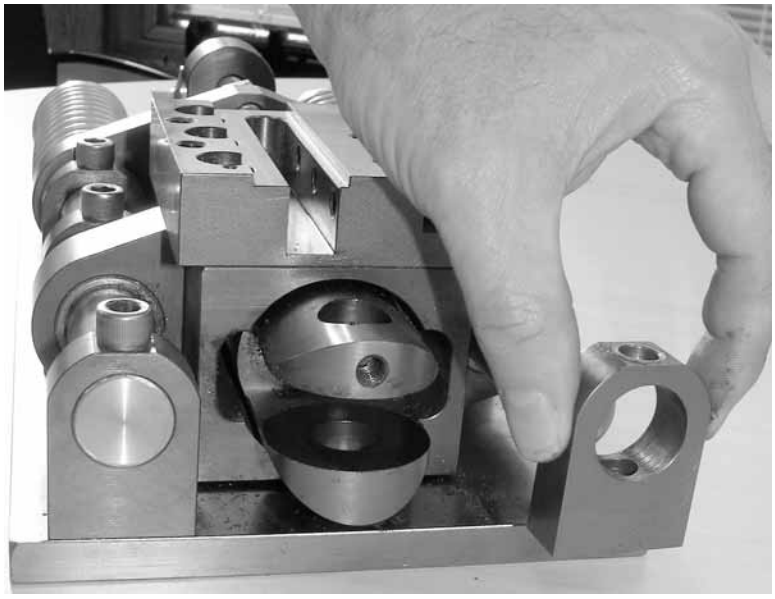


Figure 7-21. Remove the shaft supports to allow the feed block and feed screw assembly to be removed.

6. Slide the feed block and feed screw out of the tool slide housing.

7. Inspect and replace bushings if required.

8. Re-assemble the slide using these instructions in reverse order.

Chapter 8

Parts Lists and Drawings

Refer to the parts lists and drawings in this chapter for ordering and maintenance.

You can call E.H. Wachs service at (800) 323-8185 for assistance in ordering.

In This Chapter

PARTS LISTS

The parts list tables below are broken out by machine sub-assembly.

Main Frame

Qty.	Part No.	Description
84" HDSF Frame		
1	03-010-001-84	ROTATING RING
1	03-010-002-84	STATIONARY RING
4	03-010-005	GUARD, STRIP
48	51-017-00	SHAFT, ECCENTRIC
48	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET
1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
48	51-024-00	BEARING, GUIDE
43'	(in feet)	SEAL, FELT WIPER

1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
48	90-095-52	WASHER 1/2" SAE
48	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER
24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER
1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

72" HDSF Frame		
1	03-010-001-72	ROTATING RING
1	03-010-002-72	STATIONARY RING
4	03-010-005	GUARD, STRIP
38	51-017-00	SHAFT, ECCENTRIC
38	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET
1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
38	51-024-00	BEARING, GUIDE
43'	(in feet)	SEAL, FELT WIPER
1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
38	90-095-52	WASHER 1/2" SAE
38	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER
24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER

1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

60" HDSF Frame		
1	03-010-001-60	ROTATING RING
1	03-010-002-60	STATIONARY RING
4	03-010-005	GUARD, STRIP
38	51-017-00	SHAFT, ECCENTRIC
38	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET
1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
38	51-024-00	BEARING, GUIDE
43	(in feet)	SEAL, FELT WIPER
1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
38	90-095-52	WASHER 1/2" SAE
38	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER
24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER
1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

48" HDSF Frame		
1	03-010-001-48	ROTATING RING
1	03-010-002-48	STATIONARY RING
4	03-010-005	GUARD, STRIP
32	51-017-00	SHAFT, ECCENTRIC
32	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET

1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
32	51-024-00	BEARING, GUIDE
43	(in feet)	SEAL, FELT WIPER
1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
32	90-095-52	WASHER 1/2" SAE
32	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER
24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW sst
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER
1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

36" HDSF Frame

1	03-010-001-36	ROTATING RING
1	03-010-002-36	STATIONARY RING
4	03-010-005	GUARD, STRIP
26	51-017-00	SHAFT, ECCENTRIC
26	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET
1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
26	51-024-00	BEARING, GUIDE
43	(in feet)	SEAL, FELT WIPER
1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
26	90-095-52	WASHER 1/2" SAE
26	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER

24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER
1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

24" HDSF Frame		
1	03-010-001-24	ROTATING RING
1	03-010-002-24	STATIONARY RING
4	03-010-005	GUARD, STRIP
18	51-017-00	SHAFT, ECCENTRIC
18	51-018-00	SPACER, BEARING
2	03-010-014	ARM, HINGE RATCHET
1	03-010-016	HINGE, MAIN
4	03-010-015	PLATE, LIFTING
1	03-010-017	STUD, HINGE
18	51-024-00	BEARING, GUIDE
43	(in feet)	SEAL, FELT WIPER
1	03-010-200	RATCHET, HINGE
2	03-010-201	LOCK, FRAME
18	90-095-52	WASHER 1/2" SAE
18	90-045-08	NUT, NYLOCK 1/2-13
2	90-211-22	3/4-10 x 2-1/4 HHCS Gr 8
2	90-121-32	7/8-9 x 3-1/4 HHCS Gr 8
4	90-125-51	7/8 SAE WASHER
24	90-062-05	5/16-18 x 1/2" BHCS
2	90-225-04	NUT, NYLOCK 7/8-9
1	90-317-30	3/4" X 3" SHOULDER SCREW
1	90-205-04	NUT, NYLOCK
1	90-215-51	3/4 SAE WASHER
1	90-205-59	5/8 SAE WASHER
1	90-175-54	WASHER, X-TRA THICK STAINLESS
1	90-072-07	BHCS, 3/8-16 X 3/4"
2	90-214-30	3/4-10 X3" SSS
12	90-093-10	FHCS 1/2-13 x 1"

Drive Options

Qty.	*Part No.*	*Description*
03-010-405 Single Hydraulic Drive Motor		
1	03-010-080	HOUSING, PINION
1	03-010-081	COVER, PINION HOUSING
1	03-010-082	GEAR, PINION
4	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
4	90-070-07	SHCS, 3/8-16 x 3/4" LNG.
2	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
1	90-095-03	NUT, 1/2-20 JAM
1	90-075-00	NUT, 3/8-16 JAM
3	90-095-52	WASHER, 1/2 SAE
1	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
1	03-010-202	PIN, LOCATING ADJUSTABLE
1	90-059-48	WDRF KEY 1/4 x 1"
1	03-010-203	MOTOR
1	09-025-00	QD, FEMALE
1	09-026-00	QD, MALE
1	09-027-00	DUST CAP, MALE QD
1	09-028-00	DUST CAP, FEMALE QD
3	90-098-58	NIPPLE, 1/2 HEX HP
1	02-215-00	BALL VALVE
1		GEAR
1	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
1	90-074-05	SSS, 3/8-16 X 1/2
03-010-406 Double Hydraulic Drive Motor		
2	03-010-080	HOUSING, PINION
2	03-010-081	COVER, PINION HOUSING
2	03-010-082	GEAR, PINION
8	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
8	90-070-07	SHCS, 3/8-16 x 3/4" LNG.
4	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
2	90-095-03	NUT, 1/2-20 JAM
2	90-075-00	NUT, 3/8-16 JAM
6	90-095-52	WASHER, 1/2 SAE
2	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
2	03-010-202	PIN, LOCATING ADJUSTABLE
2	90-059-48	WDRF KEY 1/4 x 1"
2	03-010-203	MOTOR
1	09-025-00	QD, FEMALE

1	09-026-00	QD, MALE
1	09-027-00	DUST CAP, MALE QD
1	09-028-00	DUST CAP, FEMALE QD
3	90-098-58	NIPPLE, 1/2 HEX HP
1	02-215-00	BALL VALVE
2		GEAR
2	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
2	90-074-05	SSS, 3/8-16 X 1/2
Pneumatic Drive HDSF 1224 - HDSF 3648 (275 RPM)		
03-010-407 Single Pneumatic Drive Motor		
1	03-010-080	HOUSING, PINION
1	03-010-081	COVER, PINION HOUSING
1	03-010-082	GEAR, PINION
1	03-010-204	MOTOR, PNEUMATIC
4	90-060-07	SHCS, 5/16-18 x 3/4" LNG.
4	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
2	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
1	90-095-03	NUT, 1/2-20 JAM
1	90-075-00	NUT, 3/8-16 JAM
3	90-095-52	WASHER, 1/2 SAE
1	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
1	03-010-202	PIN, LOCATING ADJUSTABLE
1	90-059-48	WDRF KEY 1/4 x 1"
1		GEAR
1	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
1	90-074-05	SSS, 3/8-16 X 1/2
1	66-100-00	CONTROL, SPEED
1	05-082-00	OILER, AIRLINE
4	90-098-01	NIPPLE, 1/2" NPT
03-010-408 Double Pneumatic Drive Motor		
2	03-010-080	HOUSING, PINION
2	03-010-081	COVER, PINION HOUSING
2	03-010-082	GEAR, PINION
2	03-010-204	MOTOR, PNEUMATIC
8	90-060-07	SHCS, 5/16-18 x 3/4" LNG.
8	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
4	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
2	90-095-03	NUT, 1/2-20 JAM
2	90-075-00	NUT, 3/8-16 JAM
6	90-095-52	WASHER, 1/2 SAE
2	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
2	03-010-202	PIN, LOCATING ADJUSTABLE

2	90-059-48	WDRF KEY 1/4 x 1"
2		GEAR
2	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
2	90-074-05	SSS, 3/8-16 X 1/2
2	66-100-00	CONTROL, SPEED
2	05-082-00	OILER, AIRLINE
8	90-098-01	NIPPLE, 1/2" NPT
Pneumatic Drive HDSF 4860 - HDSF 7284 (185 RPM)		
03-010-409 Single Pneumatic Drive Motor		
1	03-010-080	HOUSING, PINION
1	03-010-081	COVER, PINION HOUSING
1	03-010-082	GEAR, PINION
1	03-010-205	MOTOR, PNEUMATIC
4	90-060-07	SHCS, 5/16-18 x 3/4" LNG.
4	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
2	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
1	90-095-03	NUT, 1/2-20 JAM
1	90-075-00	NUT, 3/8-16 JAM
3	90-095-52	WASHER, 1/2 SAE
1	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
1	03-010-202	PIN, LOCATING ADJUSTABLE
1	90-059-48	WDRF KEY 1/4 x 1"
1		GEAR
1	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
1	90-074-05	SSS, 3/8-16 X 1/2
1	66-100-00	CONTROL, SPEED
1	05-082-00	OILER, AIRLINE
4	90-098-01	NIPPLE, 1/2" NPT
03-010-410 Double Pneumatic Drive Motor		
2	03-010-080	HOUSING, PINION
2	03-010-081	COVER, PINION HOUSING
2	03-010-082	GEAR, PINION
2	03-010-205	MOTOR, PNEUMATIC
8	90-060-07	SHCS, 5/16-18 x 3/4" LNG.
8	90-050-07	SHCS, 1/4-20 x 3/4" LNG.
4	90-091-18	HHCS, 1/2-13 x 1-3/4 LNG. (GRADE 8/9)
2	90-095-03	NUT, 1/2-20 JAM
2	90-075-00	NUT, 3/8-16 JAM
6	90-095-52	WASHER, 1/2 SAE
2	90-086-10	DOWEL PIN, 7/16 DIA. x 1" LNG.
2	03-010-202	PIN, LOCATING ADJUSTABLE
2	90-059-48	WDRF KEY 1/4 x 1"
2		GEAR

2	90-074-17	SSS, 3/8-16 X 3/4 OVAL POINT
2	90-074-05	SSS, 3/8-16 X 1/2
2	66-100-00	CONTROL, SPEED
2	05-082-00	OILER, AIRLINE
8	90-098-01	NIPPLE, 1/2" NPT

Slides and Trip

Qty.	Part No.	Description
O.D. Tracking Slide		
2	03-010-030	PLATE, BASE
4	60-1002-01	CLAMP, SLIDE
4	03-010-032	BAR, GUIDE
12	03-010-033	MOUNT, GUIDE BAR
4	03-010-034	RETAINER, SPRING
2	03-010-035	SLIDE, TOOL
2	03-010-036	PLATE, TRACKING BAR END
2	60-1009-01	BAR, TRACKING
2	03-010-038	STARWHEEL
2	03-010-040	SCREW, FEED
2	60-1013	NUT, FEED
2	60-1014	BUSHING, TRACKING BAR
2	03-010-043	BLOCK, FEED SCREW
2	03-010-044	NUT, SLIDE RETRACTING
2	60-1016-01	WHEEL, TRACKING
2	60-1017	PIN, TRACKING WHEEL
1	60-1018-01	HOLDER, COMBINATION TOOL
1	60-1019-01	HOLDER, TOOL
2	60-1020-01	PLATE, TOOL RETAINING
2	60-1021	PIN, SLIDE COUPLING
2	03-010-206	BEARING, .75 x .875 x .50 LG. SLEEVE
2	60-1030	BEARING, 2.0 x 2.188 x 1.5 LG. SLEEVE
8	60-1032	BEARING, 1.003 x 1.253 x 1.0 LG. SLEEVE
2	03-010-209	BEARING, .753 x .878 x 1.5 LG. SLEEVE
2	60-1034	BEARING, .750 x 1.00 x .75 LG. NEEDLE
2	60-1035	BEARING, .75 x 1.25 x .0781 THRUST NEEDLE
2	53-101-00	BEARING, .50 x .937 x .0781 THRUST NEEDLE
6	60-1036	WASHER, .75 x 1.25 x .063 THRUST
4	03-010-214	WASHER, .50 x .937 x .032 THRUST
4	60-1037	WASHER, 1.0 X 1.75 x .058 THRUST

2	03-010-216	WASHER, .75 x 1.072 x .015 WAVE
2	03-010-217	RING, .937 x .021 W. - I.D. RETAINING
2	03-010-218	RING, .585 x .025 W. - O.D. RETAINING
4	60-1042	SPRING, .1.795 x 1.271 x 6 LG.
2	03-010-220	COLLAR .75 x 1.5 x .50 SHAFT - 2 PIECE
1	90-800-30	WRENCH, 3/4" COMBINATION
1	90-800-29	WRENCH, 1-1/8" COMBINATION
1	90-800-40	WRENCH, LARGE HEX KEY SET
12		SHCS, 1/4-20 x 1" LG. -SS
12		SHCS, 3/8-16 x 1" LG. -SS
8		SHCS, 3/8-16 x 1-1/4" LG. -SS
6	90-170-15	SHCS, 3/8-16 x 1-1/2" LG. -SS
3		SHCS, 3/8-16 x 1-3/4" LG. -SS
12		SHCS, 3/8-16 x 2-1/2" LG. -SS
8	90-173-10	FHCS, 3/8-16 x 1" LG. -SS
4		HHCS, 1/2-13 x 1-1/4" LG. (GRADE 8/9) ULTRACOAT
12	90-191-15	HHCS, 1/2-13 x 1-1/2" LG. (GRADE 8/9) - ULTRACOAT
2		HHCS, 1/2-13 x 4" LG. FULLY THREADED (GRADE 8/9) -ULTRACOAT
2	90-164-05	SSS, 5/16-18 x 1/2" LG.
4	90-066-07	PIN, 5/16 x 3/4, DOWEL
2	90-166-10	PIN, 5/16 x 1, ROLL -SS
16	90-195-52	WASHER, 1/2" -SS
Trip		
1	60-1025-01	TRIP, FEED
1	60-1026-01	HOUSING, FEED TRIP
1	60-1027-01	RETAINER, FEED TRIP
1	60-1028-01	BLOCK, TRIP POSITIONING
1	60-1029-01	BLOCK, TRIP MOUNTING
1	03-010-228	SPRING, .329 x .211 x 2 LG.
1	03-010-229	T-NUT, .625 SLOT x 1.0 WIDE x 1/2-13 THD.
1	03-010-230	HANDLE
1	20-033-00	KNOB
3	90-091-20	HHCS, 1/2-13 x 2" LG.
1	90-074-10	SSS, 3/8-16 X 1" LNG
3	90-095-54	WASHER, 1/2" HARDENED
1	90-046-06	PIN, 3/16 x 5/8, DOWEL
4	90-086-10	PIN, 7/16 x 1, DOWEL

Bearings

Qty.	Part No.	Description
Regreasable Bearing Assembly		
1	03-010-020	WHEEL, BEARING - REGREASABLE
1	03-010-021	SHAFT, ECCENTRIC - REGREASABLE
1	03-010-022	SPACER, BEARING - REGREASABLE
1	03-010-023	NUT, BEARING
1	90-500-05	1/4-28 GREASE ZERK
1	91831A137	NUT, NYLOCK
2	9396K19	O-RING
1	98370A033	WASHER, FLAT 1/2
1	SKF 5203_ATN9	BEARING, DOUBLE ROW
1	SKF 9815	SEAL, BEARING
1	03-010-024	CLAMP BLOCK, WHEEL
1	03-010-025	DRIVER, BEARING NUT

Clamping Legs

Qty.	Part No.	Description
Clamp Leg Assembly		
1	03-010-090	HOUSING, CLAMP LEG
1	03-010-091	KEY, CLAMP LEG
1	03-010-094	WELDMENT, CLAMP LEG
1	03-010-095	SCREW, CLAMP LEG
1	03-010-096	SPACER, CLAMP LEG
1	03-010-097	WASHER THRUST
1	03-010-098	PIN, DETENT
2	03-010-099	BRACKET, MOUNTING
1		COLLAR, 1-1/8" TWO-PIECE CLAMP (ZINC)
4		HHCS, 1/2-13 X 4" (GRADE 8 ZINC PLATED)
1		SOCKET, 1-1/8" SIX POINT x 1/2" DRIVE
1	90-800-63	WRENCH, 1/2" RATCHET
1		RING, 0.987 INCH INTERNAL RETAINING
1	98404A450	pin (used to make 03-010-098)

Hydraulic Speed Control

Qty.	Part No.	Description
Hydraulic Speed Control		
1	03-010-136	AIR CADDY WELDMENT
2	03-010-138	SPACER
2	03-010-137	HOSE ASSEMBLY
1	03-010-225	FLOW CONTROL
1	90-098-58	NIPPLE, 1/2 HEX HP
1	03-010-226	ELBOW, 1/2 MPT X 3/4-16 SAE 37 X 90 DEGREE
1	03-010-227	TEE, 3/4-16 SAE 37 X 1/2 MPT X 1/2 MPT
2	90-050-30	SHCS, 1/4-20 X 3
2	90-055-06	NUT, 1/4-20 NYLOCK
4	90-055-03	WASHER, 1/4 FLAT
2	09-025-00	QD, FEMALE
2	09-026-00	QD, MALE
2	09-027-00	DUST CAP, MALE QD
2	09-028-00	DUST CAP, FEMALE QD

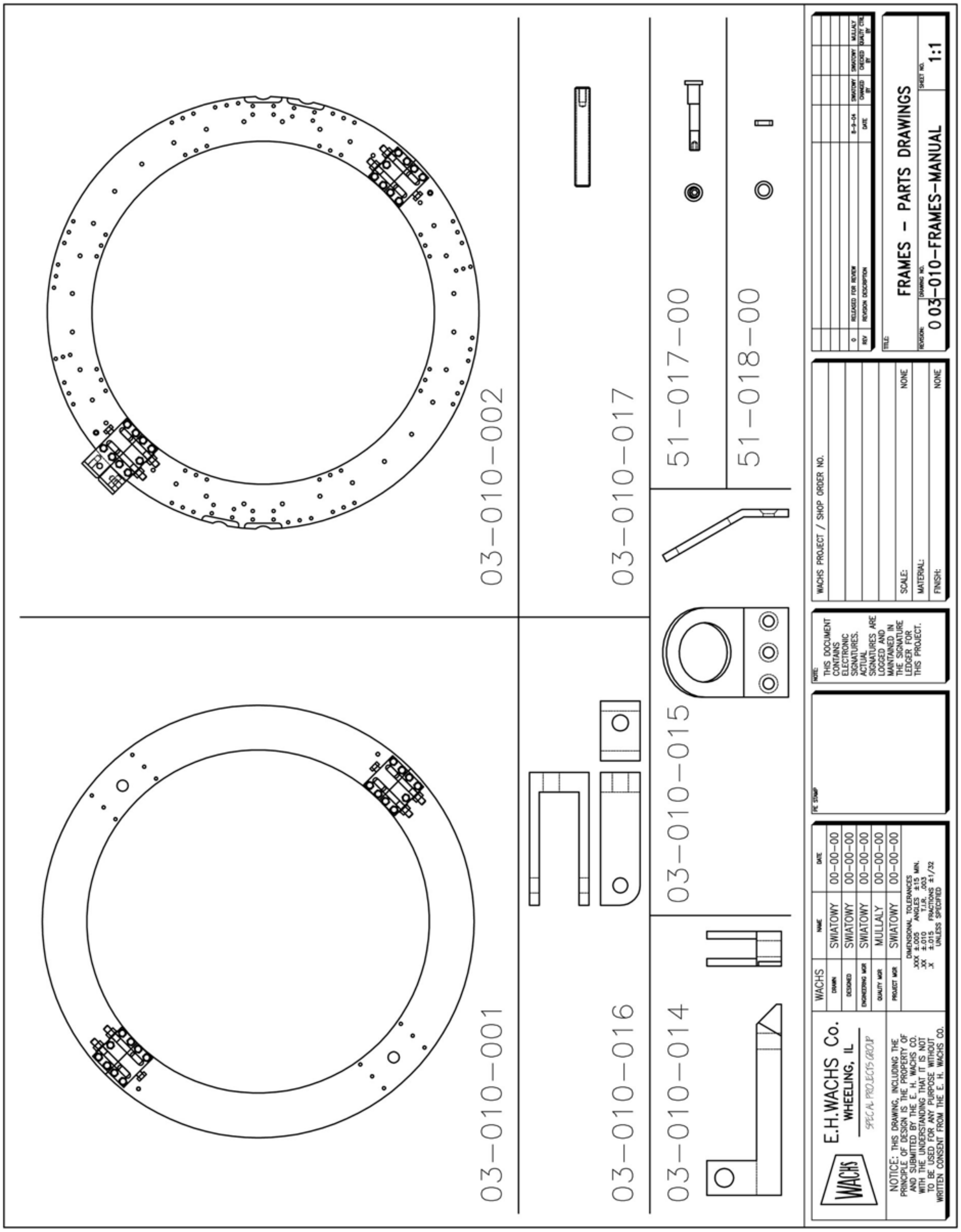
Optional Milling Attachment

Qty.	Part No.	Description
Slow Speed Drive		
1	03-010-083	Adapter, Feed Motor
1	03-010-085	Housing, Bearing
1	03-010-086	Shaft, Input
1	03-010-087	Shaft, Gearbox Output
1	03-010-088	Adapter, Pinion Housing
1	03-010-089	Flange, Adapter
1	03-010-184	Adapter, Coupling
1		Planetary Gear Set (3:1)
1		Planetary Gear Set (4:1)
1		Spacer
1		Hydraulic Motor (H-Series)
1		Radial Ball Bearing
1		Retaining Ring, External (.781)
1		Retaining Ring, Internal (2.047)
2		Bushing, Flange (1-1/8")
1		Clamp Collar (3/4-10)
1		Gearbox, Worm Reduction (20:1)
1	90-500-05	GREASE ZERK, 1/4-28 STR.

4		HHCS, 1/4-20 x 5/8" (18-8 SS)
8		HHCS, 3/8-16 x 1" (18-8 SS)
3		KEY, 1/4" SQ. x 1-1/2" (undersized)
1		KEY, 3/16" SQ. x 1" (undersized)
7		SHCS, #8-32 x 2" (18-8 SS)
1		SHCS, 1/4-20 x 3/4" (18-8 SS)
8		SHCS, 3/8-16 x 1" (18-8 SS)
4		SHCS, 3/8-16 x 1-1/4" (18-8 SS)
4		SHCS, 3/8-16 x 2-1/4" (18-8 SS)
8		WASHER, 3/8 LOCK (18-8 SS)
Mount for Offshore Drill		
1	08-046-003	Plate, Drill Mount
4		FHCS, 1/2 x 1-1/4 LG
4		Dowel, 5/16 x 1" LG

DRAWINGS

Use the drawings on the following pages for parts identification.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WHEELING, IL
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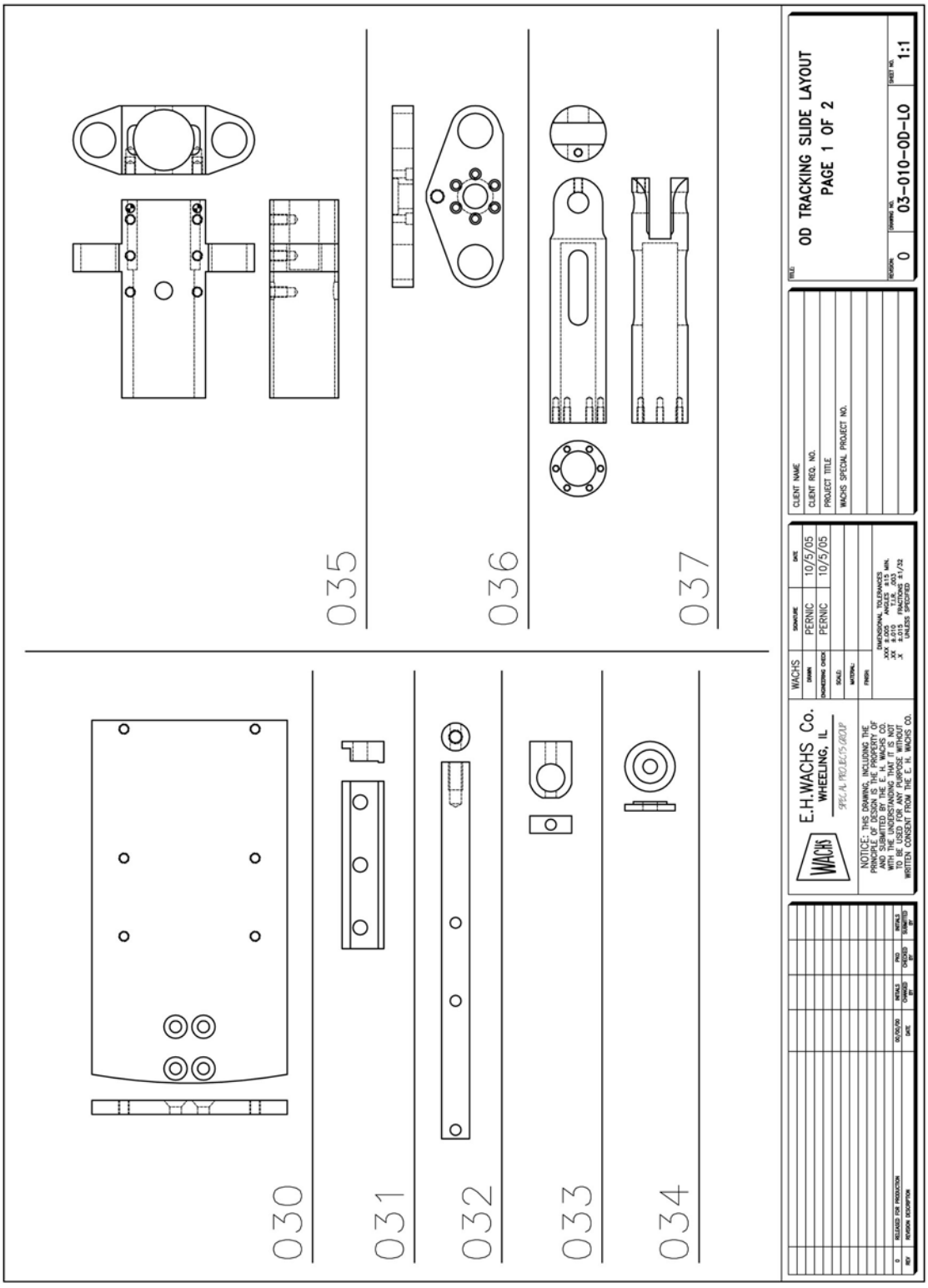
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WHEELING, IL
SPECIAL PROJECTS GROUP
OD TRACKING SLIDE LAYOUT
PAGE 1 OF 2
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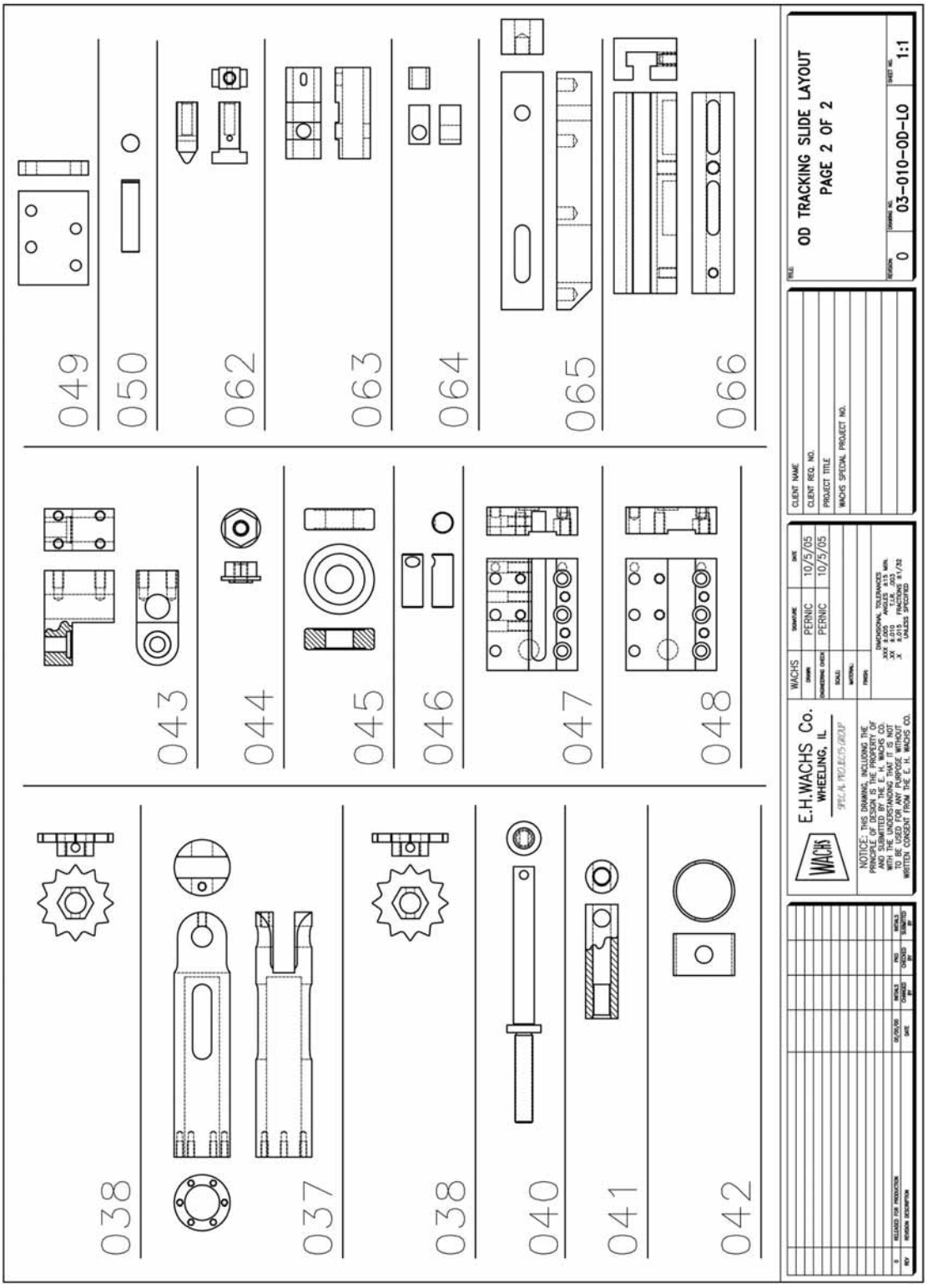
1:1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WHEELING, IL
SPECIAL PROJECTS GROUP
OD TRACKING SLIDE LAYOUT
PAGE 2 OF 2
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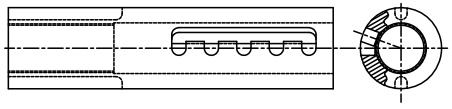

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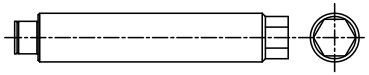

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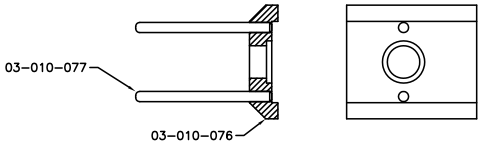

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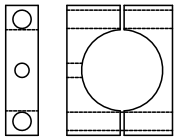

03–010–073

PARTS NOT SHOWN

03-010-222	WASHER, 1.0 x 1.562 x .063 THRUST
03-010-223	RING, 1.00 . x .042 W. - O.D RETAINING
90-091-41	HHCS, 1/2-13 x 4" LG. (GRADE 8/9)
90-095-54	WASHER, 1/2" HARDENED
90-086-10	PIN, 7/16 x 1", DOWEL
90-086-15	PIN, 7/16 x 1-1/2", DOWEL

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	WACHS	SIGNATURE	DATE
DRAWN		PERNIC	10/5/05
ENGINEERING CHECK		PERNIC	10/5/05
SCALE:			
MATERIAL:			
FINISH:			

DIMENSIONAL TOLERANCES
.XXX ±.005 ANGLES ±15 MIN.
.XX ±.010 T.I.R. .003
.X ±.015 FRACTIONS ±1/32
UNLESS SPECIFIED

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PROJECT TITLE
WACHS SPECIAL PROJECT NO.

REV	REVISION DESCRIPTION	DATE	CHANGED BY	CHECKED BY	SUBMITTED BY
A	CHANGED TO SQUARE CLAMP LEGS	08–07–06	MWW		

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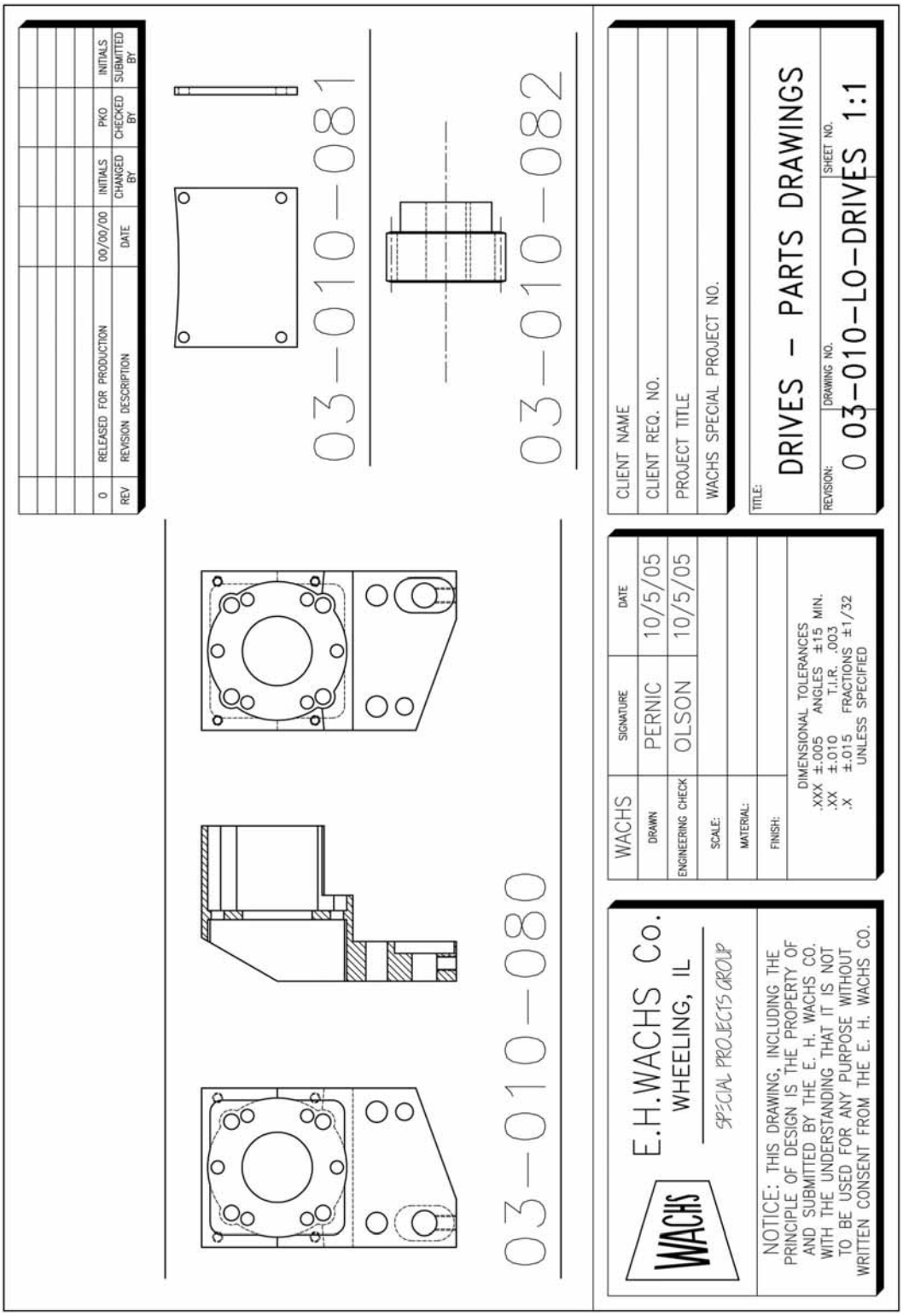
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WHEELING, IL
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WACHS
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WACHS
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DIMENSIONAL TOLERANCES
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.XX ±.010 T.I.R. .003
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CLIENT NAME
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PROJECT TITLE
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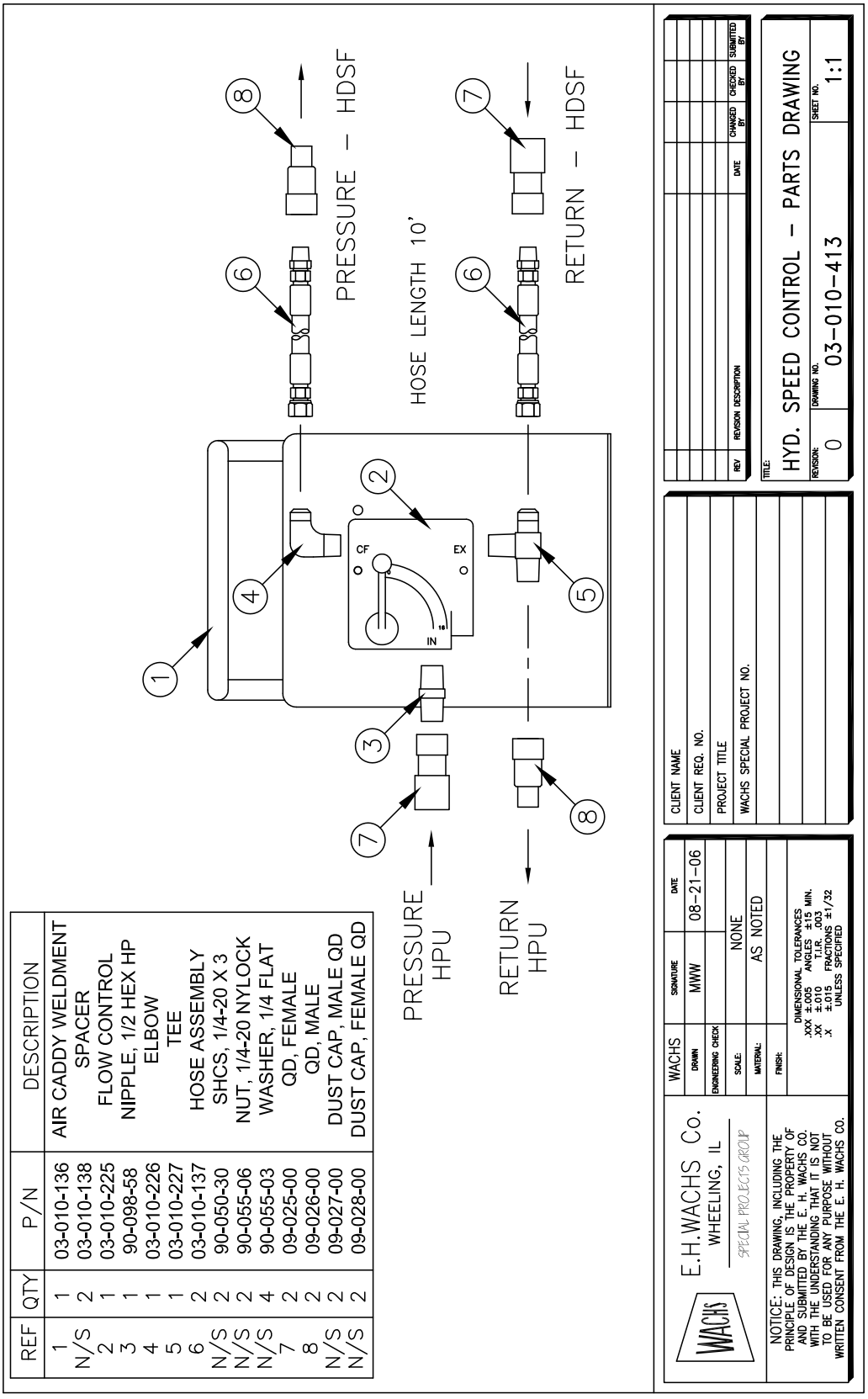

REF	QTY	P/N	DESCRIPTION
1	1	03-010-136	AIR CADDY WELDMENT
N/S	2	03-010-138	SPACER
2	1	03-010-225	FLOW CONTROL
3	1	90-098-58	NIPPLE, 1/2 HEX HP
4	1	03-010-226	ELBOW
5	1	03-010-227	TEE
6	2	03-010-137	HOSE ASSEMBLY
N/S	2	90-050-30	SHCS, 1/4-20 X 3
N/S	2	90-055-06	NUT, 1/4-20 NYLOCK
N/S	4	90-055-03	WASHER, 1/4 FLAT
7	2	09-025-00	QD, FEMALE
8	2	09-026-00	QD, MALE
N/S	2	09-027-00	DUST CAP, MALE QD
N/S	2	09-028-00	DUST CAP, FEMALE QD

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	WACHS	SIGNATURE	DATE
DRAWN	MWW		08-21-06
ENGINEERING CHECK			
SCALE:	NONE		
MATERIAL:	AS NOTED		
FINISH:			

DIMENSIONAL TOLERANCES
.XXX ±.005 ANGLES ±15 MIN.
.XX ±.010 T.I.R. .003
.X ±.015 FRACTIONS ±1/32
UNLESS SPECIFIED

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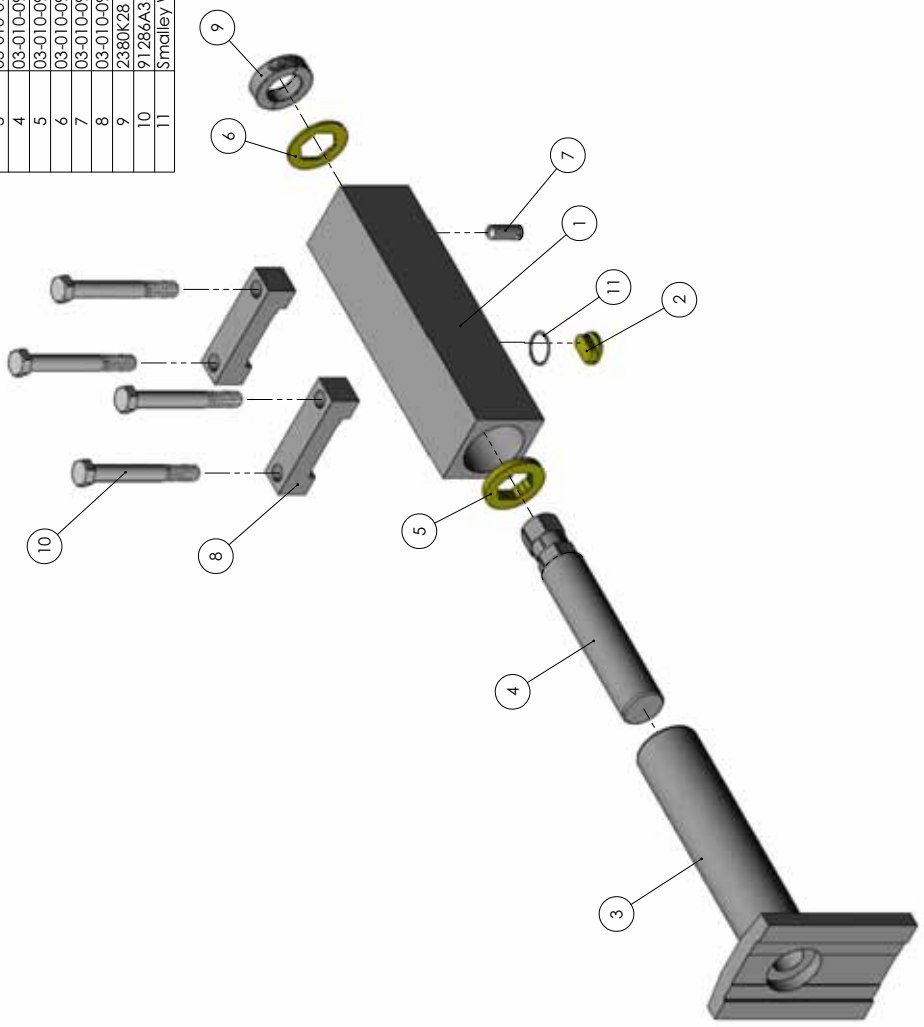
WACHS SPECIAL PROJECT NO.

REV	REVISION DESCRIPTION	DATE	CHANGED BY	CHECKED BY	SUBMITTED BY

TITLE:
HYD. SPEED CONTROL – PARTS DRAWING

REVISION:	DRAWING NO.	SHEET NO.
0	03-010-413	1:1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	03-010-090	HOUSING, CLAMP LEG	1
2	03-010-091	KEY, CLAMP LEG	1
3	03-010-094	WELDMENT, CLAMP LEG	1
4	03-010-095	SCREW, CLAMP LEG	1
5	03-010-096	SPACER, CLAMP LEG	1
6	03-010-097	WASHER, THRUST	1
7	03-010-098	PIN, DETENT	1
8	03-010-099	BRACKET, MOUNTING	2
9	2380K28	COLLAR, 1-1/8" TWO-PIECE CLAMP	1
10	91286A344	HHCS, 1/2-13 X 4" (ARMOR COAT)	4
11	Smalley WH-98	RETAINING RING, INTERNAL	1



Alternate Clamp Leg Design

Chapter 9

Accessories and Spare Parts

In This Chapter

This chapter lists accessories and recommended spares for the heavy duty split frame. See Chapter 8 for information on ordering replacement parts and accessories.

ACCESSORIES

- Speed control valve (for use with hydraulic power units without built-in flow control). See Figure 9-1.

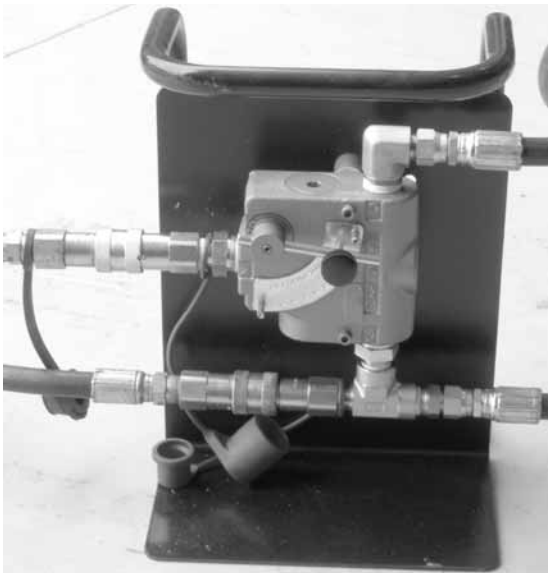


Figure 9-1. The flow control valve is used to set the cutting speed of the HDSF when there is no flow control on the hydraulic power unit.

RECOMMENDED SPARES

Table 1 lists the recommended spare parts for stocking.

Table 1: Spare Tooling

Part Description	Part Number
6” x 1/4” Parting Tool, HSS	60-711-00
37.5° Beveling Tool	53-703-00

Chapter 10
Ordering Information

To place an order, request service, or get more detailed information on any E.H. Wachs products, call us at one of the following numbers:

U.S.	800-323-8185
International:	847-537-8800

You can also visit our Web site at:

www.ehwachs.com

In This Chapter

ORDERING REPLACEMENT PARTS

When ordering parts, refer to the parts lists in Chapter 8. Please provide the part description and part number for all parts you are ordering.

REPAIR INFORMATION

Please call us for an authorization number before returning any equipment for repair or factory service. We will advise you of shipping and handling. When you send the equipment, please include the following information:

- Your name/company name
- Your address
- Your phone number
- A description of the problem or the work to be done

Before we perform any repair, we will estimate the work and inform you of the cost and the time to complete it.

WARRANTY INFORMATION

Enclosed with the manual is a warranty card. Please fill out the registration card and return to E.H. Wachs. Retain the owner's registration record and warranty card for your information.

RETURN GOODS ADDRESS

Return equipment for repair to the following address.

E.H. Wachs
600 Knightsbridge Parkway
Lincolnshire, IL 60069 USA

600 Knightsbridge Parkway • Lincolnshire, IL 60069
847-537-8800 • www.ehwachs.com