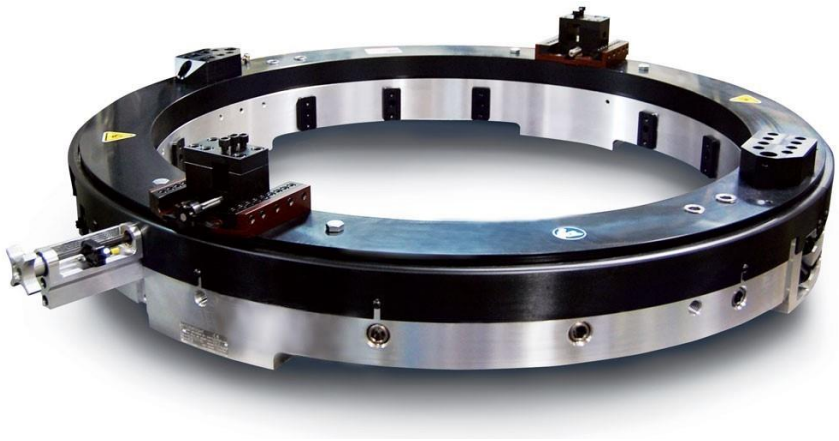


(HD) HEAVY DUTY CLAMSHELL

OPERATING AND MAINTENANCE MANUAL

Contents

VERSION HISTORY

Enerpac documentation is quality controlled and audited in accordance with **BS EN ISO 9001:2015**; the scope of which covers design, manufacture and repair of in-situ machine tools.

Version No.	Implemented By	Revision Date	Approved By	Approval Date	Comments
1	STH	28/03/019	DS	28/03/2019	1st Issue
2	STH	08/2020	-	-	Enerpac Rebrand
3	STH	19/05/2021	CC	19/05/2021	Added Compliance statement

Operation & Maintenance Manual Approval

The undersigned acknowledge they have reviewed this Machine Operation & Maintenance Manual and agree with the approach it presents. Changes to this Operation & Maintenance Manual will be coordinated with, and approved by, the undersigned or their designated representatives.

Approver 1

Signature: S. Thompson. **Date:** 28/03/2019

Name: Shailini Thompson

Title: Document Engineer

Approver 2

Signature:  **Date:** 28/03/2019

Name: Daniel Stephens

Title: Engineering Manager

1.0 HEALTH AND SAFETY

Enerpac has made every effort to ensure that the Information given in this Operation & Maintenance manual, and other publications relating to this machine is correct and understandable. However, it is acknowledged that there may be errors or omissions in this publication.
The company also reserves the right not to provide updates, corrections or amendments to this publication but will endeavour to keep its customers up to date with all changes that may affect the machine operation or safety.

1.1 Mandatory Safety Signs

(for the purpose of trials at Enerpac)

ISO 7010 SYMBOL	SAFETY DESCRIPTION
	WEAR EYE PROTECTION
	EAR PROTECTION MUST BE WORN
	HARD HATS MUST BE WORN
	PROTECTIVE GLOVES MUST BE WORN
	PROTECTIVE FOOTWEAR MUST BE WORN
	OVERALLS MUST BE WORN
	MACHINE GUARDS MUST BE USED

1.2 Machine Hazards Signs

ISO 7010 SYMBOL	HAZARD DESCRIPTION
	DANGER HIGH VOLTAGE
	WARNING MOVING MACHINERY
	CAUTION MOVING MACHINERY
	WARNING KEEP HANDS CLEAR

1.3 Safety Procedures

Detailed in this chapter is a list of good Health and Safety practices that Enerpac advise users to adhere to. Due to the nature of portable machine tools, not every eventuality can be catered for and the following is not exhaustive, as such Enerpac. strongly advise that the user carries out their own task specific risk assessments based on the machining and environment in which they intend to use the machinery

1.4 Pre-Operational Safety Checks

- Always read safety signs / labels
- Ensure no slip / trip hazards are present in workspaces and walkways
- Locate and ensure you are familiar with the operation of the ON / OFF starter and E-Stop (if fitted)
- Do not leave equipment on top of the machine
- Ensure each tool is in good condition and securely mounted
- Secure / Remove loose items
- Faulty equipment must not be used. Immediately report any suspect machinery

1.5 Operational Safety Checks

- Operator is fully conversant and trained in use of equipment
- Keep clear of moving machine parts
- Never leave the machine running unattended
- Follow correct clamping procedures - keep overhangs as small as possible and check work piece is secure
- Set the correct speed to suit the tool, the depth of cut and the material
- Before making adjustments and measurements or before cleaning swarf accumulations switch off and bring the machine to a complete standstill.

1.6 Housekeeping

- Switch off the machine
- Remove milling cutters, drill attachments and tap attachments and store them safely (if applicable)
- Leave the machine and work area in a safe, clean and tidy state

1.7 Potential Hazards

- Sharp cutters
- Moving components – hair / clothing entanglement
- Eye injury
- Skin irritation
- Metal splinters and burrs
- Flying debris

1.8 Handling

Customers, users and operators of the machines must be aware of the nature of the equipment supplied.

Although inherently robust, the machine is a precision tool and may be damaged by poor handling, tipping and falling, inadequate transport arrangements over e.g. rough terrain, misuse by operators and use outside its design specification.

Such poor handling may result in either broken or damaged parts or disturbance to fine settings resulting in an inability to meet the specified machining tolerances and capabilities.

2.0 Compliance Statement

•DLR-HD

CE These tools conform with the requirements for CE.

Enerpac declares that these products have been tested and conforms to applicable standards and is compatible to all CE Requirements.

A copy of an EU Declaration of Conformity is enclosed with each shipment of this product.

3.0 INTRODUCTION

3.1 General Description

The HD Series Clamshells are portable pipe lathes designed to simultaneously sever and bevel in-line pipe, plus form machine cut any angle bevel as they cut. The frame is split for easy installation on in-line pipe. The tool bits automatically feed into the work piece with each rotation of the lathe to assure smooth precise finish.

3.2 Machining Function and Capacities

- Sever In-Line Pipe
- Sever and Bevel In-Line Pipe
- Sever and J-Bevel In-Line Pipe
- Sever and Double Bevel In-Line Pipe
- Socket Weld Removal
- Weld Overlay Removal (accessory required)
- Single Point Cutting and Facing (accessory required)
- I.D. Counter Bore (accessory required)

3.3 Drive Assembly

There are many different drive arrangements available for the HD Clamshells (see Fig1). Straight back drives are standard and are available in pneumatic, hydraulic, or electric motors. The front drive reversible (FDR) mount allows for forward or rearward mounting positions and can be used with the hydraulic, electric or pneumatic motor. The Right Angle Adjustable (RAA) mount allows for angularly adjustable mounting positions and can be used with pneumatic or hydraulic motors.

3.4 Tooling

Standard available tooling includes ½" X 1" sever bits and 1" X 1" bevel or sever combination high speed steel bits. Any angle of bevel or counter bore bit can be designed; Enerpac stocks all standard prep configurations for right and left hand severing and beveling. Specialty bits can be designed as required. Indexable tooling is also available on request.

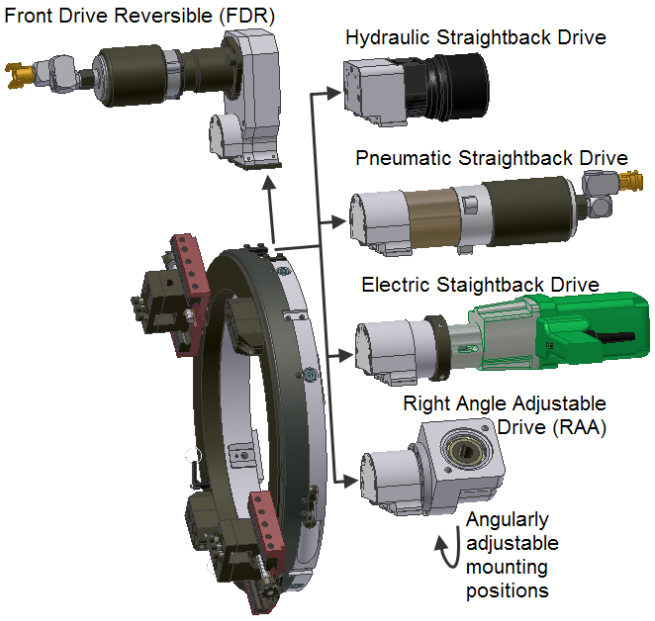


Figure 1

4.0 COMPONENTS

4.1 Housing

An aluminium split ring housing that is capable of being disassembled for installation on in-line piping. The housing has bearing mountings for the rotating cutting head, two mounts for the drive motor assembly, and locator pockets.

4.2 Cutting Head and Assembly

Made from 4140-alloy steel, this split ring assembly will align with the split lines of the housing when the Clamshell is separated into halves, (quarters for HD 60 or larger). The cutting head assembly has gear teeth on the outside diameter of the cutting head and mounting locations for the slide assemblies. An internal bearing race allows the cutting head to rotate about the housing.

4.3 Drive Assembly

The drive assembly is mounted to the housing and arranged with a pinion gear on a shaft. The mounting bracket is designed to accept the reaction torque generated by the drive motor.

4.4 Bearing

The cutting head assembly runs on adjustable precision bearings that provide for the axial and radial force reaction. The bearings are adjustable to compensate for normal wear.

4.5 Slide Assembly

The slide assembly is designed to hold the cutting tool (tool bit). The slide assembly has adjustable gibs and also contains a feed screw assembly, which is used to feed the tool bit into the work piece. The slide assemblies are bolted to the face of the clamshell assembly and can be moved in ½" increments.

4.6 Tripper Assembly

The tripper assembly is designed to hold the tripper pin. The tripper pin is used to turn the star wheel on the feed screw assembly, which "feeds" the tool bit into the work pieces. There are two different styles of tripper assemblies that may be provided with the clamshell, a sliding style and a flip style. The tripper assembly is bolted to the OD of the housing. There is 1, 3, or 4 different mounting locations (depending on the Clamshell size) that allow for more flexibility in machine mounting (see Fig. 2).

4.7 Locator Pad Assembly

The HD clamshell uses adjustable locator assemblies with 1" of travel. Turning set screws located on the outside of the housing actuates the adjustable locators. Locator extensions are required to mount on smaller diameter pipe

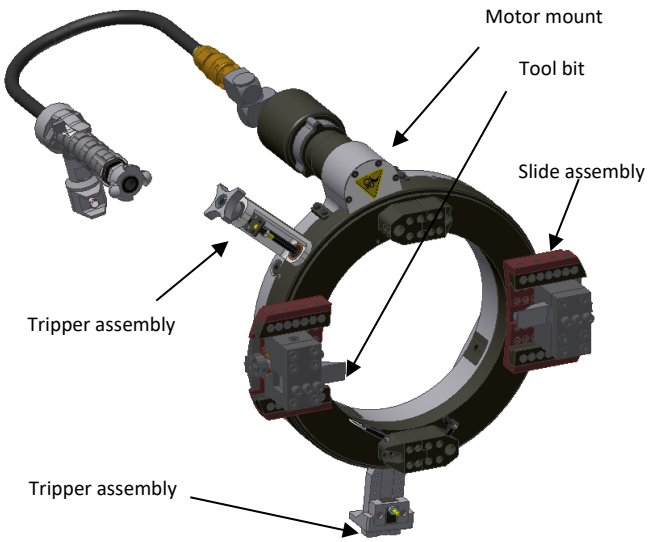


Figure 2

5.0 MACHINE WEIGHTS

The following chart lists the machine weights. Weights do not include motors or any additional components, locator extensions or attachments.

Clamshell	Weight (lbs)	Weight (Kgs)
HD32	469	212.9
HD36	509	231.1
HD39	538	244.3
HD43	595	270.1
HD45	614	278.8
HD48	643	291.9
HD50	663	301.0
HD53	692	314.2
HD54	702	318.8
HD55	716	325.1
HD57	735	333.7
HD60	831	377.3
HD66	891	404.5
HD72	952	432.2
HD80	1063	482.6
HD86	1115	506.2

6.0 MACHINE SET-UP

6.1 Pre-Installation Procedure

NOTE: ***Motor must be removed from the Clamshell.***

6.1.1 Separating Clamshell Halves

1. Rotate gear by hand until both the gear and housing split lines are aligned. If the lock pin holes in the gear will not line-up with the holes in the housing, rotate the gear 180 degrees for proper alignment.

2. Place the locking pins into the holes through the gear and housing to prevent gear rotation when the Clamshell is split. Press the top button to allow pin to slip into the hole.

3. Loosen the 4 swing bolt flange nuts (8 on HD60 or larger) and swing the bolts out of the pockets in the housing. Loosen the 2 clamping bolts (4 on HD60 or larger) on the gear halves (quarters) and separate the clamshell halves (quarters) by pulling straight apart and then open. (See Fig. 3)

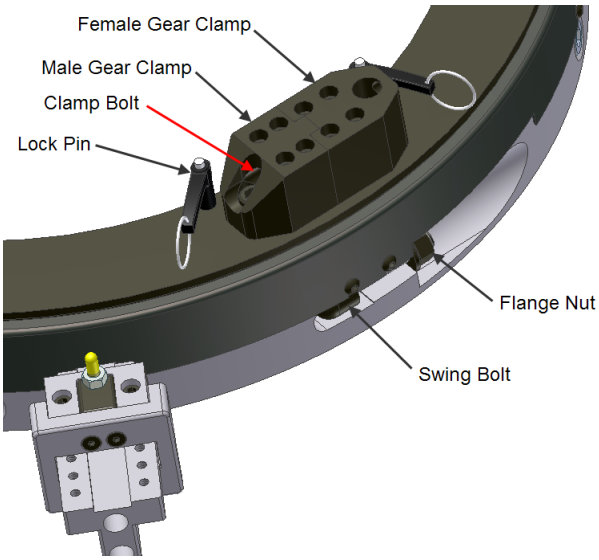


Figure 3

CAUTION: ***DO NOT FORCE THE CLAMSHELL OPEN USING TOOLS***

4. Determine pipe OD and select proper locator extensions. If required, bolt the locator extensions to the locator pads (see Fig. 4). The locator pads are adjusted by turning the set screws that are accessed from the outside of the housing with an Allen wrench. Back-up the locator pads as needed for proper clearance of pipe diameter.

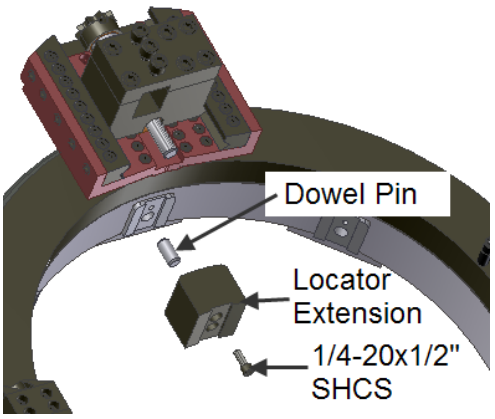


Figure 4

5. Make sure the Slide Assemblies are positioned so they clear the work piece but are as close to the OD as possible (see Fig. 5). The slides can be moved by removing the feed screw bracket and tool block and then removing the ¼-20 socket head cap screws.

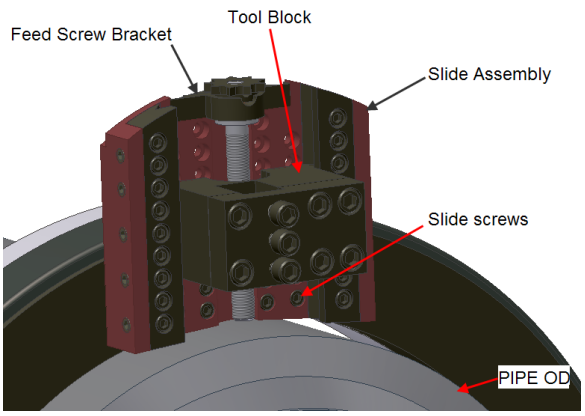


Figure 5

6. Remove the lock pin. Push the handle of the tripper pin assembly in so the tripper pin is in the “engaged” position. If the tripper pin does not line up with the star wheel, reposition it. After the tripper pin height is set, check the tripper pin length (see Fig. 6). The end of the tripper pin should be spaced .030” away from the cavity between 2 of the points of the star wheel. Lift the handle to disengage the tripper pin and reinsert the lock pin.

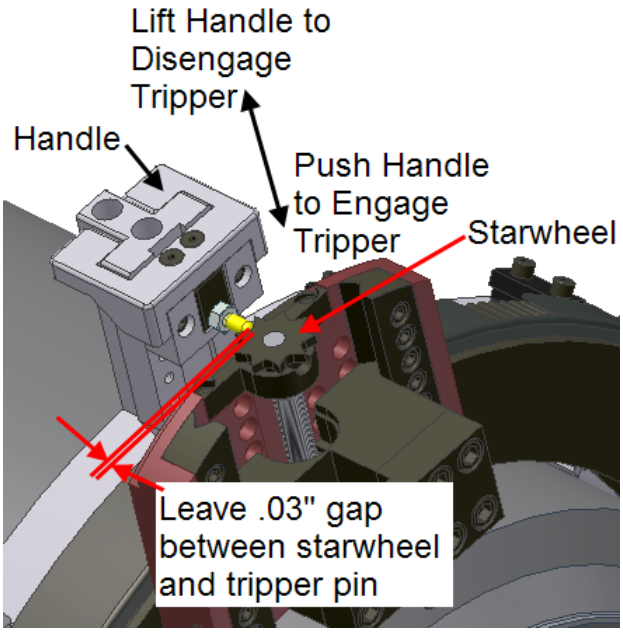


Figure 6

7.0 INSTALLATION ON IN-LINE PIPE

7.1 Joining Clamshell Halves

1. Install the 2 halves (quarters for HD 60 or larger) of the Clamshell around the pipe and tighten the housing bolts and the clamp bolts on the gear (see Fig. 7).

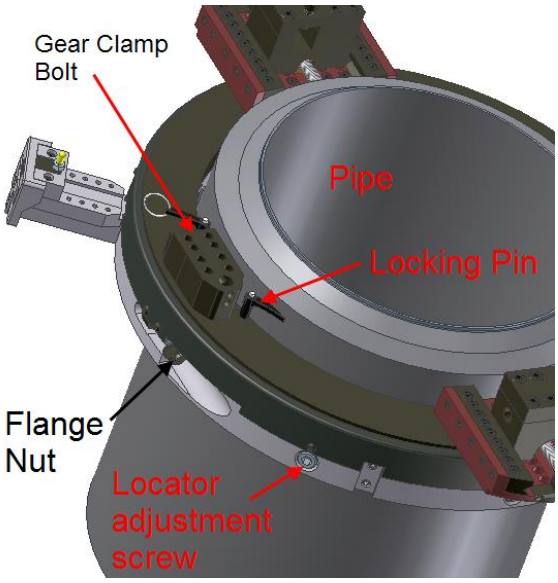


Figure 7

Note: If Clamshell will not close, check locator pads for proper size and clearance. Adjust the locators if necessary.

2. Lightly tighten two adjustable locator pads directly across from each other (locators 1 and 2 in Fig. 8), just enough to secure the Clamshell while trying to keep it centered on the work piece.

   Lightly tighten two more locator pads that are directly across from each other and close to 90 degrees away from the first set of locators (locators 3 and 4 in Fig. 8). **DO NOT TIGHTEN** down completely until the Clamshell has been both squared and centered to the pipe.

7.2 Squaring & Centering

1. Squaring: Place a square on the back of the Clamshell, directly in line with a locator, hold the square against the housing and the work piece and square the machine to the pipe at four locations around the pipe (see Fig 8).

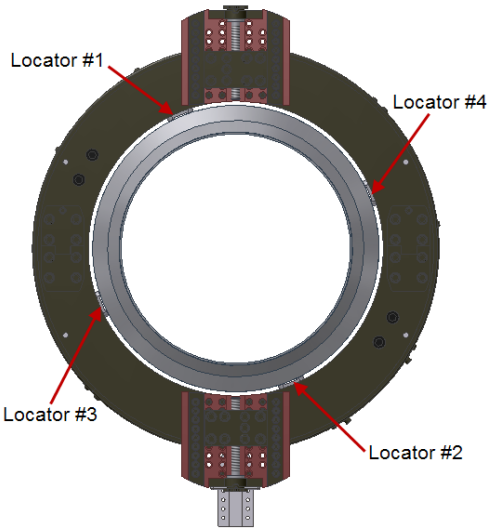


Figure 8

2. Centering: Using a 6" scale, measure the distance from the work piece to the Clamshell ID at the four lightly tightened locator positions. Tighten the four locators so the 6-inch scale reads the same at all four positions. Pull out the locking pins so the Clamshell gear can rotate.

3. Mount a dial indicator on the gear face with the tip resting on the work piece OD. Turn the gear so the indicator is positioned over one of the tighten locators (locator 1) and set the dial to zero. Slowly rotate the gear 180 degrees to another locator (locator 2) and take an indicator reading. If the reading is not zero, adjust the locators until the indicator reads one-half of the original reading. Reset the indicator dial to zero and repeat. If the Clamshell cannot be centered, different locators are required.

4. Rotate the gear 90 degrees so the indicator is positioned over another locator (locator 3) and set the dial to zero. Slowly rotate the gear 180 degrees to another locator (locator 4) and take an indicator reading. If the reading is not zero, adjust the locators until the indicator reads one-half of the original reading. Reset the indicator dial to zero and repeat. The first two locators may need to be slightly loosened in order to zero the Clamshell to the work piece.

5. Repeat steps 3 and 4 for all of the other locators. Most thin wall pipes are out of round; therefore a zero reading all the way around may not be possible.

7.3 Setting Tool Bits

1. Prior to installation of tool bits, determine which tool bits must be used for your specific machining operation.

NOTE: The Clamshell cuts in a clockwise direction, when viewed at its face. There are right hand and left hand bevel and sever bits, right hand bits bevel on the side which the Clamshell is mounted, left hand bits bevel on the opposite side.

2. Using the star wheel wrench, back the tool blocks away from the pipe, to allow enough room for the tool bits to pass completely through the pipe without running the tool blocks into the work piece. Disengage the feed pin.

3. Insert proper beveling and severing bits so that the tip touches the pipe OD. Hold the bit with one cap screw, snug but not tight.

4. Manually rotate the cutting head counter-clockwise 1 revolution. This reverse action will push the tool bits away from any high spots in the pipe that could cause tool damage. After one complete revolution has been made tighten the cap screws on both tool blocks. Back the bevel bit 1/32" away from the work piece with the star wheel wrench (see Fig. 9).

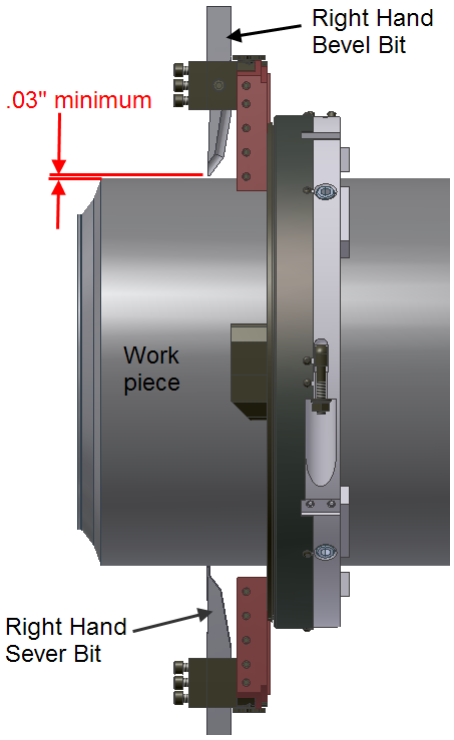


Figure 9

NOTE: Always cut with the sever bit leading the bevel bit by 1/32" in depth of cut.

7.4 Motor Installation

CAUTION: Both locking pins must be removed from the gear face before installing the motor, and all power must be turned off.

1. Loosen the four motor mount clamp screws. Position the motor mount toward the rear of the Clamshell (see Fig. 10).

2. Slide the motor mount under the motor mount clamps and slide the motor forward until the back of the motor mount is flush with the back of the Clamshell housing. If the motor mount does not slide in all the way, rotate the cutter head to align the gear teeth. Tighten the motor mount cap screws.

NOTE: If the motor does not engage, check to make sure the two gears are properly aligned. Rotate the cutting head by hand if necessary to align gear teeth.

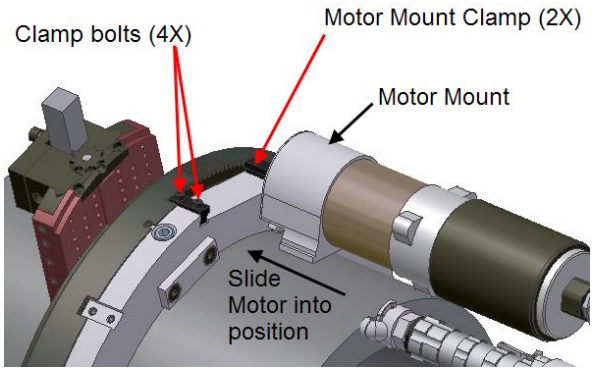


Figure 10

8.0 MACHINE OPERATION

CAUTION: ***To prevent damage to the tool bit, the work piece to be cut must be rigged properly to keep the tool bits from binding when the pipe is severed. Improperly rigged piping may result in personal injury.***

CAUTION: ***The operator should take a stance in relation to the cutting application that minimizes the risk of falling or ejected objects.***

8.1 Severing In-Line Pipe

1. Follow set-up procedures, replacing the bevel bit with another sever bit. Back up both bits (out approx. 1/32"). Attach drive motor to the Clamshell, disengage tripper pin, and open the control valve slowly to check function and speed.

NOTE: ***If the tool blocks do not move smoothly in the slides during the test rotation the adjustable gibs may need adjustment.***

CAUTION: ***The cutting operation is continuous until terminated by the operator. To stop the cutting feed during rotation, LIFT THE TRIPPER HANDLE and let the machine rotate a few times to clear the tool bit. Turn off the power to stop clamshell rotation. Letting the tool bit clear will prevent tool damage and gouging.***

2. Engage the tripper pin by pushing down on the tripper handle, after the machine has been started. Each Rotation will advance the tool bits approximately .003" with the tripper pin engaged. Use the tripper pin to advance the feed of the tool bits until both of the tool bits are cutting. If chatter or vibration occurs, reduce cutting RPM. If the tool bits chip or become dull, replace them immediately with sharp bits.

3. Use Coolant during the cutting operation to reduce friction on the cutting edge.

4. Stop the machine when the severing is complete. Back out the tool blocks with the star wheel wrench to the full position.

CAUTION: ***Never try to re-sharpen the tool bits. They must be sent back to the factory for regrinding to maintain proper relief angles. Improperly ground tool bits can cause damage to the machine.***

8.2 Severing and Beveling In-Line Pipe

Follow tool bit set-up procedures replacing both sever bits with either left hand or right hand SEVER, BEVEL combinations. Back the BEVEL bit up 1/32" above the sever bit and follow the procedures above, until the pipe is severed and beveled.

8.3 Counter Bore Attachment

The counter bore attachment comes with either a 6" or 10" long counter bore tube. The counter bore attachment can also be used for flange facing, OD beveling and flange face grooving.

1. Square and center the Clamshell on the work piece. Disengage the tripper pin. Remove the cap from the tool block on one slide assembly. Bolt the counter bore attachment to the tool block.

2. Insert the counter bore bit into the counter bore bar. The cutting side of the bit should face the set screws in the bar (see Fig. 11). Adjust the counter bore tube height and lock into place. Use the star wheel wrench and the hand wheel to position the tool bit at the edge of the inner wall of the work piece.

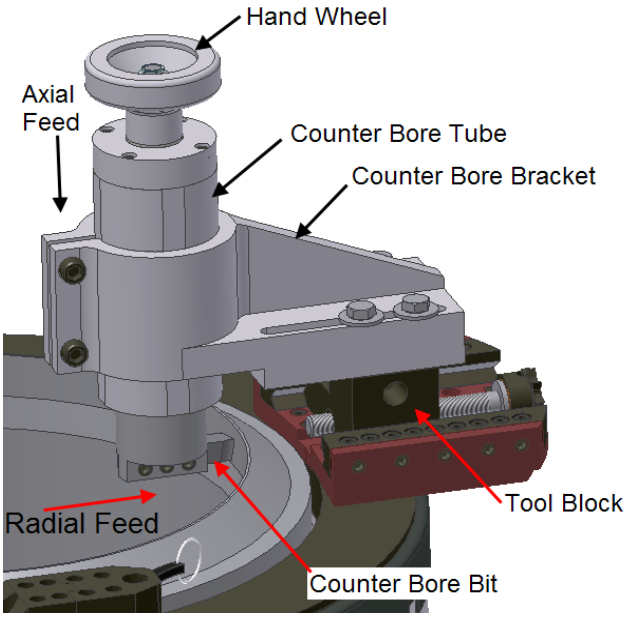


Figure 11

3. Install the motor and start the machine. Feed the tool bit axially by turning the hand wheel counter-clockwise approximately ¼ turn for every revolution of the Clamshell. Continue to feed until the correct counter bore depth is reached. Turn the hand wheel clockwise to back the tool bit up to make another cut. Stop the machine.

4. Use the star wheel wrench to radially position the counter bore attachment. Start the machine and feed the tool bit axially by turning the hand wheel. Continue to feed until the cut blends into the previous cut. Stop the machine.

5. Repeat step 4 until the desired counter bore diameter is reached.

8.4 Swivel Head Attachment

The swivel head attachment comes with either a 6” or 10” long counter bore tube. The swivel head attachment can also be used for flange facing, OD beveling and flange facing grooving.

1. Square and center the Clamshell on the work piece. Disengage the tripper pin. Remove the cap from the tool block on one slide assembly. Bolt the swivel head attachment to the tool block.

2. Insert the facing bit into the counter bore bar. The cutting side of the bit should face the setscrews in the bar (see Fig. 12). Loosen the lock down screws and swivel the counter bore to match the desired counter bore profile. Tighten the lock down screws. Adjust the counter bore tube height and lock into place with the setscrews on the flat of the counter bore tube. Use the star wheel wrench and the hand wheel to position to counter bore attachment at the edge of the inner wall of the work piece.

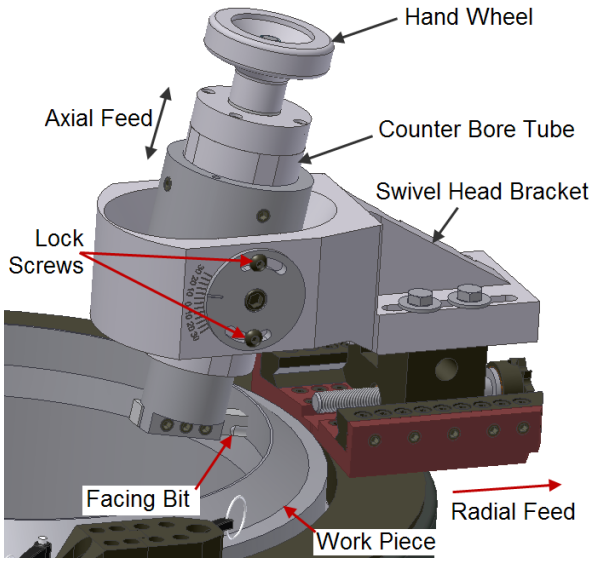


Figure 12

3. Install the motor and start the machine. Feed the tool bit axially by turning the hand wheel counter-clockwise approximately ¼ turn for every revolution of the Clamshell. Continue to feed until the correct counter bore depth is reached. Turn the hand wheel clockwise to back the tool bit up to make another cut. Stop the machine.

4. Use the star wheel wrench to radially position the counter bore attachment. Start the machine and feed the tool bit axially by turning the hand wheel. Continue to feed until the cut blends into the previous cut. Stop the machine.

5. Repeat step 4 until desired counter bore diameter is reached.

9.0 FLANGE FACING

9.1 Single Point Attachment

The single point attachment comes with either a 6” or 10” long counter bore tube. The single point attachment can also be used for ID boring, OD beveling and flange face grooving.

1. Square and center the Clamshell on the work piece. Disengage the tripper pin. Remove the cap from the tool blocks on both slide assemblies. Remove the feed screws assembly from one slide assembly. Bolt the swivel head attachment to the tool block with the slotted end of the bar pointing toward the slide assembly that has the feed screw assembly (see Fig. 13).

2. Insert the facing bit into the bore bar. The cutting side of the bit should face the set screws in the bar (see Fig. 13). Adjust the counter bore tube height and lock into place. Slide the single point attachment into position along the bar and tighten the 2 set screws to lock it in place. Tilt the counter bore tube to the desired angle and lock by tightening the 4 hex bolts on the single point attachment. Use the star wheel wrench and the hand wheel to radially and axially position the tool bit at the edge at the outer wall of the flange. Install the motor.

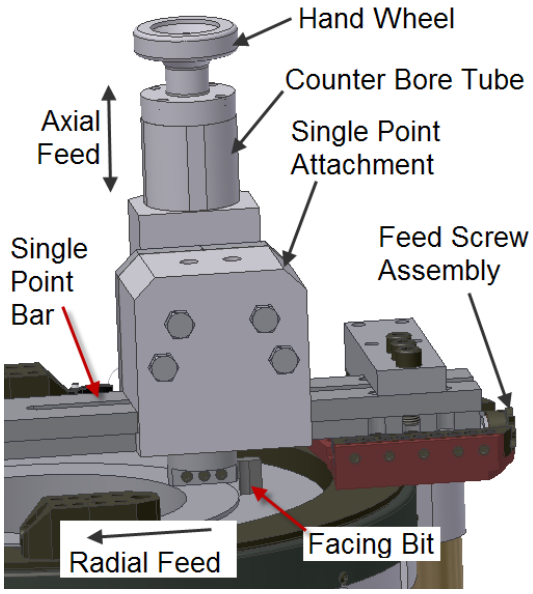


Figure 13

3. Start the machine. Engage the tripper pin to feed the tool bit radially. When the tool bit has travelled across the entire surface that needs to be faced, disengage the tripper pin and turn the hand wheel to lift the tool bit away from the surface. Stop the machine.
4. Use the star wheel wrench to radially position the tool bit at the flange OD. Turn the hand wheel to axially position the tool bit up to make another cut.

5. Repeat steps 3 and 4 until the flange face is flat.

10.0 MACHINE MAINTENANCE

We recommend that in the event of failure or of general maintenance, the Clamshell is returned to Enerpac, where our experience Service Technicians and Engineers can carry out the necessary repairs.

CAUTION: ***Disconnect the power source prior to cleaning or making adjustments to the machine.***

10.1 Adjusting Tapered Gibs on the Tool Block Slide

NOTE: ***Each tool block slide has tapered gibs, which may be adjusted for wear after heavy use. It must always fit exactly parallel to the slide for proper feed screw action.***

1. To adjust the gibs first remove the two socket head screws holding the star wheel and feed screw assembly into place on the back of the slide.

2. Pull out the tool block and feed screw assembly. Remove the feed screw assembly from the feed nut pocket on the tool block (usually this is a tight fit). Replace the tool block into the slide. Put a tool bit into the tool block and tighten it down. ***Always adjust the gibs with a tool bit installed***.

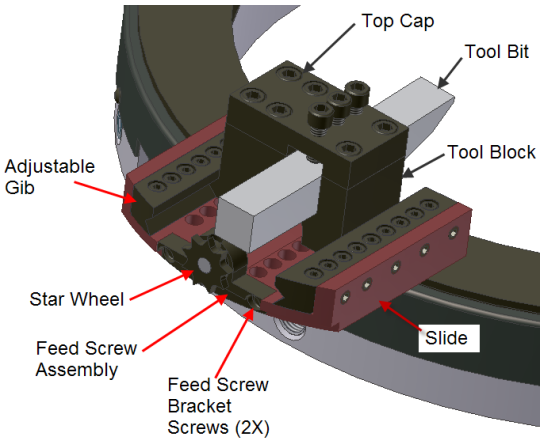


Figure 14

3. Slide the tool block up and down by hand in the slide, adjust the side set screws until a snug fit is achieved with no sideways slop, yet not binding.

4. Remove the tool block; replace the feed screw assembly and tool block. Secure the feed screw assembly with two socket head screws. Using the star wheel wrench, move the tool block up and down the slide to check for a proper fit (***moving easily yet snug***).

10.2 Adjusting The Bearings

NOTE: MS clamshells feature adjustable bearings that require periodic adjustment and lubrication.

1. Place the fully assembled clamshell onto a flat surface, gear side up. Remove the locking pins so the gear can rotate on the housing. Remove the four pipe plugs from the access holes.

2. Remove the gear shield from the clamshell. Remove the outer locking set screws and loosen the eccentric set screws.

3. Starting at the split line, rotate the gear until the access holes are directly over the top of the first two bearings. One of the bearings is an inner bearing and the other is an outer bearing. Insert an Allen wrench thru the access hole into the top of the inner bearing; turn it clockwise until it is tight against the inner gear wall. Tighten the eccentric screw to lock it in place. Insert the Allen wrench into the top of the outer bearing; turn it counter-clockwise until it is tight against the outer gear wall. Do not turn too hard or the screw on top of the bearing will unscrew and loosen up. Tighten the eccentric screw. Repeat this procedure for the bearings under the opposite side access holes.

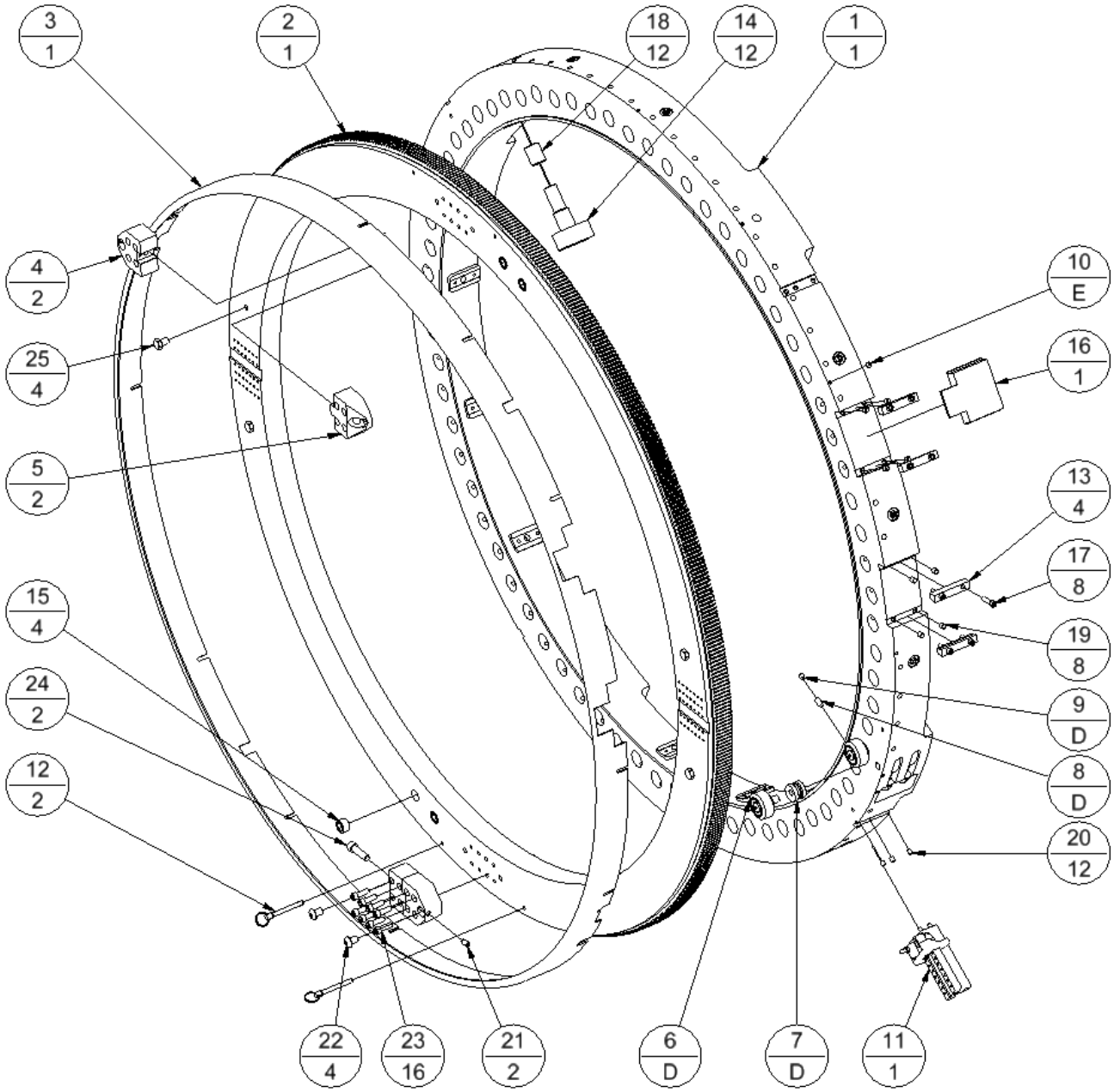
4. Rotate the gear so the access holes are directly over the next two bearings. Repeat step 3.

5. Repeat step 4 until all the bearings are tight against the gear walls.

6. Slowly run the machine. Looking thru the access holes, verify that all the bearings are turning. Retighten all the bearings that are not turning. Tighten all of the set screws to lock the eccentric screws. Install the pipe plugs into the access holes and reinstall the gear shield. Insert the locking pins.

11.0 PART NUMBERS AND DRAWINGS

11.1 HD32 to HD57 Clamshell *(Refer to table below)*



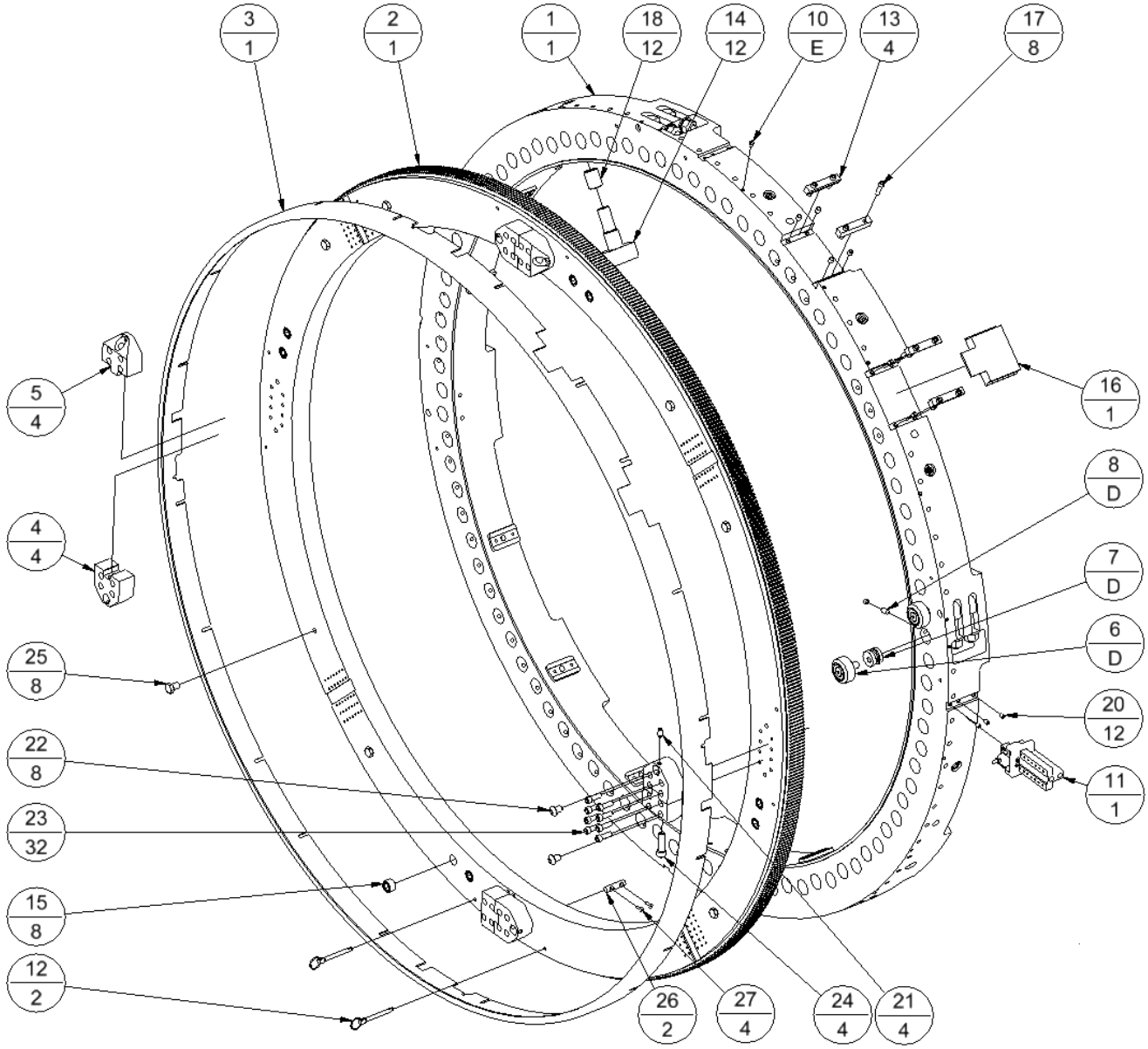
11.2 *Common Clamshell Parts & Quantities – HD32 to HD57*

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	006AA00xxxxx	HOUSING ASSEMBLY - HD
2	1	006BN00xxxxx	GEAR - HD
3	1	006AU00xxxxx	GEAR SHIELD - HD
4	2	006BL0034393	GEAR CLAMP - FEMALE HD
5	2	006BL0034400	GEAR CLAMP - MALE HD
6	D	023AA0035956	BEARING - HD
7	D	006BE0035953	ECCENTRIC - HD BEARING
8	D	001DE0035952	HD ECCENTRIC - SET SCREW
9	D	001DT0037475	S.S.S. 3/8-16 X 3/8
10	E	001CE0044262	B.H.C.S. - 1/4-20 X 3/8
11	1	F0145A0004XX or F0145A1189XX	TRIPPER PIN ASSEMBLY – HD
12	2	006AJ0044337	LOCKING PIN MS/HD
13	4	006BA0033545	LOCK - HD MOTOR MOUNT
14	12	F0120A0042XX	LOCATOR ASSY. - HD
15	4	006KC0045169	PLUG - 3/4-14 PIPE
16	1	006AU0043970	SHIELD - HD MOTOR MOUNT
17	8	001AE0044231	SHCS 5/16-18X1 1/4
18	12	003AJ0044273	HELICOIL 1 - 8 X 1-1/2
19	8	003AJ0044379	HELICOIL - 5/16-18 X 3/8
20	12	003AJ0044379	HELICOIL 1/4-20 X 3/8
21	2	001SE0037354	S.S.S - 3/8-16 X 3/4 HALF DOG
22	4	001CE0037353	B.H.C.S. - 1/2-13 X 3/4
23	16	001AE0037351	SHCS 3/8-16 X 1 1/4
24	2	001AE0037352	SHCS 1/2-13 X 1.75
25	4	001CT0040829	HEX BOLT - 1/2-13 X 1/2
Not shown	4	006BV0040312	SWING BOLT
Not shown	4	001NM0040313	FLANGE NUT
Not shown	4	017AA0044856	DOWEL PIN – SWING BOLT

11.3 Specific Clamshell Parts & Quantities – HD32 to HD57

HD CLAMSHELL	HOUSING	GEAR	GEAR SHIELD	D	E
HD32	006AA0032590	006BN0034484	006AU0041691	52	14
HD36	006AA0032591	006BN0034485	006AU0041692	52	14
HD39	006AA0032592	006BN0034486	006AU0041724	52	14
HD43	006AA0032593	006BN0034487	006AU0041693	68	14
HD45	006AA0032595	006BN0034488	006AU0041704	68	14
HD48	006AA0032596	006BN0034489	006AU0041716	68	14
HD50	006AA0032597	006BN0034491	006AU0041702	68	14
HD53	006AA0032598	006BN0034492	006AU0041706	68	14
HD54	006AA0032585	006BN0034493	006AU0041718	68	14
HD55	006AA0032599	006BN0034485	006AU0041705	72	14
HD57	006AA0032600	006BN0034496	006AU0041739	72	18

11.4 HD60 to HD86 Clamshell (Refer to table below)



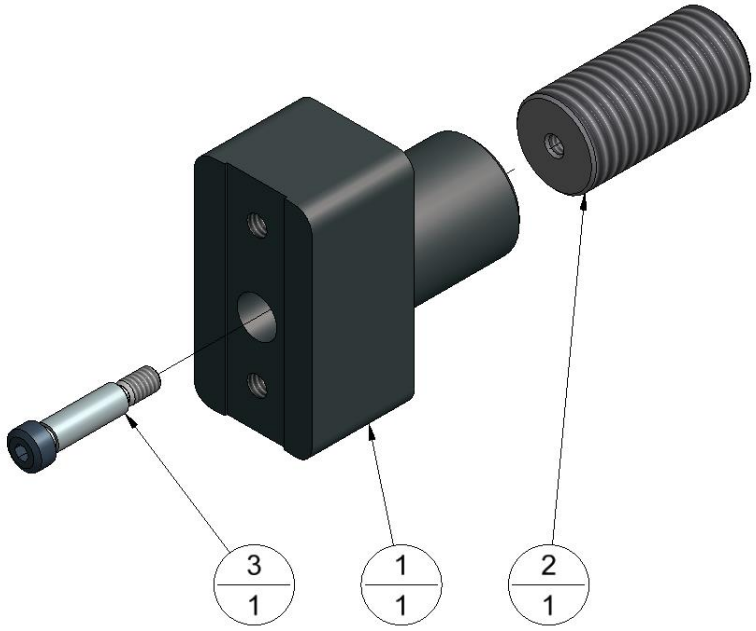
11.5 Common Clamshell Parts & Quantities – HD60 to HD86

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	100-1AAA	HOUSING ASSEMBLY - HD
2	1	200-1BBB	GEAR - HD
3	1	210-1CCC	GEAR SHIELD - HD
4	4	006BL0034393	GEAR CLAMP - FEMALE HD
5	4	006BL0034400	GEAR CLAMP - MALE HD
6	D	023AA0035956	BEARING - HD
7	D	006BE0035953	ECCENTRIC - HD BEARING
8	D	001DE0035952	HD ECCENTRIC - SET SCREW
9	D	001DT0037475	S.S.S. 3/8-16 X 3/8
10	E	001CE0044262	B.H.C.S. - 1/4-20 X 3/8
11	1	F0145A0004XX or F0145A0024XX	TRIPPER PIN ASSEMBLY - HD
12	2	006AJ0044337	LOCKING PIN MS/HD
13	4	006BA0033545	LOCK - HD MOTOR MOUNT
14	12	F0120A0042XX	LOCATOR ASSY. - HD
15	8	006KC0045169	PLUG - 3/4-14 PIPE
16	1	006AU0043970	SHIELD - HD MOTOR MOUNT
17	8	001AE0044231	SHCS 5/16-18X1 1/4
18	12	003AJ0044273	HELICOIL 1 - 8 X 1-1/2
19	8	003AJ0044379	HELICOIL - 5/16-18 X 3/8
20	12	003AJ0044378	HELICOIL 1/4-20 X 3/8
21	4	001SE0037354	S.S.S - 3/8-16 X 3/4 HALF DOG
22	8	001CE0037353	B.H.C.S. - 1/2-13 X 3/4
23	32	001AE0037351	SHCS 3/8-16 X 1 1/4
24	4	001AE0037352	SHCS 1/2-13 X 1.75
25	8	001CT0040829	HEX BOLT - 1/2-13 X 1/2
26	2	006AJ0044337	PIN - HD ALIGNMENT
Not shown	8	006BV0040312	SWING BOLT
Not shown	8	001NM0040313	FLANGE NUT
Not shown	8	017AA0044856	DOWEL PIN – SWING BOLT

11.6 Variable Clamshell Parts & Quantities – HD60 to HD86

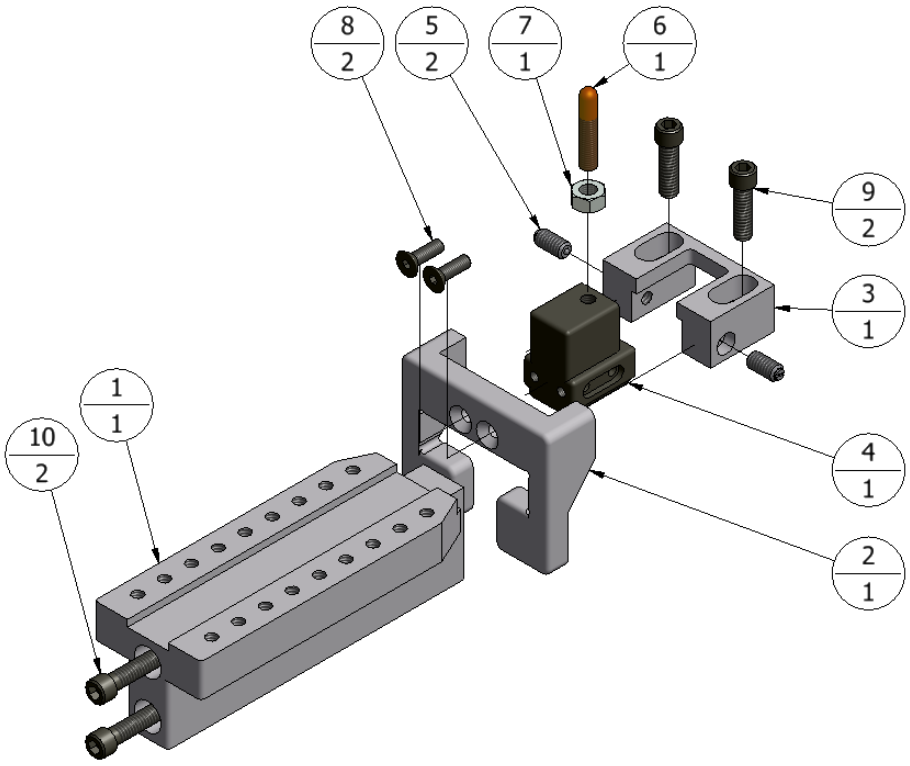
HD CLAMSHELL	HOUSING	GEAR	GEAR SHIELD	D	E
HD60	006AA0032601	006BN0034497	006AU0041694	92	24
HD66	006AA0032602	006BN0034498	006AU0041714	92	24
HD72	006AA0032603	006BN0034499	006AU0041713	92	24
HD80	006AA0032604	006BN0034500	006AU0041695	120	28
HD86	006AA0032605	006BN0034501	006AU0041752	112	28

11.7 HD Locator Assembly F0120A0042XX



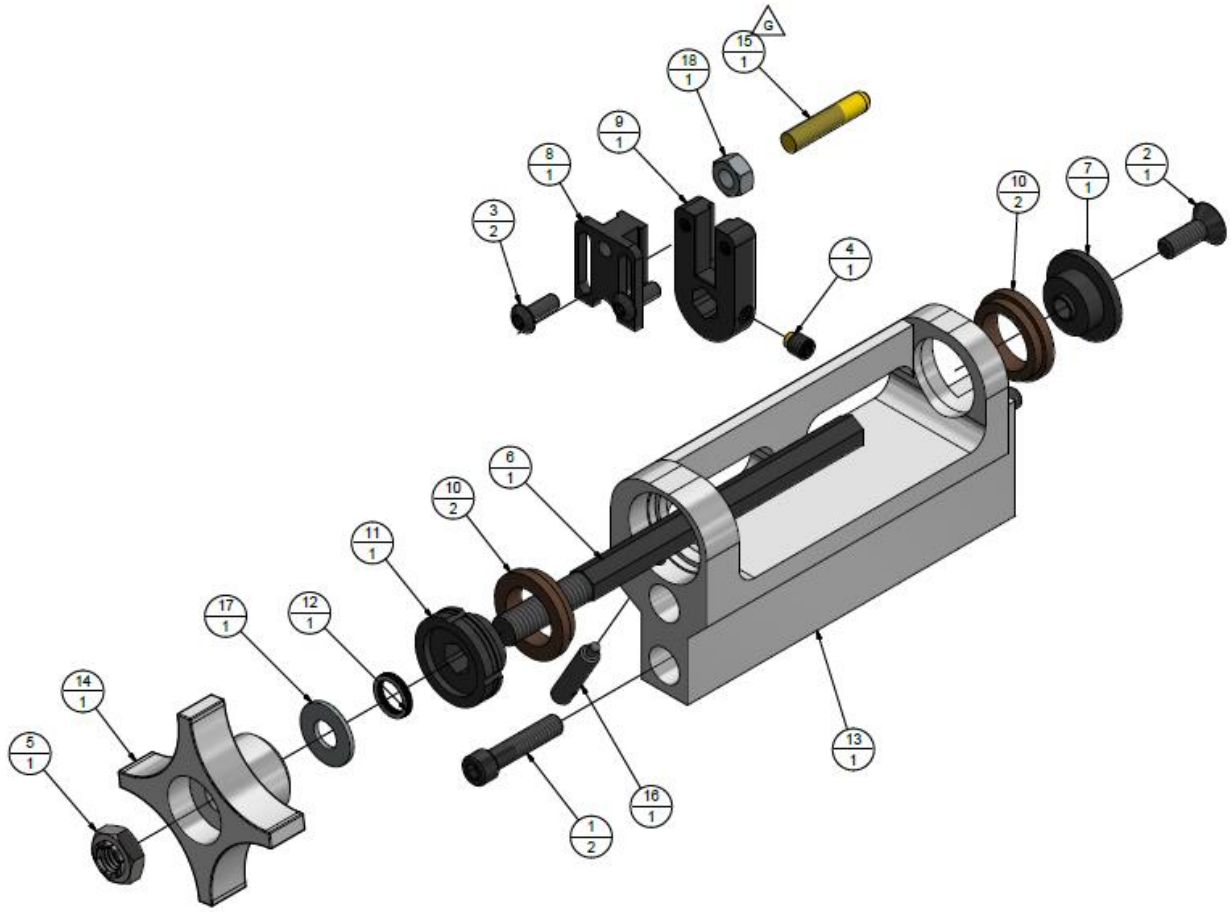
ITEM	QTY	PART #	DESCRIPTION
1	1	006AM0035958	LOCATOR - HD 1 1/4 "
2	1	006BF0036235	SET SCREW H.D. LOCATOR
3	1	001BE0035957	SHOULDER BOLT - 5/16 X 1

11.8 Tripper Assembly (SLIDE STYLE) F0145A0004XX



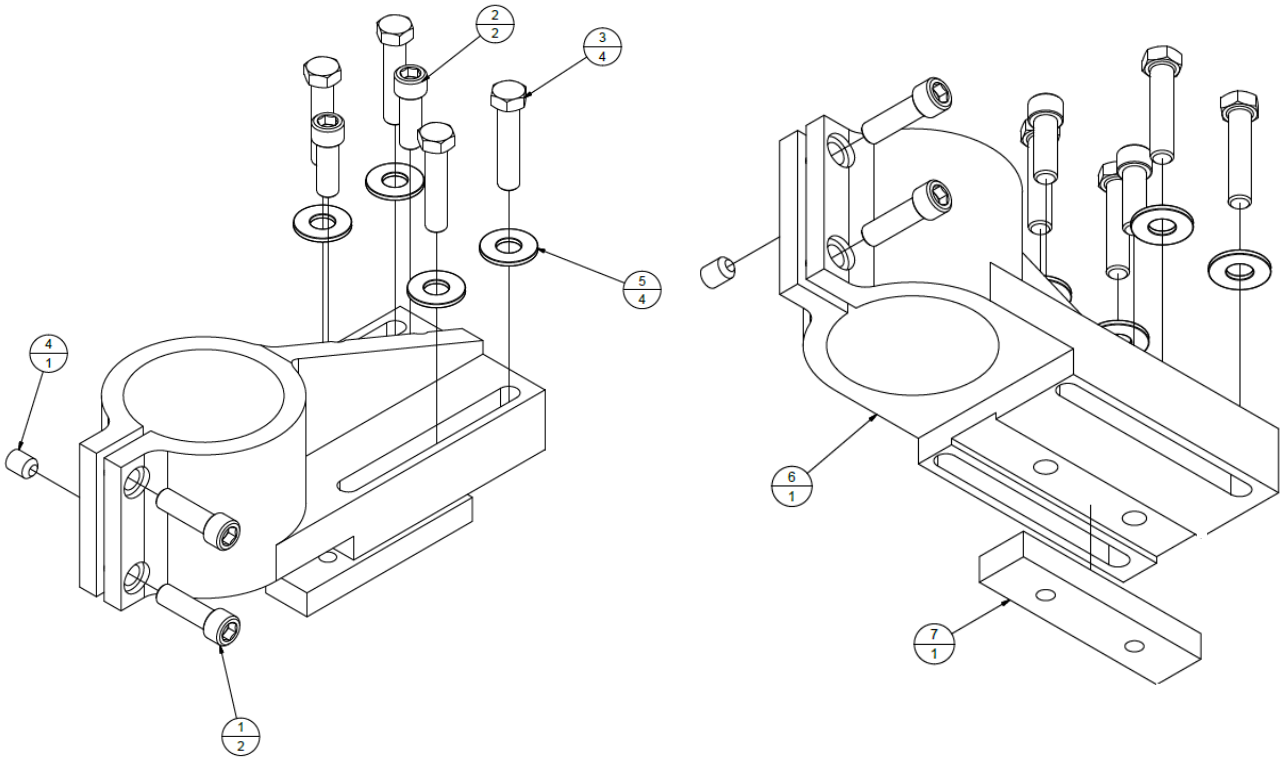
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	006BA0033548	BRACKET - HD TRIPPER
2	1	006BB0033867	HANDLE - TRIPPER SLIDE
3	1	006AP0033030	SLIDE HOLDER
4	1	006AR0033055	SLIDE - HD TRIPPER PIN
5	2	003AB0038831	PLUNGER - 1/4-20 SPRING
6	1	006CA0035815	PIN - TRIPPER 1/4-28
7	1	F0145A1012XX	NUT HEX 1/4-28

11.9 Tripper assembly (Flip style) F0145A0024XX (G)



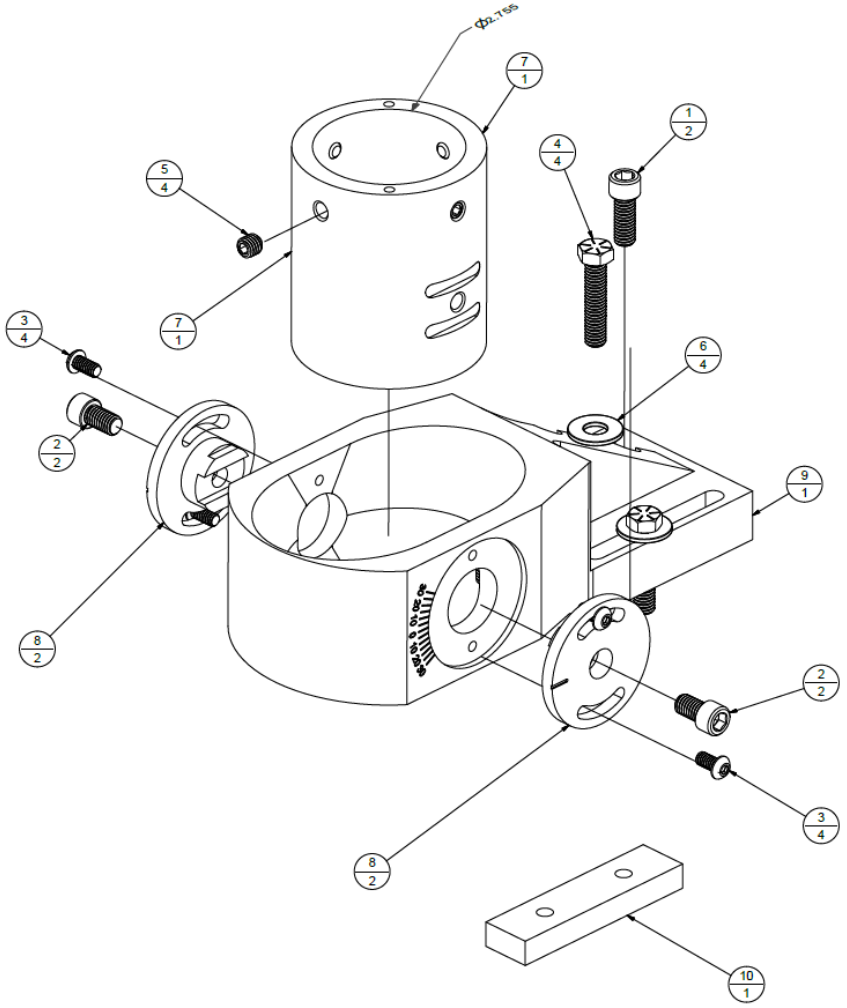
ITEM	P/N	QTY	DESCRIPTION
1	001AE0035491	2	Socket Head Cap Screw 1/4-20 UNC X 1- 1/8 Gr. 8
2	001BT0044276	1	Flat Head Cap Screw 1/4-20 UNC X 3/4
3	001CF0044829	2	Button Head Cap Screw 10-32 UNF X 1/2
4	001GE0044931	1	SOCKET SET SCREW - FLAT POINT 1/4-20 UNC X 1/4 BRASS TIP
5	001NB0044860	1	LOCK NUT - 3/8-16 HEX JAM
6	006AJ0041967	1	HEX SHAFT - FLIP TRIPPER
7	006AJ0041971	1	SHAFT END - HEX TRIPPER FLIP STYLE
8	006AP0042354	1	PIN HOLDER - FLIP TRIPPER
9	006AP0042355	1	PIN HOLDER SLIDE - FLIP TRIPPER
10	006AW0043446	2	BUSHING LARGE - TRIPPER FLIP STYLE
11	006AW0043469	1	BUSHING - FLIP TRIPPER DETENT
12	006AX0043450	1	SPRING-WAVE 0.375IDX0.562ODX0.1950 FREE LENGTH 0.06 WIRE DIA
13	006BA0033788	1	BRACKET - TRIPPER FLIP STYLE
14	006BB0044508	1	KNOB - FLIP STYLE TRIPPER
15	006CA0035815	1	TRIPPER PIN 1/4-28
16	017AM0044936	1	DETENT PIN ZINC PL- 1/4-20, 5/64 HEX
17	023BD0043319	1	WASHER - THRUST 0.375IDX0.812ODX0.0625W IN
18	F0145A1012XX	1	HEX NUT ZINC PL - 1/4-28

11.10 Counter Bore Attachment F0108A1224XX (D)



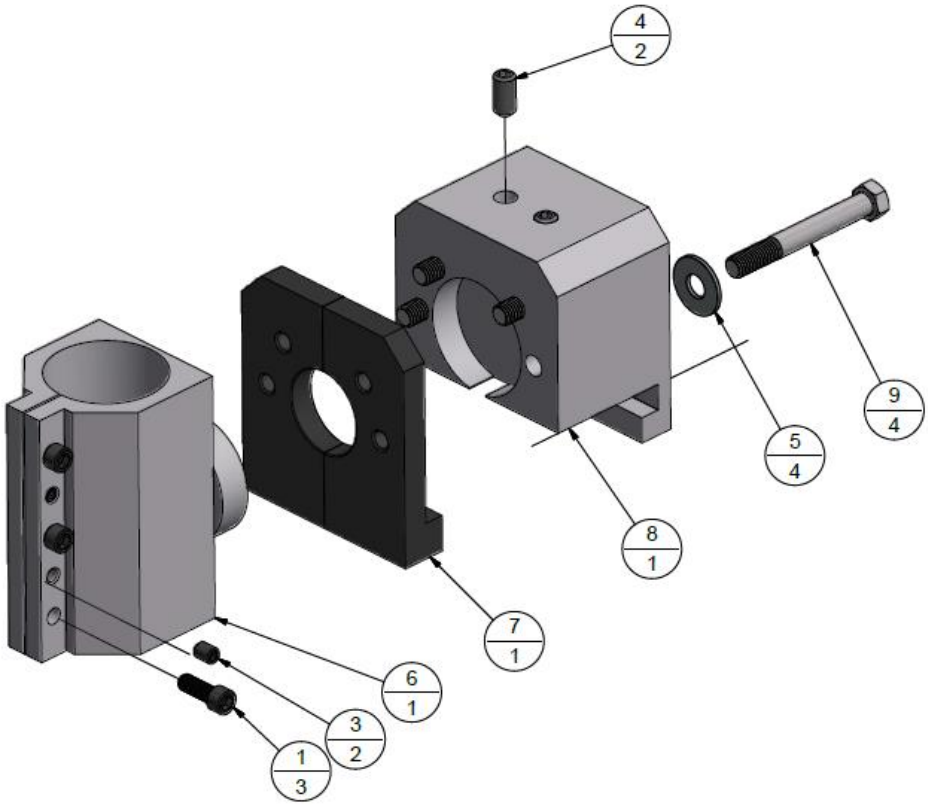
ITEM	P/N	QTY	DESCRIPTION
1	001AE0037351	2	Socket Head Cap Screw 3/8-16 UNC X 1- ¼ Gr. 8
2	001AE0044836	2	Socket Head Cap Screw 3/8-16 UNC X 1- 1/8 Gr. 8
3	001CT0036520	4	Hex Bolt 3/8-16 UNC x 1.75 Full Thread GR8 Steel Zinc
4	001DE0040318	1	Socket Set Screw 3/8-16 UNC X 0.5 in – Cup
5	001HA0036521	4	Washer, 3/8 in USS Flat 1.000OD x 0.4375ID x 0.085thk Zinc
6	006AA0032674	1	COUNTERBORE – HOUSING
7	006BD0033934	1	KEY – COUNTERBORE LOCKING

11.11Swivel Head Attachment F0108A1616XX (C)



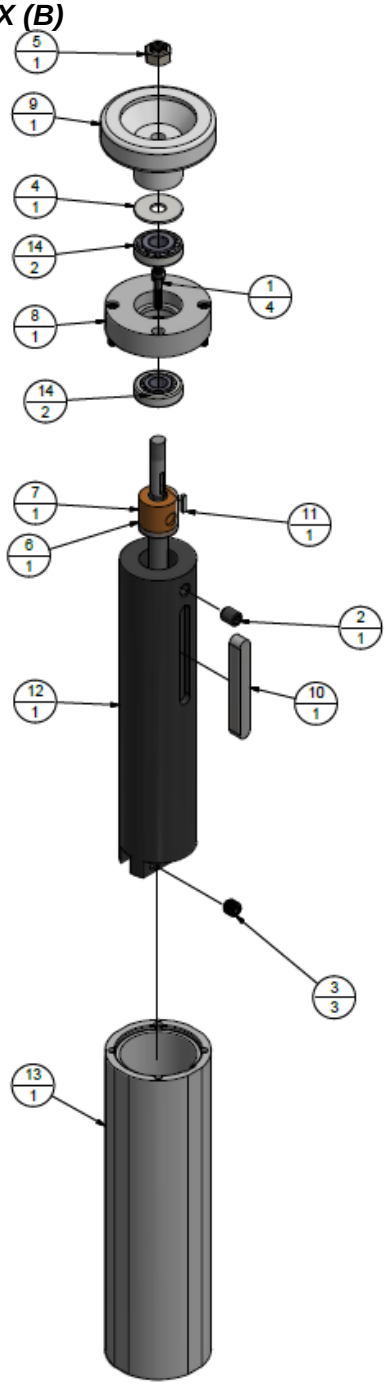
ITEM	P/N	QTY	DESCRIPTION
1	001AE0037473	2	Socket Head Cap Screw 3/8-16 UNC X 1 Gr. 8
2	001AE0044279	2	Socket Head Cap Screw 3/8-16 UNC X 5/8 Gr. 8
3	001CE0044263	4	Button Head Cap Screw 1/4-20 UNC X 1/2
4	001CT0036520	4	Hex Bolt 3/8-16 UNC x 1.75 Full Thread GR8 Steel Zinc
5	001DT0037475	4	Socket Set Screw 3/8-16 UNC X 0.375 in - Flat
6	001HA0036521	4	Washer, 3/8 in USS Flat 1.000OD x 0.4375ID x 0.085thk Zinc
7	006AC0032721	1	COUNTERBORE - HOUSING SWIVEL HEAD
8	006AJ0042157	2	TRUNNION - COUNTERBORE SWIVEL HEAD
9	006BA0033845	1	MOUNTING BRACKET C'BORE SWIVEL HEAD
10	006BD0033934	1	KEY - COUNTERBORE LOCKING

11.12 Single Point Attachment F0150A0001XX (D)



ITEM	P/N	LEGACY #	QTY	DESCRIPTION
1	001AE0037473		3	Socket Head Cap Screw 3/8-16 UNC X 1 Gr. 8
3	001DE0040318		2	Socket Set Screw 3/8-16 UNC X 0.5 in - Cup
4	001DT0037474	501-1014	2	SOCKET SET SCREW - CUP POINT 1/2"-13 UNC X 1"
5	001HA0044219		4	Washer, 1/2 in USS Flat 1.375OD x 0.5625ID x 0.11thk Zinc
6	006AP0033038	201-1028	1	HOLDER - SINGLE POINT BORE BAR
7	006BH0034055	201-1025	1	PLATE - SINGLE POINT CLAMP
8	006BV0034650	201-1027	1	BLOCK - SINGLE POINT SLIDING
9	001CT0040321		4	Hex Bolt 1/2-13 UNC x 4 - 1.25 Thread GR8 Steel Zinc

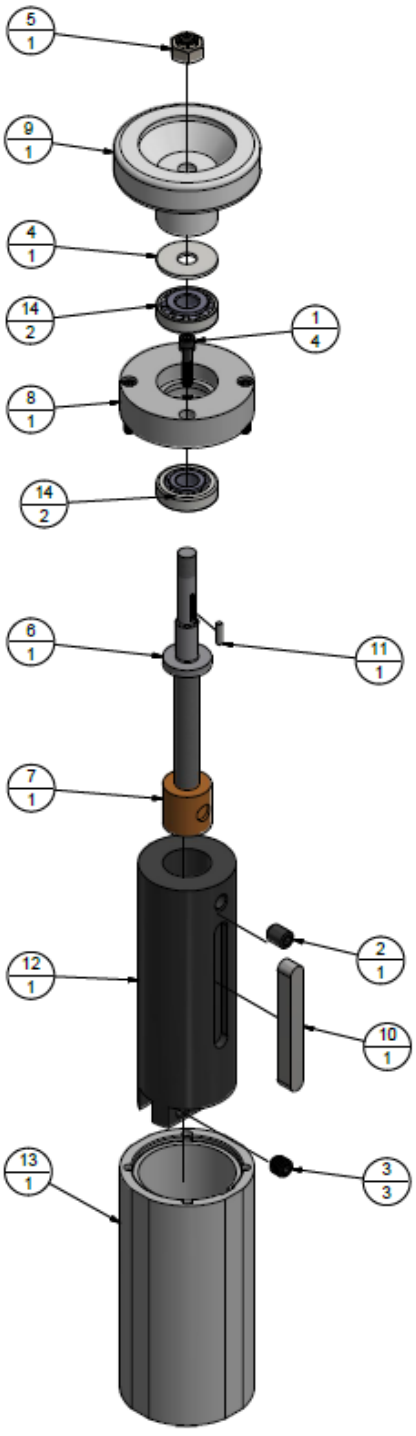
11.13 Counter Bore Assembly – 10” Single Point *F0108A1707XX (B)*



ITEM	P/N	QTY	DESCRIPTION
1	001AE0044828	4	Socket Head Cap Screw 10-32 UNF X 1 Gr. 8
2	001DE0040318	1	Socket Set Screw 3/8-16 UNC X 0.5 in - Cup
3	001DT0037475	3	Socket Set Screw 3/8-16 UNC X 0.375 in - Flat
4	001HA0044795	1	WASHER - FENDER GALVANIZED 3/8IDX1-1/4
5	001NB0044828	1	HEX LOCK NUT - HEAVY CADMIUM 3/8-16 UNC, 5/8 A/F, 25/64H
6	006AK0032801	1	FEED SCREW - C'BORE 10" LH
7	006AL0032906	1	FEED NUT- C'BORE 1/2-20 LH
8	006AU0033365	1	TUBE CAP - COUNTERBORE SWIVEL
9	006BC0033917	1	HANDWHEEL - COUNTER BORE SWIVEL
10	006BD0033932	1	KEY - 3/8 x 3/8 x 2.73 ROUNDED ENDS
11	006BD0042997	1	KEY - 3/32 X 3/32 X 0.50
12	006BJ0034117	1	BORE BAR 9.5 in
13	006BT0042153	1	TUBE - COUNTERBORE 9.5"
14	023AF0050644	2	BEARING - TAPERED ROLLER ASSY 0.4719IDx1.2595ODx0.3940W in

11.14 Counter Bore Assembly – 6” Single Point F0108A1706XX (B)

ITEM	P/N	QTY	DESCRIPTION
1	001AE0044828	4	Socket Head Cap Screw 10-32 UNF X 1 Gr. 8
2	001DE0040318	1	Socket Set Screw 3/8-16 UNC X 0.5 in - Cup
3	001DT0037475	3	Socket Set Screw 3/8-16 UNC X 0.375 in - Flat
4	001HA0044795	1	WASHER - FENDER GALVANIZED 3/8IDX1-1/4
5	001NB0044828	1	HEX LOCK NUT - HEAVY CADMIUM 3/8-16 UNC, 5/8 A/F, 25/64H
6	006AK0032802	1	LH FEED SCREW - C'BORE 6"
7	006AL0032906	1	FEED NUT- C'BORE 1/2-20 LH
8	006AU0033365	1	TUBE CAP - COUNTERBORE SWIVEL
9	006BC0033917	1	HANDWHEEL - COUNTER BORE SWIVEL
10	006BD0033932	1	KEY - 3/8 x 3/8 x 2.73 ROUNDED ENDS
11	006BD0042997	1	KEY - 3/32 X 3/32 X 0.50
12	006BJ0034116	1	BORE BAR - 6"
13	006BT0042152	1	TUBE - COUNTERBORE 5.5"
14	023AF0050644	2	BEARING - TAPERED ROLLER ASSY 0.4719IDx1.2595ODx0.3940W in



11.15 Bevel Cut/Sever Bits