# (MS) MID-SIZE 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 | 28/03/19 | DS | 28/03/19 | 1st Issue |
| 2 | STH | 08/2020 | - | - | Enerpac rebrand |
| 3 | STH | 19/05/2021 | CC | 19/05/2021 | Added CE section |
| | | | | | |
| | | | | | |

**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


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 MS Series Clamshells are portable pipe lathes designed to simultaneously sever and bevel in-line pipe, plus form machine any angle bevel as they cut. MS series clamshells are portable machines that are strong enough to cut and bevel heavy wall pipe and rigid enough to reface worn flanges. The frame is split for easy installation and the tool bits automatically feed into the work piece with each rotation of the lathe to assure precision machining.

## 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
- Reface Flange Faces (requires an additional attachment)
- ID Bevel or Counter Bore (requires an additional attachment)

## 3.3 Drive Assembly

There are many different drive arrangements available for the MS 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 bits. Enerpac stocks all standard prep configurations for right hand severing and beveling, left hand severing and beveling and counter boring. Specialty bits with any angle of bevel or counter bore are made to order.

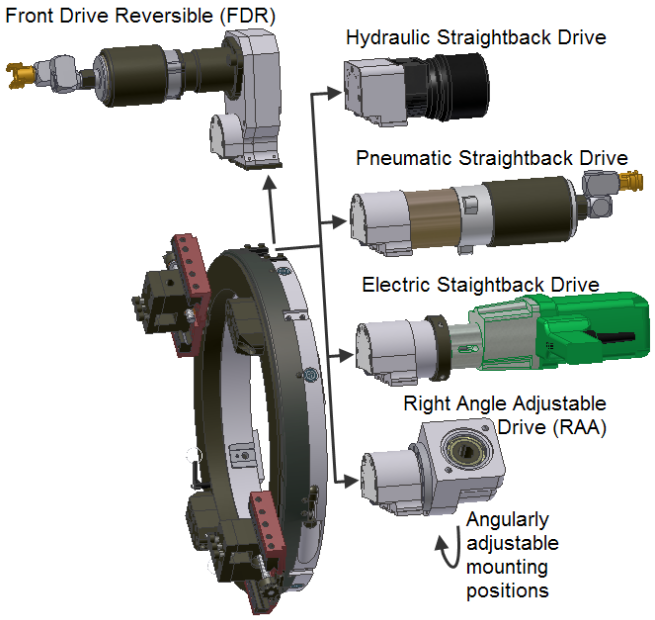



**Figure 1**

# 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, a mount for the drive motor.

## 4.2 Cutting Head and Assembly

Made from 4140-alloy steel, this split ring assembly, connected by the gear clamps, will align with the split lines of the housing when the Clamshell is separated into halves. 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 motor mounting bracket is designed to accept the reaction torque generated by the drive motor. Alignment keys are used to guarantee perpendicularity between the motor and the cutting head.

### 4.4 Bearing

The cutting head assembly runs on 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 MS clamshell uses adjustable locator assemblies with 1/2" 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.

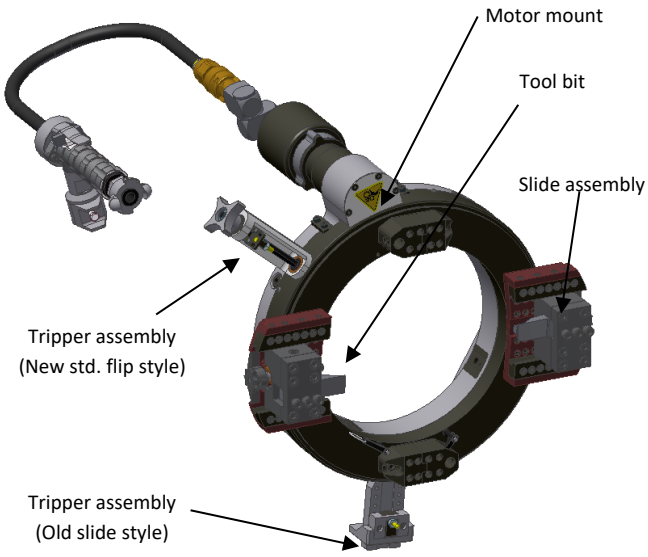



**Figure 2**

# 5.0 MACHINE SET-UP

## 5.1 Pre-Installation Procedure

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

### 5.1.1 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. **Make sure there is a locking pin in each half of the clamshell**.

***Caution: FAILURE TO INSERT LOCKING PINS DURING CLAMSHELL SEPARATION CAN RESULT IN INJURY***

3. Loosen the two swing bolt flange nuts in the housing and swing the bolts out of the pockets. Unscrew the two clamp bolts on the gear halves and separate the clamshell halves by pulling straight apart (see Fig. 3).

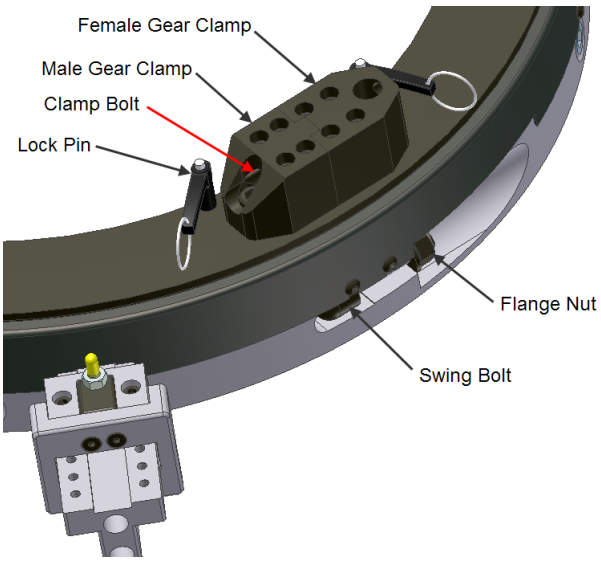



**Figure 3**

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

4. Determine pipe OD and select proper locator extensions from the MS size charts below.

| EXTENSION | MS SIZE 12 | | 16 | | 18 | | 20 | | 24 | |
|---|---|---|---|---|---|---|---|---|---|---|
| NONE | 13 1/8 | 12 1/4 | 16 1/4 | 15 3/8 | 18 1/4 | 17 3/8 | 20 1/4 | 19 3/8 | 24 1/4 | 23 3/8 |
| 1/4 | 12 5/8 | 11 3/4 | 15 5/8 | 14 3/4 | 17 5/8 | 16 3/4 | 19 5/8 | 18 3/4 | 23 5/8 | 22 3/4 |
| 3/8 | 12 3/8 | 11 1/2 | 15 1/2 | 14 5/8 | 17 1/2 | 16 5/8 | 19 1/2 | 18 5/8 | 23 1/2 | 22 5/8 |
| 1/2 | 12 1/8 | 11 1/4 | 15 1/4 | 14 3/8 | 17 1/4 | 16 3/8 | 19 1/4 | 18 3/8 | 23 1/4 | 22 3/8 |
| 3/4 | 11 5/8 | 10 3/4 | 14 3/4 | 13 7/8 | 16 3/4 | 15 7/8 | 18 3/4 | 17 7/8 | 22 3/4 | 21 7/8 |
| 1 | 11 1/8 | 10 1/4 | 14 1/4 | 13 3/8 | 16 1/4 | 15 3/8 | 18 1/4 | 17 3/8 | 22 1/4 | 21 3/8 |
| 1 1/4 | 10 5/8 | 9 3/4 | 13 3/4 | 12 7/8 | 15 3/4 | 14 7/8 | 17 3/4 | 16 7/8 | 21 3/4 | 20 7/8 |
| 1 1/2 | 10 1/8 | 9 1/4 | 13 1/4 | 12 3/8 | 15 1/4 | 14 3/8 | 17 1/4 | 16 3/8 | 21 1/4 | 20 3/8 |
| 1 3/4 | 9 5/8 | 8 3/4 | 12 3/4 | 11 7/8 | 14 3/4 | 13 7/8 | 16 3/4 | 15 7/8 | 20 3/4 | 19 7/8 |
| 2 | 9 1/8 | 8 1/4 | 12 1/4 | 11 3/8 | 14 1/4 | 13 3/8 | 16 1/4 | 15 3/8 | 20 1/4 | 19 3/8 |
| 2 1/4 | 8 5/8 | 7 3/4 | 11 3/4 | 10 7/8 | 13 3/4 | 12 7/8 | 15 3/4 | 14 7/8 | 19 3/4 | 18 7/8 |
| 2 1/2 | 8 1/8 | 7 1/4 | 11 1/4 | 10 3/8 | 13 1/4 | 12 3/8 | 15 1/4 | 14 3/8 | 19 1/4 | 18 3/8 |
| 2 3/4 | 7 5/8 | 6 3/4 | 10 3/4 | 9 7/8 | 12 3/4 | 11 7/8 | 14 3/4 | 13 7/8 | 18 3/4 | 17 7/8 |
| 3 | 7 1/8 | 6 1/4 | 10 1/4 | 9 3/8 | 12 1/4 | 11 3/8 | 14 1/4 | 13 3/8 | 18 1/4 | 17 3/8 |
| 3 1/4 | 6 5/8 | 5 3/4 | 9 3/4 | 8 7/8 | 11 3/4 | 10 7/8 | 13 3/4 | 12 7/8 | 17 3/4 | 16 7/8 |
| 3 1/2 | 6 1/8 | 5 1/4 | 9 1/4 | 8 3/8 | 11 1/4 | 10 3/8 | 13 1/4 | 12 3/8 | 17 1/4 | 16 3/8 |
| 4 | 5 1/8 | 4 1/4 | 8 3/8 | 7 1/2 | 10 3/8 | 9 1/2 | 12 3/8 | 11 1/2 | 16 3/8 | 15 1/2 |

| EXTENSION | MS SIZE 28 | | 30 | | 32 | | 36 | | 36.5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| NONE | 28 1/4 | 27 3/8 | 30 1/4 | 29 3/8 | 32 1/4 | 31 3/8 | 36 1/4 | 35 3/8 | 36 3/4 | 35 7/8 |
| 1/4 | 27 5/8 | 26 3/4 | 29 5/8 | 28 3/4 | 31 5/8 | 30 3/4 | 35 5/8 | 34 3/4 | 36 1/8 | 35 1/4 |
| 3/8 | 27 1/2 | 26 5/8 | 29 1/2 | 28 5/8 | 31 1/2 | 30 5/8 | 35 1/2 | 34 5/8 | 36 | 35 1/8 |
| 1/2 | 27 1/4 | 26 3/8 | 29 1/4 | 28 3/8 | 31 1/4 | 30 3/8 | 35 1/4 | 34 3/8 | 35 3/4 | 34 7/8 |
| 3/4 | 26 3/4 | 25 7/8 | 28 3/4 | 27 7/8 | 30 3/4 | 29 7/8 | 34 3/4 | 33 7/8 | 35 1/4 | 34 3/8 |
| 1 | 26 1/4 | 25 3/8 | 28 1/4 | 27 3/8 | 30 1/4 | 29 3/8 | 34 1/4 | 33 3/8 | 34 3/4 | 33 7/8 |
| 1 1/4 | 25 3/4 | 24 7/8 | 27 3/4 | 26 7/8 | 29 3/4 | 28 7/8 | 33 3/4 | 32 7/8 | 34 1/4 | 33 3/8 |
| 1 1/2 | 25 1/4 | 24 3/8 | 27 1/4 | 26 3/8 | 29 1/4 | 28 3/8 | 33 1/4 | 32 3/8 | 33 3/4 | 32 7/8 |
| 1 3/4 | 24 3/4 | 23 7/8 | 26 3/4 | 25 7/8 | 28 3/4 | 27 7/8 | 32 3/4 | 31 7/8 | 33 1/4 | 32 3/8 |
| 2 | 24 1/4 | 23 3/8 | 26 1/4 | 25 3/8 | 28 1/4 | 27 3/8 | 32 1/4 | 31 3/8 | 32 3/4 | 31 7/8 |
| 2 1/4 | 23 3/4 | 22 7/8 | 25 3/4 | 24 7/8 | 27 3/4 | 26 7/8 | 31 3/4 | 30 7/8 | 32 1/4 | 31 3/8 |
| 2 1/2 | 23 1/4 | 22 3/8 | 25 1/4 | 24 3/8 | 27 1/4 | 26 3/8 | 31 1/4 | 30 3/8 | 31 3/4 | 30 7/8 |
| 2 3/4 | 22 3/4 | 21 7/8 | 24 3/4 | 23 7/8 | 26 3/4 | 25 7/8 | 30 3/4 | 29 7/8 | 31 1/4 | 30 3/8 |
| 3 | 22 1/4 | 21 3/8 | 24 1/4 | 23 3/8 | 26 1/4 | 25 3/8 | 30 1/4 | 29 3/8 | 30 3/4 | 29 7/8 |
| 3 1/4 | 21 3/4 | 20 7/8 | 23 3/4 | 22 7/8 | 25 3/4 | 24 7/8 | 29 3/4 | 28 7/8 | 30 1/4 | 29 3/8 |
| 3 1/2 | 21 1/4 | 20 3/8 | 23 1/4 | 22 3/8 | 25 1/4 | 24 3/8 | 29 1/4 | 28 3/8 | 29 3/4 | 28 7/8 |
| 4 | 20 3/8 | 19 1/2 | 22 3/8 | 21 1/2 | 24 3/8 | 23 1/2 | 28 3/8 | 27 1/2 | 28 7/8 | 28 |

| | MS SIZE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 39 | | 42 | | 48 | | 50 | |
| EXTENSION | NONE | 39 1/4 | 38 3/8 | 42 1/4 | 41 3/8 | 48 1/4 | 47 3/8 | 50 1/4 | 49 3/8 |
| | 1/4 | 38 5/8 | 37 3/4 | 41 5/8 | 40 3/4 | 47 5/8 | 46 3/4 | 49 5/8 | 48 3/4 |
| | 3/8 | 38 1/2 | 37 5/8 | 41 1/2 | 40 5/8 | 47 1/2 | 46 5/8 | 49 1/2 | 48 5/8 |
| | 1/2 | 38 1/4 | 37 3/8 | 41 1/4 | 40 3/8 | 47 1/4 | 46 3/8 | 49 1/4 | 48 3/8 |
| | 3/4 | 37 3/4 | 36 7/8 | 40 3/4 | 39 7/8 | 46 3/4 | 45 7/8 | 48 3/4 | 47 7/8 |
| | 1 | 37 1/4 | 36 3/8 | 40 1/4 | 39 3/8 | 46 1/4 | 45 3/8 | 48 1/4 | 47 3/8 |
| | 1 1/4 | 36 3/4 | 35 7/8 | 39 3/4 | 38 7/8 | 45 3/4 | 44 7/8 | 47 3/4 | 46 7/8 |
| | 1 1/2 | 36 1/4 | 35 3/8 | 39 1/4 | 38 3/8 | 45 1/4 | 44 3/8 | 47 1/4 | 46 3/8 |
| | 1 3/4 | 35 3/4 | 34 7/8 | 38 3/4 | 37 7/8 | 44 3/4 | 43 7/8 | 46 3/4 | 45 7/8 |
| | 2 | 35 1/4 | 34 3/8 | 38 1/4 | 37 3/8 | 44 1/4 | 43 3/8 | 46 1/4 | 45 3/8 |
| | 2 1/4 | 34 3/4 | 33 7/8 | 37 3/4 | 36 7/8 | 43 3/4 | 42 7/8 | 45 3/4 | 44 7/8 |
| | 2 1/2 | 34 1/4 | 33 3/8 | 37 1/4 | 36 3/8 | 43 1/4 | 42 3/8 | 45 1/4 | 44 3/8 |
| | 2 3/4 | 33 3/4 | 32 7/8 | 36 3/4 | 35 7/8 | 42 3/4 | 41 7/8 | 44 3/4 | 43 7/8 |
| | 3 | 33 1/4 | 32 3/8 | 36 1/4 | 35 3/8 | 42 1/4 | 41 3/8 | 44 1/4 | 43 3/8 |
| | 3 1/4 | 32 3/4 | 31 7/8 | 35 3/4 | 34 7/8 | 41 3/4 | 40 7/8 | 43 3/4 | 42 7/8 |
| | 3 1/2 | 32 1/4 | 31 3/8 | 35 1/4 | 34 3/8 | 41 1/4 | 40 3/8 | 43 1/4 | 42 3/8 |
| | 4 | 31 3/8 | 30 1/2 | 34 3/8 | 33 1/2 | 40 3/8 | 39 1/2 | 42 3/8 | 41 1/2 |

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 a 3/8" allen wrench. Back-up the locator pads as needed for proper clearance of pipe diameter. Ensure the motor mount area will be accessible when the clamshell is tightened into place.

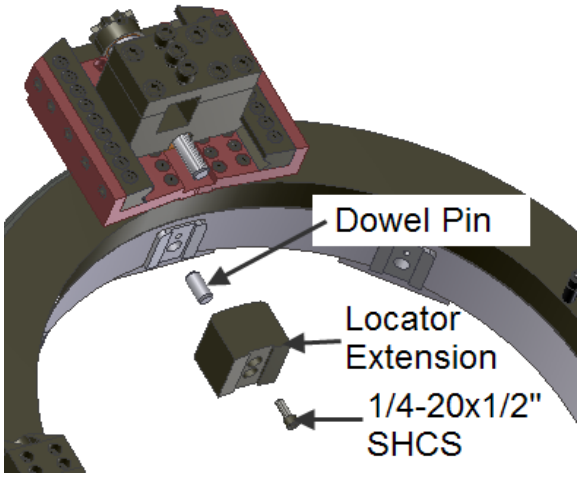



**Figure 4**

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.

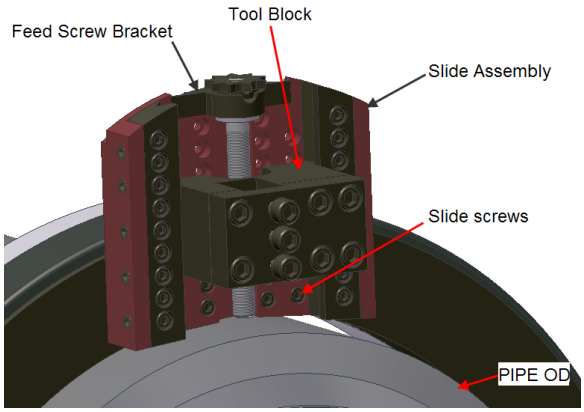



**Figure 5**

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 the handle. 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.

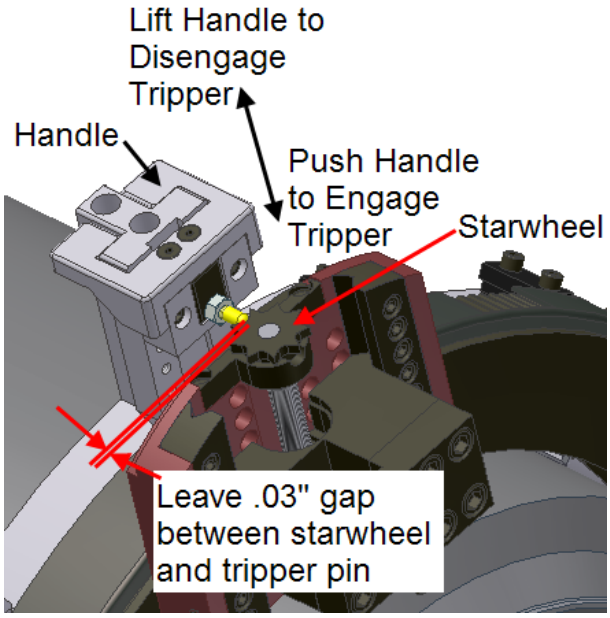



**Figure 6**

# 6.0 INSTALLATION ON IN-LINE PIPE

## 6.1 Joining Clamshell Halves

1. Install the 2 halves of the Clamshell around the pipe and tighten the housing bolts and the clamp bolts on the gear (see Fig. 7).

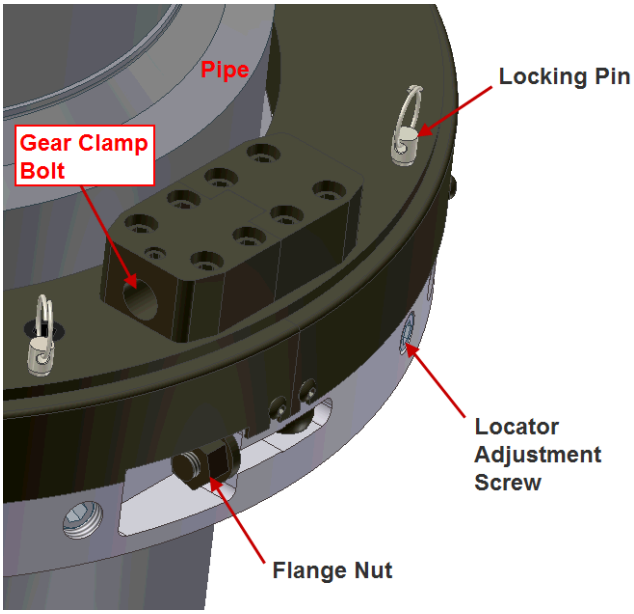



**Figure 7**

***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.

## 6.2 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 work piece at all four locations around the pipe (see Fig 8).

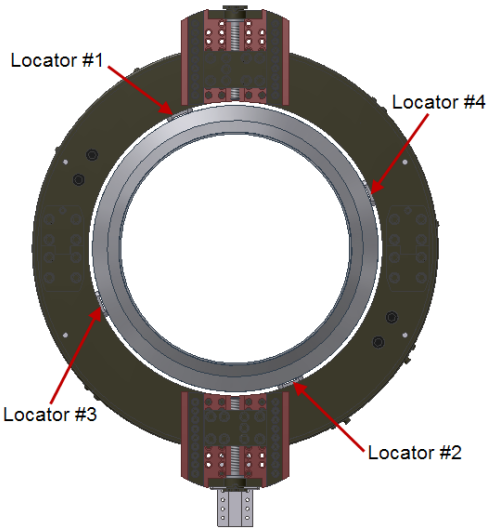



**Figure 8**

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. The number of locators varies from four to twelve, depending on the model of clamshell lathe. Most thin wall pipes are out of round; therefore, a zero reading all the way around may not be possible.

6. Tighten all of the remaining locators.

### 6.3 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 by pulling the tripper handle away from the clamshell.

3. Insert proper beveling and severing bits so that the tip touches the pipe OD and the cutting edge or tip is on center. 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).

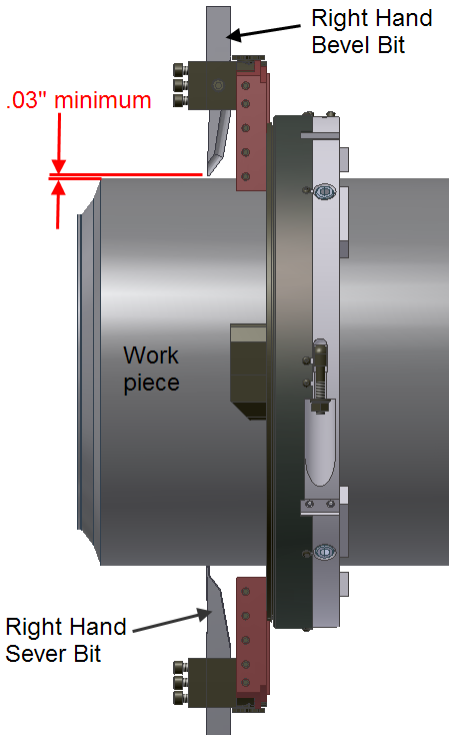



**Figure 9**

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

### 6.4 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 front of the motor mount is flush with the front 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 4 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.***

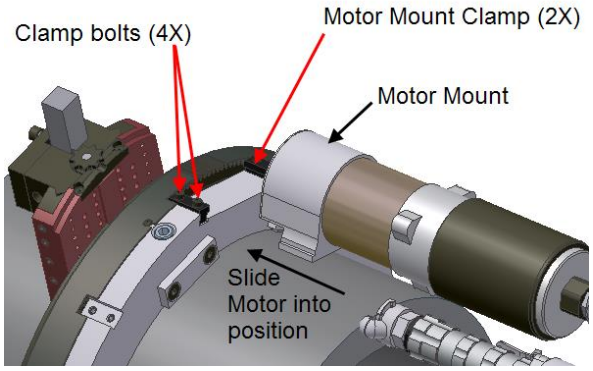



**Figure 10**

## 7.0 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.***

### 7.1 Severing In-Line Pipe

1. Follow set-up procedures, using a wide and narrow straight sever bit in opposite tool blocks. Back up both bits (out approx. 1/32"); then back up the wider bit another 2-5 turns of the star wheel, so that it will trail the narrow bit throughout the cut. Attach the drive motor to the clamshell, disengage the 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.***

### 7.2 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.

## 8.0 I.D Boring

### 8.1 Counter Bore Attachment

The counter bore attachment (see fig 11) comes with either a 6" or 10" long counter bore tube. The counter bore attachment can also be used for flange facing and flange face grooving.

1. Square and center the clamshell on the work piece. Remove the tripper bracket. 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 setscrews 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.

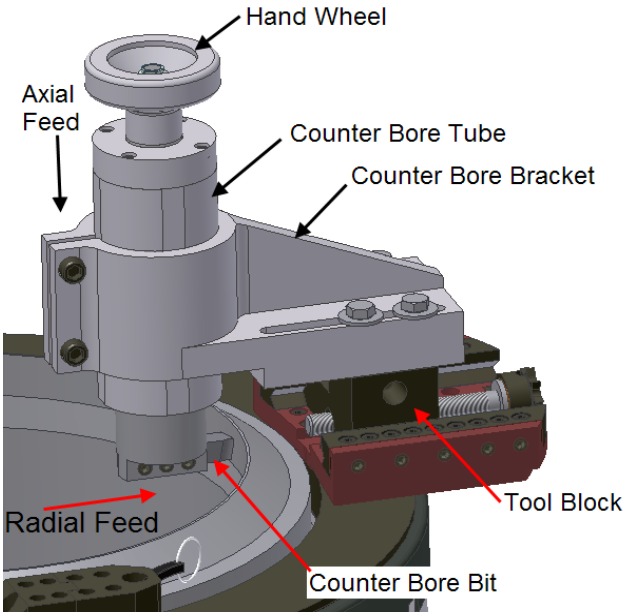



**Figure 11**

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.

### 8.2 Swivel Head Attachment

The swivel head attachment (see Fig. 12) comes with either a 6" or 10" long counter bore tube. The swivel head attachment can 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.

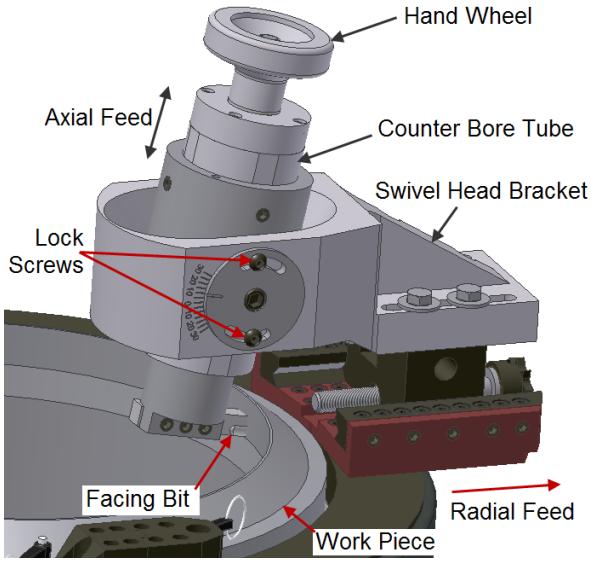



**Figure 12**

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 (see Fig 13) 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.

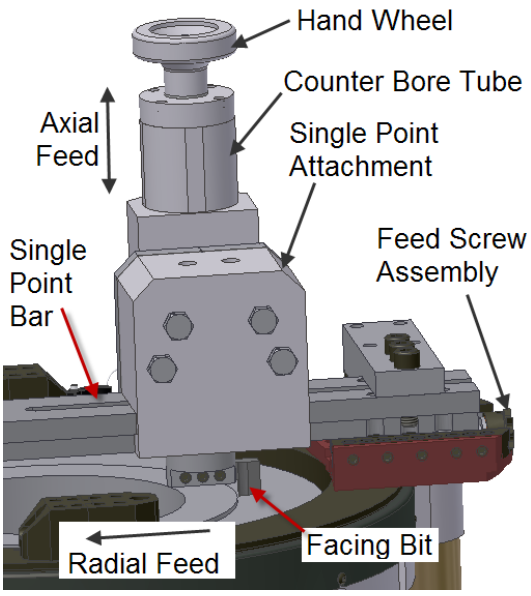



**Figure 13**

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 two 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 flat 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). A dead blow may be needed to seat the gibs against the side set screws. Tap the tool block to either side and continue to adjust the side sets screws until the slop is removed

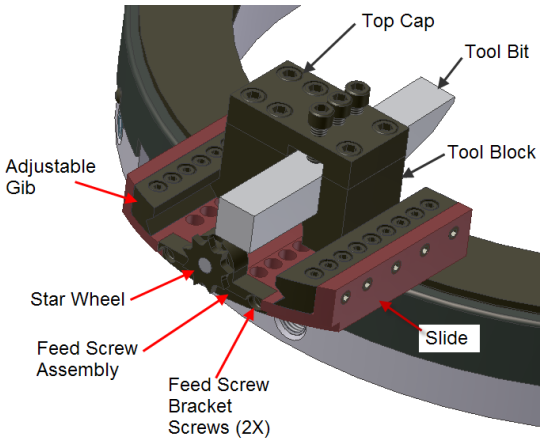



**Figure 14**

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 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.

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.

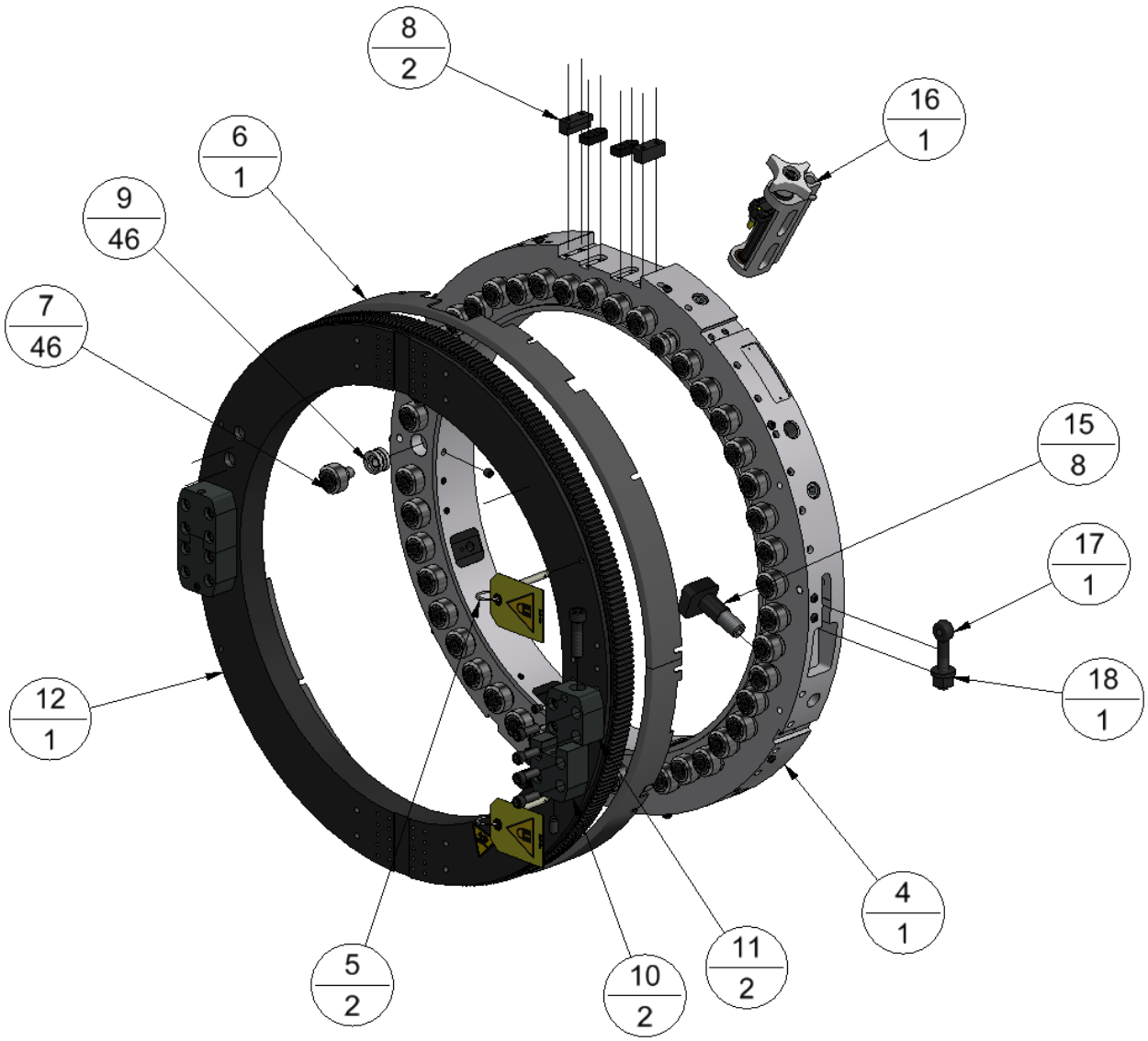
4. Rotate the gear so the access holes are directly over the next two bearings. Repeat step 3.

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

6. Slowly run the machine. Looking through 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 MS Clamshell *(Refer to table below)*



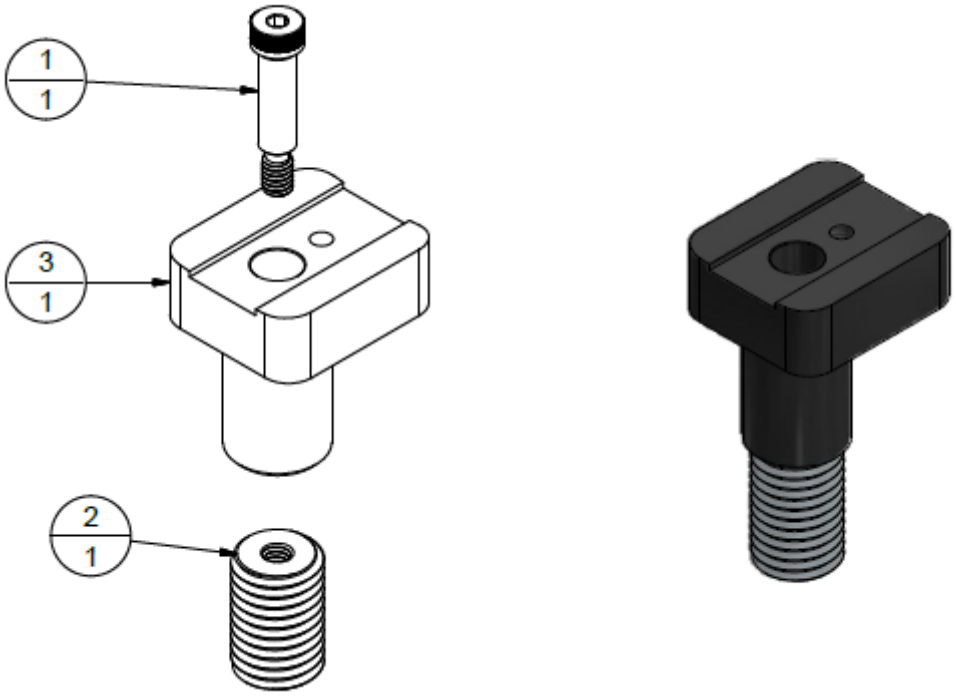
## 11.2 *Common Clamshell Parts & Quantities*

| ITEM | QTY | P/N | DESCRIPTION |
|---|---|---|---|
| 1 | varies | 001DT0037475 | Socket Set Screw (Grub) 3/8-16 UNC X 0.375 in - Flat Point |
| 2 | 2 | 001EK0044907 | Socket Set Screw (Grub) 3/8-16 UNC X 0.75 in - Half Dog Point |
| 3 | varies | 001ES0044915 | SOCKET SET SCREW - CONE POINT 3/8-16 UNC X 1/2 |
| 4 | 1 | 006AA00xxxxx | HOUSING - MS |
| 5 | 2 | 006AJ0044337 | PIN - LOCKING 5/16ODX2.50GRIP LENGTH |
| 6 | 1 | 006AU00xxxxx | SHIELD - MS GEAR |
| 7 | varies | 006AW0035235 | BEARING - NB BALL |
| 8 | 2 | 006BA0033632 | BRACKET - NB MOTOR MOUNT LOCK |
| 9 | varies | 006BE0044438 | ECCENTRIC - MS |
| 10 | 2 | 006BL0034396 | GEAR CLAMP - FEMALE MS |
| 11 | 2 | 006BL0034403 | GEAR CLAMP - MALE MS |
| 12 | 1 | 006BN00xxxxx | GEAR - MS |
| 13 | 1 | 006HG0044210 | KEY - MS MOTOR MOUNT |
| 14 | 4 | 006KC0044290 | PIPE PLUG 1/2-14 |
| 15 | varies | F0120A0115XX | LOCATOR ASSEMBLY - MS 5/8" |
| 16 | 1 | F0145A0024XX or F0145A0016XX | TRIPPER ASSEMBLY - FLIP STYLE |
| 17 | 2 | 001GK0035245 | SWING BOLT |
| 18 | 2 | 001NA0035243 | FLANGE NUT |
| 17 | 2 | 017AA0035256 | DOWEL PIN – SWING BOLT |

## 11.3 Specific Clamshell Parts & Quantities

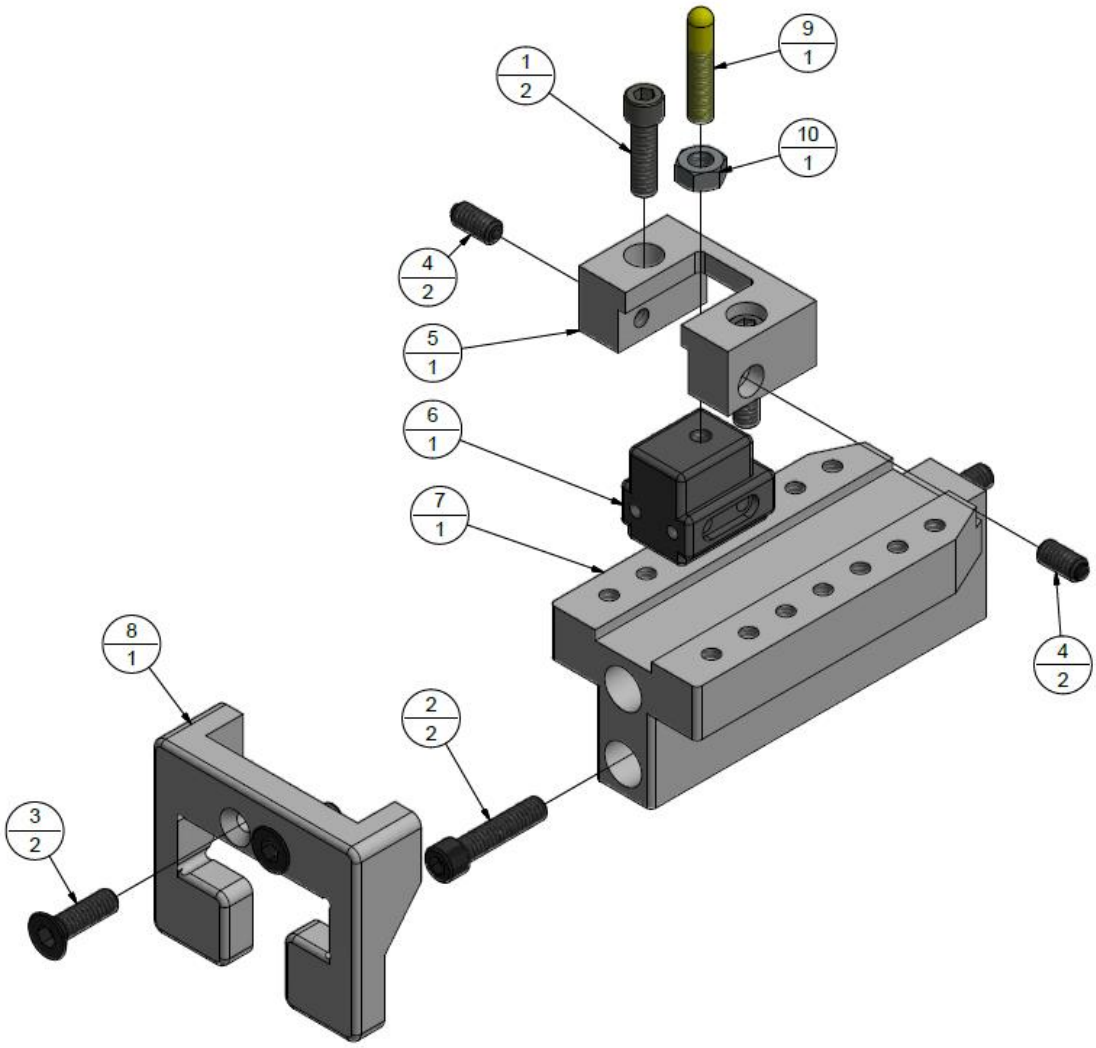
| MS CLAMSHELL | A | B | HOUSING | GEAR | GEAR SHIELD |
|---|---|---|---|---|---|
| MS12 | 4 | 30 | 006AA0032625 | 006BN0034515 | 006AU0041734 |
| MS16 | 8 | 38 | 006AA0032626 | 006BN0034517 | 006AU0041725 |
| MS18 | 8 | 42 | 006AA0032627 | 006BN0034508 | 006AU0041738 |
| MS20 | 8 | 46 | 006AA0032628 | 006BN0034518 | 006AU0041719 |
| MS24 | 8 | 54 | 006AA0032629 | 006BN0034519 | 006AU0041720 |
| MS28 | 8 | 62 | 006AA0032630 | 006BN0034521 | 006AU0041721 |
| MS30 | 8 | 66 | 006AA0032631 | 006BN0034522 | 006AU0041751 |
| MS32 | 12 | 70 | 006AA0032632 | 006BN0034523 | 006AU0041722 |
| MS36 | 12 | 78 | 006AA0032633 | 006BN0034525 | 006AU0050971 |
| MS36.5 | 12 | 70 | 006AA0032634 | 006BN0034526 | 006AU0041726 |
| MS39 | 12 | 90 | 006AA0032635 | 006BN0034527 | 006AU0041755 |
| MS42 | 12 | 90 | 006AA0032636 | 006BN0034528 | 006AU0041723 |
| MS48 | 12 | 90 | 006AA0032637 | 006BN0034530 | 006AU0041753 |
| MS50 | 12 | 98 | 006AA0032638 | 006BN0034531 | 006AU0041754 |

## 11.4 *Locator Assembly* F0108A1224XX (A)



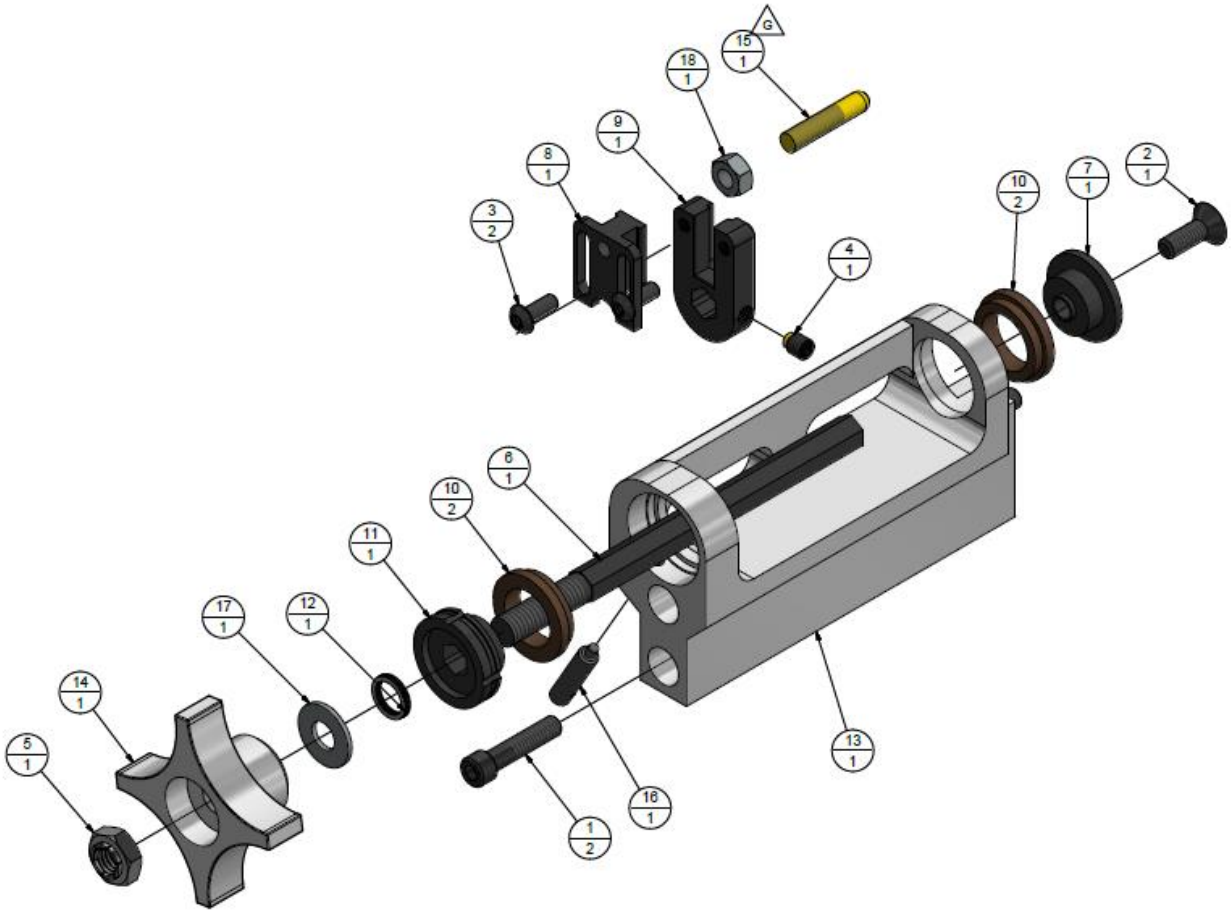

| 3 | 006AN0042116 | 1 | LOCATOR - MS PAD 5/8" |
|---|---|---|---|
| 2 | 006AN0035237 | 1 | SET SCREW - 3/4-10 LOCATOR |
| 1 | 001BE0035957 | 1 | Shoulder Screw - DIA 0.3125 in X 1 in lg - 1/4-20 UNC |
| **ITEM** | **P/N** | **QTY** | **DESCRIPTION** |

## 11.5 *Tripper Assembly* F0145A0016XX (B)



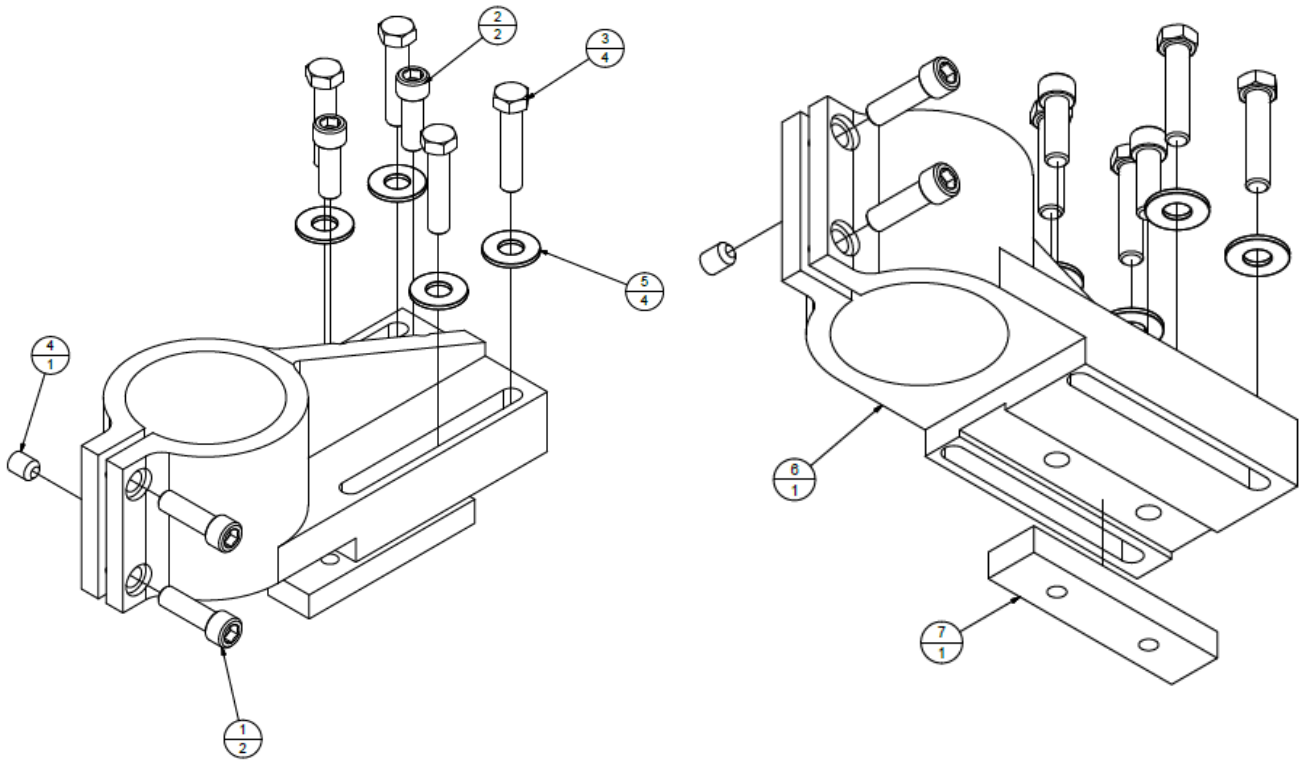

| ITEM | P/N | LEGACY # | QTY | DESCRIPTION |
|---|---|---|---|---|
| 1 | 001AE0035481 | 505-1003 | 2 | SOCKET HEAD CAP SCREW - 1/4-20 UNC x 7/8 |
| 2 | 001AE0035491 | 505-1071 | 2 | SOCKET HEAD CAP SCREW 1/4-20 UNC x 1 1/8 |
| 3 | 001BT0039328 | 505-1062 | 2 | FLAT HEAD CAP SCREW 1/4-20 UNC x 7/8 |
| 4 | 003AB0038831 | 500-1124 | 2 | SPRING PLUNGER - 1/4in-20UNC SHORT |
| 5 | 006AP0033039 | 205-1184 | 1 | HOLDER - TRIPPER PIN SLIDE |
| 6 | 006AR0042263 | 205-1493 | 1 | SLIDE - MS SAFETY TRIPPER PIN |
| 7 | 006BA0033650 | 205-1022 | 1 | BRACKET - NB TRIPPER |
| 8 | 006BB0033867 | 205-1183 | 1 | HANDLE - NB SAFETY TRIPPER |
| 9 | 006CA0035815 | 500-1177 | 1 | TRIPPER PIN 1/4-28 |
| 10 | F0145A1012XX | 505-1012 | 1 | HEX NUT ZINC PL - 1/4-28 |

## 11.6 *Tripper Assembly* F0145A0024XX (G)



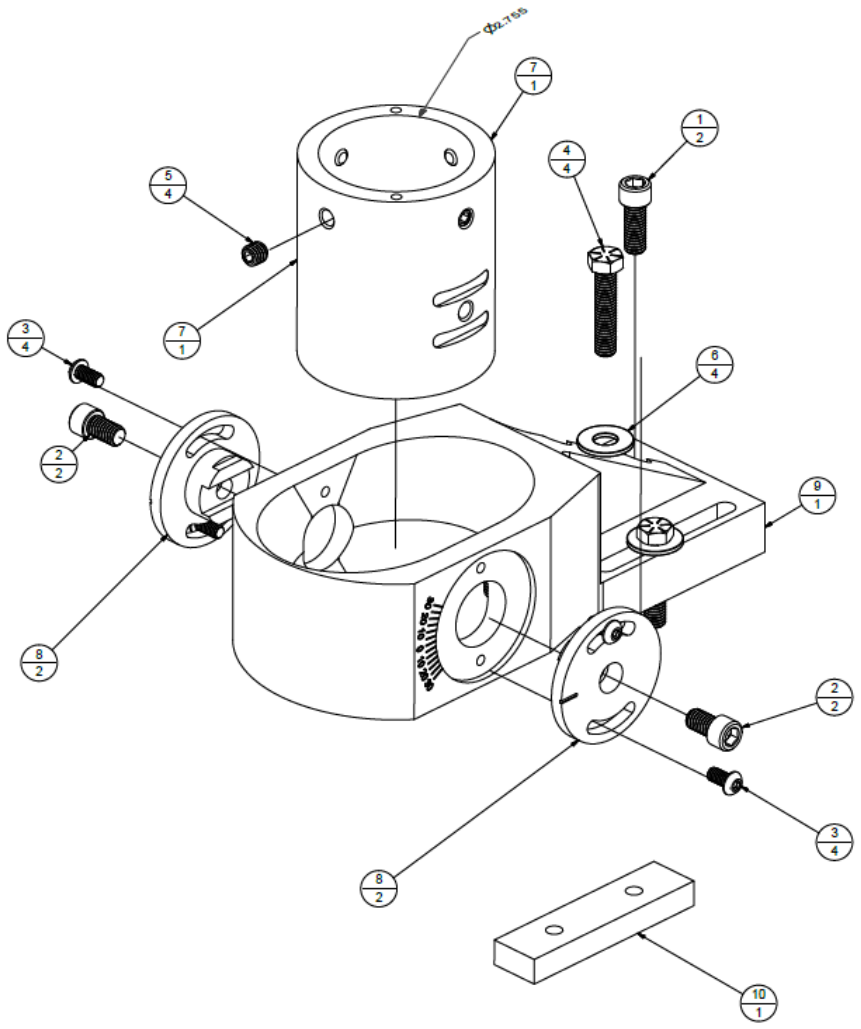

| ITEM | P/N | QTY | DESCRIPTION |
|---|---|---|---|
| 1 | 001AE0035491 | 2 | Socket Head Cap Screw 1/4-20 UNC X 1- 1/8 Gr. 8 |
| 2 | 001BT0044276 | 1 | Flat Head Cap Screw 1/4-20 UNC X 3/4 |
| 3 | 001CF0044829 | 2 | Button Head Cap Screw 10-32 UNF X 1/2 |
| 4 | 001GE0044931 | 1 | SOCKET SET SCREW - 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 |

## 11.7 *Counter Bore Fixed Head Assembly* F0108A1224XX (D)



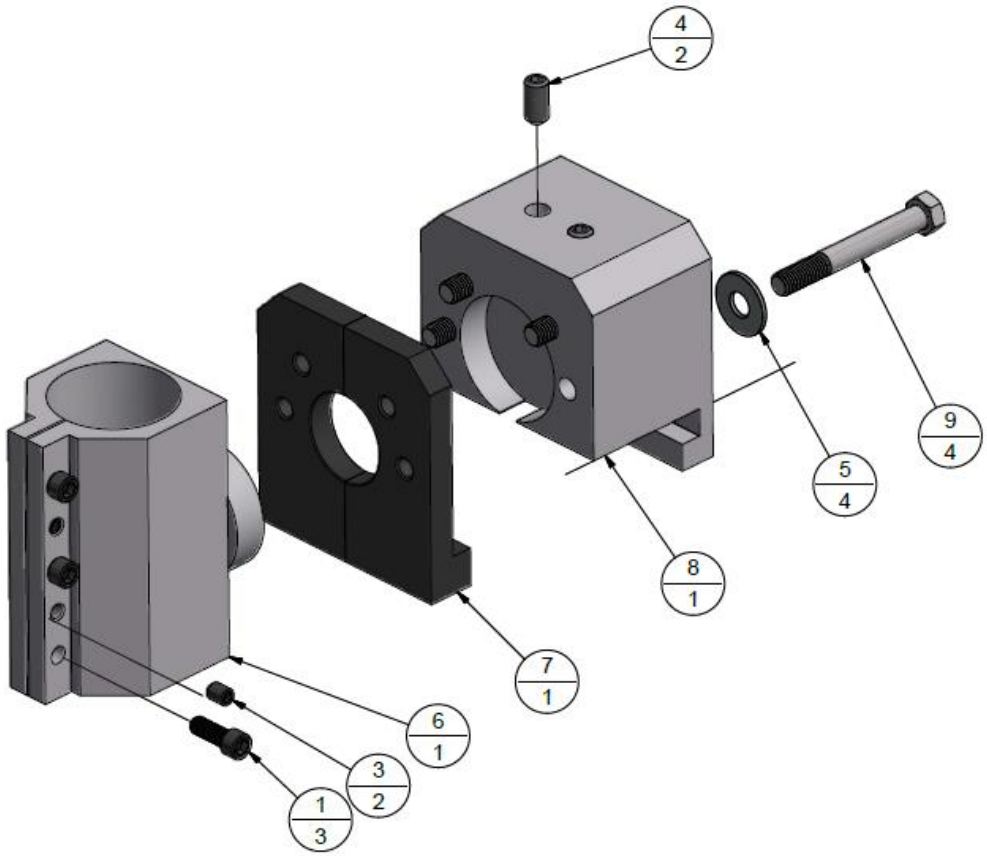

| ITEM | P/N | QTY | DESCRIPTION |
|---|---|---|---|
| 1 | 001AE0037351 | 2 | Socket Head Cap Screw 3/8-16 UNC X 1- 1/4 Gr. 8 |
| 2 | 001AE0044836 | 2 | Socket Head Cap Screw 3/8-16 UNC X 1- 1/8 Gr. 8 |
| 3 | 001CT0036520 | 4 | Hex Bolt 3/8-16 UNC x 1.75 Full Thread GR8 Steel Zinc |
| 4 | 001DE0040318 | 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 |

## 11.8 *Swivel 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 |

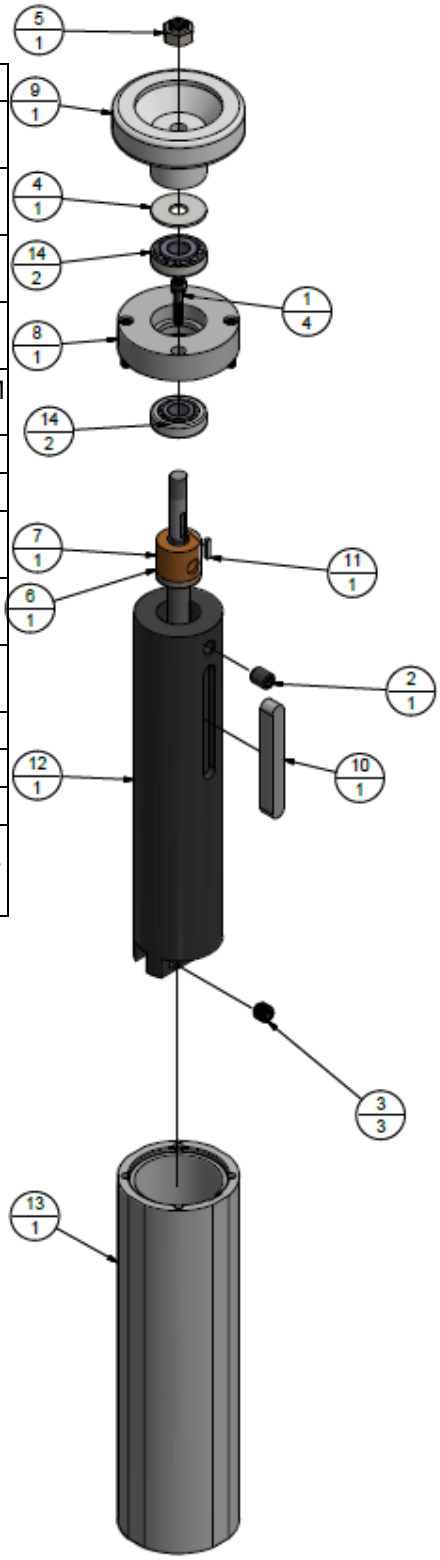
### *11.9 Single Point Attachment F0150A0001XX* (D)




| 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 |

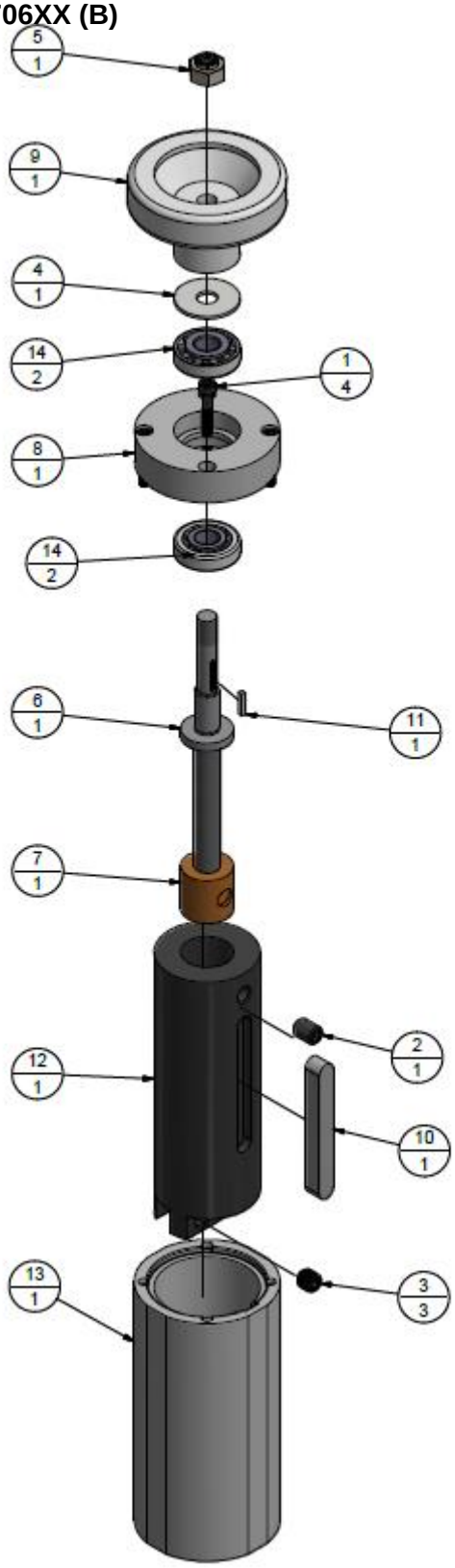
## 11.10 Counter Bore Assembly 10” Single Point F0108A1707XX (B)

| 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 |



## *11.11 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 D |
| 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 |



## *11.12 Bevel Cut/ Sever Bits*