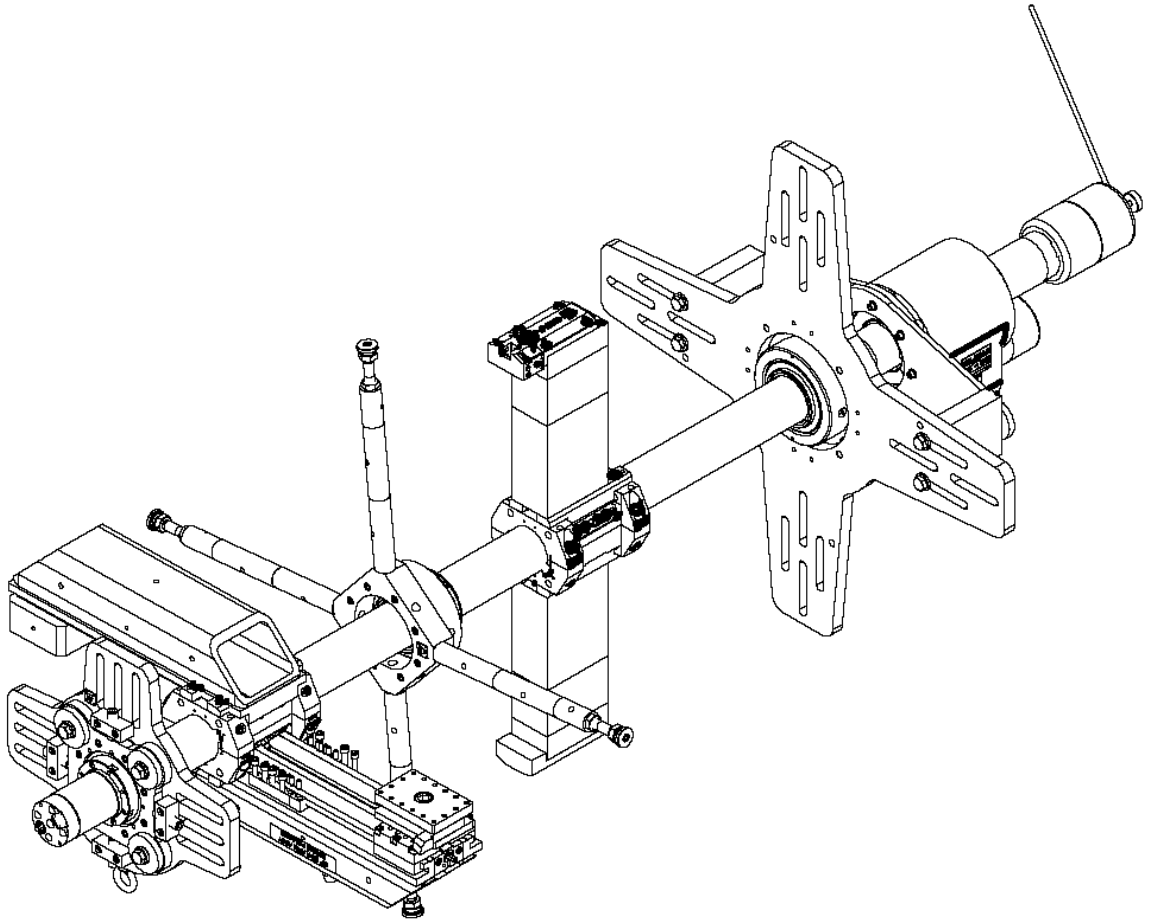
CE

# BB6100

## BORING BAR

## OPERATING MANUAL

ORIGINAL INSTRUCTIONS



CLIMAX

Portable Machining & Welding Systems

**PN: 57017** **October 2020** **Revision 4**

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For comments or questions about this manual or other CLIMAX documentation, please e-mail documentation@cpmt.com.

For comments or questions about CLIMAX products or services, please call CLIMAX or e-mail info@cpmt.com. For quick and accurate service, please provide your representative with the following:

- Your name
- Shipping address
- Telephone number
- Machine model
- Serial number (if applicable)
- Date of purchase

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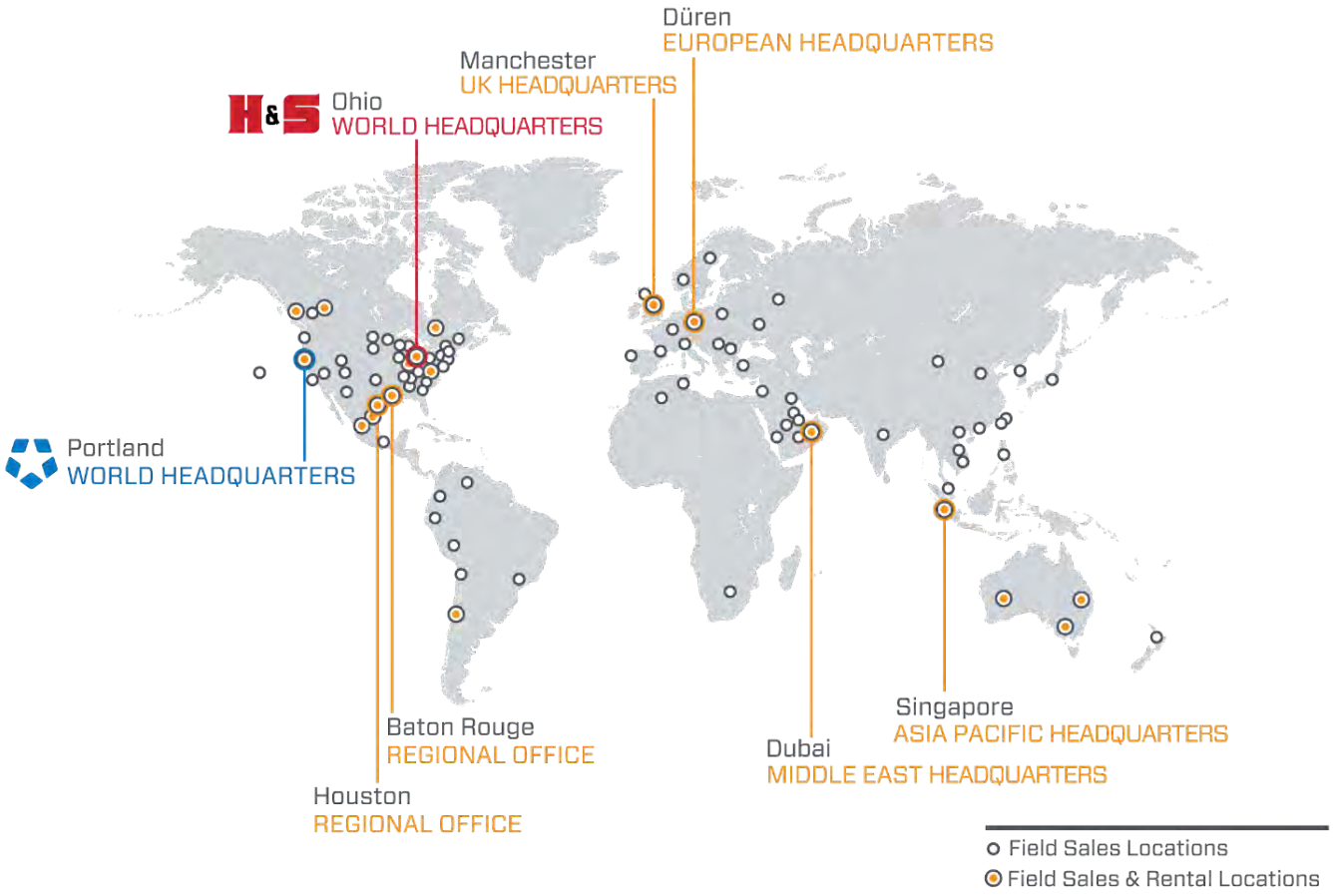
# CLIMAX WORLDWIDE LOCATIONS



# CE DOCUMENTATION

## Declaration of Conformity

**2006/42/EC Machinery Directive**

**2014/30/EU EMC Directive**

Choose an item.

**Name of Manufacturer:**
Climax Portable Machining and Welding Systems

**Full postal address including country of origin:**
2712 E. Second St., Newberg, OR 97132, USA

**Object(s) of the Declaration:**
Portable Boring Bar(s)

**Name, type or model, batch or serial number:**
S/N Range: 1101661 and Up
**BB6100, BB7100, BB8100**

**Harmonised Standards used, including number:**

EN 61000 series - EMC Emissions and Immunity
EN 349:1993+A1:2008 - Safety of Machinery; Gaps
EN ISO 3744:2010 - Acoustic Power
EN ISO 11201:2010 - Acoustics; Noise Emitted
EN ISO 12100:2010 - Safety for Machinery; Principles
EN 13128:2001+A2:2009 - Milling Machine Safety
EN 60204-1:2018 - Safety of Machinery; Electrical Equipment
EN 982:1996+A1:2008 - Safety of Machinery; Fluid Power
Choose an item.
Choose an item.

**Full postal address of the authorized person in the Community:**
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Climax GmbH
Am Langen Graben 8
52353 Duren, Germany

**Approved as conforming to Standard ISO 9001:2015 by:**
Eagle Registrations Inc.
40 N. Main Street, Suite 1880
Dayton, OH 45423

**Declaration**
I declare that the above information in relation to the supply / manufacture of this product is in conformity with the relevant provisions of the Directives and Harmonised Standards listed above in this document along with their respective amendments and other related documents. This declaration of conformity is issued under the sole responsibility of the manufacturer.

**Signature of Manufacturer:**

**Position Held: VP of Engineering**

**Date and Place: 10/21/2020 Portland, OR**

CE

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# 1 INTRODUCTION

## 1.1 Limited Warranty

Climax Portable Machine Tools, Inc. (hereafter referred to as “CLIMAX”) warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of one year after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

CLIMAX warrants that all parts are free from defects in materials and workmanship, and that all labor has been performed properly. This warranty is available to the customer purchasing parts or labor for a period of 90 days after delivery of the part or repaired machine or 180 days on used machines and components. If the customer purchasing parts or labor finds any defect in materials or workmanship within the warranty period, the purchaser should contact its factory representative and return the part or repaired machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective part and/ or correct any defect in the labor performed, both at no charge, and return the part or repaired machine shipping prepaid.

These warranties do not apply to the following:

- Damage after the date of shipment not caused by defects in materials or workmanship
- Damage caused by improper or inadequate machine maintenance
- Damage caused by unauthorized machine modification or repair
- Damage caused by machine abuse
- Damage caused by using the machine beyond its rated capacity

All other warranties, express or implied, including without limitation the warranties of merchantability and fitness for a particular purpose are disclaimed and excluded.

### *Terms of Sale*

Be sure to review the terms of sale which appear on the reverse side of your invoice. These terms control and limit your rights with respect to the goods purchased from CLIMAX.

### *About This Manual*

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

## 1.2 Alerts

Pay careful attention to the alerts appearing in this manual. Alert types are defined in the following examples.

**DANGER**

concerns a condition, procedure, or practice that, if not avoided or strictly observed, WILL result in injury or loss of life.

**WARNING**

concerns a condition, procedure, or practice that, if not avoided or strictly observed, COULD result in injury or loss of life.

**CAUTION**

concerns a condition, procedure, or practice that, if not avoided or strictly observed, could result in minor or moderate injury.

**NOTICE**

concerns a condition, procedure, or practice worthy of special attention.

**TIP:**

A tip provides additional information that can aid in completion of a task.

## 1.3 Safety Precautions

CLIMAX leads the way in promoting the safe use of portable machine tools. Safety is a joint effort. You, the machine operator, must do your part by being aware of your work environment and closely following the operating procedures and safety precautions contained in this manual, as well as your employer's safety guidelines.

Observe the following safety precautions when operating or working around the machine.

***Training*** – Before operating this or any machine tool, you should receive instruction from a qualified trainer. Contact CLIMAX for machine-specific training information.

***Risk Assessment*** – Working with and around this machine poses risks to your safety. You, the end user, are responsible for conducting a risk assessment of each job site before setting up and operating this machine.

***Intended Use*** – Use this machine in accordance with the instructions and precautions in this manual. Do not use this machine for any purpose other than its intended use as described in this manual.

***Personal Protective Equipment*** – Always wear the appropriate personal protective gear when operating this or any other machine tool. Eye and ear protection are required when operating or working around the machine. Flame-resistant clothing with long sleeves and legs is recommended when operating the machine, as hot flying chips from the workpiece may burn or cut bare skin.

***Work Area*** – Keep the work area around the machine clear of clutter. Keep all cords and hoses away from the work area when operating the machine.

***Lifting*** – Many CLIMAX machine components are very heavy. Whenever possible, lift the machine or its components using proper hoisting equipment and rigging. Always use designated lifting points on the machine. Follow all lifting instructions in the setup procedures of this manual.

***Lock Out/Tag Out*** – Lock out and tag out the machine before doing maintenance.

***Moving Parts*** – CLIMAX machines have numerous exposed moving parts and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for operating controls, avoid contact with moving parts by hands or tools during machine operation. Secure hair, clothing, jewelry, and pocket items to prevent them from becoming entangled in moving parts.

***Sharp Edges*** – Cutting tools and workpieces have sharp edges that can easily cut skin. Wear protective gloves and exercise caution when handling a cutting tool or workpiece.

***Hot Surfaces*** – During operation, motors, some housings, and cutting tools can generate enough heat to cause severe burns. Pay attention to hot surface labels, and avoid contact with bare skin until the machine has cooled.

## 1.4 Machine Specific Safety Practices

This list includes safety practices applicable to CLIMAX Portable Machines.

All aspects of the machine have been designed with safety in mind. Warning signs are affixed to the machine to warn of residual hazards associated with machine relating to operation, setup, whether or not it is in use.

***Machine safety features—***Never attempt to defeat or override the safety features designed into the machine.

***Securing the machine***—Never attempt to run the machine without first securing it to a stable work piece.

***Personal Protection***—Wear safety glasses, earplugs, and safety shoes while operating the machine. Gloves are not a form of protection and should not be worn while operating the machine. Metal chips and debris created by the machine should be disposed using a dust pan and broom.

***Keeping clean***—Maintain your machine according to the procedures described in this manual to maximize safety and machine longevity.

***Keep clear***—Keep clear of the machine during operation. Never lean or reach into the machine to remove chips or to adjust the machine while it is running. Doing so can cause serious injury or death.

***Controls***—Operator controls are located outside the danger zone of the machine. All controls perform a one-to-one action. The machine is not supplied with a power unit and, therefore, does not have an E-stop.

***Machine setup and disassembly***—With a modular design, the machine can be broken down into components to ease setup.

***Machine guards***—There are no guards used on this machine.

***Clamp Collars***—To prevent the bar from sliding through the support bearings, or falling, use P/N 25010 – The collars are used to secure the bar when the machine is in the vertical orientation. Torque these collars to 25 ft-lbs (34 Nm). Clamp collars should be positioned ABOVE at least 2 support bearings when installed in a vertical orientation. Clamp collars should be shouldered against the bearing when in use.

***Electrical emissions***—There are no electrical components used on this machine.

***Operator station***—Due to the nature of portable machinery, no designated operator's station exists.

***Moving parts***—The operator is not exposed to the cutter head when the work piece is being machined. Keep all cords and hoses away from moving parts during operation. If the cords become tangled in the machinery the operator could be seriously injured and the machine extensively damaged.

***Fluids***—Cutting fluids are required for machine operation. The machine itself does not emit any fluids.

***Lifting***—When lifting the machine for setup or disassembly, a conventional sling-type lift is suggested for convenience and safety of the operator. Use designated lifting eyes. Do not lift the machine by the turning bar.

***Repetitive motion***—Individuals can be susceptible to disorders of the hands and arms when exposed to tasks that involve highly repetitive motions and/or vibration. To reduce the likelihood of these disorders, follow these guidelines:

- Use minimum hand grip force
- Keep wrists straight
- Avoid exposure to continue vibration
- Avoid repeated bending of wrists and hands
- Keep hands and arms warm and dry

## 1.5 Risk Assessment and Hazard Mitigation

Machine Tools are specifically designed to perform precise material-removal operations.

Stationary Machine Tools include lathes and milling machines and are typically found in a machine shop. They are mounted in a fixed location during operation and are considered a complete, self-contained machine. Stationary Machine Tools achieve the rigidity needed to accomplish material-removal operations from the structure that is an integral part of the machine tool.

Portable Machine Tools are designed for on-site machining applications. They typically attach directly to the workpiece itself, or to an adjacent structure, and achieve their rigidity from the structure to which it is attached. The design intent is that the Portable Machine Tool and the structure attached to it become one complete machine during the material-removal process.

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to Portable Machine Tools.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of portable machining applications, identifying one or more hazards that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the Portable Machine Tool and the workpiece as a whole.

## 1.6 Risk Assessment Checklist

Use these checklists as part of your risk assessment:

TABLE 1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

| | Before Set-up |
|---|---|
| ☐ | I took note of all the warning labels on the machine. |
| ☐ | I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects). |
| ☐ | I considered the need for personnel safety guarding and installed any necessary guards. |
| ☐ | I read the Setup section on page 15. |
| ☐ | I created a lift plan, including identifying the proper rigging, for each of the setup lifts required during the setup of the support structure and machine. |
| ☐ | I located the fall paths involved in lifting and rigging operations. I have taken precautions to keep workers away from the identified fall path. |
| ☐ | I considered how this machine operates and the best placement for the controls, cabling, and the operator. |
| ☐ | I evaluated and mitigated any other potential risks specific to my work area. |

TABLE 2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

| | After Set-up |
|---|---|
| ☐ | I checked that the machine is safely installed (according to the Setup section) and the potential fall path is clear. If the machine is elevated, I checked that the machine is safeguarded against falling. |
| ☐ | I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel. |
| ☐ | I planned for containment of any chips or swarf produced by the machine. |
| ☐ | I followed the Maintenance section with the recommended lubricants on page 49. |
| ☐ | I checked that all affected personnel have the recommended personal protective equipment, as well as any equipment required by the site or other regulations. |
| ☐ | I checked that all affected personnel understand the danger zone and are clear of it. |
| ☐ | I evaluated and mitigated any other potential risks specific to my work area. |

# 2 OVERVIEW

Machining range from 8.8–38" (224–965 mm) diameter and faces from 7.5–42.1" (191–1,069 mm) are quickly restored to original condition with the CLIMAX BB6100 Portable Boring Machine.

This modular machine tool shown in Figure 2-1 is dedicated to on-site restoration of worn internal diameters to precise roundness and dimensional accuracy ready to accept new bearings, sleeves, shafts, or similar mating parts.

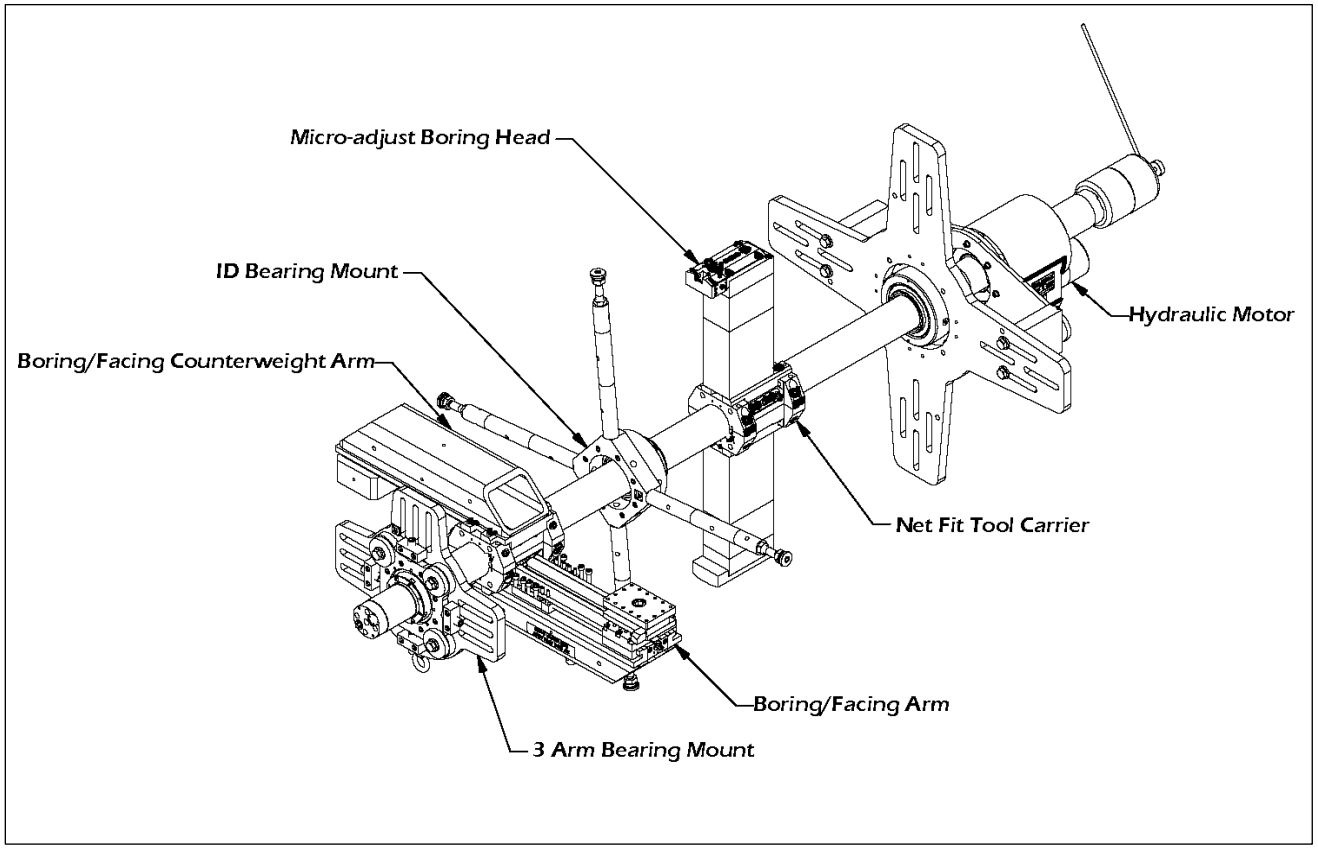



FIGURE 2-1. BB6100 COMPONENTS

| Number | Component |
|---|---|
| 1 | Boring/facing counterweight arm |
| 2 | ID bearing mount |
| 3 | Micro-adjust boring head |
| 4 | Hydraulic motor |
| 5 | Net fit tool carrier |
| 6 | Boring/facing arm |
| 7 | Three-arm bearing mount |

## 2.1 About this manual

This manual describes the most effective setup and operation of your Model BB6100 Portable Boring Machine. All parts meet CLIMAX's strict quality standards. For maximum safety and performance, read the entire manual before operating this machine.

### 2.1.1 Recommended tools

CLIMAX includes a general tool kit with the machine. You may require additional equipment specific to your worksite and particular setup. Please contact CLIMAX for accessories.

## 2.2 Receipt and inspection

Your CLIMAX product was inspected and tested before shipment and was packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery. When you receive your CLIMAX product, perform the following receipt checks.

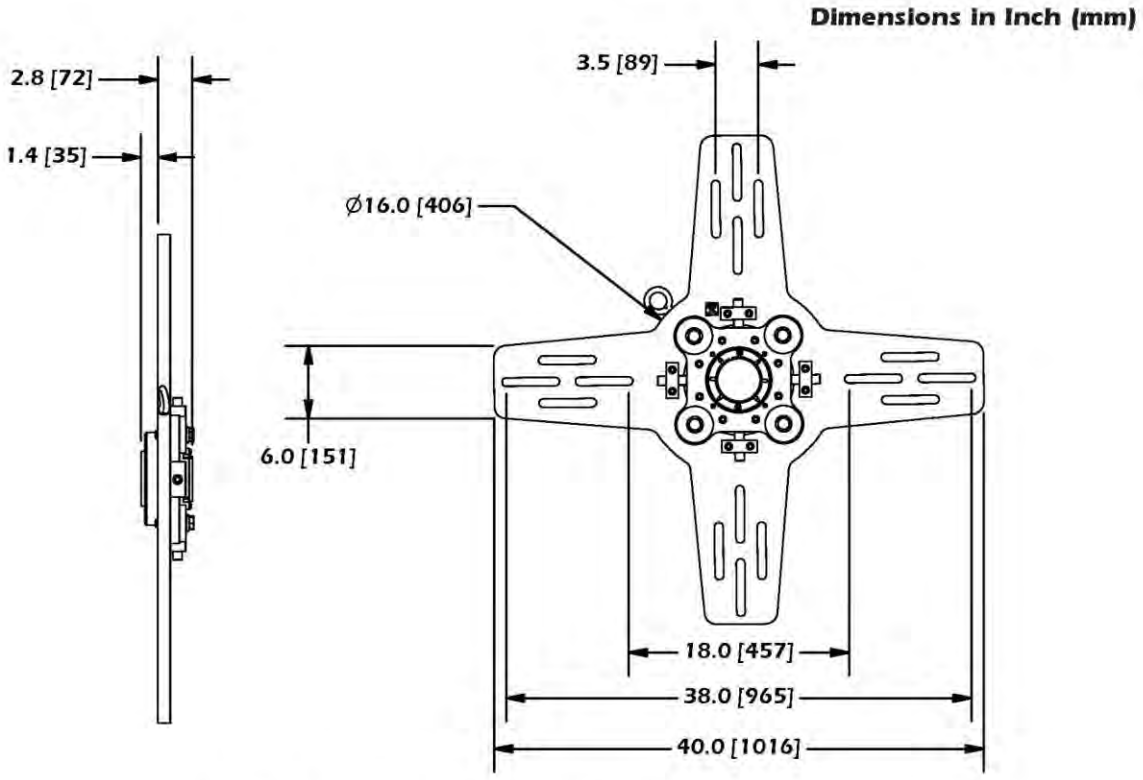
- Inspect the shipping containers for damage.
- Check the contents of the shipping containers against the included invoice to ensure that all components have been shipped.
- Inspect all components for damage.

NOTICE

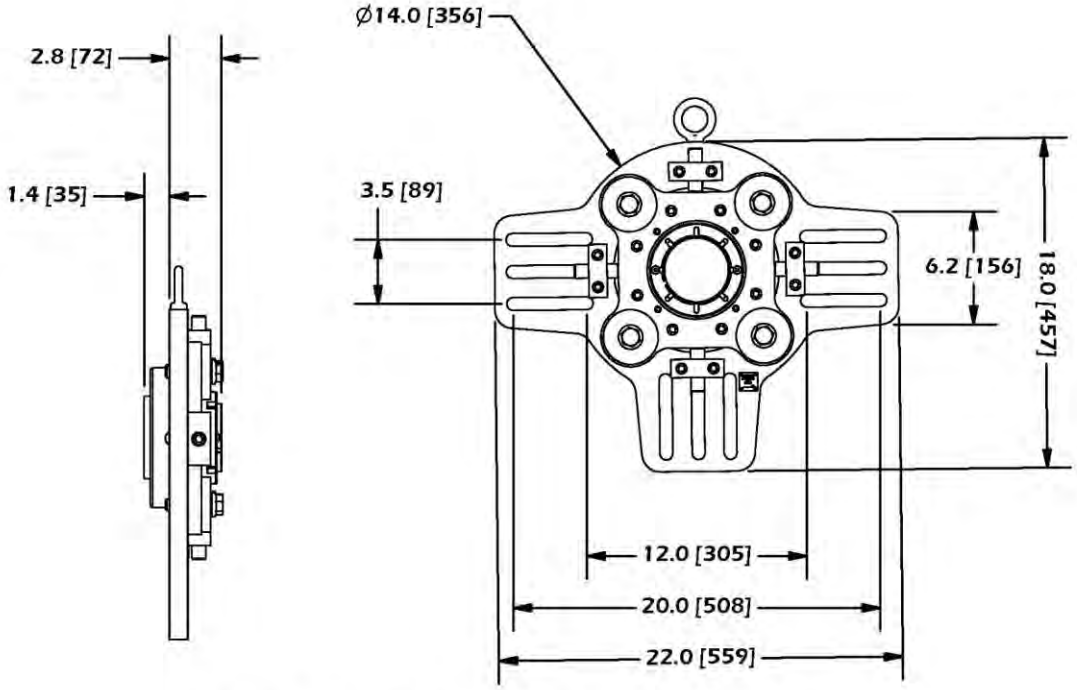
Contact CLIMAX immediately to report damaged or missing components.

## 2.3 Specifications and Dimensions

| | US | Metric |
|---|---|---|
| **Boring and Facing Ranges:** | | |
| Boring diameter range, standard stack block assembly: | 8.8 - 40.8 inches | 223.5 - 1036.3 mm |
| Boring diameter range, boring/facing arm assembly: | | |
| with 18 inch (457.2 mm) boring/facing arm | 19.9 - 32.1 inches | 505.5 - 815.3 mm |
| with 23 inch (584.2 mm) boring/facing arm | 24.8 - 42.1 inches | 629.9 - 1069.3 mm |
| Recommended facing diameter range, using mechanical facing head assy: | 10.6 - 38.0 inches | 269.2 - 965.2 mm |
| Facing diameter range, boring/facing arm assembly: | | |
| with 18 inch (457.2 mm) boring/facing arm | 17.5 - 32.1 inches | 444.5 - 815.3 mm |
| with 23 inch (584.2 mm) boring/facing arm | 17.5 - 42.1 inches | 444.5 - 1069.3 mm |
| Facing diameter range, boring/facing arm assembly, tool post reversed: ("tool post reversed" refers to rotating the tool post so that the tool is on the bar side of the tool post.) | | |
| with 18 inch (457.2 mm) boring/facing arm | 7.5 - 20.1 inches | 190.5 - 510.5 mm |
| with 23 inch (584.2 mm) boring/facing arm | 7.5 - 30.1 inches | 190.5 - 765.5 mm |
| **Performance Data** | | |
| Rotational Drive Unit (RDU) gear ratio: | 6:1 gear reduction | 6:1 gear reduction |
| Hydraulic motor size affects torque and speed | | |
| Theoretical values calculated using a 10 Hp hydraulic power unit producing 2000 psi (13790 kPa) continuous, [normal operation is 1200 psi (8270 kPa)] and pumping 10 gpm (37.9 l/min). | | |
| Hydraulic motor size range: | 3.6 - 17.9 $in^3$ | 59.9 - 293.3 $cm^3$ |
| Boring Bar Torque: | 470 - 1820 ft•lb | 637.2 - 2467.6 N•m |
| Max boring rpm: | 107 - 21 rpm | 107 - 21 rpm |
| For example, with 11.3 $in^3$ (185.3 $cm^3$) hydraulic motor (43457): | | |
| Boring Bar Torque: | 1435 ft•lb | 1945.6 N•m |
| Max boring rpm: | 33 rpm | 33 rpm |
| Feed Rate of mechanical Axial Feed Unit (AFU): | 0.003 - 0.020 inches/rev | 0.076 - 0.508 mm/rev |
| Feed Rate of electric Axial Feed Unit (AFU): | 0 - 0.3 inches/min | 0 - 7.62 mm/min |
| **Measures** | | |
| Shipping Weights (estimated): | | |
| Machine includes Rotational Drive Unit (RDU), Axial Feed Unit (AFU), boring head set, tool carrier, tool kit, and hydraulic motor. | | |
| for machine (wood crate) | 640 lbs | 290.3 kg |
| for machine (metal crate) | 740 lbs | 335.7 kg |
| for one 4 arm bearing assembly | 160 lbs | 72.6 kg |
| for one 3 arm bearing assembly | 80 lbs | 36.3 kg |
| for boring bar | 2.5 lbs/inch | 0.04 kg/mm |
| for 10 Hp Hydraulic Power Unit | 500 lbs | 226.8 kg |
| Shipping dimensions: | | |
| Machine, in wood crate, W, D, H | 18.5 x 34 x 24 inches | 469.9 x 863.6 x 609.6 mm |
| Machine, in steel crate, W, D, H | 43.3 x 29.5 x 22.5 inches | 1099.8 x 749.3 x 571.5 mm |
| Bearing (each bearing shipped separately) W, D, H | 32 x 32 x 11 inches | 812.8 x 812.8 x 279.4 mm |
| 12 foot (3657.6 mm) bar W, D, H | 11 x 13 x 154 inches | 279.4 x 330.2 x 3911.6 mm |
| 10 Hp Hydraulic Power Unit W, D, H | 27 x 33 x 48 inches | 685.8 x 838.2 x 1219.2 mm |

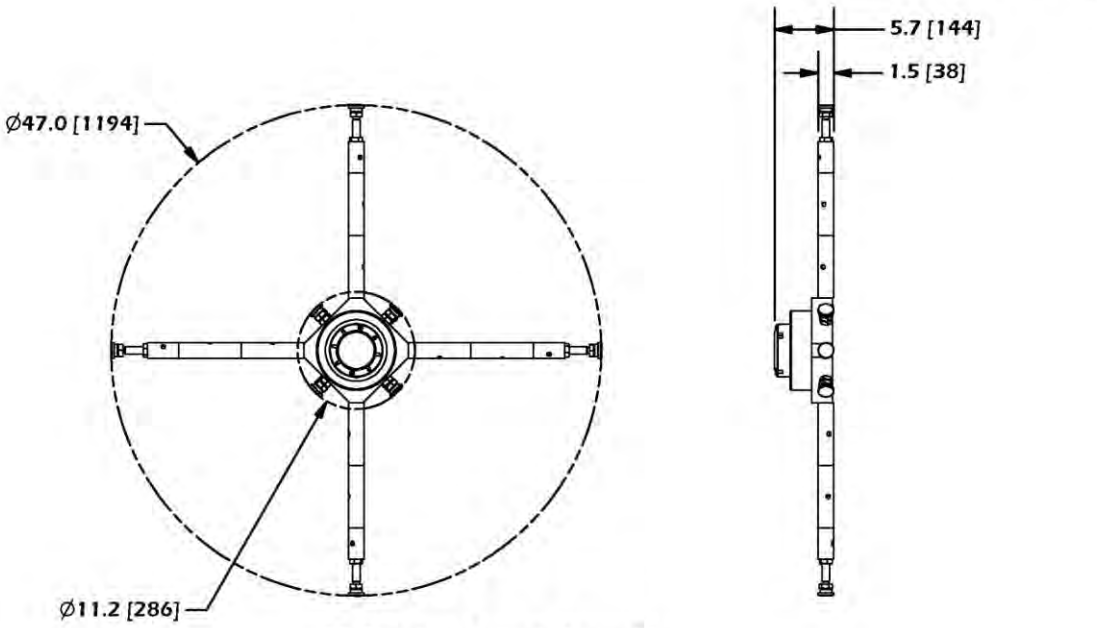



**Spider Assembly 4-Arm End Bearing Support**

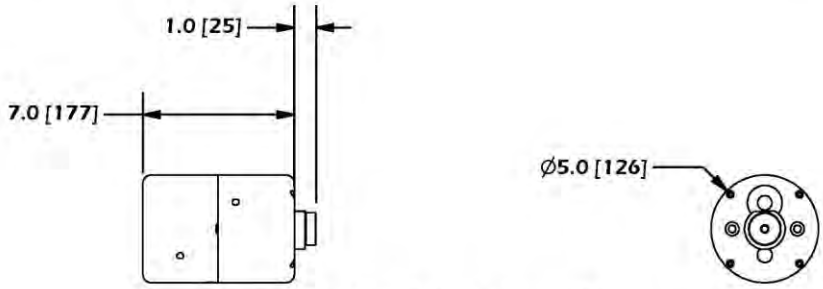



**Spider Assembly 3-Arm End Bearing Support**

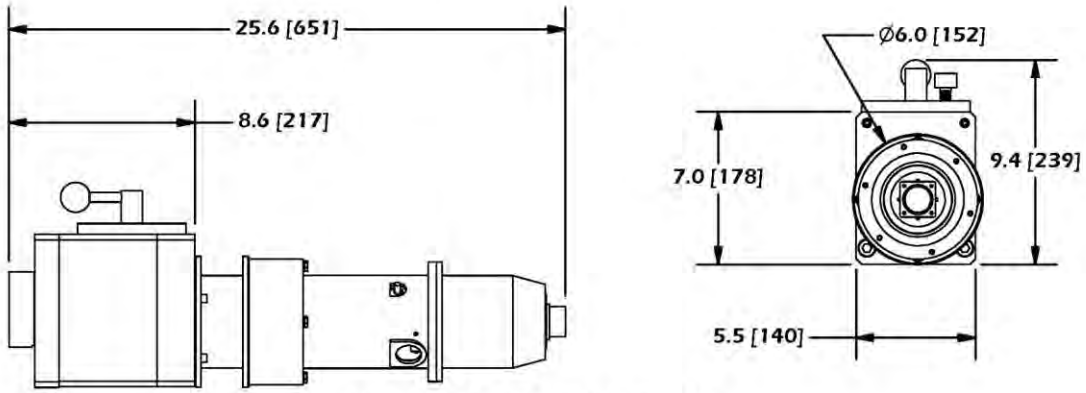
Dimensions in Inch (mm)



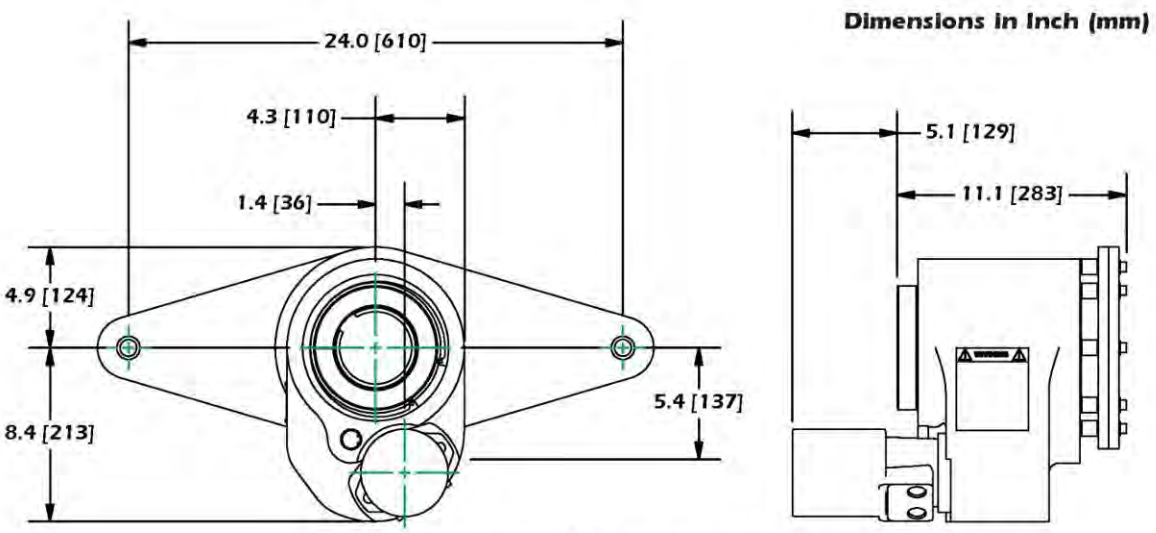

**ID Bearing Mount Assembly**
**For ID diameters of 11.25 - 47 inches (285.8 - 1193.8 mm)**



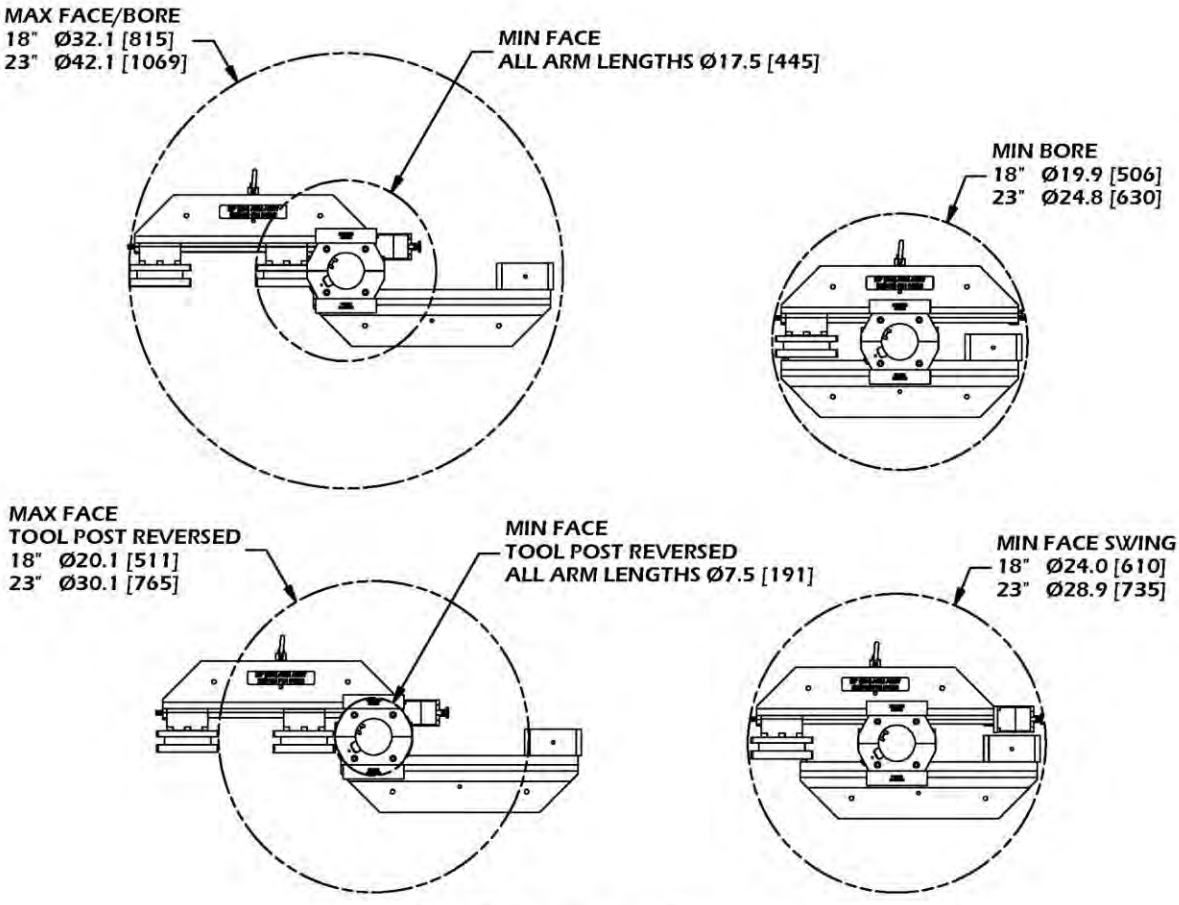

**Mechanical Axial Feed Assembly**



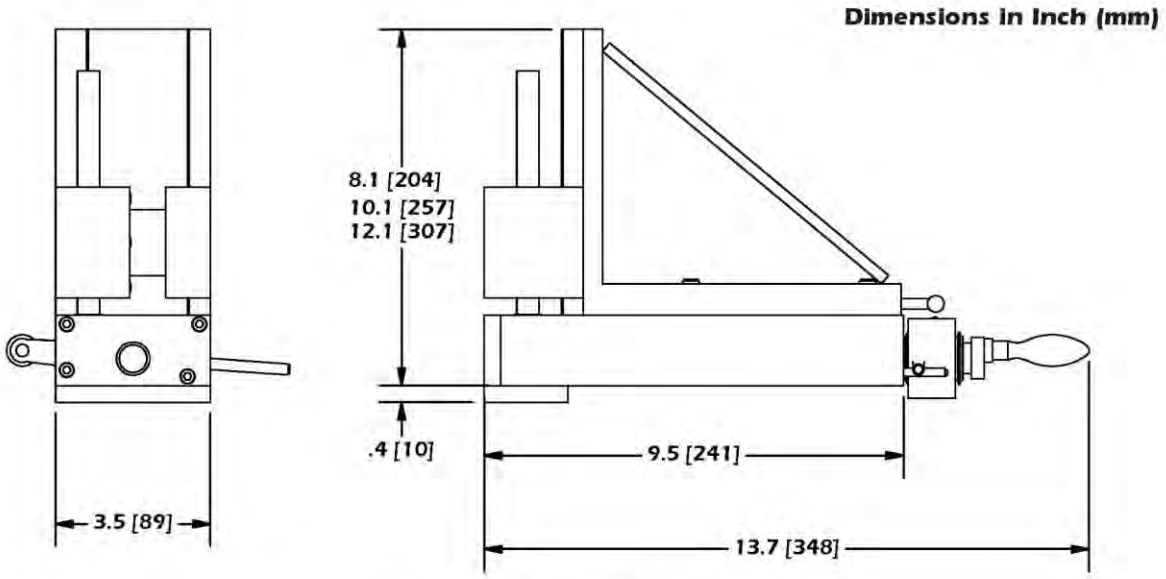

**Electrical Axial Feed Assembly**




**Rotational Drive Unit**

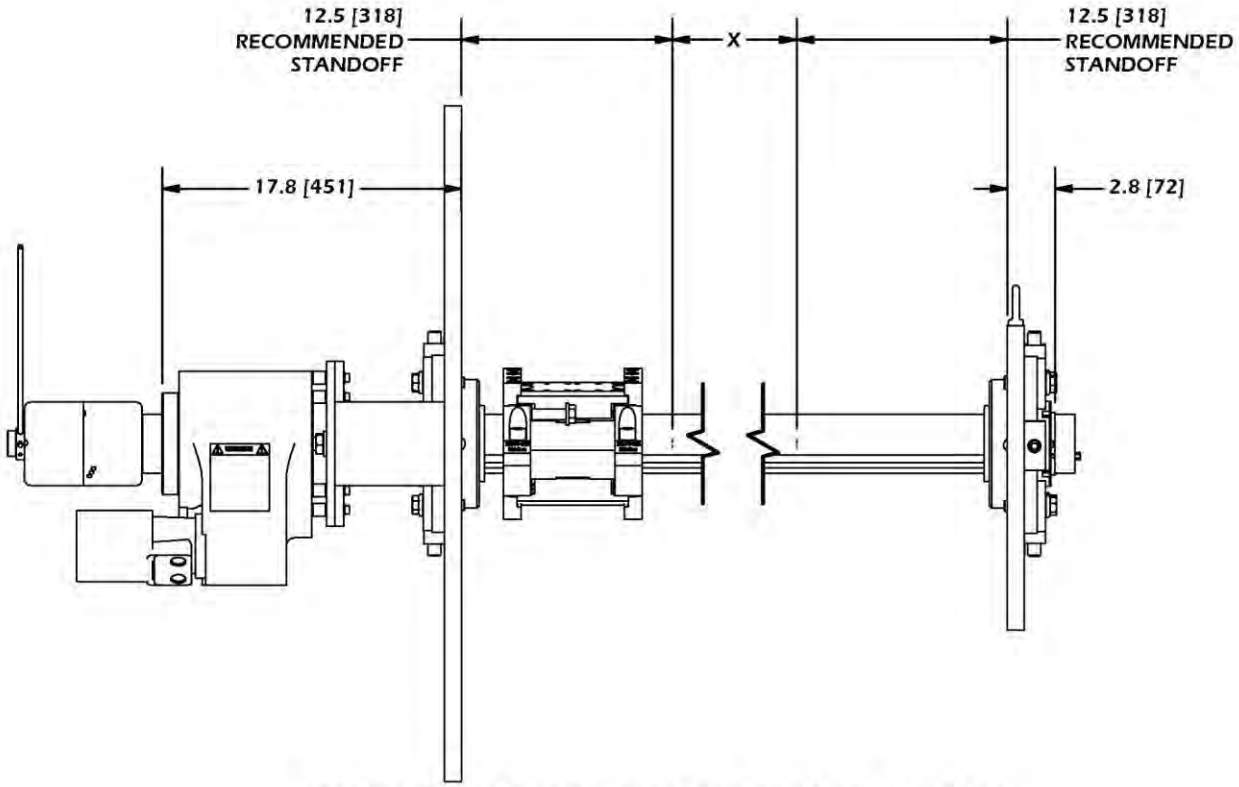



**Boring/facing arm configurations**



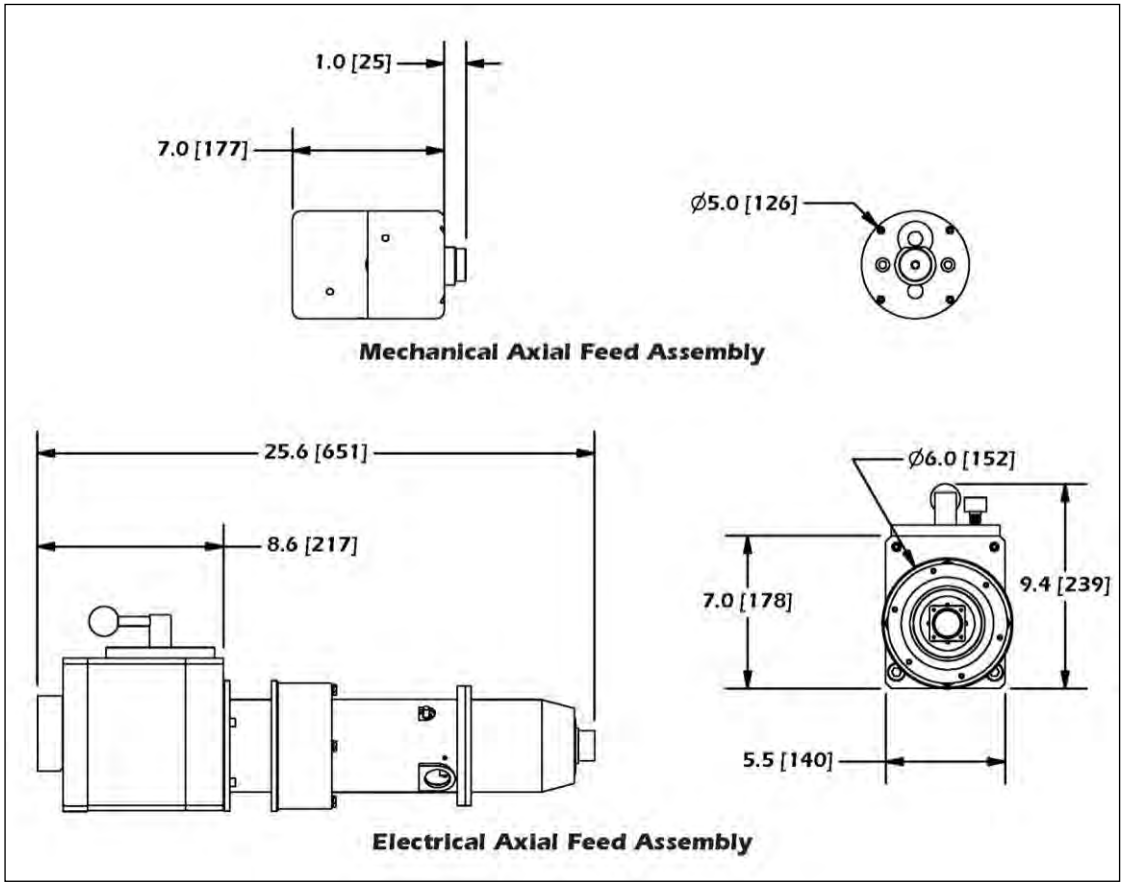

**Mechanical Facing Assembly**

**Determining the Proper Bar Length for your BB6100**




BAR LENGTH = X (BORE LENGTH) + 17.8 [451] + 2.8 [72] + STANDOFF

## 2.4 Axial Feed Assembly



# 3 SETUP

Before proceeding with set-up of the BB6100, determine the best placement of each module on the bar. The RDU and tool head assemblies can be located anywhere along the bar. Make sure to allow space for them while planning your set-up.

TIP:

A suitable lifting device is critical in the safe setup of the machine. Whenever possible, use a crane or hoist that provides smooth control and fine adjustment such as a hydraulic lift or two-stage winch. A device that is unstable, erratic, or difficult to maneuver can be awkward and consequently put the operator and equipment at risk.

TIP:

In many applications, the machine is effectively set-up using only common measuring devices such as a steel rule or tape measure. On those occasions when more precise alignment and accurate machining is called for, plan to have the following additional tools on hand:

- Magnetic base dial indicator
- Machinist's precision level
- Dial or digital slide calipers

## 3.1 Clamp collars

The clamp collars (P/N 25010) must be used to secure the bar when the machine is in the vertical orientation.

This will prevent the bar from sliding through the support bearings or falling.

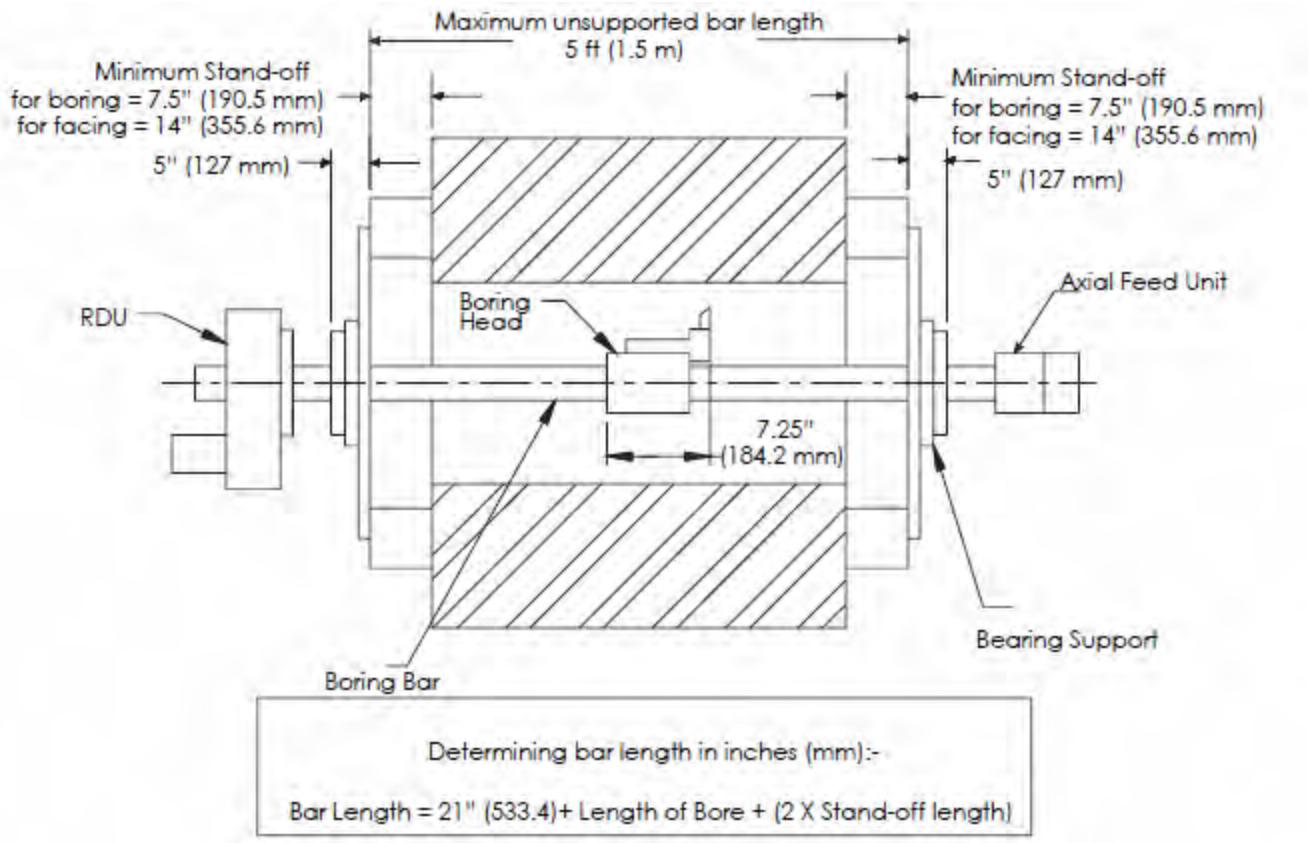
To prevent over tightening of the bearings, the clamp collars should be placed above at least two support bearings in a vertical orientation. ID mounted bearings (P/N 54355, 92850) should not be used to support the boring bar in the axial direction.

⚠ DANGER

To prevent the bar from sliding through the support bearings, or falling, use the two clamp collars provided in the tool kit when using the boring bar in a vertical orientation. Torque to 25 ft.-lbs (34 mm).

## 3.2 About Boring Machine Support

At least two bearing supports are required to obtain machine stability.




**⚠ CAUTION**

Bearings spaced too far apart allow extreme deflection of the bar and will decrease bore accuracy. Avoid spacing bearing supports more than 5 feet (1.5 m) apart.

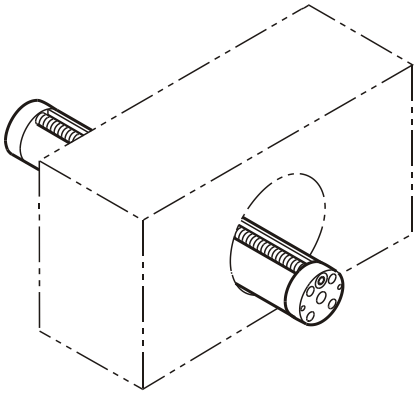
## 3.3 Installing End-mount Bearing Support

Though the end-mount bearing support attaches to the outside of the work piece, it can be positioned anywhere on the boring bar.

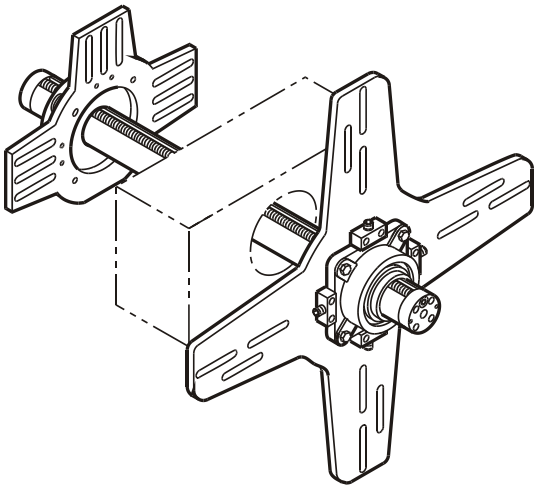
### 3.3.1 To install the end-mount bearing support

1. Clean the bore with solvent to remove grease, oil, and dirt.
2. Inspect the bar for nicks or cuts. Dress the bar smooth with a honing stone if necessary. Clean the bar with solvent to remove dirt and chips. A bar with nicks or gouges can severely damage mating parts, including the tool carrier and RDU.

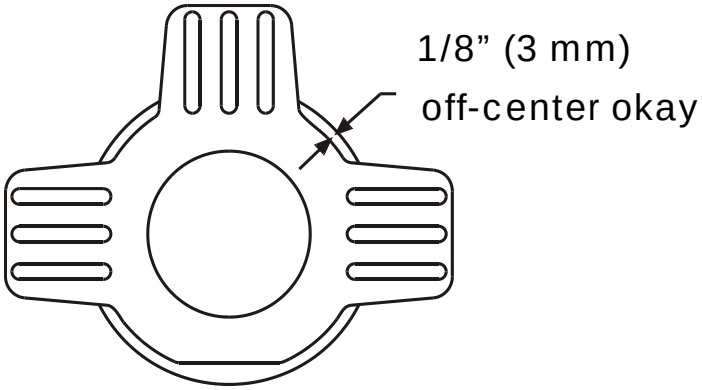
3. Slide the boring bar into the workpiece.



4. Slide the bearing supports onto the ends of the bar.



5. Using a hoist, hold the bar and bearings in the approximate center of the bore. Alignment within 1/8" (3 mm) is sufficient.




**⚠ WARNING**

Uncontrolled swinging or falling machinery can cause serious injury. Securely wrap the hoist around the bar and/or bearings before lifting the machine.

6. Use existing holes if they align with slots in the spider bearing supports. Otherwise, drill and tap new holes or weld to work piece. If holes are to be drilled and tapped, with the spider against the work, and mark their alignment.
7. Pull the bearing supports from the boring bar. Remove the boring bar from the work piece.
8. If necessary, drill and tap suitable mounting holes in the end of the work piece to align with slots in the spider bearing supports.
9. Mount one bearing support to the end of the work piece.
10. Slide the boring bar through the bearing support.
11. If the RDU is to be mounted between supports, mount it now.
12. Make sure the RDU shaft collars are on the drive hub. See Section 3.6 on page 24 for mounting information.
13. For mounting another end-mount bearing support, repeat steps #8 through #10. If using an ID-mount bearing assembly, see Section 3.4 on page 19. CLIMAX recommends no fewer than two support assemblies to obtain adequate machine stability. The maximum recommended unsupported bar length is 5 feet (1.5 m). See Section 3.2 on page 15.
14. Slide the boring bar through all bearing assemblies and position axially. Use an additional bar clamp as necessary when the bar is in a vertical orientation (see Section 3.1 on page 15).
15. Do the following to clamp the bearing support onto the bar:
    a. Align two setscrews in the bearing with the indentation in the bearing ring.
    b. Adjust the bearing ring (and screws) so it is 90° to the lead screw in the bar.
    c. Tighten the setscrews evenly until the bar is held firmly.

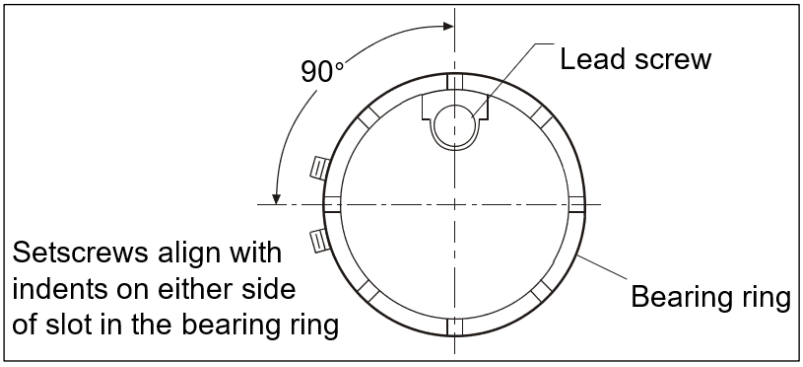



FIGURE 1. LEAD SCREW (TOP) AND BEARING RING (RIGHT)

16. Do the following to precisely align the boring bar:
    a. Use a dial indicator and four adjusting screws to center the boring bar in the bore.
    b. Tighten the four locking screws.

### 3.3.2 Clamping the bearing assembly to the bar

Do the following to clamp the bearing assembly to the bar:

1. Remove the screws holding the lock plate.
2. Slide the lock plate away from the lock nut.
3. Rotate the lock nut using both hands until it is snug. This is the zero reference point.
4. Mark or note the angular position of the lock nut.
5. Use the offset spanner wrench in the tool kit to rotate the lock nut approximately 1.25—1.5 additional turns.
6. Reapply the lock plate. If necessary, additionally tighten the lock nut until a slot in the lock plate is aligned with the retaining screw holes.
7. Reinstall the retaining screws.

## 3.4 ID-mount bearing support

The ID-mount bearing support assembly can be placed inside of the workpiece at any position along the bar.

1. Clean the bore with solvent to remove grease, oil, and dirt.
2. Examine the bar for nicks or cuts. Dress the bar smooth if necessary. A bar with nicks or gouges can severely damage mating parts, including the tool carrier assembly and RDU. Clean the bar with solvent to remove dirt and chips.
3. Measure the diameter of the bore into which the bearing is to fit.
4. Use the following table to select components required.

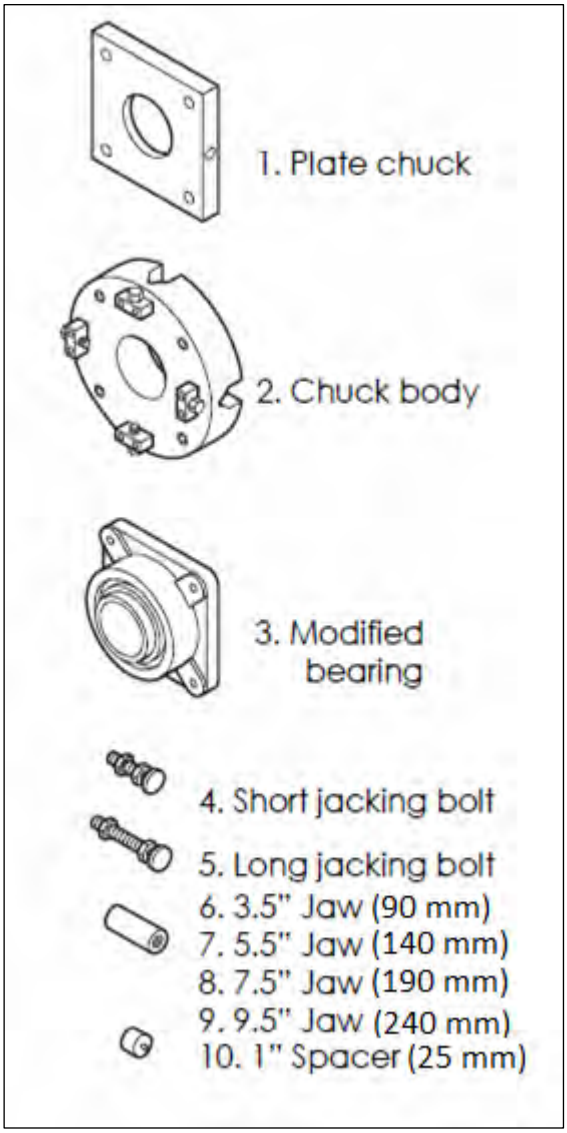



FIGURE 2. ID-MOUNT BEARING COMPONENT

| ID-Mount Bearing Assembly Bore Diameter Table | |
|---|---|
| **Bore Range Inch (mm)** | **Components required** |
| 12.0 - 14.53 (304.8 - 369.1) | 1,3,4 |
| 14.53 - 16.53 (369.1 - 419.9) | 2, 3, 6, 4 |
| 16.53 - 18.53 (419.9 - 470.7) | 2, 3, 5, 6 |
| 18.53 - 20.53 (470.7 - 521.5) | 2, 3, 4, 7 |
| 20.53 - 22.53 (521.5 - 572.3) | 2, 3, 5, 7 |
| 22.53 - 24.53 (572.3 - 623.1) | 2, 3, 5, 7, 10 |
| 24.53 - 27.53 (623.1 - 699.3) | 2, 3, 4, 8 |
| 27.53 - 29.53 (699.3 - 750.1) | 2, 3, 5, 8 |
| 29.53 - 31.53 (750.1 - 800.9) | 2, 3, 5, 8, 10 |
| 31.53 - 33.53 (800.9 - 851.7) | 2, 3, 4, 9 |
| 33.53 - 35.53 (851.7 - 902.5 | 2, 3, 5, 9 |
| 35.53 - 37.53 (902.5 - 953.3) | 2, 3, 5, 9, 10 |

TABLE 3. ID-MOUNT BEARING COMPONENT FIGURE IDENTIFICATION

| Number | Component |
|---|---|
| 1 | Plate check |
| 2 | Chuck body |
| 3 | Modified bearing |
| 4 | Short jacking bolt |
| 5 | Long jacking bolt |
| 6 | 3.5" (90 mm) jaw |
| 7 | 5.5" (140 mm) jaw |
| 8 | 7.5" (190 mm) jaw |
| 9 | 9.5" (240 mm) jaw |
| 10 | 1" (25 mm) spacer |

***If using the small plate chuck, do the following before moving on to step 5:***

a. Screw short or long jacking bolts into the sides of the plate chuck.

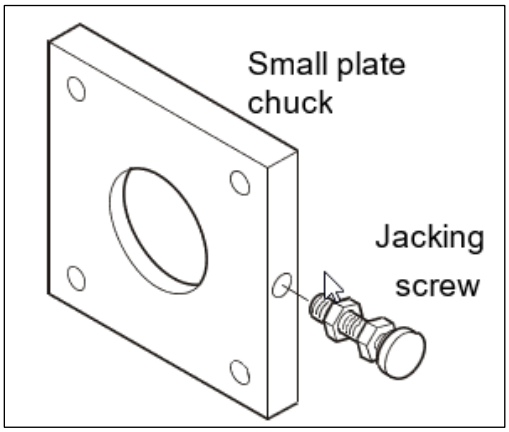
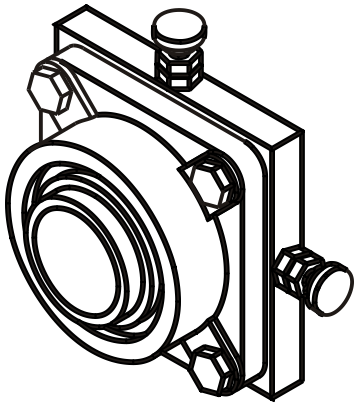


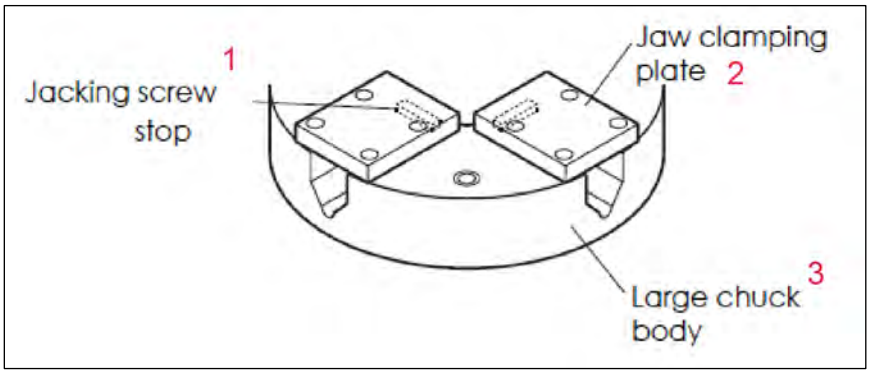

FIGURE 3. SMALL PLATE CHUCK (LEFT) AND JACKING SCREW (RIGHT)

b. Loosely mount the bearing to the plate using the spring washers, flat washers, and screws (if necessary).



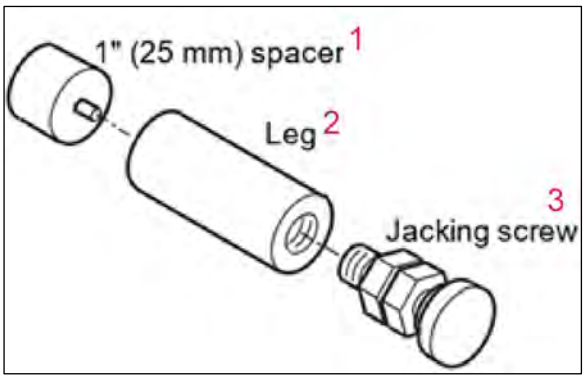
***If using the large chuck body, do the following before moving on to step 5:***

a. Loosely mount the jaw clamping plates to the chuck body. Check that the stop plates on the end of the clamping plates face toward the center of the chuck and toward the leg slot.




| Number | Component |
|---|---|
| 1 | Jacking screw stop |
| 2 | Jaw clamping plate |
| 3 | Large chuck body |

b. Screw the jacking screws into the legs. When spacers are being used, attach them to the other end of the legs.




| Number | Component |
|---|---|
| 1 | 1" (25 mm) spacer |
| 2 | Leg |
| 3 | Jacking screw |

c. Slide jacking screw assemblies into the slots in the chuck body. The legs should fit up against the stop block on the back of the jaw clamping plates.

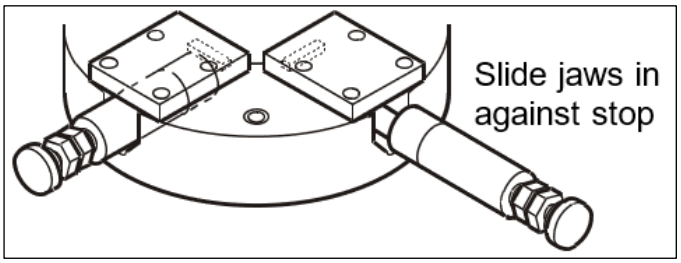
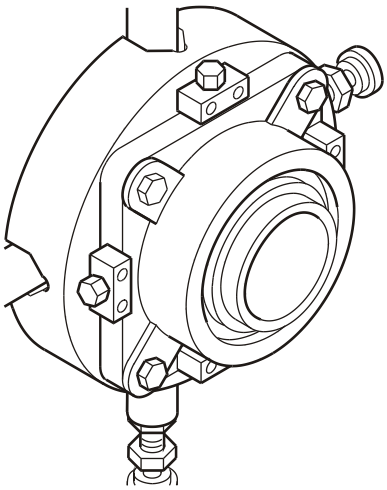



FIGURE 4. SLIDE JAWS IN AGAINST THE STOP BLOCK

d. Tighten the jaw clamping screws.

e. Mount the bearing to the chuck body using spring washers, flat washers, and screws.



5. Slide one bearing support assembly onto the boring bar.
6. Position the bearing in the bore.
7. Use a dial indicator to precisely align the boring bar to the bearing.

8. Center the bar by evenly adjusting the jacking screws then tighten the hex-head cap screws.
9. Slide the bar and bearing support into the work piece.
10. Using a dial indicator and the jacking screws, center the bar inside the work piece. Tighten the jacking screw against the inside of the bore. Do not exceed 22 ft-lbs (30 Nm) of torque.
11. If mounting the RDU between the bearing supports, do so now. See Section 3.6 on page 24 for instructions.
12. If mounting another ID-mount bearing, repeat the above steps.

### 3.4.1 If mounting an end-mount bearing

Do the following to set up an end-mount bearing support assembly:

1. Re-check the bar for center by sweeping a dial indicator inside the bore.
2. Adjust the jacking screws, if necessary.

**⚠ CAUTION**

Bearings placed too far apart allow the bar to deform, reducing bore precision. To keep the bar from deflecting, do not space the bearing supports more than 5 feet (1.5 m) apart.

### 3.4.2 Clamping the bearing assembly to the bar

Do the following to clamp the bearing assembly to the bar:

1. Remove the screws holding the lock plate.
2. Slide the lock plate away from the lock nut.
3. Rotate the lock nut using both hands until it is snug. This is the zero reference point.
4. Mark or note the angular position of the lock nut.
5. Use the offset spanner wrench in the tool kit to rotate the lock nut approximately 1.25—1.5 additional turns.
6. Reapply the lock plate. If necessary, additionally tighten the lock nut until a slot in the lock plate is aligned with the retaining screw holes.
7. Reinstall the retaining screws.

## 3.5 Preload bearing kit

The preload bearing kit is only used on bearing assemblies using the bearing cartridge P/N 23570. It is appropriate in those applications demanding greater machine stability, especially facing operations. The kit contains a pair of 3.5" (89 mm) hinged clamp collars, one standard and the other with tensioning screws. This kit can be used in either the vertical or horizontal positions.

Do the following:

1. Determine if the hinged clamp collars are to be mounted to the inside or outside of the bearing supports. Both collars must be either inside or outside the mount bearings.
2. Set up the bar and bearings as described. See Section 3.3 on page 16.

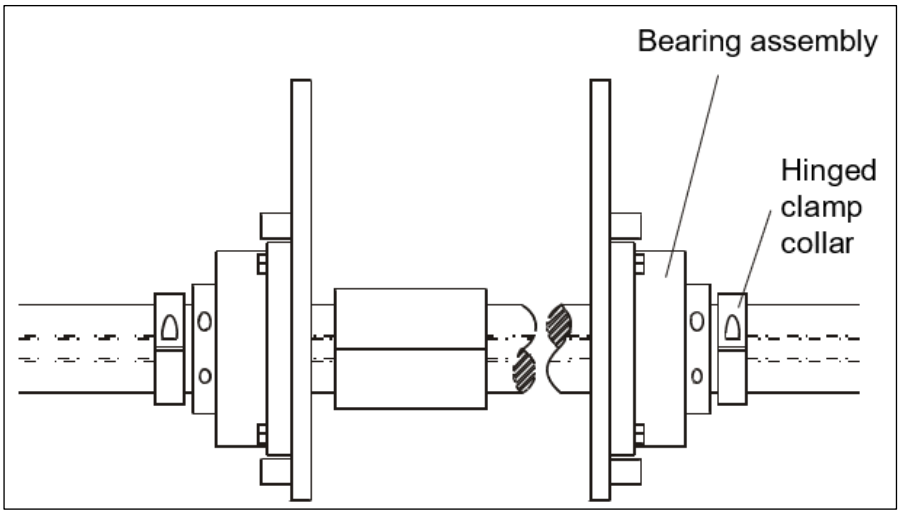



FIGURE 5. ID-MOUNT BEARING SUPPORT ASSEMBLY (LEFT) AND HINGED CLAMP COLLAR (RIGHT)

3. Mount the hinged clamp collar to the bar and tighten it.
4. Slide the bar through the bearing assemblies until the collar is against the bearings.
5. Tightly clamp the modified collar onto the bar on opposite side (either outside or inside).
6. Tighten the collar tensioning screws until there is slight resistance on the screws.
7. Rotate the bar by hand and check for resistance. If the bar will not rotate, back off the screws in the hinged clamp collar.

## 3.6 RDU Setup

The RDU can be placed anywhere along the boring bar.

**⚠ CAUTION**

The boring bar is not hardened. To prevent damage to the bar, do not strike it against the bearing supports or the work piece.

## TIP:

When mounting the RDU, the slot in the drive hub must align with the lead screw slot in the bar.

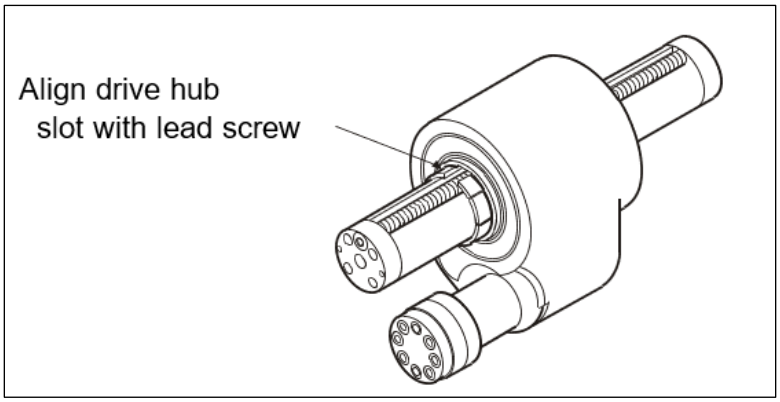



FIGURE 6. ALIGN THE DRIVE HUB SLOT WITH THE LEAD SCREW

1. Inside the torque arms are mounted to (radial direction is optional) RDU housing.
2. Mount the hydraulic motor to the RDU.
3. Slide the RDU onto the boring bar.
4. Make sure the key slots in the boring bar and the RDU drive hub are aligned.
5. Push the bar drive key into the key slot.

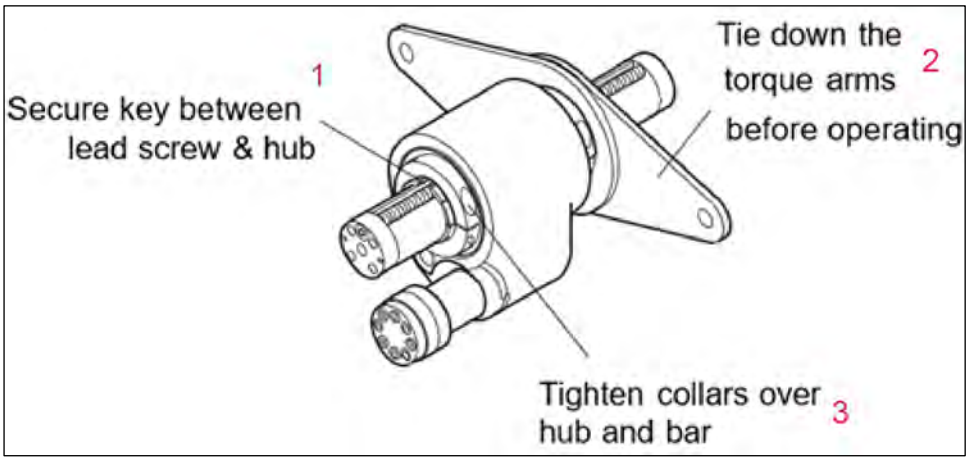
**⚠ CAUTION**

The rotational drive key must be in place before operating the boring bar. Failure to do so may damage the machine.

6. Adjust the shaft collars into place in the RDU. Tighten the clamping screws to lock the shaft collars to the boring bar.
7. Secure the torque arms to insure the RDU does not rotate when energized.

**⚠ WARNING**

Loose torque arms can seriously injure the operator and damage the machine. Secure the torque arms to a stationary structure strong enough to withstand the full torque of the RDU.




| Number | Component |
|---|---|
| 1 | Secure key between the lead screw and hub |
| 2 | Tie down the torque arms before operating |
| 3 | Tighten collars over hub and bar |

8. Connect the hydraulic lines to the hydraulic power unit. See the Hydraulic power section on page 43 for preparation and how to connect the lines.

**⚠ CAUTION**

To avoid damage to the hydraulic power unit pump, connect the motor to the power unit before plugging in and turning it on.

## 3.7 Mounting the Mechanical Axial Feed Unit

The axial feed unit can be mounted to either end of the boring bar. The hexagon hole in the output shaft fits onto the hexagon end of the bar lead screw.

1. Place the axial feed unit in NEUTRAL so the lead screw drive can rotate in either direction. See Section 3.7.1 on page 27.
2. While holding the axial feed unit against the bar end cap, turn the output shaft until the hexagons fit together.
3. Tighten the mounting cap screws.
4. Secure the stop rod to a stationary object to engage the feed mechanism.

**TIP:**

If the axial feed unit is moved to the opposite end of the bar, the feed direction will be reversed. Check the feed direction before operating the machine.

**⚠ WARNING**

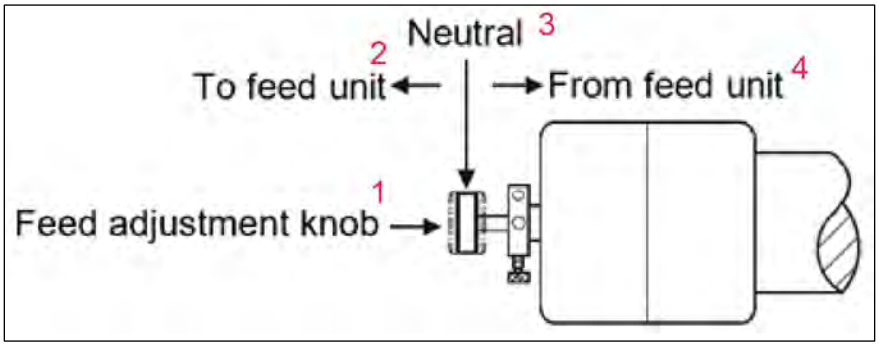
A loose trip rod can cause damage and injury. Secure the trip rod to a fixed object.

### 3.7.1 Setting feed direction and rate

Feed direction and feed rate are set using the feed adjustment knob. Axial feed rate is variable from 0.003–0.020" (0.076–0.508 mm) per revolution.

**⚠ CAUTION**

To avoid permanent damage to the axial feed unit, do not leave the wrench in the lead screw dial.




| Number | Component |
|---|---|
| 1 | Feed adjustment knob |
| 2 | To feed unit |
| 3 | Neutral |
| 4 | From feed unit |

### 3.7.2 Neutral (no feed)

In neutral, the lead screw can turn in either direction. To verify this, insert a hex wrench into the lead screw dial and turn the dial. If the machine is in neutral, the wrench will turn freely in either direction.

### 3.7.3 Feed away from the axial feed unit

Engage the feed by pushing the feed adjustment knob with one hand and slightly turning the lead screw dial with a wrench until you feel the unit engage. When the feed unit engages, the dial will turn counter-clockwise only.

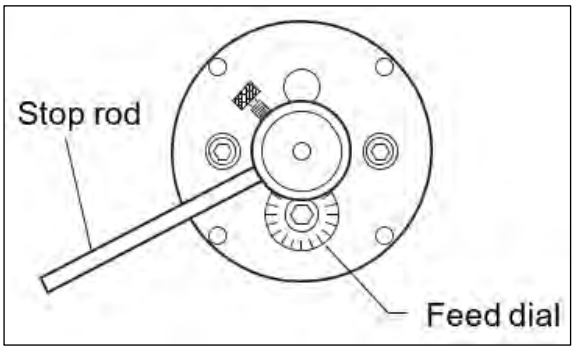



FIGURE 7. STOP ROD (LEFT) AND FEED DIAL (RIGHT)

### 3.7.4 Feed toward the axial feed unit

Engage the feed by pulling the feed adjustment knob with one hand and slightly turning the lead screw dial with a wrench until you feel the unit engage. When the feed unit engages, the dial will turn clockwise only.

### 3.7.5 Disengaging the feed under load

If the machine is stopped while the feed box is under load, it may be difficult to disengage the feed.

**⚠ CAUTION**

To avoid internal damage to the feed box, do not force the feed adjustment knob.

***To disengage a feed box under load:***

1. Insert a wrench into the dial socket.
2. Turn the wrench in the direction the lead screw was turning while pushing or pulling the feed adjustment knob.

Upon disengagement, the feed box will rotate freely in either direction.

If the feed box does not disengage:

1. Unbolt the feed box from the end of the bar.
2. Shift the feed into NEUTRAL.
3. Re-install the feed box.

### 3.7.6 Setting the feed rate

To reduce the rate of feed, pull the plunger and lock in the out position then turn the adjustment knob clockwise. To increase the feed rate, pull the plunger and lock in position then turn the adjustment knob counterclockwise. The feed is adjustable while the machine is running.

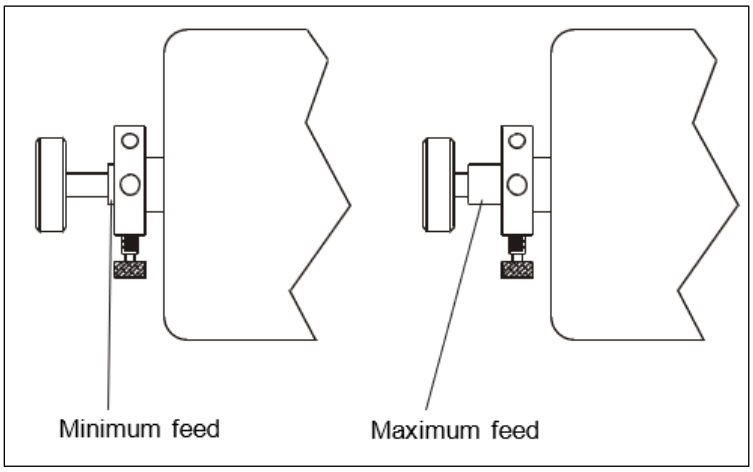



FIGURE 8. MINIMUM FEED (LEFT) AND MAXIMUM FEED (RIGHT)

### 3.7.7 Stopping the feed

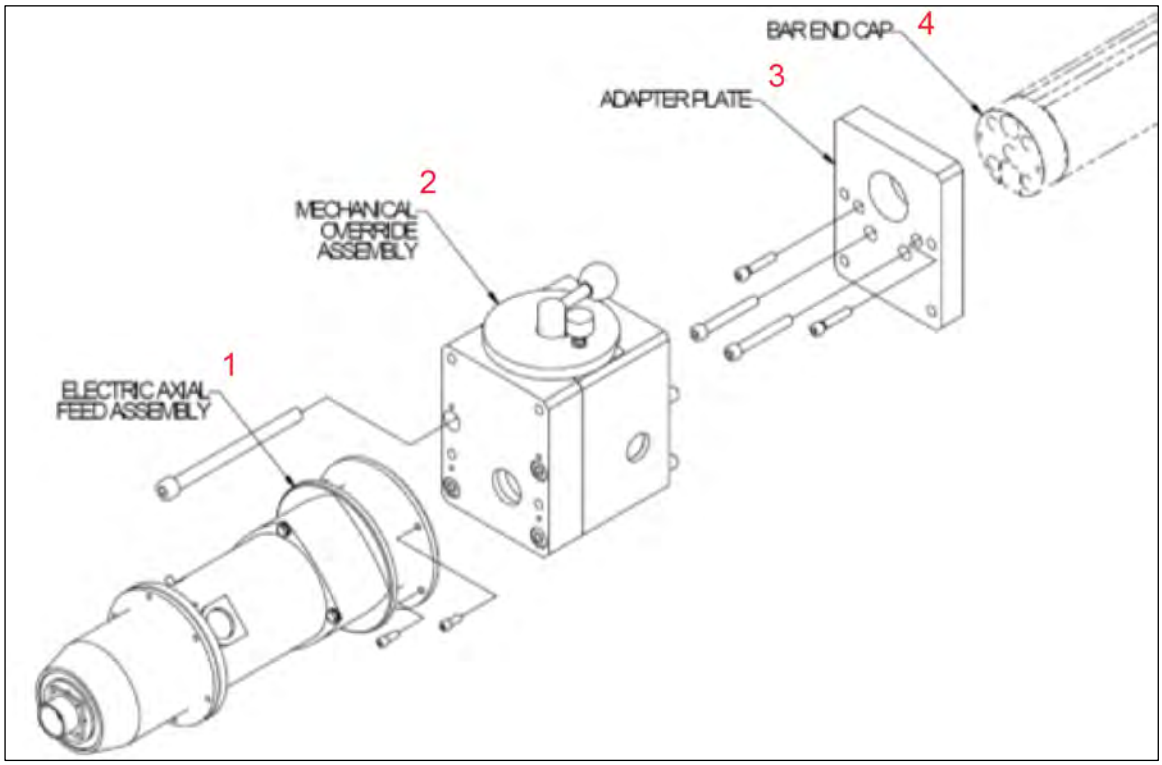
To quickly stop the boring head from feeding, pull the stop rod out of the torque hub on the axial feed unit. This is helpful when cutting up to a shoulder.

## 3.8 Mounting the Electric Axial Feed Assembly

The electric feed unit consists of the adaptor plate, manual override, electric motor assembly, and remote pendant control.

The axial feed unit can be mounted to either end of the boring bar. The locating nose and hex nut hole of the feed unit fit into the locating nose seat and protruding hex shaft of the boring bar end cap.

1. Mount the adapter plate to the end of the bar using the ¾-10 cap screw and two ½-13 cap screws.
2. Mount the mechanical override assembly to the adaptor plate. Make sure the hex in the mechanical override is aligned with the hex on the lead screw.
3. Mount the electric axial feed assembly to the back of the mechanical override with four cap screws.
4. Make sure to align the key way in the coupling.
5. Attach the pendant electrical cable to the rear of the electric axial feed.




| Number | Component |
|---|---|
| 1 | Electrical axial feed assembly |
| 2 | Mechanical override assembly |
| 3 | Adapter plate |
| 4 | Bar end cap |

## NOTICE

If the axial feed unit is moved to the opposite end of the bar, the feed direction will reverse. Check feed direction before operating the machine.

### 3.8.1 Setting the Axial Feed Rate

The feed potentiometer controls the axial feed rate. Turning the knob counterclockwise decreases the feed rate; turning the knob clockwise increases the feed rate.

Axial feed rate is adjustable and variable from 0.010–0.500" (0.25–13 mm) per minute.

## 3.9 Tool Head Setup

Do the following:

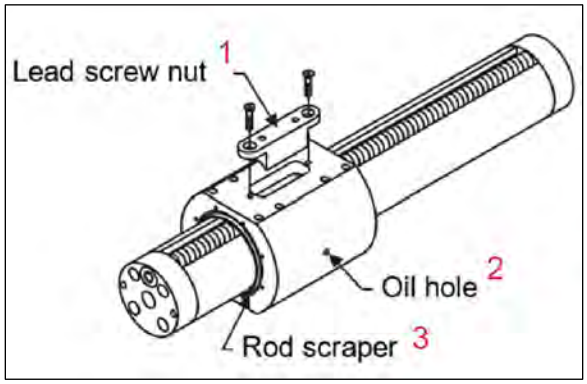
1. Check for lead screw endplay (loose axial lead screw nuts)
2. Attach carrier assembly, lifting eyes + drive key to boring bar
3. Adjust brass shoes for 0.001-0.002 clearance. (Note: Adjust for contact of each pad against the boring bar, and back off 10 degrees for 0.0015 clearances).
4. Spray with antirust lubricant.

The boring and facing heads require a tool carrier to mount them to the boring bar.

### 3.9.1 Small bore tool carrier setup

Do the following to mount the tool carrier:

1. Check the bar for nicks, burrs, or cuts. Smooth the bar if necessary. A bar with nicks, cuts or gouges can damage mating parts, including the tool carrier and RDU, beyond repair. Clean the bar with solvent to remove dirt and chips.
2. Mount the axial lead screw nut to the top of the tool carrier. Tighten the mounting screws.
3. Be sure the scraper halves are mounted securely to the ends of the tool carrier.
4. Mount the tool carrier onto the boring bar. Be sure the lead screw nut engages the lead screw.
5. Tighten the socket-head cap screws.

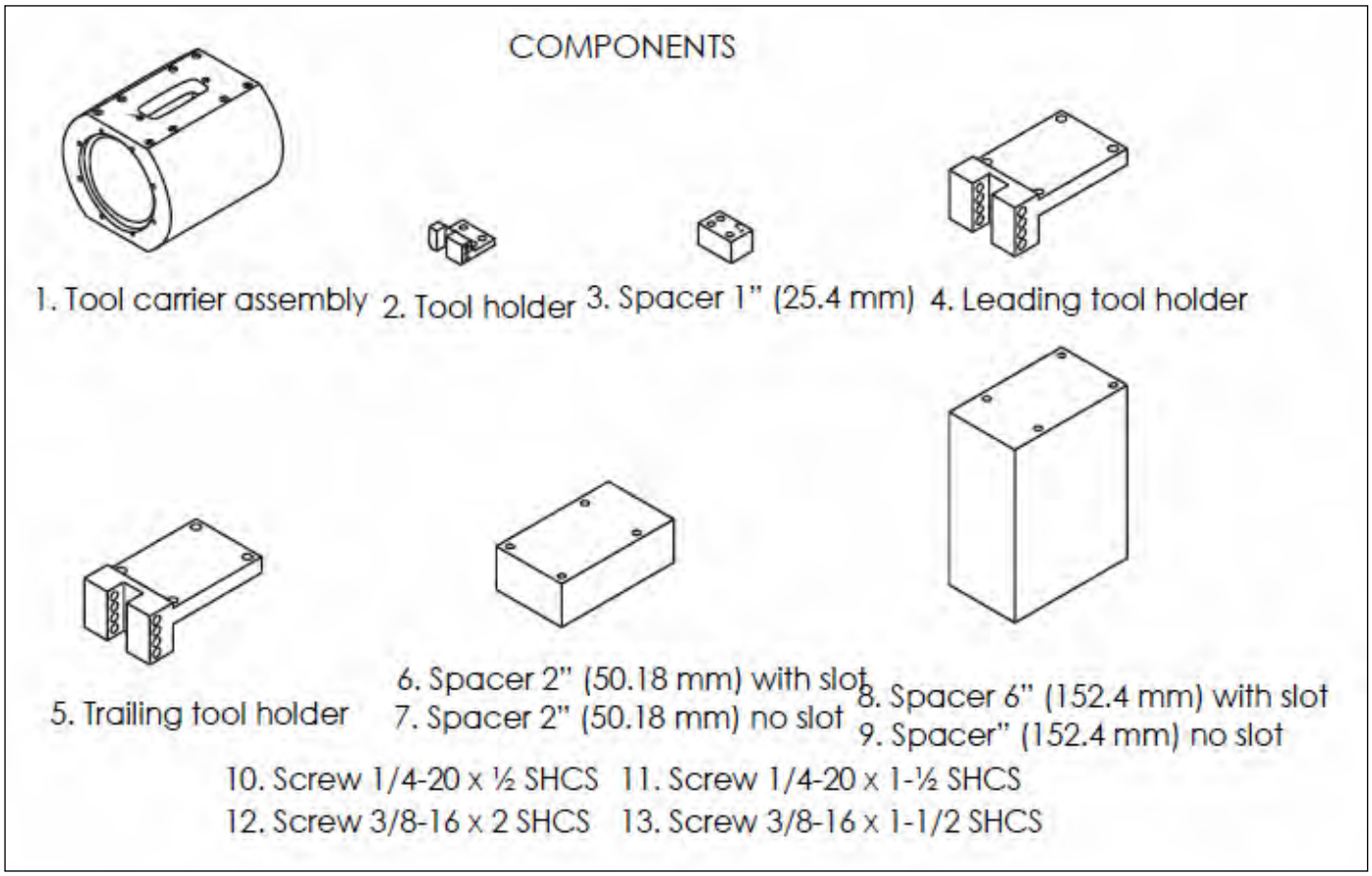



| Number | Component |
|---|---|
| 1 | Lead screw nut |
| 2 | Oil hole |
| 3 | Rod scraper |

6. Lightly oil the boring bar and lead screw so the tool carrier will move freely.

### 3.9.2 Small bore tool carrier boring head setup

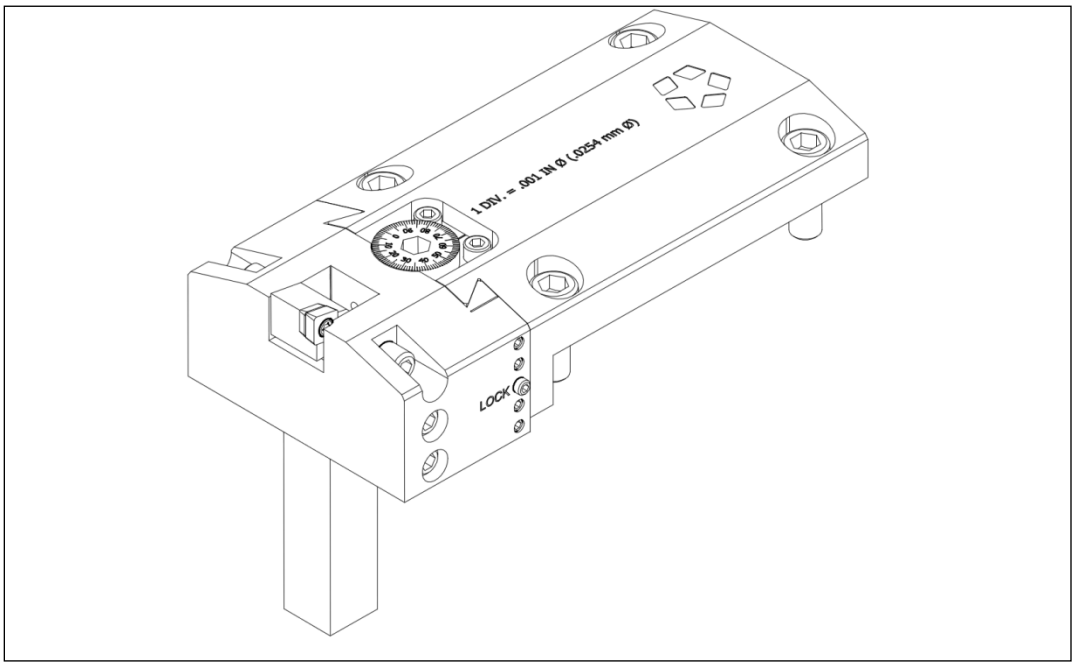
The boring head requires a tool carrier. See “Tool carrier setup” on page 31 for information.




| Number | Component |
|---|---|
| 1 | Tool carrier assembly |
| 2 | Tool holder |
| 3 | 1" (25.4 mm) spacer |
| 4 | Leading tool holder |
| 5 | Trailing tool holder |
| 6 | 2" (50.18 mm) spacer with slot |
| 7 | 2" (50.18 mm) spacer no slot |
| 8 | 6" (152.4 mm) spacer with slot |
| 9 | 6" (152.4 mm) spacer no slot |
| 10-13 | Socket head cap screws (different sizes) |

## 3.10 Micro-adjust boring head

The micro-adjust boring head offers the possibility to micro-adjust readily available off-the-shelf square shank tooling for boring. The micro-adjust travel is 0.5" (13 mm), and the ability to slide the tool without having to change the setup provides a total tool travel of more than 2" (51 mm) per setup.




To set the tool to the desired diameter, simply feed the dial screw until reaching it and then lock the middle dove tail set screw with the provided T handle hex drive. Each division in the dial screw resolves in 0.001" (0.025 mm) change in diameter. The dove tail adjustment set screws are set to the correct load by CLIMAX and should not be necessary to re-adjust them. These set screws have Vibratite-VC3 in order to avoid losing tension during vibration. The lock also has this compound, and it might be necessary to re-apply it occasionally, if necessary.

The BB6100 micro-adjust boring head comes with a 3/4" (19 mm) square shank tool holder. A bolt-on shim is provided the 3/4 tool holder so that it can be easily converted to a 1/2" (13 mm) tool holder.

To set up leading and trailing, simply shift the boring heads against the mounting screws in opposite directions.

There is a small set screw that stops the tool carriage from being removed from its holder, and the boring head should never be operated without it on.

Proper maintenance would involve cleaning and lubricating the dove tail surfaces and the dial screw threads and groove, and if the lock set screw feels loose after a while, applying the provided Vibrative VC-3.

| BB6100 Micro adjust boring head tool range table<br>8.8–40.8" (224–1,036 mm) diameter | | | |
|---|---|---|---|
| **Bore range diameter** | **Number of spacer blocks required** | | |
| | **2" (51 mm) block** | **4" (102 mm) block** | **8" (203 mm) block** |
| **8.8–12.8" (224–325 mm)** | 0 | 0 | 0 |
| **12.8–16.8" (325–427 mm)** | 1 | 0 | 0 |
| **16.8–20.8" (427–528 mm)** | 0 | 1 | 0 |
| **20.8–24.8" (528–630 mm)** | 1 | 1 | 0 |
| **24.8–28.8" (623–732 mm)** | 0 | 0 | 1 |
| **28.8–32.8" (732–833 mm)** | 1 | 0 | 1 |
| **32.8–36.8" (833–935 mm)** | 0 | 1 | 1 |
| **36.8–40.8" (935–1036 mm)** | 1 | 1 | 1 |

TIP:

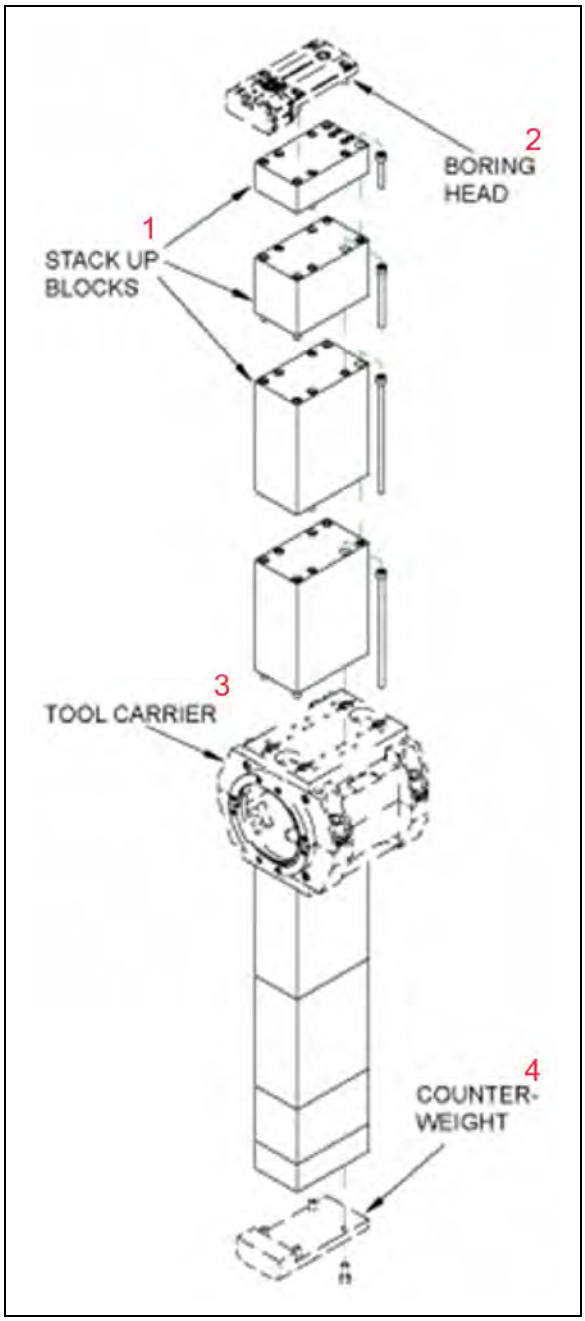
The bar can rotate in either direction. Be sure the tool bits face the correct direction.

| BB6100 Solid tooling boring head tool range table<br>9.7–42.2" (246–1,072 mm) diameter | | | | |
|---|---|---|---|---|
| **Bore range diameter** | **Number of spacer blocks required** | | | |
| | **0.75" (19 mm) block** | **2" (51 mm) block** | **4" (102 mm) block** | **8" (203 mm) block** |
| **9.7–12.7" (246–323 mm)** | 0 | 0 | 0 | 0 |
| **11.2–14.2" (285–361 mm)** | 1 | 0 | 0 | 0 |
| **13.7–16.7" (348–424 mm)** | 0 | 1 | 0 | 0 |
| **15.2–18.2" (386–462 mm)** | 1 | 1 | 0 | 0 |
| **17.7–20.7" (450–526 mm)** | 0 | 0 | 1 | 0 |
| **19.2–22.2" (488–564 mm)** | 1 | 0 | 1 | 0 |
| **21.7–24.7" (551–627 mm)** | 0 | 1 | 1 | 0 |
| **23.2–26.2" (589–665 mm)** | 1 | 1 | 1 | 0 |
| **25.7–28.7" (653–729 mm)** | 0 | 0 | 0 | 1 |
| **27.2–30.2" (691–767 mm)** | 1 | 0 | 0 | 1 |
| **29.7–32.7" (754–831 mm)** | 0 | 1 | 0 | 1 |
| **31.2–34.2" (792–869 mm)** | 1 | 1 | 0 | 1 |
| **33.7–36.7" (856–932 mm)** | 0 | 0 | 1 | 1 |
| **35.2–38.2" (894–970 mm)** | 1 | 0 | 1 | 1 |
| **39.2–42.2" (996–1,072 mm)** | 1 | 1 | 1 | 1 |

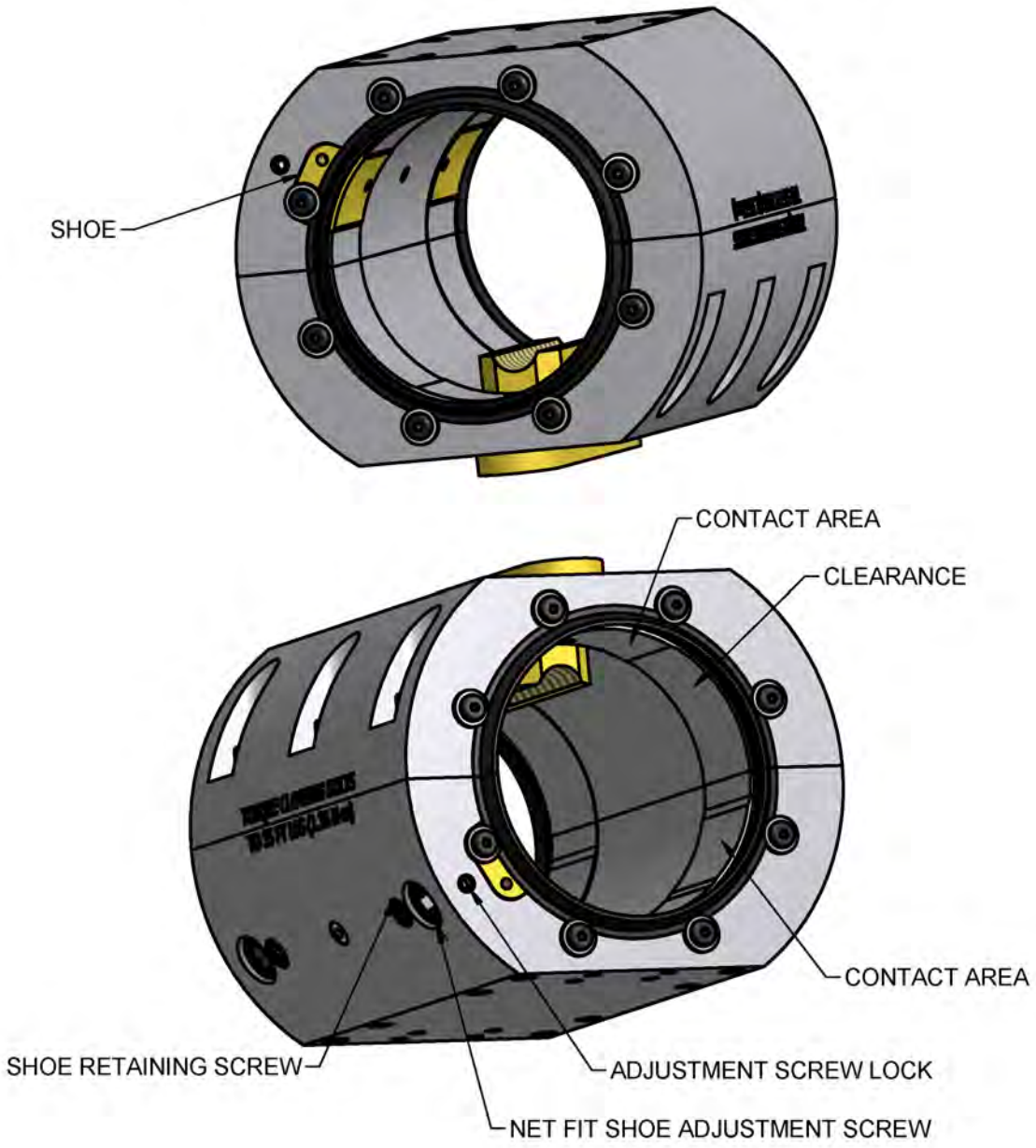
## 3.11 Boring head setup

1. Select the required parts using the “Boring head tool range” table.
2. Using the drawing as a guide, assemble the stack up blocks on to the tool carrier symmetrically on both sides of the tool carrier, from tallest to shortest.
3. Mount the boring head and the counterweight on the stack up blocks.

| Number | Component |
|---|---|
| 1 | Stack-up blocks |
| 2 | Boring head |
| 3 | Tool carrier |
| 4 | Counterweight |



BB6000 NET FIT CARRIER
3 POINT ADJUSTABLE CONTACT AT EACH END OF THE CARRIER




22377

### 3.11.1 To lock the tool carrier on the bar for other operations

1. Loosen the lock screw on the side of the tool carrier.
2. Tighten or loosen the adjustment screw.
3. Tighten the lock screw to keep the adjustment screw in position.

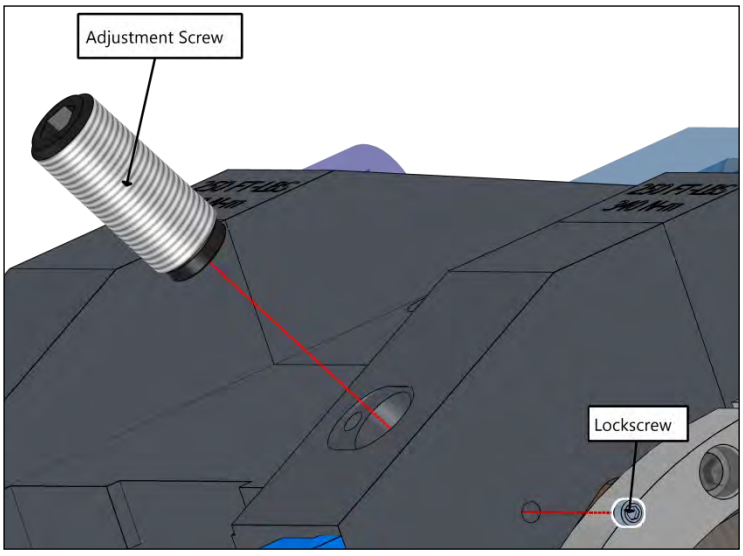



FIGURE 9. ADJUSTMENT SCREW (LEFT) AND LOCK SCREW (RIGHT)

### 3.11.2 Do the following to remove the brass nut:

1. Do not remove all the screws.
2. Remove the screws on each end of the brass nut.

(If there is too much play in the brass nut, the center set screw can be tightened.)

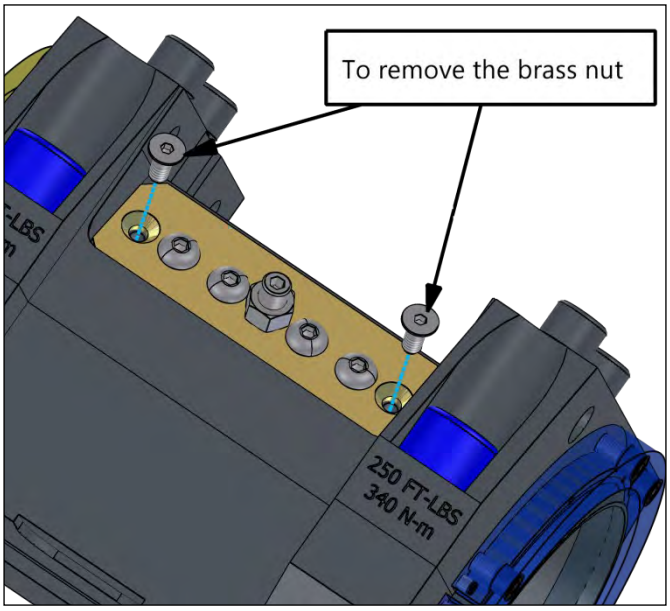
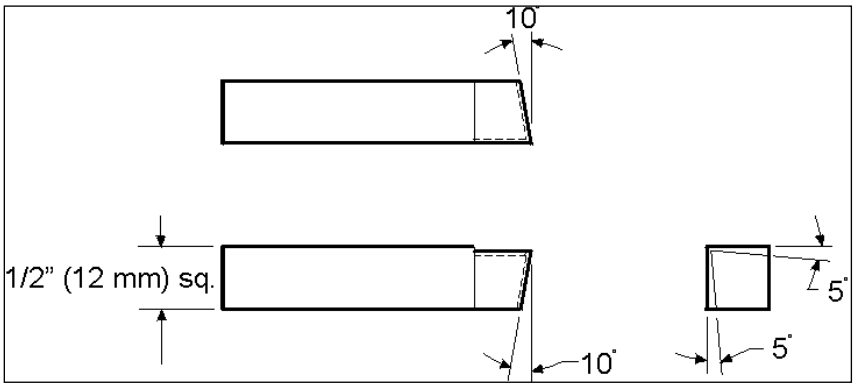



FIGURE 10. REMOVING THE BRASS NUT

3. Using the previous boring head tool range table, select the required spacers and screws. Clamp all parts tightly to the tool carrier.
4. Grind a 1/2" square HSS tool bit (see following illustration) or install inserted carbide tool holder with insert.




TIP:

Geometry shown is for a left-hand tool.

5. Secure the tool bit in the tool holder. Using a dial indicator, adjust the tool cutting depth. The maximum recommended cut is 0.125" (3 mm).

TIP:

Precision bores are best achieved by several roughing cuts and one or more shallow finishing cuts.

## 3.12 Install the slide arm onto the tool carrier

1. Using a device such as a crane, place arm onto tool carrier flush with carrier surface as shown.

NOTICE

Always use the lifting eyes when lifting the arms. The rotating lifting eyes provide the flexibility and safety during setup operations.

2. Secure arm with clamp bar (P/N 53074) with 1/2-20 x 1-3/4 screws (P/N 18225), four per clamp bar, and torque to 100 ft-lb. (135 N-m).

**⚠ DANGER**

Failure to properly torque the four ½-20 x 1-1/4 SHCS (P/N 18225) to 100 ft-lb (135 Nm) can result in unexpected slippage of the tool arm which can result in injury or be fatal.

## 3.13 Adjusting the tool carrier for perpendicularity

The tool carrier is equipped with four set screws that allow you to adjust the slide arm perpendicularity if required.

## 3.14 Feedbox assembly

Mount and secure the feedbox (see Section 7 on page 55).

## 3.15 Feedbox and trip arm set-up

### *Install the counterweight arm onto the tool carrier*

1. Rotate the tool carrier on the bar to allow the counterweight arm to be mounted on the receiving surface of the tool carrier.
2. Attach the lifting eye onto counterweight arm and install arm.

**NOTICE**

Always use the lifting eyes when lifting the arms. The rotating lifting eyes provide the flexibility and safety during setup operations.

3. Using a lifting device such as a crane, lift the counterweight assembly to the arm. Fasten the counterweight assembly to the arm using the fasteners shown in the exploded views.

Note that you can position the counterweight itself anywhere along the arm as needed to balance the assembly.

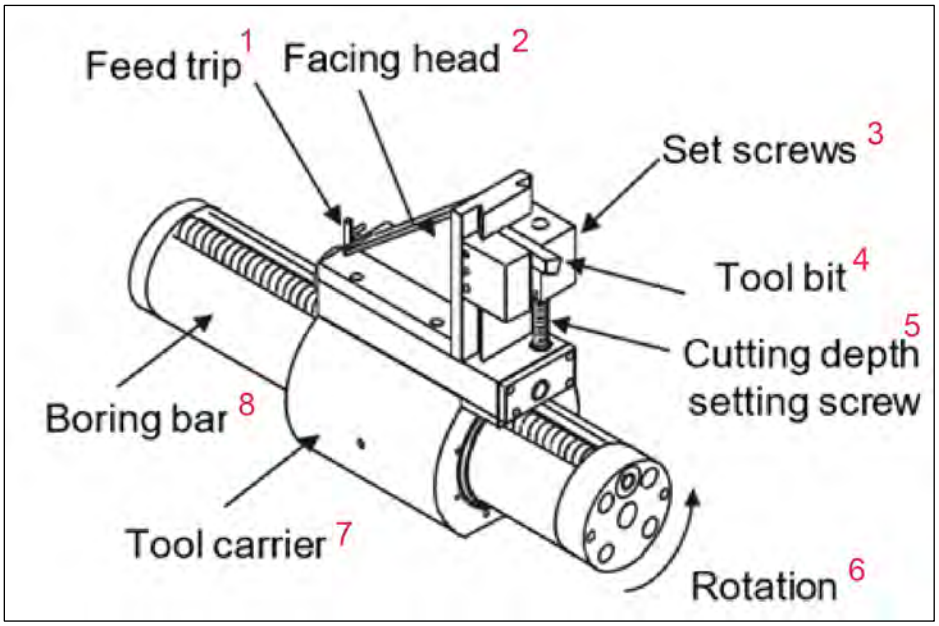
## 3.16 Mechanical facing head setup

The mechanical facing head assembly requires either a one-piece or the two-piece tool carrier.

1. Assemble the facing head as necessary. (See the following Facing Head Tool Range Table and Mechanical Facing Head exploded view drawing to see how the parts fit together).
2. Mount the facing head onto the tool carrier.
3. Secure a sharpened tool bit in the tool carrier.

**⚠ CAUTION**

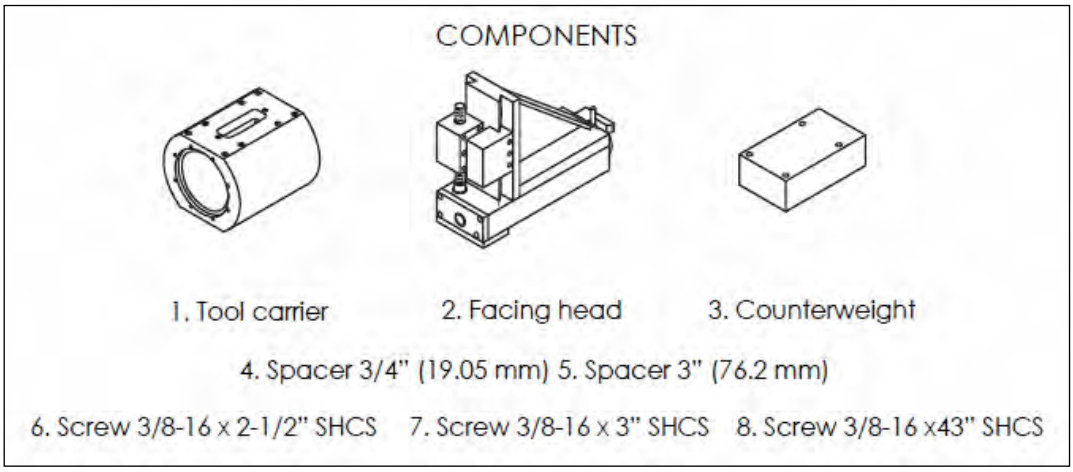
The facing head is operational in only one direction. Check that the bar rotates in the correct direction the tool bit faces appropriately.




| Number | Component |
|---|---|
| 1 | Feed trip |
| 2 | Facing head |
| 3 | Set screws |
| 4 | Tool bit |
| 5 | Cutting depth setting screw |
| 6 | Rotation |
| 7 | Tool carrier |
| 8 | Boring bar |

4. Set the depth of cut by adjusting the screw.
5. Engage the automatic feed trip. The trip mechanism produces radial feed from 0 (no trip) to 0.010" (0.254 mm). The farther down the trip rod catches on the trip, the greater the feed. Multiple trip rods increase the rate of feed.

| Facing head tool range table for 4" (102 mm) model | |
|---|---|
| **Face diameter range** | **Components required** |
| 10.5–22.5" (267–572 mm) | 1, 2, 3, 7 |
| 16.5–28.5" (419.1–724 mm) | 1, 2, 3, 5, 6, 7 |
| 24–36" (610–914 mm) | 1, 2, 3, 4, 5, 5, 6, 8 |




| Number | Component |
|---|---|
| 1 | Tool carrier |
| 2 | Facing head |
| 3 | Counterweight |
| 4-5 | Spacers (different sizes) |
| 6-8 | Socket head cap screws (different sizes) |

## TIP:

The counterweight mounts on the side of the tool carrier opposite of the facing head. The components figure shows spacers for one side only. Use an identical spacer stack for each side.

The facing head can bore diameters as small as 23.25" (590.55 mm).

## 3.17 Hydraulic power preparation and connection

**⚠ CAUTION**

Connect the hydraulic motor to the power unit pump prior to turning on the power unit. Failure to do so will damage the pump and void all warranties.

The hydraulic motor mounts to the rotational drive unit. Hydraulic hoses with quick disconnect fittings connect to hydraulic power unit and the hydraulic motor. Before connecting or disconnecting the hoses, turn off the power unit.

The return and pressure lines are interchangeable. If you switch these lines, the boring bar will rotate in the opposite direction.

Do the following to reverse bar rotation:

1. Turn off the hydraulic power unit
2. Switch the hoses at the motor end.

The control pendant's START/STOP push buttons run the hydraulic power unit. The 20-foot (6 meter) cable allows remote operation of the motor.

Make sure to check the direction of bar rotation and tool head feeding before operating the boring bar. Check that the electrical supply matches the requirements of the power unit.

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# 4 OPERATION

## 4.1 Using the remote pendants

Operator controls for the machine are located on the remote pendants, described below.

**⚠ CAUTION**

The bar rotation and the axial feed are independent of each other. Be sure the feed is OFF when the bar is not running.

### 4.1.1 Feed pendant

The following is a description of the feed pendant controls:


FEEDBOX PENDANT

| Symbol | Feature | Description |
|---|---|---|
| ∿∿ | Feed speed override | A momentary button which overrides the feed rate potentiometer and runs the axial power feed at maximum rate, regardless of the potentiometer setting. |
| ← ○ → | Feed direction | A 3-position switch that determines the direction of the axial or radial feed. In the STOP position, the motor will not move under power from the pendant. Feed direction may be changed during operation. |
| | Speed | The Feed potentiometer controls the axial feed rate. Counterclockwise decreases the feed rate; clockwise increases the feed rate. |

**⚠ CAUTION**

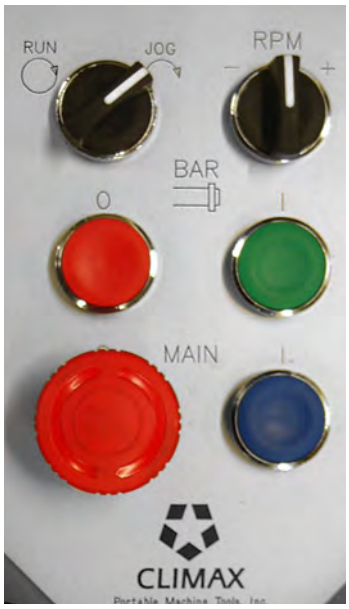
Damage to the cutter, the boring machine and your work piece may occur if the bar rotation is stopped while the power feed is engaged and the cutting tool is in contact with the work piece.

## 4.2 HPU pendant

**NOTICE**

Additional information about the HPU function, construction, and maintenance schedule can be found in the HPU manual.

The hydraulic power unit comes with a standard control pendant.




| Feature | Description |
|---|---|
| Run/Jog | |
| RPM | Increases or decreases the rotational speed. |
| Bar Off (red) | Turns off the hydraulic power unit |
| Bar On (green) | Turns on the hydraulic power unit |
| Off (red) | Turns off the electric motor |
| On (blue) | Turns on the electric motor |

## 4.3 Manual override (electrical feed only)

The manual override consists of 2-position gear lever that disengages the electric drive from the boring bar. When disengaged, a hand-drill can be installed for manual rapid operation. When the gear box is in the manual override position, the pendant functions are not active.

**⚠ CAUTION**

Do not force the shift lever to engage. Forceful engagement can damage the mechanical override mechanism.

To move the tool carrier rapidly, shift the feed lever on the top of the gearbox to the back position. With a socket on the hexagon shaft, run with an electric drill or speed wrench. To re-engage the feed, remove the socket, turn the feed on slow, and shift the feed lever to the forward position.

## 4.4 Pre-startup checks

Do the following before operating the boring bar:

1. Tie down the RDU torque arms and the axial feed unit stop rod.
2. Use only properly sharpened tool bits.
3. Secure all machine parts, including the bearing assemblies, the tool carrier, and the boring head. See that moving parts move freely.
4. Check that electric cords and cables are in good condition and correctly connected.
5. Turn the hydraulic power unit OFF.
6. Check that the power unit wiring matches the electric source. Plug the power unit into a grounded outlet.
7. Check that the reservoir level is filled above the red bar with UNAX AW32 hydraulic oil or equivalent.
8. Check that the power unit is set level.
9. Clean the hydraulic hoses and fittings before connecting them.
10. Check that the electric pump motor on the hydraulic power unit is turning as indicated by the arrow on the case.
11. If using the boring bar in a vertical orientation, check that the two clamp collars are in place to secure the bar (see Section 3.1 on page 15).

### 4.4.1 Running the machine

1. Set the feed direction and feed rate on the axial feed unit (see Section 3.7.1 on page 27).
2. Press START on the hydraulic power unit pendant.
3. Adjust the bar rotation using the speed control hand wheel on the hydraulic power unit or the knob on pendant.
4. As cutting begins, lubricate the work piece and cutting tool with plenty of cutting oil. Apply cutting oil with a squirt can.

### 4.4.2 Stopping the machine

1. Press STOP on the pendant to stop the power unit.
2. After all parts of the machine have stopped, use a brush to remove chips.
3. If you will be machining the work piece again, see Section 4.4.4. If you are done machining, see Section 4.5.

### 4.4.3 Repetitive machining

4. Reverse the boring head feed direction.
5. Manually or automatically feed the boring head back to where it started cutting.

6. Sharpen the tool bit, if necessary.
7. Use a dial indicator to reset the tool bit cutting depth. The maximum recommended cutting depth is 0.125" (3 mm).
8. Operate the boring bar as described in Section 4.4.2.

## 4.5 Disassembly

### 4.5.1 Standard disassembly

1. Turn off and unplug the hydraulic power unit.
2. Disconnect the hydraulic lines from the motor.
3. Remove the tool bit.
4. Remove the tool head and tool carrier.
5. Remove the axial feed unit from the bar.
6. Support the boring bar, bearing supports, and RDU with hoists.
7. If the RDU is between the bearing support assemblies, loosen one support first. Remove that support from the work piece and bar.
8. Secure the RDU with a hoist. Loosen the shaft collars. Remove the drive key. Carefully slide the RDU off the bar.
9. Loosen the remaining bearing support assemblies. Remove the boring bar.
10. Remove the bearing supports from the work piece.

### 4.5.2 Optional disassembly

In some cases, it is better to remove the bearings before removing the bar.

1. Turn off and unplug the hydraulic power unit.
2. Disconnect the hydraulic lines from the motor.
3. Remove the tool bit.
4. Remove the tool head and tool carrier.
5. Securely support the boring bar, bearing supports, and RDU with hoists.
6. Remove the axial feed unit from the bar.
7. If the RDU is between the bearing support assemblies, remove one support first. Remove the support from the work piece and bar.
8. Secure the RDU with a hoist. Loosen the shaft collars. Remove the drive key and carefully slide the RDU off the bar.
9. Loosen the bearing support jacking screws.
10. Place a wooden support in the bottom of the bore to support the bar.
11. Remove the bearing supports from the work piece.
12. Slide the bar out of the bore using the wooden support.

# 5 MAINTENANCE

## 5.1 Recommended lubricants

| Lubricant | Brand | Where used |
|---|---|---|
| Gear grease | Polytac EP #2 | Rotational drive, axial feed units |
| Light Oil | LPS 2 | Unpainted surfaces |
| Cutting oil | UNOCAL KOOLKUT | Tool bits, work pieces |
| Hydraulic oil | Union UNAX AW32 Anti-wear hydraulic oil | Hydraulic motor |
| Anti-seize lubricant | Moly Grade Anti-seize | Jacking bolts |

## 5.2 Boring bar/lead screw assembly

Clean the lead screw and boring bar frequently during operation. Keep chips away from the lead screw threads. Lubricate the lead screw periodically with light oil to ensure smooth travel of the tool carrier assembly. Before storage, lightly oil the bar to prevent rusting. Do not grease the leadscrew.

## 5.3 Axial feed unit

Under normal conditions, the mechanical axial feed unit is maintenance free.

## 5.4 Rotational drive unit

The RDU has sealed lubrication. Under normal use, it is maintenance free.

## 5.5 Bearing support assembly

Before using the boring bar and periodically during long machining operations, grease the bearings. Add grease slowly while the bar is rotating until a slight bead of grease forms at the seals.

Periodically apply anti-seize to jacking bolts of the ID-mounting bearing.

## 5.6 Tool head assembly

### 5.6.1 Boring head assembly

Lightly oil all parts to prevent rusting.

### 5.6.2 Mechanical facing head assembly

Before machining and frequently during operation, lubricate the tool head carrier at the grease fitting. Brush chips from the lead screw frequently to prevent thread damage. Lightly oil the lead screw.

### 5.6.3 Tool carrier maintenance

Before operating the boring bar, pump light oil into the oiler in the side of the carrier. Be careful not to damage the scrapers.

Before storage, lightly oil all parts to prevent rusting.

## 5.7 Hydraulic power unit and motor

See the HPU manufacturer's documentation for information about your HPU and its maintenance.

# 6 STORAGE

Proper storage of the portable boring bar will prevent undue deterioration or damage.

Before storing, wipe the machine down with solvent to remove grease, metal chips, and moisture.

To prevent rusting, spray with a moisture-displacement material such as JET-LUBE 550 for short-term storage, LPS 3 for long-term storage.

Store the machine in the container provided.

Place desiccant bags or vapor wrap around the machine to absorb moisture.

## 6.1 Tool kit

TABLE 4 . BB6100 TOOL KIT (P/N 54262)

| P/N | DESCRIPTION | QTY | UOM |
|---|---|---|---|
| 10855 | WRENCH EXTENSION 3/8 DRIVE X 6 | 1 | Piece |
| 11856 | WASHER 5/8 FLTW | 4 | Piece |
| 12339 | WASHER 3/4 FLTW | 2 | Piece |
| 12800 | WRENCH END 15/16 | 1 | Piece |
| 12835 | WRENCH END 1-1/8 COMBINATION LONG (KB) | 1 | Piece |
| 14735 | WRENCH EXTENSION 1/2 DRIVE X 10 | 1 | Piece |
| 14818 | WRENCH RATCHET 1/2 DRIVE | 1 | Piece |
| 15367 | WRENCH STRAP 1-3/4 WIDE X 48 LONG | 1 | Piece |
| 15781 | WRENCH HEX BIT SOCKET 3/8 X 3/8 (KB) | 1 | Piece |
| 16792 | WRENCH END 3/8 COMBINATION | 1 | Piece |
| 17378 | SCREW 5/8-11 X 2-1/4 HHCS | 4 | Piece |
| 19261 | WRENCH SOCKET 3/8 6 PT X 3/8 DRIVE | 1 | Piece |
| 19700 | CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5 | 1 | Piece |
| 20869 | WRENCH HEX SET 5/64 TO 3/4 15 PIECES | 1 | Piece |
| 21406 | SCREW 3/4-10 X 2 HHCS | 2 | Piece |

| P/N | DESCRIPTION | QTY | UOM |
|---|---|---|---|
| 23659 | FUSE AXIAL FEED 3-1/2 BAR | 1 | Piece |
| 24751 | WRENCH RATCHET 3/8 DRIVE | 1 | Piece |
| 25010 | CLAMP COLLAR SPLIT HINGED 3-1/2ID | 2 | Piece |
| 29661 | WRENCH HINGE HANDLE 1/2 DRIVE 17 IN HANDLE (KB) | 1 | Piece |
| 54411 | STANDOFF RDU 6IN | 1 | Piece |
| 54412 | STANDOFF RDU 6.5IN | 1 | Piece |
| 54717 | TOOL BEARING BB6100 | 1 | Piece |
| 56734 | WRENCH SPANNER FOR 3.5 DIA DODGE IMPERIAL BRG OFFSET 1 IN | 1 | Piece |
| 57017 | MANUAL INSTRUCTION BB6100 BORING BAR | 1 | Piece |

## 6.2 Spare Parts

Parts listed below include items most frequently required due to wear, loss, or damage. To avoid unscheduled down time you may want to stock any or all of the parts listed.

TABLE 5. SPARE PARTS KIT

| Where used | P/N | DESCRIPTION | QTY |
|---|---|---|---|
| Boring bar assembly | 22143 | NUT LEADSCREW BRG ADJUSTING 3/4 DIA | 2 |
| | 22403 | KEY DRIVE 3-1/2 BORING BAR | 1 |
| | 22814 | HOIST RING 3/4-10 X 1-1/2 1-3/4 ID 3-1/4 OD 6-3/8 OAL 5000 LBS SWIVEL | 1 |
| | 22815 | SPACER BOLT EYE 1/2 THK | 1 |
| Mechanical axial feed assembly | 22409 | DIAL FEED | 1 |
| | 14303 | ROD STOP | 1 |
| Net fit tool carrier | 54217 | SHOE ADJUSTABLE TOOL CARRIER BB6100 | 1 |
| | 54221 | SET NUT AXIAL LEAD SCREW 3/4-5 ACME BB6100 | 2 |
| | 14771 | SCREW 5/16-18 X 3/4 BHSCS | 4 |
| Small bore tool carrier | 22205 | NUT AXIAL LEADSCREW | 1 |
| | 22384 | WIPER ROD 3.5 ID MOLYTHANE | 2 |
| | 10453 | SCREW 3/8-16 X 1-1/4 SHCS | 6 |
| Boring/facing arms | 45691 | ASSY FEEDBOX REVERSE CLUTCH INPUT | 1 |
| | 54178 | NUT HALF FACING HEAD BB7100 | 1 |
| | 55094 | TRIP ARM STEEL 3 INCH | 1 |
| Hydraulic power unit | NA | See the HPU operator manual. | NA |
| Tooling | 79020 | BORING HEAD MICRO ADJUST 3/4 INCH TOOLING (1/2 INCH READY) LARGE BB | 1 |

| Where used | P/N | DESCRIPTION | QTY |
|---|---|---|---|
| | 31859 | BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE TC | 1 |
| | 31868 | BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE | 1 |
| | 33996 | HOLDER INSERT 3/4 SQ SHANK NEG RAKE RIGHT HAND | 1 |
| | 33997 | HOLDER INSERT 3/4 SQ SHANK NEG RAKE LEFT HAND | 1 |
| | 41407 | INSERT CARBIDE 80 DEG 1/2 IC 1/64 NOSE RADIUS KC5010 | 10 |
| | 50741 | INSERT CARBIDE 80 DEG 3/8 IC 1/64 NOSE RADIUS CPGM-3251 KC5010 | 10 |

# 7 EXPLODED VIEWS AND PARTS LISTS

The following diagrams and parts are for your reference purposes only. The machine Limited Warranty is void if the machine has been tampered with by anyone who has not been authorized in writing by CLIMAX to perform service on the machine.

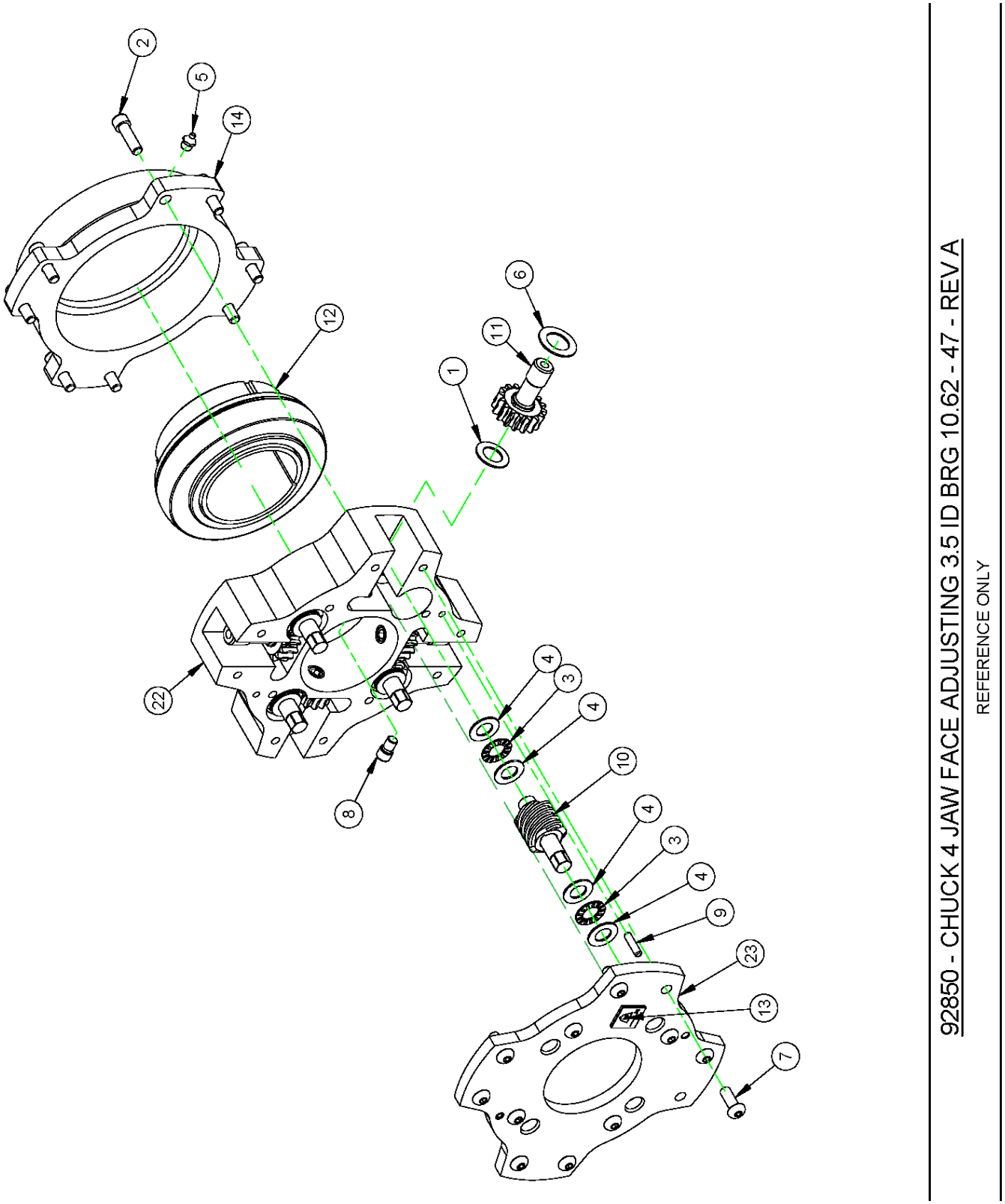
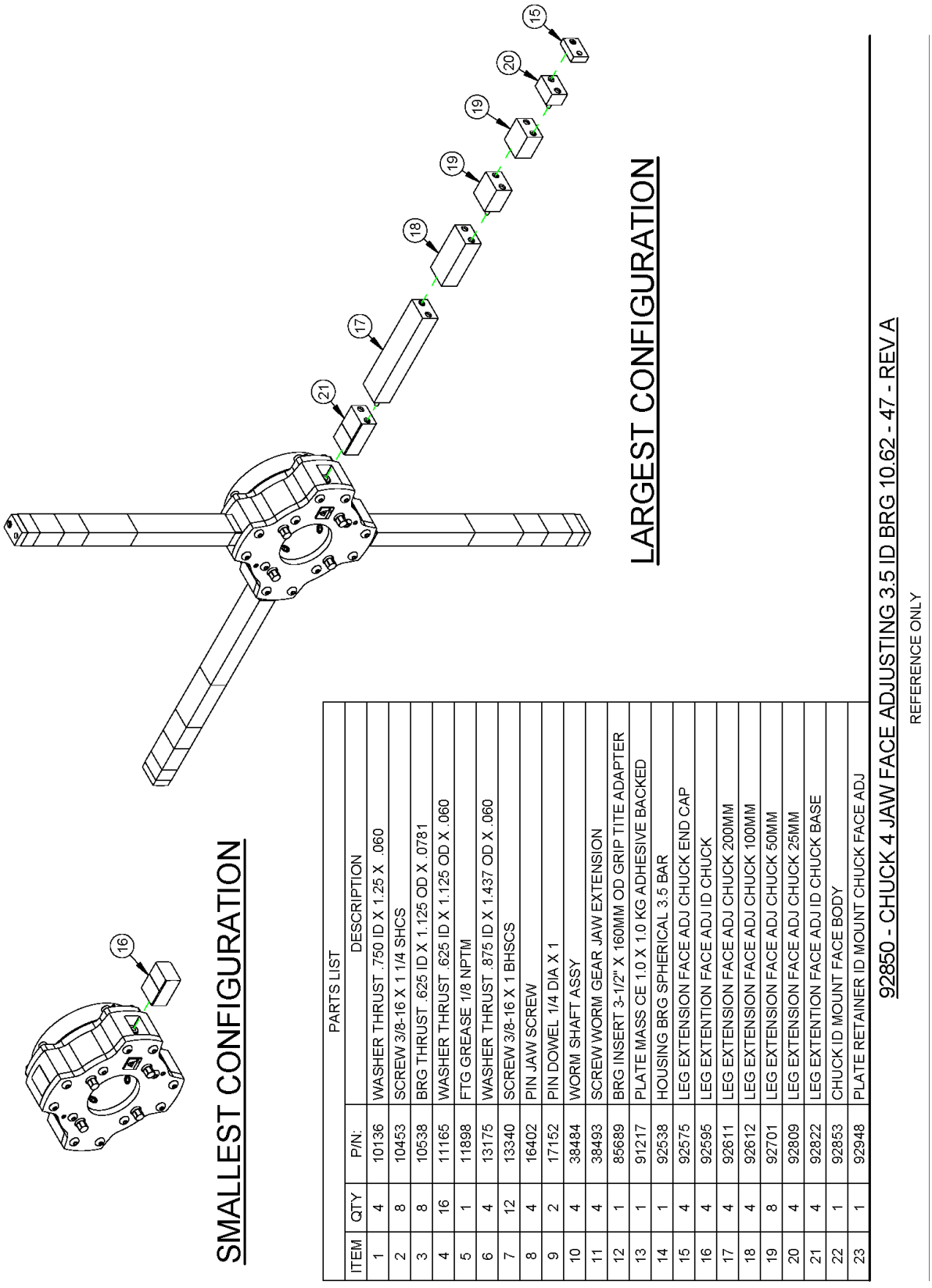



FIGURE 11. 4-JAW CHUCK FACE ADJUSTING 3.5 ID BEARING ASSEMBLY (P/N 92850)



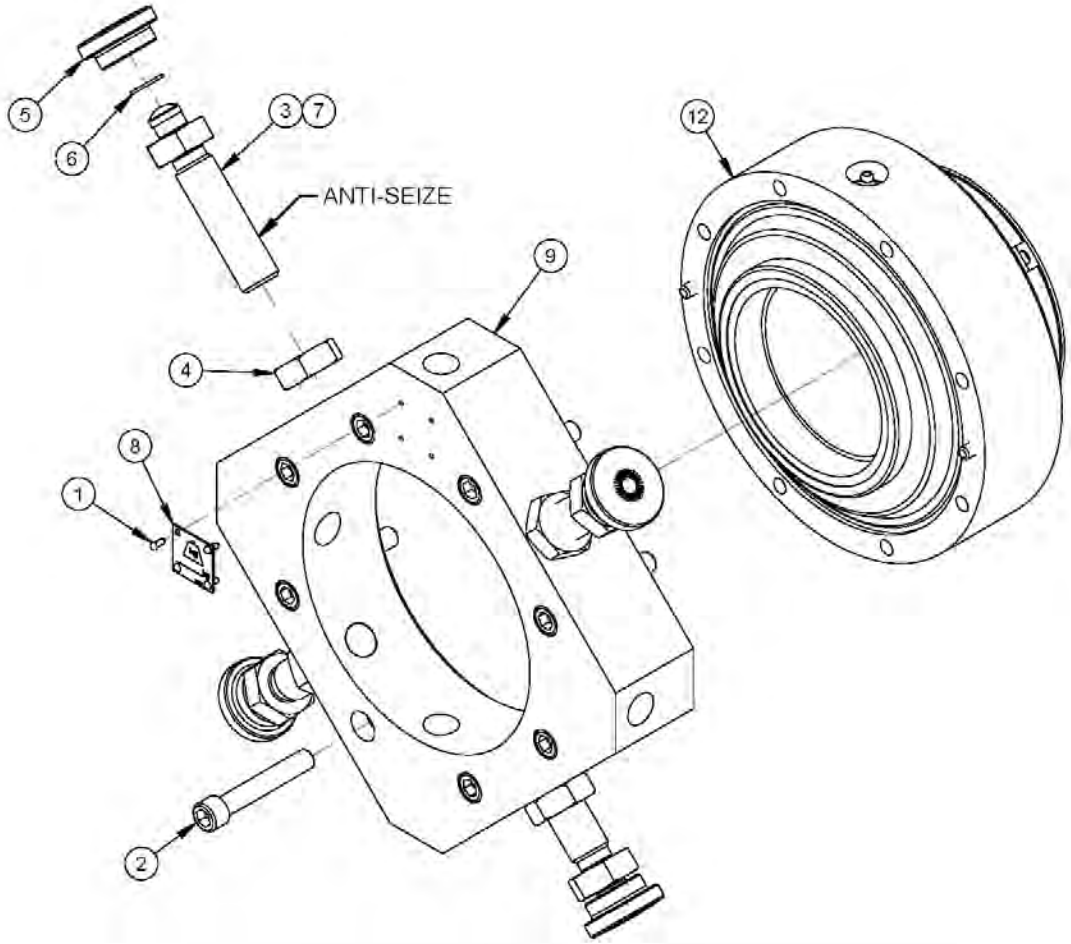

PARTS LIST

| ITEM | QTY | P/N: | DESCRIPTION |
|---|---|---|---|
| 1 | 4 | 10136 | WASHER THRUST .750 ID X 1.25 X .060 |
| 2 | 8 | 10453 | SCREW 3/8-16 X 1 1/4 SHCS |
| 3 | 8 | 10538 | BRG THRUST .625 ID X 1.125 OD X .0781 |
| 4 | 16 | 11165 | WASHER THRUST .625 ID X 1.125 OD X .060 |
| 5 | 1 | 11898 | FTG GREASE 1/8 NPTM |
| 6 | 4 | 13175 | WASHER THRUST .875 ID X 1.437 OD X .060 |
| 7 | 12 | 13340 | SCREW 3/8-16 X 1 BHSCS |
| 8 | 4 | 16402 | PIN JAW SCREW |
| 9 | 2 | 17152 | PIN DOWEL 1/4 DIA X 1 |
| 10 | 4 | 38484 | WORM SHAFT ASSY |
| 11 | 4 | 38493 | SCREW WORM GEAR JAW EXTENSION |
| 12 | 1 | 85689 | BRG INSERT 3-1/2" X 160MM OD GRIP TITE ADAPTER |
| 13 | 1 | 91217 | PLATE MASS CE 1.0 X 1.0 KG ADHESIVE BACKED |
| 14 | 1 | 92538 | HOUSING BRG SPHERICAL 3.5 BAR |
| 15 | 4 | 92575 | LEG EXTENSION FACE ADJ CHUCK END CAP |
| 16 | 4 | 92595 | LEG EXTENTION FACE ADJ ID CHUCK |
| 17 | 4 | 92611 | LEG EXTENSION FACE ADJ CHUCK 200MM |
| 18 | 4 | 92612 | LEG EXTENSION FACE ADJ CHUCK 100MM |
| 19 | 8 | 92701 | LEG EXTENSION FACE ADJ CHUCK 50MM |
| 20 | 4 | 92809 | LEG EXTENSION FACE ADJ CHUCK 25MM |
| 21 | 4 | 92822 | LEG EXTENTION FACE ADJ ID CHUCK BASE |
| 22 | 1 | 92853 | CHUCK ID MOUNT FACE BODY |
| 23 | 1 | 92948 | PLATE RETAINER ID MOUNT CHUCK FACE ADJ |

92850 - CHUCK 4 JAW FACE ADJUSTING 3.5 ID BRG 10.62 - 47 - REV A

REFERENCE ONLY

FIGURE 12. 4-JAW CHUCK FACE ADJUSTING 3.5 ID BEARING ASSEMBLY PARTS LIST (P/N 92850)

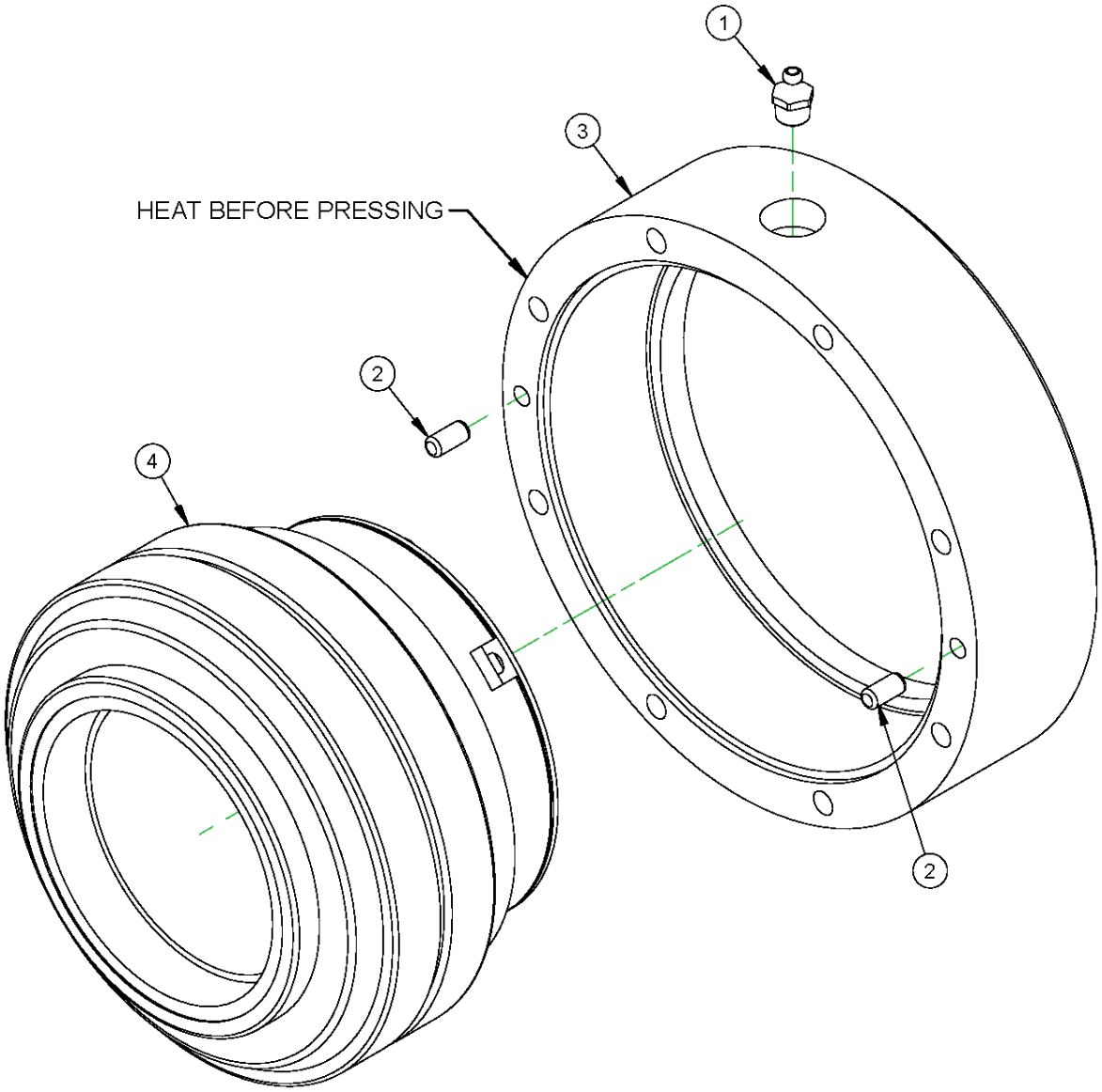



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 2 | 8 | 11196 | SCREW 3/8-16 X 2-1/4 SHCS |
| 3 | 4 | 14991 | BOLT JACKING SHORT |
| 4 | 8 | 14996 | NUT 3/4-10 JAMN |
| 5 | 8 | 15058 | PAD THRUST |
| 6 | 8 | 15059 | RING SNAP 5/8 WIRE RING |
| 7 | 4 | 26801 | BOLT JACKING LONG |
| 8 | 1 | 29152 | PLATE MASS CE |
| 9 | 1 | 54356 | SPIDER ID 11.25-47 INCH BB6100 |
| 10 | 4 | 54357 | (NOT SHOWN) SPACER 3 INCH ID MOUNT BB6100 |
| 11 | 8 | 54358 | (NOT SHOWN) SPACER 6 INCH ID MOUNT BB6100 |
| 12 | 1 | 97049 | ASSY BRG AND HOUSING 3.5" ID MOUNT BB6100 |

54355 - MOUNT ID BEARING ASSY 11.25-47 INCH BB6100 - REV B

FOR REFERENCE ONLY

FIGURE 13. ID-MOUNT BEARING ASSEMBLY (P/N 54355)

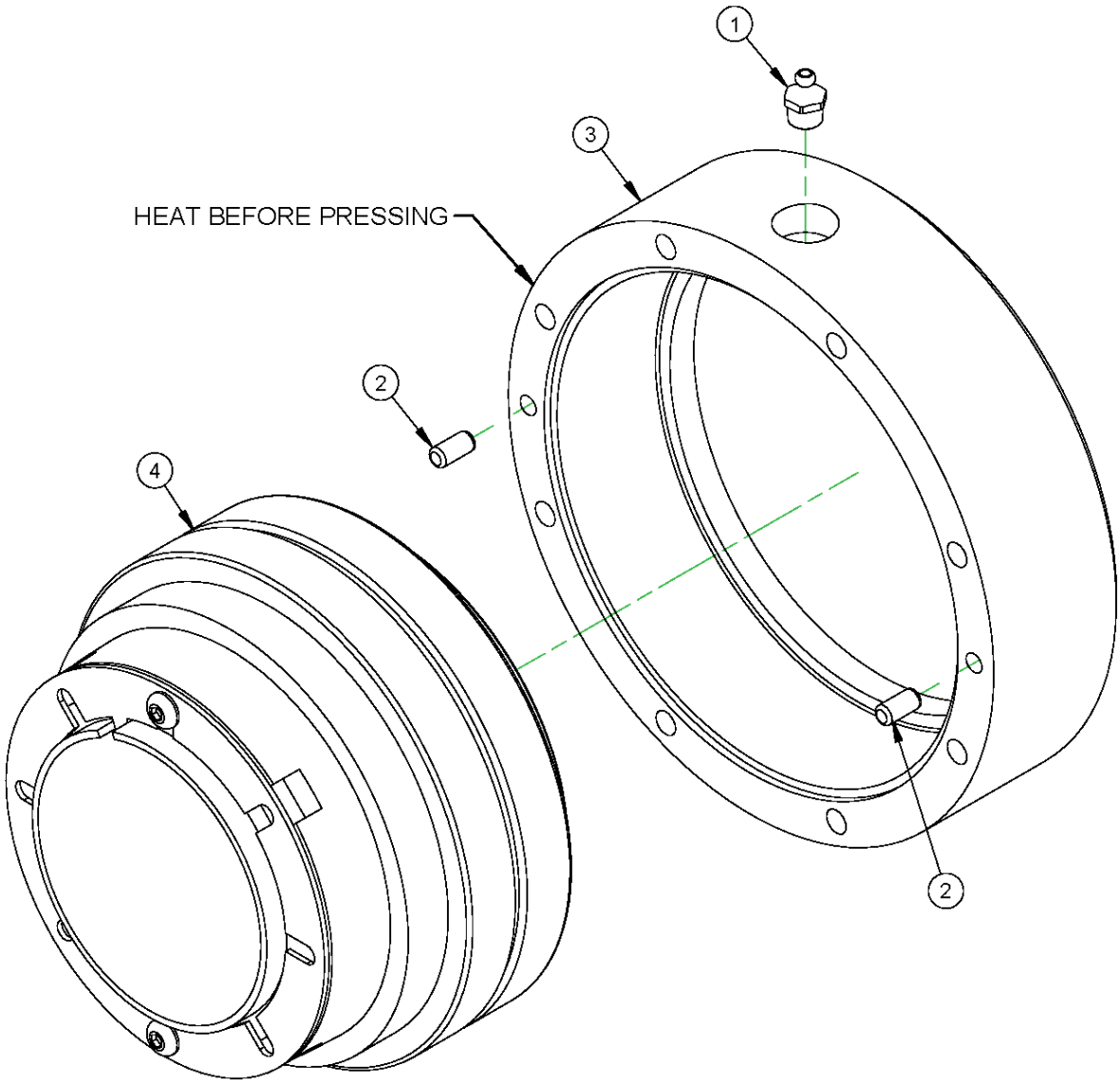



NOTE: SEE DRAWING 53691 FOR ID MOUNT ASSEMBLY

PARTS LIST

| ITEM | QTY | P/N: | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 11898 | FTG GREASE 1/8 NPTM |
| 2 | 2 | 20166 | PIN DOWEL 1/4 DIA X 1/2 |
| 3 | 1 | 53681 | BEARING HOUSING 3.5" BAR |
| 4 | 1 | 53689 | IMPERIAL BRG INSERT 070904 FOR 3.5 IN BAR |

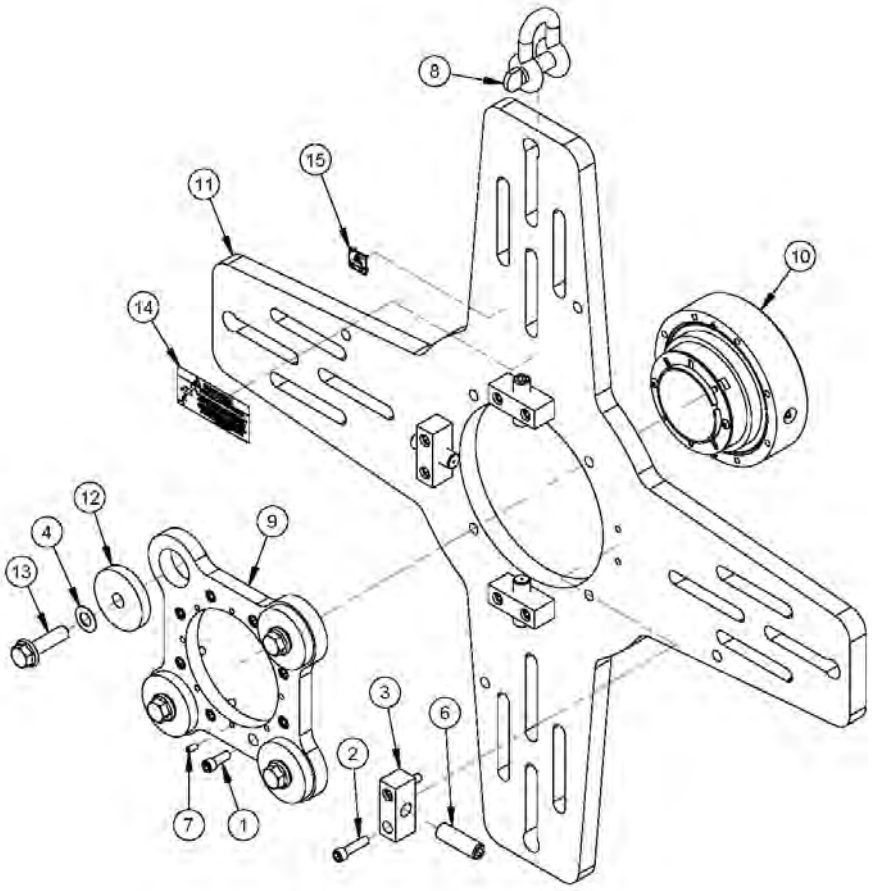
FIGURE 14. ID MOUNT BEARING ASSEMBLY AND HOUSING (P/N 97049)




NOTE: SEE DRAWING 97049 FOR OD MOUNT ASSEMBLY

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 11898 | FTG GREASE 1/8 NPTM |
| 2 | 2 | 20166 | PIN DOWEL 1/4 DIA X 1/2 |
| 3 | 1 | 53681 | BEARING HOUSING 3.5" BAR |
| 4 | 1 | 53689 | IMPERIAL BRG INSERT 070904 FOR 3.5 IN BAR |

FIGURE 15. OD MOUNT BEARING ASSEMBLY AND HOUSING (P/N 53691)

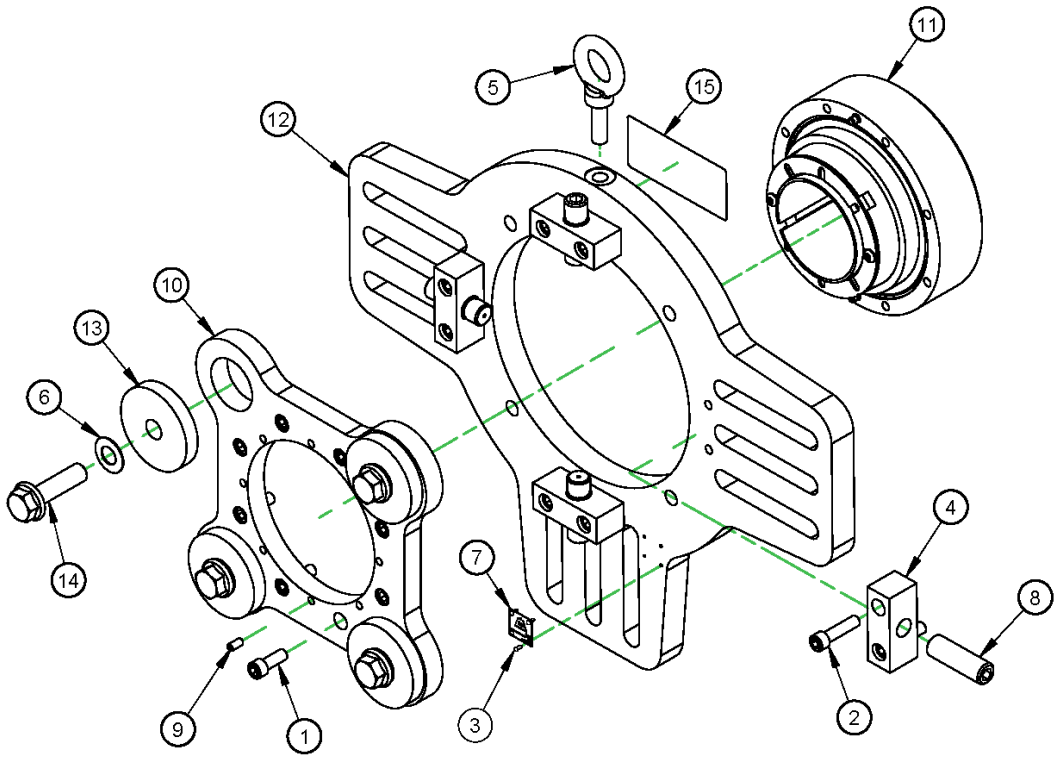



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 8 | 10191 | SCREW 3/8-16 X 1 SHCS |
| 2 | 8 | 10474 | SCREW 3/8-16 X 1-1/2 SHCS |
| 3 | 4 | 20956 | BLOCK ADJUSTING |
| 4 | 4 | 27172 | WASHER SPRING BELLEVILLE 5/8 X 1-1/4 X .040 |
| 5 | 1 | 33304 | (NOT SHOWN) CRATE 32 X 32 X 12 5/8 PLY HINGED BB6000 & BB6100 BEARINGS |
| 6 | 4 | 42212 | SCREW MOD SSSCP 3/4-10 UNC X 2.5 |
| 7 | 8 | 45004 | SCREW 1/4-28 X 1/2 SSSFP |
| 8 | 1 | 53135 | SHACKLE D FORGED 5/8 THICK 3/4 PIN 7100 LB LOAD |
| 9 | 1 | 53686 | COVER BRG 3.5" HOUSING EXTERNAL |
| 10 | 1 | 53691 | ASSY BRG AND HOUSING 3.5" BB6100 |
| 11 | 1 | 53707 | SPIDER END BRG SUPPORT 3.5" BAR DIA |
| 12 | 4 | 54239 | WASHER 5/8 FLTW .7 ID 3.0 OD .5 THICK |
| 13 | 4 | 60761 | SCREW 5/8-11 X 2-1/4 HHCS FLANGED BLK OX |
| 14 | 1 | 66767 | LABEL LARGE BORING BAR CRUSH HAZARD |
| 15 | 1 | 91217 | PLATE MASS CE 1.0 X 1.0 KG ADHESIVE BACKED |

53710 - SPIDER ASSY END BRG SUPPORT 38" BB6100 - REV C

FOR REFERENCE ONLY

FIGURE 16. SPIDER BEARING ASSEMBLY END SUPPORT (P/N 53710)

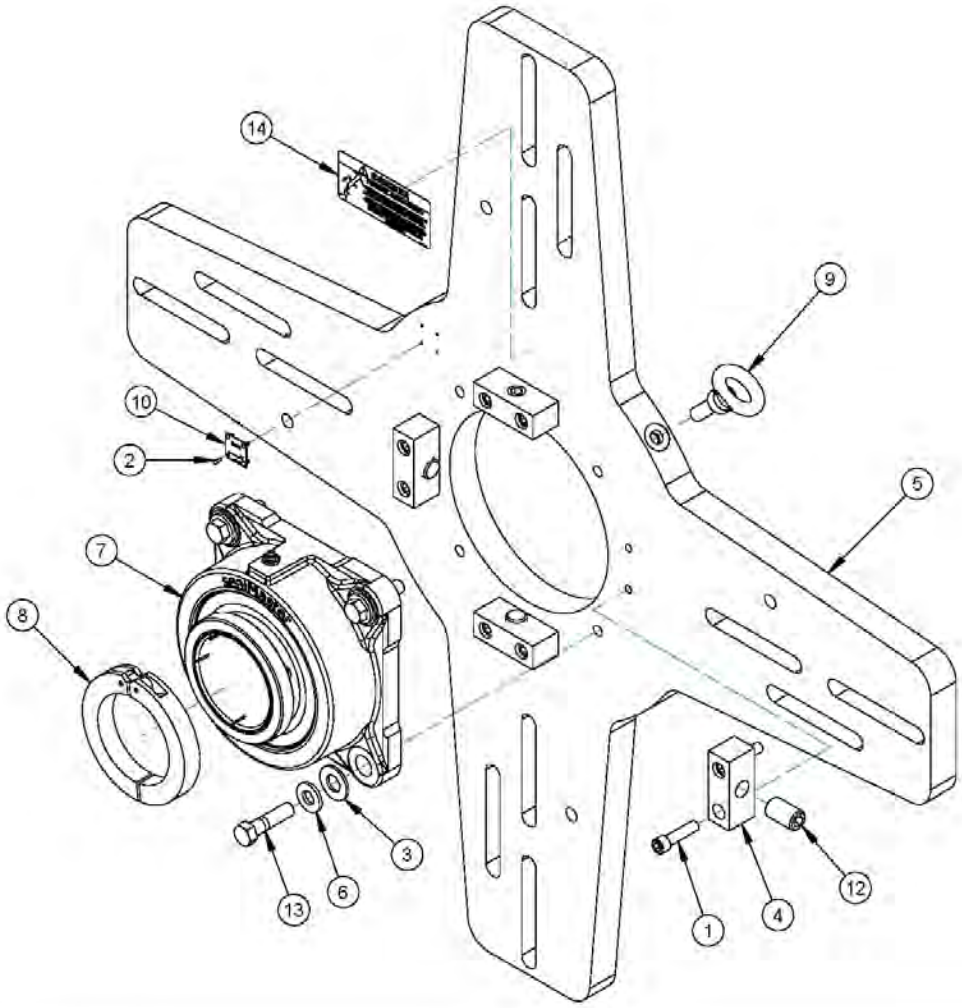



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 8 | 10191 | SCREW 3/8-16 X 1 SHCS |
| 2 | 8 | 10474 | SCREW 3/8-16 X 1-1/2 SHCS |
| 3 | 4 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 4 | 4 | 20956 | BLOCK ADJUSTING |
| 5 | 1 | 25211 | EYE LIFTING 1/2-13 |
| 6 | 4 | 27172 | WASHER SPRING BELLEVILLE 5/8 X 1-1/4 X .040 |
| 7 | 1 | 29152 | PLATE MASS CE |
| 8 | 4 | 42212 | SCREW MOD SSSCP 3/4-10 UNC X 2.5 |
| 9 | 8 | 45004 | SCREW 1/4-28 X 1/2 SSSFP |
| 10 | 1 | 53686 | COVER BRG 3.5" HOUSING EXTERNAL |
| 11 | 1 | 53691 | ASSY BRG AND HOUSING 3.5" BB6100 |
| 12 | 1 | 53839 | SPIDER END 3 ARM BRG SUPPORT 3.5" BAR DIA |
| 13 | 4 | 54239 | WASHER 5/8 FLTW .7 ID 3.0 OD .5 THICK |
| 14 | 4 | 60761 | SCREW 5/8-11 X 2-1/4 HHCS FLANGED BLK OX |
| 15 | 1 | 66767 | LABEL LARGE BORING BAR CRUSH HAZARD |

53840 - SPIDER ASSY END 3 ARM BRG SUPPORT 20" BB6100 - REV B

FOR REFERENCE ONLY

FIGURE 17. SPIDER BEARING THREE-ARM END SUPPORT ASSEMBLY (P/N 53840)

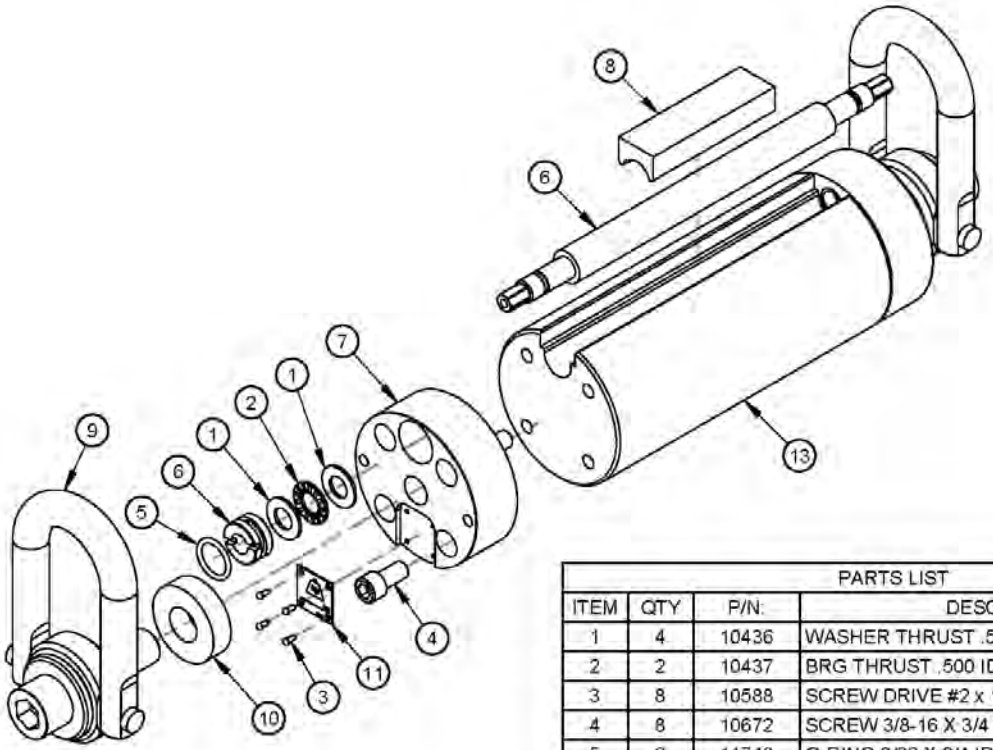



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 8 | 10474 | SCREW 3/8-16 X 1-1/2 SHCS |
| 2 | 4 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 3 | 4 | 15208 | WASHER 5/8 SAE FLTW HARDENED |
| 4 | 4 | 20956 | BLOCK ADJUSTING |
| 5 | 1 | 22092 | SPIDER PATTERN BRG SUPPORT |
| 6 | 4 | 22662 | WASHER 1/2 FLTW HARDENED 1-1/8 OD X 1/8 THK |
| 7 | 1 | 23570 | BRG ASSY 3-1/2 ID FLANGE MNT W/COLLET TYPE CLAMP |
| 8 | 1 | 25010 | CLAMP COLLAR SPLIT HINGED 3-1/2 ID |
| 9 | 1 | 25211 | EYE LIFTING 1/2-13 |
| 10 | 1 | 29152 | PLATE MASS CE |
| 11 | AR | 33304 | (NOT SHOWN) CRATE 32 X 32 X 12 5/8 PLY HINGED BB6000 & BB6100 BEARINGS |
| 12 | 4 | 38168 | SCREW MODIFIED 3/4-10 X 1.3 |
| 13 | 4 | 39179 | SCREW 1/2-13 X 2 HHHCS GRADE 8 |
| 14 | 1 | 66767 | LABEL LARGE BORING BAR CRUSH HAZARD |

22091 - ASSY BRG END MOUNT 4 ARM 3.5 DIA 38 DIA - REV A

FOR REFERENCE ONLY

FIGURE 18. 4-ARM END MOUNT BEARING ASSEMBLY (P/N 22091)




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10436 | WASHER THRUST .500 ID X .937 OD X .060 |
| 2 | 2 | 10437 | BRG THRUST .500 ID X .937 OD X .0781 |
| 3 | 8 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 4 | 8 | 10672 | SCREW 3/8-16 X 3/4 SHCS |
| 5 | 2 | 11740 | O-RING 3/32 X 3/4 ID X 15/16 OD |
| 6 | 2 | 22143 | NUT LEADSCREW BRG ADJUSTING Ø3/4 |
| 7 | 2 | 22191 | CAP END BORING BAR 3-1/2 DIA |
| 8 | 1 | 22403 | KEY DRIVE |
| 9 | 2 | 22814 | RING HOIST 3/4-10 X 1-1/2 5000 LB |
| 10 | 2 | 22815 | SPACER BOLT EYE 1/2 THK. |
| 11 | 2 | 29152 | PLATE MASS CE |
| 12 | 1 | CHART 1 | LEADSCREW 3/4 5P ACME |
| 13 | 1 | CHART 2 | BAR BORING 3-1/2 DIA |

| CHART 1 | |
|---|---|
| P/N | DESCRIPTION |
| 25216 | LEADSCREW 3/4 5P ACME 48 IN BORING BAR |
| 46242 | LEADSCREW 3/4 5P ACME 53.5 IN BORING BAR |
| 22132 | LEADSCREW 3/4 5P ACME 60 IN BORING BAR |
| 22133 | LEADSCREW 3/4 5P ACME 72 IN BORING BAR |
| 22134 | LEADSCREW 3/4 5P ACME 84 IN BORING BAR |
| 22135 | LEADSCREW 3/4 5P ACME 96 IN BORING BAR |
| 37899 | LEADSCREW 3/4 5P ACME 104 IN BORING BAR |
| 22136 | LEADSCREW 3/4 5P ACME 108 IN BORING BAR |
| 22137 | LEADSCREW 3/4 5P ACME 120 IN BORING BAR |
| 22138 | LEADSCREW 3/4 5P ACME 132 IN BORING BAR |
| 22139 | LEADSCREW 3/4 5P ACME 144 IN BORING BAR |
| 22794 | LEADSCREW 3/4 5P ACME 156 IN BORING BAR |
| 22796 | LEADSCREW 3/4 5P ACME 168 IN BORING BAR |
| 22798 | LEADSCREW 3/4 5P ACME 180 IN BORING BAR |
| 22799 | LEADSCREW 3/4 5P ACME 192 IN BORING BAR |
| 48454 | LEADSCREW 3/4 5P ACME 197 IN BORING BAR |
| 30253 | LEADSCREW 3/4 5P ACME 204 IN BORING BAR |
| 71528 | LEADSCREW 3/4 5P ACME 216 IN BORING BAR |
| 36488 | LEADSCREW 3/4 5P ACME 240 IN BORING BAR |

| CHART 2 | |
|---|---|
| P/N | DESCRIPTION |
| 25212 | BAR BORING 3-1/2 DIA X 48 |
| 46241 | BAR BORING 3-1/2 DIA X 53.5 |
| 22121 | BAR BORING 3-1/2 DIA X 60 |
| 22124 | BAR BORING 3-1/2 DIA X 72 |
| 22125 | BAR BORING 3-1/2 DIA X 84 |
| 22126 | BAR BORING 3-1/2 DIA X 96 |
| 37897 | BAR BORING 3-1/2 DIA X 104 |
| 22127 | BAR BORING 3-1/2 DIA X 108 |
| 22128 | BAR BORING 3-1/2 DIA X 120 |
| 22129 | BAR BORING 3-1/2 DIA X 132 |
| 22130 | BAR BORING 3-1/2 DIA X 144 |
| 22790 | BAR BORING 3-1/2 DIA X 156 |
| 22791 | BAR BORING 3-1/2 DIA X 168 |
| 22792 | BAR BORING 3-1/2 DIA X 180 |
| 22793 | BAR BORING 3-1/2 DIA X 192 |
| 48284 | BAR BORING 3 1/2 DIA X 197 |
| 30250 | BAR BORING 3-1/2 DIA X 204 |
| 71485 | BAR BORING 3-1/2 DIA X 216 |
| 36487 | BAR BORING 3-1/2 DIA X 240 |

71618 - CHART ASSY BORING BAR 3-1/2 DIA BB6000 - REV A

FOR REFERENCE ONLY

FIGURE 19. BORING BAR CHART ASSEMBLY (P/N 71618)

| AVAILABLE CONFIGURATIONS | |
|---|---|
| Part Number | Description |
| 22107 | ASSY BAR BORING 3-1/2 DIA X 60 LG BB6000 |
| 22108 | ASSY BAR BORING 3-1/2 DIA X 72 LG BB6000 |
| 22109 | ASSY BAR BORING 3-1/2 DIA X 84 LG BB6000 |
| 22110 | ASSY BAR BORING 3-1/2 DIA X 96 LG BB6000 |
| 22111 | ASSY BAR BORING 3-1/2 DIA X 108 LG BB6000 |
| 22112 | ASSY BAR BORING 3-1/2 DIA X 120 LG BB6000 |
| 22113 | ASSY BAR BORING 3-1/2 DIA X 132 LG BB6000 |
| 22114 | ASSY BAR BORING 3-1/2 DIA X 144 LG BB6000 |
| 22770 | ASSY BAR BORING 3-1/2 DIA X 168 LG BB6000 |
| 22777 | ASSY BAR BORING 3-1/2 DIA X 156 LG BB6000 |
| 22788 | ASSY BAR BORING 3-1/2 DIA X 180 LG BB6000 |
| 22789 | ASSY BAR BORING 3-1/2 DIA X 192 LG BB6000 |
| 24875 | ASSY BAR BORING 3-1/2 DIA X 197 LG BB6100 |
| 25221 | ASSY BAR BORING 3-1/2 DIA X 48 LG BB6000 |
| 30248 | ASSY BAR BORING 3-1/2 DIA X 204 LG BB6000 |
| 36485 | ASSY BAR BORING 3-1/2 DIA X 240 LG BB6000 |
| 37752 | ASSY BAR BORING 3-1/2 DIA X 104 LG BB6000 |
| 46239 | ASSY BAR BORING 3-1/2 DIA X 53.5 LG BB6000 |
| 71483 | ASSY BAR BORING 3-1/2 DIA X 216 LG BB6000 |

71618 - CHART ASSY BORING BAR 3-1/2 DIA BB6000 - REV A

FOR REFERENCE ONLY

FIGURE 20. BORING BAR CHART ASSEMBLY PARTS LIST (P/N 71618)

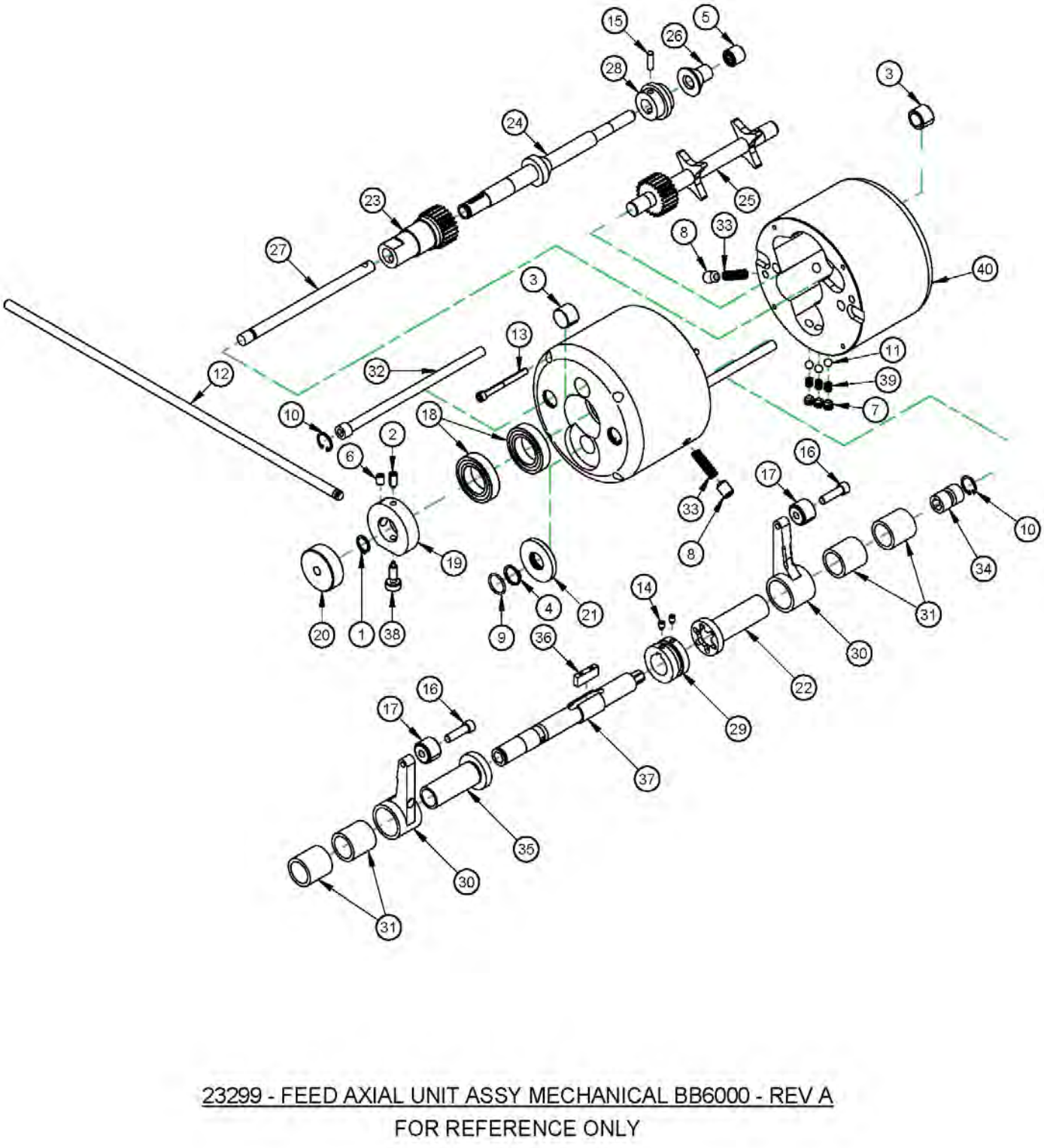



FIGURE 21. MECHANICAL AXIAL FEED UNIT ASSEMBLY (P/N 23299)

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 10829 | RING SNAP 1/2 OD |
| 2 | 1 | 10848 | PLUNGER DETENT SPRING STUBBY 1/4-20 X .531 |
| 3 | 2 | 11011 | BRG NEEDLE 1/2 ID X 11/16 OD X .500 CLOSED |
| 4 | 1 | 11019 | RING SNAP 5/8 OD X .035 THICK |
| 5 | 1 | 11021 | BRG NEEDLE 3/8 ID X 9/16 OD X .500 OPEN |
| 6 | 1 | 11325 | SCREW 1/4-20 X 3/8 SSSCP |
| 7 | 3 | 11671 | SCREW 5/16-18 X 1/4 SSSFP |
| 8 | 2 | 11722 | SCREW 3/8-16 X 1/2 SSSCP |
| 9 | 1 | 12583 | RING O 1/16 X 5/8 ID X 3/4 OD |
| 10 | 3 | 13530 | RING SNAP 5/8 ID |
| 11 | 3 | 14203 | BALL 1/4 DIA STEEL |
| 12 | 1 | 14303 | ROD-STOP |
| 13 | 4 | 14779 | SCREW 10-32 X 2 SHCS |
| 14 | 2 | 15395 | SCREW 10-32 X 1/4 SSSHDP |
| 15 | 1 | 16953 | PIN DOWEL 3/16 DIA X 5/8 |
| 16 | 2 | 17131 | SCREW 1/4-20 X 7/8 SHCS |
| 17 | 2 | 18203 | BRG CAM FOLLOWER .750 OD X .500 WIDE OPEN (VMI) |
| 18 | 2 | 21295 | BRG BALL .9843 ID X 1.6535 OD X .3543 W/SEALS |
| 19 | 1 | 22307 | HUB TORQUE |
| 20 | 1 | 22406 | KNOB FEED ADJUST |
| 21 | 1 | 22409 | DIAL FEED |
| 22 | 1 | 23258 | BUSHING FEED DIRECTION |
| 23 | 1 | 23260 | GEAR CAM DRIVE |
| 24 | 1 | 23261 | SHAFT FEED ADJUSTING |
| 25 | 1 | 23262 | CAMSHAFT AXIAL FEED |
| 26 | 1 | 23263 | CONE FEED ADJUST |
| 27 | 1 | 23264 | ROD FEED DIRECTION |
| 28 | 1 | 23265 | SLIDE FEED DIRECTION MASTER |
| 29 | 1 | 23266 | SLIDE FEED DIRECTION SLAVE |
| 30 | 2 | 23267 | ARM RATCHET |
| 31 | 4 | 23268 | BRG ROLLER CLUTCH .79 X 1.02 OD X 1.024 (VMI) |
| 32 | 2 | 23319 | SCREW 5/16-18 X 6-1/2 SHCS |
| 33 | 2 | 23536 | SPRING .30 OD X .045 WIRE X 1.50 LONG |
| 34 | 1 | 23659 | FUSE AXIAL FEED 3-1/2 BAR |
| 35 | 1 | 24940 | BUSHING FEED DIRECTION |
| 36 | 1 | 25205 | KEY MAIN DRIVE 3/16 X 3/8 |
| 37 | 1 | 25206 | SHAFT OUTPUT BB6000 BB6100 |
| 38 | 1 | 25448 | PLUNGER HAND RETRACTABLE 1/4-20 |
| 39 | 3 | 26544 | SPRING .24 OD X .022 WIRE X .5 |
| 40 | 1 | 41557 | BOX AXIAL FEED MECHAINICAL BB6000 |

23299 - FEED AXIAL UNIT ASSY MECHANICAL BB6000 - REV A

FOR REFERENCE ONLY

FIGURE 22. MECHANICAL AXIAL FEED UNIT ASSEMBLY PARTS LIST (P/N 23299)

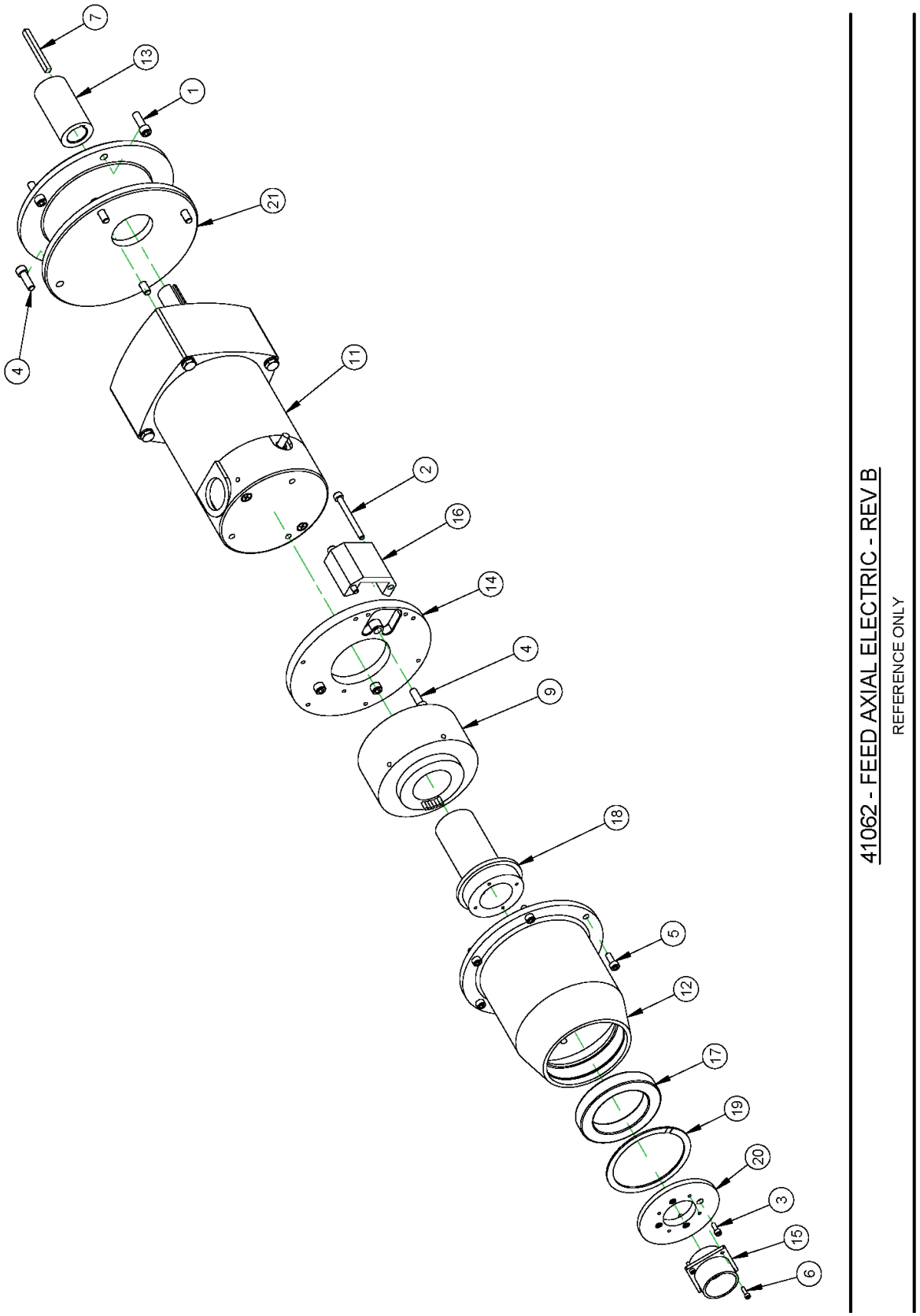



FIGURE 23. ELECTRIC AXIAL FEED ASSEMBLY (P/N 41062)

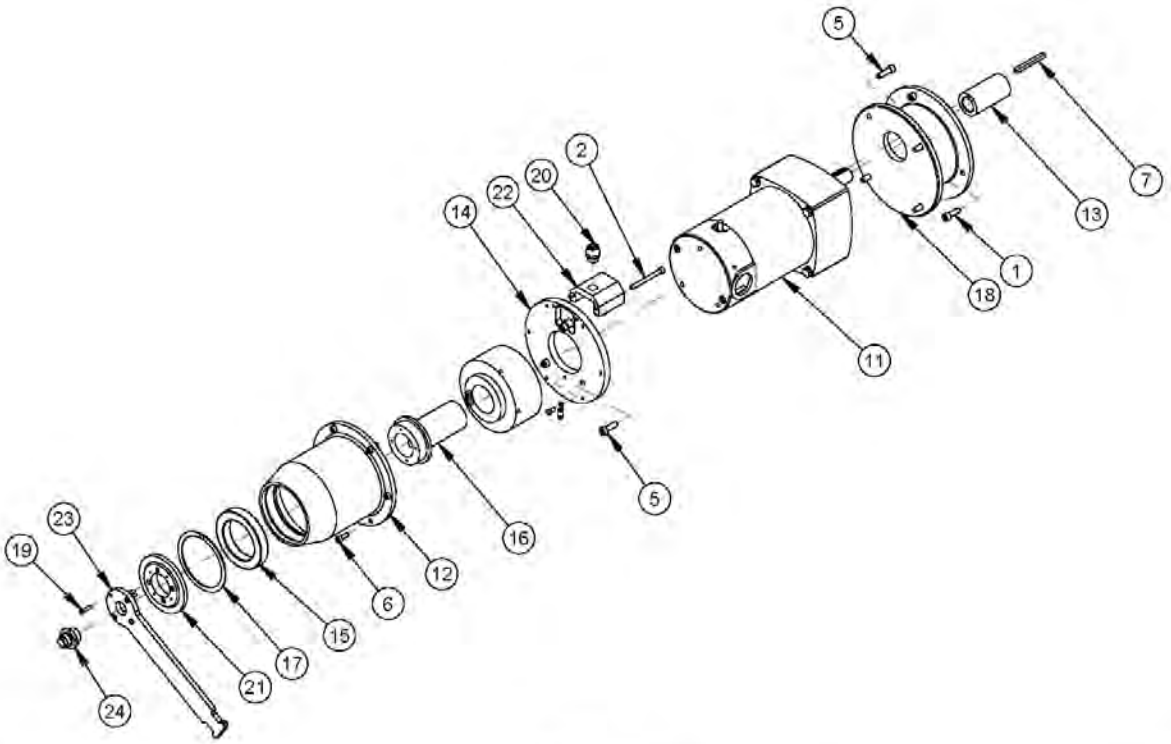
PARTS LIST

| ITEM | QTY | P/N: | DESCRIPTION |
|---|---|---|---|
| 1 | 4 | 10160 | SCREW 1/4-20 X 3/4 SHCS |
| 2 | 2 | 10229 | SCREW 10-24 X 2 SHCS |
| 3 | 4 | 10838 | SCREW 6-32 X 3/8 SHCS |
| 4 | 7 | 12647 | SCREW 1/4-28 X .75 SHCS |
| 5 | 6 | 12743 | SCREW 10-24 X 1/2 SHCS |
| 6 | 4 | 19829 | SCREW 4-40 X 3/8 SHCS |
| 7 | 1 | 20969 | KEY 3/16 SQ X 2 SQ BOTH ENDS |
| 8 | 3 | 29435 | (NOT SHOWN) TUBE SHRINK .375 DIA BLACK |
| 9 | 1 | 32371 | RING SLIP |
| 10 | 3 | 36363 | (NOT SHOWN) TERMINAL SPLICE 16-10AWG CLOSED END |
| 11 | 1 | 39012 | MOTOR MODIFIED AXIAL FEED |
| 12 | 1 | 39018 | BRACKET SLIP RING MOUNT |
| 13 | 1 | 39030 | COUPLING MOTOR SHAFT |
| 14 | 1 | 39051 | ADAPTER SLIP RING TO BODINE MOTOR |
| 15 | 1 | 39058 | CONNECTOR FLANGED RECEPT 4 POLE .22-10P |
| 16 | 1 | 39064 | COVER ELECTRIC MOTOR CABLE |
| 17 | 1 | 39124 | BEARING BALL 2.1654 ID X 3.1496 OD X .5118 |
| 18 | 1 | 39126 | ADAPTER SLIPRING CONNECTOR |
| 19 | 1 | 39131 | RING SNAP 3.149 ID (80mm) SPIRAL MED DUTY |
| 20 | 1 | 39676 | RETAINER BEARING |
| 21 | 1 | 41063 | PLATE ADAPTER AXIAL FEED MOTOR |

41062 - FEED AXIAL ELECTRIC - REV B

REFERENCE ONLY

FIGURE 24. ELECTRIC AXIAL FEED ASSEMBLY PARTS LIST (P/N 41062)




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10160 | SCREW 1/4-20 X 3/4 SHCS |
| 2 | 2 | 10229 | SCREW 10-24 X 2 SHCS |
| 3 | 4 | 10838 | SCREW 6-32 X 3/8 SHCS |
| 4 | 1 | 11359 | SCREW 8-32 X 3/8 BHSCS |
| 5 | 7 | 12647 | SCREW 1/4-28 X .75 SHCS |
| 6 | 6 | 12743 | SCREW 10-24 X 1/2 SHCS |
| 7 | 1 | 20969 | KEY 3/16 SQ X 2 SQ BOTH ENDS |
| 8 | 12 | 22800 | (NOT SHOWN) TUBE SHRINK .125 DIA BLACK |
| 9 | 1 | 28546 | TERMINAL RING 16-14AWG X #8 VINYL INSLTD BLUE |
| 10 | 1 | 32371 | RING SLIP |
| 11 | 1 | 39012 | MOTOR MODIFIED AXIAL FEED |
| 12 | 1 | 39018 | BRACKET SLIP RING MOUNT |
| 13 | 1 | 39030 | COUPLING MOTOR SHAFT |
| 14 | 1 | 39051 | ADAPTER SLIP RING TO BODINE MOTOR |
| 15 | 1 | 39124 | BEARING BALL 2.1654 ID X 3.1496 OD X .5118 |
| 16 | 1 | 39126 | ADAPTER SLIPRING CONNECTOR |
| 17 | 1 | 39131 | RING SNAP 3.149 ID (80mm) SPIRAL MED DUTY |
| 18 | 1 | 41063 | PLATE ADAPTER AXIAL FEED MOTOR |
| 19 | 4 | 62944 | SCREW 6-32 X 5/8 BHSCS |
| 20 | 1 | 86666 | RECEPTACLE EUROFAST FEMALE 4 PIN FRONT MOUNT 1/4 NPT THD 0.5M LEADS |
| 21 | 1 | 86687 | RETAINER BEARING |
| 22 | 1 | 86688 | COVER ELECTRIC MOTOR CABLE |
| 23 | 1 | 86690 | ARM ROTATION RESTRAINT |
| 24 | 1 | 89741 | RECEPTACLE TURCK VERSAFAST 6 CONDUCTOR 0.5M LEADS FRONT PANEL MOUNT M20X X1.5 THREAD |

86681 - FEED AXIAL ELECTRIC - REV A

FOR REFERENCE ONLY

FIGURE 25. ELECTRIC AXIAL FEED ASSEMBLY (P/N 86681)

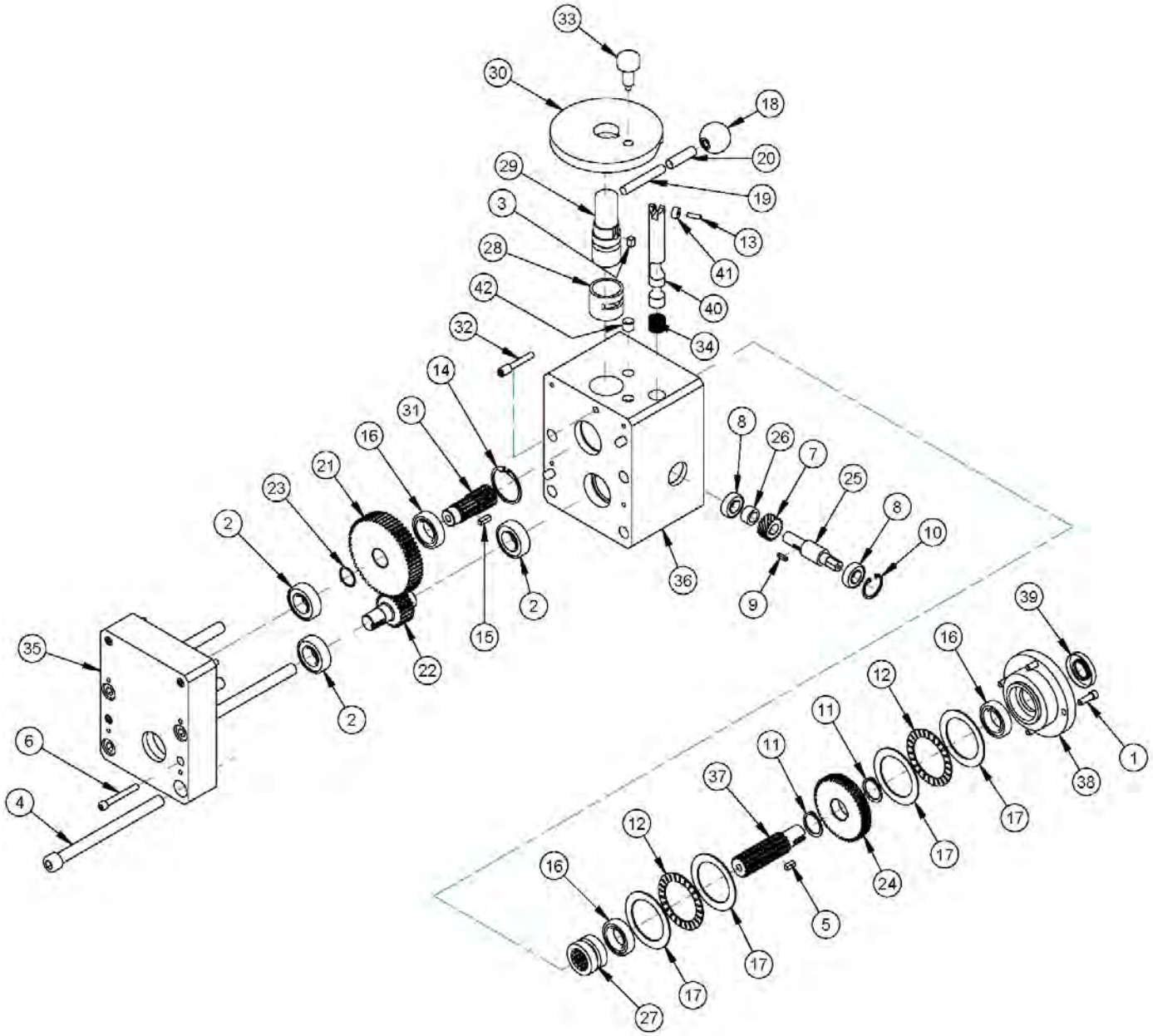



FIGURE 26. MECHANICAL FEED ASSEMBLY FOR ELECTRIC AXIAL FEED (P/N 41064)

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10160 | SCREW 1/4-20 X 3/4 SHCS |
| 2 | 3 | 10807 | BRG BALL .7874 ID X 1.6535 OD X .4724 W/SEALS |
| 3 | 1 | 10854 | KEY 1/4 SQ X .37 SQ BOTH ENDS |
| 4 | 4 | 11695 | SCREW 1/2-13 X 6-1/2 SHCS |
| 5 | 1 | 12361 | KEY 3/16 SQ X .50 SQ BOTH ENDS |
| 6 | 4 | 12444 | SCREW 1/4-20 X 2 SHCS |
| 7 | 1 | 12881 | GEAR HELICAL 16DP 16T 14.5PA 45HA RH .5 STL H |
| 8 | 2 | 14034 | BRB BALL .5000 ID X 1.125 OD X .3125 |
| 9 | 1 | 14788 | KEY 1/8 SQ X .50 SQ BOTH ENDS |
| 10 | 1 | 14980 | RING SNAP 1-1/8 ID |
| 11 | 2 | 15729 | RING SNAP 63/64 OD (25mm) |
| 12 | 2 | 16177 | BRB THRUST 2.000 ID X 2.750 OD X .0781 |
| 13 | 1 | 16953 | PIN DOWEL 3/16 DIA X 5/8 |
| 14 | 1 | 17857 | RING SNAP INT. 42MM X .062 |
| 15 | 1 | 18146 | KEY 3/16 SQ X .62 SQ BOTH ENDS |
| 16 | 3 | 21295 | BRG BALL .9843 ID X 1.6535 OD X .3543 W/SEALS |
| 17 | 4 | 30021 | WASHER THRUST 2.000 ID X 2.750 OD X .060 |
| 18 | 1 | 33526 | KNOB BALL 1-3/8 DIA 3/8-16 THD |
| 19 | 1 | 35507 | STUD HANDLE |
| 20 | 1 | 35508 | FERRULE HANDLE |
| 21 | 1 | 39017 | GEAR SPUR 16DP 60T 2-PA .745 X .875LG STEEL |
| 22 | 1 | 39029 | GEAR SPUR SHAFT INFO |
| 23 | 1 | 39074 | RING SNAP 7/8 OD SPIRAL MED DUTY |
| 24 | 1 | 40371 | GEAR HELICAL STEEL MODIFIED |
| 25 | 1 | 40380 | PINION SHAFT |
| 26 | 1 | 40382 | SPACER |
| 27 | 1 | 40383 | SPLINE COUPLING |
| 28 | 1 | 40384 | BUSHING OILITE 1-1/4 (1.254) ID X 1-1/2 (1.504) OD X 1-1/4 |
| 29 | 1 | 40394 | ROD SHIFT |
| 30 | 1 | 40395 | SHIFT PLATE |
| 31 | 1 | 40397 | SHAFT DRIVE INVOLUTE SPLINE 1 INCH 15T 16/32 |
| 32 | 1 | 40398 | LOCK SCREW |
| 33 | 1 | 40402 | PLUNGER SPRING 1/12-13 X .88 KNURLED KNOB BRASS |
| 34 | 1 | 40472 | SPRING COMP .734 OD .050 WIRE X 1.31 LG |
| 35 | 1 | 41065 | COVER GEARBOX HOUSING MECH RAPID |
| 36 | 1 | 41066 | BOX GEAR MAIN HOUSING MECH RAPID |
| 37 | 1 | 42593 | SHAFT SPLINE OUTPUT 3/4 OD KEYED |
| 38 | 1 | 42598 | CAP SEAL AND GEAR COVER |
| 39 | 1 | 42602 | SEAL .750 ID X 1.625 OD X .25 WIDE CRW1 |
| 40 | 1 | 42631 | ROD PUSH STOP RAPID FEED LOCKOUT |
| 41 | 1 | 42642 | BUSHING DRILL 3/16 ID X 1/2 OD X 1/4 |
| 42 | 2 | 42647 | BUSHING DRILL 17/64 ID X 1/2 OD X 3/8 |

41064 - ASSY MECHANICAL FEED FOR ELECTRIC AXIAL FEED - REV B

FOR REFERENCE ONLY

FIGURE 27. MECHANICAL FEED ASSEMBLY PARTS LIST FOR ELECTRIC AXIAL FEED (P/N 41064)

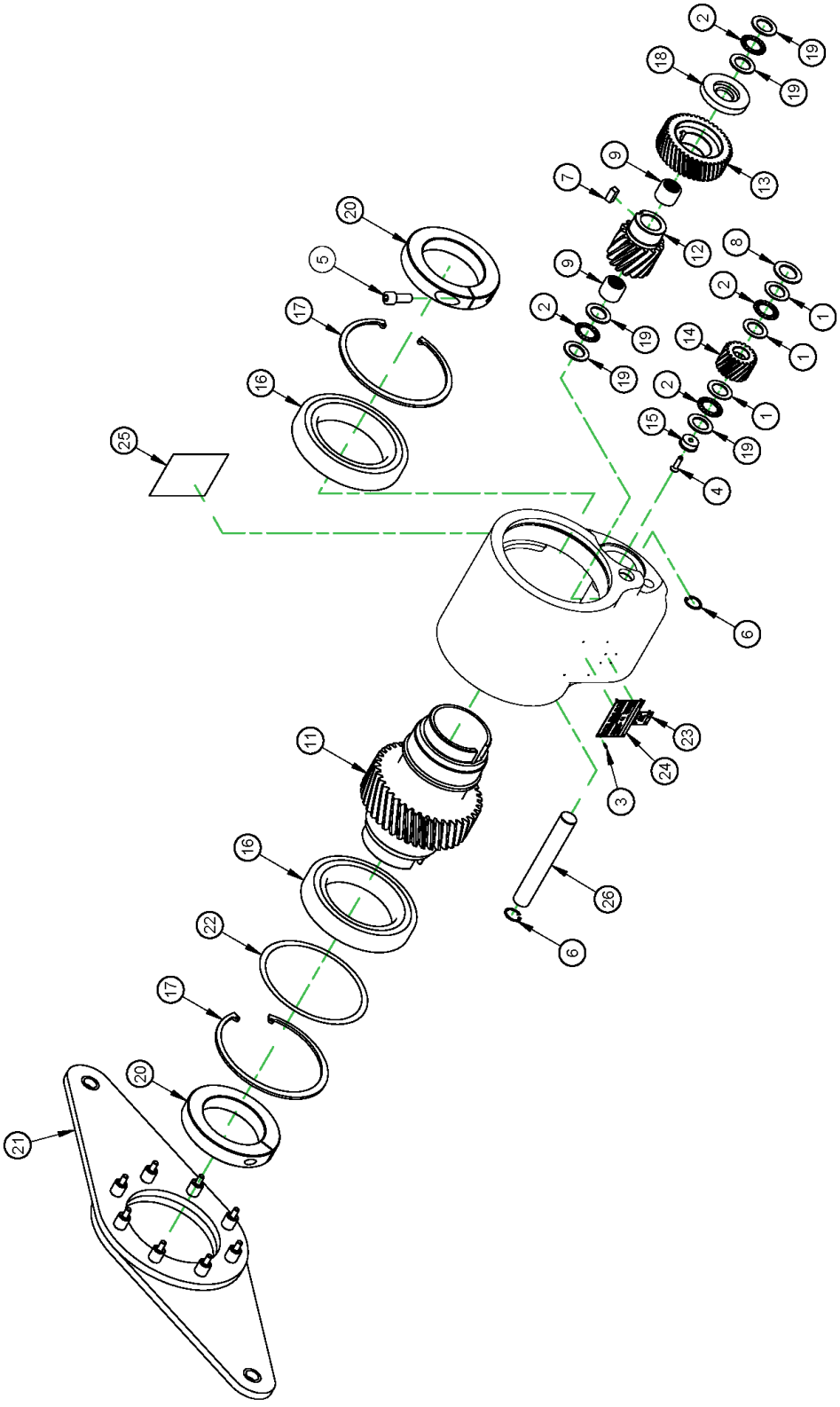



FIGURE 28. ROTATIONAL DRIVE ASSEMBLY (P/N 22221)

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 3 | 10144 | WASHER THRUST 1 ID X 1.562 OD X .060 |
| 2 | 4 | 10145 | BRG THRUST 1 ID X 1.562 OD X .0781 |
| 3 | 8 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 4 | 1 | 10888 | SCREW 1/4-20 X 1 FHSCS |
| 5 | 2 | 12646 | SCREW 1/2-13 X 1-1/4 SHCS |
| 6 | 2 | 13693 | RING SNAP 1 DI |
| 7 | 1 | 15047 | KEY 3/8 SQ X .87 SQ BOTH ENDS |
| 8 | 1 | 17786 | WASHER THRUST 1.125 X 1.75 X .095 |
| 9 | 2 | 17953 | BRG NEEDLE 1 ID X 1-5/16 OD X 1.000 OPEN |
| 11 | 1 | 22224 | DRIVE HUB 40 TOOTH GEAR |
| 12 | 1 | 22225 | GEAR HELICAL 6 DP 15 T 20 PA 23 HA LH 216 STEEL |
| 13 | 1 | 22226 | GEAR HELICAL 10 DP 42 T 20 PA 23 HA LH 1.362STL |
| 14 | 1 | 22227 | GEAR HELICAL 10 DP 19 T 20 PA 23 HA RH 1.4 STLA |
| 15 | 1 | 22228 | RETAINER PINION |
| 16 | 2 | 22385 | BEARING BALL 4.7244 ID X 7.0866 OD X 1.102 2 SEAL |
| 17 | 2 | 22386 | RING SNAP 7 ID |
| 18 | 1 | 22392 | RETAINER THRUST BEARING |
| 19 | 5 | 22402 | WASHER THRUST 1.000 ID X 1.562 OD X .095 |
| 20 | 2 | 22571 | CLAMP COLLAR SPLIT HINGED 4 ID |
| 21 | 1 | 22604 | ARM TORQUE ASSY |
| 22 | 1 | 25814 | SHIM SET 7.00 OD X 6.25 ID X .010 & .005 |
| 23 | 1 | 29152 | PLATE MASS CE |
| 24 | 1 | 29154 | PLATE SERIAL YEAR MODEL CE 2.0 X 3.0 |
| 25 | 1 | 34735 | LABEL WARNING 3-1/2 X 4 |
| 26 | 1 | 68605 | STEEL 1 DIA X 7 CLASS N THOMSON SHAFT |
| 10 | 1 | 22222 | HOUSING RDU BB6000 |

22221 - ASSY DRIVE ROTATIONAL 6:1 BB6000 - REV B

FOR REFERENCE ONLY

FIGURE 29. ROTATIONAL DRIVE ASSEMBLY PARTS LIST (P/N 22221)

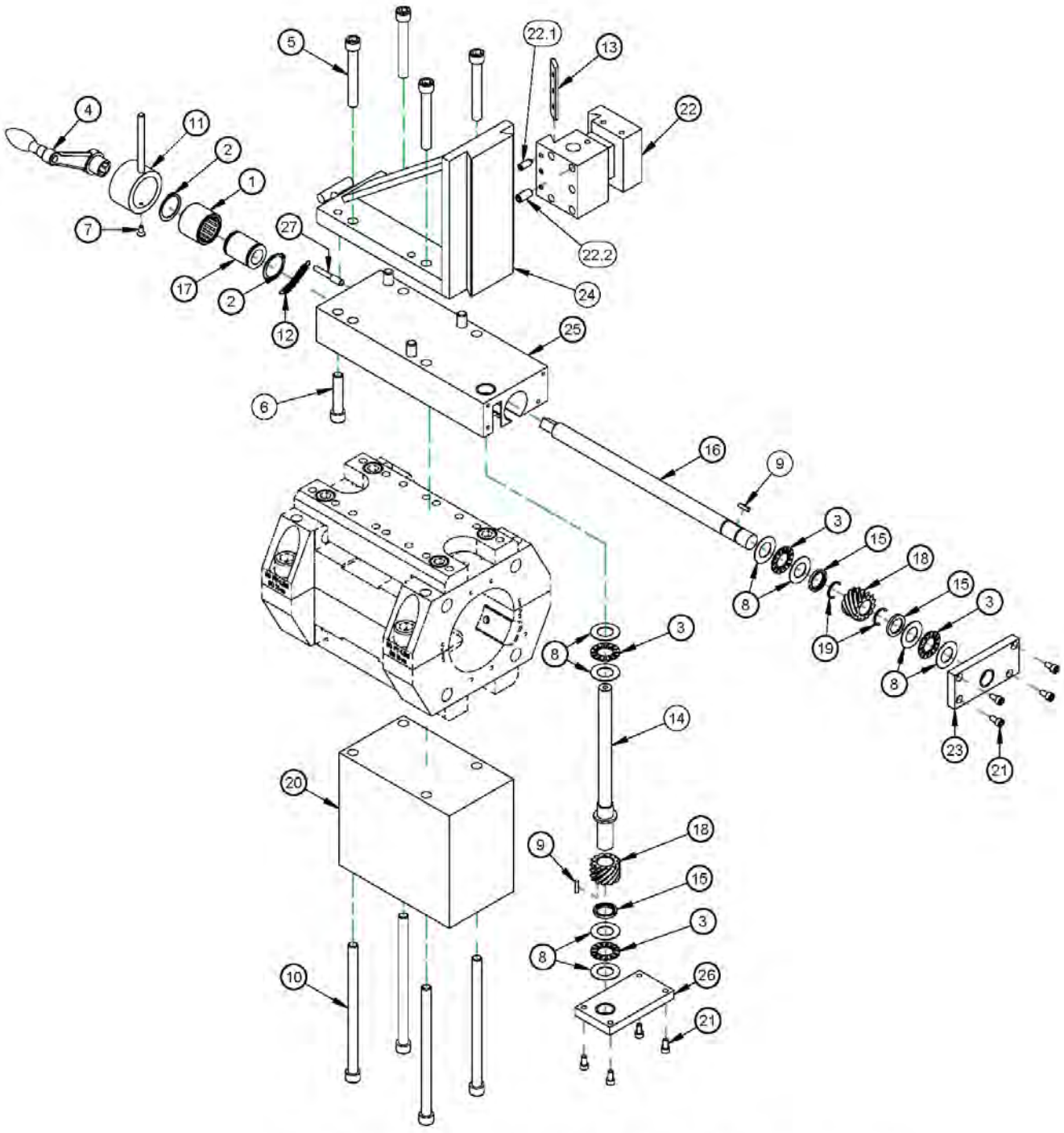



FIGURE 30. FACING HEAD CHART ASSEMBLY (P/N 75682)

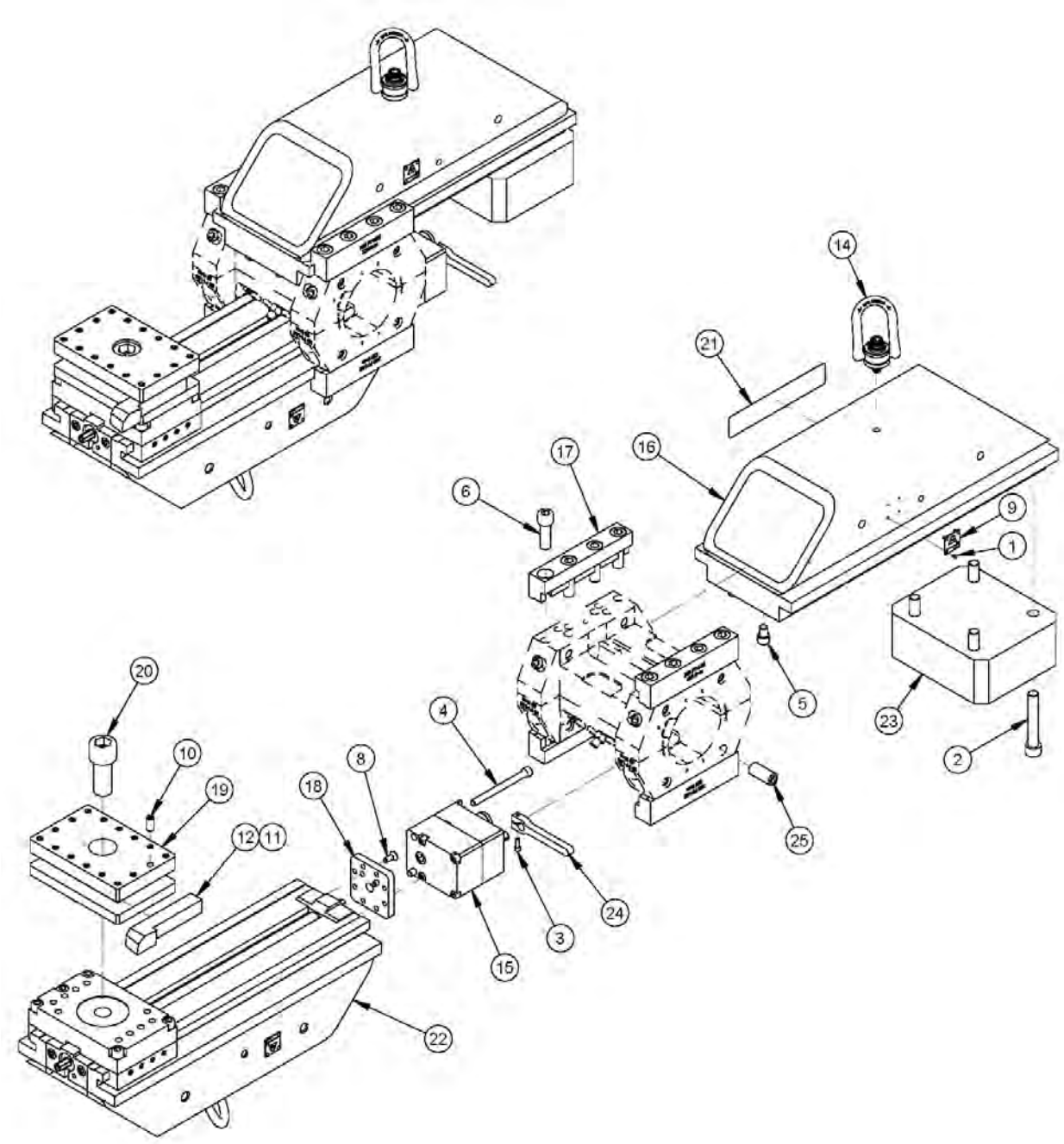
| AVAILABLE CONFIGURATIONS | |
|---|---|
| P/N | DESCRIPTION |
| 22680 | ASSY FACING HEAD 4 INCH TRAVEL BB6 BB7 |
| 49753 | ASSY FACING HEAD 6 INCH TRAVEL BB6 BB7 |
| 49754 | ASSY FACING HEAD 8 INCH TRAVEL BB6 BB7 |

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 10532 | BRG ROLLER CLUTCH 1 ID X 1-5/16 OD X 1.063 |
| 2 | 2 | 10534 | RING SNAP 1 OD |
| 3 | 4 | 10538 | BRG THRUST .625 ID X 1.125 OD X .0781 |
| 4 | 1 | 11020 | HANDLE CRANK STRAIGHT 10MM SQUARE |
| 5 | 4 | 11053 | SCREW 3/8-16 X 2-3/4 SHCS |
| 6 | 4 | 11211 | SCREW 3/8-16 X 1-3/4 SHCS |
| 7 | 1 | 11259 | SCREW 8-32 X 3/8 FHSCS |
| 8 | 8 | 11823 | WASHER THRUST .625 ID X 1.125 OD X .030 |
| 9 | 2 | 14788 | KEY 1/8 SQ X .50 SQ BOTH ENDS |
| 10 | 4 | 15613 | SCREW 3/8-16 X 6 SHCS |
| 11 | 1 | 18399 | HOUSING CLUTCH AXIAL |
| 12 | 1 | 18432 | SPRING EXTENSION .24 OD X .026 WIRE X 1.250 |
| 13 | 1 | 19099 | GIB CARRIER TOOL BB8000 FACING HEAD |
| 14 | 1 | 19104 | LEADSCREW ASSY FACING HEAD 4 INCH STROKE |
| | | 41098 | LEADSCREW ASSY FACING HEAD 6 INCH STROKE |
| | | 43366 | LEADSCREW ASSY FACING HEAD 8 INCH STROKE |
| 15 | 3 | 19105 | SPACER |
| 16 | 1 | 19110 | SHAFT DRIVE |
| 17 | 1 | 19112 | COLLAR FEED CLUTCH |
| 18 | 2 | 19122 | GEAR HELICAL 12DP 12T 14.5PA 45HA RH .75 STLH |
| 19 | 2 | 19130 | RING SNAP 5/8 OD LOW PROFILE |
| 20 | 1 | 19223 | COUNTERWEIGHT FACING ASSY |
| 21 | 8 | 19232 | SCREW 10-24 X 3/8 SHCS |
| 22 | 1 | 22685 | CARRIER TOOL |
| 22.1 | 3 | 10189 | SCREW 1/4-20 X 5/8 SSSHDPPL |
| 22.2 | 5 | 11684 | SCREW 5/16-18 X 3/4 SSSCP |
| 23 | 1 | 22686 | PLATE END DRIVE SHAFT |
| 24 | 1 | 22687 | SLIDE FACING HEAD 4 INCH TRAVEL BB6000 |
| | | 41097 | SLIDE FACING HEAD 6 INCH TRAVEL BB6000 |
| | | 43364 | SLIDE FACING HEAD 8 INCH TRAVEL BB6000 |
| 25 | 1 | 22688 | BASE PLATE FACING HEAD |
| 26 | 1 | 22689 | PLATE END LEADSCREW |
| 27 | 1 | 28953 | PIN DOWEL MODIFIED |

75682 - CHART FACING HEAD 4 THRU 8 INCH TRAVEL BB6 BB7 - REV A

FOR REFERENCE ONLY

FIGURE 31. FACING HEAD CHART ASSEMBLY PARTS LIST (P/N 75682)




| AVAILABLE CONFIGURATIONS | |
|---|---|
| PART No. | DESCRIPTION |
| 54385 | BORING/FACING SLIDE ARM SET 18" BB6100 (SHOWN) |
| 54386 | BORING/FACING SLIDE ARM SET 23" BB6100 |

81561 - CHART BORING/FACING SLIDE ARM SET BB6100 - REV A

FOR REFERENCE ONLY

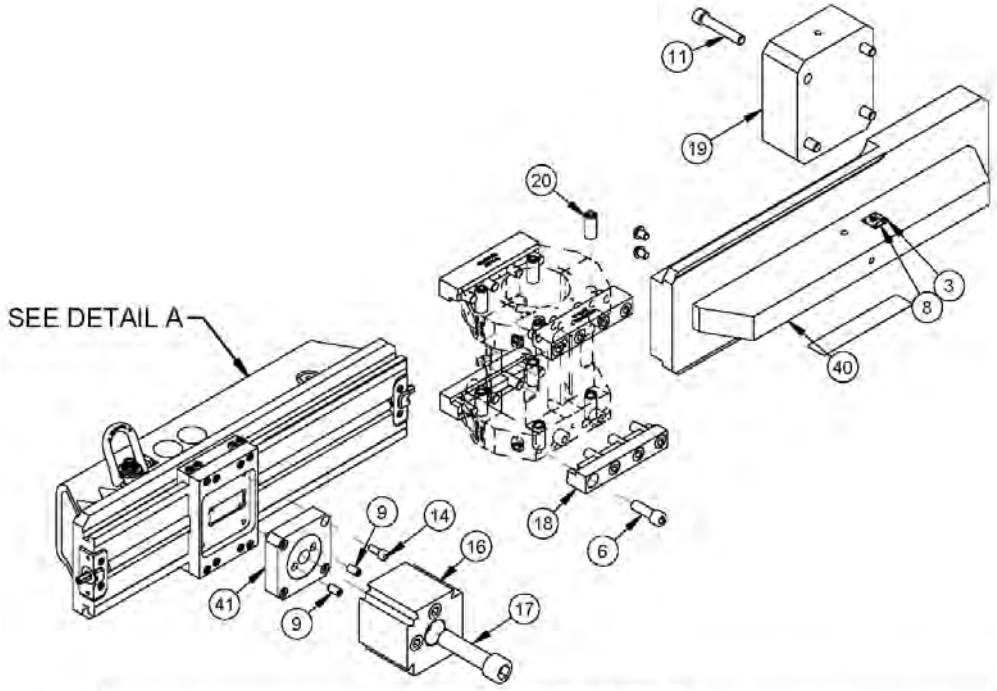
FIGURE 32. BORING/FACING SLIDE ARM SET ASSEMBLY (P/N 81561)

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 2 | 4 | 11696 | SCREW 1/2-13 X 3 SHCS |
| 3 | 1 | 11845 | SCREW 8-32 x 1/2 SHCS |
| 4 | 2 | 11873 | SCREW 5/16-18 X 3-1/2 SHCS |
| 5 | 2 | 16403 | SCREW 3/8-16 X 1/2 SHCS |
| 6 | 16 | 16559 | SCREW 1/2-20 X 1-1/2 SHCS |
| 7 | 1 | 19700 | (NOT SHOWN) CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5 |
| 8 | 2 | 22496 | SCREW 1/4-20 X 5/8 FHSCS |
| 9 | 1 | 29152 | PLATE MASS CE |
| 10 | 16 | 29378 | SCREW 3/8-16 X 3/4 SSSFP |
| 11 | 1 | 40463 | HOLDER INSERT 80 DEG NEGATIVE L/H 3/4 SHANK |
| 12 | 1 | 40787 | HOLDER INSERT 80 DEG NEG R/H |
| 13 | 10 | 41407 | (NOT SHOWN) INSERT CARBIDE 80 DEG 1/2 IC 1/64 NOSE RADIUS KC5010 |
| 14 | 1 | 41471 | HOIST RING 3/8-16 X .56 1.3 ID 2.18 OD 3.79 OAL 1000 LBS SWIVEL |
| 15 | 1 | 45691 | ASSY FEEDBOX REVERSE CLUTCH INPUT |
| 16 | 1 | 53893 | COUNTERWEIGHT ARM 18 INCH BB6100 & BB7100 |
| | | 54255 | COUNTERWEIGHT ARM 23 INCH BB6100 & BB7100 |
| 17 | 4 | 54219 | CLAMP SLIDE ARM BB6100 |
| 18 | 1 | 54867 | PLATE ADAPTER FEEDBOX |
| 19 | 1 | 54910 | TOOL POST ROTATING 3/4IN TOOLING 4IN SQUARE BB6100 |
| 20 | 1 | 54924 | SCREW 7/8-14 X 2 SHCS |
| 21 | 1 | 54939 | LABEL COUNTERWEIGHT ARM 18" |
| | | 54940 | LABEL COUNTERWEIGHT ARM 23" |
| 22 | 1 | 54955 | ASSEMBLY 18IN SLIDE ARM |
| | | 54956 | ASSEMBLY 23IN SLIDE ARM |
| 23 | 1 | 54997 | COUNTERWEIGHT BB6100 |
| 24 | 1 | 55094 | TRIP ARM STEEL 3 INCH |
| 25 | 8 | 55564 | SCREW ASSY 5/8-18 X 1-1/2 SSSFP WITH NYLON BALL TIP |

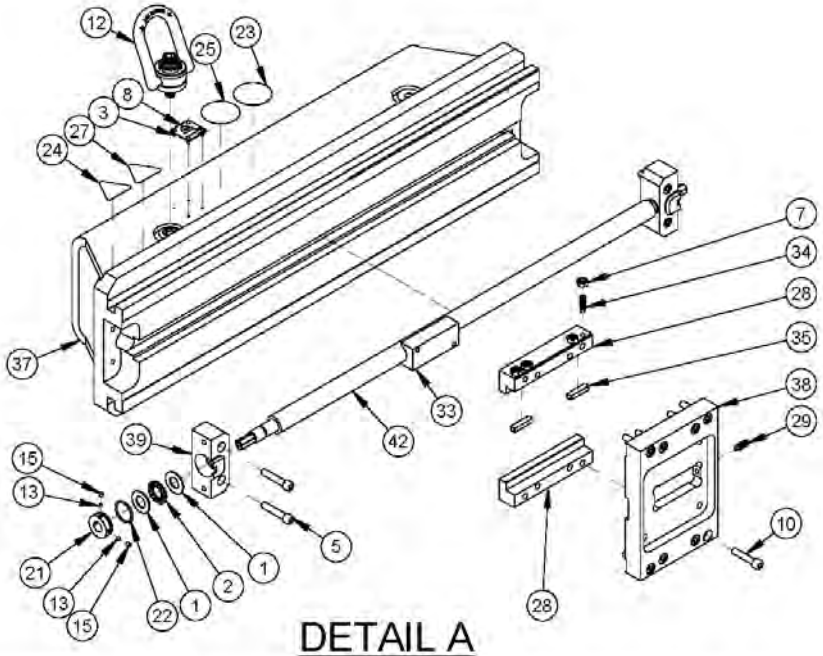
## 81561 - CHART BORING/FACING SLIDE ARM SET BB6100 - REV A

## FOR REFERENCE ONLY

FIGURE 33. BORING/FACING SLIDE ARM SET ASSEMBLY PARTS LIST (P/N 81561)




| AVAILABLE CONFIGURATIONS | | | | | | |
|---|---|---|---|---|---|---|
| PART NO | DESCRIPTION | ITEM 37 | ITEM 40 | ITEM 42 | ITEM 43 | ITEM 44 |
| 86646 | BORING/FACING ARM SET 23 IN | 86585 | 86652 | 86731 | 86795 | 86796 |




DETAIL A

86638 - CHART ASSY BORING/FACING TOOL ARM - REV -

FOR REFERENCE ONLY

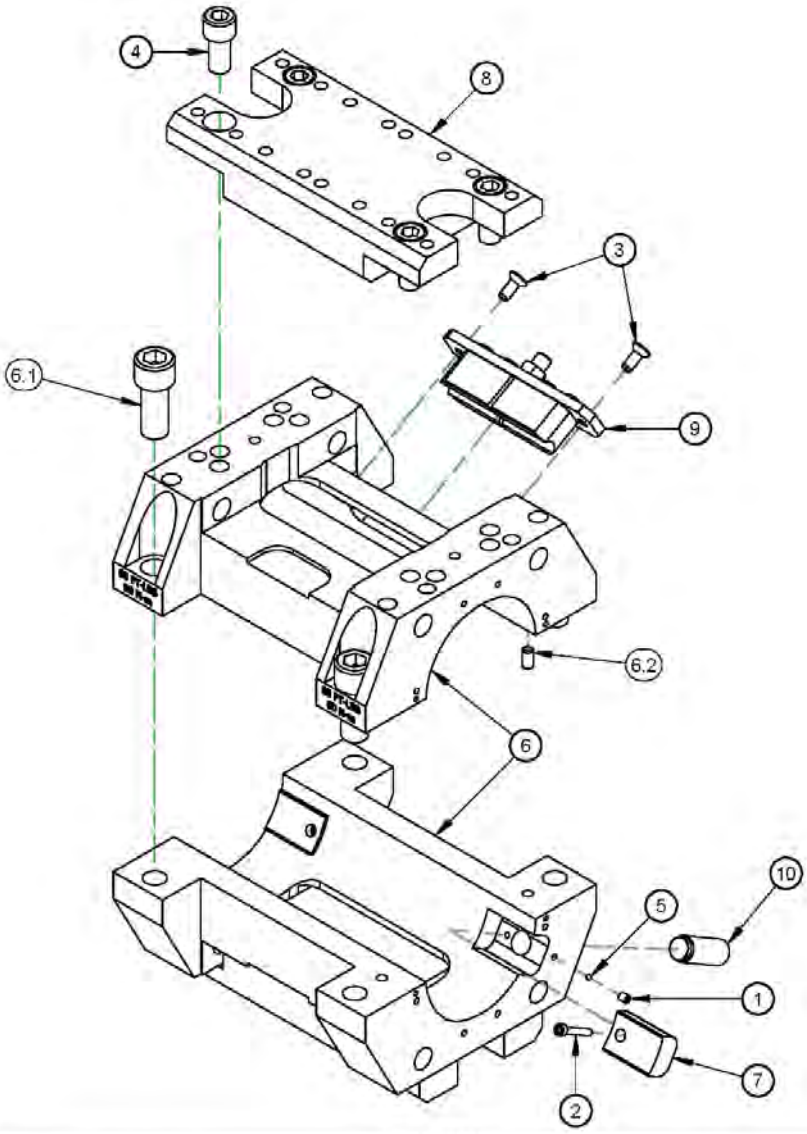
FIGURE 34. BORING/FACING TOOL ARM CHART ASSEMBLY (P/N 86638)

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10436 | WASHER THRUST .500 ID X .937 OD X .060 |
| 2 | 2 | 10437 | BRG THRUST .500 ID X .937 OD X .0781 |
| 3 | 8 | 10588 | SCREW DRIVE #2 x 1/4 HOLE SIZE .089 |
| 4 | 2 | 10650 | SCREW 3/8-16 X 1/2 BHSCS |
| 5 | 4 | 10671 | SCREW 1/4-20 X 1-1/4 SHCS |
| 6 | 16 | 16559 | SCREW 1/2-20 X 1-1/2 SHCS |
| 7 | 4 | 20772 | NUT M6 X 1.0 STDN ZINC PLATED |
| 8 | 2 | 29152 | PLATE MASS CE |
| 9 | 2 | 29378 | SCREW 3/8-16 X 3/4 SSSFP |
| 10 | 8 | 35505 | SCREW M6 X 1.0 X 30 SHCS |
| 11 | 4 | 40282 | SCREW 1/2-13 X 2-3/4 |
| 12 | 1 | 41471 | HOIST RING 3/8-16 X .56 1.3 ID 2.18 OD 3.79 OAL 1000 LBS SWIVEL |
| 13 | 4 | 43489 | BALL NYLON 1/8 DIA |
| 14 | 4 | 50458 | SCREW M8 X 1.25 X 20mm SHCS |
| 15 | 4 | 53365 | SCREW M4 X 0.7 X 4 mm SSSFP |
| 16 | 1 | 53451 | QUICK CHANGE TOOL POST MODIFIED |
| 17 | 1 | 53455 | SCREW 7/8 -14 X 3-1/2 SHCS |
| 18 | 4 | 54219 | CLAMP SLIDE ARM BB6100 |
| 19 | 1 | 54997 | COUNTERWEIGHT BB6100 |
| 20 | 8 | 55564 | SCREW ASSY 5/8-18 X 1-1/2 SSSFP WITH NYLON BALL TIP |
| 21 | 2 | 57214 | BRG RETAINING NUT AXIAL FEED LEADSCREW |
| 22 | 2 | 57320 | RING O 1/16 X 13/16 ID X 15/16 OD |
| 23 | 1 | 59035 | LABEL WARNING - WEAR EYE PROTECTION |
| 24 | 1 | 59042 | LABEL WARNING - HAND CRUSH/MOVING PARTS |
| 25 | 1 | 59044 | LABEL WARNING - CONSULT OPERATOR'S MANUAL 1.5 DIA |
| 26 | 1 | 70227 | LABEL CLIMAX LOGO 2 X 8 |
| 27 | 1 | 79324 | LABEL WARNING - HAND ENTANGLEMENT/ROTATING GEARS 1.13 TALL TRIANGLE YELLOW |
| 28 | 1 | 79796 | KEEPER SET |
| 29 | 1 | 79994 | SCREW M6 X 1.0 X 16 SSSHDP |
| 30 | A/R | 80423 | (NOT SHOWN) SHIM .55 X 4.20 .001 THICK |
| 31 | A/R | 80424 | (NOT SHOWN) SHIM .55 X 4.20 .002 THICK |
| 32 | A/R | 80425 | (NOT SHOWN) SHIM .55 X 4.20 .005 THICK |
| 33 | 1 | 80534 | HALFNUT 3/4-10 ACME LH |
| 34 | 4 | 80886 | SCREW M6 X 1.0 X 18MM SSSDP |
| 35 | 2 | 82201 | GIB CLAMP TOOL HEAD |
| 36 | A/R | 85727 | (NOT SHOWN) SHIM .55 X 4.20 .0015 THICK |
| 37 | 1 | CHART | ARM TOOL FACING/BORING |
| 38 | 1 | 86586 | PLATE RADIAL SLIDE |
| 39 | 2 | 86588 | BLOCK BEARING SLIDE ARM |
| 40 | 1 | CHART | ARM CWT FACING/BORING |
| 41 | 1 | 86659 | SPACER TOOL POST 3.5 IN BAR |
| 42 | 1 | CHART | LEADSCREW SLIDE ARM |
| 43 | 1 | CHART | LABEL TOOL ARM ASSY |
| 44 | 1 | CHART | LABEL COUNTERWEIGHT ARM |

86638 - CHART ASSY BORING/FACING TOOL ARM - REV -

FOR REFERENCE ONLY

FIGURE 35. BORING/FACING TOOL ARM CHART ASSEMBLY PARTS LIST (P/N 86638)

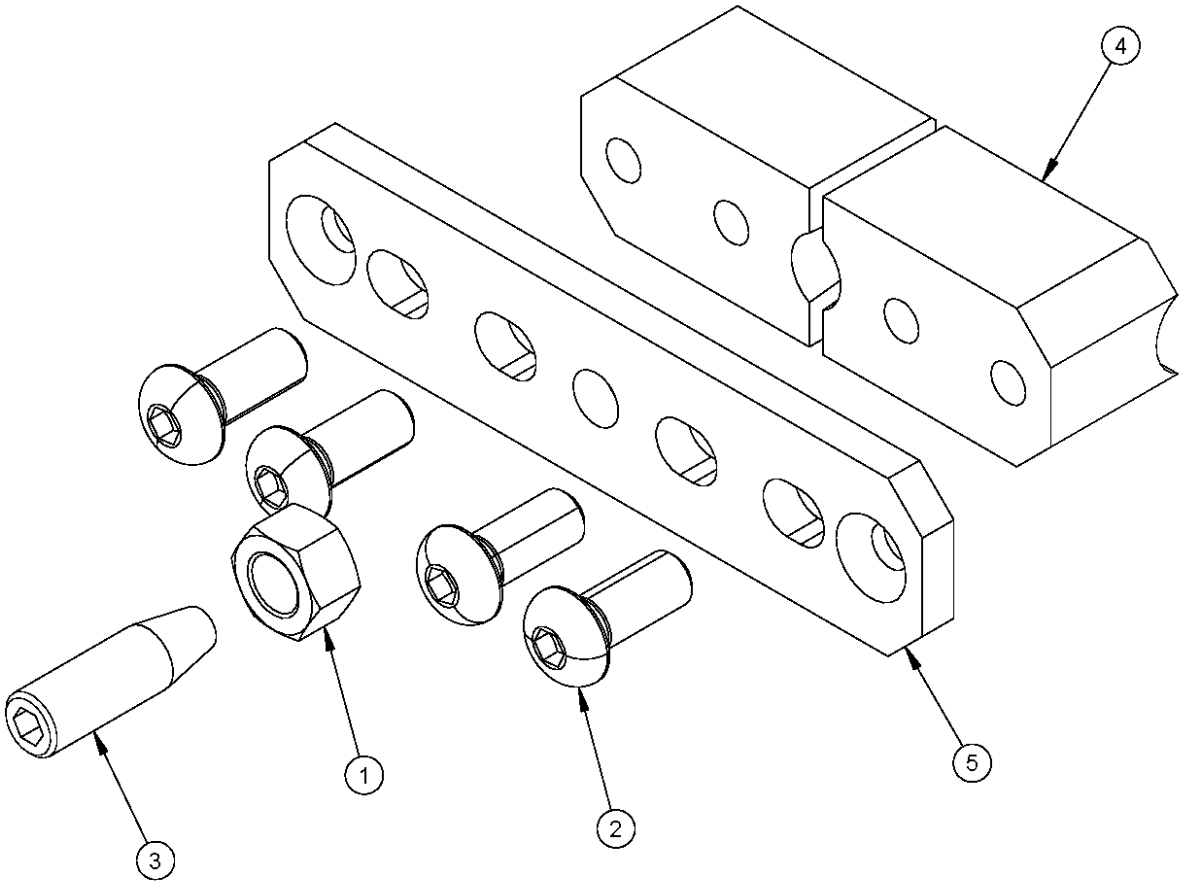



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 2 | 11672 | SCREW 10-32 X 1/4 SSSCP |
| 2 | 2 | 12880 | SCREW 8-32 X 1 SHCS |
| 3 | 2 | 22496 | SCREW 1/4-20 X 5/8 FHSCS |
| 4 | 8 | 24955 | SCREW 1/2-20 X 1 SHCS |
| 5 | 2 | 43489 | BALL NYLON 1/8 DIA |
| 6 | 1 | 53845 | TOOL CARRIER BB6100 |
| 6.1 | 4 | 12571 | SCREW 5/8-18-X 1-1/2 SHCS |
| 6.2 | 2 | 20166 | PIN DOWEL 1/4 DIA X 1/2 |
| 7 | 2 | 54217 | SHOE ADJUSTABLE TOOL CARRIER BB6100 |
| 8 | 2 | 54220 | STACK UP MOUNTING BLOCK BB6100 |
| 9 | 1 | 54223 | ADJUSTABLE NUT AXIAL LEAD SCREW 3/4-5 ACME |
| 10 | 2 | 55307 | SCREW 5/8-18 X 1.55 SSSFP MODIFIED |

54224 - TOOL CARRIER ASSY BB6100 - REV A

FOR REFERENCE ONLY

FIGURE 36. TOOL CARRIER ASSEMBLY (P/N 54224)

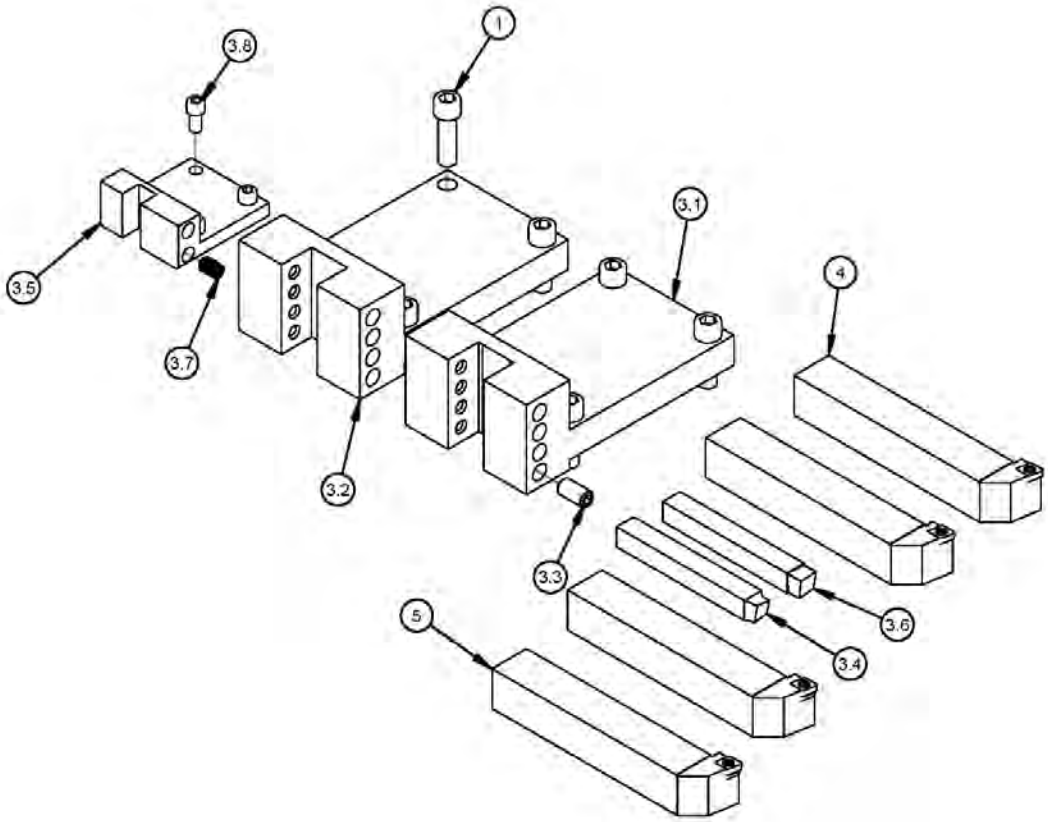



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 10536 | NUT 3/8-24 STDN |
| 2 | 4 | 14771 | SCREW 5/16-18 X 3/4 BHSCS |
| 3 | 1 | 54137 | SCREW MODIFIED 3/8-24 SSS 10 DEG TAPER |
| 4 | 1 | 54221 | SET NUT AXIAL LEAD SCREW 3/4-5 ACME BB6100 |
| 5 | 1 | 54222 | ADJUSTABLE HALFNUT BACK PLATE BB6100 |

54223 - ADJUSTABLE NUT AXIAL LEAD SCREW 3/4-5 ACME - REV A

FOR REFERENCE ONLY

FIGURE 37. ADJUSTABLE AXIAL NUT LEAD SCREW ASSEMBLY (P/N 54223)



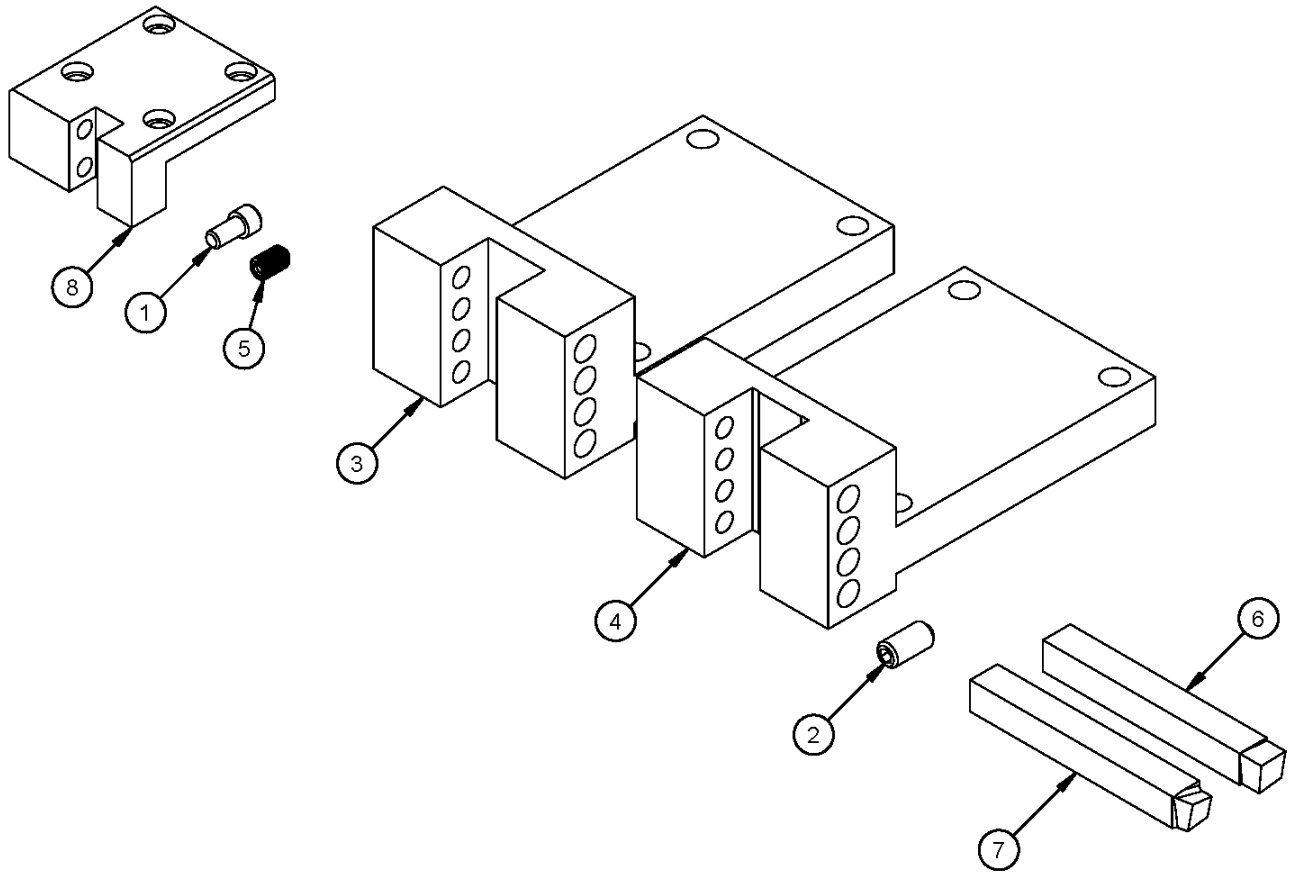

| ITEM | QTY | PART No. | DESCRIPTION |
|---|---|---|---|
| 6 | 10 | 79484 | (NOT SHOWN) INSERT CARBIDE 80 DEG 3/8 IC 1/32 NOSE RADIUS CCGT-3252 |
| 5 | 2 | 79480 | HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON RIGHT HAND |
| 4 | 2 | 79479 | HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON LEFT HAND |
| 3.8 | 4 | 10800 | SCREW 1/4-20 X 1/2 SHCS |
| 3.7 | 2 | 25150 | SCREW 5/16-24 X 1/2 SSSFP |
| 3.6 | 1 | 31859 | BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE |
| 3.5 | 1 | 54328 | 1/2" TOOL HOLDER FOR BB6100 & BB7100 BORING SET |
| 3.4 | 1 | 31868 | BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE |
| 3.3 | 16 | 11734 | SCREW 3/8-16 X 3/4 SSSCP |
| 3.2 | 1 | 23090 | HOLDER TOOL 1 IN. SQUARE LEAD |
| 3.1 | 1 | 23091 | HOLDER TOOL 1 IN. SQUARE FOLLOW |
| 3 | 1 | 60382 | BORING HEAD SET SUPPLEMENTAL SOLID TOOLING HOLDERS |
| 2 | 1 | 39694 | (NOT SHOWN) WRENCH TORX FT-15 |
| 1 | 8 | 10453 | SCREW 3/8-16 X 1 1/4 SHCS |

PARTS LIST

81246 - BORING HEAD SOLID TOOLING LEADING AND TRAILING FOR LARGE BB - REV B

FOR REFERENCE ONLY

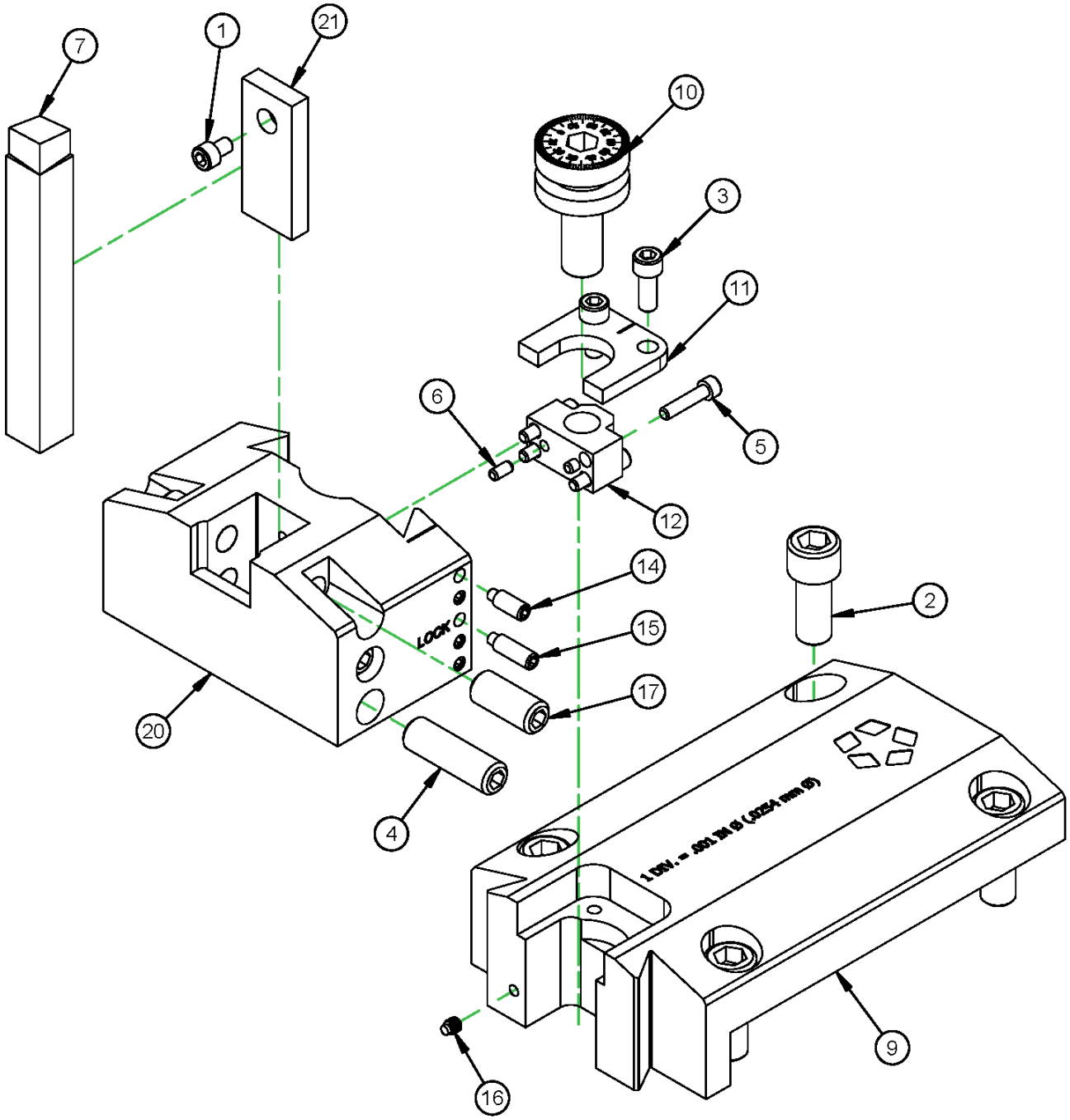
FIGURE 38. BORING HEAD SOLID TOOLING (P/N 81246)




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | PART No. | DESCRIPTION |
| 1 | 4 | 10800 | SCREW 1/4-20 X 1/2 SHCS |
| 2 | 16 | 11734 | SCREW 3/8-16 X 3/4 SSSCP |
| 3 | 1 | 23090 | HOLDER TOOL 1 IN. SQUARE LEAD |
| 4 | 1 | 23091 | HOLDER TOOL 1 IN. SQUARE FOLLOW |
| 5 | 2 | 25150 | SCREW 5/16-24 X 1/2 SSSFP |
| 6 | 1 | 31859 | BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE |
| 7 | 1 | 31868 | BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE |
| 8 | 1 | 54328 | 1/2" TOOL HOLDER FOR BB6100 & BB7100 BORING SET |

## BORING HEAD SET SUPPLEMENTAL SOLID TOOLING HOLDERS 60382

FIGURE 39. BORING HEAD SET SUPPLEMENTAL SOLID TOOLING HOLDERS (P/N 60382)




79325 - BORING HEAD MICRO ADJUST LARGE BB

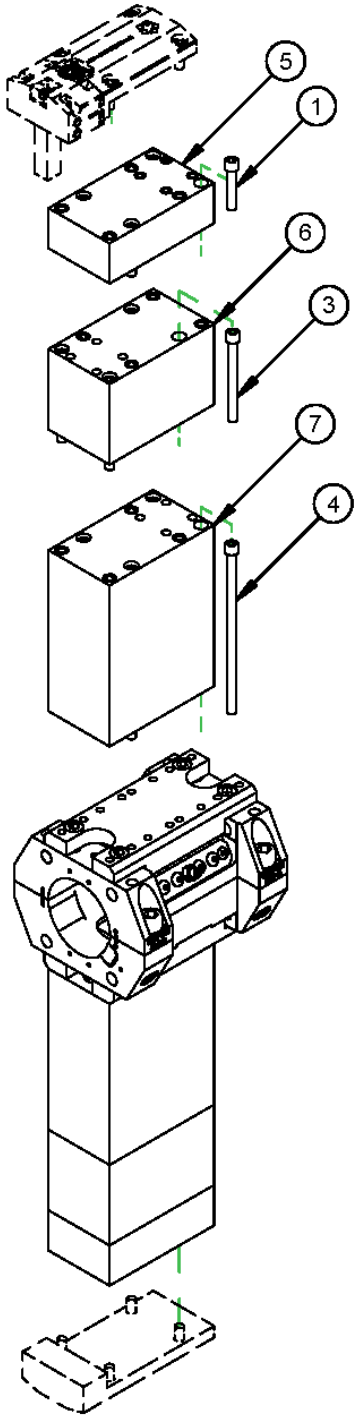
FIGURE 40. MICRO ADJUST BORING HEAD ASSEMBLY (P/N 79325)

| AVAILABLE CONFIGURATIONS | |
|---|---|
| P/N: | DESCRIPTION |
| 79468 | BORING HEAD MICRO ADJUST 1/2 INCH TOOLING LARGE BB |
| 79020 | BORING HEAD MICRO ADJUST 3/4 INCH TOOLING (1/2 INCH READY) LARGE BB |
| 79021 | BORING HEAD MICRO ADJUST 1 INCH TOOLING LARGE BB |

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 10226 | SCREW 8-32 X 1/4 SHCS (79020) |
| 2 | 8 | 11756 | SCREW 3/8-16 X 7/8 |
| 3 | 2 | 12743 | SCREW 10-24 X 1/2 SHCS |
| 4 | 4 | 13484 | SCREW 3/8-16 X 1-1/2 SSSFP (79468) |
| | | 79424 | SCREW 3/8-16 X 1-1/4 SSSFP (79020, 79021) |
| 5 | 4 | 15210 | SCREW 6-32 X 5/8 SHCS |
| 6 | 2 | 15414 | PIN DOWEL 1/8 DIA X 1/4 |
| 7 | 1 | 31859 | BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE TC (79468) |
| | | 31868 | BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE (79468) |
| 8 | 1 | 39694 | (NOT SHOWN) WRENCH TORX FT-15 (79020, 79021) |
| 9 | 1 | 78776 | BORING HEAD CARRIAGE HOLDER |
| 10 | 1 | 78807 | BORING HEAD MICRO ADJUST DIAL SCREW MOD |
| 11 | 1 | 78809 | DIAL SCREW PLATE |
| 12 | 1 | 79019 | NUT DIAL SCREW 7/16-20 UNF |
| 13 | 1 | 79242 | (NOT SHOWN) COUNTERWEIGHT BORING HEAD |
| 14 | 4 | 79418 | SCREW 10-32 X 1/2 SSSFDP |
| 15 | 1 | 79419 | SCREW 10-32 X 5/8 SSSFDP |
| 16 | 1 | 79420 | SCREW 8-32 X 3/16 SSSFDP |
| 17 | 2 | 79422 | SCREW 3/8-16 X 7/8 SSSFP |
| 18 | 10 | 79484 | (NOT SHOWN) INSERT CARBIDE 80 DEG 3/8 IC 1/64 NOSE RADIUS CCGT-3251 KC5010 (79020, 79021) |
| 19 | 1 | 79485 | (NOT SHOWN) HOLDER INSERT CARBIDE 3/4 SQ SHANK SCREW ON LEFT HAND |
| | | 79486 | (79020) |
| | | 79479 | (NOT SHOWN) HOLDER INSERT CARBIDE 3/4 SQ SHANK SCREW ON RIGHT HAND |
| | | 79480 | (79020) |
| | | | (NOT SHOWN) HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON LEFT HAND (79021) |
| | | | (NOT SHOWN) HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON RIGHT HAND (79021) |
| 20 | 1 | 79500 | CARRIAGE BORING HEAD TOOL 1/2 INCH TOOLING |
| | | 78777 | CARRIAGE BORING HEAD TOOL 3/4 INCH TOOLING |
| | | 79022 | CARRIAGE BORING HEAD TOOL 1 INCH TOOLING |
| 21 | 1 | 79556 | SHIM FOR 1/2 TOOLING IN 3/4 CARRIAGE (79020) |
| 22 | 1 | 80816 | (NOT SHOWN) VIBRA-TITE VC3 THREADLOCKER |
| 23 | 1 | 81073 | (NOT SHOWN) DRIVE HEX KEY 3/32 T HANDLE SHORT LENGTH |

## 79325 - BORING HEAD MICRO ADJUST LARGE BB

FIGURE 41. MICRO ADJUST BORING HEAD ASSEMBLY PARTS LIST (P/N 79325)




81249 - BORING DIAMETER RANGE 8.8-40.8 STACK UP BLOCKS BB6100

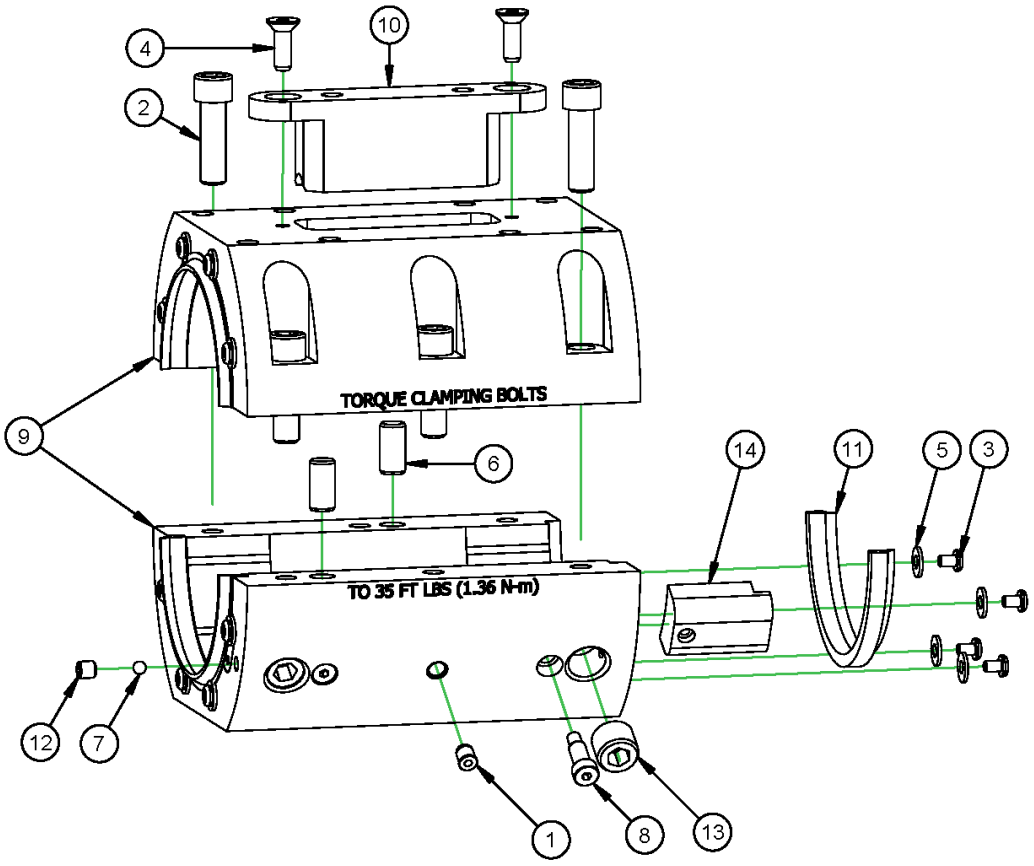
FIGURE 42. BORING DIAMETER RANGE STACK-UP BLOCKS ASSEMBLY (P/N 81249)

| AVAILABLE CONFIGURATIONS | |
|---|---|
| P/N: | DESCRIPTION |
| 81248 | BORING DIAMETER RANGE 8.8-24.8 STACK UP BLOCKS BB6100 |
| 81249 | BORING DIAMETER RANGE 8.8-40.8 STACK UP BLOCKS BB6100 |

| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 4 | 10557 | SCREW 3/8-16 X 2 SHCS |
| 3 | 4 | 15743 | SCREW 3/8-16 X 4 SHCS |
| 4 | 4 | 20884 | SCREW 3/8-16 X 8 SHCS |
| 5 | 2 | 79010 | SPACER 2.0 IN FOR BORING SET BB6100 & BB7100 |
| 6 | 2 | 79011 | SPACER 4.0 IN FOR BORING SET BB6100 & BB7100 |
| 7 | 2 | 79012 | SPACER 8.0 IN FOR BORING SET BB6100 & BB7100 |

## 81249 - BORING DIAMETER RANGE 8.8-40.8 STACK UP BLOCKS BB6100

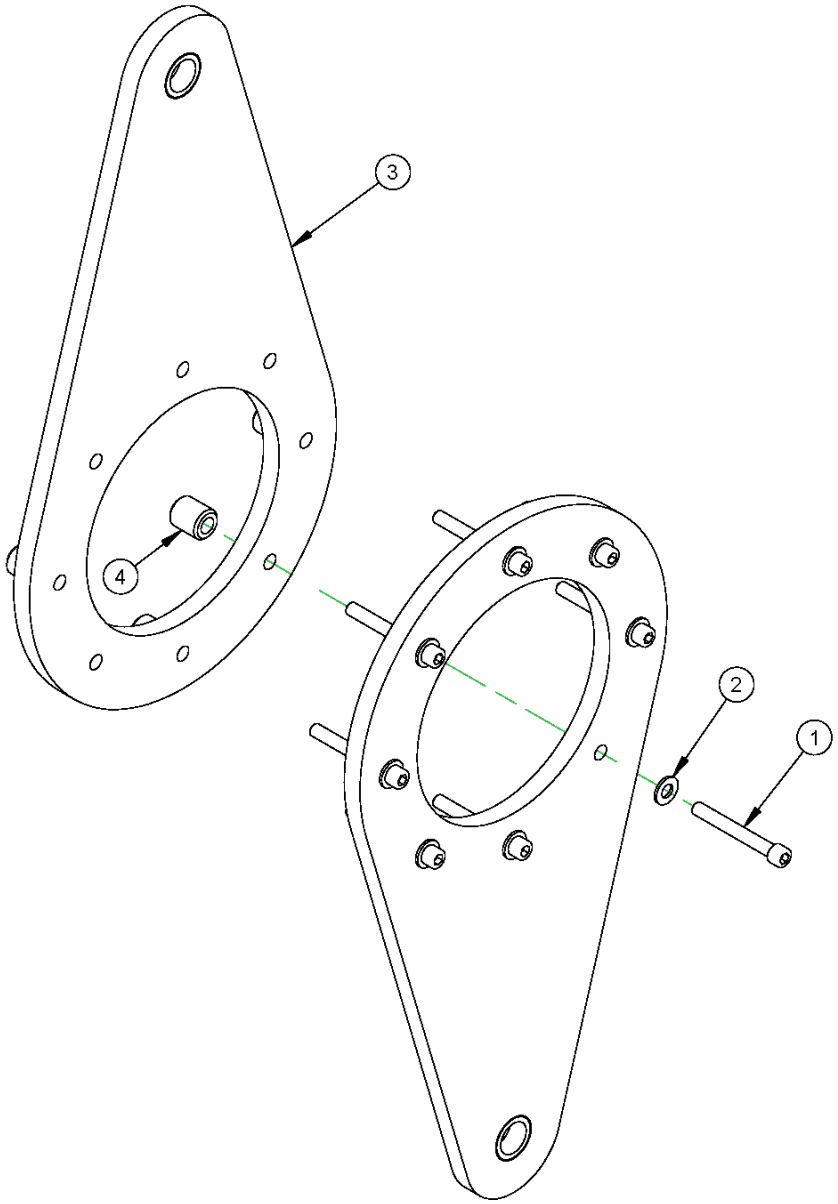
FIGURE 43. BORING DIAMETER RANGE STACK-UP BLOCKS ASSEMBLY PARTS LIST (P/N 81249)




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | PART No. | DESCRIPTION |
| 1 | 1 | 10139 | OILER BALL VALVE DRIVE IN |
| 2 | 6 | 10453 | SCREW 3/8-16 X 1 1/4 SHCS (INCLUDED W/ITEM 9) |
| 3 | 16 | 10839 | SCREW 8-32 X 1/4 BHSCS |
| 4 | 2 | 10843 | SREW 1/4-20 X 3/4FHSCS |
| 5 | 16 | 11872 | WASHER #8 FLTW SAE |
| 6 | 2 | 16407 | DOWEL PIN 3/8 DIA X 3/4 (INCLUDED W/ITEM 9) |
| 7 | 2 | 16594 | BALL NYLON 3/16 DIA |
| 8 | 2 | 20877 | SCREW 1/4 DIA X 1/2 X 10-24 SHLDCS |
| 9 | 1 | 22204 | ASSY CARRIER TOOL 3.5 DIA 2 PIECE |
| 10 | 1 | 22205 | NUT AXIAL LEADSCREW 3/4-5 ACME |
| 11 | 4 | 22384 | WIPER ROD 3.5 ID MOLYTHANE |
| 12 | 2 | 30954 | SCREW 1/4-28 X 1/4 SSSFP |
| 13 | 2 | 47041 | SCREW SET 5/8-18 X 1/2 SSSFP |
| 14 | 2 | 58430 | SHOE ADJUSTABLE TOOL CARRIER BB6000 |

22377

FIGURE 44. TOOL CARRIER ASSEMBLY (P/N 22377)

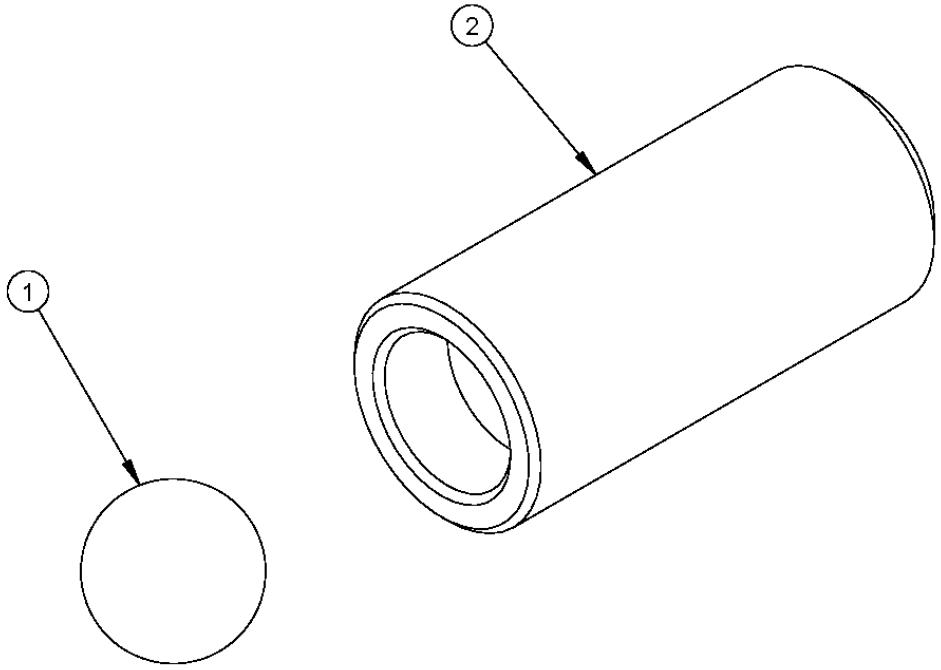



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 8 | 11296 | SCREW 5/16-18 X 2-1/2 SHCS |
| 2 | 8 | 13489 | WASHER 5/16 FLTW SAE |
| 3 | 2 | 22577 | ARM TORQUE |
| 4 | 8 | 22580 | SPACER |

22604 - ARM TORQUE ASSY - REV A

FOR REFERENCE ONLY

FIGURE 45. TORQUE ARM ASSEMBLY (P/N 22604)




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | P/N: | DESCRIPTION |
| 1 | 1 | 16502 | BALL NYLON 7/16 DIA |
| 2 | 1 | 55562 | SCREW 5/8-18 X 1-1/2 SSSFP MODIFED FOR NYLON BALL TIP |

55564 - SCREW ASSY 5/8-18 X 1-1/2 SSSFP WITH NYLON BALL TIP - REV A

FOR REFERENCE ONLY

FIGURE 46. SCREW ASSEMBLY (P/N 55564)

TABLE 6. HYDRAULIC MOTORS

| PART | DESCRIPTION |
|---|---|
| 43438 | Hydraulic, 3.6 CIR 60 SERIES QD |
| 43439 | Hydraulic, 5.6 CIR 60 SERIES QD |
| 43440 | Hydraulic, 7.3 CIR 60 SERIES QD |
| 43441 | Hydraulic, 8.9 CIR 60 SERIES QD |
| 43442 | Hydraulic, 11.3 CIR 60 SERIES QD |
| 43443 | Hydraulic, 14.3 CIR 60 SERIES QD |
| 43444 | Hydraulic, 17.9 CIR |
| 84278 | Hydraulic, 3.6 CIR ISO 16028 QD |
| 84279 | Hydraulic, 5.6 CIR ISO 16028 QD |
| 84280 | Hydraulic, 7.3 CIR ISO 16028 QD |
| 84281 | Hydraulic, 8.9 CIR ISO 16028 QD |
| 84282 | Hydraulic, 11.3 CIR ISO 16028 QD |
| 84283 | Hydraulic, 14.3 CIR ISO 16028 QD |
| 84284 | Hydraulic, 17.9 CIR ISO 16028 QD |

# 8 SCHEMATICS

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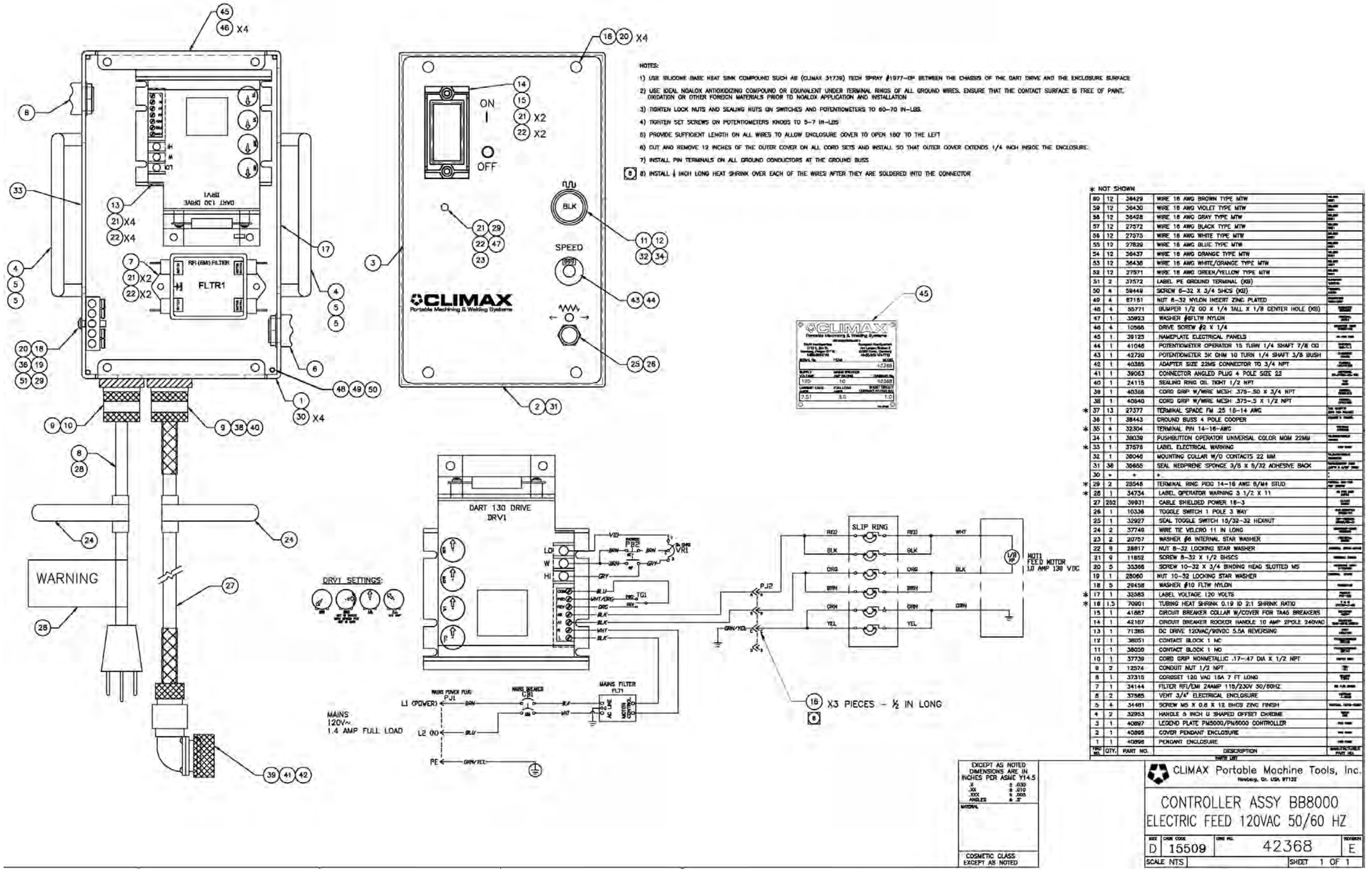


* NOT SHOWN

| | | | | |
|---|---|---|---|---|
| | 60 | 12 | 38429 | WIRE 18 AWG BROWN TYPE MTW |
| | 59 | 12 | 38430 | WIRE 18 AWG VIOLET TYPE MTW |
| | 58 | 12 | 38428 | WIRE 18 AWG GRAY TYPE MTW |
| | 57 | 12 | 27572 | WIRE 18 AWG BLACK TYPE MTW |
| | 56 | 12 | 27575 | WIRE 18 AWG WHITE TYPE MTW |
| | 55 | 12 | 27829 | WIRE 18 AWG BLUE TYPE MTW |
| | 54 | 12 | 38437 | WIRE 18 AWG ORANGE TYPE MTW |
| | 53 | 12 | 38436 | WIRE 18 AWG WHITE/ORANGE TYPE MTW |
| | 52 | 12 | 27571 | WIRE 18 AWG GREEN/YELLOW TYPE MTW |
| | 51 | 2 | 37572 | LABEL PE GROUND TERMINAL (KB) |
| | 50 | 4 | 58449 | SCREW 6-32 X 3/4 SHCS (KB) |
| | 49 | 4 | 87151 | NUT 6-32 NYLON INSERT ZINC PLATED |
| | 48 | 4 | 55771 | BUMPER 1/2 OD X 1/4 TALL X 1/8 CENTER HOLE (KB) |
| | 47 | 1 | 35923 | WASHER #8FLTW NYLON |
| | 46 | 4 | 10566 | DRIVE SCREW #2 X 1/4 |
| | 45 | 1 | 39125 | NAMEPLATE ELECTRICAL PANELS |
| | 44 | 1 | 41046 | POTENTIOMETER OPERATOR 15 TURN 1/4 SHAFT 7/8 OD |
| | 43 | 1 | 42720 | POTENTIOMETER 5K OHM 10 TURN 1/4 SHAFT 3/8 BUSH |
| | 42 | 1 | 40365 | ADAPTER SIZE 22MS CONNECTOR TO 3/4 NPT |
| | 41 | 1 | 39063 | CONNECTOR ANGLED PLUG 4 POLE SIZE 23 |
| | 40 | 1 | 24115 | SEALING RING OIL TIGHT 1/2 NPT |
| | 39 | 1 | 40366 | CORD GRIP W/WIRE MESH .375-.50 X 3/4 NPT |
| | 38 | 1 | 40840 | CORD GRIP W/WIRE MESH .375-.5 X 1/2 NPT |
| * | 37 | 13 | 27377 | TERMINAL SPADE FM .25 18-14 AWG |
| | 36 | 1 | 38443 | GROUND BUSS 4 POLE COOPER |
| * | 35 | 4 | 32304 | TERMINAL PIN 14-16-AWG |
| | 34 | 1 | 38039 | PUSHBUTTON OPERATOR UNIVERSAL COLOR MOM 22MM |
| * | 33 | 1 | 37578 | LABEL ELECTRICAL WARNING |
| | 32 | 1 | 38048 | MOUNTING COLLAR W/O CONTACTS 22 MM |
| | 31 | 36 | 35655 | SEAL NEOPRENE SPONGE 3/8 X 5/32 ADHESIVE BACK |
| | 30 | * | * | * |
| * | 29 | 2 | 28548 | TERMINAL RING PIDG 14-16 AWG 8/M4 STUD |
| * | 28 | 1 | 34734 | LABEL OPERATOR WARNING 3 1/2 X 11 |
| | 27 | 252 | 39931 | CABLE SHIELDED POWER 18-3 |
| | 26 | 1 | 10336 | TOGGLE SWITCH 1 POLE 3 WAY |
| | 25 | 1 | 32927 | SEAL TOGGLE SWITCH 15/32-32 HEXNUT |
| | 24 | 2 | 37748 | WIRE TIE VELCRO 11 IN LONG |
| | 23 | 2 | 20757 | WASHER #6 INTERNAL STAR WASHER |
| | 22 | 9 | 28817 | NUT 8-32 LOCKING STAR WASHER |
| | 21 | 9 | 11802 | SCREW 8-32 X 1/2 BHSCS |
| | 20 | 5 | 35366 | SCREW 10-32 X 3/4 BINDING HEAD SLOTTED MS |
| | 19 | 1 | 28060 | NUT 10-32 LOCKING STAR WASHER |
| | 18 | 5 | 29458 | WASHER #10 FLTW NYLON |
| * | 17 | 1 | 32583 | LABEL VOLTAGE 120 VOLTS |
| * | 16 | 1.5 | 70901 | TUBING HEAT SHRINK 0.19 ID 2:1 SHRINK RATIO |
| | 15 | 1 | 41867 | CIRCUIT BREAKER COLLAR W/COVER FOR TA45 BREAKERS |
| | 14 | 1 | 42167 | CIRCUIT BREAKER ROCKER HANDLE 10 AMP 2POLE 240VAC |
| | 13 | 1 | 71385 | DC DRIVE 120VAC/90VDC 5.5A REVERSING |
| | 12 | 1 | 38051 | CONTACT BLOCK 1 NC |
| | 11 | 1 | 38050 | CONTACT BLOCK 1 NO |
| | 10 | 1 | 37739 | CORD GRIP NONMETALLIC .17-.47 DIA X 1/2 NPT |
| | 9 | 2 | 12574 | CONDUIT NUT 1/2 NPT |
| | 8 | 1 | 37315 | CORDSET 120 VAC 15A 7 FT LONG |
| | 7 | 1 | 34144 | FILTER RFI/EMI 24AMP 115/230V 50/60HZ |
| | 6 | 2 | 37565 | VENT 3/4" ELECTRICAL ENCLOSURE |
| | 5 | 4 | 34481 | SCREW M5 X 0.8 X 12 BHCS ZINC FINISH |
| | 4 | 2 | 32953 | HANDLE 5 INCH U SHAPED OFFSET CHROME |
| | 3 | 1 | 40897 | LEGEND PLATE PM5000/PM8000 CONTROLLER |
| | 2 | 1 | 40895 | COVER PENDANT ENCLOSURE |
| | 1 | 1 | 40896 | PENDANT ENCLOSURE |
| FIND NO. | QTY. | PART NO. | DESCRIPTION | MANUFACTURERS PART NO. |

FIGURE 47. ELECTRIC FEED CONTROLLER ASSEMBLY (P/N 42368)

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# 9 SDS

Contact CLIMAX for the current list of Safety Data Sheets.

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