CE

CE only applies to the entire machine when PN 82203 or 81281 is included.

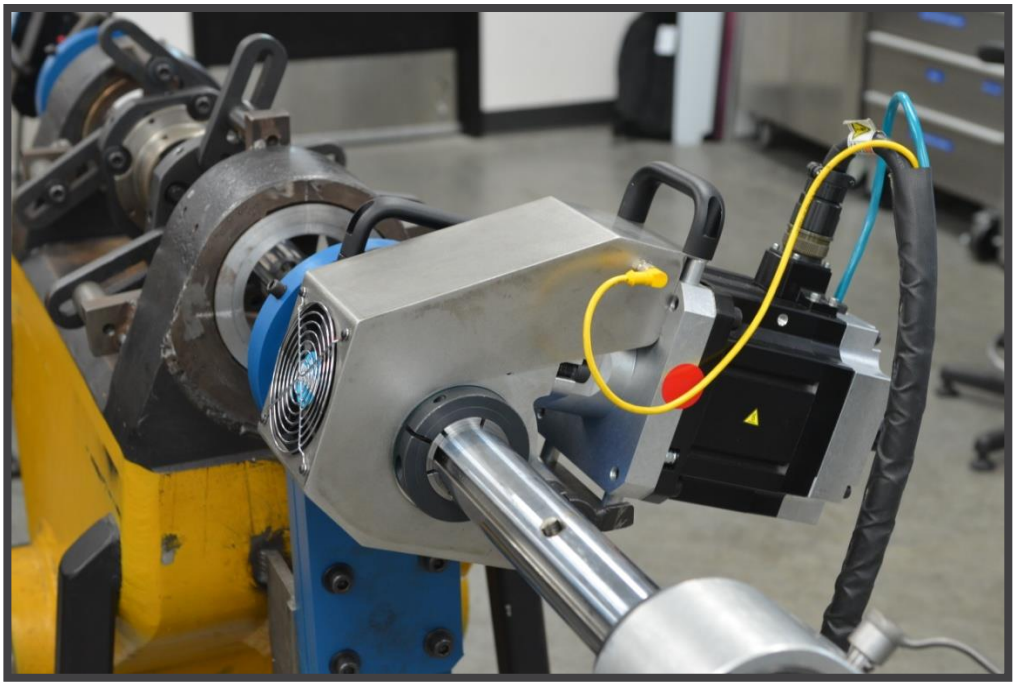
BB5000

BORING MACHINE

BB5000 OPERATING MANUAL

MACHINE SERIAL NO: 15001233

ORIGINAL INSTRUCTIONS



WHAT IS WHAT COULD BE.

CLIMAX
Portable Machining & Welding Systems

PN: 84310 **January 2018** **Revision 6**

At Climax Portable Machining and Welding Systems, we value your opinion.

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 factory representative with the following:

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

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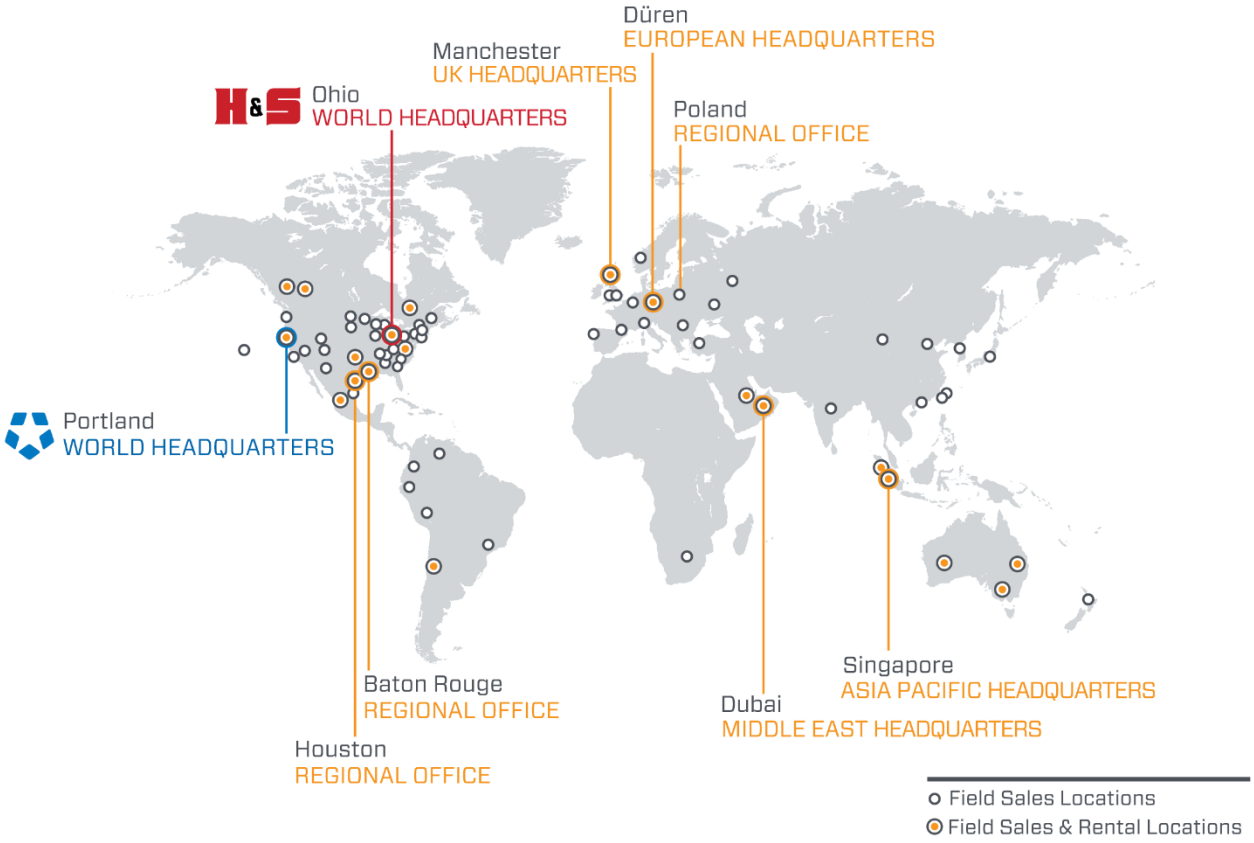
CLIMAX WORLDWIDE LOCATIONS



CE DOCUMENTATION

DECLARATION OF CONFORMITY

2006/42/EC Machine Directive
2014/30/EU EMC Directive

Name of manufacturer or supplier
Climax Portable Machining And Welding Systems

Full postal address including country of origin
2712 E Second Street
Newberg, OR 97132
USA

Description of product
Portable Boring Bar Machine

Name, type or model, batch or serial number
BB4500 and BB5000 Serial Number Range 15000177 - 2000000
Electric 230V, Servo 230V, Servo 460V,
Hydraulic Powered and Pneumatic Powered

Standards used, including number, title, issue date and other relative documents
EN ISO 3744:2010, ISO 4413:2010, BS EN ISO 4414:2010, EN ISO 11201:2010, EN ISO 12100:2010, EN 13128:2001+A2:2009, EN ISO 13732-1:2008, EN ISO 13849-1:2008, EN ISO 13857:2008, EN 60204-1:2006/AC:2010

Name of Responsible Person within the EU Sebastian Dick

Full postal address if different from manufacturers
Climax GmBH
Am Langen Graben 8
52353 Duren, Germany

Declaration

I declare that as the Manufacturer, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

Signature of Manufacturer: 

Position Held: DIRECTOR OF ENGINEERING

Date: 6/23/2015

CE

NOISE LEVEL

CE		Standard No. **EN 3744 & EN 11201**		CLIMAX Portable Machine Tools, Inc.	
Author:	J. Brooks	Sound Declaration	Machine: PM4200 (230V Electric)	Date:	3/10/15

The Declared **Sound Power** Level is:	L_{WA} =	94.0	dBA
The Declared ***Operator*** **Sound Pressure** Level is:	L_{pA} =	91.4	dBA
The Declared ***Bystander*** **Sound Pressure** Level is:	L_{pA} =	89.6	dBA

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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 How to use this manual

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 Portable Machining and Welding Systems 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 Risk assessment and hazard mitigation

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

Stationery 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. Stationery 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.

1.5 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 instructions (Section 3).
☐	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 Section 3) 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 Intervals (Section 5.1) with the recommended lubricants.
☐	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.

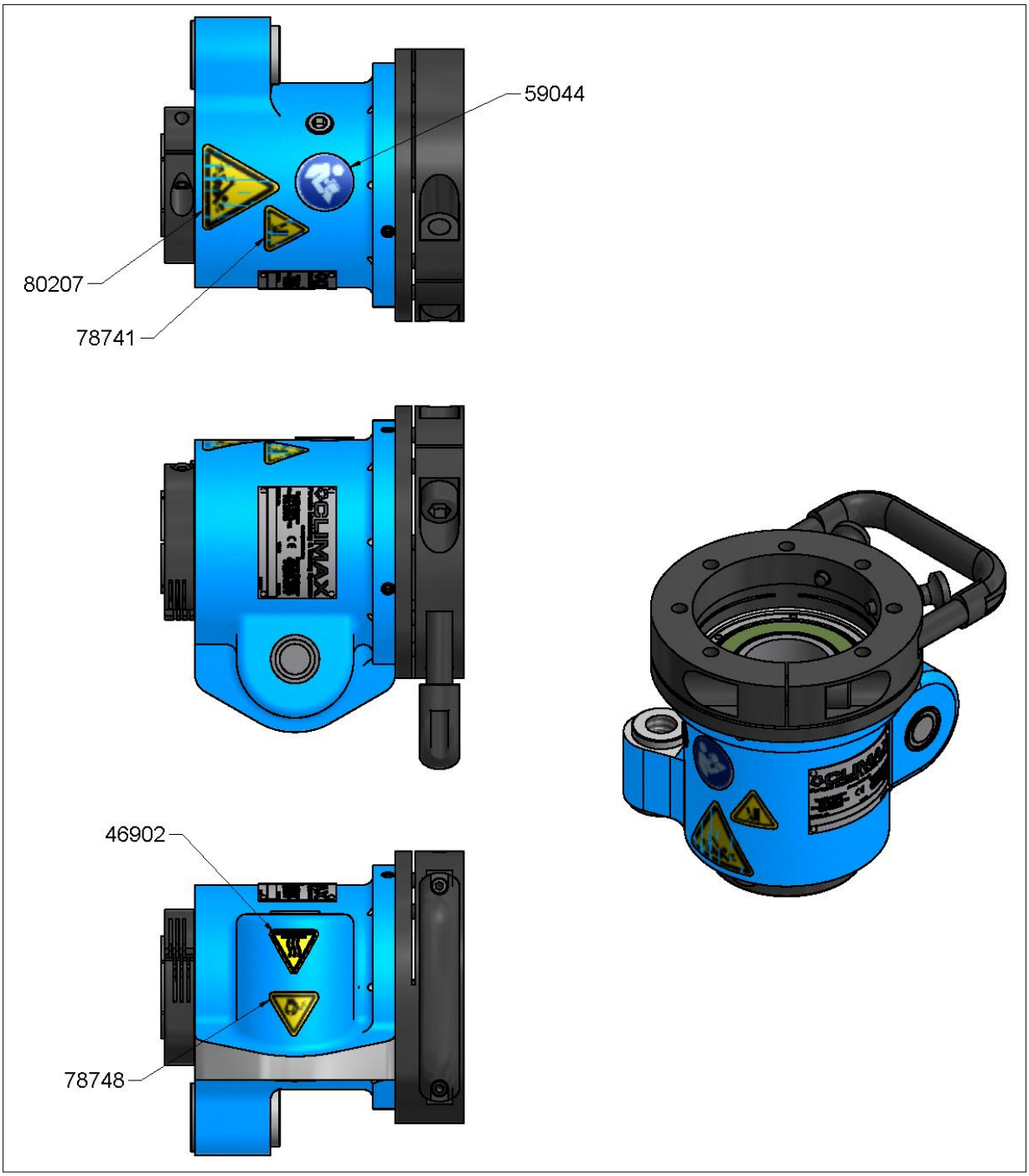
1.6 Warning labels

The following warning labels should be on your machine. If any are defaced or missing, contact Climax immediately for replacements.

TABLE 3. WARNING LABELS

	P/N 29154 Climax serial number, year and model number plate.		
	P/N 59044 Label safety warning circle: read the manual		P/N78741 Label safety warning: crush foot
	P/N 77568 IEC electrical symbol label		P/N 78742 Label safety warning: entanglement of hand, or rotating shaft warning
	P/N 78619 Label warning: hot surface		P/N 78748 Label safety warning: eye protection
	P/N 78735 Label warning hand crush		P/N 80207 Label warning entanglement danger/rotating shaft
	P/N 59037 Label warning: hearing protection required		P/N 78824 Label safety warning: keep electrical parts dry

1.7 Placement of labels




46902
78748
59044
78741
80207

2 OVERVIEW

2.1 Functions

The BB5000 can be used easily in small workspaces. Climax's mounting components provide the flexibility to handle tough boring jobs. The BB5000's through-bar design allows you to mount the rotational drive and feed unit anywhere along the bar. This flexibility means the BB5000 will complete your job where others would not even fit.

This portable boring machine is a versatile tool. Its broad array of accessories means you can use the BB5000 for blind boring, line boring, drilling, facing, threading, valve repair and trepanning. A special interface kit allows you to quickly attach and precisely align a welder to the BB5000's mounting fixtures. Climax also offers the industry's broadest range of electric, hydraulic, and pneumatic power options for added flexibility.

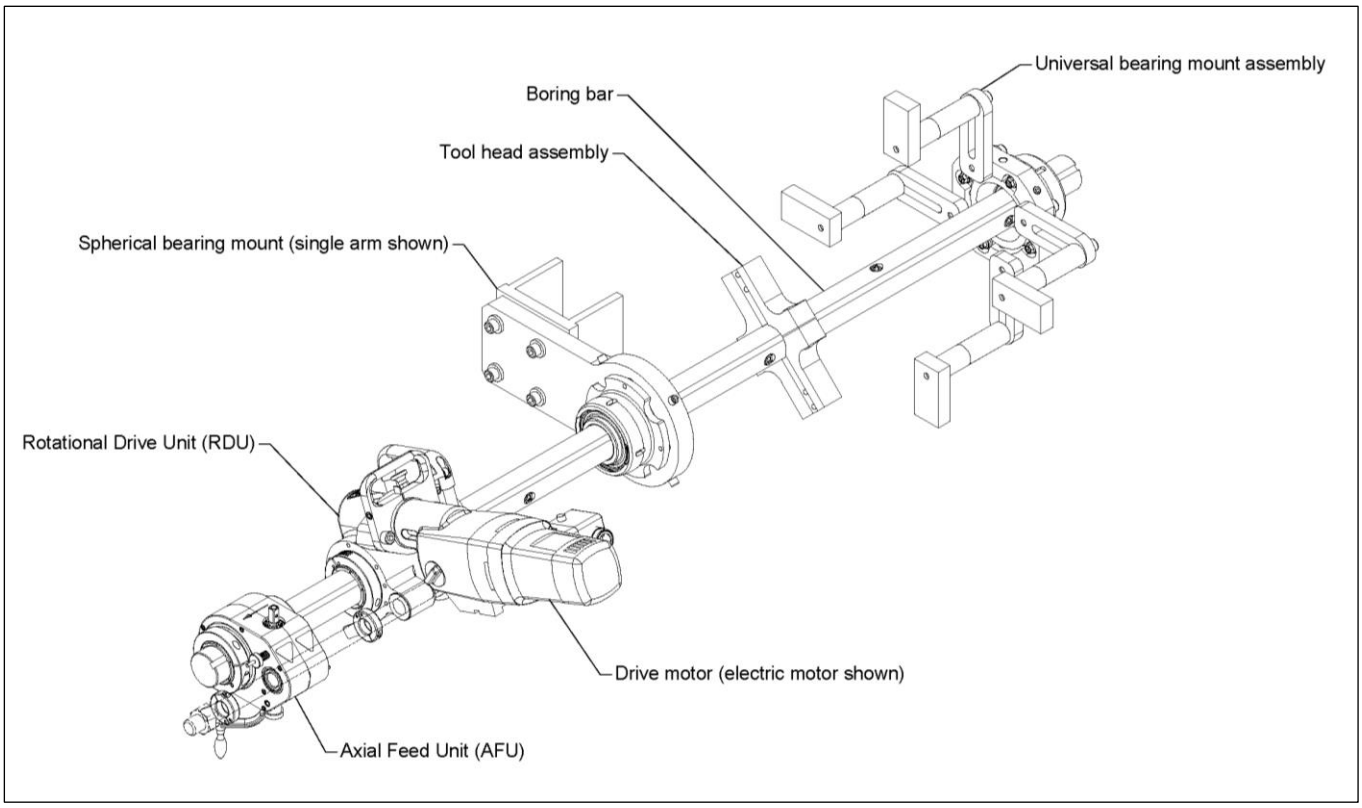


FIGURE 1. BB5000 WITH EIBENSTOCK MOTOR

This is a highly configurable machine with many options and accessories. This manual covers the use and operation of all of those possible options, although the machine configuration purchased by a customer may not contain all of the options and accessories detailed herein. If a specific machine application requires additional options or accessories, please contact Climax for assistance in obtaining the needed components.

This manual describes the operation and maintenance of your BB5000. The machine is designed for on-site maintenance of heavy-duty industrial equipment. All parts

meet Climax Portable Machine Tools' strict quality standards. For maximum safety and performance, read the entire manual before operating the machine.

2.2 Components

The machine is a combination of the following:

- Axial feed unit
- Rotational drive unit (RDU)
- Electric Eibenstock motor
- Spherical bearing mount
- Tool head assembly
- Boring bar
- Universal bearing mount assembly

TABLE 4. TOOL KIT

Part number	Description	Quantity
26850	Hand Crank	1
28756	Tack Weld Block- Leadscrew	1
27222	Feed Stops	2
29199	Hex Wrench- ½ Inch	1
33999	Hex Wrench Set- Ball End	1
29660	Hex Socket-½ Drive x 5/16 Hex	1
16794	Hex Socket-½ Drive x 3/8 Hex	1
33785	Torx Wrench- T-45	1
14650	Combination Wrench- ½"	1
29041	Open End Wrench 1 ½"	1
14251	T-handle Wrench 3/16 Inch	1
55923	T-handle Wrench 1/4 Inch	1
25550	T-handle Wrench 5/16 Inch	1
55924	T-handle Wrench 3/8 Inch	1
31866	Tool Bit- Rough ½ sq x 1.0	1
31857	Tool Bit- Finish ½ sq x 1.0	1
31867	Tool Bit- Rough ½ sq x 1.8	1
31858	Tool Bit- Finish ½ sq x 1.8	1
32344	Tool Bit- Rough ½ sq x 2.5	1
32342	Tool Bit- Finish ½ sq x 2.5	1

TABLE 5. CLAMP COLLARS AND HYDRAULIC HARDWARE

Part number	Description	Quantity
11826	Screw 1/2-13 x 1¼ HHCS	2

Part number	Description	Quantity
11238	Lock Washer- ½	2
39952	Clamp Collar- 2 ½ ID	4

TABLE 6. UNIVERSAL BEARING MOUNT HARDWARE

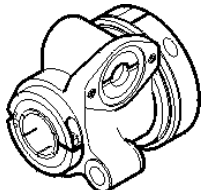
Part number	Description	Quantity
36966	Tack Weld Blocks	8
36965	Slotted extension arms	8
37598	Standoff tubes- 3.3 long	8
37599	Standoff tubes- 5.3 long	8
17145	Hard Washers- ½ inch	8
14036	Screw ½-13 x 2 SHCS	8
11879	Screw ½-13 x 5 SHCS	8
11223	Screw ½-13 x 7 SHCS	8

TABLE 7. SINGLE ARM BEARING MOUNT HARDWARE

Part number	Description	Quantity
19869	Tack Weld Plates	2
14036	Screw ½-13 x 2 SHCS	8
17145	Washer ½ inch hardened	8
36963	Universal Mount Ring with P/N 26248 Spherical Bearing	2
37472	Single Arm Bearing Mount	2
28654	Leadscrew-12” with (2ea) P/N 27356 Acme Nuts	1
29661	Breaker Bar- ½” Drive	1
11817	Boring Head Set 4½ – 12” diameter	5

TABLE 8. SET-UP CONES AND HYDRAULIC DRIVE MOTOR

Part number	Description	Quantity
26380	Set-up Cones 2.75-8.37	2
26380	Set-up Cones 8.37-12.0	2
29095	Hinged Clamp Collar Modified- 2 ¼” ID	1
28692	Hydraulic Motor with P/N 25495 ½” fitting kit	1

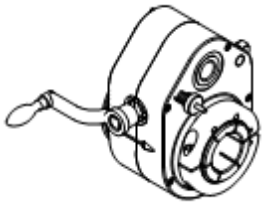


2.2.1 Rotational drive unit

The RDU with sealed lubrication has worm gear reduction and may be mounted anywhere along the bar. A key within the collet drives the boring bar. The clamp ring holds the RDU to

the spherical bearing mounting bracket. A clamp collar provides a snug, sliding fit between the RDU and the bar.

2.2.2 Axial feed assembly



The axial feed assembly is held in place by two clamp collars and may be secured in any position along the bar. It travels with the bar and tool head axially along a fixed leadscrew.

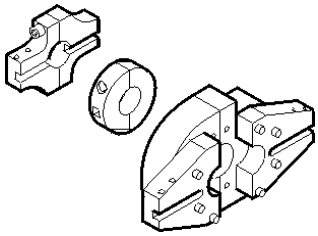
Select the feed direction by shifting the feed shaft position.

F

2.2.3 Leadscrew

The fixed leadscrew may be mounted either to the RDU or to the axial leadscrew-mounting block. Standard leadscrews have 12” (305 mm), 24” (610 mm), or 36” (914 mm) of travel. Other lengths are available to suit your requirements.

2.2.4 Tool heads



The split-body, tool heads may be clamped anywhere along the bar. Two sets of tool heads are available. One set of five tool heads bore 4.5” to 12” (114 to 305 mm) diameter. The optional large boring head features a split-body mounting hub and two sets of tool arms to bore 12” to 24” (305 to 610 mm) diameter. Tool bits are 1/2 inch or 12 mm square. Other tool head options are discussed in Section 3.6.

F

2.2.5 Boring bar

All bars have square tool bit mounting holes at 10” (254 mm) intervals. Climax offers a drill jig with tool sleeve kit for cutting intermediate tool bit holes for your special applications.

To determine the bar length required:

1. Determine the workpiece overall dimension + stroke + 27” (686 mm).
2. Round up to the next 24” (610 mm) increment.

FIGURE 5.

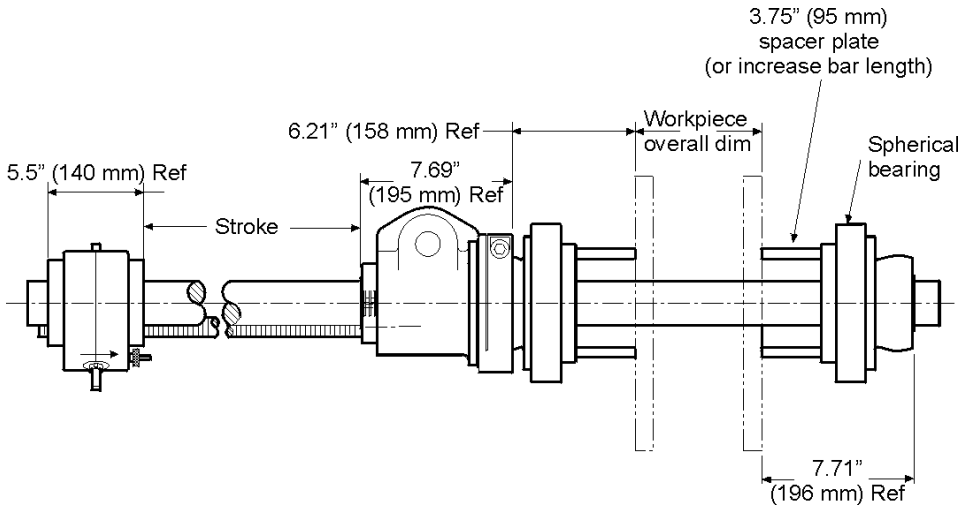


FIGURE 6. BORING BAR OPTIONS

2.2.6 Spherical bearings

Support brackets hold the bar (and machine) in place during operation. Each bracket includes a spherical self-aligning bearing for quick and accurate setup. Spacer plates can be tack welded or clamped to the workpiece to secure the brackets in place. These brackets are available in one-arm and two-arm styles and come in sets of two.

2.3 Dimensions

The BB5000 is shipped in two containers, or three containers with the hydraulic power unit (HPU) option. The size and weight dimensions are listed in Table 9and Table 10.

TABLE 9. SIZE DIMENSIONS

Item	**Width x diameter x height**
Machine	52.5" x 27" x 16.5" (1,334 x 686 x 419 mm)
72" (1,828.8 mm) bar	74.5" x 6.5" x 7" (1,892 x 165 x 178 mm)
HPU	49.5" x 30.5" x 41" (1,257 x 775 x 1,041 mm)

TABLE 10. WEIGHT DIMENSIONS

Item	**Weight**
Motor	43 lbs (20 kg)
Adapter assembly (51536)	10 lbs (5 kg)
Rotational drive unit (53165)	31 lbs (14 kg)
Total for motor, adapter assembly and RDU	85 lbs (39 kg)
Controls	45 lbs (21 kg)
Pendant	4 lbs (2 kg)

Item	Weight
Machine total weight (including single arm mounts, setup cones, and hydraulic motor)	444 lbs (201 kg)
Approximate boring bar ship weight (including the metal shipping container)	1.48 lbs/inch (0.264 kg/cm)

2.4 Specifications

Dimensions are given in the following tables.

TABLE 11. BORING SPECIFICATIONS

	Dimension
Boring bar diameter – standard	2.25” (57.2 mm)
Boring bar diameter – optional	1.75” (44.5 mm)
Boring bar diameter – optional	1.25” (31.8 mm)
Boring diameter – standard	2.5 – 12” (63.5 – 304.8 mm)
Boring diameter – optional	1.375 – 24” (34.9 – 609.6 mm)
Boring stroke	12, 24, 36” (304.8, 609.6, 914.4 mm)

TABLE 12. POWER OPTIONS

Power type	RPM range	Power
Electric	8 – 160 RPM	3.35 hp (2.5 kW)
Servo	0 – 230 RPM	4.7 hp (3.5 kW)
Hydraulic	5 hp HPU: 0 – 148 RPM	3.9 hp (2.9 kW)
Hydraulic	10 hp HPU: 0 – 20 RPM	6.5 hp (4.8 kW)
Pneumatic	0 – 120 RPM	3.0 hp (2.2 kW)

Mounting options are the following:

- Single arm
- Double arm
- Universal
- Inner diameter (ID)

The RDU has a 4:1 gear ratio reduction, with an optional 4:1 gear ratio reduction.

TABLE 13. SETUP CONES

Setup cone type	Dimension
Standard	2.75 – 12” (70 – 305 mm)
Optional	1.375 – 5” (34.9 – 127 mm)

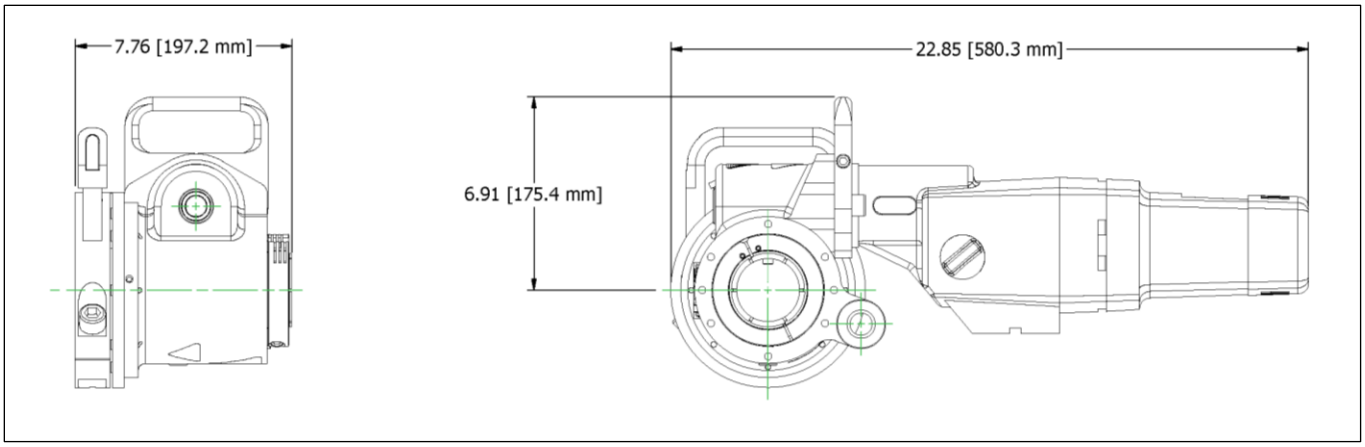


FIGURE 7. RDU AND EIBENSTOCK MOTOR

2.4.1 Hydraulic power

See the manufacturer's documentation for information about the HPU.

2.4.2 Hydraulic motors

The high-torque, low-speed hydraulic motor mounts directly to the RDU. Motor ports are 7/8 -14 SAE O-ring type. Motor fittings are included with the HPU. To reverse direction of bar rotation, switch the quick disconnect fittings at the motor.

Various hydraulic motors with other displacement ratings are available.

All HPUs used in Europe must have their own CE certification.

2.4.3 Servo motors

Servo drive versions of the BB5000 are available as 230V (16 amps) or 460V (8.5 amps).

TABLE 14. SERVO MOTOR SPECIFICATION

Input power for the 230V system	200V – 240V, 50/60 Hz dual-rated, 16 amp, 3-phase
Input power for the 460V system	380V – 480V, 50/60 Hz dual-rated, 8.5 amp, 3-phase
Bar speed	3 – 230 RPM
Rated torque (continuously running)	3 – 167 RPM: 147.9 ft-lbs (200.4 Nm)
Peak torque	3 – 167 RPM: 443.7 ft-lbs (600.4 N•m) 167 - 230 RPM: 443.7 ft-lbs (601.2 N•m)
Rotation	Variable and reversible

2.4.4 Motor data

TABLE 15. MOTOR SPECIFICATIONS

Manufacturer	Mitsubishi

Speed rated	2,000 RPM
Speed max	3,000 RPM
Speed permissible instantaneous	3,450
Nominal rated full load hp	4.7 hp (3.5 kW)
Torque rated	12.3 ft-lbs (16.7 Nm)
Torque max	37.0 ft-lbs (50.1 Nm)

2.4.5 Test data

TABLE 16. TEST DATA

Material	A-36 (mild steel)
Bore diameter	23” (584.2 mm)
Tool bit	High speed steel (HSS)
Bearing spacing	22 inches (558.8 mm)
Bar speed	30 – 40 RPM
Depth of cut	100” (2,540 mm)
Feed rate	.003 inches (.076 mm) per revolution
Length of cut	2” (50.8 mm)

2.4.6 Electric motor

Two electric versions of the BB5000 are available, as described in Table 17. The motor has an integrated rotation reverse switch, while the pendant controller has an off/off switch, emergency stop, amp meter, and speed controller.

TABLE 17. ELECTRIC MOTOR SPECIFICATIONS

	120V motor	**230V motor**
Power rating	3.35 hp (2.5 kW) 20 Amps 60 Hz	3.35 hp (2.5 kW) 10.5 Amps 60 Hz

Both motors have a four-speed gearbox for maximum versatility. Table 18 specifies the operating range for each gear.

TABLE 18. SPEED RANGE AND TORQUE PER GEAR

Gear	Knobs	**RPM range**	**Rated bar speed**	**Bar torque**
1		8.0 – 23.0 RPM	20 RPM	470 ft-lb (637 Nm)
2		12.5 – 35.5 RPM	30 RPM	300 ft-lb (407 Nm)
3		35.5 – 101.0 RPM	90 RPM	105 ft-lb (142 Nm)
4		56.5 – 160.0 RPM	142.5 RPM	65 ft-lb (88 Nm)

⚠ CAUTION

Remove the cutting load from the motor before shifting from high to low gear or from low to high gear. If you try to shift gears while the machine is under load, you could damage the motor and gearbox components.

Climax's portable machine tools require a 3-wire extension cord. Extension cords of inadequate wire size cause a serious drop in voltage with a consequent loss of power.

As the distance from the supply outlet increases, heavier gauge extension cords are required (see Table 19).

TABLE 19. RECOMMENDED WIRE GAUGE FOR EXTENSION CORDS

	Cord length					
	300" (7,620 mm)	**600" (15,240 mm)**	**900" (22,860 mm)**	**1,200" (30,480 mm)**	**1,800" (45,720 mm)**	**2,400" (60,960 mm)**
Nameplate Amps	**Minimum Wire Gauge**					
0 – 5.0	16	16	16	14	12	12
5.1 – 8.0	16	16	14	12	10	
8.1 – 12.0	14	14	12	10		
12.1 – 15.0	12	12	10	10		
15.1 – 20.0	10	10	10			

2.4.7 Air motor

The 3 hp (2.24 kW) air motor is reversible and operates under the specifications listed in Table 20.

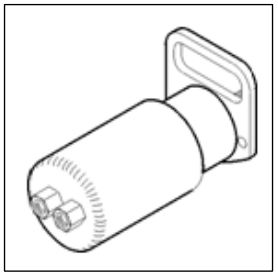


TABLE 20. AIR MOTOR SPECIFICATIONS

Air pressure required	**90 psi (620 kPa)**
Air flow requied	95 ft^3/min (2.7 m^3/min)

The available air motor assemblies produce boring-bar speeds and torques listed in Table 21.

TABLE 21. BAR RPM AND TORQUE AT MAXIMUM HP

Air motor part number	**Bar RPM**	**Torque**
28614	120 RPM	115 ft-lb (156 Nm)
28697	57 RPM	234 ft-lb (318 Nm)

The assembly includes the RDU mounting flange and associated hardware. For a complete air powered system, order an air motor assembly and connection package.

The air connection package contains an air filter and lubricator, and hoses with quick disconnect fittings.

⚠ CAUTION

To maintain the air motor and avoid invalidating your warranty, be sure to route incoming air through the air filter and lubricator.

2.4.8 Pneumatic conditioning unit

The PCU provides dry air and lubrication to the air motor. Install the PCU in the air supply circuit immediately before the BB5000.

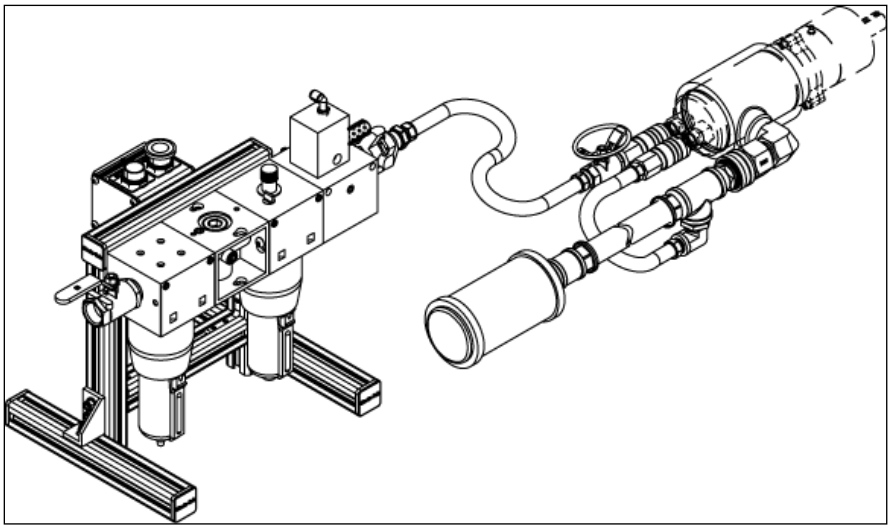


FIGURE 9. PNEUMATIC CONDITIONING UNIT

3 SETUP

3.1 Receipt and inspection

Your Climax product was inspected and tested prior to shipment, and 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:

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

Contact Climax immediately to report damaged or missing components.

3.2 Installation

The BB5000's through-bar design allows mounting of the RDU and feed box anywhere along the bar. They also do not need to be mounted next to each other. This allows set up of the BB5000 in very restricted spaces. Special setup cones are also available to make it easier to center and stabilize the bar in the work-piece bore.

Exactly attaching and aligning the tack mounting plates is easy. The initial fixture mounting can be 5 degrees or more out of alignment. Climax's spherical mounting system enables the BB5000 to align perfectly with the bore.

The BB5000 also features four precision alignment screws for precisely dialing into the center of an existing bore or into a bore that is not exactly true.

The BB5000 modular design also eliminates the problem of lifting heavy, bulky, one-piece machines on the job site. The BB5000 quickly assembles and disassembles, one component at a time.

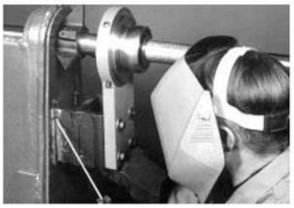
A Fast Six-Step Process

Setup of the BB5000 Portable Boring Machine is quick and easy. An experienced operator can set up the machine in most typical two-bore line boring applications in about half an hour (depending on alignment tolerances). The three main ingredients of the quick setup system are:

- Setup cones to roughly center the bar in the bore.
- Spherical mounts that can be quickly tack-welded in place.
- Quick-mount rotational drive unit, attaches to spherical mount in seconds

1 Slide the bar through the two holes to be bored and roughly center it with the set-up cones. The set-up cones are forced into the bore with the clamp ring jacking screw and locked onto the bar with a set screw.
Elapsed time: 4 minutes.

2 Slide on spherical mounts with tack weld plates, and tack weld them to the workpiece. These mounts have spherical bearings so they can be mounted up to 5° out of perpendicular alignment.
Elapsed time: 10 minutes,



3 Remove the set-up cones and replace the bar. The set-up cones will adequately center the bar, unless you have very precise tolerances, or need to move the centerline of the bore slightly. Final centering adjustments are made with the jacking screws.
Elapsed time: 5 minutes.

4 Slide the rotational drive onto the bar. Firmly push it onto the spherical mount, and lock it in place with one bolt. Tighten the rear clamping collar enough to be snug but so the bar can slide through it.
Elapsed time: 4 minutes.

5 The axial feed unit is slipped onto the bar and the leadscrew is screwed into the pocket on the rotational drive unit. Tightening two clamping collars locks the axial feed unit to the bar.
Elapsed time: 3 minutes.

6 Insert a properly ground tool bit into the tool hole in the bar, adjust for depth of cut, and lock in place with the set screw. Attach the hydraulic hoses.
Elapsed time: 5 minutes.

And there you are... ready to begin the first boring pass.

Total elapsed time: 31 minutes.

3.3 Bar and mounting bracket setup

To roughly align a Climax boring bar in a workpiece, use centering cones. These cones approximately center the bar until bearing supports and brackets are secured with clamps or welds, as appropriate. Cone sets are in two sizes cover a wide range and are offered as optional equipment with the BB5000.

The goal is to support the boring bar in place until clamping or welds on tack plates are completed. Then remove the cones and make precise adjustments to center the bar.

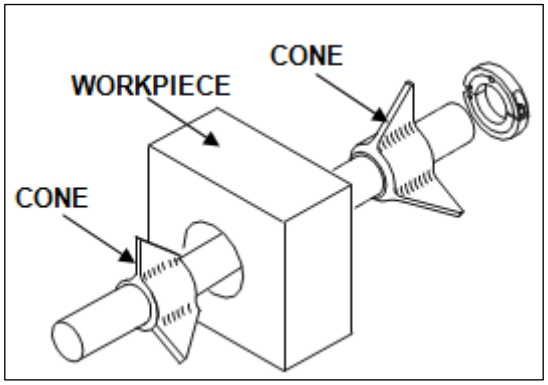


FIGURE 10. SETUP

3.3.1 Setup cones (optional equipment)

Do the following to install the setup cones:

1. Clean the bore and the boring bar to remove grease, oil, and dirt.
2. Carefully slide the boring bar through the holes to be bored.

⚠ CAUTION

To avoid bodily injury or bar damage and to ease setup, lift heavy loads (bars over 72" [1,829 mm]) using a sling type lift.

3. Slide a setup cone (or a substitute device) from each end of the bar to center the bar in the bore.
4. Tighten the set screw to secure one of the cones.
5. While pulling on the bar from the opposing end to seat the first cone, slide the second cone snug into place. Tighten the set screw.
6. Mount the clamp collar next to one setup cone. Loosen the set screw in the cone and drive it into the bore using the socket-head jacking screw. Tighten the set screw in the setup cone to hold it securely in place.

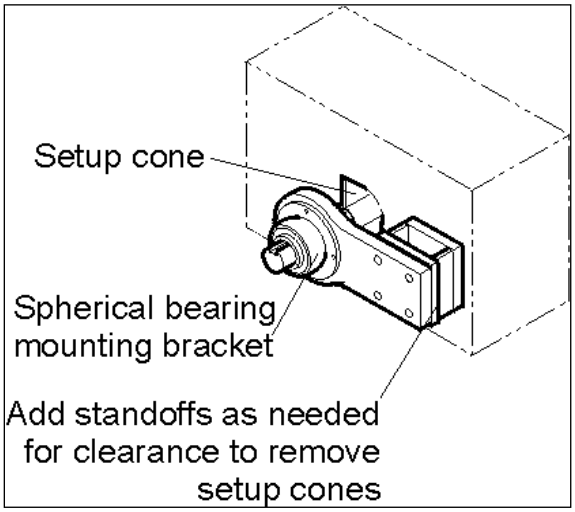


FIGURE 11.

7. Repeat steps 3-6 until the cones are seated in the bores and there is no bar movement.
8. Center the spherical bearings in the mounting brackets by doing the following:

a. Loosen the hex bolts.
b. Adjust the four set screws until the bearing is centered.
c. Tighten the hex bolts.

9. Mount tack weld plates to the spherical bearing mounting brackets. If more clearance is required, weld 1” x 1” x 6” (12 mm x 12 mm x 72 mm) tack weld blocks to the tack weld mounting spacer plates.

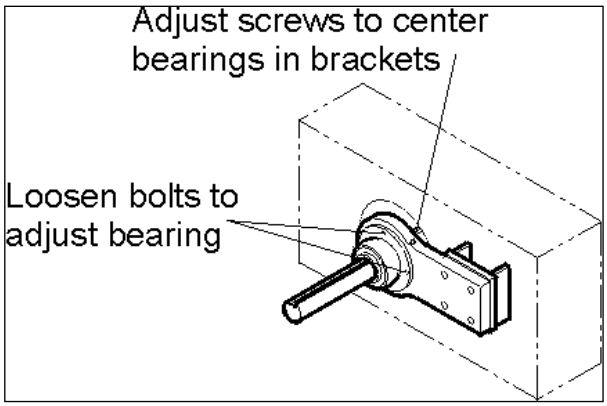


FIGURE 12. ADJUSTING THE

10. Temporarily clamp the bracket assemblies to the workpiece. Leave enough room to remove the cones after the brackets are welded in place.
11. Check that the setup cones are still securely in position.
12. Securely weld all standoffs and brackets in place.
13. Remove the temporary clamps.
14. Loosen the set screws in the setup cones.
15. Remove the bar from the brackets and remove the setup cones.
16. Carefully reinstall the bar through the mounting brackets.
17. If necessary, precisely align the bar:
    a. Loosen the hex bolts holding the bearing to the bracket.
    b. With a dial indicator attached to the bar, touch the stylus to the workpiece ID.
    c. Rotating the bar, adjust the set screws to center the bar.
    d. Tighten the hex bolts to keep the bearing and the bar in place.

3.4 Machine configurations

3.4.1 RDU position

The compact RDU may be placed anywhere along the bar. Plan the relationship between the RDU, motor, and axial feed assembly before setup to allow for enough space.

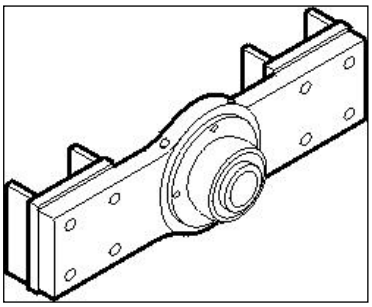
3.4.2 Axial feed assembly position

The axial feed assembly may be set anywhere along the bar. It is not essential to insert the leadscrew directly into the RDU. The leadscrew may be screwed into the tack weld block that may then be welded or clamped directly to the workpiece.

⚠ CAUTION

Take care not to bend or unduly stress the leadscrew during installation.

3.4.3 Two-am spherical bearing mounting bracket



FIGUR

Two-arm spherical bearing mounting brackets are better for those applications requiring extra support, such as when boring holes exceed an 8” (203 mm) diameter.

Do the following:

1. Carefully slide the bar through the spherical mounting bearings.
2. If the axial feed assembly is to be positioned between the mounting support brackets, slide it onto the bar now.
3. Insert the bar into the opposing bearing bracket.
4. Install the RDU onto the bar up against the spherical bearing bracket.
5. Tighten the clamp ring to 75 ft-lb (102 Nm) – that is, tighten until snug, plus a 1/3 turn.
6. Tighten the clamp collar over the collet, as shown in Figure 14. Turn the collar screw until the collar is snug, but the bar slides easily through the unit.

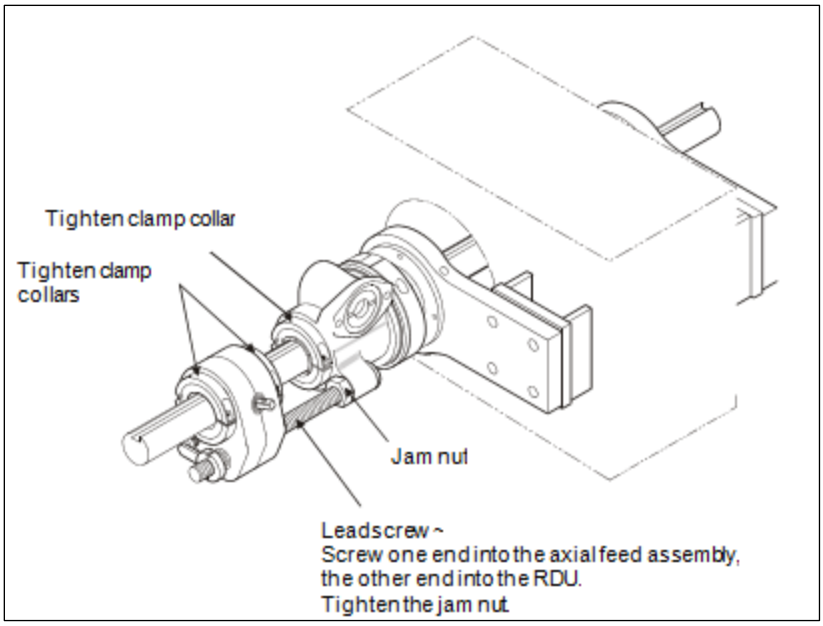


FIGURE 14. AXIAL FEED ASSEMBLY

7. Hold the motor assembly so the motor shaft will slide into the RDU housing. The key in the motor shaft must align with the keyway in the main drive worm.
8. Push the motor into the housing until the flange is snug against the drive housing face.

9. Tighten the mounting screws.
10. Install the leadscrew into the axial feed assembly. Be sure the jam nut is on the other end of the leadscrew.
11. Slide the axial feed assembly onto the bar.
12. Thread the leadscrew into the RDU housing. Secure the leadscrew by tightening the jam nut snug against the face of the drive housing.
13. If the leadscrew is to be mounted away from the RDU, weld the tack weld block to a fixed object and screw the leadscrew into it. Secure the leadscrew by tightening the jam nut snug against the face of the tack weld block.
14. Tighten the axial feed clamp collar screws to fasten the collar to the bar.

3.5 Chip shields

If you have not already done so, attach the motor assembly to the RDU.

Chip shields (rubber seals) protect the machine, particularly when working in a vertical position with the RDU at the bottom. Chip shields can be obtained from Climax or your local vendor.

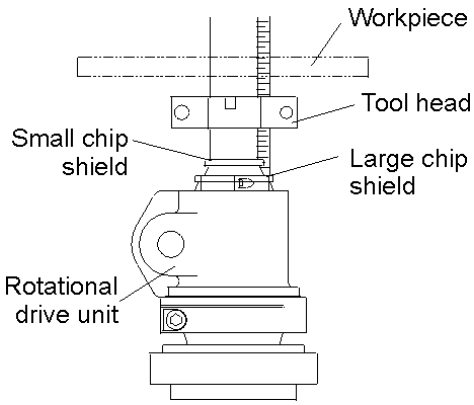


FIGURE 15. CHIP

To keep chips and debris away from the main bearings, slide the larger shield over the collar clamp and against the RDU. Slide the smaller shield over the bar and against the RDU collar clamp to keep chips and debris from between the bar and the RDU. These same chip shields are also used on the axial feed assembly.

3.6 Tool head setup

Cutting speed is governed primarily by the hardness of metal being machined and the type of tool bit. Other considerations are the power source, feed and depth of cut, and cooling medium being used.

Generally, carbide cutting tools operate at higher RPM than high-speed steel (HSS) tools.

If using a HSS tool bit, set the speed shift lever to LOW.

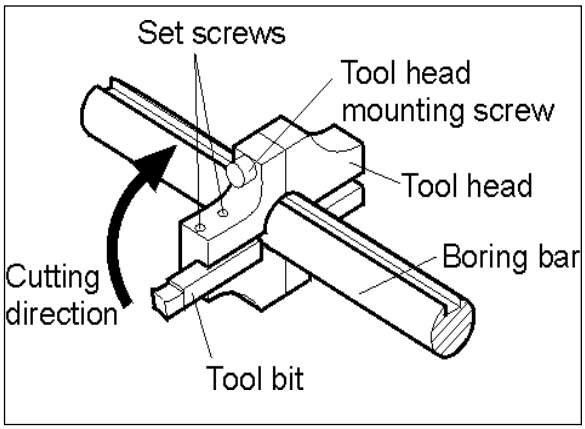
When using carbide tool bits, set the speed shift lever to HIGH.

3.6.1 Standard setup

Do the following for standard setup:

1. Using the clamping screw, secure the tool head tightly to the boring bar.
2. Select either a HSS or brazed carbide tool bit.

3. Position the tool head on the bar with the open side of the tool slot toward the workpiece in the direction of the feed.
4. Slide the tool bit into the tool head with the cutting face toward the tightening screws. This will position the cutting face at or slightly below the centerline.



TIP:

Tool bits are either right-hand or left-hand. When feeding toward the RDU with clockwise rotation, use a right-hand tool bit. When feeding away from the RDU with clockwise rotation, use a left-hand tool bit.

5. Use a dial indicator to set the tool bit to achieve the desired depth of cut. The maximum recommended cutting depth is .125" (3 mm). Tighten the tool bit mounting screws. Precision boring is best accomplished with multiple roughing passes and one shallow finishing cut.

TIP:

Climax offers a bore measuring tool specially built for setting the tool bit height and checking the actual bore diameter. Contact Climax for more information on this tool.

3.6.2 Large tool head setup

Do the following:

1. Clamp the tool hub tightly to the boring bar.
2. Mount the tool arms securely to the hub. Table 22 and Figure 17 show which holes to use.

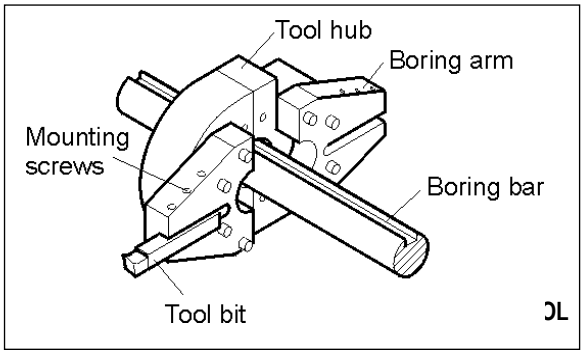


TABLE 22. SHORT AND LONG ARMS DIAMETER PER HOLE

	Short arms diameter	Long arms diameter
X holes	12-15" (305-381 mm)	18-21" (457-533 mm)
Y holes	15-18" (381-457 mm)	21-24" (533-610 mm)

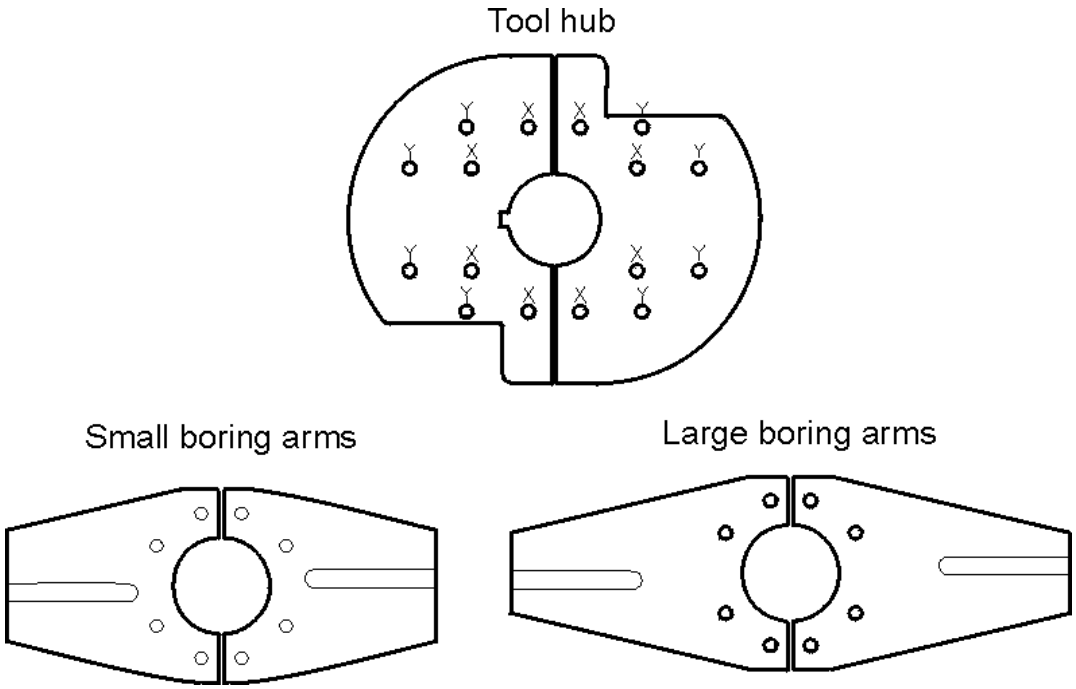


FIGURE 17. MOUNTING BORING ARMS TO TOOL HUB

TIP:

Both arms must mount to the same hole-pattern on the hub.

3. Insert a 1/2" (12 mm) square HSS tool bit. With a dial indicator, set the cutting tool depth. The maximum recommended depth of cut is .125" (3 mm).
4. Tighten the mounting screws. Precision bores are best achieved with several rough passes and one or more shallow finishing passes from .015" to .030" (.38 to 0.8 mm) deep.

3.7 Axial feed

3.7.1 Selecting the feed direction

The feed direction has three positions:

- FORWARD
- NEUTRAL
- REVERSE

Pushing the 3-position feed shaft in on one side or the other will feed in the direction indicated by the arrow on that side of the body. Be sure the engagement pins are fully engaged. The mid or NEUTRAL position is for "no feed."

A shaft under load may require a firm bump to disengage.

If the axial feed box fails to feed the tool head, check the shear pins. Replacement pins are included with the axial feed assembly. To replace a pin, see Section 5.1.1.

⚠ CAUTION

If the bar is fed into a fixed object, the internal feed clutches could be damaged.

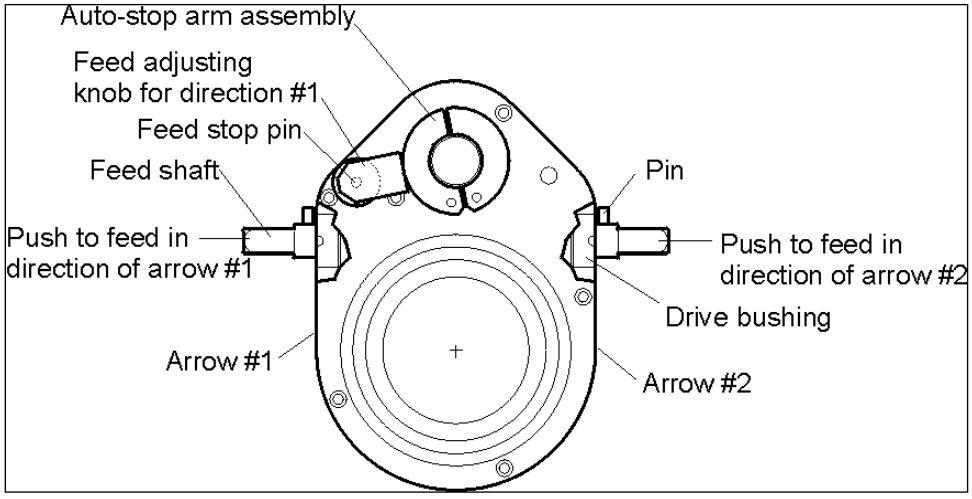


FIGURE 18. AXIAL FEED ASSEMBLY

3.7.2 Setting the feed rate

Feed rate is adjusted by an adjusting screw. Each feed rate is independent of the other; FORWARD and REVERSE have separate feed adjusting knobs.

The feed rate operates by the following rules:

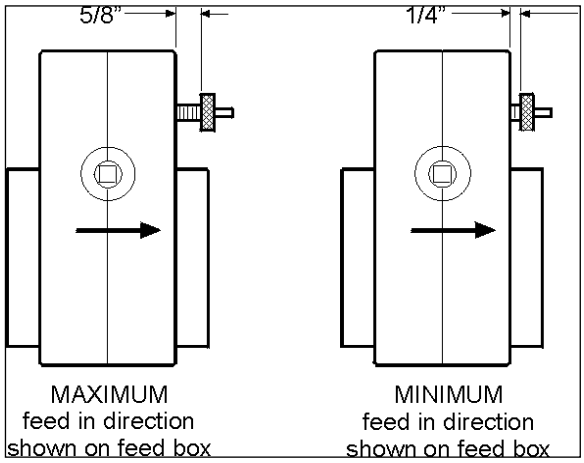


FIGURE 19. SETTING FEED RATE AND

- Turning the knob counterclockwise (out) increases the feed rate.
- Turning the knob clockwise (in) decreases the feed rate.
- The feed range is up to .018" (.45 mm) per revolution of the bar.
- Maximum feed is reached when the knob is approximately .625" (16 mm) away from the feed box.
- Minimum feed is reached when the knob completely collapses the compression spring approximately .25" (6 mm).

⚠ CAUTION

The axial feed unit will not stop until the pin is pushed in completely. To prevent overfeeding, be sure the stop arm is positioned correctly.

3.7.3 Automatic stop

This feature, shown in Figure 20, stops the axial feed unit at any point along the leadscrew.

Do the following to use the automatic feed stop:

1. Clamp a stop arm onto the leadscrew at the position where you want the axial feed to stop. (Assemblies are included for stopping in either direction.)
2. Check that the stop arm is positioned to press against the feed stop screw assembly.

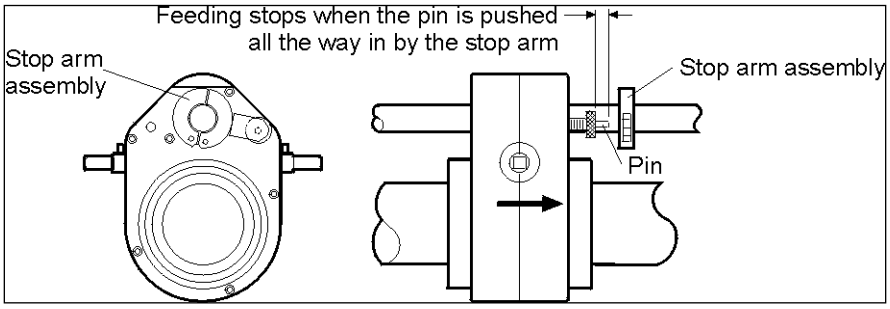


FIGURE 20. AUTOMATIC FEED STOP

When the axial feed box nears the stop arm, the stop arm will depress the feed stop screw assembly to stop the axial feed.

Do the following to retract the tool head:

1. Place the feed box in NEUTRAL.
2. Hand crank the tool bit away from the workpiece.

TIP:

To protect tool bits from chipping, place the feed box in NEUTRAL before stopping bar rotation.

3.8 Power connection

3.8.1 Servo drive machines

Do the following to connect the servo drive power:

1. Turn off and lock out the power source to the unit.
2. Examine the cables for damage. Repair or replace if necessary.
3. Connect the encoder cable and power cable to the servo motor.
4. Connect the servo power, servo decoder, and pendant cables to the main control panel, shown in Figure 21.

FIGURE 21. SERVO MOTOR CONTROL PANEL

NOTICE

The MAIN POWER DISCONNECT on the control panel is an external emergency stop circuit that ensures operation can be stopped and power switched off immediately when engaged.

⚠ WARNING

Electrical equipment can shock or cause an explosion if used near wet or flammable materials. Do not operate the motor if it is wet or exposed to combustible materials.

3.8.1.1 Servo motor pendant

Table 23 shows how to use the pendant controls (seen in Figure 22) to operate a servo-motor powered machine.

FIGURE 22. SERVO MOTOR PENDANT CONTROLS

TABLE 23. SERVO MOTOR CONTROLS AND ACTIONS

Button / Light	Action
RESET	Press and hold for a couple of seconds to start the control system on power up, or after an E-Stop.
E-STOP	Press to stop immediately all machine functions.
FAULT Light	Illuminates when the servo drive has stopped due to a fault condition, such as the following: • Motor overload • Loss of feedback • Motor is disconnected
OVERLOAD indicator	Warns that a fault condition is imminent unless the load is reduced.
DIRECTION	Turn to control the direction of bar rotation.
RPM	Controls the rotational bar speed from 3 – 230 RPM.
START	Hold for a couple of seconds to start the spindle rotation.
STOP	Press to stop the rotation of the spindle.

3.8.2 Hydraulic machines

Do the following to connect the hydraulic power:

1. Turn off power to the HPU.
2. Check that all hydraulic hose fittings are clean.
3. Connect the hydraulic lines between the HPU and the hydraulic motor. Quick disconnect fittings at the motor may be switched to reverse direction of bar rotation.

⚠ CAUTION

To avoid damaging the pump and invalidating the warranty, connect the hydraulic motor to the pump before turning on the power unit.

3.8.3 Electrical machines

⚠ WARNING

Electrical equipment can shock or cause an explosion if used near wet or flammable materials. Do not operate the motor if it is wet or exposed to combustible materials.

⚠ CAUTION

The motor rotation reverse switch must be manipulated only when the motor is completely stopped. Failure to do so can cause damage to the equipment.

Do the following to connect the electrical power:

1. Turn off and lock out the power source to the control box, or speed control.
2. Examine the power cord and plug for damage. Repair or replace if necessary.
3. Plug the motor into the control box, or speed control.
4. Connect the control box to a grounded outlet of the correct voltage. 120V motors are rated at 20 amps; 230V motors require 10.5 amps.

3.8.4 Pneumatic machines

For your safety and protection, the BB5000 has an air control valve with a brightly colored oval handle (seen in Figure 23) clearly indicating airflow direction.

Quick-disconnects between the incoming air supply and the machine enables the operator to quickly disconnect the machine if necessary.

The air filter and lubricator must be used to protect the pneumatic systems and maintain the machine warranty. The lubricator is set to deliver oil at a rate of 20-30 drops per minute at full throttle.

FIGURE 23. AIR CONTROL

⚠ CAUTION

If the machine stops moving unexpectedly, lock out the pneumatic safety valve located at the filter lubricator assembly before performing any troubleshooting.

3.9 Additional configurations

The BB5000's design allows versatility in set up, implementation, and operation of the machine. These features often provide solutions to the most challenging on-site maintenance demands.

3.9.1 Tool head options

Boring heads are designed for either 1/2" square tool bits or cartridge type tool holders with indexing carbide inserts.

Slotted boring heads hold 1/2" square tool bits and come in two sizes: the standard 4.5" to 12.0" (114.3 to 304.8 mm) and the optional 12" to 24" (304.8 to 609.6 mm) in diameter. They can use either HSS or carbide tipped tool bits. See Section 3.6 for a description of these options.

A range of cartridge boring heads is offered to machine diameters from 5.96" to 12.75" (151.3 to 323.8 mm). Typical styles are illustrated in Figure 24.

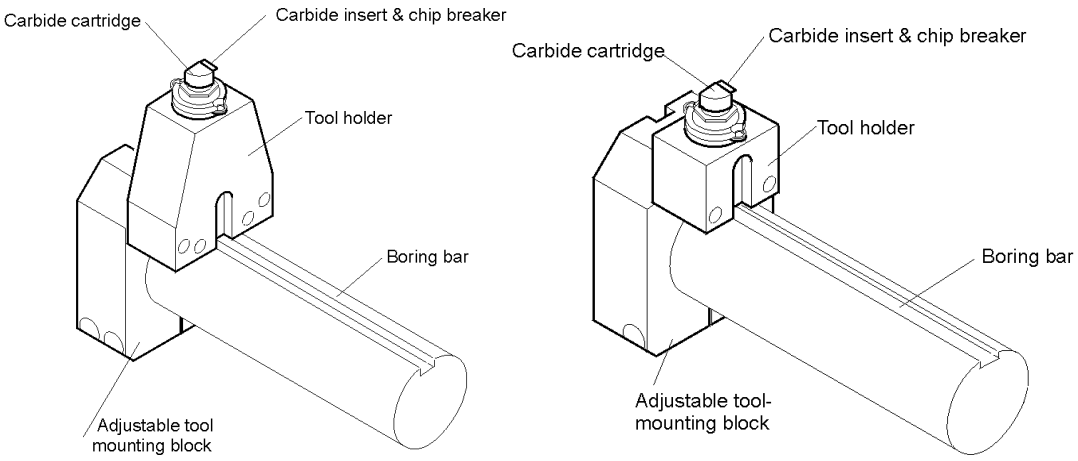


FIGURE 24. CARTRIDGE BORING HEADS

Each boring head consists of an adjustable tool-mounting block, a carbide cartridge tool holder, and the carbide boring head cartridge. One carbide cartridge is included in the assembly.

Do the following to use the carbide cartridge tool holder:

1. Slide the tool-mounting block onto the boring bar. Secure it with socket-head cap screws.
2. Determine which carbide cartridge tool holder to use.
3. Insert the tool key into the key slot in the tool-mounting block.
4. Secure the tool holder to the mounting block with socket-head cap screws. Be sure the key is in both key slots.
5. Insert the carbide cartridge into the tool holder. Tighten the cartridge screws.
6. Install carbide inserts and chip breakers into the cartridge. Tighten all mounting hardware.

TIP:

For boring diameters less than 4.5” (114.3 mm), use the small boring option.

3.9.2 Boring small diameter holes

When smaller size bores in the range 2.0” to 4.0” (51 to 102 mm) diameter are required, mount a tool bit directly into one of the square holes located at 10” (254 mm) along the boring bar.

In the unlikely event placement of standard tool bit mounting holes do not quite suit your requirements, Climax offers tooling and complete instructions to create mounting holes to accept Tool Sleeves shown in Figure 25. Contact Climax for information.

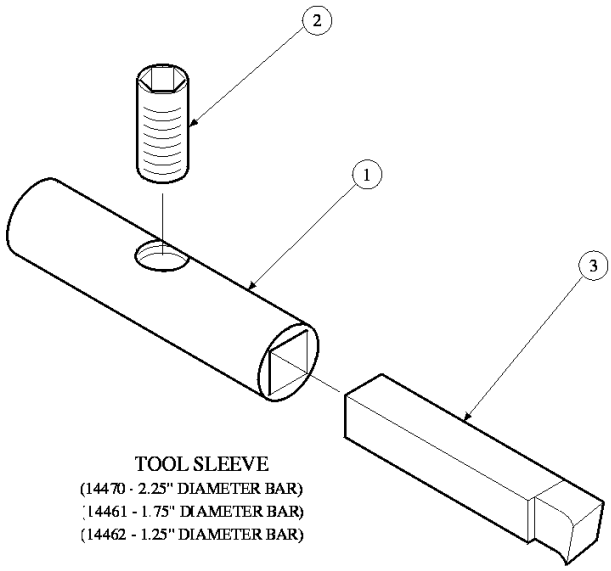


FIGURE 25. TOOL SLEEVES

3.9.2.1 Using small diameter bars

Boring bars less than 2.25” (57.15 mm) diameter are easily adapted to accept the standard RDU, axial feed assembly, and the spherical bearing mounting brackets. This adaptation for the 1.25” (32 mm) boring bar is offered as Climax small bore kit part number 28698.

NOTICE

The small bore kit adapter collets fit into the existing collets. Do not remove existing collets from the RDU and AFU.

The AFU collet is serrated on both ends and has no keyway. The RDU collet is serrated on one end only.

THE RDU COLLET HAS A KEYWAY MILLED INTO THE OUTSIDE DIAMETER WITH TWO BOLT HEADS SHOWING (SEE FIGURE 27 ON PAGE 34). THOSE ARE FOR RETAINING THE KEY IN THE INNER DIAMETER OF THE COLLET, WHICH WILL ACCEPT THE KEYWAY OF THE 1.25" BORING BAR .

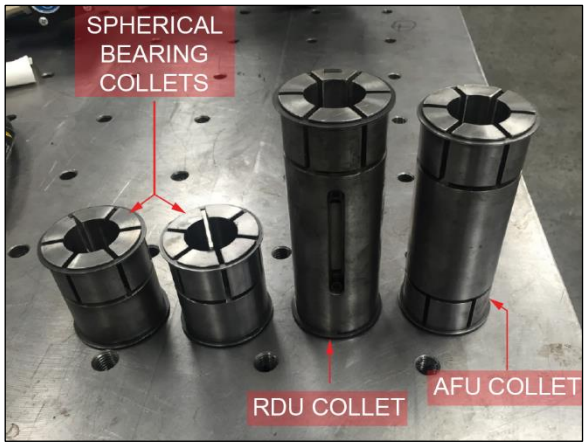


FIGURE 26. COLLETS

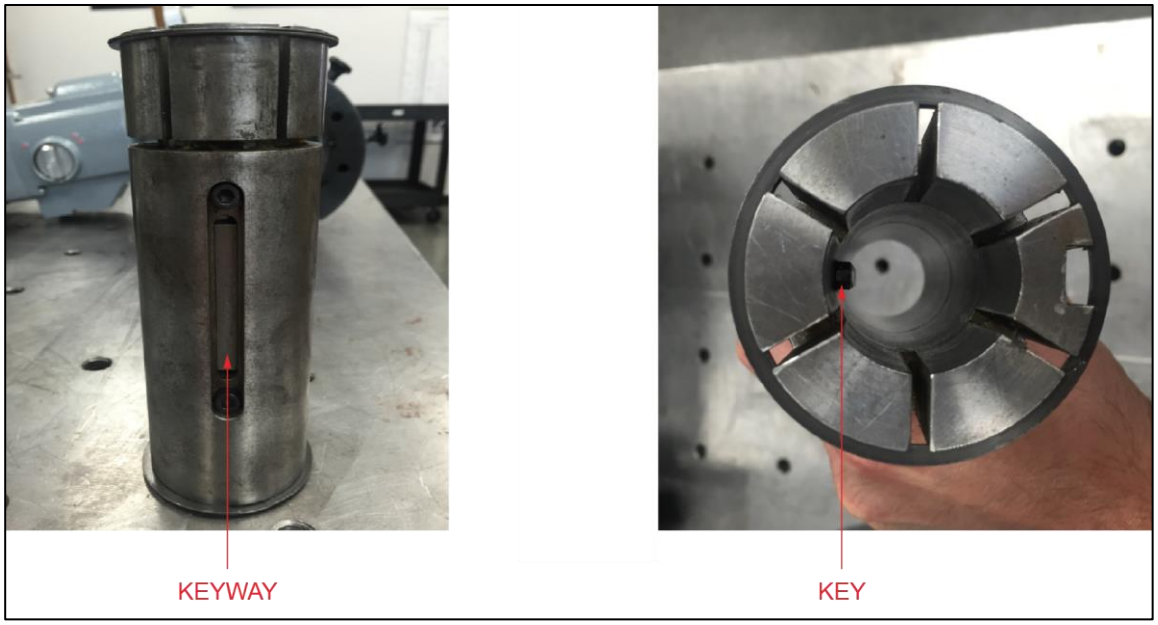


FIGURE 27. RDU COLLET KEYWAY

Do the following to install the small-bore kit, or for installation of collets for the RDU, AFU, or spherical bearings:

1. Remove a snap ring from one end of the small bore kit collet.

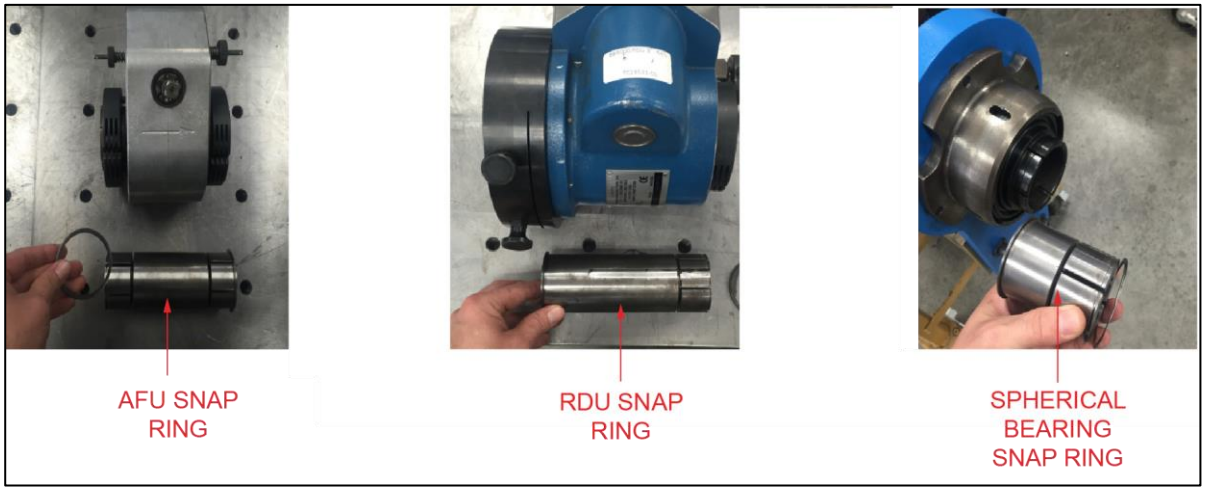


FIGURE 28. SNAP RING REMOVED

2. Insert the small bore kit adapter 1-1/4" ID collet into existing 2-1/4" ID collet.

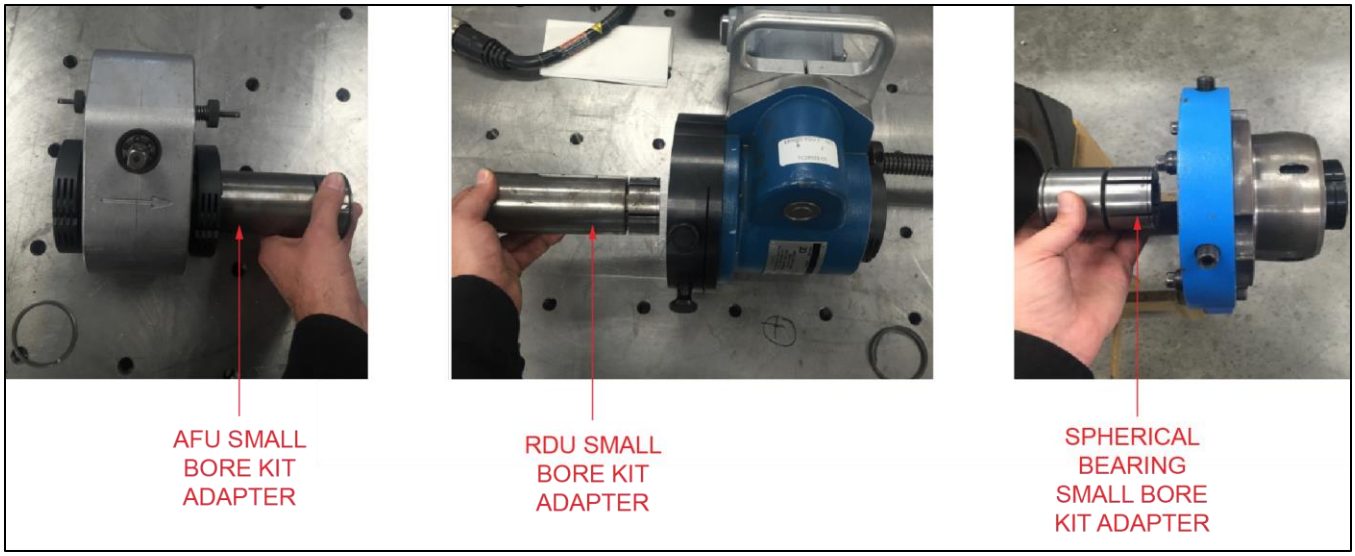


FIGURE 29. SMALL BORE KIT ADAPTER INSERTED

NOTICE

When installing the RDU collet, make sure to line up the keyway to accept the key in the RDU.

3. Replace the snap ring and install the 1-1/4" bar.

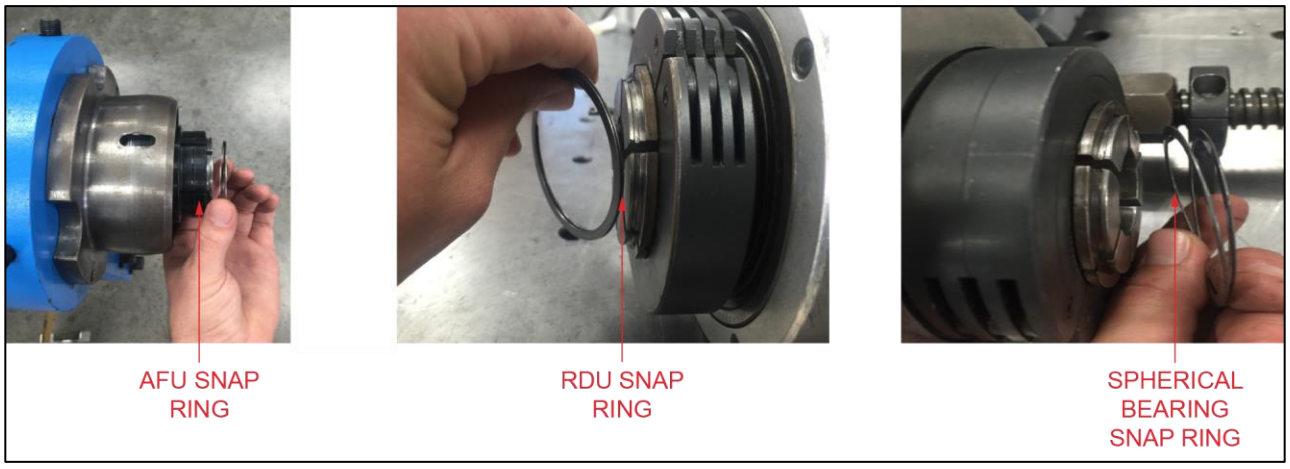


FIGURE 30. SNAP RING REPLACED

3.9.3 2" bar RDU

If you have a 2" (50.8 mm) diameter boring bar, you will need part number 65620 for the .25" (6.35 mm) keyway, or part number 65678 for the .31” (8 mm) keyway. See Appendix B for parts and details.

3.9.4 Cantilever mounting

When the BB5000 is used for blind boring, trepanning, spade drilling, or tapping, the Climax cantilever mounting kit (PN 28799) will provide greater machine rigidity.

TIP:

For these applications, a two-arm spherical-bearing mounting bracket is recommended.

3.9.5 Support bracket setup

Clean the workpiece with solvent to remove grease, oil, and dirt.

Inspect the boring bar for nicks or cuts and dress it smooth if necessary. A bar with nicks or gouges can score mating parts.

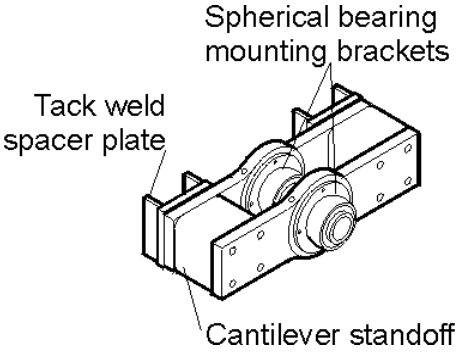


FIGURE 31. CANTILEVER MOUNTING KIT AND BEARINGS

Carefully slide the bar into the bores to be machined.

Assemble the cantilever mounting kit and two spherical bearing mounting brackets, as shown in Figure 31.

TIP:

Two-arm bearing mounting brackets require an additional pair of cantilever mounting kits.

Be sure the spherical bearing is properly centered in the bracket.

Do the following to center the bearing:

1. Loosen the hex bolts.
2. Adjust the four setscrews until the bearing is centered.
3. Tighten the hex bolts to 19 ft-lb (26 Nm).
4. Slide the assembled mounting brackets and cantilever onto the end of the bar where the RDU will be positioned.

TIP:

Machine components can be positioned anywhere along the bar. Be sure to allow space for them during setup.

5. Hold the bar and support in the center of the workpiece bore. Rough alignment within .125” (3 mm) is necessary.
6. Mark the locations of the spacer plates or mounting bracket on the workpiece.
7. Remove the bar and mounting bracket form the workpiece.
8. Tack-weld or clamp the mounting brackets to the workpiece.
9. Carefully slide the bar back through the mounting bracket.

If necessary, precisely align the bar by doing the following:

1. Loosen the hex bolts.
2. Adjust four setscrews to center the bearing and bar are centered.
3. Tighten the hex bolts to 19 ft-lb (26 Nm).
4. Complete the Cantilever mounting setup.

3.9.6 ID-mounted bearing assembly

The ID-mounted bearing assembly shown in Figure 32 secures the BB5000 in the workpiece bore. Adjustable jaws center and firmly hold the machine.

This assembly includes the ID-mount chuck, three sizes of jaws to fit bores with diameters from 11.5” to 24.0” (292.1 to 609.6 mm), two sizes of jack bolts, and the necessary hardware (see Table 24).

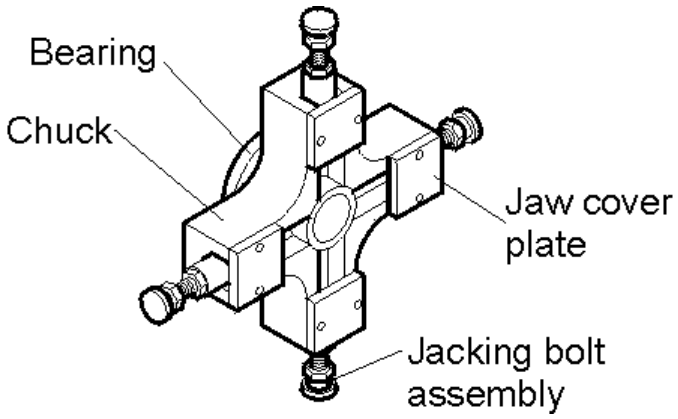


FIGURE 32. ID-MOUNTED BEARING ASSEMBLY

Measure the workpiece bore diameter. Using the table below, select the appropriate chuck jaws and jaw spacers.

Use these guidelines to select the required jacking bolts:

- Bores less than 12” (305 mm) in diameter use square-head screws.
- Bores over 12” (305 mm) diameter use jacking bolts, snap rings, and thrust pads.

TIP:

All mounting chucks must have matching size jaws and an equal number of jaw spacers.

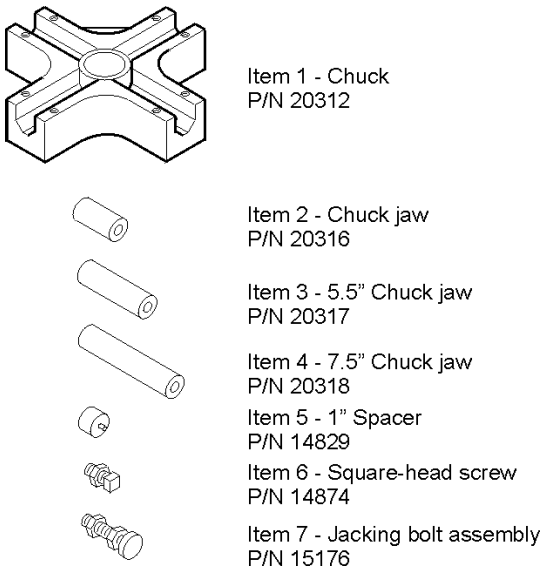


FIGURE 33. ID CHUCK ITEMS

TABLE 24. ID-MOUNTED CHUCK BORE RANGE

ID mount chuck bore range	Parts required
11.5 – 12" (292 – 305 mm)	1, 2 6
12 – 14" (305 – 356 mm)	1, 2, 7
14 – 16" (356 – 406 mm)	1, 5, 2, 7
16 – 18" (406 – 457 mm)	1, 3, 7
18 – 20" (457 – 508 mm)	1, 5, 3, 7
20 – 22" (508 – 559 mm)	1, 4, 7
22 – 24" (559 – 610 mm)	1, 5, 4, 7

- Loosely set the jaw cover plates and plate screws on the chuck arms.
- Be sure all legs are the same length. Insert the screws and jam nuts into the ends of the jaws. Screw the hardware all the way in.
- Insert the jaws into the mounting chuck arms until they rest against the inner chuck surface.
- Tighten the jaw clamping plates. Torque the ½-13x1-1/4" hex cap screws to 46 ft-lb (66 Nm).
- Tighten the chuck assembly jaws securely in the bore and adjust for center.
- Operate the boring bar as described Section 4.

3.9.7 Trepanning

Trepanning assemblies remove disks from 2.36" (60 mm) to 11.80" (300 mm) in diameter. For information, contact Climax. Two-arm mounting brackets are recommended for trepanning operations.

3.9.8 Spade drilling

Drill bits are available to spade-drill holes from 1-1/2 to 3-3/8" (38 to 86 mm) diameter. Provision is made to mount straight-shank or #5 Morse taper shank spade-drills. Coolant can be delivered to the spade-drill by way of a hole through the boring bar. To determine the necessary components, contact Climax.

4 OPERATION

4.1 Pre-operational checks

Do not operate this machine without adequate training to fully understand the safe setup, operation, and maintenance procedures.

⚠ CAUTION

To avoid serious bodily injury, keep clear of moving machinery during operation. Apply cutting oil with a squirt can.

⚠ CAUTION

For machines with air motors, if the machine stops moving unexpectedly, lock out the pneumatic safety valve located at the filter lubricator assembly before performing any troubleshooting.

Before setting up or operating the portable boring bar, check that:

- The power is off.
- Power lines and cables are properly connected.
- All machine parts, including the tool head, tool bit, and collar clamps are secure.
- The feed direction and rate are correctly set.
- All preventive maintenance has been completed

4.2 Start up

Verify that the tool bit is installed so that, as the boring bar rotates, it presents its cutting edge to the workpiece. Before machining, lubricate the bore and tool bit with cutting oil.

4.2.1 Hydraulic machine

Do the following to start the hydraulic machine:

1. Turn the HPU to its minimum flow rate (lowest speed).
2. Jog the HPU to verify the direction of bar rotation matches the bar rotation indicated on the pendant. To reverse bar rotation:
    a. Turn off the HPU.
    b. Reverse the hoses.
3. With power switched on, adjust the bar speed by turning the hydraulic speed control knob (located on the power unit).

4.2.2 Electrical machine

Do the following to start the electrical machine:

1. Turn on power at the control box.

2. Adjust the feed rate.

4.2.3 Servo motor driven machine with its pendant

See Section 3.8.1 for servo motor operation.

4.2.4 Pneumatic machine

Do the following to start the pneumatic machine:

1. Using the quick disconnect fittings, connect the pneumatic motor to the pneumatic conditioning unit.
2. Verify that the incoming air pressure is 90-psi (620 kPa) minimum.
3. Control the boring bar speed by slowly adjusting the air control valve.

NOTICE

The 3 hp (2.24 KW) air motor is reversible. Connect the airline so, as the boring bar rotates, the tool bit presents its cutting edge to the workpiece. If the tool bit is backward, quick disconnects at the motor may be reversed to change the direction of bar rotation.

⚠ CAUTION

If the machine stops moving unexpectedly, lock out the pneumatic safety valve located at the filter lubricator assembly before performing any troubleshooting.

4.2.5 Electric machine

This motor has thermal and current overload protections built in. If the motor is pushed beyond its protected range, it will stop. To prevent this, watch the amp meter on the controller and keep the reading below its rated maximum amperage (10.5 amps for the 230V and 20 amps for the 120V). See the electrical specifications in Section 2.4.6.

This motor is also reversible, which allows the bar to change the direction of rotation.

⚠ CAUTION

Always stop the motor completely before performing a rotational direction switch or rotation reverse.Failure to do so may damage both the motor and the controller.

⚠ CAUTION

Brush wear depends on load and RPM. Regularly check both brushes for excessive wear and replace if necessary.

4.3 Re-boring welded holes

The BB5000 can rebore IDs that have been built-up with weld. Mounting accessories are available to use the BB5000 with the BW3000.

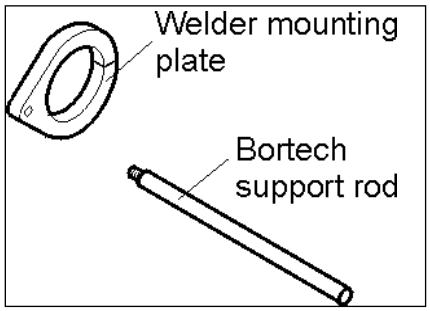


FIGURE 34. WELDER MOUNTING ROD

4.3.1 Boring strategies

The following hints and tips will optimize the process of re-boring welded holes easier:

- Carbine cutting tools are a better choice when a setup is sufficiently rigid to take higher speeds and heavier loads.
- Position bearings no more than 48” (1,219 mm) apart, with no bearing more than 12” (304 mm) from the face of the bore.

TIP:

Obtain a better surface finish with bearings set close to the workpiece.

- If using a HSS tool bit, operate with the speed shift lever to LOW.
- When using carbide tool bits, set the speed shift lever to HIGH.
- The first cut through a welded bore should be between .060” and .120” (1.5 to 3.0 mm) deep.
- Final bores and finish passes should be between .015” and .030” (.38 and .76 mm) deep.
- Set the tool bit height using the Climax Bore Measuring Tool or a magnetic base dial indicator.
- Tool chatter is usually caused by either too large a nose radius on the tool bit or by lack of rigidity in the machine setup.
- Carbide tool bits cannot tolerate tool chatter and are liable to break. If chatter persists, switch to HSS tool bits.
- To be safe, cutting oils require adequate ventilation.

⚠ WARNING

Avoid breathing the cutting oil fumes.

4.3.2 Preparing for welding

TIP:

It is recommended that the work be bored to clean up and make round before welding.

Follow these guidelines:

- Be sure the bar is properly aligned with the workpiece.
- Leaving the boring bar in place, carefully slide the RDU and the axial feed box from the bar.
- With the boring bar still in place, screw the support rod into the welder mounting plate and tighten securely.
- Slide the welder mounting plate and support rod over the end of the boring bar and onto the spherical bearing.
- Slide the alignment fixture (P/N 26487) over both the 1" (25.4 mm) support rod and the boring bar (see Figure 35). Lightly tighten the clamp bolt in the welder mounting plate.

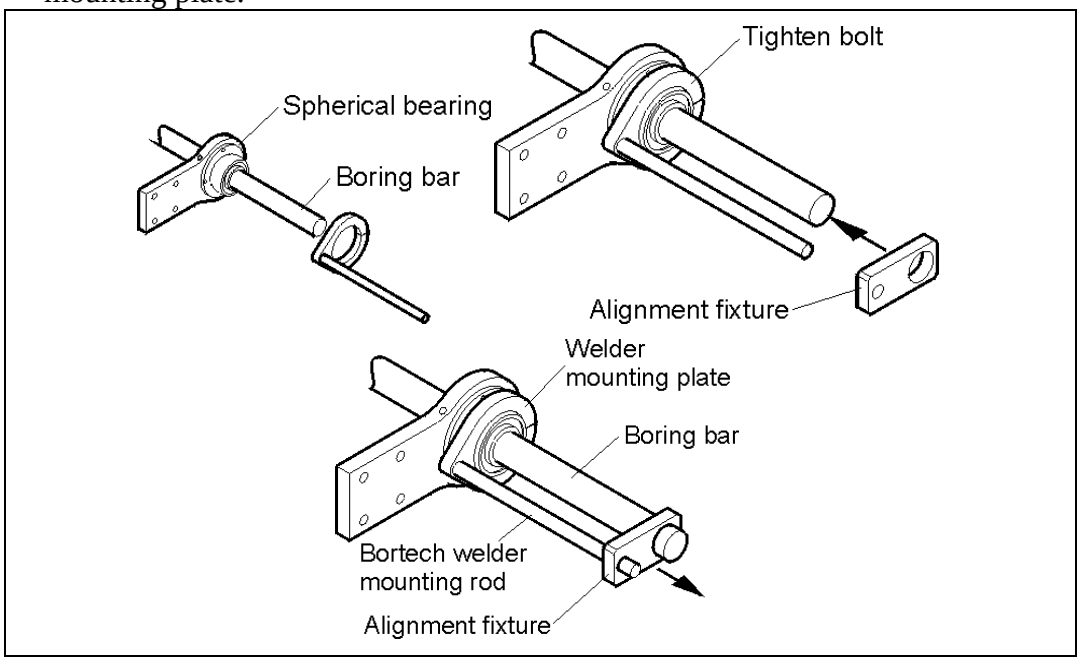


FIGURE 35. ALIGNING SUPPORT AND BORING BAR (WELDER MOUNTING ROD IS CUSTOMER SUPPLIED)

- Remove the alignment fixture. The mounting bolt should be tight enough to hold the welder mounting plate in position, but not so tight as to cause difficulty in removing the spherical bearing in step 3.
- Remove or slide the boring bar out of the way.
- Using the Climax wrench (P/N 26515), take the self-aligning bearing from the spherical mount.
- Firmly tighten the clamp bolt on the welder mounting plate.
- Slide the Borewelder over the support rod and position the offset head and spindle to the approximate center of the removed bearing.

4.3.3 Welding the bore

For information on welding the bore, see the AutoBoreWelder BW3000 manual.

4.3.4 Machining welded bores

Do the following:

1. Remove the bore welder from the workpiece.
2. Remove the welder mount plate and support rod from the spherical bearing.
3. Using the wrench (P/N 26515), install the spherical bearing to the spherical mount.
4. Carefully slide the boring bar through the spherical bearings.
5. Mount the RDU and axial feed assemblies to the bar.
6. Operate the machine as described in Section 4.

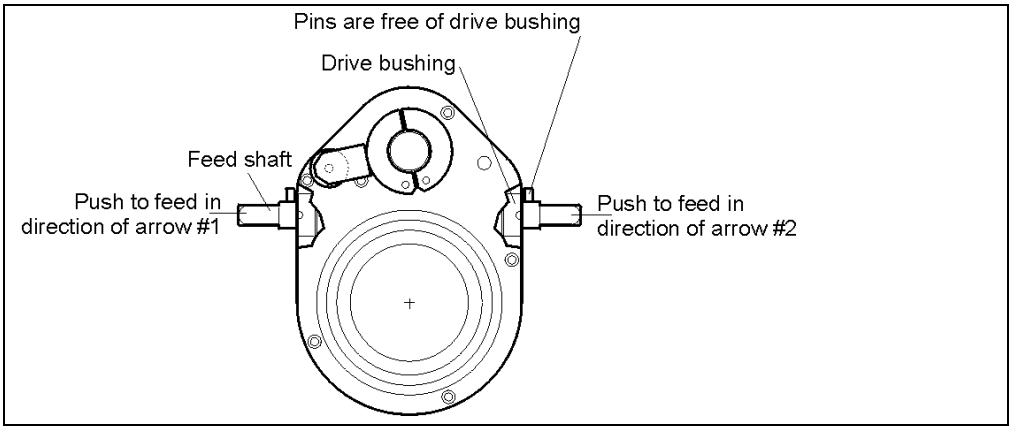
4.4 Shutdown

To protect tool bits from chipping, always place the feed box in NEUTRAL before stopping bar rotation.

⚠ CAUTION

With power off, do not use your hands, compressed air, or metal tools to remove chips. Use a brush.

1. Disengage the axial feed by pushing the feed shaft until the pins on both sides of the feed box are free of the drive bushings.
2. Switch or turn off and disconnect power to the machine.
3. After the machine is at a complete standstill, use a brush to remove chips.
4. Retract the tool from the workpiece.



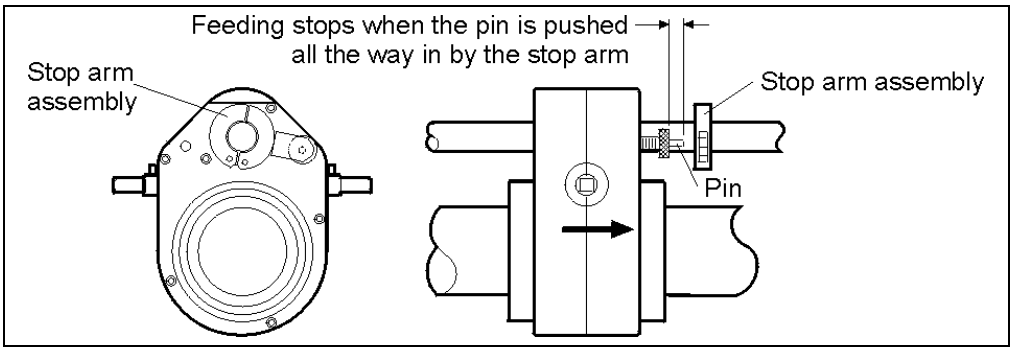


FIGURE 36. DISENGAGING THE AXIAL FEED

4.5 Disassembly

Do the following to disassemble the BB5000:

1. Turn off and disconnect power to the unit.
2. Remove the tool head.
3. Disconnect the leadscrew from the RDU.
4. Loosen the clamp collars holding the axial feed assembly to the bar.
5. Slide the axial feed unit off the bar.

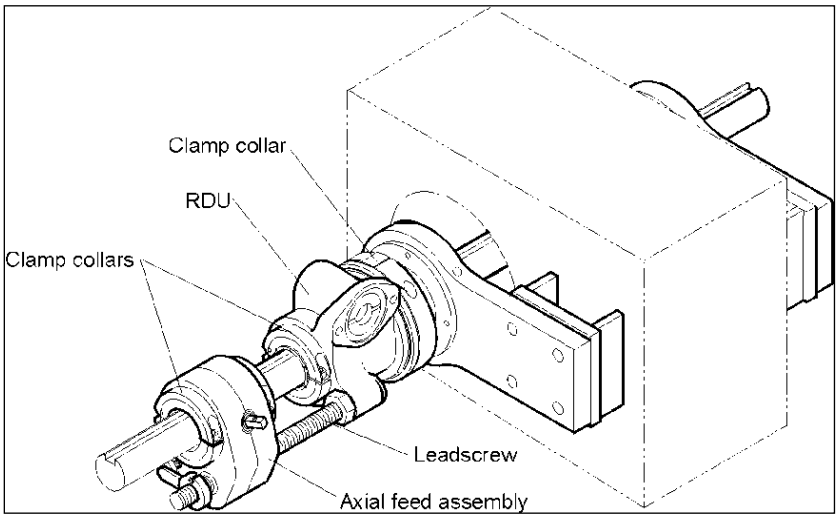


FIGURE 37. DISASSEMBLY OF THE AXIAL FEED ASSEMBLY

6. Loosen the clamp ring holding the RDU to the spherical bearing.
7. Loosen the clamp collar holding the RDU to the boring bar.
8. Remove the RDU.
9. Slide the boring bar from the workpiece.
10. Remove all mounting accessories.

5 MAINTENANCE AND TROUBLESHOOTING

This section contains periodic maintenance procedures and intervals as well as troubleshooting guidance.

5.1 Maintenance intervals

Table 25 lists maintenance intervals and tasks, along with the section where each task is described.

TABLE 25. MAINTENANCE INTERVALS AND TASKS

Interval	Task	See section
Before each use	Inspect the power cord for damage	5.1.3
	Fill the lubricator oil cup in the air motor assembly with 6 oz (177.4 mL) of AW 32.	5.1.4
	Spray the ACME screw and tool heads with WD-40.	--
	Clean and lightly oil the bar.	--
	Spray the rical bearing mounting bracket bearing mounts with WD-40.	--
Periodically	Clean and lightly oil (do not grease) the leadscrew in the axial feed assembly.	5.1.1
	Fill the 4:1 servo RDU gearbox every six months with 5 oz (148.9 mL) of Mobil SHC 634 synthetic oil.	--
	Repack the bearings in the spherical bearing mounting bracket every six months with 2 cc's (2 mL) of Jetlube 550.	--
	Check the air system periodically to be sure the air pressure is 90 psi (620 kPa).	5.1.4
	Replace hydraulic oil with AW 32 every two years. Fill to the sight glass.	5.1.2
	Check both brushes for excessive wear and replace if necessary.	5.1.3
Annually	Disassemble the axial feed unit to clean, lubricate, and replace the seals.	5.1.1
	Repack the axial feed assembly gearbox with 1 oz (29.6 mL) of Mobilith SHC 460 grease.	--

5.1.1 Axial feed assembly

Clutch performance may be compromised if the machine has been "crashed," has seen over a thousand hours of operation, or is operated in a dirty environment.

If the axial feed fails, verify that the shear pins are intact. Extra pins are included with the assembly. The pins must be in place (notched end out) to engage the feed.

NOTICE

Freezing temperatures may cause the axial feed box to run sluggishly.

5.1.2 Hydraulic power system

For information on maintaining the hydraulic power system, see the documentation from the manufacturer of your hydraulic system.

5.1.3 Electric motor assembly

⚠ WARNING

The flange/handle (PN 75648) clamped onto the motor acts as a torque restraint and should only be removed and reinstalled by an authorized Climax representative. If the flange/handle needs to be removed, contact Climax. Failure to do this could cause severe damage to the machine or bodily injury.

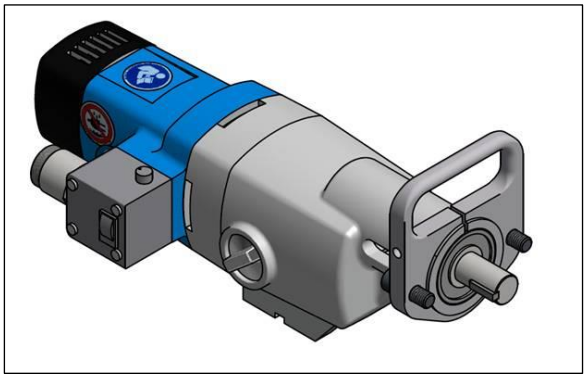


FIGURE 38. ELECTRIC

Replace or repair any damaged or abraded parts, including brushes. Use only grounded, properly rated electrical outlets.

⚠ CAUTION

Brush wear mostly depends on load and RPM. Depending on operating conditions, periodically check both brush for excessive wear and replace if necessary.

⚠ WARNING

Electrical equipment can shock or cause an explosion if used near wet or flammable materials. Do not operate the motor if it is wet or exposed to combustible materials.

5.1.4 Air motor assembly

Do the following to increase the life of the air motor:

- Route the air supply through a lubricator and filter.
- Use nonrestrictive air lines and fittings.
- Set the air motor speed only by adjusting the air control valve.

⚠ CAUTION

Do not attempt to adjust air motor speed by changing in-line air pressure from 90 psi (620 kPa).

- Use air oil that has antioxidants and rust inhibitors. The lubricator should deliver oil at a rate of 20-30 drops per minute at full throttle.
- Drain water from the air filter.

5.1.5 4:1 RDU gearbox

Improperly packed bearings or improperly torqued bearing nuts will cause the gearbox to self-destruct. Have the gearbox serviced at Climax every six months in order to maintain the warranty.

5.1.6 Cutting fluid

Only use water-base cutting fluids with the Climax air mist system. Refill the reservoir with DoAll AL2000 as required.

5.2 Quality checks

Follow Table 26 for quality checks.

TABLE 26. QUALITY CHECKS

Area	Action
Axial feed unit	• Rotate collet by hand, check for free movement. • Check feed engagement pins, feed operation, feed stop pins, and that feed screws are not bent.
RDU	Manually retract spring plungers and drive key, check for free movement.
Five tool heads	• All hardware present and in good condition for each tool head. • All single arm mount screws and washers are in good condition.
Tack weld plates (P/N 19869)	Welds are ground off and flat surface is present for welding.
Safety devices and labels	Present and in good condition.
Steel container (P/N 37732)	In good condition and all packaging materials are new.

5.3 Recommended lubricants

Use the lubricants listed in Table 27.

TABLE 27. RECOMMENDED LUBRICANTS

Where Used	Lubricant	When	Quantity
4:1 RDU	Mobilith SHC 460 Synthetic	Every 6 months	1 oz
12:1 RDU	Mobil SHC 634 Synthetic	Every 6 months	5 oz
AFU	Mobilith SHC 460	Yearly	1 oz
Spherical Bearings	JetLube 550	Every 6 months	2 cc
Hydraulic Oil	AW 32	Every 2 years	To sight glass
Air Motor	AW 32	Per use thru lubricator	6 oz
ACME Screw	WD 40	Per use by hand	A/R
Boring Bar	WD 40	Per use by hand	A/R
Tool Heads	WD 40	Per use by hand	A/R
Cutting Fluid	DoAll AL2000	As required	A/R
Long Term Rust Preventative	LP LPS-3	For storage more than 3 months	A/R

⚠ CAUTION

Avoid damage to the machine and protect your warranty by using only approved lubricants.

5.4 Troubleshooting

This section is intended to help you solve basic machine performance problems. For serious maintenance or if you have questions on the following procedures, contact Climax.

TABLE 28. TROUBLESHOOTING

Problem	**Solution**
Axial feed unit does not advance the bar	• Fully engage the feed shaft pin in the bushing slot. • Be sure the pin has not sheared. • Clean the leadscrew. • Be sure the feed rate is not too low. • Verify the axial feed unit is clamped tightly to the bar. • Be sure none of the clamp collars, except those on the axial feed unit, are over tightened. • Be sure the stop arm has not depressed one of the stop feed screw assemblies.
Tool chatter	• Sharpen the tool bit. • Decrease the nose radius on the tool bit. • Increase the feed rate. • Increase or decrease the drive motor speed. • Change the depth of cut.

Problem	Solution
	• Add additional support arms or place the existing support arms closer to the workpiece.
Machine is unstable	Tighten all clamps and hardware. Provide additional support.
RDU will not rotate	• Check that the HPU is turned on. • Check that the HPU pump motor is rotating as indicated by the arrow on the pump body. • Check the oil level in the HPU. • Check that the speed control is at maximum flow. • Check hydraulic hose connections. • On electric powered units, check electrical connections and circuit breakers. • Be sure the control box on electric motors is plugged into the motor and turned on.
Feed is in wrong direction	Check the feed shaft position on the axial feed unit.
HPU fails to deliver fluid	• Check the fluid level and add if necessary. • Be sure the pump motor is turning in the correct direction. • Check hydraulic connections for obstructions or leaks.
HPU motor does not run	• Be sure the power unit and electrical supply are compatible. • Be sure the unit is plugged in. • Check for faulty wiring. • Check the reset switch in the electrical box. • Check the fuses in the electrical box.

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6 STORAGE

6.1 Storage

Proper storage of the BB5000 will extend its usefulness and prevent undue damage.

Do the following to prepare for storage:

1. Clean the machine with solvent to remove grease, metal chips, and moisture.
2. Prevent corrosion by spraying with WD-40 for short-term storage and LPS-3 for long-term storage.
3. Place the boring bar with all tools and accessories in the case provided.
4. Add a desiccant pouch or vapor wrap to absorb moisture. Replace the pouch according to the manufacturer's instructions.
5. Pack all parts into its shipping container.

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APPENDIX A TOOLS AND RECOMMENDED SPARE PARTS

Table 29 lists items most frequently replaced due to wear, loss, or damage. Avoid downtime by maintaining a small inventory of these critical parts.

TABLE 29. TOOL KIT

Part number	Description
14650	WRENCH END 1/2 COMBINATION LONG (KB)
29661	WRENCH HINGE HANDLE 1/2 DRIVE 17 IN HANDLE (KB)
34573	BIT TOOL HSS 12MM X 1.8 LH FINISH SINGLE TC (KB)
34572	BIT TOOL HSS 12MM X 2.5 LH FINISH SINGLE TC (KB)
13052	WRENCH HEX BIT 1/2 DRIVER X 1/2 DRIVE SOCKET (KB)
34568	WRENCH HEX 5MM SHORT ARM (KB)
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)
25550	WRENCH HEX 5/16 X 11.4 BALLDRIVER T-HANDLE
54033	VIDEO BB5000 SETUP AND OPERATION DVD (KB)
34578	BIT TOOL HSS 12MM X 1.8 LH ROUGHING SINGLE (KB)
29660	WRENCH HEX BIT 5/16 DRIVER X 12 DRIVE (KB)
35340	WRENCH HEX 8MM SHORT ARM (KB)
16794	WRENCH HEX BIT 3/8 DRIVER X 1/2 DRIVE (KB)
55923	WRENCH TEE 1/4 HEX
34579	BIT TOOL HSS 12MM X 1.0 LH ROUGHING SINGLE (KB)
34574	BIT TOOL HSS 12MM X 1.0 LH FINISH SINGLE TC (KB)
37528	PRINT LAYOUT BB5000 PACKAGING (KB)
34577	BIT TOOL HSS 12MM X 2.5 LH ROUGHING SINGLE (KB)
29652	WRENCH HEX 3MM SHORT ARM (KB)
55924	WRENCH TEE 3/8 HEX
34116	LABEL ACCESSORY BAG #1 BB5000 (KB)
33785	WRENCH TORX T-45 (KB)
14251	WRENCH TEE 3/16 HEX
29199	WRENCH HEX 1/2 LONG ARM (KB)
35516	HAMMER DEAD BLOW 1-3/4 DIA HEAD
29041	WRENCH END 1-1/2 (SINGLE OPEN END) (KB)
82949	BAG TOOL 14 X 5.5 X 6 POLYESTER

Table 30 lists items most frequently replaced due to wear, loss, or damage. Avoid downtime by maintaining a small inventory of these critical parts.

TABLE 30. SPARE PARTS

Part number	Description	Quantity	UOM	Where used
12395	CLAMP COLLAR SPLIT HINGED 2-1/2 ID	4	Piece	2 Rotational Drive Unit & 2 Axial Feedbox Assembly
25957	BRG ROLLER CLUTCH 1 ID X 1.312 OD X .625	4	Piece	Axial Feedbox Assembly
26850	HANDLE CRANK MODIFIED	1	Piece	
27015	PIN DOWEL MODIFIED .187 DIA X .75 GROOVED	2	Piece	
27197	LEAD NUT BB4500 BB5000 AXIAL FEED	2	Piece	
27200	SCREW ASSY FEED STOP BB5000 AFU	2	Piece	
10191	SCREW 3/8-16 X 1 SHCS	2	Piece	Boring Head / Bar
11691	SCREW 1/2-13 X 1-1/2 SHCS	2	Piece	
11734	SCREW 3/8-16 X 3/4 SSSCP	4	Piece	
13356	SCREW 5/8-11 X 2-1/2 SHCS	4	Piece	
20273	KEY 1/4 SQ X 1.00 SQ BOTH ENDS	1	Piece	Electric Motor Assembly
26845	WRENCH HEX 3/8 SHORT ARM BONDHUS BALLDRIVER	1	Piece	
82698	SP BRUSH CARBON PAIR FOR EIBENSTOCK EAU 34/4.1 BB4500 BB5000	2	Piece	
27356	NUT 1-5 ACME 7/8 TALL 1-1/2 HEX FINISHED	2	Piece	Leadscrew Assembly
48909	KEY 1/4 SQ X 1.00 RADIUS BOTH ENDS	1	Piece	Servo Motor Assembly
53195	KEY 10mm X 8mm X 2.05 LONG RADIUS BOTH END	1	Piece	
14036	SCREW 1/2-13 X 2 SHCS	8	Piece	Spherical Bearing Mounting Brackets
21798	WASHER 5/16 FLTW HARDENED 1/8 THK BLK OX	4	Piece	
22662	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 1/8 THICK	8	Piece	
26250	SCREW 5/16-24 X 2 HHCS	4	Piece	
26252	SCREW 1/2-20 X 2 SSSFP	4	Piece	

For leadscrews, order one of the following in Table 31 as needed.

TABLE 31. LEADSCREW SPARE PARTS

Part number	Description	Quantity	UOM
28654	ASSY LEADSCREW 12 INCH FEED	1	Piece
28687	ASSY LEADSCREW 24 INCH FEED	1	Piece
28688	ASSY LEADSCREW 36 INCH FEED	1	Piece

TABLE 32. HYDRAULIC SPARE PARTS

Part number	Description	Quantity	UOM
10191	SCREW 3/8-16 X 1 SHCS	2	Piece
11691	SCREW 1/2-13 X 1-1/2 SHCS	2	Piece
11734	SCREW 3/8-16 X 3/4 SSSCP	4	Piece
13356	SCREW 5/8-11 X 2-1/2 SHCS	4	Piece
14036	SCREW 1/2-13 X 2 SHCS	8	Piece
21798	WASHER 5/16 FLTW HARDENED 1/8 THK BLK OX	4	Piece
22662	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 1/8 THICK	8	Piece
25957	BRG ROLLER CLUTCH 1 ID X 1.312 OD X .625 (KB)	4	Piece
26250	SCREW 5/16-24 X 2 HHCS	4	Piece
26252	SCREW 1/2-20 X 2 SSSFP	4	Piece
26296	SCREW 3/8-16 X 1/2 SSSFP (KB)	24	Piece
26850	HANDLE CRANK MODIFIED (KB)	1	Piece
27015	SP PIN DOWEL MODIFIED .187 DIA X .75 GROOVED (KB)	2	Piece
27197	LEAD NUT BB4500 BB5000 AXIAL FEED (KB)	2	Piece
27200	SCREW ASSY FEED STOP BB5000 AFU (KB)	2	Piece
27356	NUT 1-5 ACME 7/8 TALL 1-1/2 HEX FINISHED	2	Piece
29207	SPRING PLUNGER HAND RETRACT 1/2 X 13 (KB)	2	Piece
31858	BIT TOOL HSS 1/2 X 1.8 LH FINISHING SINGLE TC (KB)	4	Piece
31859	BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE TC	4	Piece
31867	BIT TOOL HSS 1/2 X 1.8 LH ROUGHING SINGLE (KB)	4	Piece
31868	BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE (KB)	4	Piece
32342	BIT TOOL HSS 1/2 X 2.5 LH FINISHING SINGLE TC (KB)	4	Piece
32344	BIT TOOL HSS 1/2 X 2.5 LH ROUGHING SINGLE (KB)	4	Piece
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)	1	Piece
53670	ELEMENT FILTER 5/10HP HPU 10 MICRON	1	Piece
56275	TOOL HOLDER SET 1/2 IN	2	Piece

Part number	Description	Quantity	UOM
63543	INSERT 80 DEG DIAMOND 3/8 IC .015 R KC-5010	24	Piece
64446	OIL HYDRAULIC 5 GALLON 76 UNAX AW 32	2	Piece

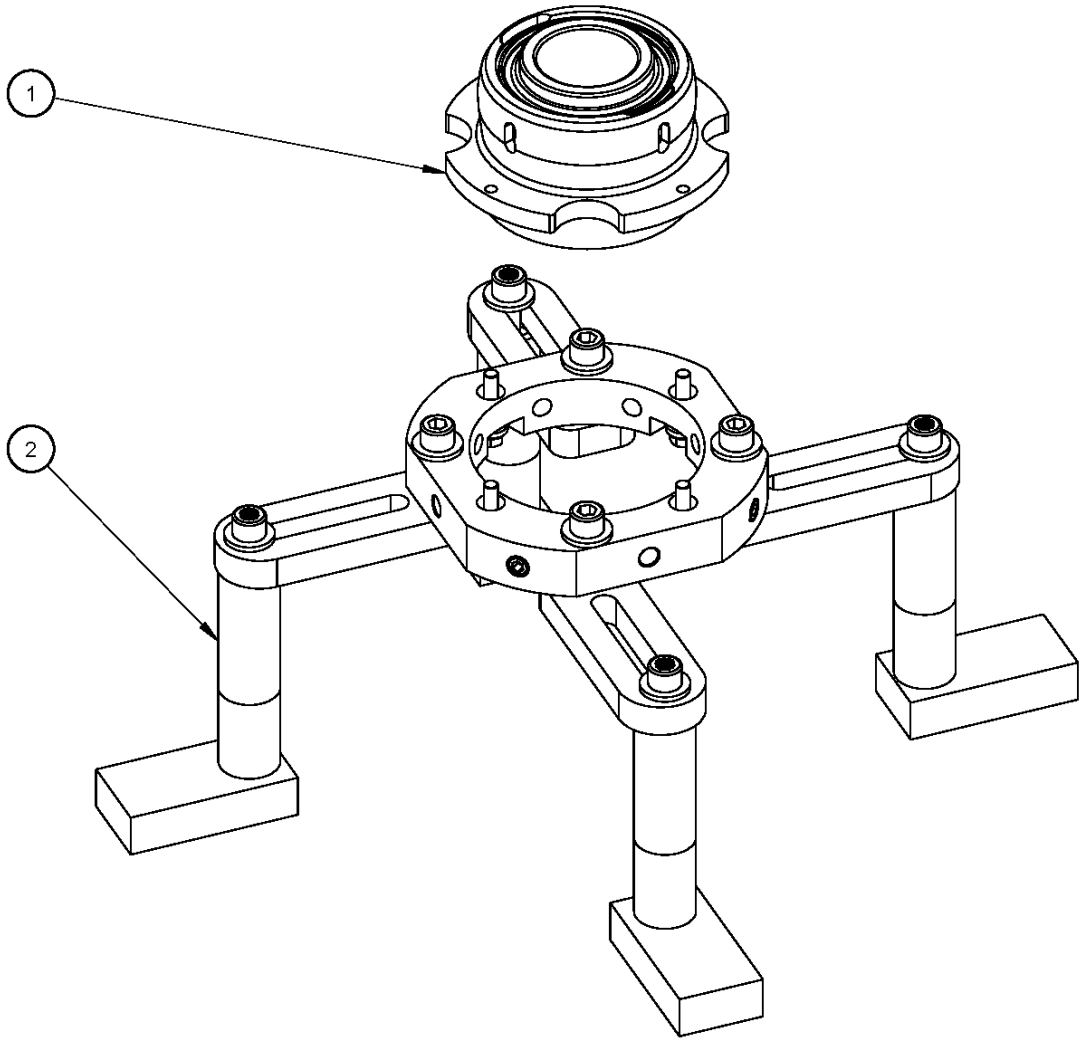
TABLE 33. HYDRAULIC METRIC SPARE PARTS

Part number	Description	Quantity	UOM
10191	SCREW 3/8-16 X 1 SHCS	2	Piece
11691	SCREW 1/2-13 X 1-1/2 SHCS	2	Piece
11734	SCREW 3/8-16 X 3/4 SSSCP	4	Piece
13356	SCREW 5/8-11 X 2-1/2 SHCS	4	Piece
14036	SCREW 1/2-13 X 2 SHCS	8	Piece
21798	WASHER 5/16 FLTW HARDENED 1/8 THK BLK OX	4	Piece
22662	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 1/8 THICK	8	Piece
25957	BRG ROLLER CLUTCH 1 ID X 1.312 OD X .625 (KB)	4	Piece
26250	SCREW 5/16-24 X 2 HHCS	4	Piece
26252	SCREW 1/2-20 X 2 SSSFP	4	Piece
26850	HANDLE CRANK MODIFIED (KB)	1	Piece
27015	SP PIN DOWEL MODIFIED .187 DIA X .75 GROOVED (KB)	2	Piece
27197	LEAD NUT BB4500 BB5000 AXIAL FEED (KB)	2	Piece
27200	SCREW ASSY FEED STOP BB5000 AFU (KB)	2	Piece
27356	NUT 1-5 ACME 7/8 TALL 1-1/2 HEX FINISHED	2	Piece
29207	SPRING PLUNGER HAND RETRACT 1/2 X 13 (KB)	2	Piece
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)	1	Piece
34571	BIT TOOL HSS 12MM X 4.0 LH FINISH SINGLE TC (KB)	4	Piece
34572	BIT TOOL HSS 12MM X 2.5 LH FINISH SINGLE TC (KB)	4	Piece
34573	BIT TOOL HSS 12MM X 1.8 LH FINISH SINGLE TC (KB)	4	Piece
34576	BIT TOOL HSS 12MM X 4.0 LH ROUGHING SINGLE (KB)	4	Piece
34577	BIT TOOL HSS 12MM X 2.5 LH ROUGHING SINGLE (KB)	4	Piece
34578	BIT TOOL HSS 12MM X 1.8 LH ROUGHING SINGLE (KB)	4	Piece
34642	SCREW M16 X 1.5 X 8 SSSFP (KB)	24	Piece
38678	WRENCH HEX SET 1.5 - 10MM BONDHUS BALL END (KB)	1	Piece
53670	ELEMENT FILTER 5/10HP HPU 10 MICRON	1	Piece
63533	TOOL HOLDER SET 12MM	2	Piece
63543	INSERT 80 DEG DIAMOND 3/8 IC .015 R KC-5010	24	Piece
64446	OIL HYDRAULIC 5 GALLON 76 UNAX AW 32	2	Piece

APPENDIX B ASSEMBLY DRAWINGS AND PARTS LISTS

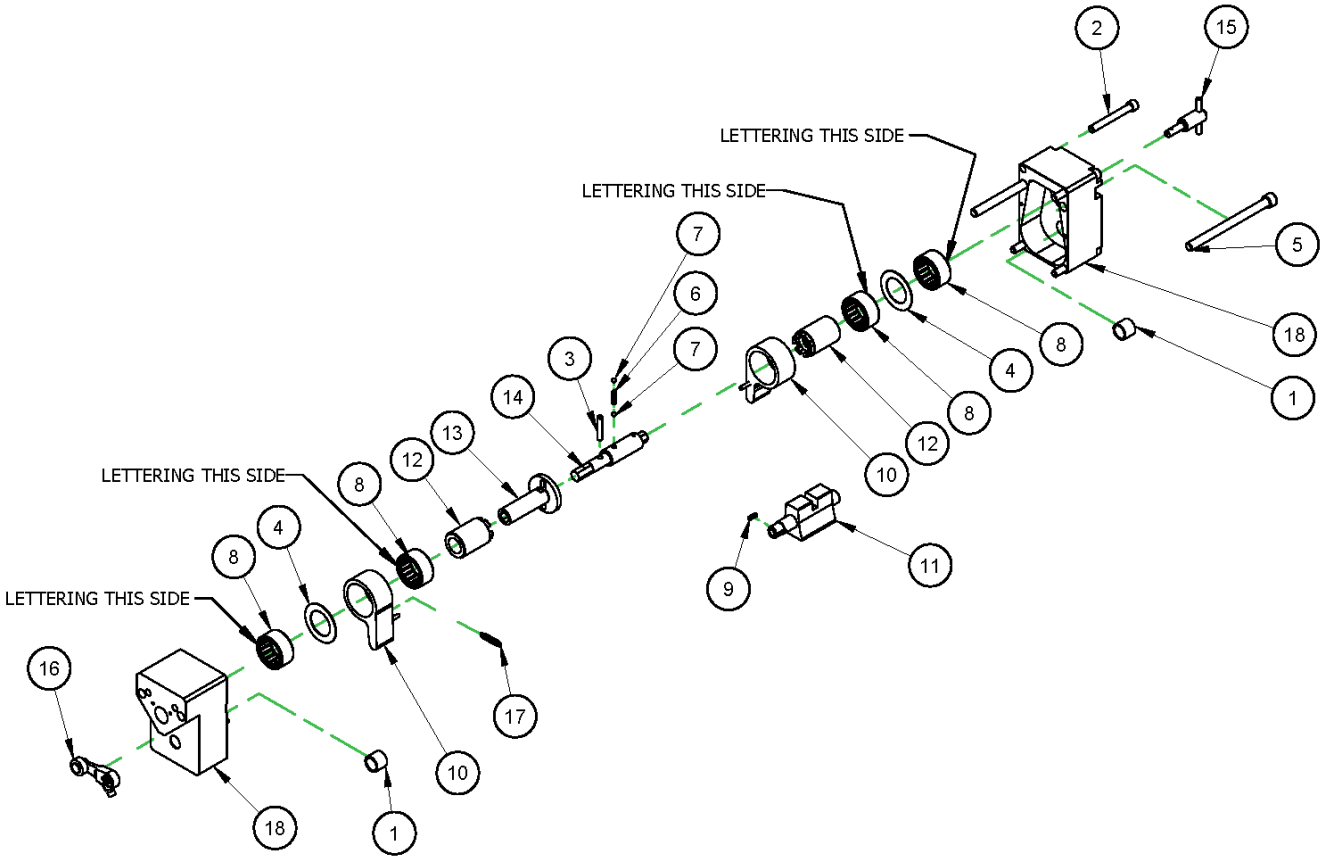
NOTICE

The following diagrams and parts lists are for 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.



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	26248	ASSY BRG SPHERICAL 2-1/4 ID W/ CLAMP COLLAR
2	1	41514	MOUNT UNIVERSAL BORING BARS BB5000 NO BEARING

FIGURE 39. UNIVERSAL MOUNT 2-1/4" BAR (P/N 36959)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	11760	BUSHING OILITE .5 ID X .625 OD X .5
2	4	12444	SCREW 1/4-20 X 2 SHCS
3	1	14284	PIN DOWEL 3/16 DIA X 1
4	2	15079	WASHER THRUST 1.000 ID X 1.562 OD X .030
5	2	15416	SCREW 5/16-18 X 4 SHCS
6	1	19561	SPRING COMP .148 OD X .023 WIRE X .50 LONG STAINLESS
7	2	19562	BALL STEEL 5/32 DIA
8	4	25957	BRG ROLLER CLUTCH 1 X 1.312 X .625
9	1	29385	KEY 3/32 SQ X 11/32 SQ BOTH ENDS
10	2	44717	CLUTCH ARM FEED ASSY
11	1	44718	CAM ASSY FEED BOX ASSY
12	2	44721	DRIVE BUSHING
13	1	44722	DRIVE SHAFT
14	1	44731	SHAFT ENGAGE
15	1	44767	PIN QUICK RELEASE
16	1	44788	LEVER ARM MODIFIED ADDED KEYWAY
17	1	44970	SPRING EXT .187 OD X .023 WIRE X 1.00 LONG
18	1	87796	GEARBOX MECHANICAL FEED

FIGURE 40. FACING HEAD FEED ASSEMBLY 24" (P/N 44716)

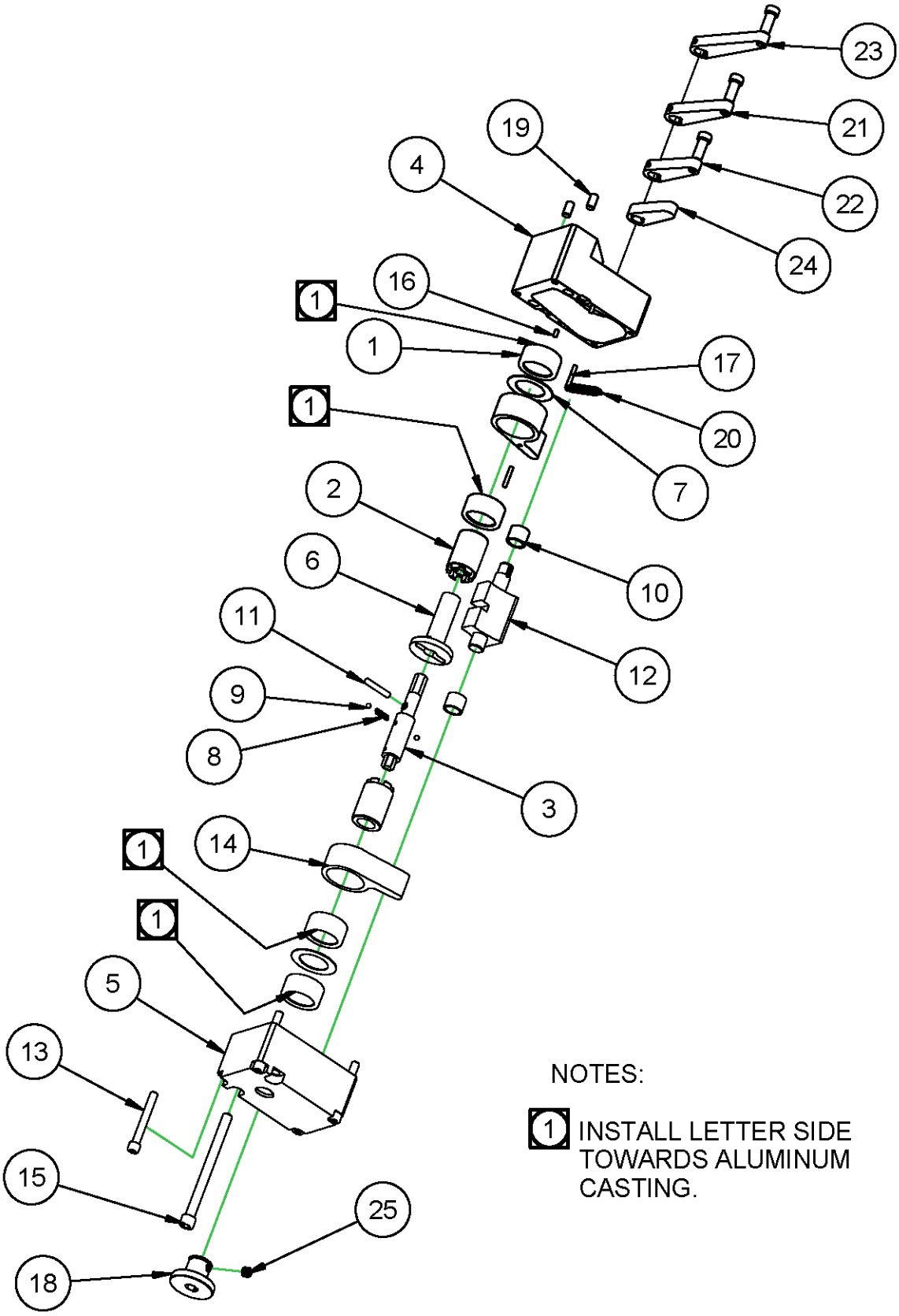


FIGURE 41. FEED BOX ASSEMBLY (P/N 47419)

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	4	25957	BRG ROLLER CLUTCH 1 X 1.312 X .625
2	2	44721	DRIVE BUSHING
3	1	44731	SHAFT ENGAGE
4	1	44719	GEAR BOX FEED MECHANISM BOTTOM
5	1	44720	GEAR BOX FEED MECHANISM TOP
6	1	44722	DRIVE SHAFT
7	2	15079	WASHER THRUST 1.000 ID X 1.562 OD X .030
8	1	19561	SPRING COMP .148 X .023 X .50
9	2	19562	BALL STEEL 5/32 DIA
10	2	11760	BUSHING OILITE .5 ID X .625 OD X .5
11	1	14284	PIN DOWEL 3/16 X 1
12	1	44718	CAM ASSY FEED BOX ASSY
13	4	12444	SCREW 1/4-20 X 2 SHCS
14	2	44717	CLUTCH ARM FEED
15	2	15416	SCREW 5/16-18 X 4 SHCS
16	2	15414	PIN DOWEL 1/8 DIA X 1/4
17	2	10861	PIN DOWEL 1/8 DIA X 3/4
18	1	47887	KNOB TRIP FEED 5902
19	2	20166	PIN DOWEL 1/4 DIA X 1/2
20	1	31979	SPRING EXT .18 OD X .029 WIRE X 1
21	1	48925	ARM TRIP FEED ASSY INTERMEDIATE 5902
22	1	48926	ARM TRIP FEED ASSY SHORT 5902
23	1	48927	ARM TRIP FEED ASSY LONG 5902
24	1	48928	ARM TRIP FEED ASSY SHORT SHORT 5902
25	1	49020	SCREW 1/4-20 X 1/4 SSSCN

FIGURE 42. FEED BOX ASSEMBLY PARTS LIST (P/N 47419)

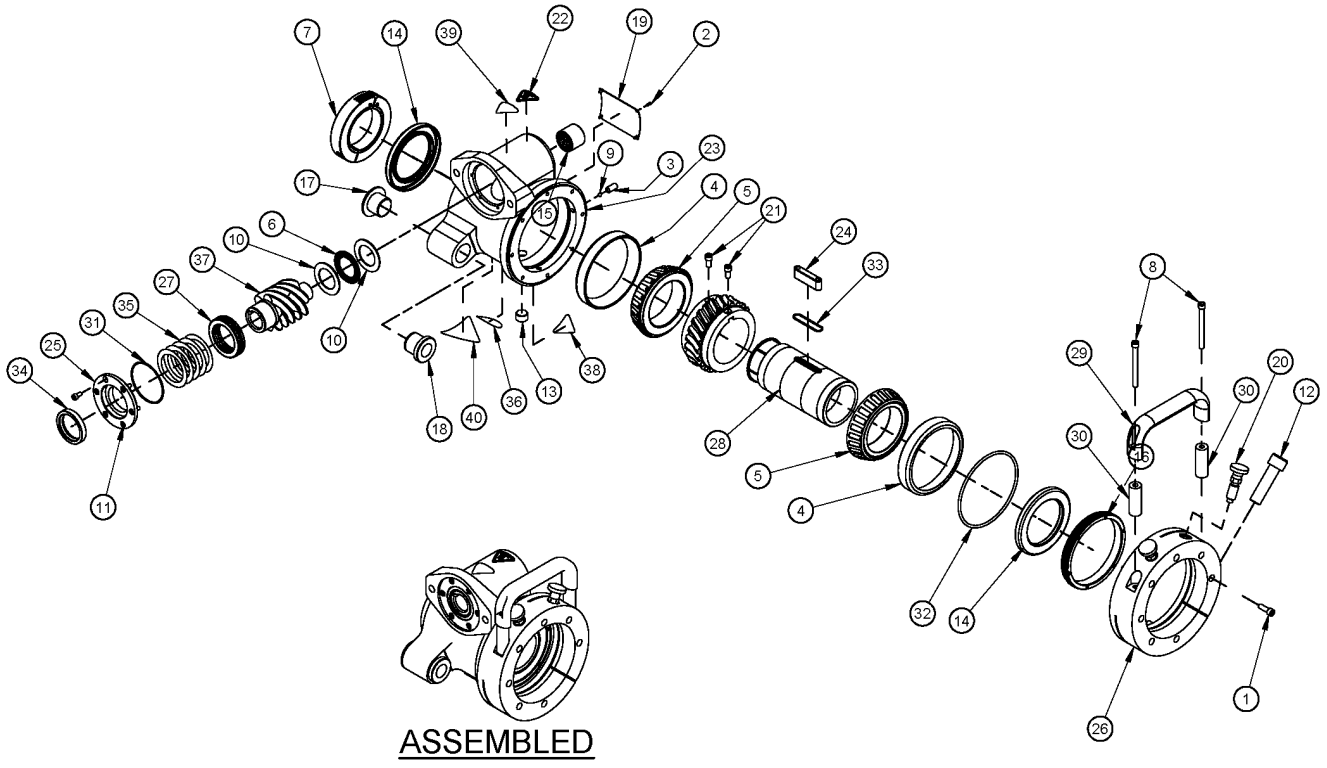


FIGURE 43. ROTATIONAL DRIVE UNIT (P/N 49684)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	7	10160	SCREW 1/4-20 X 3/4 SHCS
2	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	2	11684	SCREW 5/16-18 X 3/4 SSSCP
4	2	11821	BRG CUP 4.4375 OD X .750 WIDE
5	2	11822	BRG CONE 2.75 ID X 1.00 WIDE
6	1	12387	BRG THRUST 1.259 ID X 1.937 OD X .0781
7	1	12395	CLAMP COLLAR SPLIT HINGED 2-1/2 ID
8	2	12592	SCREW 1/4-20 X 2-3/4 SHCS
9	2	16594	BALL NYLON 3/16 DIA
10	2	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
11	6	19232	SCREW 10-24 X 3/8 SHCS
12	1	19610	SCREW 5/8-18 X 2-1/4 SHCS
13	1	21956	FTG PLUG 3/8 NPTM SOCKET
14	2	27348	SEAL 2.750 ID X 4.000 OD X .375
15	1	27353	BRG NEEDLE 1 ID X 1-1/4 OD X 1 CLOSED
16	1	28219	NUT MAIN BRG PRELOAD
17	1	28220	BUSHING LEADSCREW FLANGED
18	1	28589	BUSHING FLANGED 1 5P ACME THREADED
19	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0 (KB)
20	2	29207	SPRING PLUNGER HAND RETRACT 1/2 X 13
21	2	45900	SCREW 1/4-28 X 1/2 SHCS
22	1	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
23	1	49665	HOUSING RDU BB5000 4TH
24	1	49666	KEY MAIN DRIVE BB5000 4TH GEN
25	1	49667	CAP WORM HOUSING BB5000 4TH GEN
26	1	52303	CLAMP RING RDU MOUNT BB5000 4TH
27	1	52307	BRG BALL THRUST 40 MM ID X 60 MM OD X 13 MM
28	1	53168	COLLET MAIN DRIVE BB5000 4TH GEN
29	1	53610	HANDLE PULL 1/4 CBORE MTG 2.17 X 5.75 X 1.02W COATED
30	2	53613	SPACER .67 OD X .266 ID X 1.875 LG
31	1	54920	RING O 1/16 X 2-1/4 ID X 2-3/8 OD
32	1	54921	RING O 4-3/8 ID X 4-5/8 OD X 1/8
33	1	54922	RING O 1/16 X 1-3/8 ID X 1-1/2 OD VITON 75 DUROMETER
34	1	55708	SEAL 1.500 ID X 2.000 OD X .375 HIGH TEMP
35	A/R	55784	SHIM 1.7 ID X 2.3 OD .001 THICK
35	A/R	55790	SHIM 1.7 ID X 2.3 OD .002 THICK
35	A/R	55791	SHIM 1.7 ID X 2.3 OD .005 THICK
36	1	59044	LABEL WARNING - CONSULT OPERATOR'S MANUAL
37	1	73954	SET WORM GEAR 4:1 BB5000 4TH GEN 1PC WORM
38	1	78741	LABEL WARNING CRUSH FOOT
39	1	78748	LABEL WARNING FLYING DEBRIS/LOUD NOISE
40	1	80207	LABEL WARNING - ENTANGLEMENT/ROTATING SHAFT GRAPHIC 1.95 TALL TRIANGLE YELLOW

FIGURE 44. ROTATIONAL DRIVE UNIT PARTS LIST (P/N 49684)

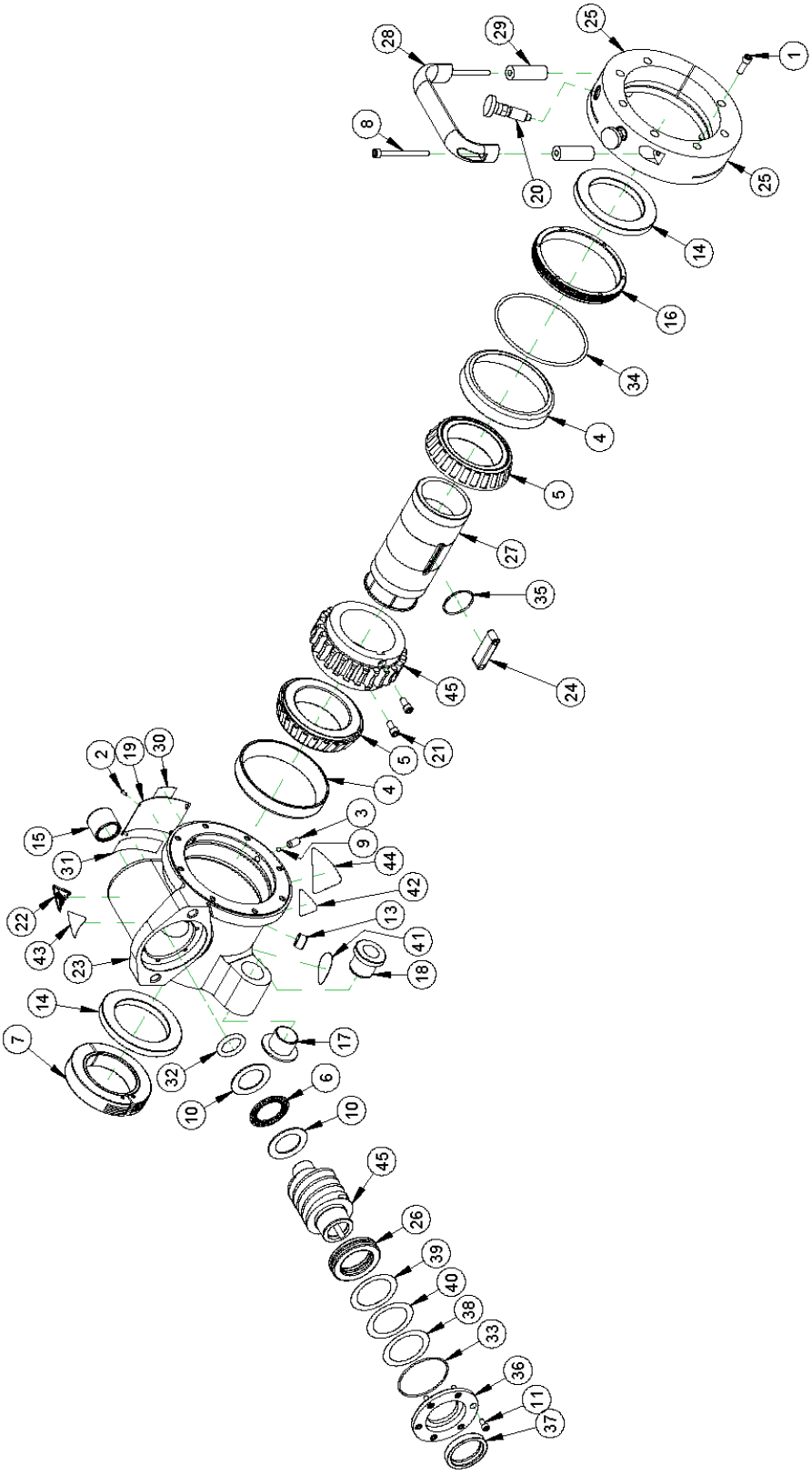


FIGURE 45. ROTATIONAL DRIVE UNIT 12:1 (P/N 53165)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	7	10160	SCREW 1/4-20 X 3/4 SHCS
2	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	2	11684	SCREW 5/16-18 X 3/4 SSSCP
4	2	11821	BRG CUP 4.4375 OD X .750 WIDE
5	2	11822	BRG CONE 2.75 ID X 1.00 WIDE
6	1	12387	BRG THRUST 1.259 ID X 1.937 OD X .0781
7	1	12395	CLAMP COLLAR SPLIT HINGED 2-1/2 ID
8	2	12592	SCREW 1/4-20 X 2-3/4 SHCS
9	2	16594	BALL NYLON 3/16 DIA
10	2	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
11	6	19232	SCREW 10-24 X 3/8 SHCS
12	1	19610	SCREW 5/8-18 X 2-1/4 SHCS
13	1	21956	FTG PLUG 3/8 NPTM SOCKET
14	2	27348	SEAL 2.75 X 4.00 X .375
15	1	27353	BRG NEEDLE 1 ID X 1-1/4 OD X 1 CLOSED
16	1	28219	NUT MAIN BRG PRELOAD
17	1	28220	BUSHING LEADSCREW FLANGED
18	1	28589	BUSHING FLANGED 1 5P ACME THREADED
19	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0 (KB)
20	2	29207	SPRING PLUNGER HAND RETRACT 1/2 X 13
21	2	45900	SCREW 1/4-28 X 1/2 SHCS
22	1	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
23	1	49665	HOUSING RDU BB5000 4TH GEN
24	1	49666	KEY MAIN DRIVE BB5000 4TH GEN
25	1	52303	CLAMP RING RDU MOUNT BB5000 4TH
26	1	52307	BRG BALL THRUST 40 MM ID X 60 MM OD X 13 MM
27	1	53168	COLLET MAIN DRIVE BB5000 4TH GEN
28	1	53610	HANDLE PULL 1/4 CBORE MTG 2.17 X 5.75 X 1.02W COATED
29	2	53613	SPACER .67 OD X .266 ID X 1.875 LG
30	1	54131	LABEL "12:1"
31	1	54133	LABEL OIL RDU
32	1	54916	RING O 3/16 X 1 ID X 1-3/8 OD VITON 75 DUROMETER
33	1	54920	RING O 1/16 X 2-1/4 ID X 2-3/8 OD
34	1	54921	RING O 4-3/8 ID X 4-5/8 OD X 1/8
35	1	54922	RING O 1/16 X 1-3/8 ID X 1-1/2 OD VITON 75 DUROMETER
36	1	55090	CAP WORM HOUSING 12:1 RDU BB5000
37	1	55708	SEAL 1.500 ID X 2.000 OD X .375 HIGH TEMP
38	A/R	55784	SHIM 1.7 ID X 2.3 OD .001 THICK
39	A/R	55790	SHIM 1.7 ID X 2.3 OD .002 THICK
40	A/R	55791	SHIM 1.7 ID X 2.3 OD .005 THICK
41	1	59044	LABEL WARNING - CONSULT OPERATOR'S MANUAL
45	1	78688	SET WORM GEAR 12:1 BB5000 4TH GEN 1PC WORM
42	1	78741	LABEL WARNING CRUSH FOOT
43	1	78748	LABEL WARNING FLYING DEBRIS/LOUD NOISE
44	1	80207	LABEL WARNING - ENTANGLEMENT/ROTATING SHAFT GRAPHIC 1.95 TALL TRIANGLE YELLOW

FIGURE 46. ROTATIONAL DRIVE UNIT 12:1 PARTS LIST (P/N 53165)

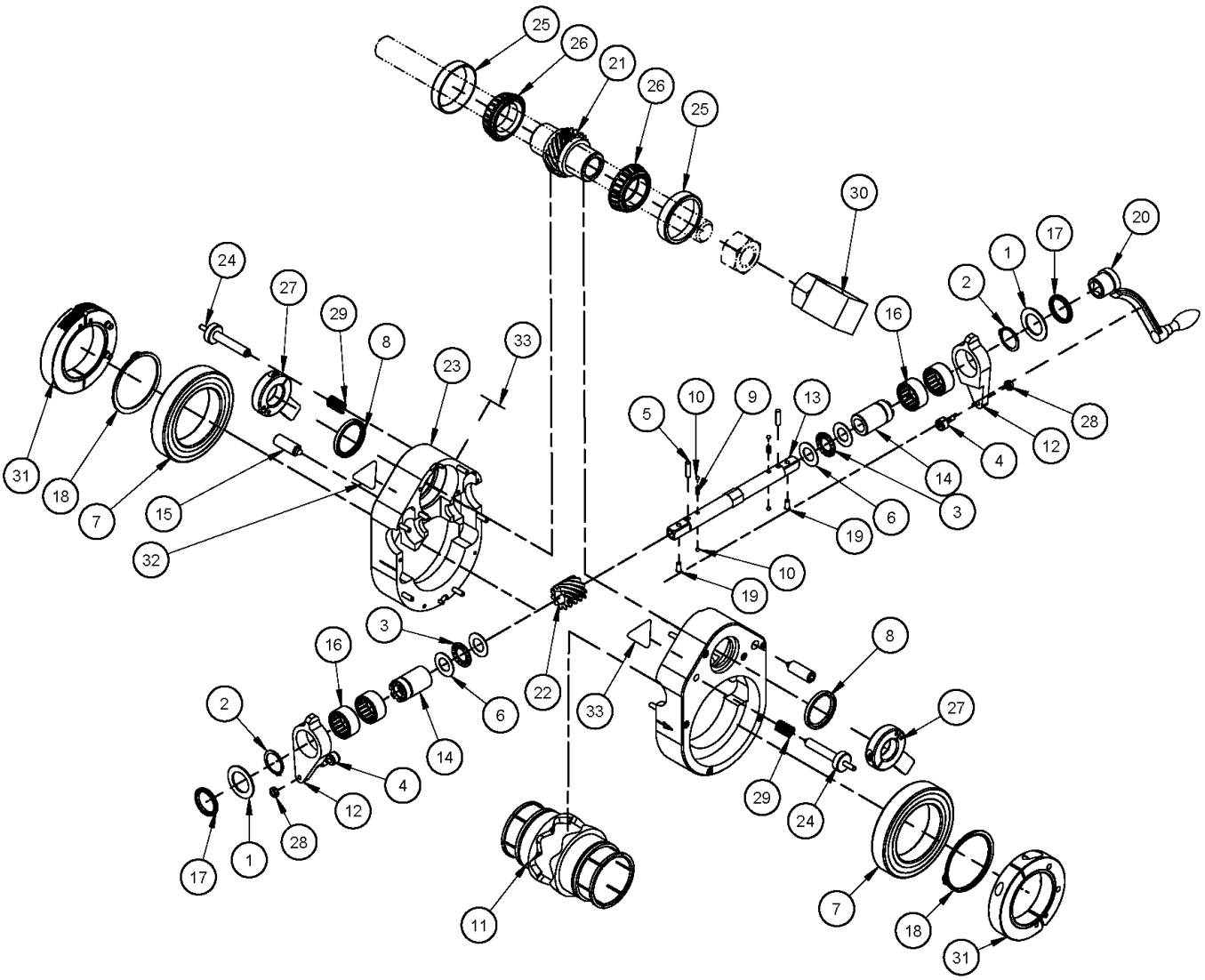
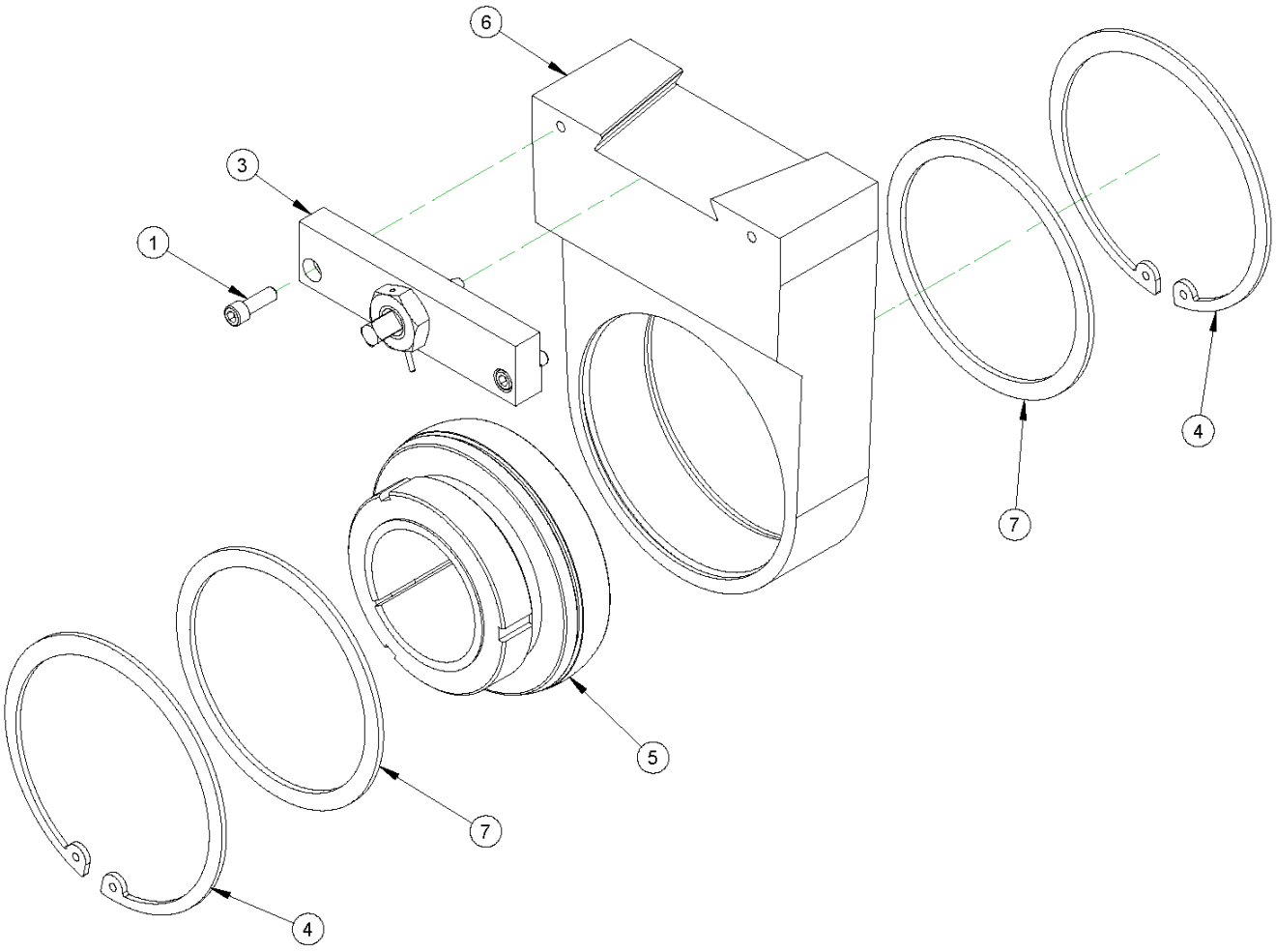


FIGURE 47. AXIAL FEED UNIT (P/N 28636)

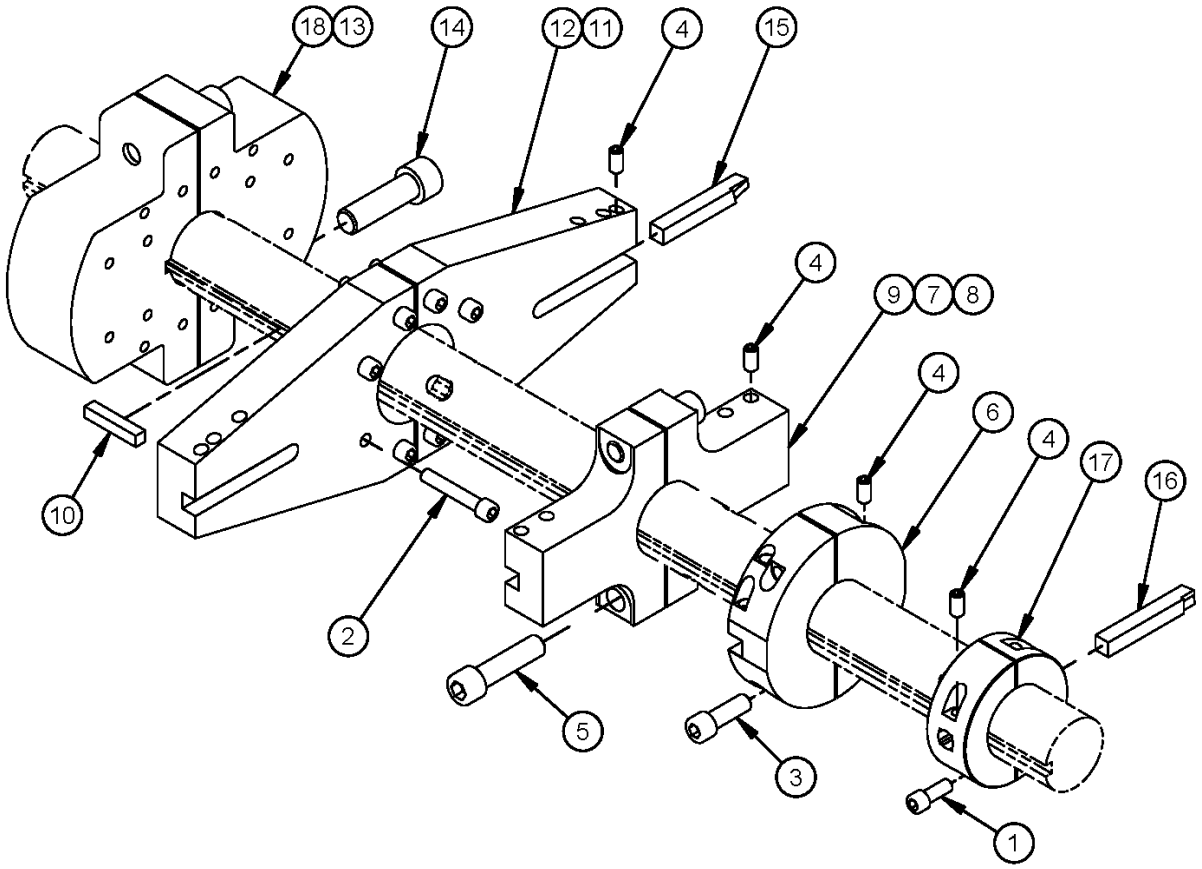
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10144	WASHER THRUST 1 ID X 1.562 OD X .060
2	2	10534	RING SNAP 1 OD
3	2	10538	BRG THRUST .625 ID X 1.125 OD X .0781
4	2	10836	BRG CAM FOLLOW .500 X .344
5	2	11763	PIN DOWEL 3/16 x 3/4
6	4	11823	WASHER THRUST .625 ID X 1.125 OD X .030
7	2	12388	BRG BALL 2.7559 X 4.3307 X .7874
8	2	16505	SEAL 1.375 ID X 1.750 OD X .197 (KB)
9	2	19561	SPRING COMP .148 OD X .023 WIRE X .50 LONG STAINLESS
10	4	19562	BALL STEEL 5/32 DIA
11	1	25945	COLLET AFU BB5000 2-1/4 BAR
12	2	25949	ARM RATCHET
13	1	25950	SHAFT FEED
14	2	25951	BUSHING DRIVE
15	2	25955	SPRING PLUNGER 1/2-13 LIGHT FORCE
16	4	25957	BRG ROLLER CLUTCH 1 X 1.312 X .625
17	2	25959	SEAL 1.000 ID X 1.312 OD X .125 HM14 LIP
18	2	25961	RING SNAP 2-3/4 BEVELED
19	2	26828	PLUNGER BALL PUSHFIT
20	1	26850	HANDLE CRANK MODIFIED
21	1	27197	LEAD NUT BB4500 BB5000 AXIAL FEED (VMI)
22	1	27198	GEAR HELICAL AXIAL FEED BB5000
23	1	27199	ASSEMBLED AXIAL FEED UNIT HOUSING
24	2	27200	SCREW ASSY FEED STOP BB5000 AFU
25	2	27203	BRG CUP 2.328 OD x .470 WIDE
26	2	27204	BRG CONE 1.3775 ID X .6600 WIDE
27	2	27222	STOP ARM ASSY
28	2	28060	NUT, 10-32 UNF KEPS
29	2	28618	SPRING COMP .48 OD X .051 WIRE X .88
30	1	28756	BLOCK TACKWELD BB5000
31	2	29552	CLAMP COLLAR MODIFIED 3RD GEN AFU
32	2	78735	LABEL WARNING HAND CRUSH/FORCE
33	2	78742	LABEL WARNING ENTANGLEMENT OF HAND/ROTATING SHAFT

FIGURE 48. AXIAL FEED UNIT PARTS LIST (P/N 28636)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10160	SCREW 1/4-20 X 3/4 SHCS
2	1	19238	WRENCH SPANNER ADJ 2 TO 4-3/4 (NOT SHOWN)
3	1	25625	CLAMP ASSY BEARING HANGER
4	2	29045	RING SNAP 5 ID
5	1	56321	BRG INSERT 2-1/2 ID X 125MM OD X 60.7MM
6	1	90676	HANGER BRG LOWER 2-1/2 DIA BAR
7	2	90732	SPACER 4.90 OD X 4.60 ID X .120

FIGURE 49. HANGER BEARING ASSEMBLY (P/N 56340)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10191	SCREW 3/8-16 X 1 SHCS
2	8	11196	SCREW 3/8-16 x 2 1/4 SHCS
3	2	11691	SCREW 1/2-13 X 1-1/2 SHCS
4	30	11734	SCREW 3/8-16 X 3/4 SSSCP
5	6	13356	SCREW 5/8-11 X 2-1/2 SHCS
6	1	13359	HEAD BORING 6.00-7.00 DIA 2-1/4 BAR
7	1	13361	HEAD BORING 7.50-9.00 DIA 2-1/4 BAR
8	1	13362	HEAD BORING 9.00-10.50 DIA 2-1/4 BAR
9	1	13363	HEAD BORING 10.5 - 12.0 DIA 2-1/4 BAR
10	1	13392	KEY 3/8 SQ X 2.00 SQ BOTH ENDS
11	1	14730	SET ARM BORING 12.00-18.00 DIA
12	1	14731	SET ARM BORING 18.00-24.00 DIA
13	1	15935	HUB MACHINING
14	2	16076	SCREW 3/4-10 X 2-1/2 SHCS
NS	1	31158	WRENCH HEX BIT SOCKET 5/8 X 1/2
15	1	31917	BIT TOOL CARBIDE 1/2 X 3.5 LH ROUGHING
16	1	31933	BIT TOOL CARBIDE 1/2 X 3.5 LH FINISHING
17	1	33794	HEAD BORING 4.50-6.00 DIA 2-1/4 BAR
18	1	34071	ARM TOOL

FIGURE 50. GROUP HEAD BORING (P/N 11816)

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	4	11223	SCREW 1/2-13 X 7 SHCS
2	4	11879	SCREW 1/2-13 X 5 SHCS
3	4	14036	SCREW 1/2-13 X 2 SHCS
4	8	21798	WASHER 5/16 FLTW HARDENED
5	4	22662	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 1/8 THK
6	4	27273	SCREW 1/2-20 X 3/4 SSSFP
7	1	29946	BRG SELF ALIGNING INSERT 2 ID
8	1	29951	SPHERICAL BEARING ASSEMBLY 2"
9	1	36963	MOUNT BRG RING 2-1/4
10	4	36965	EXTENSION ARM MOUNT
11	4	36966	TACK BLOCK 4 IN
12	4	37598	TUBE STAND OFF 3.3 IN
13	4	37599	TUBE STAND OFF 5.3 IN
14	4	45365	SCREW 5/16-24 X 1.500 HHCS FLANGED BLK OX

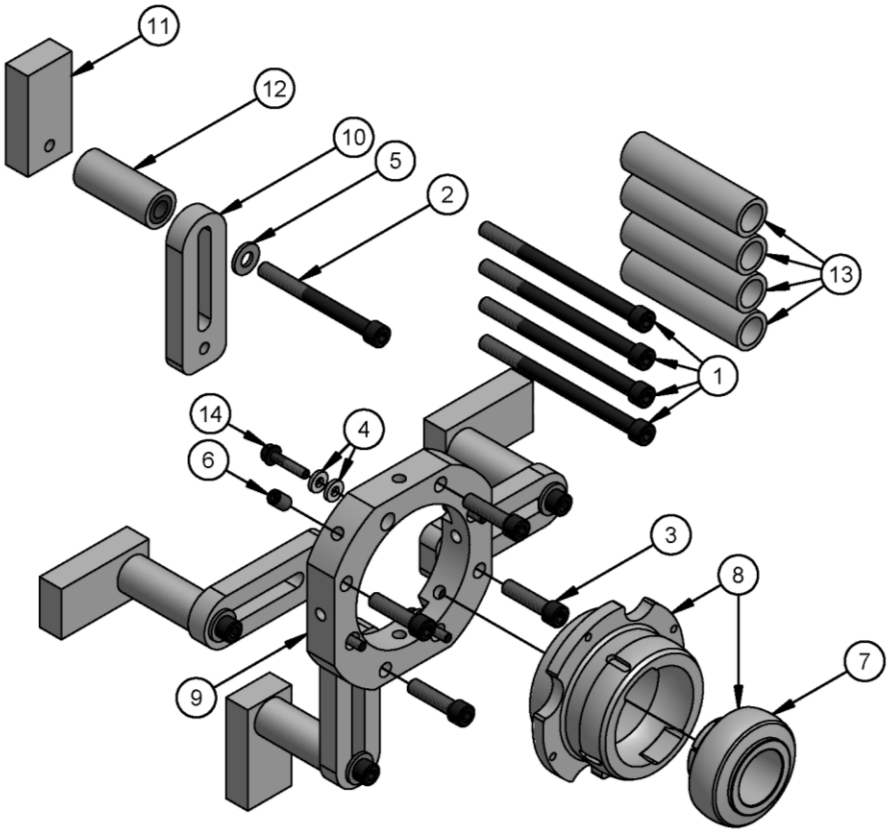
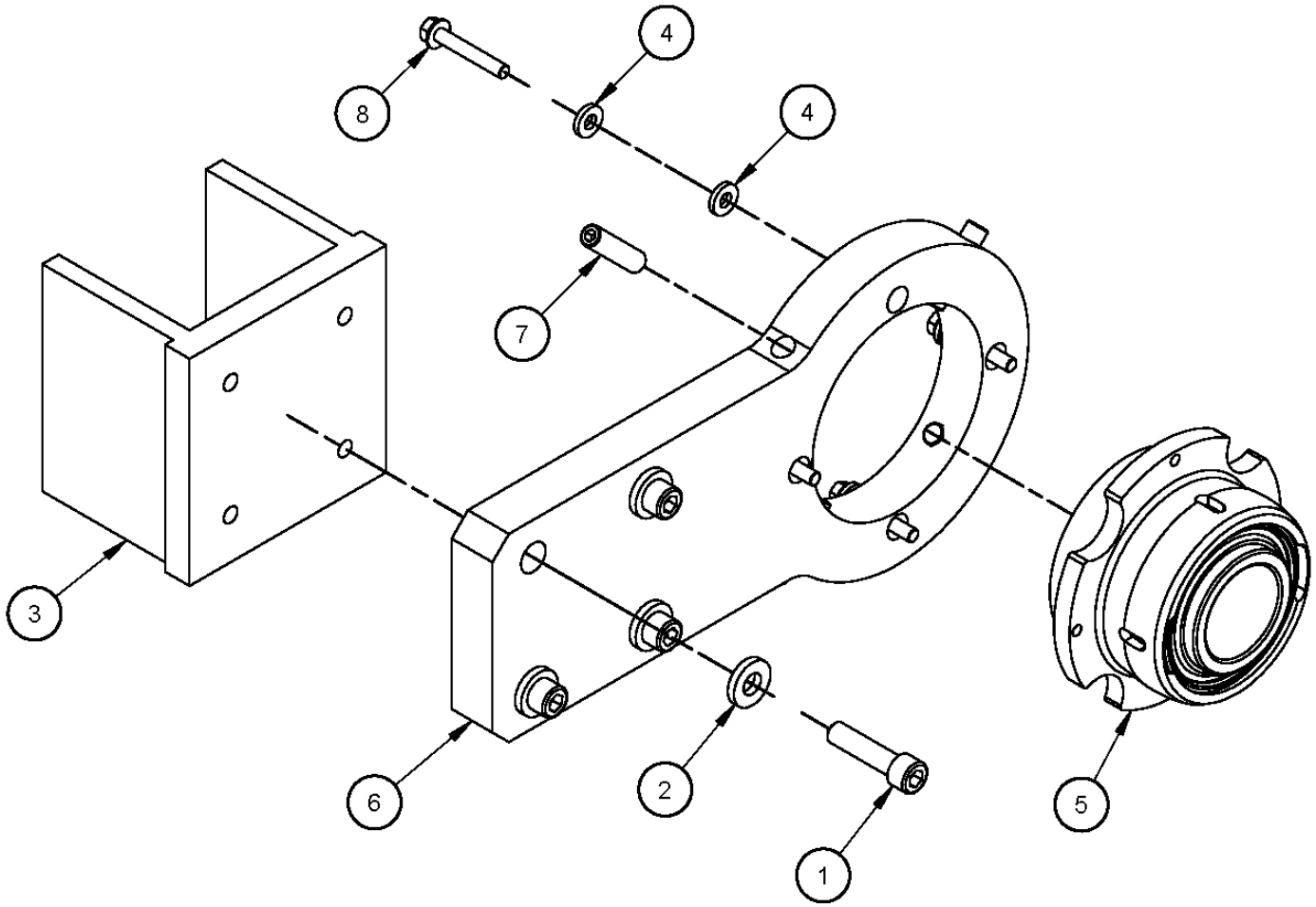
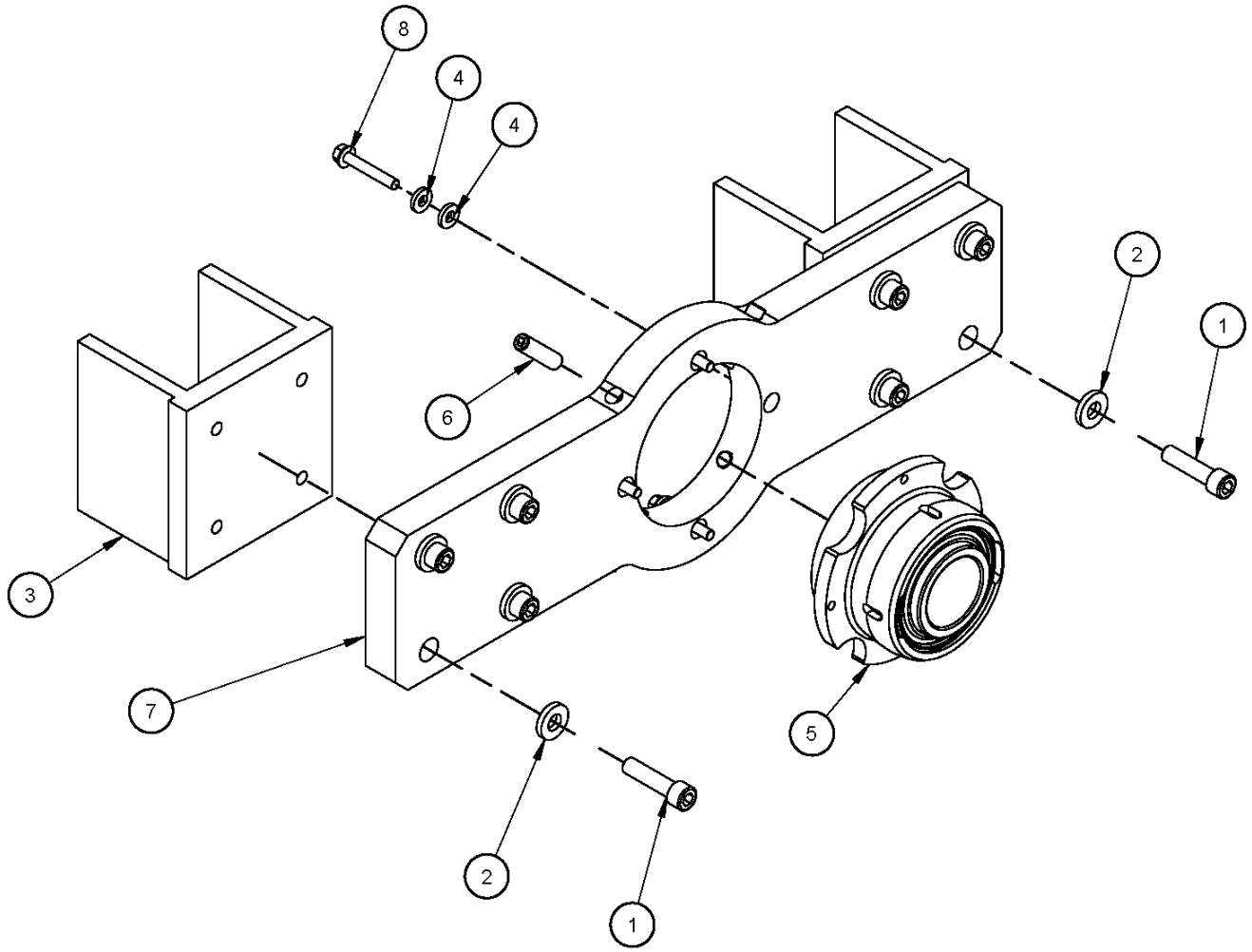


FIGURE 51. UNIVERSAL MOUNT 2" BAR (P/N 55946)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	14036	SCREW 1/2-13 X 2 SHCS
2	4	17145	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 3/16 THK
3	1	19869	PLATE SPACER TACK WELD MTG
4	8	21798	WASHER 5/16 FLTW HARDENED
5	1	26248	ASSY BRG SPHERICAL 2-1/4 ID W/ CLAMP COLLAR
6	1	26251	BRACKET MTG SPHERICAL BRG 1-ARM
7	4	26252	SCREW 1/2-20 X 2 SSSFP
8	4	45364	SCREW 5/16-24 X 2 HHCS FLANGED BLK OX

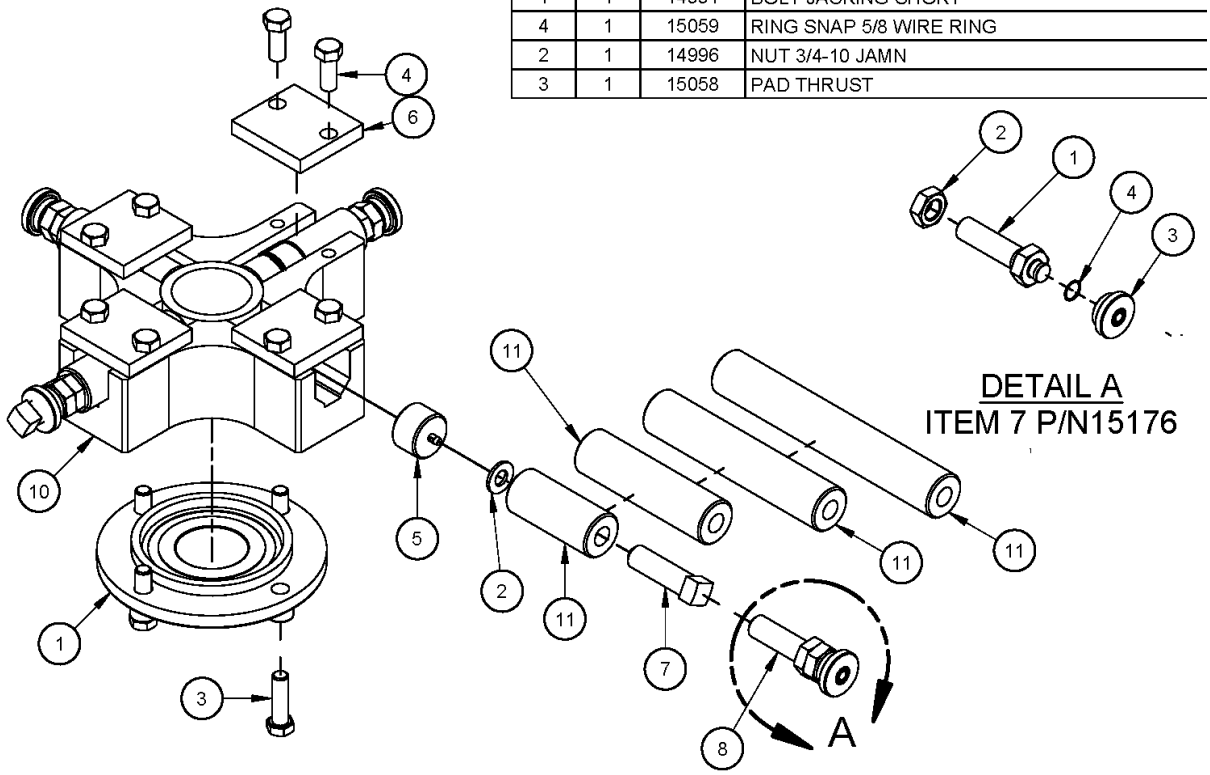
FIGURE 52. MOUNT SINGLE ARM ASSEMBLY 2-1/4" BAR (P/N 37472)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	14036	SCREW 1/2-13 X 2 SHCS
2	8	17145	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 3/16 THK
3	2	19869	PLATE SPACER TACK WELD MTG
4	8	21798	WASHER 5/16 FLTW HARDENED
5	1	26248	ASSY BRG SPHERICAL 2-1/4 ID W/ CLAMP COLLAR
6	4	26252	SCREW 1/2-20 X 2 SSSFP
7	1	26517	MTG BRACKET SPHERICAL BRG 2-ARM
8	4	45364	SCREW 5/16-24 X 2 HHCS FLANGED BLK OX

FIGURE 53. 2-ARM ASSEMBLY MOUNT 2-1/4" BAR (P/N 37473)

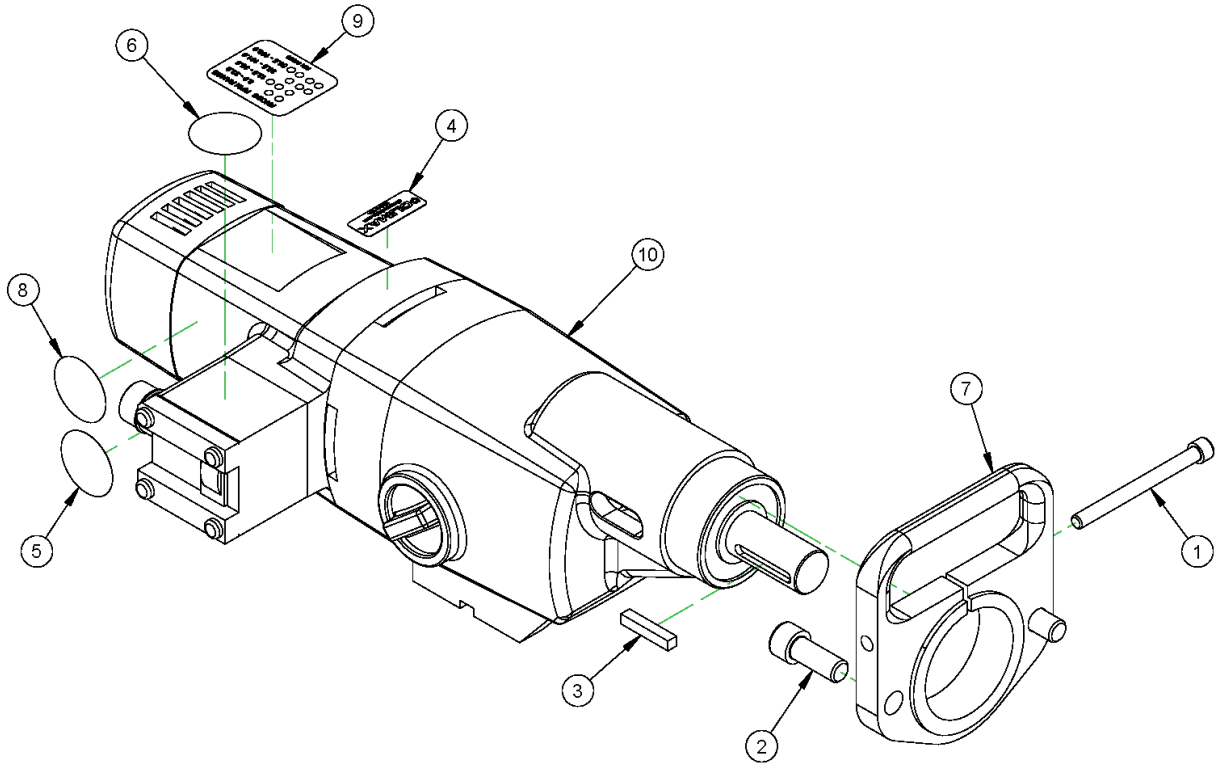
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	14991	BOLT JACKING SHORT
4	1	15059	RING SNAP 5/8 WIRE RING
2	1	14996	NUT 3/4-10 JAMN
3	1	15058	PAD THRUST



CHUCKING CONFIGURATIONS				
CHUCKING RAN	JAW P/N	ITEM 5	ITEM 7	ITEM 8
11.5-15.0	20316	Exclude	Include	Exclude
13.3-16.8	20316	Exclude	Exclude	Include
15.3-18.8	20316	Include	Exclude	Include
17.3-20.8	20317	Exclude	Exclude	Include
19.3-22.8	20317	Include	Exclude	Include
21.3-24.8	14827	Exclude	Exclude	Include
23.3-26.8	14827	Include	Exclude	Include
25.3-28.8	26800	Exclude	Exclude	Include
27.3-30.8	26800	Include	Exclude	Include

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10906	BRG FLANGE PILOTED 2-1/4 ID 4 BOLT
2	4	11779	WASHER 1/2 FLTW SAE PLAIN FINISH
3	4	11807	SCREW 1/2-13 X 1-3/4 HHCS
4	8	11826	SCREW 1/2-13 X 1-1/4 HHCS
5	8	14829	SPACER JAW 1 IN.
6	4	14830	PLATE JAW COVER
7	4	14874	SCREW 3/4-10 X 2-1/2 SQHSSCP
8	4	15176	BOLT JACKING ASSEMBLY
9	1	16011	(NOT SHOWN) CRATE 9 X 24 X 11-7/8 KM3000 5/8 PLY HINGED
10	1	20312	CHUCK OUTBOARD BRG ID MOUNT
11	1	20315	JAW SET ID MOUNT CHUCK 1149

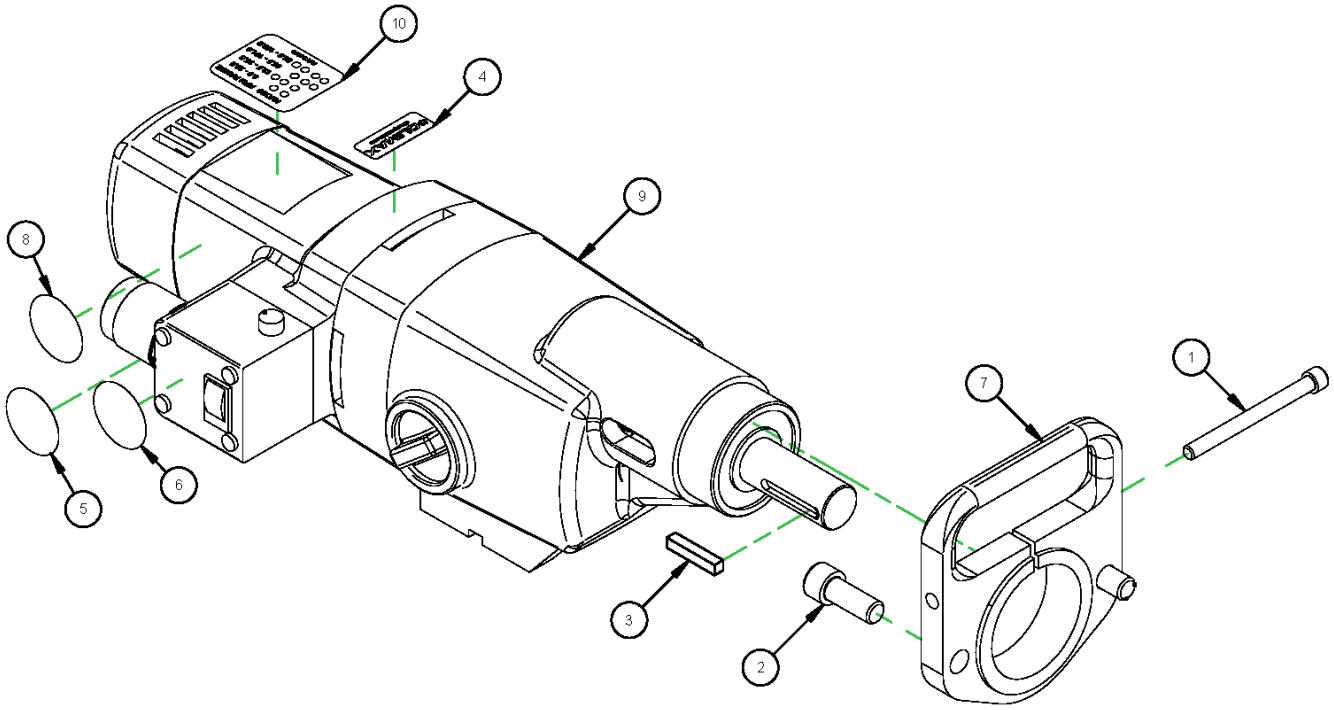
FIGURE 54. MOUNT ID CHUCK AND JAW ASSEMBLY (P/N 20319)



AVAILABLE CONFIGURATIONS	
PART NO	DESCRIPTION
88008	MOTOR ELECTRIC ASSY EIBENSTOCK 120 V 4 SPEED REVERSIBLE GEN 2
88009	MOTOR ELECTRIC ASSY EIBENSTOCK 230 V 4 SPEED REVERSIBLE GEN 2

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	11873	SCREW 5/16-18 X 3-1/2 SHCS
2	2	12646	SCREW 1/2-13 X 1-1/4 SHCS
3	1	15724	KEY 1/4 SQ X 1.37 SQ BOTH ENDS
4	1	56300	LABEL CLIMAX LOGO .66 X 1.75
5	1	59037	LABEL WARNING - WEAR EAR PROTECTION
6	1	59044	LABEL WARNING - CONSULT OPERATOR'S MANUAL 1.5 DIA
7	1	75648	FLANGE MOTOR MTG ELEC RDU BB5000
8	1	78824	LABEL WARNING - DO NOT EXPOSE TO WATER
9	1	84393	LABEL EIBENSTOCK RPM RANGES
10	1	88004	NFIS MOTOR ELECTRIC 4 SPEED REVERSIBLE 120V CE EIBENSTOCK EAU 34/4.1 CB GEN 2
		88005	NFIS MOTOR ELECTRIC 4 SPEED REVERSIBLE 230V CE EIBENSTOCK EAU 34/4.1 CB GEN 2

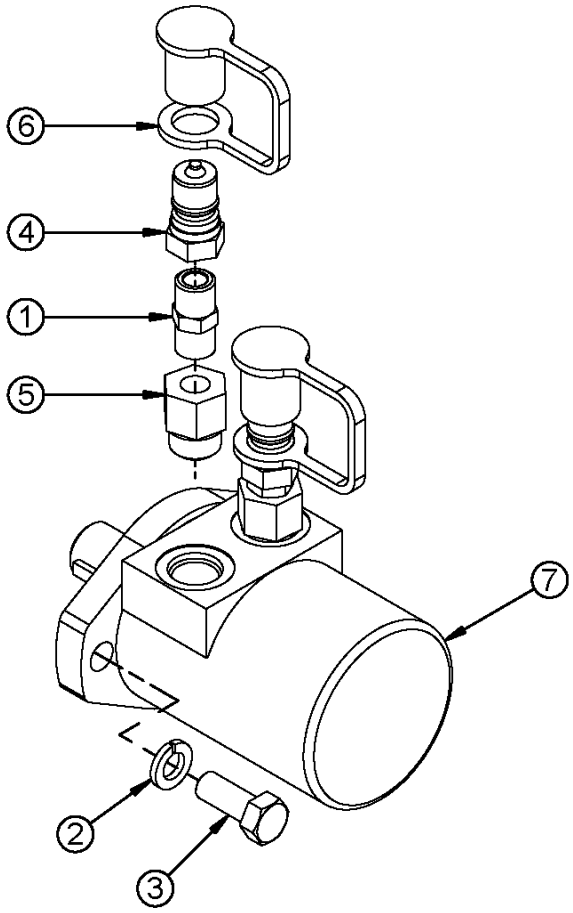
FIGURE 55. EIBENSTOCK ELECTRIC MOTOR ASSEMBLY (P/N 88012)



PART #	AVAILABLE ASSEMBLIES
82113	MOTOR ELECTRIC ASSY EIBENSTOCK 120 V 4 SPEED REVERSIBLE
82114	MOTOR ELECTRIC ASSY EIBENSTOCK 230 V 4 SPEED REVERSIBLE

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	11873	SCREW 5/16-18 X 3-1/2 SHCS
2	2	12646	SCREW 1/2-13 X 1-1/4 SHCS
3	1	15724	KEY 1/4 SQ X 1.37 SQ BOTH ENDS
4	1	56300	LABEL CLIMAX LOGO .66 X 1.75
5	1	59037	LABEL WARNING - WEAR EAR PROTECTION
6	1	59044	LABEL WARNING - CONSULT OPERATOR'S MANUAL 1.5 DIA
7	1	75648	FLANGE MOTOR MTG ELEC RDU BB5000
8	1	78824	LABEL WARNING - DO NOT EXPOSE TO WATER
9	1	82106 82107	MOTOR ELECTRIC 4 SPEED REVERSIBLE 120V EIBENSTOCK EAU 34/4 MODIFIED (82113) MOTOR ELECTRIC 4 SPEED REVERSIBLE 230 V EIBENSTOCK EAU 34/4 MODIFIED (82114)
10	1	84393	LABEL EIBENSTOCK RPM RANGES

FIGURE 56. EIBENSTOCK ELECTRIC MOTOR 4-SPEED REVERSIBLE ASSEMBLY (P/N 75860)



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	2	10593	FTG NIPPLE 3/8 NPTM X 3/8 NPTM
2	2	11238	WASHER LOCK 1/2
3	2	11826	SCREW 1/2-13 X 1-1/4 HHCS
4	2	12845	FTG QUICK COUPLER 3/8B 3/8 NPTF MALE
5	2	14056	FTG ADAPTER SAE-10 X 3/8 NPTF
6	2	27007	FTG DUST CAP 3/8 MALE QUICK COUPLING
7	1	27477	MOTOR HYD 2.2 CU IN. SAE-10 PORTS (ASSY 28615)
		20684	MOTOR HYD 3.6 CU IN. SAE-10 PORTS (ASSY 28692)
		21530	MOTOR HYD 5.9 CU IN. SAE-10 PORTS (ASSY 28693)
		20231	MOTOR HYD 7.3 CU IN. SAE-10 PORTS (ASSY 28694)
		21531	MOTOR HYD 8.9 CU IN. SAE-10 PORTS (ASSY 28695)

FIGURE 57. HYDRAULIC MOTOR ASSEMBLY (P/N 28615)

HYDRAULIC POWER		
Balloon	**Part**	**Description**
1	25318	HYDRAULIC POWER UNIT ASSEMBLY 5HP 200/3/60 2-FUNCTION FLOW CONTROL
	25319	HYDRAULIC POWER UNIT ASSEMBLY 5HP 460/3/60 2-FUNCTION FLOW CONTROL
	25320	HYDRAULIC POWER UNIT ASSEMBLY 5HP 550/3/50 2-FUNCTION FLOW CONTROL
	25321	HYDRAULIC POWER UNIT ASSEMBLY 5HP 575/3/60 2-FUNCTION FLOW CONTROL
	25322	HYDRAULIC POWER UNIT ASSEMBLY 5HP 230/1/60 2-FUNCTION FLOW CONTROL
	25323	HYDRAULIC POWER UNIT ASSEMBLY 5HP 220/1/50 2-FUNCTION FLOW CONTROL
	24592	HYDRAULIC POWER UNIT ASSEMBLY 5HP 440/3/50 2-FUNCTION FLOW CONTROL
	24593	HYDRAULIC POWER UNIT ASSEMBLY 5HP 220/3/50 2-FUNCTION FLOW CONTROL
	24595	HYDRAULIC POWER UNIT ASSEMBLY 5HP 200/3/50 2-FUNCTION FLOW CONTROL
	24594	HYDRAULIC POWER UNIT ASSEMBLY 5HP 380/3/50 2-FUNCTION FLOW CONTROL
2	12885	HOSE ASSEMBLY 560 3/8 X 3/8 NPTM ENDS X 240
4	12845	FTG QUICK COUPLER 3/8B 3/8 NPTF MALE
6	12846	FTG QUICK COUPLER 3/8B 3/8 NPTF FEMALE
8	10593	FTG NIPPLE 3/8 NPTM X 3/8 NPTM
12	14056	FTG ADAPTER 7/8 SAEM ORING X 3/8 NPTF
Not Shown	39099	FILTER ELEMENT REPLACEMENT 5HP/10HP
	29840	FLUID HYDRAULIC 76 UNAX AW 32 ANTI-WEAR

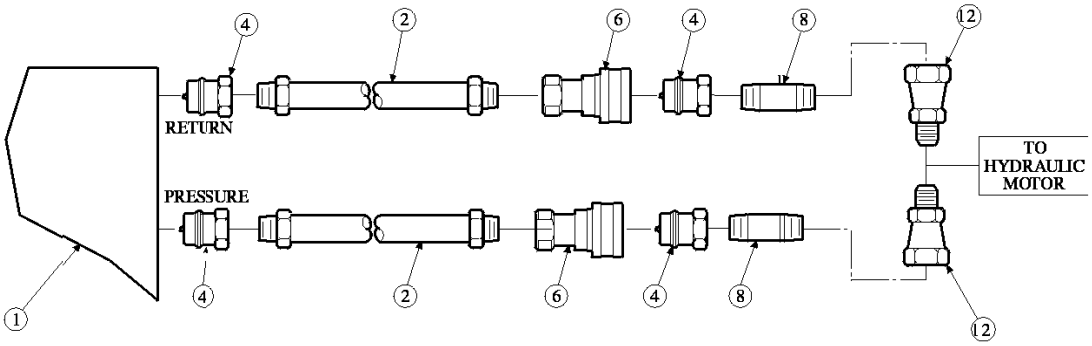


FIGURE 58. HYDRAULIC POWER SYSTEM (P/N 25584M)

PNEUMATIC MOTOR ASSEMBLY 37499 and 37500		
Balloon	**Part**	**Description**
1	10516	SCREW 5/16-10 X 3/4 FHSCS
2	28612	FLANGE MTG AIR MOTOR BB5000 3rd
3	28611	SCREW MODIFIED SEE DWG
4	15087	MOTOR AIR INGERSOLL 3HP 228 RPM REVERSIBLE
5	15109	MOTOR AIR INGERSOLL 3.2HP 485 RPM REVERSIBLE
6	26856	EXHAUST DEFLECTOR MODIFIED
7	15243	MUFFLER AIR MOTOR
8	36825	VALVE BALL 1/2 OVAL HANDLE ASSY W/LABEL
9	35670	FTG SWIVEL 1/2 NPTM X 1/2 NPTF
10	13209	FTG QUICK COUPLER 1/2B 1/2 NPTM MALE AIR
11	13208	FTG QUICK COUPLER 1/2B 1/2 NPTF FEMALE AIR
Not Shown	28826	PNEUMATIC CONDITIONING UNIT 1/2 IN
Not Shown	26845	WRENCH HEX 3/8 SHORT ARM BONDHUS BALLDRIUER
Not Shown	28826	PNEUMATIC CONDITIONING UNIT 1/2 IN
Not Shown	34735	LABEL WARNING 3-1/2 X 4
Not Shown	34866	AIRTOOL OIL COMPLETE

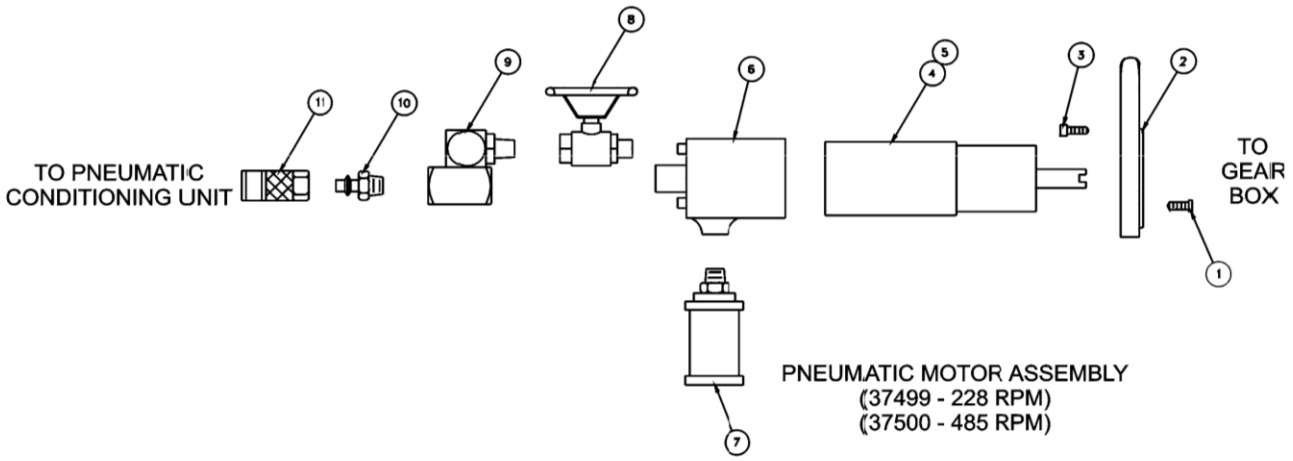


FIGURE 59. PNEUMATIC MOTOR ASSEMBLY (P/N 37499, 37500)

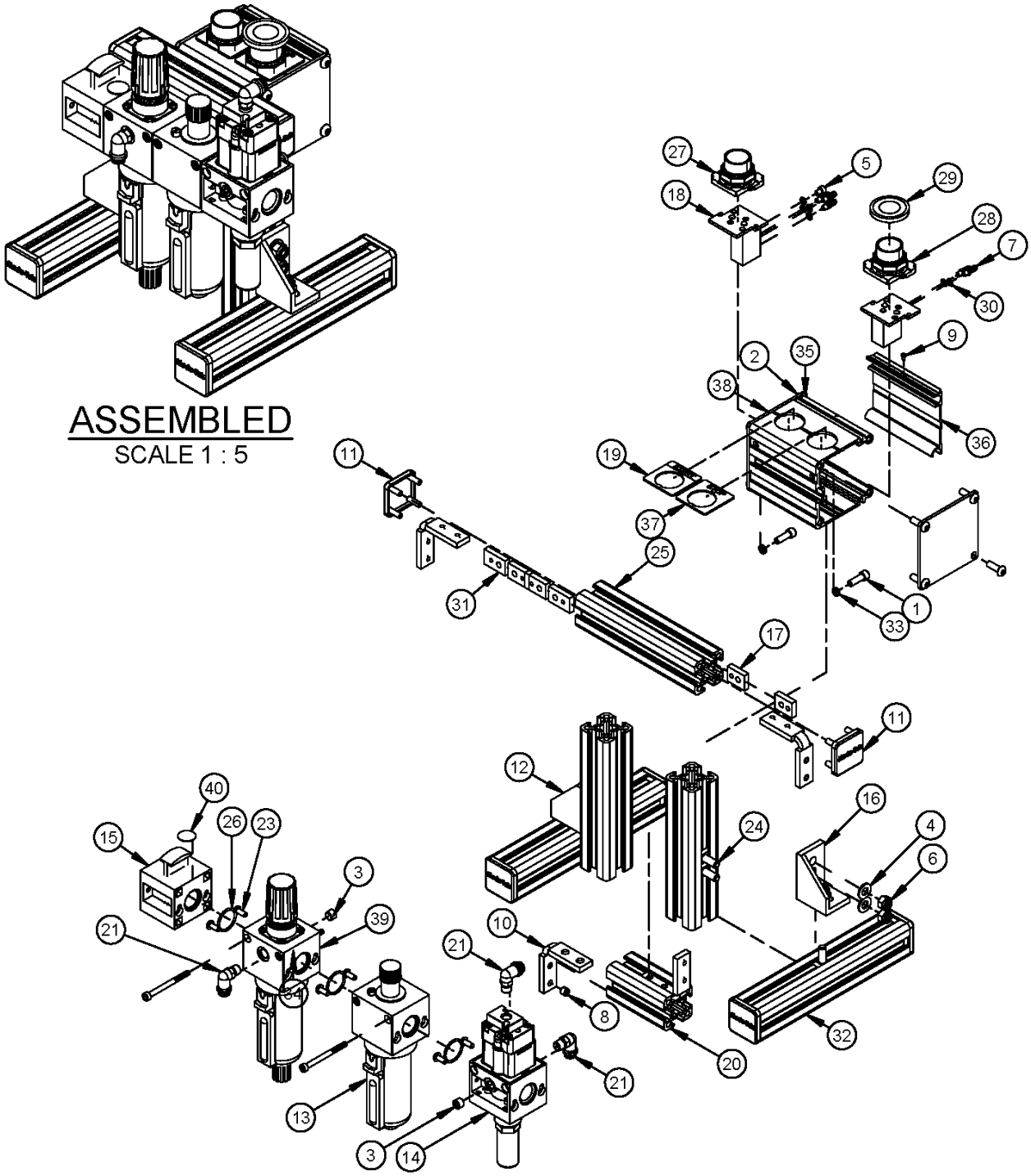
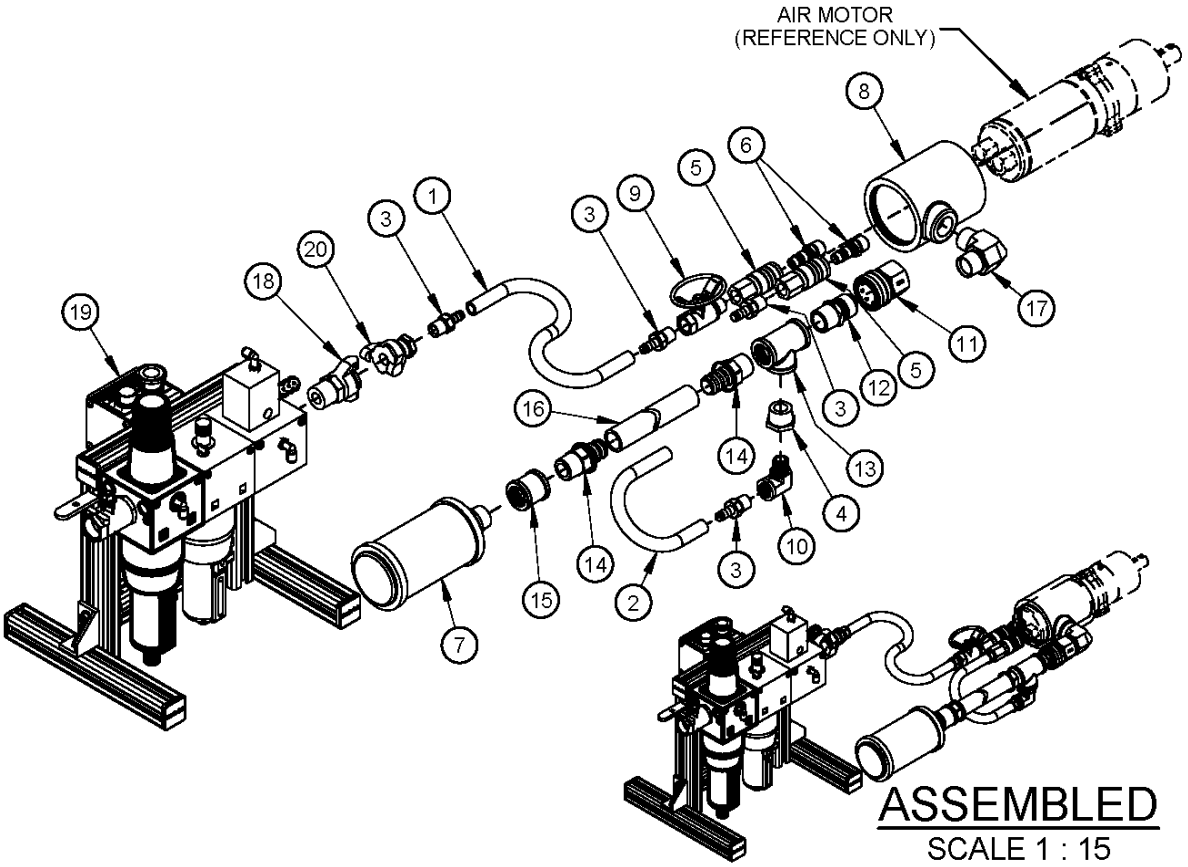


FIGURE 60. PNEUMATIC CONDITIONING UNIT (P/N 78264)

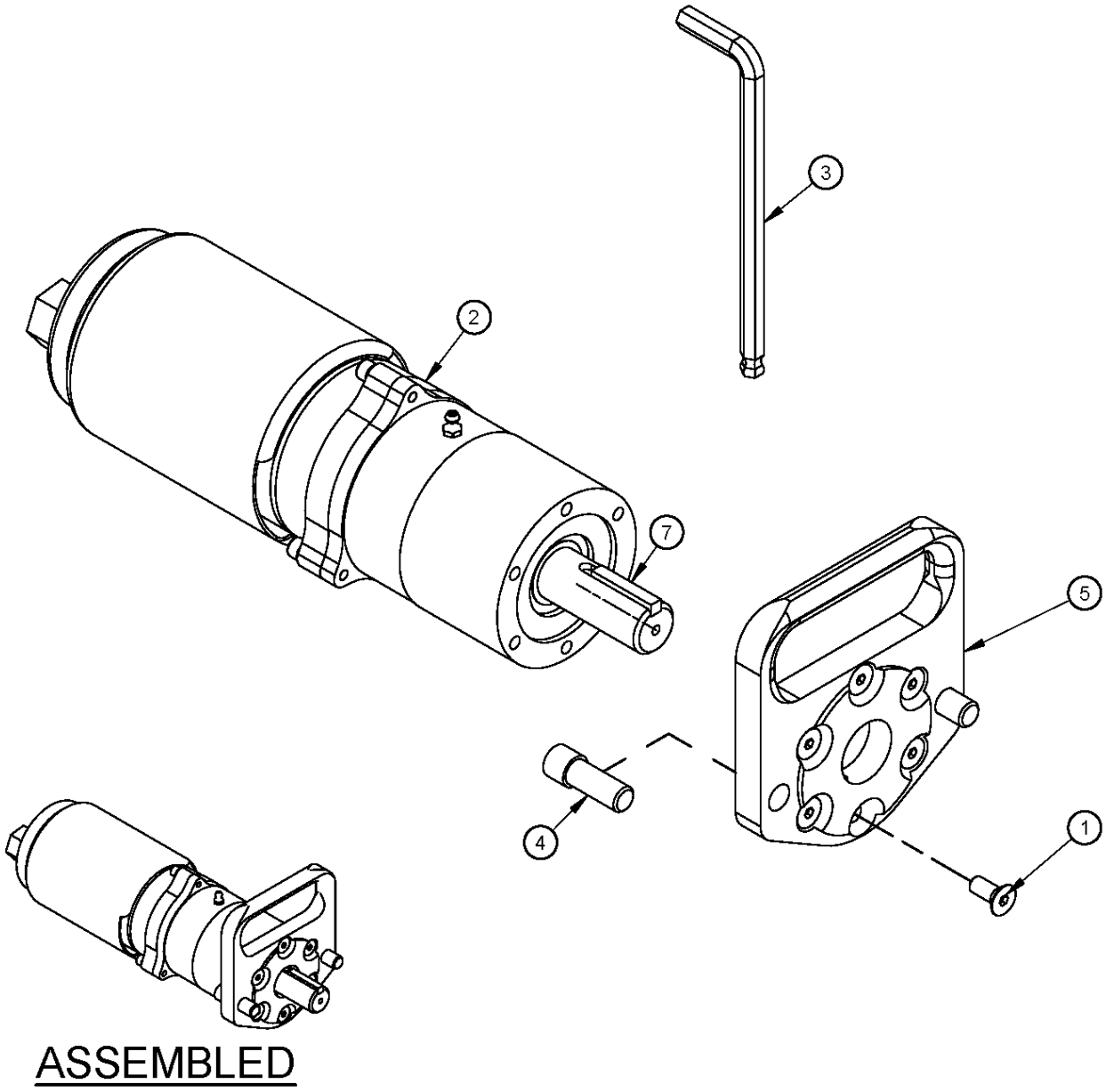
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10160	SCREW 1/4-20 X 3/4 SHCS
2	8	11365	SCREW 1/4-20 X 3/4 BHSCS
3	2	12616	FTG PLUG 1/8 NPTM SOCKET
4	6	13489	WASHER 5/16 FLTW SAE
5	1	14726	SCREW 10-32 X 1/4 SHCS
6	6	19729	NUT 5/16-18 NYLON INSERT LOCKNUT
7	5	22235	FTG BARB #10-32 X 1/8 HOSE
8	16	27895	SCREW 5/16-18 X 5/16 SSSFP
9	1	35857	SCREW 4-40 X 1/4 FHSCS
10	4	46761	BRACKET 90DEG JOINER MODU-TEK
11	6	46764	ENDCAP 1 X 1 FOR 1.63SQ MODU-TEK EXTRUSION
12	1	46765	BRACKET 1X2 SLOT HALF WEB LEFT MODU-TEK
13	1	46768	LUBRICATOR AIR 1/2 NPTF 3.8oz BOWL W/SIGHT
14	1	46769	VALVE EXHAUST QUICK PILOT 1/2NPTF MUFFLER
15	1	46777	VALVE SHUT OFF VS22 SERIES
16	1	46783	BRACKET 1X2 SLOT HALF WEB RIGHT MODU-TEK
17	2	46784	NUT SQUARE 5/16-18 AND 1/4-20
18	2	46785	VALVE PUSHBUTTON 5 PORT PNEUMATIC
19	1	46797	LEGEND PLATE START 10250 SERIES
20	1	46802	1.63 X 1.63 X 3.375L MODU-TEK EXTRUSION
21	3	48648	FTG ELBOW 1/8 NPTM X 1/4 TUBE PRESTOLOK
22	60	48650	(NOT SHOWN) TUBING 1/4 OD POLYURETHANE (INCH)
23	6	53617	SCREW M5 X 0.8 X 12MM BHCS BLACK FINISH
24	6	59436	SCREW 5/16-18 X 3/4 T-BOLT
25	3	59437	1.63 X 1.63 X 7.00L MODU-TEK EXTRUSION
26	3	59442	O-RING 2mm X 23mm ID X 25mm OD
27	1	59458	PUSHBUTTON GREEN FLUSH
28	1	59459	PUSH BUTTON PUSH PULL MAINTAINED (M-M)
29	1	59462	PUSH BUTTON OPERATOR RED 1-5/8
30	6	59480	WASHER #10 FLTW PLASTIC .32 OD .025 THICK
31	4	59705	NUT PLATE M5 X .08 AND 5/16-32 .75 X 1.25 X .25
32	2	59739	EXTRUSION 1.63 X 1.63 X 8.75 MODU-TEK
33	2	59745	WASHER 1/4 LOCW .37 OD .07 THICK
34	4	59754	SCREW M5 X 0.8 X 40MM SHCS
35	1	59820	ENCLOSURE PNEUMATIC CONTROL VALVE 3.38 X 3.435 X 3.9
36	1	59821	COVER PNEUMATIC CONTROL VALVE ENCLOSURE 3.38 X 3.435 X 3.9
37	1	59825	LEGEND PLATE STOP 10250SERIES YELLOW BACKGROUND
38	2	68644	PLATE COVER EXTRUDED WIREWAY
39	1	78054	FILTER/REGULATOR PARTICULATE 1/2NPTF METAL BOWL GLASS
40	1	81132	LABEL WARNING - INSERT SAFETY LOCK

FIGURE 61. PNEUMATIC CONDITIONING UNIT PARTS LIST (P/N 78264)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	70IN	10310	HOSE 801 SERIES PUSHLOK 1/2
2	16IN	10310	HOSE 801 SERIES PUSHLOK 1/2
3	4	10311	FTG BARB 1/2 NPTM X 1/2 HOSE
4	1	10321	FTG REDUCER BUSHING 1 NPTM X 1/2NPTF
5	2	13208	FTG QUICK COUPLER 1/2B 1/2NPTF FEMALE AIR
6	2	13209	FTG QD NIPPLE 1/2B 1/2 NPTM PNEUMATIC
7	1	15243	MUFFLER AIR MOTOR
8	1	19730	EXHAUST DEFLECTOR
9	1	35667	VALVE BALL 1/2 NPTM X 1/2 NPTF OVAL HANDLE
10	1	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS
11	1	55800	FTG QUICK COUPLER 1B 1 NPTF FEMALE AIR BRASS
12	1	55801	FTG QUICK COUPLER 1B 1 NPTM MALE AIR NON-VALVED BRASS
13	1	55802	FTG TEE 1 NPTF (3) BRASS
14	2	55803	FTG BARB 1 NPTM X 1 HOSE BRASS
15	1	55804	FTG CONNECTOR 1 NPTF X 1NPTF BRASS
16	60IN	55805	HOSE PUSH LOK 801 X 1 GREY
17	1	55832	FTG ELBOW 1 NPTM X 1 NPTM 90 DEG
18	1	58380	FTG QUICK COUPLER UNIVERSAL 1 NPTM
19	1	59248	PNEUMATIC CONDITIONING UNIT 1 IN W/ L.P. DROP OUT AND E-STOP CE
20	1	62564	FTG QUICK COUPLER UNIVERSAL 1/2 NPTF

FIGURE 62. PNEUMATIC CONNECTION PACKAGE (P/N 15088)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	6	10516	SCREW 5/16-18 X 3/4 FHSCS
2	1	15087	MOTOR AIR 3HP 475 RPM FS 228 RPM MAX 93TQ
3	1	26845	WRENCH HEX 3/8 SHORT ARM BONDHUS BALLDRIVER
4	2	28611	SCREW 1/2-13 X 1-1/4 SHCS MODIFIED
5	1	28612	FLANGE MTG AIR MOTOR BB5000

FIGURE 63. AIR MOTOR ASSEMBLY (P/N 28697)

APPENDIX C SCHEMATICS

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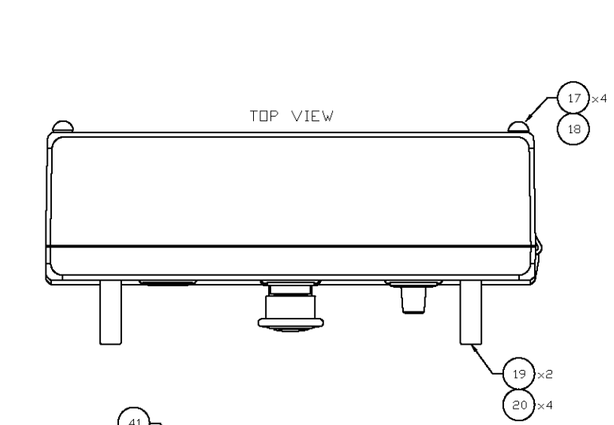
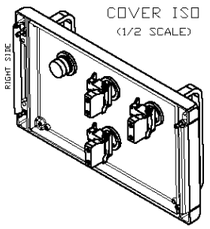
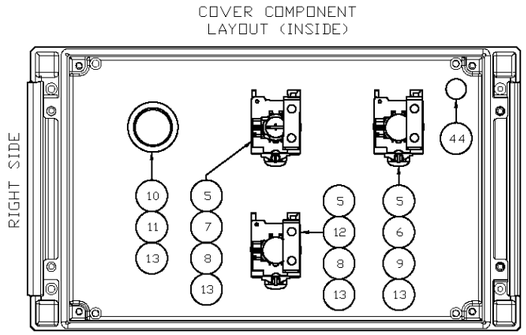
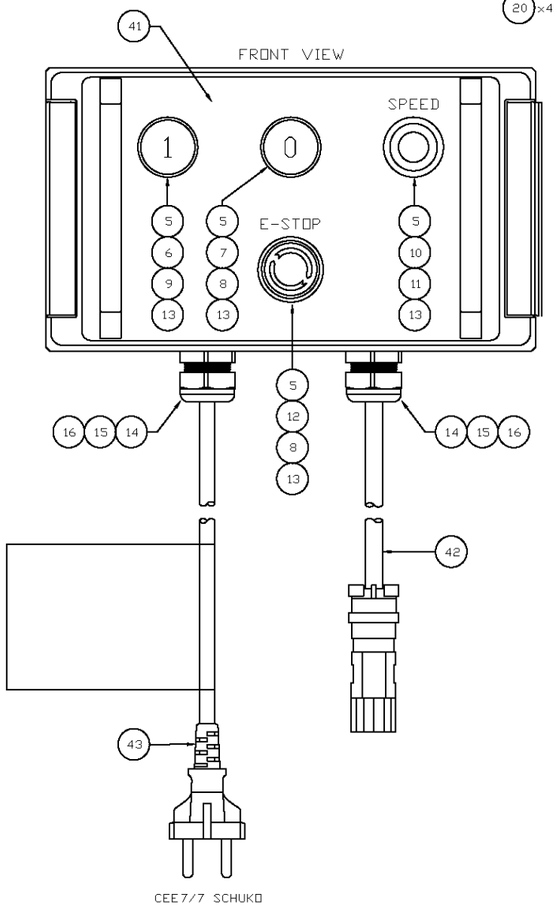
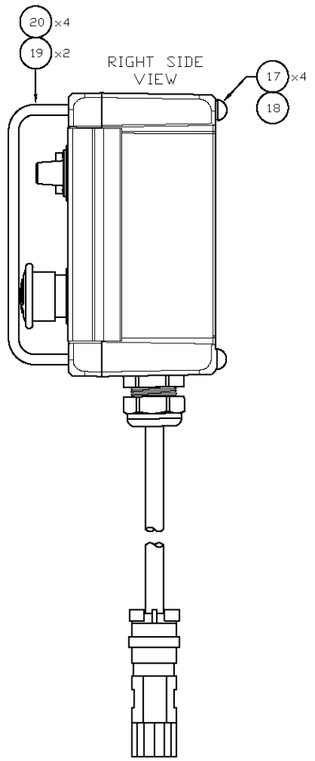
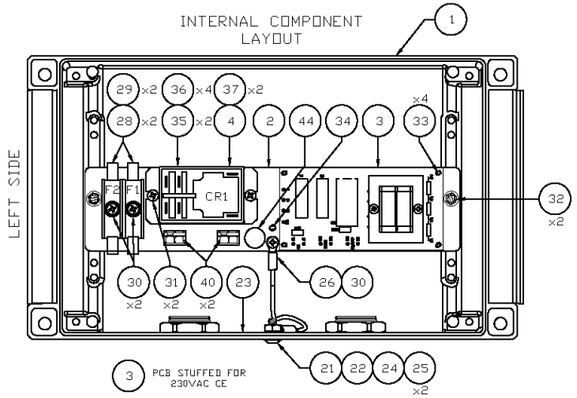


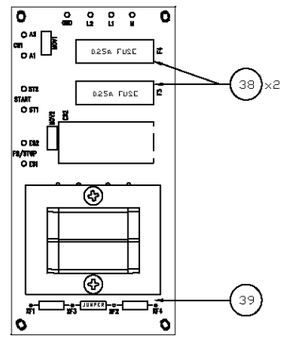








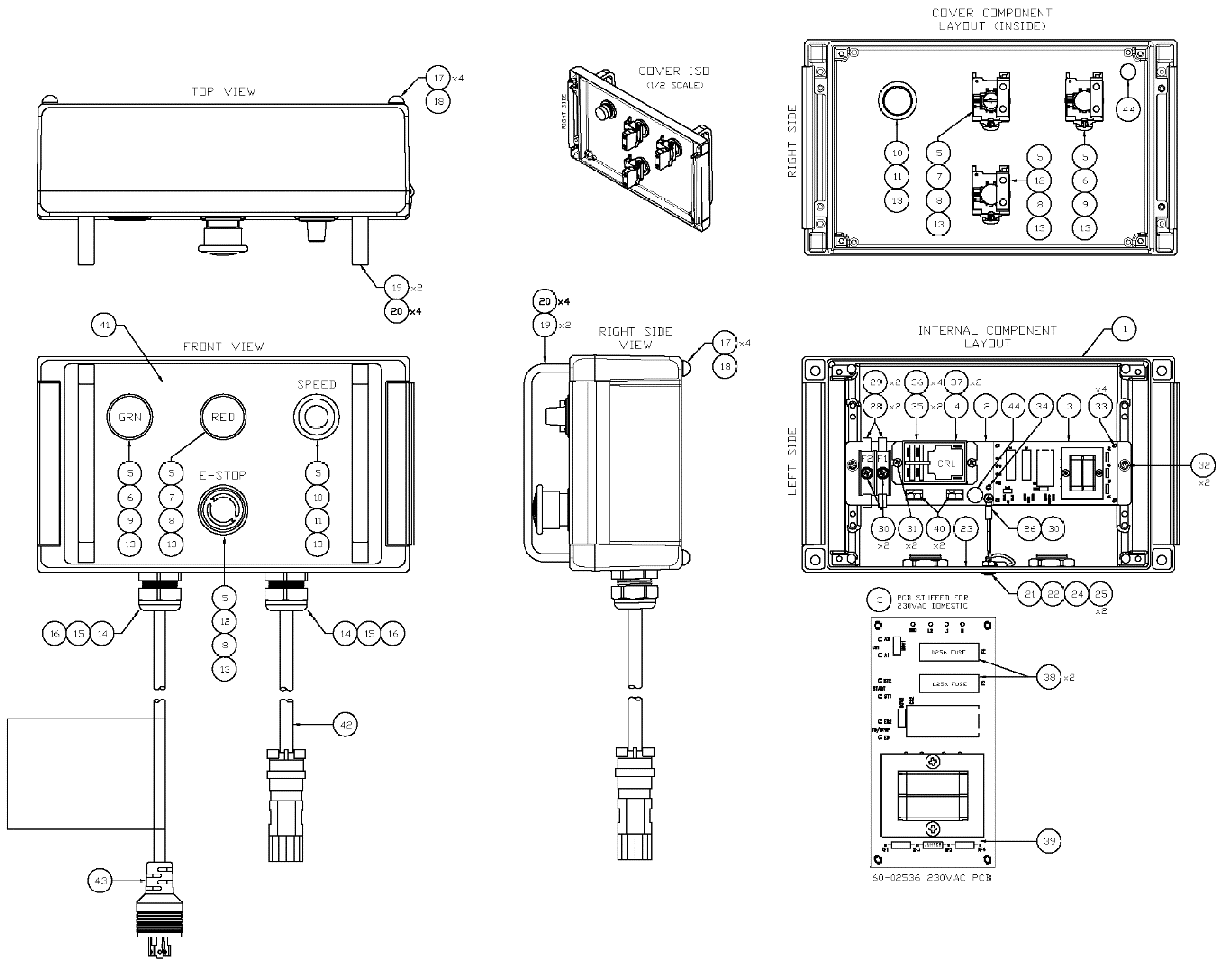




ITEM	QTY	DESCRIPTION	MFG	P/N
44	2	STICKER, GND SYMBOL	PANDUIT	PESS-A-ES
43	1	ASSY POWER CORD, CEE7/7 (SCHUKO), 1.5MM2, 115 IN	AUTOMATION SOLUTIONS	E00174
42	1	ASSY MOTOR CABLE, 230V, 14AWG, 5 CONDR, 15FT	AUTOMATION SOLUTIONS	E00171
41	1	LABEL, LEGEND/SERIAL#- 230V CE (88035)	AUTOMATION SOLUTIONS	G00245
40	2	COMPACT SPLICING CONNECTOR	WAGO	221-412
39	1	PCB JUMPER, ZERO OHM RESISTOR (OR WIRE JUMPER)	VISHAY	SFR2500Z0002R500
38	4	FUSE, 5x20mm, 0.25A SLO-BLO (2 SPARE)	LITTELFUSE	0239.250MXP
37	2	QUICK DISCONNECT, FEMALE, 18AWG	MCMASTER	7243K11
36	4	QUICK DISCONNECT, FEMALE, 12AWG	MCMASTER	7243K31
35	2	QUICK DISCONNECT w/PIGGYBACK, FEMALE, 18AWG	MCMASTER	72065K24
34	1	STANDOFF, NYLON, 1/4", ADHESIVE BACKED	McMASTER	91443A120
33	4	STANDOFF, NYLON, 4.7MM	KEYSTONE	8889
32	2	SCREW, 8-32, 1/8" LONG	MCMASTER	90096A191
31	2	SCREW, 6-32, 3/8" LONG	MCMASTER	90087A146
30	3	SCREW, 6-32, 1/4" LONG	MCMASTER	90087A144
29	4	FUSE, .25" x 1.25", 12A, SLO-BLO (2 SPARE)	LITTELFUSE	0326012.HXP
28	2	FUSEBLOCK, 1/4" x 1.25"	LITTELFUSE	03540901ZXGY
27	1	RING TERMINAL, 14-16AWG, #8 SCREW (LID NOT SHOWN)	MCMASTER	7113K38
26	1	RING TERMINAL, 14-16AWG, #6 SCREW (BACKPANEL)	MCMASTER	7113K34
25	2	RING TERMINAL, 14-16AWG, #10 SCREW (GND STUD)	MCMASTER	7113K12
24	1	RING TERMINAL, 22-18AWG, #10 SCREW (GND STUD)	MCMASTER	7113K97
23	3	STICKER, PROTECTIVE EARTH	PANDUIT	PESS-A-PE
22	1	GROUND NUT, w/WASHER, 10-32	MCMASTER	90675A195
21	1	GROUND SCREW, 10-32, 18-8SS	MCMASTER	97654A173
20	4	THREAD LOCKING SHCS SCREW, 8-32, WASHER HEAD	MCMASTER	91205A192
19	2	HANDLES	MCMASTER	15145A63
18	1	ADHESIVE PACKET FOR BUMPERS	MCMASTER	7493A41
17	4	BUMPERS, PUSH-IN, FOR 1/4" HOLE	MCMASTER	9544K22
16	2	CORD GRIP SEALING RING, 3/4"	SEALCON	SR34-NY
15	2	CORD GRIP, LOCK NUT	SEALCON	NN-21-BK
14	2	CORD GRIP, 3/4" NPT	SEALCON	CD21NR-BK
13	4	FLUSH MOUNT KIT	SCHNEIDER	ZB4BZ021
12	1	E-STOP PB, MUSHROOM HEAD	SCHNEIDER	ZB4BS844
11	1	POTENTIOMETER, 100K, LINEAR	HONEYWELL	380C1100K
10	1	POTENTIOMETER OPERATOR	SCHNEIDER	ZB4BD922
9	1	N/O CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1015
8	2	N/C CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1025
7	1	PUSHBUTTON, RED, EXTENDED, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BL432
6	1	PUSHBUTTON, GREEN, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BA331
5	3	MOUNT BASE	SCHNEIDER	ZB4BZ009
4	1	RELAY, E-MECH DPST, 30A, 24VAC COIL	SCHNEIDER	9257A22D-24
3	1	UNIVERSAL STARTER CONTROLLER PCB ASSY - 230V	AUTOMATION SOLUTIONS	60-02536
2	1	SUPPORT PLATE FOR STARTER CONTROLLER & RELAY	AUTOMATION SOLUTIONS	H00423
1	1	ENCLOSURE 11.77 x 6.81 x 3.54	ROSE-BOPLA	00126335

BILL OF MATERIALS

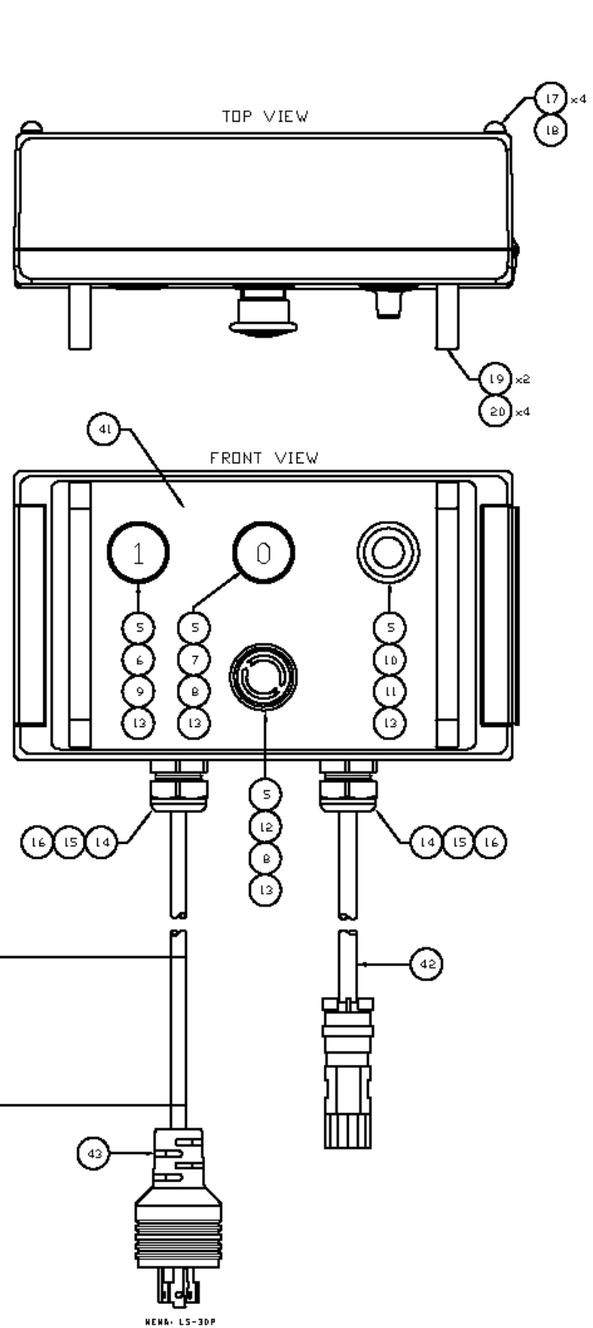
FIGURE 64. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 230V 50-60 HZ CE BOM (P/N 88035)

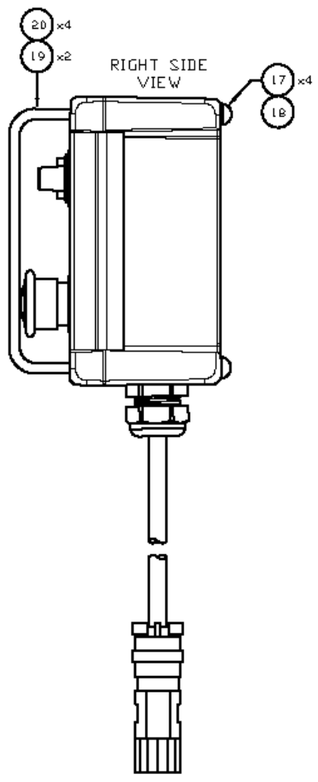


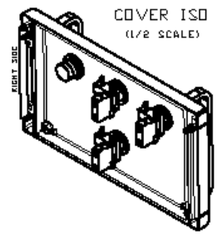
44	2	STICKER, GND SYMBOL	PANDUIT	PESS-A-ES
43	1	ASSY POWER CORD, NEMA: L6-15P, 14/3, 126 IN	AUTOMATION SOLUTIONS	E00175
42	1	ASSY MOTOR CABLE, 230V, 14AWG, 5 CONDR, 15FT	AUTOMATION SOLUTIONS	E00171
41	1	LABEL, LEGEND/SERIAL# - 230V DOMESTIC (88036)	AUTOMATION SOLUTIONS	G00246
40	2	COMPACT SPLICING CONNECTOR	WAGO	221-412
39	1	PCB JUMPER, ZERO OHM RESISTOR (OR WIRE JUMPER)	VISHAY	SFR25000Z000ZR500
38	4	FUSE, 5x20mm, 0.25A SLO-BLO (2 SPARE)	LITTELFUSE	0239.250MXP
37	2	QUICK DISCONNECT, FEMALE, 18AWG	MCMASTER	7243K11
36	4	QUICK DISCONNECT, FEMALE, 12AWG	MCMASTER	7243K31
35	2	QUICK DISCONNECT w/PIGGYBACK, FEMALE, 18AWG	MCMASTER	72065K24
34	1	STANDOFF, NYLON, 1/4", ADHESIVE BACKED	McMASTER	91443A120
33	4	STANDOFF, NYLON, 4.7MM	KEYSTONE	8889
32	2	SCREW, 8-32, 1/8" LONG	MCMASTER	90096A191
31	2	SCREW, 6-32, 3/8" LONG	MCMASTER	90087A146
30	3	SCREW, 6-32, 1/4" LONG	MCMASTER	90087A144
29	4	FUSE, .25" x 1.25", 12A, SLO-BLO (2 SPARE)	LITTELFUSE	0326012.HXP
28	2	FUSEBLOCK, 1/4" x 1.25"	LITTELFUSE	03540901ZXGY
27	1	RING TERMINAL, 14-16AWG, #8 SCREW (LID NOT SHOWN)	MCMASTER	7113K38
26	1	RING TERMINAL, 14-16AWG, #6 SCREW (BACKPANEL)	MCMASTER	7113K34
25	2	RING TERMINAL, 14-16AWG, #10 SCREW (GND STUD)	MCMASTER	7113K12
24	1	RING TERMINAL, 22-18AWG, #10 SCREW (GND STUD)	MCMASTER	7113K97
23	3	STICKER, PROTECTIVE EARTH	PANDUIT	PESS-A-PE
22	1	GROUND NUT, w/WASHER, 10-32	MCMASTER	90675A195
21	1	GROUND SCREW, 10-32, 18-8SS	MCMASTER	97654A173
20	4	THREAD LOCKING SHCS SCREW, 8-32, WASHER HEAD	MCMASTER	91205A192
19	2	HANDLES	MCMASTER	15145A63
18	1	ADHESIVE PACKET FOR BUMPERS	MCMASTER	7493A41
17	4	BUMPERS, PUSH-IN, FOR 1/4" HOLE	MCMASTER	9544K22
16	2	CORD GRIP SEALING RING, 3/4"	SEALCON	SR-34-NY
15	2	CORD GRIP, LOCK NUT	SEALCON	NN-21-BK
14	2	CORD GRIP, 3/4" NPT	SEALCON	CD21NR-BK
13	4	FLUSH MOUNT KIT	SCHNEIDER	ZB4BZ021
12	1	E-STOP PB, MUSHROOM HEAD	SCHNEIDER	ZB4BS844
11	1	POTENTIOMETER, 100K, LINEAR	HONEYWELL	380C1100K
10	1	POTENTIOMETER OPERATOR	SCHNEIDER	ZB4BD922
9	1	N/O CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1015
8	2	N/C CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1025
7	1	PUSHBUTTON, RED, EXTENDED, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BL432
6	1	PUSHBUTTON, GREEN, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BA331
5	3	MOUNT BASE	SCHNEIDER	ZB4BZ009
4	1	RELAY, E-MECH DPST, 30A, 24VAC COIL	SCHNEIDER	92S7A22D-24
3	1	UNIVERSAL STARTER CONTROLLER PCB ASSY - 230V	AUTOMATION SOLUTIONS	60-02536
2	1	SUPPORT PLATE FOR STARTER CONTROLLER & RELAY	AUTOMATION SOLUTIONS	H00423
1	1	ENCLOSURE 11.77 x 6.81 x 3.54	ROSE BOPLA	00126335
ITEM	QTY	DESCRIPTION	MFG	P/N

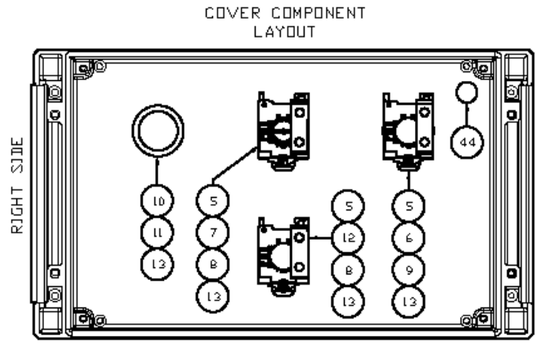
BILL OF MATERIALS

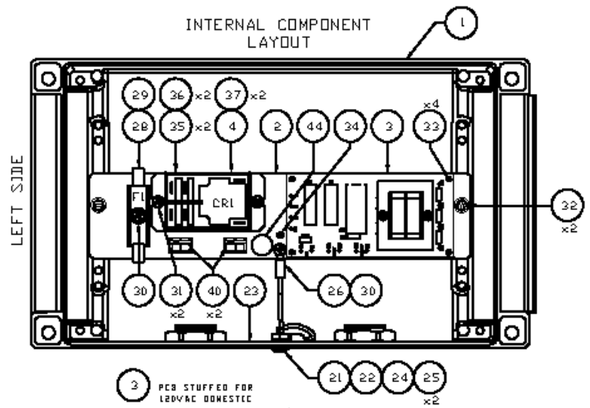
FIGURE 65. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 230V 50-60 HZ DOMESTIC BOM (P/N 88036)

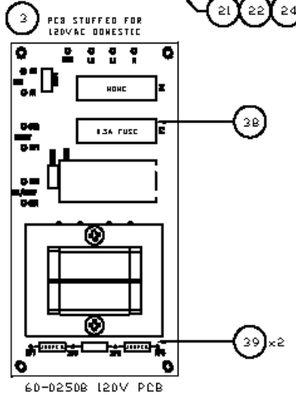






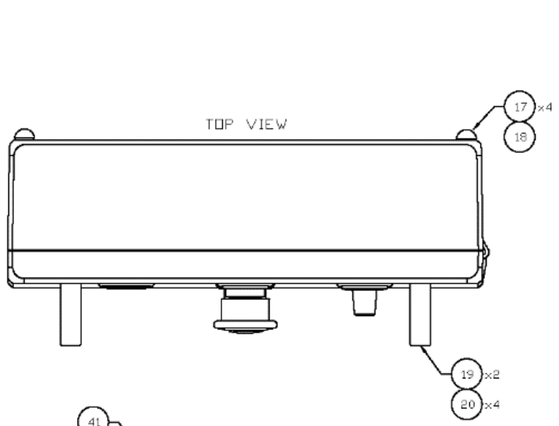


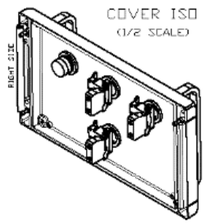


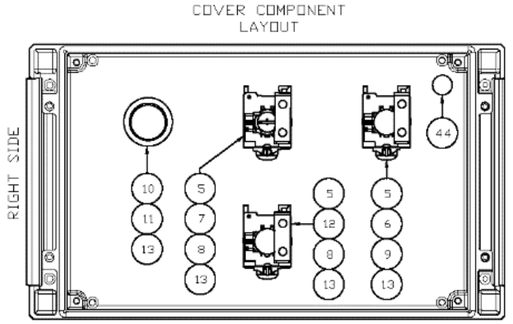


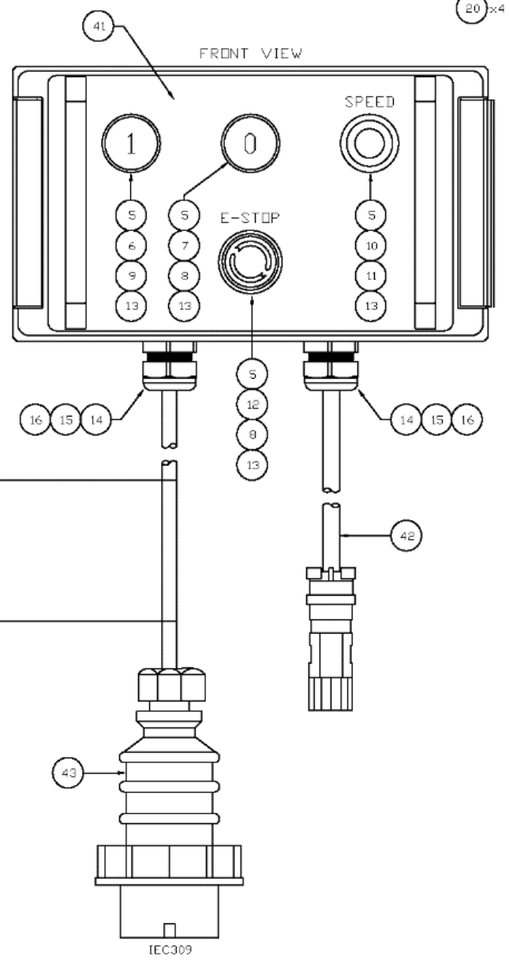
ITEM	QTY	DESCRIPTION	MFG	P/N
		BILL OF MATERIALS		
44	2	STICKER, GNDSYMBOL	PANDUIT	PESS-AES
43	1	ASSY POWER CORD, NEMA: L5-30P, 12/3, 20A, 15FT	AUTOMATION SOLUTIONS	E00172
42	1	ASSY MOTOR CABLE, 120V, 12AWG , 5 CONDR, 15FT	AUTOMATION SOLUTIONS	E00170
41	1	LABEL, LEGEND/SERIAL#-120V DOMESTIC (88037)	AUTOMATION SOLUTIONS	G00246
40	2	COMPACT SPLICING CONNECTOR	WAGO	221-412
39	2	PCB JUMPER, ZERO OHM RESISTOR (OR WIRE JUMPER)	VISHAY	DPR2500200R0FB00
38	2	FUSE, 5x20mm, 0.5A SLO-BLO (1 SPARE)	LITTELFUSE	0259.500MXP
37	2	QUICK DISCONNECT, FEMALE, 18AWG	MCMASTER	7249K11
36	2	QUICK DISCONNECT, FEMALE, 12AWG	MCMASTER	7249K31
35	2	QUICK DISCONNECT w/ PIGGYBACK, FEMALE, 18AWG	MCMASTER	7206K24
34	1	STANDOFF, NYLON, 1/4", ADHESIVE BACKED	McMASTER	91443A120
33	4	STANDOFF, NYLON, 4.7MM	KEYSTONE	8839
32	2	SCREW, 8-32, 1/8" LONG	MCMASTER	90068A191
31	2	SCREW, 6-32, 3/8" LONG	MCMASTER	90087A146
30	2	SCREW, 6-32, 1/4" LONG	MCMASTER	90087A144
29	2	FUSE, .25" x 1.25", 25A, SLO-BLO (1 SPARE)	LITTELFUSE	0826.025HXP
28	2	FUSEBLOCK, 1/4" x 1.25"	LITTELFUSE	0354090120XGY
27	1	RING TERMINAL, 14-16AWG, #8 SCREW (LID NOT SHOWN)	MCMASTER	7113K38
26	1	RING TERMINAL, 14-16AWG, #8 SCREW (BACKPANEL)	MCMASTER	7113K34
25	2	RING TERMINAL, 14-16AWG, #10 SCREW (GNDSTUD)	MCMASTER	7113K32
24	1	RING TERMINAL, 22-18AWG, #10 SCREW (GNDSTUD)	MCMASTER	7113K97
23	1	STICKER, PROTECTIVE EARTH	PANDUIT	PESS-APE
22	1	GROUND NUT, w/WASHER, 10-32	MCMASTER	90675A195
21	1	GROUND SCREW, 10-32, 18-8SS	MCMASTER	97654A178
20	4	THREAD LOCKING SHCS SCREW, 8-32, WASHER HEAD	MCMASTER	91205A192
19	2	HANDLES	MCMASTER	1514SA63
18	1	ADHESIVE PACKET FOR BUMPERS	MCMASTER	7493A41
17	4	BUMPERS, PUSH-IN, FOR 1/4" HOLE	MCMASTER	9544K22
16	2	CORD GRIP SEALING RING, 3/4"	SEALCON	SR-34-NY
15	2	CORD GRIP, LOCK NUT	SEALCON	NN-21-BK
14	2	CORD GRIP, 3/4" NPT	SEALCON	CD21NR-BK
13	4	FLUSH MOUNT KIT	SCHNEIDER	ZB4BZ021
12	1	E-STOP PB, MUSHROOM HEAD	SCHNEIDER	ZB4BS844
11	1	POTENTIOMETER, 100K, LINEAR	HONEYWELL	23BC1100K
10	1	POTENTIOMETER OPERATOR	SCHNEIDER	ZB4BD922
9	1	N/O CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1015
8	2	N/C CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1025
7	1	PUSHBUTTON, RED, EXTENDED, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BL432
6	1	PUSHBUTTON, GREEN, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZB4BA331
5	3	MOUNT BASE	SCHNEIDER	ZB4BZ009
4	1	RELAY, EMECH DPST, 30A, 24VAC COIL	SCHNEIDER	9257AZ2D-24
3	1	UNIVERSAL STARTER CONTROLLER PCB ASSY - 120V	AUTOMATION SOLUTIONS	60-02508
2	1	BACKPANEL FOR STARTER CONTROLLER & RELAY	AUTOMATION SOLUTIONS	H00423
1	1	ENCLOSURE 11.77 x 6.81 x 3.54	HOFFMAN	00126335

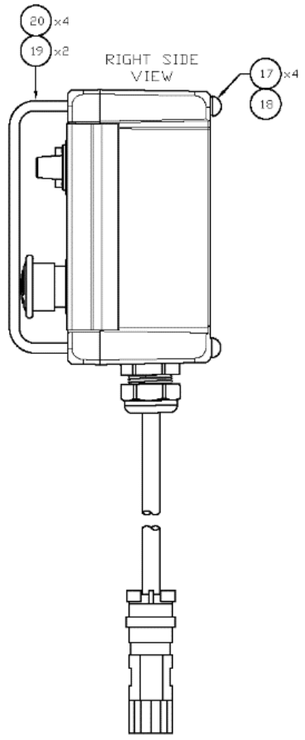
FIGURE 66. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 120V DOMESTIC BOM (P/N 88037)

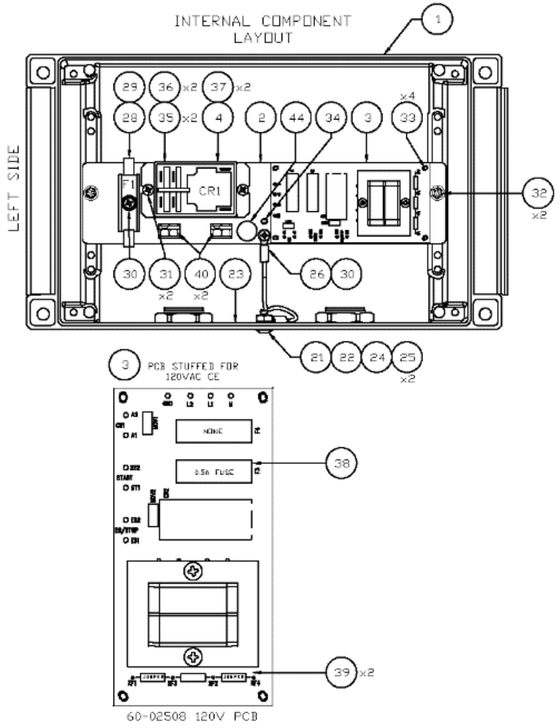












ITEM	QTY	DESCRIPTION	MFG	P/N
BILL OF MATERIALS				
1	1	ENCLOSURE 11.77 x 8.81 x 3.54	ROSEBOPLA	00126335
2	1	SUPPORT PLATE FOR STARTER CONTROLLER & RELAY	AUTOMATION SOLUTIONS	H00423
3	1	UNIVERSAL STARTER CONTROLLER PCB ASSY - 120V	AUTOMATION SOLUTIONS	60-02508
4	1	RELAY, E-MECH DPST, 30A, 24VAC COIL	SCHNEIDER	9037A22D-24
5	3	MOUNT BASE	SCHNEIDER	ZBHB2009
6	1	PUSHBUTTON, GREEN, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZBHBA131
7	1	PUSHBUTTON, RED, EXTENDED, NON-ILLUM, MOM, 22MM	SCHNEIDER	ZBHBL432
8	2	N/C CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1025
9	1	N/O CONTACT BLK, 10A, SPRING CLAMP	SCHNEIDER	ZBE1015
10	1	POTENTIOMETER OPERATOR	SCHNEIDER	ZBHB0922
11	1	POTENTIOMETER, 100K, LINEAR	HONEYWELL	380C1100K
12	1	E-STOP PB, MUSHROOM HEAD	SCHNEIDER	ZBHBB844
13	4	FLUSH MOUNT NT	SCHNEIDER	ZBHBB021
14	2	CORD GRIP, 3/4" NPT	SEALCON	CD21NRBK
15	2	CORD GRIP, LOCK NUT	SEALCON	NN21-BK
16	2	CORD GRIP SEALING RING, 3/4"	SEALCON	SRJ34-NY
17	4	BUMPERS, PUSH-IN, FOR 1/4" HOLE	MCMASTER	9544K22
18	1	ADHESIVE PACKET FOR BUMPERS	MCMASTER	7493A41
19	2	HANDLES	MCMASTER	1514SA63
20	4	THREAD LOCKING SHCS SCREW, 8-32, WASHER HEAD	MCMASTER	91205A192
21	1	GROUND SCREW, 10-32, 18-8SS	MCMASTER	97654A173
22	1	GROUND NUT, w/WASHER, 10-32	MCMASTER	90675A195
23	3	STICKER, PROTECTIVE EARTH	PANDUIT	PESS-AFE
24	1	RING TERMINAL, 22-18AWG, #10 SCREW (GND STUD)	MCMASTER	7113K97
25	2	RING TERMINAL, 14-16AWG, #10 SCREW (GND STUD)	MCMASTER	7113K12
26	1	RING TERMINAL, 14-16AWG, #6 SCREW (BACKPANEL)	MCMASTER	7113K34
27	1	RING TERMINAL, 14-16AWG, #6 SCREW (LID NOT SHOWN)	MCMASTER	7113K38
28	2	FUSEBLOCK, 1/4" x 1.25"	LITTELFUSE	03540901ZXGY
29	2	FUSE, .25" x 1.25", 25A, SLO-BLO (1 SPARE)	LITTELFUSE	0326025.MXP
30	2	SCREW, 6-32, 1/4" LONG	MCMASTER	90087A144
31	2	SCREW, 6-32, 3/8" LONG	MCMASTER	90087A146
32	2	SCREW, 8-32, 1/8" LONG	MCMASTER	90096A191
33	4	STANDOFF, NYLON, 4.7MM	KEYSTONE	8899
34	1	STANDOFF, NYLON, 1/4", ADHESIVE BACKED	MCMASTER	91443A120
35	2	QUICK DISCONNECT, w/PIGGYBACK, FEMALE, 18AWG	MCMASTER	7206BK24
36	2	QUICK DISCONNECT, FEMALE, 12AWG	MCMASTER	7293K31
37	2	QUICK DISCONNECT, FEMALE, 18AWG	MCMASTER	7243K11
38	2	FUSE, 5x20mm, 0.5A SLO-BLO (1 SPARE)	LITTELFUSE	0239.500MXP
39	2	PCB JUMPER, ZERO OHM RESISTOR (OR WIRE JUMPER)	VISHAY	SFR2500200.0R500
40	2	COMPACT SPLICING CONNECTOR	WAGO	221-412
41	1	LABEL, LEGEND/SERIAL# - 120V CE (88038)	AUTOMATION SOLUTIONS	G00245
42	1	ASSY MOTOR CABLE, 120V, 12AWG, 5 CONDR, 15FT	AUTOMATION SOLUTIONS	E00170
43	1	ASSY POWER CORD, IEC309 (PIN & SLEEVE), 12/3, 15FT	AUTOMATION SOLUTIONS	E00173
44	2	STICKER, GND SYMBOL	PANDUIT	PESS-ABS

FIGURE 67. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 120V CE BOM (P/N 88038)

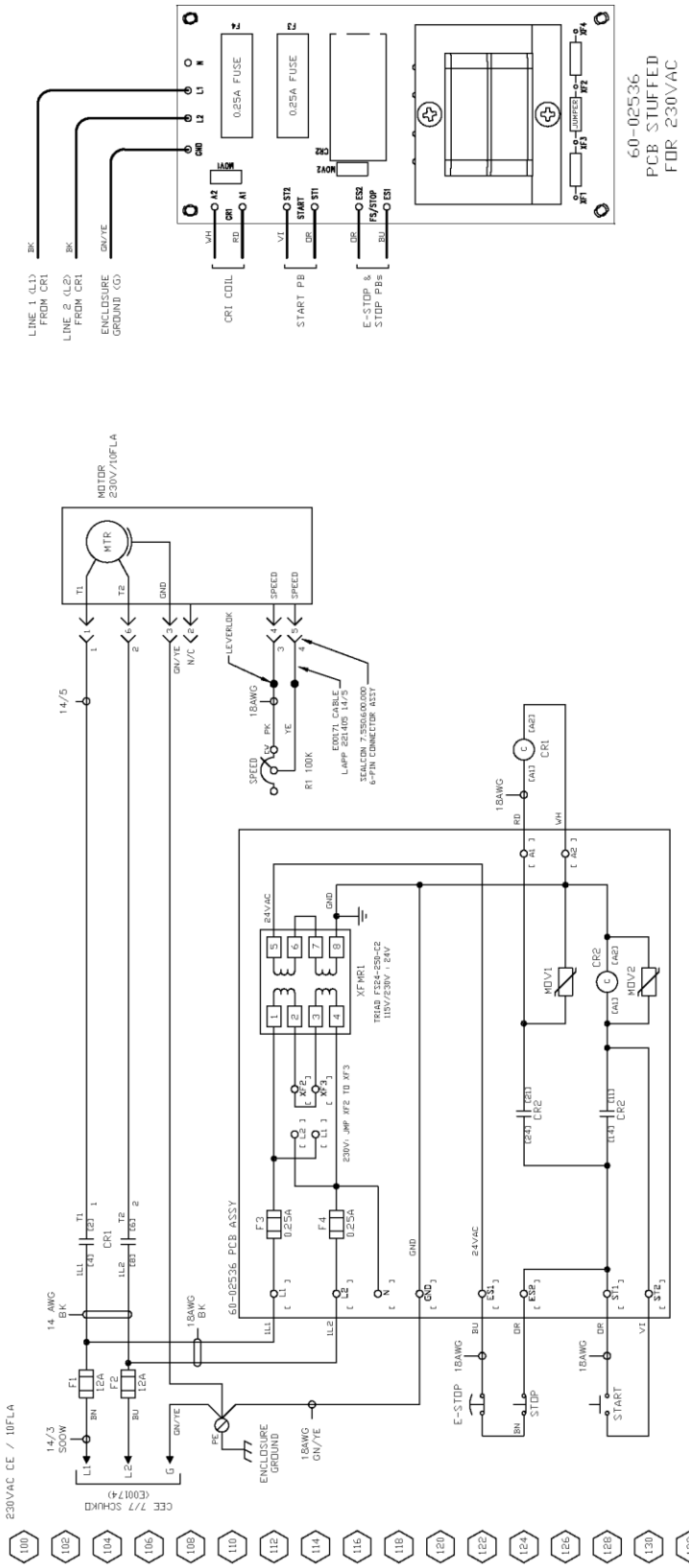


FIGURE 68. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 230V 50-60 HZ CE SCHEMATIC (P/N 88035)

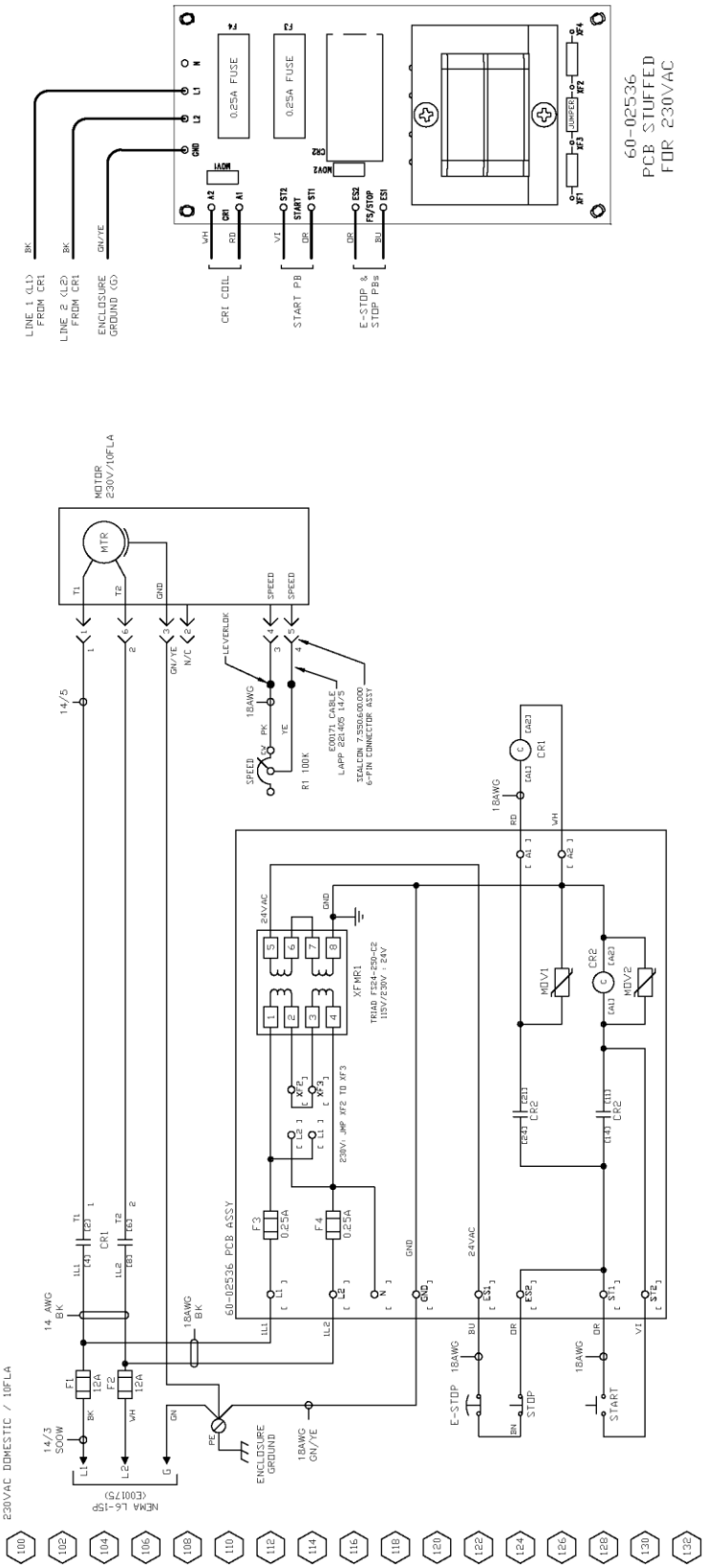


FIGURE 69. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 230V 50-60 HZ DOMESTIC SCHEMATIC (P/N 88036)

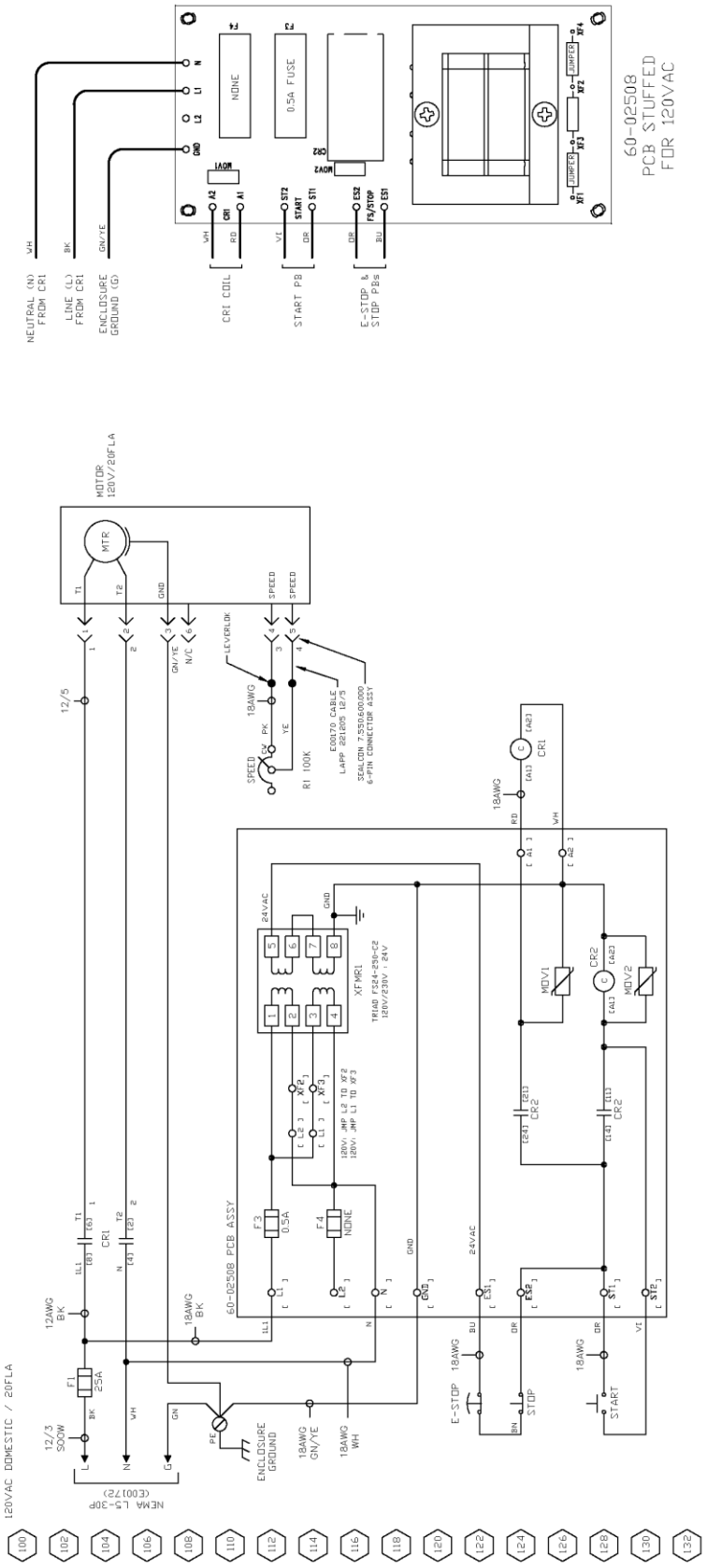


FIGURE 70. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 120V DOMESTIC SCHEMATIC (P/N 88037)

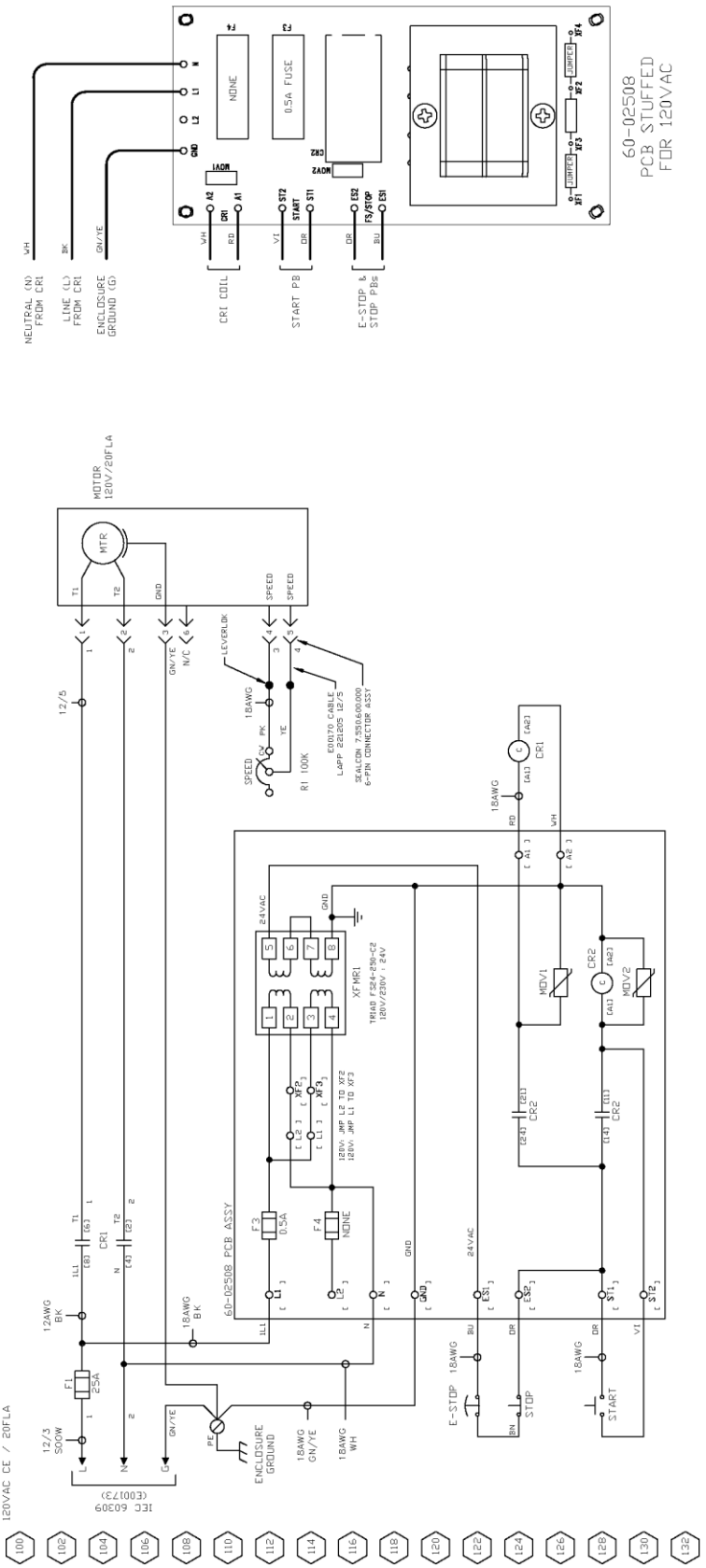


FIGURE 71. CONTROLLER BB5000 BB4500 EIBENSTOCK 2ND GEN 120V CE SCHEMATIC (P/N 88038)

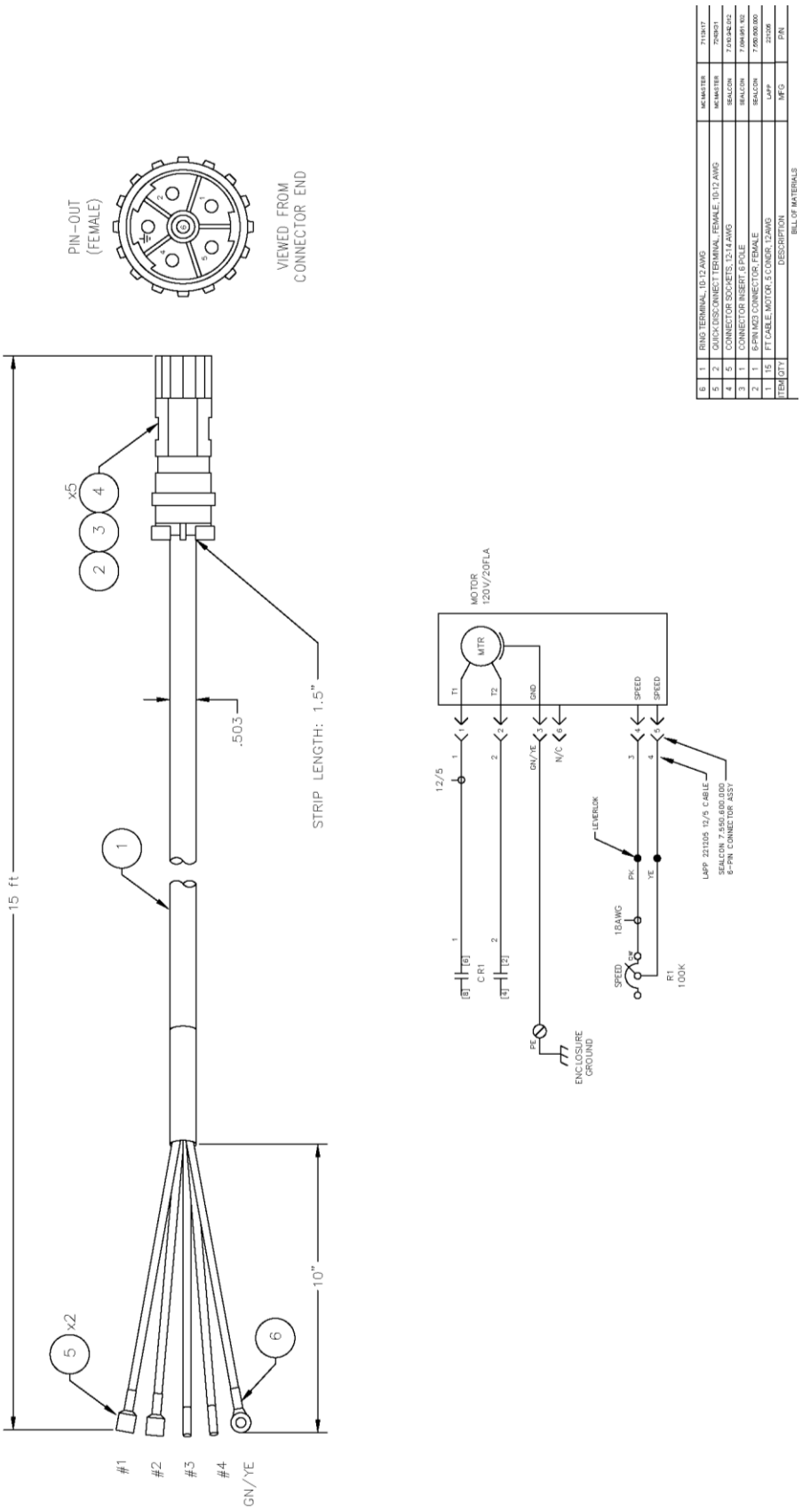


FIGURE 72. MOTOR CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 120V 12AWG BOM/SCHEMATIC (P/N 88649)

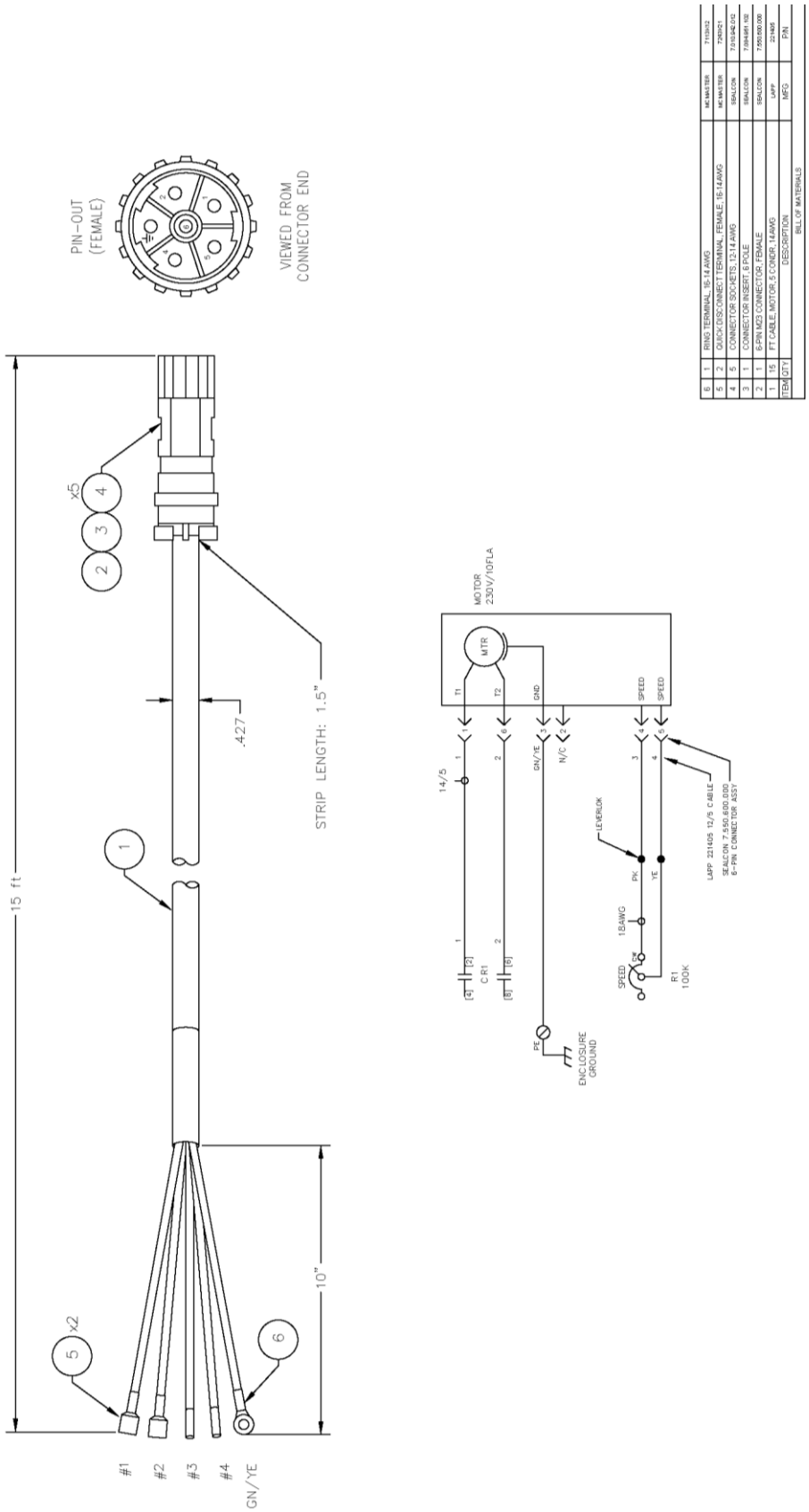


FIGURE 73. MOTOR CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 230V 14 AWG BOM/SCHEMATIC (P/N 88650)

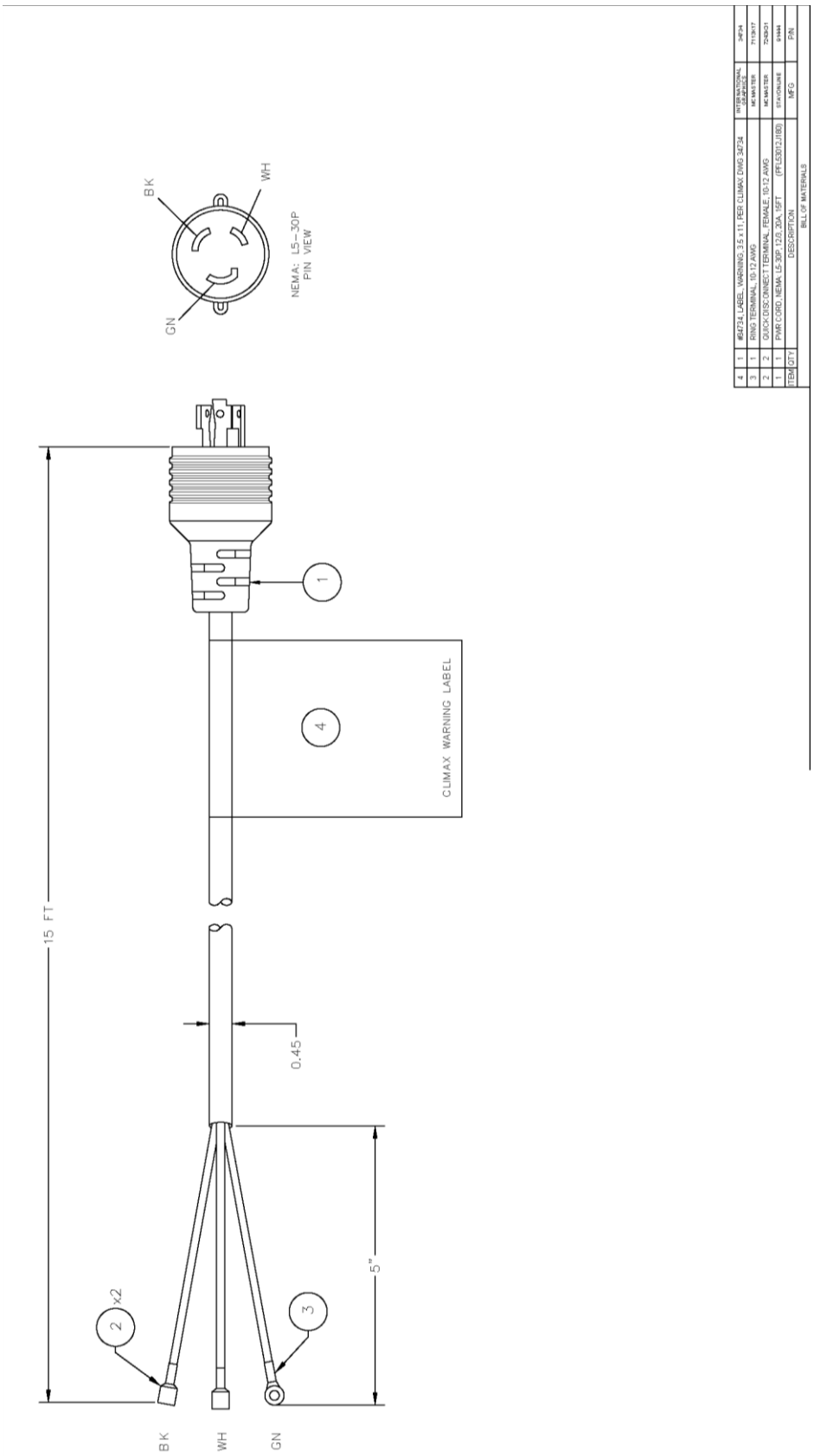


FIGURE 74. POWER CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 120V DOMESTIC L5-30P PLUG BOM (P/N 88652)

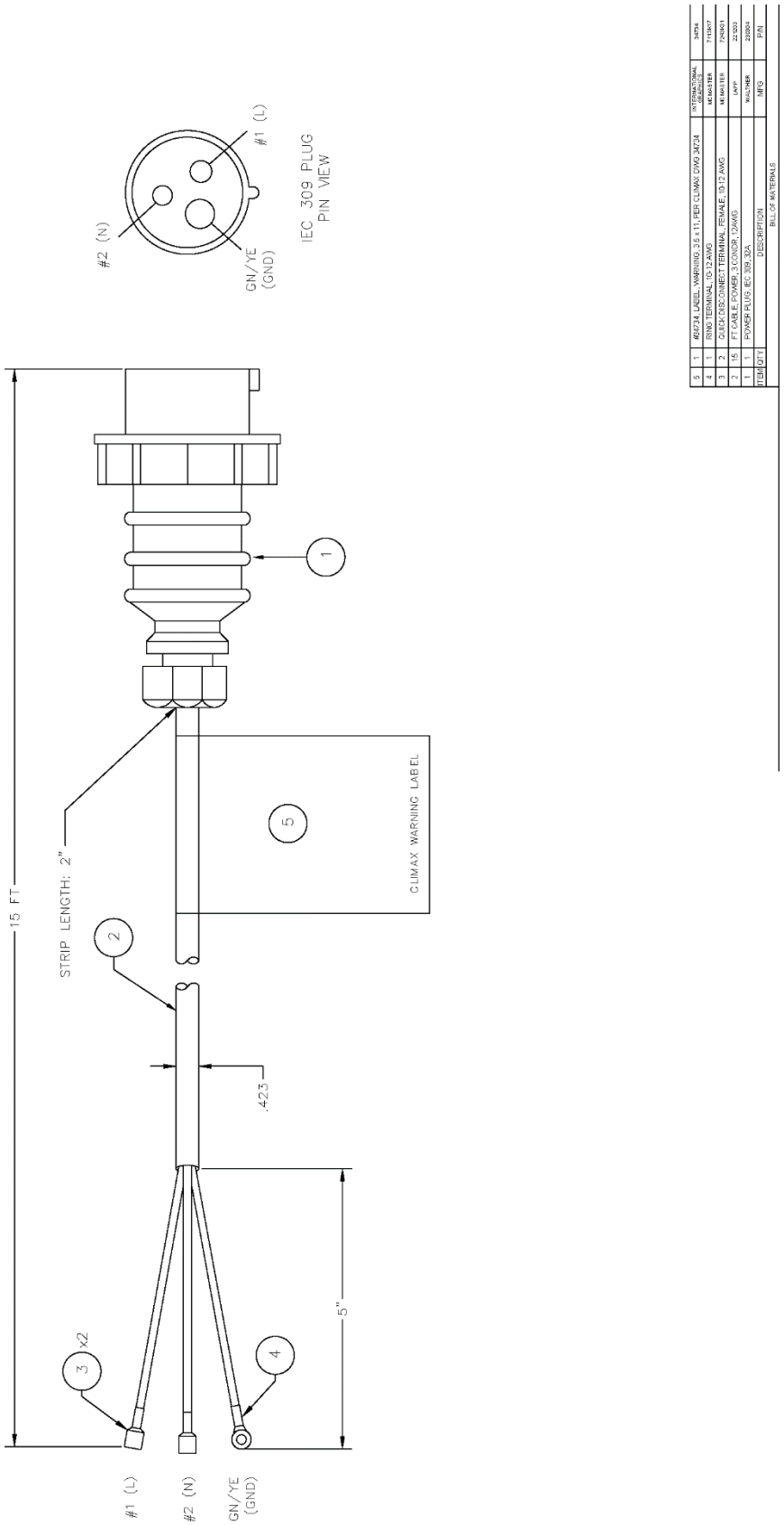


FIGURE 75. POWER CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 120V CE 332P4W PIN/SLEEVE PLUG BOM (P/N 88653)

ITEM	QTY	DESCRIPTION	MFG	P/N
4	1	#34734, LABEL, WARNING, 3.5 x 11, PER CLIMAX DWG 34734	INTERNATIONAL GRAPHICS	34734
3	1	RING TERMINAL, 16-14 AWG	MCMASTER	7113K12
2	2	QUICK DISCONNECT TERMINAL, FEMALE, 16-14 AWG	MCMASTER	7243K21
1	1	POWER CORD, SCHUKO, CEE7/7, 16A, 1.5MM2, 115"	STAYONLINE	7676

BILL OF MATERIALS

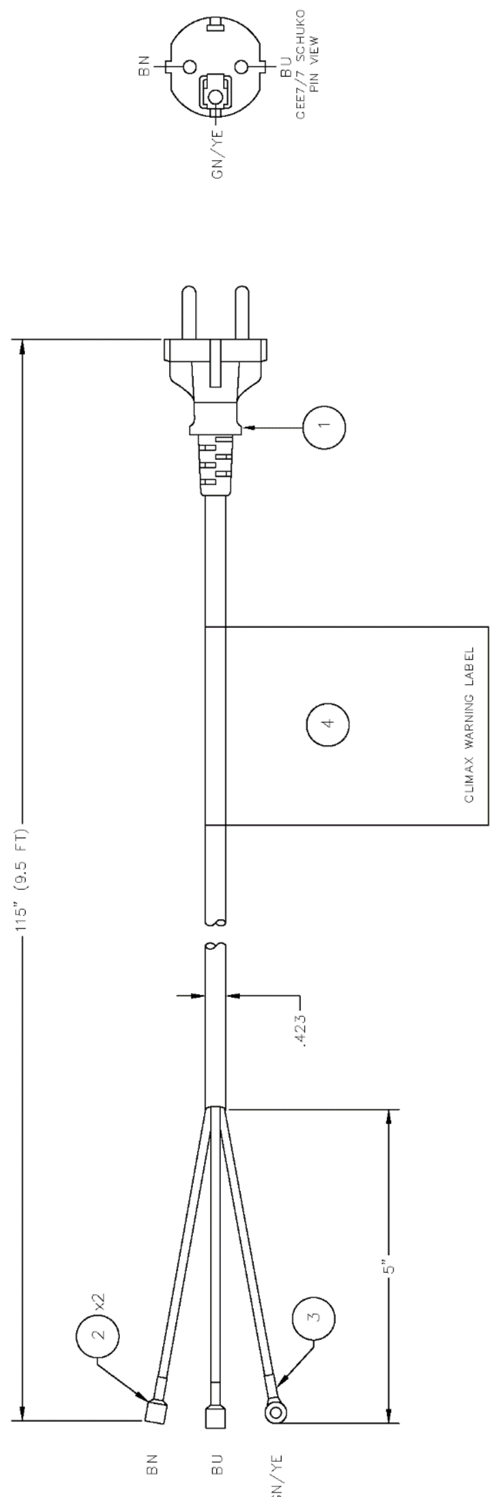


FIGURE 76. POWER CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 230V CE CEE7/7 SCHUKO PLUG BOM (P/N 88654)

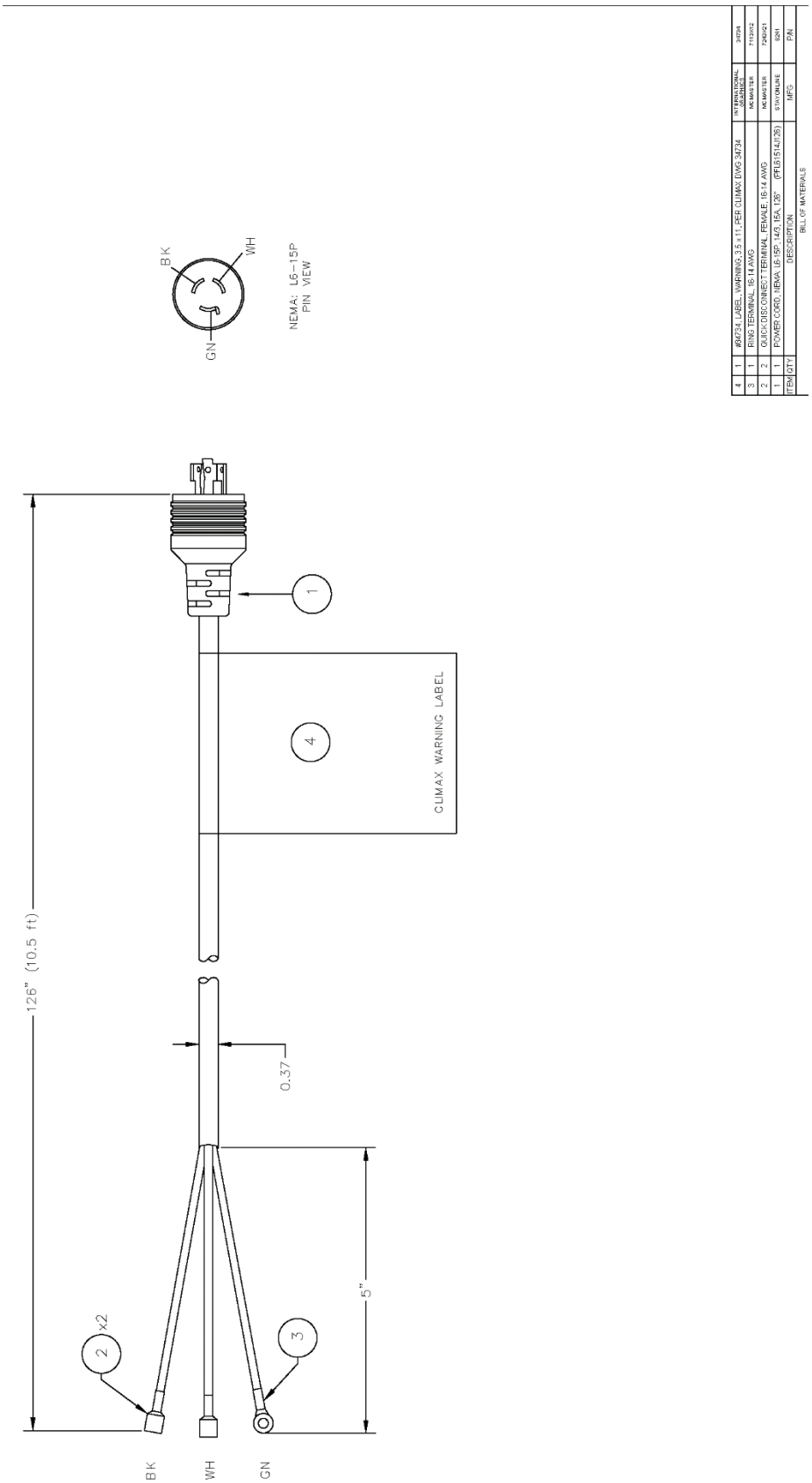


FIGURE 77. POWER CABLE ASSEMBLY BB5000 EIBENSTOCK 2ND GEN 230V DOMESTIC L6-15P PLUG BOM (P/N 88655)

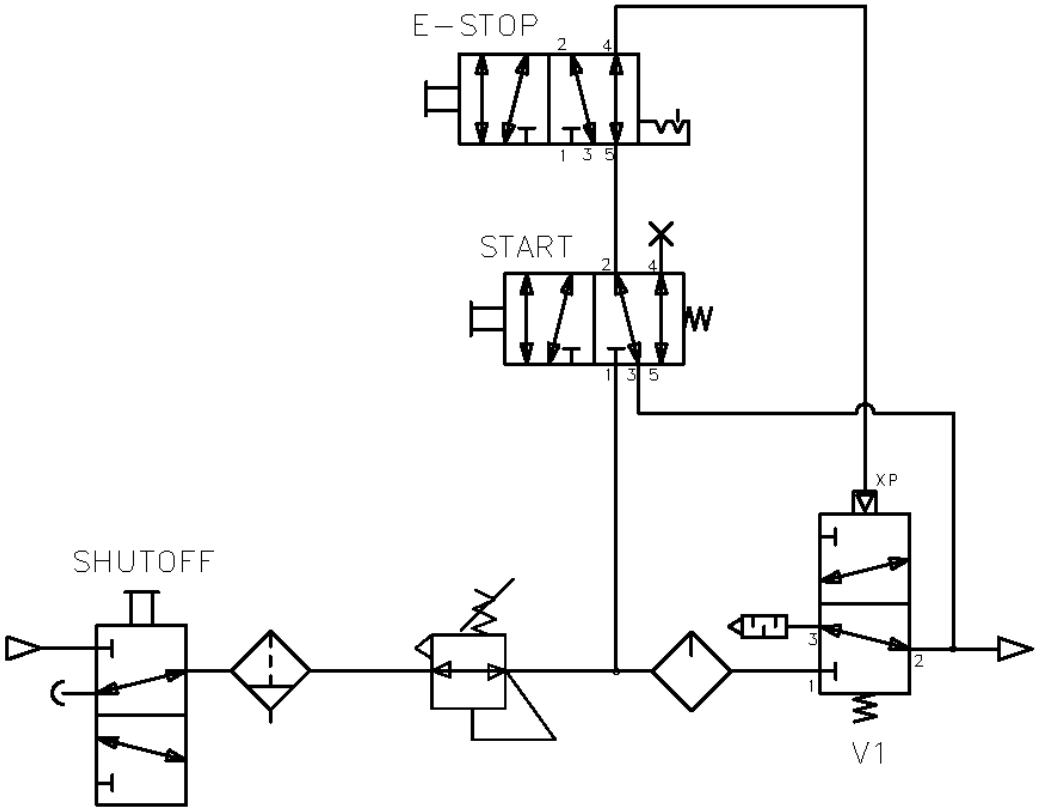


FIGURE 78. PNEUMATIC CONDITIONING UNIT SCHEMATIC (P/N 59248)

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APPENDIX D MSDS

The MSDS of the recommended lubricants are included in the following pages:

Unax® AW (All Grades)

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

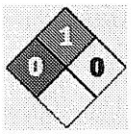
Product Name:	Unax® AW (All Grades)
MSDS Code:	722330
Synonyms:	76 Unax® AW 22 76 Unax® AW 32 76 Unax® AW 46 76 Unax® AW 68 76 Unax® AW 100 76 Unax® AW 150 76 Unax® AW 220 76 Unax® AW 320
Intended Use:	Hydraulic Fluid
Responsible Party:	ConocoPhillips Lubricants 600 N. Dairy Ashford Houston, Texas 77079-1175
Customer Service:	888-766-7676
Technical Information:	800-255-9556
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/
Emergency Telephone Numbers:	Chemtrec: 800-424-9300 (24 Hours) California Poison Control System: 800-356-3219

2. HAZARDS IDENTIFICATION

Emergency Overview

This material is not considered hazardous according to OSHA criteria.

NFPA



Appearance: Clear and bright
Physical Form: Liquid
Odor: Petroleum

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin, and possibly dermatitis (inflammation). No harmful effects from skin absorption are expected.

Inhalation (Breathing): No information available on acute toxicity.

Ingestion (Swallowing): No harmful effects expected from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, nausea and diarrhea. Inhalation of oil mist or vapors at elevated temperatures may cause respiratory irritation.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done with minimal risk. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements.
Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Conditions for safe storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH	OSHA	Other:
Lubricant Base Oil (Petroleum)	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if generated	TWA: 5 mg/m^3 as Oil Mist, if generated	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment (PPE):

Eye/Face: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the performance of their products. Suggested protective materials: Nitrile.

11. TOXICOLOGICAL INFORMATION

Chronic Data:

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum)	>5 g/kg	>2 g/kg	No data

12. ECOLOGICAL INFORMATION

Lubricant oil basestocks are complex mixtures of hydrocarbons (primarily branched chain alkanes and cycloalkanes) ranging in carbon number from C15 to C50. The aromatic hydrocarbon content of these mixtures varies with the severity of the refining process. White oils have negligible levels of aromatic hydrocarbons, whereas significant proportions are found in unrefined basestocks. Olefins are found only at very low concentrations. Volatilization is not significant after release of lubricating oil basestocks to the environment due to the very low vapor pressure of the hydrocarbon constituents. In water, lubricating oil basestocks will float and will spread at a rate that is viscosity dependent. Water solubilities are very low and dispersion occurs mainly from water movement with adsorption by sediment being the major fate process. In soil, lubricating oil basestocks show little mobility and adsorption is the predominant physical process.

Both acute and chronic ecotoxicity studies have been conducted on lubricant base oils. Results indicate that the acute aquatic toxicities to fish, Daphnia, Ceriodaphnia and algal species are above 1000 mg/l using either water accommodated fractions or oil in water dispersions. Since lubricant base oils mainly contain hydrocarbons having carbon numbers in the range C15 to C50, it is predicted that acute toxicity would not be observed with these substances due to low water solubility. Results from chronic toxicity tests show that the no observed effect level (NOEL) usually exceeds 1000 mg/l for lubricant base oils with the overall weight of experimental evidence leading to the conclusion that lubricant base oils do not cause chronic toxicity to fish and invertebrates.

Large volumes spills of lubricant base oils into water will produce a layer of undissolved oil on the water surface that will cause direct physical fouling of organisms and may interfere with surface air exchange resulting in lower levels of dissolved oxygen. Petroleum products have also been associated with causing taint in fish even when the latter are caught in lightly contaminated environments. Highly refined base oils sprayed onto the surface of eggs will result in a failure to hatch.

Extensive experience from laboratory and field trials in a wide range of crops has confirmed that little or no damage is produced as a result of either aerosol exposure or direct application of oil emulsion to the leaves of crop plants. Base oils incorporated into soil have resulted in little or no adverse effects on seed germination and plant growth at contamination rates up to 4%.

13. DISPOSAL CONSIDERATIONS

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle Used Oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

14. TRANSPORTATION INFORMATION

U.S. Department of Transportation (DOT)

Shipping Description: Not regulated
Note: If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)

MSDS Legend:
ACGIH = American Conference of Governmental Industrial Hygienists; CAS = Chemical Abstracts Service Registry; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

DoALL SAWING PRODUCTS

PRODUCT DATA SHEET

DoALL Sawing Products • 2375B Touhy Avenue, Elk Grove Village, IL 60007 • 888-DoALLSAW • www.doallsawing.com

AL-2000
MIST LUBRICANT

PRODUCT DESCRIPTION

AL-2000 is a high-efficiency metalworking lubricant that forms a high strength molecular coating on the cutting edge of the tool, reducing friction and extending tool life AL-2000 is a fully synthetic fluid containing no petroleum and is non-toxic, non-flammable, and nonpolluting. AL-2000 is designed for use with an air driven spray mist system suitable for high-efficiency fluids. AL-2000 produces "dry" chips as it is used up in the cutting operation eliminating costly clean up and disposal.

GENERAL APPLICATION

AL-2000 is designed for use in applications where flood coolants are prohibited or not required. AL-2000 is designed for most cutting, sawing, turning, tapping, drilling, and milling operations where fluid can be applied directly to the working edge of the tool. AL-2000 does not contain sulfur or chlorine (which can sain certain materials) and can be used on mild steel, aluminum, titanium, stainless steel, and most other ferrous and non-ferrous metals.

ATTRIBUTES

- Easy to Use
- Increased Tool Life
- Clean Mist Application
- Greatly Decreased Disposal Cost
- Operator and Environmentally Safe

TYPICAL PHYSICAL PROPERTIES

Appearance:	Clear Liquid
Wt/Gallon (25°C):	7.2 lbs/gal
Flash Point:	158°C
Operating Range:	0°F – 120°F

DIRECTIONS

For best results, the tool should be lubricated through the entire operation. Use slow to moderate RPM's and higher feed rates to achieve better tool life and maximum productivity. DO NOT dilute or attempt to reduce fluid. AL-2000 is ready for use directly from the container and requires no mixing.

For industrial use only on metal cutting operations. Not suitable for lubricating purposes.

*Solutions For **ALL** Your Sawing Needs*

DoALL Cutting Fluids
2375b Touhy
Elk Grove Village, IL 60007
Phone: 888/362-5572 x68916 • Fax: 847/803-1447

MATERIAL SAFETY DATA SHEET

I. CHEMICAL PRODUCT AND MANUFACTURER IDENTIFICATION

PRODUCT NAME:	AL-2000
PRODUCT CLASS:	Cutting Fluid For Misting Application
MSDS N.:	MS219
MANUFACTURER'S NAME:	DoALL COMPANY
ADDRESS:	1480 S. Wolf Rd. Wheeling, IL 60090
EMERGENCY PHONE:	(800) 535-5053 (INFOTRAC)
GENERAL INFORMATION:	(888) 362-5572 x68916
REVISION DATE:	September 1, 2007

II. HAZARDOUS INGREDIENTS IDENTIFICATION

OCCUPATIONAL EXPOSURE LIMITS				
INGREDIENTS	**CAS #**	**OSHA PEL**	**ACGIH TLV**	**PERCENT**
Fatty Ester	142-91-6	5 mg./cu. m.	5 mg./cu. m.	100.0

NOTE: This product is not considered hazardous under the law.

III. PHYSICAL DATA

Boiling Point:	150ºC @ 15mmHg
Specific Gravity:	0.86 (water = 1)
Vapor Pressure:	< 1 mm Hg @ 68 °F
Melting Point:	NA
Vapor Density:	>1 (air = 1)
Evaporation Rate:	Nil (Water = 1)
Solubility in Water:	Insoluble
pH:	NA
Appearance:	Clear Water-White Liquid
Odor:	Mild

IV. FIRE AND EXPLOSION DATA

FLASH POINT:	158 degrees Celsius COC.
EXTINGUISHING MEDIA:	Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents.
FIRE FIGHTING PROCEDURES:	The extinguishing media agents mentioned may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire or

	circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists. Wear SCBA gear in fire area.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	None

V. HEALTH HAZARD DATA

ROUTES OF EXPOSURE AND EFFECTS OF OVER-EXPOSURE

INHALATION:	Breathing difficulty. Comprehensive exposure to mist may cause upper respiratory irritation.
EYE CONTACT:	Minor irritation such as stinging sensation in the eye.
SKIN CONTACT:	Minor irritation to the skin if used as directed and good personal hygiene practiced.
INGESTION:	If swallowed in small quantities, may cause nausea, vomiting or Diarrhea.

CARCINOGENICITY:

LISTED BY NTP:	No
LISTED BY IARC:	No
LISTED BY OSHA	No

EMERGENCY FIRST AID PROCEDURES

INHALATION:	Vapor pressure is very low. Vapor inhalation under ambient conditions is normally not a problem. If overcome by vapor from hot product, immediately remove from exposure and call a physician. If breathing is irregular or has stopped, start resuscitation; administer oxygen, if available. If over exposed to oil mist, remove from further exposure until excessive oil mist condition subsides.
INGESTION:	If ingested, DO NOT INDUCE VOMITING. Immediately seek medical attention.
EYE CONTACT:	If splashed into the eyes, flush with clear water for 15 minutes lifting upper and lower lids until any discomfort subsides. Remove contact lenses if applicable. If irritation persists seek medical attention.
SKIN CONTACT:	In case of skin contact, remove any contaminated clothing. Wash skin thoroughly with plenty of mild soap and flowing warm water only for a minimum of 15 minutes. Do not use harsh soap or solvent.

SKIN ABSORPTION:	Seek medical attention.

VI. REACTIVITY DATA

STABILITY:	This product is stable and will not react violently with water.
INCOMPATIBILITY:	None known.
HAZARDOUS DECOMPOSITION PRODUCTS:	None known.
HAZARDOUS POLYMERIZATION:	Will not occur.

VII. HANDLING PRECAUTIONS

IN CASE OF ACCIDENTAL RELEASE:

Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize skin contact. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses or extensive land areas.

SMALL SPILLS:	Use absorbent material
LARGE SPILLS:	Dike and pump into drums
WASTE DISPOSAL METHOD:	Treat as an oily waste and dispose of in accordance with local, state, and federal regulations
STORAGE:	Store in a closed container in a cool place away from any fire source at <85ºF
OTHER PRECAUTIONS:	Avoid breathing MIST

VII. PROTECTIVE MEASURES

VENTILATION:	General mechanical ventilation should be adequate. If misting occurs, provide local ventilation. No smoking or open lights.
RESPIRATORY PROTECTION:	Use supplied-air respiratory protection in confined or enclosed spaces, if needed.
PROTECTIVE GLOVES:	The use of NEOPRENE gloves that are impermeable to oil is recommended.
EYE PROTECTION:	Use safety goggles or face shield when eye contact may occur.

OTHER PROTECTION:	An emergency shower and eyewash station should be available in the work area. Practice reasonable personal hygiene. Wash exposed skin with mild soap and warm water only. Oil-soaked clothing should be changed promptly and laundered before re-wearing. Removes contaminated shoes and thoroughly clean before reuse; discard if oil-soaked.
PERSONAL HYGIENE:	Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with mild soap and warm water.

IX. REGULATION COMPLIANCE INFORMATION

CAA:	Contains no ozone depleting substance.
DOT:	Not classified as hazardous.
RCRA:	As received, not a hazardous waste material.
SARA 302/304:	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (RQs) in 40 CFR 355 (used for SARA 302, 304, 311 and 312). No chemical components present in this product exceed the de minimus reporting level established under this statute.
SARA 311/312:	The Superfund Amendments and Reauthorization Act of 1989 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by A Hazard Category as defined in 40 CFR 370.2.
SARA 313:	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires submission of an annual A Toxic Chemicals ≅ Release Inventory report under 40 CRF 372. Chemical substances that must be accounted for under SARA Section 313 must also be identified in all product MSDSs that are impacted by the regulation. No chemical components present in this product exceed the de minimus reporting level established under this statute.
TSCA:	All of the components of this product are listed on the Toxic Substance Control Act (TCSA) inventory.
VOC:	THIS MATERIAL IS LISTED ON THE CANADIAN DOMESTIC SUBSTANCE LIST. THIS MATERIAL IS LISTED ON THE EUROPEAN CORE INVENTORY (EINECS# 203-935-4).

X. HMIS

HEALTH:	1
FLAMMABILITY:	1
REACTIVITY:	0

XI. WHIMIS

HEALTH:	1
FLAMMABILITY:	1
REACTIVITY:	0

XII. Abbreviations and Symbols used in this MSDS

NA	Not Applicable	< - Less Than
ND	Not Determined	> - Greater Than
BuAc	Butyl Acetate	

Data in this MSDS is believed to be correct and reliable. However, The DoALL Co. does not assume responsibility for it, or any recommendations contained in it, inasmuch as conditions and methods of use are beyond our control. Further, we make no warranty, expressed or implied, of any kind regarding this product or its use, and purchaser assumes all risks of use or handling either in accordance with directions or not.

Material Safety Data Sheet

Issuing Date 31-Oct-2012 **Revision Date** 31-Oct-2012 **Revision Number** 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **JET-LUBE® 550®**

Product Code(s) **155**

UN-Number UN3082

Recommended Use Lubricants, Greases and Release Products, Sealant

Synonyms 550®.

Manufacturer Address
Jet-Lube, Inc.
4849 Homestead Rd.
Suite 232
Houston, Texas 77028
TEL: 713-670-5700

Emergency Telephone Number EU: 44 1628-631913
North America: 713-670-5700

2. HAZARDS IDENTIFICATION

Emergency Overview

The product contains no substances which at their given concentration are considered to be hazardous to health

Appearance Black **Physical State** Semi-fluid (gel). **Odor** Petroleum Oil-Pungent

Potential Health Effects

Acute Toxicity

Eyes May cause slight irritation.

Skin Prolonged or repeated contact may cause skin dryness or cracking.

Inhalation No known effect based on information supplied.

Ingestion Not an expected route of exposure. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chronic Effects No known effect based on information supplied.

Aggravated Medical Conditions Skin disorders.

Environmental Hazard Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %
Lubricating greases A complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc.	74869-21-9	40-70
Zinc oxide	1314-13-2	7-13

4. FIRST AID MEASURES

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact Wash skin with soap and water.

Inhalation Move to fresh air.

Ingestion Clean mouth with water and afterwards drink plenty of water. Consult a physician.

Notes to Physician Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties Not flammable.

Flash Point > 221 °C

Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media Water spray jet

Explosion Data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None

Protective Equipment and Precautions for Firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA	**Health Hazard** 0	**Flammability** 1	**Instability** 0	**Physical and Chemical Hazards** -
HMIS	**Health Hazard** 0	**Flammability** 1	**Physical Hazard** 0	**Personal Protection** X

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Use personal protective equipment. Avoid contact with the skin and the eyes.

Environmental Precautions Do not allow material to contaminate ground water system. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Take up mechanically and collect in suitable container for disposal. Clean contaminated surface thoroughly.

7. HANDLING AND STORAGE

Handling Wear personal protective equipment. Avoid contact with skin and eyes. Wash thoroughly after handling.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Zinc oxide 1314-13-2	STEL: 10 mg/m^3 respirable fraction TWA: 2 mg/m^3 respirable fraction	TWA: 5 mg/m^3 fume TWA: 15 mg/m^3 total dust TWA: 5 mg/m^3 respirable fraction (vacated) TWA: 5 mg/m^3 fume (vacated) TWA: 10 mg/m^3 total dust (vacated) TWA: 5 mg/m^3 respirable fraction (vacated) STEL: 10 mg/m^3 fume	IDLH: 500 mg/m^3 Ceiling: 15 mg/m^3 dust TWA: 5 mg/m^3 dust and fume STEL: 10 mg/m^3 fume

OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. NIOSH IDLH: Immediately Dangerous to Life or Health.

Other Exposure Guidelines Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Engineering Measures Showers
Eyewash stations
Ventilation systems

Personal Protective Equipment

Eye/Face Protection Safety glasses with side-shields.

Skin and Body Protection Protective gloves.

Respiratory Protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Hygiene Measures Wash face, hands and any exposed skin thoroughly after handling When using, do not eat, drink or smoke.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Black.	**Odor**	Petroleum Oil-Pungent.
Odor Threshold	No information available	**Physical State**	Semi-fluid (gel)
pH	Neutral		
Flash Point	> 221 °C	**Autoignition Temperature**	No information available.
Decomposition Temperature	No information available.	**Boiling Point/Boiling Range**	> 316 °C / 600.8 °F
Melting Point/Range	260 °C / 500 °F		
		Flammability Limits in Air	No information available.
Specific Gravity	1.19	**Water Solubility**	Negligible
Solubility	Largely	**Evaporation Rate**	No information available
Vapor Pressure	No data available.	**Vapor Density**	No data available.

10. STABILITY AND REACTIVITY

Stability Stable under recommended storage conditions. Decomposes in contact with water.

Incompatible Products Strong oxidizing agents. Water. Acids.

Conditions to Avoid None known based on information supplied.

Hazardous Decomposition Products None known based on information supplied.

Hazardous Polymerization Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information Product does not present an acute toxicity hazard based on known or supplied information.

Inhalation None under normal use condtions

Eye Contact Contact with eyes may cause irritation.

Skin Contact Non-irritating during normal use Prolonged or repeated contact may dry skin and cause irritation.

Ingestion Not an expected route of exposure. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Lubricating greases A complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc.	= 2280 mg/kg (Rat)		
Zinc oxide	> 5000 mg/kg (Rat)		

Chronic Toxicity

Sensitization None known.

Mutagenic Effects None known.

Reproductive Toxicity None known.

Developmental Toxicity None known.

Target Organ Effects Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Ecotoxicity effects of component substances.

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Lubricating greases A complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc.	>1001 mg/l	LC50 96 h: > 2000 mg/L (Salmo gairdneri)		
Zinc oxide	Selenastrum capricornutum 72-hour EC50: 0.14 mg/l	Oncorhynchus mykiss 96-hour LC50: 0.14 mg/l		Daphnia magna 48-hour EC50: 0.07 mg/l

Persistence and Degradability Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods This material, as supplied, is not a hazardous waste according to Federal regulations (40 CFR 261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered. Consult 40 CFR 261 to determine whether the altered material is a hazardous waste. Consult the appropriate state, regional, or local regulations for additional requirements.

Contaminated Packaging Do not re-use empty containers.

This product contains one or more substances that are listed with the State of California as a hazardous waste.

Chemical Name	California Hazardous Waste
Zinc oxide	Toxic

14. TRANSPORT INFORMATION

DOT

UN-Number	UN3082
Proper shipping name	Environmentally hazardous substances, liquid, n.o.s.
Hazard Class	9
Subsidiary Class	
Packing Group	III
Description	UN3082, Environmentally hazardous substances, liquid, n.o.s.(Ci 77947), 9, III
Emergency Response Guide Number	171

TDG

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Description	UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Ci 77947), 9, III

MEX

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substances, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Description	UN3082 Environmentally hazardous substances, liquid, n.o.s.(Ci 77947), 9, III

ICAO

UN-Number	UN3082
Proper shipping name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Description	UN3082, Environmentally hazardous substance, liquid, n.o.s.(Ci 77947), 9, III

IATA

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
ERG Code	9L
Description	UN3082, Environmentally hazardous substance, liquid, n.o.s.(Ci 77947), 9, III

IMDG/IMO

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
EmS No.	F-A, S-F
Marine Pollutant	Product is a marine pollutant according to the criteria set by IMDG/IMO
Description	UN3082, Environmentally hazardous substance, liquid, n.o.s.(Ci 77947), 9, III

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Classification Code	M6
Description	UN3082 Environmentally hazardous substance, liquid, n.o.s.(Ci 77947),9,III

ADR

UN-Number	UN3082
Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Classification Code	M6
Description	UN3082 Environmentally hazardous substance, liquid, n.o.s.(Ci 77947), 9, III(E)

ADN

Proper Shipping Name	Environmentally hazardous substance, liquid, n.o.s.
Hazard Class	9
Packing Group	III
Classification Code	M6
Special Provisions	274, 335, 601
Description	UN3082 Environmentally hazardous substance, liquid, n.o.s.(Ci 77947), 9, III
Hazard Labels	9
Limited Quantity	LQ7

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Complies
EINECS	Complies
ENCS	Not determined
IECSC	Complies
KECL	Not determined
PICCS	Complies
AICS	Not determined

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

U.S. Federal Regulations

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
Zinc oxide	1314-13-2	1-2	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Zinc oxide		X		

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

U.S. State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania	Illinois	Rhode Island
Zinc oxide	X	X	X		

International Regulations

Mexico - Grade Slight risk, Grade 1

Chemical Name	Carcinogen Status	Exposure Limits
Zinc oxide		Mexico: TWA 5 mg/m^3 Mexico: TWA 10 mg/m^3 Mexico: STEL 10 mg/m^3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
Non-controlled

16. OTHER INFORMATION

Prepared By Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501
Issuing Date 31-Oct-2012
Revision Date 31-Oct-2012
Revision Note Initial Release

General Disclaimer
The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

SAFETY DATA SHEET

1. Identification

Product identifier **LPS 3® (Bulk)**

Other means of identification

Part Number 00322, 03128, 00305, 00355

Recommended use A specialized soft-film coating designed to prevent rust and corrosion on steel, aluminum and other metals.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Manufacturer

Company name LPS Laboratories, a division of Illinois Tool Works, Inc.

Address 4647 Hugh Howell Rd.
Tucker, GA 30084

Country (U.S.A.)

Tel: +1 770-243-8800

In Case of Emergency 1-800-424-9300 (inside U.S.)
+001 703-527-3887 (outside U.S.)

Website www.lpslabs.com

E-mail sds@lpslabs.com

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 3
Health hazards	Specific target organ toxicity, repeated exposure	Category 1
	Aspiration hazard	Category 1

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Flammable liquid and vapor. Causes damage to organs through prolonged or repeated exposure. May be fatal if swallowed and enters airways.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/eye protection/face protection.

Response In case of fire: Use appropriate media to extinguish. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Get medical advice/attention if you feel unwell.

Storage Store in a well-ventilated place. Keep cool. Store locked up.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Light Mineral Spirits		64742-88-7	60 - 70
Distillates Petroleum Hydrotreated Heavy		64742-54-7	1 - 10
Distillates Petroleum, Hydrotreated Light		64742-47-8	1 - 10
1-butoxy-2-propanol		5131-66-8	1 - 5

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Take off immediately all contaminated clothing. Rinse skin with water/shower. Get medical attention if irritation develops and persists.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Get medical attention if irritation develops and persists.

Ingestion Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed Aspiration may cause pulmonary edema and pneumonitis. Direct contact with eyes may cause temporary irritation. Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information Take off all contaminated clothing immediately. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media Alcohol resistant foam. Water spray. Water fog. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards Flammable liquid and vapor.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. Use personal protection recommended in Section 8 of the SDS.

Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material. The product is immiscible with water and will spread on the water surface. Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Do not breathe mist or vapor. Avoid prolonged exposure. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Xylene (CAS 1330-20-7)	PEL	435 mg/m3 100 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Xylene (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Xylene (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	Creatinine in urine	*

* - For sampling details, please see the source document.

Appropriate engineering controls	Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves. Chemical resistant gloves are recommended.
Other	Avoid contact with the skin. Wear appropriate chemical resistant clothing.

Respiratory protection	No personal respiratory protective equipment normally required. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using do not smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Color	Brown.
Odor	Mild. Cherry.
Odor threshold	Not Established
pH	Not Applicable
Melting point/freezing point	Not Established
Initial boiling point and boiling range	320 - 392 °F (160 - 200 °C)
Flash point	104.5 °F (40.3 °C) Tag Closed Cup
Evaporation rate	0.2 (butyl acetate = 1)
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	0.6 %
Flammability limit - upper (%)	6 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	2.6 mm Hg @ 20°C
Vapor density	4.8 (air = 1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Insoluble
Partition coefficient (n-octanol/water)	Not Established
Auto-ignition temperature	446 °F (230 °C) (concentrate)
Decomposition temperature	Not Established
Viscosity	200 - 800 cP @ 25°C
Other information	
Density	6.82
Percent volatile	78.45 %
Specific gravity	0.81 @ 20°C
VOC (Weight %)	75.58 % per U.S. State and Federal Consumer Product Regulations

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.

Hazardous decomposition products	Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Causes damage to organs through prolonged or repeated exposure by inhalation.
Skin contact	Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
Symptoms related to the physical, chemical and toxicological characteristics	Aspiration may cause pulmonary edema and pneumonitis. Direct contact with eyes may cause temporary irritation. Exposure may cause temporary irritation, redness, or discomfort.

Information on toxicological effects

Acute toxicity May be fatal if swallowed and enters airways.

Components	Species	Test Results
1-butoxy-2-propanol (CAS 5131-66-8)		
Acute		
Dermal		
LD50	Rabbit	1400 mg/kg, 24 Hours
		1.59 ml/kg, 24 Hours
	Rat	> 2000 mg/kg, 24 Hours
Inhalation		
LC50	Rat	> 651 ppm, 4 Hours
Oral		
LD50	Rat	3300 mg/kg
		2.83 ml/kg
Distillates Petroleum Hydrotreated Heavy (CAS 64742-54-7)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
		> 2000 mg/kg, 24 Hours
Inhalation		
LC50	Rat	2.18 mg/l, 4 Hours
Oral		
LD50	Rat	5000 mg/kg
Distillates Petroleum, Hydrotreated Light (CAS 64742-47-8)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
		> 2000 mg/kg, 24 Hours
Inhalation		
LC50	Cat	> 6.4 mg/l, 6 Hours
	Rat	> 7.5 mg/l, 6 Hours
		> 4.3 mg/l, 4 Hours
		> 0.1 mg/l, 8 Hours
Oral		
LD50	Rat	> 5000 mg/kg

Components	Species	Test Results
Light Mineral Spirits (CAS 64742-88-7)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
		> 2000 mg/kg, 24 Hours
Inhalation		
LC50	Cat	> 6.4 mg/l, 6 Hours
	Rat	> 7.5 mg/l, 6 Hours
		> 4.3 mg/l, 4 Hours
		> 0.1 mg/l, 8 Hours
Oral		
LD50	Rat	> 5000 mg/kg
Xylene (CAS 1330-20-7)		
Acute		
Dermal		
LD50	Rabbit	> 5000 ml/kg, 4 Hours
		12126 mg/kg, 24 Hours
Inhalation		
LC50	Mouse	3907 mg/l, 6 Hours
	Rat	6350 mg/l, 4 Hours
		5922 ppm, 4 Hours
Oral		
LD50	Mouse	5251 mg/kg
	Rat	3523 mg/kg
		10 ml/kg

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

ACGIH Carcinogens

Xylene (CAS 1330-20-7) A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

Xylene (CAS 1330-20-7) 3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Causes damage to organs through prolonged or repeated exposure.

Further information None known.

12. Ecological information

Ecotoxicity Not expected to be harmful to aquatic organisms.

Components		Species	Test Results
Distillates Petroleum, Hydrotreated Light (CAS 64742-47-8)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.9 mg/l, 96 hours
Xylene (CAS 1330-20-7)			
Aquatic			
Fish	LC50	Bluegill (Lepomis macrochirus)	7.711 - 9.591 mg/l, 96 hours

Persistence and degradability Not inherently biodegradable.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Xylene	3.12 - 3.2

Mobility in soil No data available.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number UN1268
UN proper shipping name Petroleum distillates, n.o.s. or Petroleum products, n.o.s. Mixture
Transport hazard class(es)
Class 3
Subsidiary risk -
Label(s) 3
Packing group III
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions 144, B1, IB3, T4, TP1, TP29
Packaging exceptions 150
Packaging non bulk 203
Packaging bulk 242

IATA

UN number UN1268
UN proper shipping name Petroleum products, n.o.s. Mixture
Transport hazard class(es)
Class 3
Subsidiary risk -
Packing group III
Environmental hazards No.
ERG Code 3L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Other information
Passenger and cargo aircraft Allowed.
Cargo aircraft only Allowed.

IMDG

UN number UN1268

UN proper shipping name	PETROLEUM DISTILLATES, N.O.S. or PETROLEUM PRODUCTS, N.O.S. MIXTURE
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	No.
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

DOT

IATA; IMDG

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Xylene (CAS 1330-20-7) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Xylene (CAS 1330-20-7)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Xylene (CAS 1330-20-7)

US. New Jersey Worker and Community Right-to-Know Act

Xylene (CAS 1330-20-7)

US. Pennsylvania Worker and Community Right-to-Know Law

Xylene (CAS 1330-20-7)

US. Rhode Island RTK

Xylene (CAS 1330-20-7)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-03-2013

Revision date 12-04-2014

Version # 06

Disclaimer LPS Laboratories cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Information Physical & Chemical Properties: Multiple Properties
Regulatory Information: Risk Phrases - Labeling

ExxonMobil

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBIL SHC 634**
Product Description: Synthetic Base Stocks and Additives
Product Code: 201560500570, 602912-00, 970321
Intended Use: Circulating/gear oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
1-DECENE, HOMOPOLYMER HYDROGENATED	68037-01-4	5 - < 10%	H304
TRIPHENYL PHOSPHATE	115-86-6	0.1 - < 1%	H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Sulfur oxides, Smoke, Fume, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could

ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
1-DECENE, HOMOPOLYMER HYDROGENATED	Aerosols (thoracic fraction)	TWA	5 mg/m3		N/A	ExxonMobil
TRIPHENYL PHOSPHATE		TWA	3 mg/m3		N/A	OSHA Z1
TRIPHENYL PHOSPHATE		TWA	3 mg/m3		N/A	ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Orange
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.869
Flammability (Solid, Gas): N/A
Flash Point [Method]: >210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D

pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): >3.5
Solubility in Water: Negligible
Viscosity: 460 cSt (460 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: -30°C (-22°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.

Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

Contains:
Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.
Material -- Not expected to demonstrate chronic toxicity to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL50 1003 mg/l: data for similar materials
Aquatic - Chronic Toxicity	21 day(s)	Daphnia magna	NOELR 1 mg/l: data for similar materials

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: TSCA
Special Cases:

Inventory	Status
AICS	Restrictions Apply
KECI	Restrictions Apply

PRODUCT REGISTRATION STATUS: USA

EPCRA SECTION 302: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHENOL, 4,4-METHYLENEBIS(2,6-BIS(1,1-DIMETHYLETHYL)-	118-82-1	5

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Updates made in accordance with implementation of GHS requirements.

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Internal Use Only
MHC: 0B,0B,0,0,0,0 PPEC: A

DGN: 2007946XUS (547900)

ExxonMobil

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBILITH SHC 460**
Product Description: Synthetic Base Stocks and Additives
Product Code: 2015A0204050, 643551-00, 970748
Intended Use: Grease

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
1H-BENZOTRIAZOLE-1-METHANAMINE, N,N-BIS(2-ETHYLHEXYL)-METHYL-	94270-86-7	0.1 - < 1%	H315, H317, H401, H411
BENZENAMINE, N-PHENYL-, REACTION PRODUCTS WITH 2,4,4-TRIMETHYLPENTENE	68411-46-1	1 - < 5%	H402, H412
LITHIUM HYDROXIDE MONOHYDRATE	1310-66-3	0.1 - < 1%	H302, H314(1B)
LITHIUM SALT OF ALIPHATIC ACID	CONFIDENTIAL	1 - < 5%	H302
METHYLENE BIS(DIBUTYLDITHIOCARBAMATE)	10254-57-6	1 - < 5%	H413
ZINC DITHIOPHOSPHATE	68649-42-3	1 - < 2.5%	H315, H318, H401, H411

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION
Under normal conditions of intended use, this material is not expected to be an inhalation hazard.

SKIN CONTACT
Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT
Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION
First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish

flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Sulfur oxides, Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume

FLAMMABILITY PROPERTIES

Flash Point [Method]: >204°C (400°F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Scrape up spilled material with shovels into a suitable container for recycle or disposal.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Skim from surface.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
LITHIUM HYDROXIDE MONOHYDRATE		Ceiling	1 mg/m3		N/A	OARS WEEL

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Solid
Form: Semi-fluid
Color: Red
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 1
Flammability (Solid, Gas): N/D
Flash Point [Method]: >204°C (400°F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F) [Estimated]
Decomposition Temperature: N/D
Vapor Density (Air = 1): N/D
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C [Estimated]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5 [Estimated]
Solubility in Water: Negligible
Viscosity: 460 cSt (460 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/D

NOTE: Most physical properties above are for the oil component in the material.

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	

Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

For the product itself:

Component concentrations in this formulation would not be expected to cause skin sensitization, based on tests of the components or similar formulations.

Contains:

Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, IECSC, KECI, TSCA

Special Cases:

Inventory	Status
NDSL	Restrictions Apply
PICCS	Restrictions Apply

EPCRA SECTION 302: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ZINC DITHIOPHOSPHATE	68649-42-3	1 - < 2.5%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
NAPHTHENIC ACIDS, ZINC SALTS	12001-85-3	15
ZINC DITHIOPHOSPHATE	68649-42-3	13, 15, 17, 19
ZINC NEODECANOATE	27253-29-8	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H314(1B): Causes severe skin burns and eye damage; Skin Corr/Irritation, Cat 1B
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H317: May cause allergic skin reaction; Skin Sensitization, Cat 1
H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H402: Harmful to aquatic life; Acute Env Tox, Cat 3
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3
H413: May cause long lasting harmful effects to aquatic life; Chronic Env Tox, Cat 4

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Updates made in accordance with implementation of GHS requirements.

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Internal Use Only
MHC: 0B,0B,0,0,0,0 PPEC: A

DGN: 2009995XUS (553328)

Material Safety Data Sheet

1 - Chemical Product and Company Identification

Manufacturer: WD-40 Company **Address: 1061 Cudahy Place (92110)** **P.O. Box 80607** **San Diego, California, USA** **92138 –0607** **Telephone:** **Emergency only: 1-888-324-7596 (PROSAR)** **Information: 1-888-324-7596** **Chemical Spills: 1-800-424-9300 (Chemtrec)** **1-703-527-3887 (International Calls)**	**Chemical Name: Organic Mixture** **Trade Name: WD-40 Aerosol** **Product Use: Lubricant, Penetrant, Drives Out Moisture, Removes and Protects Surfaces From Corrosion** **MSDS Date Of Preparation: 6/8/12**

2 – Hazards Identification

Emergency Overview:
DANGER! Flammable aerosol. Contents under pressure. Harmful or fatal if swallowed. If swallowed, may be aspirated and cause lung damage. May cause eye irritation. Avoid eye contact. Use with adequate ventilation. Keep away from heat, sparks and all other sources of ignition.

Symptoms of Overexposure:
Inhalation: High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal.
Skin Contact: Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis.
Eye Contact: Contact may be irritating to eyes. May cause redness and tearing.
Ingestion: This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death.
Chronic Effects: None expected.
Medical Conditions Aggravated by Exposure: Preexisting eye, skin and respiratory conditions may be aggravated by exposure.

Suspected Cancer Agent:
Yes No X

3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent
Aliphatic Hydrocarbon	64742-47-8	45-50
Petroleum Base Oil	64742-58-1 64742-53-6 64742-56-9 64742-65-0	<25
LVP Aliphatic Hydrocarbon	64742-47-8	12-18
Carbon Dioxide	124-38-9	2-3
Non-Hazardous Ingredients	Mixture	<10

4 – First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.
Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.
Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention.

Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

5 – Fire Fighting Measures

Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.
Special Fire Fighting Procedures: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.
Unusual Fire and Explosion Hazards: Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back.

6 – Accidental Release Measures

Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area. Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

7 – Handling and Storage

Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.
Storage: Store in a cool, well-ventilated area, away from incompatible materials. Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol.

8 – Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m3 TWA, 10 mg/m3 STEL ACGIH TLV 5 mg/m3 TWA OSHA PEL
LVP Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA (OSHA/ACGIH), 30,000 ppm STEL (ACGIH)
Non-Hazardous Ingredients	None Established

The Following Controls are Recommended for Normal Consumer Use of this Product
Engineering Controls: Use in a well-ventilated area.
Personal Protection:
Eye Protection: Avoid eye contact. Always spray away from your face.
Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.
Respiratory Protection: None needed for normal use with adequate ventilation.

For Bulk Processing or Workplace Use the Following Controls are Recommended
Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.
Personal Protection:
Eye Protection: Safety goggles recommended where eye contact is possible.

Skin Protection: Wear chemical resistant gloves.
Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.
Work/Hygiene Practices: Wash with soap and water after handling.

9 – Physical and Chemical Properties

Boiling Point:	361 - 369°F (183 - 187°C)	Specific Gravity:	0.8 – 0.82 @ 60°F
Solubility in Water:	Insoluble	pH:	Not Applicable
Vapor Pressure:	95-115 PSI @ 70°F	Vapor Density:	Greater than 1
Percent Volatile:	70-75%	VOC:	412 grams/liter (49.5%)
Coefficient of Water/Oil Distribution:	Not Determined	Appearance/Odor	Light amber liquid/mild odor
Flash Point:	122°F (49°C) Tag Open Cup (concentrate)	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8.0%
Pour Point:	-63°C (-81.4°F) ASTM D-97	Kinematic Viscosity:	2.79-2.96cSt @ 100°F

10 – Stability and Reactivity

Stability: Stable
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.
Incompatibilities: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide and carbon dioxide.

11 – Toxicological Information

The oral toxicity of this product is estimated to be greater than 5,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard.
None of the components of this product is listed as a carcinogen or suspected carcinogen or is considered a reproductive hazard.

12 – Ecological Information

No data is currently available.

13 - Disposal Considerations

If this product becomes a waste, it would be expected to meet the criteria of a RCRA ignitable hazardous waste (D001). However, it is the responsibility of the generator to determine at the time of disposal the proper classification and method of disposal. Dispose in accordance with federal, state, and local regulations.

14 – Transportation Information_

DOT Surface Shipping Description: Consumer Commodity, ORM-D
After 1/1/2014 UN1950, Aerosols, 2.1 Ltd. Qty (Note: Shipping Papers are not required for Limited Quantities unless transported by air or vessel – each package must be marked with the Limited Quantity Mark)
IMDG Shipping Description: UN1950, Aerosols, 2.1, LTD QTY
ICAO Shipping Description: UN1950, Aerosols, flammable, 2.1 NOTE: WD-40 does not test aerosol cans to assure that they meet the pressure and other requirements for transport by air. We do not recommend that our aerosol products be transported by air.

15 – Regulatory Information

U.S. Federal Regulations:
CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements, however, oil spills are reportable to the National Response Center under the Clean Water Act and many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.
SARA TITLE III:
Hazard Category For Section 311/312: Acute Health, Fire Hazard, Sudden Release of Pressure
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
Section 302 Extremely Hazardous Substances (TPQ): None
EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This product does not contain chemicals regulated under California Proposition 65.
VOC Regulations: This product complies with the consumer product VOC limits of CARB, the US EPA and states adopting the OTC VOC rules.
Canadian Environmental Protection Act: One of the components is listed on the NDSL. All of the other ingredients are listed on the Canadian Domestic Substances List or exempt from notification.
Canadian WHMIS Classification: Class B-5 (Flammable Aerosol)
This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

16 – Other Information:

HMIS Hazard Rating:
Health – 1 (slight hazard), Fire Hazard – 4 (severe hazard), Reactivity – 0 (minimal hazard)

SIGNATURE:_____ TITLE: Adm. Scientific Manager

REVISION DATE: June 2012 SUPERSEDES: March 2010


CLIMAX
Portable Machining & Welding Systems