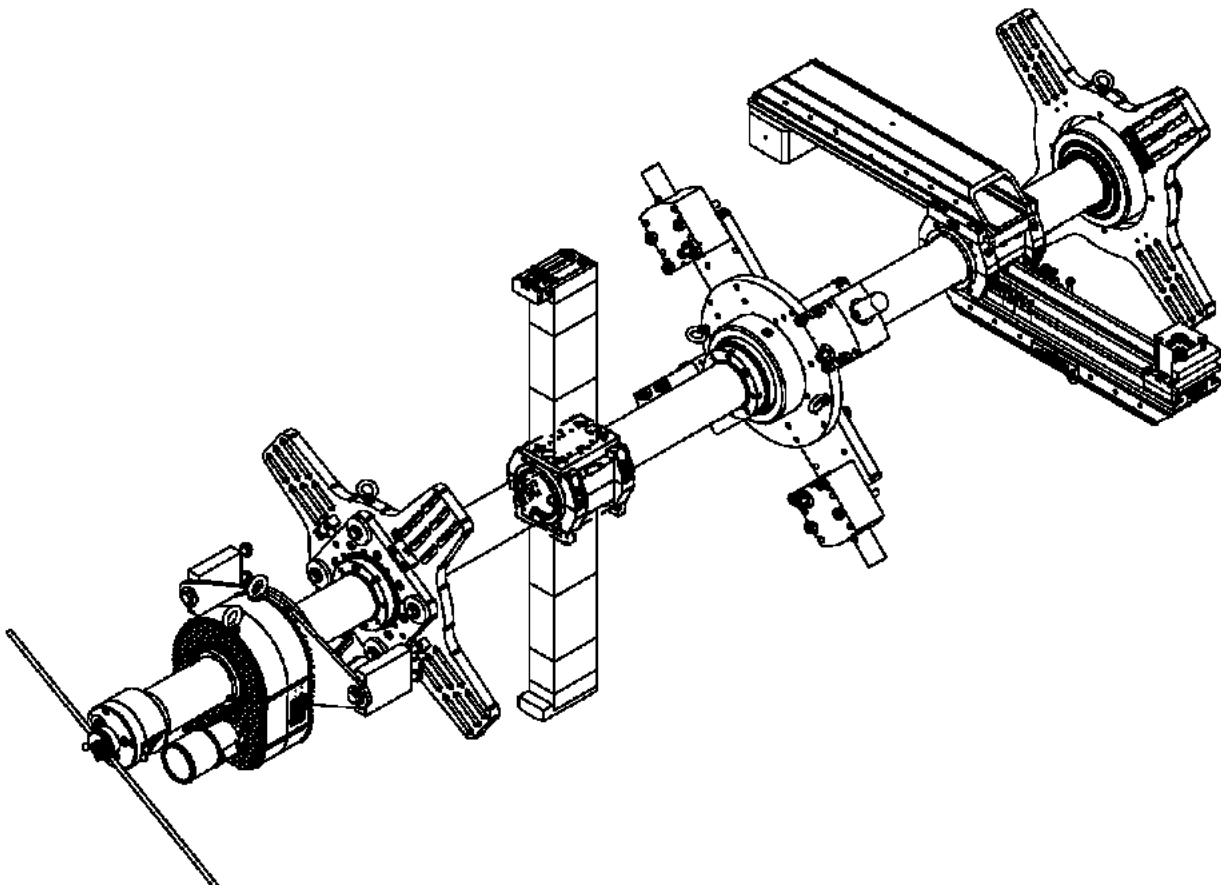


BB7100

BORING MACHINE

OPERATING MANUAL

ORIGINAL INSTRUCTIONS



 **CLIMAX**
Portable Machining & Welding Systems

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- Serial number (if applicable)
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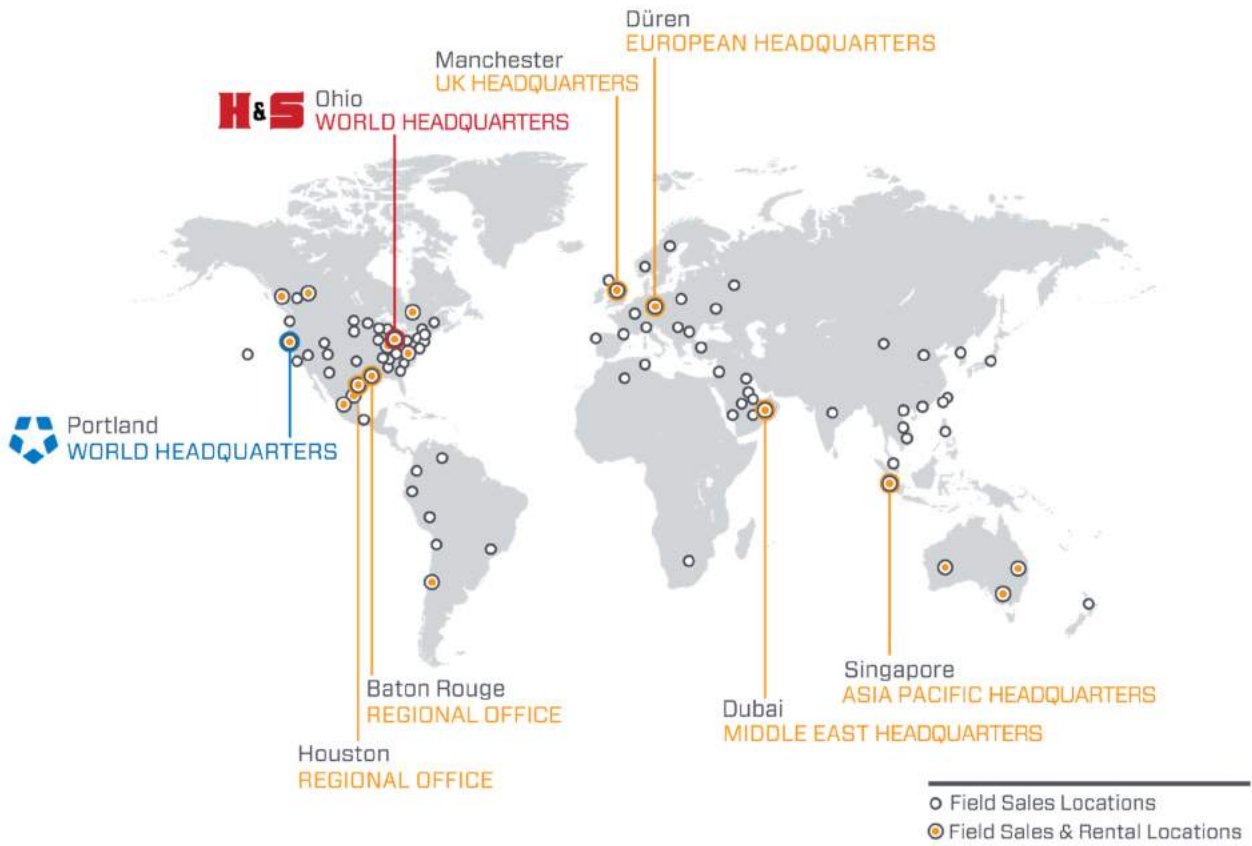
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LIMITED WARRANTY

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 pre- paid, 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.

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GENERAL SAFETY GUIDELINES

The primary challenge for most on-site maintenance is that repairs are often done under difficult conditions.

CLIMAX Portable Machining & Welding Systems leads the way in promoting the safe use of portable machine tools. Safety is a joint effort. As the operator of this machine, you are expected to do your part by closely examining the job site and following the operating procedures outlined in this manual, your own company rules, and local regulations.

	WARNING
	<p>For maximum safety and performance, read and understand this entire manual and all other related safety instructions before using this equipment. Failure to follow the instructions and guidelines in this manual could cause personal injury, fatalities and property damage.</p>

Qualified Personnel

Before operating this machine, you must receive training specific to this machine from a qualified trainer. Do not operate the machine. If you are not familiar with the proper and safe operation.

Obey Warning Labels

Obey all warning labels. Failure to follow instructions or heed warnings could result in injury, or even be fatal. Proper care is your responsibility. Contact CLIMAX immediately for replacement manuals or safety decals.

Intended Use

Use this machine according to the instructions in this operating manual. Do not use this machine for any purpose other than its intended use as described in this manual.

Stay Clear of Moving Parts

Keep clear of the machine during operation. Never lean toward or reach into the machine to remove chips or to adjust the machine while it is running.

Rotating Machinery

Rotating machinery can seriously injure an operator. Lock out all power sources before you interact with the machine.

Keep Your Work Area Clean and Tidy

Keep all cords and hoses away from moving parts during operation. Do not clutter the area around the machine.

Secure Loose Clothing and Long Hair

Rotating machinery can cause serious injuries. Do not wear loose fitting clothing or jewelry. Tie back long hair or wear a hat.

Hazardous Environments

Do not use the machine near explosive chemicals, toxic fumes, inappropriate radiation hazards or other hazardous environments.

Flying Chips

Flying metal chips can cut or burn. Do not remove chips until after the machine has been locked out, all power sources are off and the machine has stopped.

MACHINE SPECIFIC SAFETY PRACTICES

All aspects of the machine have been designed with safety in mind. Following are safety practices that you should keep in mind when using the CLIMAX BB7100 Boring Machine.

Personal Protective Equipment (PPE)

Eye and hearing protection must be worn while using the machine. These safety items do not impose constraints to the safe operation of the machine.

Operating Conditions

Do not operate the machine if it is not mounted to the workpiece as described in this manual.

Tooling

The machine is provided with all the tools for the setup and operation of the machine.

Lifting

Avoid lifting heavy objects by yourself as serious injury can result. Always follow your plant's procedures for lifting heavy objects.

Cutting Fluids

Use only recommended lubricants or similar equivalent when performing maintenance tasks. See the "Maintenance" section for more information.

Danger Zone

The operator and other persons can be anywhere in the vicinity of the machine. The operator must ensure there are no other persons in danger from the machine.

Clamp Collars

To prevent the bar from sliding through the support bearings, or falling, use P/N 42792 – The collars are made in matching sets and must be used to secure the bar when the machine is in the vertical orientation. Torque these collars to 46 ft-lbs. Use the clamp collars to prevent over tightening of the bearings. Clamp collars should be positioned ABOVE at least 2 support bearings when installed in a vertical orientation. Clamp collars should be shouldered against the bearing when in use.

Metal Fragment Hazard

The machine dispenses metallic fragments during normal operation. You should wear eye protection and gloves at all times when working with the machine.

Hazardous Environments

Do not use the machine in a hazardous environment, such as near explosive chemicals, toxic fumes, or a radiation hazard.

Radiation Hazards

There are no systems or components on this machine that are capable of producing hazardous EMC, UV or other radiation hazards. The machine does not use lasers nor does it create hazardous materials such as gasses or dust.

Adjustments and Maintenance

All adjustments, lubrication and maintenance should be done with the machine stopped, and disconnected from power. The shut-off valve should be locked and tagged out before any maintenance occurs.

Warning Labels

Warning labels are attached to your machine upon delivery. If any labels are defaced or missing, be sure to contact CLIMAX immediately for replacements.






Maintenance

Be sure the machine components are free of debris and properly lubricated prior to use.

SAFETY WARNING SYMBOLS

The purpose of product safety signs and labels is to increase the level of awareness to possible dangers.

Safety Alert Symbols indicate **DANGER**, **WARNING** or **CAUTION**. These symbols may be used in conjunction with other symbols or pictographs. Failure to obey safety warnings can result in serious injury. Always follow safety precautions to reduce the risk of hazards and serious injury.

	<p style="text-align: center;">DANGER</p> <p>Indicates a hazardous situation that could be fatal or cause serious injury.</p>
	<p style="text-align: center;">WARNING</p> <p>Indicates a potentially hazardous situation that could be fatal or cause serious injury.</p>
	<p style="text-align: center;">CAUTION</p> <p>Indicates a potentially hazardous situation that could result in minor to moderate injury, damage to the machine or interruption of an important process.</p>
	<p style="text-align: center;">IMPORTANT</p> <p>Provides critical information for the completion of a task. There is no associated hazard to people or the machine.</p>
	<p style="text-align: center;">TIP</p> <p>Provides important information regarding the machine.</p>

RISK ASSESSMENT AND HAZARD MITIGATION

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

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

In contrast, 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 to which it is attached 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.

RISK ASSESSMENT CHECKLIST

The following checklist is not intended to be an all-inclusive list of things to watch out for when setting up and operating this Portable Machine Tool. However, these checklists are typical of the types of risks the assembler and operator should consider. Use these checklists as part of your risk assessment:

TABLE 1-1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

Before set-up	
<input type="checkbox"/>	I took note of all the warning labels on the machine.
<input type="checkbox"/>	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
<input type="checkbox"/>	I considered the need for personnel safety guarding and installed any necessary guards.
<input type="checkbox"/>	I read the machine assembly instructions.
<input type="checkbox"/>	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.
<input type="checkbox"/>	I located the fall paths involved in lifting and rigging operations. I have taken precautions to keep workers away from the identified fall path.
<input type="checkbox"/>	I considered how this machine operates and identified the best placement for the controls, cabling, and the operator.
<input type="checkbox"/>	I evaluated and mitigated any other potential risks specific to my work area.

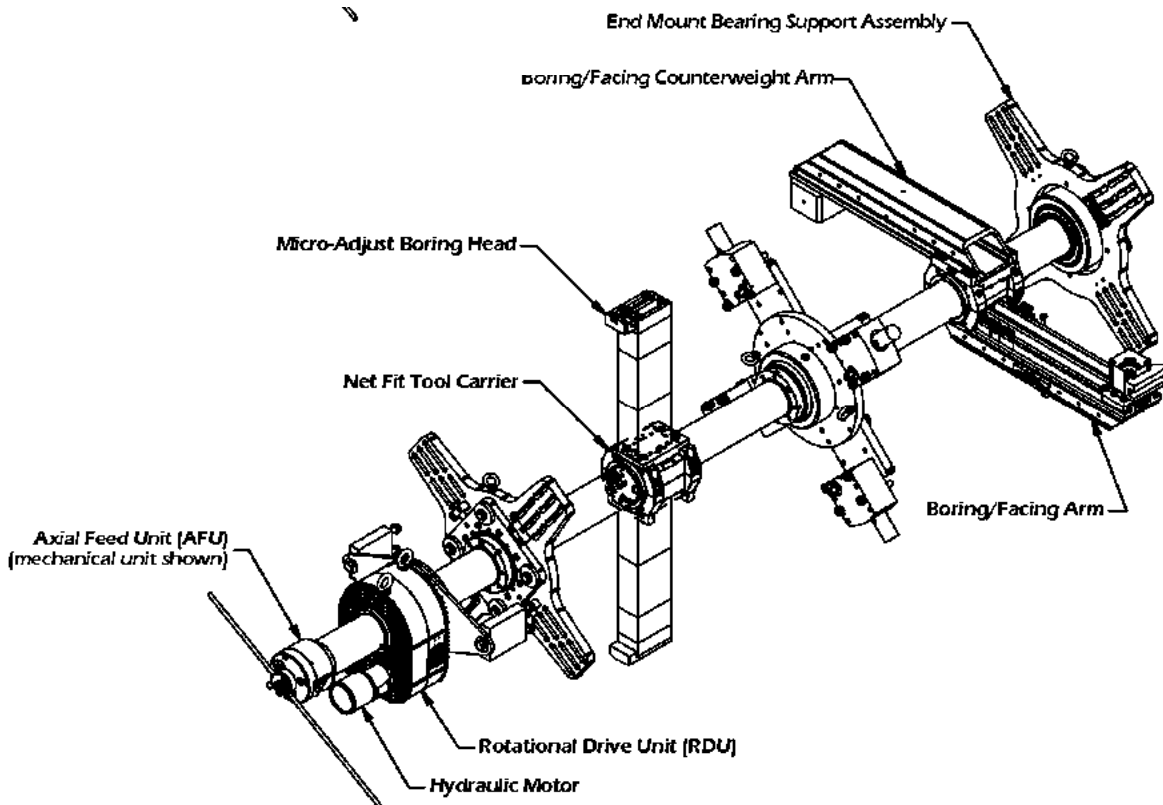
TABLE 1-2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

After set-up	
<input type="checkbox"/>	I checked that the machine is safely installed and the potential fall path is clear. If the machine is installed at an elevated position, I checked that the machine is safeguarded against falling.
<input type="checkbox"/>	I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
<input type="checkbox"/>	I planned for containment of any chips or swarf produced by the machine.
<input type="checkbox"/>	I followed the required maintenance with the recommended lubricants.
<input type="checkbox"/>	I checked that all affected personnel have the recommended personal protective equipment, as well as any site-required or regulatory equipment.
<input type="checkbox"/>	I checked that all affected personnel understand and are clear of the danger zone.
<input type="checkbox"/>	I evaluated and mitigated any other potential risks specific to my work area.

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INTRODUCTION

This manual describes how to use your Model BB7100 Portable Boring Machine. Every part meets CLIMAX's strict quality standards. For maximum safety and performance, read the entire Operating Manual before using the portable boring machine.



INSPECTING THE MACHINE


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.

	IMPORTANT
	Contact CLIMAX immediately to report damaged or missing components.


This is a highly configurable machine with many options and accessories. This manual covers the use and operation of all of those possible options. 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 a CLIMAX sales representative for assistance in obtaining the needed components.


SETUP

	WARNING
	<p>When setting up or servicing the machine, disconnect the power source and lock the machine out. Failure to do so could result in accidental start-up and seriously injure you or others.</p>

Crane or Hoist

A hoist, crane, or other lifting device is vital in the setup of the machine. Only use an apparatus that allows smooth operation with fine adjustment, such as a hydraulic lift or 2-stage winch. A lifting device that is unstable, erratic, or moves too fast or inconsistently can crash the machine into the work piece damaging the tool.

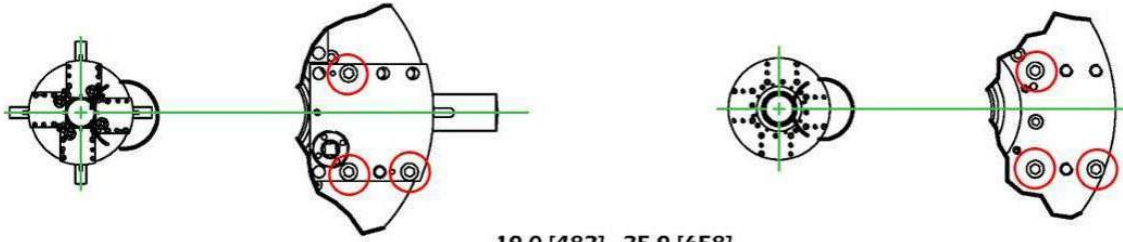
	DANGER
	<p>A machine swinging or falling out of control can cause serious injury, or even be fatal. Make sure all crane/hoist operators are trained on the proper use of the machines. Also make sure the lifting devices are secure and properly rated for the load.</p>

	CAUTION
	<p>To prevent damage to the machine, always use the lifting eyes provided on the machine.</p>

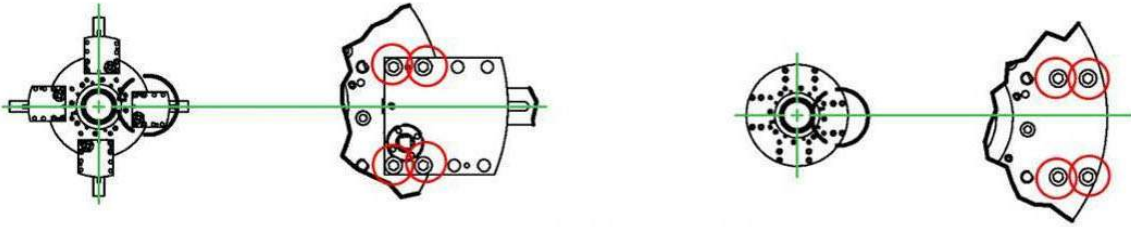
Space Requirements

Before setting up the portable boring machine, determine where you will place each assembly on the boring bar. Because the rotational drive and tool head assemblies can be anywhere along the bar, be sure to provide room for them when setting up the machine.

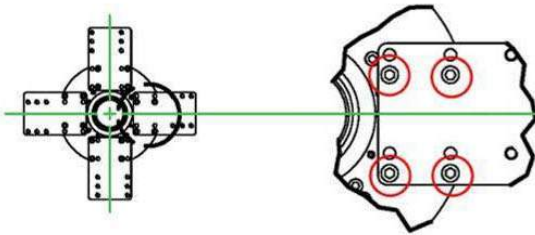
BB7100 BOLT PATTERNS



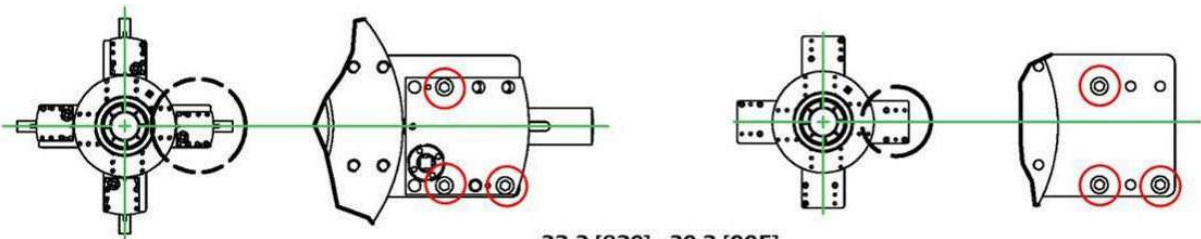
19.0 [482] - 25.9 [658]



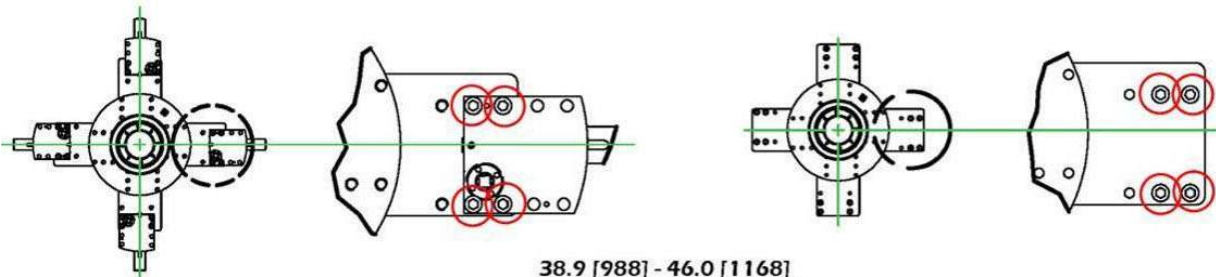
25.6 [651] - 32.5 [827]



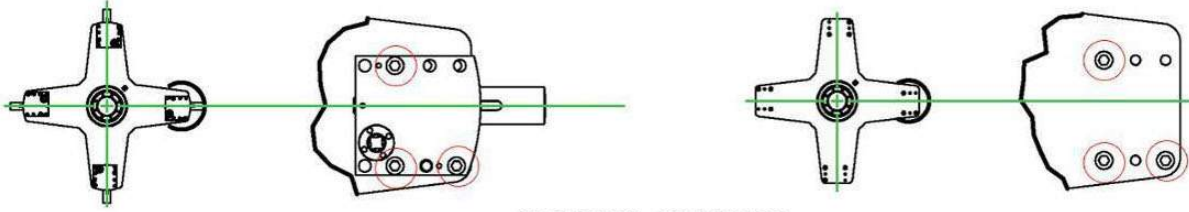
EXTENSION PLATE BOLTED POSITION



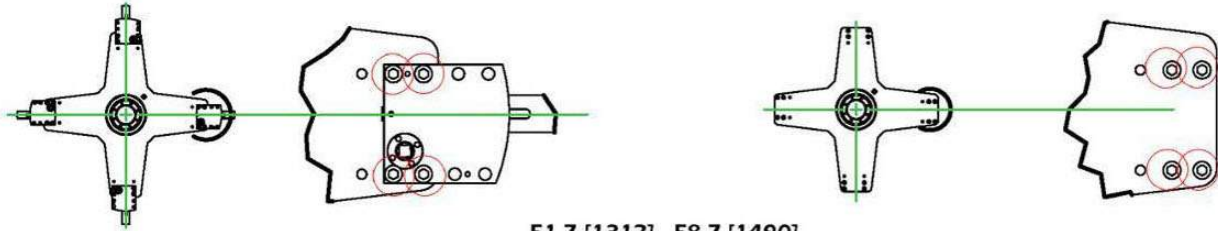
32.3 [820] - 39.2 [995]



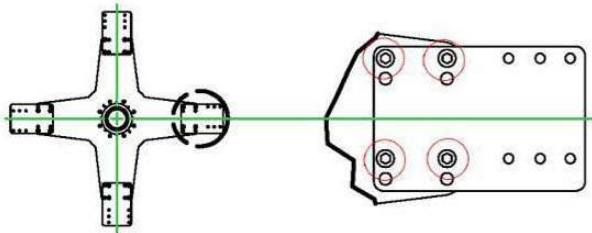
38.9 [988] - 46.0 [1168]



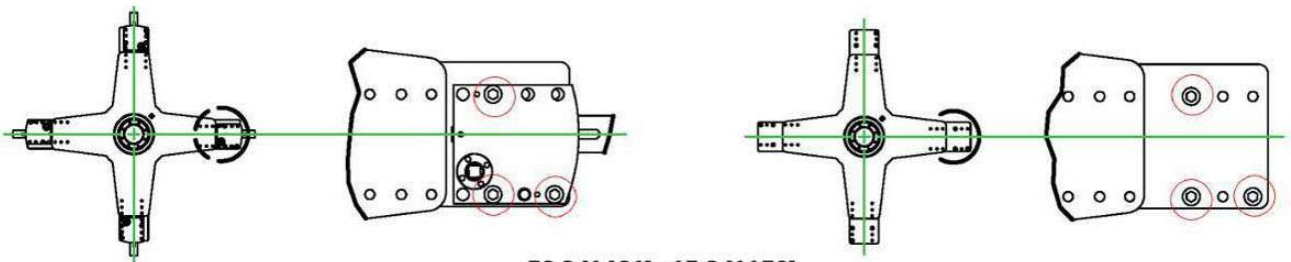
45.0 [1144] - 52.0 [1321]



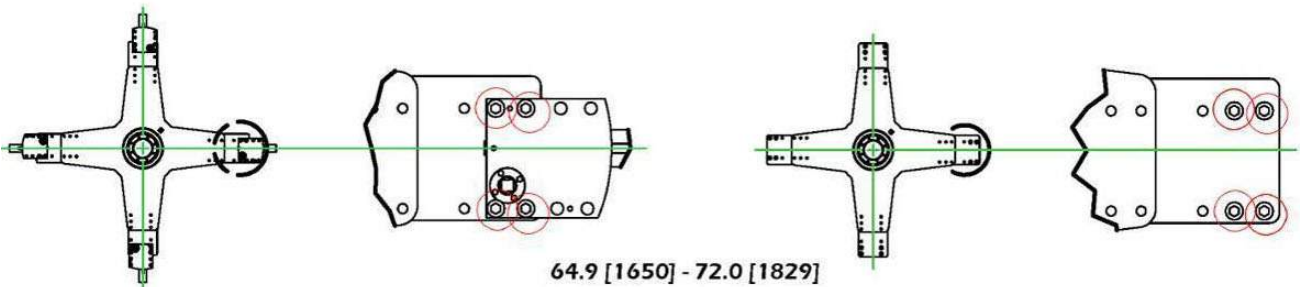
51.7 [1312] - 58.7 [1490]



EXTENSION PLATE BOLTED POSITION




58.3 [1481] - 65.3 [1659]



64.9 [1650] - 72.0 [1829]

Boring Bar and Bearing Support Setup

At least two bearing support assemblies are required to ensure machine stability. The bearing assemblies may be different styles.


	CAUTION
	At least two bearing supports are required to ensure machine stability. The bearing assemblies may be different styles. Bearing supports placed too far apart allow the bar to deflect, reducing bore precision.

Clamp Collars

P/N 42792 – The collars are made in matching sets and must be used to secure the bar when the machine is in the vertical orientation.

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


To prevent over tightening of the bearings, the clamp collars should be placed above at least two support bearings in a vertical orientation.

	DANGER
	To prevent the bar from sliding through the support bearings, or falling, use the 2 clamp collars provided in the tool kit when using the boring bar in a vertical orientation. Torque to 46 ft.-lbs!

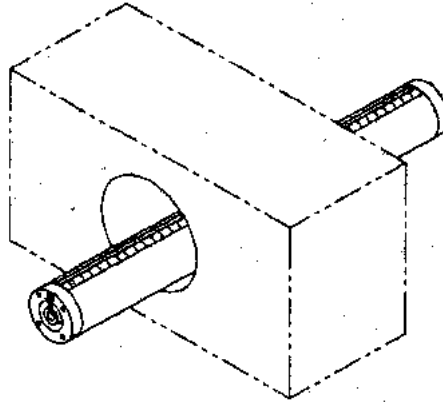
End-mount bearing support setup

Even though the end-mount bearing support attaches to the outside of the work piece, it can be placed anywhere along the boring bar. During setup, the bearings can have as much as 1 degree of angle in the + or – direction.

4. Clean the bore of the work piece with solvent to remove grease, oil, and dirt.
5. Check the bar for nicks or cuts. Dress the bar smooth, if necessary. A bar with nicks or gouges can damage mating parts beyond repair (including the axial tool carrier and rotational drive unit).
6. Clean the bar with solvent to remove dirt and chips.

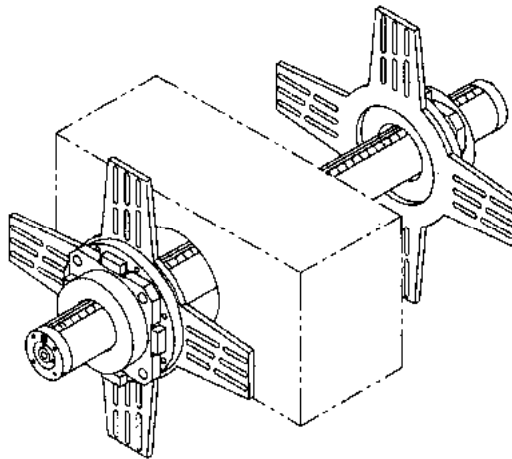
	CAUTION
	The bar is not hardened. To prevent bar damage, do not strike the bar against the bearing supports or against the work piece.

7. Place the boring bar into the bore(s) to be machined.



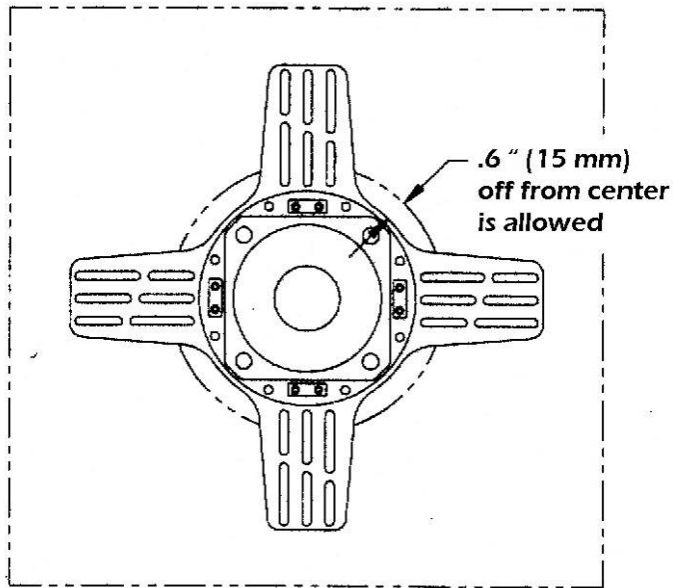
Placement of the Boring Bar in the bore

8. Slide bearing supports onto each end of the bar.




Attaching bearing supports

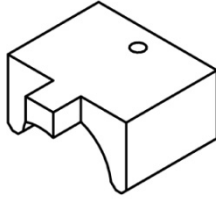
9. Using a hoist, hold the bar and bearings in the center of the bore.
10. Align within 0.6" (15 mm)



Aligning the bar and bearing supports with the center bore


	WARNING
	Swinging or falling machinery can seriously injure the operator. Securely wrap the hoist or straps around the bar and bearings before lifting the machine.

1. When using existing holes, make sure they align with the slots in the spider. Tap new holes if necessary. If holes are to be tapped in the work piece, hold the spiders against the work piece and mark the position of the slots in the spiders.
2. Pull the bearing assemblies from the boring bar.
3. Remove the bar from the work piece.
4. If necessary, tap 5/8" (16 mm) holes on the end of the work piece to align with slots in the spiders.
5. Mount one bearing to the end of the work piece.
6. Slide the boring bar through the bearing support.
7. If you need to mount the rotational drive between the supports, do it now.
8. If mounting another end-mount bearing support, repeat previous steps.
9. Slide the boring bar through all bearing assemblies.
10. Lock the bar in place by tightening the bearing cartridge nut.
11. Insert the bearing key tool between the groove in the boring bar and the groove in the bearing tapered sleeve.



P/N 55572 BEARING KEY TOOL

12. This tool (P/N 55572) rests in the leadscrew slot while tightening. The tab fits into the split of the tapered sleeve to prevent the sleeve from rotating on the bar when tightening the bearing.
13. Tighten the strap wrench around the boring bar.
14. While holding the strap wrench in place, tighten the bearing nut using the bearing nut wrench.
15. Remove the bearing key tool (P/N 55572) from the boring bar.
16. Precisely align the boring bar.
17. Position a dial indicator to measure the concentricity between the boring bar and the bore
18. Adjust the screws in the bearing support adjusting blocks until the bar is centered.

	TIP
	CLIMAX recommends using at least two support assemblies to obtain machine stability.

Mechanical Axial feed setup

Mounting the mechanical axial feed to the bar

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

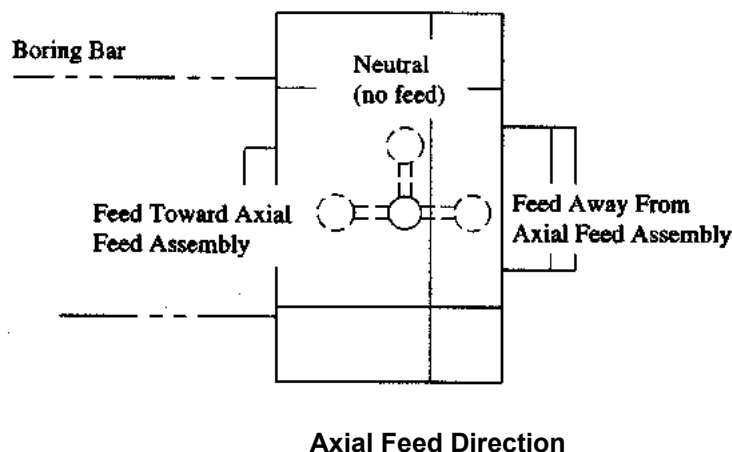
1. Place the axial feed unit in NEUTRAL so the lead screw drive can rotate in either direction.
2. While holding the axial feed against the bar end cap, turn the feed unit output shaft until the hexes fit together.
3. Secure the axial feed unit with the two screws provided.
4. Secure the trip rod to a fixed object to engage the feed mechanism.

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

Setting axial feed direction

The lever for axial feed direction is on the flat base of the axial feed.

- To feed the tool head TOWARD the axial feed, turn the lever toward the bar.
- To feed the tool head AWAY FROM the axial feed, turn the lever away from the bar.
- The feed is in NEUTRAL when the knob and the lever are perpendicular to the bar.



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

Setting the Axial Feed Rate

Axial feed rate is adjustable and variable from 0.003" to 0.025" (0.07 to 0.63 mm) per revolution.

To set the feed rate:

1. Loosen the feed rate knob.
2. Turn the feed adjustment plate to the desired setting.
3. Tighten the feed rate knob.

Setting up the Electric Feed

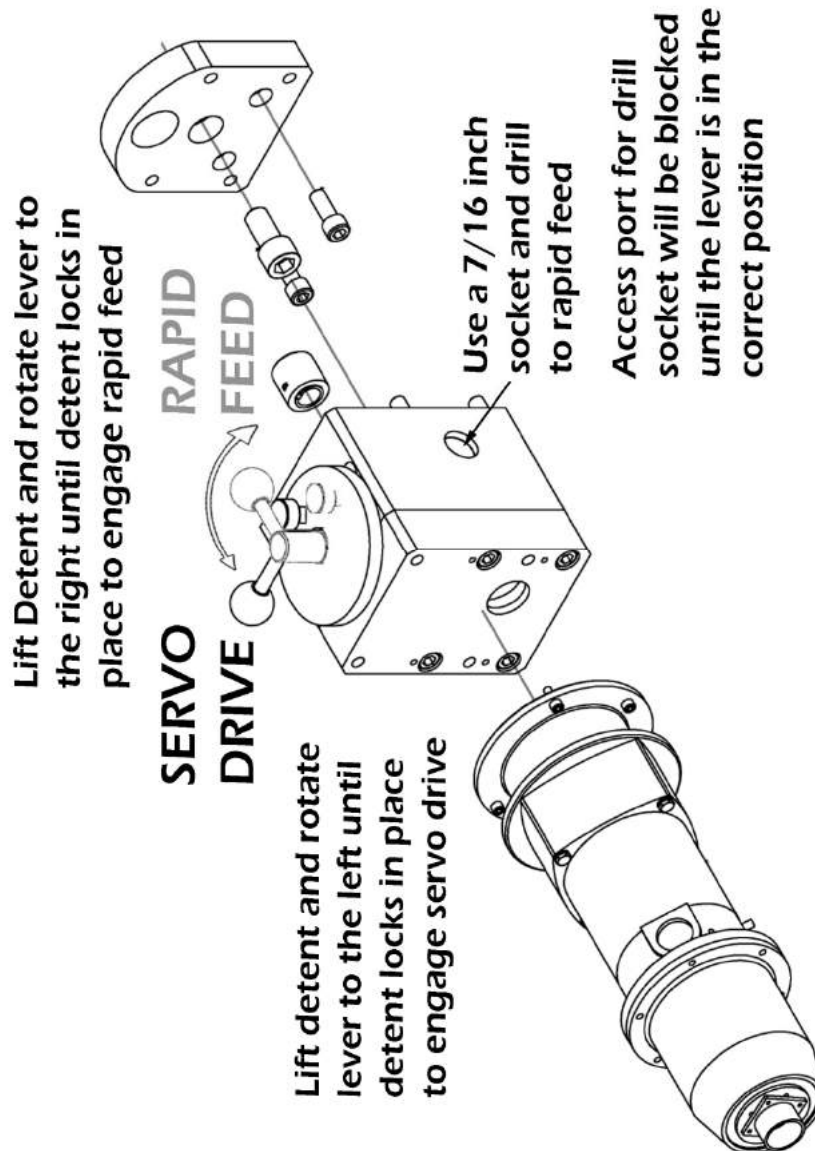
Before you connect power, ensure the main circuit breaker is rated to carry 125% of the full load of both the HPU and the axial feed drive. The full load of the axial feed drive is 10 amps at 460 volts. Refer to the electrical schematics for the HPU to determine the full load amps of the HPU and axial feed drive.

To mount the electric feed to the bar

1. Connect the power supply cable.
2. Slide the leadscrew coupling onto the gearbox output shaft.
3. Mount the adapter plate with two 3/8-16 and one 3/4-10 cap screws to the end of the boring bar.
4. Slide the gearbox with coupling onto the hex end of the boring bar leadscrew and secure with four 1/2-13 screws.
5. Install the motor shaft coupling and key on the electric feed motor shaft.
6. Mount the electric feed motor to the gearbox with four 1/4 -20 screws.
7. Secure the electrical cable to the connector on the end of the feed unit.

Attaching the Mechanical Rapid Feed (optional equipment)

The optional mechanical rapid feed attachment fits between the axial feed assembly and the end of the boring bar. It has a side port for a standard 7/16" drill socket, used to rapid advance the feed. The lever engages and disengages the rapid feed system. When engaged, access to the drill socket port is available. When the servo is engaged, the drill socket will not fit into the port. Drawings (P/N 81709) are found in the Exploded Parts and Views on page 41.



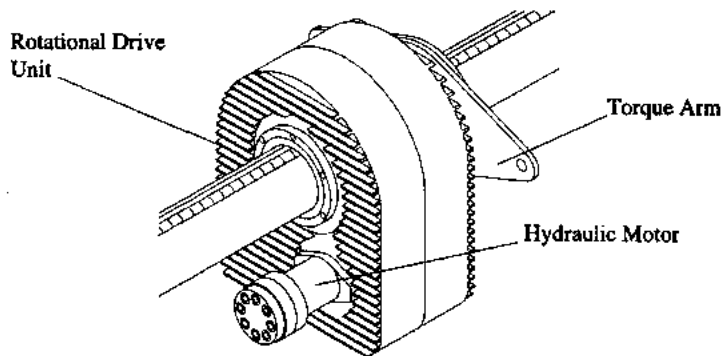
Rotational Drive Setup

The rotational drive can be placed anywhere along the boring bar.

	CAUTION
	<p>The boring bar is not hardened. To prevent bar damage, do not strike the bar against the bearing supports or against the work piece.</p>


To setup the rotational drive

1. Mount the torque arms onto the rotational drive unit housing.
2. If necessary, mount the hydraulic motor to the rotational drive unit housing.
3. Be sure mounting bolts are tight




Mounting the hydraulic motor and torque arms on the RDU

4. Loosen the bar drive lock ring clamp screws. Push out both lock rings by screwing in the jacking screws.
5. Slide the rotational drive unit over the boring bar.
6. Remove the socket-head cap screws from one bar drive lock ring. Slide the ring away from the rotational drive along the bar.
7. Be sure key slots in the boring bar and gears are aligned. Be sure the key meshes with the lead screw. Push the bar drive key into the key slot.


	CAUTION
	<p>The rotational drive key must be in engaged before operating the boring bar. Failure to do so may damage the machine.</p>

-
8. Slide the bar drive lock ring back into place in the rotational drive. Tighten the clamp screws on both lock rings.


	CAUTION
	Tighten only the six clamping socket-head cap screws in the bar drive locking rings, not the jacking screws. The jacking screws loosen the locking rings. Back out the jacking screws before clamping the rings to avoid damaging the rings.

9. Slide the bar drive lock ring back into place in the rotational drive.

10. Tighten the clamping screws on both lock rings.

	WARNING
	Weak tie down failure or loose torque arms can allow the torque arms to swing uncontrollably, seriously injuring the operator and damaging the machine. Secure the torque arms to a stationary object strong enough to withstand the full torque.


11. Connect the hydraulic lines between the motor and the hydraulic power unit.


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

Installing the Facing and Boring Arms to the Boring Bar

To mount the tool carrier

1. Check the bar for nicks or cuts. Dress the bar smooth, if necessary.
A bar with nicks or gouges can damage mating parts beyond repair (including the axial tool carrier and rotational drive unit).
2. Clean the bar and tool carrier with solvent to remove dirt and chips.
3. Re-oil the bar (see the “Maintenance” section for further information).
4. Mount the two halves of the tool carrier onto the bar.
5. Secure the tool carrier with the four 3/4-10 x 2 SHCS screws (P/N 28757).
6. Insert the removable drive key (P/N 53523) inside the tool carrier onto the leadscrew. Tighten the mounting screws (P/N 22496) to 96 in/lbs (10.85 N-m).

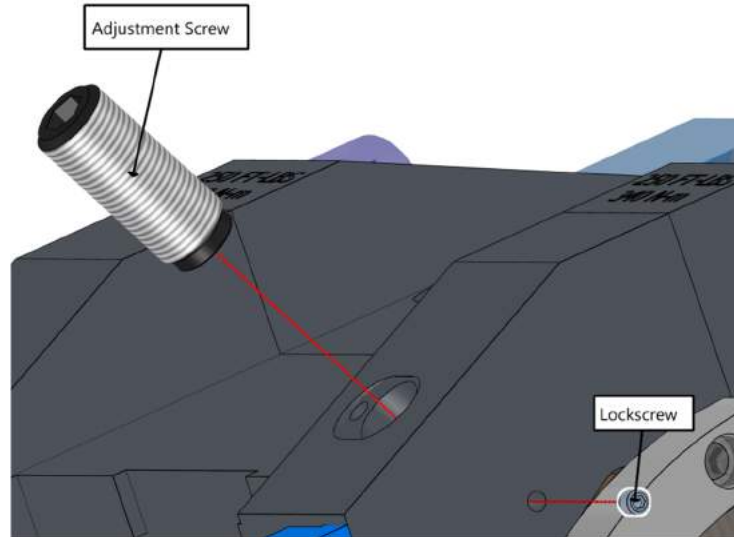
	IMPORTANT
	The bar can rotate in either direction. Be sure the rotation is correct for the carbide cartridges.

	TIP
	Precision bores are best achieved with multiple roughing cuts then one or two finishing cuts.

See the exploded view for the tool carrier (P/N 53922) in the Exploded Parts and Views on page 41.

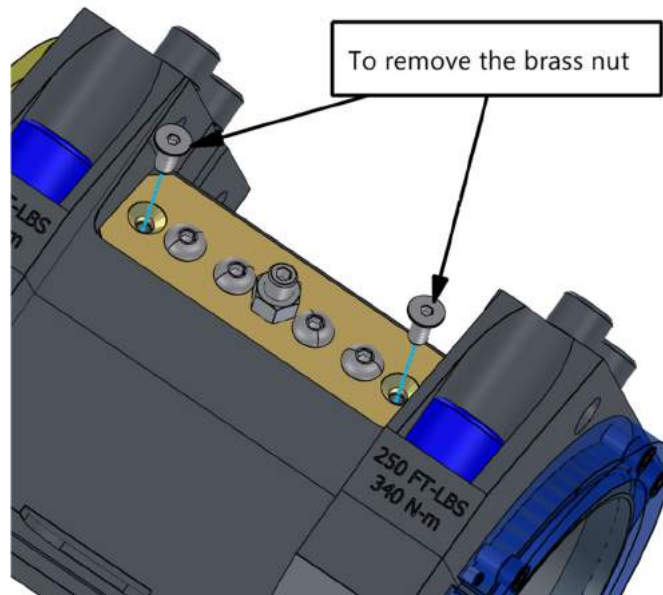
To lock the tool carrier on the bar for other operations

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




To remove the brass nut

1. Do not remove all the screws
2. Remove the screws on each end of the brass nut
3. (If there is too much play in the brass nut, the center set screw can be tightened)




Install the Slide Arm onto the Tool Carrier

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

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

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

	DANGER
	Failure to properly torque the four 1/2-20 x 1-1/4 SHCS (P/N 18225) to 100 ft-lb (135 N-m) can result in unexpected slippage of the tool arm which can result in injury or be fatal.

Adjusting the Tool Carrier for Perpendicularity

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


Feedbox Assembly

Mount and secure the feedbox with adapter plate (P/N 46879), as shown below.

Feedbox & Trip Arm Set-up

Install the Counterweight Arm onto the Tool Carrier

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

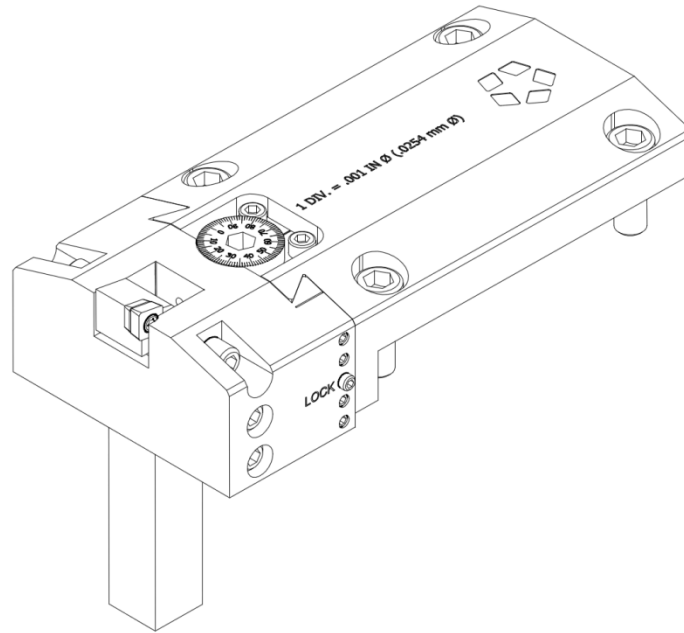
	IMPORTANT
	Always use the lifting eyes when lifting the arms. The rotating lifting eyes provide the flexibility and safety during setup operations.

- Using a lifting device such as a crane, lift the counterweight assembly to the arm. Fasten the counterweight assembly to the arm using the 7/8-14 x 1-1/2 (P/N 53049).

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

Micro Adjustment Boring Head

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



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

The BB7100 micro-adjustment boring head comes with a 3/4" square shank tool holder. A bolt-on shim is provided the 3/4" tool holder so that it can be easily converted to a 1/2" tool holder.

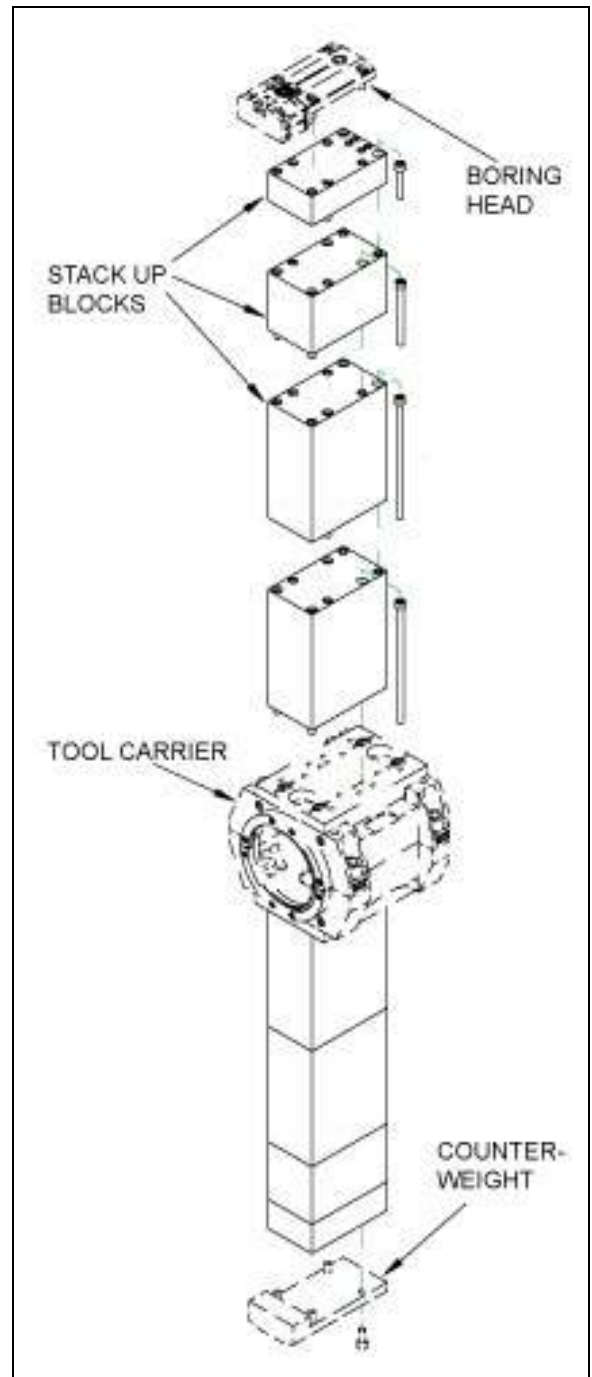
To set up leading and trailing, simply shift the boring heads against the mounting screws in opposite directions.

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

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

Boring head setup

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



BB 7100 MICRO ADJUST BORING HEAD TOOL RANGE TABLE

10.25" – 58.25" DIAMETER

BORE RANGE DIAMETER INCH (MM)	NUMBER OF SPACER BLOCKS REQUIRED		
	2" BLOCK	4" BLOCK	8" BLOCK
10.25"-14.25" (260.35-362)	0	0	0
14.25"-18.25" (362-463.5)	1	0	0
18.25"-22.25" (463.5-565.2)	0	1	0
22.25"-26.25" (565.2-666.7)	1	1	0
26.25"-30.25" (666.7-768.3)	0	0	1
30.25"-34.25" (768.3-870)	1	0	1
34.25"-38.25" (870-971.5)	0	1	1
38.25"-42.25" (971.5-1073.1)	1	1	1
42.25"-46.25" (1073.1-1174.7)	0	0	2
46.25"-50.25" (1174.7-1276.3)	1	0	2
50.25"-54.25" (1276.3-1378)	0	1	2
54.25"-58.25" (1378-1479.5)	1	1	2

BB 7100 SOLID TOOLING BORING HEAD TOOL RANGE TABLE


12.9" – 61.4" DIAMETER

BORE RANGE DIAMETER INCH (MM)	NUMBER OF SPACER BLOCKS REQUIRED			
	.75" BLOCK	2" BLOCK	4" BLOCK	8" BLOCK
12.9-15.9(327.66-403.86)	0	0	0	0
14.4-17.4 (365.76-441.96)	1	0	0	0
16.9-19.9 (429.26-505.46)	0	1	0	0
18.4-21.4 (467.36-543.56)	1	1	0	0

BB 7100 SOLID TOOLING BORING HEAD TOOL RANGE TABLE				
12.9" – 61.4" DIAMETER				
BORE RANGE DIAMETER INCH (MM)	NUMBER OF SPACER BLOCKS REQUIRED			
	.75" BLOCK	2" BLOCK	4" BLOCK	8" BLOCK
20.9-23.9 (530.86-607.06)	0	0	1	0
22.4-25.4 (568.96-645.16)	1	0	1	0
24.9-27.9 (632.46-708.66)	0	1	1	0
26.4-29.4 (670.56-746.76)	1	1	1	0
28.9-31.9 (734.06-810.26)	0	0	0	1
30.4-33.4 (772.16-848.36)	1	0	0	1
32.9-35.9 (835.66-911.86)	0	1	0	1
34.4-37.4 (873.76-949.96)	1	1	0	1
36.9-39.9 (937.26-1013.46)	0	0	1	1
38.4-41.4 (975.36-1051.56)	1	0	1	1
40.9-43.9 (1038.86-1115.06)	0	1	1	1
42.4-45.4 (1076.96-1153.16)	1	1	1	1
44.9-47.9 (1140.46-1216.66)	0	0	0	2
46.4-49.4 (1178.56-1254.76)	1	0	0	2
48.9-51.9 (1242.06-1318.26)	0	1	0	2
50.4-53.4 (1280.16-1356.36)	1	1	0	2
52.9-55.9 (1343.66-1419.86)	0	0	1	2
54.4-57.4 (1381.76-1457.96)	1	0	1	2
56.9-59.9 (1445.26-1521.46)	0	1	1	2
58.4-61.4 (1483.36-1559.56)	1	1	1	2

To install the micro adjustment boring head

1. Mount the tool carrier to the bar.
2. Mount the provided stack up blocks on the tool carrier to achieve the desired boring diameter range.
3. Mount the boring head and the counterweight to the top spacer blocks.
4. Mount the square shank tool and adjust it accordingly for the desired bore diameter.
5. Before installing turn off and lock out the electric power to the power unit.
6. Be sure all hydraulic hose fittings are clean.
7. Connect the hydraulic lines between the power unit and the hydraulic motor as described in the power unit instruction manual.
8. Plug the power unit into a grounded outlet.

	CAUTION
	Operating this hydraulic power unit for extended periods of time without connecting the hydraulic motor will overheat the system and may damage the pump.


	WARNING
	To avoid injury by flying chips or loud noise, wear personal protective equipment while operating the machine.

Jog the power unit motor to be sure the pump motor is rotating the same direction as the arrow located on the pump/motor coupling. If it is rotating the wrong way and you have a CLIMAX power unit:

- Turn off and lock out voltage to the power unit.
- Open the electrical enclosure.
- Identify wires L1, L2, and L3 on the terminal block.
- Switch any two wires.
- Close the enclosure

OPERATION

Pre-start checks

	WARNING
	<p>When setting up or servicing the machine, disconnect the power source and lock the machine out. Failure to do so could result in the machine being accidentally turned on, and seriously injuring you and others.</p>

Before operating the machine:

1. Tie down the rotational drive unit torque arms and the axial feed unit stop rod.
2. Ensure the rotational drive unit is filled with drive oil.
3. Check that all cutters are sharp and in good condition.
4. Secure all machine parts, including the axial tool carrier, tool head and cutting tool. Check that moving parts move freely.
5. Check that electric cords and cables are in good condition and correctly connected.
6. Turn the hydraulic power unit OFF.
7. Check that the hydraulic power unit wiring matches the electric power source. Plug the power unit into a grounded outlet.
8. Check the hydraulic power unit reservoir level. Fill the reservoir to above the red bar with Mobil DTE-24 anti-wear hydraulic oil or equivalent. Check that the power unit is on a level surface.
9. Clean the hydraulic hoses and fittings before connecting them.
10. Check that the hydraulic power unit pump motor is rotating as directed by the arrow on the pump/motor coupling.

Starting the machine

The CLIMAX BB7100 is intended for operation at varying rates of rotation and feed. The rotation speed is controlled by varying the output from the Hydraulic Power Unit (HPU). The feed rate of the mechanical unit is controlled manually from the feed unit.

If boring:

Set the feed direction on the axial feed.

Set the feed rate on the axial feed

If facing:

Set the feed direction on the axial feed to NEUTRAL.

Lock the tool carrier to the bar using adjustable shoes.

Adjust the automatic trip mechanism on the facing head.

1. Turn on the hydraulic power unit.
2. Adjust the bar rotation to the desired speed.
3. As cutting proceeds, apply cutting fluid.

Stopping the Machine

The axial feed is driven from the rotation of the bar. Stopping the bar also stops the feed.

	IMPORTANT
	In an emergency, turn off the hydraulic power unit.

To stop the machine


1. Stop the hydraulic power unit.
2. Turn off and lock out the power unit.
3. After the machine is completely stopped, use a brush to remove chips.

	CAUTION
	To avoid personal injury from flying chips, do not use compressed air to remove chips.

Repetitive Machining


To set the machine up for repetitive machining

1. Reverse the axial feed (tool head) direction.
2. Manually or automatically feed the tool head back to where it started cutting.
3. Sharpen the tool bit or replace the carbide inserts if necessary.
4. Using a dial indicator reset the tool bit cutting depth. Maximum recommended cutting depth is 1/8" (3 mm).
5. Operate the boring bar as described in "Starting the machine" on page 29.

	CAUTION
	The bar is not hardened. To prevent bar damage, do not strike the bar against the bearing supports or against the workpiece.

Using the Remote Pendants

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



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


Feed Pendant

The following is a description of the Feed Pendant controls:




Feedbox Pendant

Symbol	Feature	Description
	Feed speed override	A momentary button which overrides the feed rate potentiometer and runs the axial power feed at maximum rate, regardless of the potentiometer setting.
	Feed Fwd / Rev	A 3-position selector switch that determines the direction of axial feed. In neutral, power feed is disengaged. The feed rate can be adjusted or reversed during operation.
	Speed	The Feed potentiometer controls the axial feed rate. Counterclockwise decreases the feed rate; clockwise increases the feed rate.

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

HPU Pendant

	TIP
	<p>Additional information about the HPU function, construction, and maintenance schedule can be found in the HPU manual.</p>



HPU Pendant

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

Manual Override (Electrical Feed Only)

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

	CAUTION
	<p>Do not force the shift lever to engage. Forceful engagement can damage the mechanical override mechanism.</p>

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

Disassembly

To disassemble the machine

1. Turn off and lock out the hydraulic power unit.
2. Disconnect the hydraulic hose from the motor.
3. Remove the tool bit or carbide cartridge from the tool head.

4. Remove the tool head and tool carrier.
5. Remove the axial feed from the bar.
6. Securely support the boring bar, bearing supports, and rotational drive with hoists.
7. If the rotational drive is between bearing support assemblies, remove one support first by doing the following:
 - Loosen the bearing cartridge.
 - Loosen the support from the work piece.
 - Remove the support from the bar.
8. Secure the rotational drive with a hoist.
9. Loosen the six clamping screws in the rotational drive.
10. Push the bar drive lock rings out by screwing in the four jacking screws.
11. Remove one lock ring. Remove the drive key.
12. Carefully slide the rotational drive off the bar.
13. Loosen the bearing cartridges.
14. Remove the boring bar.
15. Remove the bearing support(s) from the work piece.

Alternative disassembly

To remove the bearings before removing the bar

1. Turn off and lock out the hydraulic power unit.
2. Disconnect the hydraulic hoses from the motor.
3. Remove the tool bit or carbide cartridge from the tool head.
4. Remove the tool head and tool carrier.
5. Securely support the boring bar, bearing supports, and rotational drive with hoists.
6. Remove the axial feed from the bar.
7. If the rotational drive is between the bearing support assemblies, remove one support first:
 - Loosen the bearing cartridge.
 - Loosen the support from the work piece.
 - Remove the support from the bar
8. Secure the rotational drive with a hoist.
9. Loosen the six clamping screws in the rotational drive.
10. Push the bar drive lock rings out by screwing in the four jacking screws.
11. Remove one lock ring.

-
12. Remove the drive key.
 13. Carefully slide the rotational drive off the bar.
 14. Loosen the bearing cartridges.
 15. Place a clean wooden “crib” in the bottom of the bore.
 16. Remove the bearing support(s) from the work piece.
 17. Slide the bar out of the bore using the crib.

MAINTENANCE

Recommended Lubricants

Lubricant	Brand	Where used
Gear grease	UNOBA EP #0	Bearing cartridges
Rotational drive oil	Mobil SHC 634 Synthetic	Gear box gears
Light oil	LPS 2	Unpainted surfaces
Cutting oil	UNOCAL KOOLKUT	Tool bits, work piece
Hydraulic oil	Mobil DTE-24 anti-wear hydraulic oil	Hydraulic power unit and motor

	CAUTION
	To avoid damage only use specified lubricants.

Boring bar and lead screw

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

Axial feed

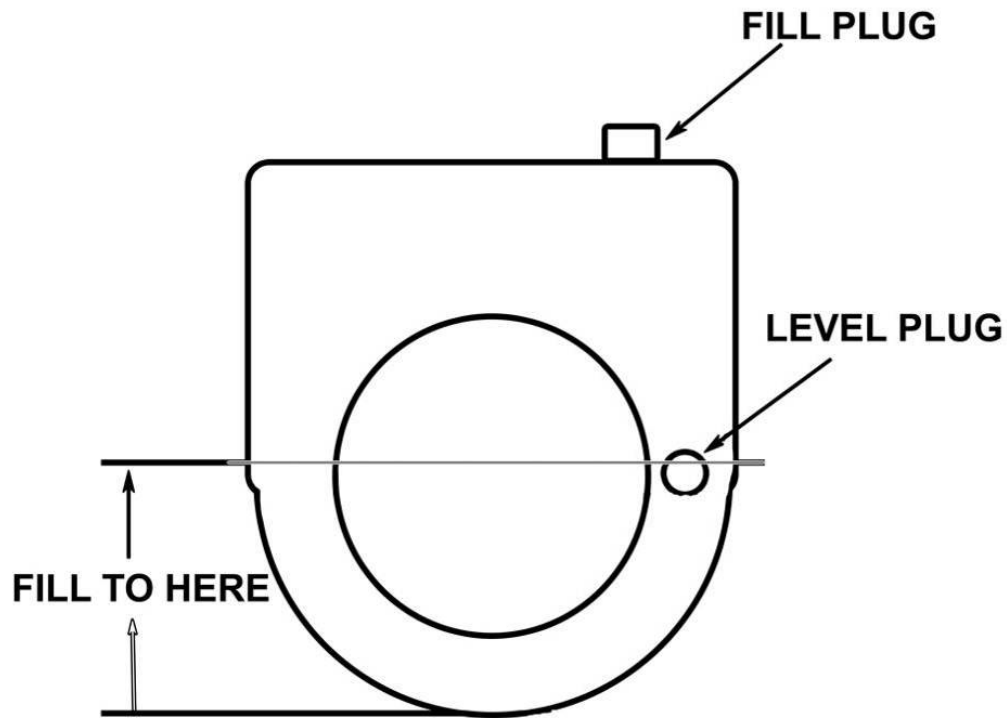
Under normal conditions, the axial feed is maintenance-free.

Rotational drive

Normally, change oil in the rotational drive gearbox every 500 hours. Lubricate the main drive gearbox every 500 hours with Aero-Lube SAE 90 gear oil or equivalent.

To fill the gear box:

1. Using the lifting eye, set the gear box upright. Secure the gearbox so it cannot move.
2. Remove the fill plug and the level plug.



Filling the gearbox with oil

3. Fill the gearbox (through the fill hole) until oil comes out the level hole.
4. Replace the level plug.
5. Add one more quart of oil.
6. Replace the fill plug.

Bearing support

End-mount bearing support assemblies

Periodically grease the bearing cartridge by pumping grease through the grease fitting in the housing.

Before storage, lightly oil the assembly to prevent rusting.

ID-mount bearing support assemblies

If the jaws stick inside the blocks, pull the jaws out and grease the worm gears inside the blocks.

Periodically grease the bearing cartridge.

Boring head

Lightly oil all parts to prevent rusting.

Mechanical facing head

Before and frequently during operation, lubricate the tool head carrier with way oil through the grease fitting. Brush chips from the lead screw to prevent thread damage. Lightly oil the lead screw periodically to ensure smooth travel of the tool holder. When changing tool holders, apply way oil to the dovetail ways.

Axial Tool carrier

Lightly oil all parts to prevent rusting.

STORAGE

Proper storage of Model BB7100 Portable Boring Machine will prevent undue deterioration or damage. Before storing the machine, clean it using solvent to remove grease, metal chips, and moisture. Spray the machine with a moisture-protective coating (LPS1 or LPS2 for short-term storage, LPS 3 for long-term storage) to prevent rusting. Store the machine in the boxes provided. Place desiccant bags or vapor wrap around the machine to absorb moisture.

SPARE PARTS

Parts listed below include items most frequently replaced due to wear, loss, or damage. To avoid unwanted down time you may choose to stock the items listed.

Problem	Check
Axial feed unit will not advance the bar	Be sure the feed direction is set to the desired setting
	Clean the leadscrew
	Be sure the feed rate is not too low
	Be sure the axial feed unit is securely mounted to the end of the bar.
Chatter	Re-sharpen the tool bit or replace the carbide inserts
	Adjust the feed rate
	Increase or decrease the hydraulic motor speed
	Change the cutter depth.

PART NO.	DESCRIPTION	QTY	WHERE USED
15549	Lead screw bearing adjustment nut	2	Boring bar
15173	Thrust washer	4	
12446	Thrust bearing	2	
15172	Needle bearing	2	
15555	Bar Drive Key	1	
15754	Trip rod	1	Mechanical axial feed
15608	Seal	2	Rotational drive
15768	Seal	2	
18432	Extension spring	3	Facing head
10532	Roller clutch bearing	1	
18399	Axial clutch housing	1	
54134	Axial lead screw nut	1	Axial tool carrier
15826	Rod scraper	2	
21114	Hydraulic filter element	2	Hydraulic power unit
19259	Bearing lock key	1	Tool kit
16496	Adjustable spanner wrench	1	
15367	Strap wrench	1	

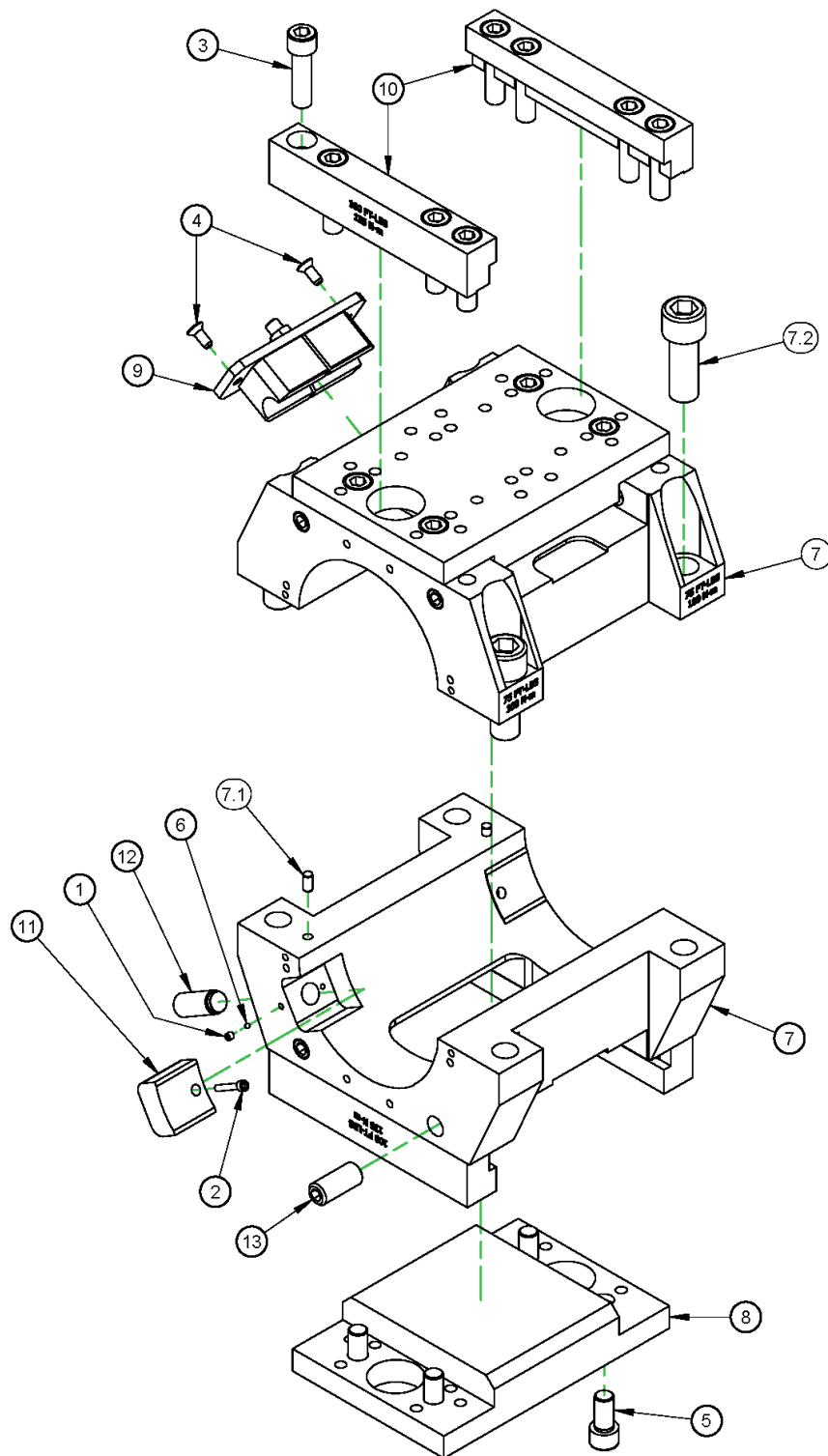
TOOL KIT

P/N 54263 BB7100 TOOL KIT

P/N	DESCRIPTION	QTY	UOM
10855	WRENCH EXTENSION 3/8 DRIVE X 6	1	Piece
11856	WASHER 5/8 FLTW	4	Piece
12339	WASHER 3/4 FLTW	2	Piece
12800	WRENCH END 15/16	1	Piece
12835	WRENCH END 1-1/8 COMBINATION LONG (KB)	1	Piece
14735	WRENCH EXTENSION 1/2 DRIVE X 10	1	Piece
14818	WRENCH RATCHET 1/2 DRIVE	1	Piece
15367	WRENCH STRAP 1-3/4 WIDE X 48 LONG	1	Piece
16792	WRENCH END 3/8 COMBINATION	1	Piece
17378	SCREW 5/8-11 X 2-1/4 HHCS	4	Piece
19261	WRENCH SOCKET 3/8 6 PT X 3/8 DRIVE	1	Piece
19700	CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5	1	Piece
20869	WRENCH HEX SET 5/64 TO 3/4 15 PIECES	1	Piece
21406	SCREW 3/4-10 X 2 HHCS	2	Piece
24751	WRENCH RATCHET 3/8 DRIVE	1	Piece
29661	WRENCH HINGE HANDLE 1/2 DRIVE 17 IN HANDLE (KB)	1	Piece
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)	1	Piece
42792	CLAMP COLLAR 5 ID X 6-1/4 OD X 7/8 2 PIECE	2	Piece
54411	STANDOFF RDU 6IN	1	Piece
54412	STANDOFF RDU 6.5IN	1	Piece
55045	WRENCH HEX BIT SOCKET SET 10 PIECE 1/2 X 3/8 DRIVE	1	Piece
55572	TOOL BEARING BB7100	1	Piece
55769	MANUAL INSTRUCTION BB7100 5 DIA BORING BAR	1	Piece
56636	WRENCH SPANNER FOR 5 DIA DODGE IMPERIAL BRG OFFSET .6 IN	1	Piece

EXPLODED PARTS AND VIEWS

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

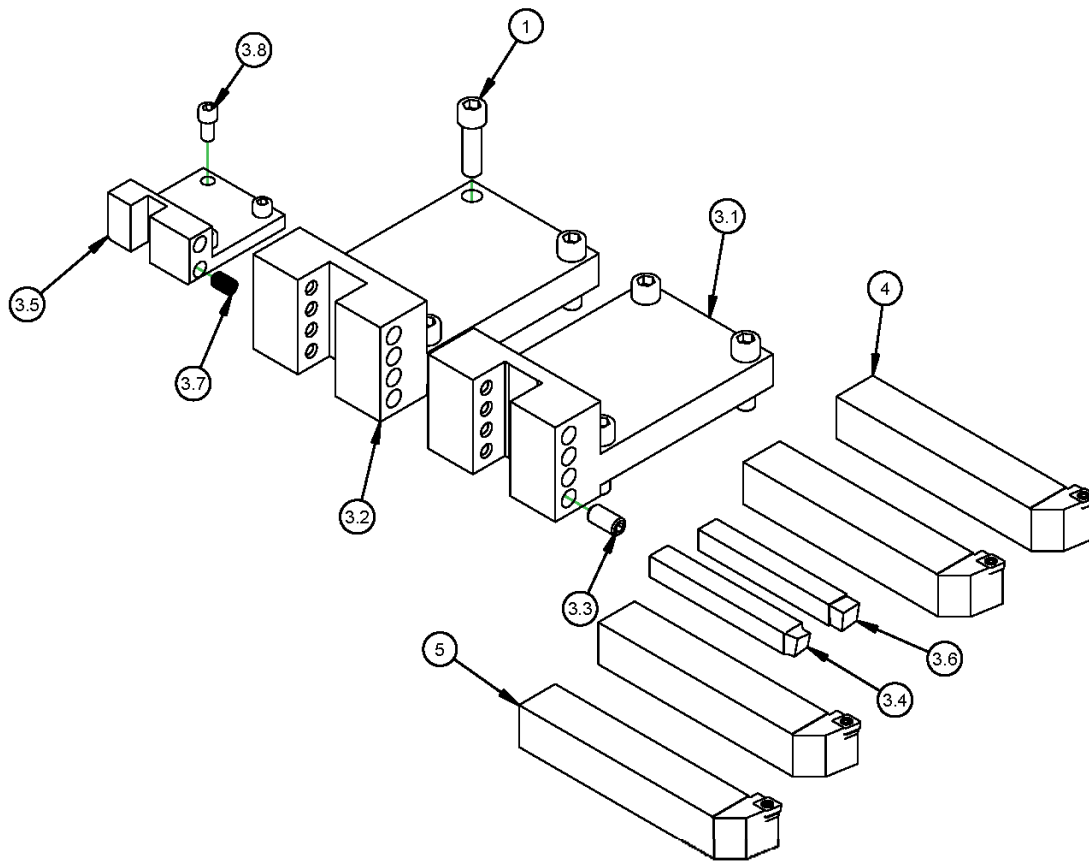


53922 - TOOL CARRIER ASSY BB7100 - REV B
 FOR REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	11050	SCREW 10-32 X 3/16 SSSCP
2	2	12880	SCREW 8-32 X 1 SHCS
3	16	18225	SCREW 1/2-20 X 1-3/4 SHCS
4	2	22496	SCREW 1/4-20 X 5/8 FHSCS
5	8	24955	SCREW 1/2-20 X 1 SHCS
6	2	43489	BALL NYLON 1/8 DIA
7	1	53850	TOOL CARRIER BB7100
7.1	2	20166	PIN DOWEL 1/4 DIA X 1/2
7.2	4	28757	SCREW 3/4-16 X 2 SHCS
8	2	53904	STACK UP MOUNTING BLOCK BB7100
9	1	54134	ADJUSTABLE NUT AXIAL LEAD SCREW 1-5 ACME
10	4	54177	CLAMP SLIDE ARM BB7100
11	2	54179	SHOE ADJUSTABLE TOOL CARRIER BB7100
12	2	55307	SCREW 5/8-18 X 1.55 SSSFP MODIFIED
13	8	55564	SCREW ASSY 5/8-18 X 1-1/2 SSSFP WITH NYLON BALL TIP

53922 - TOOL CARRIER ASSY BB7100 - REV B

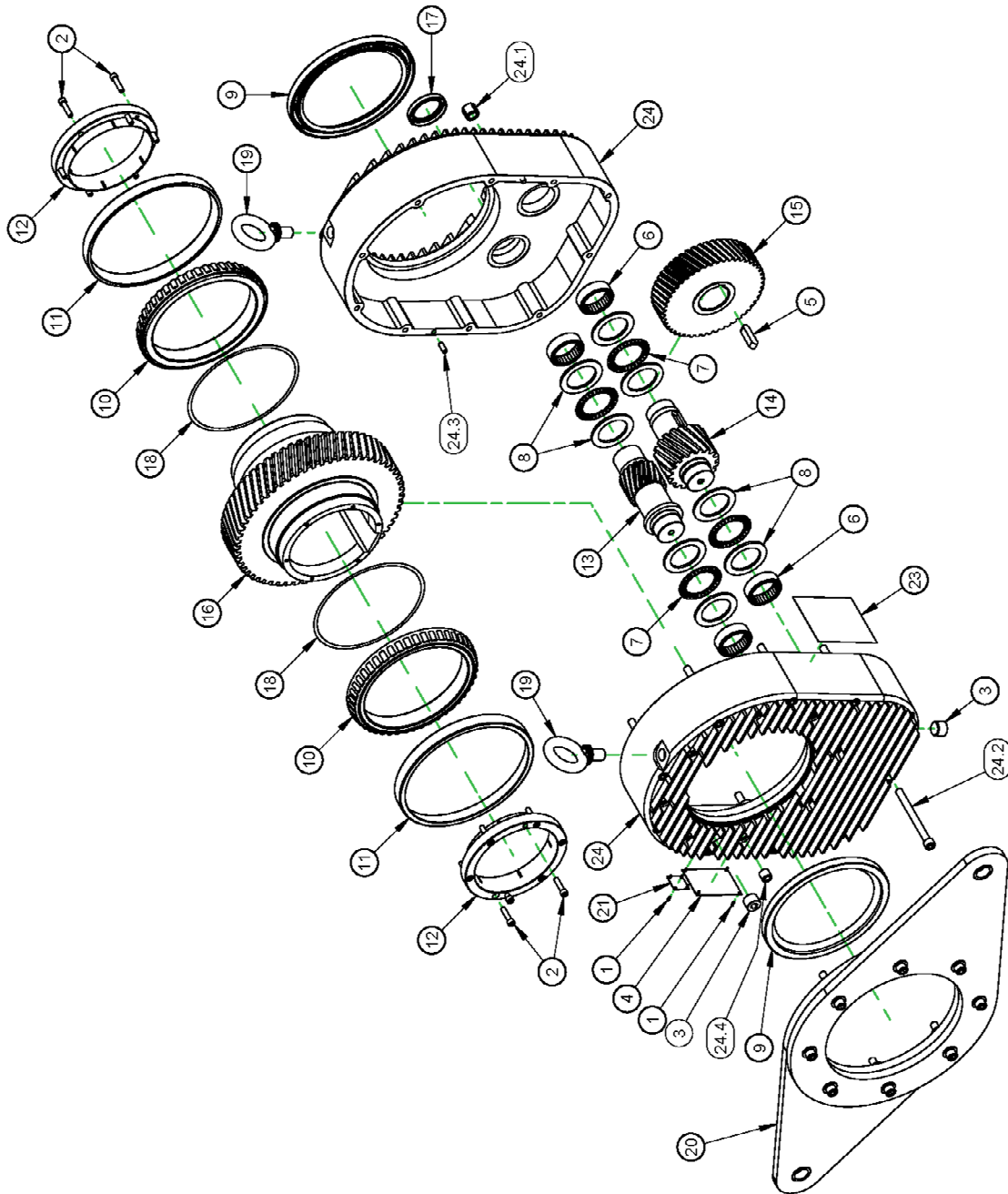
FOR REFERENCE ONLY



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

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

FOR REFERENCE ONLY



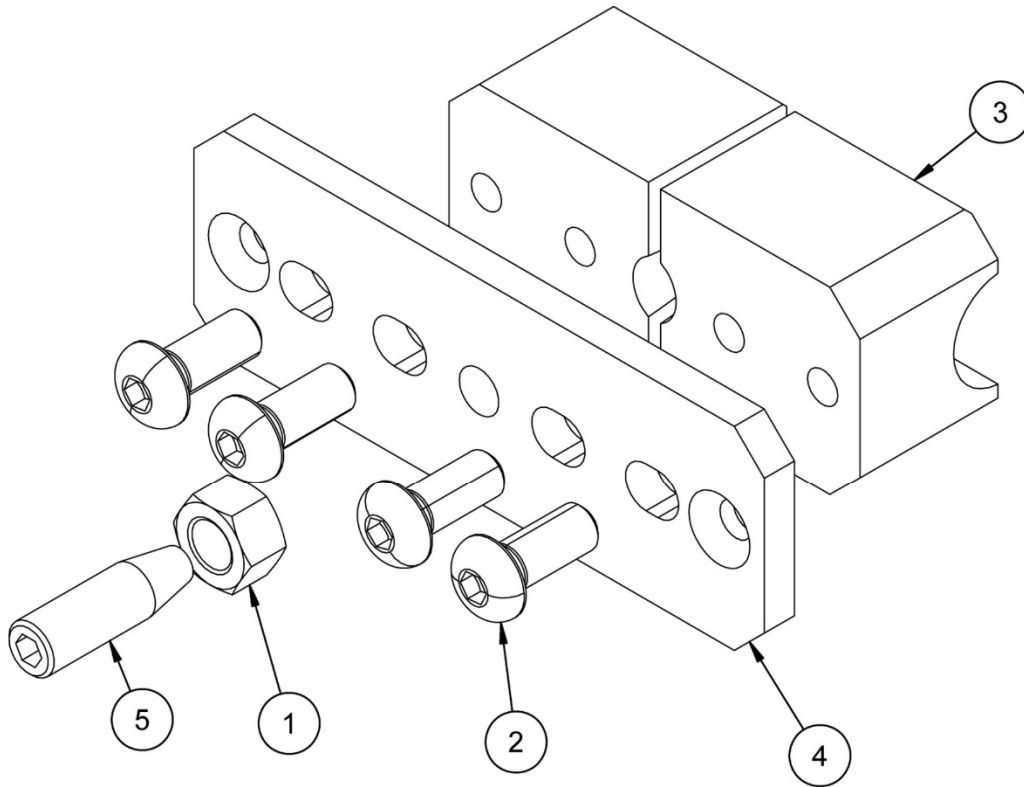
15606 - ASSY RDU 5 INCH BAR 10 59:1 BB7000 - REV A

REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	16	11118	SCREW 1/4-20 X 1 SHCS
3	2	12579	FTG PLUG 1/2 NPTM SOCKET
4	1	14684	PLATE SERIAL YEAR MODEL 2.0 X 3.0
5	1	15093	KEY 3/8 SQ X 1.50 RADIUS BOTH ENDS
6	4	15602	BRG NEEDLE 1-5/8 ID X 2 OD X .625 OPEN
7	4	15605	BRG THRUST 1.750 ID X 2.500 OD X .0781
8	8	15607	WASHER THRUST 1.750 ID X 2.500 OD X .123
9	2	15608	SEAL 6.000 ID x 7.500 OD x .500 CRWA1 DBL LIP
10	2	15621	BRG CONE 6.2500 ID X .9375 WIDE
11	2	15622	BRG CUP 8.0938 OD X .7188 WIDE
12	2	15624	LOCK RING BAR DRIVE
13	1	15672	DRIVE SHAFT ROTATIONAL DRIVE
14	1	15673	JACK SHAFT ROTATIONAL DRIVE
15	1	15679	JACK GEAR ROTATIONAL DRIVE
16	1	15680	GEAR BULL ROTATIONAL DRIVE
17	1	15768	SEAL 1.625 ID X 2.250 OD X .313
18	1	15784	SHIM SET
19	2	16174	EYE LIFTING 5/8 MODIFIED
20	1	19294	ARM TORQUE ASSY
21	1	29152	PLATE MASS CE
22	80	32569	(NOT SHOWN) OIL SYNTHETIC FOR CONE DRIVE MOBIL SHC 634
23	1	34735	LABEL WARNING 3-1/2 X 4
24	1	45463	HOUSING RDU BB7000 5 DIA BAR
24.1	2	15399	INSERT THREADED 1/2-13 KEENSERT
24.2	10	15743	SCREW 3/8-16 X 4 SHCS
24.3	2	15756	PIN DOWEL 1/4 DIA X 5/8
24.4	8	15778	INSERT THREADED KEY LOCKING 3/8-16 X 9/16-12 X .50

15606 - ASSY RDU 5 INCH BAR 10.59:1 BB7000 - REV A

FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	10536	NUT 3/8-24 STDN
2	4	14771	SCREW 5/16-18 X 3/4 BHSCS
3	2	54135	NUT AXIAL LEAD SCREW 1-5 ACME BB7100 MATCHED SET
4	1	54136	ADJUSTABLE HALFNUT BACK PLATE BB7100
5	1	54137	SCREW MODIFIED 3/8-24 SSS 10 DEG TAPER

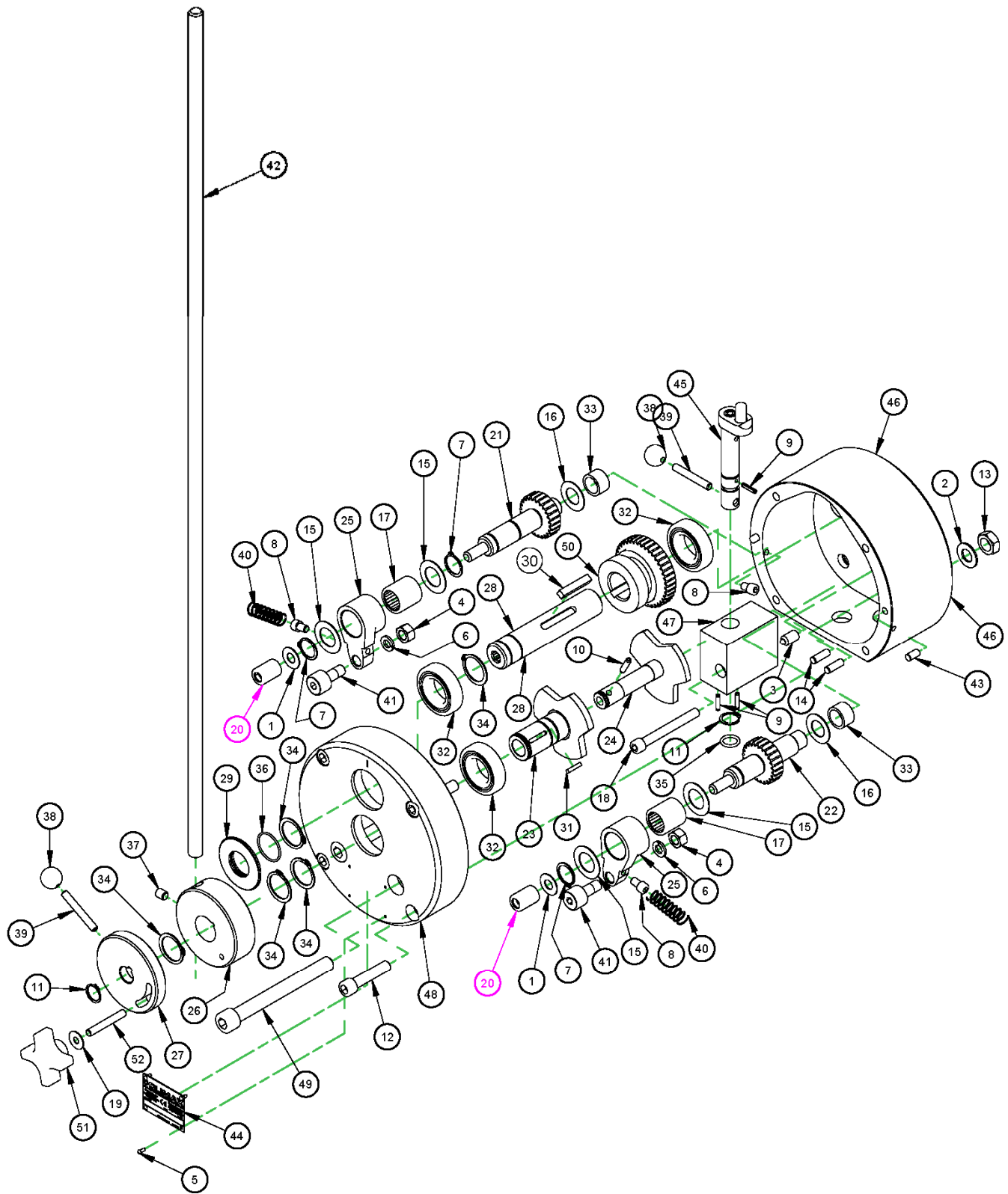
ADJUSTABLE NUT AXIAL LEAD SCREW 1-5 ACME

54134



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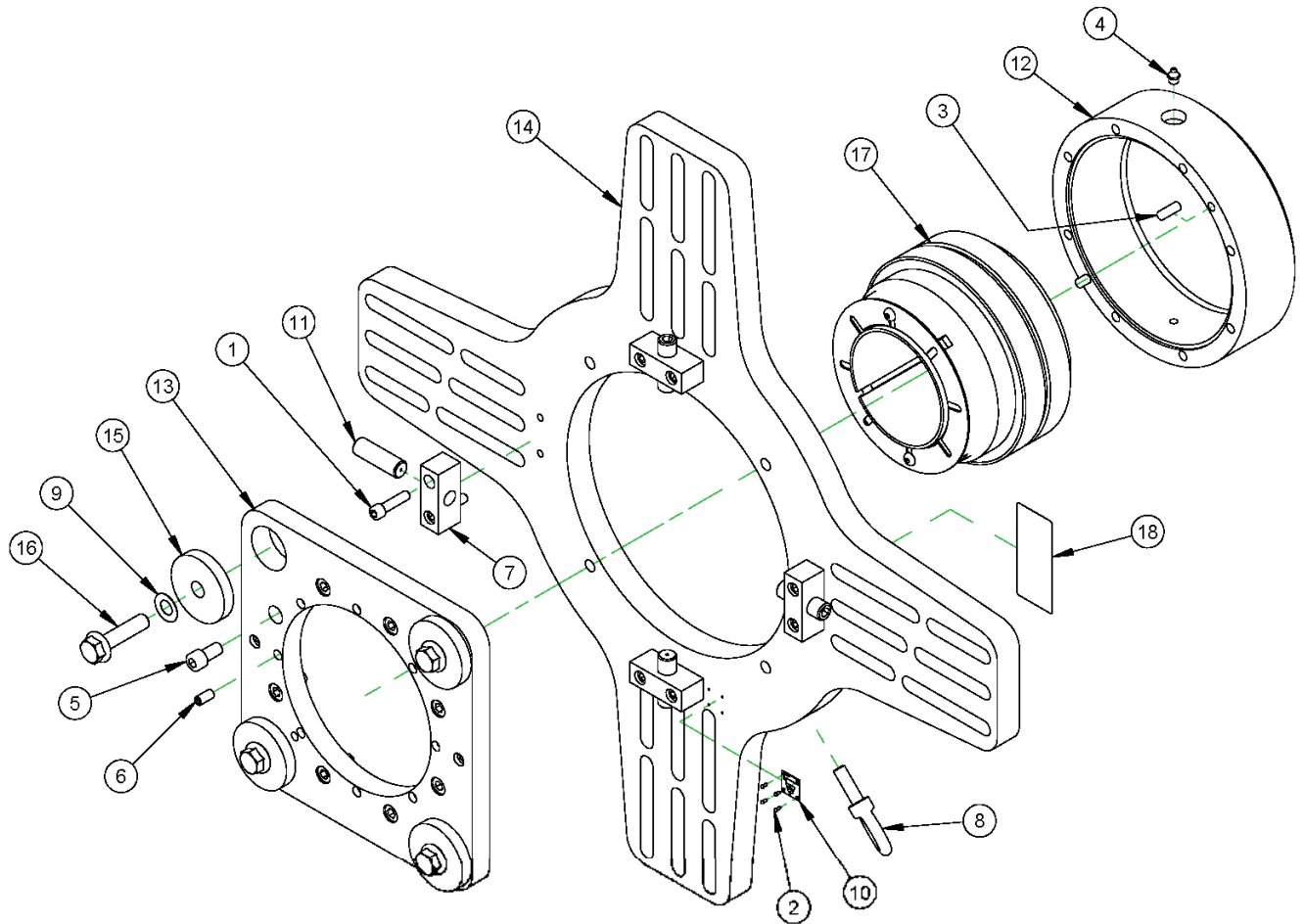
42407 - FEED AXIAL ASSY MECHANICAL BB7000 2ND GEN - REV C

FOR REFERENCE ONLY

PARTS LIST				PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION	ITEM	QTY	P/N:	DESCRIPTION
1	2	10058	WASHER THRUST .375 ID X .812 OD X .032	27	1	15717	PLATE FEED ADJUSTING
				28	1	15718	SHAFT FEED BB7000
2	2	10436	WASHER THRUST .500 ID X .937 OD X .060	29	1	15720	DIAL MANUAL FEED
				30	1	15724	KEY 1/4 SQ X 1.37 SQ BOTH ENDS
3	1	10441	SPRING PLUNGER 3/8-16 HEAVY FORCE	31	1	15725	KEY 1/8 SQ X .62 SQ
				32	3	15726	BRG BALL .9843 ID X 1.8504 OD X .4724 W/SEALS
4	2	10536	NUT 3/8-24 STDN				
5	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089	33	2	15728	BRG NEEDLE 5/8 ID X 13/16 OD X .500 CLOSED
6	2	10595	WASHER 3/8 LOCW				
7	3	10612	RING SNAP 3/4 OD	34	5	15729	RING SNAP 63/64 OD (25mm)
8	4	10670	SCREW 1/4-20 X 3/8 SHCS	35	1	15730	RING O 3/32 X 1/2 ID X 11/16 OD
9	3	10819	PIN ROLL 1/8 DIA X 5/8	36	1	15731	RING O 1/16 X 1 ID X 1-1/8 OD
10	1	10850	PIN ROLL 3/16 DIA X 3/4	37	1	15744	SCREW 5/16-18 X 3/8 SSSFP
11	2	11019	RING SNAP 5/8 OD X .035 THICK	38	2	15745	BALL 3/4 DIA BLACK PLASTIC X 1/4-20
12	4	11211	SCREW 3/8-16 X 1-3/4 SHCS	39	2	15746	STUD 1/4-20 X 1.75
13	2	11218	NUT 1/2-13 JAMN	40	2	15749	SPRING COMP .48 OD X .042 WIRE X 1.62 LONG
14	2	11729	PIN DOWEL 1/4 DIA X 3/4				
15	4	11739	WASHER THRUST .750 ID X 1.250 OD X .0312	41	2	15750	BRG CAM FOLLOWER .750 OD X .500 WIDE W/STUD
16	2	11823	WASHER THRUST .625 ID X 1.125 OD X .030	42	1	15754	ROD TRIP
				43	2	20166	PIN DOWEL 1/4 DIA X 1/2
17	2	12385	BRG ROLLER CLUTCH 3/4 ID X 1 OD X 1.000	44	1	35828	PLATE SERIAL YEAR MODEL CE 1.5 X 2.0
18	1	12578	SCREW 5/16-18 X 2-3/4 SHCS	45	1	42371	ASSY FEED SELECTOR
19	1	12629	WASHER THRUST .25 ID X .687 OD X .030	46	1	42374	BOX GEAR AXIAL FEED MECH 5 DIA STRAIGHT MNT
20	2	13492	BRG ROLLER CLUTCH 3/8 ID X 5/8 OD X .875	47	1	42375	BLOCK FEED SELECTOR
				48	1	42376	COVER AXIAL FEED
21	1	15707	SHAFT AXIAL FEED INWARD	49	2	42385	SCREW 1/2-13 X 4-3/4 SHCS
22	1	15708	SHAFT AXIAL FEED OUTWARD	50	1	42406	GEAR DRIVE
23	1	15710	CAM STATIONARY	51	1	59333	KNOB 4 LOBE 1/4-20 THREADED 2.0 DIA X 1.02 HIGH STAINLESS
24	1	15711	CAM ADJUSTABLE				
25	2	15713	ROCKER FEED	52	1	59336	STUD THREADED 1/4-20 X 1-3/4 GRADE B7
26	1	15716	HOLDER TORQUE ARM				

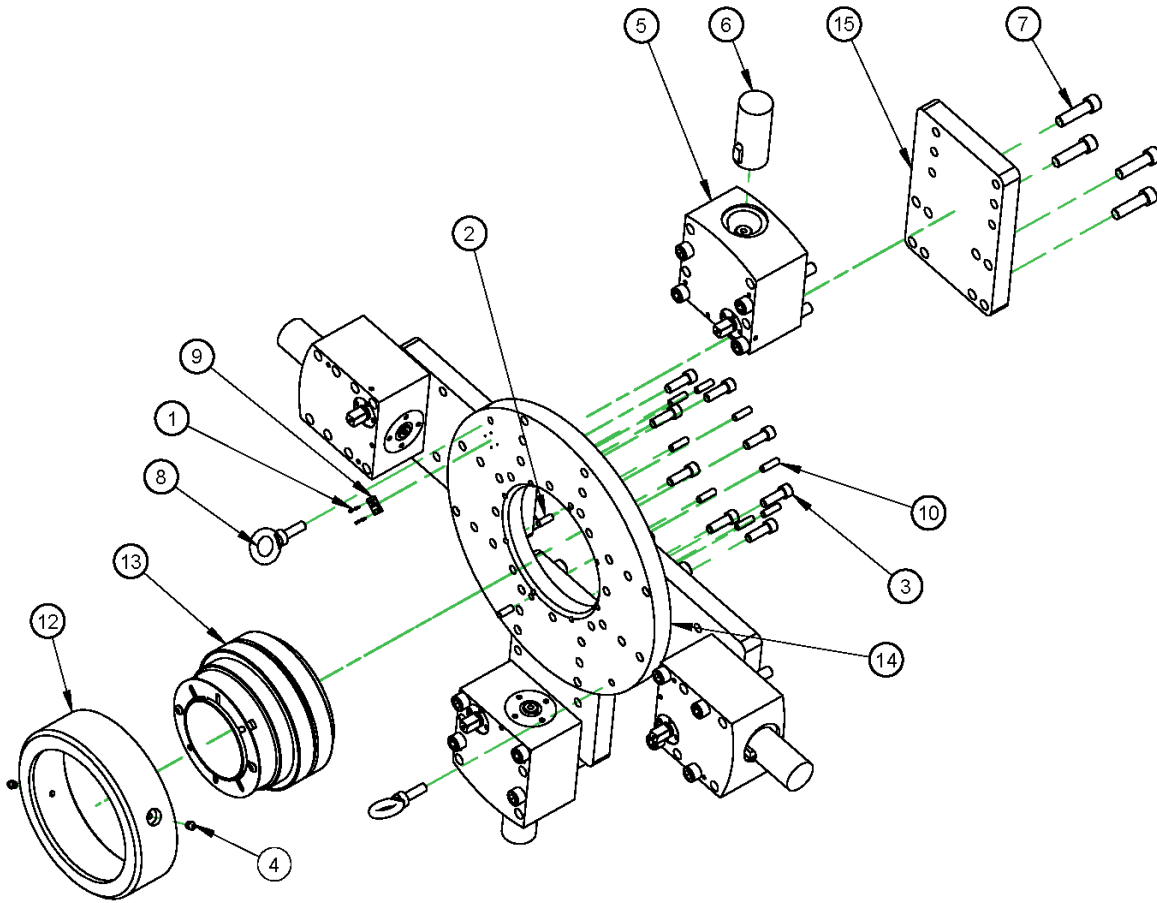
42407 - FEED AXIAL ASSY MECHANICAL BB7000 2ND GEN - REV C

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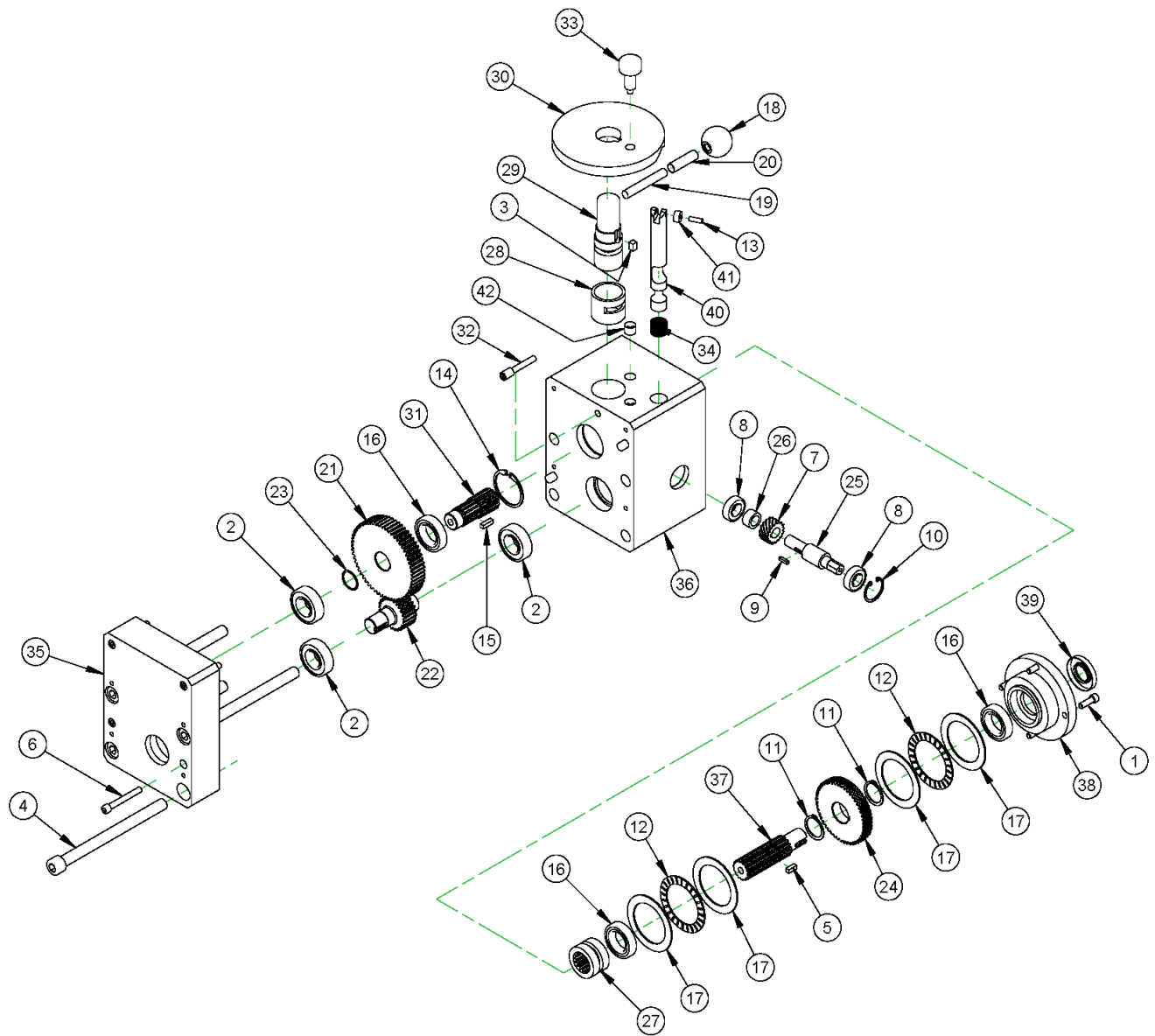
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10474	SCREW 3/8-16 X 1-1/2 SHCS
2	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	2	11027	PIN DOWEL 3/8 DIA X 1
4	2	11898	FTG GREASE 1/8 NPTM
5	8	15307	SCREW 1/2-13 X 1 SHCS
6	8	15322	SCREW 3/8-24 X 3/4 SSSFP
7	4	20956	BLOCK ADJUSTING
8	1	25211	EYE LIFTING 1/2-13
9	4	27172	WASHER SPRING BELLEVILLE 5/8 X 1-1/4 X .040
10	1	29152	PLATE MASS CE
11	4	42212	SCREW MOD SSSCP 3/4-10 UNC X 2.5
12	1	53683	BEARING HOUSING 5" BAR
13	1	53687	COVER BRG 5" HOUSING EXTERNAL
14	1	53708	SPIDER END BRG SUPPORT 5" BAR DIA
15	4	54239	WASHER 5/8 FLTW .7 ID 3.0 OD .5 THICK
16	4	54796	SCREW 5/8-11 X 2-1/2 HHCS FLANGED BLK OX
17	1	55493	BRG INSERT BB7000 MOD
18	1	66767	LABEL LARGE BORING BAR CRUSH HAZARD
19	1	73368	(NOT SHOWN) CRATE 30 X 30 X 8-5/8 PLY HINGED WITH INSERT

53711 - SPIDER ASSY END BRG SUPPORT 34.5" BB7100 - REV B
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	11027	PIN DOWEL 3/8 DIA X 1
3	8	11691	SCREW 1/2-13 X 1-1/2 SHCS
4	2	11898	FTG GREASE 1/8 NPTM
5	4	17438	BLOCK CENTERING ASSY, 5/8-18 SCREW
6	4	17448	JAW 4.62 IN ID BRG MOUNT BB8000 WITH KEY
7	16	19610	SCREW 5/8-18 X 2-1/4 SHCS
8	2	25211	EYE LIFTING 1/2-13
9	1	29152	PLATE MASS CE
10	8	32284	SCREW 3/8-24 X 1.25 SSSFP
11	1	41708	(NOT SHOWN) CRATE 36.5 X 36.5 X 17 BB7000 5/8 PLY HINGED
12	1	53683	BEARING HOUSING 5" BAR
13	1	55493	BRG INSERT BB7000 MOD
14	1	74562	SPIDER ID 19 TO 45 DIA BB7100
15	4	74563	SPIDER EXTENSION PLATE

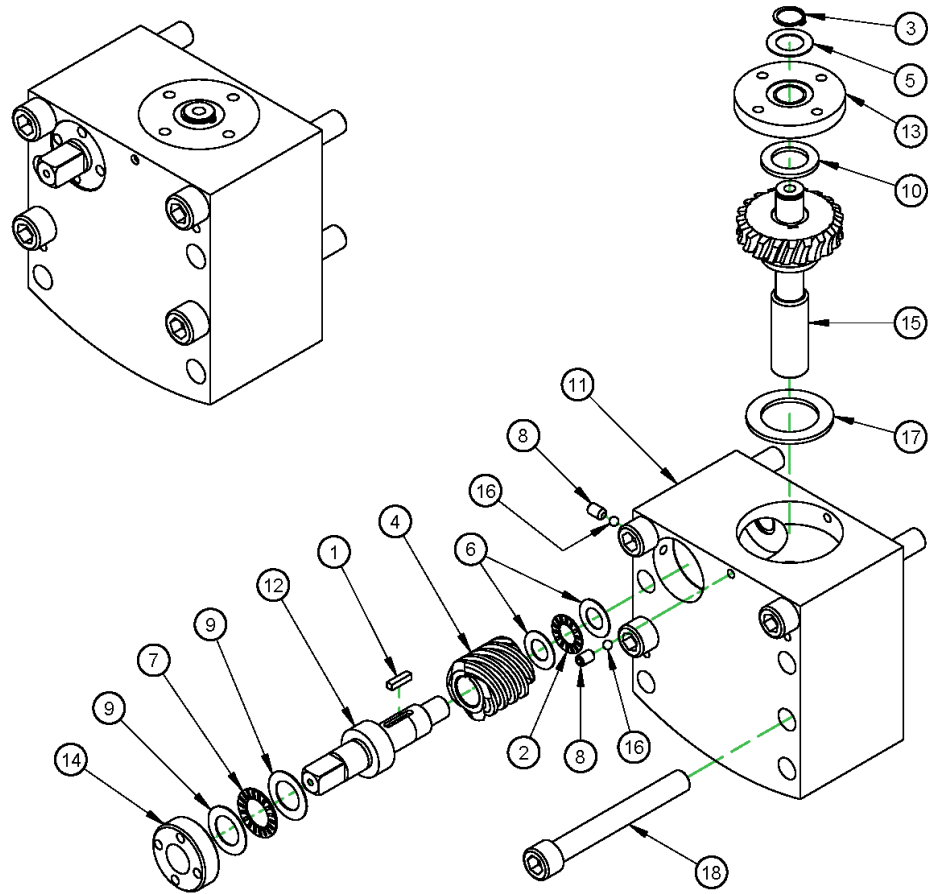
54302 - MOUNT ID BRG ASSY FACE ADJUST 19-45 ID 5 BAR - REV A
FOR REFERENCE ONLY



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

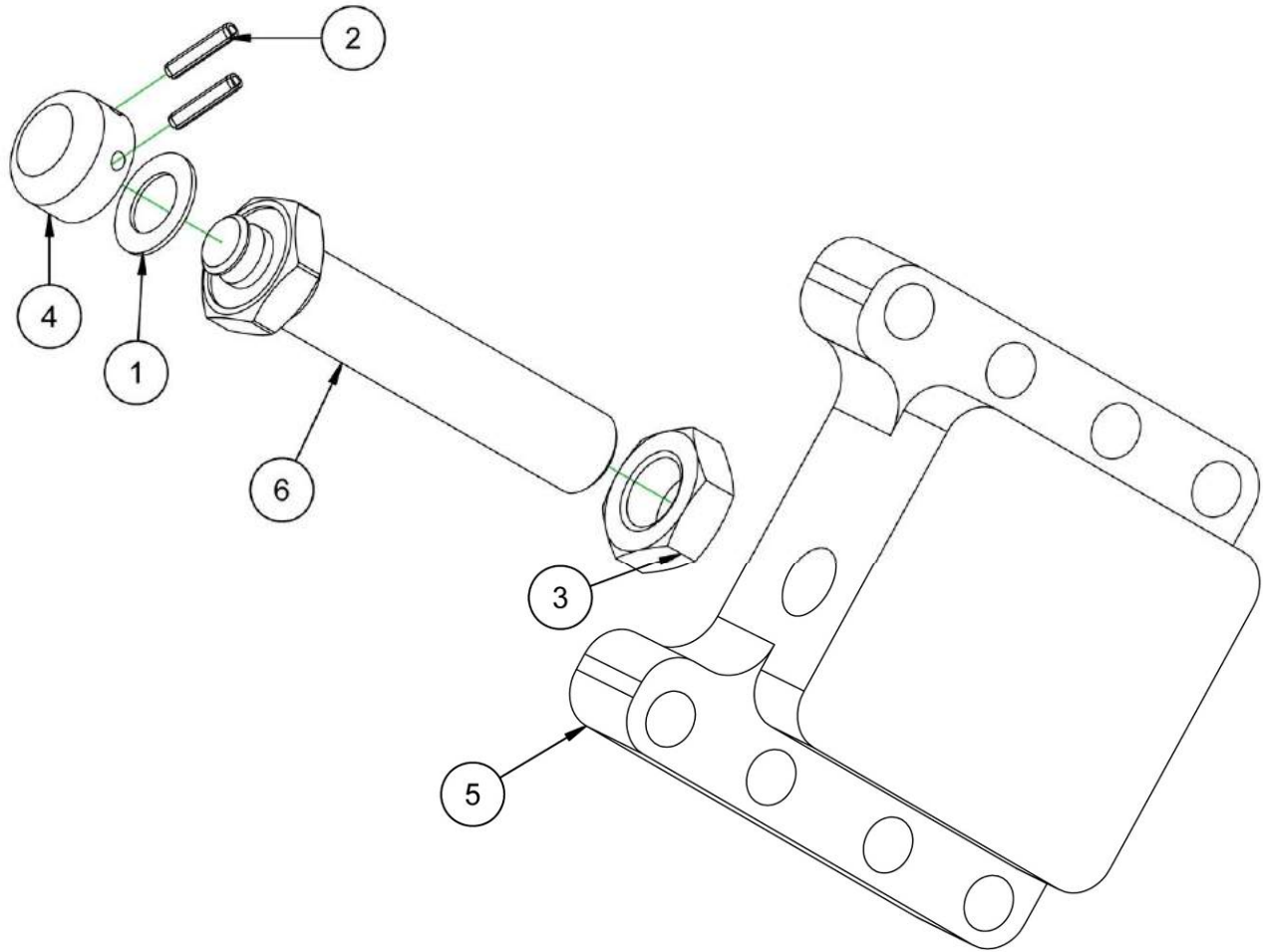
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10160	SCREW 1/4-20 X 3/4 SHCS
2	3	10807	BRG BALL .7874 ID X 1.6535 OD X .4724 W/SEALS
3	1	10854	KEY 1/4 SQ X .37 SQ BOTH ENDS
4	4	11695	SCREW 1/2-13 X 6-1/2 SHCS
5	1	12361	KEY 3/16 SQ X .50 SQ BOTH ENDS
6	4	12444	SCREW 1/4-20 X 2 SHCS
7	1	12881	GEAR HELICAL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

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



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10217	KEY 3/16 SQ X .75 SQ BOTH ENDS
2	1	10538	BRG THRUST .625 ID X 1.125 OD X .0781
3	1	10612	RING SNAP 3/4 OD
4	1	10858	WORM 3DP QUAD RH 1.75 14.5PA STEEL HARDENED
5	1	11739	WASHER THRUST .750 ID X 1.250 OD X .0312
6	2	11823	WASHER THRUST .625 ID X 1.125 OD X .030
7	1	13174	BRG THRUST .875 ID X 1.437 OD X .0781
8	2	13515	SCREW 5/16-18 X 1/2 SSSCP
9	2	14274	WASHER THRUST .875 ID X 1.437 OD X .030
10	1	17007	WASHER THRUST 1.000 ID X 1.562 OD X .123
11	1	17439	BLOCK CENTERING
12	1	17447	SHAFT CRANK
13	1	17507	NUT WORM GEAR
14	1	17508	NUT - WORM
15	1	17520	JACKING SCREW ASSEMBLY BB8000
16	2	19225	BALL NYLON 1/4 DIA
17	1	21053	WASHER THRUST
18	4	63416	SCREW 5/8-18 X 5 SHCS

17438 - BLOCK CENTERING ASSY, 5/8-18 SCREW - REV A
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	10136	WASHER THRUST .750 ID X 1.25 X .060
2	2	12959	PIN ROLL Ø3/16 X 1
3	1	15128	NUT 1-8 JAMN
4	1	50528	CAP JAW SCREW FF6100
5	1	54307	BLOCK CENTERING JACK BOLT BB7100 & BB8100
6	1	54308	JACK BOLT ID MOUNT BB7100 & BB8100

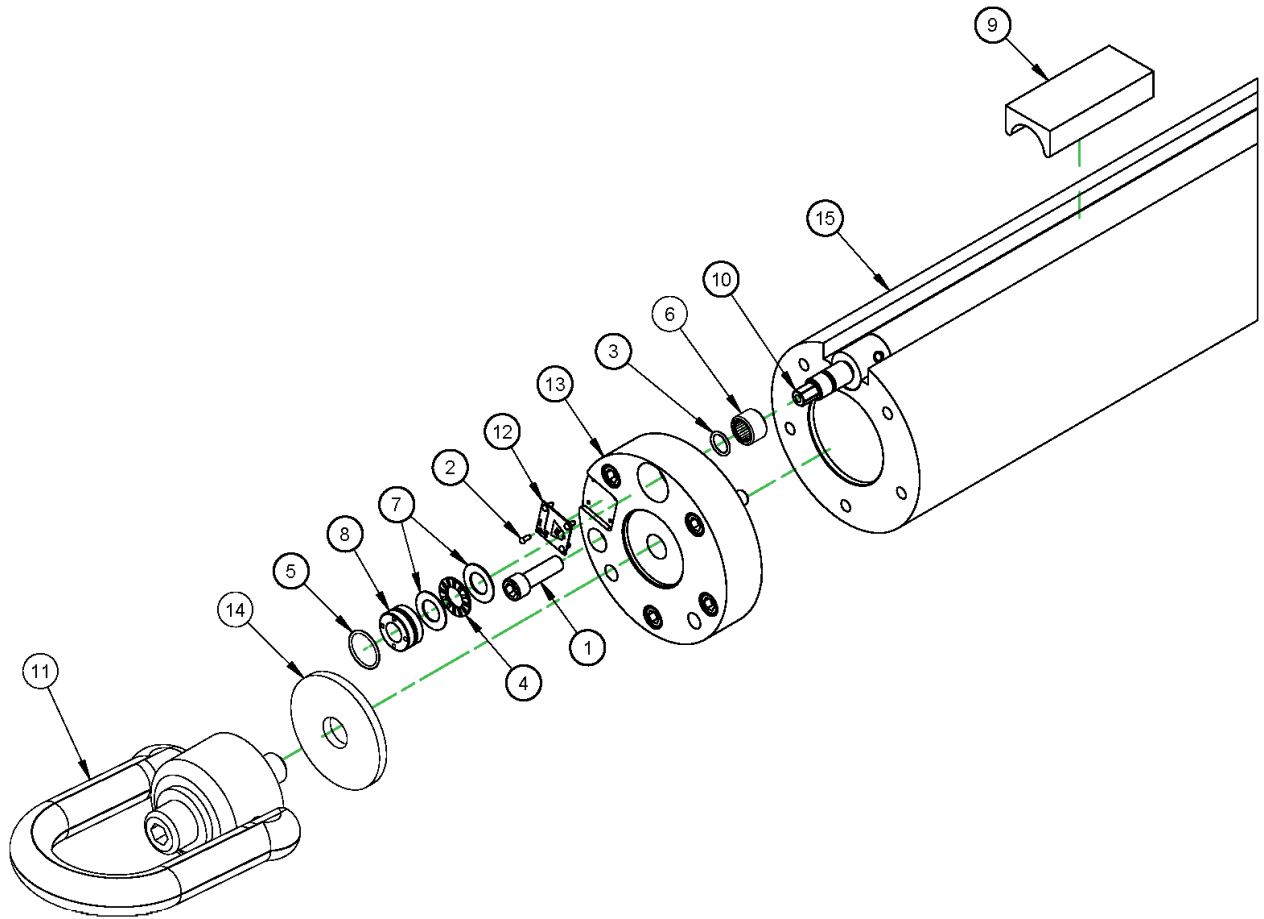
BLOCK CENTERING ASSY JACK BOLT BB7100 & BB8100

54306



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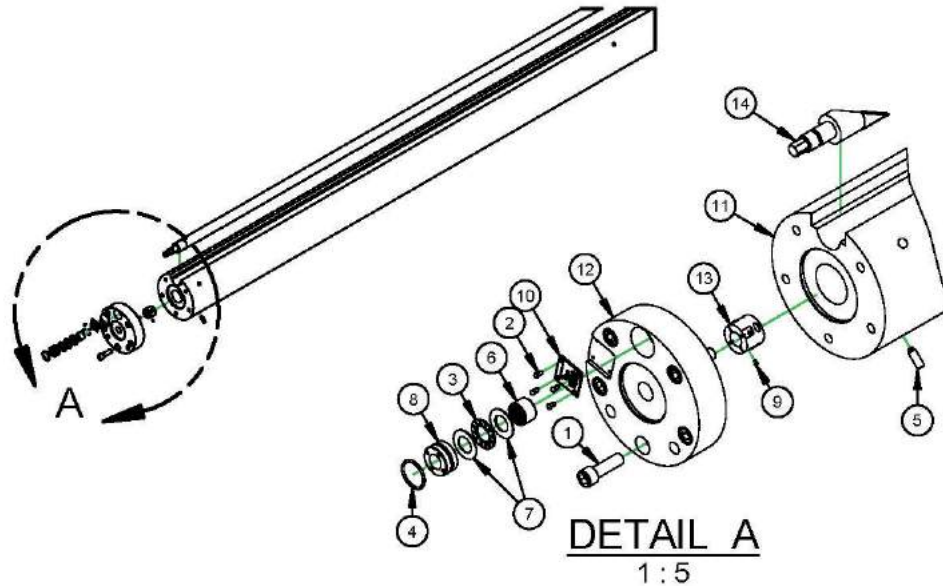


81629 - CHART BAR BORING ASSY 5 DIA PILOT MOUNT - REV A
FOR REFERENCE ONLY

AVAILABLE CONFIGURATIONS	
PART NUMBER	DESCRIPTION
45211	BAR BORING ASSY 5 DIA X 96 PILOT MOUNT
45039	BAR BORING ASSY 5 DIA X 120 PILOT MOUNT
45036	BAR BORING ASSY 5 DIA X 144 PILOT MOUNT
45037	BAR BORING ASSY 5 DIA X 168 PILOT MOUNT
45038	BAR BORING ASSY 5 DIA X 192 PILOT MOUNT
45287	BAR BORING ASSY 5 DIA X 216 PILOT MOUNT
44814	BAR BORING ASSY 5 DIA X 240 PILOT MOUNT

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	10	10453	SCREW 3/8-16 X 1 1/4 SHCS
2	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	2	10840	RING O 1/16 X 1/2 ID X 5/8 OD (VMI)
4	2	12446	BRG THRUST .562 ID X 1.000 OD X .0781
5	2	12447	RING O 1/16 X 7/8 ID X 1 OD
6	2	15172	BRG NEEDLE 9/16 ID X 3/4 OD X .500 OPEN
7	4	15173	WASHER THRUST .562 ID X 1.000 OD X .030
8	2	15549	NUT LEADSCREW BRG ADJ 1 DIA
9	1	15555	KEY BAR DRIVE
10	1	23689	LEADSCREW ASSY 5 & 6 DIA X 8 FT BORING BAR
		23691	LEADSCREW ASSY 5 & 6 DIA X 10 FT BORING BAR
		23692	LEADSCREW ASSY 5 & 6 DIA X 12 FT BORING BAR
		23693	LEADSCREW ASSY 5 & 6 DIA X 14 FT BORING BAR
		23694	LEADSCREW ASSY 5 & 6 DIA X 16 FT BORING BAR
		23695	LEADSCREW ASSY 5 & 6 DIA X 18 FT BORING BAR
		23696	LEADSCREW ASSY 5 & 6 DIA X 20 FT BORING BAR
11	2	23743	RING HOIST SAFETY HEAVY-DUTY 7000 LB
12	2	29152	PLATE MASS CE
13	2	42389	END CAP 5 DIA BB7000
14	2	44491	WASHER 3/4 ID X 3 OD X .234
15	1	45123	BAR BORING 5 DIA X 96 PILOT MOUNT
		44918	BAR BORING 5 DIA X 120 PILOT MOUNT
		45436	BAR BORING 5 DIA X 144 PILOT MOUNT
		45437	BAR BORING 5 DIA X 168 PILOT MOUNT
		45439	BAR BORING 5 DIA X 192 PILOT MOUNT
		45440	BAR BORING 5 DIA X 216 PILOT MOUNT
		44816	BAR BORING 5 DIA X 240 PILOT MOUNT

45036 - BAR BORING ASSY 5 DIA PILOT MOUNT - REV A
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	10	10453	SCREW 3/8-16 X 1 1/4 SHCS
2	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	2	12446	BRG THRUST .562 ID X 1.000 OD X .0781
4	2	12447	RING O 1/16 X 7/8 ID X 1 OD
5	12	12734	SCREW 1/4-28 X 3/4 SSSHD
6	2	15172	BRG NEEDLE 9/16 ID X 3/4 OD X .500 OPEN
7	4	15173	WASHER THRUST .562 ID X 1.000 OD X .030
8	2	15549	NUT LEADSCREW BRG ADJ 1 DIA
9	12	21457	SCREW 1-64 X 1/8 BHSCS
10	1	29152	PLATE MASS TAG
11	1	VARIES	BAR BORING 5" DIA X ?" W/ BORE FOR OPTICS
12	2	42389	END CAP 5 DIA BB7000
13	3	42390	TARGET ALIGNMENT 1.0 OD
14	1	VARIES	LEADSCREW ASSY 5 DIA X ?" BORING BAR

AVAILABLE BORING BAR ASSEMBLIES W/OPTICS							
PART No.	DESCRIPTION	BAR P/N	LEADSCREW	PART No.	DESCRIPTION	BAR P/N	LEADSCREW
54579	5 DIA X 96 (2.5 m)	54726	23689	54582	5 DIA X 192 (4.9 m)	54728	23694
42317	5 DIA X 120 (3 m)	42080	23691	54583	5 DIA X 216 (5.5 m)	54729	23695
54580	5 DIA X 144 (3.7 m)	54370	23692	54584	5 DIA X 240 (6 m)	54371	23696
49123	5 DIA X 157.5 (4 m)	49117	49121	42318	5 DIA X 275 (7 m)	42082	42437
54581	5 DIA X 168 (4.3 m)	54727	23693	49124	5 DIA X 315 (8 m)	49118	49122

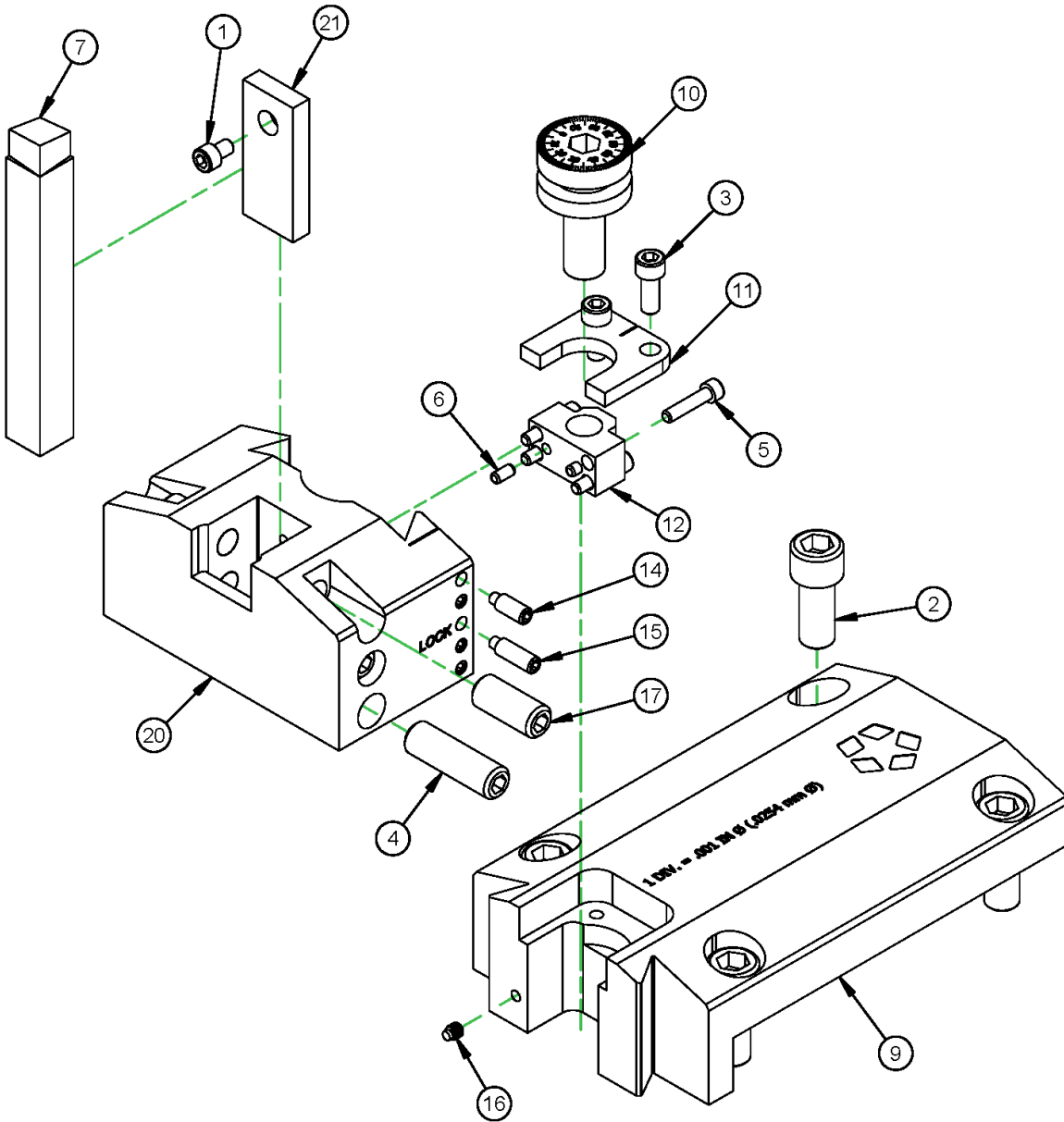
5" DIAMETER BORING BARS W/OPTICS

42318



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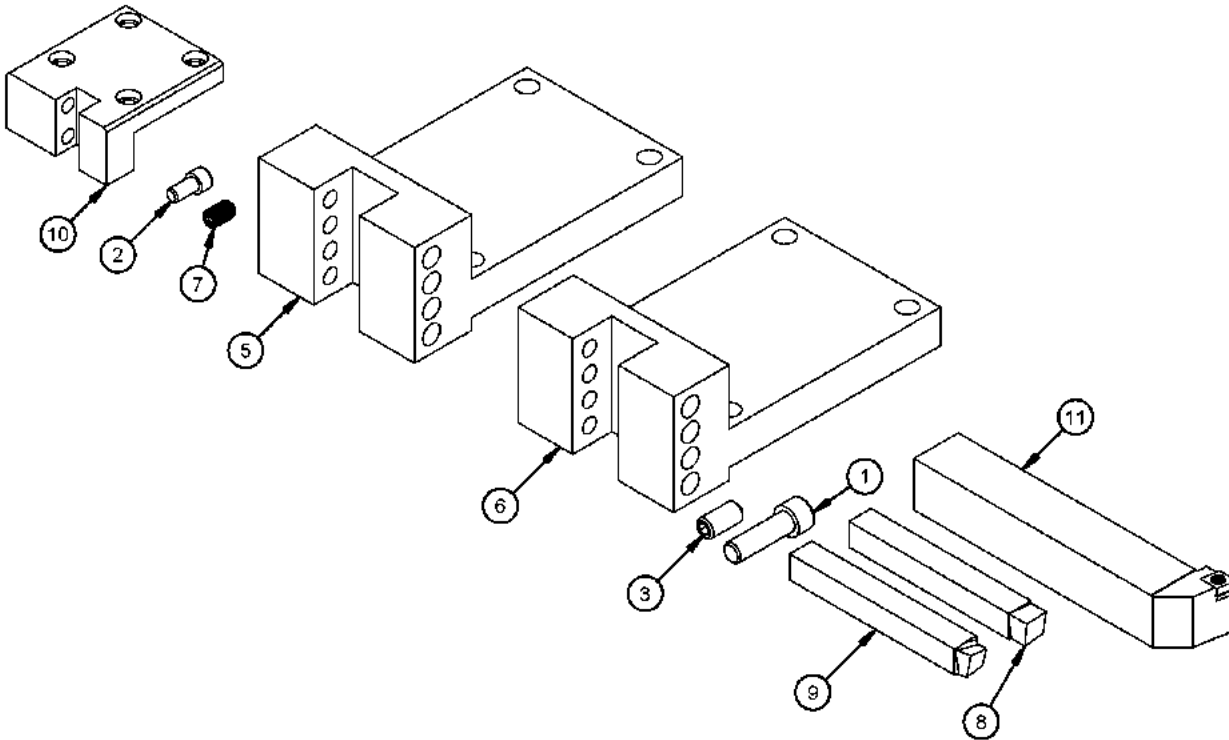


79325 - BORING HEAD MICRO ADJUST LARGE BB

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

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

79325 - BORING HEAD MICRO ADJUST LARGE BB



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	8	10453	SCREW 3/8-16 X 1 1/4 SHCS
2	4	10800	SCREW 1/4-20 X 1/2 SHCS
3	16	11734	SCREW 3/8-16 X 3/4 SSSCP
5	1	23090	HOLDER TOOL 1 IN. SQUARE LEAD
6	1	23091	HOLDER TOOL 1 IN. SQUARE FOLLOW
7	2	25150	SCREW 5/16-24 X 1/2 SSSFP
8	1	31859	BIT TOOL HSS 1/2 X 4.0 LH FINISHING SINGLE
9	1	31868	BIT TOOL HSS 1/2 X 4.0 LH ROUGHING SINGLE
10	1	54328	1/2" TOOL HOLDER FOR BB6100 & BB7100 BORING SET
11	2	79479	HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON LEFT HAND
		79480	HOLDER INSERT CARBIDE 1 SQ SHANK SCREW ON RIGHT HAND
NS	10	79484	INSERT CARBIDE 80 DEG 3/8 IC 1/32 NOSE RADIUS CCGT-3252

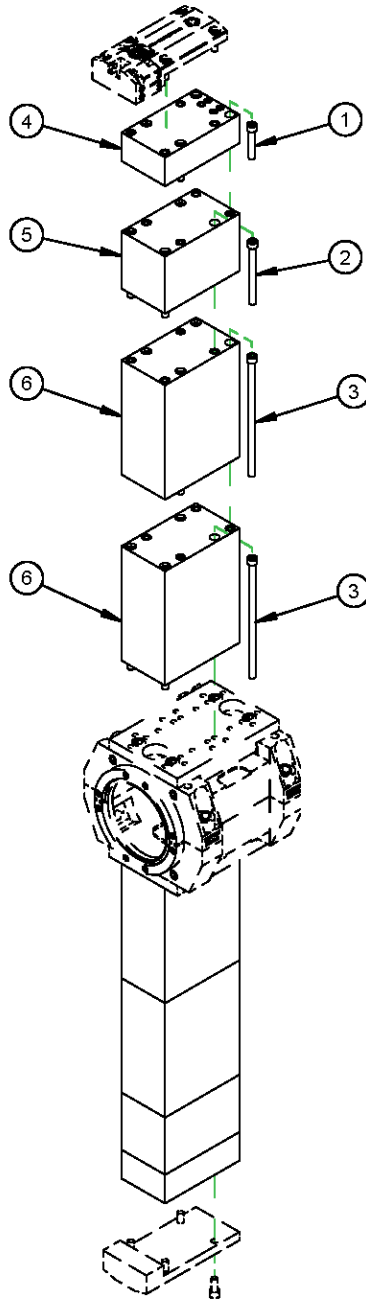
BORING HEAD SOLID TOOLING LEADING AND TRAILING FOR LARGE BB

81246



CLIMAX Portable Machine Tools, Inc. ©
Newberg, OR USA 97132

WWW.CPMT.COM inside U.S. 1-800-333-8311

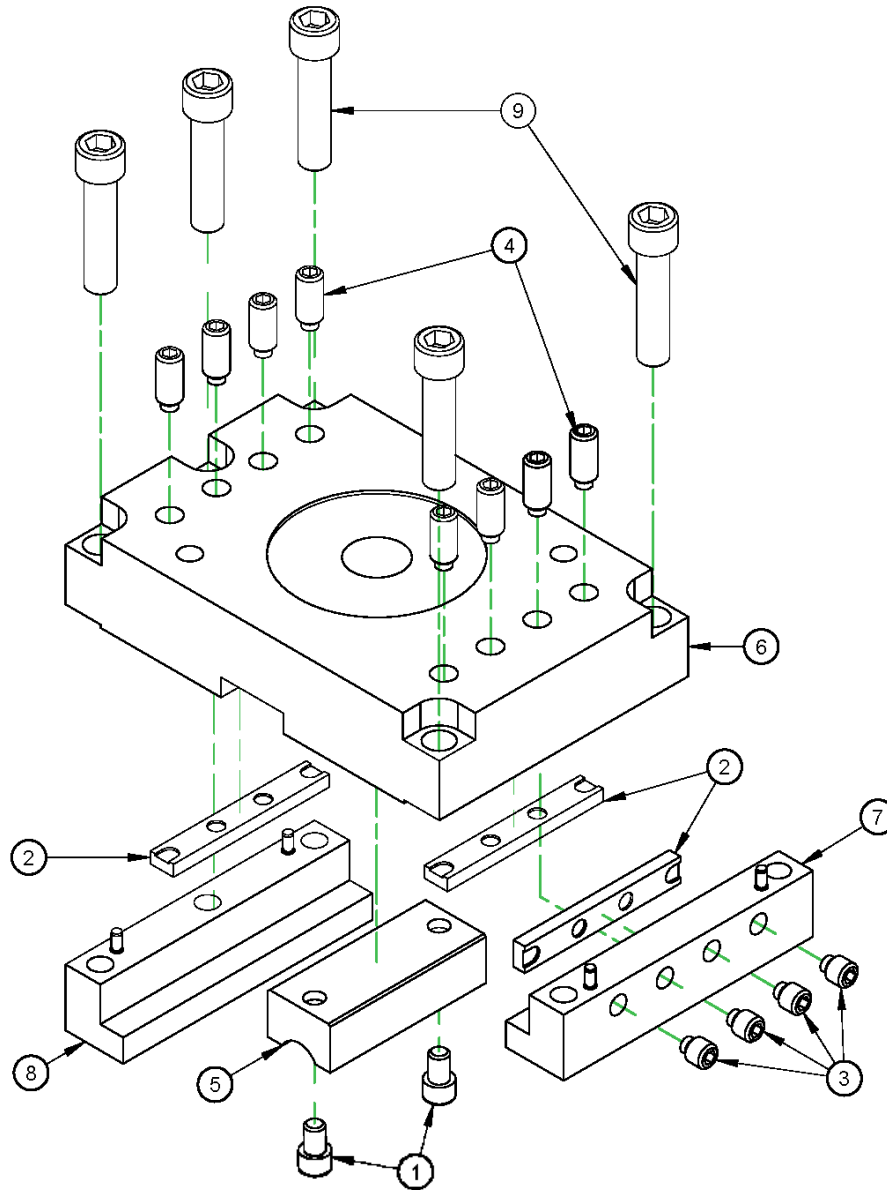


81252 - BORING DIAMETER RANGE 10.25-58.25 STACK UP BLOCKS BB7100

AVAILABLE CONFIGURATIONS	
P/N:	DESCRIPTION
81251	BORING DIAMETER RANGE 10.25-26.25 STACK UP BLOCKS BB7100
81252	BORING DIAMETER RANGE 10.25-58.25 STACK UP BLOCKS BB7100

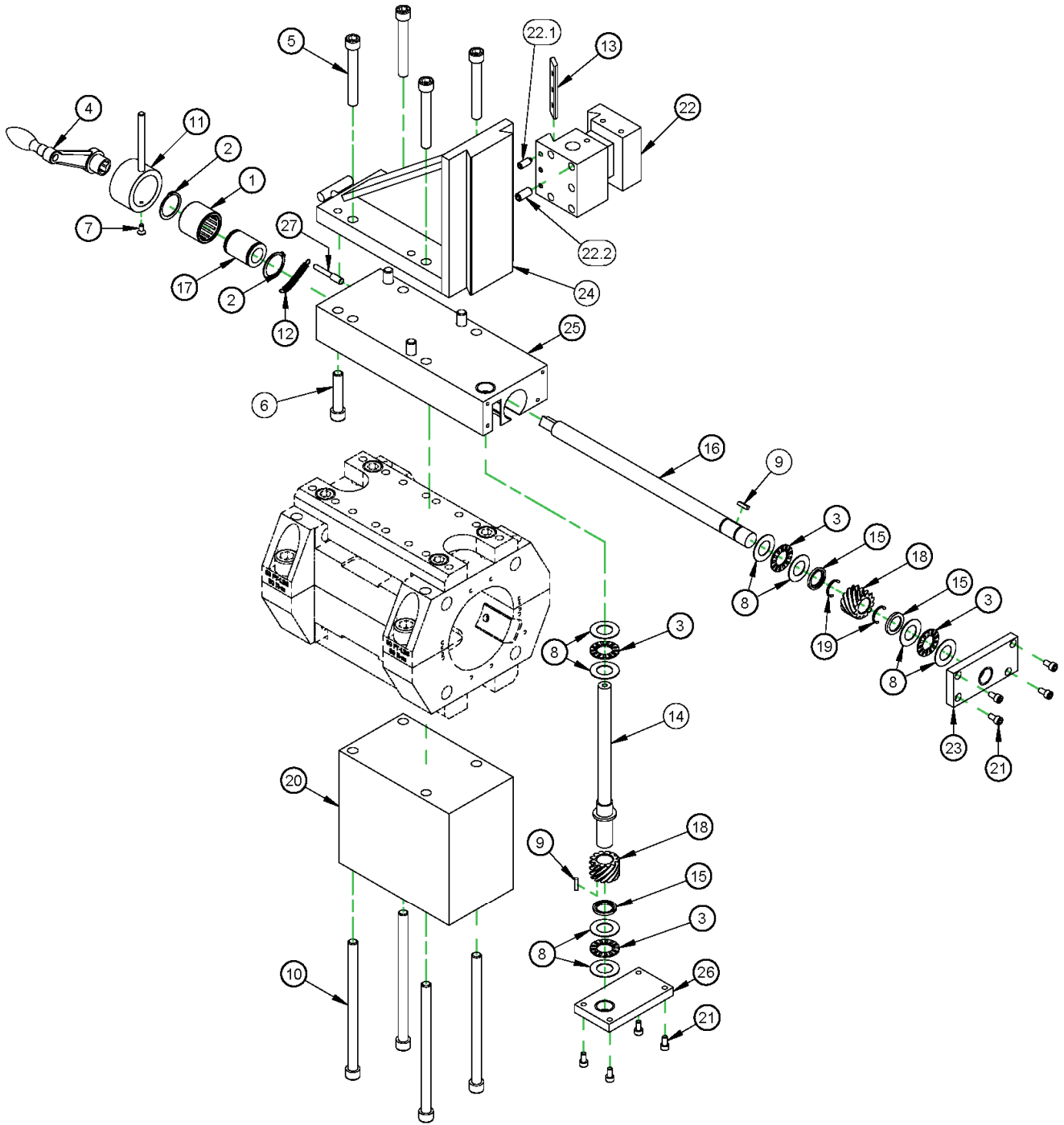
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10557	SCREW 3/8-16 X 2 SHCS
2	8	15743	SCREW 3/8-16 X 4 SHCS
3	16	20884	SCREW 3/8-16 X 8 SHCS
4	2	22760	SPACER 2.0 IN FOR BORING SET BB6100 & BB7100
5	2	79011	SPACER 4.0 IN FOR BORING SET BB6100 & BB7100
6	4	79012	SPACER 8.0 IN FOR BORING SET BB6100 & BB7100

81252 - BORING DIAMETER RANGE 10.25-58.25 STACK UP BLOCKS BB7100



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10670	SCREW 1/4-20 X 3/8 SHCS
2	3	49639	GIB TOOL CARRIER
3	4	53878	SCREW 5/16-24 X 3/8 SSSDPPL
4	8	53880	SCREW 5/16-24 X 1 SSSDPPL
5	1	54178	NUT HALF FACING HEAD BB7100
6	1	54192	FACING ARM CARRIER MOUNTING DECK BB7100
7	1	54195	KEEPER SLIDE ARM CARRIAGE GIB SIDE
8	1	57054	KEEPER SLIDE ARM CARRIAGE NON-GIB SIDE
9	5	81634	SCREW 3/8-16 X 1-5/8 SHCS

54193 - FACING CARRIER ASSY SLIDE ARM - REV A
FOR REFERENCE ONLY

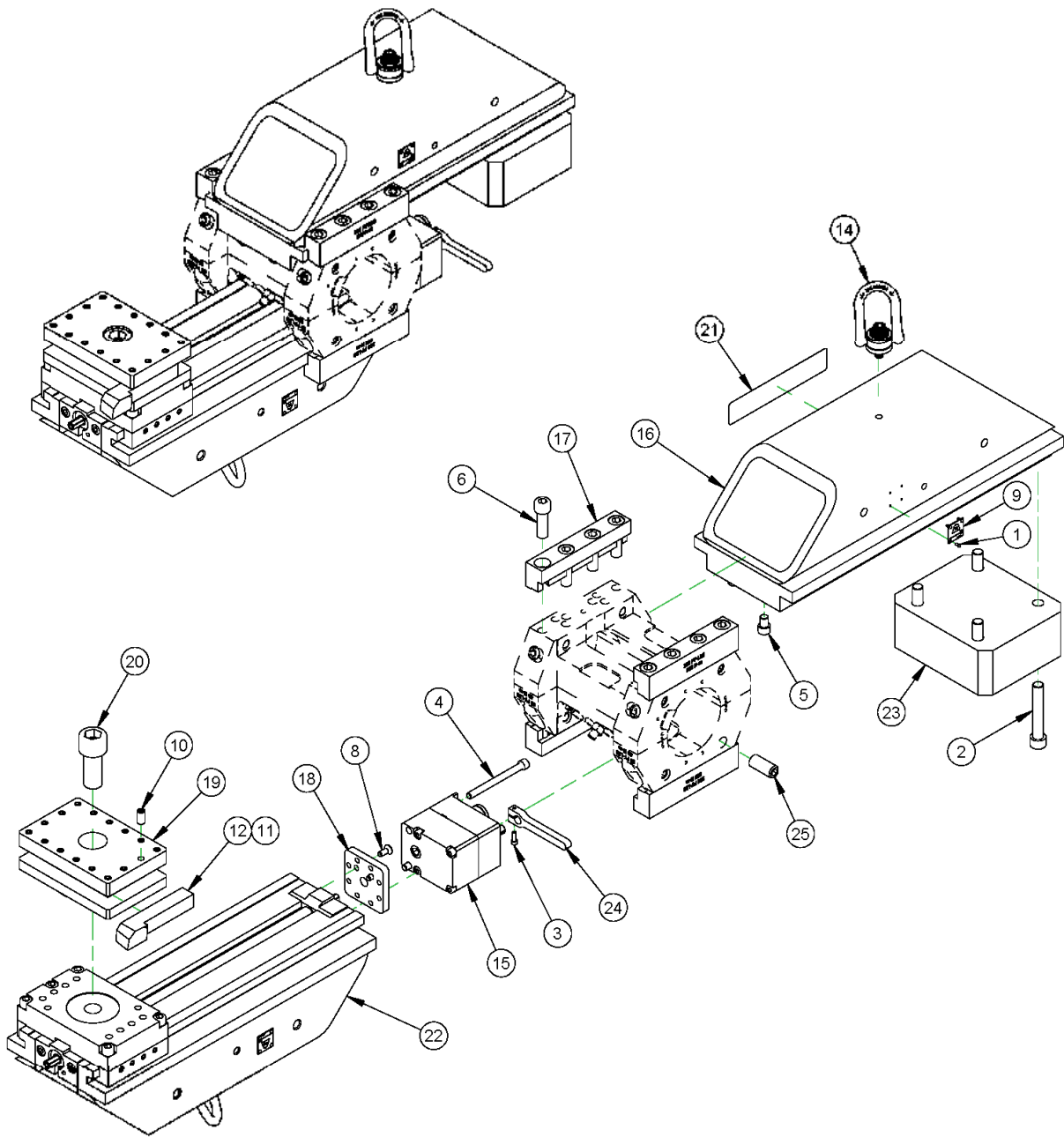


75682 - CHART FACING HEAD 4 THRU 8 INCH TRAVEL BB6 BB7 - REV A
FOR REFERENCE ONLY

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

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

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

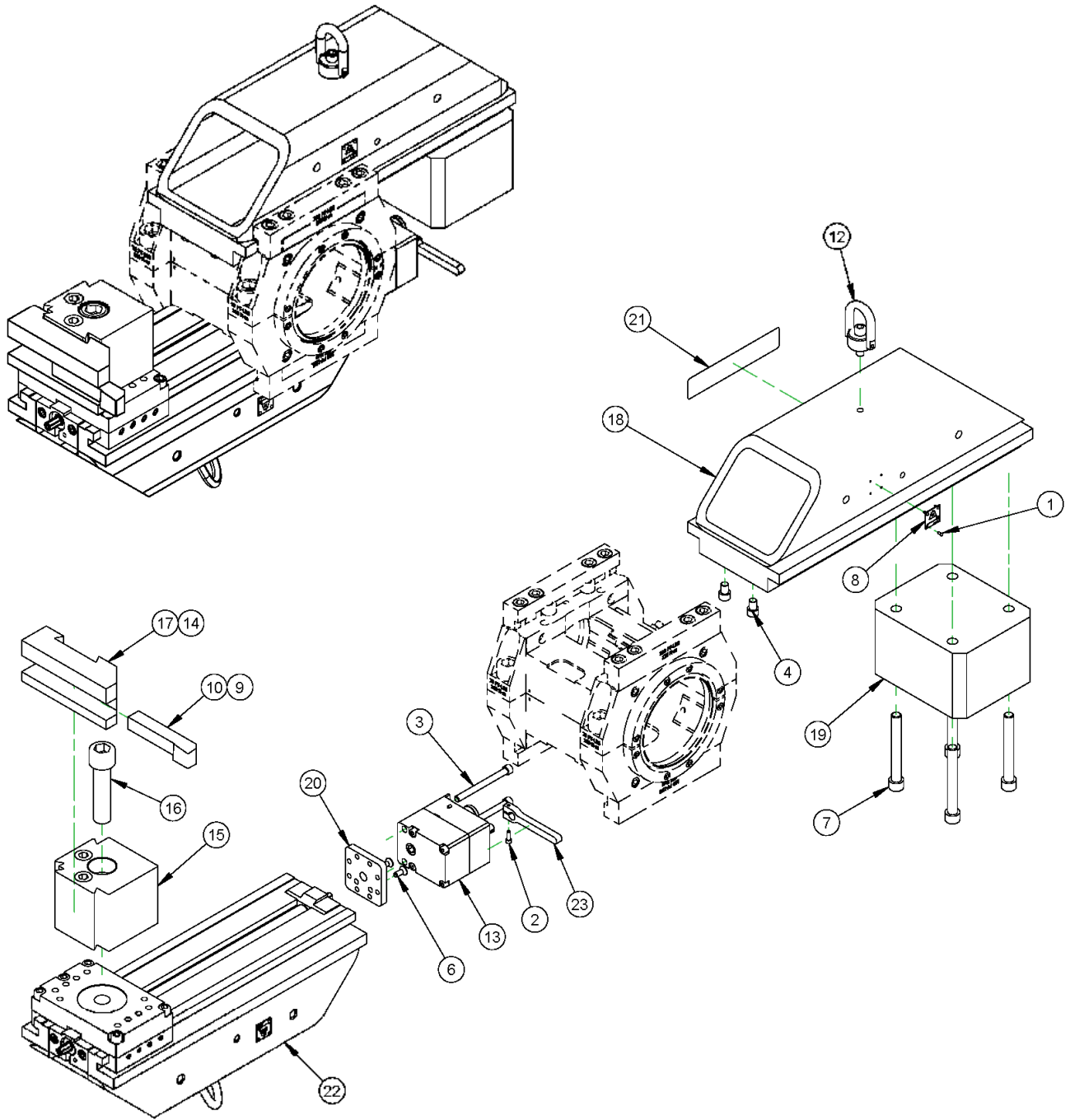


AVAILABLE CONFIGURATIONS	
PART No.	DESCRIPTION
54385	BORING/FACING SLIDE ARM SET 18" BB6100 (SHOWN)
54386	BORING/FACING SLIDE ARM SET 23" BB6100

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

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

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

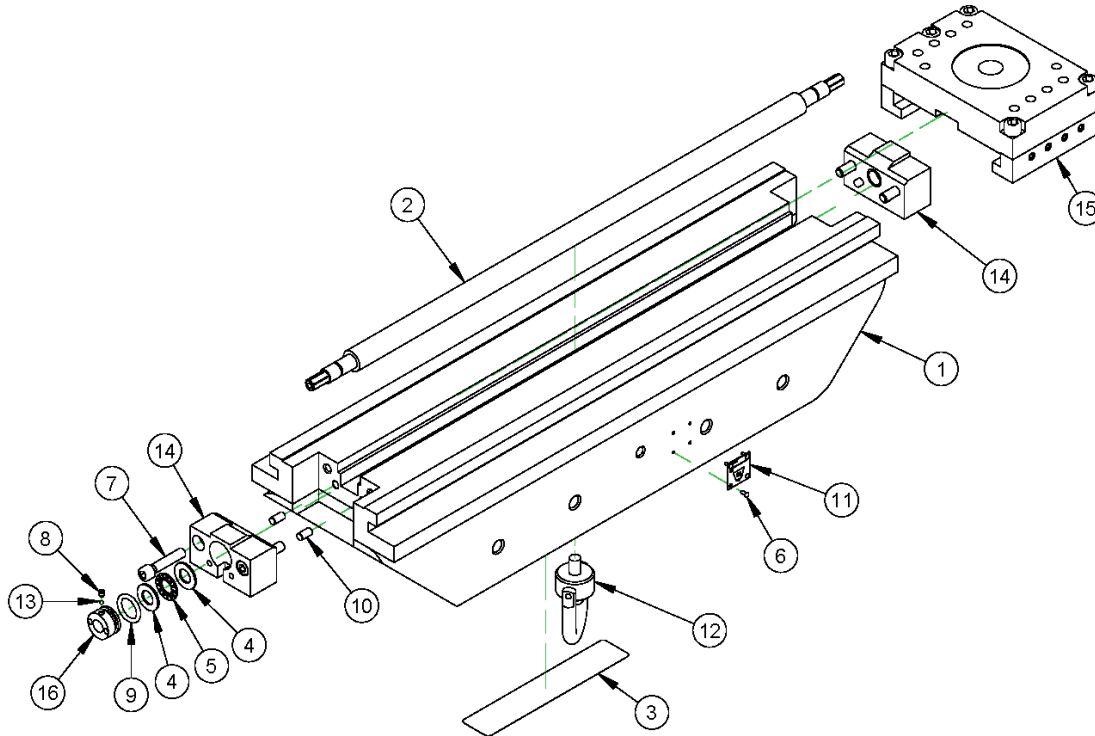


AVAILABLE CONFIGURATIONS	
PART No.	DESCRIPTION
54258	BORING/FACING SLIDE ARM SET 18" BB7100 (SHOWN)
54259	BORING/FACING SLIDE ARM SET 23" BB7100
54260	BORING/FACING SLIDE ARM SET 34" BB7100
72845	BORING/FACING SLIDE ARM SET 35" BB7100

81512 - CHART BORING/FACING SLIDE ARM SET BB7100 - REV A
FOR REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	1	11845	SCREW 8-32 x 1/2 SHCS
3	2	11873	SCREW 5/16-18 X 3-1/2 SHCS
4	2	16403	SCREW 3/8-16 X 1/2 SHCS
5	1	19700	(NOT SHOWN) CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5
6	2	22496	SCREW 1/4-20 X 5/8 FHSCS
7	4	22517	SCREW 1/2-13 X 4 SHCS
8	1	29152	PLATE MASS CE
9	1	40463	HOLDER INSERT 80 DEG NEGATIVE L/H 3/4 SHANK
10	1	40787	HOLDER INSERT 80 DEG NEG R/H
11	10	41407	(NOT SHOWN) INSERT CARBIDE 80 DEG 1/2 IC 1/64 NOSE RADIUS KC5010
12	1	41471	RING HOIST SWIVEL 3/8-16 X .56 1000 LBS
13	1	45691	ASSY FEEDBOX REVERSE CLUTCH INPUT
14	1	49621	QUICK CHANGE TOOL HOLDER RH 1 IN
15	1	53451	QUICK CHANGE TOOL POST MODIFIED
16	1	53455	SCREW 7/8 -14 X 3-1/2 SHCS
17	1	53638	QUICK CHANGE TOOL HOLDER RH 1
18	1	53893 54255 54256 54472	COUNTERWEIGHT ARM 18 INCH BB6100 & BB7100 COUNTERWEIGHT ARM 23 INCH BB6100 & BB7100 COUNTERWEIGHT ARM 34 INCH BB6100 & BB7100 COUNTERWEIGHT ARM 35 INCH BB7100
19	1	53905	COUNTERWEIGHT BB7100
20	1	54867	PLATE ADAPTER FEEDBOX
21	1	54939 54940 54942 72846	LABEL COUNTERWEIGHT ARM 18" LABEL COUNTERWEIGHT ARM 23" LABEL COUNTERWEIGHT ARM 34" LABEL COUNTERWEIGHT ARM 35"
22	1	54955 54956 54958 54782	ASSEMBLY 18IN SLIDE ARM ASSEMBLY 23IN SLIDE ARM ASSEMBLY 34IN SLIDE ARM ASSEMBLY 35IN SLIDE ARM
23	1	55094	TRIP ARM STEEL 3 INCH

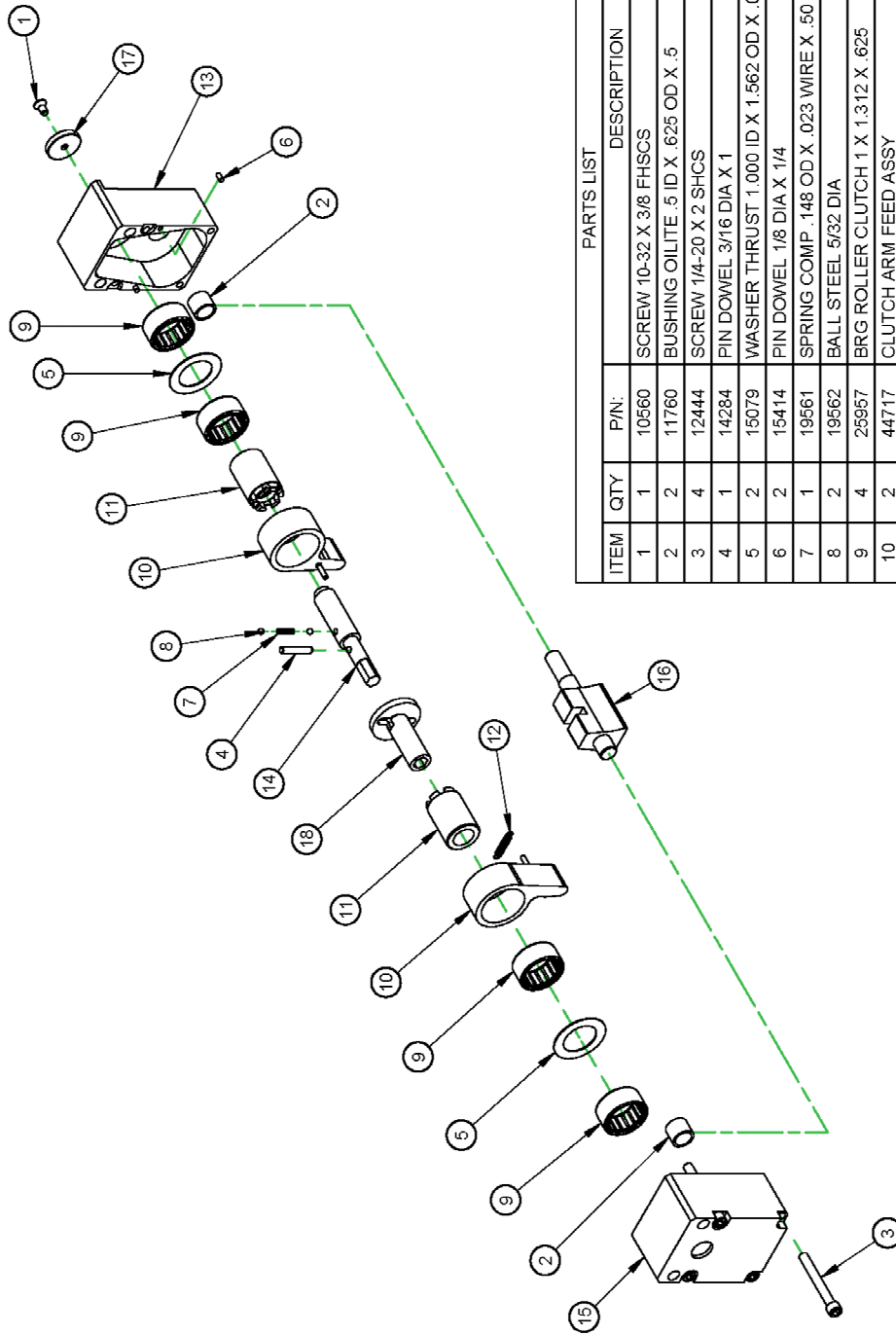
**81512 - CHART BORING/FACING SLIDE ARM SET BB7100 - REV A
FOR REFERENCE ONLY**



AVAILABLE CONFIGURATIONS				
Part Number	Description	"A"	"B"	"C"
54782	ASSEMBLY 35IN SLIDE ARM	54441	54642	54950
54783	ASSEMBLY 42IN SLIDE ARM	54449	54649	54951
54784	ASSEMBLY 27IN SLIDE ARM	54434	54635	54949
54785	ASSEMBLY 21IN SLIDE ARM	54429	54630	54948
54955	ASSEMBLY 18IN SLIDE ARM	54229	54232	54931
54956	ASSEMBLY 23IN SLIDE ARM	54230	54233	54932
54957	ASSEMBLY 26IN SLIDE ARM	54433	54634	54934
54958	ASSEMBLY 34IN SLIDE ARM	54231	54234	54933
54959	ASSEMBLY 53IN SLIDE ARM	54900	54864	54936

PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	
1	1	"A"	SLIDE ARM BB61 BB71	
2	1	"B"	LEADSCREW SLIDE ARM	
3	1	"C"	LABEL TOOL ARM ASSY	
4	4	10436	WASHER THRUST .500 ID X .937 OD X .060	
5	2	10437	BRG THRUST .500 ID X .937 OD X .0781	
6	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089	
7	4	11741	SCREW 5/16-18 X 1-1/2 SHCS	
8	2	12897	SCREW 10-32 X 3/16 SSSNT	
9	2	15906	RING O 1/8 X 3/4 X 1 OD	
10	4	20166	PIN DOWEL 1/4 DIA X 1/2	
11	1	29152	PLATE MASS CE	
12	1	41471	RING HOIST SWIVEL 3/8-16 X .56 1000 LBS	
13	2	43489	BALL NYLON 1/8 DIA	
14	2	46733	END CAP SLIDE ARM 3.5 IN BAR	
15	1	54193	FACING CARRIER ASSY SLIDE ARM	
16	2	54197	NUT BEARING PRELOAD 1/2-20 .94 OD 10-32 SETSCREW	

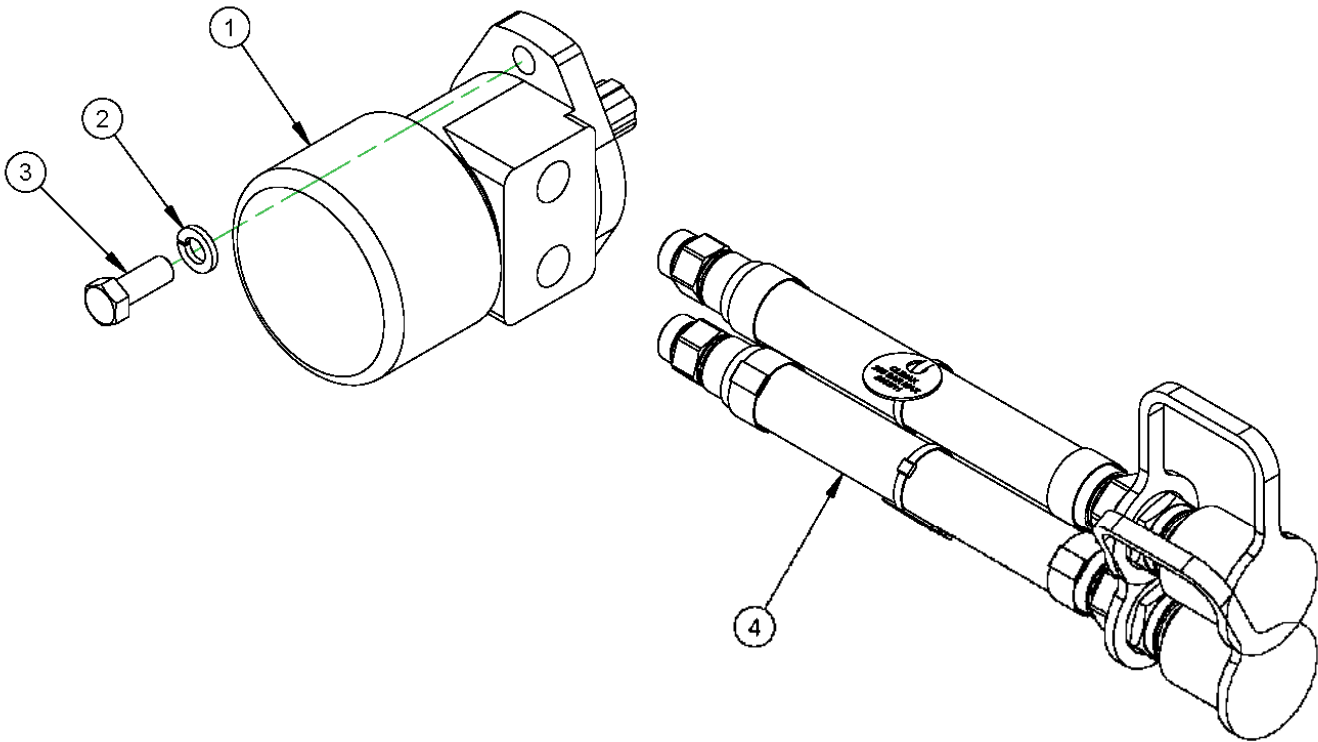
72875 - CHART ASSEMBLY SLIDE ARM BORING BAR BB6 BB7 - REV A
FOR REFERENCE ONLY



PARTS LIST		DESCRIPTION
ITEM	QTY	P/N: DESCRIPTION
1	1	10560 SCREW 10-32 X 3/8 FHSCS
2	1	11760 BUSHING OILITE .5 ID X .625 OD X .5
3	4	12444 SCREW 1/4-20 X 2 SHCS
4	1	14284 PIN DOWEL 3/16 DIA X 1
5	2	15079 WASHER THRUST 1.000 ID X 1.562 OD X .030
6	2	15414 PIN DOWEL 1/8 DIA X 1/4
7	1	19561 SPRING COMP .148 OD X .023 WIRE X .50 LONG STAINLESS
8	2	19562 BALL STEEL 5/32 DIA
9	4	25957 BRG ROLLER CLUTCH 1 X 1.312 X .625
10	2	44717 CLUTCH ARM FEED ASSY
11	2	44721 DRIVE BUSHING
12	1	44970 SPRING EXT .187 OD X .023 WIRE X 1.00 LONG
13	1	45571 HOUSING FEEDBOX REVERSE CLUTCH INPUT CAM SIDE
14	1	45573 SHAFT CLUTCH REVERSE CLUTCH INPUT FEED ASSY
15	1	45753 HOUSING FEEDBOX REVERSE CLUTCH INPUT MTG SIDE
16	1	45780 CAM ASSY FEEDBOX REVERSE CLUTCH INPUT
17	1	45801 KNOB RELEASE FEEDBOX REVERSE CLUTCH INPUT
18	1	45870 DRIVE SHAFT FEEDBOX REVERSE CLUTCH INPUT

45691 - ASSY FEEDBOX REVERSE CLUTCH INPUT - REV A

FOR REFERENCE ONLY



AVAILABLE CONFIGURATIONS			
PART NUMBER	DESCRIPTION	"A"	CHAR-LYNN P/N
43453	MOTOR ASSY HYD 3.6 CU IN SPLINE SHAFT	25472	103-1552
43454	MOTOR ASSY HYD 5.7 CU IN SPLINE SHAFT	25473	103-1083
43455	MOTOR ASSY HYD 7.3 CU IN SPLINE SHAFT	25474	103-1553
43456	MOTOR ASSY HYD 8.9 CU IN SPLINE SHAFT	25475	103-1554
43457	MOTOR ASSY HYD 11.3 CU IN SPLINE SHAFT	25476	103-1085
43458	MOTOR ASSY HYD 14.1 CU IN SPLINE SHAFT	25477	103-1086
43459	MOTOR ASSY HYD 17.9 CU IN SPLINE SHAFT	25478	103-1087

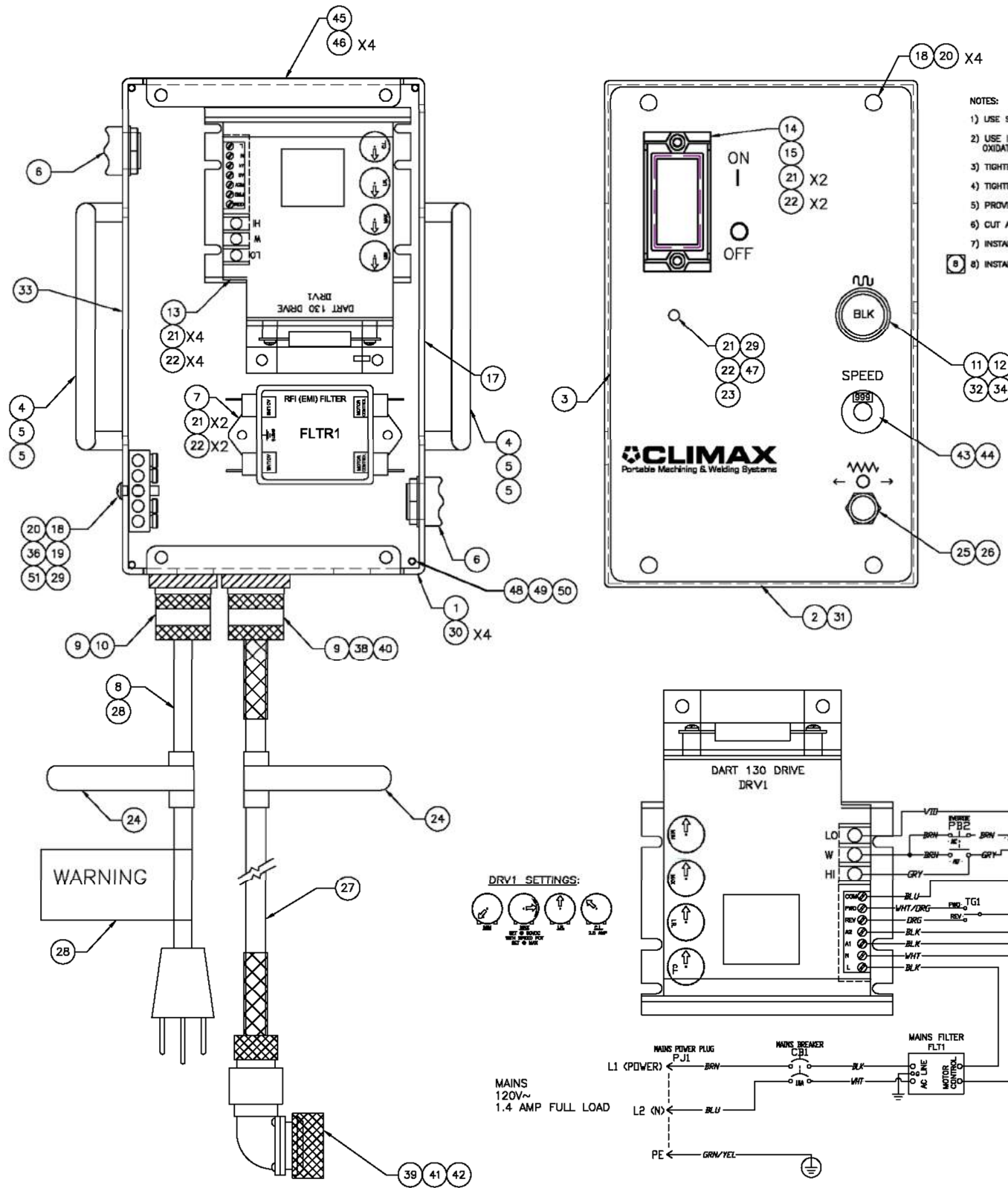
PARTS LIST			
ITEM	QTY	P/N	DESCRIPTION
1	1	"A"	MOTOR HYDRAULIC SPLINE SHAFT
2	2	11238	WASHER LOCK 1/2
3	2	11826	SCREW 1/2-13 X 1-1/4 HHCS
4	1	39829	KIT FTG 3/4 HYD 60 SERIES W/12 IN HOSES

43491 - CHART MOTOR HYD ASSY 3/4 FITTINGS - REV B
FOR REFERENCE ONLY

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SCHEMATICS

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- NOTES:
- 1) USE SILICONE BASE HEAT SINK COMPOUND SUCH AS (CLIMAX 31730) TECH SPRAY #1977-DP BETWEEN THE CHASSIS OF THE DART DRIVE AND THE ENCLOSURE SURFACE
 - 2) USE IDEAL NOALOX ANTI-OXIDIZING COMPOUND OR EQUIVALENT UNDER TERMINAL RINGS OF ALL GROUND WIRES. ENSURE THAT THE CONTACT SURFACE IS FREE OF PAINT, OXIDATION OR OTHER FOREIGN MATERIALS PRIOR TO NOALOX APPLICATION AND INSTALLATION
 - 3) TIGHTEN LOCK NUTS AND SEALING NUTS ON SWITCHES AND POTENTIOMETERS TO 60-70 IN.-LBS.
 - 4) TIGHTEN SET SCREWS ON POTENTIOMETERS KNOBS TO 5-7 IN.-LBS
 - 5) PROVIDE SUFFICIENT LENGTH ON ALL WIRES TO ALLOW ENCLOSURE COVER TO OPEN 180° TO THE LEFT
 - 6) CUT AND REMOVE 12 INCHES OF THE OUTER COVER ON ALL CORD SETS AND INSTALL SO THAT OUTER COVER EXTENDS 1/4 INCH INSIDE THE ENCLOSURE.
 - 7) INSTALL PIN TERMINALS ON ALL GROUND CONDUCTORS AT THE GROUND BUSS
 - 8) INSTALL 1/2 INCH LONG HEAT SHRINK OVER EACH OF THE WIRES AFTER THEY ARE SOLDERED INTO THE CONNECTOR



* NOT SHOWN

QTY.	PART NO.	DESCRIPTION	MANUFACTURER PART NO.
80	12	WIRE 16 AWG BROWN TYPE MTW	
59	12	WIRE 16 AWG VIOLET TYPE MTW	
56	12	WIRE 16 AWG GRAY TYPE MTW	
57	12	WIRE 16 AWG BLACK TYPE MTW	
56	12	WIRE 16 AWG WHITE TYPE MTW	
55	12	WIRE 16 AWG BLUE TYPE MTW	
54	12	WIRE 16 AWG ORANGE TYPE MTW	
53	12	WIRE 16 AWG WHITE/ORANGE TYPE MTW	
52	12	WIRE 16 AWG GREEN/YELLOW TYPE MTW	
51	2	LABEL PE GROUND TERMINAL (KB)	
50	4	SCREW 8-32 X 3/4 SHCS (KB)	
49	4	NUT 8-32 NYLON INSERT ZINC PLATED	
48	4	BUMPER 1/2 OD X 1/4 TALL X 1/8 CENTER HOLE (KB)	
47	1	WASHER #8FLW NYLON	
46	4	DRIVE SCREW #2 X 1/4	
45	1	NAMEPLATE ELECTRICAL PANELS	
44	1	POTENTIOMETER OPERATOR 15 TURN 1/4 SHAFT 7/8 OD	
43	1	POTENTIOMETER SK OHM 10 TURN 1/4 SHAFT 3/8 BUSH	
42	1	ADAPTER SIZE 22MS CONNECTOR TO 3/4 NPT	
41	1	CONNECTOR ANGLED PLUG 4 POLE SIZE 22	
40	1	SEALING RING OIL TIGHT 1/2 NPT	
39	1	CORD GRIP W/WIRE MESH .375-.50 X 3/4 NPT	
38	1	CORD GRIP W/WIRE MESH .375-.5 X 1/2 NPT	
* 37	13	TERMINAL SPADE FM .25 16-14 AWG	
36	1	GROUND BUSS 4 POLE COOPER	
* 35	4	TERMINAL PIN 14-16-AWG	
34	1	PUSHBUTTON OPERATOR UNIVERSAL COLOR MOM 22MM	
* 33	1	LABEL ELECTRICAL WARNING	
32	1	MOUNTING COLLAR W/O CONTACTS 22 MM	
31	36	SEAL NEOPRENE SPONGE 3/8 X 5/32 ADHESIVE BACK	
30	*	*	
* 29	2	TERMINAL RING PIDG 14-16 AWG 8/M4 STUD	
* 28	1	LABEL OPERATOR WARNING 3 1/2 X 11	
27	252	CABLE SHIELDED POWER 18-3	
26	1	TOGGLE SWITCH 1 POLE 3 WAY	
25	1	SEAL TOGGLE SWITCH 15/32-32 HEXNUT	
24	2	WIRE TIE VELCRO 11 IN LONG	
23	2	WASHER #8 INTERNAL STAR WASHER	
22	9	NUT 8-32 LOCKING STAR WASHER	
21	9	SCREW 8-32 X 1/2 BHSCS	
20	5	SCREW 10-32 X 3/4 BINDING HEAD SLOTTED MS	
19	1	NUT 10-32 LOCKING STAR WASHER	
18	5	WASHER #10 FLTW NYLON	
* 17	1	LABEL VOLTAGE 120 VOLTS	
* 16	1.5	TUBING HEAT SHRINK 0.19 ID 2:1 SHRINK RATIO	
15	1	CIRCUIT BREAKER COLLAR W/COVER FOR TA45 BREAKERS	
14	1	CIRCUIT BREAKER ROCKER HANDLE 10 AMP 2POLE 240VAC	
13	1	DC DRIVE 120VAC/90VDC 5.5A REVERSING	
12	1	CONTACT BLOCK 1 NC	
11	1	CONTACT BLOCK 1 NO	
10	1	CORD GRIP NONMETALLIC .17-.47 DIA X 1/2 NPT	
9	2	CONDUIT NUT 1/2 NPT	
8	1	CORDSET 120 VAC 18A 7 FT LONG	
7	1	FILTER RFI/EMI 24AMP 115/230V 50/60HZ	
6	2	VENT 3/4" ELECTRICAL ENCLOSURE	
5	4	SCREW MS X 0.8 X 12 BHCS ZINC FINISH	
4	2	HANDLE 5 INCH U SHAPED OFFSET CHROME	
3	1	LEGEND PLATE PW5000/PW6000 CONTROLLER	
2	1	COVER PENDANT ENCLOSURE	
1	1	PENDANT ENCLOSURE	

EXCEPT AS NOTED DIMENSIONS ARE IN INCHES PER ASME Y14.5
 .X ± .030
 .XX ± .010
 .XXX ± .005
 ANGLES ± .5°
 MATERIAL
 COSMETIC CLASS EXCEPT AS NOTED

CLIMAX Portable Machine Tools, Inc.
 Newberg, Or. USA 97132

CONTROLLER ASSY BB8000
ELECTRIC FEED 120VAC 50/60 HZ

SIZE: D 15509 DRW NO.: 42368 REVISION: E

SCALE: NTS SHEET: 1 OF 1

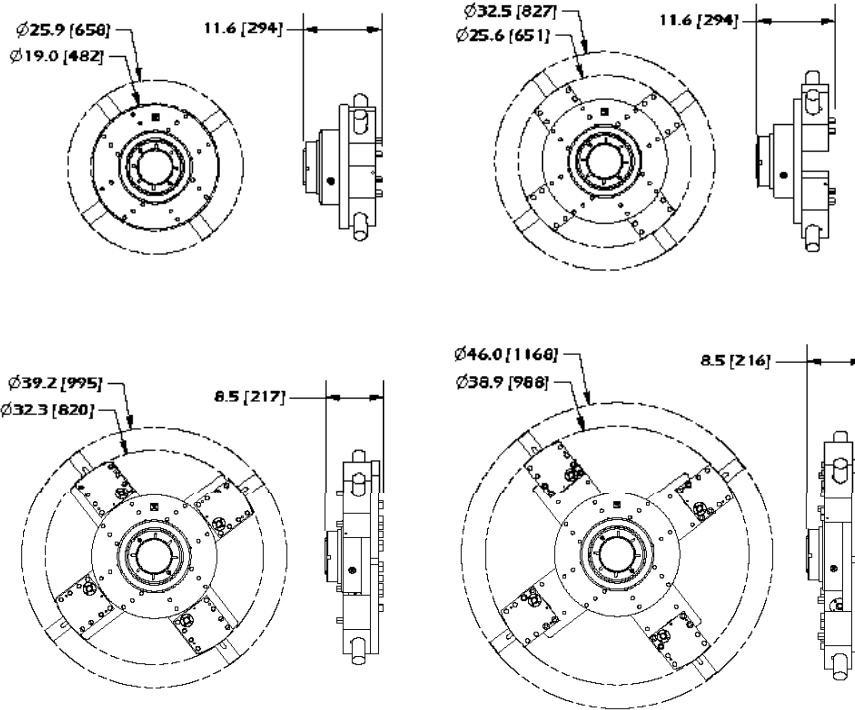
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SPECIFICATIONS

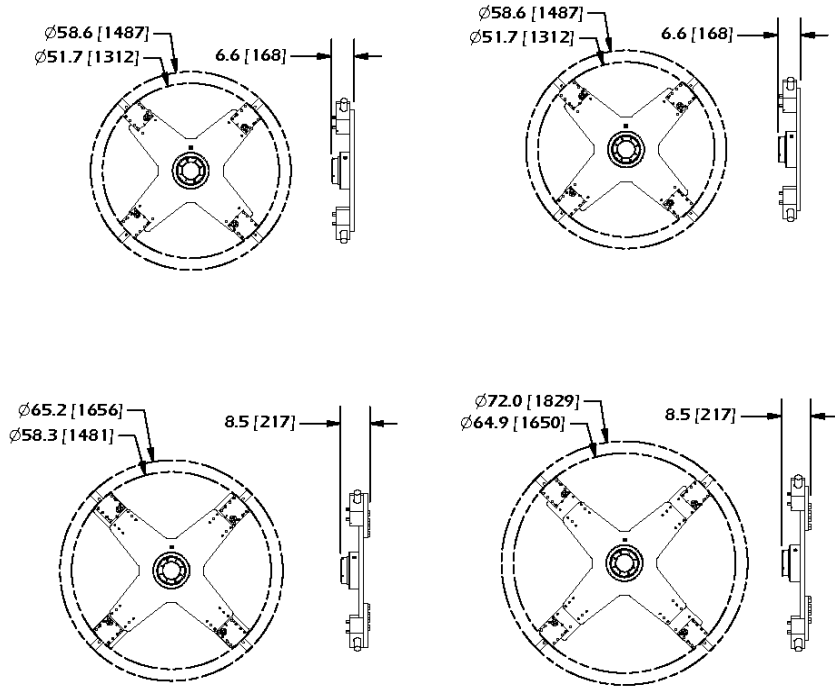
	US	Metric
Boring and Facing Ranges:		
Boring diameter range, standard stack block assembly:	10.25 - 58.25 inches	260.4 - 1479.6 mm
Boring diameter range, boring/facing arm assembly:		
with 18 inch (457.2 mm) boring/facing arm	22.1 - 30.5 inches	561.3 - 774.7 mm
with 23 inch (584.2 mm) boring/facing arm	25.1 - 40.5 inches	637.5 - 1028.7 mm
with 34 inch (863.6 mm) boring/facing arm	35.9 - 62.5 inches	911.9 - 1587.5 mm
Facing diameter range, mechanical facing head assembly:	12.0 - 57.5 inches	304.8 - 1460.5 mm
Facing diameter range, boring/facing arm assembly:		
with 18 inch (457.2 mm) boring/facing arm	17.8 - 30.5 inches	452.1 - 774.7 mm
with 23 inch (584.2 mm) boring/facing arm	17.8 - 40.5 inches	452.1 - 1028.7 mm
with 34 inch (863.6 mm) boring/facing arm	17.8 - 62.5 inches	452.1 - 1587.5 mm
Facing diameter range, boring/facing arm assembly (tool post reversed):		
("tool post reversed" refers to rotating the tool post so that the tool is on the bar side of the tool post.)		
with 18 inch (457.2 mm) boring/facing arm	9.6 - 17.4 inches	243.8 - 442.0 mm
with 23 inch (584.2 mm) boring/facing arm	9.6 - 27.4 inches	243.8 - 696.0 mm
with 34 inch (863.6 mm) boring/facing arm	9.6 - 49.4 inches	243.8 - 1254.8 mm
Performance Data		
Rotational Drive Unit (RDU) Gear Ratio:	10.59:1 gear reduction	
Hydraulic motor size affects torque and speed		
Theoretical values calculated using a 25 Hp hydraulic power unit producing 2000 psi (13790 kPa) continuous, [normal operation is 1200 psi (8270 kPa)] and pumping 15 gpm (68 l/min).		
Hydraulic motor size range:	3.6 - 17.9 in ³	59.9 - 293.3 cm ³
Boring Bar Torque:	750 - 2900 ft•lb	1020 - 3930 N•m
Max boring rpm:	90 - 18 rpm	90 - 18 rpm
For example, with 11.3 in ³ (185.3 cm ³) hydraulic motor (43457):		
Boring Bar Torque:	2280 ft•lb	3090 N•m
Max boring rpm:	29 rpm	29 rpm
Feed rate of mechanical Axial Feed Unit (AFU):	0.003 - 0.025 in/rev.	0.076 - 0.635 mm/rev.
Feed rate of electric Axial Feed Unit (AFU):		
In "slow" speed	0 - 0.3 in/min.	0 - 7.6 mm/min.
In "fast" speed	2.0 - 100 in/min.	50 - 2500 mm/min.
Measures:		
Operating weight (estimated)	2012.3 lbs.	912.8 kg
Typical machine consisting of Rotational Drive Unit (RDU), Axial Feed Unit (AFU), boring head set, tool carrier, 2 bearing mounts, 12 foot (365.8 cm) bar, tool kit, and hydraulic motor.		
Shipping weight (estimated), for machine (metal crate)	2203 lbs.	999.3 kg
Shipping weight (estimated), for machine (wood crate)	2117.3 lbs.	960.4 kg
(machine with RDU, AFU, boring head set, tool carrier, tool kit, and hydraulic motor.)		
Shipping weight (estimated), set of 2 Bearings	780 lbs.	353.8 kg
Shipping weight (estimated), Boring Bar	5.9 lbs/inch	1.05 kg/cm
Shipping weight (estimated), 15 Hp Hydraulic Power Unit	750 lbs	340.2 kg
Shipping weight (estimated), 25 Hp Hydraulic Power Unit	875 lbs	396.9 kg
Shipping dimensions:		
Machine, in wood crate, W, D, H	24 x 37 x 20.6 inches	610 x 940 x 524 mm
Machine, in steel crate, W, D, H	43.3 x 29.5 x 22.5 inches	1099 x 749 x 571.5 mm
Bearing (each bearing shipped separately) W, D, H	36.5 x 36.5 x 17 inches	927 x 927 x 432 mm
12 foot (365.8 cm) bar W, D, H	15 x 14 x 158 inches	381 x 356 x 4013 mm
15 or 25 Hp Hydraulic Power Unit W, D, H	24 x 43 x 47 inches	610 x 1092 x 1194 mm

OPERATIONAL DIMENSIONS

Dimensions in Inch (mm)

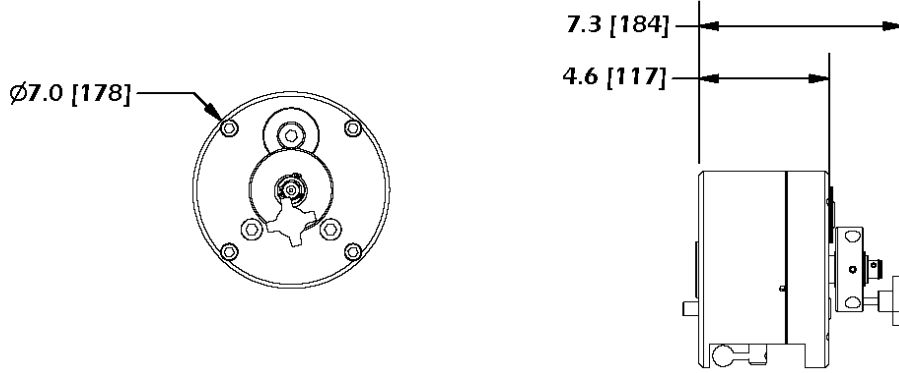


20 - 46 inch (508.0 - 1168.4 mm) ID Mount
(Face Adjust shown. Jack screw adjust ranges are the same)

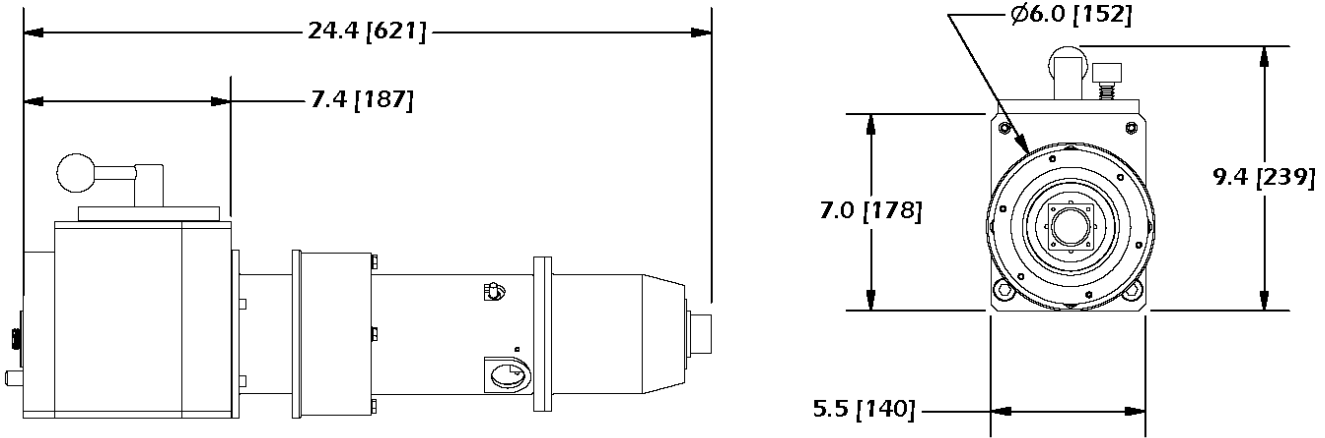


46 - 72 inch (1168.4 - 1828.8 mm) ID Mount
(Face Adjust shown. Jack screw adjust ranges are the same)

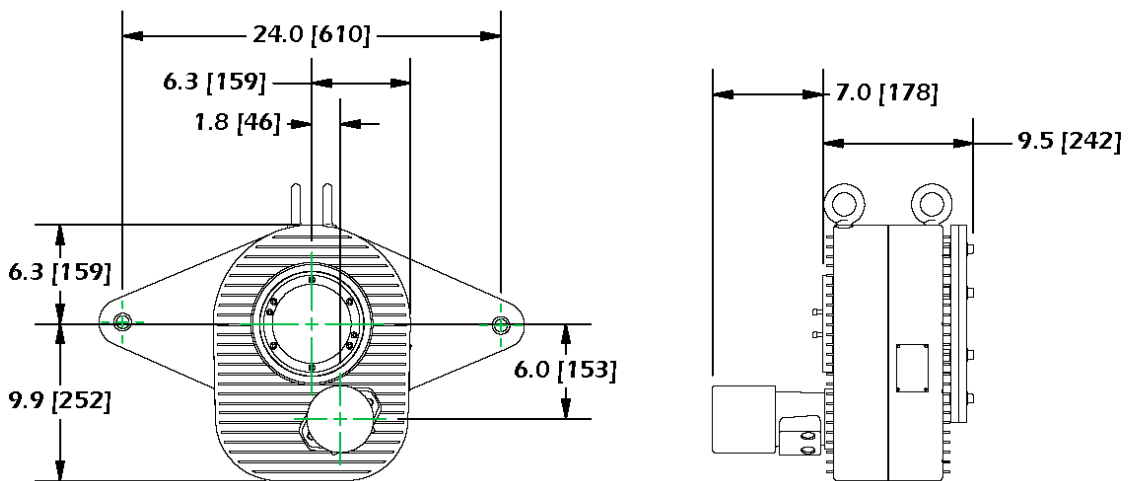
Dimensions in Inch (mm)



Mechanical Axial Feed Assembly



Electrical Axial Feed Assembly

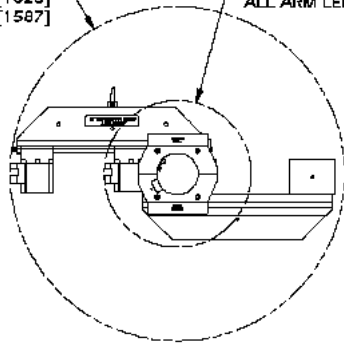


Rotational Drive Unit

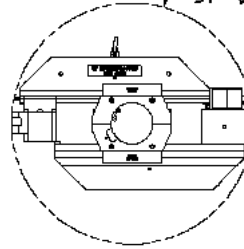
Dimensions in Inch (mm)

MAX FACE/BORE
 18" Ø30.5 [775]
 23" Ø40.5 [1026]
 34" Ø62.5 [1587]

MIN FACE
 ALL ARM LENGTHS Ø17.8 [453]

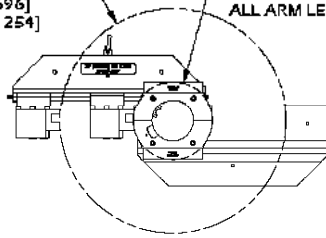


MIN FACE SWING
 18" Ø24.3 [618]
 23" Ø29.2 [742]
 34" Ø40.0 [1016]

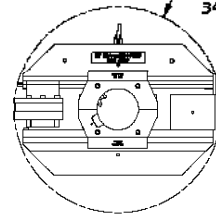


MAX FACE
 TOOL POST REVERSED
 18" Ø17.4 [442]
 23" Ø27.4 [696]
 34" Ø49.4 [1254]

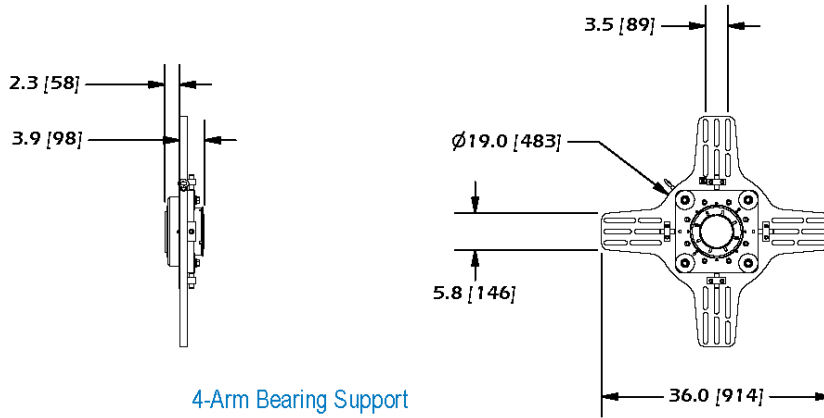
MIN FACE
 TOOL POST REVERSED
 ALL ARM LENGTHS 9.6 [244]



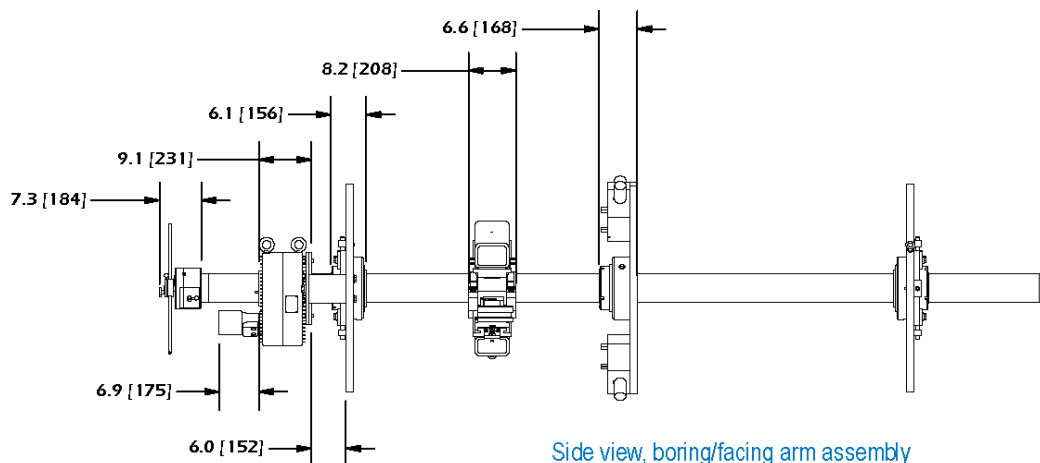
MIN BORE
 18" Ø22.1 [562]
 23" Ø25.1 [638]
 34" Ø35.9 [912]



Boring/facing arm configurations



4-Arm Bearing Support



Side view, boring/facing arm assembly

MSDS



Unoba® EP Grease (All Grades)

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Unoba® EP Grease (All Grades)
MSDS Number:	722490
Synonyms:	76 Unoba® EP Grease 00 76 Unoba® EP Grease 0 76 Unoba® EP Grease 1 76 Unoba® EP Grease 2 76 Unoba® EP Grease 3
Intended Use:	Lubricating Grease
Manufacturer/Supplier:	ConocoPhillips Lubricants 600 N. Dairy Ashford, 2W900 Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	U.S.: 888-766-7676 or International: +1-83-2486-3363
Technical Information:	800-435-7761
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

<u>Emergency Overview</u>	<u>NFPA</u>
CAUTION! Eye Irritant	

Appearance: Green
Physical Form: Semi-Solid
Odor: Petroleum

Potential Health Effects

Eye: Eye irritant. Contact may cause stinging, watering, redness, and swelling.

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 which may be aggravated by exposure include skin disorders and eye disorders.

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Status: Final

See Section 11 for additional Toxicity Information.

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Lubricant Base Oil (Petroleum)	VARIOUS	<90
Additives	PROPRIETARY	>12
Zinc dialkyl dithiophosphate	68649-42-3	<2

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

4. First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. Remove contact lenses if present and easy to do. For direct contact, hold eyelids apart and flush the affected eye(s) with clean water for at least 15 minutes. If irritation persists, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. Often these injuries require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 Flammability: 1 Instability: 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

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 safely. 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 relevant authorities in accordance with all applicable regulations. 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: Wear eye/face protection. 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 area 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	US-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.

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

Respiratory Protection: Respiratory protection is not normally required under intended conditions of use. Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Green
Physical Form:	Semi-Solid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	<0.1mm Hg
Vapor Density (air=1):	> 5
Boiling Point/Range:	No data
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Bulk Density:	7.5 lbs/gal
Percent Volatile:	Negligible
Evaporation Rate (nBuAc=1):	<1
Flash Point:	450°F / 232°C
Test Method:	Cleveland Open Cup (COC), ASTM D92
LEL (vol % in air):	No data
UEL (vol % in air):	No data
Autoignition Temperature:	No data

10. Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

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
Zinc dialkyl dithiophosphate	>2000 mg/kg (rat)	>2000 mg/kg (rat)	No data

12. Ecological Information

Ecotoxicity: Experimental studies show that acute aquatic toxicity values are in the range 1-100 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Should be regarded as capable of causing long term adverse effects in the aquatic environment.

Mobility: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. Components may behave differently in the aquatic environment with soaps dispersing and dissolving to some extent in water while the hydrocarbons will float on the surface due to their low water solubility. The hydrocarbon portion would be expected to show low mobility in soil and water. The major environmental fate would be expected to be biodegradation.

Persistence and degradability: The base oil constituents of greases are expected to be inherently, but not readily biodegradable. Some of the thickening agents may be readily biodegradable.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 4 to over 6, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

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)*

International Maritime Dangerous Goods (IMDG)

Shipping Description: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: *Not regulated*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

15. Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: Yes
Chronic Health: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration*	de minimis
Zinc compound(s)	<2	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):

This material does not contain any chemicals with CERCLA Reportable Quantities. This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:

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California Proposition 65:

Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Silica-Crystalline (Quartz)	Cancer
Naphthalene	Cancer

Canadian Regulations:

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 Regulations.

WHMIS Hazard Class
 D2B

National Chemical Inventories:

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
 All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

16. Other Information

Date of Issue: 23-Oct-2008
 Status: Final
 Previous Issue Date: 06-Apr-2005
 Revised Sections or Basis for Revision: Emergency Overview (Section 2)
 Health Hazard (Section 2)
 Composition (Section 3)
 Regulatory information (Section 15)

MSDS Number: 722490

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; 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.



Product Name: MOBIL SHC 634
Revision Date: 23May2007
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MATERIAL 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
3225 GALLOWES RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency: 609-737-4411
Transportation Emergency Phone: 800-424-9300
ExxonMobil Transportation No.: 281-834-3296
MSDS Requests: 713-613-3661
Product Technical Information: 800-662-4525, 800-947-9147
MSDS Internet Address: <http://www.exxon.com>, <http://www.mobil.com>

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

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

POTENTIAL HEALTH EFFECTS

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

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 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



Product Name: MOBIL SHC 634
 Revision Date: 23 May 2007
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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: Smoke, Fume, Oxides of carbon, Aldehydes, Incomplete combustion products, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >210C (410F) [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. 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.

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.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

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, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

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

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



Product Name: MOBIL SHC 634
 Revision Date: 23 May 2007
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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. Work conditions can greatly affect glove durability; 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

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

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

Flash Point [Method]: >210C (410F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

Boiling Point / Range: >316C (600F)

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): N/D

Solubility in Water: Negligible



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Viscosity: 460 cSt (460 mm²/sec) at 40 C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION

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

SECTION 10 STABILITY AND REACTIVITY

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.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m ³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

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.

Additional information is available by request.



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

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
 2 = NTP SUS

3 = IARC 1
 4 = IARC 2A

5 = IARC 2B
 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.

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



Product Name: MOBIL SHC 634
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LAND (TDG) : Not Regulated for Land Transport

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

AIR (IATA) : Not Regulated for Air Transport

SECTION 15	REGULATORY INFORMATION
------------	------------------------

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: IECSC, DSL, EINECS, KECI, TSCA

EPCRA: 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, 9

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

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

- Revision Changes:
 Section 13: Empty Container Warning was modified.
 Section 08: Hand Protection was modified.
 Section 06: Notification Procedures was modified.
 Section 16: Standard phrases for California Proposition 65 was added.



Product Name: MOBIL SHC 634
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This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

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MHC: 0, 0, 0, 0, 0, 0

PPEC: A

DGN: 2007946XUS (547900)

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MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Section 1 • Product and Company Identification

Product Name: LPS® 2 (Bulk)

Part Number(s): 00222, 02128, 00205, 00255, C00222, C02128, C00205, C00255

Chemical Name: Petroleum Distillates

Product Use: An industrial lubricant designed to displace moisture from equipment, provide heavy-duty lubrication and rust prevention.

Manufacturer Information: LPS Laboratories, 4647 Hugh Howell Road, Tucker, GA, USA 30084
TEL: USA & Canada: 1 800 241-8334
Outside USA and Canada: +1 770 243-8800
FAX: USA & Canada: 1 800 543-1553
Outside USA and Canada: +1 770 243-8899

Emergency Telephone Number: Chemtrec: USA & Canada: 1 800 424-9300
Outside USA and Canada: +1 703 527-3887

Website: <http://www.lpslabs.com>

Section 2 • Hazards Identification

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Emergency Overview:

Aerosol: Not applicable

Bulk: DANGER: Combustible. Keep away from heat and flame. Harmful or fatal if swallowed.

Primary route(s) of entry: Skin and eye contact. Inhalation.

Potential Acute Health Effects:

Eyes: Irritating to eyes.

Skin: Repeated exposure may cause skin dryness or cracking.

Inhalation: Excessive inhalation of vapors can cause irritation of the respiratory tract, nausea, dizziness or headache.

Ingestion: Product has a low order of acute oral toxicity, but ingestion of large quantities may cause nausea, vomiting, and gastrointestinal irritation. May cause injury if aspirated into lungs.

Potential Chronic Health Effects:

Carcinogenic Effects: NTP: No IARC: No OSHA: No ACGIH: No

Mutagenic Effects: None

Teratogenic Effects: None

Target Organs: None



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Medical conditions aggravated by exposure:

Persons with pre-existing central nervous system (CNS) disease, neurological conditions, skin disorders, chronic respiratory diseases, or impaired liver or kidney function should avoid exposure.

Signs and Symptoms

Stinging in eyes. Repeated or prolonged skin contact can cause redness, irritation, and scaling of the skin (dermatitis). Breathing of high vapor concentrations may cause headaches, stupor, irritation of throat and eyes, and kidney effects.

Section 3 • Composition / Information on Ingredients

Component	CASRN	Weight Percent
Distillates (Petroleum), Hydrotreated Light	64742-47-8	70 - 80%
Mineral Seal (Petroleum) Oil	64742-47-8 / 64742-52-5	20 - 30%

Section 4 • First Aid Measures

Eyes:	Check for and remove contact lenses. If irritation or redness develops, flush eyes with cool, clean, low pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. DO NOT use eye ointment. Seek medical attention immediately.
Skin:	Remove contaminated shoes and clothing. Clean affected area thoroughly with mild soap and water. DO NOT use ointments. Seek medical attention if irritation persists.
Inhalation:	Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, seek medical attention immediately.
Ingestion:	DO NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. DO NOT leave victim unattended. Seek medical attention immediately.
Notes to Physician:	This material is an aspiration hazard. Potential danger from aspiration must be weighed against possible oral toxicity (See Section 2 - Ingestion) when deciding whether to induce vomiting. Inhalation of high concentrations of this material, as could occur in enclosed spaces or during deliberate abuse, may be associated with cardiac arrhythmias.



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Section 5 • Fire Fighting Measures

Products of Combustion: Carbon monoxide and carbon dioxide.

General Fire Hazards: High heat will cause product to boil, evolving vapor that could cause explosive rupture of closed containers.

Firefighting media: SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use CO₂, water spray, fog or foam. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosions.

Sensitivity to Impact: None **Sensitivity to Static Discharge:** None

Protection Clothing (Fire): Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles.

Special Remarks on Explosion Hazards:
High heat will cause product to boil, evolving vapor that could cause explosive rupture of closed containers.

Section 6 • Accidental Release Measures

Containment Procedures: **Small Spill and Leak:** Absorb with an inert material and dispose of properly.

Large Spill and Leak: Secure the area and control access. Dike far ahead of a liquid spill to ensure complete collection. Pick up free liquid for disposal using absorbent pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal.

Clean-Up Procedures: Contain and recover spilled material when possible.

Evacuation Procedures: Ventilate area of leak or spill. Keep unnecessary and unprotected people away.

Special Procedures: Remove all sources of ignition. Ventilate area. Wear personal protective equipment during cleanup.

Section 7 • Handling and Storage

Handling: DO NOT spray into or around ignition sources. DO NOT allow material to come in contact with eyes or skin. Wear appropriate protective equipment during handling. Keep container closed. Avoid breathing vapors or mists. Use only with adequate ventilation. Wash thoroughly after handling.

Storage: Keep container in a cool, well-ventilated area. Avoid all sources of ignition (spark or flame). Store between 40°F and 120°F (4.4°C and 49°C).

Precautions to be taken in handling and storage:
Store all materials in a dry, well-ventilated area. Avoid breathing vapors.



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Section 8 • Exposure Controls / Personal Protection

Exposure Guidelines:

Component	CASRN	OSHA	ACGIH	NIOSH	Supplier
Distillates (Petroleum), Hydrotreated Light	64742-47-8	5 mg/m ³ (oil mist) PEL	5 mg/m ³ (oil mist) TLV 10 mg/m ³ (oil mist) STEL	5 mg/m ³ (oil mist) TWA 10 mg/m ³ (oil mist) STEL	100 ppm TWA 525 mg/m ³ TWA
Mineral Seal (Petroleum) Oil	64742-47-8 / 64742-52-5	5 mg/m ³ PEL	5 mg/m ³ (oil mist) 10 mg/m ³ (oil mist)	5 mg/m ³ (oil mist) TWA 10 mg/m ³ (oil mist) STEL	None reported

Engineering Controls: Provide general and/or local exhaust ventilation to keep exposures below the exposure guidelines listed above.

Personal protective equipment

Eye protection: Safety glasses with side shields conforming to appropriate regulations. Eye wash fountain and emergency shower facilities are recommended.

Hand protection: Normally no hand protection is required; however, if product will be sprayed for an extended period, "overspray" onto skin may occur. If so, wear chemical resistant gloves conforming to appropriate regulations. Please observe the instructions regarding permeability and breakthrough time that are provided by the supplier of the gloves.

Respiratory protection: Typical use of this product under normal conditions does not require the use of respiratory protection. If airborne concentrations are above the applicable exposure limits (listed above), use NIOSH approved respiratory protection (i.e. organic vapor cartridge).

General Hygiene Considerations: Wash thoroughly after handling. Have eye-wash facilities immediately available.



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Section 9 • Physical and Chemical Properties

Appearance:	Liquid	Color:	Brown
Odor:	Petroleum / Cherry	Evaporation Rate:	< 0.1 (BuAc = 1)
Solubility Description:	< 3% in water	Flash Point:	79°C (175°F) - dispensed liquid
Boiling Point:	195°C (383°F)	Flash Point Method:	Tag-Closed Cup
Specific Gravity (H ₂ O=1):	0.82 - 0.86 @ 20°C	Decomposition Temperature:	Not established
Vapor Density (air = 1):	4.7	Auto ignition temperature:	> 228°C (442°F)
Vapor Pressure:	< 0.05 mm Hg @ 20°C	Flammable Limits (estimated):	LOWER: 0.6% UPPER: 7.0%
Rule 1171 PPC:	Not applicable	Partition Coefficient (octanol/water):	< 1
V.O.C. Content:	Aerosol: Not applicable Bulk: 0% per State & Federal Consumer Product Regulations	Odor Threshold:	Not established
Melting Point:	< -50°C (-58°F)	Viscosity:	< 7 cSt @ 25°C
pH:	Not applicable	Volatiles:	92 - 95%
Heat of combustion:	Aerosol: Not applicable Bulk: > 30 kJ/g		

Section 10 • Stability and Reactivity

Chemical Stability:	Product is stable under recommended storage conditions.
Conditions to Avoid:	Keep away from heat and ignition sources.
Incompatibility:	Reactive or incompatible with oxidizing agents
Hazardous Decomposition:	Combustion will generate smoke, possibly thick and choking, resulting in zero visibility and combustion products include carbon monoxide and carbon dioxide.
Hazardous Polymerization:	Will not occur.



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

Section 11 • Toxicological Information

Acute and Chronic Toxicity**A: General Product Information**

An acute toxicity study of this product has not been conducted. Information given in this section relates only to individual constituents contained in this preparation.

B: Component Analysis

Component	CASRN	LC-50	LD-50
Distillates (Petroleum), Hydrotreated Light	64742-47-8	> 6.8 mg/L*	> 5 g/kg*
Mineral Seal (Petroleum) Oil	64742-47-8 / 64742-52-5	Not established	Not established

* Supplier Data

Section 12 • Ecological Information

Mobility: Semi-volatile. Readily absorbed into soil. **Persistence / Degradability:** Only slightly biodegradable

Bioaccumulative potential: No bioaccumulation potential **Other adverse effects:** See below

Ecological studies have not been conducted for this product. The following information is available for component(s) of this product

Ecotoxicity

Effects on Organisms	Component	CASRN	Test	Species	Results
Acute Toxicity on Fishes	Distillates (Petroleum), Hydrotreated Light	64742-47-8	96-hr LC50	Oncorhynchus Mykiss	3,200 µg/L*
Acute Toxicity on Daphnia	No data available				
Bacterial Inhibition					
Growth inhibition of algae					
Bioaccumulation in fish					

* Supplier Data

For the 64742-47-8 component, no toxicity has been observed in water due to extremely low water solubility. However, hydrocarbon and petroleum distillates are potentially toxic to freshwater and saltwater ecosystems. If material is spilled on soil, some potential toxic effects could occur before biodegradation could remove material.

If spilled, the 64742-46-7 constituent may kill grasses and small plants by interfering with transpiration. Spilled material may coat gill structures of fish resulting in suffocation if spilled in shallow, running water. This product may be toxic to amphibians by preventing dermal respiration. This product may also cause gastrointestinal distress to birds and mammals through ingestion. Biodegradation of this product is possible within 90 to 120 days in aerobic environments at temperatures above 21°C.



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

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Section 13 • Disposal Considerations

Waste Status: In its purchased form, this material does not meet the definition of a RCRA hazardous waste (40 CFR 261).

Disposal: Waste must be disposed of in accordance with any and all applicable environmental control rules and/or regulations.

Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information inaccurate, incomplete, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive than federal laws and regulations.

Section 14 • Transport Information

Non-aerosol versions of this product are not regulated by any mode of transportation.

The preceding information is subject to change and must be verified prior to shipment. It is the responsibility of anyone offering hazardous materials for shipment to ensure compliance with all applicable regulations.

Section 15 • Regulatory Information

U.S. Federal Regulations

RCRA Hazardous Waste No.: None

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA):
None

Toxic Substances Control Act (TSCA):
All components of this product are TSCA inventory listed and/or are exempt.

Superfund Amendments and Reauthorization Act (SARA) Title III SARA Section 311/312 (40 CFR 370) Hazard Categories:
Fire Hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard

This product contains the following toxic chemical(s) subject to reporting requirements of SARA Section 313 (40 CFR 372):
No individual section 313 component is present at or above 1%.

Section 112 Hazardous Air Pollutants (HAPs): None

State Regulations

California: This product does not contain chemical(s) known to the State of California to cause cancer, birth defects or other

California and OTC States: This product conforms to consumer product regulations.

New Jersey Right to Know:

Aerosol: Not applicable

Bulk: Distillates (Petroleum), Hydrotreated Light 64742-47-8 • Mineral Seal (Petroleum) Oil 64742-46-7 / 64742-52-5 • Proprietary NJ TS RN 800959-5152P • Proprietary NJ TS RN 800959-5153P • Alkyd Acid Phosphate 68307-94-8



MATERIAL SAFETY DATA SHEET
LPS® 2 (Bulk)

Revision Date: May 15, 2012

Supersedes: May 14, 2009

International Regulations

Canadian Environmental Protection Act (CEPA):

All of the components of this product are included on the Canadian Domestic Substances list (DSL).

Canadian Workplace Hazardous Materials Information System WHMIS:

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

WHMIS Classification:
Bulk: Class B3, Class D2B

Other Regulations:

Montreal Protocol listed ingredients: None
Stockholm Convention listed ingredients: None
Rotterdam Convention listed ingredients: None
RoHS Compliant: Yes

Section 16 • Other Information

MSDS#: 10222 MSDS Preparation Responsible Name: Elena Badiuzzi Compliance Manager Telephone: +1 770 243-8800	HMIS 1996		HMIS III		NFPA Flammability Health Reactivity Special
	Health:	1	Health:	[1] 1	
	Flammability:	2	Flammability Aerosol:	NA	
			Flammability Bulk:	2	
	Reactivity:	0	Physical Hazard Aerosol:	NA	
			Physical Hazard Bulk:	0	

Notice to Reader:

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Elena Badiuzzi, Compliance Manager
LPS Laboratories, a division of Illinois Tool Works




Koolkut® Spectrum

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Koolkut® Spectrum
MSDS Number:	778731
Intended Use:	Metalworking Fluid
Manufacturer/Supplier:	ConocoPhillips Lubricants 600 N. Dairy Ashford Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	888-766-7676
Technical Information:	800-255-9556
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

<u>Emergency Overview</u>	<u>NFPA</u>
May be harmful to breastfed babies	

Appearance: Amber
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 information available on skin absorption.

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

Ingestion (Swallowing): Low to moderate degree of toxicity by 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 which may be aggravated by exposure include skin disorders.

See Section 11 for additional Toxicity Information.

778731 - Koolkut® Spectrum
Date of Issue: 15-Oct-2008

Page 2/6
Status: Final

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Lubricant Base Oil (Petroleum)	VARIOUS	>90
Chlorinated Paraffins (C14-C17)	61788-76-9	<5
Additives	PROPRIETARY	<5

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

4. First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek medical attention.

Ingestion (Swallowing): If swallowed, seek emergency medical attention. If victim is drowsy or unconscious and vomiting, place on the left side with the head down and do not give anything by mouth. If victim is conscious and alert and ingestion occurred within the last hour, vomiting should be induced for ingestions of large amounts (more than 5 ounces in an adult) preferably under direction from a physician or poison center. Do not leave victim unattended and observe closely for adequacy of breathing.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 0 Flammability: 1 Instability: 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

OSHA Flammability Category: None

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

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 safely. 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 relevant authorities in accordance with all applicable regulations. 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.

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 area 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	US-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.

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

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	<1 mm Hg
Vapor Density (air=1):	>1
Boiling Point/Range:	No data
Melting/Freezing Point:	<-4°F / <-20°C
Solubility in Water:	Insoluble
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.89 @ 60°F (15.6°C)
Bulk Density:	7.4 lbs/gal
Viscosity:	5.4 cSt @ 100°C; 32 cSt @ 40°C
Evaporation Rate (nBuAc=1):	No data
Flash Point:	>399°F / >204°C
Test Method:	Cleveland Open Cup (COC), ASTM D92
LEL (vol % in air):	No data
UEL (vol % in air):	No data
Autoignition Temperature:	No data

10. Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. Toxicological Information

Chronic Data:

A mortality study sponsored by General Motors and the United Auto Workers suggested a link between cutting oils or machining fluids and various forms of cancer (e.g., esophageal, laryngeal, and rectal). The study evaluated workplace exposures from 1940-1984. Since the composition of these materials has changed substantially since 1940, and because the most notable effects were seen among those with work histories dating back to that time, the relevance of these findings to present-day exposures is uncertain. Cutting oils or machining fluids have not been identified as carcinogens by NTP, IARC, or OSHA.

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.

Chlorinated Paraffins (C14-C17)

Carcinogenicity: Certain Chlorinated paraffins mixtures have caused an increase in tumors when given in very high oral doses to mice and rats. This particular chlorinated paraffin has not been identified as a carcinogen by NTP, IARC or OSHA.

Target Organs: Administration of intermediate length chlorinated paraffins has demonstrated limited evidence of liver toxicity in experimental animals. Effects seen include increased liver:body weight ratios and hepatocellular hypertrophy.

Reproductive: Animal studies in both rats (up to 5000 mg/kg, orally) and rabbits (up to 100 mg/kg), orally did not demonstrate effects on the developing fetus. However, the rat studies found increased mortality in pups exposed to chlorinated paraffins via lactation.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum)	>5 g/kg	>2 g/kg	No data
Chlorinated Paraffins (C14-C17)	>4 g/kg (rat)	>10 ml/kg (rabbit)	No Data

12. Ecological Information

Ecotoxicity: Experimental studies show that acute aquatic toxicity values are greater than 1000 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Mobility: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of base oil components in soil and sediment.

Persistence and degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 4 to over 6, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

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)*

International Maritime Dangerous Goods (IMDG)

Shipping Description: *Not regulated*
 Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: *Not regulated*
 Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

15. Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: No

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 Status: Final

Chronic Health:	No
Fire Hazard:	No
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:

This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):

This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:

This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

Canadian Regulations:

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 Regulations.

WHMIS Hazard Class
 None

National Chemical Inventories:

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
 All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

16. Other Information

Date of Issue:	15-Oct-2008
Status:	Final
Previous Issue Date:	20-Jun-2007
Revised Sections or Basis for Revision:	Emergency Overview (Section 2) Toxicological (Section 11)
MSDS Number:	778731

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; 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.



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MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: MOBIL DTE 24
Product Description: Base Oil and Additives
Product Code: 201560102010, 602623-00, 970972
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA
24 Hour Health Emergency 809-737-4411
Transportation Emergency Phone 800-424-9300
ExxonMobil Transportation No. 281-834-3296
Product Technical Information 800-662-4525, 800-947-9147
MSDS Internet Address <http://www.exxon.com>, <http://www.mobil.com>

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

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

POTENTIAL HEALTH EFFECTS

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

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 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use



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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.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

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

FLAMMABILITY PROPERTIES

Flash Point [Method]: >200°C (392°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. For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

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. Keep away from incompatible materials.



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SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

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.

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.

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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: Brown
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15.6 °C): 0.871
Flash Point [Method]: >200°C (392°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)
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: 32 cSt (32 mm²/sec) at 40 °C | 5.3 cSt (5.3 mm²/sec) at 100°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -18°C (0°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

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.

HAZARDOUS POLYMERIZATION: Will not occur.



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SECTION 11	TOXICOLOGICAL INFORMATION
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ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
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. Based on assessment of the components.
Ingestion	
Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS**Contains:**

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

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

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
 2 = NTP SUS

3 = IARC 1
 4 = IARC 2A

5 = IARC 2B
 6 = OSHA CARC

SECTION 12	ECOLOGICAL INFORMATION
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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.

PERSISTENCE AND DEGRADABILITY**Biodegradation:**



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Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

OTHER ECOLOGICAL INFORMATION

VOC: 0 G/L [ASTM E1868-10]

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

AIR (IATA): Not Regulated for Air Transport



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SECTION 15	REGULATORY INFORMATION
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OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

Complies with the following national/regional chemical inventory requirements:: AICS, DSL, ENCS, IECSC, KECI, PICCS, TSCA

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
ZINC ALKYL DITHIOPHOSPHATE	68649-42-3	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
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N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:

Section 09: Boiling Point C(F) was modified.

Section 08: Comply with applicable regulations phrase was modified.

Section 09: Vapor Pressure was modified.

Hazard Identification: Health Hazards was modified.

Section 11: Dermal Lethality Test Data was modified.

Section 11: Dermal Lethality Test Comment was modified.

Section 11: Oral Lethality Test Data was modified.

Section 11: Inhalation Lethality Test Data was modified.

Section 11: Dermal Irritation Test Data was modified.

Section 11: Eye Irritation Test Data was modified.



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Revision Date: 24 Aug 2012
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Section 11: Oral Lethality Test Comment was modified.
Section 11: Inhalation Lethality Test Comment was modified.
Section 11: Dermal Irritation Test Comment was modified.
Section 11: Eye Irritation Test Comment was modified.
Section 11: Inhalation Irritation Test Data was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09: Viscosity was modified.
Section 09: Viscosity was modified.
Section 14: LAND (TDG) - Header was modified.
Section 15: List Citations Table was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 15: Community RTK - Header was modified.
Section 12: Other Ecological Information - Header was added.
Section 12: California VOC was added.
Section 12: California VOC was added.

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