

CE COMPACT DRILL

OPERATING MANUAL

ORIGINAL INSTRUCTIONS



 **CLIMAX**
Portable Machining & Welding Systems

P/N 104151
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Revision 3



OUR BRANDS



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- Shipping address
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CLIMAX World Headquarters

2712 East 2nd Street
Newberg, Oregon 97132 USA

Telephone (worldwide): +1-503-538-2815
Toll-free (North America): 1-800-333-8311
Fax: 503-538-7600

CLIMAX | H&S Tool (UK Headquarters)

Unit 7 Castlehill Industrial Estate
Bredbury Industrial Park
Horsfield Way
Stockport SK6 2SU, UK

Telephone: +44 (0) 161-406-1720

CLIMAX | H&S Tool (Asia Pacific Headquarters)

316 Tanglin Road #02-01
Singapore 247978

Telephone: +65 9647-2289
Fax: +65 6801-0699

CLIMAX | H&S Tool World Headquarters

715 Weber Dr.
Wadsworth, OH 44281 USA

Telephone: +1-330-336-4550
Fax: 1-330-336-9159
hstool.com

CLIMAX | H&S Tool (European Headquarters)

Am Langen Graben 8
52353 Düren, Germany

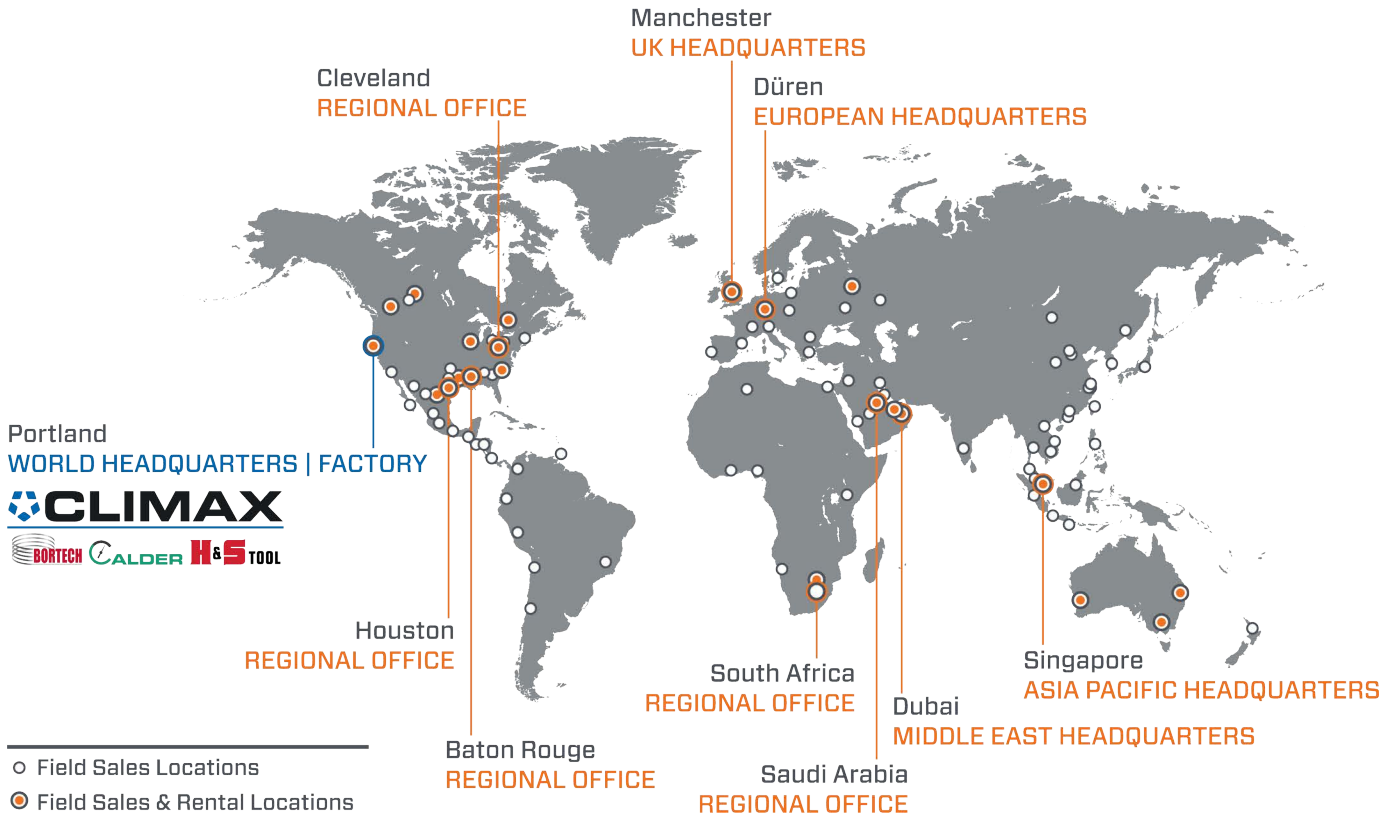
Telephone: +49 24-219-1770
E-mail: ClimaxEurope@cpmt.com

CLIMAX | H&S Tool (Middle East Headquarters)

Warehouse #5, Plot: 369 272
Um Sequim Road
Al Quoz 4
PO Box 414 084
Dubai, UAE

Telephone: +971 04-321-0328

CLIMAX GLOBAL LOCATIONS



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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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TABLE OF CONTENTS

CHAPTER/SECTION	PAGE
1 INTRODUCTION	1
1.1 HOW TO USE THIS MANUAL	1
1.2 SAFETY ALERTS	1
1.3 GENERAL SAFETY PRECAUTIONS	2
1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS	3
1.5 RISK ASSESSMENT AND HAZARD MITIGATION	4
1.6 RISK ASSESSMENT CHECKLIST	5
1.7 LABELS	6
1.7.1 Label identification	6
2 OVERVIEW	9
2.1 FEATURES AND COMPONENTS	9
2.2 CONTROLS	12
2.3 DIMENSIONS	14
2.4 SPECIFICATIONS	16
2.5 ITEMS REQUIRED BUT NOT SUPPLIED	16
3 SETUP	17
3.1 RECEIPT AND INSPECTION	17
3.2 LIFTING AND RIGGING	17
3.3 MOUNT THE STANDARD BASE	19
3.4 MOUNT THE MAGNETIC BASE (OPTIONAL)	20
3.5 DRILL SETUP	23
3.6 TEST OPERATION	24
3.7 TAPER ATTACHMENTS	25
4 OPERATION	27
4.1 PRE-OPERATION CHECKS	27
4.2 OPERATION	28
4.2.1 Starting the machine	28
4.2.2 Emergency shutdown	29
4.2.3 Stopping the machine	29
4.3 MACHINE FEED	29
4.4 DRILLING	31
4.5 REAMING	31
4.6 DISASSEMBLY	32
5 MAINTENANCE	33
5.1 MAINTENANCE CHECKLIST	33
5.2 APPROVED LUBRICANTS	33

TABLE OF CONTENTS (CONTINUED)

CHAPTER/SECTION	PAGE
5.3 MAINTENANCE TASKS	34
5.3.1 Lubricating the dovetail ways and leadscrews	35
5.3.2 Adjusting the dovetail gib screws	35
5.3.3 Feed gearing	36
5.3.4 Rotational drive unit oil	36
5.3.5 Checking the tram	36
5.4 TROUBLESHOOTING	38
6 STORAGE AND SHIPPING	39
6.1 STORAGE	39
6.1.1 Short-term storage	39
6.1.2 Long-term storage	39
6.2 SHIPPING	40
6.3 DECOMMISSIONING	40
APPENDIX A ASSEMBLY DRAWINGS	41
APPENDIX B SDS	57

LIST OF FIGURES

FIGURE	PAGE
2-1 Components 1	10
2-2 Components 2	11
2-3 Control panel	12
2-4 Dimensions	14
3-1 Drill tower lifting (lift plate only for the lifting tower, RDU assembly, and tool arbor)	18
3-2 Magnetic base lifting	19
3-3 Drill Alignment	20
3-4 Leveling set screws	20
3-5 Top view of motor on the left side of the tower	23
3-6 Top view of motor on the right side of the tower	23
3-7 Taper attachment installation	25
4-1 Hose orientation shown for correct motor rotation and forward feed.	27
4-2 Manual feed movement	30
4-3 Feed speed setting	30
5-1 Ways and leadscrews location	35
5-2 Gib screws location	35
5-3 Feed gearing location (do not remove the screws marked with an X).	36
5-4 RDU oil plug location	36
A-1 Compact drill assembly (P/N 104123)	42
A-2 Drill components and configurations (P/N 104123)	43
A-3 Magnet base assembly (P/N 104374)	44
A-4 Feed tower assembly (P/N 87792)	45
A-5 Feed tower assembly parts list (P/N 87792)	46
A-6 Feed tower configurations (P/N 87792)	47
A-7 Drill spindle assembly (P/N 95730)	48
A-8 Drill spindle assembly parts list (P/N 95730)	49
A-9 Assembly Electro-Permanent Magbase and Controller Bi-Directional Interlock 208-230V	50
A-10 Assembly Electro-Permanent Magbase and Controller Bi-Directional Interlock 380-415V	50
A-11 Assembly Electro-Permanent Magbase and Controller Bi-Directional Interlock 460V	50
A-12 Hydraulic motor 5 cubic inches 60 fittings assembly (P/N 105552)	52
A-13 Compact drill tower base mount assembly (P/N 73445)	53

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LIST OF TABLES

TABLE	PAGE
1-1 Risk assessment checklist before set-up	5
1-2 Risk assessment checklist after set-up	5
1-3 Compact Drill labels	6
2-1 Compact Drill component identification	10
2-2 Compact Drill ID chuck identification	11
2-3 Controls	12
2-4 Tower height dimensions	15
2-5 Specifications	16
3-1 Magnetic base lifting identification	19
3-2 Components identified on the top of the motor	23
4-1 Hose orientation identification	28
5-1 Maintenance intervals and tasks	33
5-2 Approved lubricants	34
5-3 Tram troubleshooting	37
5-4 Troubleshooting	38
A-1 Spare parts kit P/N 105903	54
A-2 Tool kit P/N 95870	54

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1 INTRODUCTION

IN THIS CHAPTER:

1.1 HOW TO USE THIS MANUAL	1
1.2 SAFETY ALERTS	1
1.3 GENERAL SAFETY PRECAUTIONS	2
1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS	3
1.5 RISK ASSESSMENT AND HAZARD MITIGATION	4
1.6 RISK ASSESSMENT CHECKLIST	5
1.7 LABELS	6
1.7.1 LABEL IDENTIFICATION	6

1.1 HOW TO USE THIS MANUAL

This manual describes information necessary for the setup, operation, maintenance, storage, shipping, and decommissioning of the Compact Drill.

The first page of each chapter includes a summary of the chapter contents to help you locate specific information. The appendices contain supplemental product information to aid in setup, operation, and maintenance tasks.

Read this entire manual to familiarize yourself with the Compact Drill before attempting to set it up or operate it.

1.2 SAFETY ALERTS

Pay careful attention to the safety alerts printed throughout this manual. Safety alerts will call your attention to specific hazardous situations that may be encountered when operating this machine.

Examples of safety alerts used in this manual are defined here¹:

DANGER

indicates a hazardous situation which, if not avoided, **WILL** result in death or severe injury.

WARNING

indicates a hazardous situation which, if not avoided, **COULD** result in death or severe injury.

1. For more information on safety alerts, refer to *ANSI/NEMA Z535.6-2011, Product safety Information in Product Manuals, Instructions, and Other Collateral Materials*.

 **CAUTION**

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

indicates a hazardous situation which, if not avoided, could result in property damage, equipment failure, or undesired work results.

1.3 GENERAL SAFETY PRECAUTIONS

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

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

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

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

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

Personal protective equipment – Always wear appropriate personal protective gear when operating this or any other machine tool. Flame-resistant clothing with long sleeves and legs is recommended when operating the machine. Hot chips from the workpiece may burn or cut bare skin.

Work area – Keep the work area around the machine clear of clutter. Restrain cords and hoses connected to the machine. Keep other cords and hoses away from the work area.

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

Lock-out/tag-out – Lock-out and tag-out the machine before performing maintenance.

Moving parts – CLIMAX machines have numerous exposed moving parts

and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for stationary operating controls, avoid contact with moving parts by hands or tools during machine operation. Remove gloves and secure hair, clothing, jewelry, and pocket items to prevent them from becoming entangled in moving parts.

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

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

1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

Eye hazard – This machine produces metal chips during operation. Always wear eye protection when operating the machine.

Sound level – This machine produces potentially harmful sound levels. Hearing protection is required when operating this machine or working around it.

Hazardous environments – Do not operate the machine in environments where potentially explosive materials, toxic chemicals, or radiation may be present.

Machine mounting – Do not operate the machine unless mounted to a workpiece in accordance with this manual. If mounting the machine in an overhead or vertical position, do not remove hoist rigging until the machine is mounted to the workpiece in accordance with this manual.

Magnetic base – If you have a pacemaker or other electronic medical device, do not operate or be within 15 feet of the machine while the magnetic base is operating. The magnetic base and magnetic base control system emit a strong magnetic field and electronic pulses that may affect electronic devices. Do not place sensitive electronic devices on or near the magnetic base while operating. Use caution when using metallic tools near the magnetic base while operating.

1.5 RISK ASSESSMENT AND HAZARD MITIGATION

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

Stationary Machine Tools include lathes and milling machines and are typically found in a machine shop. They are mounted in a fixed location during operation and are considered 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.

1.6 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 (Section 3.4) and took inventory of all the items required but not supplied (Section 2.5).
<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 (according to Section 3) 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 checklist (Section 5.1) with the recommended lubricants (Section 5.2).
<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.

1.7 LABELS


1.7.1 Label identification

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

TABLE 1-3. COMPACT DRILL LABELS

	<p>P/N 29152 Mass plate</p>		<p>P/N 29154 CE serial number plate</p>
	<p>P/N 34735 Warning label: machine operation hazards</p>		<p>P/N 46902 Warning label: hot surface</p>
	<p>P/N 54133 Oil specification</p>		<p>P/N 70227 CLIMAX logo</p>
	<p>P/N 70554 Label: lift point</p>		<p>P/N 79488 Warning label: read the manual</p>

TABLE 1-3. COMPACT DRILL LABELS (CONTINUED)

	<p>P/N 91217 Mass plate</p>	
-----------------------------------------------------------------------------------	---------------------------------	--

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2 OVERVIEW

IN THIS CHAPTER:

2.1 FEATURES AND COMPONENTS - - - - -	9
2.2 CONTROLS - - - - -	12
2.3 DIMENSIONS - - - - -	14
2.4 SPECIFICATIONS - - - - -	16
2.5 ITEMS REQUIRED BUT NOT SUPPLIED - - - - -	16

2.1 FEATURES AND COMPONENTS

The compact hydraulic drill is used to drill or ream holes up to 4" (101 mm) diameter in applications with limited workspace. This operating manual describes the recommended operation of a compact hydraulic drill configured with an electro-permanent magnetic base and 7–18" of tool travel.

NOTICE

The optional magnetic base requires a mild/carbon steel workpiece with a minimum 0.5" (12 mm) thickness to achieve the full holding force. The workpiece must be clean and free of rust, mill scale, dirt, burrs, and large scratches.

The workpiece must be smooth and flat (less than 0.02" (0.5 mm) deviation from flat) and free of holes or other voids. Shimming underneath the magnetic base with steel shim stock will improve the holding force on uneven surfaces. Workpieces deviating from these specifications may be accommodated with approval from CLIMAX Engineering.

WARNING

The Compact Drill compact hydraulic drill is a high-torque portable machine tool. If the base is not properly secured, or the workpiece does not meet the specifications in the above Notice, the machine could unexpectedly break free without warning during drilling operations and violently rotate about the drill spindle axis.

To prevent serious injury or death, it is the operator's responsibility to assure that the mounting surface is adequate to allow the magnetic base to achieve full holding force.

See Section 3.4 on page 20 for instructions on safely mounting the magnetic base.

Figure 2-1 on page 10 shows principal components.

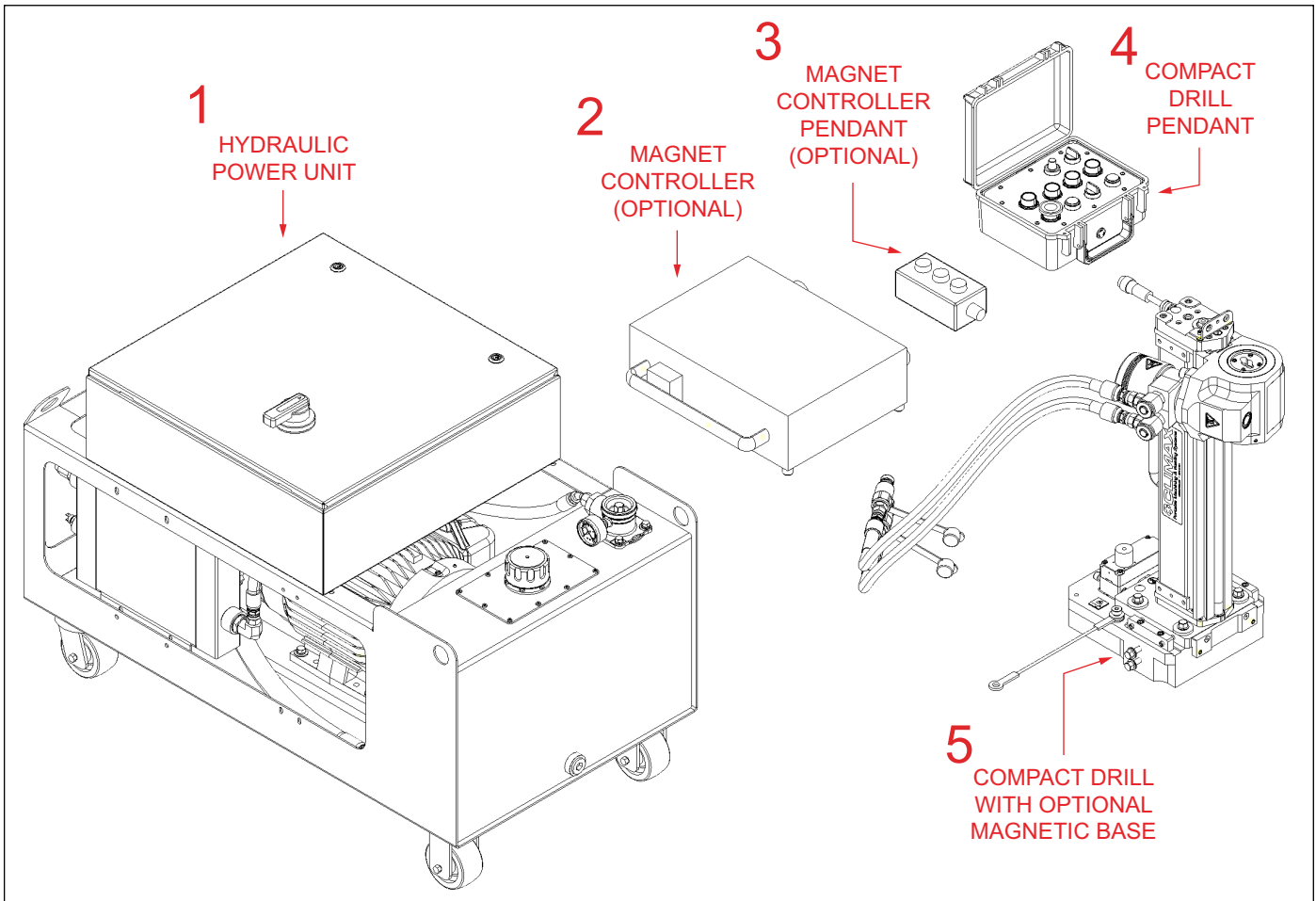


FIGURE 2-1. COMPONENTS 1

TABLE 2-1. COMPACT DRILL COMPONENT IDENTIFICATION

Number	Component
1	Hydraulic power unit
2	Magnet controller (optional)
3	Magnet controller pendant (optional)
4	Compact drill pendant
5	Compact drill with optional magnetic base

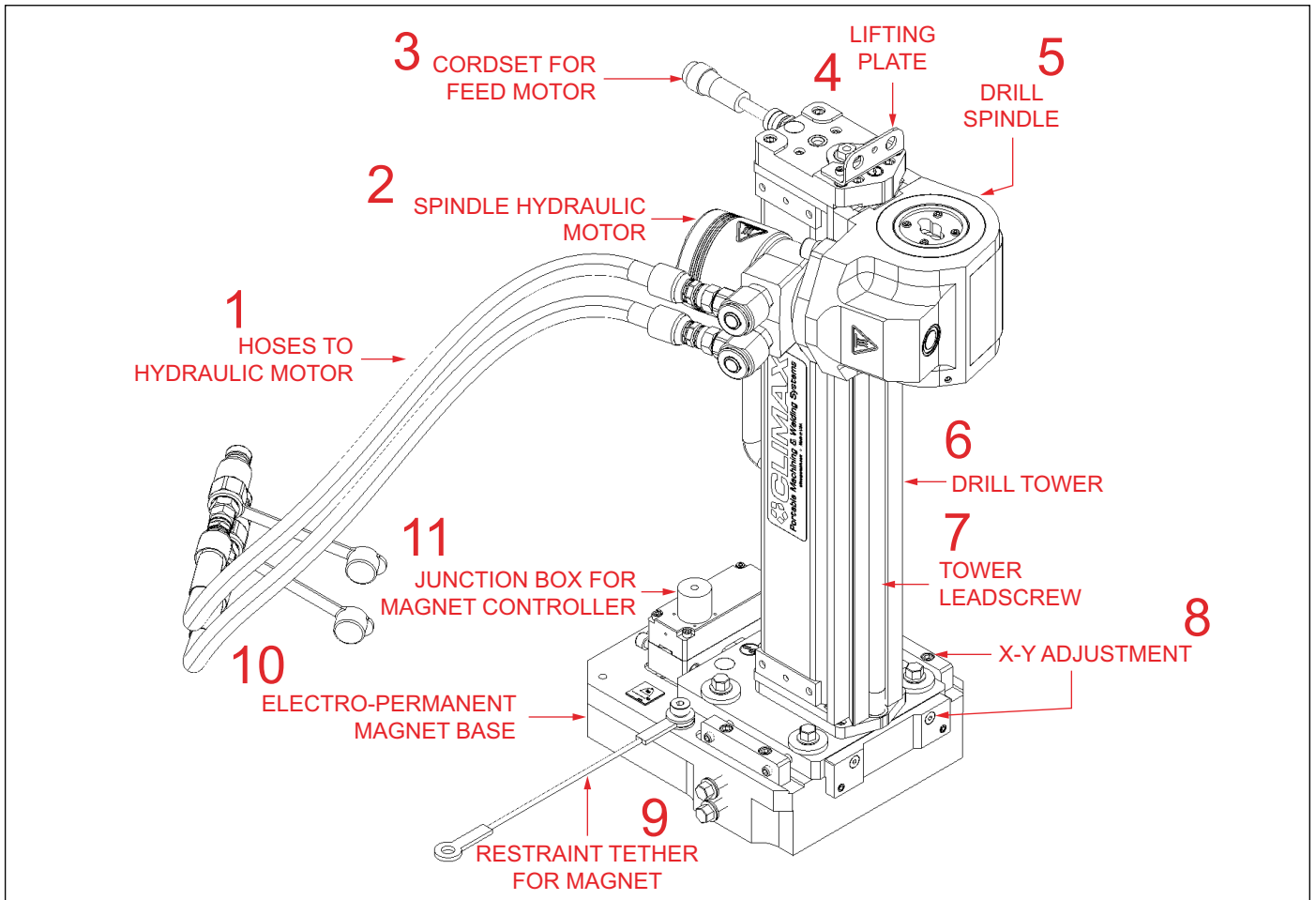


FIGURE 2-2. COMPONENTS 2

TABLE 2-2. COMPACT DRILL ID CHUCK IDENTIFICATION

Number	Component
1	Hoses to the hydraulic motor
2	Spindle hydraulic motor
3	Cord set for the feed motor
4	Lifting plate
5	Drill spindle
6	Drill tower
7	Tower leadscrew
8	X-Y adjustment
9	Restraint tether for magnet
10	Electro-permanent magnet base
11	Junction box for magnet controller

2.2 CONTROLS

See Appendix C on page 59 for the magnetic base operating manual, including controls information.

The HPU for the Compact Drill has a separate operating manual. Please refer to those instructions for detailed information.

The hydraulic compact drill feed is controlled through the control pendant (P/N 65196).

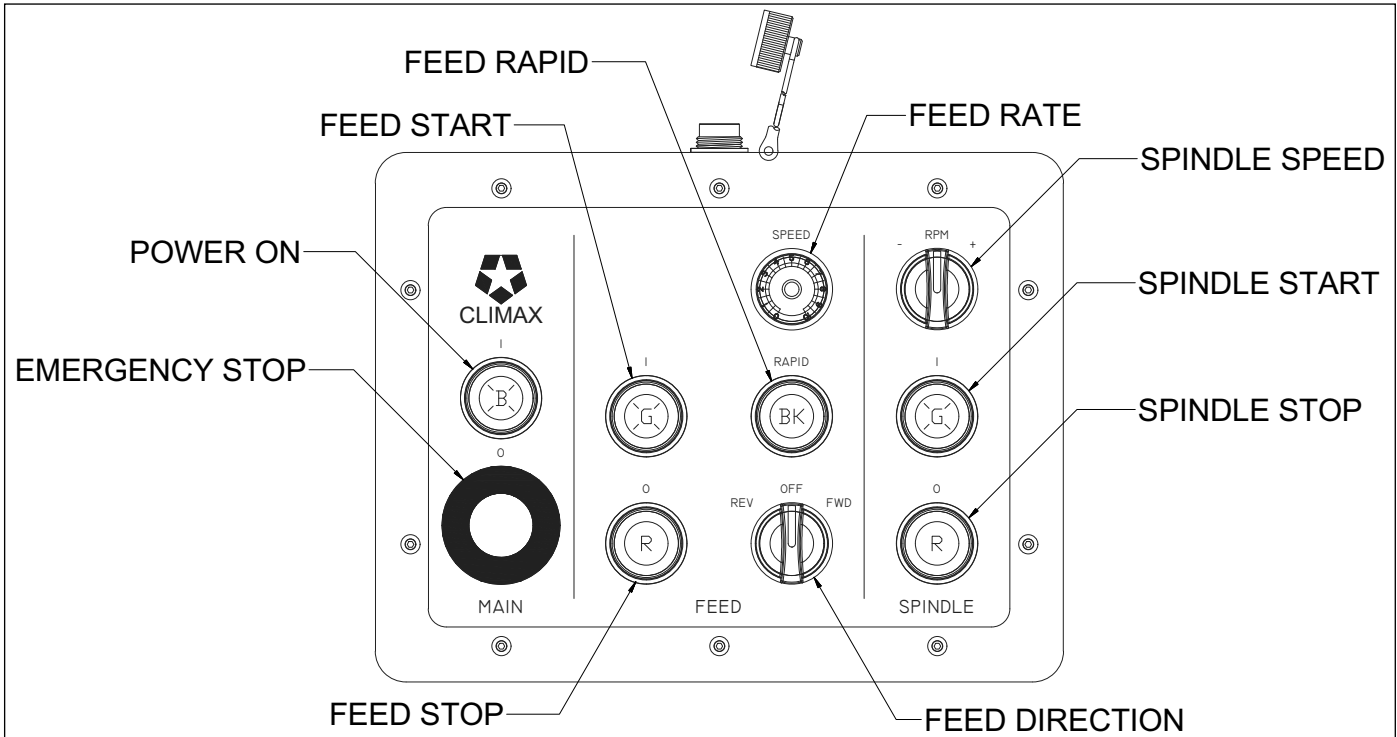


FIGURE 2-3. CONTROL PANEL

TABLE 2-3. CONTROLS

Feature	Pre-requisites	Action
EMERGENCY STOP	Machine power ON, emergency stop disengaged	Machine movements stops, hydraulic power unit (HPU) powers OFF
FEED DIRECTION	Feed ON	REV: Machine feeds away from the feed assembly OFF: Feed movement stops, feed powers OFF FWD: Machine feeds toward the feed assembly
FEED RAPID	Feed ON	Momentary increase of feed rate to max speed
FEED RATE	Feed ON	Adjusts feed speed
FEED START	Power ON, feed direction not OFF	Machine feed begins, feed powers

TABLE 2-3. CONTROLS

Feature	Pre-requisites	Action
FEED STOP	Feed ON	Feed movement stops, feed powers OFF
POWER ON	Emergency stop disengaged	Energizes machine, HPU powers ON
SPINDLE SPEED	Power ON	Turned to (+): Spindle speed increases Turned to (-): Spindle speed decreases
SPINDLE START	Machine power ON, spindle OFF	Spindle power ON
SPINDLE STOP	Spindle ON	Spindle power OFF

TIP:

The HPU and optional electro-permanent magnet controller have a bi-directional interlock. The magnet controller will not operate (to energize or de-energize the magnet) unless the interlock cable is plugged into the HPU.

Likewise, when the magnet controller is plugged into the HPU, the HPU will not operate unless the magnet controller is showing that the magnet is energized. See Appendix C for additional information.

2.3 DIMENSIONS

Figure 2-4 show the machine and operating dimensions.

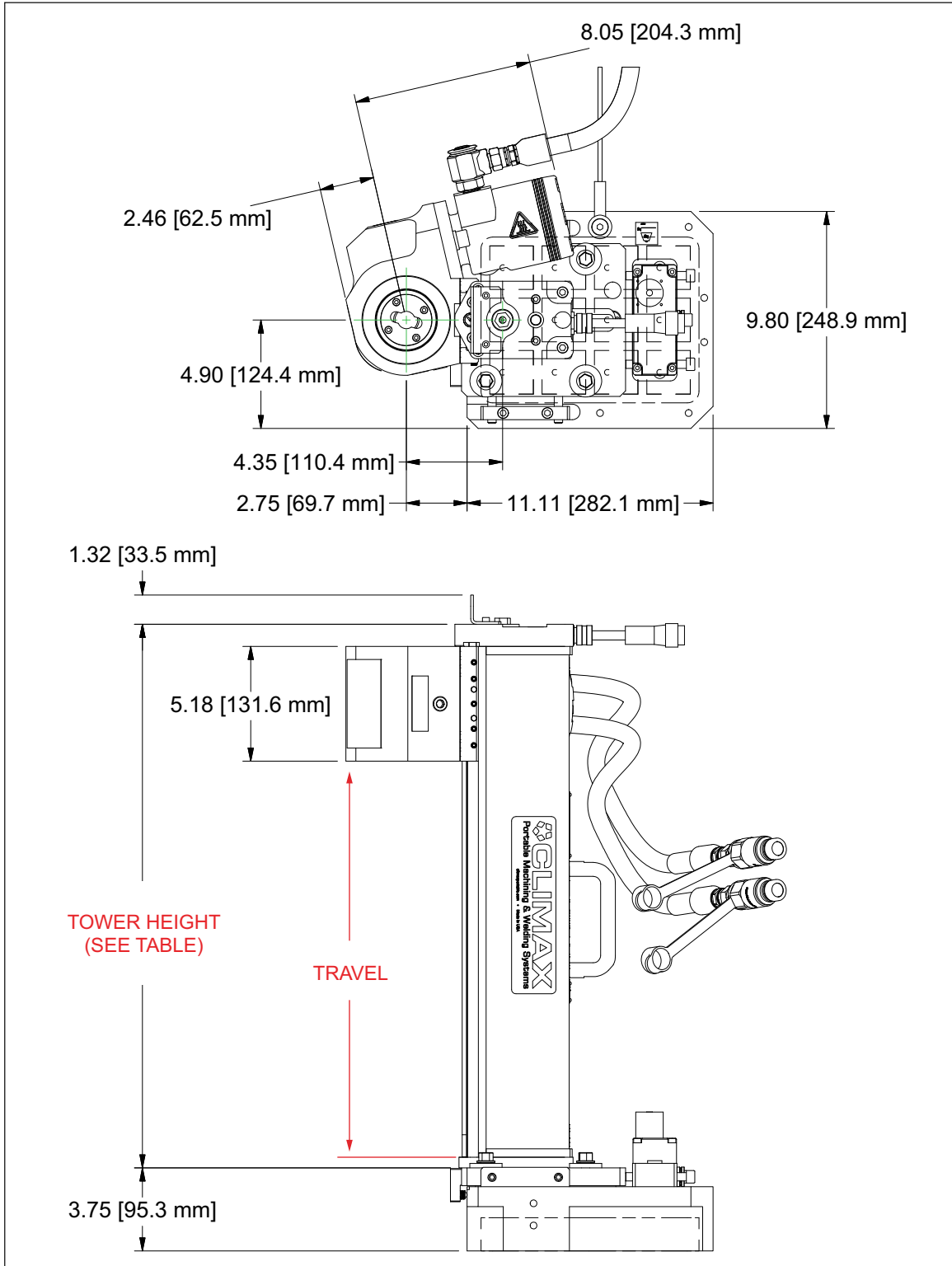


FIGURE 2-4. DIMENSIONS

TABLE 2-4. TOWER HEIGHT DIMENSIONS

Drill model	Travel	Tower height
CD18	18" (457 mm)	24.54" (623.3 mm)
CD12	12" (304 mm)	18.54" (470.5 mm)
CD20	10" (254 mm)	16.54" (420.1 mm)
CD7	7" (177 mm)	13.54" (343.1 mm)

2.4 SPECIFICATIONS

TABLE 2-5. SPECIFICATIONS

Mount style:	bolt on base or optional electro-permanent magnet base
Rotational drive:	5.7 cu.in. (93 cm ³), 8.0 cu.in. (131 cm ³), or 8.9 cu. in. 5.0 hydraulic motor
Feed motor:	90 VDC, 145 W
Machine taper:	#4 Morse Taper
Maximum spindle speed:	110 rpm with the 5.7 cu.in. motor 78 rpm with the 8.0 cu.in. motor 120 rpm with the 5.0 cu. in. motor 65 rpm with the 8.9 cu. in. motor
Variable feed rate:	.06–2.5" (1.5-64mm) per minute
Tool travel:	CD18=18" (457 mm), CD12=12" (304 mm), CD10=10" (254 mm), CD7=7" (177 mm)
Maximum torque:	420 ft-lbs (570 Nm) with the 5.7 cu.in. motor 560 ft-lbs (759 Nm) with the 8.0 cu.in. motor 350 ft-lbs (475 Nm) with the 5.0 cu.in. motor 640 ft-lbs (868 Nm) with the 8.9 cu.in. motor
Maximum axial thrust:	1,200 lbs (544 kg)
Maximum operating pressure:	1,800 psi (124 bar)
Recommended operating pressure:	1,600 psi (110 bar)
Magnetic base weight:	77 lbs (35 kg)
Drill tower/rotational drive unit:	CD18=90lbs (41 kg), CD12=75lbs (34 kg), CD10=70lbs (32 kg), CD7=62lbs (28kg)

2.5 ITEMS REQUIRED BUT NOT SUPPLIED

Items required but not supplied include the following:

- Dial indicators and holders or any other alignment/measuring hardware
- Drill or reamer tooling and consumables
- Hammer
- Torque wrench capable of 35 ft-lbs

CLIMAX recommends the Super Drill™ from Showa Tool Company or equivalent tooling.

3 SETUP

IN THIS CHAPTER:

3.1 RECEIPT AND INSPECTION	-17
3.2 LIFTING AND RIGGING	-17
3.3 MOUNT THE STANDARD BASE	-19
3.4 MOUNT THE MAGNETIC BASE (OPTIONAL)	-20
3.5 DRILL SETUP	-23
3.6 TEST OPERATION	-24
3.7 TAPER ATTACHMENTS	-25

This section describes the setup and assembly procedures for the Compact Drill compact hydraulic drill.

3.1 RECEIPT AND INSPECTION

Your CLIMAX product was inspected and tested prior to shipment, and packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery.

When you receive your CLIMAX product, perform the following receipt checks:

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

Contact CLIMAX immediately to report damaged or missing components.

NOTICE

Keep the shipping container and all packing materials for future storage and shipping of the machine.

The machine ships from CLIMAX with a heavy coating of LPS 3. The recommended cleaner is LPS PreSolve Orange Degreaser. All parts must be cleaned before use.

3.2 LIFTING AND RIGGING

Parts can shift during shipment, which may cause components to fall and drop during rigging. Before removing tools from the shipping container, check that all tool fasteners and components are secure.

! WARNING

The Compact Drill components weigh up to 90 lbs (41 kg). To prevent serious injury to yourself and others, always follow the operating procedures outlined in this manual, your own company rules, and local regulations for heavy lifting. Serious injury or fatalities can result from improper lifting methods.

! WARNING

Falling or uncontrolled swinging of machinery can cause serious injury or be fatal to the operator and bystanders. Lift the HPU only by the properly designated lifting eyes.

Use lifting shackles, slings, or the provided handle to lift the drill tower and spindle rotational drive unit (RDU) assembly from the shipping case.

! WARNING

The lift plate (see Figure 3-1 on page 18) on top of the drill tower is only for lifting the tower and RDU assembly and tool arbor. Do not attempt to use the lift plate to lift the tower while attached to the magnetic base. Attempting to lift the tower and RDU assembly while attached to the magnetic base may cause the load to become unstable and break free, causing serious injuries or fatalities.

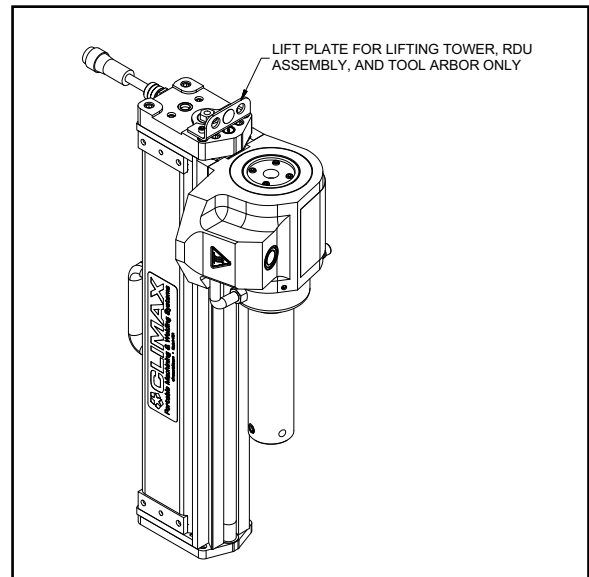


FIGURE 3-1. DRILL TOWER LIFTING (LIFT PLATE ONLY FOR THE LIFTING TOWER, RDU ASSEMBLY, AND TOOL ARBOR)

Use the lifting eye provided in the tool kit to lift the magnetic base/X-Y adjustable base assembly from the shipping case (see Figure 3-2 on page 19).

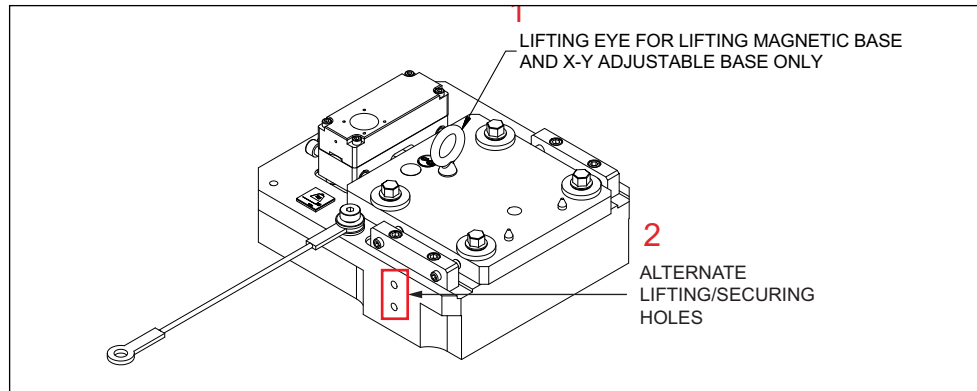


FIGURE 3-2. MAGNETIC BASE LIFTING

TABLE 3-1. MAGNETIC BASE LIFTING IDENTIFICATION

Number	Component
1	Lifting eye for the lifting magnetic base and X-Y adjustable base only
2	Alternate lifting/securing holes

! WARNING

The lift point on the magnetic base assembly is only for lifting the magnetic base and X-Y adjustable base assembly. Do not attempt to use this lift point to lift the entire assembled drill, as the load may become unstable and swing, causing serious injury or fatality.

Tooling used with this machine is sharp and can cause minor to moderate injury. Use caution when handling sharp tooling.

3.3 MOUNT THE STANDARD BASE

This section explains how to install the standard base onto the workpiece.

! WARNING

The compact hydraulic drill is a high-torque portable machine tool. If not properly secured to a rigid mounting base, it could unexpectedly break free without warning during drilling operations and violently rotate about the drill spindle axis. To prevent serious injury or death, it is the operator's responsibility to assure that the mounting base is adequate to support the compact drill's weight as well as the axial thrust and torque that will result during the drilling process.

The maximum torque is 450 ft-lbs (464 Nm) at 2,100 psi and the maximum axial thrust is 1.750 lbs (7.78 kN).

Complete los siguientes pasos para montar el taladro en la base estándar:

1. Mount the drill to the standard base.
2. Position the drill over the hole to be drilled.
3. Align the drill centerline to the hole using a dial indicator (see Figure 3-3).
4. Follow the steps below to adjust the perpendicularity to the workpiece:
 - a) Use dial indicator against the workpiece face.
 - b) Adjust perpendicularity by leveling the set screws (see Figure 3-4).
5. Tack weld the base plate to the workpiece.
6. Confirm the centerline alignment and perpendicularity using a dial indicator.

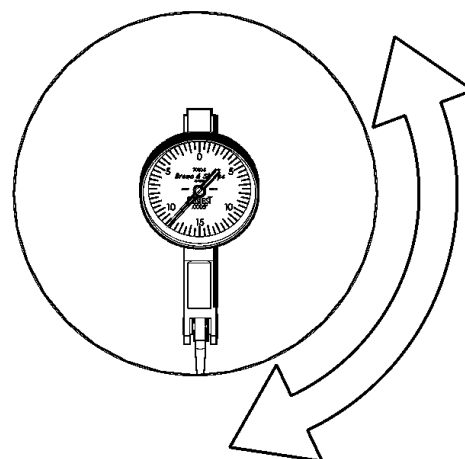


FIGURE 3-3. DRILL ALIGNMENT

TIP:

Tighten the set screws against the workpiece for extra support. Over tightening may cause misalignment.

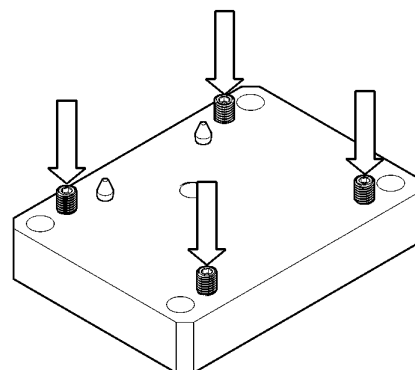


FIGURE 3-4. LEVELING SET SCREWS

3.4 MOUNT THE MAGNETIC BASE (OPTIONAL)

This section describes mounting the electro-permanent magnetic base onto the workpiece.

To help ensure operator safety, the maximum allowable machine torque is limited to 560 ft-lbf (756 Nm), and the maximum allowable axial thrust is limited to 1,200 lbs (5,340 Nm).

NOTICE

The magnetic base requires a mild/carbon steel workpiece with a minimum 0.5" (12 mm) thickness to achieve the full holding force. The workpiece must be clean and free of rust, mill scale, dirt, burrs, and large scratches. The workpiece must be smooth and flat (less than 0.02" (0.5 mm) deviation from flat) and free of holes or other voids. Shimming underneath the magnetic base with steel shim stock will improve the holding force on uneven surfaces. Workpieces deviating from these specifications may be accommodated with approval from CLIMAX Engineering.

 **WARNING**

The Compact Drill is a high-torque portable machine tool. If the base is not properly secured, or the workpiece does not meet the specifications in the above Notice, the machine could unexpectedly break free without warning during drilling operations and violently rotate about the drill spindle axis which may cause damage to the drill or workpiece.

To prevent serious injury or death, it is the operator's responsibility to assure that the mounting surface is adequate to allow the magnetic base to achieve full holding force.

Do the following to mount the magnetic base to the workpiece:

1. Clean the footprint area of the drill tower of chips and debris, and smooth it with a stone if required to remove burrs.
2. Place the magnetic base onto the workpiece.

NOTICE

For drilling on flat surfaces, it may be more effective to mount the drill onto the magnetic base before securing the magnetic base to the workpiece, to aid in aligning the drill to the workpiece. See Section 3.6 on page 24.

3. If appropriate, use the alternate 3/8-16 UNC holes on the side of the magnetic base for additional securing of the base with customer-supplied brackets (see Figure 3-2 on page 19).
4. Torque the mounting screws to 25 ft-lbs (34 Nm).

 **WARNING**

Any additional securing of the base is only a backup to increase the torque resistance of the magnetic base. Do not rely solely on the additional brackets to secure the drill. Without a properly installed

magnetic base, the drill may become dislodged from the workpiece, causing serious injury or fatality.

5. For out of position machining operations, install and secure the tether on the magnetic base to the workpiece or an adjacent surface.

 **WARNING**

The tether must be used in any application where dislodging the magnetic base would cause the base or drill to fall (such as when mounting the drill to a vertical surface or overhead). The tether must be restrained with hardware and to a surface capable of withstanding a minimum of 800 lbf (3,560 Nm).

Failure to use the tether, or failure to secure the tether adequately, may allow the drill to fall uncontrolled, causing serious injury or death. If the drill falls and is caught by the tether, replace the tether and mounting hardware immediately. The force of a fall may weaken the tether or the mounting hardware and cause it to fail should another fall occur, causing serious injury or death.

6. Place the drill tower and RDU assembly onto the X/Y adjustment base on the magnetic base. Install and tighten the draw bolt to 30 ft-lbs (40 Nm)

3.5 DRILL SETUP

This section describes mounting and adjusting the tower.

NOTICE

Some applications require the drill to fit into a tight corner. The drill can be reversed by assembling the drill to the magnetic base or to the alternate tower base assembly (PN 73445) by removing the lift plate and installing the drawbolt from the opposite side of the drill. This places the drill motor on the opposite side of the tower. See for installing the taper adapter for the correct drill orientation.

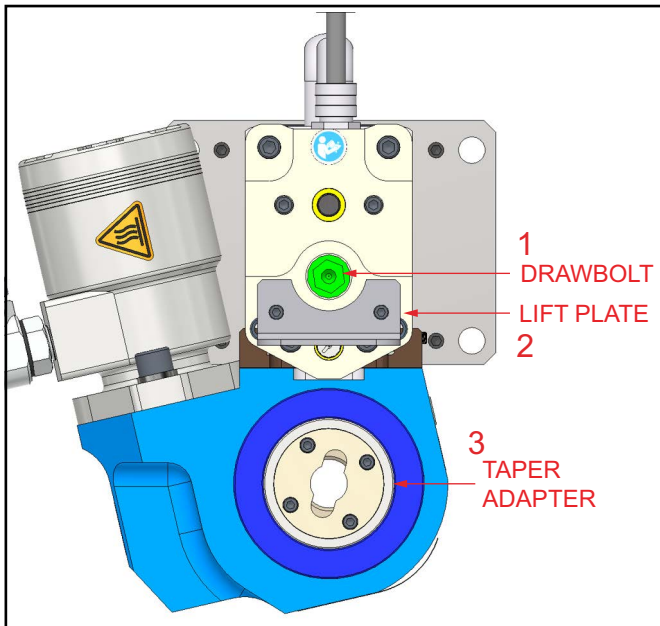


FIGURE 3-5. TOP VIEW OF MOTOR ON THE LEFT SIDE OF THE TOWER

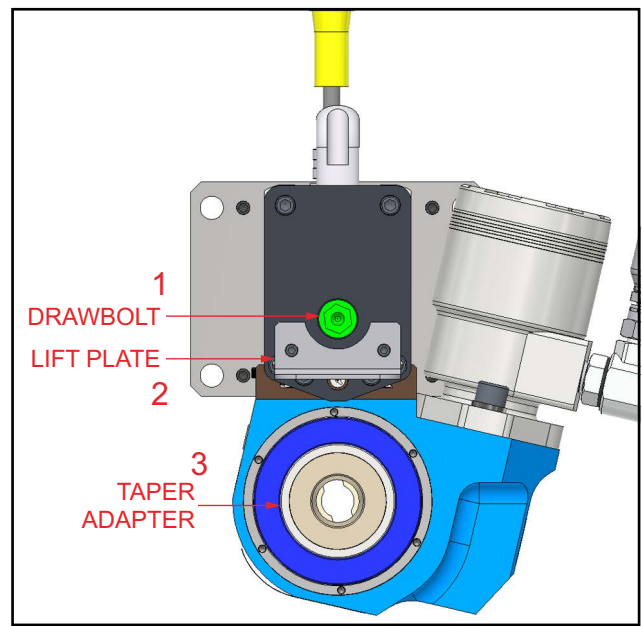


FIGURE 3-6. TOP VIEW OF MOTOR ON THE RIGHT SIDE OF THE TOWER

TABLEAU 3-2. COMPONENTS IDENTIFIED ON THE TOP OF THE MOTOR

Number	Component
1	Drawbolt
2	Lift plate
3	Taper adapter

NOTICE

If the draw bolt is not tightened to 30 ft-lbs (40 Nm), the drill may lose rigidity, causing poor drilling performance, poor surface finish, and poor hole sizing or breakage of the cutting tool.

-
1. Install the hydraulic motor assembly into the RDU and tighten the screws to 20 ft-lbs (27 Nm).
 2. Connect the hydraulic motor hoses, feed control, and pendant to the HPU.
 3. Connect the magnetic base pendant, magnetic base, and magnetic base/spindle interlock solenoid cables to the magnetic base control.
 4. Install the cutting tool into the arbor.
 5. Loosen the four screws on top of the X/Y adjustable base, and use the X/Y adjustment screws to align the cutting tool to the workpiece.
 6. Once the cutting tool is aligned, tighten the four screws on top of the X/Y adjustable base to 35 ft-lbs (47 Nm).

NOTICE

If the screws are not tightened to 35 ft-lbs (47 Nm), the drill may lose rigidity, causing poor drilling performance, poor surface finish, and poor hole sizing or breakage of the cutting tool.

3.6 TEST OPERATION

Before performing this test, review the controls shown and described in Section 2.2 on page 10.

Do the following tests to check for proper setup and functioning:

1. Energize the magnetic base. Turn on the power switch on the magnetic base controls.
 - a) Press the blue and green buttons on the magnetic control pendant simultaneously, then release them.
 - b) Check that the magnetic base is on and secure.

NOTICE

You should not be able to slide or rock the drill assembly if the magnet is activated and the installation is correct.

TIP:

Use a small steel tool, such as a screwdriver, to check for magnetism of the magnetic base. Push on the side of the drill tower to check for stability.

NOTICE

This drill is equipped with a magnetic base and spindle interlock relay in the HPU controls that is intended to prevent spindle rotation unless the magnetic base is engaged. The magnetic base must be engaged before attempting to rotate the spindle.

2. Check that the drill is rotating the correct direction for cutting.
3. Check the feed in both directions.

3.7 TAPER ATTACHMENTS

Do the following to install or replace taper attachments to use cutting tools of a matching taper:

1. Slip the taper adapter into the desired cutting side of the RDU.
2. Fit the taper retainer over the opposite side of the RDU.
3. Install the four 10-32 socket head cap screws (SHCS) to secure the taper retainer.

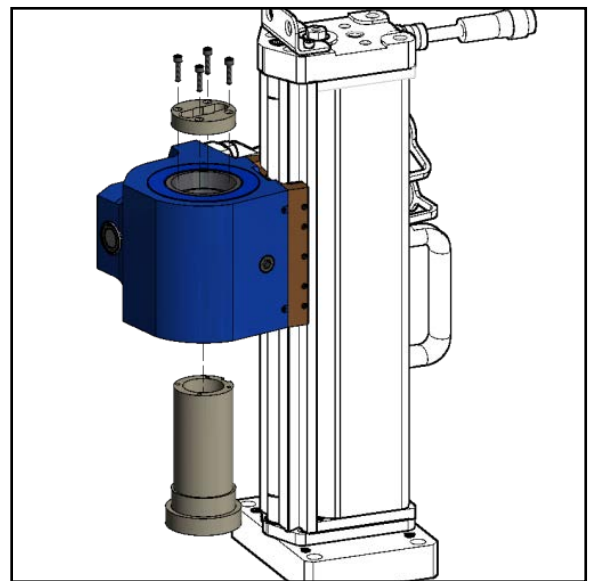


FIGURE 3-7. TAPER ATTACHMENT INSTALLATION

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4 OPERATION

IN THIS CHAPTER:

4.1 PRE-OPERATION CHECKS	-27
4.2 OPERATION	-28
4.2.1 STARTING THE MACHINE	-28
4.2.2 EMERGENCY SHUTDOWN	-29
4.2.3 STOPPING THE MACHINE	-29
4.3 MACHINE FEED	-29
4.4 DRILLING	-31
4.5 REAMING	-31
4.6 DISASSEMBLY	-32

4.1 PRE-OPERATION CHECKS

Do the following checks before operating the compact hydraulic drill:

1. Complete the risk assessment checklist in Table 1-3 on page 5.
2. Clean the workpiece and base plate of chips and debris.
3. If using the optional magnetic base, check that the drill tower is securely mounted to the magnetic base.
4. Check that the proper cutting tool is installed securely into the drill spindle.
5. Check that the spindle direction is correct.

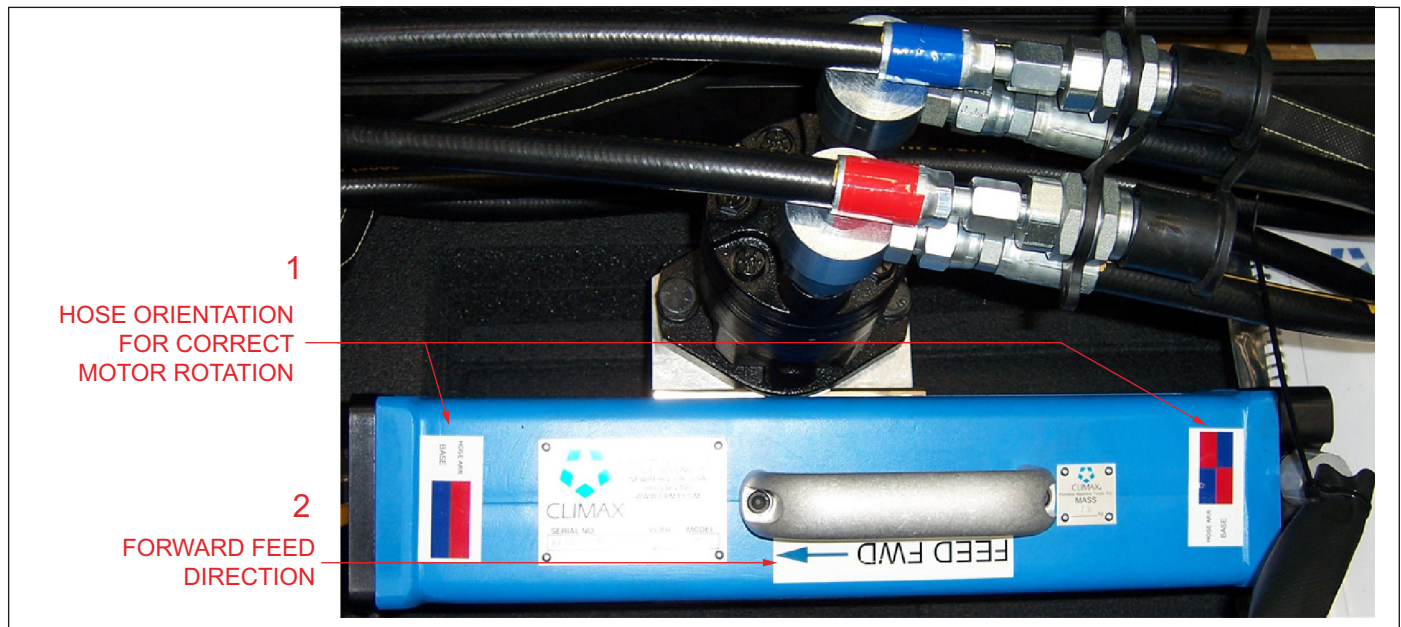


FIGURE 4-1. HOSE ORIENTATION SHOWN FOR CORRECT MOTOR ROTATION AND FORWARD FEED

TABLEAU 4-1. HOSE ORIENTATION IDENTIFICATION

Number	Component
1	Hose orientation for correct motor rotation
2	Forward feed direction

The red-blue label on the back side of the tower (see Figure 4-1) closest to the hole being drilled shows the correct hose connection arrangement between the HPU hoses and the motor hoses for the spindle to rotate the drill bit clockwise.

6. Check that the dovetail gib is properly tightened according to Section 5.3.2 on page 35.
7. Check that the work area is clear of non-essential personnel and equipment.
8. Check that the machine control/observation area will not be in the path of hot flying chips during machine operation.
9. Check the machine is securely mounted to the workpiece.
10. Check that hydraulic hoses and electrical cables hoses are routed and secured to avoid tripping, entanglement, damage from hot chips, or other damage should a connection fail.
11. Check the tool condition and sharpness.
12. Check that all hand tools are removed from inside the machine and the work area.

4.2 OPERATION

NOTICE

The operation controls depend on the supplied hydraulic power unit (HPU). Review the controls shown and described in Section 2.2 on page 10.

4.2.1 Starting the machine

Do the following to start the machine:

1. Twist the emergency stop button to disengage.
2. Check that the magnetic base is engaged and secure. You should not be able to slide or rock the drill assembly when properly installed.

NOTICE

This drill is equipped with an optional magnetic base and spindle bi-directional interlock relay in the HPU that is intended to prevent spindle rotation unless the magnetic base is engaged. If it is being used, the magnetic base must be engaged before attempting to rotate the spindle.

3. Press the START button.

4.2.2 Emergency shutdown

Do the following for an emergency shutdown:

1. Press the emergency stop button.
2. Once hazards have been eliminated, see Section 4.2.1 on page 28 to resume operation.

4.2.3 Stopping the machine

Do the following to shut down the machine:

1. Retract the tooling from the workpiece.
2. Stop the feed.
3. Stop the spindle rotation.
4. Press the emergency stop to de-energize the machine.

4.3 MACHINE FEED

Refer to Figure 4-1 on page 27 for correct hose orientation for forward feed.

NOTICE

Do not feed the rotational drive unit (RDU) into the drill tower stops. If the RDU contacts the drill tower stops, feed movement may seize.

If the RDU makes contact with the drill tower stops, feed movement will cease. To continue operation, do the following:

1. Stop the feed.
2. Stop the spindle rotation.
3. Set the feed direction away from the feed tower stops.
4. Set the feed rate to setting 1.
5. Start the feed.

6. If necessary, manually feed the RDU away from the feed tower stop (see Figure 4-2).
 - a) Use a flat blade screwdriver.
 - b) Apply force until feed movement begins.

See Appendix C on page 93 for the cutting tools manufacturer's instructions for the recommended speeds and feeds.

TIP:

The chip thickness can be calculated with the formula of feed rate/RPM. For example:
 $0.3 \text{ (per minute)} / 90 \text{ RPM} = 0.0033 \text{''}$
 $(7.6 \text{ mm} / 90 \text{ RPM} = 0.08 \text{ mm})$

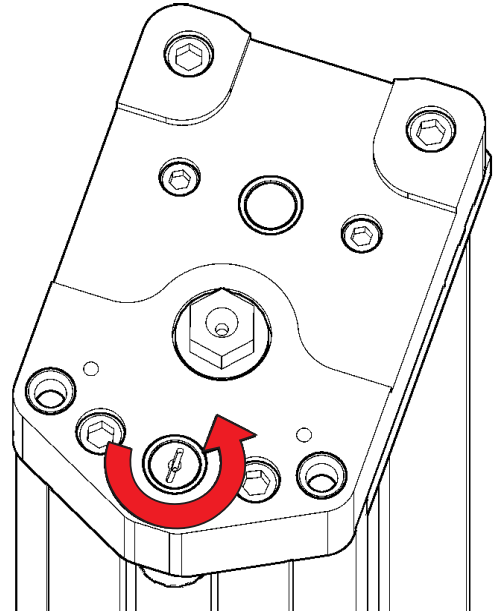


FIGURE 4-2. MANUAL FEED MOVEMENT

A chip thickness of 0.003–0.005" (0.08–0.12 mm) is normal.

Use Figure 4-3 to estimate the actual feed rate achieved by each setting on the speed dial.

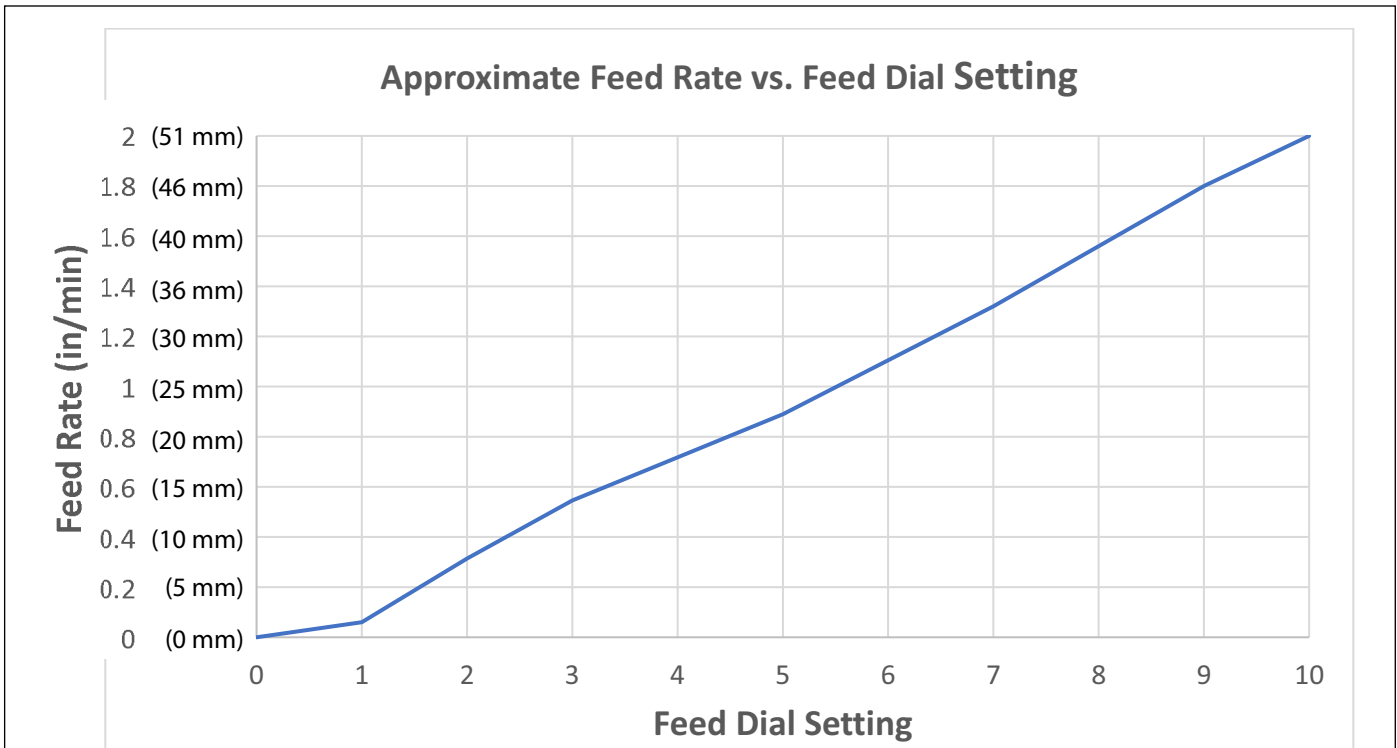


FIGURE 4-3. FEED SPEED SETTING

4.4 DRILLING

TIP:

To reduce tower deflection due to the drilling feed force, always use the shortest possible tooling necessary to achieve the finished hole depth.

Do the following before drilling:

1. Prepare the coolant/lubricant mister and connect it to the rotary coolant/lubricant adapter on the arbor.
2. If using the optional magnetic base, energize the base (see Section 2.2 on page 10 and Appendix C on page 59 for more information).
3. Start the tool rotation and adjust it to the required speed. See Appendix C on page 93.
4. Start the feed and adjust to the required speed. Appendix C on page 93.
5. Start the coolant/lubricant flow.
6. Begin cutting.

Note the following outcome guidelines:

- Chips should be silver, not blue. If chips are blue, slow the drill speed.
 - Chips should be curls, not slivers. If chips are slivers, increase the drill speed and use cutting lubricant.
 - Chips may heat up at the end of the cut before breakthrough. This is normal.
 - Smoke during cutting is normal.
7. When drilling is complete, remove the drill and taper adapter from the RDU.

TIP:

When removing the drill from the taper adapter, remove it immediately after drilling while it is still warm. If it is allowed to cool down before removing, the taper may be locked tightly and difficult to remove.

8. Reverse the feed until the RDU is near the top of the drill tower.

4.5 REAMING

TIP:

Leave the drill magnetized and assembled from the drilling operation to maintain alignment for the reaming operation.

Do the following for a reaming operation:

1. Prepare the coolant/lubricant mister for application to the exterior of the reamer.
2. Check that the magnetic base is energized (see Section 2.2 on page 10 and Appendix C on page 59 for more information).
3. Install the customer-supplied reamer tooling.
4. Start the tool rotation and adjust it to the required speed, according to the tooling manufacturer recommendations.
5. Start the feed and adjust it to the required speed, according to the tooling manufacturer recommendations.
6. Begin cutting.
7. When reaming is complete, reverse the feed and retract the reamer from the workpiece.
8. Continue feeding in reverse until the RDU is near the top of the drill tower.

4.6 DISASSEMBLY

Do the following to disassemble the drill:

1. De-energize the HPU.
2. Check that the drill is restrained and secured so that it will not fall when de-magnetized.

WARNING

Do not de-magnetize the magnetic base if the drill is in danger of falling. The magnetic base must be restrained and secured before de-magnetizing. Failure to do so could allow the machine to fall, causing serious injury or death.

3. If the optional magnetic base is used, de-magnetize the base by pressing the blue and red buttons on the magnetic base pendant simultaneously, and then releasing them.
4. Remove all hydraulic hoses and control cables.
5. Remove the hydraulic motor from the RDU.
6. Remove chips and debris from all machine components.
7. Loosen the draw bolt.
8. Hold the tower securely and remove the draw bolt.
9. Remove the drill from the workpiece.
10. Remove the optional magnetic base from the workpiece.

5 MAINTENANCE

IN THIS CHAPTER:

5.1 MAINTENANCE CHECKLIST - - - - -33
 5.2 APPROVED LUBRICANTS - - - - -33
 5.3 MAINTENANCE TASKS - - - - -34
 5.3.1 LUBRICATING THE DOVETAIL WAYS AND LEADSCREWS - - - - -35
 5.3.2 ADJUSTING THE DOVETAIL GIB SCREWS - - - - -35
 5.3.3 FEED GEARING - - - - -36
 5.3.4 ROTATIONAL DRIVE UNIT OIL - - - - -36
 5.3.5 CHECKING THE TRAM - - - - -36
 5.4 TROUBLESHOOTING - - - - -38

5.1 MAINTENANCE CHECKLIST

Table 5-1 lists maintenance intervals and tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task	Reference
Before each use	Apply lubrication to the dovetail ways and lead screws.	Section 5.3.1 on page 35
Every 8 hours of use	Check the dovetail gib screws.	--
Every 200 hours of use	Replace grease on the feed gearing.	Section 5.3.3 on page 36
Every 6 months or 500 hours of use	Replace oil in the gearbox.	--
After each use	Clean the machine to remove dirt, grease, metal chips, and moisture.	--

5.2 APPROVED LUBRICANTS

CLIMAX recommends using the following lubricants at the locations indicated. Failure to use the appropriate lubricants can result in damage and premature machine wear.

 **CAUTION**

Avoid damage, premature machine wear, and protect your warranty by using only approved lubricants.

TABLE 5-2. APPROVED LUBRICANTS

Application	Lubricant	Alternative	Quantity	Frequency
Frequently				
Rotational drive unit (RDU)	Mobil SHC 634 oil or equivalent	Castrol Alpha SP460	Approximately 5 oz.	2,500 hours or every 6 months under normal conditions. Every 2 months in moist or dusty conditions
Dovetail ways ^a	Mobil Vactra No. 2 for ISO Viscosity 68	<ul style="list-style-type: none"> • Mobil Vacuoline 1409 or equivalent • Way Oil • Chevron Texaco • Way Lube 68 	Less than 0.25 oz; apply with oiler or brush	Daily during machine use
Gearboxes and mechanisms lubricated with grease ^b	Mobil Mobilith SHC 460	CASTROL BioTac EP 2	2 cc	Monthly during machine use. Replace grease every 2 years.
Hydraulic power unit (HPU)	Summer: CASTROL Hyspin AWS-46 Winter: AWS-32	Summer: CASTROL BioBar 46 Winter: CASTROL BioBar 32	As required to fill reservoir to mid-sight glass level	Refill after every use. Replace oil every 2 years. ^c
Lead screws	Mobil Vactra No. 2 for ISO Viscosity 68	<ul style="list-style-type: none"> • Mobil Vacuoline 1409 or equivalent • Way Oil • Chevron Texaco • Way Lube 68 	Light coating applied by oiler or brush	Before use and every 2 hours during use

a. Use highly anti-corrosive, refined mineral or synthetic oil that forms a strong oil film and is not easily emulsified or washed away by coolant. Hydraulic oils are typically not suitable for slide way lubrication.

b. While lithium-based grease can be used, a calcium-based grease allows for greater lubricity while ingesting higher amounts of water (as is common in portable machine tools).

c. Always replace hydraulic filters when replacing hydraulic oil. Never assume that the oil in drums is clean. Always pump oil through a 5-micron hydraulic filter before or while filling reservoir.

5.3 MAINTENANCE TASKS

Maintenance tasks are described in the following sections.

5.3.1 Lubricating the dovetail ways and leadscrews

Apply Vactra No. 2-way oil or an equivalent lubricant to the dovetail ways and leadscrews, as shown in Figure 5-1.

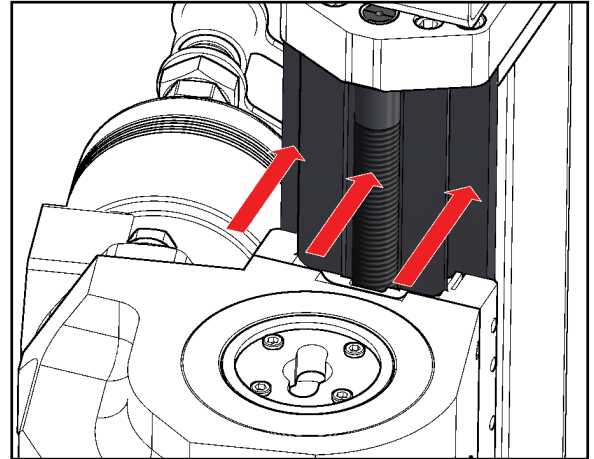


FIGURE 5-1. WAYS AND LEADSCREWS LOCATION

5.3.2 Adjusting the dovetail gib screws

Check and adjust the torque of the dovetail gib leadscrews (seen in Figure 5-2).

Do the following:

1. Adjust the screws starting in the center and working out toward the top and bottom. Torque the screws to 5 in.-lbs.
2. Check the feed to ensure smoothness and consistency, noting the following cautions:

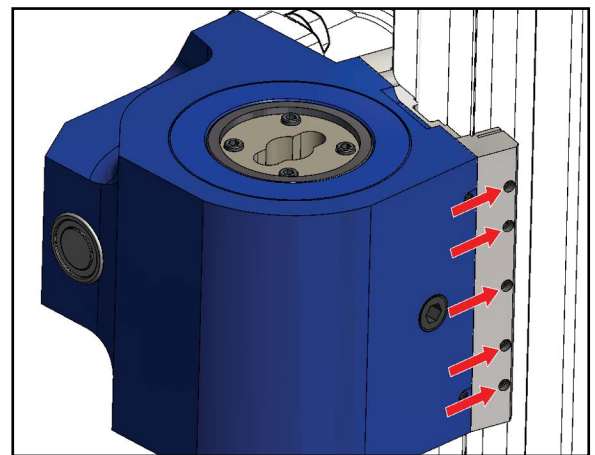


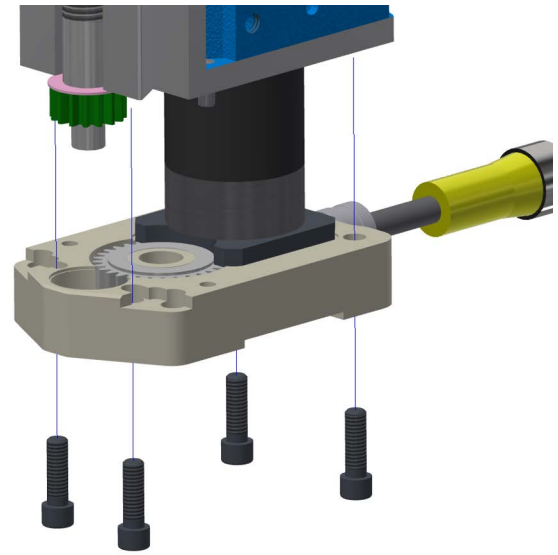
FIGURE 5-2. GIB SCREWS LOCATION

- Loose screws cause misalignment.
- Over-tightened screws cause intermittent feed stalling and excessive current levels to the motor.

5.3.3 Feed gearing

Do the following to apply Mobil Mobilith SHC 460 or an equivalent grease to the feed box gearing:

1. Remove the draw bolt from the feed tower assembly.
2. Remove the screws from the top plate.
3. Remove the top plate from the feed tower.
4. Apply 2 cc of Mobil Mobilith SHC 460 or an equivalent grease to the feed box gearing.
5. Replace all components.



5.3.4 Rotational drive unit oil

Do the following to replace the RDU oil with Mobil SHC 634 or an equivalent oil:

1. Remove the RDU oil plug.
2. Drain and dispose of RDU oil in accordance with local regulations.
3. Refill the RDU with Mobil SHC 634 or an equivalent oil.
4. Fill the RDU to the plug (approximately 5 oz).
5. Replace the fill plug.

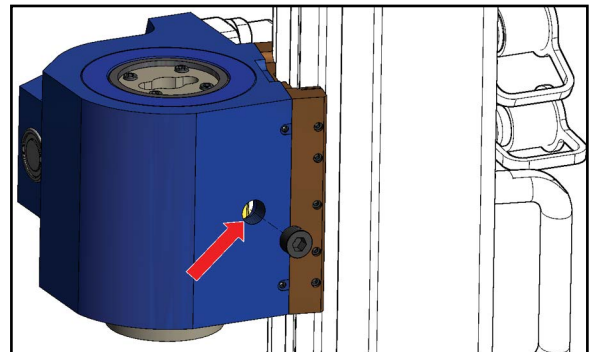


FIGURE 5-4. RDU OIL PLUG LOCATION

5.3.5 Checking the tram

NOTICE

A crash or rough use may cause the drill to come out of tram. Using the compact hydraulic drill when not properly trammed can cause binding of the cutting tooling and may result in excessive tool wear, tool breakage, poor surface finish, and poor hole size tolerance control.

Do the following to check the tram:

1. Place the magnetic base on a known flat surface, such as a granite surface plate.

2. Check the alignment bushings on the top and bottom tower plates for wear.

TIP:

The bushings must be flush with the plate.

3. Inspect the mounting surfaces for any burrs, nicks, or other signs of damage.
4. Install the compact drill tower onto the magnetic base.
5. Check for movement between the tower and the base.
6. Install a dial indicator into the tool collet.

TIP:

A drill chuck can be installed and used to hold the dial indicator.

7. Sweep the indicator along the face of the surface plate.

Drill tram acceptance criteria

The total indicator reading during the face sweep must be equal to or less than 0.005" at a 4" sweep diameter.

TABLE 5-3. TRAM TROUBLESHOOTING

Problem	Solution
Alignment bushings are worn.	Replace the bushings.
Total indicator reading is outside tolerance.	Send the machine to an authorized CLIMAX repair facility to have the tram adjusted.

5.4 TROUBLESHOOTING

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

TABLE 5-4. TROUBLESHOOTING

Problem	Remedy
Axial feed does not advance	Clean the leadscrew.
	Check that the feed rate is not too low.
	Check that the dovetail gibs screws are torqued according to Section 5.3.2 on page 35.
Tool chatter	Sharpen the tool bit.
	Increase the feed rate.
	Increase or decrease the RDU motor speed.
Machine is unstable	Tighten all mounting hardware. Provide additional support. Clean and/or flatten mounting surface.
Magnetic controller will not operate	Check that the interlock cable is plugged into the HPU and that the HPU main disconnect is closed. Check that the Emergency stop on the operator pendant is released and the power is on.
RDU will not rotate	Check electrical connections and circuit breakers.
	Check that the magnetic base is engaged and that the magnetic base and spindle interlock cord is plugged into the HPU controls.
	Check that the main control panel is plugged into the mains power (460V 3P) and that the power is on.
Feed is in the wrong direction	Change the direction on the control pendant.

Wen Magnetics Additional Troubleshooting

If the error code 10 Red flashes, 1 green Flash, indicating No Current, do the following

1. Check that all 3 circuit breakers are turned on (that is, showing red).
2. Check that all of the ribbon cables in the controller are fully seated. Even if they have hot glue on them, then may still have backed out during shipping.
3. Check continuity at the output across wires +1 and -5. This is the magnets.
4. Check continuity across wires PE and 6. This is the ground circuit.
5. Find the Enable Relay (Omron, colored white or gray) and operate the manual override several times to ensure that the relay is operating freely.
6. Observe the Enable Relay during attempted operation of the magnet. See whether or not it cycles.

6 STORAGE AND SHIPPING

IN THIS CHAPTER:

6.1 STORAGE	-39
6.1.1 SHORT-TERM STORAGE	-39
6.1.2 LONG-TERM STORAGE	-39
6.2 SHIPPING	-40
6.3 DECOMMISSIONING	-40

6.1 STORAGE

Proper storage of the compact hydraulic drill will extend its usefulness and prevent undue damage.

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

Store the compact hydraulic drill in its original shipping container. Keep all packing materials for repackaging the machine.

6.1.1 Short-term storage

Do the following for short-term storage (three months or less):

1. Retract the tool head from the workpiece.
2. Remove the tooling.
3. Remove hydraulic hoses and electrical cables.
4. Remove the machine from the workpiece.
5. Clean the machine to remove dirt, grease, metal chips, and moisture.
6. Spray all unpainted surfaces with WD-40 or equivalent to prevent corrosion.
7. Store the compact hydraulic drill in its original shipping container.

6.1.2 Long-term storage

Do the following for long-term storage (longer than three months):

1. Follow the short-term storage instructions, but use LPS-3 or equivalent instead of WD-40.
2. Add a desiccant pouch to the shipping container. Replace according to manufacturer instructions.
3. Store the shipping container in an environment out of direct sunlight with temperature < 70°F (21°C) and humidity < 50%.

6.2 SHIPPING

The compact hydraulic drill can be shipped in its original shipping container.

6.3 DECOMMISSIONING

To decommission the compact hydraulic drill before disposal, remove the drive assembly from the RDU and dispose of the drive assembly separately from the rest of the machine components. Refer to Appendix A for component assembly information.

APPENDIX A ASSEMBLY DRAWINGS

Drawing list

FIGURE A-1. COMPACT DRILL ASSEMBLY (P/N 104123) - - - - -42

FIGURE A-2. DRILL COMPONENTS AND CONFIGURATIONS (P/N 104123) - - - - -43

FIGURE A-3. MAGNET BASE ASSEMBLY (P/N 104374) - - - - -44

FIGURE A-4. FEED TOWER ASSEMBLY (P/N 87792) - - - - -45

FIGURE A-5. FEED TOWER ASSEMBLY PARTS LIST (P/N 87792) - - - - -46

FIGURE A-6. FEED TOWER CONFIGURATIONS (P/N 87792) - - - - -47

FIGURE A-7. DRILL SPINDLE ASSEMBLY (P/N 95730) - - - - -48

FIGURE A-8. DRILL SPINDLE ASSEMBLY PARTS LIST (P/N 95730) - - - - -49

FIGURE A-9. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 208-230V -50

FIGURE A-10. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 380-415V -50

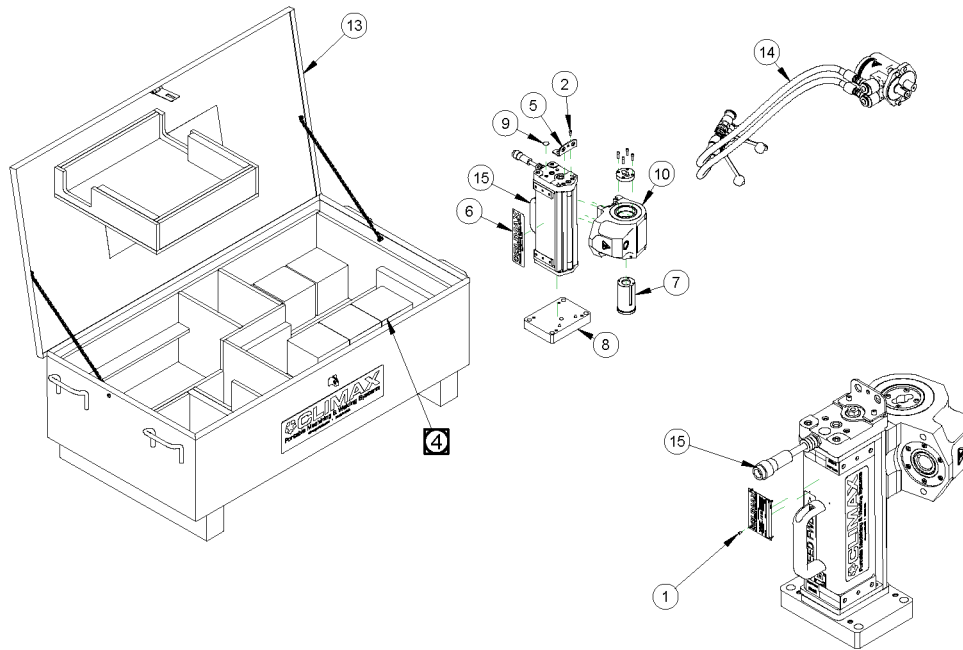
FIGURE A-11. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 460V - -50

FIGURE A-12. HYDRAULIC MOTOR 5 CUBIC INCHES 60 FITTINGS ASSEMBLY (P/N 105552) - - - - -52

FIGURE A-13. COMPACT DRILL TOWER BASE MOUNT ASSEMBLY (P/N 73445) - - - - -53

TABLE A-1. SPARE PARTS KIT P/N 105903 - - - - -54

TABLE A-2. TOOL KIT P/N 95870 - - - - -54

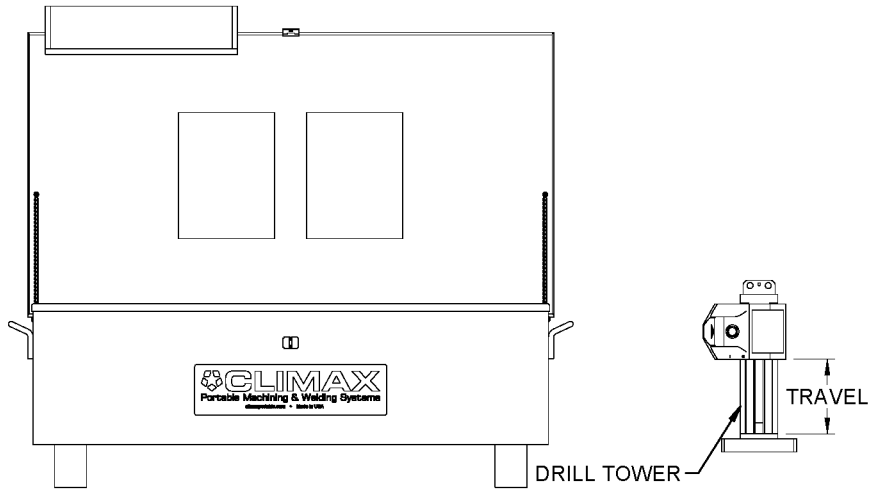


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	12743	SCREW 10-24 X 1/2 SHCS
3	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
4	1	58889	(NOT SHOWN) KIT TOOL COMPACT DRILL
5	1	59387	PLATE LIFTING COMPACT DRILL TOWER
6	2	70227	LABEL CLIMAX LOGO 2 X 8
7	1	72362	ADAPTER SYSTEM #4MT COMPACT DRILL
8	1	73445	ASSY COMPACT DRILL TOWER BASE MOUNT
9	1	79488	LABEL WARNING - CONSULT TECHNICAL MANUAL GRAPHIC .75 DIA
10	1	95730	ASSY DRILL SPINDLE COMPACT DRILL
11	1	102026	(NOT SHOWN) KIT OIL MISTER WITH BALL VALVE
12	1	104151	(NOT SHOWN) MANUAL INSTRUCTION COMPACT DRILL
13	1	106454	CONTAINER SHIPPING COMPACT DRILL METAL WITH INSERT
14	1	106684	HYD MOTOR SIDE PORT
15	1	CHART	ASSY FEED TOWER DOVETAIL COMPACT DRILL

104123 - CHART COMPACT HYD DRILL #4MT W/ STD BASE - REV C

FOR REFERENCE ONLY

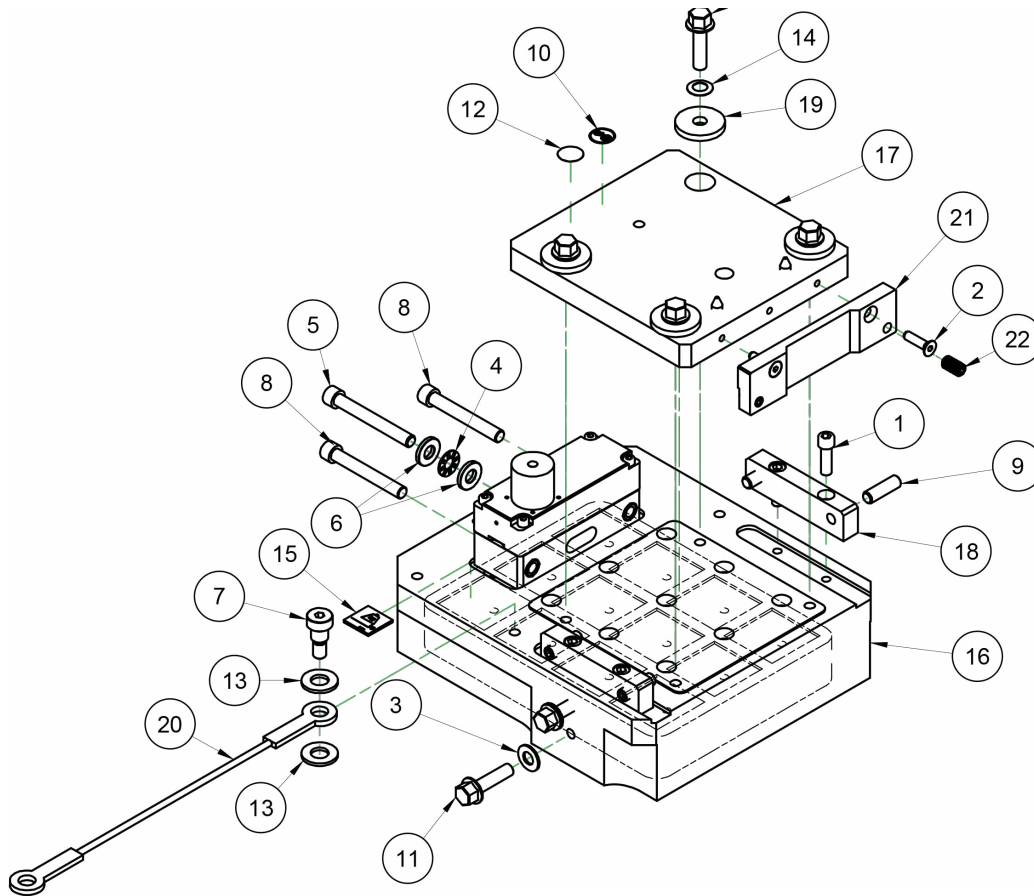
FIGURE A-1. COMPACT DRILL ASSEMBLY (P/N 104123)



AVAILABLE CONFIGURATIONS		
PART NO.	DESCRIPTION	TOWER PN
104209	COMPACT HYD DRILL 7" TRAVEL #4MT W/ STD BASE	90707
104210	COMPACT HYD DRILL 10" TRAVEL #4MT W/ STD BASE	88454
104211	COMPACT HYD DRILL 12" TRAVEL #4MT W/ STD BASE	87793
104212	COMPACT HYD DRILL 18" TRAVEL #4MT W/ STD BASE	95748

104123 - CHART COMPACT HYD DRILL #4MT W/ STD BASE - REV B
FOR REFERENCE ONLY

FIGURE A-2. DRILL COMPONENTS AND CONFIGURATIONS (P/N 104123)



22	2	104389	SCREW 3/8-16 X 3/4 SSS BALL END
21	1	104388	PLATE GUIDE MAG BASED DRILL
20	1	95770	LANYARD EYE/EYE 3/16 DIA X 12 IN LONG GALVANIZED
19	4	95756	WASHER HOLD DOWN MAG BASE
18	2	95755	BLOCK ADJUSTMENT MAG BASE
17	1	95697	PLATE MOUNTING MAGNET BASE
16	1	95679	MAGNETIC DRILL BASE
15	1	91217	PLATE MASS CE 1.0 X 1.0 KG ADHESIVE BACKED
14	4	84565	WASHER SPRING BELLEVILLE .438 ID X .75 OD X .02 THICK
13	2	83429	WASHER 1/2 FLTW SAE STAINLESS STEEL
12	1	79488	LABEL WARNING - CONSULT TECHNICAL MANUAL GRAPHIC .75 DIA
11	6	70967	SCREW 3/8-16 X 1-1/2 HHCS FLANGED GR8
10	1	70554	LABEL WARNING LIFT POINT ROUND .75"
9	4	32284	SCREW 3/8-24 X 1.25 SSSFP
8	2	28379	SCREW 3/8-24 X 2-3/4 SHCS
7	1	19368	SCREW 1/2 DIA X 1/2 X 3/8-16 SHLDCS
6	2	19236	WASHER 3/8 ID X 7/8 OD X 1/8 THICK FLTW HARDENED
5	1	16607	SCREW 3/8-24 X 3 SHCS
4	1	11844	BRG THRUST .375 ID X .812 OD X .0781
3	2	11080	WASHER 3/8 FLTW SAE PLAIN
2	2	10888	SCREW 1/4-20 X 1 FHSCS
1	4	10431	SCREW 5/16-18 X 1 SHCS
ITEM	QTY	PART No.	DESCRIPTION
PARTS LIST			

FIGURE A-3. MAGNET BASE ASSEMBLY (P/N 104374)

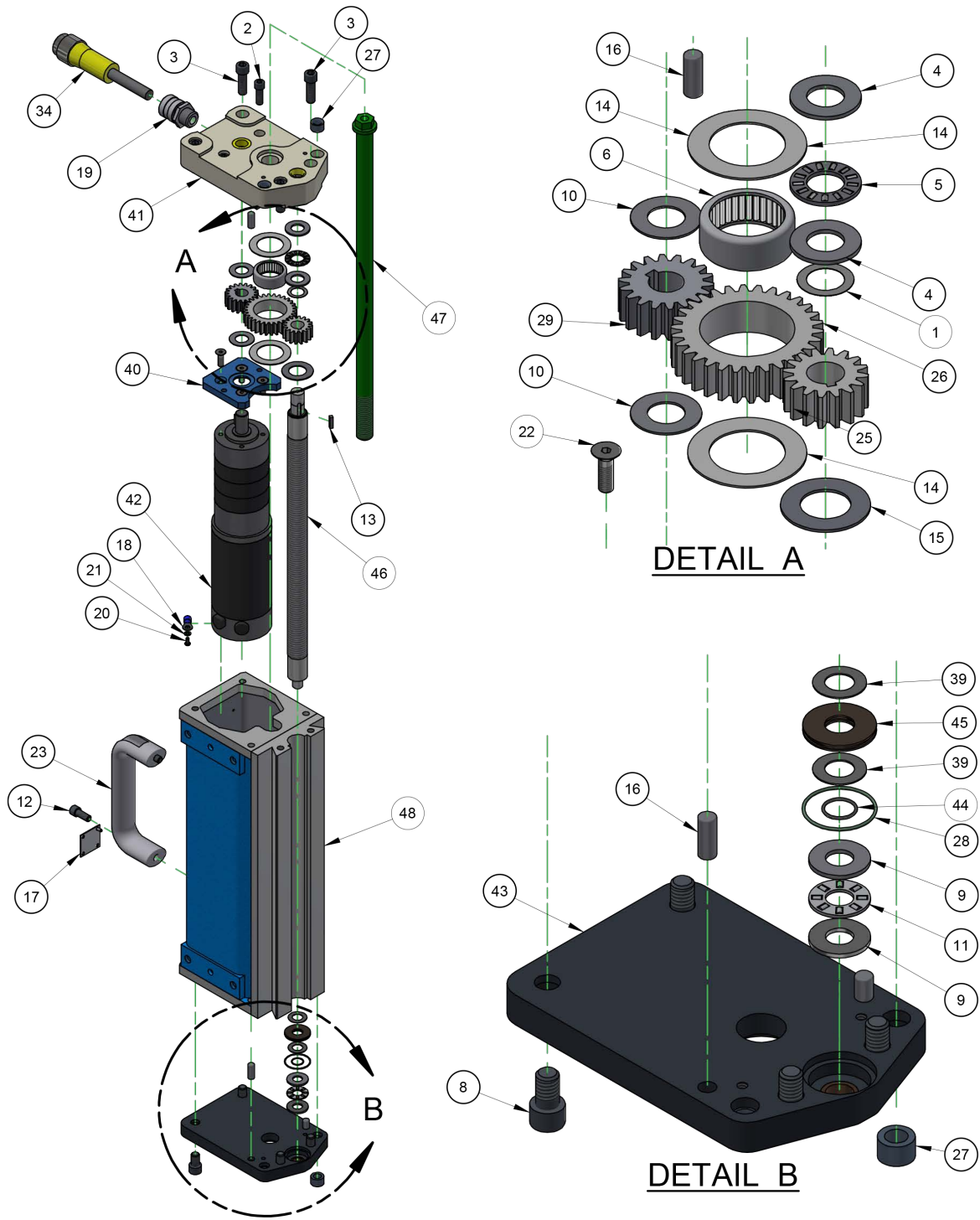


FIGURE A-4. FEED TOWER ASSEMBLY (P/N 87792)

ITEM	QTY	P/N:	DESCRIPTION
1	2	10160	SCREW 1/4-20 X 3/4 SHCS
2	4	10431	SCREW 5/16-18 X 1 SHCS
3	2	10436	WASHER THRUST .500 ID X .937 OD X .060
4	1	10437	BRG THRUST .500 ID X .937 OD X .0781
5	1	10524	BRG NEEDLE 1 ID X 1-1/4 OD X 1/2 OPEN
6	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
7	4	10615	SCREW 5/16-18 X 1/2 SHCS
8	2	11040	WASHER THRUST .375 ID X .812 OD X .060
9	2	11736	WASHER THRUST .500 ID X .937 OD X .030
10	1	11844	BRG THRUST .375 ID X .812 OD X .0781
11	2	12418	SCREW 1/4-20 X 5/8 SHCS
12	6	13243	(NOT SHOWN) WIRE TIE MEDIUM .14 X 8
13	1	14788	KEY 1/8 SQ X .50 SQ BOTH ENDS
14	2	15079	WASHER THRUST 1.000 ID X 1.562 OD X .030
15	1	15666	WASHER THRUST .669 ID X 1.181 OD X .039
16	4	15756	PIN DOWEL 1/4 DIA X 5/8
17	1	29152	PLATE MASS CE
18	2	29437	(NOT SHOWN) TERMINAL SPADE 90 DEG .020 X .187
19	1	32697	TERMINAL RING 22-16AWG #10/M4.5 STUD
20	1	35833	CORD GRIP 3/8 TO 7/16 X 3/8 NPT
21	1	37397	SCREW 4-40 X 1/4 BHSCS
22	1	42846	WASHER #4 FLAT
23	4	42855	SCREW M5 X .80 X 16mm FHSCS STAINLESS STEEL
24	1	43562	HANDLE PULL (REID WCH-100)
25	72"	56269	(NOT SHOWN) SLEEVE WELD COVER 1" DIA STRAIGHTLINE W/VELCRO CLOSURE
26	1	58214	GEAR SPUR 16DP 16T 20PA MODIFIED .5
27	1	58216	GEAR SPUR 16DP 30T 20PA MODIFIED .5
28	4	58246	BUSHING LOCATING .3135 ID X 1/2 OD X 5/16
29	1	58366	RING O 1mm X 23mm ID X 25mm OD
30	1	59894	GEAR SPUR 16DP 18T 20PA .5 12mm BORE
31	1	60218	(NOT SHOWN) LABEL FEED FORWARD W ARROW
32	1	60219	(NOT SHOWN) LABEL HOSE CONNECT SCHEME RED-RED/ BLUE-BLUE
33	1	60220	(NOT SHOWN) LABEL HOSE CONNECT SCHEME BLUE-RED/ RED-BLUE
34	24"	63971	(NOT SHOWN) WIRE WRAP SPIRAL .125 TO .5 DIA SELF EXTINGUISHING NYLON BLACK
35	1	64348	CORDSET STRAIGHT MALE CONNECTOR 3-16AWG X 3M LONG MINIFAST
36	3"	65182	(NOT SHOWN) TUBE SHRINK 3 DIA X .068 WALL 2 TO 1 BLACK
37	2	67048	(NOT SHOWN) SPADE CONNECTOR MALE DBL CRIMP 22-18 AWG .25 WIDE RED
38	2	67050	(NOT SHOWN) SPADE CONNECTOR FEMALE DBL CRIMP 22-18 AWG .250 X .032 RED
39	1	67214	(NOT SHOWN) RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
40	2	71636	SHIM LAMINATED 10mm ID X 18mm OD X 0.5mm THICK SS
41	1	81656	PLATE MOTOR MOUNT
42	1	82443	PLATE TOWER TOP
43	1	82560	GEARMOTOR MODIFIED ELECTRIC 29 RPM MAX OUTPUT 147 WATTS 90 DC VOLT 169:1 GEAR -
44	1	87987	PLATE TOWER BOTTOM
45	1	88961	RING O 1MM X 10MM ID X 12MM OD
46	1	88962	WASHER SEALING THRUST
47	1	A/R	DRAWBOLT (SEE CHART)
48	1	A/R	FEED TOWER (SEE CHART)
49	1	A/R	LEADSCREW (SEE CHART)

FIGURE A-5. FEED TOWER ASSEMBLY PARTS LIST (P/N 87792)

AVAILABLE CONFIGURATIONS					
PART NUMBER	FEED TRAVEL	TOWER	LEADSCREW	DRAWBOLT	ASSY WEIGHT
88965	6 IN	64003	88915	63966	31.4 lb
90707	7 IN	62731	88916	57892	32.6 lb
TBD	8 IN	64004	TBD	63967	34.0 lb
TBD	9 IN	64005	TBD	63968	35.3 lb
88454	10 IN	64006	88917	63969	36.6 lb
TBD	11 IN	64007	TBD	63970	37.8 lb
87793	12 IN	64008	88918	63972	39.1 lb
TBD	13 IN	64009	TBD	63973	40.4 lb
TBD	14 IN	64010	TBD	63974	41.7 lb
TDD	15 IN	64011	TBD	63975	43.0 lb
TBD	16 IN	64012	TBD	63976	44.2 lb
TBD	17 IN	64013	TBD	63977	45.5 lb
95748	18 IN	64014	95747	63978	46.8 lb

FIGURE A-6. FEED TOWER CONFIGURATIONS (P/N 87792)

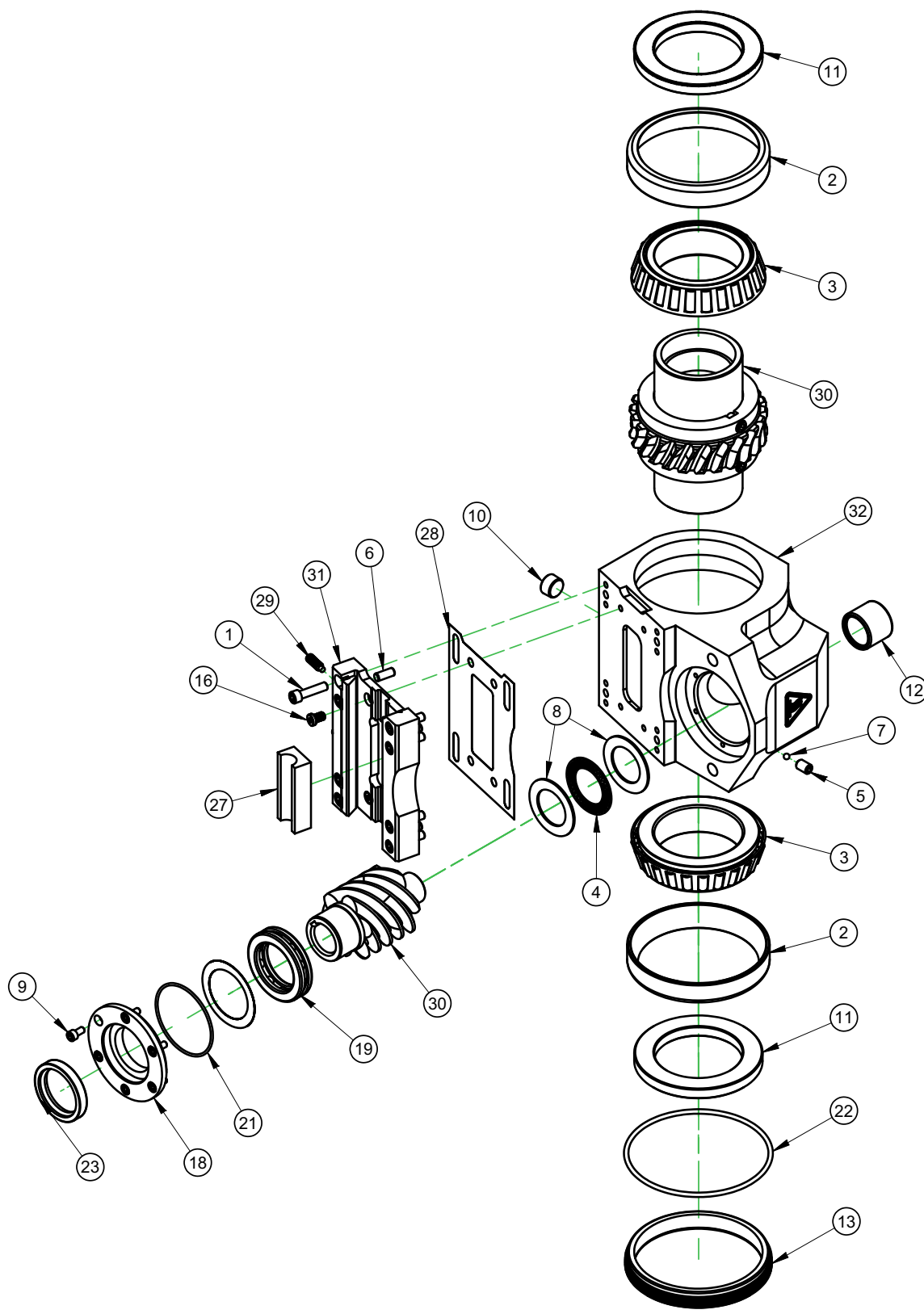


FIGURE A-7. DRILL SPINDLE ASSEMBLY (P/N 95730)

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	8	11118	SCREW 1/4-20 X 1 SHCS
2	2	11821	BRG CUP 4.4375 OD X .750 WIDE
3	2	11822	BRG CONE 2.75 ID X 1.00 WIDE
4	1	12387	BRG THRUST 1.259 ID X 1.937 OD X .0781
5	2	13515	SCREW 5/16-18 X 1/2 SSSCP
6	4	15756	PIN DOWEL 1/4 DIA X 5/8
7	2	16594	BALL NYLON 3/16 DIA
8	2	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
9	6	19232	SCREW 10-24 X 3/8 SHCS
10	1	21956	FTG PLUG 3/8 NPTM SOCKET
11	2	27348	SEAL 2.75 X 4.00 X .375
12	1	27353	BRG NEEDLE 1 ID X 1-1/4 OD X 1 CLOSED
13	1	28219	NUT MAIN BRG PRELOAD
14	5	32569	(NOT SHOWN) (FL. OZ) OIL SYNTHETIC FOR CONE DRIVE MOBIL SHC 634
15	1	34735	LABEL WARNING 3-1/2 X 4
16	4	34962	SCREW 1/4-20 X 3/8 LHSCS
17	1	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
18	1	49667	CAP WORM HOUSING BB5000 4TH GEN
19	1	52307	BRG BALL THRUST 40 MM ID X 60 MM OD X 13 MM
20	1	54133	LABEL OIL RDU
21	1	54920	RING O 1/16 X 2-1/4 ID X 2-3/8 OD
22	1	54921	RING O 4-3/8 ID X 4-5/8 OD X 1/8
23	1	55708	SEAL 1.500 ID X 2.000 OD X .375 HIGH TEMP
24	A/R	55784	SHIM 1.7 ID X 2.3 OD .001 THICK
25	A/R	55790	SHIM 1.7 ID X 2.3 OD .002 THICK
26	A/R	55791	SHIM 1.7 ID X 2.3 OD .005 THICK
27	1	57777	HALFNUT 3/4-10 ACME
28	1	64633	SHIM SET DOVETAIL SADDLE PLATE COMPACT DRILL
29	5	75017	SCREW 1/4-28 X 3/4 SSSDP
30	1	76729	ASSY GEAR SPINDLE MACHINED
31	1	87801	SADDLE PLATE DOVETAIL COMPACT DRILL
32	1	95731	HOUSING COMPACT DRILL 6804-S1

FIGURE A-8. DRILL SPINDLE ASSEMBLY PARTS LIST (P/N 95730)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	31424	LABEL VOLTAGE 208V
2	1	67167	LABEL 230 VOLT
3	1	103135	CORDSET EXTENSION MINI-LINK 5 CONDUCTOR 100 FT TPE JACKET 16 AWG
4	1	104374	ASSY MAGNET BASE WITH X-Y ADJUSTMENT
5	1	106068	CONTROL UNIT WEN MAGNET BASE 208-230V W/4M CABLES BI-DIRECTIONAL INTERLOCK

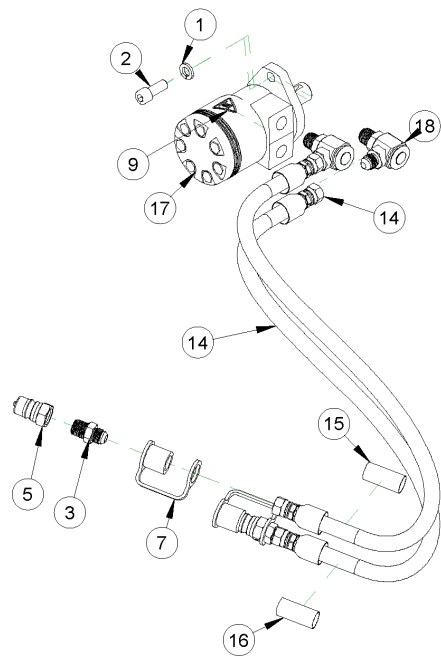
FIGURE A-9. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 208-230V

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	30823	LABEL VOLTAGE 380V
2	1	52719	LABEL VOLTAGE 415V
3	1	103135	CORDSET EXTENSION MINI-LINK 5 CONDUCTOR 100 FT TPE JACKET 16 AWG
4	1	104374	ASSY MAGNET BASE WITH X-Y ADJUSTMENT
5	1	106069	CONTROL UNIT WEN MAGNET BASE 380-415V W/4M CABLES BI-DIRECTIONAL INTERLOCK

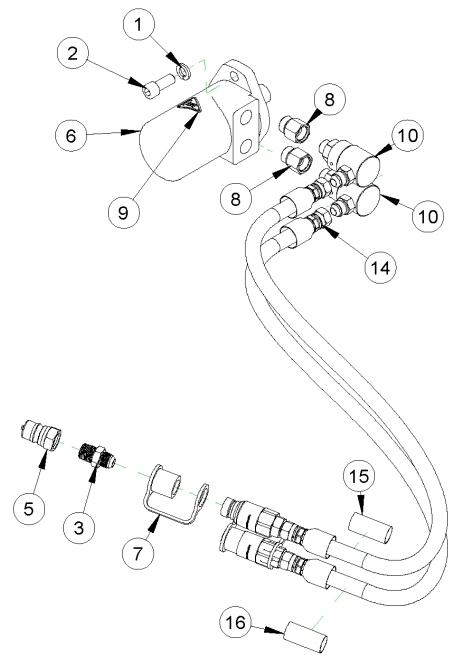
FIGURE A-10. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 380-415V

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	30082	LABEL VOLTAGE 460V
2	1	103135	CORDSET EXTENSION MINI-LINK 5 CONDUCTOR 100 FT TPE JACKET 16 AWG
3	1	104374	ASSY MAGNET BASE WITH X-Y ADJUSTMENT
4	1	106070	CONTROL UNIT WEN MAGNET BASE 460V W/4M CABLES BI-DIRECTIONAL INTERLOCK

FIGURE A-11. ASSEMBLY ELECTRO-PERMANENT MAGBASE AND CONTROLLER BI-DIRECTIONAL INTERLOCK 460V



SERIES 60 CONFIG 5.7 CU IN
SCALE 1 / 8



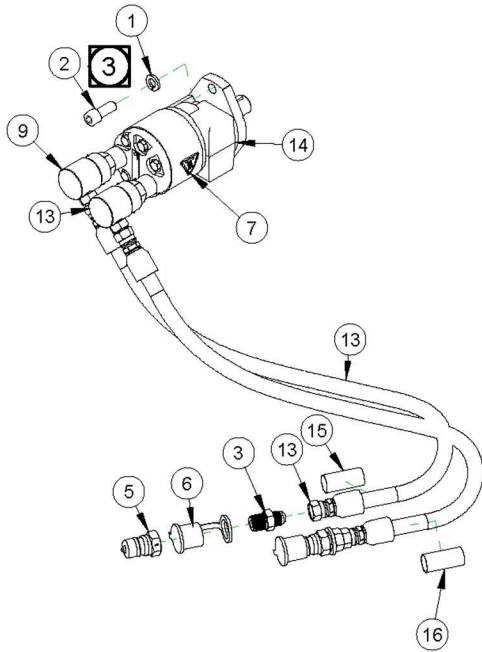
SERIES 60 CONFIG 8.8 CU IN
SCALE 1 / 8

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	11238	WASHER LOCK 1/2
2	2	12646	SCREW 1/2-13 X 1-1/4 SHCS
3	4	13253	FTG ADAPTER 1/2 NPTM X #8 JICM
4	4	16047	FTG ADAPTER SAE-10M X JIC-8M STRAIGHT
5	4	16154	FTG QUICK COUPLER 1/2B 1/2 NPTF MALE HYD
6	1	21531	MOTOR HYD 8.9 CU IN SAE O-RING
7	4	27978	FTG DUST CAP 1/2 MALE QUICK COUPLING
8	2	32499	FTG ADAPTER 10 ORBM X 8 ORBF
9	2	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
10	2	62929	FTG ELBOW SAE-8M TO JIC-8M 90 DEG SWIVEL
11	4	63427	FTG QD NIPPLE 1/2B ISO 16028 STYLE X SAE-10F
12	4	63428	DUST CAP QD NIPPLE 1/2B ISO 16028 STYLE RUBBER
13	96	64045	(NOT SHOWN) SLEEVE WELD COVER- 2.0 DIA W/VELCRO CLOSURE
14	4	95738	HOSE ASSY 3 KSI 1/2 JIC-8F X 48 OAL STRAIGHT ENDS SWIVEL
15	4	98581	TUBING HEAT SHRINK 1.5 ID 2:1 SHRINK RATIO RED
16	4	98582	TUBING HEAT SHRINK 1.5 ID 2:1 SHRINK RATIO BLUE
17	1	102818	MOTOR HYD 5.7 CU IN KEYED 1/2-14 NPTF SIDE PORTS
18	2	102836	90° ELBOW, MALE NPTF 1/2"-14 X #8 JIC SWIVEL

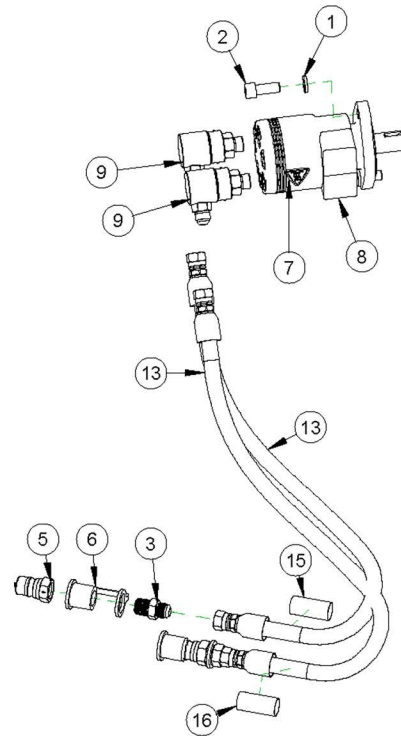
106684 - HYD MOTOR SIDE PORT - REV A

FOR REFERENCE ONLY

FIGURE A-12 HYDRAULIC MOTOR 8 CUBIC INCHES 60 FITTINGS ASSEMBLY (P/N 104399)



SERIES 60 8.0 CU IN MOTOR
SCALE 1 / 8



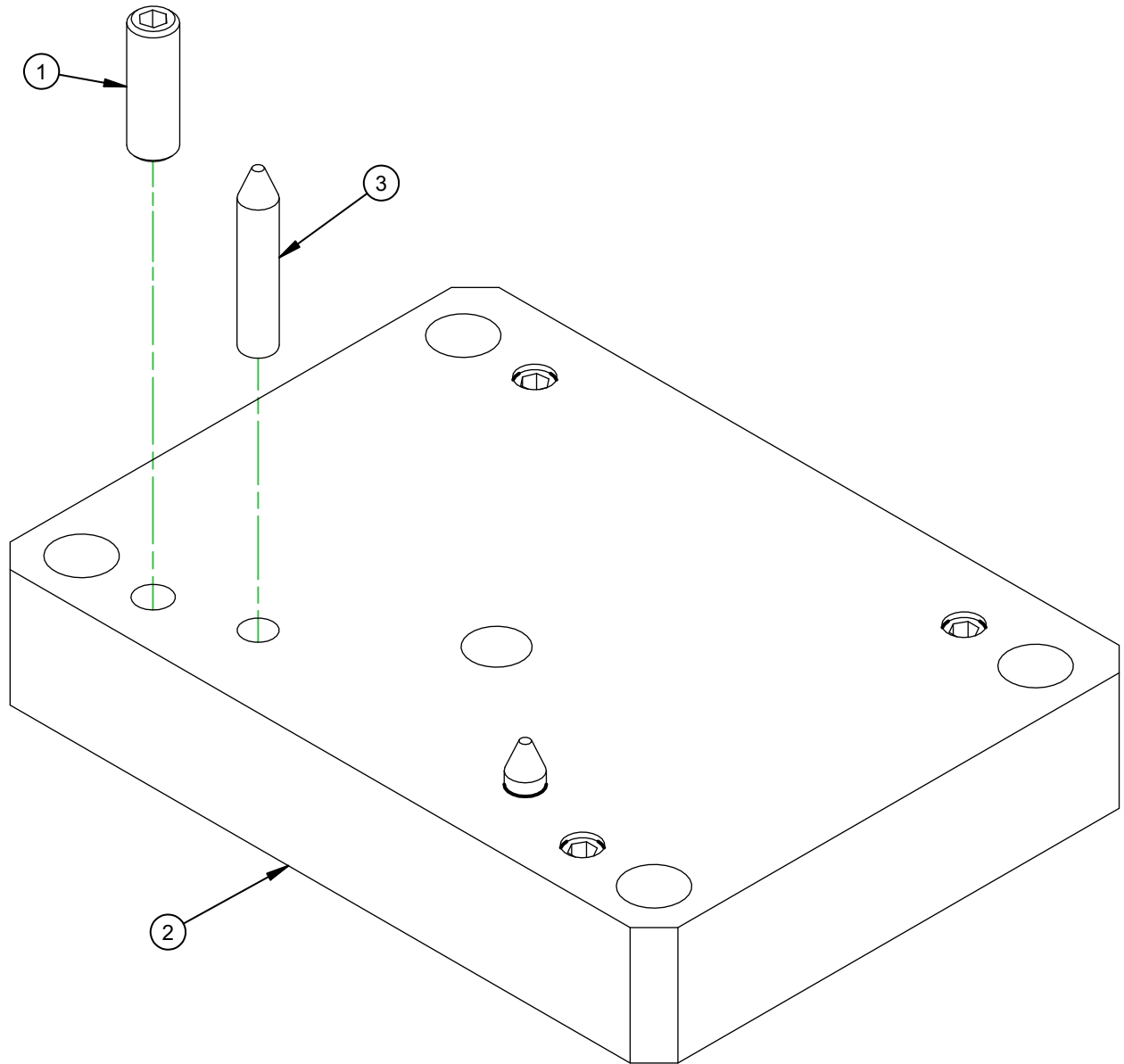
SERIES 60 5.0 CU IN MOTOR
SCALE 1 / 8

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	11238	WASHER LOCK 1/2
2	2	12646	SCREW 1/2-13 X 1-1/4 SHCS
3	4	13253	FTG ADAPTER 1/2 NPTM X #8 JICM
4	4	16047	FTG ADAPTER SAE-10M X JIC-8M STRAIGHT
5	4	16154	FTG QUICK COUPLER 1/2B 1/2 NPTF MALE HYD
6	4	27978	FTG DUST CAP 1/2 MALE QUICK COUPLING
7	2	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
8	1	58686	MOTOR HYD 5.0 CU IN KEYED .75 SAE O-RING END PORTS
9	4	62929	FTG ELBOW SAE-8M TO JIC-8M 90 DEG SWIVEL
10	4	63427	FTG QD NIPPLE 1/2B ISO 16028 STYLE X SAE-10F
11	4	63428	DUST CAP QD NIPPLE 1/2B ISO 16028 STYLE RUBBER
12	96	64045	(NOT SHOWN) SLEEVE WELD COVER- 2.0 DIA W/WELCRO CLOSURE
13	4	95738	HOSE ASSY 3 KSI 1/2 JIC-8F X 48 OAL STRAIGHT ENDS SWIVEL
14	1	95819	MOTOR HYD 8.0 CU IN KEYED .75 SAE O-RING END PORTS
15	4	98581	TUBING HEAT SHRINK 1.5 ID 2:1 SHRINK RATIO RED
16	4	98582	TUBING HEAT SHRINK 1.5 ID 2:1 SHRINK RATIO BLUE

106682 - KIT HYD MOTOR END PORT MOTORS - REV A

FOR REFERENCE ONLY

FIGURE A-12. HYDRAULIC MOTOR 5 CUBIC INCHES 60 FITTINGS ASSEMBLY (P/N 105552)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	50505	SCREW M10 x 1.5 x 30MM SSSFP
2	1	73443	PLATE BASE MOUNT
3	2	73464	PIN DOWEL 5/16 DIA X 1-5/8 TAPERED ONE END

FIGURE A-13. COMPACT DRILL TOWER BASE MOUNT ASSEMBLY (P/N 73445)

TABLE A-1. SPARE PARTS KIT P/N 105903

Part number	Description	Quantity
10436	WASHER THRUST .500 ID X .937 OD X .060 (VMI)	2
10437	BRG THRUST .500 ID X .937 OD X .0781 (VMI)	1
104405	CABLE DB9 MALE /FEMALE SHIELDED 100 FT LONG	1
11040	WASHER THRUST .375 ID X .812 OD X .060 (VMI)	2
11844	BRG THRUST .375 ID X .812 OD X .0781	1
49666	KEY MAIN DRIVE BB5000 4TH GEN (KB)	1
53670	FILTER ELEMENT HYDRAULIC PT2 SERIES DOUBLE LENGTH 10 MICRON	1
57777	HALFNUIT 3/4-10 ACME	1
64348	CORDSET STRAIGHT MALE CONNECTOR 3-16 AWG X 3M LONG MINIFAST 300V 10A GREY TPE JACKET 7.9MM OD	1
64349	CORDSET EXTENSION MINIFAST3 CONDUCTOR 16 AWG 31M LONG GREY PUR	1
65209	CORDSET EXTENSION VERSAFEST 14 CONDUCTOR 22 AWG TPE BLACK COVER 34M LONG	1
67234	DC DRIVE 120/230 10A SCR REVERSING CHASSIS HIGH SPEED CURRENT CLAMPING	1
76729	SET - ASSY GEAR SPINDLE MACHINED	1
82560	GEARMOTOR MODIFIED ELECTRIC 29 RPM MAX OUTPUT 147 WATTS 90 DC VOLT 169:1 GEAR -	1
95863	MAGNET BASE CONNECTOR BOX 4 PIN #18 SHELL CONNECTOR MALE	1
95864	CABLE DISCHARGE MAGNET BASE 4 PIN #18 CONNECTOR FEMALE 4M PUR	1
95865	PENDANT MAGNET BASE INDUSTRIAL 4M CABLE	1

TABLE A-2. TOOL KIT P/N 95870

Part number	Description	Quantity
29716	WRENCH SOCKET 9/16X3/8 DRIVE	1
33999	WRENCH SET BALL HEX .050" - 3/8" W/CADDY 13 SIZES	1
34864	BOTTLE 4 OZ W/WHT FLIP LID	1
42329	STICK MAGNETIC CHIP REMOVER MAGIC STICK	1
46247	WRENCH SOCKET 5/8 12 PT 1/2 DRIVE	1
60015	DRIFT PUNCH BRASS 3/4 DIA X 6 LONG	1
65299	SCREWDRIVER ADJUSTABLE TORQUE 1/4 HEX	1

TABLE A-2. TOOL KIT P/N 95870

Part number	Description	Quantity
65300	BIT HEX DRIVER SIZE 1/4 DRIVE 1/8 HEX	1
74095	SCREWDRIVER OFFSET 90 DEG 2 SLOTTED 2 PHILLIPS	1
77254	LIFTING EYE 3/8-16 X3/4 1 ID 1-11/16 OD 2.719 OAL 1300 LBS	1
82949	BAG TOOL 14 X 5.5 X 6 POLYESTER	1

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APPENDIX B SDS

Contact CLIMAX for the current Safety Data Sheets.

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 **CLIMAX**

 **BORTECH**  **CALDER** **H&S** **TOOL**