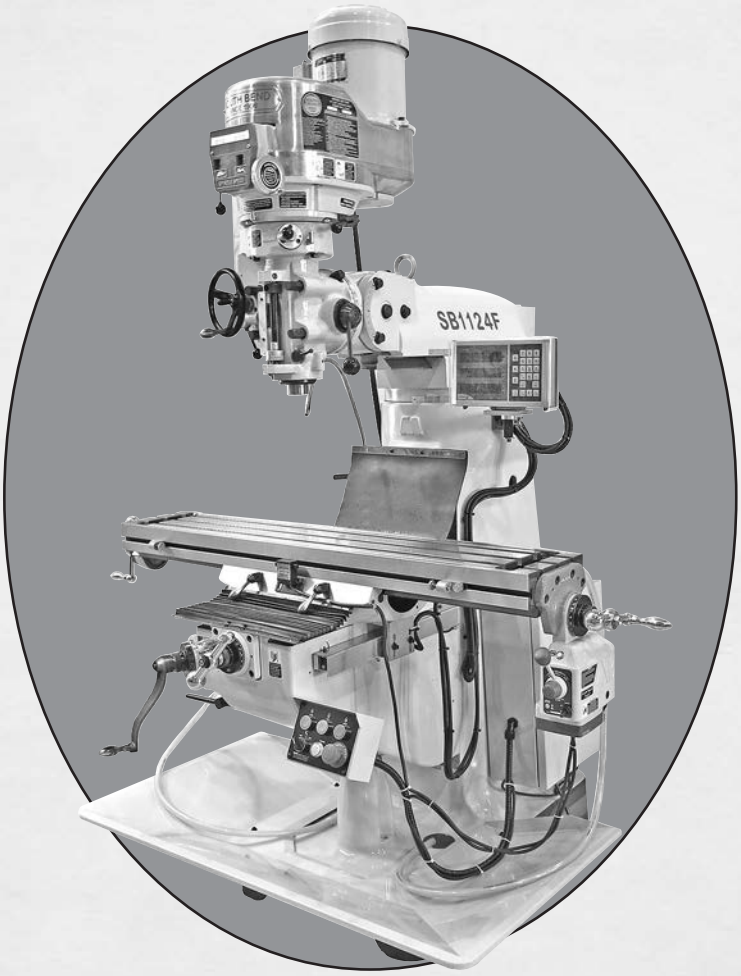
9" X 48" 3 HP VARIABLE-SPEED TURRET MILL W/DRO

MODEL SB1124F

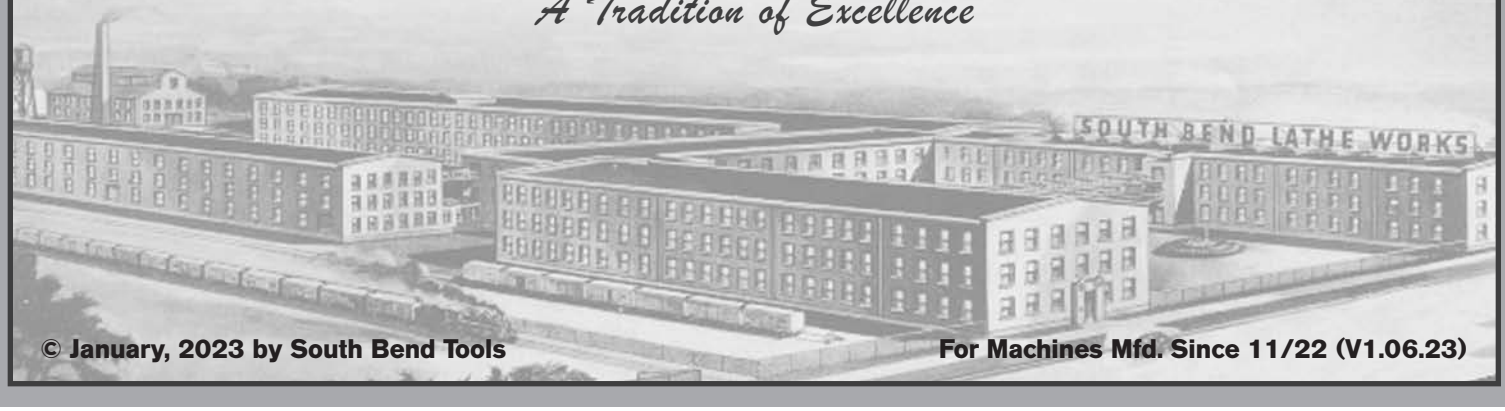


****Keep for Future Reference****

OWNER'S MANUAL

South Bend Tools®

A Tradition of Excellence



For Machines Mfd. Since 11/22 (V1.06.23)

Scope of Manual

This manual helps the reader understand the machine, how to prepare it for operation, how to control it during operation, and how to keep it in good working condition. We assume the reader has a basic understanding of how to operate this type of machine, but that the reader is not familiar with the controls and adjustments of this specific model. As with all machinery of this nature, learning the nuances of operation is a process that happens through training and experience. If you are not an experienced operator of this type of machinery, read through this entire manual, then learn more from an experienced operator, schooling, or research before attempting operations. Following this advice will help you avoid serious personal injury and get the best results from your work.

Manual Feedback

We've made every effort to be accurate when documenting this machine. However, errors sometimes happen or the machine design changes after the documentation process—so the manual may not exactly match your machine. If a difference between the manual and machine leaves you in doubt, contact our customer service for clarification.

We highly value customer feedback on our manuals. If you have a moment, please share your experience using this manual. What did you like about it? Is there anything you would change to make it better? Did it meet your expectations for clarity, professionalism, and ease-of-use?

South Bend Tools
c/o Technical Documentation Manager
P.O. Box 2027
Bellingham, WA 98227
Email: manuals@southbendtools.com

Updates

For your convenience, any updates to this manual will be available to download free of charge through our website at:

www.southbendtools.com

Customer Service

We stand behind our machines. If you have any service questions, parts requests or general questions about your purchase, feel free to contact us.

South Bend Tools
P.O. Box 2027
Bellingham, WA 98227
Phone: (360) 734-1540
Fax: (360) 676-1075 (International)
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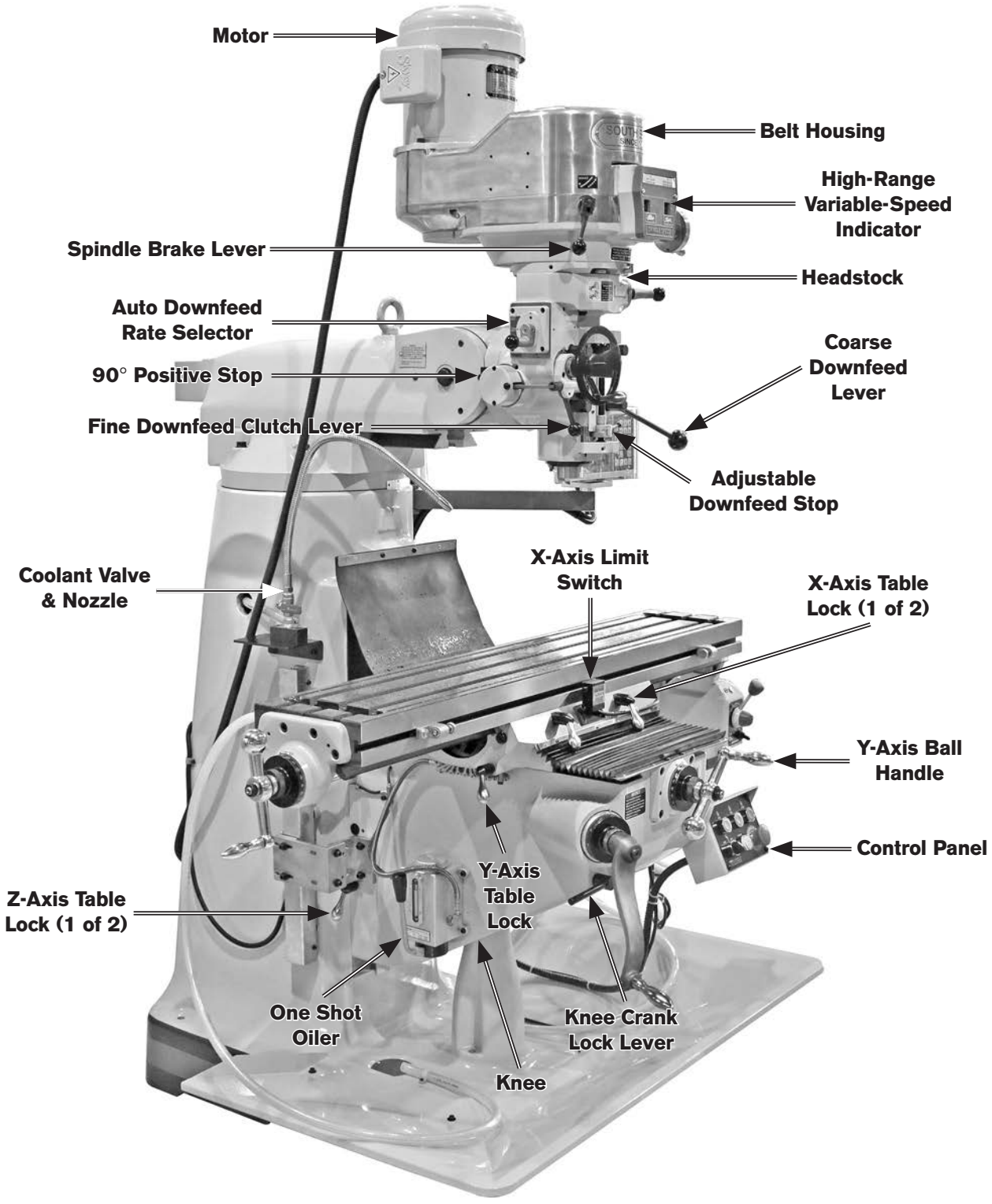
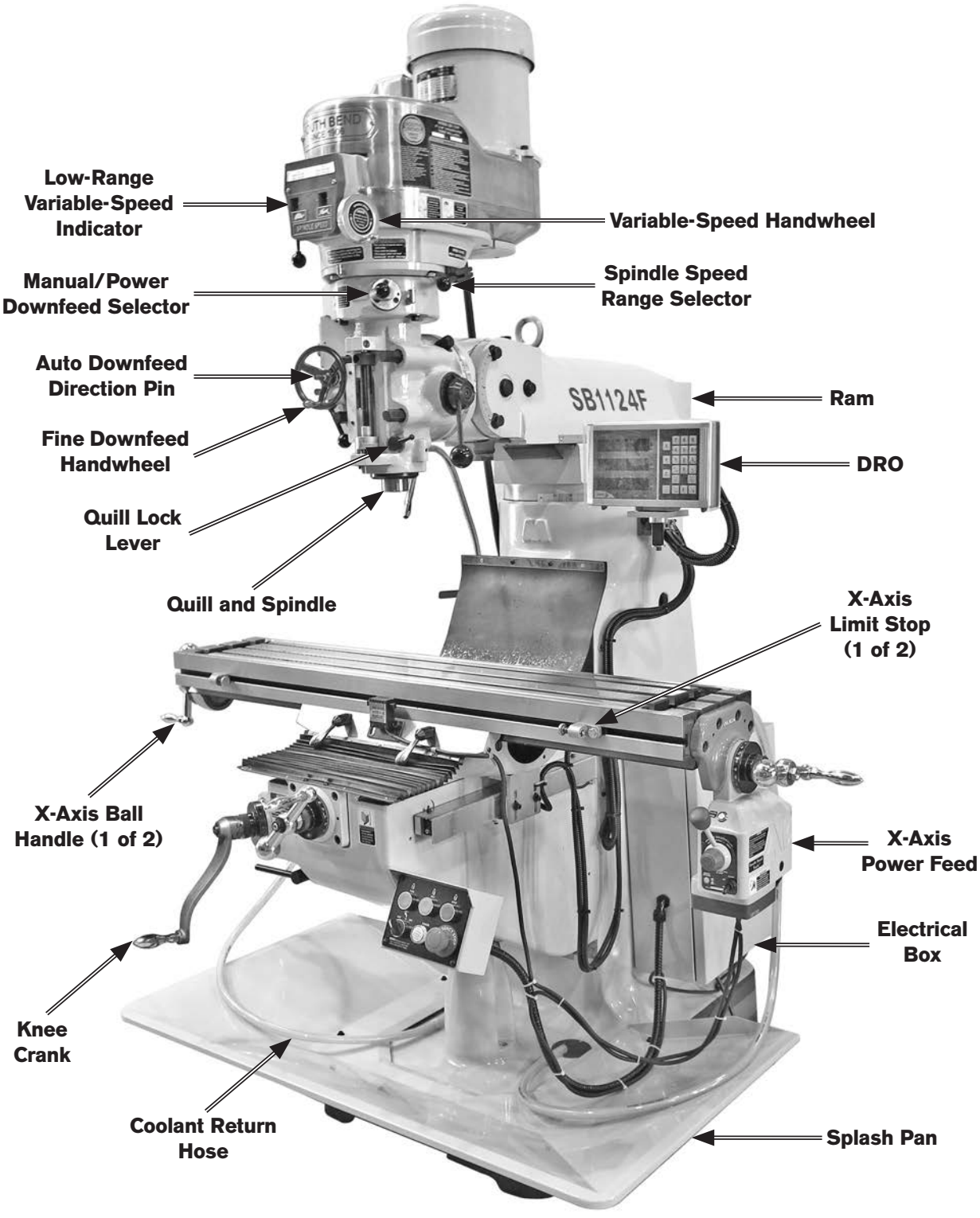
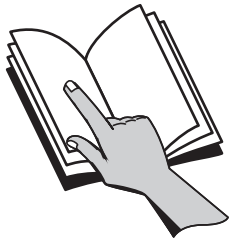
Left Front View Identification



Right Front View Identification



Description of Controls & Components



⚠WARNING

To reduce the risk of serious injury when using this machine, read and understand this entire manual before beginning any operations.

Refer to **Figures 1–6** and the following descriptions to become familiar with the basic controls and components used to operate this machine.

Master Power Switch

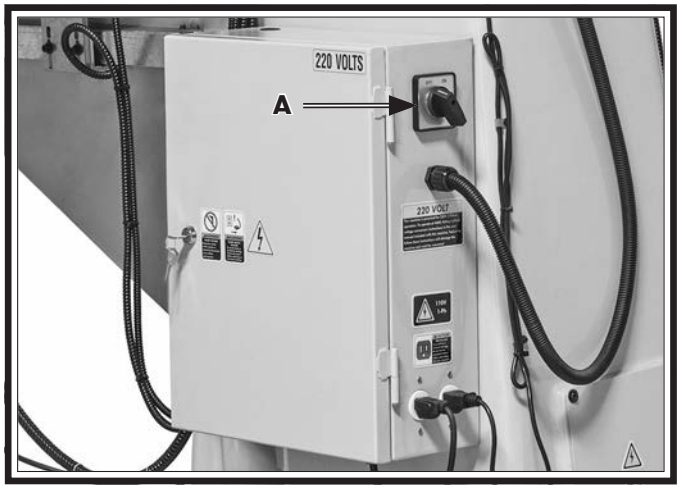


Figure 1. Location of master power switch.

A. Master Power Switch: Turns incoming power ***ON*** and ***OFF***.

Control Panel

Figure 2. Control panel.

B. FWD Button: Starts spindle forward rotation (clockwise looking down on headstock).

C. REV Button: Starts spindle reverse rotation (counterclockwise looking down on headstock).

D. Stop Button: Stops spindle rotation.

E. Coolant Pump ON/OFF Switch: Turns coolant pump ***ON*** and ***OFF***.

F. POWER Light: Illuminates when power to machine is enabled.

G. EMERGENCY STOP Button: Disables power to control panel and stops all machine functions when pressed. To reset, twist button clockwise until it pops out.

Headstock (Left)

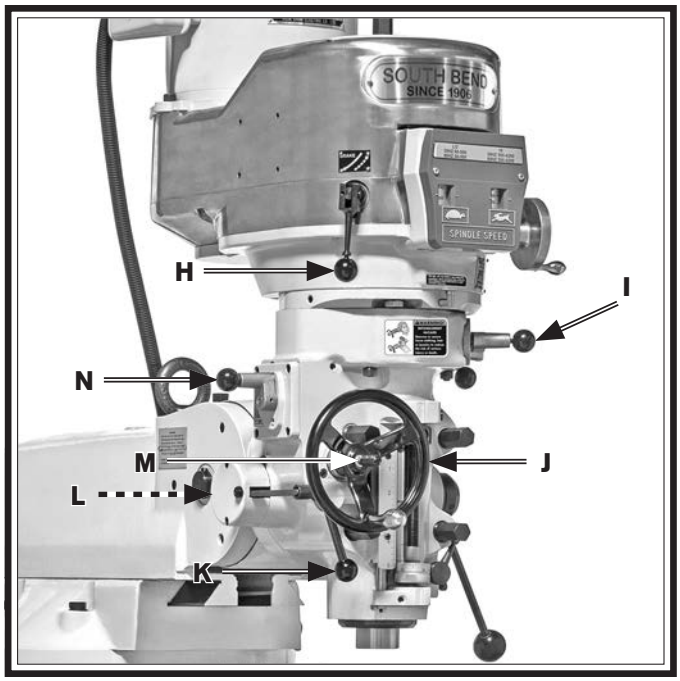


Figure 3. Headstock controls (left).

Headstock (Right)

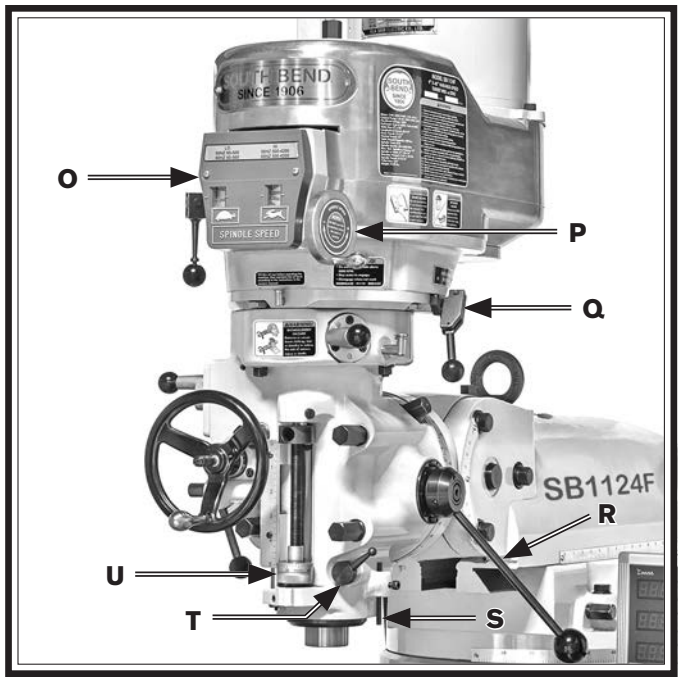


Figure 4. Headstock controls (right).

H. Spindle Brake Lever: Quickly stops spindle ***AFTER*** power to spindle is turned ***OFF***.

I. Manual/Power Downfeed Selector: Selects between manual and power downfeed.

J. Fine Downfeed Handwheel: Manually controls slow spindle downfeed for fine Z-axis control.

K. Fine/Auto Downfeed Clutch Lever: Engages fine/auto-downfeed gears.

L. 90° Positive Stop: Stops headstock at 90° to table following tilt procedure.

M. Auto-Downfeed Direction Pin: Starts, stops, and reverses auto-downfeed direction.

N. Auto-Downfeed Rate Selector: Selects one of the three auto-downfeed rates:

- 0.0015 in./rev.
- 0.003 in./rev.
- 0.006 in./rev.

O. Variable-Speed Indicators: Indicate spindle speed in high and low ranges.

P. Variable Speed Handwheel: Selects desired spindle speed within high or low range.

Q. Spindle Speed Range Selector: Engages back gear for low (60 RPM–500 RPM), and disengages back gear for high (500 RPM–4200 RPM) spindle speed ranges.

Note: *When engaged, back gear reverses spindle rotation, causing spindle FWD/REV buttons to be reversed in low range.*

R. Coarse Downfeed Lever: Quickly moves quill downward manually and automatically retracts spindle to top position when released. Typically used for drilling operations.

S. Dial Indicator Rod: Used to hold dial test indicator when tramming spindle.

T. Quill Lock Lever: Locks quill in vertical position.

U. Adjustable Downfeed Stop: Limits depth of quill travel. Dial is graduated in increments of 0.001". Typically used for repeat operations.

Table

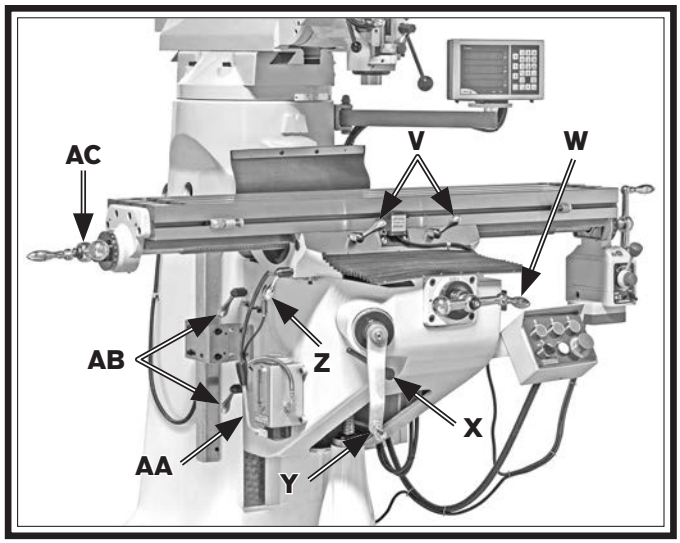


Figure 5. Table controls.

V. X-Axis Table Locks: Tighten to prevent X-axis table movement for increased rigidity during operations where X-axis should not move.

W. Y-Axis Ball Handle: Manually moves table along Y-axis (front and back).

X. Knee Crank Lock Lever: Tightens to prevent accidental movement of knee crank.

Y. Knee Crank: Manually moves table along Z-axis (up and down).

Z. Y-Axis Table Lock: Tightens to prevent Y-axis table movement for increased rigidity during operations where Y-axis should not move.

AA. One Shot Oiler: Lubricates X-, Y-, and Z-axis table ways.

AB. Z-Axis Table Locks: Tighten to prevent Z-axis table movement for increased rigidity during operations where Z-axis should not move.

AC. X-Axis Ball Handle (1 of 2): Manually moves table along X-axis (left and right).

X-Axis Power Feed

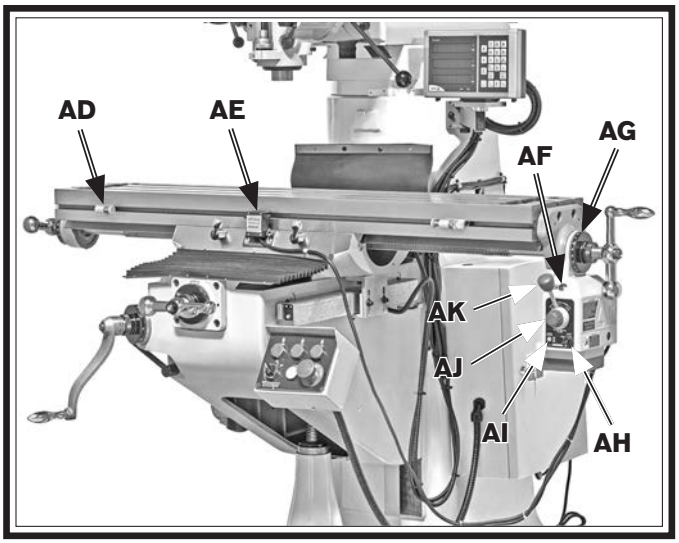


Figure 6. X-Axis power feed controls.

AD. Limit Stop (1 of 2): Restricts table movement by its positioning along front of table.

AE. Limit Switch: Stops table movement when either of the switch side plungers are pressed by limit stops.

AF. Rapid Traverse Button: When pressed, moves table at full speed when already in motion.

AG. Graduated Index Ring: Displays distance of table travel in 0.001" increments, with one full revolution equal to 0.200" of table travel.

AH. Power Feed ON/OFF Switch: Turns power feed ***ON*** and ***OFF***.

AI. Reset Button: Resets internal circuit breaker if unit is overloaded and shuts down.

AJ. Speed Dial: Controls speed of power feed. Rotating dial increases/decreases speed.

AK. Direction Lever: Selects direction of table movement. Middle position is neutral.

SOUTH BEND SINCE 1906

Product Specifications

P.O. Box 2027, Bellingham, WA 98227 U.S.A.
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SOUTH BEND SINCE 1906

Model SB1124F
9" x 48" 3 HP Variable-Speed Turret Mill With DRO

Product Dimensions

Weight..... 2315 lbs.
Width (side-to-side) x Depth (front-to-back) x Height..... 64 x 57 x 84 in.
Footprint (Length x Width)..... 24 x 36 in.
Space Required for Full Range of Movement (Width x Depth)..... 95 x 63 in.

Shipping Dimensions

Type..... Wood Crate
Content..... Machine
Weight..... 2625 lbs.
Length x Width x Height..... 66 x 59 x 77 in.

Electrical

Power Requirement..... 220V or 440V, 3-Phase, 60 hz
Prewired Voltage..... 220V
Full-Load Current Rating..... 9.6A at 220V, 4.8A at 440V
Minimum Circuit Size..... 15A at 220V, 15A at 440V
Connection Type..... Cord at 220V, Permanent (Hardwire) at 440V
Power Cord Included..... No
Recommended Power Cord..... "S"-Type, 4-wire, 14 AWG, 300 VAC
Plug Included..... No
Recommended Plug Type..... 15-20 for 220V
Switch Type..... Control Panel w/Magnetic Switch Protection

Motors

Main

Horsepower..... 3 HP
Phase..... 3-Phase
Amps..... 8A at 220V, 4A at 440V
Speed..... 1720 RPM
Type..... TEFC Induction
Power Transfer ..... Belt
Bearings..... Shielded & Permanently Lubricated

Coolant Pump

Horsepower..... 1/8 HP
Phase..... 3-Phase
Amps..... 0.4 A at 220V, 0.23A at 440V
Speed..... 3450 RPM
Type..... Induction
Power Transfer ..... Direct Drive
Bearings..... Sealed & Permanently Lubricated

Longitudinal Power Feed

Horsepower	1/10 HP
Phase	Single-Phase
Amps	0.8A
Speed	0 - 160 RPM
Type	Universal
Power Transfer	Gear Drive
Bearings	Sealed & Permanently Lubricated

Main Specifications

Operation Info

Spindle Travel	4-15/16 in.
Max Distance Spindle to Column	19 in.
Max Distance Spindle to Table	18-1/4 in.
Longitudinal Table Travel (X-Axis)	30-1/4 in.
Cross Table Travel (Y-Axis)	11-1/4 in.
Vertical Table Travel (Z-Axis)	15 in.
Ram Travel	12 in.
Turret or Column Swivel (Left/Right)	360 deg.
Head Tilt (Left/Right)	0 - 90 deg.
Head Tilt (Front/Back)	0 - 45 deg.
Drilling Capacity for Cast Iron	1 in.
Drilling Capacity for Steel	3/4 in.
End Milling Capacity	1 in.
Face Milling Capacity	4 in.

Table Info

Table Length	48 in.
Table Width	9 in.
Table Thickness	2-3/4 in.
Table Height (from Floor/Base)	42-1/2 in.
Table Weight Capacity	400 lbs.
Number of T-Slots	3
T-Slot Size	5/8 in.
T-Slots Centers	2-1/2 in.
Number of Longitudinal Feeds	Variable
X-Axis Table Power Feed Rate	0 - 3.34 FPM
X/Y-Axis Travel per Handwheel Revolution	0.200 in.
Z-Axis Travel per Handwheel Revolution	0.100 in.

Spindle Info

Spindle Taper	R-8
Number of Vertical Spindle Speeds	Variable
Range of Vertical Spindle Speeds	60 - 4200 RPM
Quill Diameter	3-3/8 in.
Quill Feed Rates	0.0015, 0.003, 0.006 in./rev.
Drawbar Thread Size	7/16-20
Drawbar Length	18-1/2 in.
Spindle Bearings	Angular Contact P4 (ABEC-7) & Double-Shielded Ball Bearing

Construction

Spindle Housing/Quill	Chrome-Plated & Precision-Ground Steel
Table	Precision-Ground Cast Iron
Head	Meehanite Cast Iron
Column/Base	Meehanite Cast Iron
Paint Type/Finish	Urethane

Other

Country of Origin ..... Taiwan
Warranty ..... 2 Years
Approximate Assembly & Setup Time ..... 2 Hours
Serial Number Location ..... ID Label
Sound Rating ..... 67 dB

Features

Fagor Digital Readout
High-Quality, Low-Vibration TEFC Spindle Motor
Auto-Downfeed Stop with Micro-Adjustable Stop
Variable-Speed Longitudinal Power Feed
Precision-Ground Table Surface
Chromed Steel Quill
Heavy-Duty Spindle Brake
Japanese Nachi Bearings
Table, Knee, and Ram are Equipped with Dual Locking Mechanisms
Meehanite Castings
Lever-Action, One-Shot Pump Lubrication System
Powered Recycling Coolant System

Included Accessories

10-Piece Hex Head Wrench Set (1.5 - 10mm)
Open-Ends Wrench 10/12mm
Combination Wrench 19mm
Combination Screwdriver
Oil Bottle
Spare Key Set (Assorted Sizes)
Toolbox

Understanding Risks of Machinery

Operating all machinery and machining equipment can be dangerous or relatively safe depending on how it is installed and maintained, and the operator's experience, common sense, risk awareness, working conditions, and use of personal protective equipment (safety glasses, respirators, etc.).

The owner of this machinery or equipment is ultimately responsible for its safe use. This responsibility includes proper installation in a safe environment, personnel training and usage authorization, regular inspection and maintenance, manual availability and comprehension, application of safety devices, integrity of cutting tools or accessories, and the usage of approved personal protective equipment by all operators and bystanders.

The manufacturer of this machinery or equipment will not be held liable for injury or property damage from negligence, improper training, machine modifications, or misuse. Failure to read, understand, and follow the manual and safety labels may result in serious personal injury, including amputation, broken bones, electrocution, or death.

The signals used in this manual to identify hazard levels are as follows:

⚠DANGER	***Death or catastrophic harm WILL occur.***	**⚠CAUTION**	***Moderate injury or fire MAY occur.***
⚠WARNING	***Death or catastrophic harm COULD occur.***	***NOTICE***	***Machine or property damage may occur.***

Basic Machine Safety

Owner's Manual: All machinery and machining equipment presents serious injury hazards to untrained users. To reduce the risk of injury, anyone who uses THIS item MUST read and understand this entire manual before starting.

Personal Protective Equipment: Operating or servicing this item may expose the user to flying debris, dust, smoke, dangerous chemicals, or loud noises. These hazards can result in eye injury, blindness, long-term respiratory damage, poisoning, cancer, reproductive harm or hearing loss. Reduce your risks from these hazards by wearing approved eye protection, respirator, gloves, or hearing protection.

Trained/Supervised Operators Only: Untrained users can seriously injure themselves or bystanders. Only allow trained and properly supervised personnel to operate this item. Make sure safe operation instructions are clearly understood. If electrically powered, use padlocks and master switches, and remove start switch keys to prevent unauthorized use or accidental starting.

Guards/Covers: Accidental contact with moving parts during operation may cause severe entanglement, impact, cutting, or crushing injuries. Reduce this risk by keeping any included guards/covers/doors installed, fully functional, and positioned for maximum protection.

Entanglement: Loose clothing, gloves, neckties, jewelry or long hair may get caught in moving parts, causing entanglement, amputation, crushing, or strangulation. Reduce this risk by removing/securing these items so they cannot contact moving parts.

Mental Alertness: Operating this item with reduced mental alertness increases the risk of accidental injury. Do not let a temporary influence or distraction lead to a permanent disability! Never operate when under the influence of drugs/alcohol, when tired, or otherwise distracted.

Safe Environment: Operating electrically powered equipment in a wet environment may result in electrocution; operating near highly flammable materials may result in a fire or explosion. Only operate this item in a dry location that is free from flammable materials.

Electrical Connection: With electrically powered equipment, improper connections to the power source may result in electrocution or fire. Always adhere to all electrical requirements and applicable codes when connecting to the power source. Have all work inspected by a qualified electrician to minimize risk.

Disconnect Power: Adjusting or servicing electrically powered equipment while it is connected to the power source greatly increases the risk of injury from accidental startup. Always disconnect power BEFORE any service or adjustments, including changing blades or other tooling.

Secure Workpiece/Tooling: Loose workpieces, cutting tools, or rotating spindles can become dangerous projectiles if not secured or if they hit another object during operation. Reduce the risk of this hazard by verifying that all fastening devices are properly secured and items attached to spindles have enough clearance to safely rotate.

Chuck Keys or Adjusting Tools: Tools used to adjust spindles, chucks, or any moving/rotating parts will become dangerous projectiles if left in place when the machine is started. Reduce this risk by developing the habit of always removing these tools immediately after using them.

Work Area: Clutter and dark shadows increase the risks of accidental injury. Only operate this item in a clean, non-glaring, and well-lighted work area.

Properly Functioning Equipment: Poorly maintained, damaged, or malfunctioning equipment has higher risks of causing serious personal injury compared to those that are properly maintained. To reduce this risk, always maintain this item to the highest standards and promptly repair/service a damaged or malfunctioning component. Always follow the maintenance instructions included in this documentation.

Unattended Operation: Electrically powered equipment that is left unattended while running cannot be controlled and is dangerous to bystanders. Always turn the power ***OFF*** before walking away.

Health Hazards: Certain cutting fluids and lubricants, or dust/smoke created when cutting, may contain chemicals known to the State of California to cause cancer, respiratory problems, birth defects, or other reproductive harm. Minimize exposure to these chemicals by wearing approved personal protective equipment and operating in a well ventilated area.

Difficult Operations: Attempting difficult operations with which you are unfamiliar increases the risk of injury. If you experience difficulties performing the intended operation, STOP! Seek an alternative method to accomplish the same task, ask a qualified expert how the operation should be performed, or contact our Technical Support for assistance.

Additional Milling Machine Safety

⚠WARNING

You can be seriously injured or killed by getting clothing, jewelry, or long hair entangled with rotating cutter/spindle. You can be severely cut or have fingers amputated from contact with rotating cutters. You can be blinded or struck by broken cutting tools, metal chips, workpieces, or adjustment tools thrown from the rotating spindle with great force. To reduce your risk of serious injury when operating this machine, completely heed and understand the following:

Understanding Controls: Make sure you understand the function and proper use of all controls before starting. This will help you avoid making mistakes that result in serious injury.

Avoiding Entanglement: DO NOT wear loose clothing, gloves, or jewelry, and tie back long hair. Keep all guards in place and secure. Always allow spindle to stop on its own. DO NOT stop spindle using your hand or any other object.

Wear Face Shield: Always wear a face shield in addition to safety glasses. This provides more complete protection for your face than safety glasses alone.

Use Correct Spindle Speed: Follow recommended speeds and feeds for each size and type of cutting tool. This helps avoid tool breakage during operation and ensures best cutting results.

Inspect Cutting Tool: Inspect cutting tools for sharpness, chips, or cracks before each use. Replace dull, chipped, or cracked cutting tools immediately.

Properly Secure Cutter: Firmly secure cutting tool or drill bit so it does not fly out of spindle during operation.

Power Disruption: In the event of a local power outage during operation, turn machine ***OFF*** to avoid a possible sudden startup once power is restored.

Clean Machine Safely: Metal chips or shavings can be razor sharp. DO NOT clear chips by hand or compressed air that can force chips farther into machine—use a brush or vacuum instead. Never clear chips while spindle is turning.

Secure Workpiece To Table: Clamp workpiece to table or secure in a vise mounted to table, so workpiece cannot unexpectedly shift or spin during operation. NEVER hold workpiece by hand during operation.

Properly Maintain Machine: Keep machine in proper working condition to help ensure that it functions safely and all guards and other components work as intended. Perform routine inspections and all necessary maintenance. Never operate machine with damaged or worn parts that can break or result in unexpected movement during operation.

Disconnect Power First: To reduce risk of electrocution or injury from unexpected startup, make sure mill/drill is turned ***OFF***, disconnected from power, and that all moving parts have come to a complete stop before changing cutting tools or starting any inspection, adjustment, or maintenance procedure.

Remove Chuck Key & Spindle Tools: Always remove chuck key, drawbar wrench, and other tools used on the spindle immediately after use. This will prevent them from being thrown by the spindle upon startup.

Preparation Overview

The purpose of the preparation section is to help you prepare your machine for operation. The list below outlines the basic process. Specific steps for each of these points will be covered in detail later in this section.

The typical preparation process is as follows:

1. Unpack the machine and inventory the contents of the box/crate.
2. Clean the machine and its components.
3. Identify an acceptable location for the machine and move it to that location.
4. Level the machine and either bolt it to the floor or place it on mounts.
5. Assemble the loose components and make any necessary adjustments or inspections to ensure the machine is ready for operation.
6. Connect the machine to the power source.
7. Test run the machine to make sure it functions properly and is ready for operation.

⚠WARNING

Serious personal injury could occur if you connect the machine to power before completing the setup process. DO NOT connect power until instructed to do so later in this manual.

⚠CAUTION

No list of safety guidelines can be complete. Every shop environment is different. Always consider safety first, as it applies to your individual working conditions. Use this and other machinery with caution and respect. Failure to do so may result in serious personal injury or property damage.

Required for Setup

The items listed below are required to successfully set up and prepare this machine for operation.

For Lifting

- A forklift or other power lifting device rated for the weight of the machine.
- Lifting straps w/safety hooks or chain (rated for at least 3000 lbs.)

For Power Connection

- A power source that meets the minimum circuit requirements for this machine. (Refer to **Power Supply Requirements** on **Page 14** for details.)
- A qualified electrician to ensure a safe and code-compliant connection to the power source.
- 14AWG power cord with 15-20 plug (for 220V connection).

For Assembly

- Cleaner/Degreaser
- Disposable Shop Rags/Gloves
- Phillips Head Screwdriver #2
- Precision Level 12"
- Thread-Sealing Tape or Pipe Sealant
- Two Assistants
- Safety Glasses for Each Person

⚠WARNING

Like all machinery there is potential danger when operating this machine. Accidents are frequently caused by lack of familiarity or failure to pay attention. Use this machine with respect and caution to decrease the risk of operator injury. If normal safety precautions are overlooked or ignored, serious personal injury may occur.

Power Supply Requirements

Availability

Before installing the machine, consider the availability and proximity of the required power supply circuit. If an existing circuit does not meet the requirements for this machine, a new circuit must be installed.

To minimize the risk of electrocution, fire, or equipment damage, installation work and electrical wiring must be done by an electrician or qualified service personnel in accordance with applicable electrical codes and safety standards.

⚠WARNING

Electrocution or fire may occur if machine is not correctly grounded and attached to the power supply. Use a qualified electrician to ensure a safe power connection.

Full-Load Current Rating

The full-load current rating is the amperage a machine draws at 100% of the rated output power. On machines with multiple motors, this is the amperage drawn by the largest motor or sum of all motors and electrical devices that might operate at one time during normal operations.

Full-Load Rating at 220V ..... 9.6 Amps
Full-Load Rating at 440V ..... 4.8 Amps

The full-load current is not the maximum amount of amps that the machine will draw. If the machine is overloaded, it will draw additional amps beyond the full-load rating.

If the machine is overloaded for a sufficient length of time, damage, overheating, or fire may result—especially if connected to an undersized circuit. To reduce the risk of these hazards, avoid overloading the machine during operation and make sure it is connected to a power supply circuit that meets the requirements in the following section.

Circuit Information

A power supply circuit includes all electrical equipment between the main breaker box or fuse panel in your building and the incoming power connections inside the machine. This circuit must be safely sized to handle the full-load current that may be drawn from the machine for an extended period of time. (If this machine is connected to a circuit protected by fuses, use a time delay fuse marked D.)

⚠CAUTION

For your own safety and protection of property, consult an electrician if you are unsure about wiring practices or applicable electrical codes.

Note: The circuit requirements in this manual are for a dedicated circuit—where only one machine will be running at a time. If this machine will be connected to a shared circuit where multiple machines will be running at the same time, consult a qualified electrician to ensure the circuit is properly sized.

Circuit Requirements for 220V

This machine is prewired to operate on a power supply circuit that has a verified ground and meets the following requirements:

Nominal Voltage 208V/220V/230V/240V
Cycle ..... 60 Hz
Phase 3-Phase
Circuit Rating..... 15 Amps
Plug/Receptacle ..... NEMA 15-20

Circuit Requirements for 440V

This machine can be converted to operate on a 440V power supply. To do this, follow the **Voltage Conversion** instructions included in this manual. The intended 440V circuit must have a verified ground and meet the following requirements:

Nominal Voltage 440V/480V
Cycle ..... 60 Hz
Phase 3-Phase
Circuit Rating..... 15 Amps
Connection ..... Hardwire with Locking Switch

Grounding Requirements

This machine must be grounded! In the event of certain types of malfunctions or breakdowns, grounding provides a path of least resistance for electric current in order to reduce the risk of electric shock.

For 220V operation: Use the plug type listed in the **Circuit Requirements** for this voltage. The listed plug (similar to the following figure) has an equipment-grounding wire to safely ground the machine. The plug must only be inserted into a matching receptacle (outlet) that is properly installed and grounded in accordance with all local codes and ordinances.

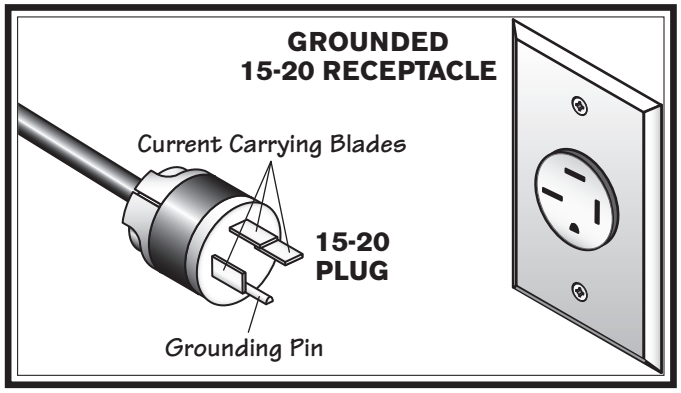
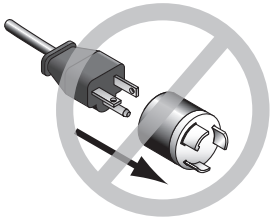


Figure 7. NEMA 15-20 plug and receptacle.

⚠CAUTION



No adapter should be used with plug. If plug does not fit available receptacle, or if machine must be reconnected for use on a different type of circuit, reconnection must be performed by an electrician or qualified service personnel, and it must comply with all local codes and ordinances.

For 440V operation: As specified in **Circuit Requirements** for 440V, the machine must be hardwired to the power source, using a locking switch as a disconnecting means (see below). The machine must also be connected to a grounded metal permanent wiring system; or to a system having an equipment-grounding conductor. Due to the complexity and high voltage involved, this type of installation MUST be done by a qualified electrician.

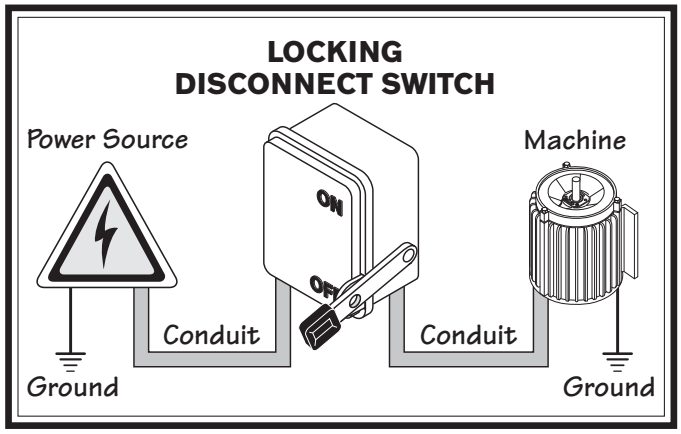


Figure 8. Typical setup of a permanently connected machine.

Improper connection of the equipment-grounding wire can result in a risk of electric shock. The wire with green insulation (with or without yellow stripes) is the equipment-grounding wire. If repair or replacement of the power cord or plug is necessary, do not connect the equipment-grounding wire to a live (current carrying) terminal.

Check with an electrician or qualified service personnel if you do not understand these grounding requirements, or if you are in doubt about whether the tool is properly grounded.

If you ever notice that a cord or plug is damaged or worn, disconnect it from power, and immediately replace it with a new one.

Phase Converters

DO NOT use a static phase converter to create 3-phase power—it can quickly decrease the life of electrical components on this machine. If you must use a phase converter, only use a rotary phase converter. See the Model G5844 in **Accessories** on **Page 47**.

Extension Cords (220V Only)

We do not recommend using an extension cord with this machine. If you must use one, only use it if absolutely necessary and only on a temporary basis.

Extension cords cause voltage drop, which may damage electrical components and shorten motor life. Voltage drop increases as the extension cord size gets longer and the gauge size gets smaller (higher gauge numbers indicate smaller sizes).

Any extension cord used with this machine must contain a ground wire, match the required plug and receptacle listed in the **Circuit Requirements** for the applicable voltage, and meet the following requirements:

Minimum Gauge Size.....12 AWG
Maximum Length (Shorter is Better) ....50 ft.

Converting Voltage to 440V

The Model SB1124F is prewired to run on 220V power, but it can be converted to 440V operation. This conversion consists of: 1) Disconnecting the machine from power, 2) rewiring the transformer for 440V operation, 3) replacing the overload relay, and 4) rewiring the motors for 440V operation.

All wiring changes must be inspected by a qualified electrician or service personnel before the saw is connected to the power source. If, at any time during this procedure you need assistance, call Grizzly Tech Support at (570) 546-9663.

Items Needed	Qty
Phillips Head Screwdriver #2	1
Hex Wrench 8mm	1
TECO Overload Relay RHU-10/4.8K1	1

To convert SB1124F to 440V operation:

1. DISCONNECT MACHINE FROM POWER!
2. Open electrical cabinet and locate transformer (see **Figure 9**).
3. Move "R" wire from 220V terminal to 440V terminal (see **Figure 9**).

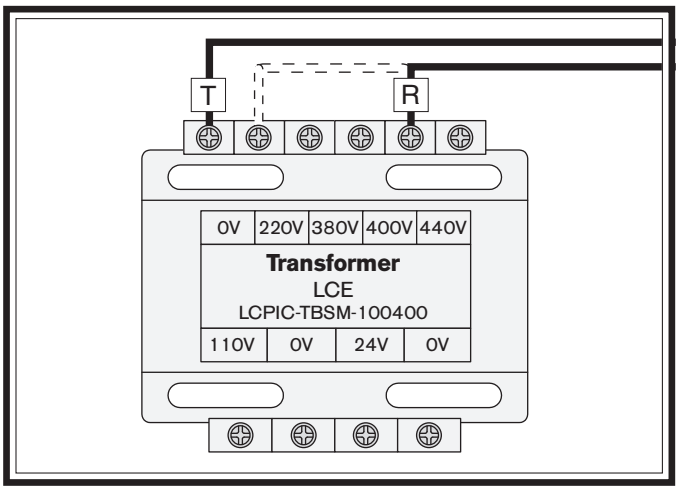


Figure 9. Moving "R" wire to 440V terminal.

4. Remove overload relay and replace with TECO RHU-10/4.8K1 overload relay (refer to wiring diagrams on **Pages 68–69**). Set amperage dial to 4.8A.
5. Close electrical cabinet.
6. Remove motor junction box covers on main and coolant motors.
7. Rewire main motor and coolant pump for 440V operation (refer to wiring diagrams on **Page 71**).

   Note: *If the diagram included on the motor conflicts with the one in this manual, the motor may have changed since the manual was printed. Use the diagram provided on the motor.*

8. Install junction box covers on main and coolant motors.

Unpacking

This item was carefully packaged to prevent damage during transport. If you discover any damage, please immediately call Customer Service at (360) 734-1540 for advice. You may need to file a freight claim, so save the containers and all packing materials for possible inspection by the carrier or its agent.

Inventory

Inventory (Figure 10)		Qty
A.	Front Way Cover	1
B.	Rear Way Cover	1
C.	Drawbar 7/16"-20 x 18½"	1
D.	Knee Crank	1
E.	Fine Downfeed Handwheel	1
F.	Revolving Handles	3
G.	Hex Wrench 10-Pc. Set 1.5–10mm	1
H.	Oil Bottle	1
I.	Tool Box	1
J.	Combination Screwdriver	1
K.	Coarse Downfeed Lever	1
L.	Open-End Wrench 10/12mm	1
M.	Combo Wrench 19mm	1
N.	Splash Pan	1
O.	Coolant Return Hose Pipe Fittings	2
P.	Coolant Return Hoses w/Clamps	2
Q.	Spare Key Set (Not Shown)	1

NOTICE

If you cannot find an item on this list, carefully check around/inside the machine and packaging materials. Often, these items get lost in packing materials while unpacking or they are pre-installed at the factory.

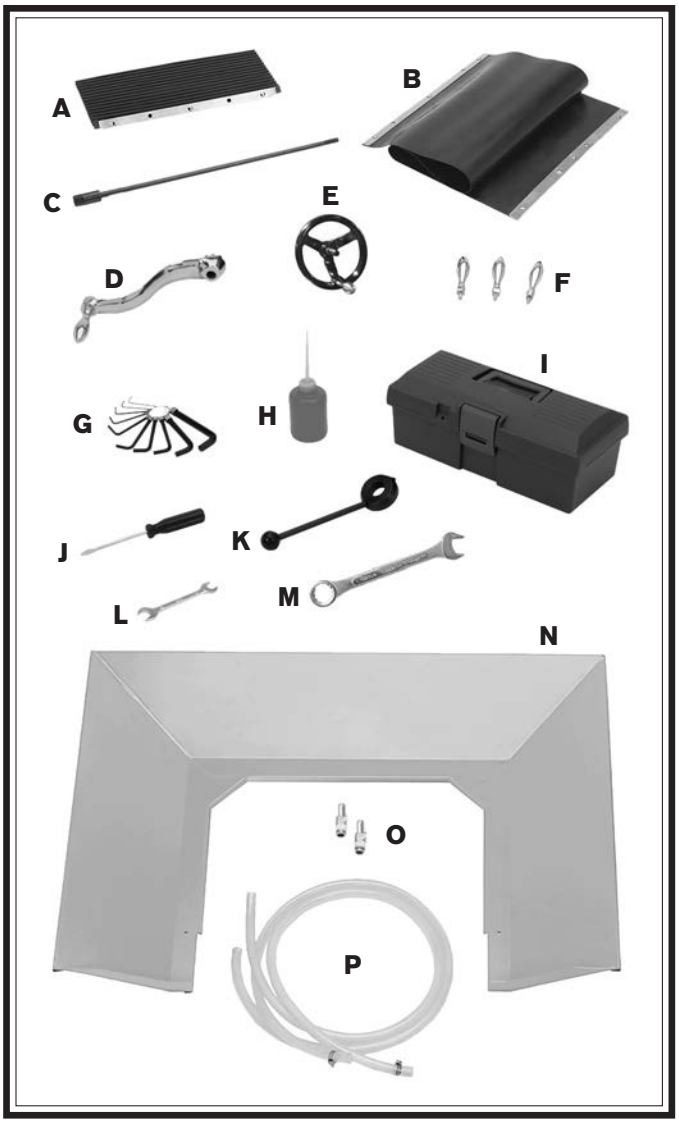


Figure 10. Inventory.

Cleaning & Protecting

The unpainted surfaces are coated at the factory with a heavy-duty rust preventative that prevents corrosion during shipment and storage. The benefit of this rust preventative is that it works very well. The downside is that it can be time-consuming to thoroughly remove.

Be patient and do a careful job when cleaning and removing the rust preventative. The time you spend doing this will reward you with smooth-sliding parts and a better appreciation for the proper care of the unpainted surfaces.

Although there are many ways to successfully remove the rust preventative, the following process works well in most situations.

Before cleaning, gather the following:

- Disposable rags
- Cleaner/degreaser (certain citrus-based degreasers work extremely well and they have non-toxic fumes)
- Safety glasses & disposable gloves

Note: *Automotive degreasers, mineral spirits, or WD•40 can be used to remove rust preventative. Before using these products, though, test them on an inconspicuous area of a painted surface to make sure they will not damage it.*

⚠WARNING

Gasoline and petroleum products have low flash points and can explode or cause fire if used for cleaning. Avoid using these products to remove rust preventative.

⚠CAUTION

Many cleaning solvents are toxic if inhaled. Minimize your risk by only using these products in a well ventilated area.

NOTICE

Avoid chlorine-based solvents, such as acetone or brake parts cleaner that may damage painted surfaces. Always follow the manufacturer's instructions when using any type of cleaning product.

Basic steps for removing rust preventative:

1. Put on safety glasses and disposable gloves.

2. Coat all surfaces that have rust preventative with a liberal amount of your cleaner or degreaser and let them soak for a few minutes.

3. Wipe off the surfaces. If your cleaner or degreaser is effective, the rust preventative will wipe off easily.

   Note: *To clean off thick coats of rust preventative on flat surfaces, such as beds or tables, use a PLASTIC paint scraper to scrape off the majority of the coating before wiping it off with your rag. (Do not use a metal scraper or it may scratch the surface.)*

4. Repeat **Steps 2–3** as necessary until clean, then coat all unpainted surfaces with a quality metal protectant or light oil to prevent rust.

T23692—Orange Power Degreaser

A great product for removing the waxy shipping grease from the ***non-painted*** parts of the machine during clean up.

Order online at www.grizzly.com OR Call 1-800-523-4777

Figure 11. T23692 Orange Power Degreaser.

Location

Physical Environment

The physical environment where your machine is operated is important for safe operation and longevity of parts. For best results, operate this machine in a dry environment that is free from excessive moisture, hazardous or flammable chemicals, airborne abrasives, or extreme conditions. Extreme conditions for this type of machinery are generally those where the ambient temperature is outside the range of 41°–104°F; the relative humidity is outside the range of 20–95% (non-condensing); or the environment is subject to vibration, shocks, or bumps.

Electrical Installation

Place this machine near an existing power source. Make sure all power cords are protected from traffic, material handling, moisture, chemicals, or other hazards. Make sure to leave access to a means of disconnecting the power source or engaging a lockout/tagout device.

Lighting

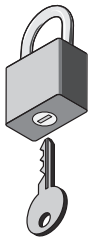
Lighting around the machine must be adequate enough to perform operations safely. Shadows, glare, or strobe effects that may distract or impede the operator must be eliminated.

Weight Load

Refer to the **Machine Specifications** for the weight of your machine. Make sure that the surface upon which the machine is placed will bear the weight of the machine, additional equipment that may be installed on the machine, and the heaviest workpiece that will be used. Additionally, consider the weight of the operator and any dynamic loading that may occur when operating the machine.

Space Allocation

Consider the largest size of workpiece that will be processed through this machine and provide enough space around the machine for adequate operator material handling or the installation of auxiliary equipment. With permanent installations, leave enough space around the machine to open or remove doors/covers as required by the maintenance and service described in this manual.



⚠CAUTION

Children or untrained people may be seriously injured by this machine. Only install in an access restricted location.

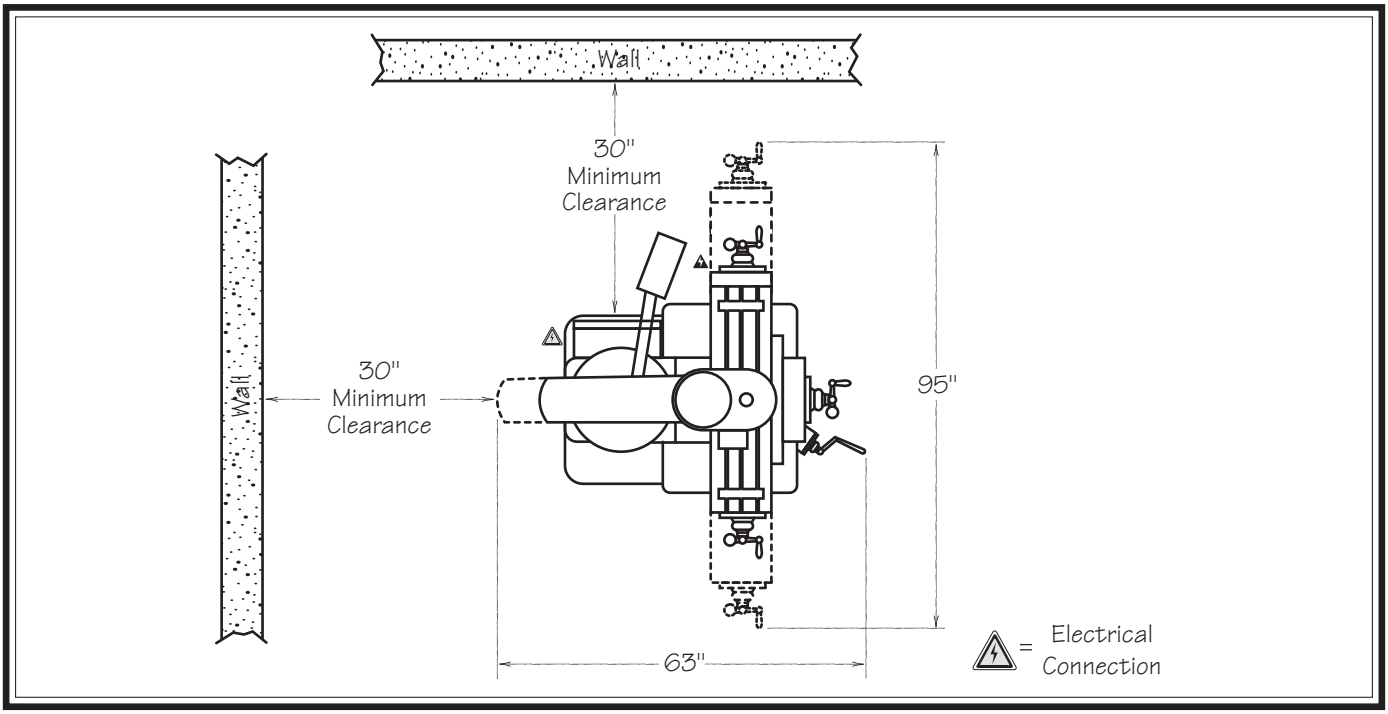
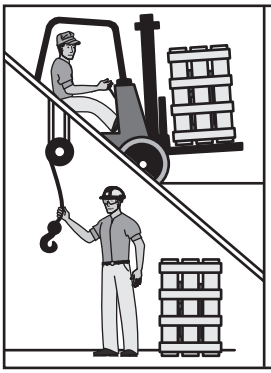


Figure 12. Clearances.

Lifting & Moving



⚠WARNING

This machine and its parts are heavy! Serious personal injury may occur if safe moving methods are not used. To reduce the risk of a lifting or dropping injury, ask others for help and use power equipment.

The method of lifting and moving the mill described below requires at least two other people for assistance, and a forklift with two lifting web straps rated for at least 3000 lbs. each.

IMPORTANT: *Before lifting the mill, make sure the four turret lock bolts (two on either side of the ram) are torqued to 47 ft/lbs.*

To lift and move mill:

1. Remove crate from shipping pallet, then move pallet and mill to installation location.

2. Rotate ram 180° so headstock is facing backward, then rotate head upright, as illustrated in **Figure 13**. (Refer to **Ram Movement** on **Page 34** and **Headstock Movement** on **Page 33** for detailed instructions).

   Note: *After re-positioning ram and headstock, make sure they are locked in place to prevent unexpected movement during lifting and moving.*

3. Place lifting web straps under ram and connect them to safety hook, as illustrated in **Figure 13**.

   Note: *Place padding between straps and mill to protect ram and ways, and to keep from cutting lifting straps.*

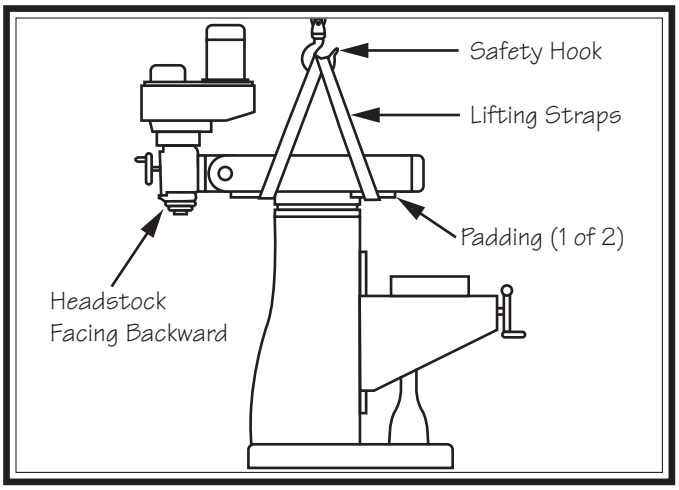


Figure 13. Lifting mill using web straps.

4. Unbolt mill from shipping pallet.

5. With assistants steadying load to keep it from swaying, lift mill a couple of inches.

   — If mill tips to one side, lower it to the ground and adjust ram or table to balance load. Make sure to tighten lock levers and bolts before lifting mill again.

   — If mill lifts evenly, continue to move it to its permanent location.

6. Rotate ram 180° so headstock is facing forward.

Leveling & Mounting

Generally, you can either bolt your machine to the floor or mount it on machine mounts. Although not required, we recommend that you secure the machine to the floor and level it while doing so. Because this is an optional step and floor materials may vary, hardware for securing the machine to the floor is not included.

NOTICE

We strongly recommend securing your machine to the floor if it is hardwired to the power source. Consult with your electrician to ensure compliance with local codes.

Leveling

Leveling machinery helps precision components, such as bed ways, remain straight and flat during the lifespan of the machine. Components on an unleveled machine may slowly twist due to the dynamic loads placed on the machine during operation.

For best results, use a precision level that is at least 12" long and sensitive enough to show a distinct movement when a 0.003" shim (approximately the thickness of one sheet of standard newspaper) is placed under one end of the level.

See the figure below for an example of a high precision level.

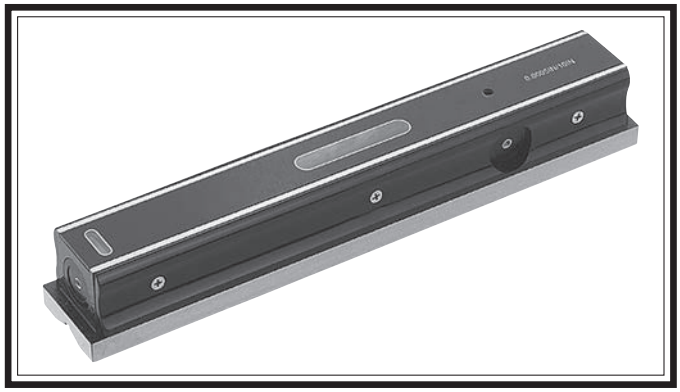


Figure 14. Example of a precision level.

Anchoring to Floor

Number of Mounting Holes 4
Diameter of Mounting Hardware..... ½"

Anchoring machine to the floor prevents tipping or shifting that may occur during operation with large/heavy workpieces.

If machine is installed in a commercial or workplace setting, or if it is permanently connected (hardwired) to the power supply, local codes may require that it be anchored to the floor.

Mounting to Concrete Floors

Lag shield anchors with lag screws (see below) are a popular way to anchor machinery to a concrete floor, because the anchors sit flush with the floor surface, making it easy to unbolt and move the machine later, if needed. However, anytime local codes apply, you MUST follow the anchoring methodology specified by the code.

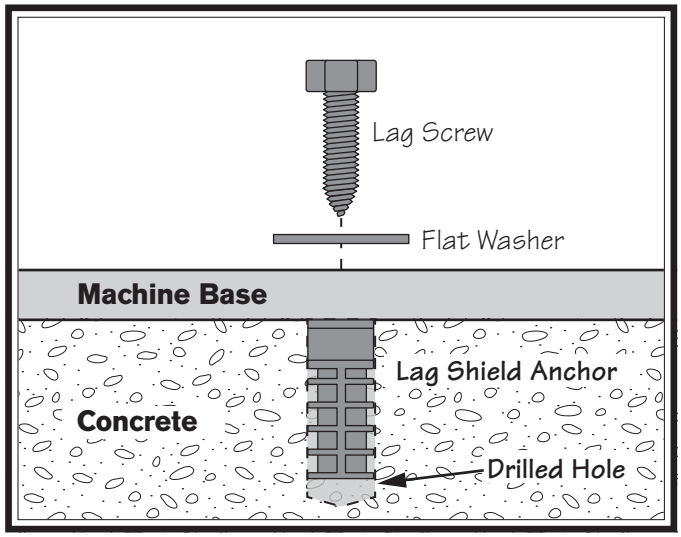


Figure 15. Popular method for anchoring machinery to a concrete floor.

Assembly

The machine must be fully assembled before it can be operated. Before beginning the assembly process, refer to **Required for Setup** and gather all the items listed. To ensure the assembly process goes smoothly, first clean any parts that are covered or coated in heavy-duty rust preventative (if applicable).

To assemble machine:

1. Remove (5) Phillips head screws from front of saddle and knee (see **Figure 16**), position pleated way cover, and secure with removed screws.

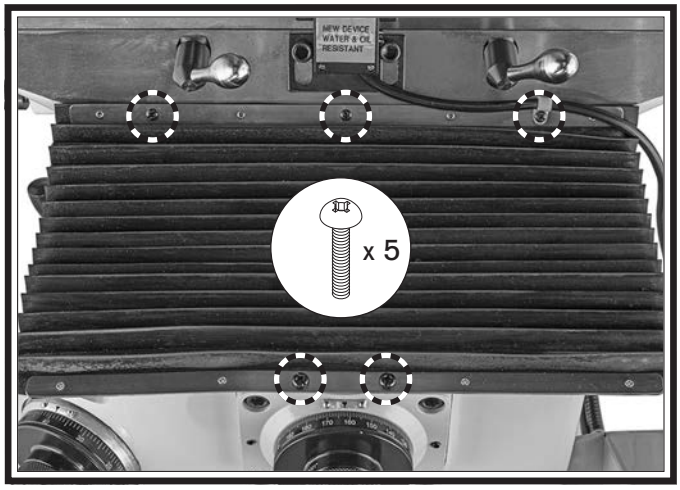


Figure 16. Front way cover installed.

2. Remove (4) Phillips head screws (see **Figure 17**) from column and back of table, position rear way cover, and secure with removed screws.

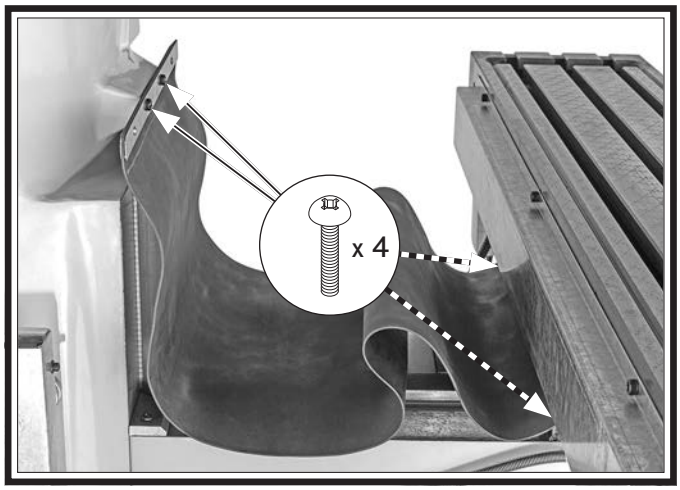


Figure 17. Rear way cover installed.

3. Thread (1) revolving handle (see **Figure 18**) into small end of each ball handle and tighten to secure.

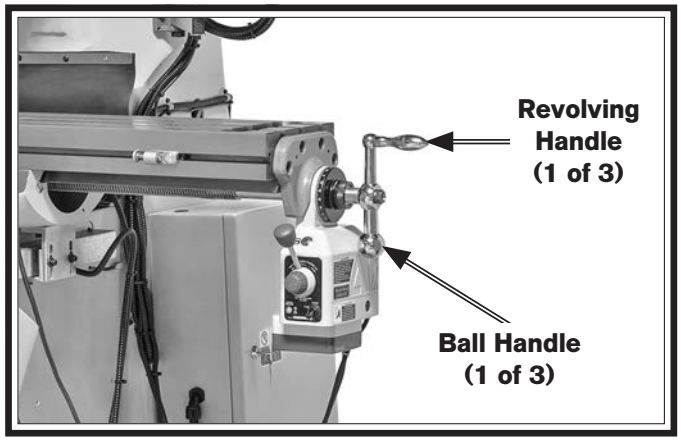


Figure 18. Revolving handle installed in ball handle.

4. Slide knee crank (see **Figure 19**) onto Z-axis leadscrew, and ensure that teeth fully engage.

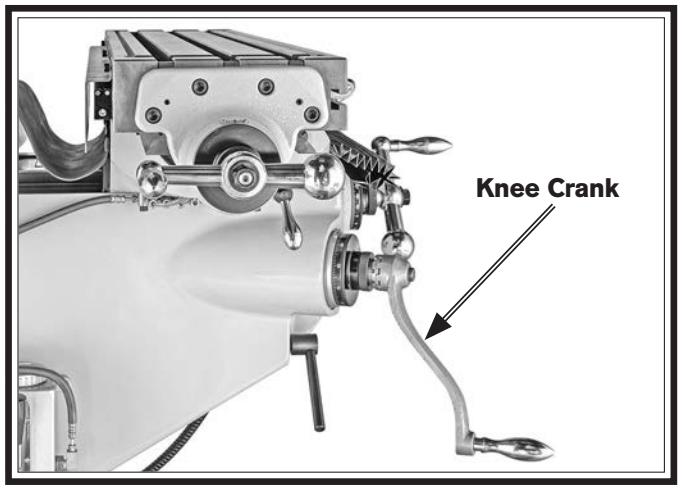


Figure 19. Knee crank installed.

5. Install coarse downfeed lever and secure with set screw (see **Figure 20**).

6. Install fine downfeed handwheel (see **Figure 20**).

Note: *Ensure pins on back of coarse downfeed lever and fine downfeed handwheel are fully seated in hubs before use.*

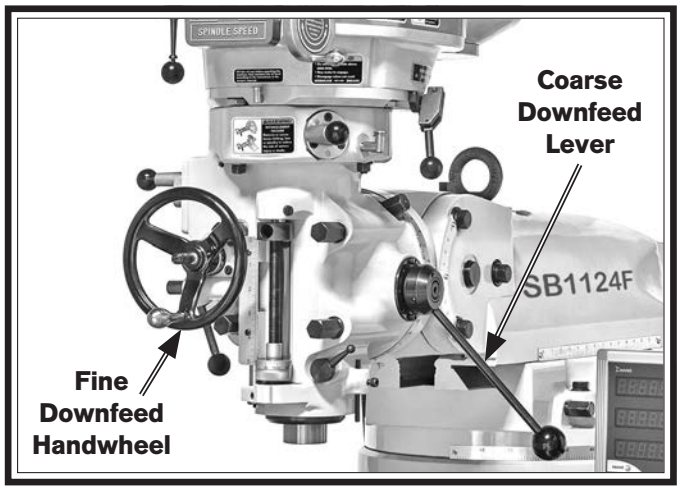


Figure 20. Coarse downfeed lever and fine downfeed handwheel installed.

7. Remove (4) Phillips head screws and flat washers (see **Figure 21**) from base, slide splash pan into position, and secure with removed screws.

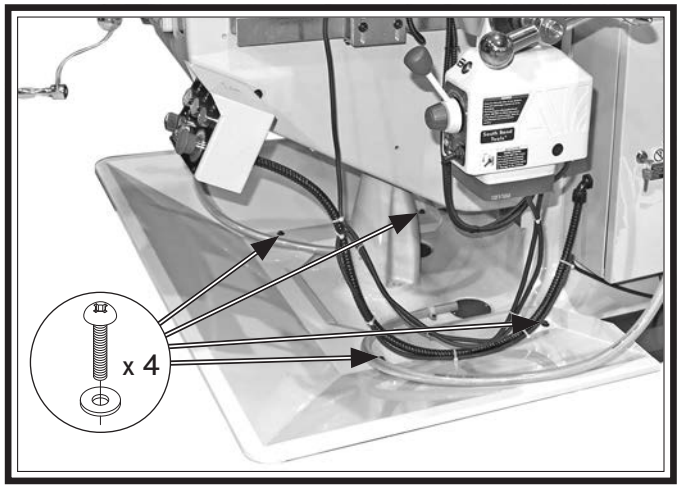


Figure 21. Splash pan installed.

8. Apply thread-sealing tape or pipe sealant on threads of (2) pipe fittings, and install them in coolant drain holes on back of table (see **Figure 22**).

9. Loosen hose clamps on coolant return hoses, push hoses onto pipe fittings (see **Figure 22**), and tighten clamps.

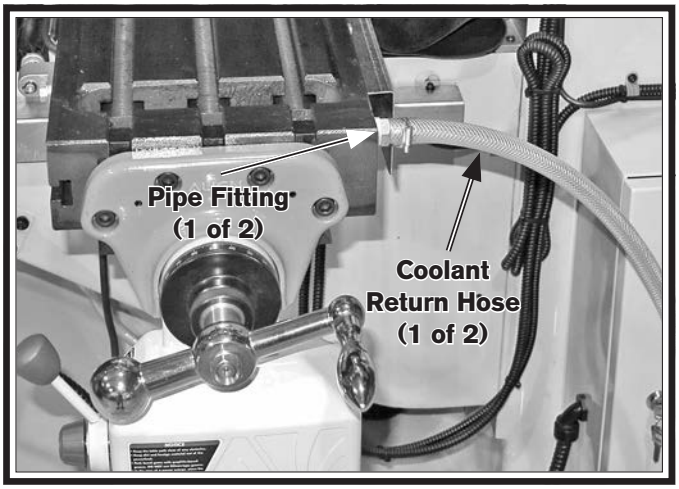


Figure 22. Coolant return hose connections.

10. Loosen hose clamps above coolant return screens (see **Figure 23**), insert hoses so they will drain into screens, then tighten hose clamps.

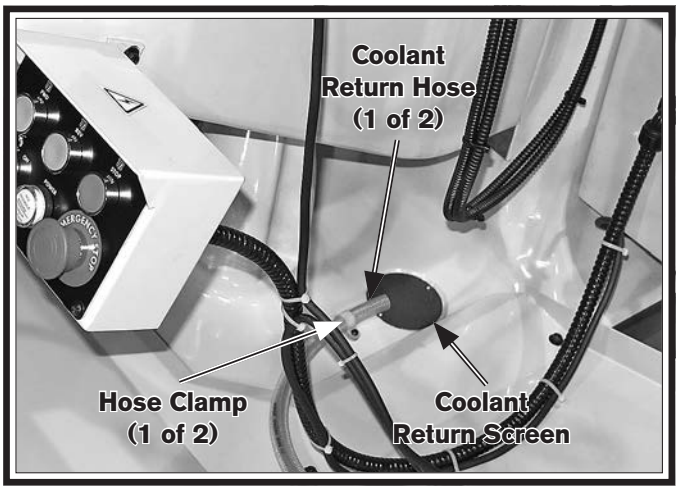


Figure 23. Coolant return hose connected.

Power Connection (220V)

⚠WARNING

Electrocution or fire may occur if machine is ungrounded, incorrectly connected to power, or connected to an undersized circuit. Use a qualified electrician to ensure a safe power connection.

Before the machine can be connected to the power source, an electrical circuit and connection device must be prepared according to **Power Supply Requirements** on **Page 14**, and all previous setup instructions in this manual must be complete to ensure that the machine has been assembled and installed properly.

Connecting Plug to Power Cord

To connect a plug to a power cord, install a NEMA 15-20 plug on the end of the power cord, per the plug manufacturer's instructions. If no instructions are included, use the wiring diagram on **Page 68**.

Power Connection

Insert the power cord plug into a matching power supply receptacle. The machine is now connected to the power source.

If you need to disconnect the machine from power later, pull the plug completely out of the receptacle.

Note About Extension Cords: Using an incorrectly-sized extension cord may decrease the life of electrical components on your machine. If you must use an extension cord, refer to **Extension Cords** on **Page 16** for more information.

Power Connection (440V)

⚠WARNING

Electrocution or fire may occur if machine is ungrounded, incorrectly connected to power, or connected to an undersized circuit. Use a qualified electrician to ensure a safe power connection.

Hardwiring to Power Source

Hardwire setups require power supply lines to be enclosed inside of a conduit, which is securely mounted and constructed in adherence to applicable electrical codes.

A hardwire setup for this machine must be equipped with a locking disconnect switch as a means to disconnect the power during adjustments or maintenance, which is a typical requirement for many lock-out/tag-out safety programs.

Figure 24 shows a simple diagram of a hardwire setup with a locking disconnect switch between the power supply and the machine.

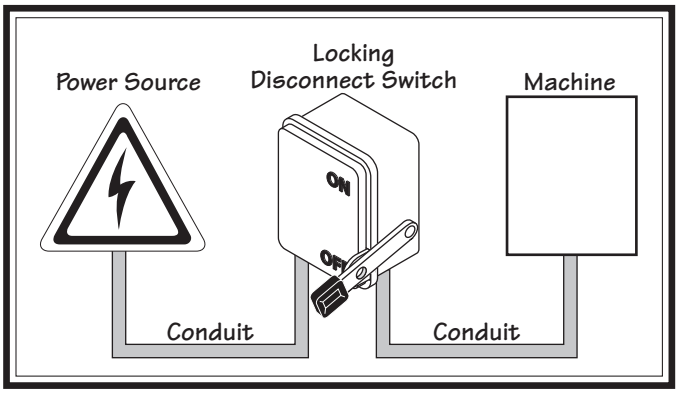


Figure 24. Typical hardwire setup with a locking disconnect switch.

Due to the complexity required for planning, bending, and installing the conduit necessary for a code-compliant hardwire setup, an electrician or other qualified person MUST perform this type of installation.

⚠WARNING

Connecting power supply wires to machine without first disconnecting power supply may result in serious injury or death.

Tool Needed	Qty
Phillips Head Screwdriver #2	1
Conduit	As Necessary

To connect power supply wires to machine:

1. Open electrical cabinet.

2. Insert incoming power wires through strain relief (see **Figure 25**) at bottom of electrical cabinet.

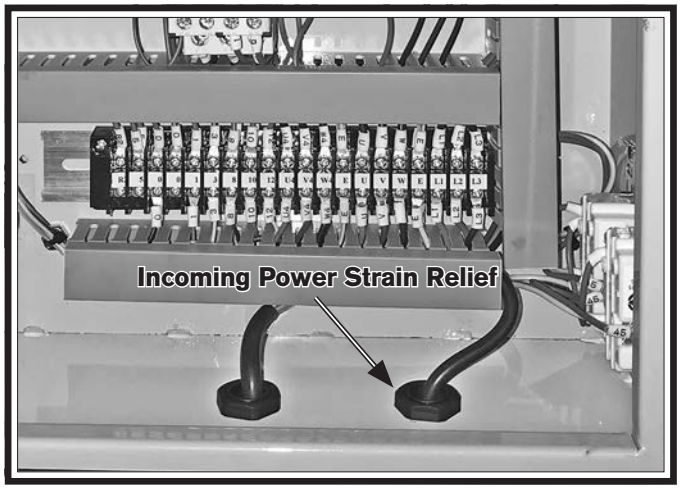


Figure 25. Location of incoming power strain relief.

⚠WARNING

During next step, make sure incoming ground wire is connected to correct terminal to ensure machine will be properly grounded (see "Ground Terminal" in Figure 26). An ungrounded or improperly grounded machine can cause electrocution if live electrical wires make contact with frame or other parts touched by operator.

3. Connect ground wire to bottom of ground terminal "E", then connect incoming power wires to bottom of "L1", "L2", and "L3" terminals (see **Figure 26**). If using a phase converter, connect wild wire to "L2" terminal.

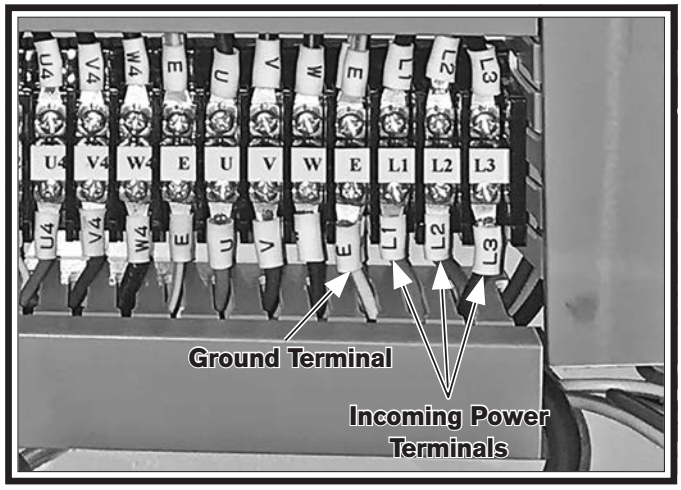


Figure 26. Incoming ground and power wire terminals.

4. Shut off main power at power source circuit breaker and attach wires to locking shut-off switch.

Initial Lubrication

This machine was lubricated at the factory, but we strongly recommend that you inspect all lubrication points yourself before performing the Test Run and provide additional lubrication if necessary. Refer to **Lubrication** on **Page 50** for specific details.

Test Run

After all preparation steps have been completed, the machine and its safety features must be tested to ensure correct operation. If you discover a problem with the operation of the machine or its safety components, do not operate it further until you have resolved the problem.

Note: *Refer to* ***Troubleshooting*** *on* ***Page 62*** *for solutions to common problems. If you need additional help, contact our Tech Support at (360) 734-1540.*

The test run consists of verifying the following:

- Motor powers up and runs correctly.
- Spindle turns in forward direction (clockwise when viewed from top of headstock).
- EMERGENCY STOP button works correctly.
- Electrical cabinet safety switch works correctly.
- Coolant system works correctly.
- Power feed unit works correctly.

⚠WARNING

Serious injury or death can result from using this machine BEFORE understanding its controls and related safety information. DO NOT operate, or allow others to operate, machine until the information is understood.

⚠WARNING

DO NOT start machine until all preceding setup instructions have been performed. Operating an improperly set up machine may result in malfunction or unexpected results that can lead to serious injury, death, or machine/property damage.

Mill Test Run

1. Clear all setup tools away from machine.
2. Set spindle speed to low range (refer to **Setting Spindle Speed Range** on **Page 36**).
3. Move downfeed selector to manual (forward) position so spindle does not automatically downfeed during this test (refer to **Spindle Downfeed** on **Page 38**).
4. Rotate master power switch to OFF position, move power feed ON/OFF switch to OFF position, rotate coolant pump ON/OFF switch to OFF position, and press EMERGENCY STOP button.
5. Connect machine to power source.
6. Rotate master power switch to ON position. POWER indicator light on control panel will illuminate.
7. Twist EMERGENCY STOP button clockwise until it springs out (see **Figure 27**). This resets switch so machine can start.

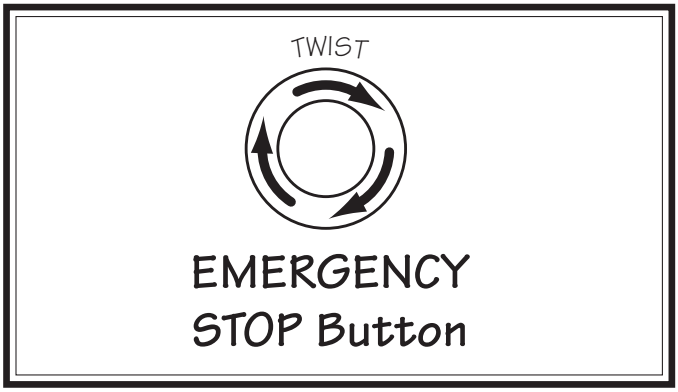


Figure 27. Resetting EMERGENCY STOP button.

8. Press FWD button (see **Figure 28**) to begin spindle rotation. Verify motor starts up and runs smoothly without any unusual problems or noises.

Figure 28. Control panel.

9. Verify direction of spindle rotation.

— If spindle rotates *clockwise*, as viewed from top of headstock, proceed to **Step 13**.

— If spindle rotates *counterclockwise*, as viewed from top of headstock, phase polarity of incoming power is reversed. Proceed to **Step 10**.

10. DISCONNECT MACHINE FROM POWER!

11. Open electrical cabinet door, swap wires at L1 and L3 terminals, as shown in **Figure 29**, then close and lock electrical cabinet door, and connect machine to power.

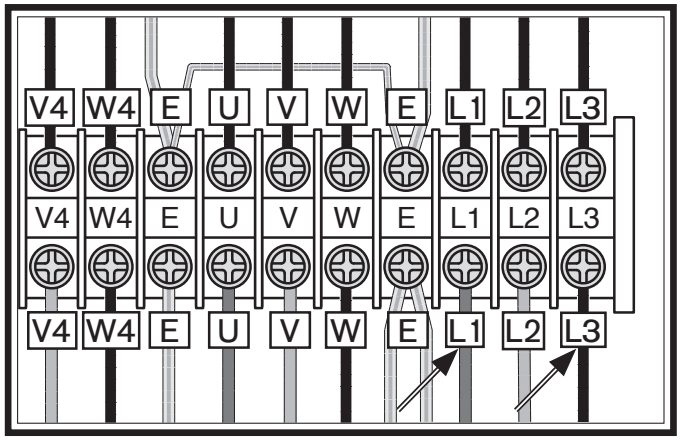


Figure 29. Location of L1 and L3 terminals.

12. Repeat **Steps 8–9**.

13. Press STOP button (see **Figure 28**) and wait for spindle to come to a complete stop.

14. Press REV button (see **Figure 28**) to begin spindle rotation. Verify motor starts up and runs smoothly without any unusual problems or noises.

15. Press EMERGENCY STOP button to stop spindle rotation.

16. WITHOUT resetting EMERGENCY STOP button, try to start machine by pressing FWD/REV buttons. Machine should not start.

— If machine *does not* start, safety feature of EMERGENCY STOP button is working correctly.

— If machine *does* start, immediately turn it ***OFF*** and disconnect power. Safety feature of EMERGENCY STOP button is NOT working correctly and must be replaced before further using machine. Contact Technical Support.

17. Reset EMERGENCY STOP button.

18. Open electrical cabinet door until safety switch (see **Figure 30**) in upper right-hand corner is fully extended.

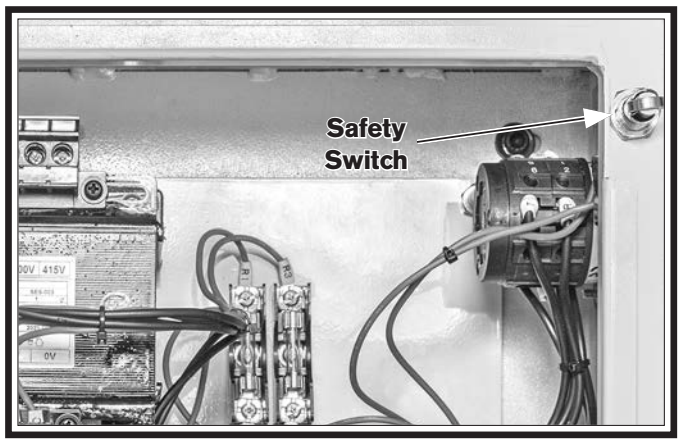


Figure 30. Electrical cabinet safety switch.

19. WITHOUT closing electrical cabinet door, try to start machine by pressing FWD/REV buttons. Machine should not start.

— If machine *does not* start, safety feature of electrical cabinet safety switch is working correctly.

— If machine *does* start, immediately turn it ***OFF*** and disconnect power. Safety feature of electrical cabinet safety switch is NOT working correctly and must be replaced before further using machine. Contact Technical Support.

20. Close and lock electrical cabinet door.

NOTICE

Operating the coolant pump on this mill without the correct amount of coolant in the reservoir could damage it and void the warranty. ALWAYS make sure there is the correct amount of coolant in the reservoir before using the pump.

21. Check coolant level in reservoir, and add coolant if necessary (refer to **Checking/ Adding Coolant** on **Page 55**).

22. Move coolant pump switch to ON position, open nozzle valve, verify coolant flows from nozzle, then move coolant pump switch to OFF position.

Power Feed Test Run

The mill comes with a power feed unit for X-axis table travel. Proper operation of the limit switch attached to the front middle of the table is critical for the safe use of this power feed unit. If the power feed does not operate as expected during the following steps, disconnect it from power and review **Troubleshooting** on **Page 62**.

To test run power feed:

1. Make sure all tools, cables, and other items are well clear of table movement as you follow these steps.

2. Refer to **Table Movement**, beginning on **Page 31**, to understand how power feed, table locks, and limit switch function.

3. Loosen X-axis table locks on front of table.

4. Make sure directional lever is in neutral (middle) position, turn speed dial completely counterclockwise, then plug power feed into a 110V outlet.

Note: *There are two 110V outlets on back of electrical cabinet that can be used for power feed or other 110V accessories.*

5. Move ON/OFF switch up to turn power feed ***ON***.

6. Move directional lever left, slowly turn speed dial clockwise to increase speed, then confirm table is moving left.

7. Watch for table limit stop to press against limit switch plunger and stop table movement.

— If power feed stops, then power feed limit switch is working correctly. Proceed to **Step 8**.

— If power feed *does not* stop, then power feed limit switch is not working correctly. Immediately turn machine ***OFF*** and disconnect power. Contact Tech Support before continuing with Test Run.

8. Move directional lever through neutral (middle) position and all the way right. Table should begin moving right.

9. Confirm table stops moving when limit stop presses against limit switch plunger.

— If power feed stops, then power feed limit switch is working correctly. Proceed to **Step 10**.

— If power feed *does not* stop, then power feed limit switch is not working correctly. Immediately turn machine ***OFF*** and disconnect power. Contact Tech Support before continuing with Test Run.

10. Move directional lever to neutral (middle) position, turn speed dial completely counterclockwise, and move ON/OFF switch down to turn power feed ***OFF***.

Congratulations! The **Test Run** is complete. Continue to the next page to perform the **Spindle Break-In** and **Adjustments & Inspections** procedures.

Spindle Break-In

The spindle break-in procedure distributes lubrication throughout the bearings to reduce the risk of early bearing failure if there are any "dry" spots or areas where lubrication has settled in the bearings. You **must** complete this procedure **before** placing operational loads on the spindle for the first time when the machine is new or if it has been sitting idle for longer than 6 months.

Always start the spindle break-in at the lowest speed to minimize wear if there *are* dry spots. Allow the spindle to run long enough to warm up and distribute the bearing grease, then incrementally increase spindle speeds and repeat this process at each speed until reaching the maximum spindle speed. Following the break-in procedure in this progressive manner helps minimize any potential wear that could occur before lubrication is fully distributed.

NOTICE

DO NOT perform this procedure independently of Test Run section. Mill could be seriously damaged if controls are set differently than instructed in that section.

To perform spindle break-in procedure:

1. Successfully perform all steps in **Test Run** section beginning on **Page 26**.

2. Set spindle speed to low range (refer to **Setting Spindle Speed Range** on **Page 36**).

Note: *When operating in low range, spindle will rotate in **reverse** when FWD button is pressed; likewise, spindle will rotate in **forward** when REV button is pressed.*

3. Run spindle in forward rotation at 60 RPM for 5 minutes, turn spindle ***OFF***, allow it to come to a complete stop, then repeat in reverse rotation.

4. Repeat **Step 3** for following speeds, progressing from lower to higher RPMs:

— 250, 400 RPM

5. Set spindle speed to high range, and repeat **Step 3** for following speeds, progressing from lower to higher RPMs:

— 500, 2500, 4000 RPM

Note: *Make sure to turn spindle **OFF** and allow it to come to a complete stop before changing directions or changing speeds.*

Congratulations, the **Spindle Break-In** is now complete!

Inspections & Adjustments

The following list of adjustments were performed at the factory before the machine was shipped:

Be aware that machine components can shift during the shipping process. Pay careful attention to these adjustments during operation of the machine. If you find that the adjustments are not set according to the procedures in this manual or your personal preferences, re-adjust them.

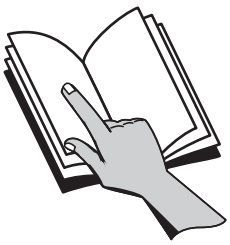
NOTICE

Since the head has been moved around for shipping purposes, you will need to tram it so that the spindle is perpendicular to the table. Refer to the Tramming Spindle section on Page 57 for detailed instructions.

Operation Overview

The purpose of this overview is to provide the novice machine operator with a basic understanding of how the machine is used during operation, so they can more easily understand the controls discussed later in this manual.

Note: *Due to the generic nature of this overview, it is not intended to be an instructional guide for performing actual machine operations. To learn more about specific operations and machining techniques, seek training from people experienced with this type of machine, and do additional research outside of this manual by reading "how-to" books, trade magazines, or websites.*



⚠WARNING

To reduce the risk of serious injury when using this machine, read and understand this entire manual before beginning any operations.

⚠WARNING

To reduce risk of eye injury from flying chips, always wear approved safety glasses and a face shield when operating this machine.

NOTICE

If you are not experienced with this type of machine, WE STRONGLY RECOMMEND that you seek additional training outside of this manual. Read books/magazines or get formal training before beginning any projects. Regardless of the content in this section, South Bend Tools will not be held liable for accidents caused by lack of training.

To complete a typical operation, the operator does the following:

1. Examines workpiece to make sure it is suitable for operation.
2. Firmly clamps workpiece to table or a mill vise securely mounted to table.
3. Installs correct cutting tool for operation.
4. Uses downfeed and table controls to correctly position cutting tool and workpiece for operation. If power feed will be used during operation, operator confirms speed and length of table movement required.
5. Configures machine for correct spindle speed of operation.
6. Puts on personal protective equipment, and makes sure workpiece and table are clear of all tools, cords, and other items.
7. Turns machine ***ON***, then starts spindle rotation and performs operation.
8. Turns machine ***OFF***.

Table Movement

The mill table moves in three directions, as illustrated in **Figure 31**:

- X-axis (longitudinal)
- Y-axis (cross)
- Z-axis (vertical)

These movements are controlled by the table ball handles and the knee crank. Additionally, the table can be moved along the X-axis with the power feed.

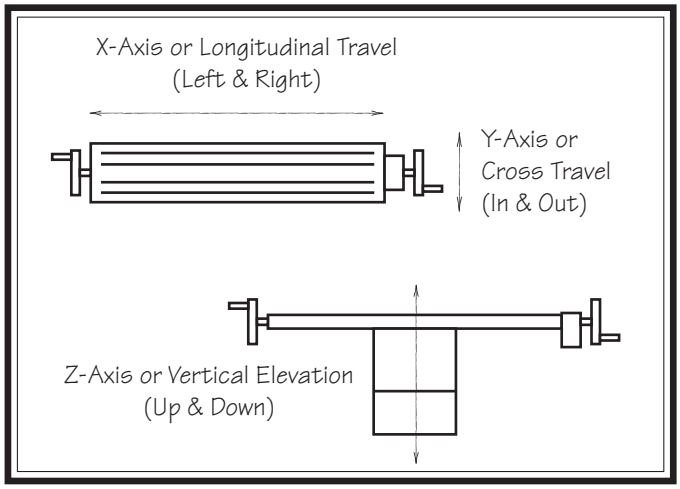


Figure 31. The directions of table movement.

Table Locks

Refer to **Figure 32** for the locations of the locks used to secure the table in place.

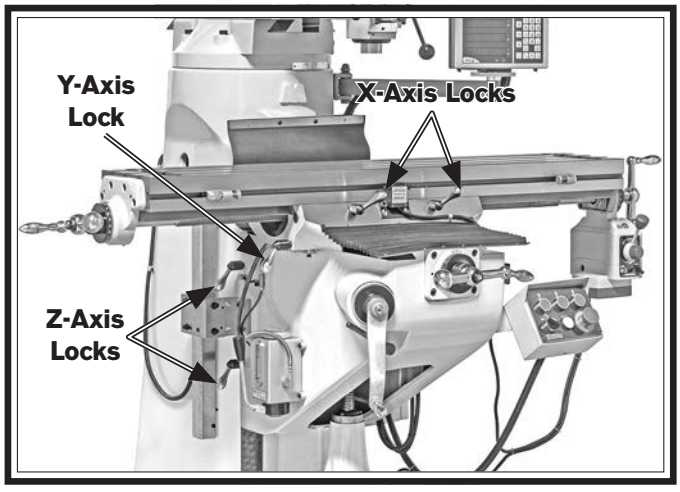


Figure 32. Locations of table locks.

Graduated Index Rings

The table ball handles and knee crank have graduated index rings (see **Figure 33**) that are used to accurately determine table movement in the increments listed in the table below:

Axis	Individual Increment	One Full Revolution
X	0.001"	0.200"
Y	0.001"	0.200"
Z	0.001"	0.100"

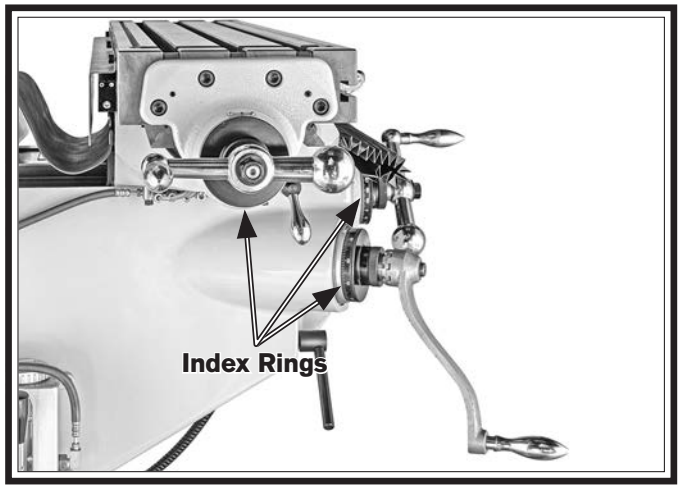


Figure 33. Location of table index rings.

NOTICE

Always keep the table locked in place unless table movement is required for your operation. Unexpected movement of the table during operations could cause damage to the cutter or workpiece.

X-Axis Power Feed

The mill is equipped with a power feed unit for X-axis table movement. Refer to the illustration in **Figure 34** and the descriptions below to understand the functions of the various components of the power feed system.

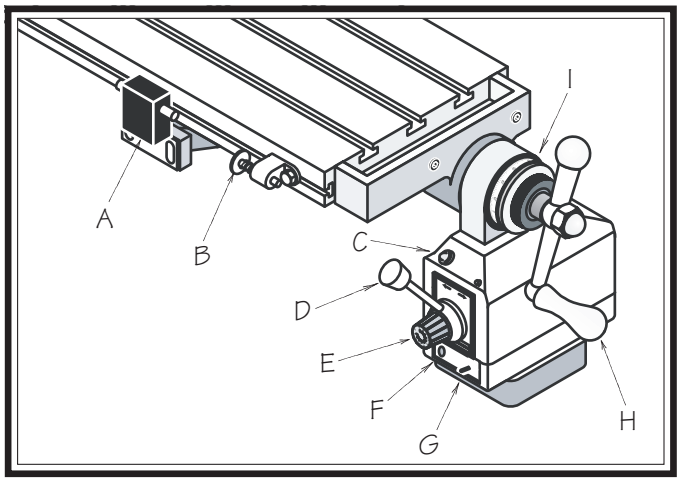


Figure 34. Power feed system components.

A. Limit Switch: Stops table movement when either of switch's side plungers are pressed by limit stops.

B. Limit Stop (1 of 2): Restricts table movement when positioned along front of table.

C. Rapid Traverse Button: Moves table at full speed when it is already in motion.

D. Directional Lever: Selects direction of table movement. Middle position is neutral.

E. Speed Dial: Controls speed of power feed. Turn dial clockwise to increase speed of table movement; turn counterclockwise to decrease speed.

F. Reset Button: Resets internal circuit breaker if unit is overloaded and shuts down.

G. Power Feed ON/OFF Switch: Turns power feed ***ON*** and ***OFF***.

H. X-Axis Ball Handle (1 of 2): Manually moves table.

I. Graduated Index Ring: Displays distance of table travel in 0.001" increments, with one full revolution equal to 0.200" of table travel.

To confirm the power feed settings that you will be using during operation, we recommend that you use the power feed to move the table through the intended cutting path before starting the spindle rotation and taking the cut.

Tool Needed	Qty
Hex Wrench 12mm	1

To operate X-axis power feed:

1. Loosen X-axis table locks (refer to **Figure 32** on **Page 31**).

2. Position limit stops along front table slot to limit distance of table travel that is correct for your operation.

   Note: *Make sure cap screws firmly lock limit stops in place once positioned.*

3. Turn speed dial all the way counterclockwise to slowest setting, move directional lever to neutral (middle) position, then move power feed ON/OFF switch up to turn power feed ***ON***.

4. With your hand poised over power switch in case you need to suddenly turn unit ***OFF***, move directional lever in desired direction of table travel.

5. Use speed dial to slowly bring speed of movement up to desired rate.

6. When you are finished using power feed, turn unit ***OFF***, then rotate speed dial all the way clockwise, and move directional lever to neutral (middle) position to avoid unexpected table movement when you next turn power feed ***ON***.

Head Movement

The mill head tilts 45° back and forth, and rotates 90° left and right, as shown in **Figures 35–36**.

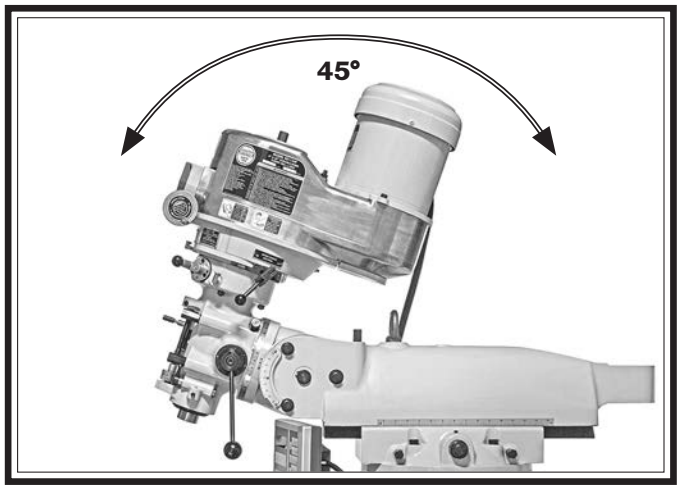


Figure 35. Head tilts 45° back and forth.

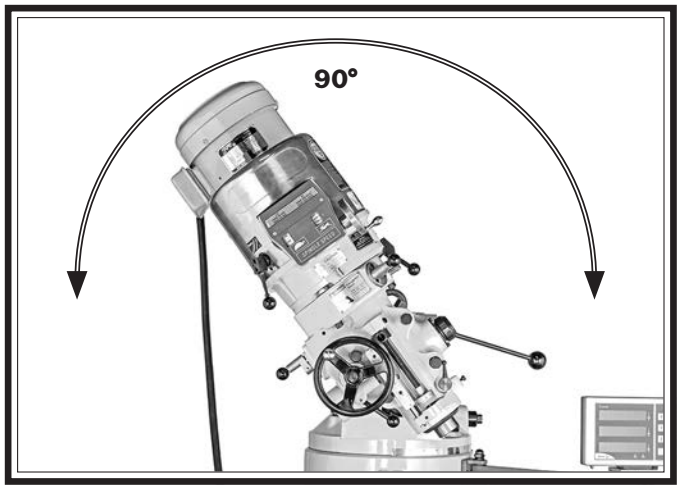


Figure 36. Head tilts 90° left and right.

NOTICE

When returning head to 0° after tilting it, you will need to tram it to make sure spindle is precisely perpendicular to table to ensure proper milling accuracy. Refer to Tramming Spindle on Page 57.

NOTICE

Always lock head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause damage to cutter or workpiece.

Tool Needed	Qty
Wrench 19mm	1

Tilting Head

1. DISCONNECT MACHINE FROM POWER!

2. Loosen (3) tilt lock bolts on right side of ram adapter shown in **Figure 37**.

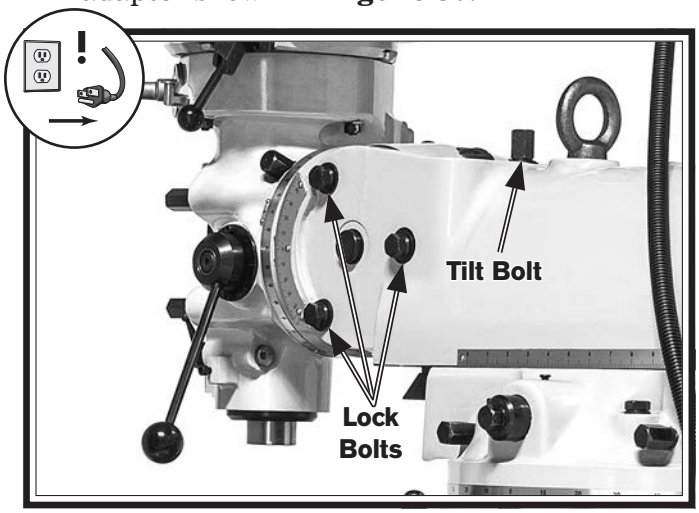


Figure 37. Head tilting controls.

3. Use one hand to apply pressure to head in direction of tilt, then slowly rotate tilt bolt. Rotating this bolt clockwise will tilt head back.

4. When head is in correct position for operation, tighten all (3) lock bolts.

Rotating Head

1. DISCONNECT MACHINE FROM POWER!

2. Loosen (4) rotation lock bolts on face of head shown in **Figure 38**.

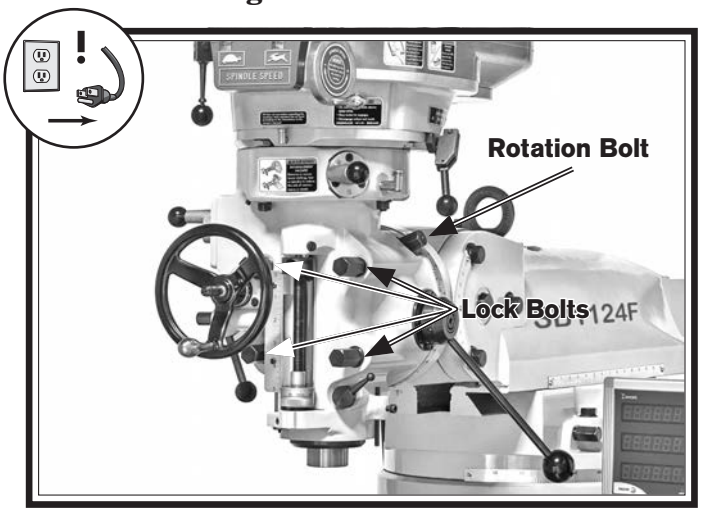


Figure 38. Head rotating controls.

3. Use one hand to apply pressure to head in direction of rotation, then slowly turn rotation bolt.

4. Tighten lock bolts when head is in desired position.

Ram Movement

The ram travels back and forth 12" and rotates 360° in either direction around the turret.

Tool Needed	Qty
Open-End Wrench or Socket 19mm	1

Moving Ram Forward/Backward

1. DISCONNECT MACHINE FROM POWER!

2. Loosen (2) lock bolts on right side of ram (see **Figure 39**).

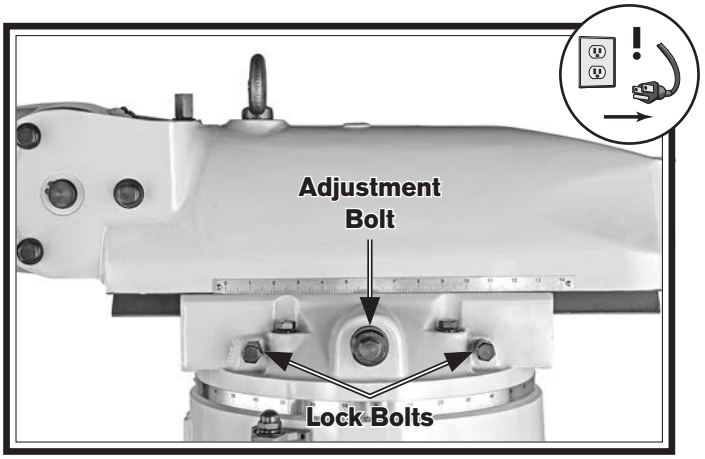


Figure 39. Ram movement controls.

3. Make sure there are no obstructions to ram travel, especially with spindle tool around workpiece, then slowly rotate adjustment bolt to move ram. Rotating bolt clockwise will move ram backward.

4. Tighten lock bolts after positioning ram.

NOTICE

Always lock head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause damage to cutter or workpiece.

Rotating Ram

1. DISCONNECT MACHINE FROM POWER!

2. Loosen (4) lock bolts on top of turret (see **Figure 40**).

   Note: *There are (2) lock bolts on either side of ram.*

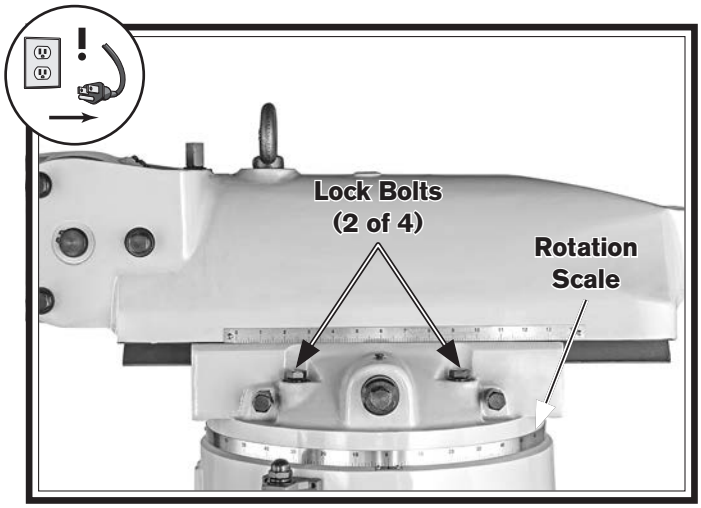


Figure 40. Ram rotating controls.

Note: *In next step, take care not to entangle or stretch electrical cabling as ram moves around turret.*

3. Push on head to manually rotate it. Use rotation scale to determine correct position for operation, then tighten (4) lock bolts to secure ram in place.

Spindle Speed

Using the correct spindle speed is important for safe and satisfactory results, as well as maximizing tool life.

To set the spindle speed for your operation, you will need to: (1) Determine the best spindle speed for the cutting task, and (2) configure the mill controls to produce the required spindle speed.

Determining Spindle Speed

Many variables affect the optimum spindle speed to use for any given operation, but the two most important are the recommended cutting speed for the workpiece material and the diameter of the cutting tool, as noted in **Figure 41**:

$$\frac{{}^{*}\text{Recommended Cutting Speed (FPM)} \times 12}{\text{Tool Dia. (in inches)} \times 3.14} = \text{Spindle Speed (RPM)}$$

*Double if using carbide cutting tool

Figure 41. Spindle speed formula for milling.

Cutting speed, typically defined in feet per minute (FPM), is the speed at which the edge of a tool moves across the material surface.

The "Recommended Cutting Speed" varies depending on the type of workpiece material. It is the ideal speed for cutting that material in order to optimize tool life and produce a desirable finish.

The books **Machinery's Handbook** or **Machine Shop Practice**, and some internet sites, provide excellent recommendations for which cutting speeds to use when calculating the spindle speed. These sources also provide a wealth of additional information about the variables that affect cutting speed, and they are a good educational resource.

Also, there are a large number of easy-to-use spindle speed calculators that can be found on the internet. These sources will help you take into account all applicable variables to determine the best spindle speed for the operation.

Setting Spindle Speed Range

Setting the spindle speed range involves using a lever to engage/disengage the spindle spline with the bull gear.

NOTICE

To avoid damage to spindle, gears, or cutting tools:

- **Spindle rotation must be turned OFF and spindle must be at a complete stop BEFORE you change spindle speed range.**
- **Mill is designed to operate ONLY with spindle speed range selector in either high or low position. To avoid damaging moving parts inside headstock, never start spindle rotation without range selector detent pin firmly seated in either high or low position.**
- **When changing spindle speed range, direction of spindle rotation will reverse due to change in gear configuration. You will need to use opposite spindle direction buttons when choosing spindle rotation direction.**

Note: *You MUST properly perform* ***Meshing Spindle & Spindle Clutch*** *procedure as instructed on* ***Page 37*** *when using high spindle speed range.*

⚠CAUTION

When spindle speed range is changed, direction of spindle rotation will reverse. ALWAYS know which way spindle is rotating before beginning cutting operation.

To set spindle speed range:

1. Make sure spindle rotation is turned ***OFF*** and spindle is at a complete stop.

2. Use chart below to find spindle speed range that includes required spindle speed for your operation.

Spindle Speed Ranges	
Low Range	**60–575 RPM**
High Range	**575–4200 RPM**

3. Press spindle speed range lever shown in **Figure 42** toward head to release detent pin from detent plate, move selector pin over opposite detent, then release selector.

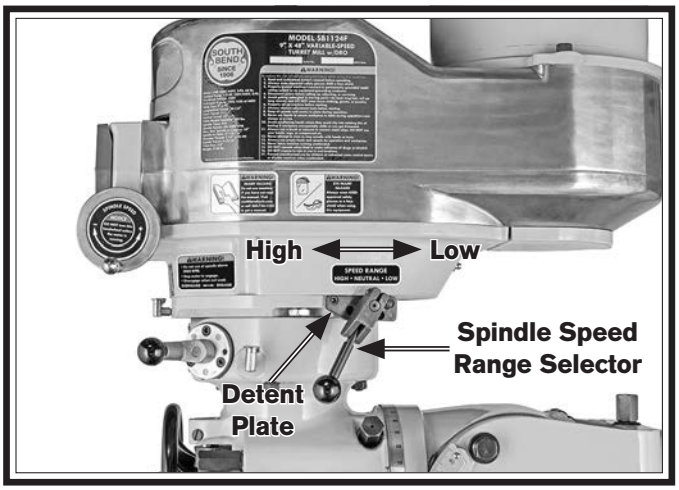


Figure 42. Spindle speed range selector.

— When selector is pointing to rear, and front detent is engaged, low speed range is selected. Conversely, when lever is pointing toward front, and rear detent is engaged, high speed range is selected.

Note: *If range selector is difficult to move, rotate spindle by hand to help mesh gears until selector moves freely.*

4. Make sure selector detent pin is well seated by attempting to move selector without pressing it toward head.

   — If selector *does not* move, then detent pin is well seated. Proceed to **Step 5**.

   — If selector *does* move, then detent pin is not well seated. Reposition selector so pin is firmly seated in detent plate.

5. Perform **Meshing Spindle & Spindle Clutch** procedure as instructed below to make sure front spindle pulley and pinion are properly seated in bull gear.

Meshing Spindle & Spindle Clutch

1. DISCONNECT MACHINE FROM POWER!

2. Set spindle speed range.

   — If you hear/feel front pulley drop into spindle clutch when you set spindle speed range, this procedure is complete, and you may continue with spindle speed setup.

   — If you *do not* hear/feel front pulley drop into spindle clutch when you set spindle speed range, proceed to **Step 3**.

Note: *The following step takes experience and patience to complete properly.*

3. Firmly grasp spindle, then rotate it in a back-and-forth motion until you hear/feel front pulley drop into spindle clutch.

   — If you do not hear/feel front pulley drop into spindle clutch, re-set spindle speed range selector to low range, then repeat **Step 3** until you are certain front pulley is seated in spindle clutch.

Setting Spindle Speed

The Model SB1124F uses a variable pulley system to set infinite speeds within the speed range selected.

NOTICE

Always make sure spindle rotation has started and is at a constant speed before using variable-speed handwheel to adjust spindle speed. Otherwise, moving parts inside belt housing could be damaged and void warranty.

To set spindle speed:

1. Select spindle speed range for your operation (refer to **Setting Spindle Speed Range** on **Page 36**).

2. Start spindle rotation.

3. Slowly rotate variable-speed handwheel (see **Figure 43**) until desired speed is displayed in speed indicator window for speed range selected.

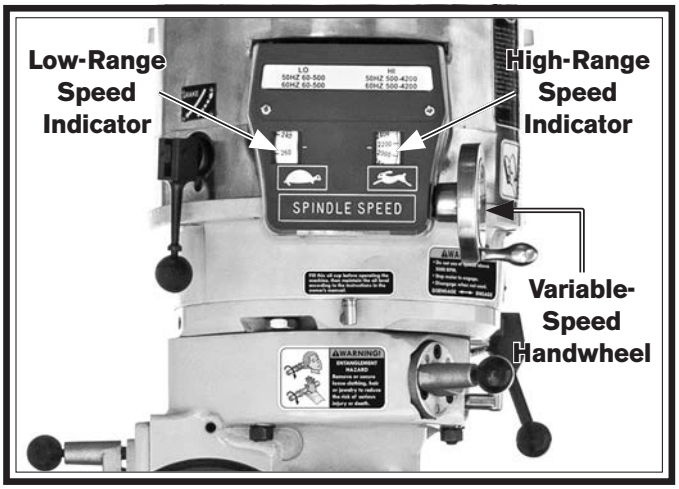


Figure 43. Variable-speed handwheel and speed indicator windows.

Spindle Downfeed

Spindle downfeed movement on the mill is controlled by three mechanisms: 1) The coarse downfeed lever, 2) the fine downfeed handwheel, and 3) the auto-downfeed system.

Downfeed Controls

Refer to **Figure 44** and the descriptions below to become familiar with the downfeed components that control spindle downfeed travel.

NOTICE

When spindle rotation is reversed, either by changing spindle speed range or by using spindle direction buttons, direction of spindle auto-downfeed will reverse.

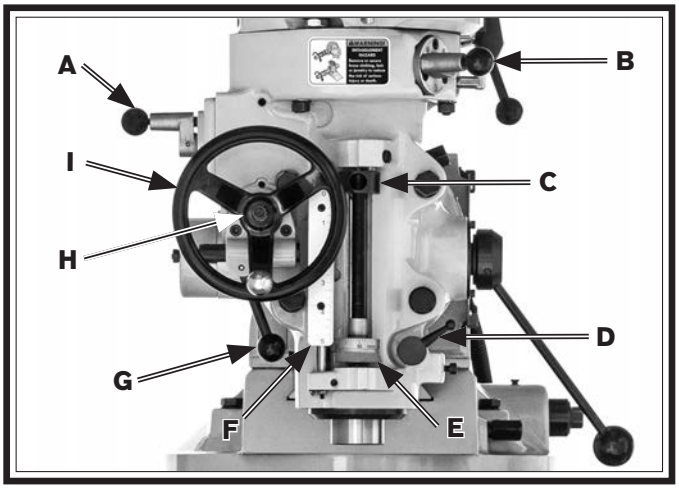


Figure 44. Fine downfeed controls.

A. Auto-Downfeed Rate Selector: Selects one of three auto-downfeed rates.

- 0.0015 in/rev
- 0.003 in/rev
- 0.006 in/rev

B. Downfeed Selector: Sets mill for manual downfeed or auto-downfeed control.

C. Quill Dog: Moves with quill and spindle, and disengages downfeed clutch lever when it meets either top or downfeed stop.

D. Quill Lock Lever: Locks quill in vertical position.

E. Downfeed Stop & Locking Wheel: Sets depth of spindle downfeed. The stop is threaded into position, and locking wheel is used to secure it in place.

F. Downfeed Scale: Used with downfeed stop and quill dog, shows depth of spindle downfeed in inches.

G. Fine/Auto Downfeed Clutch Lever: Engages fine/auto-downfeed gears.

H. Auto-Downfeed Direction Pin: Starts, stops, and reverses auto-downfeed direction.

I. Fine Downfeed Handwheel: Manually controls fine spindle downfeed.

Setting Downfeed Stop

The downfeed stop (see **Figure 44**) sets the depth of spindle travel for repeat operations. The upper edge of the downfeed stop aligns with marks on the downfeed scale to help you set the approximate depth. However, the downfeed scale functions as a general guide only, and is not intended for low-tolerance, precision results.

To set the downfeed stop, rotate the stop until the upper edge aligns with the desired depth indicated on the scale, then tighten the locking wheel against the stop to secure it.

Using Coarse Downfeed

Coarse downfeed is typically used for drilling because it allows you to quickly lower the spindle with varying speed and pressure, and it automatically retracts the spindle to the top position when released.

To maintain control of upward spindle travel and the rotating bit in the workpiece, always continue holding the handle until the spindle returns to the top position. Letting go of the handle too soon will cause the spindle to retract too quickly and slam up into the headstock.

To use coarse downfeed:

1. DISCONNECT MACHINE FROM POWER!

2. Pull downfeed selector knob out, and rotate it clockwise until selector pin under knob seats in forward manual (disengaged) position, as shown in **Figure 45**.

   Note: *It may be necessary to turn spindle by hand while moving selector to enable gears to mesh.*

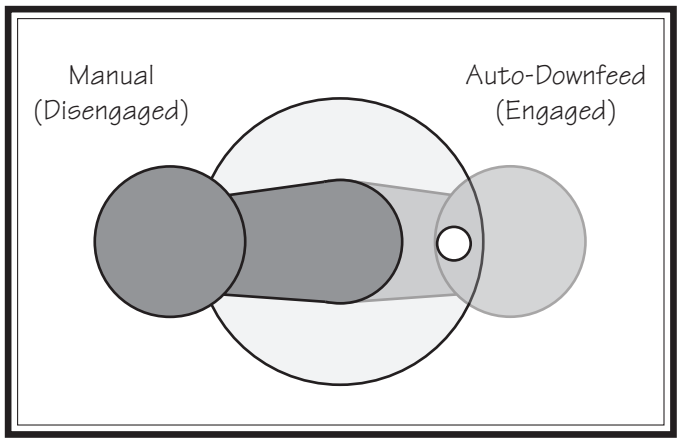


Figure 45. Downfeed selector in manual (disengaged) position.

3. Make sure selector pin is firmly seated in detent by attempting to move selector without pulling knob out.

4. Make sure pin in coarse downfeed handle hub is engaged with one of the detents on downfeed sleeve (see **Figure 46**).

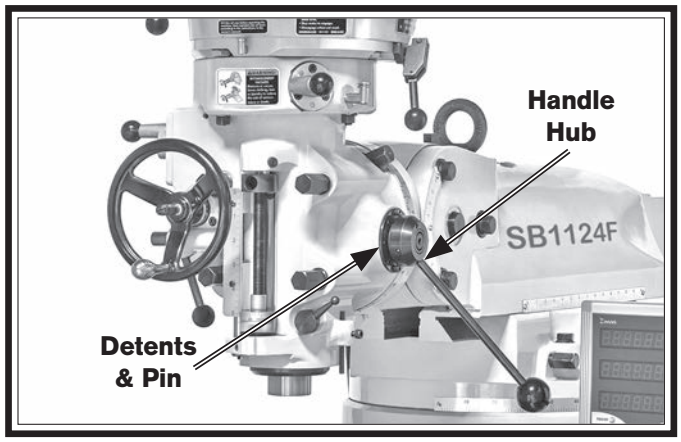


Figure 46. Coarse downfeed handle hub, detents, and pin.

5. Loosen quill lock lever so quill can move easily.

6. Rotate coarse downfeed handle around hub to control depth of spindle.

Using Fine Downfeed

Fine downfeed is used for precise Z-axis positioning of a cutter or end-mill when milling a flat surface across the face of a workpiece. In order to ensure the milled surface remains flat, the quill lock lever should be locked after each adjustment to ensure the spindle height cannot move until the entire milling operation is complete.

To use fine downfeed:

1. DISCONNECT MACHINE FROM POWER!

2. Pull downfeed selector knob out, then rotate selector clockwise until selector pin seats in forward manual (disengaged) position (see **Figure 45**).

   Note: *It may be necessary to turn spindle by hand while moving selector to enable gears to mesh.*

3. Set auto-downfeed direction pin (see **Figure 44** on **Page 38**) in neutral (middle) position to disengage fine downfeed handwheel from auto-downfeed gears.

4. Position downfeed stop for spindle depth that is correct for your operation, then secure it in place with locking wheel.

5. Use coarse downfeed lever to slightly lower spindle until you can pull clutch lever out to left and it locks in place. This will engage fine handwheel with quill and spindle.

6. Rotate fine downfeed handwheel to raise or lower spindle. When quill dog meets downfeed stop, clutch lever will disengage and spindle will return to top.

Using Auto-Downfeed System

When using the auto-downfeed system, the spindle will move in the direction you choose with the auto-downfeed direction pin. When the quill dog reaches the top or meets the downfeed stop, the downfeed clutch lever releases. Then, if the spindle was traveling upward, the movement simply stops. If the spindle was traveling downward, then the spindle moves back to the top at a rate controlled by the return spring on the left side of the head.

To use auto-downfeed system:

1. Make sure spindle rotation is turned ***OFF*** and spindle is at a complete stop.

2. Pull downfeed selector knob out, rotate selector clockwise, and seat pin in rear auto-downfeed (engaged) position, as shown in **Figure 47**.

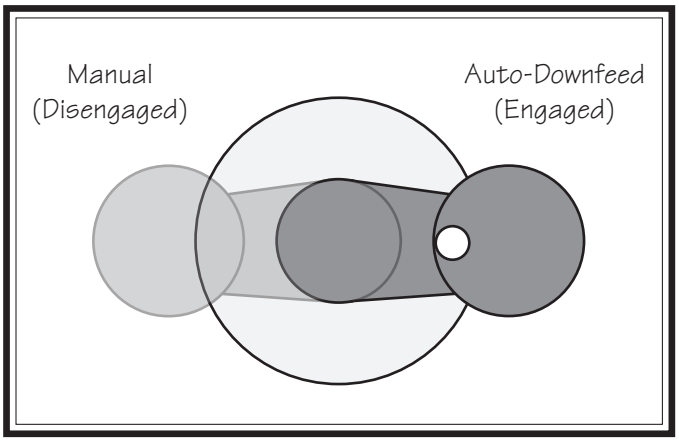


Figure 47. Downfeed selector in auto-downfeed (engaged) position.

3. Position downfeed stop for spindle depth that is correct for your operation, then secure it in place with locking wheel.

4. Position auto-downfeed direction pin for spindle travel that is correct for your operation. It may be necessary to rock fine downfeed handwheel back and forth to move pin all the way in or out.

Note: *Direction pin has three positions: 1)* ***In*** *for one downfeed direction, 2)* ***middle*** *for neutral or no movement, and 3)* ***out*** *for the reverse direction. The direction of spindle travel for in and out positions is relative to direction of spindle rotation. Keep in mind that spindle rotation and downfeed direction will reverse when spindle speed range is changed.*

5. Make sure clutch lever is all the way right in disengaged position so spindle will not travel when rotation is started.

Note: *We recommend that you complete remaining steps without a cutting tool installed or a workpiece in place, and that the table be lower than maximum spindle downfeed travel. This will enable you to test and confirm settings before beginning actual cutting operation.*

NOTICE

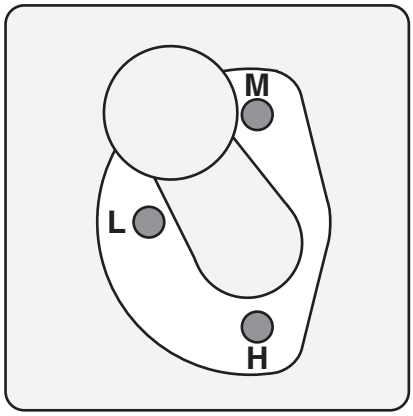
To avoid damage to system gearing, never use auto-downfeed system with spindle speeds over 3000 RPM.

6. Set machine for correct spindle speed, then begin spindle rotation.

NOTICE

To avoid risk of gear damage, always start spindle rotation BEFORE using auto-downfeed rate selector.

7. Select one of three downfeed rates (see **Figure 48**) by pulling auto-downfeed rate selector knob out, positioning selector over appropriate detent, and releasing knob. Make sure pin is firmly seated by attempting to move selector *without* pulling knob out.



H = 0.006 in./rev.
L = 0.0015 in./rev.
M = 0.003 in./rev.

(Rates given in inches of travel per revolution of the spindle)

Figure 48. Positions of auto-downfeed rate selector.

8. Use coarse downfeed lever to lower spindle slightly until you can pull clutch lever out to left, and it locks in place, which will start auto-downfeed spindle travel.

Using Spindle Brake

NOTICE

To avoid premature wear of brake system, use spindle brake ONLY after power to spindle has been turned OFF.

After turning spindle rotation ***OFF***, move the brake lever (see **Figure 49**) back or forth to bring the spindle to a full stop.

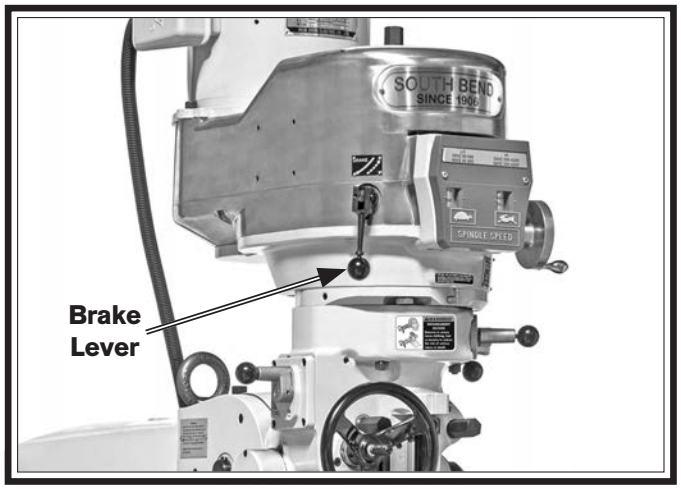


Figure 49. Brake lever location.

To evenly wear the brake shoes, alternate the direction you move the lever when braking.

Loading/Unloading Tooling

The SB1124F is equipped with an R8 spindle taper and a 7/16"-20 x 18½" spindle drawbar, as shown in **Figure 50**.

Figure 50. Spindle drawbar.

Tool Needed	Qty
Wrench 19mm	1

Loading Tooling

1. DISCONNECT MACHINE FROM POWER!

2. Clean any debris or surface substances from inside spindle taper and mating surface of tooling.

   Note: *Debris or oil substances can prevent tooling and spindle from properly mating. This condition can cause excessive vibration, poor cutting results, or tool/workpiece damage.*

3. Place machine in low spindle speed range to keep spindle from turning in following steps.

4. Align keyway of tool with protruding pin inside spindle taper, then firmly push tool into spindle to seat it.

5. With one hand holding tool in place, insert drawbar into spindle from top of head, then thread it into tool (see **Figure 51**).

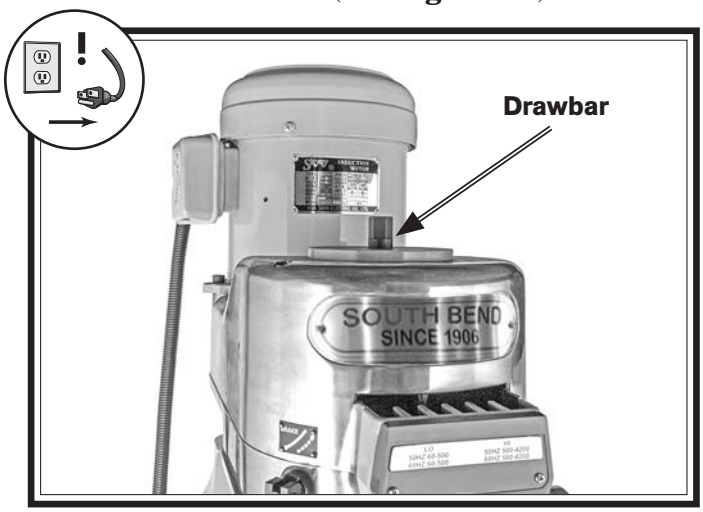


Figure 51. Drawbar loaded into spindle.

6. Tighten drawbar until it is snug. Avoid overtightening, as it could make removing tool difficult.

Unloading Tooling

Tools Needed	Qty
Wrench 19mm	1
Brass Hammer	1

1. DISCONNECT MACHINE FROM POWER!

2. Place mill in low spindle speed range to keep spindle from turning in next step.

Note: *Make sure drawbar has at least three threads engaged with tooling in next step to avoid damaging threads of drawbar or tool.*

3. Loosen drawbar a couple of turns, then tap top of it with brass hammer to knock tool loose at bottom of spindle.

4. Support tool with one hand, then completely unthread drawbar.

Accessories

This section includes the most common accessories available for your machine, which are available through our exclusive dealer, **Grizzly Industrial, Inc.**, at **grizzly.com**.

⚠WARNING

Installing unapproved accessories may cause machine to malfunction, resulting in serious personal injury or machine damage. To reduce this risk, only install accessories recommended by South Bend or Grizzly.

NOTICE

Refer to Grizzly's website or latest catalog for additional recommended accessories.

SB1365–South Bend Way Oil ISO-68
T26419–NLGI#2 Syn-O-Gen Synthetic Grease

Figure 52. Recommended products for machine lubrication.

Recommended Metal Protectants

G5562–SLIPIT® 1 Qt. Gel
G5563–SLIPIT® 11 Oz. Spray

Figure 53. Recommended products for protecting unpainted cast iron/steel parts on machinery.

T23962–ISO-68 Moly-D Way Oil, 5 Gal.
T23963–ISO-32 Moly-D Machine Oil, 5 Gal.
T26685–ISO-32 Moly-D Machine Oil, 1 Gal.
Moly-D oils are some of the best we've found for maintaining the critical components of machinery because they tend to resist run-off and maintain their lubricity under a variety of conditions—as well as reduce chatter or slip. Buy in bulk and save with 1- or 5-gallon quantities.

Figure 54. ISO-68 and ISO-32 machine oil.

H7527– 6" Rotary Table w/Div. Plates
Use this 6" rotary table in either the horizontal or vertical position for a variety of milling applications, and with the set of dividing plates and adjustable tailstock, your milling applications are nearly unlimited. With 4-degree table movement per handle rotation and 20 second vernier scale, control is very accurate and precise. Also includes a ⅜" clamping set for the 4-slot table. Everything you need in one great set!

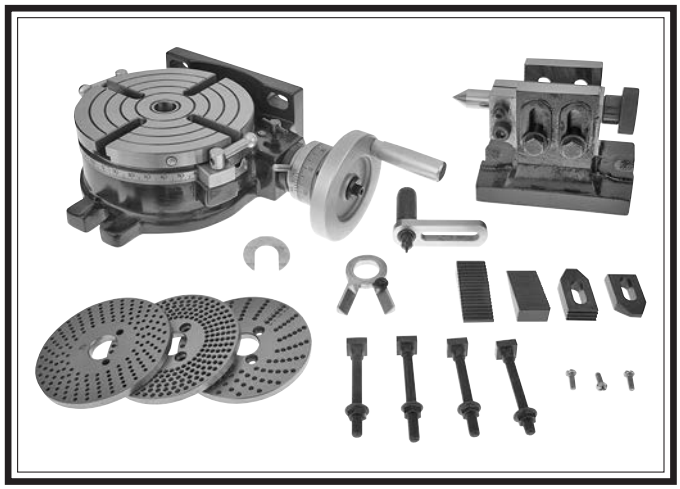


Figure 55. H7527 6" Rotary Table w/Div. Plates.

G1076—58-Pc. Clamping Kit
This clamping kit includes 24 studs, 6 step block pairs, 6 T-nuts, 6 flange nuts, 4 coupling nuts, and 6 end hold-downs. The rack is slotted so it can be mounted close to the machine for easy access. Made for ⅝" T-slots.

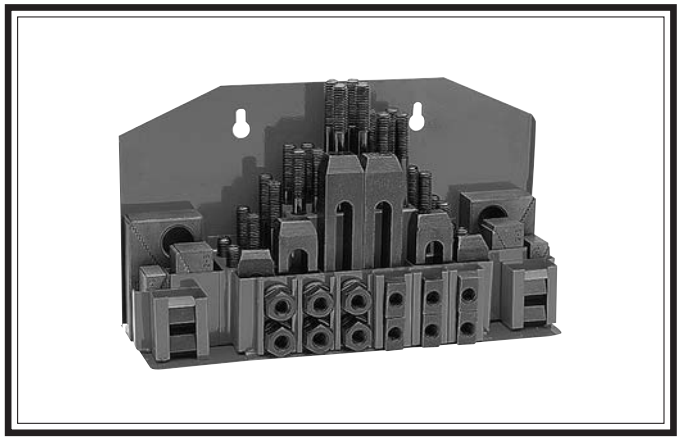


Figure 56. G1076 Clamping Kit.

G7156—4" (3⅝") Precision Milling Vise
G7154—5" (4½") Precision Milling Vise
G7155—6" (5⅝") Precision Milling Vise
Swiveling Milling Vises feature perfectly aligned, precision-ground jaws, large Acme® screws and easy to read 0°–360° scales.

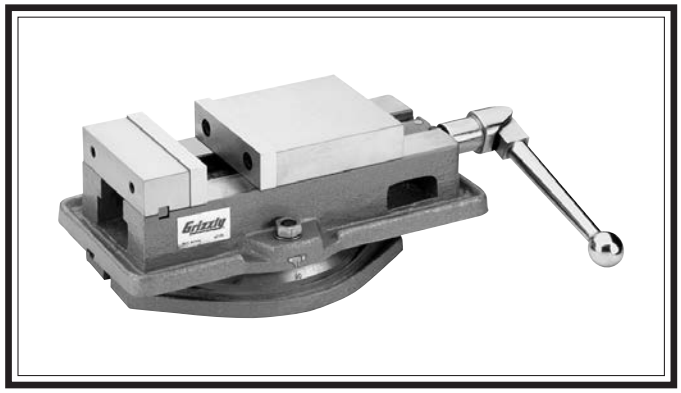


Figure 57. Precision Milling Vise.

G7066—5" Tilting/Swiveling Milling Vise
This vise offers the ultimate in workpiece setup. Precision aligned jaws and easily accessible tilt and swivel clamps secure for positively worry-free operation.

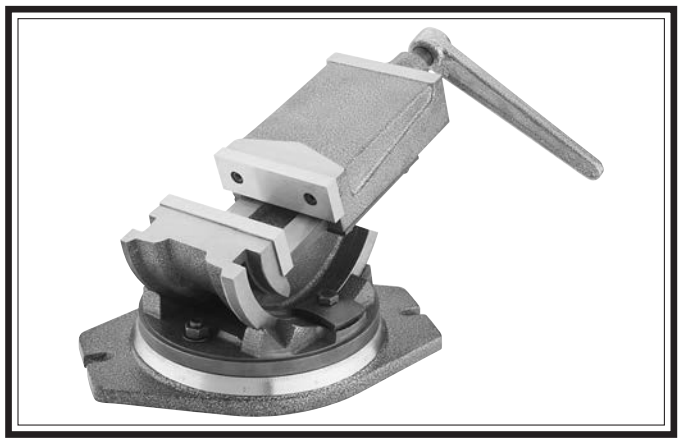


Figure 58. G7066 5" Tilting/Swiveling Milling Vise.

G9760—20-Pc. 2 & 4 Flute TiN End Mill Set
Includes these sizes and styles in two and four flute styles: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 11/16", and 3/4".

Figure 59. G9760 20-Pc. End Mill Set.

T25702—5-Pc. R8 End Mill Holder Set
This set includes holders for 3/16", 3/8", 1/2", 5/8", and 3/4" end mills. Takes a 7/16"-20 drawbar.

Figure 60. T25702 5-Pc. R8 End Mill Holder Set.

G5680—Adjustable Parallel Set
Create any parallel from 3/8" to 2 1/4" with this six-piece adjustable parallel set. Features machined and ground faces and locking set screws. Protected in a vinyl pouch.

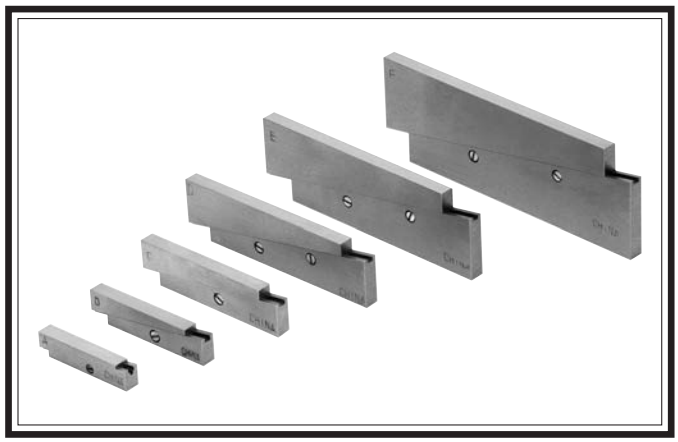


Figure 61. G5680 Adjustable Parallel Set.

G2861—Face Mill
G4051—Replacement Carbide Inserts
This 2 1/2" Face Mill accepts four carbide inserts (included) and comes with an R8 arbor. It takes a 7/16"-20 drawbar.

Figure 62. G2861 Face Mill.

T23889—V-Block Set with Clamp-Double Slot
These clamping V-blocks feature double slots for extra clamping options. Hardened and ground to ensure accuracy and durability. Capacity 1½" diameter and each block measures 2" L x 1 9/16" W x 1 9/16" H.

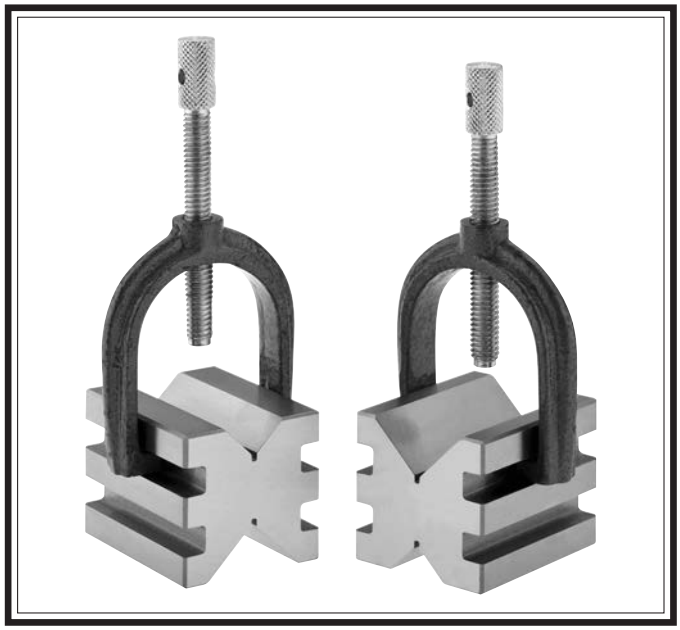


Figure 63. T23889 V-Block Set.

SB1280—Precision R8 Collet Set
This set of 12 precision R8 collets includes sizes from ⅛"-⅞" and will take a 7/16"-20 drawbar. Each collet is hardened to 55-60 Rc, and is precision ground to a total runout of less than 0.00059".

Figure 64. SB1280 Precision Collet Set.

T25615—Milling for Home Machinists
This is a project-based course book that provides a complete introduction to milling and the use of the milling machine. It assumes no prior knowledge and works through the process of using a home shop mill from beginning to end.

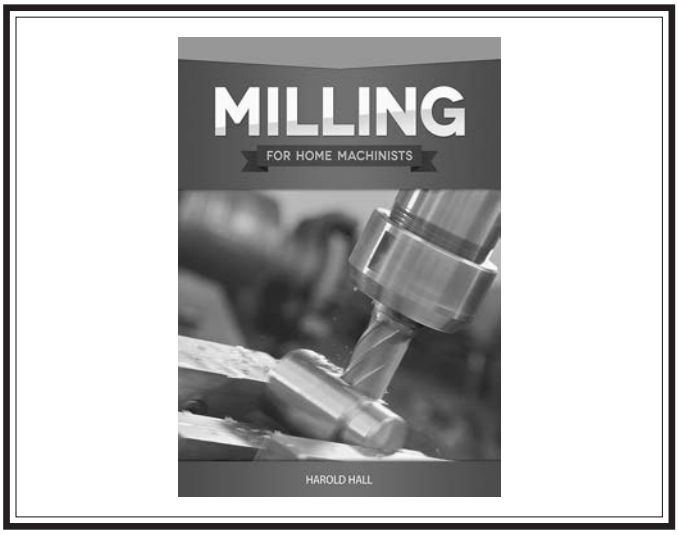


Figure 65. T25615 Milling for Home Machinists.

G5844—Rotary Phase Converter 5 HP
This rotary phase converter allows you to operate 3-phase machinery from a single-phase power source at 100% power and 95% efficiency.

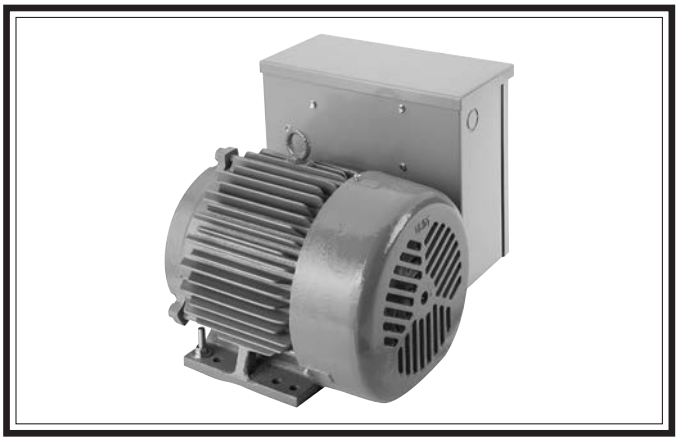
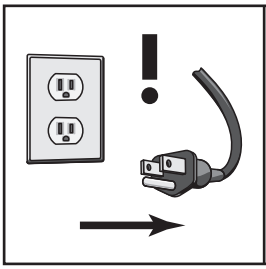


Figure 66. G5844 Rotary Phase Converter 5 HP.

Maintenance Schedule



⚠WARNING

Always disconnect machine from power before performing maintenance or serious personal injury may result.

For optimum performance from your machine, follow this maintenance schedule and refer to any specific instructions given in this section.

Ongoing

To minimize your risk of injury and maintain proper machine operation, shut down the machine immediately if you ever observe any of the items below, and fix the problem before continuing operations:

- Check/correct loose mounting bolts.
- Check/correct damaged or dull tools.
- Check/repair/replace worn or damaged wires.
- Clean/protect unpainted cast-iron surfaces.
- Clean dust or debris around machine.
- Resolve other unsafe conditions.

Daily Before Operations

- Turn master power switch to OFF position, and press EMERGENCY STOP button to prevent spindle startup when connected to power.
- Move fine downfeed clutch lever to right (disengaged) position to prevent spindle from unexpectedly auto-downfeeding when spindle rotation begins.
- Ensure X-axis power feed is turned ***OFF*** to prevent unintentional table movement when connected to power.
- Check table movement in all three axis directions for loose/tight gibs. Adjust gibs as necessary (see **Page 59**).
- Perform lubrication tasks as directed in **Lubrication** (see **Page 50**).
- Check coolant reservoir in base. Fill it or clean it out as instructed in **Coolant Reservoir** (see **Page 55**).

Daily After Operations

- Press EMERGENCY STOP button, turn master power switch to OFF position, and disconnect machine from power.
- Vacuum/clean all chips and swarf from table, slides, and base.
- Wipe down all unpainted or machined surfaces with a high-quality rust preventative.

Cleaning & Protecting

Regular cleaning is one of the most important steps in taking good care of this mill. Each operator is responsible for cleaning the machine immediately after using it or at the end of the day. We recommend that the cleaning routine be planned into the workflow schedule, so that adequate time is set aside to do the job right.

Typically, the easiest way to clean swarf from the ways and table is to use a wet/dry shop vacuum that is dedicated for this purpose only. The small chips leftover after vacuuming can be wiped up with a slightly oiled rag. Avoid using compressed air to blow off chips, as this may drive them deeper into moving surfaces and could cause sharp chips to fly into your face or hands.

Besides the ways and elevation leadscrew, all other unpainted and machined surfaces should be wiped down daily to keep them rust-free and in top condition. This includes any surface that could be vulnerable to rust if left unprotected (this especially includes any parts that may be exposed to water-soluble cutting fluids). Typically with these parts, a thin film of oil is all that is necessary for protection.

Keep tables rust-free with ISO 68 way oil.

South Bend Tools Monthly Maintenance Chart for Model SB1124F Milling Machine

Item \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Inspection																															
Coolant System																															
Gib Adjustment																															
End of Day																															
Disconnected From Power																															
Cleaned & Protected																															
Lubrication																															
Quill																															
Table, Saddle, Knee Ways																															
Speed Range Bearing Sleeve																															
Headstock Gearing																															
Ram Ways																															
Table Elevation Leadscrew																															
Power Feed Gears																															

Use this chart to keep track of the maintenance performed on the mill. Cross out or initial the "Day" box for each item on the list. If the box is blacked out, maintenance is not required for that item on that day.

Make copies of this page to use each month. Keep each chart as a maintenance record for the mill.

Month/Year:

SOUTH BEND® SINCE 1906

(360) 734-1540 • FAX: (360) 676-1075
www.southbendtools.com

Lubrication

The mill has numerous moving metal-to-metal contacts that require regular and proper lubrication to ensure efficient and long-lasting operation, and to protect your investment.

Other than the lubrication points covered in this section, all other bearings are internally lubricated and sealed at the factory. Simply leave them alone unless they need to be replaced.

Before performing any lubrication task, DISCONNECT MACHINE FROM POWER!

IMPORTANT: *Before adding lubricant, clean the debris and grime from the oil cup or grease fitting and the immediate area to prevent contamination of the oil cups, grease fittings, or new lubricant.*

Use the schedule and information in **Figure 67** as a guide for lubrication tasks.

NOTICE

The following recommended lubrication schedule is based on light to medium mill usage. Keeping in mind that lubrication helps to protect the value and operation of the mill, you may need to perform the lubrication tasks more frequently, depending on your usage.

Lubrication Task	Frequency (Hours of Operation)	Page Ref.
Quill	3–4 hrs.	51
Quill Exterior	4–8 hrs.	51
Quill Rack & Pinion	40 hrs.	51
Table Ways (One-Shot Oiler)	4–8 hrs.	51
Speed Range Bearing Sleeve	40 hrs.	52
Headstock Gearing	40 hrs.	52
Ram Ways	40 hrs.	52
Table Leadscrews	40 hrs.	53
Power Feed Gears	160 hrs.	53

Figure 67. Recommended lubrication tasks, schedules, and instruction page references.

Items Needed	Qty
Open-End Wrench 19mm	1
Grease Gun	1
Mineral Spirits	As Needed
Shop Rags	As Needed
Brush	1

Quill

Oil Type .....SB1365 or ISO 68 Equivalent
Oil Amount ..... 4 Drops
Check/Add Frequency .....3–4 hrs. of Operation

Lift the oil cup cap shown in **Figure 68** and apply 4 drops of oil.

Figure 68. Quill oil cup location.

Quill Exterior

Oil Type .....SB1365 or ISO 68 Equivalent
Oil Amount ..... Thin Coat
Check/Add Frequency .....4–8 hrs. of Operation

Fully extend the spindle to expose the quill (see **Figure 69**), then use an oily shop rag to apply a thin coat of lubricant to the smooth surface of the quill.

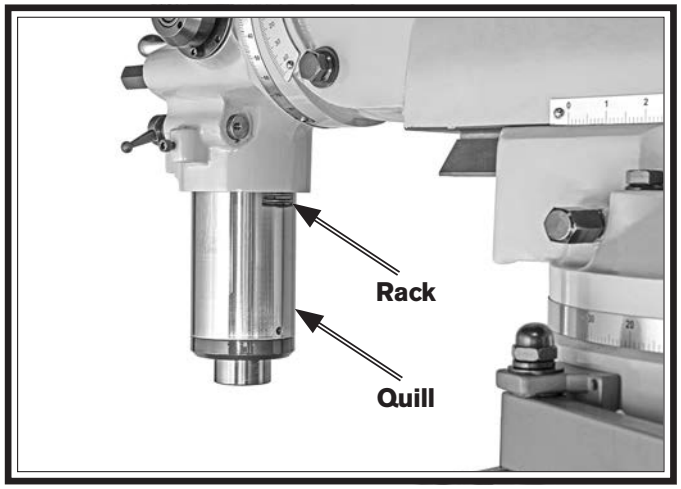


Figure 69. Quill lubrication points.

Table Ways (One-Shot Oiler)

Oil Type .....SB1365 or ISO 68 Equivalent
Oil Amount ..... One Pull of Pump Handle
Check/Add Frequency .....4–8 hrs. of Operation

The one-shot oiler is connected to a series of aluminum tubes that carry the lubricant to wear points along the table horizontal and vertical ways. After using the oiler pump handle shown in **Figure 70**, move the table through all paths of movement to evenly distribute the lubricant. Use the sight glass on the side of the oiler to know when to re-fill the reservoir.

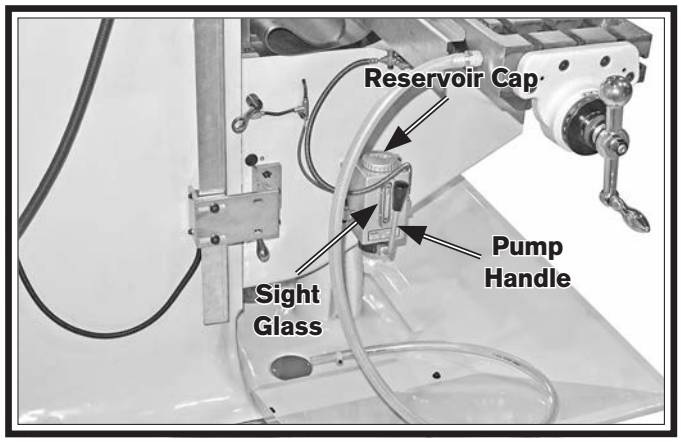


Figure 70. Location of one-shot oiler controls.

Quill Rack & Pinion

Grease Type..... T26419 or NLGI #2 Equivalent
Oil Amount ..... Thin Coat
Check/Add Frequency .....40 hrs. of Operation

Fully extend the spindle to expose the quill rack (see **Figure 69**), then use mineral spirits, shop rags, and a brush to clean the oil grease off the teeth of the rack & pinion. When dry, use a brush to apply a thin coat of grease to the teeth. Then move the quill up and down several times to evenly distribute the grease.

Speed Range Bearing Sleeve

Oil Type .....SB1365 or ISO 68 Equivalent
Oil Amount ..... Fill Oil Cup
Check/Add Frequency .....40 hrs. of Operation

Lift the oil cup cap shown in **Figure 71** to fill the oil cup with lubricant.

Figure 71. Oil cup location for speed range bearing sleeve.

Headstock Gearing

Grease Type..... T26419 or NLGI #2 Equivalent
Grease Amount .....Two Pumps of Grease Gun
Check/Add Frequency .....40 hrs. of Operation

Add two pumps from a grease gun to the grease fitting shown in **Figure 72**.

Figure 72. Headstock gearing grease fitting location.

Ram Ways

Oil Type .....SB1365 or ISO 68 Equivalent
Oil Amount ..... Thin Coat
Check/Add Frequency .....40 hrs. of Operation

Move the ram back and forth as necessary to access the full length of the ways (see **Figure 73**), then use a clean shop rag to apply a thin coat of lubricant.

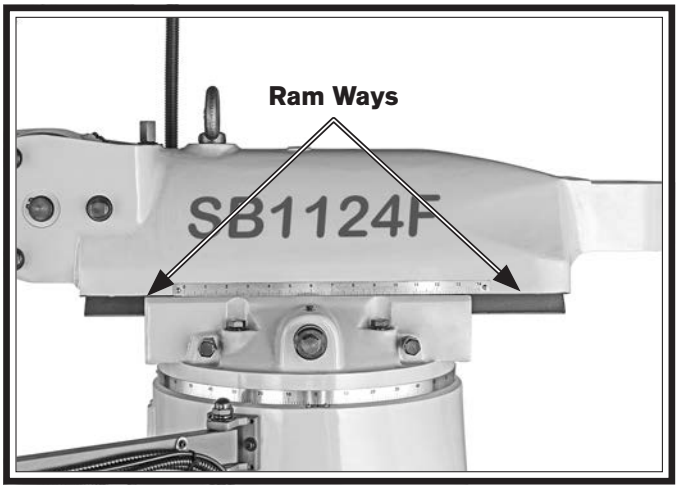


Figure 73. Exposing ram ways for lubrication.

Head Tilt & Ram Pinions

The interaction between the cast iron surfaces of these devices (see **Figure 74**) produces a dry powder that provides an adequate lubrication.

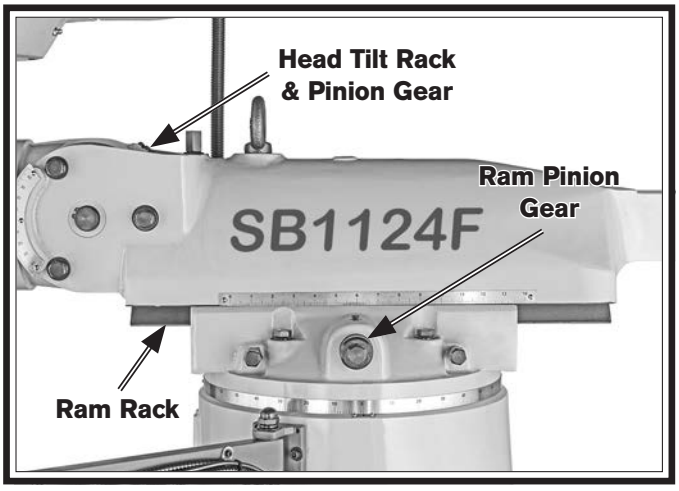


Figure 74. Locations of head tilt and ram pinions.

Do not apply any other lubricant, which could produce a stiff compound that may interfere with smooth movement.

Table Leadscrews

Grease Type..... T26419 or NLGI #2 Equivalent
Grease Amount ..... Thin Coat
Check/Add Frequency .....40 hrs. of Operation

Move the table as necessary to access the entire length of the X-, Y-, and Z-axis leadscrews (see **Figures 75–76**), then use mineral spirits, shop rags, and a brush to clean any debris and built-up grime off the threads.

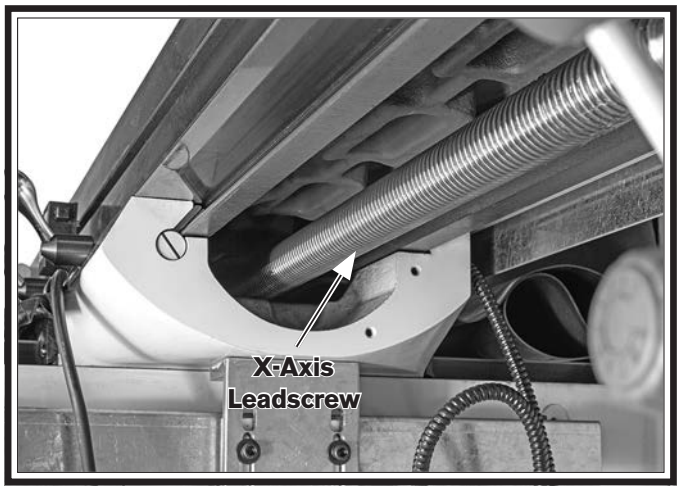


Figure 75. Location of X-axis leadscrew.

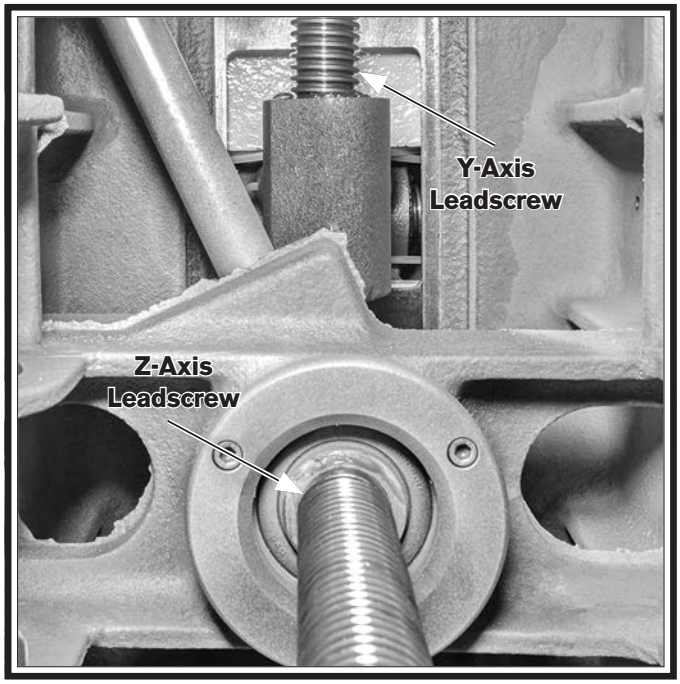


Figure 76. Location of Y- and Z-axis leadscrews.

When dry, use a clean brush to apply a thin coat of grease to the leadscrew threads, then move the table through the X-, Y-, and Z-axis paths to distribute the grease.

Power Feed Gears

Grease Type..... T26419 or NLGI #2 Equivalent
Grease Amount .....Two Pumps of Grease Gun
Check/Add Frequency .....40 hrs. of Operation

Tool Needed	Qty
Open-End Wrench 19mm	1

To lubricate power feed gears:

1. DISCONNECT MACHINE FROM POWER!
2. Remove hex nut and ball handle from power unit end of X-axis leadscrew (see **Figure 77**).
3. Unthread and remove knurled retaining ring and graduated dial ring from end of leadscrew (see **Figure 77**).

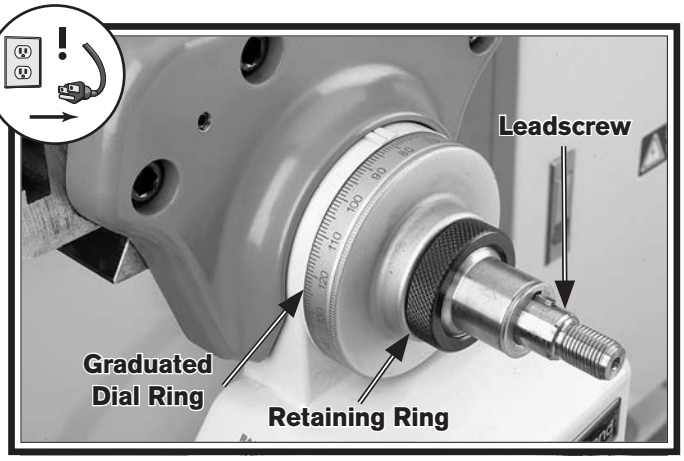


Figure 77. Example of power feed ball handle removed.

4. Remove brass bevel gear from leadscrew, then remove leadscrew alignment key (see **Figure 78**).

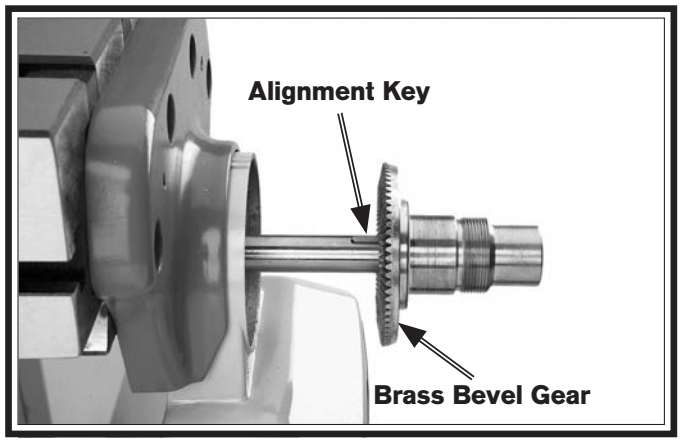


Figure 78. Example of power feed brass gear and leadscrew alignment key.

5. Brush a light coat of lubricant on teeth of bevel gear and smaller drive gear (see **Figure 79**).

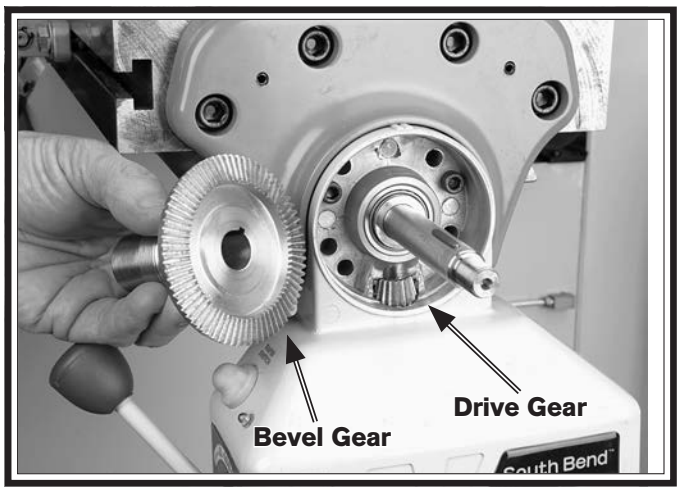


Figure 79. Example of power feed brass gear and drive gear.

6. Replace leadscrew alignment key, then align bevel gear keyway with key as you slide gear onto leadscrew and mesh its teeth with drive gear.

7. Install graduated dial ring and secure it with knurled retaining ring—do not overtighten.

8. Slide ball handle onto leadscrew, align keyway with leadscrew alignment key, then secure it with hex nut removed in **Step 2**.

9. Move table with power feed ball handle to check gear movement and to distribute grease on gears. If movement is not smooth, repeat **Steps 2–8** until it is.

Machine Storage

The machine must be properly prepared if it will be stored for any period of time. Doing this will help prevent the development of rust and corrosion and ensure the mill remains in good condition for later use.

Note: *When taking the machine out of storage, repeat the* ***Test Run*** *and the* ***Spindle Break-In****.*

Preparing Mill for Storage

1. DISCONNECT MACHINE FROM POWER!

2. Lubricate machine as directed in **Lubrication** on **Page 50**.

3. Clean out coolant reservoir as directed in **Changing Coolant** on **Page 56**.

4. Thoroughly clean all unpainted, bare metal surfaces, then coat them with quality rust preventative. Take care to ensure these surfaces are completely covered but rust preventative is kept off painted surfaces.

Note: *If machine will be out of service for only a short period of time, use way oil in place of rust preventative.*

5. Place a few moisture-absorbing desiccant packs inside electrical cabinet.

6. Cover and place machine in a dry area that is out of direct sunlight and away from hazardous fumes, paint, solvents, or gas. Fumes and sunlight can bleach or discolor paint and plastic parts.

Bringing Mill Out of Storage

1. Remove moisture-absorbing desiccant packs from electrical box.

2. Refer to **Cleaning & Protecting** on **Page 48**.

3. Repeat **Test Run** and **Spindle Break-In** procedures, beginning on **Page 26**.

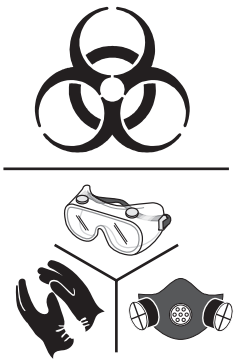
4. Add coolant, as described in **Adding/ Changing Coolant** on **Page 55**.

Coolant Reservoir

Hazards

As some coolant ages, it develops dangerous microbes which eventually proliferate and create a biological hazard. The risk of exposure to this hazard can be greatly reduced by cleaning out the coolant reservoir on a monthly basis or sooner, if needed based on your daily inspection.

The important thing to keep in mind when working with coolant is to minimize exposure to your skin, eyes, and respiratory system by wearing the proper personal protective equipment, which includes splash-resistant safety glasses, long-sleeve gloves, protective clothing, and a NIOSH-approved respirator.



⚠WARNING

BIOLOGICAL & POISON HAZARD!

Use the correct personal protection equipment when handling coolant. Follow federal, state, and fluid manufacturer requirements for proper disposal.

A small amount of coolant is lost during normal operation. Check the coolant reservoir regularly and fill it if necessary. We recommend changing the coolant every three months or sooner if it develops an unpleasant odor. However, be sure to follow the coolant manufacturer's instructions when checking, adding, or changing coolant.

The coolant reservoir holds approximately 20 liters of fluid.

NOTICE

Running coolant pump without adequate coolant in reservoir may permanently damage coolant pump. This action is considered abusive and is not covered by warranty.

Checking/Adding Coolant

Items Needed	Qty
Hex Wrench 3mm	1
Goggles	1 Pair Per Person
Gloves	1 Pair Per Person
Respirator	1 Per Person
New Coolant	As Needed
Disposable Shop Rags	As Needed

To check/add coolant:

1. DISCONNECT MACHINE FROM POWER!

2. Clean away debris and grime from coolant drain screens (see **Figure 80**).

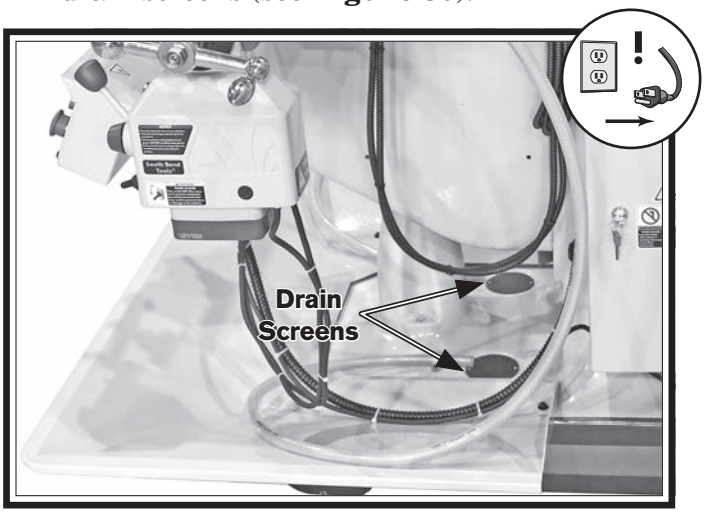


Figure 80. Locations of coolant drain screens.

3. For a dip stick, use a clean, metal tool that is narrow enough to fit through screen hole and long enough to measure coolant depth in reservoir. If level of coolant in reservoir is less than 2", add more fluid through screen to fill reservoir.

Changing Coolant

Items Needed	Qty
Hex Wrench 5mm	1
Catch Pan	1
Empty Bucket 6-Gal.	1
Rubber Hose (optional)	1
Goggles	1 Pair Per Person
Gloves	1 Pair Per Person
Respirator	1 Per Person
New Coolant	Approx. 20 Liters
Disposable Shop Rags	As Needed

To change coolant:

1. Put on personal protective equipment.

2. Place catch pan on table, position coolant nozzle over pan, then use coolant pump to drain reservoir.

Note: *When catch pan is full, empty it into 6-gallon bucket, then repeat process until reservoir is empty.*

Tip: *Alternately, slide rubber hose onto coolant nozzle and point it into a 6-gallon bucket.*

3. DISCONNECT MACHINE FROM POWER!

4. Remove coolant reservoir access panel from rear of column.

5. Remove (2) cap screws and flat washers securing pump, and move it out of the way (see **Figure 81**).

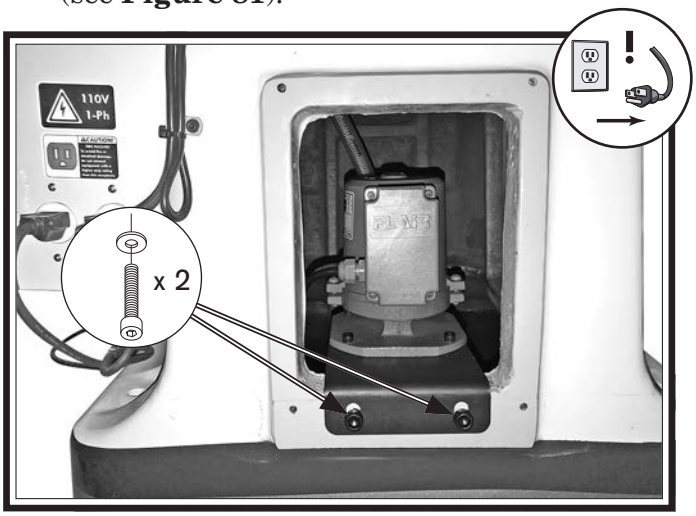


Figure 81. Location of coolant pump.

6. Thoroughly clean out bottom of reservoir and base of pump. Make sure interior is completely dry before adding new coolant.

Note: *Use cleaning solvent that is compatible with type of coolant. For instance, if you are using a water-base coolant, then use a water-base cleaning solvent.*

7. When reservoir and pump are clean and dry, replace pump and access panel.

8. Clean away debris and grime from coolant drain screens on base of mill (see **Figure 80** on previous page), then pour coolant through one of the screens to fill reservoir.

Tramming Spindle

After positioning the head at an angle, and when your operation requires that the spindle axis be precisely perpendicular to the table, you must tram or align the spindle with the table to ensure the spindle is exactly 90° to the table.

This procedure involves mounting a dial test indicator to the quill or spindle, rotating it around the table, and adjusting the spindle axis (Z-axis) 90° to the table X- and Y-axes, as illustrated in **Figure 82**.

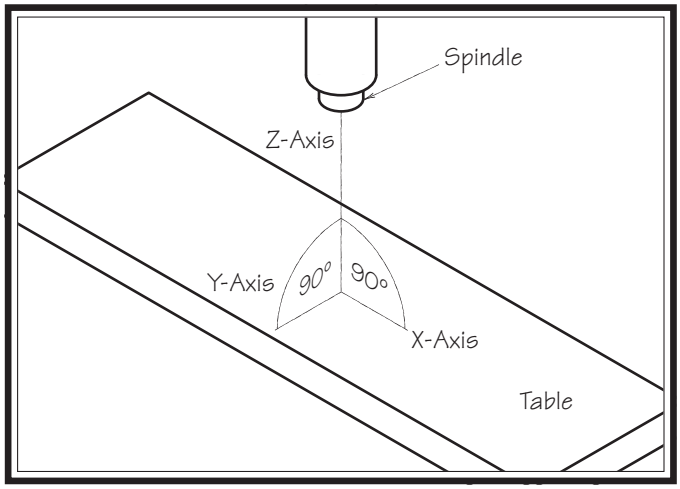


Figure 82. Spindle axis perpendicular to the table X- and Y-axes.

We encourage you to research the many variations of spindle tramming to find the one that works best for you. If you do not already have a preference for performing this operation, use the following widely-used procedure for accurately tramming the spindle to the table.

Keep in mind that all workpiece top surfaces are not exactly parallel with the table top. You may choose to tram the spindle to the top surface of the workpiece after it is mounted instead of that of the table.

Tools Needed	**Qty**
Dial Test Indicator (with at least 0.0005" resolution)	1
Indicator Holder (mounted on the quill/spindle)	1
Precision Parallel Block (at least 9" in length)	1

Note: *A precision-ground plate can be substituted for the parallel blocks. Keep in mind that the farther the indicator point can be placed from the spindle axis, the more accurate the alignment measurements will be.*

To tram spindle to table:

1. DISCONNECT MACHINE FROM POWER!
2. Prepare mill by performing following tasks:
   - Stone table to remove all nicks and burrs, then clean off all debris. Verify table is clean by running your hand over the top of it.
   - Position table for milling operation you intend to perform after tramming—preferably centered to saddle.
   - Tighten any table, knee, quill, or ram locks that should be tight during intended milling operation.
3. Place parallel block underneath spindle.

4. Install indicator holder into spindle or quill, then mount indicator onto it so point is as parallel to block as possible, as illustrated in **Figure 83**.

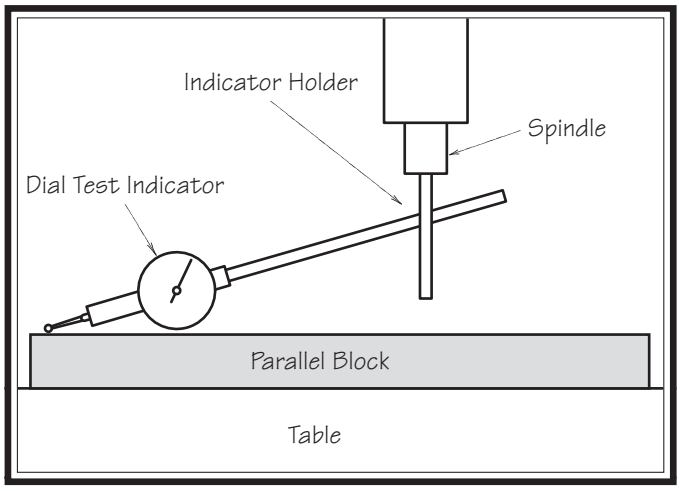


Figure 83. Dial test indicator mounted.

5. To measure spindle alignment along X-axis, place parallel block directly under spindle and indicator across length of table, as illustrated in **Figure 84**.

Note: *If you must re-position quill or knee to accommodate above step, then review tasks in* ***Step 2*** *to make sure mill is properly prepared for tramming operation.*

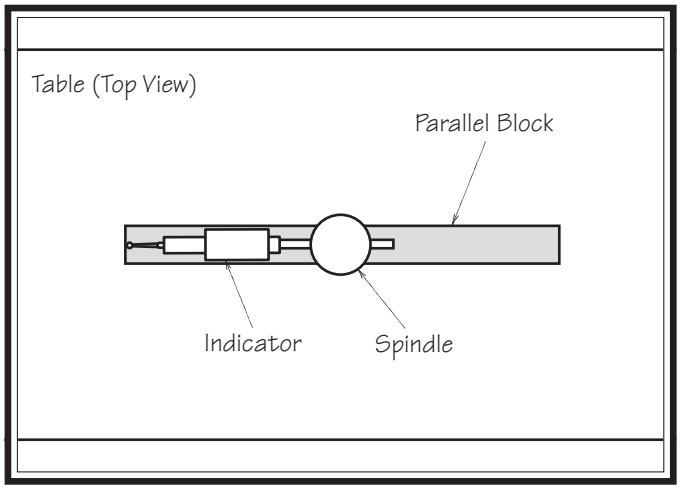


Figure 84. Parallel block positioned for X-axis measurement (top view).

Note: *Generally, the goal in next steps is to get difference of indicator readings between end of parallel block down to 0.0005". However, acceptable variance will depend on requirements for your operation.*

6. Rotate spindle by hand so indicator point rests on one end of parallel block, as illustrated in **Figure 84**, then zero dial.

7. Rotate spindle so indicator point rests in same manner on other end of block, then read dial.

— If indicator dial still reads zero or is within acceptable variance, proceed to **Step 8**.

— If indicator dial has moved from zero beyond acceptable variance, you will need to compensate for that amount by rotating head left or right. Repeat **Steps 6–7** until you are satisfied with spindle axis alignment along table X-axis.

Note: *Keep one of the rotation lock bolts snug so that head does not move loosely while you adjust it in small amounts.*

8. Tighten rotation lock bolts.

Note: *It is a good idea to repeat* ***Steps 6–7*** *again in case the head moved slightly during the process of re-tightening the lock bolts.*

9. Place parallel block directly under spindle and across width of table, as illustrated in **Figure 85**.

10. Rotate spindle so indicator point rests on parallel bar, as illustrated in **Figure 85**, then zero dial.

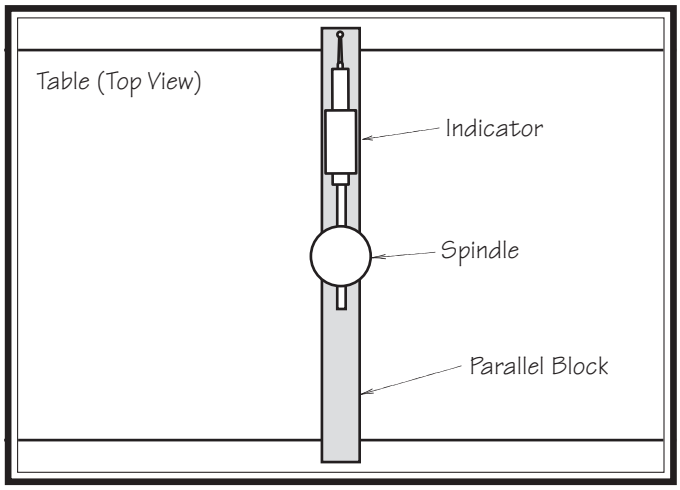


Figure 85. Parallel block positioned for the Y-axis measurement (top view).

11. Rotate spindle so indicator point rests on other end of bar in same manner, then read dial.

— If indicator dial still reads zero or is within acceptable variance, spindle is precisely perpendicular to table in both X- and Y-axes, and tramming procedure is complete.

— If indicator dial has moved from zero beyond acceptable variance, you will need to compensate for that amount by tilting head forward or back. Repeat **Steps 10–11** until you are satisfied with the spindle axis alignment along the table Y-axis.

Note: *Keep one of the tilt lock bolts snug so head does not move loosely while you adjust it in small amounts.*

12. Re-tighten tilt lock bolts.

Note: *It is a good idea to repeat **Steps 10–11** again in case the head moved slightly during the process of re-tightening the lock bolts.*

Adjusting Gibs

Gibs are tapered lengths of metal between two dovetail sliding surfaces. Gibs control the gap between these surfaces and how they slide past one another. Correctly adjusting the gibs is critical to producing good milling results.

Tight gibs make table movement more accurate but stiff. Loose gibs make moving the table sloppy but easier to do. The goal of gib adjustment is to remove unnecessary sloppiness without causing the ways to bind.

Gibs are adjusted with a screw on each end of the gib, that move the tapered gib back-and-forth to increase or decrease the friction pressure between the sliding surfaces. The process of properly adjusting the gibs requires trial-and-error and patience.

DISCONNECT MACHINE FROM POWER BEFORE ADJUSTING GIBS!

Make sure all table and knee locks are loose. Then loosen one gib adjustment screw and tighten the other the same amount to move the gib. Use the handwheel/crank to move table/knee until you feel a slight drag in that path of movement.

Refer to **Figures 86–88** on the next page to identify the locations of the table, saddle, and knee gibs, and one of the two adjustment screws for each.

Note: *It will be necessary to remove small parts, such as way wipers and covers, to access gib adjustment screws.*

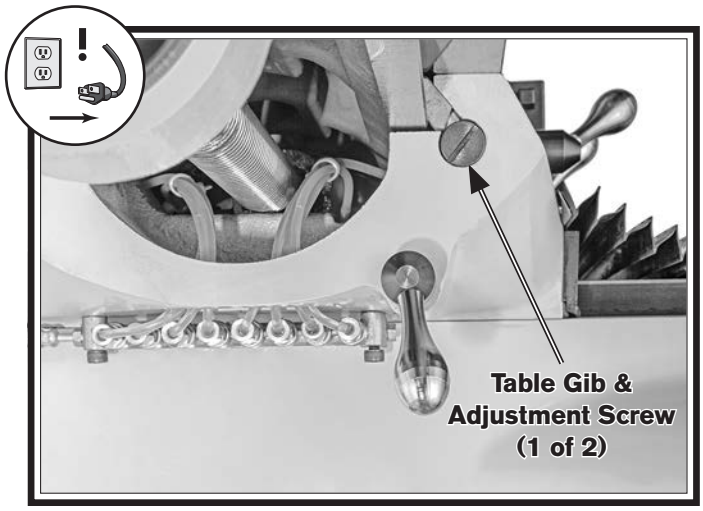


Figure 86. Table gib and adjustment screw underneath left side of table.

Figure 87. Saddle gib and adjustment screw.

Figure 88. Knee gib and adjustment screw.

Adjusting Leadscrew Backlash

Leadscrew backlash is the amount the leadscrew rotates before the attached device begins to move.

Although the mill is equipped with double-bronzed longitudinal and cross leadscrew nuts to minimize backlash, leadscrews will always have a certain amount of backlash that will increase with normal wear.

Generally, 0.005"–0.010" leadscrew backlash is acceptable to ensure smooth movement and reduce the risk of premature thread wear. However, if you find it necessary to adjust leadscrew backlash, perform the procedures listed below.

Longitudinal Leadscrew Backlash

Tools Needed	Qty
Phillips Head Screwdriver #2	1
Flat Head Screwdriver ¼"	1

To adjust longitudinal leadscrew backlash:

1. DISCONNECT MACHINE FROM POWER!

2. Loosen Phillips head screw on leadscrew nut accessed from underneath left side of table, as shown in **Figure 89**.

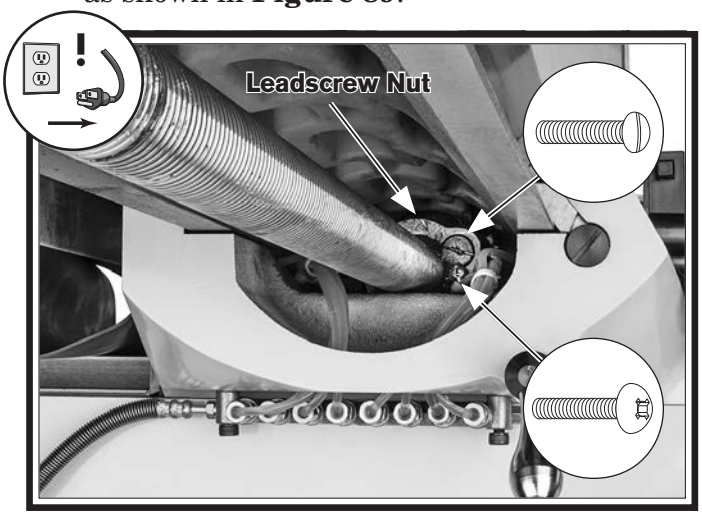


Figure 89. Longitudinal leadscrew nut and adjustment screw, as viewed from underneath left side of table.

3. Use flat head screwdriver to rotate adjustment screw on leadscrew nut in small increments, then rotate X-axis ball handle to check amount of backlash.

4. When you are satisfied with adjustment, tighten Phillips head screw.

Cross Leadscrew Backlash

Tools Needed	Qty
Hex Wrench 8mm	1
Open-End Wrench 19mm	1
Phillips Head Screwdriver #2	1
Flat Head Screwdriver ¼"	1
Dead Blow Hammer or Rubber Mallet	1

To adjust cross leadscrew backlash:

1. DISCONNECT MACHINE FROM POWER!

2. Remove hex nut and ball handle from cross leadscrew.

Note: *In next step, take care not to misplace leadscrew key as you remove parts.*

3. Unthread and remove knurled retaining ring, graduated dial ring, and leadscrew key, as shown in **Figure 90**.

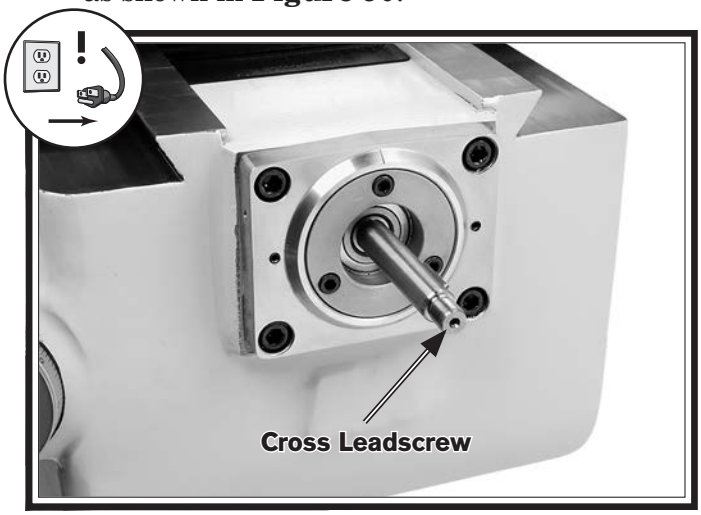


Figure 90. Example of ball handle, rings, and key removed from cross leadscrew.

4. Remove (4) cap screws from bearing housing, then slide it off leadscrew (see **Figure 91**).

   Note: *It may be necessary to use a dead blow hammer or rubber mallet on housing to knock it loose.*

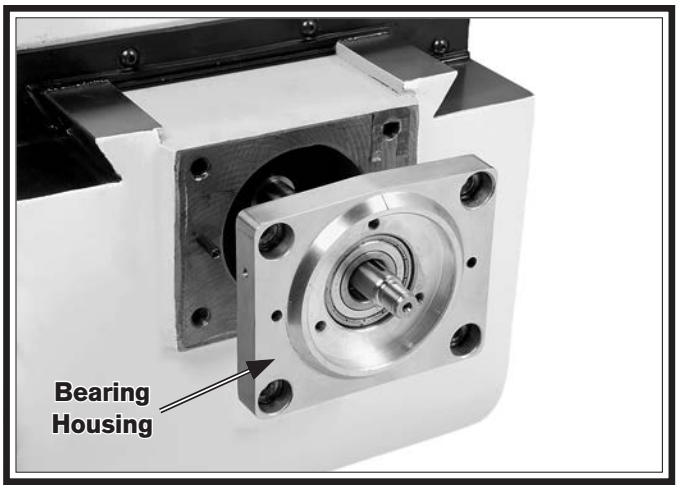


Figure 91. Example of removing bearing housing from cross leadscrew.

5. Loosen Phillips head screw on leadscrew nut shown in **Figure 92**.

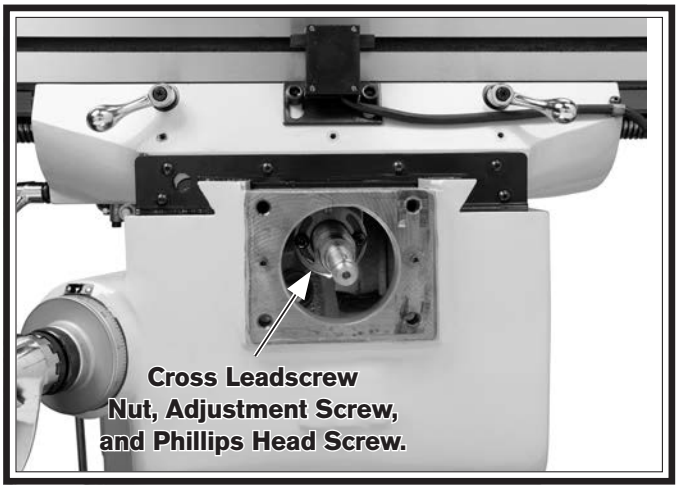


Figure 92. Example of cross leadscrew nut, adjustment screw, and Phillips head screw.

6. Re-install key onto leadscrew so you can use ball handle in next step.

7. Use flat head screwdriver to rotate adjustment screw on leadscrew nut in small increments, then use ball handle to rotate leadscrew and check amount of backlash.

8. When you are satisfied with adjustment, tighten Phillips head screw loosened in **Step 5**.

9. Re-install parts previously removed in reverse order.

If you need replacement parts, or if you are unsure how to do any of the solutions given here, feel free to call us at (360) 734-1540.

Symptom	Possible Cause	Possible Solution
Machine does not start, or power supply breaker immediately trips after startup.	**1.** Master power switch in OFF position.	**1.** Turn master power switch to ON position.
	2. EMERGENCY STOP button depressed/at fault.	**2.** Rotate EMERGENCY STOP button head to reset. Replace if at fault.
	3. Blown fuse.	**3.** Replace fuse/ensure no shorts.
	4. Incorrect power supply voltage or circuit size.	**4.** Ensure correct power supply voltage and circuit size (**Page 14**).
	5. Plug/receptacle at fault/wired incorrectly.	**5.** Test for good contacts; correct the wiring.
	6. Electrical box open/door safety switch at fault.	**6.** Close door/replace switch.
	7. Power supply circuit breaker tripped or fuse blown.	**7.** Ensure circuit is free of shorts. Reset circuit breaker or replace fuse.
	8. Motor wires connected incorrectly.	**8.** Correct motor wiring connections (**Page 71**).
	9. Thermal overload relay has tripped/ at fault.	**9.** Reset. Adjust or replace if at fault.
	10. Contactor not energized/at fault.	**10.** Test all legs for power; replace if necessary.
	11. Wiring broken, disconnected, or corroded.	**11.** Fix broken wires or disconnected/corroded connections.
	12. FWD/REV buttons at fault.	**12.** Replace buttons.
	13. Motor or motor bearings at fault.	**13.** Replace motor.
Main motor stalls or is underpowered.	**1.** Wrong workpiece material.	**1.** Use correct type/size of material.
	2. Gearbox at fault.	**2.** Select appropriate gear ratio; replace broken or slipping gears.
	3. Belt slipping/pulleys misaligned.	**3.** Clean/tension/replace belt; ensure pulleys are aligned.
	4. Motor wires connected incorrectly.	**4.** Correct motor wiring connections (**Page 71**).
	5. Plug/receptacle at fault/wired incorrectly.	**5.** Test for good contacts/correct wiring.
	6. Pulley slipping on shaft.	**6.** Tighten/replace loose pulley/shaft.
	7. Machine undersized for task.	**7.** Use correct cutter/bit; reduce feed rate; reduce spindle RPM (**Page 35**); use cutting fluid if possible (**Page 56**).
	8. Motor overheated.	**8.** Clean motor, let cool, and reduce workload.
	9. Extension cord too long.	**9.** Move machine closer to power supply; use shorter extension cord (**Page 16**).
	10. Contactor not energized/at fault.	**10.** Test all legs for power; repair/replace if at fault.
	11. Motor or motor bearings at fault.	**11.** Replace motor.
Machine operates in reverse.	**1.** Power connections wired out of phase.	**1.** Swap L1 and L3 power supply wires (**Page 68**).

Symptom	Possible Cause	Possible Solution
Machine has vibration or noisy operation.	**1.** Motor or component loose.	**1.** Replace damaged or missing bolts/nuts or tighten if loose.
	2. V-belt worn, loose, pulleys misaligned or belt slapping cover.	**2.** Inspect/replace belt. Re-align pulleys if necessary.
	3. Pulley loose.	**3.** Secure pulley on shaft.
	4. Spindle loose, improperly installed or damaged.	**4.** Tighten loose spindle, re-install spindle ensuring mating surfaces are clean, replace spindle if damaged.
	5. Workpiece loose.	**5.** Use the correct holding fixture and reclamp workpiece.
	6. Motor fan rubbing on fan cover.	**6.** Fix/replace fan cover; replace loose/damaged fan.
	7. Chuck or cutter at fault.	**7.** Replace unbalanced chuck; replace/resharpen cutter; use correct feed rate.
	8. Motor bearings at fault.	**8.** Test by rotating shaft; rotational grinding/loose shaft requires bearing replacement.
	9. Gearbox at fault.	**9.** Rebuild gearbox for bad gear(s)/bearing(s).
Breaking tools or cutters.	**1.** Spindle speed/feed rate too fast for depth of cut, cutting tool size, or workpiece material.	**1.** Reduce spindle speed (**Page 35**); reduce feed rate; take lighter cut.
	2. Improper or no lubricant/cutting tool getting too hot.	**2.** Use proper lubricant for operation (**Page 56**).
	3. Dull/incorrect cutting tool.	**3.** Sharpen/replace cutting tool.
	4. Cutting tool too small.	**4.** Use larger cutting tool and slower feed rate.
	5. Spindle extended too far down during or at beginning of operation.	**5.** Fully retract spindle and raise table (**Page 31**). This increases rigidity.
	6. Taking too big of a cut.	**6.** Reduce depth of cut and allow chips to clear.
Workpiece or tool vibrates or chatters during operation.	**1.** Table locks not tight.	**1.** Tighten table locks (**Page 31**).
	2. Workpiece not secure.	**2.** Properly clamp workpiece on table or in vise.
	3. Spindle speed/feed rate too fast.	**3.** Reduce spindle speed (**Page 35**); reduce feed rate.
	4. Gibs too loose in table.	**4.** Tighten gibs (**Page 59**).
	5. Bit chattering.	**5.** Replace/sharpen bit; index bit to workpiece; reduce feed rate.
	6. Spindle extended too far down.	**6.** Fully retract spindle and raise table (**Page 31**). This increases rigidity.
	7. Quill lock lever not tight.	**7.** Tighten quill lock lever.
	8. Chuck/cutter at fault.	**8.** Replace unbalanced chuck; replace/resharpen cutter.
Table hard to move.	**1.** Table locks tightened down.	**1.** Release table locks (**Page 31**).
	2. Chips loaded up on ways.	**2.** Frequently clean away chips during operations.
	3. Ways and leadscrews need lubrication.	**3.** Lubricate ways and leadscrews (**Page 50**).
	4. Gibs too tight.	**4.** Adjust gibs (**Page 59**).
	5. Table limit stops interfering.	**5.** Adjust table limit stops out of the way (**Page 32**).
	6. X/Y/Z-Axis leadscrews binding.	**6.** Clean and lubricate leadscrews (**Page 50**); adjust leadscrew backlash (**Page 60**) or reduce bearing preload.

Symptom	Possible Cause	Possible Solution
Tool loose in spindle.	**1.** Cutter/tooling loose. **2.** Cutting tool not fully drawn up into spindle taper. **3.** Debris on cutting tool or in spindle taper. **4.** Taking too big of a cut.	**1.** Secure cutter/tooling. **2.** Tighten drawbar (**Page 42**). **3.** Clean cutting tool and spindle taper. **4.** Lessen depth of cut and allow chips to clear.
Headstock hard to move.	**1.** Headstock lock bolt(s) at fault. **2.** Gibs too tight.	**1.** Loosen/replace lock bolt(s) (**Page 33**). **2.** Adjust gibs (**Page 59**).
Bad surface finish.	**1.** Spindle speed/feed rate too fast. **2.** Workpiece not secure. **3.** Dull/incorrect cutting tool. **4.** Wrong rotation direction of cutting tool. **5.** Spindle extended too far down during or at beginning of operation.	**1.** Reduce spindle speed (**Page 35**); reduce feed rate. **2.** Properly clamp workpiece on table or in vise. **3.** Sharpen/replace cutting tool; select better tool for operation. **4.** Check for proper direction of cutting tool rotation (**Page 35**). **5.** Fully retract spindle and raise table (**Page 31**). This increases rigidity.
Cutting results not square.	**1.** Spindle not exactly 90° to table. **2.** Table travel inconsistent.	**1.** Tram spindle (**Page 57**). **2.** Adjust gibs (**Page 59**).
Motor or spindle overheats.	**1.** Mill operated at maximum speed for extended period. **2.** Fan cover clogged. **3.** Poor spindle bearing lubrication.	**1.** Allow mill to cool; avoid operating at maximum speed for long times. **2.** Clean motor, let cool, and reduce workload. **3.** Lubricate spindle bearings (**Page 50**).
Lack of power at spindle.	**1.** Incorrect power supply voltage.	**1.** Ensure power supply meets correct circuit requirements (**Page 14**).
Spindle does not return to highest position.	**1.** Poorly adjusted return spring. **2.** Worn return spring.	**1.** Increase return spring tension. **2.** Replace return spring.
Power feed does not move table or slips.	**1.** Table locks tightened down. **2.** Drive selector not engaged. **3.** Table limit switch engaged/at fault. **4.** Gears not meshing/teeth missing. **5.** Motor shaft and gear shaft not engaged.	**1.** Release table locks (**Page 31**). **2.** Select speed, engage drive selector (**Page 35**). **3.** Test/repair/replace. **4.** Check gears and adjust/replace. **5.** Replace clutch.
Power feed operates at high speed only or is inconsistent.	**1.** Rapid micro switch stuck. **2.** Variable-speed dial doesn't work properly. **3.** Wiring harness disconnected.	**1.** Lightly tap on it to lower it. **2.** Test/repair/replace. **3.** Reconnect wiring harness.
DRO does not give reading.	**1.** DRO not turned ***ON***. **2.** DRO not getting power.	**1.** Turn DRO ***ON***. **2.** Inspect plugs and wiring connections. Replace/repair as necessary.
DRO reading is incorrect.	**1.** Initial reading incorrect. **2.** Sensors at fault.	**1.** Zero/reset DRO at beginning point. **2.** Test/replace sensors as necessary.

Electrical Safety Instructions

These pages are accurate at the time of printing. In the constant effort to improve, however, we may make changes to the electrical systems of future machines. Study this section carefully. If you see differences between your machine and what is shown in this section, call Technical Support at (360) 734-1540 for assistance BEFORE making any changes to the wiring on your machine.

Shock Hazard: It is extremely dangerous to perform electrical or wiring tasks while the machine is connected to the power source. Touching electrified parts will result in personal injury including but not limited to severe burns, electrocution, or death. For your own safety, disconnect machine from the power source before servicing electrical components or performing any wiring tasks!

Wire Connections: All connections must be tight to prevent wires from loosening during machine operation. Double-check all wires disconnected or connected during any wiring task to ensure tight connections.

Modifications: Using aftermarket parts or modifying the wiring beyond what is shown in the diagram may lead to unpredictable results, including serious injury or fire.

Motor Wiring: The motor wiring shown in these diagrams is current at the time of printing, but it may not match your machine. Always use the wiring diagram inside the motor junction box.

Circuit Requirements: Connecting the machine to an improperly sized circuit will greatly increase the risk of fire. To minimize this risk, only connect the machine to a power circuit that meets the minimum requirements given in this manual.

Capacitors/Inverters: Some capacitors and power inverters store an electrical charge for up to 10 minutes after being disconnected from the power source. To reduce the risk of being shocked, wait at least this long before working on capacitors.

Wire/Component Damage: Damaged wires or components increase the risk of serious personal injury, fire, or machine damage. If you notice that any wires or components are damaged while performing a wiring task, replace those wires or components before completing the task.

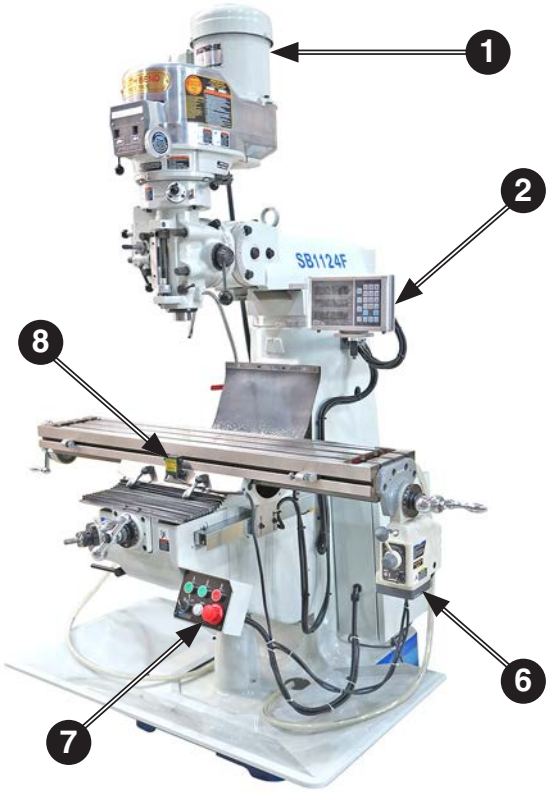
Experiencing Difficulties: If you are experiencing difficulties understanding the information included in this section, contact our Technical Support at (360) 734-1540.

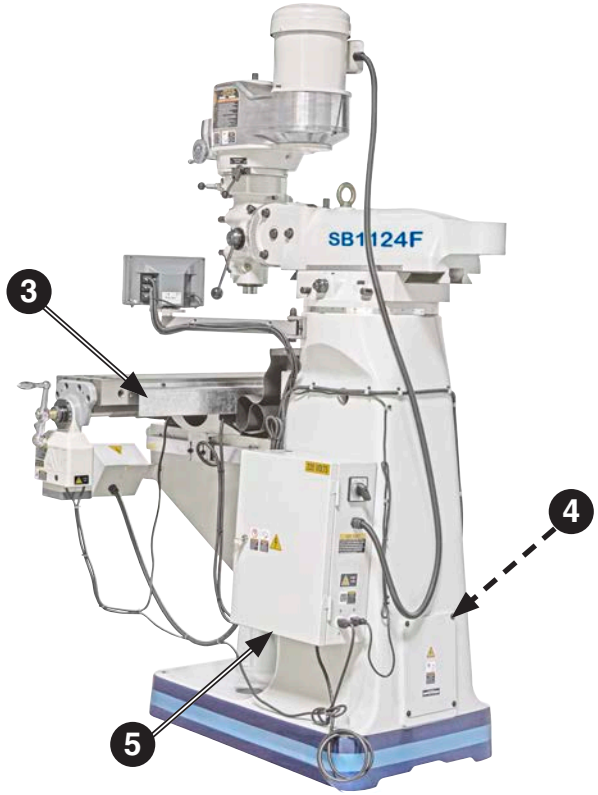
WIRING DIAGRAM COLOR KEY

BLACK (Bk)	BLUE WHITE (Bw)	RED (Rd)	PINK (Pk)	WHITE (Wt)
BLUE (Bl)	GREEN (Gn)	LIGHT BLUE (Lb)	PURPLE (Pu)	YELLOW GREEN (Yg)
BROWN (Br)	GRAY (Gy)	ORANGE (Or)	TURQUOISE (Tu)	YELLOW (Yl)

NOTICE: **The photos and diagrams included in this section are best viewed in color. You can see them in color at www.southbendtools.com.**

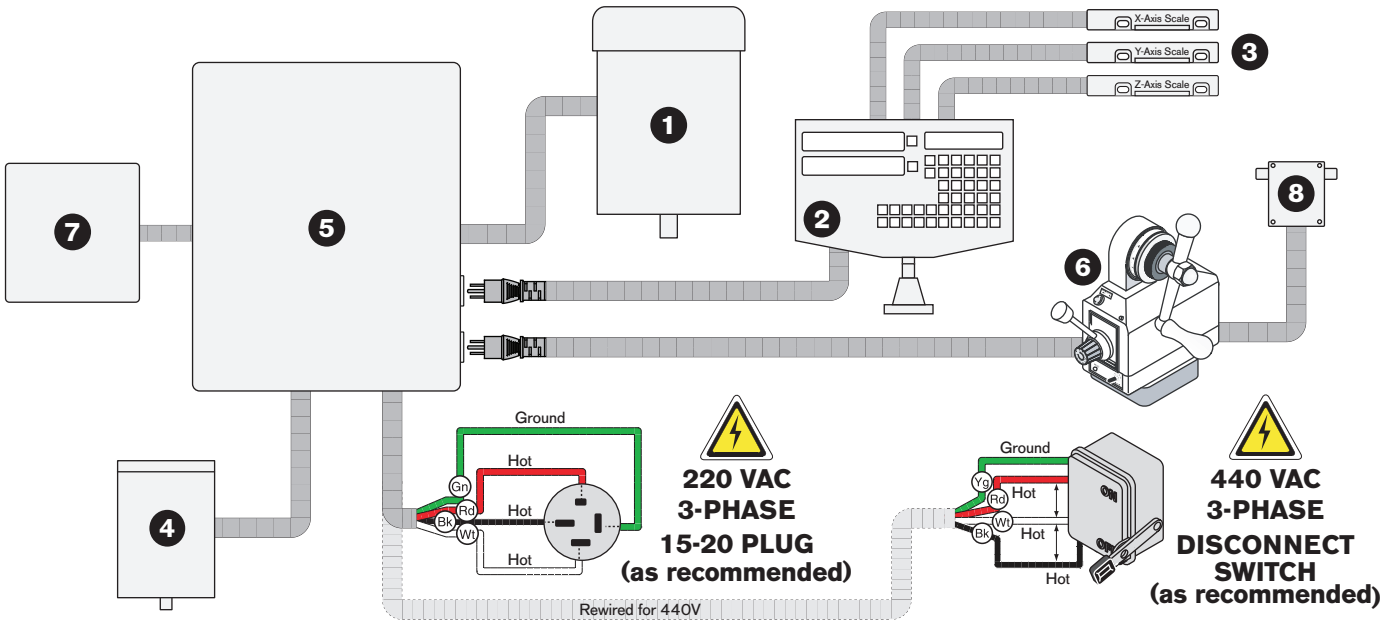
Electrical Overview





1	Main Motor (**Page 71**)
2	DRO (**Page 72**)
3	X-, Y-, Z-Axis Table Scales (**Page 72**)
4	Coolant Pump (**Page 71**)

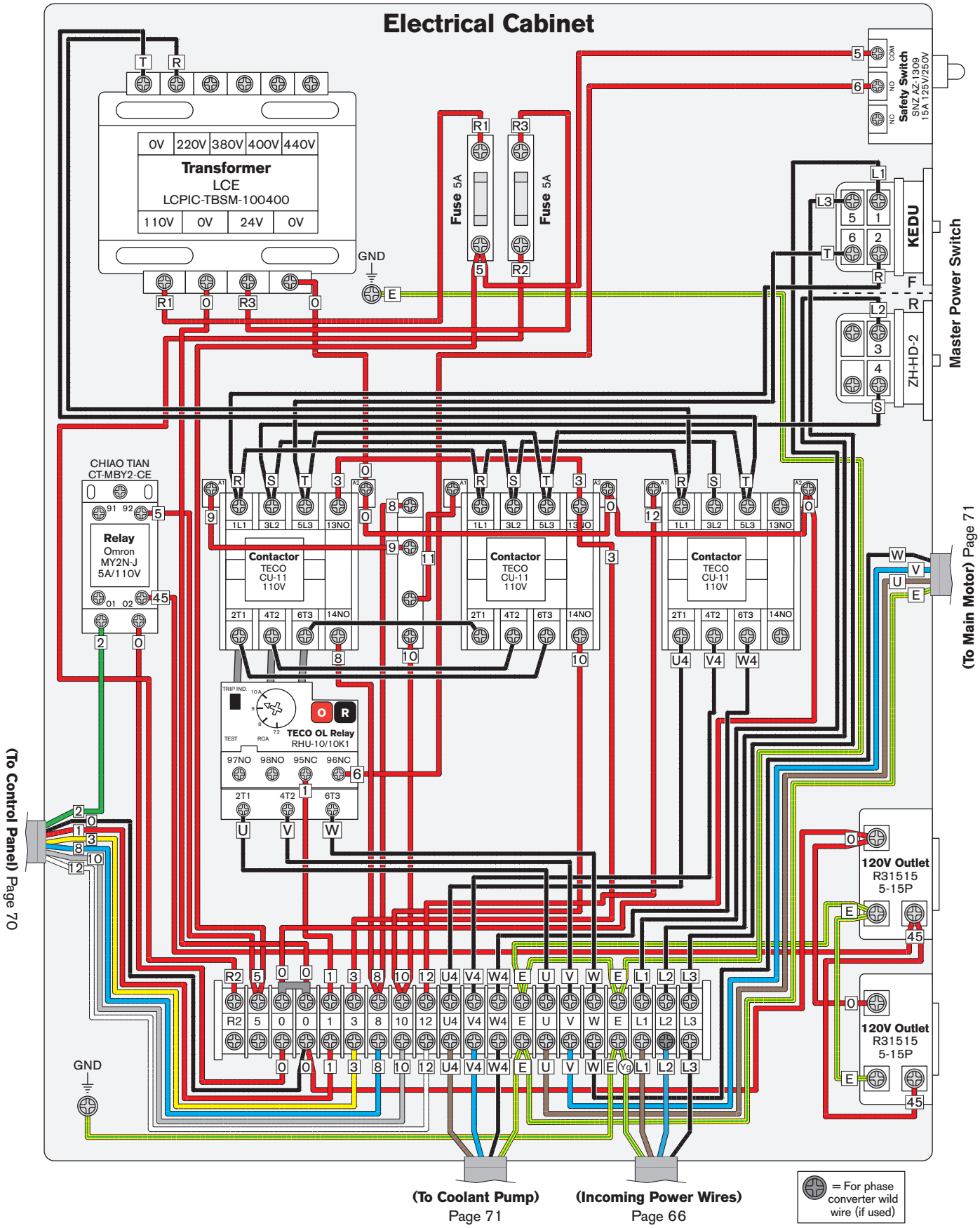
5	Electrical Cabinet (**Page 68–69**)
6	Power Feed (**Page 72**)
7	Control Panel (**Page 70**)
8	Power Feed Limit Switch (**Page 73**)



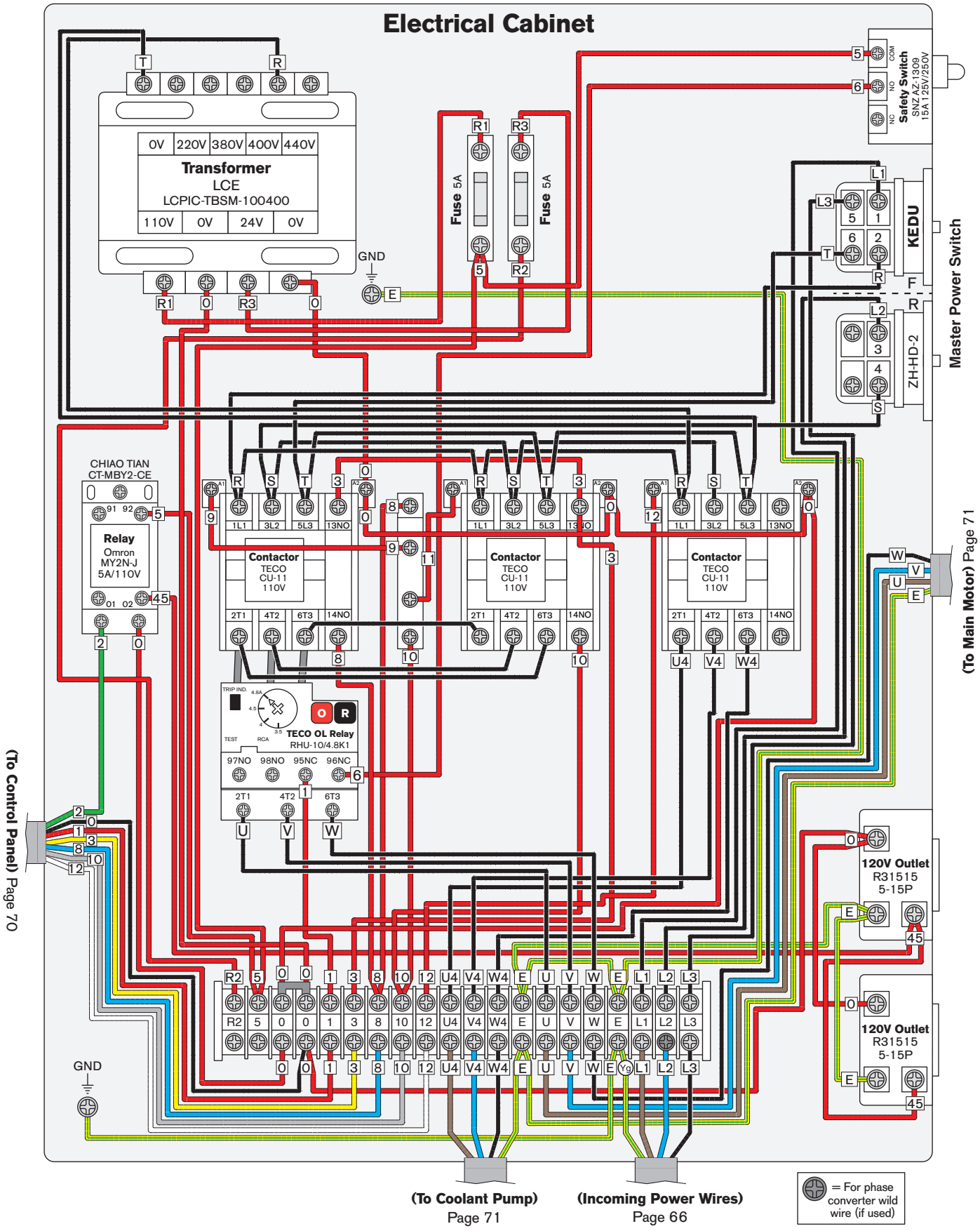
Electrical Cabinet

Figure 93. Electrical cabinet wiring.

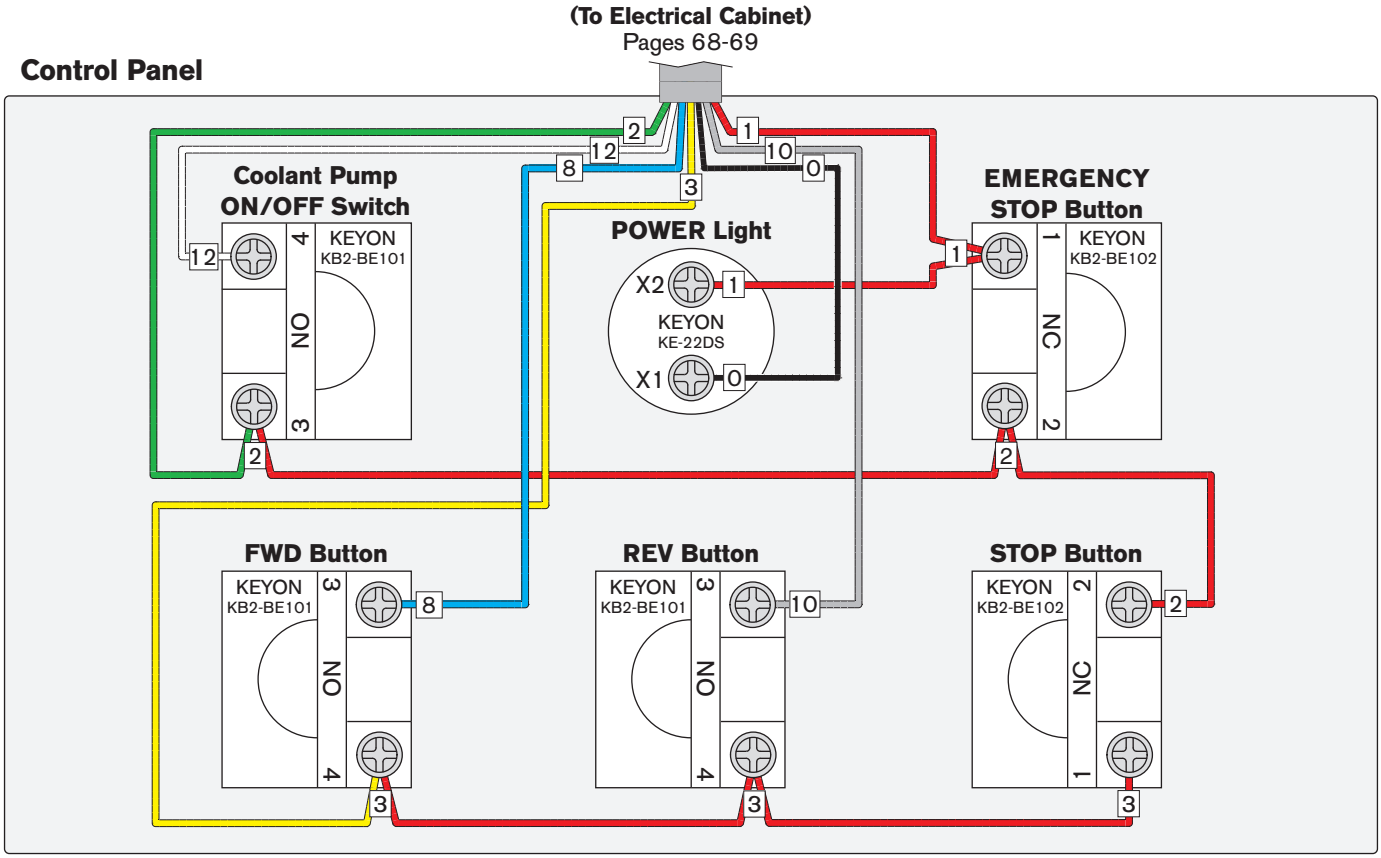
Electrical Cabinet Wiring Diagram (220V)



Electrical Cabinet Wiring Diagram (440V)



Control Panel



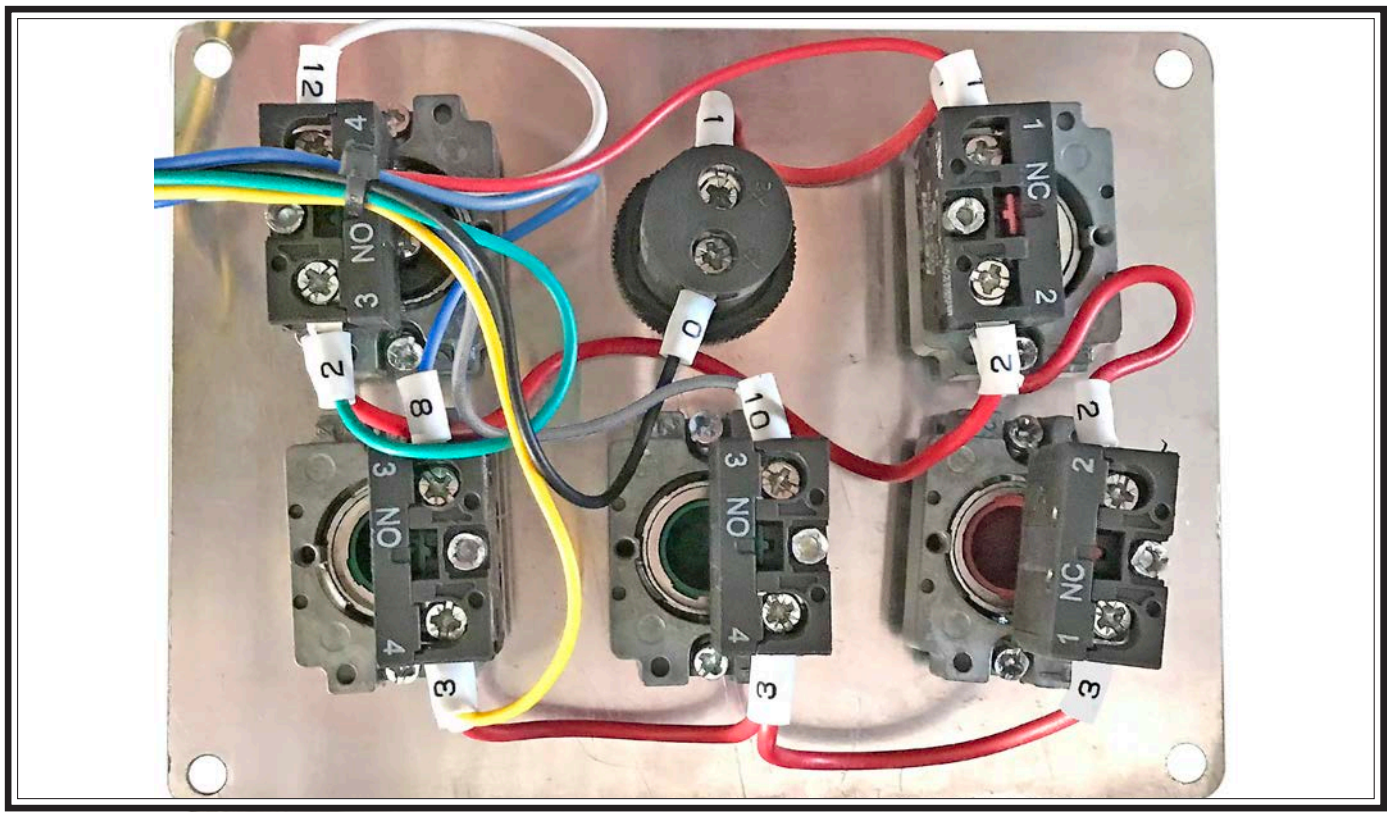
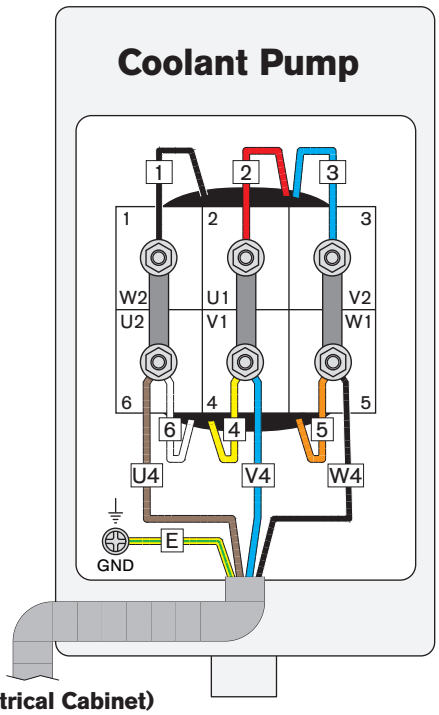


Figure 94. Control panel wiring.

Coolant Pump Wiring Diagrams

220V



(To Electrical Cabinet)
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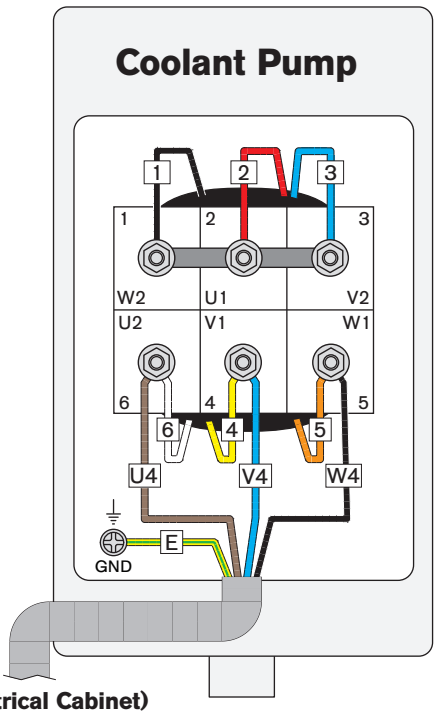
440V



(To Electrical Cabinet)
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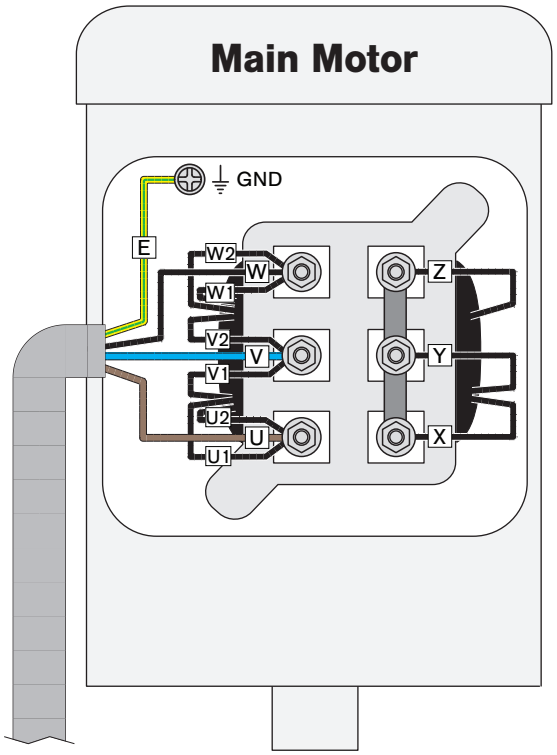
Main Motor Wiring Diagrams

220V



(To Electrical Cabinet)
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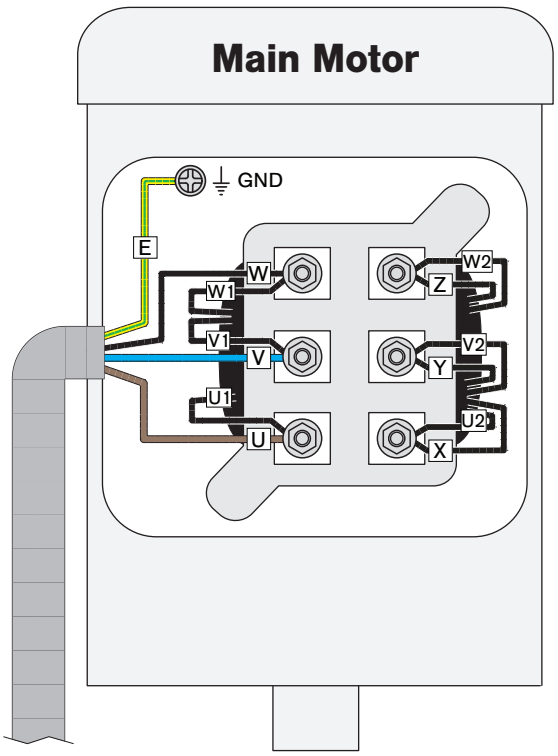
440V



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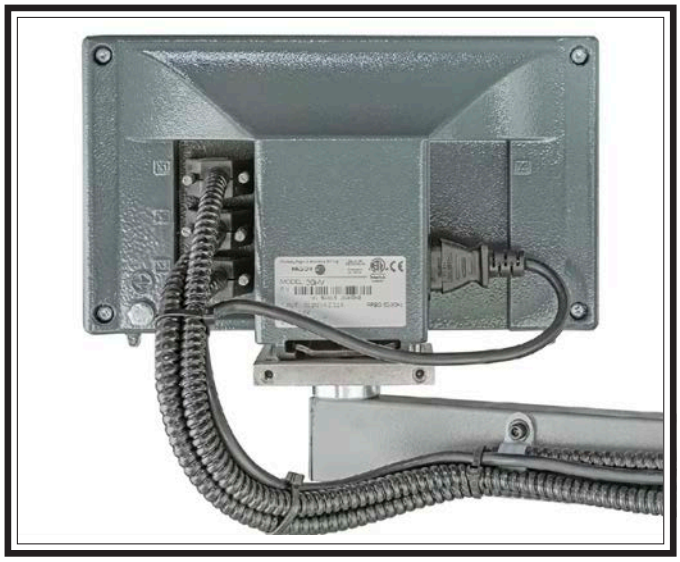
DRO Wiring Diagram



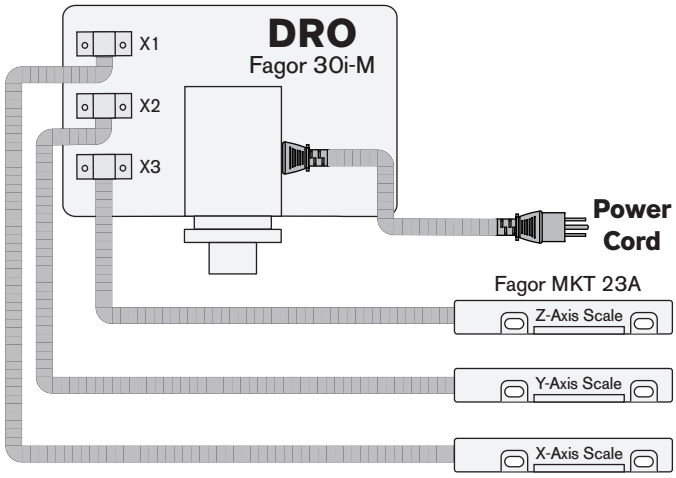
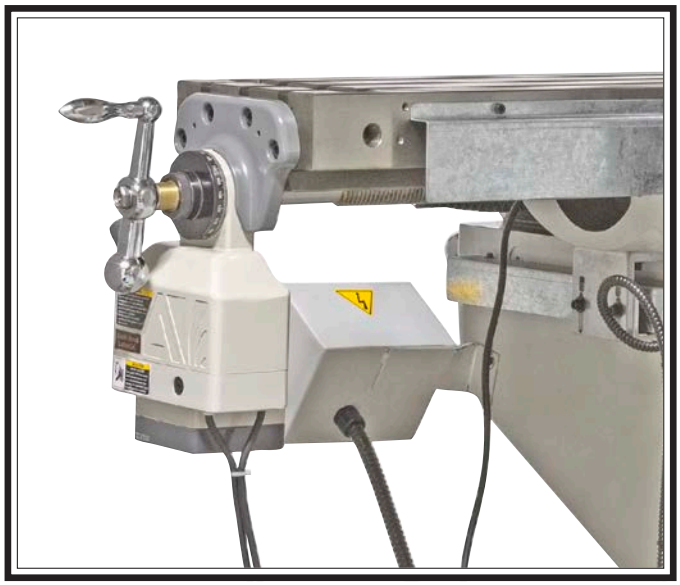


Figure 95. DRO wiring.

Power Feed Wiring Diagram



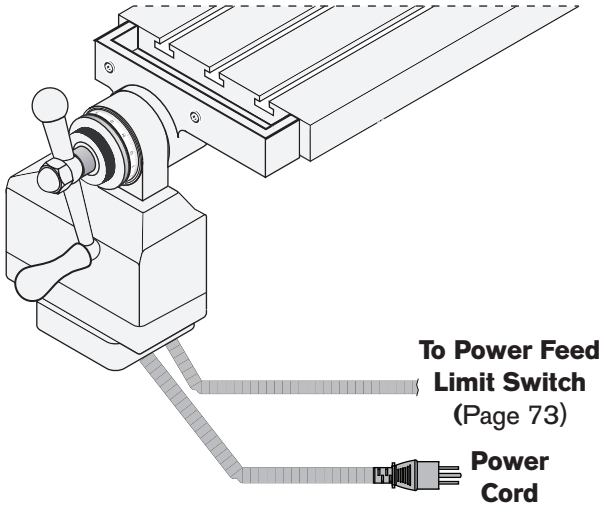


Figure 96. Power feed wiring.

Power Feed Limit Switch Wiring Diagram

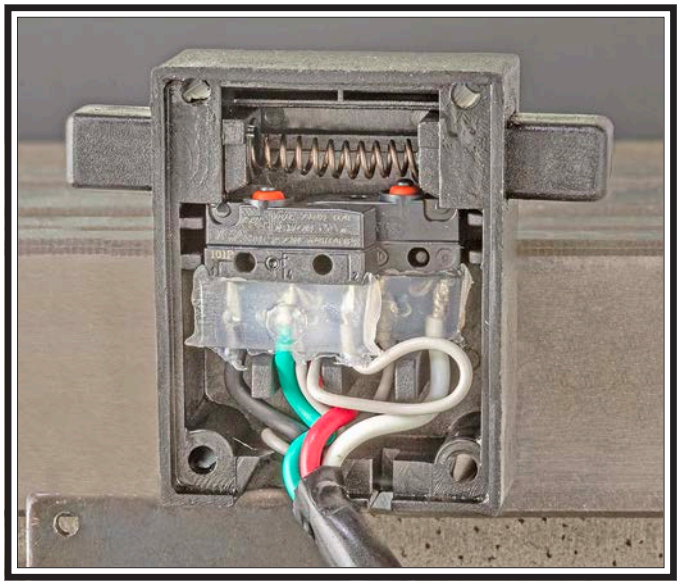
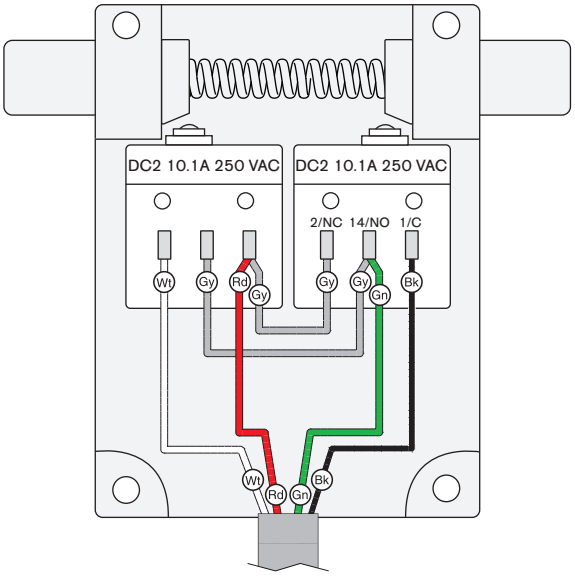


Figure 97. Power feed limit switch wiring.



To Power Feed
(Page 72)

Electrical Component Photos

Figure 98. Motor wiring (220V).

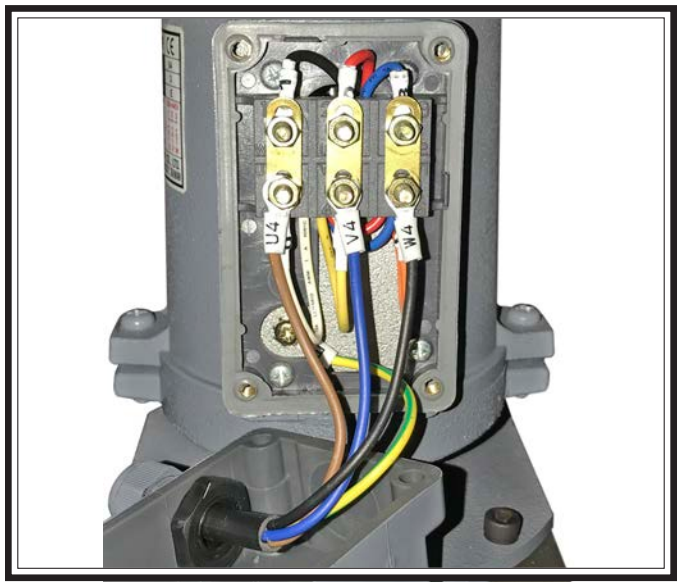
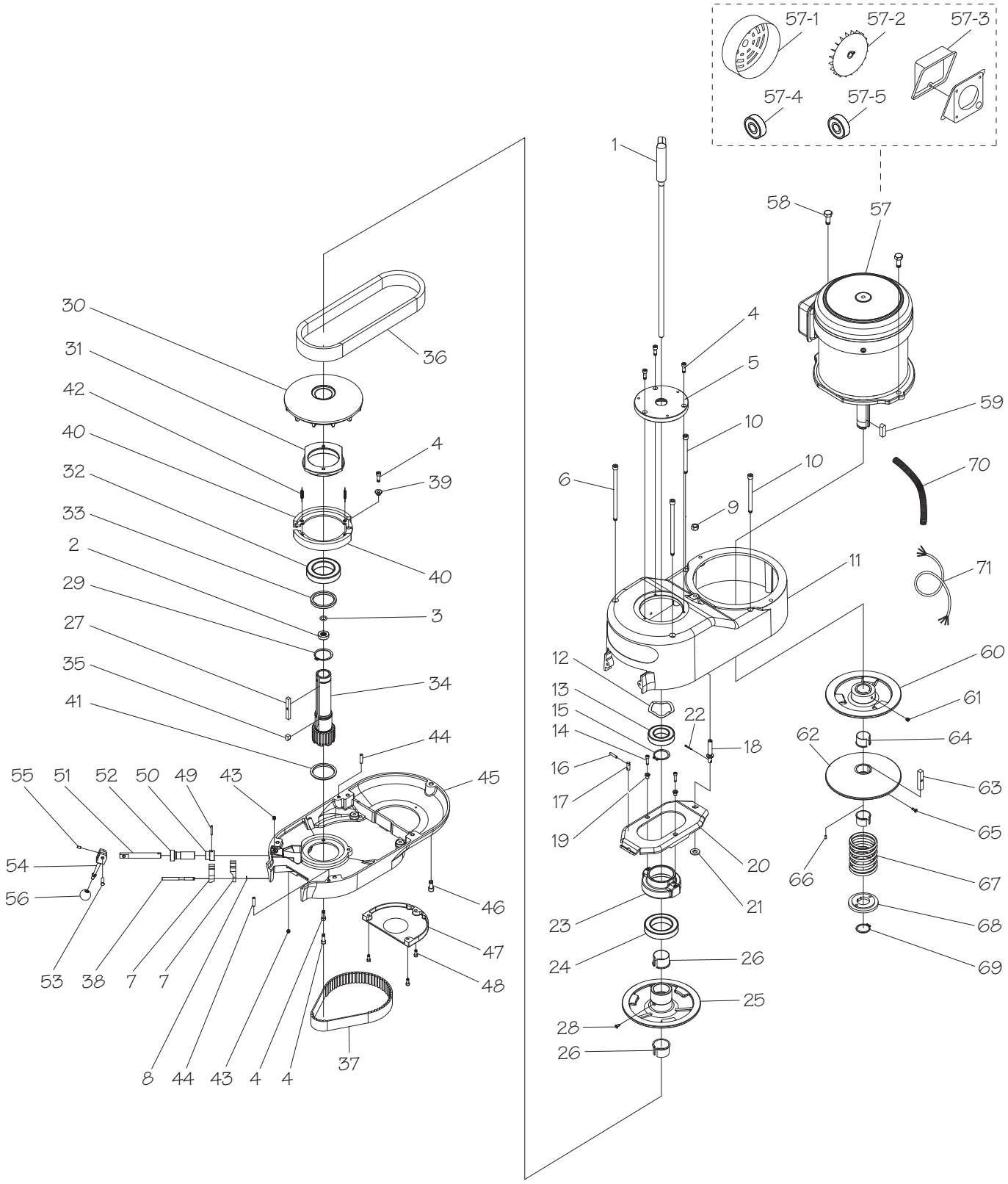


Figure 99. Coolant pump wiring (220V).

Belt Housing

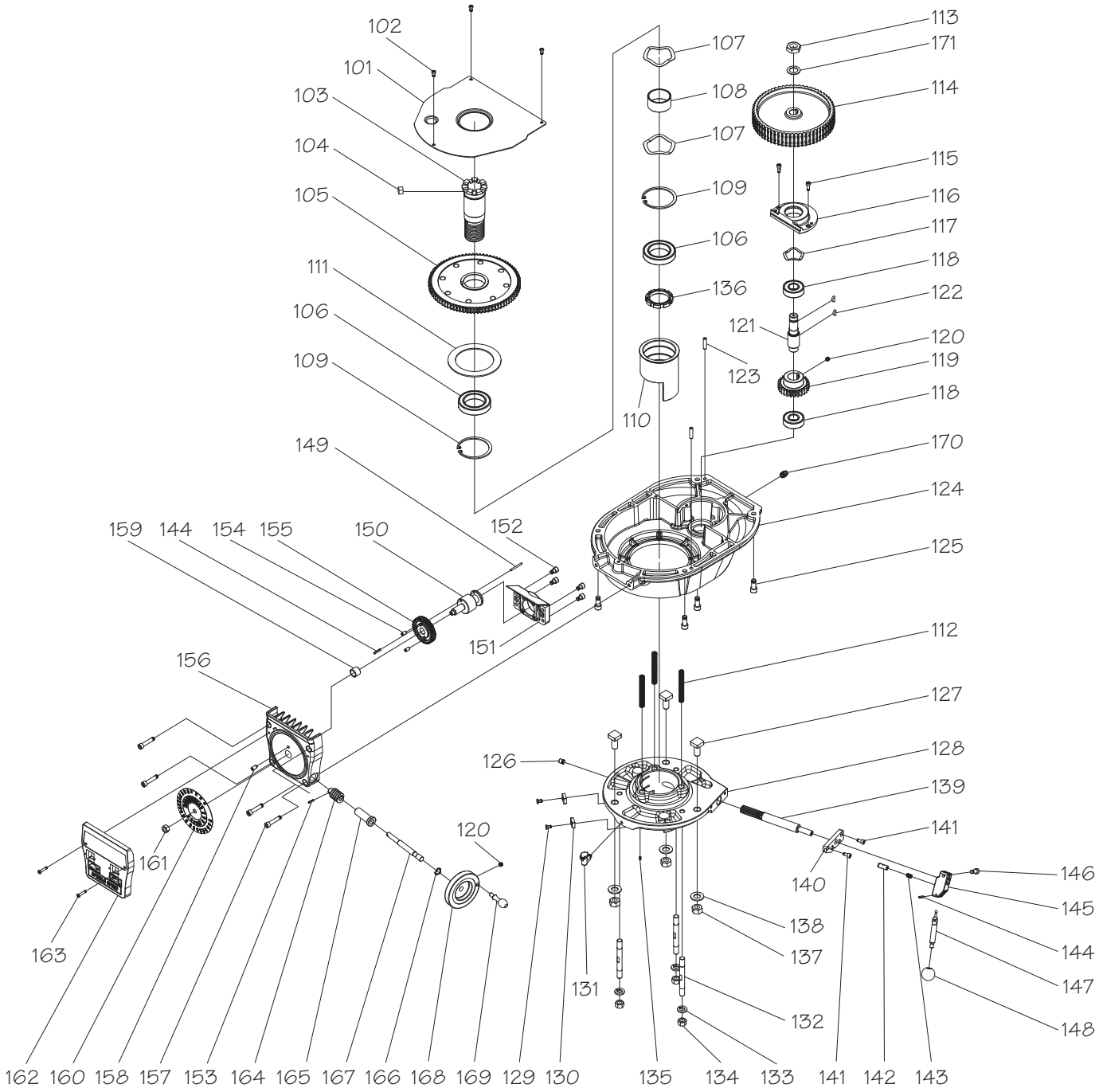


Belt Housing Parts List

REF	PART #	DESCRIPTION
1	PSB1124F0001	DRAWBAR 7/16-20 X 18-1/2
2	PSB1124F0002	DRAWBAR SPACER
3	PSB1124F0003	O-RING 11.8 X 2.4 P12
4	PSB1124F0004	CAP SCREW 1/4-20 X 3/4
5	PSB1124F0005	UPPER BEARING COVER
6	PSB1124F0006	CAP SCREW 5/16-18 X 6
7	PSB1124F0007	BRAKE OPERATING FINGER
8	PSB1124F0008	EXT RETAINING RING 6MM
9	PSB1124F0009	HEX NUT 3/8-16
10	PSB1124F0010	CAP SCREW 5/16-18 X 4
11	PSB1124F0011	BELT HOUSING
12	PSB1124F0012	WAVY WASHER 47MM
13	PSB1124F0013	BALL BEARING 6007-2RS
14	PSB1124F0014	CAP SCREW 10-32 X 3/4
15	PSB1124F0015	EXT RETAINING RING 35MM
16	PSB1124F0016	ROLL PIN 4 X 22
17	PSB1124F0017	SPEED CHANGE CHAIN STUD
18	PSB1124F0018	SPEED CHANGE PLATE PIVOT
19	PSB1124F0019	PIVOT SLEEVE
20	PSB1124F0020	SPEED CHANGE PLATE PIVOT
21	PSB1124F0021	FLAT WASHER 3/8
22	PSB1124F0022	COTTER PIN 2.5 X 16 STANDARD
23	PSB1124F0023	BEARING BRACKET
24	PSB1124F0024	BALL BEARING 6010-2RS
25	PSB1124F0025	VARIDISC
26	PSB1124F0026	PLASTIC SLEEVE
27	PSB1124F0027	KEY 7 X 7.9 X 60MM (BRONZE)
28	PSB1124F0028	FLAT HD CAP SCR M4-.7 X 8
29	PSB1124F0029	EXT RETAINING RING 40MM
30	PSB1124F0030	SPINDLE BELT PULLEY
31	PSB1124F0031	BRAKE BEARING COVER
32	PSB1124F0032	BALL BEARING 6010-2RS
33	PSB1124F0033	SPACER
34	PSB1124F0034	SPINDLE PULLEY HUB
35	PSB1124F0035	KEY 5/16 X 5/16 X 1
36	PSB1124F0036	V-BELT 875VC-3630(Y)
37	PSB1124F0037	TIMING BELT 592-8M-28
38	PSB1124F0038	BRAKE FINGER

REF	PART #	DESCRIPTION
39	PSB1124F0039	DRIVE KEY
40	PSB1124F0040	BRAKE SHOE
41	PSB1124F0041	CLUTCH SPACER
42	PSB1124F0042	EXTENSION SPRING 0.9 X 4.8 X 51
43	PSB1124F0043	SET SCREW 1/4-20 X 1/4
44	PSB1124F0044	DOWEL PIN 6 X 25
45	PSB1124F0045	BELT HOUSING BASE
46	PSB1124F0046	CAP SCREW 5/16-18 X 3/4
47	PSB1124F0047	MOTOR PULLEY COVER
48	PSB1124F0048	CAP SCREW 10-24 X 1/2
49	PSB1124F0049	ROLL PIN 3 X 25
50	PSB1124F0050	LOCK COLLAR
51	PSB1124F0051	BRAKE SHAFT
52	PSB1124F0052	GEAR SHIFT BUSHING
53	PSB1124F0053	GEAR SHIFT PIN
54	PSB1124F0054	BRAKE SHIFTER
55	PSB1124F0055	SET SCREW 10-32 X 1/4
56	PSB1124F0056	KNOB 1/4-20, D25, BALL
57	PSB1124F0057	MOTOR 3HP 220V/440V 3-PH
57-1	PSB1124F0057-1	MOTOR FAN COVER
57-2	PSB1124F0057-2	MOTOR FAN
57-3	PSB1124F0057-3	JUNCTION BOX
57-4	PSB1124F0057-4	BALL BEARING 6206ZZ (FRONT)
57-5	PSB1124F0057-5	BALL BEARING 6205ZZ (REAR)
58	PSB1124F0058	HEX BOLT 3/8-16 X 1
59	PSB1124F0059	KEY 3/8 X 3/8 X 1-1/4
60	PSB1124F0060	UPPER MOTOR PULLEY PLATE
61	PSB1124F0061	SET SCREW 1/4-20 X 1/4
62	PSB1124F0062	LOWER MOTOR PULLEY PLATE
63	PSB1124F0063	KEY 3/8 X 3/8 X 2
64	PSB1124F0064	PLASTIC SLEEVE
65	PSB1124F0065	FLAT HD CAP SCR M4-.7 X 12
66	PSB1124F0066	ROLL PIN 3 X 8
67	PSB1124F0067	PULLEY SPRING
68	PSB1124F0068	SPRING COVER
69	PSB1124F0069	EXT RETAINING RING 30MM
70	PSB1124F0070	MOTOR CORD CONDUIT 96"
71	PSB1124F0071	MOTOR WIRE 14G 4W 96"

Gearbox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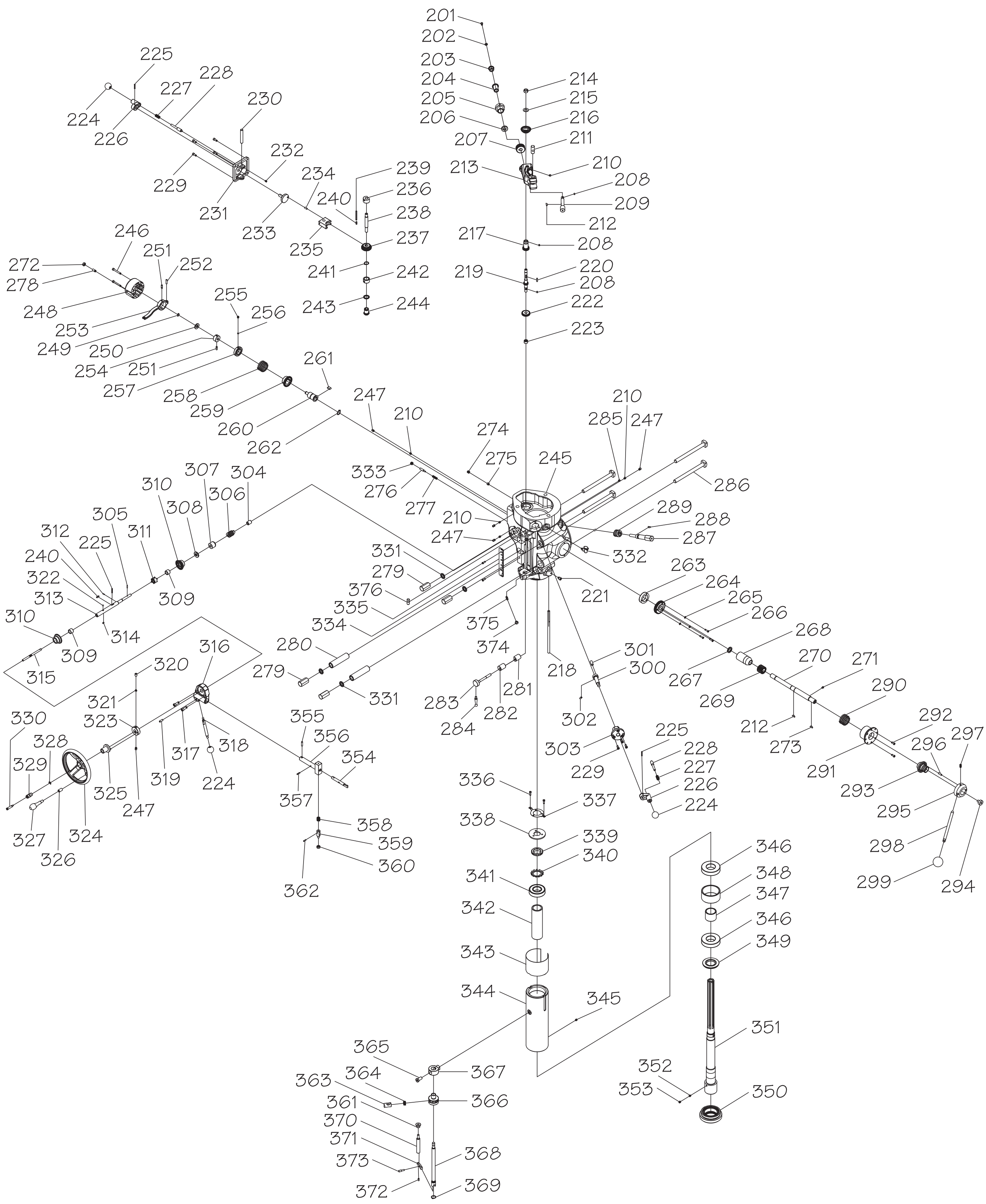
Gearbox Parts List

REF	PART #	DESCRIPTION
101	PSB1124F0101	GEARBOX COVER
102	PSB1124F0102	BUTTON HD CAP SCR 10-24 X 3/8
103	PSB1124F0103	SPINDLE GEAR HUB
104	PSB1124F0104	KEY 5/16 X 5/16 X 1/2
105	PSB1124F0105	SPINDLE BULL GEAR
106	PSB1124F0106	BALL BEARING 6908-2RS
107	PSB1124F0107	WAVY WASHER 47MM
108	PSB1124F0108	SPACER
109	PSB1124F0109	INT RETAINING RING 62MM
110	PSB1124F0110	BEARING SLEEVE
111	PSB1124F0111	BEARING SLEEVE WASHER
112	PSB1124F0112	COMPRESSION SPRING 1.4 X 9.2 X 72.5
113	PSB1124F0113	HEX NUT 5/8-18
114	PSB1124F0114	BELT PULLEY GEAR
115	PSB1124F0115	CAP SCREW 10-24 X 1/2
116	PSB1124F0116	BULL GEAR PINION BEARING CAP
117	PSB1124F0117	WAVY WASHER 30MM
118	PSB1124F0118	BALL BEARING 6203-2RS
119	PSB1124F0119	BULL GEAR PINION 26T
120	PSB1124F0120	SET SCREW 1/4-20 X 1/4
121	PSB1124F0121	BULL GEAR PINION SHAFT
122	PSB1124F0122	WOODRUFF KEY 3/16 X 3/4
123	PSB1124F0123	DOWEL PIN 6 X 25
124	PSB1124F0124	GEARBOX HOUSING
125	PSB1124F0125	CAP SCREW 5/16-18 X 3/4
126	PSB1124F0126	SET SCREW 5/16-24 X 3/8
127	PSB1124F0127	T-BOLT 7/16-14 X 1
128	PSB1124F0128	CLUTCH BASE
129	PSB1124F0129	FLAT HD CAP SCR 10-32 X 3/8
130	PSB1124F0130	SQUARE NUT 10-32
131	PSB1124F0131	OIL CUP M6-1 90-DEG
132	PSB1124F0132	STUD-DE 3/8-16 X 3-1/2, 11/16
133	PSB1124F0133	LOCK WASHER 10MM
134	PSB1124F0134	HEX NUT 3/8-16
135	PSB1124F0135	ROLL PIN 3 X 6
136	PSB1124F0136	SPANNER NUT

REF	PART #	DESCRIPTION
137	PSB1124F0137	HEX NUT 7/16-14
138	PSB1124F0138	FLAT WASHER 7/16
139	PSB1124F0139	BULL GEAR SHIFT PINION
140	PSB1124F0140	HI-LOW DETENT PLATE
141	PSB1124F0141	CAP SCREW 10-32 X 3/8
142	PSB1124F0142	HI-LOW DETENT PLUNGER
143	PSB1124F0143	COMPRESSION SPRING 0.8 X 6.1 X 14
144	PSB1124F0144	ROLL PIN 3 X 16
145	PSB1124F0145	HI-LOW PINION BLOCK
146	PSB1124F0146	CAP SCREW 1/4-20 X 3/4
147	PSB1124F0147	HI-LOW SHIFT LEVER
148	PSB1124F0148	KNOB 1/4-20, D25, BALL
149	PSB1124F0149	ROLL PIN 3 X 30
150	PSB1124F0150	SPEED CHANGE CHAIN DRUM
151	PSB1124F0151	DRUM HOUSING
152	PSB1124F0152	CAP SCREW 1/4-20 X 3/8
153	PSB1124F0153	ROLL PIN 2.5 X 12
154	PSB1124F0154	ROLL PIN 5 X 10
155	PSB1124F0155	WORM GEAR 32T
156	PSB1124F0156	SPEED INDICATOR HOUSING
157	PSB1124F0157	CAP SCREW 1/4-20 X 3/8
158	PSB1124F0158	SET SCREW 1/4-20 X 3/8
159	PSB1124F0159	BUSHING (BRONZE)
160	PSB1124F0160	VARIABLE SPEED DIAL
161	PSB1124F0161	HEX NUT 5/16-18
162	PSB1124F0162	SPEED INDICATOR FACE PLATE
163	PSB1124F0163	BUTTON HD CAP SCR 8-32 X 3/4
164	PSB1124F0164	WORM GEAR
165	PSB1124F0165	FLANGED BUSHING
166	PSB1124F0166	WAVY WASHER 10MM
167	PSB1124F0167	HANDWHEEL SHAFT
168	PSB1124F0168	HANDWHEEL 75D X 10B X 4MM
169	PSB1124F0169	FIXED HANDLE 15 X 48, 6 X 5
170	PSB1124F0170	GREASE FITTING 1/8" PT STRAIGHT
171	PSB1124F0171	FLAT WASHER 16 X 25 X 1.5MM

Headstock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Headstock Parts List

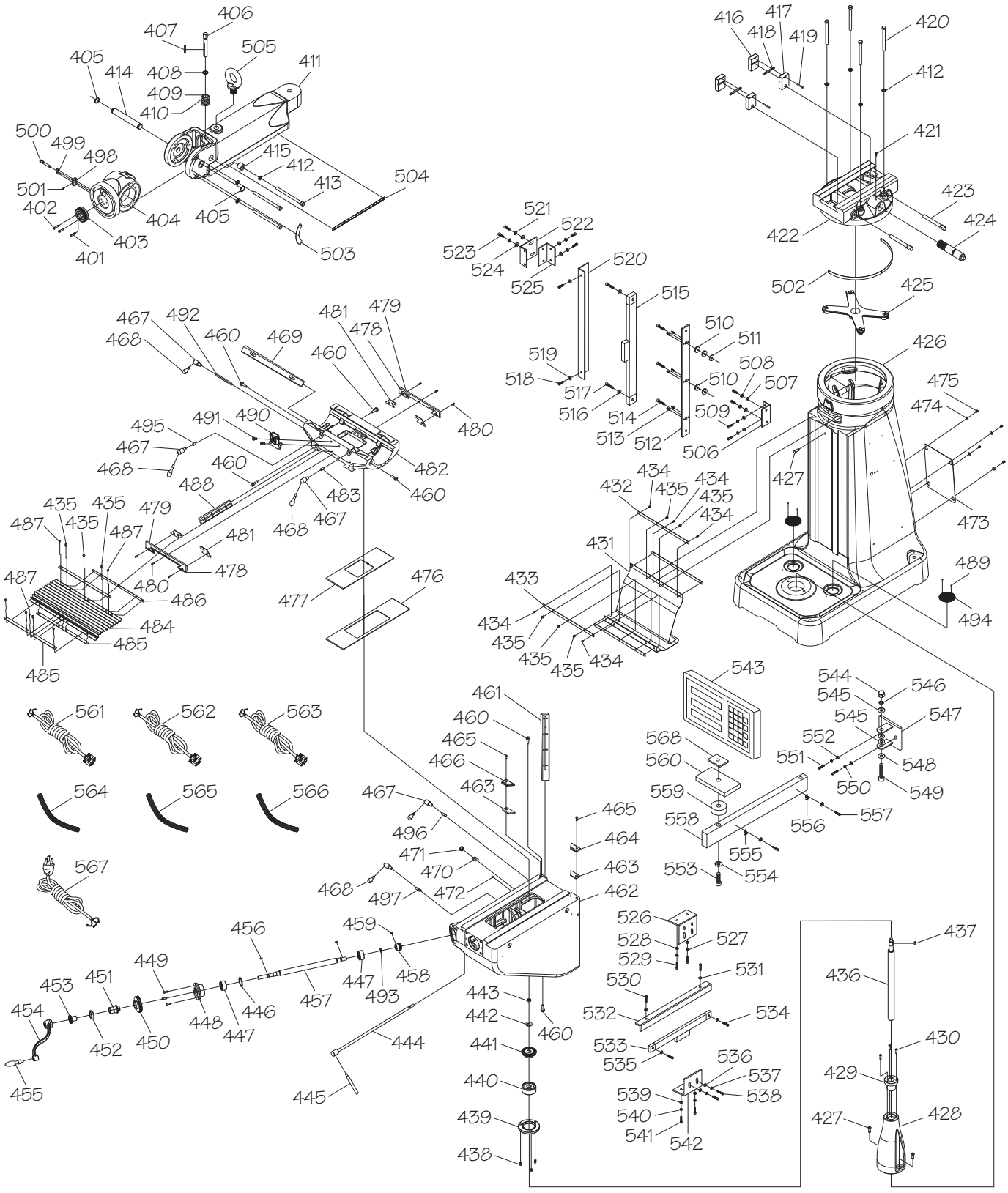
REF	PART #	DESCRIPTION
201	PSB1124F0201	BUTTON HD CAP SCR 10-24 X 3/8
202	PSB1124F0202	FLAT WASHER 5MM
203	PSB1124F0203	FEED WORM GEAR
204	PSB1124F0204	FEED SLEEVE
205	PSB1124F0205	FLANGED BUSHING
206	PSB1124F0206	SPACER
207	PSB1124F0207	FEED WORM GEAR 20T
208	PSB1124F0208	KEY 1/8 X 1/8 X 1/4
209	PSB1124F0209	FEED DRIVE SHAFT
210	PSB1124F0210	SET SCREW 1/4-20 X 1/8
211	PSB1124F0211	FEED PIN
212	PSB1124F0212	WOODRUFF KEY 1/8 X 3/4
213	PSB1124F0213	WORM GEAR BRACKET
214	PSB1124F0214	HEX NUT 3/8-24
215	PSB1124F0215	FLAT WASHER 10MM
216	PSB1124F0216	BEVEL GEAR 24T
217	PSB1124F0217	CLUSTER GEAR 18T
218	PSB1124F0218	DIAL INDICATOR ROD
219	PSB1124F0219	FEED WORM SHAFT
220	PSB1124F0220	KEY 1/8 X 1/8 X 5/8
221	PSB1124F0221	CAP SCREW 1/4-20 X 1/4
222	PSB1124F0222	CLUSTER GEAR 23T
223	PSB1124F0223	NEEDLE BEARING BA66Z
224	PSB1124F0224	KNOB 1/4-20, D25, BALL
225	PSB1124F0225	ROLL PIN 3 X 20
226	PSB1124F0226	SHIFT CRANK
227	PSB1124F0227	COMPRESSION SPRING 1 X 9 X 25
228	PSB1124F0228	GEAR SHIFT PLUNGER
229	PSB1124F0229	CAP SCREW 10-24 X 1/2
230	PSB1124F0230	FEED SHIFT ROD
231	PSB1124F0231	CLUSTER GEAR COVER
232	PSB1124F0232	SET SCREW 10-24 X 1/4
233	PSB1124F0233	CLUSTER GEAR SHIFT CRANK
234	PSB1124F0234	LOCATING PIN 3/16 X 7/16
235	PSB1124F0235	FEED GEAR SHIFTER FORK
236	PSB1124F0236	CLUSTER GEAR BEARING
237	PSB1124F0237	CLUSTER GEAR 17T/22T
238	PSB1124F0238	CLUSTER GEAR SHAFT
239	PSB1124F0239	KEY 1/8 X 1/8 X 1-3/4
240	PSB1124F0240	KEY 1/8 X 1/8 X 1/2
241	PSB1124F0241	EXT RETAINING RING 5/8
242	PSB1124F0242	BUSHING
243	PSB1124F0243	SPACER
244	PSB1124F0244	BEVEL PINION GEAR 12T
245	PSB1124F0245	QUILL HOUSING
246	PSB1124F0246	CAP SCREW 10-24 X 1-1/2
247	PSB1124F0247	SET SCREW 1/4-20 X 3/8
248	PSB1124F0248	CLUTCH ARM COVER
249	PSB1124F0249	EXT RETAINING RING 3/8
250	PSB1124F0250	CLUTCH SPACER
251	PSB1124F0251	SET SCREW 10-32 X 3/16
252	PSB1124F0252	ROLL PIN 3/16 X 3/4
253	PSB1124F0253	OVERLOAD CLUTCH TRIP LEVER
254	PSB1124F0254	CLUTCH RING
255	PSB1124F0255	SET SCREW 1/4-20 X 1/4
256	PSB1124F0256	KEY 4.5 X 2.5 (BRONZE)
257	PSB1124F0257	OVERLOAD RING
258	PSB1124F0258	COMPRESSION SPRING 3.5 X 39 X 35.8
259	PSB1124F0259	OVERLOAD CLUTCH
260	PSB1124F0260	OVERLOAD SLEEVE
261	PSB1124F0261	KEY 3/16 X 5/16 X 9/16
262	PSB1124F0262	EXT RETAINING RING 15MM
263	PSB1124F0263	OVERLOAD CLUTCH RING
264	PSB1124F0264	OVERLOAD CLUTCH WORM GEAR
265	PSB1124F0265	LOCK WASHER #8
266	PSB1124F0266	PHLP HD SCR 8-32 X 5/8
267	PSB1124F0267	PINION SHAFT WORM GEAR SPACER
268	PSB1124F0268	QUILL PINION SHAFT BUSHING
269	PSB1124F0269	GEAR 16T
270	PSB1124F0270	FEED SHAFT
271	PSB1124F0271	FIXED PIN 4.8 X 6.4
272	PSB1124F0272	HEX NUT 1/4-20
273	PSB1124F0273	WOODRUFF KEY 1/8 X 1/2
274	PSB1124F0274	SET SCREW 5/16-18 X 5/16
275	PSB1124F0275	SET SCREW 5/16-18 X 3/16
276	PSB1124F0276	SPRING PIN
277	PSB1124F0277	COMPRESSION SPRING 1.2 X 6.2 X 38.8
278	PSB1124F0278	SET SCREW 1/4-20 X 5/8
279	PSB1124F0279	CLAMP BOLT NUT 1/2-13 X 1-1/2
280	PSB1124F0280	CLAMP BOLT SPACER
281	PSB1124F0281	CAM
282	PSB1124F0282	ECCENTRIC SHAFT
283	PSB1124F0283	LOCK SHAFT
284	PSB1124F0284	FIXED HANDLE 3/8 X 5/16, 1/4-28 X 1/2
285	PSB1124F0285	SET SCREW 1/4-28 X 1/8
286	PSB1124F0286	CLAMP BOLT 1/2-13 X 6-1/4
287	PSB1124F0287	WORM SHAFT
288	PSB1124F0288	WOODRUFF KEY 1/8 X 5/8
289	PSB1124F0289	WORM GEAR
290	PSB1124F0290	FLAT COIL SPRING 0.6 X 25 X 1350
291	PSB1124F0291	RETURN SPRING COVER
292	PSB1124F0292	BUTTON HD CAP SCR 10-24 X 1/2
293	PSB1124F0293	PINION SHAFT HUB SLEEVE
294	PSB1124F0294	CAP SCREW 5/16-18 X 7/16
295	PSB1124F0295	HANDLE HUB
296	PSB1124F0296	LOCATING PIN 3/16 X 5/8
297	PSB1124F0297	SET SCREW 1/4-28 X 1/8
298	PSB1124F0298	STUD-DE 3/8-16 X 7-1/2, 3/8 BLK
299	PSB1124F0299	KNOB 3/8-16, D38, BALL
300	PSB1124F0300	FEED WORM GEAR SHAFT
301	PSB1124F0301	DOWEL PIN 5/16 X 7/8
302	PSB1124F0302	SET SCREW 10-24 X 1/4

Headstock Parts List (Cont.)

REF	PART #	DESCRIPTION
303	PSB1124F0303	SHIFT SLEEVE
304	PSB1124F0304	BUSHING
305	PSB1124F0305	ROLL PIN 2.5 X 12
306	PSB1124F0306	SHAFT WORM GEAR
307	PSB1124F0307	WORM BUSHING
308	PSB1124F0308	SPACER
309	PSB1124F0309	BUSHING
310	PSB1124F0310	FEED REVERSE BEVEL GEAR
311	PSB1124F0311	FEED REVERSE CLUTCH
312	PSB1124F0312	ROLL PIN 2.5 X 8
313	PSB1124F0313	WORM GEAR SHAFT
314	PSB1124F0314	KEY 1/8 X 1/8 X 3/8
315	PSB1124F0315	REVERSE CLUTCH ROD
316	PSB1124F0316	FEED TRIP BRACKET
317	PSB1124F0317	CAP SCREW 1/4-20 X 3/4
318	PSB1124F0318	CAM ROD
319	PSB1124F0319	ROLL PIN 5 X 20
320	PSB1124F0320	SET SCREW 5/16-24 X 3/16 SLOTTED
321	PSB1124F0321	COMPRESSION SPRING 0.4 X 4.8 X 8
322	PSB1124F0322	STEEL BALL 3/16
323	PSB1124F0323	HANDWHEEL CLUTCH
324	PSB1124F0324	HANDWHEEL TYPE-19 150D X 12B X 5/16-18
325	PSB1124F0325	FLANGED BUSHING
326	PSB1124F0326	THREADED INSERT 5/16-18 X 1/4
327	PSB1124F0327	FIXED HANDLE 7/8 X 2-3/4, 5/16-18 X 1/4
328	PSB1124F0328	E-CLIP 5MM
329	PSB1124F0329	KNURLED SLEEVE
330	PSB1124F0330	CAPTIVE PIN
331	PSB1124F0331	SPACER
332	PSB1124F0332	OIL CUP 1/8" PT 90-DEG
333	PSB1124F0333	COMPRESSION SPRING 1.2 X 9 X 17.3
334	PSB1124F0334	QUILL DEPTH SCALE
335	PSB1124F0335	PHLP HD SCR 8-32 X 3/16
336	PSB1124F0336	CAP SCREW 8-32 X 3/8
337	PSB1124F0337	RETAINING PLATE
338	PSB1124F0338	QUILL WASHER
339	PSB1124F0339	SPANNER NUT

REF	PART #	DESCRIPTION
340	PSB1124F0340	EXT TOOTH WASHER 30MM
341	PSB1124F0341	BALL BEARING 6206-2RS
342	PSB1124F0342	SLEEVE
343	PSB1124F0343	QUILL SKIRT
344	PSB1124F0344	QUILL
345	PSB1124F0345	SET SCREW 1/4-20 X 1/4 DOG-PT
346	PSB1124F0346	ANG CONTACT BEARING 7207C P4
347	PSB1124F0347	BEARING SPACER (SMALL)
348	PSB1124F0348	BEARING SPACER (LARGE)
349	PSB1124F0349	SPINDLE DIRT SHIELD
350	PSB1124F0350	QUILL END CAP
351	PSB1124F0351	SPINDLE R8
352	PSB1124F0352	SET SCREW 1/4-28 X 1/8 DOG-PT
353	PSB1124F0353	SET SCREW 1/4-28 X 1/4
354	PSB1124F0354	CAM ROD
355	PSB1124F0355	ROLL PIN 3/16 X 3/4
356	PSB1124F0356	CAM ROD SLEEVE
357	PSB1124F0357	ROLL PIN 3 X 14
358	PSB1124F0358	COMPRESSION SPRING 1.3 X 12 X 22
359	PSB1124F0359	TRIP PLUNGER
360	PSB1124F0360	FEED TRIP PLUNGER BUSHING
361	PSB1124F0361	TRIP PLUNGER BUSHING
362	PSB1124F0362	ROLL PIN 3 X 12
363	PSB1124F0363	INDICATOR BLOCK
364	PSB1124F0364	COMPRESSION SPRING 1.2 X 14.7 X 12.3
365	PSB1124F0365	QUILL PINION SHAFT
366	PSB1124F0366	QUILL MICRO STOP
367	PSB1124F0367	QUILL STOP KNOB
368	PSB1124F0368	QUILL MICRO STOP SHAFT
369	PSB1124F0369	EXT RETAINING RING 5/8
370	PSB1124F0370	FEED TRIP SHAFT
371	PSB1124F0371	TRIP PLATE
372	PSB1124F0372	SET SCREW 8-32 X 3/8
373	PSB1124F0373	FEED PIN 1/4-20
374	PSB1124F0374	SLOTTED THUMB SCREW 5/16-24 X 5/16
375	PSB1124F0375	FEED ROD
376	PSB1124F0376	FEED RETURN ROD

Column, Knee & Ram



Column, Knee & Ram Parts List

REF	PART #	DESCRIPTION
401	PSB1124F0401	ROLL PIN 8 X 25
402	PSB1124F0402	CAP SCREW 1/4-20 X 1
403	PSB1124F0403	QUILL HOUSING GEAR
404	PSB1124F0404	RAM ADAPTER
405	PSB1124F0405	EXT RETAINING RING 28MM
406	PSB1124F0406	HEAD TILT WORM SHAFT
407	PSB1124F0407	KEY 3/16 X 3/16 X 2
408	PSB1124F0408	WORM THRUST WASHER 18MM
409	PSB1124F0409	HEAD TILT WORM GEAR
410	PSB1124F0410	SET SCREW 10-32 X 3/16
411	PSB1124F0411	RAM
412	PSB1124F0412	CHAMFERED WASHER 13 X 22.2 X 3.2
413	PSB1124F0413	TILT LOCK BOLT 1/2-13 X 7-3/4
414	PSB1124F0414	PIVOT PIN 28.5 X 197
415	PSB1124F0415	SLEEVE
416	PSB1124F0416	RAM CLAMP (UNTAPPED)
417	PSB1124F0417	RAM CLAMP (TAPPED)
418	PSB1124F0418	RAM CLAMP BAR
419	PSB1124F0419	RIVET 4.7 X 50MM BLIND
420	PSB1124F0420	TURRET CLAMP BOLT 1/2-12 X 6
421	PSB1124F0421	RAM PINION SCREW
422	PSB1124F0422	TURRET
423	PSB1124F0423	RAM LOCK BOLT 5/8-11 X 5
424	PSB1124F0424	RAM PINION 13T
425	PSB1124F0425	TURRET BRACKET
426	PSB1124F0426	COLUMN
427	PSB1124F0427	CAP SCREW 3/8-16 X 1
428	PSB1124F0428	PEDESTAL
429	PSB1124F0429	VERTICAL LEADSCREW BEVEL NUT
430	PSB1124F0430	CAP SCREW 1/4-20 X 1
431	PSB1124F0431	REAR WAY COVER
432	PSB1124F0432	UPPER WAY COVER MOUNT
433	PSB1124F0433	LOWER WAY COVER MOUNT
434	PSB1124F0434	RIVET 5.5 X 3.2MM NAMEPLATE
435	PSB1124F0435	PHLP HD SCR 1/4-20 X 3/8
436	PSB1124F0436	VERTICAL LEADSCREW
437	PSB1124F0437	KEY 3/16 X 3/16 X 3/4
438	PSB1124F0438	CAP SCREW 1/4-20 X 3/8
439	PSB1124F0439	BEARING RETAINING RING
440	PSB1124F0440	BALL BEARING 6306-2RS
441	PSB1124F0441	BEVEL GEAR 36T
442	PSB1124F0442	FLAT WASHER 13.5 X 32 X 3MM
443	PSB1124F0443	HEX NUT 1/2-20
444	PSB1124F0444	KNEE LOCK SHAFT
445	PSB1124F0445	FIXED HANDLE 5/16 X 4-5/8, 5/16-18 X 4
446	PSB1124F0446	INT RETAINING RING 47MM
447	PSB1124F0447	BALL BEARING 63204-2RS
448	PSB1124F0448	BEARING RETAINING RING
449	PSB1124F0449	CAP SCREW 1/4-20 X 5/8
450	PSB1124F0450	VERTICAL INDEX RING
451	PSB1124F0451	BUSHING
452	PSB1124F0452	LOCK RING
453	PSB1124F0453	GEARSHAFT CLUTCH INSERT
454	PSB1124F0454	VERTICAL CRANK
455	PSB1124F0455	REV HANDLE 1 X 3-3/4, 7/16-14 X 5/16
456	PSB1124F0456	WOODRUFF KEY 1/8 X 3/4
457	PSB1124F0457	VERTICAL CRANK SHAFT
458	PSB1124F0458	BEVEL PINION GEAR
459	PSB1124F0459	SET SCREW 1/4-20 X 1/4
460	PSB1124F0460	GIB SCREW 1/4-20 X 1/4
461	PSB1124F0461	KNEE GIB
462	PSB1124F0462	KNEE
463	PSB1124F0463	KNEE WIPER
464	PSB1124F0464	WIPER HOLDER (RIGHT)
465	PSB1124F0465	PHLP HD SCR 1/4-20 X 1/2
466	PSB1124F0466	WIPER HOLDER (LEFT)
467	PSB1124F0467	HANDLE HUB
468	PSB1124F0468	FIXED HANDLE 7/8 X 2-3/4, 5/16-18 X 1/4
469	PSB1124F0469	TABLE GIB
470	PSB1124F0470	LOCK PLUNGER
471	PSB1124F0471	LOCK PLUNGER CAP
472	PSB1124F0472	SET SCREW 5/16-18 X 3/16 DOG-PT
473	PSB1124F0473	COLUMN COVER
474	PSB1124F0474	FLAT WASHER 1/4
475	PSB1124F0475	BUTTON HD CAP SCR 1/4-20 X 3/8
476	PSB1124F0476	LOWER CHIP GUARD
477	PSB1124F0477	UPPER CHIP GUARD
478	PSB1124F0478	FELT WIPER
479	PSB1124F0479	WAY WIPER PLATE
480	PSB1124F0480	PHLP HD SCR 10-24 X 1/2
481	PSB1124F0481	FELT WIPER
482	PSB1124F0482	SADDLE
483	PSB1124F0483	LOCK PLUNGER
484	PSB1124F0484	FRONT WAY COVER
485	PSB1124F0485	FRONT WAY COVER MOUNT
486	PSB1124F0486	REAR WAY COVER MOUNT
487	PSB1124F0487	RIVET 5.5 X 3.2MM NAMEPLATE
488	PSB1124F0488	SADDLE GIB
489	PSB1124F0489	RIVET 2.5 X 5MM BLIND
490	PSB1124F0490	POWER FEED LIMIT SWITCH
491	PSB1124F0491	CAP SCREW 3/8-16 X 1/2
492	PSB1124F0492	SADDLE LOCK PLUNGER
493	PSB1124F0493	EXT RETAINING RING 20MM
494	PSB1124F0494	SCREEN
495	PSB1124F0495	LOCK PLUNGER
496	PSB1124F0496	LOCK PLUNGER
497	PSB1124F0497	LOCK PLUNGER
498	PSB1124F0498	STOP SEAT
499	PSB1124F0499	CAP SCREW 10-24 X 1/2
500	PSB1124F0500	STOP PIN
501	PSB1124F0501	SET SCREW M5-.8 X 6 BALL-PT
502	PSB1124F0502	RAM ROTATION SCALE

Column, Knee & Ram Parts List (Cont.)

REF	PART #	DESCRIPTION
503	PSB1124F0503	HEAD TILT SCALE
504	PSB1124F0504	RAM TRAVEL SCALE
505	PSB1124F0505	EYE BOLT 1-1/2, 3/4-10 X 1-3/16
506	PSB1124F0506	L-BRACKET 2 X 3-1/2 X 3-1/2
507	PSB1124F0507	FLAT WASHER 6MM
508	PSB1124F0508	LOCK WASHER 6MM
509	PSB1124F0509	CAP SCREW M6-1 X 25
510	PSB1124F0510	SPACER 6.5 X 32 X 10
511	PSB1124F0511	SPACER 6.5 X 32 X 15
512	PSB1124F0512	SCALE MOUNTING ARM
513	PSB1124F0513	SET SCREW M6-1 X 12 DOG-PT
514	PSB1124F0514	SHOULDER SCREW M6-1 X 24, 8 X 21
515	PSB1124F0515	DRO Z-AXIS SCALE FAGOR MKT-47 22-3/4"
516	PSB1124F0516	FLAT WASHER 4MM
517	PSB1124F0517	CAP SCREW M4-.7 X 20
518	PSB1124F0518	CAP SCREW M4-.7 X 14
519	PSB1124F0519	FLAT WASHER 4MM
520	PSB1124F0520	Z-AXIS SCALE COVER
521	PSB1124F0521	LOCK WASHER 6MM
522	PSB1124F0522	L-BRACKET 2 X 4-3/4 X 3-1/2
523	PSB1124F0523	CAP SCREW M6-1 X 18
524	PSB1124F0524	FLAT WASHER 6MM
525	PSB1124F0525	L-BRACKET 2 X 2 X 3-1/2
526	PSB1124F0526	L-BRACKET 2 X 3-1/2 X 3-1/2
527	PSB1124F0527	LOCK WASHER 6MM
528	PSB1124F0528	FLAT WASHER 6MM
529	PSB1124F0529	CAP SCREW M6-1 X 20
530	PSB1124F0530	CAP SCREW M4-.7 X 8
531	PSB1124F0531	FLAT WASHER 4MM
532	PSB1124F0532	Y-AXIS SCALE COVER
533	PSB1124F0533	DRO Y-AXIS SCALE FAGOR MKT-37 18-3/4"
534	PSB1124F0534	CAP SCREW M4-.7 X 20
535	PSB1124F0535	FLAT WASHER 4MM

REF	PART #	DESCRIPTION
536	PSB1124F0536	FLAT WASHER 6MM
537	PSB1124F0537	LOCK WASHER 6MM
538	PSB1124F0538	CAP SCREW M6-1 X 20
539	PSB1124F0539	FLAT WASHER 4MM
540	PSB1124F0540	LOCK WASHER 4MM
541	PSB1124F0541	CAP SCREW M4-.7 X 16
542	PSB1124F0542	L-BRACKET 2 X 2 X 3-1/2
543	PSB1124F0543	DRO DISPLAY FAGOR 30iM
544	PSB1124F0544	ACORN NUT M14-2
545	PSB1124F0545	FLAT WASHER 14MM
546	PSB1124F0546	LOCK WASHER 14MM
547	PSB1124F0547	DRO SWING ARM MOUNT
548	PSB1124F0548	FLAT WASHER 14MM THIN
549	PSB1124F0549	SHOULDER SCREW M14-2 X 35, 14 X 44
550	PSB1124F0550	LOCK WASHER 1/4
551	PSB1124F0551	CAP SCREW 1/4-28 X 1
552	PSB1124F0552	FLAT WASHER 1/4
553	PSB1124F0553	SHOULDER SCREW 1/4-28 X 1, 1/4 X 1-3/4
554	PSB1124F0554	FLAT WASHER 1/4
555	PSB1124F0555	FLAT WASHER 4MM
556	PSB1124F0556	WIRE CLIP 3/8"
557	PSB1124F0557	CAP SCREW M4-.7 X 8
558	PSB1124F0558	DRO SWING ARM
559	PSB1124F0559	SPACER
560	PSB1124F0560	DRO MOUNT
561	PSB1124F0561	DRO SCALE CORD X-AXIS 6-1/2'
562	PSB1124F0562	DRO SCALE CORD Y-AXIS 8'
563	PSB1124F0563	DRO SCALE CORD Z-AXIS 9'
564	PSB1124F0564	DRO SCALE CORD CONDUIT X-AXIS 6-1/2'
565	PSB1124F0565	DRO SCALE CORD CONDUIT Y-AXIS 8'
566	PSB1124F0566	DRO SCALE CORD CONDUIT Z-AXIS 9'
567	PSB1124F0567	DRO POWER CORD 18G 3W 120" 5-15P
568	PSB1124F0568	MOUNTING PLATE

Table

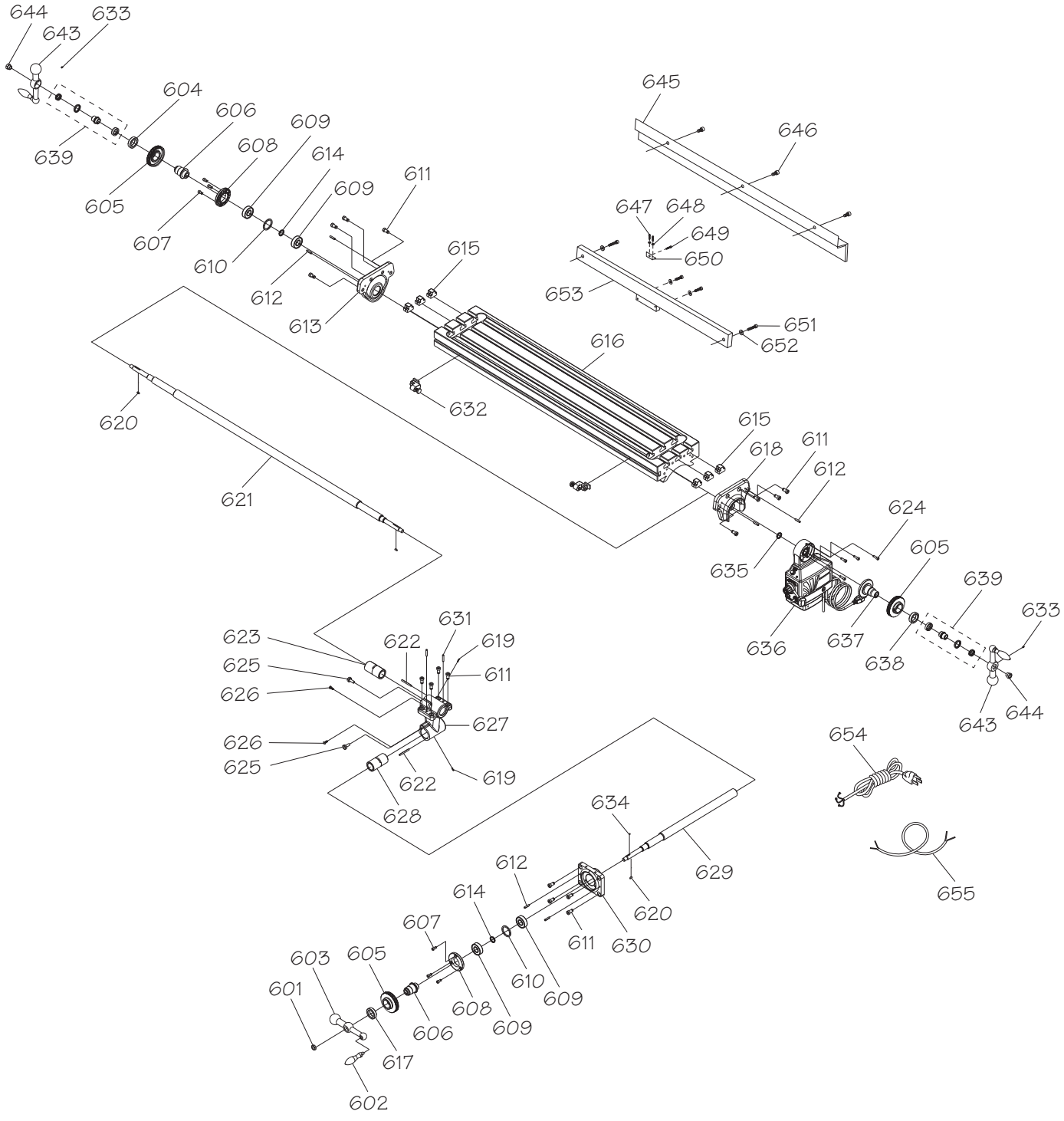

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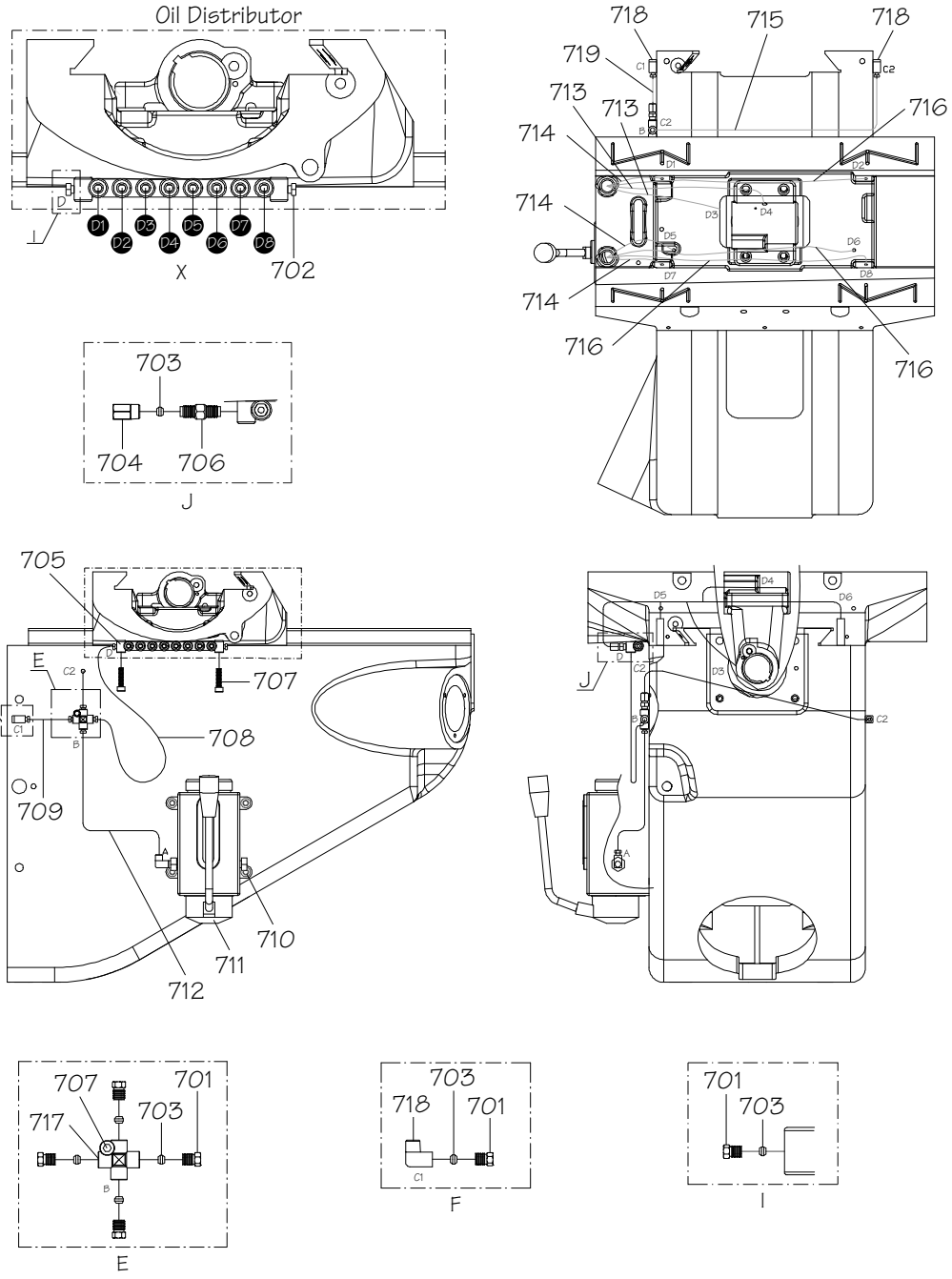
Table Parts List

REF	PART #	DESCRIPTION
601	PSB1124F0601	HEX NUT 1/2-20
602	PSB1124F0602	REV HANDLE 1 X 3-3/4, 3/8-16 X 5/16
603	PSB1124F0603	BALL HANDLE
604	PSB1124F0604	DIAL LOCK NUT
605	PSB1124F0605	X-AXIS GRADUATED DIAL
606	PSB1124F0606	DIAL RETAINER SHAFT
607	PSB1124F0607	CAP SCREW 1/4-20 X 1/2
608	PSB1124F0608	BEARING RETAINING RING
609	PSB1124F0609	BALL BEARING 6204-2RS
610	PSB1124F0610	SPACER
611	PSB1124F0611	CAP SCREW 3/8-16 X 1
612	PSB1124F0612	ROLL PIN 5 X 25
613	PSB1124F0613	BEARING BRACKET
614	PSB1124F0614	SPACER
615	PSB1124F0615	TABLE T-SLOT PLUG
616	PSB1124F0616	TABLE
617	PSB1124F0617	DIAL LOCK NUT
618	PSB1124F0618	BEARING BRACKET
619	PSB1124F0619	ROLL PIN 2.5 X 10
620	PSB1124F0620	WOODRUFF KEY 1/8 X 3/4
621	PSB1124F0621	LONGITUDINAL LEADSCREW
622	PSB1124F0622	KEY 3/16 X 3/16 X 2-1/2
623	PSB1124F0623	LONGITUDINAL FEED NUT
624	PSB1124F0624	CAP SCREW M6-1 X 20
625	PSB1124F0625	CROSS FEED SCREW 5/16-18 X 7/8
626	PSB1124F0626	PHLP HD SCR 10-24 X 5/8
627	PSB1124F0627	LEADSCREW NUT BRACKET
628	PSB1124F0628	CROSS FEED NUT
629	PSB1124F0629	CROSS FEED LEADSCREW
630	PSB1124F0630	CROSS FEED BEARING BRACKET
631	PSB1124F0631	ROLL PIN 5 X 30
632	PSB1124F0632	TRAVEL STOP
633	PSB1124F0633	SET SCREW M4-.7 X 5
634	PSB1124F0634	KEY 3 X 3 X 9
635	PSB1124F0635	SPACER
636	PSB1124F0636	POWER FEED ALIGN AL-500D
637	PSB1124F0637	BEVEL GEAR
638	PSB1124F0638	BEVEL GEAR NUT 1/4-20
639	PSB1124F0639	TABLE BALL HANDLE CLUTCH ASSY
643	PSB1124F0643	BALL HANDLE
644	PSB1124F0644	HEX NUT 1/2-20
645	PSB1124F0645	X-AXIS SCALE COVER
646	PSB1124F0646	CAP SCREW M6-1 X 12
647	PSB1124F0647	CAP SCREW M3-.5 X 6
648	PSB1124F0648	FLAT WASHER 3MM
649	PSB1124F0649	CAP SCREW M4-.7 X 8
650	PSB1124F0650	SCALE SUPPORT BRACKET
651	PSB1124F0651	CAP SCREW M4-.7 X 20
652	PSB1124F0652	FLAT WASHER 4MM
653	PSB1124F0653	DRO X-AXIS SCALE FAGOR MKT-82 36-1/2"
654	PSB1124F0654	POWER FEED POWER CORD 18G 3W 96" 5-15P
655	PSB1124F0655	LIMIT SWITCH CORD 18G 3W 48"

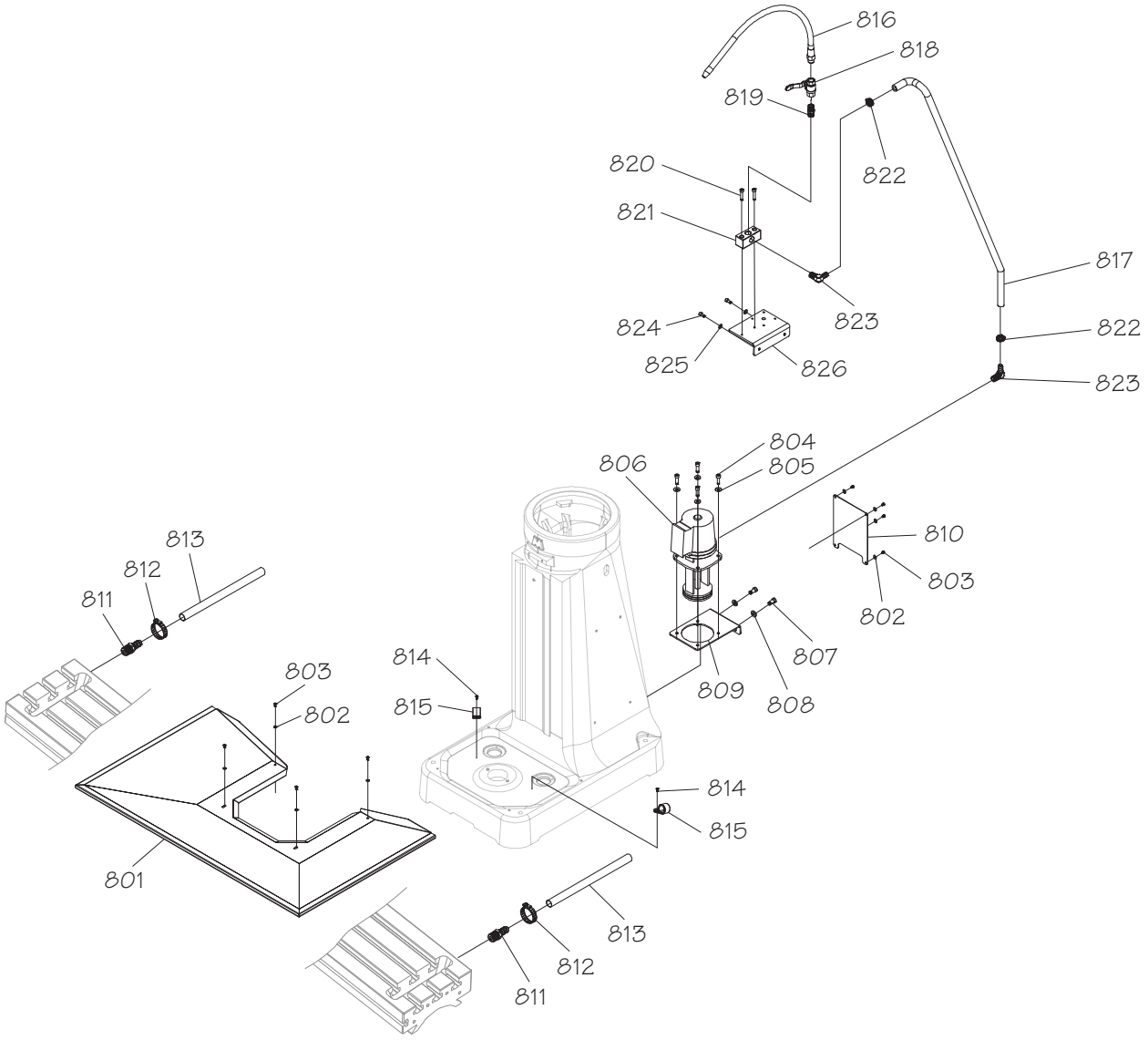
One Shot Oiler



REF	PART #	DESCRIPTION
701	PSB1124F0701	HOSE NUT M8-1
702	PSB1124F0702	PLUG M8-1
703	PSB1124F0703	SLEEVE 4MM
704	PSB1124F0704	ELBOW ADAPTER M8-1
705	PSB1124F0705	OIL MANIFOLD 8-PORT
706	PSB1124F0706	OIL FITTING M8-1 X 10
707	PSB1124F0707	CAP SCREW M6-1 X 35
708	PSB1124F0708	WIRE MESH TUBE 4 X 550MM
709	PSB1124F0709	NYLON TUBE 4 X 70MM
710	PSB1124F0710	CAP SCREW M6-1 X 6

REF	PART #	DESCRIPTION
711	PSB1124F0711	ONE-SHOT OILER ASSEMBLY ISHAN YML-8
712	PSB1124F0712	NYLON TUBE 4 X 310MM
713	PSB1124F0713	NYLON TUBE 4 X 320MM
714	PSB1124F0714	NYLON TUBE 4 X 200MM
715	PSB1124F0715	NYLON TUBE 4 X 440MM
716	PSB1124F0716	NYLON TUBE 4 X 470MM
717	PSB1124F0717	OIL DISTRIBUTOR 4-PORT
718	PSB1124F0718	ELBOW ADAPTER 90-DEG M8-1 X 1/8" PT
719	PSB1124F0719	NYLON TUBE 4 X 185MM

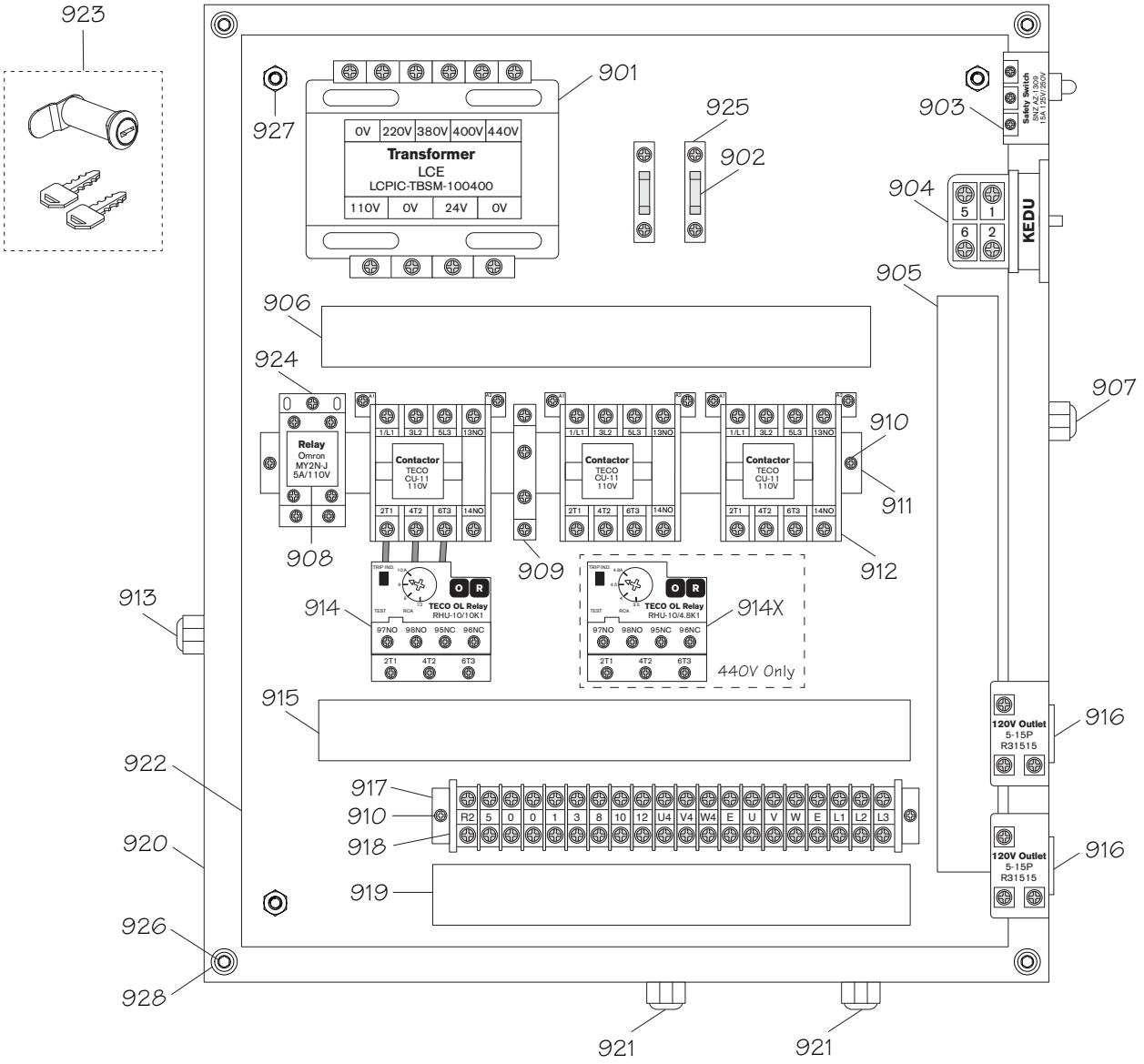
Coolant System



REF	PART #	DESCRIPTION
801	PSB1124F0801	TRAY
802	PSB1124F0802	FLAT WASHER 6MM
803	PSB1124F0803	CAP SCREW M6-1 X 16
804	PSB1124F0804	CAP SCREW M6-1 X 16
805	PSB1124F0805	FLAT WASHER 6MM
806	PSB1124F0806	COOLANT PUMP 1/8HP 220V/440V 3-PH
807	PSB1124F0807	CAP SCREW 3/8-16 X 3/4
808	PSB1124F0808	FLAT WASHER 3/8
809	PSB1124F0809	COOLANT PUMP MOUNTING PLATE
810	PSB1124F0810	COOLANT PUMP ACCESS COVER
811	PSB1124F0811	ADAPTER 1/2" X 1/2" BARBED
812	PSB1124F0812	HOSE CLAMP 3/4"
813	PSB1124F0813	HOSE 1/2" X 55"

REF	PART #	DESCRIPTION
814	PSB1124F0814	PHLP HD SCR 10-24 X 1/2
815	PSB1124F0815	HOSE CLAMP 3/4"
816	PSB1124F0816	COOLANT NOZZLE 3/8" X 24"
817	PSB1124F0817	HOSE 1/2" X 48"
818	PSB1124F0818	BALL VALVE 3/8"
819	PSB1124F0819	STRAIGHT CONNECTOR 3/8" X 3/8"
820	PSB1124F0820	CAP SCREW M6-1 X 30
821	PSB1124F0821	MANIFOLD BLOCK
822	PSB1124F0822	HOSE CLAMP 3/4"
823	PSB1124F0823	ADAPTER 3/8" X 1/2" 90-DEG
824	PSB1124F0824	CAP SCREW M6-1 X 16
825	PSB1124F0825	FLAT WASHER 6MM
826	PSB1124F0826	MOUNTING PLATE

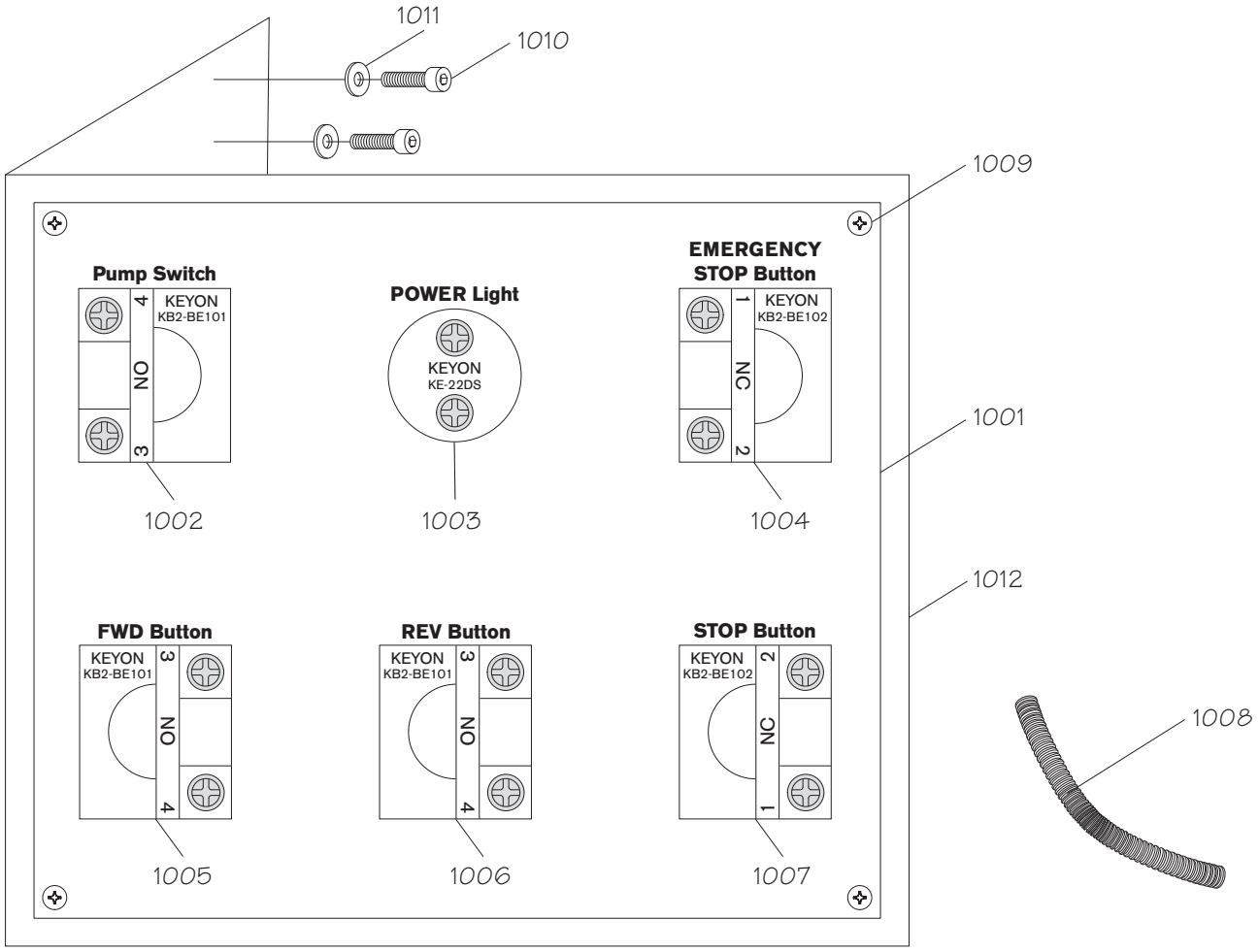
Electrical Cabinet



REF	PART #	DESCRIPTION
901	PSB1124F0901	TRANSFORMER LCE LCPIC-TBSM-100400
902	PSB1124F0902	FUSE 5A 250V 0.25" FAST-ACTING, GLASS
903	PSB1124F0903	SAFETY SWITCH SNZ AZ-1309 15A 125V/250V
904	PSB1124F0904	MASTER POWER SWITCH KEDU ZH-HD-2
905	PSB1124F0905	WIRE LOOM 10-1/4"
906	PSB1124F0906	WIRE LOOM 9"
907	PSB1124F0907	STRAIN RELIEF TYPE-3 PG11A
908	PSB1124F0908	RELAY OMRON MY2N-J 5A 110V
909	PSB1124F0909	AUXILIARY CONTACT BLOCK TECO CNI-18
910	PSB1124F0910	FLANGE SCREW M4-.7 X 10
911	PSB1124F0911	DIN RAIL 8-1/2"
912	PSB1124F0912	CONTACTOR TECO CU-11 110V
913	PSB1124F0913	STRAIN RELIEF TYPE-8 90° KNURLED 3/8"
914	PSB1124F0914	OL RELAY TECO RHU-10/K1 7.2-10A
914X	PSB1124F0914X	OL RELAY TECO RHU-4.8K1 3.5-4.8A

REF	PART #	DESCRIPTION
915	PSB1124F0915	WIRE LOOM 8"
916	PSB1124F0916	ELECTRICAL OUTLET 120V R31515
917	PSB1124F0917	DIN RAIL 10"
918	PSB1124F0918	TERMINAL BAR 20P
919	PSB1124F0919	WIRE LOOM 9"
920	PSB1124F0920	ELECTRICAL CABINET W/DOOR
921	PSB1124F0921	STRAIN RELIEF TYPE-3 M20-1.5
922	PSB1124F0922	BACK PLATE
923	PSB1124F0923	ELECTRICAL CABINET LOCK W/KEYS
924	PSB1124F0924	RELAY LB2HN
925	PSB1124F0925	FUSE HOLDER
926	PSB1124F0926	CAP SCREW 1/4-28 X 5/8
927	PSB1124F0927	HEX NUT M8-1.25
928	PSB1124F0928	FLAT WASHER 1/4

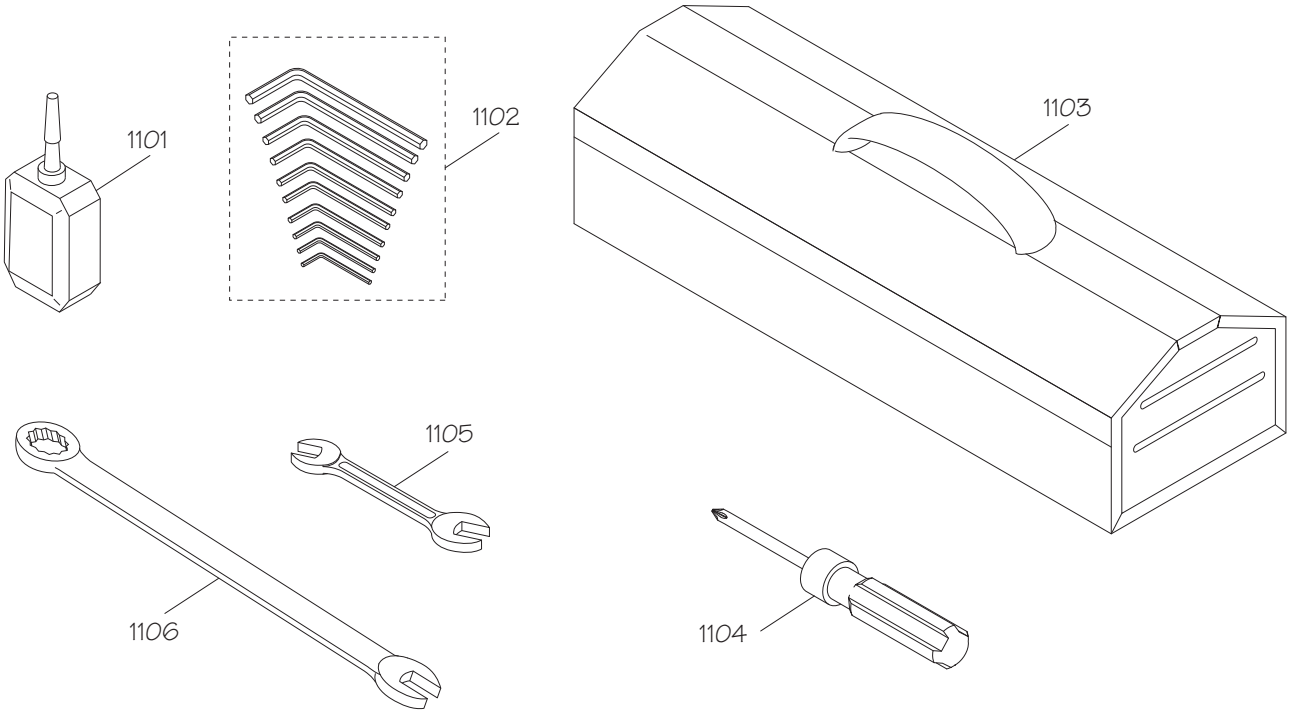
Control Box



REF	PART #	DESCRIPTION
1001	PSB1124F1001	CONTROL PANEL
1002	PSB1124F1002	COOLANT PUMP SWITCH KEYON KB2-BE101
1003	PSB1124F1003	POWER LIGHT KEYON KE-22DS
1004	PSB1124F1004	E-STOP BUTTON KEYON KB2-BE102
1005	PSB1124F1005	FWD BUTTON KEYON KB2-BE101
1006	PSB1124F1006	REV BUTTON KEYON KB2-BE101

REF	PART #	DESCRIPTION
1007	PSB1124F1007	STOP BUTTON KEYON KB2-BE102
1008	PSB1124F1008	CONTROL BOX CONDUIT
1009	PSB1124F1009	PHLP HD SCR M4-.7 X 6
1010	PSB1124F1010	CAP SCREW M6-1 X 16
1011	PSB1124F1011	FLAT WASHER 6MM
1012	PSB1124F1012	CONTROL BOX

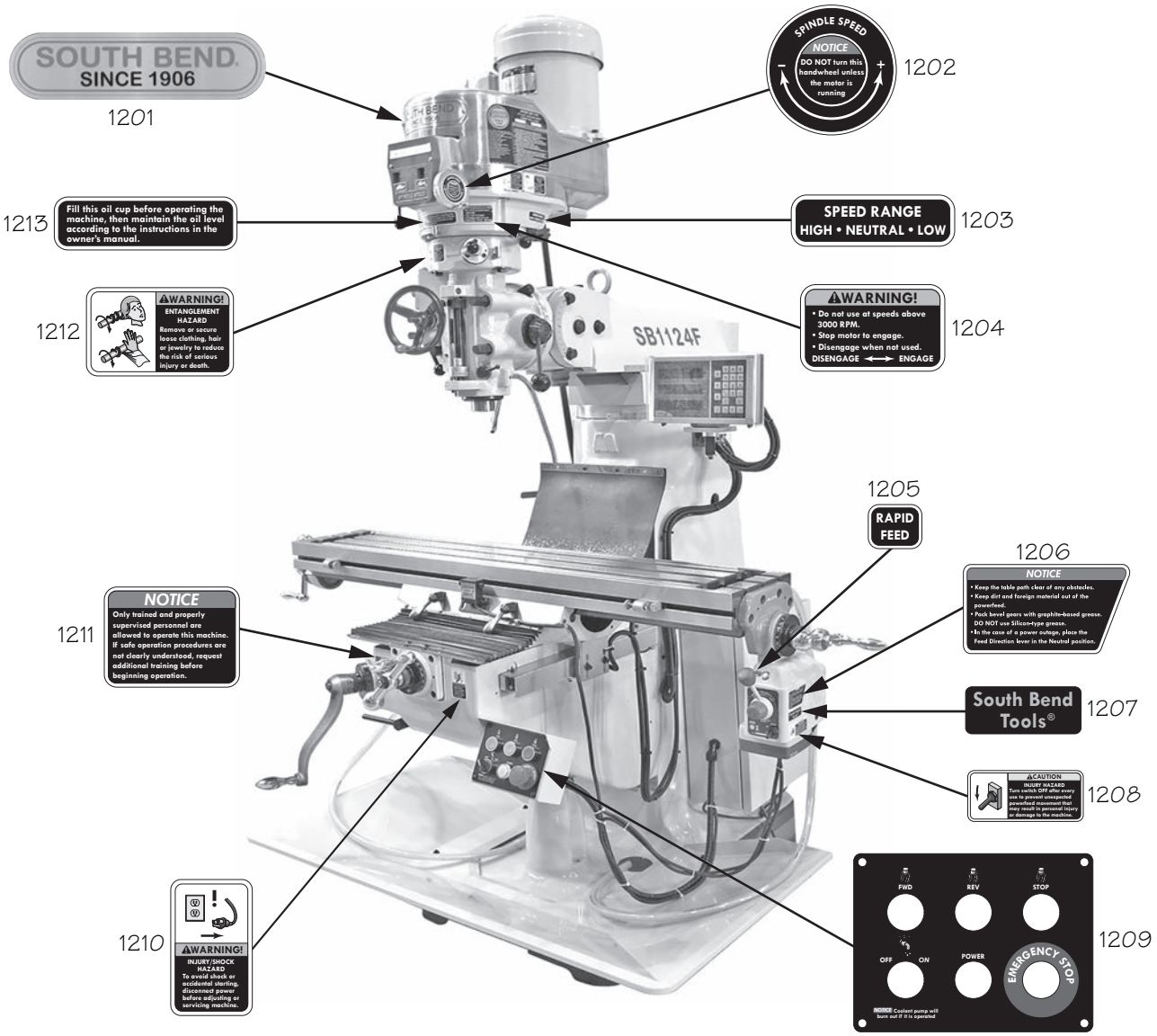
Accessories



REF	PART #	DESCRIPTION
1101	PSB1124F1101	BOTTLE FOR OIL
1102	PSB1124F1102	HEX WRENCH SET 1.5-10MM
1103	PSB1124F1103	TOOLBOX

REF	PART #	DESCRIPTION
1104	PSB1124F1104	COMBO SCREWDRIVER
1105	PSB1124F1105	WRENCH 10 X 12MM OPEN-ENDS
1106	PSB1124F1106	WRENCH 19MM COMBO

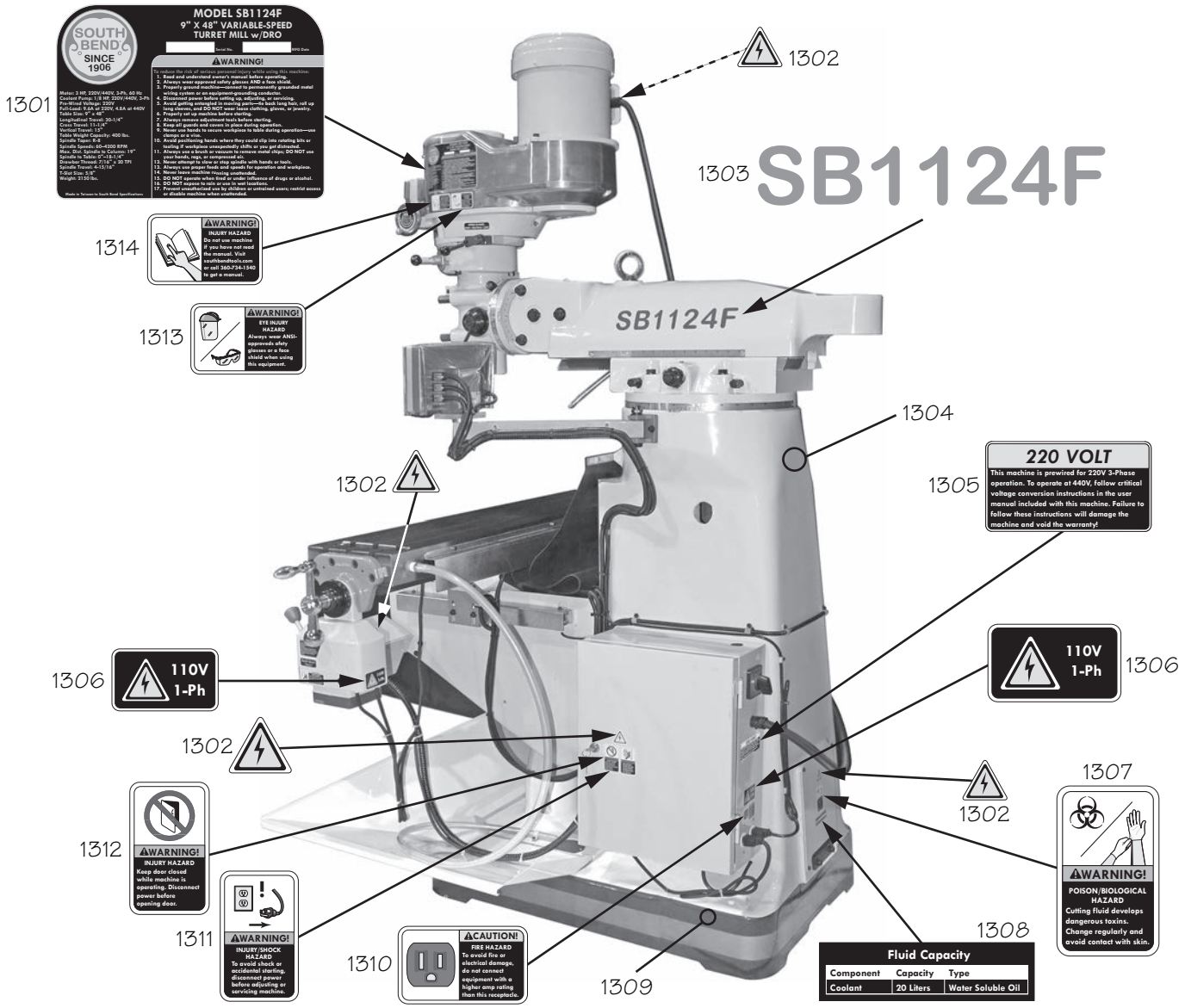
Machine Labels (Front)



REF	PART #	DESCRIPTION
1201	PSB1124F1201	SOUTH BEND NAMEPLATE
1202	PSB1124F1202	SPINDLE SPEED LABEL
1203	PSB1124F1203	SPEED RANGE LABEL
1204	PSB1124F1204	DOWNFEED WARNING LABEL
1205	PSB1124F1205	RAPID FEED LABEL
1206	PSB1124F1206	POWER FEED NOTICE LABEL
1207	PSB1124F1207	SOUTH BEND TOOLS LABEL

REF	PART #	DESCRIPTION
1208	PSB1124F1208	POWER FEED ON/OFF LABEL
1209	PSB1124F1209	CONTROL PANEL LABEL
1210	PSB1124F1210	DISCONNECT POWER LABEL
1211	PSB1124F1211	TRAINED PERSONNEL LABEL
1212	PSB1124F1212	ENTANGLEMENT HAZARD LABEL
1213	PSB1124F1213	OIL CUP LABEL

Machine Labels (Side)



REF	PART #	DESCRIPTION
1301	PSB1124F1301	MACHINE ID LABEL
1302	PSB1124F1302	ELECTRICITY LABEL
1303	PSB1124F1303	MODEL NUMBER LABEL
1304	PSB1124F1304	TOUCH-UP PAINT, SOUTH BEND GREY
1305	PSB1124F1305	PREWIRED 220V LABEL
1306	PSB1124F1306	110V LABEL
1307	PSB1124F1307	POISON HAZARD LABEL

REF	PART #	DESCRIPTION
1308	PSB1124F1308	FLUID CAPACITY LABEL
1309	PSB1124F1309	TOUCH-UP PAINT, SOUTH BEND DARK BLUE
1310	PSB1124F1310	FIRE HAZARD LABEL
1311	PSB1124F1311	DISCONNECT POWER LABEL
1312	PSB1124F1312	KEEP DOOR CLOSED LABEL
1313	PSB1124F1313	FACE SHIELD/GLASSES LABEL
1314	PSB1124F1314	READ MANUAL LABEL

Warranty

This quality product is warranted by South Bend Tools to the original buyer for **2 years** from the date of purchase. This warranty does not apply to consumable parts, or defects due to any kind of misuse, abuse, negligence, accidents, repairs, alterations or lack of maintenance. We do not reimburse for third party repairs. In no event shall we be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our products.

We do not warrant or represent that this machine complies with the provisions of any law, act, code, regulation, or standard of any domestic or foreign government, industry, or authority. In no event shall South Bend's liability under this warranty exceed the original purchase price paid for this machine. Any legal actions brought against South Bend Tools shall be tried in the State of Washington, County of Whatcom.

This is the sole written warranty for this machine. Any and all warranties that may be implied by law, including any merchantability or fitness, for any purpose, are hereby limited to the duration of this warranty.

Thank you for your business and continued support.

To take advantage of this warranty, register at **https://www.grizzly.com/forms/warranty**, or you can scan the QR code below to be automatically directed to our warranty registration page. Enter all applicable information for the product.

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