

Grizzly **Industrial, Inc.**®

MODEL G0740 **14" X 40" HIGH-PRECISION** **TOOLROOM LATHE** **OWNER'S MANUAL** *(For models manufactured since 11/12)*



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 **WARNING!**

This manual provides critical safety instructions on the proper setup, operation, maintenance, and service of this machine/tool. Save this document, refer to it often, and use it to instruct other operators.

Failure to read, understand and follow the instructions in this manual may result in fire or serious personal injury—including amputation, electrocution, or death.

The owner of this machine/tool is solely responsible for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training and usage authorization, proper inspection and maintenance, manual availability and comprehension, application of safety devices, cutting/sanding/grinding tool integrity, and the usage of personal protective equipment.

The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

 **WARNING!**

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- **Lead from lead-based paints.**
- **Crystalline silica from bricks, cement and other masonry products.**
- **Arsenic and chromium from chemically-treated lumber.**

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: Work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

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INTRODUCTION

Machine Description

The Model G0740 metal lathe is used to remove material from a rotating workpiece, which is held in place on the spindle with a chuck or faceplate. The cutting tool is mounted on the carriage or tailstock and moved against the spinning workpiece to perform the cut.

This lathe has 16 available spindle speeds and powered feed for the carriage and cross slide. The use of the cutting fluid system and spindle brake is optional.

Typical cutting operations for a metal lathe include facing, turning, parting, drilling, reaming, grooving, knurling, and threading. There are a wide variety of tools and workpiece holding devices available for each of these operations.

Contact Info

We stand behind our machines. If you have any questions or need help, use the information below to contact us. Before contacting, please get the serial number and manufacture date of your machine. This will help us help you faster.

Grizzly Technical Support
1203 Lycoming Mall Circle
Muncy, PA 17756
Phone: (570) 546-9663
Email: techsupport@grizzly.com

We want your feedback on this manual. What did you like about it? Where could it be improved? Please take a few minutes to give us feedback.

Grizzly Documentation Manager
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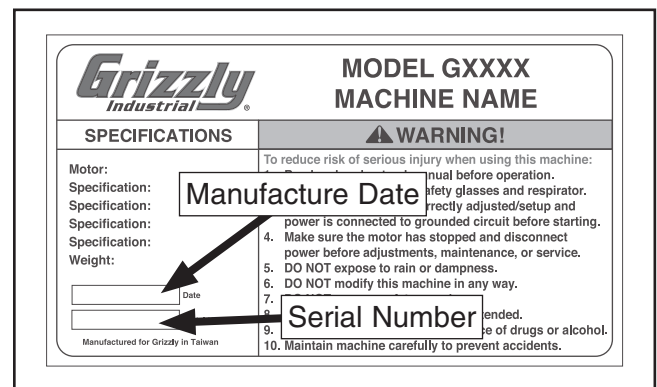
Manual Accuracy

We are proud to provide a high-quality owner's manual with your new machine!

We made every effort to be exact with the instructions, specifications, drawings, and photographs contained inside. Sometimes we make mistakes, but our policy of continuous improvement also means that **sometimes the machine you receive will be slightly different than what is shown in the manual.**

If you find this to be the case, and the difference between the manual and machine leaves you confused about a procedure, check our website for an updated version. We post current manuals and manual updates for free on our website at www.grizzly.com.

Alternatively, you can call our Technical Support for help. Before calling, please write down the **Manufacture Date** and **Serial Number** stamped into the machine ID label (see below). This information helps us determine if updated documentation is available for your machine.



Identification

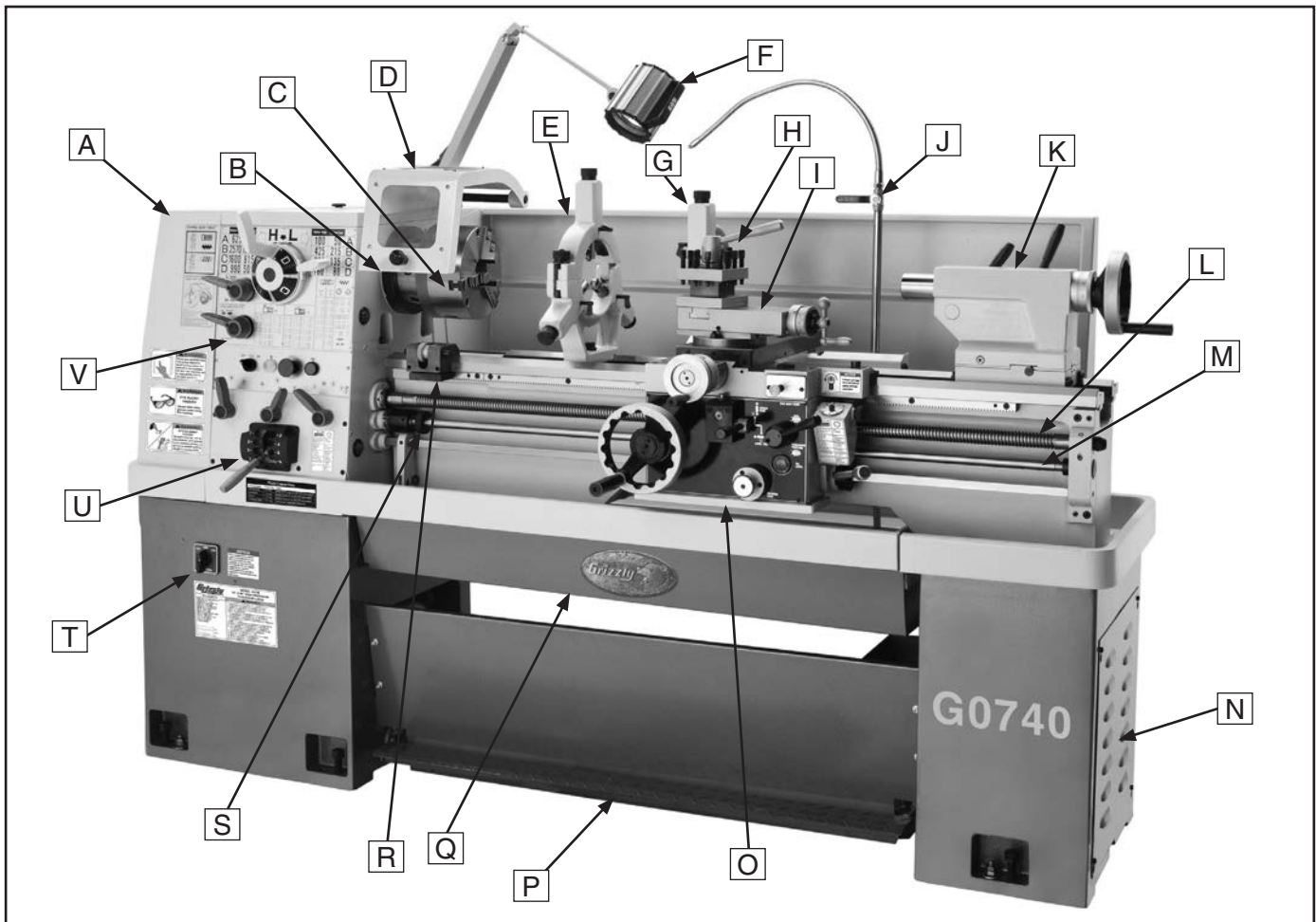


Figure 1. Identification.

- | | |
|--|--|
| <ul style="list-style-type: none"> A. Headstock B. D1-5 Camlock MT#5 Spindle C. 3-Jaw Chuck 8" D. Chuck Guard w/Safety Switch E. Steady Rest F. Halogen Work Lamp G. Follow Rest H. 4-Way Tool Post I. Compound Rest J. Coolant Nozzle & Valve K. Tailstock (see Page 7 for details) | <ul style="list-style-type: none"> L. Longitudinal Leadscrew M. Feed Rod N. Coolant Reservoir & Pump Access O. Carriage (see Page 6 for details) P. Safety Foot Brake Q. Chip Drawer R. Micrometer Stop S. Stop Collar T. Two-Speed Motor Switch U. Quick-Change Gearbox V. Headstock Controls (see Page 5 for details) |
|--|--|

!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.

!WARNING

Untrained users have an increased risk of seriously injuring themselves with this machine. Do not operate this machine until you have understood this entire manual and received proper training.



Controls & Components

Refer to **Figures 2–6** and the following descriptions to become familiar with the basic controls of this lathe.

Two-Speed Motor Switch

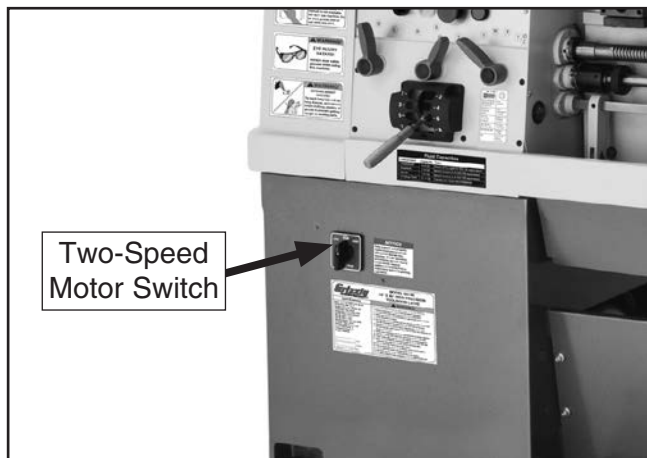


Figure 2. Location of the two-speed motor switch.

The two-speed motor switch has three positions:

- Low (left position), enables speeds in the *right* headstock spindle speed chart
- OFF (middle position)
- High (right position), enables speeds in the *left* headstock spindle speed chart

Headstock

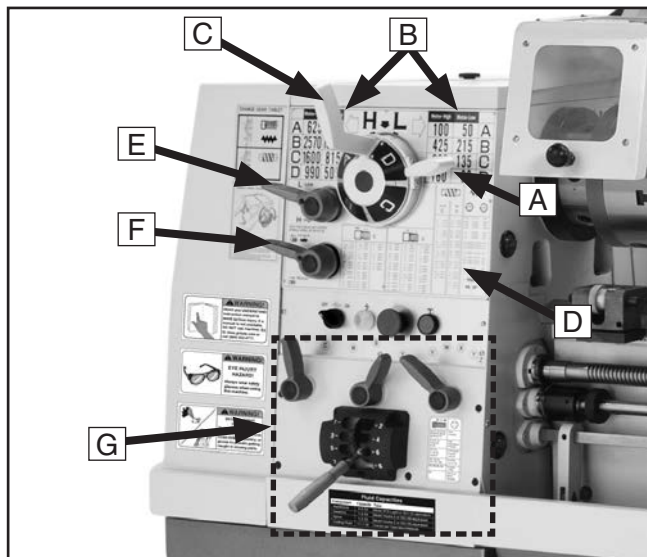


Figure 3. Headstock controls.

- A. Spindle Range Lever:** Selects the speed range on the left (high) or right (low) spindle speed chart to be active.
- B. Spindle Speed Charts:** Display the arrangement of the spindle range and spindle speed levers for each of the 16 spindle speeds. The two-speed motor switch enables the available speeds from the high or low spindle speed chart.
- C. Spindle Speed Lever:** Selects one of the four available spindle speeds within the selected speed range.
- D. Threading and Feed Charts:** Displays the necessary configuration of the gearbox levers and end gears for different threading or feeding options.
- E. Gearbox Range Lever:** Shifts the quick-change gearbox into low range, neutral, or high range.
- F. Headstock Feed Direction Lever:** Controls the direction that the leadscrew and feed rod rotate.
- G. Quick-Change Gearbox Levers:** Control the leadscrew and feed rod speed for threading and feed operations.



Control Panel

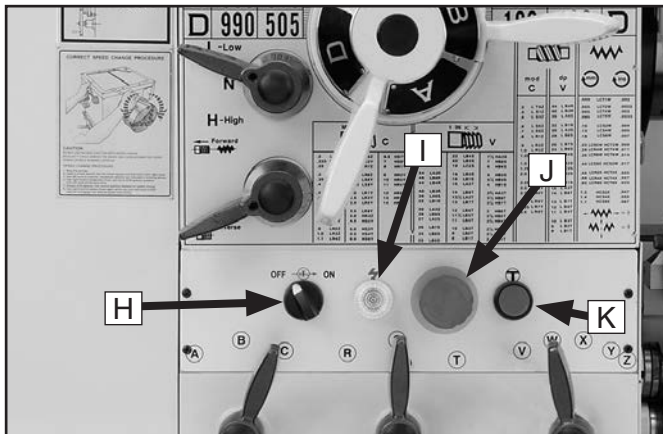


Figure 4. Control panel.

- H. **Coolant Pump Switch:** Controls the coolant pump motor.
- I. **Power Light:** Illuminates when lathe controls are receiving power.
- J. **STOP Button:** Stops all machine functions. Twist clockwise to reset.
- K. **Jog Button:** Starts forward spindle rotation as long as it is pressed.

Carriage

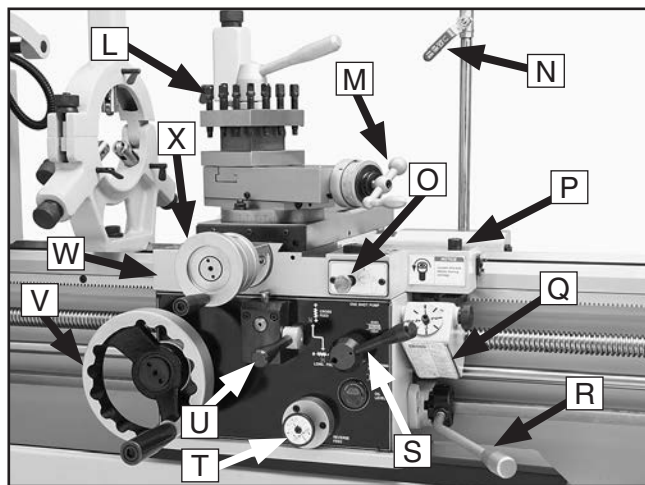


Figure 5. Carriage controls.

- L. **4-Way Tool Post:** Mounts up to four cutting tools at once that can be individually indexed to the workpiece.
- M. **Compound Rest Handwheel:** Moves the tool toward and away from the workpiece at the preset angle of the compound rest.

- N. **Coolant Flow Control Lever:** Controls the flow of coolant from the nozzle.
- O. **One-Shot Oiler:** Draws oil from the apron reservoir to lubricate the carriage ways through various oil ports.
- P. **Carriage Lock:** Secures the carriage in place for greater rigidity when it should not move.
- Q. **Thread Dial and Chart:** Dial indicates when to engage the half nut during threading operations. Chart indicates on which thread dial reading to engage the half nut for specific inch thread pitches.
- R. **Spindle Lever:** Starts, stops and reverses direction of spindle rotation.
- S. **Half Nut Lever:** Engages/disengages the half nut for threading operations.
- T. **Apron Feed Direction Knob:** Changes direction of the carriage or the cross slide feed without having to stop the lathe and move the headstock feed direction lever.
- U. **Feed Selection Lever:** Selects the carriage or cross slide for power feed.
- V. **Carriage Handwheel:** Moves the carriage along the bed.
- W. **Apron:** Houses the carriage gearing.
- X. **Cross Slide Handwheel:** Moves the cross slide toward and away from the workpiece.



Tailstock

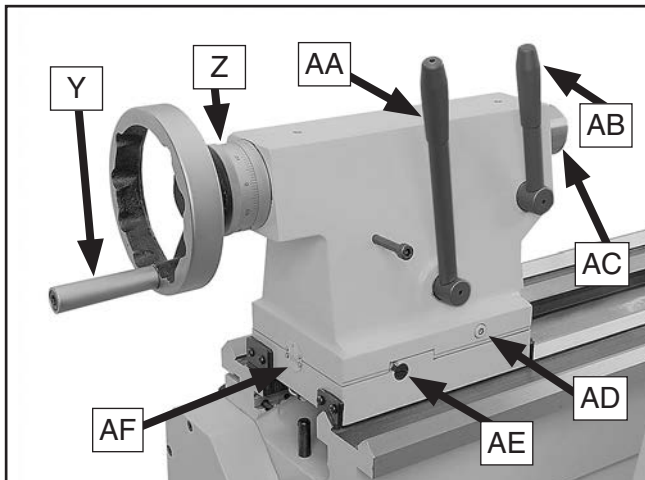


Figure 6. Tailstock controls.

- Y. Quill Handwheel:** Moves the quill toward or away from the spindle.
- Z. Graduated Scale:** Indicates quill movement in increments of 0.001" with one full revolution equaling 0.100" of quill travel.
- AA. Tailstock Lock Lever:** Secures the tailstock in position along the bedway.
- AB. Quill Lock Lever:** Secures the quill in position.
- AC. Quill:** Moves toward and away from the spindle and holds centers and tooling.
- AD. Tailstock Offset Screw:** Adjusts the tailstock offset left or right from the spindle centerline (1 of 2).
- AE. Gib Adjustment Screw:** Adjusts the tapered gib to control tailstock offset accuracy (1 of 2).
- AF. Offset Scale:** Indicates the relative distance of tailstock offset from the spindle centerline.

End Gears

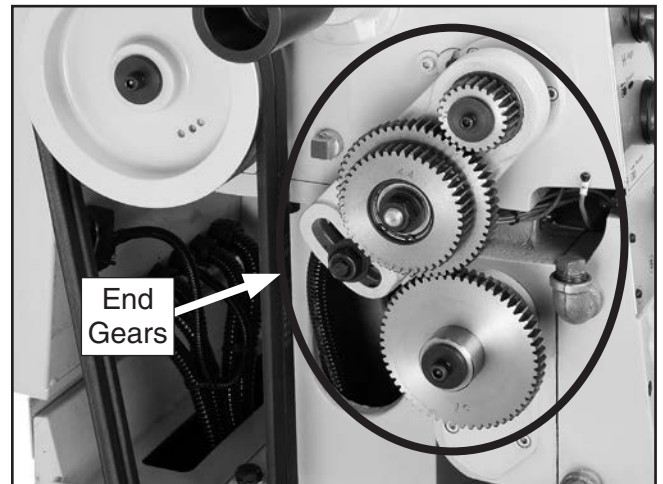


Figure 7. End gear components.

Configuring the end gears shown in **Figure 7** will control the speed of the leadscrew for threading or the feed rod for power feed operations. The rotational speed of these components depends not only on the end gear configuration, but the spindle speed as well.

Safety Foot Brake

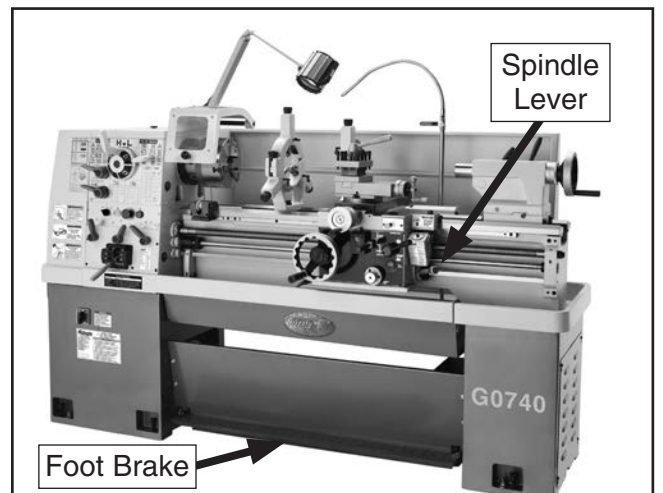


Figure 8. Foot brake and spindle lever.

This lathe is equipped with a foot brake (see **Figure 8**) to quickly stop the spindle instead of allowing the spindle to coast to a stop on its own. Pushing the foot brake while the spindle is **ON** cuts power to the motor and stops the spindle.

After the foot brake is used, the spindle lever must be returned to the OFF (middle) position to reset the spindle switches before re-starting spindle rotation.





MACHINE DATA SHEET

Customer Service #: (570) 546-9663 · To Order Call: (800) 523-4777 · Fax #: (800) 438-5901

MODEL G0740 14" X 40" 3-PHASE HIGH PRECISION TOOLROOM METAL LATHE

Product Dimensions:

Weight..... 2420 lbs.
 Width (side-to-side) x Depth (front-to-back) x Height..... 80-3/4 x 32-1/8 x 54-3/8 in.
 Footprint (Length x Width)..... 80-3/4 x 19-1/2 in.

Shipping Dimensions:

Type..... Wood Slat Crate
 Content..... Machine
 Weight..... 2684 lbs.
 Length x Width x Height..... 90 x 40 x 69 in.

Electrical:

Power Requirement..... 220V, 3-Phase, 60 HZ
 Full-Load Current Rating..... 14.4A
 Minimum Circuit Size..... 20A
 Switch..... Magnetic with Thermal Protection
 Switch Voltage..... 220V
 Plug Included..... No
 Recommended Plug/Outlet Type..... NEMA 15-20

Motors:

Main

Type..... TEFC Induction
 Horsepower..... 5 HP at 3450 RPM, 2.5 HP at 1725 RPM
 Voltage..... 220V
 Phase..... 3-Phase
 Amps..... 14A/10A
 Speed..... 3450/1725 RPM
 Cycle..... 60 Hz
 Number of Speeds..... 2
 Power Transfer V-Belt & Gear
 Bearings..... Shielded and Permanently Sealed

Coolant

Type..... TEFC Induction
 Horsepower..... 1/8 HP
 Voltage..... 220V
 Phase..... 3-Phase
 Amps..... 0.4A
 Cycle..... 60 Hz
 Number of Speeds..... 1
 Power Transfer Direct Drive
 Bearings..... Shielded and Permanently Sealed



Main Specifications:

Operation Info

Swing Over Bed.....	14.17 in.
Distance Between Centers.....	40 in.
Swing Over Cross Slide.....	8.66 in.
Swing Over Saddle.....	13.75 in.
Swing Over Gap.....	20.94 in.
Maximum Tool Bit Size.....	0.75 in.
Compound Travel.....	4 in.
Carriage Travel.....	36.5 in.
Cross Slide Travel.....	7 in.

Headstock Info

Spindle Bore.....	1.653 in.
Spindle Taper.....	MT#5
Number of Spindle Speeds.....	16
Spindle Speeds.....	50 – 2570 RPM
Spindle Type.....	D1-5 Camlock
Spindle Bearings.....	NTN Tapered Roller
Spindle Length.....	20.87 in.
Spindle Length with 3-Jaw Chuck.....	28.74 in.
Spindle Length with 4-Jaw Chuck.....	30.71 in.

Tailstock Info

Tailstock Quill Travel.....	4-3/8 in.
Tailstock Taper.....	MT#3
Tailstock Barrel Diameter.....	1.968 in.

Threading Info

Number of Longitudinal Feeds.....	17
Range of Longitudinal Feeds.....	0.002 – 0.067 in.
Number of Cross Feeds.....	17
Range of Cross Feeds.....	0.001 – 0.034 in.
Number of Inch Threads.....	45
Range of Inch Threads.....	2 – 72 TPI
Number of Metric Threads.....	39
Range of Metric Threads.....	0.2 – 14 mm
Number of Modular Pitches.....	18
Range of Modular Pitches.....	0.3 – 3.5 MP
Number of Diametral Pitches.....	21
Range of Diametral Pitches.....	8 – 44 DP

Dimensions

Bed Width.....	9 in.
Leadscrew Diameter.....	1-1/8 in.
Leadscrew TPI.....	4
Leadscrew Length.....	59 in.
Steady Rest Capacity.....	5/16 – 4-5/16 in.
Follow Rest Capacity.....	5/8 – 3-1/8 in.
Faceplate Size.....	10 in.
Feed Rod Diameter.....	3/4 in.
Floor to Center Height.....	42-5/8 in.
Height With Leveling Jacks.....	54-3/8 in.

Construction

Base.....	Cast Iron
Headstock.....	Cast Iron
Headstock Gears.....	Flame Hardened Steel
Bed.....	Induction Hardened and Ground Cast Iron
Stand.....	Cast Iron
Paint.....	Urethane



Other Specifications:

Country Of Origin Taiwan
Warranty 1 Year
Serial Number Location ID Label on Front of Headstock
Customer Assembly & Setup Time 2 Hours
Sound Rating 76 dB

Features:

Hardened & Precision-Ground Bed with Meehanite Castings
Halogen Work Light (24V/70W)
4-Way Tool Post
Complete Coolant System
Micrometer Carriage Stop
Threading Dial Indicator
Full Length Splash Guard
Front Removable Sliding Chip Tray
Headstock Gears Run in an Oil Bath
Jog Button and Emergency Stop
Safety Chip Guard
Completely Enclosed Universal Gearbox for Cutting Inch, Metric, Modular and Diametral Pitches

Accessories Included:

#5 to #3 Morse Taper Spindle Sleeve
10 in. 4-Jaw Independent Chuck D1-5
10 in. Faceplate D1-5
8 in. 3-Jaw Scroll Chuck D1-5
Follow Rest
Service Tools
Six Leveling Pads
Steady Rest with Roller Bearing Tips
Tool Box
Two Morse Taper #3 Dead Centers (1 Carbon Steel and 1 Carbide-Tipped)



SECTION 1: SAFETY

For Your Own Safety, Read Instruction Manual Before Operating This Machine

The purpose of safety symbols is to attract your attention to possible hazardous conditions. This manual uses a series of symbols and signal words intended to convey the level of importance of the safety messages. The progression of symbols is described below. Remember that safety messages by themselves do not eliminate danger and are not a substitute for proper accident prevention measures. Always use common sense and good judgment.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, **WILL** result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE This symbol is used to alert the user to useful information about proper operation of the machine.

Safety Instructions for Machinery

⚠ WARNING

OWNER'S MANUAL. Read and understand this owner's manual **BEFORE** using machine.

TRAINED OPERATORS ONLY. Untrained operators have a higher risk of being hurt or killed. Only allow trained/supervised people to use this machine. When machine is not being used, disconnect power, remove switch keys, or lock-out machine to prevent unauthorized use—especially around children. Make workshop kid proof!

DANGEROUS ENVIRONMENTS. Do not use machinery in areas that are wet, cluttered, or have poor lighting. Operating machinery in these areas greatly increases the risk of accidents and injury.

MENTAL ALERTNESS REQUIRED. Full mental alertness is required for safe operation of machinery. Never operate under the influence of drugs or alcohol, when tired, or when distracted.

ELECTRICAL EQUIPMENT INJURY RISKS. You can be shocked, burned, or killed by touching live electrical components or improperly grounded machinery. To reduce this risk, only allow qualified service personnel to do electrical installation or repair work, and always disconnect power before accessing or exposing electrical equipment.

DISCONNECT POWER FIRST. Always disconnect machine from power supply **BEFORE** making adjustments, changing tooling, or servicing machine. This prevents an injury risk from unintended startup or contact with live electrical components.

EYE PROTECTION. Always wear ANSI-approved safety glasses or a face shield when operating or observing machinery to reduce the risk of eye injury or blindness from flying particles. Everyday eyeglasses are not approved safety glasses.



WARNING

WEARING PROPER APPAREL. Do not wear clothing, apparel or jewelry that can become entangled in moving parts. Always tie back or cover long hair. Wear non-slip footwear to avoid accidental slips, which could cause loss of workpiece control.

HAZARDOUS DUST. Dust created while using machinery may cause cancer, birth defects, or long-term respiratory damage. Be aware of dust hazards associated with each workpiece material, and always wear a NIOSH-approved respirator to reduce your risk.

HEARING PROTECTION. Always wear hearing protection when operating or observing loud machinery. Extended exposure to this noise without hearing protection can cause permanent hearing loss.

REMOVE ADJUSTING TOOLS. Tools left on machinery can become dangerous projectiles upon startup. Never leave chuck keys, wrenches, or any other tools on machine. Always verify removal before starting!

INTENDED USAGE. Only use machine for its intended purpose and never make modifications not approved by Grizzly. Modifying machine or using it differently than intended may result in malfunction or mechanical failure that can lead to serious personal injury or death!

AWKWARD POSITIONS. Keep proper footing and balance at all times when operating machine. Do not overreach! Avoid awkward hand positions that make workpiece control difficult or increase the risk of accidental injury.

CHILDREN & BYSTANDERS. Keep children and bystanders at a safe distance from the work area. Stop using machine if they become a distraction.

GUARDS & COVERS. Guards and covers reduce accidental contact with moving parts or flying debris. Make sure they are properly installed, undamaged, and working correctly.

FORCING MACHINERY. Do not force machine. It will do the job safer and better at the rate for which it was designed.

NEVER STAND ON MACHINE. Serious injury may occur if machine is tipped or if the cutting tool is unintentionally contacted.

STABLE MACHINE. Unexpected movement during operation greatly increases risk of injury or loss of control. Before starting, verify machine is stable and mobile base (if used) is locked.

USE RECOMMENDED ACCESSORIES. Consult this owner's manual or the manufacturer for recommended accessories. Using improper accessories will increase the risk of serious injury.

UNATTENDED OPERATION. To reduce the risk of accidental injury, turn machine **OFF** and ensure all moving parts completely stop before walking away. Never leave machine running while unattended.

MAINTAIN WITH CARE. Follow all maintenance instructions and lubrication schedules to keep machine in good working condition. A machine that is improperly maintained could malfunction, leading to serious personal injury or death.

CHECK DAMAGED PARTS. Regularly inspect machine for any condition that may affect safe operation. Immediately repair or replace damaged or mis-adjusted parts before operating machine.

MAINTAIN POWER CORDS. When disconnecting cord-connected machines from power, grab and pull the plug—NOT the cord. Pulling the cord may damage the wires inside. Do not handle cord/plug with wet hands. Avoid cord damage by keeping it away from heated surfaces, high traffic areas, harsh chemicals, and wet/damp locations.

EXPERIENCING DIFFICULTIES. If at any time you experience difficulties performing the intended operation, stop using the machine! Contact our Technical Support at (570) 546-9663.



Additional Safety for Metal Lathes

WARNING

SPEED RATES. Operating the lathe at the wrong speed can cause nearby parts to break or the workpiece to come loose, which will result in dangerous projectiles that could cause severe impact injuries. Large or non-concentric workpieces must be turned at slow speeds. Always use the appropriate feed and speed rates.

CHUCK KEY SAFETY. A chuck key left in the chuck can become a deadly projectile when the spindle is started. Always remove the chuck key after using it. Develop a habit of not taking your hand off of a chuck key unless it is away from the machine.

SAFE CLEARANCES. Workpieces that crash into other components on the lathe may throw dangerous projectiles in all directions, leading to impact injury and damaged equipment. Before starting the spindle, make sure the workpiece has adequate clearance by hand-rotating it through its entire range of motion. Also, check the tool and tool post clearance, chuck clearance, and saddle clearance.

LONG STOCK SAFETY. Long stock can whip violently if not properly supported, causing serious impact injury and damage to the lathe. Reduce this risk by supporting any stock that extends from the chuck/headstock more than three times its own diameter. Always turn long stock at slow speeds.

SECURING WORKPIECE. An improperly secured workpiece can fly off the lathe spindle with deadly force, which can result in a severe impact injury. Make sure the workpiece is properly secured in the chuck or faceplate before starting the lathe.

CHUCKS. Chucks are very heavy and difficult to grasp, which can lead to crushed fingers or hands if mishandled. Get assistance when handling chucks to reduce this risk. Protect your hands and the precision-ground ways by using a chuck cradle or piece of plywood over the ways of the lathe when servicing chucks. Use lifting devices when necessary.

CLEARING CHIPS. Metal chips can easily cut bare skin—even through a piece of cloth. Avoid clearing chips by hand or with a rag. Use a brush or vacuum to clear metal chips.

STOPPING SPINDLE BY HAND. Stopping the spindle by putting your hand on the workpiece or chuck creates an extreme risk of entanglement, impact, crushing, friction, or cutting hazards. Never attempt to slow or stop the lathe spindle with your hand. Allow the spindle to come to a stop on its own or use the brake.

CRASHES. Aggressively driving the cutting tool or other lathe components into the chuck may cause an explosion of metal fragments, which can result in severe impact injuries and major damage to the lathe. Reduce this risk by releasing automatic feeds after use, not leaving lathe unattended, and checking clearances before starting the lathe. Make sure no part of the tool, tool holder, compound rest, cross slide, or carriage will contact the chuck during operation.

COOLANT SAFETY. Coolant is a very poisonous biohazard that can cause personal injury from skin contact alone. Incorrectly positioned coolant nozzles can splash on the operator or the floor, resulting in an exposure or slipping hazard. To decrease your risk, change coolant regularly and position the nozzle where it will not splash or end up on the floor.

TOOL SELECTION. Cutting with an incorrect or dull tool increases the risk of accidental injury due to the extra force required for the operation, which increases the risk of breaking or dislodging components that can cause small shards of metal to become dangerous projectiles. Always select the right cutter for the job and make sure it is sharp. A correct, sharp tool decreases strain and provides a better finish.



Additional Chuck Safety

WARNING

ENTANGLEMENT. Entanglement with a rotating chuck can lead to death, amputation, broken bones, or other serious injury. Never attempt to slow or stop the lathe chuck by hand, and always roll up long sleeves, tie back long hair, and remove any jewelry or loose apparel BEFORE operating.

CHUCK SPEED RATING. Excessive spindle speeds greatly increase the risk of the workpiece or chuck being thrown from the machine with deadly force. Never use spindle speeds faster than the chuck RPM rating or the safe limits of your workpiece.

USING CORRECT EQUIPMENT. Many workpieces can only be safely turned in a lathe if additional support equipment, such as a tailstock or steady/follow rest, is used. If the operation is too hazardous to be completed with the lathe or existing equipment, the operator must have enough experience to know when to use a different machine or find a safer way.

TRAINED OPERATORS ONLY. Using a chuck incorrectly can result in workpieces coming loose at high speeds and striking the operator or bystanders with deadly force. To reduce the risk of this hazard, read and understand this document and seek additional training from an experienced chuck user before using a chuck.

CHUCK CAPACITY. Avoid exceeding the capacity of the chuck by clamping an oversized workpiece. If the workpiece is too large to safely clamp with the chuck, use a faceplate or a larger chuck if possible. Otherwise, the workpiece could be thrown from the lathe during operation, resulting in serious impact injury or death.

CLAMPING FORCE. Inadequate clamping force can lead to the workpiece being thrown from the chuck and striking the operator or bystanders. Maximum clamping force is achieved when the chuck is properly maintained and lubricated, all jaws are fully engaged with the workpiece, and the maximum chuck clamping diameter is not exceeded.

PROPER MAINTENANCE. All chucks must be properly maintained and lubricated to achieve maximum clamping force and withstand the rigors of centrifugal force. To reduce the risk of a thrown workpiece, follow all maintenance intervals and instructions in this document.

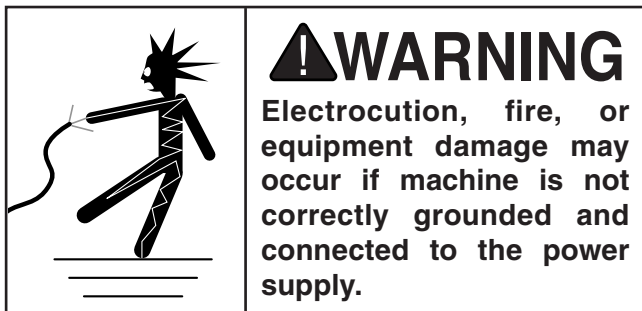
DISCONNECT POWER. Serious entanglement or impact injuries could occur if the lathe is started while you are adjusting, servicing, or installing the chuck. Always disconnect the lathe from power before performing these procedures.



SECTION 2: POWER SUPPLY

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 all applicable codes and standards.



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 Current Rating at 220V .. 14.4 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 Requirements for 220V

This machine is prewired to operate on a 220V power supply circuit that has a verified ground and meets the following requirements:

Nominal Voltage220V
Cycle60 Hz
Phase 3-Phase
Power Supply Circuit 20 Amps
Plug/Receptacle NEMA 15-20
Cord “S”-Type, 4-Wire, 12 AWG, 300 VAC

A power supply circuit includes all electrical equipment between the breaker box or fuse panel in the building and the machine. The power supply circuit used for this machine must be sized to safely handle the full-load current 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.)



Note: *The circuit requirements listed in this manual apply to 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 that the circuit is properly sized for safe operation.*



Grounding Instructions

This machine **MUST** be grounded. In the event of certain malfunctions or breakdowns, grounding reduces the risk of electric shock by providing a path of least resistance for electric current.

The power cord and plug specified under "Circuit Requirements for 220V" on the previous page has an equipment-grounding wire and a grounding prong. 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 (see figure below).

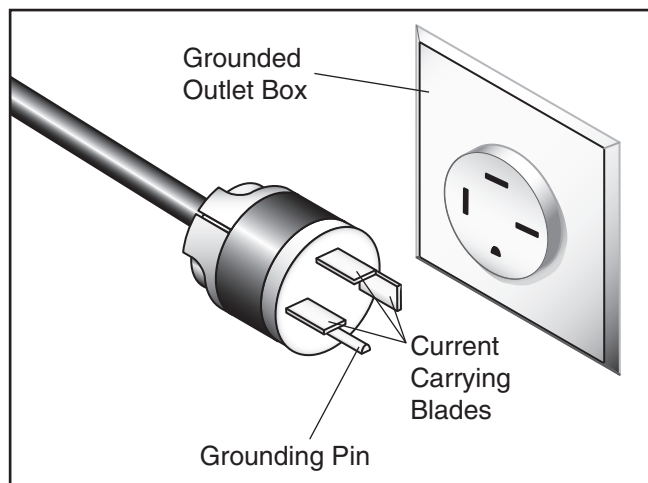
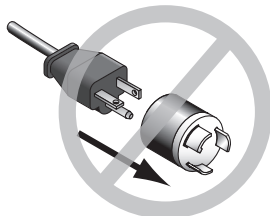


Figure 9. Typical 15-20 plug and receptacle.

!WARNING

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

!CAUTION



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

!WARNING

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

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 a qualified electrician or 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.

Extension Cords

We do not recommend using an extension cord with this machine. If you must use an extension cord, 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, and meet the following requirements:

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



Correcting Phase Polarity Wiring

This sub-section is only provided for troubleshooting. If you discover during the **Test Run (Page 26)**, that the lathe will not operate, or that the spindle runs backwards, the lathe may be wired out of phase. Without the proper test equipment to determine the phase of power source legs, wiring machinery to 3-phase power may require trial-and-error.

Correcting the phase polarity requires reversing the positions where two of the incoming power source wires are connected. Due to the high voltage and risk of serious shock involved, we strongly recommend this procedure only be done by an electrician or qualified service personnel.

To correct wiring that is out of phase:

1. Push the STOP button, turn the two-speed motor switch to OFF, and DISCONNECT THE MACHINE FROM POWER!

2. Open the electrical box and swap any two hot wires R, S, T, as illustrated in **Figure 10**.

Note: If using a phase converter for 220V 3-phase operation, ONLY swap the R and T wires to correct out of phase wiring. The "wild wire" is connected to the S terminal.

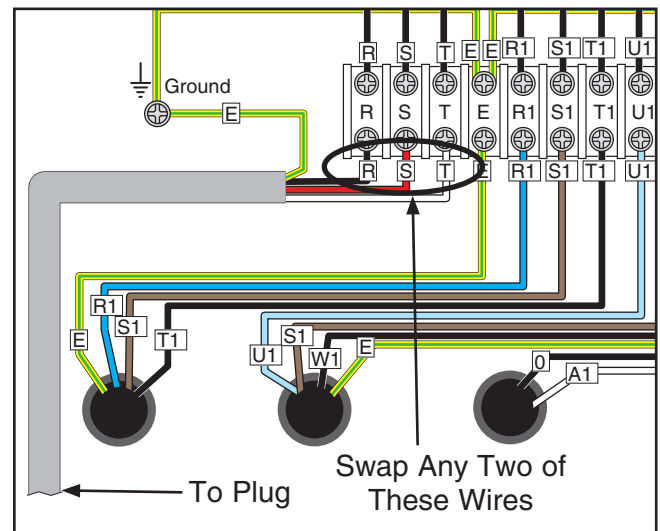


Figure 10. Swapping power connections to correct out-of-phase wiring.

3. Close and latch the electrical box, and reconnect the machine to the power source.



SECTION 3: SETUP

Preparation

The list below outlines the basic process of preparing your machine for operation. Specific steps are covered later in this section.

The typical preparation process is as follows:

1. Unpack the lathe and inventory the contents of the box/crate.
2. Clean the lathe and its components.
3. Identify an acceptable location for the lathe and move it to that location.
4. Level the lathe and either bolt it to the floor or place it on leveling pads.
5. Assemble the loose components and make any necessary adjustments or inspections to ensure the lathe is ready for operation.
6. Check/lubricate the lathe.
7. Connect the lathe to the power source.
8. Test run lathe to ensure it functions properly.
9. Perform the spindle break-in procedure to prepare the lathe for operation.

Unpacking

Your machine was carefully packaged for safe transportation. Remove the packaging materials from around your machine and inspect it. If you discover any damage, *please call us immediately at (570) 546-9663 for advice.*

Save the containers and all packing materials for possible inspection by the carrier or its agent. *Otherwise, filing a freight claim can be difficult.*

When you are completely satisfied with the condition of your shipment, inventory the contents.

Needed for Setup

The following are needed to complete the setup process, but are not included with your machine.

- **For Lifting and Moving:**
 - A forklift or other power lifting device rated for at least 3500 lbs.
 - Two lifting straps rated for at least 3500 lbs. each
 - Guide rods for steadying the load when lifting (see **Page 22**)
 - Two other people for moving machine
 - Hardwood blocks (see **Page 22**)
- **For Power Connection:**
 - A power source that meets the minimum circuit requirements for this machine (review **Power Supply** on **Page 15** for details)
 - An electrician or qualified service personnel to ensure a safe and code-compliant connection to the power source
- **For Assembly:**
 - Shop Rags
 - Cleaner/degreaser (see **Page 20**)
 - Quality metal protectant lubricant
 - Safety glasses for each person
 - Wrench or socket 21mm
 - Wrench or socket 19mm
 - Floor mounting hardware as needed (see **Page 24**)
 - Precision level at least 12" long



Inventory

The following is a list of items shipped with your machine. Before beginning setup, lay these items out and inventory them.

If any non-proprietary parts are missing (e.g. a nut or a washer), we will gladly replace them; or for the sake of expediency, replacements can be obtained at your local hardware store.

Box 1: (Figure 11)	Qty
A. Steady Rest Assembly (Installed)	1
B. 10" Faceplate w/D1-5 Camlock Stud Set ...	1
C. 10" 4-Jaw Chuck w/Reversible Jaws.....	1
D. 3-Jaw Chuck Key	1
E. 4-Jaw Chuck Key	1
F. Follow Rest Assembly (Installed)	1

Tool Box Inventory: (Figure 12)	Qty
G. Tool Box.....	1
H. Open End Wrench 22/24mm.....	1
I. Open End Wrench 14/17mm	1
J. Open End Wrench 10/12mm	1
K. Phillips Screwdriver #2	1
L. Standard Screwdriver #2.....	1
M. Hex Wrench 8mm.....	1
N. Tapered Spindle Sleeve MT#5-#3.....	1
O. Dead Center MT#3.....	1
P. Carbide-Tipped Dead Center MT#3	1
Q. Camlock Key D1-5.....	1
R. Tool Post T-Wrench (Clamped on Tool Post)	1
S. Hex Wrench Set 1.5-10mm	1
T. Carriage Handwheel Handle	1
U. Cross Slide Handwheel Handle	1
V. Cast Iron Leveling Pads	6

Pre-Installed (Not Shown)	Qty
• 8" 3-Jaw Chuck w/2-Pc. Jaw Set	1
• 8¼" Back Plate D1-5	1

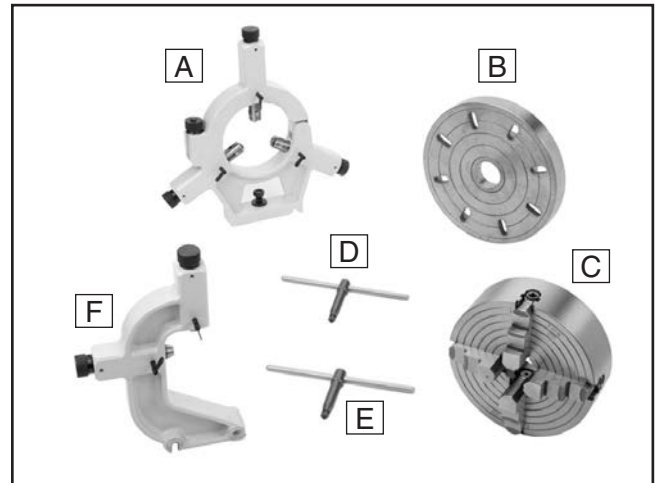


Figure 11. Main inventory.

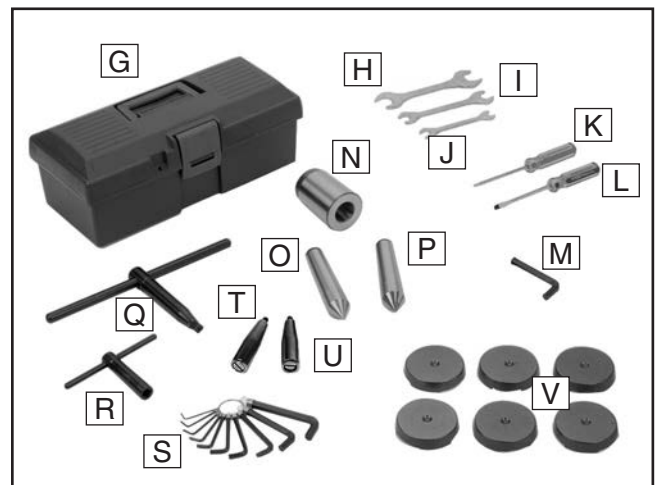
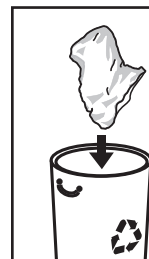


Figure 12. Toolbox inventory.

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 packaging materials while unpacking or they are pre-installed at the factory.



WARNING

SUFFOCATION HAZARD!

Keep children and pets away from plastic bags or packing materials shipped with this machine. Discard immediately.



Cleanup

The unpainted surfaces of your machine are coated with a heavy-duty rust preventative that prevents corrosion during shipment and storage. This rust preventative works extremely well, but it will take a little time to clean.

Be patient and do a thorough job cleaning your machine. The time you spend doing this now will give you a better appreciation for the proper care of your machine's unpainted surfaces.

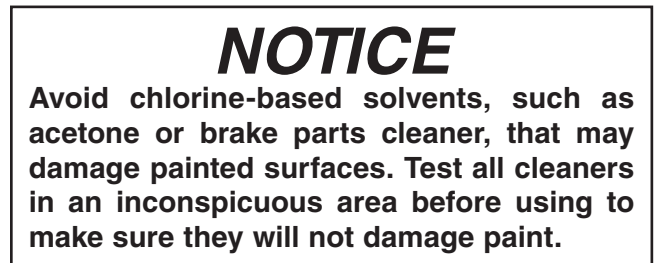
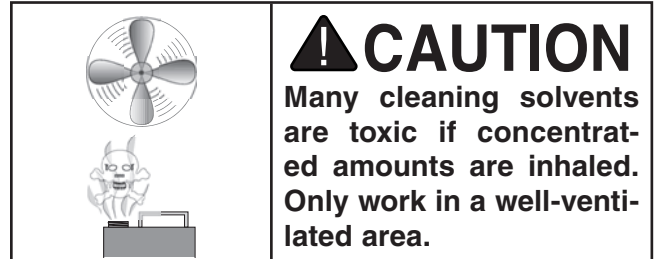
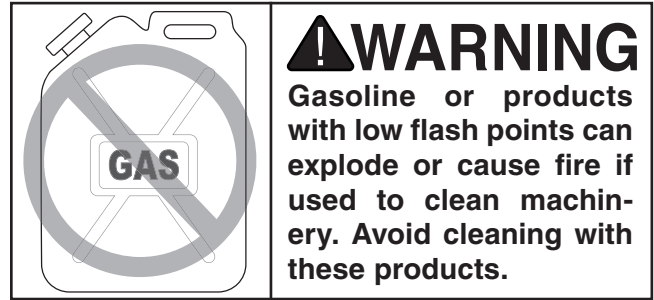
There are many ways to remove this rust preventative, but the following steps work well in a wide variety of situations. Always follow the manufacturer's instructions with any cleaning product you use and make sure you work in a well-ventilated area to minimize exposure to toxic fumes.

Before cleaning, gather the following:

- Disposable Rags
- Cleaner/degreaser (WD-40 works well)
- Safety glasses & disposable gloves
- Plastic paint scraper (optional)

Basic steps for removing rust preventative:

1. Put on safety glasses.
2. Coat the rust preventative with a liberal amount of cleaner/degreaser, then let it soak for 5–10 minutes.
3. Wipe off the surfaces. If your cleaner/degreaser is effective, the rust preventative will wipe off easily. If you have a plastic paint scraper, scrape off as much as you can first, then wipe off the rest with the rag.
4. Repeat **Steps 2–3** as necessary until clean, then coat all unpainted surfaces with a quality metal protectant to prevent rust.



T23692—Orange Power Degreaser

A great product for removing the waxy shipping grease from your machine during clean up.



Figure 13. T23692 Orange Power Degreaser.



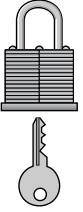
Site Considerations

Weight Load

Refer to the **Machine Data Sheet** 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. **See below for required space allocation.**

	<p>CAUTION</p> <p>Children or untrained people may be seriously injured by this machine. Only install in an access restricted location.</p>
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Physical Environment

The physical environment where the machine is operated is important for safe operation and longevity of machine components. For best results, operate this machine in a dry environment that is free from excessive moisture, hazardous chemicals, airborne abrasives, or extreme conditions. Extreme conditions for this type of machinery are generally those where the ambient temperature range exceeds 41°–104°F; the relative humidity range exceeds 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, if required.

Lighting

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

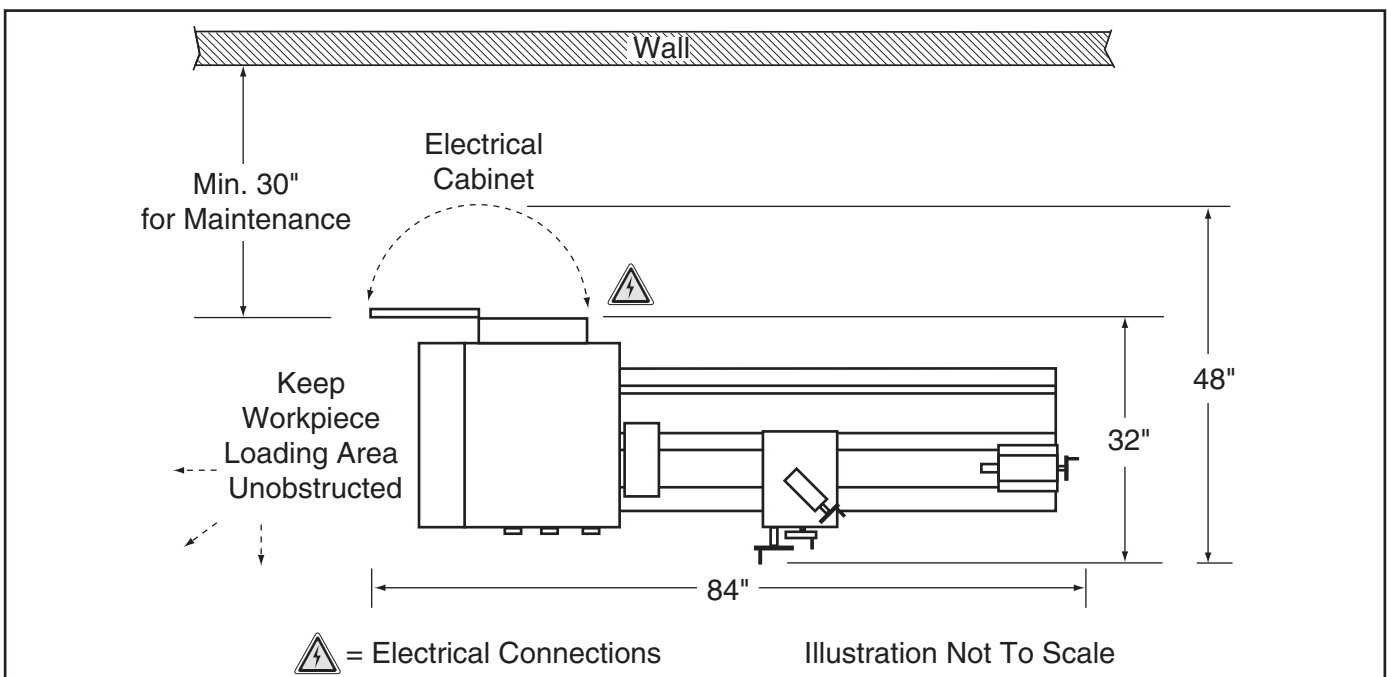
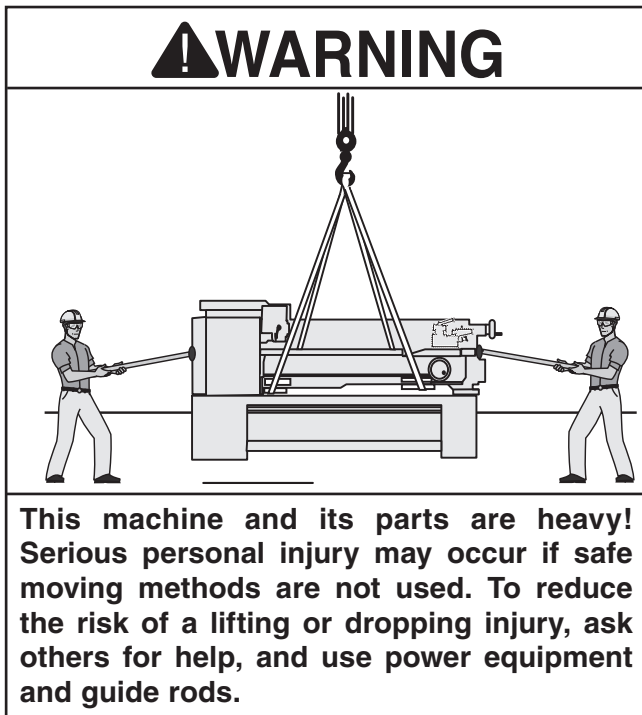


Figure 14. Minimum working clearances.



Lifting & Moving



Do not attempt to lift or move this lathe without using the proper lifting equipment (such as forklift or crane) or the necessary assistance from other people. Each piece of lifting equipment must be rated for at least 25% more than the shipping weight of your lathe to support dynamic loads that may be applied while lifting. Refer to **Needed for Setup** on **Page 18** for details.

To lift and move the lathe:

1. Remove the shipping crate top and sides, then remove the small components from the shipping pallet.
2. Move the lathe to its prepared location while it is still attached to the shipping pallet.
3. Unbolt the lathe from the shipping pallet
4. To balance the load for lifting, move the tailstock and carriage to the extreme right end of the bedway, then lock them in place.

Note: Before attempting to move the carriage, make sure the carriage lock is loose, the half nut is disengaged, and the power feed is disengaged (feed selection lever).

5. Position hardwood blocks under each end of the bed as shown in **Figure 15**. This will keep the lifting straps away from the leadscrew, feed rod, and spindle rod to prevent bending them during lifting.

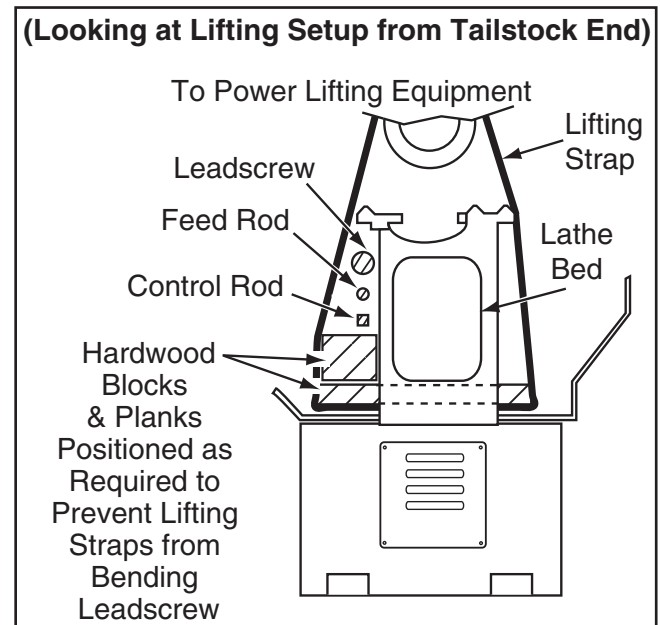


Figure 15. Lifting setup to keep straps from bending leadscrew or rods.

Note: Fasten a center support between the hardwood blocks so that they will stay spread apart and in place when lifting (see the example in **Figure 16**).

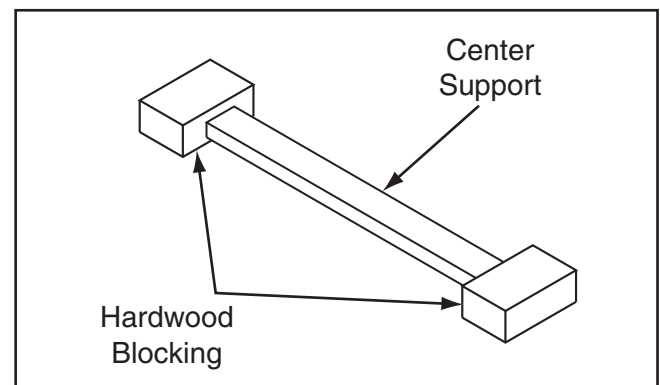


Figure 16. Example of blocking center support.



- Attach the lifting straps to the power lifting equipment (see **Figure 17** for an example).

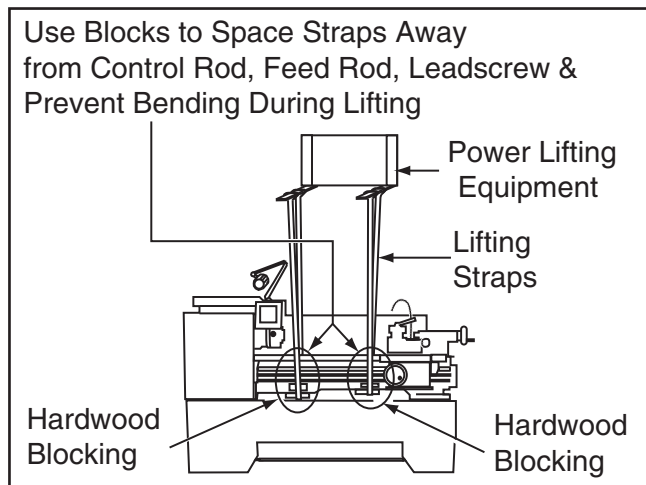


Figure 17. Example of lathe setup for lifting.

- At each end of the lathe, have assistants connect guide rods to safely keep the lathe from swaying or tipping during lifting.

NOTICE

When lifting the lathe with straps, the load will be top heavy. Take extra care to keep the load balanced vertically and only lift the lathe far enough to remove the shipping pallet.

- Raise the lathe a couple of inches and check the balance of the load.
 - If the load is not safely balanced, immediately lower the lathe and resolve the issue before attempting to lift it again.
- Raise the lathe enough to clear the shipping pallet, carefully remove the pallet, then lower the lathe into position.

Leveling & Mounting

You must level your machine and either use the included foot pads and leveling hardware or bolt and shim your lathe to the floor. Because mounting your lathe to the floor with permanent hardware is an optional step and floor materials may vary, floor mounting hardware is not included.

Leveling

NOTICE

For accurate turning results and to prevent warping the cast iron bed and ways, the lathe bedways **MUST be leveled from side-to-side and from front-to-back on both ends.**

Re-check the bedways 24 hours after installation, two weeks after that, and then annually to make sure they remain level.

Leveling machinery helps precision components, such as bedways, remain straight and flat during the lifespan of the machine. Components on a machine that is not level 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.

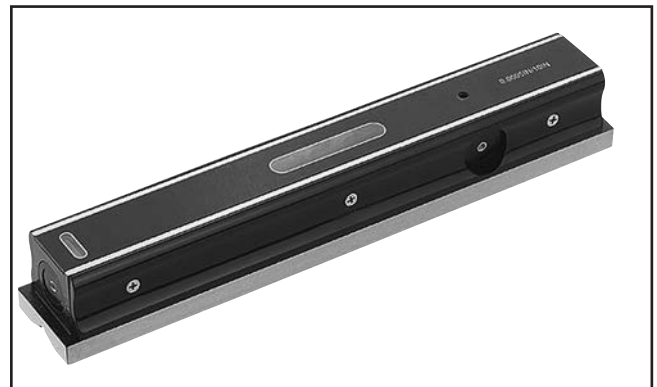


Figure 18. Model H2683 precision level.



—If using the included leveling pads (see **Figure 19**), place them under the six leveling jack bolt locations, then adjust the bolts to level the lathe.

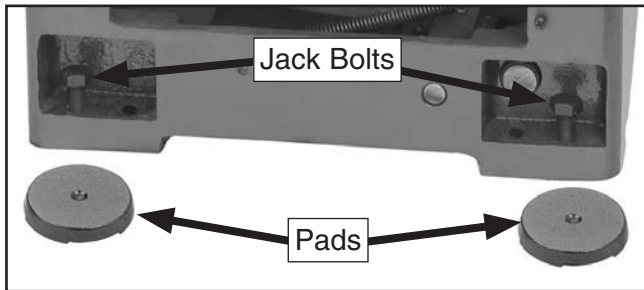


Figure 19. Leveling pads and screws.

—If using mounting hardware that does not allow for adjustment, level the lathe by placing metal shims between the lathe base and the floor before bolting it down.

Bolting to Concrete Floors

Lag screws and anchors, or anchor studs (see **Figure 20**), are two popular methods for bolting machinery to a concrete floor. We suggest you research the many options and methods for mounting your machine and choose the best one for your specific application.

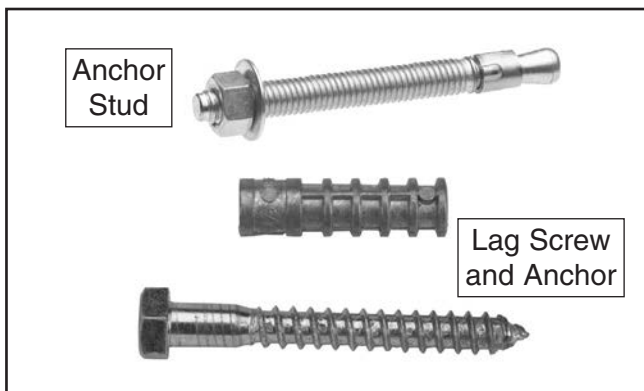


Figure 20. Typical fasteners for mounting to concrete floors.

NOTICE

Unless otherwise specified by your local codes, this machine **MUST** be secured to the floor if it is permanently connected (hardwired) to the power supply.

Assembly

With the exception of the handwheel handles, the lathe is shipped fully assembled.

To install the handwheel handles, thread the large handle into the carriage handwheel and the small handle into the cross slide handwheel, as shown in **Figure 21**.

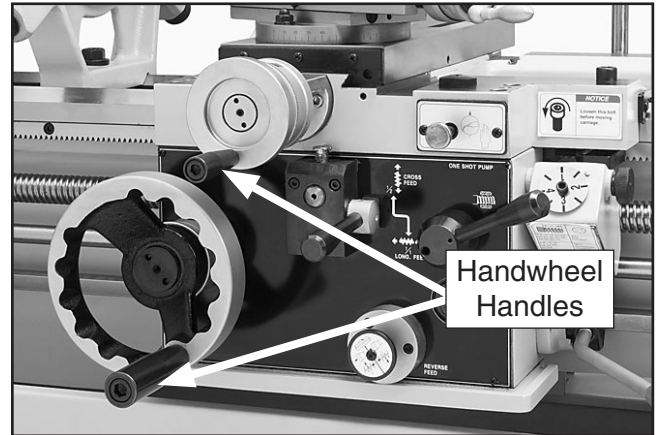


Figure 21. Handwheel handles installed.

Lubricating Lathe



The headstock, quick-change gearbox, and apron oil reservoirs must have the proper amount of oil in them before the lathe can be operated initially.

Damage caused to the bearings and gears from running the lathe without oil in the reservoirs will not be covered under warranty. Refer to the **Lubrication** section, beginning on **Page 65**, for checking and adding oil.



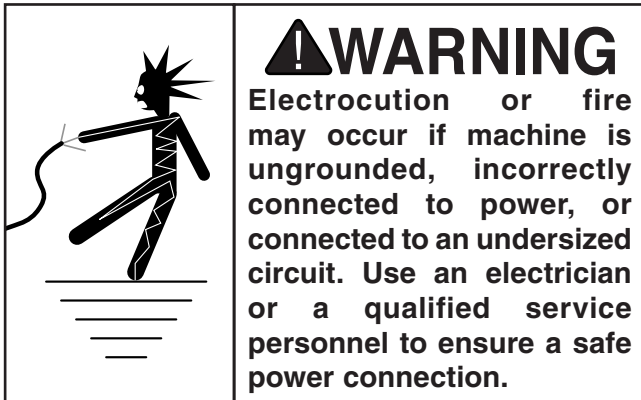
In addition to the reservoirs, we also recommend that you lubricate all other points on the machine at this time. This can be accomplished by following the maintenance schedule on **Page 64**.

Note: *If this lathe was shipped with oil in the reservoirs, do not change that oil until after the test run and spindle break-in procedures.*

Adding Coolant

Add the coolant of your choice now. For detailed instructions on where the coolant tank is located and how to add fluid, refer to **Coolant System Service on Page 70**.

Power Connection



Before the machine can be connected to the power source, an electrical circuit must be made available that meets the minimum specifications given in **Circuit Requirements for 220V on Page 15**. If a power circuit has not been prepared for the machine, do that now.

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.

Note About Extension Cords: *Using an incorrectly sized extension cord may decrease the life of electrical components on your machine. Refer to **Extension Cords on Page 16** for more information.*

Note About 3-Phase Power: *Due to the startup load from this machine, we do not recommend using a static phase converter to create 3-phase power—as 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 and connect the manufactured leg or "wild wire" to the S terminal (see location in **Figures 22–23**). The S terminal can handle power fluctuation because it is wired directly to the motor.*

To connect the power cord to the lathe:

1. Press the STOP button, turn the two-speed motor switch to the OFF position then open the electrical cabinet door.
2. Identify the R, S, and T terminals and the grounding terminal (see **Figure 22**).

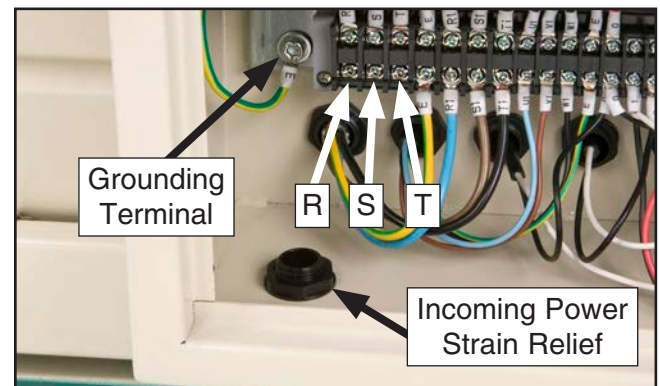


Figure 22. Location of hot wire terminals, ground terminal and strain relief inside electrical cabinet.

3. Thread the power cord through the strain relief shown in **Figure 22**.
4. Connect the incoming hot wires and ground wire to the terminals shown in **Figure 23**.

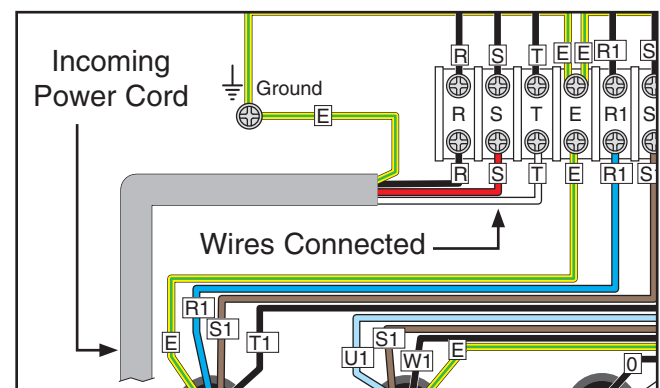


Figure 23. Ground and hot wires connected.



5. Make sure the power cord and wires have slack between the strain relief and terminal connections so that they do not bind, then tighten the strain relief to secure the cord.

Note: *The strain relief must be tightened against the outer jacket of the cord. Avoid over-tightening the strain relief or it may crush the cord and cause a short.*

6. Test the strain relief to ensure it is properly tightened by pulling the cord from outside the box with light-to-moderate force. When the strain relief is properly tightened, the cord will not move inside the cabinet.
7. Install a NEMA 15-20 plug on the other end of the power cord per the plug manufacturer's instructions.
8. Close and lock the main electrical box door.

NOTICE

To avoid unexpected start-up of lathe components, keep the two-speed motor switch turned OFF and the STOP button pressed in until instructed otherwise in the Test Run.

9. Connect the plug to the matching receptacle and power source as specified in **Circuit Requirements for 220V** on **Page 15**.

Test Run

Once the assembly is complete, test run your machine to make sure it runs properly and is ready for regular operation.

The test run consists of verifying:

- The motor powers up and runs correctly.
- The motor turns in the correct direction (machine is not wired out of phase).
- The safety features work correctly.
- The brake system works correctly.
- The cutting fluid system works correctly.

If, during the test run, you cannot easily locate the source of an unusual noise or vibration, stop using the machine immediately, then review **Troubleshooting** on **Page 73**.

WARNING

Before starting the lathe, make sure you have performed the preceding assembly and adjustment instructions, and you have read through the rest of the manual and are familiar with the various functions and safety features on this machine. Failure to follow this warning could result in serious personal injury or even death!

To test run your machine:

1. Make sure the two-speed motor switch (see **Figure 24**) is turned **OFF** and the spindle lever is in the OFF (middle) position.



Figure 24. Location of the two-speed switch.



- Clear away all tools and objects used during assembly, lubrication, and preparation.
- Make sure that the chuck and jaws, if installed, are secure (refer to **Chuck and Faceplate Mounting on Page 32**).

Note: If a chuck is not installed on the lathe, you do not need to install one for this test.

- Push the STOP button on the control panel (see **Figure 25**), and point the coolant nozzle into the chip pan.

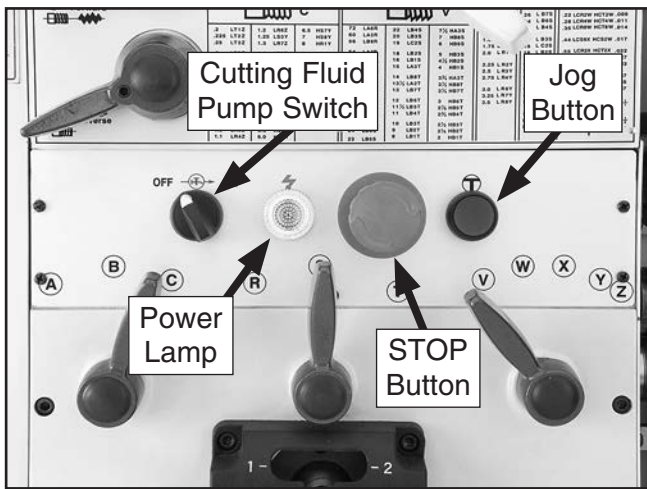


Figure 25. Control panel.

- Disengage the quick-change gearbox from the drive train by moving the feed range lever to the neutral (middle) position (see **Figure 26**).

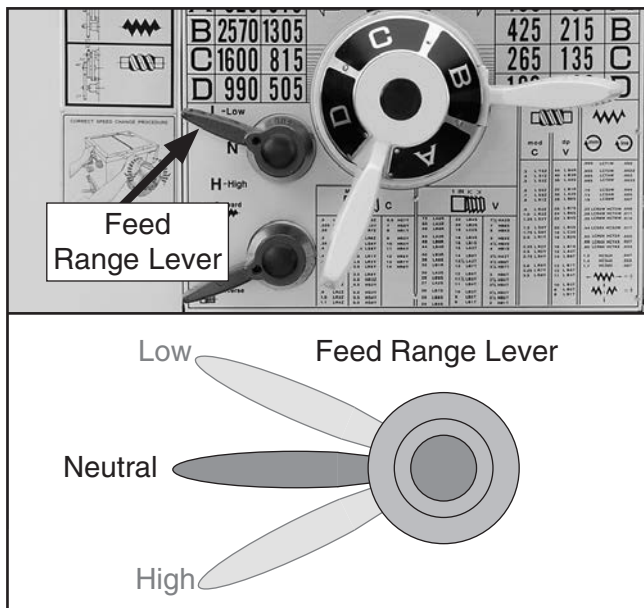


Figure 26. Feed range lever.

Note: In the next step, use the chuck key to rock the chuck back-and-forth so that the gears will mesh as you make the adjustments. Be sure to remove the chuck key before continuing.

- Set the spindle speed to 50 RPM as follows:
 - Move the spindle range lever so that the arrow on top of its hub is pointing toward the right-hand spindle speed chart (see **Figure 27**).

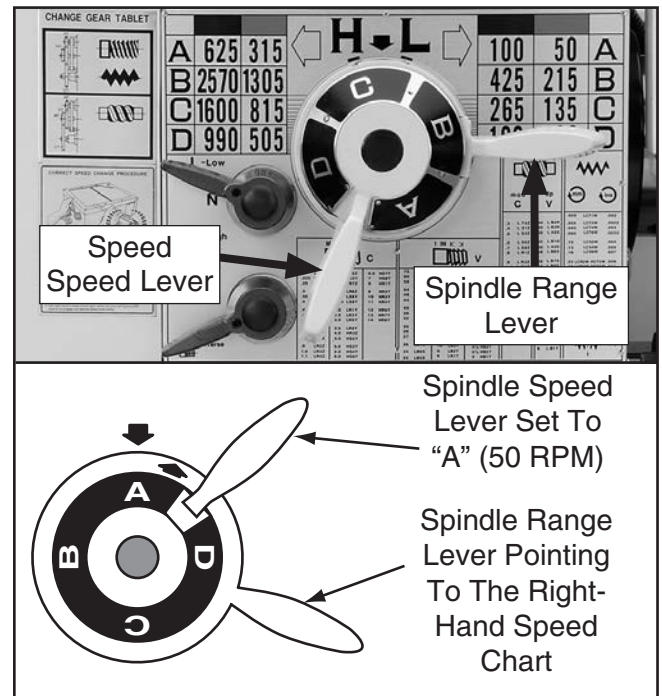


Figure 27. Spindle speed set to 50 RPM.

- Move the spindle speed lever so that the "A" on its hub is directly under the arrow on the headstock. This corresponds to the "A" in the right-hand spindle speed chart.
- Turn the two-speed motor switch to the LOW position. This enables all the low speeds in the green columns of the spindle speed charts.



- To ensure the carriage components do not unexpectedly move during the following steps, disengage the half nut lever and feed selection lever (see **Figure 28**).

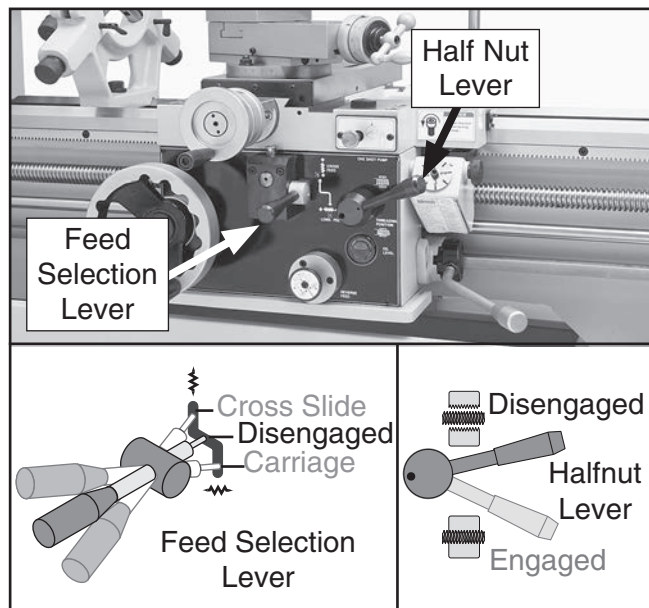


Figure 28. Disengaging carriage components.

- Reset the STOP button by twisting it clockwise until it pops out. The power lamp on the control panel should illuminate.
- Verify that the machine is operating correctly by pulling the spindle lever out and moving it down to start spindle rotation (see **Figure 29**).

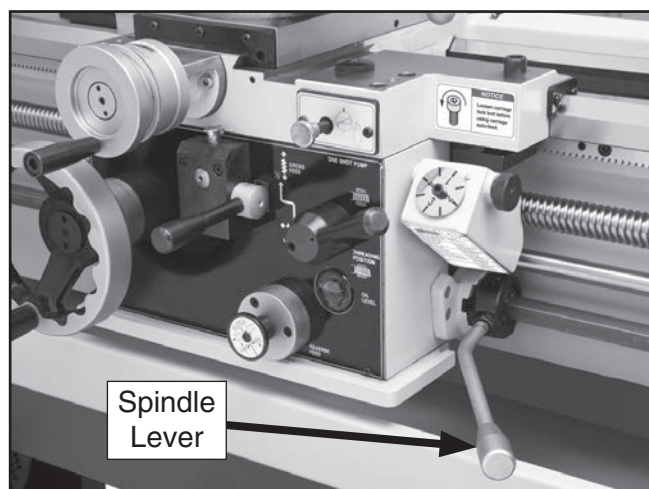


Figure 29. Spindle lever in down (forward) position.

—When operating correctly, the machine runs smoothly with little or no vibration or rubbing noises.

—Investigate and correct strange or unusual noises or vibrations before operating the machine further. Always disconnect the machine from power when investigating or correcting potential problems.

- With the spindle lever in the down position, the spindle should be rotating counterclockwise—down and toward you as you face the lathe.

—If the spindle and chuck *are not* rotating counterclockwise, the power supply is connected out-of-phase. Stop the machine, disconnect it from power, then follow the instructions in the **Correcting Phase Polarity** section on **Page 17**. After correcting the wiring, repeat **Steps 7–10**.

- Press the STOP button to turn the lathe **OFF**, then, without resetting the STOP button, try to restart spindle rotation. The spindle should *not* start.

—If spindle rotation *does* start with the STOP button pressed in, the STOP button safety is not operating correctly. This safety feature must operate properly before continuing operation. Use the spindle lever to stop the lathe, disconnect it from power, and call Tech Support for help.

- Move the spindle lever to the OFF (middle) position, reset the STOP button by twisting it clockwise until it pops out, then restart spindle rotation.

- Push the foot brake. The spindle should come to a quick stop.

—If the brake pedal has no effect on the lathe, push the STOP button, and refer to **Brake & Switch** on **Page 80** to make any required adjustments.

- Move the spindle lever to the OFF (middle) position. Remove the end gear cover from the left side of the headstock. This activates a safety switch that should prevent the spindle from starting while this cover is removed.



Spindle Break-In

15. Stand away from all the exposed gears on the side of the headstock, and attempt to start spindle rotation. The spindle should *not* start.

—If spindle rotation *does start* with the end cover removed, the safety switch is not operating correctly. This safety feature must operate properly before continuing operation. Press the STOP button to turn the lathe **OFF**, disconnect it from power, and call Tech Support for help.

16. Push the STOP button in, move the spindle lever to the OFF position, then replace the end gear cover.

17. Lift the chuck guard up—this will activate the chuck guard safety switch. Reset the STOP button and attempt to start spindle rotation. The spindle should *not* start.

—If spindle rotation *does start* with the chuck guard in the up position, the safety switch is not operating correctly. This safety feature must operate properly before continuing operation. Press the STOP button to turn the lathe **OFF**, disconnect it from power, and call Tech Support for help.

18. Use the cutting fluid pump switch on the control panel to start the pump, then open the valve. Verify that the cutting fluid flows from the nozzle, turn the pump **OFF**, then move the spindle lever to the OFF position.

Congratulations! The test run is complete. Turn the lathe **OFF** and perform the following **Spindle Break-In** procedure.

NOTICE

After the first 16 hours of use, the V-belts will stretch and seat into the pulley grooves. The V-belts must be properly re-tensioned after this period to avoid reducing their useful life. Refer to the V-Belts subsection on Page 79 for detailed instructions.

Before subjecting the lathe to full loads, it is essential to complete the spindle break-in process as described below. This will ensure the best results and maximum life of the precision components inside the lathe.

The break-in procedure must be performed in succession with the **Test Run** procedure described in this manual, because many of the test run steps prepare the lathe controls for the break-in process.

Important: *Do not perform the break-in procedure independently from the **Test Run** section—serious damage could occur to the lathe if the controls are set differently than instructed in that section.*

NOTICE

Do not leave the lathe unattended during the Spindle Break-In procedure. If your attention is needed elsewhere during this procedure, stop the lathe and restart the procedure later from the beginning.

To perform the spindle break-in:

1. Successfully complete the **Test Run** procedure beginning on **Page 26**.
2. Using the spindle speed levers to set the spindle speed, run the lathe for 10 minutes at each of the spindle speeds, starting at the slowest.

Note: *If necessary, refer to **Setting Spindle Speed** on **Page 51** for detailed instructions.*
3. Use the foot brake to stop spindle rotation, set the spindle speed at 2570 RPM, then use the spindle lever to reverse the spindle rotation and run the lathe for 10 minutes.



4. Use the foot brake to stop spindle rotation, then run the lathe at 215 RPM for 10 minutes with the gearbox range lever on the headstock in the **L** (low) position, and then run the lathe another 10 minutes with the lever in the **H** (high) position.
5. While the oil is still warm and any metal particles are still suspended in the oil, change the headstock and gearbox oil (refer to **Lubrication** beginning on **Page 65** for detailed instructions).
6. Check the V-belt tension, and if necessary, re-tension them (refer to **V-Belts** on **Page 79** for detailed instructions).

Congratulations! The spindle break-in is complete.

Recommended Adjustments

The following adjustments have been made at the factory. However, because of the many variables involved with shipping, we recommend that you at least verify the following adjustments to ensure the best possible results from the lathe.

Step-by-step instructions for these adjustments can be found on the pages referenced below.

Factory adjustments that should be verified:

- Tailstock alignment (see **Page 40**).
- Compound and cross slide backlash adjustment (see **Page 76**).
- Gib adjustments (see **Page 77**).

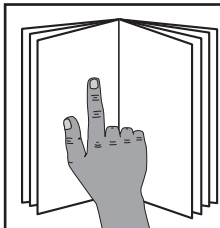


SECTION 4: OPERATIONS

Operation Overview

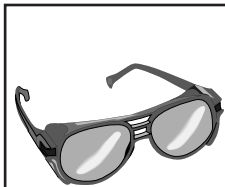
The purpose of this overview is to provide the novice machine operator with a basic understanding of how the machine is used during operation, so the machine controls/components discussed later in this manual are easier to understand.

Due to the generic nature of this overview, it is **not** intended to be an instructional guide. To learn more about specific operations, read this entire manual and seek additional training from experienced machine operators, and do additional research outside of this manual by reading "how-to" books, trade magazines, or websites.



!WARNING

To reduce your risk of serious injury, read this entire manual **BEFORE** using machine.



!WARNING

To reduce the risk of eye injury from flying chips always wear safety glasses.

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, Grizzly Industrial will not be held liable for accidents caused by lack of training.

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

1. Puts on safety glasses, rolls up sleeves, removes jewelry, and secures any clothing, jewelry, or hair that could get entangled in moving parts.
2. Examines the workpiece to make sure it is suitable for turning, then securely mounts the workpiece in one of the chucks or on the faceplate, and removes the chuck key.
3. Mounts the tooling, aligns it with the workpiece, then backs it away to establish a safe startup clearance.
4. Clears all setup tools from the lathe.
5. Checks for safe clearances by rotating the workpiece by hand at least one full revolution.
6. Moves slides to where they will be used during operation.
7. Sets the correct spindle speed for the operation.
8. If using power feed, selects the proper feed rate for the operation.
9. Turns the two-speed motor switch **ON** (HIGH or LOW position), resets the STOP button, then moves the spindle lever down to start spindle rotation.
10. Uses the carriage handwheels or power feed options to move the tooling into the workpiece for operations.
11. When finished cutting, moves the spindle lever to the OFF position, presses the foot brake to completely stop the spindle, then removes the workpiece.



Chuck & Faceplate Mounting

This lathe is equipped with a D1-type spindle nose. This type of spindle uses camlocks that are adjusted with a chuck key to securely mount a chuck or faceplate with repeatable precision and ease.

⚠️ WARNING

Never use spindle speeds faster than the chuck RPM rating or the safe limits of your workpiece. Excessive spindle speeds greatly increase the risk of the workpiece or chuck being thrown from the machine with deadly force!

This lathe ships with the 3-jaw chuck installed. This is a scroll-type chuck where all three jaws move in unison when the chuck key is used.

The included 4-jaw chuck features independent jaws, which are used for square or unevenly-shaped stock, and to mount work that needs to be adjusted to near zero total indicated runout.

If neither chuck can hold your workpiece, the cast iron faceplate has slots for T-bolts that hold standard or custom clamping hardware. With the correct clamping hardware, a faceplate offers a wide range of uses, including machining non-concentric workpieces, straight turning between centers, off-center turning, and boring.

Installation & Removal Devices

Because chucks are heavy and often awkward to hold, some kind of lifting, support, or protective device should be used during installation or removal. The weight and size of the chuck will determine the appropriate device to use (refer to the following figure for examples).

⚠️ WARNING

A dropped chuck can cause amputation, serious crushing injuries, or property damage. Always use a support or protective device to reduce this risk when installing or removing a chuck.

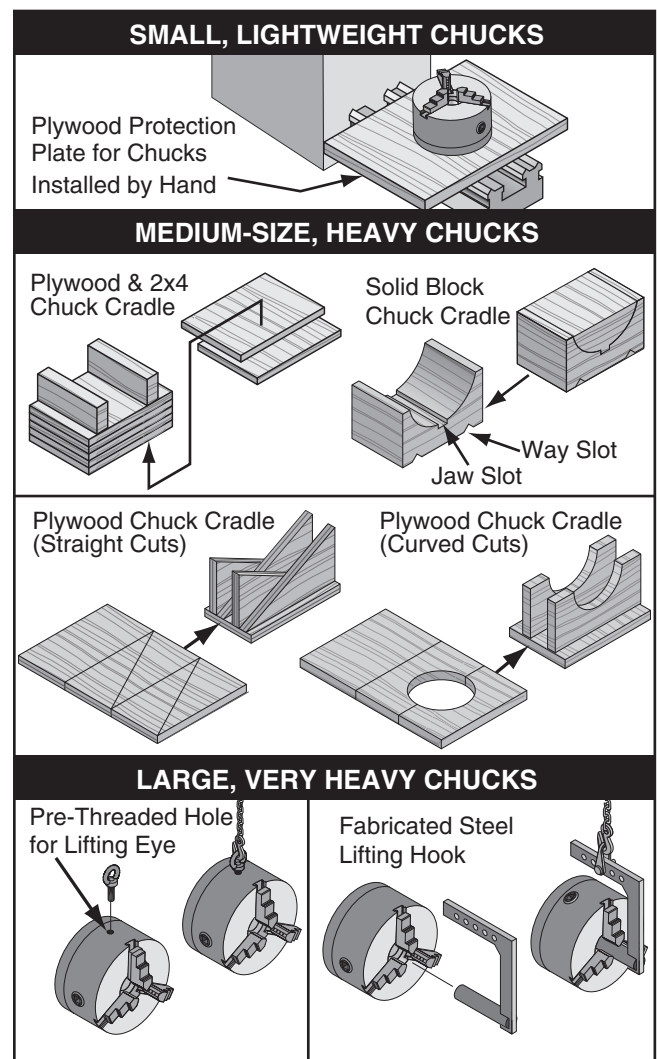


Figure 30. Examples of common devices used during chuck installation and removal.



Chuck Installation

To ensure accurate work, it is extremely important to make sure the spindle nose and chuck mating surfaces/tapers are clean. Even a small amount of lint or debris can affect accuracy.

The chuck is properly installed when all camlocks are tight, the spindle and chuck tapers firmly lock together, and the back of the chuck is firmly seated against the face of the spindle all the way around—without any gaps.

To install the chuck:

1. DISCONNECT LATHE FROM POWER!
2. Use an appropriate lifting, support, or protective device to protect the ways and support the chuck during the installation process (refer to the **Installation & Removal Devices** section in this Manual).
3. Clean and lightly oil the camlock studs, then thoroughly clean the mating surfaces of the spindle and chuck.
4. Install the chuck by inserting the camlock studs straight into the spindle cam holes.

Important: Avoid inserting the studs by pivoting them in from an angle or rotating the spindle. This can damage studs or spindle cam holes.

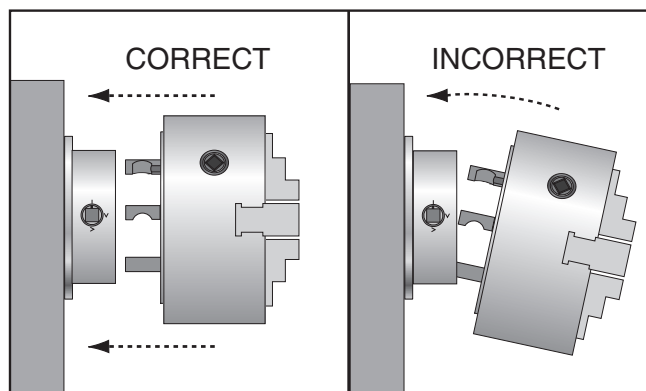


Figure 31. Inserting camlock studs into spindle cam holes.

5. Incrementally tighten the camlocks in a criss-cross or star pattern to ensure that the chuck seats evenly against the spindle.
6. When the chuck is fully seated and all the camlocks are tight, verify that the cam line is between the two “V” marks on the spindle nose, as shown in the following figure.

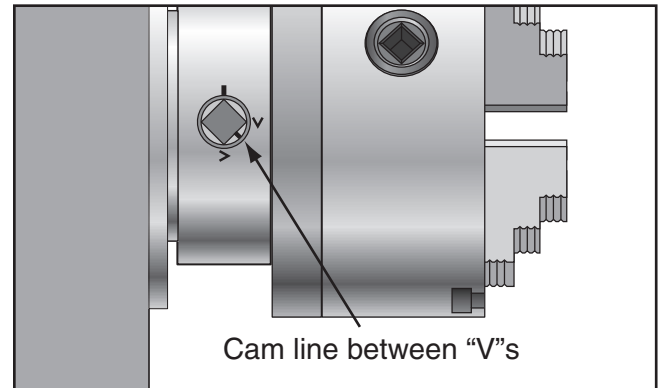


Figure 32. Cam line positioned between the “V” marks after the camlocks are fully tightened.

- If the cam line is NOT between the “V” marks when the camlock is tight, the stud may be installed at the incorrect height. To fix this, adjust the stud height as shown in the following figure. Make sure to re-install the stud cap screw afterward.
- If adjusting the stud height does not correct the problem, try swapping stud positions on the chuck.

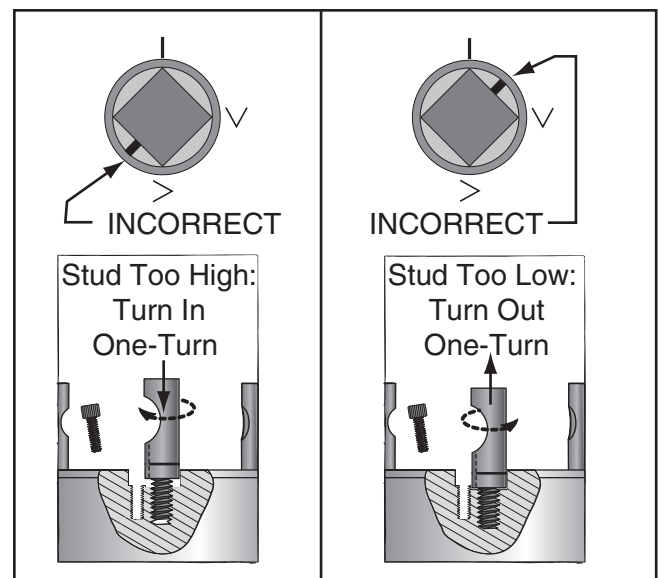


Figure 33. Correcting an improperly installed stud.



- Verify that the chuck fits the spindle properly by checking for any gaps between the mating surfaces.

—If there are no gaps, proceed to **Step 8**.

—If there is a gap, remove the chuck, re-clean the mating surfaces carefully, and re-install. If the problem persists, contact our Tech Support.

- Verify that the chuck/spindle tapers are seated firmly together by removing the chuck, per the **Chuck Removal** instructions, and pay close attention to how easily the tapers release.

—If it was necessary to bump the chuck or use a mallet to release the tapers, then they are seating together properly.

—If the tapers released easily with little intervention, they are not seated together firmly as required. Remove the chuck, re-clean the mating surfaces carefully, and re-install. If the problem persists, contact our Tech Support.

Registration Marks

Lightly stamp registration marks across the mating seams of chuck components. These marks will help you re-install the chuck in the same position after removal, which ensures consistent chuck balance and turning results, and allows the same camlocks and studs to operate together for consistent locking and unlocking.

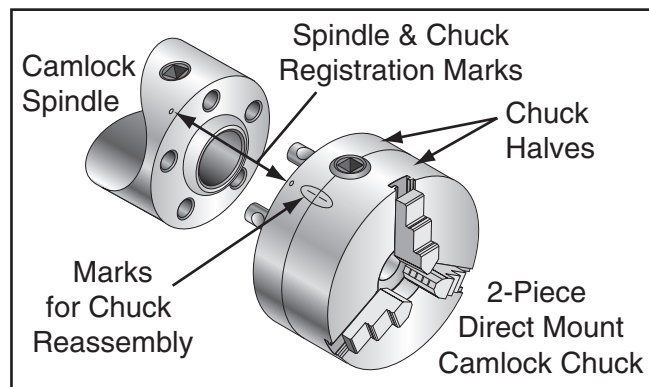


Figure 34. Registration mark locations.

Chuck Removal

To remove the chuck:

- DISCONNECT LATHE FROM POWER!
- Use an appropriate lifting, support, or protective device to protect the ways and support the chuck (refer to the **Installation & Removal Devices** section in this manual).
- Loosen the camlocks by turning the key counterclockwise until each of the cam lines are aligned with its corresponding spindle mark, as shown in the **Figure** below.

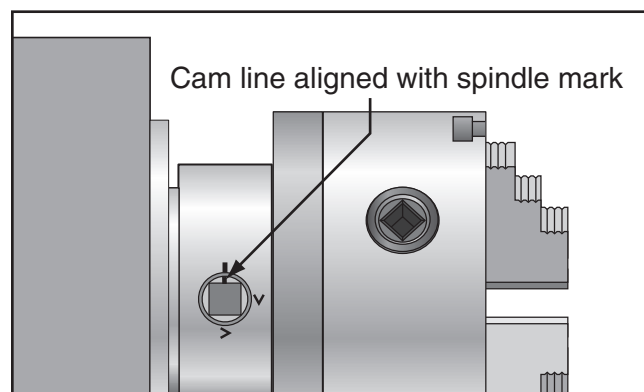


Figure 35. Camlock is fully loosened when the cam line is aligned with the spindle mark.

Tip: Camlocks can become very tight. A cheater pipe may be used as a last resort to add leverage when loosening. After loosening, you may need to wiggle the chuck key in the camlock to fully disengage the stud.

- Using a dead blow hammer or other soft mallet, lightly tap around the outer circumference of the chuck body to loosen it from the spindle.
- Remove the chuck from the spindle, using a light rocking motion to carefully slide the studs out of the cam holes.

—If the chuck does not immediately come off, rotate it approximately 60° and tap it again. Make sure all the marks on the cams and spindle are in proper alignment for removal.



Scroll Chuck Clamping

This 3-jaw scroll-type chuck has an internal scroll-gear that moves all jaws in unison when adjusted with the chuck key. This chuck will hold cylindrical parts on-center with the axis of spindle rotation and can be rotated at high speeds if the workpiece is properly clamped and balanced.

Never mix jaw types or positions to accommodate an odd-shaped workpiece. The chuck will spin out of balance and may throw the workpiece! Instead, use an independent jaw chuck or a faceplate.

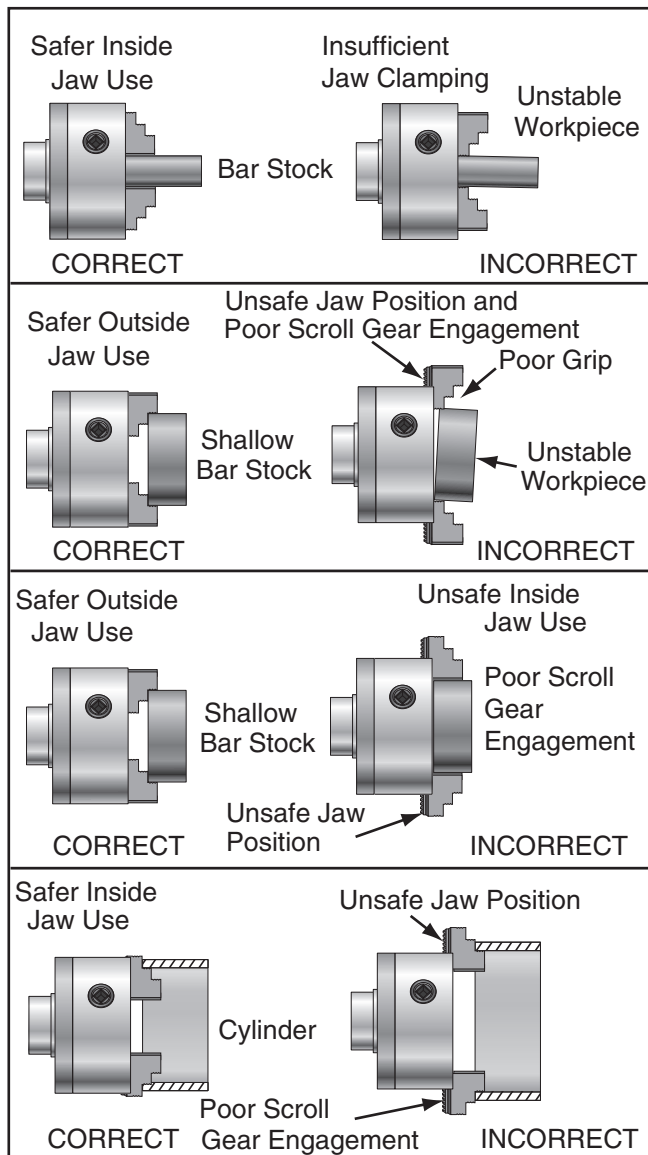


Figure 36. Jaw selection and workpiece holding.

Chuck Jaw Reversal

This chuck has 2-piece jaws that consist of a top jaw and a master jaw. The top jaw can be removed, rotated 180°, and re-installed in the reverse position for additional work-holding options. When reversing the top jaws, always keep them matched with their original master jaw to ensure the best fit.

To reverse 2-piece jaws:

1. DISCONNECT MACHINE FROM POWER!
2. Remove the cap screws that secure the top jaw to the master (bottom) jaw.
3. Remove the top jaw, rotate it 180°, then re-install it with the longest cap screw in the tallest portion of the jaw.
4. Repeat **Steps 2–3** with each remaining jaw (we recommend only reversing one jaw at a time to keep all original parts together).

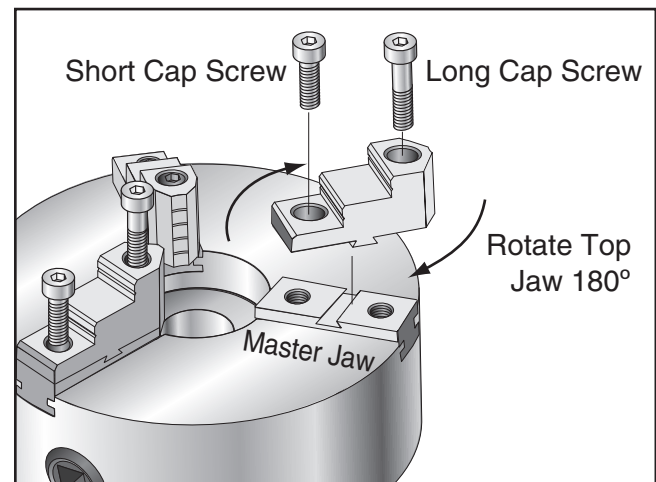


Figure 37. Reversing the chuck jaws.



4-Jaw Chuck

Refer to the prior **Chuck Installation** and **Chuck Removal** sections for instructions on installing or removing the 4-jaw chuck.

The 4-jaw chuck features independently adjustable hardened steel jaws for holding non-concentric or off-center workpieces. Each jaw can be independently removed from the chuck body and reversed for a wide range of work holding versatility.

!WARNING

Because of the dynamic forces involved in machining a non-concentric or off-center workpiece, always use a low spindle speed to reduce risk of the workpiece coming loose and being thrown from the lathe, which could cause death or serious personal injury.

Mounting Workpiece

1. DISCONNECT LATHE FROM POWER!
2. Place a chuck cradle or plywood on the bedway below the chuck to protect the bedway surfaces.
3. Use the chuck key to open each jaw so the workpiece will lay flat against the chuck face, jaw steps, or into the spindle opening.
4. With help from another person or a holding device, position the workpiece so it is centered in the chuck.

5. Tighten each jaw in small increments. After you have adjusted the first jaw, continue tightening the remaining jaws in an opposing sequence, as shown by the sequential order in the **Figure** below.

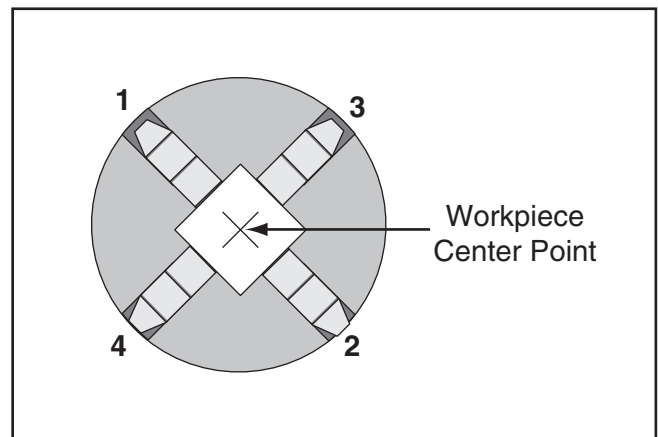


Figure 38. 4-jaw tightening sequence.

6. After the workpiece is held in place by the jaws, use a dial indicator to make sure the workpiece is centered in the chuck.

—If the workpiece is not correctly centered, make fine adjustments by slightly loosening one jaw and tightening the opposing jaw until the workpiece is correctly positioned (see the **Figure** below for an example).

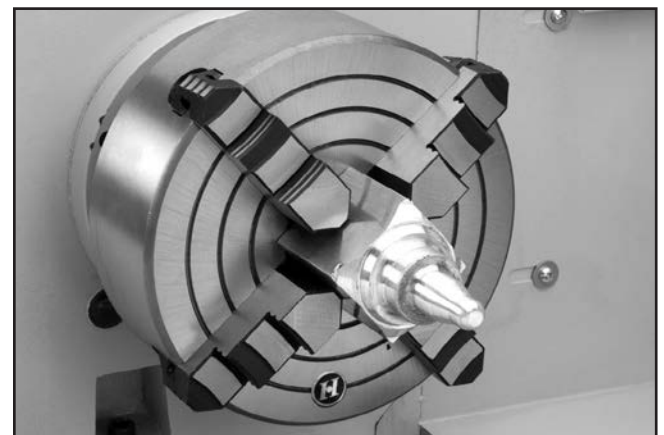


Figure 39. Generic picture of non-cylindrical workpiece correctly mounted on the 4-jaw chuck.



Faceplate

Refer to the prior **Chuck Installation** and **Chuck Removal** sections for instructions on installing or removing the faceplate.

The faceplate included with your lathe can be used for a wide range of operations, including machining non-concentric workpieces, straight turning between centers, off-center turning, and boring.

The tools needed for mounting a workpiece will vary depending on the type of setup you have.

⚠️ WARNING

Machining non-concentric workpieces at a high speed could cause the workpiece to be thrown from the spindle with deadly force at the operator or bystanders. To reduce this risk, only machine non-concentric workpieces at low speeds and clamp counter-weights to the faceplate to balance it.

⚠️ WARNING

Failure to properly secure a workpiece to the faceplate could cause the workpiece to be thrown from the lathe with deadly force at the operator or bystanders. Use a minimum of THREE independent clamping devices to hold the workpiece onto the faceplate.

To mount a non-concentric workpiece to the faceplate:

1. DISCONNECT LATHE FROM POWER!
2. Protect the bedway with a piece of plywood.
3. With help from another person or a holding device to support the workpiece, position it onto the faceplate and clamp it in place with a minimum of three independent clamping devices (see **Figure** below for an example).

Be sure to take into account the rotational and cutting forces that will be applied to the workpiece when clamping it to the faceplate. If necessary, use counter-weights to balance the assembly and use a dial indicator to make sure that the workpiece is properly positioned for your operation.

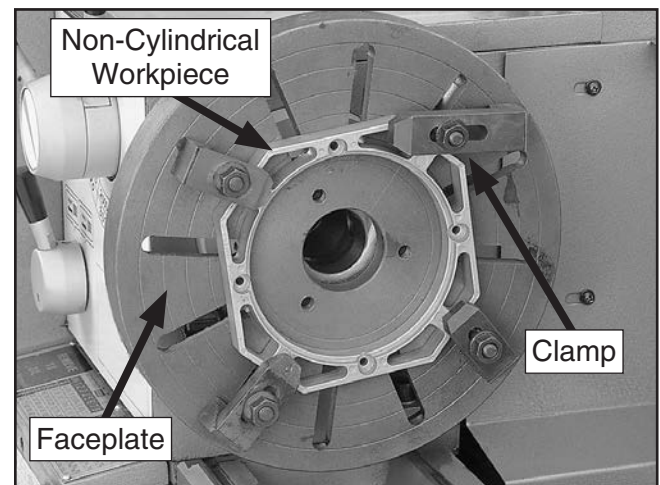


Figure 40. Generic picture of workpiece clamped in a faceplate.



Tailstock

The tailstock (see **Figure** below) is typically used to support long workpieces by means of a live or dead center (refer to **Centers** in the following section). It can also be used to hold a drill or chuck to bore holes in the center of a part. Custom arbors and tapers can also be cut on your lathe by using the offset tailstock adjustment.

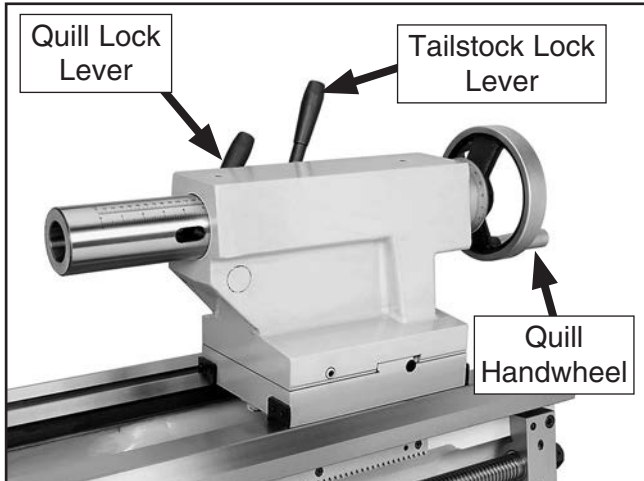


Figure 41. Tailstock and quill lock levers in locked position.

Graduated Dial

Increments..... 0.001"
One Full Revolution..... 0.100"

Increments on Quill

Inch 0"-4½ in 1/16" Increments
Metric..... 0-114mm in 1mm Increments

Positioning Tailstock

1. Pull the tailstock lock lever backward (away from the spindle) to unlock the tailstock from the bedway.
2. Slide the tailstock to the desired position.
3. Push the tailstock lock lever forward (toward the spindle) to lock the tailstock against the bedway.

Using Quill

1. Move the quill lock lever away from the spindle to unlock the quill.
2. Turn the quill handwheel clockwise to move the quill toward the spindle or counterclockwise to move it away from it.
3. Move the lock lever toward the spindle to secure the quill in place.

Installing Tooling

This tailstock uses a quill with an MT#3 taper that has a lock slot in the back of the bore that accepts tang arbors and drill bits (see the **Figures** below for examples).

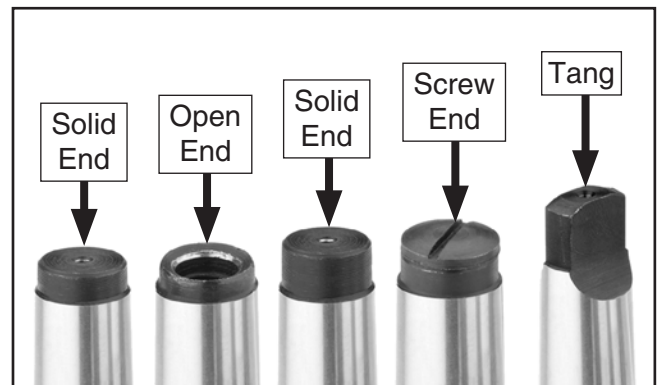


Figure 42. Types of tapered arbors and tooling.

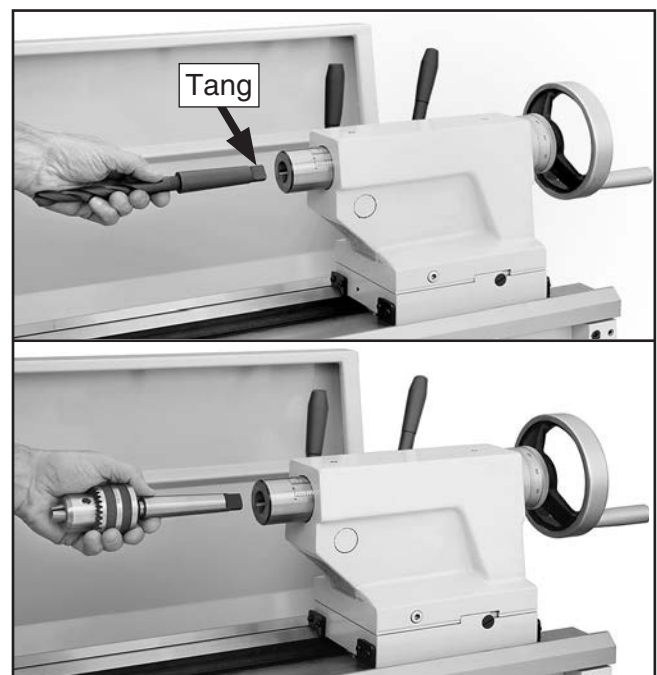


Figure 43. Example photos of inserting tools with tangs into the tailstock.



However, other tooling without tangs, such as the four remaining tools shown previously, can still be used if the potential load will not exceed the strength of the tapered fit. For example, this includes smaller drill chucks, drill bits, and centers.

Note: *If the tooling has an open hole in the end but is too short to be exposed in the drift slot for removal, then a screw can be threaded into the end of the tool to provide a solid surface for the quill pin to push against when the quill is retracted for tool removal. Otherwise, removal of such tooling may be difficult.*

To install tooling in the tailstock:

1. With the tailstock locked in place, unlock the quill, then use the handwheel to extend it approximately 1".
2. Thoroughly clean and dry the tapered mating surfaces of the quill and the center, making sure that no lint or oil remains on the tapers.

Note: *If the tapered tool shaft has a tang, align it with the slot in the back of the quill before seating it.*

3. With a firm and quick motion, insert the tool into the quill. Check to see if it is firmly seated by attempting to twist it—a firmly seated tool will not twist.
4. Unlock the tailstock and move it until the tip of the tool is close to, but not touching, the workpiece, then re-lock the tailstock.
5. Start spindle rotation, unlock the quill lock lever, then turn the quill handwheel clockwise to feed the tool into the workpiece.

Removing Tooling

1. Use a shop rag to hold the tool.
2. Rotate the quill handwheel counterclockwise until the tool is forced out of the quill.

—If the tool does not come loose by retracting the quill, extend the quill and use a drift key in the slot shown in the **Figure** below to remove the tool.



Figure 44. Drift key slot in the side of the quill.

Offsetting Tailstock

The tailstock can be offset from the spindle centerline for turning tapers. Move the tailstock top casting toward the front of the lathe to machine a taper at the tailstock end. Conversely, move the tailstock top casting toward the back of the lathe to machine a taper at the spindle end.

Note: *The marks on the offset indicator are arbitrary. For a precise offset, use a dial indicator to check quill movement while adjusting the screws.*

Tools Needed	Qty
Hex Wrench 6mm.....	1
Wrench 17mm.....	1



To offset the tailstock:

1. Loosen the hex bolts underneath both ends of the tailstock to release the clamping pressure between the top and bottom castings shown in the **Figure** below.

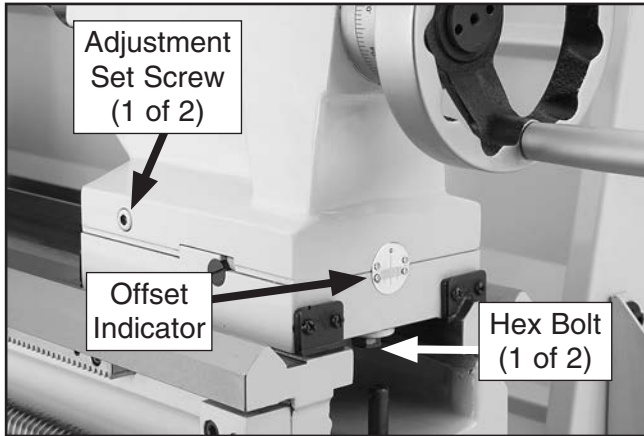


Figure 45. Tailstock offset controls.

2. Rotate the adjustment set screws in opposite directions for the desired offset (see the illustration below).

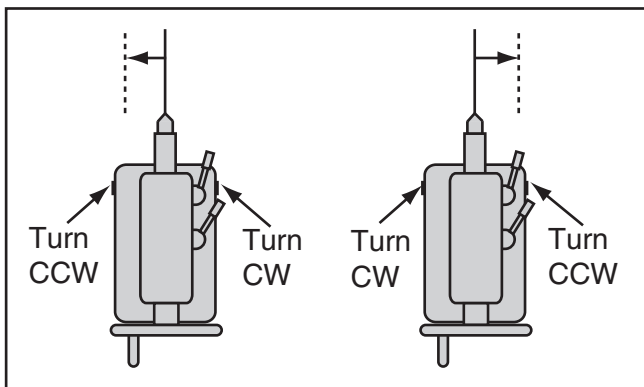


Figure 46. Set screw adjustment in relation to tailstock movement.

3. Retighten the clamping hex bolts underneath the tailstock to secure the offset.

This is an essential adjustment that should be verified or performed each time the tailstock is used to turn concentric workpieces between centers or immediately after offsetting the tailstock when turning a taper. If the tailstock is not aligned with the spindle centerline when it is supposed to be, turning results will be inaccurate along the length of the workpiece.

Aligning Tailstock to Spindle Centerline

This is an essential adjustment that should be verified or performed each time the tailstock is used to turn concentric workpieces between centers or immediately after offsetting the tailstock when turning a taper. If the tailstock is not aligned with the spindle centerline when it is supposed to be, turning results will be inaccurate along the length of the workpiece.

Items Needed

	Qty
Hex Wrench 6mm.....	1
Wrench 17mm.....	1
Round Stock 2" x 6"	2
Precision Level	1

To align the tailstock to the spindle centerline:

1. Use the precision level to make sure the bedway is level from side-to-side and from front-to-back.

—If the bedway is not level, correct this condition before continuing with this procedure (refer to the **Leveling & Mounting** section in this manual).

2. Center drill both ends of one piece of round stock, then set it aside for use in **Step 5**.
3. Use the other piece of round stock to make a dead center, and turn it to a 60° point, as illustrated in the **Figure** below.

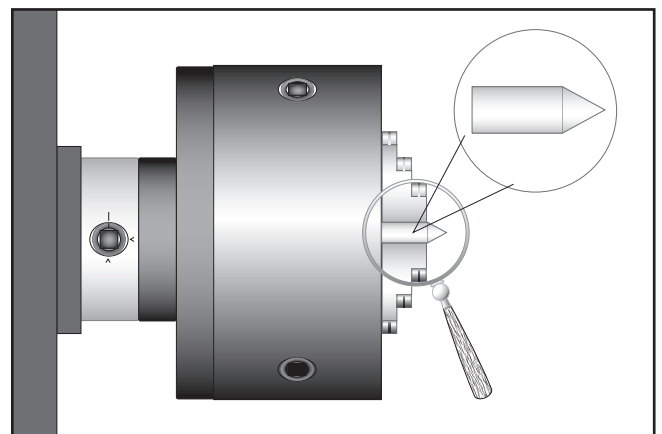


Figure 47. Turning a dead center.



Note: As long as this dead center remains in the chuck, the point of the center will remain true to the spindle centerline. The point will have to be refinished whenever the center is removed and then returned to the chuck.

4. Install a center in the tailstock.
5. Attach a lathe dog to the test stock from **Step 2**, then mount it between the centers as shown in the **Figure** below.



Figure 48. Example photo of stock mounted between the centers.

6. Turn 0.010" off the stock diameter.
7. Mount a test or dial indicator so that the plunger is on the tailstock quill.

Note: If necessary in the following step, refer to the **Offsetting Tailstock** subsection for detailed instructions.

8. Use calipers to measure both ends of the workpiece.

—If the test stock is *thicker* at the tailstock end, move the tailstock toward the *front* of the lathe $\frac{1}{2}$ the distance of the amount of taper, as shown in the **Figure** below.

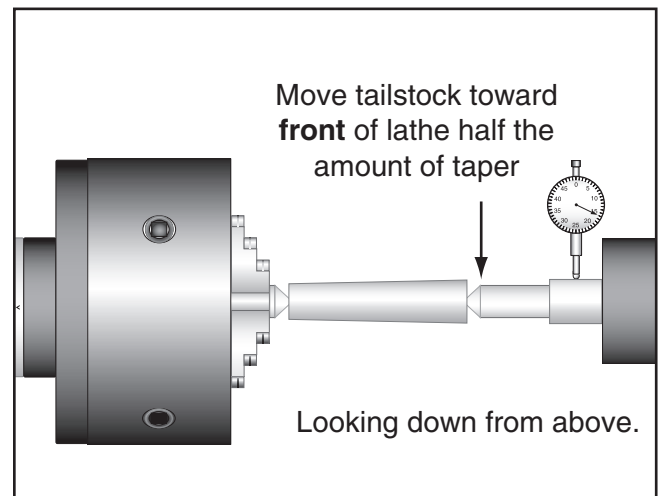


Figure 49. Adjust tailstock toward the operator.

—If the test stock is *thinner* at the tailstock end, move the tailstock toward the *back* of the lathe $\frac{1}{2}$ the distance of the amount of taper, as shown in the **Figure** below.

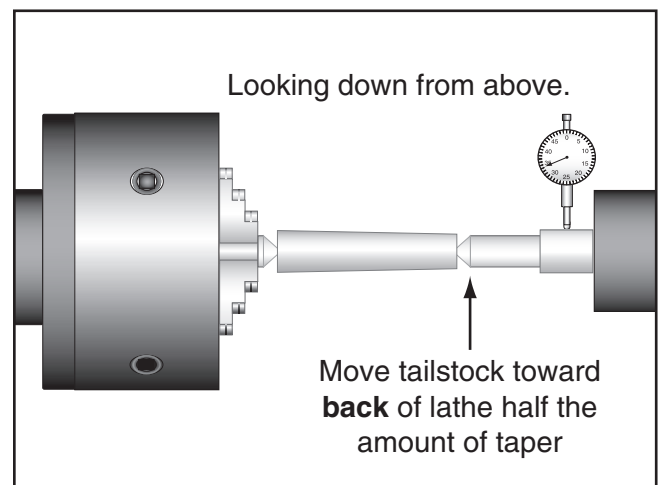


Figure 50. Adjust tailstock away from the operator.

9. Repeat **Steps 6–8** until the desired accuracy is achieved.



Centers

Figure 51 shows the MT#3 dead centers included with the lathe. In addition, an MT#5–MT#3 tapered spindle sleeve is included for mounting in the spindle.

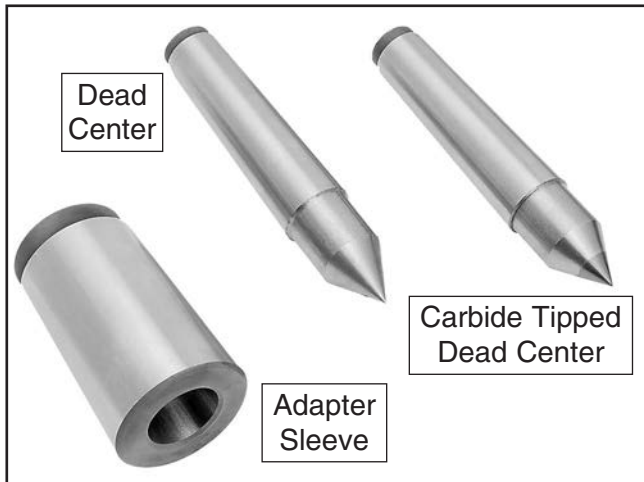


Figure 51. Adapter sleeve and dead centers.

Dead Centers

A dead center is a one-piece center that does not rotate with the workpiece and is used to support long, slender workpieces.

Use the dead center in the spindle for operations where the workpiece rotates with the center and does not generate friction.

The carbide-tipped dead center can better withstand the effects of friction and is best used in the tailstock where the workpiece will rotate against it. The tip of the center must be generously lubricated during the operation to avoid premature wear and maximize smooth operation. Using low spindle speeds will also reduce the heat and wear from friction.

Live Centers

A live center has bearings that allow the center tip and the workpiece to rotate together; it can be installed in the tailstock quill for higher speeds. However, a live center typically does not provide the same level of rigidity as a dead center, and final workpiece accuracy can suffer as a result.

Mounting Dead Center in Spindle

1. DISCONNECT LATHE FROM POWER!
2. Thoroughly clean and dry the tapered mating surfaces of the spindle bore, adapter sleeve, and the center, making sure that no lint or oil remains on the tapers.

Note: This will prevent the tapered surfaces from seizing due to operational pressures, which could make it very difficult to remove the center.

3. Mount a chuck or faceplate onto the spindle, whichever is correct for your operation.
4. Insert the center into the sleeve, then insert the sleeve into the spindle bore through the chuck or faceplate.

Figure 52 shows an example photo of a dead center installed in the spindle, using a lathe dog and faceplate for turning between centers.

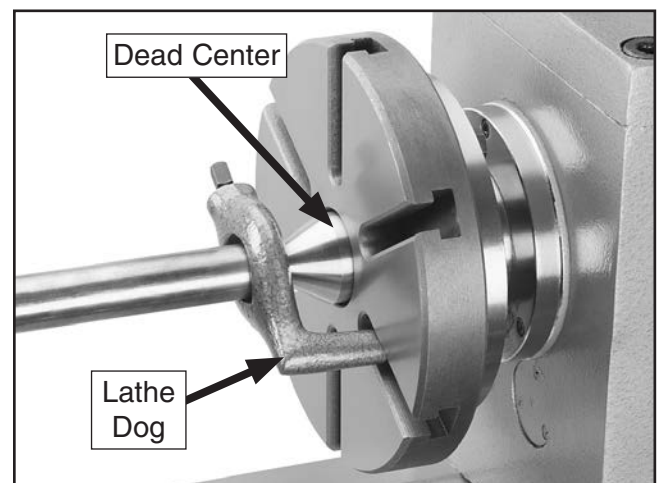


Figure 52. Example photo of using a dead center with a faceplate and lathe dog.



Removing Center from Spindle

To remove the sleeve and center from the spindle, insert a piece of round bar stock or similar tool through the outboard end (on the left side of the headstock). Have another person hold onto the sleeve and center with a gloved hand or shop rag, then tap the sleeve loose.

Mounting Center in Tailstock

Either a carbide-tipped dead center or live center can be used in the tailstock. Mounting instructions are the same for both. **Figure 53** shows an example photo of a dead center mounted in a tailstock.

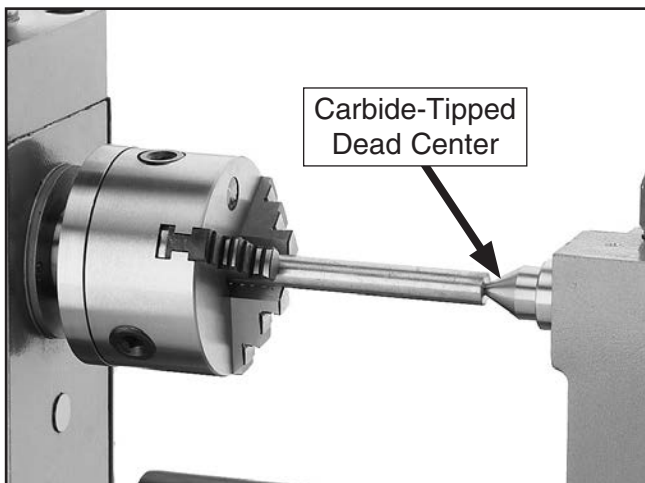


Figure 53. Example photo of using a carbide-tipped dead center installed in the tailstock.

NOTICE

To avoid premature wear of the dead center or damage to the workpiece, use low spindle speeds and keep the tip of the dead center mounted in the tailstock well lubricated.

To mount a center in the tailstock:

1. DISCONNECT LATHE FROM POWER!
2. Thoroughly clean and dry the tapered mating surfaces of the tailstock quill bore and the center, making sure that no lint or oil remains on the tapers.

3. Use the quill handwheel to feed the quill out from the casting approximately 1".

Note: Do not extend the quill more than 2" or stability and accuracy will be reduced.

4. Insert the center into the tailstock quill.
5. Seat the center firmly into the quill during workpiece installation by rotating the quill handwheel clockwise to apply pressure with the center engaged in the center hole in the workpiece.

Note: Only apply enough pressure with the tailstock quill to securely mount the workpiece between centers. Avoid overtightening the center against the workpiece, or it may become difficult to remove later, and it will result in excessive friction and heat, which may damage the workpiece and center.

Removing Center from Tailstock

To remove the center from the quill, hold onto it with a gloved hand or shop rag, then rotate the quill handwheel counterclockwise to draw the quill back into the casting until the center releases.

If the center does not come loose by retracting the quill, extend the quill to expose the slot shown in **Figure 54**, then use a drift key to remove the center.



Figure 54. Drift key slot in the side of the quill.



Mounting Workpiece Between Centers

1. DISCONNECT LATHE FROM POWER!
2. Drill center holes in both ends of the workpiece.
3. Install a dead center in the spindle with a lathe dog and a chuck or faceplate, then install a live center or carbide-tipped dead center in the tailstock.
4. Lubricate the workpiece center holes, then mount the workpiece between the centers and hold it in place with light pressure from the tailstock center.
5. Seat the center firmly into the quill by rotating the quill handwheel clockwise to apply pressure against the workpiece (see the example in **Figure 55**).



Figure 55. Example photo of a workpiece mounted between the centers.

Only apply enough pressure to securely mount the workpiece between centers. Avoid over-tightening the center against the workpiece, or it may become difficult to remove later. Also, over-tightening will result in excessive friction and heat, which may damage the workpiece or center.



Steady Rest

The steady rest supports long shafts and can be mounted anywhere along the length of the bedway.

Familiarize yourself with the steady rest components shown in **Figure 56** to better understand its operation.

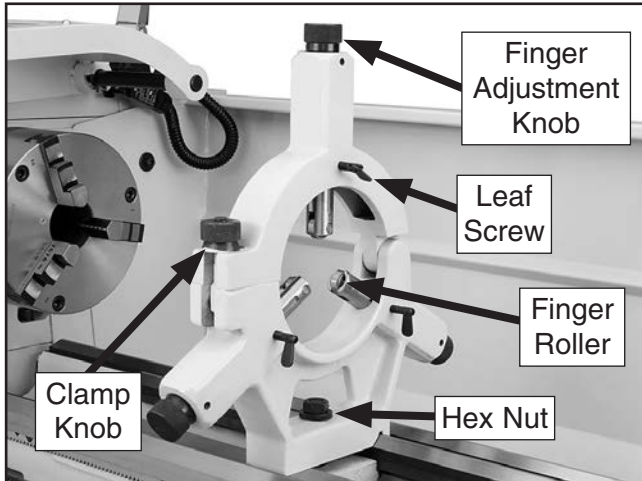


Figure 56. Steady rest components.

To install and use the steady rest:

1. DISCONNECT LATHE FROM POWER!
2. Thoroughly clean all mating surfaces, then place the steady rest base on the bedways so the triangular notch fits over the bedway prism.
3. Position the steady rest where required to properly support the workpiece, then tighten the hex nut shown in **Figure 56** to secure it in place.

4. Loosen the clamp knob that secures the two halves of the steady rest and open the top portion, as shown in **Figure 57**.

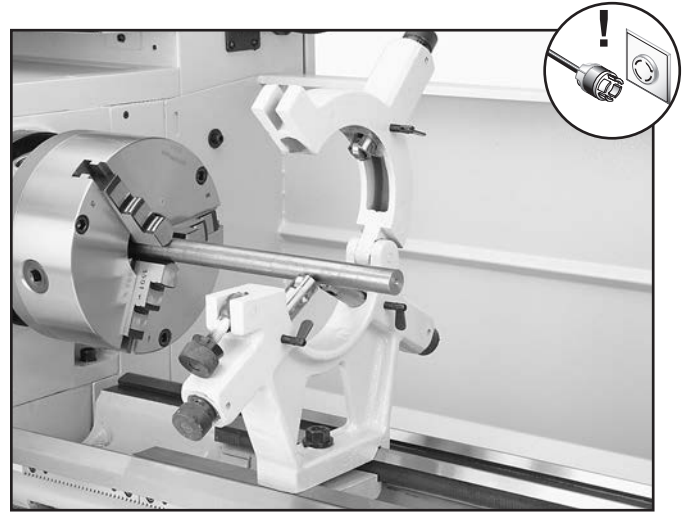


Figure 57. Workpiece mounted in the steady rest.

5. Loosen the three leaf screws so the finger roller positions can be adjusted.
6. Use the finger adjustment knobs to position the bottom two finger rollers against the workpiece, as shown in the example of **Figure 57**.
7. Close the steady rest, then use the finger adjustment knobs to adjust all three finger rollers so that they just touch the workpiece without causing deflection.
Note: *The finger rollers should properly support the workpiece along the spindle centerline while still allowing it to freely rotate.*
8. Tighten the three leaf screws to secure the settings.



Follow Rest

The follow rest mounts to the saddle with two cap screws (see **Figure 58**). It is used on long, slender parts to prevent workpiece deflection from the pressure of the cutting tool during operation. Adjust the follow rest fingers in the same manner as the those on the steady rest.

Note: To reduce the effects of friction, lubricate the brass finger tips with generous lubricant during operation.



Figure 58. Follow rest attachment.

Carriage & Slide Locks

The carriage, cross slide, and compound rest have locks that can be tightened to provide additional rigidity during operation, especially during heavy cuts.

See **Figures 59–60** to identify the locations of the locks for each device.

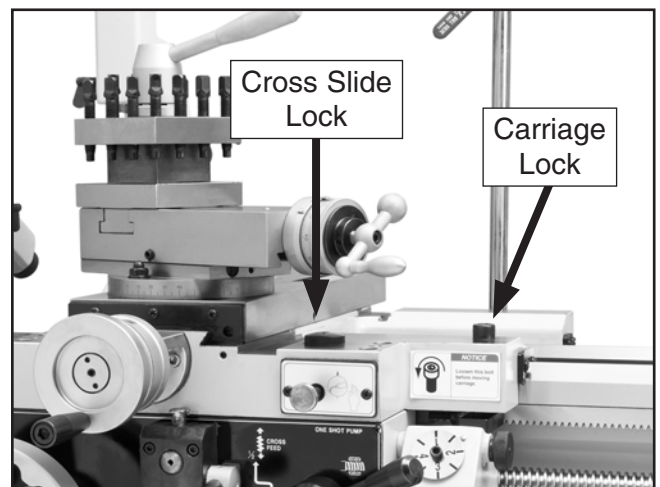


Figure 59. Location of carriage and cross slide locks.

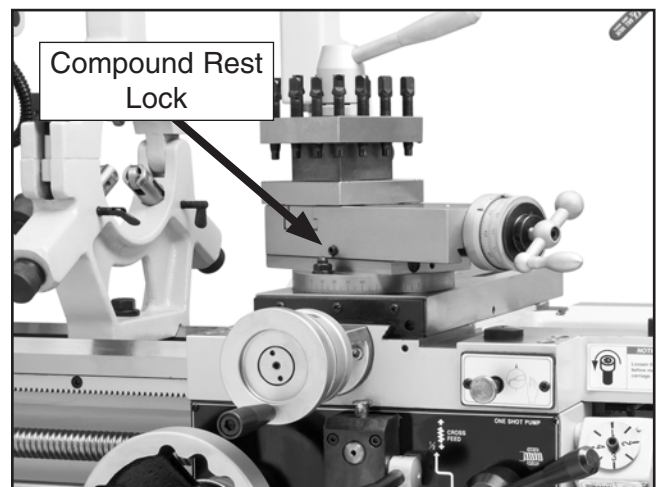


Figure 60. Location of compound rest lock.



Compound Rest

The compound rest handwheel has an indirect-read graduated scale. This means that the distance shown on the scale represents the actual distance the cutting tool moves. The base of the compound rest has another graduated scale used for setting the cutting tool to a specific angle.

Graduated Dial

Increments..... 0.001" (0.02mm)
 One Full Revolution..... 0.100" (2.54mm)

Tool Needed	Qty
Wrench 14mm	1

To set the compound rest at a certain angle:

1. Loosen the two hex nuts at the base of the compound rest (1 of 2 shown in **Figure 61**).

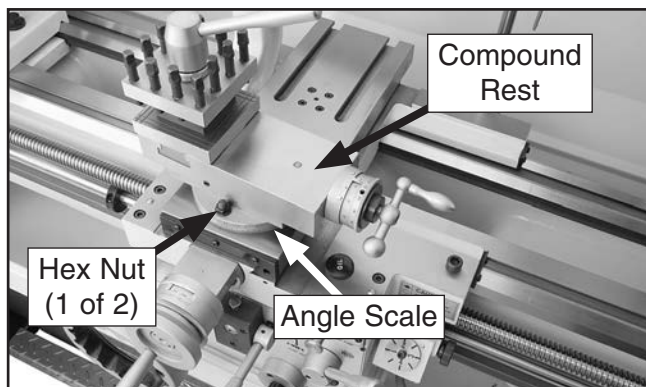


Figure 61. Compound rest.

2. Rotate the rest to the desired angle, as indicated by the scale at the base, then retighten the two hex nuts.

Tip: The first time you set the angle of the compound rest for cutting threads, mark the location on the cross slide as a quick reference point. This will allow you to quickly return the compound rest to that exact angle the next time you need to cut threads.

Four-Way Tool Post

The four-way tool post is mounted on top of the compound rest and allows a maximum of four tools to be loaded simultaneously.

Each tool can be quickly indexed to the workpiece by loosening the top handle, rotating the tool post to the desired position, then re-tightening the handle to lock the tool into position.

Installing Tool

Tool Needed	Qty
Tool Post T-Wrench	1

To install a tool in the tool post:

1. Adjust the tool post bolts so that the cutting tool can fit underneath them (see **Figure 62**).

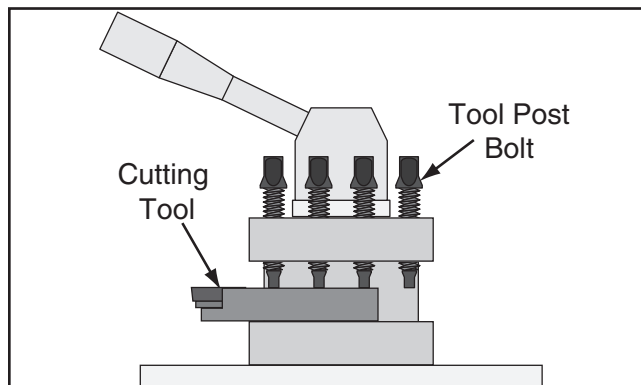


Figure 62. Example of tool mounted in tool post.

!WARNING

Over-extending a cutting tool from the post will increase the risk of tool chatter, breakage, or tool loosening during operation, which could cause metal pieces to be thrown at the operator or bystanders with great force. DO NOT extend a cutting tool more than 2.5 times the width of its cross-section (e.g., 2.5 x 0.5" = 1.25").

2. Firmly secure the cutting tool with at least two tool post bolts.
3. Check and adjust the cutting tool to the spindle centerline, as instructed in the next subsection.



Aligning Cutting Tool with Spindle Centerline

For most operations, the cutting tool tip should be aligned with the spindle centerline, as illustrated in **Figure 63**.

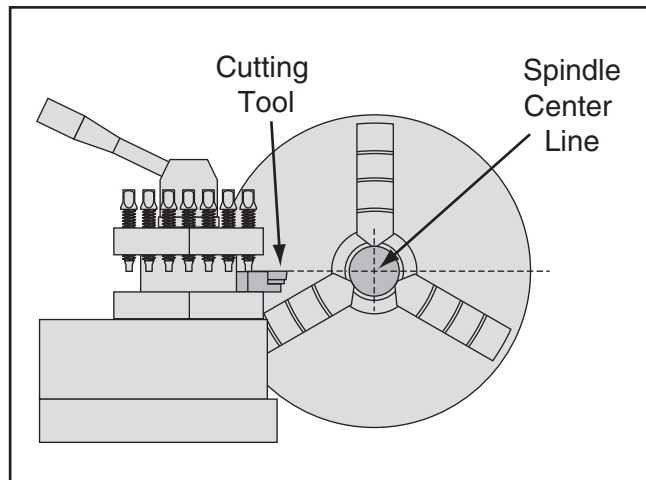


Figure 63. Cutting tool aligned with spindle centerline (viewed from tailstock).

There are a number of ways to check and align the cutting tool to the spindle centerline. If necessary, you can raise the cutting tool by placing steel shims underneath it. The shims should be as long and as wide as the cutting tool to properly support it.

Below are two common methods:

- Align the tip of the cutting tool with a center installed in the tailstock, as instructed on this page. For this to work, the tailstock must be aligned to the spindle centerline (refer to **Aligning Tailstock To Spindle Centerline** on **Page 40** for detailed instructions).
- Make a facing cut on a piece of round bar stock. If the tool is above or below the spindle centerline, a nub will be left in the center of the workpiece. Adjust the height of the tool, then repeat the facing cut to check the adjustment. Repeat as necessary until the center of the workpiece face is smooth.

Tools Needed	Qty
Tool Post T-Wrench	1
Steel Shims	As Needed
Cutting Tool	1
Fine Ruler.....	1
Tailstock Center.....	1

To align the cutting tool with the tailstock center:

1. Mount the cutting tool in the tool post, then secure the post so the tool faces the tailstock.
2. Install a center in the tailstock, and position the center tip near the cutting tool tip.
3. Lock the tailstock and quill in place.
4. Adjust the height of the cutting tool so that the tool tip is aligned vertically and horizontally with the center tip, as shown in **Figure 64**.

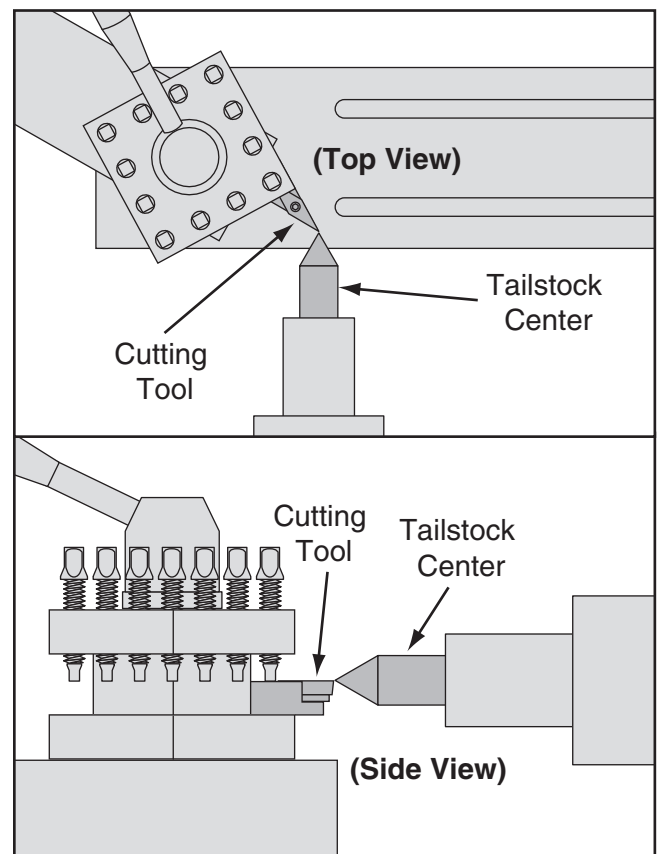


Figure 64. Cutting tool aligned to the tailstock center.



Adjustable Feed Stop

Use the adjustable feed stop collar (shown in **Figure 65**) to set the location where the carriage should disengage from power feed.

When the apron stop plate contacts the stop collar during an operation that uses the feed rod, the clutch disengages the carriage from the feed rod and movement stops.

Tools Needed	Qty
Hex Wrench 5mm.....	1

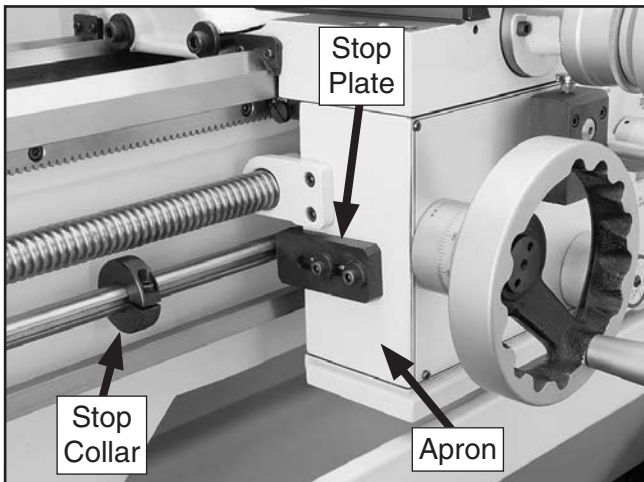


Figure 65. Adjustable feed rod stop.

NOTICE

The adjustable feed stop system is designed to stop longitudinal carriage movement at the desired location **ONLY** when the carriage is engaged with the feed rod.

When the carriage is engaged with the leadscrew for threading operations, the adjustable feed stop system **WILL NOT** stop carriage movement—you must use the half nut lever instead. Otherwise, the carriage can crash into the chuck, or if it contacts the stop, the leadscrew shear pin will break.

Before doing any threading operation, make sure to loosen the feed stop collar so it slides freely on the feed rod and will not interfere with carriage travel.

Micrometer Stop

Use the carriage stop as a guide to help judge when to stop carriage movement.

NOTICE

The carriage stop on this lathe will **NOT** automatically stop the carriage during threading operations when the carriage is engaged with the leadscrew! Failure to heed this notice could result in the carriage crashing and causing severe machine or property damage.

Tools Needed	Qty
Hex Wrench 8mm.....	1

To set the micrometer stop:

1. DISCONNECT LATHE FROM POWER!
2. Loosen the cap screws shown in **Figure 66**, then use the carriage handwheel to position the carriage and cutting tool at the desired stopping point.

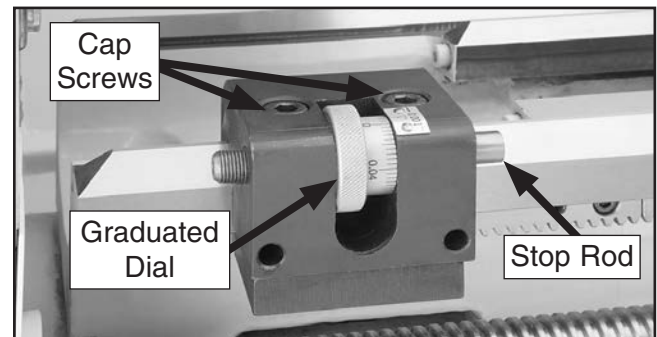


Figure 66. Micrometer stop.

3. Move the micrometer stop up to the carriage, use the graduated dial to fine tune the position, then retighten the cap screws loosened in **Step 2**.
4. Verify that tooling will not make contact with the chuck, jaws, or other components.



Manual Feed

The handwheels shown in **Figure 67** allow the operator to manually move the cutting tool.

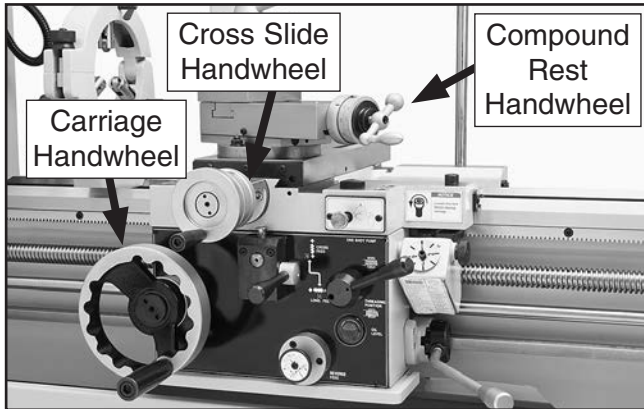


Figure 67. Carriage Controls.

Carriage Handwheel

The carriage handwheel moves the carriage left or right along the bed. It has a graduated dial with 0.01" increments, and one full revolution moves the carriage 0.80".

Cross Slide Handwheel

The cross slide handwheel moves the tool toward and away from the work. Adjust the position of the graduated scale by holding the handwheel with one hand and turning the dial with the other. The cross slide handwheel has a direct-read graduated dial, which shows the total amount of material removed from the diameter of the workpiece. The dial has 0.001" (0.02mm) increments, and one full revolution moves the slide 0.200" (5.08mm). Rotate the dial collar 180° to read in metric units.

Compound Rest Handwheel

The compound rest handwheel moves the cutting tool linearly along the set angle of the compound rest. The compound rest angle is set by hand-rotating it and securing in place with two hex nuts. The compound rest has an indirect-read graduated dial with 0.001" (0.02mm) increments. One full revolution of the handwheel moves the slide 0.100" (2.54mm). Rotate the dial collar 180° to read in metric units.

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 lathe 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 workpiece, as noted in the formula shown in **Figure 68**.

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

*Double if using carbide cutting tool

Figure 68. Spindle speed formula for lathes.

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

A recommended cutting speed is an ideal speed for cutting a type of material in order to produce the desired finish and optimize tool life.

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 the applicable variables in order to determine the best spindle speed for the operation.



Setting Spindle Speed

Selecting one of the 16 spindle speeds available is a combination of configuring the two-speed motor switch, the spindle range lever, and the spindle speed lever shown in **Figure 69**.

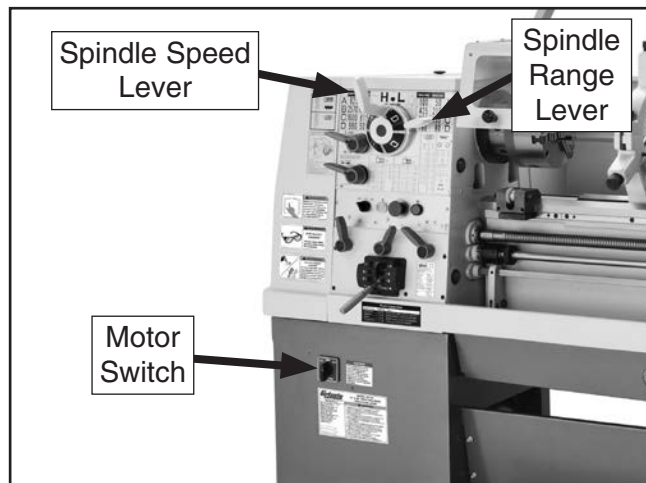


Figure 69. Spindle speed controls.

The motor switch controls the speed of the spindle motor, either a low speed of 1725 RPM or a high speed of 3450 RPM.

The spindle speed and range levers control the gear configuration in the headstock to produce the selected spindle speed. The spindle range lever selects speeds in the left- or right-hand speed chart to be available for the spindle speed lever. The spindle speed lever selects one of the speeds available in the active chart and column.

NOTICE

If the spindle is rotating when attempting to change the spindle speed, the headstock gears will suffer damage! **ALWAYS** make sure the spindle is completely stopped **BEFORE** using the headstock control levers to make changes.

NOTICE

Operating the lathe at spindle speeds higher than 315 RPM when the high (H) gearbox range is selected could result in gearbox damage. Always use spindle speeds of 315 RPM or lower when using the high (H) gearbox range.

Configuration Examples

Using the controls on the lathe, follow along with these two examples for setting the spindle speed to gain a better understanding of this task.

Setting Spindle Speed of 215 RPM

1. Make sure the spindle is completely stopped and the spindle lever is in the OFF (middle) position.
2. Turn the motor switch (see **Figure 69**) to the low (left) position.

Note: The green color of the motor switch low position corresponds to the column in the right-hand speed chart with the green header that contains the speed of 215 RPM.

3. Move the spindle range lever to the right so that the arrow on top of its hub points toward the right-hand speed chart (see the illustration in **Figure 70**).

Note: If necessary, use the chuck key to rock the spindle back-and-forth to help mesh the gears as you move the levers.

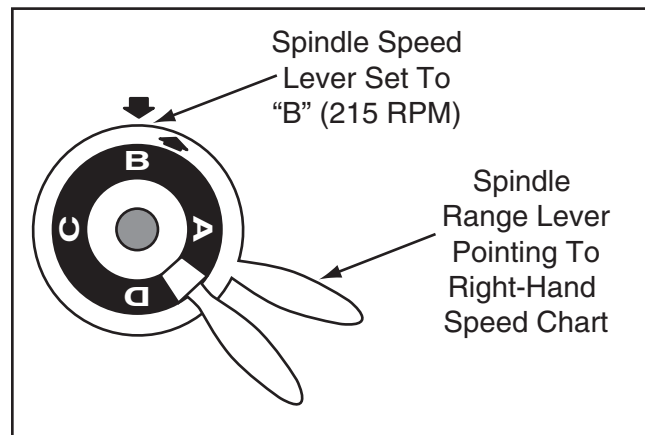


Figure 70. Setting the spindle speed to 215 RPM.

4. Position the spindle speed lever so that the "B" is directly under the arrow on the headstock.

Note: You will hear a distinctive "click" when the spindle speed lever is in the correct position.

The lathe is now set for a spindle speed of 215 RPM.



Setting Spindle Speed of 1600 RPM

1. Make sure the spindle is completely stopped and the spindle lever is in the OFF (middle) position.
2. Turn the motor switch to the high (right) position.

Note: The blue color of the motor switch high position corresponds to the column in the left-hand speed chart with the blue header that contains the speed of 1600 RPM.

3. Move the spindle range lever to the left so that the arrow on top of its hub points toward the left-hand speed chart (see the illustration in **Figure 71**).

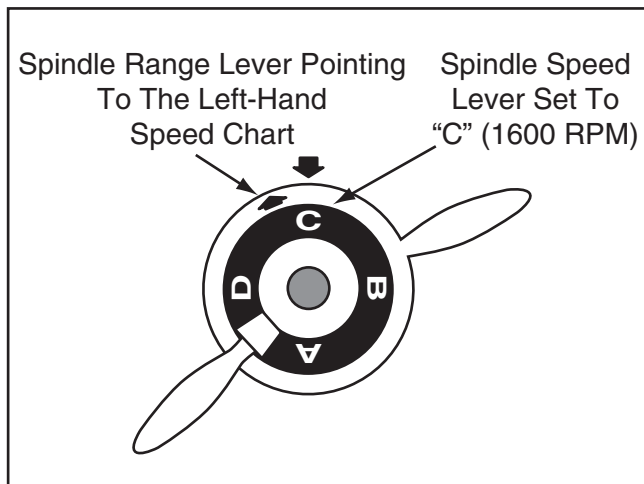


Figure 71. Spindle speed set at 1600 RPM.

4. Position the spindle speed lever so that the "C" is directly under the arrow on the headstock.

The lathe is now set for a spindle speed of 1600 RPM.

Power Feed

Both the carriage and cross slide have power feed capability when the carriage is engaged with the feed rod. The rate that these components move (feed rate) is controlled by the headstock and quick-change gearbox lever positions, and the end gear configuration.

Feed rate and spindle speed must be considered together. Keep in mind that the feed rate is expressed in the amount of travel per revolution of the spindle. The sources you use to determine the optimum spindle speed for an operation will also provide the optimal feed rate to use with that spindle speed.

Often, the experienced machinist will use the feeds and speeds given in their reference charts or web calculators as a starting point, then make minor adjustments to the feed rate (and sometimes spindle speed) to achieve the best results.

The carriage can alternately be driven by the leadscrew for threading operations. However, this section only covers the use of the power feed option for the carriage and cross slide components for non-threading operations. To learn how to power the carriage for threading operations, refer to **Threading** on **Page 57**.

NOTICE

Operating the lathe at spindle speeds higher than 315 RPM when the high (H) gearbox range is selected could result in gearbox damage. Always use spindle speeds of 315 RPM or lower when using the high (H) gearbox range.



NOTICE

If the spindle is rotating when attempting to change the configuration of the headstock feed controls, the gears in the headstock and quick-change gearbox will become damaged! ALWAYS make sure the spindle is completely stopped BEFORE using the headstock control levers to make changes.

Power Feed Controls

Use **Figures 72–73** and the following descriptions to become familiar with the locations and functions of the controls that you will use to set up the correct power feed for your operation.

Note: Before using power feed, you may have to re-configure the end gears, depending on how they are set up. Refer to **End Gears on Page 55** for detailed instructions.

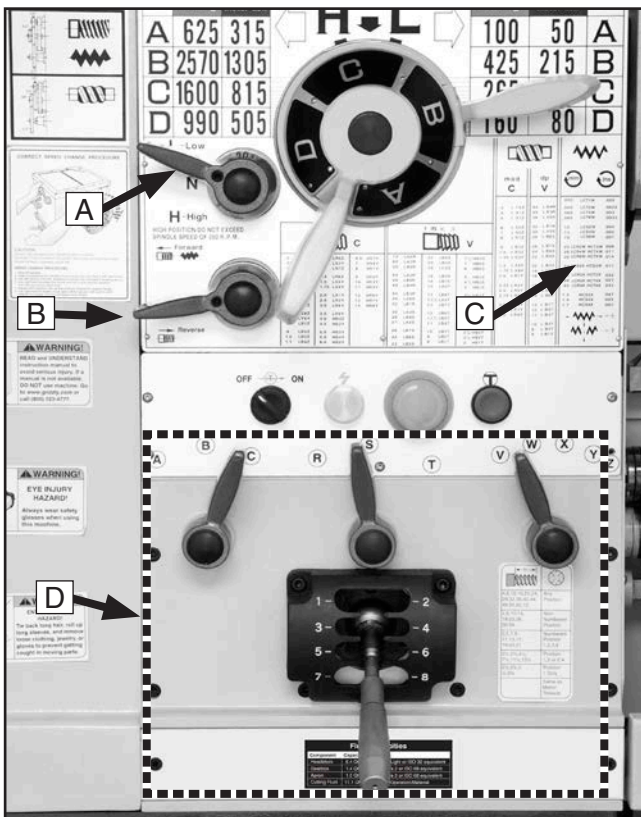


Figure 72. Power feed controls on the headstock.

A. Feed Range Lever: Selects the low or high feed rate range by re-aligning the headstock transfer gear. In the middle position, disables power feed.

B. Feed Direction Lever: When the lathe is stopped, selects the direction for power feed.

Note: When the lathe is running, use the quick-change feed direction knob on the apron.

C. Feed Rate Chart: Displays the settings for the headstock and quick-change gearbox controls for the selected feed rate. Refer to **Setting Power Feed Rate** subsection on the next page for detailed instructions.

D. Quick-change Gearbox Feed Levers: Configure the quick-change gearbox gears for the feed rate selected.

—Left Lever Positions: **A–C**

—Middle Lever Positions: **R–T**

—Right Lever Positions: **V–Z**

—Bottom Lever Positions: **1–8**

NOTICE

Even though there is a lock-out device in the apron to prevent the feed selection lever and the half nut lever from being engaged at the same time, this lock-out device could break if forced. Attempting to engage these levers at the same time could cause severe lathe damage and will void the warranty.



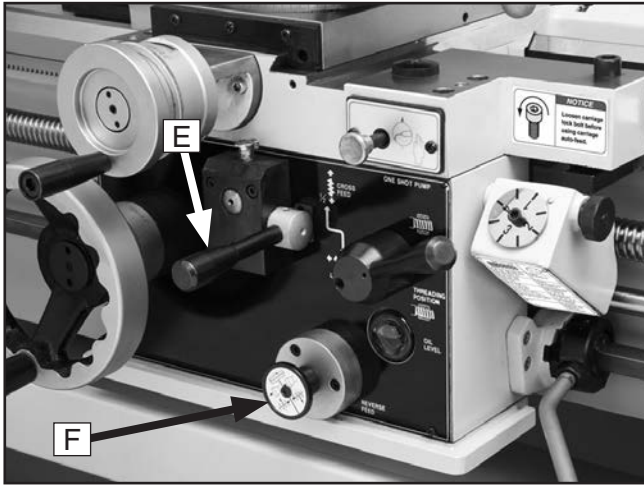


Figure 73. Apron power feed controls.

- E. Feed Selection Lever:** Directs the power feed to either the cross slide or the carriage.

When the lever is down and the indent pin is pointing up, the cross slide is selected. Conversely, when the lever is up and the pin is pointing down, the carriage is selected.

In the middle position, the apron gears are disengaged from the feed rod and neither component will move.

Note: When using this lever, you may need to slightly rotate the handwheel of the component you are trying to engage, so that the apron gears can mesh.

- F. Apron Feed Direction Knob:** Changes the feed direction when the lathe is running.

The advantage of this knob is that you can quickly reverse power feed direction while the spindle is rotating—without having to turn the lathe **OFF**, waiting until the spindle is stopped, then using the feed direction lever on the headstock.

NOTICE

Depending on the combined configuration of the headstock feed direction lever and the apron feed direction knob, the actual direction of power feed may be different from the printed indicators on the machine!

Setting Power Feed Rate

The feed rate chart on the upper right of the headstock face displays the settings for the headstock feed controls for metric and inch feed rates.

Using the controls on the lathe, follow along with the example below to better understand how to set the lathe for the desired power feed rate.

Setting Power Feed Rate of 0.18mm/rev

1. Make sure the end gears are in the standard configuration, which is applicable for general feed operations (refer to **End Gears** on the next page for detailed instructions).
2. Locate the line in the feed rate chart that lists the setting for 0.18mm of feed per revolution of the spindle, as illustrated in **Figure 74**.




  mm  in.		
.050	LCT1W	.002
.055	LCT2W	.0022
.065	LCT4W	.003
.085	LCT8W	.0033
.10	LCS2W	.004
.13	LCS4W	.005
.18	LCS8W	.007

Figure 74. Feed rate chart.

NOTICE

When using power feed to move the cross slide, the feed rate is $\frac{1}{2}$ the value stated in the feed rate chart.



- The configuration string of characters to the right of the selected feed rate (**LCS8W**) displays the positions to set the feed controls for a feed rate of 0.18mm/rev. (see **Figure 74**).

Note: In the next step, use the chuck key to rock the spindle back and forth to help mesh the gears as you make adjustments.

- Position the controls as directed by the configuration string as follows (see **Figure 75**):

L: Move the feed range lever to the low (Low) position.

C: Point the left quick-change gearbox lever to the **C**.

S: Move the middle quick-change gearbox lever to the **S**.

8: Position the bottom gearbox lever in the **8** slot.

W: Point the right gearbox lever to the **W**.

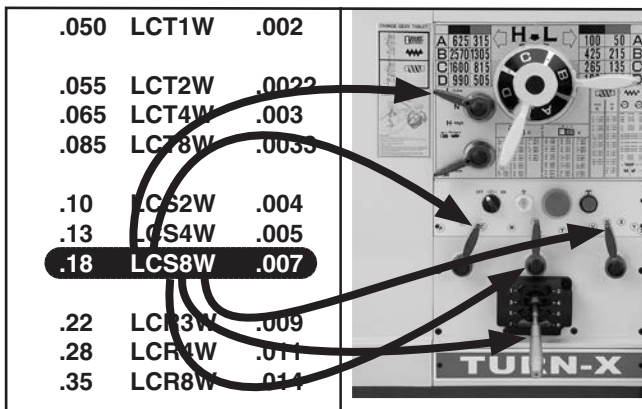


Figure 75. Power feed controls positioned for 0.18 mm/rev.

The lathe is now set up for a power feed rate of 0.18mm per spindle revolution.

End Gears

The end gears can be setup for the standard or alternate configuration, depending upon the type of operation to be performed. The lathe is shipped with the end gears in the standard configuration.

Standard End Gear Configuration

Use the standard end gear configuration for inch threading, metric threading, and all general feed operations.

In this configuration, the end gears are installed as follows: the 24T end gear is installed in the top position, the 44T/56T transposing gears in the middle position, and the 57T end gear in the bottom position, as shown in **Figure 76**. In this configuration the 56T and 57T gears are meshed.

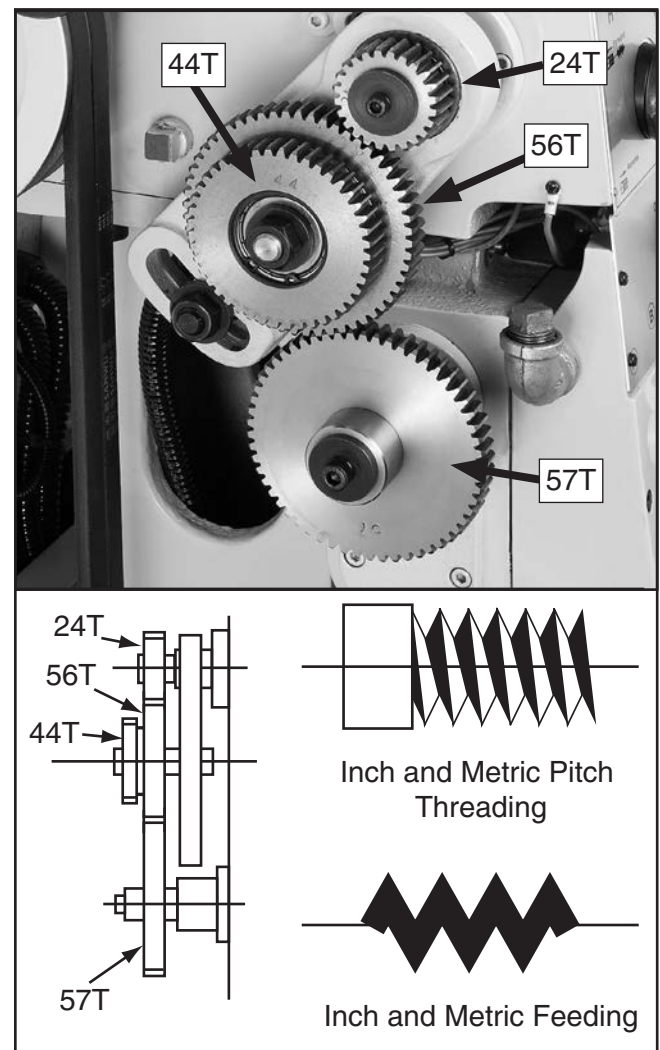


Figure 76. End gears in the standard configuration.



Alternate Configuration

The alternate end gear configuration is used when cutting modular or diametral threads. The 57T end gear is positioned on the outside so that it meshes with the 44T transposing gear instead of the 56T gear, as illustrated in **Figure 77**.

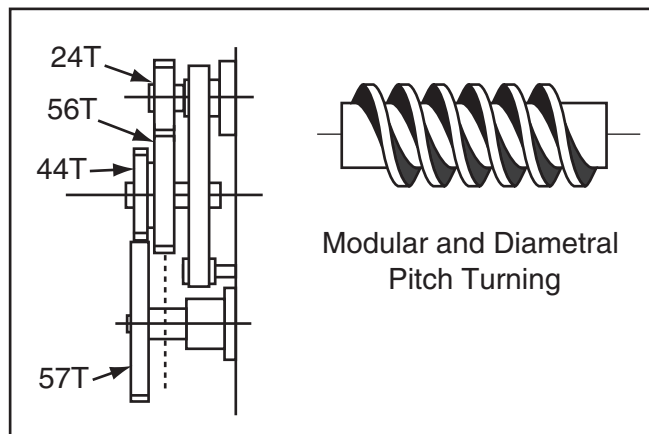


Figure 77. Alternate end gear configuration.

Configuring End Gears

Tools Needed

	Qty
Hex Wrench 6mm.....	1
Wrench 22mm.....	1

To configure the end gears:

1. DISCONNECT LATHE FROM POWER!
2. Remove the headstock end gear cover.
3. Remove the cap screw, lock washer, and flat washer from the bottom 57T end gear (see **Figure 78**).

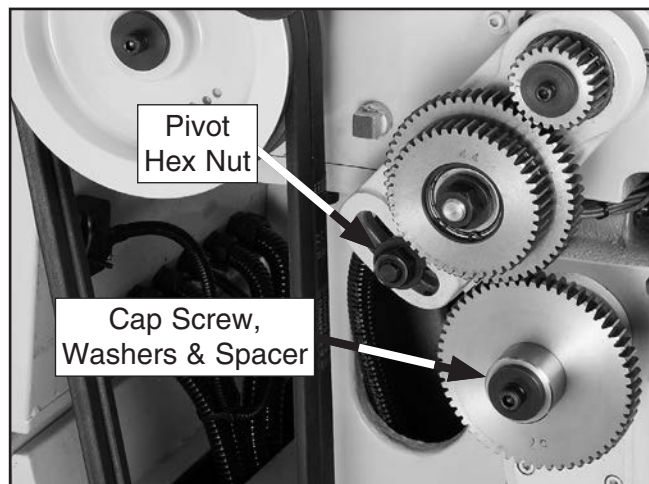


Figure 78. End gear components.

4. Loosen the pivot arm hex nut shown in **Figure 78**, then swing the pivot arm to the left so that 44T/56T gears are away from the 57T gear. Hand tighten the hex nut to keep the arm in place.
5. Use a stiff brush and mineral spirits to clean away the debris and grime from the gears and shafts, then lubricate these devices as instructed in the **End Gears** lubrication subsection on **Page 69**.
6. Making sure to keep the key seated in the shaft, remove the spacer and the 57T gear, then re-install them as follows:
 - For the standard end gear configuration, slide the 57T gear on first, then the spacer on the outside.
 - For the alternate end gear configuration, slide the spacer on first, then the gear.
7. Re-install the cap screw, lock washer, and flat washer you removed in **Step 3** to secure the spacer and 57T gear.

Note: *DO NOT overtighten the cap screw—it merely holds the gear in place. Overtightening it will make it harder to remove later and may restrict the rotation of the gears.*

8. Slide the pivot arm back so that either the 44T or the 56T meshes with the 57T gear, then retighten the pivot arm hex nut.

Note: *Make sure to keep approximately 0.002" play between the gears.*

9. Replace and secure the end gear cover before re-connecting the lathe to power.



Threading

The following subsections will describe how to use the threading controls and charts to set up the lathe for a threading operation. If you are unfamiliar with the process of cutting threads on a lathe, we strongly recommend that you read books, review industry trade magazines, or get formal training before attempting any threading projects.

Headstock Threading Controls

The threading charts on the headstock face display the settings for metric, inch, modular, and diametral threading.

Using the controls on the lathe, follow along with the example below to better understand how to set up the lathe for the desired threading operation.

Setting Metric Thread Pitch of 1.75

1. Make sure the end gears are in the standard configuration, which is used for all metric threading (refer to **End Gears** on **Page 55** for detailed instructions).
2. Locate the line in the metric thread chart that lists the setting for 1.75 thread pitch, as illustrated in **Figure 79**.

3. The configuration string of characters to the right of the selected thread pitch (**LS8Y**) displays the positions to set the threading controls for a metric thread pitch of 1.75 (see **Figure 79**).

Note: In the next step, use the chuck key to rock the spindle back-and-forth to help mesh the gears as you make adjustments.

4. Position the controls as follows:

Note: Each of the thread charts has a **C** or **V** in the header that is to be used for all of the listings in that chart. For the **C**, use the left quick-change gearbox lever, and for the **V** use the right.

L: Move the feed range lever to the low (Low) position.

S: Point the middle quick-change gearbox lever to the **S**.

8: Position the bottom gearbox lever in the **8** slot.

Y: Point the right gearbox lever to the **Y**.

The lathe is now set up to cut 1.75 TPmm threads.

mm		C			
.2	LT1Z	1.2	LR6Z	6.5	HS7Y
.225	LT2Z	1.25	LS3Y	7	HS8Y
.25	LT3Z	1.3	LR7Y	8	HR1Y
.3	LT6Z	1.4	LR8Z	9	HR2Y
.35	LT8Z	1.5	LS6Y	10	HR3Y
.4	LS1Z	1.75	LS8Y	11	HR4Y
.45	LS2Z	2.0	LR1Y	12	HR6Y
.5	LS3Z	2.5	LR3Y	13	HR7Y

Figure 79. Metric thread chart with 1.75 TPmm highlighted.



Apron Threading Controls

The half nut lever engages the carriage with the leadscrew, which moves the carriage and cutting tool along the length of the workpiece for threading operations (see **Figure 80**).

Important: Make sure the feed selection lever is in the disengaged (middle) position before attempting to engage the half nut.

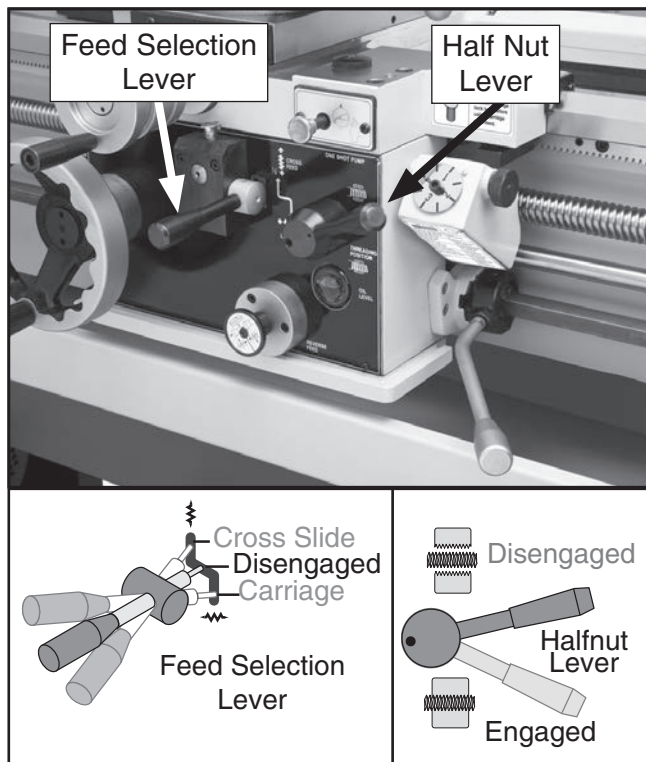


Figure 80. Apron threading controls.

Thread Dial

The numbers on the thread dial are used with the thread dial chart to show when to engage the half nut during inch threading. The thread dial gear must be engaged with the leadscrew for this to work. Loosen the knurled knob on the thread dial, pivot the dial gear toward the leadscrew so that it properly meshes with the leadscrew threads, then re-tighten the knob, as shown **Figure 81**.

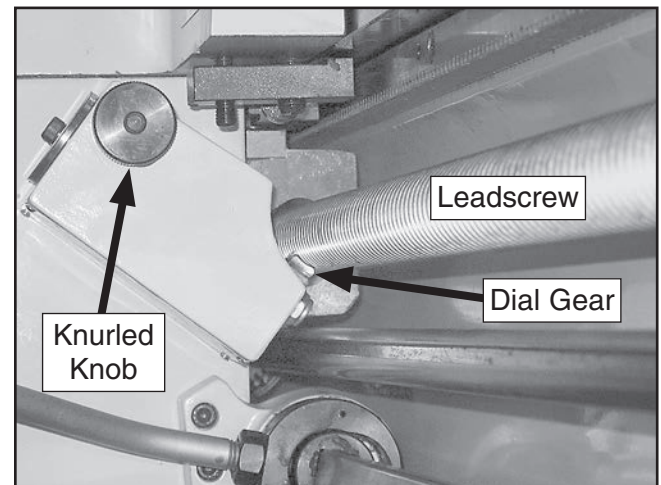


Figure 81. Thread dial engaged with the leadscrew.

NOTICE

When threading, we recommend using the slowest speed possible and avoiding deep cuts, so you are able to disengage the half nut when required and prevent an apron crash!



Thread Dial Chart

Find the TPI (threads per inch) that you want to cut in the left column of the thread dial chart (see **Figure 82**), then reference the dial number to the right of it. The dial numbers indicate when to engage the half nut for a specific thread pitch. The thread dial chart can also be found on the front of the thread dial housing.

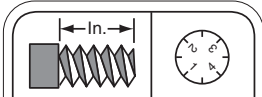
	
4,8,12,16,20,24, 28,32,36,40,44, 48,56,60,72	Any Position
2,6,10,14, 18,22,26, 30,54	Non- Numbered Position
3,5,7,9, 11,13,15, 19,23,27	Numbered Position 1,2,3,4
$2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, $7\frac{1}{2}$, $11\frac{1}{2}$, $13\frac{1}{2}$	Position 1,3 or 2,4
$2\frac{1}{4}$, $2\frac{3}{4}$, $3\frac{1}{4}$, $3\frac{3}{4}$	Position 1 Only
$2\frac{7}{8}$	Same as Metric Threads

Figure 82. Thread dial chart.

Note: The thread dial is not used for metric threading, or diametral and modular pitches. You must leave the half nut engaged from the beginning until the turning is complete for these types of operations.

The following examples explain how to use the thread dial chart.

TPI Divisible By 4

For threading a TPI that is divisible by four, use any line on the thread dial (see **Figure 83**).


TPI		
4,8,12,16,20,24, 28,32,36,40,44, 48,56,60,72	Any Position	

Figure 83. Any position on the dial for threading TPI divisible by 4.

Even TPI Not Divisible By 4

For threading a TPI that is even but not divisible by 4, use any of the non-numbered lines on the thread dial (see **Figure 84**).


TPI		
2,6,10,14, 18,22,26, 30,54	Non- Numbered Position	

Figure 84. Marks are selected on the dial for threading even TPI not divisible by 4.

Odd Numbered TPI

For odd numbered TPI, use any of the numbered lines on the thread dial (see **Figure 85**).

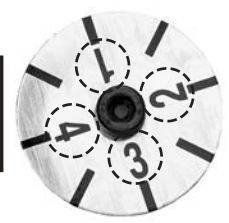
TPI		
3,5,7,9, 11,13,15, 19,23,27	Numbered Position 1,2,3,4	

Figure 85. Numbers are selected on the dial for threading odd numbered TPI.

$\frac{1}{2}$ Fractional TPI

Use any opposing number pairs— $2/4$ or $1/3$ on the thread dial for $\frac{1}{2}$ fractional TPI (see **Figure 86**). For example, to cut a $3\frac{1}{2}$ thread, select 1 or 3 on the dial.


TPI		
$2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, $7\frac{1}{2}$, $11\frac{1}{2}$, $13\frac{1}{2}$	Position 1,3 or 2,4	

Figure 86. Opposing number group are selected on dial for cutting $\frac{1}{2}$ thread TPI.



1/4 or 3/4 Fractional TPI

For TPI that have a 1/4 or 3/4 fraction, use position 1 on the thread dial (see **Figure 87**).

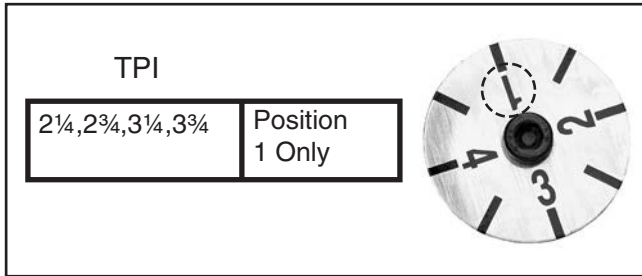


Figure 87. Position for 1/4 or 3/4 fractional TPI.

2 7/8 TPI

The thread dial is not used for 2 7/8 or metric threading, or diametral and modular pitches (see **Figure 88**). The half nut must stay engaged with the leadscrew throughout the entire threading operation.

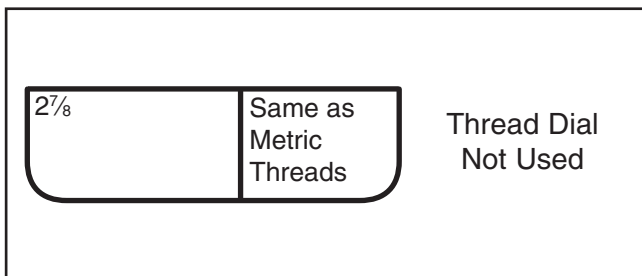


Figure 88. Half nut stays engaged for 2 7/8 TPI.

Chip Drawer

The chip drawer catches swarf and metal chips during the machining process. It contains a screen that keeps the large chips from returning to the reservoir with the run-off coolant—this prevents the chips causing pump damage.

Also, it slides open and is removable for cleaning (see **Figure 89**).



Figure 89. Chip drawer.

⚠ CAUTION

The chip drawer is very heavy. Unless removing the chip drawer for cleaning, do not pull it out more than halfway to prevent it falling and causing impact injuries. If removing the drawer for cleaning, get assistance!



Coolant System

When the coolant pump is turned **ON**, the fluid is delivered through the nozzle attached to the carriage. The flow is controlled by the valve lever at the base of the nozzle (see **Figure 90**).

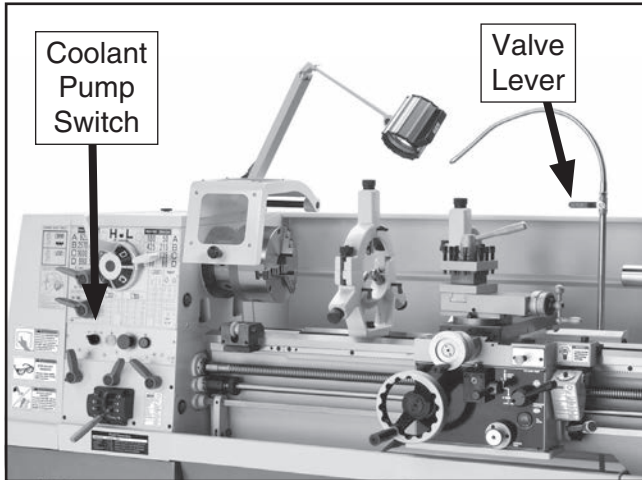



Figure 90. Coolant flow controls.

Always use high quality coolant and follow the manufacturer's instructions for diluting. The quick reference table shown in **Figure 91** can help you select the appropriate fluid.

Refer to **Coolant System Service** on **Page 70** for detailed instructions on how to add or change fluid. Check the coolant regularly and promptly change it when it becomes overly dirty or rancid, or as recommended by the fluid manufacturer.

	<p>! WARNING BIOLOGICAL & POISON HAZARD! Use the correct personal protection equipment when handling coolant. Follow federal, state, and fluid manufacturer requirements for proper disposal.</p>
	

<p>NOTICE</p> <p>Running the pump without adequate fluid in the coolant tank may permanently damage it, which will not be covered under warranty.</p>
--

To use the coolant system on your lathe:

1. Make sure the coolant tank is properly serviced and filled with the appropriate fluid, and that you are wearing the necessary personal protection equipment.
2. Position the coolant nozzle for your operation.
3. Use the coolant pump switch on the control panel to turn the pump **ON**.
4. Adjust the flow of coolant by using the valve lever near the base of the nozzle hose.

Important: Promptly clean any splashed fluid from the floor to avoid a slipping hazard.

Workpiece	Dry	Water Soluble Oil	Synthetic Fluids	Sulferized Oil	Mineral Oil
Aluminum		X	X		
Brass	X	X	X		
Bronze	X	X	X		X
Cast Iron	X				
Low Carbon Steel		X	X		
Alloy Metals		X	X	X	X
Stainless Steel		X	X	X	X

General Note: Cutting fluids are used for heavy-duty lathe operations and production turning. Oil-water emulsions and synthetic cutting fluids are the most common for typical lathe operations. Sulferized oils often are used for threading. For small projects, spot lubrications can be done with an oil can or brush, or omitted completely.

Figure 91. Coolant selection table.



SECTION 5: ACCESSORIES

!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 for this machine by Grizzly.

NOTICE

Refer to our website or latest catalog for additional recommended accessories.

T23962—ISO 68 Moly-D Machine Oil, 5 gal.

T23963—ISO 32 Moly-D Machine Oil, 5 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 5-gallon quantities.



Figure 92. ISO 68 and ISO 32 machine oil.

T10295—7 Pc. Indexable Carbide Set 5/8"

This 7-piece turning tool set is ideal for just about any project. Supplied with right hand and left hand turning/facing tool holders, the set is complimented with one threading and cut-off tool too. Indexable inserts ensure cutting surfaces stay sharp.

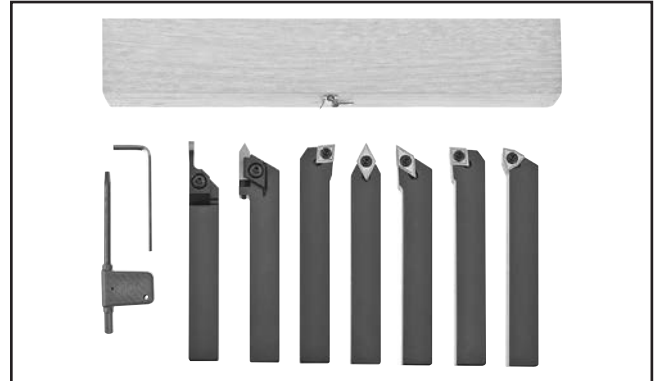


Figure 93. 17-Pc. Indexable Carbide Tool Set.

T10439—4 Pc. Carbide Insert CCMT Boring Bar Set

These right-hand indexable solid steel Boring Bars use $\frac{1}{4}$ " and $\frac{3}{8}$ ", 80° diamond inserts and feature a negative 7° end and side cutting angle. Includes $\frac{3}{8}$ " x 6", $\frac{1}{2}$ " x 7", $\frac{5}{8}$ " x 8", and $\frac{3}{4}$ " x 10" boring bars. Set comes with Torx® wrenches and fitted aluminum case with handle.



Figure 94. Carbide Insert CCMT Boring Bar Set.

order online at www.grizzly.com or call 1-800-523-4777



G1070—MT3 Live Center Set

A super blend of quality and convenience, this live center set offers seven interchangeable tips. High-quality needle bearings prolong tool life and special tool steel body and tips are precision ground. Supplied in wooden box.



Figure 95. G1070 Live Center Set.

G0688—Tool Post Grinder

This tool post grinder has what it takes to make your project to spec and look good, too! The heavy support casting is loaded with a precision spindle that will provide spectacular finishes on even the toughest jobs. Comes supplied with one external grinding wheel, one internal grinding wheel, and balanced mandrel pulleys and belts for each wheel.

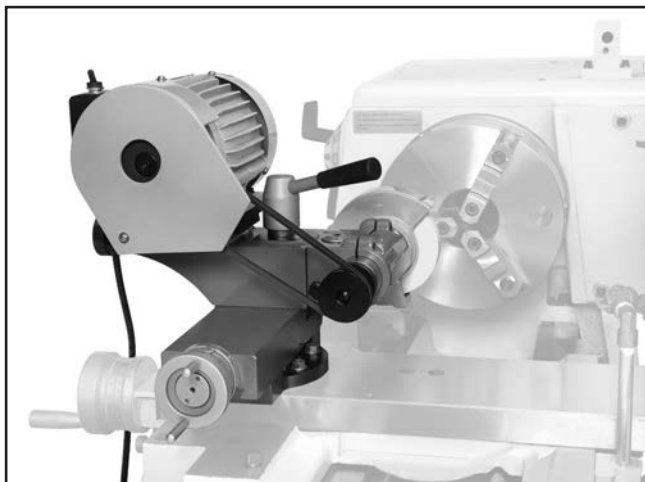


Figure 96. G0688 Tool Post Grinder.

G9610—Test Indicator

.03" Range/.001" Resolution

G9611—Test Indicator

.008" Range/.0001" Resolution

G9612—Test Indicator

.030" Range/.0005" Resolution

These test indicators have an easy to read dial and a pivoting stylus that moves at right angles to the dial face.



Figure 97. Test Indicator.

G7978—Rotary Phase Converter

The Model G7978 15HP Rotary Phase Converter allow you to operate the 3-phase G0740 from a single-phase power source at 100% power and 95% efficiency.



Figure 98. G7978 Rotary Phase Converter.



SECTION 6: MAINTENANCE



Schedule

Ongoing

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

- Loose mounting bolts or fasteners.
- Worn, frayed, cracked, or damaged wires.
- Guards or covers removed.
- Emergency STOP button not working correctly or not requiring you to reset it before starting the machine again.
- A reduction in braking speed or efficiency.
- Oil level not visible in the sight glasses.
- Coolant not flowing out.
- Damaged or malfunctioning components.

Daily, Before Operations

- Check/add headstock oil (**Page 65**).
- Check/add gearbox oil (**Page 66**).
- Check/add apron oil (**Page 67**).
- Check/add coolant (**Page 70**).
- Lubricate the ways (**Page 67**).
- Add oil to the ball oilers (**Page 68**).
- Clean/lubricate the leadscrew (**Page 68**).
- Disengage the feed selection lever on the apron (to prevent crashes upon startup).
- Ensure carriage lock bolt is loose.

Daily, After Operations

- Depress STOP button and shut **OFF** the two-speed motor switch (to prevent accidental startup).
- Vacuum/clean all chips and swarf from bed, slides, and chip drawer.
- Wipe down all unpainted or machined surfaces with an oiled rag.

Monthly

- Drain and clean the coolant tank, then add new fluid (**Page 70**).

Semi-Annually

- Change the headstock oil (**Page 65**).

Annually

- Change the gearbox oil (**Page 66**).
- Change the apron oil (**Page 67**).
- Lubricate end gears (**Page 69**).
- Check/level bedway (**Page 23**).

Cleaning/Protecting

Because of its importance, we recommend that the cleaning routine be planned into the workflow schedule.

Typically, the easiest way to clean swarf from the machine is to use a wet/dry shop vacuum that is dedicated for this purpose. The small chips left over 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 the moving surfaces or cause sharp chips to fly into your face or hands.

All unpainted and machined surfaces should be wiped down daily to keep them rust free and in top condition. This includes any surface that is vulnerable to rust if left unprotected (especially parts that are exposed to water soluble cutting fluid). Use a quality rust protectorate such as SLIPIT® or Boeshield® to prevent corrosion.



Lubrication

Use the schedule and information in the chart below as a daily guide for lubrication tasks. We recommend using Grizzly Model T23962 or T23963 lubricants (see Accessories, **Page 62**) for most of the lubrication tasks.

Lubrication Task	Frequency	Page Ref.
Headstock	Daily	66
Quick-Change Gearbox	Daily	67
Apron	Daily	67
One-Shot Oiler	As Needed	67
Longitudinal Leadscrew	Daily	68
Ball Oilers & Oil Cup	Daily	68
End Gears	Annually	69

NOTICE

The recommended lubrication is based on light-to-medium usage. Keeping in mind that lubrication helps to protect the value and operation of the lathe, these lubrication tasks may need to be performed more frequently than recommended here, depending on usage.

Failure to follow reasonable lubrication practices as instructed in this manual could lead to premature failure of lathe components and will void the warranty.

Headstock

Oil Type.... Grizzly T23963 or ISO 32 Equivalent
 Oil Amount..... 7.4 Quarts
 Check/Add Frequency..... Daily
 Change Frequency..... Semi-Annually

The headstock gearing is lubricated by an oil bath that distributes the lubricant with the motion of the gears, much like an automotive manual transmission.

Checking Oil Level

The headstock reservoir has the proper amount of oil when the oil level in the sight glass is approximately halfway. The oil sight glass is located on the right side of the headstock, as shown in **Figure 99**.



Figure 99. Location of headstock oil sight glass.

Adding Oil

The oil fill plug is located on top of the headstock, as shown in **Figure 100**.

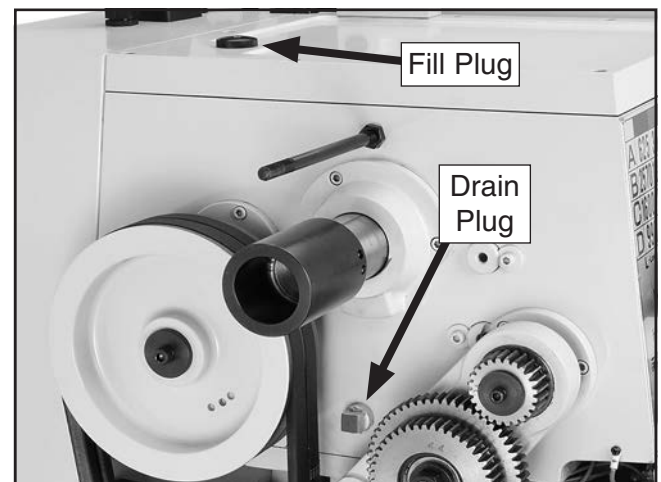


Figure 100. Headstock fill and drain plugs.



To change the headstock oil:

1. DISCONNECT LATHE FROM POWER!
2. Remove the end gear cover.
3. Remove the V-belts so that oil does not get on them, necessitating their replacement (refer to the **V-Belt** subsection on **Page 79** for detailed instructions).
4. Remove the fill plug on top of the headstock to allow the oil to drain more freely.
5. Place a 2 gallon catch pan under the headstock drain plug (see **Figure 100** on **Page 65**), then remove the plug with a $\frac{5}{8}$ " wrench.
6. When the headstock reservoir is empty, replace the drain plug and clean away any oil that may have spilled.
7. Fill the headstock reservoir until the oil level is approximately halfway in the sight glass.
8. Replace and re-tension the V-belts, then secure the end gear cover before re-connecting the power.

Quick-Change Gearbox

Oil Type.... Grizzly T23962 or ISO 68 Equivalent
Oil Amount..... 1 Quart
Check/Add Frequency..... Daily
Change Frequency..... Annually

Checking Oil Level

The gearbox reservoir has the proper amount of oil when the oil level in the sight glass is approximately halfway. The oil sight glass is located on the right side of the gearbox, as shown in **Figure 101**.



Figure 101. Location of gearbox oil sight glass.

Adding Oil

Use a 12mm wrench to remove the gearbox fill plug (see **Figure 102**), then add the oil until the level is approximately halfway in the gearbox oil sight glass.

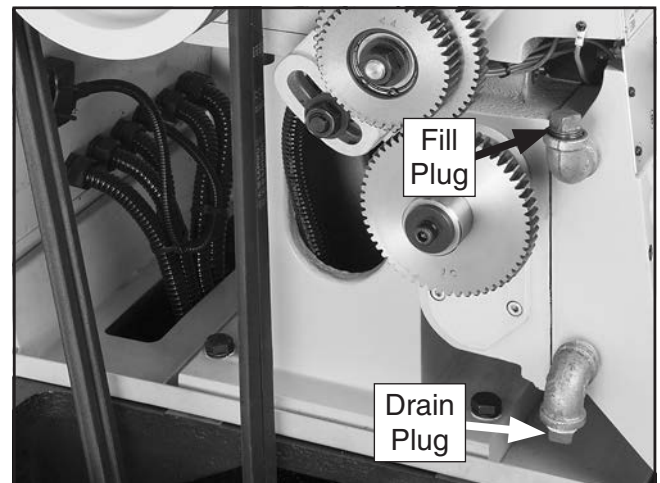


Figure 102. Locations of the quick-change gearbox fill and drain plugs.

Draining Oil

Place a catch pan under the quick-change gearbox drain plug (see **Figure 102**), use a 12mm wrench to loosen the fill plug and remove the drain plug, then allow the gearbox reservoir to empty.



Apron

Oil Type Grizzly T23962 or ISO 68 Equivalent
Oil Amount..... 1.2 Quarts
Check/Add Frequency..... Daily
Change Frequency..... Annually

Checking Oil Level

The apron oil sight glass is on the front of the apron, as shown in **Figure 103**. Maintain the oil volume so that the level is approximately halfway in the sight glass.

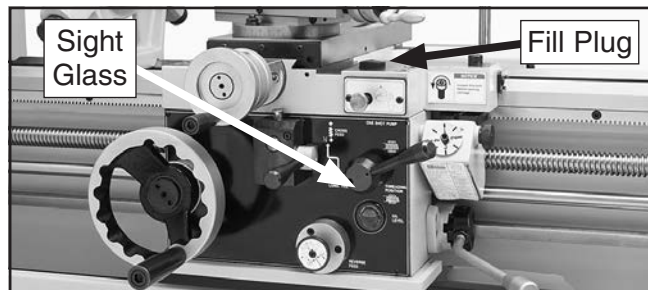


Figure 103. Location of apron oil sight glass.

Draining Oil & Flushing Reservoir

Since the apron oil reservoir supplies the one-shot oiler, the oil is constantly being refreshed when the reservoir is filled. However, small metal particles may accumulate at the bottom of the reservoir with normal use. Therefore, to keep the reservoir clean, drain and flush it at least once a year.

Place a catch pan under the apron drain plug shown in **Figure 104**, loosen the fill plug, then use a 5mm hex wrench to remove the drain plug and empty the reservoir.

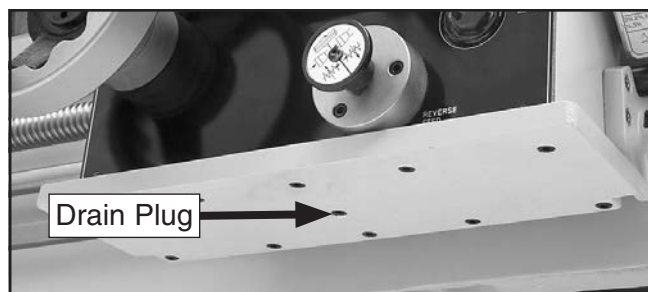


Figure 104. Location of apron drain plug.

Flush the reservoir by pouring a small amount of clean oil into the fill hole and allowing it to drain out the bottom.

Replace the drain plug, add oil as previously described.

One-Shot Oiler

The one-shot oiler shown in **Figure 105** lubricates the saddle ways with oil from the apron reservoir.

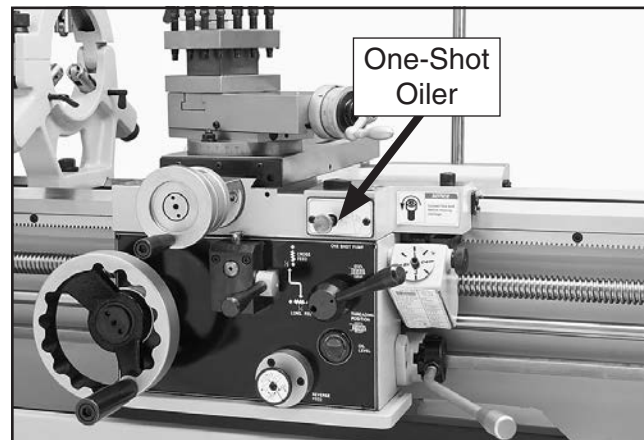


Figure 105. Location of one-shot oiler on the apron.

To use the one-shot oiler, pull the pump knob out for two or three seconds and then push it in. The pump draws oil from the apron reservoir and then forces it through drilled passages to the carriage ways.

Repeat this process while moving the carriage and cross slide through their full range of movement to distribute oil along the ways.

Lubricate the ways before and after operating the lathe. If the lathe is in a moist or dirty environment, increase the lubrication interval.

Check the apron oil level through the sight glass before using the one-shot oiler to make sure the reservoir has enough oil.



Longitudinal Leadscrew

Oil Type Grizzly T23962 or ISO 68 Equivalent
 Oil Amount..... As Needed
 Lubrication Frequency..... Daily

Before lubricating the leadscrew, clean it first with mineral spirits. A stiff brush works well to help clean out the threads. Make sure to move the carriage out of the way, so you can clean the entire length of the leadscrew.

Apply a thin coat of oil along the length of the leadscrew. Use a stiff brush to make sure the oil is applied evenly and down into the threads.

Note: *In some environments, abrasive material can become caught in the leadscrew lubricant and drawn into the half nut. In this case, lubricate the leadscrew with a quality dry lubricant.*

Ball Oilers & Oil Cup

Ball Oiler Oil Type..... Grizzly T23963 or ISO 32 Equivalent
 Oil Cup Oil Type Grizzly T23962 or ISO 68 Equivalent
 Oil Amount..... 1 or 2 Squirts/Fill
 Lubrication Frequency..... Daily

This lathe has seven ball oilers and one oil cup that should be oiled on a daily basis before beginning operation.

Ball Oilers

Proper lubrication of ball oilers is done with a pump-type oil can that has a plastic or rubberized cone tip. We do not recommend using metal needle or lance tips, as they can push the ball too far into the oiler, break the spring seat, and lodge the ball in the oil galley.

Lubricate the ball oilers before and after machine use, and more frequently under heavy use. When lubricating ball oilers, first clean the outside surface to remove any dust or grime. Push the rubber or plastic tip of the oil can nozzle against the ball oiler to create a hydraulic seal, then pump the oil can once or twice. If you see sludge and contaminants coming out of the lubrication area, keep pumping the oil can until the oil runs clear. When finished, wipe away any excess oil.

Oil Cup

Lift the oil cup lid and fill the cup to the top. The oil will slowly drain into the gearing over time. Refer to **Figures 106–108** and the following descriptions to identify the locations of each oil device.

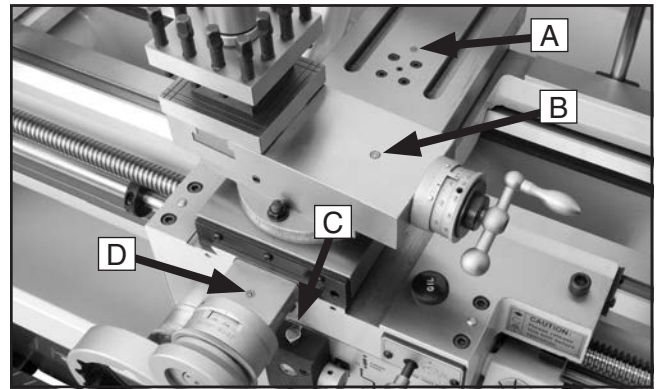


Figure 106. Carriage ball oilers and oil cup.

- A. Cross Slide Leadscrew & Nut
- B. Compound Rest Leadscrew & Nut
- C. Feed Selection Lever Gearing
- D. Cross Slide Leadscrew Bearing

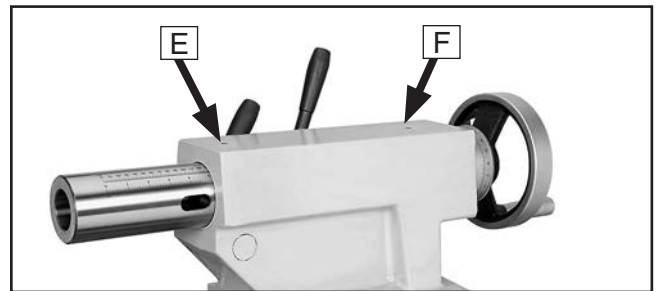


Figure 107. Tailstock ball oilers.

- E. Quill Barrel
- F. Quill Leadscrew & Nut

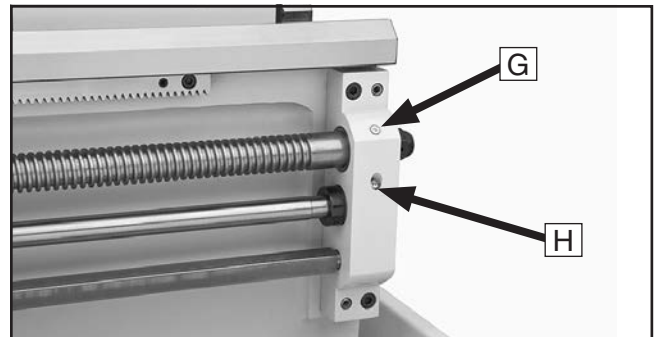


Figure 108. Leadscrew and feed rod end bearing ball oilers.

- G. Leadscrew End Bearing
- H. Feed Rod End Bearing



End Gears

Grease Type.....NLGI#2
Frequency..... Annually or When Changing

The end gears, shown in **Figure 109**, should always have a thin coat of heavy grease to minimize corrosion, noise, and wear. Wipe away excess grease that could be thrown onto the V-belts and reduce optimal power transmission from the motor.



Figure 109. End gears.

Handling & Care

Make sure to clean and lubricate any gears you install or change. Be very careful during handling and storage—the grease coating on the gears will easily pick up dirt or debris, which can then spread to the other gears and increase the rate of wear.

Make sure the end gear cover remains installed whenever possible to keep the gears free of dust or debris from the outside environment.

Lubricating

1. DISCONNECT LATHE FROM POWER!
2. Remove the end gear cover and all the end gears shown in **Figure 109**.
3. Clean the end gears thoroughly with mineral spirits to remove the old grease. Use a small brush if necessary to clean between the teeth.
4. Clean the shafts, and wipe away any grease splatters in the vicinity and on the inside of the end gear cover.
5. Using a clean brush, apply a thin layer of grease on the gears. Make sure to get grease between the gear teeth, but do not fill the teeth valleys.
6. Install the end gears and mesh them together with an approximate 0.002" backlash. Once the gears are meshed together, apply a small dab of grease between them where they mesh together—this grease will be distributed when the gears rotate and re-coat any areas scraped off during installation.
7. Re-install the end gear cover before re-connecting the lathe to power.



Coolant System Service

The coolant system consists of a fluid tank, pump, and flexible nozzle. The pump pulls fluid from the tank and sends it to the valve, which controls the flow of coolant to the nozzle. As the fluid leaves the work area, it drains back into the tank through the chip drawer and catch tray where the swarf is screened out.

Use **Figures 110–111** to identify the locations of the coolant system controls and components.

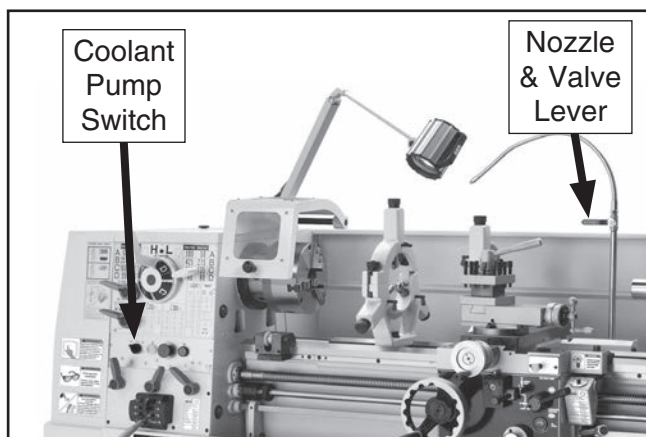


Figure 110. Coolant controls.

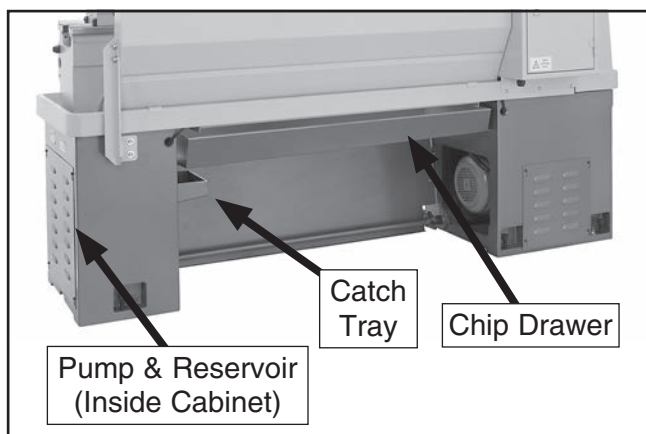




Figure 111. Additional coolant components.

Although most swarf from machining operations is screened out of the coolant before it returns to the tank, small particles will accumulate in the bottom of the tank in the form of sludge. To prevent this sludge from being pulled into the pump and damaging it, the pump's suction tube is positioned a couple inches from the bottom of the tank and fitted with a fine screen. This works well when the tank is regularly cleaned; however, if too much sludge is allowed to accumulate before the tank is cleaned, the pump will inevitably begin sucking it up.

Hazards

As coolants age and get used, dangerous microbes can proliferate and create a biological hazard. The risk of exposure to this hazard can be greatly reduced by replacing the old fluid on a monthly basis, or as indicated by the fluid manufacturer.

The important thing to keep in mind when working with the coolant is to minimize exposure to your skin, eyes, and lungs by wearing the proper PPE (Personal Protective Equipment), such as long-sleeve waterproof gloves, protective clothing, splash-resistant safety goggles, 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.



Adding Coolant

Items Needed:	Qty
Safety Wear.....	See Hazards on Page 70
New Coolant.....	25.4 Quarts
Phillips Screwdriver #2.....	1
Disposable Shop Rags.....	As Needed

To add coolant:

1. DISCONNECT LATHE FROM POWER!
2. Remove the vented access cover from the side of the right stand, then slide the tank out, as shown in **Figure 112**.

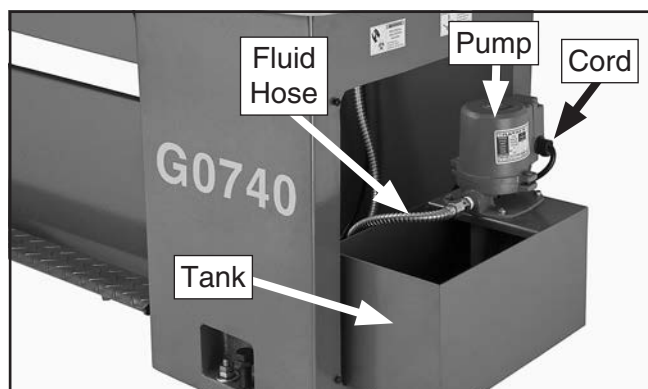


Figure 112. Coolant tank and pump.

3. Pour coolant into the tank until it is nearly full.
4. Slide the tank back into the cabinet and replace the access cover.

Changing Coolant

When you replace the old coolant, take the time to thoroughly clean out the chip drawer, catch tray, and fluid tank. The entire job only takes about a ½ hour when you are prepared with the proper materials and tools. Make sure to dispose of old fluid according to federal, state, and fluid manufacturer's requirements.

Items Needed:	Qty
Safety Wear.....	See Hazards on Page 70
New Coolant.....	25.4 Quarts
Empty 5-Gallon Bucket w/Lid.....	2
Phillips Screwdriver #2.....	1
Wrench ¾".....	1
Disposable Shop Rags.....	As Needed
Hose or Tubing 5/8" x 60" (Optional).....	1 Piece
Magnets (Optional).....	As Many As Desired

Model G0740 (Mfg. Since 11/12)

To change the coolant:

1. Position the coolant nozzle over the back of the back splash so that it is pointing behind the lathe.
2. Place the 5-gallon bucket behind the lathe and under the coolant nozzle. If you are using the optional hose, connect it to the nozzle and place it in the bucket. Otherwise, you may need to have another person hold the bucket up to the nozzle to prevent coolant from splashing out.
3. Turn the coolant pump **ON** and pump the old fluid out of the reservoir. Turn the pump **OFF** immediately after the fluid stops flowing.

NOTICE

Running the coolant pump longer than necessary for this procedure without adequate fluid in the tank may permanently damage it, which will not be covered under warranty.

4. DISCONNECT LATHE FROM POWER!
5. Remove the vented access cover from the side of the right stand, then slide the tank out.
6. To enable the remaining fluid to be poured out in the next step, disconnect the fluid hose from the pump (see **Figure 112**).

Note: The pump cord was purposely left long, so the tank can be removed and dumped out without disconnecting the wires from the pump.

7. Pour the remaining coolant into the 5-gallon bucket and close the lid.
8. Clean all the sludge out of the bottom of the tank and then flush it clean. Use the second bucket to hold the waste and make sure to seal the lid closed when done.

Dispose of the old coolant and swarf according to federal, state, and fluid manufacturer's requirements.



9. Slide the tank partially into the base and re-connect the fluid hose.

Tip: Leave one or more magnets at the bottom of the tank to collect metal chips and make cleanup easier next time. This will also help keep small metal chips out of the pump.

10. Refill the tank with new coolant, then slide it completely into the base.
11. Replace the access cover panel.
12. Re-connect the lathe to power and point the nozzle into the chip drawer.
13. Reset the STOP button.
14. Turn the coolant pump **ON** to verify that fluid cycles properly, then turn it **OFF**.

Machine Storage

To prevent the development of rust and corrosion, the lathe must be properly prepared if it will be stored for a long period of time. Doing this will ensure the lathe remains in good condition for later use.

To prepare the lathe for storage:

1. Run the lathe and bring all reservoirs to operating temperature, then drain and refill them with clean oil.
2. Pump out the old coolant, then add a few drops of way oil and blow out the lines with compressed air.
3. **DISCONNECT LATHE FROM POWER!**

4. Thoroughly clean all unpainted, bare metal surfaces, then apply a liberal coat of way oil, heavy grease, or rust preventative. Take care to ensure these surfaces are completely covered but that the rust preventative or grease is kept off of painted surfaces.
5. Lubricate the machine as outlined in the lubrication section. Be sure to use an oil can to purge all ball oilers and oil passages with fresh oil.
6. Loosen or remove the V-belts so they do not become stretched during the storage period. (Be sure to place a maintenance note near the power button as a reminder that the belts have been loosened or removed.)
7. Place a few moisture absorbing desiccant packs inside of the electrical box.
8. Cover the lathe and place it 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 make the chuck guard cloudy.
9. Every few months, rotate by hand all gear-driven components a few times in several gear selections. This will keep the bearings, bushings, gears, and shafts well lubricated and protected from corrosion—especially during the winter months.

Slide the carriage, micrometer stop, tailstock, and steady rest down the lathe bed to make sure that way spotting is not beginning to occur.

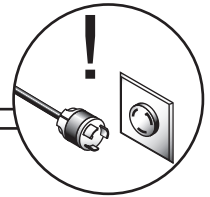


SECTION 7: SERVICE

Review the troubleshooting and procedures in this section if a problem develops with your machine. If you need replacement parts or additional help with a procedure, call our Technical Support at (570) 546-9663.

Note: Please gather the serial number and manufacture date of your machine before calling.

Troubleshooting



Motor & Electrical

Symptom	Possible Cause	Possible Solution
Machine does not start or a circuit breaker trips.	<ol style="list-style-type: none"> 1. Motor will start, only backward. 2. STOP button is engaged or at fault. 3. Spindle switch(es) are at fault. 4. Power supply is switched OFF at two-speed motor switch or breaker. 5. Wall fuse/circuit breaker is blown/tripped; short in electrical system; start-up load too high for circuit. 6. Fuse has blown in machine electrical box. 7. One or more safety switches or brake switch are engaged. 8. Thermal overload relay has tripped. 9. Motor connection wired incorrectly. 10. Safety/brake switch(es) at fault. 11. Contactor not getting energized/has burned contacts. 12. Wiring is open/has high resistance. 13. Motor is at fault. 	<ol style="list-style-type: none"> 1. Correct out-of-phase wiring (refer to Page 17 for details). 2. Rotate button clockwise until it pops out to reset it for operation; replace if not working properly. 3. Replace bad switch(es). 4. Make sure two-speed motor switch and circuit breaker are turned ON. 5. Verify circuit is rated for machine amp load; troubleshoot and repair cause of overload; replace weak breaker; find/repair electrical short. 6. Replace fuse; determine if overload is due to heavy operation; ensure power source has high enough voltage and power cord is correctly sized. 7. Verify chuck guard, spindle, and brake switches are not engaged. 8. Turn the thermal relay cut-out dial to increase working amps and push the reset pin. Replace if tripped multiple times (weak relay). 9. Correct motor wiring connections (Page 90). 10. Test all switches and replace as necessary. 11. Test for power on all legs and contactor operation. Replace unit if faulty. 12. Check for broken wires or disconnected/corroded connections, and repair/replace as necessary. 13. Test/repair/replace.
Loud, repetitious noise coming from lathe at or near the motor.	<ol style="list-style-type: none"> 1. Pulley set screws or keys are missing or loose. 2. Motor fan is hitting the cover. 	<ol style="list-style-type: none"> 1. Inspect keys and set screws. Replace or tighten if necessary. 2. Tighten fan, shim cover, or replace items.
Motor overheats.	<ol style="list-style-type: none"> 1. Motor overloaded. 	<ol style="list-style-type: none"> 1. Allow motor to cool; reduce load on motor.
Motor is loud when cutting, or bogs down under load.	<ol style="list-style-type: none"> 1. Excessive depth of cut or feed rate. 2. Spindle speed or feed rate wrong for cutting operation. 3. Cutting tool is dull. 	<ol style="list-style-type: none"> 1. Decrease depth of cut or feed rate. 2. Refer to the feeds and speed charts in Machinery's Handbook or a speeds and feeds calculator on the internet. 3. Sharpen or replace the cutting tool.



Lathe Operation

Symptom	Possible Cause	Possible Solution
Entire machine vibrates upon startup and while running.	<ol style="list-style-type: none"> 1. Workpiece is unbalanced. 2. Loose or damaged V-belt(s). 3. V-belt pulleys are not properly aligned. 4. Worn or broken gear present. 5. Chuck or faceplate is unbalanced. 6. Gears not aligned in headstock or no backlash. 7. Broken gear or bad bearing. 8. Workpiece is hitting stationary object. 9. Spindle bearings at fault. 	<ol style="list-style-type: none"> 1. Re-install workpiece as centered with the spindle bore as possible. 2. Re-tension/replace the V-belt(s) as necessary (see Page 79). 3. Align the V-belt pulleys. 4. Inspect gears, and replace if necessary. 5. Re-balance chuck or faceplate; contact a local machine shop for help. 6. Adjust change gears and establish backlash. 7. Replace broken gear or bearing. 8. Stop lathe immediately and correct interference problem. 9. Reset spindle bearing preload or replace worn spindle bearings.
Bad surface finish.	<ol style="list-style-type: none"> 1. Wrong spindle speed or feed rate. 2. Dull tooling or poor tool selection. 3. Tool height not at spindle centerline. 4. Too much play in gibs. 	<ol style="list-style-type: none"> 1. Adjust for appropriate spindle speed and feed rate. 2. Sharpen tooling or select a better tool for the intended operation. 3. Adjust tool height to spindle centerline (see Page 48). 4. Tighten gibs (see Page 77).
Tapered tool difficult to remove from tailstock quill.	<ol style="list-style-type: none"> 1. Quill is not retracted all the way back into the tailstock. 2. Contaminants not removed from taper before inserting into quill. 	<ol style="list-style-type: none"> 1. Turn the quill handwheel until it forces the tapered tool out of quill. 2. Clean the taper and bore, then re-install tool.
Cross slide, compound rest, or carriage feed has sloppy operation.	<ol style="list-style-type: none"> 1. Gibs are out of adjustment. 2. Handwheel is loose or backlash is high. 3. Leadscrew mechanism worn or out of adjustment. 	<ol style="list-style-type: none"> 1. Adjust gibs (see Page 77). 2. Tighten handwheel fasteners, adjust handwheel backlash to a minimum (see Page 76). 3. Adjust leadscrew to remove end play (see Page 77).
Cross slide, compound, or carriage feed handwheel hard to move.	<ol style="list-style-type: none"> 1. Dovetail ways loaded with shavings, dust, or grime. 2. Gib screws are too tight. 3. Backlash setting too tight. 4. Bedways are dry. 	<ol style="list-style-type: none"> 1. Remove gibs, clean ways, lubricate, and re-adjust gibs. 2. Loosen gib screw(s) slightly (see Page 77), and lubricate bedways. 3. Slightly loosen backlash setting (see Page 76). 4. Lubricate bedways/ball oilers.
Cutting tool or machine components vibrate excessively during cutting.	<ol style="list-style-type: none"> 1. Tool holder not tight enough. 2. Cutting tool sticks too far out of tool holder; lack of support. 3. Gibs are out of adjustment. 4. Dull cutting tool. 5. Incorrect spindle speed or feed rate. 	<ol style="list-style-type: none"> 1. Check for debris, clean, and re-tighten. 2. Re-install cutting tool so no more than $\frac{1}{3}$ of the total length is sticking out of tool holder. 3. Adjust gibs at affected component (see Page 77). 4. Replace or resharpen cutting tool. 5. Use the recommended spindle speed and feed rate.



Symptom	Possible Cause	Possible Solution
Workpiece is tapered.	1. Headstock and tailstock are not properly aligned with each other.	1. Re-align the tailstock to the headstock spindle centerline (see Page 40).
Chuck jaws will not move or do not move easily.	1. Chips lodged in the jaws or scroll plate.	1. Remove jaws, clean and lubricate scroll plate, then replace jaws.
Carriage will not feed or is hard to move.	<ol style="list-style-type: none"> 1. Gears are not all engaged. 2. Half nut lever engaged. 3. Loose screw on the feed handle. 4. Carriage lock is tightened down. 5. Chips have loaded up on bedways. 6. Bedways are dry and in need of lubrication. 7. Micrometer or feed stop is interfering. 8. Gibs are too tight. 9. Gears or shear pin broken. 	<ol style="list-style-type: none"> 1. Adjust gear levers. 2. Disengage half nut lever. 3. Tighten. 4. Check to make sure the carriage lock bolt is fully released. 5. Frequently clean away chips that load up during turning operations. 6. Lubricate bedways/ball oilers. 7. Check micrometer or feed stop position and adjust it as necessary (see Page 49). 8. Loosen gibs screw(s) slightly (see Page 77). 9. Replace gears or shear pin (see Page 82).
Gear change levers will not shift into position.	1. Gears not aligned inside headstock/quick change gearbox.	1. Rotate spindle by hand with light pressure on the lever until gear falls into place.



Backlash Adjustment

Backlash is the amount of free play felt while changing rotation directions with the handwheel. This can be adjusted on the compound rest and cross slide leadscrews. Before beginning any adjustment, make sure all associated components are cleaned and lubricated and locks are loose.

NOTICE

Reducing backlash to less than 0.002" is impractical and can lead to accelerated wear of the wedge, nut, and leadscrew. Avoid the temptation to overtighten the backlash set screw while adjusting.

Compound Rest

Tools Needed: Qty
Hex Wrench 3mm..... 1

The compound rest backlash is adjusted by tightening the set screws shown in **Figure 113**. When these screws are adjusted against the leadscrew nut, they offset part of the nut to remove play between the nut and leadscrew.

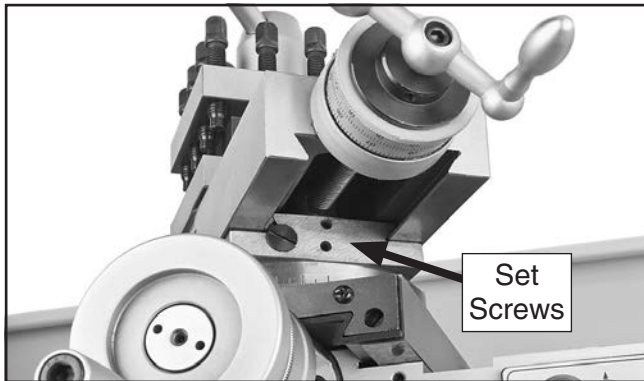


Figure 113. Compound rest backlash adjustment set screws.

To adjust the backlash, rock the handwheel back and forth, and tighten the screws slowly until the backlash is approximately 0.002"–0.003", as indicated on the graduated dial.

If you end up adjusting the nut too tight, loosen the set screws, tap the compound rest a few times with a rubber or wooden mallet, and turn the handwheel slowly back and forth until it moves freely—then try again.

Cross Slide

Tools Needed: Qty
Hex Wrench 3mm..... 1
Hex Wrench 5mm 1

The cross slide backlash is adjusted by loosening all four cap screws shown in **Figure 114**, then tightening the center set screw. This will push down on a wedge and force the leadscrew nut apart, taking up lash between the nut and leadscrew.

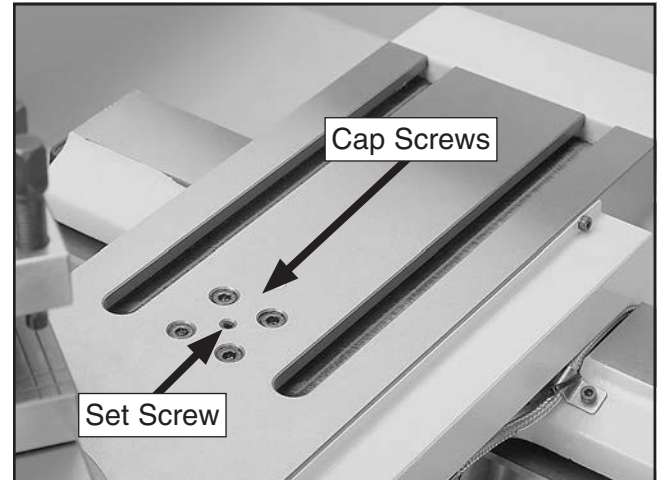


Figure 114. Cross slide backlash adjustment screws.

To adjust the backlash, remove the compound rest and loosen the four cap screws. Then, rock the cross slide handwheel back and forth, and tighten the set screw slowly until the backlash is approximately 0.002"–0.003" as indicated on the graduated dial.

If you end up adjusting the nut too tight, loosen the set screw, tap the cross slide a few times with a rubber or wooden mallet, and turn the handwheel slowly back and forth, until the handle turns freely—then try again.

Remember to re-tighten the four cap screws when you are finished.



Leadscrew End Play Adjustment

After a long period of time, you may find that the leadscrew develops a small amount of end play. This end play can be removed with an easy adjustment.

Tools Needed:	Qty
Hex Wrench 3mm.....	1
Wrench 24mm	1

To remove leadscrew end play:

1. DISCONNECT LATHE FROM POWER!
2. Loosen the two set screws in the leadscrew end nut (see **Figure 115**).

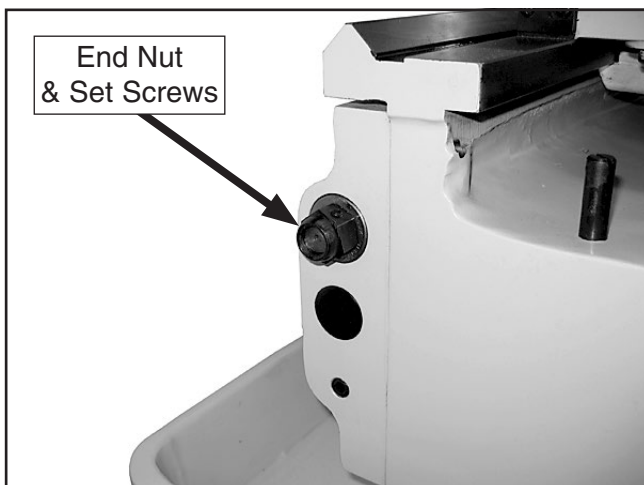


Figure 115. Leadscrew end nut.

3. Engage the half nut with the leadscrew.
4. Use the handwheel to move the carriage slightly toward the tailstock, then tighten the end nut at the same time until the end play is removed.
5. Retighten both set screws.

Gib Adjustment

The goal of adjusting the gib screws is to remove sloppiness or "play" from the ways without over-adjusting them to the point where they become stiff and difficult to move.

In general, loose gibs cause poor finishes and tool chatter; however, over-tightened gibs cause premature wear and make it difficult to turn the handwheels.

Important: Before adjusting the gibs, loosen the locks for the device so that the gibs can freely slide during adjustment, then lubricate the ways.

The gibs are tapered and held in position by a screw at each end. To adjust the gib, turn one screw $\frac{1}{4}$ turn clockwise and the other screw $\frac{1}{4}$ turn counterclockwise, so both screws move in the same direction and the same amount. Test the feel of the sliding component by turning the handwheel, and adjust the gib screws as necessary to make it tighter or looser.

The gib adjustment process usually requires some trial-and-error. Repeat the adjustment process as necessary until you find the best balance between loose and stiff movement. Most machinists find that the ideal gib adjustment is one where a small amount of drag or resistance is present, yet the handwheels are still easy to move.



Figures 116–120 show the location of the adjustment screws for each gib on this machine.

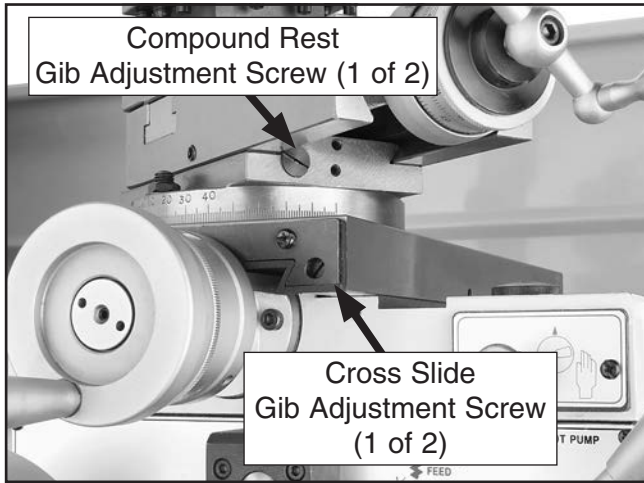


Figure 116. Compound and cross slide gib adjustment screws.

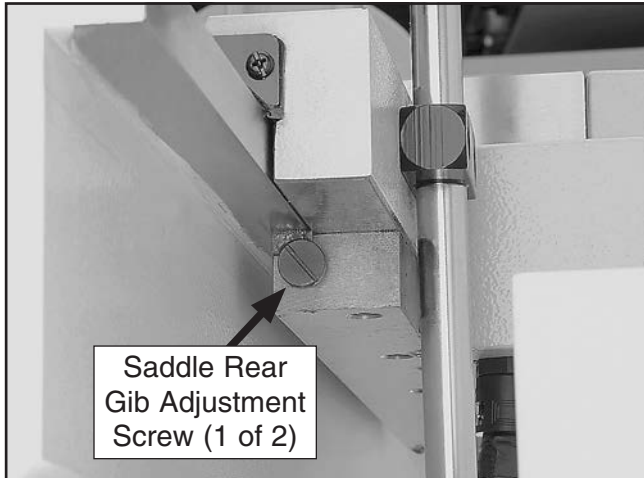


Figure 117. One of two rear saddle gib adjustment screws.

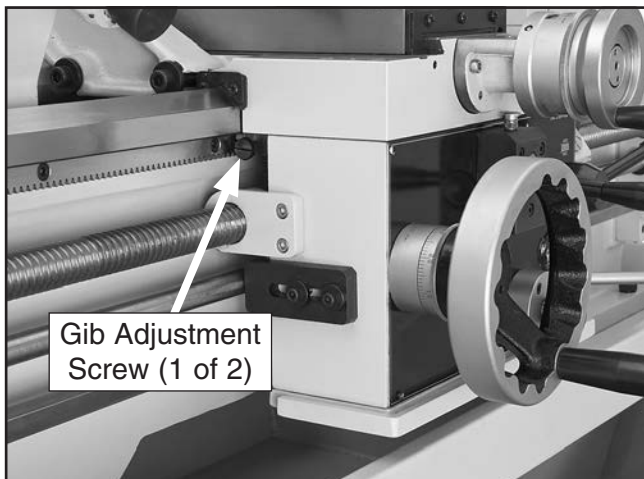


Figure 118. Front saddle gib adjustment screw.

Note: Remove the thread dial body and the carriage lock clamp to access the saddle gib adjustment screw on the tailstock side (see **Figure 119**).

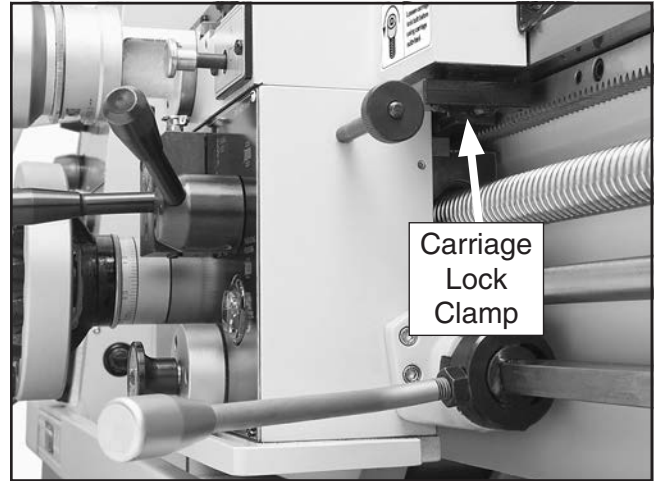


Figure 119. Carriage lock clamp.

Note: Before adjusting the tailstock gib, loosen the clamping hex bolts underneath both ends of the tailstock (see **Figure 120**) to release the clamping pressure between the upper and lower castings. Test the gib adjustment by using the offset adjustment screws. When you are satisfied with the setting, retighten the clamping hex bolts.

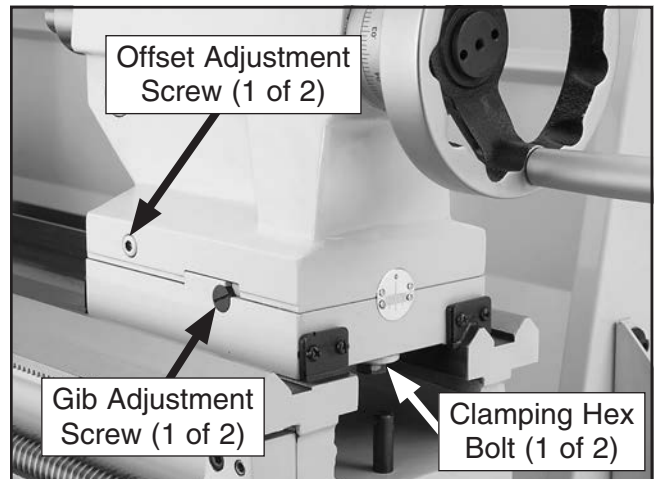


Figure 120. Tailstock gib adjustment controls.

Half Nut Adjustment

The clamping pressure of the half nut is fully adjustable with a gib that can be loosened or tightened by two set screws. Use this procedure to adjust the half nut if it becomes loose from wear, or it is too tight for your preferences. A half nut that is too loose will make it difficult to produce accurate work. A half nut that is too tight will increase the rate of wear on itself and the leadscrew.

Tool Needed: Qty
Hex Wrench 3mm..... 1

To adjust the half nut:

1. DISCONNECT LATHE FROM POWER!
2. Disengage the half nut, then remove the thread dial.
3. Turn the two set screws (see **Figure 121**) clockwise to tighten the half nut and counter-clockwise to loosen it. Make sure to turn the set screws in even amounts so that one end of the gib does not become tighter than the other.

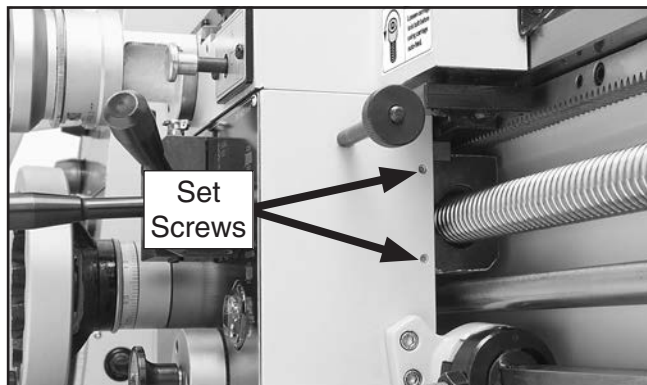


Figure 121. Half nut gib adjustment.

4. Engage/disengage the half nut several times and notice how it feels. The half nut is correctly adjusted when it has a slight drag while opening and closing. The movement should not be too stiff or too sloppy.
5. Repeat **Steps 3–4**, if necessary, until you are satisfied with the half nut pressure.
6. Re-install the thread dial.

V-Belts

V-belts stretch and wear with use, so check the tension on a monthly basis to ensure optimal power transmission. Replace all of the V-belts as a matched set if any of them show signs of glazing, fraying, or cracking.

Tools Needed: Qty
Phillips Screwdriver #2 1
Open End Wrench 24mm..... 1

To adjust the V-belts:

1. DISCONNECT LATHE FROM POWER!
2. Remove the end gear cover, the motor access panel, and the rear access panel to expose the V-belts, pulleys, and motor (see **Figure 122**).

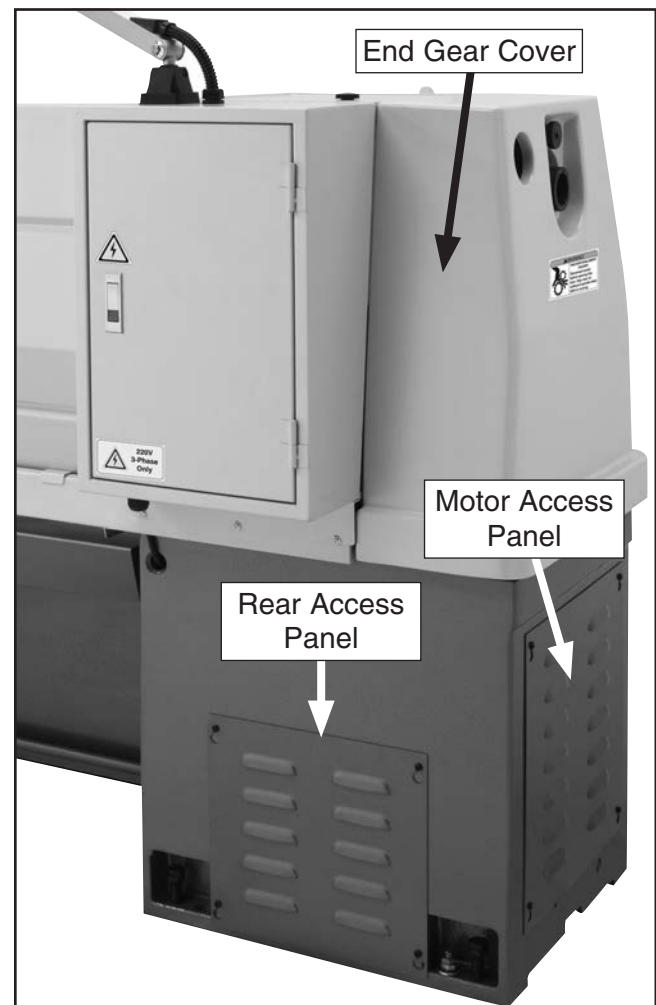


Figure 122. End gear cover and access panels.



- Adjust the hex nuts on the motor mount bolts shown in **Figure 123**, until there is approximately $\frac{3}{4}$ " deflection of the V-belts when moderate pressure is applied midway between the pulleys.

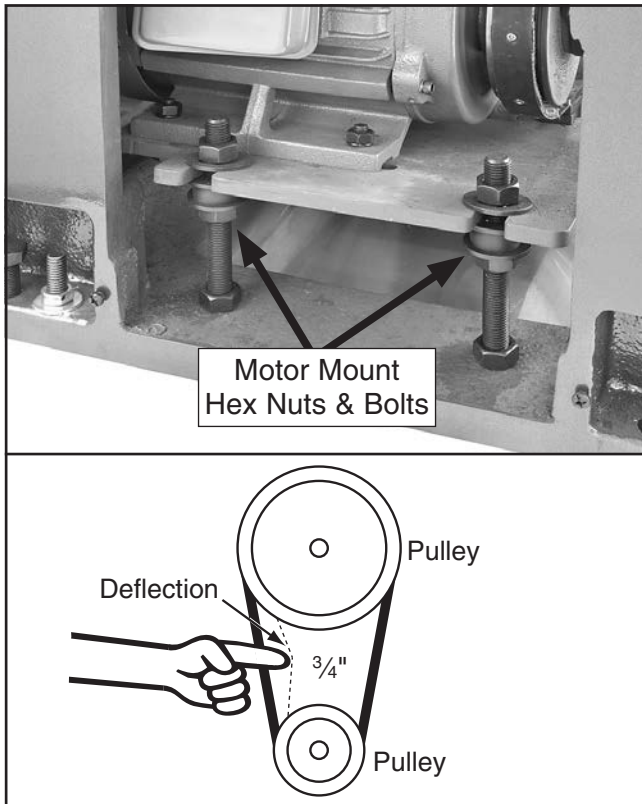


Figure 123. Adjusting V-belt tension.

- Firmly tighten the hex nuts to secure the setting, then re-install the covers.

Brake & Switch

As the brake lining wears, the foot pedal develops more travel. If the brake band is not adjusted to compensate for normal wear, the limit switch will still turn the lathe **OFF**, but the spindle will not stop as quickly. It is especially important that the brake is kept properly adjusted so you can quickly stop the spindle in an emergency.

Tools Needed:	Qty
Phillips Screwdriver #2	1
Hex Wrench 6mm.....	1

To adjust the brake and brake switch:

- DISCONNECT LATHE FROM POWER!
- Put on a respirator and eye protection to protect yourself from hazardous brake dust.
- Remove the motor access panel from the left cabinet.
- Measure the remaining brake band lining at the thinnest point, which is usually at the 8 o'clock position, as shown in **Figure 124**.

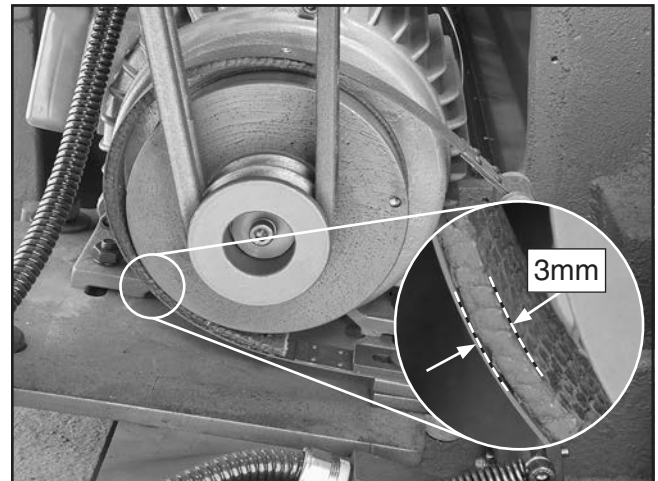


Figure 124. Minimum brake belt thickness.

When the brake band is new, the lining is approximately 6mm thick. If the lining thickness wears to 3mm or less, the brake band must be replaced. Otherwise, the rivets that secure the lining to the band will soon grind into the brake hub. If the hub becomes damaged, it must be replaced.



5. Remove the pedal stop shown in **Figure 125**.

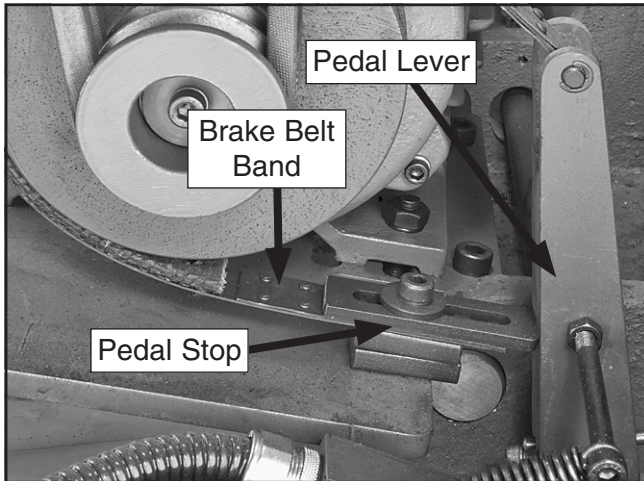


Figure 125. Brake belt adjustment components.

6. Move the brake band to the right one hole, and re-install the pedal stop, tightening the cap screw until it is just snug.

Note: *If installing a new brake band, install the cap screw so there is one hole to the left for future brake adjustment.*

7. Firmly push the pedal lever to the right until it stops and the brake band is fully clamped around the brake hub.
8. Tap the pedal stop into position so there is approximately a 25mm gap between the pedal lever and the stop (see **Figure 126**), then firmly tighten the pedal stop cap screw.

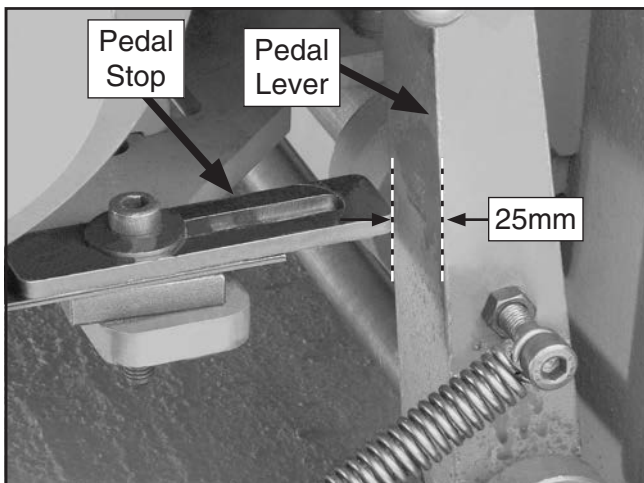


Figure 126. Brake pedal travel adjustment.

9. Locate the brake switch shown in **Figure 127**.

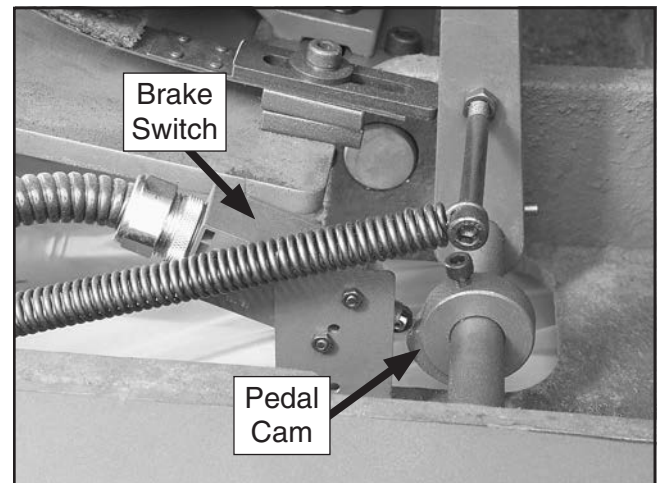


Figure 127. Brake switch and pedal cam.

10. Push the pedal lever down to verify that the cam lobe pushes the brake switch plunger in. When pushed in, the switch should click.

—If the switch does not click, loosen the switch mounting screws, push the brake pedal all the way down, and move the switch closer to the lobe until it clicks. Secure the switch in place at this location.

Note: *In the released position, there should be an approximate 3mm gap between the switch plunger and the cam lobe.*

11. Re-install the motor access panel, connect the lathe to power, then test the brake pedal. If you are not satisfied with the brake performance, repeat this procedure until you are.

Leadscrew Shear Pin Replacement

The leadscrew is secured to a connecting collar that is part of the headstock drivetrain with the use of a soft-metal shear pin. The shear pin is designed to break and disengage the power transfer to the leadscrew to help protect more expensive lathe components in the case of a carriage crash or the lathe is overloaded.

Contact Grizzly Customer Service at (570) 546-9663 to order a replacement shear pin (Part Number P07400844) or use the specifications in **Figure 128** to fabricate your own.

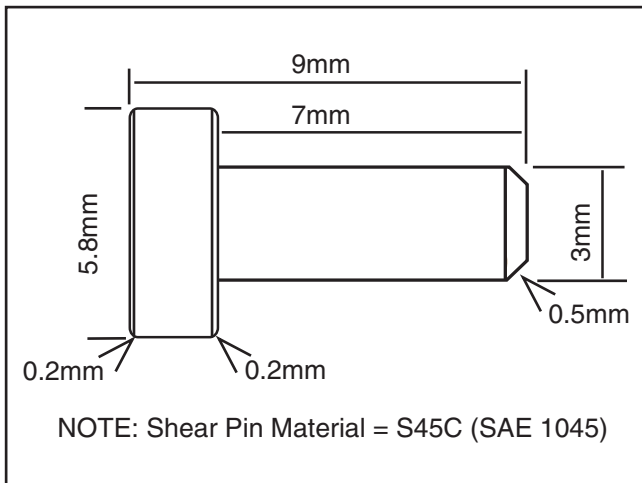


Figure 128. Shear pin specifications.

NOTICE

If you fabricate your own shear pin, make sure to use the material and dimensions specified in **Figure 128**. Otherwise, the shear pin may not provide the intended protection and lathe damage could result.

Tools Needed:	Qty
External Retaining Ring Pliers #1	1
Magnet.....	1
Safety Goggles.....	1
Blow Gun w/Compressed Air	1
Light Machine Oil.....	As needed

To replace the shear pin:

1. DISCONNECT LATHE FROM POWER!
2. Rotate the shroud washer on the leadscrew shown in **Figure 129**, so that the cutout lines up with the shear pin head.

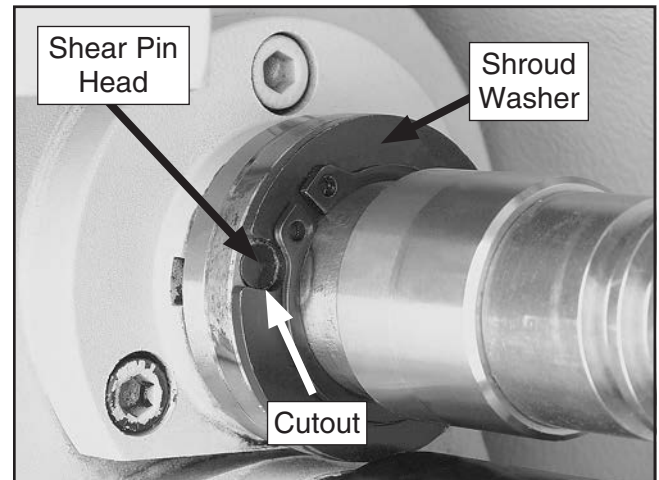


Figure 129. Shroud washer and shear pin alignment.

3. Put on safety glasses.
4. Move the retaining ring shown in **Figure 130** away from the shroud washer.



Figure 130. Shear pin access.

5. To make enough room to remove the shear pin, move the shroud washer away from the shear pin and against the retaining ring, as shown in **Figure 130**.
6. Set up the lathe for threading (refer to **Page 57**) so the leadscrew turns when you rotate the spindle in the next step.



- Use the magnet to remove the shear pin head, then rotate the lathe spindle to line up the inner and outer bores, as shown in **Figure 131**. Next, use the magnet to remove the other half of the broken shear pin when it becomes visible.

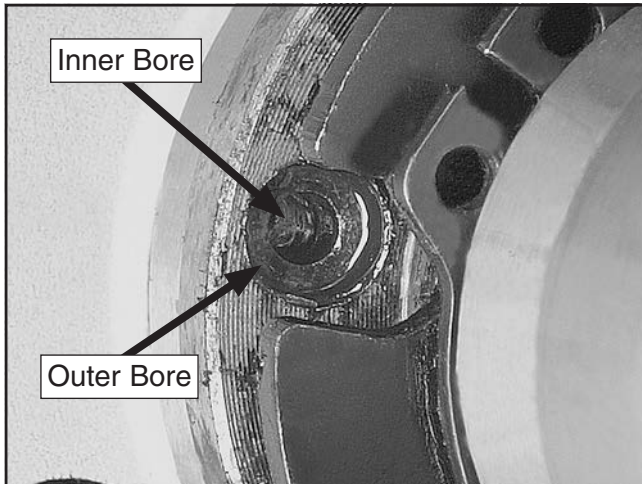


Figure 131. Shear pin bores aligned.

- Insert the blow gun tip into the shear pin hole, blow out the hole with compressed air, then put a drop of oil in the hole.
- Insert the new shear pin into the bore, as shown in **Figure 132**.

Note: If the pin does not freely slide into the bore, DO NOT use a hammer on the pin or you may permanently damage the shear mechanism and bore, which would make it nearly impossible to remove and install a new shear pin later.

Instead, take the time to carefully line up the two bores. You may need to file a slight chamfer on the end of the pin to make it easier to insert.

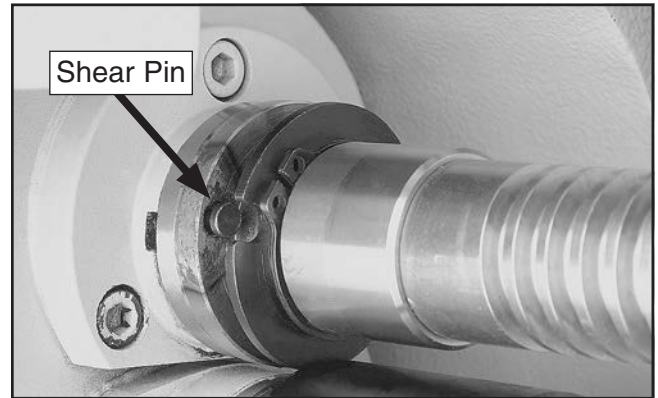


Figure 132. New shear pin installed in bore.

- With the pin completely seated in the bore and the head flush with the leadscrew shoulder, slide the shroud washer against the shoulder, then rotate the washer 180° to completely cover the head of the shear pin, as shown in **Figure 133**.

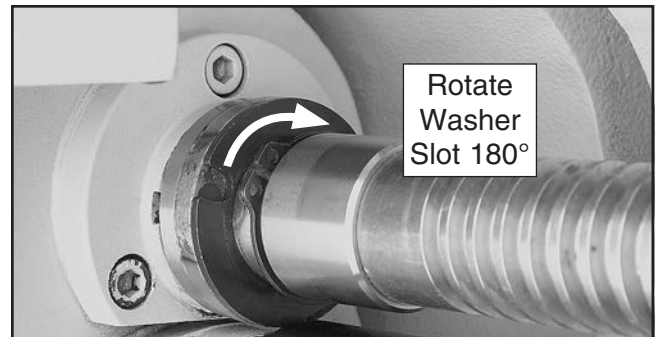


Figure 133. Shroud washer positioning.

- Return the retaining ring against the shroud washer and position the retaining ring ears over the shear pin head, as shown in **Figure 134**. This will prevent the shear pin from falling out if the shroud washer should rotate during operation.

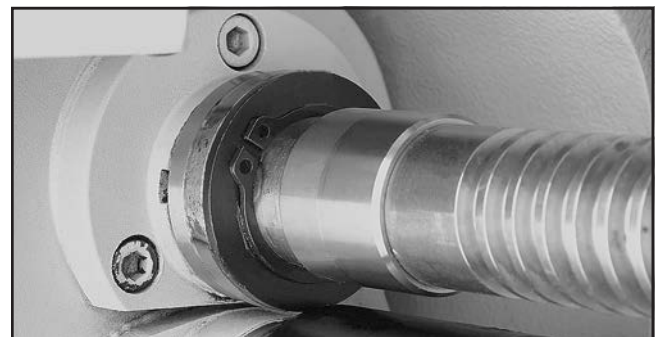


Figure 134. Retaining ring positioned with ears in front of pin access groove.

Gap Insert Removal & Installation

The gap insert directly under the spindle (see **Figure 135**) can be removed to create additional space for turning large diameter parts.

The gap insert was installed, then ground flush with the bed at the factory to ensure a precision fit and alignment. Therefore, if the gap insert is removed, it may be difficult to re-install with the same degree of accuracy.

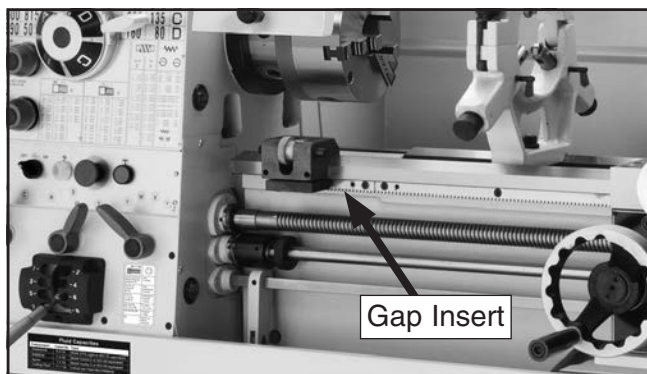


Figure 135. Gap insert.

Tools Needed:	Qty
Hex Wrenches 6mm.....	1
Hex Wrench 8mm.....	1
Wrench 17mm.....	1
Dead Blow Hammer	1

Gap Removal

1. Remove the four gap-bed cap screws, shown in **Figure 136**.

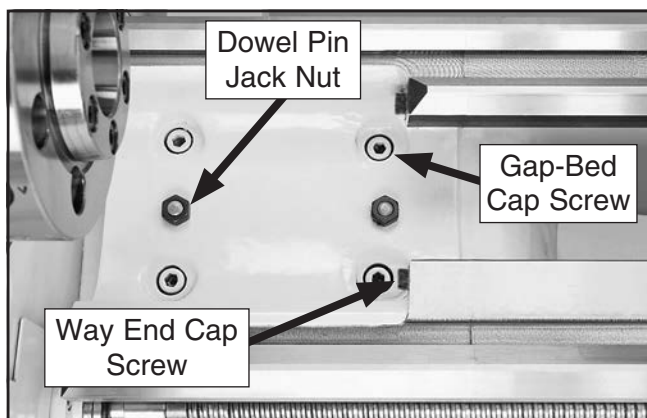


Figure 136. Fasteners holding gap in place.

2. Remove the two way-end cap screws.
3. Tighten the two dowel-pin jack nuts until the pins are pulled free from the gap insert.
4. Tap the outside of the gap insert with a dead blow hammer to loosen it, then remove it.

Gap Installation

1. Use mineral spirits and a clean lint-free rag to clean the mating surfaces of the gap, bed, and ways. If necessary, stone the mating surfaces to remove scratches, dings, or burrs.
2. Wipe a thin layer of light machine oil on the mating surfaces.
3. Place the gap insert into the gap and use a dead-blow hammer to align the insert with the lathe bed.
4. Back off the dowel pin jack nuts, and lightly tap the dowel pins back into their respective holes until they are seated. This process will further help align the gap insert and bed mating surfaces.
5. Install all fasteners and lightly snug them in place.
6. Mount a dial indicator with a magnetic base to the top of the saddle to indicate alignment.
7. First test the peak of the two prisms of the gap insert that the saddle rides on, then test the flanks of the prisms.
8. Tighten the gap bed cap screws in an alternating manner and tap the side of the gap insert into alignment.
9. Inspect the gap alignment 24 hours later to make sure the gap is still aligned. If necessary, loosen the gap bed cap screws and repeat **Steps 7–8** until the insert is properly aligned.



SECTION 8: WIRING

These pages are current at the time of printing. However, in the spirit of improvement, we may make changes to the electrical systems of future machines. Compare the manufacture date of your machine to the one stated in this manual, and study this section carefully.

If there are differences between your machine and what is shown in this section, call Technical Support at (570) 546-9663 for assistance BEFORE making any changes to the wiring on your machine. An updated wiring diagram may be available. **Note:** Please gather the serial number and manufacture date of your machine before calling. This information can be found on the main machine label.

WARNING

Wiring Safety Instructions

SHOCK HAZARD. Working on wiring that is connected to a power source is extremely dangerous. Touching electrified parts will result in personal injury including but not limited to severe burns, electrocution, or death. Disconnect the power from the machine before servicing electrical components!

MODIFICATIONS. Modifying the wiring beyond what is shown in the diagram may lead to unpredictable results, including serious injury or fire. This includes the installation of unapproved after-market parts.

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.

CIRCUIT REQUIREMENTS. You MUST follow the requirements at the beginning of this manual when connecting your machine to a power source.

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.

MOTOR WIRING. The motor wiring shown in these diagrams is current at the time of printing but may not match your machine. If you find this to be the case, use the wiring diagram inside the motor junction box.











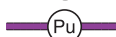



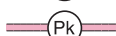
CAPACITORS/INVERTERS. Some capacitors and power inverters store an electrical charge for up to 10 minutes after being disconnected from the power source. To reduce the risk of being shocked, wait at least this long before working on capacitors.

EXPERIENCING DIFFICULTIES. If you are experiencing difficulties understanding the information included in this section, contact our Technical Support at (570) 546-9663.

NOTICE

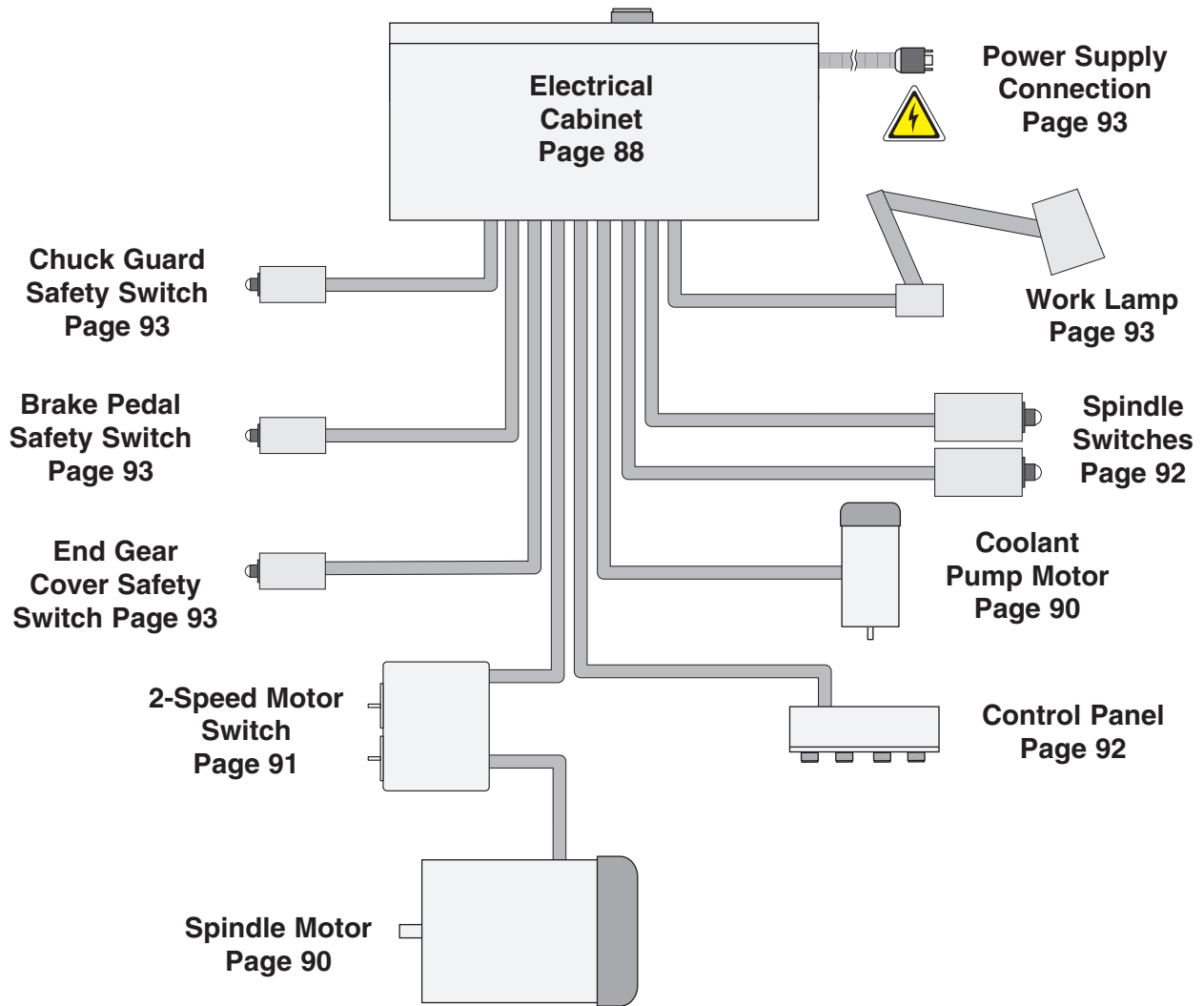
The photos and diagrams included in this section are best viewed in color. You can view these pages in color at www.grizzly.com.

COLOR KEY

BLACK		BLUE		YELLOW		LIGHT BLUE	
WHITE		BROWN		YELLOW GREEN		BLUE WHITE	
GREEN		GRAY		PURPLE		TURQUOISE	
RED		ORANGE		PINK			



Wiring Overview



Component Location Index

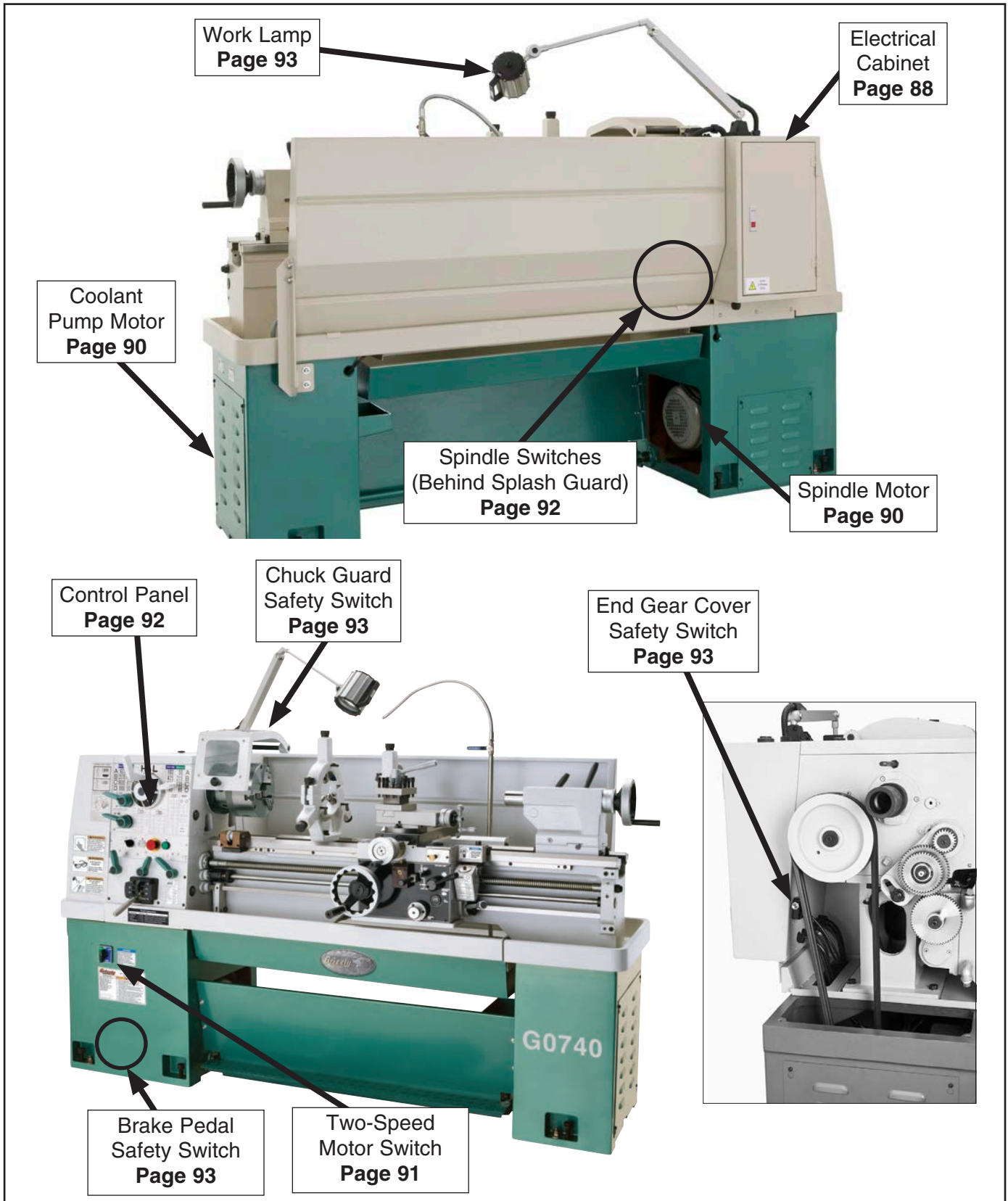
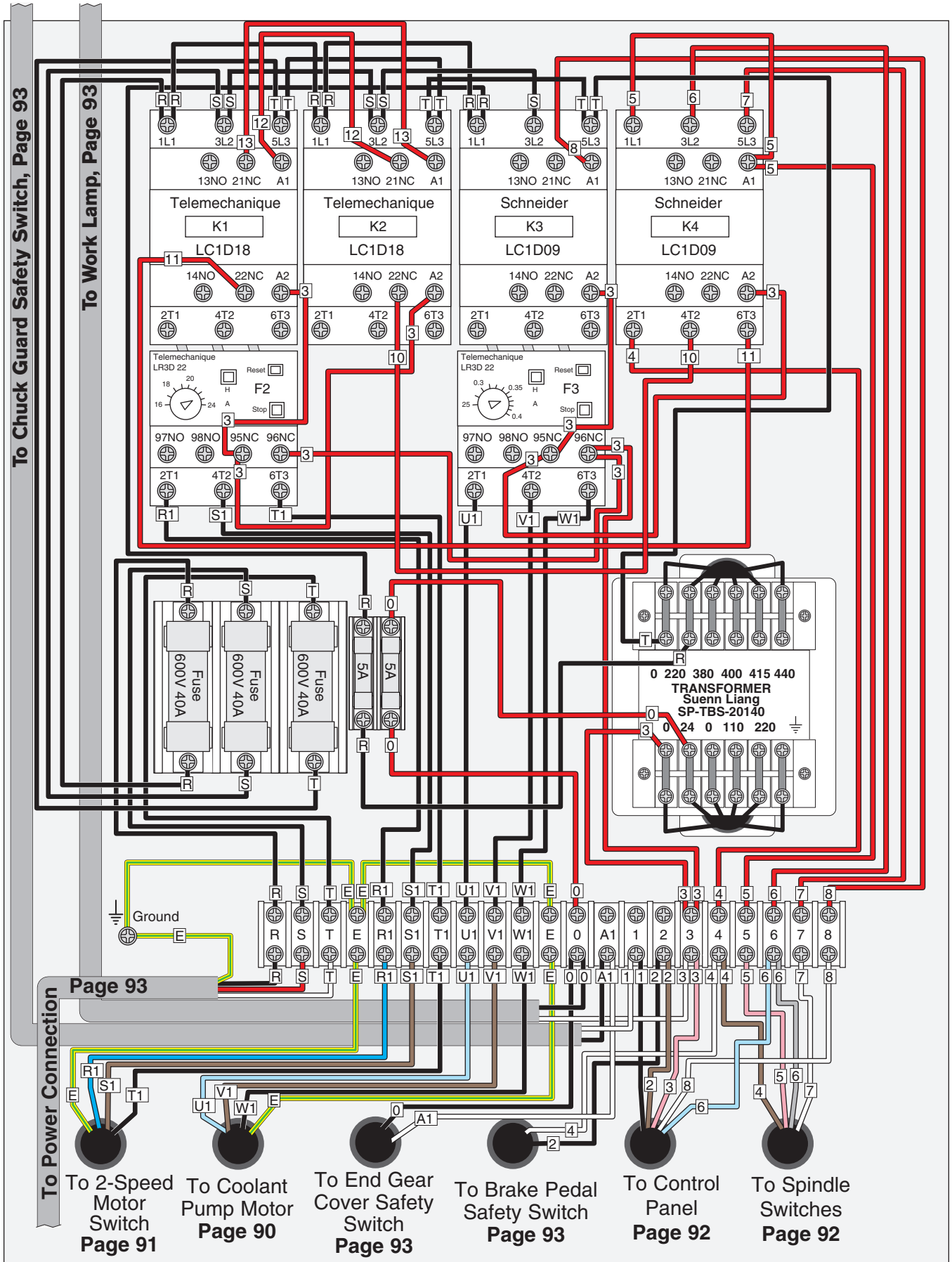


Figure 137. Component location index.



Electrical Cabinet Wiring



Electrical Box

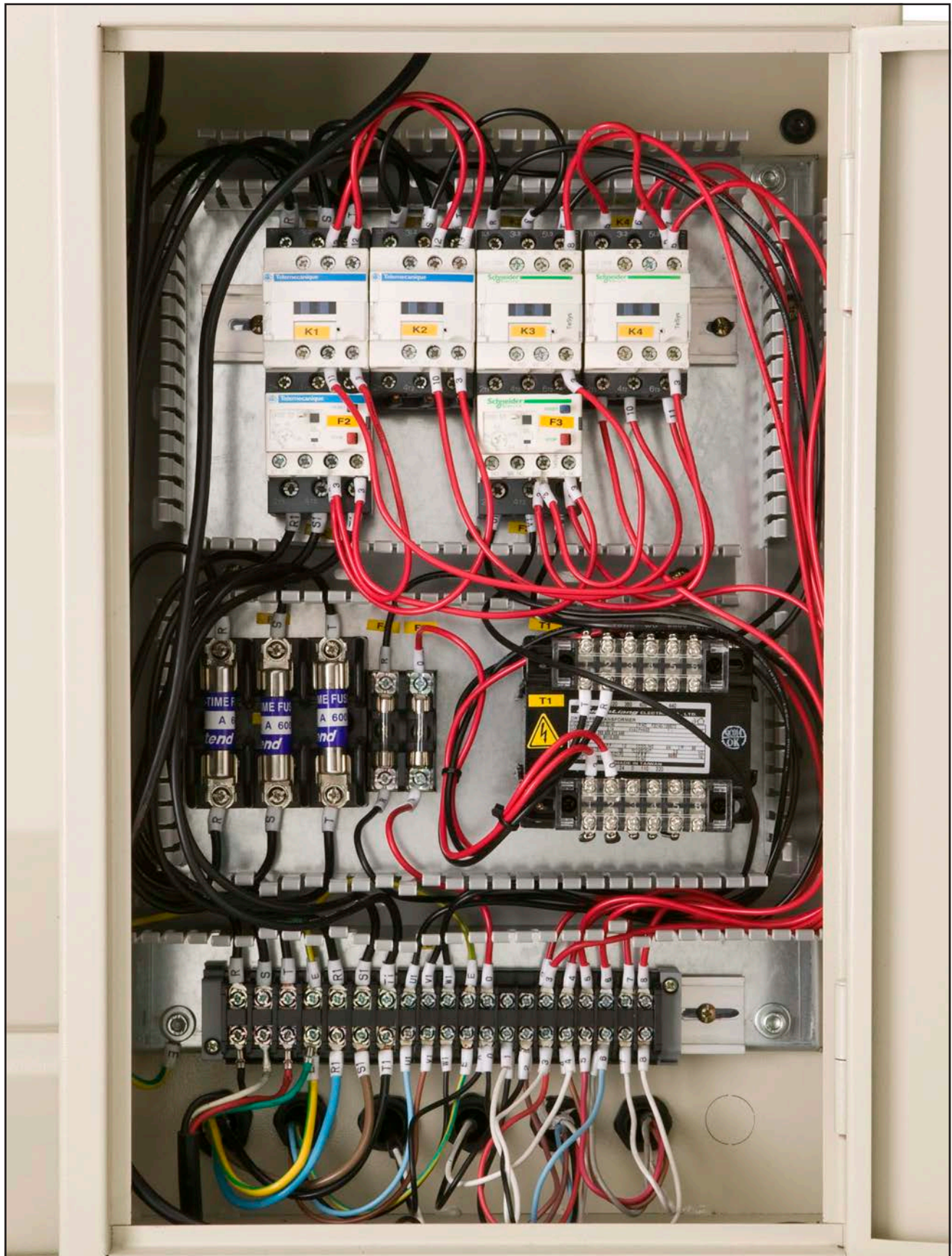
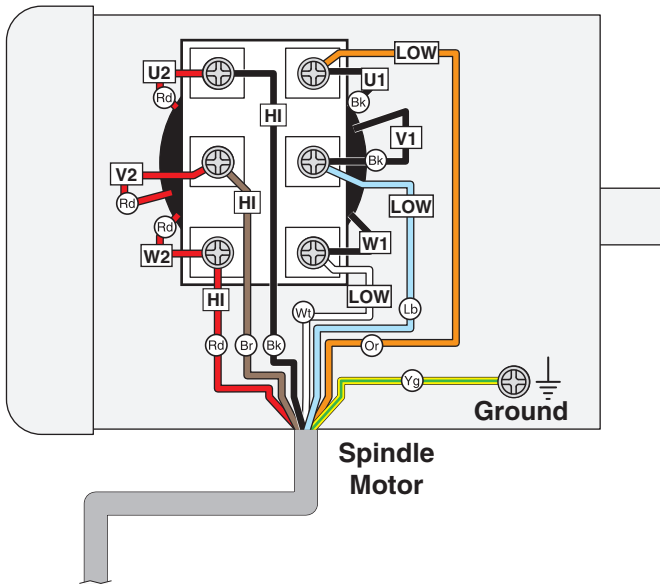


Figure 138. Electrical box wiring.



Spindle Motor



To 2-Speed
Motor Switch
Page 91

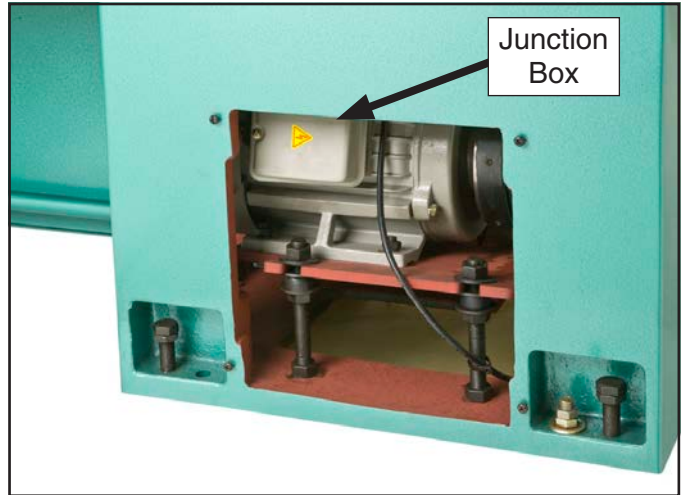


Figure 139. Spindle motor junction box.

Coolant Pump Wiring

To Electrical
Cabinet
Page 88

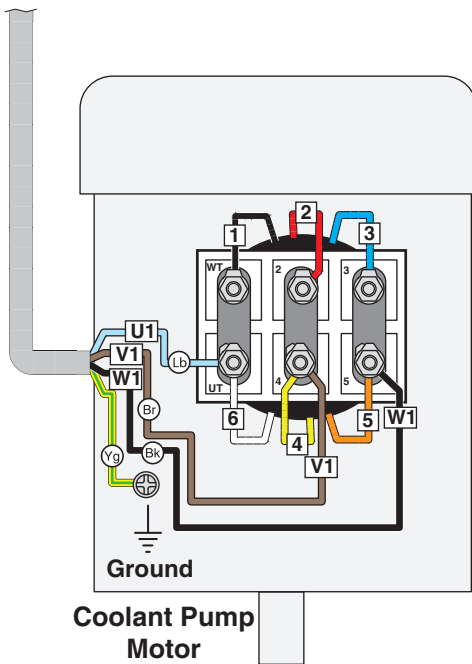


Figure 140. Coolant pump location.



2-Speed Motor Switch

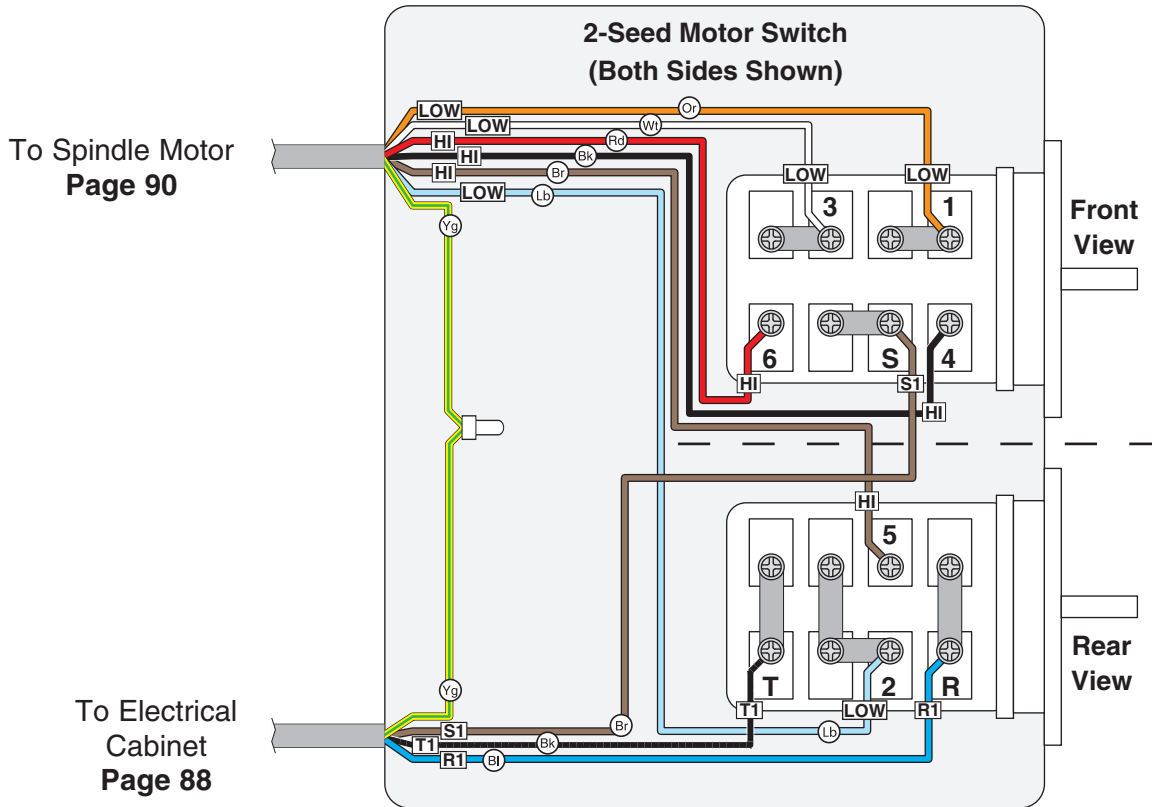


Figure 141. 2-Speed motor switch.



Control Panel Wiring

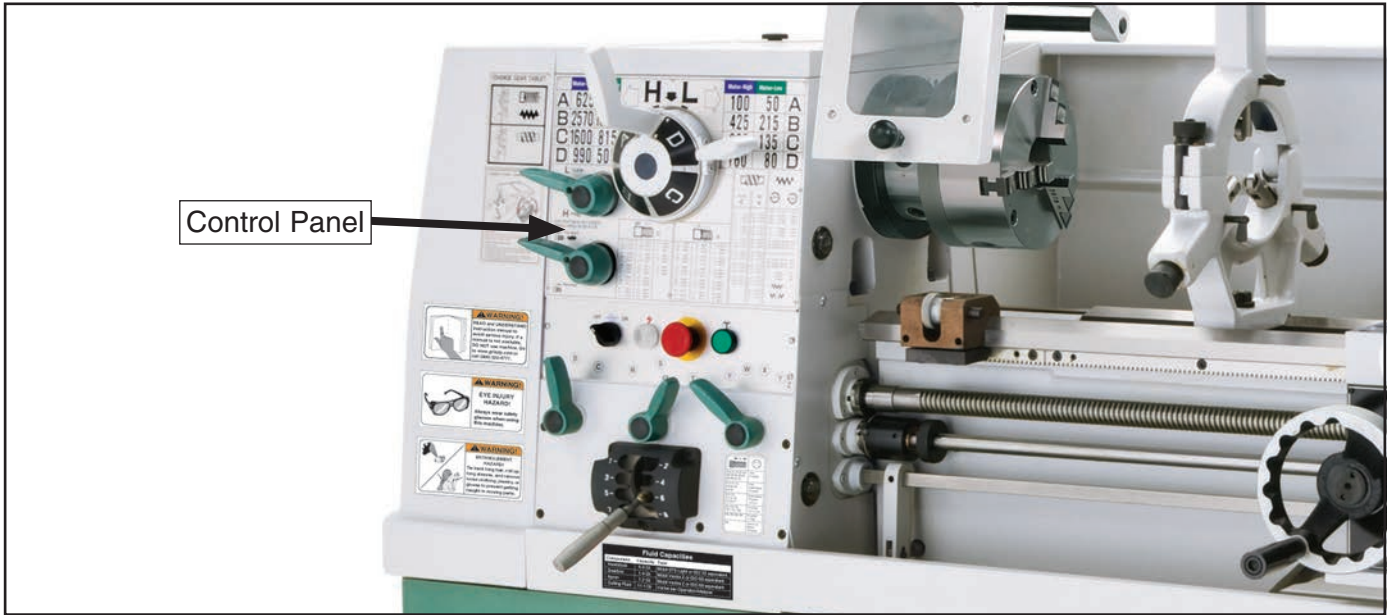
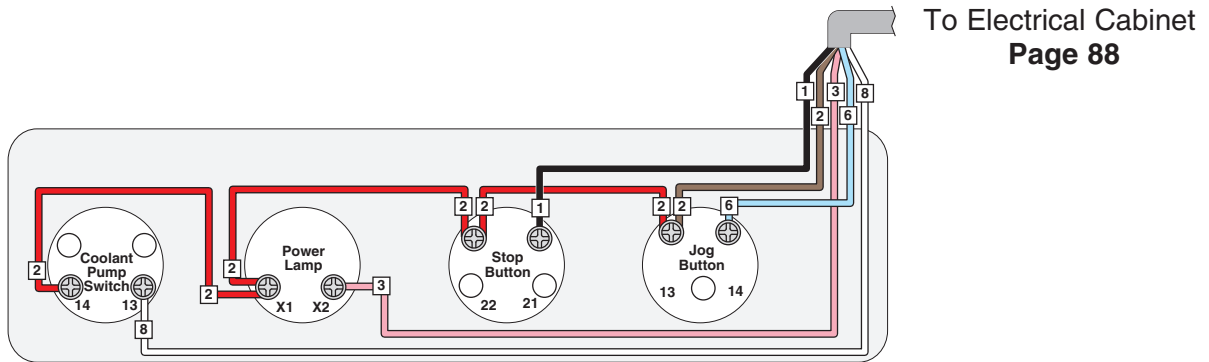


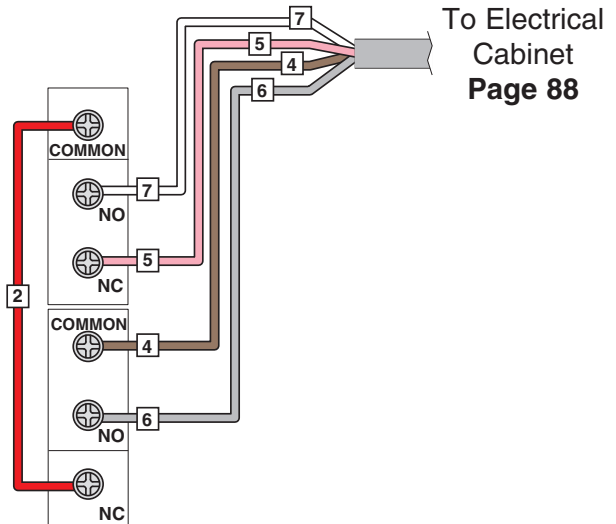
Figure 142. Control panel location.



Spindle Switches



Figure 143. Spindle rotation switch location.



Additional Component Wiring

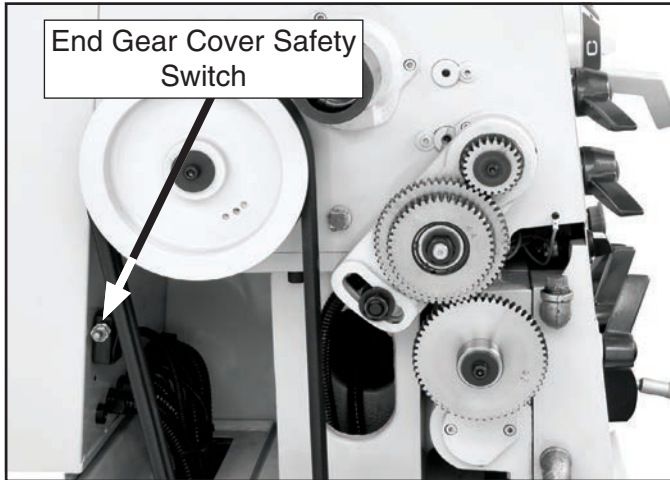


Figure 144. End Gear Cover Safety switch location.

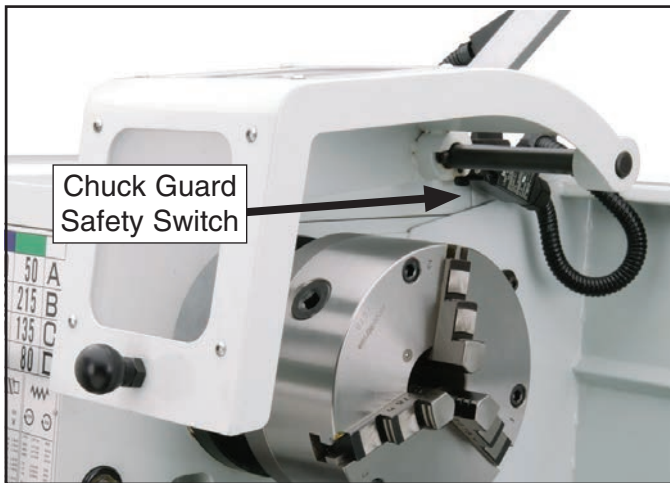
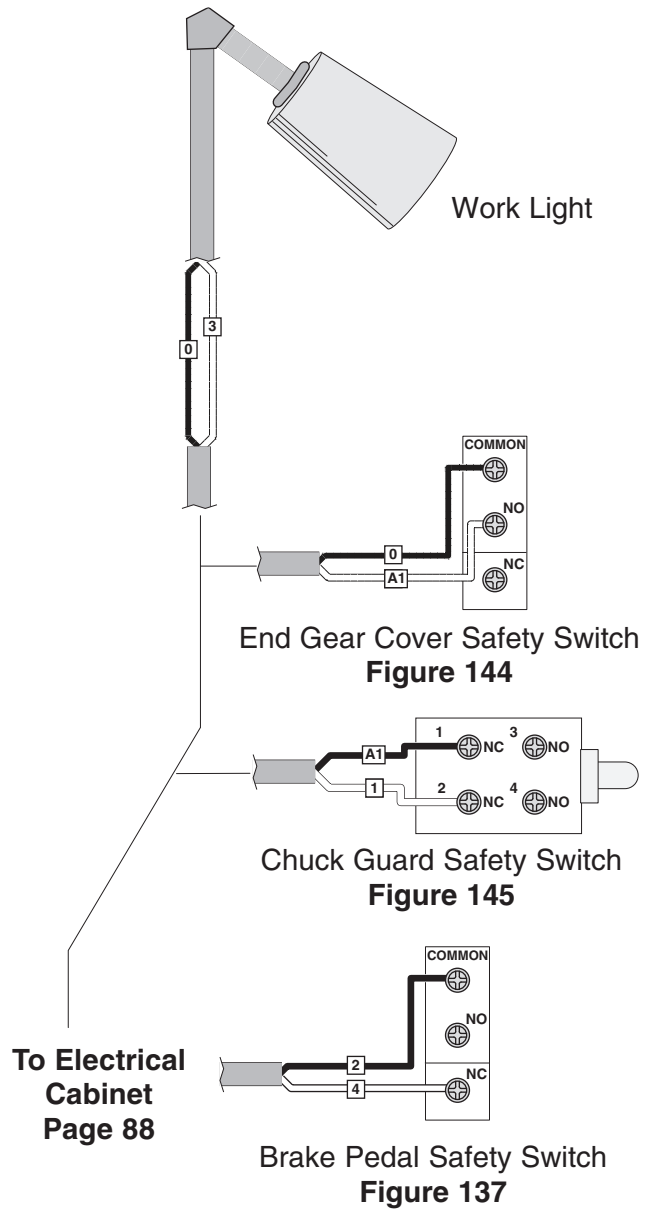
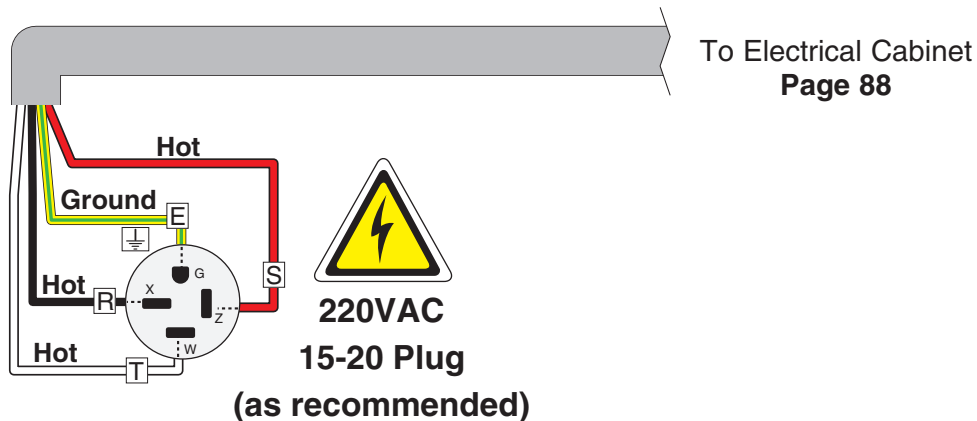


Figure 145. Chuck Guard Safety switch location.

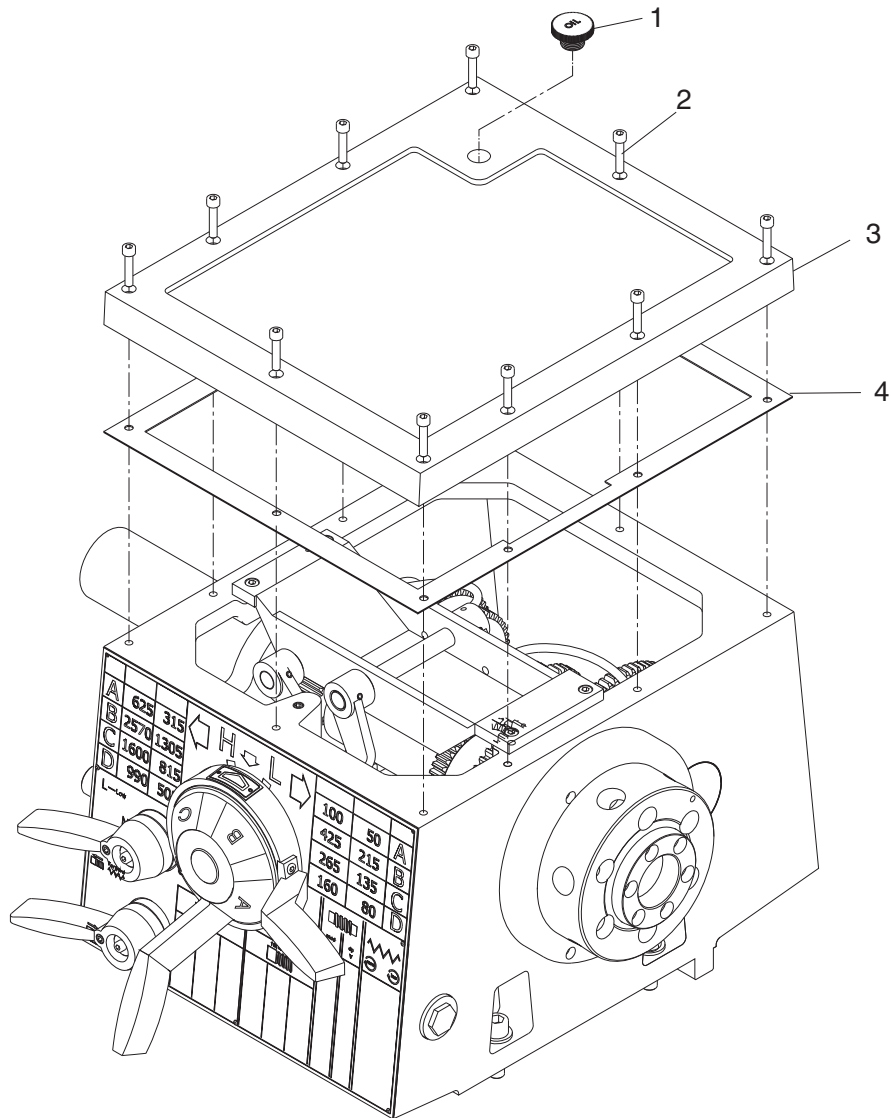


Power Connection



SECTION 9: PARTS

Headstock Cover



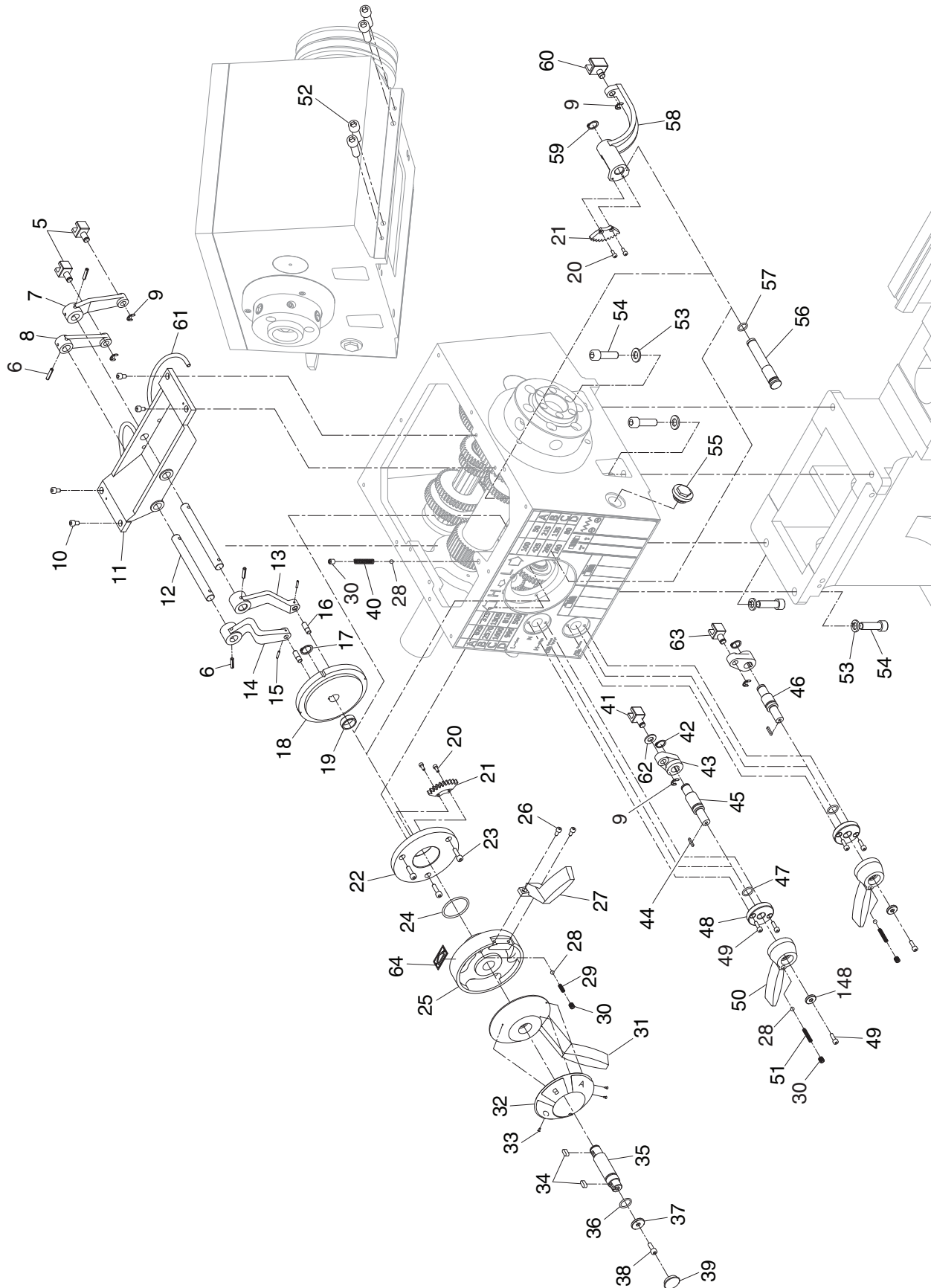
REF	PART #	DESCRIPTION
1	P07400001	HEADSTOCK OIL FILL CAP
2	PCAP29M	CAP SCREW M6-1 X 40

REF	PART #	DESCRIPTION
3	P07400003	HEADSTOCK COVER
4	P07400004	HEADSTOCK COVER GASKET

Please Note: We do our best to stock replacement parts whenever possible, but we cannot guarantee that all parts shown here are available for purchase. Call (800) 523-4777 or visit our online parts store at www.grizzly.com to check for availability.



Headstock Controls



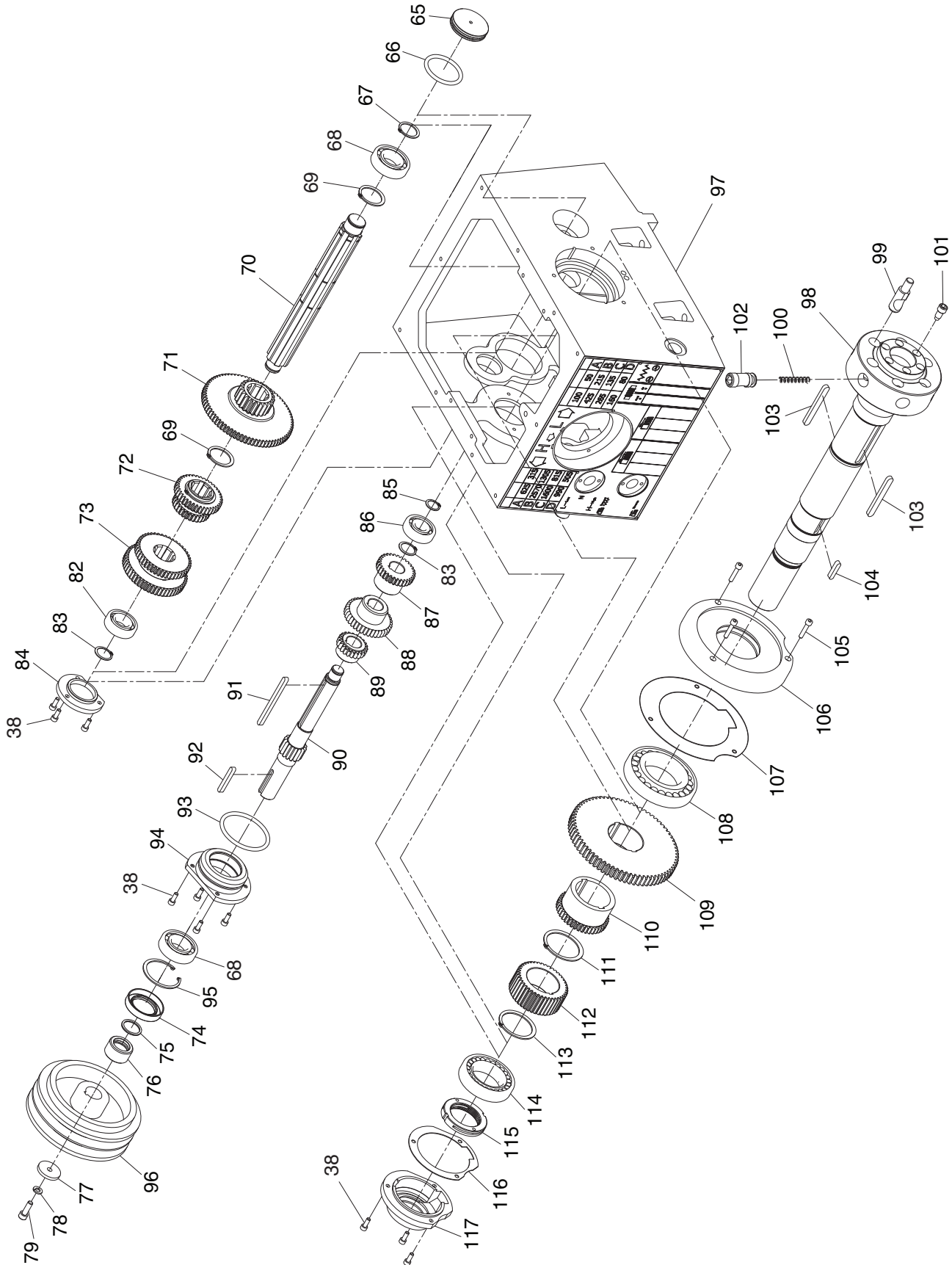
Headstock Controls Parts List

REF	PART #	DESCRIPTION
5	P07400005	SPINDLE SPEED SHIFT FORK
6	PRP06M	ROLL PIN 5 X 24
7	P07400007	RIGHT REAR SHIFT PIVOT ARM
8	P07400008	LEFT REAR SHIFT PIVOT ARM
9	PEC015M	E-CLIP 8MM
10	PCAP04M	CAP SCREW M6-1 X 10
11	P07400011	LUBRICATION TRAY
12	P07400012	SHIFT ROD
13	P07400013	RIGHT FRONT SHIFT PIVOT ARM
14	P07400014	LEFT FRONT SHIFT PIVOT ARM
15	PRP02M	ROLL PIN 3 X 16
16	P07400016	STEP PIN
17	PR07M	EXT RETAINING RING 18MM
18	P07400018	SHIFT CAM WHEEL
19	P07400019	SHIFT SHAFT BUSHING
20	PCAP17M	CAP SCREW M4-.7 X 10
21	P07400021	GEAR 40T
22	P07400022	CAM WHEEL END CAP
23	PCAP02M	CAP SCREW M6-1 X 20
24	PORP044	O-RING 43.7 X 3.5 P44
25	P07400025	RANGE SELECTOR
26	PCAP50M	CAP SCREW M5-.8 X 10
27	P07400027	RANGE SELECTOR HANDLE
28	PSTB001	STEEL BALL 1/4
29	P07400029	COMPRESSION SPRING
30	PSS20M	SET SCREW M8-1.25 X 8
31	P07400031	SPEED SELECTOR HANDLE
32	P07400032	SPEED SELECTOR PLATE
33	PRIV001M	STEEL FLUTED RIVET 2 X 5MM
34	PK101M	KEY 6 X 6 X 14
35	P07400035	SHIFT SHAFT

REF	PART #	DESCRIPTION
36	PORP018	O-RING 17.8 X 2.4 P18
37	P07400037	SHIFT SHAFT FLAT WASHER
38	PCAP01M	CAP SCREW M6-1 X 16
39	P07400039	SHIFT SHAFT END CAP
40	P07400040	COMPRESSION SPRING
41	P07400041	HIGH-LOW SHIFT FORK
42	PR05M	EXT RETAINING RING 15MM
43	P07400043	PIVOT ARM
44	PK155M	KEY 3 X 3 X 18
45	P07400045	HIGH-LOW SHIFT SHAFT
46	P07400046	DIRECTION SHIFT SHAFT
47	PORP016	O-RING 15.8 X 2.4 P16
48	P07400048	SHAFT END CAP
49	PCAP10M	CAP SCREW M5-.8 X 15
50	P07400050	SHIFT HANDLE
51	P07400051	COMPRESSION SPRING
52	PCAP92M	CAP SCREW M12-1.75 X 40
53	PLW05M	LOCK WASHER 12MM
54	PCAP92M	CAP SCREW M12-1.75 X 40
55	P07400055	OIL SIGHT GLASS 3/4"
56	P07400056	GEAR SHAFT
57	PORP014	O-RING 13.8 X 2.4 P14
58	P07400058	LEVER ARM
59	PR06M	EXT RETAINING RING 16MM
60	P07400060	SHIFT FORK
61	P07400061	LUBRICATION TUBE 6 X 270MM
62	PW04M	FLAT WASHER 10MM
63	P07400063	DIRECTION SHIFT FORK
64	P07400064	INDICATOR PLATE
148	P07400148	SHIFT HANDLE FLAT WASHER 5MM



Headstock Internal Gears



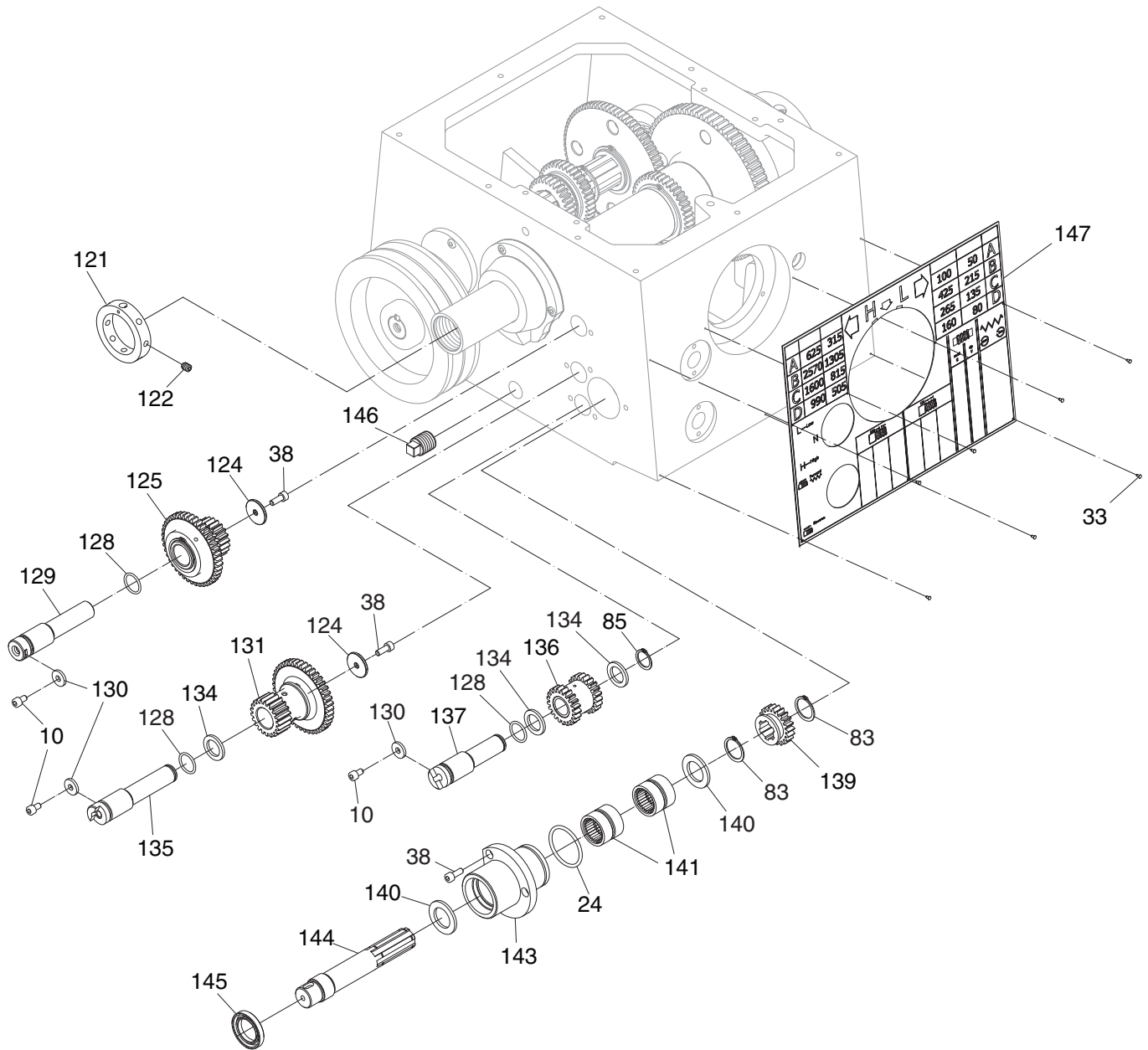
Headstock Internal Gears Parts List

REF	PART #	DESCRIPTION
38	PCAP01M	CAP SCREW M6-1 X 16
65	P07400065	SHAFT END CAP
66	PORP055	O-RING 54.6 X 5.7 P55
67	PR15M	EXT RETAINING RING 30MM
68	P6206-OPEN	BALL BEARING 6206-OPEN
69	PR31M	EXT RETAINING RING 38MM
70	P07400070	SPLINED SHAFT
71	P07400071	COMBO GEAR 22T/72T
72	P07400072	COMBO GEAR 22T/38T
73	P07400073	COMBO GEAR 45T/52T
74	P07400074	OIL SEAL 40 X 62 X 12
75	PORP028	O-RING 27.7 X 3.5 P28
76	P07400076	PULLEY SHAFT SPACER
77	P07400077	SPINDLE PULLEY FLAT WASHER
78	PLW04M	LOCK WASHER 8MM
79	PCAP31M	CAP SCREW M8-1.25 X 25
82	P6205-OPEN	BALL BEARING 6205-OPEN
83	PR11M	EXT RETAINING RING 25MM
84	P07400084	DRIVE SHAFT END CAP
85	PR09M	EXT RETAINING RING 20MM
86	P6304-OPEN	BALL BEARING 6304-OPEN
87	P07400087	GEAR 30T
88	P07400088	GEAR 38T
89	P07400089	GEAR 22T
90	P07400090	SPINDLE PULLEY GEAR SHAFT 16T
91	P07400091	KEY 7 X 7 X 104

REF	PART #	DESCRIPTION
92	PK66M	KEY 7 X 7 X 55
93	PORP075	O-RING 74.6 X 5.7 P75
94	P07400094	FLANGE BEARING SEAT
95	PR38M	INT RETAINING RING 62MM
96	P07400096	SPINDLE PULLEY
97	P07400097	HEADSTOCK CASTING
98	P07400098	SPINDLE
99	P07400099	CAM LOCK BOLT
100	P07400100	CAM LOCK COMPRESSION SPRING
101	P07400101	SPINDLE HEAD CAP SCREW
102	P07400102	CAM LOCK
103	PK162M	KEY 10 X 6 X 85
104	PK109M	KEY 7 X 7 X 35
105	PCAP07M	CAP SCREW M6-1 X 30
106	P07400106	INBOARD SPINDLE BEARING COVER
107	P07400107	BEARING COVER GASKET
108	P30213-T	TAPERED ROLLER BEARING 30213 NTN
109	P07400109	GEAR 72T
110	P07400110	GEAR 41T
111	PR71M	EXT RETAINING RING 60MM
112	P07400112	GEAR 42T
113	PR91M	EXT RETAINING RING 56MM
114	P32011-T	TAPERED ROLLER BEARING 32011 NTN
115	P07400115	SPANNER NUT
116	P07400116	SPINDLE END CAP GASKET
117	P07400117	OUTBOARD SPINDLE END CAP



Headstock Transfer Gears

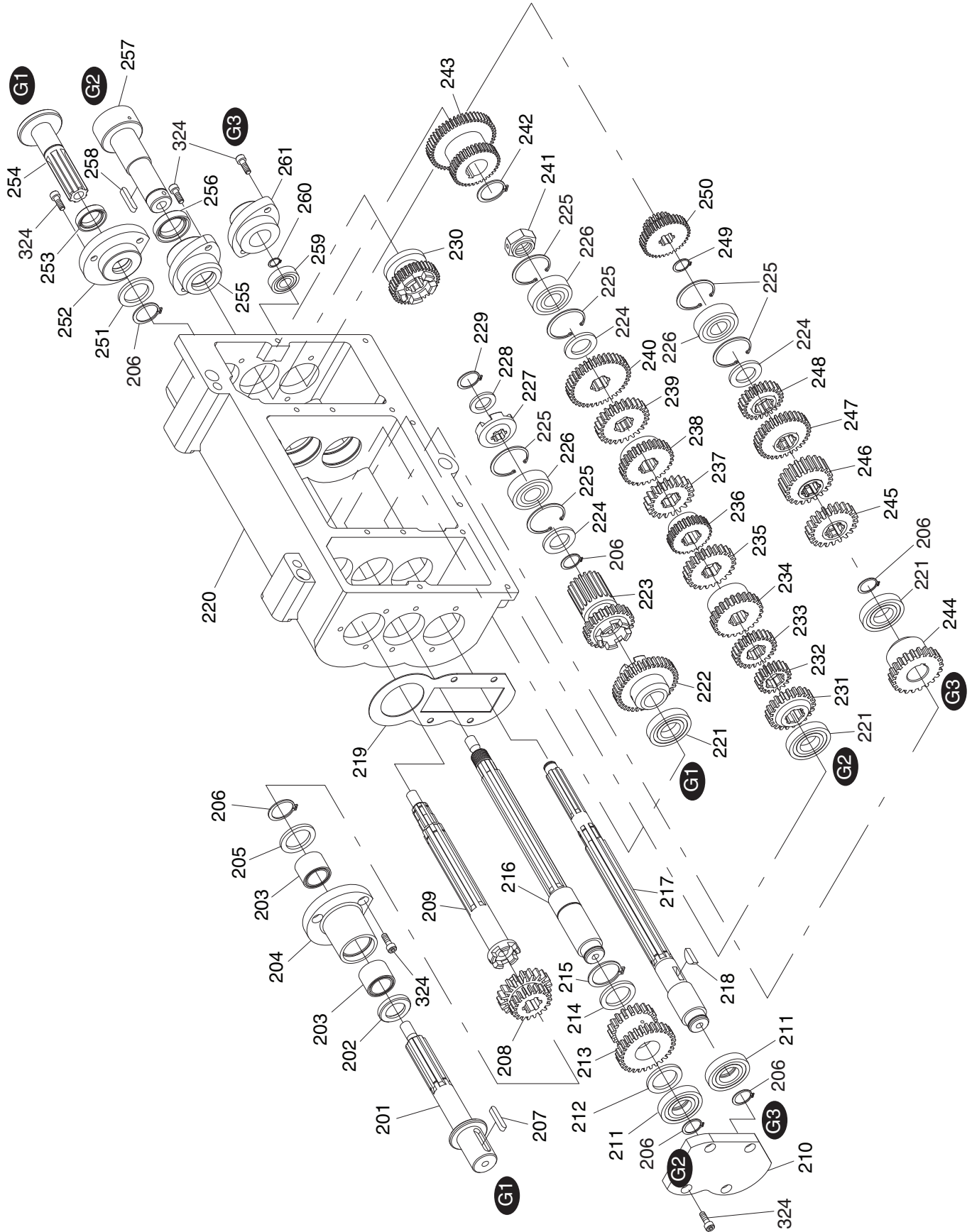


REF	PART #	DESCRIPTION
10	PCAP04M	CAP SCREW M6-1 X 10
24	PORP044	O-RING 43.7 X 3.5 P44
33	PRIV001M	STEEL FLUTED RIVET 2 X 5MM
38	PCAP01M	CAP SCREW M6-1 X 16
83	PR11M	EXT RETAINING RING 25MM
85	PR09M	EXT RETAINING RING 20MM
121	P07400121	SPINDLE BALANCE SLEEVE
122	PSS30M	SET SCREW M10-1.5 X 10
124	P07400124	GEAR FLAT WASHER
125	P07400125	COMBO GEAR 21T/42T
128	PORP021	O-RING 20.8 X 2.4 P21
129	P07400129	TOP GEAR SHAFT
130	P07400130	GEAR SHAFT FLAT WASHER

REF	PART #	DESCRIPTION
131	P07400131	COMBO GEAR 21T/42T
134	P07400134	THRUST WASHER
135	P07400135	MIDDLE GEAR SHAFT
136	P07400136	COMBO GEAR 21T/21T
137	P07400137	LOWER GEAR SHAFT
139	P07400139	GEAR 21T
140	P07400140	THRUST WASHER
141	P07400141	NEEDLE BEARING RNA-6904
143	P07400143	FLANGE BEARING SEAT
144	P07400144	SPLINED SHAFT
145	P07400145	OIL SEAL 28 X 44 X 7
146	P07400146	SQUARE HEAD OIL DRAIN PLUG 1/2 PT
147	P07400147	HEADSTOCK INFORMATION FRONT PANEL



Gearbox Gears



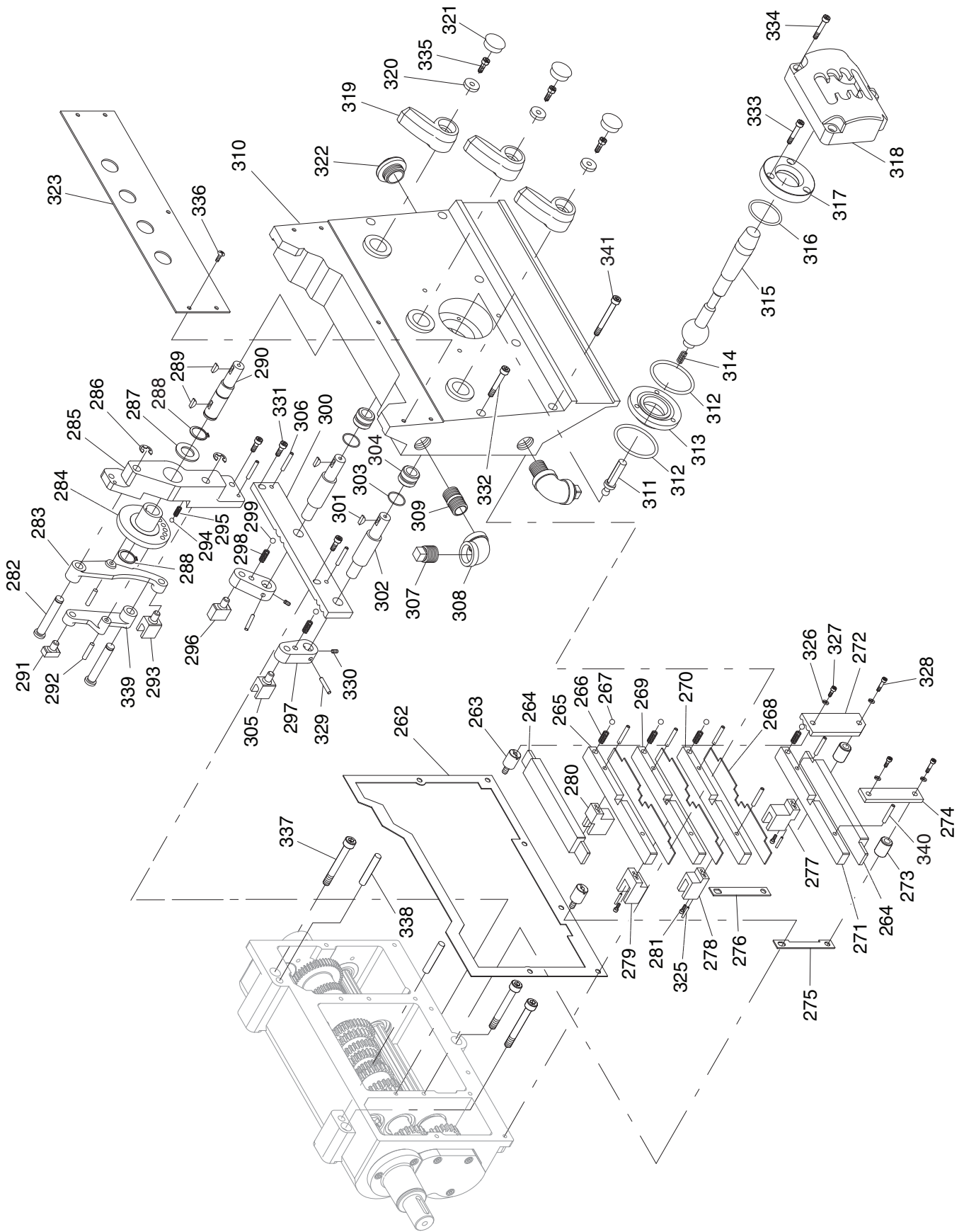
Gearbox Gears Parts List

REF	PART #	DESCRIPTION
201	P07400201	OUTBOARD SPLINED SHAFT (G1)
202	P07400202	OIL SEAL 20 X 32 X 5
203	P07400203	NEEDLE ROLLER BEARING TAF202820
204	P07400204	FLANGE BEARING SEAT
205	P07400205	THRUST WASHER
206	PR09M	EXT RETAINING RING 20MM
207	PK109M	KEY 7 X 7 X 35
208	P07400208	COMBO GEAR 19T/20T
209	P07400209	CLUTCH SPLINED SHAFT (G1)
210	P07400210	OUTBOARD SHAFT END CAP
211	P16004ZZ	BALL BEARING 16004ZZ
212	P07400212	THRUST WASHER
213	P07400213	COMBO GEAR 19T/30T
214	P07400214	THRUST WASHER
215	PR11M	EXT RETAINING RING 25MM
216	P07400216	SPLINED SHAFT (G2)
217	P07400217	SPLINED SHAFT (G3)
218	P07400218	WOODRUFF KEY 5 X 19
219	P07400219	OUTBOARD END CAP GASKET
220	P07400220	GEARBOX CASTING
221	P16004ZZ	BALL BEARING 16004ZZ
222	P07400222	CLUTCH GEAR 38T
223	P07400223	COMBO CLUTCH GEAR 23T/19T
224	P07400224	THRUST WASHER
225	PR23M	INT RETAINING RING 40MM
226	P6203	BALL BEARING 6203ZZ
227	P07400227	CLUTCH
228	P07400228	THRUST BEARING
229	PR06M	EXT RETAINING RING 16MM
230	P07400230	CLUTCH GEAR 35T
231	P07400231	GEAR 22T

REF	PART #	DESCRIPTION
232	P07400232	GEAR 19T
233	P07400233	GEAR 20T
234	P07400234	GEAR 24T
235	P07400235	GEAR 23T
236	P07400236	GEAR 27T
237	P07400237	GEAR 24T
238	P07400238	GEAR 28T
239	P07400239	GEAR 26T
240	P07400240	GEAR 38T
241	P07400241	SPANNER NUT
242	PR10M	EXT RETAINING RING 22MM
243	P07400243	COMBO GEAR 36T/50T
244	P07400244	GEAR 22T
245	P07400245	GEAR 22T
246	P07400246	GEAR 22T
247	P07400247	GEAR 33T
248	P07400248	GEAR 22T
249	PR18M	EXT RETAINING RING 17MM
250	P07400250	COMBO GEAR 20T/36T
251	P07400251	THRUST WASHER
252	P07400252	INBOARD FLANGE BEARING SEAT
253	P07400253	OIL SEAL 20 X 32 X 5
254	P07400254	INBOARD SPLINED SHAFT (G1)
255	P07400255	INBOARD FLANGE BEARING SEAT
256	P07400256	OIL SEAL 24 X 35 X 8
257	P07400257	INBOARD SHAFT (G2)
258	PK15M	KEY 5 X 5 X 35
259	P6001ZZ	BALL BEARING 6001ZZ
260	PR03M	EXT RETAINING RING 12MM
261	P07400261	INBOARD FLANGE BEARING SEAT
324	PCAP26M	CAP SCREW M6-1 X 12



Gearbox Controls



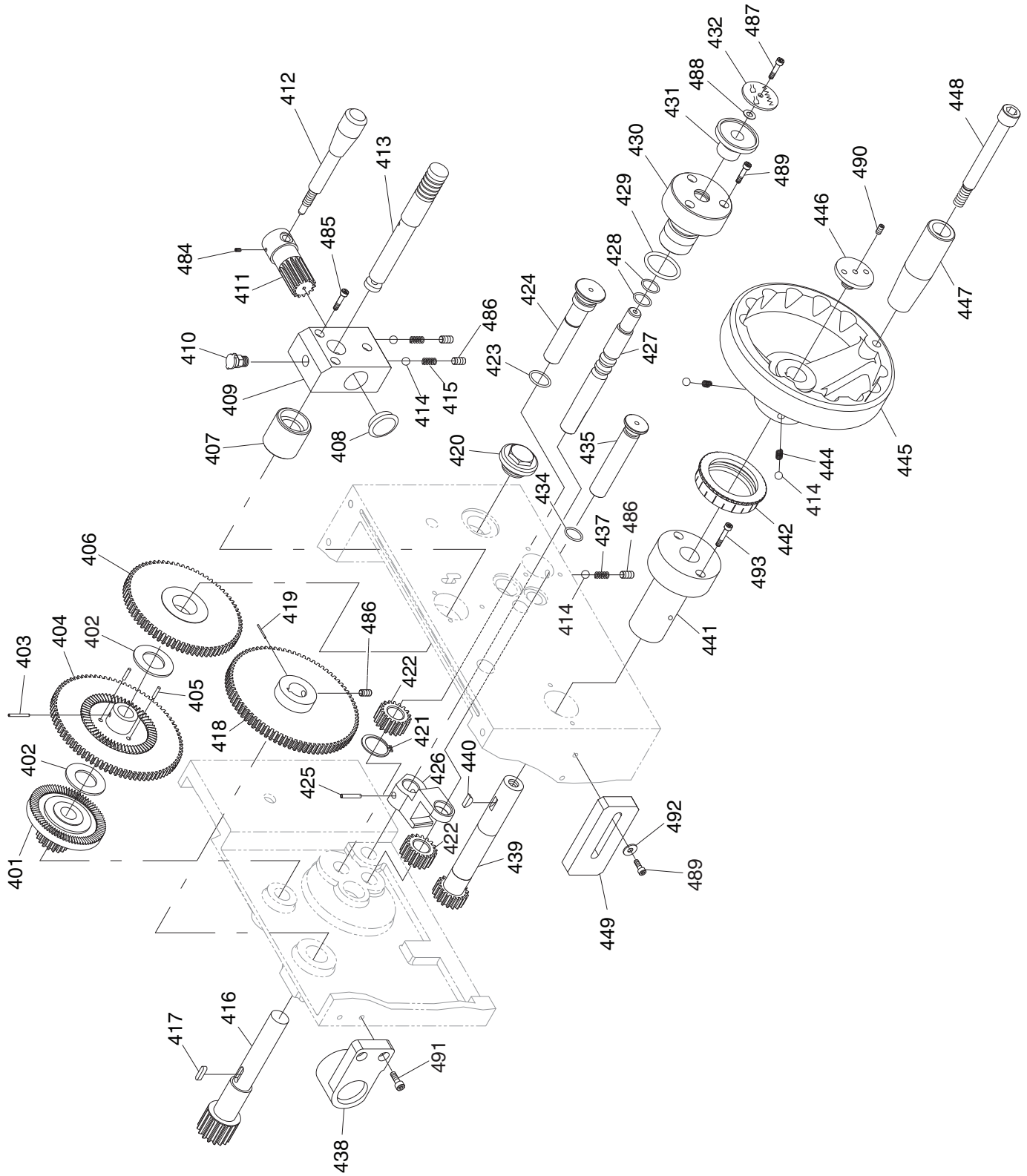
Gearbox Controls Parts List

REF	PART #	DESCRIPTION
262	P07400262	GEARBOX COVER GASKET
263	P07400263	PARTITION SCREW
264	P07400264	END PLATE
265	P07400265	UPPER FORK SUPPORT
266	P07400266	COMPRESSION SPRING 4 X 19MM
267	PSTB001	STEEL BALL 1/4
268	P07400268	FORK SUPPORT PARTITION
269	P07400269	UPPER MIDDLE FORK SUPPORT
270	P07400270	LOWER MIDDLE FORK SUPPORT
271	P07400271	LOWER FORK SUPPORT
272	P07400272	REVERSE STOP
273	P07400273	BRACKET SPACER
274	P07400274	LEFT SHOULDER PLATE
275	P07400275	LEFT SHOULDER PLATE BRACKET
276	P07400276	REVERSE STOP BRACKET
277	P07400277	LOWER SHIFT FORK
278	P07400278	MIDDLE SHIFT FORK
279	P07400279	LEFT UPPER SHIFT FORK
280	P07400280	RIGHT UPPER SHIFT FORK
281	PRP02M	ROLL PIN 3 X 16
282	P07400282	PIVOT ARM SHAFT
283	P07400283	OUTER RIGHT SHIFT PIVOT ARM
284	P07400284	SHIFT CAM
285	P07400285	RIGHT SHIFT BRACKET
286	PEC015M	E-CLIP 8MM
287	P07400287	SHAFT WASHER
288	PR18M	EXT RETAINING RING 17MM
289	P07400289	WOODRUFF KEY 4 X 13
290	P07400290	RIGHT SHIFT SHAFT
291	P07400291	RIGHT SHIFT PAD
292	P07400292	DOWEL PIN
293	P07400293	RIGHT SHIFT FORK
294	PSTB001	STEEL BALL 1/4
295	P07400295	COMPRESSION SPRING 4 X 19MM
296	P07400296	MIDDLE SHIFT PAD
297	P07400297	MIDDLE SHIFT PIVOT ARM
298	P07400298	COMPRESSION SPRING 6 X 13MM
299	PSTB001	STEEL BALL 1/4
300	P07400300	SHIFT SHAFT SUPPORT BRACKET
301	P07400301	WOODRUFF KEY 4 X 13

REF	PART #	DESCRIPTION
302	P07400302	LEFT SHIFT SHAFT
303	PORP018	O-RING 17.8 X 2.4 P18
304	P07400304	SHIFT SHAFT BUSHING
305	P07400305	LEFT SHIFT FORK
306	PRP24M	ROLL PIN 5 X 16
307	P07400307	SQUARE HD OIL PLUG 1/2 PT
308	P07400308	PIPE ELBOW 1/2 X 1/2 PT
309	P07400309	PIPE NIPPLE 1/2 X 1 PT
310	P07400310	GEARBOX FRONT COVER
311	P07400311	SELECTOR SHAFT
312	PORG040	O-RING 39.4 X 3.1 G40
313	P07400313	SELECTOR LEVER SUPPORT
314	P07400314	COMPRESSION SPRING 9 X 38MM
315	P07400315	SELECTOR LEVER
316	PORG030	O-RING 3.1 X 29.4 G30
317	P07400317	SELECTOR LEVER END CAP
318	P07400318	SELECTOR PLATE
319	P07400319	SHIFT LEVER
320	P07400320	SHIFT LEVER WASHER
321	P07400321	SHIFT LEVER END CAP
322	P07400322	OIL SIGHT GLASS
323	P07400323	CONTROL PANEL PLATE
325	PCAP15M	CAP SCREW M5-.8 X 20
326	PLW03M	LOCK WASHER 6MM
327	PCAP26M	CAP SCREW M6-1 X 12
328	PCAP48M	CAP SCREW M6-1 X 35
329	PRP04M	ROLL PIN 4 X 24
330	PSS03M	SET SCREW M6-1 X 8
331	PCAP02M	CAP SCREW M6-1 X 20
332	PCAP167M	CAP SCREW M6-1 X 70
333	PCAP38M	CAP SCREW M5-.8 X 25
334	PCAP26M	CAP SCREW M6-1 X 12
335	PCAP33M	CAP SCREW M5-.8 X 12
336	PS17M	PHLP HD SCR M4-.7 X 6
337	PCAP66M	CAP SCREW M8-1.25 X 65
338	P07400338	TAPER PIN #7 X 3-1/4"
339	P07400339	INNER RIGHT SHIFT PIVOT ARM
340	P07400340	DOWEL PIN
341	PCAP190M	CAP SCREW M6-1 X 80



Apron Front View



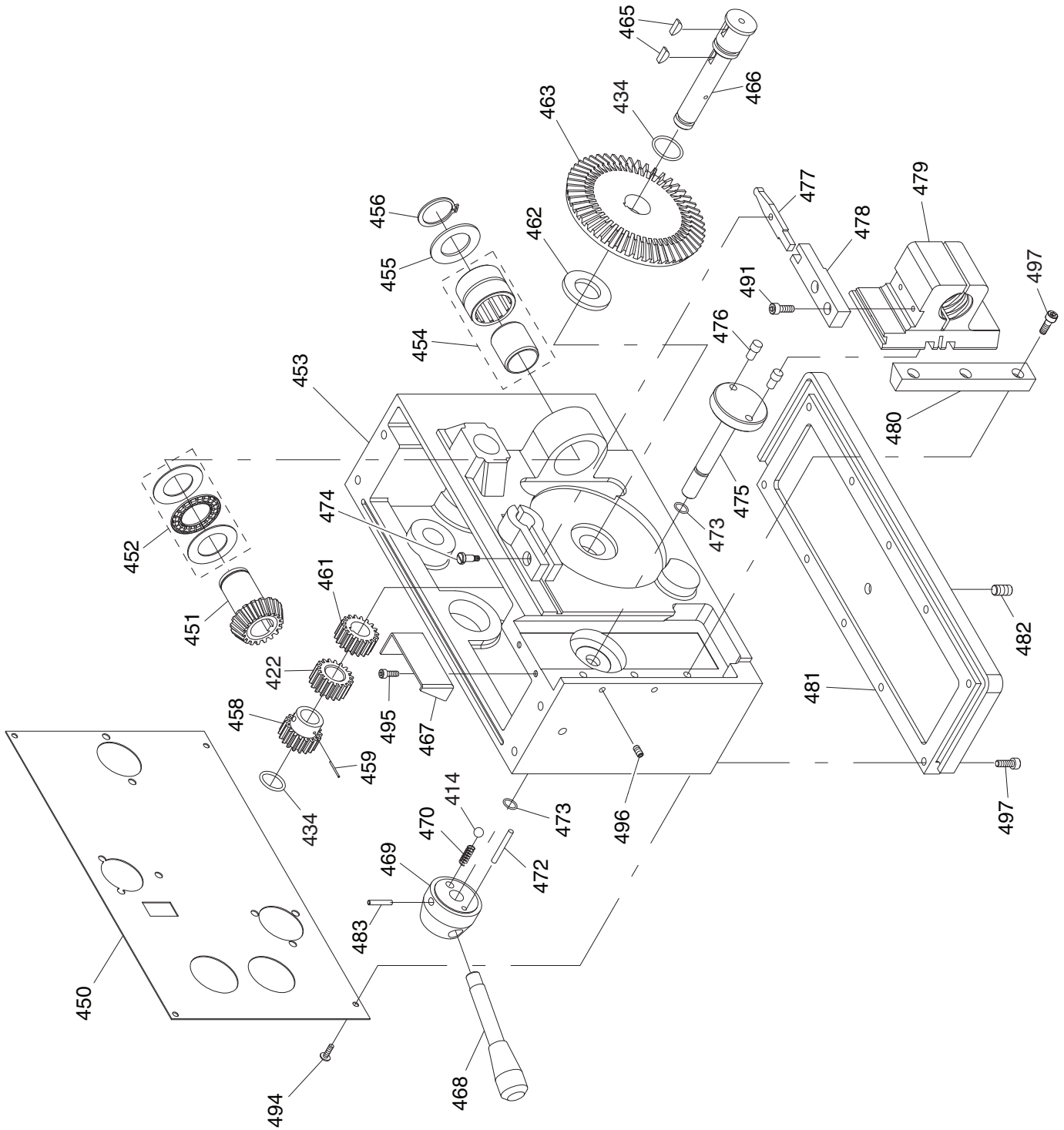
Apron Front View Parts List

REF	PART #	DESCRIPTION
401	P07400401	COMBO GEAR 18T/60T
402	P07400402	THRUST WASHER
403	PRP20M	ROLL PIN 4 X 22
404	P07400404	COMBO GEAR 81T/60T
405	P07400405	DOWEL PIN 4 X 17
406	P07400406	COMBO GEAR 72T/60T
407	P07400407	GEAR SPACER
408	P07400408	CASTING PLUG
409	P07400409	FEED SELECTOR BRACKET
410	P07400410	OIL FILL CAP
411	P07400411	FEED SELECTOR SPLINED SHAFT
412	P07400412	FEED SELECTOR LEVER
413	P07400413	FEED SELECTOR PINION SHAFT
414	PSTB001	STEEL BALL 1/4
415	P07400415	COMPRESSION SPRING 6 X 13MM
416	P07400416	GEAR SHAFT 16T
417	PK14M	KEY 5 X 5 X 18
418	P07400418	GEAR 81T
419	PRP10M	ROLL PIN 5 X 36
420	P07400420	OIL SIGHT GLASS
421	PR06M	EXT RETAINING RING 16MM
422	P07400422	GEAR 18T
423	PORP018	O-RING 17.8 X 2.4 P18
424	P07400424	RIGHT REVERSE FEED SHAFT
425	PRP04M	ROLL PIN 4 X 24
426	P07400426	REVERSE FEED PIVOT ARM
427	P07400427	REVERSE FEED CONTROL SHAFT
428	PORP016	O-RING 15.8 X 2.4 P16

REF	PART #	DESCRIPTION
429	PORP026	O-RING 25.7 X 3.5 P26
430	P07400430	REVERSE FEED SHAFT HOUSING
431	P07400431	REVERSE FEED KNOB
432	P07400432	REVERSE FEED DIRECTION PLATE
434	PORP012	O-RING 11.8 X 2.4 P12
435	P07400435	LEFT REVERSE FEED SHAFT
437	P07400437	COMPRESSION SPRING 4 X 19MM
438	P07400438	LEADSCREW STABILIZER
439	P07400439	CARRIAGE GEAR SHAFT 18T
440	P07400440	WOODRUFF KEY 5 X 19
441	P07400441	CARRIAGE GEAR SHAFT HOUSING
442	P07400442	CARRIAGE GRADUATED DIAL
444	P07400444	COMPRESSION SPRING
445	P07400445	CARRIAGE HANDWHEEL
446	P07400446	HANDWHEEL END CAP
447	P07400447	HANDWHEEL HANDLE
448	P07400448	HANDLE CAP SCREW
449	PW03M	BED STOP PLATE
484	PSS26M	SET SCREW M5-.8 X 6
485	PCAP79M	CAP SCREW M5-.8 X 35
486	PSS20M	SET SCREW M8-1.25 X 8
487	PS08M	PHLP HD SCR M5-.8 X 12
488	PW03M	FLAT WASHER 6MM
489	PCAP06M	CAP SCREW M6-1 X 25
490	PSS12M	SET SCREW M6-1 X 25
491	PCAP01M	CAP SCREW M6-1 X 16
492	PW03M	FLAT WASHER 6MM
493	PCAP38M	CAP SCREW M5-.8 X 25



Apron Rear View



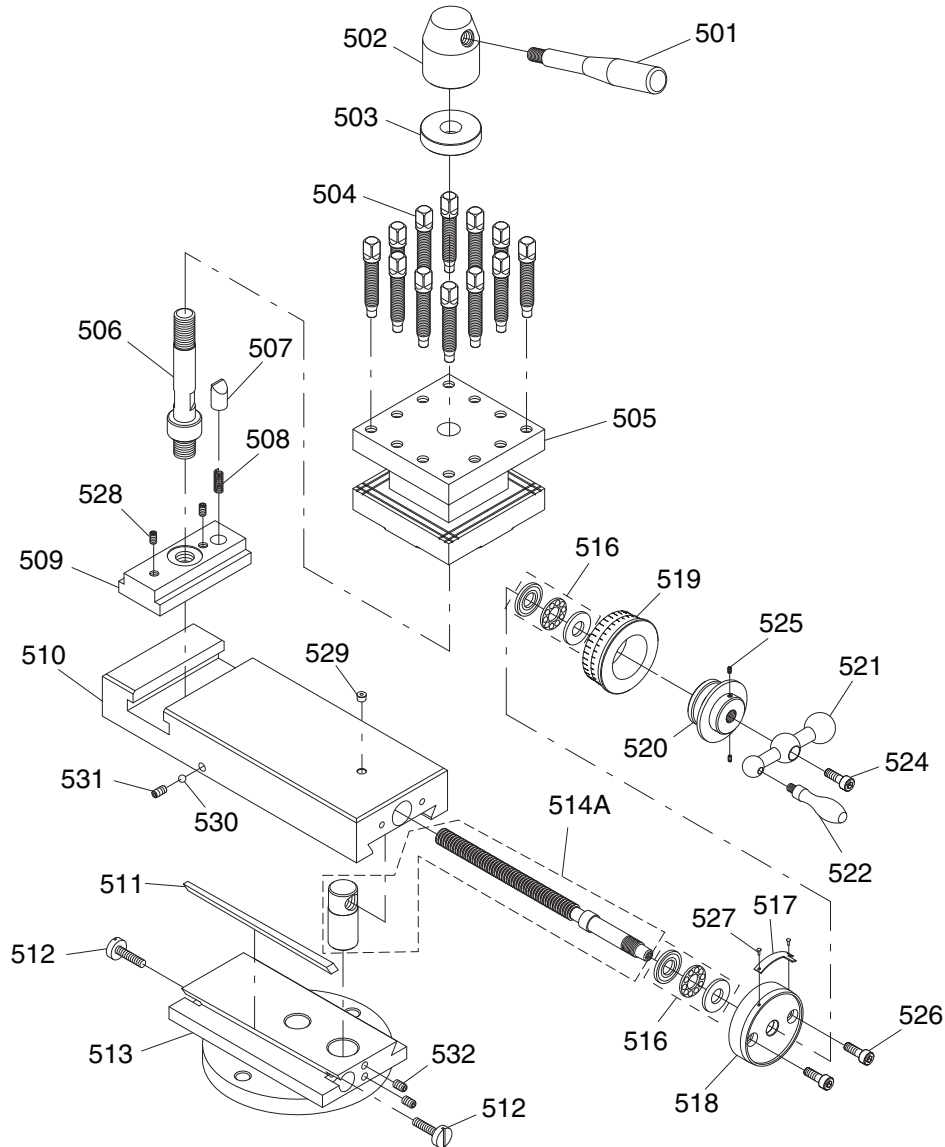
Apron Rear View Parts List

REF	PART #	DESCRIPTION
414	PSTB001	STEEL BALL 1/4
422	P07400422	GEAR 18T
434	PORP012	O-RING 11.8 X 2.4 P12
450	P07400450	FRONT APRON INFORMATION PANEL
451	P07400451	BEVEL GEAR 23T
452	P07400452	THRUST NEEDLE BEARING 2542-NTB/AS
453	P07400453	APRON CASTING
454	P07400454	CYLINDRICAL ROLLER BEARING 2930
455	P07400455	THRUST WASHER
456	PR11M	EXT RETAINING RING 25MM
458	P07400458	GEAR 18T
459	PRP88M	ROLL PIN 5 X 22
461	P07400461	GEAR 18T
462	P07400462	THRUST WASHER
463	P07400463	BEVEL GEAR 64T
465	P07400465	WOODRUFF KEY 4 X 13
466	P07400466	GEAR SHAFT
467	P07400467	OIL FENCE
468	P07400468	HALF-NUT LEVER

REF	PART #	DESCRIPTION
469	P07400469	LEVER HUB
470	P07400470	COMPRESSION SPRING 6 X 27MM
472	PRP04M	ROLL PIN 4 X 24
473	PORP020	O-RING 19.8 X 2.4 P20
474	P07400474	STEP SCREW
475	P07400475	HALF-NUT CAM SHAFT
476	P07400476	STEP PIN
477	P07400477	HALF-NUT PIVOT ARM
478	P07400478	PIVOT ARM BRACKET
479	P07400479	HALF-NUT
480	P07400480	HALF-NUT GIB
481	P07400481	APRON BOTTOM COVER
482	P07400482	OIL DRAIN PLUG 1/8 PT
483	PRP102M	ROLL PIN 4 X 36
491	PCAP01M	CAP SCREW M6-1 X 16
494	PS17M	PHLP HD SCR M4-.7 X 6
495	PCAP03M	CAP SCREW M5-.8 X 8
496	PSS02M	SET SCREW M6-1 X 6
497	PCAP24M	CAP SCREW M5-.8 X 16



Compound Rest & Tool Post

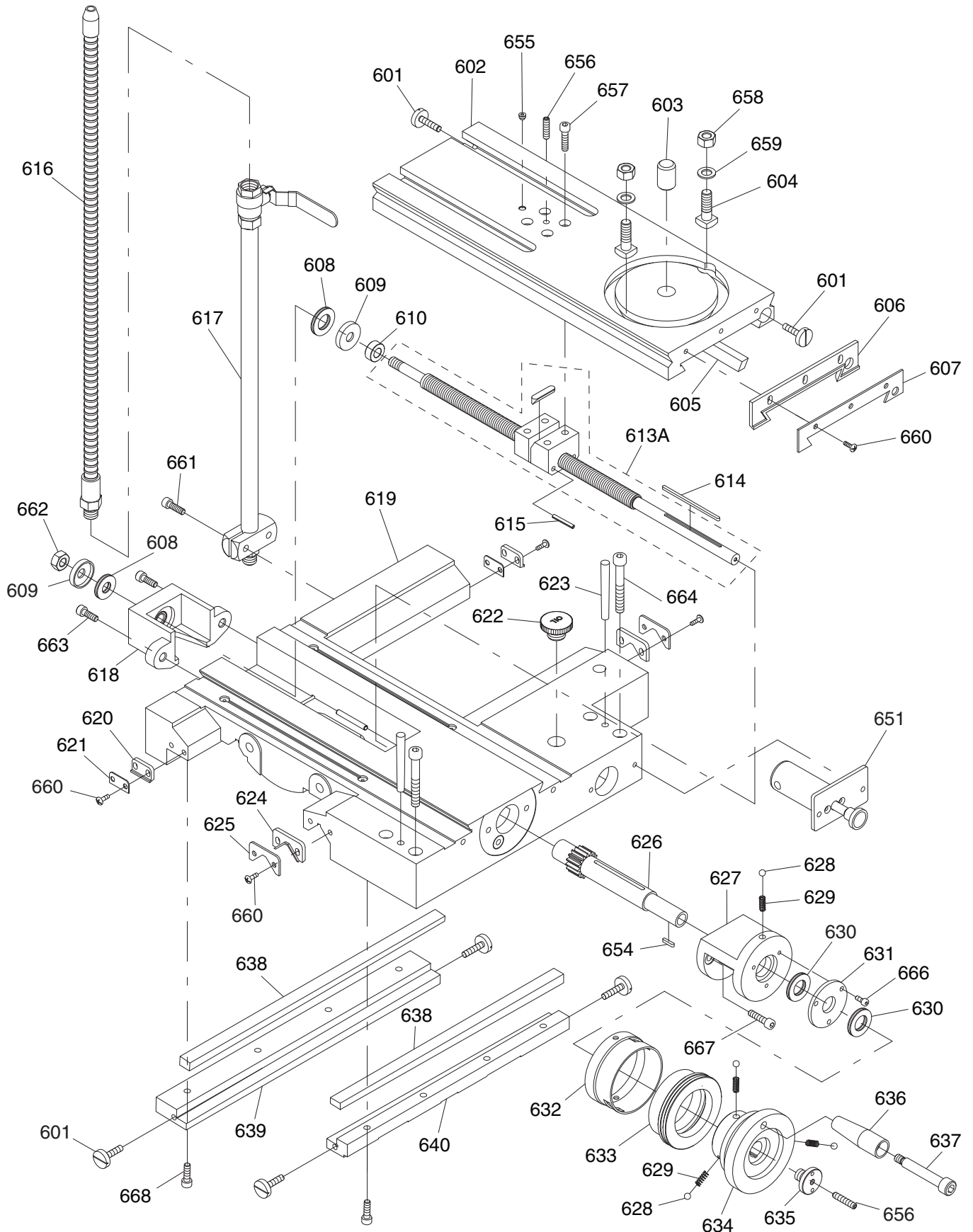


REF	PART #	DESCRIPTION
501	P07400501	POST LEVER
502	P07400502	POST LEVER HUB
503	P07400503	HUB THRUST WASHER
504	P07400504	TOOL POST BOLT
505	P07400505	POST BODY
506	P07400506	POST SHAFT
507	P07400507	TOOL POST PLUNGER
508	P07400508	COMPRESSION SPRING 6 X 27MM
509	P07400509	TOOL POST T-SLIDER
510	P07400510	COMPOUND SLIDE
511	P07400511	COMPOUND SLIDE GIB
512	P07400512	GIB ADJUSTMENT SCREW
513	P07400513	COMPOUND SLIDE PIVOT BASE
514A	P07400514A	COMPOUND SLIDE LEADSCREW W/NUT
516	P51101	THRUST BEARING 51101

REF	PART #	DESCRIPTION
517	P07400517	INDICATOR PLATE
518	P07400518	LEADSCREW BRACKET
519	P07400519	GRADUATED DIAL
520	P07400520	FLANGE BEARING SEAT
521	P07400521	BALL HANDLE
522	P07400522	HANDLE
524	PCAP04M	CAP SCREW M6-1 X 10
525	PSS03M	SET SCREW M6-1 X 8
526	PCAP02M	CAP SCREW M6-1 X 20
527	PRIV001M	STEEL FLUTED RIVET 2 X 5MM
528	PSS14M	SET SCREW M8-1.25 X 12
529	PLUBE001	TAP-IN BALL OILER 1/4
530	PSTB001	STEEL BALL 1/4
531	PSS16M	SET SCREW M8-1.25 X 10
532	PSS03M	SET SCREW M6-1 X 8



Saddle Top View



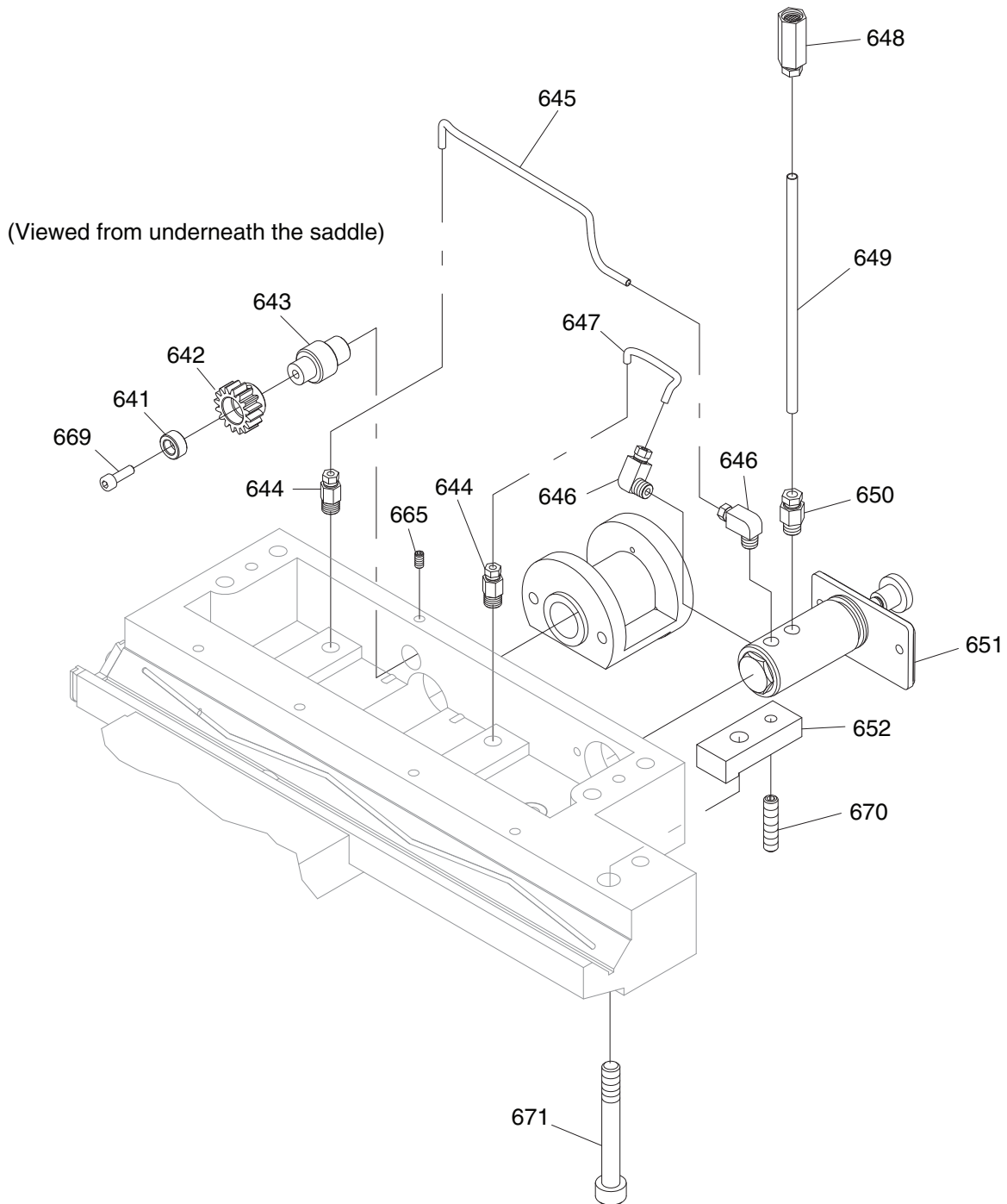
Saddle Top View Parts List

REF	PART #	DESCRIPTION
601	P07400601	GIB ADJUSTMENT SCREW
602	P07400602	CROSS SLIDE
603	P07400603	COMPOUND SLIDE PIVOT PIN 18 X 28
604	P07400604	COMPOUND SLIDE PIVOT T-BOLT
605	P07400605	CROSS SLIDE GIB
606	P07400606	CROSS SLIDE WAY WIPER
607	P07400607	CROSS SLIDE WAY WIPER PLATE
608	P07400608	THRUST BEARING 1226-NTB/AS2
609	P07400609	BEARING SEAT
610	P07400610	LEADSCREW BUSHING
613A	P07400613A	CROSS SLIDE LEADSCREW W/NUT
614	PK168M	KEY 3 X 3 X 80
615	PRP28M	ROLL PIN 5 X 40
616	P07400616	COOLANT NOZZLE 3/8 NPT X 24"
617	P07400617	COOLANT STAND PIPE ASSY 3/8 NPT
618	P07400618	CROSS SLIDE END BRACKET
619	P07400619	SADDLE CASTING
620	P07400620	SADDLE STRAIGHT WAY WIPER
621	P07400621	SADDLE STRAIGHT WAY WIPER PLATE
622	P07400622	OIL FILL CAP 3/4-16
623	P07400623	TAPER PIN #6 X 2-1/2"
624	P07400624	SADDLE V-WAY WIPER
625	P07400625	SADDLE V-WAY WIPER PLATE
626	P07400626	CROSS SLIDE GEAR SHAFT 22T
627	P07400627	GEAR SHAFT BRACKET
628	PSTB001	STEEL BALL 1/4
629	P07400629	COMPRESSION SPRING 6 X 15MM

REF	PART #	DESCRIPTION
630	P07400630	THRUST BEARING 1730-NTB/AS2
631	P07400631	PINION SHAFT END CAP
632	P07400632	GRADUATED DIAL HOUSING
633	P07400633	GRADUATED DIAL
634	P07400634	HANDWHEEL
635	P07400635	HANDWHEEL END CAP
636	P07400636	HANDWHEEL HANDLE
637	P07400637	HANDLE SCREW
638	P07400638	SADDLE GIB
639	P07400639	FRONT SADDLE GIB SUPPORT
640	P07400640	REAR SADDLE GIB SUPPORT
651	P07400651	ONE-SHOT OILER ASSEMBLY
654	PK52M	KEY 3 X 3 X 15
655	PLUBE001	TAP-IN BALL OILER 1/4 STRAIGHT
656	PSS28M	SET SCREW M6-1 X 30
657	PCAP07M	CAP SCREW M6-1 X 30
658	PN02M	HEX NUT M10-1.5
659	PW04M	FLAT WASHER 10MM
660	PS08M	PHLP HD SCR M5-.8 X 12
661	PCAP06M	CAP SCREW M6-1 X 25
662	PN02M	HEX NUT M10-1.5
663	PCAP02M	CAP SCREW M6-1 X 20
664	PCAP35M	CAP SCREW M8-1.25 X 60
666	PCAP17M	CAP SCREW M4-.7 X 10
667	PCAP02M	CAP SCREW M6-1 X 20
668	PCAP02M	CAP SCREW M6-1 X 20



Saddle Bottom View

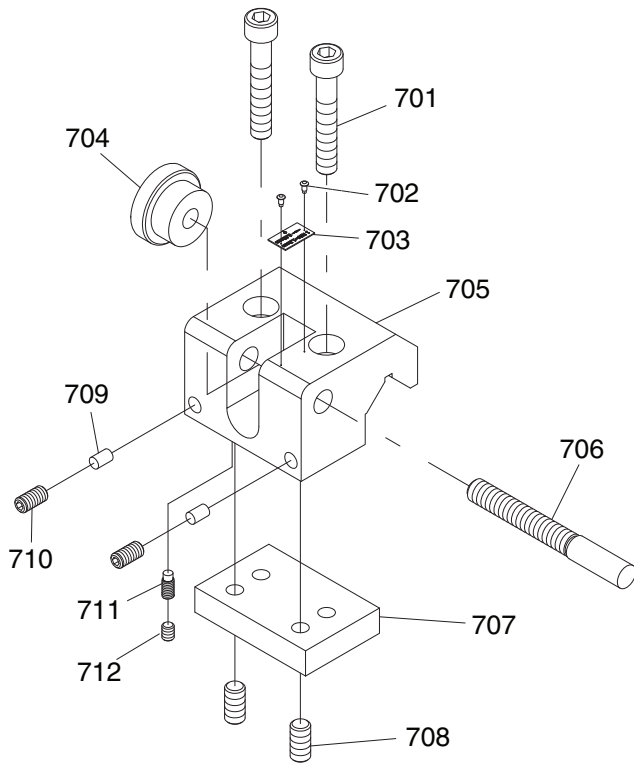


REF	PART #	DESCRIPTION
641	P07400641	GEAR BUSHING
642	P07400642	GEAR 16T
643	P07400643	GEAR SHAFT
644	P07400644	STRAIGHT PIPE ADAPTER 1/8 NPT X 4MM
645	P07400645	ALUMINUM OIL PIPE 4 X 260MM
646	P07400646	ELBOW PIPE ADAPTER 1/8 NPT X 4MM
647	P07400647	ALUMINUM OIL PIPE 4 X 120MM
648	P07400648	OIL FILTER 6MM

REF	PART #	DESCRIPTION
649	P07400649	ALUMINUM OIL PIPE 6 X 160MM
650	P07400650	STRAIGHT PIPE ADAPTER 1/8 NPT X 6MM
651	P07400651	ONE-SHOT OILER ASSEMBLY
652	P07400652	SADDLE STOP BLOCK
665	PSS03M	SET SCREW M6-1 X 8
669	PCAP24M	CAP SCREW M5-.8 X 16
670	PSS74M	SET SCREW M8-1.25 X 35
671	PCAP169M	CAP SCREW M12-1.75 X 75

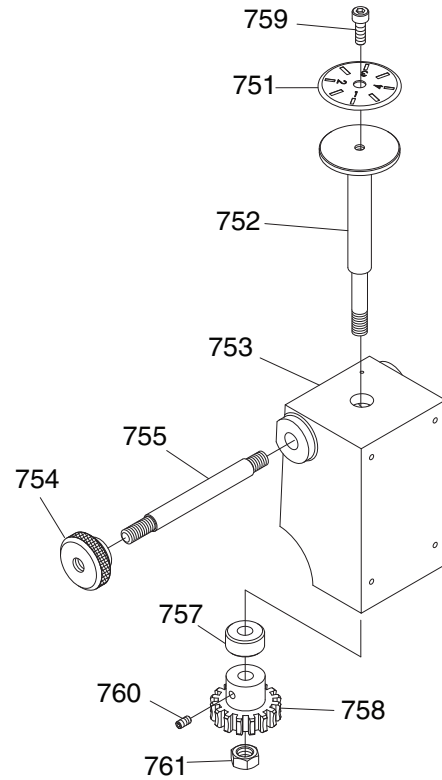


Bed Stop



REF	PART #	DESCRIPTION
701	PCAP71M	CAP SCREW M10-1.5 X 60
702	PRIV001M	STEEL FLUTED RIVET 2 X 5MM
703	P07400703	INDICATOR PLATE
704	P07400704	MICROMETER DIAL
705	P07400705	BED STOP CASTING
706	P07400706	BED STOP ROD
707	P07400707	CLAMP PLATE
708	PSS10M	SET SCREW M10-1.5 X 20
709	P07400709	COPPER PLUNGER
710	PSS06M	SET SCREW M8-1.25 X 16
711	P07400711	SET SCREW M8-1.25 X 12 DOG POINT
712	PSS14M	SET SCREW M8-1.25 X 12

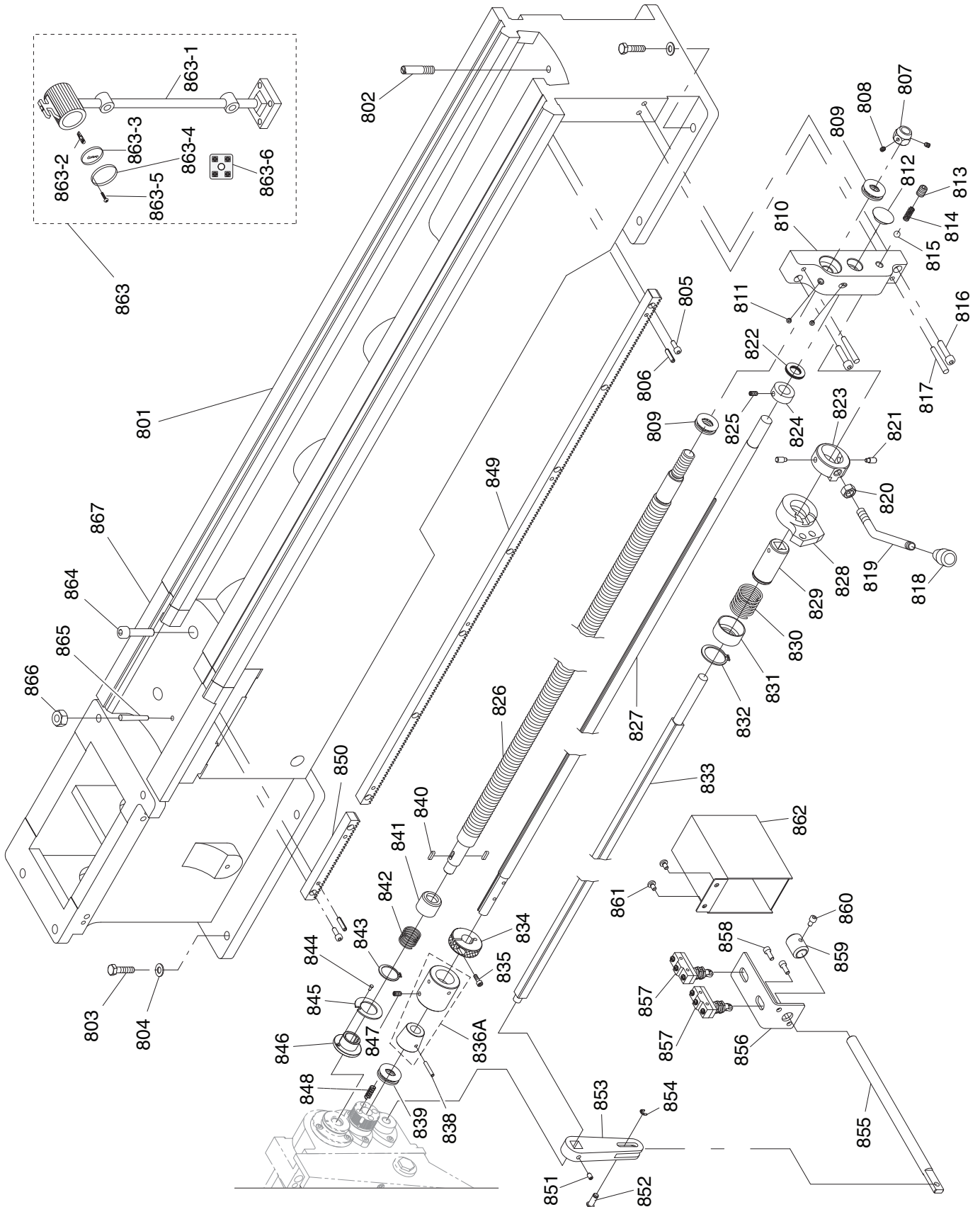
Dial Indicator



REF	PART #	DESCRIPTION
751	P07400751	DIAL PLATE
752	P07400752	PIVOT BOLT
753	P07400753	DIAL INDICATOR CASTING
754	P07400754	KNURLED KNOB
755	P07400755	STUD-UDE M8-1.25 X 110 20/30
757	P07400757	GEAR SPACER
758	P07400758	DIAL GEAR 16T
759	PCAP04M	CAP SCREW M6-1 X 10
760	PSS02M	SET SCREW M6-1 X 6
761	PN03M	HEX NUT M8-1.25



Bed & Shafts



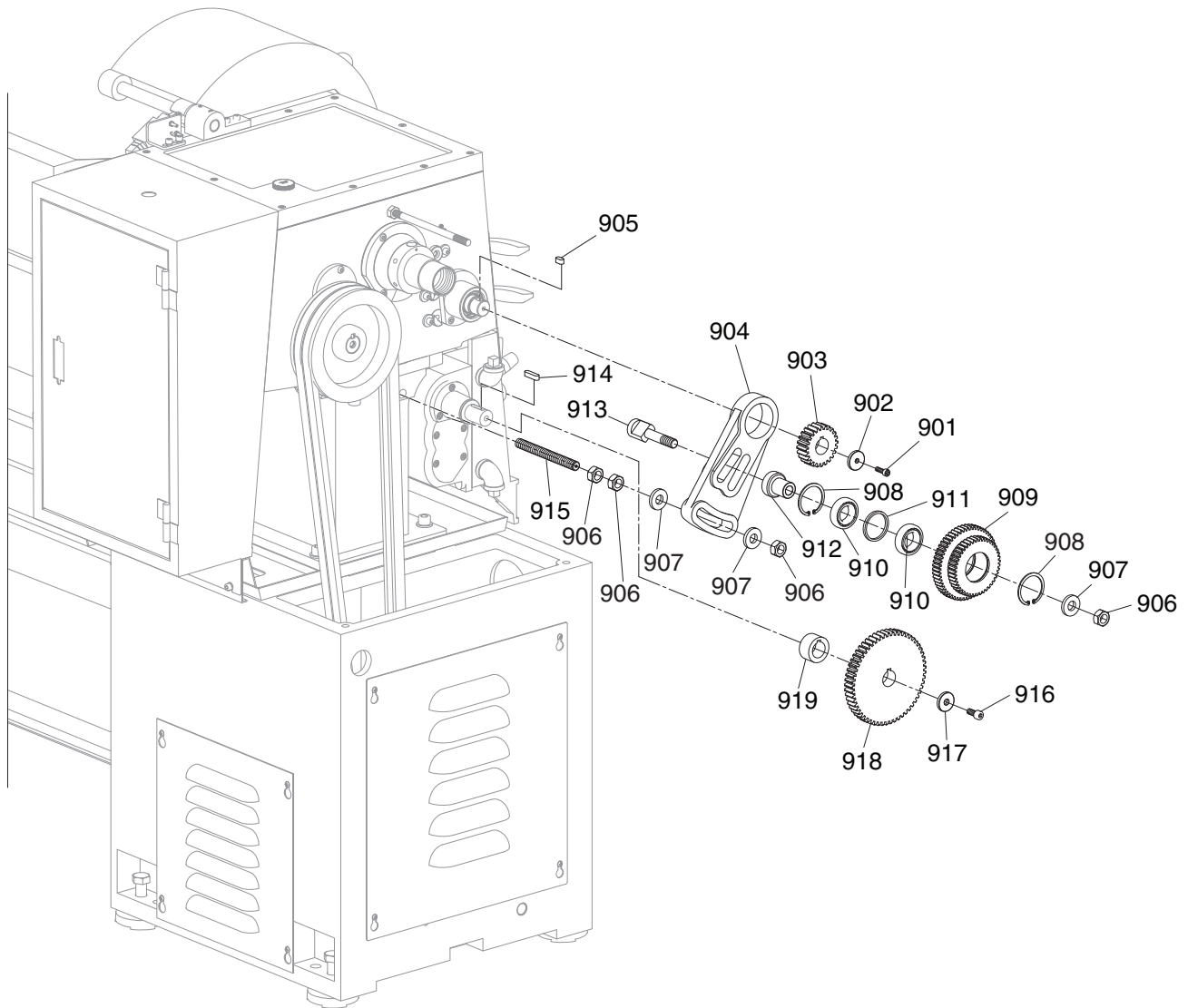
Bed & Shafts Parts List

REF	PART #	DESCRIPTION
801	P07400801	BED
802	P07400802	BED STOP STUD
803	PB24M	HEX BOLT M12-1.75 X 45
804	PW06M	FLAT WASHER 12MM
805	PCAP02M	CAP SCREW M6-1 X 20
806	PRP93M	ROLL PIN 6 X 25
807	P07400807	LEADSCREW LOCK NUT
808	PSS03M	SET SCREW M6-1 X 8
809	P51203	THRUST BEARING 51203
810	P07400810	SHAFT END BRACKET
811	PLUBE001	TAP-IN BALL OILER 1/4 STRAIGHT
812	P07400812	FEED ROD END CAP
813	PSS15M	SET SCREW M12-1.75 X 12
814	P07400814	COMPRESSION SPRING
815	PSTB003	STEEL BALL 3/8
816	PCAP40M	CAP SCREW M8-1.25 X 35
817	P07400817	TAPER PIN #6 X 2"
818	P07400818	SPINDLE ON/OFF LEVER KNOB
819	P07400819	SPINDLE ON/OFF LEVER
820	PN09M	HEX NUT M12-1.75
821	P07400821	STEP PIN
822	P07400822	THRUST BEARING 1831-NTB/AS2
823	P07400823	SPINDLE ON/OFF LEVER HUB
824	P07400824	LOCK COLLAR
825	PSS03M	SET SCREW M6-1 X 8
826	P07400826	LONGITUDINAL LEADSCREW 4 TPI
827	P07400827	FEED ROD
828	P07400828	SPLINDLE LEVER SELECTOR BRACKET
829	P07400829	SPINDLE ROD SLEEVE
830	P07400830	SPINDLE ROD COMPRESSION SPRING
831	P07400831	SPINDLE ROD SPRING HOUSING
832	PR37M	EXT RETAINING RING 32MM
833	P07400833	SPINDLE ROD
834	P07400834	FEED ROD STOP COLLAR
835	PCAP02M	CAP SCREW M6-1 X 20
836A	P07400836A	FEED ROD CLUTCH COLLAR ASSY

REF	PART #	DESCRIPTION
838	P07400838	TAPER PIN #4 X 1-1/4"
839	P51203	THRUST BEARING 51203
840	PK20M	KEY 5 X 5 X 15
841	P07400841	LEADSCREW SPRING HOUSING
842	P07400842	LEADSCREW SPRING
843	PR37M	EXT RETAINING RING 32MM
844	P07400844	LEADSCREW SHEAR PIN
845	P07400845	SHEAR PIN SHROUD
846	P07400846	LEADSCREW FLANGE WASHER
847	PSS02M	SET SCREW M6-1 X 6
848	P07400848	COMPRESSION SPRING 8 X 32
849	P07400849	BED RACK
850	P07400850	GAP RACK
851	PSS14M	SET SCREW M8-1.25 X 12
852	P07400852	CAPTIVE PIN
853	P07400853	SPINDLE SWITCH PIVOT ARM
854	PEC09M	E-CLIP 6MM
855	P07400855	SPINDLE SWITCH LINKAGE ROD
856	P07400856	SPINDLE SWITCH BRACKET
857	P07400857	SPINDLE SWITCH
858	PCAP01M	CAP SCREW M6-1 X 16
859	P07400859	LOCK COLLAR
860	PCAP04M	CAP SCREW M6-1 X 10
861	PS68M	PHLP HD SCR M6-1 X 10
862	P07400862	SPINDLE SWITCH COVER BOX
863	P07400863	HALOGEN LAMP ASSEMBLY
863-1	P07400863-1	LAMP BODY
863-2	PBULB3	HALOGEN BULB 24V
863-3	P07400863-3	LENS
863-4	P07400863-4	LENS RETAINER
863-5	PS55M	PHLP HD SCR M3-.5 X 10
863-6	P07400863-6	LAMP TERMINAL BLOCK 2P
864	PCAP64M	CAP SCREW M10-1.5 X 25
865	P07400865	GAP INSERT THREADED TAPER PIN
866	PN03M	HEX NUT M8-1.25
867	P07400867	GAP INSERT



End Gears

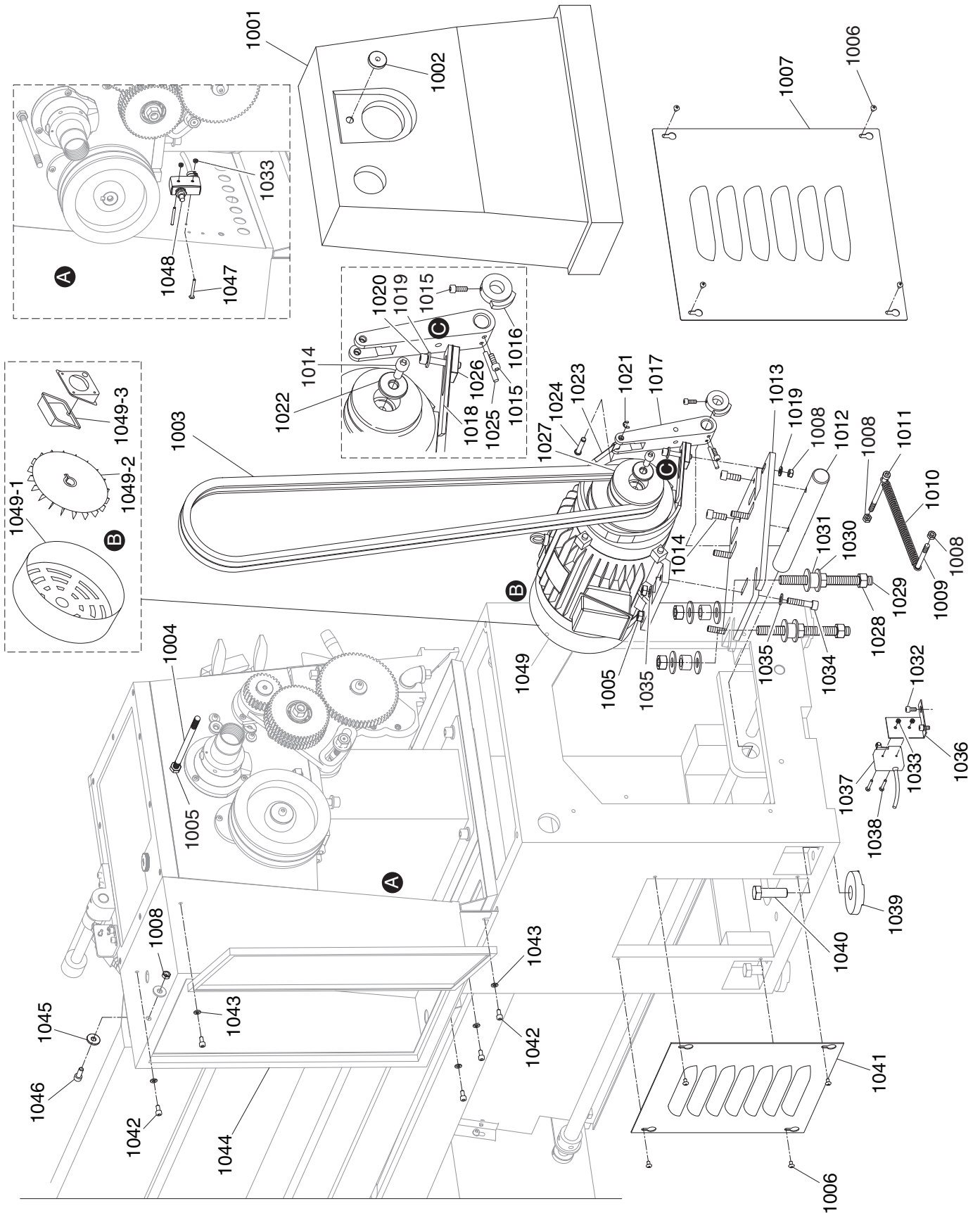


REF	PART #	DESCRIPTION
901	PCAP02M	CAP SCREW M6-1 X 20
902	P07400902	GEAR FLAT WASHER
903	P07400903	GEAR 24T
904	P07400904	PIVOT ARM
905	PK166M	KEY 7 X 7 X 15
906	PN32M	HEX NUT M14-2
907	P07400907	GEAR FLAT WASHER
908	PR25M	INT RETAINING RING 47MM
909	P07400909	COMBO GEAR 44T/56T
910	P6005ZZ	BALL BEARING 6005ZZ

REF	PART #	DESCRIPTION
911	P07400911	THRUST WASHER
912	P07400912	SHAFT SLEEVE
913	P07400913	T-HEAD SHAFT
914	PK28M	KEY 7 X 7 X 30
915	P07400915	STUD-FT M14-2 110/110
916	PCAP14M	CAP SCREW M8-1.25 X 20
917	P07400917	GEAR FLAT WASHER
918	P07400918	GEAR 57T
919	P07400919	GEAR SPACER



Main Motor



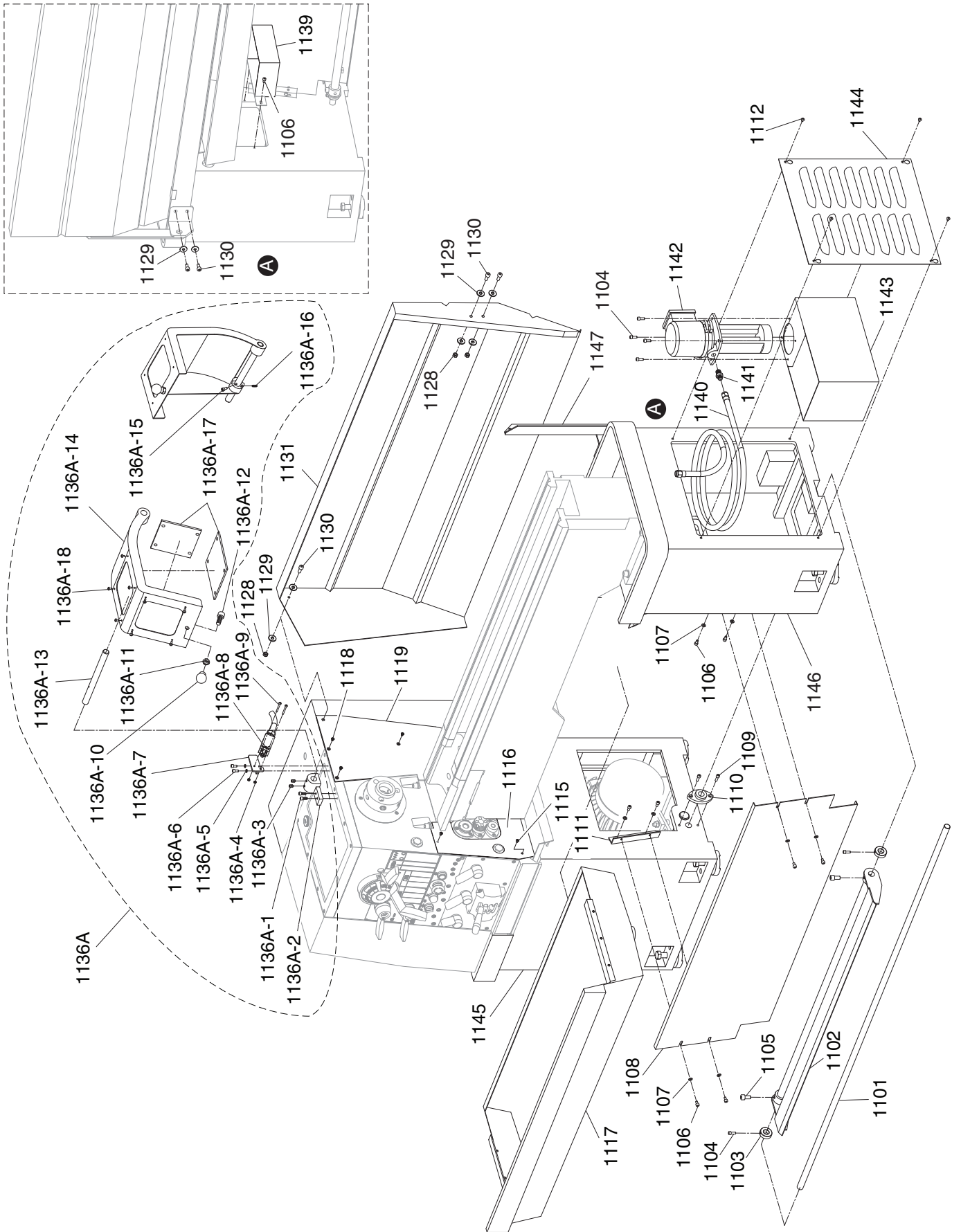
Main Motor Parts List

REF	PART #	DESCRIPTION
1001	P07401001	HEADSTOCK LEFT COVER
1002	P07401002	KNURLED KNOB
1003	PVB76	V-BELT B76
1004	P07401004	STUD-DE M10-1.5 X 135 30
1005	PN02M	HEX NUT M10-1.5
1006	PS68M	PHLP HD SCR M6-1 X 10
1007	P07401007	LEFT CABINET SIDE ACCESS PANEL
1008	PN03M	HEX NUT M8-1.25
1009	P07401009	STUD-SE M8-1.25 X 50 20
1010	P07401010	BRAKE PEDAL TENSION SPRING
1011	PCAP191M	CAP SCREW M8-1.25 X 120
1012	P07401012	MOTOR MOUNT PIVOT ROD
1013	P07401013	MOTOR MOUNT PLATE
1014	PCAP64M	CAP SCREW M10-1.5 X 25
1015	PCAP01M	CAP SCREW M6-1 X 16
1016	P07401016	BRAKE LINKAGE CAM COLLAR
1017	P07401017	BRAKE BELT PIVOT ARM
1018	P07401018	BRAKE BELT TOP CLAMP PLATE
1019	PW01M	FLAT WASHER 8MM
1020	PCAP45M	CAP SCREW M8-1.25 X 45
1021	PEC015M	E-CLIP 8MM
1022	P07401022	MOTOR PULLEY FLAT WASHER
1023	P07401023	BRAKE BELT
1024	P07401024	BRAKE BELT PIVOT ARM CAPTIVE PIN
1025	P07401025	TAPER PIN #4 X 1-3/4"
1026	P07401026	BRAKE BELT BOTTOM CLAMP PLATE

REF	PART #	DESCRIPTION
1027	P07401027	MOTOR PULLEY
1028	PN13M	HEX NUT M16-2
1029	P07401029	STUD-FT M16-2 X 170 170
1030	P07401030	MOTOR MOUNT STUD WASHER
1031	P07401031	RUBBER CUSHION RING
1032	PCAP26M	CAP SCREW M6-1 X 12
1033	PN04M	HEX NUT M4-.7
1034	PCAP70M	CAP SCREW M10-1.5 X 45
1035	PW04M	FLAT WASHER 10MM
1036	P07401036	BRAKE SWITCH BRACKET
1037	P07401037	BRAKE SWITCH
1038	PS51M	PHLP HD SCR M4-.7 X 30
1039	P07401039	CAST IRON FOOT PAD
1040	PB51M	HEX BOLT M16-2 X 50
1041	P07401041	RIGHT CABINET REAR ACCESS PANEL
1042	PCAP04M	CAP SCREW M6-1 X 10
1043	PW03M	FLAT WASHER 6MM
1044	P07401044	ELECTRICAL CABINET W/DOOR LATCH
1045	PW01M	FLAT WASHER 8MM
1046	PCAP14M	CAP SCREW M8-1.25 X 20
1047	PS65M	PHLP HD SCR M4-.7 X 40
1048	P07401048	HEADSTOCK LEFT COVER LIMIT SWITCH
1049	P07401049	MOTOR 5HP/2.5HP 220V 3-PH
1049-1	P07401049-1	MOTOR FAN COVER
1049-2	P07401049-2	MOTOR FAN
1049-3	P07401049-3	MOTOR JUNCTION BOX



Cabinets & Panels



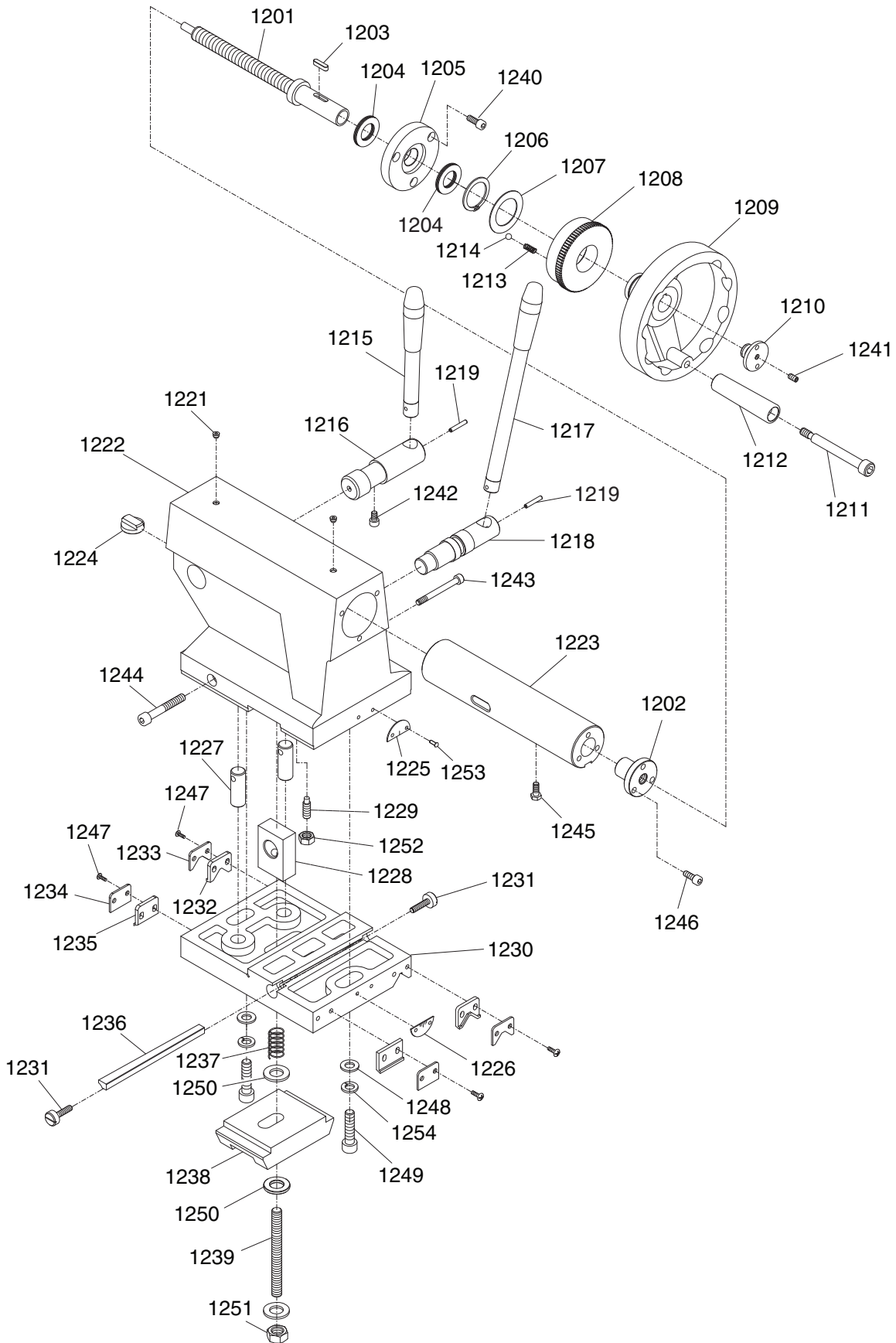
Cabinets & Panels Parts List

REF	PART #	DESCRIPTION
1101	P07401101	BRAKE PEDAL SHAFT
1102	P07401102	BRAKE PEDAL
1103	P07401103	LOCK COLLAR
1104	PCAP01M	CAP SCREW M6-1 X 16
1105	PCAP56M	CAP SCREW M3-.5 X 10
1106	PCAP04M	CAP SCREW M6-1 X 10
1107	PW03M	FLAT WASHER 6MM
1108	P07401108	CENTER PANEL
1109	PCAP02M	CAP SCREW M6-1 X 20
1110	P07401110	FLANGE BEARING
1111	P07401111	CENTER PANEL BRACKET
1112	PS68M	PHLP HD SCR M6-1 X 10
1115	PS05M	PHLP HD SCR M5-.8 X 8
1116	P07401116	SHAFT CLUTCH COVER
1117	P07401117	CHIP DRAWER
1118	PFH30M	FLAT HD SCR M5-.8 X 8
1119	P07401119	ACCESS PANEL
1128	PN03M	HEX NUT M8-1.25
1129	PW01M	FLAT WASHER 8MM
1130	PCAP14M	CAP SCREW M8-1.25 X 20
1131	P07401131	SPLASH GUARD
1136A	P07401136A	CHUCK GUARD ASSEMBLY
1136A-1	PB56M	CAP SCREW M10-1.5 X 20
1136A-2	P07401136A-2	CHIP GUARD PIVOT BRACKET
1136A-3	PSS14M	SET SCREW M8-1.25 X 12

REF	PART #	DESCRIPTION
1136A-4	PN04M	HEX NUT M4-.7
1136A-5	PLW03M	LOCK WASHER 6MM
1136A-6	PCAP26M	CAP SCREW M6-1 X 12
1136A-7	P07401136A-7	LIMIT SWITCH BRACKET
1136A-8	P07401136A-8	LIMIT SWITCH TEND TZ-9212
1136A-9	PS65M	PHLP HD SCR M4-.7 X 40
1136A-10	P07401136A-10	ROUND KNOB M12-1.75
1136A-11	PN09M	HEX NUT M12-1.75
1136A-12	PCAP129M	CAP SCREW M12-1.75 X 20
1136A-13	P07401136A-13	CHUCK GUARD PIVOT ROD
1136A-14	P07401136A-14	CHUCK GUARD FRAME
1136A-15	PCAP26M	CAP SCREW M6-1 X 12
1136A-16	PSS34M	SET SCREW M5-.8 X 16
1136A-17	P07401136A-17	CHUCK GUARD PLEXIGLASS WINDOW
1136A-18	PBHS09M	BUTTON HD CAP SCR M6-1 X 12
1139	P07401139	COOLANT CHUTE
1140	P07401140	COOLANT HOSE 3/8 NPT X 72"
1141	P07401141	PIPE NIPPLE 3/8 NPT X 3/8 PH
1142	P07401142	COOLANT PUMP 1/8HP 220V 3-PH
1143	P07401143	COOLANT RESERVOIR
1144	P07401144	COOLANT ACCESS PANEL
1145	P07401145	LEFT CABINET
1146	P07401146	RIGHT CABINET
1147	P07401147	SPLASH GUARD SUPPORT



Tailstock



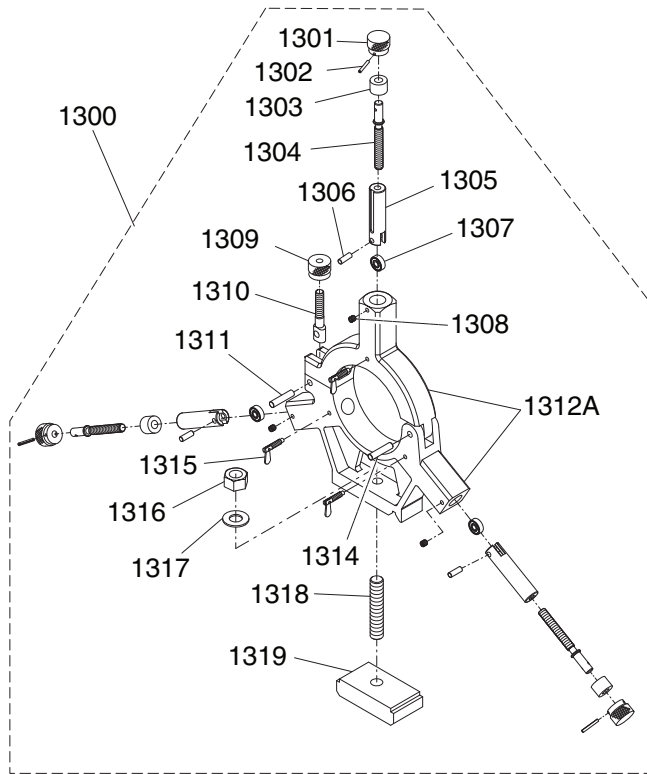
Tailstock Parts List

REF	PART #	DESCRIPTION
1201	P07401201	TAILSTOCK LEADSCREW
1202	P07401202	TAILSTOCK LEADSCREW NUT
1203	PK34M	KEY 5 X 5 X 20
1204	P07401204	THRUST BEARING 2035-NTB/AS2
1205	P07401205	BEARING FLANGE SEAT
1206	PR37M	EXT RETAINING RING 32MM
1207	P07401207	THRUST WASHER
1208	P07401208	GRADUATED DIAL
1209	P07401209	QUILL HANDWHEEL
1210	P07401210	HANDWHEEL END CAP
1211	P07401211	HANDLE BOLT
1212	P07401212	HANDWHEEL HANDLE
1213	P07401213	COMPRESSION SPRING 6.2 X 16MM
1214	PSTB001	STEEL BALL 1/4
1215	P07401215	QUILL LOCK LEVER
1216	P07401216	QUILL LOCK LEVER CAM SHAFT
1217	P07401217	TAILSTOCK LOCK LEVER
1218	P07401218	TAILSTOCK LOCK LEVER CAM SHAFT
1219	PRP04M	ROLL PIN 4 X 24
1221	PLUBE001	TAP-IN BALL OILER 1/4 STRAIGHT
1222	P07401222	TAILSTOCK CASTING
1223	P07401223	QUILL
1224	P07401224	QUILL ALIGNMENT KEY
1225	P07401225	UPPER OFFSET PLATE
1226	P07401226	LOWER OFFSET PLATE
1227	P07401227	ALIGNMENT PIN
1228	P07401228	PIVOT BLOCK

REF	PART #	DESCRIPTION
1229	P07401229	SET SCREW M8-1.25 X 25 DOG POINT
1230	P07401230	TAILSTOCK BASE
1231	P07401231	GIB ALIGNMENT SCREW M6-1 X 16
1232	P07401232	V-WAY WIPER
1233	P07401233	V-WAY WIPER PLATE
1234	P07401234	STRAIGHT WAY WIPER PLATE
1235	P07401235	STRAIGHT WAY WIPER
1236	P07401236	TAILSTOCK GIB
1237	P07401237	COMPRESSION SPRING 25 X 45
1238	P07401238	CLAMP PLATE
1239	P07401239	TAILSTOCK STUD-FT M14-2 X 110
1240	PCAP01M	CAP SCREW M6-1 X 16
1241	PSS04M	SET SCREW M6-1 X 12
1242	PCAP26M	CAP SCREW M6-1 X 12
1243	PCAP128M	CAP SCREW M8-1.25 X 70
1244	PCAP35M	CAP SCREW M8-1.25 X 60
1245	PB05M	HEX BOLT M6-1 X 8
1246	PCAP01M	CAP SCREW M6-1 X 16
1247	PS08M	PHLP HD SCR M5-.8 X 12
1248	PW04M	FLAT WASHER 10MM
1249	PCAP47M	CAP SCREW M10-1.5 X 40
1250	PW10M	FLAT WASHER 14MM
1251	PN32M	HEX NUT M14-2
1252	PN03M	HEX NUT M8-1.25
1253	PRIV001M	STEEL FLUTED RIVET 2 X 5MM
1254	PLW06M	LOCK WASHER 10MM

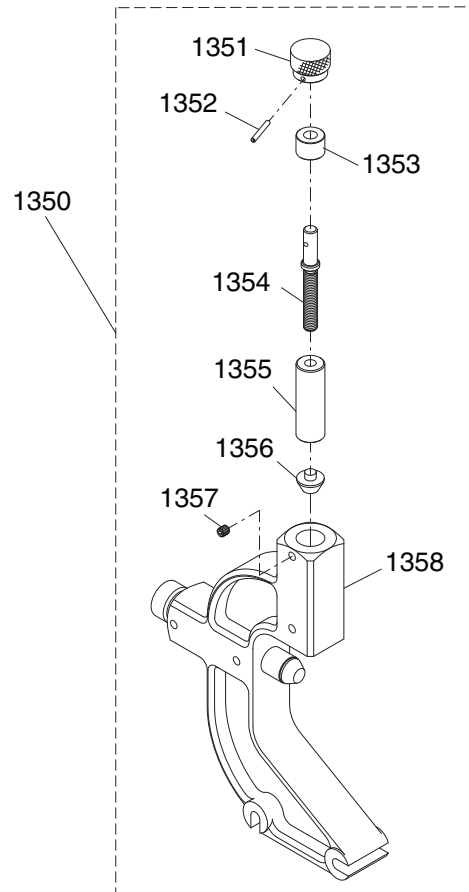


Steady Rest



REF	PART #	DESCRIPTION
1300	P07401300	STEADY REST ASSEMBLY
1301	P07401301	FINGER ADJUSTMENT KNOB
1302	PRP51M	ROLL PIN 4 X 40
1303	P07401303	BUSHING
1304	P07401304	FINGER ADJUSTMENT SCREW
1305	P07401305	FINGER
1306	P07401306	DOWEL PIN
1307	P627ZZ	BALL BEARING 627ZZ
1308	PSS20M	SET SCREW M8-1.25 X 8
1309	P07401309	CLAMP SCREW KNOB
1310	P07401310	CLAMP SCREW
1311	P07401311	DOWEL PIN
1312A	P07401312A	STEADY REST CASTING ASSY
1314	P07401314	HINGE PIN
1315	P07401315	LEAF SCREW M8-1.25 X 25 DOG PT
1316	PN09M	HEX NUT M12-1.75
1317	PW06M	FLAT WASHER 12MM
1318	P07401318	STUD-DE M14-2 X 80 28/35
1319	P07401319	CLAMP PLATE

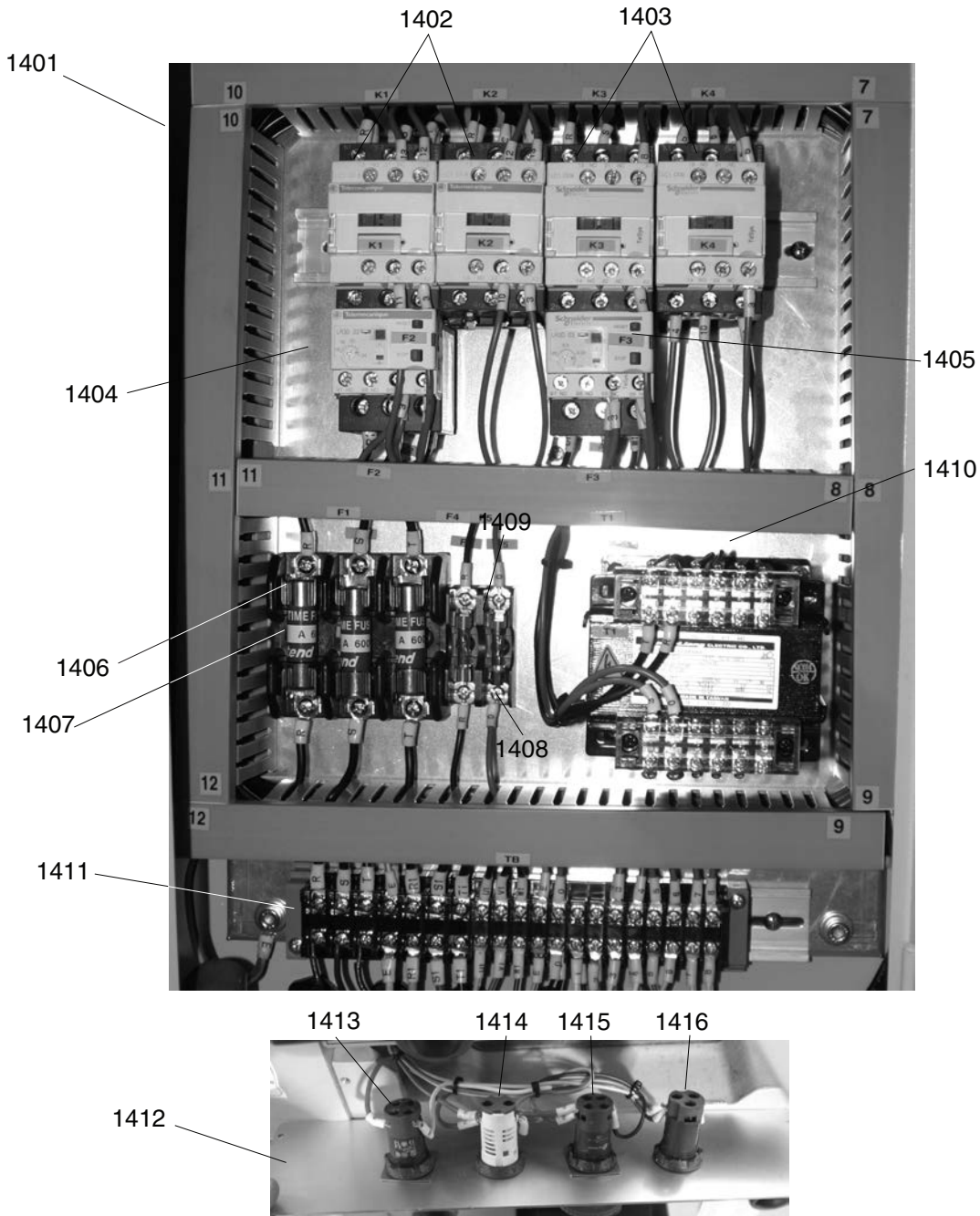
Follow Rest



REF	PART #	DESCRIPTION
1350	P07401350	FOLLOW REST ASSEMBLY
1351	P07401351	FINGER ADJUSTMENT KNOB
1352	PRP51M	ROLL PIN 4 X 40
1353	P07401353	BUSHING
1354	P07401354	FINGER ADJUSTMENT SCREW
1355	P07401355	FINGER
1356	P07401356	BRASS FINGER POINT
1357	PSS20M	SET SCREW M8-1.25 X 8
1358	P07401358	FOLLOW REST CASTING



Electrical Cabinet & Control Panel

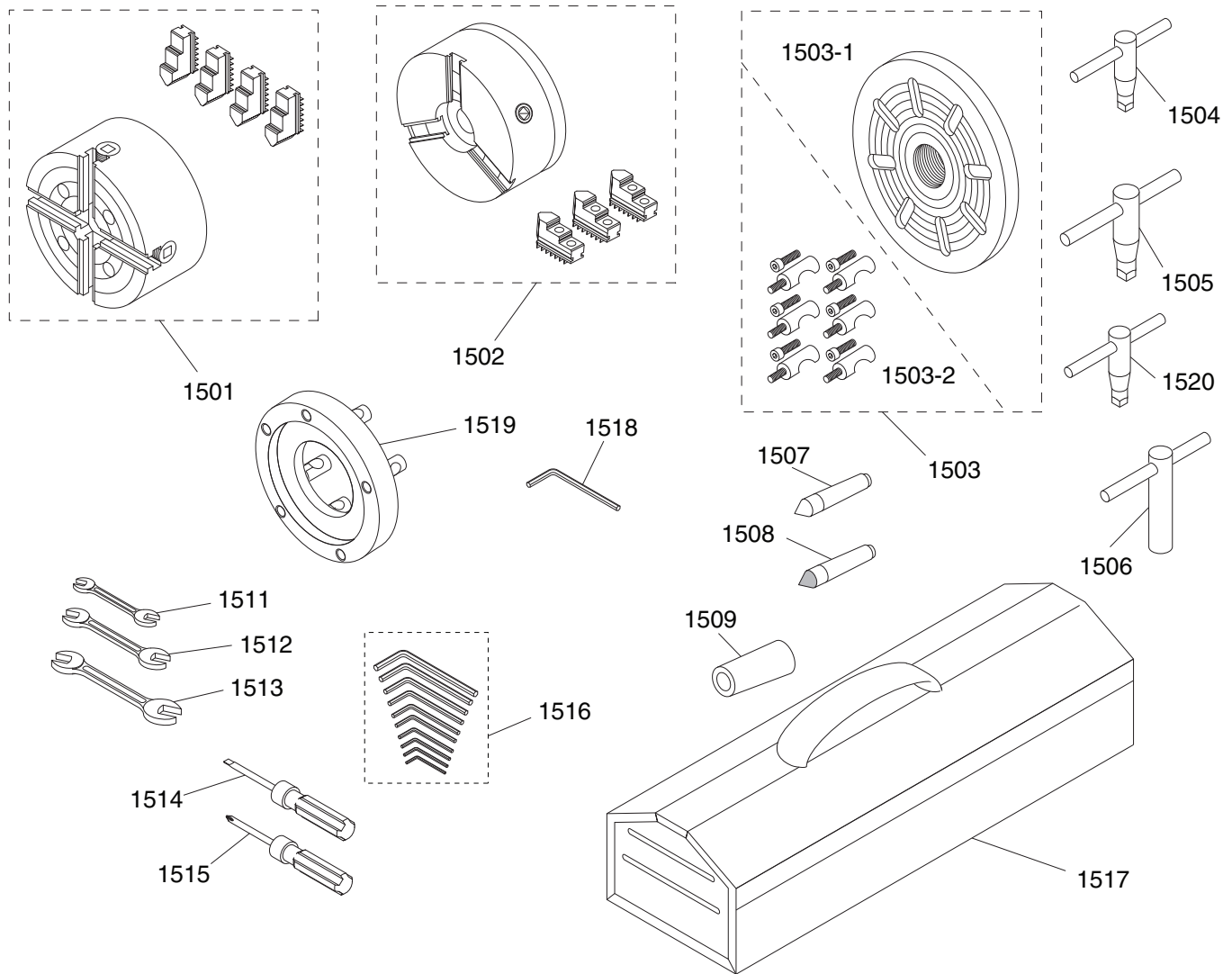


REF	PART #	DESCRIPTION
1401	P07401401	ELECTRICAL BACKPLATE
1402	P07401402	CONTACTOR TELE LC1D18 110V
1403	P07401403	CONTACTOR SCHN LC1D09 110V
1404	P07401404	OL RELAY TELE LR3D22 16-24A
1405	P07401405	OL RELAY SCHN LR3D03 0.25-0.4A
1406	P07401406	FUSE HOLDER 40A
1407	P07401407	FUSE 600V 40A
1408	P07401408	FUSE HOLDER 5A

REF	PART #	DESCRIPTION
1409	P07401409	FUSE 5A 0.25" GLASS
1410	P07401410	TRANSFORMER SUENN LIANG SP-TBS-20140
1411	P07401411	TERMINAL BAR 20P
1412	P07401412	CONTROL PANEL PLATE
1413	P07401413	COOLANT ON/OFF BUTTON XB7ED21P
1414	P07401414	POWER LAMP XB7-EV6P
1415	P07401415	STOP BUTTON XB7-ES542P
1416	P07401416	JOG BUTTON XB7-EA1P



Accessories



REF	PART #	DESCRIPTION
1501	P07401501	4-JAW CHUCK 10"
1502	P07401502	3-JAW CHUCK 8" W/2PC JAW SET
1503	P07401503	FACEPLATE ASSEMBLY 10"
1503-1	P07401503-1	FACEPLATE BODY 10"
1503-2	P07401503-2	FACEPLATE CAMLOCK STUD SET
1504	P07401504	3-JAW CHUCK KEY
1505	P07401505	4-JAW CHUCK KEY
1506	P07401506	TOOL POST T-WRENCH
1507	P07401507	DEAD CENTER MT#3 HSS TIP
1508	P07401508	DEAD CENTER MT#3 CARBIDE TIP
1509	P07401509	SPINDLE SLEEVE MT#3/MT#5

REF	PART #	DESCRIPTION
1511	PWR1012	WRENCH 10 X 12MM OPEN-ENDS
1512	PWR1417	WRENCH 14 X 17MM OPEN-ENDS
1513	PWR2224	WRENCH 22 X 24MM OPEN-ENDS
1514	PSDF2	SCREWDRIVER FLAT #2
1515	PSDP2	SCREWDRIVER PHILLIPS #2
1516	PAW1510M	HEX WRENCH SET 10PC 1.5-10MM
1517	P07401517	TOOLBOX
1518	PAW08M	HEX WRENCH 8MM
1519	P07401519	BACK PLATE D1-5 8-1/4"
1520	P07401520	CAMLOCK KEY D1-5



Front Machine Labels



REF	PART #	DESCRIPTION
1601	P07401601	MACHINE ID LABEL
1602	PLABEL-55B	ENTANGLEMENT HAZARD LABEL
1603	PLABEL-11C	EYE INJURY HAZARD LABEL
1604	PLABEL-12B	READ MANUAL LABEL
1605	P07401605	THREAD DIAL CHART LABEL
1606	P07401606	SPINDLE SPEED HAZARD
1607	P07401607	RELEASE BOLT NOTICE LABEL

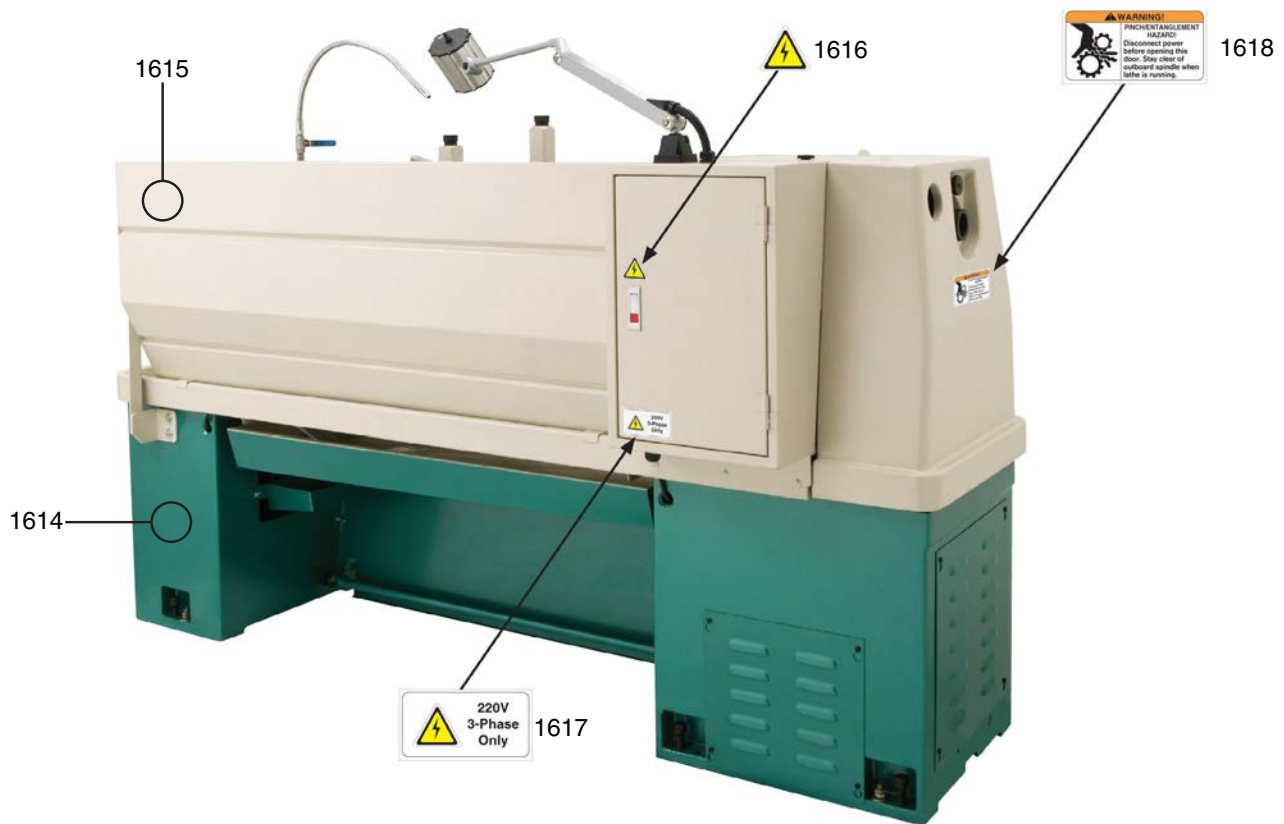
REF	PART #	DESCRIPTION
1608	PLABEL-63B	DISCONNECT POWER LABEL
1609	PLABEL-50B	BIOHAZARD LABEL
1610	P07401610	MODEL NUMBER LABEL
1611	G8588	GRIZZLY NAMEPLATE
1612	P07401612	FLUID CAPACITIES LABEL
1613	P07401613	AUTHORIZED PERSONNEL NOTICE LABEL

WARNING

Safety labels help reduce the risk of serious injury caused by machine hazards. If any label comes off or becomes unreadable, the owner of this machine **MUST** replace it in the original location before resuming operations. For replacements, contact (800) 523-4777 or www.grizzly.com.



Rear & Side Machine Labels



REF	PART #	DESCRIPTION
1614	PPAINT-1	GRIZZLY GREEN TOUCH-UP PAINT
1615	PPAINT-11	PUTTY TOUCH-UP PAINT
1616	PLABEL-14	ELECTRICITY LABEL

REF	PART #	DESCRIPTION
1617	P07401617	220V 3-PHASE LABEL
1618	P07401618	OUTBOARD ENTANGLEMENT LABEL

WARNING

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 Model # _____ Order # _____ Serial # _____

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1. How did you learn about us?

Advertisement Friend Catalog
 Card Deck Website Other:

2. Which of the following magazines do you subscribe to?

<input type="checkbox"/> Cabinetmaker & FDM	<input type="checkbox"/> Popular Science	<input type="checkbox"/> Wooden Boat
<input type="checkbox"/> Family Handyman	<input type="checkbox"/> Popular Woodworking	<input type="checkbox"/> Woodshop News
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<input type="checkbox"/> Live Steam	<input type="checkbox"/> Shop Notes	<input type="checkbox"/> Other:
<input type="checkbox"/> Model Airplane News	<input type="checkbox"/> Shotgun News	
<input type="checkbox"/> Old House Journal	<input type="checkbox"/> Today's Homeowner	
<input type="checkbox"/> Popular Mechanics	<input type="checkbox"/> Wood	

3. What is your annual household income?

\$20,000-\$29,000 \$30,000-\$39,000 \$40,000-\$49,000
 \$50,000-\$59,000 \$60,000-\$69,000 \$70,000+

4. What is your age group?

20-29 30-39 40-49
 50-59 60-69 70+

5. How long have you been a woodworker/metalworker?

0-2 Years 2-8 Years 8-20 Years 20+ Years

6. How many of your machines or tools are Grizzly?

0-2 3-5 6-9 10+

7. Do you think your machine represents a good value? Yes No

8. Would you recommend Grizzly Industrial to a friend? Yes No

9. Would you allow us to use your name as a reference for Grizzly customers in your area?

Note: We never use names more than 3 times. Yes No

10. Comments: _____

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We shall in no event be liable for death, injuries to persons or property or for incidental, contingent, special, or consequential damages arising from the use of our products.

To take advantage of this warranty, contact us by mail or phone and give us all the details. We will then issue you a "Return Number," which must be clearly posted on the outside as well as the inside of the carton. We will not accept any item back without this number. Proof of purchase must accompany the merchandise.

The manufacturers reserve the right to change specifications at any time because they constantly strive to achieve better quality equipment. We make every effort to ensure that our products meet high quality and durability standards and we hope you never need to use this warranty.

Please feel free to write or call us if you have any questions about the machine or the manual.

Thank you again for your business and continued support. We hope to serve you again soon.

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