



Operation and Maintenance Instructions

Geared-Head Lathe

Model GH-1440ZX



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1.0 IMPORTANT SAFETY INSTRUCTIONS

Read and understand the entire owner's manual before attempting to set up or operate this lathe.

1. Read and understand the entire owner's manual before attempting assembly or operation.
 2. Read and understand the warnings posted on the machine and in this manual. Failure to comply with all of these warnings may cause serious injury.
 3. Replace the warning labels if they become obscured or removed.
 4. This lathe is designed and intended for use by properly trained and experienced personnel only. If you are not familiar with the proper and safe operation of a lathe, do not use until proper training and knowledge have been obtained.
 5. Do not use this lathe for other than its intended use. If used for other purposes, JET®, disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.
 6. Always wear approved safety glasses/face shields while using this lathe. Everyday eyeglasses only have impact resistant lenses; they are not safety glasses.
 7. Before operating this lathe, remove tie, rings, watches and other jewelry, and roll sleeves up past the elbows. Remove all loose clothing and confine long hair. Non-slip footwear or anti-skid floor strips are recommended. Do not wear gloves.
 8. Wear ear protectors (plugs or muffs) during extended periods of operation.
 9. Some dust created by power sanding, sawing, grinding, drilling and other construction activities contain 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 paint.
 - Crystalline silica from bricks, cement and other masonry products.
 - Arsenic and chromium from chemically treated lumber.
- Your risk of exposure 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 face or dust masks that are specifically designed to filter out microscopic particles.
10. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.
 11. Make certain the switch is in the OFF position before connecting the machine to the power supply.
 12. Make certain the machine is properly grounded.
 13. Make all machine adjustments or maintenance with the machine unplugged from the power source.
 14. Remove adjusting keys and wrenches. Form a habit of checking to see that keys and adjusting wrenches are removed from the machine before turning it on.
 15. Keep safety guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately after maintenance is complete.
 16. Check damaged parts. Before further use of the machine, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
 17. Do not use power tools in damp/wet locations or other dangerous environments. Do not expose them to rain. Keep work area well lighted. Provide for adequate space surrounding work area and non-glare, overhead lighting.
 18. Keep the floor around the machine clean and free of scrap material, oil and grease.
 19. Keep visitors a safe distance from the work area. Keep children away.

CONTENTS

20. Make your workshop child proof with padlocks, master switches or by removing starter keys.
21. Give your work undivided attention. Looking around, carrying on a conversation and “horse-play” are careless acts that can result in serious injury.
22. Maintain a balanced stance at all times so that you do not fall or lean against moving parts. Do not overreach or use excessive force to perform any machine operation. Never force the cutting action.
23. Do not operate the lathe in flammable or explosive environments. Do not use in a damp environment or expose to rain.
24. Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and more safely.
25. Use recommended accessories; improper accessories may be hazardous.
26. Maintain tools with care. Keep cutting tools sharp and clean for the best and safest performance. Follow instructions for lubricating and changing accessories.
27. Do not attempt to adjust or remove tools during operation. Disconnect tools before servicing; when changing accessories, such as blades, bits, cutters, and the like.
28. Never stop a rotating chuck or workpiece with your hands.
29. Choose a low spindle speed when working unbalanced workpieces, and for threading and tapping operations.
30. Do not exceed the maximum speed of the workholding device.
31. Do not exceed the clamping capacity of the chuck.
32. Secure Work. For safety and use of both hands, use clamps or a vise to hold work when practical.
33. Workpieces longer than 3 times the chucking diameter must be supported by the tailstock or a steady rest.
34. Avoid small chuck diameters with large turning diameters.
35. Avoid short chucking lengths and small chucking contact.
36. Turn off the machine and disconnect from power before cleaning. Use a brush to remove shavings or debris — do not use your hands.
37. Do not stand on the machine. Serious injury could occur if the machine tips over.
38. Never leave the machine running unattended. Turn the power off and do not leave the machine until moving parts come to a complete stop.
39. Remove loose items and unnecessary work pieces from the area before starting the machine.
40. Direction of feed — feed work into a blade or cutter against the direction of rotation of the blade or cutter only.
41. Installation work and electrical wiring must be done by qualified electrician in accordance with all applicable codes and standards.
42. Tighten all locks before operating.
43. Rotate workpiece by hand before applying power.
44. Rough out workpiece before installing on faceplate.
45. Do not mount split workpiece or one containing knot.
46. Use lowest speed when starting new workpiece.

SAFETY

Safety Devices

⚠ WARNING

Do not bypass, remove, or override safety devices built into this machine. Injury or death to yourself or those nearby may result. Possible consequences include parts flying off at high speed, contact with moving parts, electrocution, and clothing being pulled into the machine.

The lathe includes the following safety devices:

Lockable Main Switch (Figure A)

When the main switch is switched off ("0" position), the current supply to the lathe is interrupted. In the "0" position, the main switch can be secured against accidental or unauthorized activation using a padlock.



Figure A

Emergency-Stop Button (Figure B)

Pressing the emergency-stop button switches the lathe off. Turn the button clockwise to restart the machine.



Figure B

Chuck Shield with Position Switch (Figure C)

Raise the chuck shield to gain access to the chuck and spindle. When the chuck shield is lowered into place, the position switch is activated, allowing the machine to be turned on.

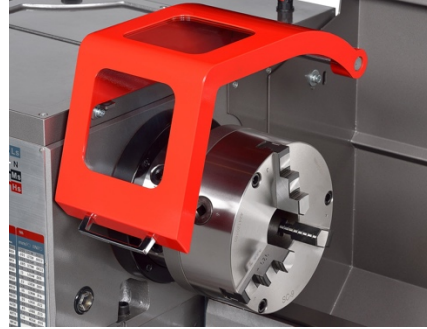


Figure C

Headstock End Panel with Position Switch (Figure D)

When the headstock end panel cover is in place, the position switch is activated, allowing the machine to be turned on.



Figure D

The Overload Clutch on the feed shaft prevents overloading of the machine.

Safety Screws for the camlock bolts on the workpiece holder.

Familiarize yourself with the following safety notices used in this manual:

⚠ CAUTION

This means that if precautions are not heeded, it may result in minor injury and/or possible machine damage.

⚠ WARNING

This means that if precautions are not heeded, it may result in serious injury or possibly even death.

Identification

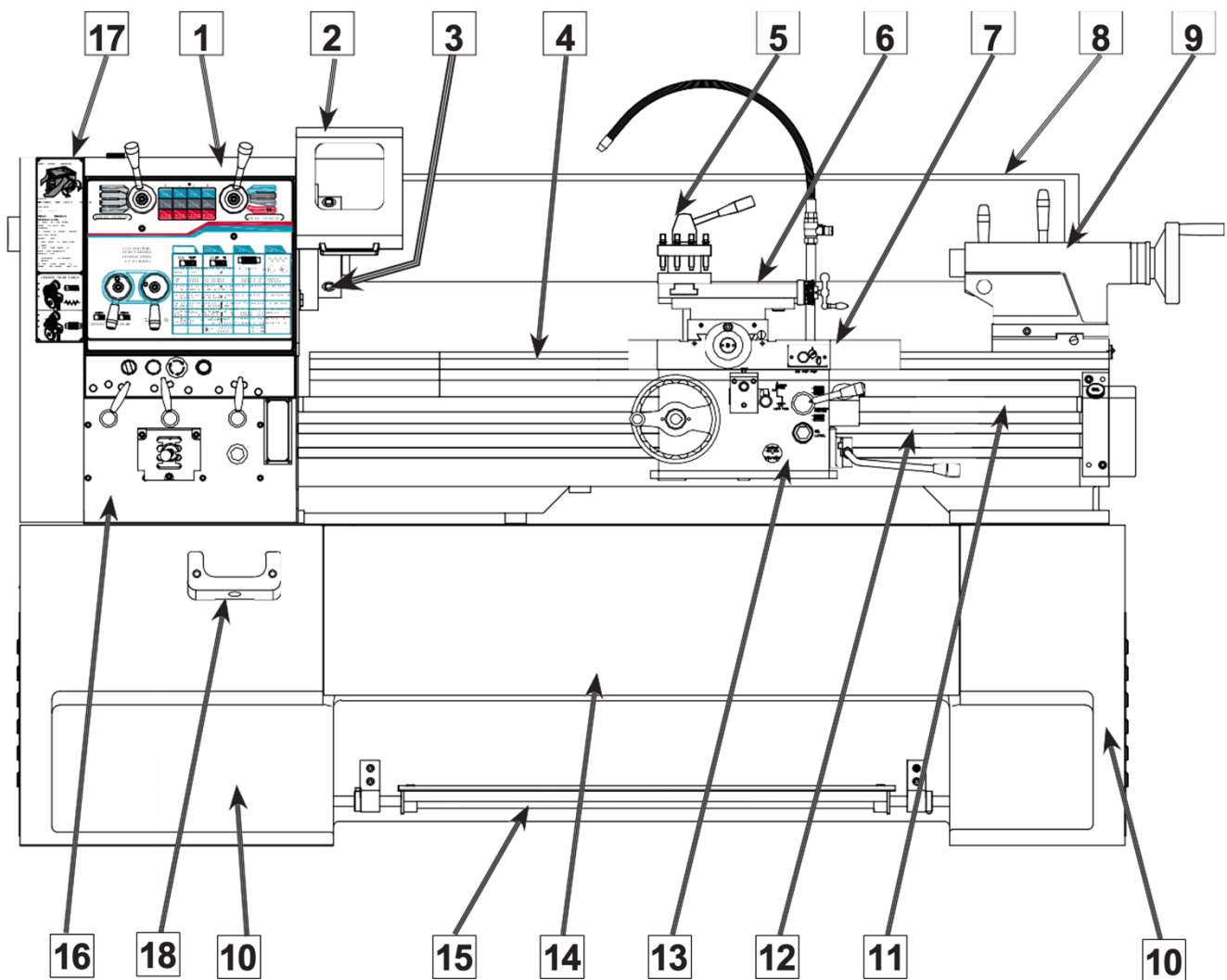


Figure 1. The GH-1440ZX Lathe

- | | |
|------------------------------|----------------------------|
| 1. Headstock | 10. One-piece solid stand |
| 2. Chuck Safety Guard | 11. Leadscrew |
| 3. D1-6 Camlock MT#6 Spindle | 12. Feed rod |
| 4. Bed | 13. Apron |
| 5. 4-Way Tool Post | 14. Chip tray |
| 6. Compound slide | 15. Footbrake |
| 7. Cross slide | 16. Gearbox |
| 8. Splash guard | 17. End Cover (Gear Train) |
| 9. Tailstock | 18. Chuck key bracket |

Control Panel

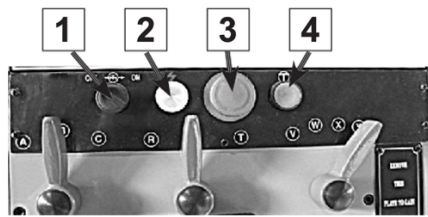


Figure 2. Control Panel

1. **Cutting Fluid Pump Switch:** Turns cutting fluid delivery ON / OFF.
2. **Power Light:** Illuminates when the lathe is receiving power.
3. **Emergency Stop Button:** Stops all machine functions. Twist clockwise to reset.
4. **Jog Button:** Turns the spindle motor ON while being pressed and held.

Headstock Controls

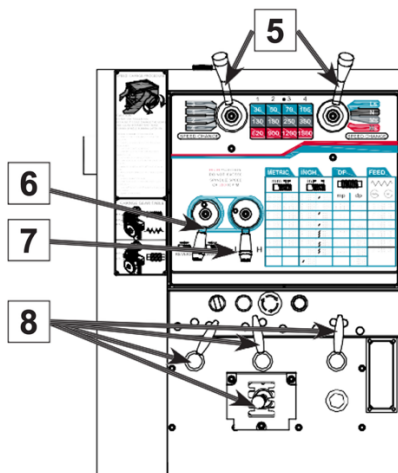


Figure 3. Headstock Controls

5. **Spindle Range Lever:** Shifts the headstock into low or high range for spindle speeds between 36 and 1800 RPM.
6. **Feed Direction Lever:** This lever reverses the direction of the gearbox, and, as a result, the leadscrew and feed rod change direction.
7. **Gearbox Range Lever:** This lever puts the gearbox in high or low range and has no effect on spindle RPM.
8. **Gearbox Levers:** Moves the gearbox gears into particular ratios, which then turn the leadscrew and feed rod for threading and power feed operations.

Carriage Controls

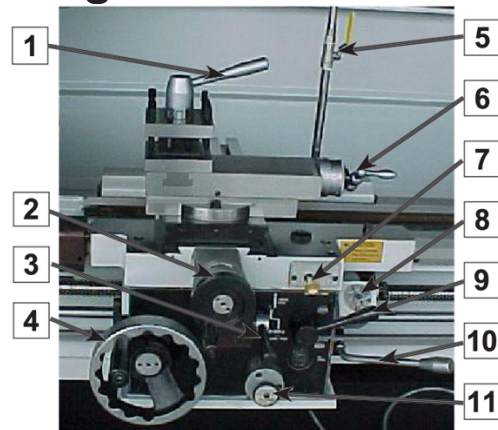


Figure 4. Carriage Controls.

1. **4-Way Tool Post Lever:** Used for locking the rotary tool post in four possible settings.
2. **Cross Slide Handwheel:** Positions the cross slide in or out.
3. **Feed Control Lever:** Engages and disengages the cross-feed and longitudinal feed gearing.
4. **Longitudinal Carriage Handwheel:** Allows for manual movement of the carriage from left to right along the bed.
5. **Cutting Fluid Flow Control Lever:** Used to vary the flow of cutting fluid out of the nozzle.
6. **Compound Hand Crank:** Used to position the compound along the compound slide.
7. **Manual Carriage Oil Pump:** Draws oil from the apron case and lubricates the carriage and ways through various oil ports.
8. **Thread Dial:** Indicates when to engage the half nut during threading operations.
9. **Half Nut Lever:** Engages and disengages the apron with the leadscrew for threading operations.
10. **Spindle ON / OFF Lever:** Used to start and stop the lathe during normal operation.
11. **Feed Direction Lever:** This lever reverses the direction of the gearbox, and as a result, the leadscrew and feed rod change direction.

Tailstock Controls

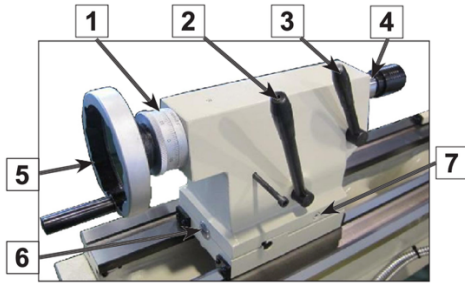


Figure 5. Tailstock Controls.

1. **Graduated Scale:** Indicates quill movement in increments of 0.001" or 0.02mm.
2. **Tailstock Lock Lever:** Secures the tailstock in place along the bedway.
3. **Quill Lock Lever:** Locks the quill in position.
4. **Quill:** Moves toward and away from the spindle, holding centers and tooling.
5. **Quill Handwheel:** Moves the quill toward or away from the spindle.
6. **Offset Scale:** Indicates the distance of tailstock offset from the spindle center line.
7. **Tailstock Offset Screw:** Adjusts and secures the tailstock offset (1 of 2).

Foot Brake

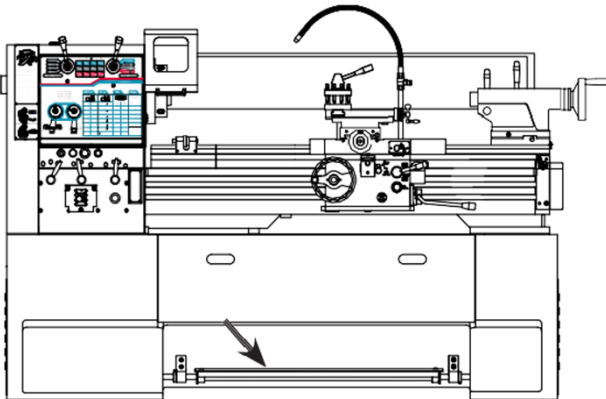


Figure 6. Foot Brake.

This lathe is equipped with a foot brake (Figure 6) to quickly stop the spindle. Pushing the foot brake while the spindle is ON cuts power to the motor, stopping the spindle. Once stopped, the spindle lever **MUST** be returned to the neutral position before the spindle can be restarted.

Physical Environment

The physical environment where your machine is operated is important for safe operation and longevity of parts. For best results, operate this machine in a dry environment that is free from excessive moisture, hazardous or flammable chemicals, airborne abrasives, or extreme conditions. Extreme conditions for this type of machinery are generally those where the ambient temperature is outside the range of 9° ~ 72°C (48.2° ~ 161.6°F); the relative humidity is outside the range of 20–95% (non-condensing); or the environment is subject to vibration, shocks, or bumps.

Electrical Installation

⚠ WARNING

Electrical connections must be made by a qualified electrician in compliance with all relevant codes. This machine must be properly grounded while in use to help protect the operator from electrical shock and possible fatal injury.

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.

Confirm that power available at the lathe's location is the same rating as the lathe.

IMPORTANT: The lathe must be wired properly and phased correctly. The spindle should rotate counterclockwise (as viewed from the tailstock end) while the feed rod rotates clockwise (as viewed from the tailstock end). If the phasing needs correction, disconnect lathe from power source and switch any two of the three power leads (not the green ground wire).

Make sure the lathe is properly grounded.



Voltage Conversion

This machine has been pre-wired for 230-volt operation. To change from 230 to 460-volt operation:

Remove junction box cover on motor and change wires according to diagram found on inside cover (Figure 6B).

Change incoming lead on transformer from 230V to 460V terminal (Figure 6B).

Adjust overload relay setting to appropriate amperage (Figure 6B).

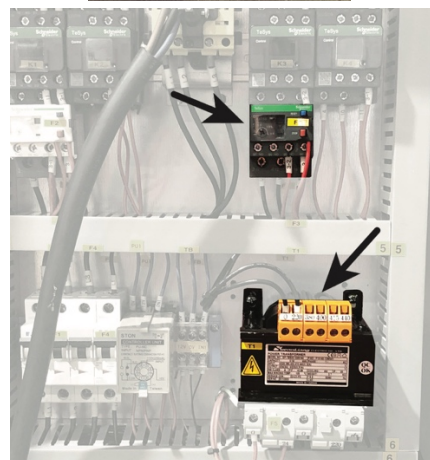
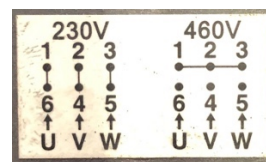


Figure 6B

Before connecting to power source, make sure that switch is in OFF position.

The machine must be properly grounded.

Check for proper spindle rotation. The spindle should rotate counterclockwise when viewed from tailstock. If spindle rotates clockwise, stop the machine and disconnect the lathe from the power source. Switch any two of the three power leads (not the green ground wire) and reconnect the lathe to the power source. Recheck spindle rotation.

Lighting

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

Weight Load

Make sure that the surface on which the machine is placed will bear the weight of the machine, any additional equipment installed on the machine, and the heaviest workpiece to be used. Additionally, consider the operator's weight and any dynamic loading during machine operation.

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.

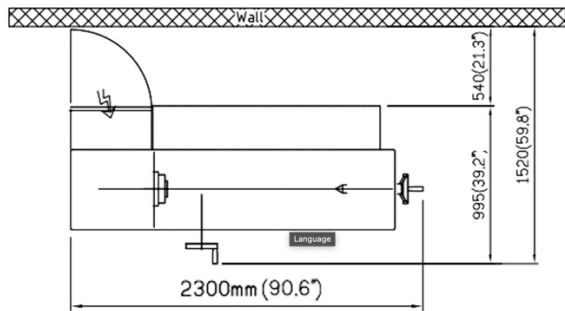


Figure 7. Space required for full range of movement.

Lifting & Moving

This lathe is extremely heavy. Serious personal injury or death may occur if safe lifting and moving methods are not followed. Get assistance from a professional rigger if you are unsure about your abilities or maximum load ratings of your lifting equipment.

To lift and move your lathe:

1. Prepare the permanent location for the lathe.

2. Remove the shipping crate top and sides, then remove the small components from the shipping pallet.
3. To balance the lifting load, loosen the tailstock lock lever (Figure 8), move the tailstock to the end of the bedway, then lock it in place.



Figure 8. Tailstock lock lever.

4. To further balance the load, loosen the carriage lock bolt, disengage the half nut lever, put the feed control lever in neutral, then use the carriage handwheel to move the carriage next to the tailstock. (Figure 9)

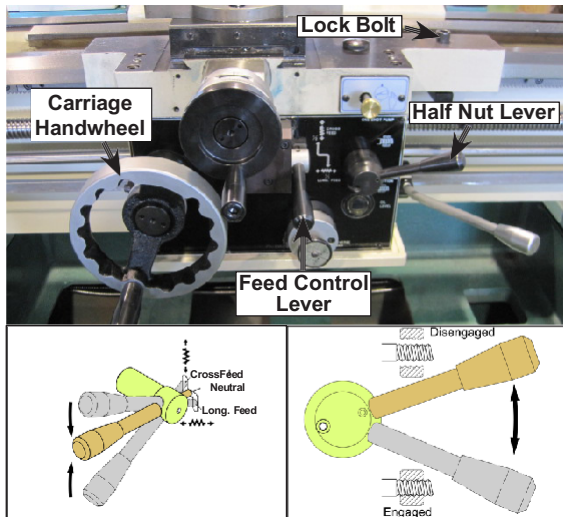


Figure 9. Carriage controls set for moving the carriage.

5. Lock the carriage lock bolt and tailstock lock lever.
6. **Lifting the machine with crane.**
 - a. Make sure that crane capacity at least 2-tons.
 - b. Only an authorized crane operator should lift and move the machine.
 - c. Use two people when lifting and moving this machine. Use one person to operate the crane and another to watch and guide its movement.
 - d. Install the lifting jig to bedway.
 - e. Make sure that the two hexagon nuts are fixed.
 - f. Keep the machine's center of gravity at the center of the crane.

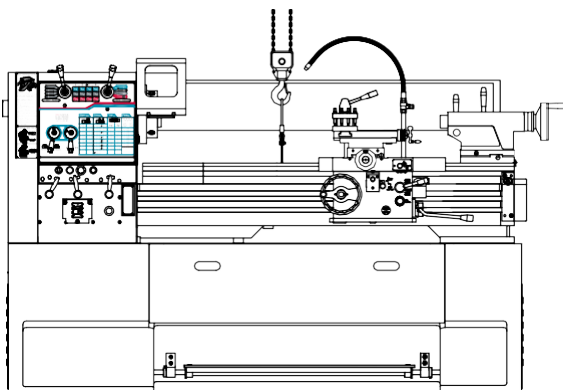


Figure 10. Lifting the machine with crane.

7. Moving the machine with a forklift.

- a. This lathe is very heavy. Ensure the forklift capacity is at least 2-tons.
- b. Use two people when lifting and moving this machine. Use one person to operate the forklift and another to watch and guide the movement.
- c. Widen the fork to their maximum width and place under the lathe. Place the lathe's center of gravity between the two forks to keep the lathe balanced on the forks.

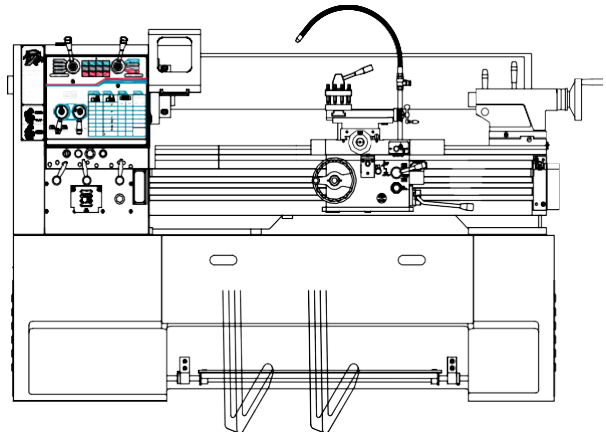


Figure 11. Moving the machine with a forklift.

Leveling

This lathe must be placed on the included leveling studs and cast-iron feet. Complete support at each of the six leveling stud locations is mandatory. The bed cannot be twisted or bent, and the ways must be perfectly level with the floor. If a misalignment condition arises, adjust the leveling studs, or shim the cast iron feet where they touch the floor until the bed and ways are in alignment.



Figure 12. Leveling pads and screws.

This lathe can also be attached to the floor using J-bolts set in the concrete floor. Using J-bolts require careful placement of the J-bolts so they align with the base mounting holes. The J-bolts must be set in concrete and the concrete must fully cure before installing the machine. J-bolts and bolts and nuts are not provided. J-bolt size is M10 x 330 (L:mm). See Figure 13B for J-bolt installation.

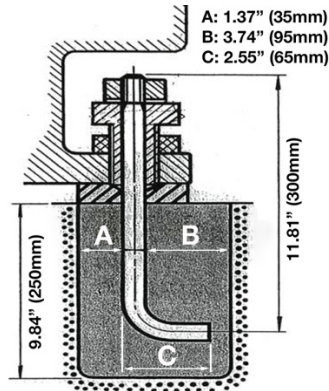


Figure 12B. J-Bolts

To level the machine, use a precision level to make sure the bedways are level from side-to-side and from front-to-back.

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



Figure 13. Example of a precision level.

Test Run

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

To test run the lathe:

1. Disconnect the lathe from power.

2. Make sure that the headstock oil tank, gearbox, apron, and lead screw reservoir oil levels are full.
3. Make sure the chuck and jaws are secure.
4. Turn the pump switch to the OFF position, fill the cutting fluid reservoir, and point the fluid nozzle into the chip pan. (Figure 14)
5. Move the Right headstock range lever (Figure 15) to Ls or Ms position so the headstock is in low range (36-380 RPM).

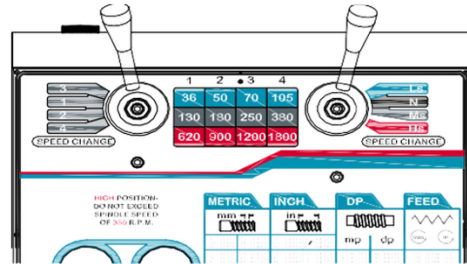
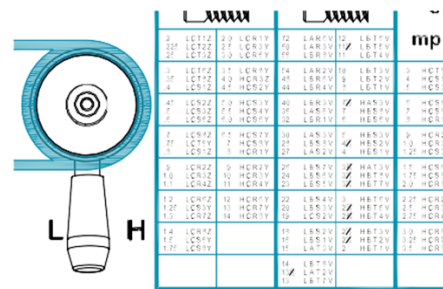


Figure 15. Headstock range lever.

6. Move the Gearbox range lever to neutral as shown in Figure 16.



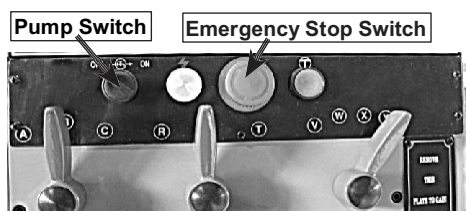


Figure 14. Control Panel.

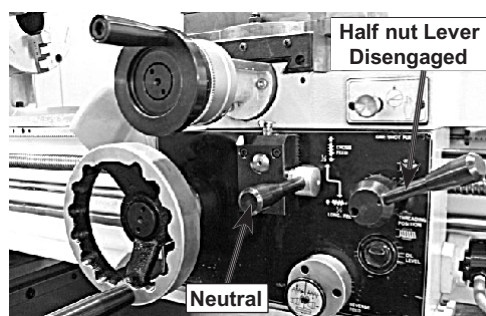


Figure 18. Apron disengaged.

- Using a 10mm hex wrench, loosen the carriage lock (Figure 19) so the carriage is free to slide.

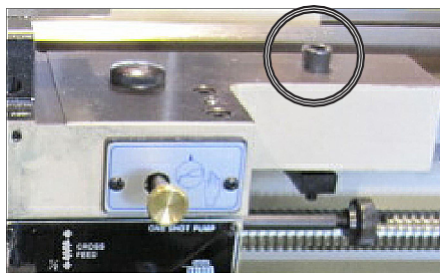


Figure 19. Carriage lock.

- Move the spindle ON / OFF lever to the OFF position as shown in Figure 20.

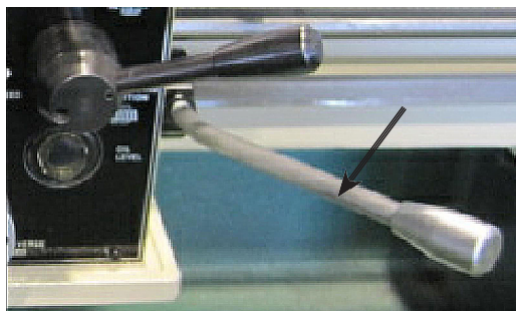


Figure 20. Spindle ON / OFF lever.

- Rotate the red EMERGENCY stop switch knob clockwise until it pops out and the pump will turn on. Observe the oil pump tube sight glass (Figure 21). When oil flows out of the tube and against the sight glass, you can start the lathe.

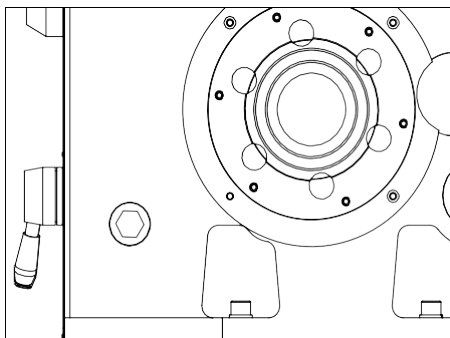


Figure 21. Oil pump sight glass.

- Make sure that all bystanders are out of the way, tools are cleared away, and the chuck key is removed from the chuck.
- Move the spindle ON/OFF lever down and the chuck will rotate.
- Observe and listen for any abnormal noises or vibrations. The lathe should run smoothly with little or no vibration or rubbing noises.
- Push the foot brake, and the lathe should stop quickly.

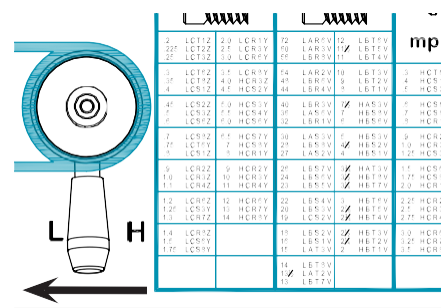
- Open the lathe headstock side cover approximately 25mm so the door safety limit switch opens and disables the lathe from starting
- Attempt to start the lathe. If the lathe starts, the safety limit switch is faulty and needs to be replaced.
- Close the door and start the lathe again and push the EMERGENCY STOP switch and the lathe should stop.
- Turn the cutting fluid pump on, and fluid should flow from the nozzle.
- The test run is now finished. Shut the lathe down and begin the Spindle Break-In procedure.

Spindle Break-in

It is essential to closely follow proper break-in procedures to ensure trouble-free performance. Complete this process once you have familiarized yourself with all instructions in this manual and completed the test run.

To break-in the spindle:

- Complete the Test Run procedure.
- Move the gearbox range lever (Figure 22) to low range.



5. Disengage the half nut and the power feed levers shown in Figure 24.

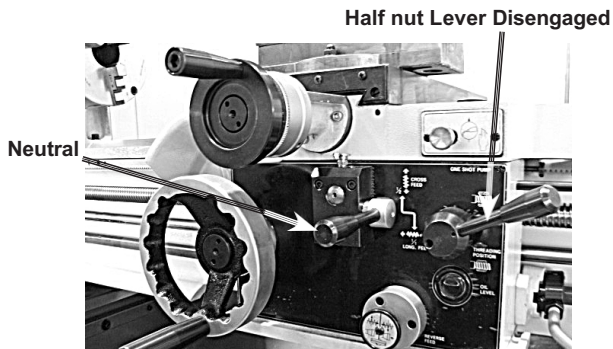


Figure 24. Power feed and half nut levers disengaged.

6. Turn the lathe ON and let it run for ten minutes in each speed of 36, 50, 70, 105 RPM. The Right Speed Change Lever must be in level Ls (blue color), then change the Left Speed Change Lever step by step (1, 2, 3, 4) for each speed. After that, stop the lathe, move the Right Speed Change Lever to Ms level (gray color), and let it run also ten minutes in each speed of 130, 180, 250 and 380 RPM.
7. After completing Step 6, stop the lathe, keep the gearbox range lever in "L" position, then move the Spindle speed lever to "Hs" position (red color).
8. Turn the lathe ON and let it run for ten minutes in each speed of 620, 900, 1200 and 1800 RPM.
9. After completing Step 8, reduce the spindle speed to 620 RPM and let the lathe run for a final 15 minutes to allow the machine to cool and circulate the oil.
10. Shut the lathe down, replace the headstock and gearbox oil, and re-tension the V-belts.

Chuck

This lathe is shipped with the 3-jaw chuck installed. This is a scroll-type chuck, meaning that all three jaws move in unison when adjusted.

The optional 4-jaw chuck features independent jaws for square or irregularly shaped stock.

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, this faceplate will hold non-cylindrical parts such as castings.

The chucks and faceplate have a D1-6 camlock mount. A chuck key is used to turn the locking cams (Figure 25) to secure / release the chuck / faceplate.

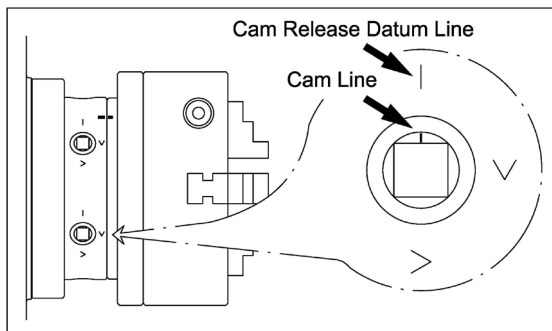


Figure 25. Camlock loosened with the cam line aligned with the datum line.

To install a chuck:

1. Disconnect lathe from power.
2. Place a piece of plywood across the lathe ways and position it just under the chuck.
3. Place the chuck on the cradle.
4. Make sure the chuck taper and spindle taper mating surfaces are perfectly clean.
5. Inspect and make sure that all camlock studs are undamaged, are clean and lightly oiled, and that the camlock stud cap screws are in place and snug.
6. If equipped, align the chuck-to-spindle timing marks (Figure 26), and slide the chuck onto the spindle.

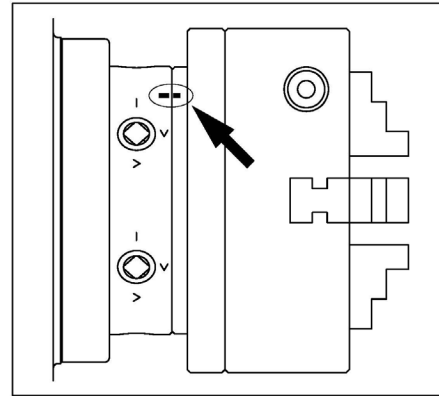


Figure 26. Chuck timing marks aligned.

7. Turn a camlock with the chuck key until the cam line falls between the "V" marks shown in Figure 27.

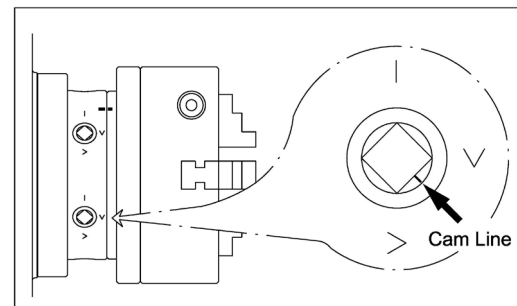


Figure 27. Cam and lines.

8. Lock the other cams in a crisscross or star pattern so the chuck is drawn up evenly on all sides without any chance of misalignment.
9. Remove the chuck key.

To remove a chuck:

1. Disconnect lathe from power.
2. Place a piece of plywood across the lathe ways to protect the ways or use a support cradle and position it just under the chuck.
3. Turn a cam with the chuck key until the cam line aligns with the cam release datum line.
4. Unlock the other cams in the same manner. Make sure to support the chuck as you align the last cam.
5. Remove the chuck key.

Installing and Adjusting Camlock Stud

When fitting a chuck or faceplate with camlock studs, or when mounting a new chuck or faceplate, it may be necessary to install or adjust the camlock studs.

In order to properly install or adjust one or more camlock studs, you must remove a stud locking cap screw, then thread the camlock stud in or out until the line on the side of the stud is flush with the top of the chuck casting.

3-Jaw Chuck

The 3-jaw scroll-type chuck included with this lathe features hardened steel jaws that center the workpiece. When the operator opens or closes the jaws with the chuck key, the jaws move in unison.

There are two sets of jaws included with the 3-jaw chuck — inside and outside jaws. Use the correct jaws for the size and configuration of the workpiece to hold it firmly and securely on the chuck.

Numbered from 1-3, the jaws must be used in the matching numbered jaw guides, as shown in Figure 28.

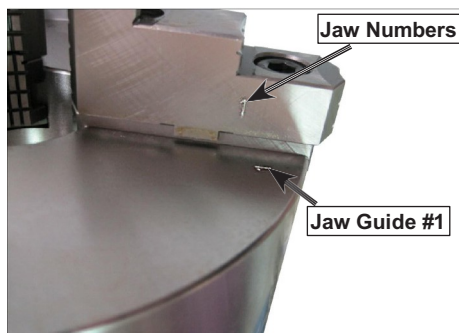


Figure 28. Jaw guides and jaw numbers.

To change the jaw:

1. Disconnect Lathe from power.
2. Place a piece of wood over the ways to protect them from potential damage.
3. Insert the chuck key and turn it counterclockwise to back the jaws out and remove them.
4. Clean the jaw mating surfaces and apply a thin film of white lithium grease to the mating surfaces.
5. Set the previously mounted jaws aside in a safe place free of moisture and abrasives.
6. Rotate the chuck key clockwise until you see the tip of the scroll gear lead thread just begin to Insert jaw #1 into jaw guide #1 and hold the jaw against the scroll gear lead thread.

7. Rotate the chuck key clockwise one turn to engage the tip of the scroll gear lead thread into the jaw.
8. Pull on the jaw—now it should be locked into the jaw guide.
9. Repeat the Steps 6–8 on the remaining jaws.



Figure 29. Inserting jaw.

To mount a workpiece in the 3-jaw chuck:

1. Disconnect Lathe from power.
2. Place a chuck cradle or plywood on the bedway below the chuck to protect it.
3. Use the chuck key to move the jaws and mount the workpiece to the chuck, similar to one of the methods shown in Figure 30. Make sure the workpiece is mounted firmly on the chuck.

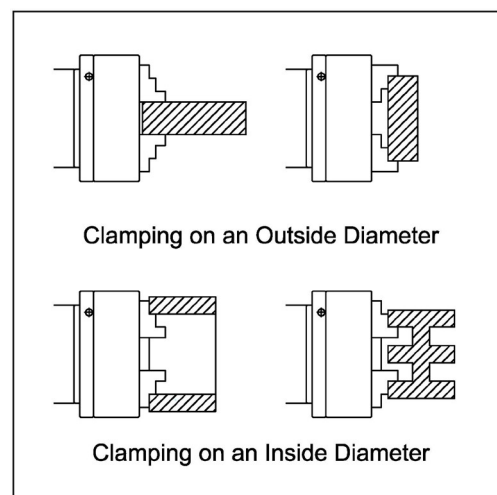


Figure 30. Examples of workpiece mounted in the 3-jaw chuck.

4. Rotate the chuck by hand to make sure the workpiece makes even contact with all three jaws and is centered.

4-Jaw Chuck

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

To mount a workpiece on the 4-jaw chuck:

1. Disconnect Lathe from power.
2. Place a chuck cradle or plywood on the bedway below the chuck to protect it.
3. Use the chuck key to open each jaw so the workpiece will lay flat against the chuck face or jaw steps.
4. With help from another person or a supporting device, mount the workpiece centered on the chuck, then turn each jaw until it makes contact with the workpiece.
5. Tighten each jaw in small increments. After you have adjusted the first jaw, continue tightening in an opposing sequence.
6. After the workpiece is held in place by the jaws, turn the chuck by hand and pay attention to the workpiece alignment.

Tailstock

The tailstock on your lathe can be used to support workpieces with the use of a live or dead center.

It can also be used to drill or bore holes in the center of a part or cut shallow tapers by using the offset adjustment.

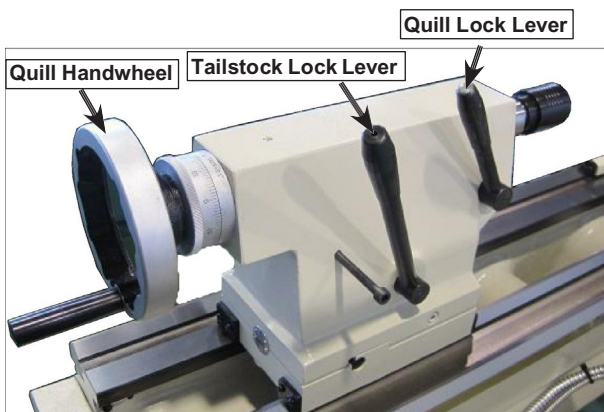


Figure 31. Tailstock and quill lock levers in locked position.

To move the tailstock:

1. Pull back on the lock lever.
2. Slide the tailstock to the desired position.
3. Push the tailstock lock lever forward to lock the tailstock to the lathe bed.

To use the tailstock quill:

1. With the tailstock locked to the bed, release the quill lock lever.
2. Turn the quill feed handwheel clockwise to feed/move the quill towards the spindle or turn counterclockwise to move the quill away from the spindle.
3. Push the quill lock lever forward to lock the quill in place.

To install tooling in the tailstock:

1. With the tailstock locked, unlock the quill lock lever.
2. Turn the quill handwheel CW to extend quill about 25mm out of the casting.
3. Insert a tapered drill arbor or a tapered drill bit into the quill until the taper is firmly seated and the tang is locked to the quill slot.
4. Turn the quill handwheel CW to feed the drill bit into the rotating workpiece.
5. To remove the tooling from the tailstock, turn the quill handwheel CCW until the tooling is pushed out of the taper.

To offset the tailstock:

1. Lock the tailstock in position.
2. Loosen two nuts of bottom, adjust the left and right jack screws until the scale (Figure 32) indicates the offset you want. See Figure 33 for adjustment direction.
3. When the offset is achieved, snug the jack screws so the tailstock position is locked.

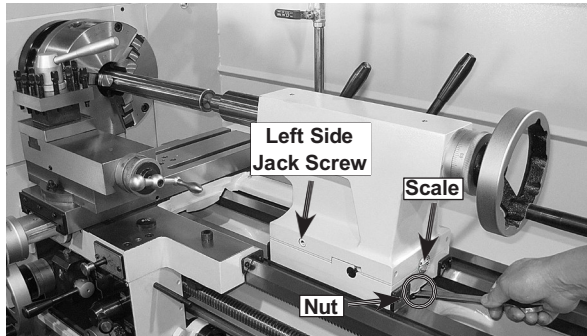


Figure 32. Tailstock offset adjustments.

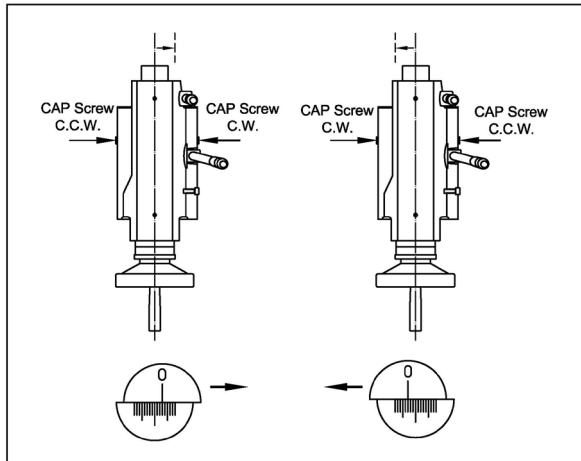


Figure 33. Jack screw adjustment versus tailstock movement.

Centers

Dead Centers

The dead center achieves more accurate results than a live center, but it requires low spindle speeds and a small amount of oil to reduce friction heat that may damage the workpiece.

Use the HSS dead center in the spindle, where the workpiece does not rotate on the tip and does not generate friction.

Use the carbide-tipped dead center in the tailstock where the workpiece will rotate against it and generate friction. The carbide-tipped dead center can better withstand the effects of friction; however, the tip of the center must be lubricated to avoid premature wear and maximize smooth operation. Also, 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 and can be installed in the spindle and the tailstock quill for higher speeds, but with a slight bit of accuracy loss.

Mounting Dead Center in Spindle

1. Disconnect Lathe from power.
2. Thoroughly clean and dry the tapered mating surfaces of the spindle bore, tapered sleeve, and the center.
3. Insert the center into the sleeve, then insert the sleeve into the spindle bore through the chuck or faceplate.

Mounting Center in Tailstock

Either a dead center or live center can be mounted in the tailstock. Mounting instructions are the same for both.

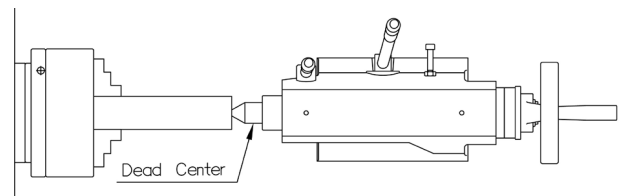


Figure 34. Example of using a dead center installed in the tailstock.

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 carbide-tipped dead center.
3. Use the tailstock quill handwheel to feed the quill out from the casting about 25mm.
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.

Removing Center from Tailstock

To remove the center from the quill, hold onto it with a rag in one hand, then rotate the tailstock handwheel counterclockwise to draw the quill back into the casting until the center released.

Steady Rest

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

To install and use the steady rest:

1. Disconnect Lathe from power.
2. Thoroughly clean the machined base of the steady rest, then place it on the lathe 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 35 to secure it in place.

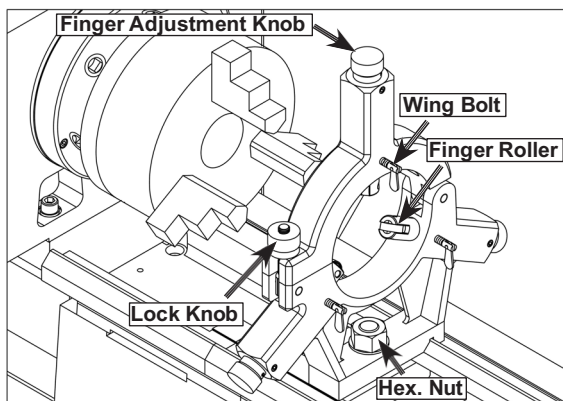


Figure 35. Steady rest components.

4. Loosen the lock knob and open the steady rest so the workpiece can rest on the bottom two finger rollers, as shown in Figure 36.

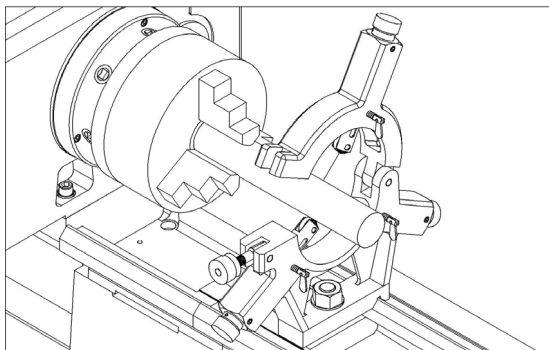


Figure 36. Workpiece mounted in the steady rest.

5. Close the steady rest so that the workpiece is inside the finger rollers, then tighten the lock knob.
6. Loosen the three wing bolts so the finger roller positions can be adjusted.
7. Use the finger adjustment knobs to just touch the finger rollers against the workpiece without causing workpiece deflection.
8. Tighten the three wing bolts.

Follow Rest

The follow rest mounts to the saddle with two cap screws (Figure 37). It is used on long, slender parts to prevent workpiece flexing from the pressure of the cutting tool during operation.

Adjust the sliding finger rollers on the follow rest in the same manner as those on the steady rest.

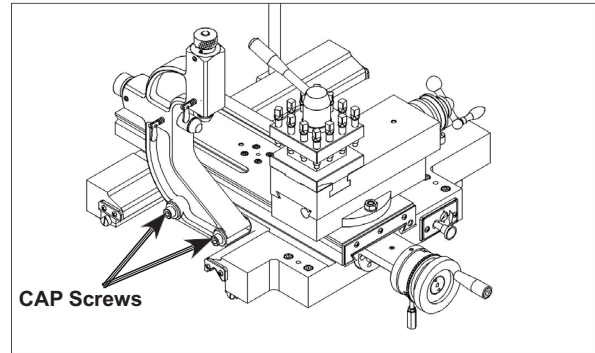


Figure 37. Follow rest attachment.

Compound Slide

The compound slide handwheel has an indirect-read graduated scale. This means that the distance shown on the scale represents the actual distance the tool moves, which of course, will remove twice as much material from the diameter of the workpiece. The base of the compound slide has another graduated scale used for setting the tool to a specific angle.

To set the compound slide at a certain angle:

1. Loosen the two hex nuts at the base of the compound slide (1 of 2 shown in Figure 38).

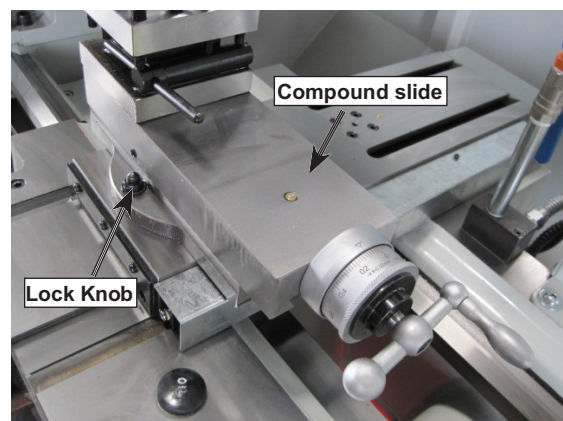


Figure 38. Compound slide set at an angle.

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

4-Way Tool Post

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

The four-way tool post allows for quick indexing to different tools. This is accomplished by loosening the top handle, rotating the tool post to the desired position, then re-tightening the handle to lock the tool into position.

To load the tool:

1. Choose the desired cutting tool.
2. Loosen the tool post bolts so that the cutting tool can fit underneath them.
3. Firmly secure the cutting tool with at least two tool post bolts, as shown in Figure 39.

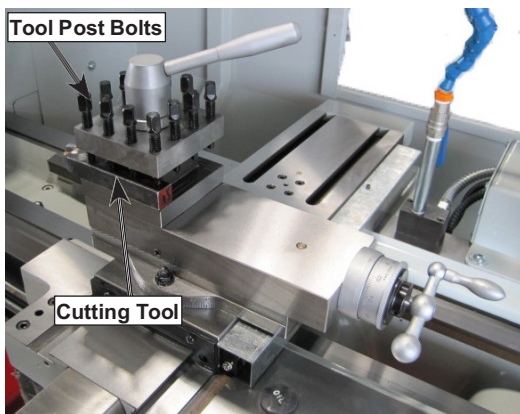


Figure 39. 4-way tool post.

Aligning Cutting Tool with Tailstock Center

For most operations, the cutting tool tip should be aligned with the spindle center line, as illustrated in Figure 40.

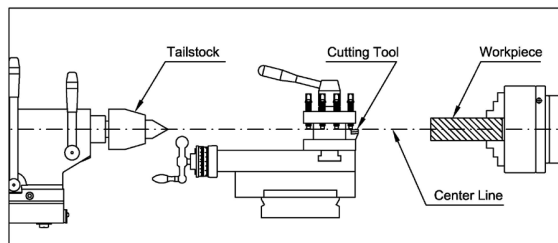


Figure 40. Cutting tool aligned with workpiece center.

There are a number of ways to check and align the cutting tool to the spindle center line. Below are two common methods:

- Align the tip of the cutting tool with a center installed in the tailstock. For this to work, the tailstock must be aligned to the spindle center line.

- Make a facing cut on a piece of round bar stock. If the tool is above/below the spindle center line, a nub will be left in the center of the workpiece. Adjust the height of the workpiece, then repeat the facing cut to check the adjustment. Repeat as necessary until the center of the workpiece is smoothly faced.

To align the cutting tool with the tailstock center:

1. Mount the cutting tool in the tool post, then turn the tool post so the tooling faces the tailstock.
2. Install a center in the tailstock and position the center tip near the tip of the cutting tool.
3. Lock the tailstock and quill in place.
4. Adjust the height of the cutting tool with a steel shim, so the tip just touches the end of the tailstock center.

Apron Stop

Use the adjustable apron stop collar to set the location where the carriage will be disengaged by the feedrod friction clutch.

When the adjustable apron stop contacts the stop collar during a longitudinal feeding operation, the clutch disengages the feedrod from the apron and the carriage movement stops.

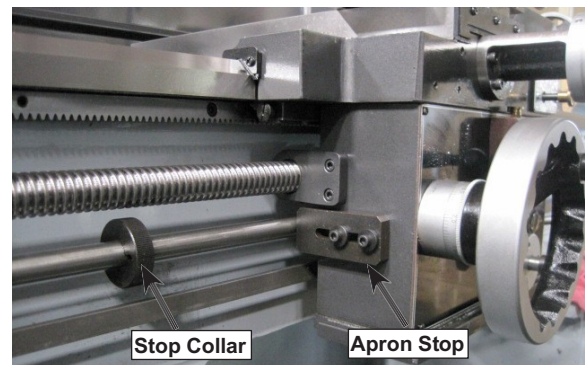


Figure 41. Apron stop and collar.

Manual Feed

You can manually move the cutting tool around the lathe for facing or turning operations using the handwheels shown in Figure 42 and described below.

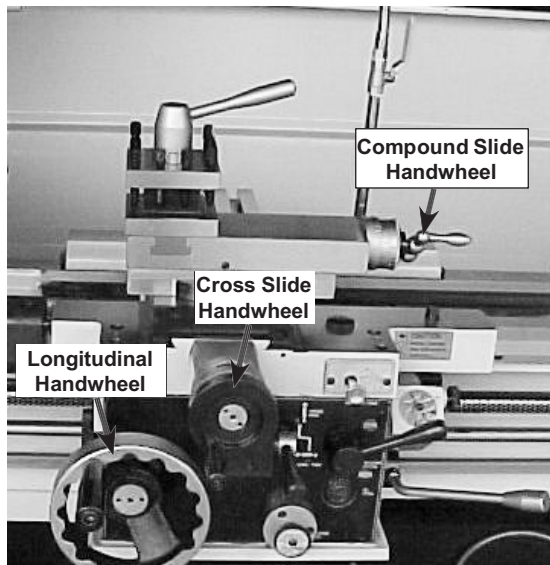


Figure 42. Carriage Controls.

Longitudinal Handwheel

The longitudinal handwheel moves the carriage left or right along the bed. Use this control when setting up the machine for facing or turning.

Cross Slide Handwheel

The cross slide handwheel moves the top slide toward and away from the work. Turning the dial clockwise moves the slide toward the workpiece. Adjust the graduated scale by holding the handwheel with one hand and turning the dial with the other.

Compound Slide Handwheel

The compound slide handwheel controls the position of the cutting tool relative to the workpiece. The compound is adjustable for any angle within its range. The combo inch/metric graduated scale is engraved into a rotatable barrel. Angle adjustment is secured by cap screws on the base of the compound.

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.
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 operations, 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:

$$RPM = \frac{CS \times 4}{D}$$

RPM = Spindle speed, revolution per minute.

CS = Cutting speed in surface feet per minute (SFM)

D = Diameter of workpiece

EXAMPLE:

If the cutting speed is 40 for a certain alloy steel and the workpiece is 2 inches in diameter, find the rpm as follows:

$$RPM = (40 \times 4) / 2 = 80$$

After calculating the RPM, use the nearest or next lower speed on the lathe and set the spindle speed.

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. All of these sources will help you take into account all the applicable variables in order to determine the best spindle speed for the operation.

Setting Spindle Speed

1. Make sure the spindle is turned OFF and it has come to a complete stop.
2. Use the chart in Figure 43 to determine the available spindle speed range closest to your calculated spindle speed.

SPEED				
LS	36	50	70	105
MS	130	180	250	380
HS	620	900	1200	1800

Figure 43. Spindle speed range chart.

- Adjust the spindle speed range lever to the range that covers your calculated spindle speed.
- Turn the spindle ON and slowly turn the variable speed dial to carefully adjust the spindle speed to your calculated spindle speed.

Power Feed

On this machine, both the carriage and cross slide have power feed capability. The rate at which these components move (feed rate) is controlled by how the levers are configured on the gearbox.

Feed rate and spindle speed must be considered together. 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 covers using the power feed option for the carriage and cross slide components for non-threading operations.

Power Feed Controls

The feed direction lever controls direction of the carriage. The quick-change feed direction knob reverses the feed direction of the carriage while the lathe is running.

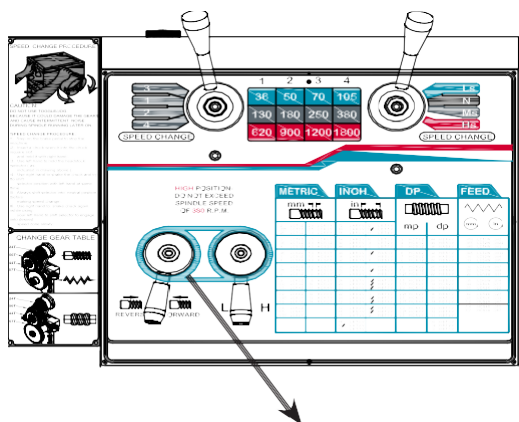


Figure 44. Feed Direction Lever.

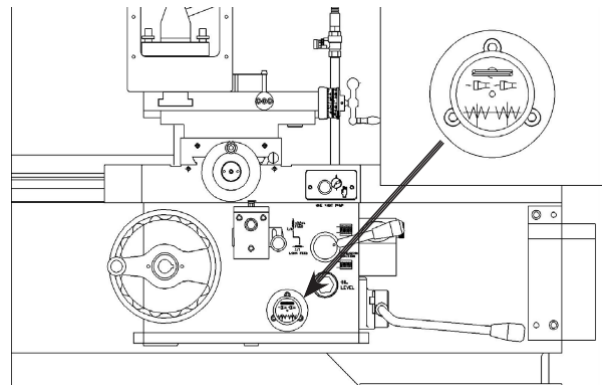


Figure 45. Quick-change feed direction knob.

To engage the power feed:

- Make sure the spindle is OFF and has come to a complete stop.
- Use the feed direction lever to select the direction that the feed rod will rotate.
- Use the feed control lever on the front of the apron to engage power feed for either the carriage or the cross slide (see Figure 46). To engage the carriage, push the lever to the left and down. To engage the cross slide, push the lever to the right and up.

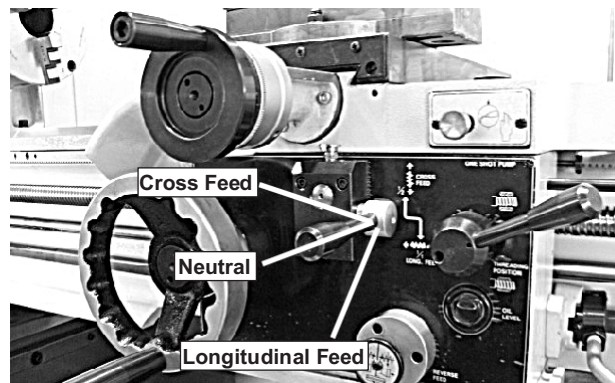


Figure 46. Feed control lever positions.

To use the quick-change feed direction knob:

- While the lathe is running, place the feed control lever in neutral.
- Push or pull the quick-change feed direction knob to change the direction of the feed rod.
- Re-engage the feed direction lever. The feed rod rotation will now be reversed, causing the engaged carriage or cross slide to move in the opposite direction.

Thread & Feed Rate Chart

Figure 47 shows the configurations of gearbox levers that are required to set the available feed rates. This same chart can also be found on the machine.

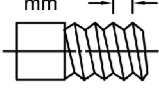
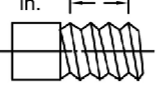
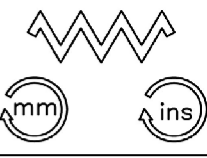
METRIC THREADING				INCH THREADING				MODULAR OR DIAMETRAL				TURNING FEED RATE (DIST./REVOLUTION)		
														
.2	LCT1Z	2.0	LCR1Y	72	LAR6V	12	LBT6V	mod	dp					
.225	LCT2Z	2.5	LCR3Y	60	LAR3V	11½	LBT5V	.3	HCT6Z	44	HBR4V	.050	LCT1W	.002
.25	LCT3Z	3.0	LCR6Y	56	LBR8V	11	LBT4V	.4	HCS1Z	40	HBR3V	.055	LCT2W	.0022
.3	LCT6Z	3.5	LCR8Y	54	LAR2V	10	LBT3V	.5	HCS3Z	36	HAS6V	.065	LCT4W	.003
.35	LCT8Z	4.0	HCR3Z	48	LBR6V	9	LBT2V	.6	HCS6Z	32	HBR1V	.085	LCT8W	.0033
.4	LCS1Z	4.5	HCS2Y	44	LBR4V	8	LBT1V	.7	HCS8Z	30	HAS3V	.10	LCS2W	.004
.45	LCS2Z	5.0	HCS3Y	40	LBR3V	7½	HAS3V	.8	HCR1Z	28	HBS8V	.13	LCS4W	.005
.5	LCS3Z	5.5	HCS4Y	36	LAS6V	7	HBS8V	.9	HCR2Z	26	HBS7V	.18	LCS8W	.007
.6	LCS6Z	6.0	HCS6Y	32	LBR1V	6	HBS6V	1.0	HCR3Z	24	HBS6V	.22	LCR2W	.009
.7	LCS8Z	6.5	HCS7Y	30	LAS3V	5	HBS3V	1.25	HCS3Y	22	HBS4V	.28	LCR4W	.011
.75	LCT6Y	7	HCS8Y	28	LBS8V	4½	HBS2V	1.5	HCS6Y	20	HBS3V	.35	LCR8W	.014
.8	LCR1Z	8	HCR1Y	27	LAS2V	4	HBS1V	1.75	HCS8Y	19	HCS2V	.44	LCS8X	.017
.9	LCR2Z	9	HCR2Y	26	LBS7V	3¾	HAT3V	2.0	HCR1Y	18	HBS2V	.55	LCR2X	.022
1.0	LCR3Z	10	HCR3Y	24	LBS6V	3½	HBT8V	2.25	HCR2Y	16	HBS1V	.68	LCR4X	.027
1.1	LCR4Z	11	HCR4Y	23	LBS5V	3¼	HBT7V	2.5	HCR3Y	15	HAT3V	.85	LCR8X	.033
1.2	LCR6Z	12	HCR6Y	22	LBS4V	3	HBT6V	2.75	HCR4Y	14	HBT8V	1.2	HCS2X	.047
1.25	LCS3Y	13	HCR7Y	20	LBS3V	2¾	HBT5V	3.0	HCR6Y	13	HBT7V	1.4	HCS4X	.055
1.3	LCR7Z	14	HCR8Y	19	LCS2V	2½	HBT4V	3.25	HCR7Y	12	HBT6V	1.7	HCS8X	.067
1.4	LCR8Z			18	LBS2V	2¼	HBT3V	3.5	HCR8Y	11	HBT4V			
1.5	LCS6Y			16	LBS1V	2	HBT2V			10	HBT3V			
1.75	LCS8Y			15	LBT3V		HBT1V			9	HBT2V			
				14	LBT8V					8	HBT1V			

Figure 47. Thread and feed rate chart.

Positioning Gearbox Levers

To cut a particular thread or establish a particular feed rate, you may need to first swap the gearbox drive gear, depending on where it is currently set.

Once you have confirmed that the end gear is set up properly, you can then move the gearbox levers to the required positions. The arrows going from Figure 47 to Figure 48 show which gearbox levers must be moved to achieve an example feed rate.

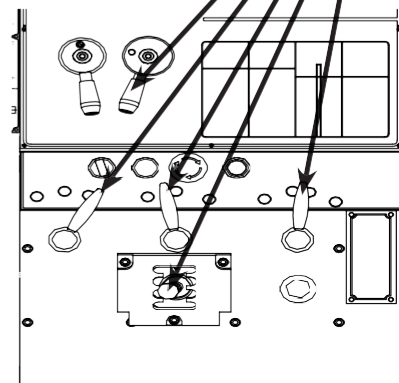


Figure 48. Thread and feed rate chart.

End Gear Setup

The gearbox drive gear on this lathe can be configured for the normal position or the alternate position, depending upon the type of operation to be performed. The lathe is shipped with the end gears in the normal position. Gears must be thoroughly cleaned and re-coated in grease before installing, and the backlash must be maintained at 0.127mm (0.005") for correct meshing.

Normal Position (Inch)

The 24T end gear is installed in the top position, the 44T/56T end gears in the middle position, and the 57T end gear in the bottom position, as shown in Figure 49. In the normal position, the 56T and 57T gears are meshed, which allows for inch threading and all general feed operations.

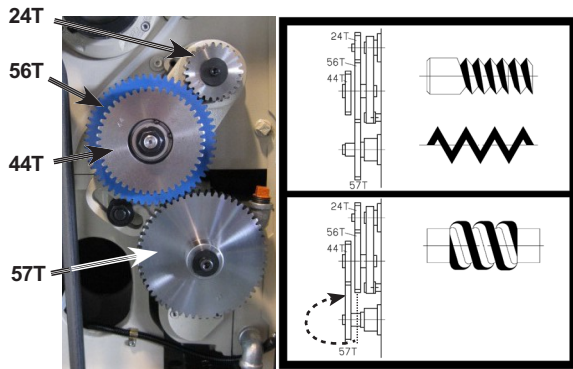


Figure 49. Normal end gear position.

Alternate Position (Inch)

When the 44- and 57-tooth end gears are meshed, you can perform modular and diametral pitch turning.

Configuring the End Gears

1. Disconnect Lathe from power.
2. Move the gearbox range lever to "Low" so that the gears will not rotate in the following steps, then open the lathe headstock side cover.
3. **To change the position of the 57T gear:**
 - a. Remove the cap screw and flat washer that secures the gear, then remove the gear.
 - b. Clean away debris and grime from the gear and apply a light coat of machine oil.
 - c. Swap the position of the gear, then align it with the key and insert it on the gear shaft.
 - d. Re-install the flat washer and cap screw.
4. Close and secure the headstock side cover.

Normal Position (Metric)

The 28T end gear is installed in the top position, the 55T/54T end gears in the middle position, and the 64T/22T end gear in the bottom position, as shown in Figure 50. In the normal position, the 55T and 64T gears are meshed, which allows for metric threading and all general feed operations.

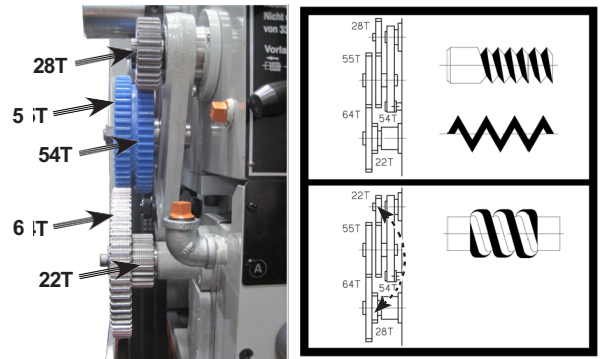


Figure 50. Normal end gear position.

Alternate Position (Metric)

When the 28- and 22-tooth end gears are exchanged, you can perform modular and diametral pitch turning.

Configuring the End Gears

1. Disconnect Lathe from power.
2. Move the gearbox range lever to "Low" so that the gears will not rotate in the following steps, then open the lathe headstock side cover.
3. To change the position of the 22T/28T gear:
 - a. Remove the cap screw and flat washer that secures the gear, then remove the gear.
 - b. Clean away debris and grime from the gear and apply a light coat of machine oil.
 - c. Swap the position of the gear, then align it with the key and insert it on the gear shaft.
 - d. Re-install the flat washer and cap screw.
4. Close and secure the headstock side cover.

Threading Controls

If you are unfamiliar with threading procedures on a lathe, we strongly recommend that you read books, review industry trade magazines, or get formal training before beginning any threading projects.

Power Feed Lever

The feed control lever must be in the neutral (horizontal) position for threading operations, or the half nut will not engage with the leadscrew (see Figures 51–52).

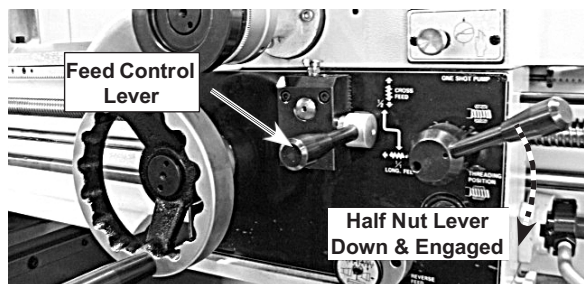


Figure 51. Carriage controls set up for threading.

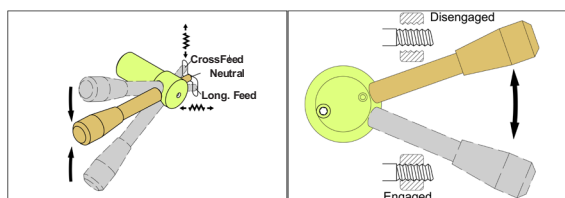


Figure 52. Feed control lever and half nut positions for threading.

Half Nut Lever

The half nut lever engages the carriage with the leadscrew which moves the cutting tool along the length of the workpiece.

Thread Dial & Chart Overview

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 hand knob on the thread dial, pivot the dial gear into mesh with the leadscrew, then tighten the hand knob, (see Figure 53).

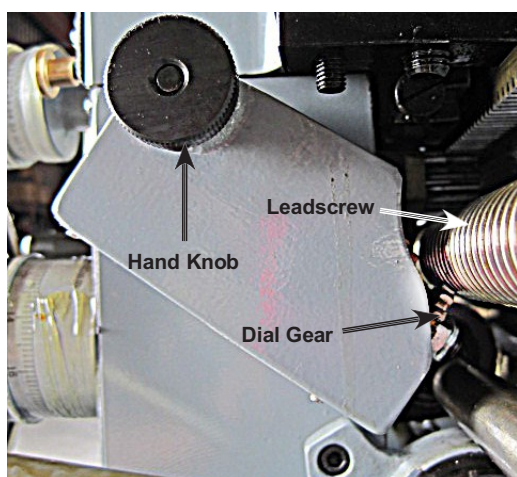


Figure 53. Thread dial engaged with the leadscrew.

Using Thread Dial and Chart (Metric)

Find the length of each thread that you want to cut in the left column (see Figure 54), 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.

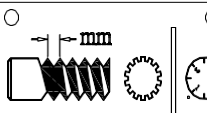
	
1.75, 3.5, 7, 14	14T
4, 5, 9	18T
5.5, 11	22T
2.5, 5, 7.5, 1	16T
1.5, 2, 3, 4	16T
6, 8, 12	20T
1.25, 2.5, 5, 10	20T

Figure 54. Thread dial chart (Metric).

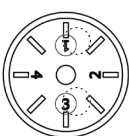
1.75, 3.5, 7, 14	14T	1, 3	
4.5, 9	18T		
5.5, 11	22T		

Figure 55. Thread dial chart of numbered position 1, 3.

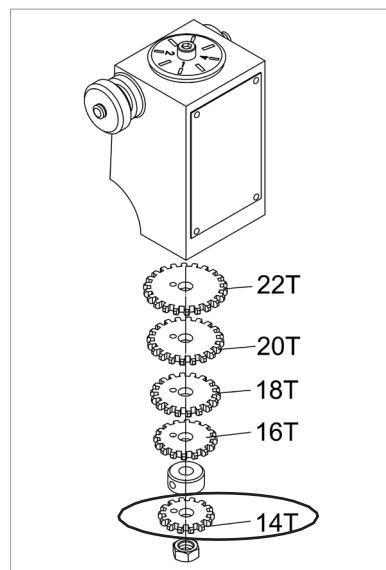


Figure 56. Example of thread dial - 14T.

Length of each thread 1.75, 3.5, 7, 14

Select position 1, 3 on the thread dial and use the 14T gear on the bottom of thread dial for threading length of each thread 1.75, 3.5, 7, 14. (Figure 55 - 56)

Length of each thread 4.5, 9

Select position 1, 3 on the thread dial and use the 18T gear on the bottom of thread dial for threading length of each thread 4.5, 9. (Figure 55 - 56)

Length of each thread 5.5, 11

Select position 1, 3 on the thread dial and use the 22T gear on the bottom of thread dial for threading length of each thread 5.5, 11. (Figure 55 - 56)

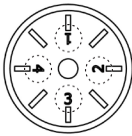
.25, .5, .75, 1	16T	1, 2	
1.5, 2, 3, 4			
6, 8, 12	20T	3, 4	
1.25, 2.5, 5, 10			

Figure 57. Thread dial chart of numbered position 1, 2, 3, 4.

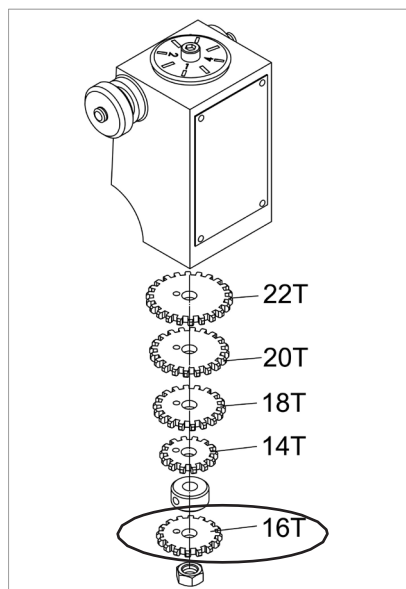


Figure 58. Example of thread dial - 16T.

Length of each thread 0.25 - 12 divisible by 0.25

Select position 1, 2, 3 or 4 on the thread dial and use the 16T gear on the bottom of thread dial for threading length of each thread 0.25 - 12 divisible by 0.25. (Figure 57 - 58)

Length of each thread 1.25, 2.5, 5, 10

Select position 1, 2, 3 or 4 on the thread dial and use the 20T gear on the bottom of thread dial for threading length of each thread 1.25, 2.5, 5, 10. (Figure 57 - 58)

Using Thread Dial and Chart (Inch)

Find the TPI (threads per inch) that you want to cut in the left column (see Figure 59), 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.

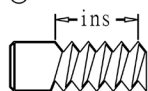
	
4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 56, 60, 72	ANY POSITION
2, 6, 10, 14, 18, 22, 26, 30, 54	NON NUMBERED POSITION
3, 5, 7, 9, 11, 13, 15, 19, 23, 27	NUMBERED POSITION 1, 2, 3, 4
2 $\frac{1}{2}$, 3 $\frac{1}{2}$, 4 $\frac{1}{2}$, 7 $\frac{1}{2}$, 11 $\frac{1}{2}$, 13 $\frac{1}{2}$	POSITION 1, 3 OR 2, 4
2 $\frac{3}{4}$, 2 $\frac{1}{4}$, 3 $\frac{3}{4}$, 3 $\frac{1}{4}$	POSITION 1 ONLY
2 $\frac{7}{8}$ SAME METRIC THREADS CUTTING	

Figure 59. Thread dial chart (Inch).

TPI 4-72 Divisible By 4

Use any line (position) on the thread dial, shown in Figure 60, or threading TPI divisible by 4.

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

Figure 60. Any position is selected on the dial for hreading 4-72 TPI.

TPI 2-54 Not Divisible By 4

Use any of the non-numbered lines on the thread dial for threading the TPI shown in Figure 61.

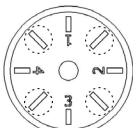
TPI		
2, 6, 10, 14, 18, 22, 26, 30, 54	NON NUMBERED POSITION	

Figure 61. Marks are selected on the dial for threading 2-54 TPI.

Odd Numbered TPI

Use any of the numbered lines on the thread dial for threading the TPI shown in Figure 62.

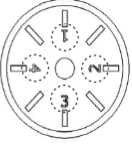
TPI	NUMBERED POSITION	
3,5,7,9, 11,13,15, 19,23,27	1,2,3,4	

Figure 62. Numbers are selected on the dial for threading odd numbered TPI.

1/2 Fractional TPI

Use any opposing number pairs—2 or 4, or 1 or 3 on the thread dial for 1/2 fractional TPI (Figure 63). For example, to cut a 3 1/2 thread, select 1 on the dial, then start threading.

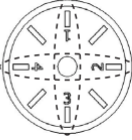
TPI	POSITION	
2 1/2, 3 1/2, 4 1/2, 7 1/2, 11 1/2, 13 1/2	1,3 OR 2,4	

Figure 63. Opposing number group are selected on dial for cutting 1/2 thread TPI.

Other Fractional TPI

Use position 1 on the thread dial for cutting the TPI shown in Figure 64.

TPI	POSITION	
2 1/4, 2 3/4, 3 1/4, 3 3/4	1 ONLY	

Figure 64. Any number on dial is selected for other fractional TPI

2 7/8 TPI

Use any numbered or non-numbered line on the thread dial to cut the TPI shown in Figure 65.

TPI		
2 7/8	SAME METRIC THREADS CUTTING	

Figure 65. Any number on the dial can be selected for 2 7/8 TPI.

Cutting Fluid System

The cutting fluid system delivers cutting fluid through an adjustable nozzle. It is controlled by the control panel cutting fluid pump switch and the valve lever near the base of the nozzle hose.

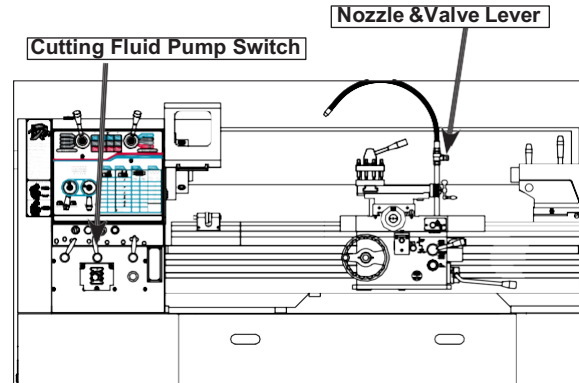


Figure 66. Coolant system controls and components.

Always use high quality cutting fluid in your coolant system and follow the manufacturer's instructions for diluting.

Refer to Cutting Fluid System on Page 28 for detailed instructions on how to add or change cutting fluid. Check the cutting fluid regularly and promptly change it when it becomes overly dirty or rancid.

To use the cutting fluid system on your lathe:

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

Schedule

Each operator of this machine is responsible for ensuring proper care of the equipment. We strongly recommend all operators make a habit of following the daily maintenance procedures.

For optimum performance from this machine, this maintenance schedule must be strictly followed.

Ongoing

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

- Loose mounting bolts or fasteners.
- Worn, frayed, cracked, or damaged wires.
- Guards removed.
- Limit/kill switches bypassed.
- 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.
- Headstock oil not flowing against sight glass.
- Cutting fluid not flowing out.
- Any other unsafe condition.

Daily, Before Operations

- Check / add gearbox oil.
- Check / add apron oil.
- Check cutting fluid level.
- Lubricate the ways.
- Put oil in the ball oilers.
- Check / add leadscrew & feedrod bearing oil.
- Clean / lubricate the leadscrew.
- Turn spindle speed dial all the way down.
- Move the power feed lever on the apron to neutral (to prevent crashes upon startup).
- Ensure carriage lock bolt is loose.

Daily, During Operations

- Verify headstock oil flows when power is turned ON.
- Verify electrical box cooling fan is operating.
- Verify headstock oil temperature is under 138°C (280° F).

Daily, After Operations

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

Monthly

- Drain and clean the cutting fluid tank, then add new cutting fluid.

- Remove electrical box air filter and clean with compressed air or a vacuum.

Annually (or Semi-Annually with Hard Use)

- Drain and clean the headstock oil reservoir, then add new oil.
- Change the apron oil.
- Change the gearbox oil.

Cleaning

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

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

All visible swarf should be removed from the lathe during cleaning. Remember, personal neatness gives you personality.

Lubrication

Headstock

Monitoring Oil Temperature

During operations, regularly monitor the oil temperature shown in the sight glass in Figure 67. The temperature of the headstock oil must remain under 138°C (280° F). or the oil will start to overheat and break down, causing it to lose its lubrication properties.

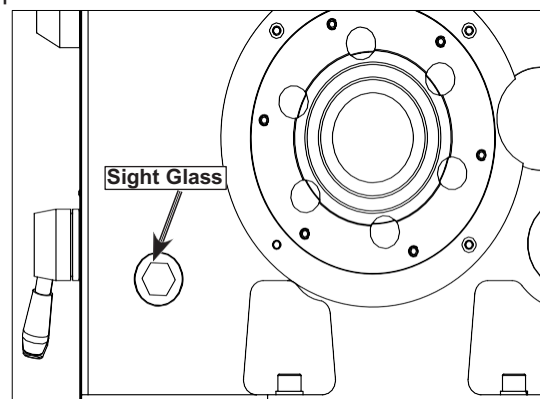


Figure 67. Location of the headstock oil sight glass.

Under normal conditions, the oil should not reach 138°C (280° F).; however, if it does, shut down the machine and allow the oil to cool. Investigate why the oil is getting so hot. Possibilities may be poor ventilation, excessive work loads, poor oil quality, oil that is losing lubricity due to long term use, or extreme work site temperatures.

If possible, correct the conditions causing the oil to get hot. If the oil is old or you suspect it is of poor quality, change it. If the work loads or working environment are extreme, reduce the duty cycle of the lathe to allow the oil to cool down when it gets hot.

If the oil temperature ever exceeds 138°C (280°F)., change it as soon as possible to make sure the spindle bearings have high quality lubrication.

Verifying Oil Pump Operation

If the oil pump ever stops working, the spindle bearings and headstock gears will stop being lubricated, which can quickly result in major damage. Therefore, it is critical to regularly monitor the oil flow while operating the lathe.

Gearbox

Checking & Adding Oil

The sight glass shown in Figure 68 shows the oil level in the gearbox. At the maximum level, the oil fills approximately 3/4 of the sight glass. At the minimum level, the oil only fills 1/4 of the sight glass.

Check the oil level daily. When the oil approaches the minimum level, add enough oil to bring it up to the maximum level.

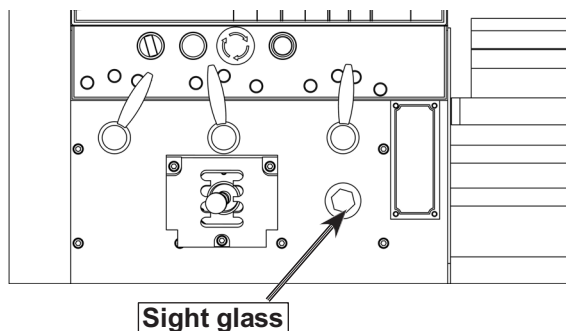


Figure 68. Gearbox sight glass location.

Changing Oil

The gearbox oil must be changed after the break-in period and then annually (or every six months with hard service or extreme working conditions). Figure 69 shows fill and drain plugs used when changing the gearbox oil.

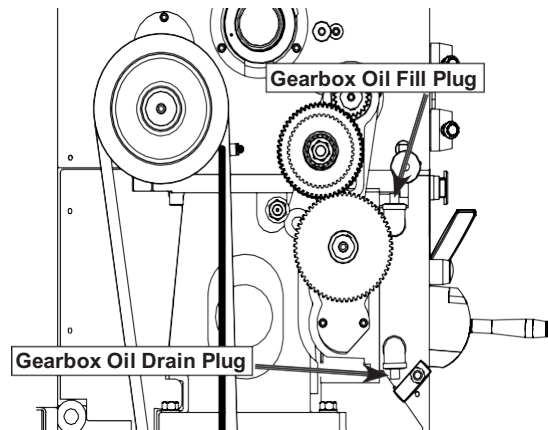


Figure 69. Location of gearbox fill and drain plugs.

Checking & Adding Oil

The sight glass shown in Figure 70 shows the oil level in the apron. At the maximum level, the oil fills approximately 3/4 of the sight glass. At the minimum level, the oil only fills 1/4 of the sight glass.

Check the oil level daily. When the oil approaches the minimum level, add enough oil to bring it up to the maximum level. This oil is also used by the way pump to lubricate the ways and slides.

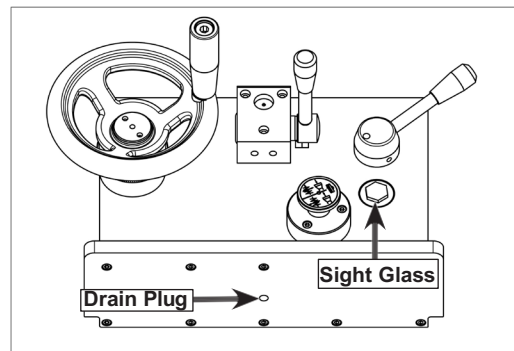


Figure 70. Location of apron drain plug & sight glass.

Changing Oil

The oil in the apron reservoir must be changed after the break-in period and then annually (or every six months with hard service or extreme working conditions). The drain plug is shown in Figure 70 and the fill plug is shown in Figure 71.

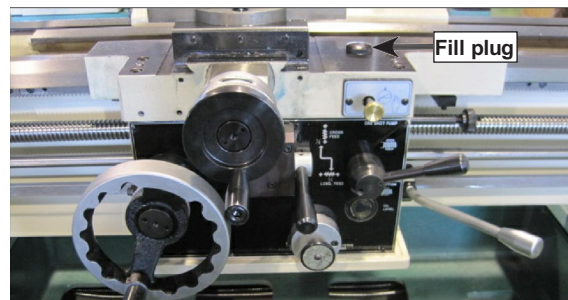


Figure 71. Location of fill plug for apron oil reservoir.

Lead Screw & Feedrod Bearings

Checking & Adding Oil

To check the oil level, remove the fill plug and look inside the reservoir (Figure 72). The oil level must remain full to keep the leadscrew bearing adequately lubricated. Pour oil in the reservoir until it is as full as possible without overflowing.



Figure 72. Leadscrew lubrication.

Lead Screw

Before lubricating the leadscrew (Figure 72), clean it first with mineral spirits. A paint 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 oil along the length of the leadscrew. Use a paint brush to make sure the oil is evenly applied and down in the threads.

Ways & Slides

The way pump shown in Figure 73 lubricates the saddle and cross slide way guides with the oil from the apron reservoir.

To use the way pump to lubricate the ways, 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 way guides.

Repeat this process and move the carriage left/ right and the cross slide forward/backward to distribute oil along the way guides.

Lubricate the guides once before and once after operating the lathe. If the lathe is in a moist or dirty environment, increase the lubrication interval and make sure to keep the oil level full.

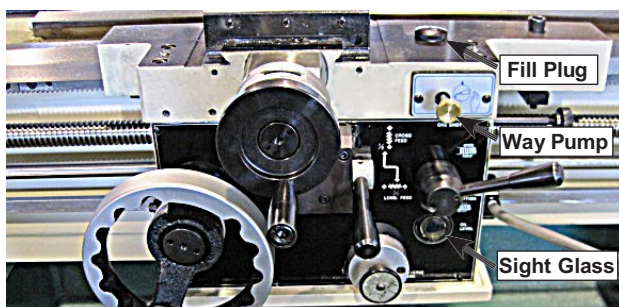


Figure 73. Location of way pump, fill plug, and sight glass on the apron.

Unpainted & Machined Surfaces

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

Ball Oilers

This lathe has five ball oiler locations (see Figures 74–75) that should be oiled on a daily basis. In order to properly squirt oil into the ball oiler mechanisms, you will need an oil can or gun.

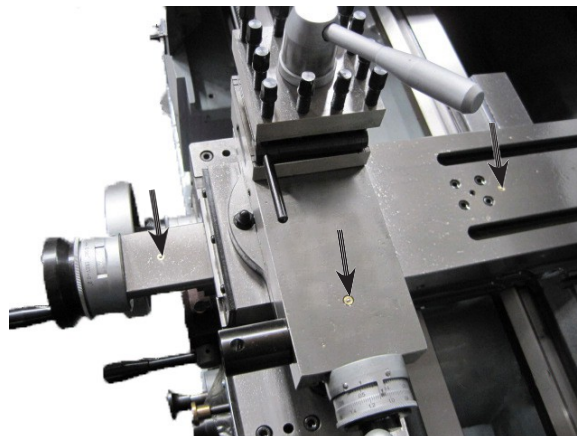


Figure 74. Ball oiler locations.

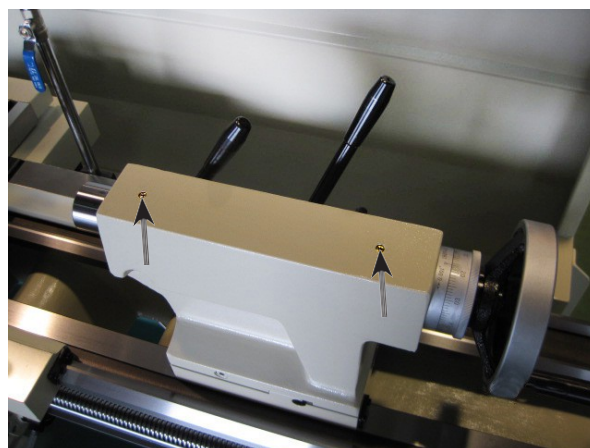


Figure 75. Tailstock ball oiler locations.

To lubricate the ball oilers, clean the outside surface to remove any dust or grime, push the ball with the tip of the oil can nozzle, and squirt a small amount inside. If the lathe is in a moist or dirty environment, increase the oiling interval.

End Gearing

The end gears, shown in Figure 76, should always have a thin coat of heavy grease to reduce the minimize/prevent corrosion, noise, and wear. Care must be taken to avoid over-greasing because excess grease may be flung onto the V-belts, which will reduce optimal power transmission from the motor.

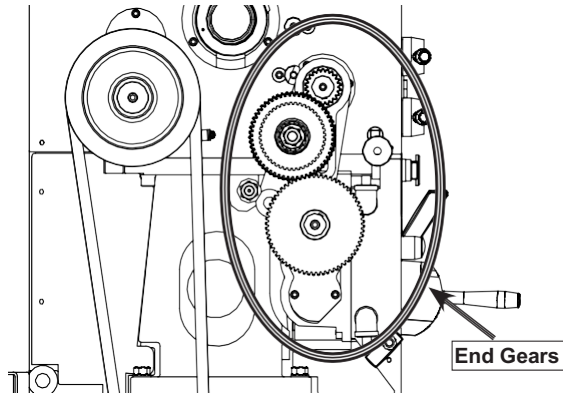


Figure 77. Location of end gears that require grease.

Handling & Care

Make sure to clean and lubricate any gears you install or swap. Unless you are very careful during handling and storage, the coating of grease on the gears will easily pickup dirt or debris, which can then spread to the other gears and increase the rate of wear.

Make sure to the 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 headstock side cover and all the end gears shown in Figure 77.
3. Clean the end gears thoroughly in mineral oil to remove all the old grease. Use a small brush if necessary to clean between the teeth.
4. Clean the shafts from which the end gears were removed and wipe up any old grease splatters in the vicinity and on the inside of the headstock cover.
5. With clean hands, apply a thin layer of grease on both sides of the gears. Make sure to get grease between the gear teeth, but not so much that it fills the voids between the teeth.
6. Install the end gears and mesh them together with an approximate backlash of 0.127mm. Once the gears are meshed together, apply a small dab of grease in the crux of where the gears mesh together—this grease will spread around when the gears start moving and re-coat any areas scraped off during installation.

Annual Maintenance

Once a year, remove all the end gears, clean them thoroughly, and apply a new coating of grease. Even if the headstock side cover has been kept in place throughout the year, it is still possible for dust from the V-belts to build-up in the grease, and the grease may also start to break down with extended or heavy use.

Cutting Fluid System

The cutting fluid 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 cutting fluid to the work area. When the valve is opened or closed, the fluid comes out of the nozzle and drains through the chip drawer and into the catch tray and then into the tank where it is picked up again by the pump. Figure 77 shows many of these components and their locations.

Although most swarf from machining operations falls into the chip tray and stays there, some small chips drain into the tank. The pump uses a screen to prevent it from picking up the small swarf that ends up in the tank.

Since the swarf is spread throughout the coolant system, cleaning the system on a regular basis is a requirement to maintain the life of the pump.

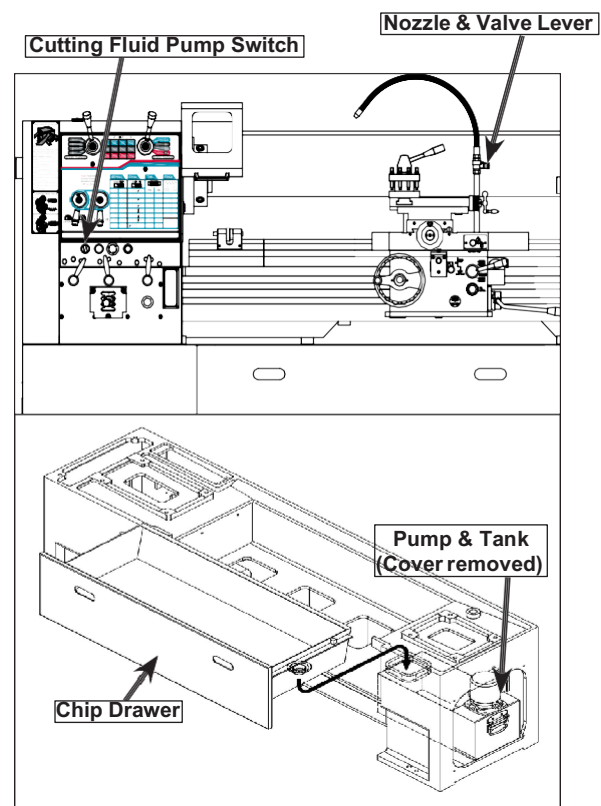


Figure 78. Cutting fluid system components and locations.

Hazards

As some cutting fluid ages, dangerous microbes can proliferate and create a biological hazard.

The risk of exposure to this hazard can be greatly reduced by replacing the old cutting fluid on a monthly basis, as indicated in the maintenance schedule.

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

Adding Fluid

1. Disconnect Lathe from power.
2. Remove the vented cover and slide the tank out, as shown in Figure 79.

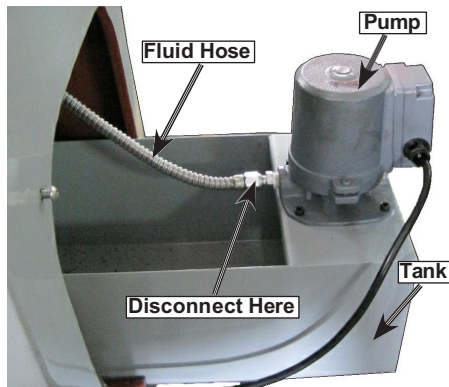


Figure 79. Cutting fluid pump and tank.

3. Pour cutting fluid in the tank until it is nearly full.
4. Slide the tank back into the base and replace the vented cover.

Changing Cutting Fluid

When you replace the old cutting fluid, take the time to thoroughly clean out the chip drawer, catch tray, and chip tray while you are at it. The entire job only takes about a 1/2 hour when you are prepared with the proper materials and tools.

To change the cutting fluid:

1. Position the coolant nozzle over the splash guard, so it is pointing behind the lathe. If you have the optional hose, connect it to the end of the coolant nozzle now.
2. Place the 5-gallon bucket behind the lathe and underneath the coolant nozzle. If you have the optional hose, place the hose in the bucket. Otherwise, you may need to hold the bucket up to the coolant nozzle to prevent coolant from splashing outside of the bucket.
3. Turn cutting fluid the pump ON (or have another person turn it ON if you are holding the bucket), and pump the old cutting fluid out of the tank. Turn the pump OFF immediately after fluid stops flowing.
4. Disconnect Lathe from power.
5. Remove the vented cover shown in Figure 78 and slide the tank half way out of the base, as shown in Figure 79.

If necessary, disconnect the fluid hose from the pump, where shown in Figure 79.

6. Pour out the old cutting fluid into your 5-gallon bucket and close the lid.
7. Flush the tank with hot soapy water, making sure the intake screen at the bottom of the pump intake pipe (inside the tank) is clean, and wipe up any remaining fluid residue.
8. Slide the tank partially into the base and reconnect the fluid hose.
9. Refill the tank with new cutting fluid, then slide the tank completely into the base.
10. Connect Lathe to power.
11. Open the valve on the cutting fluid nozzle.
12. Turn the cutting fluid pump ON to verify that fluid cycles properly, then turn it OFF.

Machine Storage

If the machine is not properly prepared for storage, it may develop rust or corrosion. If decommissioning this machine, use the steps in this section to ensure that it remains in good condition for later use.

To prepare your machine for short-term storage (up to a year):

1. Pump out the old cutting fluid and flush the lines and tank.
2. Disconnect Lathe from power.
3. Thoroughly clean all unpainted, bare metal surfaces, then apply a liberal coat of way oil.
4. Lubricate the machine as outlined in the lubrication section.
5. Cover and place the machine in a dry area that is out of direct sunlight and away from hazardous fumes, paint, solvents, or gas. Fumes and sunlight can bleach or discolor paint and make plastic guards cloudy.
6. Once or twice a month, depending on the ambient humidity levels in the storage environment, wipe down the machine as outlined in Step 3.
7. Every few months, start the machine and run all gear-driven components for a few minutes. This will keep the bearings, bushings, gears, and shafts well lubricated and protected from corrosion, especially during the winter months.

To prepare your machine for long-term storage (a year or more):

1. If the machine has oil-lubricated gearboxes, bring the machine to operating temperature and drain and refill all gearboxes with fresh oil.
2. Pump out the old cutting fluid and flush the lines and tank.
3. Disconnect Lathe from power.
4. Thoroughly clean all unpainted, bare metal surfaces, then apply a liberal coat of way oil, a 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.
6. Loosen or remove machine belts so they do not become stretched during the storage period. Be sure to also affix a maintenance note on the machine 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 and place the machine in a dry area that is out of direct sunlight and away from hazardous fumes, paint, solvents, or gas. Fumes and sunlight can bleach or discolor paint and make plastic guards cloudy.

Backlash Adjustment

Compound Leadscrew

Backlash is adjusted by tightening the set screws shown in Figure 80. When these screws are adjusted against the leadscrew nut, they offset part of the half nut to remove play between the nut and leadscrew.

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

To readjust the backlash, rock the handle back and forth, and tighten the screws slowly until the backlash is at approximately 0.025mm as indicated on the handwheel dial.

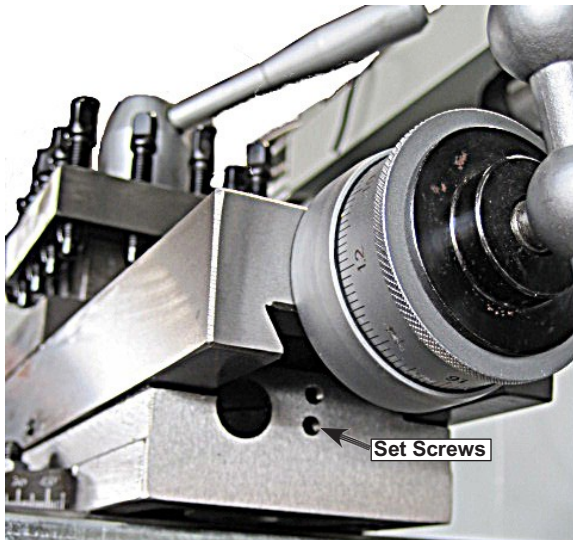


Figure 80. Compound slide backlash adjustment set screws.

Cross Slide Leadscrew

Backlash can be felt by turning the cross slide handwheel in one direction, then turning the handwheel the other direction, then noticing the amount the handwheel moves while the cross slide does not. When the cross slide begins to move, the backlash has been taken up.

Backlash is adjusted by loosening all four cap screws shown in Figure 81, and then tightening the center set screw, which pushes down on a wedge and forces the half nut apart, taking up lash in the half nut and leadscrew. If you end up adjusting the half nut too tight, loosen the set screw, tap the cross slide a few times with a rubber or wooden mallet, and turn the handle slowly back-and-forth, until the handle turns freely.

To re-adjust the backlash, rock the handle back and forth and tighten the set screw slowly until the backlash is at approximately 0.025mm as indicated on the handwheel dial.

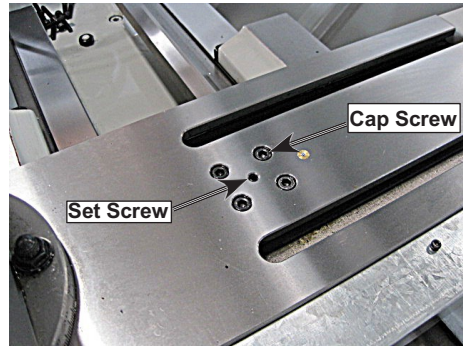


Figure 81. Compound slide backlash adjustment set screws.

Leadscrew End Play Adjustment

After a long period of time, you may find that the leadscrew develops a small amount of end play. This lathe is designed so that leadscrew end play can be easily removed with adjustment.

To remove leadscrew end play:

1. Disconnect Lathe from power.
2. Remove the three cap screws and end cover.
3. Loosen both retaining nut set screws shown in Figure 82.



Figure 82. Leadscrew end play adjustment.

4. Engage the half nut lever.
5. Rotate the carriage feed handwheel back and forth slightly and tighten the retaining nut at the same until the end play is removed.
6. Tighten both set screws and reinstall the cover.

Gib Adjustment

The goal of adjusting the cross slide, tailstock, saddle, and compound gib screws is to remove sloppiness in the ways without over-adjusting them to the point where the slides become stiff and difficult to move.

In general, loose gibs cause poor finishes and tool chatter; however, over-tightened gibs cause premature wear on the slide, leadscrew, and half nut, and are difficult to operate.

The gibs have a tapered shape and are held in position by screws at opposing ends of the slide. When the opposing screws are turned in the opposite directions from each other, the taper fills the void between the sliding components.

The gib adjustment process usually requires some trial-and-error. Typically, you make a slight adjustment to the gib screw, then check the feel of the adjustment by turning the handwheel.

You then repeat this process as necessary until you find the best balance between loose and stiff movement. Most machinists find that the ideal gib adjustment is where a small amount of drag or resistance is present yet the handwheels are still easy to move.

Figures 83–86 show the location of the screws for each gib on this machine.

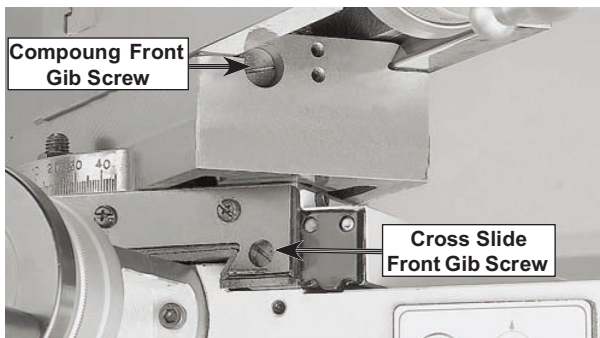


Figure 83. One of two cross slide and compound gib screws.



Figure 84. One of two rear saddle gib screws.



Figure 85. One of two front saddle gib screws.



Figure 86. One of two tailstock gib screws.

Half Nut Adjustment

The half nut mechanism can be tightened if it becomes loose from wear. The pressure exerted by the half nut is controlled by a gib similar to the one in the saddle. The half nut gib is adjusted with two set screws.

To adjust the half nut:

1. Open the half nut.
2. Remove the thread dial.
3. Turn the two half-nut adjustment set screws, shown in Figure 87, clockwise about 1/8th of a turn.

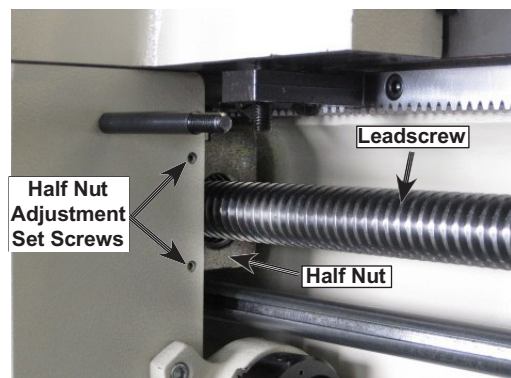


Figure 87. Half nut gib adjustment.

4. Open/close the half nut several times and notice how it feels (you may need to move the carriage handwheel slightly to get the half nut to close).

The half nut is correctly adjusted when it has a slight drag while opening and closing.

5. The movement should not be too stiff or too sloppy.
6. Repeat Steps 3 – 4, if necessary, until you are satisfied with the half nut adjustment. (If the half nut becomes too stiff, turn the set screws counterclockwise to loosen it.)
7. Re-install the thread dial.

Feedrod Clutch Adjustment

This lathe has an adjustable feed clutch that helps protect the drivetrain from overload.

The feed clutch release point is adjusted at the factory. However, it can be easily adjusted depending on operator requirements.

To adjust the clutch release point:

1. Disconnect Lathe from power.
2. Remove the front and side feed access covers, as shown in Figure 88.



Figure 88. Feed access covers removed.

3. Remove the clutch collar set screw, as shown in Figure 89.

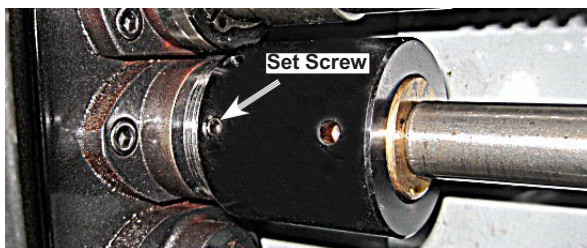


Figure 89. Removing set screw from clutch collar.

4. Insert the hex wrench into the collar adjustment hole shown in Figure 90, and use the wrench to rotate the clutch collar.

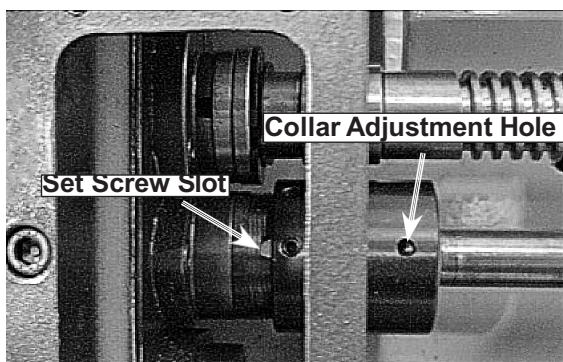


Figure 90. Feed clutch set screw alignment.

5. Line up the set screw hole in the clutch collar with the closest set screw slot that is cut into the feedrod.
6. Install and tighten the set screw so it is fully seated in the slot.
7. Reinstall both access covers.

V-Belts

V-belts stretch and wear with use, so they should be checked monthly to ensure optimal power transmission. Replace all the V-belts if any of them show signs of glazing, fraying, or cracking.

To adjust or replace the V-belts on the lathe:

1. Disconnect Lathe from power.
2. Remove the cover shown in Figure 91.

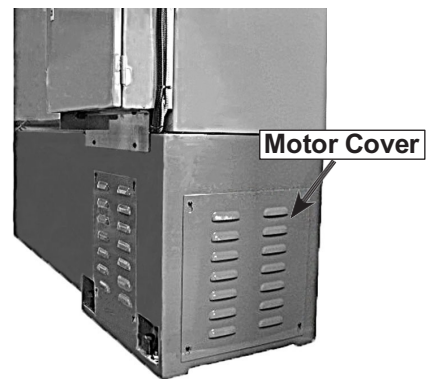


Figure 91. Location of motor cover.

3. Turn the hex nuts on the motor mount bolts shown in Figure 92 to move the motor mount plate up or down and adjust the V-belt tension. When correctly tensioned, each belt should have about 19mm deflection when pressed firmly.

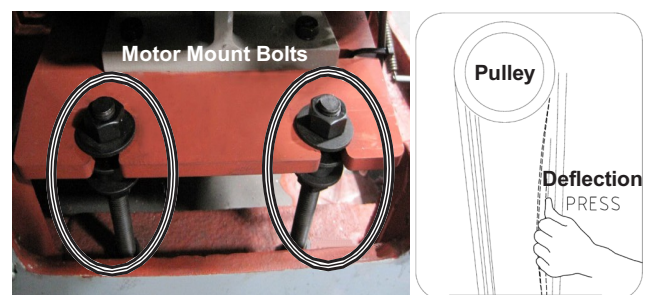


Figure 92. V-belt adjustment.

4. Firmly tighten the hex nuts (loosened in the previous step) against the motor mount plate to prevent it from moving out of adjustment during operation, then reinstall the motor cover.

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.

To adjust the brake and brake switch:

1. Disconnect Lathe from power.
2. Put on a respirator and eye protection to protect yourself from hazardous brake dust.
3. Remove the motor cover.
4. Measure the remaining brake band lining at the thinnest point, which is usually at the 8 o'clock position, as shown in Figure 93.

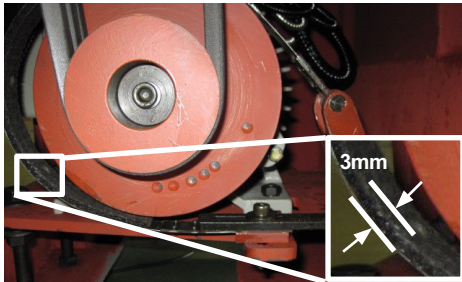


Figure 93. Minimum brake band lining thickness.

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, which will substantially increase the cost of repair, compared to just replacing the brake band.

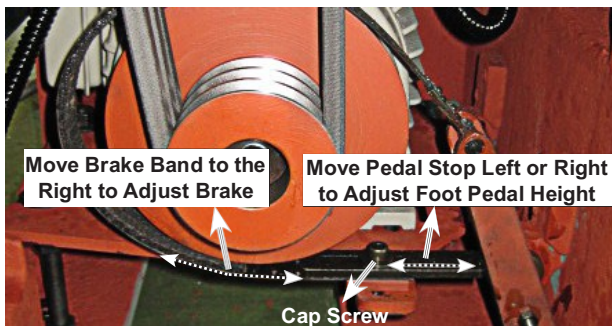


Figure 94. Brake linkage adjustments.

5. Remove pedal stop shown in Figure 95.
6. Move the brake band to the right one hole, and reinstall the pedal stop, tightening it until it is just snug.

7. Firmly push the pedal lever (Figure 95) 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 95).

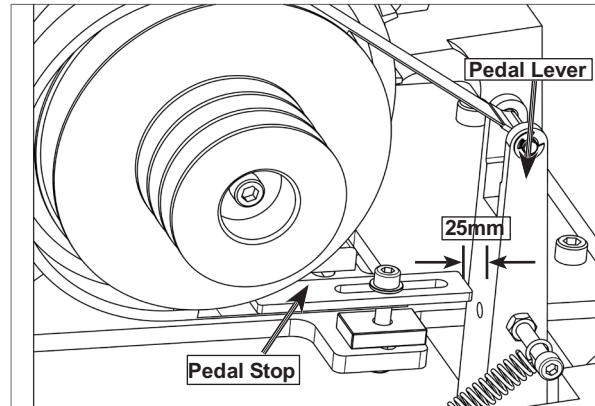


Figure 95. Pedal travel adjustment.

9. Tighten the cap screw on the pedal stop.
10. Locate the motor kill switch (shown in Figure 96) at the tailstock end of the lathe.

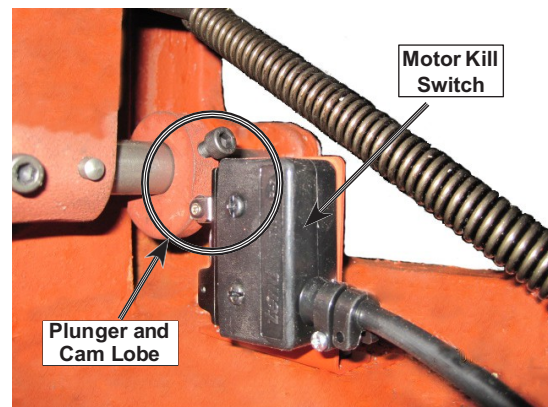


Figure 96. Motor kill switch.

11. Push the pedal lever down to verify that the cam lobe pushes the kill switch plunger in.
12. When pushed in, you should hear the switch click.
13. Reinstall the cover, test the brake operation.

Leadscrew Shear Pin Replacement

To replace the shear pin:

1. Disconnect Lathe from power.
2. Remove the front and side feed access covers, as shown in Figure 97.



Figure 97. Feed access covers removed.

3. Rotate the shroud washer so the cutout lines up with the shear pin head, as shown in Figure 98.

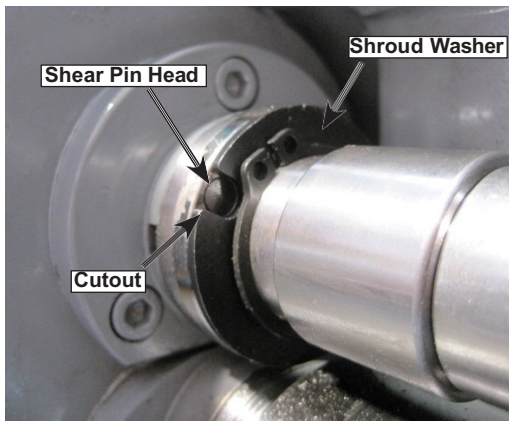


Figure 98. Shroud washer / pin alignment.

4. Put on safety glasses.
5. Remove the retaining ring from its groove and place it in the rear-most position away from the shroud washer.
6. Move the shroud washer away from the shear pin (to the rear position), so there is enough of a gap to remove the shear pin.

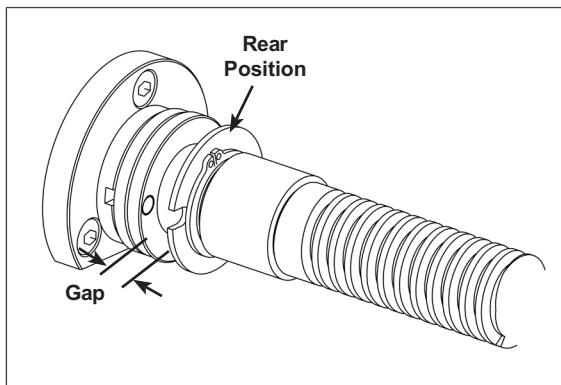


Figure 99. Shear pin access.

7. Use the magnet to remove the shear pin head, then rotate the lathe spindle to line up the inner and outer bores. Next, use the magnet to remove the other half of the broken shear pin when it becomes visible.
8. Insert a blow gun tip into the shear pin hole, blow out the hole with compressed air, and put a drop of oil in the hole.
9. Insert the new shear pin into the bore, as shown in Figure 100.

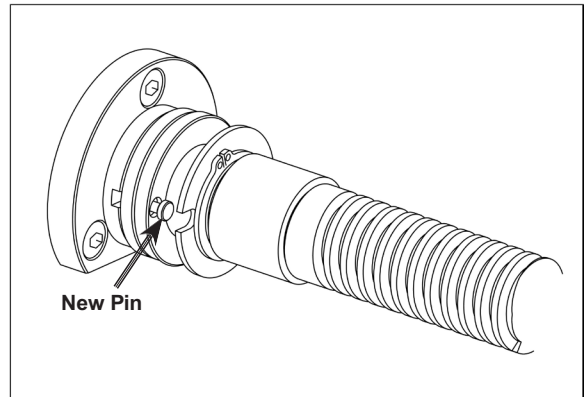


Figure 100. New shear pin installed in bore.

10. 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° until it covers the head of the shear pin, as shown in Figure 101.

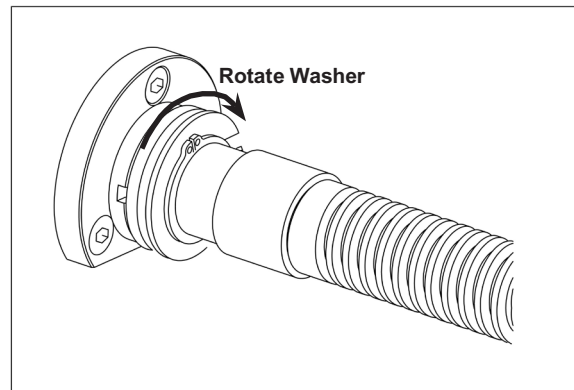


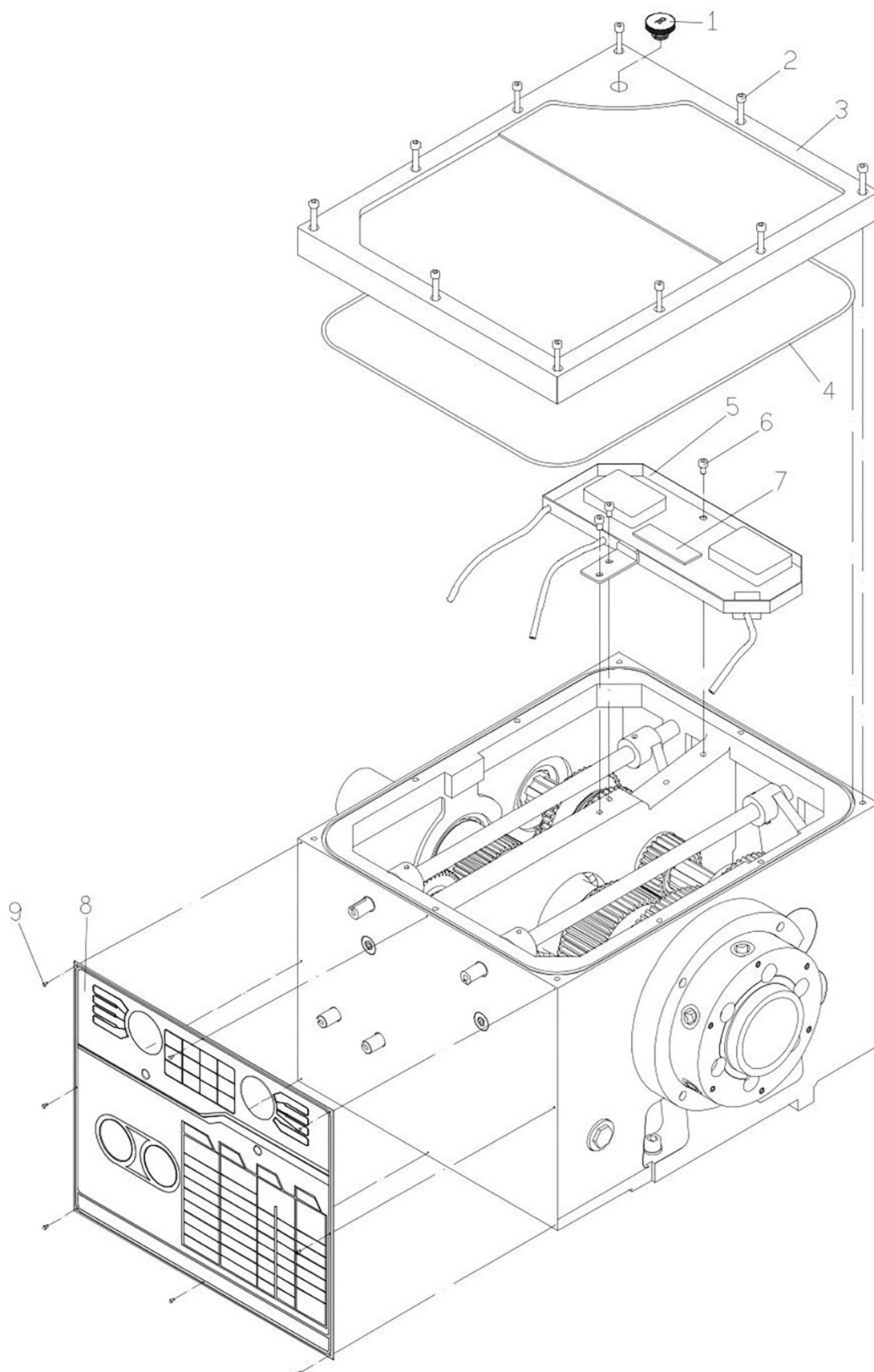
Figure 101. Shroud washer positioning.

11. Using retaining ring pliers, return the retaining ring to its groove, and position the retaining ring ears over the shear pin head, to prevent the shear pin from falling out—if the shroud washer rotates into alignment with the pin access groove lines.
12. Reinstall the access covers.

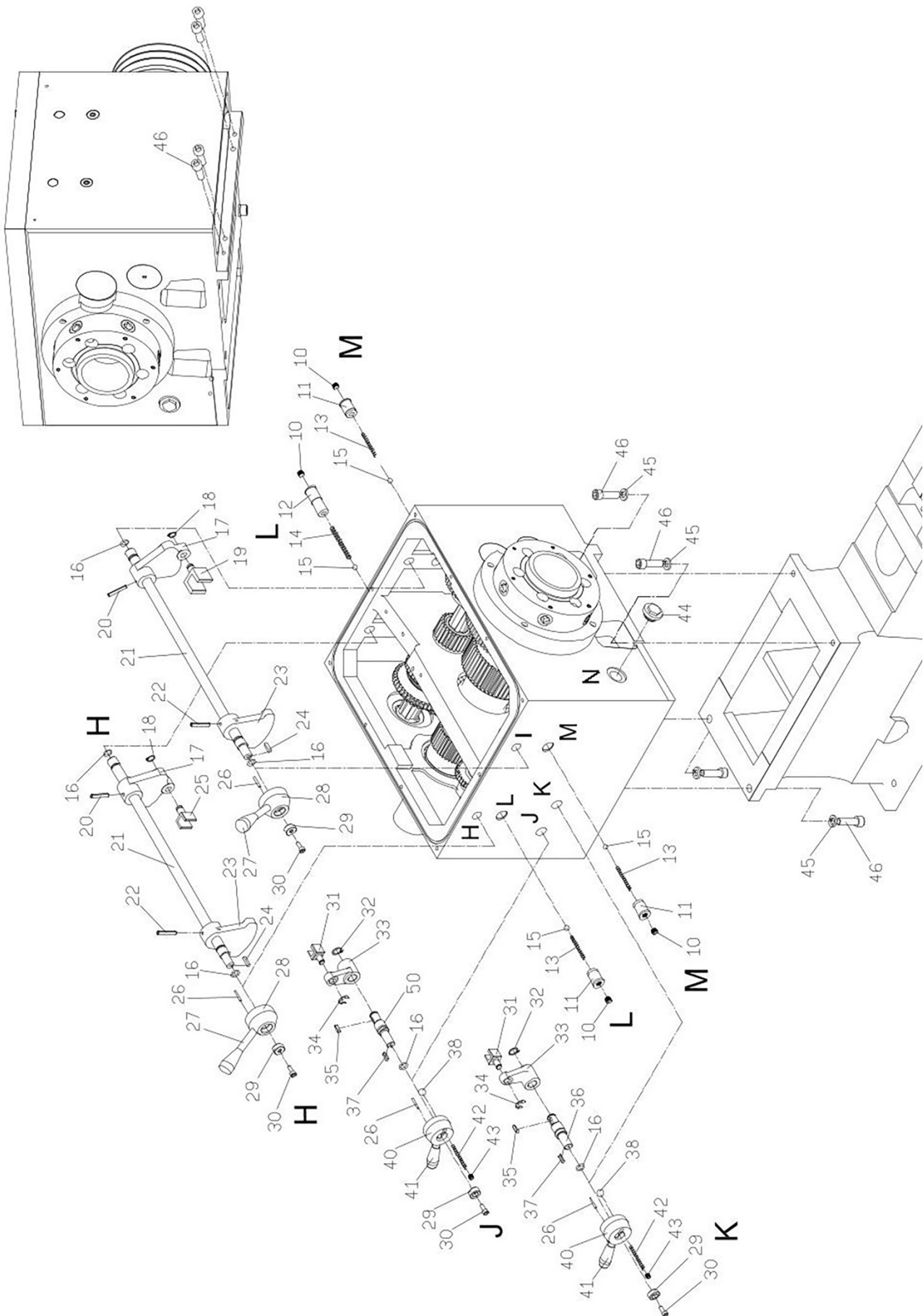
Service Parts

To order parts or reach our service department, call 1-800-274-6848 Monday through Friday (see our website for business hours, www.jettools.com). Having the Model Number and Serial Number of your machine available when you call will allow us to serve you quickly and accurately.

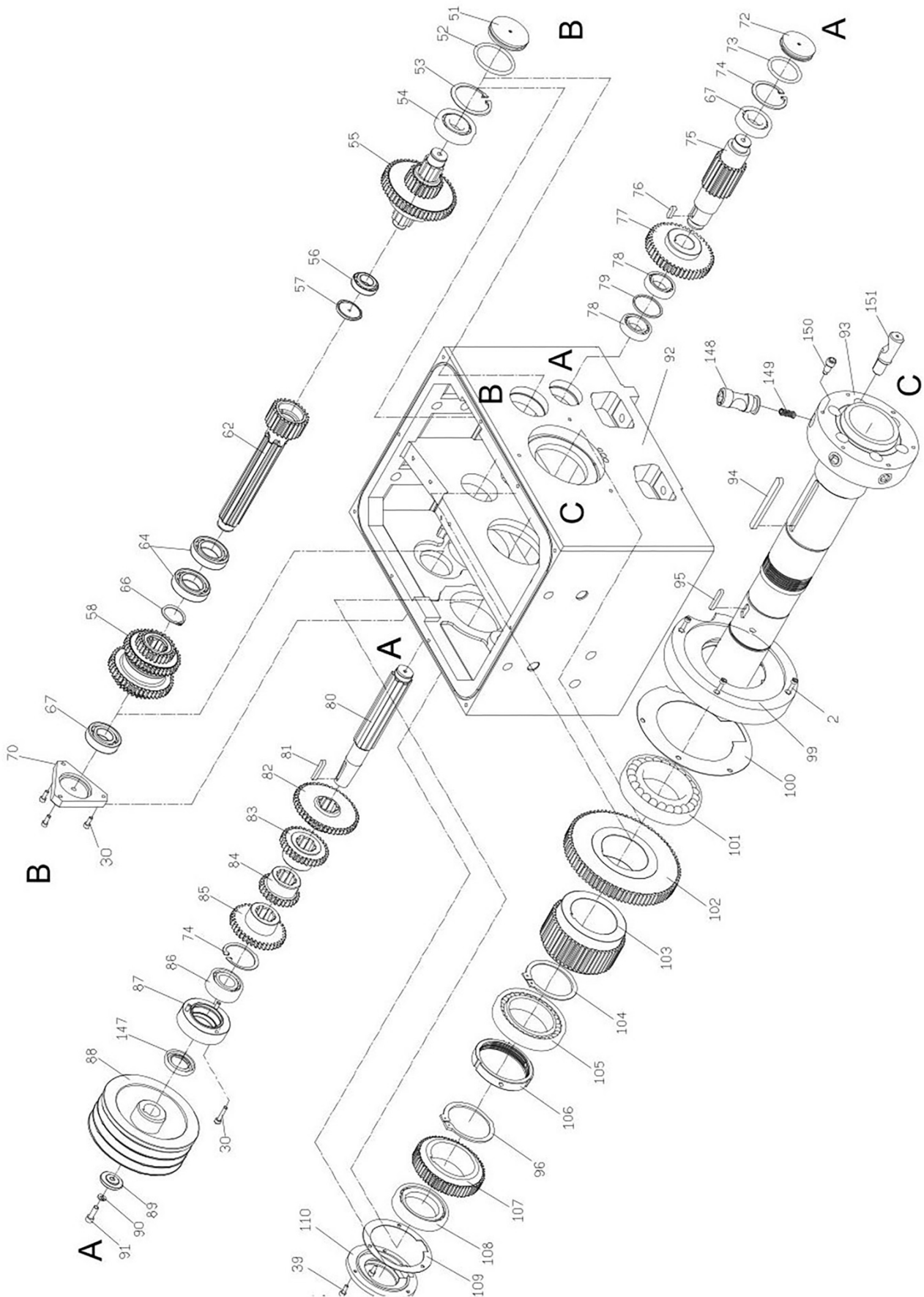
Headstock Assembly I – Exploded View



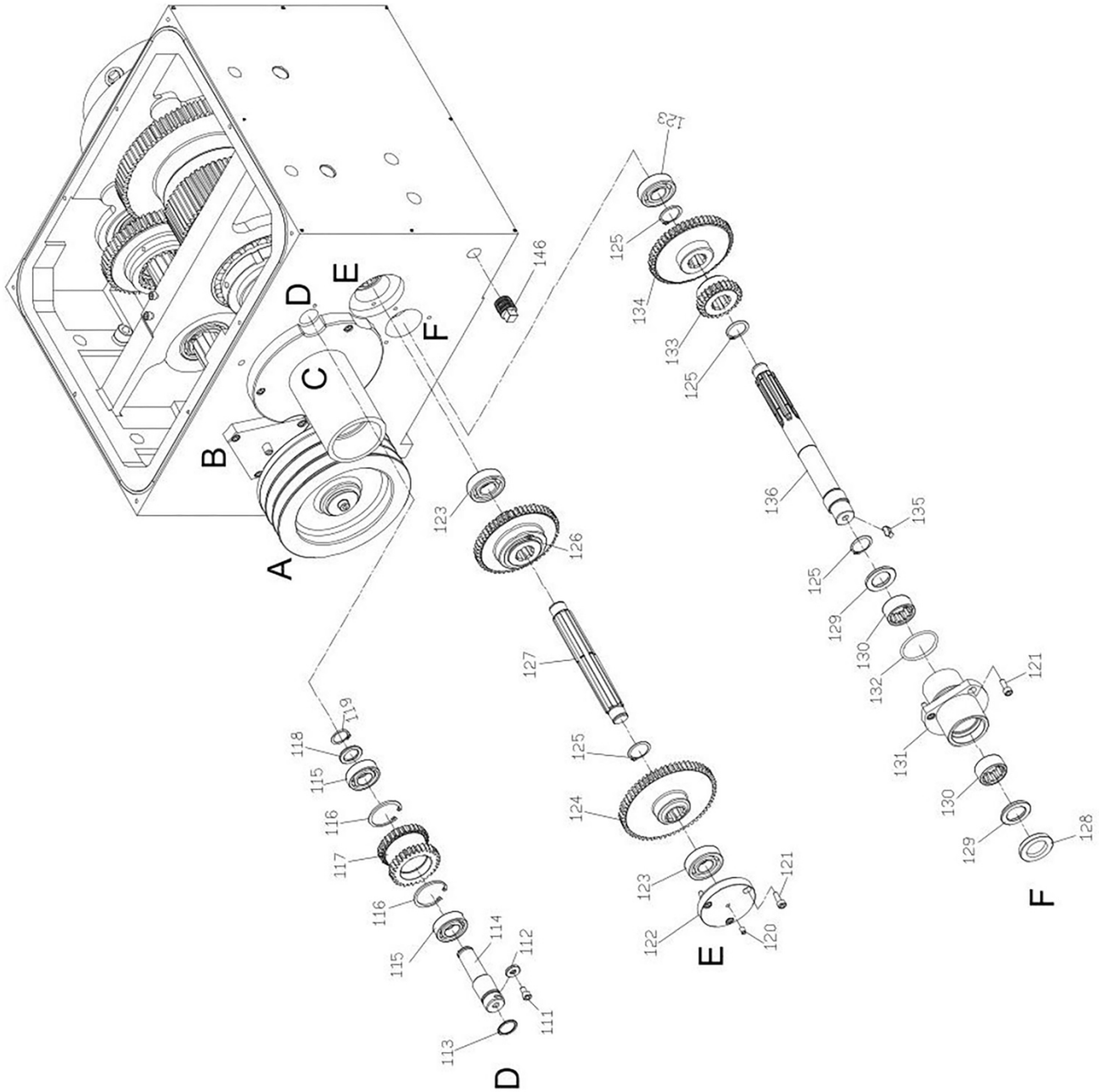
Headstock Assembly II – Exploded View



Headstock Assembly III – Exploded View



Headstock Assembly IV – Exploded View



Headstock Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Oil Cover	3/4"	1
2	**	Hex. Socket Head Bolt	CAP M6x40	16
3	**	Headstock Cover		1
4	**	"O" Ring	Ø4x1700	1
5	**	Oil Tank		1
6	**	Hex. Socket Head Bolt	CAP M6x10	3
7	**	Magnetic Iron Plate		1
8	**	Name Plate		1
9	**	Rivet	Ø2	8
10	**	Set Screw	M10x10L	4
11	**	Bush		3
12	**	Bush		1
13	**	Spring	Ø8x45L	3
14	**	Spring	Ø8x66L	1
15	**	Steel Ball	Ø8.5	4
16	**	"O" Ring	P14	6
17	**	Lever		1
18	**	Clip	S12	2
19	**	Fork		1
20	**	Spring Pin	Ø6x36	2
21	**	Rod		2
22	**	Spring Pin	Ø6x40	2
23	**	Lever		1
24	**	Key	5x5x22L	2
25	**	Fork		1
26	**	Spring Pin	Ø3x24	4
27	**	Handle		2
28	**	Hub		2
29	**	Washer		4
30	**	Hex. Socket Head Bolt	M6x16	19
31	**	Fork		2
32	**	Clip	S15	2
33	**	Lever		2
34	**	Clip	E8	2
35	**	Key	5x5x16L	2
36	**	Shaft		2
37	**	Key	5x5x16L	2
38	**	Steel Ball	Ø1/4"	2
39	**	Hex. Socket Head Bolt	M6x20	3
40	**	Hub		2
41	**	Handle		2
42	**	Spring	Ø6x27.5L	2
43	**	Set Screw	M8x8L	2
44	JT1-3064	Oil Sight	3/4"	1
45	**	Spring Washer	M12	4
46	**	Hex. Socket Head Bolt	M12x40	4
47	**	"O" Ring	G85	1
50	**	Shaft		1
51	**	Plug		1
52	**	O Ring	G65	1

SERVICE PARTS

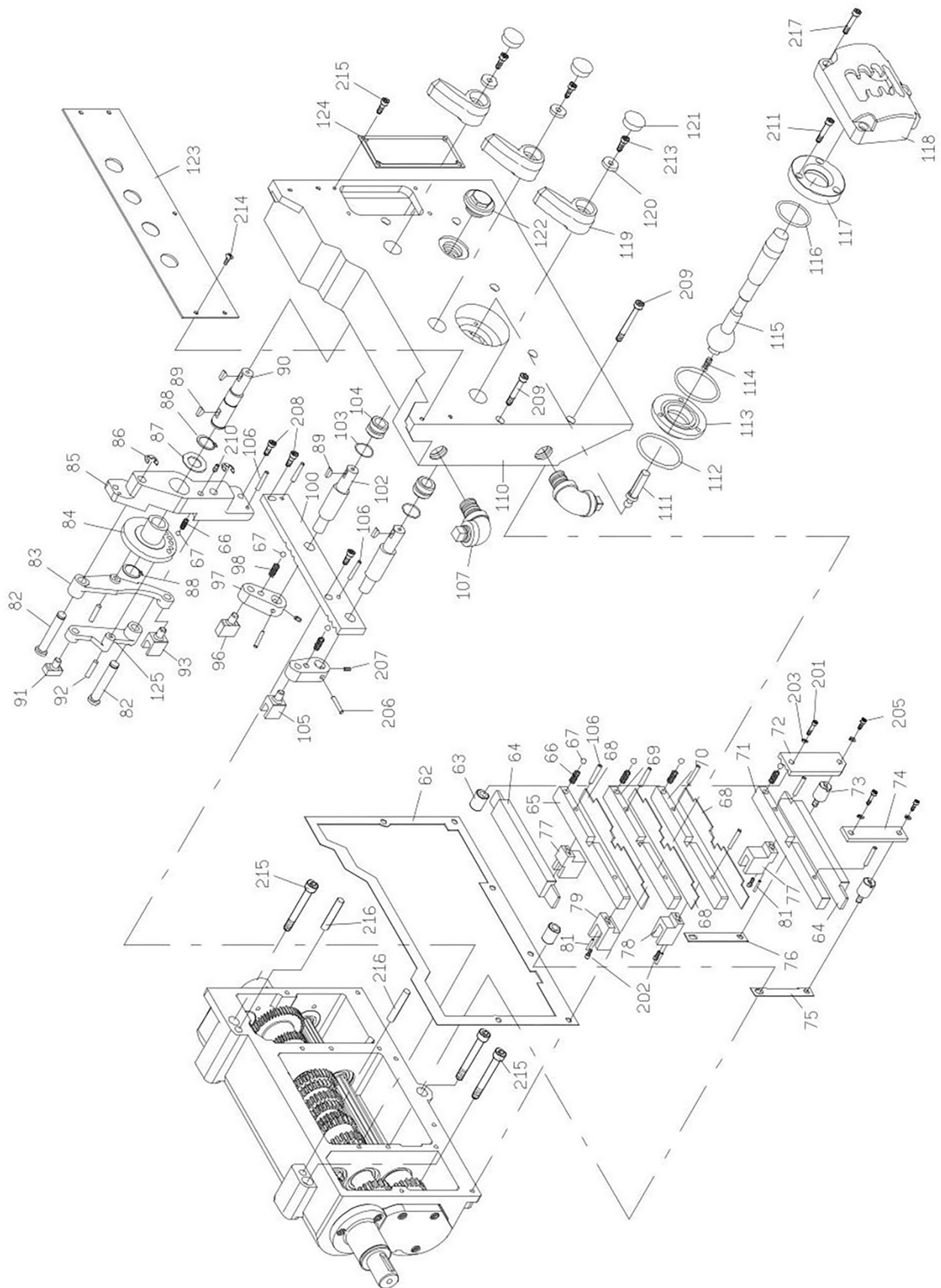
53	** **	Clip	R72	1
54	**	Ball Bearing	6306	1
Index	Part No.	Description	Size	Qty
55	**	Gear(82T)(52T), Key (8X7X22), Clip(S50), Shaft	Assembly for replacement	1
56	**	Double Law Deep Groove Ball Bearing	25BD4715DUL16	1
57	**	Washer		1
58	**	Gear(26T),(39T),(45T),(33T), Key (8X7X55), Clip(S55)	Assembly for replacement	1
62	**	Gear	25T	1
64	**	Ball Bearing	6008	2
66	**	Clip	S38	1
67	**	Ball Bearing	6206	2
70	**	Cover		1
72	**	Cover		1
73	**	O Ring	G55	1
74	**	Clip	R62	2
75	**	Shaft		
76	**	Key	8x7x25L	1
77	**	Gear	47T	1
78	**	Ball Bearing	6006	2
79	**	Collar		1
80	**	Gear Shaft		1
81	**	Key	7x7x45L	1
82	**	Gear	46T	1
83	**	Gear	33T	1
84	**	Gear	27T	1
85	**	Gear	39T	1
86	**	Ball Bearing	5206	1
87	**	Cover		1
88	**	Pulley		1
89	**	Washer		1
90	**	Spring Washer	M8	1
91	**	Hex. Socket Head Bolt	M8x30	1
92	**	Head Stock		1
93	**	Spindle		1
94	**	Key	12x8x120L	1
95	**	Key	12x8x30L	1
96	**	Clip	S80	1
99	**	Front Bearing Cover		1
100	**	Packing F		1
101	**	Ball Bearing	Taper 32019XU	1
102	**	Gear	82T	1
103	**	Gear	53T	1
104	**	Clip	S85	1
105	**	Ball Bearing	32017XU	1
106	**	Nut	YSR85	1
107	**	Gear	62T	1
108	**	Ball Bearing	6216	1
109	**	Packing O		1
110	**	Outside Cover		1
111	**	Hex. Socket Head Bolt	M6x12	1
112	**	Washer		1
113	**	"O" Ring	P20	1
114	**	Shaft		1

SERVICE PARTS

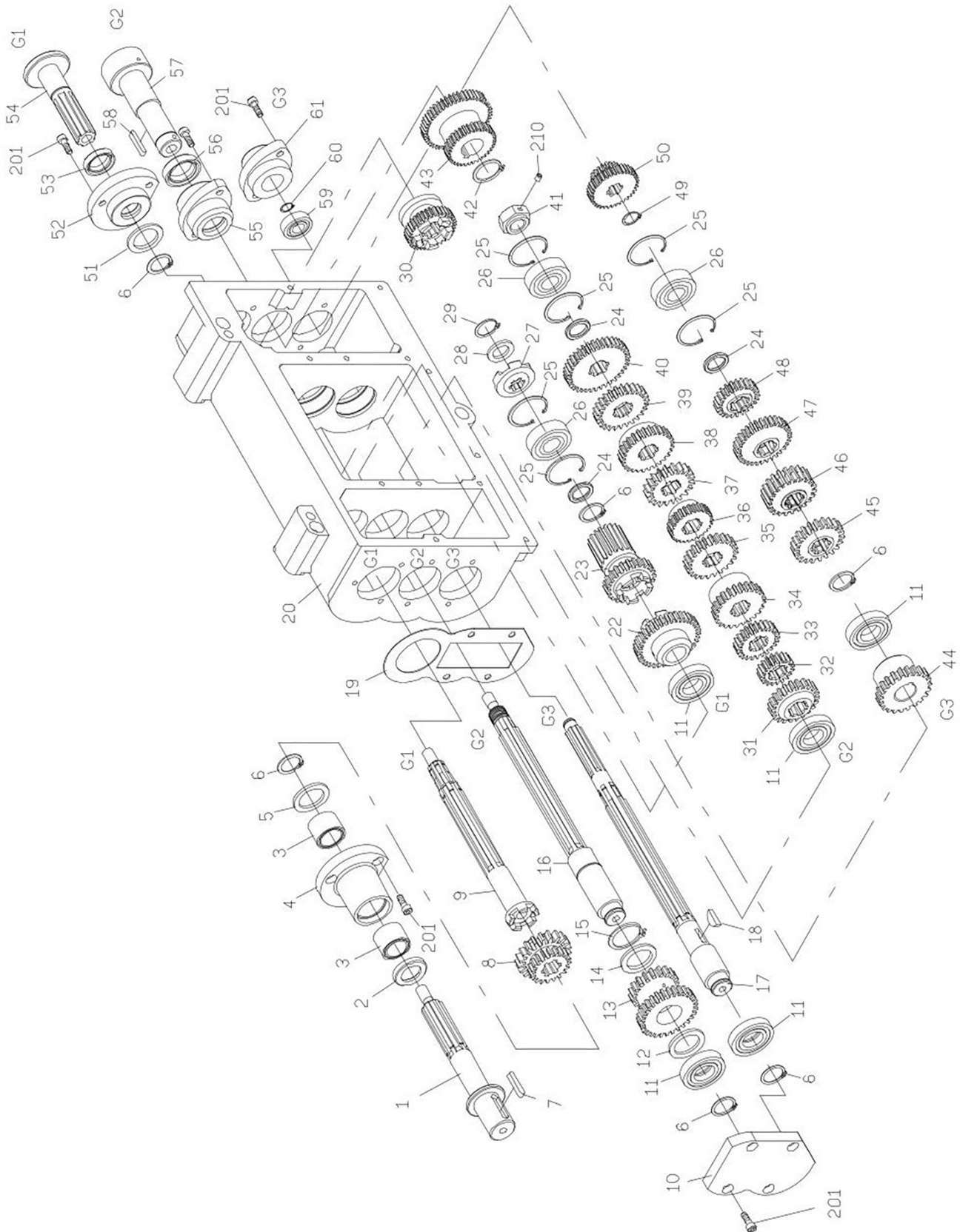
115	**	Ball Bearing	6004	2
116	**	Clip	R42	2
Index	Part No.	Description	Size	Qty
117	**	Gear	42T	1
118	**	Washer		1
119	**	Clip	S20	1
120	**	Set Screw	M6x8	1
121	**	Hex. Socket Head Bolt	M6x16	6
122	**	Cover		1
123	**	Ball Bearing	6204	3
124	**	Gear	62T	1
125	**	Clip	S25	4
126	**	Gear(27T),(54T), Key (7X7X20), Clip(S45)	Assembly for replacement	1
127	**	Shaft		1
128	**	"O" Ring	TC 25x44x7	2
129	**	Washer	21T	2
130	**	Ball Bearing	RNA 6904	2
131	**	Gear	S25	1
132	**	"O" Ring	P44	1
133	**	Gear	27T	1
134	**	Gear	54T	1
135	**	Key	7x7x16	1
136	**	Shaft		1
146	**	Plug	PT1-2	1
147	**	Oil Seal	TC305008	1
148	**	Cams		6
149	**	Spring		6
150	**	Set Screw		6
151	**	Cams		6

** These parts are shown for reference only and are not available for order individually. Non-proprietary parts, such as fasteners, can usually be found at local hardware stores.

Gearbox Assembly I – Exploded View



Gearbox Assembly II – Exploded View



SERVICE PARTS

Gearbox Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Shaft		1
2	**	Oil Seal	20x32x05	1
3	**	Bearing	TAF202820	2
4	**	Flanged Bearing		1
5	**	Washer		1
6	**	Clip	S20	6
7	**	Key	7x7x30	1
8	**	Gear	19T/20T	1
9	**	Shaft		1
10	**	Cover		1
11	**	Bearing	16004	5
12	**	Washer		1
13	**	Gear	19T/30T	1
14	**	Washer		1
15	**	Clip	S25	1
16	**	Shaft		1
17	**	Shaft		1
18	**	Woodruff Key	5xØ19	1
19	**	Packing		1
20	**	Gearbox Body		1
22	**	Gear	38T	1
23	**	Gear	23T/19T	1
24	**	Washer		3
25	**	Clip	R40	6
26	**	Bearing	6203	3
27	**	Clutch		1
28	**	Washer		1
29	**	Clip	S16	1
30	**	Gear	35T	1
31	**	Gear	22T	1
32	**	Gear	19T	1
33	**	Gear	20T	1
34	**	Gear	24T	1
35	**	Gear	23T	1
36	**	Gear	27T	1
37	**	Gear	24T	1
38	**	Gear	28T	1
39	**	Gear	26T	1
40	**	Gear	38T	1
41	**	Nut		1
42	**	Clip	S22	1
43	**	Gear	36T/50T	1
44	**	Gear	22T	1
45	**	Gear	22T	1
46	**	Gear	22T	1
47	**	Gear	33T	1
48	**	Gear	22T	1
49	**	Clip	S17	1
50	**	Gear	20T/36T	1
51	**	Washer		1
52	**	Flanged Bearing		1
53	**	Oil Seal	20x32x05	1

SERVICE PARTS

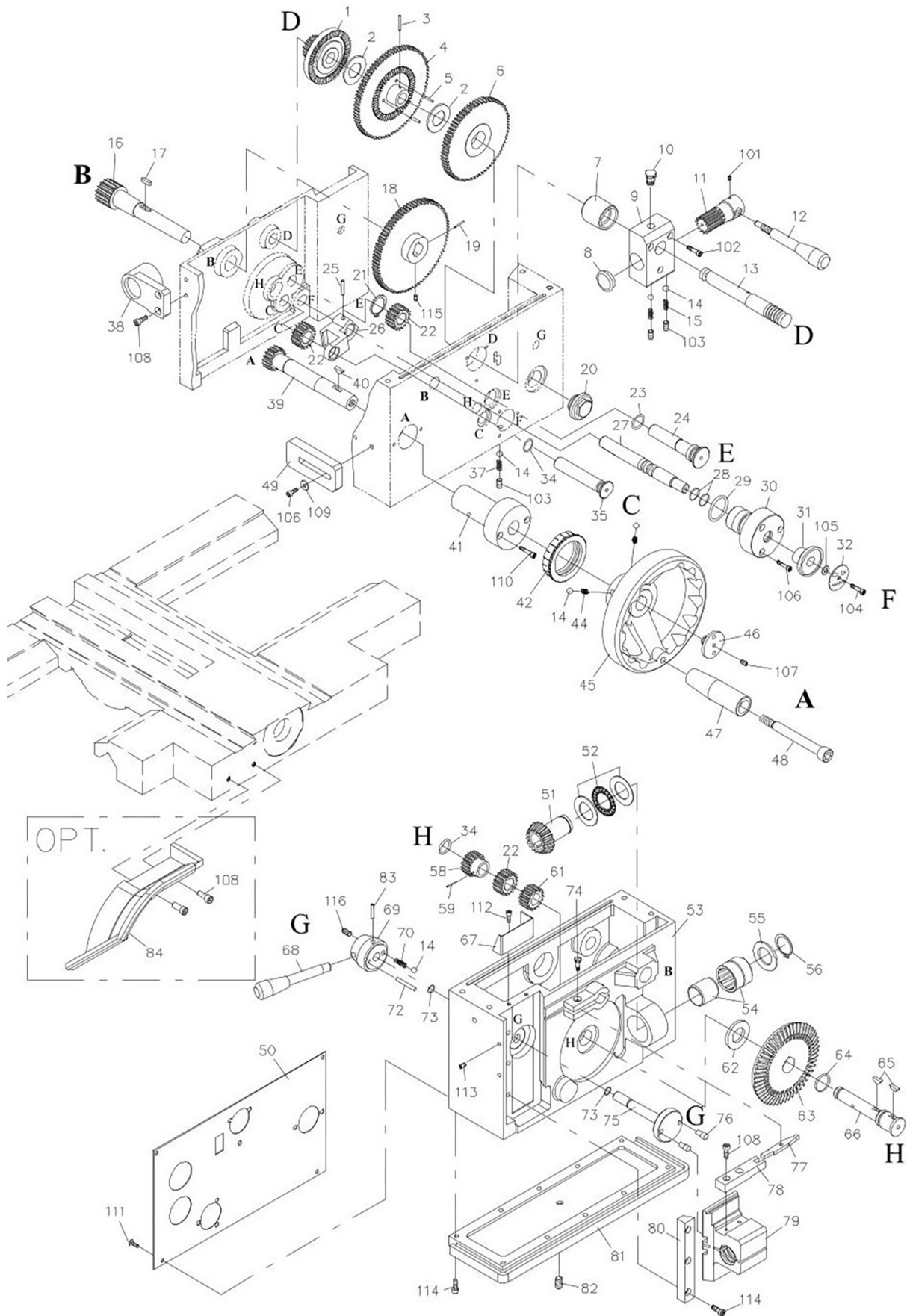
Index	Part No.	Description	Size	Qty
54	**	Shaft		1
55	**	Flanged Bearing		1
56	**	Oil Seal	24x35x08	1
57	**	Shaft		1
58	**	Key	5x5x35	1
59	**	Bearing	6001	1
60	**	Clip	S12	1
61	**	Flanged Bearing		1
62	**	Packing		1
63	**	Partition Nut		2
64	**	Upper Plate		2
65	**	Fort Support		1
66	**	Spring	Ø6.35x18	5
67	**	Steel Ball	1/4"	7
68	**	Partition		3
69	**	Fort Support		1
70	**	Fort Support		1
71	**	Fort Support		1
72	**	Reverse-Stop		1
73	**	Spacer		2
74	**	Shoulder Plate		1
75	**	Fixed Plate A		1
76	**	Fixed Plate B		1
77	**	Fork		2
78	**	Fork		1
79	**	Fork		1
81	**	Spring Pin	Ø3x16	8
82	**	Shaft		2
83	**	Lever		1
84	**	Cam		1
85	**	Support Seat		1
86	**	Clip	E8	2
87	**	Washer		1
88	**	Clip	S17	2
89	**	Woodruff Key	4xØ13	4
90	**	Shaft		1
91	**	Fork		1
92	**	Pin		2
93	**	Fork		1
96	**	Pad		1
97	**	Lever		2
98	**	Spring	Ø6x13	2
100	**	Selector Bar		1
102	**	Shaft		2
103	**	O-Ring	P18	2
104	**	Bush		2
105	**	Fork		1
106	**	Spring Pin	Ø5x16	12
107	**	Square Head Plug(1/2"), Elbow(1/2"), Nipple(1/2"X1")	Assembly for replacement	2
110	**	Gearbox Cover		1
111	**	Selector Lever		1
112	**	O-Ring	G40	2
113	**	Selector Lever Support		1

SERVICE PARTS

Index	Part No.	Description	Size	Qty
114	**	Spring		1
115	**	Selector Lever		1
116	**	O-Ring	G30	1
117	**	Selector Lever Cover		1
118	**	Specifying Base		1
119	**	Handle		3
120	**	Washer		3
121	**	Plug		3
122	JT1-3064	Oil Sight		1
123	**	Switch Plate		1
124	**	Plate		1
125	**	Arm		1
201	**	Hex. Socket Head Bolt	CAP 6x12	19
202	**	Hex. Socket Head Bolt	CAP 5x20	4
203	**	Spring Washer	M6	4
205	**	Hex. Socket Head Bolt	CAP 6x35	2
206	**	Spring Pin	Ø4x24	2
207	**	Set Screw	SET 6x8	2
208	**	Hex. Socket Head Bolt	CAP 6x20	4
209	**	Hex. Socket Head Bolt	CAP 6x70	6
210	**	Set Screw	SET 5x6	
211	**	Hex. Socket Head Bolt	CAP 5x25	3
212	**	Set Screw	SET 8x8	1
213	**	Hex. Socket Head Bolt	CAP 5x12	3
214	**	Dome Cross Screw	M4x6	5
215	**	Hex. Socket Head Bolt	CAP 8x65	3
216	**	Taper Pin	#7x3 1/4"	2
217	**	Hex. Socket Head Bolt	CAP 6x25	3

** These parts are shown for reference only and are not available for order individually. Non-proprietary parts, such as fasteners, can usually be found at local hardware stores.

Apron Assembly – Exploded View



SERVICE PARTS

Apron Assembly – Parts List

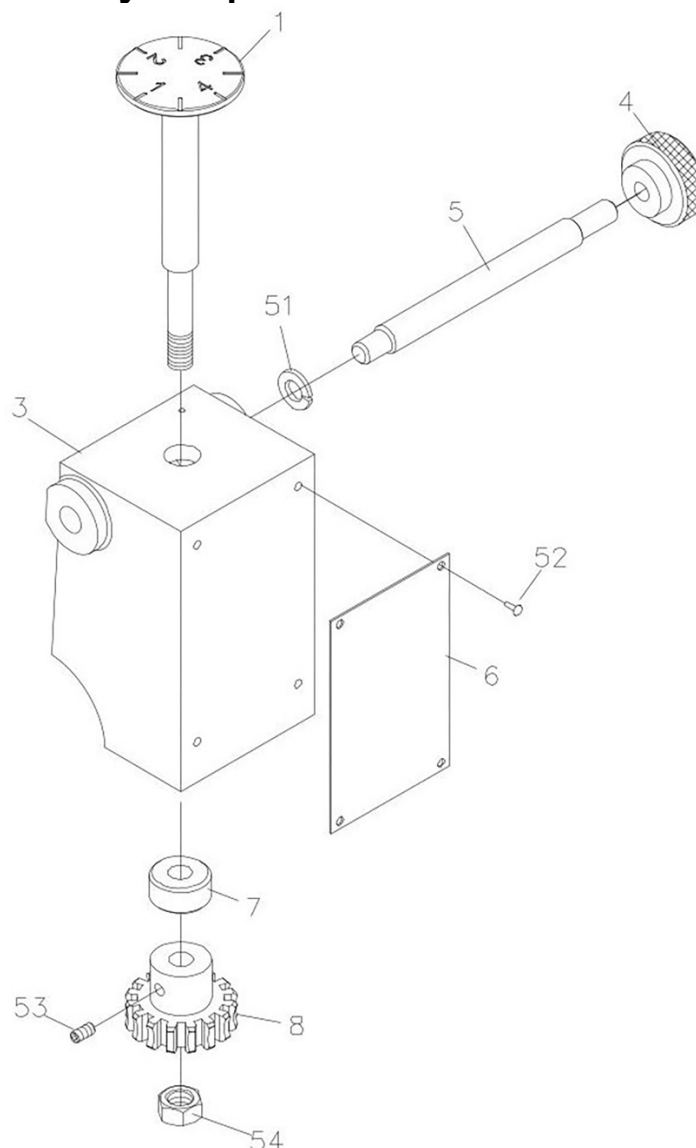
Index	Part Nol	Description	Size	Qty
1	**	Gear	18T/60T	1
2	**	Washer	AS3047	2
3	**	Spring Pin	Ø4x22	1
4	**	Gear	81T/60T	1
5	**	Pin	Ø4x16	3
6	**	Gear	72T/60T	1
7	**	Collar		1
8	**	Plug		1
9	**	Gear Bracket		1
10	**	Oil Cap		1
11	**	Cam Shaft		1
12	**	Handle		1
13	**	Shaft		1
14	**	Steel Ball	1/4"	7
15	**	Spring	Ø6x13	2
16	**	Gear Shaft	16T	1
17	**	Key	5x5x16	1
18	**	Gear	81T	1
20	JT1-3064	Oil Sight		1
21	**	Clip	S16	1
22	**	Gear	18T	3
23	**	O Ring	P18	2
24	**	Shaft		1
25	**	Spring Pin	Ø4x24	1
26	**	Fork		1
27	**	Shaft		1
28	**	O Ring	P16	2
29	**	O Ring	P26	1
30	**	Shaft Liner		1
31	**	Knob		1
32	**	Plate		1
34	**	O Ring	P12	2
35	**	Shaft		1
37	**	Spring	Ø4x19	1
38	**	Bracket		1
39	**	Gear Shaft	18T	1
40	**	Woodruff Key	19xØ5	1
41	**	Shaft Liner		1
42	**	Index Ring		1
44	**	Spring		3
45	**	Handle Wheel		1
46	**	Plug		1
47	**	Handle		1
48	**	Screw		1
49	**	Safety Plate		1
50	**	Plate		1
51	**	Bevel Gear	23T	1
52	**	Thrust Bearing	NTB/AS-2542	1
53	**	Apron		1
54	**	Bearing	NK29/30	1
55	**	Washer		1
56	**	Clip	S25	1

SERVICE PARTS

Index	Part Nol	Description	Size	Qty
58	**	Gear	18T	1
59	**	Spring Pin	Ø5x22	1
61	**	Gear	18T	1
62	**	Washer		1
63	**	Bevel Gear	64T	1
64	**	O Ring	P18	1
65	**	Woodruff Key	4xØ13	2
66	**	Shaft		1
67	**	Oil Fence		1
68	**	Handle		1
69	**	Hub		1
70	**	Spring	Ø6x27	1
72	**	Spring Pin	Ø4x24	1
73	**	O-Ring	P9	2
74	**	Screw		1
75	**	Cam Shaft		1
76	**	Pin		2
77	**	Lever		1
78	**	Stopper		1
79	**	Half Nut		1
80	**	Gib		1
81	**	Base Plate		1
82	**	Plug	1/8"	1
83	**	Spring Pin	Ø4x36	1
84	**	Handle Wheel Guard	OPT.	1
101	**	Set Screw	SET 5x6	1
102	**	Hex. Socket Head Bolt	CAP 5x35	3
103	**	Set Screw	SET 8x8	4
104	**	Dome Hexagon Screw	M5x12	1
105	**	Washer	M6	1
106	**	Hex. Socket Head Bolt	CAP 6x25	5
107	**	Set Screw	SET 6x25	1
108	**	Hex. Socket Head Bolt	CAP 6x16	4
109	**	Washer		2
110	**	Hex. Socket Head Bolt	CAP 5x25	2
111	**	Dome Cross Screw	M4x6	4
112	**	Hex. Socket Head Bolt	CAP 5x8	2
113	**	Set Screw	SET 6x6	2
114	**	Hex. Socket Head Bolt	CAP 5x16	15
115	**	Hex. Socket Head Bolt	CAP M6x12	1
116	**	Set Screw	SET 8x16	1
117	**	Clip	S18	1

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Dial Indicator Assembly – Exploded View

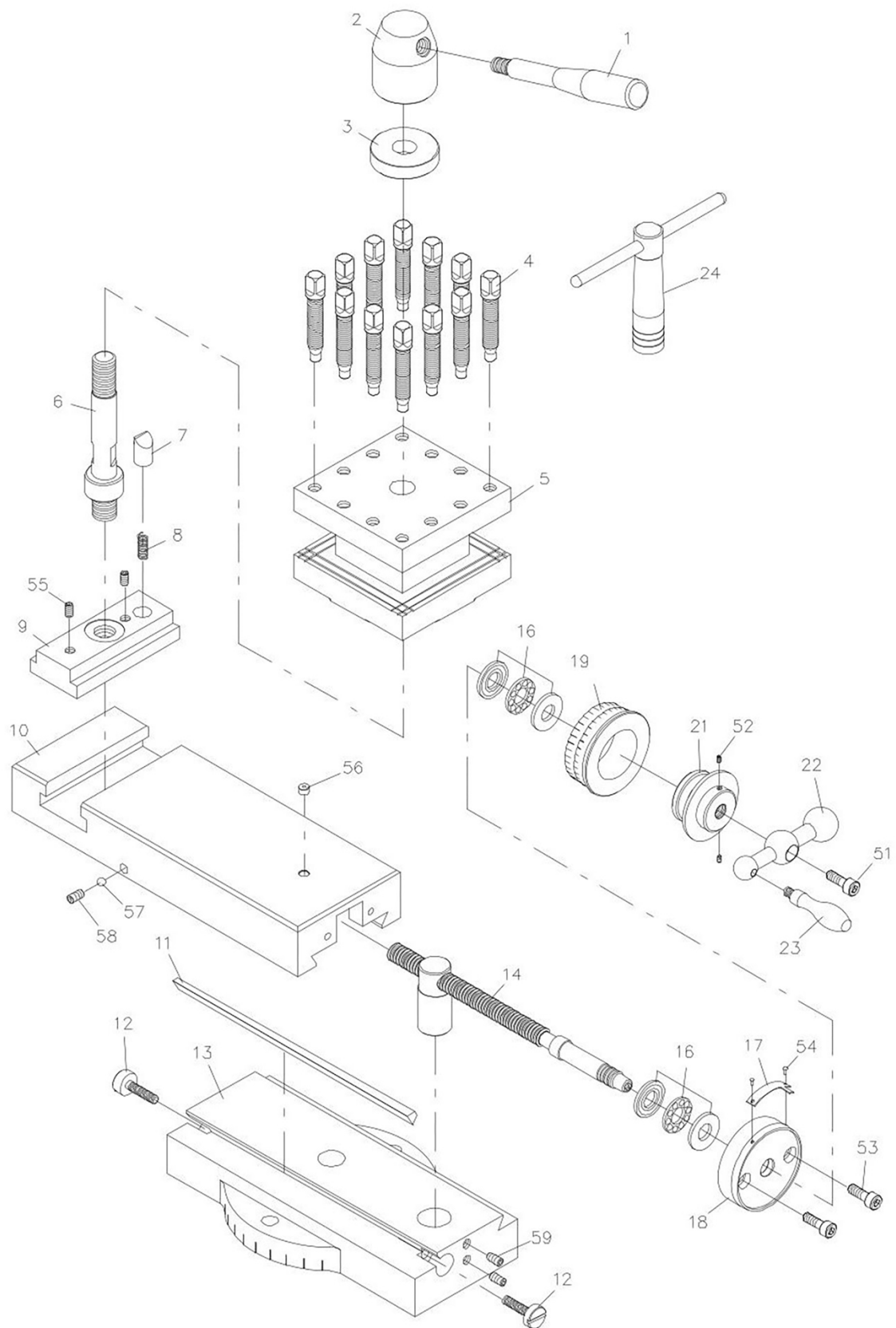


Dial Indicator Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Gear Pivot		1
3	**	Body		1
4	**	Nut		1
5	**	Stud		1
6	**	Threading Plate		1
7	**	Spacer		1
8	**	Dial Gear	16T	1
51	**	Spring Washer	M10	1
52	**	Rivet		4
53	**	Set Screw	M6x6L	1
54	**	Hexagon Nut	M8	1

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4-Way Tool Post Assembly – Exploded View

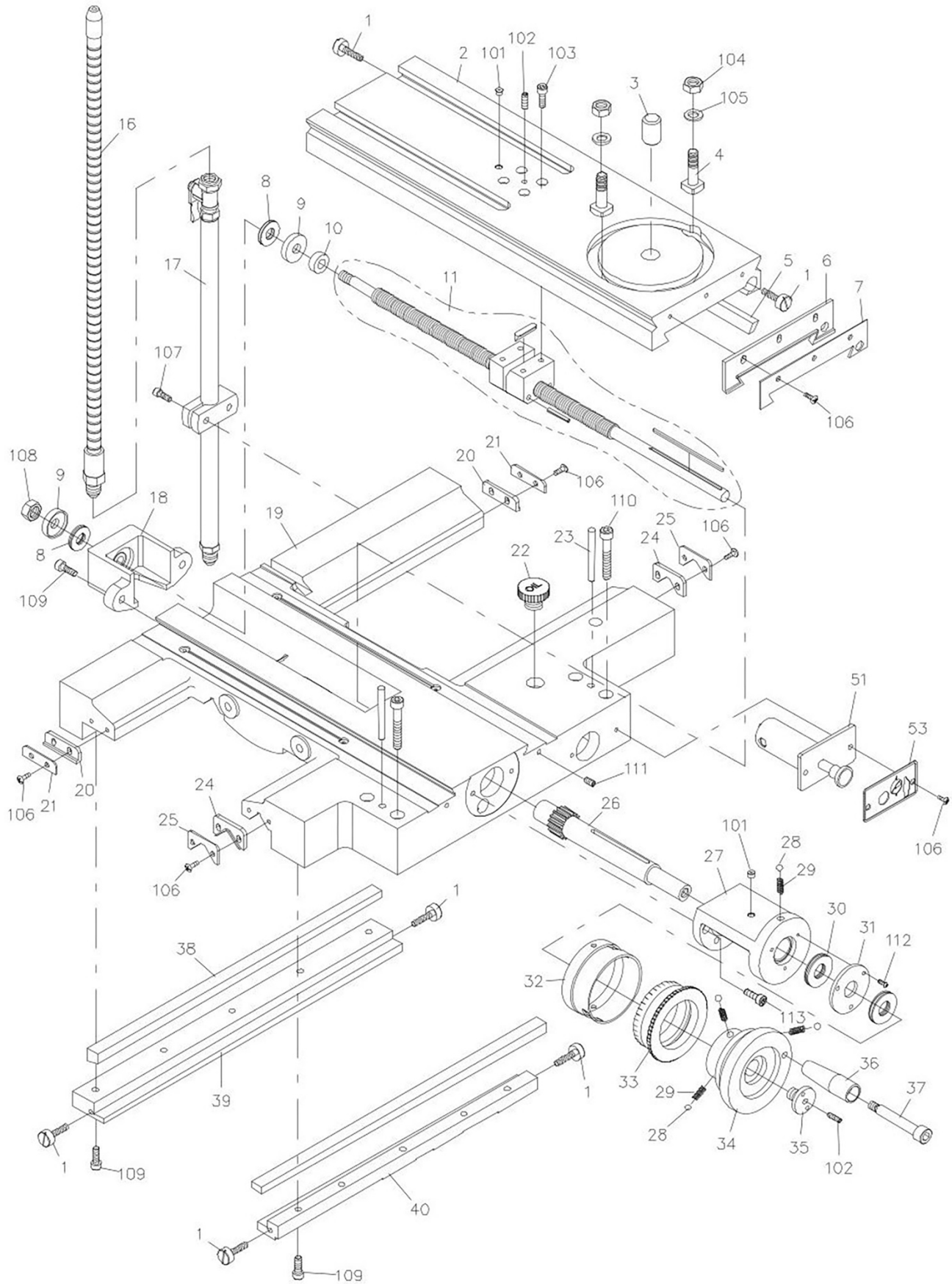


4-Way Tool Post Assembly – Parts List

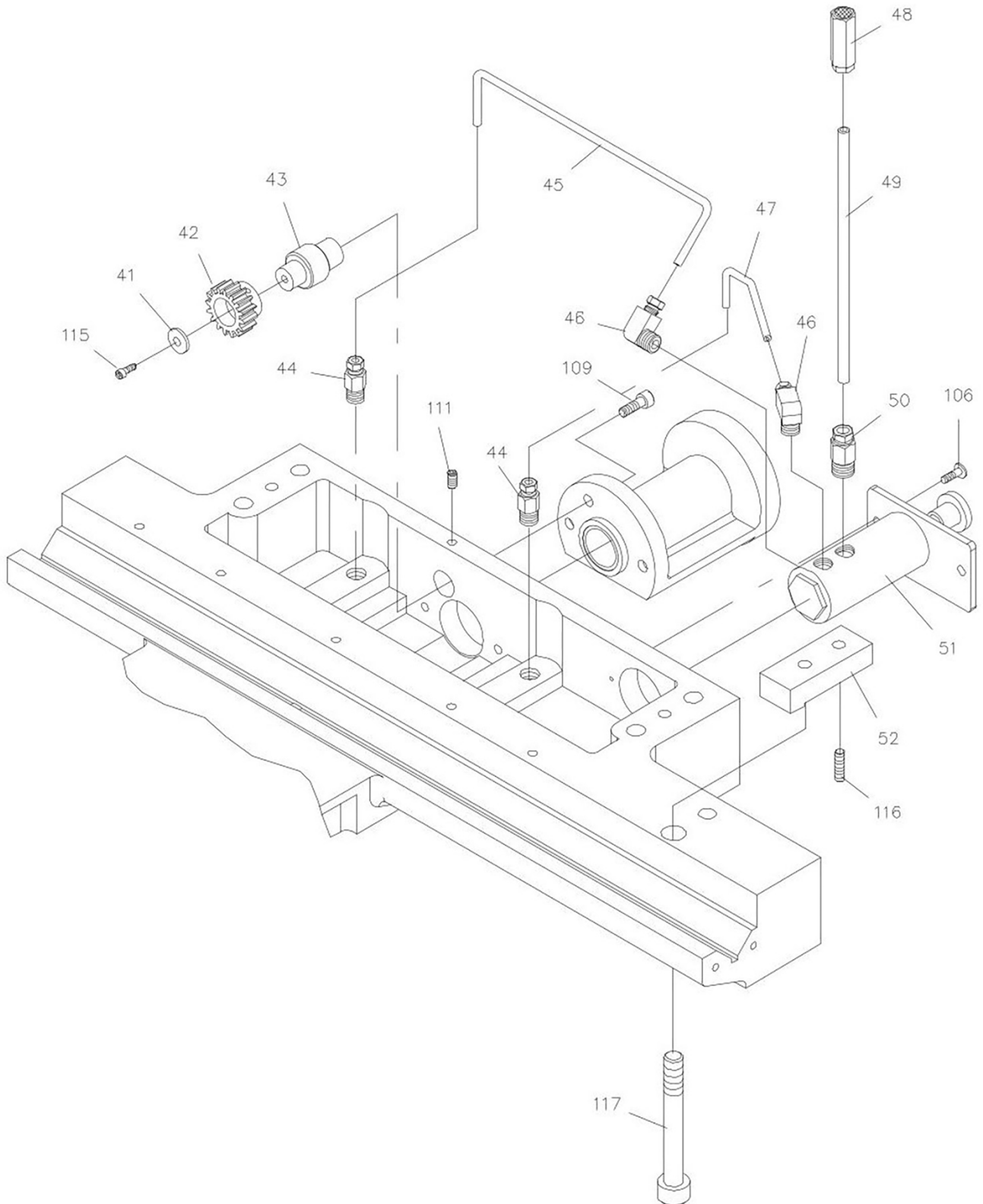
Index	Part No.	Description	Size	Qty
1	**	Handle		1
2	**	Turret Nut		1
3	**	Collar		1
4	**	Bolt		12
5	**	Turret Body		1
6	**	Turret Shaft		1
7	**	Pin		1
8	**	Spring		1
9	**	T Nut		1
10	**	Solid Topslide		1
11	**	Gib		1
12	**	Screw		1
13	**	Swivel Slide		1
14	**	Nut & Screw	Assembly for replacement	1
16	**	Trust Bearing	51101	2
17	**	Curve Pilot		1
18	**	Keep Assy		1
19	**	Dual Dial		1
21	**	Bush		1
22	**	Handle Wheel		1
24	**	T Wrench		1
51	**	Hex. Socket Head Bolt	CAP 6x10	1
52	**	Set Screw	SET 5x8	2
53	**	Hex. Socket Head Bolt	CAP 6x20	2
54	**	Rivet	Ø2	2
55	**	Set Screw	SET 8x16	2
56	**	Oil Ball	1/4"	1
57	**	Steel Ball	1	1
58	**	Set Screw	SET 8x12	1
59	**	Set Screw	SET 6x16	2

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Saddles Assembly I – Exploded View



Saddles Assembly II – Exploded View



SERVICE PARTS

Saddles Assembly – Parts List

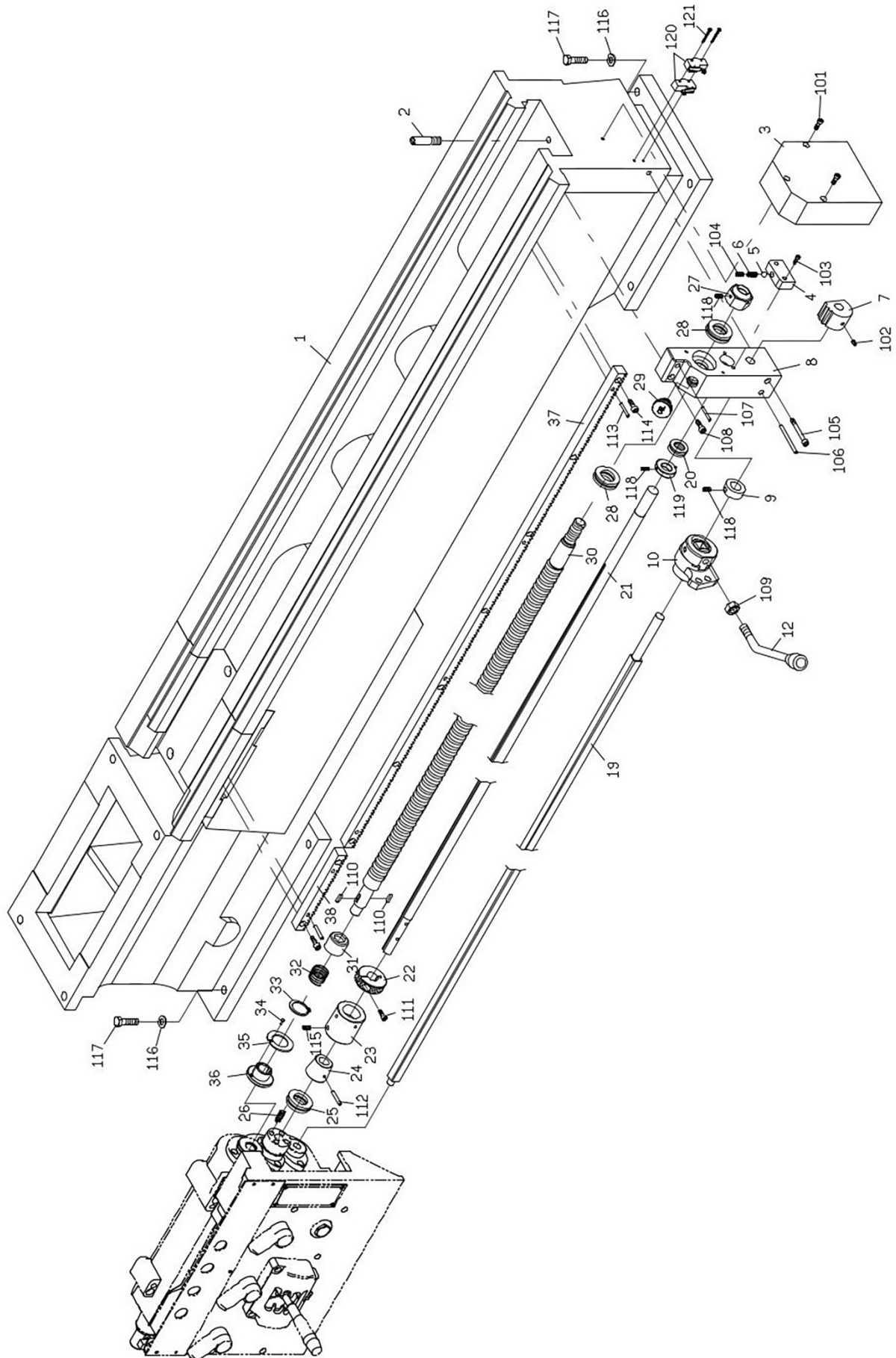
Index	Part No.	Description	Size	Qty
1	**	Adjust Screw		6
2	**	Cross Slide		1
3	**	Pivot	Ø18x28	1
4	**	T Bolt		2
5	**	Gib-X		1
6	**	Wiper-X		1
7	**	Plate -X		1
8	**	Trust Bearing	NTB/AS2 1226	2
9	**	Cap Collar		2
10	**	Washer		1
11	**	Wedge(7X7X30), Nut, Screw, Key(3X3X100), Spring Pin(5X40)	Assembly for replacement	1
16	**	Spraying Pipe	PT3/8 x 24"	1
17	**	Valve & Junction Assy.	PT3/8	1
18	**	Rear Bracket		1
19	**	Saddle		1
20	**	Wiper F		2
21	**	Plate F		2
22	**	Oil Cover	NF 3/4"	1
23	**	Taper Pin	#6x2 3/4"L	2
24	**	Wiper V		2
25	**	Plate V		2
26	**	Pinion	160DP 16T	1
27	**	Front Bracket		1
28	**	Steel Ball	1/4"	4
29	**	Spring	Ø6x15 L	4
30	**	Trust Bearing	NTB/AS2 1730	2
31	**	Washer	Ø18xØ52x4	1
32	**	Dial Ring		1
33	**	Dual Dial	200div/I , 254div/M	1
34	**	Hand Wheel		1
35	**	Fix Screw	M12xP1.75	1
36	**	Handle		1
37	**	Bolt		1
38	**	Gib-Z		2
39	**	Front Anti-Floater		1
40	**	Rear Anti-Floater		1
41	**	Washer	Ø6.5xØ15x3	1
42	**	Gear	16T	1
43	**	Short Shaft		1
44	**	Straight Adapter	PT1/8xØ4	2
45	**	Al. Tube	Ø4x260	1
46	**	Elbow Adapter	PT1/8xØ4	2
47	**	Al. Tube	Ø4x120	1
48	**	Oil Filter	Ø6	1
49	**	Al. Tube	Ø6x160	1
50	**	Straight Adapter	PT1/8xØ6	2
51	**	Lubricator Assy.		1
52	**	Clamp Plate		1
53	**	Plate		1
101	**	Oil Ball	1/4"	2
102	**	Set Screw	SET 6x30	2

SERVICE PARTS

Index	Part No.	Description	Size	Qty
103	**	Hex. Socket Head Bolt	CAP 6x30	4
104	**	Nut	M10	2
105	**	Washer	M10	2
106	**	Dome Cross Screw	M5x12	13
107	**	Hex. Socket Head Bolt	CAP 6x25	2
108	**	Nut	M10	1
109	**	Hex. Socket Head Bolt	CAP 6x20	15
110	**	Hex. Socket Head Bolt	CAP 8x60	4
111	**	Set Screw	SEY 6x8	3
112	**	Hex. Socket Head Bolt	CAP 4x10	3
115	**	Hex. Socket Head Bolt	CAP 5x16	1
116	**	Set Screw	SET 8x35	1
117	**	Hex. Socket Head Bolt	CAP 12x75	1

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Bed and Shafts Assembly – Exploded View



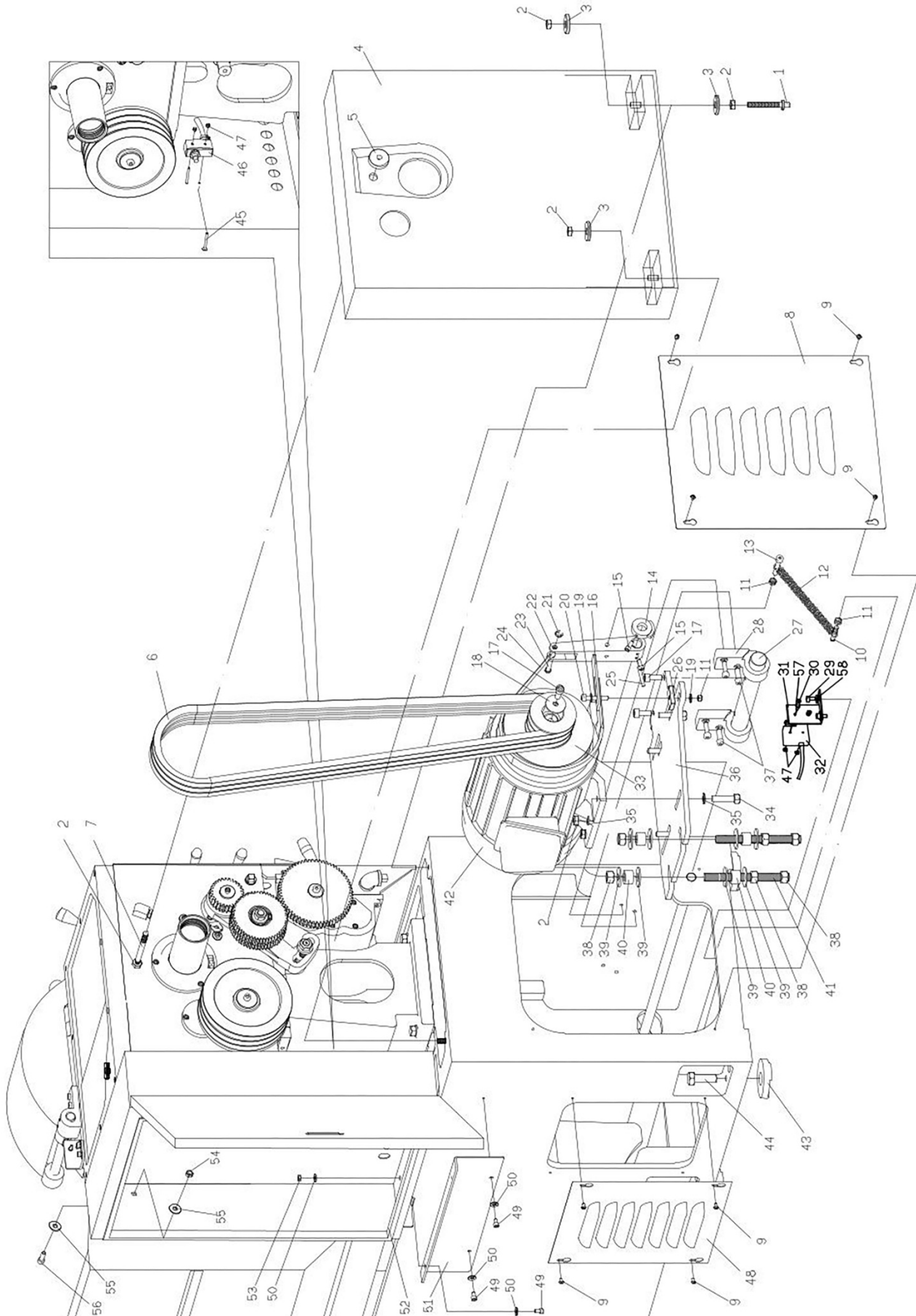
SERVICE PARTS

Bed and Shafts Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Bed		1
2	**	Bolt		1
3	**	Cover		1
4	**	Fixed Block		1
5	**	Steel Ball	5/16"	1
6	**	Spring		1
7	**	Switch Flanged		1
8	**	Bracket		1
9	**	Collar		1
10	**	Lever Assy, Pin, Third Rod Bracket, Sleeve, Spring, Spring Cover, Snap Ring(S32)	Assembly for replacement	1
12	**	Knob & Handle	Assembly for replacement	1
19	**	Third Rod Shaft		1
20	**	Thrust Bearing	NTB/AS2 1831	1
21	**	Feed Rod		1
22	**	Stopper		1
23	**	Clutch Collar		1
24	**	Bush		1
25	**	Thrust Bearing	51203	1
26	**	Spring		4
27	**	Nut		1
28	**	Thrust Bearing	51105	2
29	**	Oil Cover		1
30	**	Leadscrew		1
31	**	Spring Cover		1
32	**	Spring	Ø27x55	1
33	**	Snap Ring	S30	1
34	JT1-3067	Shear Pin		1
35	**	Shroud Washer		1
36	**	Collar		1
37	**	Rack		1
38	**	Gap Rack		1
101	**	Hex. Socket Head Bolt	CAP 6x55	3
102	**	Set Screw	SET 6x16	1
103	**	Hex. Socket Head Bolt	CAP 6x25	2
104	**	Set Screw	SET 10x10	1
105	**	Hex. Socket Head Bolt	CAP 8x70	1
106	**	Taper Pin	#7x3 1/4"L	1
107	**	Taper Pin	#7x2"L	1
108	**	Hex. Socket Head Bolt	CAP 8x35	1
109	**	Nut	M12	2
110	**	Key	5x5x15	2
111	**	Hex. Socket Head Bolt	CAP 6x20	1
112	**	Taper Pin	#4x30L	1
113	**	Spring Pin	Ø6x25L	6
114	**	Hex. Socket Head Bolt	CAP 6x20	9
115	**	Set Screw	SET 6x6	1
116	**	Washer	M12	8
117	**	Hexagon Head Bolt	M12x45	8
118	**	Set Screw	SET 6x8	3
119	**	Collar		1
120	**	Limit Switch	TM1704	2
121	**	Dome Cross Screw	M4x40	2

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Main Motor Assembly – Exploded View



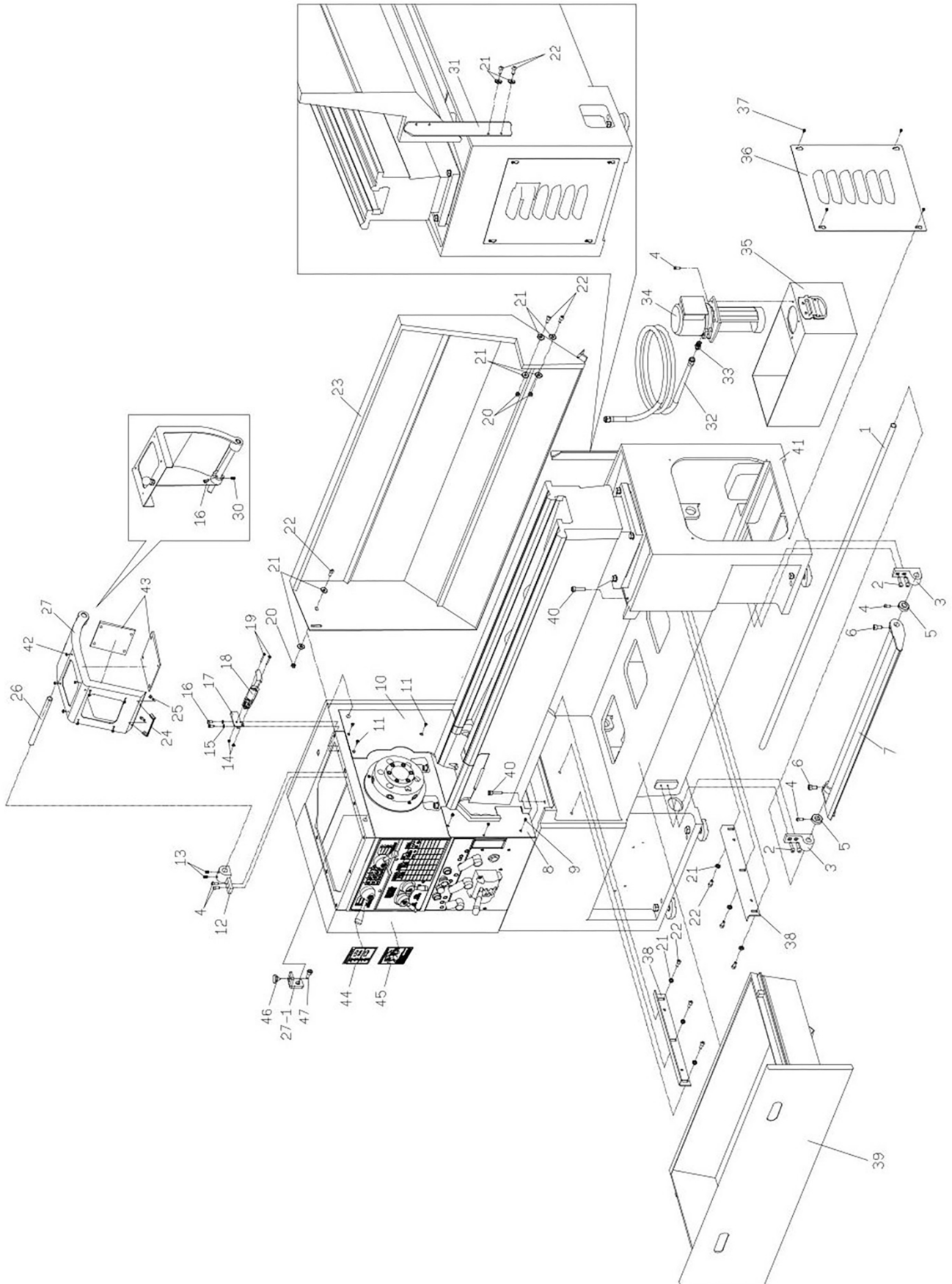
SERVICE PARTS

Main Motor Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Pin		2
2	**	Nut	M10	9
3	**	Washer	M10	4
4	**	Cover		1
5	**	Nut		1
6	JT1-3068	V Belt	B75	3
7	**	Bolt		1
8	**	Cover		1
9	**	Dome Cross Screw	M6x10	8
10	**	Bolt		1
11	**	Nut	M8	3
12	**	Spring		1
13	**	Hex. Socket Head Bolt	CAP 8x55	1
14	**	Cam		1
15	**	Hex. Socket Head Bolt	CAP 6x16	2
16	**	Fixed Plate		1
17	**	Hex. Socket Head Bolt	CAP 10x25	1
18	**	Washer		1
19	**	Washer	M8	2
20	**	Hex. Socket Head Bolt	CAP 8x45	1
21	**	Clip	E8	1
22	**	Lever		1
23	**	Pin		1
24	JT1-3069	Brake Belt		1
25	**	Taper Pin	#4x1 3/4"L	1
26	**	Platform		1
27	**	Shaft		1
28	**	Support		1
29	**	Hex. Socket Head Bolt	CAP 6x12	2
30	**	Dome Cross Screw	M4x30	2
31	**	Bracket		1
32	**	Limit Switch	Tm-1704	1
33	**	Motor Pulley		1
34	**	Hex. Socket Head Bolt	CAP 10x45	4
35	**	Washer	M10	8
36	**	Plate		1
37	**	Hex. Socket Head Bolt	M8x25L	4
38	**	Nut	M16xP2.0	6
39	**	Washer	Ø16.5xØ40	8
40	**	Rubber Ring		4
41	**	Screw	M16x170	2
42	**	Motor	5HP 230/460V 3Ph	1
43	**	Block		4
44	**	Hexagon Head Bolt	M16x50	4
45	**	Dome Cross Screw	M4x40	2
46	**	Limit Switch	Tm1307	1
47	**	Nut	M4	2
48	**	Cover		1
49	**	Hex. Socket Head Bolt	CAP 6x10	4
50	**	Washer	Ø6xØ16	6
51	**	Cover		1
52	**	Electrical Box		1
53	**	Nut	M6	2
54	**	Nut	M8	1
55	**	Washer	M8	2
56	**	Hex. Socket Head Bolt	CAP 8x20	1
57	**	Washer	M4	2
58	**	Washer	M6	2

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Cabinet and Panel Assembly – Exploded View



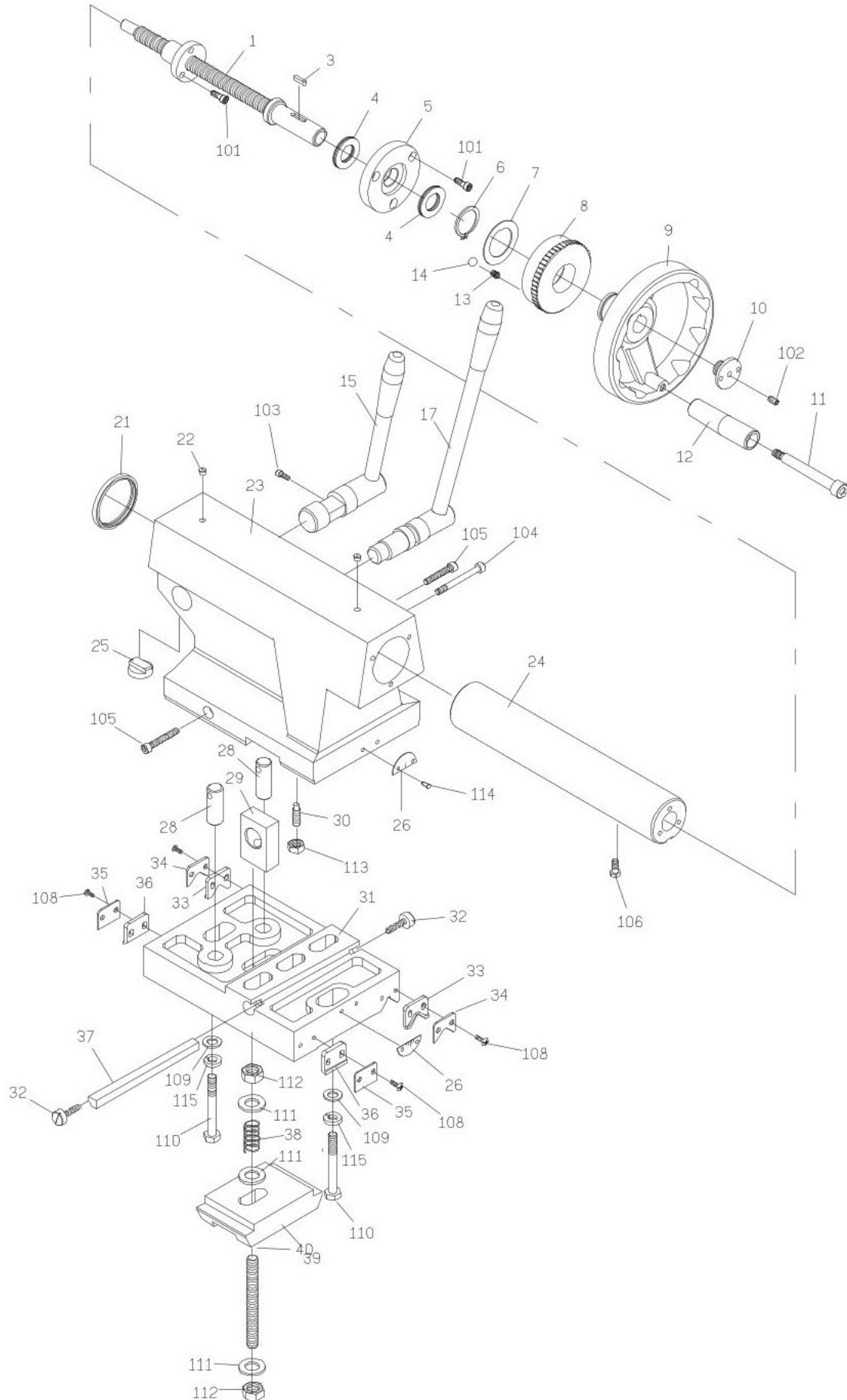
SERVICE PARTS

Cabinet and Panel Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Shaft		1
2	**	Hex. Socket Head Bolt	CAP 8x25	4
3	**	Pedal Bracket		2
4	**	Hex. Socket Head Bolt	CAP 6x16	6
5	**	Collar		2
6	**	Hex. Socket Head Bolt	CAP 10x20	2
7	**	Saddle		1
8	**	Guard		1
9	**	Dome Cross Screw	M5x8	3
10	**	Plate		1
11	**	Flat Hexagon Screw	M5x8	3
12	**	Small Bracket		1
13	**	Set Screw	SET 8x12	2
14	**	Nut	M4	2
15	**	Spring Washer	M6	2
16	**	Hex. Socket Head Bolt	CAP 6x12	3
17	**	Bracket		1
18	**	Limit	Tz9212	1
19	**	Dome Cross Screw	M4x40	2
20	**	Nut	M8	3
21	**	Washer	M8	14
22	**	Hex. Socket Head Bolt	CAP 8x20	11
23	**	Splash Guard		1
24	**	Handle		1
25	**	Hex. Socket Head Bolt	CAP 5x12	1
26	**	Pivot		1
	**	Chuck Safety Guard Assembly (including L27, L27-1)		
27	**	Chuck Safety Guard		1
27-1	**	L Type Plate		1
30	**	Set Screw	SET 5x16	1
31	**	Angle Steel		1
32	**	Coolant Conduit	CT801x3/8"x72"	1
33	**	Nipple	3/8"PTx3/8"PH	1
34	JT1-3070	Coolant Pump	MC8150	1
35	**	Coolant Tank		1
36	**	Cover		1
37	**	Dome Cross Screw	M6x10	4
38	**	Angle Steel		2
39	**	Chip Tray		1
40	**	Hex. Socket Head Bolt	CAP 10x45	2
41	**	Base		1
42	**	Dome Hexagon Screw	M6x12	8
43	**	Plate	PC	2
44	**	Plate		1
45	**	Plate		1
46	**	Rubber		1
47	**	Hex. Socket Head Bolt	CAP M6x10	1

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Tailstock Assembly – Exploded View

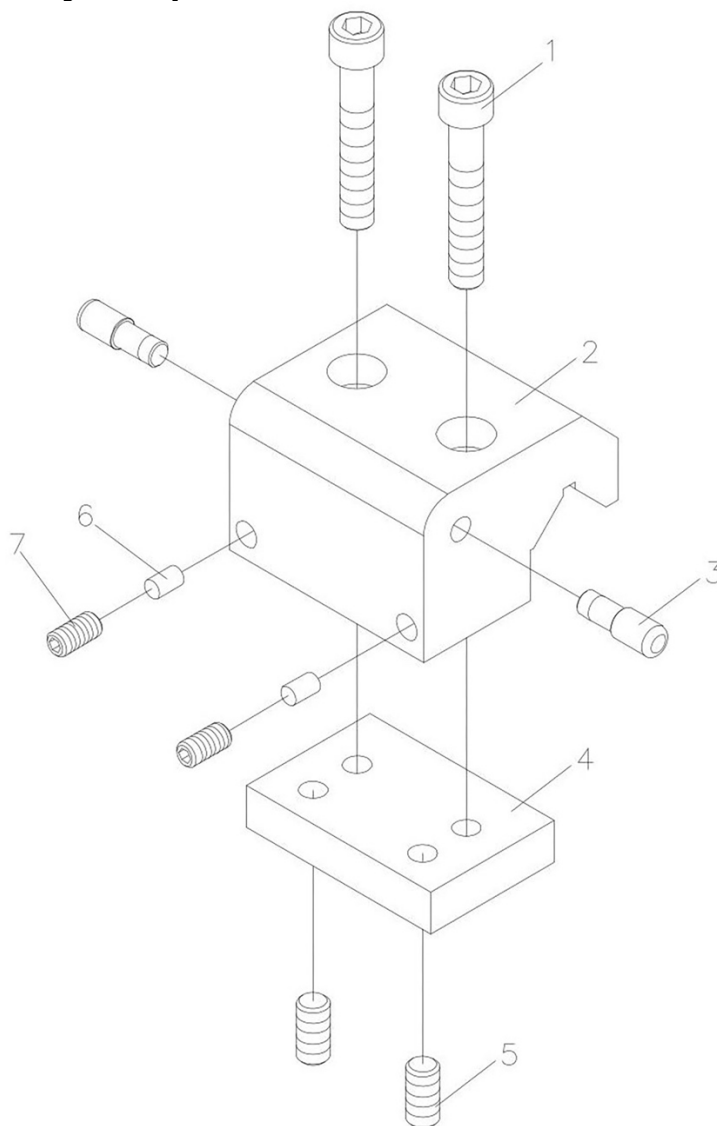


Tailstock Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Lead Screw & Nut	Assembly for replacement	1
3	**	Key	5x5x20L	1
4	**	Thrust Bearing	MTB/AS2-2035	2
5	**	Flange		1
6	**	Snap Ring	S32	1
7	**	Washer		1
8	**	Index Ring	100 dividing	1
9	**	Handwheel		1
10	**	Fixed Screw		1
11	**	Bolt	M8x90L	1
12	**	Handle		1
13	**	Spring	Ø6.2x16	3
14	**	Steel Ball	1/4"	3
15	**	Clamp Lever L & Cam Shaft L & Spring Pin (Ø4X24)	Assembly for replacement	1
17	**	Clamp Lever R & Cam Shaft R & Spring Pin (Ø4X24)	Assembly for replacement	1
21	**	Oil Seal	DH53	1
22	**	Oil Ball	1/4"	2
23	**	Tail Stock		1
24	**	Quill		1
25	**	Guide Key		1
26	**	Marked Plate		1
28	**	Pin Nut		2
29	**	Pivot Block		1
30	**	Set Screw	14-M8x25	1
31	**	Base		1
32	**	Gib Screw	M6xØ16	2
33	**	Wiper V		2
34	**	Plate V		2
35	**	Plate F		2
36	**	Wiper F		2
37	**	Gib C		1
38	**	Spring	Ø25x122L	1
39	**	Clamp Block		1
40	**	Stud	M14x135L	1
101	**	Hex. Socket Head Bolt	CAP 6x16	6
102	**	Set Screw	SET 6x25	1
103	**	Hex. Socket Head Bolt	CAP 6x12	1
104	**	Hex. Socket Head Bolt	CAP 8x70	1
105	**	Hex. Socket Head Bolt	CAP 8x60	2
106	**	Hex. Socket Head Bolt	CAP 6x8	1
108	**	Dome Cross Screw	M5x12	8
109	**	Washer	M10	4
110	**	Hexagon Head Bolt	M10x55	2
111	**	Washer	M14	4
112	**	Hexagon Nut	M14	2
113	**	Hexagon Nut	M8	1
114	**	Rivet	Ø2	4
115	**	Spring Washer	M10	2

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Bed Stop Assembly – Exploded View

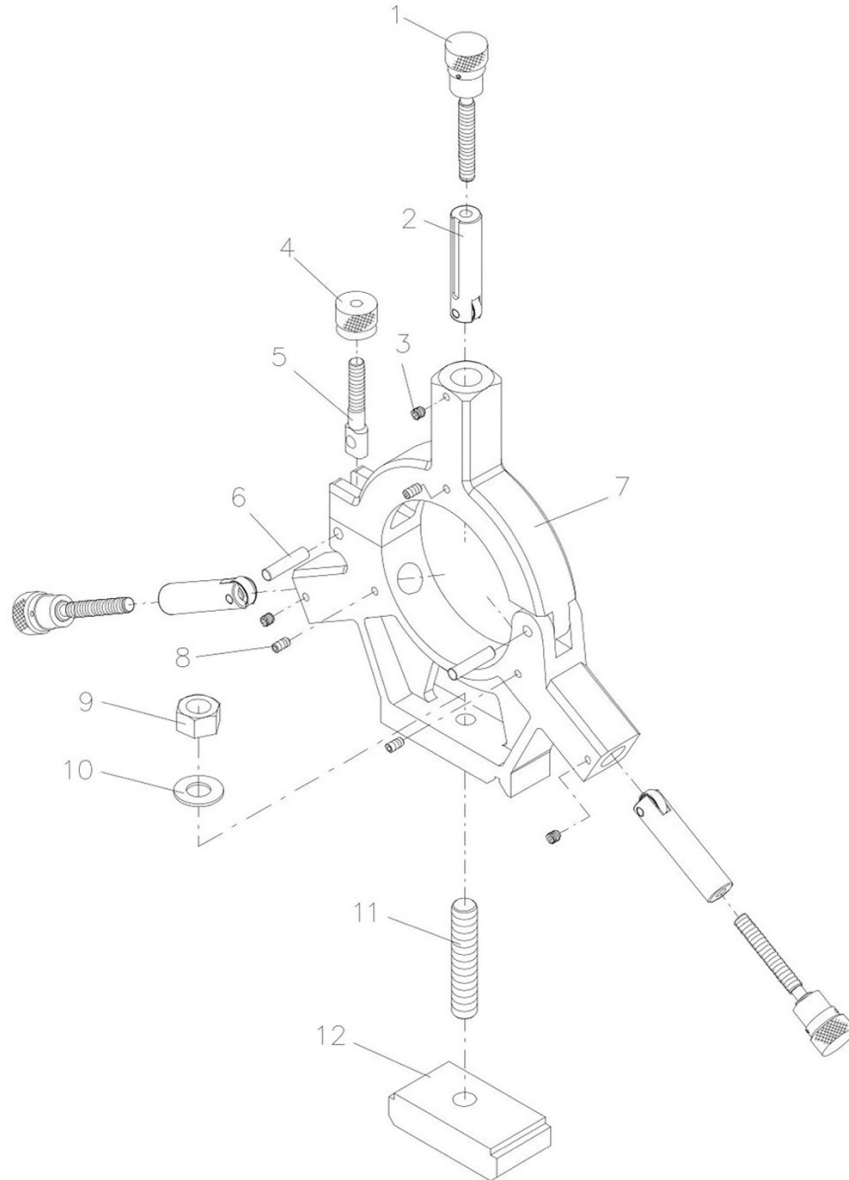


Bed Stop Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Hex. Socket Head Bolt	M10x60	2
1	**	Hex. Socket Head Bolt	M10x60	2
2	**	Body		1
3	**	Pad		2
4	**	Clamp Plate		1
5	**	Set Screw	M10x20	2
6	**	Copper Pin		2
7	**	Set Screw	M8x16	2

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Steady Rest Assembly – Exploded View

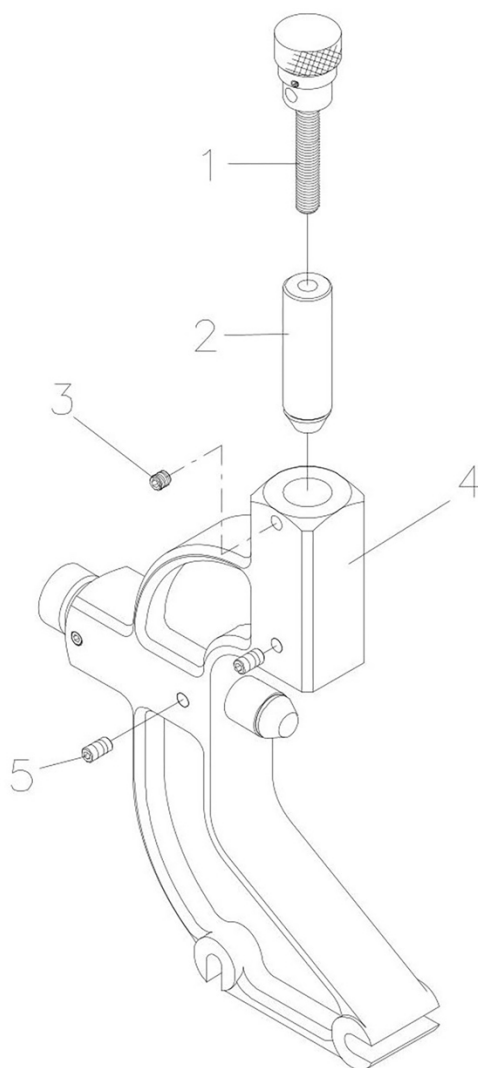


Steady Rest Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Adjusting Knob , Spring Pin(Ø4X40L) , Collar, Screw	Assembly for Replacement	3
2	**	Finger, Pin(Ø8X23), Ball Bearing(627)	Assembly for Replacement	3
3	**	Set Screw	SET 8x8	3
4	**	Knob Nut		1
5	**	Clamp Screw		1
6	**	Hinge Pin		2
7	**	Top Casting & Base Casting	Assembly for Replacement	1
8	**	Set Screw	SET 8x16	3
9	**	Nut	M12	1
10	**	Spring Washer	M12	1
11	**	Hexagon Head Bolt	M12x75	1
12	**	Clamp Plate		1

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Follow Rest Assembly – Exploded View

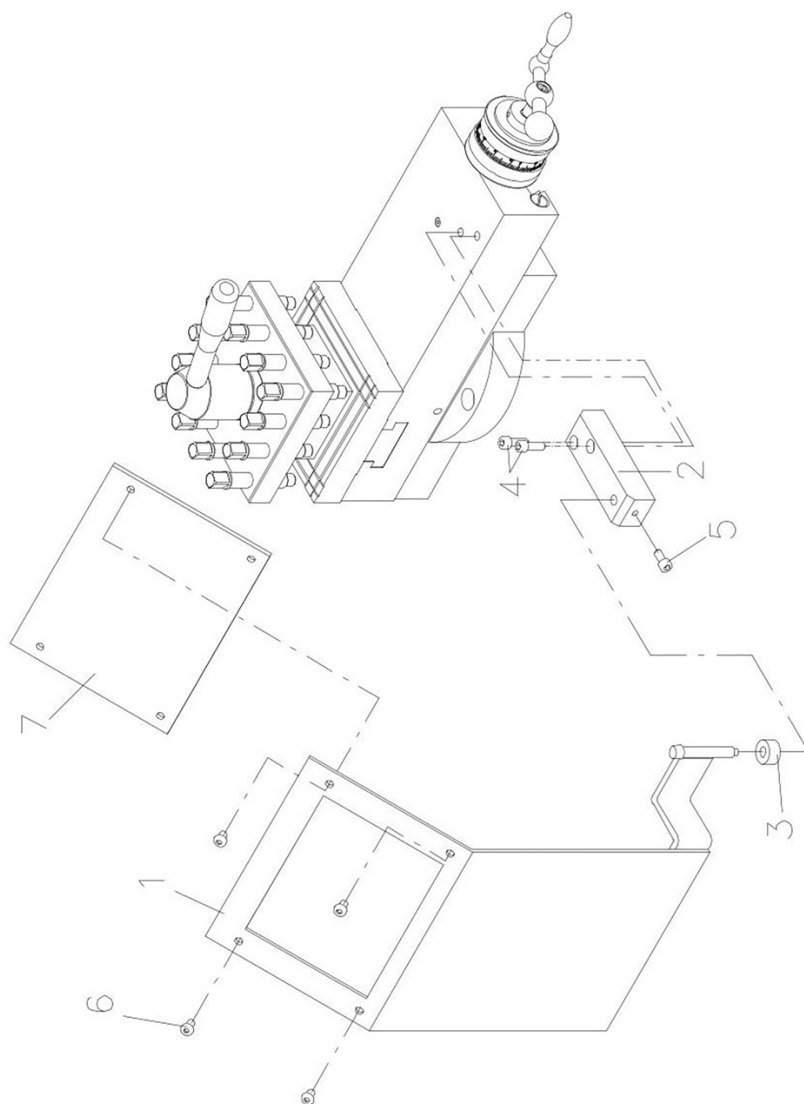


Follow Rest Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Adjusting Screw, Spring Pin(4X40L), Collar, Screw	Assembly for replacement	2
2	**	Finger, Bracket	Assembly for replacement	2
3	**	Set Screw	SET 8x8	2
4	**	Casting		1
5	**	Set Screw	SET 8x16	2

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Tool Post Safety Guard Assembly – Exploded View

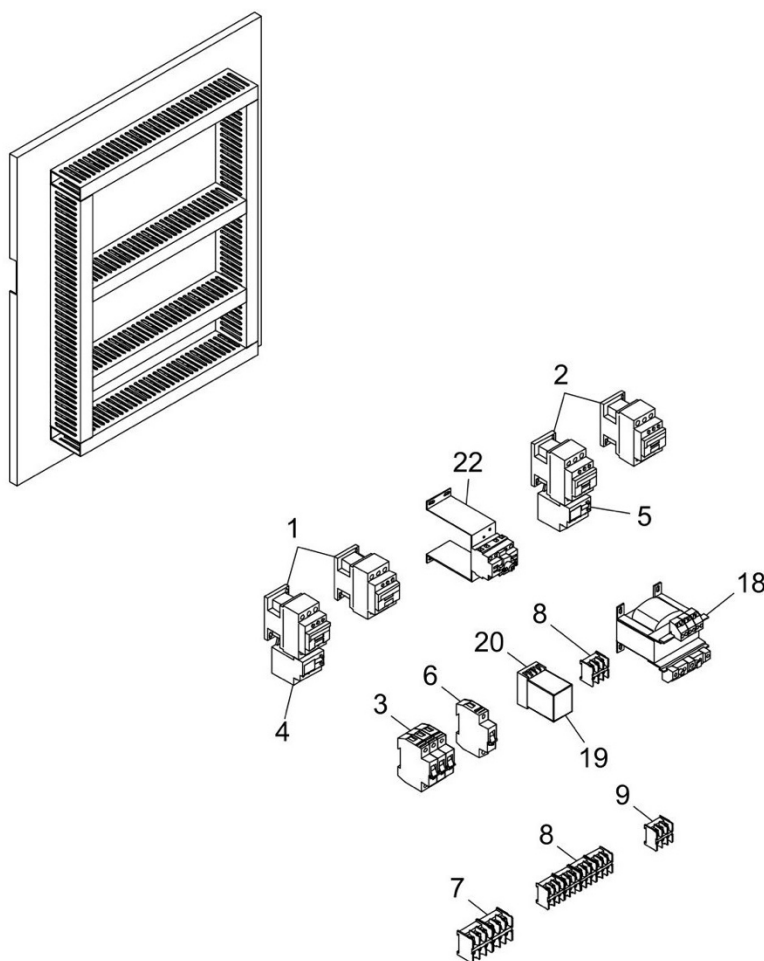


Tool Post Safety Guard Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Chip Frame		1
2	**	Cover Seat		1
3	**	Wash		1
4	**	Hex. Socket Head Bolt	CAP M6x30L	2
5	**	Hex. Socket Head Bolt	CAP M6x12L	1
6	**	Dome Hexagon Screw	M5x8	4
7	**	Cover		1

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Electrical Box Assembly – Exploded View

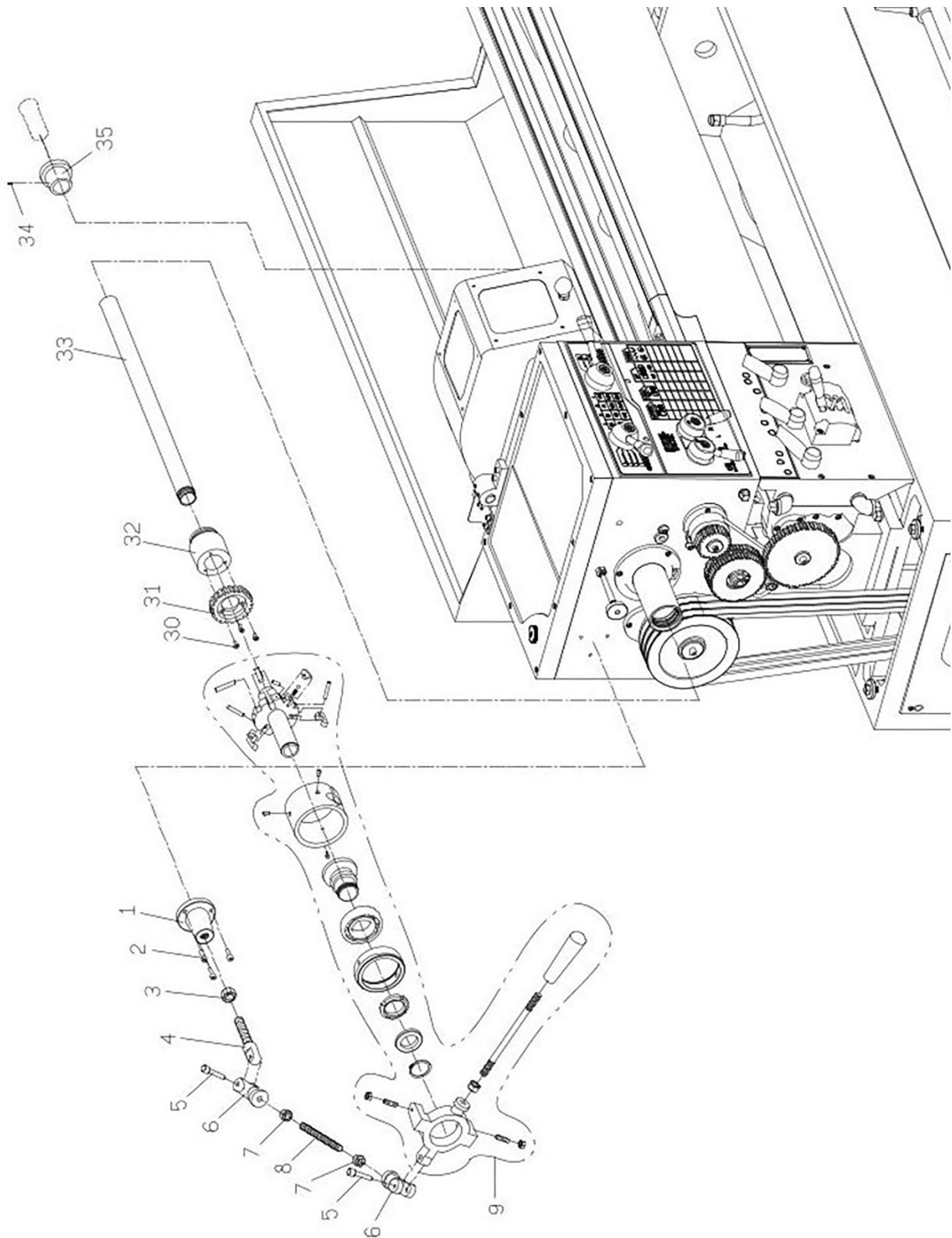


Electrical Box Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	AC Magnetic Switch	K1,K2 LC1D18B7	2
2	**	AC Magnetic Switch	K3,K4 LC1D09B7	2
3	JT1-3071	Circuit Breaker	F1 FAZ-D20/3	1
4	**	Over Relay	F2 LR3D22 16A~24A	1
5	**	Over Relay	F3 LR3D03 0.25A~0.4A	1
6	JT1-3072	Circuit Breaker	F4 FAZ-D1/1	1
7	**	Terminal Board	TB IN20BK	2
8	**	Terminal Board	TB IN13SBK	5
9	**	Terminal Board	TB IN12BK	1
18	**	Transformer	T1 0V,220V,440V 140VA 0V,24V,0V,220V	1
19	**	Amplifier	PU1 PU-NC	1
20	**	Relay Seat	PF085A	1
22	**	Door-Type Main Cam Switch	Q1 32A ,SE163003B+011/0001	1

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5C Collet Closer Assembly (Optional) – Exploded View

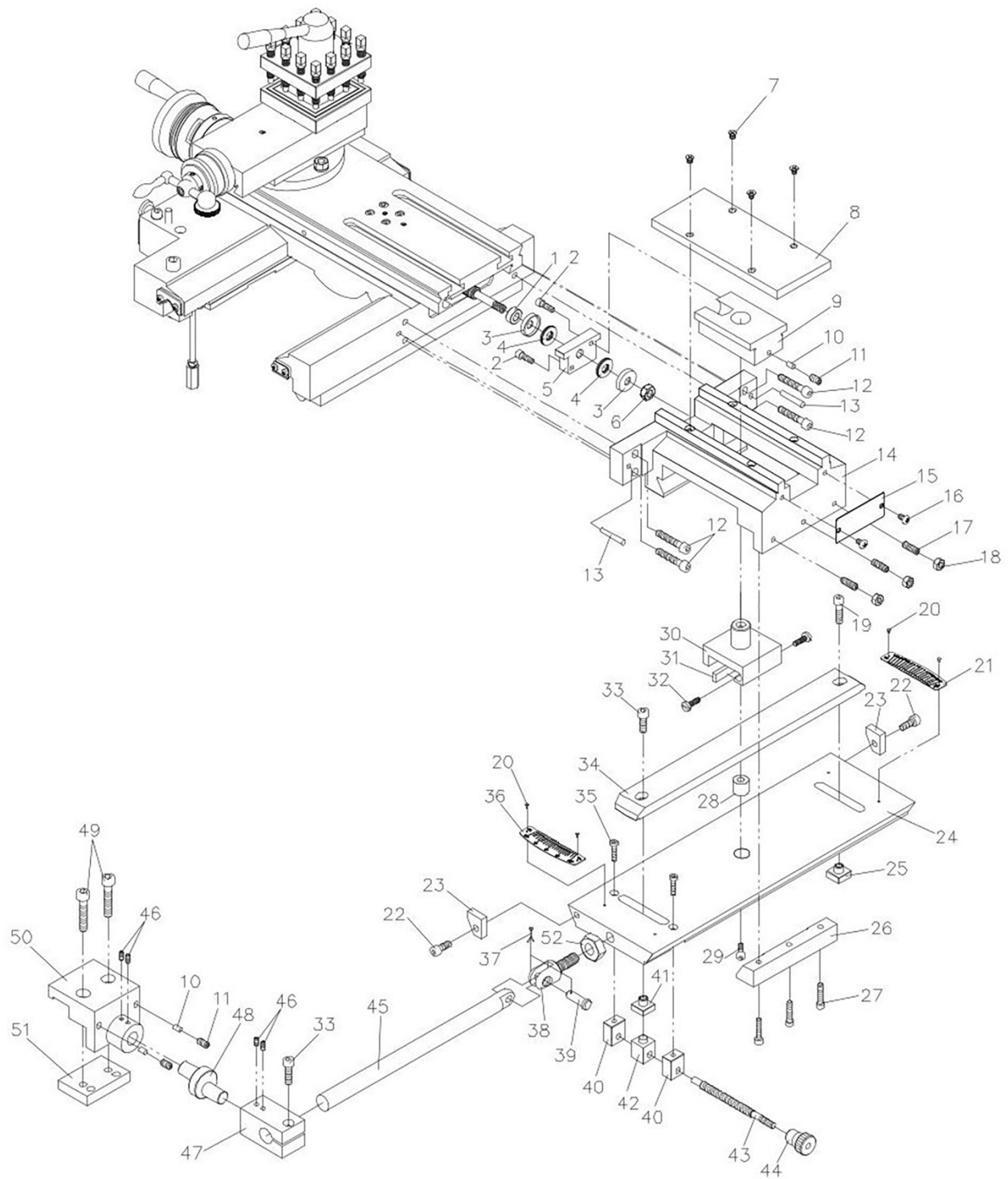


5C Collet Closer Assembly (Optional) – Parts List

Index	Part No.	Description	Size	Qty
1	**	Bracket		1
2	**	Hex. Socket Head Bolt	M6x25	3
3	**	Nut	M16	1
4	**	Bolt		1
5	**	Bolt		1
6	**	Connector Casting		1
7	**	Nut	W1/2"	2
8	**	Screw	W1/2x155mm	1
9	**	Handle Casting		1
		Set Screw	SET 8x30	2
		Nut	M8	2
		Nut	1/2"-12UNC	1
		Handle Rod		1
		Handle		1
		Clip	S34	1
		Washer	Ø52.4xØ34.4x9	1
		Nut		1
		Bearing And Retainer		1
		Ball Bearing	6208	1
		Cam		1
		Hex. Socket Head Bolt	CAP 4x8	3
		Collar		1
		Tube		1
		Finger		3
		Pivot Pin	Ø6x40	3
		Knob		1
		Steel Ball	Ø5	1
		Spring		1
		Pin	Ø5x18	1
30	**	Hex. Socket Head Bolt	M5x12	3
31	**	Index Ring		1
32	**	Hub		1
33	**	Tube		1
34	**	Pin		1
35	**	Bush		1

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Taper Attachment Assembly (Optional) – Exploded View



SERVICE PARTS

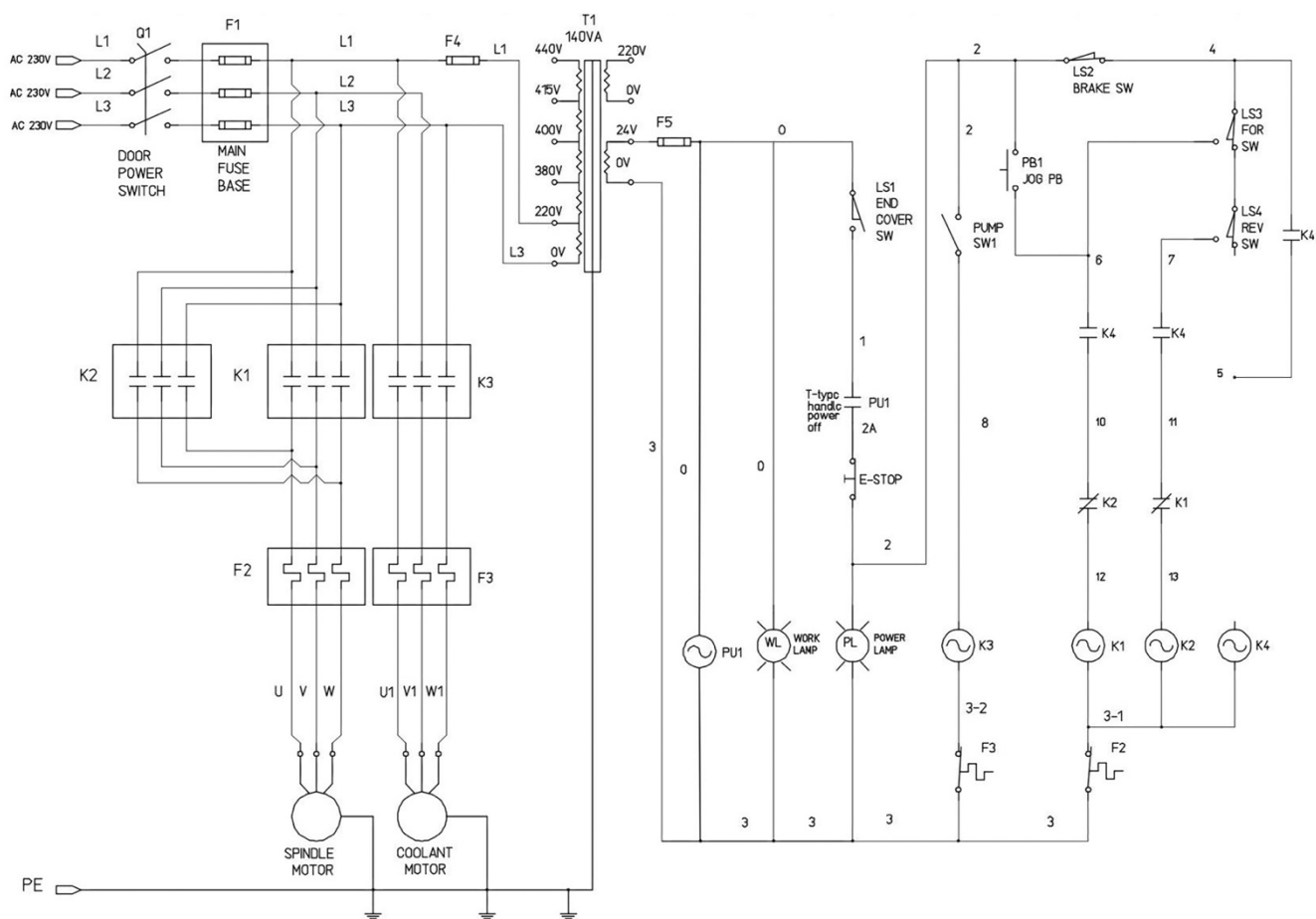
Taper Attachment Assembly (Optional) – Parts List

Index	Part No.	Description	Size	Qty
1	**	Collar		1
2	**	Hex. Socket Head Bolt	CAP 6x20	2
3	**	Cap Collar		2
4	**	Thrust Bearing	NTB/AS2 1226	2
5	**	Yoke Plate		1
6	**	Nut	M10	1
7	**	Flat Hexagon Screw	M6x8	4
8	**	Cover Plate		1
9	**	Yoke		1
10	**	Copper Pin		3
11	**	Set Screw	SET 8x20	3
12	**	Hex. Socket Head Bolt	CAP 8x45	4
13	**	Taper Pin	#6x1 1/2"L	2
14	**	Main Bracket		1
15	**	Plate		1
16	**	Done Cross Screw	M6x10	2
17	**	Set Screw	SET 8x25	3
18	**	Hexagon Nut	M8	3
19	**	Hex. Socket Head Bolt	CAP 8x30	2
20	**	Rivet	Ø2	4
21	**	Name Plate		1
22	**	Hex. Socket Head Bolt	CAP 8x20	2
23	**	Stop		2
24	**	Plate		1
25	**	Nut		1
26	**	Gib		1
27	**	Hex. Socket Head Bolt	CAP 6x30	3
28	**	Slide Pivot Pin		1
29	**	Hex. Socket Head Bolt	CAP 8x16	1
30	**	Side Block		1
31	**	Gib		1
32	**	Screw		1
33	**	Hex. Socket Head Bolt	CAP 8x25	2
34	**	Swive Slide		1
35	**	Hex. Socket Head Bolt	CAP 6x25	2
36	**	Name Plate		1
37	**	Split Pin	Ø2.5x16	1
38	**	Bolt		1
39	**	Pin		1
40	**	Block		2
41	**	Nut		1
42	**	Block		1
43	**	Screw		1
44	**	Knob		1
45	**	Bolt		1
46	**	Set Screw	SET 6x12	4
47	**	Bracket		1
48	**	Eccentric Pin		1
49	**	Hex. Socket Head Bolt	CAP 10x50	2
50	**	Bracket		1
51	**	Hub		1
52	**	Nut	M14	1

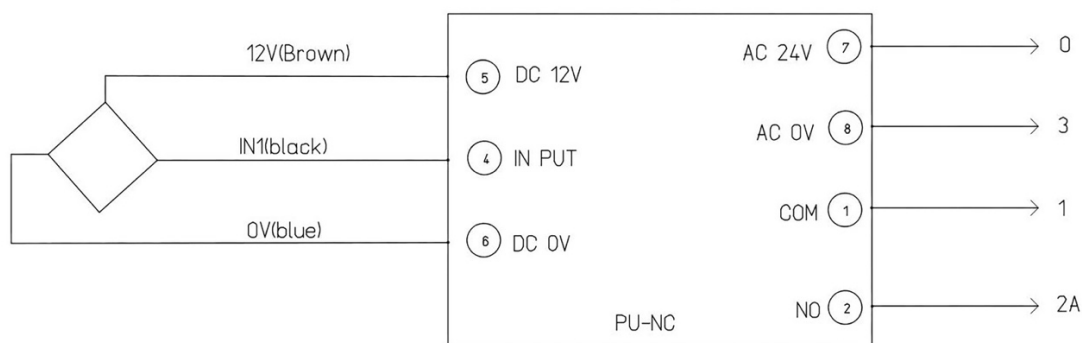
** These parts are shown for reference only and are not available for order individually. Non-proprietary parts, such as fasteners, can usually be found at local hardware stores.

Wiring Diagrams

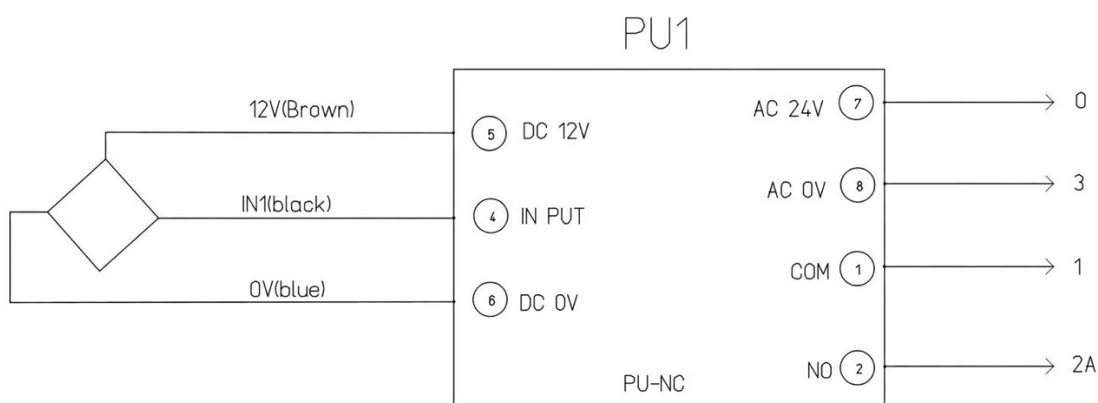
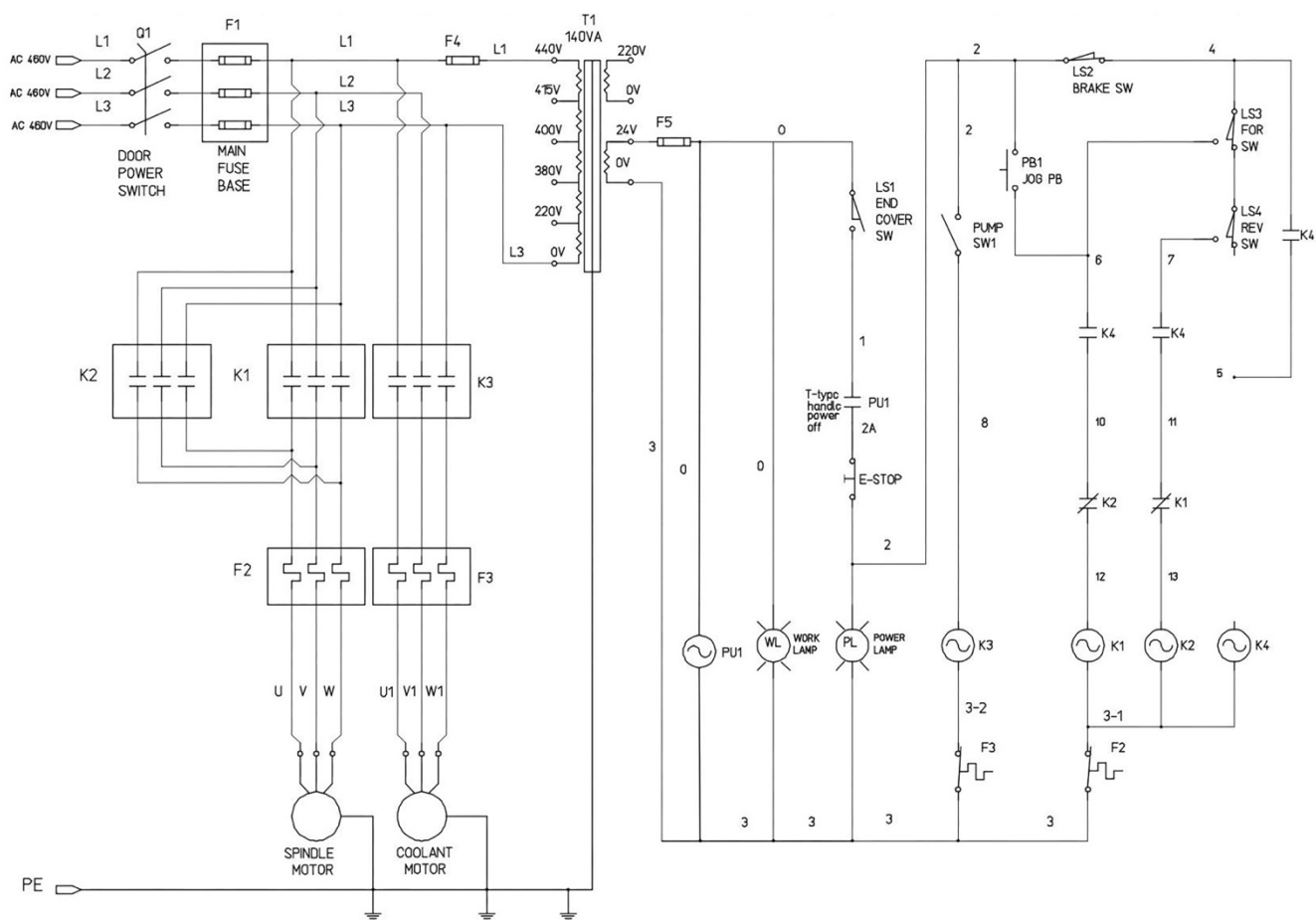
230V



PU1



460V





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