



Operation and Maintenance Instructions

Large Spindle Bore Gear Head Lathe

Models GH-1640ZX, GH-1660ZX, GH-1860ZX, GH-1880ZX, GH-2180ZX



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CONTENTS

SAFETY: Important Safety Instructions	2	Section 4: Maintenance	27
Section 1: Introduction	5	Schedule	27
Specifications	5	Cleaning	27
Identification	6	Lubrication	27
Control Panel	7	Cutting Fluid System	30
Headstock Controls	7	Machine Storage	32
Carriage Controls	7	Section 5: Service	33
Tailstock Controls	8	Backlash Adjustment	33
Foot Brake	8	Leadscrew End Play Adjustment	33
Section 2: Setup	9	Gib Adjustment	34
Electrical Installation	9	V-Belts	34
Lighting	9	Brake & Switch	35
Weight Load	9	Section 6: Service Parts	36
Space Allocation	9	Section 7: Wiring Diagrams	89
Lifting & Moving	10		
Locating and Leveling	11		
Test Run	11		
Spindle Break-in	12		
Section 3: Operation	13		
Chuck	13		
Tailstock	15		
Centers	16		
Steady Rest	17		
Follow Rest	17		
Compound Slide	17		
Apron Stop	18		
4-Way Tool Post	18		
Manual Feed	19		
Power Feed	20		
Leadscrew & Feed Rod support	21		
Thread & Feed Rate Chart	22		
Positioning Gearbox Levers	22		
End Gear Setup	23		
Threading Controls	23		
Cutting Fluid System	26		



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.
 20. Make your workshop child proof with

SAFETY

- 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.

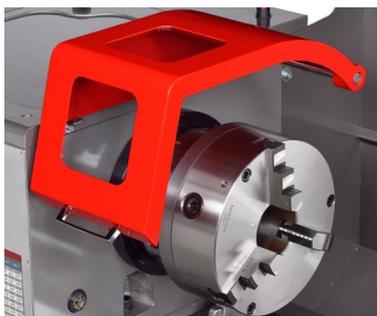


Figure C

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.

INTRODUCTION

Specifications

Stock Numbers	JT1-2712 / JT1-2713 / JT1-2714 / JT1-2715 / JT1-2716
Model Numbers	GH-1640ZX / 1660ZX / 1860ZX / 1880ZX / 2180ZX
Main Motor (GH-1640ZX / 1660ZX / 1860ZX / 1880ZX)	10HP, 3PH, 230/460V, 60Hz, 26.5/13.3A
Main Motor (GH-2180ZX)	10HP, 3PH, 230/460V, 60Hz, 27.4/13.8A
Transformer	0V 220V 440V 0.14KVA 0V 24V
Coolant Pump	1/8Hp 230/460V 60Hz 3Ph 2P 0.2/0.1A 3600/min
Swing Over Bed (1640/1660, 1860/1880, 2180)	16.14" (410mm), 18.11" (462mm), 21.34" (542mm)
Swing Over Cross Slide (1640/1660, 1860/1880, 2180)	10.3" (262mm), 12" (305mm), 15.23" (387mm)
Swing Over Gap (1640/1660, 1860/1880, 2180)	22.95" (583mm), 25.59" (650mm), 28.74" (730mm)
Gap in Front of Faceplate	5.31" (135mm)
Center Height (1640/1660, 1860/1880, 2180)	8.07" (205mm), 9.05" (231mm), 10.67" (271mm)
Distance Between Centers (1640/1660, 1860, 1880/2180)	40" (1000mm), 60" (1500mm), 83.46" (2120mm)
Bed Width	10.236" (260mm)
Spindle Bore	3.15" (80mm)
Spindle Nose	D1-8
Spindle Taper Adapter	MT-5
Number of Spindle Speeds	12
Range of Spindle Speeds	26-1500 RPM
.....	A: 26/40/60/90
.....	B: 105/145/205/305
.....	C: 510/715/1000/1500
Cross Slide Travel (1640/1660, 1860/1880/2180)	9.84" (250mm), 11.81" (300mm)
Top Slide Travel	4.92" (125mm)
Whitworth Threads: Kinds/Range	45 Kinds/2~72 TPI
Metric Threads: Kinds/Range	39 Kinds/0.2~14 mm
D.P. Threads: Kinds/Range	21 Kinds/8~44 D.P.
M.P. Threads: Kinds/Range	18 Kinds/0.3~3.5 M.P.
Longitudinal Feeds	0.04~1.0 mm (0.0015"~0.04")
Cross Feeds	0.02~0.5 mm (0.00075"~0.02")
Quill Diameter (1640/1660/1860, 1880/2180)	2.322" (59mm), 2.677" (68mm)
Quill Travel (1640/1660/1860, 1880/2180)	5" (127mm), 6" (153mm)
Taper of Center	MT No.4
Gross Weight (1640, 1660)	4299 lbs. (1950kg), 4740 lbs. (2150kg),
Gross Weight (1860, 1880, 2180)	4850 lbs. (2200kg), 5842 lbs. (2650kg), 5952 lbs. (2700kg)
Net Weight (1640, 1660)	3858 lbs. (1750kg), 4189 lbs. (1900kg)
Net Weight (1860, 1880, 2180)	4299 lbs. (1950kg), 5181 lbs. (2350kg), 5291 lbs. (2400kg)

The specifications in this manual were current at the time of publication. JET reserves the right to change specifications at any time and without prior notice, without incurring obligations

Identification

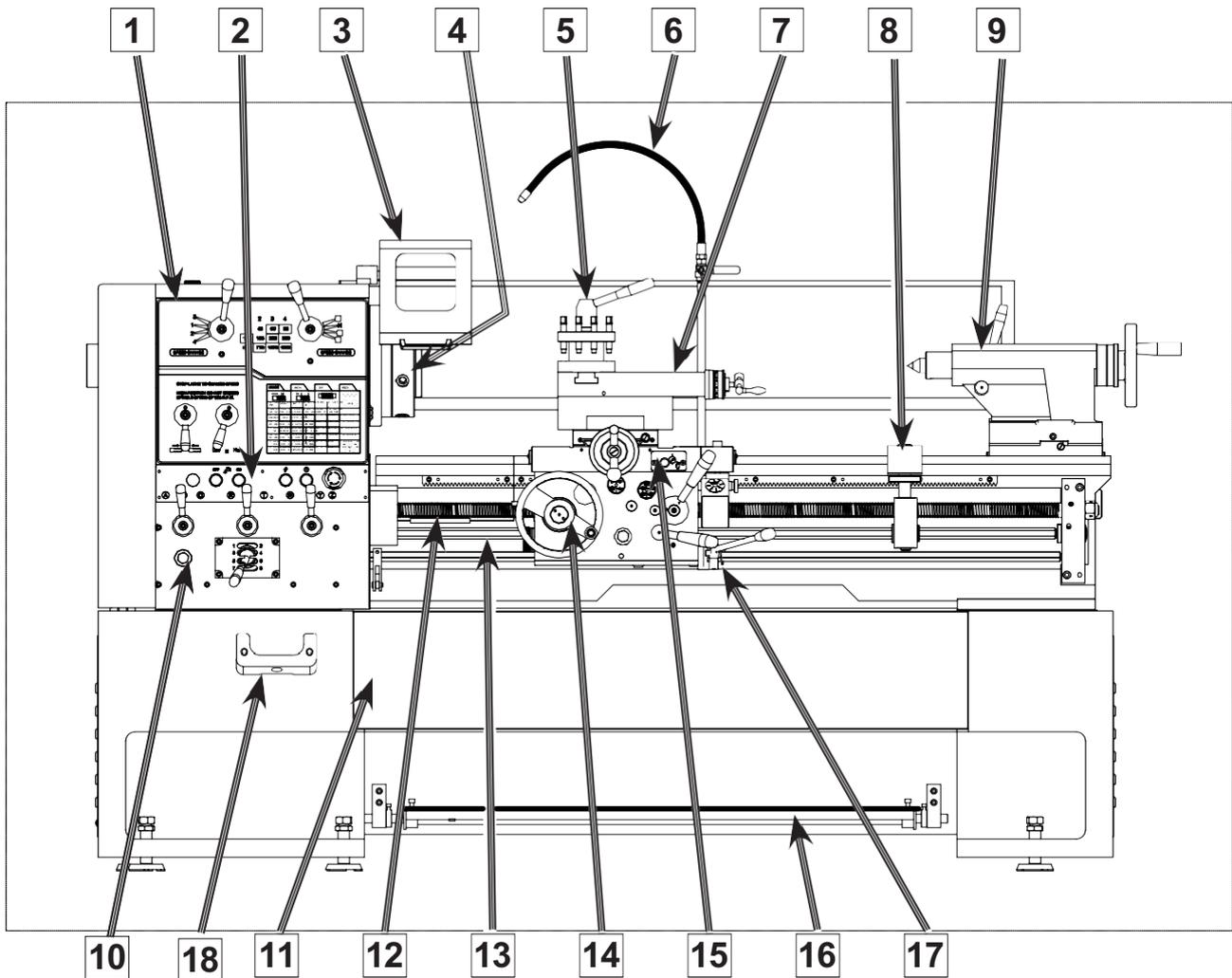


Figure 1. The 1860 Lathe.

- | | |
|----------------------------------|--------------------------|
| 1. Headstock | 10. Gearbox |
| 2. Control Panel | 11. Chip Tray |
| 3. Chuck Safety Guard | 12. Leadscrew |
| 4. D1-6 Camlock MT#5 Spindle | 13. Feed Rod |
| 5. 4-Way Tool Post | 14. Apron |
| 6. Cutting Fluid Tube and Nozzle | 15. Cross Slide |
| 7. Compound Slide | 16. Brake Pedal |
| 8. Bed | 17. Spindle ON / OFF Rod |
| 9. Tailstock | 18. Chuck key bracket |

INTRODUCTION

Control Panel

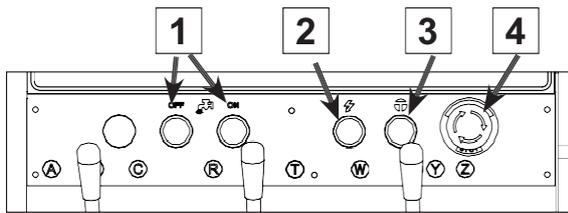


Figure 2. Control Panel.

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

Headstock Controls

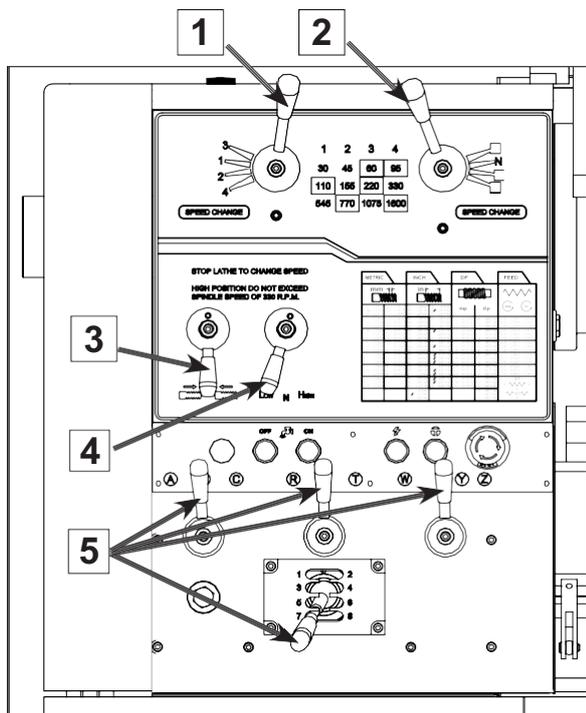


Figure 3. Headstock Panel.

- Spindle Speed Lever:** Selects 1, 2, 3 or 4 gear position on the spindle speed chart.

- Spindle Range Lever:** Selects A, B or C range of spindle speeds on the spindle speed chart
- Feed Direction Lever:** This lever reverses the direction of the gearbox, and, as a result, the leadscrew and feed rod change direction.
- Gearbox Range Lever:** This lever puts the gearbox in high or low range and has no effect on spindle RPM.
- 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

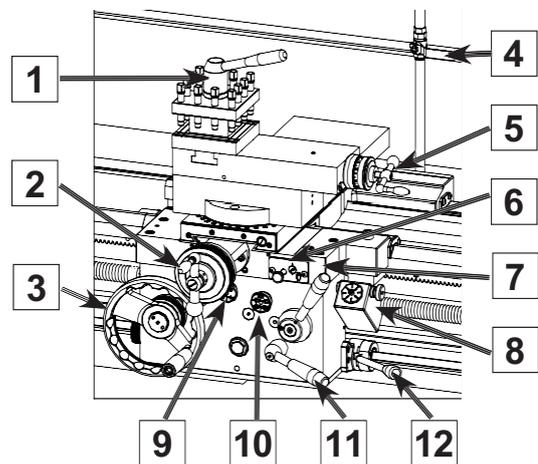


Figure 4. Carriage Controls.

- 4-Way Tool Post Lever:** Used for locking the rotary tool post in eight possible settings.
- Cross Slide Handwheel:** Positions the cross slide in or out.
- Carriage Handwheel:** Allows for manual movement of the carriage from left to right along the bed.
- Cutting Fluid Flow Control Lever:** Used to vary the flow of cutting fluid out of the nozzle.
- Compound Hand Crank:** Used to position the compound along the compound slide.
- Manual Carriage Oil Pump:** Draws oil from the apron case and lubricates the carriage and ways through various oil ports.
- Half Nut Lever:** Engages and disengages the apron with the leadscrew for threading operations.

INTRODUCTION

8. **Thread Dial:** Indicates when to engage the half nut during threading operations.
9. **Feed Selection Knob:** Selects the carriage or cross slide for power feed.
10. **Apron Feed Direction Knob:** Changes direction of carriage or the cross slide feed without having to stop the lathe and move the headstock feed direction lever.
11. **Feed ON / OFF Lever:** Engages / disengages power feed.
12. **Spindle ON / OFF Lever:** Used to start and stop the lathe during normal operation.
13. **Feed Clutch:** This adjustable clutch helps protect the feed system against broken gears and shafts caused by accidental overloads.
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 and holds 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).
8. **Tailstock Gib Screw:** Adjust the tapered gib to control tailstock offset accuracy.

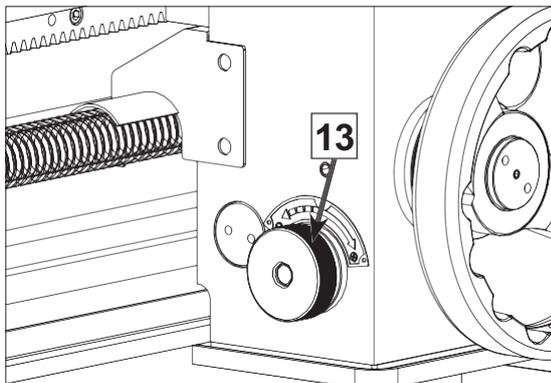


Figure 5. Feed clutch.

Tailstock Controls

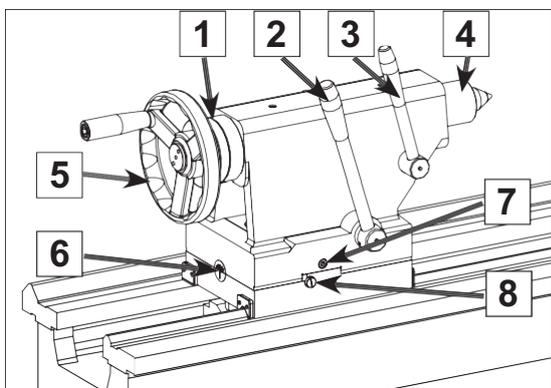


Figure 6. Tailstock Controls.

Foot Brake

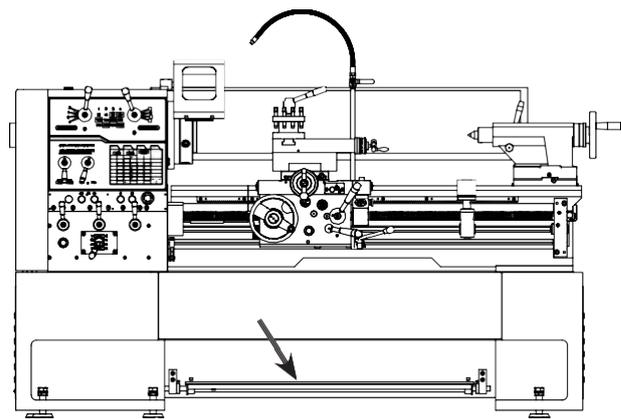


Figure 7. Foot Brake.

This lathe is equipped with a foot brake (Figure 7) to quickly stop the spindle. Pushing the foot brake while the spindle is ON cuts power to the motor and stops 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).

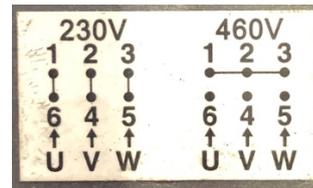


Figure 6B

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.

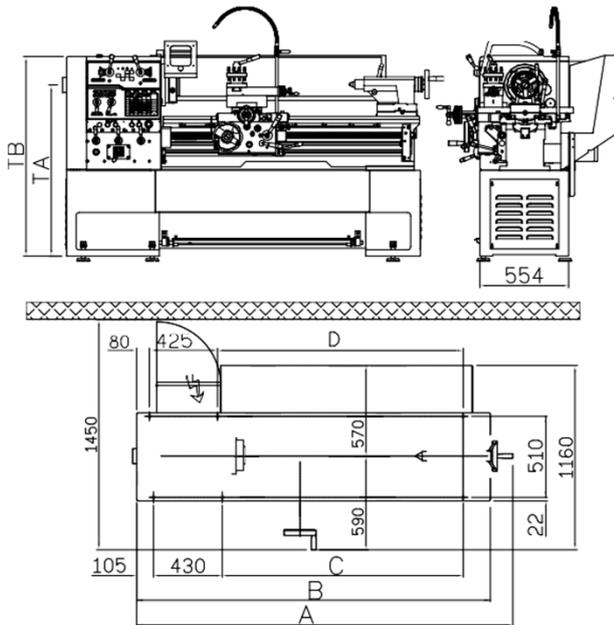
Weight Load

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.

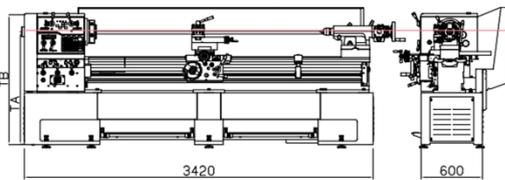
Space Allocation

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.

SET UP



Model	TA	TB		
1 6 4 0 / 1 6 6 0	1078	1257		
1 8 4 0 / 1 8 6 0	1093	1272		
2 1 4 0 / 2 1 6 0	1133	1312		
UNIT:mm				
Model	A	B	C	D
1640/1840/2140	2377	2260	1505	1535
1660/1860/2160	2877	2760	2005	2035



Model	TA	TB		
1880	1065	1244		
2180	1105	1284		
UNIT:mm				

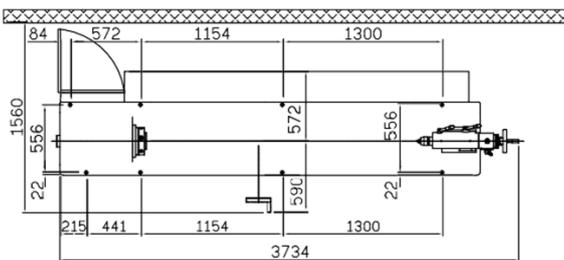


Figure 8. Space required

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 9), move the tailstock to the end of the bedway, then lock it in place.

Tailstock Lock Lever

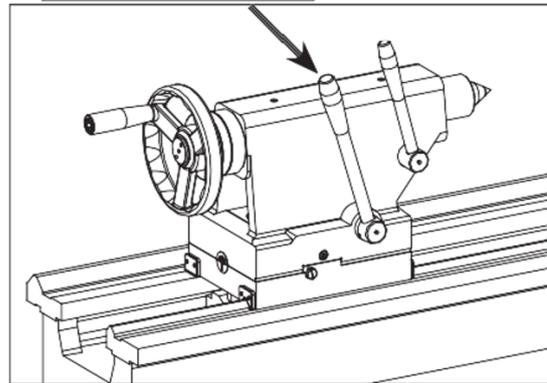


Figure 9. Tailstock lock lever.

4. To further balance the load, loosen the carriage lock bolt, disengage the half nut lever, then use the carriage handwheel to move the carriage next to the tailstock. (Figure 10)

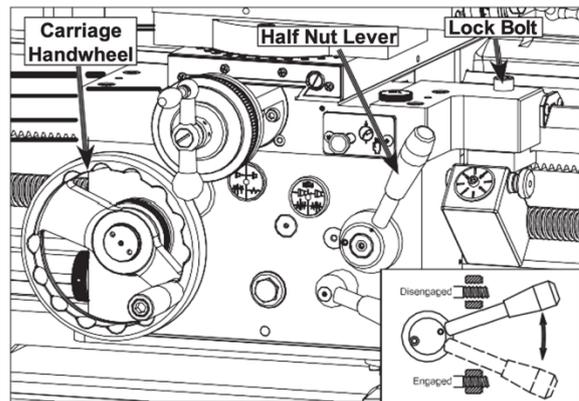


Figure 10. Carriage controls set for moving the carriage.

5. Lock the carriage lock bolt and tailstock lock lever.
6. **Lifting the machine with crane.**
 - a. Make sure that crane capacity is at least 3-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.
 - a. Install the lifting jig to bedway.
 - d. Make sure that the two hexagon nuts are fixed.
 - e. Keep the machine's center of gravity at the center of the crane.

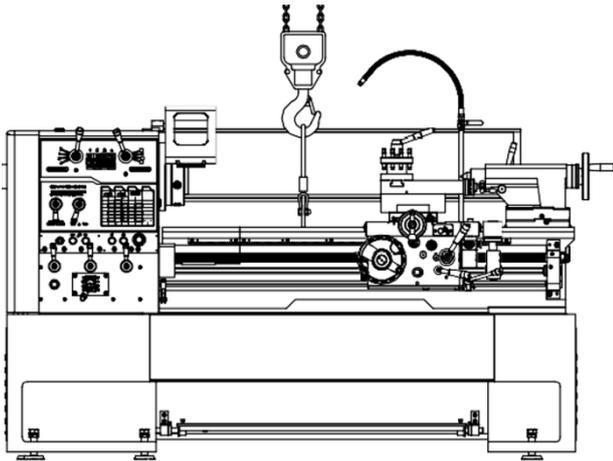


Figure 11. Lifting the machine with crane.

7. Moving the machine with a forklift.

- This lathe is very heavy. Ensure the forklift capacity is at least 3-tons.
- Use two people when lifting and moving this machine. Use one person to operate the forklift and another to watch and guide its movement.
- Widen the forks 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.

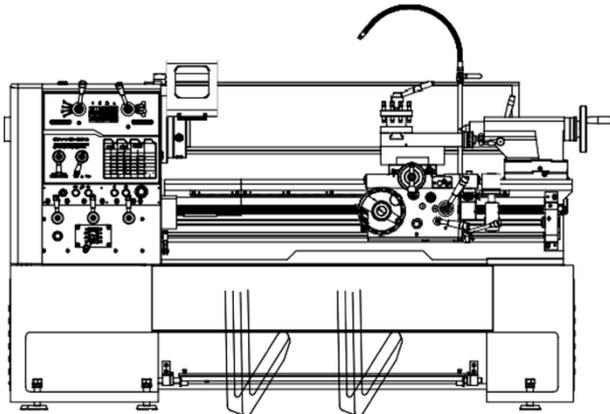


Figure 12. Moving the machine with a forklift.

Locating and 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.

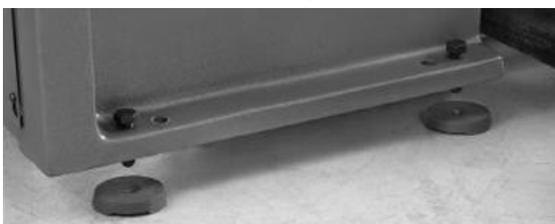


Figure 13. Leveling pads and screws.

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.

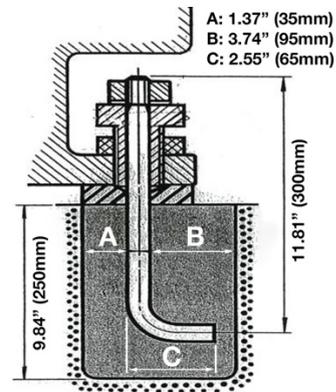


Figure 13B. J-Bolts

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.

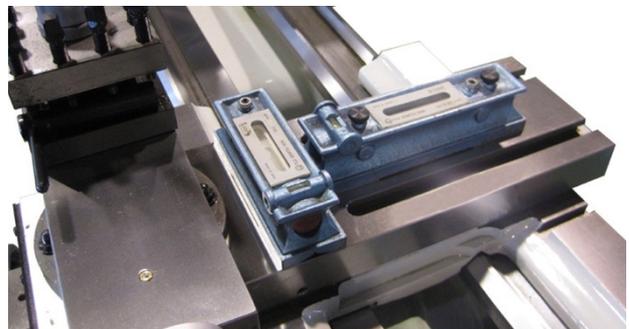


Figure 14. Example of a precision level.

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:

- Disconnect the lathe from power.
- Make sure that the headstock oil tank, gearbox, apron oil levels are full.
- Make sure the chuck and jaws are secure. If a chuck is not installed on the lathe, you do not need to install one for this test.

SET UP

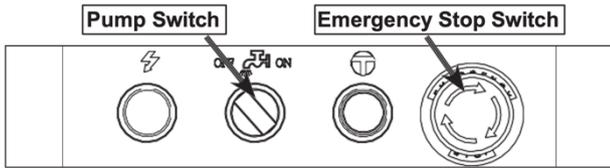


Figure 15. Control Panel.

4. Move the spindle range lever so that the indicator points to the A. (Figure 16)
5. Rotate the spindle speed lever so that the indicator points to the 1. (Figure 16)

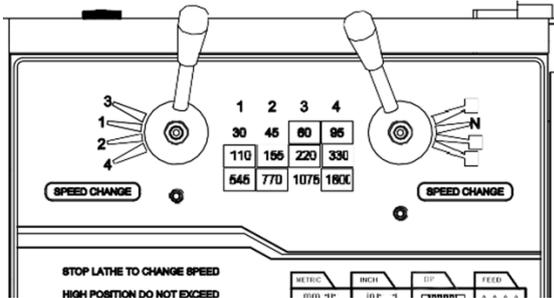


Figure 16. Headstock range lever.

6. Pull up on the half nut and the feed ON/OFF levers as shown in Figure 17.

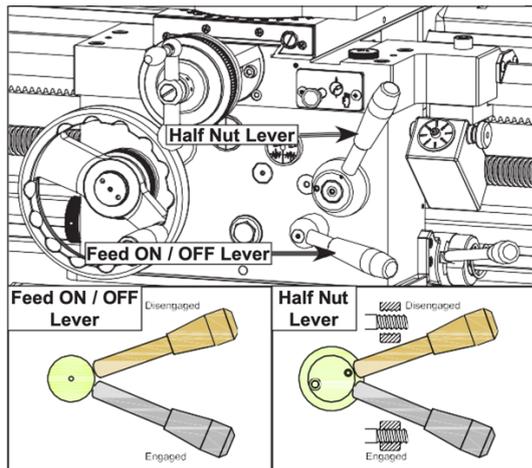


Figure 17. Apron controls for test run.

7. Using a 10mm hex wrench, loosen the carriage lock (Figure 18) so the carriage is free to slide.
8. Move the spindle ON / OFF lever to the OFF (middle) position as shown in Figure 18.

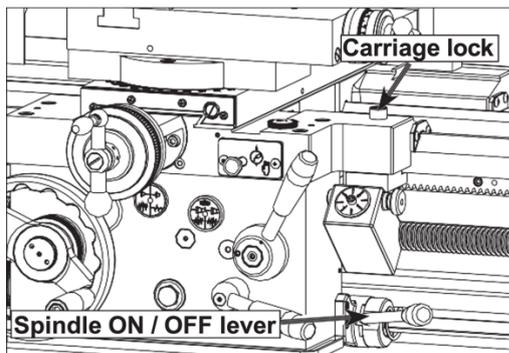


Figure 18. Carriage lock & Spindle ON / OFF lever.

9. Press the STOP button on the control panel to ensure that the lathe does not unexpectedly start when connected to power during the next step.

10. Connect the lathe to power source.
11. Rotate STOP button clockwise until it pops out. The power light on the control panel should illuminate.
12. Move the spindle ON / OFF lever down and the spindle/chuck will rotate.
13. Observe and listen for any abnormal noises or vibrations. The lathe should run smoothly with little or no vibration or rubbing noises.
14. Push the foot brake, and the lathe should stop quickly.
15. Lift the chuck guard and try to start the lathe again. The cover kill switch should prevent the lathe from starting while the guard is open.
16. Move the spindle ON/OFF lever to the OFF (middle) position. Remove the lathe end gear cover so the safety switch opens and disables the lathe from starting.
17. Attempt to start the lathe. If the lathe starts, the safety switch is faulty and needs to be replaced.
18. Push the STOP button in, move the spindle ON/OFF lever to the OFF position, then replace the end gear cover.
19. Point the coolant nozzle down into the chip drawer and verify that there is coolant in the reservoir.
20. Start the lathe, turn the coolant pump on, then open the valve. Verify that the coolant flows from the nozzle, then close the valve and turn the pump OFF.
21. 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:

1. Complete the Test Run procedure.
2. Set the spindle speed for 36 RPM.
3. Run the lathe for 10 minutes.
4. Turn the lathe OFF and wait until the spindle stops completely.
5. Repeat Steps 2–4 for each of the remaining 11 spindle speeds.
6. Set the spindle speed to 36 RPM and let the lathe run for a final 15 minutes to allow it to cool down, then turn the lathe OFF.
7. Change the oil in the headstock, quick-change gearbox, and apron reservoirs.
8. Check and, if necessary, 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 D-6 camlock mount. A chuck key is used to turn the locking cams (Figure 19) to secure / release the chuck / faceplate.

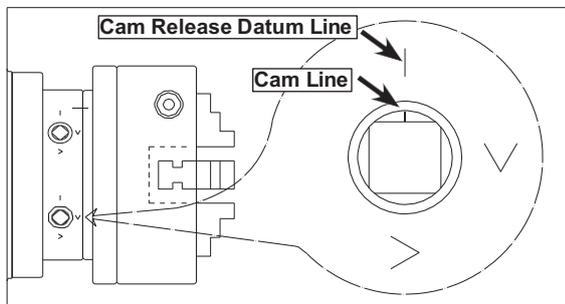


Figure 19. Camlock loosened with the cam line aligned with the datum line.

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 20), and slide the chuck onto the spindle.

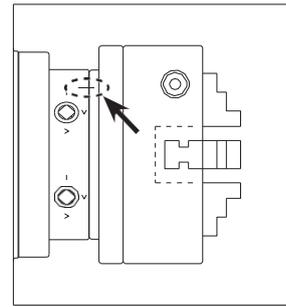


Figure 20. Chuck timing marks aligned.

7. Turn a camlock with the chuck key until the cam line falls between the "V" marks shown in Figure 21.

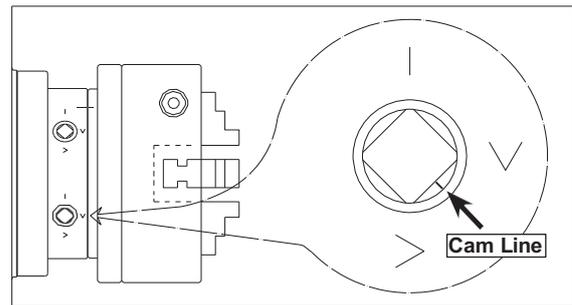


Figure 21. Cam and lines.

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 22.

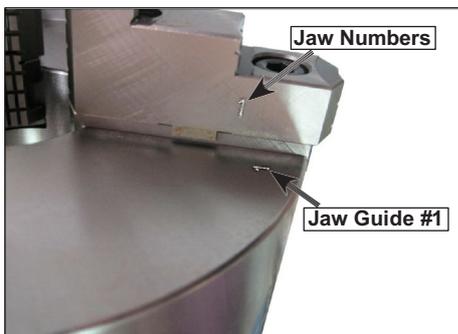


Figure 22. Jaw guides and jaw numbers.

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.



Figure 23. Inserting 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.

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 24. Make sure the workpiece is mounted firmly on the chuck.

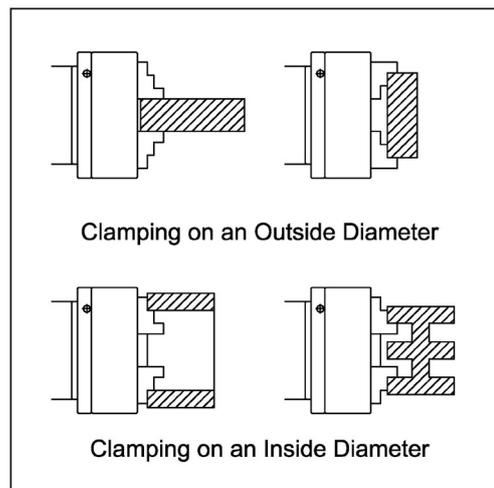


Figure 24. Examples of workpiece mounted in the 3-jaw chuck.

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.

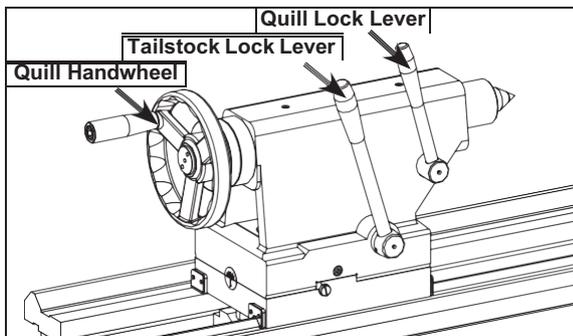


Figure 25. Tailstock and quill lock handles in locked position.

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 26) indicates the offset you want. See Figure 27 for adjustment direction.
3. When the offset is achieved, snug the jack screws so the tailstock position is locked.

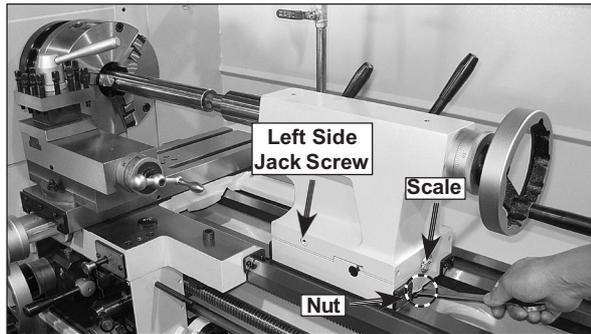


Figure 26. Tailstock offset adjustments.

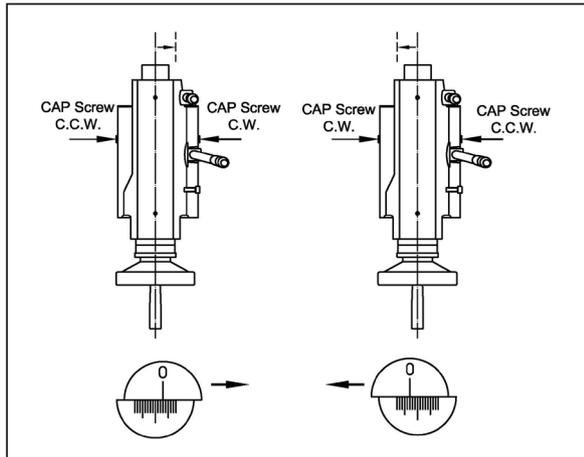


Figure 27. Jack screw adjustment versus tailstock movement.

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.

Removing Center from Spindle

To remove the sleeve and center from the spindle, insert a piece of round bar stock or similar tool through the outboard end (on the left side of the headstock), then tap the sleeve loose.

Mounting Center in Tailstock

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

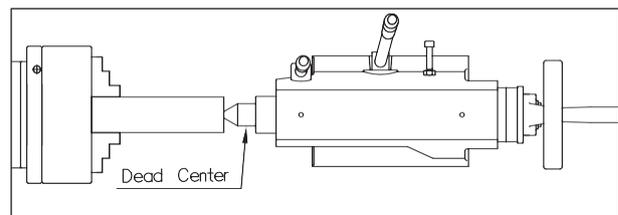


Figure 28. Example of using a dead center installed in the tailstock.

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 29 to secure it in place.

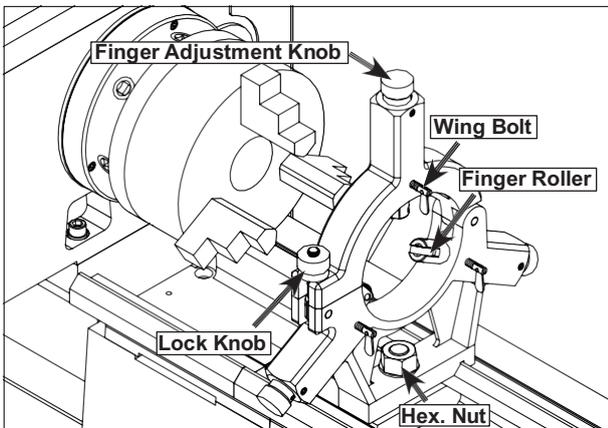


Figure 29. Steady rest components.

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 30.

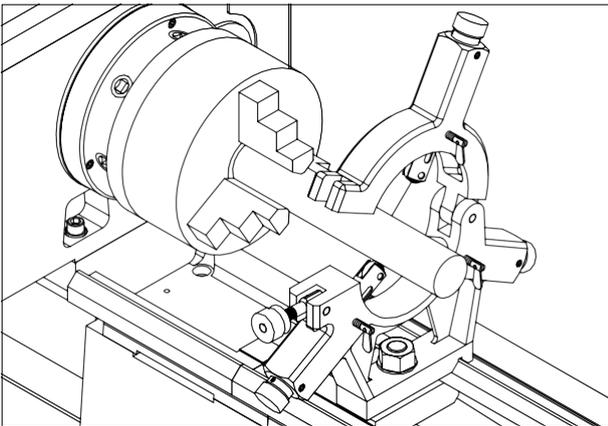


Figure 30. Workpiece mounted in the steady rest.

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 31). 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.

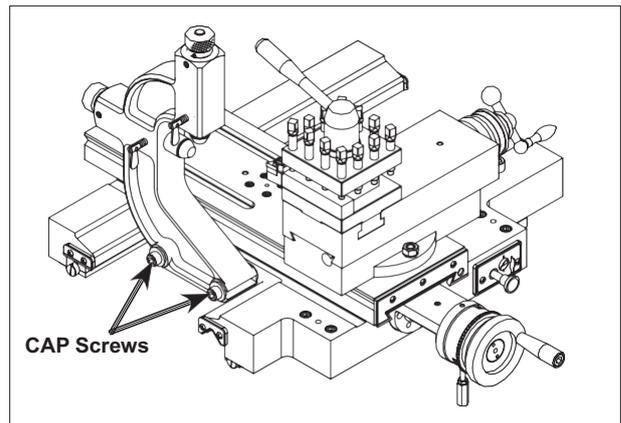


Figure 31. Follow rest attachment.

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 three CAP screws at the base of the compound slide (Figure 32).

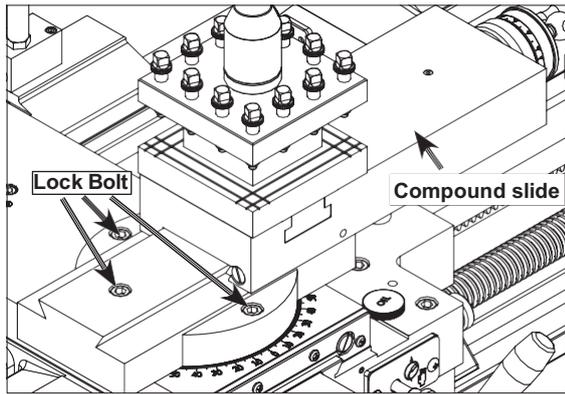


Figure 32. Compound slide set at an angle.

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

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 post:

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 33.

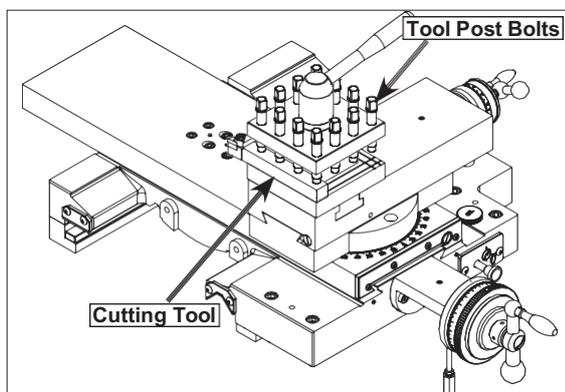


Figure 33. 4-way tool post.

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 34.

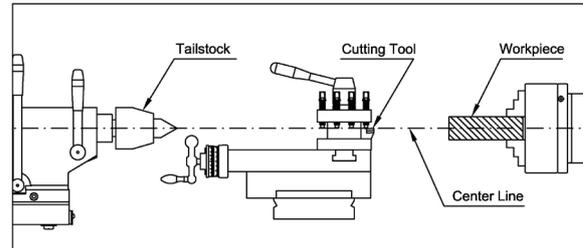


Figure 34. Cutting tool aligned with workpiece center.

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.

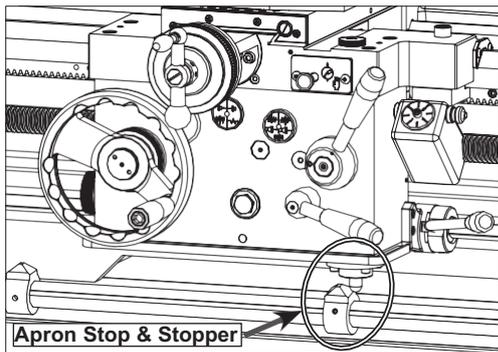


Figure 35. Apron stop and Stopper.

Manual Feed

You can manually move the cutting tool around the lathe for facing or turning operations using the handwheels shown in Figure 36 and described below.

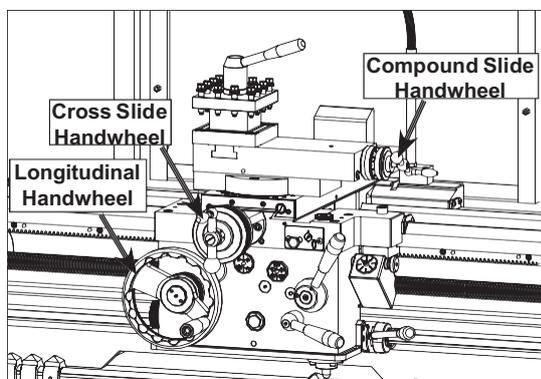


Figure 36. Carriage Controls.

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:

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

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:

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

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 37 to determine the available spindle speed range closest to your calculated spindle speed.

SPEED				
A	30	45	60	95
B	1130	155	220	330
C	545	770	1075	1600
LEVER	1	2	3	4

Figure 37. Spindle speed range chart.

3. Move the spindle speed range lever to the range that covers your calculated spindle speed.
4. Move the spindle speed lever to your calculated spindle speed.

Power Feed

On this machine, both the carriage and cross slide have power feed capability. The rate that 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 headstock feed direction lever shown in Figure 45 controls the direction the carriage moves. However, it is important to understand that there is a direction change relationship between the headstock feed direction lever and the apron feed direction knob (Figure 46). The apron feed direction knob and the headstock feed direction lever reverse the feed direction of each other. For example:

- When the apron feed direction knob is pushed-in, the direction of carriage travel shown on the headstock feed direction lever plate is applicable only when threading. For feeding, the directions shown will be opposite.
- When the apron feed direction knob is pulled-out, the direction of carriage travel shown on the headstock feed direction plate is accurate only when feeding. For threading, the directions shown will be opposite.

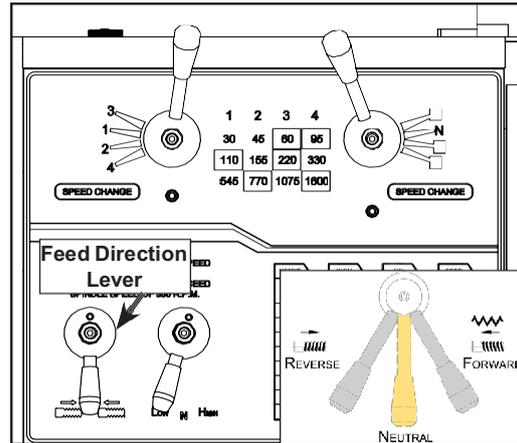


Figure 38 . Feed Direction Lever.

The main benefit of the apron feed direction knob shown in Figure 39 is that it changes the direction of the selected feed without having to stop the lathe, and walk over and shift the headstock feed direction lever.

The feed selection knob shown in Figure 39 engages either the carriage or cross slide feed.

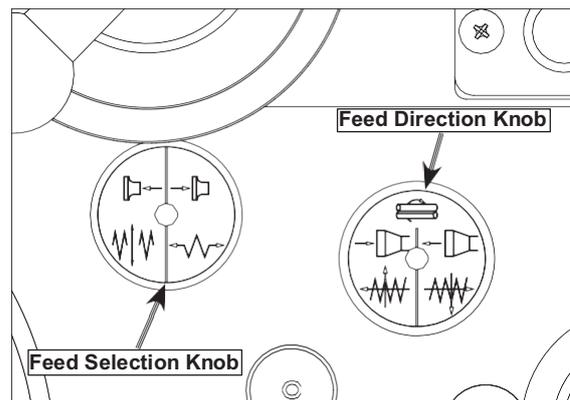


Figure 39. Apron feed knobs.

If the threading or general carriage feed is required, the carriage lock (Figure 40) must be disengaged. If the cross feed will be used for facing, the carriage lock should be engaged and the cross feed gib lock screw should be loose. If it is tight, loosen the cross feed gib lock using a 3mm hex wrench.

To engage the power feed:

1. Make sure the spindle is OFF and has come to a complete stop.
2. Shift the headstock feed direction lever to engage the leadscrew or feed rod. Sometimes you need to slightly rotate the handwheel of the component you are trying to engage, so that the gears can mesh.

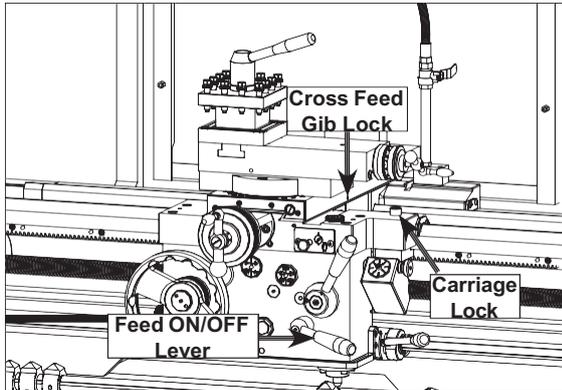


Figure 40. Carriage lock and gib lock.

3. Push down on the feed ON / OFF lever (Figure 40) on the front of the apron to engage power feed for either the carriage or the cross slide.
4. Push the feed selection knob in to select carriage feed, or pull the feed selection knob out to select cross feed.
5. Adjust the feed clutch knob, shown in Figure 41, to set at which point the feed clutch will slip to avoid feed system overload.

Tighten the feed clutch knob completely to seat the clutch. Next, count how many turns it takes to back it off completely.

Then tighten the knob $\frac{1}{3}$ of the distance that was backed-off. If the clutch slips too easily at this conservative setting, the knob can be tightened further. But keep in mind that when the knob is completely tight, the feed clutch is overridden and will not slip in the event of a feed system overload, resulting in feed system damage.

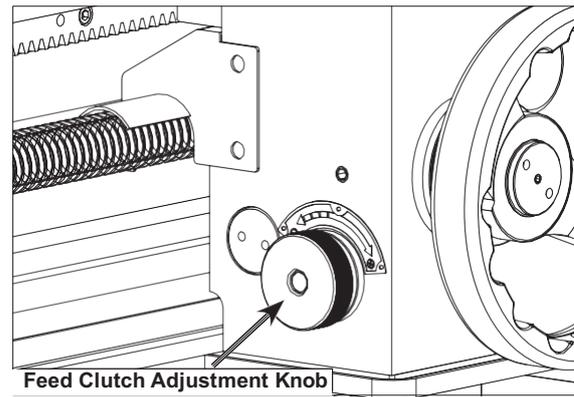


Figure 41. Feed clutch knob.

To use the quick change feed direction knob:

1. While the lathe is running, place the feed control lever in neutral.
2. Push or pull the quick change feed direction knob to change the direction of the feed rod.
3. 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.

Leadscrew & Feed Rod support

This support bracket was used for protect the Leadscrew and Feed rod to prevent these parts to be out of shape when the apron has been moved toward the chuck side, when the shorter cutting job required.

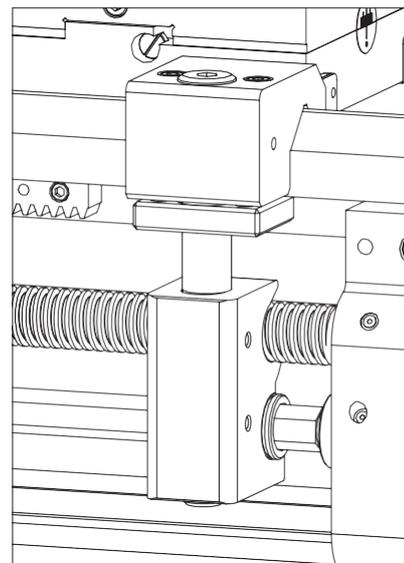


Figure 42. Leadscrew & Feed rod support

Thread & Feed Rate Chart

Figure 43 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.

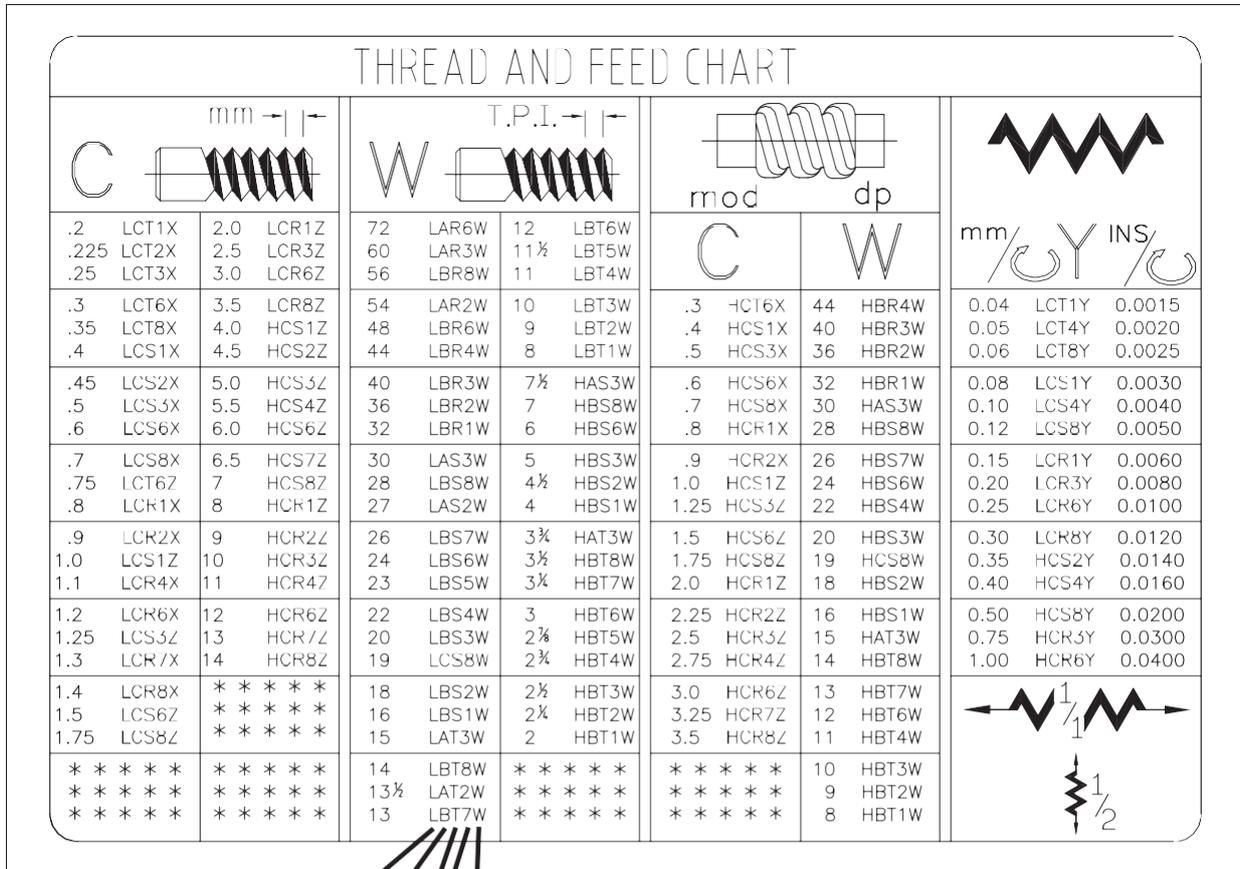


Figure 43. Thread and feed rate chart.

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 43 to Figure 44 show which gearbox levers must be moved to achieve an example feed rate.

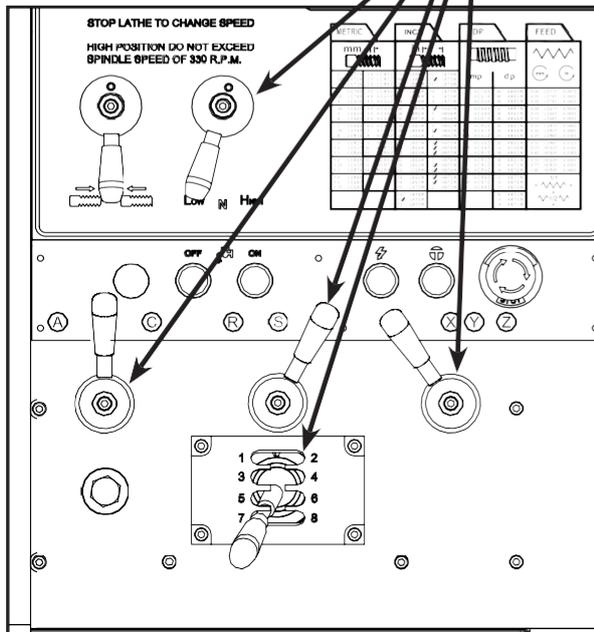


Figure 44. Example for thread and feed rate chart.

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 45. In the normal position, the 56T and 57T gears are meshed, which allows for inch threading and all general feed operations.

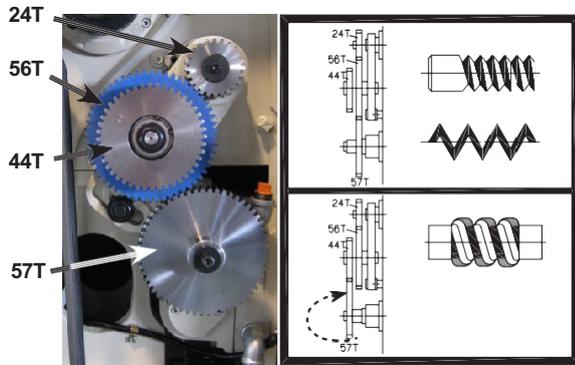


Figure 45. Normal end gear position.

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 46. In the normal position, the 55T and 64T gears are meshed, which allows for metric threading and all general feed operations.

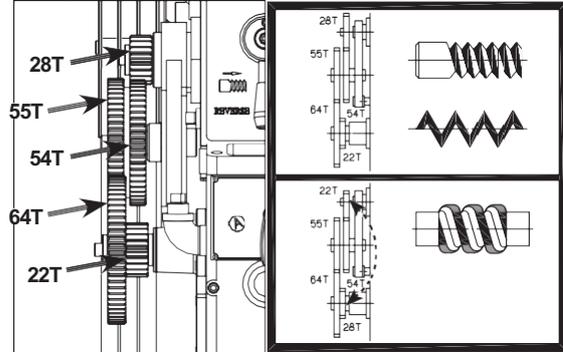


Figure 46. Normal end gear position.

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 fully up disengaged position or the internal lockout will prevent the half nut lever from applying the half nut. Also to avoid shearing the leadscrew shear pin, the carriage lock (Figure 47) must be loosened before threading begins.

OPERATION

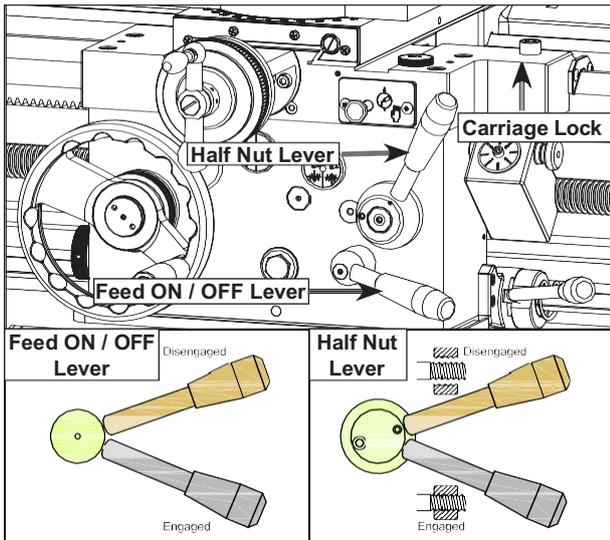


Figure 47. Carriage controls.

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 (Figure 48).

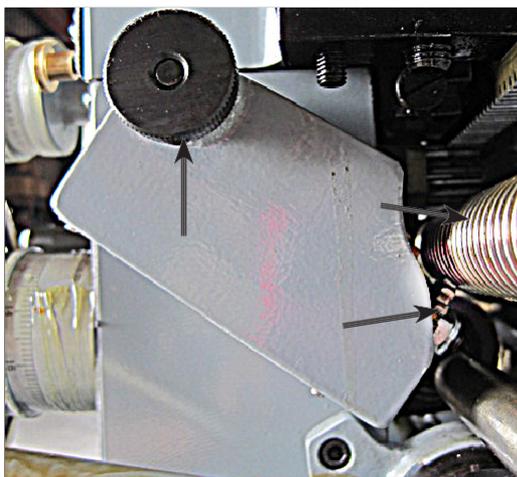


Figure 48. Thread dial engaged with the leadscrew.

Using Thread Dial and Chart (Inch)

Find the TPI (threads per inch) that you want to cut in the left column (Figure 49), then reference the dial number to the right of it. The dial numbers indicate when to engage the half nut for a specific thread pitch. The thread dial chart can also be found on the front of the thread dial housing.

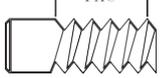
	
	
4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 56, 60, 72	ANY POSITION
2, 6, 10, 14, 18, 22, 26, 30, 54	NON NUMBERED POSITION
3, 5, 7, 9, 11, 13, 15, 19, 23, 27	NUMBERED POSITION 1, 2, 3, 4
$2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, $7\frac{1}{2}$, $11\frac{1}{2}$, $13\frac{1}{2}$	POSITION 1, 3 OR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

Figure 49. Thread dial chart (Inch).

TPI 4-72 Divisible By 4

Use any line (position) on the thread dial, shown in Figure 50, or threading TPI divisible by 4.

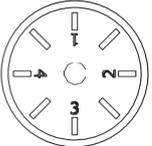
TPI 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 56, 60, 72	ANY POSITION	
---	-----------------	---

Figure 50. Any position is selected on the dial for threading 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 51.

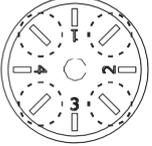
TPI 2, 6, 10, 14, 18, 22, 26, 30, 54	NON NUMBERED POSITION	
---	-----------------------------	---

Figure 51. 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 52.

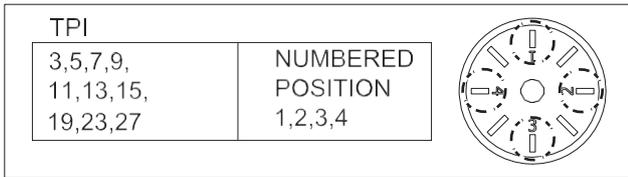


Figure 52. Numbers are selected on the dial for threading odd numbered TPI.

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 53). For example, to cut a 3 1/2 thread, select 1 on the dial, then start threading.

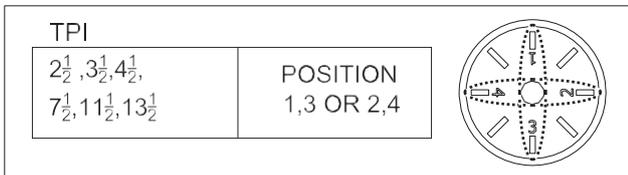


Figure 53. Opposing number group are selected on dial for cutting 1/2 thread TPI.

Other Fractional TPI

Use position 1 on the thread dial for cutting the TPI shown in Figure 54.

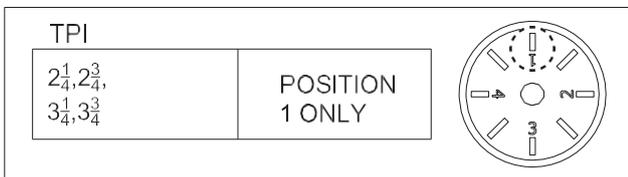


Figure 54. Position for 1/4 or 3/4 fractional TPI.

2 7/8 TPI

Use any numbered or non-numbered line on the thread dial to cut the TPI shown in Figure 55.

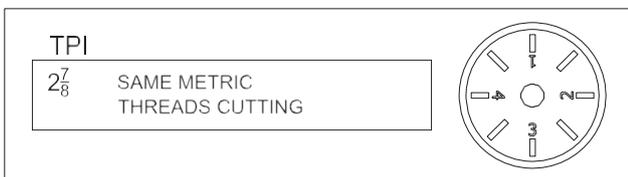


Figure 55. Half nut stays engaged for 2 7/8 TPI.

Using Thread Dial and Chart (Metric)

Find the length of each thread that you want to cut in the left column (Figure 56), 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.

 mm		 14T	
1.75, 3.5, 7, 14	14T		1, 3
4, 5, 9	18T		
5.5, 11	22T		

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

Figure 56. Thread dial chart (Metric).

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 57 - 58)

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

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

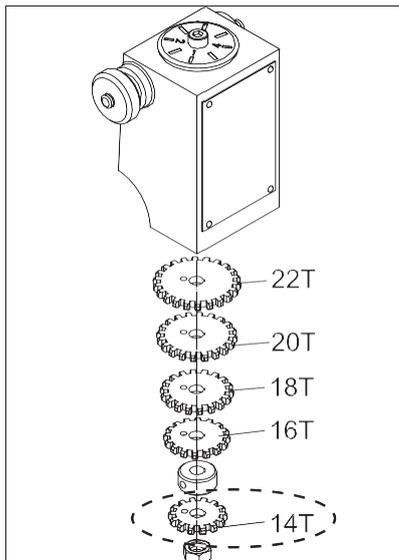


Figure 58. Example of thread dial - 14T.

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 57 - 58)

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 57 - 58)

.25, .5, .75, 1	16T	1, 2	
1.5, 2, 3, 4	18T	3, 4	
6, 8, 12	20T		
1.25, 2.5, 5, 10	22T		

Figure 59. Thread dial chart of numbered position 1, 2, 3, 4.

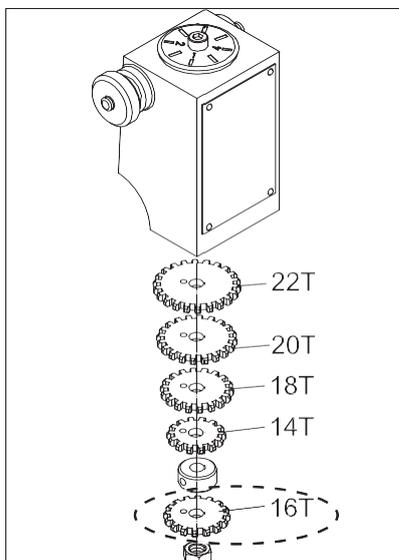


Figure 60. Example of thread dial - 16T.

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 59 - 60)

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 59 - 60)

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.

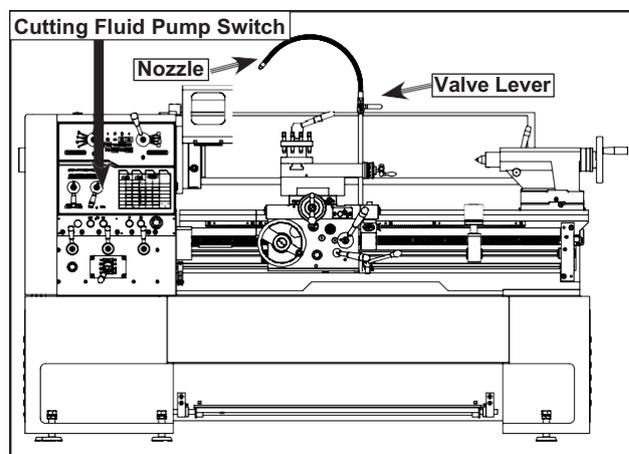


Figure 61. Coolant system controls and components.

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.
- 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

Checking & Adding Oil

Before operating the lathe, please check the status of the oil inside of the headstock from the oil sight glass. To replenish it up to the center line of the oil sight glass when it is lower than this center line.

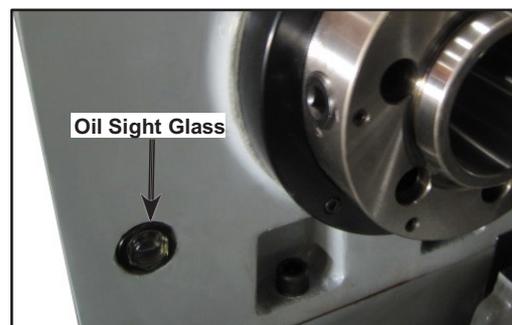


Figure 62. Location of the headstock oil sight glass.

Changing Oil

The headstock oil must be changed after the break-in period and then annually (or every six months with heavy service or extreme working conditions). The fill and drain plug is shown in Figure 63.

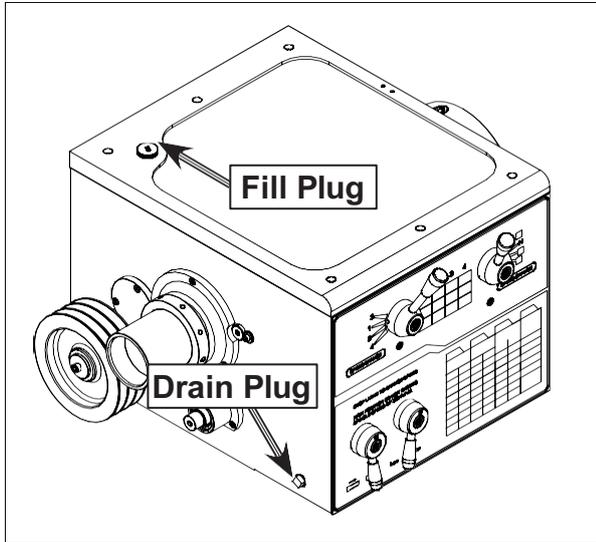


Figure 63. Location of headstock fill and drain plugs.

Gearbox

Checking & Adding Oil

The sight glass shown in Figure 64 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.

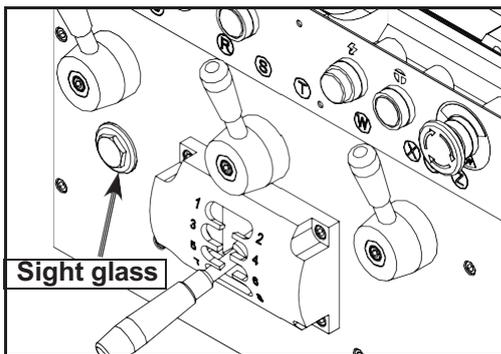


Figure 64. Gearbox sight glass location.

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 65 shows fill and drain plugs used when changing the gearbox oil.

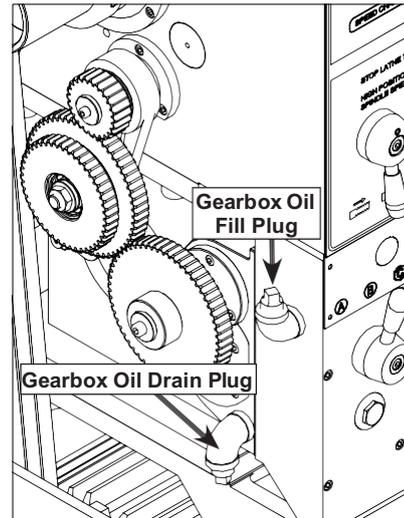


Figure 65. Location of gearbox fill and drain plugs.

Apron

Checking & Adding Oil

The sight glass shown in Figure 66 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.

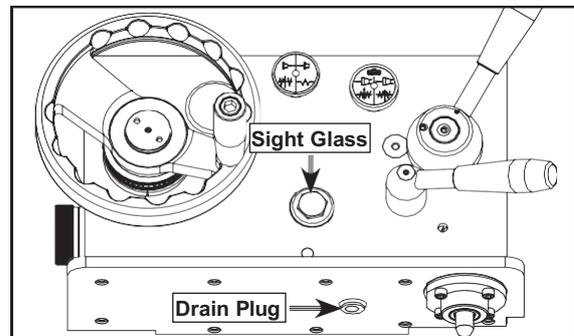


Figure 66. Location of apron drain plug & sight glass.

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 66 and the fill plug is shown in Figure 67.

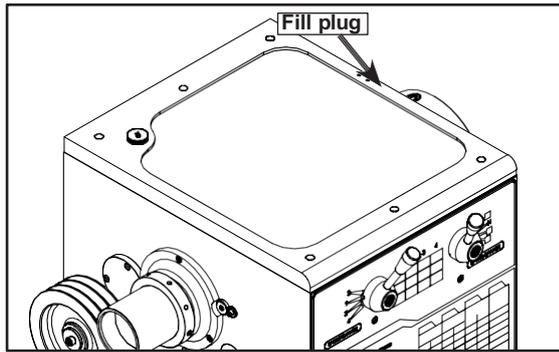


Figure 67. Location of fill plug for apron oil reservoir.

Lead Screw

Before lubricating the leadscrew, 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 68 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.

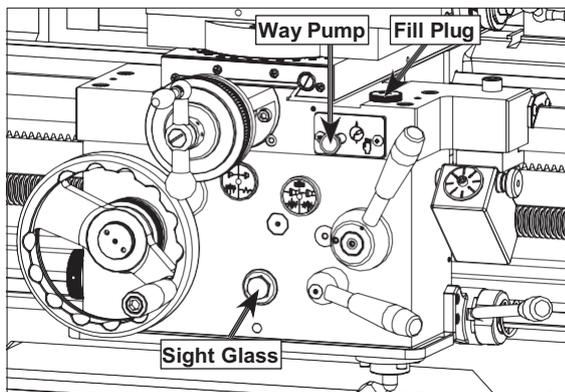


Figure 68. Location of way pump, fill plug and sight glass on the apron.

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

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

Lubricate the ball oilers before and after machine use, and more frequently under heavy use. When lubricating ball oilers, first clean the outside surface to remove any dust or grime. Push the rubber or plastic tip of the oil can nozzle against the ball oiler to create a hydraulic seal, then pump the oil can once or twice. If you see sludge and contaminants coming out of the lubrication area, keep pumping the oil can until the oil runs clear. When finished, wipe away any excess oil. (Figure 69 - 70)

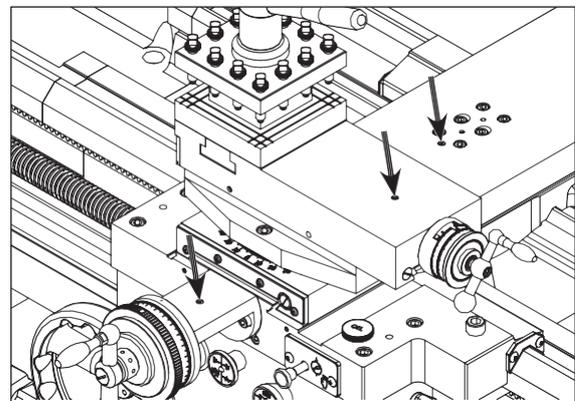


Figure 69. Carriage ball oiler .

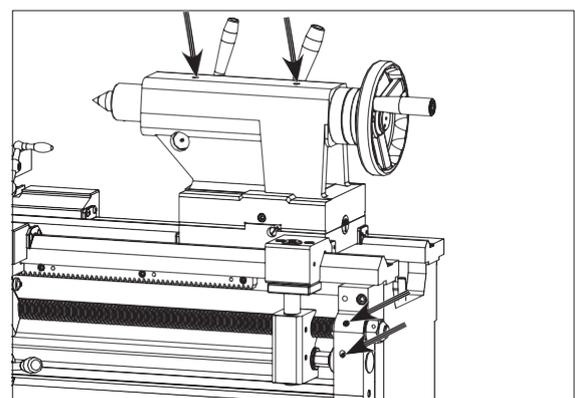


Figure 70. Tailstock and Leadscrew end ball oiler.

End Gearing

The end gears, shown in Figure 71, 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.

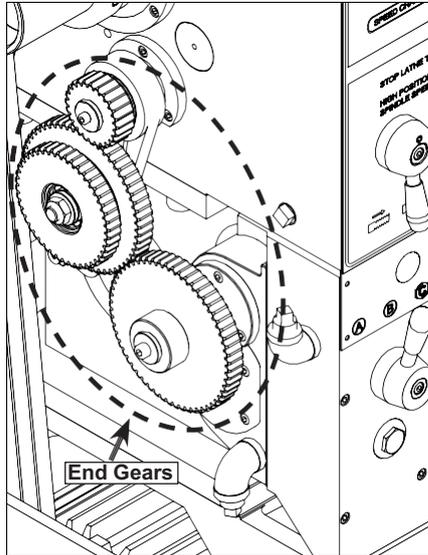


Figure 71. Location of end gears that require grease.

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 pick up 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.
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 72 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.

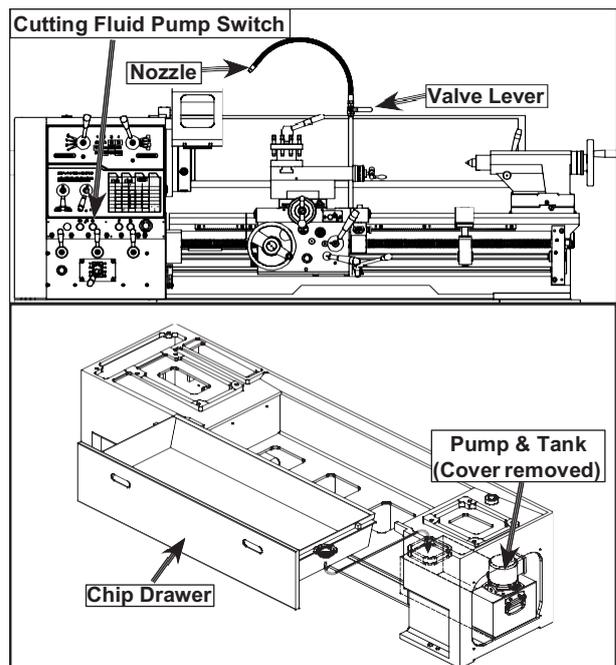


Figure 72. Cutting fluid system components and locations.

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 73.
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.

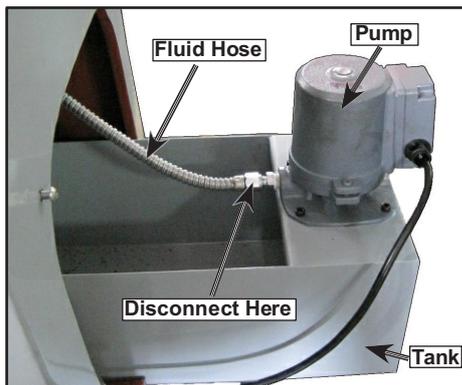


Figure 73. Cutting fluid pump and tank.

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 and slide the tank half way out of the base, as shown in Figure 73.

If necessary, disconnect the fluid hose from the pump, where shown in Figure 73.

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 74. 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.

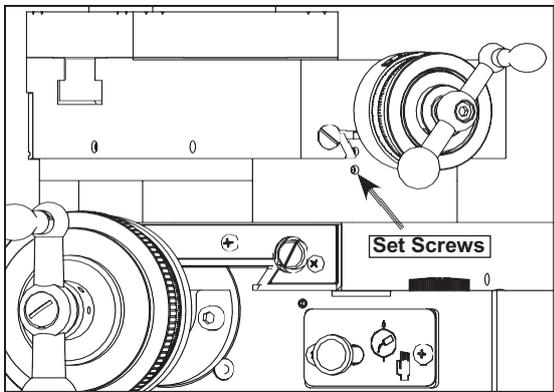


Figure 74. Compound slide backlash adjustment set screws.

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 75, 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.

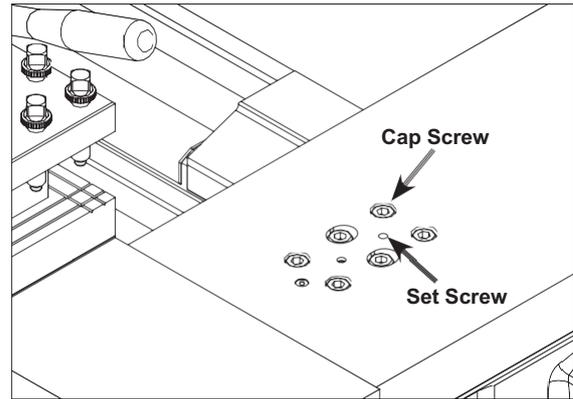


Figure 75. Cross slide backlash adjustment screws.

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 two cap screws and end cover.
3. Loosen both retaining nut set screws shown in Figure 76.

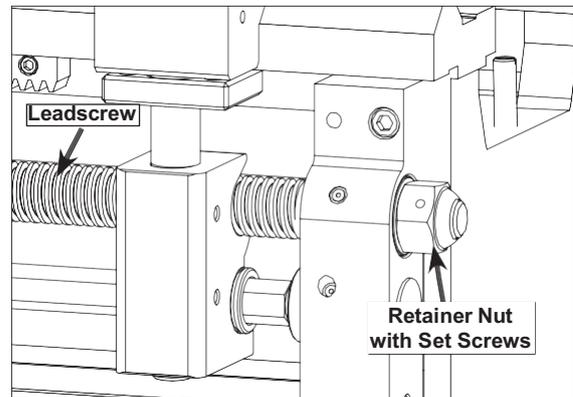


Figure 76. Leadscrew end play adjustment.

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 77 – 79 show the location of the screws for each gib on this machine.

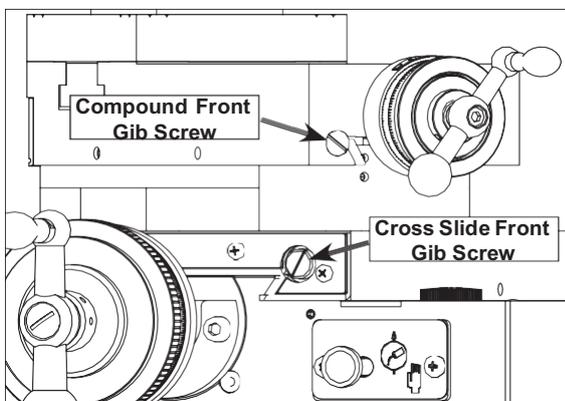


Figure 77. Compound and cross slide gib screw.



Figure 78. One of two front saddle gib screws.

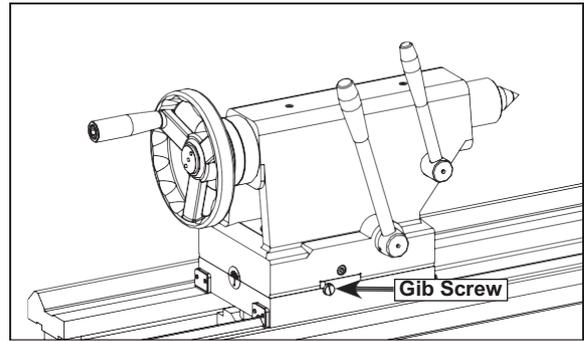


Figure 79. One of two tailstock gib screws.

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.

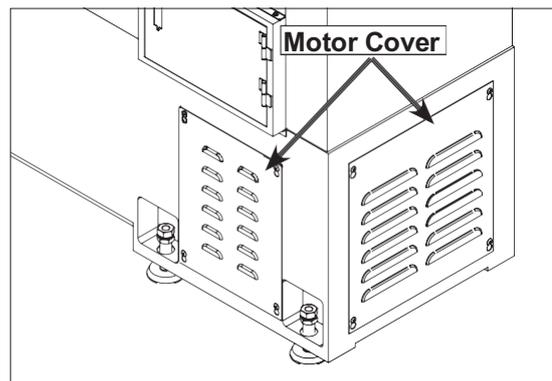


Figure 80. Location of motor cover.

3. Turn the hex nuts on the motor mount bolts shown in Figure 81 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.

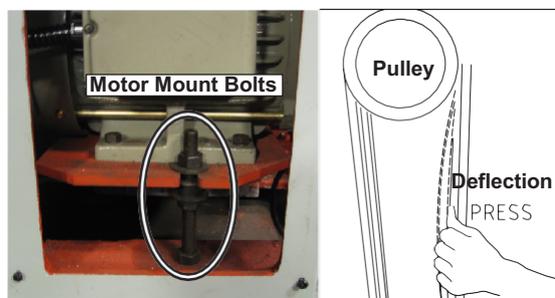


Figure 81. V-belt adjustment.

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 82.

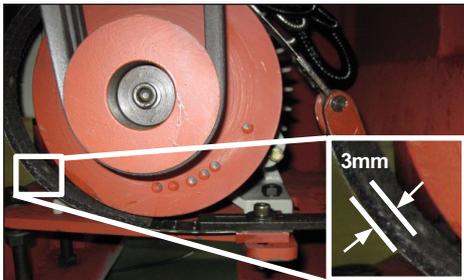


Figure 82. Minimum brake band lining thickness.

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.

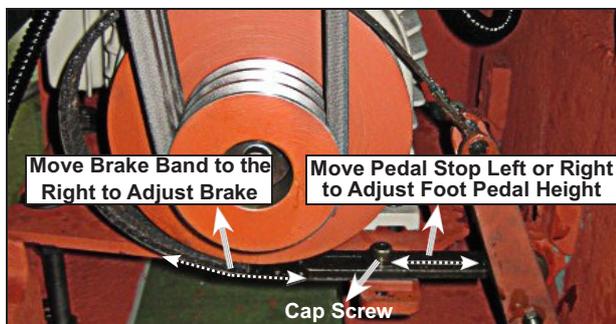


Figure 83. Brake linkage adjustments.

5. Remove pedal stop shown in Figure 84.
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 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.

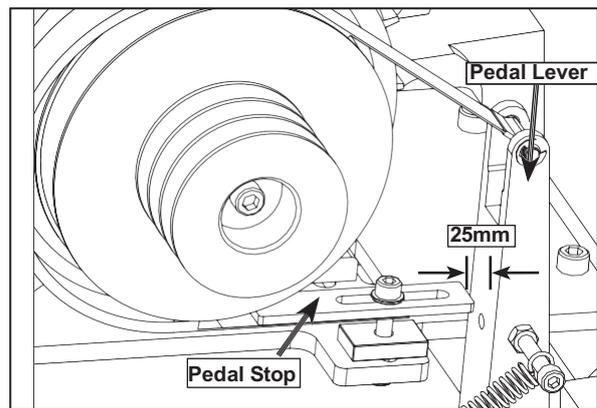


Figure 84. Pedal travel adjustment.

9. Tighten the cap screw on the pedal stop.
10. Locate the motor kill switch (Figure 85) at the tailstock end of the lathe.

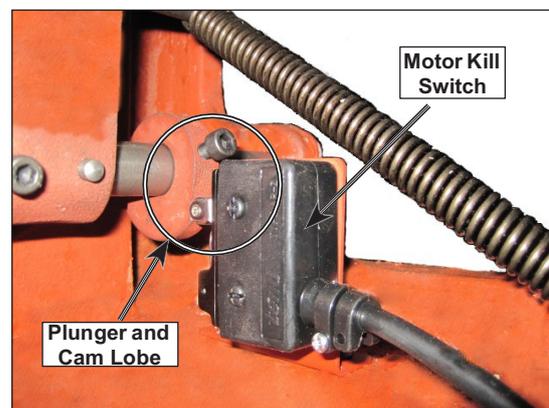
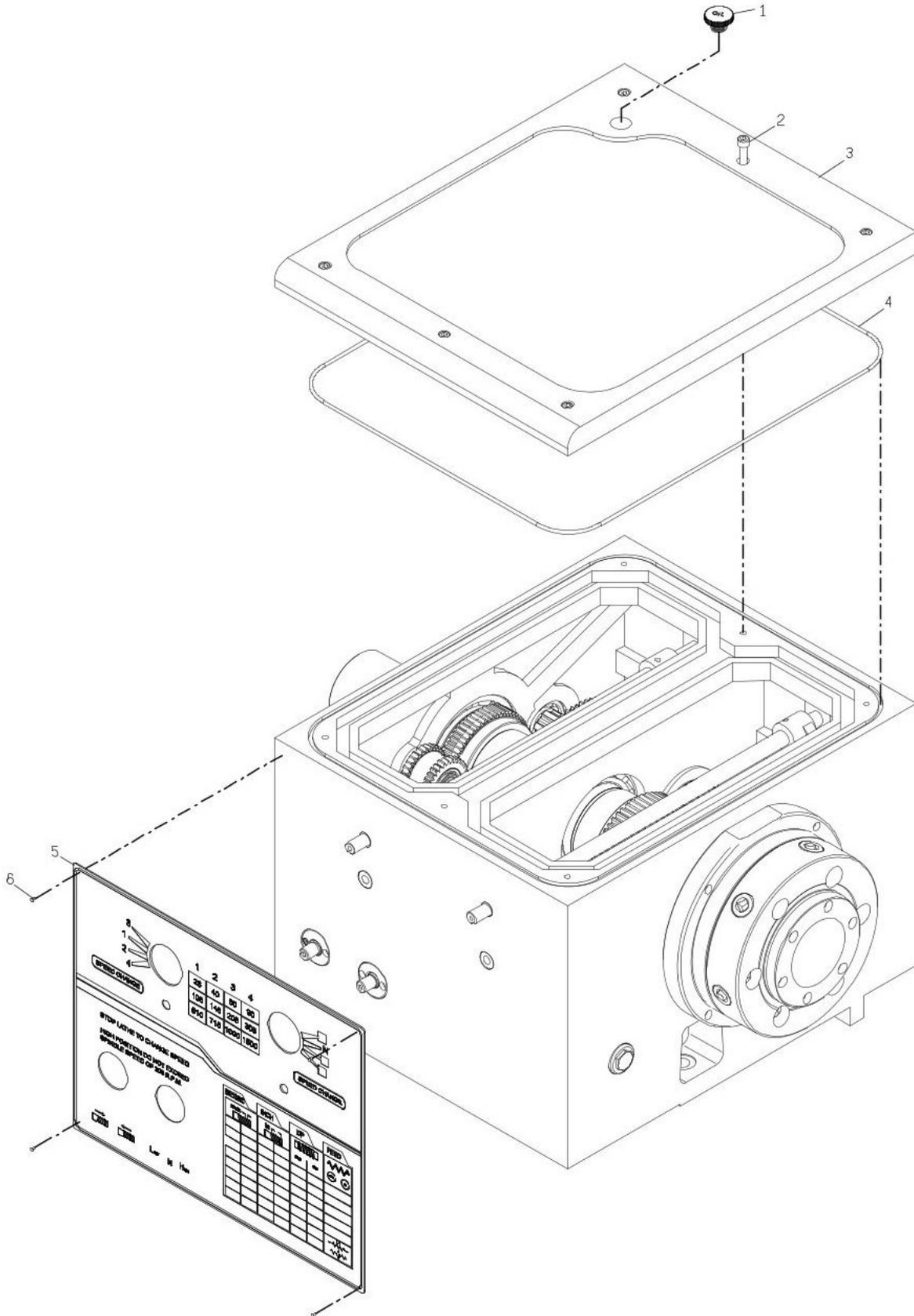


Figure 85. Motor kill switch.

Service Parts

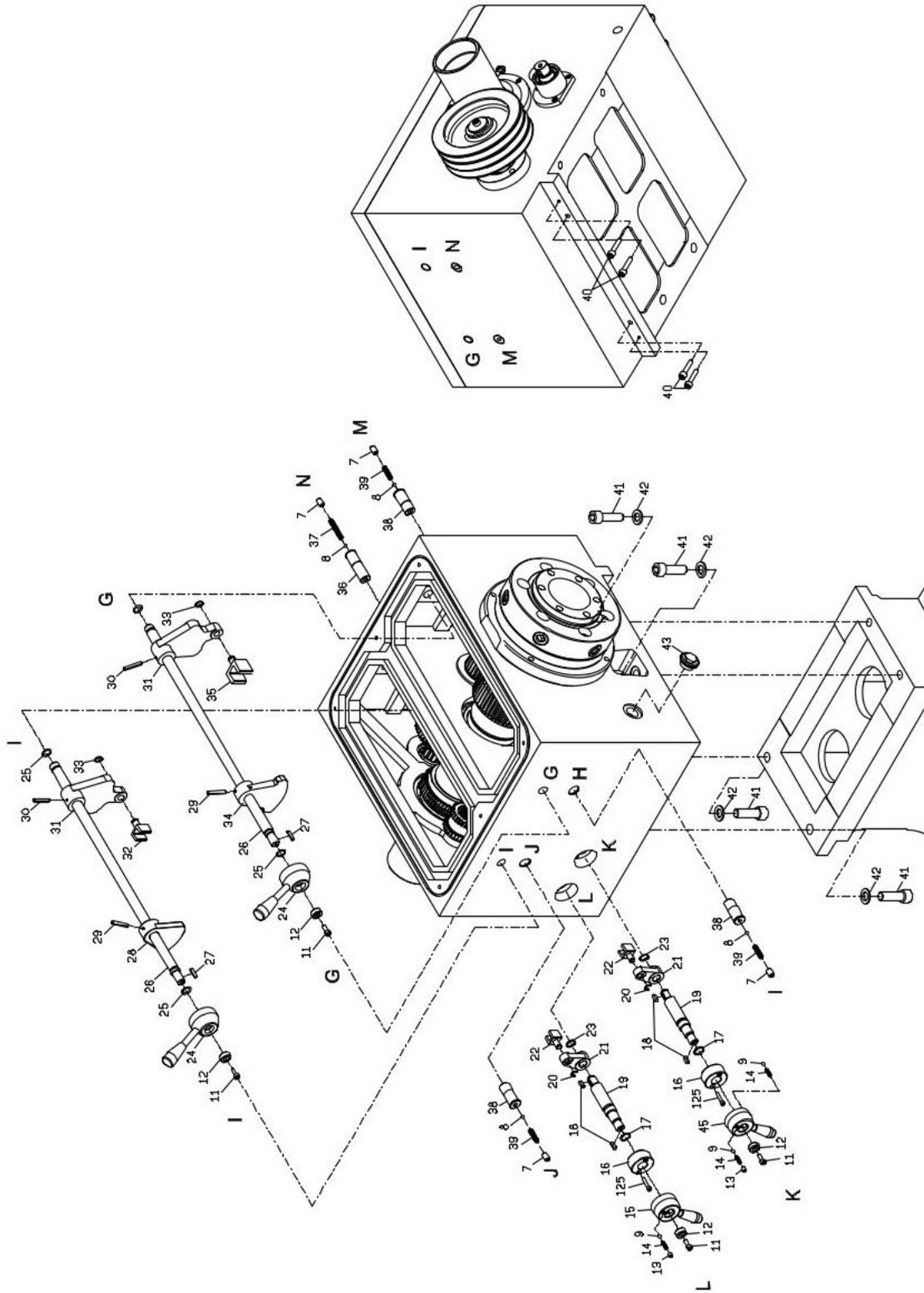
To order parts or reach our service department, call 1-800-274-6848 Monday through Friday (see our website for business hours, www.jettools.com). Having the Model Number and Serial Number of your machine available when you call will allow us to serve you quickly and accurately.

Headstock Assembly I – Exploded View



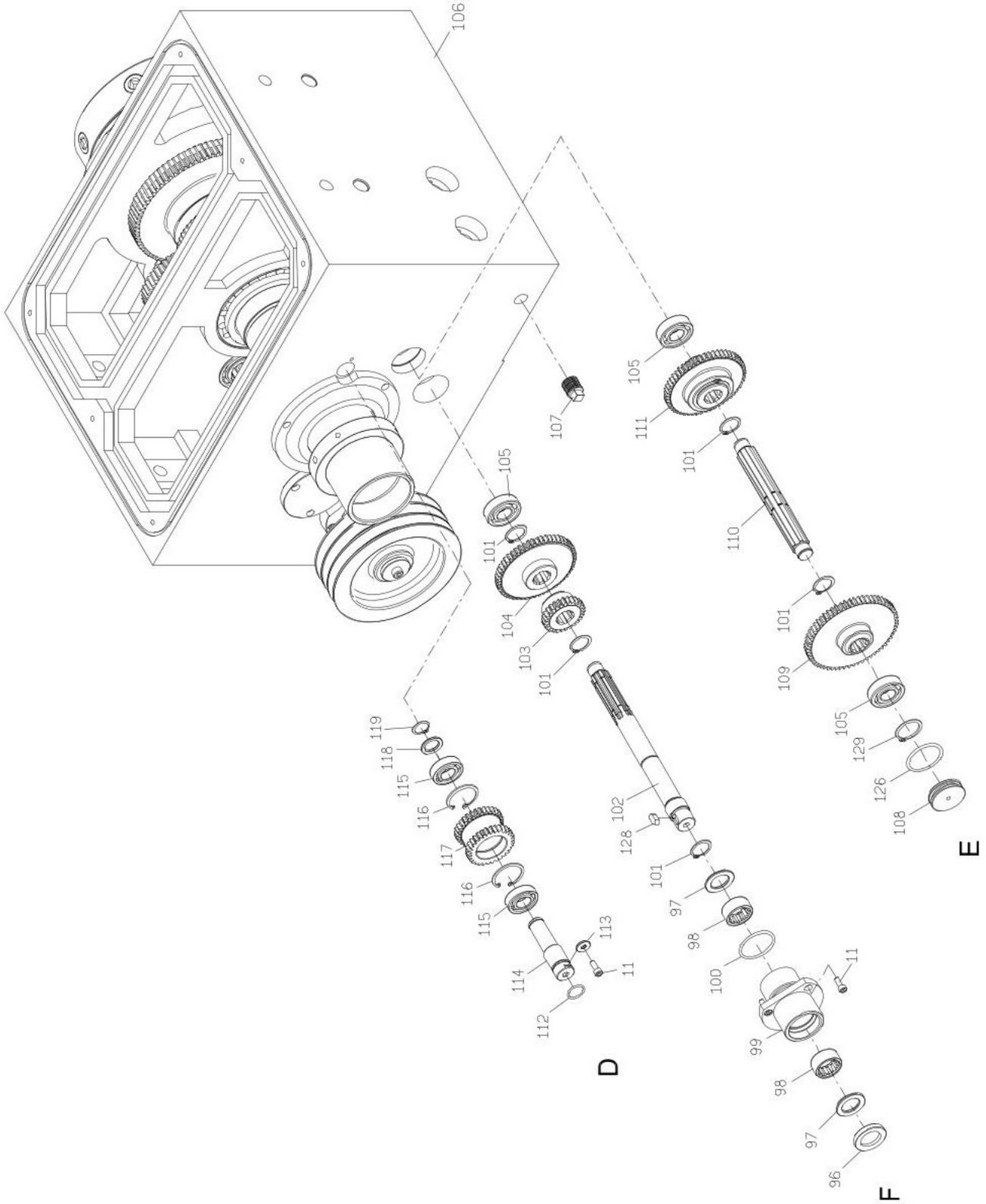
SERVICE PARTS

Headstock Assembly II – Exploded View



SERVICE PARTS

Headstock Assembly IV – Exploded View



SERVICE PARTS

Headstock Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Oil Cover	3/4"	1
2	**	Hex. Socket Head Bolt	CAP 8x30	7
3	**	Headstock Cover		1
4	**	O Ring	Ø4x1840	1
5	**	Name Plate	For 16", 18", and 21"f	1
6	**	Rivet	Ø2	4
7	**	Set Screw	SET 10x16	4
8	**	Steel Ball	Ø8.5	4
9	**	Steel Ball	Ø1/4"	3
11	**	Hex. Socket Head Bolt	CAP 6x16	20
12	**	Washer		4
13	**	Set Screw	SET 8x8	2
14	**	Spring		3
15	**	Hub, Handle, Spring Pin (Ø3x24)	Assembly for replacement	1
16	**	Collar		2
17	**	O Ring	P18	2
18	**	Key	5x5x16	4
19	**	Shaft		2
20	**	Clip	E8	2
21	**	Lever		2
22	**	Fork		2
23	**	Clip	S15	2
24	**	Hub, Handle, Spring Pin (Ø3x25)	Assembly for replacement	1
25	**	O Ring	P14	4
26	**	Rod		2
27	**	Key	5x5x22	2
28	**	Lever		1
29	**	Spring Pin	Ø6x40	2
30	**	Spring Pin	Ø6x36	2
31	**	Lever		2
32	**	Fork		1
33	**	Clip	S12	2
34	**	Lever		1
35	**	Lever		1
36	**	Bush		1
37	**	Spring		1
38	**	Bush		3
39	**	Spring		3
40	**	Hex. Socket Head Bolt	CAP 8x35	4
41	**	Hex. Socket Head Bolt	CAP 16x50	4
42	**	Washer	M16	4
43	JT1-3064	Oil Sight	3/4"	1
44	**	Spindle		1
45	**	Hub, Handle, Spring Pin (Ø3x25)	Assembly for replacement	1
48	**	Key	12x8x120	1
49	**	Key	12x8x30	1
50	**	Hex. Socket Head Bolt	CAP 6x35	3
51	**	Front Bearing Cover		1
52	**	Packing F		1
53	**	Taper Roller Bearing	32024XU	1
54	**	Gear	82T	1
55	**	Gear	53T	1

SERVICE PARTS

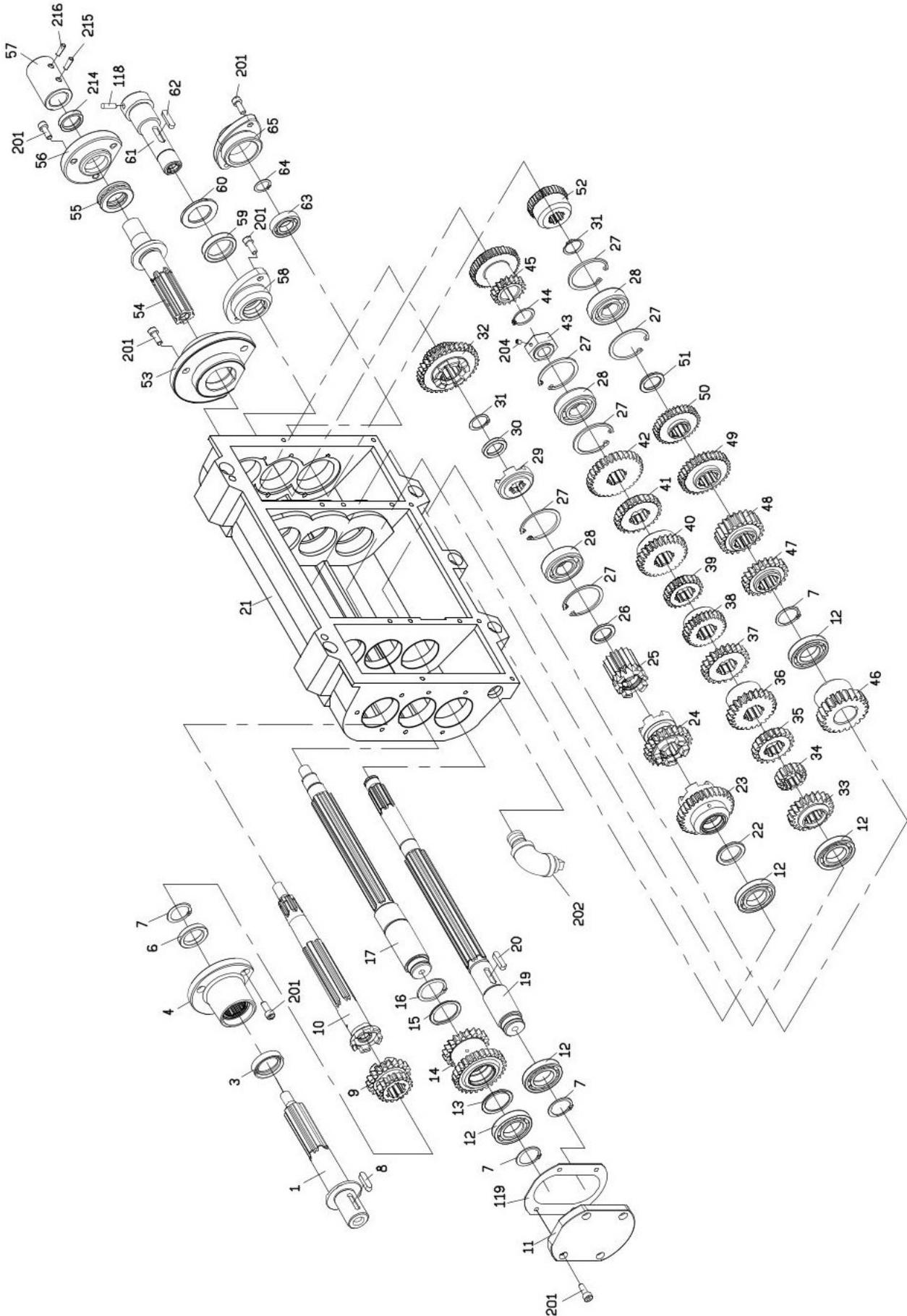
Index	Part No.	Description	Size	Qty
56	**	Clip	S105	1
57	**	Taper Roller Bearing	32020X	1
58	**	Nut	YSR100	1
59	**	Gear	62T	1
60	**	Ball Bearing	6019	1
61	**	Outside Cover		1
62	**	Balance Ring		1
63	**	Set Screw	SET 6x8	2
64	**	Cover		1
65	**	Ball Bearing	6206	2
66	**	Gear Shaft	20T	1
67	**	Key	8x7x25L	1
68	**	Gear	47T	1
69	**	Ball Bearing	6006	3
70	**	Collar		1
71	**	Gear	46T	1
72	**	Gear	33T	1
73	**	Gear	27T	1
74	**	Gear	39T	1
75	**	Shaft		1
76	**	Key	7x7x45	1
77	**	Flanged Bearing		1
78	**	Hex. Socket Head Bolt	CAP 6x30	3
79	**	Ball Bearing	5206S	1
80	**	Clip	R62	2
81	**	Oil Seal	TC306212	1
82	**	Pulley		1
83	**	Washer		1
84	**	O Ring	G65	1
85	**	Plug		1
86	**	Clip	R72	1
87	**	Ball Bearing	6306	1
88	**	Gear(23T),(25T/52T), Key (8x7x22), Clip(S50), Shaft	Assembly for replacement	1
89	**	Double Law Deep Groove Ball Bearing	25BD4715DUL16	1
90	**	Washer		1
91	**	Gear Shaft	25T	1
92	**	Ball Bearing	6008	2
93	**	Clip	S38	1
94	**	Gear(26T),(39T),(45T),(33T), Key (8x7x70), Clip(S55)	Assembly for replacement	1
96	**	Oil Seal	TC28x44x7	1
97	**	Washer		2
98	**	Needle Bearing	RNA6904	2
99	**	Flanged Bearing		1
100	**	O Ring	P44	1
101	**	Clip	S25	5
102	**	Shaft		1
103	**	Gear	27T	1
104	**	Gear	54T	1
105	**	Ball Bearing	6204	3
106	**	Head Stock	For 16", 18", and 21"	1
107	**	Square Head Plug	PT 1/2"	1
108	**	Cover		1

SERVICE PARTS

Index	Part No.	Description	Size	Qty
109	**	Gear	62T	1
110	**	Shaft		1
111	**	Gear(27T),(54T), Key (7x7x20), Clip(S45)	Assembly for replacement	1
112	**	O Ring	P21	1
113	**	Washer		1
114	**	Shaft		1
115	**	Ball Bearing	6004	2
116	**	Clip	R42	2
117	**	Gear	31T	1
118	**	Washer		1
119	**	Clip	S20	1
120	**	Packing		1
121	**	Set Screw	SET 8x12	3
123	**	Cover		1
125	**	Hex. Scket Head Bolt	CAP 5x25	4
126	**	O Ring	P41	1
127	**	O Ring	G55	1
128	**	Key	7x7x16	1
129	**	Clip	R47	1
130	**	Cams		6
131	**	Set Screw		6
132	**	Spring		6
133	**	Cams		6

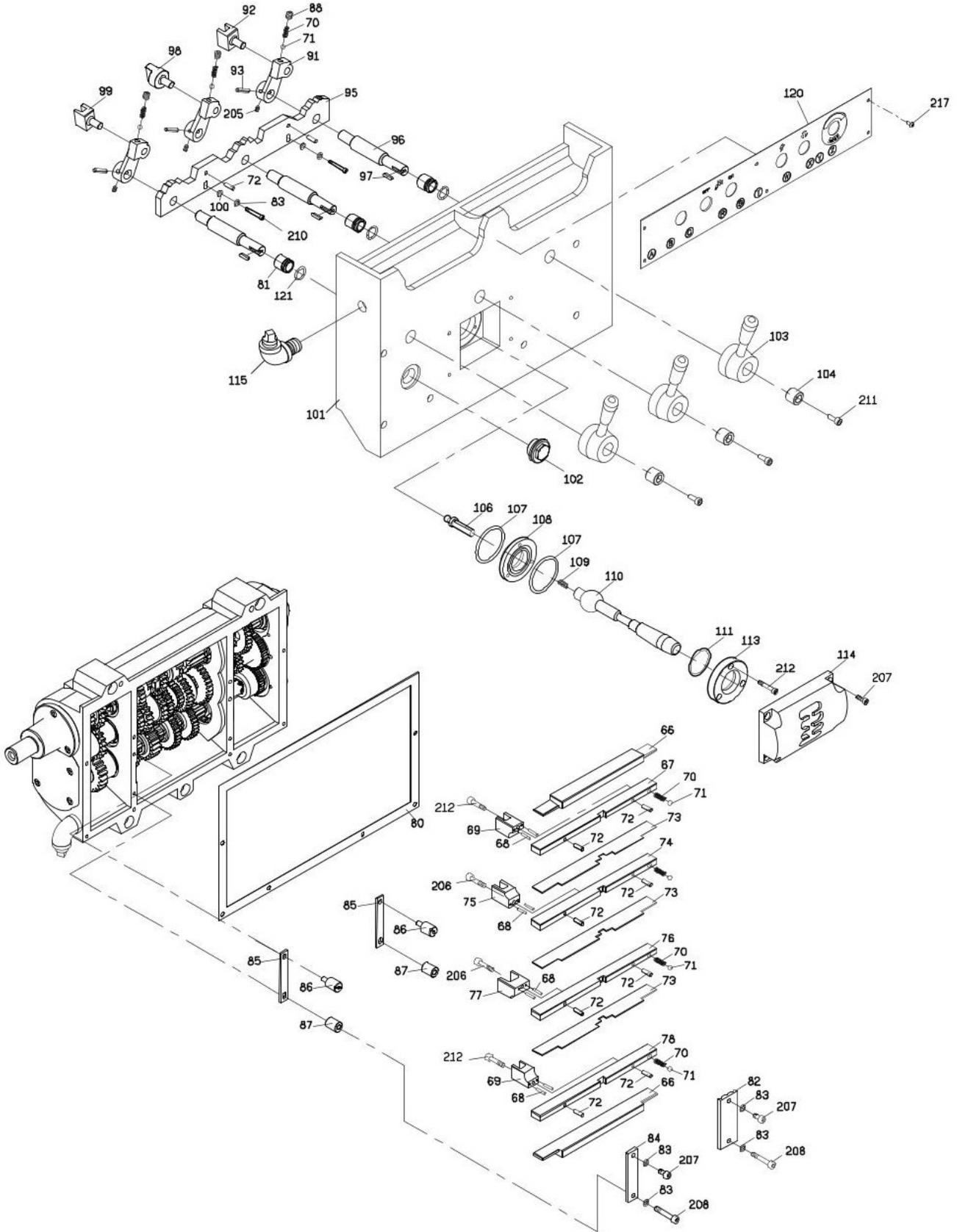
** These parts are shown for reference only and are not available for order individually. Non-proprietary parts, such as fasteners, can usually be found at local hardware stores.

Gearbox Assembly I – Exploded View



SERVICE PARTS

Gearbox Assembly II – Exploded View



SERVICE PARTS

Gearbox Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Shaft		1
3	**	Oil Seal	25x37x08	1
4	**	Bearing(TAF25/20), Flanged Bearing	Assembly for replacement	1
6	**	Washer		1
7	**	Clip	S25	4
8	**	Key	7x7x30	1
9	**	Gear	19T/19T	1
10	**	Shaft		1
11	**	Cover		1
12	**	Bearing	16005	5
13	**	Washer		1
14	**	Gear	30T/20T	1
15	**	Washer		1
16	**	Clip	S30	1
17	**	Shaft		1
19	**	Shaft		1
20	**	Key	6x6x25	1
21	**	Gearbox Body		1
22	**	Washer		1
23	**	Gear	32T	1
24	**	Gear	23T	1
25	**	Gear	16T	1
26	**	Washer		1
27	**	Clip	R47	6
28	**	Bearing	6204	3
29	**	Clutch		1
30	**	Washer		1
31	**	Clip	S20	2
32	**	Gear	35T	1
33	**	Gear	22T	1
34	**	Gear	16T	1
35	**	Gear	20T	1
36	**	Gear	24T	1
37	**	Gear	23T	1
38	**	Gear	27T	1
39	**	Gear	24T	1
40	**	Gear	28T	1
41	**	Gear	26T	1
42	**	Gear	32T	1
43	**	Nut		1
44	**	Clip	S22	1
45	**	Gear	18T/45T	1
46	**	Gear	22T	1
47	**	Gear	22T	1
48	**	Gear	22T	1
49	**	Gear	33T	1
50	**	Gear	22T	1
51	**	Washer		1
52	**	Gear	36T	1
53	**	Flanged Bearing		1
54	**	Shaft		1

SERVICE PARTS

Index	Part No.	Description	Size	Qty
55	**	Bearing	51105	1
56	**	Flanged Bearing		1
57	**	Sleeve		1
58	**	Flanged Bearing		1
59	**	Oil Seal	28x40x05	1
60	**	Washer		1
61	**	Shaft		1
62	**	Key	5x5x35	1
63	**	Bearing	16003	1
64	**	Clip	S17	1
65	**	Flanged Bearing		1
66	**	Upper Plate		2
67	**	Fort Support		1
68	**	Spring Pin	Ø3×16	8
69	**	Fork		2
70	**	Spring	Ø4×19	7
71	**	Steel Ball	1/4"	7
72	**	Spring Pin	Ø5x16	10
73	**	Partition		3
74	**	Fort Support		1
75	**	Fork		1
76	**	Fort Support		1
77	**	Fork		1
78	**	Fort Support		1
80	**	Seal		1
81	**	Spacer		3
82	**	Reverse-Stop		1
83	**	Spring Washer	M6	6
84	**	Shoulder Plate		1
85	**	Fixed Plate		2
86	**	Partition Nut		2
87	**	Spacer		2
88	**	Set Screw	SET 8x8	3
91	**	Lever		3
92	**	Fork		1
93	**	Spring Pin	4x24	3
95	**	Selector Bar		1
96	**	Shaft		3
97	**	Key	4x4x15	3
98	**	Fork		1
99	**	Fork		1
100	**	Washer	M6	2
101	**	Gearbox Cover		1
102	JT1-3064	Oil Sight	3/4"	1
103	**	Handle & Hub	Assembly for replacement	1
104	**	Washer		3
106	**	Selector Lever		1
107	**	O Ring	G40	2
108	**	Selector Lever Support		1
109	**	Spring	9x38	1
110	**	Selector Lever		1
111	**	O Ring	G30	1
113	**	Selector Lever Cover		1

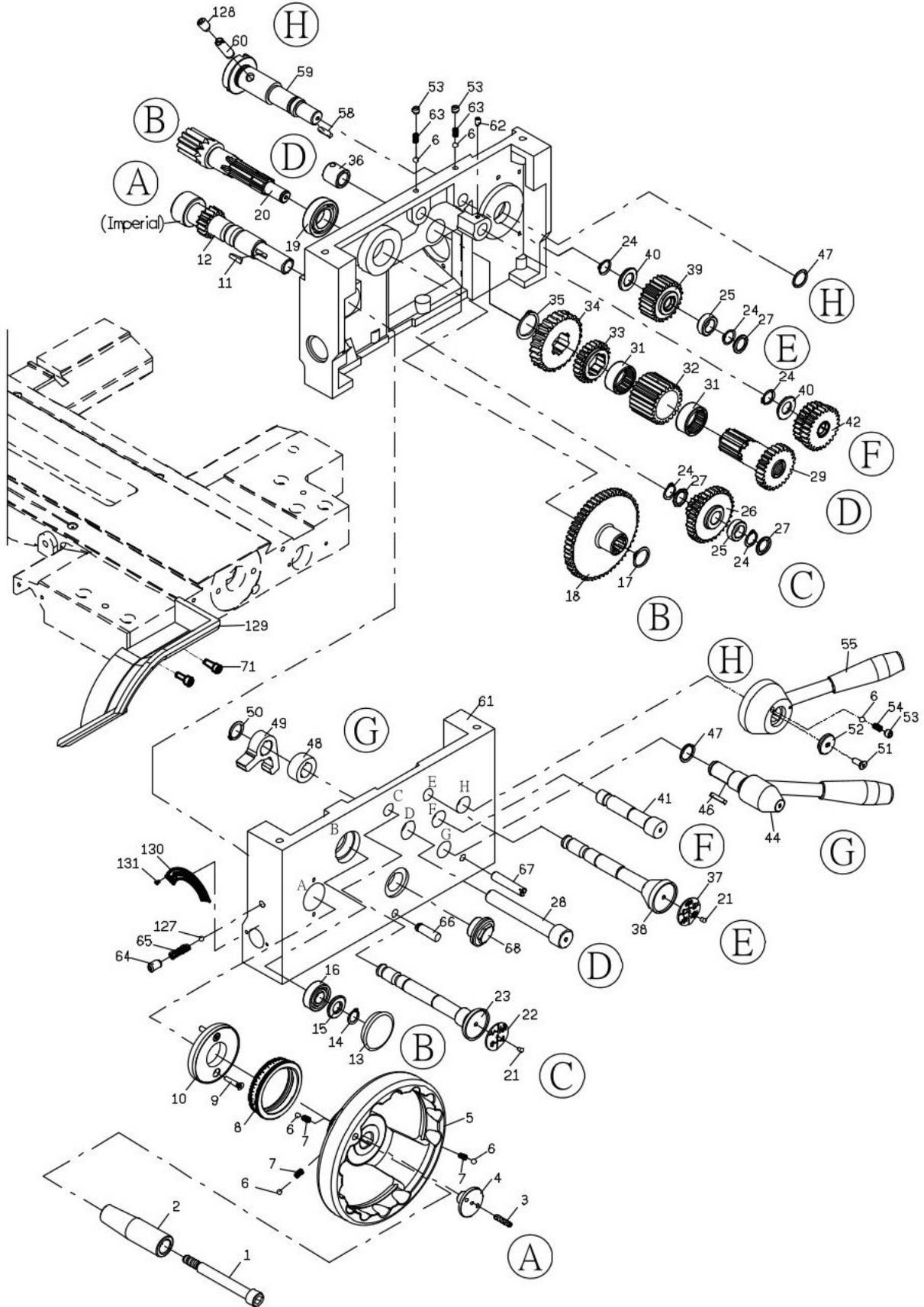
SERVICE PARTS

Index	Part No.	Description	Size	Qty
114	**	Specifying Base		1
115	**	Square Head Plug(3/4"), Elbow(3/4"), Nipple(3/4"x1")	Assembly for replacement	1
118	**	Pin	Ø6×36	1
119	**	Seal		1
120	**	Plate		1
121	**	O Ring	P16	3
201	**	Hex. Socket Head Bolt	CAP 6x16	17
202	**	Square Head Plug(1/2"), Elbow(1/2"), Nipple(1/2"x1")	Assembly for replacement	1
204	**	Set Screw	SET 5x6	1
205	**	Set Screw	SET 6x6	3
206	**	Hex. Socket Head Bolt	CAP 5x20	2
207	**	Hex. Socket Head Bolt	CAP 6x16	9
208	**	Hex. Socket Head Bolt	CAP 6x40	2
209	**	Hex. Socket Head Bolt	CAP 6x25	3
210	**	Hex. Socket Head Bolt	CAP 6x20	2
211	**	Hex. Socket Head Bolt	CAP 6x10	3
212	**	Hex. Socket Head Bolt	CAP 5x25	3
214	**	Oil Seal	24x35x08	1
215	**	Pin	#4×32	1
216	JT1-3075	Pin	#4×32(Copper)	1
217	**	Dome Hexagon Screw	M4x8	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.

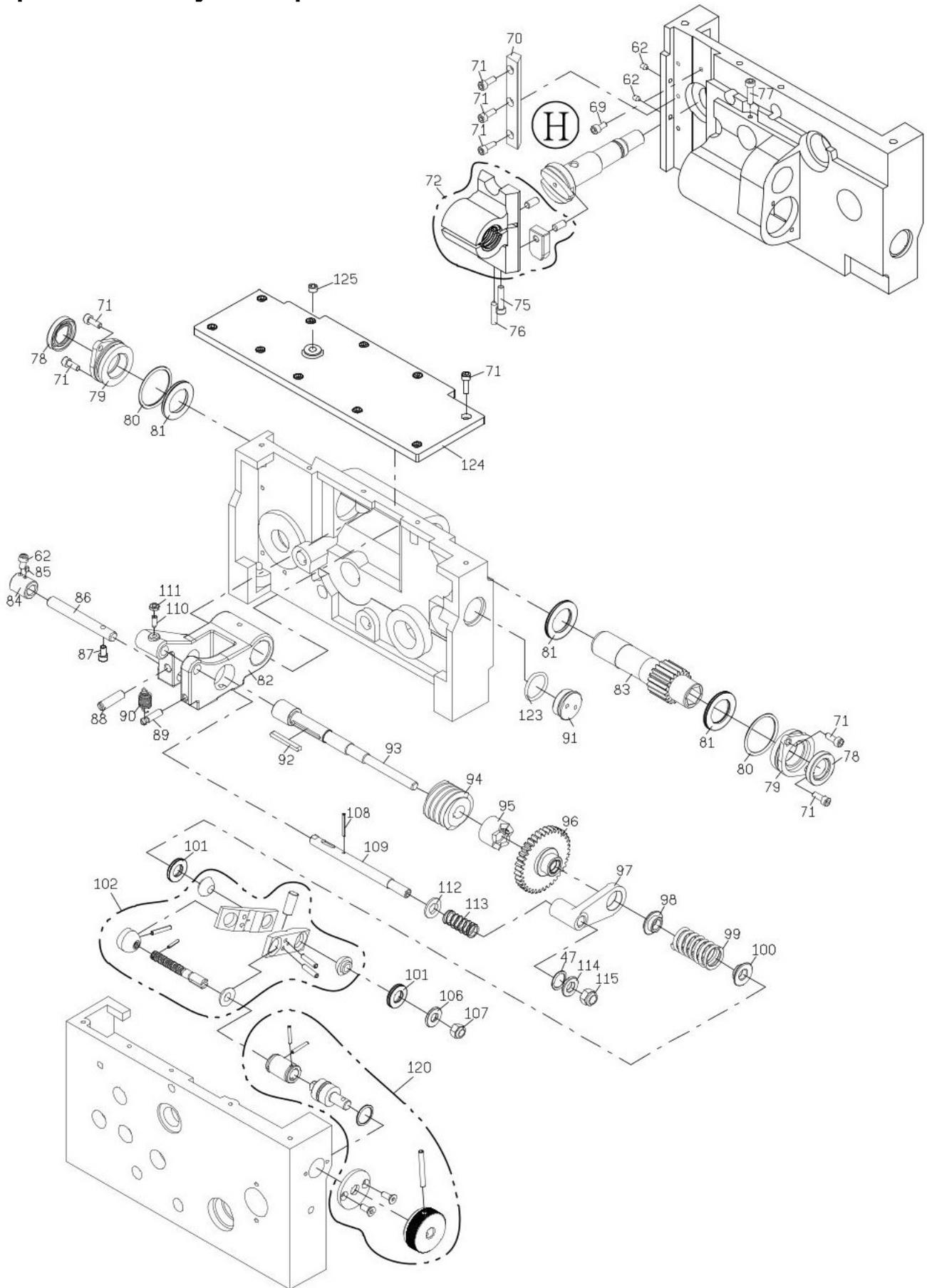
SERVICE PARTS

Apron Assembly I – Exploded View



SERVICE PARTS

Apron Assembly II – Exploded View



SERVICE PARTS

Apron Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Screw		1
2	**	Handle		1
3	**	Set Screw	SET 6×25	1
4	**	Bolt		1
5	**	Hand Wheel	Left	1
6	**	Steel Ball	1/4"	6
7	**	Spring		3
8	**	Index Ring		1
9	**	Flat Hexagon Screw	5×12	2
10	**	Shaft Liner		1
11	**	Woodruff Key	Ø5×19	1
12	**	Gear Shaft		1
13	**	Plug		1
14	**	Snap Ring	S15	1
15	**	Collar		1
16	**	Ball Bearing	6202LR	1
17	**	Snap Ring	S22	1
18	**	Gear	56T	1
19	**	Ball Bearing	6005LU	1
20	**	Gear Shaft		1
21	**	Rivet	Ø2.8×10	2
22	**	Name Plate		1
23	**	Shaft		1
24	**	Snap Ring	S16	5
25	**	Collar	IMPERIAL	1
26	**	Gear	15T/33T	1
27	**	Collar		3
28	**	Shaft		1
29	**	Needle Bearing & Gear Shaft Assembly		1
31	**	Needle Bearing	TLA3016	2
32	**	Gear	24T	1
33	**	Gear	24T	1
34	**	Worm Wheel		1
35	**	Snap Ring	S30	1
36	**	Collar		1
37	**	Name Plate		1
38	**	Shaft		1
39	**	Gear	24T	1
40	**	Collar		2
41	**	Shaft		1
42	**	Gear	24T/26T	1
44	**	Spring Pin, Handle, Sleeve Assembly		1
46	**	Key	4×4×25	1
47	**	O Ring	P18	3
48	**	Pad		1
49	**	Elasticity Pole		1
50	**	Snap Ring	S18	1
51	**	Flat Hexagon Screw	M6×16	1
52	**	Washer		1
53	**	Set Screw	SET8×8	3
54	**	Spring		2

SERVICE PARTS

Index	Part No.	Description	Size	Qty
55	**	Lead Nut Lever, Handle , Spring Pin	Assembly for replacement	1
58	**	Key	5x5x20	1
59	**	Cam Shaft		1
60	**	Set Screw	SET 10x40	1
61	**	Apron		1
62	**	Set Screw	SET 6x8	4
63	**	Spring		2
64	**	Set Screw	SET 10x16	1
65	**	Spring		2
66	**	Pin		1
67	**	Pin		1
68	JT1-3064	Oil Sight	3/4"	1
69	**	Hex. Socket Head Bolt	CAP 6x12	1
70	**	Adjust Plate		1
71	**	Hex. Socket Head Bolt	CAP 6x16	19
72	**	Pin, Slide Plate, Half Nut	Assembly for replacement	1
75	**	Hex. Socket Head Bolt	CAP 6x30	1
76	**	Set Screw	SET 6x30	1
77	**	Hex. Socket Head Bolt	CAP 6x25	1
78	**	Oil Seal	30x40x5	2
79	**	Sleeve		2
80	**	O Ring	G45	2
81	**	Thrust Bearing	NTB3047/AS2	3
82	**	Bracket		1
83	**	Pinion		1
84	**	Spacer		1
85	**	Spring Pin	Ø4x20	1
86	**	Pin		1
87	**	Hex. Socket Head Bolt	CAP 5x25	1
88	**	Pin		1
89	**	Pin		1
90	**	Spring		1
91	**	Nut		1
92	**	Key	5x5x46	1
93	**	Shaft		1
94	**	Worm		1
95	**	Clutch		1
96	**	Clutch Gear		1
97	**	Lever Arm		1
98	**	Washer		1
99	**	Spring		1
100	**	Washer		1
101	**	Thrust Bearing	NTB1528/AS2	2
102	**	Flanged Bearing Assembly	Assembly for replacement	1
106	**	Washer		1
107	**	Nylon Jam Nut	M10	1
108	**	Spring Pin	Ø4x24	1
109	**	Trip Rod		1
110	**	Set Screw	SET 6x16	1
111	**	Nylon Jam Nut	M6	1
112	**	Washer		1
113	**	Spring		1
114	**	Washer		1
115	**	Nylon Jam Nut	M12	1

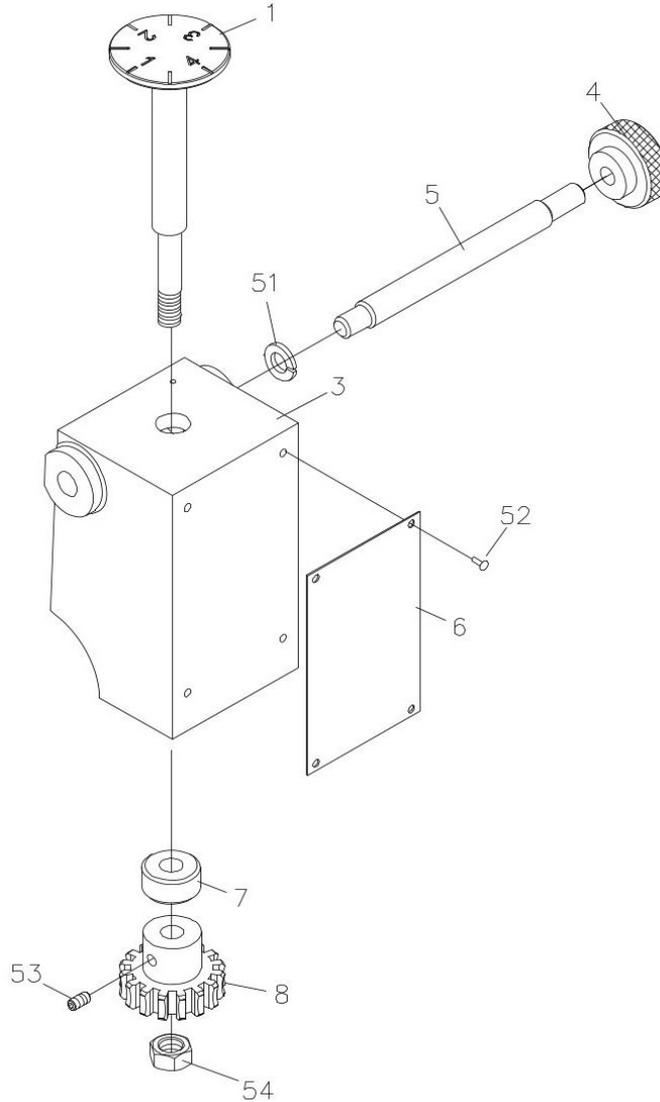
SERVICE PARTS

Index	Part No.	Description	Size	Qty
120	**	Flat Hexagon Screw Assembly	Assembly for replacement	1
123	**	O Ring	P21	1
124	**	Plate		1
125	**	Hex. Socket Head Plug	PT1/4"	1
127	**	Steel Ball	3/8"	1
128	**	Set Screw	SET 10×10	2
129	**	Handle Wheel Guard		1
130	**	Plate		1
131	**	Rivet	Ø2	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.

SERVICE PARTS

Dial Indicator Assembly – Exploded View



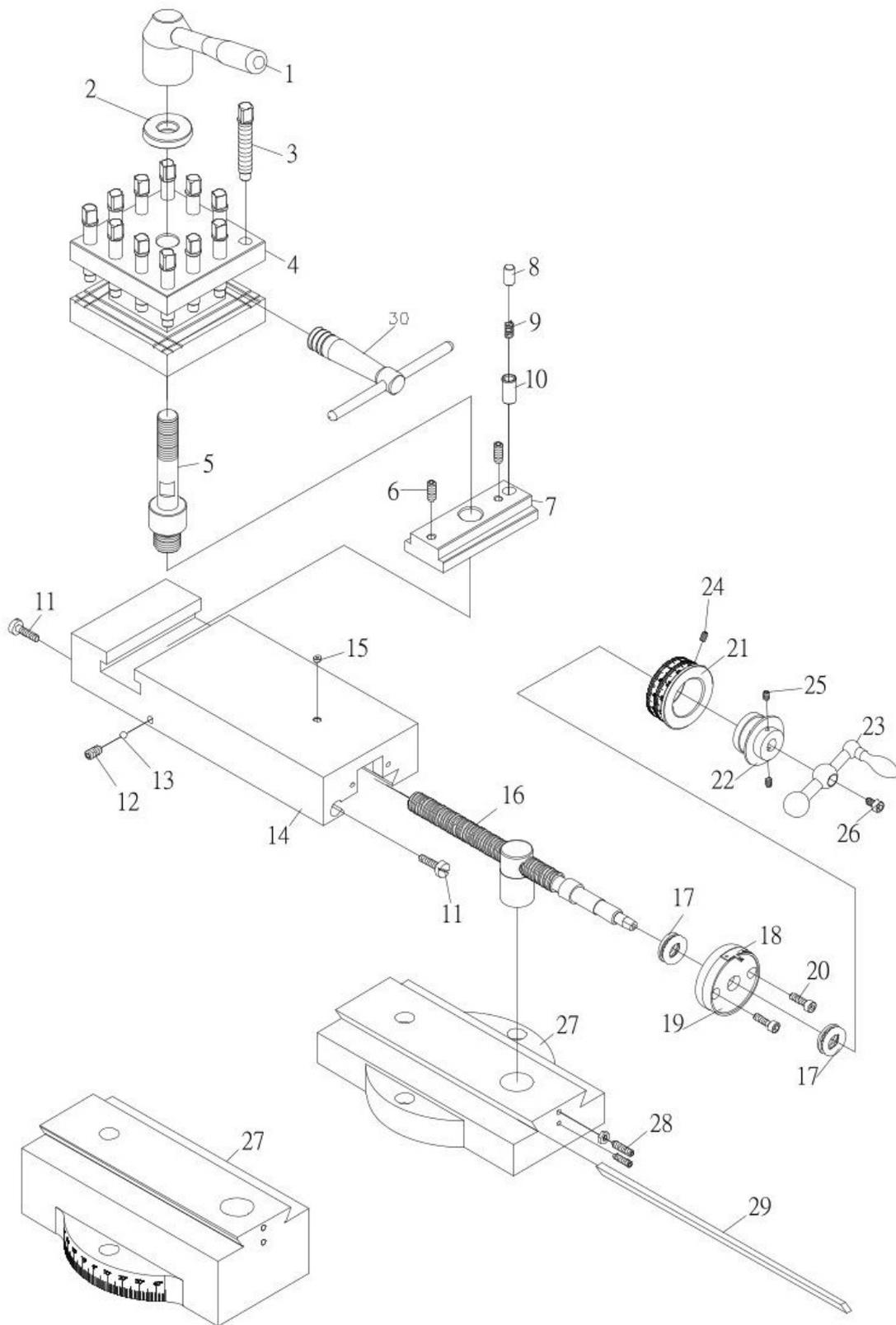
Dial Indicator Assembly – Parts List

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	**	Gear	16T	1
51	**	Spring Washer	M10	1
52	**	Rivet	Ø2	4
53	**	Set Screw	M6x6L	1
54	**	Nylon Jam Nut	M8	1

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SERVICE PARTS

4-Way Tool Post Assembly – Exploded View



SERVICE PARTS

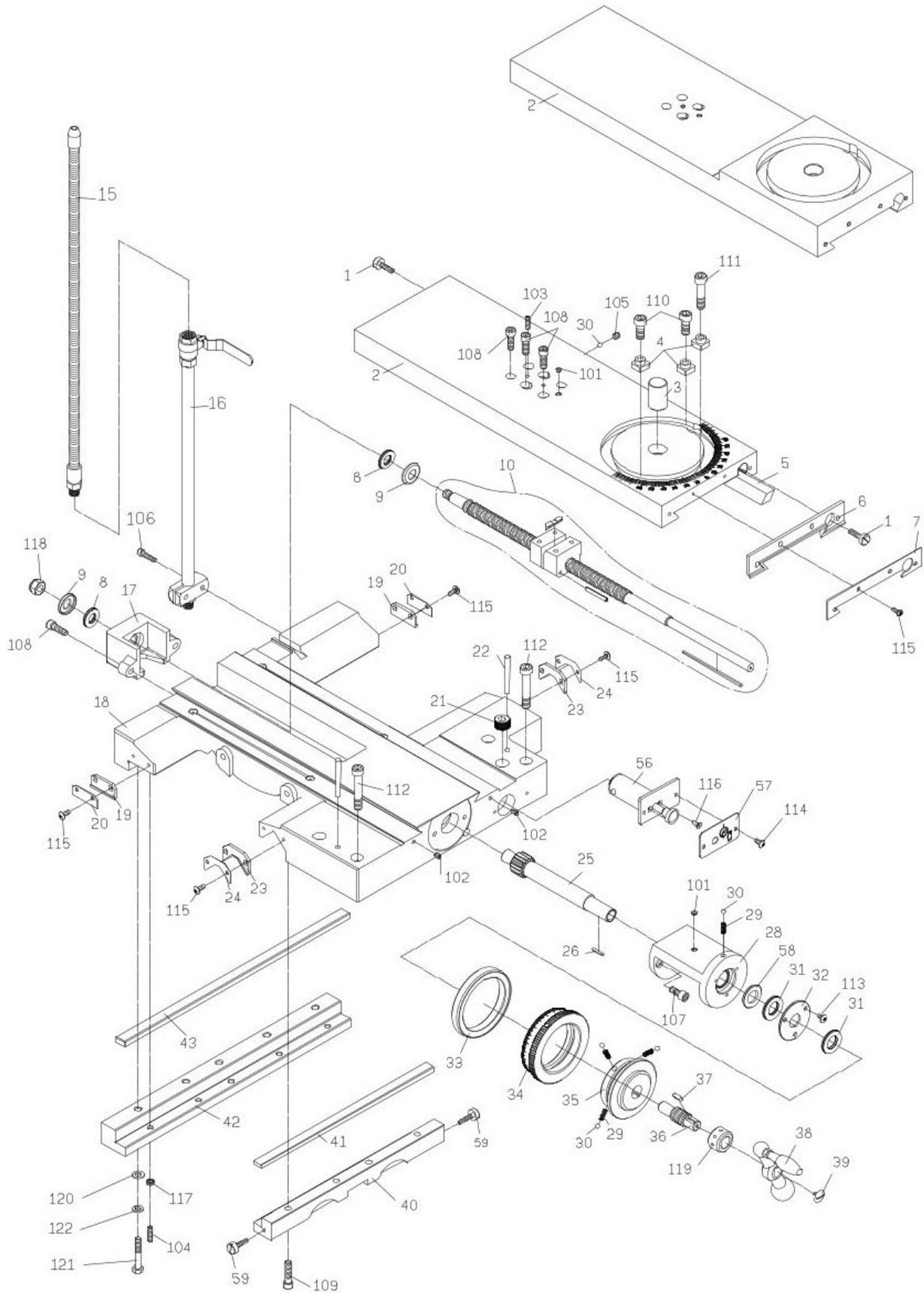
4-Way Tool Post Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Handle & Turret Nut	Assembly for replacement	1
2	**	Collar		1
3	**	Bolt		12
4	**	Turret Body		1
5	**	Turret Shaft		1
6	**	Set Screw	SET 8x20	2
7	**	Nut		1
8	**	Pin		1
9	**	Spring		1
10	**	Bush		1
11	**	Screw		2
12	**	Set Screw	SET 8x12	1
13	**	Steel Ball	1/4"	1
14	**	Solid Topslide		1
15	**	Oil Ball	1/4"	1
16	**	Nut & Screw	Assembly for replacement	1
17	**	Trust Bearing	51102	2
18	**	Curve Pilot		1
19	**	Keep Assy		1
20	**	Hex. Socket Head Bolt	CAP 6x20	2
21	**	Dial Ring		1
22	**	Bushs		1
23	**	Handwheel And Handle		1
24	**	Set Screw	SET 5x8	1
25	**	Set Screw	SET 5x6	1
26	**	Hex. Socket Head Bolt	CAP 6x16	1
27	**	Swivel		1
28	**	Set Screw	CAP 6x20	2
29	**	Gib		1
30	**	T Wrench		1

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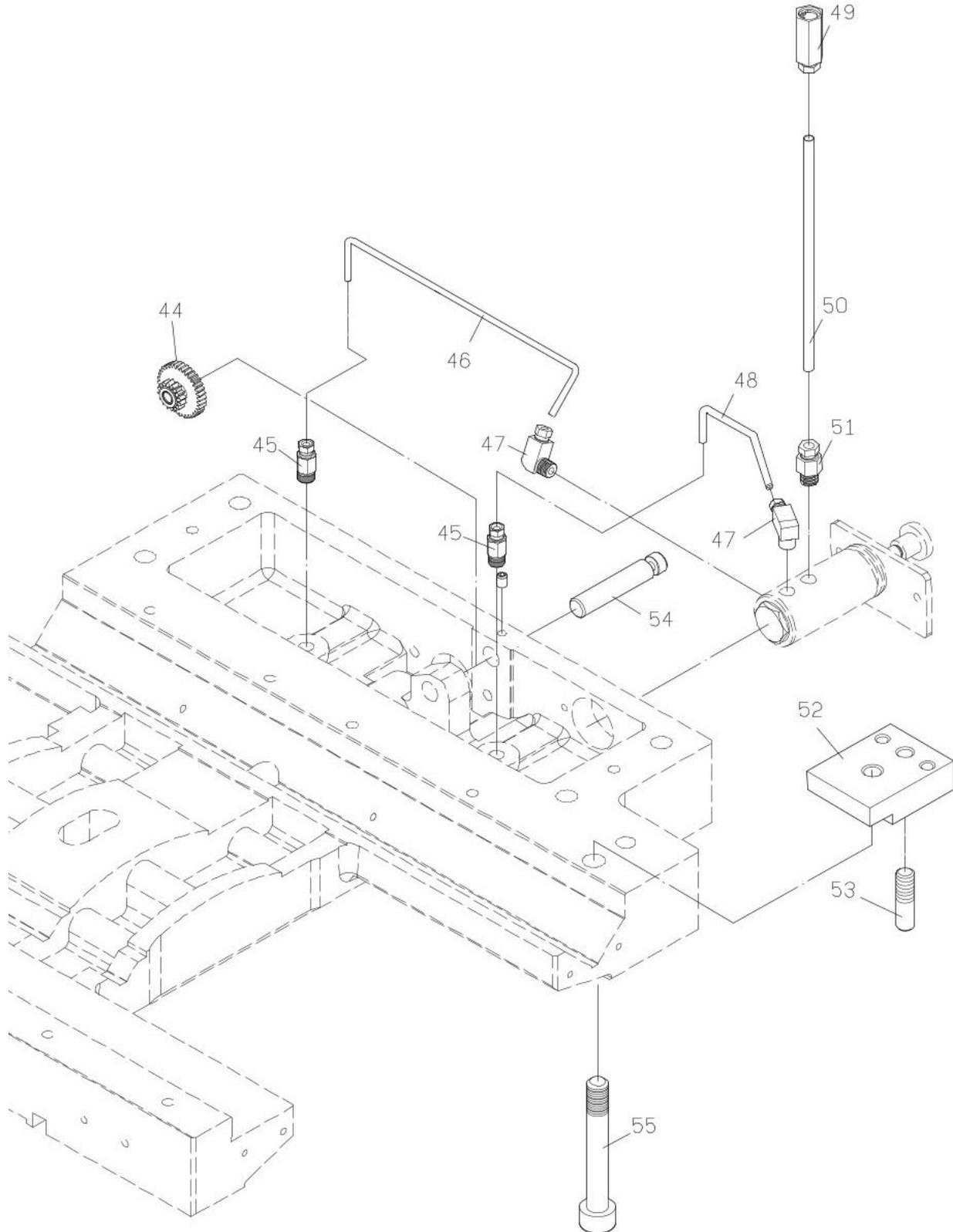
SERVICE PARTS

Saddles Assembly I – Exploded View



SERVICE PARTS

Saddles Assembly II – Exploded View



SERVICE PARTS

Saddles Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Adjust Screw	Ø19	2
2	**	Cross Slide	For 16", 18" and 21"	1
3	**	Pivot	Ø25x35	1
4	**	T Bolt		3
5	**	Gib-X		1
6	**	Wiper-X		1
7	**	Plate -X		1
8	**	Thrust Bearing	NTB/AS2 1528	2
9	**	Cap Collar		2
10	**	Pin, Screw(16"), Nut, Key(3X3X115), Spring Pin(5X40)	Assembly for replacement	1
15	**	Spraying Pipe	PT3/8 x 24"	1
16	**	Valve & Junction Assy.	PT3/8	1
17	**	Rear Bracket	For 16", 18" and 21"	1
18	**	Saddle		1
19	**	Wiper F		2
20	**	Plate F		2
21	**	Hex. Socket Head Plug	PT 1/2"	1
22	**	Taper Pin	#6x70L	2
23	**	Wiper V		2
24	**	Plate V		2
25	**	Gear	16T For 16"	1
26	**	Key	3x3x20	1
28	**	Front Bracket	For 16", 18" and 21"	1
29	**	Spring	Ø6x15 L	4
30	**	Steel Ball	1/4"	5
31	**	Thrust Bearing	NTB/AS2 2035	2
32	**	Washer		1
33	**	Dial Ring		1
34	**	Dual		1
35	**	Bush		1
36	**	Shaft		1
37	**	Key	5x5x15	1
38	**	Hand Wheel & Handle	Assembly for replacement	1
39	**	Screw		1
40	**	Front Anti-Floater		1
41	**	Gib-Z		1
42	**	Rear Anti-Floater		1
43	**	Gib-Y		1
44	**	Gear	16T/36T	1
45	**	Straight Adapter	Ø4x1/8	2
46	**	Al. Tube	Ø4x258	1
47	**	Elbow Adapter	Ø4x1/8	2
48	**	Al. Tube	Ø4x121	1
49	**	Oil Filter	Ø6	1
50	**	Al. Tube	Ø6x170	1
51	**	Straight Adapter	Ø6x1/8	2
52	**	Clamp Plate		1
53	**	Bolt		1
54	**	Short Shaft		1
55	**	Hex. Socket Head Bolt	CAP12x85	1
56	**	Lubricator Assy.		1

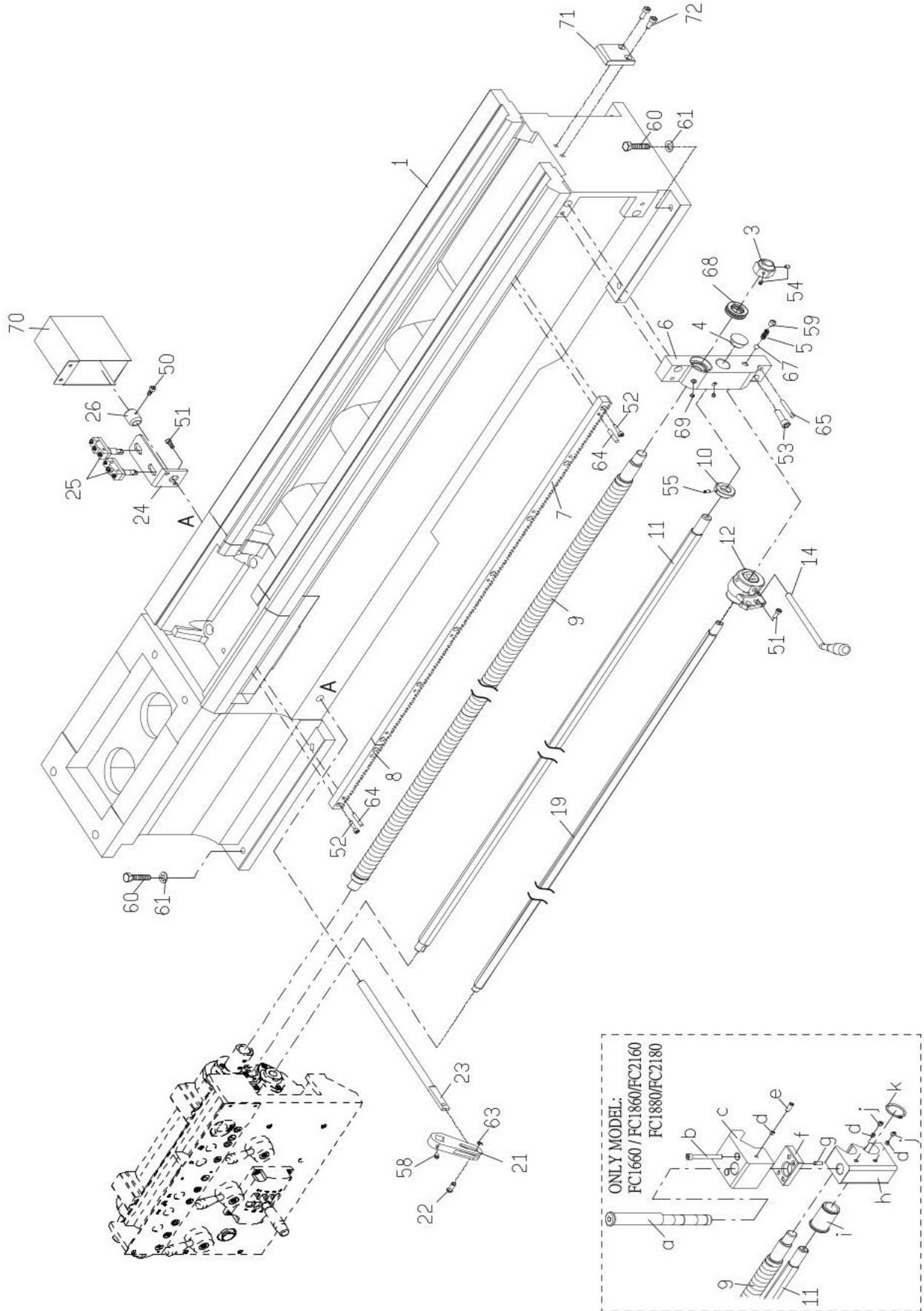
SERVICE PARTS

Index	Part No.	Description	Size	Qty
57	**	Plate		1
58	**	Washer		1
59	**	Adjust Screw	Ø16	2
60	**	Joint Block		1
101	**	Oil Ball	1/4"	2
102	**	Set Screw	SET 6x8	2
103	**	Set Screw	SET 6x20	1
104	**	Set Screw	SET 8x25	5
105	**	Set Screw	SET 8x8	1
106	**	Hex. Socket Head Bolt	CAP 6x25	2
107	**	Hex. Socket Head Bolt	CAP 8x20	2
108	**	Hex. Socket Head Bolt	CAP 8x25	8
109	**	Hex. Socket Head Bolt	CAP 8x35	4
110	**	Hex. Socket Head Bolt	CAP 10x30	2
111	**	Hex. Socket Head Bolt	CAP 10x50 (16" & 18")	1
111	**	Hex. Socket Head Bolt	CAP 10x90 (21")	1
112	**	Hex. Socket Head Bolt	CAP 10x60	4
113	**	Dome Cross Screw	M5x10	3
114	**	Dome Cross Screw	M5x12	2
115	**	Dome Cross Screw	M5x16	10
116	**	Flat Hexagon Screw	M5x12	2
117	**	Nut	M8	5
118	**	Nylon Nut	M12	1
119	**	Nut		1
120	**	Washer	M8	5
121	**	Hexagon Head Bolt	M8x50	5
122	**	Spring Washer	M8	5

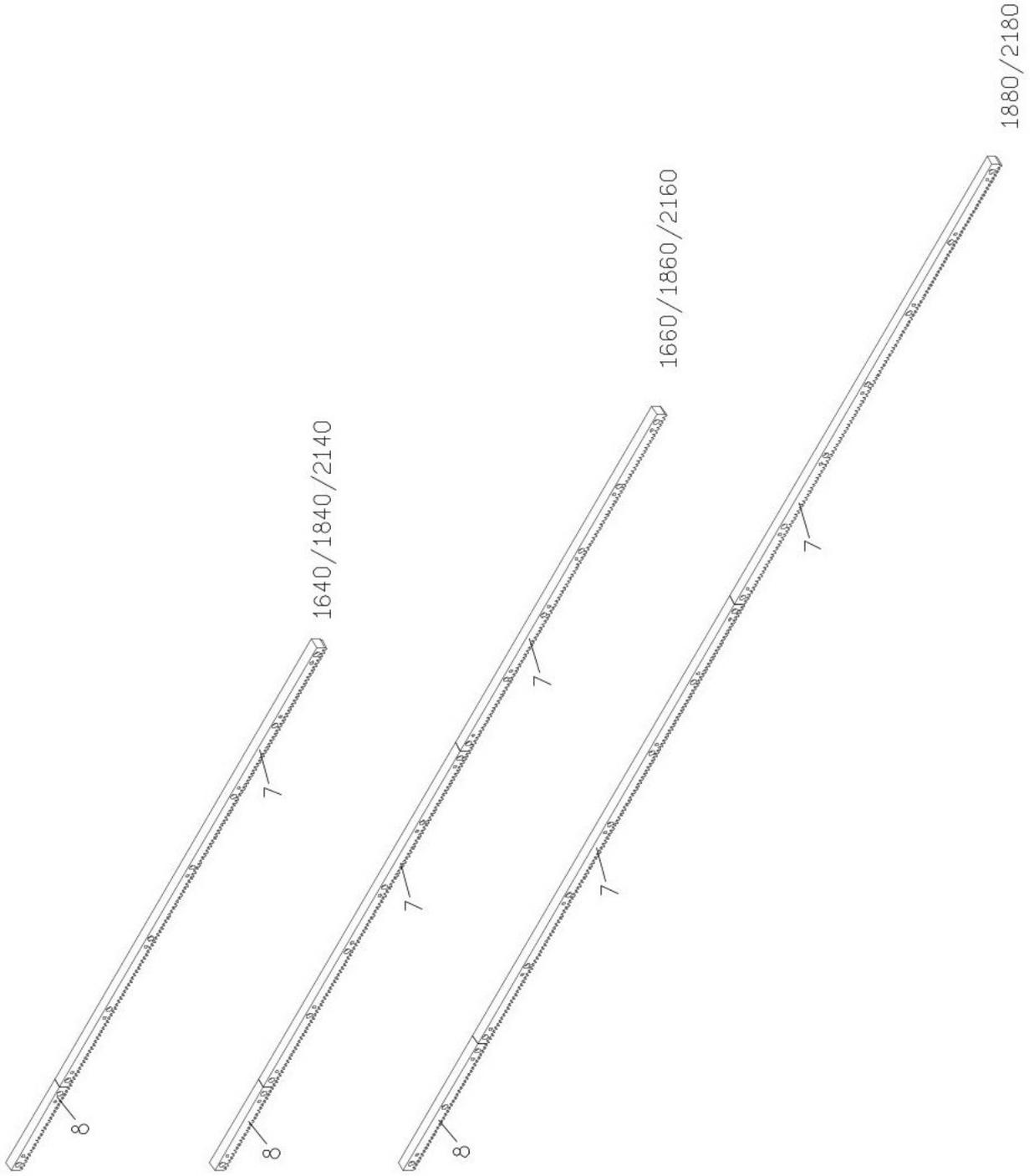
** These parts are shown for reference only and are not available for order individually. Non-proprietary parts, such as fasteners, can usually be found at local hardware stores.

SERVICE PARTS

Bed and Shafts Assembly I – Exploded View



Bed and Shafts Assembly II – Exploded View



SERVICE PARTS

Bed and Shafts Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Bed	For 40"	1
1	**	Bed	For 60"	1
1	**	Bed	For 80"	1
3	**	Nut		1
4	**	Plug		1
5	**	Spring		1
6	**	Bracket		1
7	**	Rack(Imperial)	For 40"	1
7	**	Rack(Imperial)	For 60"	1
7	**	Rack(Imperial)	For 80"	1
8	**	Rack(Imperial)	For 40"/60"	1
8	**	Rack(Imperial)	For 80"	1
9	**	Leadscrew	For 40"	1
9	**	Leadscrew	For 60"	1
9	**	Leadscrew	For 80"	1
10	**	Collar		1
11	**	Feed Rod	For 40"	1
12	**	Lever Assy		1
14	**	Knob & Handle	Assembly for replacement	1
19	**	Third Rod Shaft	For 40"	1
19	**	Third Rod Shaft	For 60"	1
19	**	Third Rod Shaft	For 80"	1
21	**	Connecting Rod		1
22	**	Pin		1
23	**	Connecting Rod		1
24	**	Switch Base		1
25	**	Limit Switch	TM1308	2
26	**	Collar		1
50	**	Hex. Socket Head Bolt	CAP 6x12	1
51	**	Hex. Socket Head Bolt	CAP 6x16	4
52	**	Hex. Socket Head Bolt Cap 6X20	For 40"	9
52	**	Hex. Socket Head Bolt Cap 6X20	For 60"	9
52	**	Hex. Socket Head Bolt Cap 6X20	For 80"	9
53	**	Hex. Socket Head Bolt	CAP 10x35	2
54	**	Set Screw	SET 6x8	2
55	**	Set Screw	SET 6x10	1
58	**	Set Screw	SET 8x10	1
59	**	Set Screw	SET 12x12	1
60	**	Hexagon Head Bolt	M12x50	8
61	**	Washer	M12	8
63	**	Snap Ring	E6	1
64	**	Pin Ø6×25	For 40"	9
64	**	Pin Ø6×25	For 60"	9
64	**	Pin Ø6×25	For 80"	9
65	**	Pin	Ø7x45	2
67	**	Steel Ball	3/8"	1
68	**	Thrust Bearing	51105	2
69	**	Oil Ball	1/4"	2
70	**	Block Oil Plate		1
71	**	Block		1
72	**	Hex. Socket Head Bolt	CAP 8x25	2
a	**	Shaft		1

SERVICE PARTS

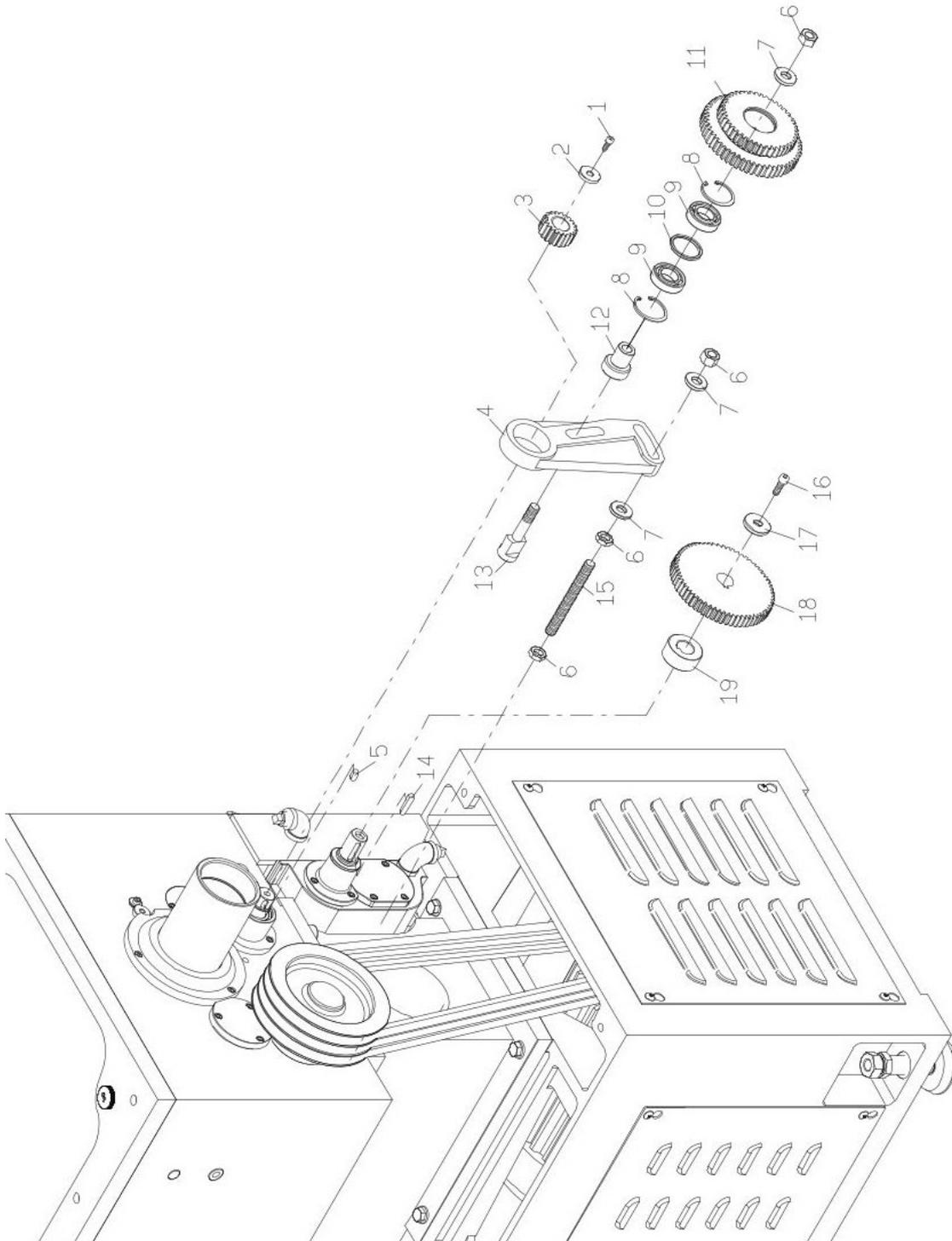
Index	Part No.	Description	Size	Qty
b	**	Hex. Socket Head Bolt	CAP 8x70	2
c	**	Block		1
d	**	Pin		3
e	**	Set Screw	SET 8x20	1
f	**	Block		1
g	**	Set Screw	SET 8x16	1
h	**	Beracket		2
i	**	Barrel		1
j	**	Set Screw	SET 8x8	1
k	**	Clip	S35	1

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SERVICE PARTS

End Gear Assembly I – Exploded View

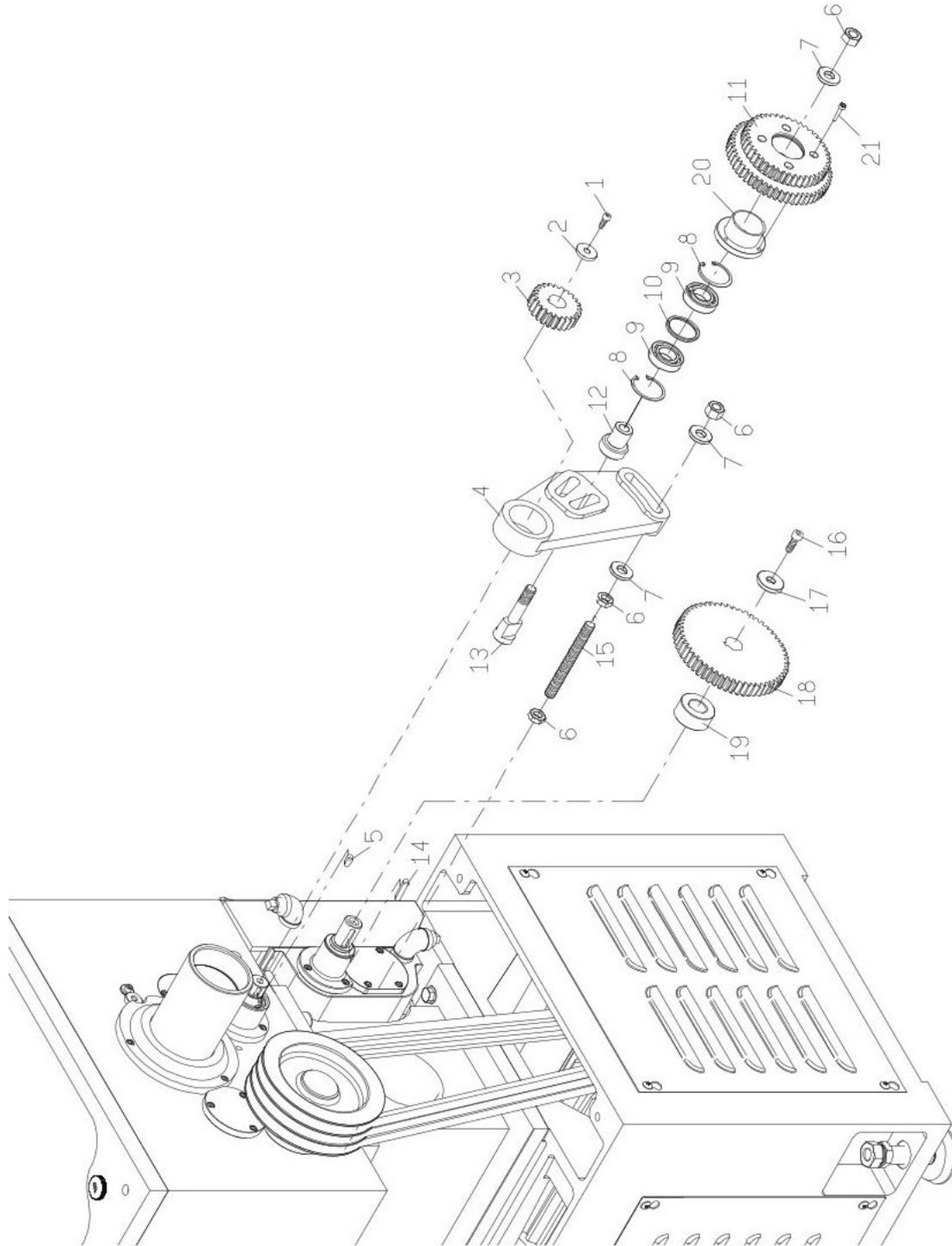
Models GX-1640ZX, GX-1660XZ & GX-1860ZX



SERVICE PARTS

End Gear Assembly II – Exploded View

Models GX-1880ZX & GX-2180ZX



SERVICE PARTS

End Gear Assembly – Parts List

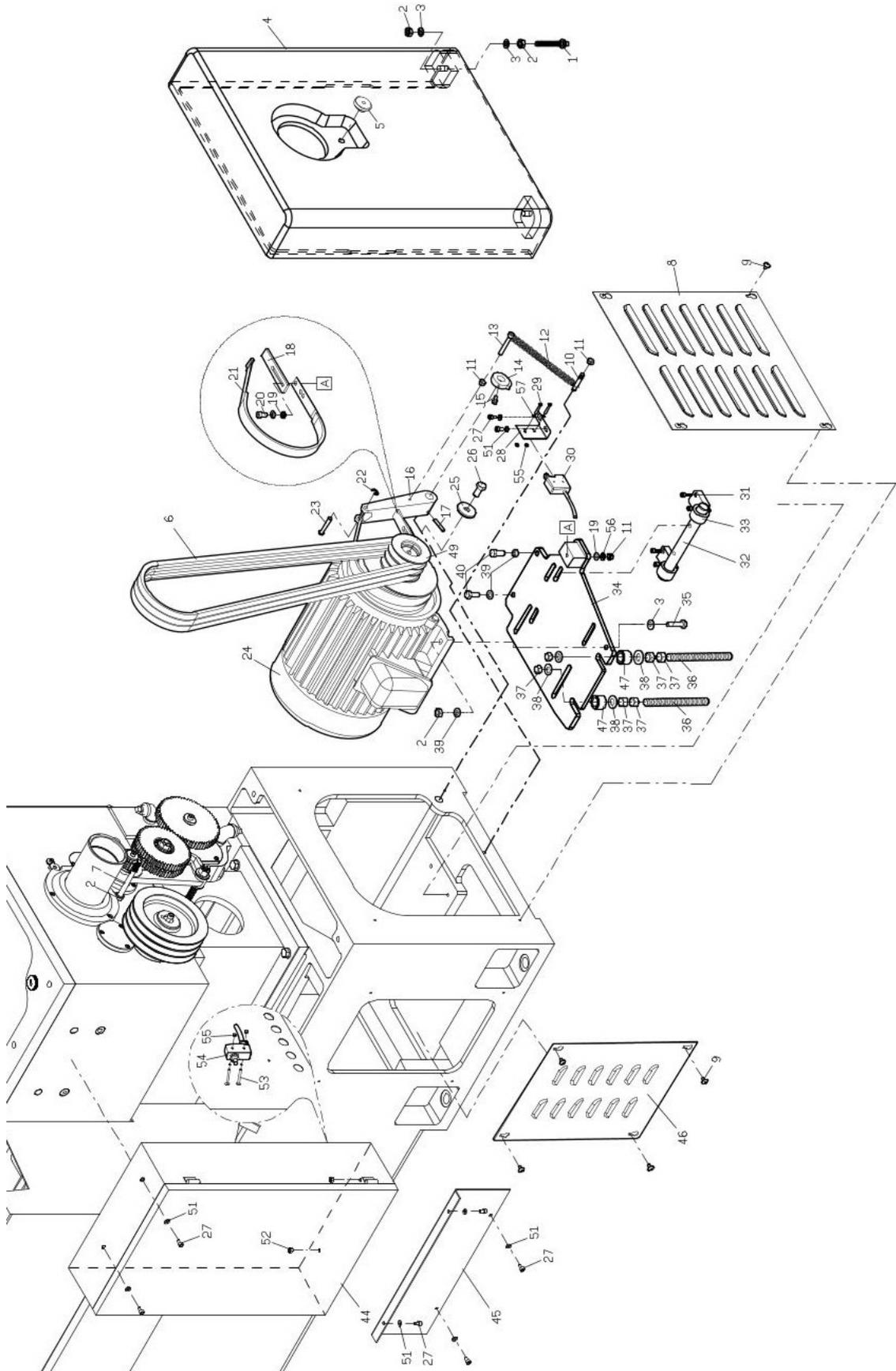
Index	Part No.	Description	Size	Qty
1	**	Hex. Socket Head Bolt	CAP 6x16	1
2	**	Washer		1
3	**	Gear	24T	1
4	**	Swing Frame		1
5	**	Key	7x7x15	1
6	**	Nut	M14	4
7	**	Washer		3
8	**	Clip	R47	2
9	**	Ball Bearing	6005Z	2
10	**	Collar		1
11	**	Gear	44T / 56T	1
12	**	Shaft Collar		1
13	**	Gear Shaft		1
14	**	Key	7x7x30	1
15	**	Stud		1
16	**	Hex. Socket Head Bolt	CAP 8x25	1
17	**	Washer		1
18	**	Gear	57T	1
19	**	Collar		1
21	**	Hex. Socket Head Bolt (GX-2180ZX)	CAP 6x30	4

** 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.

SERVICE PARTS

Main Motor Assembly II – Exploded View

Models GX-1880ZX & GX-2180ZX



SERVICE PARTS

Main Motor Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Bolt		2
2	**	Nut	M10	9
3	**	Washer	M10	9
4	**	Cover	For 16"	1
5	**	Nut		1
6	JT1-3077	V Belt	For GX-1640ZX & 1660ZX	3
6	JT1-3082	V Belt	For GX-1860ZX	3
6	JT1-3083	V Belt	For GX-1880ZX	3
6	JT1-3085	V Belt	For GX-2180ZX	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	1
16	**	Lever		1
17	**	Spring Pin	Ø6x35	1
18	**	Fixed Plate		1
19	**	Washer	M8	2
20	**	Hex.Socket Head Bolt	CAP 8x20	1
21	JT1-3078	Brake Belt (GX-1640ZX, 1660ZX, 1860ZX)	660	1
21	JT1-3084	Brake Belt (GX-1880ZX, 2180ZX)	660	1
22	**	Clip	E8	1
23	**	Pin		1
24	**	Motor	10HP 230/460V 3Ph	1
25	**	Washer		1
26	**	Hexagon Head Bolt	M12x25	1
27	**	Hex. Socket Head Bolt	CAP 6x12	8
28	**	Bracket		1
29	**	Dome Cross Screw	M4x30	2
30	**	Limit Switch	TM-1704	1
31	**	Hex. Socket Head Bolt	CAP 10x35	4
32	**	Shaft (GX-1640ZX, 1660ZX, 1860ZX)		1
32	**	Shaft (GX-1880ZX, 2180ZX)		1
33	**	Support (GX-1640ZX, 1660ZX, 1860ZX)		1
33	**	Support (GX-1880ZX, 2180ZX)		1
34	**	Plate (GX-1640ZX, 1660ZX, 1860ZX)		1
34	**	Plate (GX-1880ZX, 2180ZX)		1
35	**	Hexagon Head Bolt	M10x40	1
36	**	Screw (GX-1640ZX, 1660ZX, 1860ZX)		1
36	**	Screw (GX-1880ZX, 2180ZX)		2
37	**	Nut (GX-1640ZX, 1660ZX, 1860ZX)	M16	3
37	**	Nut (GX-1880ZX, 2180ZX)	M16	6
38	**	Washer (GX-1640ZX, 1660ZX, 1860ZX)	M16	2
38	**	Washer (GX-1880ZX, 2180ZX)	M16	4
39	**	Spring Washer	M10	6
40	**	Hexagon Head Bolt	M10x25	2
44	**	Electrical Box		1
45	**	Cover		1
46	**	Cover		1
47	**	Rubber Ring (GX-1640ZX, 1660ZX, 1860ZX)		1

SERVICE PARTS

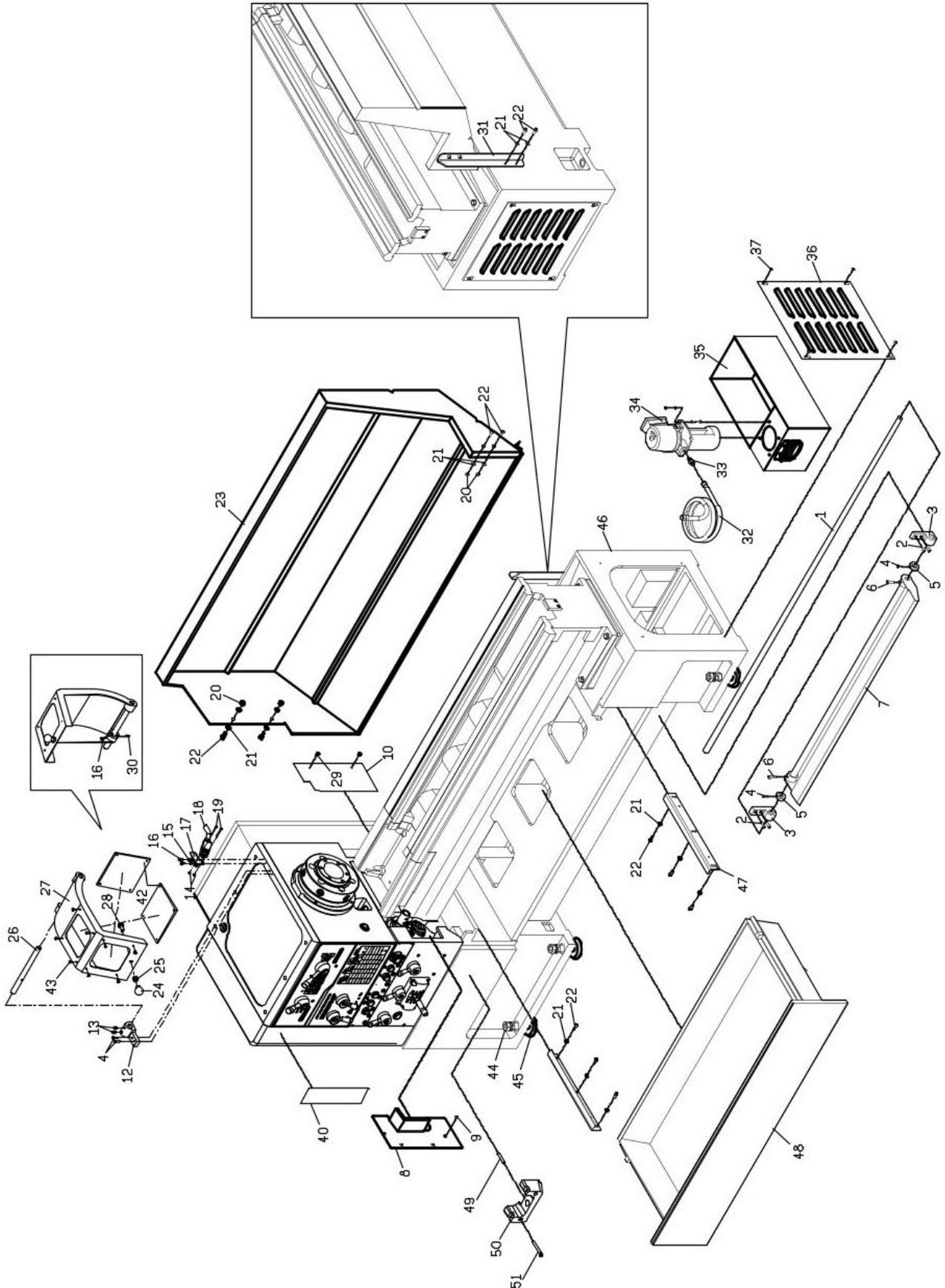
Index	Part No.	Description	Size	Qty
47	**	Rubber Ring (GX-1880ZX, 2180ZX)		2
49	**	Motor Pully		1
51	**	Washer	M6	8
52	**	Nut	M6	2
53	**	Dome Cross Screw	M4x40	2
54	**	Limit Switch	TM1307	1
55	**	Nut	M4	4
56	**	Spring Washer	M8	2
57	**	Washer	M4	2

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SERVICE PARTS

Cabinet and Panel Assembly I – Exploded View

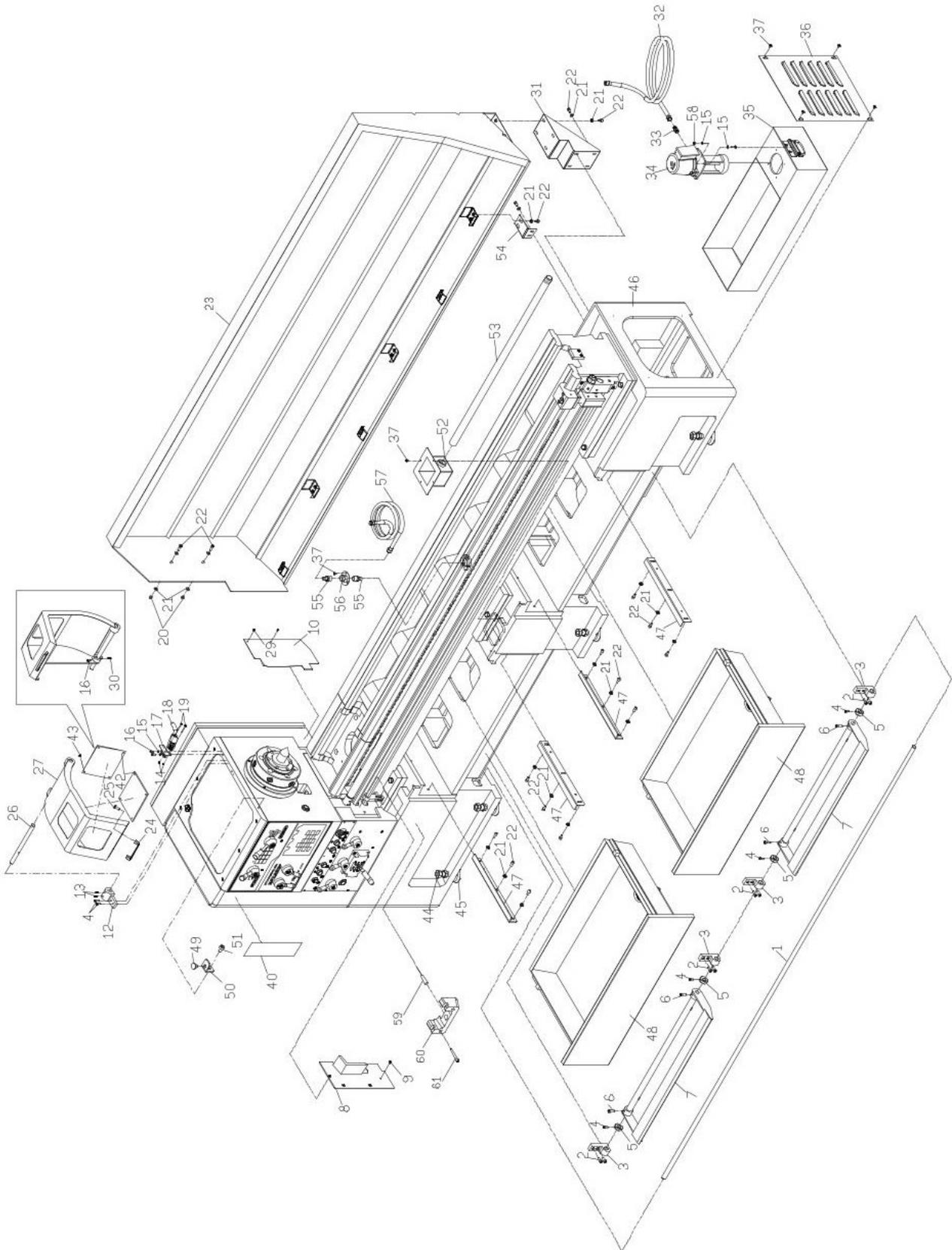
Models GX-1640ZX, GX-1660XZ & GX-1860ZX



SERVICE PARTS

Cabinet and Panel Assembly II – Exploded View

Models GX-1880ZX & GX-2180ZX



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	**	Ring		2
6	**	Hex. Socket Head Bolt	CAP 10x20	2
7	**	Saddle		1
7	**	Saddle		1
8	**	Plate		1
9	**	Dome Hexagon Screw	M5x8	4
10	**	Plate		1
12	**	Small Bracket		1
13	**	Set Screw	SET 8x12	2
14	**	Nut	M4xP0.7	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	4
21	**	Washer	M8	14
22	**	Hex. Socket Head Bolt	CAP 8x20	12
23	**	Splash Guard		1
24	**	Knob (GX-1640ZX, 1660ZX, 1860ZX)		1
24	**	Knob (GX-1880ZX, 2180ZX)	A-3-1	1
25	**	Nut (GX-1640ZX, 1660ZX, 1860ZX)	M12xP1.75	1
25	**	Hex. Head Bolt (GX-1880ZX, 2180ZX)	Screw 3/16"x3/8"	1
26	**	Pivot		1
27	**	Chuck Safety Guard		1
28	**	Hex. Socket Head Bolt	CAP 12x20	1
29	**	Flat Hexagon Screw	M5x8	2
30	**	Set Screw	SET 5x16	1
31	**	Angle Steel (GX-1640ZX, 1660ZX, 1860ZX)		1
31	**	Bracket (GX-1880ZX, 2180ZX)		1
32	**	Coolant Conduit 40 (GX-1640ZX, 1660ZX, 1860ZX)	CT801x3/8"x72"	1
32	**	Coolant Conduit 60 (GX-1640ZX, 1660ZX, 1860ZX)	CT801x3/8"x78"	1
32	**	Coolant Conduit (GX-1880ZX, 2180ZX)	CT801x3/8"x74"	1
33	**	Nipple	3/8"PTx3/8"PH	1
34	JT1-3070	Coolant Pump	1/8Hp 230/460V 3Ph	1
35	**	Coolant Tank		1
36	**	Cover		1
37	**	Dome Cross Screw	M6x10	4
40	**	Nameplate		1
42	**	Plate	PC	2
43	**	Dome Hexagon Screw (GX-1640ZX, 1660ZX, 1860ZX)	M6x12	8
43	**	Nylon Jam Nut (GX-1880ZX, 2180ZX)	M6	8
44	**	Screw & Nut	Assembly for replacement	8
45	**	Block		1

SERVICE PARTS

Index	Part No.	Description	Size	Qty
46	**	Base		1
46	**	Base		1
47	**	Angle Steel		2
48	**	Chip Tray		1
49	**	Sensor (GX-1640ZX, 1660ZX, 1860ZX)	M12x1.0	1
49	**	Rubber (GX-1880ZX, 2180ZX)	M12x1.0	1
50	**	Bracket (GX-1640ZX, 1660ZX, 1860ZX)		1
50	**	Fixed Support (GX-1880ZX, 2180ZX)		1
51	**	Screw (GX-1640ZX, 1660ZX, 1860ZX)	M6x70	2
51	**	Hex. Socket Head Bolt (GX-1880ZX, 2180ZX)	CAP 6x10	1
52	**	Box (GX-1880ZX, 2180ZX)		1
53	**	Tube (GX-1880ZX, 2180ZX)		1
54	**	Bracket (GX-1880ZX, 2180ZX)		1
55	**	Nipple (GX-1880ZX, 2180ZX)	1/2"PTx3/8"PH	1
56	**	Cover (GX-1880ZX, 2180ZX)		1
57	**	Coolant Conduit (GX-1880ZX, 2180ZX)	CT801x3/8"x98"	1
58	**	Nut (GX-1880ZX, 2180ZX)	M6	4
59	**	Sensor (GX-1880ZX, 2180ZX)	M12x1.0	1
60	**	Bracket (GX-1880ZX, 2180ZX)		1
61	**	Screw (GX-1880ZX, 2180ZX)	M8x70	2

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SERVICE PARTS

Tailstock Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Screw & Nut	Assembly for replacement	1
2	**	Key	6×6x25	1
3	**	Thrust Bearing	51105	2
4	**	Flange		1
5	**	Index Ring		1
6	**	Handle		1
7	**	Handle		1
8	**	Bolt		1
9	**	Fixed Screw		1
10	**	Spring		3
11	**	Steel Ball	1/4"	3
13	**	Guide Key		1
14	**	Screw		2
15	**	Tail Stock		1
16	**	Clamp Lever L & Cam Shaft L	Assembly for replacement	1
17	**	Clamp Lever R & Cam Shaft R & Pins	Assembly for replacement	1
19	**	Quill		1
20	**	Pin Nut		2
21	**	Pivot Block		1
22	**	Plate V		2
23	**	Wiper V		2
24	**	Plate F		2
25	**	Wiper F		2
26	**	Base	For 16"	1
27	**	Gib Screw		2
28	**	Gib		1
29	**	Hexagon Head Screw (GX-1640ZX, 1660ZX, 1860ZX)	M18x65	2
29	**	Hexagon Head Screw (GX-1880ZX, 2180ZX)	M18x130	2
30	**	Clamp Block		2
31	**	Stud Bolt (GX-1640ZX, 1660ZX, 1860ZX)	M18×150L	1
31	**	Stud Bolt (GX-1880ZX)	M18×165L	1
31	**	Stud Bolt (GX-2180ZX)	M18×205L	1
32	**	Warked Plate		1
33	**	Stud Bolt (GX-1640ZX, 1660ZX, 1860ZX)	M18×180L	1
33	**	Stud Bolt (GX-1880ZX)	M18×197L	1
33	**	Stud Bolt (GX-2180ZX)	M18×237L	1
34	**	Nut		1
35	**	Washer		2
36	**	Spring		1
37	**	Washer		1
101	**	Hex. Socket Head Bolt	CAP 6x20	2
102	**	Hex. Socket Head Bolt	CAP 6x25	3
103	**	Set Screw (GX-1640ZX, 1660ZX, 1860ZX)	SET 8x28	1
103	**	Set Screw (GX-1880ZX, 2180ZX)	SET 8x30	1
104	**	Hex. Socket Head Bolt	CAP 6x10	1
105	**	Hex. Socket Head Bolt	CAP 8×55	2
106	**	Set Screw	SET 8×25	1
107	**	Washer	M18	4
108	**	Nut	M18	3

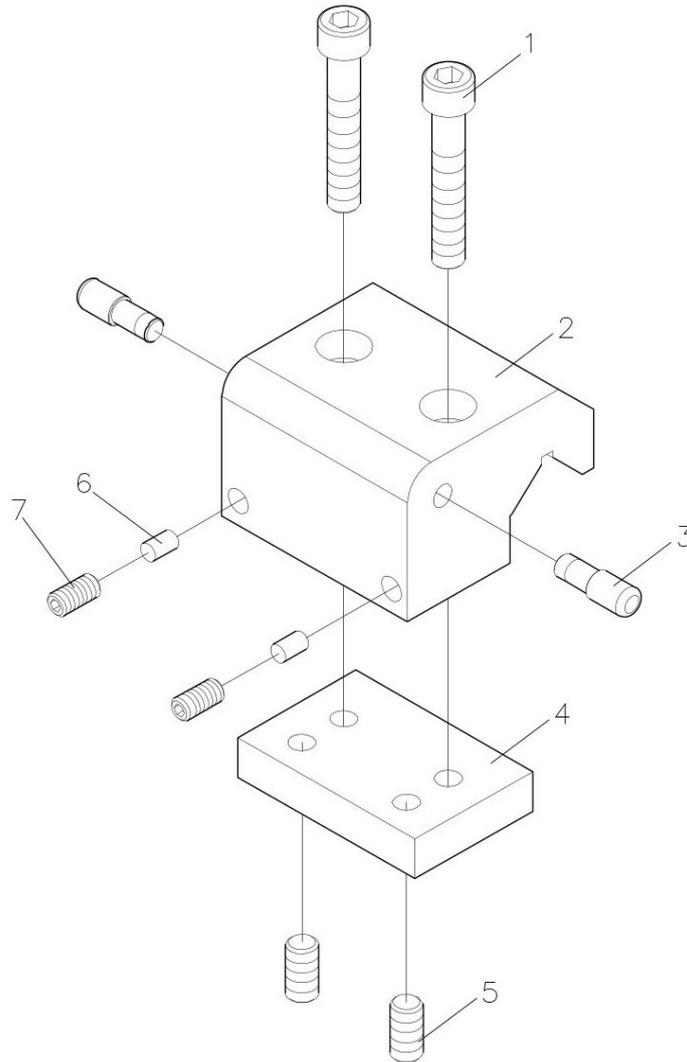
SERVICE PARTS

Index	Part No.	Description	Size	Qty
109	**	Dome Cross Screw	M5×12	8
110	**	Spring Washer	M18	2
111	**	Pin	Ø4×38	1
112	**	Oil Seal (GX-1640ZX, 1660ZX, 1860ZX)	DH-60	1
112	**	Oil Seal (GX-1880ZX, 2180ZX)	TC689012	1
113	**	Nut	M6	1
114	**	Pin (GX-1880ZX, 2180ZX)	Ø8×50	1

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SERVICE PARTS

Bed Stop Assembly – Exploded View



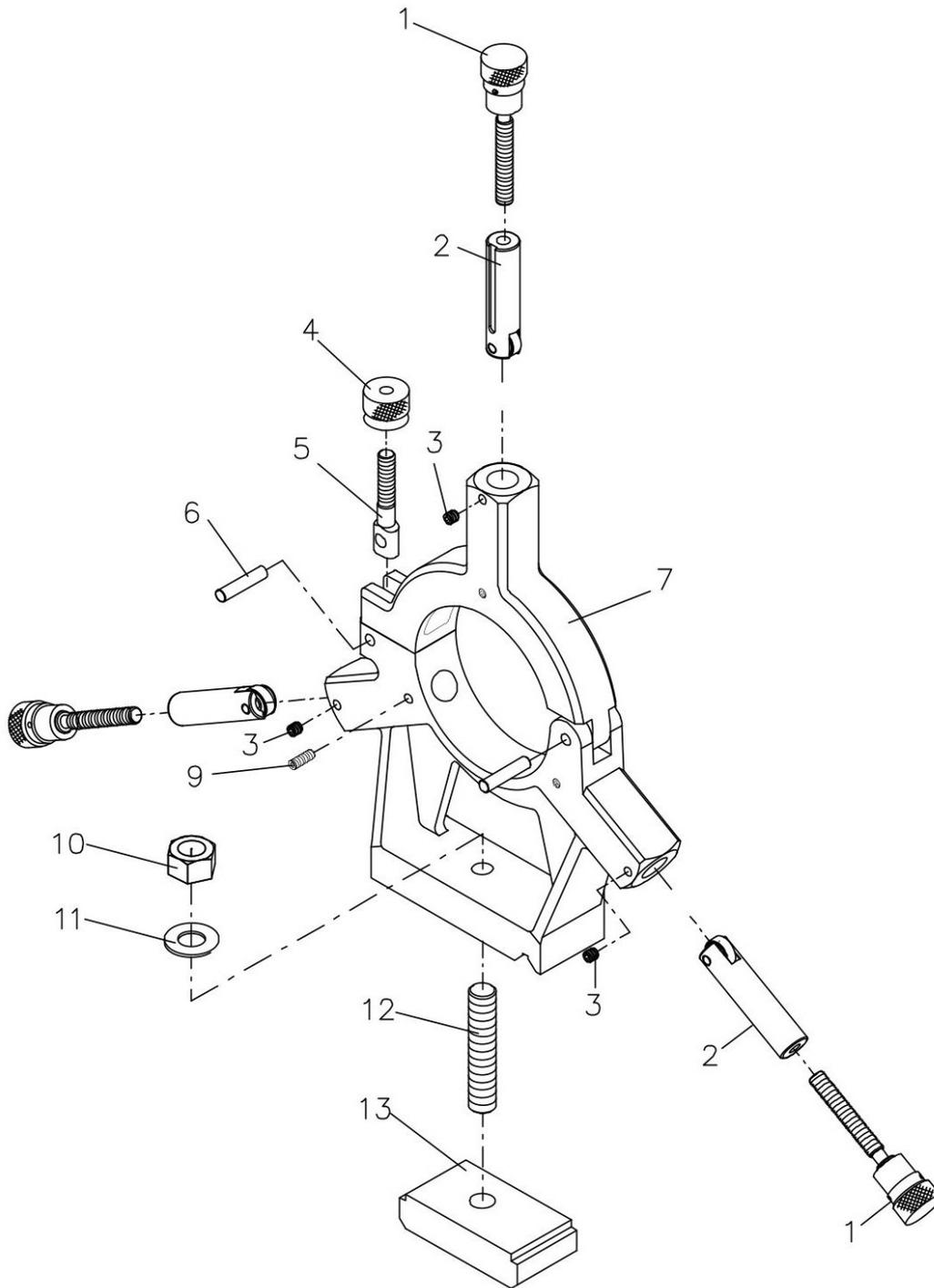
Bed Stop Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Hex. Socket Head Bolt	CAP 10x60	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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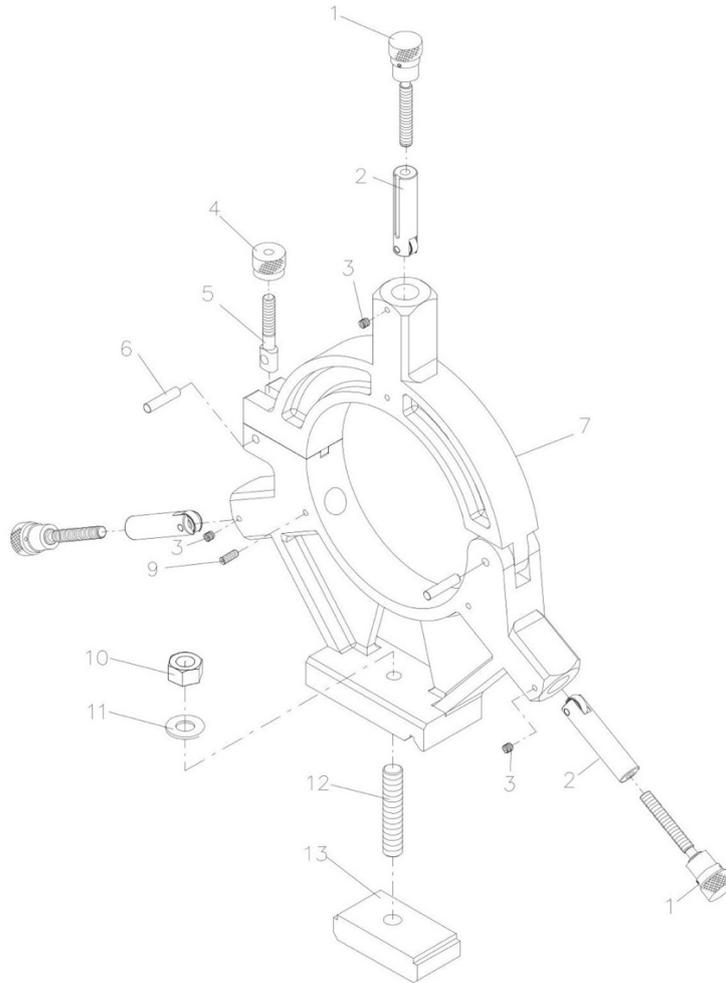
SERVICE PARTS

Steady Rest Assembly I – Exploded View



SERVICE PARTS

Steady Rest Assembly II – Exploded View



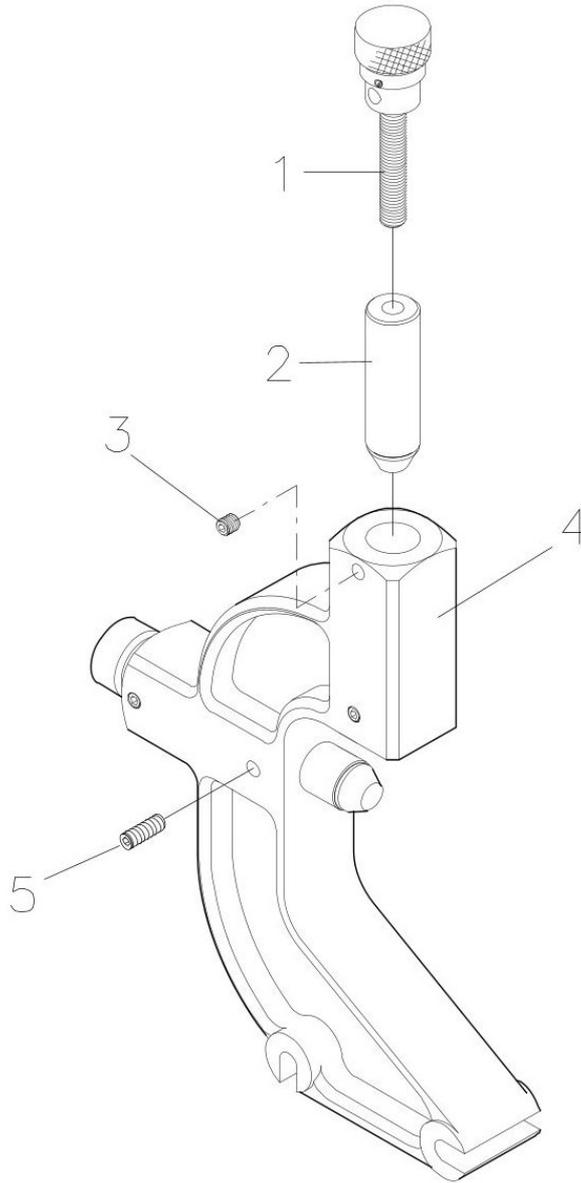
Steady Rest Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Adjusting Knob , Spring Pin(Ø4X40L), Collar, Screw	Assembly for Replacement	3
1	**	Adjusting Knob , Spring Pin(Ø4X30L), Collar, Screw (GX-2180ZX)	Assembly for Replacement	3
2	**	Finger , Pin , Ball Bearing(627)	Assembly for Replacement	3
2	**	Finger , Pin , Ball Bearing(638) (GX-2180ZX)	Assembly for Replacement	3
3	**	Set Screw	M8x8L	3
3	**	Set Screw (GX-2180ZX)	M8x12L	3
4	**	Knob Nut		1
5	**	Clamp Screw		1
6	**	Hinge Pin		2
7	**	Top Casting & Base Casting (GX-1640ZX & 1660ZX)		1
7	**	Top Casting & Base Casting (GX-1860ZX & 1880ZX)		1
7	**	Top Casting & Base Casting (GX-2180ZX)		1
9	**	Set Screw	M8x16L	3
10	**	Nut	M14	1
11	**	Spring Washer		1
12	**	Hexagon Head Bolt	M14x95	1
13	**	Clamp Plate		1

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SERVICE PARTS

Follow Rest Assembly – Exploded View



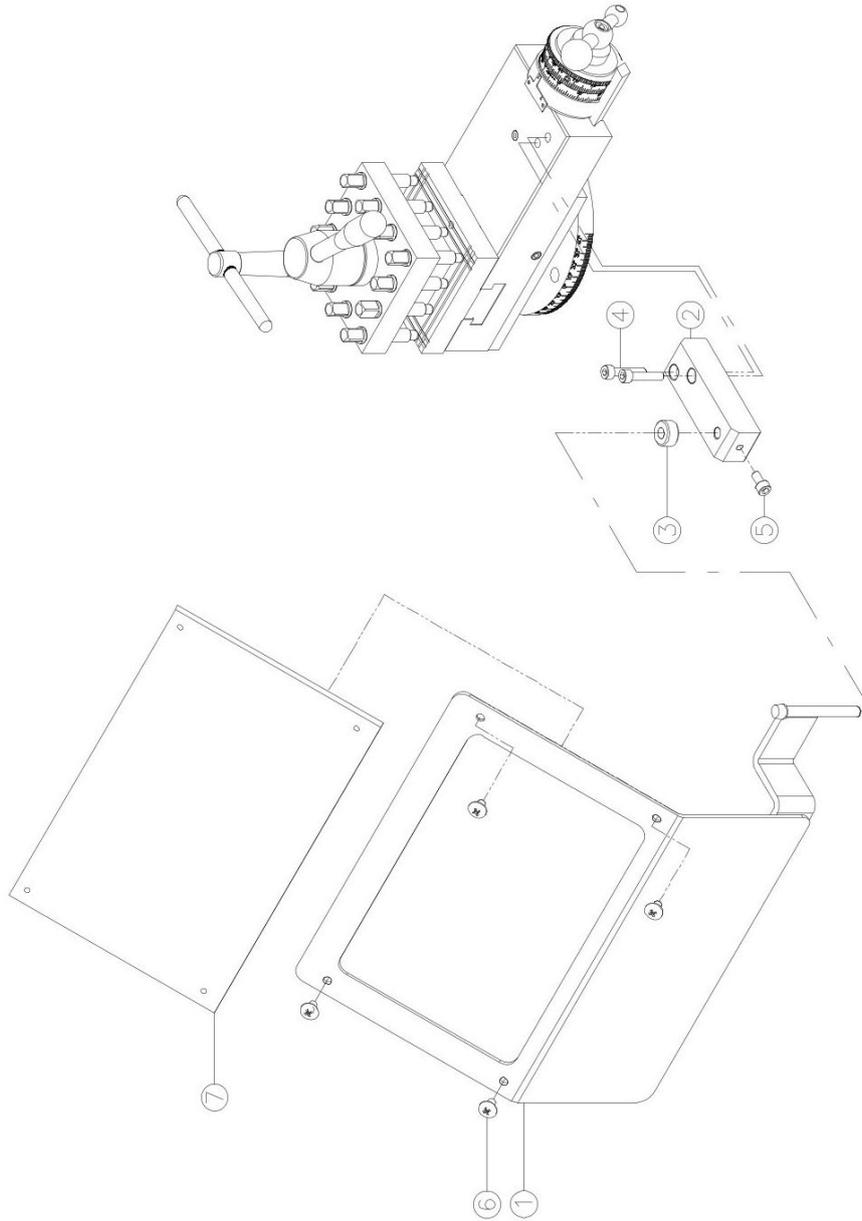
Follow Rest Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	Adjusting Screw, Spring Pin(4X30L), Collar, Screw	Assembly for replacement	2
2	**	Finger, Bracket	Assembly for replacement	2
3	**	Set Screw	M8x10	2
4	**	Casting (GX-1640ZX & 1660ZX)	for 16"	1
4	**	Casting (GX-1860ZX & 1880ZX)	for 16"	1
4	**	Casting (GX-2180ZX)	for 16"	1
5	**	Set Screw	M8x16	2

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SERVICE PARTS

Tool Post Safety Guard Assembly – Exploded View



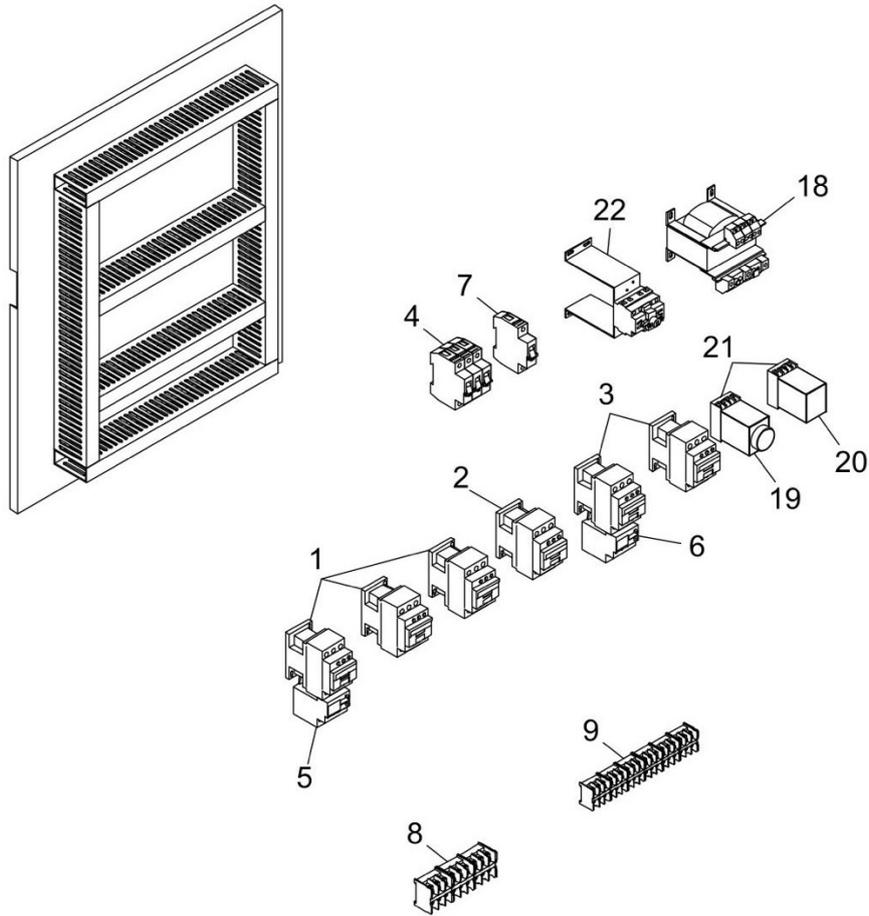
Tool Post Safety Guard Assembly – Parts List

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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SERVICE PARTS

Electrical Box Assembly – Exploded View



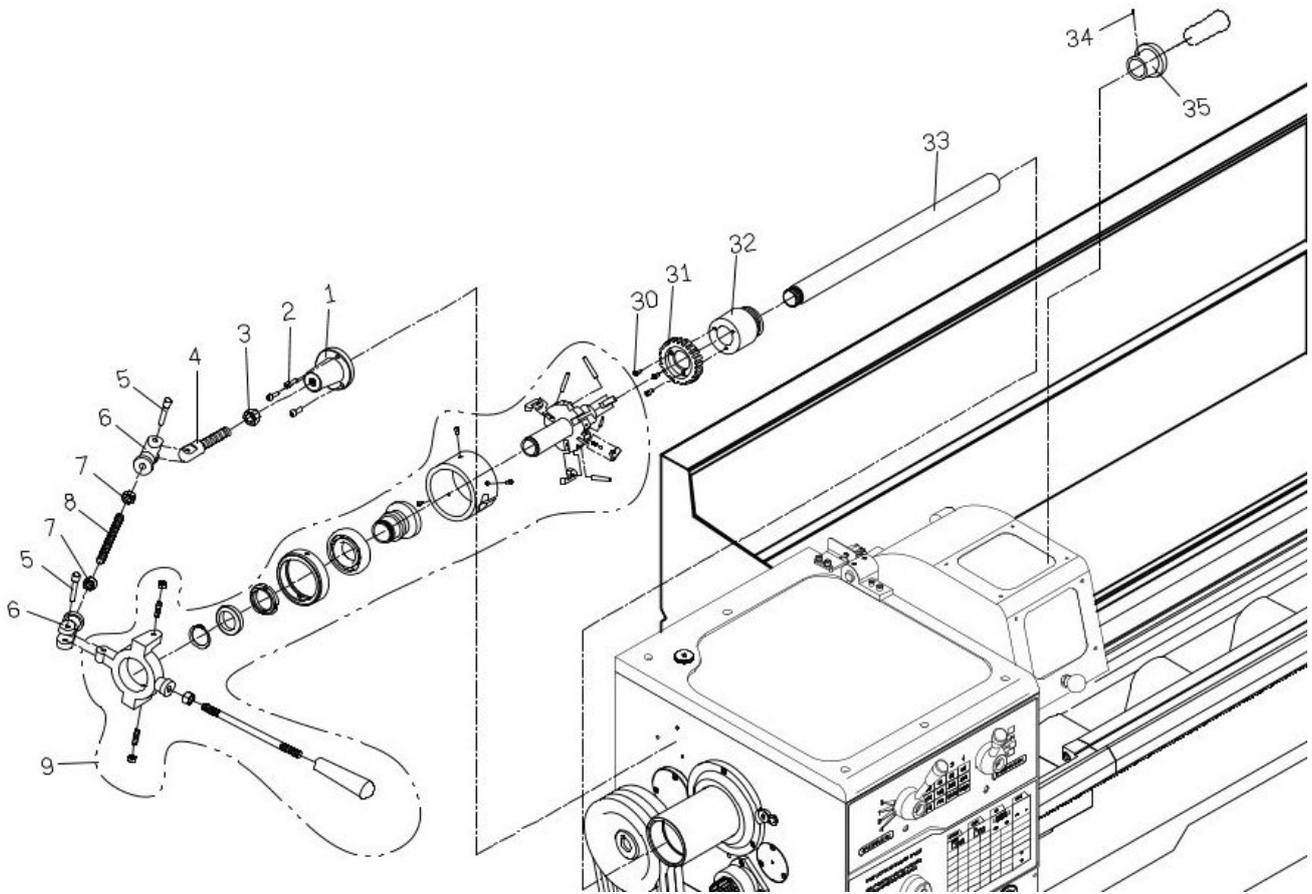
Electrical Box Assembly – Parts List

Index	Part No.	Description	Size	Qty
1	**	AC Magnetic Switch	K1,K2,K6 LC1D32B7	3
2	**	AC Magnetic Switch	K5 LC1D18B7	1
3	**	AC Magnetic Switch	K3,K4 LC1D09B7	2
4	JT1-3080	Circuit Breaker	F1 FAZ-D32/3	1
5	**	Over Relay	F2 LR3D32 23A~32A	1
6	**	Over Relay	F3 LR3D03 0.25A~0.4A	1
7	JT1-3072	Circuit Breaker	F4 FAZ-D1/1	1
8	**	Terminal Board	TB1 IN30BK	3
9	**	Terminal Board	TB2 MACK IN 13SBK(3P 20A)	6
18	**	Transformer	T1 0V,220V,440V 140VA 0V,24V,0V,220V	1
19	**	Multi-Range Analoge Timer	KT1 AH3-RC	1
20	**	Amplifier	PU1 PU-NC	1
21	**	Relay Seat	PF085A	2
22	**	Door-Type Main Cam Switch	Q1 32A ,SE163003B+011/0001	1

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SERVICE PARTS

5C Collet Closer Assembly (Optional) – Exploded View



SERVICE PARTS

5C Collet Closer Assembly (Optional) – Parts List

Index	Part No.	Description	Size	Qty
1	**	Bracket	CAP 6x25	1
2	**	Hex. Socket Head Bolt		3
3	**	Nut	M16	1
4	**	Bolt		1
5	**	Bolt		1
6	**	Connector Casting		1
7	**	Nut	W½"	2
8	**	Screw	W½ x 155mm	1
9	**	Handle Casting		1
	**	Set Screw	SET M8x10	2
	**	Nut	M8	2
	**	Nut	½" - 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	CAP 5x12	3
31	**	Index Ring		1
32	**	Hub		1
33	**	Tube		1
34	**	Pin		1
35	**	Bush		1

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SERVICE PARTS

Taper Attachment Assembly (Optional) – Parts List

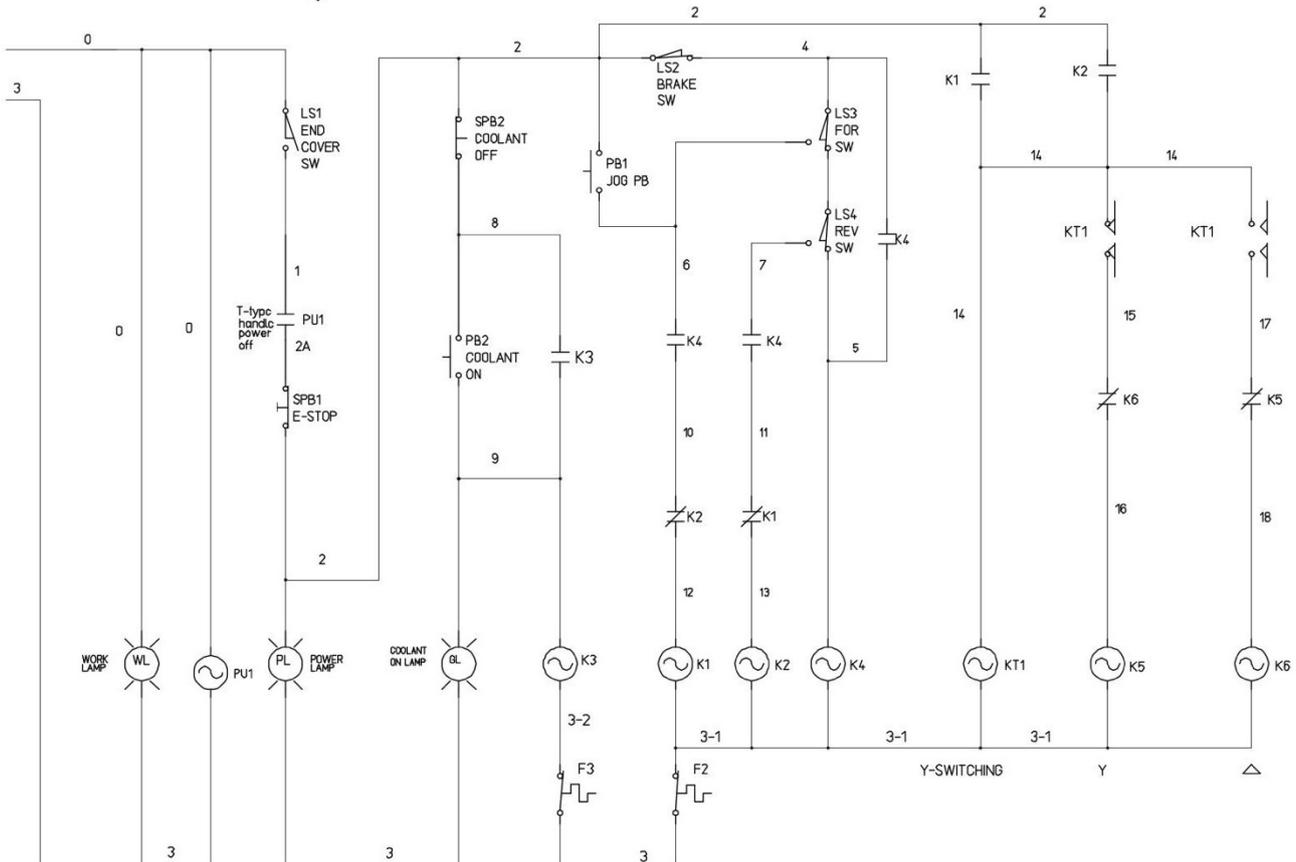
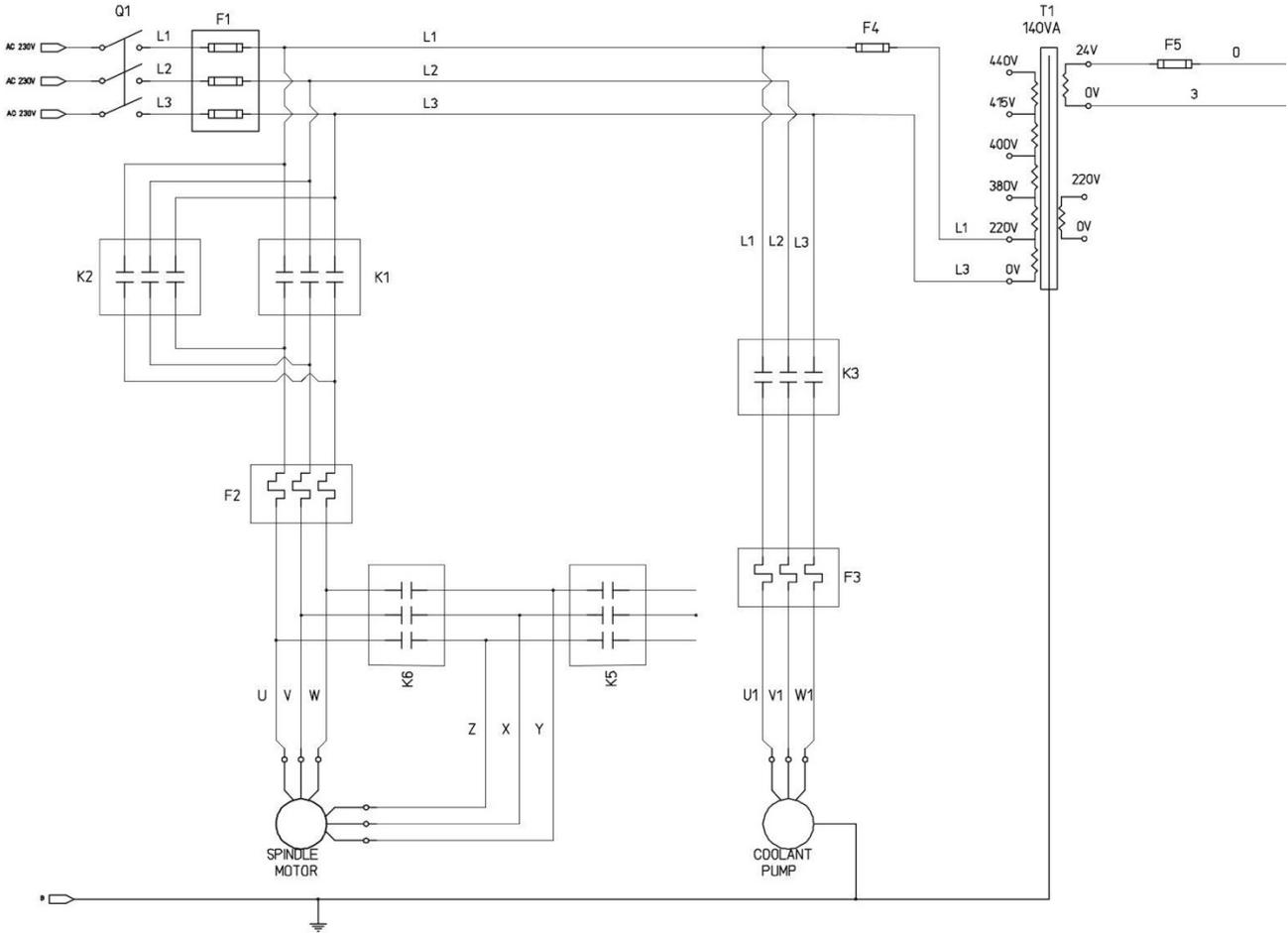
Index	Part No.	Description	Size	Qty
1	**	Collar		1
2	**	Hex. Socket Head Bolt	CAP 6x20	2
3	**	Cap Collar		2
4	**	Thrust Bearing	NTB / AS2-1226	2
5	**	Yoke Plate		1
6	**	Nut	M12	1
7	**	Flat Hexagon Screw	M5x12	4
8	**	Cover Plate		1
9	**	Yoke		1
10	**	Copper Pin		3
11	**	Set Screw	M8x20	3
12	**	Hex. Socket Head Bolt	CAP 8x45	4
13	**	Taper Pin	#6x1½"	2
14	**	Main Bracket		1
15	**	Plate		1
16	**	Done Cross Screw	M6x10	2
17	**	Set Screw	M8x25	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	M6x12	4
47	**	Bracket		1
48	**	Eccentric Pin		1
49	**	Hex. Socket Head Bolt	CAP 10x70	2
50	**	Bracket		1
51	**	Hub		1
52	**	Nut	M14	1

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WIRING DIAGRAMS

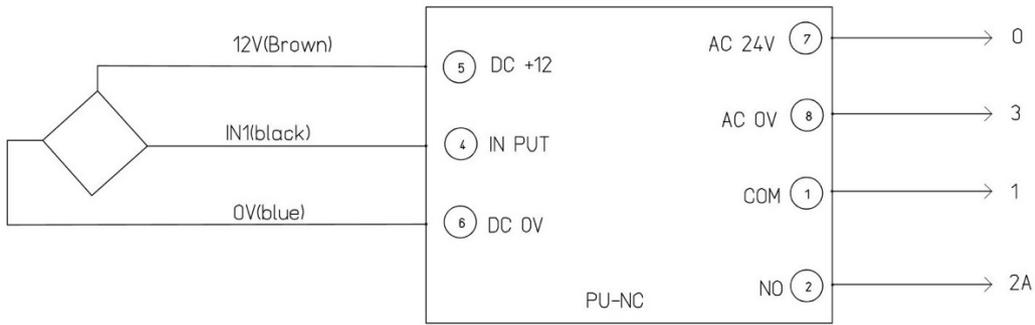
Wiring Diagrams

230V

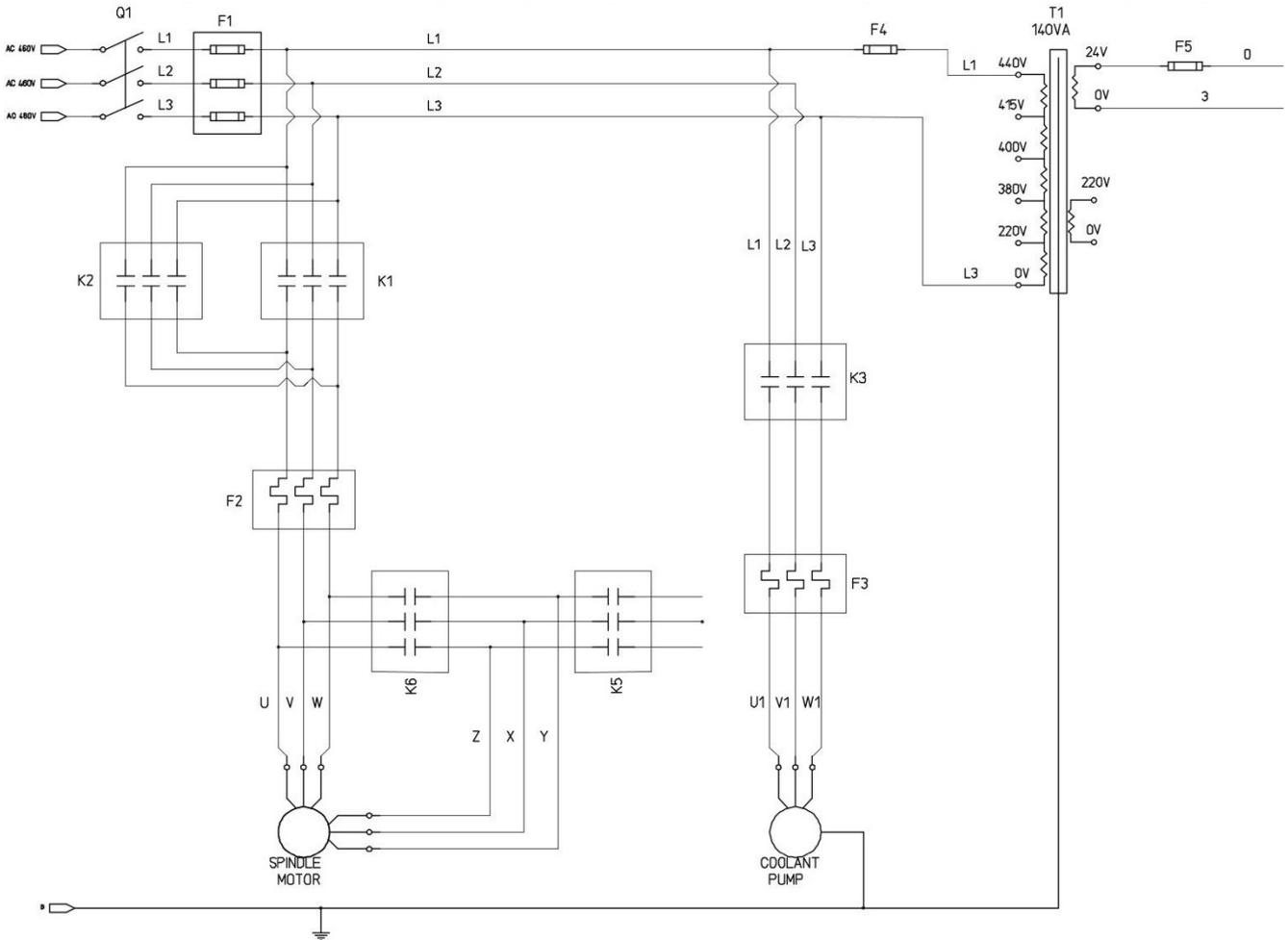


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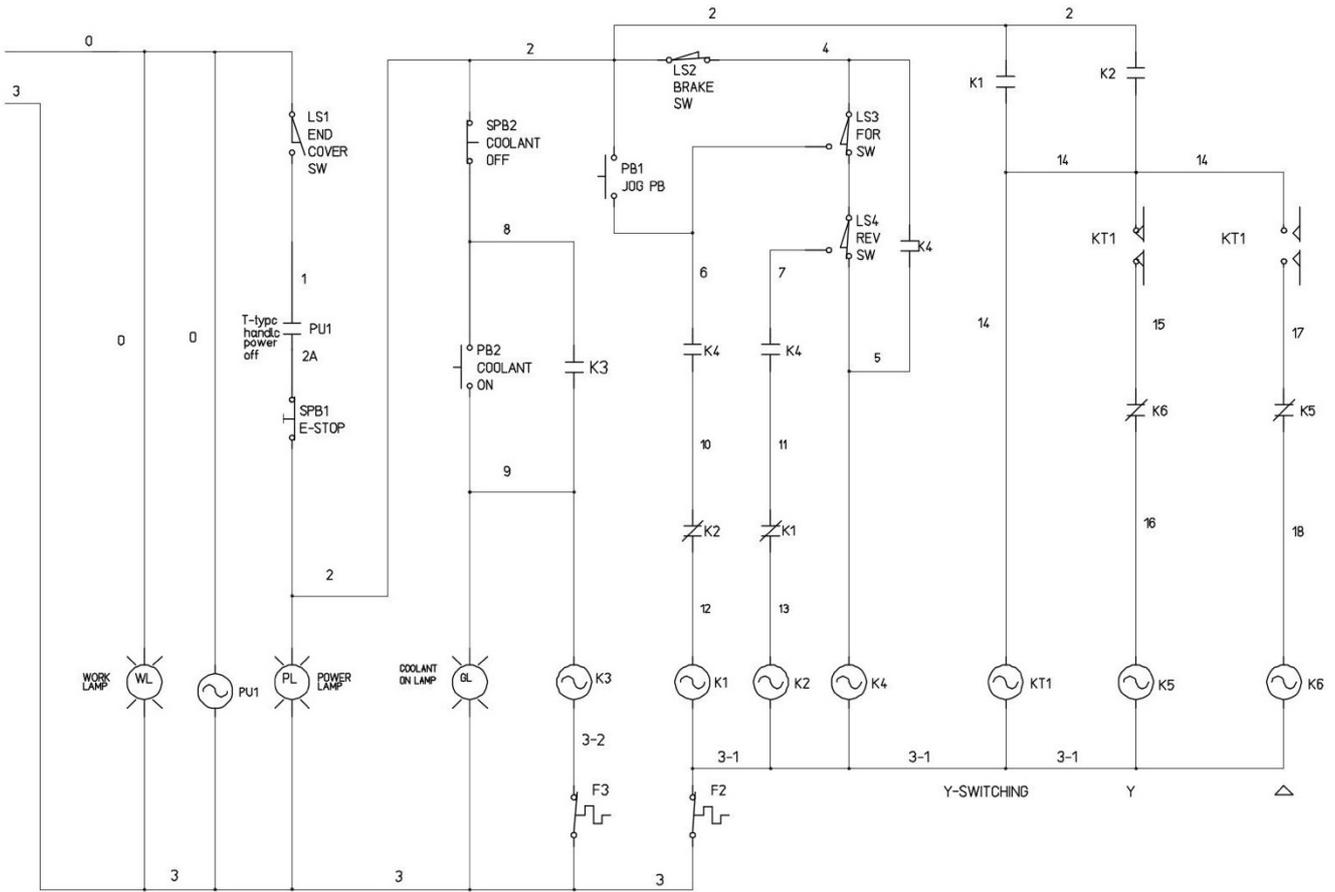
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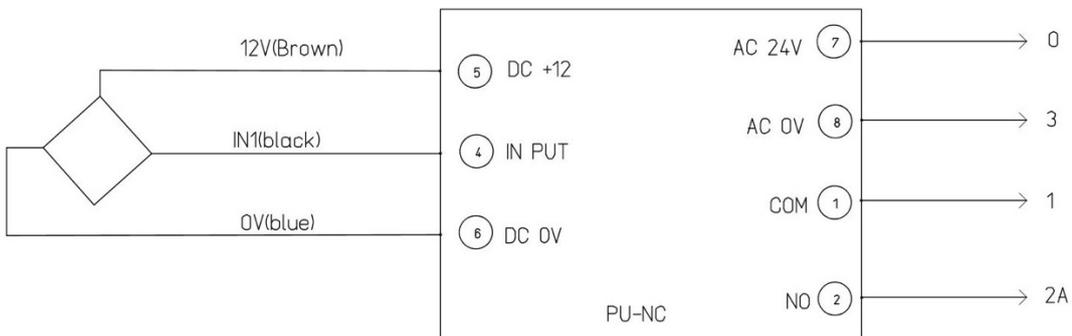
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