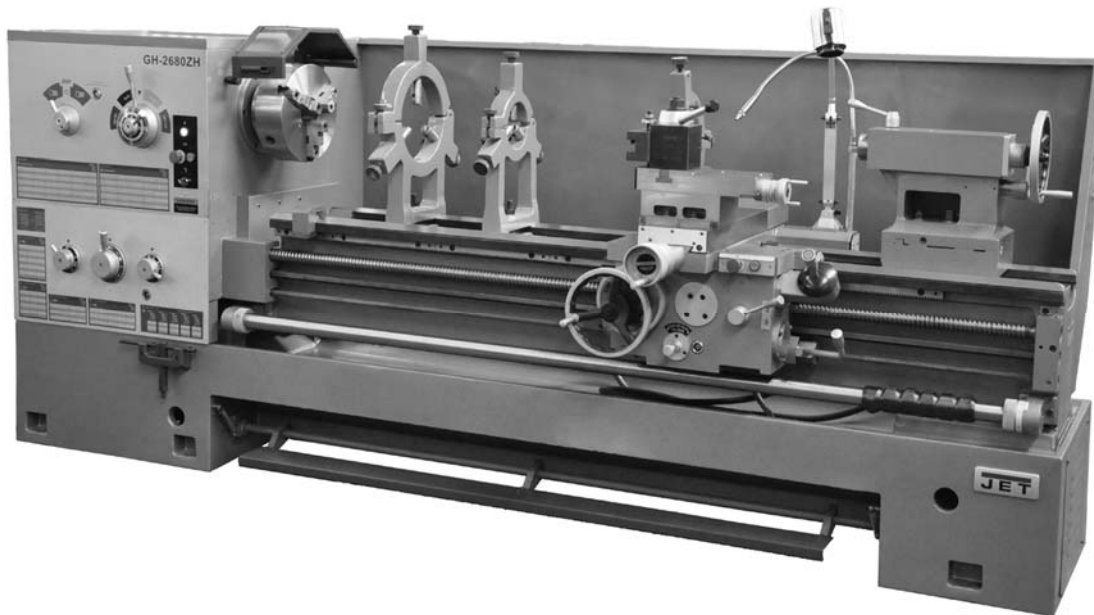


Operation and Maintenance Instructions

ZH Series Large Bore Lathes

Models GH-2680ZH; GH-26120ZH



Model GH-2680ZH shown

For ZH-Series Lathes Parts List and Electrical Diagrams, see document M-321860-1

JET

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Part No. M-321860
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1.0 IMPORTANT SAFETY INSTRUCTIONS

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. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.
10. Make certain the switch is in the **OFF** position before connecting the machine to the power supply.
11. Make certain the machine is properly grounded.
12. Make all machine adjustments or maintenance with the machine unplugged from the power source.
13. 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.
14. 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.
15. 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.
16. Provide for adequate space surrounding work area and non-glare, overhead lighting.
17. Keep the floor around the machine clean and free of scrap material, oil and grease.
18. Keep visitors a safe distance from the work area. **Keep children away.**
19. Make your workshop child proof with padlocks, master switches or by removing starter keys.
20. Give your work undivided attention. Looking around, carrying on a conversation and "horse-play" are careless acts that can result in serious injury.
21. 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.
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. 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.
24. Use recommended accessories; improper accessories may be hazardous.
25. Maintain tools with care. Keep cutting tools sharp and clean for the best and safest performance. Follow instructions for lubricating and changing accessories.
26. Do not attempt to adjust or remove tools during operation.
27. Never stop a rotating chuck or workpiece with your hands.
28. Choose a low spindle speed when working unbalanced workpieces, and for threading and tapping operations.
29. Do not exceed the maximum speed of the workholding device.
30. Do not exceed the clamping capacity of the chuck.

31. Workpieces longer than 3 times the chucking diameter must be supported by the tailstock or a steady rest.
32. Avoid small chuck diameters with large turning diameters.
33. Avoid short chucking lengths and small chucking contact.
34. Turn off the machine and disconnect from power before cleaning. Use a brush to remove shavings or debris — do not use your hands.
35. Do not stand on the machine. Serious injury could occur if the machine tips over.
36. Never leave the machine running unattended. Turn the power off and do not leave the machine until moving parts come to a complete stop.
37. Remove loose items and unnecessary work pieces from the area before starting the machine.
38. Do not operate the lathe in flammable or explosive environments. Do not use in a damp environment or expose to rain.

⚠ WARNING: Some dust, fumes and gases created by power sanding, sawing, grinding, drilling, welding and other construction activities contain chemicals known to the State of California to cause cancer and 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 dust masks that are specifically designed to filter out microscopic particles. For more information go to <http://www.p65warnings.ca.gov/> and <http://www.p65warnings.ca.gov/wood>.

⚠ WARNING: This product can expose you to chemicals including lead and cadmium which are known to the State of California to cause cancer, and phthalates which are known to the State of California to cause birth defects or other reproductive harm. For more information go to <http://www.p65warnings.ca.gov>.

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.

2.0 Warranty and Service

JET warrants every product it sells against manufacturers' defects. If one of our tools needs service or repair, please contact Technical Service by calling 1-800-274-6846, 8AM to 5PM CST, Monday through Friday.

Warranty Period

The general warranty lasts for the time period specified in the literature included with your product or on the official JET branded website.

- JET products carry a limited warranty which varies in duration based upon the product. (See chart below)
- Accessories carry a limited warranty of one year from the date of receipt.
- Consumable items are defined as expendable parts or accessories expected to become inoperable within a reasonable amount of use and are covered by a 90 day limited warranty against manufacturer's defects.

Who is Covered

This warranty covers only the initial purchaser of the product from the date of delivery.

What is Covered

This warranty covers any defects in workmanship or materials subject to the limitations stated below. This warranty does not cover failures due directly or indirectly to misuse, abuse, negligence or accidents, normal wear-and-tear, improper repair, alterations or lack of maintenance. JET woodworking machinery is designed to be used with Wood. Use of these machines in the processing of metal, plastics, or other materials may void the warranty. The exceptions are acrylics and other natural items that are made specifically for wood turning.

Warranty Limitations

Woodworking products with a Five Year Warranty that are used for commercial or industrial purposes default to a Two Year Warranty. Please contact Technical Service at 1-800-274-6846 for further clarification.

How to Get Technical Support

Please contact Technical Service by calling 1-800-274-6846. **Please note that you will be asked to provide proof of initial purchase when calling.** If a product requires further inspection, the Technical Service representative will explain and assist with any additional action needed. JET has Authorized Service Centers located throughout the United States. For the name of an Authorized Service Center in your area call 1-800-274-6846 or use the Service Center Locator on the JET website.

More Information

JET is constantly adding new products. For complete, up-to-date product information, check with your local distributor or visit the JET website.

How State Law Applies

This warranty gives you specific legal rights, subject to applicable state law.

Limitations on This Warranty

JET LIMITS ALL IMPLIED WARRANTIES TO THE PERIOD OF THE LIMITED WARRANTY FOR EACH PRODUCT. EXCEPT AS STATED HEREIN, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

JET SHALL IN NO EVENT BE LIABLE FOR DEATH, INJURIES TO PERSONS OR PROPERTY, OR FOR INCIDENTAL, CONTINGENT, SPECIAL, OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF OUR PRODUCTS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

JET sells through distributors only. The specifications listed in JET printed materials and on official JET website are given as general information and are not binding. JET reserves the right to effect at any time, without prior notice, those alterations to parts, fittings, and accessory equipment which they may deem necessary for any reason whatsoever. JET® branded products are not sold in Canada by JPW Industries, Inc.

Product Listing with Warranty Period

90 Days – Parts; Consumable items
1 Year – Motors; Machine Accessories
2 Year – Metalworking Machinery; Electric Hoists, Electric Hoist Accessories; Woodworking Machinery used for industrial or commercial purposes
5 Year – Woodworking Machinery
Limited Lifetime – JET Parallel clamps; VOLT Series Electric Hoists; Manual Hoists; Manual Hoist Accessories; Shop Tools; Warehouse & Dock products; Hand Tools; Air Tools

NOTE: JET is a division of JPW Industries, Inc. References in this document to JET also apply to JPW Industries, Inc., or any of its successors in interest to the JET brand.

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4.0 Specifications

Model Number.....	GH-2680ZH	GH-26120ZH
Stock Number	321860.....	321890

General Capacities:

Maximum Swing over Bed.....	26" (660mm).....	26" (660mm)
Maximum Swing over Cross Slide.....	16-1/2" (420mm).....	16-1/2" (420mm)
Maximum Swing Through Gap.....	34" (870mm).....	34" (870mm)
Length of Gap.....	7-7/8" (200mm).....	7-7/8" (200 mm)
Distance between Centers	80" (2030mm).....	120" (3050mm)
Width of Bed.....	16" (405mm).....	16" (405mm)

Motors and Electrical:

Main Motor.....	TEFC Induction.....	TEFC Induction
Horsepower	10 HP (7.5kW).....	10 HP (7.5kW)
Phase	3 PH.....	3 PH
Voltage	230/460V (prewired 230V).....	230/460V (prewired 230V)
Full Load Amps.....	25.4/12.7A.....	25.4/12.7A
Cycle	60 Hz.....	60 Hz
Feed Motor	Induction.....	Induction
Horsepower	1/2 HP.....	1/2 HP
Phase	3 PH.....	3 PH
Voltage	230/460V (prewired 230V).....	230/460V (prewired 230V)
Full Load Amps.....	2.85/1.65A.....	2.85/1.65A
Cycle	60 Hz.....	60 Hz
Coolant Pump Motor.....	Induction.....	Induction
Horsepower	1/8 HP.....	1/8 HP
Phase	3 PH.....	3 PH
Voltage	230/460V (prewired 230V).....	230/460V (prewired 230V)
Full Load Amps.....	0.54/0.27A.....	0.54/0.27A
Cycle	60 Hz.....	60 Hz
Power Transmission	v-belt (x 4).....	v-belt (x 4)
Controls circuit.....	110V A.C.....	110V A.C.
Lamp circuit	24V A.C.	24V A.C.
Indicators circuit.....	110V A.C.....	110V A.C.

Headstock and Spindle:

Spindle Bore	4-1/8" (105mm).....	4-1/8" (105mm)
Spindle Mount.....	D1-8 Camlock.....	D1-8 Camlock
Spindle Taper with Sleeve.....	113mm Dia. 1:20 / MT-5.....	113mm Dia. 1:20 / MT-5
Number of Spindle Speeds.....	12.....	12
Range of Spindle Speeds.....	36 to 1600 RPM.....	36 to 1600 RPM
Distance Floor to Spindle Center (approx.)	46".....	46"
3-Jaw Scroll Chuck:		
Load Capacity.....	661 lb (300 kg).....	661 lb (300 kg)
Inside Diameter	5-11/16" (145mm).....	5-11/16" (145 mm)

Carriage:

Maximum Compound Rest Travel	5-1/2" (140 mm).....	5-1/2" (140 mm)
Maximum Compound Rest Swivel.....	+/- 90 deg.....	+/- 90 deg.
Maximum Cross Slide Travel.....	14-1/16" (358 mm).....	14-1/16" (358 mm)
Maximum Carriage Travel	65" (1650mm).....	106-1/4" (2700 mm)

GH-2680ZH**GH-26120ZH****Gearbox:**

Number of Longitudinal Feeds.....	51.....	51.....
Range of Longitudinal Feeds.....	0.0020 – 0.094 in./rev. (0.051-2.39mm/rev).....	0.0020 – 0.094 (0.051-2.39mm)
Number of Cross Feeds	40.....	40.....
Range of Cross Feeds	0.0010 – 0.040 in./rev. (0.027-1.02mm/rev).....	0.0010 – 0.40 (0.027-1.02mm)
Number of Inch Threads.....	48.....	48.....
Range of Inch Threads.....	30-2 T.P.I.....	30-2 T.P.I
Number of Metric Threads.....	22.....	22.....
Range of Metric Threads.....	1-14 mm.....	1-14 mm
Number of Diametral Threads.....	24.....	24.....
Range of Diametral Threads.....	56-4 D.P.....	56-4 D.P.
Number of Modular Threads.....	18.....	18.....
Range of Modular Threads.....	0.5-7mm.....	0.5-7mm
Leadscrew Pitch.....	1/2" (12.7mm).....	1/2" (12.7mm)

Tailstock:

Tailstock Spindle Travel	6" (150mm).....	6" (150mm)
Tailstock Taper.....	MT-5.....	MT-5
Maximum Tailstock Cross Displacement.....	+/- 0.40" (10mm).....	+/- 0.40" (10mm)

Other:

Small Steady Rest Capacity	3/4" – 5" (20-125mm).....	3/4" – 5" (20-125mm)
Large Steady Rest Capacity.....	4" – 9.5" (100-240mm).....	4" – 9.5" (100-240mm)
Follow Rest Capacity.....	3/4" – 4" (20-100mm).....	3/4" – 4" (20-100mm)
Coolant tank capacity	3.4 gal. (13L).....	7.1 gal. (27L)
Overall Dimensions	137-13/16"L x 53-1/8"W x 58-1/16"H....	177-5/32"L x 48-1/32"W x 58-1/16"H
	(3500 x 1350 x 1475 mm)	(4500 x 1220 x 1475 mm)
Approximate Net Weight.....	7932 lbs. (3595 kg).....	8010 lbs. (3630kg)

¹Values are emission levels, not necessarily to be seen as safe operating levels. Since workplace conditions vary, this information is only intended to allow the user to make a better estimation of the hazards involved.

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

5.0 Dimensions and mounting hole centers

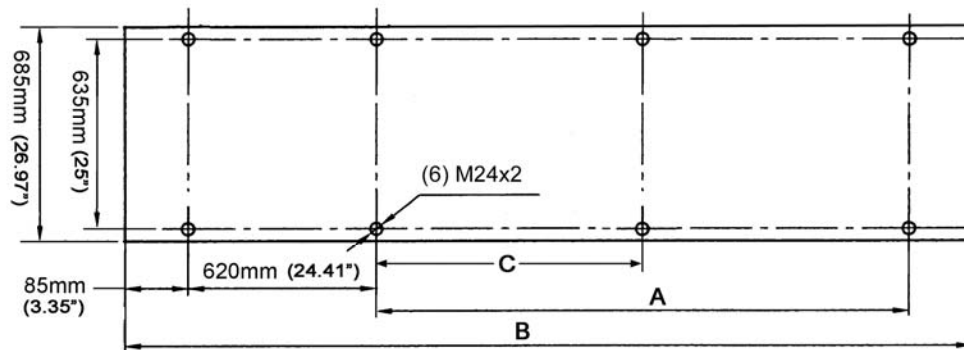


Figure 1

Lathe Size	80 inch (GH-2680ZH)	120 inch (GH-26120ZH)
A	2560mm(100.8 in.)	3565mm(140.4 in.)
B	3500mm(137.60 in.)	4500mm (177.2 in.)
C		1721.5mm (67.8 in)

Table 1

6.0 General description and nomenclature

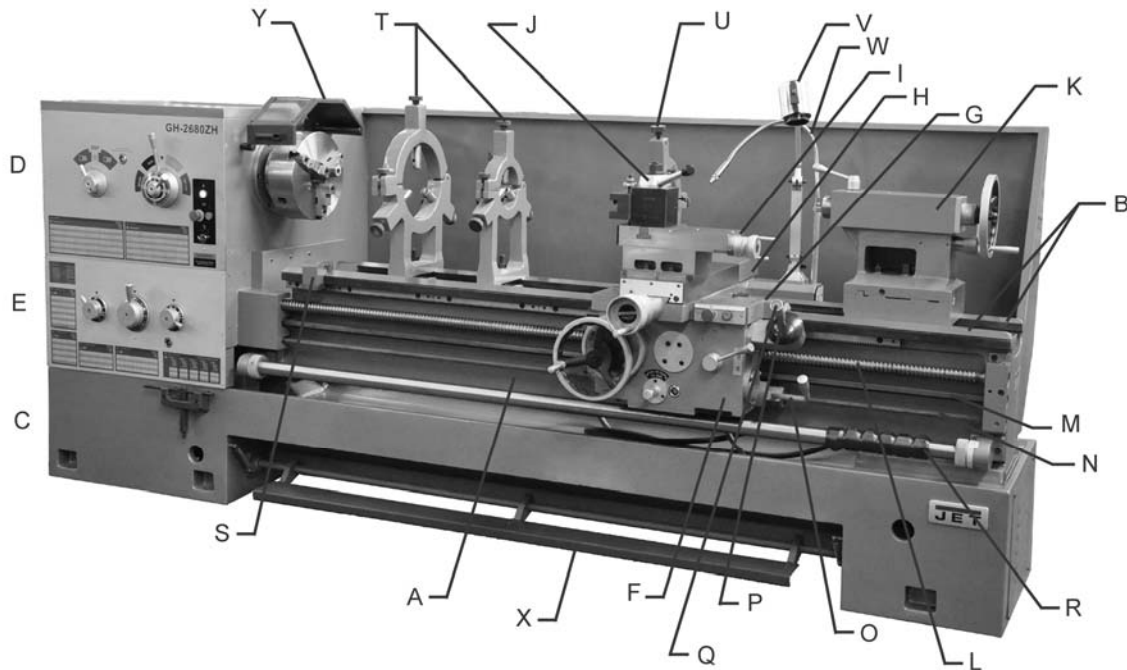


Figure 2 – General Description (GH-2680ZH shown)

The ZH series lathe operates on a centralized gear system. The motor power is transferred through four v-belts to a shaft, which in turn transmits the energy through a multi-disc friction clutch and various gear pairs, to the spindle. The clutch also controls the spindle's direction of rotation. Through clutch disengagement, the operator can stop the spindle without turning off the motor, which will prolong the life of the motor.

Bed and Stand

The lathe bed (A) is made of cast iron with low vibration and high rigidity. Two precision-ground v-slideways (B), reinforced by supersonic frequency hardening, offer precision guidance for the carriage. The main drive motor is mounted in the stand (C) below the gearbox.

(The GH-26120ZH model has three stands: left, center, and right).

Headstock

The headstock (D) is cast from high grade, low vibration cast iron. In the head, the spindle is supported at three points; by a cylindrical roller bearing at the front and a tapered roller bearing and ball bearing. See *section 11.0* for detailed explanation of controls. The electrical box is mounted to the rear of the headstock.

Feed Gearbox

The gearbox (E) is made from high quality cast iron and is mounted to the left side of the machine bed. This lathe adopts a three-axle sliding common gear mechanism, together with thread selection change mechanism, and doubling mechanism, which enable it to cut a comprehensive range of metric, modular and diametral pitch threads, thus eliminating the need for gear changes except where special threading is required.

Carriage

The carriage assembly is composed of the *Apron*, the *Saddle*, the *Cross Slide*, the *Compound Rest*, and the four-way *Tool Post*.

Apron (F). Quick travel of the Apron for positioning is accomplished by means of a bed-mounted rack and pinion, operated manually by the handwheel on the front of the apron, or automatically by the feed direction handle (P), which has a rapid traverse (Q).

Saddle (G). The saddle is made from high quality cast iron and rides along the v-ways.

Cross Slide (H). The cross-slide is mounted on the saddle and used for cross feed operations. It moves on a dovetailed slideway which can be adjusted for play by means of the gibs.

Compound Rest. The compound rest (I), which is T-slotted and mounted on the cross slide, can be rotated 360°, allowing tapers to be turned. The compound rest travels on dovetailed ways, with adjustable gibbs.

Quick Change Tool Post. The tool post (J) is a turret design, mounted to the compound rest. It holds up to one tool.

Tailstock

The tailstock (K) slides on a v-way and can be locked at any location by a clamping lever. The tailstock has a heavy duty quill with a No. 5 Morse Taper and etched graduation scale. The tailstock can be offset for taper cutting, and bearings can be adjusted for drag along the ways.

Leadscrew and Feed Rod

The leadscrew (L) and feed rod (M) are mounted on the front of the machine bed. They are connected to the gearbox at the left and are supported by bearings on both ends.

The leadscrew is used only for threading functions. This maintains its accuracy and prolonged service life.

Spindle Direction Control Axle(N)

Spindle rotation can be reversed by simply moving the control lever (O) mounted at the right of the carriage. (Allow spindle to come to a stop before reversing.)

Travel Stops

Six stops (R) can be moved to any position along the travel setting rod, and are secured in place using socket head screws. The convex surface of the stop contacts a limit switch on the underside of the apron. The travel setting rod can be rotated on an eccentric into six positions to modulate the contact between stops and limit switch.

A carriage stop (S) is also provided for manual carriage operation.

Steady Rest

The ZH series lathes are provided with small and large steady rests (T). A steady rest serves as a support for shafts on the free tailstock end. The steady rest is mounted on the bedway and secured from below with a bolt, nut and locking plate.

Follow Rest

The traveling follow rest (U) is mounted to the saddle, and thus follows the movement of the turning tool. Only two fingers are required as the place of the third is taken by the turning tool. The follow rest is used for turning operations on long, slender work pieces. It prevents the work piece from flexing under the pressure of the cutting tool.

Work Lamp

Adjustable halogen lamp (V) with independent on/off switch.

Coolant Nozzle(W)

Fully adjustable gooseneck; flow is regulated through a valve lever at its base.

Foot Brake(X)

Activates a braking strap at the motor for emergency stopping of all lathe functions.

Chuck Guard (Y)

7.0 Unpacking

Open shipping container and check for shipping damage. Report any damage immediately to your distributor and shipping agent. Do not discard any shipping material until the Lathe is set up and running properly.

Compare the contents of your container with the following parts list to make sure all parts are intact. Missing parts, if any, should be reported to your distributor. Read the instruction manual thoroughly for set up, maintenance and safety instructions.

7.1 Contents of the Shipping Container

(Refer to Figure 3)

- 1 Lathe
- 2 Steady Rests (mounted on Lathe)
- 1 Follow Rest (mounted on Lathe)
- 1 Three Jaw Scroll Chuck, 12-25/32" (mounted on Lathe) – **A**
- 1 Drive Plate – **B**
- 4 Tool Holder – **C**
- 1 Face Plate, 24-25/32" (with 6 dogs) – **D**
- 1 Round Nut Spanner, 170-210 mm – **E**
- 4 Change Gears – 63T, 69T, 78T, 90T – **F**

- 1 Tool Box, containing the following:
 - 1 Morse Reduction Sleeve – **G**
 - 1 Live Center, MT-5 – **H**
 - 1 Dead Center, MT-5 – **I**
 - 2 Drive Pins – **J**
 - 1 Cam Wrench – **K**
 - 1 Chuck Wrench – **L**
 - 2 Hex Socket Head Cap Screw – **M**
 - 1 Gap Bridge Pin Driver – **N**
 - 1 Drift Key – **O**
 - 1 Round Nut Spanner (45-52 mm) – **P**
 - 1 Hex Key Set (2, 3, 4, 6, 8, 10, 12 mm) – **Q**
 - 6 Leveling Bolts with Hex Nuts – **R**
(qty. 8 for GH-26120ZH)
 - 6 Leveling Pads – **S**
(qty. 8 for GH-26120ZH)
 - 1 Flat Blade Screwdriver – **T**
 - 1 Cross Point Screwdriver – **U**
 - 2 Open End Wrenches (17/19, 19/22) – **V**
 - 1 White Touch-up Paint Can – **W**
 - 1 Oil Gun – **X**
 - 1 Operating Instructions Manual
 - 1 Parts List Manual
 - 1 Warranty Card
 - 1 Test Record
 - 1 Packing List

NOTE: Optional accessories are available for JET Lathes, such as Taper Attachment, Collet Closer and Digital Read Out. Contact your dealer or JET for more information.

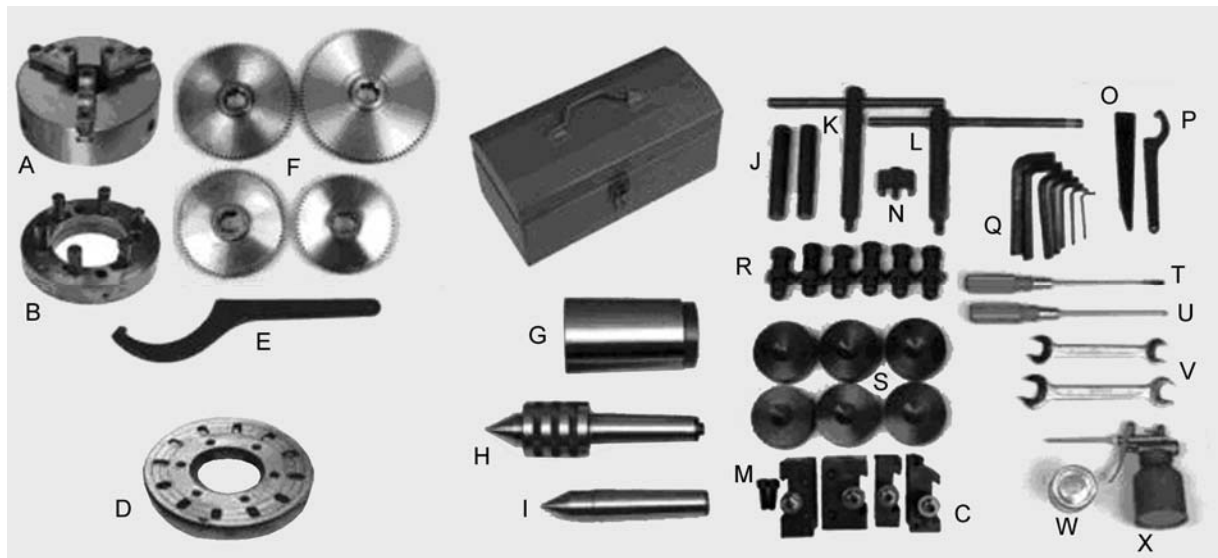


Figure 3
ZH Series Lathes – Contents of Shipping Container

8.0 Installation

1. Finish removing all crate material from around lathe.
2. Unbolt lathe from shipping pallet.
3. Choose a location for the lathe that is dry and has sufficient illumination.
4. Allow enough room to service the lathe on all four sides, and to load and off-load work pieces. In addition, if bar work is to be performed, allow enough space for stock to extend out the headstock end. If used in production operations, leave enough space for stacking unfinished and finished parts.
5. The foundation must be solid to support the weight of the machine and prevent vibration, preferably a solid concrete floor.
6. The lathe's center of weight is near the headstock. Before lifting, move the tailstock and the carriage (*release carriage lock, section 11.0*) to the right end of the bed and lock them.
7. Sling the lathe using steel rods or pipes of sufficient strength inserted through the holes in the stand (see Figure 4). **Do not lift lathe by the spindle.** With properly rated lifting equipment, slowly raise the lathe off the shipping pallet.

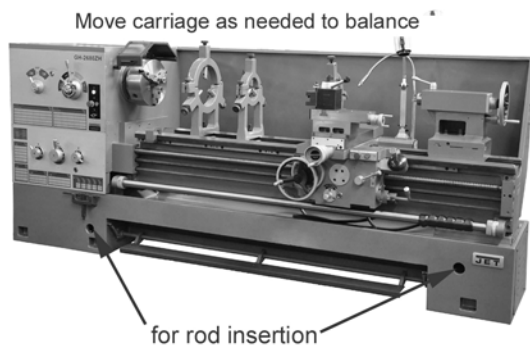


Figure 4 – Lifting preparation

CAUTION Confirm that all suspension equipment is properly rated and in good condition for lifting the lathe. Do not allow anyone beneath or near the load while lifting.

8. The lathe can be placed upon the cast iron leveling pads under each foot hole, and adjusted using the adjusting bolts with hex nuts. Or, it may be secured to the floor using bolts placed head-down in the concrete, and using shims where needed to level the machine.

8.1 Leveling the lathe

It is imperative that the lathe be on a level plane; that is, where headstock and tailstock center points remain aligned throughout the tailstock travel, with the bed ways absent of twist and thus parallel to the operational center line.

A lathe which is not properly leveled will be inaccurate, producing tapered cuts. Also, the center point of the tailstock will vary as it is positioned along the bed, thus requiring constant readjustment of the set of the tailstock.

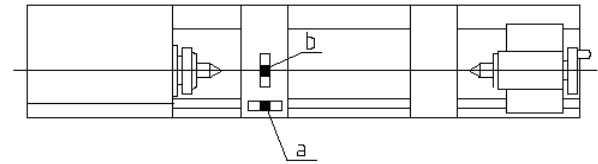


Figure 5 – Leveling

9. Use a machinist's precision level on the bed ways both front to back and side to side, as shown in Figure 5. Take the reading in one direction every 10 inches. Make sure the ways are clean and free of any debris before placing a level upon them.
10. Deviation over bed length (see Figure 5):
 - (a) Maximum 0.02/1000mm
 - (b) Maximum 0.04/1000mm
11. Tighten foot screw nuts evenly to avoid distortion.
12. Leveling should be inspected occasionally, and especially if the accuracy of the lathe begins to diminish.

8.2 Completing installation

13. Exposed metal surfaces have been coated with a rust protectant. Remove this using a soft rag and mild commercial solvent or kerosene. Do not use paint thinner, gasoline, or lacquer thinner, as these will damage painted surfaces. Cover all cleaned surfaces with a light film of ISO68/SAE-20W machine oil, such as Mobil DTE Oil Heavy Medium.
14. Open the end gear cover. Clean all components of the end gear assembly and coat all gears with a heavy, non-slinging grease. Close the end gear cover. (Note: A limit switch prevents the lathe from operating when the end gear cover is open.)

8.3 Chuck Preparation

⚠WARNING Read and understand all directions for chuck preparation. Failure to comply may cause serious injury and/or damage to the lathe.

The three-jaw scroll chuck is shipped pre-installed on the lathe. It can be used for clamping cylindrical, triangular and hexagonal stock, and has reversible jaws.

Note: An optional 4-jaw chuck is available (part no. ZH-2504). See your dealer to order.

⚠WARNING Use an assistant or hoist to help remove a chuck.

Before removing a chuck, place a flat piece of thick plywood across the bedways under the chuck to prevent damage to the bedways should the chuck fall from your hands. Alternatively, many users make a wood chuck cradle that sits atop the ways and accepts the specific diameter of chuck. Figure 6 shows an example.

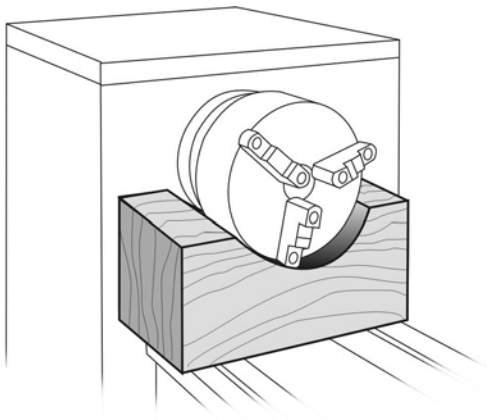


Figure 6 – Chuck cradle (not included)

To remove a chuck from the spindle:

1. Support the chuck while turning six camlocks 1/4-turn counterclockwise, using the chuck wrench from the tool box. See Figure 7.
2. Carefully remove the chuck from the spindle and place on a firm work surface. If the spindle seems stuck, use a mallet at various points on the back side to help free it from the spindle.
3. Inspect the camlock studs. Make sure they have not become cracked or broken during transit. Clean all parts thoroughly with solvent. Also clean the spindle and camlocks.
4. Cover all chuck jaws and the scroll inside the chuck with #2 lithium tube grease. Cover the spindle, camlocks, and chuck body with a light film of 20W oil.

5. Lift the chuck up to the spindle nose and press onto the spindle. Tighten in place by turning the camlocks 1/4 turn clockwise. The index mark (A, Figure 7) on the camlock should be between the two indicator arrows (B) when tight, as shown in Figure 7.
 - If the index mark (A) is *not* between the two arrows, i.e. the cam turns beyond the indicator arrows, then remove the chuck and turn the camlock stud IN one full turn.
 - If a camlock will not engage, remove the chuck and turn the camlock stud OUT one full turn.
6. Make sure chuck is secure on the spindle with the camlocks correctly engaged.

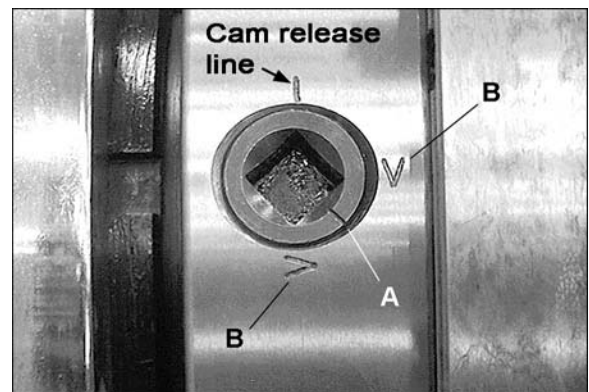


Figure 7 – Camlocks

8.4 Break-In Period

Do not run the lathe above 560 RPM for the first six hours of operation, to allow gears and bearings to adapt and run smoothly.

9.0 Maintenance/Lubrication

CAUTION Lathe must be serviced at all lubrication points and all reservoirs filled to operating level before the lathe is put into service. Failure to comply may cause serious damage to the lathe.

The ZH series lathe is shipped with oil in the reservoirs. Coolant is not included.

Use clean lubricants and check levels often, including before each working shift. To ensure proper lubrication, oil levels should not be less than the center of the oil sight glass. Try not to overfill, as this may cause leakage.

A chart is supplied in section 15.0 for quick reference to all lubrication points.

Unless specified otherwise, the lubrication points require a non-detergent, ISO 68, SAE 20W oil. The recommended brand for this lathe is Mobil DTE® Oil Heavy Medium.

1. **Headstock** – Oil must be up to indicator mark in oil sight glass at the rear of the headstock. [NOTE: The sight glass on the front of the headstock (A, Figure 8) verifies operation of the oil pump, the one at rear of headstock (not shown) indicates oil level]. Top off with SAE 20W oil. Fill by removing the rubber mat and unscrewing the plug (B) on top of the headstock.
2. To drain the headstock, remove the nut on the drain pipe (C, figure 9). Drain oil completely and clean out all metal shavings, then rinse the casting case with kerosene. During the breaking-in process for the lathe, the first oil change should be after 10 days; the second after 20 days. Then change the oil in the headstock every three months.

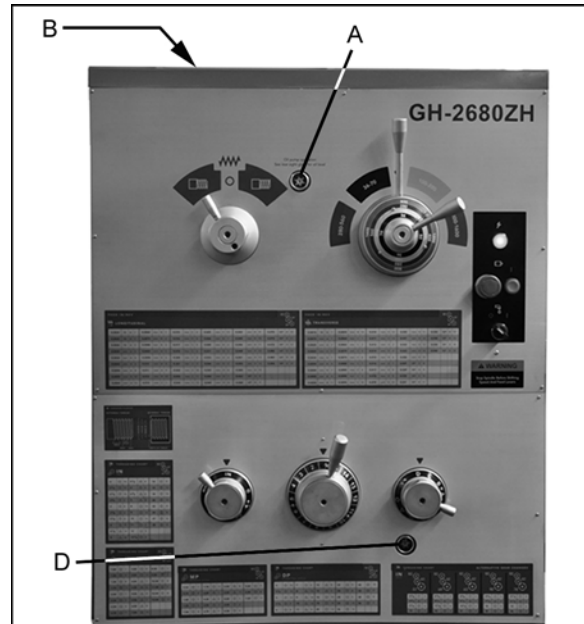


Figure 8 – Headstock lubrication

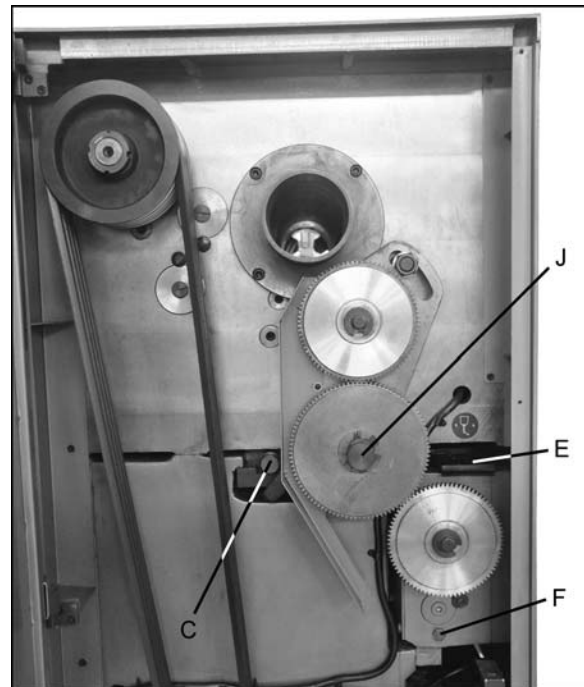


Figure 9 – Lubrication points

3. **Oil Filter** – The filter should be cleaned once a month. To access, open the top cover on the headstock, unscrew the nut on the oil line, and pull up the oil line to bring the filter up. See Figure 10. Use a brush to clean.

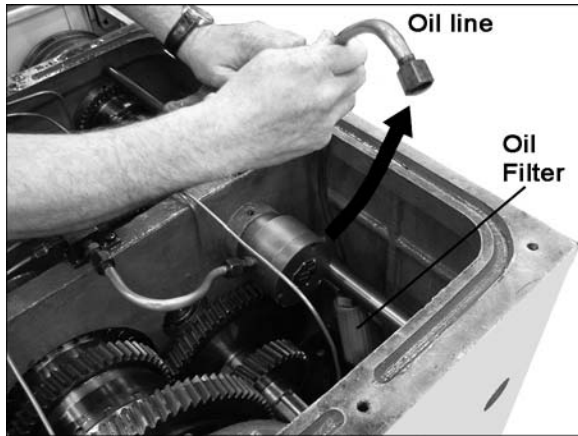


Figure 10 – Oil filter access

4. **Change Gear Axle** – Periodically remove end plug (J, Figure 9) and press #2 lithium grease into the axle to lubricate the gear axle and sleeve. Coat all gears with non-slinging grease.
5. **Gearbox** – Oil must be up to indicator mark in oil sight glass (D, Figure 8). Top off with SAE 20W oil. To add oil to the gearbox, pour it into the pan (E, Figure 9). To drain, remove drain plug (F, Figure 9). Drain oil completely and refill after the first three months of operation. Then change oil in the gearbox every six months.
6. **Apron** – Oil must be between indicator marks in the oil sight glass (G, Figure 11). Top off with SAE 20W oil. Unscrew oil plug (H, Figure 11) to fill. To drain, remove drain plug on the underside of apron. Drain oil completely and refill after the first three months of operation. Then, change oil in the apron annually.

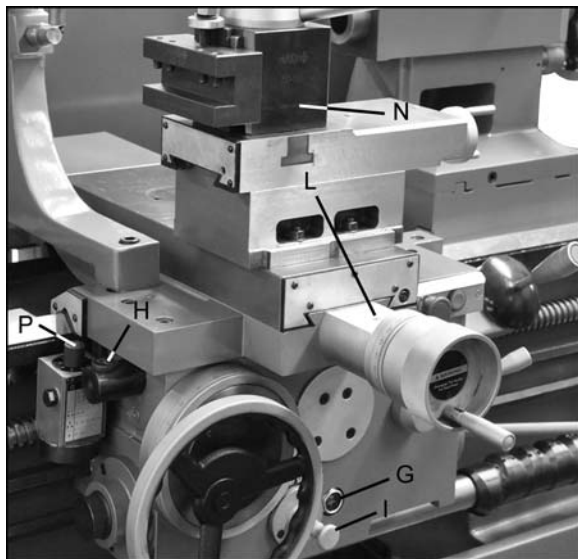


Figure 11 – Lubrication points

7. **One-shot Lube System:** Pull knob (I, Figure 11) and hold for several seconds to allow oil to fill the pump from the apron reservoir. Then release the knob which will push the oil

through various oil lines to lubricate the ways below the saddle. Perform this several times daily.

8. **Threading Dial** – Frequently lubricate via one ball oiler (P, Figure 11) on top of the dial with SAE 20W oil.
9. **Cross Slide** – Daily lubricate one ball oiler on the handwheel housing (L, Figure 11) and three ball oilers on the platform (K, Figure 12), with SAE 20W oil.

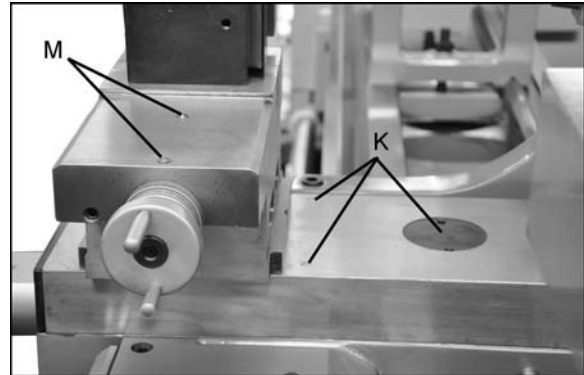


Figure 12 – Lubrication points

10. **Saddle** – The anti-dust felt on both ends of the v-guide ways (Figure 13) should be cleaned weekly with kerosene. If the felt becomes damaged, replace it.

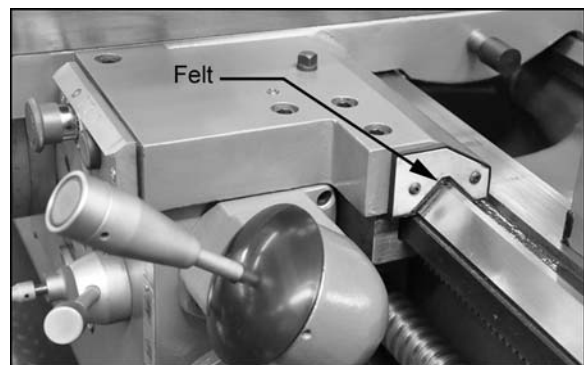


Figure 13 – Anti-dust felt

11. **Compound Rest** – Daily lubricate two ball oilers (M, Figure 12) on top of compound rest with SAE 20W oil.
12. **Tool Post** – Regularly clean dirt and coolant from around the tool post to maintain its re-positioning accuracy (N, Figure 11).
13. **Leadscrew, Feed Rod, and Direction Control Axle** – Slide the cover on the right side bracket (Figure 14) to expose the oil port and fill with SAE 20W oil daily. The oil is distributed to all three elements by a woolen line.

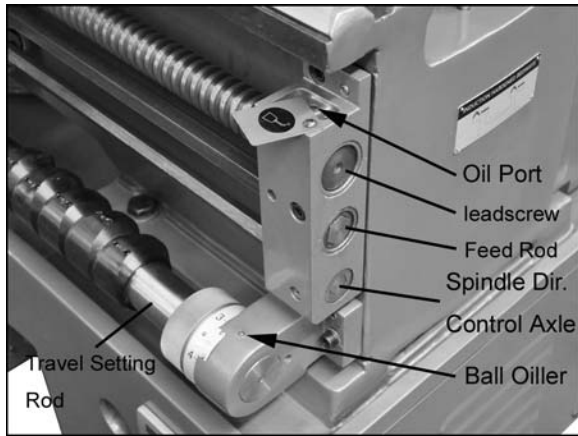


Figure 14 – Lubrication points

14. **Travel Setting Rod** – Periodically insert SAE 20W oil into the ball oiler on each end of the rod (Figure 9).
15. **Tailstock** – Daily lubricate two ball oilers (Figure 15) on top of tailstock with SAE 20W oil.

The anti-dust felt beneath the tailstock that runs along the ways should be cleaned weekly with kerosene. If the felts become damaged, replace them.

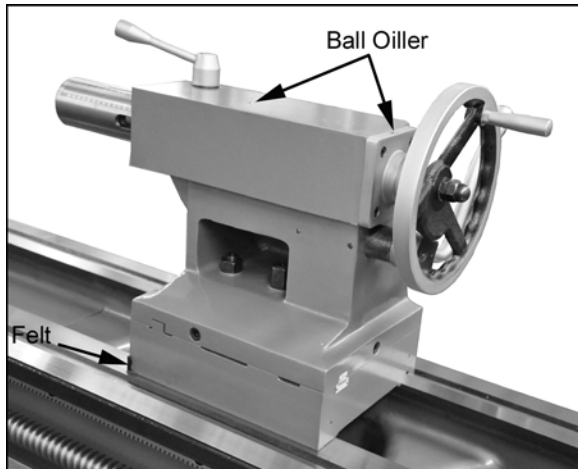


Figure 15 – Tailstock lubrication

16. **V-Belts** – Regularly check and adjust the tightness of the v-belts to prolong their service life. See section 13.5.

9.1 Coolant Preparation

CAUTION Follow local regulations and/or coolant manufacturer's recommendations for use, care and disposal.

1. **GH-2680ZH:** Remove access cover on the tailstock end of the lathe stand. Make sure coolant pump has not shifted during transport. Pour four gallons (approximate) of coolant mix into the reservoir.

GH-26120ZH: Pour coolant (approx. four gallons) into one of the chip trays (Figure 16). Or, slide out one of the chip trays and pour directly into the side trough on the center stand.

2. After machine has been connected to power, turn on coolant pump and check to see that coolant is cycling properly. Flow is controlled by the tap at the base of the nozzle.
3. Reinstall access cover or chip tray.

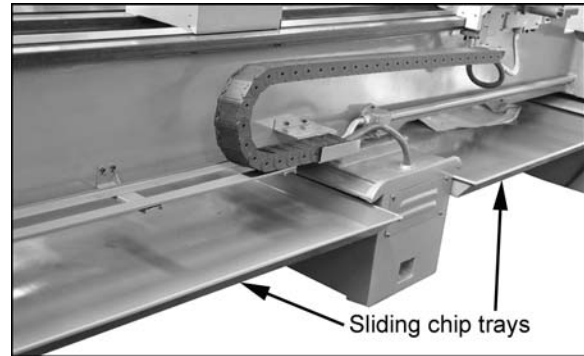


Figure 16 – GH-26120ZH chip trays

10.0 Electrical Connections

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.

The main motor is rated for 230/460V and comes from the factory prewired at 230V. Confirm that power available at the lathe's location is the same rating as the lathe.

A minimum 10-gauge wire should be used for incoming power leads.

IMPORTANT: The lathe must be wired properly and phased correctly. *The spindle must rotate counterclockwise (as viewed from the tailstock end) while the feed rod must rotate clockwise (as viewed from the tailstock end).* If the motor runs and the lathe operates, but the *rapid traverse does not function*, this signals that the machine has been incorrectly phased. If this occurs, disconnect lathe from power source and switch any two of the three power leads (not the green ground wire).

Main Power Switch (Figure 17).

Power Source Cable Receiver (Figure 17).

Make sure the lathe is properly grounded.

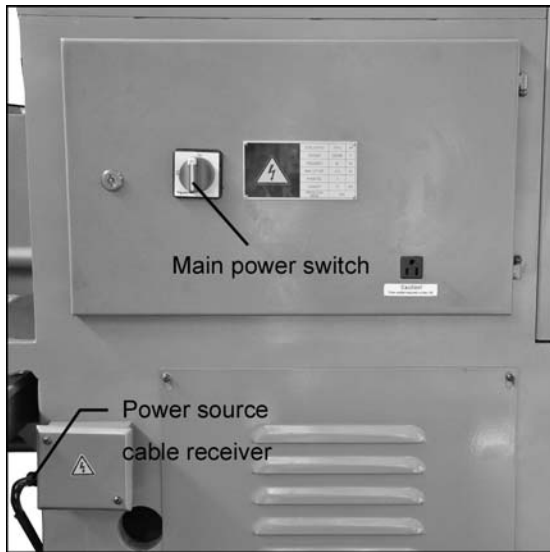


Figure 17 – Power input

10.1 Conversion to 460 Volt Operation

⚠WARNING Disconnect machine from power source. Failure to do so may cause serious or fatal injury.

Wiring diagrams are located at the relevant areas on the machine; each diagram is also provided in section 17.0. Should discrepancies exist, the diagrams on the machine take precedence.

There are four steps involved in converting to 460 volt power:

1. **Main Motor:** Open lower panel at rear of lathe beneath the gearbox, and change the wires in the junction box on the main motor, according to the diagram on the junction box cover.
2. **Rapid Feed Motor:** Remove the control panel on the saddle (Figure 18) to rewire the rapid feed motor. Change the leads according to the wiring diagram in sect. 17.0. **It is not necessary to pull out the rapid feed motor for voltage conversion.**

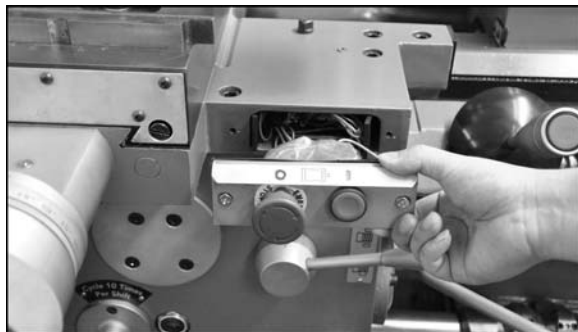


Figure 18 – Rapid feed motor wire access

3. **Coolant Pump:**

GH-2680ZH: Open access panel on the base at the tailstock end. Change wires in coolant

pump junction box according to diagram on the junction box cover.

GH-26120ZH:

- 1) Remove top panel inside the bed (Figure 19).
- 2) Remove rear panel on center stand then remove the two socket head screws (Figure 20) that secure the plate on which the coolant pump is mounted.

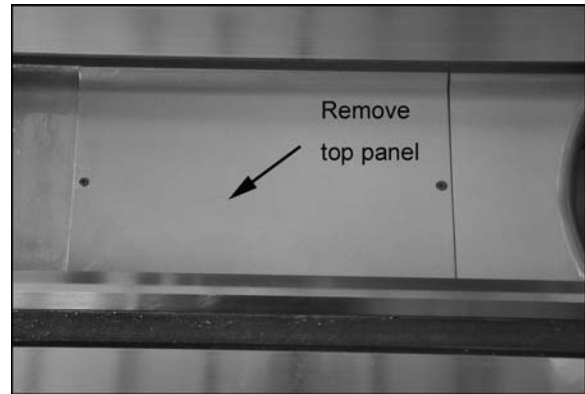


Figure 19 –Coolant pump access (GH-26120ZH)

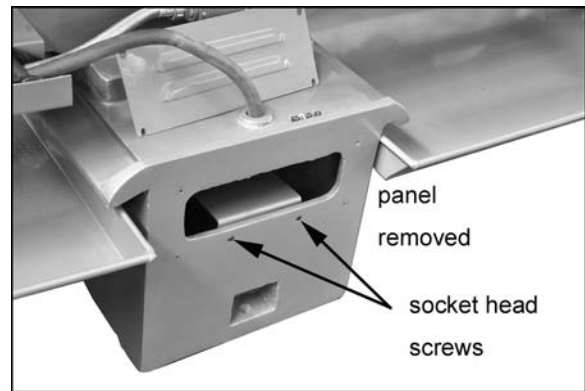


Figure 20 – Coolant pump access (GH-26120ZH)

- 3) Tilt the plate until you can reach the coolant pump junction box through the top opening in the bed. Follow the diagram on the coolant pump to change the leads.
- 4) Properly orient the pump, and secure the plate with the two screws.
- 5) Close both covers.
4. **Transformer:** Open electrical box on rear of machine on the headstock side. Switch wire from 230V terminal to 460V terminal as outlined on the transformer label. See Figure 21.

Voltage conversion is now complete. Close the electrical box before operating the lathe.

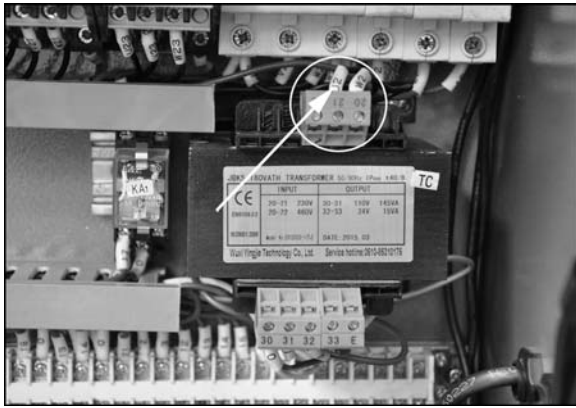


Figure 21 – Transformer rewiring

11.0 Basic Controls

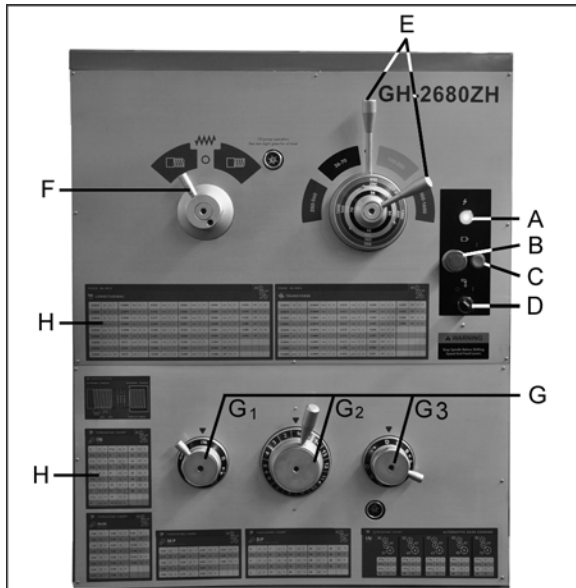


Figure 22 – Headstock Controls

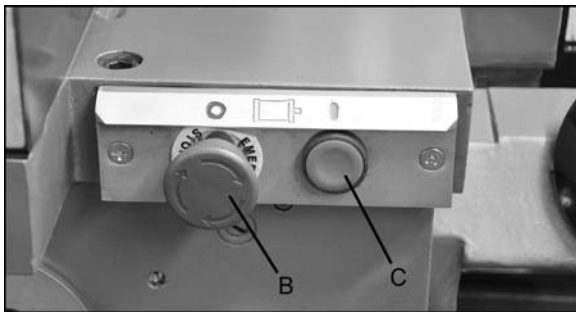


Figure 23 – Alternate controls

1. **Control Panel:** Located on front of headstock. An abbreviated control panel is also mounted to front of carriage.
 - **Power Indicator Light (A, Figure 22).** Illuminates whenever lathe is receiving power.
 - **Emergency Stop Button (B, Figure 22 and 23).** Shuts down all machine functions.

NOTE: Lathe will still have power. Twist button clockwise to reset.

- **ON Button (C, Figure 22 and 23).** Activates motor.
 - **Coolant On-Off Switch (D, Figure 22).** Activates coolant pump.
2. **Speed Selection Levers (E, Figure 22):** Located on front of headstock. Move levers left or right to desired spindle speed, according to accompanying chart on the dial.
 3. **Feed Direction Lever (F, Figure 22):** Located on front of headstock. Moving the lever changes direction of feed. Center position is neutral.


CAUTION Do not move feed direction lever while machine is running.

4. **Thread Pitch and Feed Selector Levers (G, Figure 22):** Located on front of headstock, are used conjunctively to set up for threading or feeding, according to the accompanying chart (H).

Lever G₁ is used to control/change between the different thread styles, and is also used for altering the feed setting.

The symbols on the dial are identified as follows:

mm = metric threads
IN = inch threads
MP = module pitch
DP = diametral pitch

 = when this position is selected, the input shaft of the gearbox is directly connected to the lead screw, and will bypass the gearbox.

This function is available for cutting special thread forms or nonstandard thread forms, which are not covered by the standard gearbox drive train set-up.

Note: Control dial **G₃** must be set to position **O** for this operation.

Example: The current standard set of gears installed with the machine are 82, 97, and 81. This will give a thread pitch equal to 0.506" (12.857mm).

Calculating pitch:

$$P = \frac{(82/97) \times (97/81)}{2} = 0.6061" (12.857\text{mm})$$

Nonstandard threads are attained by changing gears in the gear train, based on this calculation.

Lever G₂ selects the pitch of the thread and the feed/revolution.

Lever G₃ doubles the thread pitch or feed dependent on the following positions:

I/II/III/IV = The leadscrew is used to cut thread forms.

A/B/C/D = The feed rods used to control the feed/revolution.

The ratios between them are:

I: II: III: IV: = A:B:C:D = 1:2:4:8

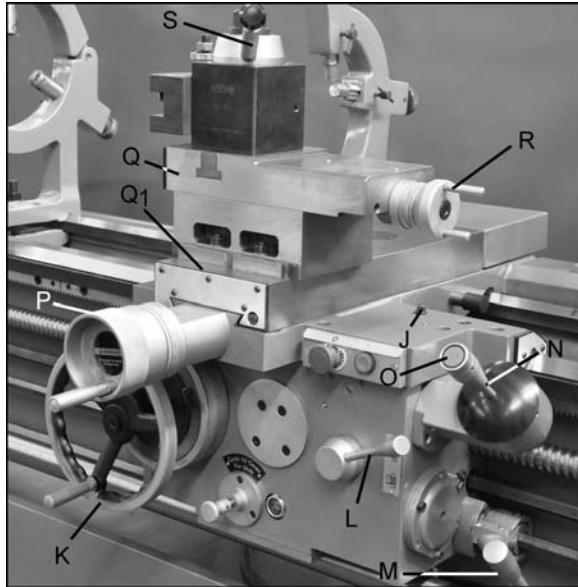


Figure 24 – Carriage controls and settings

5. **Carriage Lock** (J, Figure 24): Located on top right of carriage. Turn clockwise to lock, counterclockwise to unlock.

CAUTION Carriage lock must be loose before moving carriage or damage to lathe may occur.

6. **Carriage Handwheel** (K, Figure 24): Located on the apron. Rotate handwheel clockwise to move carriage assembly toward tailstock (right). Rotate the wheel counterclockwise to move carriage assembly toward headstock (left). A scale is mounted to the ring, graduated in 0.05 inch increments, and can be calibrated by loosening the thumb screw lock and rotating the ring as needed. Always re-tighten ring before using the feed.
7. **Half Nut Lever** (L, Figure 24): Located on front of apron assembly. Engages the leadscrew for threading operations.
8. **Threading Dial** (Figure 25): Indicates the point on the leadscrew where the half nut can be re-engaged to continue inch threading.

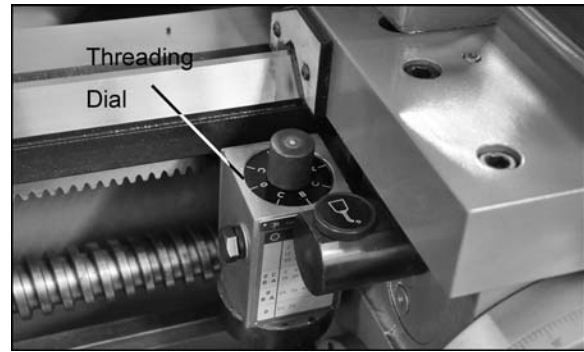


Figure 25

9. **Spindle Direction Control Lever** (M, Figure 24). Move lever to the right so that its tab clears the notch, then down for forward spindle rotation, or up for reverse spindle rotation. *Allow spindle to come to a stop before changing directions.*

Position lever in neutral position (tab in notch) before shutting off the lathe.

10. **Feed Direction Lever** (N, Figure 24): Left and right moves the carriage in the corresponding directions (longitudinal feed); up and down moves the cross slide (cross feed).

11. **Rapid Traverse Button** (O, Figure 24). Push for rapid movement in the direction set by the feed direction lever. Rapid longitudinal movement disengages the carriage handwheel. **However, the cross slide handwheel should be disengaged (pull it out) before using rapid feed.**

IMPORTANT:The rapid traverse button is not used for actual feeding of the tool, only for initial positioning. Also, be aware that engaging the rapid traverse will override automatic feed.

12. **Cross Slide Handwheel** (P, Figure 24): Located above apron assembly. Clockwise rotation moves cross slide toward rear of machine. The accompanying scale is graduated in 0.002 inch increments. Before using rapid feed, disengage this handle by pulling it outward.

13. **Compound Rest** (Q, Figure 24): Located on top of the cross slide and can be rotated 360° by loosening four nuts (two in front, two in back). There are calibrations in degrees (Q1, Figure 24) to assist in placement of the compound rest to the desired angle.

14. **Compound Rest Handle** (R, Figure 24): Rotate clockwise or counterclockwise to position. The accompanying scale on the collar is graduated in 0.001 inch increments.

15. **Tool Post Clamping Lever** (S, Figure 24): Rotate counterclockwise to loosen and clockwise to tighten. Always use minimum of two clamping screws to secure a cutting tool.

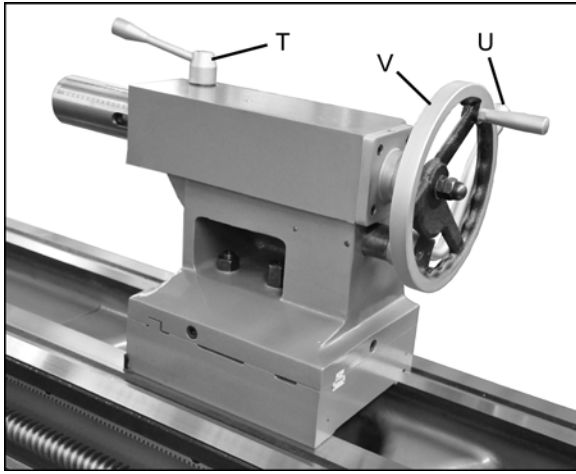


Figure 26 – Tailstock controls

16. **Tailstock Quill Clamping Lever (T, Figure 26):** Rotate clockwise to lock the sleeve. Rotate counterclockwise to unlock.
17. **Tailstock Clamping Lever (U, Figure 26):** Lift up to lock. Push down to unlock.
18. **Tailstock Quill Traverse Handwheel (V, Figure 26):** Rotate clockwise to advance the quill and counterclockwise to retract it. Fully retract it to eject a center or drill chuck.

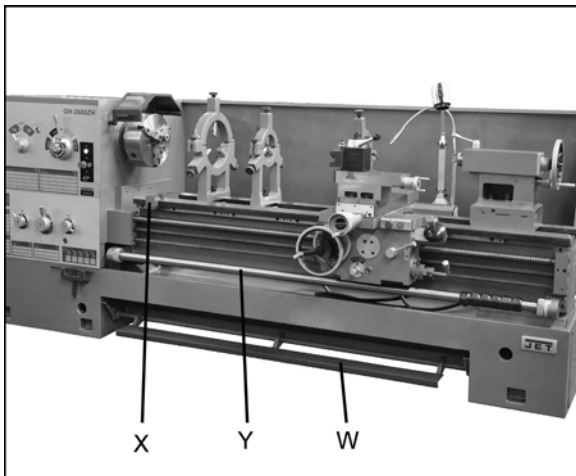


Figure 27 – Other controls

19. **Foot Brake (W, Figure 27):** For emergency shutdown of all lathe functions. The connecting rod mechanism is in the bed stand, and activates a brake strap at the main motor. (**Caution:** Lathe still has power.)

The foot brake is not intended for normal stopping of the lathe. Overuse can result in hastened wear of brake parts.

20. **Manual Carriage Stop (X, Figure 27):** Can be used during manual feed operation to limit carriage travel. *NOTE: It is not intended to stop the carriage during automatic feed.* The carriage stop can be repositioned along the bed by loosening the two screws underneath the stop.

21. **Travel Setting Rod (Y, Figure 27):** Up to six pre-set configurations are possible for repetitive operations, without having to reposition the stops each time. Use the knurled knob at the right end of the rod to set the rod at one of six positions shown on the dial. Then move the desired number of eccentric stops into position for that particular operation and tighten them securely to the rod with the screws beneath them. When the apron trip lever contacts a stop, the clutch will disengage.

12.0 Operation

The operator should consult shop manuals such as “Machinery’s Handbook” for cutting speeds and feeds appropriate to specific workpieces. Correct feed depends upon the material to be cut, cutting operation, tool type, chucking rigidity, depth of cut, and desired surface quality.

IMPORTANT: Allow a break-in period for the new lathe so that gears and bearings can adapt; do not run the lathe above 560 RPM for the first six hours of operation.

CAUTION The following points must be observed when operating the lathe:

- Never turn any handles or levers when the spindle is at high speed.
- Change spindle speed only after the spindle stops.
- Change feed rate only when the spindle is at low speed or is stopped.
- Never exceed the maximum speed limitation of the work holding device.
- Before starting the spindle, always verify that the oil pump is working (there should be oil in the sight glass on the *front* of the headstock).
- Before starting spindle, check that each handle or lever is at correct position to ensure normal engagement of the gears. The spindle direction control lever should be at neutral position.
- If the brake becomes ineffective, turn off the machine and adjust the brake immediately. Never reverse the friction clutch for braking.
- When operating spindle direction control lever, always turn it to correct position; never use “pre-position” for cutting at a reduced speed.
- Jaw teeth and scroll must be fully engaged, to prevent the jaws from breaking and being thrown from the chuck (see Figure 28).

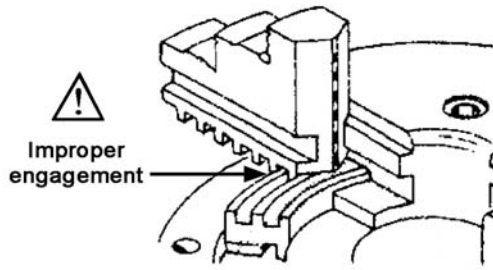


Figure 28 – Insufficient jaw tooth engagement

- Avoid long workpiece extensions, as parts may bend or fly off (see figure 29). Use rests or the tailstock for support.

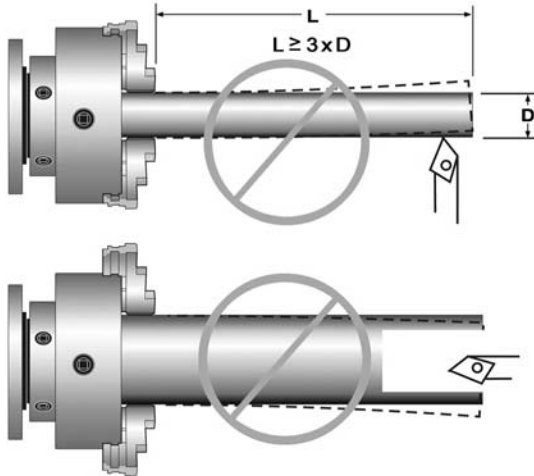


Figure 29 – Improper setups

- Avoid short clamping contact (Figure 30, A) or clamping on a minor part diameter (Figure 30, B). Face-locate the workpiece for added support.

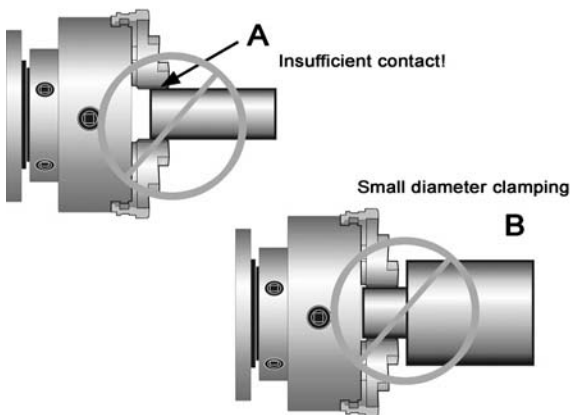


Figure 30 – Improper setups

12.1 Tool Setup

The cutting angle is correct when the cutting edge is in line with the center axis of the workpiece. Use

the point of the tailstock center as a gauge and shims under the tool to obtain the correct center height.

Use a minimum of two clamping screws to secure each tool.

12.2 Spindle Speed

Twelve speeds are available by placing the first speed lever (E₁, Figure 31) in one of four positions, and placing second lever (E₂) in a position that matches the color for the range you desire. These selections are identified on the lever hub, as well as in Table 6, section 16.3.

You may need to turn the chuck by hand to assist engagement of the gears.

Never change speed while spindle is turning.

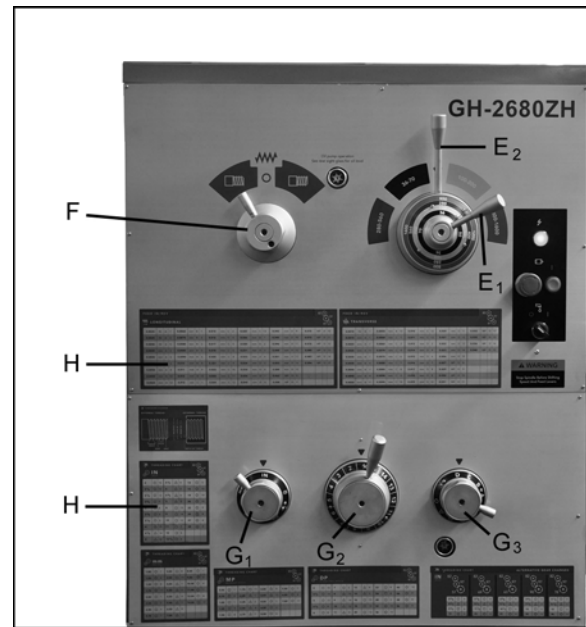


Figure 31

12.3 Feed and Thread Selection

To obtain various feed settings and thread pitches, the four levers (F,G₁,G₂,G₃) are used conjunctively.

1. Refer to the *Feed and Thread Chart* on the front of the headstock (H, Figure 31). The chart is also shown in section 16.10 of this manual.
2. Any gear changes should be made in accordance with the chart.
3. Move levers (G₁,G₂,G₃, Figure 31) to the appropriate position according to the Feed and Thread Chart.

TIP: When selecting feed/speed correlations, remember the general principal that high speeds complement fine feeding, and low speeds are better for coarse feeding.

12.4 Thread Cutting

Threading is performed in multiple passes, with an initial cutting depth of about 0.2 mm, and decreasing depth in succeeding cuts. It is recommended that test cuts be made on scrap material and the results checked before proceeding with regular material.

1. Move **thread selection lever** (F, Figure 31) to desired direction, for right-hand or left-hand threads. *NOTE: The overrunning clutch in the apron will prevent the tool post from feeding for left-hand threads. It will only feed when right-hand threads are being cut.*

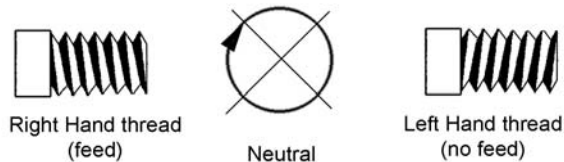


Figure 32

2. Set **speed levers** (E₁, E₂, Figure 31) to desired speed. Use the lowest speed possible when threading.
3. Select desired thread using **thread pitch levers** (G₁, G₂, G₃, Figure 31) in conjunction with the charts on the headstock. These charts are also included in section 16.10 of this manual.
4. Engage the half nut (Figure 33). The half nut must be engaged during the entire threading process when doing metric, diametral, and modular threading.



Figure 33

5. When tool reaches end of cut, disengage and back out the tool to clear the workpiece.
6. Reverse direction to allow cutting tool to return to its starting point.
7. Repeat the process until desired result is obtained.

NOTE: When a special thread must be cut that is not found on the chart, move thread change control lever (G₁, Figure 31) to $\overline{\text{III}}$ position, and lever (G₃) to **IV**, then reset the change gears.

13.0 Adjustments

CAUTION Adjustments to the lathe, especially those involving alignments of bearings, spindle, leadscrew, clutch, etc., should only be performed by qualified personnel, as improper alignments can damage the machine and/or create a safety hazard.

WARNING Turn off main switch and press emergency stop button before making adjustments to the lathe.

13.1 Chuck Jaw Reversal

The three jaws on the scroll chuck are reversible, to hold stock with larger diameters. See Figure 34. Loosen the two screws with the provided hex key, remove the jaw, and rotate it 180-degrees. Re-install the jaw, and tighten each screw in increments until fully tightened.

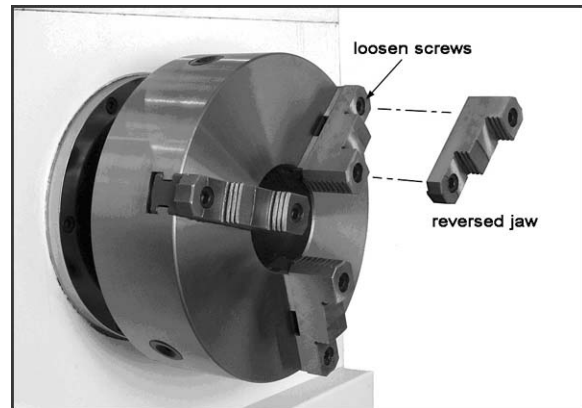


Figure 34 – Chuck jaw reversal

13.2 Gib Adjustments

After a period of time, some of the moving components may need adjustment for play due to wear. *Do not overtighten gib screws as this can hasten wear to components.*

Saddle – Turn screws (A, Figure 35) on either side of the saddle at the rear to adjust drag on the saddle.

Cross Slide – Gib screws are located at front and rear of slide opposite to one another (B, Figure 36). To adjust drag, loosen rear gib screw one turn, and tighten front gib screw a quarter turn. Rotate the handwheel to check the play. Repeat as needed until slide moves freely without play. Gently tighten rear gib screw.

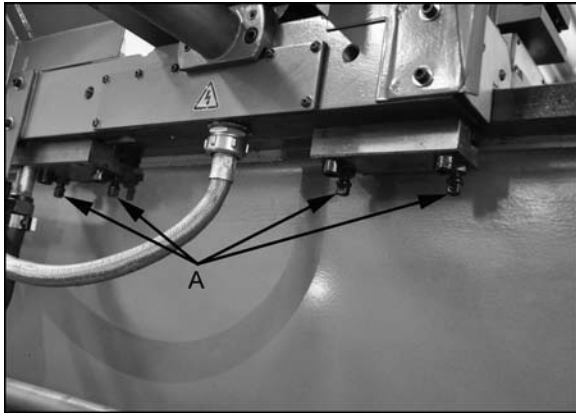


Figure 35– Saddle sliding plate adjustment



Figure 36 – Gib adjustments, slide and rest

Compound Rest – Gib screws are located at front and rear of the compound rest (C, Figure 36). To adjust, use the same method as for the Cross Slide.

Half Nut – Gib screws are located on the right side of the apron (D, Figure 37). Loosen the jam nuts and rotate the screws clockwise until any backlash is corrected. Then retighten nuts.

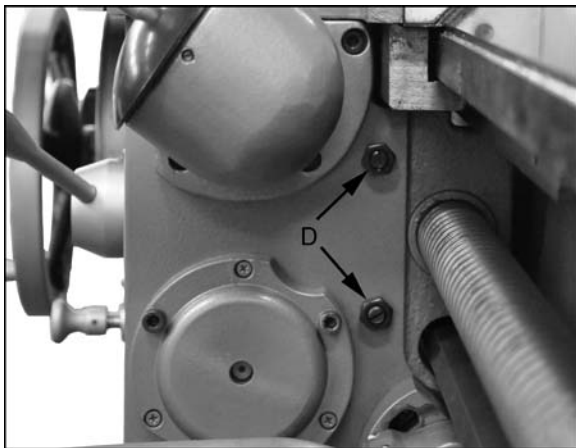


Figure 37 – Half Nut gib adjustment

13.3 Tailstock Adjustments

The tailstock can be offset to cut shallow tapers up to 5° angle. See Figure 38.

1. Loosen tailstock in position by lowering locking handle (A).
2. Loosen socket head cap screw (B).

3. Alternately loosen and tighten front and rear screws (C). (only front screw shown.)

The scale (D) on the end of the tailstock indicates amount of offset, and helps when re-centering.

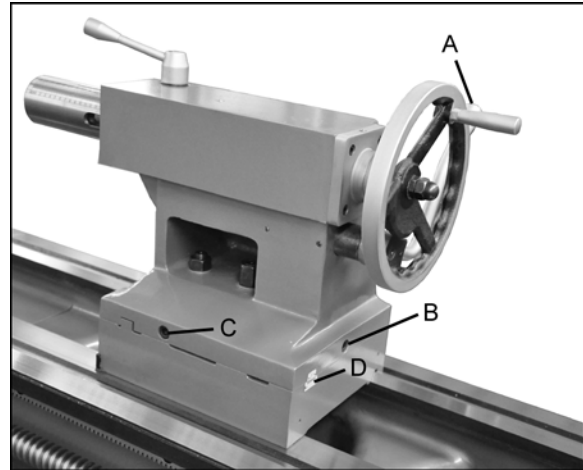


Figure 38 – Tailstock adjustments

If the clamping force needs to be adjusted, use the hex nut (E, Figure 39).

When the clamping lever is released, the tailstock “floats” upward approximately 0.05 to 0.15mm from the bed ways through four elastically supported bearings, which allows easy sliding of the tailstock. The float amount of these bearings can be adjusted by turning the set screws (F, Figure 39) at either end. **IMPORTANT:** This is a sensitive adjustment. Always clamp the tailstock to the bed before turning these set screws, to ensure rigidity and prevent the bearings from crashing.

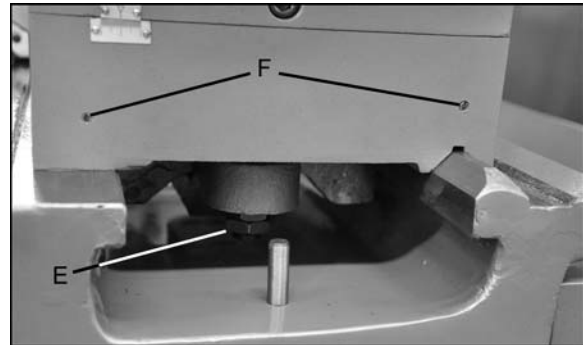


Figure 39 – Tailstock bearing adjustment

13.4 Gap Section

1. To remove the gap section (A, Figure 40), remove four socket head bolts (B) and two socket bolts at the ends of the rails (C).
2. Remove the two tapered alignment pins (D) by placing the provided gap bridge pin driver (E) over them and threading the screw (E₁) down into them, until the pins are loosened enough to be pulled out.
3. Remove the gap section.

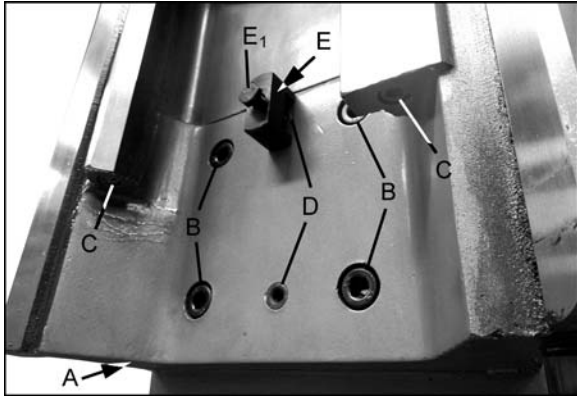


Figure 40 – Gap section

To reinstall the gap section:

4. Clean the bottom and the ends of the gap section thoroughly.
5. Set gap section in place and align the ends.
6. Insert the tapered pins into their holes through the gap and into the lathe bed.
7. Reinstall the six bolts (B/C), and tighten alternately until all are snug. Make sure gap remains aligned with the ways while tightening the screws.

13.5 Belt Adjustment and Replacement

The belts should be inspected periodically. New belts have a tendency to stretch slightly after a short period of use; and prolonged use will require that they be tightened to compensate for normal wear.

NOTE: If a worn, cracked or frayed belt needs replacing, replace *all three* as a matched set.

To adjust or replace belts:

1. Disconnect machine from power source.
2. Open end gear cover, remove lower rear cover and lower side cover. This will expose the motor and v-belts.
3. Loosen upper hex nut (A, Figure 41). Place scrap piece of wood under motor to act as lever. Lift motor up and block temporarily.
4. Remove belts. Install new belts onto pulleys.
5. Lift up on motor and remove temporary blocking.
6. Tension belts by loosening lower nut (B, Figure 41) and tightening down upper nut (A, Figure 41) until light finger pressure causes approximately 3/4" deflection on each belt.
7. Install covers and connect lathe to the power source.

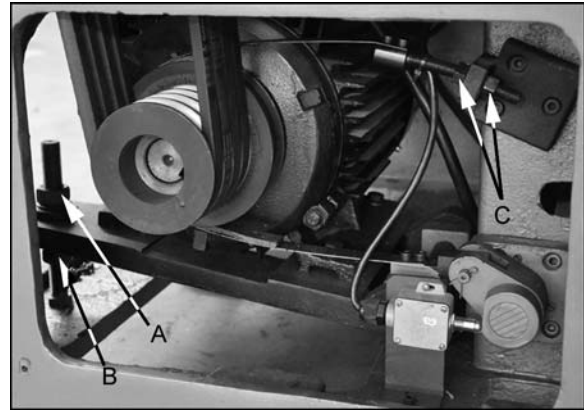


Figure 41 – Belt and brake strap adjustment

13.6 Brake Strap

After the clutch is disengaged, the main drive can be stopped by the brake. If the spindle does not stop rapidly, the brake strap may need adjustment. Use the two adjusting nuts (Figure 41) to tighten the strap. Do not overtighten the strap, which can cause it to distort.

13.7 Friction Clutch Adjustment

The lathe operates on a centralized gear drive. The power of the main motor is transferred through v-belts to an axle, then through a multi-disc friction clutch and various gear pairs to the spindle. The spindle's forward and reverse motion is controlled by the clutch; it also provides an overload protection.

The clutch must be in proper adjustment to ensure normal working of the spindle. If the clutch is too loose, its efficiency is reduced and it may slip or cause heat build-up; if too tight, it becomes difficult to operate the spindle direction control lever and the clutch will not properly engage.

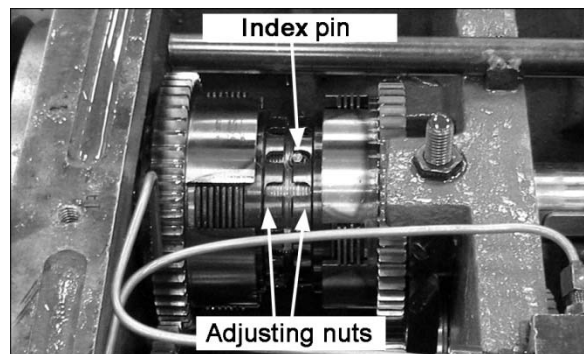


Figure 42 – Spindle Clutch Adjustment

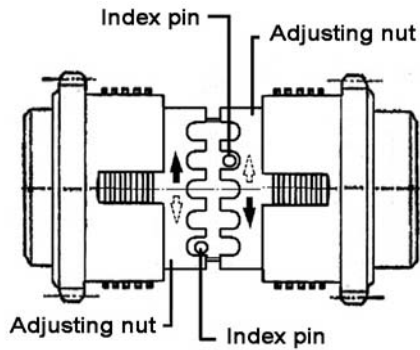


Figure 43 – Spindle Clutch Adjustment

1. Make sure the lathe is OFF at the master switch.
2. Remove the top cover of the headstock.
3. Determine the appropriate clutch.
4. Use a screwdriver to push in the index pin (Figures 42 and 43). The pin is spring loaded.
5. Rotate the adjusting nut to the next index position, which will be indicated by a “click.”

NOTE: The clutch reacts quickly; adjust clutch nut by one division only. You must feel and hear the clutch engagement – a clicking sound. If clutch adjustment is too tight, it will not engage.

If the spindle does not stop in the OFF position, the forward/reverse clutch adjustment is out of balance. (The spindle follows the direction with the tighter clutch adjustment).

6. Reinstall headstock cover, and test the clutch function.

NOTE: Never reverse the friction clutch for braking.

13.8 Aligning Tailstock to Headstock

Headstock and Tailstock have been aligned at the factory and should not require attention. If future adjustment should ever be needed, proceed as follows. (Make sure that twist in the lathe bed is not contributing to the problem – refer to section 8.1, *Leveling the Lathe.*)

1. Fit a 12” ground, center-drilled, steel bar between centers of the headstock and tailstock (Figure 44).
2. Fit a dial indicator to the top slide and traverse the center line of the bar. If it indicates a taper, adjustment is needed.
3. Align the tailstock using the off-set screws at front and back (see C, Figure 38) until the tailstock is aligned.

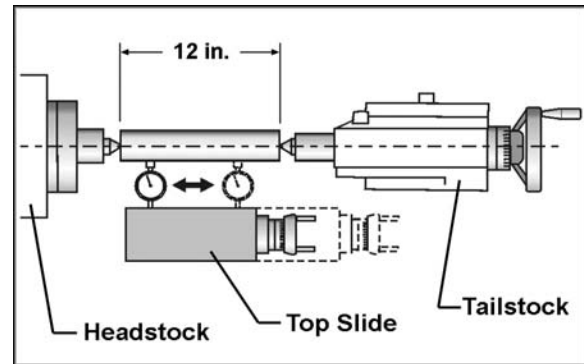


Figure 44 – Tailstock/Headstock alignment

13.9 Spindle Bearings

The spindle system is supported by three bearings, with the rear bearing serving as an auxiliary support.

Any play of the spindle bearings has been adjusted out by the manufacturer, so that radial and axial run-out of the spindle is within tolerances. If play develops in the future, adjust the bearings as follows (see Figure 45):

1. Loosen nut (1). Then loosen lock ring and loosen nut (2).
2. Adjust the play of front and middle bearings using nuts (3) and (4).
3. After adjustment, tighten the nuts one by one.
4. Run the machine without load for at least two hours, at highest speed. The temperature rise should not exceed 70 degrees Celsius (158°F). Otherwise, the machine must be adjusted again.

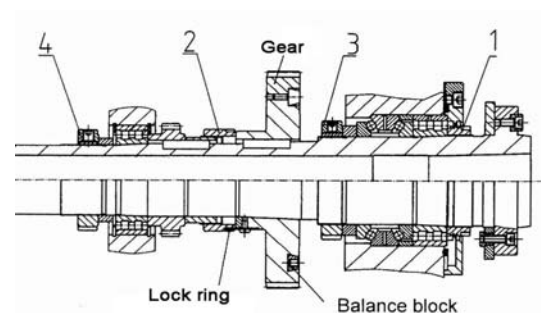


Figure 45 – Spindle bearing adjustment

13.10 Speed Control

If the chain on the speed control mechanism of the main drive becomes elongated and loose, the position of the speed control dial may become inaccurate.

Open the top cover of the headstock. Tighten the chain using the adjusting screw (Figure 46).

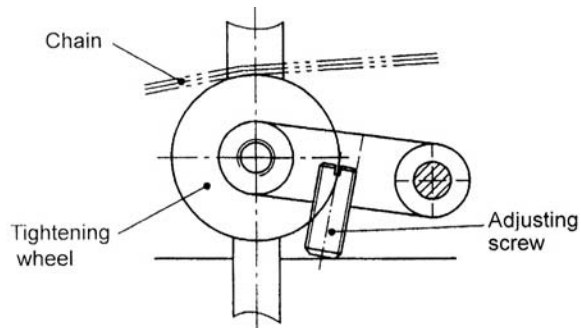


Figure 46 – Speed control chain adjustment

13.11 Lead Screw

To ensure the pitch accuracy in cutting threads, any axial run-out of the lead screw must be eliminated. See Figure 47. This is achieved by adjusting the thrust bearings (2 and 3) using the nut (1).

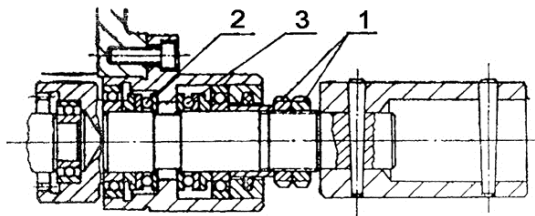


Figure 47 – Lead screw runout adjustment

13.12 Apron Feed Clutch

The feed transmission begins with the feed rod to the apron, through feed clutch to worm, through the gear drives, to longitudinal or cross movement.

The worm axle is equipped with an overstep clutch to provide rapid feed for the carriage. When the rapid feed motor drives the worm axle, it oversteps the feed rod in one direction.

The carriage (longitudinal feed) handwheel is automatically disengaged when the carriage is in rapid feed or longitudinal automatic feed. When the feed movements stop, the handwheel will reengage.

If the cutting force will not reach rated maximum value, remove the cap and adjust the clutch using the adjusting screw (see Figure 48).

CAUTION Do not over tighten the feed clutch. Over tightening may nullify the protective feature and can damage the lathe.

To avoid feed rod and lead screw engaging at the same time, an interlocking mechanism is situated between longitudinal feed axle and half nut operation axle.

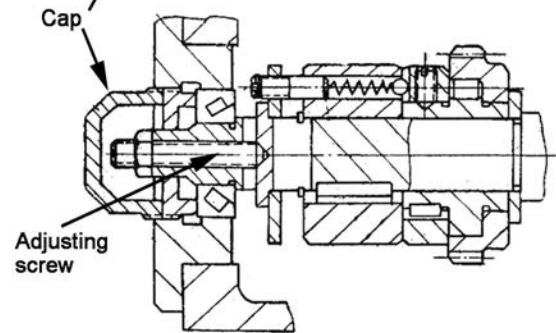
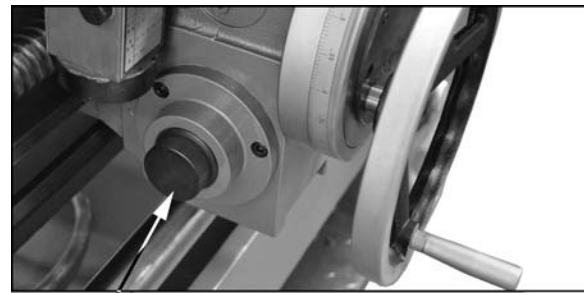


Figure 48 – Feed clutch adjustment

13.13 Tool Post

Tool holder (2) is positioned to the tool post body (1) through a dovetail groove and its center height can be adjusted by sliding the dovetail along the groove and turning screw (5).

The tool holder can be fixed by turning lever (7) and the middle bolt will drive the wedge block (4) downward for clamping the tool holder.

The whole tool post can be fixed by the top nut (6). Tool shank can be fixed to the tool holder by its screw (3) (see Figure 49).

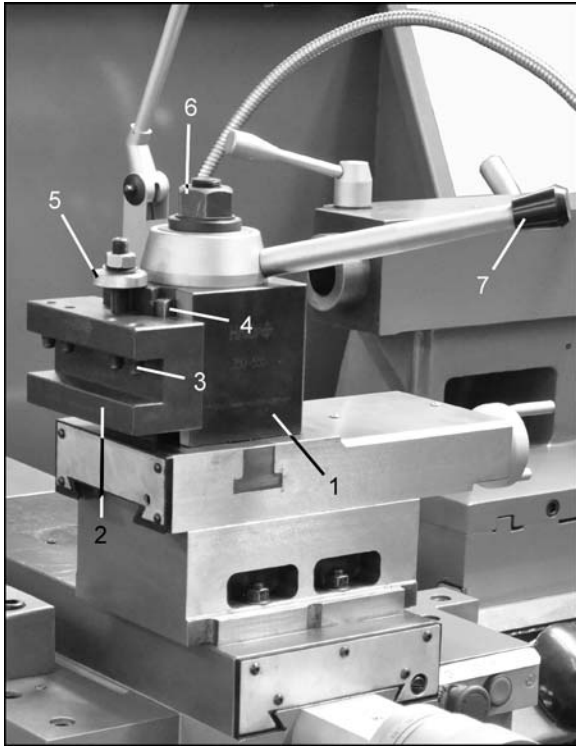


Figure 49 – Tool post adjustment

13.14 Cross Slide Nut Adjustment

The cross slide moves via a lead screw which drives a nut. The nut is a half-split nut, allowing slight adjustment if the cross slide becomes hard to move or develops backlash. Backlash is identified by turning the cross slide handwheel left and right – if there is a delay before any cross slide movement, the nut needs adjusting (Refer to Figure 50).

1. Remove dust cover (3).
2. Loosen set screw (1).
3. Tighten socket head screw (2) until the play is eliminated. *Do not overtighten, which may cause excessive wear to components.*
4. Retighten set screw (1).
5. Reinstall dust cover.

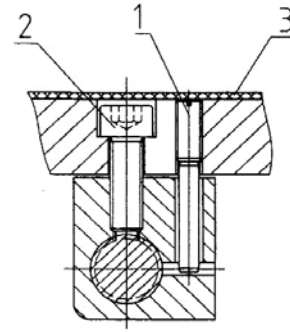
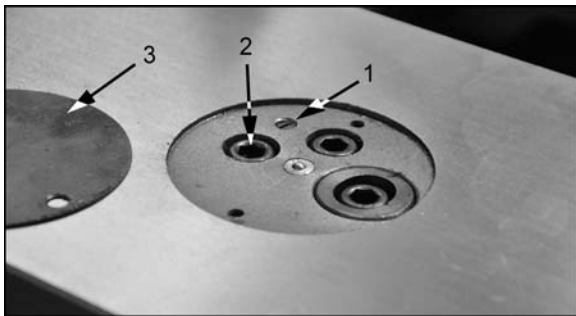


Figure 50 – Cross slide nut adjustment

13.15 Shear Pin Replacement

The lead screw and feed shaft are equipped with shear pins, which are designed to break in order to protect the drive system against overload. A broken shear pin must be replaced.

Knock out the broken pin; line up the holes and insert new pin.

13.16 Steady Rest Adjustment

Always grease the fingers before using the steady rest. The point at which the fingers contact the workpiece require continuous lubrication to prevent premature wear.

To set the steady rest (see Figure 51):

1. Loosen the hex nut (A) at the base of the steady rest, to slide the steady rest along the ways.
2. Loosen the knurled handle (B) at the side until it can be pivoted out of the slot.
3. Loosen the three lock knobs (C), and back off the fingers (D) using the knurled handles.
4. Pivot the collar on its hinge and position the steady rest around the workpiece.
5. Firmly tighten the hex nut at the base.
6. Set the fingers snugly to the work piece and secure by tightening the locking knobs. *Fingers should be snug but not overly tight.*

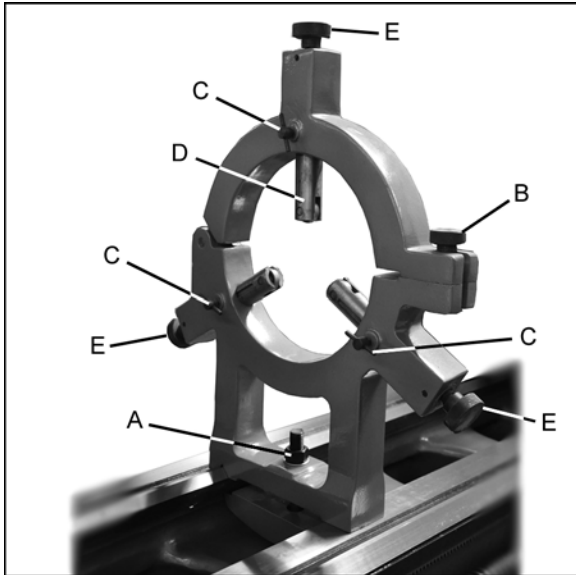


Figure 51 – Steady rest adjustment

13.17 Follow Rest Adjustment

The follow rest mounts to the saddle with two socket head cap bolts. The follow rest should be mounted so that the locking knobs point away from the chuck.

The sliding fingers are set similar to those on the steady rest – free of play, but not binding.

Always lubricate the fingers sufficiently with grease before operating.

14.0 Troubleshooting the ZH Series Lathes

Table 2

Trouble	Probable Cause	Remedy
Lathe will not start.	No electrical power, or wiring incorrect.	Verify incoming power, main leads, main switch is on.
	Emergency stop switch is pressed.	Rotate switch clockwise to release.
	End gear cover open, limit switch activated.	Close cover.
	Fuse blown in main electrical box.	Replace fuse.
	Fuse blown/circuit breaker tripped at power source.	Reset. Verify incoming power is proper for lathe.
	Defective on/off switch, motor or cable.	Have electrician test elements.
	Foot brake switch is faulty.	Check and replace as needed.
	Thermal relay tripped.	Reset. If it trips frequently, increase amp setting.
Spindle lacks turning power; or starts up slowly.	Friction clutch is slipping.	Adjust clutch.
	Belts are slipping.	Tighten belts.
Excessive machine vibration.	Workpiece unbalanced.	Reduce spindle speed.
	Workpiece deflecting.	Change chucking length or diameter. Use support on tailstock end.
	Tool deflecting.	Reduce tool length.
	Backlash on slide ways/gibs.	Adjust backlash.
	Slides running dry.	Properly lubricate slides/ways.
	Tool edge is dull.	Resharpener or replace tool.
	Chip load too high.	Reduce depth of cut or feed rate.
	Spindle bearings out of adjustment.	Adjust bearings.
Belts misaligned.	Inspect belts and correct.	
Lathe overheating.	Bogging down in cut; excessive feed rate or depth of cut.	Decrease feed rate or depth of cut.
Tool tip burns.	Cutting speed too high.	Reduce speed.
	Tool is dull.	Resharpener or replace.
Lathe turns a taper.	Tailstock not aligned with headstock.	Align tailstock.
	Lathe bed is twisted.	Correct by leveling lathe.
No automatic power feed.	Shear pin is broken.	Replace shear pin.
Carriage, cross slide or compound rest move with difficulty.	Carriage lock is tightened down.	Release carriage lock.
	Gibs are too tight.	Adjust using gib screws.
	Bed ways have shavings/debris on them; or are dry.	Clean ways and verify they are being lubricated properly.

15.0 Lubrication Schedule and General Maintenance

Regularly scheduled maintenance is crucial to ensure a long service life for your machine. The schedule below shows general cleaning, lubrication points and coolant replacement information for the ZH Series Lathes. **Push stop button and power off before lubricating.** Follow local regulations for disposal of used coolant/lubricants. Minimize direct skin contact with lubricants and coolants, and wear eye protection when pouring coolant in case of splash.

Mobile DTE® Oil Heavy Medium is recommended for the SAE-20W machine oil.

If the brand of oil is ever changed, it is recommended that you flush and clean the reservoir first to prevent any compatibility issues.


Table 3


Figure/Sect.	Element	Action	Lubricant	Frequency
sect 8.3	Chuck	Grease jaws and scroll	#2 lithium tube grease	periodically
sect 8.3	Spindle/cam locks/chuck body	light coat of oil	SAE-20W machine oil	periodically
sect 8.2	All exposed metal surfaces	light coat of oil	SAE-20W machine oil	frequently
Figure 9,10	Headstock	Drain and fill	SAE-20W machine oil	- after first 10 days, - after next 20 days, - every 2 to 3 months
Figure 11	Oil filter	Clean		monthly
Figure 9,10	Gearbox	Drain and fill	SAE-20W machine oil	- after first 3 months, - every 6 months
Figure 12	Apron and Saddle	Activate one shot lube handle		multiple times per shift, or as needed
Figure 12		Drain and fill	SAE-20W machine oil	- after first 3 months, - then annually
Figure 15	Leadscrew; Feed Rod; Spindle Direction Control Axle	Fill at oil port	SAE-20W machine oil	as needed
Figure 15	Travel Setting Rod	Fill at (2) ball oilers	SAE-20W machine oil	as needed
Figure 10	Change Gear Axle	grease	#2 lithium tube grease	once every shift
Figure 13	Cross slide	Fill at (2) ball oilers	SAE-20W machine oil	daily
Figure 13	Compound rest	Fill at (3) ball oilers	SAE-20W machine oil	daily
Figure 16	Tailstock	Fill at (2) ball oilers	SAE-20W machine oil	daily
Figure 14,16	Anti-dust felt on v-ways	Clean	kerosene	Inspect weekly
sect 9.1	Coolant reservoir *	(follow coolant manufacturer's directions)	Coolant of choice, approx. 4 gallons	(follow coolant manufacturer's directions)
sect 9.1	Chip trays	Clean; clear drain filters		periodically
Figure 52	Steady Rest	Lubricate finger shafts and contact points	Lead-based grease	before each use
sect 13.17	Follow Rest	Lubricate finger shafts and contact points	Lead-based grease	before each use
Figure 42	Belts	Inspect and tighten if needed		periodically


16.0 Reference Tables























16.1 Inch Lead And Feed


Table 4


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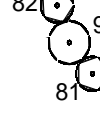
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
























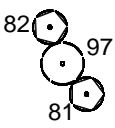
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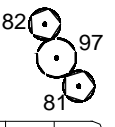
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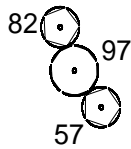
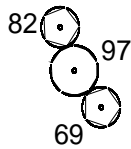
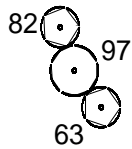
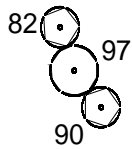
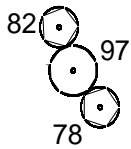
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1.50	□	8	2.75	△	7	5.00	4	○			

THREADING CHART														
														
4	15	○	7	5	○	12	8	△	22	9	□	40	12	□
4½	14	○	8	15	△	14	5	△	24	8	□	44	9	□
5	12	○	9	14	△	16	15	□	28	5	□	48	8	□
5½	9	○	10	12	△	18	14	□	32	15	□	56	5	□
6	8	○	11	9	△	20	12	□	36	14	□			

16.2 Special Inch Lead And Feed

Table 5

THREADING CHART				ALTERNATIVE GEAR CHANGES				
								
	2¾ ○ 6	2⅞ ○ 6	2⅝ ○ 6	3¾ ○ 6	3¼ ○ 6			
	4¾ △ 6	5¾ △ 6	5¼ △ 6	7½ △ 6	6½ △ 6			
	9½ □ 6	11½ □ 6	10½ □ 6	15 □ 6	13 □ 6			
	19 □ 6	23 □ 6	21 □ 6	30 □ 6	26 □ 6			

16.3 Speed Selection Lever Positions

Table 6

No.	Lever Position		Spindle Speeds (RPM)
	A	B	
1	black	black	36
2			50
3			70
4	light grey	light grey	100
5			140
6			200
7	red	red	280
8			400
9			560
10	grey	grey	800
11			1200
12			1600

17.0 Electrical – 230 volt to 460 volt Conversion

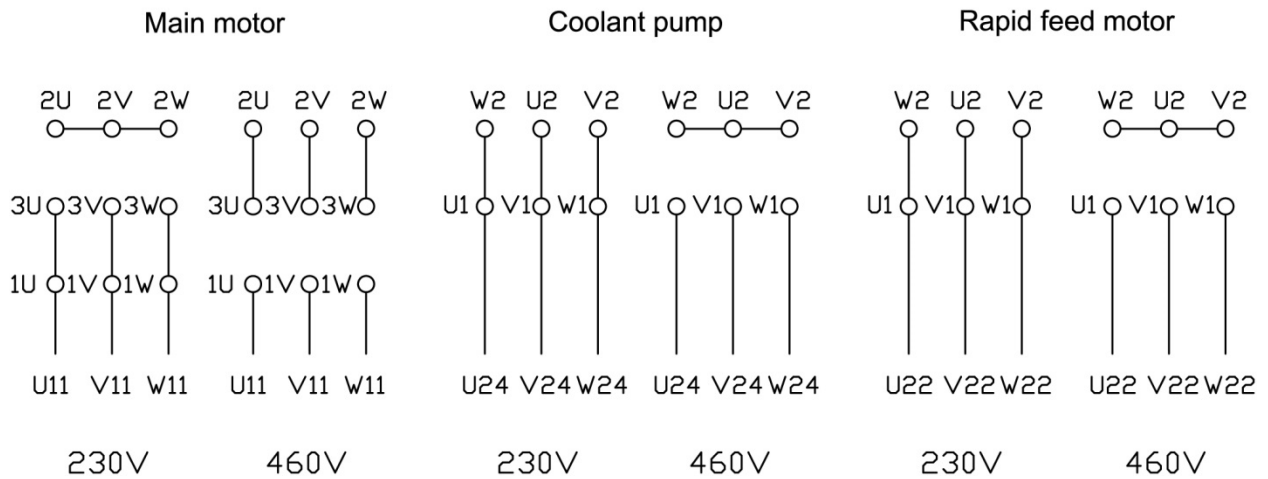


Figure 53

18.0 Change Gear Diagram

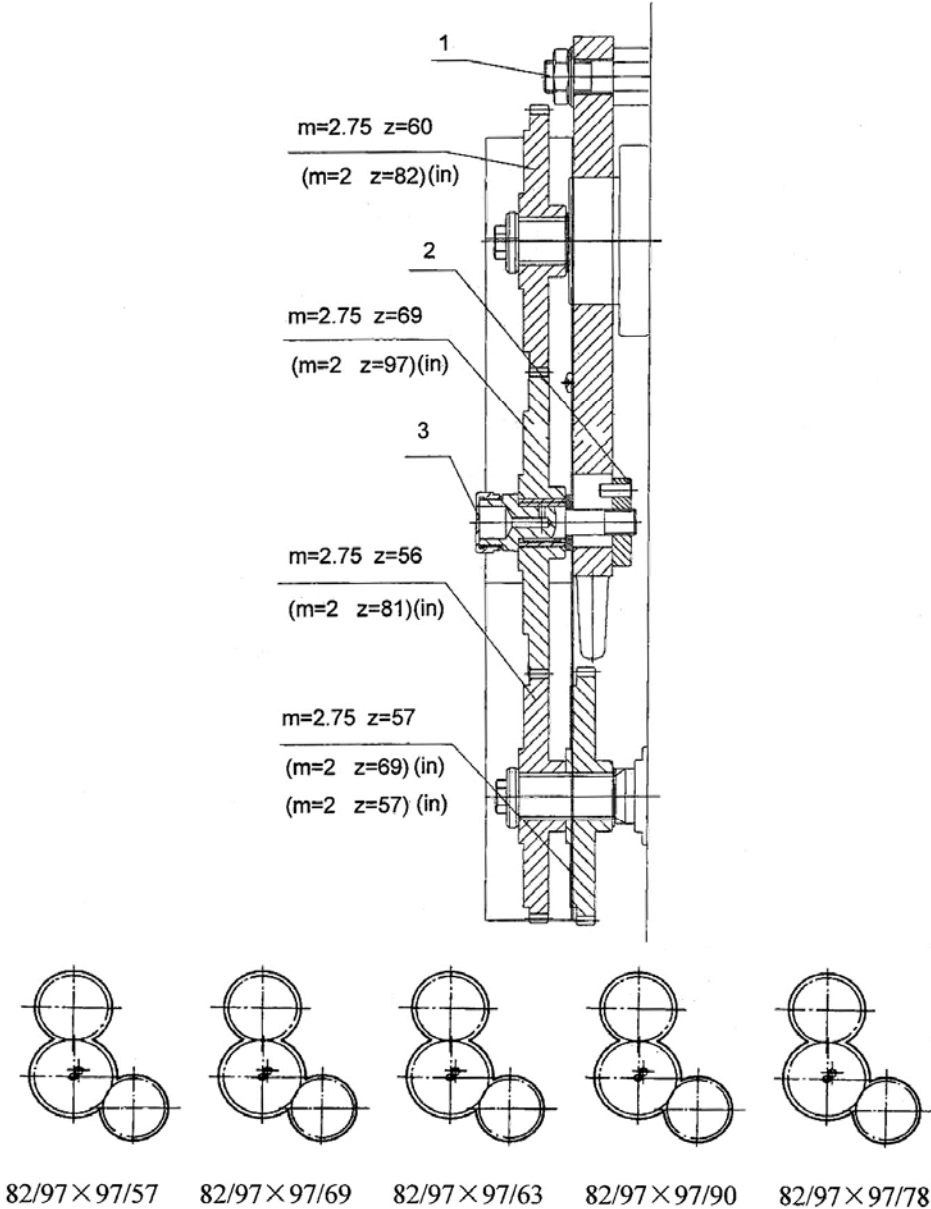


Figure 54

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