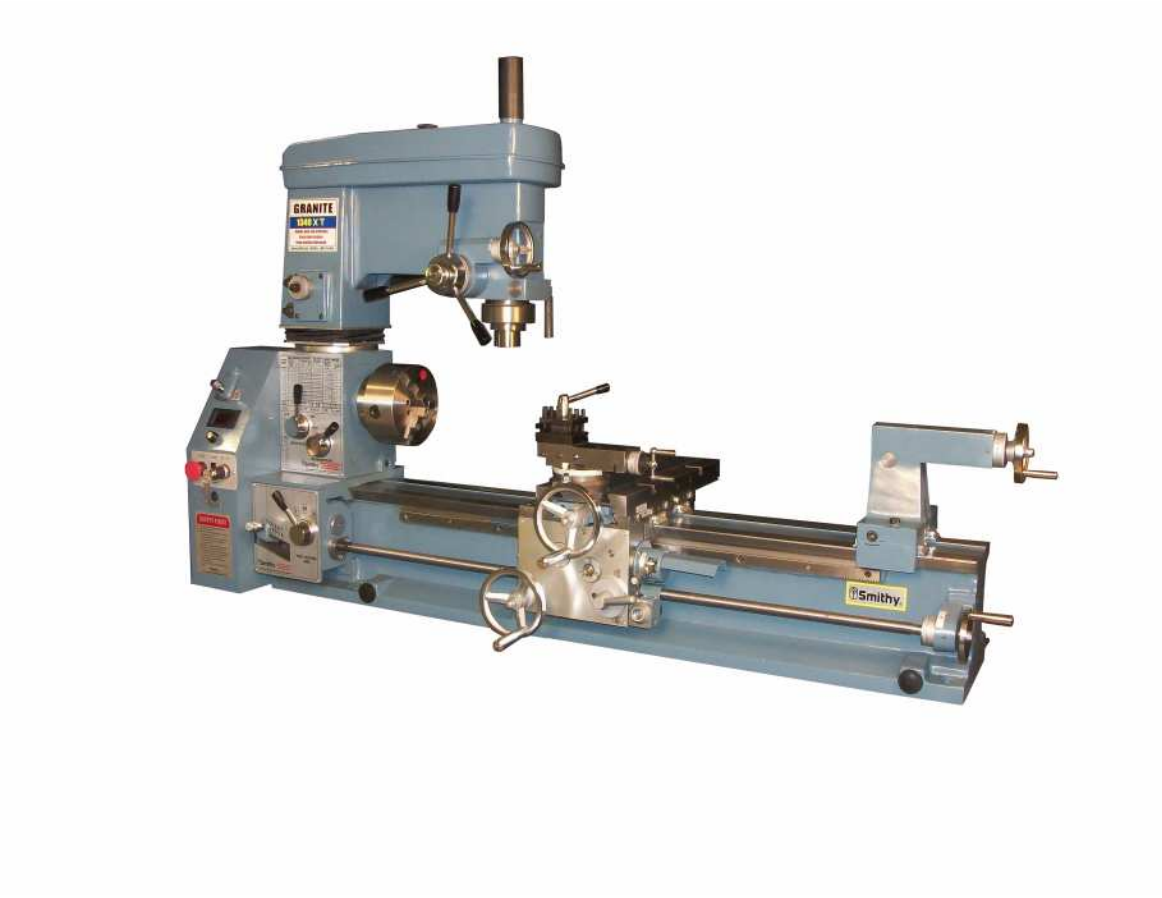
Smithy®

GRANITE 1300 SERIES
COMBINATION LATHE/MILL/DRILL



OPERATOR'S MANUAL

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170 Aprill Dr., Ann Arbor, MI, USA 48103
800-476-4849
www.smithy.com

170 Aprill Dr., Ann Arbor, Michigan, USA 48103
1-800-476-4849

International: 734-913-6700

All images shown are from Granite Classic 1324 model.
All other images for other Granite models are specified.

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Introduction 1

Welcome

Congratulations on the purchase of your Smithy Granite machine. We welcome you to the Smithy family. Smithy strives to provide you with the best in machine tools. Please read through this manual carefully to ensure that you get the most out of your Granite 3-in-1 lathe-mill-drill.

The purpose of this manual is to give beginning thru advanced machinists the information needed to operate the Smithy Granite 1300 series. It will teach you about the machine's parts and how to care for them. Most of the photographs in this manual show the GN-1324 model. Individual model variations will be noted as necessary. This manual is complete and current at the time of printing*. In our continuing effort to bring you the best in machine tools, changes may be made. Please visit us at **www.smithy.com** for the latest updates.

This manual—and any other manuals associated with this Smithy machine—should remain with the machine. If ownership changes, please include the Quick Start Manual and the Operating Manual with the machine.

Please read the operating manual carefully and closely follow the procedures described. If you don't understand how your machine works, you risk injury to yourself or others. Misuse of the machine can lead to damaging it or your project. To learn more about general machining practices, Smithy offers books that meet the needs of machinists with varying levels of experience. We also suggest your local library as a resource. Enrolling in a machining class will give you the best knowledge of machining.

Suggestions or Comments

We are interested in any suggestions you might have to improve our products and services. Feel free to contact us with your suggestions by phone or in writing. If you have comments about this operator's manual, or if you have a project you'd like to share with other Smithy owners, contact Detroit Machine Tools, 170 Aprill Dr., Ann Arbor, MI 48103. You can also e-mail support@detroitmt.zendesk.com 24 hours a day.

Questions?

If you have questions not covered in the manuals, please call our toll-free number:

1-800-476-4849

Our friendly service technicians are available Monday through Friday from 9:00 a.m. to 5:30 p.m. Eastern Standard Time. You can also e-mail your questions 24 hours a day to **support@detroitmt.zendesk.com**.

Customer Information

Please record the information below about your Smithy machine. Having this information readily available will save time if you need to contact Smithy for questions, service, accessories, or replacement parts.

Model number:_____

Purchase Date: _____

Delivery Date: _____

We look forward to a long working relationship with you, and thank you again for putting your trust in Smithy.

Safety 2

Overview

Smithy machines are proven to be safe and reliable; however, if abused or operated improperly, any machine can cause injury. Please read this manual carefully before you start machining. Proper use will create a safe working environment and prolong the life of your machine.

Symbols Used In This Manual

In this manual, the symbols below draw attention to specific operating issues.

⚠ **CAUTION**	Potential hazard, unsafe situation, or potential equipment damage that may result in injury to yourself or damage to your machine.
⚠ **DANGER**	Hazardous situation which if not avoided could result in series injury or death.
⚠ **WARNING**	Potential hazard, unsafe situation, or equipment damage could result in death or serious injury.
! NOTICE !	Alerts user to helpful and proper operating instructions.

Shop Safety Rules

Your workshop is only as safe as you make it. Take responsibility for the safety of those who use or visit it. This list of rules is by no means complete, so remember that common sense is a must.

Smithy strongly discourages the use of casters or wheels on metal-working machine benches. The weight of the machine could result in the bench tipping while being moved. Once the machine is mounted, consider your workbench to be permanent. If you must move the machine, first remove it from the bench

1. **Read this manual thoroughly before operating your machine**. Don't try to do more than you or your machine can handle. Understand the hazards of operating a machine tool. In particular, remember never to change speeds or setups until the machine is completely stopped and never operate it without first rolling up your sleeves.

2. **Wear proper clothing.** Avoid loose-fitting clothes, gloves, neckties, or jewelry that could get caught in moving parts. If you have long hair, tie it up or otherwise keep it from getting into the machine. Always wear non-slip footwear.

3. Protect yourself. Use ANSI approved safety glasses, goggles, or a face shield at all times. Use safety glasses designed for machinery operation; regular glasses will not do. Have extras available for visitors. Know when to wear a face mask or earplugs as well.

4. Keep your work area clean and organized. Cluttered work areas and benches invite accidents. Have a place for everything and put everything in its place.

5. Childproof your work area and keep children away from the machine while it is in use. Childproof your shop with padlocks, master switches, and starter keys or store the machine where children do not have access to it.

6. Never operate your machine under the influence of drugs and alcohol.

7. Keep track of tools. Remove adjusting keys and wrenches from the machine before operating. A chuck key or misplaced Allen wrench can be a safety hazard.

8. Avoid accidental starts. Turn the switch to the **OFF** position before plugging in the machine. Turn the speed dial to zero before starting your machine.

9. Ground your machine. The machine has a three-conductor cord and three-prong, grounding-type plug. Never connect the power supply without proper grounding

10. Keep your mind on your work. By paying attention to what you are doing and avoiding distractions you will spend many safe, enjoyable hours in your workshop.

11. Never leave your machine running unattended.

Machine Safety Rules

⚠ WARNING

1. Stop the machine before servicing. Stop the machine before making changes, removing debris, or measuring your work.

2. Don't over reach. Don't reach over the machine when it's operating. Keep your hands out of the way.

3. Turn the switch OFF. Turn the switch to off before plugging in the machine. Turn the speed dial to zero before starting your machine.

4. Use proper tooling. Use only recommended accessories and understand how they should be used before trying them out. Don't try to make a tool into something it isn't or attempt to use a tool in inappropriate ways. Remember to always use the proper tooling for the material you are cutting. Reference a general machining guide such as Machinist Ready Reference for recommended tooling for your material.

5. Secure your work. Before starting your machine, be certain that your workpiece is properly and securely mounted. Flying metal is dangerous!

6. Do not run you machine beyond its limits of travel. Before starting your project, ensure that your work area does not go beyond the limits of travel on your machine. Going beyond the limits of travel will cause serious damage to your machine which will not be covered by your warranty.

7. Run your machine at recommended spindle speeds and feed rates. Always cut at the recommended speed and feed rates for the type of metal that you are cutting for optimum performance. Do not begin your cut until the machine has reached the full and proper speed.

8. Do not change the direction of the spindle rotation or leadscrew rotation while your machine is running. Changing the rotation direction of the spindle or leadscrew while your machine is running could cause serious damage to your machine.

9. Do not stop the spindle by hand. Always use your on/off switch to stop the spindle from rotating.

10. Do not clear chips by hand. Metal chips are very sharp and can easily cut your hand. Use a brush to clear chips.

11. Protect bed ways. When removing or installing tooling from your lathe spindle, place a piece of wood or other material across the bed to protect the ways from being damaged if the tooling is dropped.

12. Keep your machine maintained. Always replace worn or damaged parts before using your machine to prevent damage to your machine or the operator. Follow the maintenance schedule outline in this manual for peak performance.

Inventory Checklist 3

Overview

It is a good idea to take inventory of the parts of your machine soon after it is unpacked. By doing so, you can quickly determine if any parts are missing. In addition, should you find it necessary to return the machine to Smithy for any reason , the inventory will ensure that all parts you received have been returned. Check the items you've received against the packing slip attached to your machine.

Machine Overview 4

Overview

This chapter will help you to familiarize yourself with the Smithy Granite 1300 models and standard accessories. Figures 4.1 through 4.15 identify the major components and functions of your machine. The photographs in this section depict a Granite 1324 model. Distinguishing features are noted.

Major Features Identified

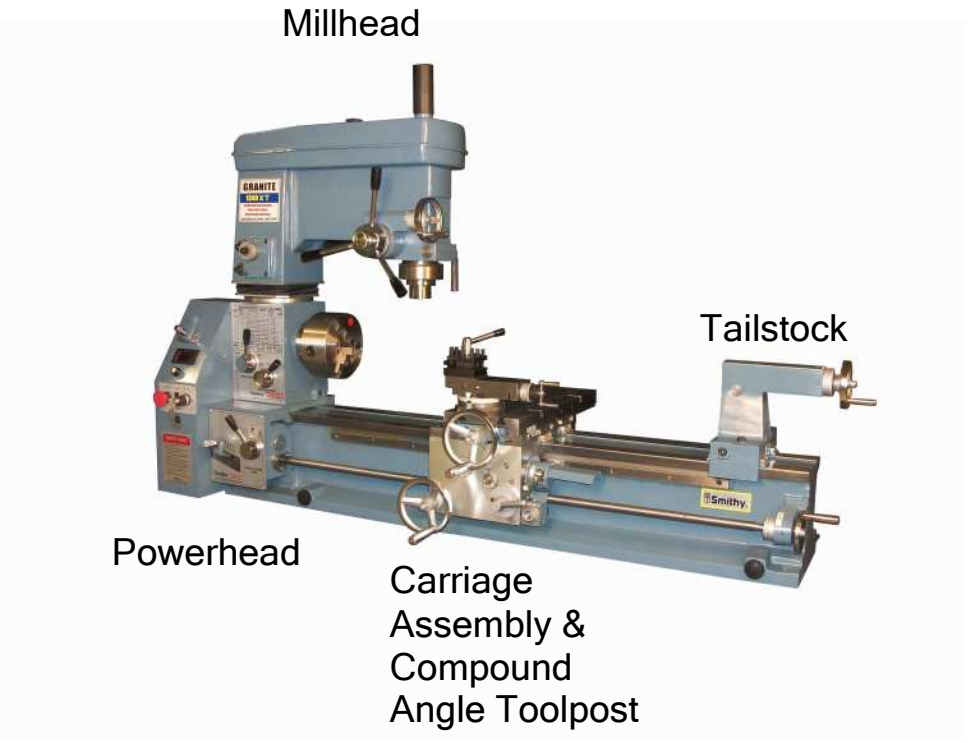


Figure 4.1 Granite 1324 Front View

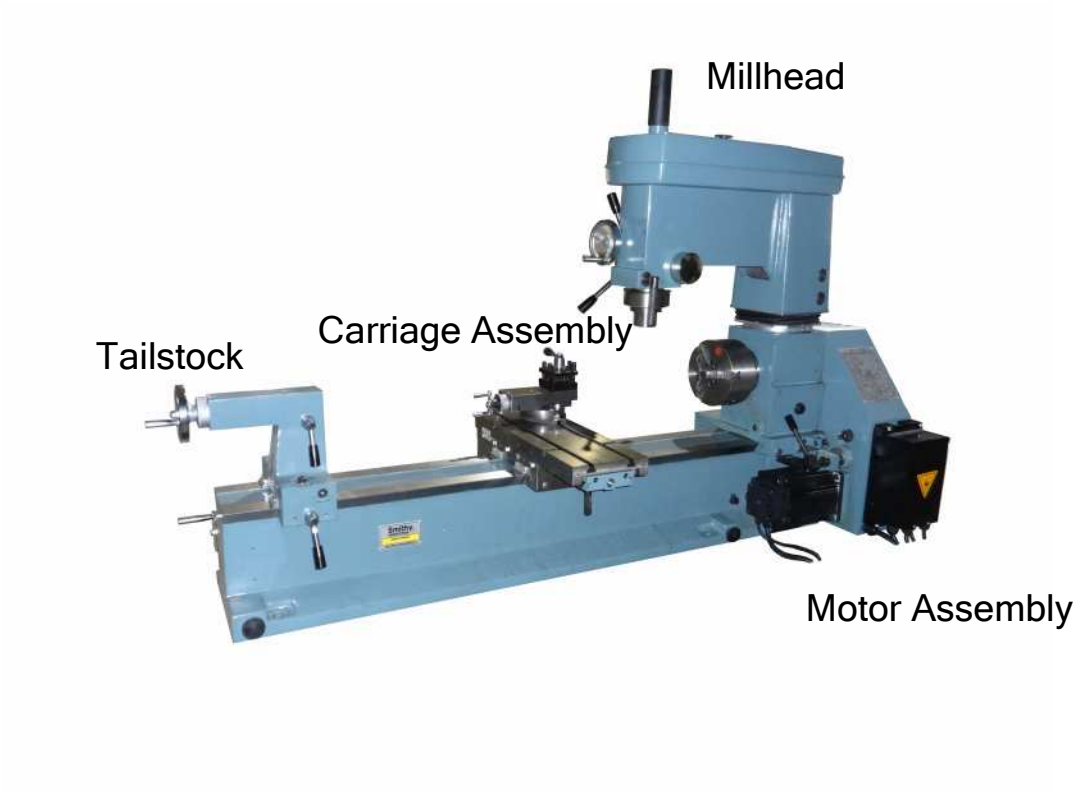


Figure 4.2 Granite 1324 Back View

Millhead Components & Functions

The photos below show the front and back of the millhead of the Smithy Granite machine. The millhead holds the tooling necessary to perform milling and drilling operations. The following section identifies the components and functions of the millhead.

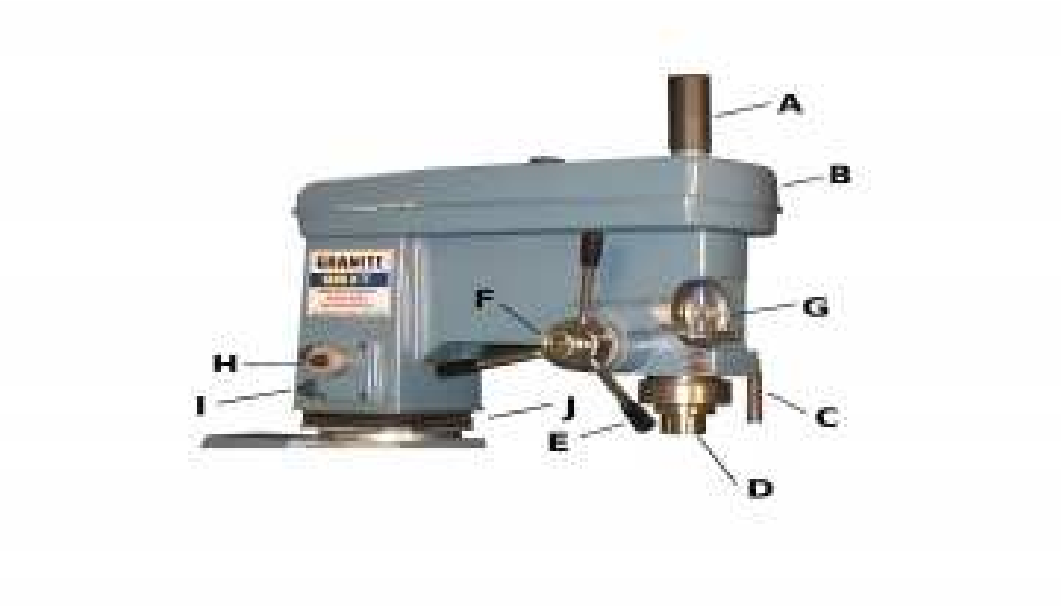


Figure 4.3 Granite Millhead (Front & Back)

A. Spindle Cover - The spindle cover protects the spindle from dust and debris. It also protects the operator from injury. The spindle cover should be in place whenever the machine is in operation. The drawbar is located under the spindle cover.

B. Millhead Cover - The Millhead cover protects the belt and pulleys of the millhead. The cover should always be in place when the machine is in operation.

C. Quill Lock - The quill lock locks the mill/drill quill in place during a horizontal milling operation or while changing tools.

D. Mill/Drill Spindle - The mill drill spindle is an R-8 taper. It holds and rotates the the tooling used during milling and drilling operation. The spindle also moves in and out of the millhead quill. The quill is an internal part which is not seen in this picture.

E. Drill Press Handles - The drill press handles move the quill in and out of the mill head during a drilling operation. Rotating the handles in a clockwise direction moves the quill downward, out of the millhead casting.

F. Coarse Feed/Fine Feed Clutch - Pulling out the coarse feed/fine feed clutch knob engages the drill press handles/coarse feed. Pressing the knob in engages drill/mill fine feed hand wheel. To easily engage/disengage the clutch, rotate the drill press handles slightly while pulling/pushing the knob.

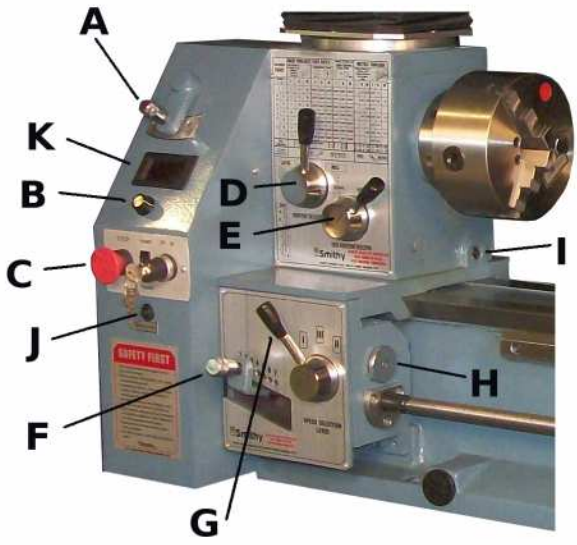
G. Drill/Mill Fine Feed Handwheel - The handwheel controls the fine feed movement of the quill in and out of the millhead.

H. Height Adjustment Drive - The height adjustment drive works with the millhead crank to raise and lower the millhead. Insert the millhead crank over the stud, as in Figure 4.4, rotate clockwise to raise the millhead and counter clockwise to lower the millhead.

Figure 4.4 Adjusting Millhead Height

I. Millhead Locking Studs - The locking studs secure the millhead in position. Insert the millhead crank over the upper stud, rotate counterclockwise to unlock the stud. Repeat the process on the lower stud. Position the millhead in the desired position and lock BOTH locking studs before starting your machine.

J. Bellows - Bellows keep debris off of the Z-Axis column and rack.



A. Lathe/Mill Selector - This clutch engages the mill portion of the Smithy Granite Lathe-Mill-Drill when pulled out and moved to the left. When moved to the right the lathe is engaged. Central position is neutral.

B. Speed Dial - The speed dial controls the motor rpm. Rotating clockwise increases the speed.

C. Forward/Reverse, Emergency Stop & On/Off Switch - GRANITE XT ONLY - The key switch turns the machine on and off. The center toggle switch reverses the motor. The large, red button is the emergency stop, which cuts off power to the machine. To reset the emergency stop, rotate the button clockwise until it pops out.

D. Powerfeed Function Lever - Moving the lever to the left powers the lathe powerfeed, whereas turning the lever to the right powers the mill powerfeed.

E. Leadscrew Rotation Direction Handle - Positioning the handle to the right causes the leadscrew to rotate clockwise, whereas positioning the handle to the left will cause the leadscrew to rotate counterclockwise.

F. Selector Lever 1-7 - Used in conjunction with the selector lever I-III to set the feed rate or pitch setting for cutting threads.

G. Selector Lever I-III - Used in conjunction with the selector lever 1-7 to set the feed rate or pitch setting for cutting threads.

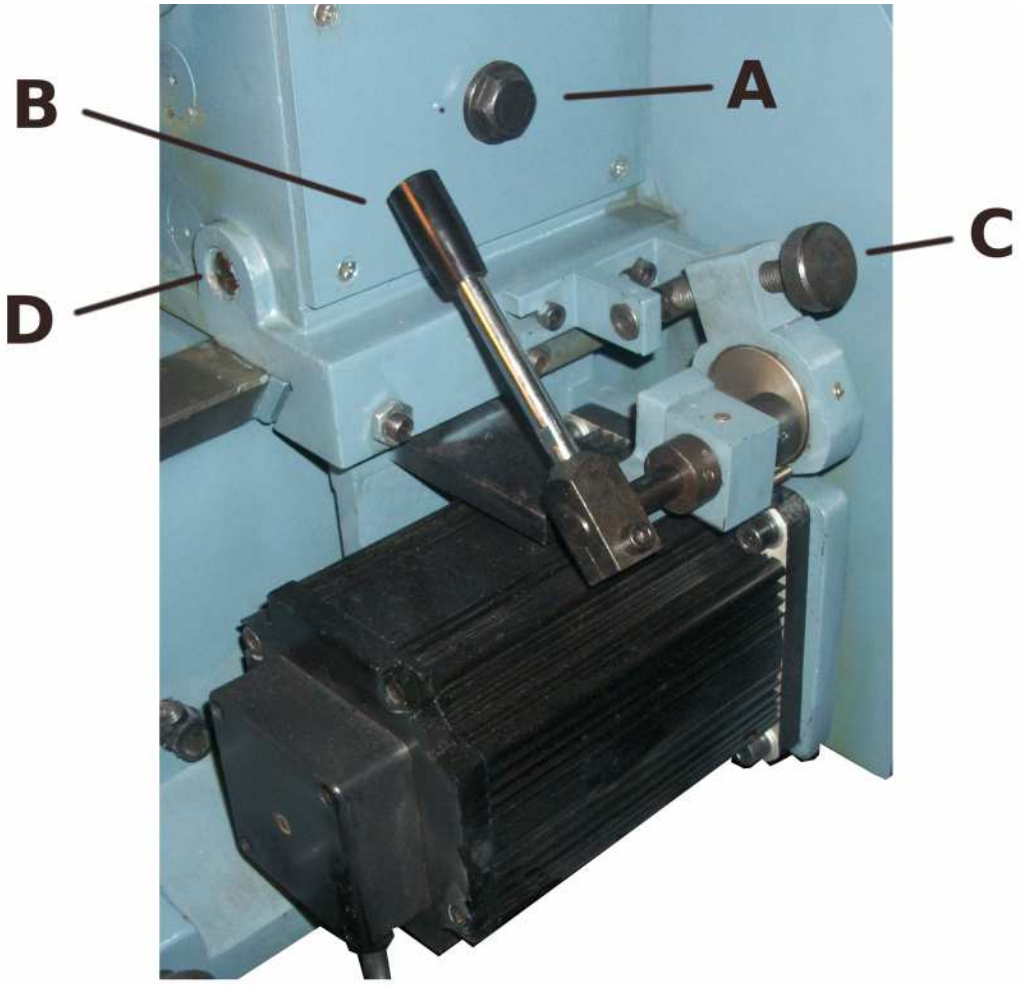
H. Jog Knob - Assists in meshing gears inside the quick change gear box which is controlled by selector levers 1-7 and I-III. Rotating the knob helps align gears.

I. Oil Level/Sight Glass - Normal oil level is at the half way point, add oil if the level of oil in the sight glass drops below this level.

J. Reset Button - Resets the drive for all MX, IMX, & XT machines.

K. Tachometer - GRANITE XT ONLY - Indicates the spindle RPM.

L. Forward/Reverse, Emergency Stop & On/Off Switch - Classic, MX & IMX - The red button underneath the yellow cover reverses the direction of the motor. The green button in the middle is the "power-on" button. The red, circular button is the emergency stop, which cuts power to the machine.



A. Oil Fill Port - Located directly above the motor, it holds 8-10oz of 30 weight oil. Remove the screw to add oil as necessary.

B. Belt Tension Quick Release - Moves the motor and pulley releasing tension on the belts. Pull the lever down to loosen the tension on the belt and push the lever up to add tension to the belts.

C. Belt Tension Fine Adjustment - Used to set final tension on the belt.

D. Oil Site Gauge - The oil lever should be 1/2 way up the window.

Pulley Box

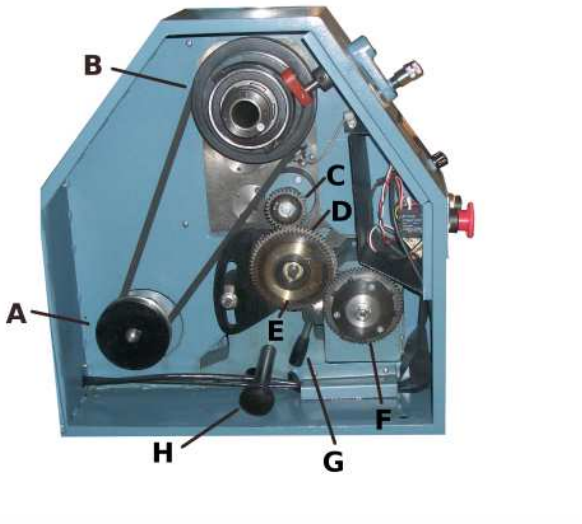


Figure 4.7 Granite Pulley Box (Inside)

The pulley box houses the drive pulleys, gears and power components.

A. Motor Pulley - A three-step pulley attached to the shaft of the motor.

B. Spindle Pulley - A two-step pulley attached to the main lathe spindle.

C. Change Gear A - A 30-tooth gear installed at the factory. The change gears only need to be reconfigured when cutting metric threads.

D. Change Gear B - A 60 tooth gear installed at the factory. The change gears only need to be reconfigured when cutting metric threads.

E. Change Gear C- A 66 tooth gear that rides behind change gear B (60 tooth gear) and is installed at the factory. The change gears only need to be reconfigured when cutting metric threads.

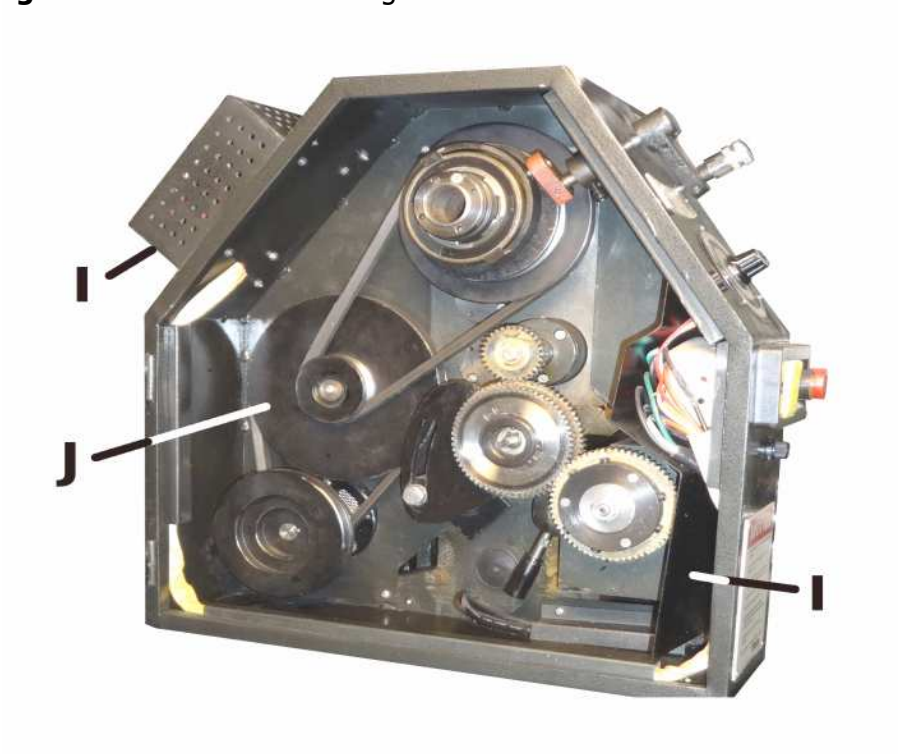
F. Change Gear D - A 60 tooth gear installed at the factory.

G. Inch/Metric Selector - Used when cutting threads. Pull the lever out toward the operator when cutting metric threads. When cutting inch (SAE) threads, make sure the lever is pushed in toward the machine.

! NOTICE !

There is a neutral position with this selector. Be sure that it is completely engaged in either the metric or inch mode before you begin your threading operation.

H. Lifting Handle - Pull outward to gain access to handle.



GRANITE CLASSIC ONLY

I. Motor Control Module - Converts the AC power coming into the machine to DC power for the motor. This may be located in one of the two indicated places.

J. Speed Reduction Pulley - Sits between the motor and spindle pulley and is used for low speed operations when increased torque is desired.

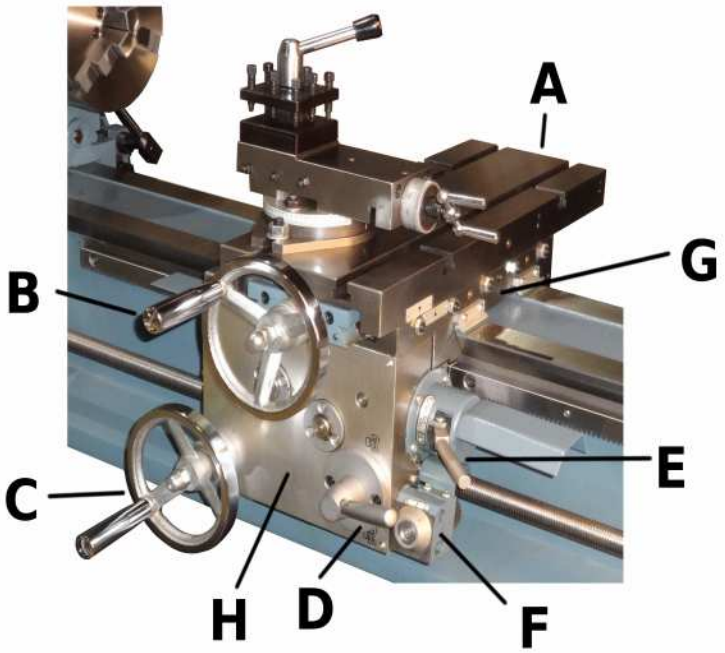


Figure 4.8 Granite Carriage Assembly

The carriage assembly consists of:

- Crossslide table
- Carriage; the lower portion of the table that rides on the bed ways,
- Apron; the portion that hangs from the cross-slide table in front of the machine.

The carriage moves by hand or can be powered along the bed ways. Its function is to support the cutting tool rigidly while in the lathe mode, and to secure the workpiece while in the mill mode. The carriage can be locked into place with the lock found on the back of the carriage.

The figure to the above identifies and defines the major components of the carriage assembly.

A. Cross-Slide Table - The top portion of the carriage assembly. It supports the compound angle toolpost (not pictured) which holds the lathe cutters and tooling. The table also supports your workpiece when operating the mill. The cross-slide table has four, 7/16" sized t-slots for securing tooling and mounting workpieces.

B. Cross-Slide Handwheel - This handwheel moves the table toward and away from the operator along the Y-Axis. Rotating the handwheel clockwise moves the table away from the operator while moving it counterclockwise moves the table toward the operator.

C. Longitudinal Handwheel - This handwheel is located at the bottom left of the carriage assembly. Manually rotating the handwheel clockwise will move the carriage assembly along the X-Axis towards the tailstock end of the machine. Rotating the handwheel counter clockwise will move the the carriage assembly towards the headstock end of the machine.One revolution moves the assembly approximately .040".

NOTE: This handwheel is for coarse movements only. Use the handwheel at the end of the leadscrew for fine movement (0.001")

D. Half-Nut Engagement Lever - This lever closes the half-nut on to the leadscrew. When the half-nut is engaged, in the down position, the table assembly will be powered to move right and left along the X-Axis leadscrew.

! NOTICE !

The half-nut engagement lever is only engaged for rapid travel or threading operations.

E. Longitudinal and Lateral Powerfeed Selector - This selector determines whether the carriage will be powered to move along the X-Axis (longitudinal axis) or the Y-Axis (lateral axis). When the lever is in the upper position the table will move along the Y-Axis. When moved into the lower position, the table will move along the X-Axis. Center position is neutral.

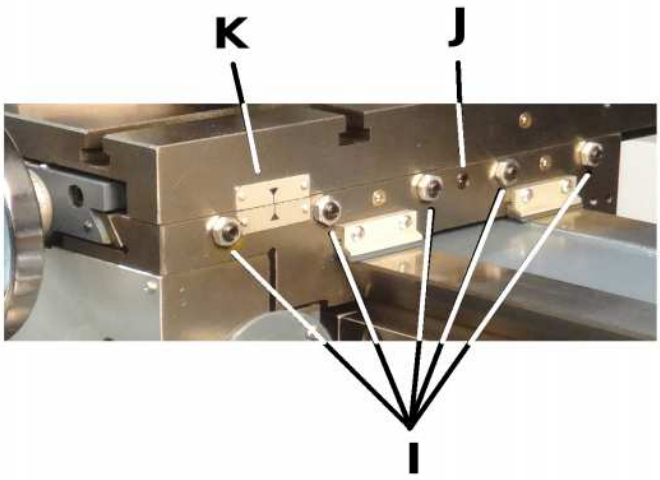
F. Threading Dial - The threading dial is used to coordinate consecutive cuts when cutting threads. Restarting each cut from the same point on the dial ensures that each cut follows the same path, leading to accurately machined threads.

! NOTICE !

The threading dial can only be used when cutting inch (SAE) threads.

G. Saddle Assembly - The saddle supports the cross-slide table and moves along the X-Axis of the machine.

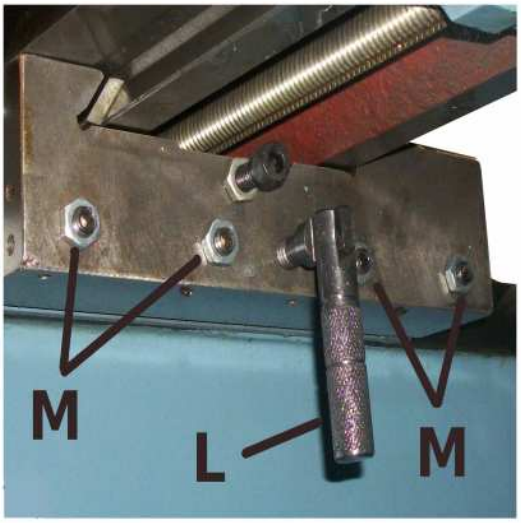
H. Apron Assembly - The apron houses the gear mechanism for the X and Y-Axis powerfeed.



I. Carriage Gib Adjustment Screws - These screws press a small metal plate (the gib) to the ways of the bed, increasing or decreasing the tension when moving the cross-slide assembly. (Figure 4.9)

J. Carriage Lock (Y-Axis) - is an M8 screw. Turning the screw clockwise will prohibit movement of the carriage along the Y-Axis. (Figure 4.10)

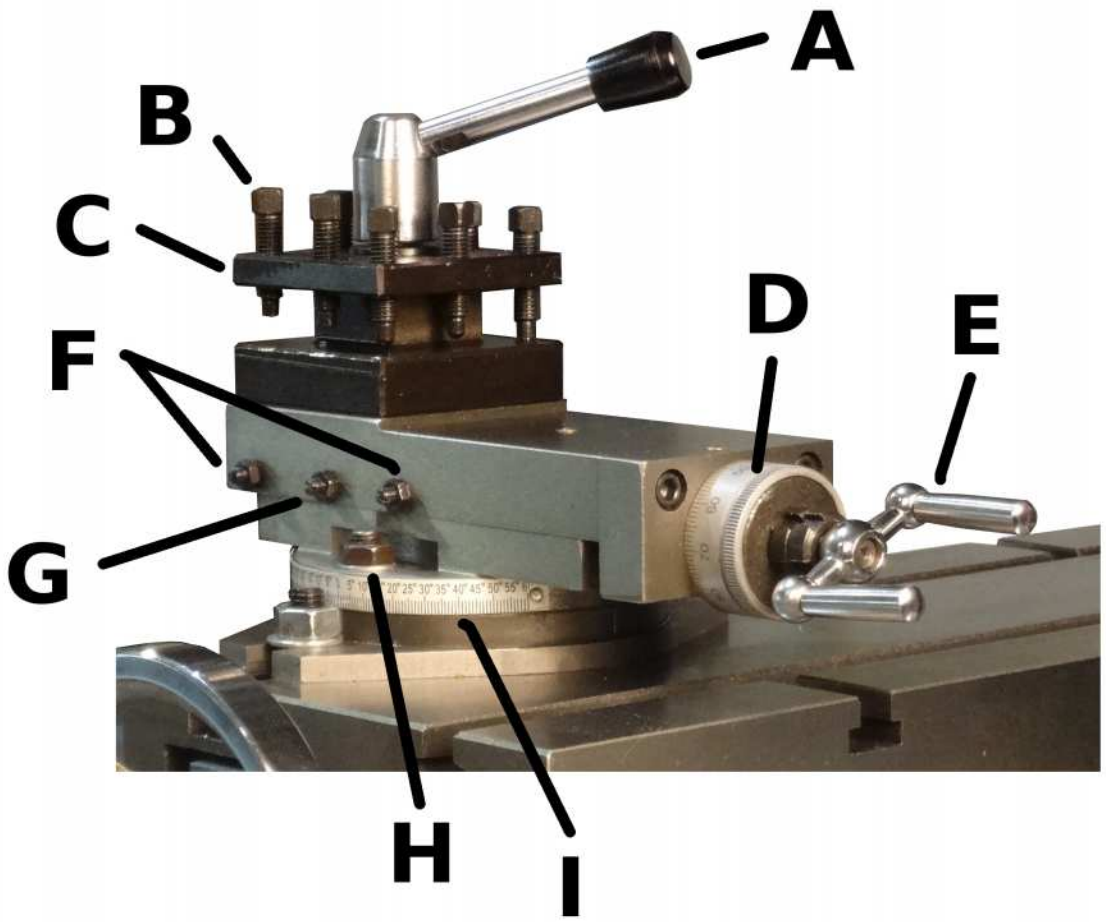
K. Travel Indicators - Mark the limit of travel on the crossfeed table. Running the top portion of the indicator located on the tailstock side of the cross-slide table past the lower indicator on the bottom portion of the table (carriage) will cause serious damage to your machine.



L. Carriage Lock X-Axis - is an M8 screw located on the back side of the carriage. Turning this screw clockwise locks the carriage to the bedways.

M. Carriage Gib Adjustments Screws - when screwed in, these screws press a small metal plate (the gib) to the ways of the bed, increasing or decreasing the tension when moving the carriage assembly along the bed ways.

Carriage Assembly-Compound Angle Toolpost



The compound angle toolpost is bolted to the cross-slide table with 10mm T-Bolts. The compound angle toolpost swivels to any angle horizontal to the lathe axis. The calibrations on the swivel base are in degrees , (60º-0º-60º). The following section identifies and explains the functions of the toolpost.

A. CATP (Compound Angle Toolpost) Lock down handle - The handle rotates counterclockwise to loosen the tension on the four position turret, allowing the user to turn the turret 90º per turn.

B. Turret Bolts - These bolts secure your tooling to the turret.

C. 4 Position Turret - The turret holds up to 1/2" tooling. The turret can support up to 4 tools.

D. Floating Dial - The floating dial can be repositioned to zero at any point to measure tool feed in or out.

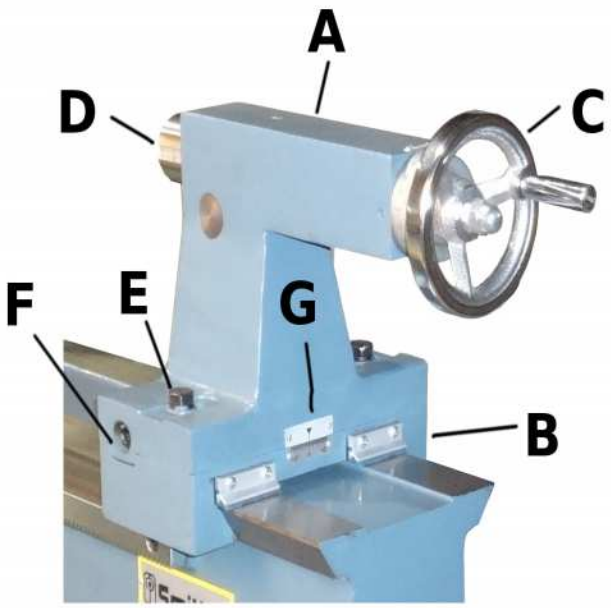
E. Feed Handle - Used to advance or retract the tool.

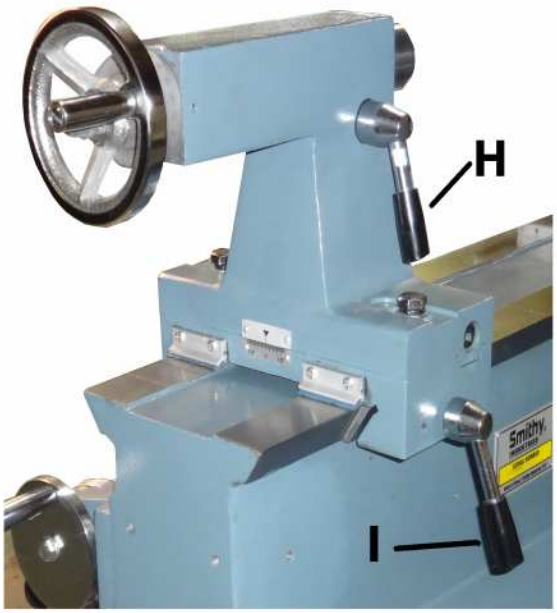
F. Compound Gib Adjustment Screws - These screws press a small metal plate (the gib) to the ways of the bed, increasing or decreasing the tension when moving the compound slide.

G. Slide lock - This slide lock locks the compound slide to the carriage to secure the slide in position.

H. Swivel Base Locking Bolts - The swivel base secures the CATP and allows it to rotate 360º in either direction.

I. Degree Scale - A calibrated scale at the bottom of the base shows positioning in degrees from +60º to -60º.





The tailstock holds tooling that supports the end of a workpiece. It also holds tooling such as center drills, reamers and taps. It moves along the bed of the machine and can be stopped and locked in position at any point along the bed ways. The photos above show the tailstock of the Granite machine. This section will identify and define major components and functions of the Granite tailstock.

A. Tailstock Body - This is the main casting of the tailstock.

B. Tailstock Base - The tailstock base secures the tailstock body to the bed of the machine.

C. Tailstock Handwheel - Allows for movement of the tailstock barrel.

D. Tailstock Barrel - The barrel holds the MT3 tooling that supports the end of the workpiece.

E. Off-Setting Lock Bolts - These bolts allow the user to offset the toolpost foor cutting papers.

F. Tailstock Off-Setting Bolts - These bolts allow the user to offset the toolpost for cutting tapers.

G. Alignment indicator - Helps align the tailstock back to zero after it has been moved to do an off-set turning.

H. Tailstock Barrel Lock - This locks the barrel into position.

I. Tailstock Lock - This locks the tailstock to the bed ways.

5 Preparing Your Machine For Operation

Overview

The Quick-Start Manual you received before delivery of your Smithy machine provides detailed instructions for mounting and locating your machine. Please complete those instructions if you have not already done so. As you unpack, it is a good idea to inventory the parts. Before operating your machine, you should assemble the remaining components of your machine, clean the machine, and lubricate it. This section will guide you through those steps.

Assembly of Minor Components

The installation of the drill chuck, arbor and arbor plug; mill spindle covers; and several handles should be completed according to the procedures described below.

Drill Chuck and Arbor

Before proceeding both the arbor and the chuck should be thoroughly cleaned to ensure a good fit. Once cleaned attach the chucks to the respective arbors. Follow the steps below to achieve the best possible fit.

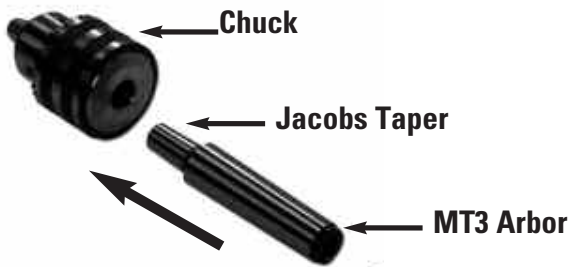


Figure 5.1 Installing Arbor into Chuck

Step 1: Place the arbor in a freezer for about 1 hour to slightly shrink the metal.

Step 2: Remove the cold arbor from the freezer and place it into the drill chuck.

Step 3: Use a soft mallet or a block of wood to tap the end of the arbor.

Step 4: Allow the arbor to return to room temperature.

! NOTICE !

Arbor Plug

Install the plug setscrew (S12898 into the tailstock arbor before inserting the arbor into the tailstock. A plug is installed in the tailstock arbor (the MT3 to JT33 arbor, part number C30523), which allows the ejector pin inside the tailstock to eject the arbor when the tailstock barrel is retracted.

Morse Taper 3 (MT3) tooling is used in the tailstock of the machine. R-8 tooling is used in the millhead of the machine and used in conjunction with a drawbar.

Mill Spindle Cover

Figure 5.3 Installing Mill Spindle Cover

The mill spindle cover slides over the flange on the top of the millhead.

⚠ WARNING

Do not operate your machine without the mill spindle cover. Doing so could cause harm to yourself or your machine.

Handles

Figure 5.4 Installing Handles

Install any handles or handwheels that have been removed for shipping. Handles can be hand installed and tightened with a flat-head screwdriver. Remove and reverse the tailstock handwheel.

Cleaning & Lubricating Your Machine

Smithy machines are shipped with a light protective grease coating that must be removed prior to use. Use a noncorrosive kerosene or white mineral spirits to remove the coating. WD-40® also works well.

Once cleaned, your Smithy must be lubricated. Make sure to lubricate carefully and thoroughly before starting the machine. Use a pump oil can and a supply of good quality SAE30 weight nondetergent oil or 30-weight compressor oil. Lubricants can be obtained at most home and building supply stores. A lubrication point chart can be found on the backside of the millhead.

Lubrication Schedule

Lubrication depends a lot on the use of your machine and your climate. The schedule below is intended to be used as a guide, use your best judgement for lubricating your machine based on your use and environment.

Check Oil	**Before each use**
Oil Ports	**Before each use**
Add Oil	**As Needed**

See **Chapter 11** for a complete maintenance schedule.

Lubrication Points

Follow the instructions on the next page and refer to the lubrication chart on the backside of the millhead.

Gearbox

Open the gearbox door. Lightly grease the gears with a good quality molybdenum or lithium grease or motorcycle-chain lubricant.

Figure 5.5 Brush a thin layer of lithium grease over the gear quadrant in the pulley box

Check the oil sight glass under the chuck. If necessary, add oil until the sight glass is half full. The oil-fill plug is at the back of the headstock above the motor. Be careful not to overfill, the gearbox requires only 8 to 10 ounces of oil.

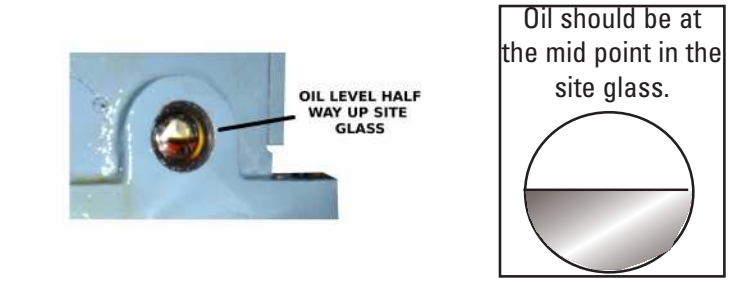


Figure 5.6 The oil level should be half way in the oil site glass located under the lathe spindle.

Figure 5.7 Add oil through the oil port located on the back side of the headstock.

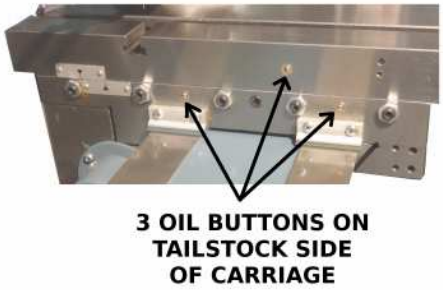
Ways

Run the carriage as far to the left as possible. Put a few drops of oil on the ways. Run the carriage to the extreme right and repeat.

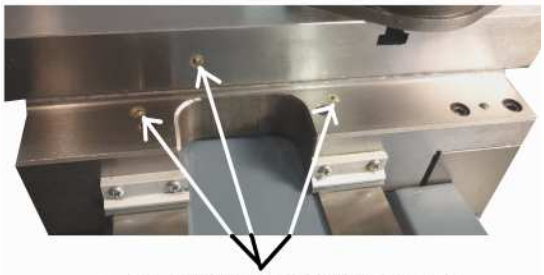
Carriage Assembly-Saddle & Cross Slide Table

Lubricate the six oil buttons of the carriage assembly.

There are three buttons on both the right (tailstock) side and left side (head stock) of the carriage for the saddle ways and the cross slide table.



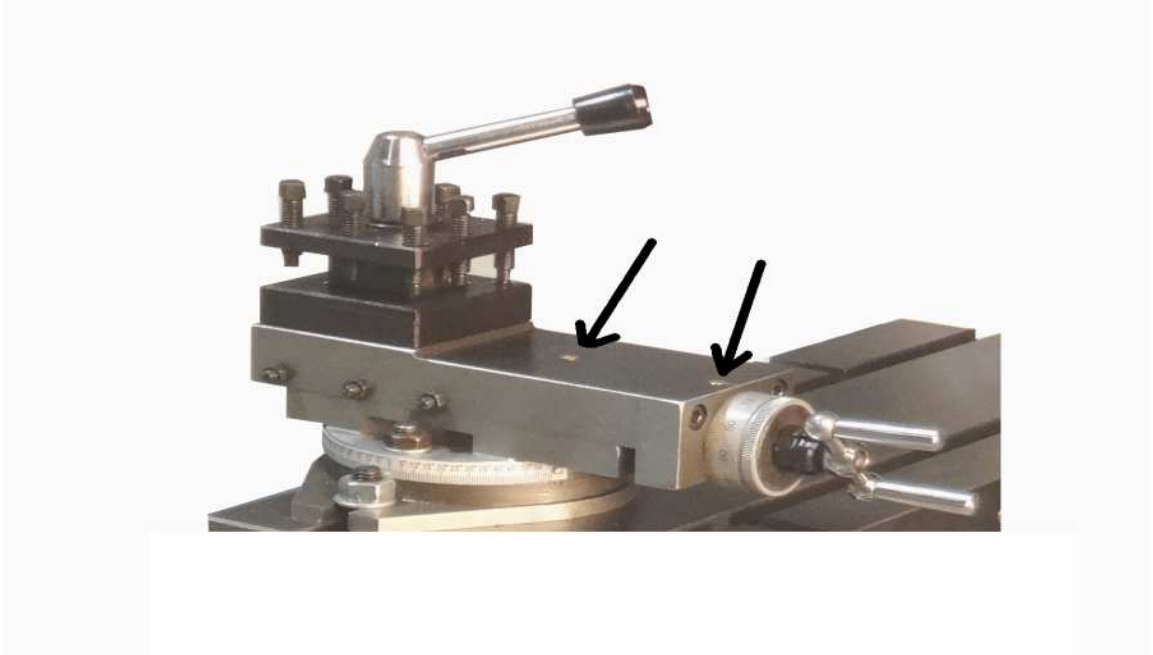
3 OIL BUTTONS ON TAILSTOCK SIDE OF CARRIAGE



3 OIL BUTTONS ON HEADSTOCK SIDE OF CARRIAGE

Compound Angle Toolpost

Oil the two buttons on top of the compound rest.



Cross-Slide Screw

Oil the cross-slide screw. The oil button is located on top of the cross-slide table.

Oil the buttons between the cross-slide and longitudinal-feed handwheels (at right).

Figure 5.11 A & B Cross-Slide Screw Apron Oil Points and Cross-Slide Screw Table Oil Points

Leadscrew

Oil the support for the right end of the leadscrew. Put a few drops of oil along the leadscrew itself.

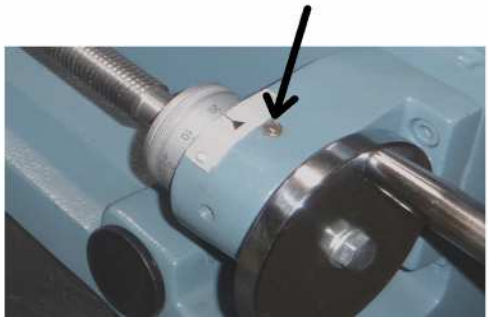


Figure 5.12 Leadscrew Oil Point

Oil Drip

Oil the end of the oil-drip trough from inside the gear box.

Figure 5.13 Oil Drip

Quick Change Gear Box

Use a spray can of lithium grease or motorcycle-chain lubricant. Spray inside the quick-change gearbox through the slot for the powerfeed (1-7) selector.

Figure 5.14 Oil the Quick Change Gear Box through the Powerfeed Slot

Tailstock Barrel

Oil the two buttons on top of the tailstock.

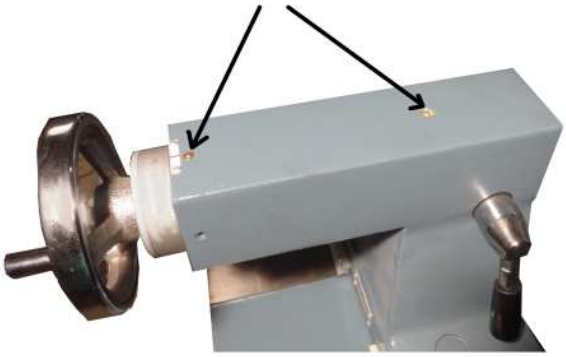


Figure 5.15 Tailstock Barrel Oil Points

Mill/Drill Clutch, Fine Feed

Oil the button on top of the mill/drill clutch housing.

Figure 5.16 Mill/Drill Clutch Oil Points

Adjusting Gibs

The Granite 1300 models have a series of straight gibs. The gibs are found on the carriage, the cross-slide table, compound angle toolpost and the tailstock. These gibs should be adjusted periodically to maintain accuracy and smooth operation.

! NOTICE !

Always make sure your machine is well lubricated before adjusting the gibs.

Carriage Assembly-Saddle

Adjust the gibs on the saddle assembly using the procedure below.

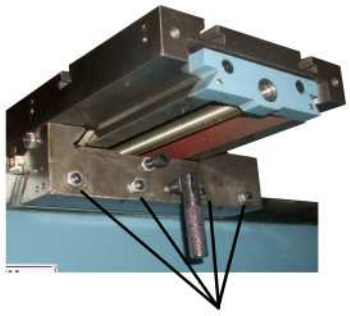


Figure 5.17 Carriage Gibs

Step1: Loosen the four jam nuts on the back side of the saddle with the 6" adjustable wrench that was shipped with your machine.

Step 2: Back out the gib adjusting screws found on the back side of the saddle two turns with the 4 mm allen wrench.

Step 3: Using the 4 mm Allen wrench, tighten each of the four gib adjustment screws until they are lightly touching the gib.

⚠ CAUTION

Do not apply excessive force.

Step 4: Back the gib adjustment screws out 1/8 to 1/4 turn.

Step 5: With the adjustment screws now set at roughly the same position, make the fine adjustments on each individual screw. Starting with one of the inner screws, slowly tighten the screw while moving the carriage assembly by turning the leadscrew handwheel until you feel slight resistance.

Step 6: Once slight resistance is felt, hold the gib adjustment screw in position and tighten the jam nut.

Step 7: Repeat steps 5 and 6 with the other inner screw and then with the two outer screws.

Adjusting the Gibs on the Carriage Assembly - Cross-Slide Table

Adjust the gibs on the cross-slide table using the procedure below.

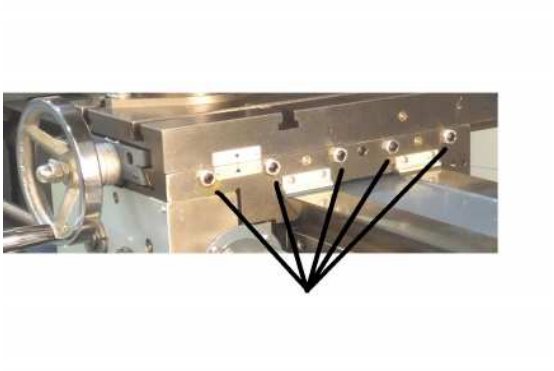


Figure 5.18 Gib Adjustment Screws - Cross-Slide Table

Step 1: Loosen the four jam nuts on the tailstock side on the table with the 6" adjustable wrench that was shipped with your machine.

Step 2: Back out the gib adjusting screws two turns.

Step 3: Using the 4 mm Allen wrench, tighten each of the four gib adjustment screws until they are lightly touching the gib.

⚠ CAUTION

Do not apply excessive force.

Step 4: Back the gib adjustment screws out 1/8 to 1/4 turn.

Step 5: With the adjustment screws now set at roughly the same position, make the fine adjustments on each individual screw. Starting with one of the inner screws, slowly tighten the screw while moving the cross-slide table by turning the cross-slide handwheel until you feel slight resistance.

Step 6: Once slight resistance is felt, hold the gib adjustment screw in position and tighten the jam nut.

Step 7: Repeat steps 5 and 6 with the other inner screw and then with the two outer screws.

Adjusting the Gibs on the Compound Angle Toolpost

Adjust the gibs on the compound-angle toolpost using the procedure below.

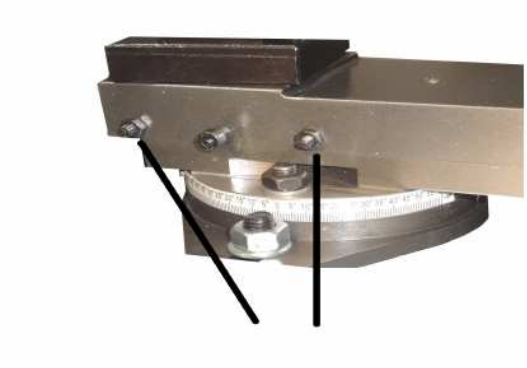


Figure 5.19 Gib Adjustment Screws - Compound Angle Toolpost

Step 1: Loosen the jam nuts on the side of the compound-angle toolpost with the 6 inch adjustable wrench.

Step 2: Back out the gib adjustment screws out two turns .

Step 3: Using the a flat-head screw driver, tighten the two gib adjustment screws until they are lightly touching the gib.

⚠ CAUTION

Do not apply excessive force.

Step 4: Back the gib adjustment screws out 1/8 to 1/4 turn.

Step 5: With the adjustment screws now set at roughly the same position, make the fine adjustments on each individual screw. Starting with the screw closest to the handle, slowly tighten the screw while moving the compound angle toolpost by turning the compound-slide handle until you feel *slight* resistance.

Step 6: Once slight resistance is felt, hold the gib adjustment screw in position and tighten the jam nut.

Step 7: Repeat steps 5 and 6 with the remaining gib adjustment screw.

Adjusting the Gibs on the Tailstock

Adjust the gibs on the tailstock using the procedure below.

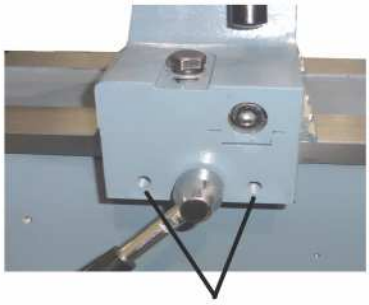


Figure 5.20 Gib Adjusting Screws - Tailstock (Shown with tailstock lock removed)

Step 1: Unlock the tailstock.

Step 2: Remove the outer setscrews with the 4 mm Allen wrench provided.

! NOTICE !

There are two setscrews in each hole. To tighten the tailstock gibs the outer setscrews need to be removed.

Step 3: Using the 4 mm Allen wrench, tighten each gib adjustment screw until it touches the gib lightly.

Step 4: Back each gib adjustment screw out 1/4 turn.

Step 5: Reinstall each outer setscrew and bottom it against the inner screws to lock the corresponding inner screw in place.

Step 6: Repeat steps 2 through 5 on the remaining screw.

! NOTICE !

Unlike the carriage, cross-slide and compound-angle toolpost gib adjustments, you will not feel a slight resistance when moving the tailstock. The tailstock will be locked to the ways with the tailstock lock. The objective of adjusting the tailstock is to ensure that the tailstock remains parallel to the ways.

Adjusting Backlash

Backlash is lost motion in the screw. The user will notice an initial small movement in the handwheel before the screw responds. The procedures in this section will help minimize backlash.

Adjusting Backlash from the Cross-Slide Screw

Before making any adjustments to the cross-feed screw system, all the gibs on the table and carriage system should be checked and adjusted as described previously.

Excessive backlash in the cross-slide can come from three different places.

- The fit of the cross-slide screw to the front screw mount
- The fit of the cross-slide screw into the brass crossfeed nut
- The fit of the brass cross-feed nut into the carriage casting

There are adjustments for each of these areas. Follow the procedures below to make each adjustment.

Adjusting Backlash Cross-Slide Screw to the Front Screw Mount

Step 1: Loosen the two nuts that hold the cross-slide handwheel on to the end of the cross-slide screw.

Figure 5.21 Loosen the two outer nuts holding the handwheel

Step 2: Tighten the inner nut slowly while checking the ease of movement of the cross-slide handwheel. When the screw starts to become difficult to turn, loosen the nut slightly so that the screw turns freely.

Step 3: Hold the inner nut in place with a wrench and tighten the outer nut against the inner nut to lock both nuts in position.

Step 4: Recheck the backlash.

Cross-Slide Screw to Brass Nut & Nut to Saddle

If there is still excess backlash after the previous adjustment, the backlash is either between the cross-slide screw and the brass nut or between the brass nut and the saddle. The following procedure covers both adjustments.

Step 1: Remove the rear support on the backside of the cross-slide table.

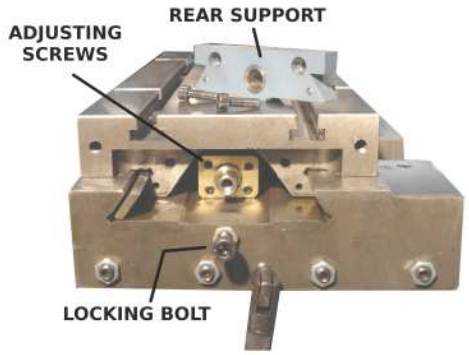


Figure 5.22 Remove mount on backside of the table to access the brass cross slide nut

Step 2: Loosen the allen bolt that locks the brass nut into the saddle. (See Figure 5.23)

Step 3: Use the handwheel to move the cross-slide table toward the operator side of the machine. Watch under the table from the backside and stop before the cross-slide screw comes out of the brass nut.

Step 4: Slowly tighten the four adjusting screws on the brass nut, one at a time, until a slight drag is felt while turning the cross-slide handwheel. It is best to continue turning the handwheel back and forth while adjusting the nut to balance ease of operation and backlash.

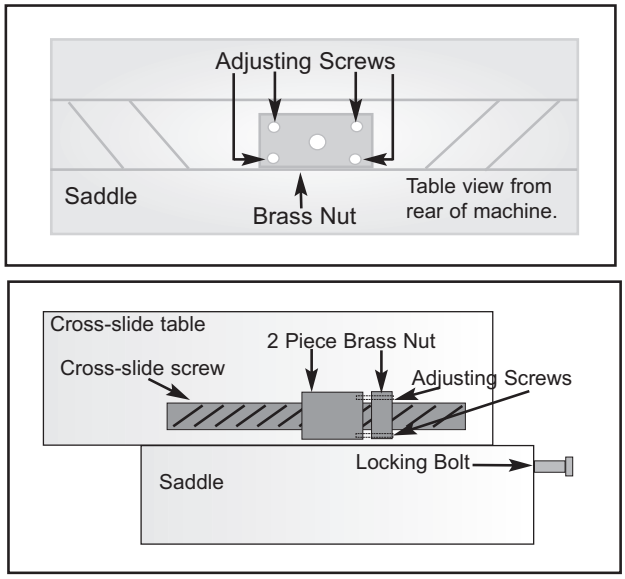


Figure 5.23 Tighten the adjusting screws on the brass nut

Step 5: Reinstall the rear support and tighten the locking bolt for the brass nut.

Step 6: Recheck the backlash on the cross-slide.

> **! NOTICE !**
>
> If you find that the four adjusting screws will not stay in place, use a small amount of thread-locking compound to keep the screws tight. If you use a Lock-Tite® product, use the Lock-Tite® Purple, not Red which will not allow for future adjustments

Adjusting Backlash from the Longitudinal Leadscrew

Excessive backlash in the longitudinal feed can come from two places.

- The fit of the longitudinal feed screw to the right-hand mounting trestle
- The fit of the half-nut to the feed screw

Engage the half-nut lever. Slowly turn the longitudinal handwheel clockwise as viewed from the right end of the machine and watch the gap between the dial and the feed screw mounting trestle. Reverse the direction you are turning the feed screw and see if the gap increases slightly. If so then there is some backlash in the mounting. Follow the procedure below to reduce the backlash.

Adjusting the fit of the longitudinal feed screw to the right-hand mounting trestle

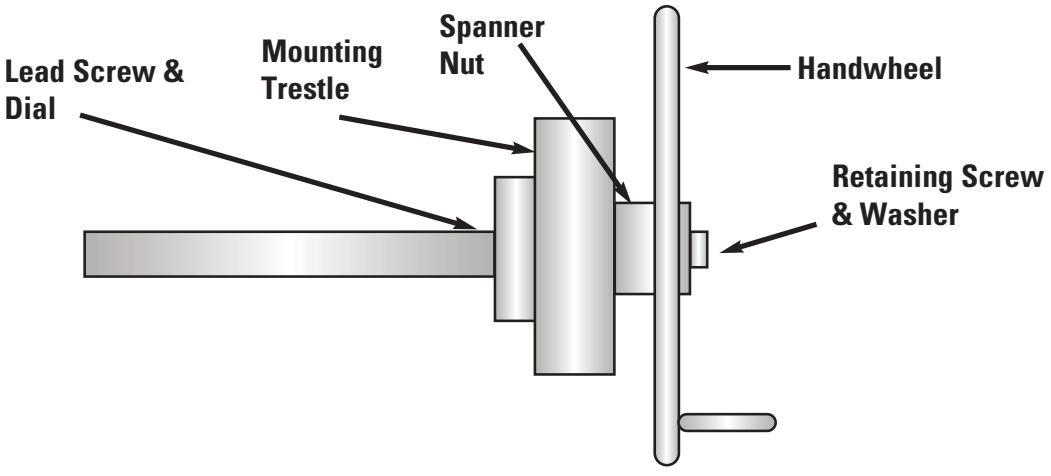


Figure 5.24 Adjusting backlash from the leadscrew

Step 1: Remove the retaining screw and washer in the right end of the longitudinal feed handwheel.

Step 2: Unscrew the handwheel from the end of the feed screw.

Step 3: Using a punch and a small hammer, tighten the spanner nut about one-eighth of a turn and recheck the backlash in the leadscrew.

Step 4: If backlash is acceptable, replace the handwheel, washer, and retaining screw. If more adjustment is needed, repeat step 3 above.

Half-Nut to Leadscrew Backlash

Worn threads on the half-nut can cause excessive backlash in the longitudinal direction. Half nuts are made of a brass-like material and do wear out over a period of time. The only fix for a worn half nut is to replace the worn nut with a new one.

! NOTICE !

The longitudinal handwheel (Rack & Pinion) is intended for rapid, coarse feed and is not calibrated for fine measurement. There is no backlash procedure for this mechanism.

Adjusting Mill Feed Backlash

Excessive backlash in the vertical fine feed can come from two places.

- The fit between the worm gear and the pinion gear shaft
- The fit of the quill gear to the quill rack

Adjusting the Fit Between the Worm Gear and Pinion Gear Shaft

Follow the procedure below to adjust the fit between the worm gear and pinion gear.

Step 1: Remove the fine-feed handwheel and dial.

Step 2: Loosen the two setscrews that hold the left and right worm gear bearing supports in place. They are located on top of the vertical feed housing at the left and right end of the worm gear.

! NOTICE !

The bearing housing has two holes in the outside surface to allow a punch or spanner wrench to turn the housing.

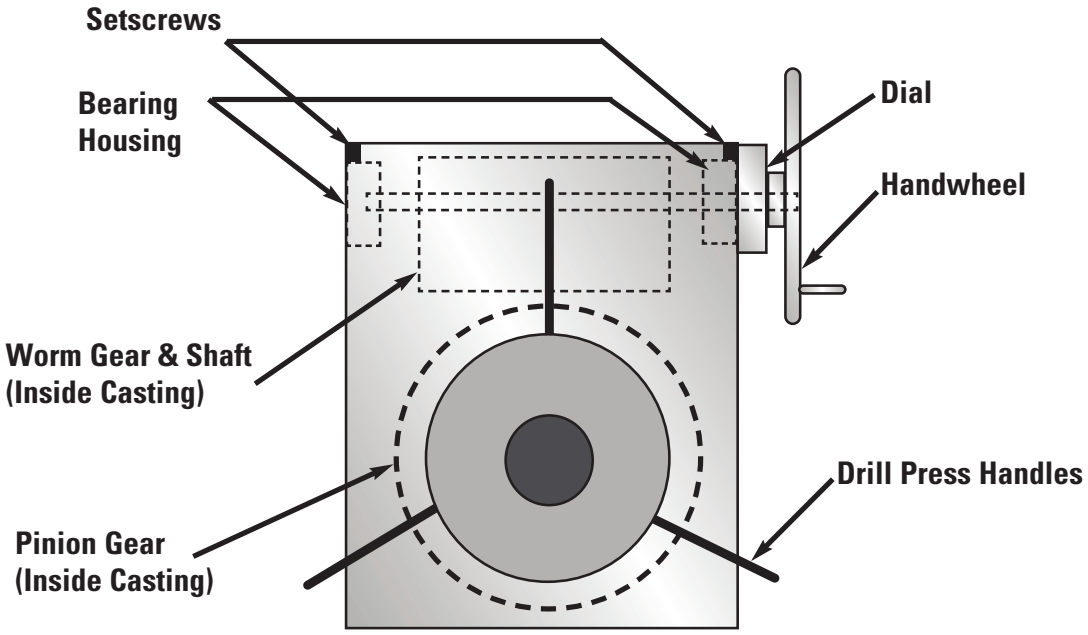


Figure 5.25 Adjusting backlash from the mill feed

Step 3: Use a small spanner wrench or a punch with a small mallet to rotate the bearing supports one at a time. The support bearings are mounted slightly off center in these housings and rotation of the housings will raise or lower the worm gear down towards the pinion gear. The bearing support on the right should be rotated clockwise and the left should be rotated counter clockwise. Rotating the right and left bearing supports should be done in conjunction with each other.

Step 4: Turn the right housing and watch the worm gear shaft to see in which direction it moves. Turn the housing in the direction that will move the worm gear down towards the pinion gear.

Step 5: Move to the left housing and repeat step 4.

Step 6: Alternate moving the front a little and then the rear a little while turning the worm gear to check for binding.

Step 7: Stop as soon as resistance is felt in the rotation of the worm gear. The adjustment is completed.

Step 8: Tighten the setscrews to the bearing housings to lock adjustment in place.

Adjusting the fit of the Quill Gear to the Quill Rack

Adjusting the fit between the quill shaft feed gear and the quill rack is done using the split section of the feed gear. The feed gear is made up of two parts.

- A wide section that is locked to the feed shaft by a key and has a fixed position on the shaft

- Another section that is not as wide and is not keyed to the shaft. It is held in place on the shaft via a locking nut and can be repositioned as desired.

The narrow section can be offset from the wide section to give the effect of a gear with thicker teeth. This in turn will give a tighter tooth-to-tooth fit between the feed shaft gear and the rack on the spindle.

Adjustments are made on the split gear from up inside the mill head casting. This is accessible from under the mill head between the quill and the support column. Follow the procedure below to make these adjustments.

Step 1: Look into the millhead casting and locate the items shown in the drawing 5.26.

Step 2: Turn the feed shaft with the coarse feed handwheel until the locking tab of the locking washer is accessible. Lock the quill in that position with the quill lock lever on the rear of the millhead.

Step 3: Bend the locking tab straight and use a small punch to loosen the spanner nut just enough to be able to rotate the adjustable gear with the same punch and small hammer.

Step 4: With the quill still locked in position, have someone turn the coarse feed handwheel clockwise until it removes any backlash. Then have them *hold the handle in this position until the completion of step 6*. This will move the bottom part of the wide fixed gear to the left as viewed from below.

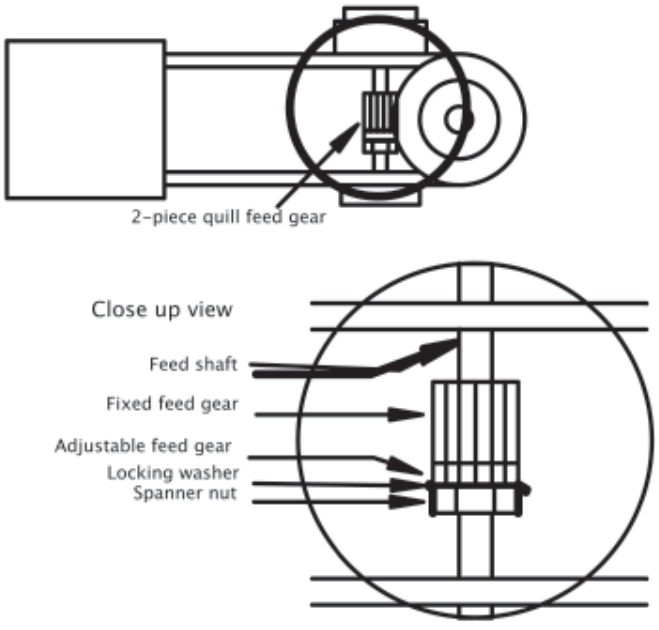


Figure 5.26 Adjusting the quill gear to the quill rack

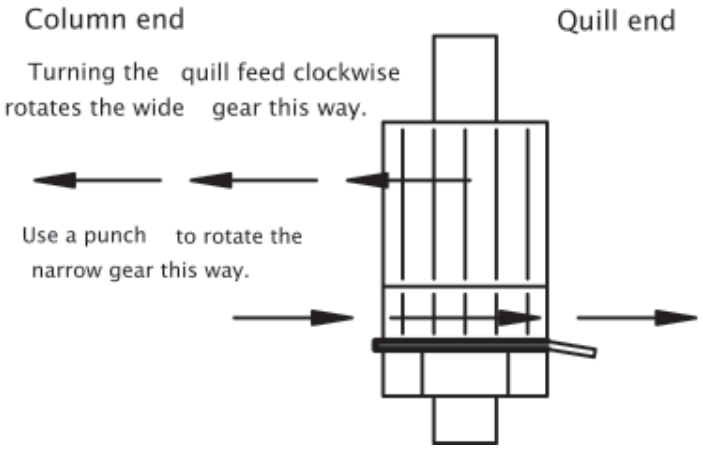


Figure 5.27 Adjusting the quill gear to the quill rack

Step 5: Using the punch and small hammer, tap the narrow movable gear toward the right. This will make the gear assembly appear to have thicker teeth.

Step 6: Tighten the spanner nut with the punch and hammer.

Step 7: With the quill still locked, move the coarse feed handle and check for a reduction in backlash.

Step 8: Bend the locking tab back into one of the slots in the spanner nut.

Adjusting Drive Belt Tension

Adjust the belt tension before using your machine and recheck it periodically.

Adjusting Millhead Belt Tension

Step 1: Remove the millhead cover.

Step 2: Position the roller to the outside of the belt.

Step 3: Loosen the shaft with a wrench on the two flats at the top of the shaft.

Step 4: Position the roller against the flat side of the belt and apply light thumb pressure to tension the belt.

Step 5: Tighten the roller shaft.

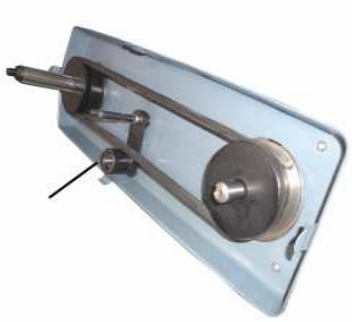


Figure 5.28 Adjusting Millhead Belt Tension

Adjusting Lathe Belt Tension

The lathe-belt tensioner is made up of a Quick Release Handle and the Tension Adjustment Knobs. Raise the Quick Release Handle to apply tension and down to release tension. Proper setting of the tension follows:

Step 1: Raise Quick Release Tension handle all the way up

Step 2: Adjust the tension by turning the knurled knob clockwise to increase tension or counter clockwise to loosen tension. Once the belt tension is adjusted the Quick Release Handle can be used to release and apply tension for positioning belts.

Figure 5.29 Adjusting Lathe Belt Tension - Shown in the down position

Becoming Familiar with Operating Your Smithy Granite

Once the machine has been lubricated and adjusted and before you begin working, take time to become familiar with the operation of your Smithy machine.

Although all Smithy machines are run at the factory, it is wise to put your machine through a break-in run before putting it to work.

Follow the steps below.

Step 1: With the machine unplugged, set the variable speed selector to 0.

Step 2: Set the leadscrew direction selector in neutral and disengage the powerfeed/ thread selector (1-7).

Step 3: Place the lathe/mill clutch selector into the lathe position.

Step 4: Plug the machine into an appropriately grounded circuit.

Step 5: ***GRANITE XT ONLY***

A - Place the forward/reverse into forward position.

B - Place the speed control dial into the zero position.

C - Position the key switch in the off position

D - Rotate the e-stop red button clockwise to make sure it is popped out in the engaged position

E - Turn the key switch to the run position.

F - Turn the speed knob up to start the motor. There is a soft start feature built into the motor system so there may be a 2 to 4 second delay before the motor starts to turn.

Step 6: ***GRANITE CLASSIC, MAX, IMAX*** Push the green button to start the motor. There is an intentional 6 to 8 second delay before the lathe chuck begins turning.

To reverse the motor, **push the red button to stop the motor.** Lift the cover over the rocker switch only after the motor has stopped, and push the rocker switch only after the motor has stopped. Press the rocker switch either up or down to reverse the motor rotation. Set the variable speed selector to zero and then push the green button to start the machine

⚠ CAUTION

Do not change motor rotation until the motor and spindle are fully stopped. Changing directions while the motor is running can damage the motor.

Step 7: Use the variable speed selector to increase the speed gradually to approximately 1000 rpm and let the lathe run for 15 minutes.

Step 8: Turn the variable speed selector to zero and push the red stop button.

Running in the Lathe

Perform these operations to familiarize yourself with lathe operation.

Step 1: Position the carriage and cross-slide table to a mid-range position.

Step 2: Keep the lathe/mill clutch in the lathe position from the previous steps.

Step 3: Position the powerfeed function selector to lathe operation.

Step 4: Position the leadscrew direction selector. This is just an operation check, it doesn't matter if the position is in the clockwise or counter clockwise position.

Step 5: Position the powerfeed/thread selector lever (1-7) in position 7.

Step 6: Position the powerfeed/thread selector lever (I-III) in position III.

Step 7: On the granite XT rotate the stop button clockwise to start the motor. On the granite classic, max or imax push the green start button.

Step 8: Use the variable speed selector to slowly increase motor speed to between 150 and 200 rpm.

Step 9: Engage the half nut engagement lever and observe the longitudinal movement of the carriage assembly. Disengaged the half nut.

! NOTICE !

The half nut engagement lever is used primarily for threading operations and for manual longitudinal feed movement.

Step 10: Move the longitudinal and lateral powerfeed selector to the longitudinal position. (Move the handle to the left and down.) Observe the slower longitudinal movement of the carriage assembly.

Step 11: Move the longitudinal and lateral powerfeed selector to the neutral position.

! NOTICE !

The longitudinal and lateral powerfeed selector is used to move the carriage assembly for all lathe operations except threading.

Step 12: Move the longitudinal and lateral powerfeed selector to the lateral position. (Move the handle to the right and up.) Observe the lateral movement of the cross-slide table.

Step 13: Move the longitudinal and lateral powerfeed selector to the neutral position.

Step 14: Turn the variable speed selector to zero.

Step 15: Push the red mushroom stop switch to stop the lathe.

CAUTION

Figure 5.30 Travel indicator marks

Remain aware of the travel limits, Figure 5.30, during the initial running in. To prevent damage to your machine, do not run the table past the travel indicator marks.

Running in the Mill/Drill

Perform these operations to familiarize yourself with mill and drill press operation.

Step 1: Position the carriage and cross-slide table to a mid-range position.

Step 2: Engage the mill with the lathe/mill clutch.

Step 3: Position the powerfeed function selector to mill operation.

Step 4: On the granite XT rotate the stop button clockwise to start the motor. On the granite classic, max or imax push the green start button.

Step 5: Use the variable speed selector to slowly increase motor speed rpm. Verify that the speed rotation is correct. It the rotation is not correct, the STOP the machine, reverse the toggle switch under the yellow cover on the main switch panel and then restart.

Step 6: Move the longitudinal and lateral powerfeed selector to the longitudinal position. (Move the handle to the left and down.) Observe the slower longitudinal movement of the carriage assembly.

Step 7: Move the longitudinal and lateral powerfeed selector to the neutral position.

Step 8: Move the longitudinal and lateral powerfeed selector to the lateral position. (Move the handle to the right and up.) Observe the lateral movement of the cross-slide table.

Step 9: Move the longitudinal and lateral powerfeed selector to the neutral position.

Step 10: Turn the variable speed selector to zero.

Step 11: Push the red mushroom stop switch to stop the machine.

6 Tooling Installation

Overview

This section contains information on installing tooling for your lathe and mill.

Setting-up Lathe Tooling

There are three main areas to set-up tooling when you are using the lathe portion of your Granite 1300 series tool:

- Lathe Spindle
- Compound Angle Toolpost
- Tailstock

Lathe Spindle

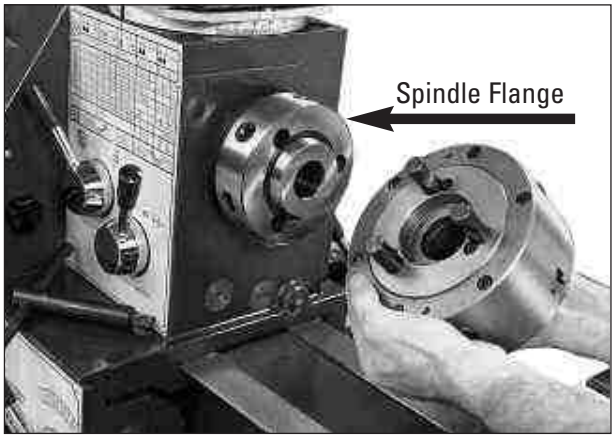


Figure 6.1 D1-4 Lathe Chuck

Any tooling that is mounted to the lathe spindle will use the D1-4 camlock mounting system.

Three studs on each attachment are inserted into matching holes in the lathe spindle. (See figure 6.1 for example.) A camlock socket for each stud is rotated with the lathe chuck key to lock it securely in place. Index marks on the spindle as well as the camlock sockets must be aligned properly for installation or removal of the studs from the holes.

The position of the index marks on the spindle flange and on the tooling should meet at the 12 o'clock position when they are in the unlocked position. Standard rotation is clockwise to lock the studs into postion and counter clockwise to loosen. Each cam should turn approximately 140º to 180º for a secure lock on the stud. Adjustment of stud depths can be made if necessary to obtain proper rotation.

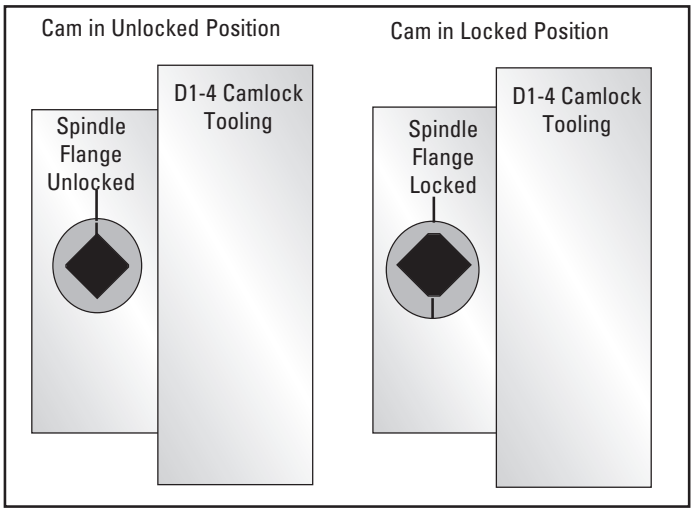


Figure 6.2 D1-4 Lathe Spindle in Locked & Unlocked Positon

Removing D1-4 Camlock Tooling From the Lathe Spindle

Step 1: Protect the ways by placing a wooden board or protective material such as styrofoam on the ways below the lathe spindle.

Step 2: Insert the chuck key provided into each of the three camlock sockets on the spindle nose and turn counterclockwise to the unlocked position.

Step 3: Using a soft mallet, tap the tooling off the spindle.

If you prefer you can also mount a piece of stock in the chuck and then "wiggle" the tooling loose.

⚠ WARNING

When the tooling comes loose, be prepared to support it immediately.

Installing D1-4 Camlock Tooling

Tooling attaches quickly to the lathe spindle with three camlocks.

Step 1: Check the sockets on the spindle flange to make sure the index marks are at the 12 o'clock/unlocked position.

Step 2: Align the three mounting studs to the spindle nose and slide the chuck into place.

Step 3: With the chuck in position, insert the chuck key provided into each

socket on the spindle flange and rotate each camlock clockwise to the locked position. The indicator hashmark on each camlock socket should be somewhere between the 5 and 6 o'clock position.

If the desired rotation on any cam lock cannot be obtained, the mounting studs may need to be adjusted. (See Troubleshooting in chapter 12.)

Tailstock

The tailstock will accept any tooling with a Morse Taper #3 shank or arbor. This type of mount is a friction-fit taper, so it is important that the mounting surfaces be clean and dry. You will need to extend the tailstock barrel approximately 1/2 to 3/4 inches before inserting any tooling, and then firm hand pressure is all that is needed to lock tooling into the taper.

Figure 6.3 Install a plug into MT3 arbors when using them in the tailstock of a Granite machine

! NOTICE !

You can use either the tang or drawbar style arbors, however, it is important that the threaded drawbar hole be plugged with a bolt or setscrew before inserting into the barrel so that the item will be automatically ejected when you retract the barrel.Tang arbors may require the tang to be ground off to allow for proper fit into the tailstock barrel.

Installing Compound Angle Toolpost

The compound-angle toolpost (CATP) is mounted to the top of the cross-slide table using 10mm t-bolts, washers and nuts. You can substitute t-nuts and the proper length studs in place of the t-bolts if desired. Mount the toolpost on the table surface wherever there is a t-slot that allows the tooling to reach your workpiece.

Installing Tooling into the Compound Angle Toolpost

The four-sided turret can hold up to four individual cutters up to a 1/2 inch in size. To insert tooling, loosen the screws on top of the turret with the provided wrench. Insert tooling and tighten the screws again. Each cutter can be moved into place by loosening the top turret lock and rotating the turret counter clockwise 90º. Each cutter in the turret must be adjusted so that the cutting tip is aligned with the center line of the workpiece. This is achieved by installing shims or feeler gauges under the cutter before tightening it in place. An inexpensive source for shims is a set of flat feeler gauges.

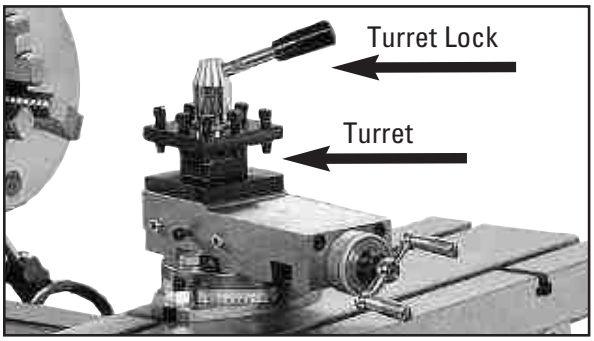


Figure 6.4 Compound Angle Toolpost Installed on Cross-Slide Table

Setting-up Tooling in the Mill/Drill Spindle

This section will explain tool mounting in the mill/drill spindle.

The mill spindle of the Granite 1300 series machines is an R-8 (Bridgeport®) standard. It features a straight shank with a flared nose for centering the tool and a keyway for alignment.

Aligning Tooling

Use the procedure below to align your tooling in the R-8 spindle:

Step 1: Select the appropriate tool or fixture.

Step 2: Wipe the surfaces of the tooling and spindle interior to ensure a proper fit. Grease or debris on either surface will cause misalignment.

Step 3: Align the keyway in your tooling with the key inside the mill spindle and insert the fixture in the lower mill spindle opening.

You can feel the key in the mill spindle with your finger. It is located just beyond the tapered portion of the spindle.

Securing R-8 Tooling with the Drawbar

Use the procedure below for the drawbar:

Step 1: Remove the mill spindle cap located on the top of the mill belt cover and insert a drawbar (SAE standard 7/16-20) from the top of the spindle.

Step 2: Tighten the drawbar clockwise into the fixture or tooling that is inserted into the mill spindle opening. Use the spanner wrench to stabilize the spindle while tightening the drawbar.

Step 3: Use a wrench to apply torque to the drawbar. This will draw the fixture firmly into the spindle.

Step 4: Reinstall the spindle cap when the fixture/tooling is in place.

Figure 6.5 Use the supplied spanner wrench to hold the spindle in place while tightening the drawbar

! NOTICE !

When installing or removing tooling with sharp edges, always cover the sharp edges with a shop towel or appropriate covers or guards to prevent injuries. Always shield yourself appropriately when using hammers.

Removing R-8 Tooling from the Drawbar

Use the procedure below to remove tooling using the drawbar method:

Step 1: Stabilize the drawbar with the spanner wrench and use a wrench to apply force counterclockwise to the drawbar nut.

Step 2: Loosen the drawbar two to three turns counterclockwise.

Step 3: Use a deadblow or brass hammer to strike a downward blow on the top of the drawbar to loosen the fixture from the spindle.

Unscrew the drawbar only two to three turns before striking. Unscrewing it further before striking the drawbar can damage the threads on the drawbar or the fixture.

Step 4: Continue turning the drawbar until it unscrews from the tooling.

Step 5: After the tool is free from the spindle, hold the fixture with your free hand or use a catch box to prevent the tooling from dropping onto your machine or workpiece.

A common catch box consists of a cardboard or wooden box eight to ten inches square with four- to six-inch high sides. Rags loosely thrown in the bottom of the box provide padding for the tool to land in when the drawbar is removed from the fixture and the fixture falls from the mill spindle.

NOTES:

7 Manual Operations

Overview

This section contains information on manual machine operations that are specific to the Granite 1300 series machines. General machining practices can be found in one of the many machining reference books that Smithy carries such as the Home Machinist Handbook, item 10-005. Appendix A includes a machining guide.

General Safety Operations

⚠ CAUTION

For your own safety and the safety of those around you, follow the rules below.

⚠ DANGER

Never leave or walk away from an operating machine.

⚠ DANGER

Do not change motor rotation direction until the motor and spindle are fully stopped. Changing directions while the motor is running can damage the motor.

! NOTICE !

Observe all general safety rules as presented in Chapter 2.

Instructions in this section apply to both lathe and mill operations.

Changing Between Lathe and Mill Operation

The lathe/mill clutch lever is located on the upper front surface of the lathe pulley box. Turning the spindle slowly by hand will help align the drive gears smoothly when engaging the lathe/mill clutch.

To change the position of the selector, pull the knob outward and move the selector to the desired position. There are three positions for the selector.

- The center position is marked with an "O." This is the neutral position where neither the mill or lathe spindle are engaged.

- The right position is marked with a lathe-chuck icon. This position engages the lathe spindle for all lathe operations.

- The left position is marked with a mill-spindle icon. This position engages the mill spindle for all mill operations

Figure 7.1 Lathe/Mill Clutch Shown in the Neutral Position

⚠ WARNING

Turn the machine off and wait for the motor and spindle to stop turning before shifting between positions.

Manual Feeding

Feeding is the act of moving the cutter through the workpiece or moving the workpiece along the cutter while the machine is in operation.

Manual feeding uses a handwheel to move the quill or the carriage and cross-slide table.

When manually feeding your machine, make sure the selector lever (1-7) is not engaged into any position before attempting to manually feed the carriage assembly or cross-slide table.

Position the carriage assembly and table in the mid-range position at the beginning of any setup to ensure the pending operation will not proceed past the mechanical limits of travel on any moveable axis.

Mill/Drill Spindle

When in the mill mode, the rotating cutter can be fed down into the stationary workpiece one of two ways:

- The spindle coarse feed is used for positioning during setup and for feeding drill-press operations.

- The spindle fine feed is used for milling operations and can also be used for drilling where a more precise control of the drill bit may be required.

Coarse Feed Operation

Figure 7.2 Mill/Drill Press Clutch pulled out, engaging the Drill Press

Pull the fine-feed clutch knob outward while slowly rotating the drill press handles back and forth. Once the knob is pulled out, the drill press handles can be used for coarse feeding by rotating the handles clockwise to feed into the workpiece and counter clockwise to feed away from the workpiece.

Fine Feed Operation

Figure 7.3 Mill/Drill Clutch pushed in engaging the Fine Feed

Push the fine-feed clutch knob inward while slowly rotating the drill press handles to engage the fine feed. Turning the fine-feed handwheel allows for slow and precise movement of the spindle up or down. The dial behind the handwheel indicates the amount of vertical movement. The dial is calibrated in 0.001"

There is no powerfeed available for vertical movement of the mill spindle.

Cross-Slide Table and Carriage Assembly

In milling, the crossfeed table and carriage assembly feed the workpiece into the rotating cutter. In lathe work, the same mechanisms move the tool into the rotating workpiece.

Cross-Slide Table

The cross-slide table is moved laterally by rotating the cross-slide handwheel. Rotate the handwheel clockwise to move the cross-slide table away from the

operator or counterclockwise to move it toward the operator.The dial is calibrated in 0.001". One rotation moves the table 0.10".

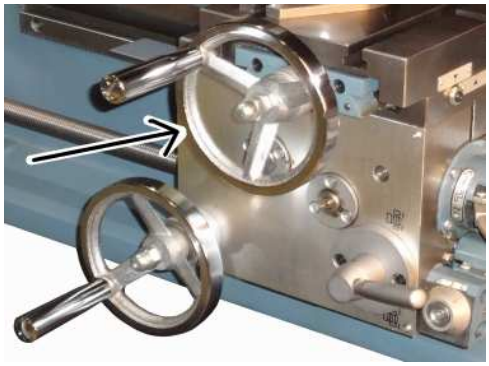


Figure 7.4 The Cross-Slide Table Handwheel

Carriage Assembly

The carriage assembly (crossfeed table and saddle) is moved left and right by the longitudinal handwheel (coarse feed) on the front of the apron or the fine-feed handwheel on the right end of the leadscrew.

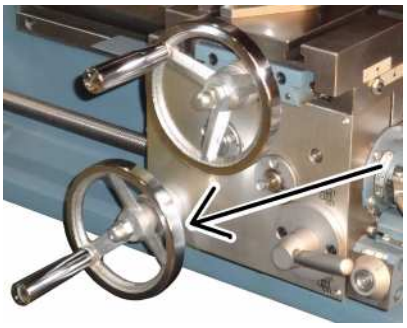


Figure 7.5 Manually moving the carriage assembly for coarse feed

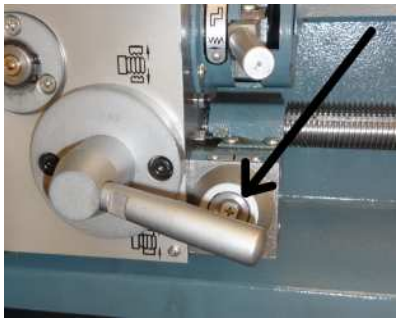


Figure 7.6 Longitudinal Fine Feed Handwheel (Left) & Half-Nut Engaged (Right)

Rotate the handwheel clockwise to move the carriage assembly toward the tailstock end of the machine and counter-clockwise to move the carriage assemble toward the headstock end of the machine.

The longitudinal handwheel is always engaged and movement is measured by the dial behind the handwheel. This feed is typically used for rapid movement of the carriage assembly.

Before using the longitudinal fine feed handwheel disengage Selector Lever (1-7) and the Selector Lever (I-III). Move the half-nut engagement lever to the engaged position (handle pointing down). Turn the leadscrew handwheel to feed the carriage assembly left or right. The movement is measured by the dial on the right end of the leadscrew. This is a very precise feed that is used for most lathe and mill operations.

NOTES:

Speeds and Feeds 8

Overview

Before using the more advance features of your Granite 1300 Series Lathe-Mill-Drill, it is important to have a basic understanding of feeds and speeds. This section contains information on how to set the speed and feeds rates for your machine. We encourage you to learn and understand as much as you can about this fundamental element of machining. A general reference guide such as the Home Machinist Handbook or the Ready Reference are good reference guides to assist you with this task. As always, remember to follow the general safely rules listed below and in Chapter 2 of this manual.

⚠ CAUTION

For your own safety and the safety of those around you, follow the rules below.

⚠ DANGER

Never leave or walk away from an operating machine.

⚠ WARNING

Do not change motor rotation direction until the motor and spindle are fully stopped. Changing directions while the motor is running can damage the motor.

Speed and Feed Rates Defined

Speed is how fast the spindle rotates. Feed rate is how fast the cutter moves along the workpiece.

Speed and feed rates are calculated based on the type of material you are cutting, the size of the material and the type of cutter being used. Refer to the Home Machinist Handbook (Item # 10-005) or Ready Reference (Item #10-015) for more detail. Remember, speed and feed rates are given in a range and you will need to adjust within that range for your machine's size and power.

Setting the Spindle Rotational Speed

Once you have determined the proper speed and feed rate for the material that you are cutting and the type of cutter that you will be using, you will need to setup your machine to cut within the range of the selected speeds and feed rates.

Setting the spindle speed is a two-stage operation consisting of an initial belt position setting and a final adjustment with the variable speed selector on the front of the gearbox.

GRANITE XT, MX, IMX - (see page 8-4 for the Granite Classic)

The belt positions give you three speed ranges and the electronic control gives fine adjustments within the selected range. The variable speed selector dial shows the speeds for each of the three speed ranges. These speeds are applicable to both the lathe and mill spindles.

Step 1: Refer to a machining reference guide such as the Home Machinist Handbook or Ready reference to determine the optimal rotational spindle speed for the materials and tooling you are using.

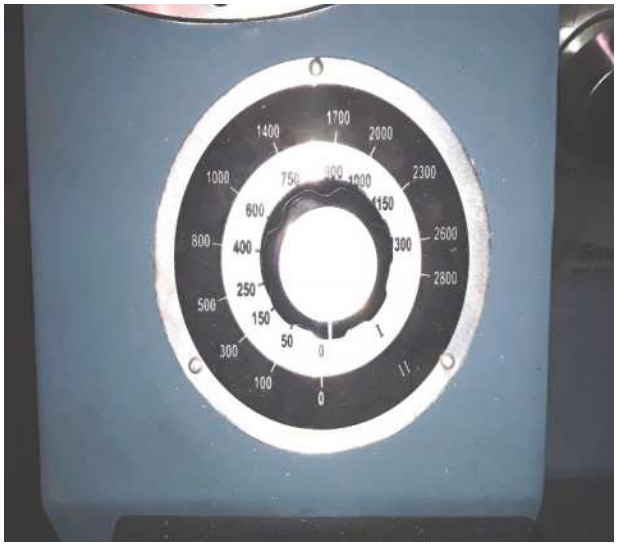
! NOTICE !

Many reference charts give feed and speed rates for high speed steel cutters. Most work today is done with carbide cutters which can cut at much faster rates. If you are using carbide cutters, make sure the charts you are referencing are for carbide cutters.

Step 2: The Granite XT has a digital readout to show the spindle speeds
.

Figure 8.1 Use the Granite Speed Dial for fine adjustments

The Granite MX and IMX have a placard around the speed control knob that shows the speeds in the low and the high speed belt positions. The inner ring of the placard is the slow speed belt position, whereas the outer ring is the high speed position.

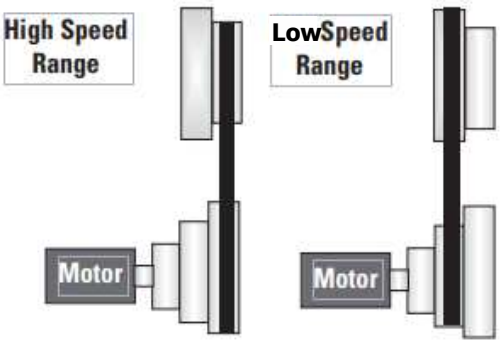


Step 3: Set up the belts as necessary to obtain the desired speed range. The variable speed selector dial can be used to adjust the speed within the range.

HIGH SPEED RANGE SET-UP (Excluding Granite Classic)

Use the procedure below to set up for high speed (500-2800 RPM) operations.

Step 1: Release the belt tensioned at the motor by rotating the tension lever down.
Step 2: Position the belt around the largest sheave of the motor and the smallest sheave on the spindle pulley.
Step 3: Create tension in the belt by rotating the tension lever on the motor all the way upwards.



LOW SPEED RANGE SET-UP (Excluding Granite Classic)

Use the procedure below to set up for low speed (100-1500 RPM) operations.

Step 1: Release the belt tensioned at the motor by rotating the tension lever downwards.
Step 2: Position the belt around the smallest sheave of the motor and the largest sheave on the spindle pulley.
Step 3: Tension the belt by rotating the tension lever on the motor all the way up.

GRANITE CLASSIC ONLY

The Granite Classic does not have a constant torque motor like the MX, IMX and XT machines. To produce torque at low speeds the two belt drive must be used. This is why the Classic has an idler or speed reduction pulley located between the spindle and the motor.

The belt positions give you three speed ranges and the electronic control gives fine adjustments within the selected range. The variable speed selector dial shows the speeds for each of the three speed ranges. These speeds are applicable to both the lathe and mill spindles.

! NOTICE !

The life of the electrical system will be greatly extended and available machine torque increased by using the lower pulley setting and keeping the motor speed up.

High Range-Speed Set-up (Granite Classic Only)

Use the procedure below to set up for high speed (1500 to 3000 RPM) operations.

Step 1: Release the belt tensioned at the motor by rotating the tension lever downwards.

Step 2: Position the belt around the largest sheave of the motor and the smallest sheave on the spindle pulley.

Step 3: Tension the belt by rotating the tension lever on the motor all the way up.

Mid Range-Speed Set-up (Granite Classic Only)

Use the procedure below to set up for middle speed (400 to 1500 RPM) operations.

Step 1: Release the belt tensioned at the motor by rotating the tension lever downwards.

Step 2: Position the belt around the center sheave of the motor and the largest sheave on the spindle pulley.

Step 3: Tension the belt by rotating the tension lever on the motor all the way up.

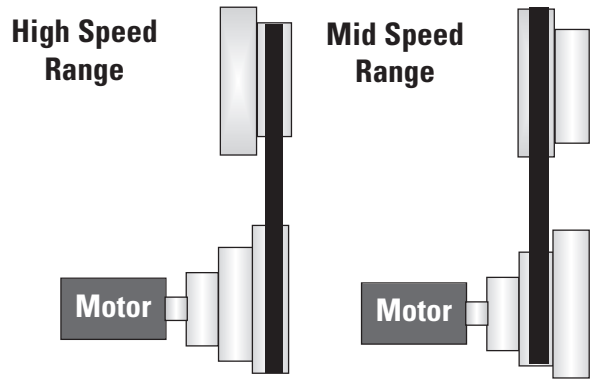


Figure 8.2 The high & mid-speed ranges only require the use of one belt

Low Range-Speed Set-up (Granite Classic Only)

For low-speeds (optional on early machines), you must convert to a double drive belt configuration. Use the procedure below to set up for low speed (400 RPM or less) operations.

Step 1: Release the belt tensioned at the motor by rotating the tension lever down.

Step 2: Remove the belt from the motor pulley by following steps 3-6 below.

Step 3: Loosen the cap screw on the shaft of the lathe/mill clutch inside the pulley box and pull the selector lever outward to move the shifter fork arm away from the shifter fork.

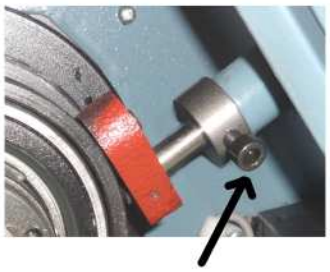


Figure 8.3 Loosen the cap screw from the lathe-mill clutch lever

Step 4: Slide the single belt off the spindle pulley and the end of the main drive spindle.

Step 5: Loosen the bolt that holds the gear quadrant and the reduction pulley bracket in place. This will allow the two belts you are about to install to be properly tensioned.

Step 6: Place the larger of the two belts on the smallest motor pulley sheave and on the largest pulley sheave of the speed reduction pulley. Place the smaller belt on the smallest sheave on the speed reduction pulley and the largest sheave on the main drive spindle pulley.

Figure 8.4 Loosen the bolt of the speed reduction pulley bracket when installing belts for the low speed

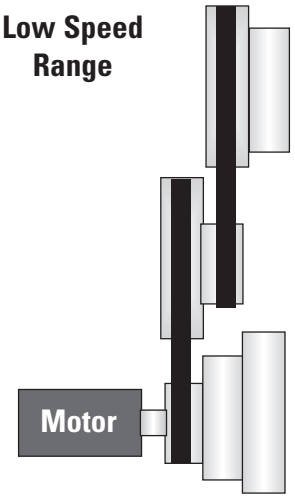
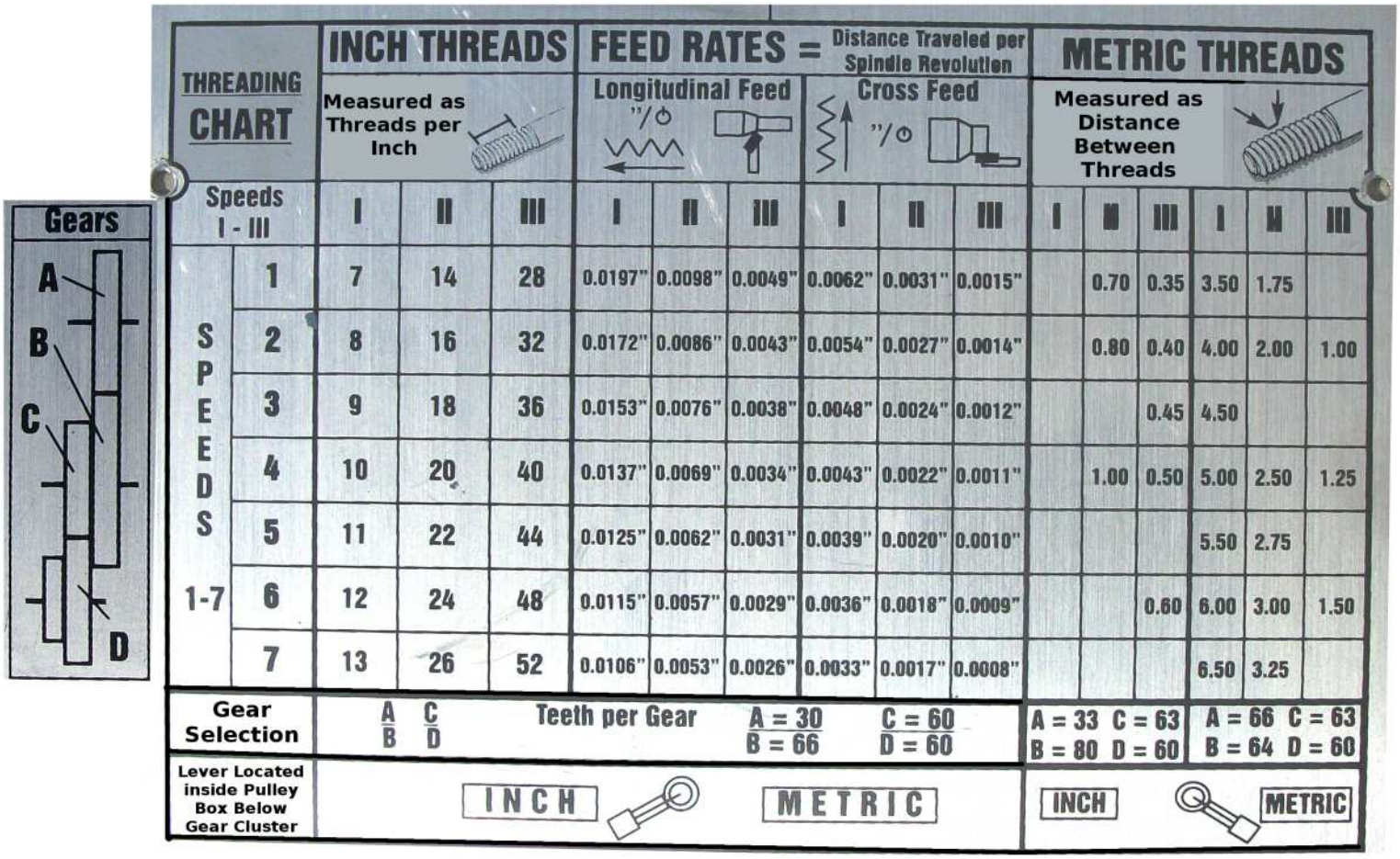


Figure 8.5 Low Range Belt Setting

Step 7: Tension the belts by rotating the tension lever on the motor all the way up. Tighten the bolt on the gear quadrant to lock the quadrant and the reduction pulley in place.

Step 8: Reassemble the lathe/mill selector arm and tighten the cap screw to secure the selector shaft in place.



THREADING CHART

Speeds I - III		INCH THREADS Measured as Threads per Inch			FEED RATES = Distance Traveled per Spindle Revolution: Longitudinal Feed			Cross Feed			METRIC THREADS Measured as Distance Between Threads					
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
SPEEDS 1-7	1	7	14	28	0.0197"	0.0098"	0.0049"	0.0062"	0.0031"	0.0015"		0.70	0.35	3.50	1.75	
	2	8	16	32	0.0172"	0.0086"	0.0043"	0.0054"	0.0027"	0.0014"		0.80	0.40	4.00	2.00	1.00
	3	9	18	36	0.0153"	0.0076"	0.0038"	0.0048"	0.0024"	0.0012"			0.45	4.50		
	4	10	20	40	0.0137"	0.0069"	0.0034"	0.0043"	0.0022"	0.0011"		1.00	0.50	5.00	2.50	1.25
	5	11	22	44	0.0125"	0.0062"	0.0031"	0.0039"	0.0020"	0.0010"				5.50	2.75	
	6	12	24	48	0.0115"	0.0057"	0.0029"	0.0036"	0.0018"	0.0009"			0.60	6.00	3.00	1.50
	7	13	26	52	0.0106"	0.0053"	0.0026"	0.0033"	0.0017"	0.0008"				6.50	3.25	
Gear Selection		A/B C/D			Teeth per Gear			A = 30 B = 66		C = 60 D = 60	A = 33 B = 80		C = 63 D = 60	A = 66 B = 64		C = 63 D = 60
Lever Located inside Pulley Box Below Gear Cluster		INCH			METRIC						INCH			METRIC		

Feed Chart Explained

Before setting the feed rates, it is important to know how to correctly read the feed rate and threading chart found on the headstock of your Granite 1300 series machine.

IMPORTANT!

"Do NOT change selector handle positions while the machine is running. Please stop the machine while changing feed directions, gear selections, feed-rate selections, etc."

The left side of the chart shows gear cluster positions inside the pulley box.
There are 4 gears in the powerfeed cluster:

- "A" gear is the top gear and is on a shaft by itself. "A" gear touches "B" gear.

- "B" and "C" gear are on the same shaft. "B" gear is on the shaft first and touches "A" gear above it. " C" gear is the outermost on the shaft and touches "D" gear below it.

- "D" gear is on the shaft that provides power to the quick change gear box on the front of the machine. The "D" gear touches the "C" gear above it.

There are 3 main vertical columns:
-Inch threads
-Feed rates
-Metric threads

INCH THREADS
You have a selection of 21 different imperial (inch) threads the machine will cut. This section will show the selector positions and gear sizes required for cutting these threads.

For example, if you desire to cut a 16 thread per inch:

- You would first locate the 16 in the inch thread portion of the chart

- Go up from the 16 and you will see the roman numeral "II." This is the position required for the "I" - " II" - "III" selector on the front of the quick change gear box.

- Go to the left of the 16 and you will see Speed 2. This is the required position of the 1 through 7 selector on the quick change gear box.

- Go down from the 16 and you will see the gear selection required in the powerfeed gear cluster. "A" will be 30, "B" will be 66, "C" will be 60, and "D" is always 60 (you cannot change it).

- Below the gear selection is the Inch/Metric selector. It must be pushed inward toward the machine.

Section four and five of the chart list the metric thread pitches when using the following gear set-up:

Section 4	Section 5
A=33	A=66
B=80	B=64
C=63	C=63
D=60	D=60

Changing gears will be covered in the Threading chapter.

Sample Settings

Here are a couple of examples to illustrate the speed/feed chart.

Example 1
Settings to thread 10 threads per inch.

In section 1, locate number 10. Follow the row over to the column next to the meshing gears which is the number 4. Follow the column up to the Roman Numerals which is Roman Numeral I. To cut this thread you will need:

1. Selector lever (1-7) in position 4
2. Selector lever (I-III) in position I
3. 30 tooth gear in position A
4. 66 tooth gear in position B
5. 60 tooth gear in position C
6. 60 tooth gear in position D.
7. Set the Inch/Metric selector, found in the pulley box, to Inch.

Example 2
Setting to move the carriage assembly 0.0069 in per spindle revolution.

Locate the rate 0.159 in section 2. Follow the row over to the column next to the diagram of the meshing gears which is 5. Follow the column up to the Roman Numerals which is II. To feed your carriage at this rate you will need to:

1. Selector lever (1-7) in position 5
2. selector lever (I-III) in position II
3. 30 tooth gear in position A
4. 66 tooth gear in position B
5. 60 tooth gear in position C
6. 60 tooth gear in position D.
7. The Inch/Metric selector found in the gear box would need to be set to Inch.

These example settings will aid you in correctly setting up your machine for powerfeeding which will be covered in the next section of this manual.

! NOTICE !

The feed chart on older machines is in millimeters per spindle revolution.

NOTES:

9 Using Powerfeeds

Overview

The previous section of this manual explained speeds and feed and how they are determined. This section will give you step by step instructions for using the powerfeed on your Granite 1300 series lathe-mill-drill.

General machining practices can be found in the one of the many machining reference books that Smithy carries such as the Home Machinist Handbook, item 10-005.

General Safety Operations

⚠ CAUTION

For your own safety and the safety of those around you, follow the rules below and those listed in chapter 2 of this manual.

⚠ DANGER

Never leave or walk away from an operating machine.

⚠ CAUTION

Do not change motor rotation direction until the motor and spindle are fully stopped. Changing directions while the motor is running can damage the motor.

Powefeeding Defined

Power feeding is using the motor and gear train of the machine to provide power to move the cross-slide table and carriage assembly along the X and Y-axes.

The carriage can be moved longitudinally and the cross-slide table laterally using the powerfeed capabilities of the machine. Power feeding will give a more uniform finish on the workpiece and is available for both milling and lathe work.

⚠ CAUTION

The two-position powerfeed function selector must be in either the lathe or mill position according to which machine function is being used at the time.

Figure 9.1 Always match the Powerfeed Function lever to the appropriate operation

! NOTICE !

If the mill/lathe clutch is in the mill position, you must also position the powerfeed function selector in the mill position to enable the machine to move the table.

The powerfeed operates in either the x- or y-axis. It incorporates the quick change gear box by engaging the Selector Lever (1-7) and Selector Lever (I-III) as well as the carriage gearing by engaging the powerfeed lever into the proper position.

Figure 9.2 Selector Lever (1-7) & Selector Lever (I-III)

The powerfeed engagement lever is located on the upper right side of the apron and has a three-position gate with neutral, longitudinal (x axis) and cross feed (y axis). The powerfeed engagement lever can be operated while the machine is running.

Figure 9.3 Powerfeed Engagement Lever Shown with Y-Axis powerfeed engaged

Engagement of the x axis is achieved by moving the lever to the left and pushing down and the engagement of the y axis is to the right and lifting up.

DANGER

Don't allow the table to move beyond the travel limitations. Before running the powerfeed, do a "dry run" by manually feeding the cross-slide table and carriage assembly the distance that you will be feeding your project. This will prevent any unnecessary crashes that can cause serious damage to your machine.

Figure 9.4 Half Nut Disengaged

! NOTICE !

When using the X-Axis powerfeed for a given feed rate, make sure the the half nut is DISENGAGED.

! NOTICE !

If the powerfeed lever will not engage, first check the half-nut lever. The powerfeed will not engage if the half-nut is engaged (down position). You may also have a situation where the teeth on the respective gears are not meshing. Rotate the leadscrew handwheel slightly to allow the teeth to mesh.

The Jog Knob

The chrome knurled knob located on the upper right side of the gearbox can be used to manually turn the gear shafts and allow the straight cut gears to mesh easier when moving the powerfeed selector levers.

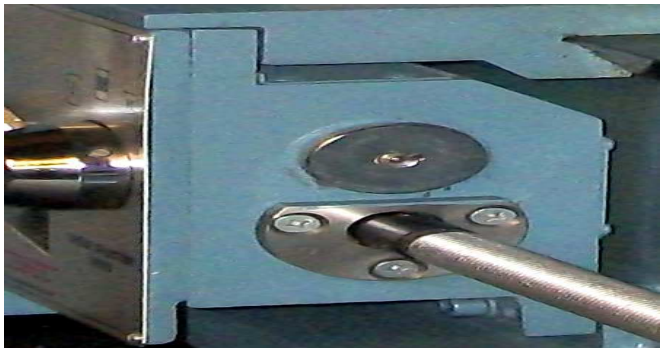


Figure 9.5 Jog Knob

Step-By-Step Lathe Powerfeeding

Step 1: Determine the proper speed and feed rate for the material you are cutting and the cutter you will be using from a general reference guide such as the Machinist Ready Reference.

Step 2: With your workpiece and tooling properly mounted, place the power-feed selection lever in the lathe mode by moving the lever to the lathe chuck icon all the way to the left.

Step 3: Referencing the chart on the front of the machine's headstock, find the desired feed rate (or the closest to the listed range for your work material cutter.) See section 8 for a detailed chart explanation.

Step 4: Position the selector (1-7) into the position listed on the chart for the desired feed rate.

Step 5: Position the selector (I-III) into the position listed on the chart for the desired feed rate.

Step 6: Set the recommeded speed for the work stock material and cutter that you are using. (See chapter 8 for setting speeds.)

> **! NOTICE !**
>
> For optimum performance, be certain to set the belts to run in the upper portion of the suggested spindle rotation speed range.

Step 7: Before running the powerfeed do a "dry run" by manually feeding the cross-slide table and carriage assembly the distance that you will be feeding your project. Also, rotate the chuck by hand to verify tool clearances. This will prevent any unnecessary crashes.

Step 8: Once your speed has been set start the machine and engage the powerfeed selector into the desired position. (Pushing the lever up will run the powerfeed along the Y-Axis. Pushing the lever down will engage the X-Axis powerfeed.)

Step 9: To stop powerfeeding, disengage the powerfeed by moving the lever into the neutral position which is half way between the Y-Axis and X-Axis engagement.

Step I0: If you wish to reverse the direction of your cut,stop the machine and move the leadscrew rotation lever into the opposite direction. Restart the machine and engage the powerfeed selector lever.

Step-By-Step Mill Powerfeeding

Step 1: Determine the proper speed and feed rate for the material your cutting and the cutting material you will be using from a general reference guide such as the Machinist Ready Reference.

Step 2: With your workpiece and tooling properly mounted, place the powerfeed selection lever in the mill mode by moving the lever to the mill spindle icon all the way to the right. (Reference figure 9.1 above.)

Step 3: Referencing the chart on the front of the machine's headstock, find the desired feed rate (or the closest to the listed range for your work material and cutter.)

Step 4: Position the selector (1-7) into the position listed on the chart for the desired feed rate.

Step 5: Position the selector (I-III) into the position listed on the chart for the desired feed rate.

Step 6: Set the recommended speed for the work stock material and cutter that you are using. (See chapter 8 for setting speeds.)

> **! NOTICE !**
>
> For optimum performance be certain to set the belts to run in the upper portion of the suggested spindle rotation speed range.

Step 7: Before running the powerfeed do a "dry run" by manually feeding the cross-slide table and carriage assembly the distance that you will be feeding your project. This will prevent any unnecessary crashes.

Step 8: Once your speed has been set start the machine and engage the powerfeed selector into the desired position. (Pushing the lever up will run the powerfeed along the Y-Axis. Pushing the lever down will engage the X-Axis powerfeed.)

Step 9: To stop powerfeeding, disengage the powerfeed by moving the lever into the neutral position which is half way between the Y-Axis and X-Axis engagement.

10 Threading

Overview

This section of your manual covers threading operations on your Granite 1300 series lathe-mill-drill. This section will build the information presented in chapters 8 and 9. If you have not read these sections, please do so before continuing.

General Safety Operations

⚠ CAUTION

For your own safety and the safety of those around you, follow the rules below and those listed in chapter 2 of this manual.

⚠ DANGER

Never leave or walk away from an operating machine.

⚠ CAUTION

Do not change motor rotation direction until the motor and spindle are fully stopped. Changing directions while the motor is running can damage the motor.

Leadscrew Safety Clutch Adjustment

Before begining your threading operation, note the leadscrew safety clutch may need to be adjusted.

The lead screw safety clutch is functioning in the threading mode. It will slip to prevent damage to the machine apron if the carriage is accidentally run into the head of the machine.

NOTE: The clutch will not prevent damage if the carriage or cross-slide table pass the end of their mechanical limits

The clutch assembly is located inside the lathe pulley box. It is a round flat nub in the change gear shaft with the "D" gear. There are six setscrews above the springs and ball bearings located radially around the clutch in front of the gear. The setscrews screw inward toward the center of the clutch.

Figure 10.1 Leadscrew Safety Clutch

If slippage occurs during your threading operation adjust the safety clutch by turning each setscrew one at a time, a half turn each time until the clutch is solid and no slippage occurs . Do not bottom the screws completely or the clutch will not work.

An approximate initial setting is when the set screws have two or three threads exposed from the surface of the clutch housing.

Basic Threading

Refer to a machining reference guide such as the Machinist Ready Reference for threading theories and spindle speeds based on the material type and diameter that you will be machining.

Step 1: Select the thread pitch which you want to cut from the chart located on the headstock of your Granite series machine (The is also reprinted on page 8-5 of this manual.) Chose the desired pitch from the chart and follow the horizontal row and vertical columns to set the correct positions for selector levers (1-7) and selector lever (I-III).

Figure 10.2 Selector Lever (1-7) & Selector Lever (I-III)

Step 2: Consult the thread chart on the headstock support column for the thread pitch that you wish to cut. The bottom row of the chart will show you the gear set-up inside the pulley box that is required to cut the desired thread pitch.

Step 3: If changing the gear set-up is necessary to achieve the desired thread pitch, follow the procedure under the title "Changing Gears" in the next section.

Changing Gears

Step 1: The A gear is secured with a bolt and washer assembly and the location is fixed. To remove the gear remove the bolt and washer.

Step 2: The B and C gears share the same shaft and are secured with a snap ring. Remove the snap ring from the shaft to remove the gears.

Step 3: Place the proper gear in the A position for cutting the desired thread pitch. Reinstall the washer and bolt.

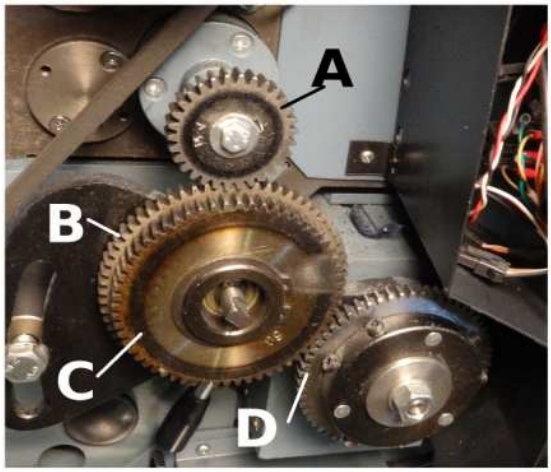


Figure 10.3 Make certain that your gears are properly set-up to obtain the desired thread pitch

Step 4: The shaft for the B/C gears mounts on a slotted plate to adjust for the different diameters of the gears. There are two flats on the end of the shaft to loosen and tighten the assembly to allow for adjustment. Adjust the B/C gear shaft as needed to accommodate the B and C gears needed for cutting your desired thread pitch.

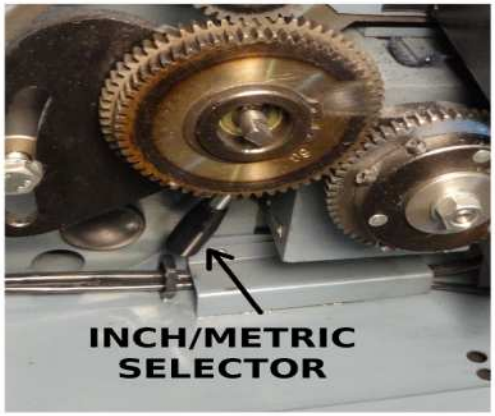


Figure 10.4 Inch/metric Selector located inside the pulley box

Step 5: Loosen the hex head bolt. This allows the assembly to drop down.

Step 6: Position the installed B/C gear unit to mesh with the D gear.

Step 6: Rotate the gear assembly until the B gear meshes with the A gear. Lock the assembly in place by tightening the hex head bolt.

The hex head bolt also tensions the speed reduction pulley support arm. Be sure the belts are in the appropriate position before tightening the hex head bolt.

Cutting Inch Threads

Step 1: Select the desired thread pitch that you wish to cut from the chart located on the headstock of the Granite 1300 series lathe-mill-drill.

Step 2: Engage selector levers (1-7) and selector lever (I-III). Remember, you can use the jog knob located on the right side of the gear box to help align the gears if the levers are difficult to engage.

Step 3: Check the gear set-up inside the pulley box to confirm the gearing is set-up correctly to cut your desired thread pitch. If the gears are not correct, change gears using the previous procedure.

NOTE: The default factory setting is for cutting inch, SAE, threads.

Step 4: Confirm that your belts inside the pulley box are properly set-up to reach the recommended spindle speed for cutting your work piece material with your specific cutter.

Step 5: Set your compound angle toolpost to 29-1/2º and install the E8 carbide bit that came with your machine.

Step 6: Inside the pulley box at the left lower side of the gear cluster is the inch/metric lever, which must be pushed away from you for inch threading.

Step 7: Turn your machine on and adjust variable speed to the recommended speed.

Step 8: Once you have made all of your tooling and machine settings, you are ready to begin the first pass. Set the dials on the compound angle toolpost and cross-slide table to zero. Move the compound angle toolpost into the desired position and feed the cutter into your workpiece using the small CATP feed handle. Watch the threading dial rotate until one of the numbers is just about to the reference mark. At this point apply firm constant downward pressure on the half-nut engagement lever until you feel the lever drop into position and the carriage begins to move. (More information to follow on the threading dial.)

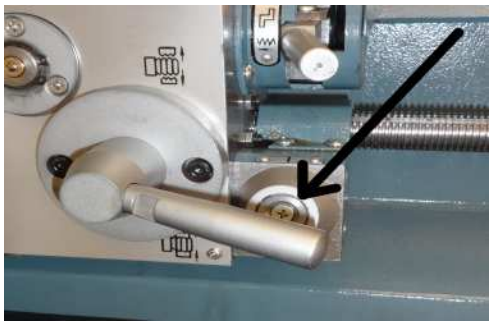


Figure 10.5 Half Nut Engaged

Step 9: When you reach the end of the first cut, lift up on the half-nut engagement lever, back the cutter out using the CATP feed and return the cutter to the starting point.

Step 10: Feed the cutter in the desired amount for the next cut, wait for the same number as before to come up on the dial and engage the half nut. Continue making passes until you have completed the full depth of cut.

Using the Threading Dial to Cut Inch Threads

The threading dial is used for cutting inch threads only. Special procedures for cutting metric threads can be found in the section under " Cutting Metric Threading" on the next page.

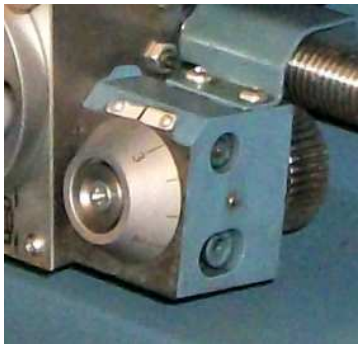


Figure 10.6 Note the number on the threading dial as your halfnut engages

The threading dial is a mechanical indicator for engaging the cutter at the exact same point for each consecutive pass. The numbers on the dial have no specific reference to pitch, but they provide a reference point so you can start at the earliest available point and use the same number again for each consecutive pass.

Note: When the carriage is moving and the half nut is engaged, you will notice that the dial no longer rotates. This is normal.

Cutting Metric Threads

Step 1: Select the desired thread pitch that you wish to cut from the chart located on the headstock of the Granite 1300 series lathe-mill-drill.

Step 2: Engage selector levers (1-7) and
selector lever (I-III). Remember, you can use the jog knob located on the right side of the gear box to help align the gears if the levers are difficult to engage.

Step 3: Check the gear set-up inside the pulley box to confirm the gearing is set-up correctly to cut your desired thread pitch. If the gears are not correct, change gears using the previous procedure.

Step 4: Confirm that your belt set-up inside the pulley box is properly set-up to reach the recommended spindle speed for cutting your work piece material with your specific cutting tool material.

Step 5: Set your compound angle toolpost to 29-1/2º and install the E8 carbide bit that came with your machine.

Step 6: Inside the pulley box at the left lower side of the gear cluster is the inch/metric lever, which must be pulled toward you for metric threading.

Step 7: Turn your machine on and adjust the variable speed to the recommended rpm.

Step 8: Once you have made all of your tooling and machine settings, you are ready to begin the first pass. Apply firm constant downward pressure on the half-nut engagement lever until you feel the lever drop into position and the carriage begins to move.

.

Step 9: Do not disengage the half nut at the end of the pass, stop your machine and reverse the feed direction. Rotate the handle on the compound angle toolpost counter clockwise to back out your cutter.

Step 10: Restart your machine and bring the cutter back to is original position. Stop your machine, reverse the direction again.

Step 11: Feed the cutter in the desired amount for the next cut using the CATP and restart your machine. Continue this process until you have reached the desired depth of cut.

11 Machine Maintenance Schedule

Overview

To keep your Smithy Granite machine running at optimum performance, follow this basic maintenance schedule:

Before Each Use

1. Make sure your work area is clean and free of all obstructions.

2. Clear machine cross-slide table, bed ways and tool post of all chips built up from your previous job.

> **⚠ CAUTION**
>
> Do not clear chips by hand. Metal chips are very sharp and can easily cut your hand. Use a brush or shop vaccum to clear chips.

3. Oil all oil buttons.

4. Clean tailstock barrel taper and mill spindle taper with a clean shop towel.

5. Check the oil site gauge under the lathe chuck and add oil if the level is below the half-way point.

6. Check all tooling and holding devices for tightness before you turn on the machine.

7. Check the condition and tension of the drive belts.

After Each Use

1. Clean chip build up from machine.

2. Brush chips off the longitudinal feed screw.

3. Remove any excess cutting fluid that may have accumulated on the machine.

4. Apply protective oil coating to all bare metal surfaces that may rust or corrode.

10 Hours (Daily)

1. Clean chip build up from machine.

2. Brush chips off the longitudinal feed screw.

3. Check the oil site gauge under the lathe chuck and add oil if the level is below the half-way point.

4. Oil all oil buttons

25 Hours (Monthly)

1. Check the oil site gauge under the lathe chuck and add oil if the level is below the half-way point.

2. Oil all oil buttons

3. Apply a light coating of oil to the outside of the mill spindle and the top of the mill spindle splines.

4. Lubricate the change gears in the lathe pulley box with an aerosol chain lubricant.

5. Lubricate the inside of the quick change gearbox with an aerosol chain lubricate by spraying through the openings in the front of the gearbox.

6. Remove and clean the lathe chuck and the spindle nose. Lubricate the chuck and the cam locks with oil.

7. Check all gib adjustments.

8. Check and adjust backlash as necessary.

9. Check the condition of all drive belts and replace if necessary.

100 Hours (Yearly)

1. Change oil in the headstock.

2. Remove the X and Y-Axis gibs and clean with solvent. Coat gibs with way oil and reinstall.

12 Troubleshooting

Powerfeed and Thread Cutting

1. Powerfeed does not move carriage

Cause	*Solution*
• Carriage locked	• Unlock carriage
• Speed selector not engaged	• Select speed I or II or III, engage drive selector
• Sheared pin	• Replace pin
• Gears not meshing or teeth missing	• Check gears and adjust
• Inch/metric lever in neutral	• Engage fully

2. Cut is not smooth

Cause	*Solution*
• Tool dull	• Sharpen or replace tool
• Tool not on center	• Center tool (shim, if needed)
• Tools not mounted tightly in post	• Remount tools
• Cross-slide gibs to bed and base loose	• Adjust gibs
• Gibs in toolpost loose	• Adjust gibs in toolpost
• Tool turret not tight	• Tighten toolpost
• Feed rate too fast	• Choose correct setting
• Gear loose	• Tighten gears and posts

3. Thread is not smooth

Cause	*Solution*
• Tool dull	• Sharpen tool
• Tool not centered	• Center tool
• Tools not mounted tight in post	• Remount tool
• Cross-slide gibs to bed and base loose	• Adjust gibs
• Gibs in compound loose	• Adjust gibs
• Tool turret not tight	• Tighten toolpost
• Gears loose	• Tighten gears and posts

4. Tools is not cutting "on thread"

Cause	*Solution*
• Powerfeed slipping	• Engage halfnut fully
• Clutch slipping	• Tighten screws (6)

Carriage/Milling Table

1. Table won't move

Cause	*Solution*
• Table locks engaged	• Loosen locks
• Gibs too tight	• Loosen gibs

2. Horizontal and vertical movement in cross-slide table

Cause	*Solution*
• Carriage gib improperly adjusted	• Adjust carriage gib
• Table gib improperly adjusted	• Adjust table gib

3. Carriage moves smoothly in only one direction

Cause	*Solution*
• Debris on way or gib	• Remove debris
• Burr on gib	• Remove burr with fine file
• Gib improperly tensioned	• Loosen gib and re-tension
• One or more wipers mounted too low	• Reposition wiper(s)

4. Cross-slide handwheel turns during cutting operations

Cause	*Solution*
• Cross-slide brass nut worn	• Tighten or replace brass nut
• Carriage lock not tight	• Tighten carrriage locks
• Gibs too loose	• Readjust gibs

5. Too much backlash in the cross-slide

Cause	*Solution*
• Loose screw	• Tighten screw, review how to eliminate backlash
• Loose brass nut	• Put a shim between the stud on the nut and the side of the hole
• Worn brass nut	• Replace brass nut or adjust screw at end of nut
• Excessive space between bearing	• Add shim washer and dial

Lathe Turning

Cause	*Solution*
• Tool dull	• Sharpen or replace tool
• Tool not ground properly	• Regrind tool
• Tool at wrong angle	• Correct tool position
• Tools not held tightly	• Tighten toolholder
• Wrong cutter for material	• Use correct cutter
• Cutting speed incorrect	• Increase or reduce speed

2. Work has unwanted taper

Cause	*Solution*
• Work improperly aligned	• Realign centers on work
• Debris in spindle, setup, or tools	• Clean and reset setup, work, or tool
• Offset tailstock incorrectly positioned	• Correct position of tailstock
• Spindle bearings loose	• Tighten taper bearings to return to alignment, replace spindle bearings

3. Machine vibrates

Cause	*Solution*
• Work mounted wrong	• Remount work
• Speed too high	• Reduce Speed
• Too much pressure at tailstock	• Reduce pressure and increase lubrication

4. Work stops turning but machine continues to run

Cause	*Solution*
• Work not mounted securely	• Remount work
• Tools forced into work/ excessive cut	• Reduce force on tools
• Belts slipping	• Tension belts, use belt dressing, or replace belts

5. Diameter of work is not consistent

Cause	*Solution*
• Too much flex in workpiece	• Use a follow rest, use tailstock center
• Too much flex compound rest, cross slide, or carriage	• Tighten gibs, clean ways

6. Too much backlash in the compound

Cause	*Solution*
• Loose spanner nuts	• Tighten spanner nuts
• Worn Nut	• Replace nut

7. Machine slings oil from behind the chuck or in belt box

Cause	*Solution*
• Oil reservior overfilled	• Check oil lever
• Worn oil seal	• Replace felt in seal

Milling

1. Tool chatter

Cause	*Solution*
• Gibs too loose on cross slide, compound, or carriage	• Readjust gibs
• Unused feeds not locked	• Lock all axes but the one moving
• Millhead not locked	• Lock millhead
• Quill too loose	• Tighten quill lock
• Tool not on center	• Center tool
• Improper tool shape, tool dull	• Reshape, sharpen, or replace tool
• Feed too light or slow	• Adjust feed rate

2. Depth of cut is not consistent

Cause	*Solution*
• Quill moving	• Lock quill
• Setup wrong	• Make sure setup is parallel to table

Drilling

1. Hole is off center or bit wanders

Cause	*Solution*
• Bit dull	• Use sharp bits
• Bit not mounted correctly in chuck	• Remount tool
• Bit bent	• Replace bit
• Chuck loose in spindle	• Remount chuck on arbor
• Drawbar not secured	• Tighten drawbar
• Debris on spindle	• Clean debris and arbor and remount tool
• Bearing loose or worn	• Tighten or replace bearings

• Cutting too fast	• Reduce speeed
• Incorrect bit	• Use correct bits
• No pilot hole	• Drill small pilot hole

2. Entrance hole is out of round

Cause	*Solution*
• Bit dull	• Use sharp bit
• Incorrect drill bit	• Use correct drill bit

3. Bit turns erratically or stops

Cause	*Solution*
• Bit fed into work too fast	• Reduce feed rate
• Belts slipping	• Reduce feed rate, re-tension belts

4. Chuck is difficult to tighten or loosen

Cause	*Solution*
• Chuck sticking	• Apply lubricant
• Debris in chuck	• Clean chuck

5. Chuck wobbles

Cause	*Solution*
• Chuck loose on arbor	• Clean arbor and remount
• Drawbar not tight	• Clean spindle and replace drawbar

Drive System

1. Turn on the machine and nothing happens

Cause	*Solution*
• Breaker Blown	• Re-set circuit breaker
• Machine unplugged	• Plug in the machine
• Loose electrical connections	• Tighten wiring connections
• Electrical components bad	• Replace defective parts

2. Motor and pulleys turn, but not lathe or mill

Cause	*Solution*
• Mill or lathe not selected	• Select proper function

Chuck and Accessories

If the chuck does not seat properly.

Adjusting the chuck mounting studs

The D1-4 mounting system used on all Granite machines consists of three adjustable studs mounted on the chuck and three rotating cam locks on the spindle flange. This is a very fast and accurate method of chuck mounting; however, there are some adjustments to be made to insure optimum fit and accuracy.

Removing the chuck

1. The first step in removing the chuck is to place a piece of wood on top of the machine bed underneath the chuck. This will protect the bed if the chuck accidentally slips out of your hand and falls onto the machine.

2. There is an alignment mark on each cam and on the spindle flange adjacent to each cam. Using the chuck key, turn the cam counter clockwise until the two marks align with each other as shown below.

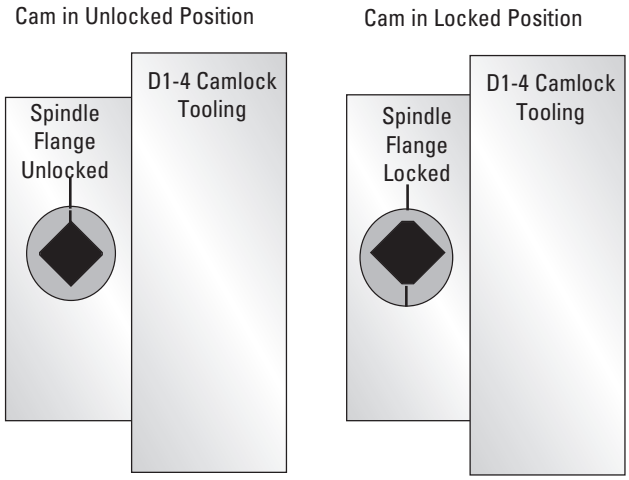


Figure 12.1 D1-4 Lathe Chuck in Locked & Unlocked Position

3. Position all three cams in the unlocked position, put your right hand under the chuck for support and tap the chuck with a block of wood to break it loose from the spindle.

4. Inspect the mating surfaces on the end of the spindle and the back of the chuck for burrs or foreign matter. Clean and deburr these areas as necessary.

Installing and Adjusting the chuck

1. Make sure that the cams are aligned in the unlocked position and slide the chuck onto the spindle.

2. Turn each cam clockwise to lock the chuck in place.

3. Each cam should turn between 140^{o} to 180^{o} of a turn to lock correctly. See the diagram below.

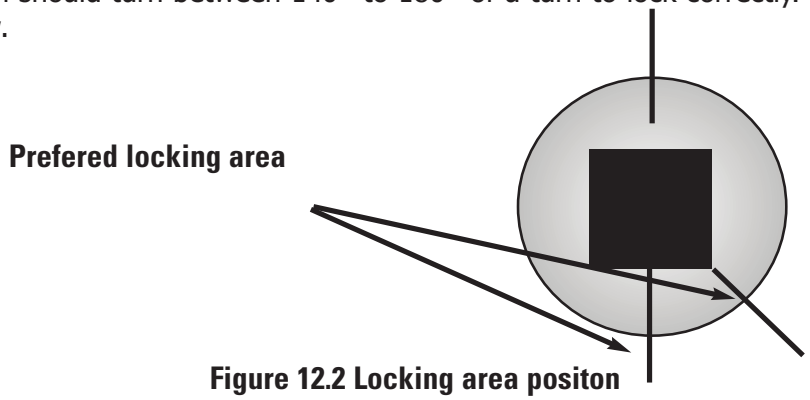


Figure 12.2 Locking area positon

4. If the cam turns less than one fourth of a turn, it will be necessary to remove the chuck and adjust the corresponding chuck stud.

5. Before removing the chuck, mark each location **on the chuck** that will need adjusting.

6. Remove the chuck and place it face down on a work surface.

7. There is a locking screw along side each chuck stud. Remove the locking screws for the studs that need adjusting.

8. Unscrew the studs one turn and install the locking screws.

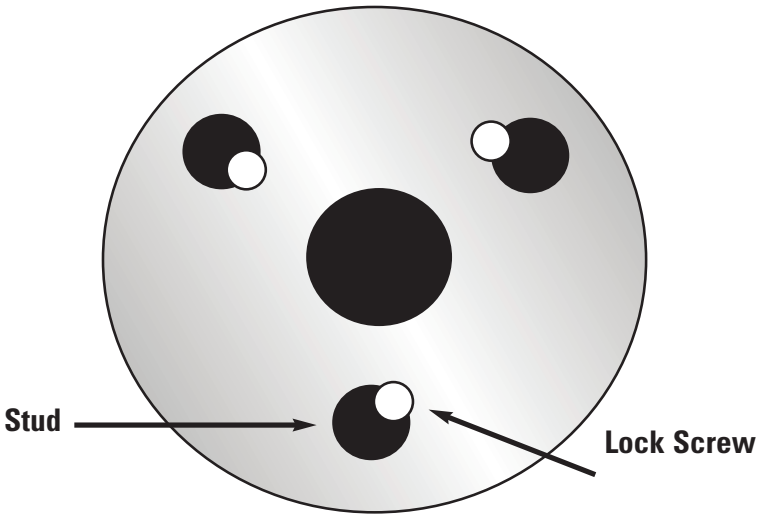


Figure 12.3 Back of the chuck

9. Install the chuck and check the cam rotation. Repeat as necessary.

Since there are three studs and cam mounts on the chuck, there are three possible position that the chuck may be mounted. You will find that one of these positions will be slightly more accurate than the others. Try the chuck in all three possible positions. Once the most accurate position is determined, mark the chuck and spindle flange so that the chuck can be installed in the same position each time that it is mounted onto the machine. This is best done by putting a punch mark on the chuck and a corresponding mark on the spindle flange.

This next step is only for the 3-jaw self centering chuck.

Mark each of the three jaws, and the slot it is in. Remove the jaws, and keeping them in the same order, reinsert them into the next slot over making sure the scroll plate engages the first thread on the first jaw. Try the jaws in all three positions; one should be more accurate than the other two.

Leadscrew

Having trouble on the leadscrew backlash particularly on engaging the half nut?

Leadscrew Backlash Adjustment

Excessive backlash in the longitudinal feed can come from two places:

1. The fit of the longitudinal feed screw to the right hand mounting trestle.

2. The fit of the half nut to the feed screw.

Screw to mount backlash

Engage the half nut lever. Slowly turn the longitudinal feed screw clockwise as viewed from the right end of the machine and watch the gap between the dial and the feed screw mounting trestle. Reverse the direction you are turning the feed screw and see if the gap increases slightly. If so then there is some play in the mounting. To reduce the play, accomplish the following.

1. Remove the bolt/ washer from the right end of the longitudinal feed screw.

2. Unscrew the handle from the end of the feed screw.

3. Using a punch and a small hammer, tighten the spanner nut about one eigth of a turn and recheck the play in the screw.

4. If the play is acceptable, replace the handle and retaining bolt. If more adjustment is needed, repeat the step above.

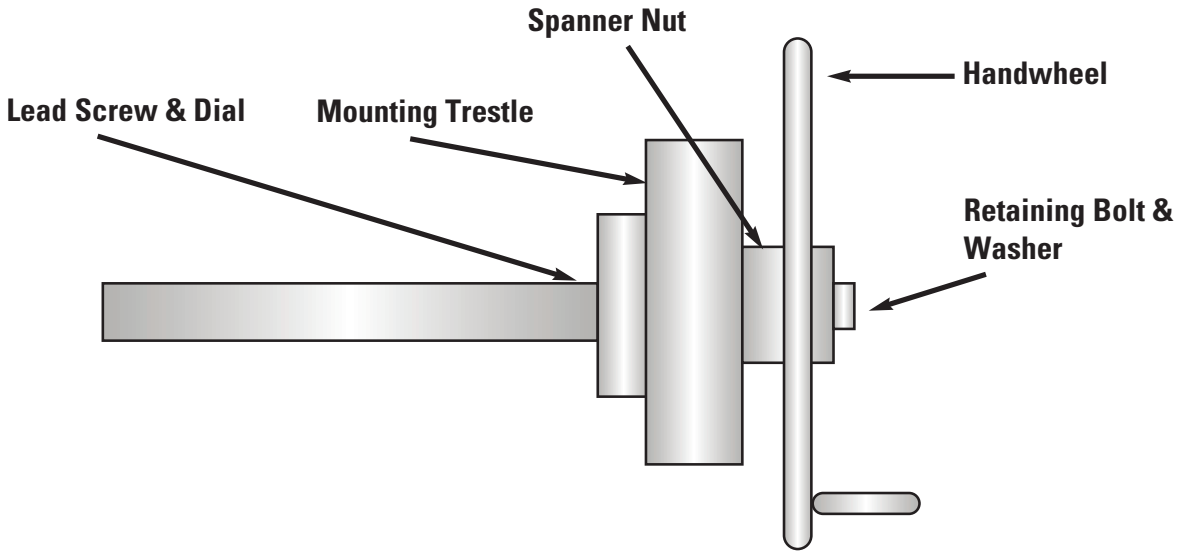


Figure 12.4 Parts of the Handwheel

Half nut to screw backlash

Worn threads on the half nut can cause excessive backlash in the longitudinal direction. Half nuts are made of brass and do wear out over a period of time. The only fix for a worn half nut is to replace the worn nut with a new one.

Crossfeed Backlash Adjustment

Excessive backlash in the crossfeed can be coming from three different places:

1. The fit of the crossfeed screw to the front screw mount.

2. The fit of the crossfeed screw into the brass crossfeed nut.

3. The fit of the brass crossfeed nut into the carriage casting.

There are adjustments for each of the above areas. Before making any adjustments to the crossfeed screw system, it is recommended that all the gibbs on the table and carriage system be checked and adjusted as per the owners' manual.

Crossfeed Screw To Front Mount

Slowly turn the crossfeed handle clockwise and watch the gap between the dial and the front screw support mount. Change directions and note if the gap increases slightly. If so this is a sign that there is some play in the mounting. To reduce this play, follow the procedure below.

1. Loosen the two nuts that hold the crossfeed handle on the end of the screw.

2. Tighten the inner nut slowly while checking the ease of movement of the crossfeed

handle. When the screw starts to get hard to turn, loosen the nut slightly so the screw turns free.

3. Hold the inner nut in place and tighten the outer nut against it to lock the nuts in position.

4. Recheck the backlash.

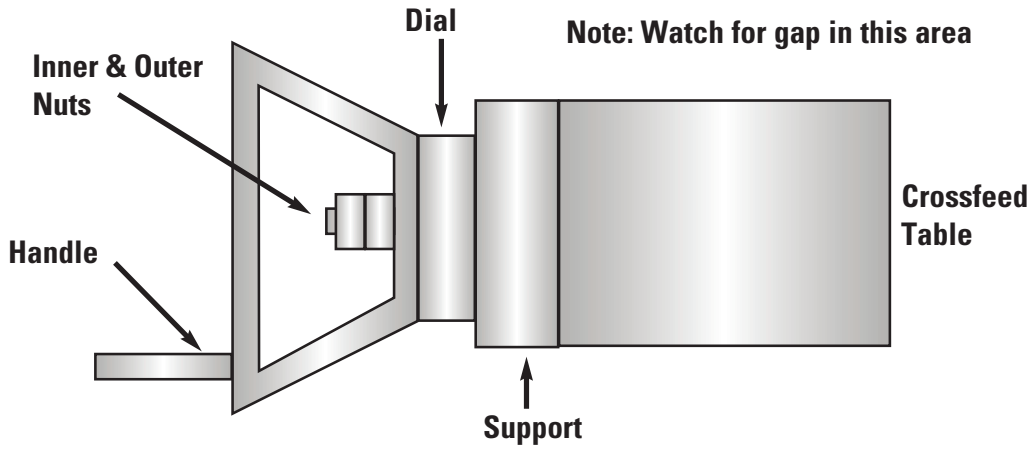


Figure 12.5 Crossfeed Screw Parts

Crossfeed Screw to Brass Nut & Nut to Carriage (Locking Bolt)

If there is still an excess of backlash after the above adjustments are made, the play will be either between the crossfeed screw and the brass nut or between the brass nut and the carriage. The following procedure covers both adjustments at the same time:

1. Remove the crossfeed screw rear support.

2. Loosen the Allen head bolt that locks the brass nut into the carriage.

3. Crank the crossfeed table toward the operator side of the machine. Watch under the table from the backside and stop before the crossfeed screw comes out of the brass nut.

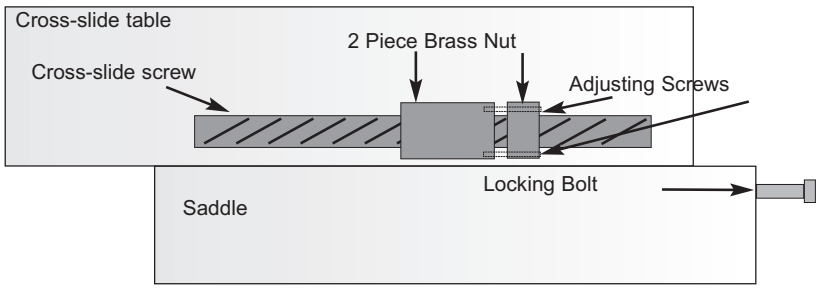


Figure 12.6 Crossfeed Table Cross Section

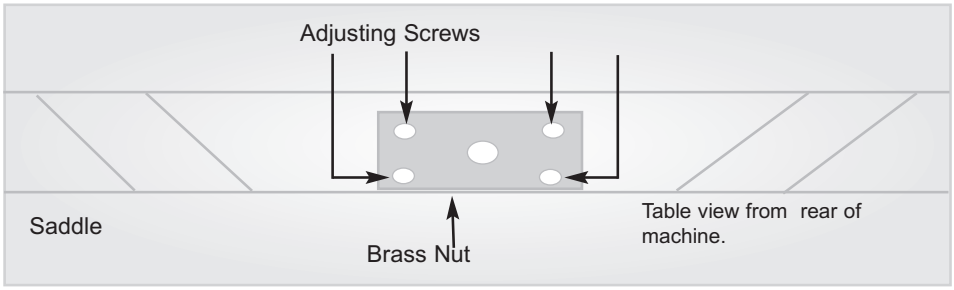


Figure 12.7 Crossfeed Table Rear View Cross Section

4. Slowly tighten the four adjusting screws on the brass nut, one at a time, until a slight drag is felt while turning the crossfeed handle.

5. Install the rear crossfeed support and tighten the locking bolt for the brass nut.

6. Recheck the backlash on the crossfeed.

If you find that the four adjusting screws are not staying in place, you can use a small amount of a thread-locking compound to keep the screws tight.

Granite Series Leadscrew Handwheel Fabrication & Installation (Earlier Machines)

Purchase part # G91027 or use the instructions below.

Installation of a handwheel to the right end of the leadscrew will allow a more precise lateral feeding of the carriage travel than is now possible using the carriage feed handwheel. The following is a simple handwheel plan that can be made using the Granite machine. The wheel portion can be made from a piece of mild steel, aluminum, or cast iron. The handle portion should be made of mild steel.

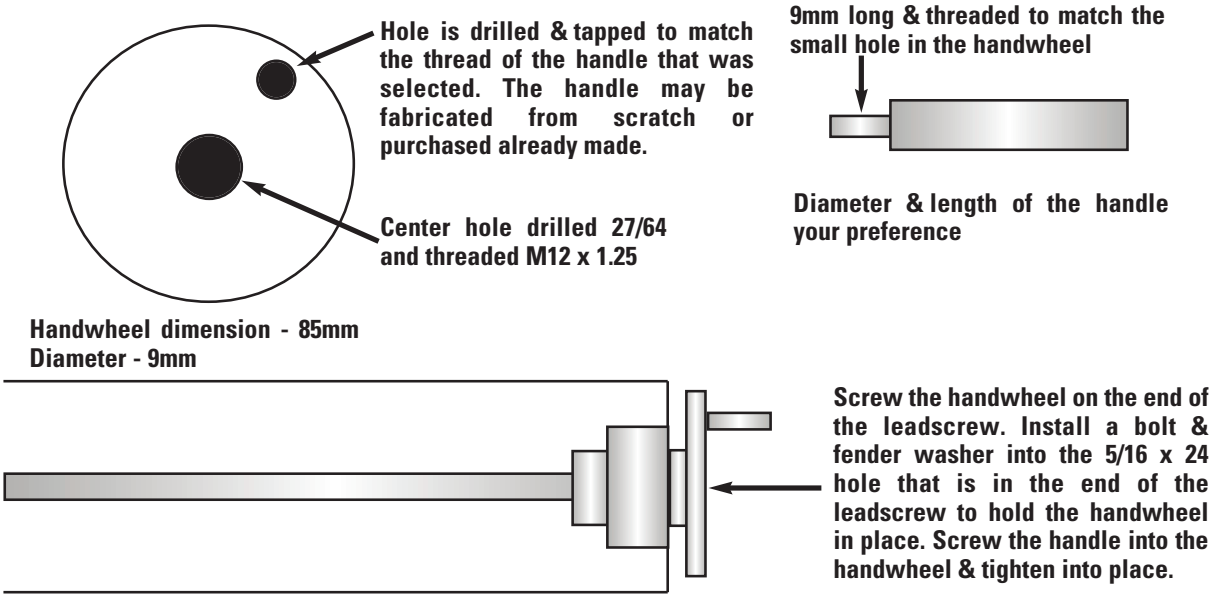


Figure 12.8 Handwheel Fabrication & Installation

Note: If you have an older Granite model, the end of the lead screw may not be drilled and tapped. This is a very simple process. You will need a 5/16 x 24 tap, a 17/64 or a "I" drill bit, and an electric hand drill. Set up your machine on the slow speed pulley, full RPM, with leadscrew turning counter clockwise as viewed from the right end and the gearbox set on 1 and "I". By having the leadscrew turning as well as the drill, the drill bit will center itself and go straight down the center of the lead screw. Drill the hole about 5/8 inch deep. Tap the hole with the 5/16 tap. Do not forget to use oil when drilling and tapping.

NOTES:

13 Machine Specifications

Granite 1324 Series Machine

General Specifications

General Dimension:	39″ height X 46″ length X 22-1/2″ width
Machine Weight:	Shipping 770 lbs, Machine 661 lbs
Crate Size:	49-1/2″ X 22-3/4″ X 44″
Footprint (static):	48″ X 36″
Footprint (operating):	72-1/2″ X 45-1/4″
T-Slot Size:	7/16″
Spindle Accuracy TIR:	0.00078″
Powerfeed (X-Axis):	Yes
Powerfeed (Y-Axis):	Yes
Powerfeed (Z-Axis):	No
Table Size:	6-3/4″ X 17-3/4″
Threading Dial:	Yes

Lathe Specifications

Distance Between Centers:	24″
Dial Calibration on Crossfeed:	0.001″
Dial Calibration on Toolpost:	0.001″
Dial Calibration on Leadscrew:	0.001″
Dial Calibration on Tailstock:	0.001″
Dial Calibration on Longfeed Rack:	0.01″
Headstock Taper:	MT4
Lathe Chuck- Max. diameter workpiece:	6″
Lathe Chuck- Min. diameter workpiece:	1/8″
Lathe Chuck Bore:	1.6″
Lathe Chuck Diameter:	6″
Lathe Chuck Mount:	D1-4 Camlock
Lathe Chuck Type:	3 Jaw Self Centering
Spindle Bore:	1.125″
Spindle Speeds:	Variable (Range 0-2800 RPM)
X-Axis Travel (w/ tailstock installed):	20″
Y-Axis Travel:	7-5/8″
Feed Rate (X-Axis):	0.003″- 0.020″
Feed Rate (Y-Axis):	0.001″- 0.006″
Tailstock Offset:	19/32″
Tailstock Barrel Travel:	3″
Tailstock Taper:	MT3
Swing Over Bed:	13″
Swing Over Work Table:	7-1/2″
Threads:	SAE 7-52 TPI
Toolbit Size:	1/2″
Toolpost Travel:	3-3/16″

Mill Specifications

Column Diameter:	3-3/16″
Dial Calibration Drill-Coarse Feed:	0.05″
Dial Calibration Mill-Fine Feed:	0.001″
Drawbars Size (included):	7/16″
Drill Chuck Size (included):	5/8″
Drill Chuck Arbor Size (included):	R-8/JT3
Head Rotation:	360 Degrees
Quill Diameter:	2-3/4″
Quill Travel:	4-7/8″
Spindle Taper:	R-8
Spindle to Table Distance (min-max):	4″ to 13-3/8″
Tool Size Limits:	1″
X-Axis Travel:	9-1/2″
Y-Axis Travel:	7-5/8″
Head Travel (Z-Axis):	4-3/8″
Feed Rate (Y-Axis):	0.001″- 0.006″
Feed Rate (X-Axis):	0.003″- 0.020″
Spindle Speeds:	Variable (Range 0-2800 RPM)
Spindle Center to Front of Chuck:	
GN Classic:	4-5/8″
GN-MAX & GN-IMX:	8-1/2″
Spindle Center to Lathe Spindle Flange:	
GN Classic:	7-1/4″
GN-MAX & GN-IMX:	11-1/4″
Spindle Center to Support Column:	
GN Classic:	9-1/2″
GN-MAX & GN-IMAX:	13-3/8″

Electrical Specifications

Amperage:	
GN Classic & GN-MAX:	15 amps
GN-IMAX:	8-10 amps
Horsepower:	
GN Classic:	1.5 HP
GN-MAX & GN-IMX:	2.0 HP
Motor Type:	
GN Classic:	D/C Variable Speed (Permanent Magnet)
GN-MAX & GN-IMX:	D/C Variable Speed (Brushless Servo)
Voltage:	
GN Classic & GN-MAX:	110 Volts A/C
GN-IMX:	220 Volts A/C
Phase:	Single

Recommended Oil for Lubricant

For Gear Box:	SAE30 weight non-detergent oil or 30 weight compressor oil
For External :	Regular Oil
For Cleaning:	Noncorrosive Kerosene or White Mineral Spirits or even WD-40

Granite 1340 Series Machine

General Specifications

General Dimention:	39" height X 62" length X 22-1/2" width
Machine Weight:	Shipping 910 lbs, Machine 728 lbs
Crate Size:	64-1/2" X 22-3/4" X 44"
Footprint (static):	64" X 36"
Footprint (operating):	88-1/2" X 45-1/4"
T-Slot Size:	7/16"
Spindle Accuracy TIR:	0.00078"
Powerfeed (X-Axis):	Yes
Powerfeed (Y-Axis):	Yes
Powerfeed (Z-Axis):	No
Table Size:	6-3/4" X 17-3/4"
Threading Dial:	Yes

Lathe Specifications

Distance Between Centers:	40"
Dial Calibration on Crossfeed:	0.001"
Dial Calibration on Toolpost:	0.001"
Dial Calibration on Leadscrew:	0.001"
Dial Calibration on Tailstock:	0.001"
Dial Calibration on Longfeed Rack:	0.01"
Headstock Taper:	MT4
Lathe Chuck- Max. diameter workpiece:	6"
Lathe Chuck- Min. diameter workpiece:	1/8"
Lathe Chuck Bore:	1.6"
Lathe Chuck Diameter:	6"
Lathe Chuck Mount:	D1-4 Camlock
Lathe Chuck Type:	3 Jaw Self Centering
Spindle Bore:	1.125"
Spindle Speeds:	Variable (Range 0-2800 RPM)
X-Axis Travel (w/ tailstock installed):	20"
Y-Axis Travel:	7-5/8"
Feed Rate (X-Axis):	0.003"- 0.020"
Feed Rate (Y-Axis):	0.001"- 0.006"
Tailstock Offset:	19/32"
Tailstock Barrel Travel:	3"
Tailstock Taper:	MT3
Swing Over Bed:	13"
Swing Over Work Table:	7-1/2"
Threads:	SAE 7-52 TPI
Toolbit Size:	1/2"
Toolpost Travel:	3-3/16"

Mill Specifications

Column Diameter:	3-3/16"
Dial Calibration Drill-Coarse Feed:	0.05"
Dial Calibration Mill-Fine Feed:	0.001"
Drawbars Size (included):	7/16"

Drill Chuck Size (included):	
GN Classic:	1/2″
GN-MAX & GN-IMX:	5/8″
Drill Chuck Arbor Size (included):	R-8/JT3
Head Rotation:	360 Degrees
Quill Diameter:	2-3/4″
Quill Travel:	4-7/8″
Spindle Taper:	R-8
Spindle to Table Distance (min-max):	
GN Classic:	4″ to 13-1/3″
GN-MAX & GN-IMX:	4″ to 13-3/8″
Tool Size Limits:	1″
X-Axis Travel:	9-1/2″
Y-Axis Travel:	7-5/8″
Head Travel (Z-Axis):	4-3/8″
Feed Rate (Y-Axis):	0.001″- 0.006″
Feed Rate (X-Axis):	0.003″- 0.020″
Spindle Speeds:	Variable (Range 0-2800 RPM)
Spindle Center to Front of Chuck:	
GN Classic:	4-5/8″
GN-MAX & GN-IMX:	8-1/2″
Spindle Center to Lathe Spindle Flange:	
GN Classic:	7-1/4″
GN-MAX & GN-IMX:	11-1/4″
Spindle Center to Support Column:	
GN Classic:	9-1/2″
GN-MAX & GN-IMX:	13-3/8″

Appendix A

Machining Reference Guide

How to Determine Speeds and Feeds for Lathe Turning (machine, materials, and tools)

The lathe rotates a workpiece against a cutting edge. With its versatility and numerous attachments, accessories, and cutting tools, it can do almost any machining operation.

The modern lathe offers the following:

- The strength to cut hard, tough materials
- The means to apply power
- The means to hold the cutting point tight
- The means to regulate operating speed
- The means to feed the tool into or across, or into and across, the work, either manually or by engine power, under precise control
- The means to maintain a predetermined ratio between the rates of rotating works and the travel of the cutting point or points

Turning Speed

When metal cuts metal at too high a speed, the tool burns up. You can machine soft metals like aluminum at fast speeds without danger or trouble, but you must cut hard steels and other metals slowly.

You must also consider the diameter of the workpiece. A point on a 3" diameter shaft will pass the cutting tool three times as fast as a point an a 1"-diameter shaft rotating at the same speed. This is because the point travels a tripled circumference. For work in any given material, the larger the diameter, the slower the speed in spindle revolutions needed to get the desired feet-per-minute (fpm) cutting speed.

Lathes cut threads in various numbers per inch of materials threaded, according to the operator's needs. The Smithy Granite Series machine cuts threads to metric or inch standards.

In thread cutting, the carriage carries the thread-cutting tool and moves by the rotating leadscrew. The basic principle is that the revolving leadscrew pulls the carriage in the desired direction at the desired speed. The carriage transports the toolrest and the threading tool, which cuts the screw thread into the metal being machined.

The faster the leadscrew revolves in relation to the spindle, the coarser the thread. This is because the threading tool moves farther across the revolving metal with each workpiece revolution.

The lathe spindle holding the workpiece revolves at a selected speed (revolution per minute, or rpm) according to the type and size of the workpiece. The leadscrew, which runs the length of the lathe bed, also revolves at the desired rpm. There is a definite and changeable ratio between spindle and leadscrew speeds.

Cutting Speeds for Various Diameters

FPM	50	60	70	80	90	100	110	120	130	140	150	200	300
DIAM	RPM												
1/16"	3056	3667	4278	4889	5500	6111	6722	7334	7945	8556	9167	12229	18344
1/8"	1528	1833	2139	2445	2751	3056	3361	3667	3973	4278	4584	6115	9172
3/16"	1019	1222	1426	1630	1833	2037	2241	2445	2648	2852	3056	4076	6115
1/4"	764	917	1070	1222	1375	1538	1681	1833	1986	2139	2292	3057	4586
5/16"	611	733	856	978	1100	1222	1345	1467	1589	1711	1833	2446	3669
3/8"	509	611	713	815	917	1019	1120	1222	1324	1426	1528	2038	3057
7/16"	437	524	611	698	786	873	960	1048	1135	1222	1310	1747	2621
1/2"	382	458	535	611	688	764	840	917	993	1070	1146	1529	2293
5/8"	306	367	428	489	550	611	672	733	794	856	917	1223	1834
3/4"	255	306	357	407	458	509	560	611	662	713	764	1019	1529
7/8"	218	262	306	349	393	426	480	524	568	611	655	874	1310
1"	191	229	267	306	366	372	420	458	497	535	573	764	1146
1-1/8"	170	204	238	272	306	340	373	407	441	475	509	679	1019
1-1/4"	153	183	216	244	275	306	336	367	397	428	458	612	918
1-3/8"	139	167	194	222	250	278	306	333	361	389	417	556	834
1-1/2"	127	153	178	204	229	255	280	306	331	357	382	510	765
1-5/8"	117	141	165	188	212	235	259	282	306	329	353	470	705
1-7/8"	102	122	143	163	183	204	224	244	265	285	306	408	612
2"	95	115	134	153	172	191	210	229	248	267	287	382	573
2-1/4"	85	102	119	136	153	170	187	204	221	238	255	340	510
2-1/2"	76	91	107	122	137	153	168	183	199	214	229	306	459
2-3/4"	69	82	97	111	125	139	153	167	181	194	208	278	417
3"	64	76	89	102	115	127	140	153	166	178	191	254	371

! NOTICE !

The data table provides exact speeds (RPM). It does not take machine speed limitations into account. Determine the desired rate of speed and find the closest speed available on your machine.

Cutting Speed and Feeds for High Speed Steel Tools

The energy expended at the lathe's cutting point converts largely into heat, and because the energy expended is great, the heat is intense. Before today's HSS, carbide, and ceramic tool, this heat created a serious machining problem. Machining could be done only under a steady flow of coolant, which kept the tool from heating to its annealing point, softening, and breaking down.

With HSS, you can cut dry on cast iron or non-ferrous metals unless a small lathe is running at extremely high speed on continuous, heavy-duty production work. Because steel expands when heated, it is a good idea, especially when working on long shafts, to check the tightness of the lathe centers frequently and make sure workpiece expansion does not cause the centers to bind.

Cutting Speeds and Feeds for High Speed Steel Tools

	Low-Carbon Steel	High-Carbon Steel Annealed	Alloy Steel Normalized	Aluminum Alloys	Cast Iron	Bronze
Speed (sfm) Roughing Finishing	90 120	50 65	45 60	200 300	70 80	100 130
Feed (ipr) Roughing Finishing	0.010-0.202 0.003-0.005	1.101-0.020 0.003-0.005	0.010-0.020 0.003-0.005	0.015-0.030 0.005-0.010	0.010-0.020 0.003-0.010	0.010-0.020 0.003-0.10

In everyday lathe operations like thread cutting and knurling, always use a cutting oil or other lubricant. On such work, especially if the cut is light and lathe speed low, dipping a brush in oil occasionally and holding it against the workpiece will provide sufficient lubrication. For continuous, high-speed, heavy-duty production work however, especially on tough alloy steels, using a cutting oil or coolant will increase cutting efficiency. It's essential if you're using a non-HSS cutting tool. When you use coolant, direct it against the cutting point and cutter. Consider installing a coolant system if you don't have one.

To set up safe rpm rates, you should follow the list for cutting speeds and feeds for HSS cutters. The formula is as follows:

rpm = CS x 4 / D"

where:

CS - cutting speed in surface feet per minute (sfm)
D" - diameter of the workpiece in inches.

To use this formula, find the cutting speed you need on the chart and plug that number into the CS portion of the formula. After calculating the rpm, use the nearest or next-lower speed on the lathe and set the speed.

If you were to make a finish cut on a piece of aluminum 1" in diameter, for example, you would see the desired sfm is 300. Then

rpm = 300 sfm x 4 / 1

rpm = 1200 / 1

rpm = 1200 or next lower speed.

For high-carbon steel, also 1" in diameter,

rpm = 50 sfm x 40 / 1

rpm = 200 / 1

rpm = 200 or next slower speed.

The four-turret toolpost lets you mount up to four different tools at the same time. You can install all standard-shaped turning and facing tools with 1/2" or smaller shanks. The centerline is approximately 5/8" above the bottom of the turret. Smithy also offers quick-change tool sets that greatly speed up lathe operations. Contact a Smithy technician for details.

How to Determine Speeds and Feeds for Milling (machine, materials, and tools)

Speeds

Milling cutting rates vary according to the machinability of the material being cut; whether cutting fluid is used and, if so, what kind; the type, size, and material of the cutter and the coarseness of its teeth; and the amount of metal being removed. Cutting speed for milling is the distance the cutting edge of a tooth travels in one minute. If cutting speed is too high, the cutter overheats and becomes dull. If it's too low, production is inefficient and rough.

There is no exact right cutting speed for milling a particular material. Machinist usually start with an average speed, then increase or decrease it as needed. For light cuts, use the upper end. Use the lower end for heavy cuts and when you don't use cutting fluid.

Determining rpm. To set the spindle speed, you have to know the cutter rpm (revolutions per minute). For inch measurements, use this formula:

rpm = 12 x CS (fpm) / D" x π

where:
CS - cutting speed
fpm - feet per minute
D" - diameter of the cutter in inches
π - 3.14 You can use an rpm chart for selected diameters of cutting tools at different cutting speeds.

For metric measurement, use this formula:

rpm = CS (mpm) x 1000 / D (mm) x π

where:
CS - cutting speed
mpm - meters per minute
D (mm) - diameter of the cutter in millimeters
π - 3.14. You can use an rpm chart for selected diameters of cutting tools at different cutting speeds.

Change Speeds by selecting the belt location and turning the speed dial

Feeds

Set the direction of feed before you begin milling. Up milling, or conventional milling, is when the direction of feed is opposite to the direction of cutter rotation. Down milling, or climb milling, is when the direction of feed is the same as the direction of cutter rotation.

Up Milling

In up milling, forces on the workpiece tend to pull it out of the vise or fixture holding it, so fasten it securely. These forces also push the workpiece away from the cutter, which eliminates backlash. Up milling is advised for milling cast iron, softer steels, and other ductile materials. In general, it's how you should perform milling operations.

Down Milling

Down milling usually produces good surface finishes because chips do not sweep back into the cut. Setups are more rigid, an advantage when cutting thin workpieces held in a vise or workpieces held in a magnetic chuck. Down milling also produces straighter cuts. We recommend down milling when using carbide cutters because there is less wear on the cutting tool. In general, however, avoid it because of the backlash problems associated with it.

Feed Rates

Your feed rates should be as high as your machine, cutting tool, workholding method, and workpiece can tolerate while giving a good finish. Feed rate is usually given in inches per minute (ipm). You determine feed rate by the speed of the cutter in rpm and the number of teeth in the cutter.

There are many factors to consider in selecting the feed per tooth, and there is no easy formula to follow. Here are several principles to guide you:

- Use the highest feed rate conditions allow
- Avoid using a feed rate below 0.001" per tooth
- Harder materials required lower feed rates than softer materials
- Feed wider, deeper cuts more slowly than narrow, shallow cuts
- Slower feed rates gives a better surface finish
- Never stop the feed before finishing the cut

If you know the feed in inches per tooth, use the formula to calculate table feed rate in inches per minute (ipm):

ipm = ipt x N x rpm

where:
ipt - inches per tooth
N - number of teeth in the milling cutter
rpm - spindle speed of the milling machine.

High-speed-steel Cutters

The advantage of HSS cutter bits is you can shape them to exact specifications through grinding. This lets you grind a stock shape into any form. Stock shapes come in an assortment of types, including squares, flats, and bevels. Many shops buy their cutters as ready-ground or ready-to-grind bits or blades.

Ready-to-grind bits and blades are of specially selected HSS, cut to length and properly heat-treated. They are fine tools in the rough and generally superior to HSS shapes sold by the pound.

In grinding HSS cutter bits, you have five major goals:

- A strong, keen cutting edge or point
- The proper cutting form (the correct or most convenient shape for a specific operation)
- Front clearance away from the toolpoint
- Clearance away from the side of the tool (side rake)
- Free chip movement over the tool and away from the cutting edge

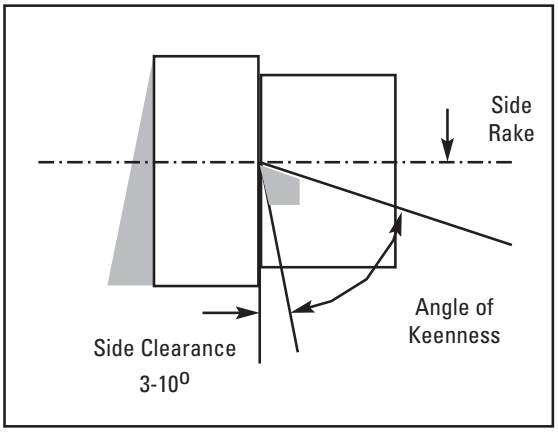


Figure A.1 Keenness angles vary from 60° to 90°.

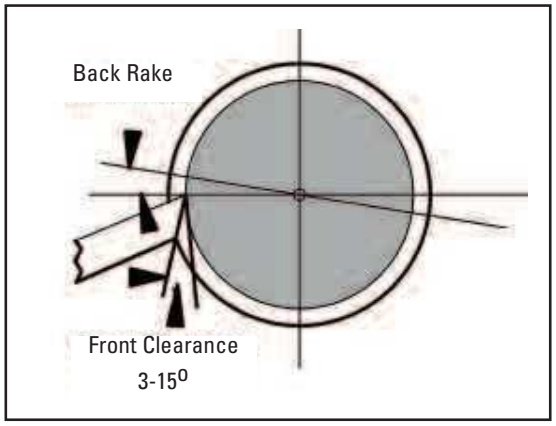


Figure A.2 The edge weakens if front clearance is too great.

Keenness angles can vary from 60° for mild softness to 90° for hard steels and castings (Figure A.1).

Front clearance must always be sufficient to clear the work. If it is too great, however, the edge weakens and breaks off (Figure A.2). Side and back-rate requirements vary with the material used and operation performed. Back rake is important to smooth chip flow, which is needed for a uniform chip and good finish, especially in soft materials. Side rake directs the chip flow away from the point of cut.

Grind cutters on a true-surfaced, good-quality, medium-grit grinding wheel (preferably an 8”, 46-60A-grit or 68A-grit Carborundum wheel) at 3000 or 3500 rpm. When starting with an unground cutter bit, the procedure in Figure A.3 is usually to:

1. grind the left-side clearance
2. grind the right-side clearance
3. grind the end form or radius
4. grind the end clearance
5. grind the top rake, touching in a chipbreaker.

If you are honing the cutting edge (for fine finishing or machining soft materials), draw the cutter away from the cutting edge across the oilstone (Figure A.4).

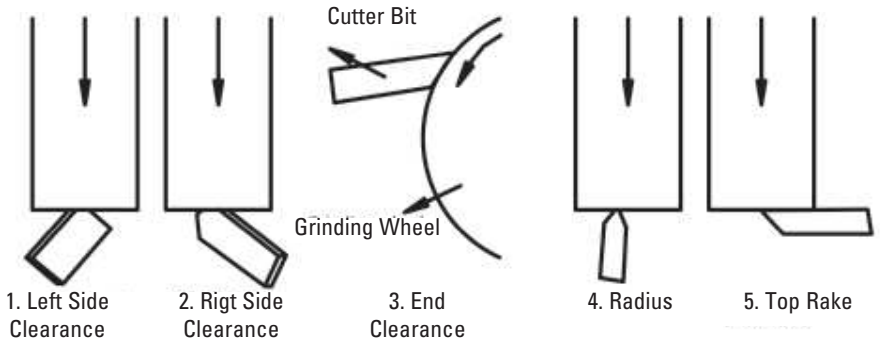


Figure A.3 Grinding sequence for an unground cutter bit

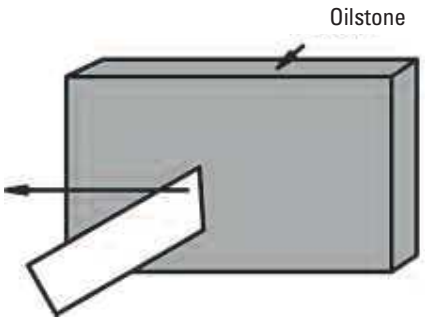


Figure A.4 When honing, draw the cutter away from the cutting edge across the oilstone

Materials other than Steel

As pointed out earlier,when grinding HSS cutters, we determine cutting angles primarily by strength requirements, not keenness requirements. Angles and rakes for general industrial shops use are established. In machining steel, the softer the steel, the keener the angle of the cutting edge. For soft steels, angles as acute as 61° are possible (Figure A.5).

The same general rule applies to cast iron. Chilled or very hard cast iron requires tools with cutting-edge angles as great as 85°. For ordinary cast iron, you obtain greatest efficiency with a more accurate cutting edge – approximately 71° (Figure A.6).

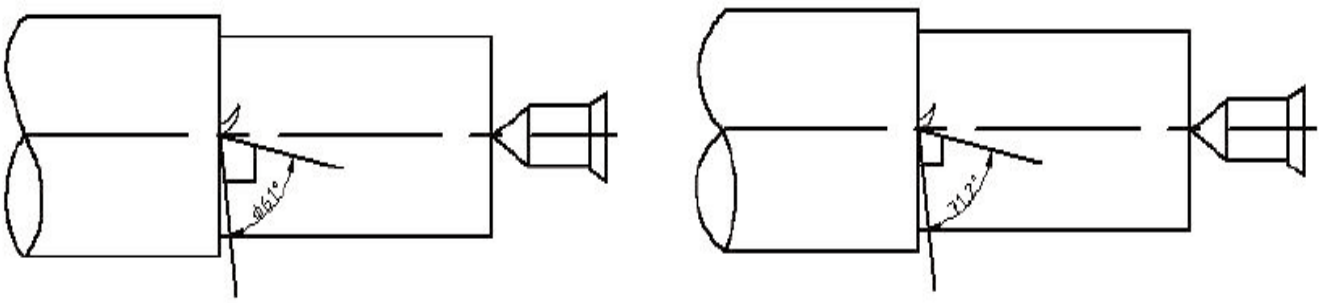


Figure A.5 With soft steels, 61° angles are possible
Figure A.6 With cast iron, a 71° angle is most efficient

Bits for Turning and Machining Brass

Brass tends to pull or drag when machined. It's best to machine it on dead center with the top rake in the horizontal plane of the lathe centers. Softer than steel, brass needs less support for the cutting edge. Brass cutters require an almost flat top angle and can gain greater angle keenness only in increased side and end rakes. It is often advisable to hone the cutting edges of cutters used to machine brass.

Note: All roundnose cutters are ground with flat tops and equal side rake because they are fed across the work, to both right and left.

Special Chip Craters and Chip Breakers

When grinding cut-off blades, and occasionally on other cutter bits where the material's extreme hardness or toughness makes it difficult to control the chip leaving the work, it sometimes helps to grind a smooth, round crater just behind the cutting edge. This serves as a chip guide and starts the chip curling smoothly (Figure A.7).

Figure A.7 A crater starts the chip curling smoothly

Using a Center Gauge to Check V-Thread Form

It may be convenient to grind a standard cutter bit for thread cutting, especially for cutting standard 60° V-threads. When grinding an ordinary square cutter into a thread-cutting tool, take care to ensure a true thread form. The easiest way is to use an ordinary center gauge for a standard V-thread tool or a special thread gauge for special thread forms.

To grind a cutter for an ordinary V-thread, grind first the left side of the tool, then the right side, to 30°. Be careful to grind equally from both sides to center the toolpoint. Then test for true form by inserting the newly ground point in the closest-sized V in a standard center gauge (Figure A.8)

Examine the gauge and cutter above a light. When the cutter is ground perfectly, no light streak shows between the tool and gauge. Use a grinding chart for other rakes.

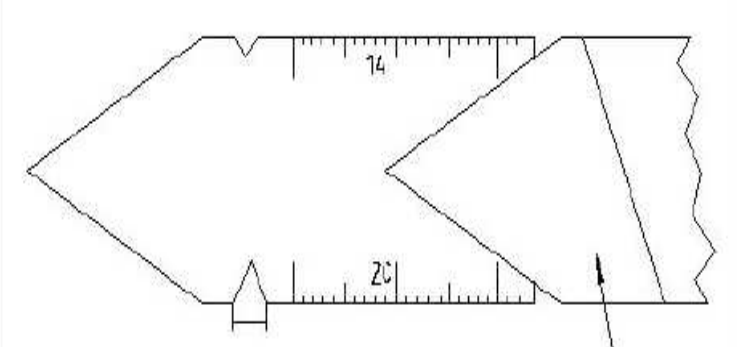


Figure A.8 Insert the point into the nearest-sized V in the center gauge

Acme or Other Special Thread

Thread gauge are available for all standard threads. Before grinding such cutters, ascertain the correct pitch angle of the particular thread profile. For example, the pitch of an acme thread is 29° to a side, and the toolpoint is ground back square to an exact thread profile that requires a different end width for each thread size.

Thread forms must be accurate if threads are to fit snugly and smoothly. Every resharpening of this type of cutter requires regrinding the entire form. It is far better, when doing any amount of threading, to use a threading tool with a special form cutter. Sharpening such cutters requires only flat, top grinding, whch does not alter the cutting profile.

Carbide-Tipped Cutters and Cutter Forms

Carbide is a compound of carbon and a metal. In cutting tools, it is usually carbon and tungsten. The hardness of carbide cutting materials approaches that of diamond. While carbides permit easy machining of chilled cast iron, hard and tough steels, hard rubber, bakelite, glass, and other difficult or "unmachinable" materials, its primary use in industry is for long production runs on ordinary steel. On such work, carbide-tipped tools permit higher running speeds and much longer runs between resharpenings. The cutting edge of carbide tools stands up 10 to 200 times as long as the edge of HSS tools.

The advantage of carbide is that it tolerates much higher heat than HSS or other alloys so you can run at higher speeds. The disadvantage is that it is more brittle than HSS and must have adequate support in the toolpost to prevent vibration and breakage.

The table on the next page shows the different Carbide grades used in different applications and uses.

Application	Use	Grade
Cast Iron	Roughing cuts	C-1
Non-ferrous, non-metallic, high-temperature alloys	General purpose	C-2*
200 and 300 Series stainless steels	Light finishing Precision boring Roughing cuts General Purpose	C-3 C-4 C-5 C-6*
Alloy steels	Finishing cuts	C-7
400 Series stainless steel, high velocity	Precision boring	C-8
***C-2 and C-6 are the most commonly used carbides.**		

When to Use Different Kind of Endmills

Choose milling cutters for the type of cut, the number of parts, and the material. Rake angles depend on both cutter and work material. Clearance angles range from 3° to 6° for hard or tough materials to 6° to 12° for soft materials.

To determine the number of teeth you want, consider the following:

- There should not be so many teeth that they reduce the free flow of chips.
- The chip space should be smooth so chips don't clog.
- Don't engage more than two teeth at a time in a cut.

Endmill Cutters

Endmill cutters cut on their ends and sides. They are either solid (cut from a single piece of material) or shell (separate cutter body and shank). They have two, three, four, or more teeth and may do right or left-handed cutting. Their flute twist or helix may also be right or left-handed. Solid endmills have straight or tapered shanks; shell endmill adapters have tapered shanks.

Endmills machine horizontal, vertical, angular, or irregular surfaces in making slots, keyways, pockets, shoulders, and flat surfaces.

- **Two-flute or center-cutting endmills** have two teeth that cut to the center of the mill. They may feed into the work like a drill (called plunge milling), then go lengthwise to form a slot. Teeth may be on one end (single-ended) or both ends (double-ended).

- **Multiple-flute endmills** have three, four, six, or eight flutes and may be single or double-ended. Multiple-flute mills are center-cutting or non-center cutting. Don't use noncenter-cutting endmills for plunge milling.

- **Geometry-forming endmills** form particular geometries. They include ball endmills, roughing endmills, dovetail endmills, T-slot cutters, keyseat cutters, and shell endmills.

- **Ball endmills** cut slots or fillets with a radius bottom, round out pockets and bottoms of holes, and do diesinking and diemaking. Four-flute ball endmills with center cutting lips are available.

- **Roughing endmills** remove large amounts of metal rapidly with minimum horsepower. They have three to eight flutes. Also called hogging endmills, they have wavy teeth on their periphery that provide many cutting edge, minimizing chatter.

- **T-slot Cutters** cut T-slots. After machining a groove for the narrow part of the T-slot with an end or side mill, finish up with the T-slotcutter.

- **Keyseat cutters** cut keyseats for Woodruff keys (shaped like a half circle)

- **Shell endmills**, which mill wide, flat surfaces, have a hole for mounting on a short arbor. The center of the shell is recessed to provide space for the screw or nut that fastens the cutter to the arbor. The teeth are usually helical, and diameters are as large as 6".

- **Insert-type endmills** use replaceable HSS or carbide inserts. Small endmills use two inserts; larger endmills, three or more.

- **Face milling cutters** start in size at 2" and have inserted teeth on the periphery and face. Most of the cutting takes place on the periphery. They are similar to, but larger than, shell endmills.

Plain Milling Cutters

Plain milling cutters have teeth only on their periphery. Used to mill plain, flat surfaces, they may combine with other cutters to produce various shapes. Thay are cylindrical and come in many widths and diameters.

- **Light-duty plain cutters** for light cuts and fine feeds come in two forms. Narrow ones have straight teeth parallel to the cutter axis. Wide ones have helical teeth at a 25° angle. Features include ease of starting cuts, little chatter, and good surface finishes.

- **Heavy-duty plain cutters**, or coarse-tooth cutters, come in a larger widths and have larger and fewer teeth. Strongly supported cutting edges and wide flutes provide strength and space for heavy chip removal. The helix angle of their teeth is 25° to 45°.

- **Helical plain milling cutters** have even fewer and coarser teeth with a helix angle of 45°-60° or greater. These cutters are for wide, shallow profiling cuts on brass or soft steel.

Side Milling Cutters

Similar to plain milling cutters, side milling cutters also have teeth on one or both sides. The teeth on the periphery do most of the cutting; those on the sides finish the side of the cut to size. They cut grooves or slots and often work with other cutters to mill special shapes in one operation.

- **Plain side milling cutters** have straight teeth on the periphery and both sides. Side teeth taper toward the center of the cutter, giving side relief or clearance.
- **Half side milling cutters** have helical teeth on the periphery and one side. These cutters do heavy-duty face milling and straddle milling where teeth are needed on only one side. The side teeth are deeper and longer for more chip clearance.
- **Staggered-tooth side milling cutters** are narrow cutters with teeth alternating on opposite sides. There is less dragging and scoring and more space for chip removal. These cutters do heavy-duty keyway and slotting cuts.

Slitting Saws

Slitting saws do narrow slotting and cut-off operations.

- **Plain slitting saws** are thin, plain milling cutters with only peripheral teeth. The teeth are fine, and the sides taper slightly toward the hole, giving side relief.
- **Slitting saws** with side teeth are like side milling cutters and are for deeper slotting and cut-off operations normally done with plain slitting saws.
- **Staggered-tooth slitting saws** have peripheral teeth with alternate right and left hand helix and alternate side teeth. They are for 0.2” and wider cuts and may do deeper cuts with standard feeds.
- **Screw-slotting cutters** are plain slitting saws with fine-pitch teeth that cut slots in screwheads. Their sides are straight and parallel and offer no side relief.

Angle Milling Cutters

Angle milling cutters, for such operations as cutting V-grooves, dovetails, and reamer teeth, come as single and double-angle cutters.

- **Single-angle cutters** have one angular surface. Teeth are on the angular surface and the straight side, and they usually have 45° or 60° angles.
- **Double-angle cutters** machine V-grooves. Those with equal angles on both faces usually have an included angle of 45°, 60°, or 90°.

Form-relieved Cutters

- **Formed-tooth cutters** machine surfaces with curved outlines. You can sharpen them without changing the tooth outline. Concave cutters mill convex half-circles; Convex cutters cut concave surfaces.

- **Corner-rounding cutters** round outside corners. Gear cutters cut gear teeth. Fluting cutters cut flutes in reamers and milling cutters. Formed-tooth cutters come in right and left-hand styles various special shapes.

Flycutters

With one or more single-point toolbits or cutters, flycutters perform end milling even though they're not endmills. They take light face cuts from large surface areas. You must grind the toolbit properly to get correct rake and clearance angles. Grind toolbits for flycutters as you grind lathe tools. You can also use flycutters for boring.

Note: When the tool revolves, the cutting tool becomes almost invisible, so be careful.

How To Do Threading

Before beginning to cut threads, it's useful to learn the major terms used in thread cutting:

- **Pitch**. Metric pitch is the distance from the center of a thread to the center of the next thread. To measure pitch in inches, measure an inch on a bolt and count the threads.

- **Pitch Diameter.** This is the diameter of an imaginary cylinder superimposed on a straight screw thread, the surface of which would make an equal width of the thread and the spaces cut by the cylinder.

- **Lead.** The lead is the distance a screw thread advances axially (as through a nut) with one complete revolution.The lead and pitch of a single thread are identical, but they differ on multiple threads (the lead of a double thread is twice its pitch; of a triple thread, three times its pitch).

Because screw-thread cutting is generally a part of machine work, anyone interested in building things of metal should master it. Threading requires a bit of patience and skill. Before attempting to cut a thread on a workpiece, cut a few practice threads on odd bits of steel, iron, and aluminum.

Built for thread cutting, the Smithy Granite Series machine, cuts standard internal and external threads, as well as special threads. You may cut coarse or fine threads in a great range of threads per inch, in V or square shapes, in established profiles like Unified National, acme, and metric. You can cut single threads or multiple threads that are concurrently along the shaft. You determine the type of thread by how you'll use the screw. Each thread form requires a different shaped tool to cut or chase it.

For most work, the beginner will use the Unified National Standard, which is a V-form thread slightly flat on top and at the root. Screw threads are usually referred to by pitch numbers, such as 18 or 24, meaning 18 or 24 threads per inch (tpi). The Smithy Granite Series machine cuts standard threads in pitches from 7 to 52 tpi and metric threads from 0.35 to 6.5 mm.

Because the lathe spindle, which carries the work, connects by gearing to the leadscrew, which moves the cutting tool along the lathe bed, a ratio exist between spindle speed in revolutions per minute and cutting tool movement in inches. When you change the gearing, you change this ratio. For this reason you can cut screw threads of various pitches by changing both the thread selection lever and the rate-of-feed selection lever at the head of the lathe.

Thread charts on the machine show both inch and metric measures. The inch chart on the headstock shows the tpi from 7 to 52. The metric chart show the distance from thread crest to crest from 0.35 to 6.5 mm.

For right-hand threads, start the threading or chasing tool at the right end of the workpiece and feed it toward the headstock. For left-hand threads, reverse the leadscrew's rotation direction using the direction lever on the headstock and feed the threading tool from left to right. (You actually have the choice of changing the spindle rotation and/or cutting off the backside).

With practice, you can grind cutters to almost any profile. It is difficult, however, to sharpen such cutters without altering the cutting form, and almost every resharpening requires a complete regrinding of profile and clearance angles.

After turning the work to be threaded to the outside diameter of the thread and setting the gears for the desired thread, put a threading tool in the toolpost. Set it exactly on the dead center of the workpiece you'll be threading, using a center gauge as a guide.

To make sure your cutter is on dead center, place a credit card or shim between the cutter point and workpiece. When the tool is on dead center, the credit card or shim will remain vertical. With a credit card, there in no possibility of chipping the cutter as the workpiece and cutter come together.

Set the compound perpendicular to the line of centers and rotate it 29-1/2° to the right. Place the thread gauge on the point of the threading tool and feed the tool toward the workpiece (Figure A.9). Adjust the tool so the edge of the gauge is exactly parallel to the workpiece. A slip of white paper held below the gauge will help check the parallel of the gauge to the shaft and the fit of the tool point in the V of the gauge. Placing the threading tool perpendicular to the surface of the workpiece assures a true-form thread.

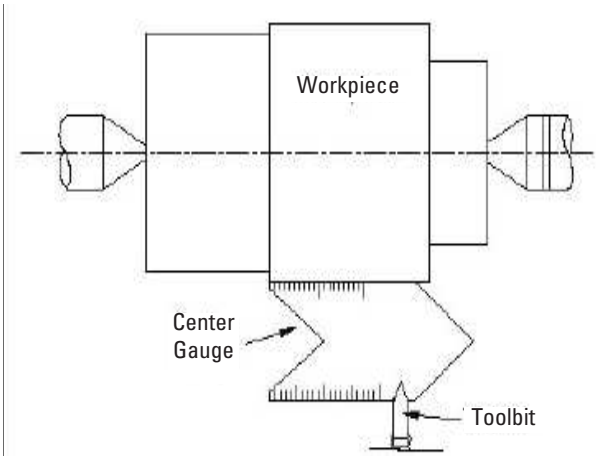


Figure A.9 Using a center gauge, set the threading tool at exactly dead center on the workpiece

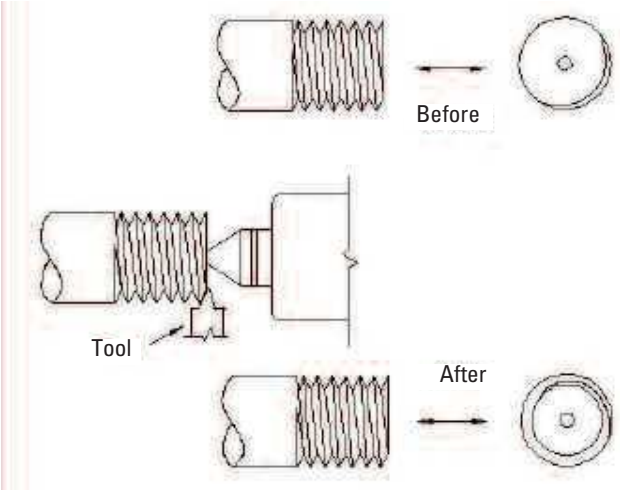


Figure A.10 Chamfer the end of the thread to protect it from damage

Cutting Right-hand Threads

Now you are ready to cut right-hand threads. First, advance the tool so it just touches the workpiece and turn the compound calibration to zero. Then, using the compound feed, feed in the tool 0.002". Turn on the motor, engage the power feed (lever located on the lower right hand face of the headstock) at the speed as indicated on the threading chart. (You'll choose, I, II or III depending on the chart). With the leadscrew turning, engage the half-nut by pushing the lever down and note the number lined up wiht the mark on the threading dial. This closes the half-nut on the leadscrew and the powers the cross-slide table to the left or right on the lathe bed ways. When you have finished the cut, disengage the half-nut by lifting up on the handle.

It is best to take a light, scratch cut first without using cutting fluid. After the tool runs the desired length, disengage the half-nut and back the tool out of the work. Then return the tool to the starting position. Do not engage the half-nut until the threading dial is at the same point as when you began. (If you began cutting at zero, do not re-engage until zero on the threading dial once again matches the hashmark. Using a screw-pitch gauge, check the thread pitch. The benefit of taking the light cut is that you can correct any mistakes you might have made.

It's time to take the real cut now, so apply the appropriate cutting fluid to the work. Feed the compound feed in 0.005-0.020" for the first run, depending on the pitch of the thread you have to cut. If you are cutting a coarse thread, start by taking a few heavy cuts. Reduce the cut depth for each run until it is about 0.002" at the final run. Bring the cross-feed calibration to zero, then make the second cut.

Continue this process until the tool is within 0.010" of the finished depth. Brush the threads regularly to remove chips. After the second cut, check the thread fit using a ring gauge, a standard nut or mating part, or a screw thread micrometer. It is required to leave the piece in the chuck and not remove it for testing.

Continue taking 0.002" cuts. Then check the fit between each cut. when you thread the nut, it should go on easily but without end play. When you have the desired fit, chamfer the end of the thread to protect it from damage. To chamfer is to take a 45° cut off the end of the bolt.

Cutting Left-hand Threads

Cut left-hand threads exactly as you cut right-hand threads, except feed the carriage toward the tailstock instead of away from it. Or the spindle rotation is reversed. Reverse the cutter clearance and grind the cutters back with a clearance angle on the left side. swing the compound rest to the left rather than to the right.

Cutting Multiple Threads

Cut multiple threads one at a time exactly as you cut single threads, except increase the lead to make room for succeeding threads (a double lead for a double thread, a triple lead for a triple thread, etc.). After completing the first thread, remove the work from the centers without loosening the lathe dog. Then put it back in the lathe with the tail of the lathe dog in the correct slot to index the work for the next thread. This work requires a faceplate with accurately positioned slot, uniformly spaced and equal in number to the number of threads to be cut.

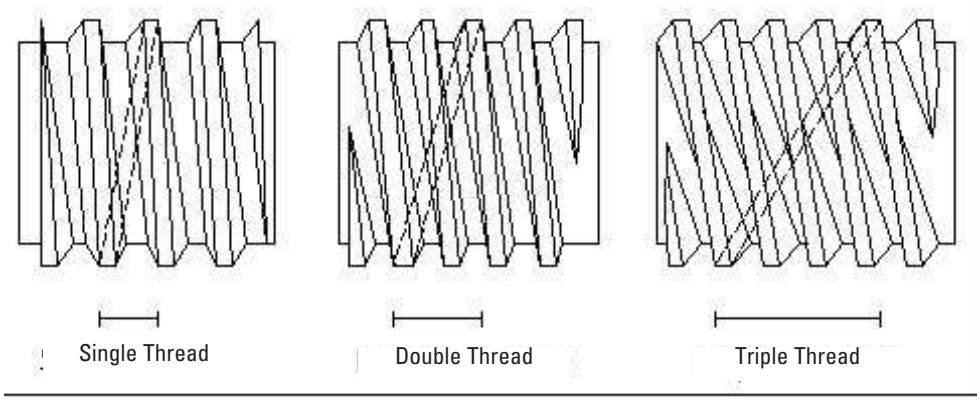


Figure A.11 When cutting multiple threads, increase the lead to make room for succeesding threads.

Cutting Internal Threads

Internal thread cutting is like external thread cutting, except you have the clearance restrictions and tool problems of boring. You use the same toolholders, but the cutters have thread forms and are fed at thread-cutting ratios of feed to spindle revolutions.

Another difference between boring and inside threading is the cutting angle at which the cutter approaches the workpiece. As with external thread cutting, the internal threading tool must engage the work on dead center and be held so the cutter coincides with the workpiece's center radius.

In squaring the cutter with the work, use a center gauge or thread gauge. Internal cutters require greater end and side clearance, and cutter length is also restricted because internal thread cutters must have enough end clearance that the cutter lifts clear of the thread for removal. Before cutting an internal thread, bore the workpiece to the exact inside diameter.

Because the feed of successive cuts is toward, not away from the operator, the thread-cutting set is reversed. Also, you must take lighter cuts because of the cutter's extension from the toolpost. Take an extra finishing cut without changing the setting of the compound rest.

Cutting Special-form Internal Threads

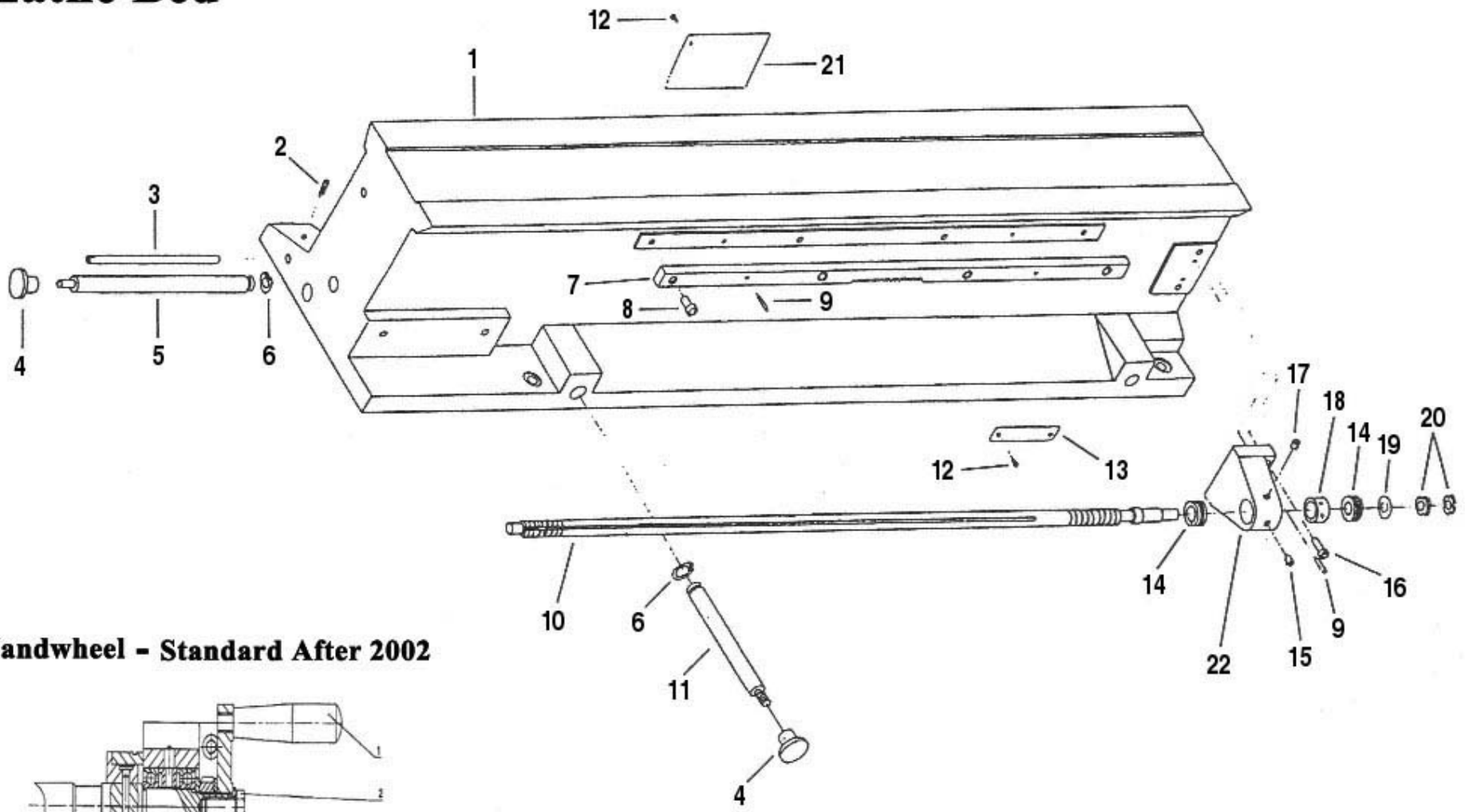
You can cut internal forms in all the thread forms used for external threads. There is only one factor that calls for special attention in cutting special-shaped internal threads: the difference of clearances between the nut and screw recommended for different thread types. If you don't have recommended clearances, it is safe to cut a nut (internal thread) thread 0.005” to 0.010” per inch larger than the screw's outside diameter.

Cutting Threads on a Taper

Cut thread on a taper the same as on a straight shaft, except in the setup of the tools. set the threading tool at 90° to the axis of the taper, rather than at 90° to its surface.

14 Diagrams & Parts List

Lathe Bed



Handwheel - Standard After 2002

Lathe Bed & Handwheel

Diagram Number	Part Number	Reference Number	Description
1	G01001 G01001L	 1-01	Bed for GN-1324 Bed for GN-1340
2	G01002	S11992	Cone-point set screw M6 x 20
3	G01003	1-02	Shaft Pin
4	G01004	C30030	Lifting Knob
5	G01005	1-22	Lifting Pin (II)
6	G01006	GB894.1	Snap Ring M20
7	G01007	Rack for	GN-1324
	G01007L	1-12	Rack for GN-1340 (Note: This is two pieces)
8	G01008	S11340	Sockethead Cap Screw M6 x20
9	G01009	GB117	Taper Pin M4 x 22
10	G01010		Leadscrew for GN-1324
	G01010L	1-13	Leadscrew for GN-1340
11	G01011	C30063	Lifting Pin
12	G01012	BG827	Rivet M2 x 5
13	G01013	1-24	Smithy Plate
14	G01014	GB292	Angular Contract Bearing 46102
15	G01015	GB71	Setscrew M6 x 10
16	G01016	GB70	Hex-Socket Screw M6 x 20
17	G01017	C30050	Oiler #6
18	G01018	1-15	Spacer
19	G01019	GB97.1	Washer M12
20	G01020	GB812	Spanner Nut M12 X 1.25
21	G01021	1-25	Data Plate
22	G01022	1-14	Leadscrew Support

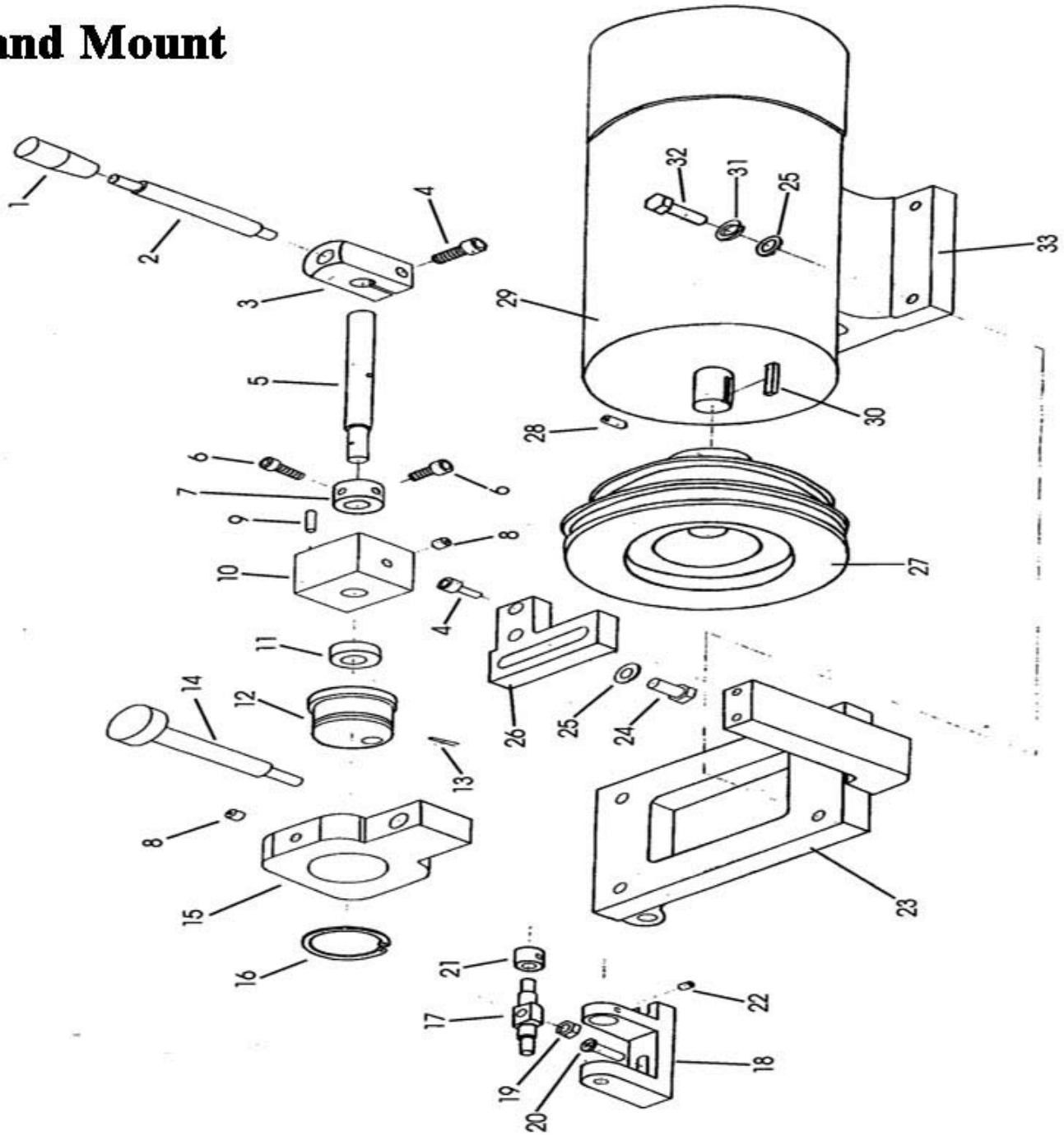
Additional Leadscrew Dial Assembly G91023

1	G01023		Leadscrew Outer Dial
2	G05068		Leadscrew Inner Dial
3	G05069		Dial Spring
4	S11946		Dial Setscrew
5	G91023		Leadscrew Assembly

Handwheel Assembly

1	G01028	HY8310.4-1	Handle
2	SS160		Bolt, 5/16"-18 x 1/2"
3	S18140	GB97.1-85	Washer, M8
4	G01027	G1324.1-29	Hand Wheel
5	S18200	GB97.1-85	Washer, M12

Motor and Mount



Motor & Mount

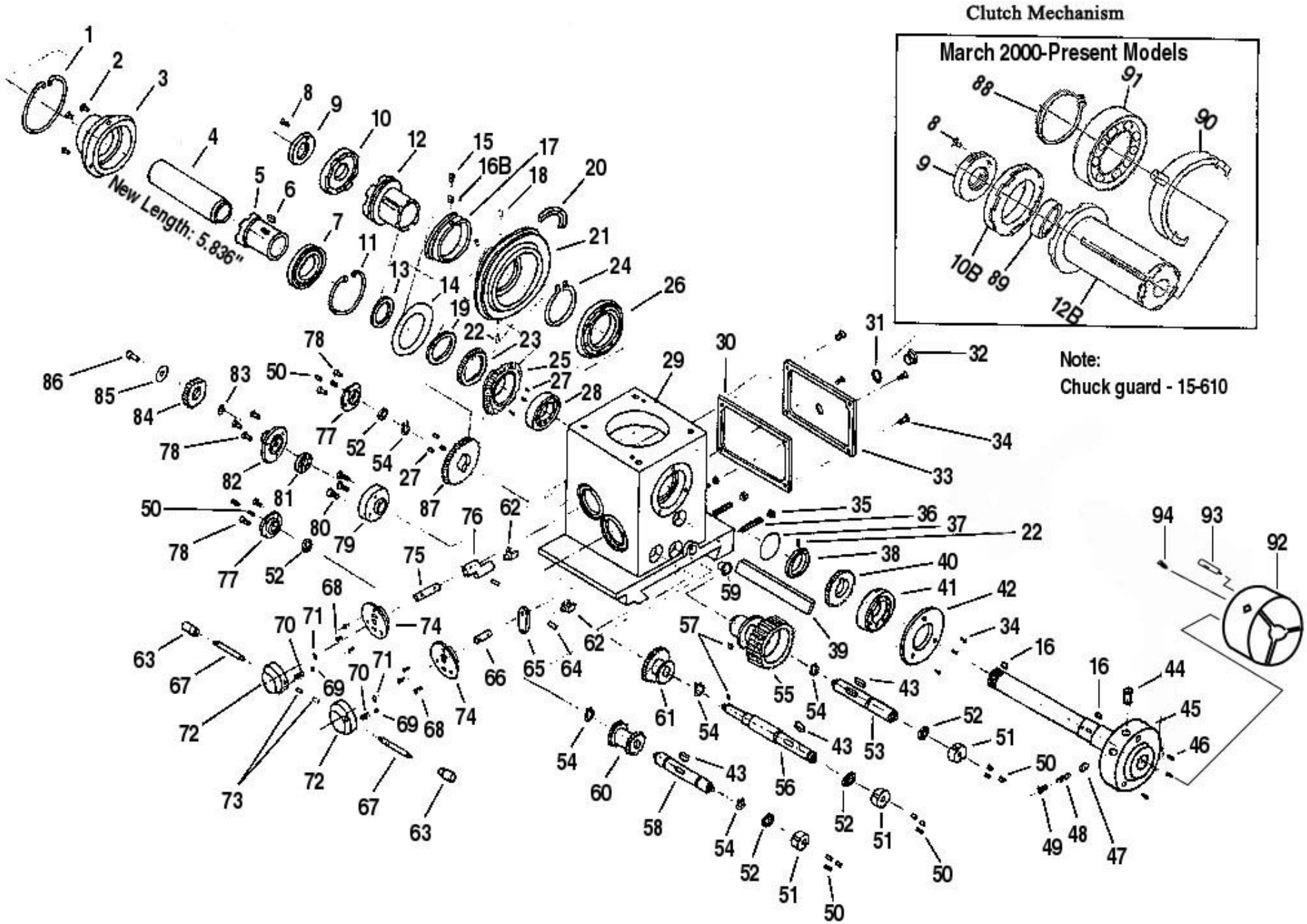
Diagram Number	Part Number	Reference Number	Description
1	G02001	JB/T7271.5	Handle sleeve BM 8 x 40
2	G02002	JB/T271.6	Handle BM 8 x 80
3	G02003	1-11	Handle Seat
4	G02004	S11971	Sockethead capscrew M6 x 16
5	G02005	1-10	Cam Shaft
6	G02006	S11671	Sockethead capscrew M5 x 16
7	G02007	1-09	Bushing (II)
8	G02008	C30050	Oiler #6
9	G02009	GB119	Pin 4 x 18
10	G02010	1-08	Block, Tensioner, center
11	G02011	1-07	Bushing (1)
12	G02012	1-05	Cam
13	G02013	GB117	Taper Pin 3 x 16
14	G02014	1-19	Adjusting Knob
15	G02015	1-06	Cam Seat
16	G02016	GB6170	Snap Ring 40
17	G02017	1-20	Shaft Pin

Diagram Number	Part Number	Reference Number	Description
18	G02018	1-17	Standoff Bracket
19	G02019	GB6170	Hex Nut M6
20	G02020	S11340	Sockethead Capscrew M6 x 20
21	G02021	1-18	Bushing
22	G02022	S1132	Conepoint Setscrew M4 x 6
23	G02023	1-03	Motor Mount
24	G02024	S12290	Hex Bolt M8 x 28
25	G02025	S18140	Washer M8
26	G02026	1-16	Mount end bracket
27	G02027	(G02027A) 1-04	Motor Pulley
28	G02028	(S11958) GB71	Setscrew M6 x 10
29	G02029	SS777	Motor
30	G02030	S18140	Washer M8
31	G02031	Key	
32	G02032	S12290	Hex Bolt M8 x 20
33	G02033		Motor Bracket

New DC Motor
G02029-110
G02029-220

Granite Motor Upgrade
GMX02029-110
GMX02029-220

Headstock


Clutch Mechanism
March 2000-Present Models
New Length: 5.836"
Note:
Chuck guard - 15-610

Headstock

Diagram Number	Part Number	Reference Number	Description
1	G03001	GB893 1-86	Snap ring M100
2	G03002	GB819-85	Countersunk Phillips M6x20
3	G03003	2-28	Pulley seat
4	G03004	2-10	Sleeve
5	G03005	2-25	Right Coupler
6	G03006	GB1096-79	Key 3x20
7	G03007	GB276-82	Ball bearing
8	G03008	GB68-85	Countersunk Phillips M5x8
9	G03009	CQ9108.206	Lock nut M34x1.5
10	G03010	CQ9108.212	Left Coupler
11	G03011	GB893.1-86	Snap ring A80
12	G03012	2-13	Center coupler
13	G03013	2-11	Spanner
14	G03014	2-08	Oil collar -Slinger
15	G03015	(S11342) GB65-85	Setscrew M4x10
16	G03016	(S21512) GB1096-79	Key 5x12
17	G03017	(G08017)2-09	Coupler sleeve 16B 6X14 (S21530)

Diagram Number	Part Number	Reference Number	Description
18	G03018	GB1096-79	Key 6x14
19	G03019	2-27	Spacer
20	G03020	GB1171-74	V-belt A1000
21	G03021	2-07	Pulley
22	G03022	GB71-85	Setscrew M6x8
23	G03023	2-26	Gear (ii)
24	G03024	GB8894.186	Snap ring A65
25	G03025	2-24	Bevel gear
26	G03026	GB276-82	Ball bearing 113
27	G03027	GB73-85	Setscrew M5x10
28	G03028	GB297-84	Taper roller bearing E2001710E
29	G03029	2-01	Headstock
30	G03030	2-16	Gasket
31	G03031	GB1235-76	O-ring 25x24
32	G03032	Q/ZB20	Oil plug M20x1.5
33	G03033	1-17	Gearbox cover
34	G03044	GB68-85	Flathead Phillips M5x20

HeadStock

Diagram Number	Part Number	Reference Number	Description
35	G03035	GB6172-86	Flathead Phillips M5x20
36	G03035	GB6172-86	Hex nut M10
37	G03036		Wire 1.2x190
38	G03038	2-52	Spacer
39	G03039	2-20	Gib
40	G03040	2-23	Gear
41	G03041	GB297-84	Taper rolling bearing E2007108E
42	G03042	2-22	Bearing cover
43	G03043	GB1096-79	Key 5x20 (use 30mm key)
44	G03044	2-45	Cam
45	G03045	2-21	Spindle
46	G03046		Three-jaw chuck
47	G03047	2-43	Stopper
48	G03048	2-44	Spring
49	G03049	GB67-85	Setscrew M8x20
50	G03050	GB73-85	Setscrew M5x6
51	G03051	2-29	Bearing cover
52	G03052	GB276-82	Ball bearing 18

Diagram Number	Part Number	Reference Number	Description
53	G03053	2-30	Shaft #1
54	G03054	GB894.1-86	Snap ring 16
55	G03055	2-31	Gear
56	G03056	2-34	Shaft #3 (Has 30mm T-slot)
57	G03057	GB1096-79	Key 5x6
58	G03058	2-32	Shaft #2
59	G03059	GB1160-79	Oil glass
60	G03060	2-33	Duplex gear
61	G03061	2-35	Sliding gear
62	G03062	CQ9101.6-52A	Fork
63	G03063	C30054	Handle Sleeve M8x40
64	G03064	G117-86	Taper pin 3x20
65	G03065	2-47	Arm
66	G03066	2-48	Crank shaft (III)
67	G03067	GB4141.15-84	Handle M8x50
68	G03068	GB819-85	Setcrew M5x10

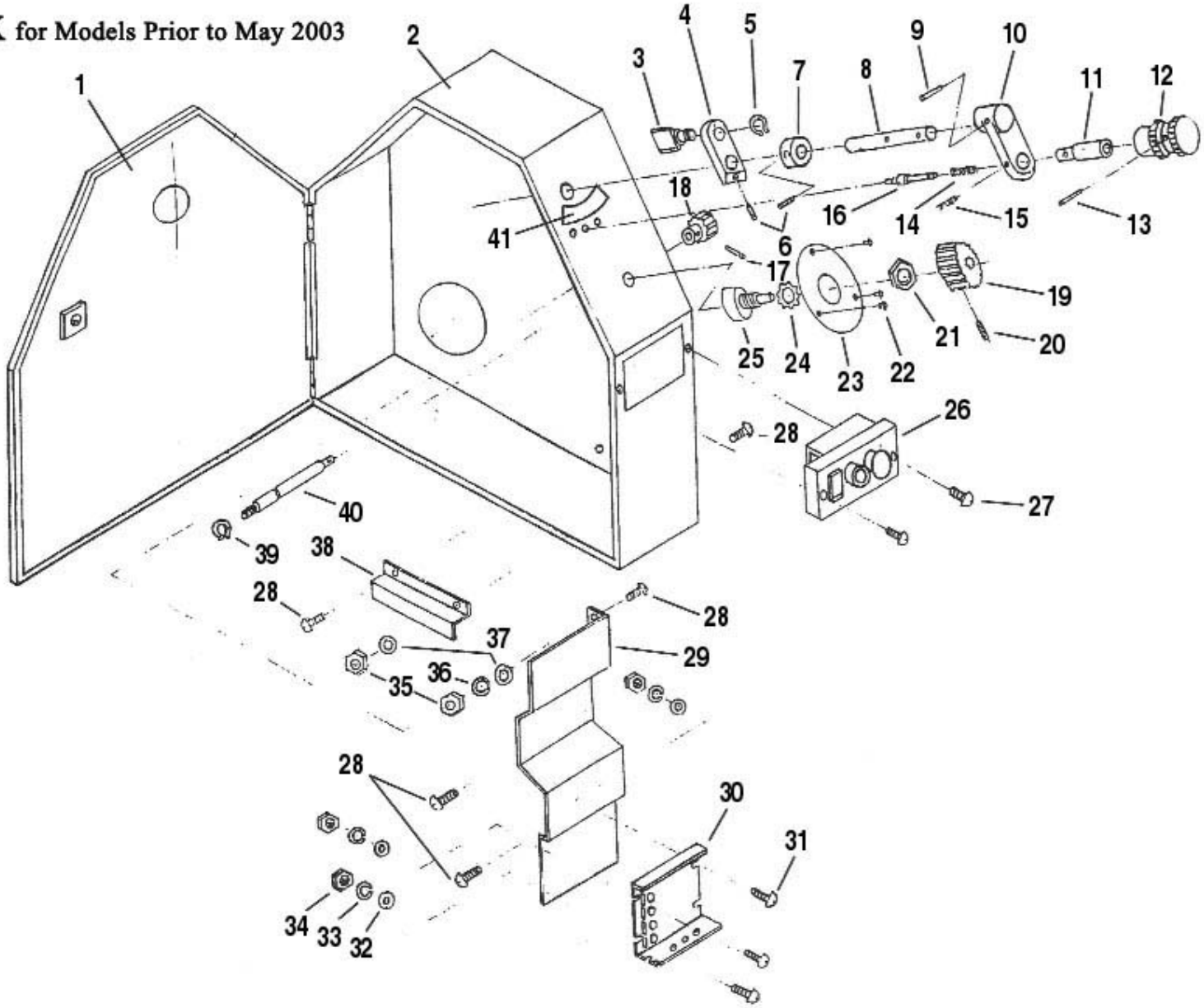
HeadStock

Diagram Number	Part Number	Reference Number	Description
69	G03069	(C30126) GB308-77	Ball 6.5
70	G03070	GB2089-80	Spring 0.8x5x25
71	G03071	GB1235-76	Handle seat 12x50
72	G03072	GB4141.1984	Handle seat 12x50
73	G03073	GB117-86	Taper pin 5x50
74	G03074	2-46	Cover
75	G03075	2-42	Crank shaft (II)
76	G03076	2-41	Crank (II)
77	G03077	2-05	Bearing cover
78	G03078	GB68-85	Setscrew M5x12
79	G03079	2-04	Bearing seat
80	G03080		Hex socket setscrew (M5x25)
81	G03081	GB276-82	Ball bearing 103
82	G03082	2-02	Bearing cover
83	G03083	GB1235-76	O-ring 22 x 2.4
84	G03084	2-03	Drive gear
85	G03085	CJ0625.2-18	Washer M6
86	G03086	GB5783-86	Hex bolt M6x12
87	G03087	2-06	Gear
88	S23055		Snap ring M55
89	G03089	2-55	Spacer
90	G03090	2-37-00	Arm
91	G03091	GB276-84	Bearing, 55 x 90 x18
92	G03046		3 Jaw Chuck
93	G03088		Chuck Stud Camlock
94	S11951		Stud Screw

Clutch Mechanism-2000 to Current

8	G03008	GB68-85	Countersunk Phillips M5x8
9	G03009	CQ9108.206	Lock nut M34x1.5
10B	G03010B	G1324.212B	Coupler Left
12B	G03012B	G1324.213B	Coupler Center
88	S23065		Snap ring M55
89	G03089	2-55	Spacer
90	G03090	2-37-00	Arm
91	G03091	GB276-84	Bearing, 55 x 90 x18

Pulley Box for Models Prior to May 2003



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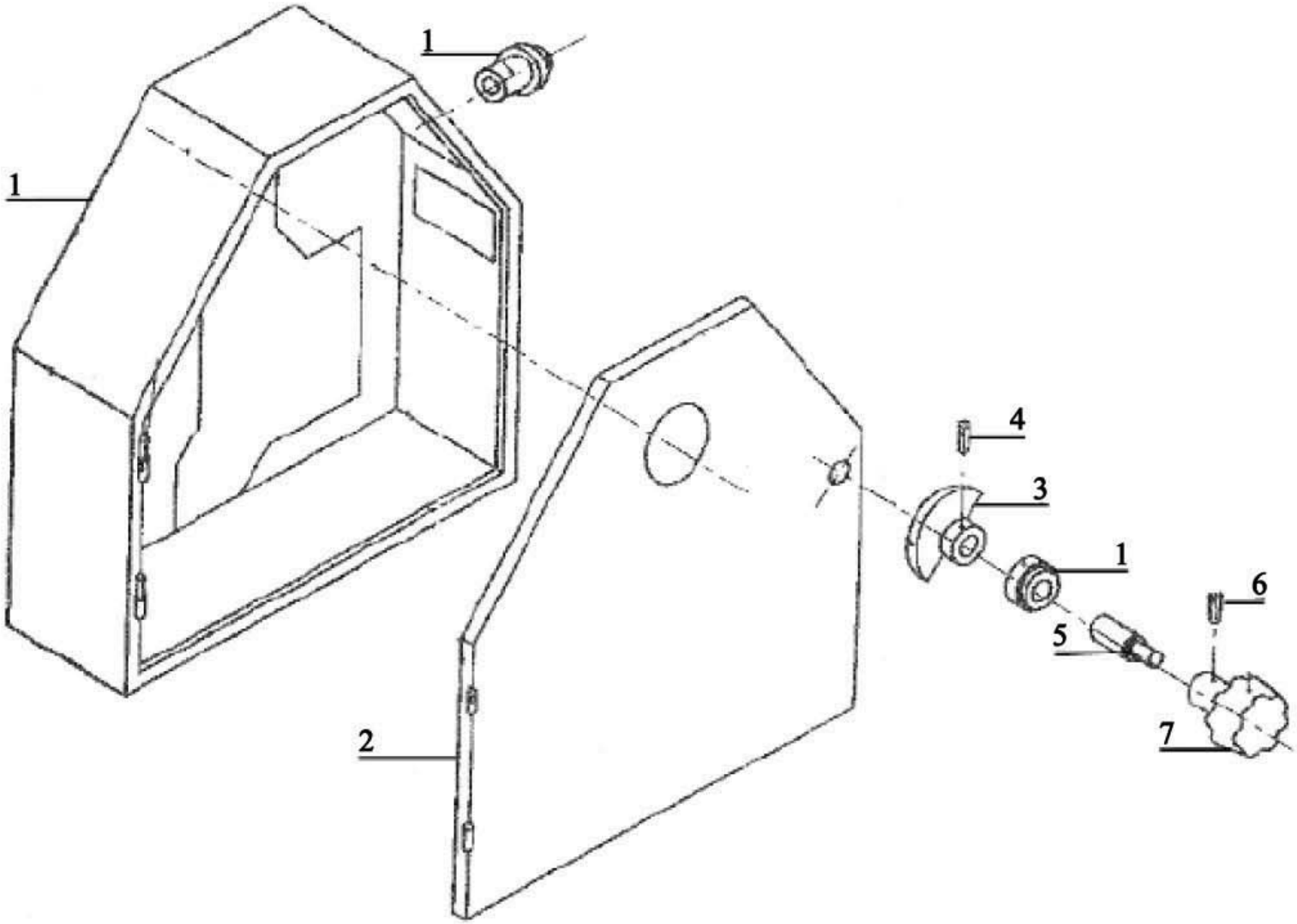
Pulley Box for Models After to May 2003



Pulley Box for Models Prior to May 2003

Diagram Number	Part Number	Reference Number	Description
1	G04001	2-18	Door
2	G04002	2-49	Pulley box
3	G04003	2-37	Slide
4	G04004	2-36	Lever arm (I)
5	G04005	GB894.1	Snap ring M8
6	G04006	S11952	Cone point setscrew M6x12
7	G04007	2-38	Spacer
8	G04008	2-40	Lever shaft (I)
9	G04009	GB117 (S22091)	Taper pin 4x26
10	G04010	2-39	Lever arm
11	G04011	CQ1909.7-18	Pin
12	G04012	CQ9109.7-19	Knob
13	G04013	GB117 (S22218)	Taper pin 2x18
14	G04014	CQ9109.7-17	Spring
15	G04015	S11912	Conepoint setscrew M6x8
16	G04016	CQ9109.716	Locating pin
17	G04017	GB117	Taper pin 3x20

Diagram Number	Part Number	Reference Number	Description
18	G04018	GB4141.29	Knob 8x32
19	G04019		Knob
20	G04020		Setscrew
21	G04021		Hex nut
22	G04022	GB827	Rivet 2x5
23	G04023	8/1-04	Speed dial
24	G04024		Lock washer
25	G04025		Potentiometer
26	G04026		Switch
27	G04027	GB818	Panhead Phillips screw M5x16
28	G04028	GB818	Panhead Phillips screw M5x12
29	G04029	8/1-01	Electrical box
30	G04030	SS702 (Use SS770)	SCR module
31	G04031	GB818	Panhead screw M4x12
32	G04032	GB97.1	Washer M4
33	G04033	GB93	Lock washer M4
34	G04034	GB6170	Hex nut M4

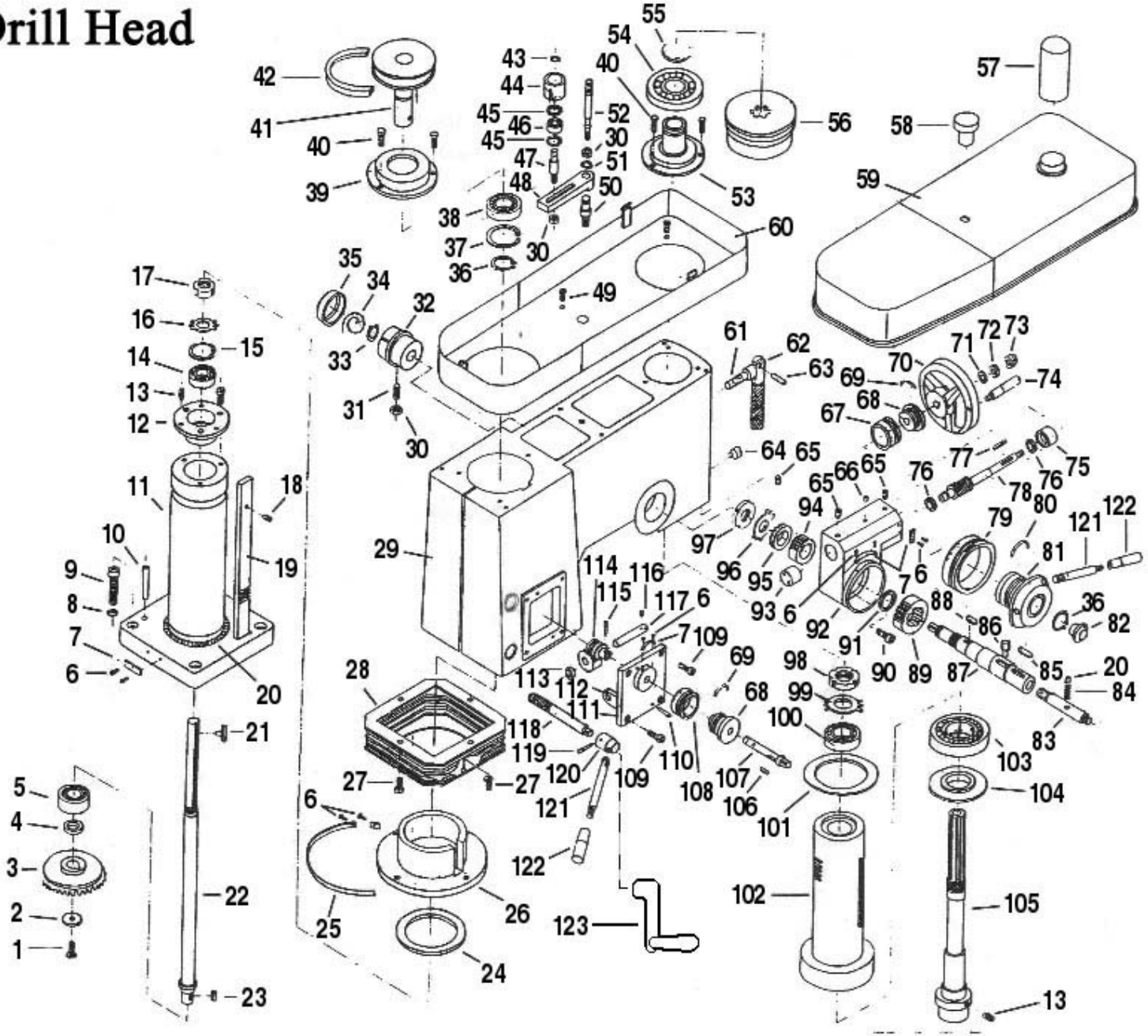
Pulley Box Model Prior to May 2003

Diagram Number	Part Number	Reference Number	Description
35	G04035	GB6170	Hex nut M5
36	G04036	GB93	Washer M5
37	G04037	GB97.1	Lock washer 5
38	G03038	8/1-03	Wire cover
39	G03039	GB894.1	Snap ring 10
40	G03040	2-51	Latch
41	G03041		Mill/lathe plate
42	G04042		Taper Pin M5x25
	G94001		Door and Pulley Box Assembly
	G04047		Fuse

Pulley Box for Models After to May 2003

Diagram Number	Part Number	Reference Number	Description
1	G04002N	G1324.2-49Z-2	Pulley Box-Includes Hinge and Bushing welded to pulley box
2	G04001N	G1324-0.49Z-1	Pulleym Box Door includes hinges and bushing welded to door
3	G04043	CQ6132W.4.1-10	Locking Piece
4			Taper Pin
5	G04040N	CJ0625.130	Shaft
6	G04042	S22170	Taper Pin 5 x 25
7	G04018N	JB/T7274.494	Knob 10 x 40

Mill / Drill Head



MIll / Drill Head

Diagram Number	Part Number	Reference Number	Description
1	G05001	GB68	Setscrew M5x10
2	G05002	3-30	Washer
3	G05003	3-29	Bevel gear
4	G05004	3-28	Spacer
5	G05005	GB276	Ball bearing E205Z
6	G05006	GB827	Rivet 2x5
7	G05007	Z04124-63	Indicator
8	G05008	S18195	Lock washer M12
9	G05009	GB70	Hex-socket setscrew M12x1.75x30mm
10	G05010	GB118	Taper pin 8x30
11	G05011	3-27	Column
12	G05012	3-41	Bearing seat
13	G05013	GB75	Setscrew M6x12
14	G05014	GB292	Ball bearing E46204Z
15	G05015	GB893	Snap ring
16	G05016	GB858	Lock washer
17	G05017	GB812	Spanner nut M20x1.5

Diagram Number	Part Number	Reference Number	Description
18	G05018	GB65	Setscrew M5x16
19	G05019	3-38	Rack
20	G05020	GB308	Ball
21	G05021	3-05	T-key
22	G05022	3-06	Mill shaft
23	G05023	GB1096	Key 6x12
24	G05024	3-26	Spacer
25	G05025	3-25	Angle plate
26	G05026	3-24	Cover mount
27	G05027	GB67	Panhead slotted screw M5x8
28	G05028	3-23	Column cover
29	G05029	3-40	Mill/drill head
30	G05030	GB6172	Jam nut M8
31	G05031	GB71	Setscrew M8x25
32	G05032	Z7030.2-20	Spring housing
33	G05033	GB894	Snap ring M20
34	G05034	CQ9106-53	Coil spring

Mill / Drill Head

Diagram Number	Part Number	Reference Number	Description
35	G05035	ZQ4124-59	Spring cover
36	G05036	GB894	Snap ring M30
37	G05037	GB893	Snap ring M62
38	G05038	GB276	Ball bearing
39	G05039	3-03	Bearing seat #1
40	G05040	GB5783	Hex bolt M5x16
41	G05041	3-04	Mill pulley
42	G05042	GB1171	V-belt A900
43	G05043	GB894	Snap ring M10
44	G05044	3-14	Sleeve
45	G05045	GB893	Snap ring M26
46	G05046	GB276	Ball bearing
47	G05047	3-15	Roller shaft
48	G05048	3-16	Tensioner
49	G05049	GB67	Panhead slotted setscrew M6x8
50	G05050	3-07	Fulcrum
51	G05051	GB894	Snap ring M15
52	G05052	3-08	Cover lock bolt

Diagram Number	Part Number	Reference Number	Description
53	G05053	3-13	Bearing seat #2
54	G05054	GB276	Ball bearing E208
55	G05055	GB894	Snap ring M40
56	G05056	3-12	Spindle pulley
57	G05057	3-11	Mill cap
58	G05058	C30030	Knob
59	G05059	3-02	Upper cover
60	G05060	3-01	Lower cover
61	G05061	ZQ4124-38	Locking bolt
62	G05062	ZQ4124-39	Locking handle
63	G05063	GB119	Pin4x18
64	G05064	Z7030.2-14	Eccentric shaft
65	G05065	S11942	Conepoint slotted setscrew M6x10
66	G05066	C30050	Oiler #6
67	G05067	3-46	Dial
68	G05068	CJ0625.328	Dial

Mill / Drill Head

Diagram Number	Part Number	Reference Number	Description
69	G05069	Use C30173	Spring piece
70	G05070	GB414.22	Handwheel B12x100
71	G05071	GB97	Washer M10
72	G05072	GB6172	Jam M10
73	G05073	S18160	Acorn nut M10
74	G05074	GB4141.5	Handle M6x50
75	G05075	3-45	Bushing #2
76	G05076	GB276	Ball bearing 1000801
77	G05077	GB1096	Key 4x25
78	G05078	3-43	Worm-geared shaft
79	G05079	3-20	Dial
80	G05080	CQA9111.808	Spring piece
81	G05081	3-19	Handle seat
82	G05082	JB1357	Knob
83	G05083	3-18	Locking shaft
84	G05084	CQ9106-31	Spring
85	G05085	S21805	Key 8x25
86	G05086	CQA9111.8-06	Locking piece

Diagram Number	Part Number	Reference Number	Description
87	G05087	3-22	Feeding shaft
88	G05088	GB1096	Key 8x14
89	G05089	3-21	Worm gear
90	G05090	S11971	Sockethead capscrew M6x16
91	G05091	CQA9111.8-2	Washer
92	G05092	3-44	Worm-gear box
93	G05093	3-42	Bushing #1
94	G05094	3-34	Main gear
95	G05095	3-33	Gear
96	G05096	GB858	Lock washer M22
97	G05097	GB812	Spanner nut M22x1.5
98	G05098	GB812	Spanner nut M30x1.5
99	G05099	GB858	Lock washer M30
100	G05100	GB292	Ball bearing E46206101
101	G05101	Z7030.2-15	Rubber mat
102	G05102	3-09	Quill

Mill / Drill Head

Diagram Number	Part Number	Reference Number	Description
103	G05103	GB292	Ball bearing E46208
104	G05104	3-48	Cover
105	G05105	3-10	Mill/drill spindle
106	G05106	GB1096	Key 4x10
107	G05107	3-35	Shaft
108	G05108	3-36	Dial
109	G05109	S11671	Sockethead capscrew M5x16
110	G05110	S22140	Taper pin 3x20
111	G05111	3-37	Mount plate
112	G05112	ZQ4124.54	Worm gear
113	G05113	CQA9111.705	Spacer
114	G05114	3-39	Worm gear
115	G05115	GB117	Taper pin 3x20
116	G05116	GB71	Setscrew M4x8
117	G05117	CQZ9111.706	Shaft
118	G05118	3-32	Locking bolt
119	G05119	GB117	Taper pin 4x26
120	G05120	3-31	Locking handle seat

Diagram Number	Part Number	Reference Number	Description
121	G05121	GB4141.15	Locking handle BM10x100
122	G05122	GB4141.14	Locking handle sleeve BM10x50
123	G05123	New Mill Head Crank	Mill Head Crank - Replaced Daigram # 119-122
	G05118	New Replacement	Replaced Daigram # 119-122

Compound Angle ToolPost

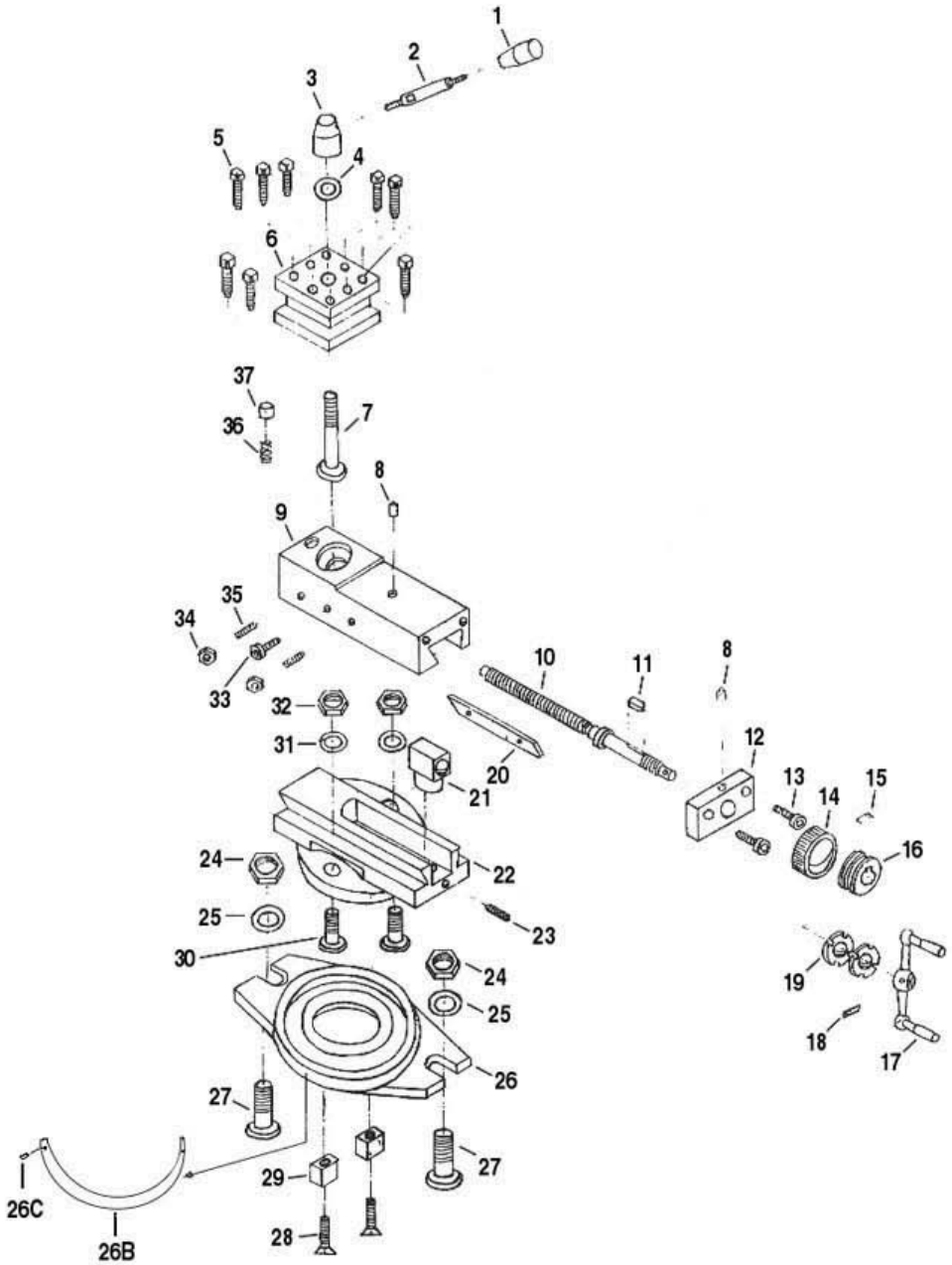


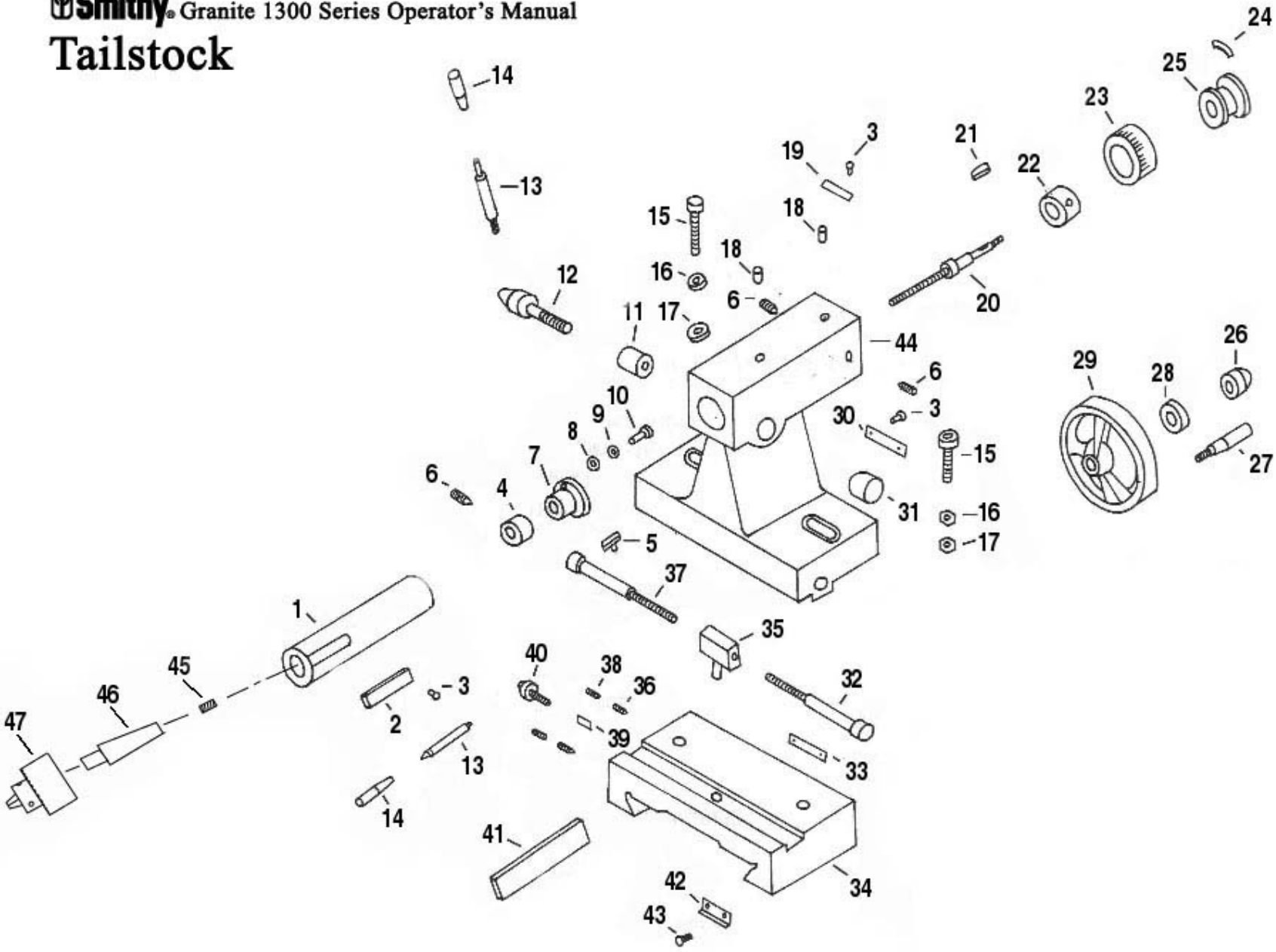
Diagram Number	Part Number	Reference Number	Description
1	G06001	C30054	Handle sleeve BM8x40
2	G06002	C30053	Handle BM8x50
3	G06003	C30185	Handle seat BM12x26
4	G06004	C30556	Washer M10
5	G06005	GB83	Square-head bolt M8x32
6	G06006	C30184	Tool post
7	G06007	S12696	Bolt
8	G06008	C30050	Oiler
9	G06009	C30175	Upper slide
10	G06010	4-06	Screw
11	G06011	GB1096	Key 3x10
12	G06012	4-07	Mount piece
13	G06013	S11671	Sockethead capscrew M5x16
14	G06014	4-08	Dial
15	G06015	C30173	Spring piece
16	G06016	4-12	Dial seat
17	G06017	GB4141.10	Crank handle 8x25

Compound Angle Toolpost

Diagram Number	Part Number	Reference Number	Description
18	G06018	S22110	Taper pin 3x16
19	G06019	C30220	Spanner nut M10x1
20	G06020	C30176	Gib
21	G06021	C30612	Nut
22	G06022	C30184	Lower slide
23	G06023	GB71	Setscrew M5x10
24	G06024	GB6170 (S18155)	Hex nut M10
25	G06025	GB97.1 (S18170)	Washer
26	G06026	4-14	Mount plate
26B	C30407	C30407	Label
26C	S22355	S22355	Rivet 2.5
27	G06027	GB37	T-bolt M10x30 (S12626)
28	G06028	GB819	Countersunk Phillips screw M4x12
29	G06029	4-10	Locating piece
30	G06030	S12296	T-bolt M8x20 (5/16"x18"x3/4" Carriage Bolt)
31	G06031	S18140	Washer

Diagram Number	Part Number	Reference Number	Description
32	G06032	S18125	Hex nut M8
33	G06033	GB77	Sockethead capscrew M5x15
34	G06034	S18065	Hex nut M5
35	G06035	S11672	Conepoint setscrew M5x16
36	G06036	C30183	Ball with spring
37	G06037	4-17	Stopper
	G06039		Wrench, CATP GN

Tailstock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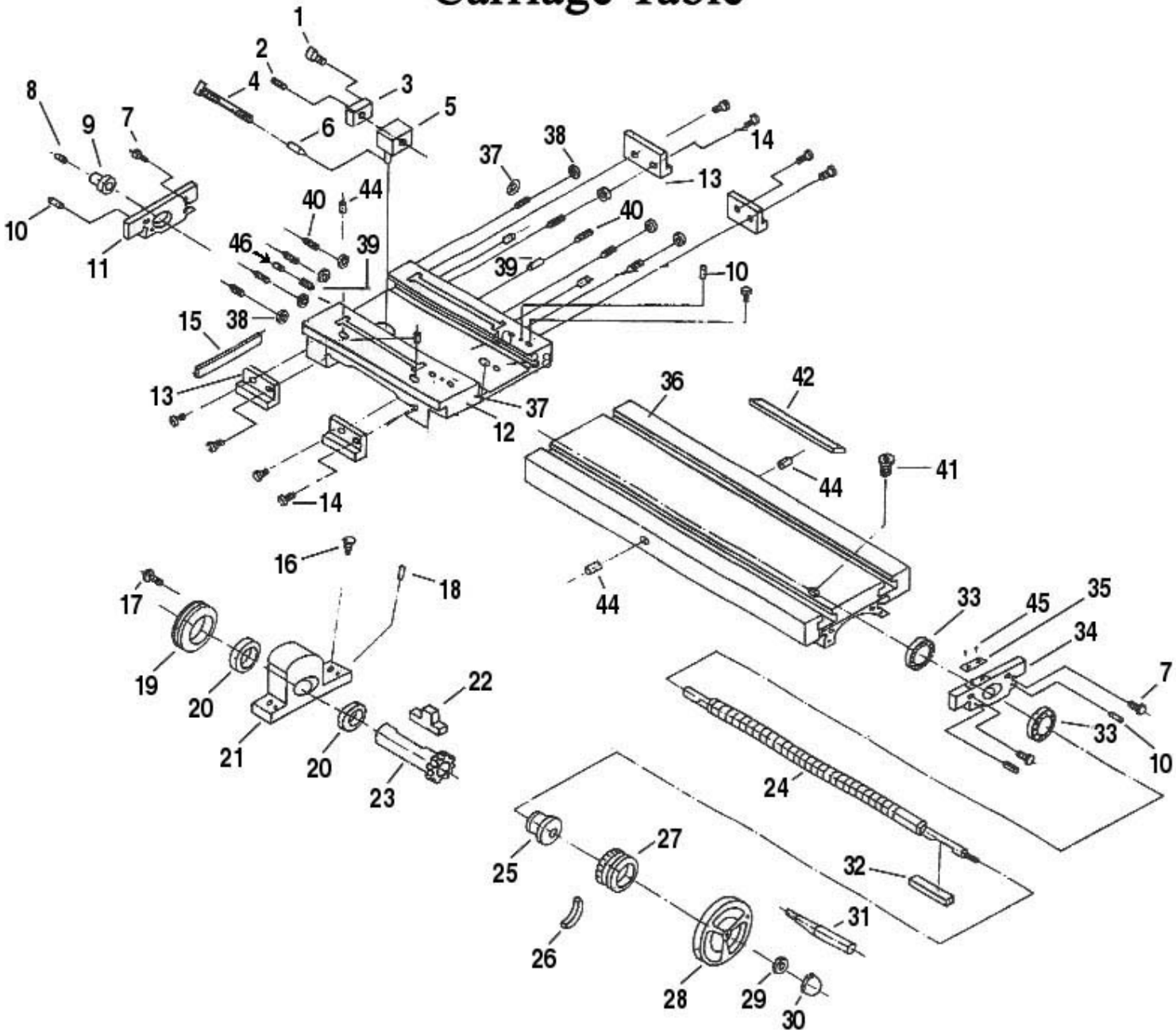
Tailstock

Diagram Number	Part Number	Reference Number	Description
1	G07001	5-04	Barrel
2	G07002	5-03	Ruler
3	G07003	GB827	Rivet
4	G07004	5-06	Nut
5	G07005	CQ9107.508	T-key
6	G07006	S11632	Setscrew M5x8
7	G07007	5-07	Adjusting nut
8	G07008	GB848	Washer M4
9	G07009	S18045	Lock washer M4
10	G07010	GB818	Setscrew M4x12
11	G07011	5-11	Locking piece (I)
12	G07012	5-10	Locking shaft
13	G07013	GB4141.15	Handle BM8x50
14	G07014	GB4141.14	Handle sleeve BM8x40
15	G07015	GB5783	Hex bolt M10x40
16	G07016	GB93	Lock washer M10
17	G07017	S18170	Washer M10
18	G07018	GB1155	Oiler 5mm (C30050)

Diagram Number	Part Number	Reference Number	Description
19	G07019	ZQ4124-63	Indicator
20	G07020	5-05	Screw
21	G07021	S21170	Key 4x20
22	G07022	5-08	Bushing
23	G07023	5-18	Dial
24	G07024	CQ9109.618	Spring piece
25	G07025	5-09	Dial seat
26	G07026	S18160	Acorn nut M10
27	G07027	GB4141.5	Handle M6x50 (Use G05074)
28	G07028	GB6172	Jam nut M10
29	G07029	GB4141.22	Handwheel B12x100
30	G07030	5-17	Indicator
31	G07031	5-12	Locking piece (II)
32	G07032	GB70	Hex-socket bolt M10x80
33	G07033	5-16	Scale piece
34	G07034	5-01	Tailstock carriage

Diagram Number	Part Number	Reference Number	Description
35	G07035	5-15	Nut
36	G07036	S12278	Half dogpoint setscrew
37	G07037	GB70	Sockethead capscrew M10x40
38	G07038	GB75	Conepoint setscrew M8x12
39	G07039	S22420	Locking pin
40	G07040	5-14	Locking seat
41	G07041	5-13	Gib
42	G07042	6-20	Wiper
43	G07043	GB818	Slotted panhead screw M5x12
44	G07044	5-02	Tailstock
45	S12898		Arbor Plug
46	C30523		Drill Chuck Arbor (No tang)
47	72-001		Drill Chuck JT33

Carriage Table



Carriage Table

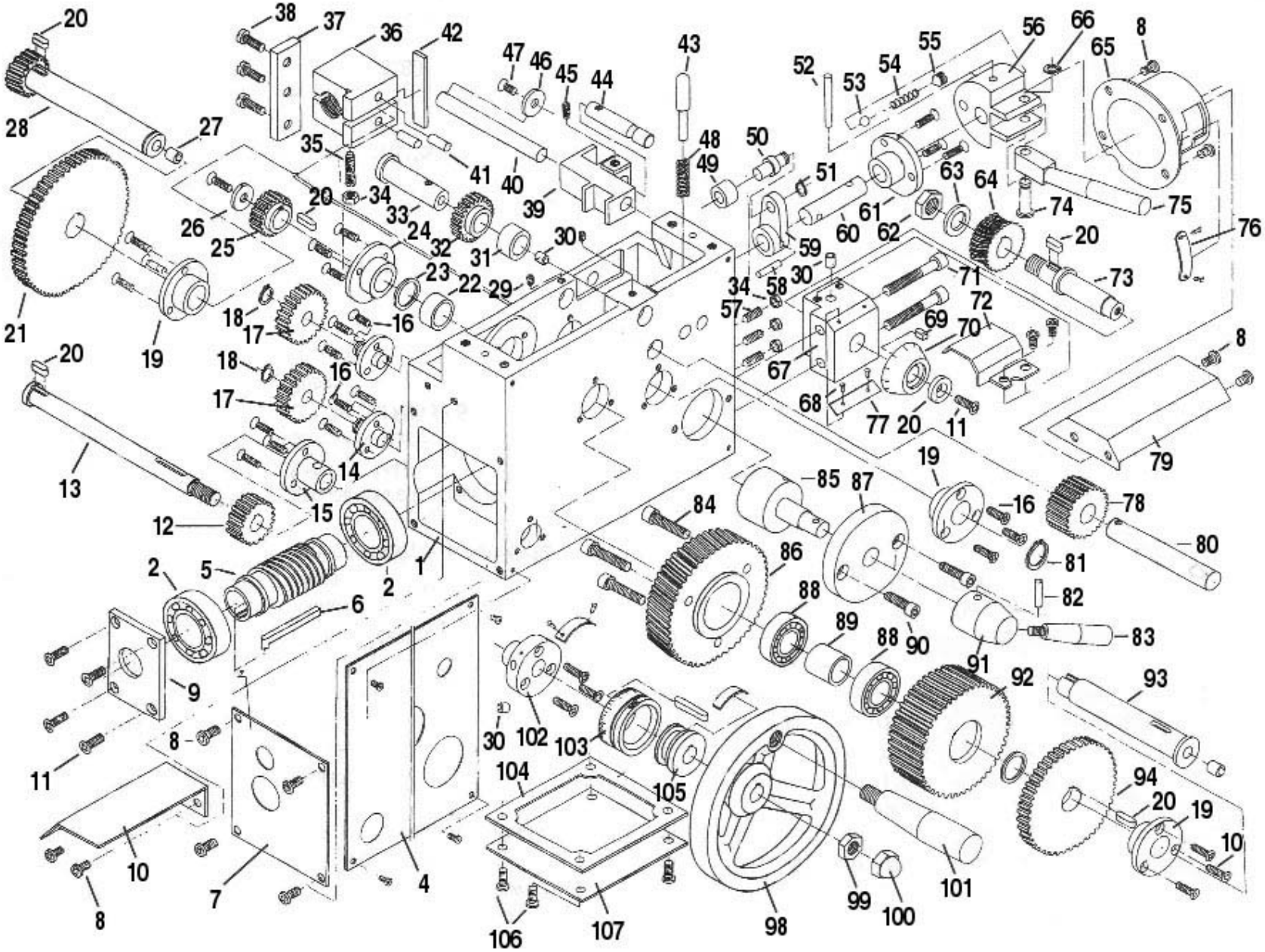
Diagram Number	Part Number	Reference Number	Description
1	G08001	S11691	Sockethead capscrew M5x20
2	G08002	S11642	Conepoint slotted setscrew M5x12
3	G08003	6-06	Adjusting nut
4	G08004	GB73	Sockethead capscrew M6x30
5	G08005	6-07	Nut
6	G08006	6-79	Locking pin
7	G08007	S11340	Sockethead capscrew M6x20
8	G08008	GB1155	Oiler
9	G08009	6-01	Bushing (I)
10	G08010	GB117	Taper pin 4x26
11	G08011	6-02	Screw bracket (I)
12	G08012	6-08	Carriage
13	G08013	6-20	Wiper
14	G08014	GB818	Panhead Phillips screw M5x12
15	G08015	6-05	Gib
16	G08016	S11971	Sockethead capscrew M6x16
17	G08017	GB819	Setscrew M4x8
18	G08018	GB117	Taper Pin A4x16

Diagram Number	Part Number	Reference Number	Description
19	G08019	JB24	Locking nut M24x1.5
20	G08020	6-12	Bushing
21	G08021	6-09	Bushing seat
22	G08022	6-10	Key
23	G08023	6-11	Gear sleeve
24	G08024	6-04	Crossfeed screw
25	G08025	6-18	Dial seat
26	G08026	3-19	Spring piece
27	G08027	6-17	Dial
28	G08028	GB4141.22	Handwheel B12x25
29	G08029	GB6172	Jam nut M10
30	G08030	S18160	Acorn nut M10
31	G08031	GB4141.5	Handle M10x80
32	G08032	GB1096	Key 4x28
33	G08033	GB292	Ball bearing 46101
34	G08034	6-16	Screw seat

Carriage Table

Diagram Number	Part Number	Reference Number	Description
35	G08035	ZQ4124-63	Indicator
36	G08036	6-03	Table
37	G08037	GB79	Sockethead capscrew M10x25
38	G08038	S18125	Hex nut M8
39	G08039	CQ9107.515	Locking pin
40	G08040	Use S11805 / GB79	Dogpoint setscrew M8x45 (M8x50)
41	G08041	GB70	Sockethead capscrew M8x12
42	G08042	6-19	Gib
43	G08043	GB79	Hex-socket setscrews
44	G08044	C30035	Oiler 8 mm
45	G08045	GB827	Rivet 2x5
46	S12618		Locking Bolt M10x25 1.5 Pitch

Apron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Apron

Diagram Number	Part Number	Reference Number	Description
1	G09001	6-38	Apron
2	G09002	GB292	Ball bearing 46105
3	G09003	GB818	Setscrew M3x10
4	G09004	6-71	Plate
5	G09005	6-33	Worm
6	G09006	6-47	L-key
7	G09007	6-75	Slide cover
8	G09008	GB818	Panhead Phillips screw M5x8
9	G09009	6-34	Bearing cover
10	G09010	6-35	Leadscrew cover(I)
11	G09011	GB819	Countersunk Phillips screw M5x16
12	G09012	6-41	Gear t20
13	G09013	6-39	Shaft (II)
14	G09014	6-61	Shaft cover
15	G09015	6-40	Bushing(IV)
16	G09016	GB819	Flatpoint setscrew M4x16
17	G09017	6-62	Gear t24

Diagram Number	Part Number	Reference Number	Description
18	G09018	GB894	Snap ring
19	G09019	6-60	Gear shaft cover (V)
20	G09020	GB1096 (S21522)	Key 4x12
21	G09021	6-58	Gear t65
22	G09022	6-56	Spacer
23	G09023	6-53	Washer
24	G09024	6-55	Shaft cover (IV)
25	G09025	6-54	Gear with keyway
26	G09026	6-53	Washer
27	G09027	Use C30035	Oiler 8mmx50190
28	G09028	6-59	Gear shaft
29	G09029	GB71 (S11946)	Conepoint setscrew M4x6
30	G09030	GB1155	Oiler
31	G09031	6-14	Bushing (II)
32	G09032	6-13	Gear t20
33	G09033	6-15	Shaft (I)
34	G09034	GB6172	Hex nut M5

Apron

Diagram Number	Part Number	Reference Number	Description
35	G09035	GB75	Conepoint setscrew M5x25
36	G09036	6-42	Half nut
37	G09037	6-43	Mount piece
38	G09038	GB65	Panhead Phillips screw M5x16
39	G09039	6-22	Fork
40	G09040	6-21	Stud
41	G09041	GB119	Taper pin B6x16
42	G09042	6-63	Stopping plate (Gib)
43	G09043	6-46	Locking pin (I)
44	G09044	6-48	Locking stud (II)
45	G09045	GB71	Conepoint slotted setscrew M5x12
46	G09046	6-70 (S11512)	Washer M5
47	G09047	GB819	Panhead Phillips screw M5x10
48	G09048	6-47	Spring
49	G09049	6-23	Bushing (III)
50	G09050	6-24	Fulcrum (I)
51	G09051	GB894	Snap ring
52	G09052	GB117	Taper pin 4x40

Diagram Number	Part Number	Reference Number	Description
53	G09053	GB308	Ball 6.5
54	G09054	GB2089	Spring 0.8x5x25
55	G09055	GB71	Conepoint slotted setscrew M8x10
56	G09056	6-26	Power feed handle seat
57	G09057	GB71	Setscrew M5x16
58	G09058	GB117	Taper pin A4x20
59	G09059	6-29	Crank arm
60	G09060	6-27	Arm shaft
61	G09061	6-28	Shaft pin seat
62	G09062	GB6172	Hex nut M12
63	G09063	6-65	Washer M12
64	G09064	6-66	Worm gear
65	G09065	6-25	Positioning cover
66	G09066	GB894	snap ring
67	G09067	6-67	Threading dial seat
68	G09068	GB827	Rivet 2x5

Apron

Diagram Number	Part Number	Reference Number	Description
69	G09069	GB1096	Key 4x8
70	G09070	6-69	Threading dial
71	G09071	(S12051)GB70	Sockethead capscrew M6x45
72	G09072	6-64	Worm cover
73	G09073	6-68	Threading dial shaft
74	G09074	6-31	Clevis pin
75	G09075	6-30	Handle
76	G09076	6-49	Feeding direction plate
77	G09077	ZQ4124-63	Indicator
78	G09078	6-50	Gear t23
79	G09079	6-78	Leadscrew cover (II)
80	G09080	6-51	Shaft (III)
81	G09081	GB894	Snap ring
82	G09082	GB117	Taper pin A4x26
83	G09083	GB4141.1	Handle M6x50
84	G09084	GB70	Sockethead capscrew M6x30
85	G09085	6-44	Half-nut closer
86	G09086	6-32	Helical gear t60

Diagram Number	Part Number	Reference Number	Description
87	G09087	6-45	Half-nut closer seat
88	G09088	GB276	Ball bearing
89	G09089	6-73	Bushing (V)
90	G09090	GB70	Sockethead capscrew M5x20
91	G09091	CJ0625.3-21	Handle seat
92	G09092	6-74	Gear t52
93	G09093	6-57	Shaft (IV)
94	G09094	6-72	Gear with keyway
95	G09095	GB819	Setscrew M4x20
96	G09096	GB1096	Key4x28
97	G09097	CJ0625.3-19	Spring piece
98	G09098	GB4141.22	Handwheel B12x125
99	G09099	S18155	Hex nut M10
100	G09100	S18160	Acorn nut M10
101	G09101	GB4141.5	Handle M10x80
102	G09102	6-37	Shaft cover (II)

Apron

Diagram Number	Part Number	Reference Number	Description
103	G09103	6-36	Dial
104	G09104	6-76	Gasket
105	G09105	6-18	Dial seat
106	G09106	GB818	Panhead Phillips screw M5x12
107	G09107	6-77	Bottom cover
	G99-000		Entire Apron Assembly

Gearbox

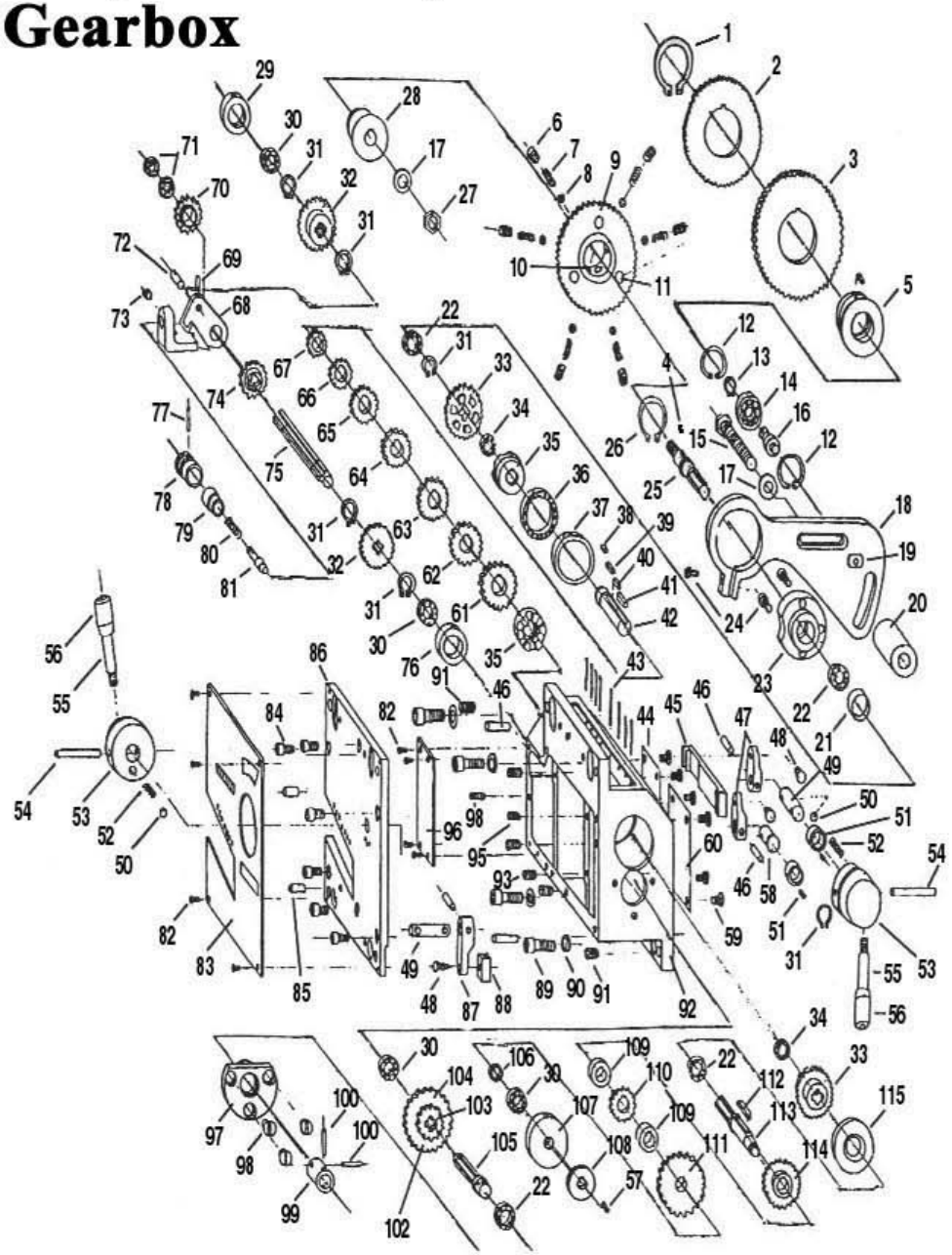


Diagram Number	Part Number	Reference Number	Description
1	G10001	GB894.1	Snap ring **(S23038)**
2	G10002	7-27	Outside gear with key
3	G10003	7-27	Inside gear with key
4	G10004	GB1096	Key 4x16
5	G10005	7-26	Bushing
6	G10006	GB73	Flatpoint setscrew M8x8
7	G10007	CQ9109.7-35	Spring
8	G10008	GB308	Ball
9	G10009	7-28	Gear
10	G10010	7-29	Outer sleeve
11	G10011	GB869	Rivet 4x22
12	G10012	GB893.1	Snap ring
13	G10013	GB894.1	Snap ring
14	G10014	GB276	Ball bearing
15	G10015	GB5780	Hex bolt M10x90
16	G10016	7-24	Shaft
17	G10017	GB95	Washer M10

Gearbox

Diagram Number	Part Number	Reference Number	Description
18	G10018	7-23	Bracket
19	G10019	7-25	T-nut
20	G10020	7-22	Spacer
21	G10021	7-31	Spacer
22	G10022	GB276	Ball bearing 1000801
23	G10023	7-21	Bearing seat
24	G10024	GB70 (S12516)	Sockethead capscrew M5x16
25	G10025	7-20	Shaft #1
26	G10026	GB894.1	Snap ring
27	G10027	S18155	Hex nut M10
28	G10028	7-30	Inner sleeve
29	G10029	7-32	Bearing seat
30	G10030	GB276	Ball bearing 1000099
31	G10031	GB894.1	Snap ring
32	G10032	7-37	Spline gear
33	G10033	7-16	Spline clutch gear
34	G10034	GB276	Ball bearing 1000069

Diagram Number	Part Number	Reference Number	Description
35	G10035	7-17	Clutch jaw
36	G10036	GB276	Ball bearing 1000806
37	G10037	7-39	Bearing seat
38	G10038	GB1096	Key 4x6
39	G10039	GB1096	Key 4x22
40	G10040	GB1096	Key 4x18
41	G10041	GB1096	Key 4x22
42	G10042	7-19	Shaft with keyway
43	G10043		Oil felt 2x50
44	G10044	7-49	Cover (I)
45	G10045	7-45	Fork
46	G10046	GB117	Pin 5x26
47	G10047	7-43	Crank arm
48	G10048	7-44	Connecting pin
49	G10049	7-46	Handle shaft
50	G10050	GB308	Ball 6.5
51	G10051	7-42	Spacer

Gearbox

Diagram Number	Part Number	Reference Number	Description
52	G10052	GB2089	Spring 0.5x5x25
53	G10053	GB4141.19	Handle seat 12x50
54	G10054	GB117	Taper pin A5x50
55	G10055	GB03067	Handle BM8x50
56	G10056	GB03063	Handle sleeve BM8x40
57	G10057	GB73	Conepoint setscrew M4x8
58	G10058	7-41	Shaft
59	G10059	GB6	Setscrew M5x8
60	G10060	7-50	Cover (II)
61	G10061	7-18	Gear #7
62	G10062	CQ9109.706	Spline gear #6
63	G10063	CQ9109.706	Spline gear #5
64	G10064	CQ9109.706	Spline gear #4
65	G10065	CQ9109.706	Spline gear #3
66	G10066	CQ9109.706	Spline gear #2
67	G10067	CQ9109.706	Spline gear #1
68	G10068	7-38	Tumbler
69	G10069	GB71	Conepoint setscrew M4x8

Diagram Number	Part Number	Reference Number	Description
70	G10070	CQ9109.736	Idle gear
71	G10071	GB276	Ball bearing 1000096
72	G10072	GB119	Pin B6x24
73	G10073	GB71	Conepoint slotted setscrew M6x8
74	G10074	CQ9107.738	Sliding gear
75	G10075	7-36	Shaft #2
76	G10076	7-40	Bearing seat
77	G10077	GB117	Taper pin A2x18
78	G10078	CQ9109.719	Gripper
79	G10079	CQ9109.718	Gripper sleeve
80	G10080	CQ9109.717	Spring
81	G10081	7-51	Positioning pin
82	G10082	GB818	Panhead Phillips M3x8
83	G10083	7-35	Gearbox plate
84	G10084	GB70	Hex socket screw M6x12
85	G10085	GB118	Inner thread taper pin A6x16

Gearbox

Diagram Number	Part Number	Reference Number	Description
86	G10086	7-34	Gearbox cover
87	G10087	7-47	Crank arm
88	G10088	CQ9109.751	Fork
89	G10089	GB70	Hex socket screw
90	G10090	GB95	Washer
91	G10091	GB73	Flatpoint slotted
92	G10092	7-01	Gearbox
93	G10093	GB71	Flatpoint slotted setscrew M6x12
94	G10094	GB71	Flatpoint slotted setscrew M6x16
95	G10095	GB71	Setscrew M5x12
96	G10096	7-33	Left cover
97	G10097	7-03	Bearing seat
98	G10098	GB68	Panhead Phillips M6x12
99	G10099	CQ9109.725	Sleeve
100	G10100	GB117	Taper pin 3x20
101	G10101	GB73	Pin M4x12
102	G10102	7-05	Sliding gear(II)

Diagram Number	Part Number	Reference Number	Description
103	G10103	7-04	Sliding gear (I)
104	G10104	7-06	Sliding gear (III)
105	G10105	7-02	Shaft #5
106	G10106	7-09	Spacer
107	G10107	7-10	Bearing seat
108	G10108	7-08	Knob
109	G10109	7-12	Spacer
110	G10110	7-13	Gear (II)
111	G10111	7-11	Gear (I)
112	G10112	GB1096	Key 4x45
113	G10113	7-07	Shaft #4
114	G10114	7-14	Gear (III)
115	G10115	7-15	Bearing seat

Speed Reduction Pulley 40-300G

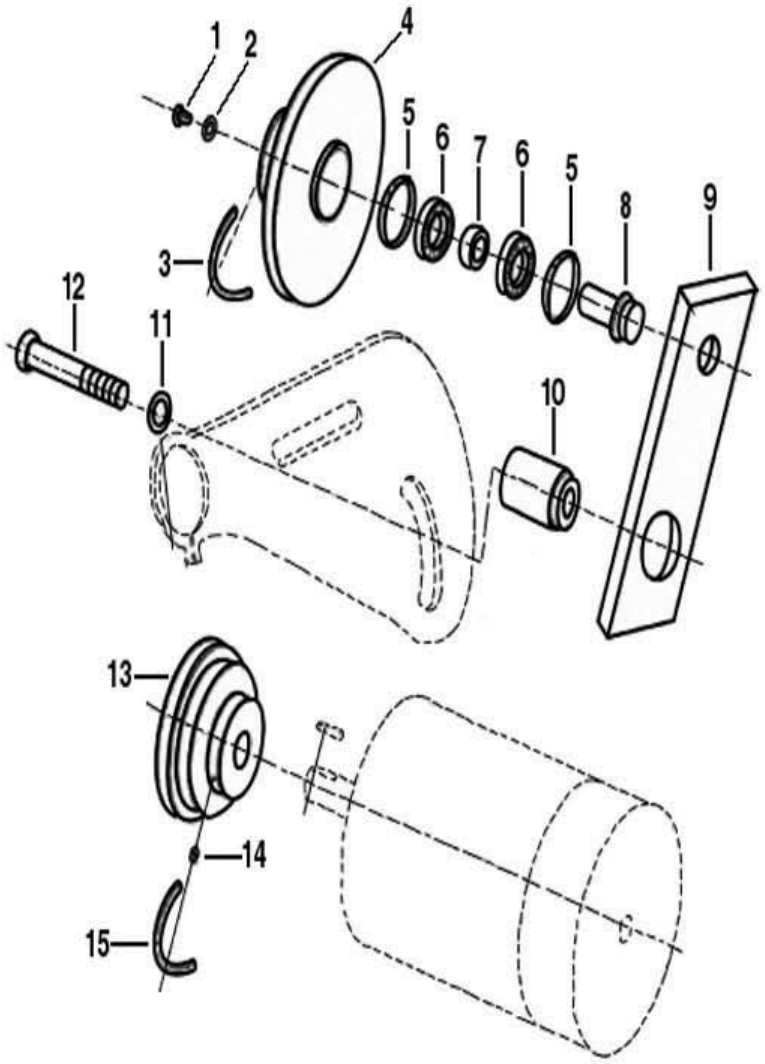


Diagram Number	Part Number	Reference Number	Description
1	S11680	GB818-85	Pan head screw M6-1.0 x 8
2	S18110	G1324F.8-05	Washer M6
3	G02034	GB1171-74	V-Belt A710
4	G02035	G1324F.8.02	Middle pulley
5	LX03280	GB893-86	Internal retaining clip
6	G02036	GB276-82	Single row ball bearing 100090
7	G02037	G1324F.8-04	Spacer ring
8	G02038	G1324.8-03	Support shaft
9	G02039	G1324.8-01	Support plate
10	G02040	G1324.8-07	Support washer for adjustable gear
11	S18170	GB95-85	Washer, M10
12	S12109	GB5780-86	Bolt M10 x 90
13	G02027A	G1324.1-04(a)	Motor Pulley
14	S11942	GB71-85	Screw, set cone point M6 x 10
15	G02043	GB1171-74	V-Belt A630

Granite 1340 Stand

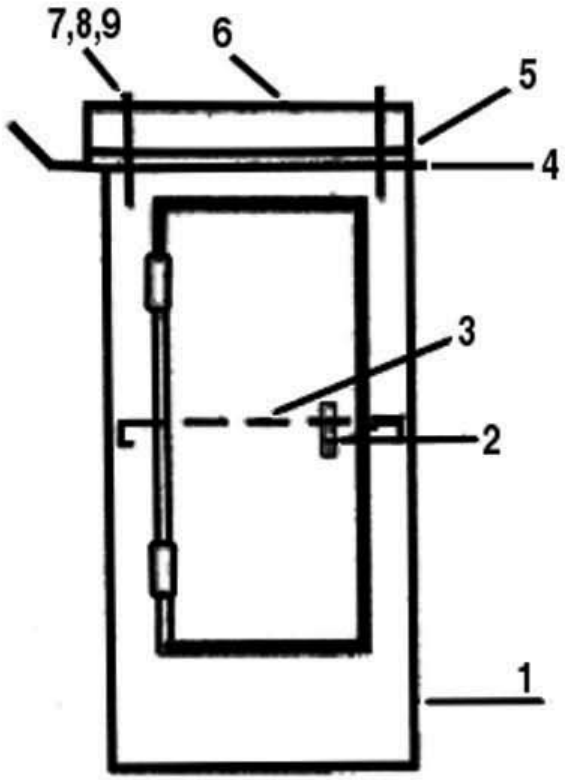
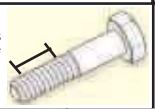
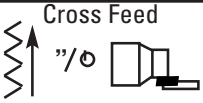


Diagram Number	Part Number	Reference Number	Description
1	80-020	Right/Left	Left/Right base
2			Door lock
3			Shelf
4	G14001		Chip tray
5	G14005		Rubber washer
6	G14004		Left/Right block
7	S12650		Socket Cap Screw M10 x 45 (4 Total)
8	S18170		Nut M10 (4 Total)
9	S18200		Washer M10 (4 Total)
10			Bolt M12 x 90 (4 Total-Use to secure machine to stand)
11	S18200		Washer M12 (8 Total-Use to secure machine to stand)
12	S18185		Nut M 12 (4 Total-Use to secure machine to stand.)
13	S18331		Nut M6 (6 Total-Use for securing connecting plate to left and right base)
14	S11620		Screw, pan head M6 x 20(6 Total-Use for securing connecting plate to left and right
15	G14002		Connecting Plate (connects right & left ends, not shown)

Appendix B

Inch Feed Rates

THREADING CHART		INCH THREADS			FEED RATES = Distance traveled per Spindle Revolution						METRICTHREADS					
		Inch threads are defined as the number of threads in one inch. 			Longitudinal Feed ”/ 			Cross Feed ”/ 			Metric threads are defined as the distance between two adjacent crests. 					
Selector I - III		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
SELECTOR 1-7	1	7	14	28	0.0197”	0.0098”	0.0049”	0.0062”	0.0031”	0.0015”		0.70	0.35	3.50	1.75	
	2	8	16	32	0.0172”	0.0086”	0.0043”	0.0054”	0.0027”	0.0014”		0.80	0.40	4.00	2.00	1.00
	3	9	18	36	0.0153”	0.0076”	0.0038”	0.0048”	0.0024”	0.0012”			0.45	4.50		
	4	10	20	40	0.0137”	0.0069”	0.0034”	0.0043”	0.0022”	0.0011”		1.00	0.50	5.00	2.50	1.25
	5	11	22	44	0.0125”	0.0062”	0.0031”	0.0039”	0.0020”	0.0010”				5.50	2.75	
	6	12	24	48	0.0115”	0.0057”	0.0029”	0.0036”	0.0018”	0.0009”			0.60	6.00	3.00	1.50
	7	13	26	52	0.0106”	0.0053”	0.0026”	0.0033”	0.0017”	0.0008”				6.50	3.25	
Gear Selection		X = Teeth per gear A = 30 B = 66 C = 60 D = 60									A = 33 C = 63 B = 80 D = 60			A = 66 C = 63 B = 64 D = 60		
Lever located inside Pully Box below gear cluster		INCH  METRIC									INCH  METRIC					

Machine Warranty

30 Day Trial Offer

Try a Smithy for 30 days. If, for any reason within that time, you decide to return your Smithy, just call our Customer Service department at 1-800-476-4849. We will help you arrange shipping back to us. When we receive the machine back, we'll refund your full purchase price. Please note: return shipping charges and any shipping damage from improper repacking is your responsibility.

Smithy Warranty

Smithy 3-in-1 and Dedicated Machines are warranted for two years (unless otherwise noted)to the original purchaser against defects in materials and workmanship. During that time, Smithy will replace any defective parts that are returned to our warehouse, free of charge. Upon receipt of the defective parts, Smithy technicians will arrange with you to send replacement parts immediately. This warranty does not cover parts that are worn out through the negligence on the part of the operator nor does it cover consequential damages resulting from defects in material or workmanship.

SmithyCNC warrants its machines and control systems for a period of one (1) year to the original purchaser from the date of purchase. If within one (1) year form the date of purchase a SmithyCNC machine and/or control system fails due to defect in material or workmanship, SmithyCNC will at their choice repair and/or replace components with new or remanufactured parts free of charge.

(Some have asked why SmithyCNC machines have a shorter warranty period than Smithy manual machines. There are several reasons, but the greatest factor is that, on average, CNC automated machine tools, are operated a significantly greater number of hours per day than the average manual machine. Also, by comparison, most of our competitors selling benchtop CNC machines only offer a six (6) months warranty. Whereas SmithyCNC machine have a full one (1) year warranty.)

Most warranty repairs and/or replacements are handled routinely, but sometimes request for warranty service many not be appropriate. This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accidents, repairs, or lack of routine maintenance. This warranty is also void if the serial number of the machine or SmithyCNC control system has been removed or has been altered or modified.

In no event shall Smithy be liable for indirect, incidental or consequential damages for the sale or use of the product. This disclaimer applies to both during and after the term of this warranty.

We do not warrant or represent that the merchandise complies with the provisions of any law or acts unless Smithy Company so warrants. In no event shall Smithy's liability under this warranty exceed the purchase price paid for the product. Legal actions brought against Smithy Co. shall be tried in the State of Michigan, County of Washtenaw.

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

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

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you.

Telephone Support (Service Technicians are available 9 am to 5:30 pm EST)

Service and Parts

Tel No. 1-800-476-4849

Email Address: support@detroitmt.zendesk.com

Software and Programming Consultancy Services

In addition to our customary technical support for the machines and controls, we also provide technical consulting support to our customers by providing engineering and G-code programming services. The standard rate for these services is $28.00 per hour. Our principal objective is to support you and to increase your productivity while reducing the machining cost. Give us a call for such support as and when required.

Tel No. 1-800-476-4849

Email Address: support@detroitmt.zendesk.com