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The premier source of tooling, parts, and accessories for bench top machinists.

HiTorque 8½×20 Bench Lathe User's Guide

Model 7500 • Model 7550 Deluxe
from LittleMachineShop.com

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Introduction

This user's guide covers care and operation of the LittleMachineShop.com HiTorque 8½×20 Bench Lathe. Be sure to read and understand the safety guidelines presented in this book before using your lathe.

The HiTorque 8½×20 Bench Lathe is available in two models:

- Model 7500 is the standard version.
- Model 7550 is the deluxe version. It includes all the features of Model 7500 and adds:
  - Digital position readouts (DRO) on the carriage, cross slide, compound rest, and tailstock
  - Quick change tool post set (QCTP) with five tool holders
  - Compound rest modified to better accommodate the QCTP
  - Anodized aluminum hand wheels and chrome knobs and levers
  - Full length heavy duty splash guard

Chris' Tip: You can upgrade your Model 7500 lathe with the following items available from LittleMachineShop.com:

- Part number 5497: Digital position readout (carriage, cross slide, and compound rest)
- Part number 5513: Android tablet display
- Part number 5880: Digital position readout (tailstock)
- Part number 2280: Quick change tool post set, AXA
- Part number 4914: Compound rest top (required for AXA QCTP)
- Part numbers 4162, 4165, 2104, 2145: Chrome hand wheels and handles

Installation of these components creates a machine that functions like a Model 7550 deluxe lathe, although it will have some cosmetic differences.

Specifications

Swing over bed	8.5" (215 mm)
Swing over saddle	4.6" (118 mm)
Distance between centers	20" (510 mm)
Cross slide travel	3.9" (100 mm)
Compound rest travel	2.8" (70 mm)
Spindle through hole	0.8" (20 mm)
Spindle taper	#3 Morse taper
Tailstock taper	#2 Morse taper
Spindle speed	100–2000 RPM
Range of threads	3–100 TPI; 0.25–5.0 mm

Longitudinal power feed rates	0.0018" (0.045 mm)/revolution 0.0049" (0.126 mm)/revolution
Cross slide power feed rates	0.0007" (0.019 mm)/revolution 0.0019" (0.048 mm)/revolution
Power requirements	120 V 60 Hz 12 Amps
Spindle motor output	1.34 hp (1000 Watts)
Machine weight	220 lbs (100 kg)
Overall dimensions	40" x 22" x 16" (1010 mm x 550 mm x 400 mm)

Safety Considerations

Always use common sense when using a power tool. Besides the general safety rules for any power tool, following also are specific considerations for the bench lathe.

General Safety

- Use common sense. Think through the results of your actions before you act.
- Understand the operation of the machine. Do not operate the machine if you do not know what is going to happen.
- Learn, don't experiment. Study, understand, and do things where you have a clear expectation of the outcome. Don't "see what will happen."
- You are responsible for your own actions. We can't be held responsible for your actions when you use the machine.

Lathe Safety

- Your bench lathe is a small lathe. Don't attempt jobs that are beyond its capacity.
- Check the work piece after you place it in the chuck or other work holding device. Be sure it is secure before turning on the lathe.
- Don't wear loose clothing or jewelry when operating the lathe.
- Stop the spindle and make sure the machine is in a safe condition before:
    - Opening or removing safety shields
    - Reaching into work area
    - Changing or adjusting tools
    - Changing or adjusting work pieces
    - Changing speed ranges
    - Clearing chips or coolant
- Inspect cutting tools for sharpness, chips, and cracks before each use. Replace dull, chipped, or cracked cutting tools immediately.
- Handle cutting tools with care. Cutting edges are very sharp and can cause lacerations.
- Do not use unbalanced work pieces or fixtures in the spindle
- Remove all tools (wrenches, chuck keys, locking pins, and so on) from the spindle immediately after using them.

Electrical Safety

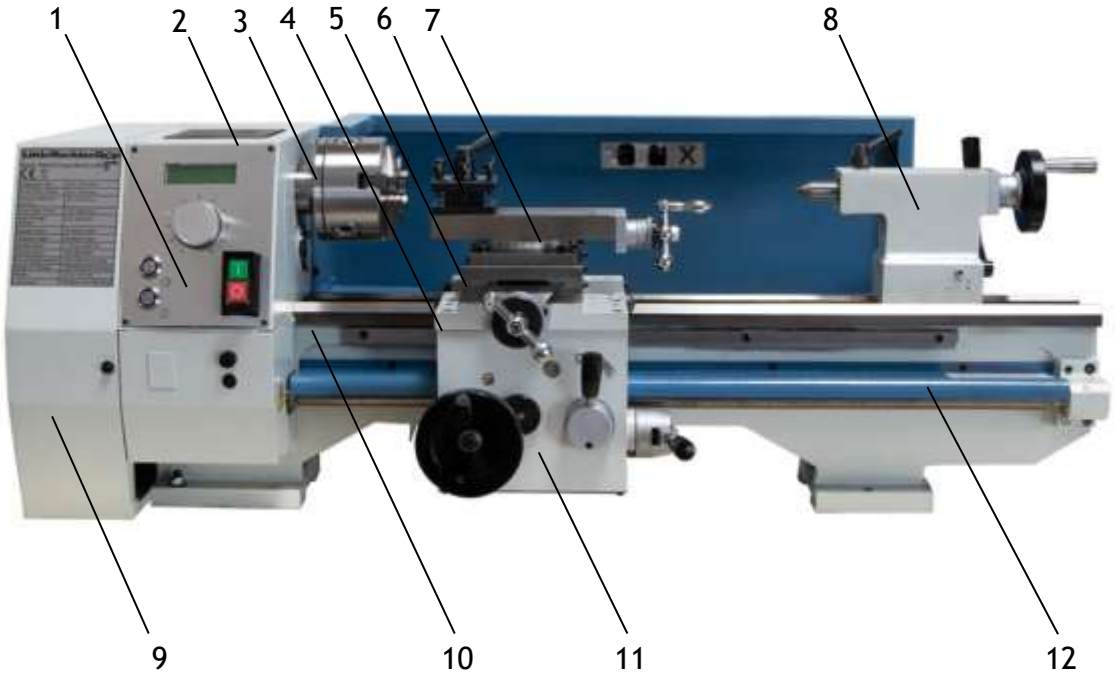
- Plug the machine into a grounded receptacle.
- Ensure that all components are properly grounded. The easiest way to ensure this is to plug your machines and devices into grounded outlets that you have tested.
- Use caution when using liquids and electricity. Ensure that coolants and lubricants are kept away from high voltage electrical components.
- Disconnect all components from the power receptacle before servicing.
- In the event of a power outage, turn off all components to ensure that the machine does not restart unexpectedly.

Machine Safety

- Keep bystanders, children, and visitors a safe distance away while operating any power tool.
- Read the manual. Know the operation of every control before you attempt any operation of the machine.
- Make sure that all guards are in place and functioning before operating the machine.
- Check for damage and abnormal wear before operating the machine.
- Always wear safety glasses (side shields are recommended) that are ANSI Z87.1-2003 compliant.
- Wear hearing protection (ear plugs or ear muffs) when operating loud machines.
- Wear appropriate clothing; no rings, gloves, neckties, jewelry, or loose-fitting garments. Bind long hair or wear a hat.
- Do not use compressed air for cleaning machines. A shop vacuum works well and is much safer.
- Don't operate machinery while under the influence of drugs or alcohol.
- Ensure that your machines are well lit. Ensure that your shop is well lit and have additional task lighting where appropriate.
- Maintain a clean and uncluttered work area.
- Avoid pinch points.
- Never leave a running machine unattended.
- Do not force or overload machinery.
- Use appropriate cutting tools with appropriate feeds and speed.
- Cutting tools get hot during use and can cause burns if handled inappropriately.
- Do not attempt to use work pieces that are too large or two heavy for the machine.
- Maintain your machines. Ensure that it is well-adjusted and in a safe state.
- Clear chips with a brush or other tool, never with your hands or with compressed air.
- Make sure the machine is on a flat, level surface that can support the weight of the machine plus fixtures, vise, and work piece.
- Clamp work securely. Cutting forces are significant and can turn work pieces that are not secured into projectiles.
- Be aware that chips and dust from some materials (magnesium, for example) are flammable. Understand the materials you are using.

Features

Front View



1. Motor controls (for details, see “Motor Controls” on page 9)
2. Headstock
3. Chuck
4. Carriage
5. Cross slide
6. Tool post
7. Compound rest
8. Tailstock (for details, see “Tailstock Controls” on page 13)
9. Change gear cover
10. Bed ways
11. Apron (for details, see “Carriage and Cross Feed Controls” on page 10)
12. Lead screw

Accessories

The following accessories come with the HiTorque Bench Lathe.

- #2 Morse taper dead center
- #3 Morse taper dead center
- Change gears (for details, see “Threading” on page 29)
- Outside jaws for the 3-jaw chuck (for details, see “Changing Chuck Jaws” on page 23)
- Chuck key for the 3-jaw chuck
- Open end wrenches: 8 x 10 mm, 14 x 17 mm, and 17 x 19 mm
- Hex wrenches: 2.5, 3, 4, 5, and 6 mm
- Mounting bolts and washers

Cleaning

Your lathe will arrive coated with grease to protect it from corrosion during shipment. Follow this procedure to remove the grease:

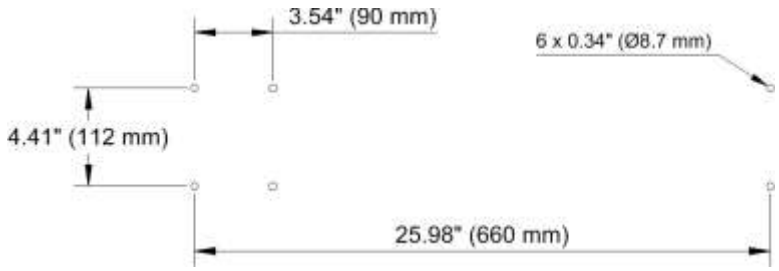
1. Wipe most of the grease off with rags or paper towels.
2. Clean the surfaces with mineral spirits (paint thinner).
3. Coat the surfaces with oil.

See “Lubrication” on page 22 for specific recommendations for lubricants.

Mounting Your Lathe

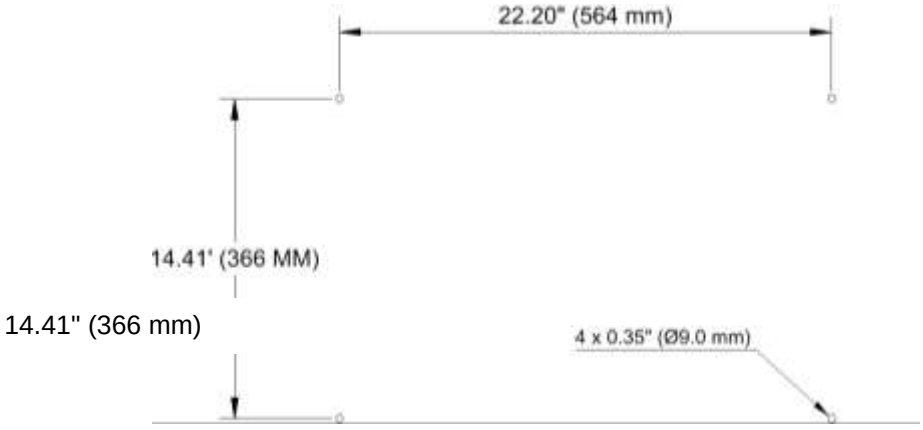
Many people purchase a stand or chip tray for the HiTorque Bench Lathe. The machine bolts right to these with the cap screws that are furnished. You might need to unbolt the motor to install the two bolts on the back of the headstock.

You can also bolt your lathe to your workbench. The following diagram shows the holes required.



Mount the lathe to the workbench with M8 (or 5/16") bolts. Use fender washers on the underside of wooden benches to prevent the bolt heads from pulling through. You might need to unbolt the motor to install the two bolts on the back of the headstock.

If you have the chip tray, its mounting dimensions are shown below.



Lathe Controls

Become familiar with the controls used to operate the lathe before you use the lathe.

Motor Controls

1. Power switch
2. Emergency stop (E-stop) switch
3. Start/stop button
4. Spindle direction button
5. Speed control knob
6. Spindle speed readout

Power Switch and Emergency Stop (E-stop) Switch

The green power switch enables input power to the speed control circuit board. The red E-stop switch disconnects the power.

Turn the power off when you are not using the lathe.

Start/Stop Button

The Start/Stop button illuminates and starts the spindle when pressed while the power is on. The spindle runs at the last set speed. Press the button again to stop the spindle. Use this button for normal operation of the lathe.

Spindle Direction Button

The spindle direction button controls the direction the spindle turns. After turning on the power and pressing Start, the spindle turns in the forward direction—the direction used for normal turning. Press the button to toggle between forward and reverse directions. The button illuminates to indicate reverse direction.

You can change the motor direction at any time and at any speed that safety allows. The motor will make a controlled change of direction.

Speed Control Knob

The speed control knob adjusts the spindle speed.

Spindle Speed Readout

The spindle speed readout shows the speed of the spindle in revolutions per minute (RPM). It also indicates the direction of turning, forward or reverse.

Using the Motor Controls

Use the motor controls to turn the spindle.

To power up the lathe:

- Press the top half of the power switch. The spindle speed readout illuminates.

To start the lathe:

1. Press the start/stop button. The button illuminates and the spindle turns.
2. If you want the spindle to turn in the other direction, press the spindle direction button.
3. Use the speed control knob to adjust the spindle speed.

To stop the lathe:

- Press the start/stop button. The lathe retains the speed and direction settings so that the next time you start the lathe, it resumes at the same speed and direction.

To stop the lathe in an emergency:

- Press the red E-stop button.

Carriage and Cross Feed Controls

You can power the carriage, you can power the cross feed, and you can thread with the HiTorque Bench Lathe.

1. Carriage hand wheel
2. Cross slide feed handle
3. Compound rest feed handle
4. Carriage lock screw
5. Half nut lever
6. Power feed lever

Carriage Hand Wheel

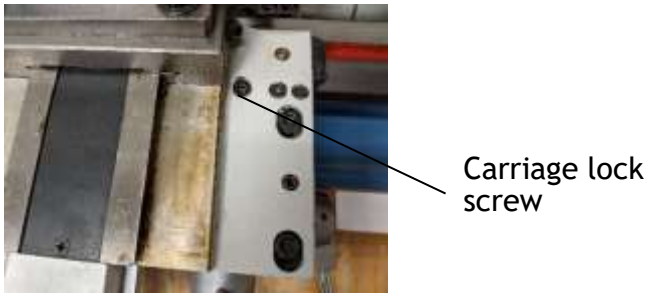
The carriage hand wheel moves the carriage toward or away from the headstock, depending on which way it is turned.

Use this hand wheel to position the carriage. Because this hand wheel moves the carriage quickly it is not easy to use this hand wheel to move the carriage while you are turning.

Pull the hand wheel towards you to disengage it when you are using power feed.

Carriage Lock Screw

Use a 4-mm hex wrench to tighten the carriage lock screw when you want to prevent the carriage from moving.



Cross Slide Feed Handle

The cross slide feed handle moves the cross slide in and out. Use this handle to advance the tool into the work and for facing cuts.

The dial on this handle indicates the relative position of the cross slide. The graduated dial can be repositioned for convenience.

There are 50 divisions on the dial. Each turn of the handle advances the cross slide 0.050".

Compound Rest Feed Handle

The compound rest feed handle advances or retracts the compound rest. Use this handle to advance the tool into the work.

The dial on this handle indicates the relative position of the compound rest. The graduated dial can be repositioned for convenience.

There are 50 divisions on the dial. Each turn of the handle advances the cross slide 0.050".

Digital Position Readout (Model 7550 only)

The HiTorque Deluxe Bench Lathe has a digital readout on the compound rest.

To use the digital readout:

The readout is easy to use. There are two buttons: ON/OFF and mm/inch.

Button	Function
ON/OFF	Press to turn on the display. While the display is on, press to set the display to zero at the current position. Press and hold to turn off the display. Doing so extends battery life. (The display shuts off automatically after about 30 minutes of nonuse.)
mm/inch	Switches the display between millimeters and inches.

Chris' Tip: These digital readouts do not account for backlash in the feed screw. Always take your readings when you are turning the screw in the same direction. This is not a problem on a lathe, because a single cut will only be made in one direction—in for turning, and out for boring.

To replace the battery:

Each DRO uses a single CR2032 lithium battery (LittleMachineShop.com part number 4292).

1. On the bottom of the display unit, squeeze together the two tabs and then pull out the battery drawer.
2. Replace the battery and then slide the drawer in until it snaps shut.

Compound Rest Rotation

The compound rest rotates on the cross slide and you can position it at any angle.

Position the compound rest so it moves parallel to the ways to make precise facing cuts.

Position the compound rest at 29.5 degrees for cutting standard threads.

To change the angle of the compound rest:

1. Loosen the two socket head cap screws along the sides of the compound rest.
2. Turn the compound rest to the desired angle.

Chris' Tip: You may need to remove one of the compound rest hold-down nuts to turn the compound past it.

3. Tighten the two socket head cap screws.

Chris' Tip: For accurate work, use a protractor between the compound rest and the cross slide. Don't depend on the markings on the side of the compound rest.

Half Nut Lever

The half nut lever locks the half nuts around the lead screw, which engages the carriage drive for threading.

The half nuts are engaged when this lever is to the right and disengaged when this lever is to the left.

CAUTION: Do not engage the half nuts for any turning or facing operation.

Chris' Tip: Don't try to engage the half nuts when the power feed is engaged. There's an interlock, but you can break it if you try.

You'll find it easier to engage or disengage the half nuts while the lathe is running. If you do attempt to change when the lathe is stopped, don't force it.

Power Feed Lever

The power feed lever engages the carriage drive when it is down, and the cross slide drive when it is up. Power feed is disengaged in the middle position. Push the lever to the left before moving it up or down.

Chris' Tip: Don't try to engage the power feed when the half nuts are engaged. There's an interlock, but you can break it if you try.

You'll find it easier to engage or disengage the power feed while the lathe is running. If you do attempt to change when the lathe is stopped, don't force it.

Tailstock Controls

Use the tailstock for turning between centers.

Tailstock Locking Lever

The tailstock is locked into position on the ways by the tailstock locking lever on the back of the tailstock. Pull the lever toward you to tighten the tailstock lock. Push the lever back to release the tailstock.

Tailstock Quill Hand Wheel

The tailstock quill hand wheel moves the tailstock quill in and out. There are (mm) graduations on the top of the quill that show how far it is extended. There are 0.001" graduations on the hand wheel dial.

Retract the tailstock quill all the way to remove tools from the taper in the tailstock quill.

Tailstock Quill Digital Position Readout (Model 7550 only)

The HiTorque Deluxe Bench Lathe has a digital readout on the tailstock that displays the quill position more precisely than the graduated markings on the standard model. Operation of the tailstock readout is the same as those for the compound rest. See "Digital Position Readout (Model 7550 only)" on page 12.

Tailstock Quill Locking Lever

The tailstock quill locking lever keeps the tailstock quill from moving. Use the tailstock quill locking lever to lock the tailstock quill in position when you are turning between centers. Turn the lever clockwise to lock the tailstock quill, and counterclockwise to unlock the tailstock quill.

Bluetooth DRO (Model 7550 only)

The Android tablet included with your DRO has the SIEG DRO app preinstalled. To begin using it, you must pair the tablet to the DRO scales, and you must configure the app, as described in the following sections.

To pair the devices

1. Be sure the lathe is plugged in so that the Bluetooth transceiver in the lathe has power.
2. Use the furnished USB cable to plug the tablet into the back of the lathe. (This connection is only for power, so if it's more convenient to plug the tablet into another USB port or power receptacle, that's fine.)

Then, on the Android tablet:

3. Turn on the power and swipe up to unlock it.
4. Open Settings. (If you don't see a Settings icon near the center of the screen, open the app drawer—the middle icon of the quick launch bar on the bottom or right edge of the screen.)
5. In Settings, tap **Bluetooth** under Wireless & Networks.
6. Tap **Search For Devices** in the upper right corner of the screen.
7. Tap **HC-06** when it appears under Available Devices.
8. Enter the PIN 1234 and tap **OK**.

The devices are now paired.

Chris' Tip: If you're using a single display device for multiple DROs, you can change the name from HC-06 to give each machine a unique name. Tap a name under Paired Devices, edit the name, and tap **OK**.

To configure the app:

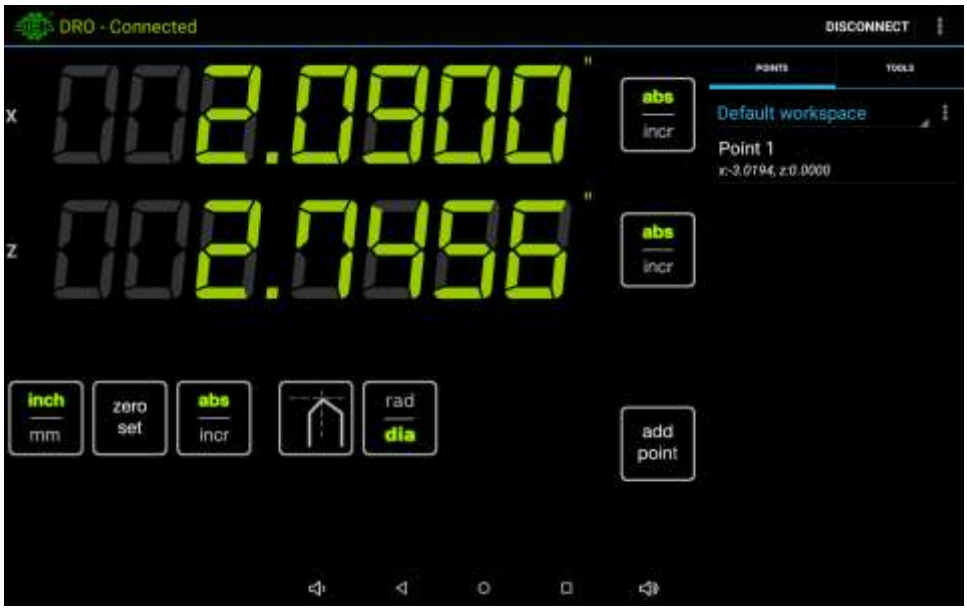
1. Start the SIEG DRO app.
2. If it appears in the upper-right corner of the screen, tap **Connect** to select the correct Bluetooth device. Tap **HC-06** to select the lathe.
3. The vertical ellipsis in the upper right corner of the screen is a menu. Tap it and select **Settings**.
4. Here is where you tell the app about your machine. Verify the following settings.
    - Machine type: Lathe
    - Under X Axis
        - Axis CPI: 5080
        - Invert Readout: check
    - Under Y Axis
        - Enable Y Axis: remove check
    - Under Z Axis
        - Axis CPI: 5080

- Under W Axis
    - Enable W Axis: remove check

5. Tap the Back button at the bottom of the screen when you have made the settings.

Using the app

Your DRO should now be working. Turn a hand wheel and watch the numbers change. By convention, the axis parallel to the spindle (that is, the axis on which the carriage moves) is the Z axis, and the cross slide moves along the X axis.



The axis readouts appear at the left top of the screen.

The buttons across the bottom affect all axes.

The abs/incr button to the right of each axis readout affects only that axis.

The right side of the screen has a list of saved points and a list of saved tools.

inch / mm	Chooses inch or mm display
zero set	Sets the workspace origin to the current position of the machine
abs / incr	Selects Absolute coordinates or Incremental coordinates for all axes
	Sets tool offsets
rad / dia	For the X-axis, switches between measuring radius or diameter

Axis detail settings

Tap one of the axis position values to see the Axis Details.

Tap the Position value to enter the current position value.

zero set	Tap to set the incremental value to zero. Hold to set both the absolute value and the incremental value to zero.
	Turns on an audible warning that you are approaching a defined point.

Absolute versus incremental coordinates

The DRO keeps track of two coordinate systems: absolute and incremental.

Absolute coordinates are the overall coordinates of your work piece. Select an edge of the workpiece and set the axes to 0.000.

Incremental coordinates are used when you want to work on a feature, such as a groove, that exists on your work piece. You can, for example, set an incremental 0 position at one edge of the groove, and then use incremental values to machine the groove.

Points and workspaces

Points are a set of coordinates that define a spot on your work piece. Workspaces keep track of points that you have recorded. The right side of the display window shows a list of recorded points.

To save a point:

- Any time you are at a location you want to save, tap **Add Point**. A point with the current coordinates is added to the list.

To go to a point:

- Tap the point in the list. The display changes to show how far from the point you are. Simply move the carriage and cross slide until the Z- and Y- positions read zero and you are at the point.
- To de-select a point, tap it again.

To preview a workspace

- Once you have a collection of points, you can get an idea if they are correct by previewing the workspace. Tap the vertical ellipsis menu to the right of the workspace name. Choose Preview Workspace to see the relationship of the points.

Tools

The DRO can keep track of your tool dimensions. This is useful if your tools maintain their X-axis position between uses, such as when you use a quick change tool post to hold your turning tools. Replacing a tool like this will return it to the same X-axis position.

You can enter the values for the current tool using the Tool Offsets button. Enter the values and tap **Set Tool Offset**. While a tool offset is in effect, the position readouts are shown in red to alert you to this fact.

To clear the current tool offset, press and hold the Tool Offset button.

Predefined tools

To add a tool:

1. Tap the vertical ellipsis menu in the upper right corner. Select **Add Tool**.
2. Name your tool and add the values for that tool.
3. Tap **Save** to add the tool to the list of tools.

To select a tool:

- To choose a tool and use the predefined offset, simply tap the tool in the list of predefined tools. (Tap Tools on the right side of the screen to see the list.) The Tool Offset window appears. You can adjust any values you need for this job and tap **Set Tool Offset**. These changes are not saved with the tool.
- Alternatively, tap the Tool Offsets button and select the tool from the Tools list. Then tap **Set Tool Offset**.

To modify or delete a tool:

- Tap and hold the tool's name in the list of predefined tools. Then tap **Edit Tool** or **Delete Tool**.

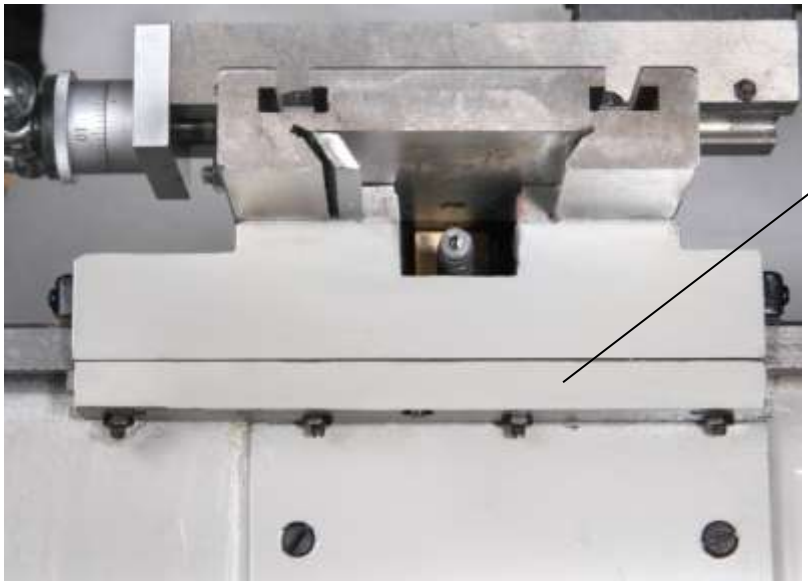
Adjustments

Keeping your lathe in adjustment is an ongoing process. You should check all the following adjustments when you set up your lathe and then periodically as you use your lathe. Looseness in the carriage retaining plates or the gibs can cause chatter when you are using the lathe. If you experience chatter, check all these adjustments.

Carriage

The carriage is held on the ways by retainers with gibs that are bolted to the bottom of the carriage.

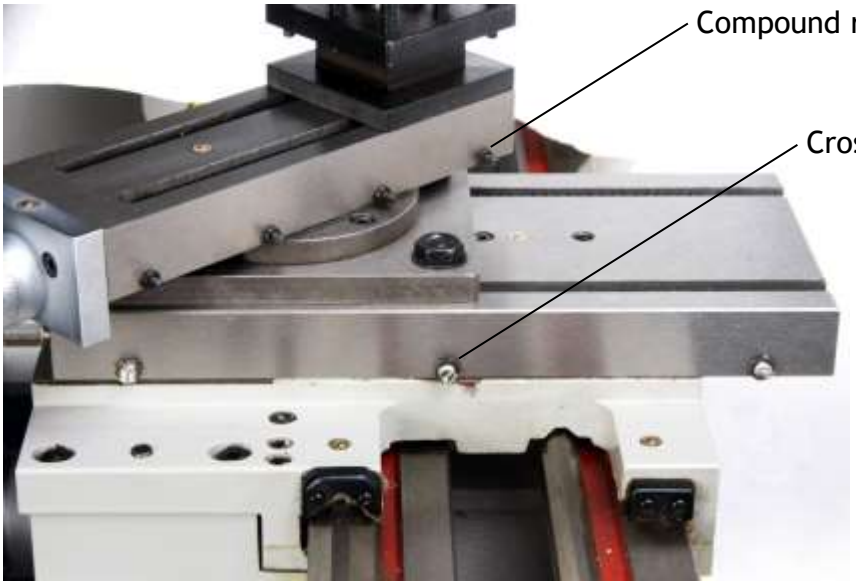
A gib is a strip of metal placed between the bearing surface of two machine parts to ensure a precision fit and provide adjustment for wear. The bench lathe has gibs in several places, including the carriage.



To adjust the carriage gibs:

1. Loosen the three socket head cap screws on the back bottom of the carriage.
2. Loosen the four lock nuts on the back bottom of the carriage.
3. Slightly loosen all four set screws.
4. Snug each cap screw equally. This will lock the carriage in position.
5. Loosen each cap screw about 1/8 turn to allow carriage to move, but without play.
6. Snug the set screws to lock the cap screws in position. Do not over tighten.
7. While holding the set screws from turning, tighten the lock nuts.
8. Test by moving the carriage. Loosen or tighten all the cap screws the same amount until the carriage moves freely, but without play on the ways.

Cross Slide Gib



To adjust the cross slide gib:

1. Loosen the three lock nuts on the side of the cross slide.
2. Slightly loosen all three set screws on the side of the cross slide.
3. Snug each set screw equally. This will lock the cross slide in position.
4. Loosen each set screw 1/8 turn to allow the cross slide to move.
5. While holding the set screws from turning, tighten the lock nuts.
6. Test by turning the handle. Loosen or tighten all the set screws the same amount until the cross slide moves freely, but without play in the dovetail.

Cross Slide Nut

The cross slide nut is adjustable to remove free play from the cross slide feed screw.

The cross slide nut is partially split and set screws adjust the gap to allow adjustment of play in the nut.

To adjust the cross slide nut:

1. Move the cross slide as far back as it will go. The screw disengages.
2. Engage the nut and move the cross slide back toward you enough that the nut is fully engaged.
3. Adjust the set screws in the cross slide nut to remove play without making it hard to turn.

Compound Rest Gib

The compound rest also incorporates a gib for adjustment.

To adjust the compound rest gib:

1. Loosen the four lock nuts on the side of the compound rest.
2. Slightly loosen all four set screws on the side of the compound rest.
3. Snug each set screw equally. This will lock the compound rest in position.
4. Loosen each set screw 1/8 turn to allow the compound rest to move.
5. While holding the set screws from turning, tighten the lock nuts.
6. Test by turning the handle. Loosen or tighten all the set screws the same amount until the compound rest moves freely, but without play in the dovetail.

Compound Rest Nut

The compound rest nut is adjustable to remove free play from the compound rest feed screw.

The compound rest nut is partially split and set screws adjust the gap to allow adjustment of play in the nut.

To adjust the compound rest nut:

1. Remove the compound rest by removing the two socket head cap screws that lock it from rotating.
2. Turn the compound rest over to access the adjustable nut.
3. Adjust the cap screw in the cross slide nut to remove play without making it hard to turn.
4. Replace the compound rest and the two socket head cap screws.

Apron Position

The apron is adjustable to center the half nuts horizontally on the lead screw.

To adjust the apron position:

1. Loosen the four socket head cap screws that secure the apron to the carriage. There are two on the left side of the carriage and two on the right side of the carriage
2. Engage the half nuts on the lead screw.
3. Tighten the four socket head cap screws.

Tailstock Position

The tailstock is adjustable from front to rear so you can align it with the spindle.

To adjust the tailstock position:

1. Remove the 3-jaw chuck from the lathe spindle.
2. Put a 3 Morse taper dead center in the spindle.
3. Remove the tailstock from the lathe.
4. Loosen the two small locking set screws.
5. Place the tailstock back on the ways.
6. Put a 2 Morse taper dead center in the tailstock quill.
7. Move the tailstock toward the spindle until the two centers almost touch.
8. Use the tailstock adjustment set screws to move the upper part of the tailstock casting until the centers are aligned.
9. Place a steel rule between the two centers. The length of the rule should be horizontal and roughly perpendicular to the axis of the lathe; the width of the rule should be vertical. Bring the centers together to hold the rule in place.
10. Adjust the upper part of the tailstock casting until the steel rule is perpendicular to the axis of the lathe. If the near end of the rule angles toward the headstock, move the tailstock back.
11. When the tailstock is in the correct position, tighten the tailstock locking set screws.
12. Check the adjustment.

Half Nuts

The half nut gib takes the play out of the half nut.

To adjust the half nut gibs:

- Tighten the three set screws in the right side of the apron to remove play from the half nuts.

Drive Belt

The drive belt is a timing belt and should rarely need adjustment.

To adjust the drive belt:

1. Unplug the power cord.
2. Open the change gear cover.

3. Loosen the four motor mounting socket head cap screws.
4. While you push down on the motor pulley inside the change gear cover with your right thumb, tighten one socket head cap screw on the top and one on the bottom of the motor.
5. Tighten the other two socket head cap screws.
6. Close the change gear cover.

Maintenance

Maintenance of the bench lathe is simple, but important. Regular maintenance will keep your bench lathe working like new for many years.

Cleaning

The maintenance you perform most often is cleaning. Keeping swarf (chips, shavings, and debris) off of wearing surfaces is the most important thing you can do to prolong the life of your bench lathe.

- Use a 1" paintbrush to remove swarf from the ways as you work.
- Clean swarf from the lathe, from top down after each use.

Lubrication

We recommend the use of two lubricants on your mill.

- Where oil is required, we recommend Mobil Vactra Oil No. 2, an oil especially designed for machine tool way lubrication and bearing lubrication.

Chris' Tip: Mobil Vactra Oil No. 2 is available from LittleMachineShop.com (part number 4120). If you prefer to purchase locally, get Mobil 1 synthetic motor oil, any viscosity, available at most auto parts stores.

- Where grease is required, we recommend Lubriplate 630-AA Lithium-Based Grease. Lubriplate 630-AA is an NLGI No. 1 lubricant. Lithium grease is a plastic-friendly general use grease that is easy to find and easy to use.

Chris' Tip: Lubriplate 630-AA grease is available from LittleMachineShop.com (part number 3984), but you might have trouble finding it locally. Don't worry about the brand name. Get white lithium grease. Every auto parts store and most hardware stores have it.

The following points on your lathe require lubrication.

Location	Lubricant	Frequency	Notes
Lathe ways	Oil	Daily	Apply oil to both the front and back ways on both sides of the carriage. Move the carriage back and forth to spread the oil.
Lead screw threads	Oil	Daily	Clean swarf (chips, shavings, and debris) daily.
Compound rest dovetail	Oil	Daily	Advance the compound rest to the extent of its normal travel. Apply oil to the end of the gib and the ends of the dovetails. Retract the compound rest.

Location	Lubricant	Frequency	Notes
Cross slide dovetail	Oil	Daily	Advance the cross slide to the extent of its travel. Apply oil to the end of the gib and the ends of the dovetails. Retract the cross slide.
Oil fittings	Oil	Weekly	There are several oil fittings on the lathe. Lubricate each one with one squirt from a pump oiler.
Other machined surfaces	Oil	Weekly	Oil lubricates and prevents corrosion.
Chuck	Oil	Monthly	Disassemble, clean and lubricate. Wrap with a paper towel, secure with an elastic band, and run the lathe to sling out excess oil.
Change gears	Grease	Monthly	Apply a light coat of grease to the change gears each time you change them. Apply grease to the installed gears at least monthly.
Change gear B-C shaft and bushing	Oil	Monthly	Oil the B-C shaft and bushing every time you change gears, and at least monthly.
Tailstock quill and screw	Grease	Yearly	

The spindle bearings are tapered roller bearings that are behind seals and do not require additional lubrication. The countershaft and other bearings are ball bearings that are shielded and do not require additional lubrication.

Chuck

Changing Chuck Jaws

3-jaw lathe chucks come with two sets of jaws.

The “normal” set is called the inside jaws, because the stepped side is designed to fit inside of hollow work pieces and hold by an outward force. In many cases, however, these jaws are used to clamp on the outside of smaller objects using the long straight side.

The second set of jaws is called the outside jaws because the stepped side of these jaws is designed to clamp on the outside of larger objects.

Because of the construction of a 3-jaw chuck, each of the three jaws in a set is different. You will find a number in the groove in the side of each jaw that identifies its position in the set.

To remove a set of chuck jaws:

1. Place a piece of wood on the ways to protect them in case you drop something.
2. Place your right hand around the chuck to prevent the jaws from falling out.
3. With your left hand, turn the lathe chuck key counter clockwise to open the jaws.
4. The jaws will come loose from the chuck, one at a time, when about half the length is exposed beyond the diameter of the chuck.

To install a set of chuck jaws:

1. Place the three jaws in numeric order on the bench.
2. Slide jaw number 1 into the slot in the chuck that has the serial number stamped in it.
3. Press the jaw into the slot with one hand, and with the other hand, turn the chuck key to open the chuck.
4. You will feel the jaw move out of the slot as you turn. Stop turning right after the jaw clicks inward in the slot.
5. Turn the chuck key to close the chuck about ¼ turn to engage jaw 1.
6. Slide jaw 2 into the next slot counterclockwise from jaw 1 when you are looking toward the headstock.
7. Slide jaw 3 into the open slot.
8. While pressing jaws 2 and 3 into the slots, turn the chuck key to close the chuck.

Mounting Work in a 3-Jaw Chuck

Three jaw lathe chucks are good for most lathe operations. All three jaws move together as you turn the chuck key. But because of the way they are made, 3-jaw chucks have limited accuracy. They will center work to within about 0.003" runout. If you need better concentricity, use an independent 4-jaw chuck or a collet.

If you chuck a work piece, create a part, and then part it off, the lack of concentricity will not cause a problem. The only time it is a problem is when you try to re-chuck a work piece.

Place your work piece between the jaws of the lathe chuck and turn the chuck key clockwise to close the jaws. Tighten firmly. To get the jaws as tight as possible, tighten all three locations with the chuck key.

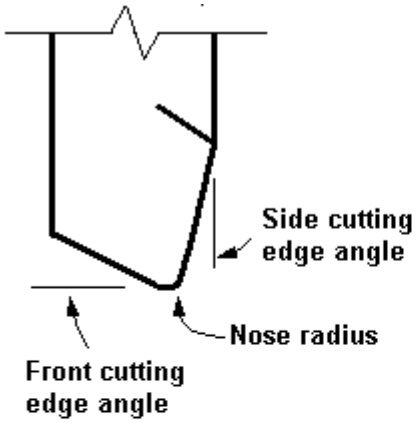
Tool Bits

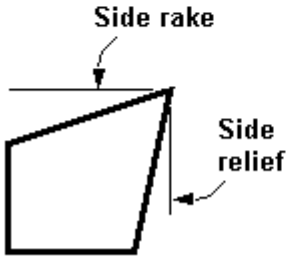
When you purchase a new lathe tool bit, it might have an angle on the end, but it is not properly sharpened for turning. Grinding lathe tool bits is a bit of an art. It takes some practice to get good at it.

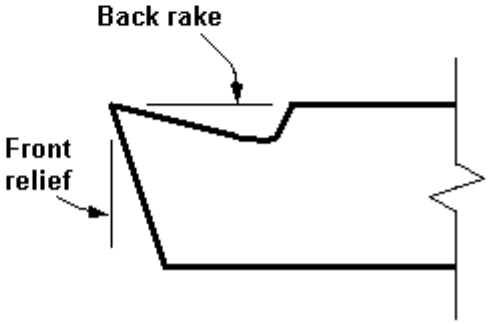
You need to create a cutting edge that is sharp, extends out so that the cutting edge and not the side of the tool contacts the work, but that still has enough support to maintain sufficient strength to cut metal.

Before diving in, there are some terms you need to understand. The following illustration shows these terms.

First, notice that there are two cutting edges on the tool bit. There is a cutting edge on the end of the tool bit called the front cutting edge. There is also a cutting edge on the side of the tool. Between these cutting edges is a rounded section of cutting edge called the nose.







Side cutting edge	The side cutting edge does most of the cutting. As the tool bit moves along the work piece the side cutting edge removes most of the material.
Front cutting edge	The front cutting edge cuts when the tool is advanced into the work.
Nose	The nose is a critical part of the cutting edge, because it produces the surface finish of the work piece.
Side rake	The side rake produces the side cutting edge that cuts into the work piece.
Side relief	Side relief provides clearance for the side cutting edge. Without side relief, the side of the tool bit would hit the work piece and not allow the cutting edge to penetrate the work piece.
Back rake	The back rake produces the front cutting edge that cuts into the work piece.
Front relief	Front relieve provides clearance for the front cutting edge. Without front relief, the front of the tool bit would hit the work piece and not allow the cutting edge to penetrate the work piece.

Grinding Tool Bits

Use a bench grinder to sharpen your tool bits. Even an inexpensive bench grinder can do a good job grinding lathe tool bits. In some cases, you might want to purchase a higher quality fine grit wheel.

Keep a small cup of water near your grinder. Grinding generates heat, which can cause two problems. The tool bit will become too hot to hold. Overheating can also affect the heat treatment of the tool bit, leaving the cutting edge soft.

Use a protractor to measure the angles. They are not super-critical, but you should try to stay within one degree of the recommendations.

Grind the Front Relief

The first step in creating a tool bit is to grind the front relief. For most work, a relief angle of 10° works well.

While you are grinding the front relief, you are also creating the front cutting edge angle. Make this angle about 10° also, so that the corner formed by the front cutting edge and the side cutting edge is less than 90°.

Grind the Left Side Relief

Form the left side relief next. Again, create about a 10° angle. You don't need to form a side cutting angle. The side cutting edge can be parallel to the side of the tool blank.

Grind the Top Rake

The top of the tool bit is ground at an angle that combines the back rake and the side rake. The side rake is most important, because the side cutting edge does most of the work. For cutting steel and aluminum, the side rake should be about 12° and the back rake should be about 8°. For cutting brass, the rake angles should be much less, or even 0°.

Round the Nose

A small nose radius allows you to turn into tight corners. A large nose radius produces better surface finishes. Create a nose radius that is appropriate for the tool bit you are creating.

Adjusting Tool Bit Height

The cutting edge of the tool bit should almost always be set to the center height of the lathe spindle.

There are several methods for checking the height of the tool bit. Perhaps the simplest way is to place a thin strip of metal, such as a steel rule or feeler gage, between the work piece and the point of the tool bit. If the height is correct, the strip of metal will be held vertical. If the top is leaning toward you, the tool bit is too low. If the top is leaning away from you, the tool bit is too high.

Using the standard tool post, you adjust the tool bit height using shims under the tool bit. You can get an economical set of shims, about the right size, at any auto parts store. Purchase a set of feeler gages and remove the pivot pin.

Chris' Tip: The easy way to adjust the tool bit height is to get a quick change tool post. Virtually all quick change tool posts incorporate a mechanism for easily adjusting the tool bit height.

Turning

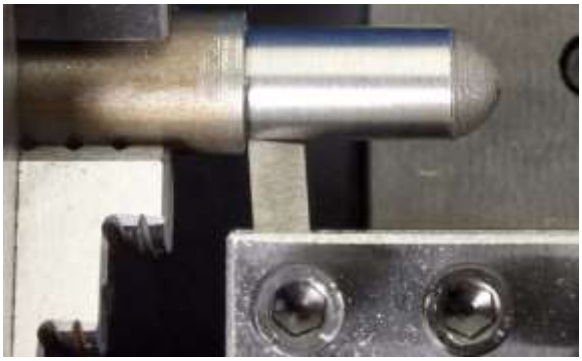
The most common use of a lathe is turning down the diameter of a work piece.

Manual Turning

Follow these steps to turn the outside diameter of a work piece.

To turn manually:

1. Put a tool bit in the tool holder and adjust the cutting edge to center height.
2. Angle the tool so that the front cutting edge forms an acute angle with the axis of the work piece, as shown in the illustration below.



3. Move the carriage so that the tool bit is near the right end of the work piece.
4. Turn the lathe on. Adjust the speed to an appropriate speed for the material and diameter you are working on. The LittleMachineShop.com Web site has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds
5. Using the cross slide feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
6. Move the carriage to the right so that the tool bit is past the end of the work piece.
7. Using the cross slide feed handle, advance the tool bit about 0.010".
8. Using the carriage hand wheel, move the carriage slowly to the left. As the tool bit meets the work piece, it starts cutting.

Turning with Power Feed

The bench lathe incorporates a power carriage feed that can move the carriage.

Change Gears for Turning

There are two options for turning. Use the finer feed for finish turning and the coarser feed for roughing cuts. The bench lathes are shipped with the gears set for finish turning.

Feed per Spindle Revolution	A	B	C	D
0.0018" (0.045 mm)	30	120	60	120
0.0049" (0.126 mm)	50	100	70	100

To learn how to change the gears, see “Change Gears” on page 30.

To turn with power feed:

1. Put a tool bit in the tool holder and adjust the cutting edge to center height.

2. Angle the tool so that the front cutting edge forms an acute angle with the axis of the work piece, as shown in the preceding illustration.
3. Move the carriage so that the tool bit is near the right end of the work piece.
4. Turn the lathe on. Adjust the speed to an appropriate speed for the material and diameter you are working on. The LittleMachineShop.com Web site has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds
5. Using the cross slide feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
6. Move the carriage to the right so that the tool bit is past the end of the work piece.
7. Using the cross slide feed handle, advance the tool bit about 0.010".
8. Push left and then down on the power feed lever until the power feed engages. As the tool bit meets the work piece, it starts cutting.
9. When the carriage has moved as far as you want, raise the power feed lever to disengage the power feed. The carriage stops.

Facing

Facing is cutting on the end (or face) of the work piece.

To face a work piece:

1. Put a tool bit in the tool holder and adjust the cutting edge to center height.
2. Angle the tool so that the side cutting edge forms an acute angle with the face of the work piece.
3. Move the carriage to the right so that the tool bit is past the right end of the work piece.
4. Ensure that the power feed lever is in the middle (disengaged) position.
5. Turn the lathe on. Adjust the speed to an appropriate speed for the material and diameter you are working on. The LittleMachineShop.com Web site has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds
6. Using the compound rest feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
7. Move the cross slide back so that the tool bit is clear of the diameter of the work piece.
8. Using the compound rest feed handle, advance the tool bit about 0.005".
9. Using the cross slide feed handle, advance the cross slide slowly. As the tool bit meets the work piece, it starts cutting.
10. Continue advancing the cross slide until the tool bit reaches the center.

Facing with Power Feed

The bench lathe incorporates a power cross feed that can move the cross slide.

The change gear settings for turning also affect the cross slide speed. The cross slide moves at less than half the speed of the carriage.

Feed per Spindle Revolution	A	B	C	D
0.0007" (0.019 mm)	30	120	60	120
0.0019" (0.048 mm)	50	100	70	100

To learn how to change the gears, see “Change Gears” on page 30.

To face with power feed:

1. Put a tool bit in the tool holder and adjust the cutting edge to center height.
2. Angle the tool so that the side cutting edge forms an acute angle with the face of the work piece.
3. Move the carriage to the right so that the tool bit is past the right end of the work piece.
4. Turn the lathe on. Adjust the speed to an appropriate speed for the material and diameter you are working on. The LittleMachineShop.com Web site has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds
5. Using the compound rest feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
6. Move the cross slide back so that the tool bit is clear of the diameter of the work piece.
7. Using the compound rest feed handle, advance the tool bit about 0.005".
8. Push left and then up on the power feed lever until the power feed engages. As the tool bit meets the work piece, it starts cutting.
9. When the cross slide has moved as far as you want, lower the power feed lever to disengage power feed. The cross slide stops.

Turning Angles

There are several methods of turning angles or tapers.

- For large angles of short length, such as a chamfer, turn the compound rest to the angle you want. Advance the tool across the work with the compound rest and advance the tool into the work with the cross slide or the carriage.
- You can use the same method for small angles (usually called tapers) of a length less than the compound rest travel.
- For longer tapers, the work is usually placed between centers with the tail center offset from the centerline of the lathe.

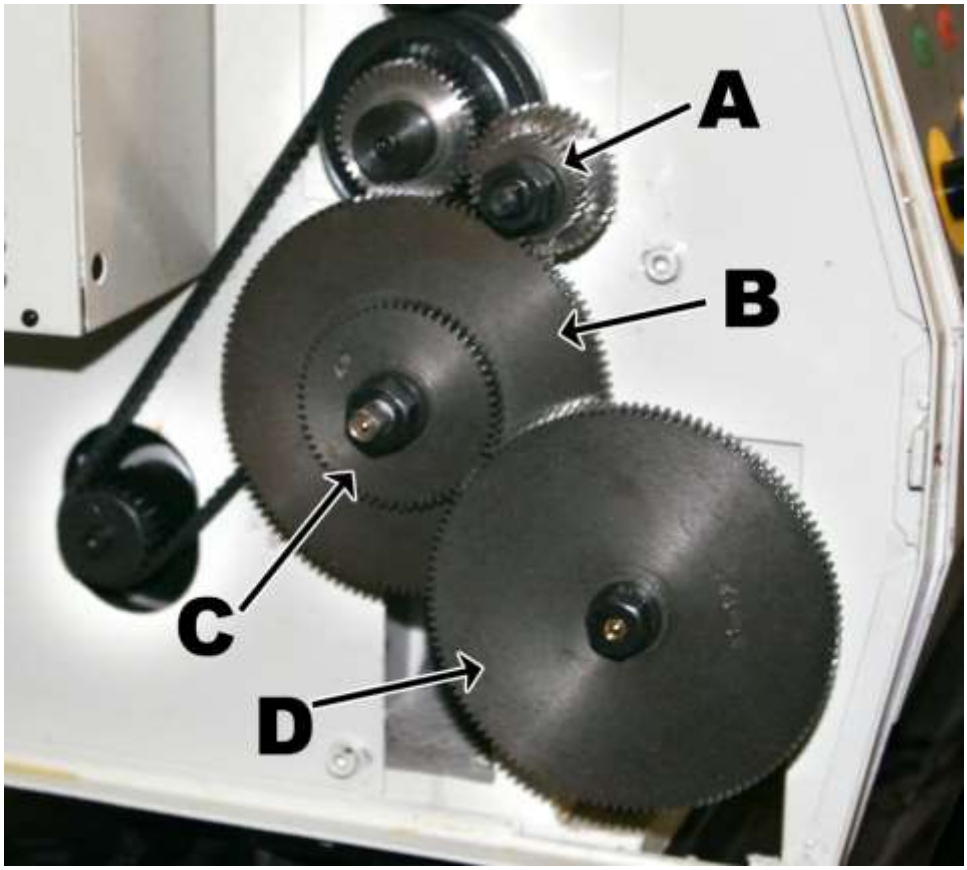
Threading

Much of the mechanism of your lathe is provided to allow you to cut threads. Your lathe can cut a broad range of thread pitches. In fact, with the standard change gears, you can cut many more thread pitches than those shown on the table on the lathe.

Change Gears

The series of gears that drive the lead screw are called change gears because you change them to turn different thread pitches.

There are 4 positions for the change gears, commonly called A, B, C, and D.



A	This is the top change gear position. It is forward of and slightly below the spindle.
B	Gear positions B and C are on the same shaft, between positions A and D. Position B is the inside gear on this shaft.
C	Gear positions B and C are on the same shaft; between positions A and D. Position C is the outside gear on this shaft.
D	Position D is the end of the lead screw.

The change gears are commonly tight on the shaft when new. You might need to use a screwdriver behind them to pry them off.

- To change a gear in position A, use an 8 mm end wrench on the square end of the shaft to keep it from turning. Loosen the nut with a 19 mm end wrench and remove the notched washer from behind the nut. Remove the nut so you can slide the gear off the shaft.

- To change a gear in positions B or C, use an 8 mm end wrench on the square end of the shaft to keep it from turning. Loosen the nut with a 19 mm end wrench and remove the notched washer from behind the nut. Remove the nut so you can slide the gear off the shaft.

  The B and C gears ride on a sleeve that is free to turn on the shaft. It has a keyway and key that keep the B and C gears turning together. Lubricate this sleeve every time you change a B or C gear. Bad things happen when these sleeves seize on the shaft.
- To change the gear in position D, use a 17 mm end wrench to remove the shoulder bolt that retains the gear. Gear position D has a spacer behind the gear. When you only use three gears, put the spacer outside the gear so the gear will align with the gear in position B.

In the change gear tables, some combinations have “Any” in column C. For these combinations, you can use any gear for position C; this gear acts only as a spacer and does not engage the other gears. Position B is an idler and does not affect the overall gear ratio. The table shows a gear that makes it easy to properly engage the gears, although you can use any gear in position B as well.

The B-C Gear shaft is mounted on an arm that pivots around the lead screw. You can move the B-C shaft location to engage different gear combinations. To engage a new set of gears, use a 5 mm hex wrench to loosen the socket head cap screw that locks the B-C arm around the lead screw. Use an 8 mm end wrench on the square end of the B-C shaft to loosen it in the slot in the arm. Move the gears so they are all in engagement. Tighten the arm around the lead screw and tighten the B-C shaft.

Change Gear Tables

Inch Threads - Right Hand

TPI	A	B	C	D
3	50	30	127	50
4	45	30	127	60
5	56	40	127	70
6	50	100	127	30
7	50	100	127	35
8	50	100	127	40
9	50	100	127	45
10	50	100	127	50
11	50	100	127	55
11.5	40	35	87	90
12	50	100	127	60
13	50	94	90	49
14	30	120	127	35
16	30	120	127	40
18	30	120	127	45
20	30	120	127	50
24	30	120	127	60
26	40	87	85	80
27	50	85	80	100
28	49	94	87	100
32	56	50	45	127
36	56	80	40	127
40	49	90	70	120
44	55	120	80	127
48	56	100	60	127
50	49	120	56	90
56	49	90	50	120
64	56	100	45	127
72	56	100	40	127
80	35	90	49	120
100	35	127	40	87

Inch Threads - Left Hand

TPI	A	B	C	D
5	60	30	127	100
6	50	100	127	30
7	50	100	127	35
8	50	100	127	40
9	50	100	127	45
10	50	100	127	50
11	50	100	127	55
11.5	56	70	120	87
12	50	100	127	60
13	55	94	100	60
14	40	100	127	56
16	45	80	127	90
18	60	120	127	90
20	30	120	127	50
24	30	120	127	60
26	60	120	85	87
27	40	90	127	120
28	30	120	127	70
32	30	80	127	120
36	30	90	127	120
40	30	120	80	127
44	55	120	80	127
48	56	100	60	127
50	49	120	56	90
56	49	90	50	120
64	56	100	45	127
72	56	100	40	127
80	60	120	30	94
100	55	127	35	120

Metric Threads - Right Hand

Pitch	A	B	C	D
0.25	30	120	60	120
0.3	30	100	60	120
0.35	35	100	60	120
0.4	40	100	60	120
0.45	45	100	60	120
0.5	30	80	Any	120
0.6	30	100	Any	100
0.7	50	100	70	100
0.75	45	80	Any	120
0.8	50	100	80	100
1	50	80	Any	100
1.25	50	100	Any	80
1.5	45	100	Any	60
1.75	49	120	Any	56
2	50	120	Any	50
2.5	50	120	Any	40
3	50	100	120	40
3.5	49	40	100	70
4	35	30	120	70
4.5	45	30	120	80
5	50	30	120	80

Metric Threads - Left Hand

Pitch	A	B	C	D
0.25	60	120	30	120
0.3	30	100	60	120
0.35	35	100	60	120
0.4	40	100	60	120
0.45	45	100	60	120
0.5	30	80	Any	120
0.6	30	100	Any	100
0.7	50	100	70	100
0.75	45	80	Any	120
0.8	50	100	80	100
1	50	80	Any	100
1.25	50	100	Any	80
1.5	45	100	Any	60
1.75	49	120	Any	56
2	50	120	Any	50
2.5	50	120	Any	40
3	50	100	120	40
3.5	49	40	100	70
4	35	30	120	70
4.5	45	30	120	80
5	50	30	120	80

Making Left Hand Threads

You can make left hand threads with this lathe by changing one gear. Move the driver gear from the idler shaft to the drive shaft and also swap the spacer.

Gears set for right hand threads

Gears set for left hand threads

Tool Bit

For threading, the tool bit is ground to the profile of the thread. For most threads, this is a point with a 60° included angle. The front of the tool should have about 10° of relief. No back rake is

used. The left side should have about 8° of relief, and the right side should have about 10° of relief. The tip of the tool should have a flat that is 1/8 of the thread pitch.

Compound Angle

Set the compound rest at a 29.5° angle from a line perpendicular to the axis of the lathe. This allows you to advance the tool with the compound rest. At this angle the tool cuts only on the left side of the thread form. This helps prevent chatter that might result from cutting the entire V form of the thread at once.

Chris' Tip: Use an accurate protractor when setting the compound rest. The scale on the lathe is not accurate enough.

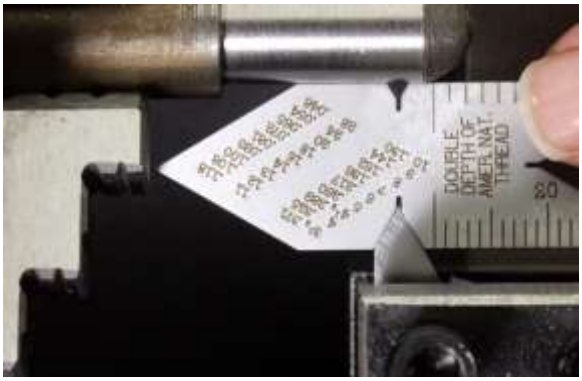
Setting the Cutting Tool

Even though the compound rest is set at an angle to the work piece, the thread cutting tool must be set square to the work piece. A center gage makes this setting possible. A center gage has several V-shaped cutouts. They can be used to check the tool bit as you grind it, and to check the angle of the tool with respect to the work piece.

To align the tool bit to the work:

1. Ensure that the point of the tool bit is set at the center height of the lathe.

2. Place the center gage between the point of the tool bit and the work piece. Leave enough room so that the center gage can be moved back and forth so you can check each side of the tool bit separately.



3. Align the tool bit to the sides of the V-shaped cutout in the side of the center gage.
4. Secure the tool bit in position.
5. Advance the tool bit until the point just contacts the work piece.
6. Zero the cross slide dial. Hold the cross slide feed handle and rotate the graduated dial.

Threading Process

It takes several passes to cut a thread to full depth. You must follow the correct procedure during each pass to ensure the thread is cut correctly.

Use the power feed lever to engage the lead screw drive. The carriage should move from right to left (toward the head stock) to cut right-hand threads, or from left to right (away from the head stock) to cut left-hand threads.

For each pass in cutting threads:

1. Move the carriage to the beginning of the cut.
2. Advance the cross slide to the initial position. For the first pass, you are already there. For additional passes, advance it 2 complete turns to the 0 mark.
3. Advance the compound rest to move the tool bit into the work. For the first pass, this should be only 0.001". For additional passes, it should be 0.005" to 0.010".
4. Start the lathe. Run it at the lowest speed.
5. Engage the half nuts.
6. When the tool reaches the end of the thread, stop the lathe.
7. Back off the cross slide exactly 2 turns.
8. Run the lathe in reverse back to the beginning of the thread.
9. Repeat steps 2 through 8 until the thread is finished.

After you have made the first pass, which should leave just a spiral mark on the work piece, use a thread gage to check that you are cutting the correct number of threads per inch.

Use a nut or the matching part to tell when you are done cutting the thread.

Common Accessories

You will soon find that the purchase of a lathe is just an initial step. There are many tools and accessories that you will need to get full use from your lathe. LittleMachineShop.com carries a full

selection of accessories. Following are some common accessories used with the bench lathe, a small sampling of the complete LittleMachineShop.com line.

Quick Change Tool Post

The standard bench lathe tool post has positions for up to four tools. While this is useful, the standard bench lathe tool post does not have the capability to hold boring bars or cut-off tools without an adapter of some sort.

Quick-change tool posts provide several advantages. They provide an easy way to adjust the height of the tool bit. They provide a quick way to change from one tool to the other. They provide a way to hold several different kinds of tools, usually including turning tools, cut-off blades, and boring bars. And they are indexable, meaning that you can remove a tool, and when you replace it, it returns to the same position, with no adjustment necessary.

LittleMachineShop.com part number 4101. This is a very high quality quick-change tool post for the HiTorque Bench Lathe.

It holds tools up to 3/8" shank.

The set includes:

- Tool post
- Turning & facing tool holder
- Boring, turning & facing tool holder
- Heavy duty boring tool holder
- Universal parting blade holder
- Knurling, facing & turning tool holder

Indexable Turning Tools

Indexable turning tools usually come in a set of five tools, providing a range of cutting angles. These tools use indexable inserts, usually made from carbide, but sometimes from high-speed steel. They are called indexable because you can change an insert and the new insert will take the exact position of the insert it replaces. You can resume work with no further adjustments. Indexable inserts are pre-sharpened.

LittleMachineShop.com part number 1669. This set of indexable turning tools includes 5 tools (AR, AL, BR, BL, TE), wrenches, and extra screws. It comes in a fitted case. (The letters designate the angles of the cutting edge.)

4-Jaw Chuck

The 3-jaw scroll chuck that comes with the bench lathe provides a quick way to clamp round and hexagonal work accurately.

A 4-jaw independent chuck provides several advantages over a 3-jaw scroll chuck. It can hold square or rectangular work, as well as round. Work can be centered more accurately because you adjust each jaw independently. It can hold larger work than the same size 3-jaw chuck. You can offset work in a 4-jaw chuck by clamping it off center.

LittleMachineShop.com part number 1588. 4 inch, 4-jaw chuck. Each jaw is independently adjustable and reversible.

This set includes a chuck key and reversible jaws. The through bore of this chuck is 0.98". The chuck can hold work up to 100 mm (3.94") in diameter.

LittleMachineShop.com part number 2338 & 2961. 5 inch, 4-jaw chuck. Each jaw is independently adjustable and reversible. With an appropriate adapter a 5" chuck can be mounted on the bench lathe.

This set includes a chuck key and reversible jaws plus an adapter to mount the 5" lathe chuck on the HiTorque Bench Lathe. The through bore of this chuck is 1.18". The chuck can hold work up to 125 mm (4.92") in diameter.

Faceplate

A faceplate allows you to mount work that can't be held in a chuck. You can bolt odd-shaped work pieces to the faceplate.

LittleMachineShop.com part number 3400. Faceplate for the HiTorque Bench Lathe. The faceplate is 7.1" in diameter and has 8 slots for mounting work.

LittleMachineShop.com part number 3401. Clamping kit for faceplate. This kit includes clamping bars and fasteners to attach work to the faceplate.

Live and Dead Centers

A live center goes in the tailstock and is used to support the end of a long work piece; it rotates with the work piece. A dead center goes in the spindle and supports work being turned between two centers.

The live center is LittleMachineShop.com part number 1592. It has a 2 Morse taper shank. This center fits the tailstock of the bench lathe.

The dead center is LittleMachineShop.com part number 1188. It has a 3 Morse taper shank. This center fits the headstock of the bench lathe. The center has a 60 degree included point angle.

Steady Rest and Follower Rest

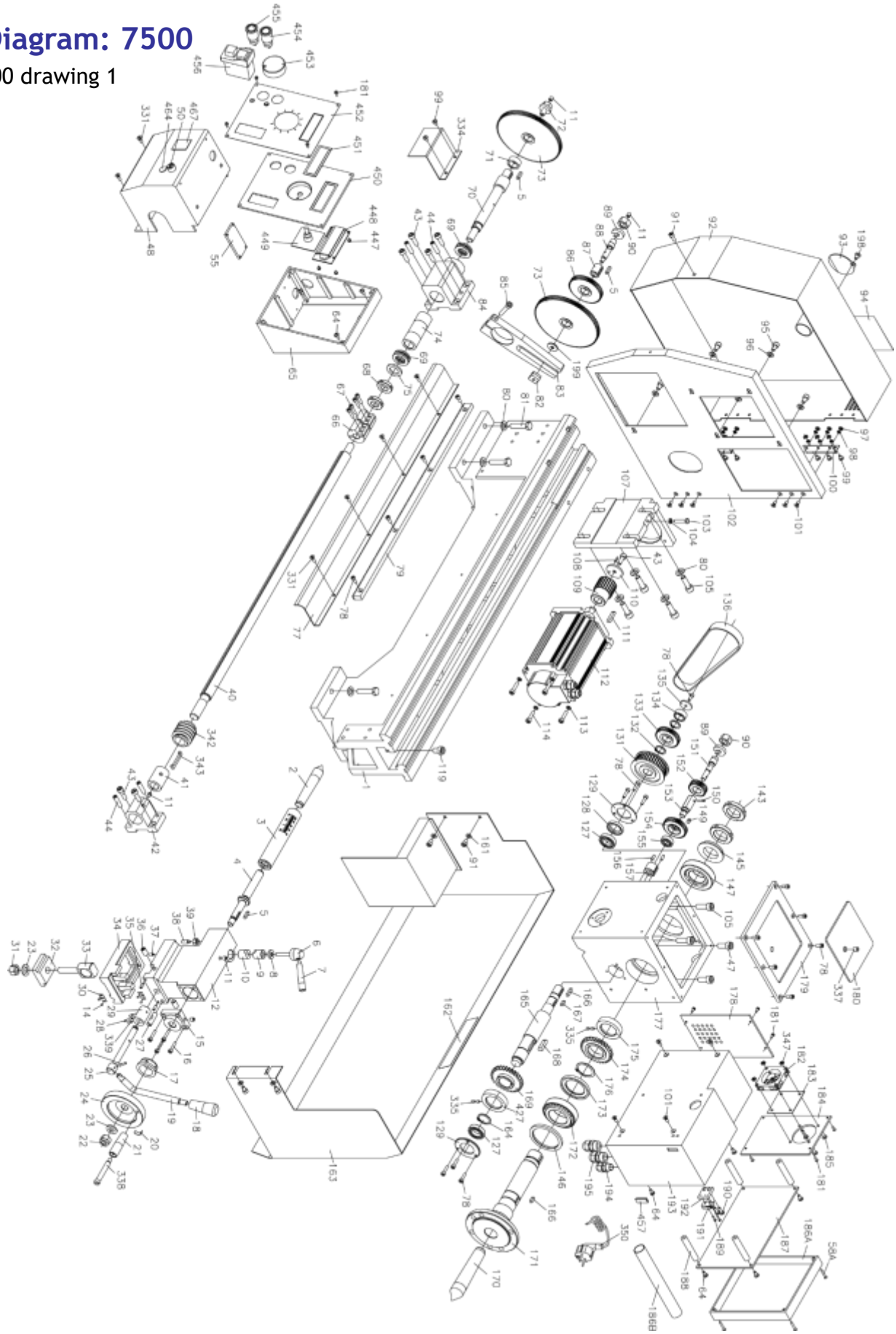
Steady and follower rests support small diameter work that would otherwise flex too much. A steady rest mounts in a fixed position on the ways of the lathe. A follower rest mounts on the carriage and moves with the cutting tool, providing support where it is needed.

The steady rest is LittleMachineShop.com part number 3398. The steady rest can support work up to 2.2" in diameter.

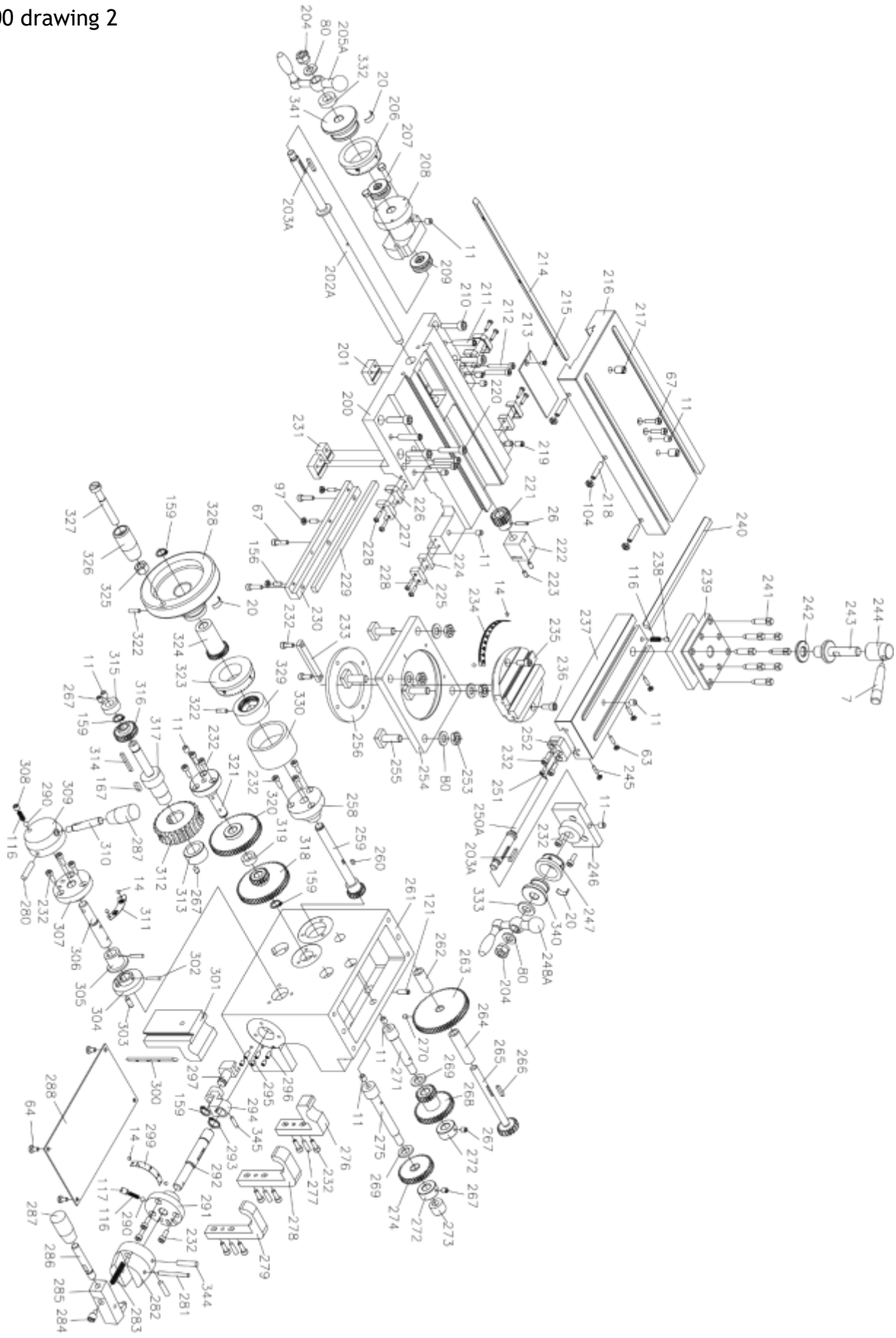
The follower rest is LittleMachineShop.com part number 3399.

Parts Diagram: 7500

Model 7500 drawing 1

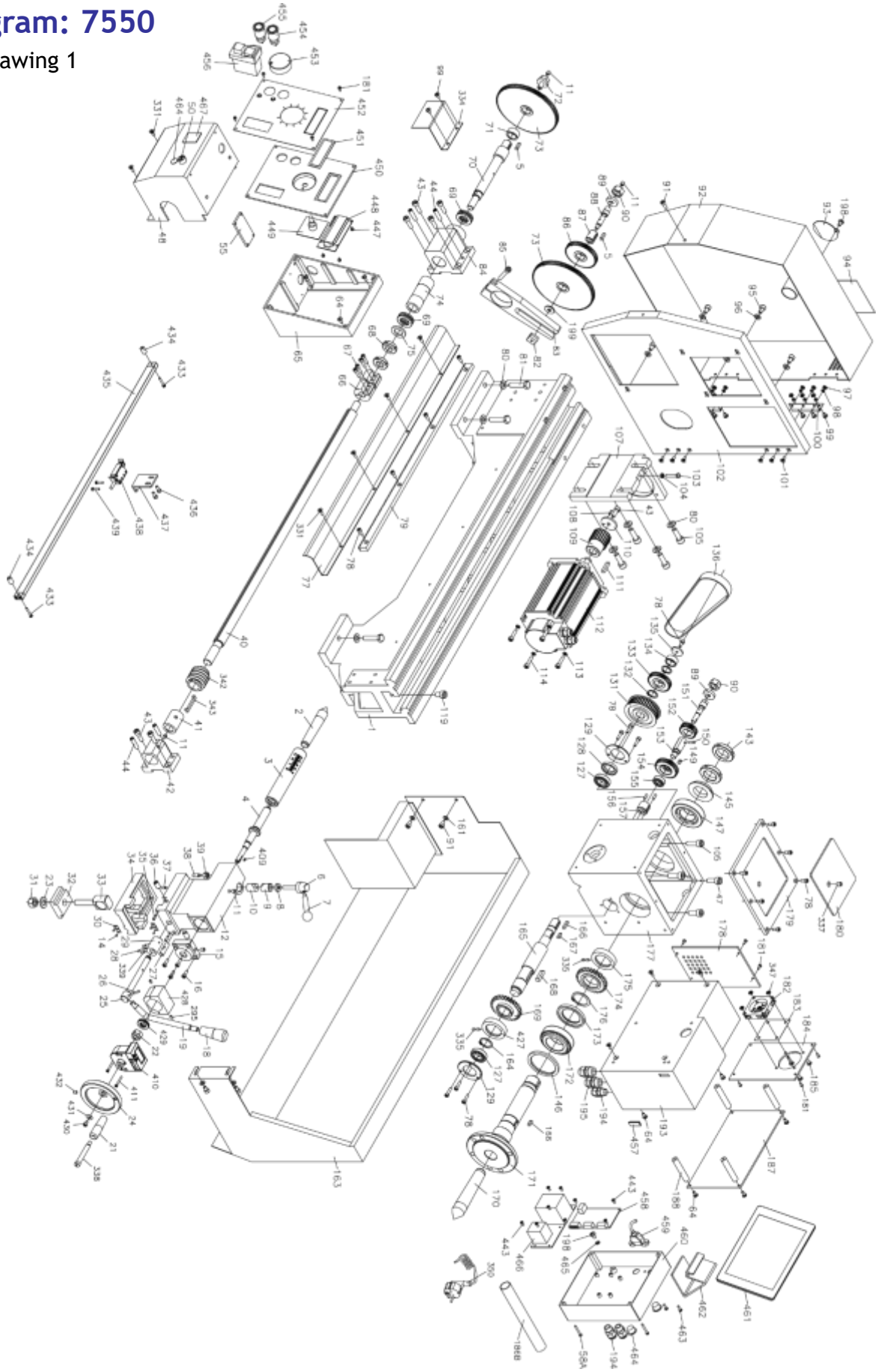


Model 7500 drawing 2

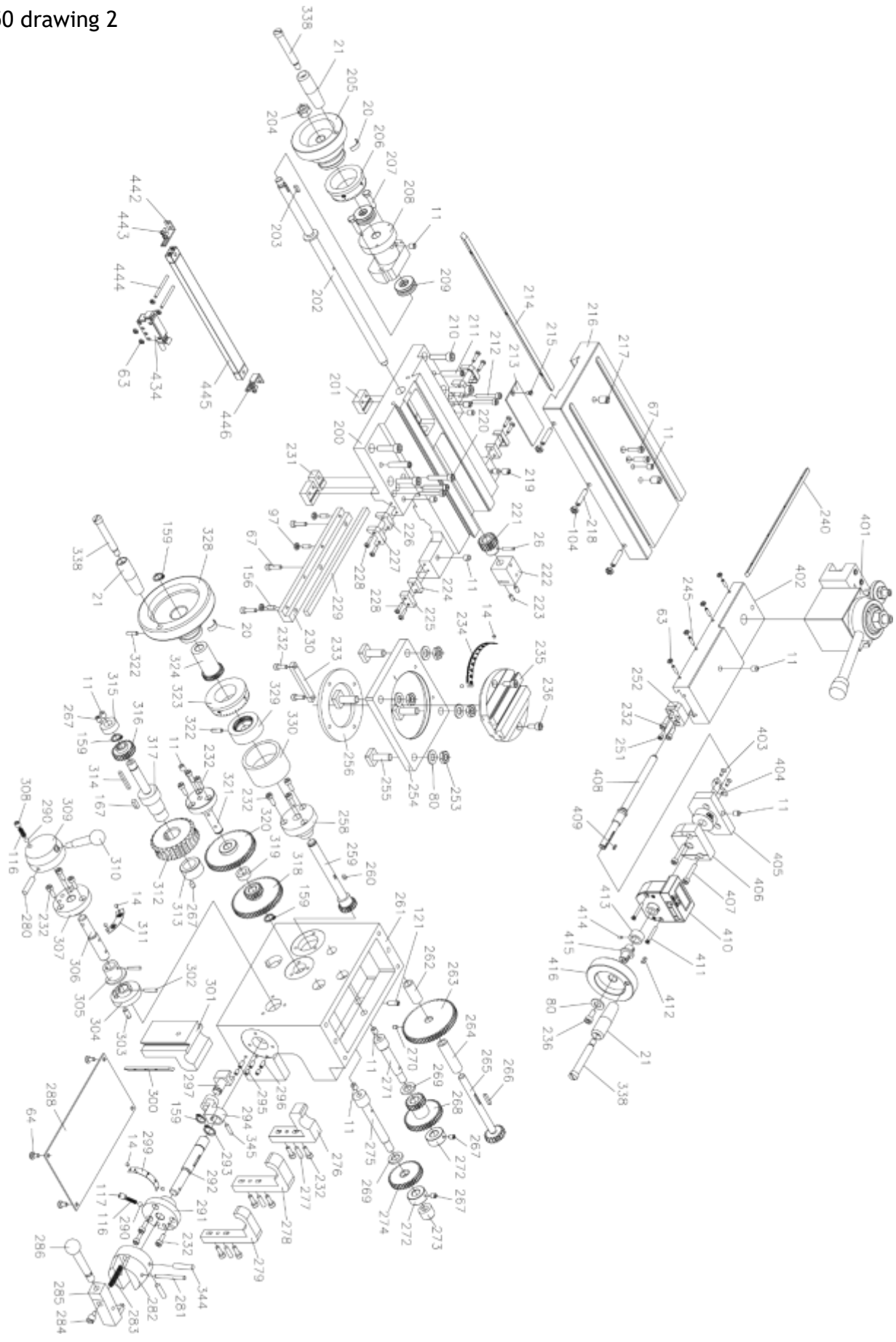


Parts Diagram: 7550

Model 7550 drawing 1



Model 7550 drawing 2



Parts List

Refer to the parts diagrams on the preceding pages and find the number of the part you need (Dwg PN). The LMS PN column shows the LittleMachineShop.com part number—the number you use to order on our website.

Dwg PN	Description	LMS PN
1	Bed way	5104
2	Dead center, 2MT	1890
3	Quill	4335
4	Feed screw (7500)	4336
4	Feed screw (7550)	6132
5	Key, 4×16 mm	1473
6	Locking axis	5210
7	Handle	4337
8	Adjusting washer	5211
9	Locking sleeve	5212
10	Locking nut	5213
11	Oil fitting	1655
12	Tailstock casting	5215
14	Rivet, M2×4	1988
15	Feed screw retainer	4338
16	Cap screw, M4×20	2076
17	Scale ring	5217
18	Knob	1346
19	Handle	5219
20	Spring	1773
21	Handle	2104
22	Nut, M10	6133
23	Washer, M10	1581
24	Handwheel (7500)	4340
24	Handwheel (7550)	4162
25	Rotating shaft	5221
26	Spring pin, 3×16	5105
27	Limit shaft	5222
28	Spring pin, 3×20	5223
29	Eccentric sleeve	5224
30	Zero label	5225
31	Nut, M10	1772
32	Press plate	5226
33	Tension shaft	5227
34	Base casting	5016
35	Set screw, M4×12	5795
36	Set screw, M8×14	5796
37	Set screw, M4×10	5797
38	Set screw, M6×16	2681
39	Nut, M6	1226
40	Lead screw	5097
41	Brass cover	5229
42	Lead screw support	5230
43	Cap screw, M6×16	1540
44	Pin, 6×26 tapered	5231
47	Cap screw, M8×20	1544
48	Protection cover	4342
50	Fuse holder	1333

Dwg PN	Description	LMS PN
52	EMI filter	5237
55	Fan power supply	4345
63	Nut, M4	4194
64	Screw, M4×8	1557
65	Electrical operation box	4349
66	Lead screw connecting sleeve	5234
67	Cap screw, M4×16	5128
68	Nut, M16×1.5	5798
69	Bearing, 51103	5205
70	Lead screw shaft	4495
71	Spacer	4852
72	Bolt	4494
73	Gear, 120T	4938
74	Copper cover	5204
75	Washer	5799
77	Lead screw protection cover	5261
78	Cap screw, M4×10	1529
79	Rack	5266
80	Washer, M8	1586
82	Nut	—
81	Cap screw, M8×35	4481
83	Gear lever	4352
84	Lead screw support	5235
85	Cap screw, M6×35	6134
86	Gear, 60T	4939
87	Bushing	4353
88	Shaft	4219
89	Washer	4493
90	Nut, M12	6135
91	Cap screw, M5×8	1538
92	Gear box cover	4354
93	Cover	4498
94	Label, caution	2119
95	Cap screw, M6×10	4196
96	Washer, M6	1585
97	Nut, M4	4194
98	Locking washer, M4 (GB 93 87 4)	—
99	Screw, M4x6	1909
100	Hinge	4355
101	Screw, M4×10	1555
102	Gear box back cover	4354
103	Cap screw, M5×25	6136
104	Nut, M5	4193
105	Cap screw, M8×25	1979

Dwg PN	Description	LMS PN
107	Motor mount	4459
108	Spring pin, 3×10	3301
109	Pulley, motor	4357
110	Positioning disk	5800
111	Key, 5×25 mm	5244
112	Motor	4358
113	Locking washer, M5 (GB 859 87 5)	—
114	Cap screw, M5×20	1535
116	Spring, 4×12 mm	5245
117	Set screw, M6×6	5815
119	Cap screw, M8×12	—
121	Set screw, M5×16	5801
127	Bearing, 6903-2RS	5253
128	Sleeve	5254
129	Cover	5255
131	Pulley, timing	4359
132	Retaining ring, M16	3300
133	Gear, 42T	4908
134	Spacer	5802
135	Ring	5257
136	Timing belt	4360
143	Nut, M27×1.5	1329
145	Ring	5263
146	Oil seal	4366
147	Bearing, 6206-2RS	1219
149	Key, 4×8 mm	1376
150	Pin, 3×14 tapered	5803
151	Shaft	4499
152	Gear, 30T	4909
153	Shaft	4500
154	Gear, 42T	4465
155	Bearing, 608-2RS	1907
156	Set screw, M4×12	5804
157	Retainer	4501
159	Retaining ring, M10	1185
161	Washer, M5	1584
162	Label, safety	5262
163	Splashguard	4363
164	Retaining ring, M21	2138
165	Shaft	4497
166	Key, 4×18 mm	5339
167	Key, 4×12 mm	2111
168	Key, 6×25 mm	5340
169	Slipping gear, 32T	4364
170	Dead center, 3MT	1188
171	Spindle	4365
172	Bearing, HR32007XJ	5267

Dwg PN	Description	LMS PN
173	Oil seal	4362
174	Gear, 32T	4367
175	Adjusting block	5268
176	Retaining ring, M30	5805
177	Headstock	4368
178	Side cover	5270
179	Cover	4369
180	Rubber insert	4370
181	Screw, M2.9×9.5	5134
182	Fan	4371
183	Dust net	4372
184	Small cover	4374
185	Screw, M3×14	5823
186A	Cover	5275
186B	Plastic tube	5276
187	Motor controller	1176
188	Insert	5272
189	Screw, M2.2×9.5	5273
190	Screw, M4×12	3689
191	Micro switch	4376
192	Micro switch panel	4377
193	Electrical box	5274
194	Strain relief, 12 mm	3516
195	Strain relief, 16 mm	4019
198	Screw, M5×8	1559
199	Washer, M6	5002
200	Saddle	4378
201	Press plate	4379
202	Feed screw (7550)	4179
202A	Feed screw (7500)	4407
203	Key, 2×6 mm	4172
203A	Key, 3×20 mm	4408
204	Nut, M8	2516
205A	Handle	4409
206	Graduated scale	5282
207	Cap screw, M5×20	5283
208	Bearing retainer	5284
209	Bearing, 51100	5285
210	Cap screw, M6×25	1542
211	Pin, 6×30 tapered	3330
212	Cap screw, M4×30	—
213	Cover	5281
214	Gib, 250 mm	4380
215	Screw, M3×6	3872
216	Cross slide	4381
217	Set screw, M8×12	5806
218	Set screw, M5×30	4588
219	Set screw, M6×10	1573
220	Cap screw, M5×30	—
221	Gear, 19T	5286
222	Feed screw nut (7500)	4382
222	Feed screw nut (7550)	

Dwg PN	Description	LMS PN
223	Set screw, M4×8	5807
224	Linoleum	4383
225	Protection cover	4384
226	Linoleum	4385
227	Protection cover	4386
228	Screw, M3×12	6137
229	Gib, 170 mm	4387
230	Retainer	4388
231	Bridled press plate	4389
232	Cap screw, M4×12	1530
233	Locating block	5288
234	Angle scale	5289
235	Base	4390
236	Cap screw, M5×12	1532
237	Compound rest top	4391
238	Fixed block	5290
239	Tool post	4392
240	Gib, 170 mm	4393
241	Cap screw, M6×25	1542
242	Adjusting washer	4394
243	Tool post mount	4395
244	Handle	4396
245	Set screw, M3×16 (7500)	4485
245	Set screw, M4×16 (7550)	5808
246	Feed screw support	5291
247	Graduated scale	5292
248A	Handle	4410
250A	Feed screw	4411
251	Cap screw, M3×8	4166
252	Feed screw nut (7500)	4397
252	Feed screw nut (7550)	4401
253	Nut, M8	5549
254	Base	5294
255	T-bolt, M8	5295
256	Press plate	5046
258	Gear protection sleeve	5303
259	Gear shaft, 19T	5297
260	Key, 3×6 mm	5341
261	Carriage apron	5298
262	Sleeve	4605
263	Gear, 65T	4967
264	Sleeve	4604
265	Gear shaft, 17T	4606
266	Key, 3×16 mm	1297
267	Set screw, M5×6	5809
268	Gear 21T/44T	5304
269	Washer, M10	1581
270	Set screw, M4×6	5810
271	Shaft	5305

Dwg PN	Description	LMS PN
272	Positioning ring	5811
273	Shaft sleeve	5307
274	Gear, 39T	5308
275	Shaft	5309
276	Lead screw support	4220
277	Pin, 4×16 tapered	5310
278	Lead screw support	4148
279	Lead screw support	4221
280	Set screw, M6×20	5812
281	Pin, 4×16	5312
282	Handle	5313
283	Spring, 5×30 mm	5314
284	Set screw, M8×10	1814
285	Handle block	5315
286	Handle shaft (7500)	5316
286	Handle (7550)	4163
287	Knob	1346
288	Lower cover	5311
290	Ball, 5 mm	1337
291	Limit flange sleeve	5319
292	Handle shaft	5320
293	Retaining ring, M12	1182
294	Fork	4402
295	Set screw, M4×6	5813
296	Set screw, M4×8	3780
297	Block	4403
299	Label, autofeed	5322
300	Gib, 63 mm	4404
301	Half nut	4405
302	Pin, 3×18 tapered	5814
303	Pin, M5×12	1372
304	Center plate	5326
305	Locking wheel	5327
306	Shaft	5328
307	Locating flange sleeve	5329
308	Set screw, M6×6	5815
309	Handle set	5330
310	Handle shaft (7500)	5251
310	Handle (7550)	4164
311	Label, half nut lever	5331
312	Worm wheel	4406
313	Shaft sleeve	5332
314	Key, 3×28 mm	5342
315	Shaft sleeve	5333
316	Slipping gear, 25T	5334
317	Shaft	5335
318	Gear, 20T/60T	5033
319	Sleeve	5336
320	Gear, 60T	5337
321	Shaft	5032
322	Set screw, M4×14	2626
323	Graduated scale	5299
324	Gear, 30T	5518

Dwg PN	Description	LMS PN
325	Nut, M8	5182
326	Handle	1347
327	Screw, M8×55	1565
328	Handwheel (7500)	4414
328	Handwheel (7550)	4165
329	Inner gear, 30T	5301
330	Gear protection sleeve	5303
332	Washer	5597
333	Washer	5598
334	Protection cover	5236
335	Set screw, M6×5	2153
337	Oil cup	5269
338	Bolt (7500)	2145
338	Bolt (7550)	4184
339	Set screw, M4×10	5818
340	Scale ring sleeve	5293
341	Scale ring	5287
342	Worm shaft	5232
343	Key	5233
344	Set screw, M5×20	5819
345	Pin, 3×16 tapered	5323
347	Nut, M3	5939
350	Power cord	3380
401	Quick change tool post set, 0XA	3112
402	Compound rest top	4914
403	Screw, M3×8	4167
404	Bracket	4168
405	Retainer	4169
406	Mount	4170
407	Screw, M4×25	5828
408	Feed screw	4171
409	Key, 2×6 mm	4172
410	Readout	5673
411	Screw, M3×25	1496
412	Key, 3×8 mm	1357
413	Bushing	4173
414	Set screw, M3×4	4174
415	Shaft	4175
416	Handwheel	4176
421	Handwheel	4176
422	Retainer	4177
424	Screw, M3×8	4166
425	Screw, M3×14	4178
426	Feed screw	4179
427	Spacer	6138
428	Retainer	6139
429	Bearing, 12×22×5	5720
430	Screw, M4×6	6141
431	Washer, M4	1583
432	Set screw, M5×6	6143
433	Screw, M3×20	5825
434	Spacer	6144

Dwg PN	Description	LMS PN
435	Scale, 1 m	5498
436	Screw, M4×10	1529
437	Bracket	6145
438	Washer	5799
439	Screw, M3×14	5823
442	Bracket back	6146
443	Screw, M3×6	1554
444	Stud	6147
445	Scale, 1 m	5498
446	Bracket front	6148
447	Screw, M2.9×9.5	2148
448	Spindle speed display	6149
449	Potentiometer	6151
450	Faceplate	6152
451	Protective plate	6124
452	Cover	6153
453	Knob	6154
456	Switch	5527
457	Cover	6156
458	Bluetooth sender	5784
459	USB port	6041
460	Cover	6159
461	Android tablet	5513
462	Stand	6160
463	Screw, M3×10	5822
464	Plug	6107
467	Cover	6163

Wiring Diagram