Model PM-1022V/1030V

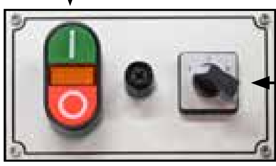
110 Vac 1 HP fully equipped machine
Variable speed DC motor
Spindle speeds from 50 to 1000 & 100 to 2000 rpm
22 or 30 in. between centers, 10 in. swing over bed
Spindle bore: 1 in. clearance
3-jaw and 4-jaw chucks
Faceplate, steady & follower rests
Quick change tool post & tool holders
Gearbox and change gears for full-range screw cutting, U.S. (TPI) & Metric
Bi-directional power feed for saddle & cross-slide
Weight, excluding stand approx. 375 / 400 lb

PRECISION MATTHEWS

PM-1030V

FAQ

Nothing happens when RUN MOTOR button pressed



110Vac power connected?
Motor direction switch set to O = OFF? ***Set to F or R***

E-Stop button pressed down?
Twist to release

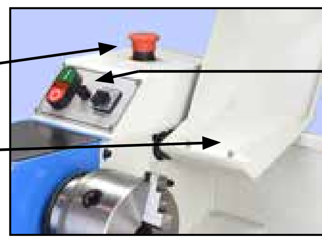
Chuck guard up?
Swing it down to close

Fuse on ***back panel*** of electrical box good?

Gear cover in place, LH side of headstock?
Replace cover to close safety switch

Everything else is OK but the motor still doesn't run

Fuse on front panel good?



This manual contains essential safety advice on the proper setup, operation, maintenance, and service of the PM-1030V lathe. Failure to read, understand and follow the manual may result in property damage or serious personal injury.

There are many alternative ways to install and use a lathe. As the owner of the lathe you are solely responsible for its proper installation and safe use. Consider the material contained in this manual to be advisory only. Quality Machine Tools, LLC cannot be held liable for injury or property damage during installation or use, or from negligence, improper training, machine modifications or misuse.

This manual describes PM-1030V machines as shipped from late 2017. There may be detail differences between your specific machine and the information given here (with little or no impact on functionality). If you have questions about any aspect of the manual or your machine, please email us at service@precisionmat-thews.com. Your feedback is welcomed!

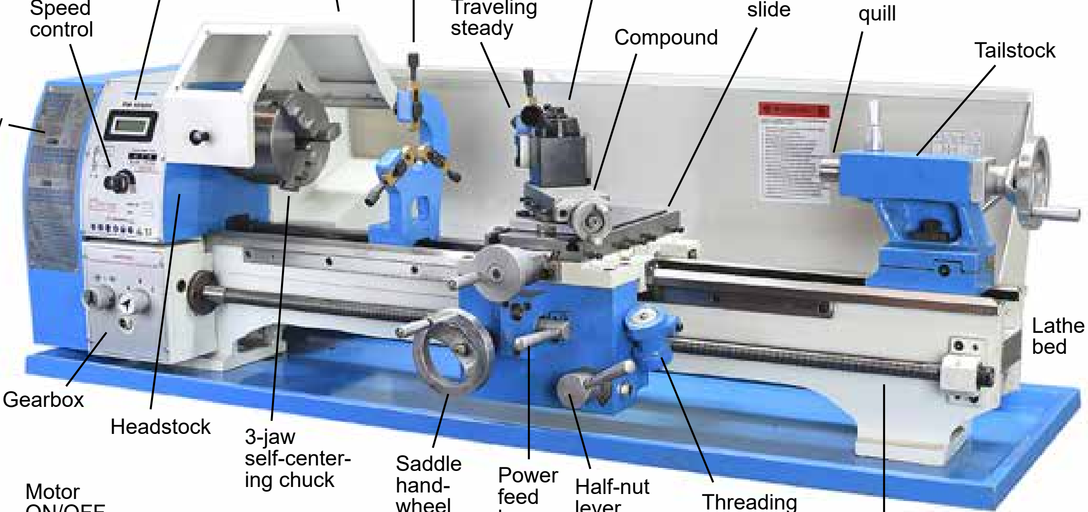
Section 1 INSTALLATION

THESE ARE THE MAIN POINTS TO WATCH OUT FOR!

But read the following pages for more information

! *Check oil level in the gearbox and apron before use*

- Handling the lathe is at least a two-man job.
- Lifting gear – sling, hoist or forklift – must be rated for at least 1/2 ton.
- Care must taken when lifting to avoid flexing or other damage to any component of the lathe, especially the leadscrew and hex-section feed shaft.
- Working location of the lathe must allow space for opening drive system cover at left; also, access to the electrical box at the back of the headstock.
- Power requirement is 110V, 60Hz, single phase.
- Extension cord not recommended; if no alternative, use 12 AWG not longer than 20 ft.
- Before connecting power be sure that:
  1. The machine is on a firm footing.
  2. Chuck attachment bolts are tight, no wrench left in chuck.
  3. Saddle and cross-slide approx. mid-travel, power feed disengaged (Figure 1-2).
  4. The speed control knob is set for a low or zero spindle speed, fully counter clockwise.



MAIN COMPONENTS

SETTING UP THE LATHE

The PM-1030V is shipped in two packing cases, one for the lathe, one for the optional stand. When installed on the stand, the machine can be lifted in one piece by an overhead hoist or forklift with slings and/or chains, all items rated for a total weight of at least 1/2 ton. A suggested setup for lifting is shown in Figure 1-1.

Figure 1-1 **Lifting with slings**

When selecting a location for the lathe, allow sufficient room at the right to allow removal/servicing of the leadscrew.

Be sure to keep all lifting gear clear of any part of the lathe, especially the leadscrew at the front. Use spreaders if necessary, at least "2-by" studs.

Before lifting, protect the bed, then remove the chuck if installed. Move the tailstock and saddle as far to the right as possible to balance the machine at the point(s) of suspension.

With the lathe in its permanent location, level it using metal shims under the cabinets, or (preferred), install eight leveling mounts in the mounting holes of the two stand cabinets, 4 to each cabinet.

LEVELING

The following procedure ensures that the lathe bed is in the same state as it was when the lathe was checked for accuracy in manufacture — level from end to end along the bed, and from front to back. In other words, no warping.

Make sure all leveling mounts and/or shims are ***properly weight bearing***, firmly in contact with the floor. Check and adjust level from end to end using a precision machinist's level, if available. If not, use the most reliable level on hand. Check and adjust level front-to-back across the bed using a matched pair of spacer blocks to clear the Vee tenons on the bed ways. The blocks need to be at least 1/4 inch thick, ground or otherwise accurately dimensioned. Alternatively, check for level on the ground surface of the cross-slide as the saddle is traversed from end to end. See also "Aligning the Lathe" in Section 3.

CLEANUP

Metal surfaces may be protected by thick grease and/or paper. Carefully remove these using a plastic paint scraper, disposable rags and a light-oil such as WD-40.

INITIAL CHECKS

Read Section 3 if unsure about any item in the following

1. Check oil level (sight glasses) in the ***gearbox*** and ***apron***, see Section 4.
2. Remove the belt cover left of the headstock. Make sure the belt is set for the desired speed range, and properly tensioned, four bolts, arrowed in Figure 1-1.
3. Replace the belt cover.

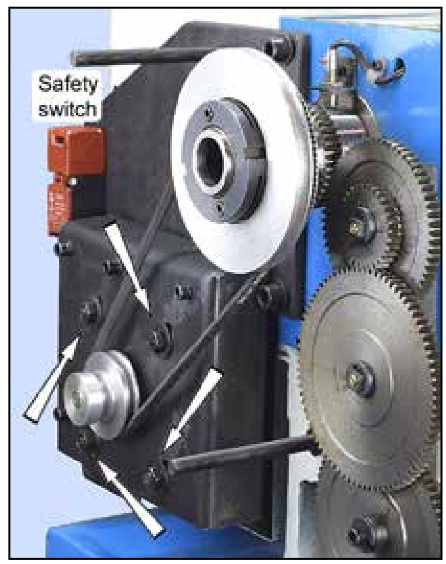


Figure 1-1 **Drive belt adjustment**

4. If a chuck or faceplate is installed check tightness of the three nuts on the spindle nose.
5. Lower the chuck guard.
6. Set the spindle speed knob fully counter clockwise, lowest speed, Figure 1-2.
7. Check that there are no clamps or locks on moving parts.
8. Set the saddle and cross-slide to approximate mid-travel,
9. Make certain that the power feed levers are disengaged, Figure 1-3.
10. Be sure the E-Stop button has not been pushed in (it should pop out when twisted clockwise). FAQs, page 2.
11. Set the motor control switch to F = Forward, Figure 1-4.
12. Connect 110 Vac power. The tachometer (speed) display should light.

Figure 1-2 **Speed control**

Figure 1-3 **Power feed levers on apron**

Figure 1-4 **Motor ON/OFF & Direction controls**

13. Press the GREEN Motor ON button. The spindle should turn forward, counter clockwise, viewed from the tailstock end.
14. Check the emergency function by pressing the E-Stop button. The motor should stop. ***If this doesn't happen, the E-stop function is defective, and needs attention.***
15. Reset (twist) the E-Stop button to restore power.
16. Check that the chuck guard switch stops the motor when the guard is swung up.
17. Check that the belt cover safety switch stops the motor when the belt cover is removed, Figure 1-1.
18. Press the RED Motor OFF button, Figure 1-4. The motor should stop.

OPTIONAL TEST RUN PROCEDURE

With the spindle stationary, use the handwheel to run the saddle back and forth a few times from headstock to tailstock (if the handwheel cannot be turned, check that the power feed lever and half-nut lever on the apron are in neutral, Figure 1-3). With the power feed lever still in neutral, run the cross-slide front to back a few times.

1. With the power feed and half-nut levers in neutral, run the spindle for a few minutes, forward and reverse, at a selection of speeds in both speed ranges (transfer the Vee belt from inner to outer pulley grooves to change speed range).
2. The gearbox should also be run at this time, but first make certain that the leadscrew and feed shaft oilers at the tailstock end have been lubricated.
3. Power-feed the saddle and cross-slide, Figures 1-5, and 1-6, stopping well before end limits or other obstructions.
4. After the initial test run, with 20 additional hours of machine time, drain and refill the gearbox and apron with the lubricants specified in Section 4.

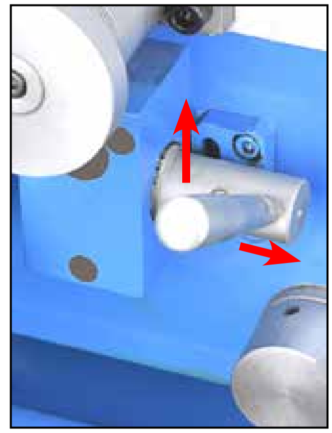


Figure 1-5 **Saddle feed**
Lever RIGHT and UP

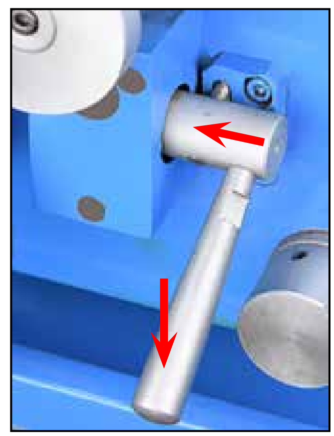


Figure 1-6 **Cross-slide feed**
Lever LEFT and DOWN

ALIGNING THE LATHE

The most important attribute of a properly set up lathe is its ability to "machine parallel", to cut a cylinder of uniform diameter over its entire length. In other words, no taper.

Leveling of the lathe is a part of this, see earlier in this section. Equally important is the alignment of the center-to-center axis with the lathe bed, as seen ***from above***. [Vertical alignment is nowhere near as critical, rarely a cause of taper unless the lathe is damaged or badly worn.] For more information see the final pages of Section 4, Servicing the Lathe.

Section 2 FEATURES & SPECIFICATIONS

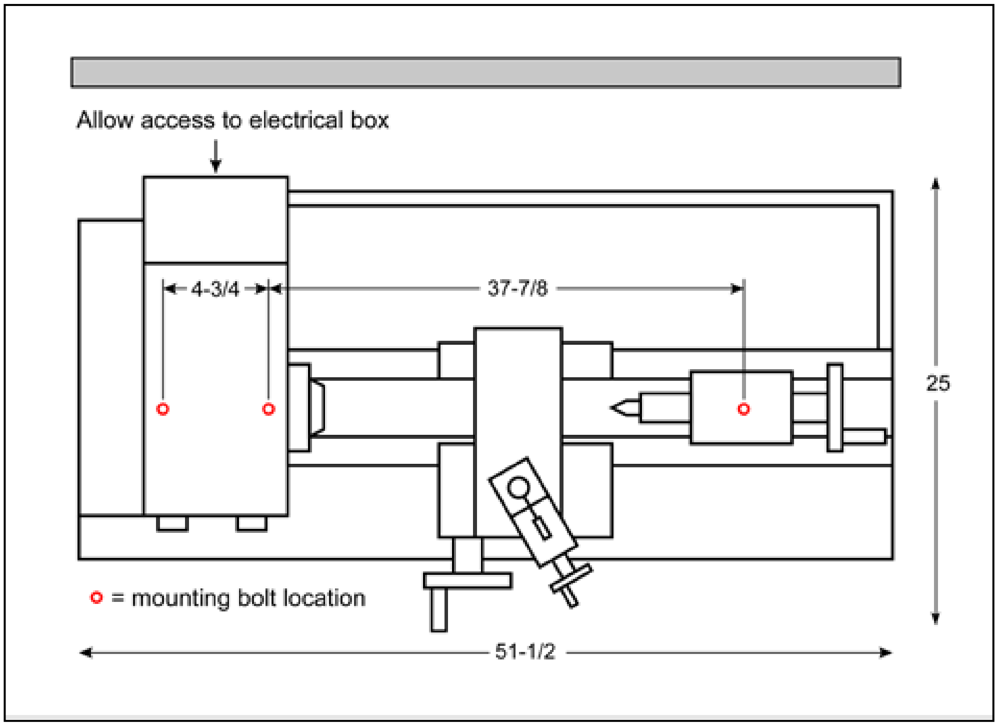
MODEL PM-1030V Lathe

General information

This is a compact, full-featured lathe ideal for the smaller model shop. It features a high-torque 1 HP DC motor giving smoothly variable spindle speeds in two ranges, from 50 to 1000 rpm and 100 to 2000 rpm. Power requirement is 110 V, 60Hz. The lathe ships fully assembled, approximate net weight 395 lb. A sheet metal stand with two cabinets is available as an option.

The spindle has a 1 inch bore, and is unusually short — just 11 inches, ideal for through-spindle work. Long service life is assured by high precision taper-roller spindle bearings, together with hardened and ground bed ways. All internal gears in the gearbox and apron are continuously splash-lubricated.

Power feed for the saddle and cross-slide is supplied by a three-speed gearbox driving a "two-in-one" leadscrew. This is a conventional 8 TPI leadscrew for thread cutting, with a key slot to drive the saddle and cross-slide for routine turning and facing operations (an advantage of this arrangement, compared with using a leadscrew for all power-feed functions, is reduced wear on the thread). External change gears provide for a full range of UNC and UNF threads from 8 to 80 TPI, and metric threads from 0.35 to 3 mm pitch. The gearbox is instantly reversible for left-hand thread cutting, and for reverse motion of saddle and cross-slide.



PM-1030V approximate dimensions (not to scale)

Check mounting bolt locations on the actual machine before drilling bench top

Everyday precautions

- This machine is intended for use by experienced users familiar with metal-working hazards.
- Untrained or unsupervised operators risk serious injury.
- Wear ANSI-approved full-face or eye protection at all times when using the machine (everyday eyeglasses are not reliable protection against flying particles).
- Wear proper apparel and non-slip footwear – be sure to prevent hair, clothing or jewelry from becoming entangled in moving parts. Gloves – including tight-fitting disposables – can be hazardous!
- Be sure the work area is properly lit.
- Never leave chuck keys, wrenches or other loose tools on the machine.
- Be sure the workpiece, toolholder(s) and machine ways are secure before commencing operations.
- Use moderation: **light** cuts, **low** spindle speeds and **slow** table motion give better, safer results than "hogging".
- Don't try to stop a moving spindle by hand – allow it to stop on its own.
- Disconnect 110 Vac power from the lathe before maintenance operations such as oiling or adjustments.
- Maintain the machine with care – check lubrication and adjustments daily before use.
- Clean the machine routinely – remove chips by brush or vacuum, not compressed air (which can force debris into the ways).

No list of precautions can cover everything.
You cannot be too careful!

PM-1030V SPECIFICATIONS

Dimensions, approximate overall, incl. stand	Width 52 in. x Height 19 in. x Depth 25 in. (full range cross-slide motion)
	Footprint (excluding handles): Width 52 in. x Depth 19 in.
	Bed length, excluding headstock: 41-1/2 in.
	Bed width: 5-1/4 in.
	Spindle centerline to machine tray 12 in., to floor (on stand) 42 in.
	Weight, approximate: 395 lb net, with stand 475 lb net

Power requirement	110 Vac, 60 Hz, 1Ø, 12 A max
Motor	1 HP (750 W) dc

Work envelope

Headstock center to tailstock center	30 in. max
Swing over bed	10 in. diameter
Swing over cross-slide	5-1/2 in. diameter
Spindle face to tailstock quill face	32-1/2 in. max
Saddle travel along bed	29-1/4 in.
Cross-slide travel	5 in.
Compound (top slide) travel	3 in.

Drive system *DC drive with 2-speed Vee pulleys*

Low range, rpm	50 to 1000
High range, rpm	100 to 2000

Saddle drive, thread cutting	Leadscrew 8 TPI, 3/4 in. diameter
Inch threads	Choice of 37, from 8 to 80 TPI
Metric threads	Choice of 21, from 0.35 mm to 3 mm pitch

Saddle / cross-slide drive, turning & facing	Worm driven by keyed slot in leadscrew
Turning operations (saddle feed)	Choice of feed rates from 0.0025 to 0.014 in./spindle rev
Facing operations (cross-slide feed)	Choice of feed rates from 0.0014 to 0.004 in./spindle rev

Spindle

Chuck/faceplate attachment	Direct mount
Internal taper	MT4
Spindle bore	1 in.
Spindle length, LH end to back of chuck	10-3/4 in. approx.
Spindle length, LH end to chuck face (typical)	13-3/4 in. approx.

Tailstock

Internal taper	MT2
Quill	1.175 in. diameter, 2-1/2 in. travel

Work holding

3-jaw chuck, 5 in.	
4-jaw chuck, 5 in.	
Faceplate 8 in.	
Center rest (steady rest) capacity	Up to 1-1/2 in. diameter
Follower rest capacity	Up to 1 in. diameter

Section 3 USING THE LATHE

The PM-1022V and PM-1030V are conventional engine lathes that requires little explanation except for details specific to this particular model — speed control, thread cutting, and the saddle/cross-slide power feed system. Because the user is assumed to be familiar with general purpose metal lathes, this section contains very little tutorial.

Those unfamiliar with lathe work may find the following helpful: ***HOW TO RUN A LATHE***, published many years ago by the original South Bend Machine Works (not the current owners of the brand), with many revisions through the 1960s. This is the classic go-to source for lathe users of every level of experience.

DRIVE SYSTEM

Two-speed pulleys and a Vee belt connect the high-torque dc motor direct to the spindle, Figure 3-1. The high speed coupling illustrated gives spindle speeds from 100 to 2000. To change the coupling for lower speeds, 50 to 1000 rpm, transfer the belt from larger to smaller on the motor pulley. Do this by hand-rolling the belt out of the ***larger diameter*** groove, followed by similar action — in reverse — on the other pulley.

If necessary, adjust belt tension by moving the motor (four hex head screws, arrowed in Figure 3-1). Firm figure pressure midway between the pulleys should deflect the belt about 1/4" — no tighter than that.

Many users will find that the low range is suitable for much of their work, so there is rarely a need to reconfigure the drive.

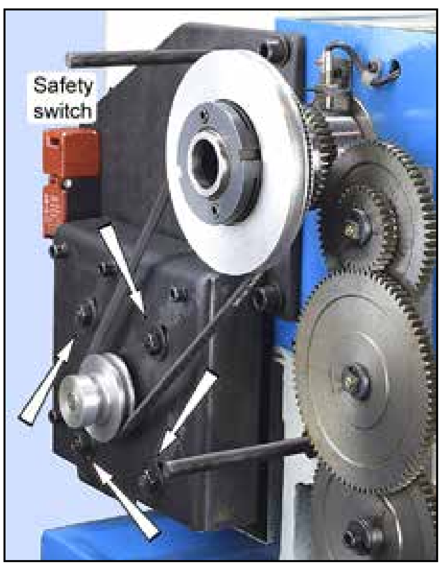


Figure 3-1 **Vee belt and pulleys**

Safety switch

Figure 3-1

The lathe will not function unless the external gear cover is closed.

Emergency Stop button

Figure 3-2

Slap the E-Stop button with the palm of the hand to disconnect power instantly. The button pops out when twisted clockwise a few degrees. This restores power, but does ***not activate*** the motor.

MOTOR CONTROL

To operate the lathe, first select **F** (Forward) or **R** (Reverse), then press the **GREEN** button, Figure 3-2. To stop the motor press the **RED** button.

Switching from F to R, or vice versa, shuts off the motor.

Figure 3-2 **Motor controls & tachometer**

Spindle direction switch: F = Forward (counter-clockwise, as viewed from the tailstock); O = Off, power disconnected; R = Reverse (clockwise, viewed from tailstock). Push buttons: motor ON, GREEN (I) button; motor OFF, RED (O) button.

Speed display (tachometer)

Figure 3-3

This is a 4-digit LCD that continuously monitors spindle speed in revolutions per minute (rpm). ***The tachometer display should light when power is on.***

Figure 3-3 **Spindle speed control & tachometer**

Speed control

Figure 3-3

This is a potentiometer. Set it fully counter-clockwise for minimum speed.

Unexpected problems? Motor doesn't run?
See FAQs, page 2

Speed sensor
Input to the tachometer is from a sensor mounted on the left hand surface of the headstock, Figure 3-4.

Figure 3-4 **Spindle speed sensor**

POWER FEED

The PM-1030V gearbox is driven by a train of external gears taking power from the spindle gear, Figure 3-1. It has a "two-in-one" output, an 8 TPI leadscrew with a full length key slot. For thread-cutting operations the saddle is driven by the leadscrew threads engaging a half-nut on the apron. The key slot provides an independent means of driving the saddle and cross-slide for routine turning and facing operations. An advantage of this arrangement — compared with using the leadscrew for all power feed functions — is reduced wear on the leadscrew.

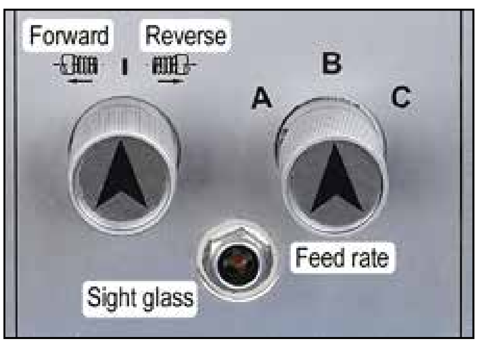


Figure 3-5 **Gearbox front panel**

The gearbox provides three choices (A, B, C) of leadscrew speed relative to spindle speed, Figure 3-5. The combination of gearbox and external gear configurations provides a range of feed speeds, plus the ability to cut U.S. threads from 8 to 80 threads per inch, and metric threads from 0.35 to 3.9 mm pitch.

A second knob on the gearbox reverses the power feed, driving the saddle from left to right — and the cross-slide towards the operator. Reverse power feed is also used to cut left-hand threads.

! ***Stop the motor before reversing feed direction!***

Move the spindle back and forth by hand while trying to ease into mesh.

! ***Do not change feed rate A-B-C while machine is running at high speed!***

If in doubt, stop the motor before changing feed rate.

CHUCK REMOVAL & REPLACEMENT

Chucks and faceplates are secured to the PM-1030V spindle by three threaded studs and nuts, Figures 3-7 and 3-8. A knurled shutter ring allows the chuck to be removed or re-installed with the nuts in place — more convenient than if the nuts would need to be reattached in the small gap between spindle nose and headstock.

Before using tools at the headstock end of the lathe it is a good idea to protect the bed, Figure 3-6.

Figure 3-6 **Protect the bed when removing or replacing a chuck**
Chucks, faceplates and wrenches can seriously damage the bed if dropped.

Chuck removal

! ***Disconnect power from the lathe!***

Loosen, but do not remove, the three hex nuts behind the knurled black shutter ring, Figure 3-7. (Do NOT unscrew the hex heads securing the chuck to its backing plate.) While holding the chuck with one hand, rotate the shutter ring counter-clockwise about one-eighth of a turn (top of knurled ring toward you). Remove the chuck. It may need to be tapped lightly with a dead-blow non-marring mallet.

Chuck replacement

Reverse the above steps, taking care that the shutter ring is fully clockwise before tightening the nuts.

Be sure the nuts are fully tightened before powering up.

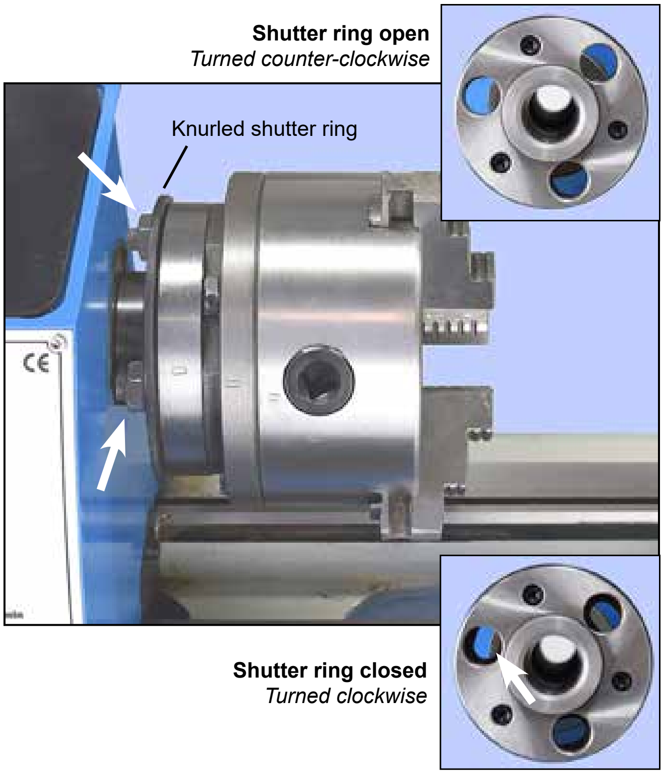


Figure 3-7 **Chuck attachment to spindle nose**
Chuck and faceplate nuts clamp onto a shutter ring behind the spindle nose. When turned counter-clockwise (viewed from the tailstock) the shutter opens fully, allowing the chuck to be removed complete with clamp nuts, arrowed. When turned clockwise the shutter ring becomes a clamping surface, slots instead of holes. ***Note the '0' markings*** *for best alignment on the chuck, backing plate and spindle nose.*

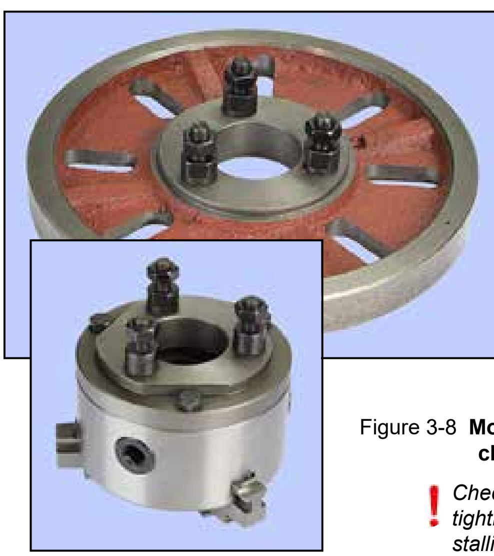


Figure 3-8 **Mounting studs on chuck & faceplate**

! *Check the studs for tightness before re-installing on the lathe!*

SADDLE

For manual turning operations the saddle is traversed left to right along the bed by a handwheel, Figure 3-9.The saddle may be locked in place by an M8 socket head cap screw adjacent to the cross-slide, Figure 3-13. Because the saddle is frequently locked to prevent movement in facing operations, some users replace the standard screw with a ratcheting lever screw that can be turned quickly without tools.

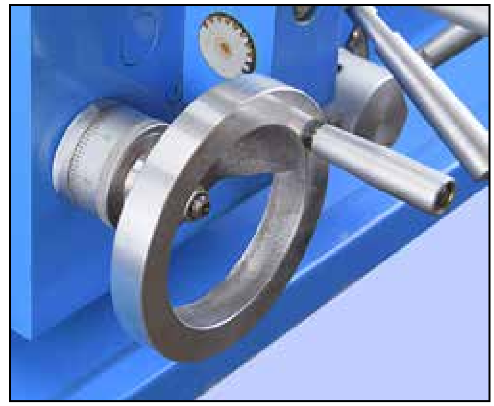


Figure 3-9 **Saddle handwheel**

CROSS SLIDE & COMPOUND

The cross slide and compound, Figure 3-10, both have 10 TPI leadscrews, with 100-division graduated collars. Each division represents a true motion of 0.001”. On the cross-slide dial, only, this shows as 0.002” per division, meaning that a 0.001” depth of cut reduces the diameter of the workpiece by 0.002”.

The compound can be rotated through 360 degrees. It rests on a turntable casting with a ± 60 degree graduated scale, Figure 3-11. The compound is secured to the cross-slide by a clamp ring and two M8 T-screws with lock nuts, Figures 3-12 and 3-13.

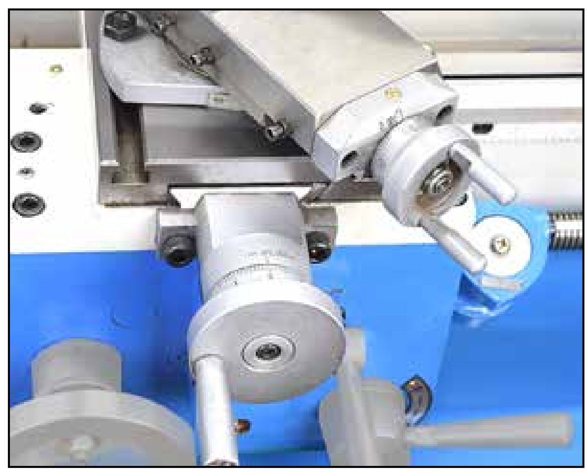


Figure 3-10 **Cross-slide and compound dials**
Both collars are friction-coupled to their leadscrews by leaf springs. To zero a dial, or set it to any desired number, hold the handwheel firmly, then rotate the knurled rim.

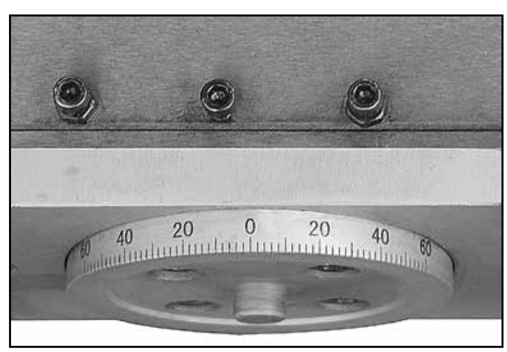


Figure 3-11 **Compound turntable**

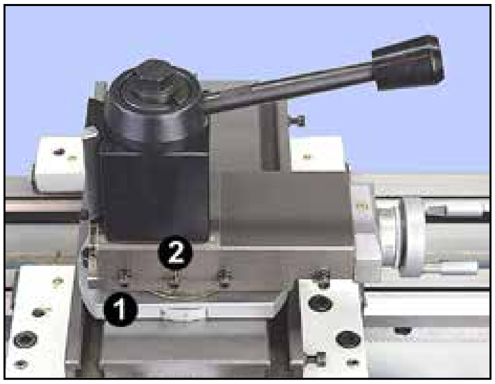


Figure 3-12 **Compound at zero degrees**
Compound clamp ring (1); Compound lock screw (2)

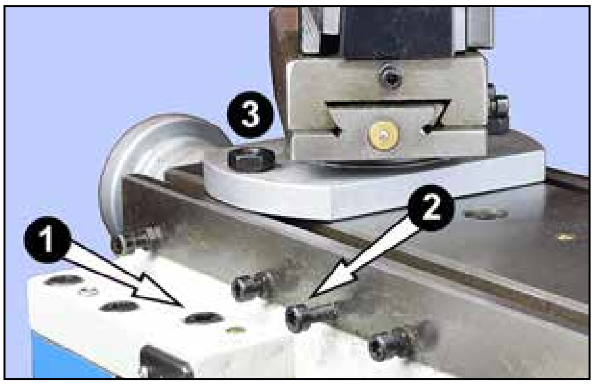


Figure 3-13 **Saddle & cross-slide lock screws**
Saddle lock screw (1); Cross-slide lock screw (2). Hex nut (3) is one of two locknuts securing the compound clamp ring.

The cross-slide and compound each have a clamp screw that presses the gib against its mating dovetail. Clamping provided by these screws is just that, more of a stiffening action than a rigid lock. Note that the other socket head cap screws (with lock nuts) on the cross-slide and compound are for a different purpose — they adjust gib pressure on the dovetails for the best compromise of slideability and rigidity.

! *Be sure to release clamp screws before moving compound, cross-slide or saddle, especially under power*

USING CUTTING TOOLS

In most turning operations the cutting tool is firmly mounted on the compound, and is moved relative to the workpiece by a combination of saddle, cross-slide and compound motions. The AXA (100-Series) QCTP (Quick-change toolpost) typically used with the PM-1030V is shown in Figure 3-14. It can be used with any number of interchangeable toolholders, most of which are intended for square-section tool shanks up to 1/2". A key feature of the QCTP is its ***repeatability***, meaning that a toolholder can be removed, then later re-installed, without further attention. This is because each toolholder has its own micrometer-style height adjustment — set it once and forget it — a great time-saver compared with other tool-holding systems.

Like other toolholding systems, the QCTP can be freely rotated about its vertical axis, then locked in position. This can be used to change the side cutting edge angle of (say) a knife tool, converting it quickly from diameter turning to face cutting.

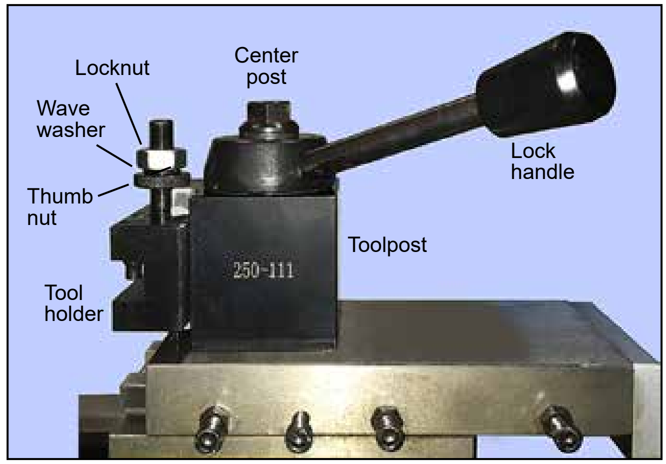


Figure 3-14 **QCTP with toolholder**
This style of toolholder is used for rectangular-shank tools up to 1/2" x 1/2". Its height is set by the thumb nut resting on the top surface of the toolpost. The wave washer and hex locknut prevent accidental rotation of the thumb nut. To rotate the QCTP, loosen the center post.

TAILSTOCK

The tailstock leadscrew has a 10 TPI thread, with 3 inch travel. A graduated collar on the tailstock handwheel reads 0.001" per division. To remove tooling from the tailstock taper (MT2) turn the handwheel counter-clockwise (handle end view) until resistance is felt, then turn the handle a little more to eject the tool. Conversely, to install a taper tool make certain that the quill is out far enough to allow firm seating.

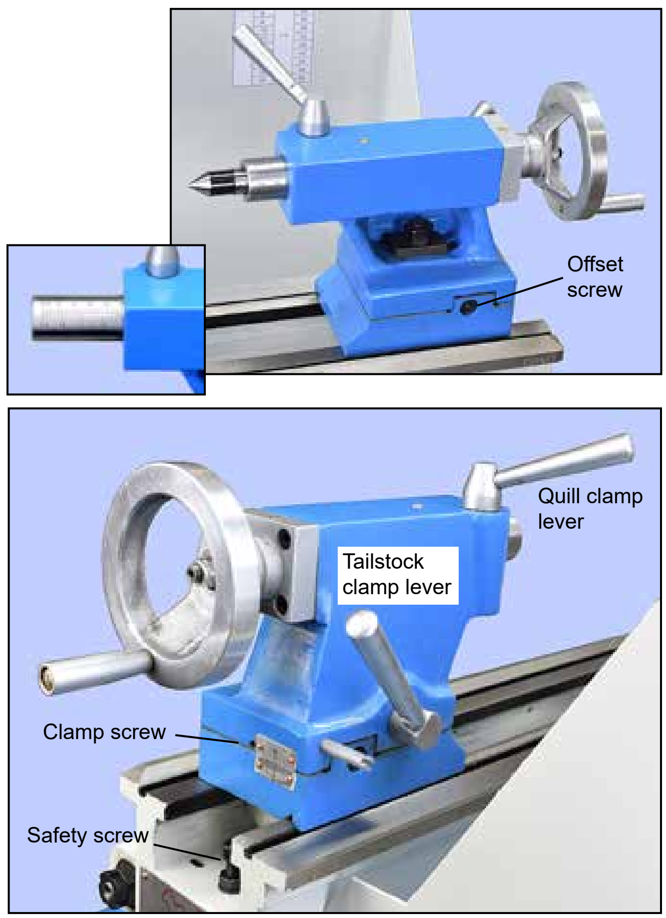


Figure 3-15 **Tailstock**
The safety screw prevents accidental dropping of the tailstock

To offset the tailstock for taper turning, loosen the tailstock clamp lever, Figure 3-15, then loosen the clamp screw (M5 set screw) at the tail end of the tailstock. The tailstock can now be moved forward or backward by adjusting the M8 socket head cap screws on either side. To move the tailstock to the back, for instance, the screw on the clamp lever side would be unscrewed, then the opposing screw would be screwed in to move the upper assembly. Re-tighten the clamp screw when the offset is done.

Offsetting the tailstock for a specific taper is not a straightforward job; it is a lengthy, iterative process. The same goes for re-zeroing for normal operations.

A visual indication of the offset is provided by a scale on the back surface, but this is not a reliable measure for precise work. In practice, the only way to determine the offset precisely is to "cut and try' on the workpiece, or scrap stock, homing in on the correct degree of offset in small increments.

The same issues arise when re-establishing "true zero" of the tailstock, in other words returning it to the normal axis for routine operations. One way to avoid cut-and-try is to prepare in advance a bar of (say) 1" diameter quality ground stock, with ***precise center drillings*** at both ends (do this by indicating for zero TIR in a 4-jaw chuck, not in a 3-jaw unless known to be predictably accurate). The prepared bar can then be installed between centers and indicated along its length.

POWER FEED (Turning & Facing operations)

The PM-1030V gearbox is driven by a train of external gears taking power from the spindle gear, Figure 3-16. The output from the gearbox is a "two-in-one" leadscrew, with: 1. Threads (8 TPI), for thread-cutting operations only, and; 2. A full length key slot. ***Only the key slot is active for turning and facing operations:*** it is the source of power for an internally keyed, smooth-bore worm that slides along the leadscrew as the saddle and apron are driven along the bed (see item #32, apron components drawing).

Figure 3-17 lists the coarse and fine feed rates available with two external gear setups. Because the difference between the two is quite small (1.4/1), many users opt for one or the other for all their work, saving time by not changing external gears. The gearbox (A-B-C) provides 2:1 and 4:1 speed choices within each range.

External change gear swapping

The general procedure for this is:

1. Loosen the M8 socket head screw securing the change gear support bar; swing the support bar down. ***In the following steps, note the position and type of all bushings and washers.***
2. Remove the upper and lower gear axles; tap free the externally keyed bushings.
3. Remove the M6 socket head screw from the gearbox input shaft.
4. Install the selected gear pairs on the upper and lower keyed bushings; install the selected lower gear on the gearbox input shaft, bearing in mind the ***location of the internally keyed bushings***, above or below the gears, see Figures 3-20, 3-21 and 3-22.

Figure 3-16 **External change gears**

5. Re-install the upper and lower gear axles, loosely threading them into the T-nuts at the back of the support bar.
6. Bring the lower gear pair into mesh with the gearbox input gear; tighten the lower gear axle in its T-nut.
7. Bring the upper gear (or gear pair) into mesh with the lower; tighten the upper gear axle in its T-nut.
8. Check, making minor adjustments to, the mesh of all gears in the train (see note below).
9. Swing the gear support bar up to mesh the upper gear with the spindle gear; tighten the M8 socket head screw securing the support bar.
10. Lubricate the gears using (say) lithium grease.

How to gauge “correct mesh” Some users go by feel and intuition, others use a paper feeler gauge. The mesh is good if a scrap of 0.004” printer paper can be run between the gears with definite resistance.

? **Difficulty re-installing gears?**

When new, the gears may be a tight fit on the externally keyed bushings. Check for burrs on the bushings, dressing with a fine file if necessary. The gear bores may also need de-burring with Scotch-Brite, or other fine-grit abrasive (or using a rod-shape diamond hone). Aim for an easy push fit of all gears on both bushings.

ENGAGING THE POWER FEED

First check for obstructions — Locks OFF?
Do not engage at high leadscrew speeds!

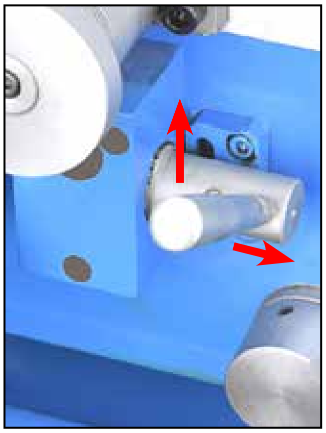


Figure 3-17 **Saddle feed**
Lever RIGHT and UP

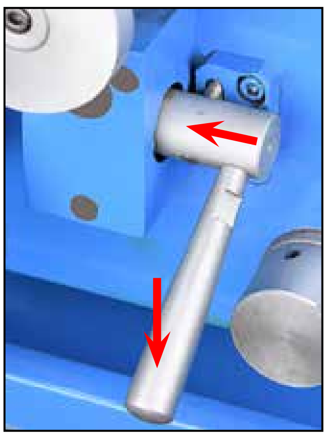


Figure 3-18 **cross-slide feed**
Lever LEFT and DOWN

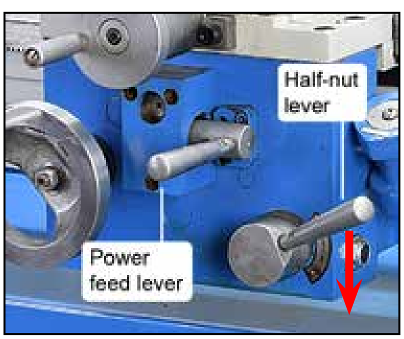
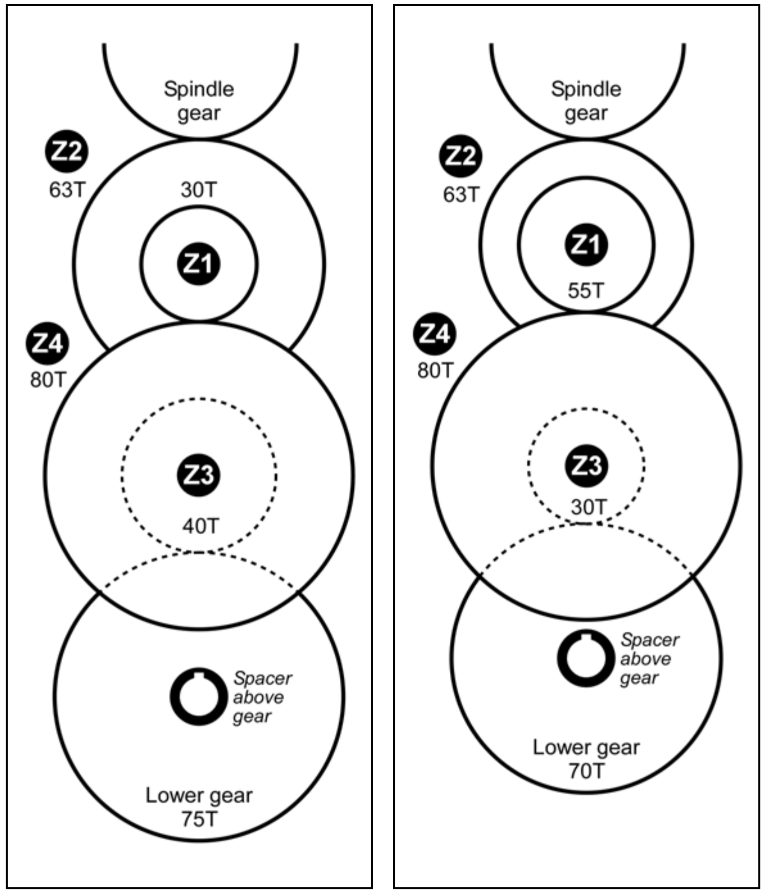


Figure 3-19 **Power feed disengaged**

Engage by first shifting the power feed lever to the right or left, then swing the lever up or down. Disengage by swinging the lever to its mid-position, Figure 3-19.

POWER FEED RATES (Turning & Facing operations)



Fine feed setup

Coarse feed setup

Fine feed setup — SADDLE:

C	0.0025
A	0.005
B	0.01

Fine feed setup — CROSS SLIDE:

C	-
A	0.0014
B	0.0028

Coarse feed setup — SADDLE:

C	0.0035
A	0.007
B	0.014

Coarse feed setup — CROSS SLIDE:

C	-
A	0.002
B	0.004

Figure 3-20 **Feed rates in inches per spindle revolution**

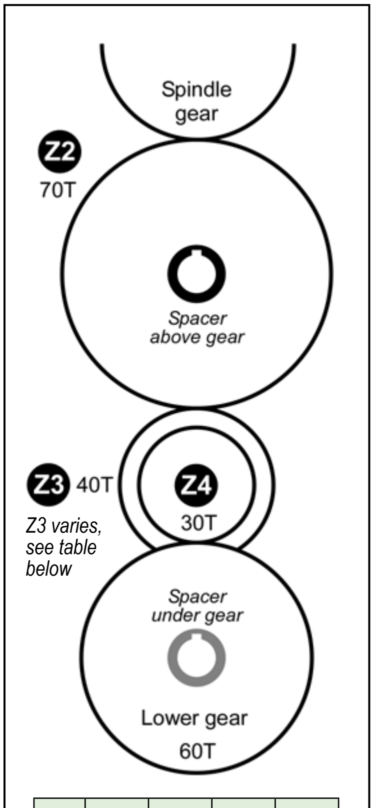
POWER FEED (Thread cutting operations)

For thread cutting, the saddle is driven by the threads on the leadscrew in combination with a half nut in the apron, Figure 3-19.

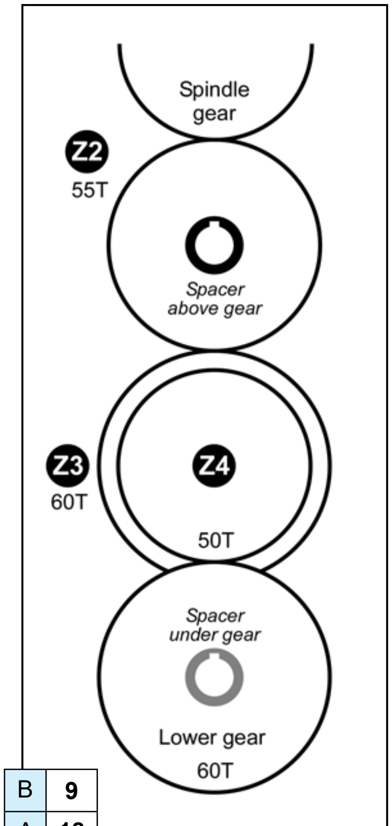
Before engaging the half nut be sure there are no obstacles to saddle movement, and that the power feed lever is in its neutral, mid-position.

The power feed doesn't stop by itself! Other than intervention by the operator, there is nothing to stop (for instance) the saddle running into the tailstock.

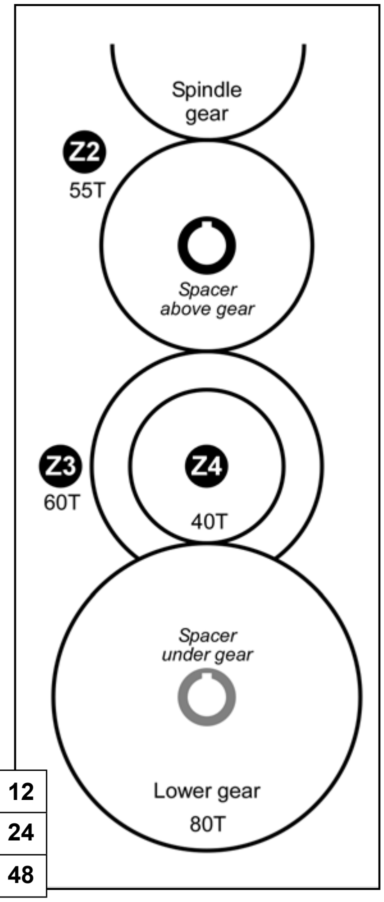
THREAD CUTTING SETUPS — U.S. threads in TPI *(threads per inch)*



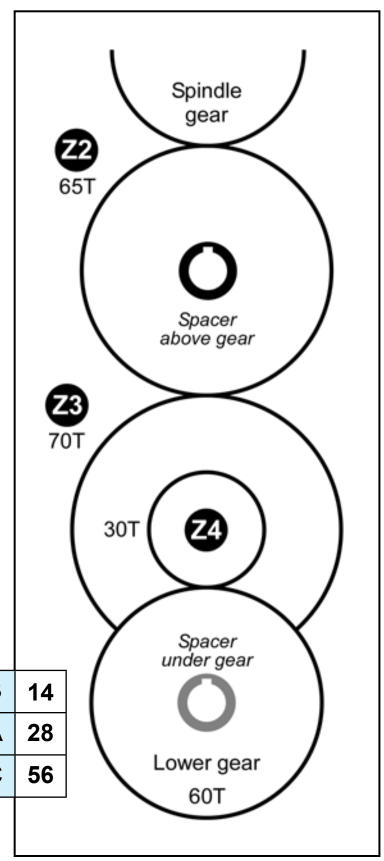
Z3	40T	50T	55T	65T
B	**8**	**10**	**11**	**13**
A	**16**	**20**	**22**	**26**
C	**32**	**40**	**44**	**52**



B	**9**
A	**18**
C	**36**



B	**12**
A	**24**
C	**48**



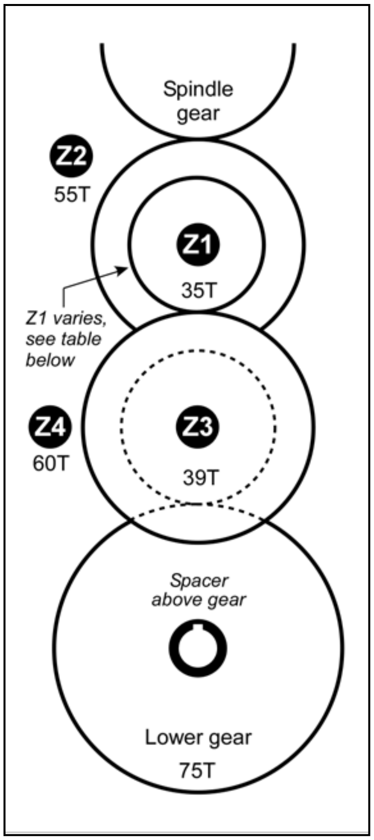
B	**14**
A	**28**
C	**56**

Z2	65T	70T	65T	65T	65T	65T
Z3	50T	46T	60T	60T	45T	50T
Z4	40T	30T	30T	30T	20T	20T
Lower gear	76T	75T	60T	80T	80T	80T
B	**9-1/2**	**11-1/2**	**15**	**16**	**-**	**-**
A	**19**	**23**	**30**	**32**	**36**	**40**
C	**38**	**46**	**60**	**64**	**72**	**80**

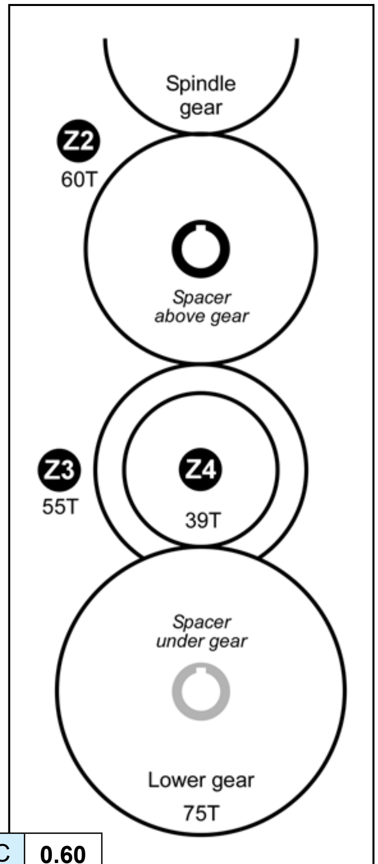
Less common threads (not illustrated)

Figure 3-21 **Gear setups for U.S. threads**

THREAD CUTTING SETUPS — Metric threads in mm pitch



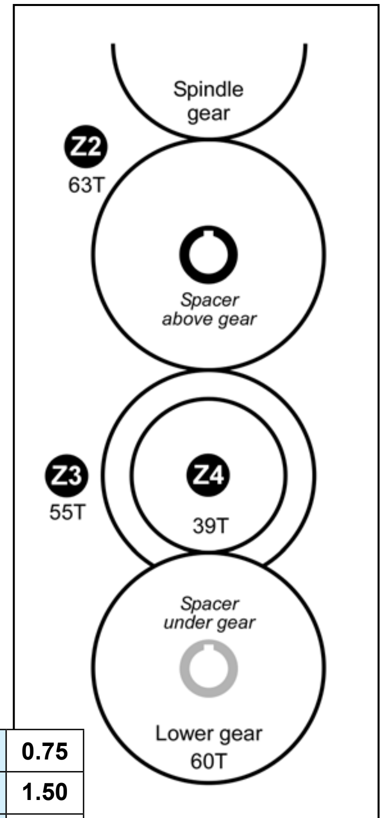
Z1	35T	40T	45T	50T
C	**0.35**	**0.40**	**0.45**	**0.50**
A	**0.70**	**0.80**	**0.90**	**1.00**
B	**1.40**	**1.60**	**1.80**	**2.00**



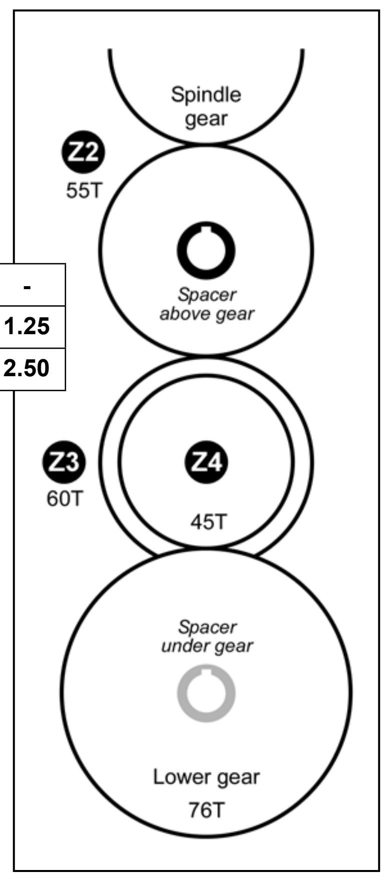
C	**0.60**
A	**1.20**
B	**2.40**

Not illustrated
Z2: 65T
Z3: 45T
Z4: 39T
Lower gear: 63T

C	-
A	**1.75**
B	-



C	**0.75**
A	**1.50**
B	**3.00**



C	-
A	**1.25**
B	**2.50**

Figure 3-22 **Gear setups for metric threads**

THREAD CUTTING

A key fact to remember ...

! ***For metric threads the half-nut in the apron must remain engaged throughout the entire process.***

COMPOUND SETUP FOR THREAD CUTTING

Thread cutting on the lathe is unlike most other turning operations, for two reasons: 1. The cutting tool must be precisely ground with an included angle of 60 degrees for most American and metric threads, and; 2. It is preferable to feed the tool into the workpiece at an angle so it cuts mostly on the left flank of the thread, Figure 3-18. The correct angle relative to the cross-slide (zero degrees) is debatable — should it be 29, 29-1/2 or 30 degrees? Many machinists prefer 29 degrees because it holds the cutting tool marginally clear of the right flank of the thread, close enough for cleanup of the flank while at the same time avoiding appreciable rubbing.

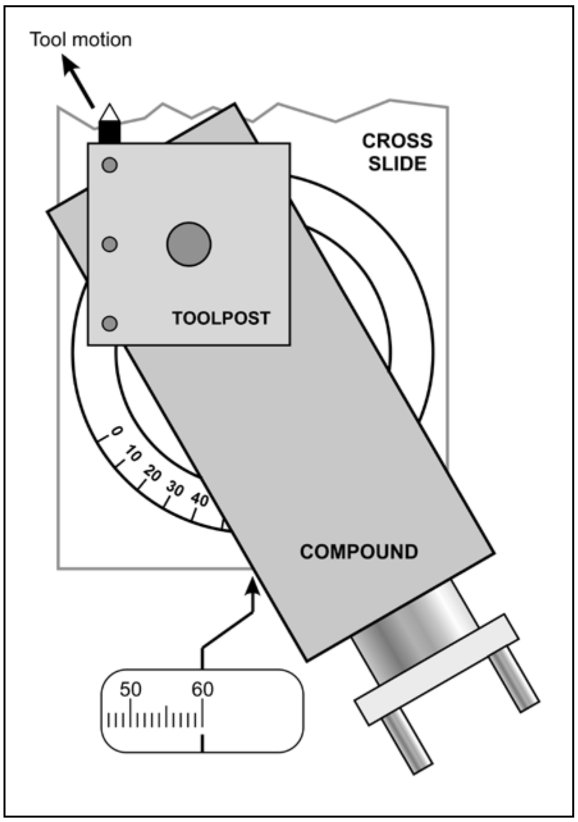


Figure 3-23 **Setting the compound for 30° infeed**

CUTTING PROCEDURE FOR TPI THREADS

This procedure assumes that a single point thread cutting tool will be used, and that the worm wheel on the threading dial assembly properly engages the leadscrew, Figure 3-x.

The threading dial cannot used for metric threads! The split-nut on the apron must not be disengaged until the threading operation is completed.

For metric and UNC/UNF threads the tool is ground to 60° (included angle). It is installed so that its flanks are exactly 30° either side of the cross axis, ideally with the compound offset as Figure 3-23. Single-point threads are cut in as many as 10 successive passes, sometimes more, each shaving a little more material off the workpiece.

To make the first thread-cutting pass the leadscrew is run at the selected setting (tables on following two pages), and the saddle is moved by hand to set the cutting tool at the starting point of the thread. With the tool just grazing the workpiece, the half-nut lever (Figure 3-19) is lowered to engage the leadscrew. This can be done at any point, ***provided*** the split-nut remains engaged throughout the ***entire multi-pass thread cutting process***.

When the first pass is completed, the tool is backed out clear the workpiece (using the cross-slide), and the spindle is reversed to bring the saddle back to the starting point. The cross-slide is returned to its former setting, then the tool is advanced a few thousandths by the compound for the next pass. Each successive pass is done in the same way, each with a slightly increased infeed setting of the compound.

Many users working on U.S. threads save time by disengaging the split-nut at the end of each cutting pass, reversing the saddle quickly by hand, then re-engaging, usually by reference to the threading dial, Figure 3-24.

For most TPI numbers every engagement, ***including the first***, must at the point where a ***specific line*** on the threading dial comes into alignment with the datum mark. If not, the second and subsequent passes will be out of sync. In some cases, see the "visualization" Figure 3-26, there is a choice of lines for re-engagement, but in every case the process calls for careful timing.

[NOTE: Disengagement and re-engagement of the split-nut is not applicable to metric threads — leave the split-nut engaged throughout the entire process]

Typical depths of cut per pass vary from an initial 0.005" or so, to as little as 0.001", even less. A finishing pass or two with increments of only 0.0005" — or none at all, to deal with the spring-back effect, can make all the difference between a too-tight thread and one that runs perfectly.

Assuming that the compound is set over at between 29 and 30 degrees, the total depth of cut is approximately 0.69 times the thread pitch, P (this equates to a straight-in thread depth of 0.6 times P). There may be a need for a few thousandths more in-feed than 0.69P, almost certainly not less.

Figure 3-25 **Threading dial (US threads only)**

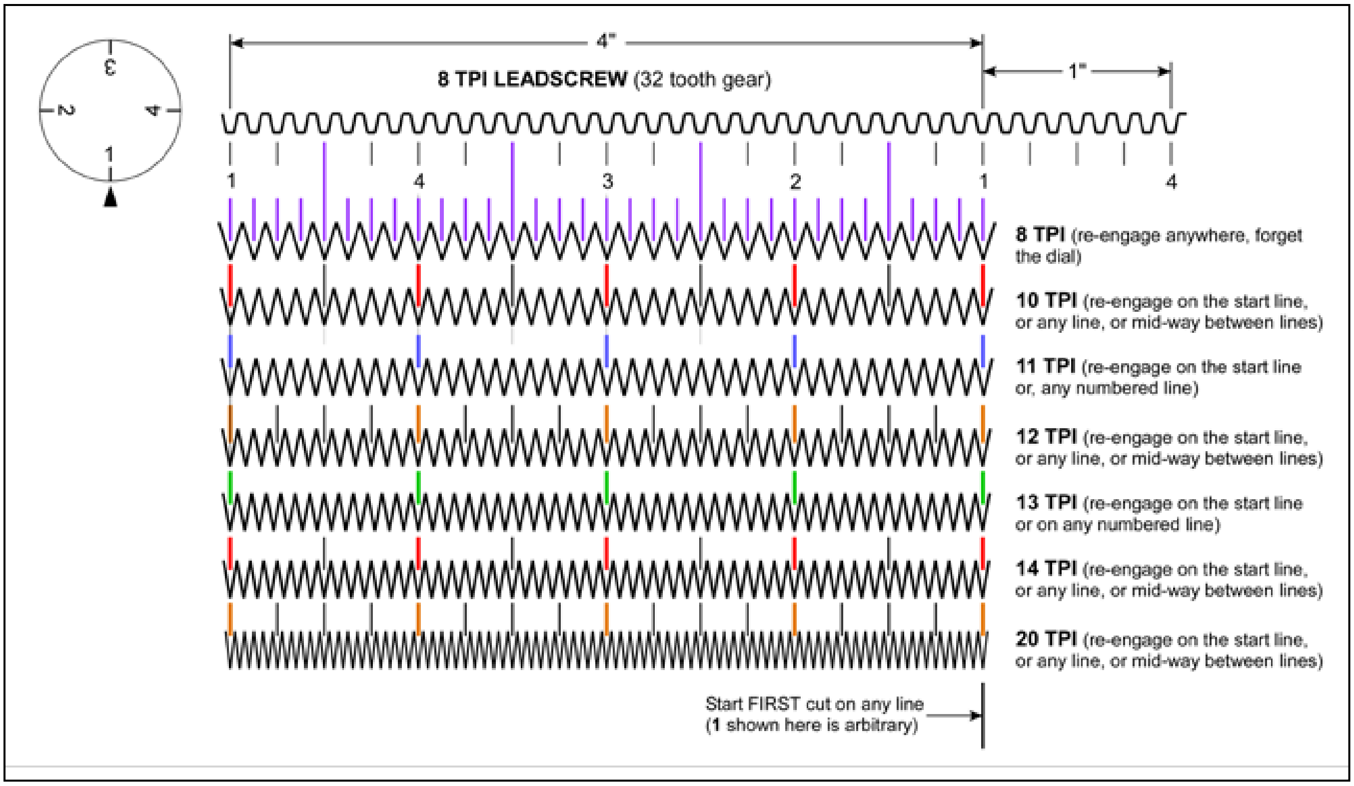


Figure 3-26 **Threading dial visualization for selected U.S. threads**

GENERAL RULES FOR THE THREADING DIAL

If the TPI value gives a ***whole number*** when divided by two, you can re-engage the half-nut on any line, also ***mid-way between*** the numbered lines on the dial (marking the mid-points will give you double the number of re-engagement choices).

Special cases: if the ÷ 2 result is an even whole number, example 12/2 = 6, there are even more re-engagement choices, see the visualization chart above. This may not be usable in practice due to the difficulty of estimating the exact point to re-engage. ***If in doubt, re-engage on the start line!***

STEADY & FOLLOWER RESTS

Short, rigid workpieces mounted in a chuck can typically be machined without additional support. Long, slender workpieces need support near the cutting tool. There are two options for this: 1. A tailstock center (usually a live center), or; 2. A steady rest, Figure 3-17. This is often used in combination with the saddle-mounted follower rest, Figure 3-28.

The tailstock center can be used with any size and shape of workpiece (such as non-symmetrical castings), but it may obstruct the turning tool for facing operations, and it also may disallow drilling or tapping with a tailstock chuck.

On the other hand the steady rest does allow face turning and tailstock chuck operations; however, it can only be used if the outboard end of the workpiece is circular and centered on the lathe axis with practically zero runout.

Figure 3-27 **Steady rest** *Maximum diameter 1-1/2 in.*

The step-by-step procedure for setting up the steady rest depends on personal preferences. Some users start by fixing the steady rest casting on the bed, then mounting the workpiece in a chuck (or between centers); others set up the workpiece first, then install the steady rest on the lathe bed. Either way, the region of the workpiece under the steady rest fingers must run true, and the fingers must not apply any off-axis loading.

To set up the steady rest, loosen the three hex nuts, inset photo, then back out the thumbscrews to spread the fingers beyond the workpiece diameter. Tighten the nuts just enough to allow the thumbscrews to push the fingers inward. Fully tighten the nuts when the fingers are gently touching — but not deflecting — the workpiece. Apply oil frequently at the contact points while machining.

The follower rest helps prevent flexing of the workpiece by providing support directly ahead of the cutting tool, Figure 3-29. It is secured to the saddle with two 8 mm socket head screws.

Figure 3-28 **Follower rest** *Maximum diameter 1 in.*

Section 4 SERVICING THE LATHE

Disconnect power before any maintenance operation!

Remove all machining debris and foreign objects before lubricating ANYTHING! Use the recommended lubricants or similar. Any oil is better than no oil – but only as a stop gap.

GENERAL

Aside from abrasive particles and machining debris, lack of proper lubrication is the main cause of premature wear. Rotating parts are easy to lubricate, sliding parts are not. Gibs are tightened for the best compromise between rigidity and slideability, which means practically zero gap between the ways. It is not obvious which are the bearing surfaces on the various dovetail surfaces — some of the interfaces look like bearing surfaces, but are simply narrow gaps.

Every few hours of operation: 1. Apply the recommended way-oil with a dedicated short-bristle brush such as the type used for applying flux; 2. Use a similar brush to apply oil or grease to the leadscrews; 3. Apply oil to the ball oilers, see below.

The spindle runs on sealed, pre-lubricated roller bearings requiring no routine attention.

Recommended lubricants

Gearboxes: 75W80 gear oil. Approximate quantities required:

Gearbox 1 pint
Apron 1 pint

Ball oilers: ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

Machine ways (dovetails): ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

External change gears: light general purpose grease, NLGI No. 2, or equivalent.

Leadscrews: ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

BALL OILERS

Use a pump-type oil can, preferably with a flexible spout tipped with a soft tube. The ID of the tip should be large enough to seat on the oiler's brass flange, more than spanning the spring-loaded steel ball. When the oil can tip is firmly pressed onto the brass surface oil pressure must displace the ball, allowing oil to flow into the bearing. Before oiling check that the ball is not stuck – press it lightly with a probe.

LUBRICATION — GEARBOX DRAIN & REFILL

Take time to prepare. A pint of oil is a lot to clean up!

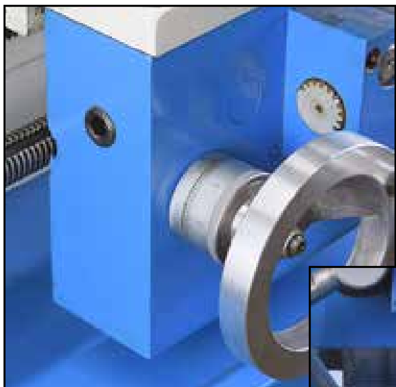
1. Run the lathe for a few minutes to warm the oil if necessary.
2. Remove the fill plug on the top surface of the headstock, Figure 4-2.
3. Remove the external change gears if necessary for access to the drain plug, Figure 4-1.
4. Place a drain pan under the drain plug.
5. Fold a sheet of card stock to make a Vee-shape drain channel. Trim the Vee to seal against the gearbox.
6. With the drain channel in place, remove the drain plug.
7. Allow the oil to drain completely, then replace the drain plug.
8. Attach a short length of 3/8" OD clear PVC tubing to a small funnel.
9. Insert the tube into the fill hole, then add just an ounce or two of oil.
10. When satisfied that the gearbox is oil-tight, add oil to the halfway mark on the sight glass (about 1 pint).
11. Replace the fill plug.

Figure 4-1 **Gearbox drain plug (1) & sight glass (2)**

Figure 4-2 **Gearbox fill plug**

LUBRICATION — APRON DRAIN & REFILL

1. Remove the apron fill plug, Figure 4-3.
2. Locate the drain plug on the underside of the apron casting.
3. Place a drain pan below the drain plug, then remove the plug.
4. Allow the oil to drain completely, then replace the drain plug.
5. Using a funnel and tubing assembly as described above for the gearbox, add an ounce or two of oil.
6. When satisfied that the gearbox is oil-tight, add oil to the halfway mark on the sight glass (about 1 pint).
7. Replace the fill plug.



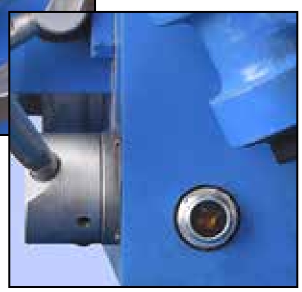


Figure 4-3 **Apron fill plug & sight glass**

LUBRICATION — OILERS

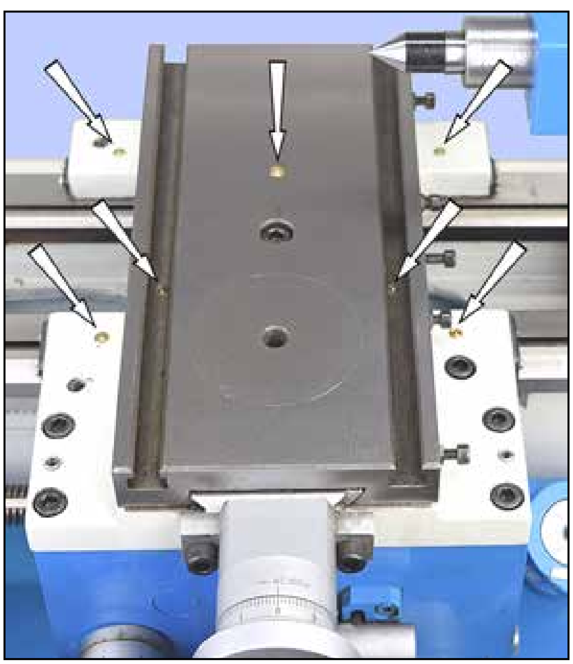


Figure 4-4 **Saddle & cross-slide oilers**

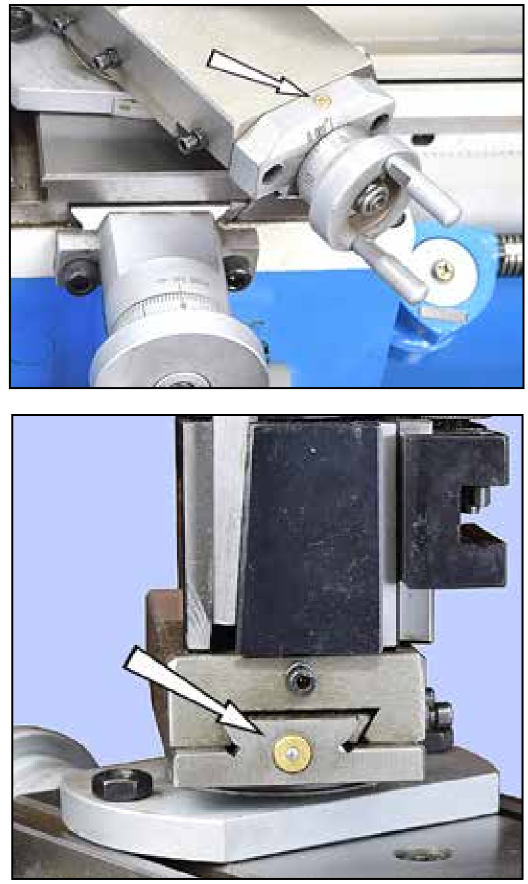


Figure 4-5 **Compound oilers**

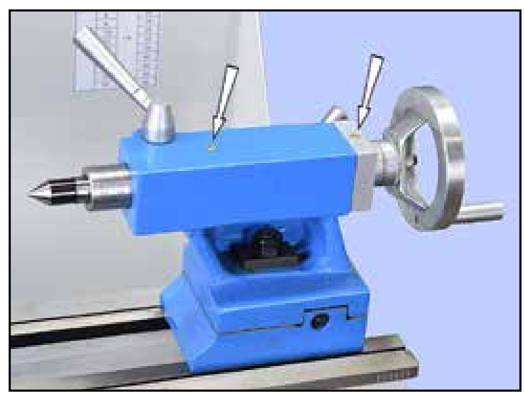


Figure 4-6 **Tailstock oilers**

Figure 4-7 **Leadscrew oiler**

ADJUSTMENT — GIB SCREWS

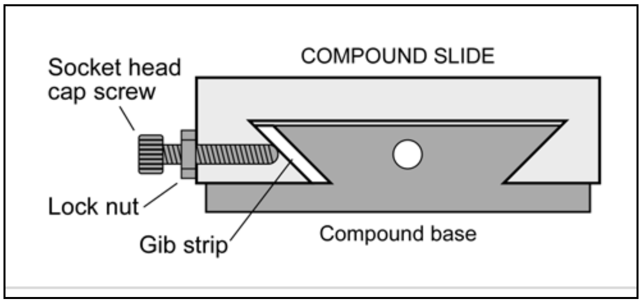


Figure 4-8 **Gib strip schematic**

The cross-slide and compound slide on ground dovetail ways, Figure 4-8. In the gap between inner and outer dovetails is a thin strip of cast iron, the ***gib strip***. Screws with locknuts on the sliding component press the gib strip firmly against the inner dovetail, eliminating unwanted side to side movement while at the same time allowing smooth positioning by leadscrew and handwheel. Adjusting the gib screws is a trial and error process that takes time and patience. Aim for the best compromise of rigidity and reasonably free slide motion. Too tight means accelerated wear on the ways and leadscrews. Too free means instability of the cutting tool, inaccuracies and chatter.

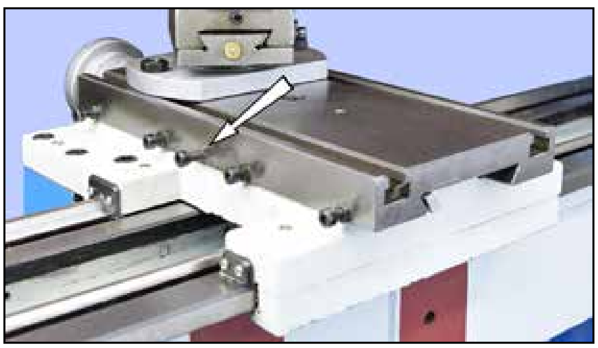


Figure 4-9 **Cross-slide gib screws (four)**
Arrowed screw is the lock screw

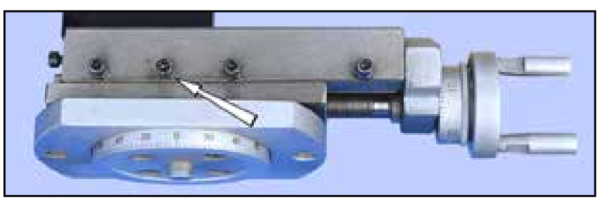


Figure 4-10 **Compound gib screws (three)**
Arrowed screw is the lock screw

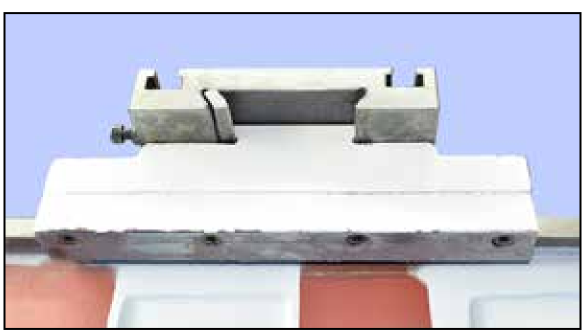


Figure 4-11 **Saddle gib support**
The saddle gib is not adjustable

ADJUSTMENT — CROSS-SLIDE BACKLASH

When alternating between clockwise and counter clockwise rotation, the cross-slide handwheel may move freely a few degrees but the cross-slide table stays put.

Cross-slide lost motion is due to two factors: 1. Too-loose attachment of the handwheel attached to the leadscrew, and; 2. Wear in the leadscrew nut, item #32 in the parts diagram, page 30. This is a split nut that is adjustable by M4 screws, item #39.

ADJUSTMENT — SPINDLE BEARINGS

The spindle runs on two grease-packed tapered roller bearings. They are factory adjusted, and should need no attention. If end play becomes evident (workpiece chatter, poor finish, etc.), this can be corrected by tightening the slotted nut securing the Vee pulley, Figure 4-12. To do this, loosen the two clamp screws, then gently tighten the slotted nut using a soft metal drift and hammer. Don't overdo this! Over-tightening can damage the bearings. Re-tighten the clamp screws.

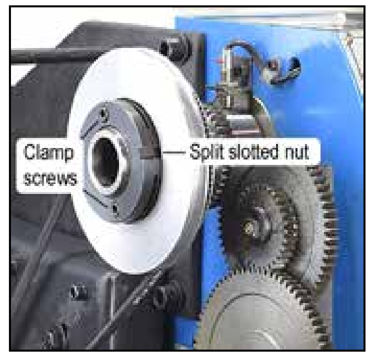


Figure 4-12 **Spindle nut**

ALIGNING THE LATHE

The most important attribute of a properly set up lathe is its ability to “machine parallel”, to cut a cylinder of uniform diameter over its entire length. In other words, no taper.

Leveling of the lathe is a part of this, see Section 1. Equally important is the alignment of the center-to-center axis with the lathe bed, as seen ***from above***. [Vertical alignment is nowhere near as critical, rarely a cause of taper unless the lathe is damaged or badly worn.]

How to align lathe centers
The tailstock may be offset for taper turning and other operations. For routine operations, the offset must be ***precisely*** zero, Figure A.

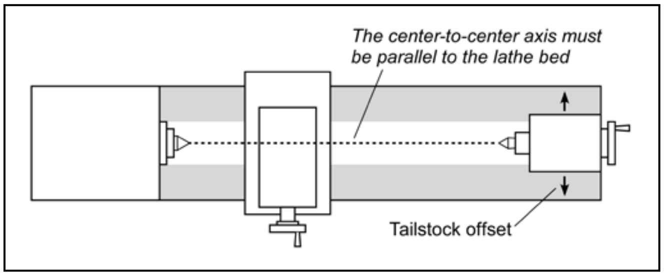


Figure A **Center-to-center axis**

The scale provided on the tailstock is not reliable for precision work — think of it as only a starting point. What follows are two methods for aligning centers, one quick and easy, the other more precise.

Quick method
This method works only if the centers are in new condition, sharp and clean.

1. Carefully clean the taper sockets and the tapers themselves. Install the tapers.
2. Move the saddle left as far as it will go, then slide the tailstock left to touch the saddle.
3. Lock the tailstock (this is important — unlocked to locked can mean an offset of several thousandths). Try to use the same locking force every time you move the tailstock.
4. Advance the tailstock quill to bring the centers together.
5. Place a scrap of hard shim stock or an old-style double-edge razor blade between the centers, Figure B.
6. Advance the tailstock quill to trap the blade, then lock the quill. If the centers are aligned, the blade will point squarely front to back. If not, adjust the tailstock offset by a series of very small adjustments.
7. If the range of quill motion permits, check the blade alignment at various extensions of the quill. There should be no appreciable variation.

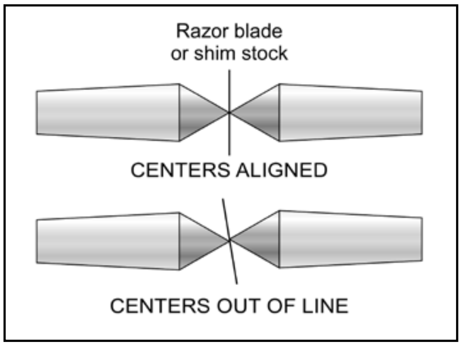


Figure B **Quick alignment check**

Precise method
This method uses a precision ground steel rod at least 10" long. Look for 3/4 or 1 inch "drill rod" with a diameter tolerance of ± 0.001" or less.

Straightness and uniform diameter are both important (absolute diameter is not).

1. Set the rod in a collet chuck, or independent 4-jaw chuck, with the outer end about 1/2 inch clear of the chuck.
2. Use a dial indicator to check for runout. If using a 4-jaw adjust as necessary for minimum TIR (aim for 0.0005" or less).
3. Center-drill the end of the ground rod.
4. Reverse the rod, re-adjust for minimum TIR, then drill the other end.
5. Set the drill rod snugly between centers, as Figure C. Lock the tailstock.
6. Set a dial indicator on the cross-slide (to eliminate vertical error use a flat disc contact, not the usual spherical type — if a disc contact is not available, machine a cap to fit over the spherical point).
7. Starting at location (1), note which way the pointer rotates when the cross-slide is moved inward. (In this diagram the pointer is shown turning clockwise.)
8. Pre-load the indicator by a few thousandths, then traverse the saddle from (1) to (2).

If the pointer turns clockwise as you go toward the tailstock, as Figure C, the tailstock is biased to the front. This will cause the lathe to cut a tapered workpiece with the larger diameter at the headstock end. Correct this by a series of ***very small*** adjustments to the tailstock offset, aiming for the perfect result — no pointer movement from (1) to (2), Figure D.

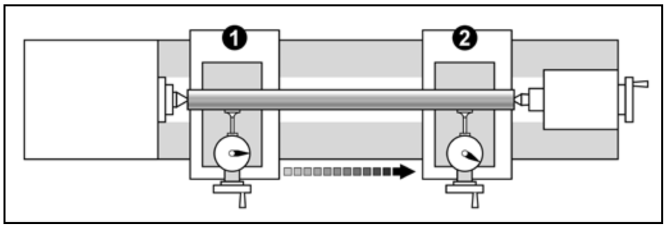


Figure C **Drill rod between misaligned centers**

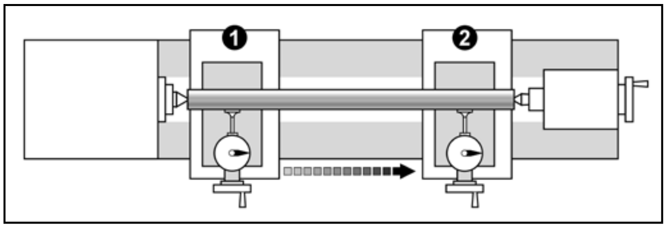
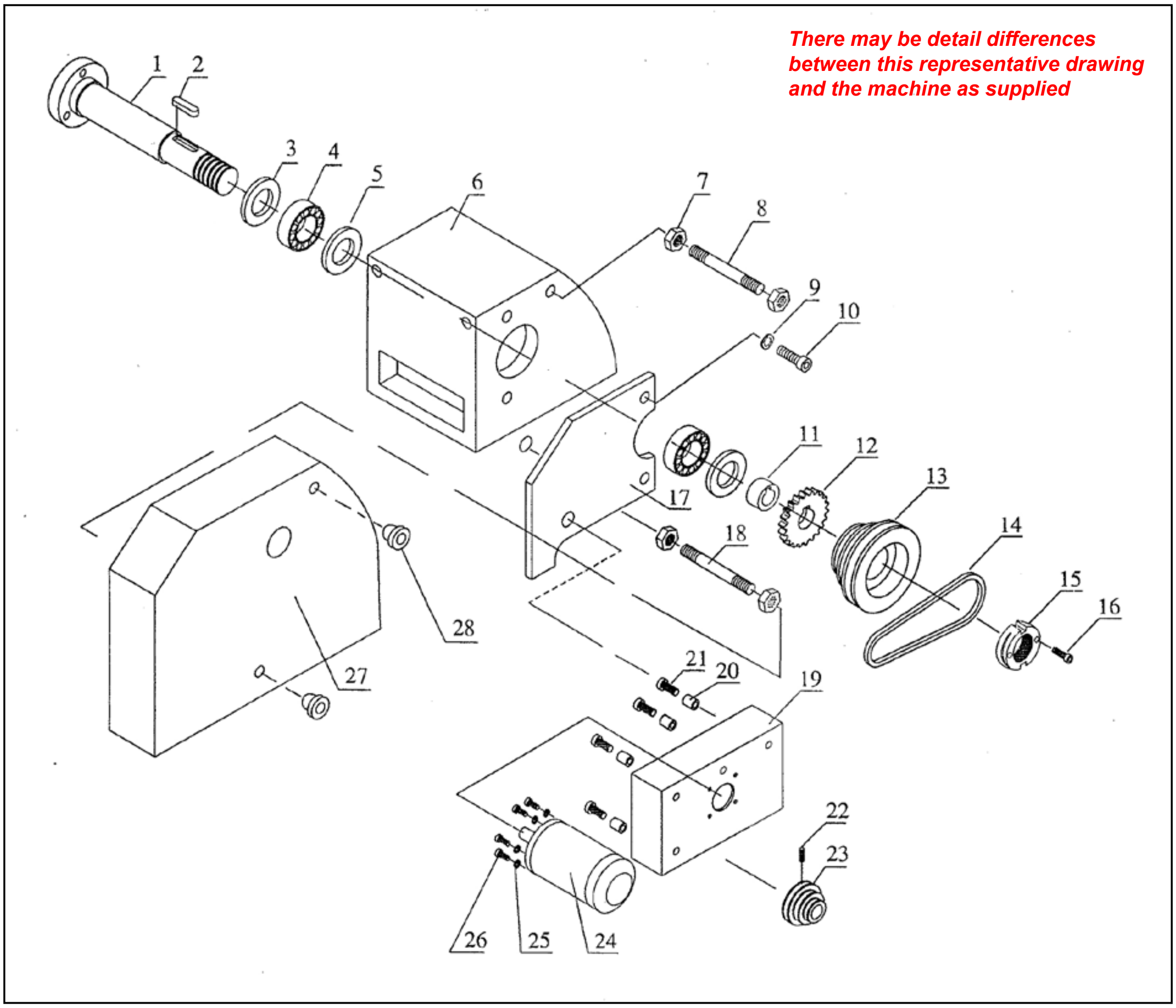


Figure D **Perfect alignment: zero indicator change between locations 1 and 2**

Section 5 PARTS

HEADSTOCK

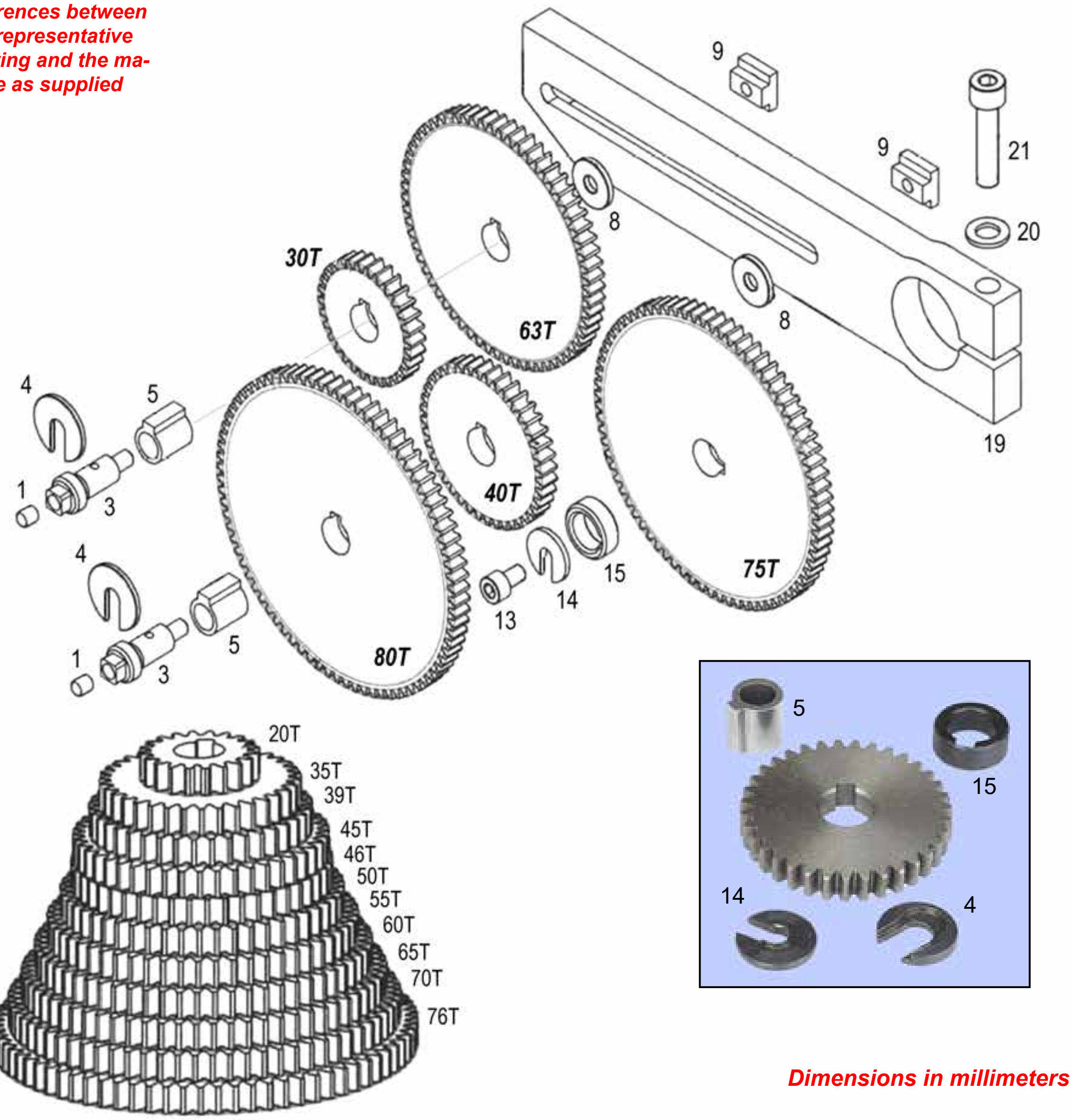


Ref	Description	Qty
1	Spindle	1
2	Key 8 x 45	1
3	Outer spacer	2
4	Tapered roller bearing 32009	2
5	Inner spacer	2
6	Headstock casting	1
7	Nut M10	4
8	Double ended stud M10 x 115	1
9	Washer Φ10	3
10	Screw M10 x 20	2
11	Sleeve	1
12	Gear 40T	1
13	Spindle pulley	1
14	V-belt 7M730	1
15	Locknut	1
16	Screw M5 x 10	1
17	Support plate	1
18	Double ended stud M10 x 115	1
19	Motor mount	1
20	Washer Φ6	4
21	Screw M6 x 10	4
22	Set screw M6 x 10	1
23	Motor pulley	1
24	DC motor 108ZYT005AL	1
25	Washer Φ8	4
26	Screw M8 x 25	4
27	Cover	1
28	Knurled nut	2

Dimensions in millimeters

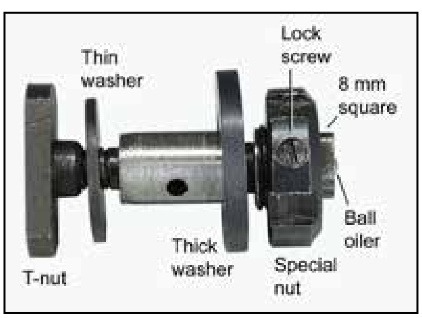
EXTERNAL CHANGE GEARS

There may be detail differences between this representative drawing and the machine as supplied



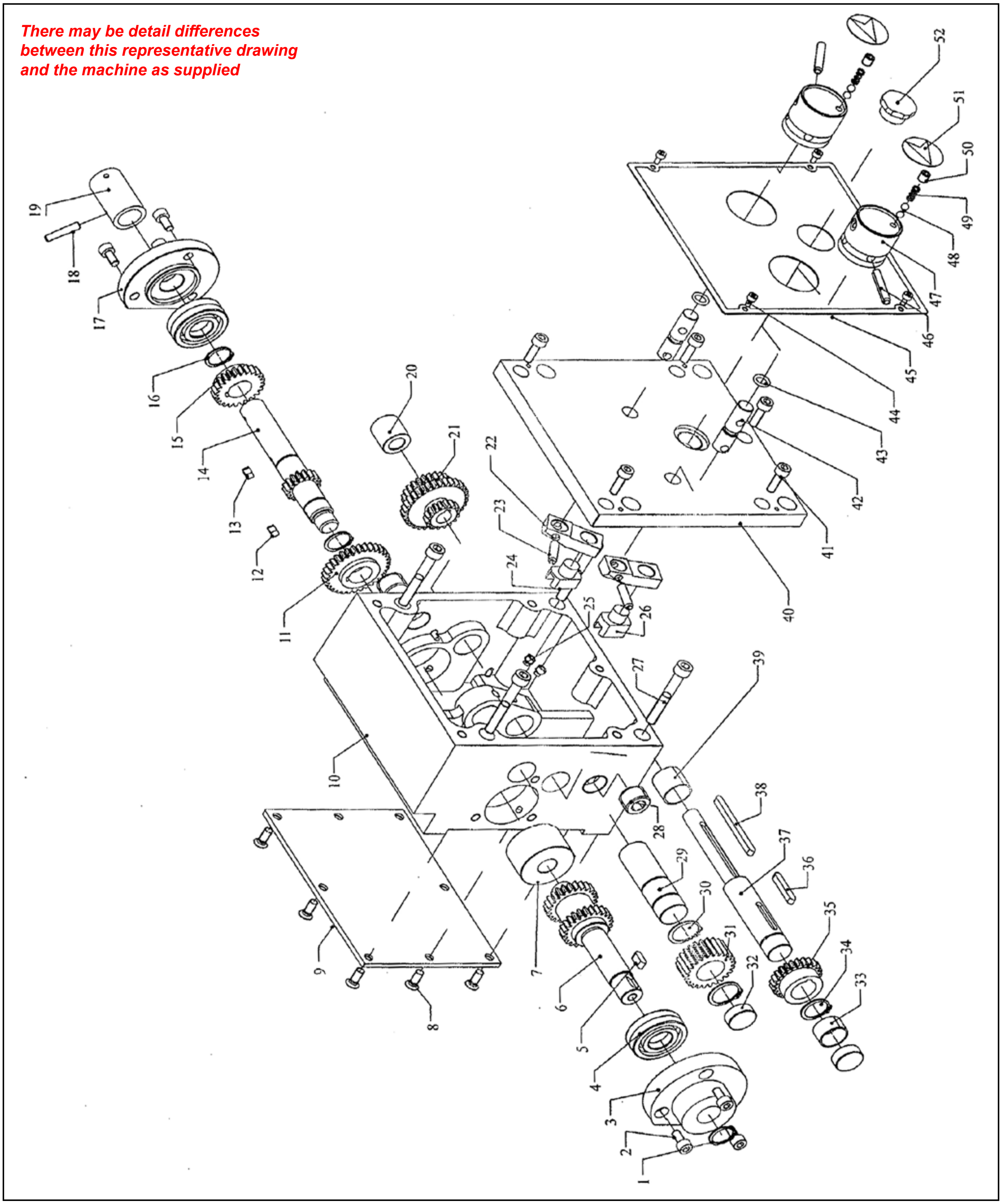
Dimensions in millimeters

Ref	Description	Qty
1	Oiler Φ6	2
3	Gear axle	2
4	Special C-washer	2
5	Ext. keyed bushing	2
8	Thin spacer washer, special	2
9	T-nut	2
13	Skt hd cap screw M6 x 10	1
14	Special C-washer	1
15	Int. keyed bushing	1
19	Change gear support bar	1
20	Washer Φ8	1
21	Skt hd cap screw M8 x 35	1



Adjustable gear axle
(Shipments from late 2017 on) Screw the axle into the T-nut, then tighten with an 8 mm wrench. Install the gear(s) on the axle. Loosen the lock screw, then rotate the special castellated nut to take up end-float. Re-tighten the lock screw. This is typically a one-time adjustment; thereafter the axle can be treated as a one-piece shoulder bolt.

GEARBOX



There may be detail differences between this representative drawing and the machine as supplied

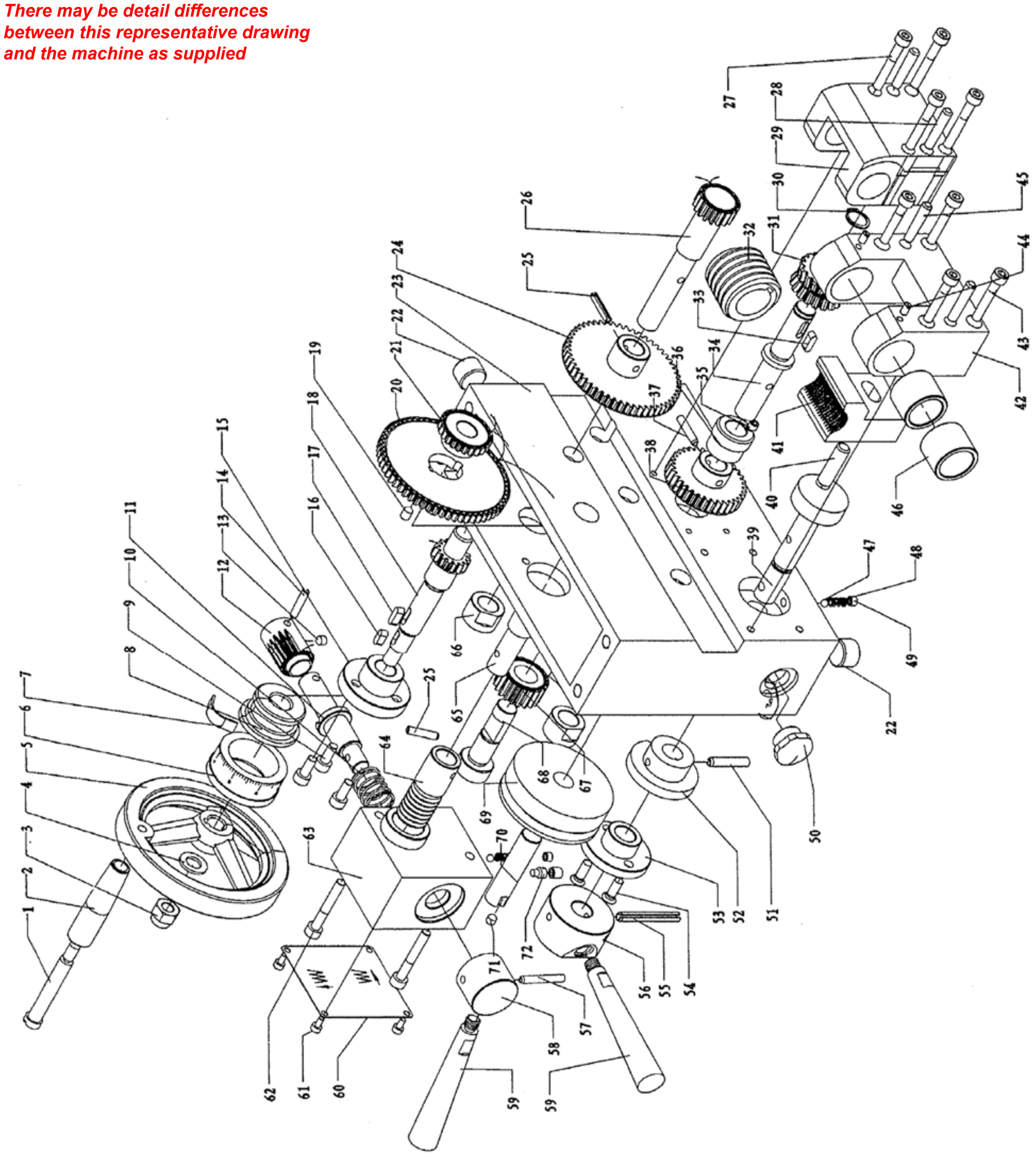
GEARBOX

Ref	Description	Qty
1	Circlip Φ14	1
2	Screw M5 x 10	6
3	Left-hand flange	1
4	Ball bearing 6202	2
5	Key 5 x 12	1
6	Double gear assembly	1
7	Sleeve	1
8	Screw M5 x 8	8
9	Rear cover	1
10	Body casting	1
11	Gear	1
12	Key 4 x 8	1
13	Key 4 x 10	1
14	Gear shaft	1
15	Gear	1
16	Circlip	2
17	Right-hand flange	1
18	Taper pin Φ4 x 22	1
19	Leadscrew coupler	1
20	End plug	1
21	Triple gear assembly	1
22	Gear shifter crank	2
23	Pin Φ5x16	2
24	Shifter fork	1
25	Hex set screw M6 x 6	2
26	Shifter fork	1
27	Screw M6 x 45	4
28	Bushing	1
29	Shaft	1
30	Circlip	2
31	Intermediate gear	1
32	End plug	1
33	Sliding bearing 1610	1
34	Circlip	1
35	Gear	1
36	Key	1
37	Shaft	1
38	Key 4 x 50	1
39	Sliding bearing 1616	1
40	Front cover	1
41	Screw M5 x 16	5
42	Shaft	2
43	O-ring Φ10 x 1.8	2
44	Screw M3 x 6	4
45	Gearbox label	1
46	Pin Φ5 x 26	2
47	Knob	2
48	Steel ball Φ5	4
49	Spring Φ0.8x4x14	2
50	Set screw M6 x 16	2
51	Pointer label	2
52	Sight glass	1

Dimensions in millimeters

APRON

There may be detail differences between this representative drawing and the machine as supplied



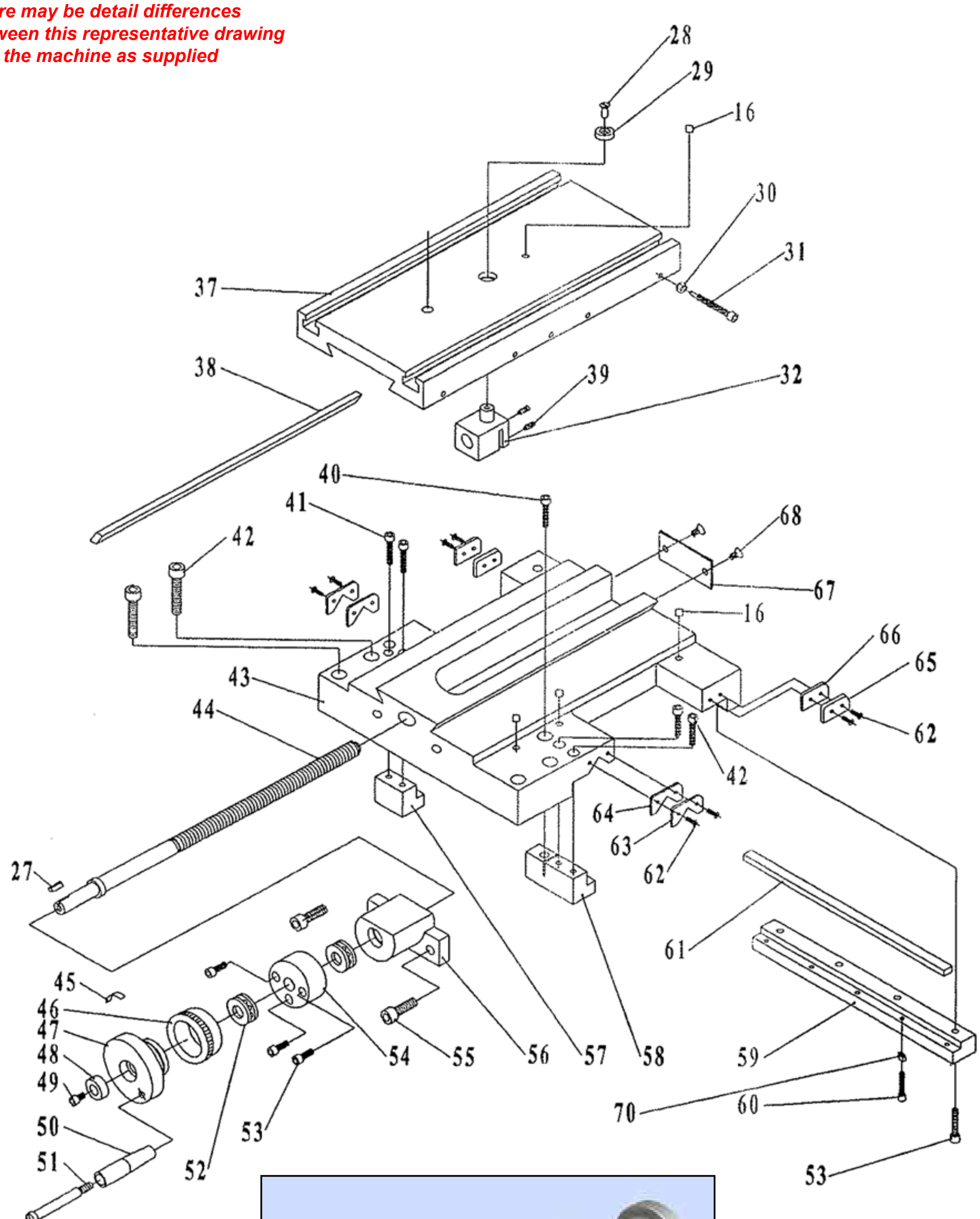
Ref	Description	Qty
1	Handle bolt	1
2	Handle sleeve	1
3	Locknut M8	1
4	Washer M8	1
5	Handwheel	1
6	Graduated collar	1
7	Leaf spring	1
8	Flange	1
9	Screw M5 x 12	3
10	Spring 1 x 16 x 20	1
11	Shifter shaft	1
12	Feed selector gear	1
13	Set screw M5 x 6	1
14	Roll pin Φ4 x 20	1
15	Flange	1
16	Key 4 x 4 x 10	1
17	Key 4 x 4 x 12	1
18	Gear shaft	1
19	set screw M5 x 8	2
20	Gear 60T	1
21	Gear 23T	1
22	Oil plug M16 x 12	2
23	Apron body	1
24	Gear 53T	1
25	Roll pin Φ4 x 20	1
26	Gear shaft	1
27	Screw M5 x 35	4
28	Taper pin Φ5 x 28	4
29	Worm support block	1
30	Circlip Φ12	1
31	Worm gear 17T	1
32	Int. keyed worm	1
33	Key 4 x 4 x 12	1
34	Worm gear shaft	1
35	Set screw, coned M4 x 8	1
36	Collar	1

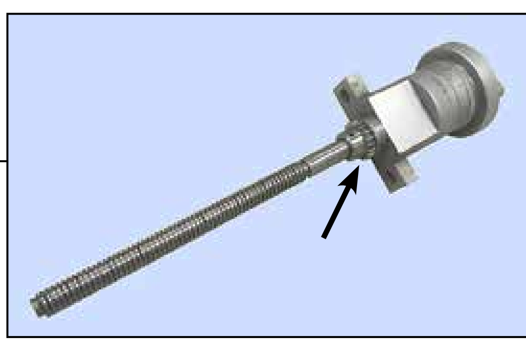
Ref	Description	Qty
37	Roll pin Φ4 x 20	1
38	Gear 34T	1
39	Cam shaft	1
40	Pin 8 x 24	2
41	Half nut	1
42	Half nut support	1
43	Screw M5 x 30	1
44	Set screw, coned M4 x 8	2
45	Roll pin Φ4 x 20	1
46	Bushing	2
47	Steel ball Φ5	2
48	Spring 0.8 x 4 x 14	2
49	Set screw M6 x 6	3
50	Sight glass	1
51	Roll pin Φ4 x 25	1
52	Flange	1
53	Flange	1
54	Screw M5 x 12	2
55	Roll pin Φ5 x 40	1
56	Half nut lever hub	1
57	Roll pin Φ4 x 28	1
58	Feed lever hub	1
59	Lever	2
60	Label	1
61	Screw M3 x 6	4
62	Screw M5 x 35	1
63	Feed selector base	1
64	Selector sleeve	1
65	Shaft	1
66	Spacer bushing	1
67	Idler gear 20T	1
68	Shaft	1
69	Locking wheel	1
70	Shaft	1
71	Set screw, coned M4 x 8	1
72	Set screw M6 x 6	1

Dimensions in millimeters

SADDLE &CROSS-SLIDE

There may be detail differences between this representative drawing and the machine as supplied

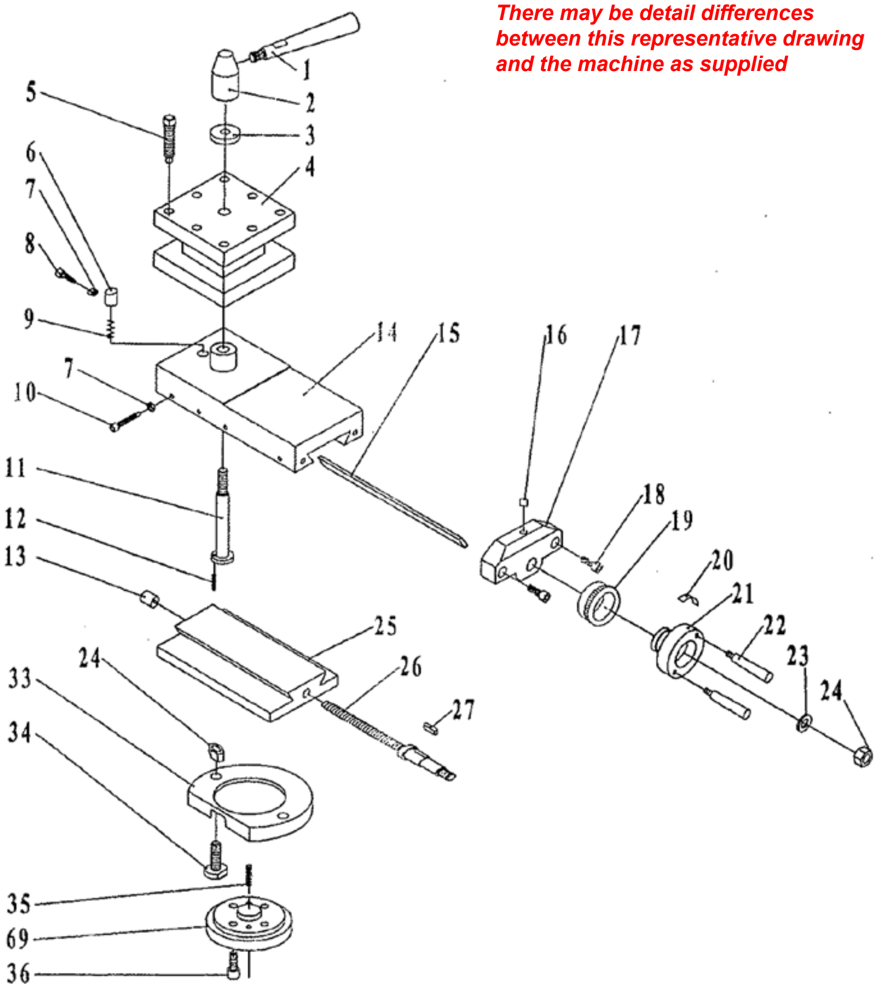




Leadscrew drive gear
(not shown in above drawing)

COMPOUND

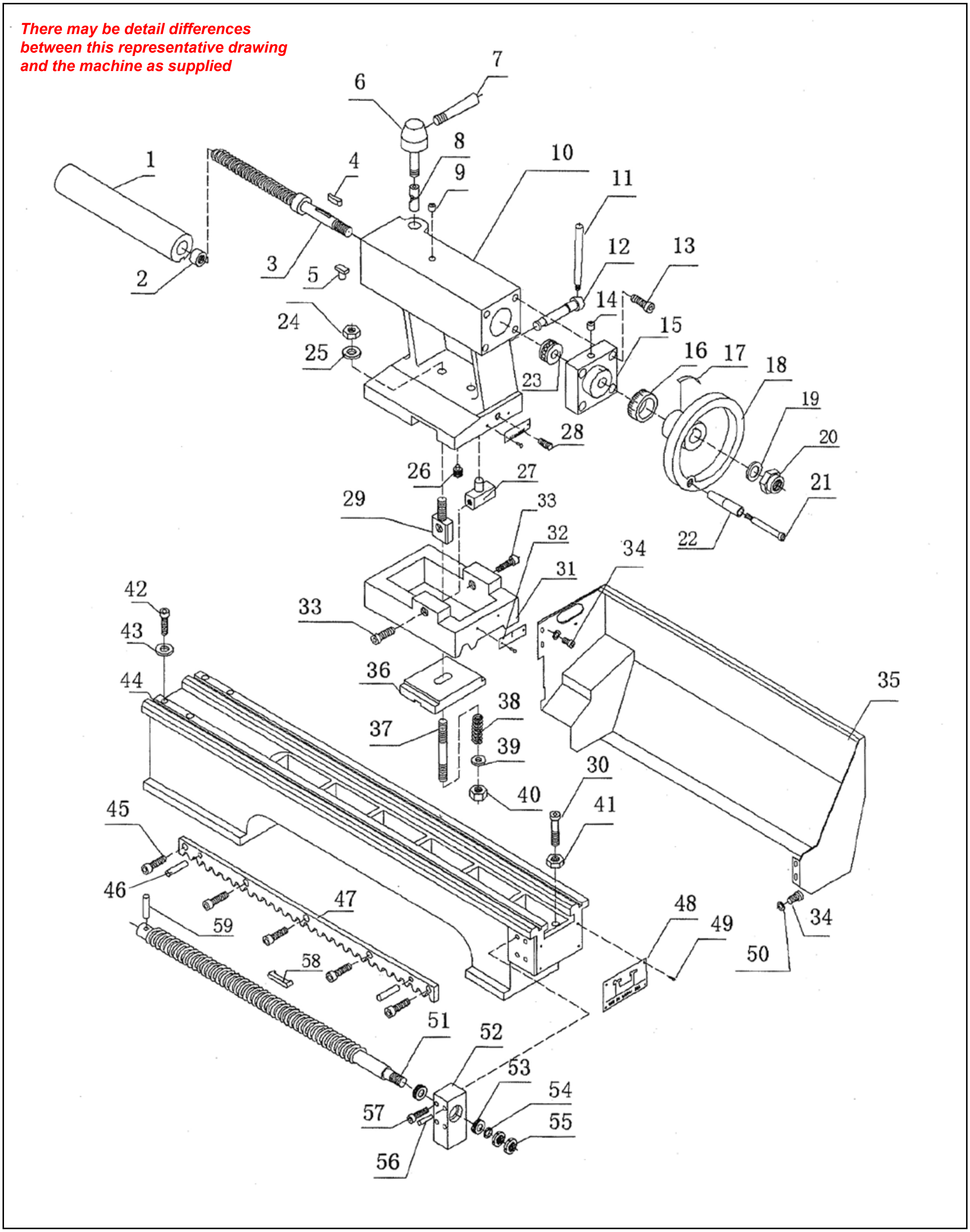
There may be detail differences between this representative drawing and the machine as supplied



Ref	Description	Qty
1	Toolpost handle	1
2	Handle hub	1
3	Washer	1
4	4-Way Toolpost	1
5	Square hd screw M8 x 30	1
6	Detent pin	1
7	Locknut	4
8	Screw M4 x 16	1
9	Spring 0.8 x 4.8 x 16	1
10	Gib screw M4 x 20	4
11	Toolpost spindle	1
12	Pin 3 x 6	1
13	Oiler Φ10	2
14	Compound casting	1
15	Compound gib	1
16	Oiler Φ6	9
17	Compound leadscrew flange	1
18	Skt hd screw M5 x 16	2
19	Graduated collar	1
20	Leaf spring	1
21	Handwheel	1
22	Handwheel handle	2
23	Washer Φ8	1
24	Locknut M8	3
25	Compound base	1
26	Compound leadscrew	1
27	Key 3 x10	2
28	Screw M5 x 8	1
29	Washer	1
30	Locknut M5	4
31	Screw M5 x 40	5
32	Leadscrew nut	1
33	Compound clamp ring	1
34	T-bolt M8 x 22	2
35	Pin 4 x 6	2
36	Screw M6 x 14	4
37	Cross-slide casting	1
38	Cross-slide gib	1
39	Set screw M4 x 12	2
40	Screw M8 x 35	1
41	Screw M5 x 25	4
42	Screw M6 x 35	4
43	Saddle casting	1
44	Cross-slide leadscrew	1
45	Leaf spring	1
46	Graduated collar	1
47	Handwheel	1
48	Special washer	1
49	Screw M5 x 8	1
50	Handle sleeve	1
51	Handle bolt	1
52	Thrust bearing 5101	2
53	Screw M5 x 20	7
54	Base collar	1
55	Screw M8 x 20	2
56	Compound leadscrew flange	1
57	Slide block	1
58	Saddle clamp block	1
59	Saddle gib support	1
60	Screw M4 x 20	5
61	Saddle gib	1
62	Screw M3 x 8	8
63	V-wiper backing, front	2
64	Rubber V-wiper, front	2
65	Plain wiper backing, rear	2
66	Plain wiper, rear	2
67	Cover	1
68	Screw M4 x 8	2
69	Compound swivel base	1
70	Locknut M4	5

Dimensions in millimeters

BED & TAILSTOCK

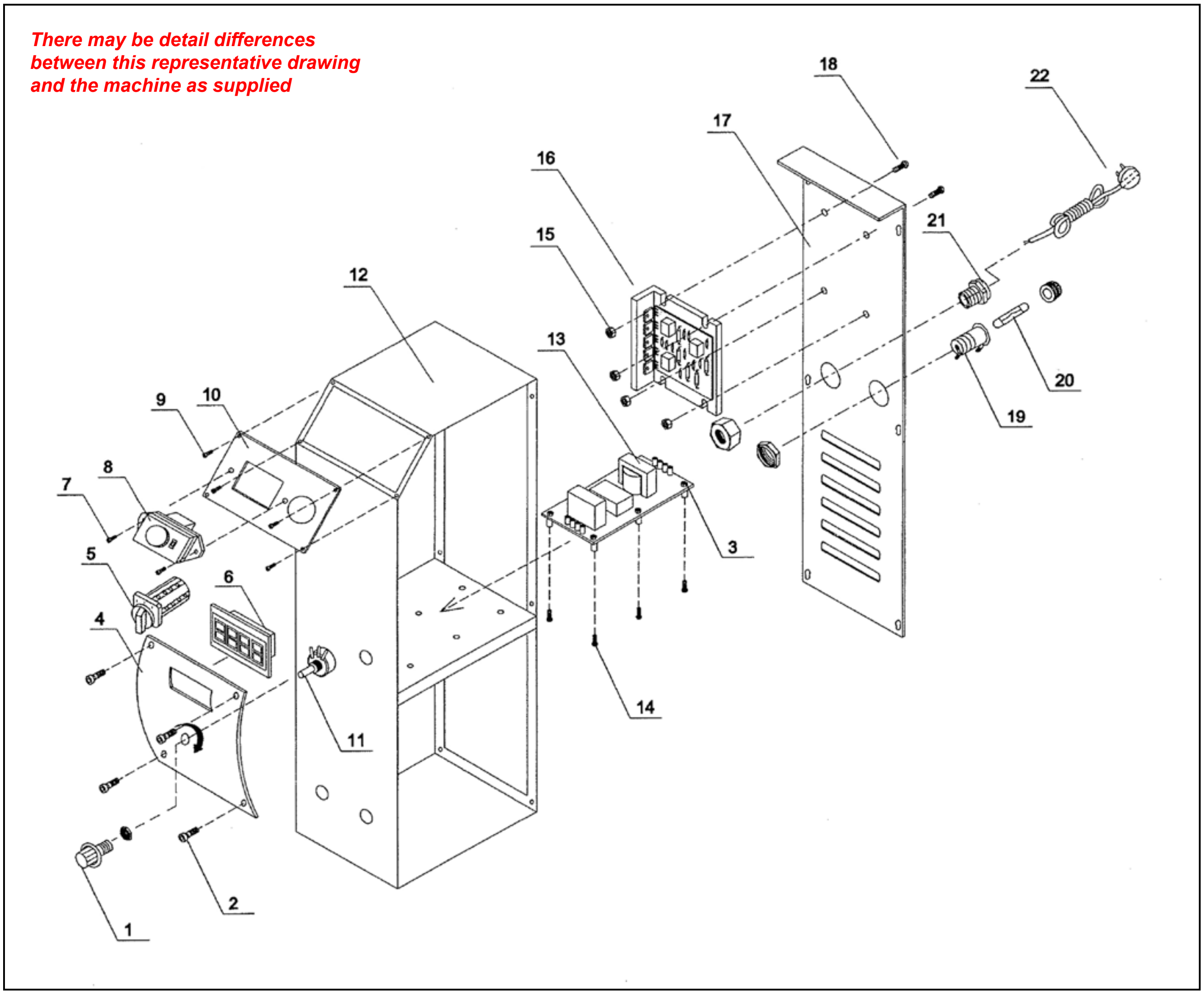


BED & TAILSTOCK

Ref	Description	Qty
1	Tailstock quill	1
2	Leadscrew nut	1
3	Leadscrew	1
4	Key 4 x 4 x 15	1
5	Quill slide key	1
6	Lock lever hub	1
7	Lock lever	1
8	Quill clamp sleeve	1
9	Oiler Φ6	2
10	Tailstock body	1
11	Lock lever	1
12	Eccentric shaft	1
13	Screw M5 x 16	4
15	Leadscrew flange	1
16	Graduated collar	1
17	Leaf spring	1
18	Handwheel	1
19	Washer M8	1
20	Locknut	1
21	Handle bolt	1
22	Handle sleeve	1
23	Thrust bearing	1
24	Nut M10	1
25	Washer Φ10	1
26	Set screw M6 x 10	1
27	Adjusting block	1
28	Screw M6 x 16	1
29	Clamp bolt	1
30	Screw M8 x 25	1
31	Tailstock base	1
32	Offset label	1
33	Screw M8 x 30	2
34	Screw M5 x 8	4
35	Splash guard	1
36	Clamp plate	
37	Threaded stud M12/M10	1
38	Spring 13 x 1 x 62	1
39	Washer Φ12	1
40	Nut M12	1
41	Nut M8	1
42	Screw M8 x 30	4
43	Washer Φ8	4
44	Bed	1
45	Screw M5 x 10	5
46	Rack locating pin	2
47	Rack	1
48	Label	1
49	Rivet	4
50	Washer Φ5	4
51	Leadscrew 8TPI	1
52	Support block	1
53	Thrust bearing	2
54	Washer Φ15	1
55	Nut M12	1
56	Pin Φ6 x 25	2
57	Screw M6 x 12	2
58	Key 5 x 5 x 25	1
59	Drive pin	1

Dimensions in millimeters

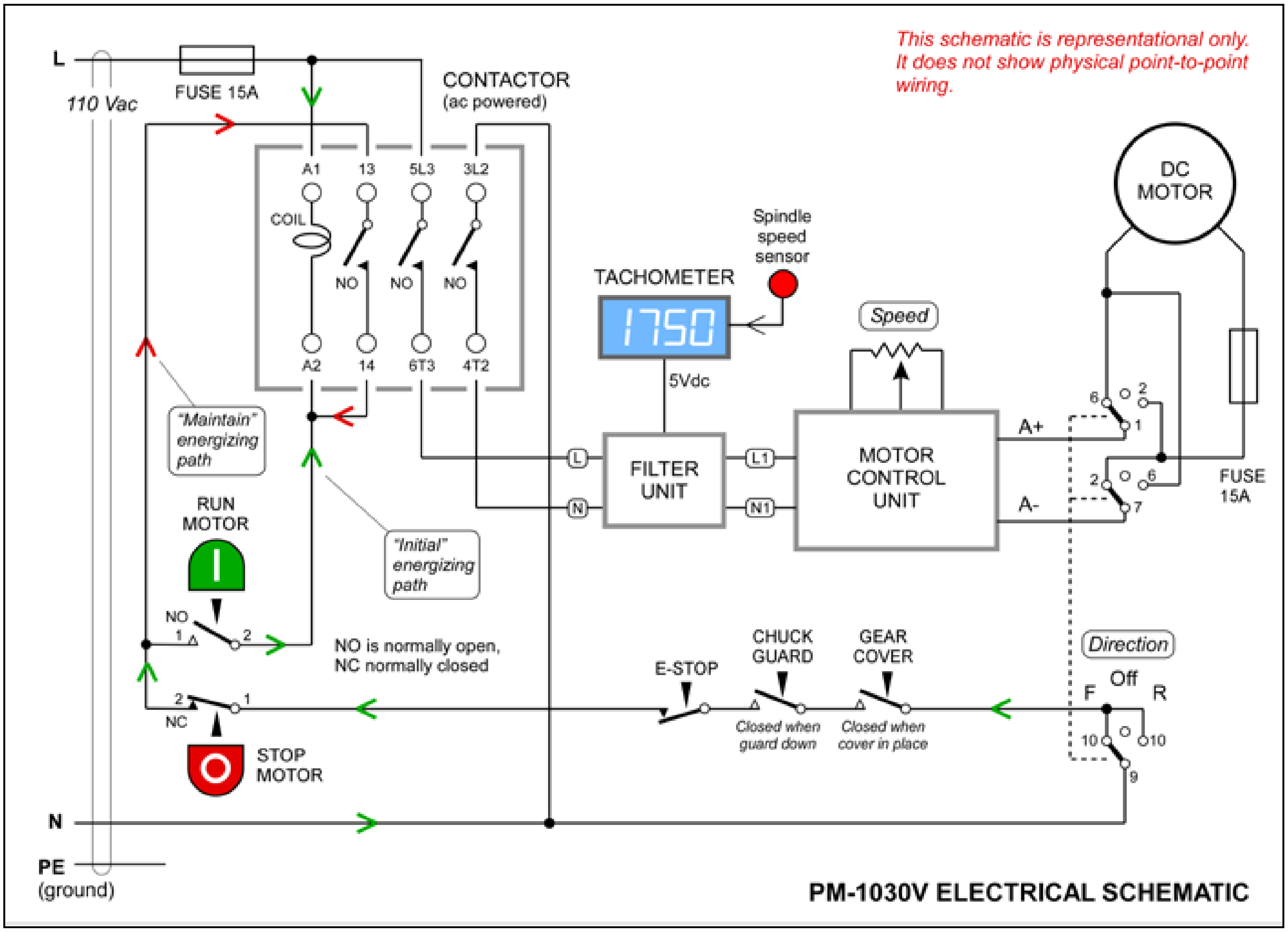
ELECTRICAL BOX



Ref	Description	Qty
1	Speed control knob	1
2	Screw M3 x 6	4
3	Nut M4	4
4	Front panel	1
5	Forward-reverse switch	1
6	Speed display	1
7	Screw M4 x 14	2
8	E-Stop switch	1
9	Screw M3 x 6	4
10	Upper panel	1
11	Potentiometer	1

12	Electrical box	1
13	Filter unit	1
14	Screw M4 x 14	6
15	Nut M4	4
16	Motor control unit	1
17	Rear cover	1
18	Screw M4 x 12	4
19	Fuse holder	1
20	Fuse 15A	1
21	Strain relief M16	1
22	Power cord	1

Dimensions in millimeters



NOTES

1. This is a brushed dc motor.
2. RUN MOTOR (green) and STOP MOTOR (red) switches are momentary-type push buttons that return to their normal state when released.
3. The motor control unit is Penta Power KBLC.
4. The filter unit is a printed circuit assembly that suppresses high frequency electrical noise (RFI/EMI) caused by devices in the motor control unit. It prevents feedback of such interference to the 110Vac supply.
5. When pushed, the E-STOP button remains in, disconnecting power, until reset by twisting action.
6. For electrical continuity the Chuck Guard and Gear Cover must be closed at all times.
7. The contactor is an ac powered power-switching relay controlled by 5 low-power contacts: RUN MOTOR, STOP MOTOR, E-Stop, Chuck Guard, and Gear Cover.

CHANGING MOTOR DIRECTION ...

When rotated from F to R, and vice versa, the Direction Switch swaps the A+ and A- connections to the motor (switch contacts 1 and 7 to 2 and 6).

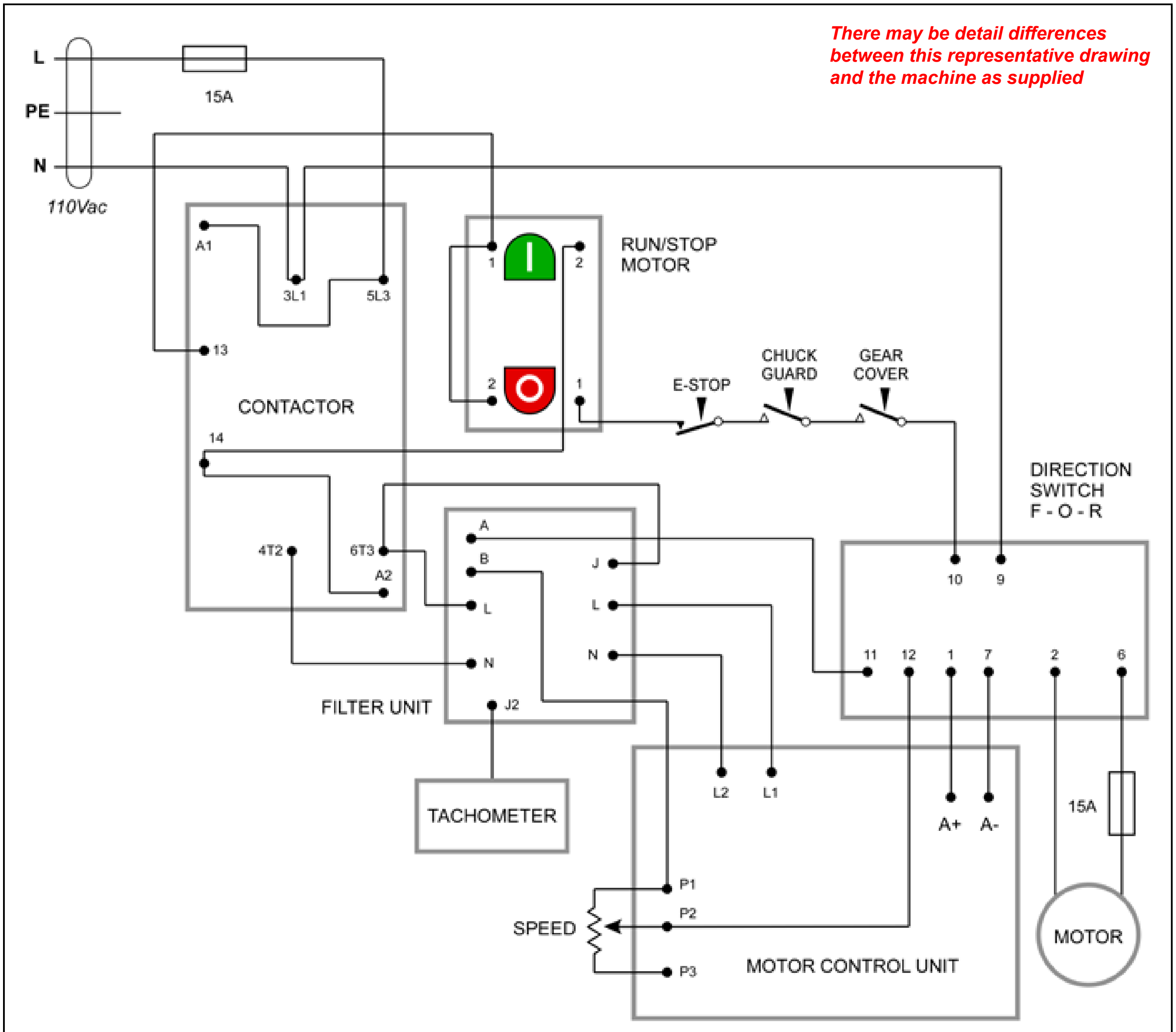
HOW THE CONTACTOR WORKS ...

If, and only if, the Direction Switch (F-O-R) is set to either F or R, the neutral (N) line is connected to the normally open RUN MOTOR contact. The hot line (L) is full-time connected to the contactor coil, terminal A1.

When the RUN MOTOR button is pressed the contactor coil (A2) is energized through the "initial" line (green arrows). This energizes the motor drive through contacts 5L3-6T3 (L) and 3L2-4T2 (N). At the same time an alternate energizing path is completed through contacts 13 and 14 (red arrows). This is the "maintain" path that keeps the coil energized when the RUN MOTOR button is released.

When the STOP MOTOR button is pressed, the neutral line from the E-STOP button is broken, de-energizing the contactor coil.

There may be detail differences between this representative drawing and the machine as supplied



PM-1030V WIRING

Filter unit

Motor control unit