



INSTRUCTION MANUAL

L1550 / L1560

High Speed Precision Lathe



Instruction and Spare Parts Manual

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1 Safety

Read this chapter before you install, operate or service the lathe. Every person who uses the machine must understand these precautions.

1.1 General safety precautions

Think about what you are going to do before you do it. Before each job, go through this safety checklist:

- Do I know how to operate this machine?
- What are the potential hazards involved?
- Are all guards in place?
- Are my procedures safe?
- Am I doing something that I probably should not do?
- Have I made all the proper adjustments and tightened all locking bolts and clamps?
- Is the workpiece secured properly?
- Do I have proper safety equipment?
- Do I know where the stop switch is?
- Do I think about safety in everything I do?

1.1.1 Clothing, hair and jewellery

- Wear a short-sleeved shirt, or roll long sleeves up above the elbow.
- Keep your shirt tucked in and remove your necktie. A shop apron is recommended.
- A shop coat may be worn as long as the long sleeves are rolled up. Do not wear fuzzy sweaters.
- Secure long hair so that it cannot be entangled in a moving machine.
- Remove your wristwatch and rings before you operate the machine. They can cause serious injury if they are caught in a moving part.

1.1.2 Hand protection

- Use a brush to remove chips. Do not use your hands, and resist the temptation to grab chips as they come from a cut.
- Do not remove chips with a rag. Metal particles become embedded in the cloth and can cut you.
- Avoid direct contact with cutting oils, coolants and solvents as much as possible. They can cause a rash or an infection. Wash your hands as soon as possible after contact.

■ WARNING

Do not wear gloves while operating the machine. If a glove is caught in a moving part, it will be pulled in together with the hand inside it.

■ WARNING

Do not blow chips off the machine with compressed air. The air propels metal particles at high velocity and can injure you or someone on the other side of the machine. Do not blow compressed air on your clothing or skin: the air can be dirty, and the force can implant dirt and germs into your skin.

1.1.3 Electrical

■ WARNING

Before you adjust or maintain the machine, unplug it from the electrical supply. If it is permanently wired, switch off the circuit breaker and tag it with an appropriate warning.

1.2 Machine safety

The machine is safe only if the machinist is aware of the hazards involved in its operation. Develop safe work habits in the use of set-ups, chip breakers, guards and other protective devices. Safety standards exist as guidelines to help you eliminate unsafe practice. The main hazards are listed below.

1.2.1 Pinch points due to movement

Keep your hands away from dangerous positions, such as gears, the chuck or rotating cutters.

1.2.2 Falling components

Heavy chucks, workpieces, vices and similar items are dangerous if they are dropped. Handle them with care.

■ WARNING

A chuck wrench left in the chuck becomes a missile when the machine is switched on. Always remove the chuck wrench immediately after use.

1.2.3 High-temperature components

Burns usually come from handling hot chips or a hot workpiece. Gloves may be worn to handle a hot workpiece, but never while the machine is running.

1.2.4 Sharp edges, corners and projections

- Use shields, usually made of clear plastic, for protection from flying chips and coolant.
- Never remove stringy chips with bare hands. Wear heavy gloves and use hook tools or pliers, and always switch off the machine before you remove chips.
- Break chips rather than letting them form a stringy mass or long wire. Chip breakers on the tools and correct feeds help to produce safe, easily handled chips.
- Remove burred edges before you take the workpiece off the machine.
- Always remove the tool bit when you set up or remove a workpiece, so that you do not cut yourself.

1.2.5 Workholding devices

When a workpiece is clamped, parts of the holding device often extend beyond its outside diameter. Guards, barriers and warnings (signs or verbal instructions) are used to make you aware of this hazard.

■ WARNING

Never run a geared scroll chuck without something gripped in the jaws. Centrifugal force on the jaws can unwind the scroll and throw the jaws out of the chuck.

Keep tools, files and micrometers off the machine. They can vibrate off into the revolving chuck, workpiece or cutter.

1.2.6 Stopping the spindle

■ WARNING

Never slow or stop the spindle or workpiece by gripping it by hand or by any other means. Always use the machine controls to stop or slow it.

1.2.7 Workpieces extending out of the lathe

■ WARNING

Support any workpiece that extends out of the lathe with a stock tube. A slender workpiece that extends a foot or so beyond the headstock spindle without support can fly outward under centrifugal force. It will bend, and it is a very great danger to anyone standing near.

1.2.8 Other safety considerations

- When polishing rotating work, hold one end of the abrasive cloth strip in each hand. Do not let either hand get closer than a few inches to the work.
- Keep rags, brushes and fingers away from rotating work, especially when knurling. Roughing cuts quickly drag in and wrap up rags, clothing, neckties, emery cloth and hair.
- When checking boring work, move the carriage back out of the way and cover the tool with a cloth.
- When removing or installing chucks or heavy workpieces, use a board on the ways. To lift a heavy chuck or workpiece (larger than an 8-inch diameter chuck), get help or use a crane. Remove the tool, or turn it out of the way, during this operation.
- Do not shift gears or take measurements while the lathe is running and the workpiece is in motion.
- Never use a file without a handle. The file tang can quickly cut your hand or wrist if a spinning chuck jaw or lathe dog strikes the file.
- Left-hand filing is considered safest on a lathe: the left hand grips the handle and the right hand holds the tip end of the file.

2 Specifications

This manual covers the L1550 / L1560 high-speed precision lathe (original model designation -1550, 15" x 50").

NOTE This manual applies only to the machine with the serial number shown. The serial number is stamped on the rear of the lathe bed at the tailstock end. Quote it in all communications about after-sales service.

2.1 General layout

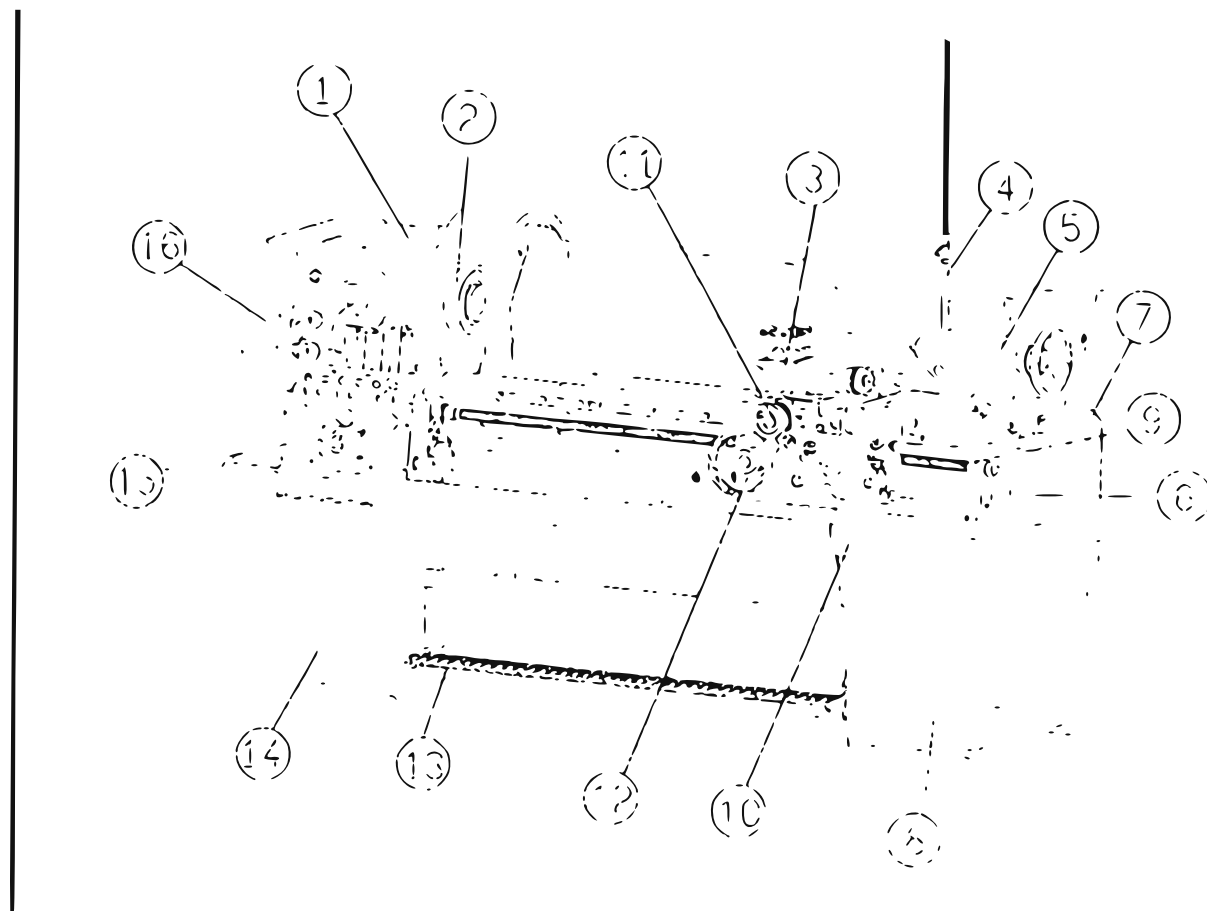


Figure 2-1: General layout of the lathe

2.2 Brief specification

Height of centres	7.48in (190mm)
Distance between centres	50in (1250mm)
Swing over bed	15.23in (387mm)
Swing over cross-slide	9.37in (238mm)
Swing in gap (gap-bed lathe)	24in (610mm)
Spindle nose	D1-6, MT No.6
Spindle bore (max. bar diameter)	2.2in (56mm)
Taper of centre	No.4 Morse
Drive motor	7.5 h.p.
Spindle speeds	16 speeds, 25-2000rpm
Net weight (approx.)	1450kgs

The original sales specification gives the following additional data for the same machine (FCL-1550G).

Table 2-1: Additional specification data

Item	Value
Swing over bed	387mm (15-1/4")
Swing over cross slide	238mm (9-3/8")
Between centres	1250mm (50")
Bed width	280mm (11")
Spindle speed	16 steps / 25-2000rpm
Spindle bore / nose / taper	56mm (2-1/4") / D1-6 / MT#6
Tailstock - diameter / travel / taper	Ø59mm (2-1/4") / 127mm (5") / MT#4
Slide travel - cross / top slide	235 / 120mm (9-1/4" / 4-3/4")
Spindle drive motor	5.5kW (7.5HP)
Net weight	1450kgs (3200 Lbs)

*Figure 2-2: Overall dimensions*

3 Installation

3.1 Foundation plan

Install the lathe on a solid foundation laid out as shown in Figure 3-1.

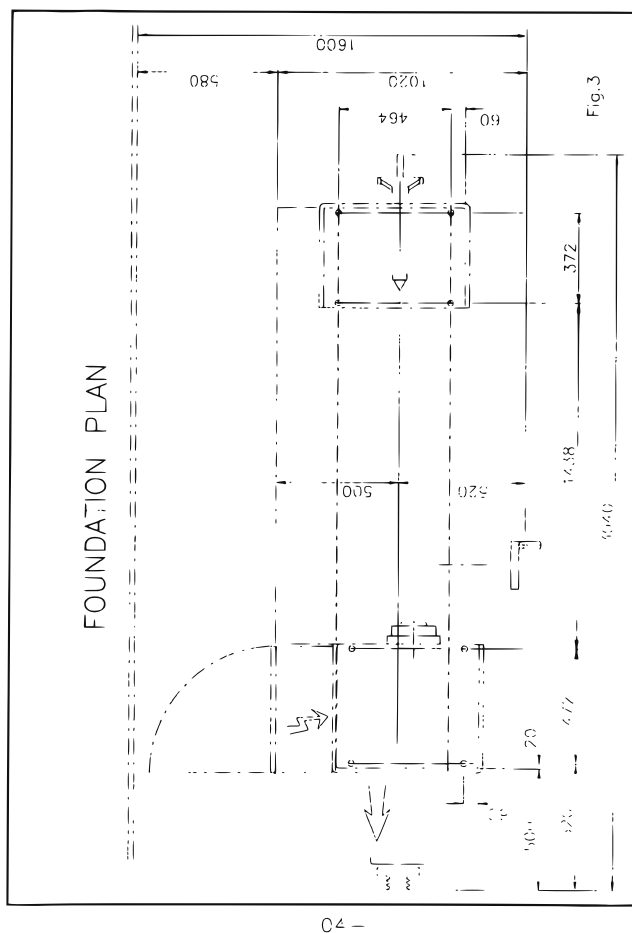


Figure 3-1: Foundation plan

3.2 Lifting the machine with a crane

Prepare the lift as follows:

- The -1550EVS machine weighs about 1450/1700kgs.
- Make sure that the crane has a minimum capacity of more than 2 tons, for security.
- Only an authorised crane operator may lift the machine.
- Crane work must be done by two people working together: an operator and a watchman.
- Make sure that the two hexagon nuts are fixed.
- Keep the machine's centre of gravity at the centre of the crane.

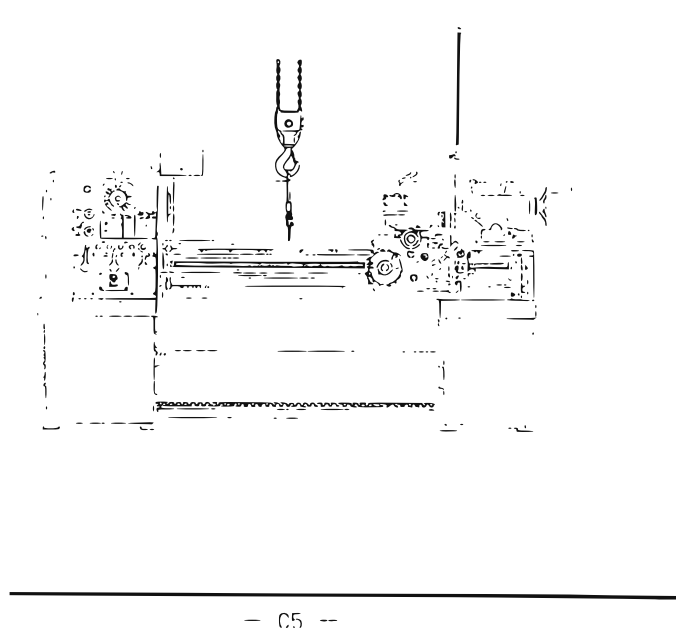


Figure 3-2: Lifting the machine with a crane

3.3 Cleaning

- 1 Before you operate any controls, remove the anti-corrosion coating from all slideways and from the end gear train (Figure 3-3).
- 2 Clean with white spirit or kerosene. Do not use cellulose solvents: they damage the paint finish.
- 3 Immediately after cleaning, oil all bright machined surfaces with machine oil or slideway lubricant.
- 4 Apply heavy oil or grease to the end gears.

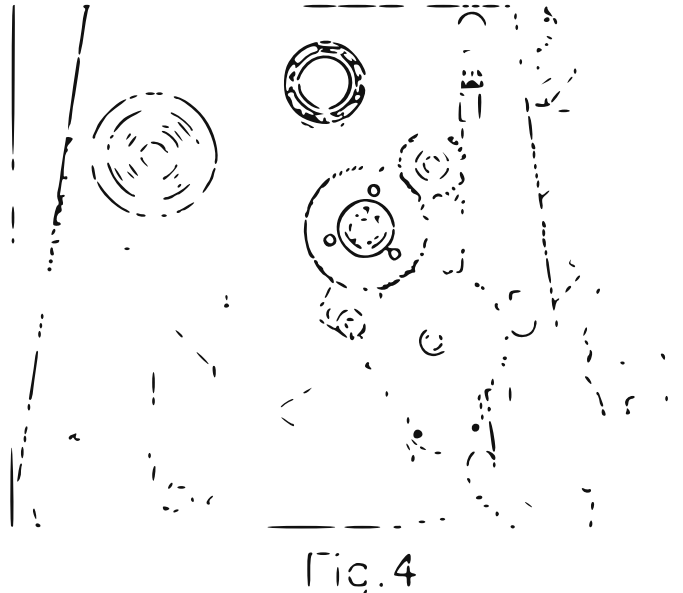


Figure 3-3: End gear train, coated for shipping

3.4 Installing

- 1 Locate the machine on a solid foundation laid out according to the foundation plan (Figure 3-1). The lathe can be free-standing or bolted to the foundation.
- 2 Free-standing installation: position the lathe on the foundation and adjust each of the eight mounting feet so that each takes an equal share of the load.
- 3 Place an engineer's precision level on the bedways as shown in Figure 3-4, and adjust the feet to level the machine.
- 4 Fixed installation: position the lathe over eight bolts set into the foundation to match the holes in the mounting feet. The dimensions are shown on the foundation plan (Figure 3-1).
- 5 Level the machine accurately as shown in Figure 3-4, then tighten the hold-down bolts.
- 6 Recheck the bed level.

NOTE Check the bed level periodically to keep the lathe accurate.

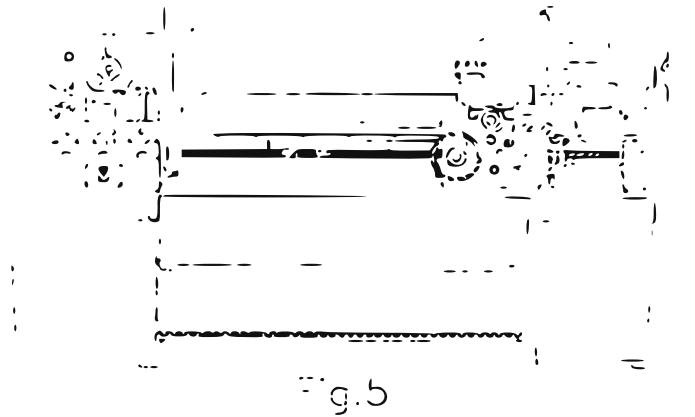


Figure 3-4: Levelling the bedways with a precision level

3.5 Electrical supply connection

- 1 Connect the input wires to the main terminals of the isolator switch on the electrical panel at the back of the bed, below the headstock (Figure 3-5).
- 2 Check the main motor rotation. It must turn anti-clockwise viewed from the pulley end. If the motor runs in the wrong direction, interchange any two of the three phase lines.

The wiring diagrams are in Chapter 7.

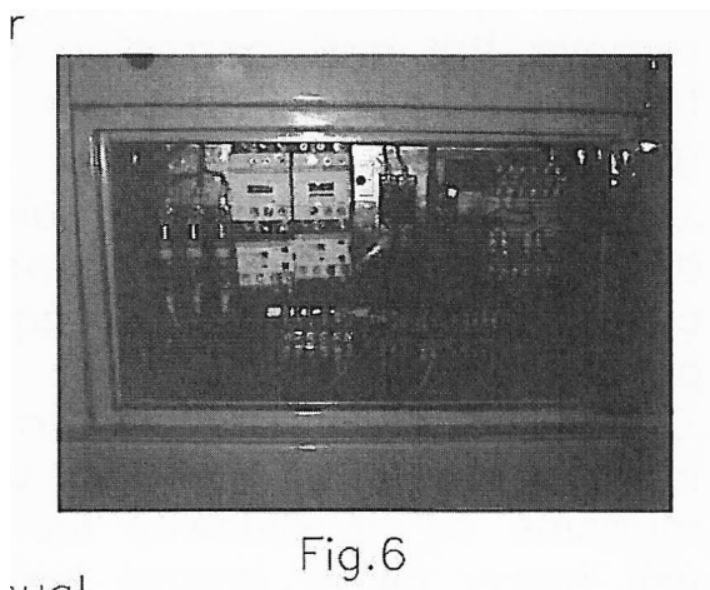


Figure 3-5: Isolator switch and electrical panel

3.6 Lubrication checks before first use

Before you operate the machine, make the following checks (Figure 3-6):

- 1 Check that the oil tank in the head-end plinth is filled to the correct level shown on the dipstick. Use oil R32, 7.5 litres, or equivalent.
- 2 Check that the gearbox is filled to the level marked on the oil sight window. Use oil R68, 2.4 litres, or equivalent.
- 3 Check that the carriage apron is filled to the level mark on the oil sight window. Use oil R68, 1.5 litres, or equivalent.
- 4 Use an oil can to oil the points on the lubrication diagram that need daily oiling. Use light machine oil or way lubricant.
- 5 Before each working shift, operate the manual lubrication pump to make sure that the carriage is adequately lubricated.

NOTE When the lathe motor is switched on, the oil sight window in front of the headstock must be full of oil. This shows that the pump is working. If it is not, stop the machine and investigate the cause.

NOTE For economy, the headstock lubrication tank is filled on delivery only to the minimum working quantity of 3 imperial gallons.

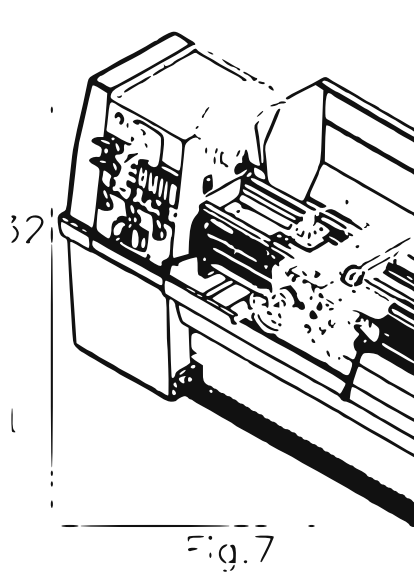


Figure 3-6: Lubrication check points

4 Controls and Operation

4.1 Chuck and chuck mounting (D1-6 spindle)

■ WARNING

Use high-speed chucks with these machines only.

- 1 Before you fit a chuck or faceplate, make sure that the spindle and chuck tapers are scrupulously clean and that all cams lock in the correct positions first.
- 2 When you mount a new chuck, it may be necessary to reset the camlock studs (A). Remove the hexagon socket locking screws (B).
- 3 Set each stud so that the scribed ring (C) is flush with the rear face of the chuck, with the slot lining up with the locking screw hole.
- 4 Mount the chuck or faceplate on the spindle nose and tighten the six cams in turn.
- 5 When fully tightened, check that the cam lock line on each cam is between the two V marks on the spindle nose. If any cam does not tighten fully within these limit marks, remove the chuck or faceplate and readjust the stud as shown in Figure 4-1.
- 6 Fit and tighten the locking screw (B) at each stud before you remount the chuck for work.
- 7 Make a reference mark on each correctly fitted chuck or faceplate to line up with the reference mark scribed on the spindle nose. This helps subsequent remounting.

■ WARNING

Do not interchange chucks or faceplates between lathes without checking for correct cam locking.

■ CAUTION

Take careful note of the speed limits for faceplates. Do not run 12 inch faceplates at more than 1000 rev/min, or 14 inch faceplates at more than 770 rev/min.

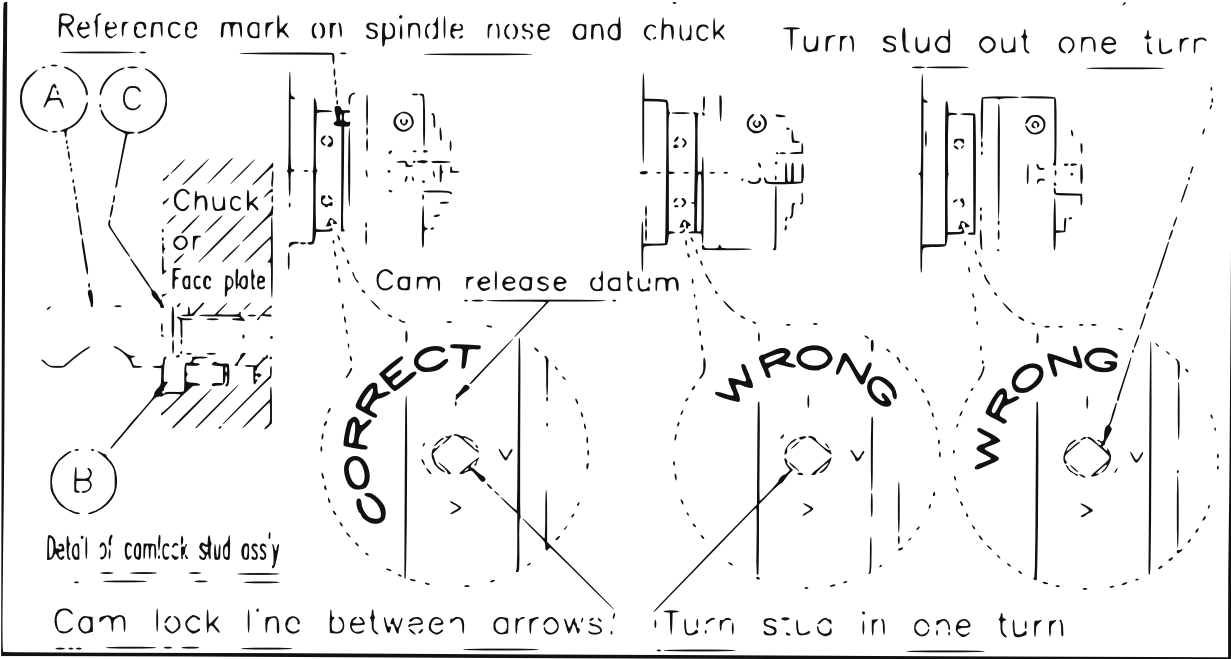


Figure 4-1: Camlock stud adjustment

4.2 Lathe controls

LATHE CONTROLS

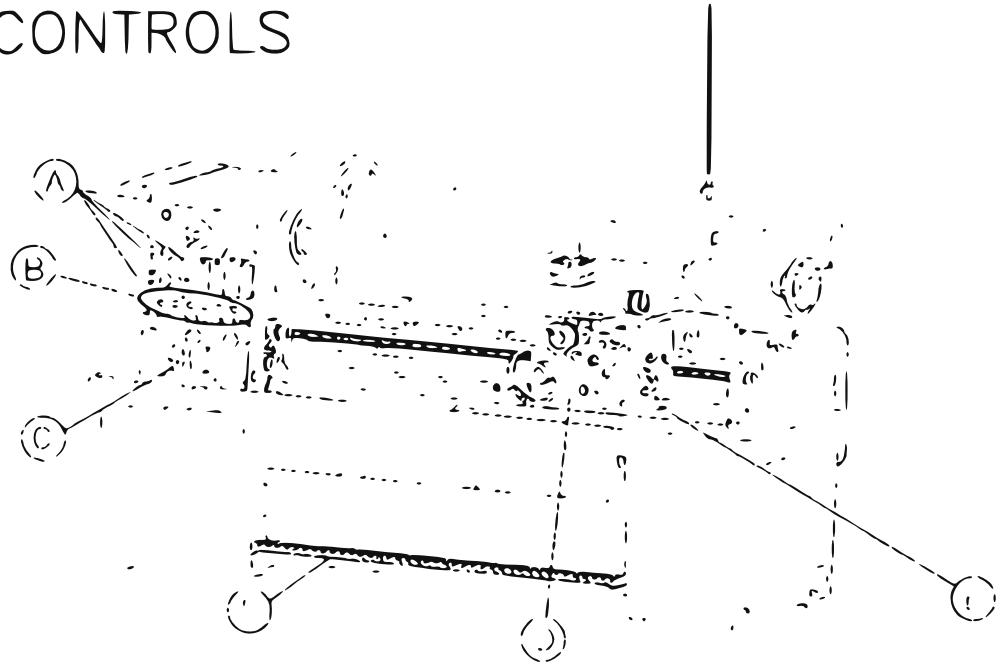
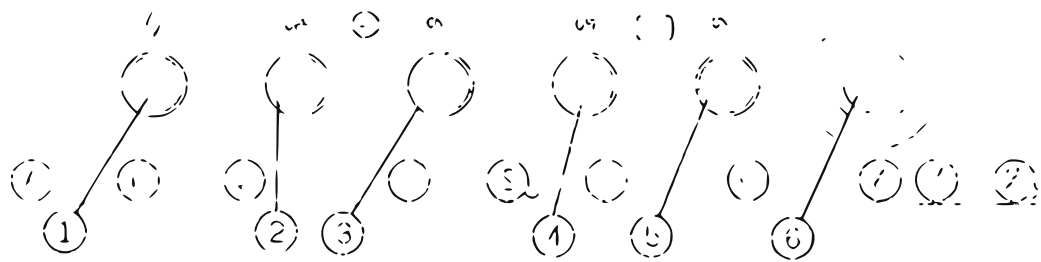


Figure 4-2: Lathe controls

4.3 Electrical control

Apart from the lathe isolator, all electrical controls are on the front face of the headstock (Figure 4-3).

ELECTRICAL CONTROL



With the exception of the lathe isolator, all electrical controls are fitted onto the front face of the headstock.

1. Power ON light, it will glow when the electricity is ON.
2. Coolant pump OFF push button.

Figure 4-3: Electrical control panel

4.4 Speed controls

4.4.1 Spindle rotation

Select spindle rotation with the lever controls (A) and (B) in Figure 4-4, with the main motor running. Move the lever out and down to engage forward or reverse rotation of the spindle. Return it straight to the control position to disengage the drive.

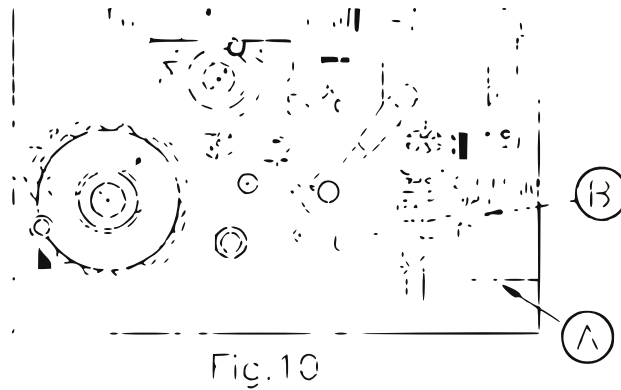


Figure 4-4: Spindle rotation levers

4.4.2 Spindle speeds

Select the spindle speed with the grouped dial controls on the headstock (Figure 4-5). The sixteen speeds are shown on the lever-operated dial (A) in four groups, each with four spindle speeds.

- 1 Turn dial (A) with the large handle to bring the required speed group uppermost, opposite the fixed section (B).
- 2 Turn the other handle dial (C) until the coloured arrow lines up with the required speed on the uppermost dial group.

■ CAUTION

Do not select speeds while the spindle is rotating or the clutches are engaged. The apron control must be central (disengaged) to avoid gear damage.

To free the spindle for hand rotation, set any one of the blank spaces on the group dial to the mid-position of the fixed section (Y).

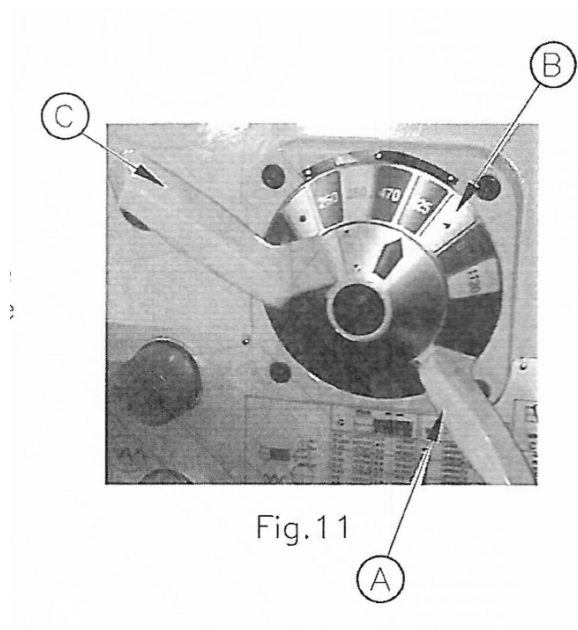


Figure 4-5: Spindle speed dials

4.5 Footbrake

A foot control between the plinths operates the spindle brake. At the same time it returns the selector lever to the central (disengaged) position. The height of the foot pedal depends on the position of a pin engaged in the bar (Figure 4-6). There is a choice of three positions.

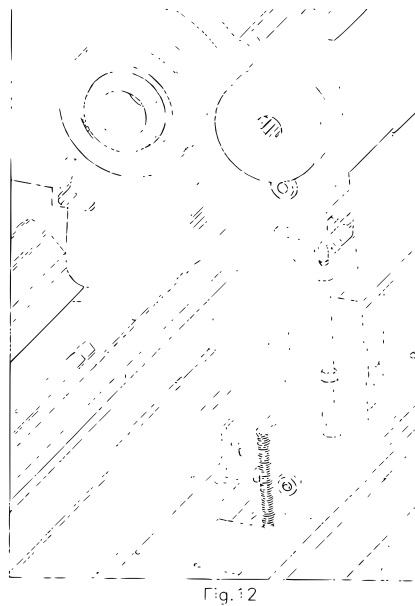


Figure 4-6: Footbrake pedal and height-adjusting bar

4.6 Threading dial indicator

The threading dial indicator is on the right-hand side of the apron on lathes with a Metric leadscrew. Except when a rapid threader unit is fitted as an optional extra, use it as follows:

- 1 Engage the indicator pinion with the leadscrew and tighten the handnut to hold the indicator in engagement.

- 2 When the indicator is not needed, release the handnut, swing the indicator out of engagement and secure it with the handnut.
- Even numbers of threads per inch: close the leadscrew nut as any line on the dial passes the datum mark.
 - Odd numbers of threads per inch: close the leadscrew nut at any NUMBERED line.
 - Fractional threads of 1/2 or 1/4 t.p.i.: close the nut at the SAME numbered line on each pass of the tool.

NOTE This dial cannot be used with a Metric leadscrew to cut English threads, D.P., module pitches or fractional threads other than those shown. For these, keep the leadscrew nut closed and reverse the machine with the apron control lever after each cutting pass and tool withdrawal.

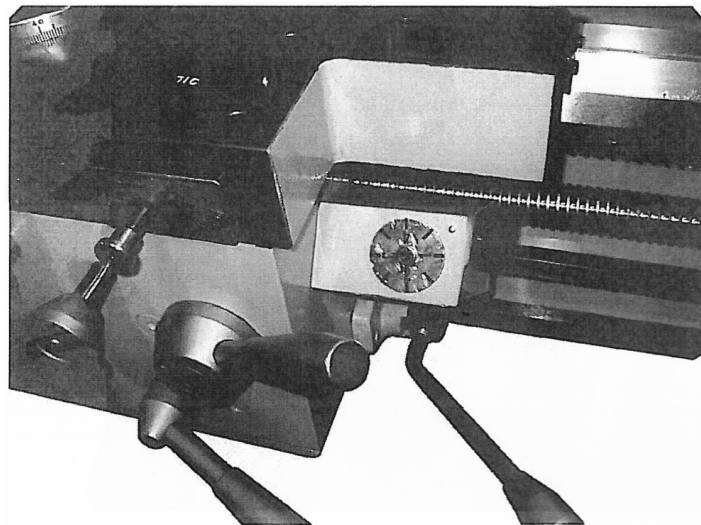


Figure 4-7: Threading dial indicator on the apron

4.7 Multi-start threads

Multi-start threads can be cut on a lathe in three ways:

- Reposition the compound (top) slide one pitch forward for each start. The slide is normally set at 90 deg to the axis of the machine cross-slide. The accuracy of this method depends on the skill of the operator.
- Use an accurately divided driver plate and turn the workpiece one division forward for each start.
- Advance the driver gear a calculated number of turns, to advance the spindle by one pitch of the thread to be cut. The accuracy of this method is that of the machine.

4.8 Apron controls

Besides handwheel traverse, the carriage can be power-operated through the controls on the front of the apron (Figure 4-8).

- Lever (A): move up to engage power feed, and down for manual operation.
- Push-pull knob (B): pull out to select power surfacing (cross-feed); push right in to select sliding feeds.
- Push-pull handle (C): controls forward or reverse feed direction.
- Lever (D): press down to engage the leadscrew nut for screwcutting. To avoid undue wear, release the nut except when screwcutting.

NOTE An interlock inside the apron prevents levers A and D from being engaged at the same time.

NOTE Do not use the headstock lever to reverse the feeds except during left-hand screwcutting. Use the apron handle (C) instead.

4.8.1 Feed-trip adjustment

A trip mechanism in the apron lets the saddle and/or cross-slide be fed up to fixed stops. Set the trip load high or low with the knurled handwheel on the side of the apron.

During power operation or screwcutting, disengage the apron handwheel from its gear train by pulling the handwheel outwards to its second spring-ball detent.

NOTE This does not apply when the longitudinal micro stop is fitted.

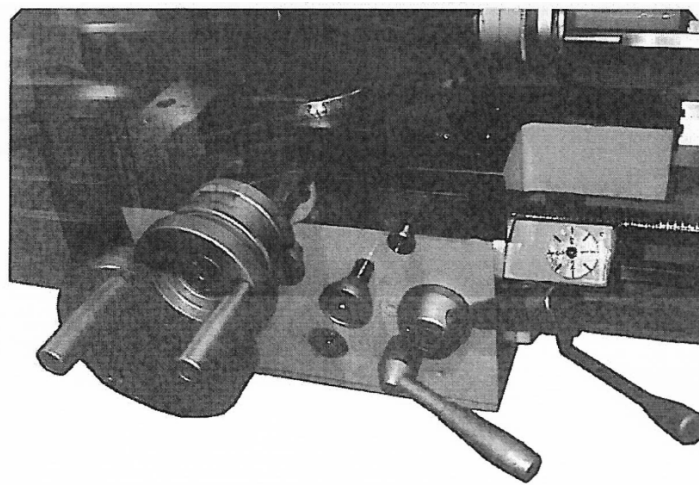


Figure 4-8: Apron controls

4.9 Cross-slide and top slide

A solid top slide is fitted as standard to the cross-slide. It is mounted on a swivel base marked 0-90-0-90 deg for accurate indexing.

The handwheel dials are graduated in inch or metric divisions to suit the operating screw and nut fitted.

To power-operate the cross-slide, pull out the knob (B). The cross-feed is half the sliding feed per spindle revolution. To operate the cross-slide by hand, use the large-diameter dial, graduated in either inch or metric divisions to suit the operating screw and nut fitted.

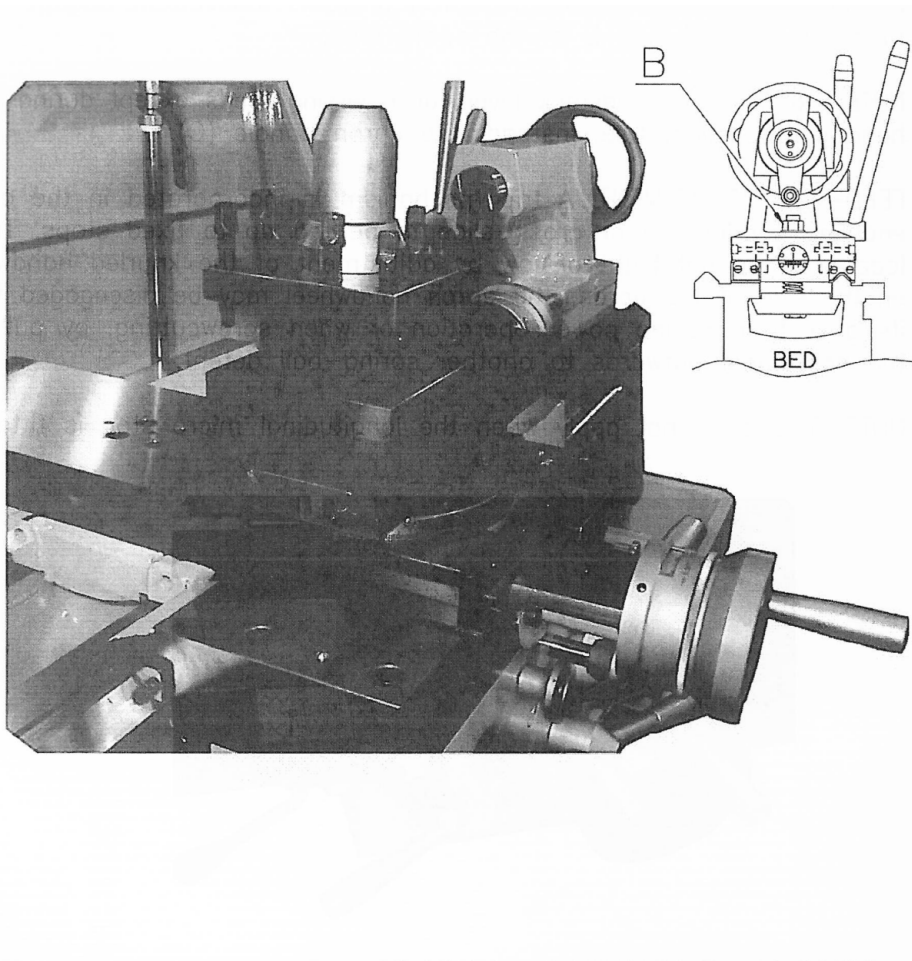


Figure 4-9: Cross-slide and top slide

4.10 Tailstock

- To move the tailstock along the bed, unlock the clamp lever (A).
- For additional clamping, tighten the large nut (B) in the recess below the handwheel. Release this nut before you move the tailstock.
- Lock the tailstock barrel with lever (C).

The tailstock can be set over to turn shallow tapers or for realignment:

- 1 Release the clamping lever.
- 2 Adjust the screws (S) at each side of the base to move the tailstock laterally across the base. The datum mark (D) on the tailstock end face shows the set-over.
- 3 Apply the clamp lever after adjusting the set-over.

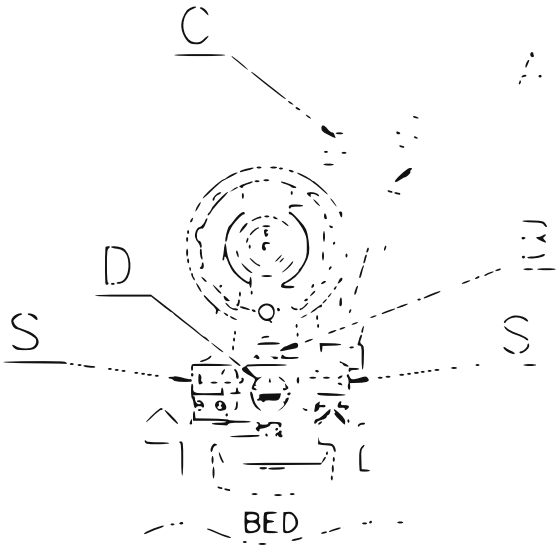


Figure 4-10: Tailstock controls



Figure 4-11: Detail of mark D

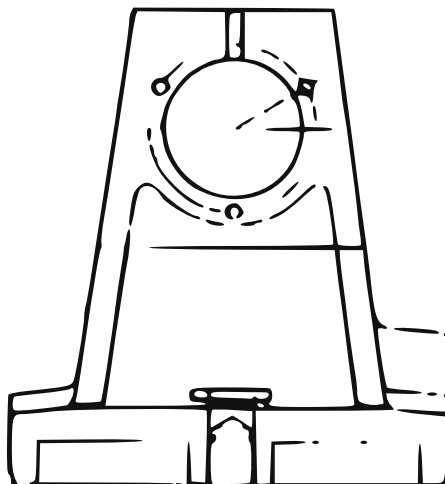


Figure 4-12: Tailstock base

5 Lubrication

5.1 Headstock lubrication system

An impeller-type pump attached to a tank in the head-end plinth supplies oil to the headstock bearings and gears. A distributor inside the headstock feeds oil to the drive clutches, bearings and gears.

A vee-belt from the main motor drives the oil pump, so oil is supplied continuously while the main motor runs. The oil sight window in the headstock front face shows the supply. A self-adjusting jockey pulley keeps the belt tension constant. A large-bore pipe returns oil from the bottom of the headstock to the tank.

- Check the oil weekly.
- Change the oil every year.
- Use oil R68 or an equivalent grade (see 5.2). The tank capacity is 3½ gallons.

To empty the tank:

- 1 Set the apron control lever to the central position and stop the main motor.
- 2 Detach the delivery pipe at the headstock and remove the pipe cleats.
- 3 Direct the pipe into a suitable container.
- 4 Restart the main motor so that the pump empties the tank.
- 5 Drain the small quantity of oil left below the pump intake through the drain plug that projects from the end of the tank through the plinth wall.

5.2 Gearbox lubrication

The gearbox is splash-lubricated from an internal oil reservoir (R68, 2.4 litres).

- Keep the oil level at the mark on the oil sight window in the front end face of the gearbox. A weekly check is recommended.
- Change the oil every year.
- Top up through the filler cap in the top of the gearbox, inside the end-guard.
- Drain through the drain plug in the bottom of the gearbox.

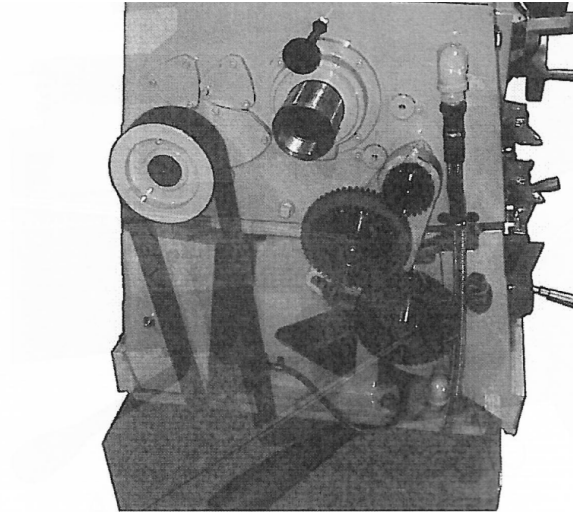


Figure 5-1: Gearbox oil sight window and filler

■ CAUTION

Incorrect grades of oil can cause damage. Where oil R68 is not available, use a grade with the characteristics in Table 5-1.

Table 5-1: Oil characteristics where R68 is not available

Property	Value
Specific gravity (20 C)	0.870
Flash point closed	210° C (410F)
Pour point	-29° C (-20F)
Viscosity, Redwood No.1	70° -320° secs
	140° F -68 secs
	200° F -41 secs
Viscosity, Engler degrees	

5.3 Apron and slideway lubrication

A manually operated lubricating pump (A) is built into the apron. It draws oil from the apron reservoir so that the slideways can be kept adequately lubricated (Figure 5-2).

- 1 Operate the pump before you start work, and occasionally during the work period.
- 2 Continue until oil flows from the tell-tale hole (B) in the carriage saddle. This shows that the system has received a full supply of oil.
- 3 If no oil appears at (B), refill the reservoir to the level of the oil sight (C) with oil R68.

To drain the apron, unscrew the hexagon-headed drain plug in the bottom plate.

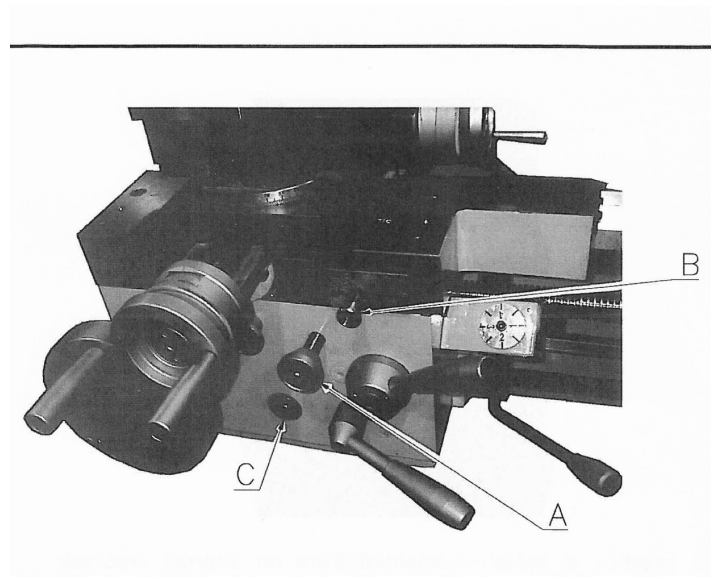


Figure 5-2: Apron lubrication

5.4 General lubrication

- Besides the pump-fed lubrication, oil points are provided for the saddle, cross-slide, cross-slide nut and top-slide (compound slide) screw. Use a standard pump-type oil can with light machine oil or way lubricant.
- Oil the tailstock oiler points daily with a standard oil can.
- After each period of work, clean the slideways, leadscrew and feed shaft (a bristle paint brush is useful for this) and oil them lightly.

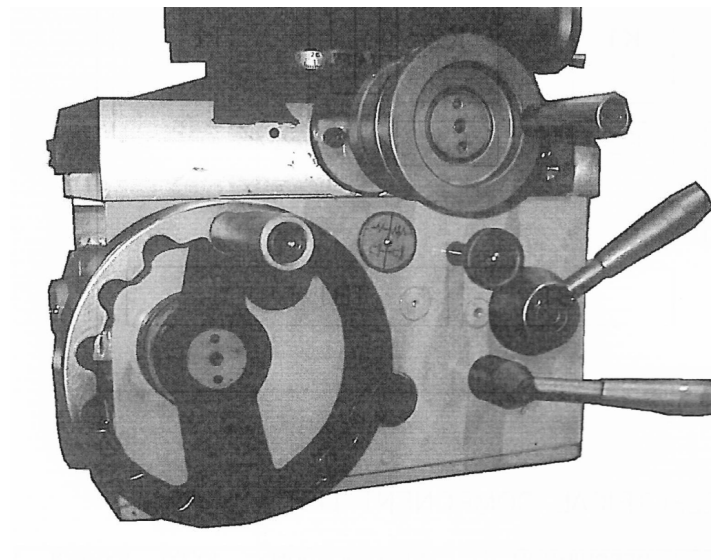


Figure 5-3: Daily oiling points

6 Service and Maintenance

6.1 Lathe alignment

With the lathe installed and running, check the machine alignment before you start work. Check the levelling and alignment at regular intervals to keep the lathe accurate.

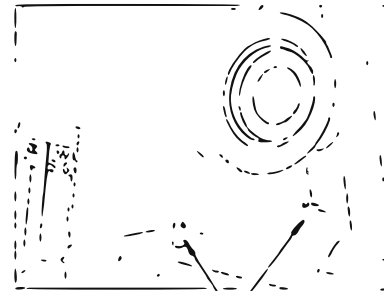
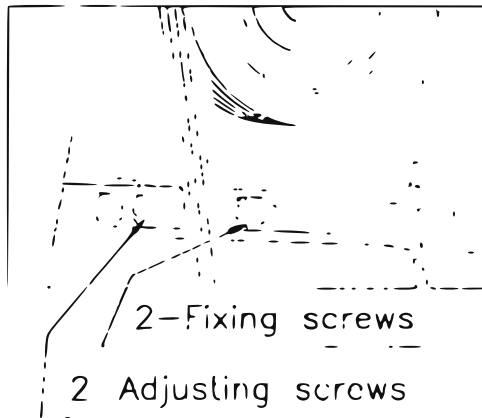
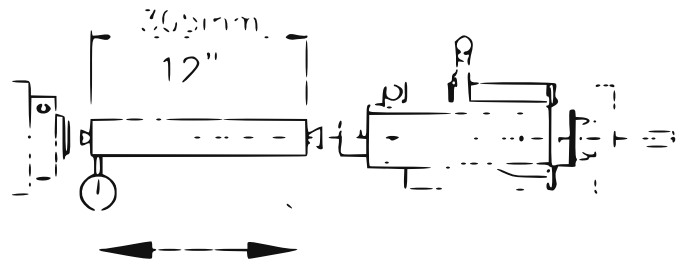
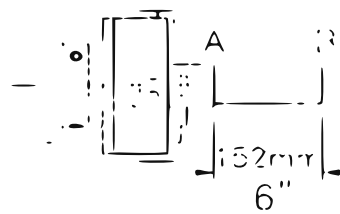
6.1.1 Headstock check

- 1 Take a light cut with a keen tool over a 6" (150mm) long, 2" dia. (50mm) steel bar gripped in the chuck and not supported at the free end.
- 2 Measure the turned length with a micrometer at each end (A and B). The readings must be the same.
- 3 To correct a difference, slacken the four headstock hold-down screws (J) and adjust the screws on the rib and rear beneath the headstock.
- 4 Tighten all screws after adjustment.
- 5 Repeat the test cut and micrometer readings until the readings are identical.

6.1.2 Tailstock check

- 1 Fit a 12" (305mm) ground steel bar between the headstock and tailstock centres.
- 2 Fit a dial test indicator to the topslide and traverse it along the centre line of the bar (lower sketch in Figure 6-1).
- 3 To correct an error, release the tailstock clamp lever and adjust the set-over screws.
- 4 Continue checking and correcting until the alignment is perfect.

is perfect.



(J) 2-Hex. socket head bolts

Figure 6-1: Headstock and tailstock alignment checks

6.2 End gear train

A gear train inside the headstock end-guard carries the drive from the headstock to the gearbox. The intermediate gears are carried on an adjustable swing-frame (M), shown in Figure 6-2.

- Clean the gears thoroughly before fitting.
- Keep the backlash at 0.005" (0.127mm) for correct meshing.
- Lubricate the gears regularly with thick oil or grease.



DRIVEN BELTS

Swing-frame (M)

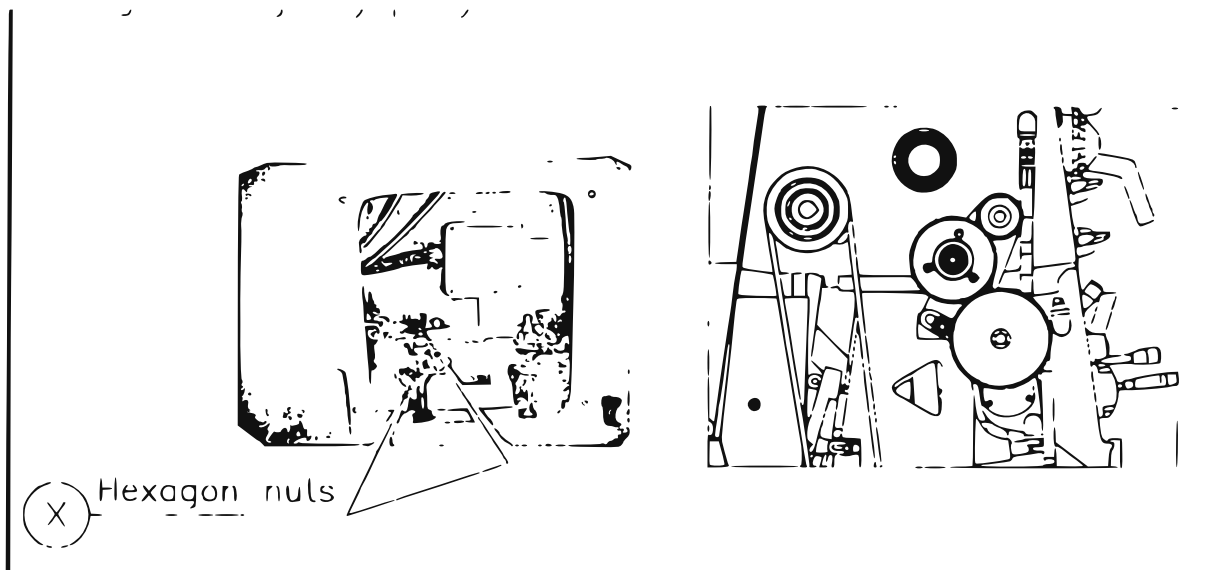
To alter belt tension, remove the cover plate in back of the

Figure 6-2: End gear train and swing-frame

6.3 Drive belts

- 1 Remove the cover plate at the back of the headstock plinth.
- 2 Adjust the two screws (X) on the hinged motor platform to change the belt tension.
- 3 Make sure that the motor is correctly aligned with the lathe axis.
- 4 Check the tension: light finger pressure midway between the motor and headstock pulleys must give about 3/4" (19mm) movement of each belt.

NOTE The oil pump drive belt is tensioned automatically by its own spring-loaded jockey pulley.



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Figure 6-3: Drive belt adjustment

6.4 Leadscrew shear pin

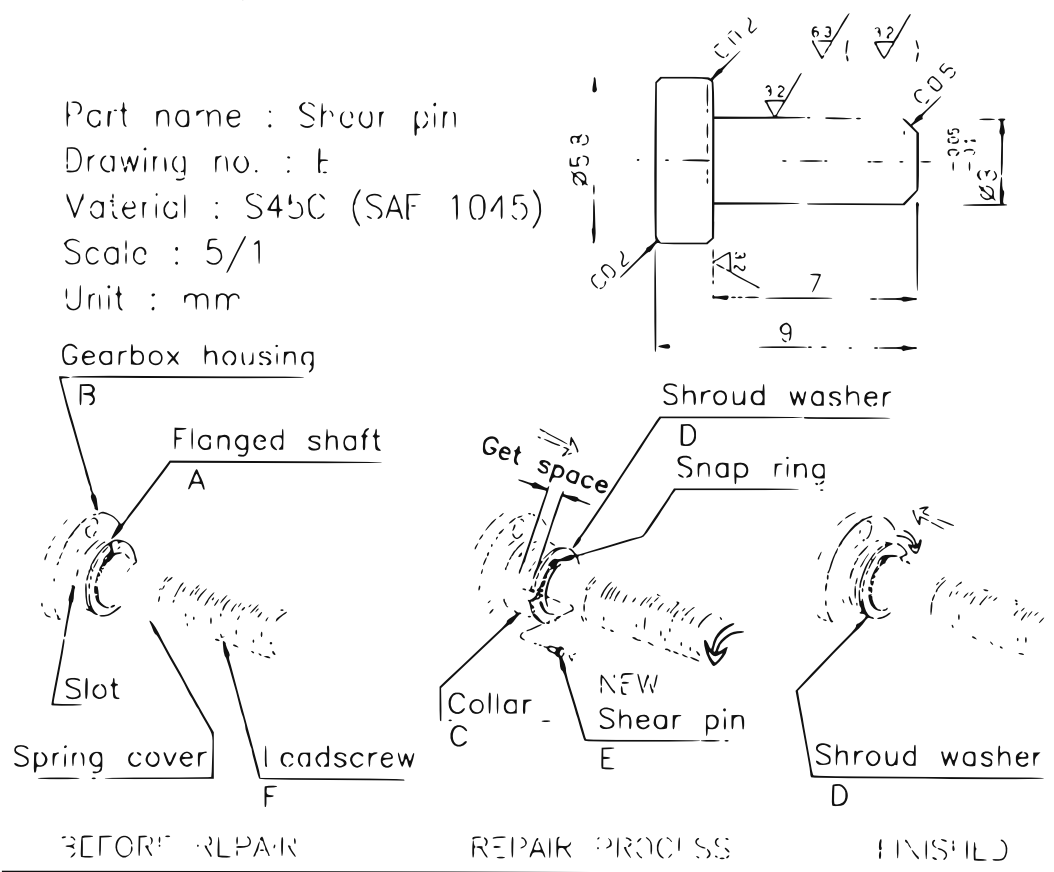
A shear pin in the leadscrew drive, just in front of the gearbox, protects the transmission against severe overload. To replace a sheared pin:

- 1 Disengage the drive to the leadscrew (F) by setting the right-hand lever of the gearbox to position Y.
- 2 Rotate the flanged shaft (A), which carries the broken pin, to the slot at the bottom of the gearbox housing (B).
- 3 Press the spring-loaded collar (C) to the right and push the pin into the slot.
- 4 Rotate the shroud washer (D) to expose the pin head, and remove the pin from the collar (C).
- 5 Line up the holes in the flanged shaft (A), collar (C) and shroud washer (D).
- 6 Insert the new shear pin, and turn the shroud washer to cover and retain it.

■ CAUTION

Use only correct replacement shear pins, made of 1/8 in. diameter steel of 30 ton tensile strength.

DIAMETER STEEL, 30 TON TENSILE STRENGTH ONLY.



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Figure 6-4: Shear pin replacement (shear pin: drawing no. E, material S45C (SAE 1045), scale 5/1, unit mm)

6.5 Headstock clutch adjustment

Worn clutch discs reduce the torque. When this happens, adjust the clutches as shown below.

NOTE Make sure that the main drive belts are correctly tensioned (6.3) before you adjust the clutches.

- 1 Isolate the main power supply.
- 2 Set the apron clutch control lever to neutral.
- 3 Remove the cover (board) from the rear of the headstock (Figure 6-5).
- 4 Slide back the knurled lock ring (D) to disengage it, and rotate one clutch in the direction of the arrow to tighten it (Figure 6-6).
- 5 Slide the lock ring forward to lock the setting.
- 6 Check the performance. When correctly set, the clutches accelerate the spindle from rest to top speed within 3 to 4 seconds, with a 3-jaw chuck fitted and no workpiece.

■ WARNING

Over-adjustment causes serious damage to the clutches or operating mechanism, with no gain in performance.

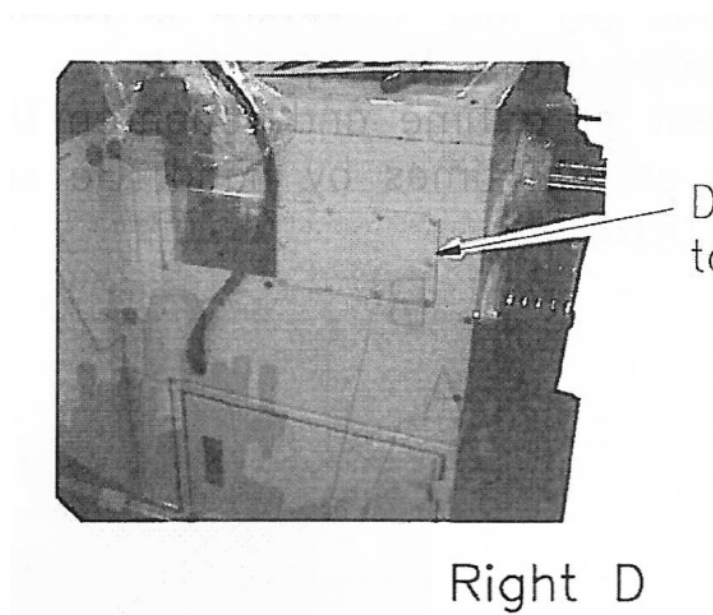


Figure 6-5: Remove the board to adjust the clutch

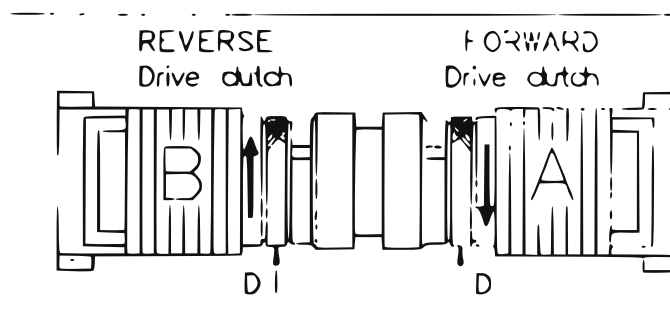


Figure 6-6: Drive clutches and lock rings

6.6 Cross-slide nut

The cross-slide nut is adjustable to take up slackness that may develop after long service. To reduce backlash:

- 1 Slacken the rear cap-head screw in the top of the cross-slide (A).
- 2 Carefully screw in the centre screw (B) to adjust the wedge inside the split nut. Make only a small adjustment at a time.
- 3 Retighten the screw (A) before you operate the cross-slide.
- 4 Operate the cross-slide several times by hand. Make sure that it moves smoothly over its full travel.

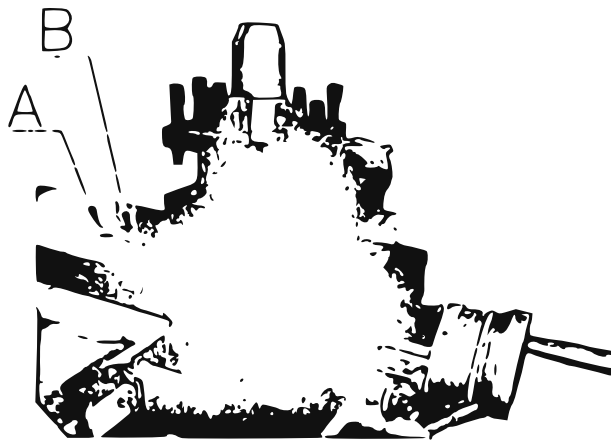


Figure 6-7: Cross-slide nut adjusting screws

6.7 Slideway attention

Tapered gib strips are fitted to the slideways of the saddle, cross-slide and top (compound) slide, so that any slackness that develops can be taken up.

- 1 Clean and lubricate the slideways thoroughly before adjustment.
- 2 Reset the gibs: slacken the rear gib screw, then tighten the front screw a little at a time.
- 3 Check constantly for smooth action over the full slide travel.

■ CAUTION

Avoid over-adjustment. It increases the wear rate and gives a stiff or jerky action.

7 Electrical

7.1 Layout of the electrical box

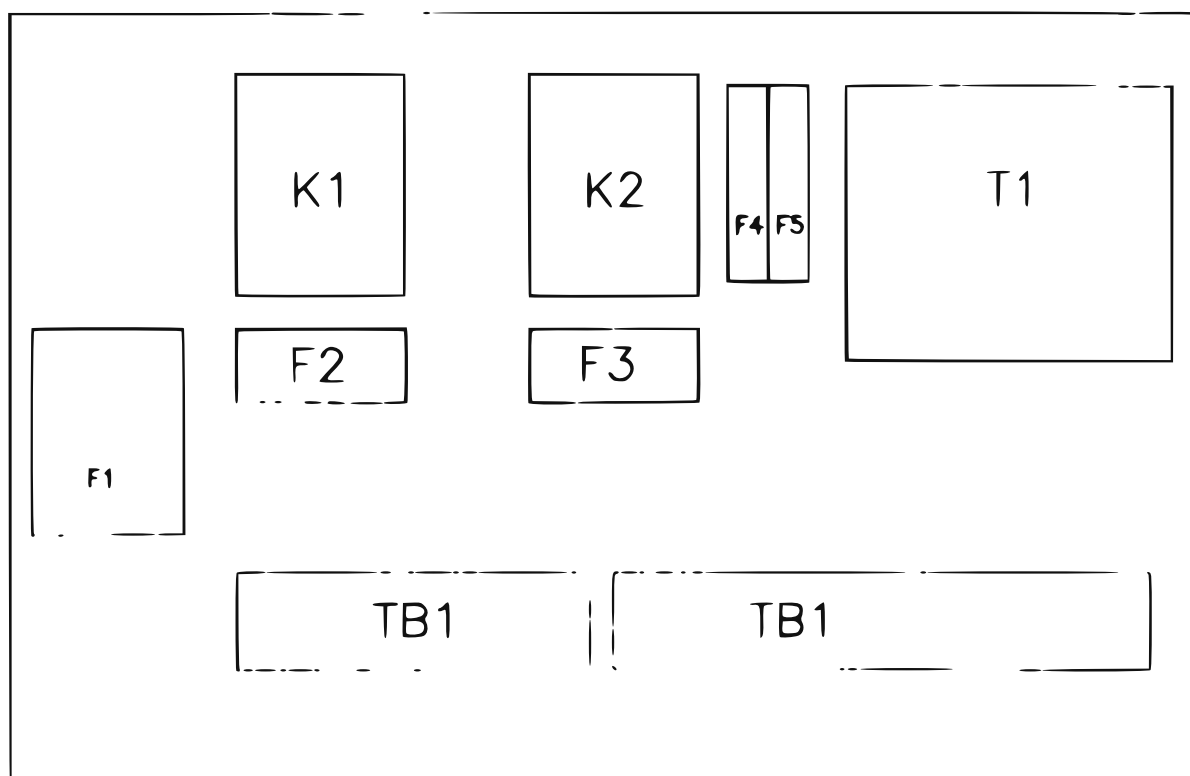


Figure 7-1: Layout of the electrical box

7.2 Electrical component list

Table 7-1: Electrical component list, 7.5HP 220V

Description	Specification	Qty	Symbol
AC magnetic switch	TENLC1D256B7	1	K1
AC magnetic switch	TENLC1D096B7	1	K2
Over relay	TENLR3D326	1	F2
Over relay	TENLR3D036	1	F3
Main fuse base	TFU-303 3P50A	1	F1
Fuse base	TFBR-102 2P10A	1	F4, F5
Micro switch	TM-1307	1	LS1
E-Stop	ALEPB-22-1B	1	E-STOP
Spindle motor stop	APB-22-1B-R	1	SPB1
Spindle motor run	NFLPB-1A-30V-G	1	PB1
Coolant stop	APB-22-1B-R	1	SPB2
Coolant run	NFLPB-1A-30V-G	1	PB2
Power lamp	ALPL-22-30V-W	1	POWER LAMP
Transformer	140VA	1	T1
Terminal board	TB-25A-6P	1	TB2
Terminal board	TB-15A-12P	1	TB1

7.3
Electrical circuit diagram

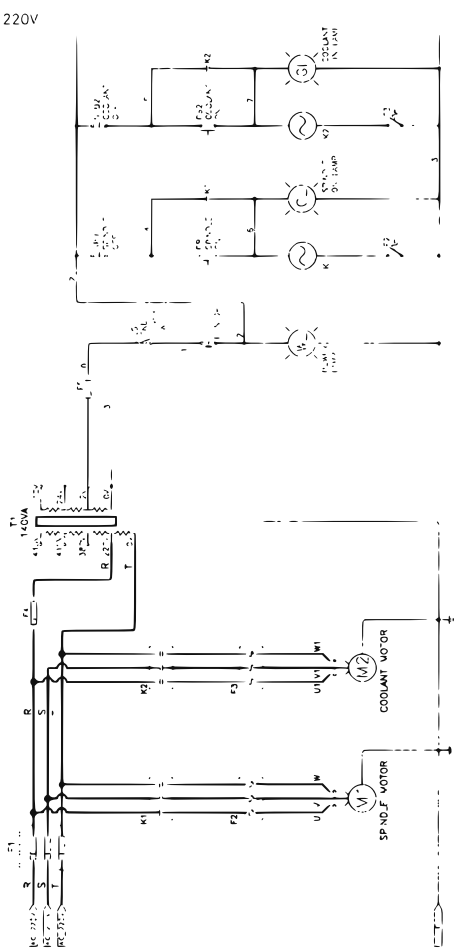


Figure 7-2: Electrical circuit diagram, 7.5HP 220V

8 Spare Parts

This chapter lists the spare parts for each assembly. Each table is followed by its exploded view; the key numbers in the table match the callouts on the drawing. When you order parts, quote the machine serial number, the assembly, the key number, the part number and the part name.

- Where a part has metric and imperial versions, both part numbers are listed against the same key number (suffix -M for metric, -I for imperial).
- Items with no part number are standard fasteners or bought-in components. Order them by the size or type in the Remark column.
- Remarks in the original were partly in Chinese. They are given here in English where they add information; remarks that only repeated the part name are left out.
- Key numbers listed in the original with no part are kept as blank rows.

NOTE Machines built with the 2024 headstock: use Chapter 9 for the headstock instead of 8.2.

8.1 Hardware code names

The headstock drawings label standard hardware with a two-digit code followed by its size (for example 02|M6x20 is a hexagon socket head bolt, M6x20). Table 8-1 lists the codes.

Table 8-1: Hardware code names

Code	Description
01	Hexagon head bolt
02	Hexagon socket head bolt
03	Set screw
04	Flat hexagon screw
05	Dome cross screw
06	Flat cross screw
07	Washer
08	Spring washer
09	Hexagon nut
10	Nylon jam nut
11	Snap ring (S: for shaft, R: for hole, E-type)
12	O ring (P: dynamic, G: static)
13	Key
14	S key
15	Woodruff key
16	Spring pin
17	Taper pin
18	Straight pin
19	Split pin
20	Oil ball
21	Oil seal
22	Steel ball
23	Grease cap
24	Square head plug
25	Female elbow
26	Nipple
27	Nylon tube
28	Oil cap
29	Oil sight
30	Oil cover
31	Net hose
32	Hose clamp
33	V-belt
34	Ball bearing
35	Taper roller bearing
36	Needle bearing
37	Thrust bearing

Code	Description
38	Band cable chain
39	Clutch
40	Rivet
41	Handle
42	Brake cable
43	Locking washer
44	Angular ball bearing
45	Precision locknut
46	Double cylindrical bearing
47	Dome hexagon screw
48	Power ring
49	Male elbow
50	Hexagon bushing
51	Hose fitting
52	Quarter joint
53	Hexagon connector
54	Flexible tube
55	Gauge tube
56	Aluminium tube
57	Hydraulic power chuck
58	Rotary hydraulic cylinder
59	Timing belt
60	Pipe clip
61	Oil distributor
62	B-oil distributor
63	Bronze ball valve
64	Male hose bib fitting
65	Wing nut
66	Oil filter
67	Coolant hose with SS
68	Coolant nozzle
69	Coolant conduit
70	Coolant pump
71	Pneumatic cylinder
72	Hydraulic cylinder
73	Hydraulic high pressure hose
74	Limit switch
75	Encoder

Code	Description
76	Servo motor
77	Induction motor
78	Hexagon socket head plug
79	Electric lubricator
80	Switch dog

8.2 Headstock assembly

NOTE This section covers the original headstock. Machines built with the 2024 headstock use Chapter 9, which replaces this section, the headstock drawings in Figures 8-1 to 8-7 and Table 8-2.

The original headstock parts list gives part numbers, names and remarks only: it has no key numbers or quantities. The headstock drawings identify each part by its part number. Pairs marked 'Assembly for replacement' are supplied together.

Table 8-2: Headstock parts list (-15)

Part No.	Part Name	Remark
10001	Headstock	
10002	Headstock cover	
10003-D6	Spindle	For D1-6
10003-A6	Spindle	For A1-6
10004	Pulley	
10005	Washer $\varnothing 44.5 \times t6$	
10006	Shaft A	
10007	BS collar $\varnothing 48 \times t7.5$	
10008	Collar $\varnothing 30 \times t24$	
10009	Flanged bearing	
10011	Clutch	Assembly for replacement
10012	Gear 27T	Assembly for replacement
10014	Gear 31T	
10016	Washer $\varnothing 38 \times t5$	
10017	BS collar $\varnothing 40 \times t4$	
10018	Brake housing	
10019	Brake bush	
10020	Brake pieces	
10021	Spring $\varnothing 9 \times 18.5$	
10022	Bakelite brake	
10023	Support shaft	
10026	Collar	
10027	Gear 26T	
10028	Shaft B	
10029	Cover C	
10030	Flanged bearing	
10031	Shaft C	
10032	Gear 27T	
10033	Collar $\varnothing 34 \times t24$	
10034	Gear 23T	
10036	Gear 27T	
10037	Gear 19T	
10038	Collar $\varnothing 34 \times t22$	
10039	Gear 31T	
10041	Cover D	
10043	Gear 16T & shaft D	
10044	Washer $\varnothing 34 \times t8$	

Part No.	Part Name	Remark
10045	Gear 40T	Assembly for replacement
10046	Gear 25T	Assembly for replacement
10047	Gear 35T	
10048	Collar ø30 x t26	
10049	Gear 16T & shaft E	
10050	Shaft E	
10051	Gear 32T	
10052	Washer ø52 x t1	
10053	Gear 30T	Assembly for replacement
10054	Gear 34T	Assembly for replacement
10055	Gear 38T	Assembly for replacement
10056	Gear 26T	Assembly for replacement
10057	Gear 21T	Assembly for replacement
10058	Gear 40T	Assembly for replacement
10059	Plug CE	
10060	Gear 75T	
10061	Gear 56T	
10062-D6	Front bearing cover	For D1-6
10062-A6	Front bearing cover	For A1-6
10062-P	Packing	
10065	Outside cover	
10065-P	Packing	
10066	Gear 42T	
10067	Gear 42T	Assembly for replacement
10068	Gear 21T	Assembly for replacement
10069	Shaft G	
10070	Washer ø30 x t6	
10071	Washer ø19.05 x t6	
10072	Gear 21T	Assembly for replacement
10073	Gear 42T	Assembly for replacement
10074	Shaft H	
10076	Collar ø97 x t23	
10078	Collar ø43 x t3.5	
10079	Collar ø38 x t3.5	
10080	Gear 21T	
10081	Shaft I	
10082	Gear 21T	
10083	Shaft J	

Part No.	Part Name	Remark
10084	Flanged bearing J	
10089-D6	Spring $\varnothing 9 \times 22$	For D1-6
10090-D6	Hex. socket hd bolt	For D1-6
10091-D6	Cams	For D1-6
10098-A6	Driver pin	For A1-6
12001	Nipple	
12002	Oil distributor	
13001	Roller	
13002	Pin pivot	
13003	Bush	
13004	Sleeve	
13005	Shaft CLH	
13006	Washer $\varnothing 25 \times t2.8$	
13007	Washer $\varnothing 25 \times t3$	
13008	Collar	
13009	Shift lever	
13011	Shift fork	
13012	Swing plate	
13013	Pivot screw M10	
13015	Spring $\varnothing 16 \times 120$	
13016	Fixed screw M10	
13017	Fixed plate	
13042	Cross lever	
20001	Lever frame	
20002	Cam support	
20003	Outer drum cam	
20004	Inner plate cam	
20005	Cam shaft I	
20006	Cam shaft O	
20007	Speed selector B	
20008	Speed selector S	
20009	Spring $\varnothing 11 \times 120$	
20011	Washer $\varnothing 19 \times t3.5$	
20013	Rubber plug	
20014	Lever 3	
20015	Slide rod 1	
20016	Linking collar	
20017	Guide rod	

Part No.	Part Name	Remark
20018	Action pin L	
20019	Action pin S	
20020	Fork E1	
20021	Fork E2	
20022	Lever 4	
20023	Slide rod 2	
20024	Lever 1	
20025	Lever 2	
20026	Fork E3	
20027	Pivot bolt M12	
20028	Guide block	
20029	Locking pin	
20030	Spring $\varnothing 8 \times 15$	
20031	Fork D	
20032	Shift lever J	
20033	Shift lever G	
20034	Extend rod	
20035	Shift pawl	
20036	Shaft FR	
20037	Shaft HL	
20038	Collar $\varnothing 48 \times t13.5$	
20039	Handle	
20041	Washer $\varnothing 19 \times t4$	
20051	Spring $\varnothing 6 \times 20$	
61001	Thread chart	
61024	Pilot plate	
61025	Speed plate	
61026	Positive plate	
61034	Oil distributor	
61034-P	Packing	

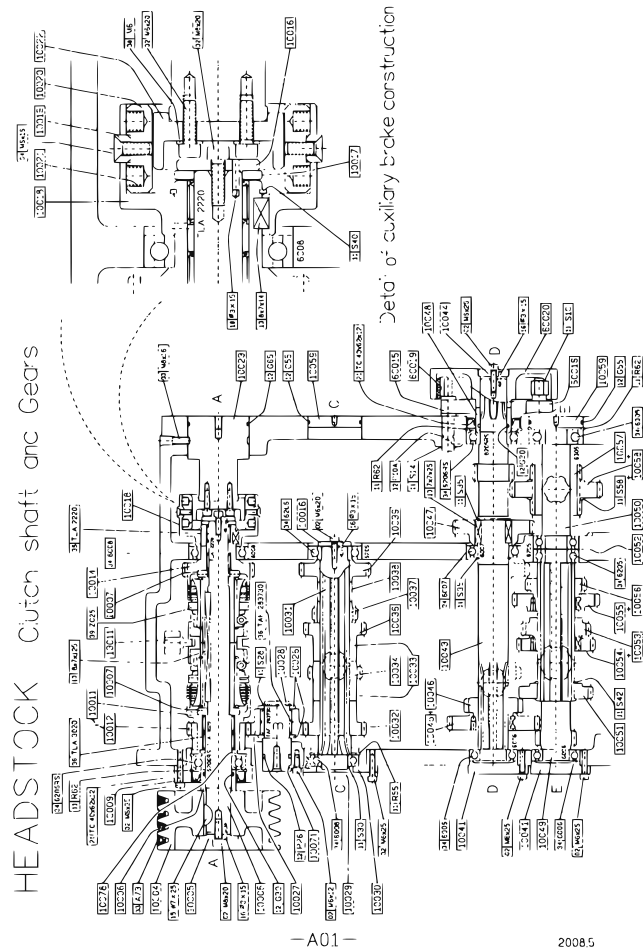


Figure 8-1: Headstock: clutch shaft and gears, with detail of auxiliary brake construction

HEADSTOCK

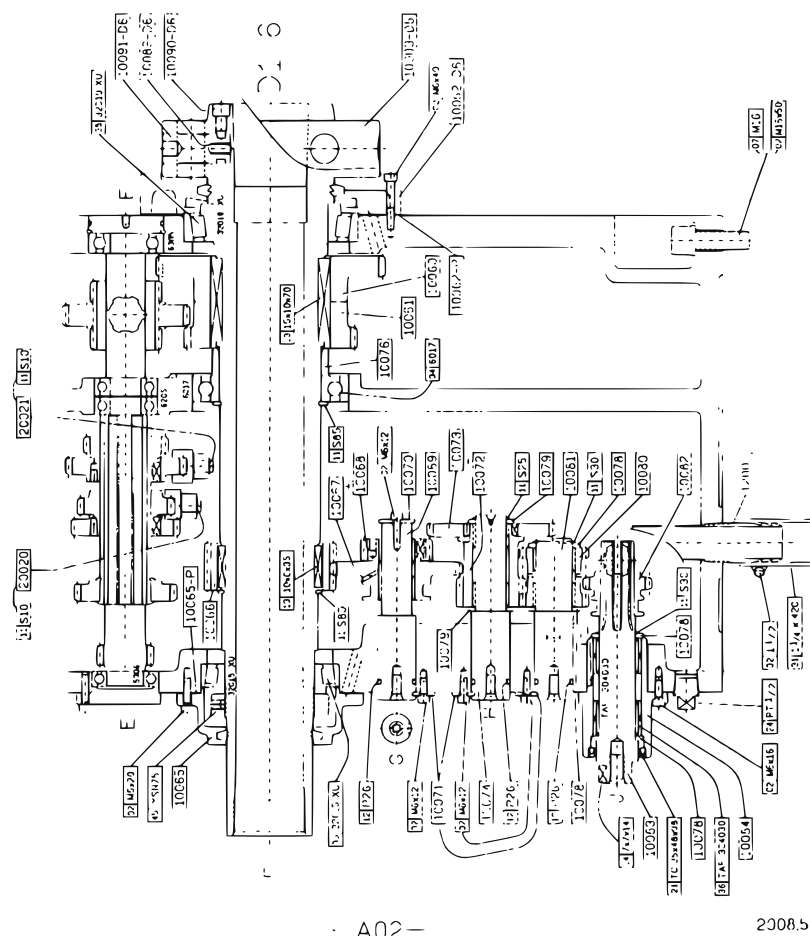


Figure 8-2: Headstock: spindle and gears (D1-6)

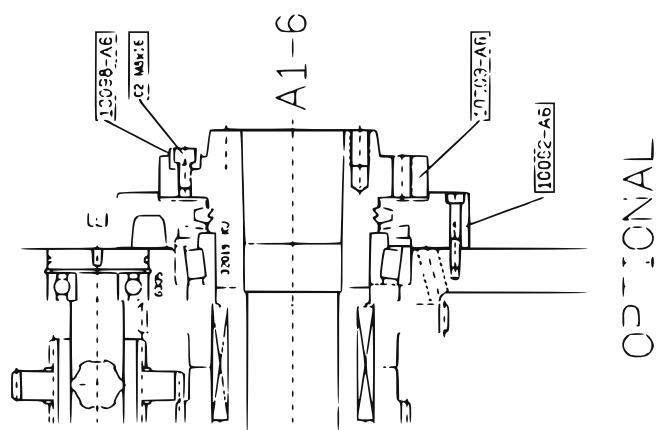


Figure 8-3: Headstock: spindle nose, A1-6 (optional)

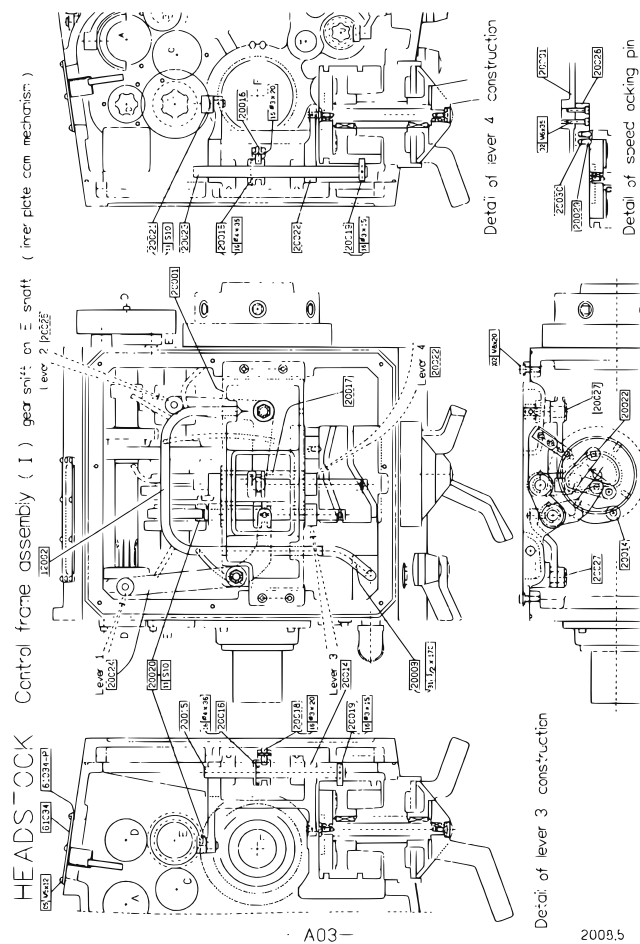


Figure 8-4: Headstock: control frame assembly (I), gear shift on E shaft (inner plate cam mechanism), with details of levers 3 and 4 and the speed locking pin

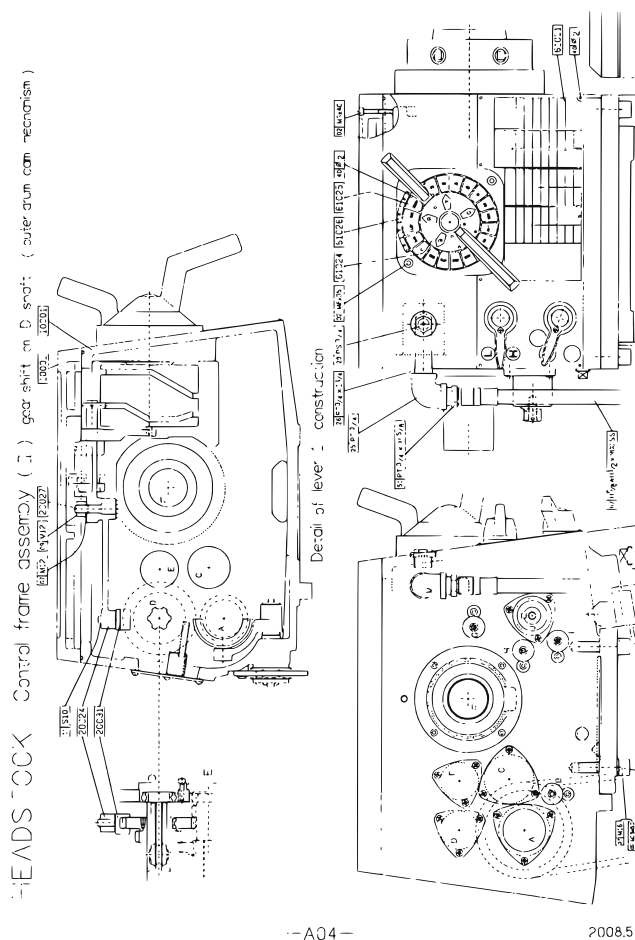


Figure 8-5: Headstock: control frame assembly (II), gear shift on D shaft (outer drum cam mechanism), with detail of lever 1

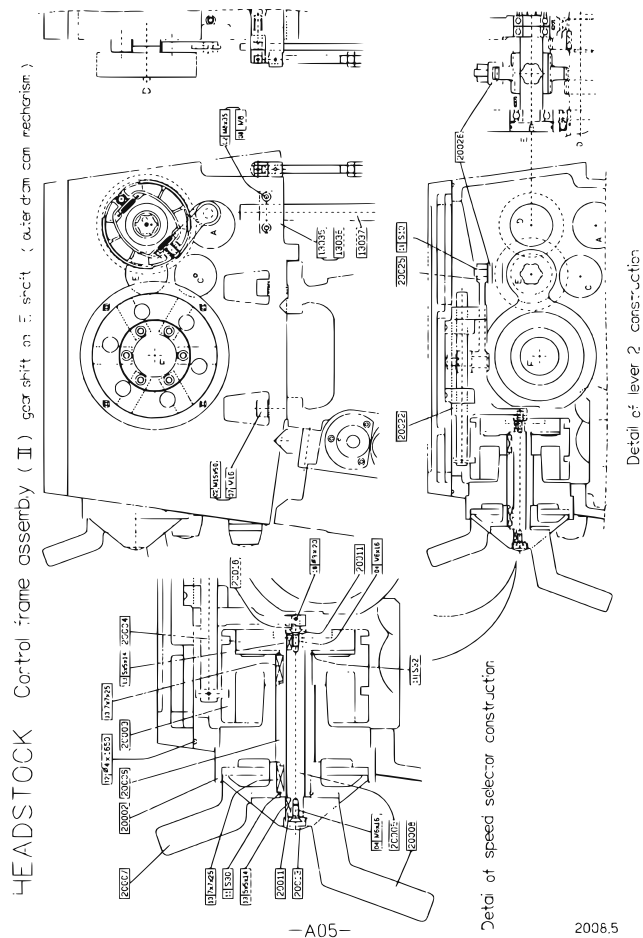


Figure 8-6: Headstock: control frame assembly (III), gear shift on E shaft (outer drum cam mechanism), with details of lever 2 and the speed selector

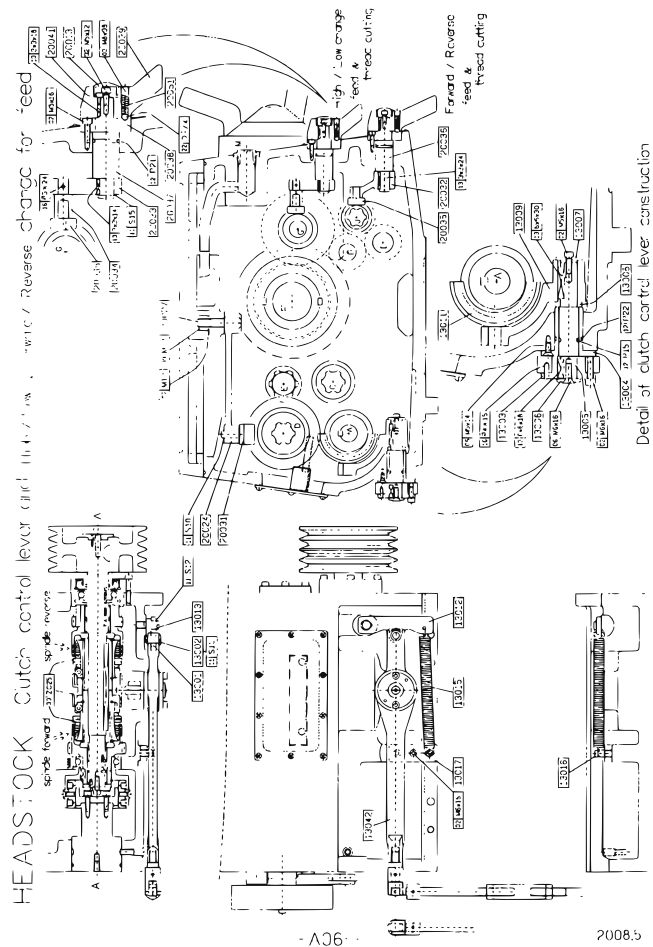


Figure 8-7: Headstock: clutch control lever and High/Low, Forward/Reverse change for feed, with detail of the clutch control lever

8.3 Gearbox assembly (-15")

Table 8-3: Gearbox assembly (-15-02)

Key No.	Part No.	Part Name	Qty	Remark
1	30003	Shaft	1	
2	30088	Washer	1	
3		Oil seal	1	25x35x05
4		Bearing	2	TAF25/20
5	30004	Flanged bearing	1	
6	30005	Washer	1	
7		Clip	4	S25
8		Key	1	7x7x35
9	30006	Gear	1	19T/19T
10	30007	Shaft	1	
11	30021	Cover	1	
12		Bearing	5	16005
13	30013	Washer	1	
14	30023	Gear	1	30T/20T
15	30024	Washer	1	
16		Clip	1	S30
17	30022	Shaft	1	
18	30040	Gear	1	22T
19	30039	Shaft	1	
20		Key	1	6x6x25
21	30001	Gearbox body	1	
22	30008	Washer	1	
23	30009	Gear	1	32T
24	30010	Gear	1	23T
25	30011	Gear	1	16T
26	30012	Washer	1	
27		Clip	6	R47
28		Bearing	3	6204
29	30014	Clutch	1	
30	30015	Washer	1	
31		Clip	2	S20
32	30017	Gear	1	35T
33	30025	Gear	1	22T
34	30026	Gear	1	16T
35	30027	Gear	1	20T
36	30028	Gear	1	24T

Key No.	Part No.	Part Name	Qty	Remark
37	30029	Gear	1	23T
38	30030	Gear	1	27T
39	30031	Gear	1	24T
40	30032	Gear	1	28T
41	30033	Gear	1	26T
42	30034	Gear	1	32T
43	30035	Nut	1	
44		Clip	1	S22
45	30037	Gear	1	18T/45T
46	30040	Gear	1	22T
47	30041	Gear	1	22T
48	30042	Gear	1	22T
49	30043	Gear	1	33T
50	30044	Gear	1	22T
51	30005	Washer	1	
52	30045	Gear	1	36T
53	30018	Washer	1	
54	30020	Flanged bearing	1	
55		Oil seal	2	28x40x05
56	30089	Clip	1	S28
57	30016	Shaft	1	
58	30038	Flanged bearing	1	
59	30090	Washer	1	
60	30036	Shaft	1	
61		Key	1	5x5x35
62		Bearing	1	16003
63		Clip	1	S17
64	30046	Flanged bearing	1	
65	30002-P	Seal	2	
66	30059	Upper plate	1	
67	30060	Fork support	1	
68		Spring pin	8	M3
69	30058	Fork	1	
70		Spring	4	
71		Steel ball	4	1/4"
72		Spring pin	8	5x16
73	30061	Partition	3	
74	30062	Fork support	1	

Key No.	Part No.	Part Name	Qty	Remark
75	30057	Fork	1	
76	30063	Fork support	1	
77	30056	Fork	1	
78	30064	Fork support	1	
79	30058	Fork	1	
80				
81				
82	30069	Reverse-stop	1	
83		Spring washer	4	
84	30068	Shoulder plate	1	
85	30065	Fixed plate	2	
86	30066	Partition nut	2	
87	30067	Spacer	2	
88		Set screw	3	SET 8x8
89		Spring	3	
90		Steel ball	3	1/4"
91	30051	Lever	3	
92	30048	Fork	1	
93		Spring pin	3	4x24
94		Set screw	3	SET 6x6
95	30055	Selector bar	1	
96	30053A	Shaft	3	
97		Key	3	4x4x15
98	30049	Fork	1	
99	30050	Fork	1	
100		Washer	2	
101	30002	Gearbox cover	1	
102		Oil sight	1	
103	30077	Handle	3	
104		Washer	3	
105	30086	Plug	1	
106	30071	Selector lever	1	
107		O-ring	2	G40
108	30073	Selector lever support	1	
109	30072	Spring	1	
110	30074	Selector lever	1	
111				
112		O-ring	1	G30

Key No.	Part No.	Part Name	Qty	Remark
113	30075	Selector lever cover	1	
114	30076	Specifying base	1	
115		Square head plug	1	3/4"
116		Elbow	1	3/4"
117		Nipple	1	3/4"
118		Pin	1	6 x 35
119				
120				
121				
122				
123				
201		Hex. socket head bolt	12	CAP 6x16
202		Square head plug	1	1/2"
203		Elbow	1	1/2"
204		Nipple	1	1/2"
205		Set screw	1	SET 6x6
206		Hex. socket head bolt	4	CAP 8x20
207		Hex. socket head bolt	2	CAP 6x16
208		Hex. socket head bolt	2	CAP 6x35
209		Hex. socket head bolt	3	CAP 5x25
210		Spring pin	2	5x16
211		Hex. socket head bolt	2	CAP 6x20
212		Hex. socket head bolt	3	CAP 5x12L

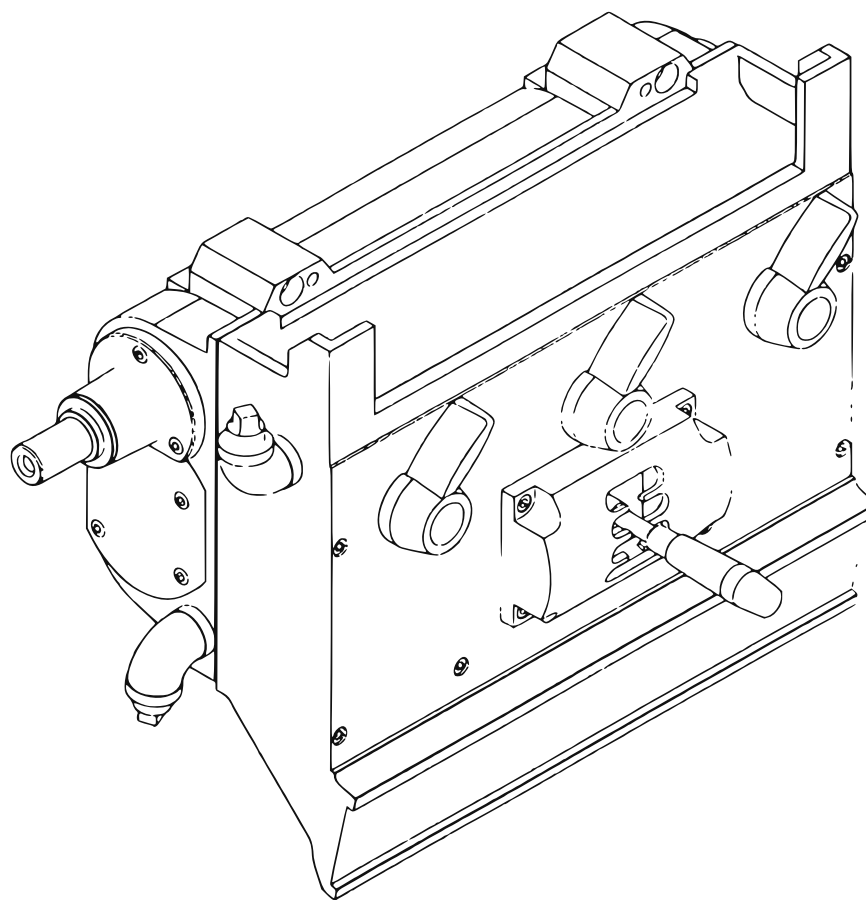


Figure 8-8: Gearbox assembly

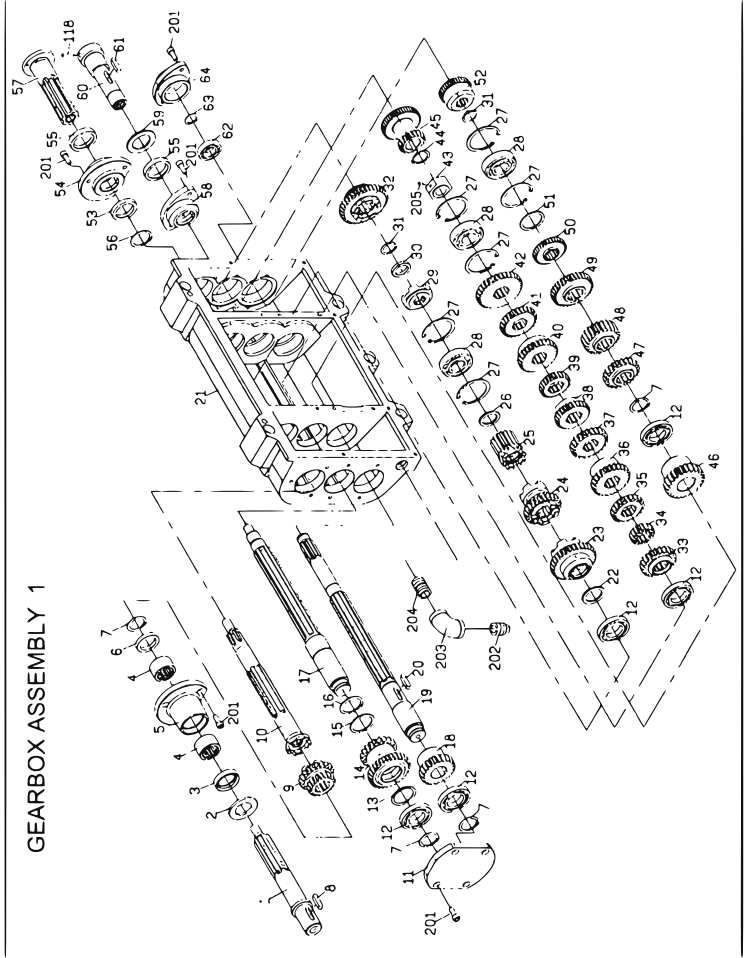


Figure 8-9: Gearbox assembly 1

8.4 Apron (L.H.) assembly

Table 8-4: Apron (L.H.) assembly (-15-03)

Key No.	Part No.	Part Name	Qty	Remark
1	40012	Handle	1	Handle bolt
2	40011	Handle	1	Handwheel handle
3		Set screw	1	SET 6x25
4	40014	Bolt	1	Handwheel lock bolt
5	40010	Hand wheel	1	
6		Steel ball	6	1/4"
7	40004	Spring	3	Compression spring
8	40007-M	Index ring	1	
8	40007-I	Index ring	1	
9		Flat hexagon screw	2	5x12
10	40005-ML	Shaft liner	1	
10	40005-MR	Shaft liner	1	
10	40005-IL	Shaft liner	1	
10	40005-IR	Shaft liner	1	
11		Woodruff key	1	5x19
12	40003-L	Gear shaft	1	Gear shaft (A)
12	40003-R	Gear shaft	1	Gear shaft (A)
13	40120	Plug	1	
14		Snap ring	1	S15
15	40025	Collar	1	
16		Ball bearing	1	6202LR
17		Snap ring	1	S22
18	40020	Gear	1	56T
19		Ball bearing	1	60005LU
20	40017	Gear shaft	1	Gear shaft (B)
21		Rivet	2	2.8x10
22	40023	Name plate	1	Thread-cutting feed instruction plate
23	40022	Shaft	1	Shaft C
24		Snap ring	5	S16
25	40027	Collar	2	Spacer
26	40026	Gear	1	15T/33T
27	40021	Collar	1	
28	40028	Shaft	1	Shaft D
29		Needle bearing	2	TLA1616
30	40029	Gear shaft	1	
31		Needle bearing	2	TLA3016

Key No.	Part No.	Part Name	Qty	Remark
32	40030	Gear	1	24T
33	40031	Gear	1	24T
34	40032	Worm wheel	1	
35		Snap ring	1	S30
36	40033	Collar	1	Shaft D retaining collar
37	40035	Name plate	1	Feed instruction plate
38	40034	Shaft	1	Shaft E
39	40036	Gear	1	24T
40	40024	Collar	2	Spacer
41	40037	Shaft	1	Shaft F
42	40038	Gear	1	24T/26T
43		Spring pin	3	4x24
44	40081	Handle	1	
45	40080	Sleeve	1	Feed engagement handle
46		Key	1	4x4x25
47		O ring	3	P18
48	40122	Pad	1	Spacer
49	40113	Elasticity pole	1	
50		Snap ring	1	S18
51		Flat hexagon screw	3	6x16
52	40045	Washer	1	
53		Set screw	3	SET8x8
54	20022	Spring	2	
55	40042	Handle	1	
56	40041-L	Lead nut lever	1	Half-nut handle seat
56	40114	Lead nut lever	1	Half-nut handle seat
57		O ring	1	P21
58		Key	1	5x18
59	40040-L	Cam shaft	1	
59	40112-R	Cam shaft	1	
60		Set screw	1	SET 10x40
61	40001-L	Apron	1	Apron body
61	40001-R	Apron	1	Apron body
62		Set screw	3	SET 6x8
63	40006	Spring	1	
64		Set screw	1	SET 10x16
65	40083	Spring	2	
66	40087	Pin	1	Spring pin

Key No.	Part No.	Part Name	Qty	Remark
67	40084	Pin	1	Locating pin
68		Oil sight	1	
69		Hexagon socket head bolt	2	CAP 6x12
70	40049	Adjust plate	1	
71		Hexagon socket head bolt	17	CAP6x16
72	40047	Pin	2	Cam pin
73	40048	Slide plate	1	
74	40046-M	Half nut	1	
74	40046-I	Half nut	1	
75		Hexagon socket head bolt	1	CAP 6x30
76		Set screw	1	SET 6x30
77		Hexagon socket head bolt	1	CAP 6x25
78		Oil seal	2	30x40x5
79	40053	Sleeve	2	Oil seal sleeve
80		O ring	2	G40
81		Thrust bearing	3	NTB3047/AS2
82	40055-L	Bracket	1	Worm bracket
82	40108-R	Bracket	1	Worm bracket
83	40054A	Pinion	1	
84	40119	Spacer	1	
85		Spring pin	1	4x20
86	40090	Pin	1	
87		Set screw	1	SET5x25
88	40085	Pin	1	Locating pin
89	40086	Pin	1	Spring pin
90	40088	Spring	1	Tension spring
91	40091	Nut	1	
92		Key	1	5x5x45
93	40057	Shaft	1	Worm shaft
94	40058	Worm	1	
95	40059	Clutch	1	
96	40056	Clutch gear	1	
97	40060	Lever arm	1	
98	40063	Washer	1	Spring washer
99	40064	Spring	1	Worm compression spring
100	40065	Washer	1	Spring washer
101		Thrust bearing	2	NTB1528/AS2
102	40066	Flanged bearing	2	Thrust bearing housing

Key No.	Part No.	Part Name	Qty	Remark
103		Spring pin	2	5x28
104	40070	Pin	1	
105	40068	Plate	2	Pressure plate
106	40115	Washer	1	
107		Nylon jam nut	1	M10
108		Spring pin	1	4x24
109	40061	Trip rod	1	
110		Set screw	1	SET 6x14
111		Nylon jam nut	1	M6
112	40116	Washer	1	
113	40062	Spring	1	Trip rod compression spring
114	40117	Washer	1	
115		Nylon jam nut	1	M12
116	40071	Nut	1	Adjusting nut
117		Spring pin	1	3x16
118	40073	Rod	1	Adjusting rod
119	40072	Washer	1	
120		Spring pin	2	3x24
121	40074	Coupling	1	
122	40075	Shaft	1	Adjusting shaft
123		O ring	2	P21
124	40077	Washer	1	
125		Spring pin	1	5x36
126	40078	Sleeve	1	Adjusting sleeve
127	40089-L	Plate	1	Bottom cover
127	40110-R	Plate	1	Bottom cover
128		Hexagon socket head plug	1	PT1/4"
129		Steel ball	1	3/8"
130		Set screw	1	SET 10x10

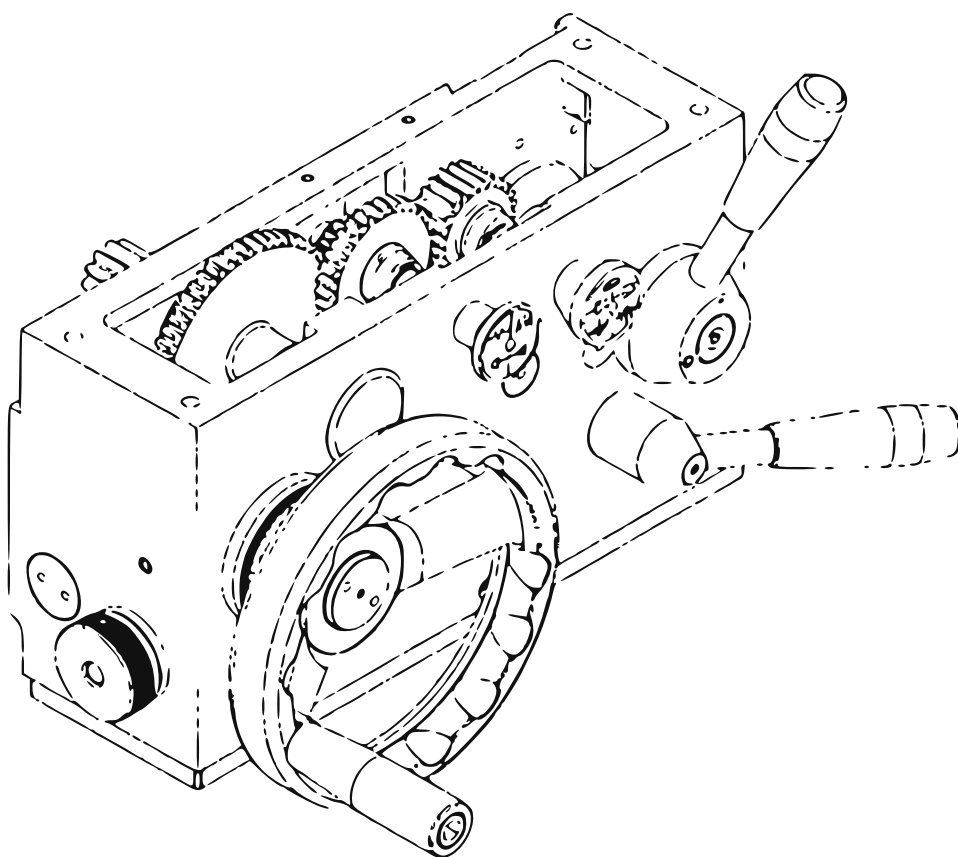


Figure 8-11: Apron (L.H.) assembly

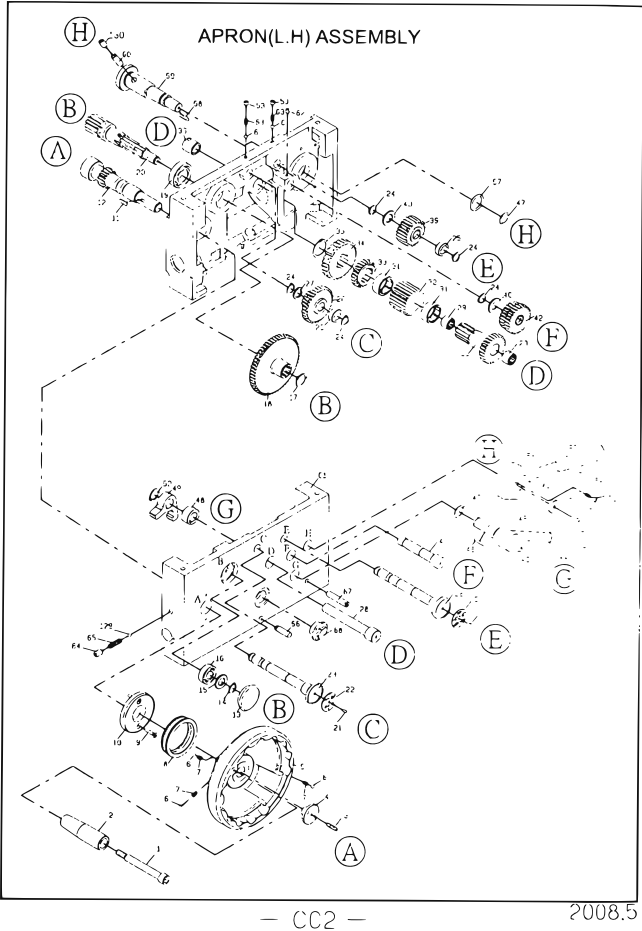


Figure 8-12: Apron (L.H.) assembly, exploded view 1

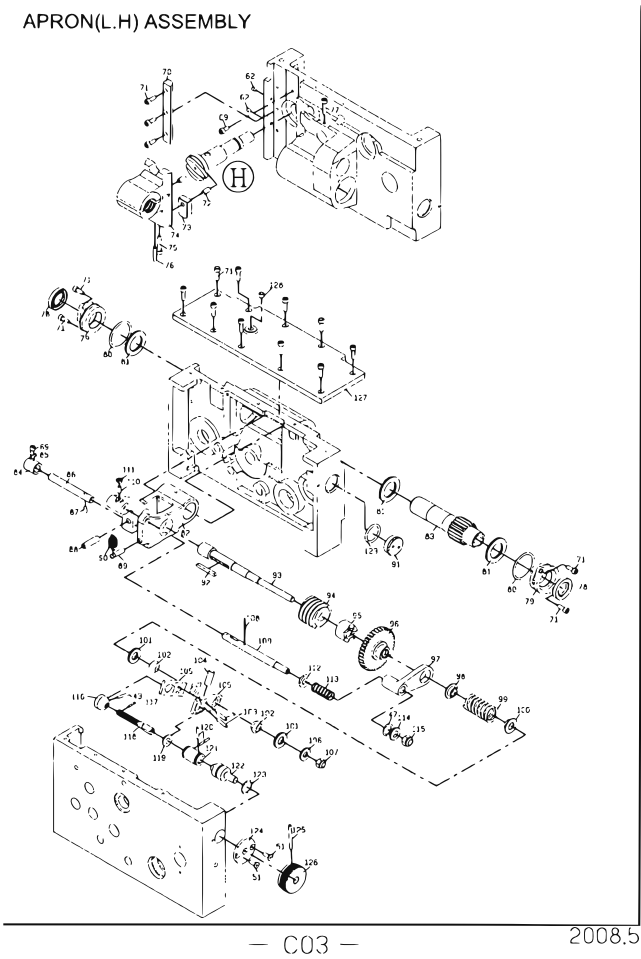


Figure 8-13: Apron (L.H.) assembly, exploded view 2

8.5 Threading dial indicator assembly

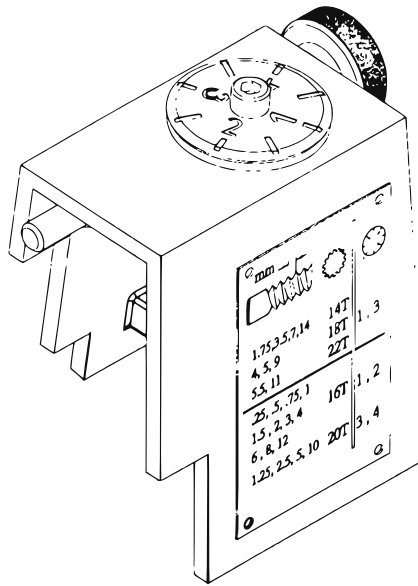


Figure 8-14: Threading dial indicator assembly

8.5.1 Metric (leadscrew pitch 6)

Table 8-5: Threading dial indicator, metric (leadscrew pitch 6) (-15-04)

Key No.	Part No.	Part Name	Qty	Remark
1	40049	Pilot plate	1	
2	40048	Gear pivot	1	
3	40092	Body	1	
4	40094	Nut	1	
5	40052	Stud	1	
6	40074-M	Threading plate	1	for METRIC
7	40058	Gear	1	22T
8	40057	Gear	1	20T
9	40056	Gear	1	18T
10	40055	Gear	1	16T
11	40051	Spacer	1	
12	40054	Gear	1	14T
51		Hex. socket head bolt	1	M6x10L
52		Rivet	4	ø2
53		Set screw	1	M6x6L
54		Hexagon nut	1	M8
55		Spring pin	1	ø3x10L

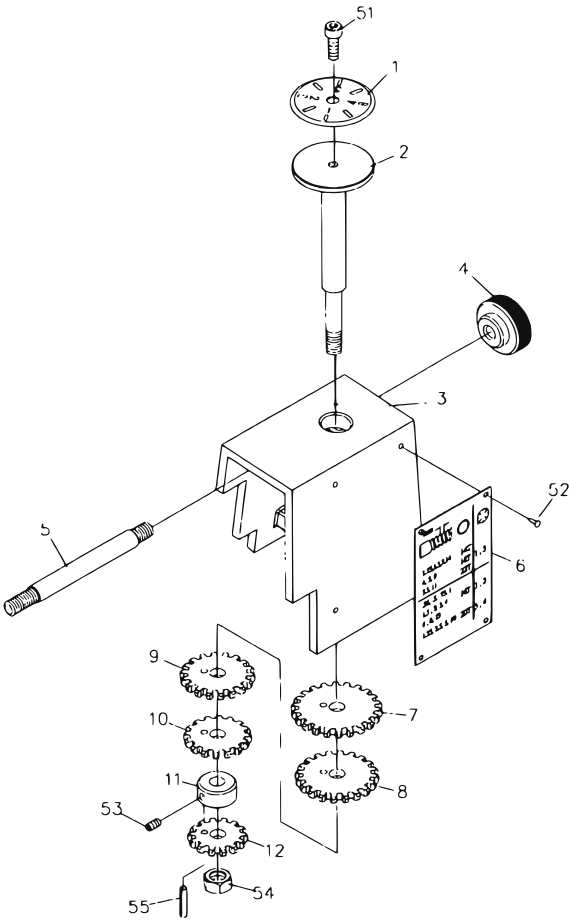


Figure 8-15: Threading dial indicator, metric (leadscrew pitch 6)

8.5.2 Imperial (leadscrew 4 T.P.I.)

Table 8-6: Threading dial indicator, imperial (leadscrew 4 T.P.I.) (-15-04)

Key No.	Part No.	Part Name	Qty	Remark
1	40049	Pilot plate	1	
2	40048	Gear pivot	1	
3	40092	Body	1	
4	40094	Nut	1	
5	40052	Stud	1	
6	40074-I	Threading plate	1	for IMPERIAL
7	40050	Spacer	1	
8	40059	Dial gear	1	16T
51		Hex. socket head bolt	1	M6x10L
52		Rivet	4	
53		Set screw	1	M6x6L
54		Hexagon nut	1	M8

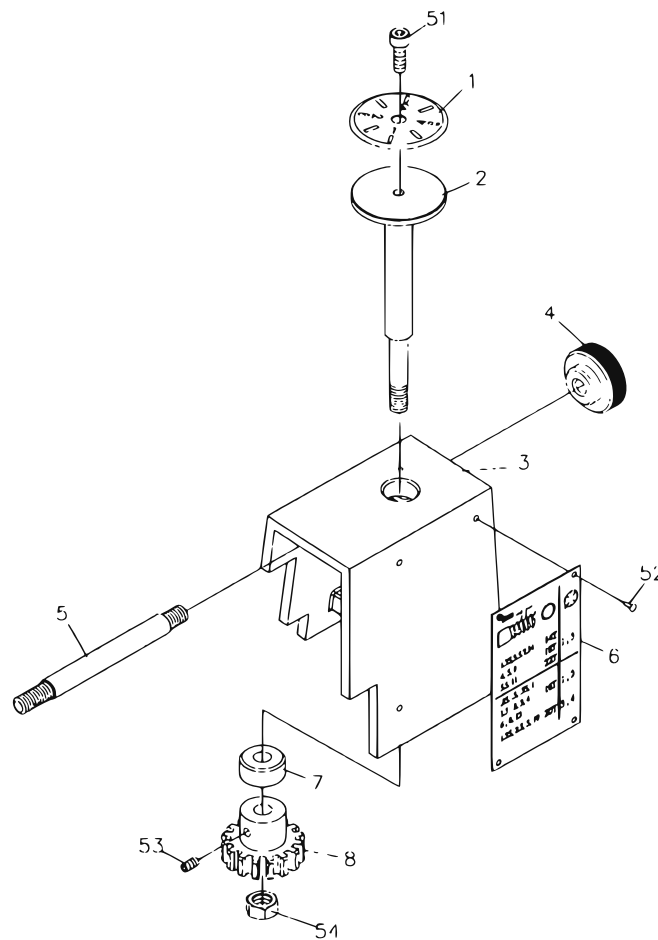


Figure 8-16: Threading dial indicator, imperial (leadscrew 4 T.P.I.)

8.6 Four-way toolpost

Table 8-7: Four-way toolpost (-15/05)

Key No.	Part No.	Part Name	Qty	Remark
1	50074	Handle	1	Toolpost handle
2	50073	Turret nut	1	
3		Thrust bearing	1	51104
4	50072	Collar	1	Spacer
5	50075	Bolt	12	Toolpost screw
6	50068	Turret body	1	
7	50071	Turret shaft	1	
8	50069	Pin	1	Locating pin
9	50067	Spring	1	
10	50070	Nut	1	
11	50005-M	Solid topslide	1	
11	50005-I	Solid topslide	1	
12	50053	Gib	1	
13	50054	Screw	2	Adjusting screw
14	50004	Swivel	1	
15	50034-M	Nut (MET.)	1	
15	50034-I	Nut (ENG.)	1	
15	50036-M	Screw (MET.)	1	Leadscrew
15	50036-I	Screw (ENG.)	1	Leadscrew
16		Key	1	4x4x15
17		Thrust bearing	2	NTB/AS2 1730
18	50026	Spring	4	
19	50035	Keep assy	1	Screw bracket
20	50040-M	Dial (MET.)	1	Collar
20	50040-I	Dial (ENG.)	1	Collar
21	50038-M	Dial (MET.)	1	Graduated ring
21	50038-I	Dial (ENG.)	1	Graduated ring
22	50041-M	Handle	1	Handwheel
22	50041-I	Handle	1	Handwheel
23	50037	Handle	1	
24	50042	Screw	1	Bolt
25	50044	Handle	1	Toolpost handle
50		Set screw	2	SET 8x20
51		Set screw	1	SET 8x10
52		Steel ball	5	1/4"
53		Oil ball	1	1/4"

Key No.	Part No.	Part Name	Qty	Remark
54		Set screw	2	SET 6x16
55		Hex. socket head bolt	2	CAP 8x20
56		Set screw	1	SET 6x35

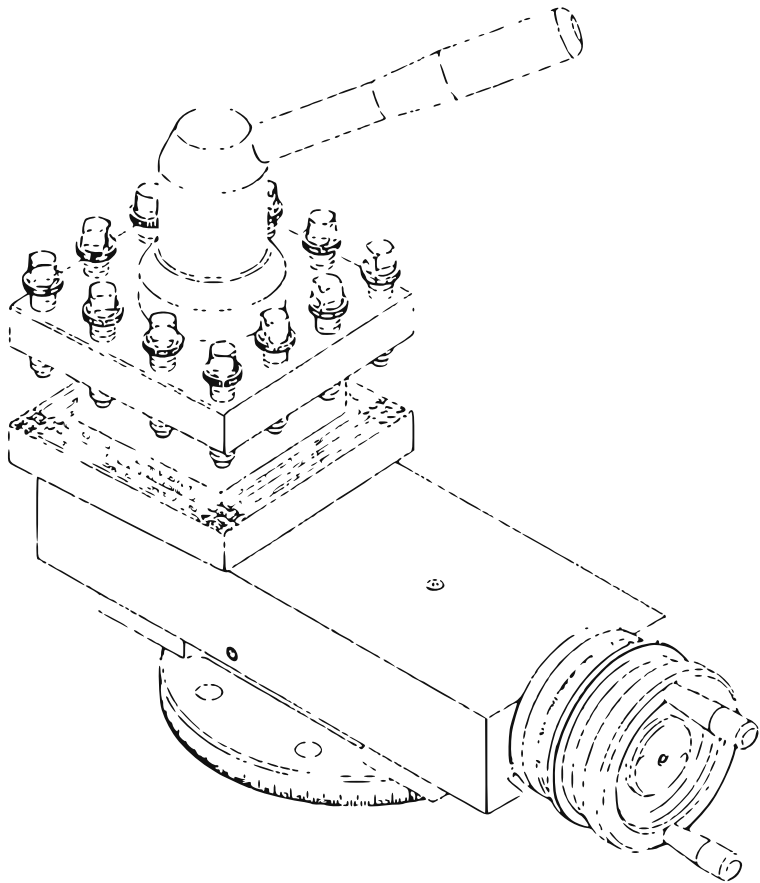


Figure 8-17: Four-way toolpost

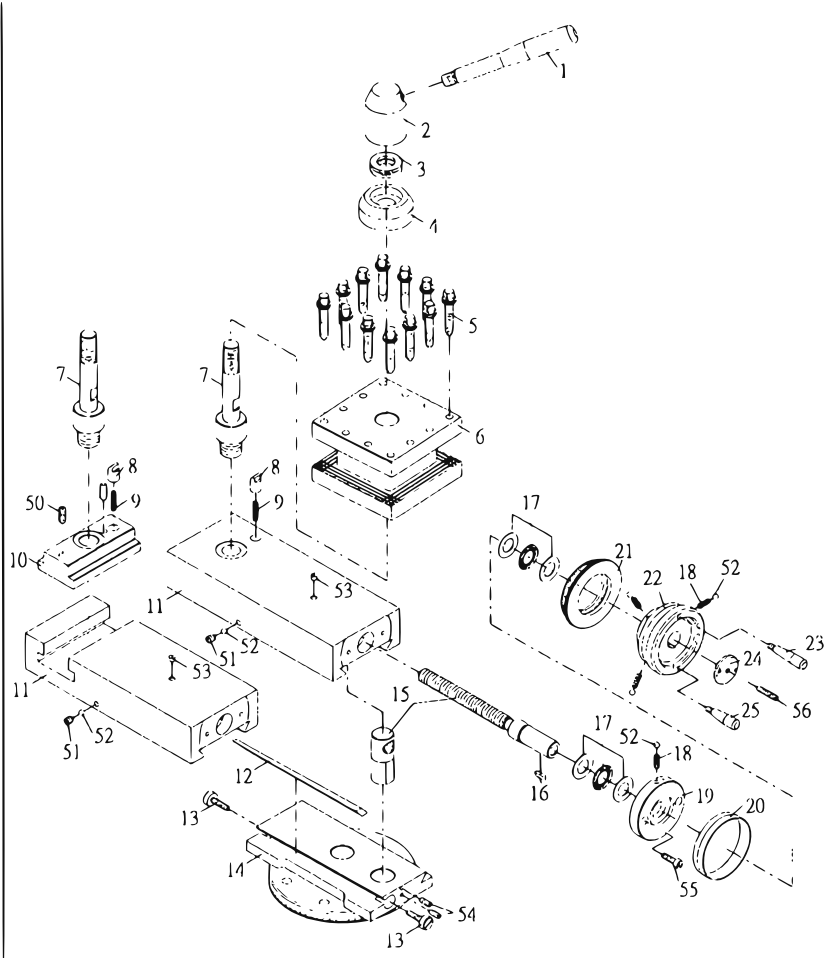


Figure 8-18: Four-way toolpost, exploded view

8.7 Saddle assembly

Table 8-8: Saddle assembly (-15/06)

Key No.	Part No.	Part Name	Qty	Remark
1	50019	Adjust screw	6	
2	50003	Cross slide	1	
3	50032	Pivot	1	ø25x40
4	50033	T bolt	2	
5	50018	Gib-X	1	
6	50078	Wiper-X	1	
7	50077	Plate -X	1	Wiper plate
8		Thrust bearing	2	NTB/AS2 1528
9	50020	Cap collar	2	Bearing cap
10	50021	Wedge	1	7x7x30
11	50014-5M	Nut (MET.)	1	Leadscrew nut
11	50014-5I	Nut (ENG)	1	Leadscrew nut
12	50011-M	Screw (MET.)	1	Leadscrew
12	50011-I	Screw (ENG)	1	Leadscrew
13		Key	1	3x3x115
14		Spring pin	2	ø5x40
15		Spraying pipe	1	PT3/8 x 24"
16		Valve & junction assy.	1	PT3/8
17	50012	Bracket	1	Leadscrew rear bracket
18	50001	Saddle	1	
19	50047	Wiper F	2	
20	50048	Plate F	2	
21		Oil cover	1	NF3/4"
22		Taper pin	2	#6x70L
23	50045	Wiper V	2	
24	50049	Plate V	2	
25	50009	Pinion	1	16T
26		Key	1	3x3x20
27	50101	Bolt	1	M16x5L
28	50010	Keep assy.	1	Leadscrew front bracket
29	50026	Spring	4	ø6x15L
30		Steel ball	4	1/4"
31		Thrust bearing	2	NTB/AS2 2035
32	50024	Washer	1	Spacer
33	50021-M	Dial ring	1	
33	50022-I	Dial ring	1	

Key No.	Part No.	Part Name	Qty	Remark
34	50025-M	Dial (MET.)	1	Graduated ring
34	50025-I	Dial (ENG)	1	Graduated ring
35	50027-M	Hand wheel	1	Feed handwheel
35	50027-X	Hand wheel	1	Feed handwheel
36	50028	Fix screw	1	Leadscrew end bolt
37	50031	Handle	1	Handwheel handle
38	50030	Bolt	1	Handle bolt
39	50052	Gib-Z	2	
40	50051	Front anti-floater	2	
41	50008	Gear	1	16T/36T
42		Straight adapter	2	1/8x ø4
43		AL. tube	1	ø4x258
44		Elbow adapter	2	1/8x ø4
45		AL. tube	1	ø4x121
46		Oil filter	1	ø6
47		AL. tube	1	ø6x170
48		Straight adapter	2	1/8x ø6
49		Lubricator assy.	1	
50	50056	Clamp plate	1	
51	50007	Short shaft	1	Gear shaft
52	50066	Plate	1	Lubricator instruction plate
53	50023	Washer	1	Spacer
101		Oil ball	2	1/4"
102		Set screw	2	SET 6x25
103		Hex. socket head bolt	6	CAP 8x25
104		Washer	2	M10
105		Nut	2	Nylon M10
106		Dome cross screw	13	M5x12
107		Hex. socket head bolt	2	CAP 6x25
108		Nut	1	Nylon M10
109		Hex. socket head bolt	4	CAP10x70
110		Set screw	3	SET 6x8
111		Dome hexagon screw	3	M5x10
112		Hex. socket head bolt	2	CAP 8x20
113		Hex. socket head bolt	8	CAP6x35
114		Flat hexagon screw	2	M5x12L
115		Set screw	1	SET 8x35
116	50055	Hex. socket head bolt	1	CAP12x85

SADDLES ASSEMBLY

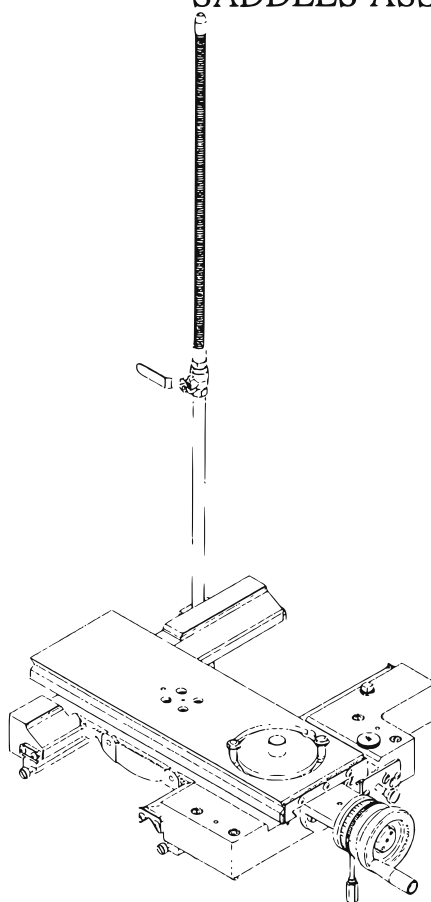


Figure 8-19: Saddle assembly

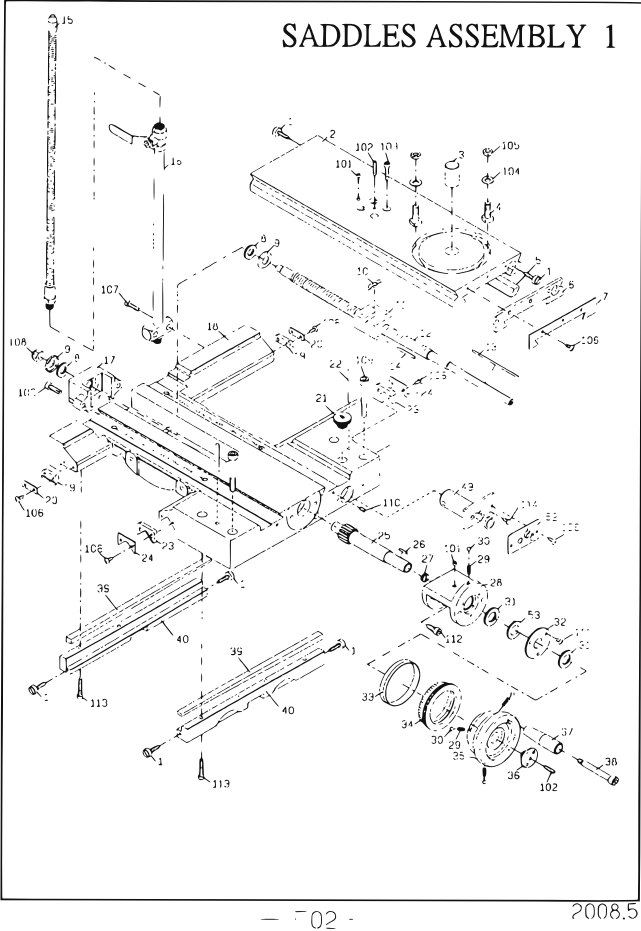


Figure 8-20: Saddle assembly 1

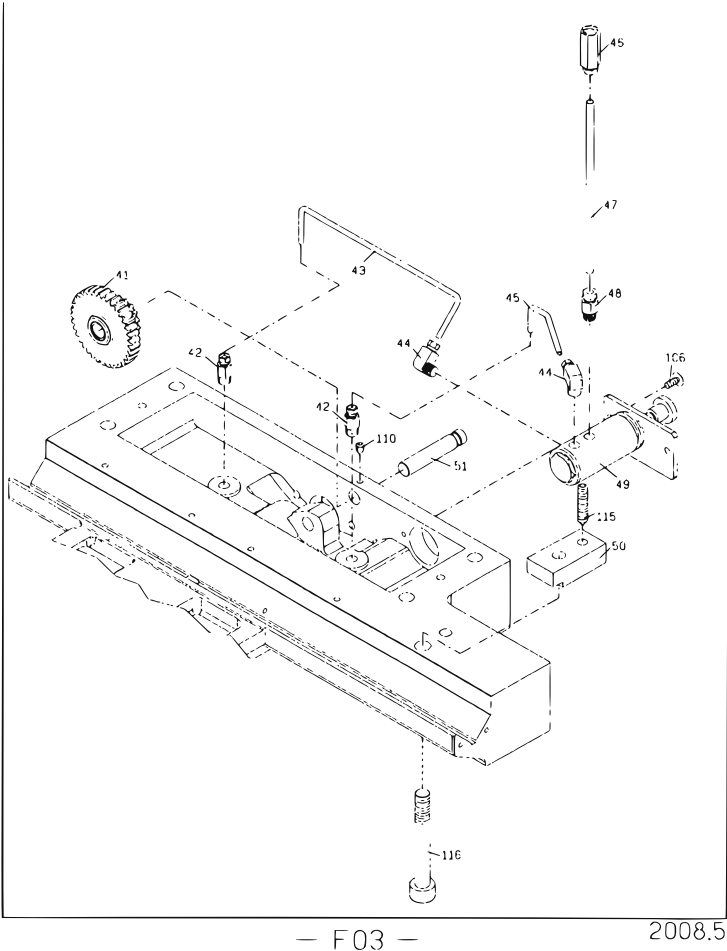


Figure 8-21: Saddle assembly 2

8.8 Bed and shafts assembly

Table 8-9: Bed and shafts assembly (-15-07)

Key No.	Part No.	Part Name	Qty	Remark
1	63001-G	Bed	1	
2	63038	Bolt	1	
3		Hexagon head bolt	8	M16x45
4		Washer	8	
5		Hex. socket head bolt	10	CAP 6x25
6		Spring pin	6	ø6x25
7	63023	Nut	1	
8		Set screw	2	SET 6x8
9		Thrust bearing	2	51105
10	63024	Bracket	1	Leadscrew bracket
11		Oil ball	2	1/4"
12	63025	Plug	1	
13		Set screw	1	SET 12x12
14	10089	Spring	1	
15		Steel ball	1	3/8"
16		Taper pin	2	#7x45
17		Hex. socket head bolt	2	CAP 10x35
18	63040	Knob	2	
19	63020	Handle	1	Starting lever handle
20		Nut	2	M12
21	63019	Pin	2	Locating pin
22	63018	Lever assy	1	
23		Set screw	1	SET 6x12
24	63012	Collar	1	Retaining ring
25	63005-M	Lead screw	1	METRIC
25	63005-I	Lead screw	1	IMPERIAL
26	63011-A	Feed rod	1	
27	63014	Bracket	1	Starting lever bracket
28	63017	Sleeve	1	
29	63016	Spring	1	
30	63015	Spring cover	1	
31		Clip	1	S32
32	63013	Thirg rod shaft	1	Starting lever
33	60045	Bracket	1	Auxiliary starting lever bracket
34		Set screw	1	SET 8x8
35	60046	Handle	1	Auxiliary starting lever handle

Key No.	Part No.	Part Name	Qty	Remark
36		Snap ring	1	E6
37	60031	Connecting rod	1	
38	60030	Pin	1	Straight pin
39		Set screw	1	SET 8x12
40	60028	Connecting rod	1	
41		Taper pin	2	#7x83
42		Key	2	5x5x15
43	63021	Rack	1	
44	63022	Rack	1	Rack with recessed block
45	63006	Spring cover	1	
46	63007	Spring	1	
47		Clip	1	S30
48	63008	Washer	1	
49	63010	Shear pin	1	Hardened pin
50	63009	Collar	1	Inner collar
51		Hex. socket head bolt	3	CAP 10x60

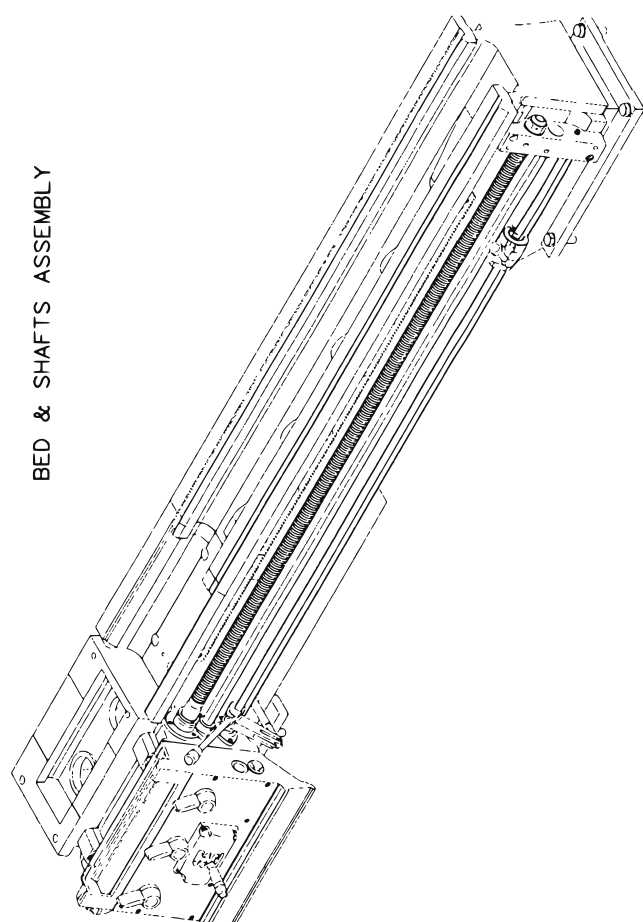


Figure 8-22: Bed and shafts assembly

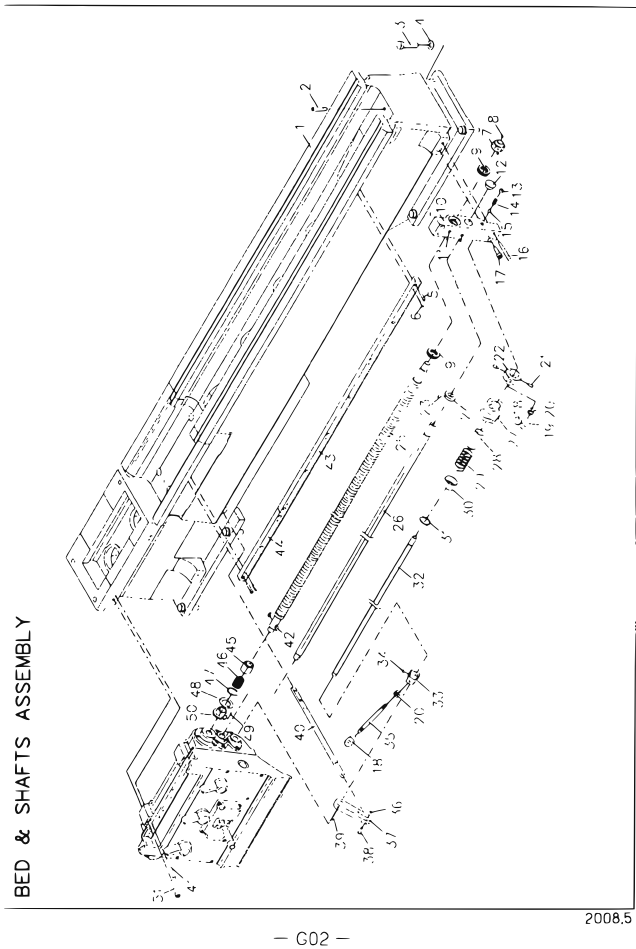


Figure 8-23: Bed and shafts assembly, exploded view

8.9 End gear assembly

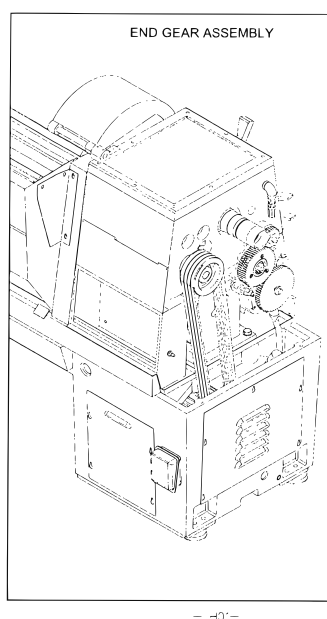


Figure 8-24: End gear assembly

8.9.1 End gear, metric

Table 8-10: End gear, metric (-15)

Key No.	Part No.	Part Name	Qty	Remark
1		Hexagon head bolt	2	M12x25
2	60003	Washer	6	
3	15-60001	Gear	1	28T
4	15-60010	Swing frame	1	Bracket
5		Nut	4	M14
6		Clip	2	R47
7		Ball bearing	2	6005Z
8	60005	Collar	1	Spacer
9	15-60004-M	Gear	1	54T/55T
10	60007	Shaft	1	
11	60009	Shaft	1	Gear shaft
12		Key	1	7x7x35
13	60011	Bolt	1	Stud M14x110
14	15-60012-M	Gear	1	64T
15	15-60002-M	Gear	1	22T

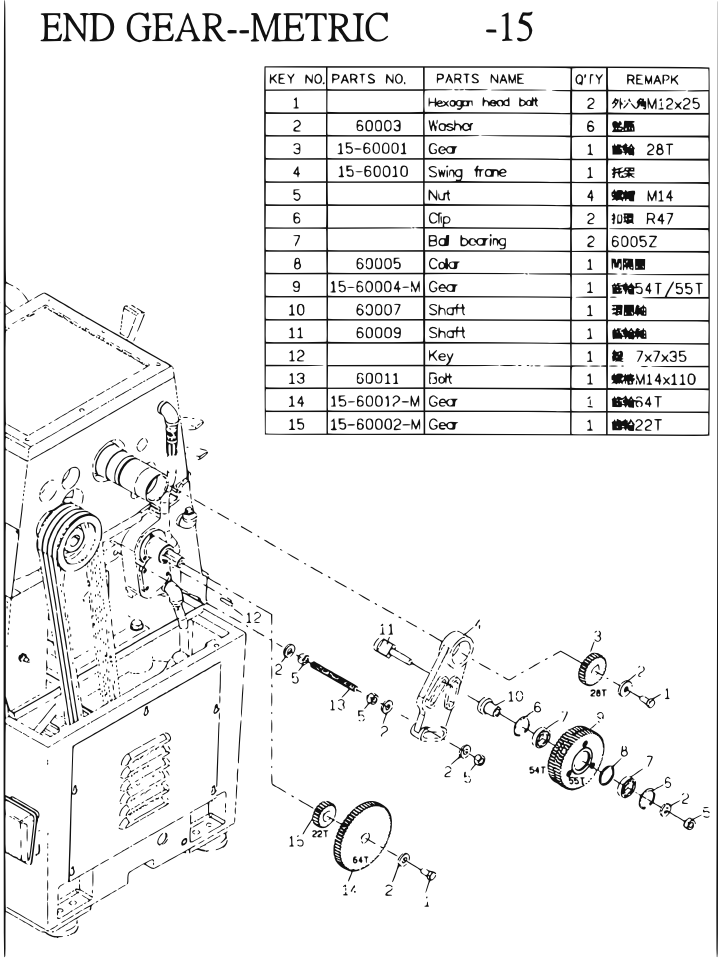


Figure 8-25: End gear, metric

8.9.2 End gear, imperial

Table 8-11: End gear, imperial (-15)

Key No.	Part No.	Part Name	Qty	Remark
1		Hexagon head bolt	2	M12x25
2	60003	Washer	6	
3	15-60001-I	Gear	1	24T
4	15-60010	Swing frame	1	Bracket
5		Nut	4	M14
6		Clip	2	R47
7		Ball bearing	2	6005Z
8	60005	Collar	1	Spacer
9	15-60004-I	Gear	1	44T/56T
10	60007	Shaft	1	
11	60009	Shaft	1	Gear shaft
12		Key	1	7x7x35
13	60011	Bolt	1	Stud M14x110
14	15-60012-I	Gear	1	57T
15	15-60044-I	Collar	1	Spacer

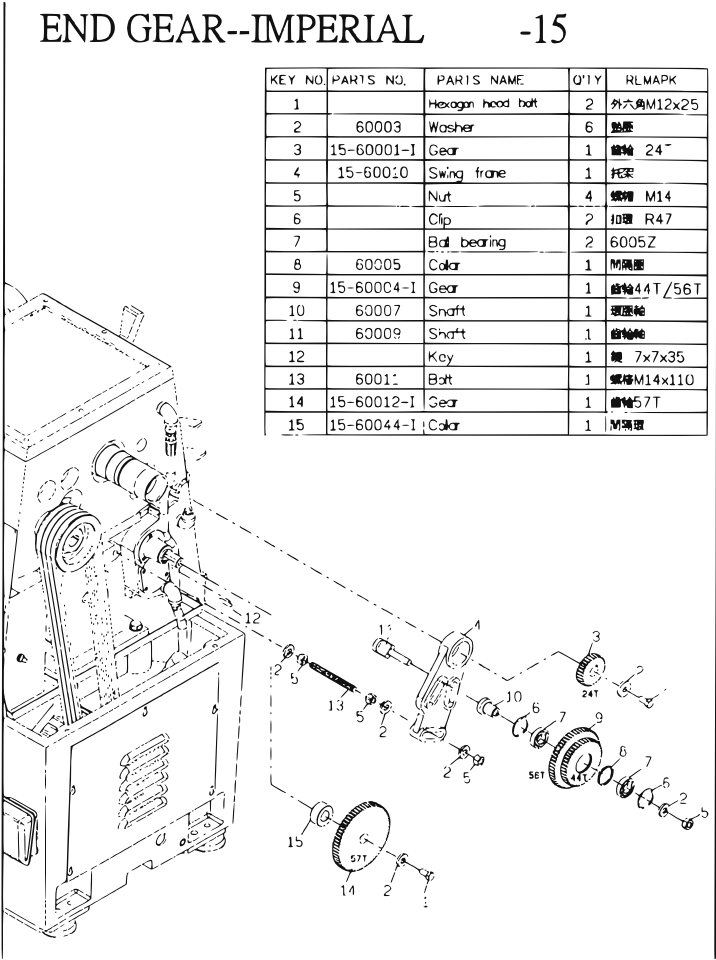


Figure 8-26: End gear, imperial

8.10 Lubrication system

Table 8-12: Lubrication system (-15-09)

Key No.	Part No.	Part Name	Qty	Remark
1		Flexible tube	1	5/8x1/2 steel-braided hose
2		Hexagon	1	3/8x1/2
3	11007	Spring	1	Tension spring
4	11006	SET screw	1	
5	11001	Pump Pu	1	Pump body
6	11004	Impeller	1	
7		Snap ring	1	S15
8		Washer	1	M8
9		Nut	1	Nylon M8
10		Hexagon head bolt	3	CAP 5x35
11	11010	Backplate	1	Rear cover
12		Flat cross screw	7	M6x12
13				
14	65018	Tank	1	Headstock oil tank
15	61028	Plug	1	Drain pipe
16	11005	Plate	1	Bracket arm
17		Snap ring	2	R35
18		Ball bearing	2	6202
19	11012	Alternate ring	1	Spacer
20		Oil seal	1	18x35x8
21	11009	Middle wheel	1	Intermediate pulley
22		V belt	1	50HZ-A34 / 60HZ-A33
23	11003	Pump wheel	1	Pump pulley
24	11002	Shaft	1	Pump shaft
25		Key	1	4x4x8
26		Key	1	6x6x20
27		Snap ring	2	R32
28	11008	Middle shaft	1	Intermediate shaft
29		Ball bearing	1	6201
30		Snap ring	1	S12
31	60067	Shaft	1	Support shaft
32		Induction motor	1	50HZ-4P-7.5HP / 60HZ-4P-7.5HP
33		V belt	1	50HZ-A73 / 60HZ-A72
34	60040B50	Motor wheel	1	Motor pulley 50Hz
34	60040B60	Motor wheel	1	Motor pulley 60Hz
35		Washer	1	ø12xø45x5

Key No.	Part No.	Part Name	Qty	Remark
36		Hex. socket head bolt	1	CAP 10x25
37		Nut	6	M16
38	60031	Screw	2	Bolt
39		Washer	8	ø16.5xø40
40	60048	Rubber ring	4	
41		Hexagon head bolt	4	10x45
42		Washer	8	M10
43	65037	Plate	1	Motor plate
44		Hex. socket head bolt	2	CAP10x25
45		Nut	4	M10
46	65014	Plate	1	Plinth rear side cover (left/right)
47		Dome cross screw	4	6x10
48	65019	Electrical box	1	
49		TM1307	1	Micro switch
50	65023	Plate	1	Cover plate
51	61038	Terminal box	1	
52		Dome cross screw	2	M4x20
53		Dome cross screw	1	M5x8
54		Nut	1	M10
55		Hexagon socket head plug	1	1/4"
56		Hexagon head bolt	4	CAP 8x16
57	60033	Connect	2	Oil pipe connector 1"x60
58		Male elbow	1	Hydraulic elbow 1"x90°
59		Hose clamp	2	
60	60034	Connect	2	Oil pipe connector 1"x75
61		Net hose	1	Braided rubber hose

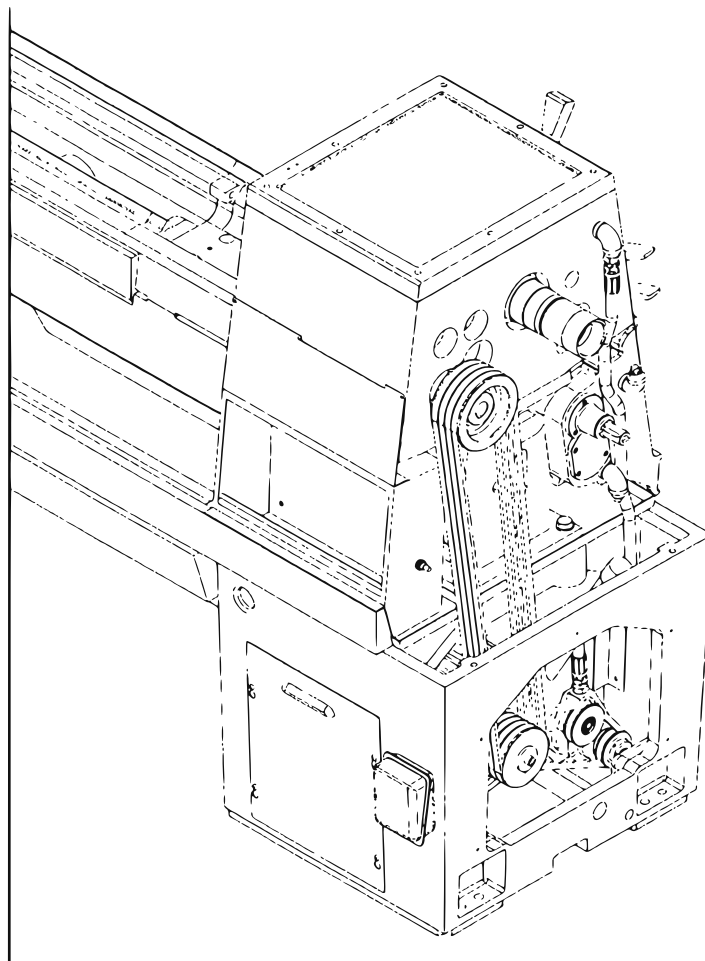


Figure 8-27: Lubrication system

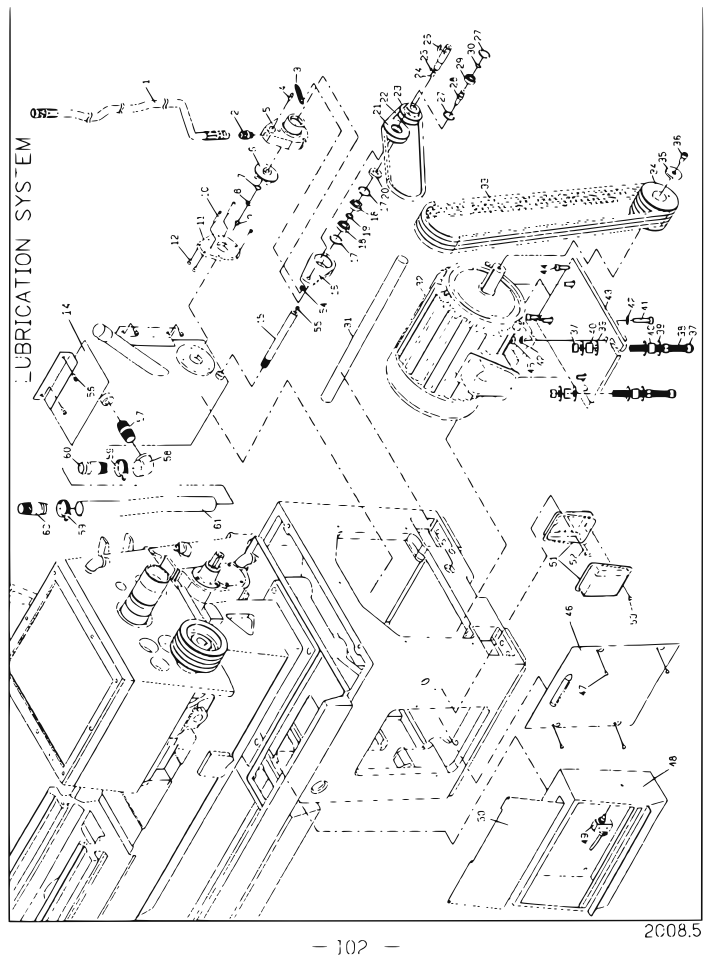


Figure 8-28: Lubrication system, exploded view

8.11 Cabinet and panel (front moveable chip tray)

Table 8-13: Cabinet and panel, front moveable chip tray (-15-10)

Key No.	Part No.	Part Name	Qty	Remark
1	10102	Shaft	1	
2	65040	Saddle	1	Footboard
3	60027	Collar	2	Spacer
4		Hex. socket head bolt	6	CAP 6x16
5		Hex. socket head bolt	10	CAP 6x10
6		Washer	8	M6
7	65008	Plate	1	Centre partition
8	65005	Sliding tray	1	Chip tray
9	65009	Bracket	2	Angle iron
10		Dome cross screw	4	M5x8
11	65011-G	Guard	1	Right plinth cover
12	65006	Brake guard	1	
13	65016	Plate	1	Connecting plate
14	10101	Small bracket	1	
15		Hex. socket head bolt	2	CAP 10x20
16		Set screw	2	M8x12
17		Nut	2	M4
18		Spring washer	2	M6
19		Hex. socket head bolt	2	M6x12
20	65056	Bracket	1	Bracket B
21		Limit switch	1	Tz9212
22		Dome cross screw	2	M4x40
23		Nut	5	M8xP1.25
24		Washer	12	M8
25		Hex. socket head bolt	7	CAP 8x20
26	65007	Splash guard	1	Rear splash guard
27		Knob	1	Ball knob
28		Nut	1	M12
29		Hex. socket head bolt	1	CAP12x20
30		Pivot	1	
31	65053	Chuck safety guard	1	
32		Hex. socket head bolt	1	CAP 6x12
33		Set screw	1	SET 5x16
34	65027	Chute	1	Coolant return plate
35		Coolant conduit	1	CT801x3/8"x72"
36		Nipple	1	3/8"PTx3/8"PH

Key No.	Part No.	Part Name	Qty	Remark
37		Coolant pump	1	MC-8150
38	65010	Coolant tank	1	
39	65014	Cover	1	Plinth motor cover (left/right)
40		Dome cross screw	9	M6x10
41	65004	Tray	1	Drip tray
42	65003	Cover	1	Left side cover
43	65013	Cover plate	1	Left plinth motor cover
44	65065	Bracket	1	
45	61017-N	Plate	1	Speed/feed instruction plate
46	63004	Tail end plinth	1	
47	63003	Head end plinth	1	
48	63042	Block	8	Plinth spacer
49		Hexagon head bolt	8	M16x55

CABINET AND PANEL
(FRONT MOVEABLE CHIP TR.)

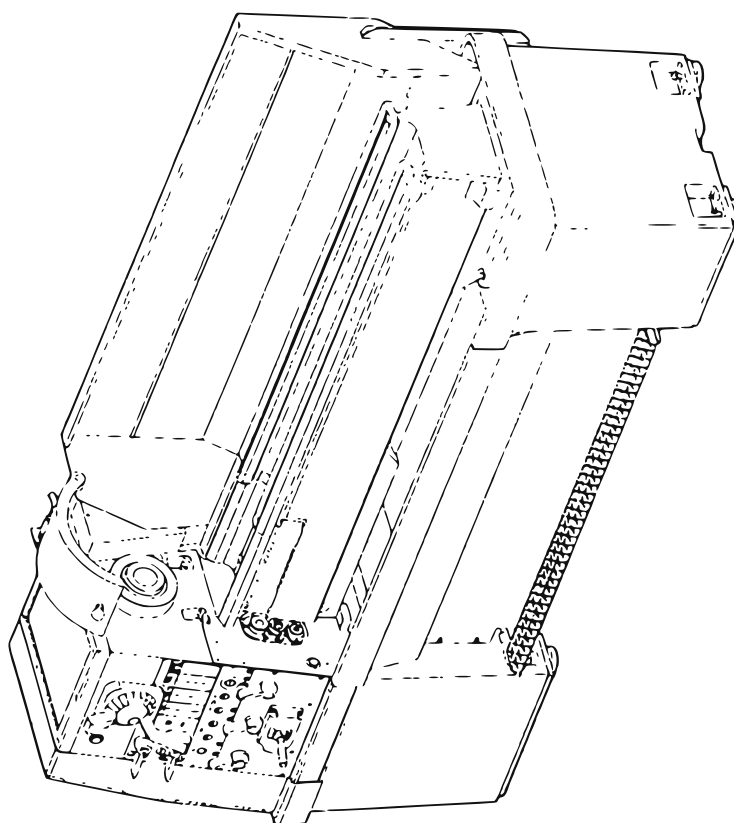


Figure 8-29: Cabinet and panel (front moveable chip tray)

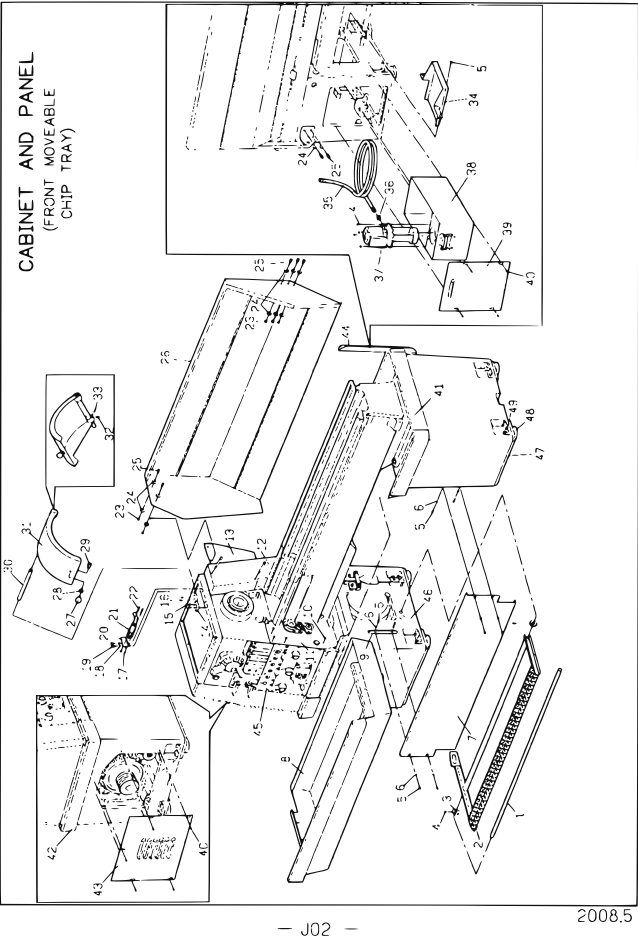


Figure 8-30: Cabinet and panel, exploded view

8.12 Conventional tailstock assembly

Table 8-14: Conventional tailstock assembly (-15-11)

Key No.	Part No.	Part Name	Qty	Remark
1	70004-M	Lead screw	1	
1	70004-I	Lead screw	1	
1	70005-M	Nut	1	
1	70005-I	Nut	1	
2		Key	1	5x5x10
3		Thrust bearing	2	51105
4	70006-M	Flange	1	
4	70006-I	Flange	1	
5	70007-M	Index ring	1	
5	70007-I	Index ring	1	
6	70010	Handle	1	Handwheel
7	70012	Handle	1	Handwheel handle
8	70011	Bolt	1	Handle bolt
9	70009	Fixed screw	1	Locking screw
10	70008	Spring	1	Compression spring
11		Steel ball	3	1/4"
12	70030	Dead center	1	
13	70018	Guide key	1	
14		Oil ball	2	1/4"
15	70001	Tail stock	1	Tailstock body
16	70017	Clamp lever L	1	
16	70019	Cam shaft L	1	Eccentric shaft
17	70023	Cam shaft R	1	Eccentric shaft
17	70024	Clamp lever R	1	
18	70025	Pins	1	
19	70003	Quill	1	
20	70020	Pin nut	2	
21	70022	Pivot block	1	Clamp block
22	70028	Plate V	2	
23	70026	Wiper V	2	
24	70029	Plate F	2	
25	70027	Wiper F	2	
26	70002	Base	1	
27	70034	Gib screw	2	
28	70033	Gib	1	
29	70013	Hexagon head screw	2	

Key No.	Part No.	Part Name	Qty	Remark
30	70021	Clamp block	1	
31	70031	Stud bolt	1	130L
32	70016	Clamp block	1	
33	70014	Stud bolt	1	
34	70015	Nut	1	
102		Hexagon socket head bolt	5	CAP 6x20
103		Set screw	1	SET 8x28
104		Hexagon socket head bolt	1	CAP 6x16
105		Hexagon socket head bolt	2	CAP 8x55
106		Set screw	1	SET 8x16
107		Washer	4	M18
108		Nut	2	M18
109		Dome cross screw	8	M5x12
110		Spring washer	2	M18
111		Pin	1	ø4x38

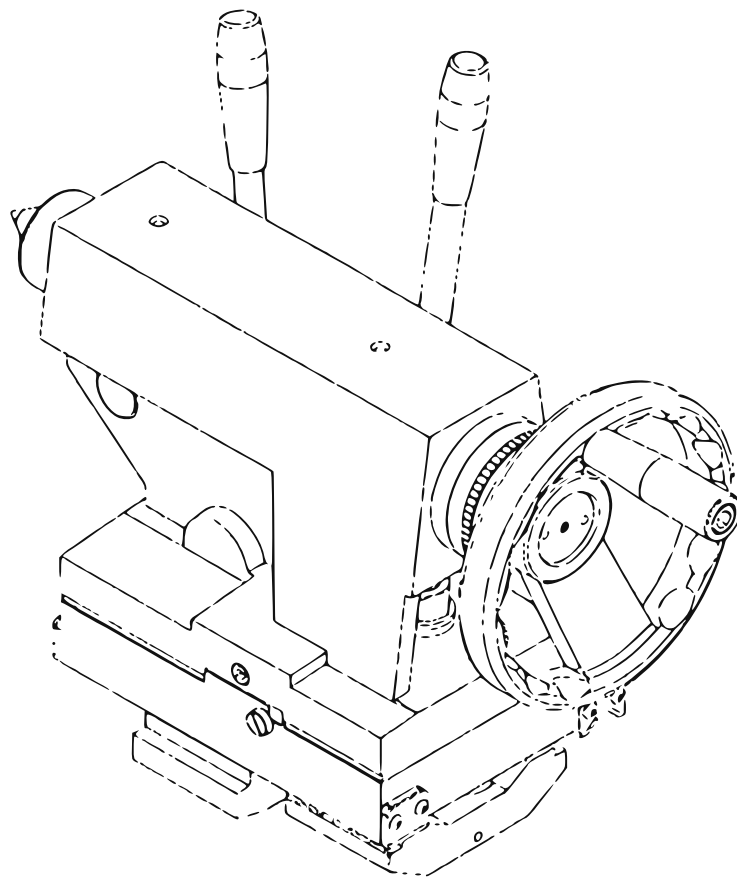


Figure 8-31: Conventional tailstock assembly

8.13 Taper attachment

Table 8-15: Taper attachment (-15-12)

Key No.	Part No.	Part Name	Qty	Remark
1	50017	Collar	1	
2		Hex. socket head bolt	2	M6x20
3	50026	Cap collar	2	
4		Thrust bearing	2	NTB/AS2 1528
5	80005	Yoke plate	1	
6		Nut	1	M10
7		Flat hexagon screw	4	M6x8
8	80002	Cover plate	1	
9	80004	Yoke	1	
10	18-70083	Copper pin	3	
11		Set screw	3	M8x16
12		Hex. socket head bolt	4	M8x45
13		Taper pin	2	#6x1 1/2"L
14	15-80001	Main bracket	1	
15	18-80003	Plate	1	
16		Dome cross screw	2	M6x10
17		Set screw	3	M8x25
18		Hexagon nut	3	M8
19		Hex. socket head bolt	2	M8x30
20		Rivet	4	ø2
21	15-80025	Name plate	1	
22		Hex. socket head bolt	2	M8x20
23	18-80033	Stop	2	
24	15-80010	Plate	1	
25	18-80017	Nut	1	
26	15-80012	Gib	1	
27		Hex. socket head bolt	3	M6x30
28	18-80011	Slide pivot pin	1	
29		"O" ring	1	P21
30	18-80006	Side block	1	
31	80008	Gib	1	
32	80007	Screw	1	
33		Hex. socket head bolt	2	M8x25
34	15-80009	Swivel slide	1	
35		Hex. socket head bolt	2	M6x25
36	15-80024	Name plate	1	

Key No.	Part No.	Part Name	Qty	Remark
37		Split pin	1	ø2.5x16
38	18-80031	Bolt	1	
39	18-80030	Pin	1	
40	18-80019	Block	2	
41	18-80016	Nut	1	
42	18-80018	Block	1	
43	18-80015	Screw	1	
44	18-80014	Knob	1	
45	18-80028	Bolt	1	
46		Set screw	4	M6x12
47	18-80021	Bracket	1	
48	18-80020	Eccentric pin	1	
49		Hex. socket head bolt	2	M10x50
50	80027-15	Bracket	1	
51	18-80023	Hub	1	

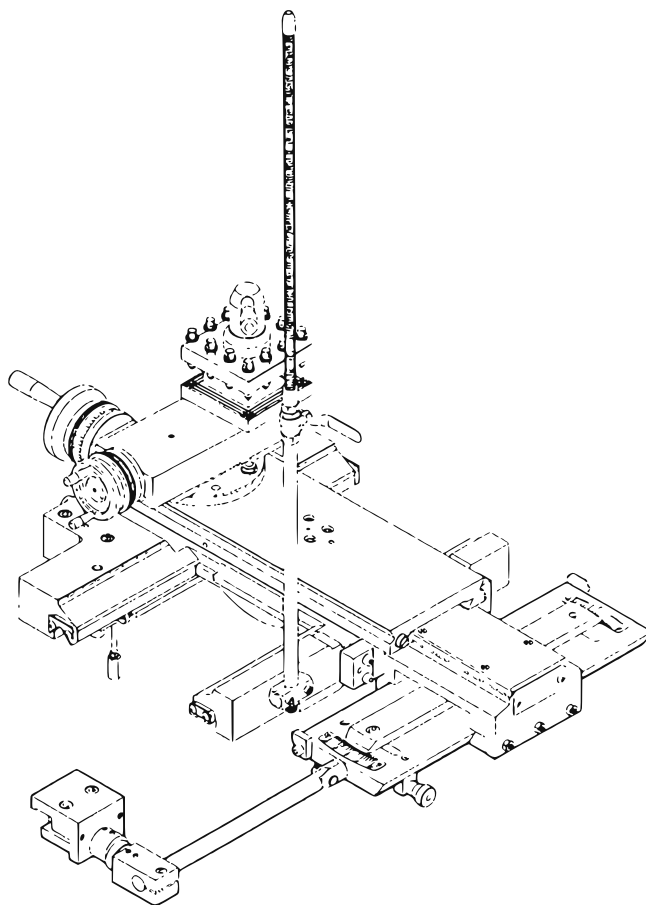
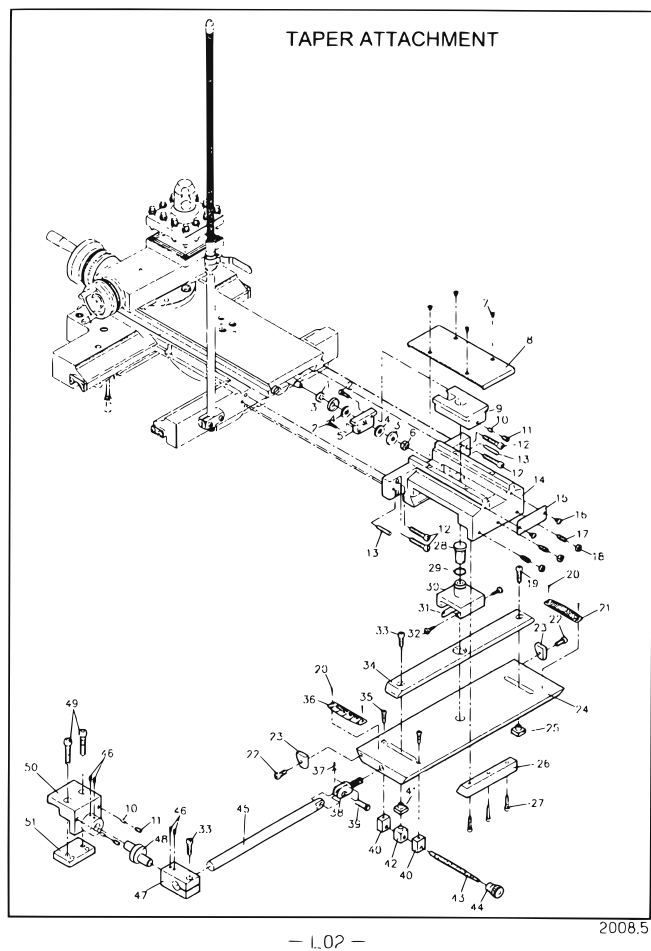


Figure 8-33: Taper attachment



8.14 Bed stop

Table 8-16: Bed stop (-15-13)

Key No.	Part No.	Part Name	Qty	Remark
1		Hex. socket head bolt	2	M10x60
2	70085-15	Body	1	
3	18-70084	Pad	2	
4	18-70059	Clamp plate	1	
5		Set screw	2	M10x20
6	18-70083	Copper pin	2	
7		Set screw	2	M8x16

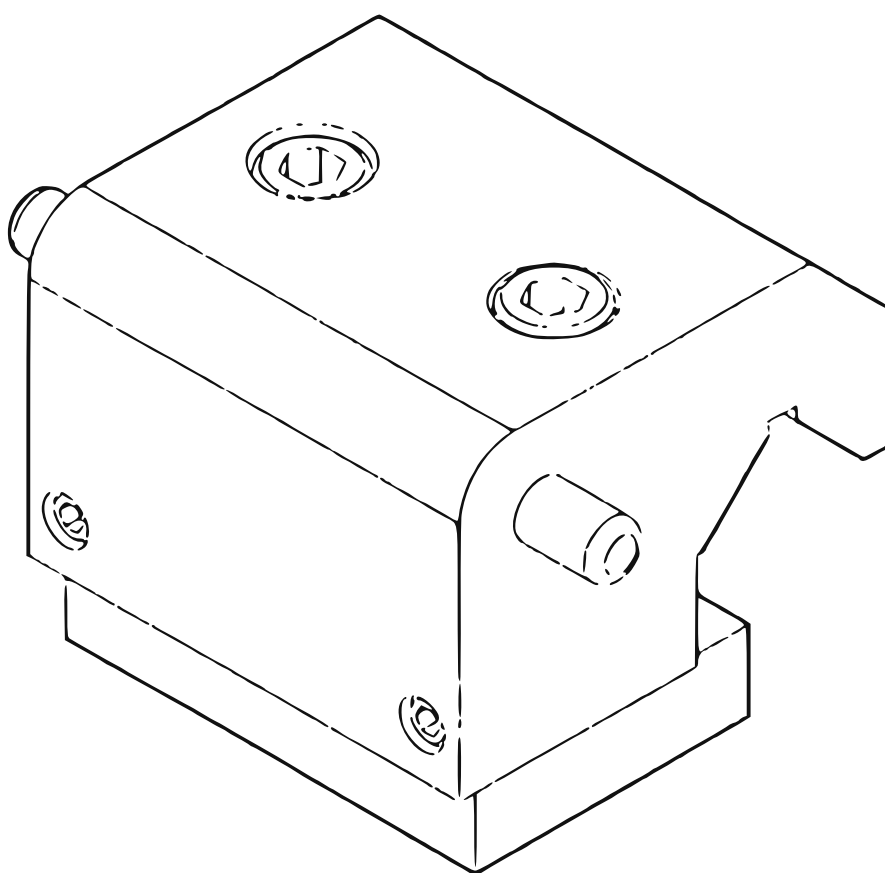


Figure 8-35: Bed stop

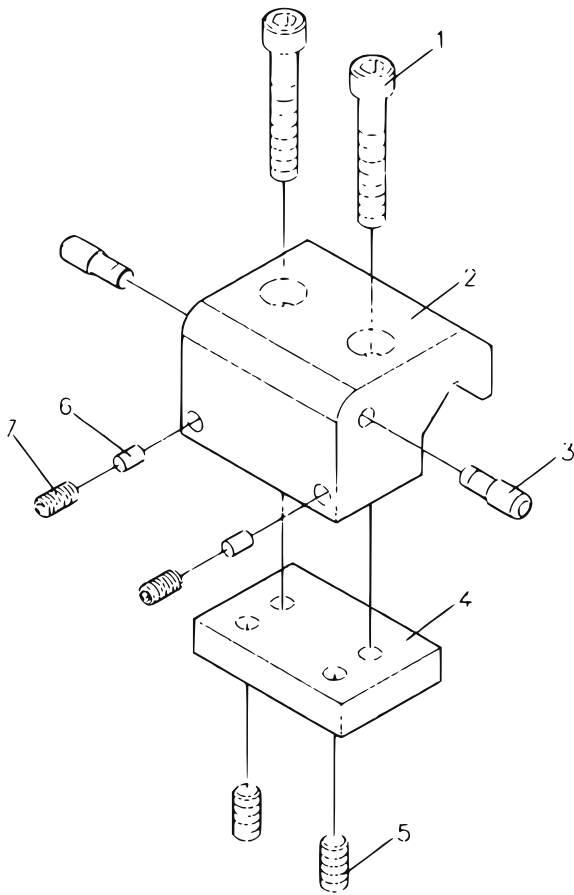


Figure 8-36: Bed stop, exploded view

8.15 Micrometer bed stop

Table 8-17: Micrometer bed stop (-15-14)

Key No.	Part No.	Part Name	Qty	Remark
1		Hex. socket head bolt	2	M10x60
2		Rivet	2	ø2
3	18-70060-M	Name plate	1	for METRIC
3	18-70060-I	Name plate	1	for IMPERIAL
4	18-70057-M	Micro dial	1	for METRIC
4	18-70057-I	Micro dial	1	for IMPERIAL
5	70048-15	Body	1	
6	18-70056-M	Rod	1	for METRIC
6	18-70056-I	Rod	1	for IMPERIAL
7	18-70059	Clamp plate	1	
8		Set screw	2	M10x20
9	18-70083	Copper pin	2	
10		Set screw	2	M8x16
11	OOST12M8	Set screw	1	M8x12
12		Set screw	1	M8x12

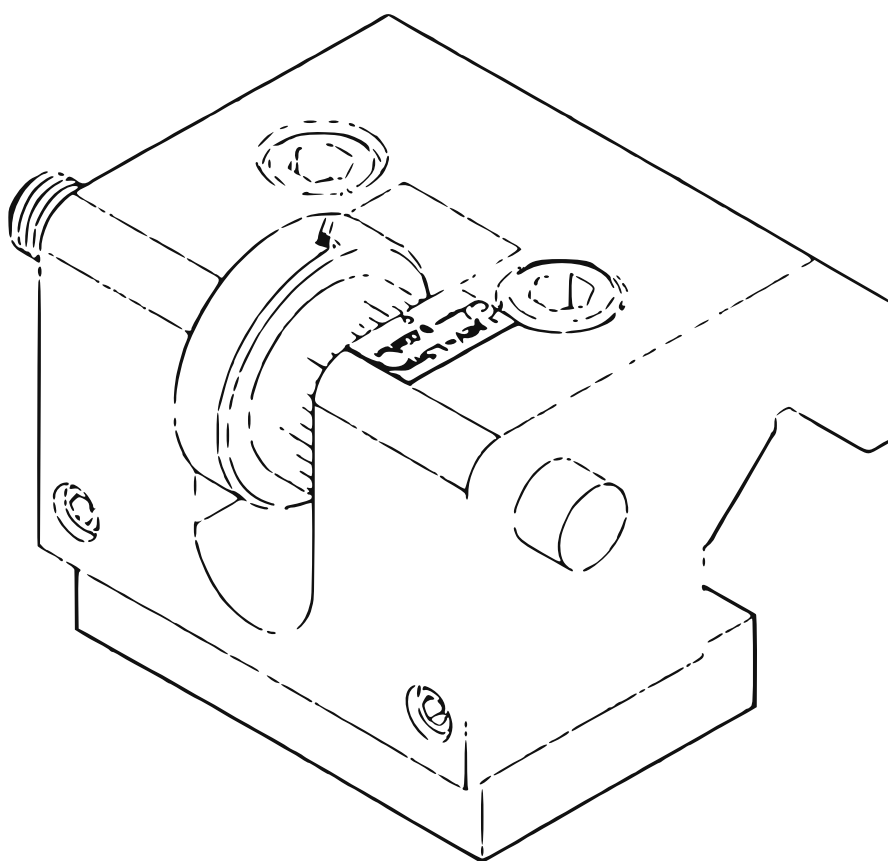


Figure 8-37: Micrometer bed stop

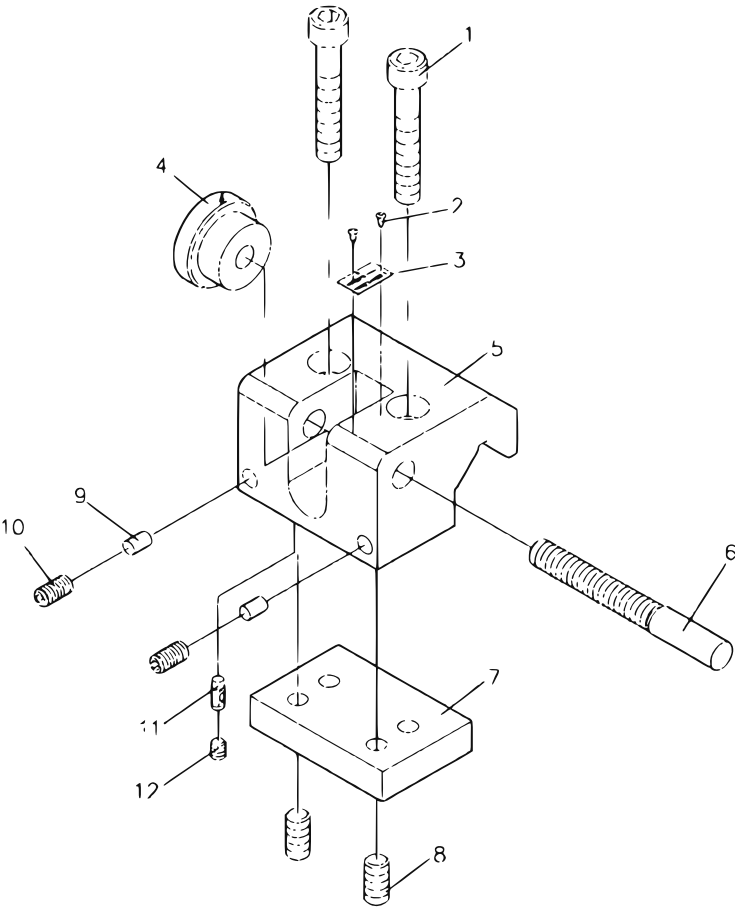


Figure 8-38: Micrometer bed stop, exploded view

8.16 Stationary steady

Table 8-18: Stationary steady (-15-15)

Key No.	Part No.	Part Name	Qty	Remark
1	70038	Adjusting screw	3	
1		Spring pin	3	ø4x40
1	70062	Collar	3	
1	70035	Screw	3	
2	70037	Finger	3	
2	70040	Pin	3	
2		Ball bearing	2	627
3		Set screw	3	M8x8L
4	70064	Knob nut	1	
5	70033	Clamp screw	1	
6	70029	Top casting	1	
6	70030	Base casting	1	
7	70031	Pin	1	
8	70063	Single wing bolt	3	
9	70032	Hinge pin	1	
10		Nut	1	M12
11		Spring washer	1	M12
12		Hexagon head bolt	1	M12x75L
13	70039	Clamp plate	1	

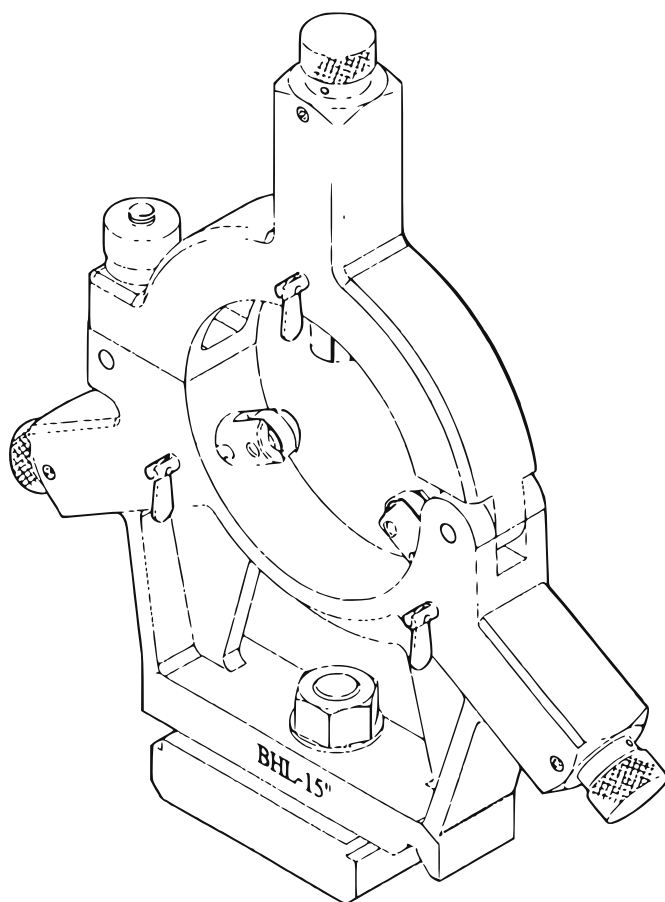


Figure 8-39: Stationary steady

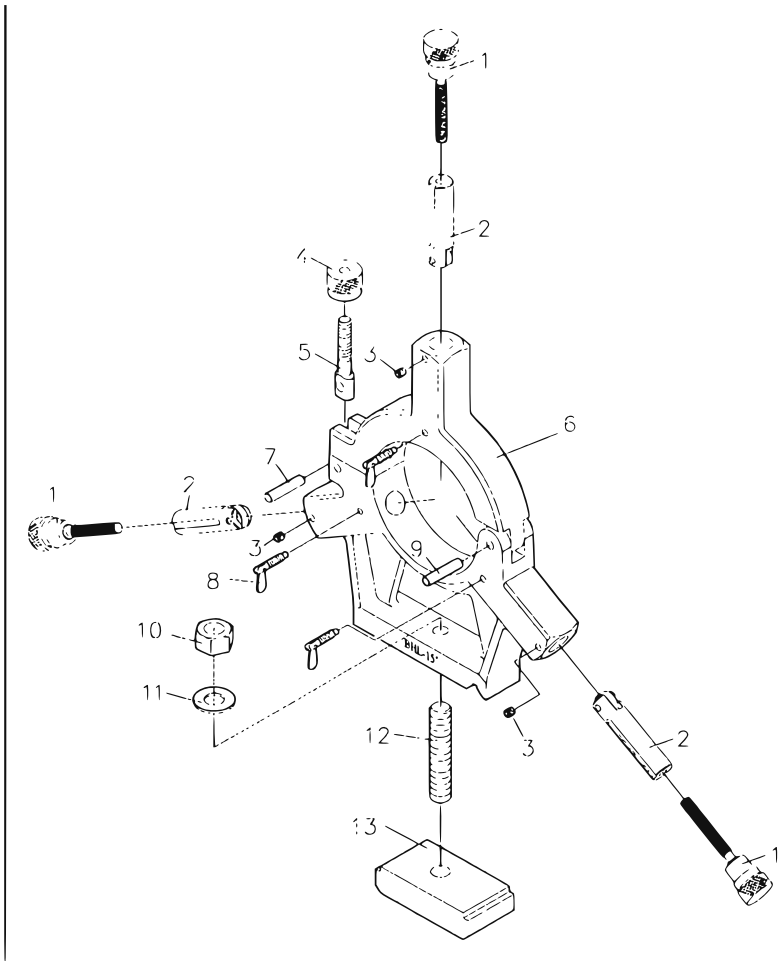


Figure 8-40: Stationary steady, exploded view

8.17 Travelling steady

Table 8-19: Travelling steady (-15-16)

Key No.	Part No.	Part Name	Qty	Remark
1	70038	Adjusting screw	2	
1		Spring pin	3	ø4x40L
1	70062	Collar	3	
1	70045	Screw	2	
2	70044	Finger	2	
2	70047	Bracket	2	
3		Set screw	2	M8x8L
4	70041	Casting	1	
5	70063	Single wing bolt	3	

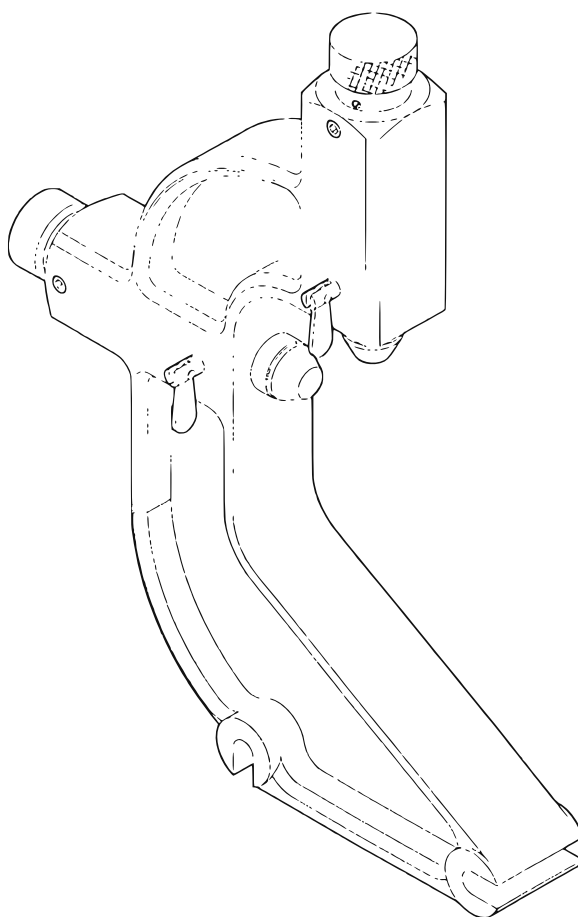


Figure 8-41: Travelling steady

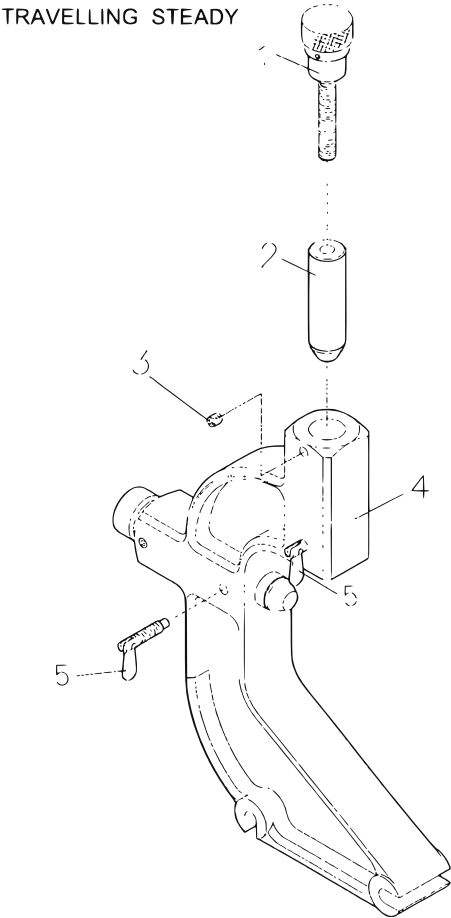


Figure 8-42: Travelling steady, exploded view

8.18 Chip cover

Table 8-20: Chip cover (-15-17)

Key No.	Part No.	Part Name	Qty	Remark
1		Dome hexagon screw	10	M6x10L
2	18-68001	Chip frame	1	
3	18-68004	Plate - down	1	199x175xt4.5
4	18-68003	Plate - up	1	199x144xt4.5
5		Hex. socket head bolt	1	M6x12L
6		Hex. socket head bolt	2	M6x60L
7	18-68002		1	

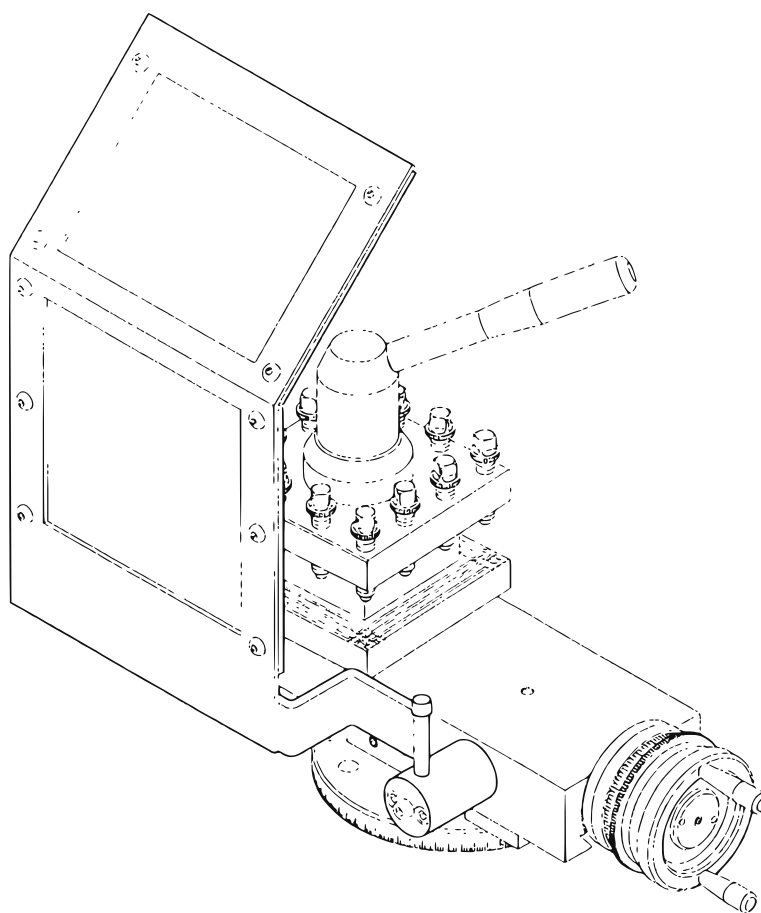
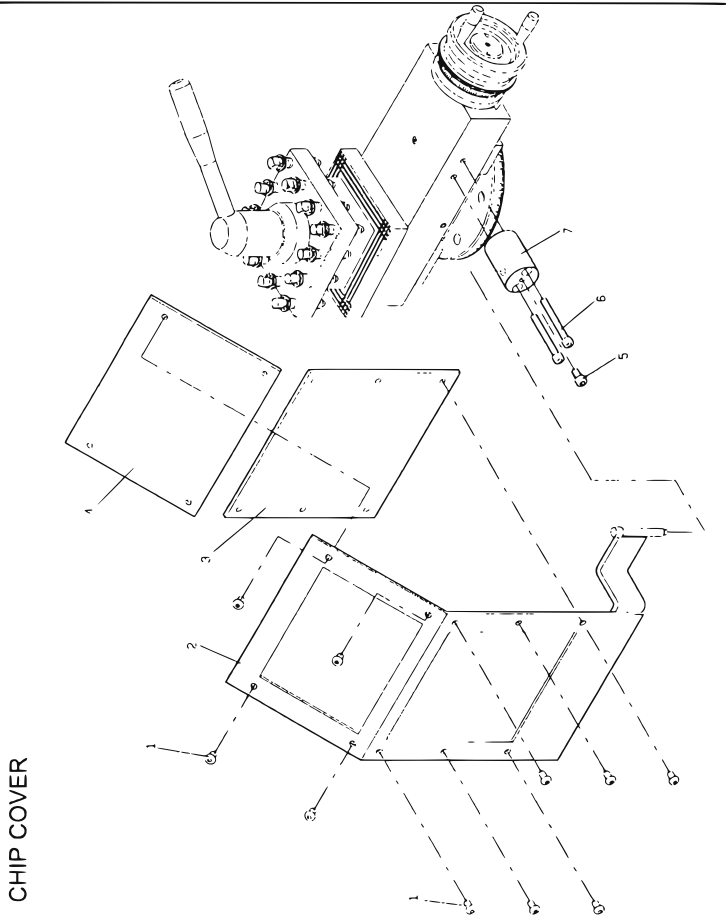


Figure 8-43: Chip cover



CHIP COVER

Figure 8-44: Chip cover, exploded view

8.19 Brake

Table 8-21: Brake (-15-18)

Key No.	Part No.	Part Name	Qty	Remark
1	60031	Rod	1	Connecting rod
2	60030	Pin	2	Straight pin
3		Snap ring	4	E6
4	60028	Connecting rod	1	
5		Washer	2	ø8xø25x3
6	13033	Gyro wheel	1	Roller
7	13022	Pin	1	Headed pin
8	13027	Bracket	1	
9		Hex. socket head bolt	2	CAP 6x35
10		Pin	2	ø4x24
11	13021	Rocker arm	1	
12		Hex. head bolt	2	10x35
13	13025	Pin	1	Roller pin
14		Hex. socket head bolt	2	CAP 8x50
15	13015	Spring	1	
16		Nut	1	M8
17		Hex. socket head bolt	2	CAP 8x30
18	13035	Fixed plate	1	Fixed block
19	13037	Board	1	Guide plate
20	13036	Chunk	1	Guide block
21	61033	Control and put	1	Control swing arm
22		Nut	4	M10 (nylon)
23	13031	Fixed plate	1	Fixed block
24	65040	Footboard	1	
25	60022	Pin	1	Round pin
26	60032	Bolt	1	
27	13030	Bolt	2	
28	13029	Gyro wheel	2	Roller
29		Hex. socket head bolt	2	CAP 8x35
30		Washer	2	M8
31	13028	Bracket	1	Fixed bracket
32		Hex. socket head bolt	1	CAP 6x10
33	13048	Stop	1	Stop block
34	13047	Guard shield	1	
35	13020	Rod	1	Connecting rod
36	13045	Nut	1	

Key No.	Part No.	Part Name	Qty	Remark
37	13019	Nut	1	Connecting sleeve
38		Nut	1	M12
39	13018	Bolt	1	
40		Pin	2	ø4x20
41	13041	Joint assy	2	Universal joint
41	13040	Joint assy	1	Universal joint
42	60017	Washer	1	
43	60018	Shaft	1	
44	60015	Cam	1	
45	60016	Shaft	1	Short shaft
46	60019	Brake lining	2	
47	60024	Spring	2	
48		Snap ring	1	E8
49	60020	Brake cylinder	1	Brake drum
50		Washer	2	M8
51	13043	Pin	1	Locating pin

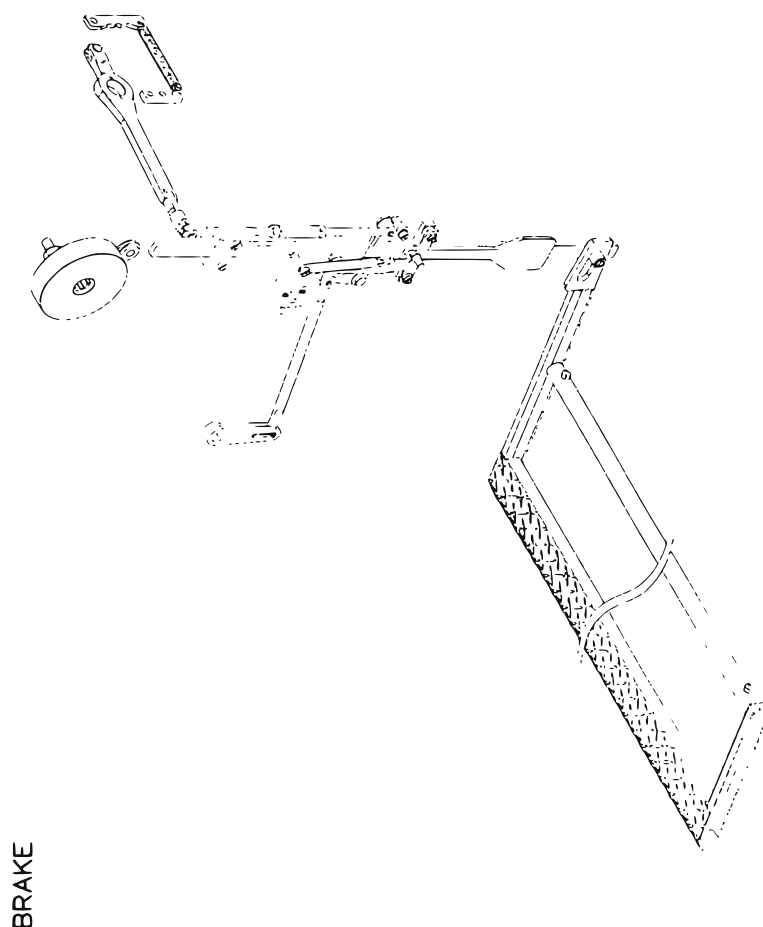


Figure 8-45: Brake

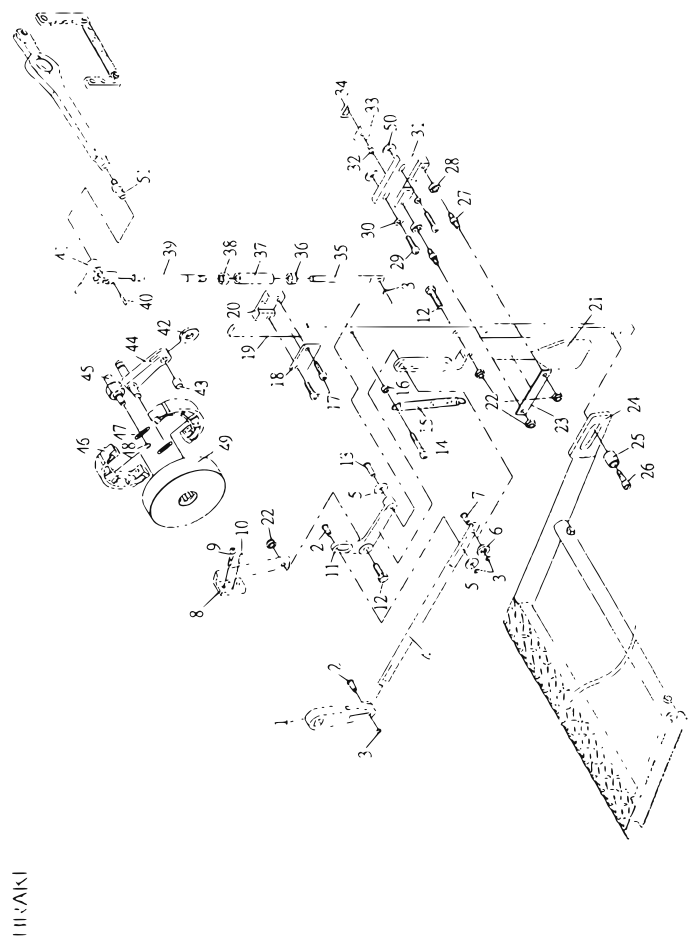


Figure 8-46: Brake, exploded view

9 2024 Headstock

NOTE This chapter is the 2024 new-headstock supplement. On machines fitted with the 2024 headstock it replaces the headstock parts information in 8.2 (Table 8-2 and Figures 8-1 to 8-7). Many part numbers are carried over from the original headstock, but some are new (for example those with a -C suffix or 18- prefix, and front bearing cover 10062-D1). Check which headstock your machine has before you order parts.

The 2024 headstock is listed in two parts: the control frame, speed selector and covers (9.1), and the drive shafts, gears, clutches, brake and spindle (9.2). Each table is followed by its exploded views.

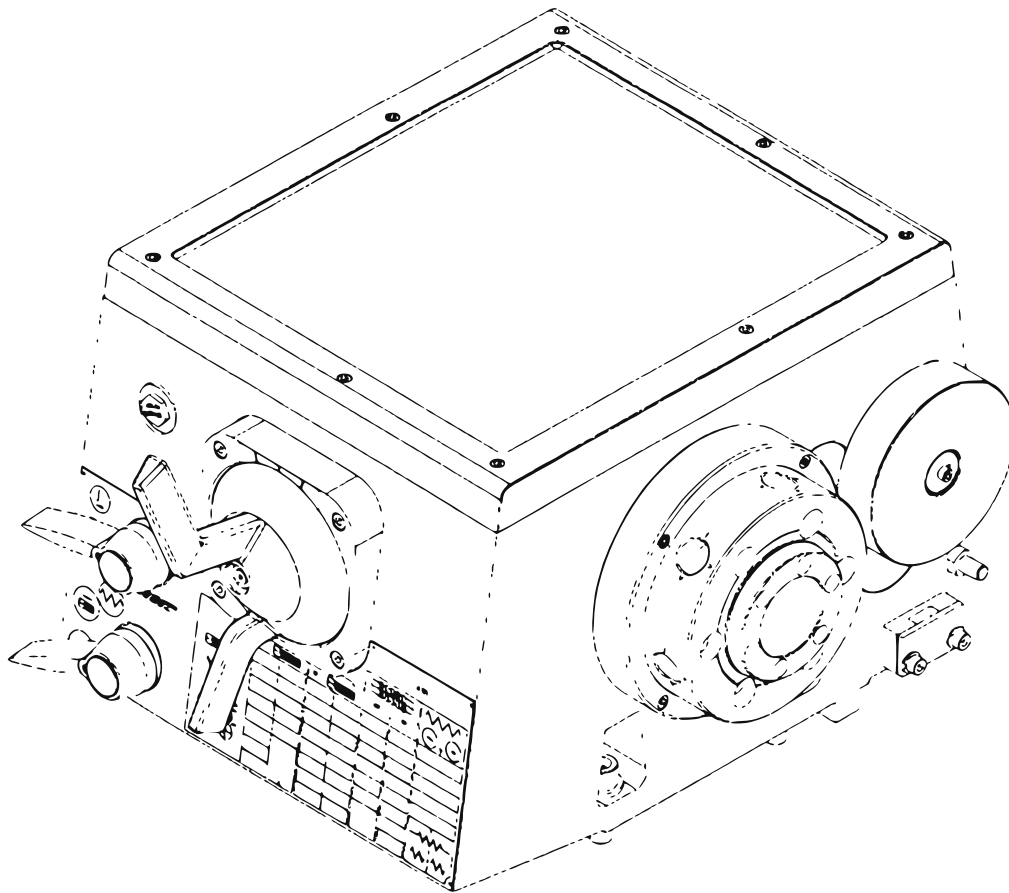


Figure 9-1: 2024 headstock, general view

9.1 Control frame, speed selector and covers

Table 9-1: 2024 headstock: control frame, speed selector and covers

No.	Part No.	Part Name	Qty	Remark
1	10001	Headstock	1	
2	20001	Lever frame	1	
3	20022	Lever	1	
4	20014	Lever	1	
5	20024	Lever	1	
6	20015	Rod	1	
7	20023	Rod	1	
8	20019	Pin	2	
9		Spring pin	2	Ø3 x 15
10	18-20016	Collars	2	
11		Spring pin	2	Ø3 x 40
12	20018	Pin	4	
13	20027	Bolt	2	
14		Nut	2	M12
15	20020	Change speed claw	1	
16	20021	Change speed claw	1	
17	20025	Lever	1	
18	20017	Rod	2	
19	20031	Change speed claw	1	
20		Snap ring	4	S10
21		Washer	2	M12
22	20026	Change speed claw	1	
23		Spring pin	2	Ø3 x 20
24	20028	Bracket	1	
25		Hex. socket head bolt	2	CAP 6 x 30
26	20029	Pin	2	
27	20030	Spring	2	
28		Hex. socket head bolt	4	CAP 8 x 20
29	20005	Cam shaft	1	
30		Key	2	5x5x14
31	18-20007	Speed selector	1	
32	18-20008	Speed selector	1	
33	18-20011	Washer	2	
34		Flat hexagon screw	2	M6 x 16
35	20002	Cam cover	1	
36		Hex. socket head bolt	4	CAP 8 x 35

No.	Part No.	Part Name	Qty	Remark
37	20003-15	Cam	1	
38	20006	Cam shaft	1	
39		Key	2	7x7x25
40	20004	Cam	1	
41		Snap ring	1	S32
42		Snap ring	1	S30
43	20037	Shaft	1	
44		Key	2	3x3x18
45		Key	1	3x3x14
46	13-20021	Handle	2	
47	20041	Washer	2	
48		Hex. socket head bolt	2	CAP 5 x 12
49	18-20013	Cover	2	
50		O ring	2	P21
51	20038	Collar	2	
52		Hex. socket head bolt	4	CAP 5 x 16
53	20051	Spring	2	
54		Set screw	2	SET M8 x 8
55		Steel ball	2	1/4"
56	20033	Shift levers	1	
57		Snap ring	2	S15
58		Spring pin	1	Ø3 x 24
59	20034	Connecting rod	1	
60	20035	Claw	2	
61	20036	Shaft	1	
62		Key	1	3x3x24
63	20032	Shift levers	1	
64		Oil sight	1	3/4"
65		O ring	1	4x1650
66	10002	Headstock cover	1	
67		Hex. socket head bolt	8	CAP 6 x 40
68		Washer	2	M16
69		Hex. socket head bolt	2	CAP 16 x 50
70	61025	Spindle speed panel	1	
71	61001-I	Name panel	1	
71	61001-M	Name panel	1	
72	61026	Speed panel	1	
73	13005-C	Shaft	1	

No.	Part No.	Part Name	Qty	Remark
74		Key	1	6x6x18
75		Key	1	6x6x30
76	13003-C	Bush	1	
77	13006-C	Washer	1	
78		Hex. socket head bolt	4	CAP 6 x 16
79	13004-C	Bush	1	
80		Flat hexagon screw	3	M5 x 16
81		O ring	1	P15
82		O ring	1	P22
83	13008-C	Spacing washer	1	
84	13009-C	Shift levers	1	
85	13007	Washer	1	
86	13011-C	Shift claw	1	
87		Spring pin	2	Ø4 x 15
88	13042	Lever	1	
89	13012-C	Pivot plate	1	
90	13013-C	Pin	1	
91		Snap ring	1	S12
92	13002-C	Roller shaft	1	
93	18-13001	Roller	1	
94	18-13015	Spring	1	
95	13017-C	Bar	1	
96	13016-C	Pin	1	
97	61034	Oil tray	1	
98		Set screw	1	SET M5 x 12

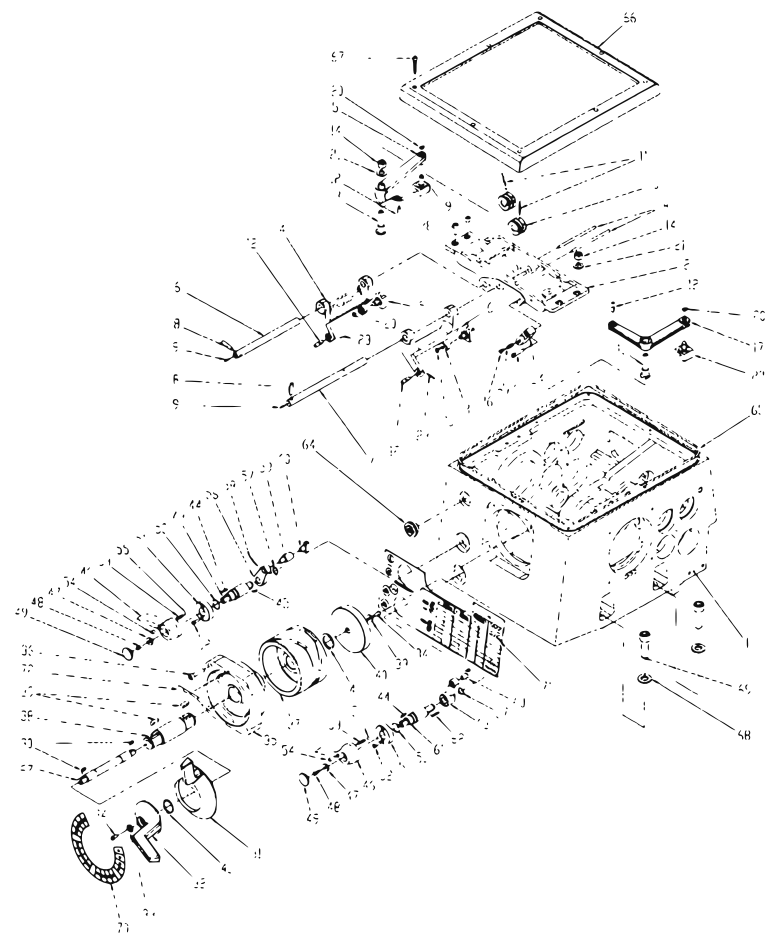


Figure 9-2: 2024 headstock: control frame and speed selector

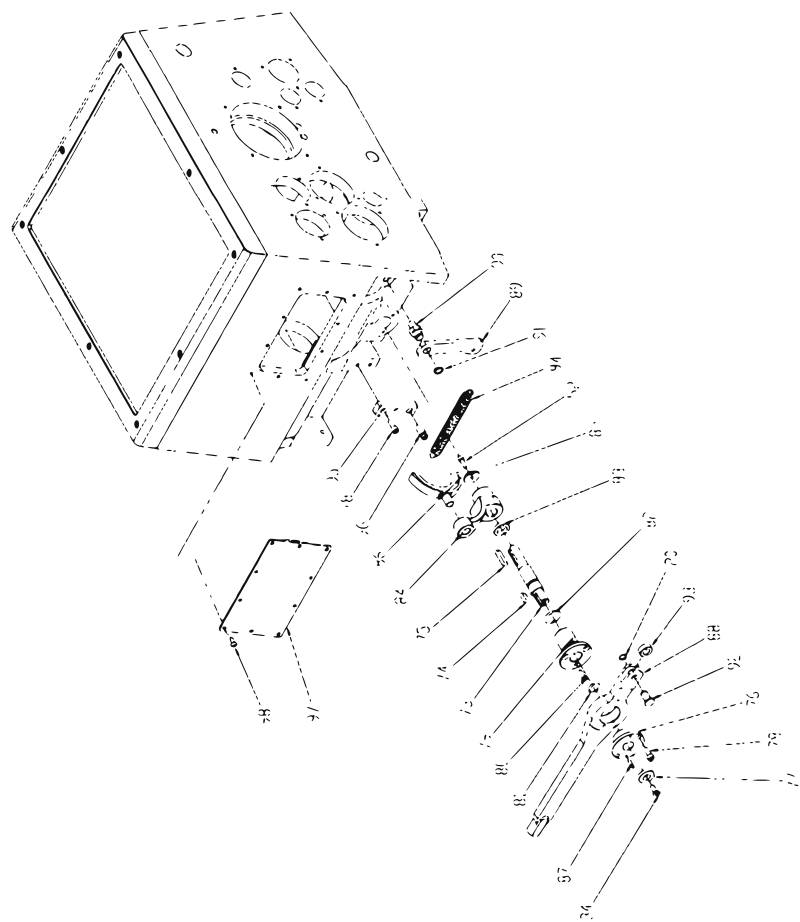


Figure 9-3: 2024 headstock: shift lever and oil tray

9.2 Drive shafts, gears, clutches, brake and spindle

Table 9-2: 2024 headstock: drive shafts, gears, clutches, brake and spindle

No.	Part No.	Part Name	Qty	Remark
1	10001	Headstock	1	
2	10006	Shaft	1	
3		Woodruff key	1	7x25
4		Key	1	8x7x125
5	10004	Pulley	1	
6	10005	Washer	1	
7		Hex. socket head bolt	1	CAP 8 x 20
8	10009	Bearing seat	1	
9		Oil seal	1	TC306210
10		Snap ring	4	R62
11		Ball bearing	3	6206
12		Snap ring	4	S30
13		Hex. socket head bolt	3	CAP 6 x 35
14	10078	Collar	5	
15	10011	Clutch	1	
15	10012	Gear	1	27T
17		Set screw	4	SET 6 x 12
18		Needle bearing	2	TLA3020
19	10007	Collar	2	
20		Clutch	1	ZC25DGDW
21		Snap ring	1	S42
34	10014	Gear	1	31T
35		Needle bearing	2	TLA2220
36		Ball bearing	1	6008
37		Key	1	8x7x14
38		Snap ring	1	S40
39	10018	Brake cylinder	1	
40	10020	Brake strap	4	
41	10021	Spring	8	
42	10019	Brake bush	4	
43		Flat hexagon screw	4	M6 x 16
44	10022	Brake disc	1	
45	10016	Washer	2	
46		Hex. socket head bolt	8	CAP 6 x 20
47	10017-C	Washer	1	
48	10023	Brake shaft	1	

No.	Part No.	Part Name	Qty	Remark
49		O ring	1	G65
50	10031	Shaft	1	
51		Ball bearing	3	6006
52	10032	Gear	1	27T
53	10033	Collar	2	
54	10034	Gear	1	23T
55	10036	Gear	1	27T
56	10038	Collar	1	
57	10039	Gear	1	31T
58	10037	Gear	1	19T
59	10029	Cover	1	
60	10030	Cover	1	
61		Snap ring	1	R55
62		Hex. socket head bolt	10	CAP 6 x 25
63	10059	Plug	2	
64		O ring	2	G55
65	10043	Gear shaft	1	
66		Key	2	7x7x25
67	10045	Gear	1	40T
67	10046	Gear	1	25T
69		Snap ring	2	S35
70		Ball bearing	1	6007
71	10047	Gear	1	35T
72		Oil seal	1	TC406212
73	10048	Collar	1	
74		O ring	1	G30
75	10044	Washer	1	
76		Spring pin	2	Ø3 x 16
77	10041	Cover	2	
78	10049	Gear shaft	1	
79	10051	Gear	1	32T
80	10054	Gear	1	34T
80	10053	Gear	1	30T
82	10055	Gear	1	38T
82	10056	Gear	1	26T
84		Ball bearing	2	6205
85	10050	Shaft	1	
86	10057	Gear	1	21T

No.	Part No.	Part Name	Qty	Remark
86	10058	Gear	1	40T
86		Snap ring	2	S58
89		Ball bearing	1	6305
90	10052	Washer	1	
91	10003-D6	Spindle	1	
92		Key	1	10x6x35
93		Key	1	15x10x70
94	10062-D1	Front bearing cover	1	
95	10062-P	Front cover	1	
96		Hex. socket head bolt	4	CAP 6 x 40
97		Taper roller bearing	1	32019
98	10060	Gear	1	75T
99	10061	Gear	1	56T
100	10076	Collar	1	
101		Ball bearing	1	6017
102		Snap ring	1	S85
103	10066	Gear	1	42T
104		Snap ring	1	S80
105	10065	Outside cover	1	
106	10065-P	Turcite Pad	1	
107		Taper roller bearing	1	32015
108		Nut	1	M75x2
109	10069	Shaft	1	
110	10070	Washer	1	
111		Flat hexagon screw	1	M6 x 12
112	10067	Gear	1	42T
113	10068	Gear	1	21T
114		O ring	4	P26
115	10071	Washer	4	
116		Hex. socket head bolt	4	CAP 6 x 12
117	10074	Shaft	1	
118	10079	Collar	2	
119	10072	Gear	1	21T
119	10073	Gear	1	42T
121		Snap ring	1	S25
122	10081	Shaft	1	
123	10080	Gear	1	
124	10083	Shaft	1	

No.	Part No.	Part Name	Qty	Remark
125		Key	1	7x7x14
126	10084	Flanged bearing	1	
127		Needle bearing	2	TAF304030
128	10082	Gear	1	21T
129		Hex. socket head bolt	3	CAP 6 x 16
130		Oil seal	1	TC354808
131		Plug	1	1/2" PT
132	10028	Shaft	1	
133	10026	Washer	2	
134	10027	Gear	1	26T
135		Needle bearing	1	TAF283730
136		Snap ring	1	S28

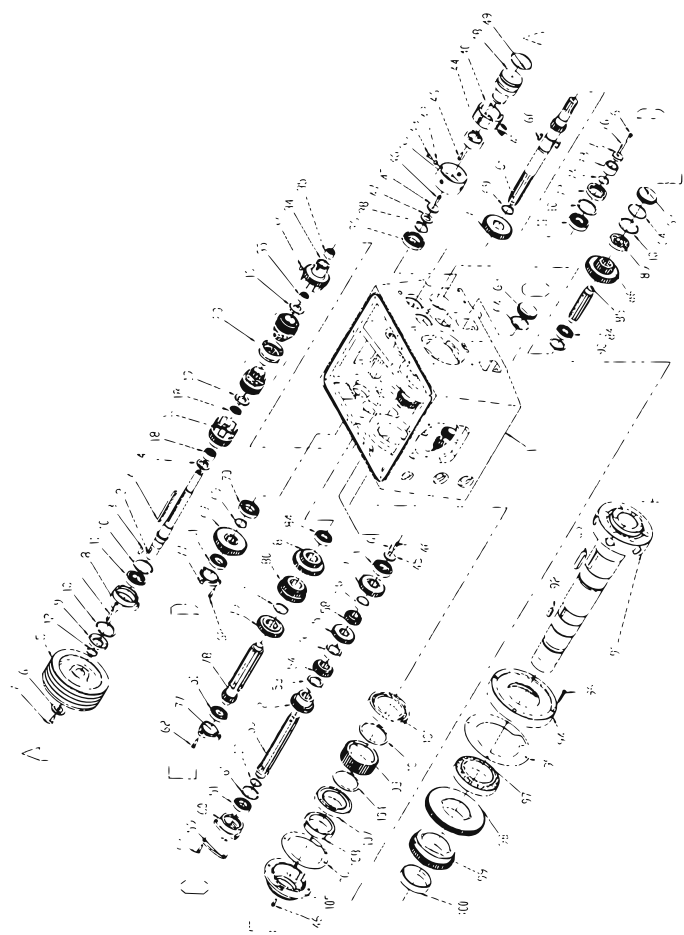


Figure 9-4: 2024 headstock: main drive, clutch, brake and spindle

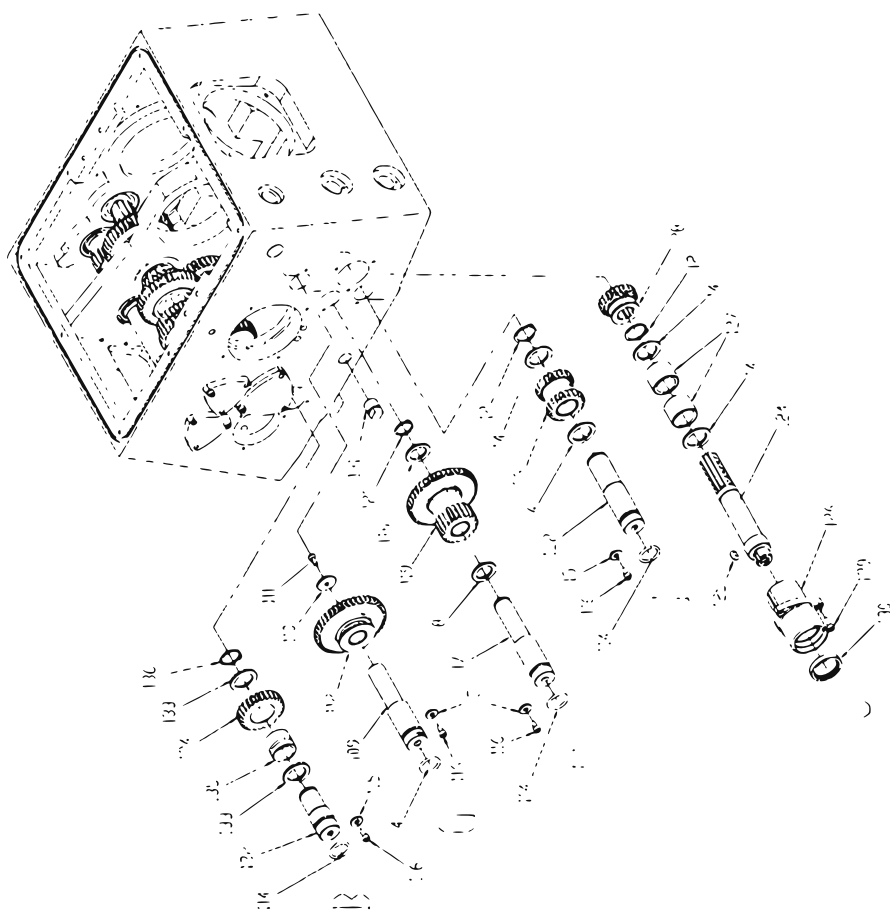


Figure 9-5: 2024 headstock: feed drive shafts B, G, H, I and J



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