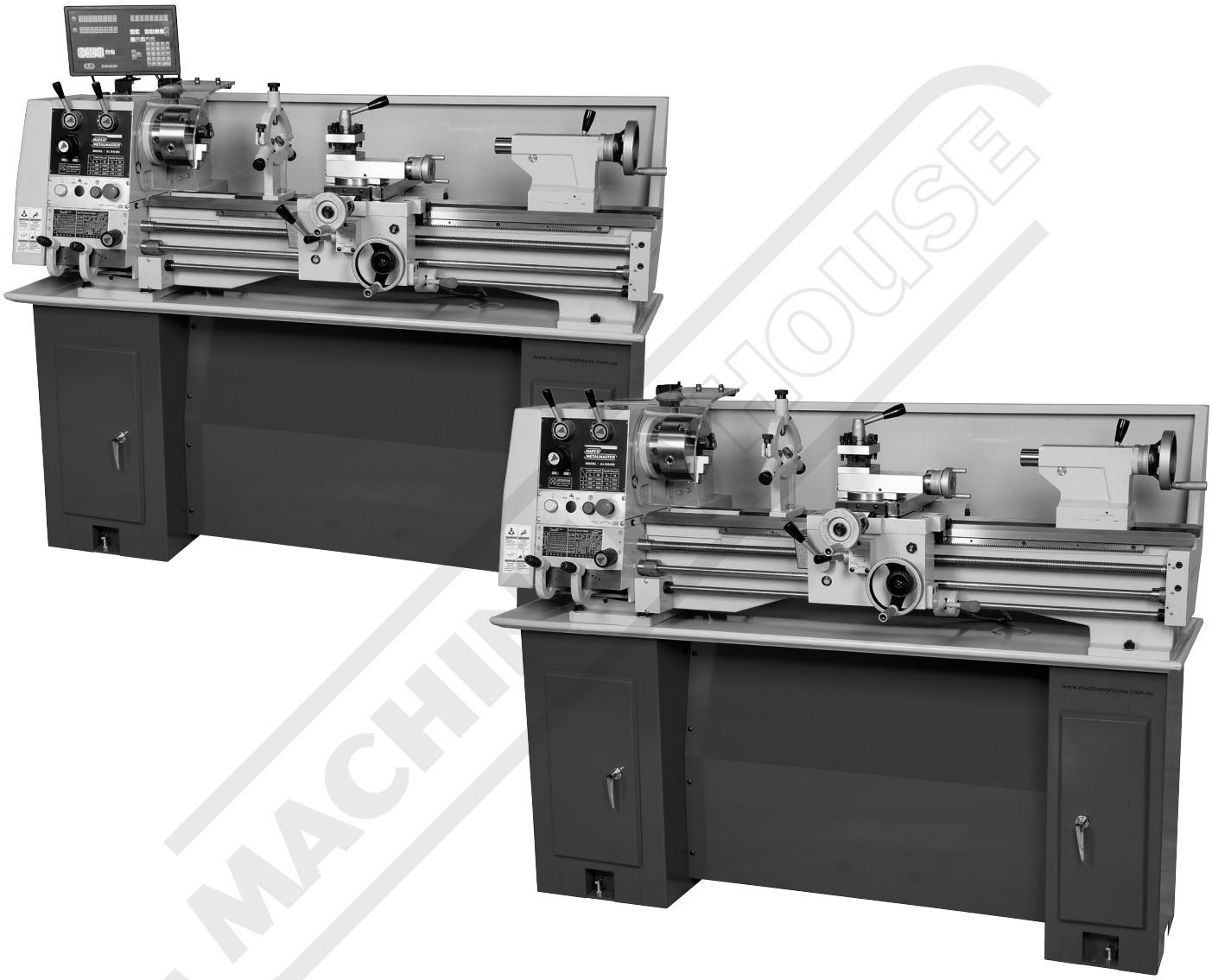
HAFCO
METALMASTER



Edition : 2.0
Date: (07/25)

Instruction Manual

CENTRE LATHE
AL-960B

ORDER CODE: (L237 & L237D)

MACHINE DETAILS

MACHINE	CENTRE LATHE
MODEL NO.	AL-960B
SERIAL NO.	
DATE OF MANF.	

Imported by

Australia

HARE&FORBES MACHINERYHOUSE

www.machineryhouse.com.au

New Zealand

MACHINERYHOUSE

www.machineryhouse.co.nz

NOTE:
This manual is only for your reference. At the time of the compiling of this manual every effort to be exact with the instructions, specifications, drawings, and photographs of the machine was taken. Owing to the continuous improvement of the HAFCO METALMASTER machine, changes may be made at any time without obligation or notice. Please ensure the local voltage is the same as listed on the specification plate before operating any electric machine.

SAFETY SYMBOLS:
The purpose of safety symbols is to attract your attention to possible hazardous conditions

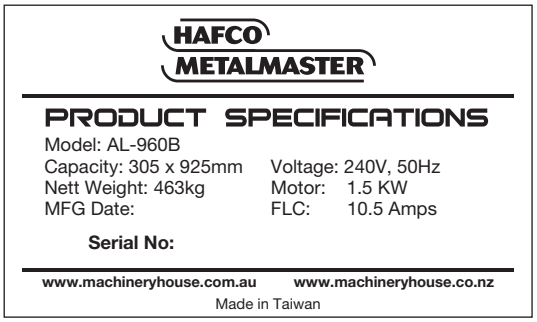
⚠ WARNING ***Indicates a potentially hazardous situation causing injury or death***

⚠ CAUTION ***Indicates an alert against unsafe practices.***

Note: Used to alert the user to useful information

NOTE:
In order to see the type and model of the machine, please see the specification plate. Usually found on the back of the machine. See example (Fig.1)

FIG.1



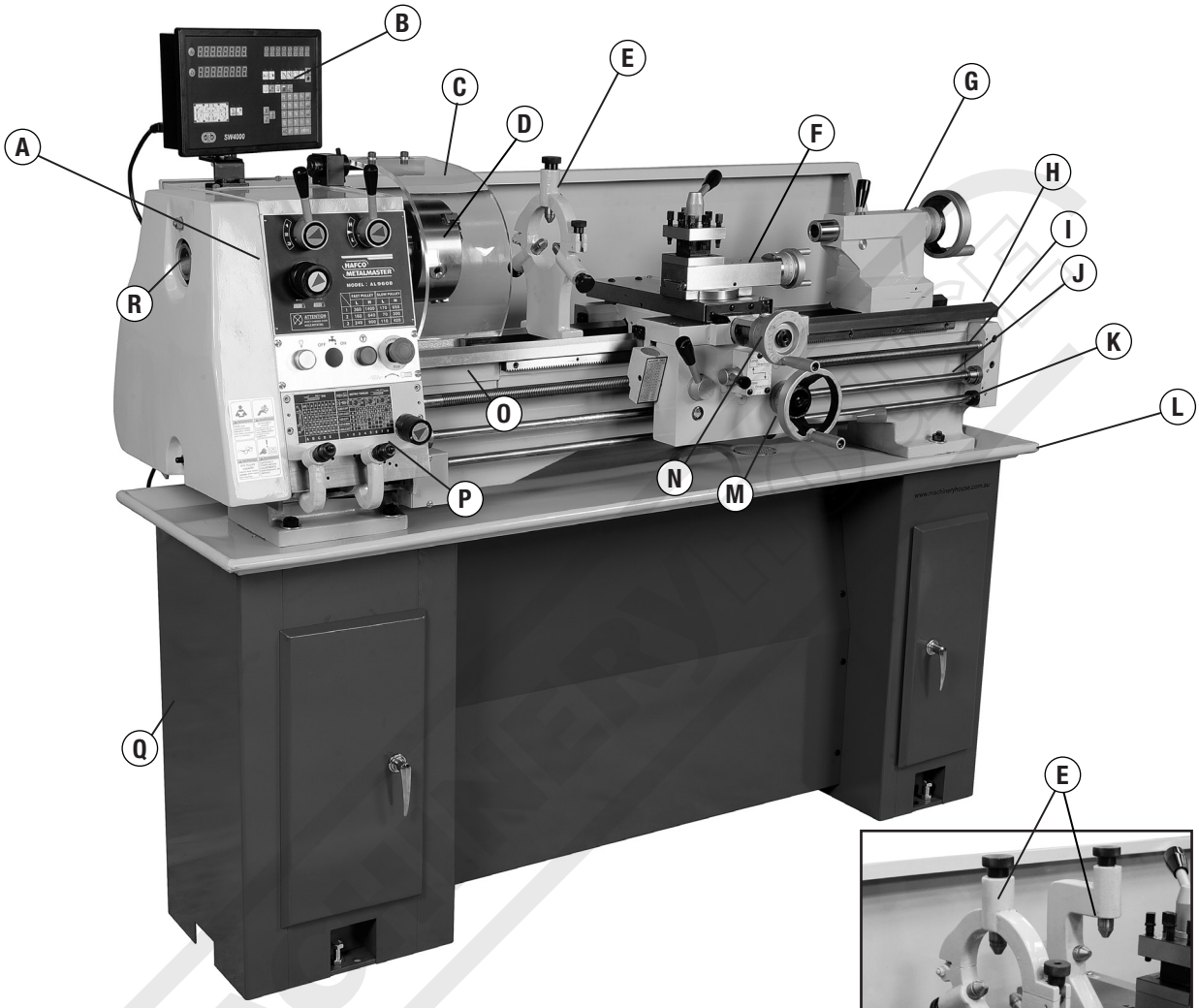
CONTENTS:

1.1 SPECIFICATION

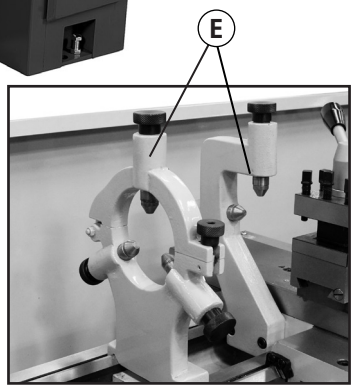
Order Code	L237	L237D
MODEL	**AL-960B**	**AL-960B**
Swing Over Bed (mm)	305	305
Distance Between Centres (mm)	925	925
Spindle Bore (mm)	40	40
Swing In Gap (mm)	450	450
Swing Over Cross-slid (mm)	180	180
Digital Readout System Fitted	Optional	Yes
Quick Change Toolpost Fitted	Optional	Optional
Tool Height To Suit (mm)	12	12
Centre Height (mm)	152.5	152.5
Spindle Nose Size or Type Camlock	D1-4	D1-4
Bed Width (mm)	190	190
Headstock Spindle Taper (MT)	5	5
Tailstock Taper (MT)	3	3
Cross Slide Travel (mm)	170	170
Compound Slide Travel (mm)	90	90
Leadscrew Type	Imperial	Imperial
Imperial Cross Feed (X-Axis) (inch/rev)	0.03 / 1.04	0.03 / 1.05
Imperial Longitudinal Feed (Z-Axis) (inch / rev)	0.06 /2.08	0.06 / 2.08
Metric Thread Steps & Pitch (No / mm)	26 (0.25 - 7.5	26 (0.25 - 7.5
Imperial Thread Steps & TPI (No / TPI)	40 (4 - 112)	40 (4 - 112)
3 Jaw Chuck Diameter (mm)	160	160
4 Jaw Chuck Diameter (mm)	200	200
Spindle Steps / Speeds (No / rpm)	12 (70 - 1400)	12 (70 - 1400)
Motor Power (kW / hp)	1.5 / 2	1.5 / 2
Voltage / Amperage (v / amp)	240 / 15	240 / 15
Dimensions (L x W x H) (mm)	1700 x 750 x 1450	1700 x 750 x 1500
Nett Weight (kg)	463	470

1.2 IDENTIFICATION

Become familiar with the names and locations of the controls and features shown below to better understand the instructions when mentioned later in this manual.



L237D Shown



A	Headstock	**J**	Feed Shaft
B	Digital Readout Display (L237D Only)	**K**	Start and Stop Shaft
C	Chuck Safety Guard	**L**	Swarf Tray
D	3 Jaw Chuck	**M**	Saddle
E	Fixed & Travelling Steadies	**N**	Cross Slide
F	Top Slide	**O**	Bed Gap
G	Tailstock	**P**	Feed Gearbox
H	Bed	**Q**	Stand
I	Leadscrew	**R**	Spindle

2.1 GENERAL METALWORKING MACHINE SAFETY

DO NOT use this machine unless you have read this manual or have been instructed in the use of this machine in its safe use and operation

WARNING

This manual provides safety instructions on the proper setup, operation, maintenance, and service of this machine. Save this manual, refer to it often, and use it to instruct other operators.

Failure to read, understand and follow the instructions in this manual may result in fire or serious personal injury—including amputation, electrocution, or death.

The owner of this machine is solely responsible for its safe use. This responsibility includes, but is not limited to proper installation in a safe environment, personnel training and authorization to use, proper inspection and maintenance, manual availability and comprehension, of the application of the safety devices, integrity, and the use of personal protective equipment.

The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

- ✓ Always wear safety glasses or goggles.
- ✓ Wear appropriate safety footwear.
- ✓ Wear respiratory protection where required.
- ✓ Gloves should never be worn while operating the machine, and only worn when handling the workpiece.
- ✓ Wear hearing protection in areas > 85 dBA. If you have trouble hearing someone speak from one metre (three feet) away, the noise level from the machine may be hazardous.
- ✓ DISCONNECT THE MACHINE FROM POWER when making adjustments or servicing.
- ✓ Check and adjust all safety devices before each job.
- ✓ Ensure that guards are in position and in good working condition before operating.
- ✓ Ensure that all stationary equipment is anchored securely to the floor.
- ✓ Ensure all machines have a start/stop button within easy reach of the operator.
- ✓ Each machine should have only one operator at a time. However, everyone should know how to stop the machine in an emergency.

2.1 GENERAL METALWORKING MACHINE SAFETY Cont.

- ✓ Ensure that keys and adjusting wrenches have been removed from the machine before turning on the power. Appropriate storage for tooling should be provided.
- ✓ Ensure that all cutting tools and blades are clean and sharp. They should be able to cut freely without being forced.
- ✓ Stop the machine before measuring, cleaning or making any adjustments.
- ✓ Wait until the machine has stopped running to clear cuttings with a vacuum, brush or rake.
- ✓ Keep hands away from the cutting head and all moving parts.
- ✓ Avoid awkward operations and hand positions. A sudden slip could cause the hand to move into the cutting tool or blade.
- ✓ Return all portable tooling to their proper storage place after use.
- ✓ Clean all tools after use.
- ✓ Keep work area clean. Floors should be level and have a non-slip surface.
- ✓ Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position any shade lighting sources so that they do not cause any glare or reflections.
- ✓ Ensure there is enough room around the machine to do the job safely.
- ✓ Obtain first aid immediately for all injuries.
- ✓ Understand that the health and fire hazards can vary from material to material. Make sure all appropriate precautions are taken.
- ✓ Clean machines and the surrounding area when the operation is finished.
- ✓ Use proper lock out procedures when servicing or cleaning the machines or power tools.

DO NOT

- × Do not distract an operator. Horseplay can lead to injuries and should be strictly prohibited.
- × Do not wear loose clothing, gloves, neckties, rings, bracelets or other jewellery that can become entangled in moving parts. Confine long hair.
- × Do not handle cuttings by hand because they are very sharp. Do not free a stalled cutter without turning the power off first. Do not clean hands with cutting fluids.
- × Do not use rags or wear gloves near moving parts of machines.
- × Do not use compressed air to blow debris from machines or to clean dirt from clothes.
- × Do not force the machine. It will do the job safer and better at the rate for which it was designed.

CAUTION!

It is impossible to cover all possible hazards Every workshop enviroment is different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

WARNING!

Before operating any machine, take time to read and understand all safety signs and symbols. If not understood seek explanation from your supervisor or an experienced operator.

2.1 GENERAL METALWORKING MACHINE SAFETY Cont.

HAZARDS ASSOCIATED WITH MACHINES include, but are not limited to:

- Being struck by ejected parts of the machinery
- Being struck by material ejected from the machinery
- Contact or entanglement with the machinery
- Contact or entanglement with any material in motion

Health Hazards (other than physical injury caused by moving parts)

- Chemicals hazards that can irritate, burn, or pass through the skin
- Airborne items that can be inhaled, such as oil mist, metal fumes, solvents, and dust
- Heat, noise, and vibration
- Ionizing or non-ionizing radiation (X-ray, lasers, etc.)
- Biological contamination and waste
- Soft tissue injuries (for example, to the hands, arms, shoulders, back, or neck) resulting from repetitive motion, awkward posture, extended lifting, and pressure grip.

Other Hazards

- Slips and falls from and around machinery during maintenance
- Unstable equipment that is not secured against falling over
- Safe access to/from machines (access, egress)
- Fire or explosion
- Pressure injection injuries from the release of fluids and gases under high pressure
- Electrical Hazards, such as electrocution from faulty or ungrounded electrical components
- Environment in which the machine is used (in a machine shop, or on a work site)

CAUTION

It is impossible to cover all possible hazards. All workshop environments are different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

CAUTION

A prepared list of safety guidelines can never be complete. Every workshop environment is different. Always consider Safety first, as it applies to your individual working conditions. Use this machine and other machinery with caution and respect. Failure to do so could result in serious Personal injury, damage to the equipment, or poor work results.

2.2 SPECIFIC LATHE SAFETY

DO NOT use this machine unless you have been instructed in its safe use and operation and have read and understood this manual


Safety glasses must be worn at all times in work areas


Long and loose hair must be contained


Gloves must not be worn when using this machine


Sturdy footwear must be worn at all times in work areas


Close fitting/protective clothing must be worn


Rings and jewelery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Check the job is clamped tight in the chuck.
- ✓ Remove all tools from the bed and slides of the machine.
- ✓ Ensure the correct speed for machining process is selected.
- ✓ Remove the chuck key before starting the lathe.

OPERATIONAL SAFETY CHECKS

- ✓ Before making adjustments or measurements, switch off and bring the machine to a complete standstill.
- ✓ Always remove the chuck key from the chuck.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Reset all guards to a fully closed position.
- ✓ Avoid letting swarf build up on the tool or job. Stop the machine and remove it.
- ✓ Leave the machine in a safe, clean and tidy state.

DON'T

- × **Do not** use faulty equipment. Immediately report suspect machinery.
- × **Do not** try to lift chucks or face plates that are too heavy for you.
- × **Do not** leave the machine running unattended.
- × **Do not** attempt to slow or stop the chuck or revolving work by hand.
- × **Do not** leave equipment on top of the machine.

POTENTIAL HAZARDS AND INJURIES

- ❒ Flying objects such as the chuck key left in chuck.
- ❒ Cutting tool injury when cleaning, filing or polishing.
- ❒ Hair/clothing getting caught in moving machine parts.
- ❒ Metal splinters and swarf.
- ❒ Eye Injuries.

3. POWER SUPPLY

3.1 ELECTRICAL INSTALLATION

Place the machine near an existing power source. Make sure all power cords are protected from traffic, material handling, moisture, chemicals, or other hazards. Make sure there is access to a means of disconnecting the power source. The electrical circuit must meet the requirements for 240V.

NOTE : The use of an extension cord is not recommended as it may decrease the life of electrical components on your machine.

ELECTRICAL REQUIREMENTS

Nominal Voltage..... 240V
Cycle..... 50 Hz
Phase..... Single Phase
Power Supply Circuit.....15 Amps
Full Load Current.....10.5 Amps

(Full load current rating is also on the specification plate on the motor.)

3.2 FULL-LOAD CURRENT RATING

The full-load current rating is the amperage a machine draws when running at 100% of the output power. Where machines have more than one motor, the full load current is the amperage drawn by the largest motor or a total of all the motors and electrical devices that might operate at one time during normal operations.

Full-Load Current Rating for these machine at 240V is 10.5 Amps.

It should be noted that the full-load current is not the maximum amount of amps that the machine will draw. If the machine is overloaded, it will draw additional amps beyond the full-load rating and if the machine is overloaded for a long period of time, damage, overheating, or fire may be caused to the motor and circuitry.

This is especially true if connected to an undersized circuit or a long extension lead. To reduce the risk of these hazards, avoid overloading the machine during operation and make sure it is connected to a power supply circuit that meets the requirements.

4 SETUP

4.1 UNPACKING

This machine was carefully packaged for safe transport. When unpacking, separate all enclosed items from packaging materials and inspect them for shipping damage. If items are damaged, please contact your distributor.

NOTE: Save all the packaging materials until you are completely satisfied with the machine and have resolved any issues with the distributor, or the shipping agent.

When unpacking, check the packing list to make sure that all parts shown are included. If any parts are missing or broken, please contact the your distributor.

4.2 INCLUDED ACCESSORIES

160mm 3-jaw chuck with reverse jaws
200mm 4-jaw chuck
Face plate
Fixed and traveling steadies
Change gears
Dead centre
Cabinet stand
Splash tray
Toolbox and instruction booklet
Swarf tray
Thread-chasing dial
Chuck guard

4.3 CLEAN - UP

The unpainted surfaces of the machine have been coated with a waxy oil to protect them from corrosion during shipment. Remove the protective coating with a solvent cleaner or a citrus based degreaser.

Optimum performance from your machine will be achieved when you clean all moving parts or sliding contact surfaces that are coated with rust prevented products.

It is advised to avoid chlorine based solvents, such as acetone or brake parts cleaner, as they will damage painted surfaces and strip metal should they come in contact. Always follow the manufacturer's instructions when using any type of cleaning product.

4.4 SITE PREPARATION

When selecting the site for the machine, consider the largest size of workpiece that will be processed through the machine and provide enough space around the machine for operating the machine safely. Consideration should be given to the installation of auxiliary equipment. Leave enough space around the machine to open or remove doors/covers as required for the maintenance and service as described in this manual.

It is recommended that the machine is anchored to the floor to prevent tipping or shifting. It also reduces vibration that may occur during operation.

4.5 LIFTING INSTRUCTIONS

On the day that the machine arrives, make sure that a crane or forklift with sufficient capacity is available to unload the machine from the vehicle. Ensure access to the chosen site is clear and that doors and ceilings are sufficiently high and wide enough to receive the machine.

To handle the machine, the slings should be positioned so the machine is level when lifted.

Mount The Lathe On The Stand

1. Slowly lift the lathe, controlling any tendency for it to swing as it clears the pallet. (Fig. 4.2)
2. Move the lathe into position, then hover it close over the chip tray. This will allow to mark the perimeters of the lathe bed pedestals for the purpose of caulking.
3. Apply a thick bead of silicone caulk just inside the marked perimeters on the tray.
4. Lower the lathe onto the chip tray, making sure that the six mounting holes are properly aligned. Excess caulk squeezed out by the pedestals will form a coolant-proof seal.

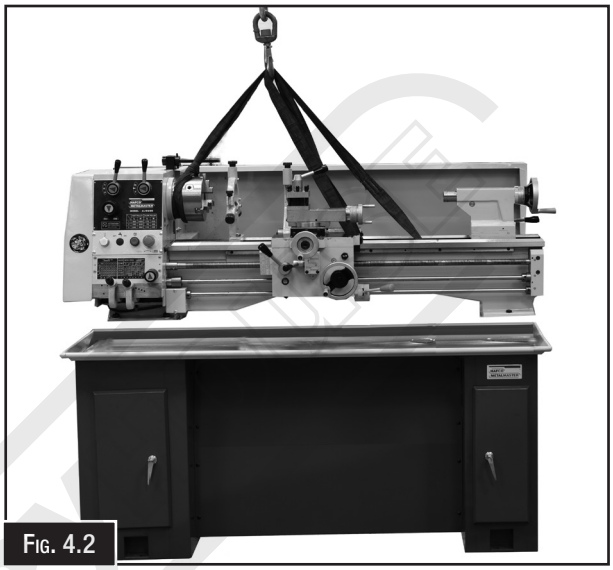


FIG. 4.2

LIFTING POINT

To obtain a balanced condition before lifting, it is necessary to move the tailstock to the right hand end of the bed way and clamp it there. Make sure to clean the bed ways before moving the carriage or tailstock. Use the bed clamping plate and eyebolt to sling the lathe. Position the saddle and tailstock along the bed to obtain the balance. Raising and lowering the machine should be done carefully, Especially when you are lowering the machine. Be sure not to bump the machine against the floor.

Important: Do not use slings around the bed as lead-screw and feed shaft may be bent.

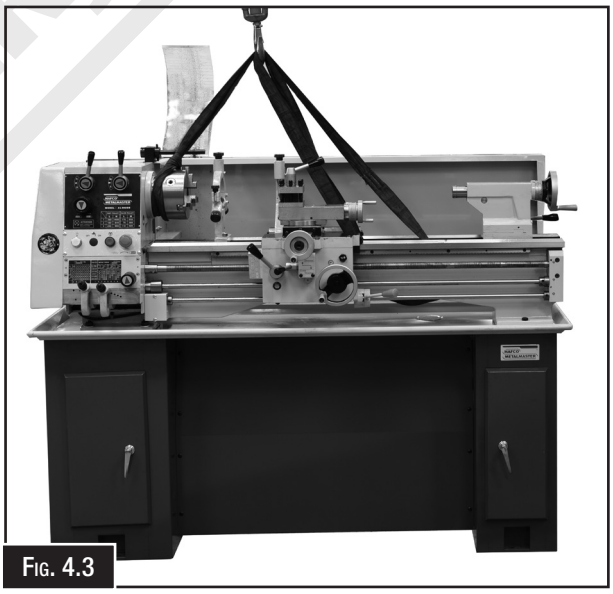
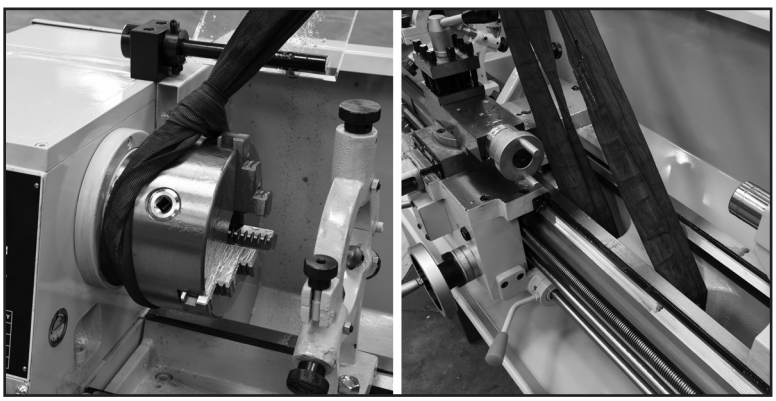


FIG. 4.3



4.6 ANCHORING TO THE FLOOR

OPTIONS FOR MOUNTING

The machine is best mounted on a concrete slab. Masonry anchors with bolts are the best way to anchor machinery, because the anchors sit flush with the floor surface, making it easy to unbolt and move the machine later, if needed. (Fig. 4.4)

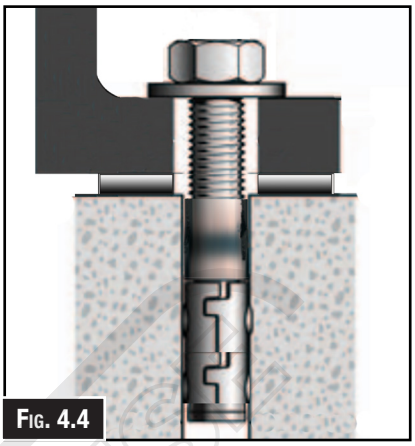


FIG. 4.4

4.7 MACHINE LEVELING

To set your machine up so that it operates to optimum performance, apply the following procedure.

After your machine has been anchored to a concrete slab floor, it then needs to be levelled. Loosen the hold down bolts and place a level on the surface of the Lathe bed. Metal shims need to be placed under corner of the base of the machine until level. Once level and the machine is stable then tighten the hold down bolts. (Fig. 4.5).

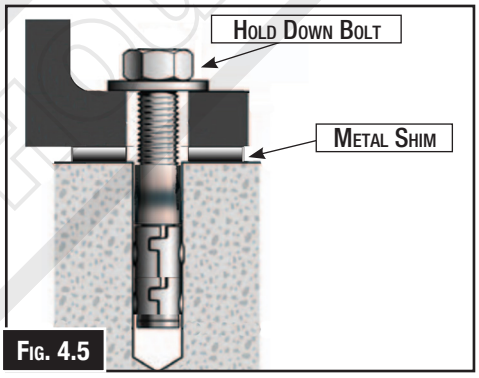
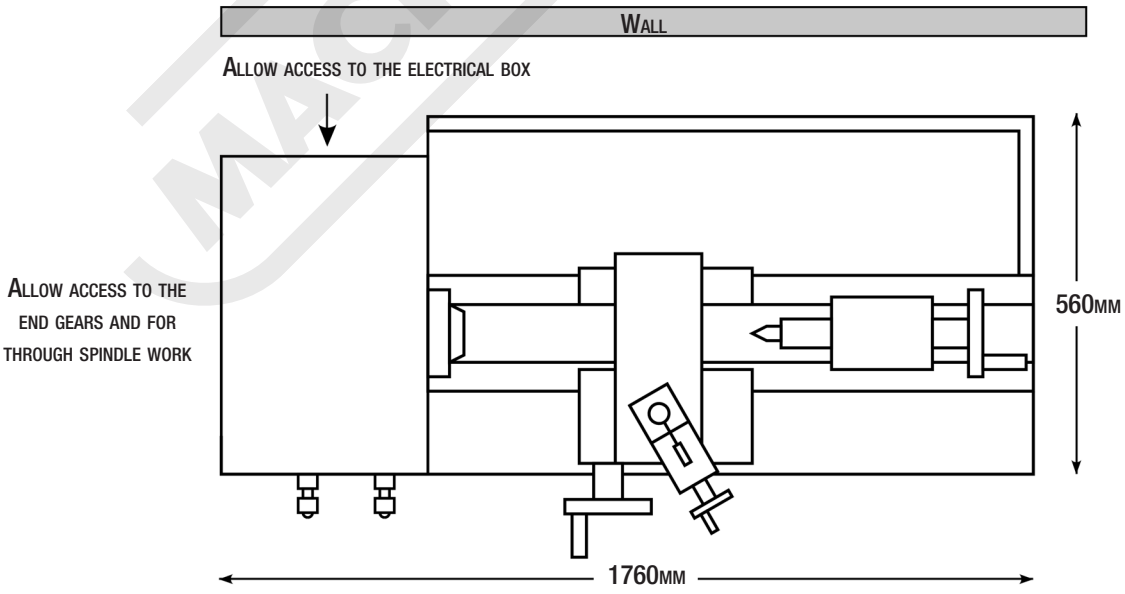


FIG. 4.5

Floor Plan



4.8 ASSEMBLY

The machine must be fully assembled before it can be operated. First clean any parts that are coated in rust preventative to ensure the assembly process can proceed smoothly.

Mounting The Digital Readout (DRO Model Only)

Disconnect the machine from the power before installing the DRO.

The Digital Readout will need to be fitted using the aluminium angle bracket. (Fig. 4.6)

NOTE: In some cases the machine may be supplied fully assembled and may only require the fitting of the chuck to the spindle.

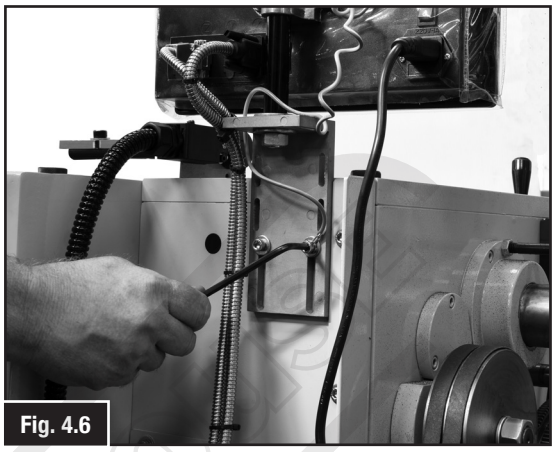


Fig. 4.6

Chuck Safety Guard. (Fig.4.7)

Assembly required will be the bolting on of the safety guard.

Disconnect the machine from the power before installing the guard. Bolt the perspex chuck guard onto the mounting shaft making sure not to over tighten the screws and crack the perspex.

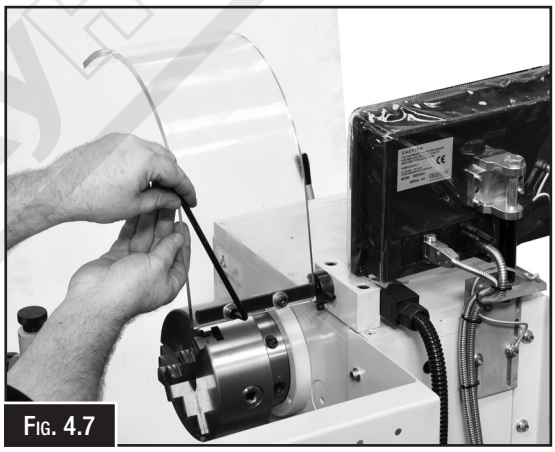


Fig. 4.7

5. OPERATION

This machine may perform many types of operations that are beyond the scope of this manual. Many of these operations may be dangerous or deadly if performed incorrectly.

The instructions in this section are written with the understanding that the operator has the necessary knowledge and skills to operate this machine. If at any time you are experiencing difficulties performing any operation, stop using the machine!

If you are an inexperienced operator, we strongly recommend that you read books, trade articles, or seek training from an experienced operator before performing any unfamiliar operations.

Above all, your safety should come first!

5.1 CONTROLS

The purpose of this control overview is to provide the novice machine operator with a basic understanding of how the machine is used during operation, and the machine controls and what they do. It also helps the operator to understand if they are discussed later in this manual.

NOTE: DO NOT start the machine until all of the setup instructions have been performed.

HEADSTOCK ELECTRICAL CONTROLS Fig.5.1

1. **Pilot Lamp:** Illuminates when power is connected to the control panel.

2. **Coolant Switch:** Switches the coolant On or OFF

3. **Jog Button:** Allows for the spindle to be rotated in small amounts.

4. **Emergency Stop Button:** When pressed disconnects power to the control panel and stops the machine. To reset the stop button the top of the stop button must be twisted to allow the button to pop up.

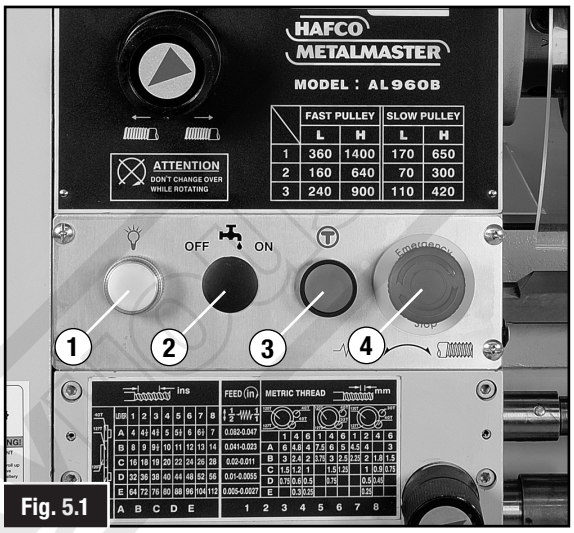


Fig. 5.1

HEADSTOCK CONTROLS Fig.5.2

A. **Spindle Speed Levers:** Alpha (right) and numeric (left) are used to select one of the 12 available spindle speeds.

B. **Headstock Feed Direction Knob:** Controls the direction that the leadscrew and feed rod rotate.

C. **Spindle Speed Chart:** Displays the speed lever positions for each speed.

D. **Thread and Feed Charts:** Displays the necessary configuration of the gearbox dials and end gears for different threading or feeding options.

E. **Quick-Change Gearbox Levers:** Controls the leadscrew and feed rod speed for threading and feeding operations.

F. **Thread Or Feed Shaft Selector:** Selects between the feed shaft or the lead screw

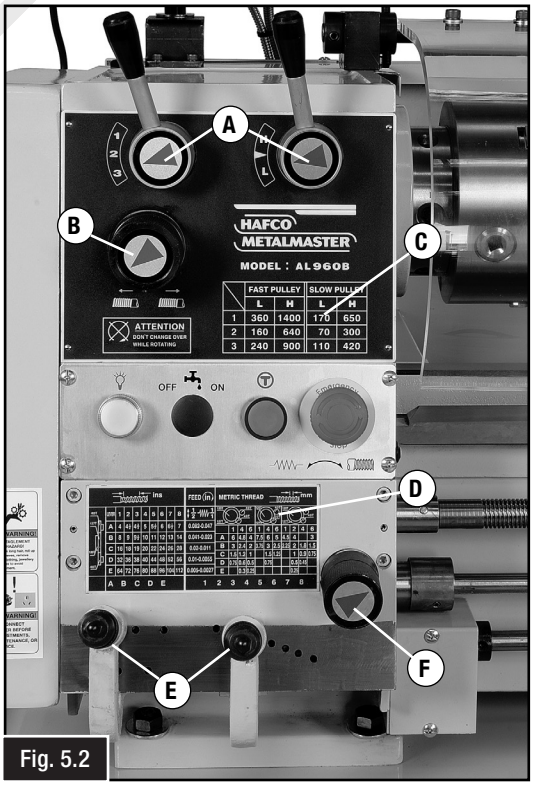


Fig. 5.2

SADDLE Fig.5.3

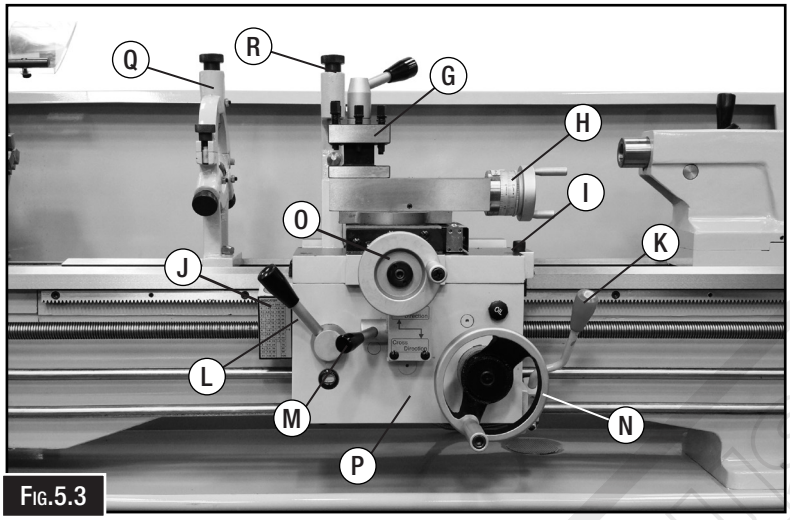


FIG.5.3

G. Tool Post: Allows the operator to load and unload tools.

H. Compound Rest Hand wheel: Moves the tool toward and away from the workpiece at the preset angle of the compound rest.

I. Carriage Lock: Secures the carriage in place for greater rigidity when it should not move.

J. Thread Dial: Indicates when to engage the half nut during threading operations.

K. Spindle Lever: Starts, stops and reverses direction of spindle rotation.

L. Half Nut Lever: Engages/disengages the half nut for threading operations.

M. Feed Selection Lever: Selects the carriage or cross slide for power feed.

N. Carriage Hand wheel: Moves the carriage along the bed.

O. Cross Slide Hand wheel: Moves the cross slide toward and away from the workpiece.

P. Apron: Houses the carriage gearing.

Q. Fixed Steady: Used to support longer work pieces. Can be removed for normal machining or installed when support is required for longer work pieces.

R. Travelling Steady; Travels with the saddle and is used to support thin materials and sits opposite the tool.

TAILSTOCK Fig. 5.4

The tailstock has many functions. The main use is for holding drill chucks and centres.

The barrel has been etched` with graduations in millimetres and inches and has a Morse taper #3 bore. The tailstock also can be offset to cut tapers.

A. Top Lock Lever - This lever locks the tailstock barrel in place.

B. Side Lock Lever - This lever locks the tailstock in place on the lathe bed.

C. Tailstock Hand-wheel - Turning the hand-wheel advances or retracts the barrel in the tailstock. The graduated dial on the hand wheel is adjustable.

D. Tailstock Adjustment - Two grub screws, (one either side) control the adjustment of the tailstock when taper turning is required

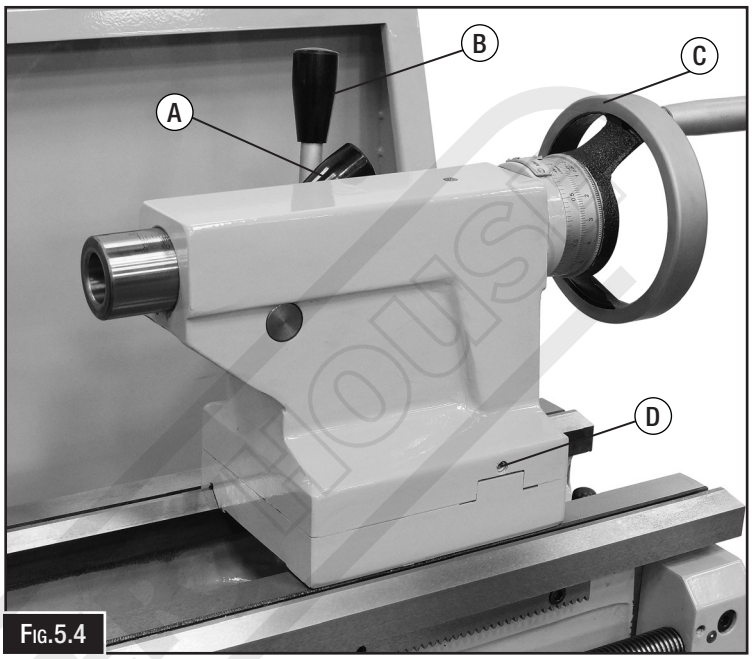


FIG.5.4

STEADIES Fig.5.5

E. Knurled Screws - Moves the fingers in or out to allow for adjustment.

F. Lock Nut - When unlocked allows the fixed steady to be split to allow the steady to be placed around the work.

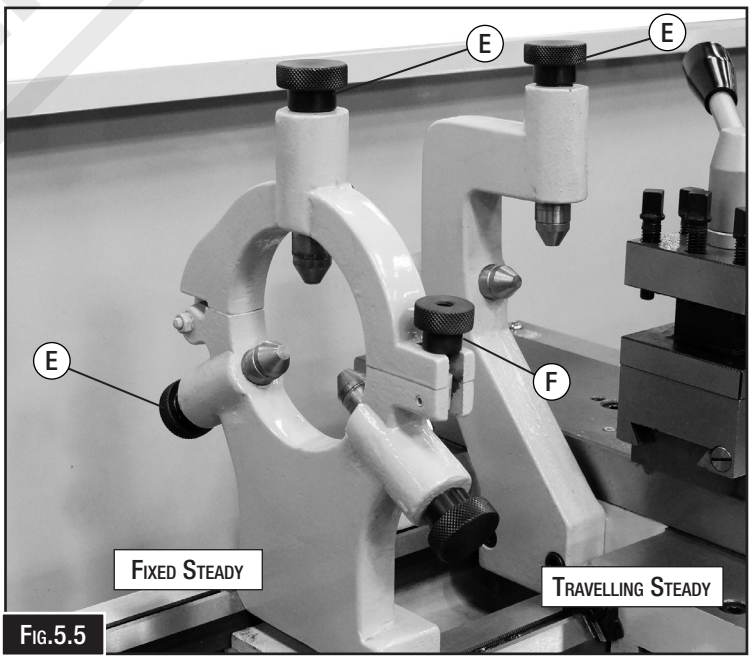


FIG.5.5

5.2 CHUCK & FACEPLATE MOUNTING

This lathe is equipped with a D1- 4 Camlock spindle nose. This type of spindle uses cams that are adjusted with a chuck key to securely mount a chuck or faceplate with repeatable precision and ease.

Because chucks are heavy and often awkward to hold, some kind of lifting, support, or protective device should be used during installation or removal. (Fig. 5.6)

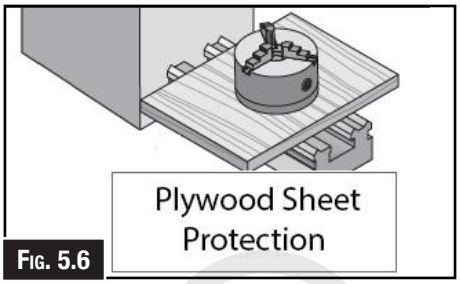


FIG. 5.6

To ensure that the work is accurate, it is extremely important to make sure the spindle nose and chuck mating surfaces and tapers are clean. Even a small amount of lint or dirt can affect the accuracy.

The chuck is properly installed when all camlocks are tight, the spindle and chuck tapers firmly lock together, and the back of the chuck is firmly seated against the face of the spindle all the way and without any gaps.

Mounting The Chuck

Clean and lightly oil the camlock studs, then thoroughly clean the mating surfaces of the spindle and chuck.

Install the chuck by inserting the camlock studs straight into the spindle cam holes.

NOTE: Avoid inserting the studs in from an angle or rotating the spindle. This can damage the studs or the cam holes. (Fig. 5.7)

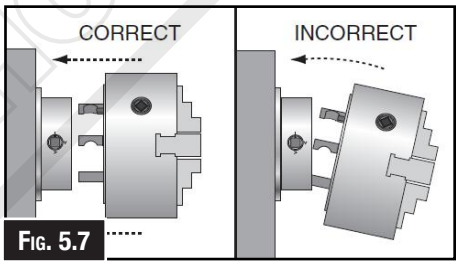


FIG. 5.7

When the chuck is fully seated and all the camlocks are tight, check that the cam line is between the two “V” marks on the spindle nose, as shown in Fig. 5.8.

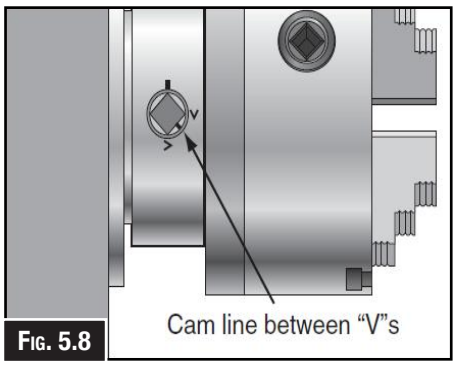


FIG. 5.8

If the cam line is not between the “V” marks when the camlock is tight, the stud may be installed at the incorrect height.

First check that the line on the cam is flush with the surface of the chuck. If it is not then adjust the stud height as shown (Fig. 5.9).

Make sure to re-install the stud cap screw afterward.

If adjusting the stud height does not correct the problem, try swapping stud positions on the chuck.

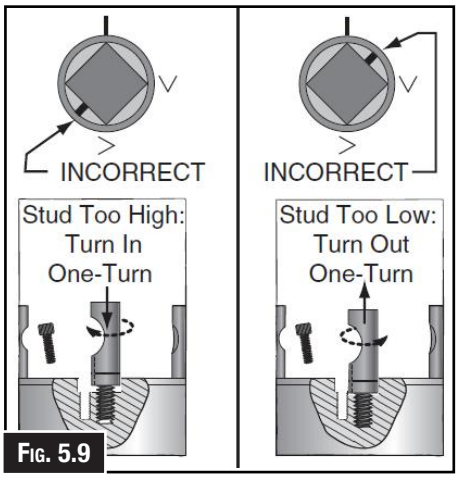


FIG. 5.9

5.3 SETTING THE CUTTING TOOL ON THE CENTERLINE

The tip of the cutting tool should be set up so that it is in line with the centerline of the spindle, as illustrated in Fig. 5.10.

The cutting tool can be raised by placing steel shims underneath it. The shims should be as long and as wide as the cutting tool to properly support it.

There are a number of ways to check that the cutting tool is on the centre line of the spindle.

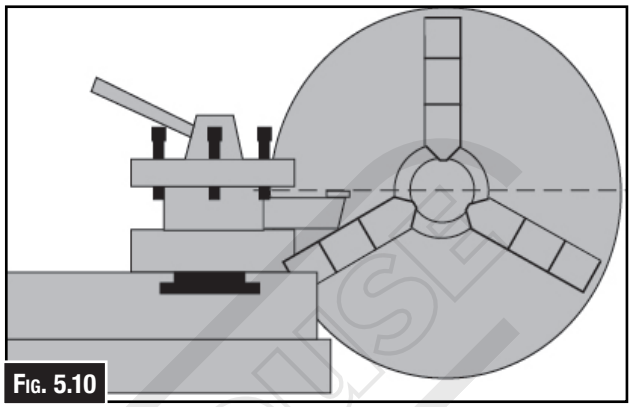


FIG. 5.10

Below are two common methods:

1. Move the tailstock center over the cross slide and use a fine ruler to measure the distance from the surface of the cross slide to the tip of the center. Adjust the cutting tool height so it is the same distance above the cross slide as the tailstock center.
2. Align the tip of the cutting tool with a tail stock center, as described in the following procedure.

a. Mount the cutting tool and secure the post so the tool faces the tailstock.

b. Install a center in the tailstock, and position the tip near the cutting tool.

c. Lock the tailstock and quill in place.

d. Adjust the height of the cutting tool tip to meet the center tip, as shown. (Fig. 5.11)

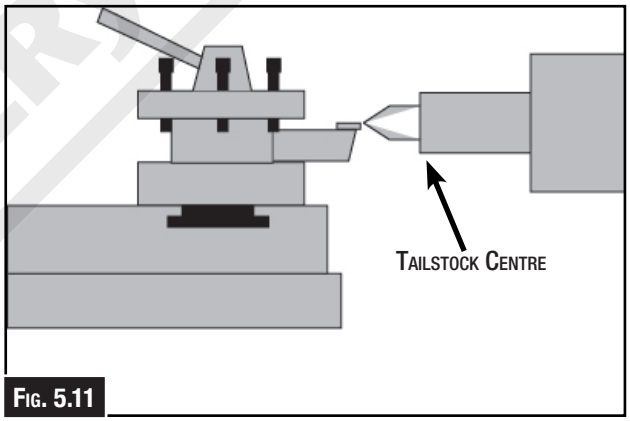


FIG. 5.11

WARNING

The machine is the sole responsibility of the owner for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training, proper inspection and maintenance, manual availability and comprehension. The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

5.4 SPINDLE SPEEDS

Using the correct spindle speed is important for getting safe and satisfactory results, as well as maximizing tool life.
To set the spindle speed for your operation, you will need to: 1) Determine the best spindle speed for the cutting task, and 2) configure the lathe controls to produce the required spindle speed.

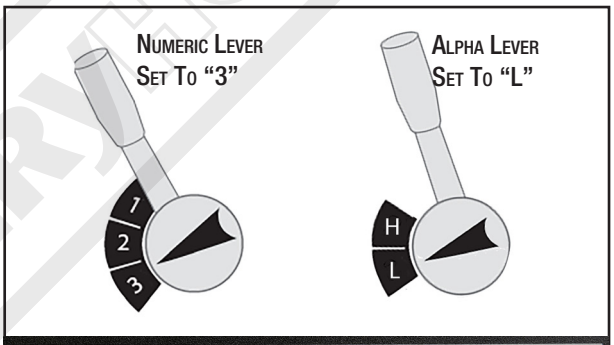
Determining Spindle Speed

Many variables affect the optimum spindle speed to use for any given operation, but the two most important are the recommended cutting speed for the workpiece material and the diameter of the workpiece, as noted in the formula shown below.

$$\frac{\text{Recommended Cutting Speed (Mtrs/Min) x 1000}}{\text{Diameter in Millimeters x 3.14}} = \text{RPM}$$

The Fitting & Machining handbook (L341) and some Internet sites, provide excellent recommendations for which cutting speeds to use when calculating the spindle speed.

These sources also provide a wealth of additional information about the variables that affect cutting speed and they are a good educational resource.



	FAST PULLEY		SLOW PULLEY	
	L	H	L	H
1	360	1400	170	650
2	160	640	70	300
3	240	900	110	420

Fig. 5.12

Example

Figure 5.12 shows the levers positioned for a spindle speed of 240 RPM or 110 RPM depending on the pulley configuration.

Note: If the spindle speed levers do not easily adjust into position, rotate the spindle by hand

while you apply pressure to the lever. When the gears align, the lever will easily move into place. If you have trouble rotating the spindle by hand, you can use the spindle key or a chuck key to get additional leverage—just be sure to remove the key when you are done.

WARNING!

To avoid damaging gears, ALWAYS make sure the spindle is completely stopped BEFORE moving the spindle speed levers.

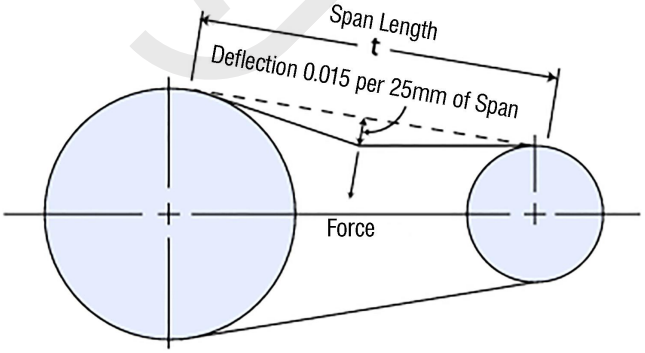
High And Low Range

The switch between HIGH and LOW speed range is achieved through V-belts and pulleys on the end of the machine. (Fig. 5.13) Below is the procedure for making the change.

To change from High to Low speed:

1. View the speed chart on the headstock and decide if High or Low speed is required.
2. DISCONNECT THE MACHINE FROM THE POWER SUPPLY.
3. Remove the gear train cover on the end of the machine.
4. Loosen the motor adjust screw to allow the motor to move up or down. (Fig. 5.14)
5. Lift the motor up so that the V-belt is easily moved and move the V-belt to the desired pulleys.
6. Allow the motor to drop down to put tension on the belt.
7. Tighten the motor adjust screw making sure that the belt has been tensioned correctly. (See tension diagram below)
8. Replace the gear train cover.
9. Connect the machine to the power and test the machine to make sure that it runs correctly.

FIG. 5.13



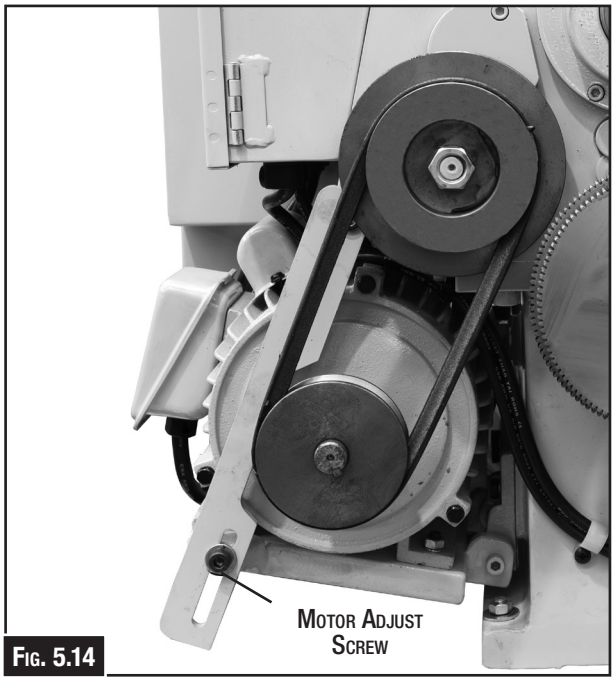
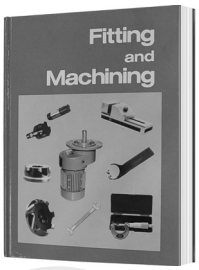


FIG. 5.14

5.5 THREADING

The machine is designed to cut most metric and inch threads. The following sections will describe how to use the threading controls to set up the lathe for a threading operation. If you are unfamiliar with the process of cutting threads on a lathe, it is strongly recommend that you read a trade manual such as Hafco L341, or seek formal training before attempting any threading projects. Consult the thread charts for the correct lever settings.



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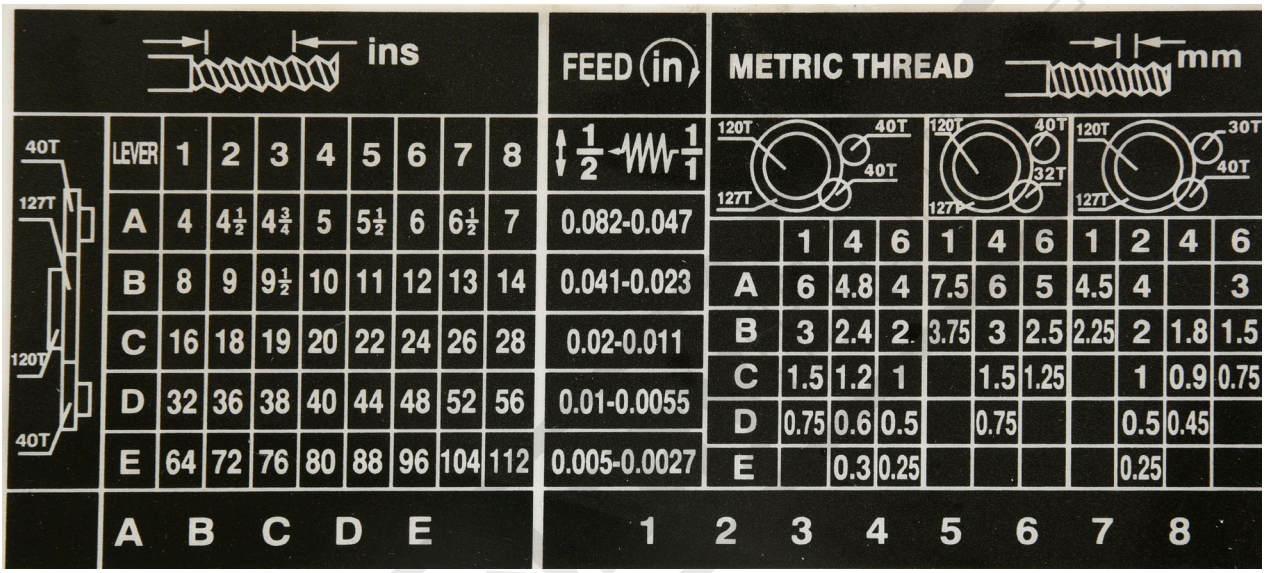
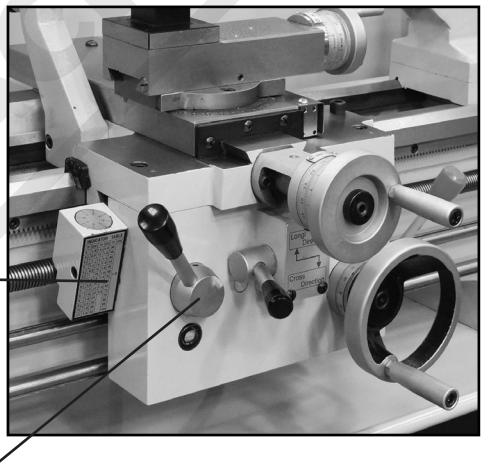


The numbers on the thread dial are used with the thread dial chart to show when to engage the half nut during threading. (Fig. 5.15)

FIG. 5.15



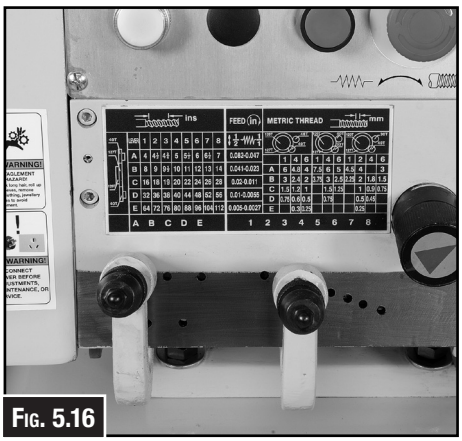
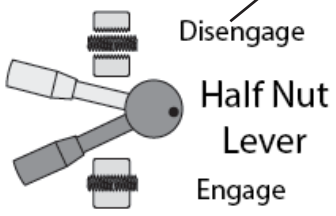


FIG. 5.16



Cutting Threads
To obtain the desired pitch a combination of a letter, (Left hand lever) and a number,(Right hand lever) (Fig.5.16)

Example: To obtain 5tpi thread, the left lever is placed in the "A" slot and the right lever in the 4 position.

5.6 CHANGE GEARS

The end gears are used to setup for power feed, inch, or metric threading operations. See Fig. 5.17 to identify the upper gear, middle 120T/127T change gears, and the lower gear. Details on which gear to use are found on the headstock feed and threading charts.

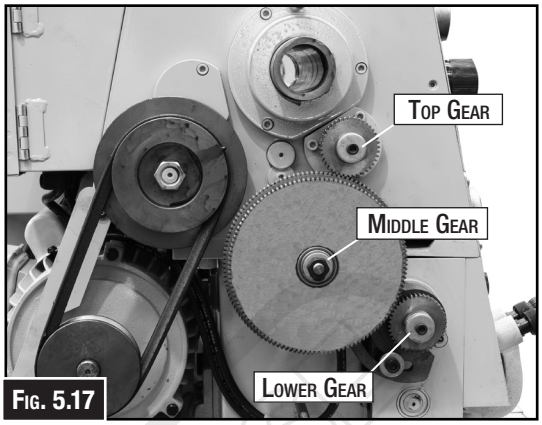


Fig. 5.17

Change Gear Configuration

To configure the change gears:

1. Locate the chart on the headstock that has the thread or feed option that is required.

2. DISCONNECT THE MACHINE FROM POWER!

3. Remove the headstock end gear cover.

4. While holding the 120T/127T gears, loosen the arm by undoing the gear support hex nut and slowly let the gears pivot down and away from the upper top gear, as illustrated. (Fig. 5.18)

5. Loosen the 120T/127T gear hex nut and slide the middle gear away from the bottom gear. The 120T/127T gears many need to be reversed. Undo the 120T/127T gear hex nut (Fig. 5.18) and reverse the gears.

6. Remove the cap screw and flat washer from the top gear, then slide the gear off the shaft. Slide the desired gear onto the top gear shaft and desired gear onto the bottom gear shaft making sure to align the keys and keyways. Position the flat, non-stepped face of the gears away from the headstock so they will mesh with either the 120T or 127T gear depending on which one is required.

7. Secure the top and bottom gears with the flat washers and cap screws that were removed earlier

8. Raise the gear support arm and mesh the top gear with the 120T/127T, then tighten the gear support hex nut and replace the change gear cover.

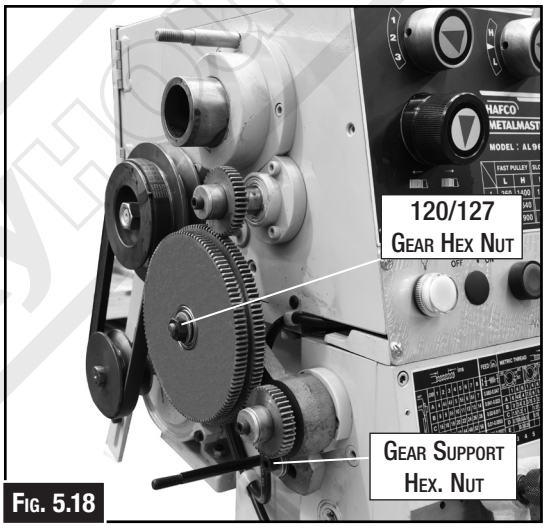


Fig. 5.18

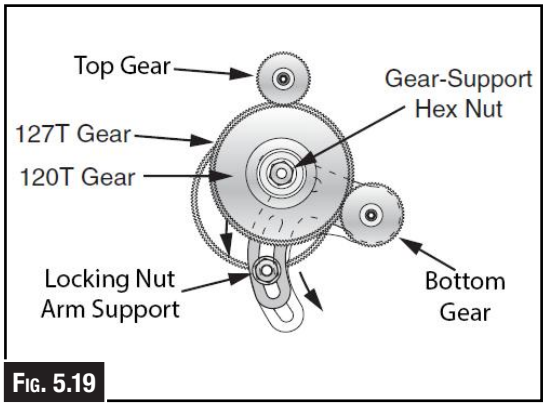


Fig. 5.19

5.7 SELECTING THE FEEDS

The AL-960B Metal Lathe can cut left or right while feeding or threading, and both ways for facing operations. This feed direction is controlled by the selection knob on the headstock. (Fig.5.20)

NOTE: The feed direction knob should not be changed while the spindle is rotating.

FIG. 5.20

Feed Lever - Longitudinal and cross slide powered feeds are controlled by the feed lever. The lever pivots through two stops which require moving the lever left and right as well as up and down. Moving this lever upward activates the automatic longitudinal feed. Moving the lever down activates the cross slide for facing operations. (Fig. 5.21)

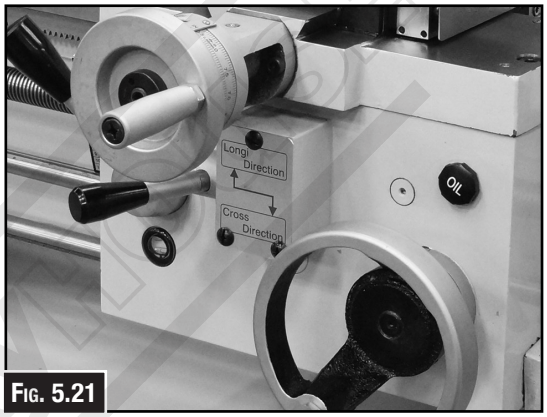
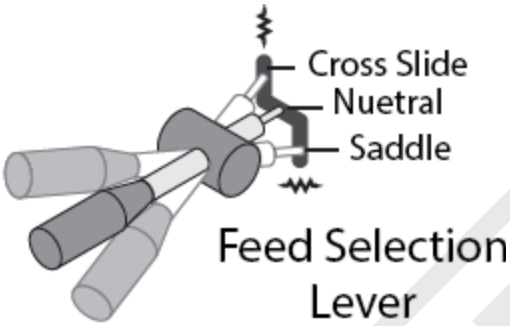


FIG. 5.21



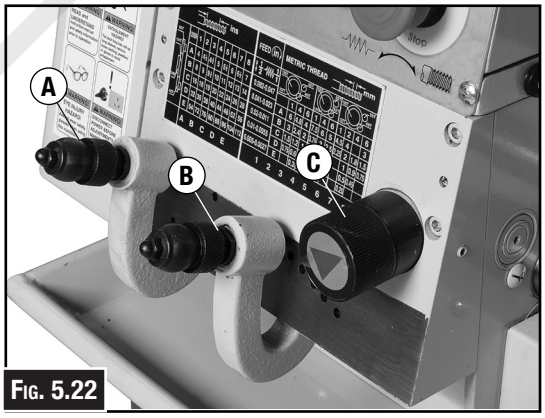


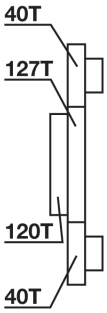
FIG. 5.22

Selecting the Feeds

The feed rod can be selected by rotating the Knob to the left (C in Fig. 5.22). Use this position for all feeding operations. When the knob is positioned straight up, no drive device is selected and the gear train is now disconnected.

To select the feed rate check for the rate on the table below and then use levers (A & B in Fig. 5.22) to select the feed.

FEED RATE (in) 1/1 1/3



	1	2	3	4	5	6	7	8
A	0.0590	0.0524	0.0496	0.0472	0.0429	0.0393	0.0363	0.0337
B	0.0295	0.0262	0.0248	0.0236	0.0214	0.0197	0.0181	0.0168
C	0.0147	0.0131	0.0124	0.0118	0.0107	0.0098	0.0091	0.0084
D	0.0074	0.0066	0.0062	0.0059	0.0054	0.0049	0.0045	0.0042
E	0.0037	0.0033	0.0031	0.0029	0.0027	0.0025	0.0023	0.0021

5.8 ALIGNING TAILSTOCK TO SPINDLE CENTERLINE

This is an essential adjustment that should be checked or performed each time the tailstock is used to turn concentric workpieces between centers or immediately after offsetting the tailstock when turning a taper. If the tailstock is not aligned with the spindle centerline when it is supposed to be, turning results will not be parallel along the length of the workpiece.

Steps to align the tailstock to the spindle centerline:

1. Center drill both ends of one piece of round bar, then set it aside for use later in step 4.
2. Use the other piece of round stock to make a dead center, and turn it to a 60° point, as illustrated in the Fig. 5.23

NOTE ! Do not remove machined centre from the chuck. The point of the center will remain true to the spindle centerline

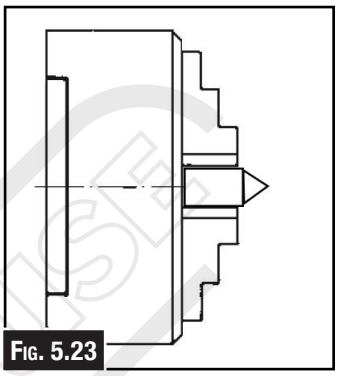


FIG. 5.23

FIG. 5.24

3. Install a center in the tailstock.
4. Attach a lathe dog to the test piece of round stock from Step 1, then mount it between the centers as shown in Fig. 5.24.
5. Turn 1mm off the stock diameter.
6. Mount a test or dial indicator so that the plunger is on the tailstock quill and set the dial to “0”. (Fig. 5.25)
7. Use a micrometer to measure both ends of the workpiece. If the test stock is larger at the tailstock end, then adjust the tailstock toward the front of the lathe half the distance of the difference.
8. Repeat the steps until the round bar is turned parallel.

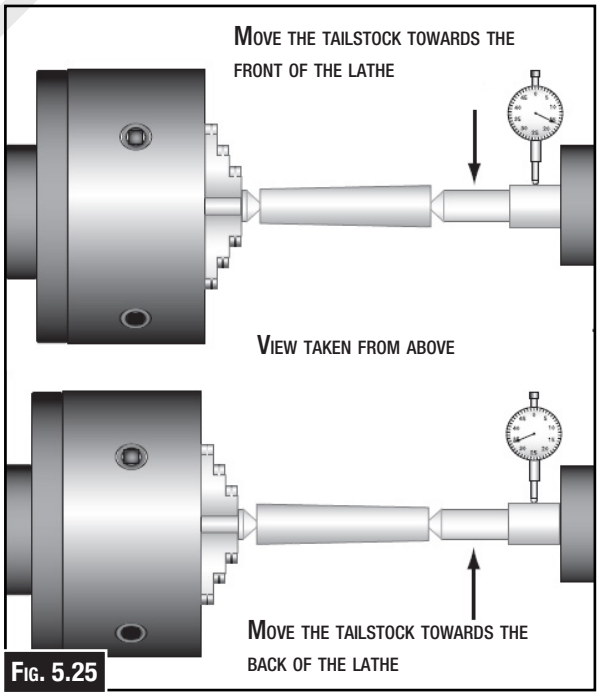


FIG. 5.25

5.9 REMOVING AND REPLACING THE BED GAP

This AL-960B Lathe bed is equipped with a removable gap that allows for the turning of large diameter workpieces. The gap was seated, pre-loaded, and then ground for precise mating and alignment at the factory.

Removing the gap can cause the lathe insert to slightly spring out of shape. When re-installed, there is no guarantee that original alignment and flush mating will be the same. For this reason, removing the gap is considered a permanent alteration to the lathe, even if it is later re-installed.

To Remove The Gap

1. DISCONNECT MACHINE FROM POWER!
2. Remove the four cap screws that secure gap to bed.
3. Tighten dowel-pin jack nut (Fig. 5 .26) to remove the pin from the gap.
4. Loosen the pusher set screws (Fig. 5.26) a few turns until they are no longer in contact with the headstock.
5. Tap the outside of the gap piece with a soft face hammer to loosen it and remove the gap piece.

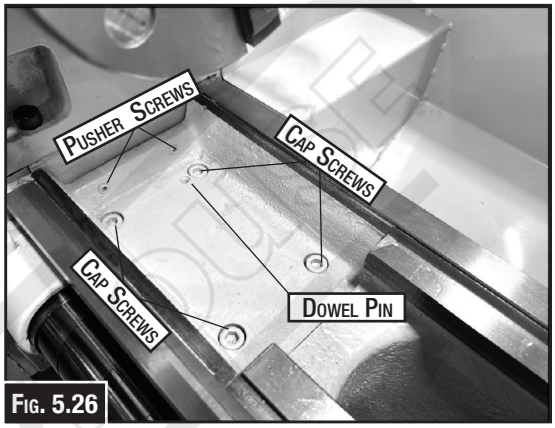


FIG. 5.26

To Re-install The Gap

1. Make sure all mating surfaces are clean.
2. Place the gap in position and tap in the dowel pin.
3. Install the 4 hold down socket head cap screws snug but not tight.
4. Jack the insert to the right with the pusher screws to close the gap, if any, between the ground surfaces of the bed ways at the join.
5. Tighten the four hold down bolts.

WARNING

SAFETY FIRST	***The safety instructions given in this manual cannot be complete. The environment in every shop is different. Always consider your safety first as it applies to your individual working conditions.***

WARNING!

Serious injury or death can result from using this machine BEFORE understanding its controls and related safety information. DO NOT operate, or allow others to operate, the machine until the information is understood.

CAUTION!

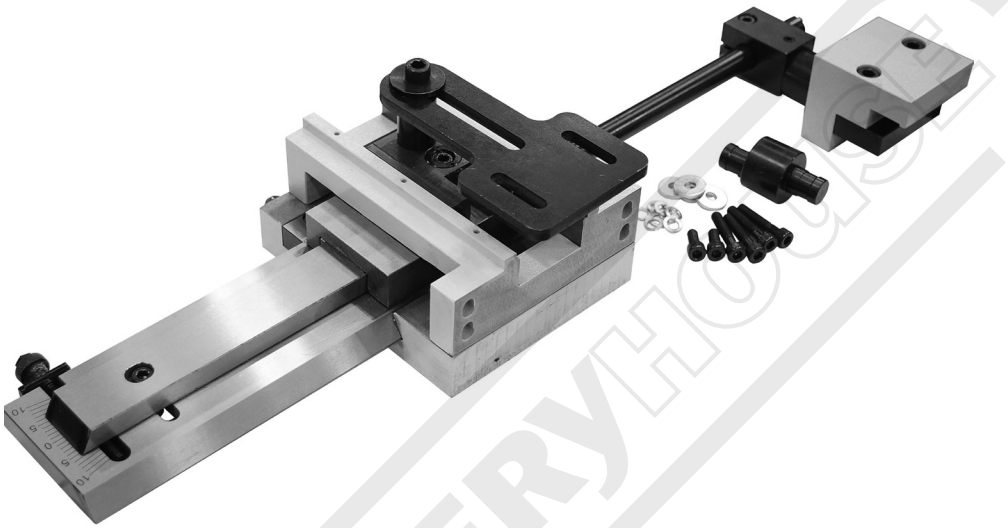
Check the oil levels and lubrication points before running the machine for the first time. Lack of lubrication can cause damage to the machine and may void the warranty.

5.10 OPTIONAL TAPER TURNING ATTACHMENT

Taper attachments are designed to enable lathes to accurately create tapered cuts in workpieces.

Advantage is that once the tool is made with cutting edge at particular angle, as long as tool is aligned perpendicular to the axis of the lathe, one can easily turn the jobs at required angle.

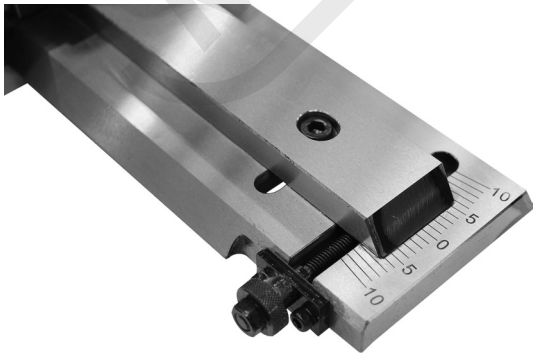
During taper turning, the job is held between centres or in a chuck. The guide bar is turned to a required angle. The angle is calculated using the formula, angle = D – d /2l. Lg - Half of the total length of the guide bar.

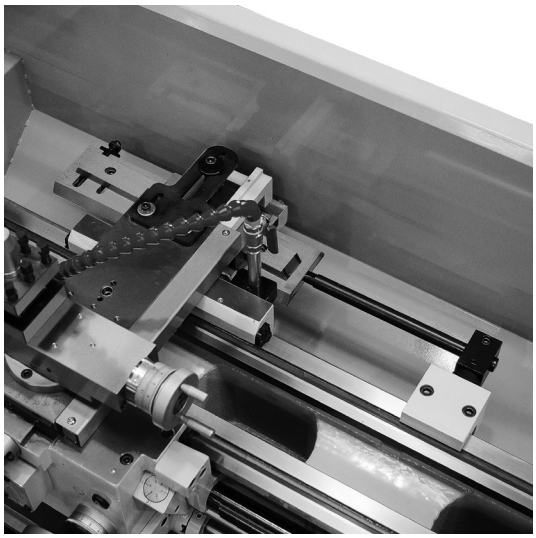


Suits AL-960B & AL-1000C/D centre lathes or it can be adapted to many other lathes as well

Please Note: Some modifications maybe required to fit taper attachment to these lathes

Features
300mm taper turning travel
±10° adjustable taper in 1° increments
Hardened & ground slides
Includes mounting brackets & stops





6. MAINTENANCE

6.1 LUBRICATION

⚠ WARNING ***Before maintaining or cleaning the machine, turn off the circuit breaker, or disconnect the machine from the power supply. Post a sign to inform other workers that the machine is under maintenance.***

For optimum performance from the machine, it is important that the machine is well lubricated and maintained. Follow the maintenance schedule listed in the following section and refer to any specific instructions given.

Use the information in the charts below as a daily guide for lubrication tasks

Assembly	Part	Method	Lubricant	Interval
Headstock	Spindle Gears and Bearings	Oil Bath	Machine Oil	6 Months
Feed Box	Gears and Bearings	Oil Bath	Machine Oil	Check site glass daily and fill as required
Carriage	Gears and Bearings	Oil Bath	Machine Oil	Check site glass daily and fill as required
End Gears	Change gears and quadrant	Oil Can	Machine Oil and Grease	Once per shift
Carriage Slide	Bed-way slides	Oil Can	Machine Oil	Once per shift
Cross Slide	Slides and Screws	Oil Can	Machine Oil	Once per shift
Tailstock	Quill and Screw	Oil Can	Machine Oil	Once per shift
Feed and Lead Screw	Screws and Bearings	Oil Can	Machine Oil	Once per shift

6.2 LUBRICATION POINTS

Headstock

The headstock reservoir has the proper amount of oil when the oil level in the sight glass is approximately halfway. (Fig. 6.1) The oil sight glass is located below the chuck, The oil should be changed every six months by firstly draining the oil by removing the drain plug (Fig. 6.2) then filling by the oil filler plug. (Fig. 6.3)

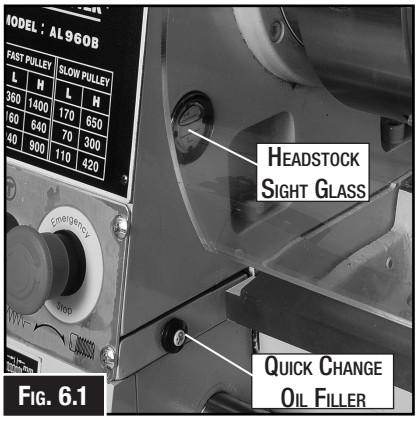


Fig. 6.1

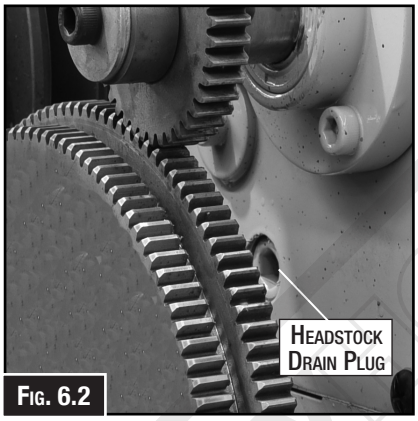


Fig. 6.2

Fig. 6.3

APRON

The apron oil sight glass is on the front of the apron, as shown in Fig. 6.4. Maintain the oil volume so that the level is approximately halfway in the sight glass.

Changing Oil & Flushing Reservoir

Small metal particles may accumulate at the bottom of the reservoir with normal use. Therefore, to keep the reservoir clean, drain and flush it at least once a year. Place a catch pan under the apron drain plug (Fig. 6.4), remove the fill plug, then use a 6mm hex wrench to remove the drain plug and empty the reservoir. Flush the reservoir by pouring a small amount of clean oil into the fill hole and allowing it to drain out the bottom. Replace the drain plug, add oil as required, then re-install the fill plug.

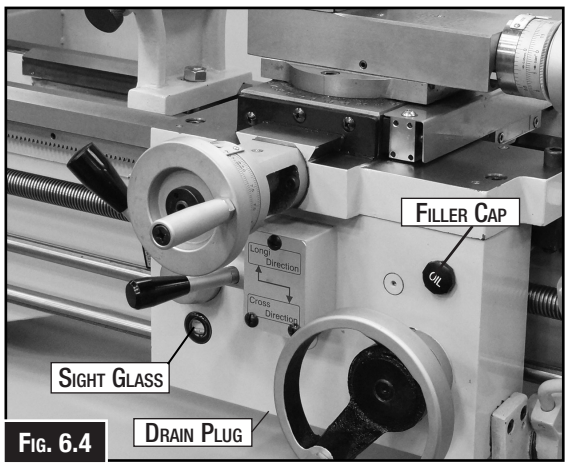


Fig. 6.4

WARNING!

Before operating any machine, take time to read and understand all safety signs and symbols. If not understood seek explanation from trade magazines or an experienced operator.

Longitudinal Leadscrew

Before lubricating the leadscrew (Fig. 6.5) it should be cleaned with mineral spirits. The use of a stiff brush will help clean out the threads. Move the carriage out of the way, so you can clean the entire length of the leadscrew. Apply a thin coat of oil along the length of the leadscrew. Use a stiff brush to make sure the oil is applied evenly and down into the threads.

FIG. 6.5

Ball Oilers (Fig. 6.6 ~ 6.7)

Proper lubrication of ball oilers is done with a pump-type oil can that has a plastic or rubberized cone tip, usually supplied with the accessories.

Lubricate the ball oilers before and after machine use, and more frequently under heavy use. When lubricating ball oilers, first clean the outside surface to remove any dust or grime. Push the tip of the oil can nozzle against the ball oiler to create a hydraulic seal, then pump the oil can once or twice. It is important not to press the ball oiler to hard with nozzle of the oil can as it may cause the ball to jam in the open position, allowing dirt to enter. If you see sludge and dirt coming out of the lubrication area, keep pumping the oil can until the oil runs clear. When finished, wipe away any excess oil.

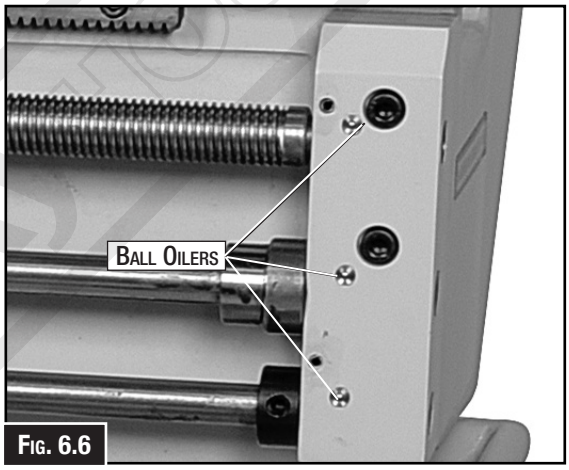


FIG. 6.6

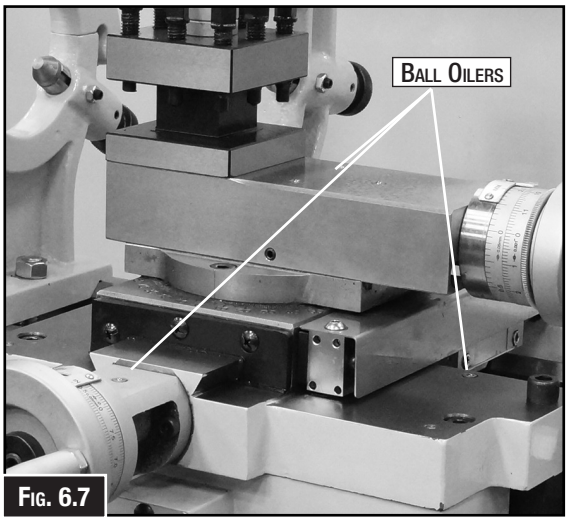


FIG. 6.7

Oilers can be found below

- ❑ Cross-slide leadscrew & slides
- ❑ Compound-rest leadscrew & slides
- ❑ Saddle slides
- ❑ Carriage hand wheel
- ❑ Feed selection lever gearing
- ❑ Tailstock ball oilers
- ❑ Leadscrew end bearing
- ❑ Feed rod end bearing

6.3 ADJUSTMENTS

SLIDE WAY GIBS

Tapered gibs are fitted to the slide ways of the saddle, cross-slide and top (compound) slides so that if any slackness, that may develop can be reduced. Make sure that slide ways are thoroughly cleaned and lubricated before attempting adjustment.

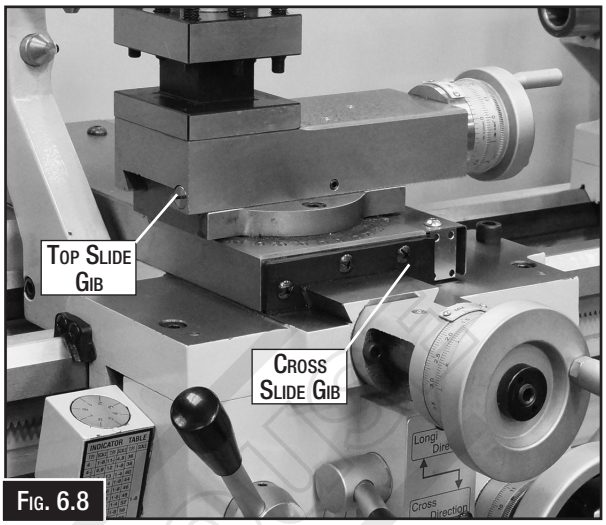


Fig. 6.8

To adjust the top slide gib:

1. DISCONNECT THE MACHINE FROM THE POWER SUPPLY.
2. Release the rear gib screw and tightening the front screw a little at a time. Check constantly for a smooth action throughout the full slide travel. (Fig. 6.8)

To adjust the cross slide gib:

1. DISCONNECT THE MACHINE FROM THE POWER SUPPLY.
2. Undo the three button head screws that hold the slide wiper and remove the rubber wiper.
3. Release the rear gib screw and tightening the front screw a little at a time. Check constantly for a smooth action throughout the full slide travel.

NOTE: Avoid over adjustment, which can result in an increased wear rate and stiff or jerky action of the movement.

Cross Slide Nut Adjustment.

This is an adjustment that can be made to eliminate excessive backlash, which may develop over time. Backlash is reduced through the cap head screw located at the rear of the nut.

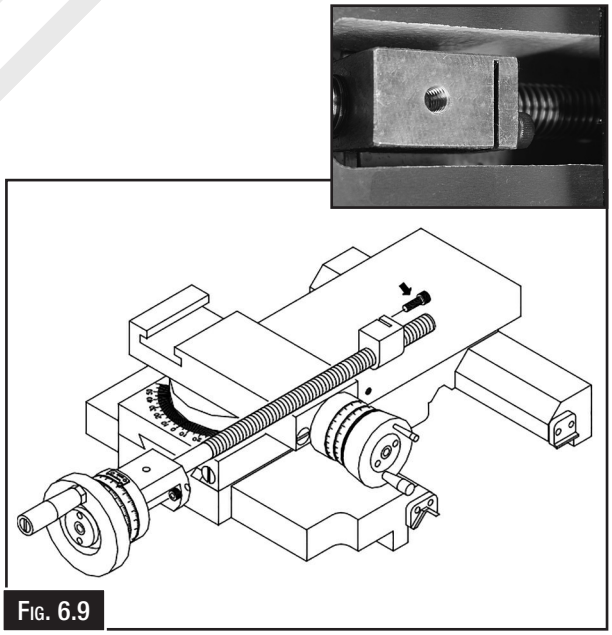


Fig. 6.9

To adjust the backlash:

1. DISCONNECT THE MACHINE FROM THE POWER SUPPLY.
2. Remove the back splash guard.
3. With a long hex key in the cap head screw, make only small adjustment. Operating the cross slide several times by hand to be sure of smooth operation throughout the travel. (Fig. 6.9)

WARNING!

Before operating any machine, take time to read and understand all safety signs and symbols. If not understood seek explanation from trade magazines or an experienced operator.

6.4 FEED CLUTCH ADJUSTMENT

The AL-960B is equipped with a feed rod clutch, that connects the feed drive with the feed rod through a set of spring loaded ball bearings. This clutch helps protect the apron feed system from overload. The feed rod clutch comes set from the factory, and unless there is a problem, it needs no adjustment.

The clutch may slip if the path for the carriage or the cross feed is obstructed during turning or facing operations.

1. DISCONNECT MACHINE FROM POWER!
2. Point the feed direction dial pointer to the middle position (Fig. 6.10). This allows the feed rod to move freely so adjustments can be made to the clutch.
3. If the clutch slips during normal work loads, increase the clutch spring pressure by tightening each of the two clutch drive set screws on the face of the clutch hub ("S" in Fig. 6.11) one full turn, then re-check for slippage.

   If the clutch does not slip when it should, reduce the clutch spring pressure by loosening each of the four clutch set screws one full turn, then recheck for slippage.

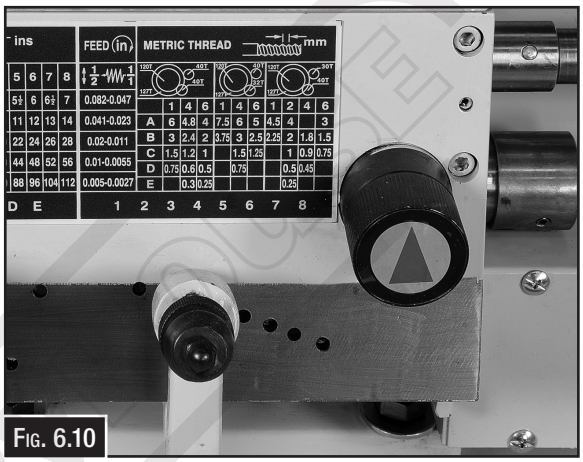


FIG. 6.10

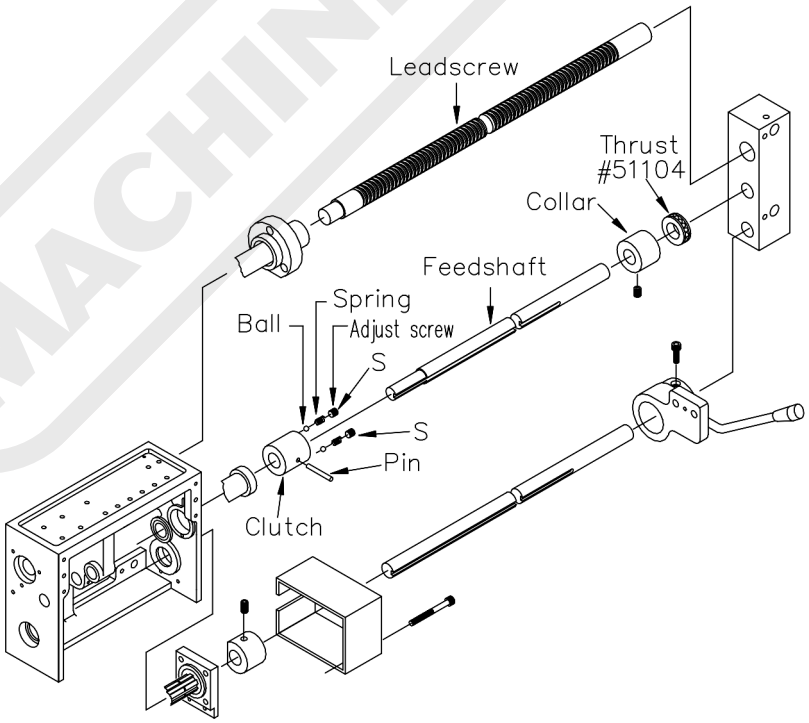


FIG. 6.11

6.5 TROUBLE SHOOTING

If the machine develops a problem, review the trouble shooting section below to find a fix for the problem. If the problem cannot be solved then contact your dealer for help or to book a service engineer.

Symptoms	Possible Cause	Possible Solution
Machine does not start or circuit breaker trips	Emergency button needs to be reset.	Rotate the emergency stop button until it pops out and resets
	Fuse has blown in the machines electrical box.	Replace fuse. Determine if overload is due to heavy operation; ensure power source has high enough voltage
	Power supply has switched OFF	Ensure power supply is ON and the voltage is correct
	Thermal overload relay has tripped.	The wiring connection is correct .
	Wall fuse or circuit breaker is blown/ tripped; caused by a short in electrical system;	Verify circuit is rated for machine amp load; troubleshoot and repair cause of overload; Have a qualified electrician replace weak breaker; find/repair electrical short.
	Start capacitor at fault	Test/replace if faulty.
	Contactor not getting energized. Has burnt contacts.	Test for power supply to contactors and that contactor operation is correct. Replace unit if faulty.
	Motor is at fault.	Test/replace if faulty.
Motor stalls or is under powered	Belts slipping	Check the tension of the belts and replace if worn.
	Faulty run capacitor	Test and replace if faulty.
	Motor faulty	Test and replace if faulty
Loud noises coming from near the motor	Pulley keys worn or are missing or set crews loose	Inspect keys and set screws. Replace or tighten as required.
	Motor fan is loose.	Tighten the fan and reset the fan cover
Motor is noisy when the machine is cutting	Depth of cut is too deep	Reduce the depth of cut or feed rate.
	Speed or feed rate is wrong	Consult the speed and feed charts in the machinery handbook
	Cutting tool is dull	Replace or sharpen the cutting tool
Machined surface finish is rough.	Incorrect spindle speed or feed rate.	Adjust for appropriate spindle speed and feed rate.
	Blunt tool or poor tool selection	Sharpen tooling or select a better tool for the intended operation.
	Tapered gibs not correctly adjusted.	Tighten gibs

6.5 TROUBLE SHOOTING Cont.

Symptoms	Possible Cause	Possible Solution
Entire machine Vibrates excessively upon startup and while running	Workpiece is unbalanced.	Reinstall workpiece so it is as centered with the spindle bore as possible.
	Loose or damaged belt(s).	Tighten/replace the belt as necessary.
	V-belt pulleys not properly aligned.	Align the V-belt pulleys.
	Worn or broken gear present.	Inspect gears and replace if necessary.
	Chuck or faceplate has become unbalanced.	Re-balance chuck or faceplate; contact a local machine shop for help.
	Spindle bearings badly worn.	Replace spindle bearings.
Bad surface finish.	Wrong RPM or feed rate.	Adjust for appropriate RPM and feed rate.
	Dull tooling or poor tool selection.	Sharpen tooling or select a better tool for the intended operation.
	Too much play in gibs.	Tighten gibs.
	Tool too high.	Lower the tool position.
Can't remove tapered tool from tailstock quill.	Quill had not retracted all the way back into the tailstock.	Turn the quill handwheel until it forces taper out of quill.
	Debris on the taper before inserting	Always make sure that taper surfaces are clean.
Cross slide, compound slide, or carriage feed has sloppy operation	Gibs are out of adjustment.	Tighten gib screw(s).
	Handwheel is loose.	Tighten handwheel fasteners.
	Mechanism worn or needs adjustment.	Tighten any loose fasteners on lead screw mechanism.
Cutting tool or machine components vibrate excessively during cutting	Tool holder not tight enough.	Check for debris, clean, and re-tighten.
	Cutting tool sticks too far out of tool holder; lack of support.	Reinstall cutting tool so no more than 1/3 of the total length is sticking out of tool holder.
	Gibs are out of adjustment.	Tighten gib screws at affected component.
	Dull cutting tool.	Replace or resharpen cutting tool.
	Incorrect spindle speed or feed rate.	Use the recommended spindle speed.
Inaccurate turning results from one end of the workpiece to the other.	Headstock and tailstock are not properly aligned with each other.	Realign the tailstock to the headstock spindle bore centre line.
Chuck jaws won't move or don't move easily.	Chips lodged in the jaws.	Remove jaws, clean and lubricate chuck threads, and replace jaws.

CENTRE LATHE
AL-960B

Order Code: (L237 & L237D)

Edition : 2.0
Date: (07/25)

The following section covers the spare parts diagrams and lists that were current at the time this manual was originally printed. Due to continuous improvements of the machine, changes may be made at anytime without notification.

HOW TO ORDER SPARE PARTS

1. Have your machines model number, serial number & date of manufacture on hand, these can be found on the specification plate mounted on the machine.
2. A scanned copy of your parts list/diagram with required spare part/s identified.

NOTE: SOME PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

3. Go to www.machineryhouse.com.au/contactus and fill out the inquiry form attaching a copy of scanned parts list.

WARNING!
Electricity is dangerous and could cause death
All electrical work must be carried out by a qualified electrician.

CAUTION!
It is impossible to cover all possible hazards Every workshop enviroment is different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

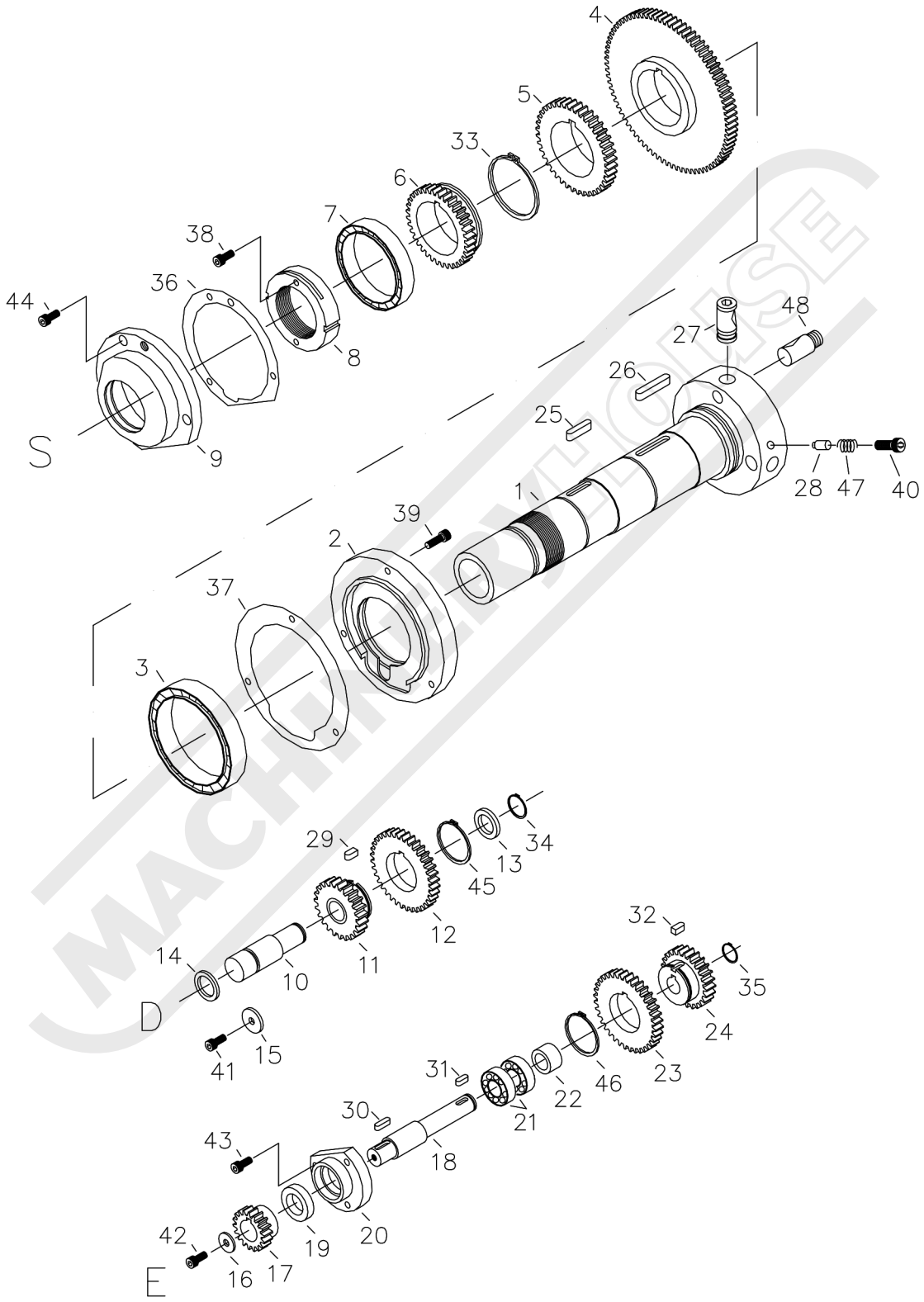
HEADSTOCK SPARE PARTS DIAGRAM

HEADSTOCK SPARE PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	A-3101	HEADSTOCK CASTING	1
2	A-3154	HEADSTOCK COVER	1
3	A-3156	HANDLE	1
4	A-3131	GEAR SHIFT FORK	1
5	A-3132	HANDLE	1
6	A-3133	LEVER	1
7	A-3137	COLLAR	1
8	A-3135	SHAFT	1
9	A-3138	SHIFT FORK	1
10	A-3136	FORK ARMS	1
11	A-3132	HANDLE	1
12	A-3133	LEVER	1
13	A-3137	COLLAR	1
14	A-3135	SHAFT	1
15	A-3138	SHIFT FORK	1
16	A-3136	FORK ARMS	1
17	A-3146	PLUG (3 / 8 G. P.)	1
19	A-3147	OIL SIGHT(29mm)	1
20	A-3148	INDICATOR PLATE	1
21	A-3149	SNAP RING (S48)	1
22	A-3150	OIL RING(P42)	1
23	A-3151	GASKET	1
24	A-3152	CAP SCREW (M8 x 20L)	4
25	A-3153	INDICATOR PLATE	1
26	A-3155	SET SCREW (M8 x 8L)	1
27	A-3157	SPRING	1
28	A-3158	STEEL BALL (6)	1
29	A-3159	SPRING PIN (5mm x 45L)	1
30	A-3134	PVC KNOB	1
31	A-3160	OIL RING (P9)	1
32	A-3161	SET SCREW (M8 x 6L)	1
33	A-3162	SPRING PIN (5mm x 20L)	1
34	A-3163	OIL RING (P9)	1
35	A-3164	INDICATOR PLATE	1
36	A-3165	SET SCREW (M8 x 8L)	1
37	A-3166	SPRING	1
38	A-3167	STEEL BALL (6)	1
39	A-3168	SPRING PIN (5mm x 45L)	1
40	A-3134	PVC KNOB	1
41	A-3169	OIL RING (P9)	1
42	A-3170	SET SCREW (M8 x 6L)	1
43	A-3171	SPRING PIN (5mm x 20L)	1
44	A-3172	OIL RING (P9)	1

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

HEADSTOCK SPINDLE & GEARS DIAGRAM



HEADSTOCK SPINDLE & GEARS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	A-3102	MAIN SPINDLE	1
2	A-3103	COVER (FRONT)	1
3	A-3173	BEARING (#30212)	1
4	A-3104	GEAR (M2 x 75T)	1
5	A-3105	GEAR (M2 x 46T)	1
6	A-3106	GEAR (M2 x 39T)	1
7	A-3174	BEARING (#30211)	1
8	A-3107	NUT	1
9	A-3108	COVER (BACK)	1
10	A-3112	SHAFT	1
11	A-3113	GEAR (M2 x 28T)	1
12	A-3110-1	GEAR (M2 x 39T)	1
13	A-3114	WASHER	1
14	A-3115	OIL RING (P21)	1
15	A-3175	WASHER	1
16	A-3140	WASHER	1
17	A-3119	GEAR (M2 x 19T)	1
18	A-3109	SHAFT	1
19	A-3176	OIL SEAL (22x35x8L)	1
20	A-3111	COVER	1
21	A-3177	BEARING (#6203)	2
22	A-3141	WASHER	1
23	A-3110-1	GEAR (M2 x 39T)	1
24	A-3110	GEAR (M2 x 28T)	1
25	A-3178	KEY (6mm x 40mm)	1
26	A-3179	KEY (8mm x 45mm)	1
27	A-3180	CAM D1-4	3
28	A-3181	CAMLOCK STUD	3
29	A-3182	KEY (6mm x 13mm)	1
30	A-3183	KEY (5mm x 18mm)	1
31	A-3184	KEY (5mm x 14mm)	1
32	A-3185	KEY (6mm x 13mm)	1
33	A-3186	SNAP RING (S57)	1
34	A-3187	SNAP RING (S20)	1
35	A-3188	SNAP RING (S17)	1
36	A-3189	GASKET	1
37	A-3190	GASKET	1
38	A-3191	CAP SCREW (M6 x 15L)	2
39	A-3192	CAP SCREW (M6 x 25L)	3
40	A-3193	SCREW	3
41	A-3194	CAP SCREW (M6 x 20L)	1
42	A-3195	CAP SCREW (M6 x 16L)	1
43	A-3196	CAP SCREW (M6 x 20L)	2

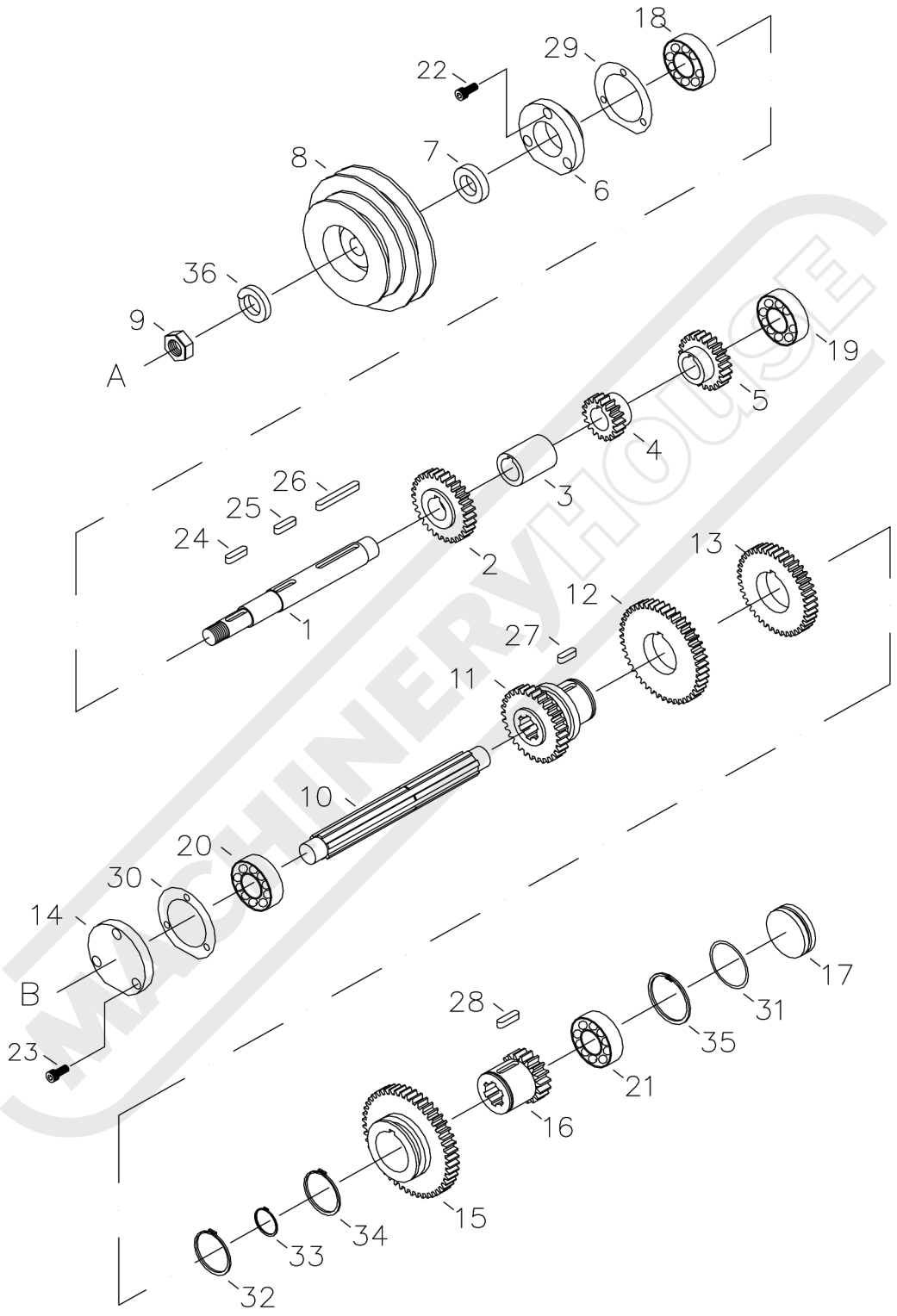
NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

HEADSTOCK SPINDLE & GEARS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
44	A-3197	CAP SCREW (M6 x 16L)	3
45	A-3198	SNAP RING (S40)	1
46	A-3199	SNAP RING (S40)	1
47	A-3200	SPRING	3
48	A-3221	STUD	3

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

HEADSTOCK GEARS PARTS DIAGRAM

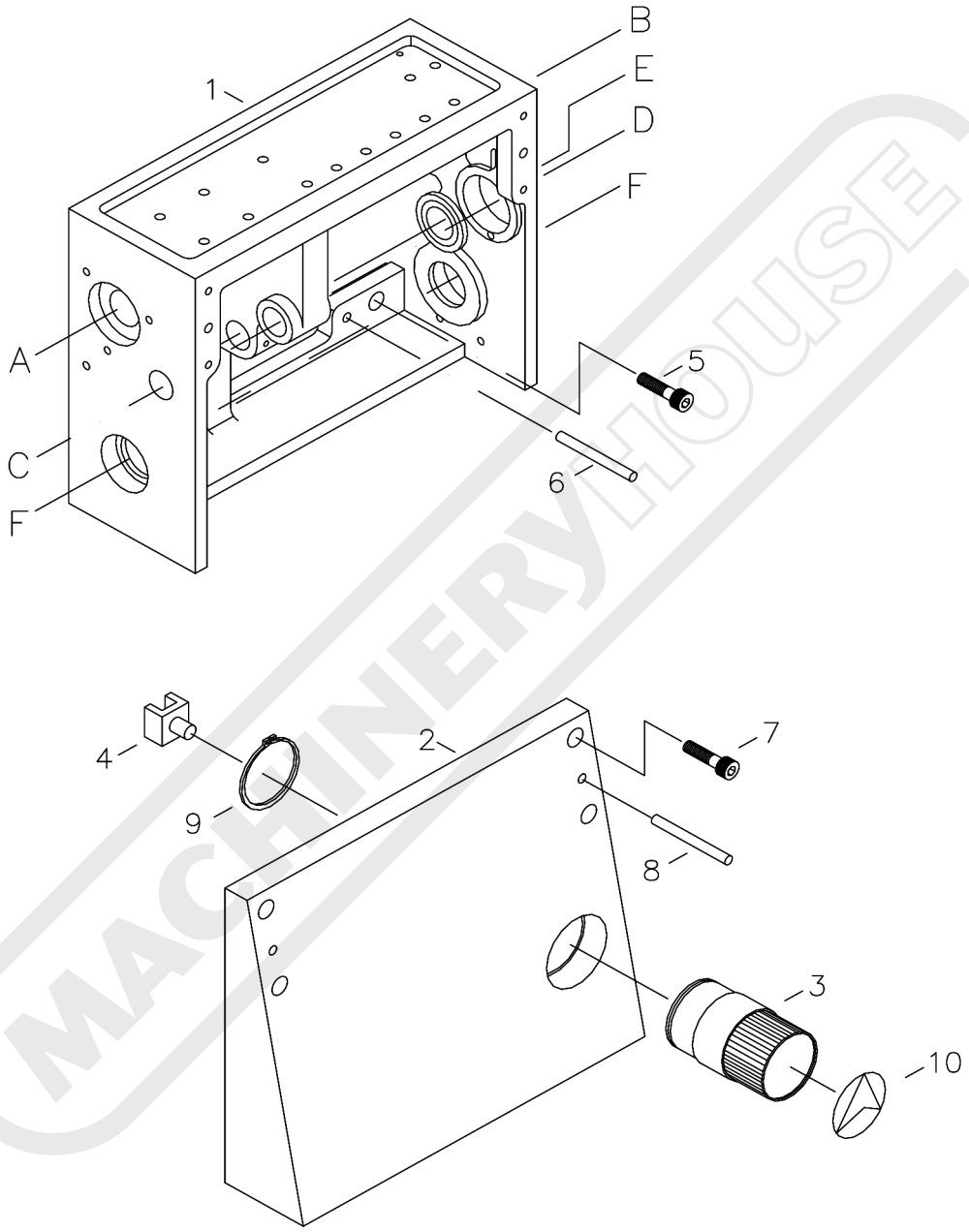


HEADSTOCK GEARS PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty
1	A-3116	SHAFT	1
2	A-3117	GEAR (M2 x 32T)	1
3	A-3118	GEAR BUSHING	1
4	A-3119	GEAR (M2 x 19T)	1
5	A-3120	GEAR (M2 x 25T)	1
6	A-3125	COVER	1
7	A-3201	OIL SEAL (20 x 35 x 8)	1
8	A-3127	V-BELT PULLEY	1
9	A-3128	NUT	1
10	A-3122	SHAFT	1
11	A-3124	GEAR (M2 x 34T)	1
12	A-3124-1	GEAR (M2 x 47T)	1
13	A-3124-2	GEAR (M2 x 41T)	1
14	A-3121	COVER	1
15	A-3123-1	GEAR (M2 x 51T)	1
16	A-3123	GEAR (M2 x 22T)	1
17	A-3126	BORE PLUG	1
18	A-3202	BEARING (#6204)	1
19	A-3203	BEARING (#6204)	1
20	A-3204	BEARING (#6204)	1
21	A-3205	BEARING (#6204)	1
22	A-3206	CAP SCREW (M6 x 20L)	3
23	A-3207	CAP SCREW (M6 x 20L)	3
24	A-3208	KEY (6mm x 24mm)	1
25	A-3209	KEY (6mm x24mm)	1
26	A-3210	KEY (6mm x 50mm)	1
27	A-3211	KEY (6mm x20mm)	1
28	A-3212	KEY (6mm x24mm)	1
29	A-3113	GASKET	1
30	A-3214	GASKET	1
31	A-3215	OIL RING (P41)	1
32	A-3216	SNAP RING (S40)	1
33	A-3217	SNAP RING (S25)	1
34	A-3218	SNAP RING (S40)	1
35	A-3219	SNAP RING (R47)	1
36	A-3220	WASHER	1

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

GEAR BOX PARTS DIAGRAM

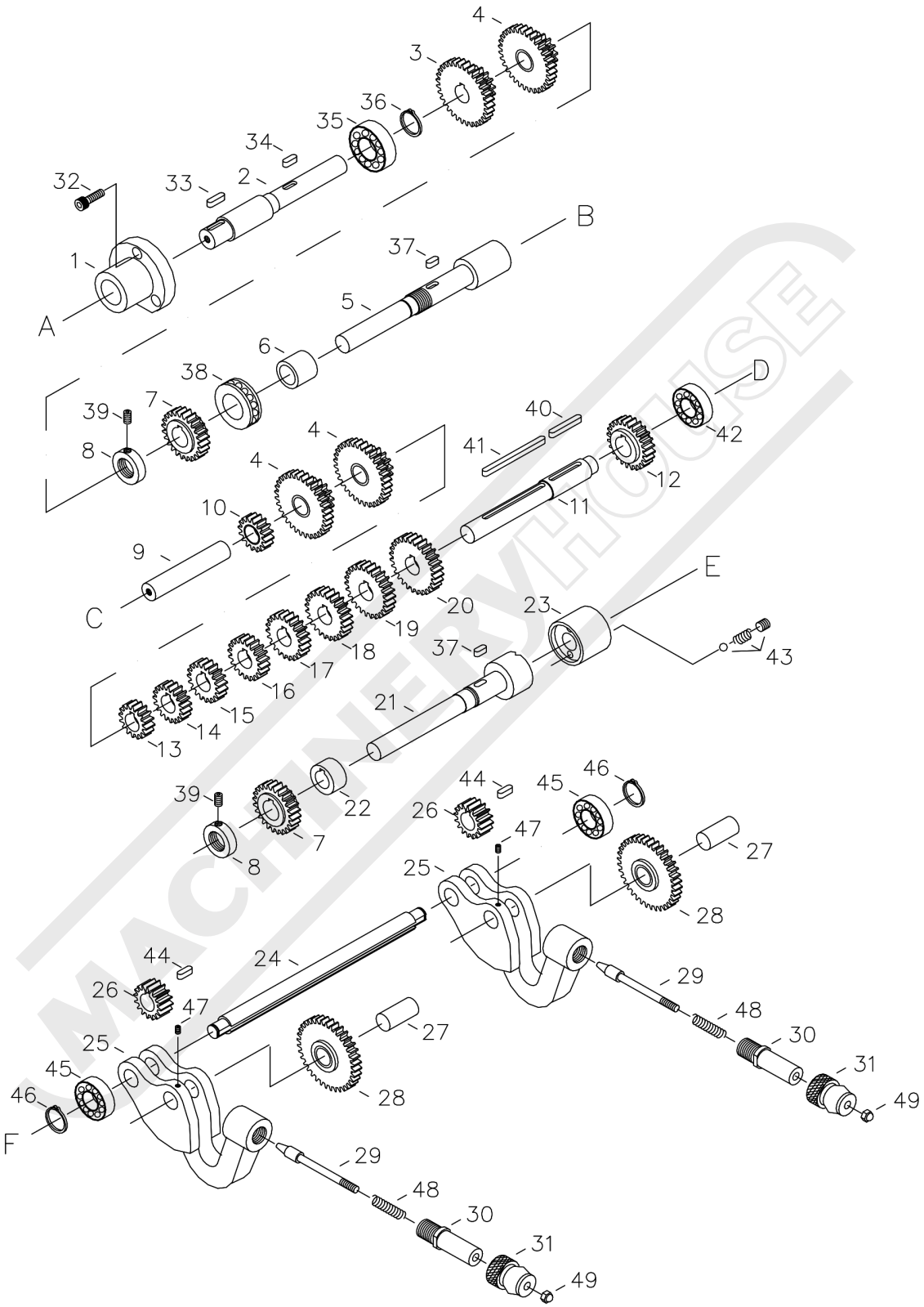


GEAR BOX PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3201	GEAR BOX	1
2	3202	FRONT COVER	1
3	3250	HANDLE	1
4	3251	SHIFT FORK	1
5	3263	CAP SCREW (M8 x 30L)	3
6	3264	SPRING PIN (5mm x 25L)	2
7	3265	CAP SCREW (M6 x 30L)	4
8	3266	SPRING PIN (5mm x 30L)	2
9	3267	SNAP RING (S40)	1
10	3268	INDICATOR PLATE	1

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

INCH GEARBOX PARTS DIAGRAM



INCH GEAR BOX PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3203	COVER	1
2	3204	SHAFT	1
3	3205	GEAR (M1.75 x 32T x 16T)	1
4	3206	GEAR (M1.75 x 32T x 16T)	3
5	3207	SHAFT	1
6	3238	COLLAR	1
7	3208	GEAR (M1.75 x 24T)	2
8	3240	NUT	2
9	3209-1	SHAFT	1
10	3210	GEAR (M1.75 x 16T)	1
11	3209	SHAFT	1
12	3219	GEAR (M1.75 x 24T)	1
13	3211	GEAR (M1.75 x 16T)	1
14	3212	GEAR (M1.75 x 18T)	1
15	3213	GEAR (M1.75 x 19T)	1
16	3214	GEAR (M1.75 x 20T)	1
17	3215	GEAR (M1.75 x 22T)	1
18	3216	GEAR (M1.75 x 24T)	1
19	3217	GEAR (M1.75 x 26T)	1
20	3218	GEAR (M1.75 x 28T)	1
21	3220-1	SHAFT	1
22	3249	SPACER	1
23	3221	COLLAR	1
24	3222	SHAFT	1
25	3223	SHIFT FRAME	2
26	3224	GEAR (M1.75 x 16T)	2
27	3225	SHAFT	2
28	3226	GEAR (M1.75 x 36T)	2
29	3232	PLUNGER	2
30	3233	BUSH	2
31	3234	KNOB	2
32	3269	CAP SCREW (M6 x 15L)	3
33	3270	KEY (5mm x 18mm)	1
34	3271	KEY (5mm x 14mm)	1
35	3272	BEARING (# 6003)	1
36	3273	SNAP RING (S16)	1
37	3274	KEY (5mm x 12mm)	2
38	3275	BEARING (# 2903)	1
39	3276	SCREW (M6 x 10L)	2
40	3277	KEY (5mm x 35mm)	1
41	3278	KEY (5mm x 70mm)	1
42	3279	BEARING (# 6002)	1
43	3280	SET SCREW SPRING AND STEEL BALL	2

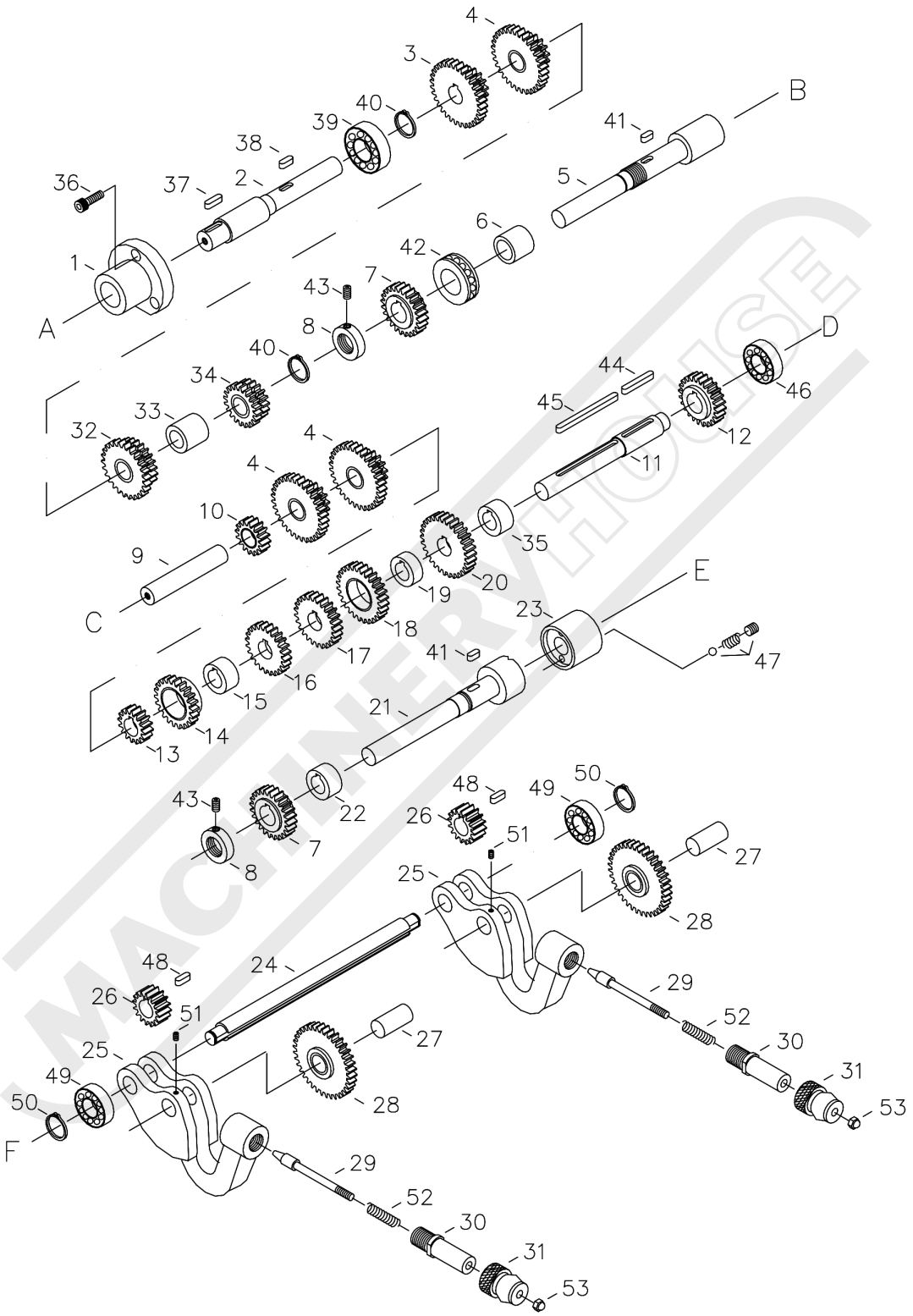
NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

INCH GEAR BOX PARTS LIST

No	FACTORY CODE	DESCRIPTION	Qty.
44	3281	KEY (5mm x 14mm)	2
45	3282	BEARING (# 6201)	2
46	3283	SNAP RING (S12)	2
47	3284	SET SCREW (M4 x 6L)	2
48	3285	SPRING	2
49	3286	NUT	2

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

METRIC GEARBOX PARTS DIAGRAM



METRIC GEARBOX PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3203	COVER	1
2	3204	SHAFT	1
3	3205	GEAR (M1.75 x 32T x 16T)	1
4	3206	GEAR (M1.75 x 32T x 16T)	3
5	3207	SHAFT	1
6	3238	COLLAR	1
7	3208	GEAR (M1.75 x 24T)	2
8	3240	NUT	2
9	3209-1	SHAFT	1
10	3210	GEAR (M1.75 x 16T)	1
11	3209	SHAFT	1
12	3219	GEAR (M1.75 x 24T)	1
13	3211	GEAR (M1.75 x 16T)	1
14	3245	GEAR (M1.75 x 24T)	1
15	3245-1	COLLAR	1
16	3252	GEAR (M1.75 x 24T)	1
17	3246	GEAR (M1.75 x 25T)	1
18	3247	GEAR (M1.75 x 24T)	1
19	3247-1	COLLAR	1
20	3248	GEAR (M1.75 x 30T)	1
21	3220-1	SHAFT	1
22	3249	SPACER	1
23	3221	COLLAR	1
24	3222	SHAFT	1
25	3223	SHIFT FRAME	2
26	3224	GEAR (M1.75 x 16T)	2
27	3225	SHAFT	2
28	3226	GEAR (M1.75 x 36T)	2
29	3232	PLUNGER	2
30	3233	BUSH	2
31	3234	KNOB	2
32	3244	GEAR (M1.75 x 28T)	1
33	3242	COLLAR	1
34	3243	GEAR (M1.75 x 20T,18T)	1
35	3248	GEAR (M1.75 x 30T)	1
36	3269	CAP SCREW (M6 x 15L)	3
37	3270	KEY (5mm x 18mm)	1
38	3271	KEY (5mm x 14mm)	1
39	3272	BEARING (# 6003)	3
40	3273	SNAP RING (S16)	2
41	3274	KEY (5mm x 12mm)	2
42	3275	BEARING (# 2903)	1
43	3276	SET SCREW (M6 x 10L)	2

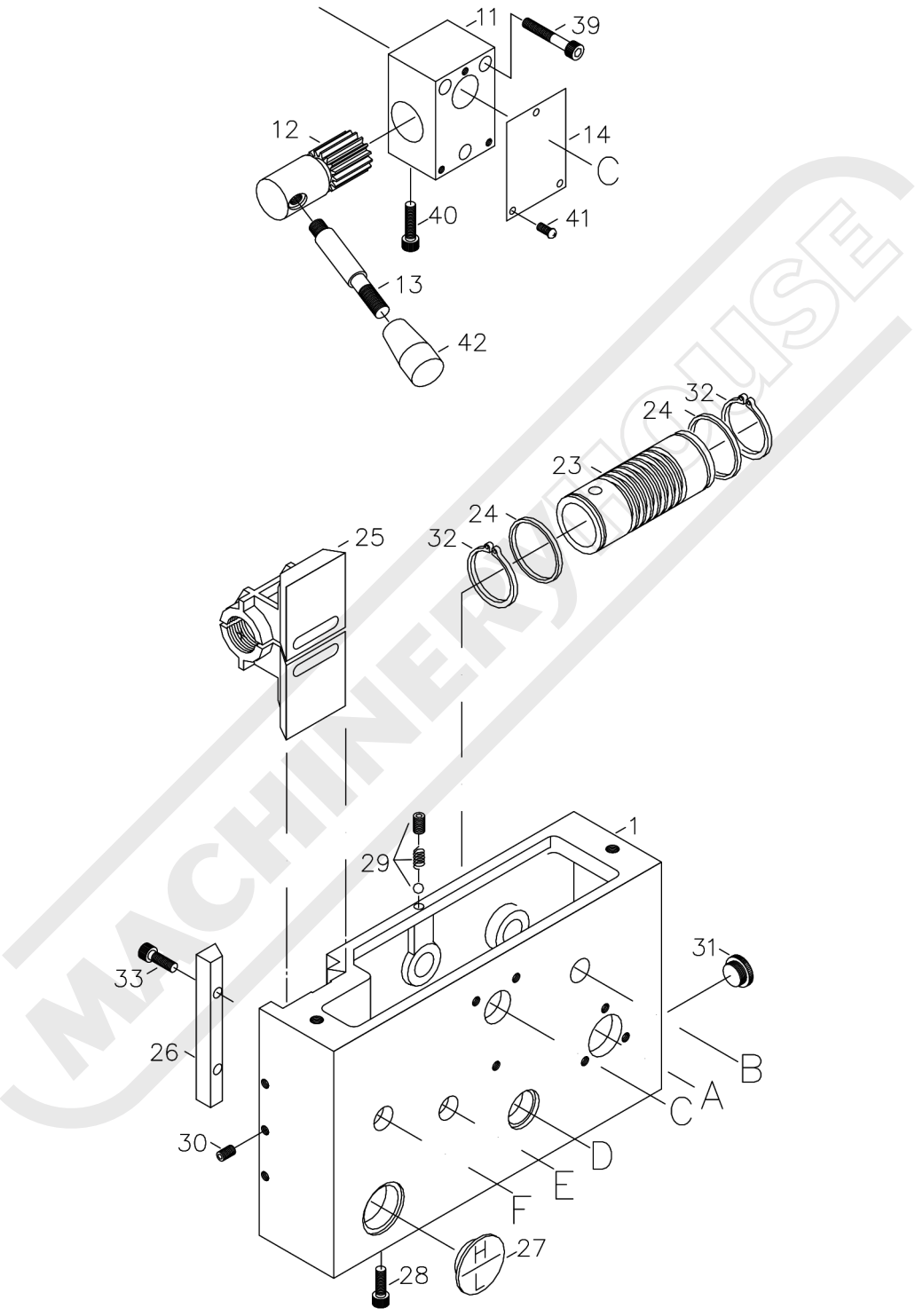
NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

METRIC GEARBOX PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
44	3277	KEY (5mm x 35mm)	1
45	3278	KEY (5mm x 70mm)	1
46	3279	BEARING (# 6002)	1
47	3280	SET SCREW SPRING AND STEEL BALL	2
48	3281	KEY (5mm x 14mm)	2
49	3282	BEARING (# 6201)	2
50	3283	SNAP RING (S12)	2
51	3284	SET SCREW (M4 x 6L)	2
52	3285	SPRING	2
53	3286	NUT	2

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

APRON CASTING PARTS DIAGRAM

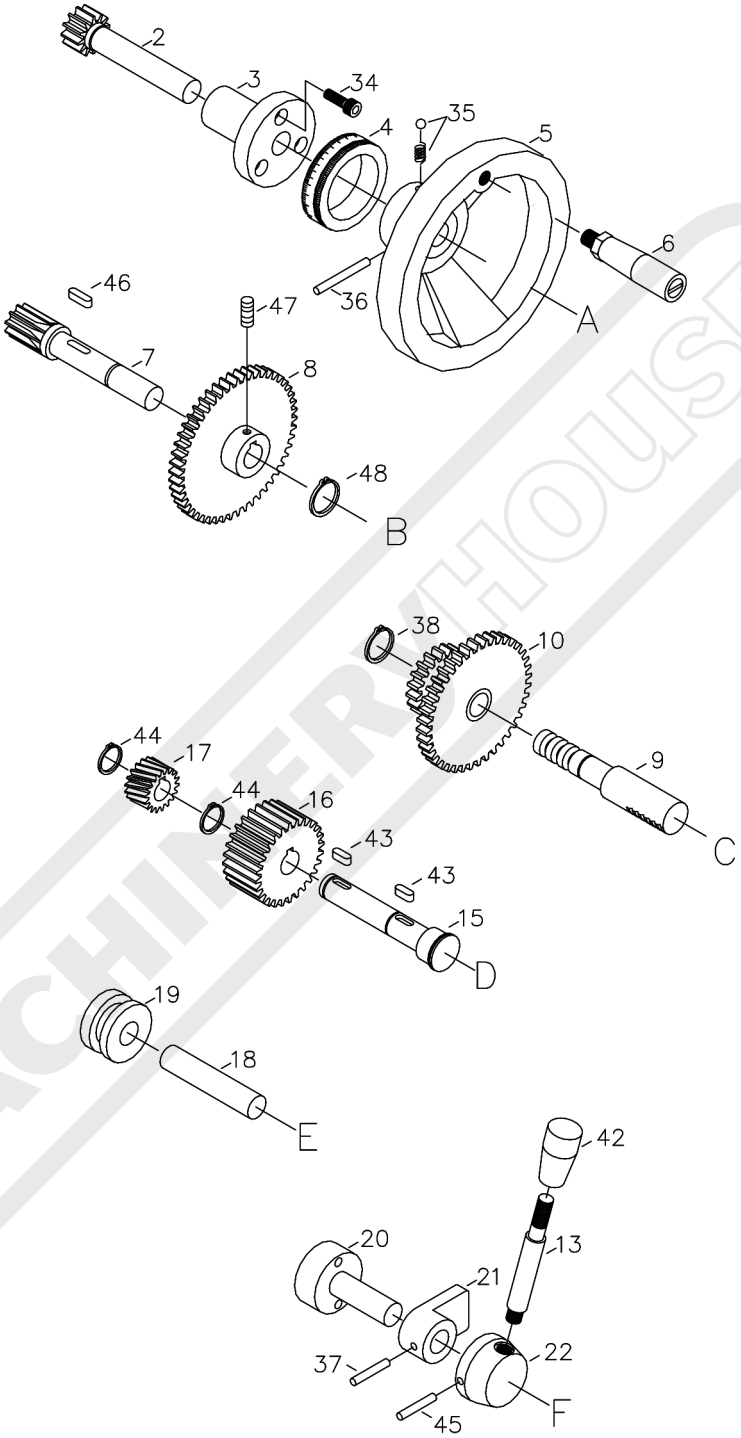


APRON CASTING PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3301	APRON CASTING	1
11	3316	BRACKET	1
12	3317	GEAR SHAFT (M1.5 x 16T)	1
13	3318	LEVER	2
14	3362	INDEXING PLATE	1
23	3309	WORM	1
24	3310	COLLAR	1
25	3325	HALF NUT CLUTCH	1
26	3326	GIB	1
27	3358	OIL SIGHT (29mm)	1
28	3357	CAP SCREW (M8 x 10L)	1
29	3355	STEEL BALL SET SCREW AND SPRING	1
30	3354	SET SCREW (M6 x 10L)	3
31	3356	PLUG (5/8 IN)	1
32	3352	SNAP RING (S 30)	2
33	3353	CAP SCREW (M6 x 20 L)	2
39	3363	CAP SCREW (M6 x 40 L)	4
40	3360	CAP SCREW (M6 x 25 L)	1
41	3361	SCREW (3/16 x 3/8 IN)	3
42	3359	PVC KNOB	2

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

APRON GEARS & SHAFTS PARTS DIAGRAM



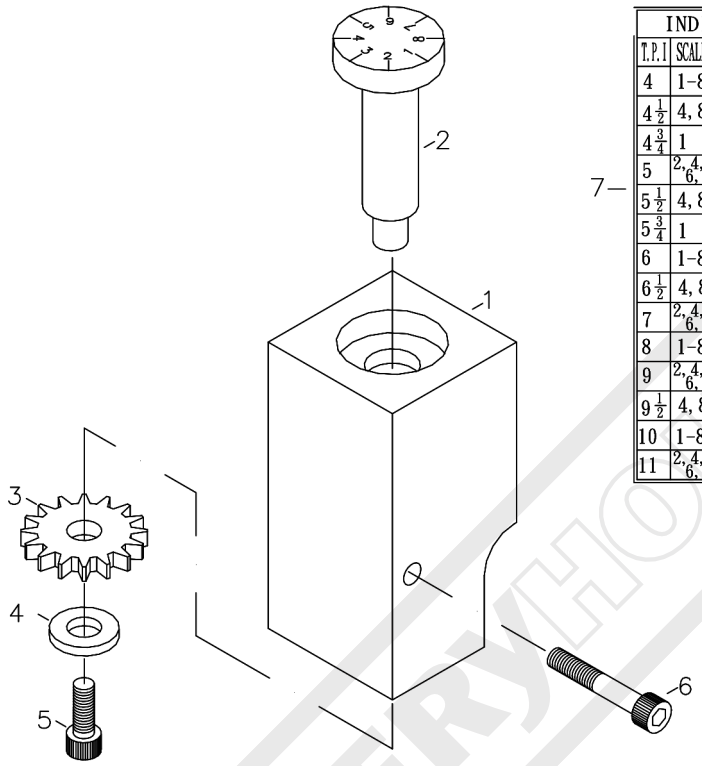
APRON GEARS & SHAFTS PARTS LIST

No	FACTORY CODE	DESCRIPTION	Qty.
2	3302	GEAR SHAFT (M2 x 12T)	1
3	3303	KEEP ASSY	1
4	3304	INDEX RING	1
5	3305	HANDWHEEL	1
6	3306	HANDLE	1
7	3307	GEAR SHAFT (M1.5 x 13T)	1
8	3308	GEAR (M2 x 50T)	1
9	3314	SHAFT	1
10	3315	GEAR (M2 x 22T) (M2 x 44T)	1
15	3311	SHAFT	1
16	3312	GEAR (M2 x 22T)	1
17	3313	GEAR (M1.5 x 18 T)	1
18	3319	SHAFT	1
19	3320	COLLAR	1
20	3321	SHAFT	1
21	3322	LEVER	1
22	3323	HANDLE	1
34	3340	CAP SCREW (M6 x 16L)	3
35	3341	STEEL BALL AND SPRING	1
36	3342	PIN (5mm x 50mm)	1
37	3343	PIN (5mm x 30mm)	2
38	3344	CIRCLIP (E12)	1
43	3348	KEY (5mm x 14mm)	2
44	3346	SNAP RING (S14)	2
45	3351	PIN (5mm x 40mm)	1
46	2352	KEY (5mmx18mm)	1
47	3353	SET SCREW (M8 x10L)	1
48	3354	SNAP RING (S16)	1

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

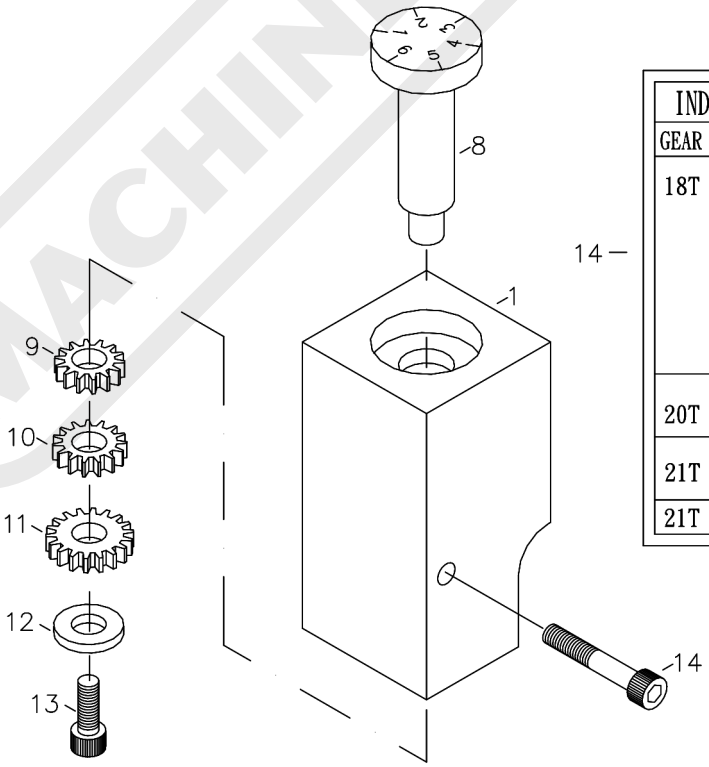
THREADING INDICATOR PARTS DIAGRAM

IMPERIAL



INDICATOR TABLE					
T.P.I	SCALE	T.P.I	SCALE	T.P.I	SCALE
4	1-8	11½	4, 8	36	1-8
4½	4, 8	12	1-8	38	
4¾	1	13	2, 4, 6, 8	40	
5	2, 4, 6, 8	14	1-8	44	
5½	4, 8	16	1-8	46	
5¾	1	18	1-8	48	
6	1-8	19	2, 4, 6, 8	52	
6½	4, 8	20	1-8	56	
7	2, 4, 6, 8	22	1-8	64	
8	1-8	23	2, 4, 6, 8	72	
9	2, 4, 6, 8	24		76	
9½	4, 8	26	1-8	80	
10	1-8	28		96	
11	2, 4, 6, 8	32		104	

METRIC



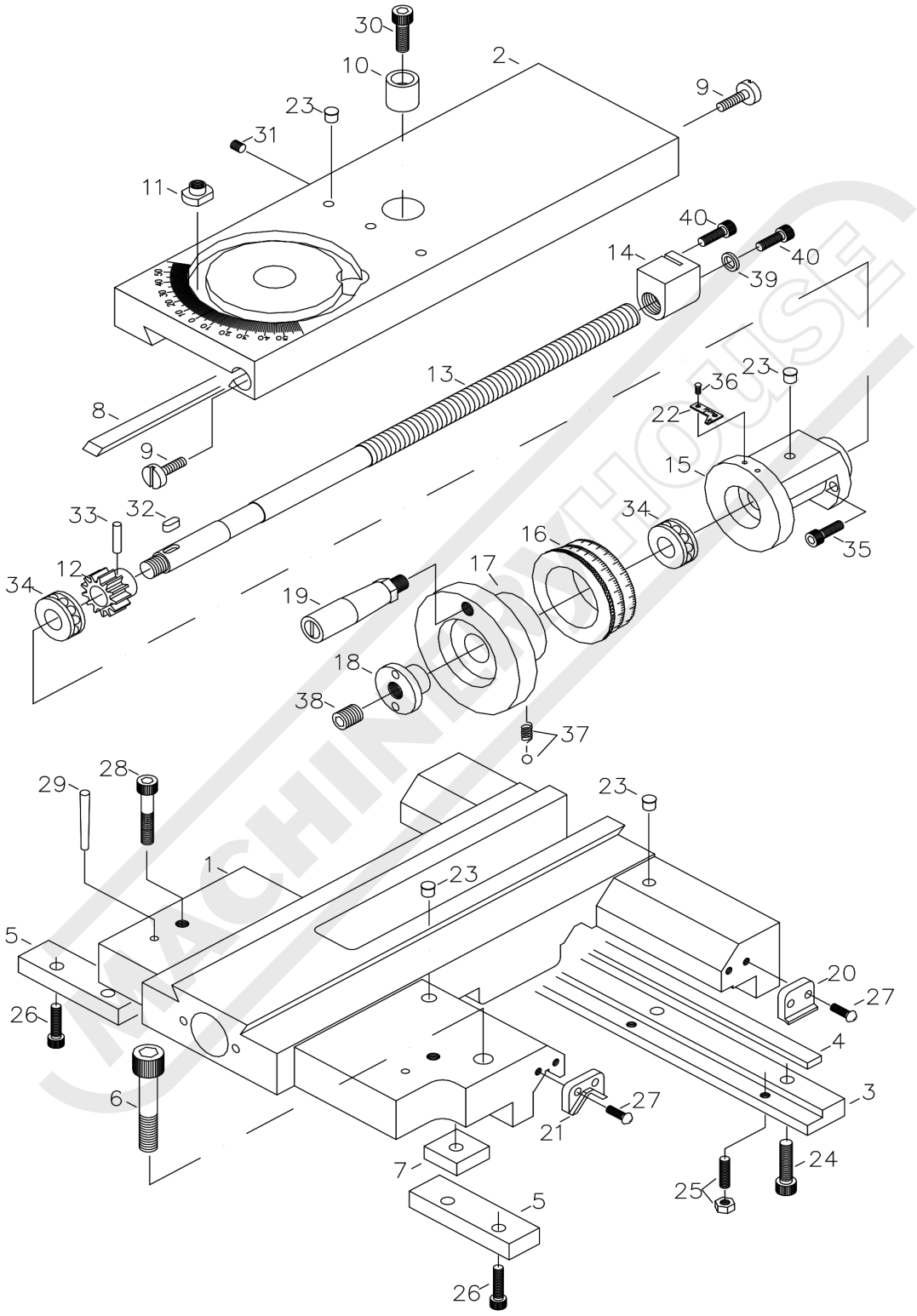
INDICATOR TABLE		
GEAR	PITCH	SCALE
18T	0.45 0.9 2.25 4.5	1, 4
	0.25 0.5 0.75 1 1.5 2 3 4 6	1-6
20T	1.25 2.5 5	1, 4
21T	1.75 3.5 7	1,3,5
21T	0.7	1, 4

THREADING INDICATOR PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3327	THREAD BODY INDICATOR	1
2	3328-2	THREAD DIAL BODY (INCH TYPE)	1
3	3329	GEAR (M2 x 16T)	1
4	3366	FLAT WASHER	1
5	3365	CAP SCREW (M6 x 12L)	1
6	3364	CAP SCREW (M6 x 45L)	1
7	3328-2-A	THREAD CHART PLATE (IN TYPE)	1
8	3328-1	THREAD CHART PLATE (METRIC TYPE)	1
9	3330	GEAR (M1.25 x 18T)	1
10	3331	GEAR (M1.25 x 20T)	1
11	3332	GEAR (M1.25 x 21T)	1
12	3366	FLAT WASHER	1
13	3365	CAP SCREW (M6 x 12L)	1
14	3328-1-A	THREAD CHART PLATE (METRIC TYPE)	1

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

SADDLE & CROSS SLIDE PARTS DIAGRAM

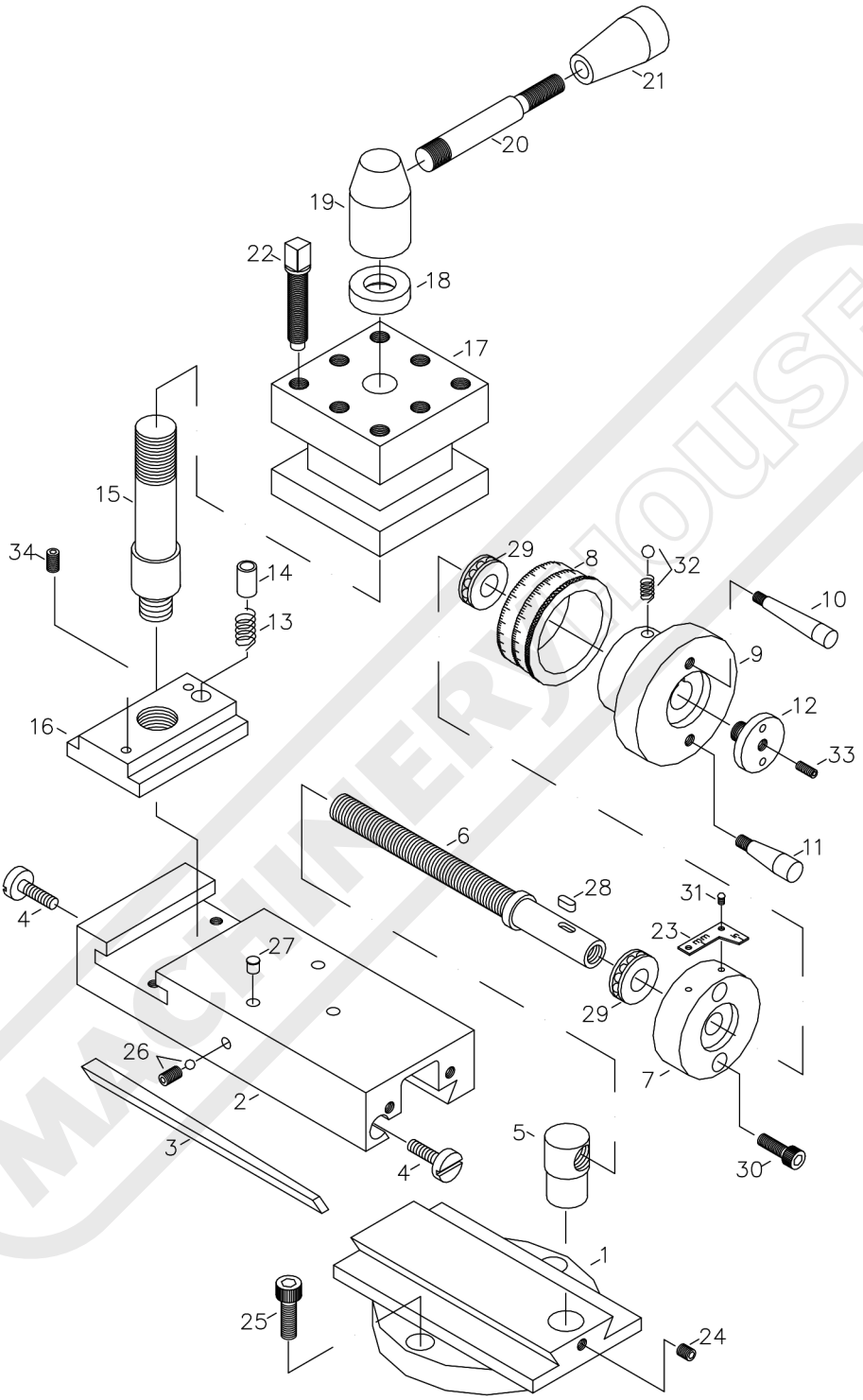


SADDLE & CROSS SLIDE PARTS LIST

No	FACTORY CODE	DESCRIPTION	Qty.
1	3401	SADDLE CASTING	1
2	3402	CROSS-SLIDE	1
3	3403	CLAMP REAR	1
4	3404	GIB	1
5	3405	CLAMP FRONT	2
6	3406	CAP SCREW (7/16 x 2-1/2 IN)	1
7	3407	WASHER	1
8	3408	GIB	1
9	3409	GIB SCREW	2
10	3410	COLLAR	1
11	3419	NUT	2
12	3411	GEAR (M2 x 13T)	1
13	3412	SCREW	1
14	3413	NUT	1
15	3414	KEEP ASSY	1
16	3415	INDEX RING	1
17	3417	HANDWHEEL	1
18	3416	PLUG	1
19	3418	HANDLE	1
20	3439	WIPER	2
21	3440	WIPER	2
22	3465	DIAL	1
23	3450	OILER (1/4 IN)	5
24	3454	CAP SCREW (M8 x 20L)	3
25	3453	SCREW AND NUT	5
26	3451	CAP SCREW (M8 x 16L)	4
27	3452	SCREW (3/16 x 1/2 IN)	8
28	3466	CAP SCREW	2
29	3467	PIN	2
30	3462	CAP SCREW (M8 x 20L)	1
31	3461	SCREW (M8 x 16L)	1
32	3460	KEY (5mm x 12mm)	1
33	3459	PIN (5mm x 22mm)	1
34	3457	THRUST (2902)	2
35	3458	CAP SCREW (M6 x 25L)	2
36	3446	NAIL (2mm)	2
37	3456	STEEL BALL AND SPRING	1
38	3455	SCREW (M12 x 12L)	1
39	3464	WASHER	1
40	3463	CAP SCREW (M6 x 12L)	2

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

TOP SLIDE PARTS DIAGRAM

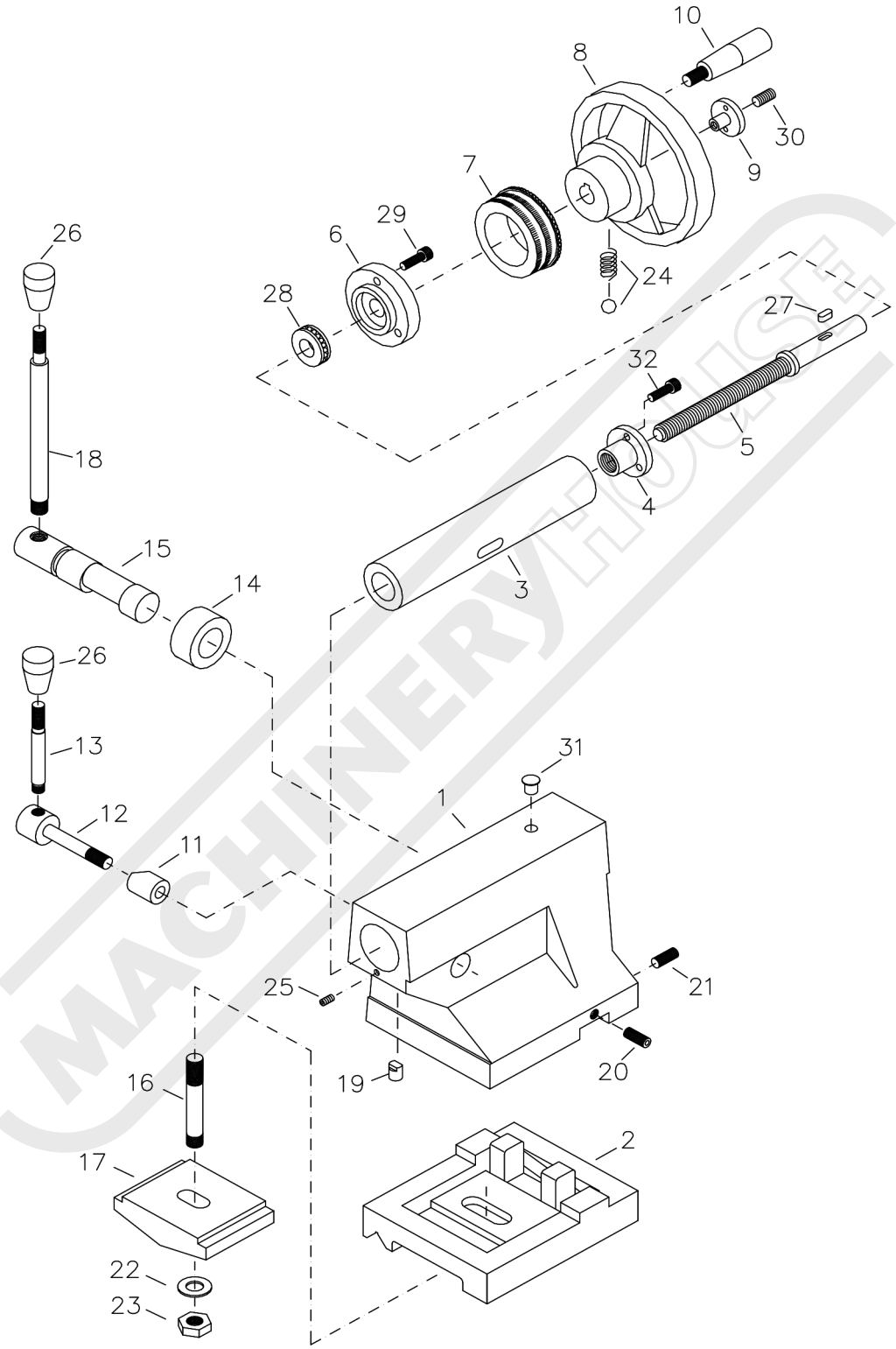


TOP SLIDE PARTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	3420	SWIVEL SLIDE	1
2	3421	TOP-SLIDE (T-SLOT)	1
3	3422	GIB	1
4	3423	SCREW	2
5	3424	NUT	1
6	3425	LEAD SCREW	1
7	3426	BRACKET	1
8	3427	INDEXING RING	1
9	3428	HANDWHEEL	1
10	3429	GRIP (LONG)	1
11	3430	GRIP (SHORT)	1
12	3431	NUT	1
13	3442	SPRING	1
14	3431	PIN	1
15	3432	BOLT	1
16	3441	T-SLOT NUT	1
17	3433	4-WAY TOOL POST	1
18	3434	WASHER	1
19	3435	HUB	1
20	3436	LEVER	1
21	3437	PVC KNOB	1
22	3438	SCREW (3/8 IN)	8
23	3443	DIAL	1
24	3463	SET SCREW (M6 x 12L)	1
25	3462	CAP SCREW (M8 x 16L)	2
26	3445	STEEL BALL AND SCREW	1
27	3469	OIL CAP (1/4 IN)	3
28	3450	KEY (4mm x 10mm)	1
29	3464	THRUST BEARING (51101)	2
30	3465	CAP SCREW (M6 x 25L)	2
31	3466	NAIL (2mm)	2
32	3446	STEEL BALL & SPRING	1
33	3467	SCREW (M6x16L)	1
34	3455	SET SCREW (M6x16L)	2

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

TAILSTOCK PARTS DIAGRAM

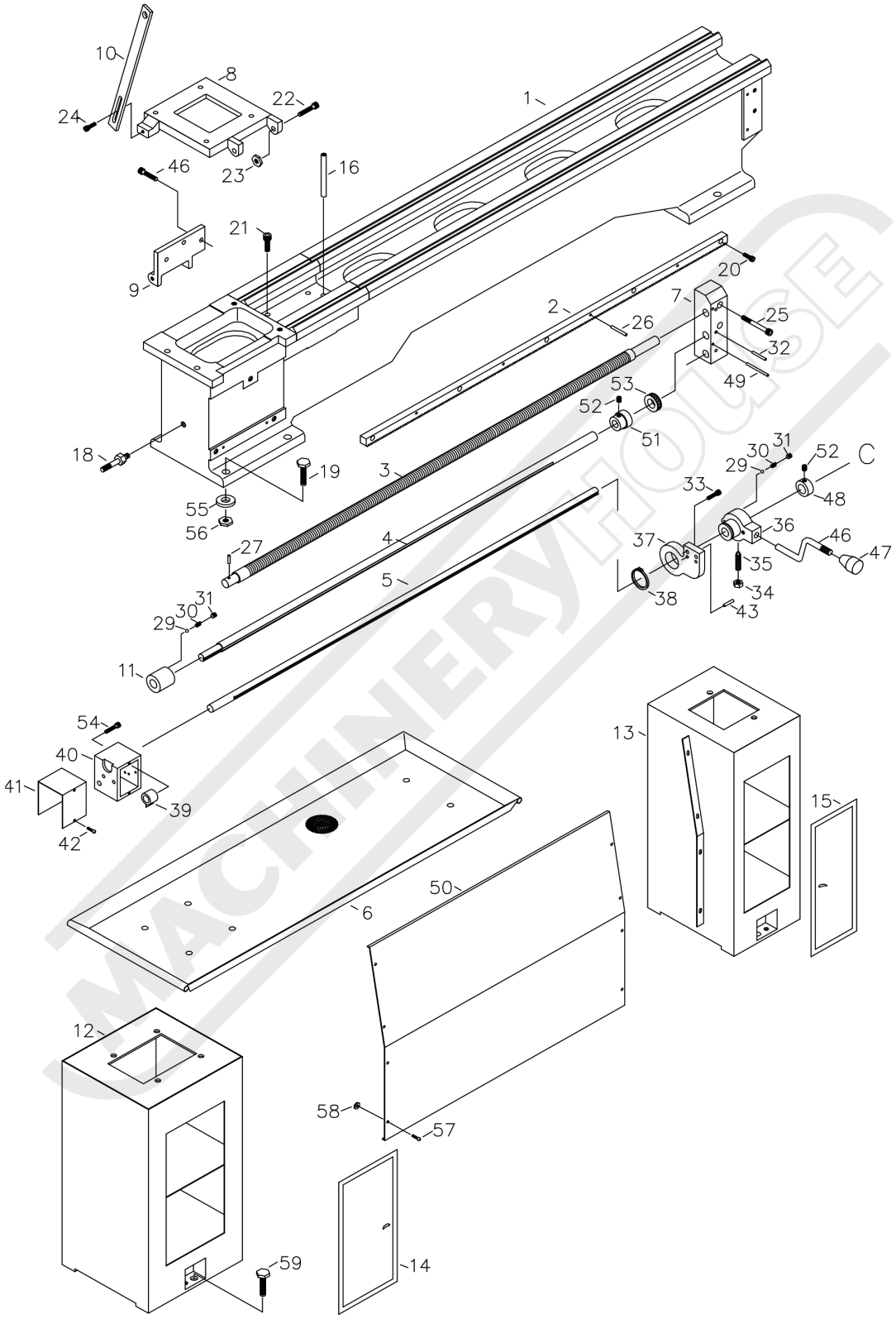


TAILSTOCK PARTS LIST

No	FACTORY CODE	DESCRIPTION	Qty.
1	3501	TAILSTOCK CASTING	1
2	3502	TAILSTOCK BASE	1
3	3503	TAILSTOCK BARREL	1
4	3504	NUT	1
5	3505	FEED SCREW	1
6	3506	BRACKET	1
7	3507	DIAL	1
8	3508	HANDWHEEL	1
9	3509	NUT	1
10	3510	HANDLE	1
11	3511	NUT	1
12	3512	SHAFT	1
13	3513	LEVER	1
14	3514	COLLAR	1
15	3515	CAM SHAFT	1
16	3516	CLAMP STUD	1
17	3517	CLAMP	1
18	3518	CLAMP HANDLE LEVER	1
19	3519	KEY	1
20	3520	SET SCREW (M 8 x 30L)	2
21	3521	SET SCREW (M8 x 30L)	2
22	3522	WASHER (M12)	1
23	3523	NUT (M12)	1
24	3524	STEEL BALL & SPRING	1
25	3525	SET SCREW (M5 x 10L)	1
26	3526	PVC KNOB	2
27	3528	KEY (5mmx 12mm)	1
28	3529	THRUST BEARING (2902)	1
29	3530	CAP SCREW (M6 x 20L)	3
30	3531	SCREW (M6 x 16L)	1
31	3527	OILER (1/4 IN)	1
32	3532	CAP SCREW (M5 x 16L)	3

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

BED, RACK LEAD SCREW AND SHAFTS DIAGRAM



BED, RACK LEAD SCREW AND SHAFTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
1	A-3601	BED	1
2	A-3603	RACK	1
3	A-3604	LEAD SCREW	1
4	A-3606	SHAFT	1
5	A-3605	FOR / REV CONTROL , THIRD-ROD SHAFT	1
6	A-3608	CHIP PAN	1
7	A-3602	END BRACKET	1
8	A-3144	MOTOR PLATE	1
9	A-3142	MOTOR PLATE	1
10	A-3145	ROD	1
11	3221	COLLAR	1
12	3701	LEFT PEDESTAL HEAD-END	1
13	3702	RIGHT PEDESTAL TAIL-END	1
14	3701-1	DOOR	1
15	3702-1	DOOR	1
16	A-3614	SCREW TAPER PIN	2
17			
18	A-3622	SCREW	1
19	A-3623	CAP SCREW (M14 x 30L)	6
20	A-3624	CAP SCREW (M6 x 20L)	7
21	A-3625	CAP SCREW (M10 x 35L)	2
22	A-3626	CAP SCREW (M10 x 30L)	2
23	A-3627	NUT (M10)	2
24	A-3628	CAP SCREW (M8 x1 6L)	1
25	A-3629	CAP SCREW (M8 x 60L)	2
26	A-3630	PIN (5mm x 28mm)	5
27	A-3631	PIN	1
28			
29	A-3655	STEEL BALL (6mm)	3
30	A-3656	SPRING	3
31	A-3657	SCREW (M8 x 8L)	3
32	A-3633	PIN (5mm x 15mm)	3
33	A-3634	CAP SCREW (M6 x 16L)	2
34	A-3635	CAP SCREW (M 8 x 28L)	1
35	A-3636	NUT (M8)	1
36	A-3618	BUSH	1
37	A-3617	BRACKET	1
38	A-3637	SNAP RING (C30)	1
39	A-3622	CRANK	2
40	A-3620	BOX	1
41	A-3621	COVER	1
42	A-3631	SCREW	1
43	A-3640	PIN (5mm x 28mm)	2

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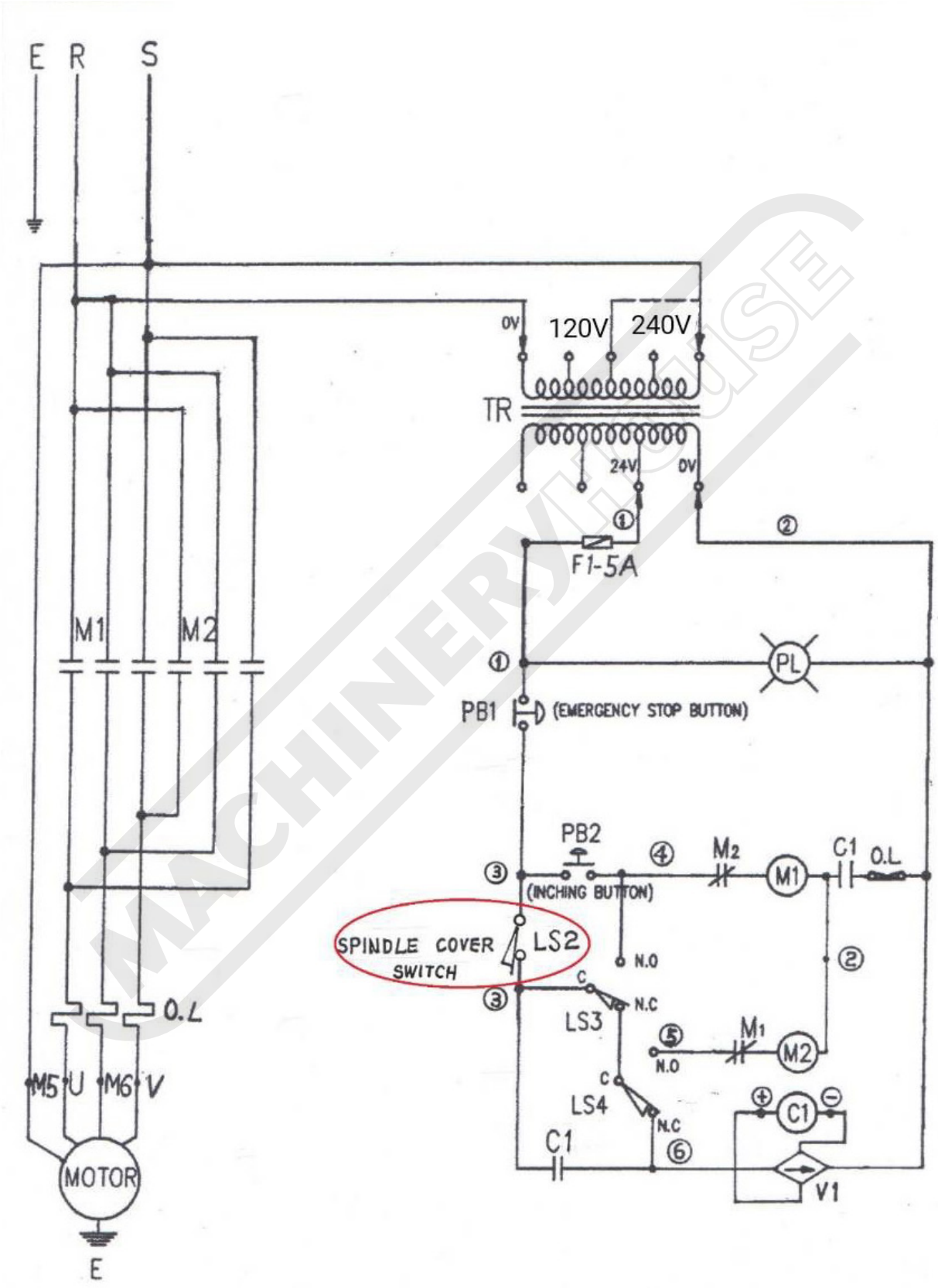
BED, RACK LEAD SCREW AND SHAFTS LIST

No.	FACTORY CODE	DESCRIPTION	Qty.
44			
45			
46	A-3619	LEVER	1
47	A-3643	KNOB	1
48	A-3644	COLLAR	1
49	A-3645	PIN (5mm x 50mm)	2
50	3703	CONNECTING PLATE	1
51	A-3609	COLLAR	1
52	A-3647	SET SCREW (M8 x 8L)	2
53	A-3648	THRUST (# 51103)	1
54	A-3649	CAP SCREW (M6 x 16L)	2
55	A-3650	WASHER	6
56	A-3651	NUT	6
57	A-3652	SCREW	8
58	A-3653	NUT	8
59	A-3654	SCREW (1/2” x 2”)	4

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

ELECTRICAL DIAGRAM



NOTES:

ENVIRONMENT PROTECTION

Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycling centre and disposed of in a manner which is compatible with the environment. When the product becomes completely unserviceable and requires disposal, drain any fluids (if applicable) into approved containers and dispose of the product and fluids according to local regulations.

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