ATRUMP
MACHINERY

AV series
CNC TOOLROOM BED MILL

Operator's Manual & Parts List

AV-32

AV-35

1-1 Safety Precautions

This machine is provided with a number of safety devices to protect personnel and equipment from injury and damage.
However, these cannot cover all aspects of safety; therefore, the operator must read thoroughly and understand the operation manual before operating the machine. Operators should consider other aspects of safety related to specific environmental conditions and materials. Reserve sufficient space around the machine so that technicians can open the electrical cabinet door for maintenance or repair.
The service of a qualified electrician should be used to connect the machine to plant power. The power supply voltage must be the same as the machine requires.
Be sure that all wiring is in accordance with local building codes. This machine is a multifunction CNC toolroom bed milling machine with automatic operation and typical manual operate model. It is primary used to cut the materials such as steel, cast iron, copper, aluminum…etc.
It is not recommended to cut a danger material such as Magnesium or worked in a potential explosion environment.

1. Basic Operation Specifications

A. Specific control panels, transformers, motors, junction boxes, and other parts have high-voltage terminals, these should not be touched, or a severe electric shock will be sustained.

B. Do not touch a switch with wet hands. This can cause electric shock.

C. Make sure that all doors and safety cover are fitted before switching on the power. If any door or safety cover is to be removed, first cut off and lock the main breaker.

D. The machine operator must be familiar with the position and function of the "**emergency stop push button**".

E. Before replacing a fuse, the main power must be turned off.

F. Provide sufficient working space to avoid hazardous falls.

G. Water or oil can make floors slippery and hazardous. To prevent accidents, all floors should be dry and clean.

H. Before operating switches, always check that they are the right ones you are going to push.

I. Never touch a switch accidentally.

J. Work benches near the machine must be strong enough to prevent accidents. Articles should be prevented from slipping off the bench surface.

K. If a job is being done by two or more people, they have to be well-trained and good communication has to be established. Coordinating signals should be given at each step of the operation. Unless a signal is given and acknowledged, the next step should not be taken.

L. Do not handle coolant with bare hands since it is prone to cause irritation. Operators with allergies should take special precautions

M. Do not operate the machine during violent thunderstorms

N. Do not remove or otherwise interfere with safety devices such as stop dogs, limit switches, or interlocks in order to increase axis travel.

O. Do not modify the machine in any way that will affect its safety.

P. This machine is not used for working in the potential environment of explosion.

Q. If there is a danger of explosion or fire due to cutting flammable materials, or a danger of fire due to coolant, please make sure you have a fire extinguisher on hand. In addition, please ask the supplier who provides potentially explosive materials. He is responsible for providing safety precautions for cutting dangerous materials. (E.g. magnesium)

R. Check slings, chains, hoists, and other lifting gear for defects before use. Repair or replace defective gear immediately.

2. Routine inspections

When checking belt tensions, do not get your fingers caught between the belts and pulley.

(1) Inspect pressure gauges for proper reading.

(2) Inspect motors, gear box and other parts for abnormal noises.

(3) Inspect the motor lubrication, and sliding parts for evidence of proper lubrication.

(4) Inspect safety covers and safety devices for proper operation.

(5) Inspect belt tensions. Replace any set of belts that has become stretched with a new matching set.

3. Warm-up

(1) In automatic operation mode, run the machine at half or one-third of the maximum speed for 10 minutes or 20 minutes to warm up the machine, especially the main shaft and feed axis.

(2) If the machine is used for actual processing immediately after starting, after a long idling time, the sliding parts may wear out due to lack of oil. Moreover, the thermal expansion of machine parts can impair machining accuracy. To avoid this situation, be sure to warm up the machine.

(3) Thermal expansion may reduce machining accuracy. In order to avoid these failures, such as abnormal wear of sliding surfaces, stick-slip, etc., Warm-up should be performed. Due to sufficient warm-up, thermal expansion becomes stable, and the machine can manufacture products with uniformity and high processing accuracy.

(4) Warm-up is always required before daily operation. In cold areas, warm up should be fully carried out. During the warm-up, inspect the operation and lubrication of each part.

4. Coolant

When selecting a coolant, take the following items into consideration by consulting the supplier of the coolant.

(1) Use water-soluble coolant. If oil-based coolant is used the coolant temperature rises as its delivery decreases, causing thermal distortion of the machine. In addition, it is necessary to take precautions against fire hazards, such as installing a fire extinguisher, since oil-based coolant is flammable.

(2) Take the lubricity, corrosion – prevention performance, and anti-foaming characteristics into consideration

(3) Make sure that the coolant has no adverse effects on the human body. Since water-soluble coolant often causes poisoning, pay sufficient attention to the hygiene of the operators.

(4) Make sure that the coolant does not cause curing or expansion of rubber or plastic products, or chemical products.

(5) Make sure that mixing of the coolant with the recommended lubricating oil does not cause problems. In some cases, the mixing of coolant with lubricating oil causes a chemical change, resulting in discoloration or solidification of the coolant.

5. Operation

A. Keep your hair away from moving parts. Wear appropriate safety headgear.

B. Do not operate switches with gloves on. Gloves are easily caught in moving parts.

C. Whenever a heavy work-pieces must be moved, two or more people should always work together if there is any risk involved.

D. Only trained and qualified workers can operate forklifts, cranes, other lifting equipment and apply slings.

E. When operating forklifts, cranes, or lifting equipment, one should be particularly careful to avoid collision and damage to the surrounding environment.

F. Wire ropes or slings should be strong enough to handle the loads to be lifted and should conform to the mandatory provisions.

G. Securely clamping the workpiece properly

H. Stop the machine before adjusting the coolant nozzle.

I. Never touch rotating workpiece or spindle with bare hands or in any other way.

J. To remove workpieces from the machine, stop the tool and provide plenty of distance between the workpieces and the tool.

K. While a workpiece is turning, do not wipe it off or remove chips with a cloth or by hand. Always stop the machine first and then use a brush and a sweeper.

L. Do not operate the machine with safety front door removed.

M. Use a brush to remove chips from the tool tip not by bare hands.

N. Stop the machine whenever installing or removing a tool.

O. Whenever machining magnesium alloy parts, wear a protective mask.

P. Always use safety shoes with steel toe caps and oil-resistant soles.

Q. Before operating this machine remove all jewelry including watches and rings, neckties, and any loose-fitting clothing. To avoid getting caught in moving parts.

R. Never operate the machine after consuming alcoholic beverages, or taking strong medication, or while using non-prescription drugs.

S. Always wear helmet of there are any overhead obstacles in the work area.

T. Never run the machine with enclosure doors open.

U. When performing heavy-duty machining, carefully prevent chips from being accumulated since hot chips are flammable.

V. Wear a safety glasses at all times during the operation of the machine to avoid coolant splashing into eyes.

W. When the machine working for a heavy-duty cutting or want to obtain highly machining quality. It may be required and recommended to use coolant for prevent the fire hazard generated and take good performance.

6. To interrupt machining

When leaving the machine temporarily after completing a job, turn off the power switch on the operation panel, and main circuit breaker.

7. Completing a job

A. Always clean the machine or equipment. Remove and dispose of chips & clean cover windows, etc.

B. Do not clean the machine or equipment, before it has stopped.

C. Return each machine component to its initial condition.

D. Check wipers for breakage. Replace broken wipers.

E. Check coolants, oils and lubricants for contamination. Change them if they are seriously contaminated.

F. Check coolant, oil and lubricant levels. Add, if necessary.

G. Check the chip tank filter.

H. Before leaving the machine at the end of the shift, at the following order turn off power switch on the operating panel, machine main circuit breaker and factory feeder switch.

8. Safety devices

A. Front door, rear guard and splashguard with interlock.

B. Overtravel limit switches.

C. Emergency stop push button.

9. Maintenance operation preparations

A. Do not proceed to any maintenance operation unless instructed to do so by your supervisor.

B. Replacement parts, consumables (packing, oil seals, O-rings, bearing, oil and grease etc.) should be arranged in advance.

C. Prepare to record preventive and corrective maintenance operations.

D. Thoroughly study and understand the safety precautions in the operation manual.

E. Thoroughly read the whole maintenance manual and fully understand the principles, construction and precautions involved.

10. Maintenance operation

A. Personnel who are not engaged in maintenance work should not operate the main circuit breaker or the control power switch on the operation panel. For this reason, "Do not touch the switch, maintenance operations are in progress!" or similar work should be indicated on such a switch in any other suitable position. This indication should be guaranteed in the reading direction by semi-permanent means.

B. With the machine turned on, any maintenance operation can be dangerous. In principle, the main circuit breaker should be turned off throughout the operation.

C. After the power has been switched off for a short while, check the voltage with a multi-meter or similar instrument to make sure that there is no residual voltage. Also discharge the capacitors.

D. The electrical maintenance should be done by a qualified. Keep close contact with the responsible person. Do not decide by yourself.

E. Overall limit and proximity switches and interlock mechanisms including functional parts should not be removed or modified.

F. When working at a height, use steps or ladders which are maintained and controlled daily for safety.

G. Use fuses, cable, electrical components…etc. that are made by qualified manufacturers.

H. Always switch off the main power breaker and lock it before replacing bulbs or other electrical equipment and use products with the same specifications as the original.

I. Do not use compressed air to clean the machine or to remove chips.

J. Always use gloves when clearing away chips; never touch chips with bare hands.

11. Pre-operation after maintenance

A. Arrange things in order around the section to receive the maintenance, including work environments. Wipe water and oil off parts and provide safe working environment.

B. All parts and waste oils should be removed by the operator and placed far enough away from the machine to be safe.

C. The maintenance person should check that the machine operates safely.

D. Maintenance and inspection data should be recorded and kept for reference.

1-2. Safety Equipment

Please pay extra care on practicing these safety tips previously mentioned to prevent hazardous accident.
Also please take note on the following safeguards and realize their functions to maintain the machine running in normal condition and longer life.

Item	Equipment	Function	Position
1	Splash guard	To prevent chips and coolant from emitting	Machine front
2	Emergency stop	To immediately disable machine function.	Control panel
3	Lubricant alarm	To prevent slide ways from wearing.	Control panel
4	Overload alarm	To prevent motor from overloading	Control panel
5	X-axis limit switch	To prevent X-axis from overtravel.	Saddle of X-axis
6	Y-axis limit switch	To prevent Y-axis from overtravel	Saddle of Y-axis
7	Z-axis limits switch	To prevent Z-axis from overtravel	Column of Z-axis
8	X-Y&Z axis software switch	To prevent X-Y & Z axis overtravel	CNC parameter setting
11	Movable doors interlock device	To protect operator insulated dangerous and injury from the automatic operation	Top of both movable doors
12	Cabinet door safety device	To prevent personnel be electric shocked from the electrical device	Electric cabinet

1-3. Safety Decals

All milling machines contain hazards from rotating cutting tools, belts, pulleys, high voltage electricity, noise and compressed air…etc.

Symbol	Description
	High voltage electricity can severely injure or kill you. Never attempt to adjust or repair electrical circuits unless you are qualified to work on the electrical circuits, always keep electrical cabinet closed when operating this machine.
	Do not operate this machine until you have read all warnings, cautions, and instructions.
	Do not remove security device and protections.
	Turn off and lock out system power before servicing
	Use appropriate eye and ear protection when you operate the machine
	Always wear safety shoes with steel toe caps and oil resistant soles to prevent slip and falls.

Decal Symbols Reference

This section gives explanations and clarifications for the safety symbols you will see on your machine.

DANGER

Hazardous voltage will cause severe injury or death.

Turn off and lock out system power before servicing

DANGER

Risk of Eye and Ear injury

Wear safety glasses and ear protection

DANGER

Risk of serious bodily injury.

Unexpected objects may fly out can cause injury

Do not operate with door open or guards removed

Keep interlock and other safety devices in place and functioning.

DANGER

Severe injury can occur.

Moving parts can cause severe injure

Make sure the machine is not in automatic operation before reaching inside.

DANGER

Severe injury can occur.

Do not operate with guards removed

Follow lockout procedure before servicing

DANGER

Risk of serious bodily injury.

Serious cut, abrasions and physical injury may result from slips and falls.

Do not operate machine in wet or poorly lit areas

LB-0010-D

Decal Symbols Reference

This section gives explanations and clarifications for the safety symbols you will see on your machine.

WARNING

Machine may start at any time.

Injury or death could be caused by untrained operator.
Read and understand operator manual and safety signs before using this machine.

WARNING

Risk of serious bodily injury.

High speed moving parts may fly out can cause injury
Do not operate with door open or guards removed
Do not machine using an unsafe setup or exceed rated chuck RPM.

WARNING

Cutting tools can seriously injure or kill.

DO NOT operate unless doors are closed and interlocks are working

WARNING

Moving tools can seriously injure and cut.

Do not operate with door open or guards removed
Follow lockout procedure before servicing.

WARNING

Crush hazard.

Keep hands clear when doors is closing

WARNING

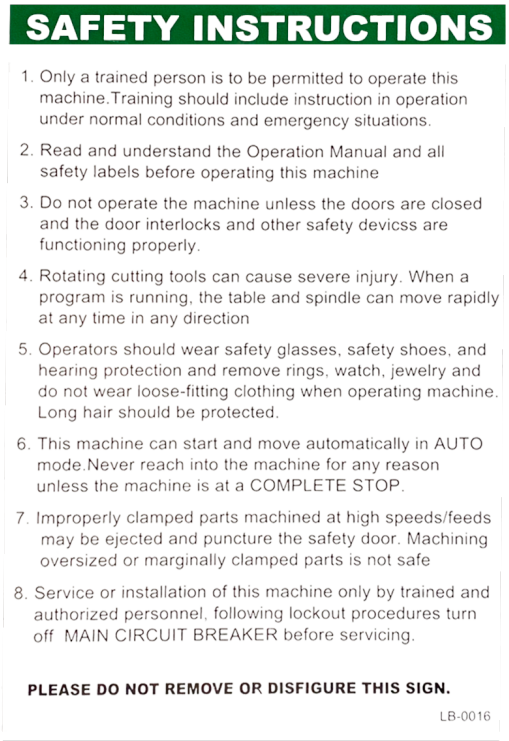
Crush hazard.

Can cause serious injury or death Stay clear of moving mechanism.
Moving parts can crush and cut

LB-0011-M

Decal Symbols Reference

This section gives explanations and clarifications for the safety symbols you will see on your machine.



SAFETY INSTRUCTIONS

1. Only a trained person is to be permitted to operate this machine.Training should include instruction in operation under normal conditions and emergency situations.
2. Read and understand the Operation Manual and all safety labels before operating this machine
3. Do not operate the machine unless the doors are closed and the door interlocks and other safety devicss are functioning properly.
4. Rotating cutting tools can cause severe injury. When a program is running, the table and spindle can move rapidly at any time in any direction
5. Operators should wear safety glasses, safety shoes, and hearing protection and remove rings, watch, jewelry and do not wear loose-fitting clothing when operating machine. Long hair should be protected.
6. This machine can start and move automatically in AUTO mode.Never reach into the machine for any reason unless the machine is at a COMPLETE STOP.
7. Improperly clamped parts machined at high speeds/feeds may be ejected and puncture the safety door. Machining oversized or marginally clamped parts is not safe
8. Service or installation of this machine only by trained and authorized personnel, following lockout procedures turn off MAIN CIRCUIT BREAKER before servicing.

PLEASE DO NOT REMOVE OR DISFIGURE THIS SIGN.

LB-0016

2. Description of The Machine

2.1 Specifications of Machines and Accessories

Machine Specification

	AV-32	AV-35
Spindle motor	3HP	5HP
Table	10" x 50"	10" x 54"
X axis Travel	31.5"	35"
Y axis Travel	18"	19.6"
Z axis Travel	20"	22"
Spindle Taper	R8/NT30	NST40
Quill diameter	Ø3.37"	Ø3.93"
Quill travel	Ø 5"	
Spindle speed rpm (Lo/Hi)	70 -4500 rpm with Hi/Lo gears	
Head swivel (right/left)	90 degrees	
Servo motors on X-Y-Z:	1.0 kW / 1.0 kW / 1.0 kW - AC	
Coolant pump	1/8 HP	
Lubrication pump	150 W	
Power requirement	8 KVA 3 phase 208V-230V (Max)	10 KVA 3 phase 208V-230V
Table load capacity (lbs)	880 LBS	1,100 LBS
T - slot (W*N*P)	0.62" x 2.55"	
Spindle nose to table top	3.93" to 24.01" (100-610mm)	3.93" to 25.98" (100-660mm)
Spindle Center to Column	21.5" (546mm)	
Rapid feed rate· X/Y/Z:	300 ipm AC	
Cutting feed rate:	1 to 120 ipm	
Saddle size	20" (510mm)	24" (560mm)
Machine weight (lbs)	3740 LBS	5000 LBS
Machine dimeter	105.8" x 69.05" x 94.2"	111.14" x 69.05" x 94.2"

All data subject to change without notice

2-1-1. Standard Accessories

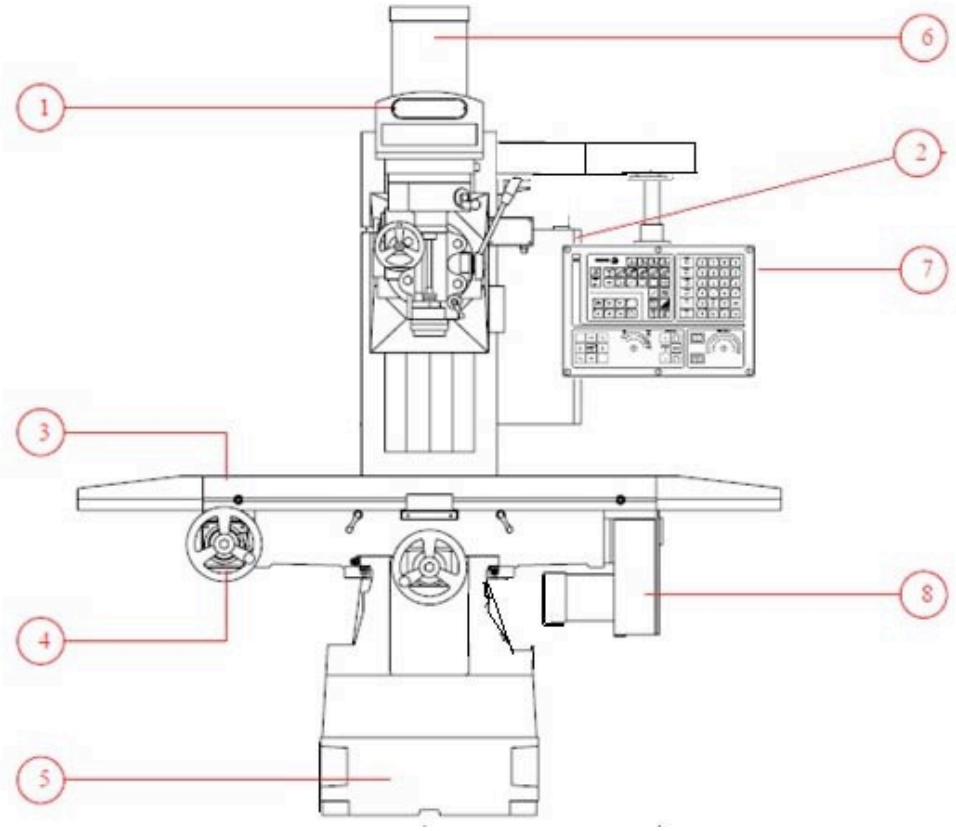
- Splash guard
- Powerful AC Servo Spindle motor.
- Coolant system
- way cover for X-Y-Z axes
- Halogen Work lamp.
- Auto. Central lubrication system
- Tool and tool box
- Leveling bolts and pads
- Operation manual & parts list.

2-1-2. Optional Accessories:

- 4th Axis preparation
- Φ 6", 4th Axis Rotary table Package
- Auto Tool Length Measurement

2.2 CNC Bed Mill Features (front view)

No.	Description	No.	Description
1	Spindle head	5	Bed Base
2	Electric	6	Spindle motor
3	Work table	7	CNC Control panel
4	Handle wheel	8	X-axis servo Motor



2.3 Noise Level

Detail of the noise level inspection methods please refer to ISO 3744 instruction. Static of machine (noise background): 80 dB

2. 4 Brightness level

We use digital lux meter to measure the lighting. The meter is produced by TES electronic corp., the type is TES 1332. The brightness lighting we measured is about 600 lux under the light. The distance is 310 mm from the spindle nose. It can take well vision when operating the machine.

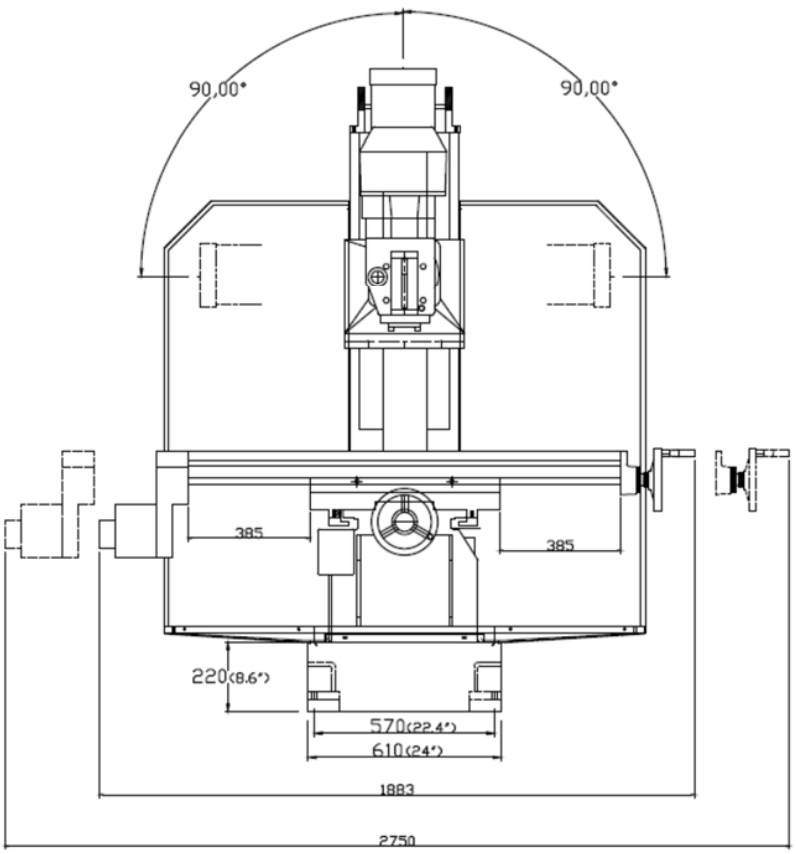
2-5 Power Specifications

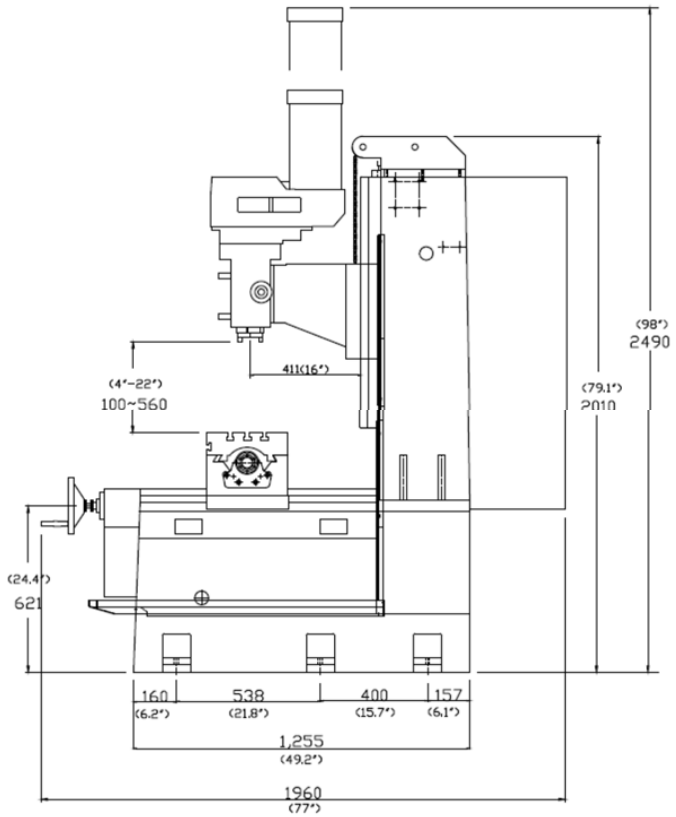
Item	AV-32	AV-35
Voltages	3 Phase, 220V	3 Phase, 220V
Frequency	60HZ	60HZ
Voltage tolerance	208-230(Max)	208-230(Max)
Power gross load capacity	3HP: 8KVA/5HP: 10KVA	10KVA

*1. These values are calculated if:
Allowable max. temperature of insulation material 65℃
Ambient temperature 35℃
Metal duct wiring
The ground resistance must be 100 Ω or below

2-6. Floor space of Machine:

AV-32 and AV-35





3. INSTALLATION

3-1. Machine Foundation Requirement

Incorrect foundation will affect machine's accuracy. Only correctly done foundation will avoid machine vibration, reduce machine malfunction, and loosening level of the machine.
All these factors will contribute to machine's machining accuracy.
Every machine has a different control and is weighed differently. They are also designed different. Therefore, they also need a different foundation. We strongly suggest customers to build the foundation according to the requirement (shown on fig. 2).
All new machines, we have supply with leveling pads and screws. They are used to level the machine, and reduce the vibration. All accessories are shipped with the machine.
Please check for any missing items and contact your distributor for replacement.

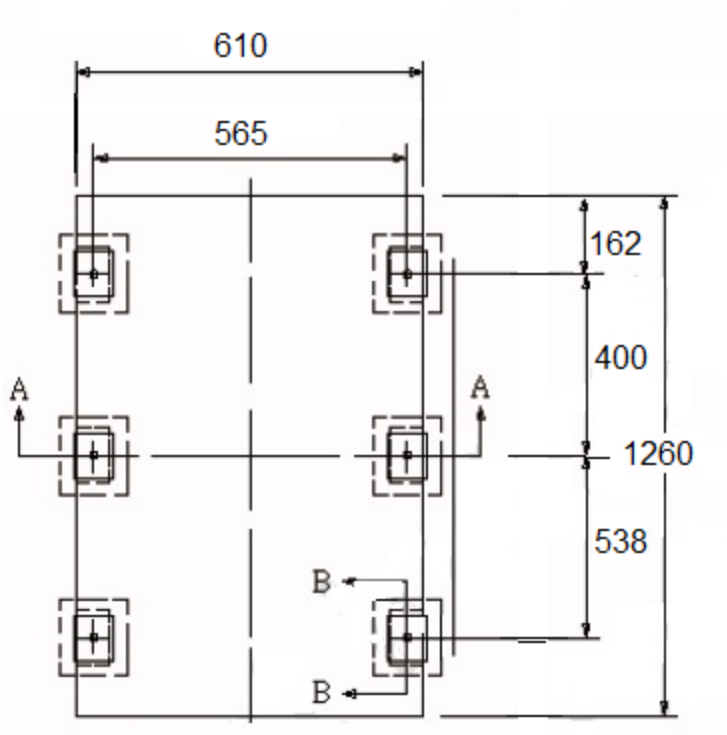
3-2. Installation

To prolong the life of the machine and its accuracy, please carefully select the proper installation site. The criteria are:

A. Find the site where there is vibration-free and there is no power shortage. Please avoid to install the machine around press, shaping machine etc. They will affect the accuracy of the machine.

B. Never install the machine under direct sunlight or where humidity is high.

C. Avoid the site where there is corrosive powder and mist.



3-3. Level & Leveling Screws

The method of building the foundation is as figure 2. Please build the foundation 15 days before machine arrive. The procedure is as follow:

A. Check the foundation map before digging.

B. Dig the foundation area to the proper depth, flatten it, fill it with rocks, and use rubbles to fill the gaps.

C. Make the screw molds for selected leveling screw area. Make sure they are not out of straight or penetrate out of shape.

D. Concrete mix ratio is 1:2:4 (concrete: sand: small rubbles), they need to be mixed thoroughly, and make sure the concrete mix has the right elasticity and color content.

E. Before pouring in the concrete mix, place the screw molds in place. They are prepared for J type locating screws.

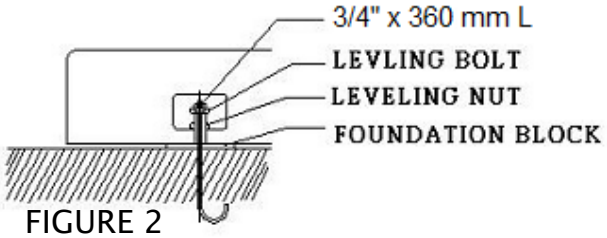
F. After concrete solidified, you may remove the molds. In summer, the time required for concrete to solidify is 4~5 days, and in winter, it is 8~10 days.

G. When the machine is shipped to the location, install the J type locating screws through leveling screws and screw on the hex nuts, and then slowly settling down the machine on the foundation site. Be sure to match each J screw position before completely lowering down the machine.

H. After adjusting each J screws' length to 6" above the ground, the concrete can be poured into the J screw positions.

I. After the concrete is solidified, you may then adjust the level of the machine.

J. Machine level in X and Y axis has to be within 0.0008/12" or better.



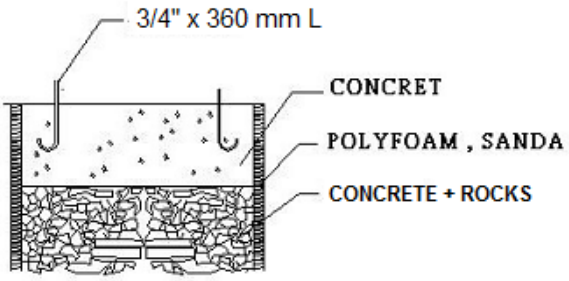


FIGURE 2

3-4. MACHINE PACKAGE & ITS METHOD

To make sure quality and accuracy of the machine are maintained. Before machine is shipped out, we carefully inspect packaging procedure and check the final packaging pallet.

Package Method before Shipping:

On the pallet, a PE plastic bag is set on top of it. Then the machine is lowered on the pallet, and is screwed tight onto the pallet. Before the PE plastic bag is wrapped up, absorbent bags are placed and machine is sprayed with anticorrosion paint. Please see the following picture for sample (Figure 4).

FIGURE 4

To reduce the vibration when shipping, all movable objects are fixed and tightened in specific positions. The positions are as follow:

a. X axis ball screw is fixed by tighten the table clamp lever to the saddle. (Fig 5)

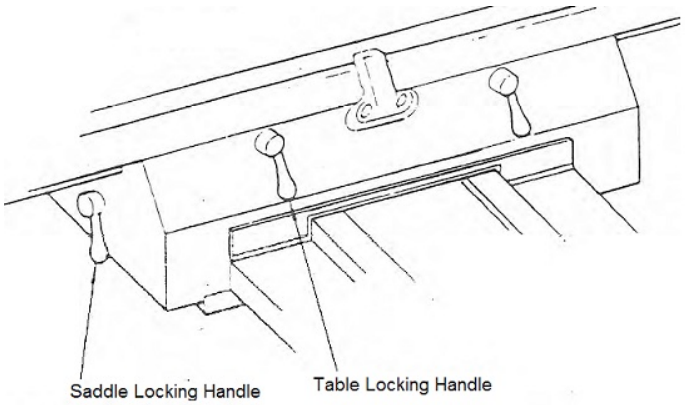
b. Y axis ball screw is fixed by tighten the saddle locking lever to the saddle. (Fig 5)

c. Z axis ball screw is fixed by the wooden block under the spindle nose. (Fig 6)

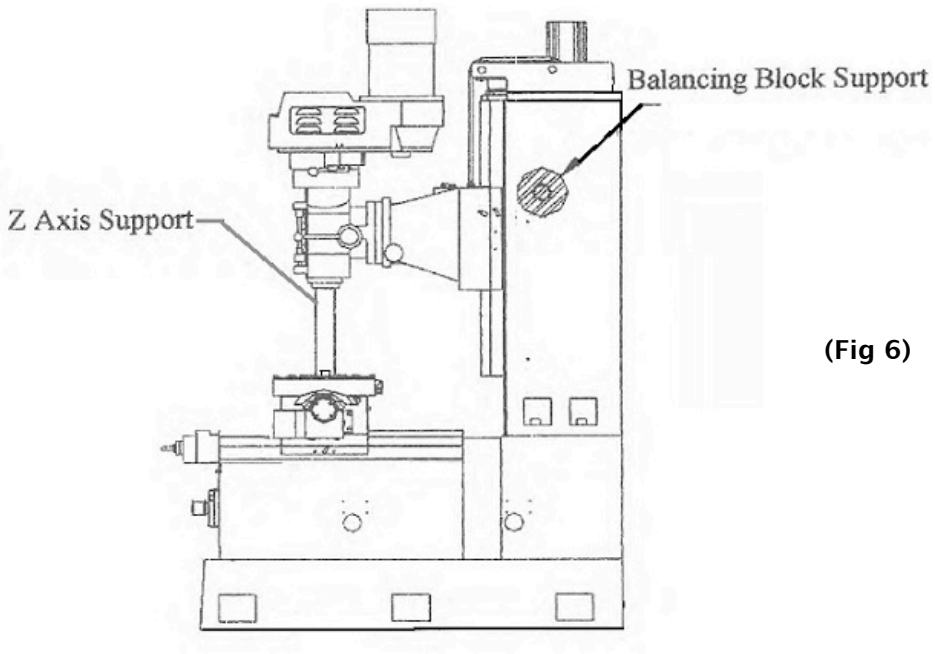
d. Balancing block is tightened at column. (Fig 6)

e. Control box is support on top of the table with wooden block. (Option)

***To make sure all levers and locating items are loosen, please double-check and make sure all of them in doubt are "surely" loosen before operating the machine.



(Fig 5)



(Fig 6)

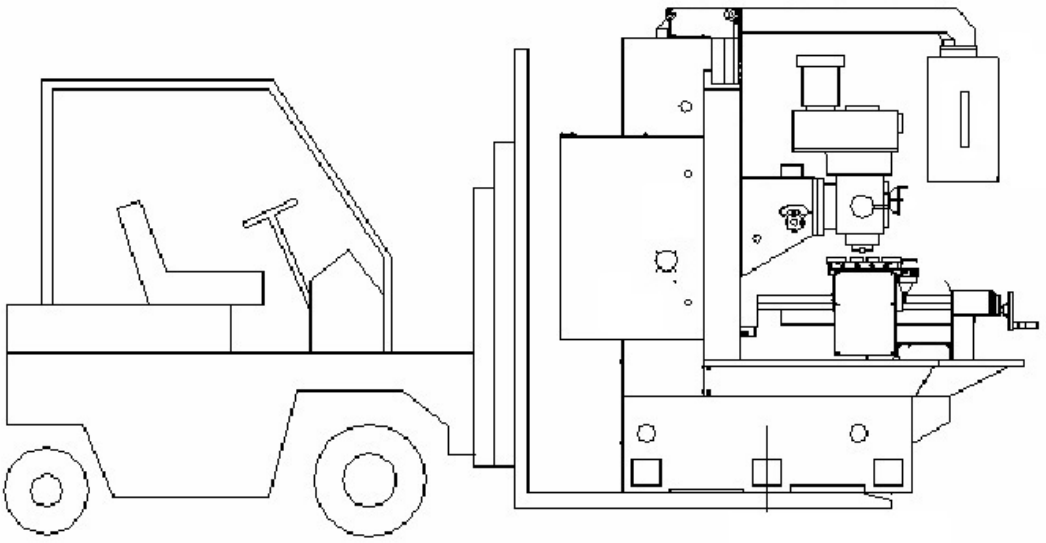
3-5. Unpacking

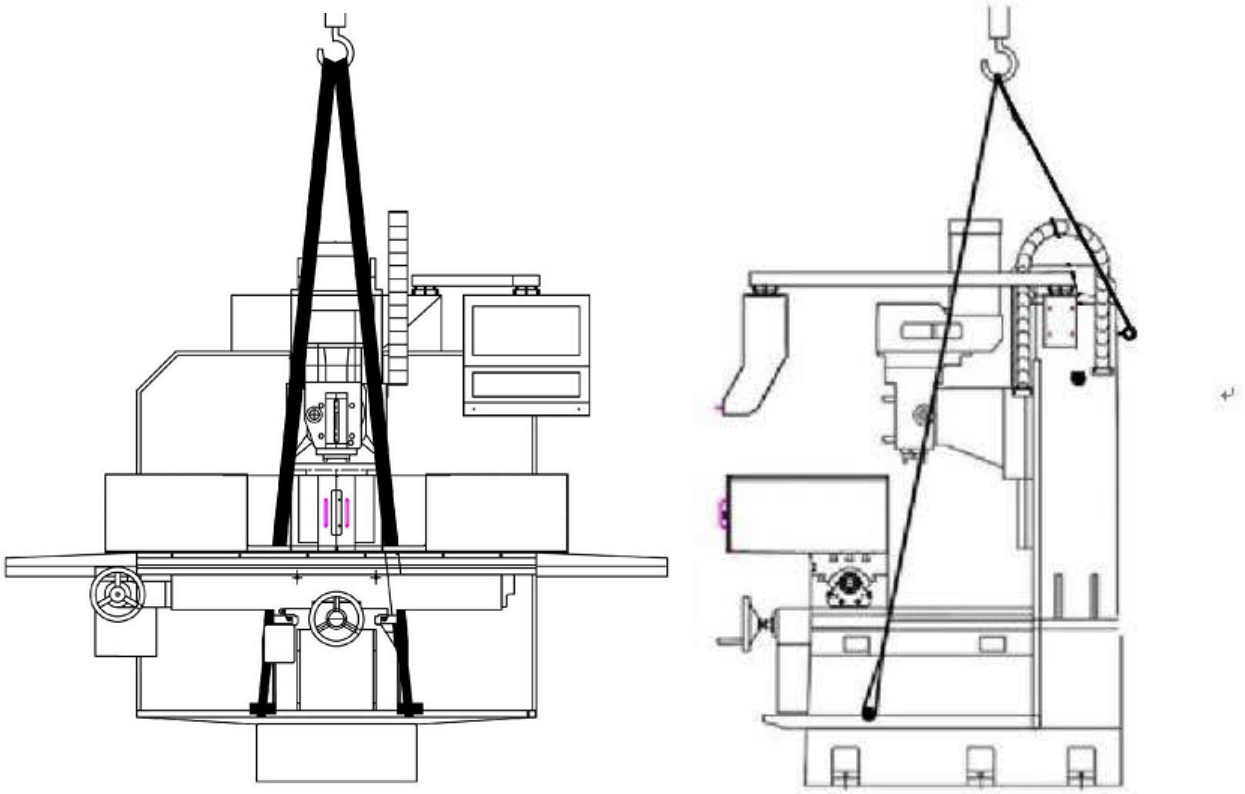
Carefully take out fittings at first, if necessary. Remove the set screws used for holding the machine on the base. Disassembling packing crate and remove skids as carefully as possible to avoid damaging the machine.
If the machine is damaged during transportation, contact your local dealer and the transportation company who delivered your machine immediately. Be sure to check your machine against the packing list which is shipped with every machine. In cases of shortages, note items not received and contact your dealer.

3-6. Moving unpacked machine with forklift

- The forklift truck must be able to withstand the load over 3 tons because machine's weight about 2 tons.
- The size unpacked of machine is 2800 (L) x 2250 (W) x 2200 (H), therefore you must pay attention to whether there is any blockage in moving path or not, clear all the blockages before moved.
- Adjust the fork of forklift truck to right position and be aware of machine gravity. Machine must be placed in the load center of forklift truck to avid machine tilt that damage the machine and injure people.
- The fork and rear sides of machine are not allowed to be contact with forklift truck. Keep any part of the machine at least 15 cm away from masts of the forklift truck. Place two wood blackings of 89 x 20 cm in the thick respectively between the machine and masts.
- Be careful for the height of forklift truck when lifting. Don't raise too high that will generate vibration because of gravity, or machine will tilt and people will be hurt and the machine be damaged.
- Have someone instruct the movement when moving machine to assure security.

4-7. Proper Method for Lifting Machine





3-8. Use crane for lifting the machine:

1. Insert one Ø40 mm x 700 mm bar to pass through the hole of base.
2. Place four ropes through the eye bolt on the column and the base for lifting as shown in Figure on above.
3. Lift the machine above the ground about 50 mm (2”), Then move it to the determined place.

Caution:

a. Move table to the middle of the saddle and the saddle near to the column as close as possible while the machine is being moved.
b. Watch out for the machine balance during moving.
c. The safety loading ability of required for crane and sum of all the safety straps used must more than 4,000kgs at least.
d. Place protection material on any part of the machine that might be touched by straps.
e. Only an authorized crane operator should use the crane.

4. **9. Clean & Lubricating Machine**

All protective coating must be removed before using the machine. Do not attempt to move the ways if the coating still exists.

Be cautious while selecting a suitable cleaning agent. Paraffin applied with a clean brush will soften the protective coating. The protective coating can then be removed with clean rags.

Note:

(1) Do not use gasoline or any other flammable solution to clean the machine.

(2) Clean and lubricate all the exposed ways of table and saddle. Drive the table & saddle to one end of travel. Clean and lubricate ways thoroughly then drive table & saddle to the other end and clean and lubricate ways thoroughly as well. Be sure to use a suitable lubricant such as Sunoco Waylube#11180 or Mobil Vactra Oil #2.

(3) This job has to be done after the machine is already under normal power supplied.

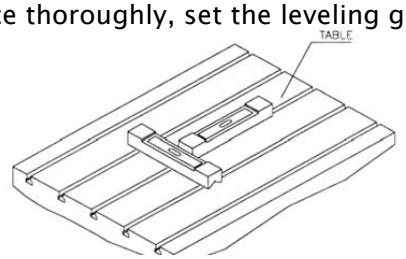
3-10. Leveling Machine

It is necessary to level the machine before starting to operate the machine.

A. Please prepare the accurate leveling gauge (spec. 0.02mm/1000mm or 0.001 in/4ft).

B. Let three axes return to the home position.

C. Clean the table surface thoroughly, set the leveling gauge on just as the drawing shown.



D. Adjust the foundation bolts and nuts to make the foundation bolts lock within the slot of pad.

E. Move X-axis to -425 mm and Y-axis to - 230 mm (for AV-35). Adjust the foundation bolts and ensure the bubbles of level gauges in the middle position or keep the deviation within 0.02mm.

F. Move X axis to the zero position and - 850 mm (for AV-35) by adjusting the bolts and nuts to make the difference between the two points within 0.05 mm.

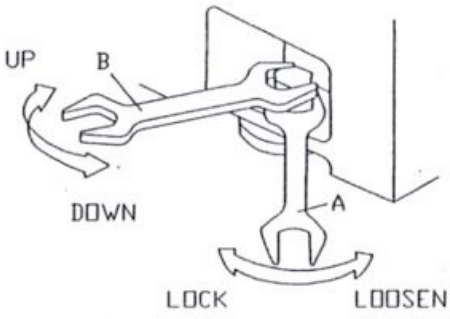
G. After returning Y axes to -460mm (for AV-35), and move Y axis to zero, the difference value between the two points within 0.05 mm.

Lock the nuts (A) on the leveling screws, and recheck the level to see whether the level of machine is still correct.

Suggestion:

For the newly installed machine, check its level once every week.

When the foundation is rigid enough, then you may level the machine once per month.



4. Starting the Machine

A. Before Switching On:

1) Use adequate cable and wiring protected with local regulations.
2) Make sure the correct voltage and capacity have been connected well to machine.
3) be sure to close well door or cover to avoid water or dust into the cabinet.
4) be sure every oil level, such as coolant oil is adequate.
5) Turn on the feeder switch at the factory and the machine main circuit breaker.

B. Before Switching On:

1) Check and see the ready lamp should be lit when turning on the power.
2) Make sure there is no unusual noise at the motor and other parts.
3) When first starting machine, after unpacking, check the coolant pump if running at correct
4) direction.
5) When first starting, the machine each sliding parts must be lubricated with enough lubricant.
6) Check safety guard and safety device for proper operation.

C. Machine in Operation:

1) Never check / touch a turning spindle or work piece with unprotected hands.
2) Never check / touch spindle nose with unprotected hands. Use brush to clean it.
3) Never open the safety guards while machine is running.

D. Completion of a Job:

1) Before leaving machine at the end of the shift, turn off the machine main circuit breaker and factory feeder switch in order.

5. Maintenance

A. The electrical maintenance must be managed by qualified personnel or someone who is competent to do the job.
B. Use fuses, cable, electrical components…etc. that are made by qualified manufacturers.

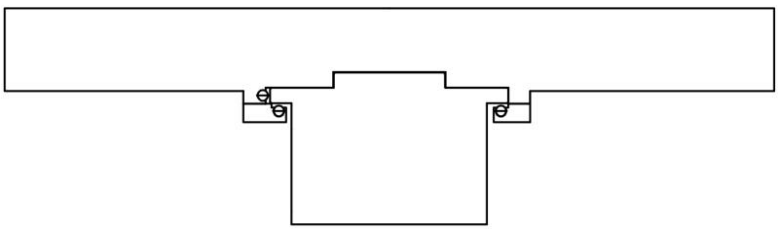
5-1. Air Regulator, Filter, and Lubrication Unit

This unit is for controlling the input air pressure and the quality of air. It will filtrate the moisture of the input air mixed the lubricant to ensure the pneumatic driving units and spindle are protected and free from rust. The daily check for filter and lubricator is necessary. The low-density lubricant or equivalent to ISO VG32 is recommended for the lubricator.

6. Adjustment

SADDLE OF FRONT/REAR GIBS (AS DRAWING "A")

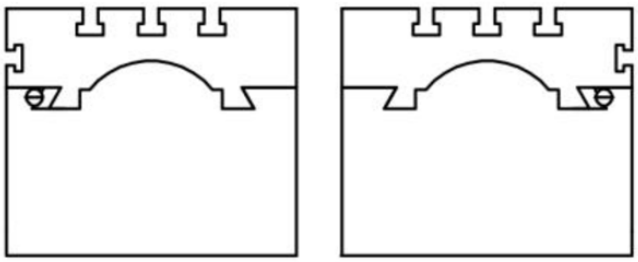
1. Take off the chip wipers.
2. There are 3 gibs on the saddle. One located at the outside of the box slide way is for adjusting the clearance of right / left direction. The other 2 gibs underneath the box slide way are for adjusting the clearance of fitness.
3. Release the screws at the rear of the gibs which must be adjusted and turn the screws in front of gibs clockwise for adjusting to a proper clearance.



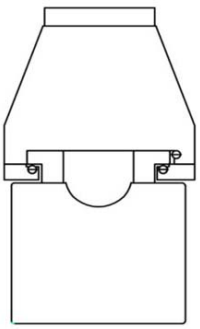
DRAWING A

TABLE WAYS

1. Remove all swarf from area.
2. Turn the table gib screw clockwise whilst moving the table until slight drag is felt.



DRAWING B

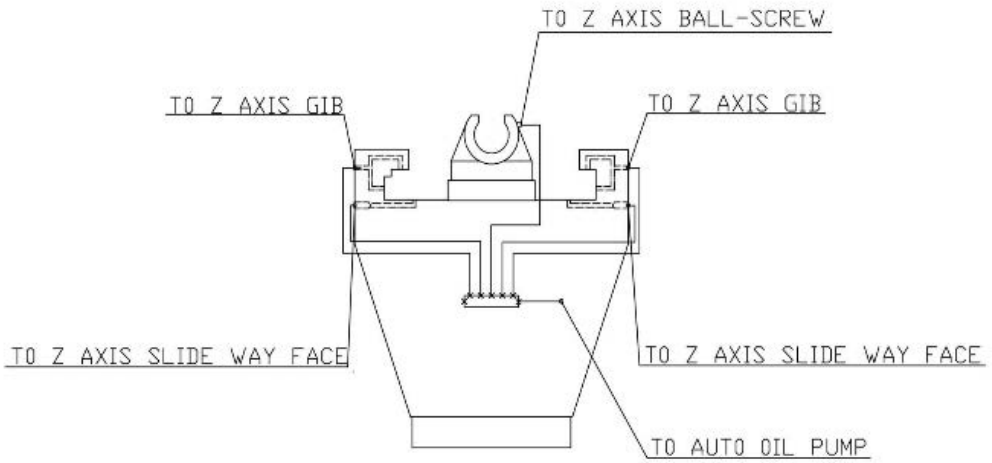


DRAWING C

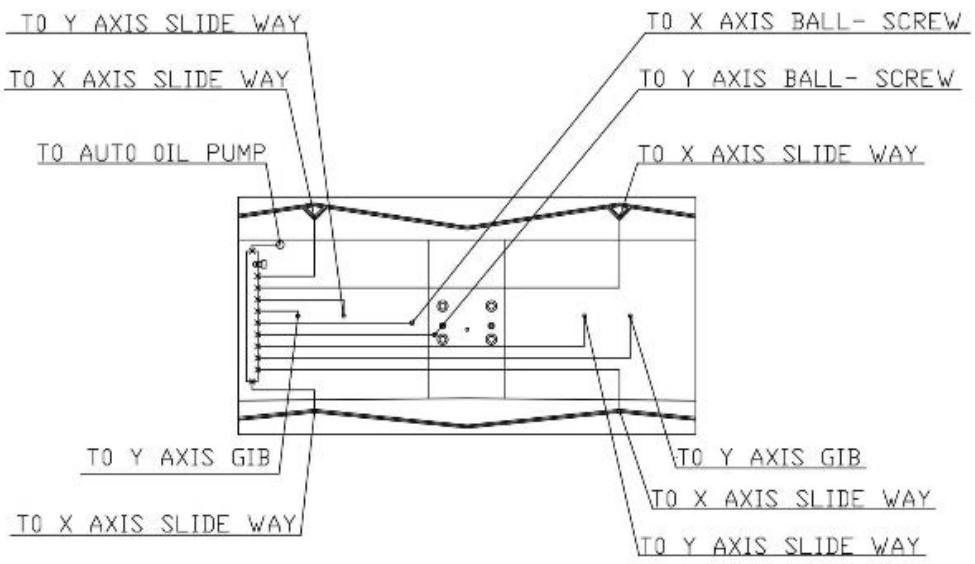
HEADSTOCK SUPPORT GIBS (AS DRAWING "C")

1. Take off the chip wipers.
   There are 3 gibs connected with head stock support and the column. One by outside of the box slide way is for adjusting the right/left backlash of the headstock support. The other 3 gibs located underneath of the box slide way are for adjusting the clearance of front / rear inclination.
2. Release the screws at the lower end the gib which must be adjusted. Turn the screws at the top end of gib clockwise for forward.

Headstock Lubricating Oil Pipe Distribution Diagram



Saddle Lubricant Oil Pipe Distribution Diagram



Features of the variable Speed Headstock

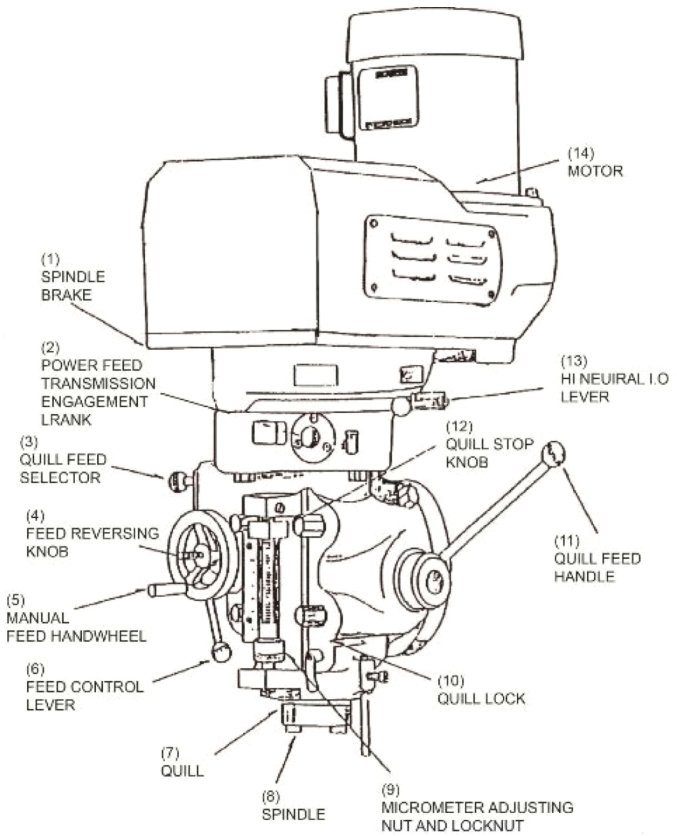


Figure 9 Inverter Variable Speed Head

SPINDLE BRAKE (#1 Figure 9):
Brake lever can move in either direction to stop spindle. When locking spindle, lever should be moved right or left and then raised. There are no adjustments on brake so it must be replaced when worn out.

CAUTION
BE CERTAIN THAT THE SPINDLE BRAKE IS RELEASED BEFORE STARTING THE MOTOR. THIS IS IMPORTANT AS THE MOTOR CAN BE DAMAGED IF SWITCH IS TURNED ON WITH BRAKE IN LOCKED POSITION.

POWER FEED TRANSMISSION ENGAGEMENT CRANK (#2 Figure 9):
When lever is in right hand hole. the power feed worm gear is engaged. To disengage worm gear, pull nob and crank handle in clock wise or down direction and move to opposite position.

NOTE
CRANK CANNOT BI SWUNG AROUND IN COUNTER CLOCK WISE DIRECTION, ROWEVER. NO DAMAGE WILL OCCUR IF MOVED IN THIS DIRECTION TO ENGAGE THE WORM A CLOCKWISE MOVEMENT IS REQUIRED.

CAUTION
POWER FEED WORM GEAR MAY BE ENGAGED WHEN SPINDLE IS ROTATING.
HOWEVER. IT SHOULD BE ENGAGED GENTLY TO AVOID DAMAGE TO WORM GEAR. THE WORM GEAR MAY BE DISENGAGED AT ANY TIME. DO NOT USE POWER FEED AT SPEEDS ABOVE 3000 RPM.

IMPORTANT: It is recommended that the Power Feed worm gear be disengaged whenever the power feed is not required. This will avoid unnecessary wear on power feed worm gear.

QUILL FEED SELECTOR (#3 Figure 9):
This crank is used for selecting the three feeds: 0015".003" and 006" per revolution. It is shifted by pulling knob out and turning from one position to the other. Feeds are stamped on cover below indentation hole. Feed is more readily engaged when spindle is running.

FEED REVERSING KNOB (#4 Figure 9):
Position of this knob depends upon direction of spindle rotation. If boring with right hand cutting tools, pull feed handle towards operator until clutch becomes engaged.
Neutral position is between forward and reverse position. It is recommended that the handle be left in neutral position when not in use.

MANUAL FEED (#5 Figure 9):
Feed reversing knob should be in neutral position and feed control lever (8) engaged. Clock wise traction of handwheel moves quill down. The Manual Feed Handwheel and the Quill Feed Handle may be disengaged by moving them outward about 1/8".

NOTE
THE FEED CONTROL LEVER MUST BE ENGAGED IN ORDER TO USE MANUAL FEED CONTROLS. THE QUILL FEED HANDLE AND MANUAL FEED HAND WHEEL MAY BE TAKEN OIL WHEN NOT IN USE.

FEED CONTROL LEVER (#6 Figure 9):
Engages over load clutch on pinion shaft when positioned left and will stay engaged until either quill stop comes in contact with micrometer adjusting nut, forcing feed control lever to drop out automatically, or released manually by engaging lever to right.

NOTE
THE FEED CONTROL LEVER IS CAREFULLY SET AT PLANT TO DISENGAGE AUTOMATICALLY WHEN QUILL STOP GOES AGAINST MICROMETER ADJUSTING NUT OR AGAINST THROW OUT PIN AT TOP. HOWEVER, IF THIS SHOULD GO OUT OF ADJUSTMENT, IT MAY EASILY BE BROUGHT BACK BY REGULATING THE SOCKET SET SCREW LOCATED AT BOTTOM OF TRIPPING ROD.

CAUTION
WHEN ADJUSTING THE SOCKET SET SCREW, CHECK AUTOMATIC DISENGAGEMENT IN BOTH DIRECTIONS; THAT IS WITH QUILL. STOP NUT AGAINST THE FEED TRIP LEVER FOR DOWN POSITION, AND AGAINST REVERSE TRIP BALL LEVER FOR THE UP POSITION.

MICROMETER ADJUSTING NUT (#9 Figure 9):
This nut is used for setting of depths. Each graduation on nut indicates 001" of depth, It reads directly to scale mounted alongside of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

QUILL LOCK (#10 Figure 9):

This is a friction quill lock to be used when quill is in stationary position such as milling operations. It is recommended that this lock be used whenever quill movement is not desired.

QUILL FEED HANDLE (#11 Figure 9):

May be removed by simply pulling handle quill. It is recommended that handle be disengaged when using power feed.

QUILL STOP KNOB (#12 Figure 9):

Is used to disengage automatic feed in either direction as well as the setting point for working to given depths.

HI-NEUTRAL-LO LEVER (#13 Figure 9):

The lever is used to put the head into either direct drive or back gear. Rotate the spindle by hand to facilitate meshing of clutch or gears.
Neutral can be obtained at mid-way position, and is provided to permit free spindle rotation for indicating and set up.
After an extended period of use, the neutral position may cause noise by allowing the clutch teeth to rugelach other. This can be corrected by loosening set screw, and reversing the position of the detent plate.
In high speed (Direct Drive), the spindle is driven by tapered clutch teeth. If the clutch is not meshed tightly, clutch rattle will be heard. This can be corrected by moving the detent plate upward as the clutch wears. This is also the reason for possible loss of neutral. requiring the reversal of the detent plate.

CAUTION
DO NOT shift Hi Lo Lever while motor is running.

POSITION OF RAM

Can be regulated by loosening two Ram Lock Studs on turret and pulling the ram in or out to dense position.

CAUTION
CARE SHOULD BE TAKEN TO LOCK RAM SECURELY AFTER SETTING.

NOTE
It is recommended that on heavy mitting work. Head should be kept as close to column as possible. Where maximum rigidity is obtained.

USING DRAWBAR AND COLLET

When tightening or loosening the drawbar it is necessary to lock the spindle. To accomplish this. Use the spindle brake (#1. Figure 9) which is located on the left side of belt housing. Turning it either to the right or left until it binds, then raise the quill feed handle (#11. Figure 9). Drawbar has 5/5-11 NC right hand thread and should be tightened with normal amount of pressure using wrench furnished with machine. To loosen collet back off drawbar and if collet does not open immediately give knob on top of drawbar a slight tap. Spindle has non-sticking taper and collet should release readily.

RECOMMENDATIONS

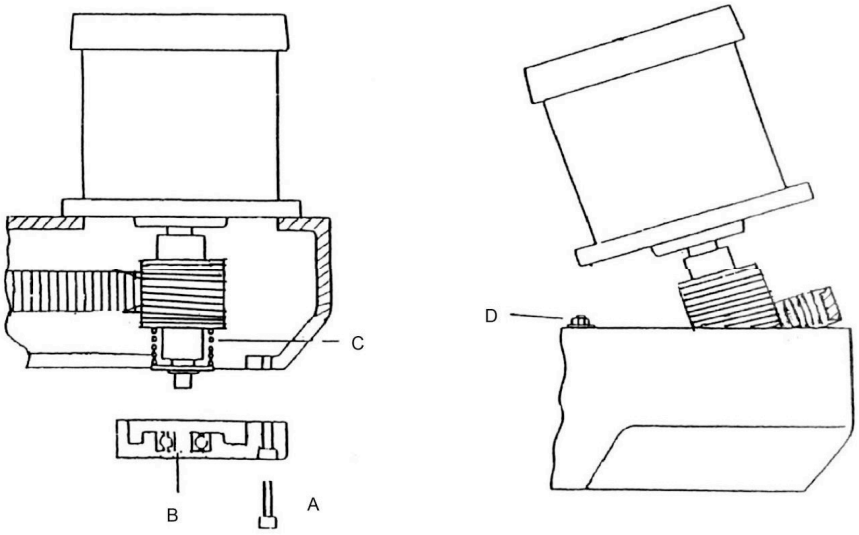
Lose 2, 3. or 4 Flute end mills Eight flute end mills are usually not as satisfactory for general milling. When using shell mills. Face mills or any other tooling. Proper machining practice should be observed.
Power feed can be used for thrills up to 3/ 8", in diameter. Use manual feed for drills larger than 3/8" Overload clutch is set at factory to hold up to 200 lbs. down pressure on quill, which will accommodate drills up to 3/8" diameter in mild tool steel.
Can be regulated by loosening two Ram Lock Studs on turret and pulling the ram in or out to dense position.

CAUTION
THIS CLUTCH SHOULD NOT BE TAMPERED WITH IN THE FIELD.

REMOVING THE MOTOR (See Figure 10):

Run the attachment to the bottom of either speed range or shut off the motor. This puts the vari-drive belt in the best position for disassembly.

1. DISCONNECT THE POWER and then remove the switch from the side of the belt housing.
2. Remove the cover (B. Figure 10) at the lower end of the motor shaft. Use two cover screws (A) to fasten the spring © on the lower end of the motor shaft. to the lower motor vari-drive pulley. This will reduce the hazard of personal injury that is always present when a heavy spring is under compression. When the pulley. The spring retainer and spring are securely fastened as a single unit. Crank the speed change handwheel (#16 Figure 9) to top speed position.
3. Now, remove the screw (D) that secures the motor to the belt box. The motor should be slightly lifted, and then firmly pulled away from the spindle and toward the rear of the belt cover. This will pull the box drive belt deeply into the main shaft pulley. Provides the stack required to transport the belt to the motor pulley.
4. Now lift the motor high enough to rest the motor base GENTLY on the adjusting screw (E) seen directly in front of the motor flange. The bell can now be slipped over the lower pulley and the motor removed from the housing.



CHANGING VARI-DRIVE BELT

Complete the above procedures for removing the motor, then remove the three screw (A, Figure 11) and lift out the top bearing cap (B). Looking down inside of the housing. Locate and remove two socket head cap screws and sleeves (C). Next, remove the four screws (D) and the screw (E) holding the belt housing (G) to the base. Un-screw and remove the two lower screws in the speed changer bracket just below the speed dial (F).

NOTE
On Models with plastic face plate remove screws first.

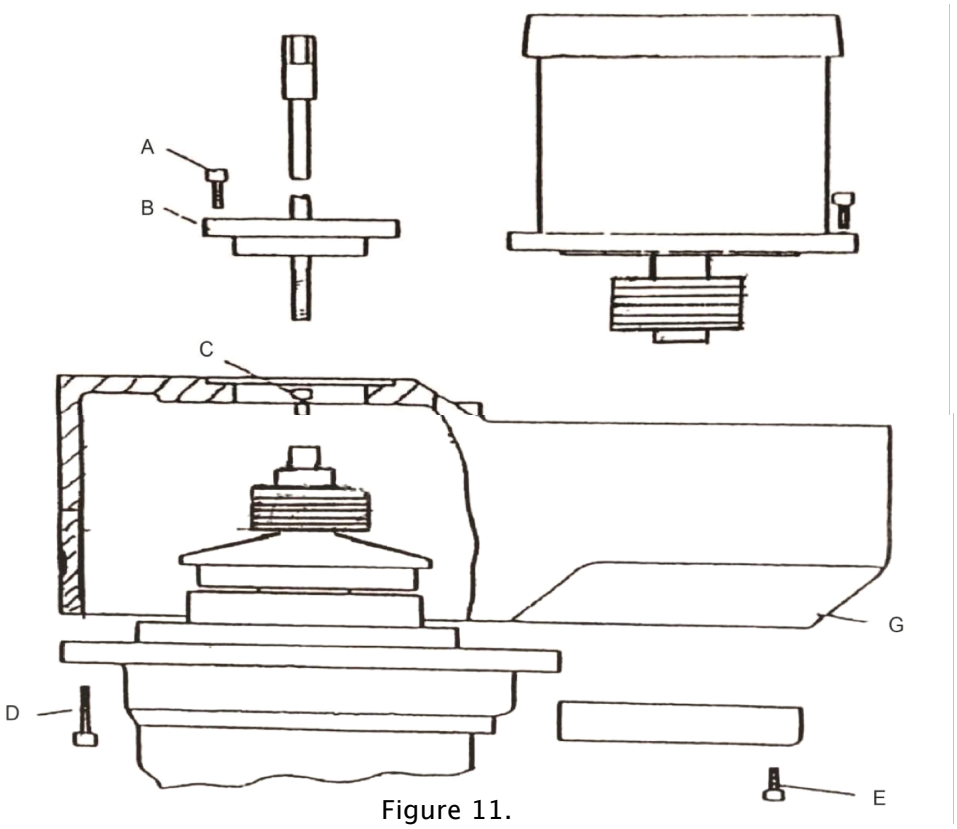


Figure 11.

The belt housing complete with speed changer bracket, is now removed from its belt housing base. A slight blow under the speed changer bracket may be needed to separate the belt housing from the belt housing base.
Remove the old belt and replace it with a new belt. Vibration and heat could result from the use of the wrong belt.

CHANGING TIMING BELT

Complete the operation for removing the motor. Then put the Hi Neutral Lo lever (#15. Figure 9)
In the Lo position. remove the drawbar (A. Figure 12) and lower the spindle.
Remove screws (B) holding the upper and lower housings together, including the two lower screws (C) in speed changer braked just below the speed dial.

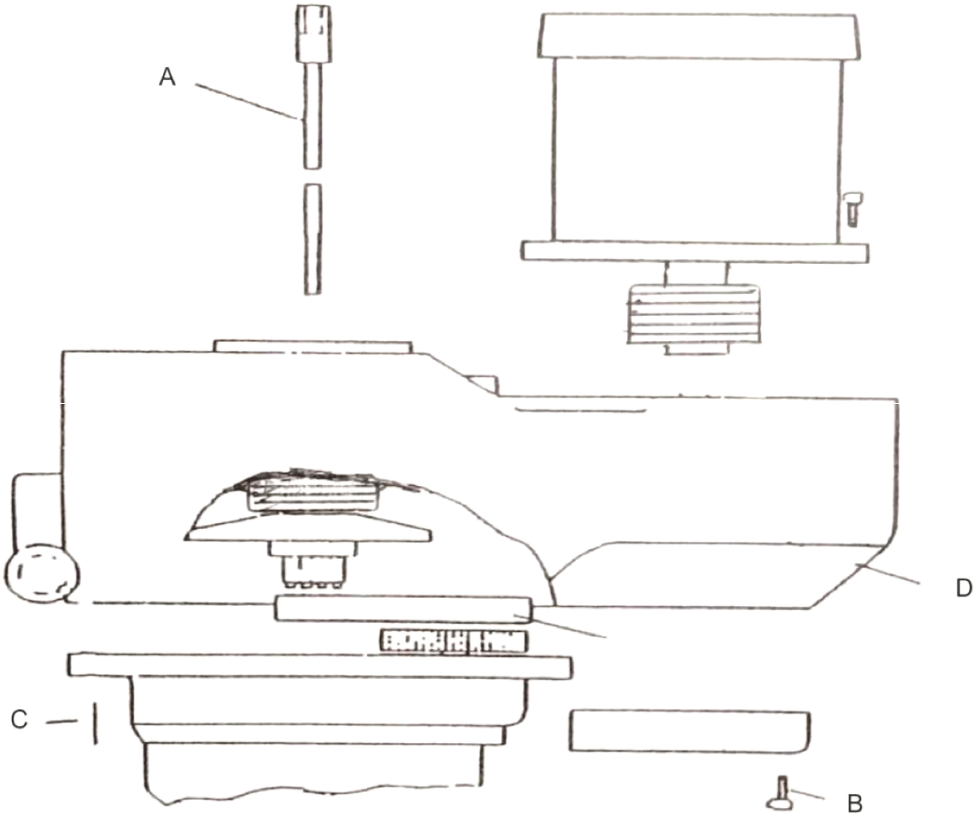


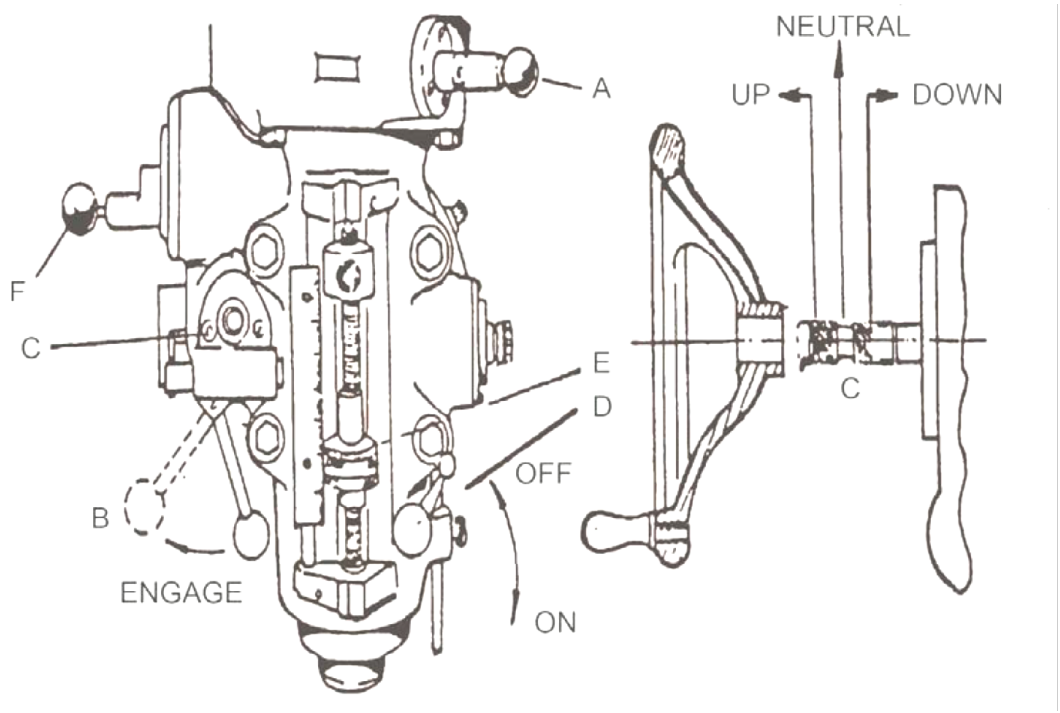
Figure 12. Removing Timing Belt

A slight blow under the speed changer bracket may be needed to separate the upper housing (D) from is base.

As the housings are being appointed. The HTD belt (D) still connects them, resisting the separating movement. The separation can be assisted by queenly pushing the belt off the large pulley as the upper housing is being raised.

Remove the old belt and replace with a new belt.

QUILL FEED



FINE HAND FEED

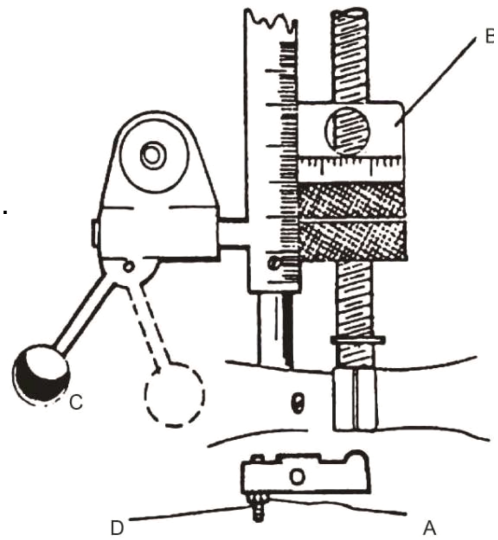
a. Disengage Auto quill feed 'A'
b. Locate 'C' in mid(neutral) position.
c. Engage Feed trip lever 'B'
d. The Quill is now underhand wheel control.

AUTOMATIC FEED

a. Ensure quill lock is off 'D'
b. Set micrometer dial to required depth 'E'
c. Engage auto quill feed 'A' (when motor has stopped).
d. Select feed rate 'F'
e. Select feed direction 'C'
f. Engage feed trip lever 'B'
g. The feed will automatically trip out at a
h. depth within ±.1.10" (±.25mm).
i. Hand feed to dead stop for repeating
j. accuracy ±3001" (±.0.25mm)

FEED TRIP ADJUSTMENT

1. Release locknut ‘A’
2. Engage trip handle ‘C’
3. Adjust micro nuts against quill stip ‘B’.
4. Slowly turn adjusting screw ‘D’ until lever ‘C’ trips.
5. At this point secure locknut ‘A’.
6. Check that smart trip action is obtained.



6-1. POSITIONING THE HEAD UPRIGHT

If delivery of your machine is made with the milling head in an upside-down position, follow the instructions below to prepare your machine for operation.
For shipping purposes, the hand cranks are inverted to face the machine. To reverse them, engage the lock mechanism to the saddle and table. Using a (1-inch) wrench, remove the retaining lead screw nut and install the hand cranks properly.
Loosen four head mounting bolts “C”, Figure 1.3, and pull stop pin “A”, Figure 1.2, out to detent and rotate head attachment using the swivel bolt “B”, Figure 1.3, in either direction until it has been moved within approximately 20% of vertical. It is recommended supporting the head by hand to relieve the weight on the swivel bolt, as a safety precaution, push the stop pin back in. Continue to raise the head attachment to vertical position. Align the indicator on the head attachment with the ZERO line on the ram adapter scale. Tighten all nuts first to 25 lb-ft torque in a diagonal sequence, then to 50 lb-ft.

- NOTE -

Care should be taken to avoid excessive pressure since this will cause distortion in the quill.

1. up the headstock proximately 6” (150mm).
2. Withdraw the safety pin on the left-hand side of ram adapter.
3. Loosen the unit head mounting bolts (4 bolts).
4. Support unit head manually and use a spanner on swivel bolt to wind into upright position.
5. Press the safety pin back into the ram adapter after passing the 25° mark.
6. Tighten bolts first to 25 lb-ft torque in a diagonal sequence as noted in Figure 1.4, then to 50 lb-ft. Over tightening could cause bind in the quill movement.

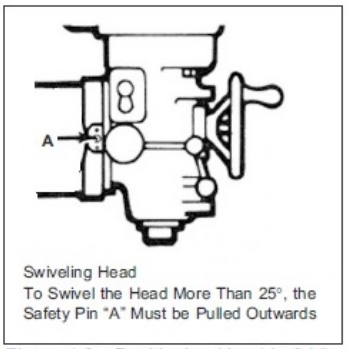


Figure 1.2 - Positioning Head Left View

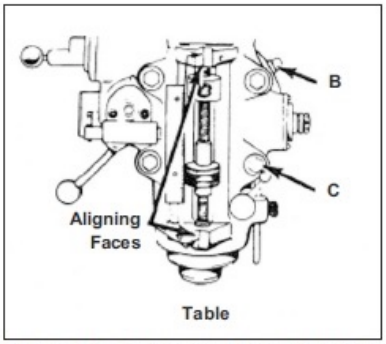


Figure 1.3 - Positioning Head Front View

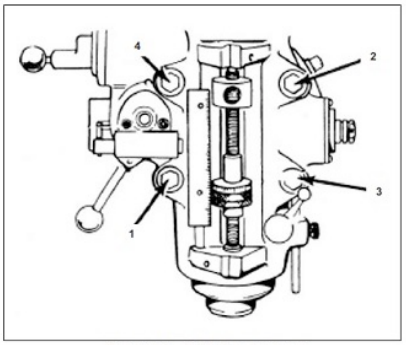


Figure 1.4 - Tightening Sequence

6-2. ALIGNMENT OF THE HEAD FOR FINE WORK

For precision boring or work of that nature, where it is necessary to have the head perfectly square with the table, use method described below. To set head perfectly square with table, adjust ram adapter through vertical adjusting worm shaft with ram adapter on ram. Loosen four locknuts but leave drag on same for fine adjustment. To square head to table in the longitudinal axis, mount indicator as shown in Figure 1.10. For general milling use, graduations provided on the head are close enough.

Tighten the four head locknuts in a diagonal order as previously described on page 1-2.

Tighten the three ram locking bolts to 50 lb-ft.

- CAUTION -

Do not operate the machine until properly lubricated.

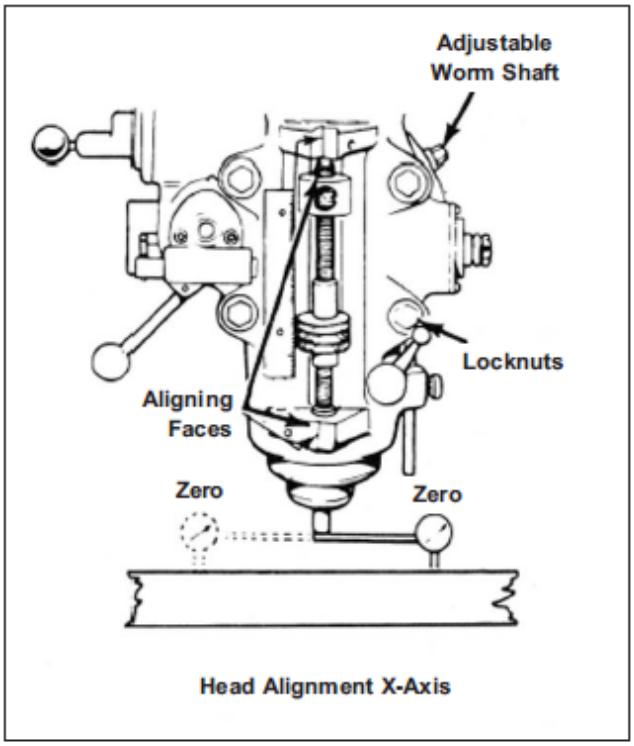


Figure 1.10 - Head Alignment for X Axis

7. PREVENTIVE MAINTENANCE

7-1. Everyday maintenance:

1) Check the oil level of lubrication pump. Add more if it is below low level.
2) Check all lubrication points to see if oil is present.
3) Check compressor pressure to be 6 kg/cm 2.
4) Check all air hoses for leaking. Must fix the air leak if it is found!
5) Check oil level of air filter gauge. Add if not to the level.
6) Remove all movable items from the machine to reduce the chance of damaging the machine and operator.
7) Check coolant system to see if it is operational?
8) After each day's work, clean the machine and lubricate all moving parts.
9) Spindle taper must be clean and lubricated each day.
10) Add a few drops of #10 spindle oil into oil cups around the milling head.
11) If any false signal is present, please stop the machine and repair the machine immediately.

7-2. Weekly maintenance:

1) Please use clean rugs or paper towels to clean halogen light and control panel to keep them readable.
2) Use water-based solvent to clean air filter. This is to keep air pressure normal and machine operational.
3) Make sure spindle taper is smooth and chip-less.
4) Check all lubrication points and lubrication pump to see if they are function normally.

7-3. Six months maintenance:

1) Check taper run-out of spindle to see if it is still within accuracy.
2) Check all machine's screws and nuts to see if they are still tight?
3) Check the tightness of the gibs. Are they still within specification?
4) Inspect all electrical terminals and wires. Make sure they are normal and functional. Clean the dust within the electric cabinet.
5) Inspect the servo drive and its parameters. Make sure they are adjusted.
6) Level the machine with precision engineering levels again. Levelness should come within 0.00008/12" (0.02mm/300mm). If not, please re-level the machine.
7) Lower head gear housing must add grease thru the grease fitting.

7-4. Annual maintenance

1) Check all electric components on the control panel to see if they are still sensitive.
2) Remove all carbon deposit on the magnetic contactors.

3) Check balance block mechanism. Are they functional?
4) Replace coolant liquid with new one to ensure machining accuracy.
5) Clean and replace lubrication pump's oil reservoir with new way lube oil.
6) Check leveling and adjust the machine to maintain machine accuracy.

7-5. Points to watch on doing maintenance

1) All scheduled maintenance must be exercised and recorded.
2) During mechanical maintenance such as gibs adjustment, etc., all power must be shut-off to prevent accidental injury.
3) When inspecting servo drive boards outside of their sockets, do not supply power! It might cause servo motor to rotate in its highspeed state and cause injury.
4) In any unable maintenance situation, please contact authorized distributor or corresponding manufacturer.
5) Before doing any maintenance work, maintenance personnel must concur with manual to disconnect power or not. This is to reduce accidental injury.

8. LUBRICATION SYSTEM

8-1. Lubrication of the machine

All machines have lubrication system. To maintain their accuracy, users must check and inspect lubrication system every so often. A properly lubricated machine will prolong its lifespan and maintain its accuracy longer. All sections of a machine need to be lubricated, but there are few parts that particularly need more attention:

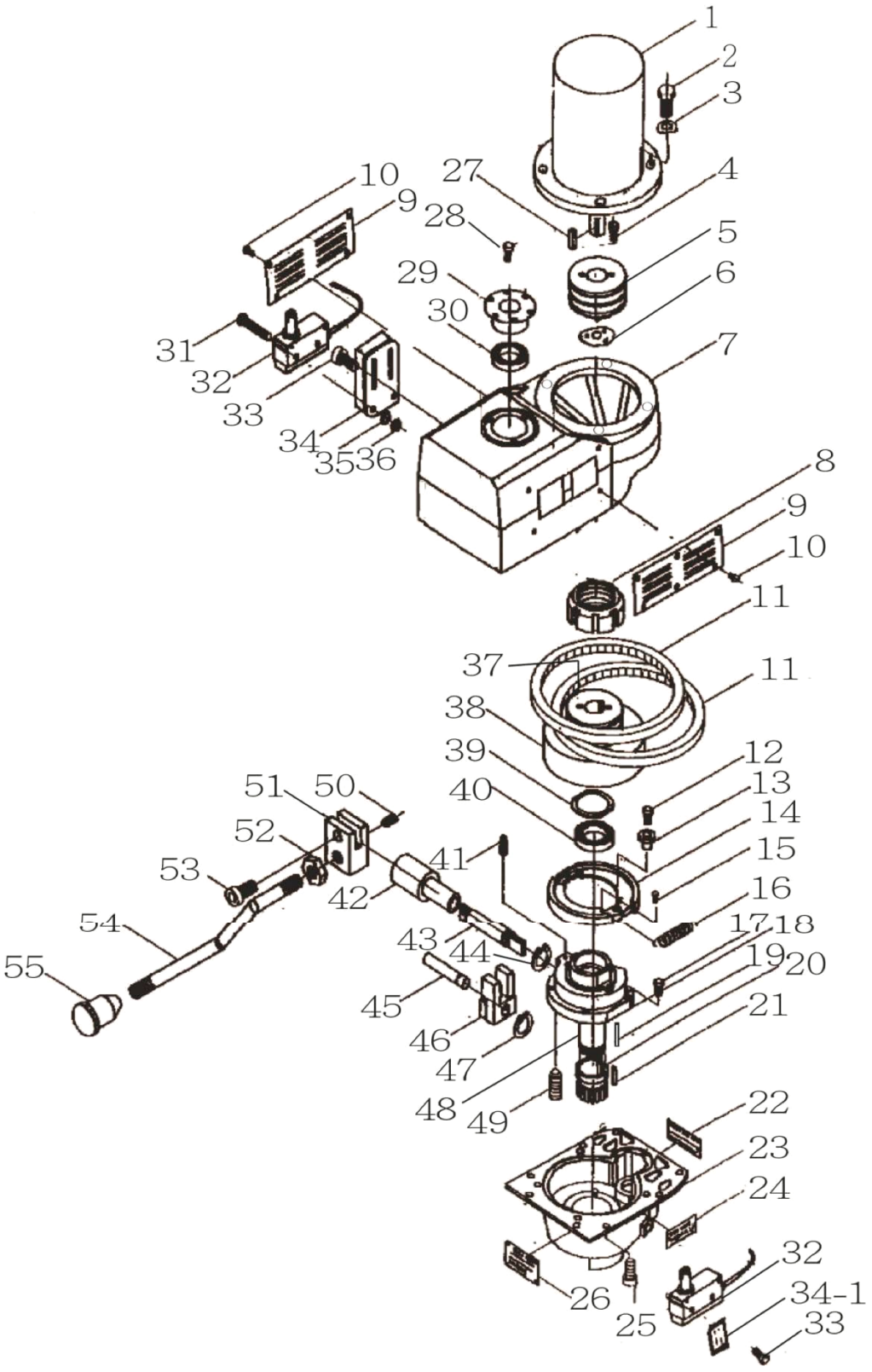
1) Spindle bearing has seal packed high pressure & temperature grease. It needs to be inspected for its condition every 6 months. Recommended grease type: Kluber LDS 18 or equivalent.
2) Some section of slideways are coated with Turcite-B to reduce wear and vibration. The way lube oil for this type of material must have high viscosity, and it is tolerable to high pressure and very wear resistance. Recommended oil type:
    - Mobil Vactra #2 way lube, Chevron 68X way lube or equivalent.
3) All ball screws must be lubricated. They need oil present at all time.
    - Recommended oil type: See item b.
4) Balance block's chain mechanism need to be greased when needed.
5) Recommended grease type: Any lithium-based grease is OK.
6) Air filter unit needs #10 spindle oil when below recommended level.

8-2. Lubrication Chart

Lubricates	X-Y-Z Slideways, and Ball Screws	Quill	Gear Head
Interval	Add if low	Daily	Annually
Lubricant	*Mobil Vactra #2	*Mobil DTE oil light	* Multi-purpose grease

Parts List

Head-Top Housing (H)

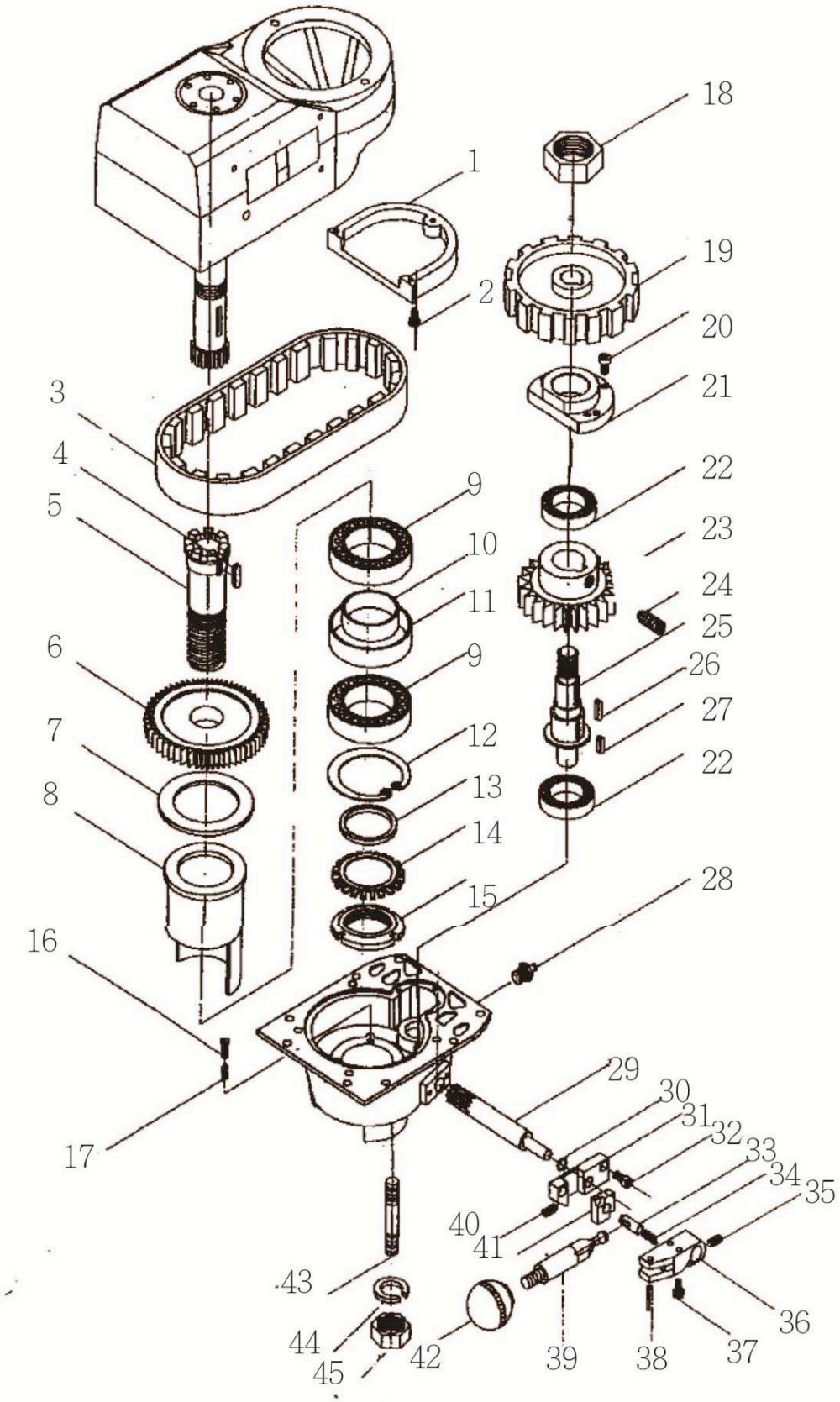


Head-Top Housing (H)

ITEM	DESCRIPTION
H1	Motor
H2	Hex HD Screw (4 req)
H3	Washer
H4	Hex HD Screw
H5	Motor Pulley
H6	V-belt pulley Sleeve
H7	Belt Housing
H8	Spindle Hub Look Nut
H9	Ventilator (2Red)
H10	Round Cap Wooden Screw
H11	Belt
H12	Hex HD Screw
H13	Brake Shoe Pivot Sleeve
H14	Brake Shoe Assembly (2Red)
H15	Round Cap Screw
H16	Brake Spring (2Red)
H17	Socket HD Cap Screw
H18	Belt Housing Base
H19	Key
H20	Spindle Pulley Hub
H21	Key
H22	Grease Add Name Plate
H23	Gear Housing
H24	Hi-Low Range Name Plate
H25	Socket Cap Screw
H26	Quill Feed Name Plate
H27	Key
H28	Socked Cap Screw (3Red)

ITEM	DESCRIPTION
H29	Top Bearing Cap
H30	Ball Bearing
H31	Round Socket Cap Screw
H32	Limit Switch w/Cable
H33	Socket HD Cap Screw
H34	Limit Switch Bracket Plate
H35	Spring Washer
H36	Hex Nut
H37	Spindle Pulley
H38	Stationary Driven Varidise
H39	Snap Ring
H40	Ball Bearing
H41	Socket Set Screw
H42	Sleeve for Brake Lock Shaft
H43	Brake Lock Shaft
H44	Snap Ring
H45	Brake Pivot Stud
H46	Brake Finger
H47	Snap Ring
H48	
H49	
H50	
H51	Brake knob
H52	Nut
H53	Socket HD Cap Screw
H54	Brake Handle
H55	Brakelite Ball Handle

Lower Head (HL)

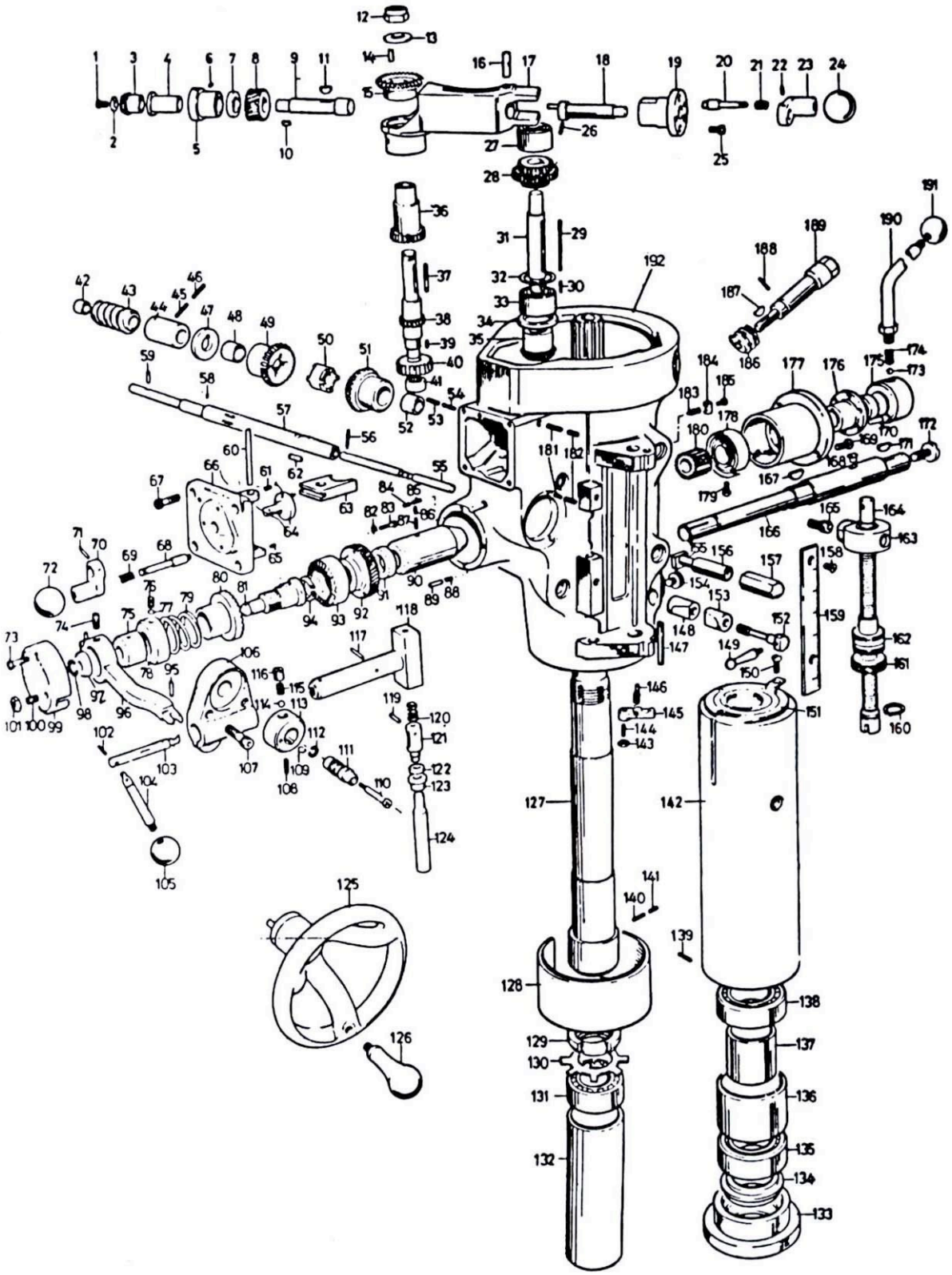


Lower Head (HL)

ITEM	DESCRIPTION
HL1	Motor Shaft Cover
HL2	Socket Cap Screw
HL3	Timing Belt
HL4	Key
HL5	Spindle Gear Hub
HL6	Spindle Bull Gear Assembly
HL7	Ball Bearing Sleeve Washer
HL8	Bearing Sleeve
HL9	Bearing
HL10	Bearing Spacer
HL11	Bearing Spacer
HL12	Snap Ring
HL13	Gear Hub Spacer
HL14	Washer (tooth)
HL15	Bearing Lock Nut
HL16	T-Tip Pin
HL17	Compression Spring
HL18	Hex Nut
HL19	Timing Belt Pulley
HL20	Socket Cap Screw
HL21	Bull Gear Pinion Bearing Cap
HL22	Ball Bearing
HL23	Bull Gear Pinion
HL24	Set Screw
HL25	Bull Gear Pinion Counter Shaft
HL26	Key
HL27	Key

ITEM	DESCRIPTION
HL28	Grease Nibble
HL29	Bull Gear Shift Pinion
HL30	Spring Washer
HL31	Hi-Low Detent Plate
HL32	Socket Cap Screw
HL33	Hi-Low Detent Plunger
HL34	Spring
HL35	Set Screw
HL36	Hi-Low Pinion Block
HL37	Socket Cap Screw
HL38	Spring Pin
HL39	Hi-Low Shift Crank
HL40	Set Screw
HL41	Adjust Plate
HL42	Brakelite Ball
HL43	Stud
HL44	Spring Washer
HL45	Hex Nut

Spare Parts of HEAD ASSEMBLY (B)

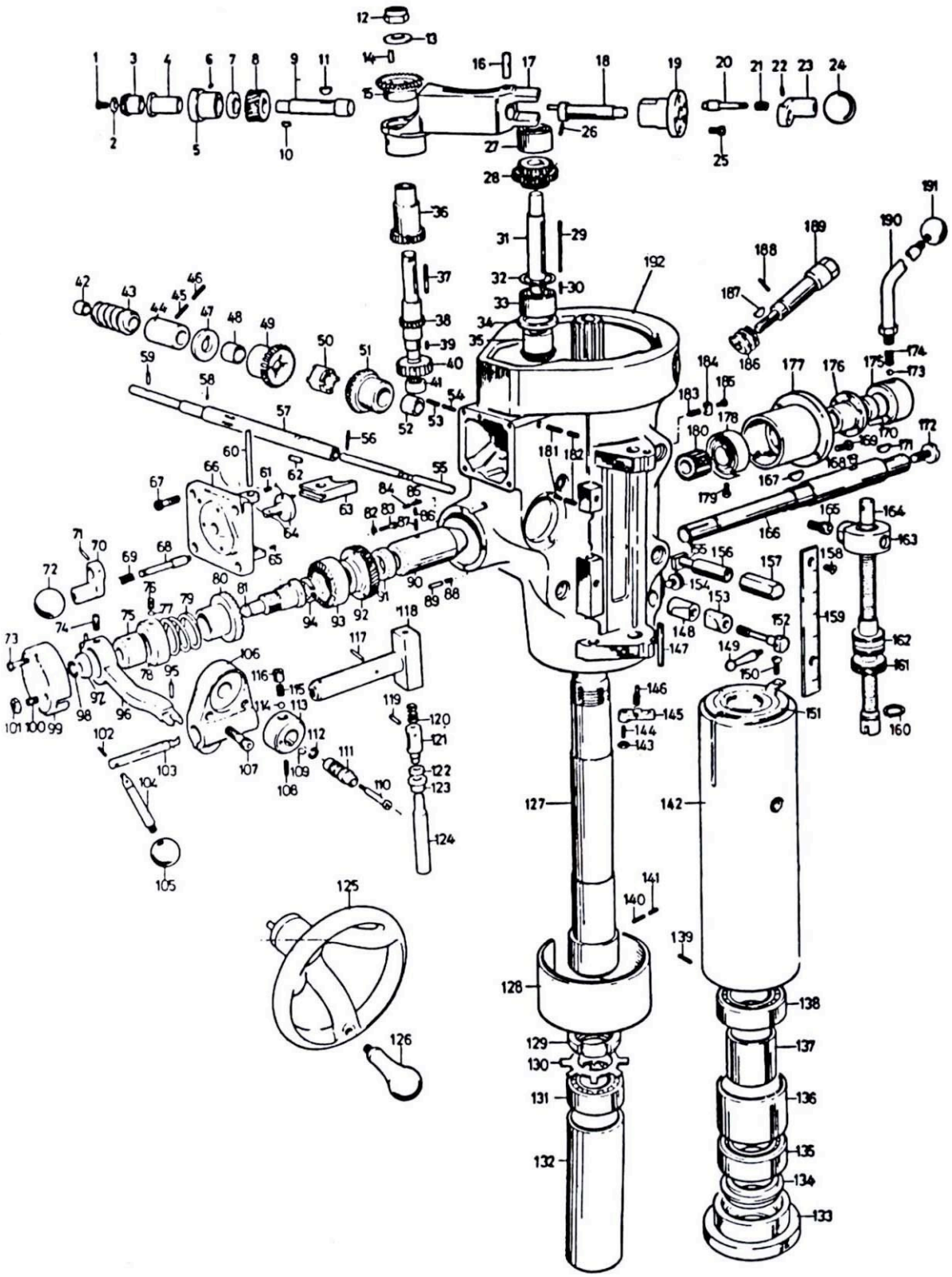


Spare Parts of HEAD ASSEMBLY (B)

ITEM	DESCRIPTION
B1	Screw
B2	Washer
B3	Feed Bevel Pinion
B4	Feed Worm shaft Sleeve
B5	Worm Cradle Bushing
B6	Set Screw (1/4" x 1/4")
B7	Worm Gear Spacer
B8	Feed Drive Worm Gear
B9	Feed Drive worm Gear Shaft
B10	Key (3/8" x 5/16")=B014
B11	Woodruff Key (No. 7))
B12	Lock Nut (3/8"-24)
B13	Washer (3/8")
B14	Key(3/8" X 5/16")
B15	Feed Reverse Bevel Gear
B16	Feed Engage Pin
B17	Worm Gear Cradle
B18	Cradle Throw Out
B19	Shift Sleeve
B20	Gear Shift Plunger
B21	Compression Spring
B22	Roll Pin (1" X 7/8")
B23	Shift Crank
B24	Black Plastic Ball (1" Dia.)
B25	Socket Cap Screw (No. 10-24 x 1/2")
B26	Set Screw (No. 10-24 x 3/8")
B27	Cluster Gear Upper Bearing
B28	Cluster Gear Assy.
B29	Key
B30	Key (1/8" x 9/16")(round ends)
B31	Cluster Gear Shaft
B32	Retaining Ring(Waldes Circlip)
B33	Bevel Gear Bearing
B34	Bevel Gear Thrust Spacer
B35	Feed Reverse Bevel Pinion

ITEM	DESCRIPTION
B36	Feed Driving Gear
B37	Key 1/8" x 3/8"(round ends)
B38	Cluster Gear Input Shaft
B39	Key 3/8" x 5/16"
B40	Feed Drive Gear
B41	Needle Bearing(B-66)
B42	Bushing
B43	Worm
B44	Feed Worm Shaft Bushing
B45	Set Screw (1/4"-20 x 1/2")
B46	1/4"-20 Mock-it-lock screw
B47	Thrust Washer
B48	A-672-4 Oilite Bearing
B49	Feed Reverse Bevel Gear
B50	Feed Reverse Clutch
B51	Feed Reverse Bevel Gear
B52	A-672-4 Oilite Bearing
B53	Set Screw 5/32" (special hollow, chem B1)
B54	Set Screw 5/16-18 x 5/16"
B55	Reverse Clutch Rod
B56	Roll Pin (3/32" x 3/4")
B57	Feed Worm Shaft L:186mm
B58	Pin 3/32" x 5/16")
B59	Pin (110 X 7/16)
B60	Feed Shift Rod
B61	Set Screw 10-32 x 1/4"
B62	Key (1/8" x 9/16")(round ends)
B63	Feed Gear Shift Fork
B64	Cluster Gear Shift Fork
B65	Set Screw (10-32 x 1/4")
B66	Cluster Gear Cover
B67	Cap Screw(10-24 X 1/2")
B68	Gear Shift Plunger
B69	Compression Spring
B70	Shift Crank

Spare Parts of HEAD ASSEMBLY (B)

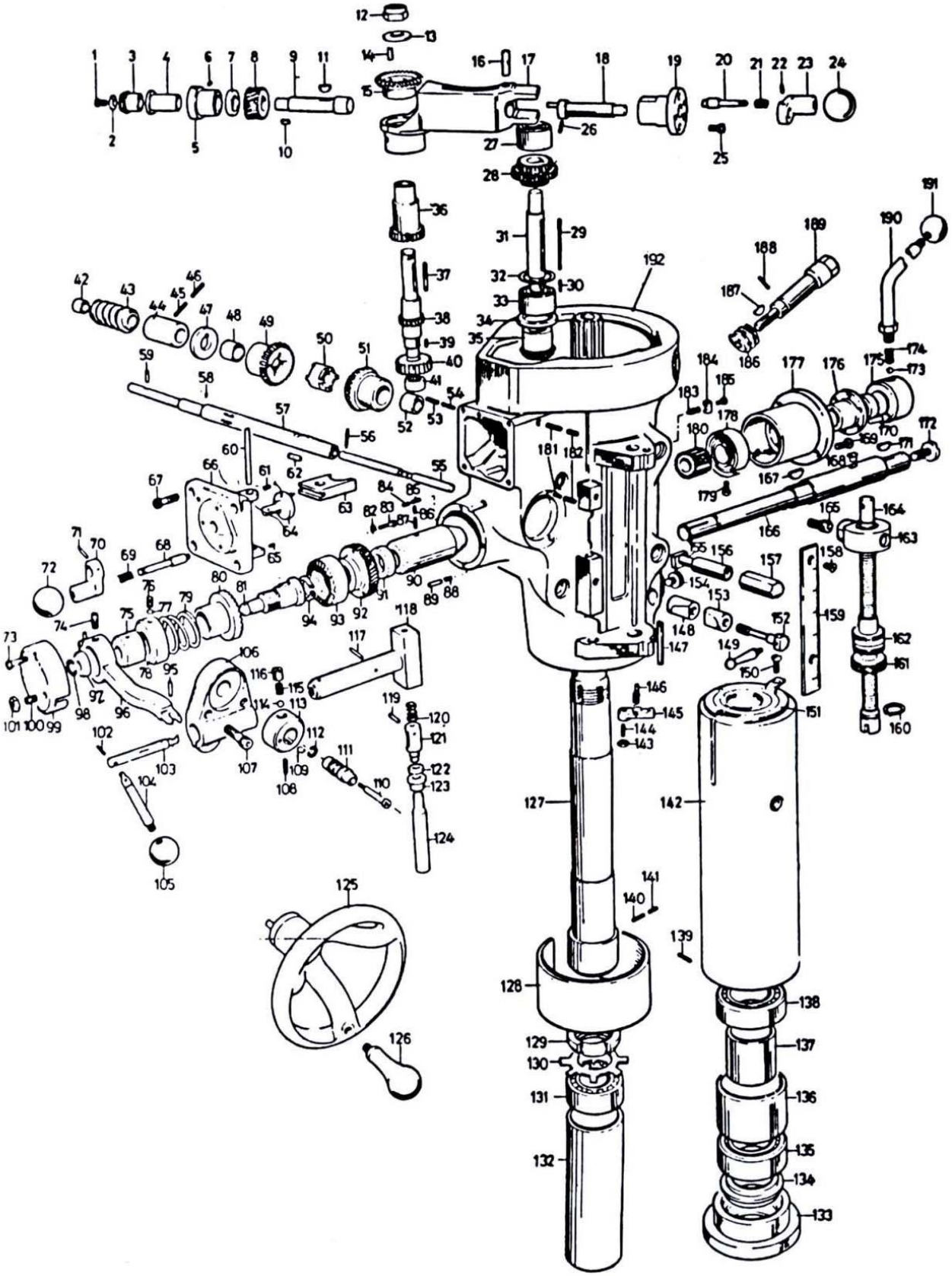


Spare Parts of HEAD ASSEMBLY (B)

ITEM	DESCRIPTION
B71	Roll Pin (1/8" x 7/8")
B72	Black Plastic Ball (1" Dia.)
B73	Cap Screw (10-24 x 1 1/2")
B74	Clutch Ring Pin
B75	Clutch Ring Assy.
B76	Set Screw (1/4"-20 x 1/4")
B77	Brass Plug
B78	Overload Clutch
B79	Safety Clutch Spring
B80	Overload Clutch
B81	Overload Clutch Sleeve
B82	Single Spring Washer
B83	Round Head Screw (8-32 x 5/8")
B84	1/4"-20 Mock-it-lock screw
B85	Set Screw (1/4"-20 x 1/2")
B86	1/4"-20 Mock-it-lock screw
B87	Set Screw (1/4"-20 x 1/2")
B88	Compression Spring(1/4" x 1-1/4")
B89	Overload Clutch Lever Spring Plunger
B90	Quill Pinion Shaft Bushing
B91	Worm Gear Spacer
B92	Overload Clutch Worm Gear
B93	Overload Clutch Ring
B94	Kohinoor Circle
B95	Dowel Pin (3/16" x 5/8")
B96	Overload Clutch Trip Lever
B97	Overload Clutch Washer
B98	5108 - 37 Kohinoor Snap Ring
B99	Clutch Arm Cover
B100	Set Screw 1/4"-20 X 1/2"
B101	Lock Nut (1/4-20 UNC)
B102	Dowel Pin (3/16" x 3/4")
B103	Cam Rod
B104	Trip Handle
B105	Black Plastic Ball (1" Dia.)

ITEM	DESCRIPTION
B106	Feed Trip Bracket
B107	Cap Screw (10-24 x 1 1/2")
B108	1/2" x 20 x 5/16"
B109	Key
B110	Feed Reverse Knob Stud
B111	Reverse Knob
B112	Snap Ring 5100-25
B113	Handwheel Clutch
B114	Steel Ball (3/16" Dia.)
B115	Compression Spring
B116	Spring Screw
B117	Roll Pin(1/8" x 9/16")
B118	Cam Rod Sleeve Assy.
B119	Roll Pin(1/8" x 7/16")
B120	Compression Spring
B121	Trip Plunger
B122	Feed Trip Plunger Bushing
B123	Trip Plunger Bushing
B124	Feed Trip Plunger
B125	Handwheel
B126	Handwheel Handle
B127	R8 Spindle
B128	Quill Skirt
B129	Locknut (No. 06)
B130	Lock washer(W-06)
B131	Bearing (M206K 132J30)
B132	Sleeve(J-1750)
B133	Nose Piece
B134	Dirt Shield
B135	Spindle Bearing (Fafnir MM207 LU35T)
B136	Bearing Spacer - Large (from J-1750)
B137	Bearing Spacer - Small
B138	Spindle Bearing (Fafnir MM207 LU35T)
B139	Set Screw (1/4"-20 x 1/4")
B140	Collet Alignment Screw(1/4" x 32 UNF x 343)

Spare Parts of HEAD ASSEMBLY (B)

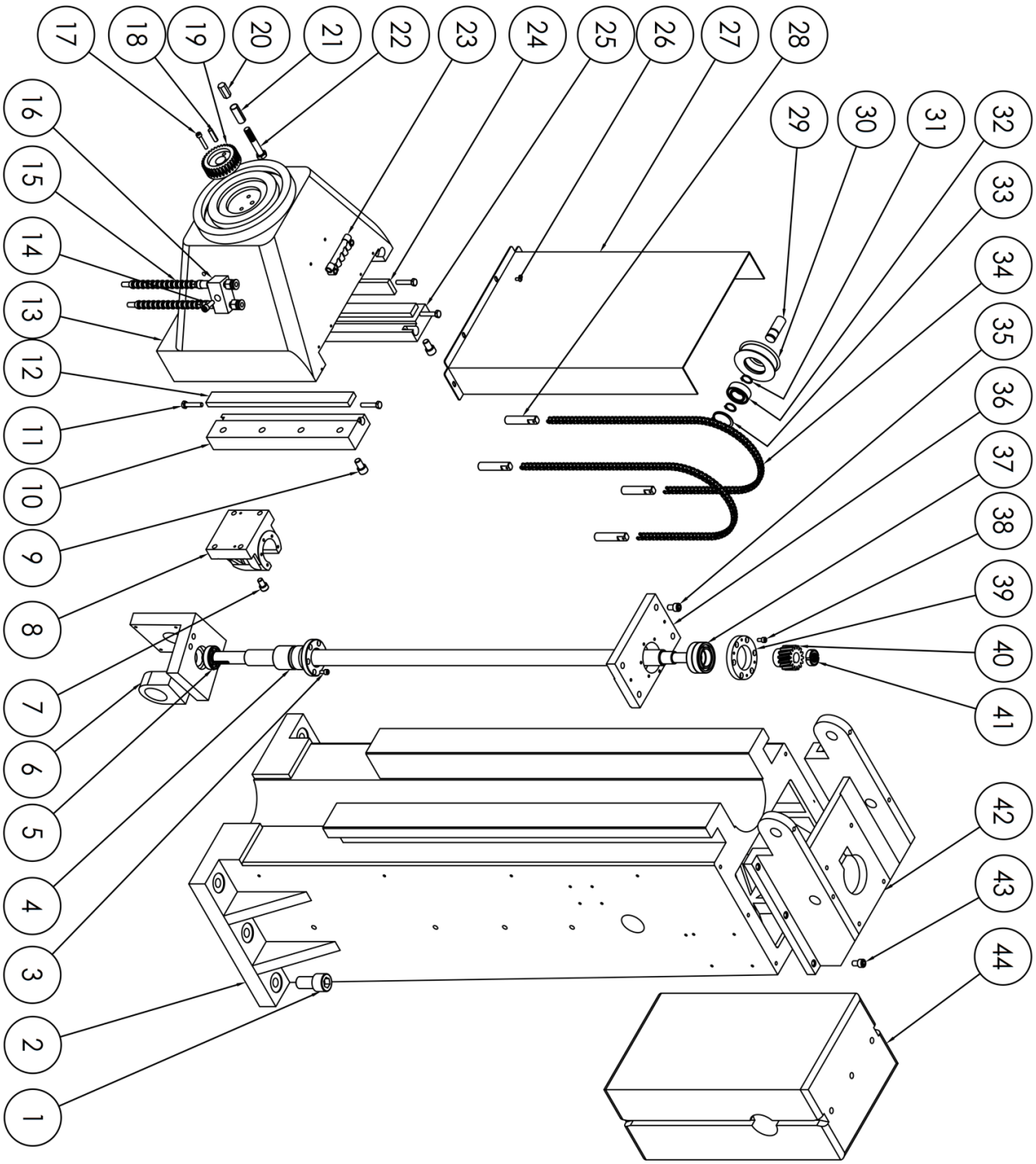


Spare Parts of HEAD ASSEMBLY (B)

ITEM	DESCRIPTION
B141	Special Socket Set Screw(M6x6)
B142	Quill
B143	Nut (6-32 NC)
B144	Set Screw (6-32 x 3/8")
B145	Feed Trip Lever
B146	Trip Lever Pin
B147	Indicator Rod
B148	Drilled Lock Sleeve
B149	Lock Handle
B150	Screw (10-32 x 5/16")
B151	Oil Strainer for Quill Bearing
B152	Quill Lock Bolt
B153	Quill Lock Sleeve Tapped
B154	Indicator Rod Screw
B155	T-Bolt (1/2" 6 3/16")
B156	Bolt Spacer
B157	Locknut(1/2" x 1 1/2")
B158	Screw(6-32 X 3/16")
B159	Micrometer Scale
B160	Snap Ring (5108 - 62)
B161	Quill Micro Stop Nut
B162	Micrometer Nut
B163	Quill Stop Knob
B164	Quill Stop Micro Screw
B165	Stop Knob Screw(3/8 24 X 5/8")
B166	Quill Pinion Shaft

ITEM	DESCRIPTION
B167	Woodruff Key (No. 7))
B168	Spring Pin
B169	Head Screw (No. 10-24 X 3/8")
B170	Dowel Pin (3/16" 3/4")
B171	Woodruff Key (No.3)
B172	Hub Screw
B173	3/16" Steel Ball
B174	Compression Spring
B175	Rack Feed Handle Hub
B176	Pinion Shaft Hub Sleeve
B177	Spring Cover
B178	Clock Spring
B179	Outside Spring Pin
B180	Quill Pinion
B181	Screw (1/4"-20 x 1/2"
B182	1/4"-20 Mock-it-lock screw
B183	Reverse Trip Ball Lever
B184	Trip Plunger
B185	Trip Lever Screw
B186	Worm Gear
B187	No. 5 Woodruff Key
B188	Set Screw(1/4UNC x 20 x 1/4)
B189	Worm Shaft
B190	Pinion Shaft Hub Handle
B191	Black Plastic Ball (1 3/8" Dia.)
B192	Quill Housing

Column/Elevating(Z)



Column/Elevating(Z)

ITEM	DESCRIPTION
Z1	Screw 5/8* 2 1/2 x6
Z2	Column
Z3	Screw M6*16x5
Z4	Ballscrew
Z5	Bearing 6005ZZ
Z6	Bearing Bracket
Z7	Screw M8*25x4
Z8	Nut Bracket
Z9	Screw 1/2* 1 1/2x8
Z10	Sliding Bracket
Z11	Screw 5/16* 1 1/4 x6
Z12	Gib
Z13	Headstock
Z14	Screw M8*25
Z15	Nozzle
Z16	Nozzle Base
Z17	Screw M6*30x2
Z18	Roll Dowel M8*30
Z19	Quill Housing ADJ Gear
Z20	Headstock Nut
Z21	Sleeve
Z22	T Bolt x4

ITEM	DESCRIPTION
Z23	Oil Distributor
Z24	Gib
Z25	Sliding Bracket
Z26	Screw M5*10*4
Z27	Z-axis Way Cover
Z28	Chain Fixed Block x2
Z29	Chain supporter
Z30	Wheel
Z31	R-buckles R20
Z32	Bearing 6204
Z33	R-buckles R47
Z34	Counter Weight Chain Set x2
Z35	Screw M10*40x4
Z36	Bearing Bracket
Z37	Bearing 25TAC62B x2
Z38	Screw M6*16x6
Z39	Bearing Cover
Z40	Pulley
Z41	Precision Nut M20*1.0
Z42	Motor Plate
Z43	Screw M8*30x6
Z44	Counter Weight

Table and Saddle (X)

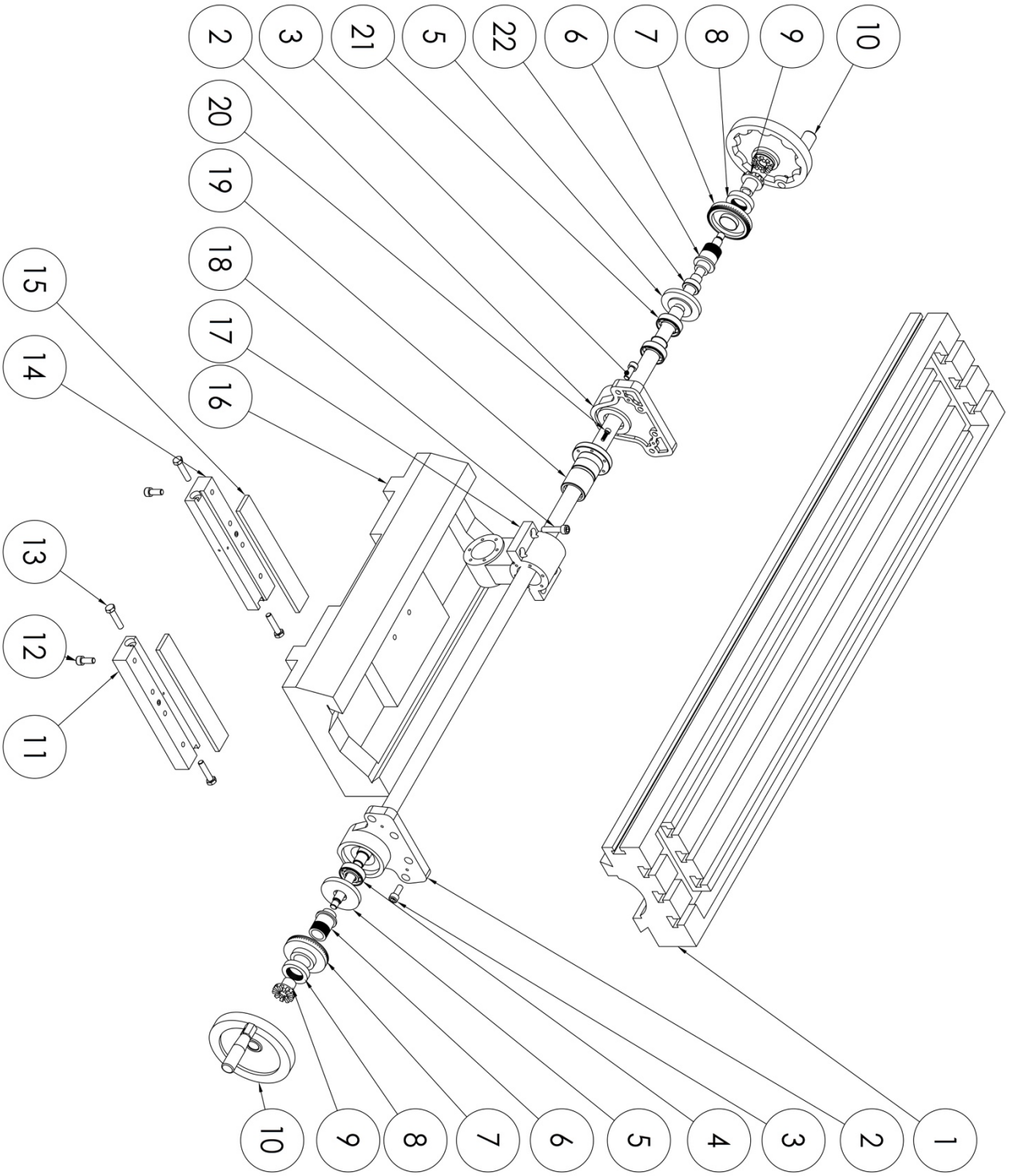
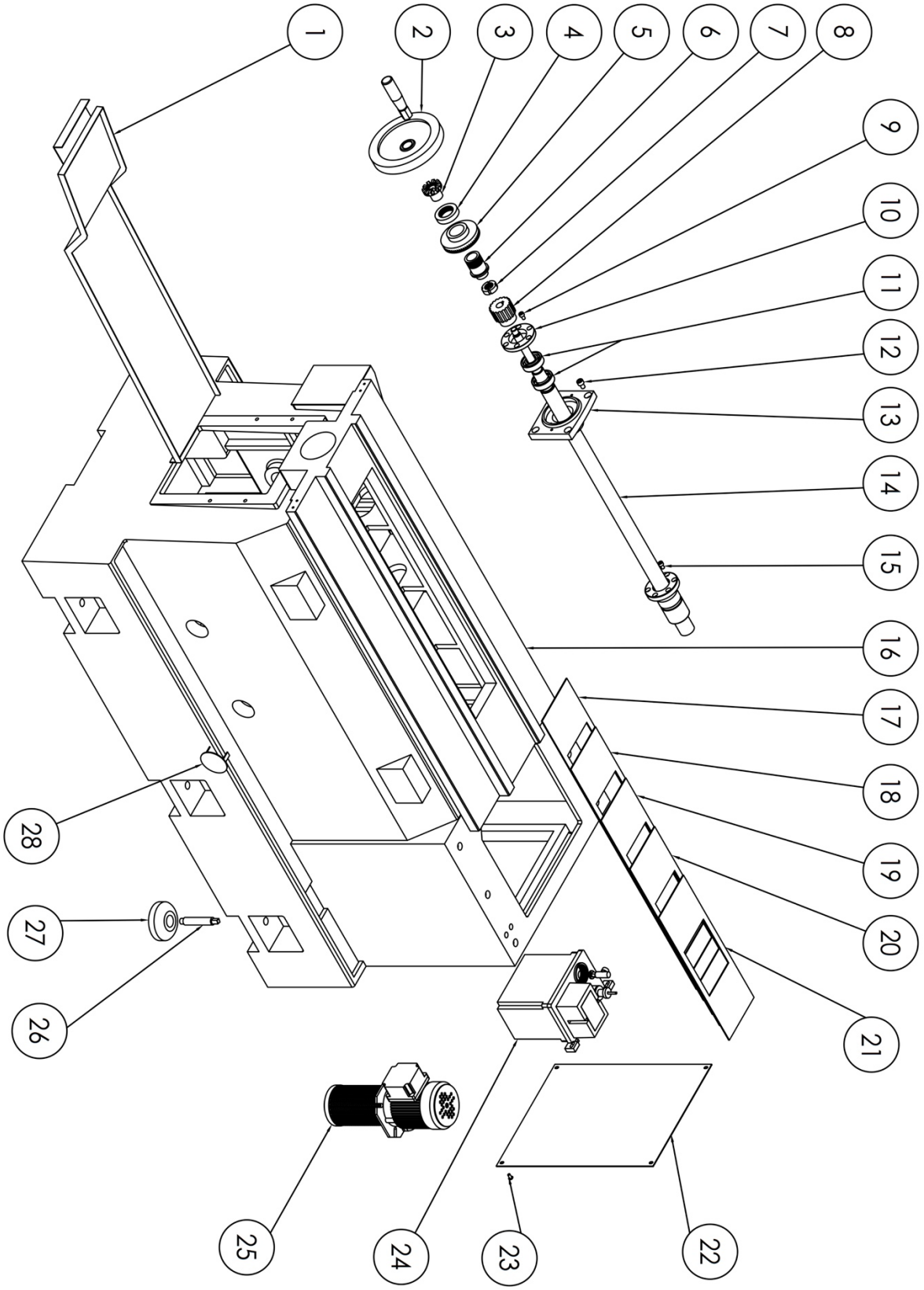


Table and Saddle (X)

ITEM	DESCRIPTION
X1	Table
X2	Motor Bracket
X3	Screw M8*25x8
X4	Bearing 6204
X5	Bearing Cover
X6	Dial Holder
X7	Dial with Graduations
X8	Dial Lock Nut
X9	Manual Feed Drive Gear
X10	Hand Wheel
X11	Saddle Plate(R)
X12	Screw 3/8*1 1/2 x8
X13	Gib Screw 5/16*1 1/4 x6
X14	Saddle Plate(L)
X15	Gib x3
X16	Saddle
X17	X-axis Ballscrew Nut Housing
X18	Screw M10*40x4
X19	X-axis Ballscrew Nut Housing
X20	Screw M6*20x6
X21	Bearing 7204 x2
X22	Precision Nut M20*1.0

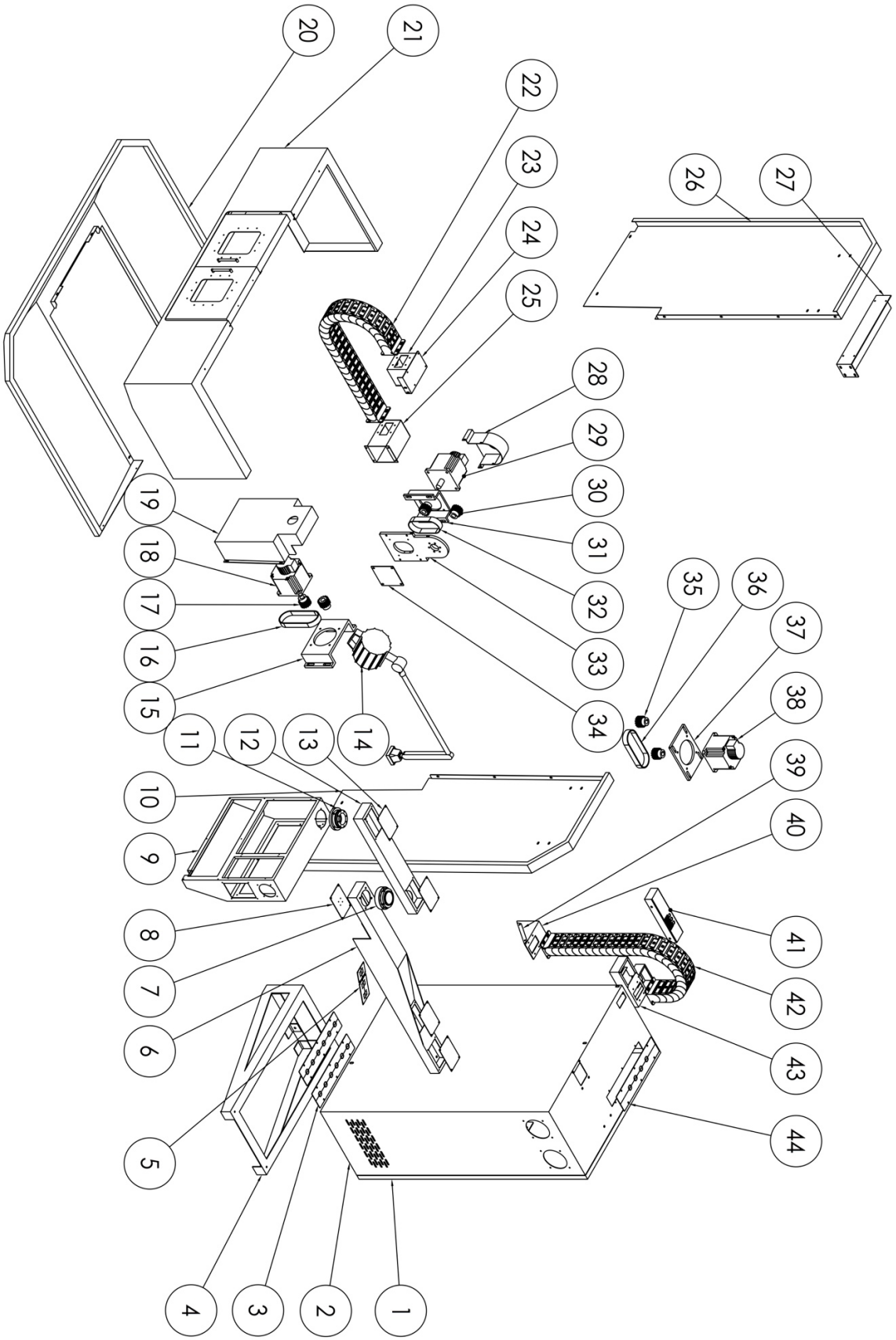
Base (Y)



Base (Y)

ITEM	DESCRIPTION
Y1	Oil Guard
Y2	Hand Wheel
Y3	Manual Feed Drive Gear
Y4	Dial Lock Nut
Y5	Dial with Graduations
Y6	Dial Holder
Y7	Precision Nut M20*1.0
Y8	Pulley
Y9	Screw M6*16x3
Y10	Bearing Bracket
Y11	Bearing 7204 x2
Y12	Screw M8*20x4
Y13	Y-axis Bracket
Y14	Y-axis Ballscrew
Y15	Screw M6*20x6
Y16	Base
Y17	Chip Guard 720
Y18	Chip Guard 660
Y19	Chip Guard 570
Y20	Chip Guard 460
Y21	Chip Guard 360
Y22	Cover
Y23	Screw M5*12x4
Y24	Lubrication Unit
Y25	Coolant Pump
Y26	Leveling Bolt 5/8*3"x6
Y27	Leveling Pad x6
Y28	Cover x4

Sheet Metal(A)



Sheet Metal(A)

ITEM	DESCRIPTION
A1	Electric Cabinet Door
A2	Electric Cabinet
A3	Wire Adapter Plate*4
A4	Bracket
A5	Wire Adapter Plate
A6	Console Arm (Bottom)
A7	Rotating Unit
A8	Cover
A9	Console Box
A10	Splash Guard(Right)
A11	Rotating Unit
A12	Console Arm (Top)
A13	Cover
A14	Work light
A15	Y-axis Bracket
A16	Belt 5M-535
A17	Y-axis Pulley
A18	Y-axis Servo Motor
A19	Y-axis Motor Cover
A20	Chip Pan
A21	Table Guard
A22	Chain Cable Carrier

ITEM	DESCRIPTION
A23	Y-axis Wire Box
A24	Y-axis Wire Box Bracket
A25	Y-axis Wire Box
A26	Splash Guard(Left)
A27	Splash Guard Support (L)
A28	Cover
A29	X-axis Servo Motor
A30	X-axis Pulley
A31	X-axis Motor Plate
A32	Belt 5M-400
A33	X-axis Motor Bracket
A34	Cover
A35	Z-axis Pulley
A36	Z-axis Belt 5M-535
A37	Z-axis Motor Bracket
A38	Z-axis Servo Motor
A39	Cover
A40	Z-axis Cable Carrier Bracket
A41	Bracket
A42	Chain Cable Carrier
A43	Z-axis Wire Box
A44	Wire Adapter Plate*2

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