



INSTALLATION, OPERATION, MAINTENANCE, AND PARTS LIST

SERIES I MILLING MACHINES



TP5260

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Information in this manual is subject to change without notice.

This manual covers installation, operation, maintenance, and parts list for Series I milling machines.

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ORDERING REPLACEMENT PARTS

Please provide the following information when ordering replacement parts:

1. The complete machine serial number. The machine serial number tag is located on the power case door.
2. List the following:
 - A. Manual Number (M-450).
 - B. Page Number.
 - C. Item Number.
 - D. Part Description.
 - E. Part Number.
 - F. Quantity of each part required.
3. Specify how and where to ship.

- NOTICE -

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SAFETY

To prevent serious bodily injury, you should observe the following basic safety precautions when installing, operating or servicing the milling machine.

1. Follow all instructions in the manual.
2. Wear approved industrial safety glasses and safety shoes.
3. Do not wear gloves, long sleeves, long hair, rings, watches, jewelry or other items that could become caught in moving parts.
4. Keep all parts of your body away from moving parts (belts, cutters, gears, etc.)
5. Use proper point of operation safeguarding.

These and other safety precautions are discussed in the American National Standard Institute standard entitled safety requirements for the construction, care, and use of drilling, milling, and boring machines (ANSI B11-8-1983).

This publication is available from:

American National Standards Institute
25 West 43rd Street, 4th floor
New York, NY 10036

Safeguarding for protection at the point of operation can only be designed and constructed when the parameters of the particular operation have been determined. As a result, ANSI B11.8-1983, Section 5.1, states that "*it shall be the responsibility of the employer to provide, and ensure use of, a guard, guarding device, awareness barrier, awareness device, or shield...*"

To assist machine users in designing point of operation safeguarding for their specific machine applications, the Occupational Safety And Health Administration has published a booklet entitled Concepts and Techniques of Machine Safeguarding (O.S.H.A. Publication No. 3067).

This publication is available from:

The Publication Office – O.S.H.A.
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, D.C. 20210

The general purpose point of operation shield provided with this machine and shown in certain illustrations throughout this manual may not be appropriate and cannot be utilized for all possible applications of the machine. Use additional or alternate safeguarding where this shield is not appropriate or cannot be utilized. Note that for purposes of display, the shield has been removed in certain other illustrations in this manual.

WARNINGS, CAUTIONS, AND NOTES

- WARNING -

Warning notices are used in this publication to emphasize that hazardous mechanical conditions, voltages, currents, or temperatures exist in this equipment which could cause serious personal injury and/or damage to the equipment.

- CAUTION -

Caution notices are used where equipment might be damaged if care is not taken.

In situations where inattention could cause either personal injury or damage to the equipment, a warning notice is used.

- NOTE -

Notes merely call attention to information that is especially significant in understanding and operating the equipment.

This document is intended for the use of those who install, operate and maintain the milling machine. Although reasonable care has been exercised in the preparation of this manual to make it complete and accurate, this manual does not purport to cover all conceivable problems or applications pertaining to this machine.

SAFETY RECOMMENDATIONS

DO NOT OPERATE EQUIPMENT until you have read and understood the appropriate operator and safety maintenance manuals.

DO NOT OPERATE EQUIPMENT until you have read and understood all machine and control key signs.

DO NOT OPERATE EQUIPMENT for the first time without a qualified instructor. Consult your supervisor when in doubt as to the correct way to perform an operation.

DO NOT OPERATE EQUIPMENT unless proper maintenance has been regularly performed and the equipment is known to be in good working order.

DO NOT ALLOW the operation or repair of equipment by untrained personnel.

WARNING or INSTRUCTION TAGS are mounted on the equipment for your safety and information. Do not remove them.

DO NOT OPERATE EQUIPMENT if any unusual or excessive heat, noise, smoke, or vibration occurs. Report any excessive or unusual vibration, sounds, smoke, or heat as well as any damaged parts.

WEAR SAFETY GLASSES with side shields and SAFETY SHOES with steel toes and oil-resistant soles at all times. When necessary, wear respirator, helmet, and ear muffs or plugs.

DO NOT OPERATE ANY MACHINE while wearing rings, watches, jewelry, loose clothing, neckties, or long hair not contained by a net or shop cap.

DO NOT WEAR GLOVES while operating equipment. Gloves are easily caught in moving parts.

REMOVE ANY LOOSE PARTS OR TOOLS left on machine or in the work area before operating the machine. Always check the machine and work area for loose tools and parts, especially after work has been completed by maintenance personnel.

REMOVE CHUCK WRENCHES before starting the machine.

NEVER OPERATE A MACHINE after taking strong medication, using non-prescription drugs or consuming alcoholic beverages.

SAFEGUARD THE CUTTING ZONE ("point of operation"). Use standard, general purpose safeguards when possible. Use special safeguards when required.

PROTECT YOUR HANDS. Stop the spindle completely before changing tools.

PROTECT YOUR HANDS. Stop the spindle completely before loading or unloading a workpiece.

DO NOT REMOVE CHIPS with hands. Use a hook or similar device and make certain that all machine movements have ceased.

DO NOT ADJUST tooling, workpieces or coolant hoses while the machine is running.

PROTECT YOUR HANDS. Stop the spindle completely before taking measurements.

PROTECT YOUR HANDS. Stop the spindle completely before opening safeguards or covers.

NEVER REACH around a safeguard.

PROTECT YOUR HANDS. Stop the machine before changing or adjusting belts, pulleys or gears.

PROTECT YOUR HANDS. Keep hands and arms clear of spindle start switch when changing tools.

PROTECT YOUR EYES AND THE MACHINE. Never use a compressed air hose to remove chips.

KEEP WORK AREA WELL LIGHTED. ask for additional light if needed.

DON'T SLIP. Keep your work area clean and dry. Remove chips, oil and obstacles.

NEVER LEAN ON your machine. Stand away when the machine is running.

MAKE CERTAIN that you are clear of any "pinch points" created by moving slides before starting the machine.

PREVENT OBJECTS from flying loose. Securely clamp and locate workpiece. Use stop blocks where necessary. Keep clamps clear of cutter path.

PREVENT CUTTER BREAKAGE. Use correct table feed and spindle speed for the job. Reduce feed and speed if you notice unusual noise or vibration.

PREVENT CUTTER BREAKAGE. Rotate spindle in clockwise direction for right-hand tools, counterclockwise for left-hand tools. Use the correct tool for the job.

PREVENT WORKPIECE and cutter damage. Never start the machine when the cutter is in contact with the workpiece.

DO NOT USE worn or defective tools. Use the proper size and type of tool for the task at hand.

KEEP ROTATING CRANKS AND HANDWHEELS well lubricated and maintained. Do not remove safety springs.

CERTAIN MATERIALS, such as magnesium, are highly flammable in dust and chip form. See your supervisor before working with these materials.

PREVENT FIRE. Keep flammable liquids and materials away from work area and hot chips.

PREVENT MACHINE from moving unexpectedly. Disengage power feed when not being used (manual machines only).

PREVENT MACHINE from moving unexpectedly. Always start machine in manual mode.

UNLESS OTHERWISE NOTED, all operating and maintenance procedures are to be performed by one person. To avoid injury to yourself and others, be sure that all personnel are clear of the machine when opening or closing the coolant guard door and any access covers.

INSTALLATION AND USE OF SAFEGUARDS

Both American National Standard B11.8 and OSHA Section 1910.212 assign responsibility for point of operation safeguarding of milling machines to the employer/user. Therefore, to prevent serious injury resulting from the rotating cutter, flying chips, or splashing coolant, point of operation safeguarding should be used on milling machines to the greatest extent practicable.

This booklet provides basic information for the installation and use of the general purpose safeguard. It also contains the names of several manufacturers of other types of point of operation safeguarding for vertical milling machines.

Remember, point of operation safeguarding is your responsibility as the employer/user. You are in the best position to evaluate your safeguarding needs and ensure that the proper safeguards are installed and used.

- CAUTION -

A safety shield is supplied for protection from chips and coolant with every machine.

The chip and coolant shields have been designed and are custom manufactured with the highest clear impact material commercially available: polycarbonate (G.E. Lexan). It has an impact strength 5 to 10 times greater than acrylic (plexiglass) or butyrate (UVEX) materials, thereby offering the greatest protection for our customers.

Some of the new "easy to dispose of" coolants and/or cutting oils contain chemicals harmful to polycarbonate. These chemicals are: Mono-ethanolamine, Di-ethanolamine, Tri-ethanolamine and the combination thereof. These chemicals may significantly reduce the impact strength of the shield within days, and could destroy the entire shield in weeks.

Use of use of coolants and/or cutting oils containing these chemicals will void the warranty on your safety shield, and could cause injury to your workers.

- WARNING -

This safeguard DOES NOT take the place of any other safety practice or safety equipment.

YOU MUST ALWAYS wear safety glasses and safety shoes.

YOU MUST ALWAYS stop the spindle of the machine completely before changing or adjusting the workpiece, fixture, or tool.

YOU MUST NEVER wear gloves, long sleeves, long hair, rings, watches, neckties, jewelry or other loose items.

GENERAL PURPOSE SAFEGUARDS

There is no single safeguard which can match the versatility of the Series I machine. As a result, you will find that the general purpose safeguard, Figure I.I, like all safeguards, will be suitable for some operations, but not for others. Carefully analyze the operation to be performed before deciding whether this safeguard is suitable. Adjust the safeguard to suit your special requirements. If you find that it is not suitable for a particular application, you should use an alternate form of protection.

Installation for Machines with R-8 Spindle Taper

If your Series I standard milling machine was manufactured on or after January 1, 1983, the manufacturer has drilled and tapped two holes in the nose cap of the spindle to be used for mounting the guard (the two untapped holes serve to remove the nose cap with a spanner wrench).

1. Place mounting ring "B" underneath top of guard "D".
2. Place two socket head cap screws "A" through the holes in ring, and hand-start them into the threaded holes in the nose cap until hand tight.
3. Align guard to be square with table of machine (unless angular mounting is desired).
4. Tighten screws with a 3/16" Allen wrench.

Retrofits

If your Series I standard machine was manufactured prior to January 1, 1983, you must retrofit as follows:

1. Manually tap the existing spanner wrench holes with a .250"-20 bottoming tap.

- CAUTION -

There is no need to drill new holes, nor deepen the existing holes. Attempts at either practice may result in spindle damage.

2. Proceed to mount the guard as indicated above.

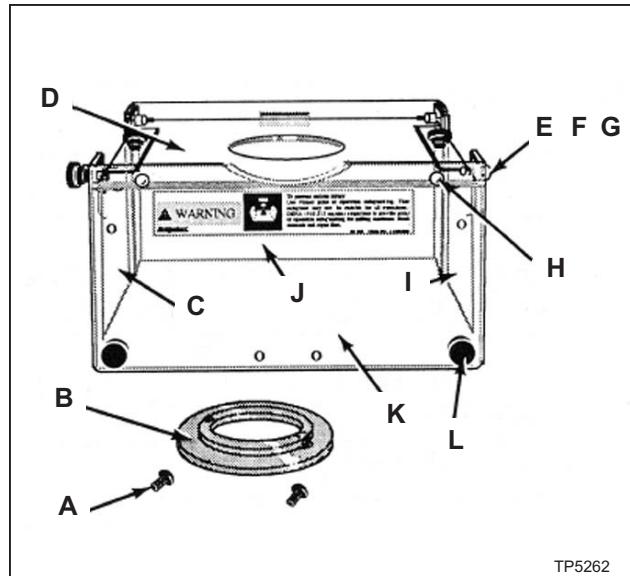


Figure I.I - General Purpose Safeguard Assembly

Machines with Erickson #30 Quick Change or Universal #200 Quick Change Spindles

If your milling machine attachment was manufactured after January 1, 1985 and has either an Erickson #30 or a Universal #200 quick change spindle, the manufacturer has drilled and tapped four #8-32 holes in the nose cap of the spindle for mounting the guard.

ERICKSON SPINDLE

If the nose cap mounting ring has not been installed, the following procedure will apply:

1. Remove the spindle locknut. This is done by removing the long button head black finish screw, which is normally left of the cadmium-finished button head screw on the locknut of the spindle. This will allow you to unscrew the locknut by turning it counter-clockwise.
2. Place the nose cap mounting ring "O" up against the quill nose cap and install the four button head cap screws "M".

- NOTE -

The counterbored side of the nose cap mounting ring fits against the nose cap.

3. Lower the quill. Place the clamping ring "P" underneath the top of the guard "Q" and position the guard under the spindle.
4. Install the four socket head cap screws "N" through the nose cap mounting ring and thread them into the clamping ring.
5. Align the front of the guard parallel to the front of the table. Tighten the screws clamping the guard in position.
6. Reinstall the quick change locknut. Refer to assembly instructions.

If the nose cap mounting ring has been installed, omit steps 1, 2, and 6.

UNIVERSAL #200 QUICK CHANGE SPINDLES

The quick change locknut is not to be removed. To install the spindle safeguard, follow the preceding steps listed above: 2, 3, 4 and 5.

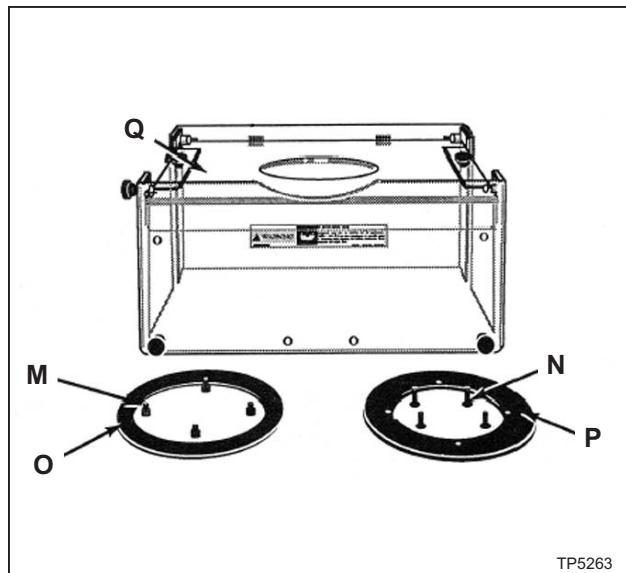


Figure I.II - Spindle Guard Assembly

Code No. 11191200 – R-8 Shield Assembly

ITEM	CODE	DESCRIPTION	QTY
A	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	2
B	12191201	Ring, Guard	1
C	11191204	Shield, Left Side	1
D	11191206	Shield Assy, Top	1
E	11665810	Screw, Button Hd Cap, #10-32x.750"	3
F	11010065	Washer, Plastic, #10-32	8
G	11010055	Nut, Stop, Plastic, #10-32	3
H	11010063	Screw, Drive, Type U, #12 x .625"	2
I	11191205	Shield, Right Side	1
J	11191203	Assembly, Rear Shield	1
K	11121202	Assembly, Front Shield	1
L	11010056	Screw, Hand, #10-32 x .750"	4

Code No. 11190341 – Quick Change Shield Assembly

ITEM	CODE	DESCRIPTION	QTY
A	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	2
C	11191204	Shield, Left Side	1
E	11665810	Screw, Button Hd Cap, #10-32x.750"	3
F	11010065	Washer, Plastic, #10-32	8
G	11010055	Nut, Stop, Plastic, #10-32	3
H	11010063	Screw, Drive, Type U, #12 x .625"	2
I	11191205	Shield, Right Side	1
J	11191203	Assembly, Rear Shield	1
K	11121202	Assembly, Front Shield	1
L	11010056	Screw, Hand, #10-32 x .750"	4
M	11651199	Screw, Button Hd Cap, #10-32 x .500"	4
N	11980224	Screw, Socket Hd Cap, #8-32 x .625"	4
O	12190330	Ring, Guard	1
P	12190331	Ring, Guard	1
Q	11191207	Shield Assy, Top	1

- NOTES -

- NOTES -

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CHAPTER 1 - INSTALLATION

UNCRATING

Carefully remove protective crating and skids so that the machine and parts are not marred, scratched or impaired. In the event of damage having occurred during transit, communicate at once with our representative and the transportation company making delivery.

SHORTAGES

Check shipment carefully against the itemized packing list which is included in the parts box. In case of shortages, report them immediately to the representative from whom the machine was purchased, indicating the parts not received which have been checked on the packing list.

CLEANING

Thoroughly clean protective coating from the machine with a suitable cleaning solution.

- WARNING -

DO NOT use gasoline or any other flammable cleaning agent to clean machine.

- NOTE -

Do not move the table, saddle, knee, or any moveable part until all ways have been well cleaned and lubricated.

1. After initial cleaning, move table, saddle and knee in one direction by hand to limit stop.
2. Clean and lubricate the exposed ways.
3. Move each unit to the opposite limit stop, and clean and lubricate the exposed ways.
4. Move each unit to the opposite stop once more and similarly clean and lubricate the exposed ways.
5. Loosen bolts to unlock the ram, and move it forward and backward to the full length in order to clean and lubricate.

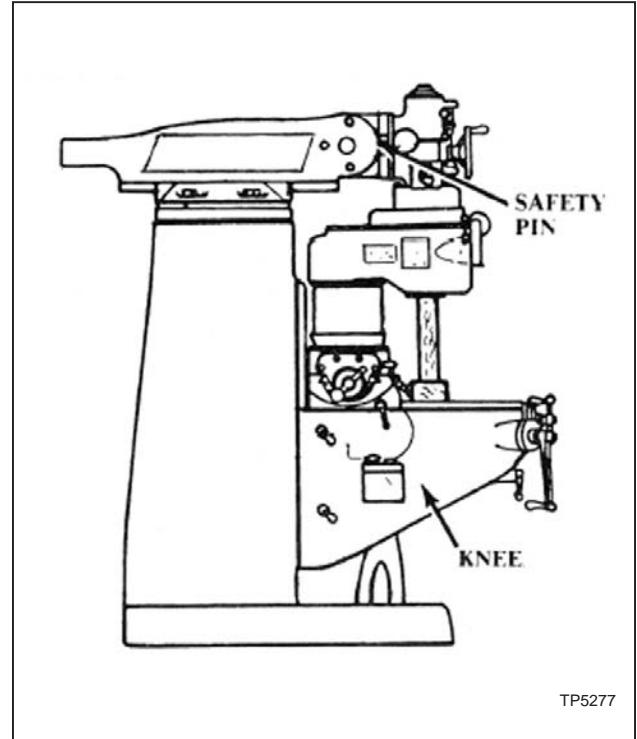


Figure 1.1 - Milling Machine
Left Side View

INSTALLATION

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.

HANDLES

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.

POSITIONING HEAD UPRIGHT

Loosen four locknuts "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 ft/lbs.

- NOTE -

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

1. Lower knee approximately 6" (150mm).
2. Withdraw the safety pin on the left-hand side of ram adapter.
3. Loosen the four unit head mounting 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 the four unit head mounting bolts first to 25 lb-ft in a diagonal sequence then to 50 lb-ft.

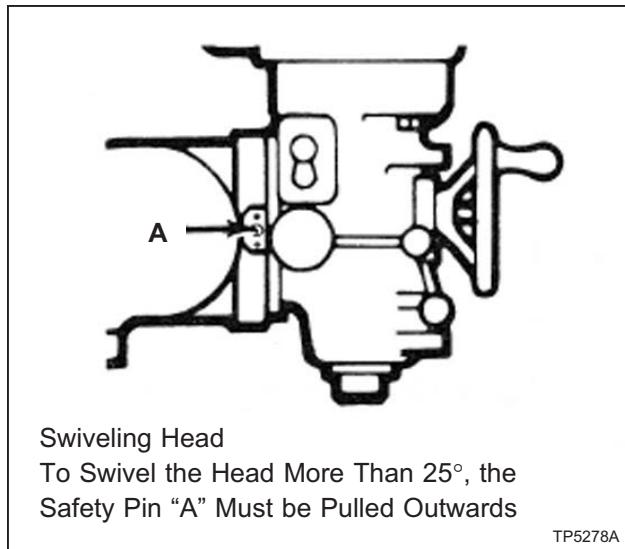


Figure 1.2 - Positioning Head
Left View

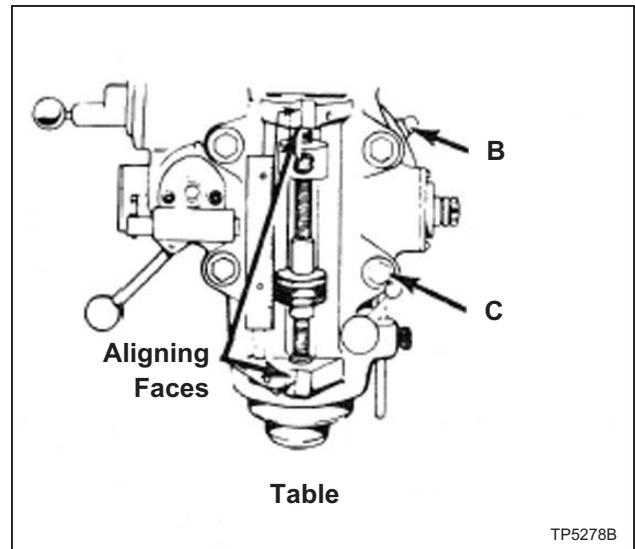


Figure 1.3 - Positioning Head
Front View

HANDLING

Lifting the Machine

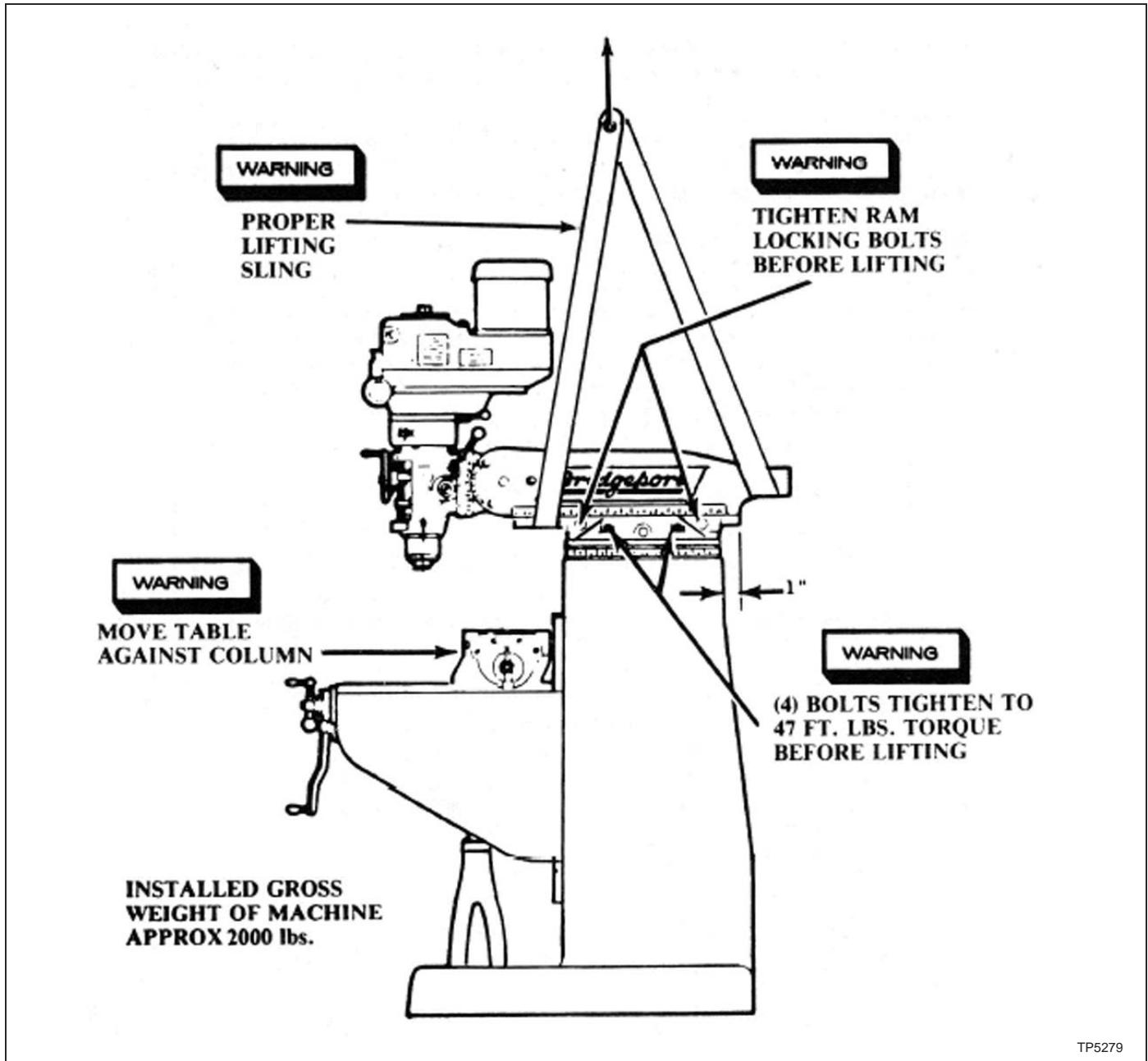


Figure 1.4 - Lifting the Machine

- WARNING -

BE SURE to use proper sling when lifting. Improper lifting could cause serious injury.

Note position of ram and table when lifting with sling. Machine should be lifted by placing a sling under the ram as illustrated in Figure 1.4.

FOUNDATION

MACHINE

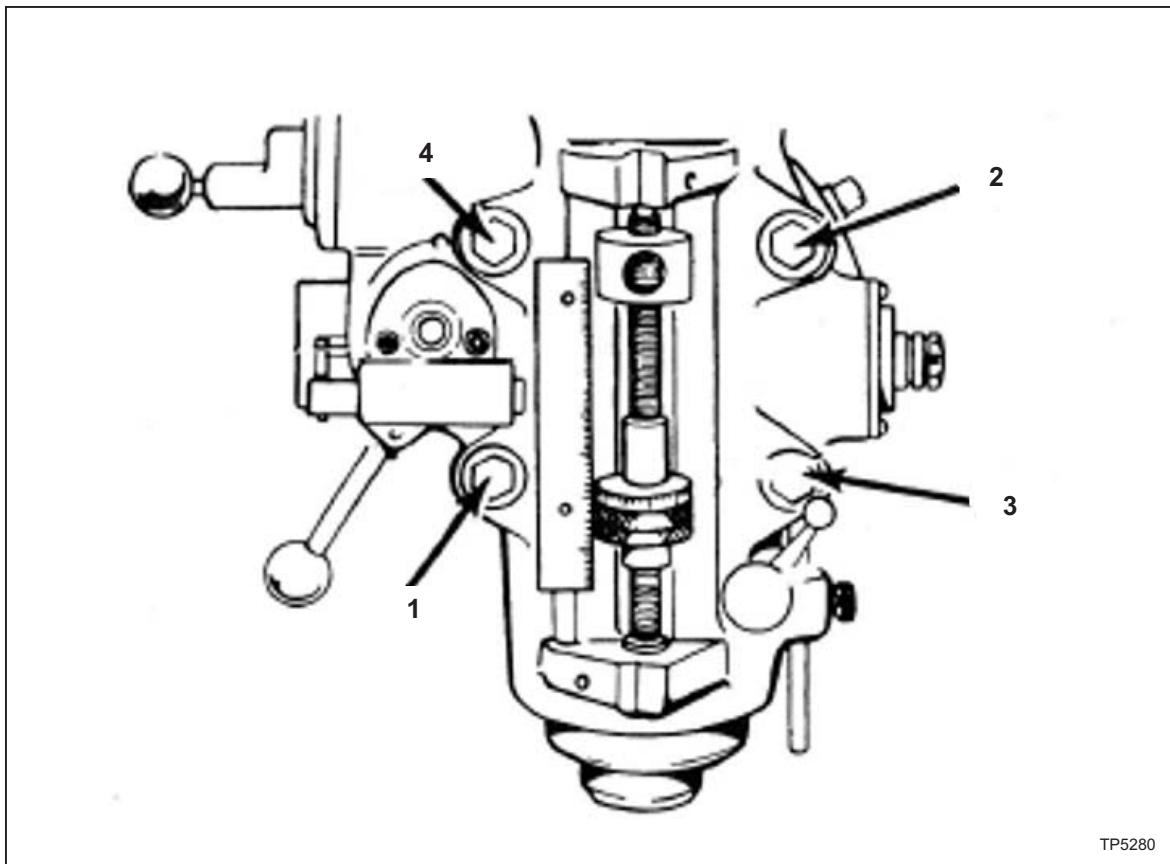


Figure 1.5 - Tightening Sequence

Tightening Sequence

Tighten bolts first to 25 lb-ft torque in a diagonal sequence as noted in Figure 1.5, then to 50 lb-ft. Overtightening could cause bind in the quill movement.

Placing on Solid Foundation

When setting machine on a concrete foundation, it is advisable to use a little grout (thin mortar) to take care of any unevenness in the concrete as well as to provide a solid foundation at all points.

When setting machine on a floor than has any surface irregularities, shims should be used to correct this condition to the greatest extent possible.

- NOTE -

It is recommended that the machine be secured to the floor to prevent movement or tipping due to off-center loading.

Before securing machine to floor by tightening hold-down bolts, make certain that all four corners are making contact with the floor after machine is leveled. If above condition is not met, it is possible to twist the column and put a bind into ways.

Ideally all milling machines should be bolted to a concrete foundation. The machine should be placed on a solid level floor with shims or anti-vibration pads as shown in Figure 1.6 to insure machine base is positioned evenly.

Leveling Machine

Set machine by leveling the work table lengthwise and crosswise with a precision instrument as shown in Figure 1.7.

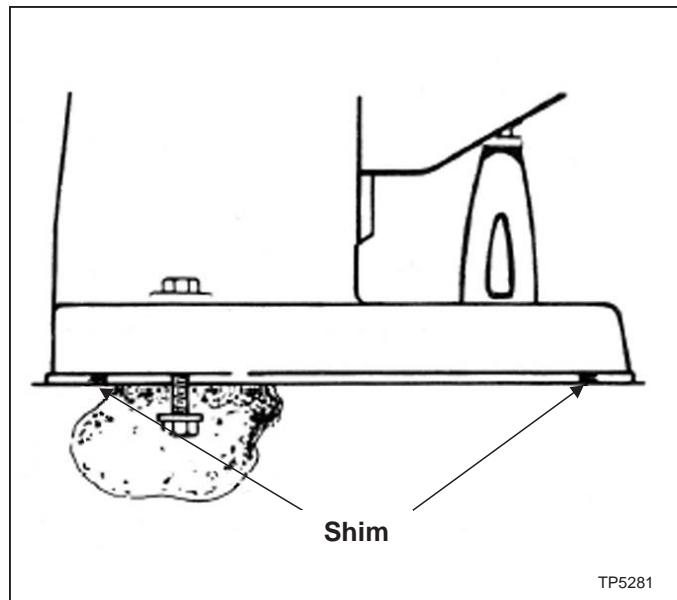


Figure 1.6 - Foundation

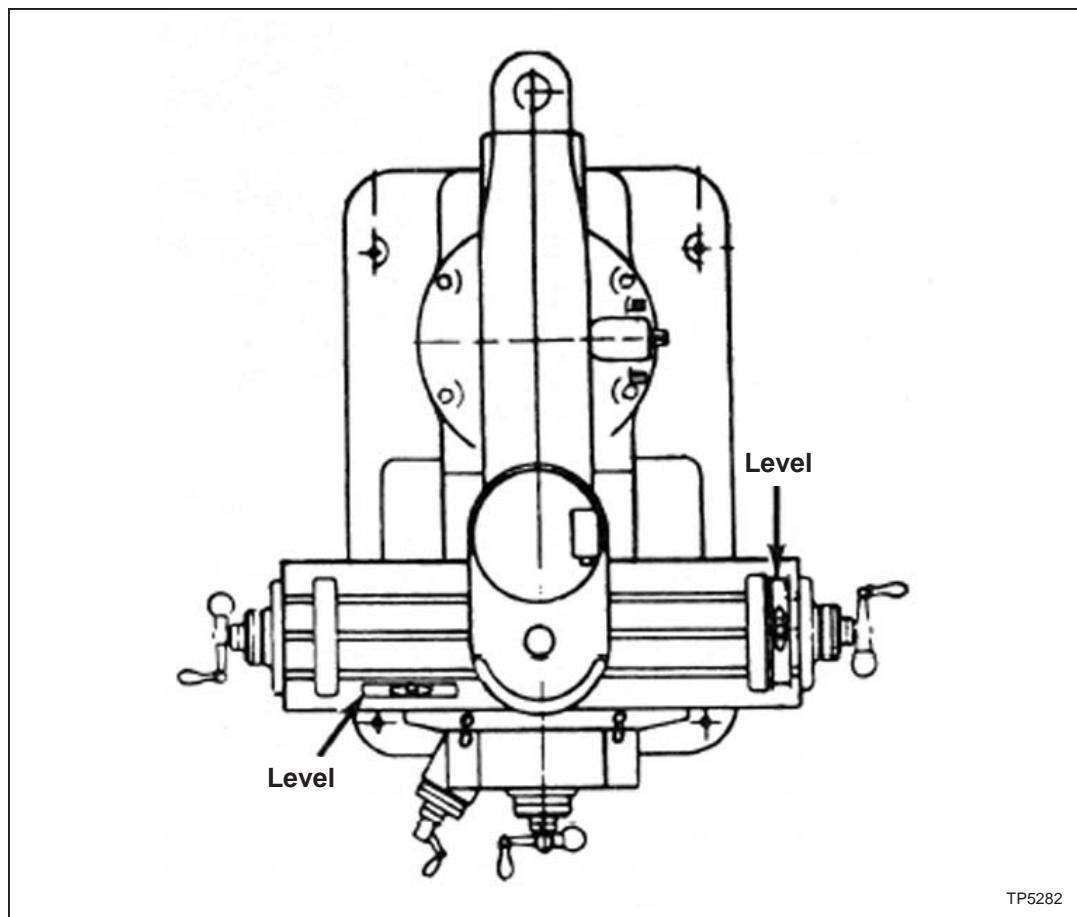


Figure 1.7 - Leveling the Machine

MACHINE POWER SUPPLY

- WARNING -

MACHINE MUST be hooked up by a qualified electrician.

CONNECTING THE POWER SUPPLY

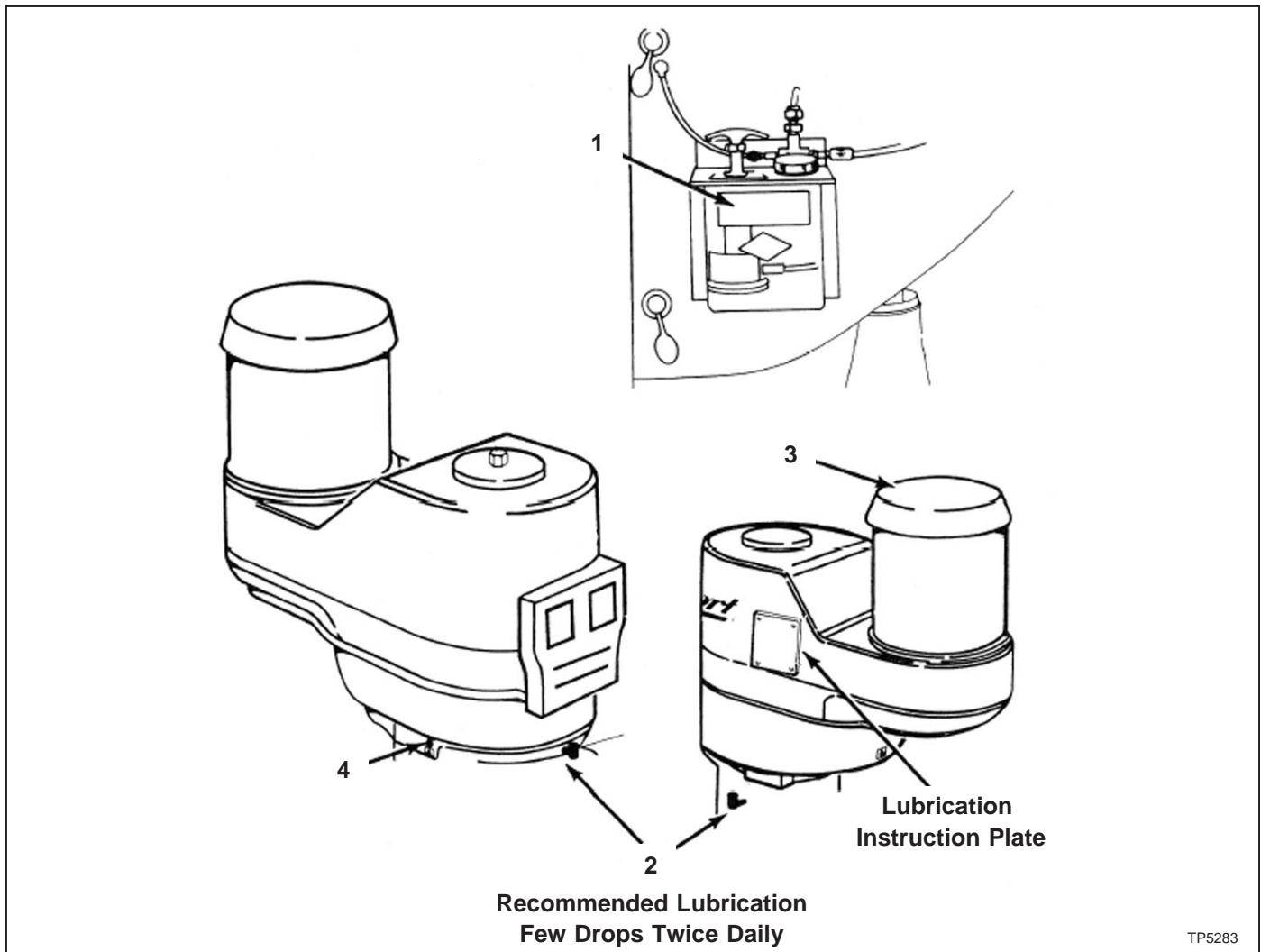
To connect the machine to the plant supply, have a qualified electrician proceed as follows:

1. Check required voltage against power supply to ensure that they are compatible.
2. Connect machine wiring to power supply making sure connection is in compliance with safety regulations.
3. Check for correct spindle rotation. In the HIGH SPEED range, the spindle should rotate clockwise when viewed from the top of the machine.

- NOTE -

Drum switch and hi-neutral-lo lever must be in hi range when checking spindle rotation.

LUBRICATION



TP5283

Figure 1.8 - Lubrication Requirements

Indicator	Lubrication Area	Type of Lubrication
1	Way Surfaces and Lead Screws	Sunoco Waylube #1180 or equivalent
2	Milling Heads (Spindle Bearings)	S.A.E. 10 or 10W Light Oil (None on grease-packed heads)
3	Motor	None required. Motor greased for life of bearings
4		Grease with lubricate every six months as described on lubrication plate
Not Shown	Power Feed	Oil to sight level with Mobilube No. 46 S.A.E. 140
Not Shown	Shaping Attachment	Mobil 600W Oil or equivalent

INITIAL SETTINGS

HEAD CONTROLS

Alignment of 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 1.9. For general milling use, graduations provided on the head are close enough.

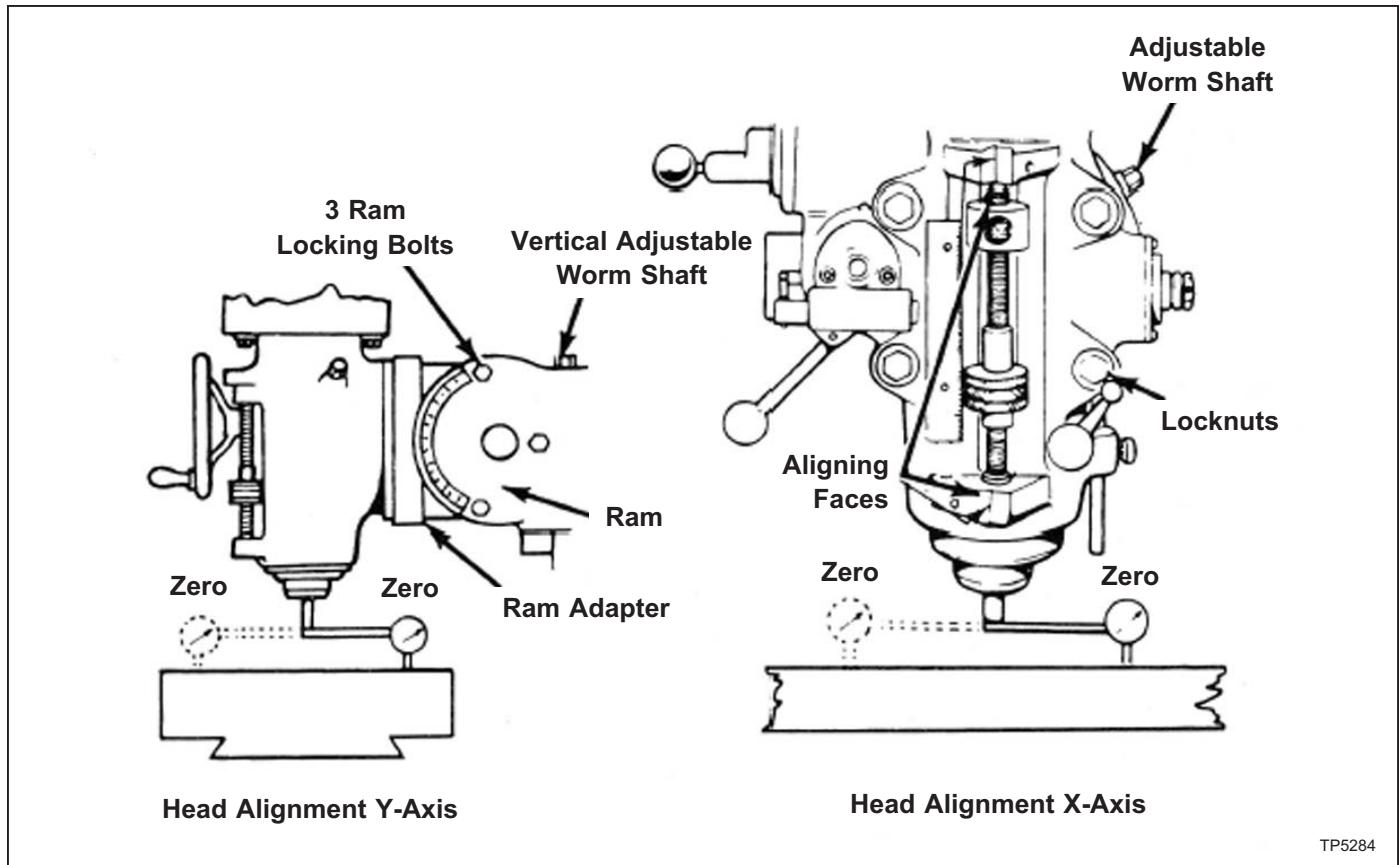


Figure 1.9 - Head Alignment for Y- and X-Axis

Tightening Sequence

Tighten the four head locknuts in a diagonal order as previously described on Page 1-4. Tighten the three ram locking bolts to 50 lb-ft.

Lubrication

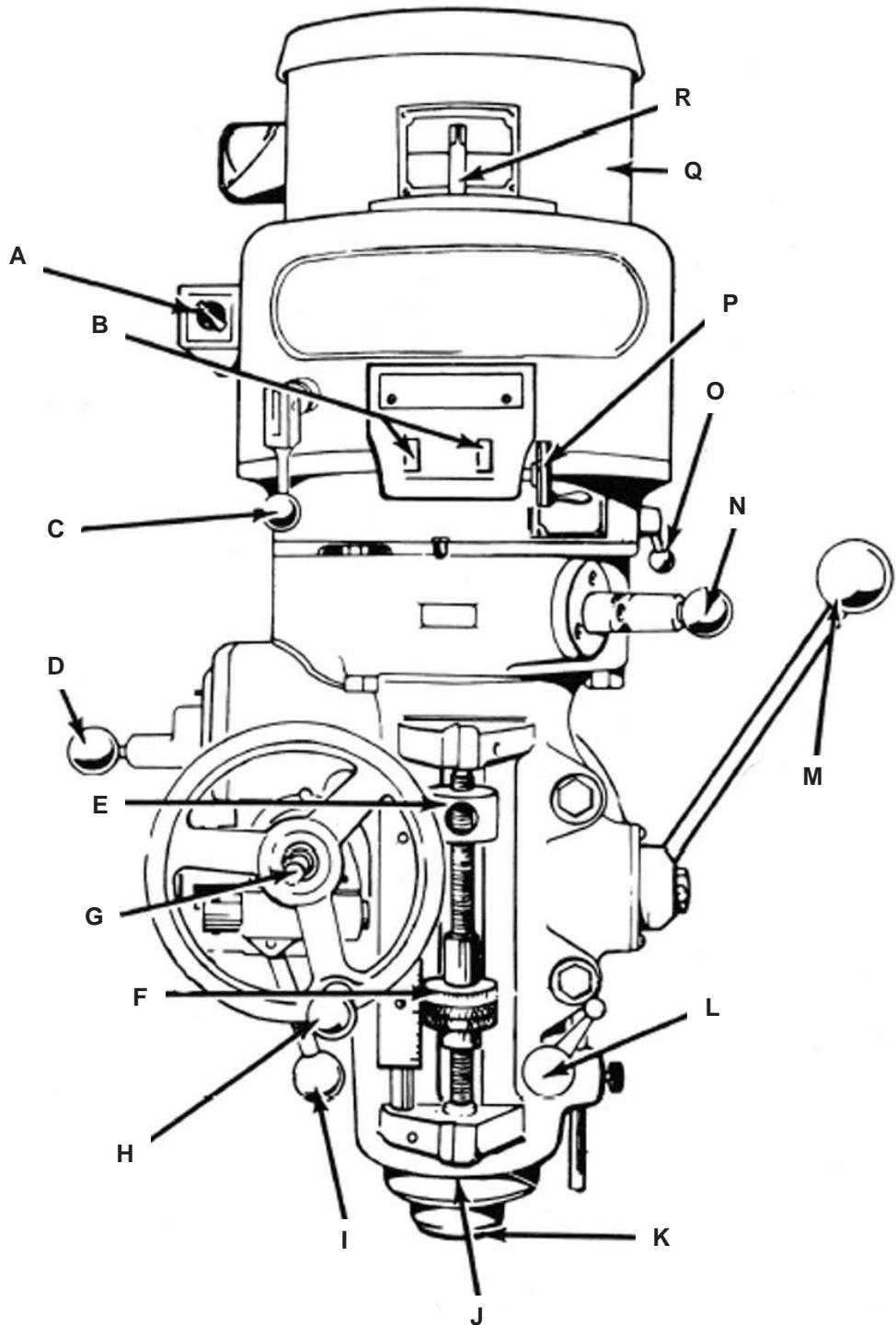
Do not operate machine until properly lubricated.

- NOTES -

- NOTES -

CHAPTER 2 - OPERATION

HEAD CONTROLS



TP5285

Figure 2.1 - Head Controls Parts Assembly

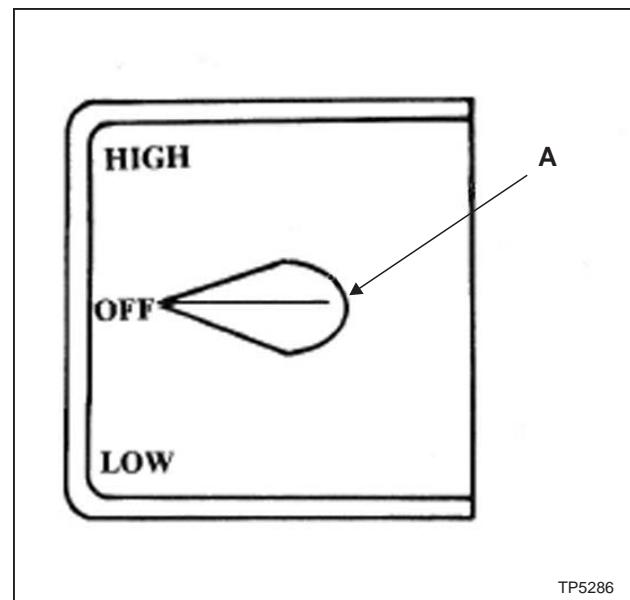
HIGH-LOW RANGE SWITCH

High-Low Range Switch "A", Figure 2.2, is a motor reversing switch. When the attachment is in direct drive (HIGH SPEED), the motor and spindle are turning in a clockwise direction as viewed from the top of machine. When the attachment is in "Back Gear" (LOW SPEED), the spindle will run backwards (counter-clockwise) unless the motor direction is reversed by moving switch to "Low".

The back gear lever is marked Hi-Lo. This will indicate the proper switch position. They should be positioned alike or the spindle will run backwards.

- NOTE -

Spindle should run in clockwise position.



TP5286

Figure 2.2 - High-Low Range Switch

VARIABLE SPEED DIAL

Variable Speed Dial "B", Figure 2.3, visibly indicates, in windows, the speed range that the machine is operating in, 60 to 500 low range, 500 to 4200 high range.

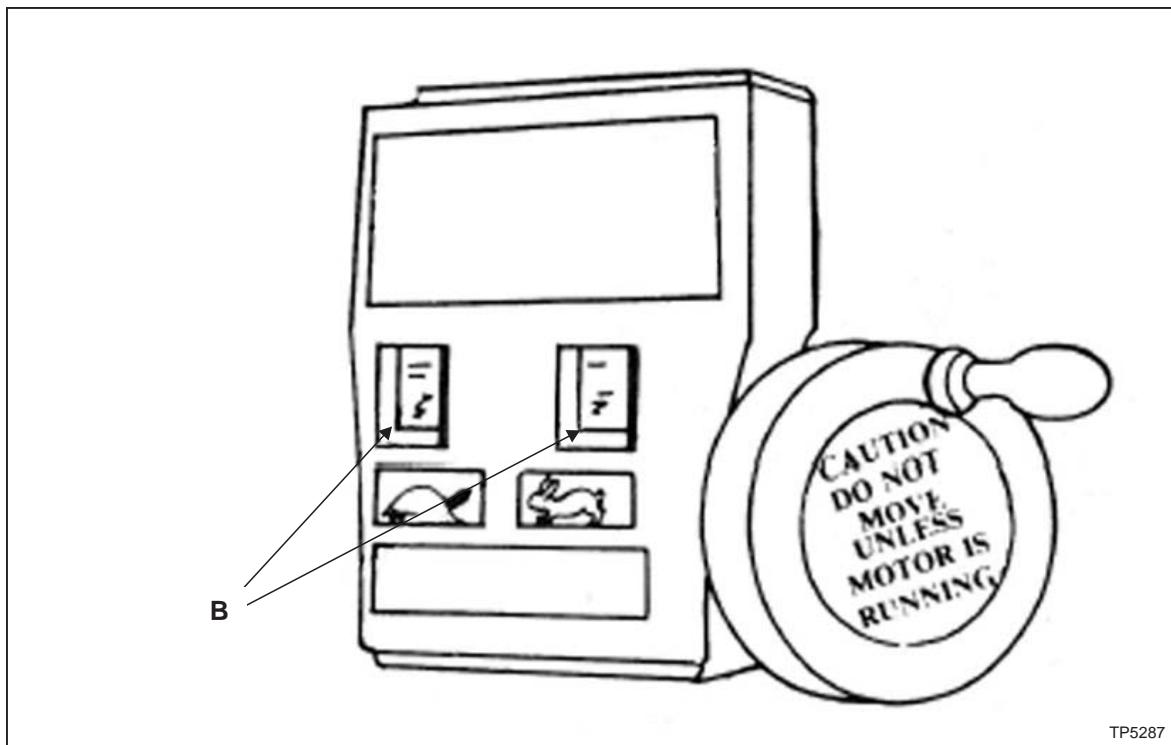


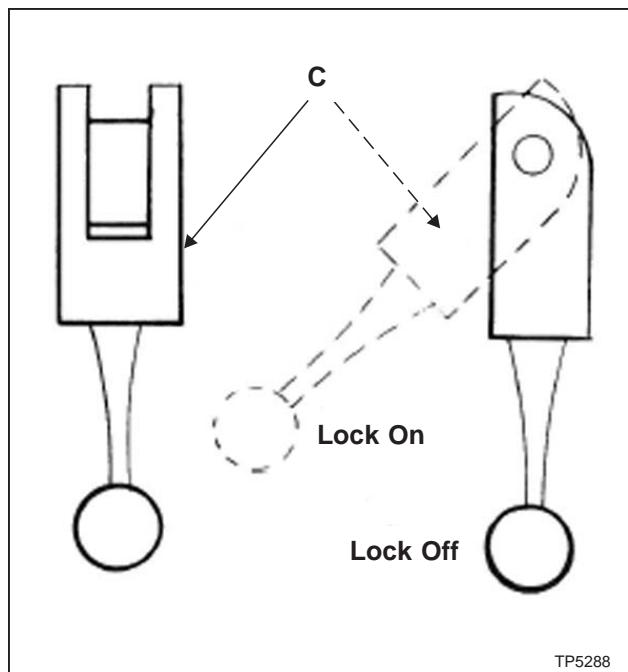
Figure 2.3 - Variable Speed Dial

SPINDLE BRAKE

Spindle Brake "C", Figure 2.4, can be moved in either direction to stop spindle; however, when locking spindle, brake lever should be moved either by pulling towards the operator or pushing away from the operator, then raised. When brake is worn out it has to be replaced. There are no adjustments to be made.

- CAUTION -

BE certain that 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.

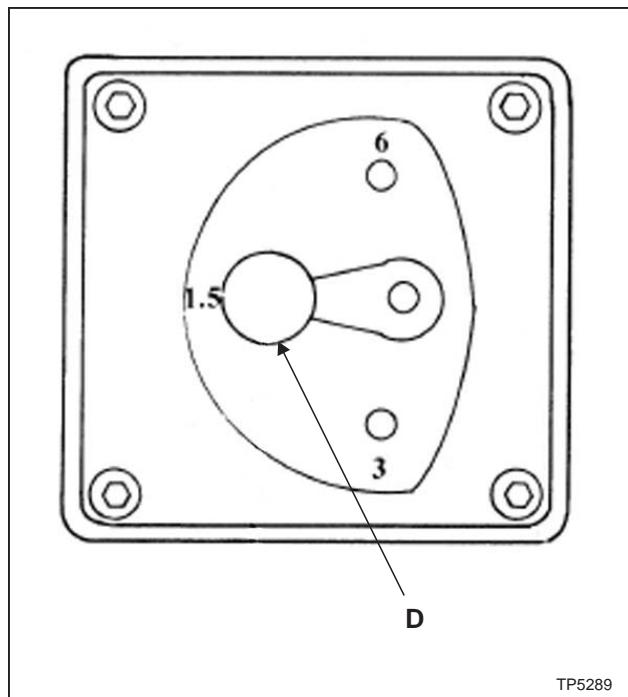


TP5288

Figure 2.4 - Spindle Brake

QUILL FEED SELECTOR

The Quill Feed Selector "D", Figure 2.5, 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.



TP5289

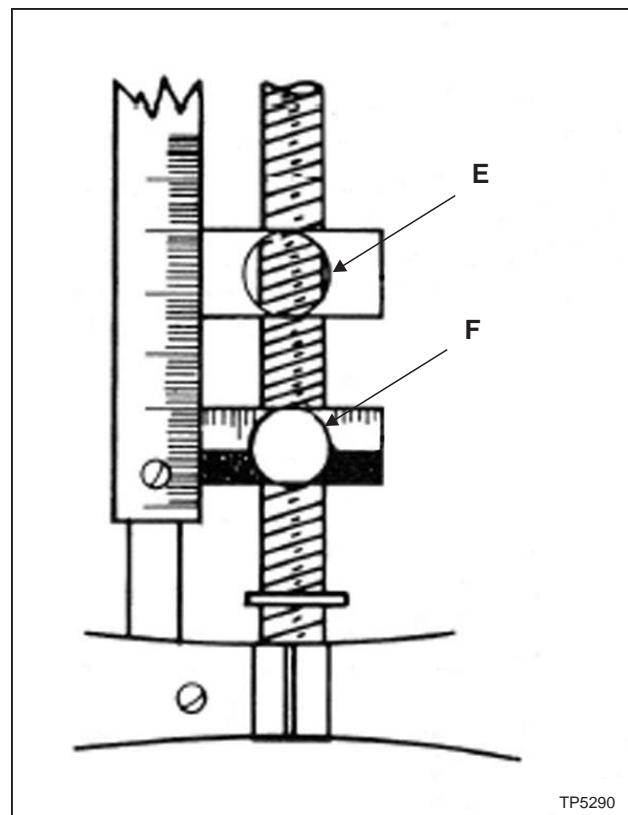
Figure 2.5 - Quill Feed Selector

QUILL STOP KNOB

Quill Stop Knob "E", Figure 2.6, is used to disengage automatic feed in either direction as well as the stop point setting working depths.

MICROMETER NUT

Micrometer Nut "F", Figure 2.6, is used for setting depths. Each graduation on nut indicates .001" of depth, it reads directly to scale mounted along the side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.



TP5290

Figure 2.6 - Quill Stop Knob and Micrometer Nut

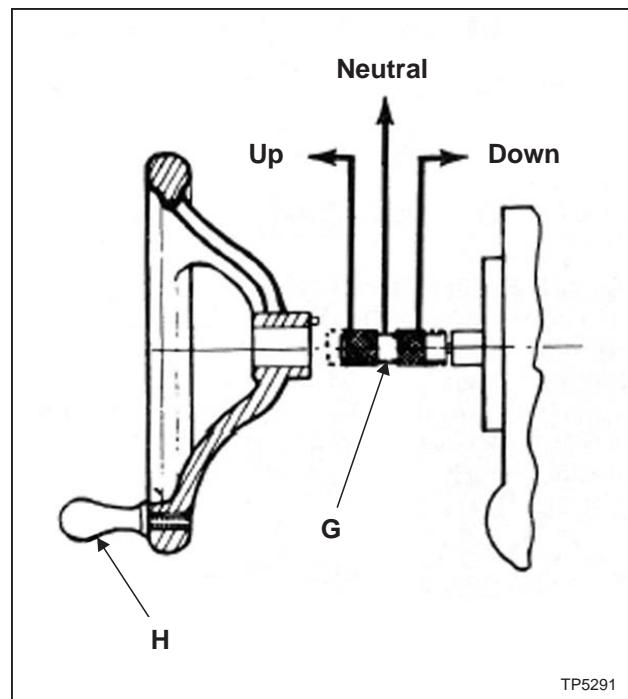
FEED REVERSE KNOB

The position of the Feed Reverse Knob "G", Figure 2.7, 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 HANDWHEEL

Feed Reverse Knob "G" should be in neutral position and Feed Control Lever "I", Figure 2.8 engaged. Clockwise rotation of Manual Feed Handwheel "H", Figure 2.7, moves quill down. The manual feed handwheel and the quill feed handle may be disengaged by moving them outward about .125".



TP5291

Figure 2.7 - Feed Reverse Knob and Manual Feed Handwheel

FEED CONTROL LEVER

Feed Control Lever "I", Figure 2.8, engages overload 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 release manually by engaging lever to right.

FEED CONTROL OVERLOAD CLUTCH

The Feed Control Overload Clutch is set at the factory to hold up to 200 lbs of down pressure on quill, which will accommodate drills up to .375" diameter in mild tool steel.

- CAUTION -

This clutch should not be tampered with in the field.

- NOTE -

The feed control lever must be engaged in order to use manual feed controls. the quill feed handle and manual feed handwheel may be removed when not in use.

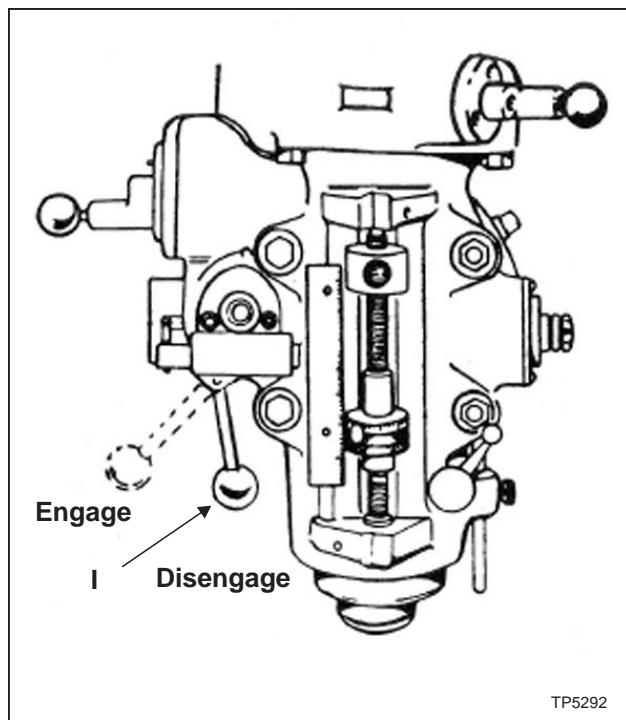


Figure 2.8 - Feed Control Lever and Feed Control Overload Clutch

QUILL

Quill "J", Figure 2.9, contains the spindle assembly and can be raised or lowered by using the quill feed handle "M", Figure 2.10.

SPINDLE

Spindle "K", Figure 2.9, performs the actual rotation and also retains the machine tooling.

QUILL LOCK

Quill Lock "L", Figure 2.9, is a friction lock for use when quill is in a stationary position such as a milling operation. It is recommended that this lock be used whenever quill movement is not desired.

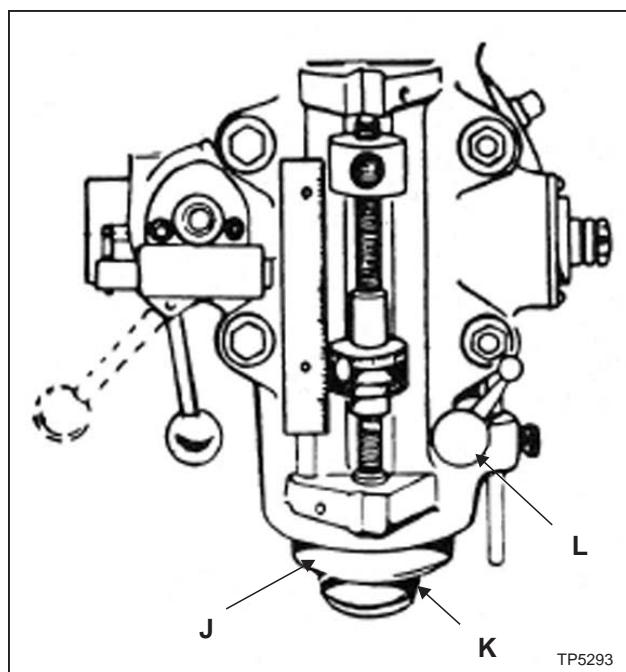


Figure 2.9 - Quill, Spindle and Quill Lock

QUILL FEED HANDLE

Quill Feed Handle "M", Figure 2.10, is used to raise and lower the quill manually. It is generally recommended that handle be engaged when using the power feed. It may be removed by simply pulling handle off.

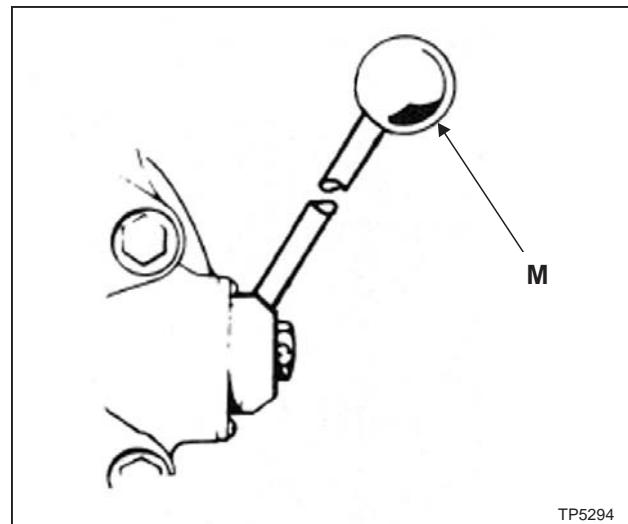


Figure 2.10 - Quill Feed Handle

POWER FEED TRANSMISSION ENGAGEMENT CRANK

Power Feed Transmission Engagement Crank "N", Figure 2.11, engages power feed worm gear. When lever is in right hand hole, the power feed worm gear is engaged.

To engage worm gear, pull knob out and crank handle in clockwise or down direction and move to opposite position (see Figure 2.12).

- NOTE -

Crank should be rotated counter-clockwise to engage power quill feed. Crank should be rotated clockwise to disengage.

- 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.

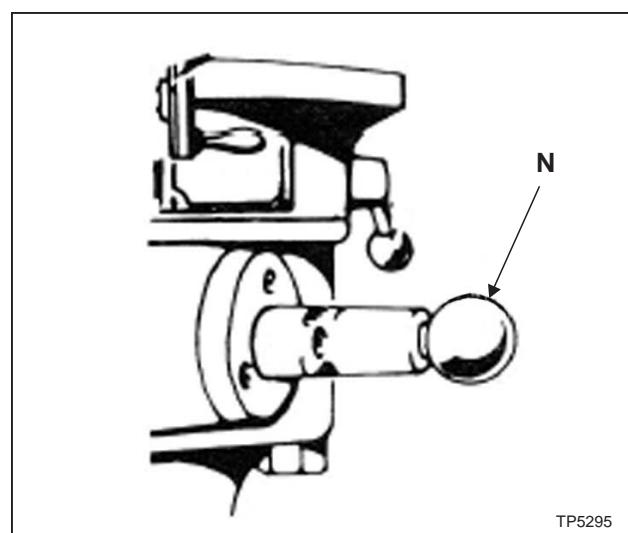


Figure 2.11 - Power Feed Transmission Engagement Crank

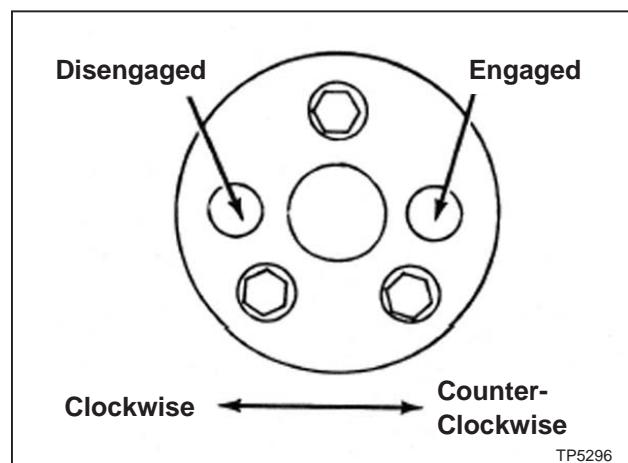


Figure 2.12 - Worm Gear Disengagement

HI-NEUTRAL-LO LEVER

The Hi-Neutral-Lo Lever "O", Figure 2.13, is used to put the attachment into either back gear or direct drive. Rotate the spindle by hand to facilitate meshing of clutch or gears.

Neutral is provided to permit free spindle rotation for indicating and setup work.

In the high speed position (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 loosening the two securing screws in lever while in high speed position. The clutch spring will automatically adjust the clutch. Tighten the two securing crews in lever.

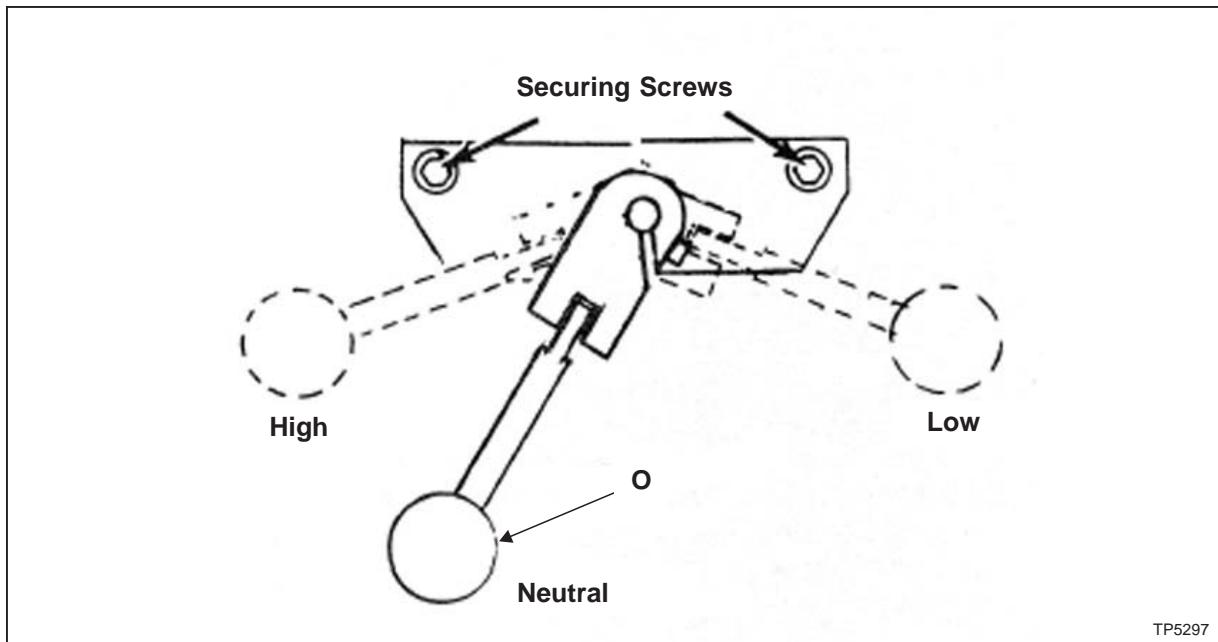


Figure 2.13 - Hi-Neutral-Lo Lever

- CAUTION -
Do not shift hi-lo lever while motor is running.

SPEED CHANGE HANDWHEEL

- CAUTION -

DO NOT attempt to change spindle RPM unless the motor is running. Dial speeds will only be approximate. Belt wear will cause a slight variation in speeds from what is indicated on the dial.

Spindle speeds are adjusted by turning Speed Change Handwheel "P", Figure 2.14, on the front of the belt housing. There are two ranges: 60 to 500 and 500 to 4200.

To obtain 60 to 500 (low range):

1. Hold the Hi-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the Hi-Neutral-Lo lever to the "Lo" position (back gear).
3. Use the low range on the drum switch to engage the back gears.

- CAUTION -

If the back gears do not mesh, do not force the lever.

To obtain 500 to 4200 (high range):

1. Hold the Hi-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the Hi-Neutral-Lo lever to the "Hi" position.
3. Set the drum switch to high range.

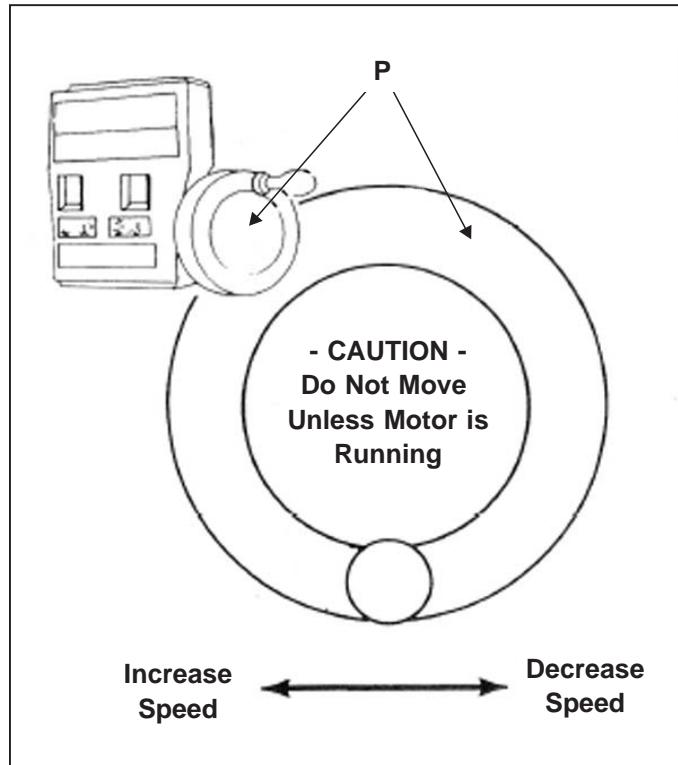


Figure 2.14 - Speed Change Handwheel

- CAUTION -

Try to avoid shifting the hi-lo lever when the feed worm is engaged.

MOTOR

Motor "Q", Figure 2.15, has the following specifications:

- 2 HP variable speed (with 2J head)
- 3 HP 30 minute duty rate

DRAWBAR

When tightening or loosening the Drawbar "R", Figure 2.15, it is necessary to lock the spindle. To accomplish this, use the spindle brake which is located on the left side of the belt housing, pulling towards the operator or pushing away from the operator until it binds, then raise the quill feed handle.

Drawbar has 7/16"-20 right hand thread and should be tightened by hand 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.

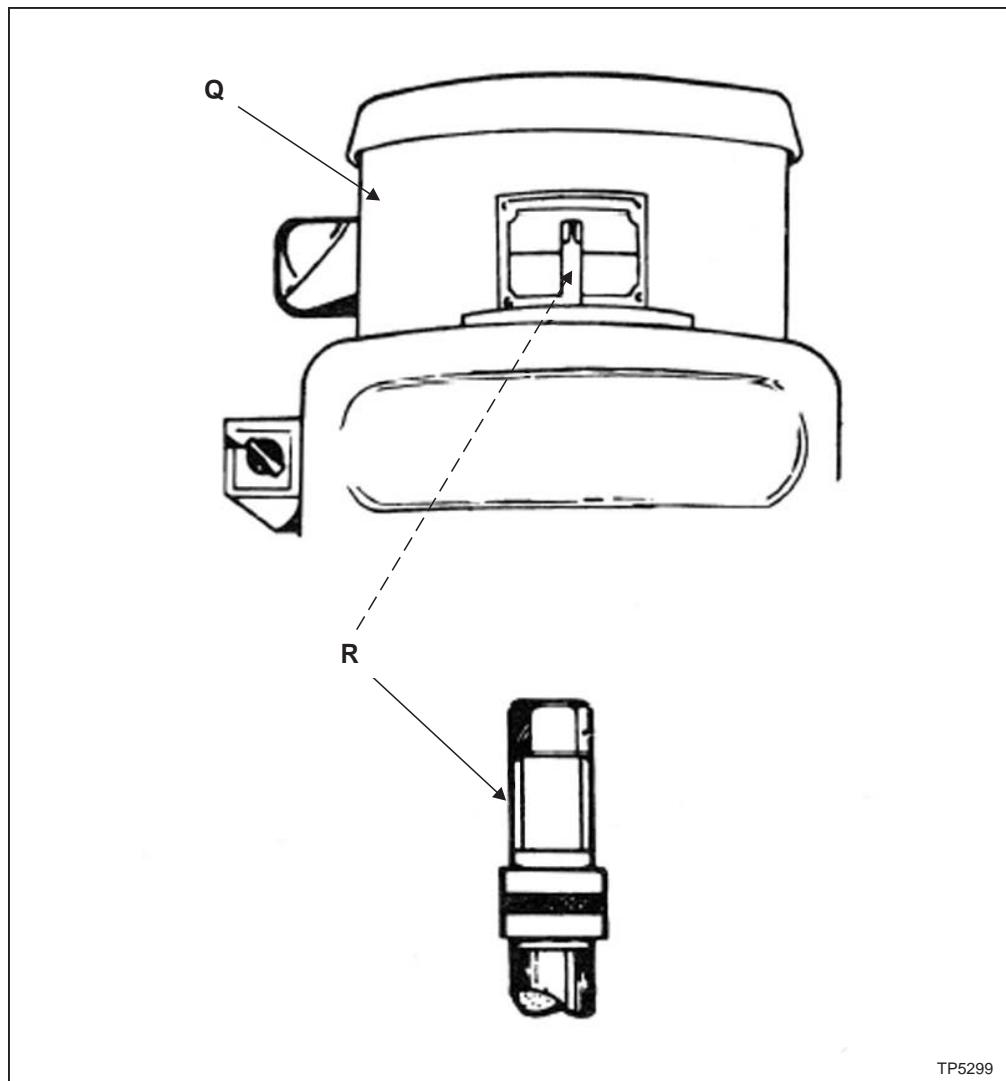


Figure 2.15 - Motor and Drawbar

TP5299

OPERATIONAL PROCEDURES

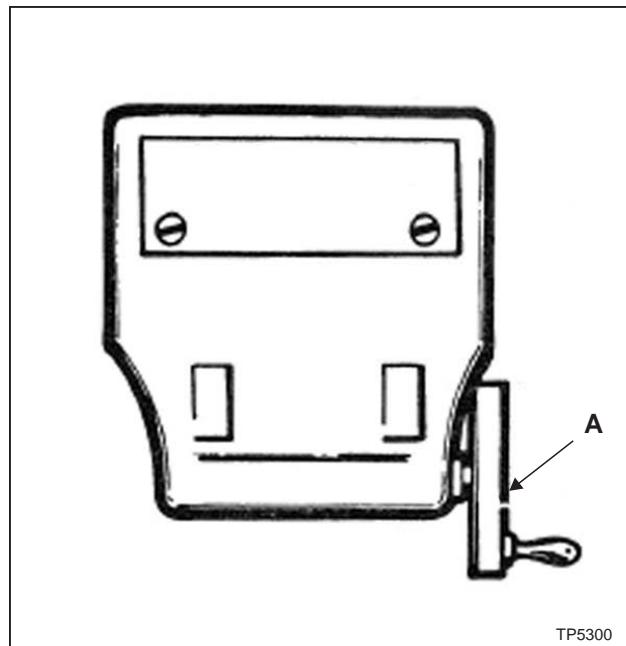
Spindle Speed

- CAUTION -

DO NOT change speed when spindle is stationary. Change speed only when spindle is running.

To change speed within range:

1. Start spindle.
2. Turn handwheel "A", Figure 2.16, to select required speed.



TP5300

Figure 2.16 - Spindle Speed Change

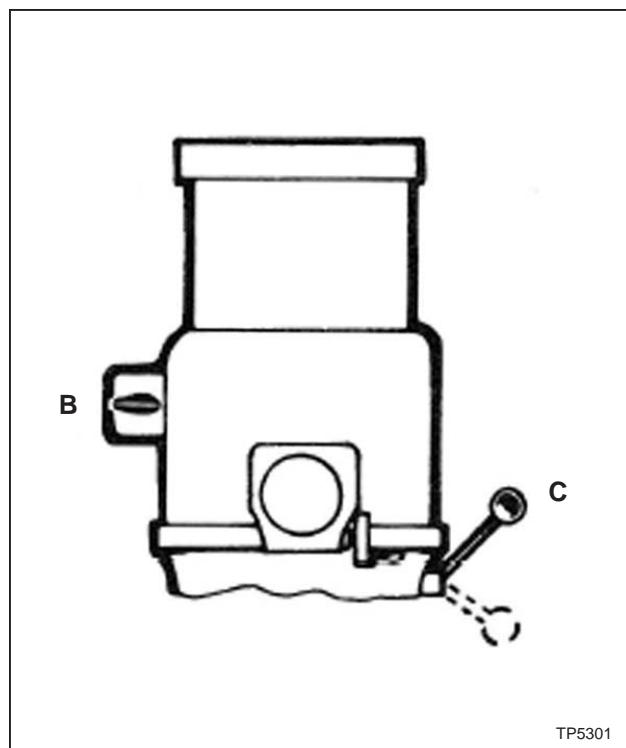
Back Gear (Low Speed)

- CAUTION -

DO NOT change range while spindle is running. Change range only when spindle is stationary.

To change range from direct to back gear drive:

1. Switch "B", Figure 2.17, to OFF (Stop spindle rotation).
2. Move lever "C" through neutral to LOW (This reverses the spindle rotation).
3. Switch "B" to LOW.



TP5301

Figure 2.17 - Back Gear Range Change

Direct Drive (High Speed)

To change range from back gear to direct drive:

1. Switch "B" to OFF (Stop spindle rotation).
2. Move lever "C", Figure 2.18, through neutral to HIGH.
3. Rotate spindle by hand until the clutches are felt to engage.
4. Switch "B" to HIGH.

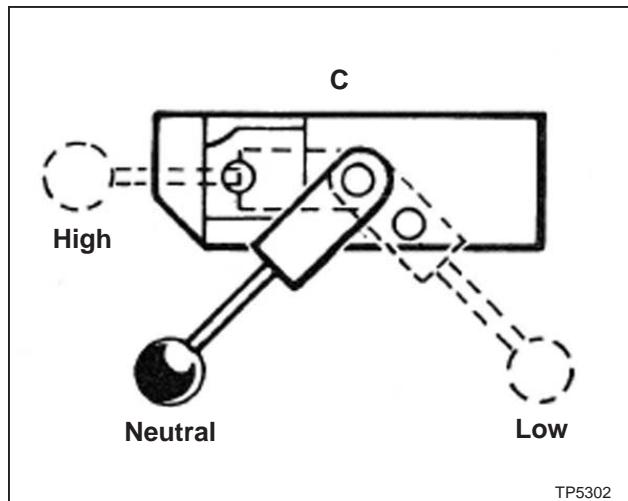


Figure 2.18 - Direct Drive Lever

TP5302

Quill Feed

FINE HAND FEED

1. Disengage Auto Quill Feed "D", Figure 2.19.
2. Locate "F" in mid (neutral) position.
3. The quill is now under handwheel control

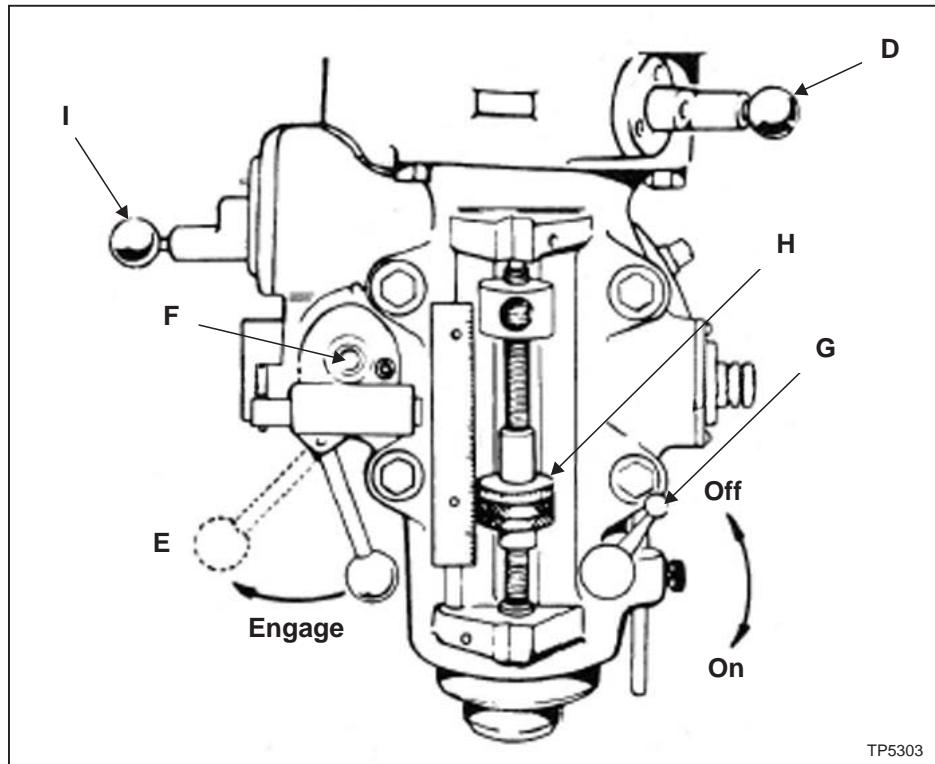


Figure 2.19 - Quill Feed
Fine Hand Feed Control

TP5303

AUTOMATIC FEED

- NOTE -

Maximum loading .375" (9.5mm) diameter drill steel.

1. Ensure quill lock "G", is off.
2. Set micrometer dial "H" to required depth.
3. Engage auto quill feed "D" when motor has stopped
4. Select feed rate "I".
5. Select feed direction "F", Figure 2.22.
6. Engage feed trip lever "E". The feed will automatically trip out at a depth within .010" (.25mm)
7. Hand feed to dead stop for repeating accuracy .001" (.025mm)

- CAUTION -

Do not engage quill feed "D" over 3000 RPM.

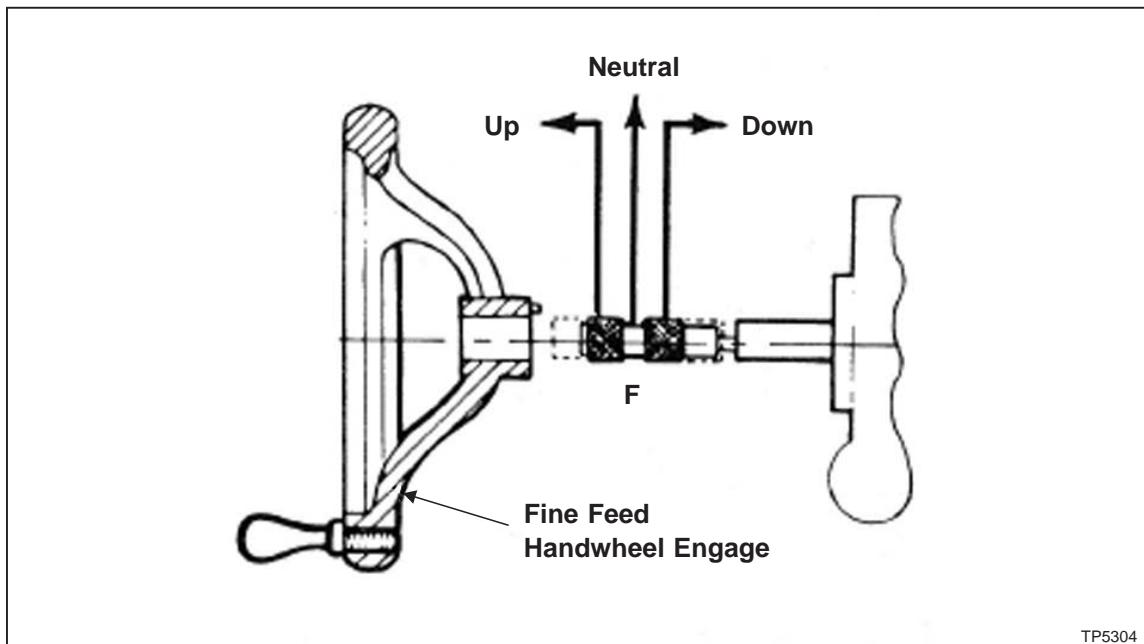


Figure 2.20 - Quill Feed
Automatic Feed Control

TP5304

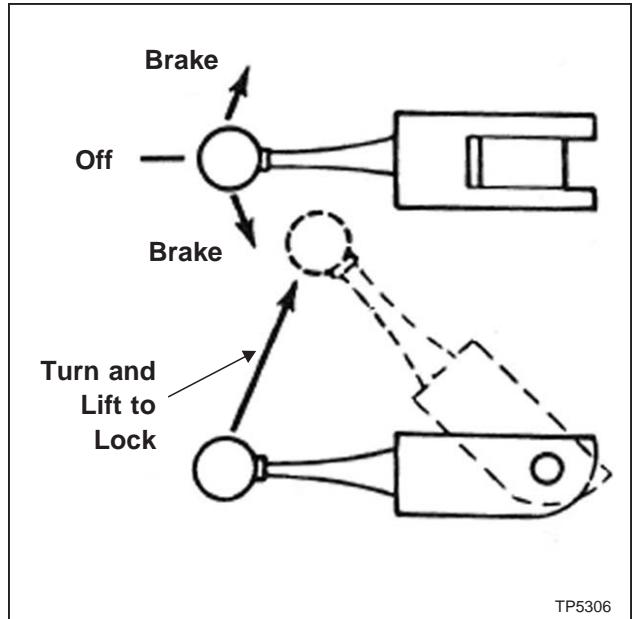
HEAD

OPERATIONAL PROCEDURES

Spindle Brake

Brake lever has capability to rotate in either direction to brake and lock.

1. CAM upwards to lock and prevent movement of spindle (see Figure 2.21).

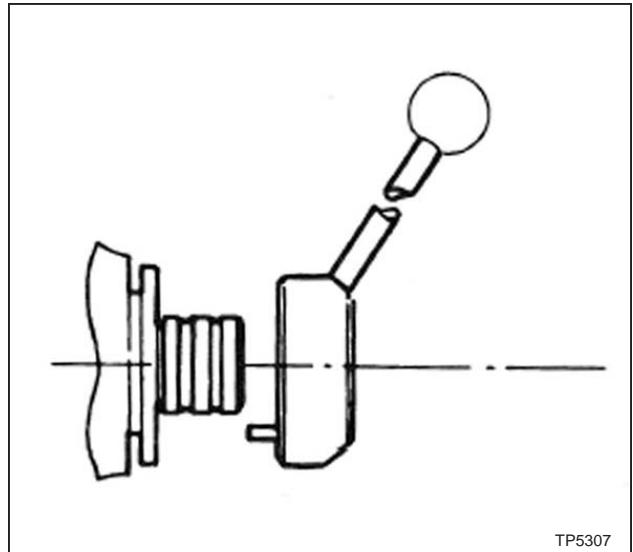


TP5306

Figure 2.21 - Spindle Brake

Quill Sensitive Hand Feed

1. Place the handle on the quill feed shaft.
2. Select the most suitable position.
3. Push home until the locating pin engages.



TP5307

Figure 2.22 - Quill Sensitive Hand Feed

MACHINE

OPERATIONAL PROCEDURES

Swivel Belt Housing

- CAUTION -

Incorrect spline alignment can be caused by unequal tightening of the locknuts 'J' causing fluctuation of the quill feed which can be felt through the sensitive feed handle. It is advised to call Hardinge service department before attempting this procedure.

1. Loosen three locknuts "J", Figure 2.23.

- WARNING -

DO NOT remove these locking nuts.

2. Swivel to required angular setting.
3. Tighten three locknuts "J" snugly before final tightening of locknuts. Run spindle to give correct spline alignment, then tighten lock-nuts securely.

Swivel Turret

1. Use wrench supplied with machine to loosen the four bolts "K", Figure 2.24.

- WARNING -

DO NOT remove these four bolts.

2. Index to the required setting.
3. Lock the four bolts "K" to 47 lb-ft.

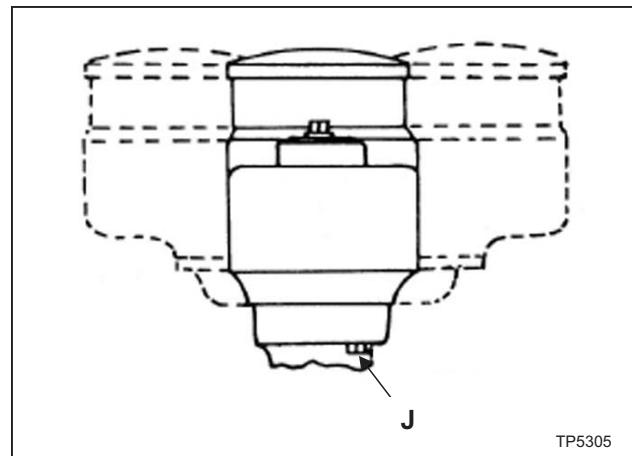


Figure 2.23 - Swivel Belt Housing

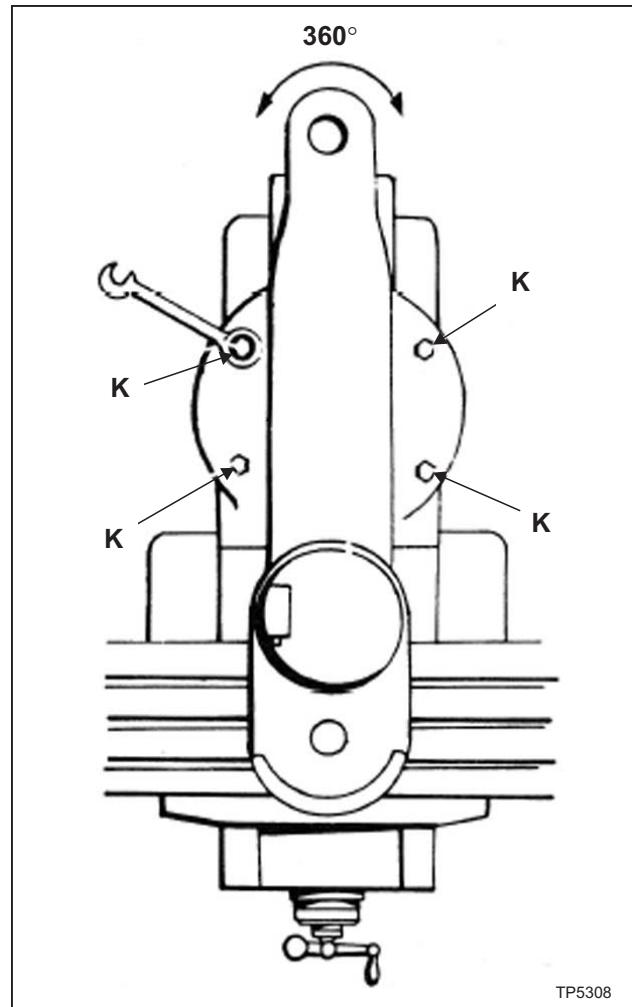


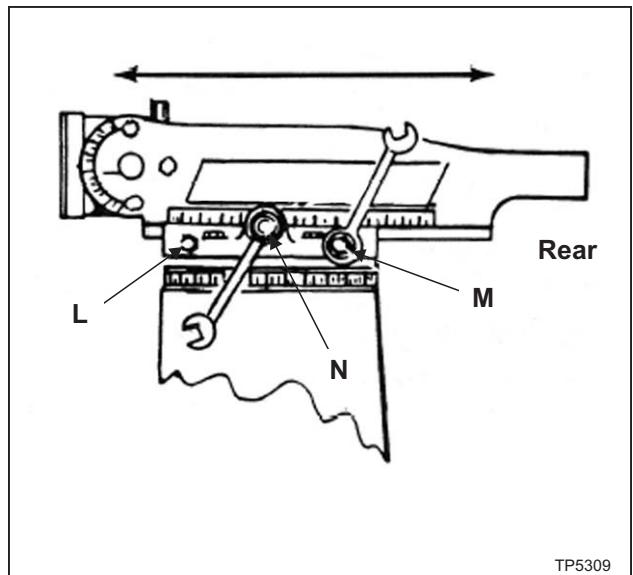
Figure 2.24 - Swivel Turret

Move Ram Slide

1. Use wrench provided with machine to loosen bolts "L" and "M", Figure 2.25.
2. Use wrench to move the slide to the desired position using bolt "N".
3. Tighten bolts "L" and "M", starting with the rear bolt.

- NOTE -

It is recommended that on heavy milling work, head should be kept as close to column as possible, where maximum rigidity is obtained.



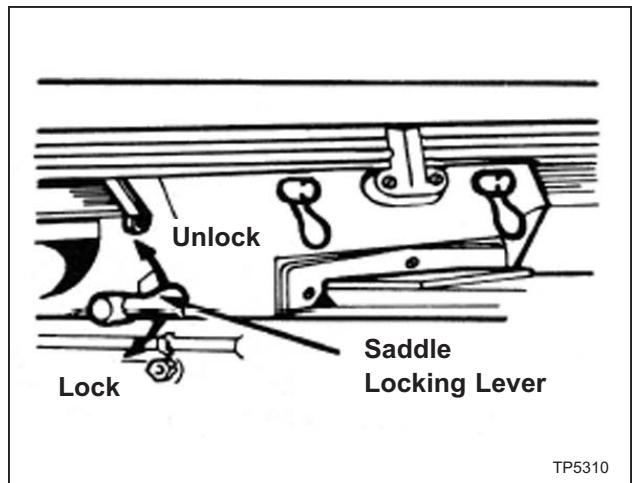
TP5309

Figure 2.25 - Ram Slide

Saddle Clamping

When milling with longitudinal table feed only, it is advisable to clamp the knee to the column (see Figure 2.27) and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left hand side of the saddle.

Excessive moisture can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.



TP5310

Figure 2.26 - Saddle Clamping

Table Clamping

The table clamp levers are located on front of saddle and should always be clamped when longitudinal movement is not required (see Figure 2.28).

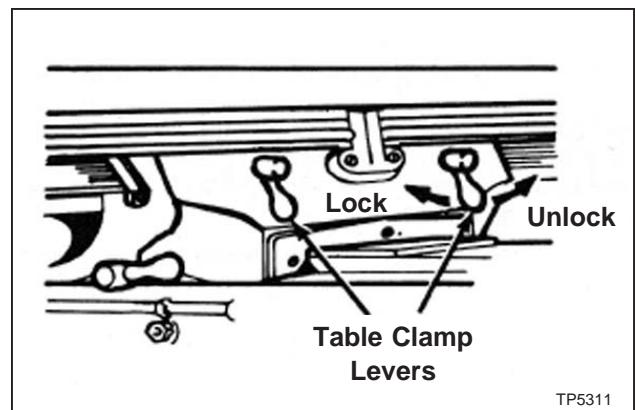


Figure 2.28 - Table Clamping

Knee Clamping

The knee clamping levers are at the left side of the knee and front of knee. Leave clamped at all times unless using knee in operation (see Figure 2.27).

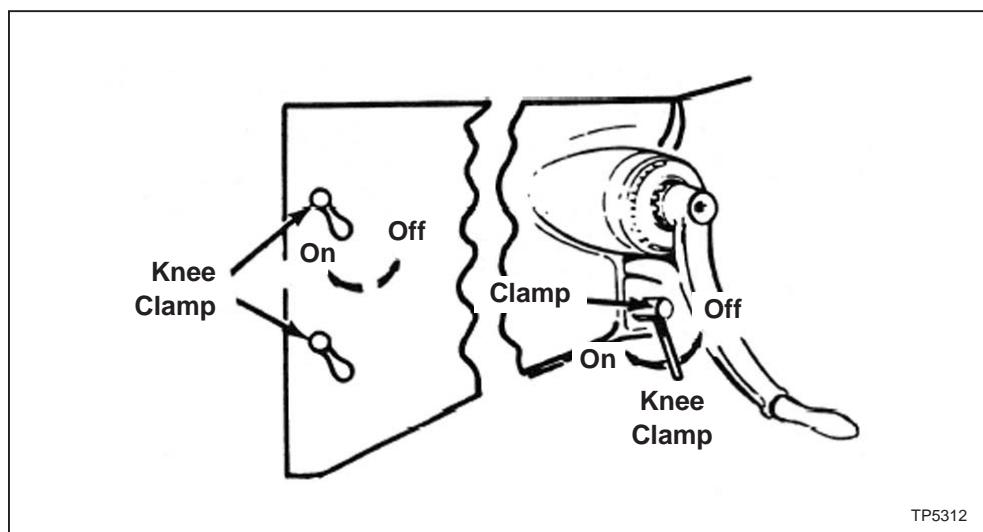


Figure 2.27 - Knee Clamping

POWER FEED CONTROLS

OPERATIONAL PROCEDURES

Variable Table Feeds

Power Feed (X-Axis) Table

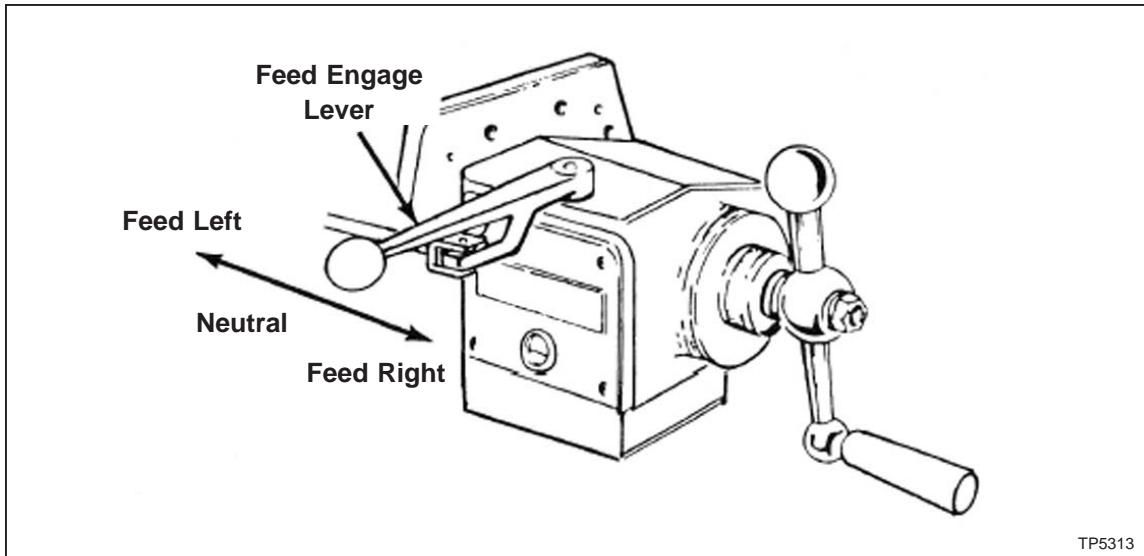


Figure 2.29 - Variable Table Feeds

Quick-Release Safety Handle

Grip handle and turn to either left or right until spring loaded plunger engages in position.

- NOTE -

Ball crank handle is a safety device. Do not tamper with this assembly.

Variable Cross Slide Feed

Cross Feed Power Feed (Y-Axis)

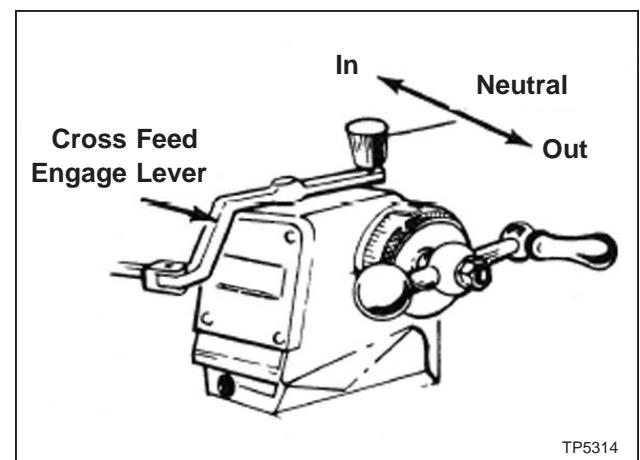


Figure 2.30 - Variable Cross Slide Feed

E-HEAD CONTROLS

OPERATIONAL PROCEDURES

Head Swivel

1. Loosen the four locknuts (see Figure 2.32). Support unit to prevent free fall.
2. Swivel to required angular setting.
3. Tighten the four locknuts first to 25 lb-ft. Then 50 lb-ft (ref. Page 1-4).

- NOTE -

Remove the screw sealing vent hole before operating machine (ref. Page 3-15).

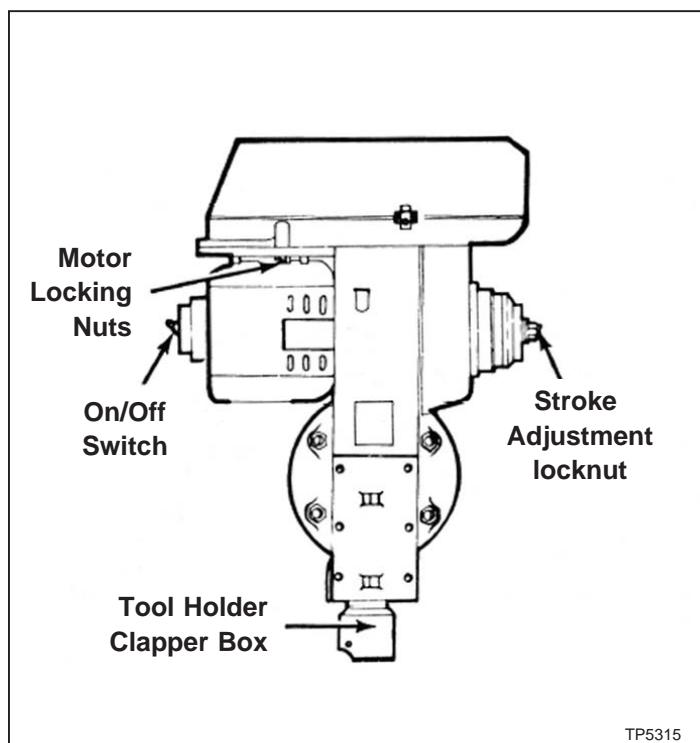


Figure 2.31 - Shaping Head
(Guard Removed for Clarity)

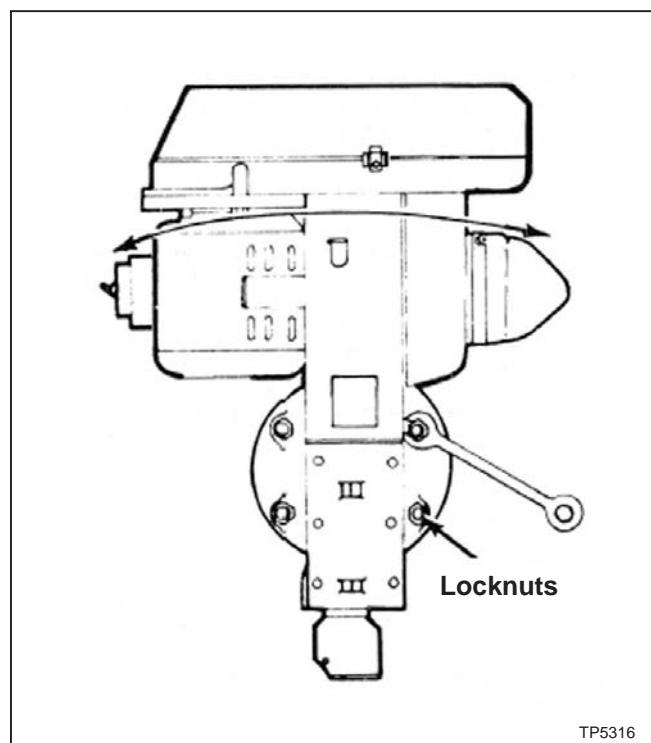


Figure 2.32 - Shaping Head
(Guard Installed)

To Change Speed

1. Disconnect power from head.
2. Loosen the two motor locknuts (see Figure 2.33).
3. Slide motor forward.
4. Position vee belt on appropriate pulleys.
5. Slide motor to rear to tension vee belt.
6. Tighten the two motor locknuts.

With 50 cycle 1425 rpm 60, 85, 120, 170, 245 350 strokes per minute.

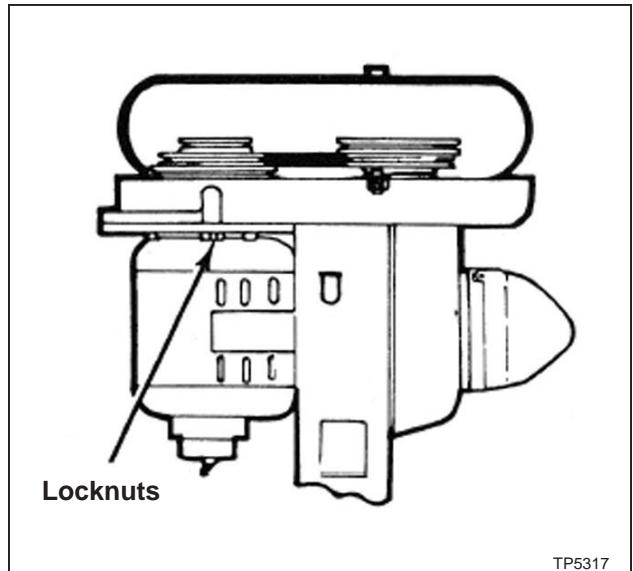


Figure 2.33 - Changing E-Head Speed

To Change Stroke

1. Loosen locknut (see Figure 2.34).
2. Turn stroke dial to required setting.
3. Press dial home to engage pin.
4. Tighten locknut.

- NOTE -

Before operating attachment, ensure locknut is tight.

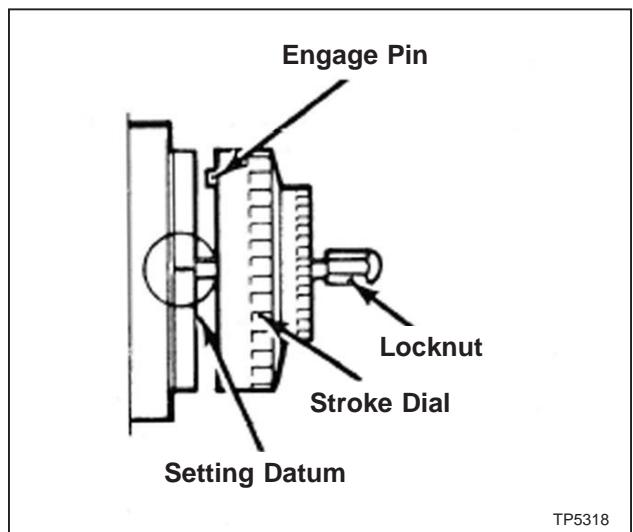


Figure 2.34 - Changing E-Head Stroke

Clapper Box

To Swivel Clapper Box:

1. Loosen the two set screws "O", Figure 2.35.
2. Rotate to the required angular setting.
3. Tighten the two set screws "O".

Tool Relief

1. Loosen set screw "P".

The tool will now have automatic relief on the return stroke.

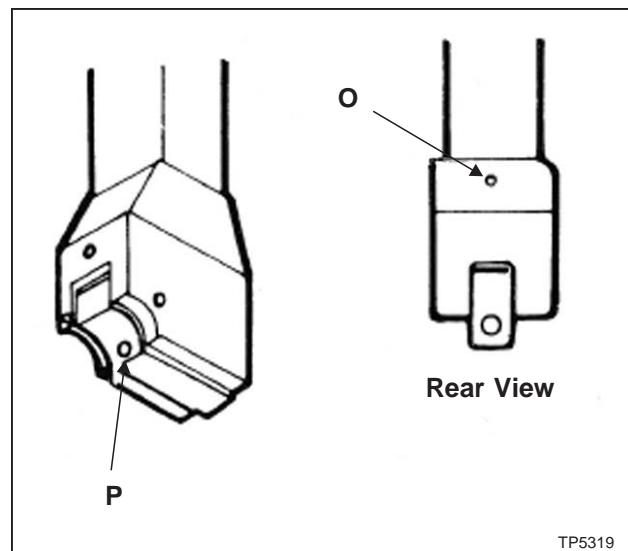


Figure 2.35 - Swiveling E-Head
Clapper Box

- NOTES -

- NOTES -

CHAPTER 3 - MAINTENANCE

2J-HEAD

MAINTENANCE PROCEDURES

Motor Removal

1. Run head to adjust to lowest speed.
2. Disconnect power.
3. Remove three screws "A" and cover "B", Figure 3.1.
4. Using the two screws "A", compress spring "C".
5. Rotate the speed changer to the highest speed.
6. Remove the reversing switch from the belt housing.
7. Remove the two securing screws "D".
8. Lift the motor and rest the case on stud "E", Figure 3.2.
9. Ease the belt over the lower drive disc and remove the motor.

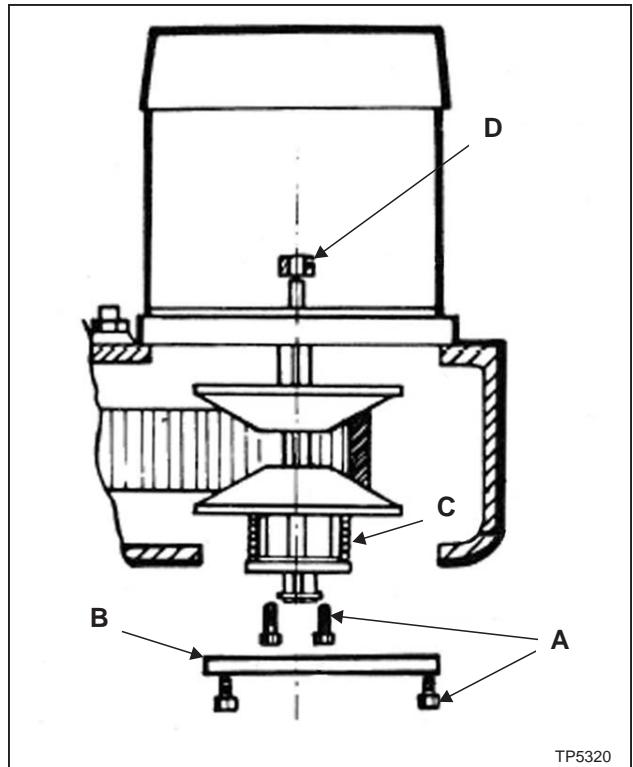


Figure 3.1 - Motor Removal
Front View

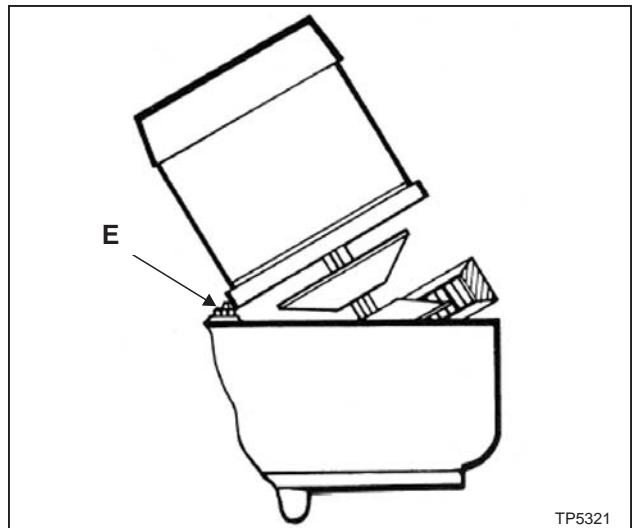
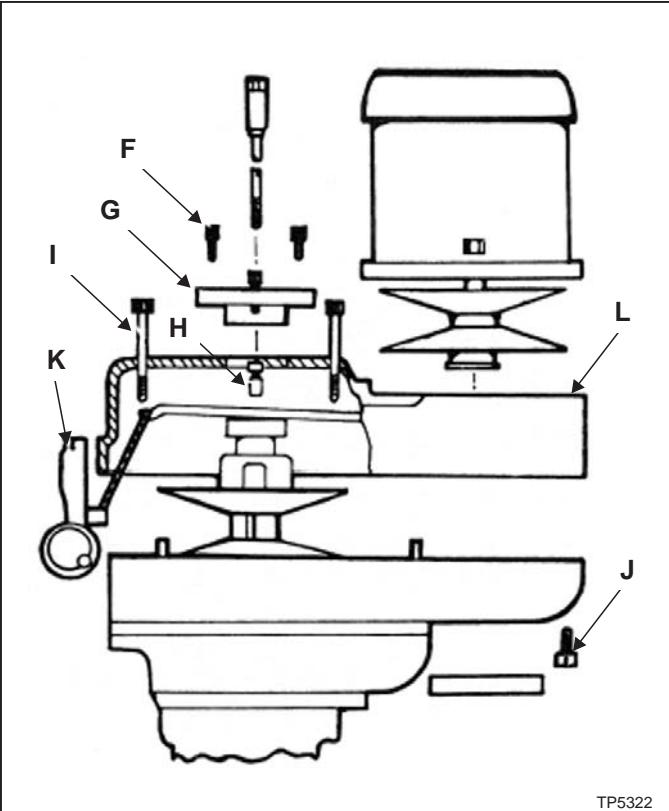


Figure 3.2 - Motor Removal
Side View

Drive Belt Replacement

1. Remove the motor as described on Page 3-1.
2. Remove the three screws "F", Figure 3.3, insert into the adjacent tapped holes and withdraw bearing housing "G".
3. Remove the two screws and the bushings "H".
4. Remove four screws "I" and one screw "J".
5. Remove four screws securing speed changer "K".
6. Remove top housing "L". Tap to clear the dowels.
7. Replace the belt.

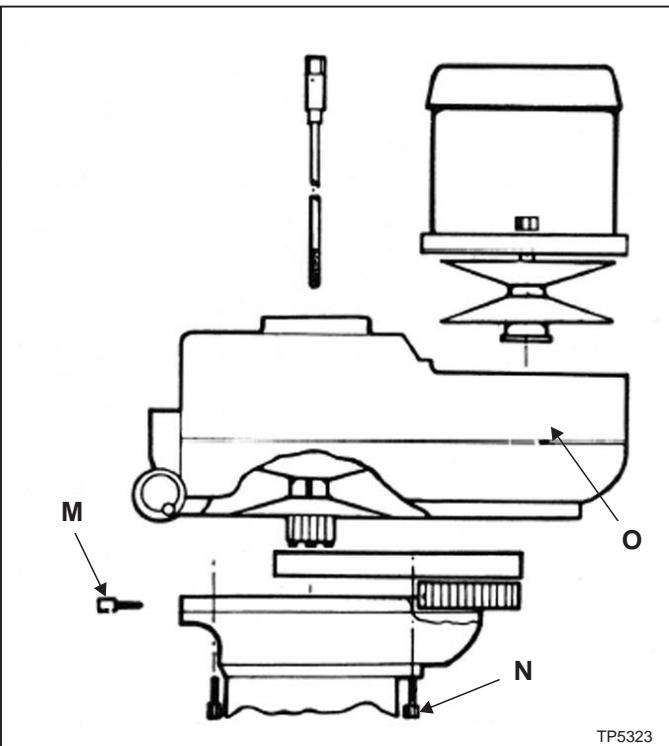


TP5322

Figure 3.3 - Drive Belt Replacement

Timing Belt Replacement

1. Remove the motor.
2. Lower the quill to full extent.
3. Remove the two lower cap screws "M", Figure 3.4, from the speed changer housing.
4. Remove the four cap screws "N".
5. Remove the top assembly "O", and tap to clear dowels
6. Replace the belt.



TP5323

Figure 3.4 - Timing Belt Replacement

Brake Shoe Replacement

1. Remove the top section.
2. Remove the two screws "P", Figure 3.5.
3. Remove the clutch hub assembly "Q".
4. Replace the brake shoes "R".
5. Remove the bearing, drive discs and circlips from the hub assembly "Q".
6. Replace the bearing and housing "S".
7. Thread hub "B" through the bearing and reassemble the discs, etc.

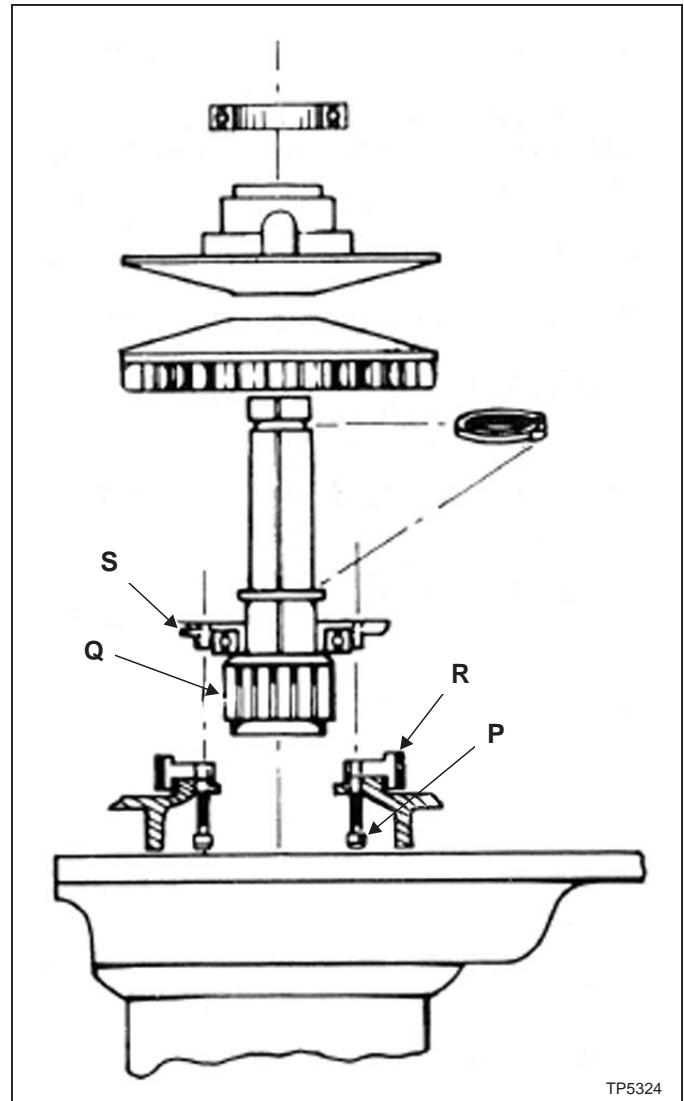


Figure 3.5 - Brake Shoe Replacement

TP5324

HEAD

MAINTENANCE PROCEDURES

Micro Feed Trip Assembly and Quill Removal

1. Remove screw "A" and ball reverse lever "B", Figure 3.6.
2. Remove retaining ring "C", screw "D" and arm "E".
3. Thread shaft "F" through micro nuts and remove.
4. Remove screw "G" and stop "H".
5. Remove quill.
6. Clean all areas, oil liberally and reassemble.
7. Check correct operation of micro feed trip assembly together with feed trip linkage as per feed tripping adjustment (see Figure 3.8).

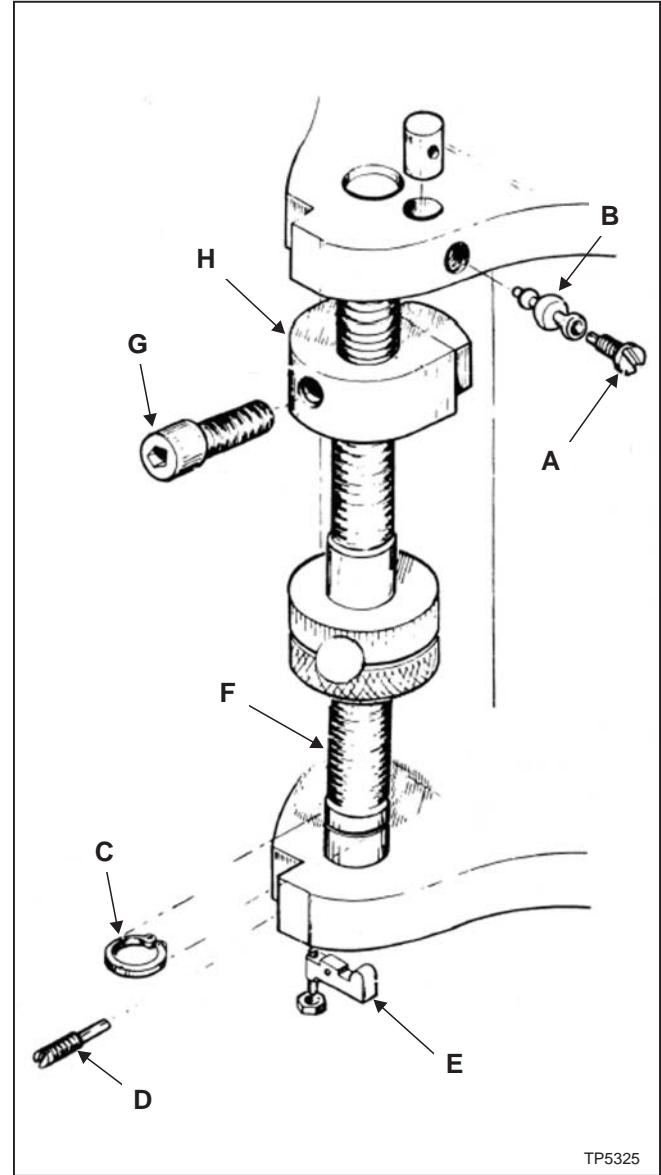


Figure 3.6 - Micro Feed Trip Assembly and Quill Removal

TP5325

Balance Spring Replacement

1. With quill in maximum up position apply quill lock.
2. Remove screw "I", hub "J", and key "K", Figure 3.7.
3. Remove screws "L", allowing housing to rotate slowly releasing spring tension.
4. Lift end of spring from pin on the pinion shaft.
5. Rotate housing "M" counter-clockwise from head casting.
6. Remove spring from housing and replace.
7. Refit spring to main housing casting. Turn housing clockwise until spring locates on pin in pinion shaft.

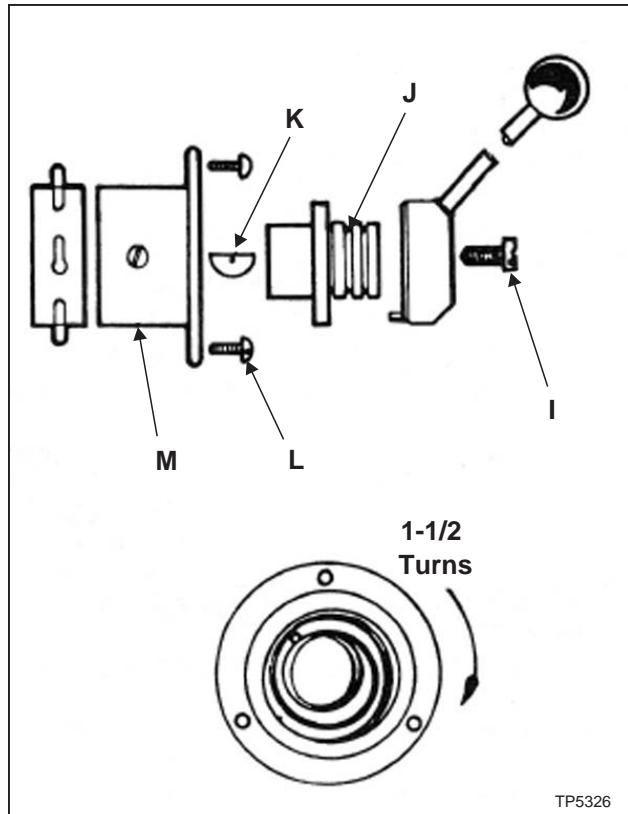


Figure 3.7 - Balance Spring Replacement

Feed Trip Adjustment

1. Release locknut "N", Figure 3.8.
2. Engage trip handle lever "P".
3. Adjust micro nuts against quill stop "O".
4. Slowly turn adjusting screw "Q" until lever "P" trips. If set to light will not be able to drill.
5. At this point secure locknut "N".
6. Check for quick action response.

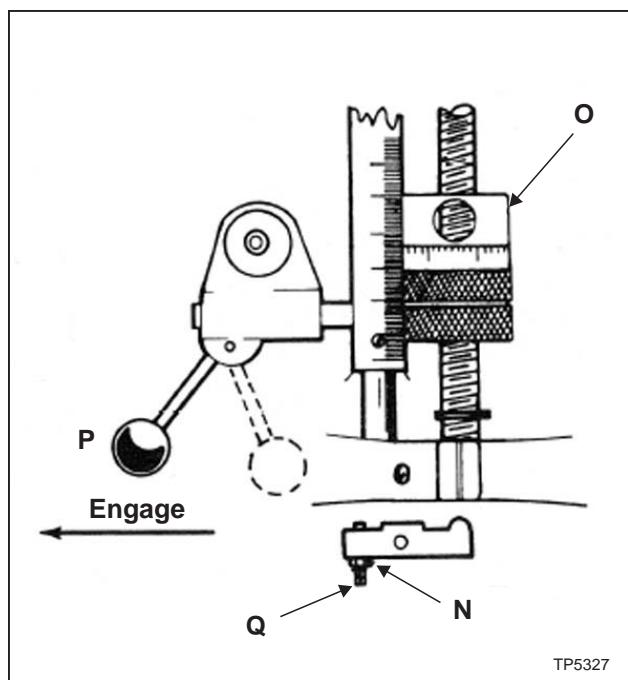


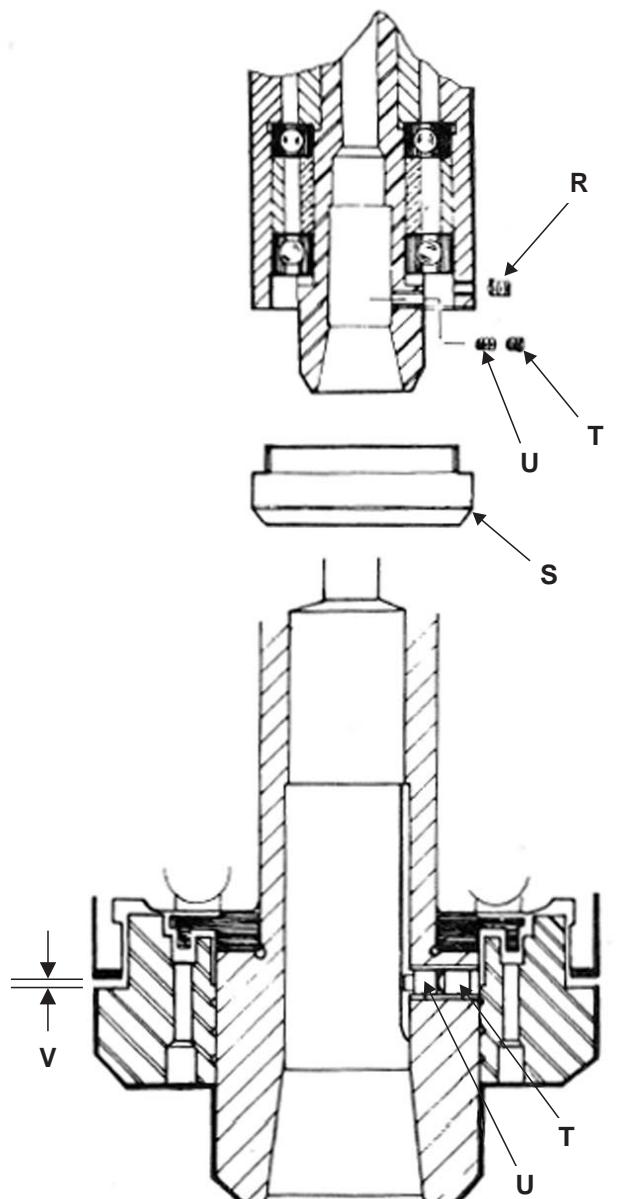
Figure 3.8 - Feed Trip Adjustment

Collet Aligning Screw Replacement

1. Use felt pen, mark reference line on quill and nose cap "S", Figure 3.9.
2. Remove set screw "R".
3. Unscrew nose cap "S".
4. Remove lock screw "T" and collet aligning screw "U".
5. Replace "U"; insert collet and check that the dog on the end of the screw does not interfere with the bottom of the guide slot.
6. Replace lock screw "T".
7. Replace nose cap "S"; check felt pen markings for correct alignment.
8. Replace set screw "R". CAUTION - DO NO OVERTIGHTEN as this will cause distortion.
9. Check gap "V" (.003", .08mm)

- CAUTION -

Do not attempt to remove nose cap before removing set screw "R". Doing so will cause serious damage.



TP5328

Figure 3.9 - Collet Aligning Screw Replacement

GIB STRIP ADJUSTMENT

MAINTENANCE PROCEDURES

Adjustment of Table Gib

The table is provided with a full length tapered gib in the saddle, and an adjusting screw on the left side (see Figure 3.10). To take up gib, tighten gib adjusting screw slightly and repeat until a slight drag is felt when moving the table by hand.

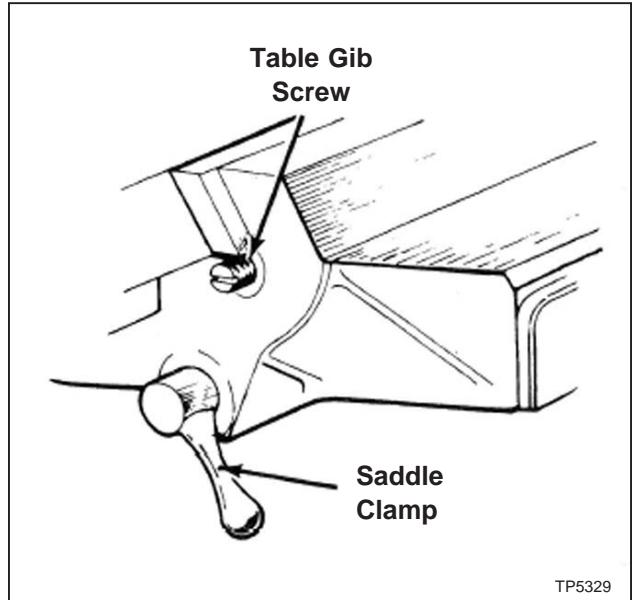


Figure 3.10 - Table Gib Adjustment

Adjustment of Saddle and Knee Gibs

A tapered gib is used for adjusting the saddle bearing on the knee. This forms a guide for the saddle. To tighten gib, the same principle as described above is used; however, the chip wiper has to be removed first (see Figure 3.11).

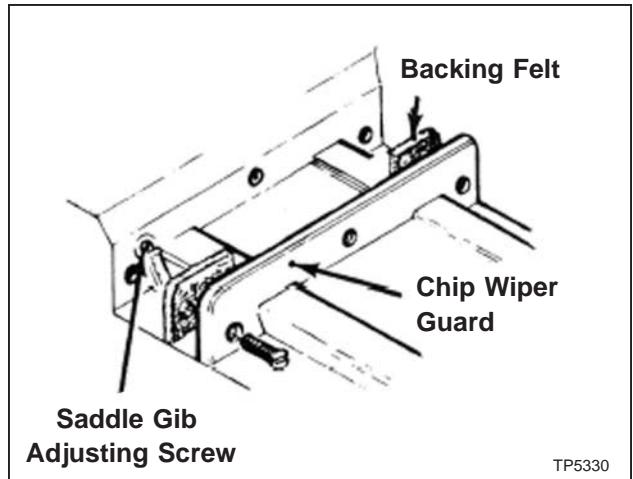


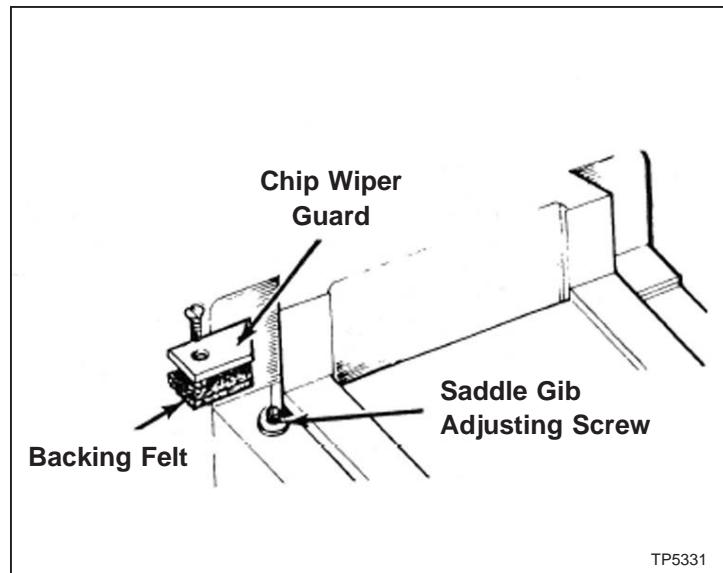
Figure 3.11 - Saddle and Knee Gibs Adjustment

Adjustment of Knee Gib

Remove chip wiper and adjust screw until smooth movement is attained (see Figure 3.12).

- NOTE -

Loose gibbs will cause loss of machine accuracy.



TP5331

Figure 3.12 - Knee Gib Adjustment

TABLE SCREW

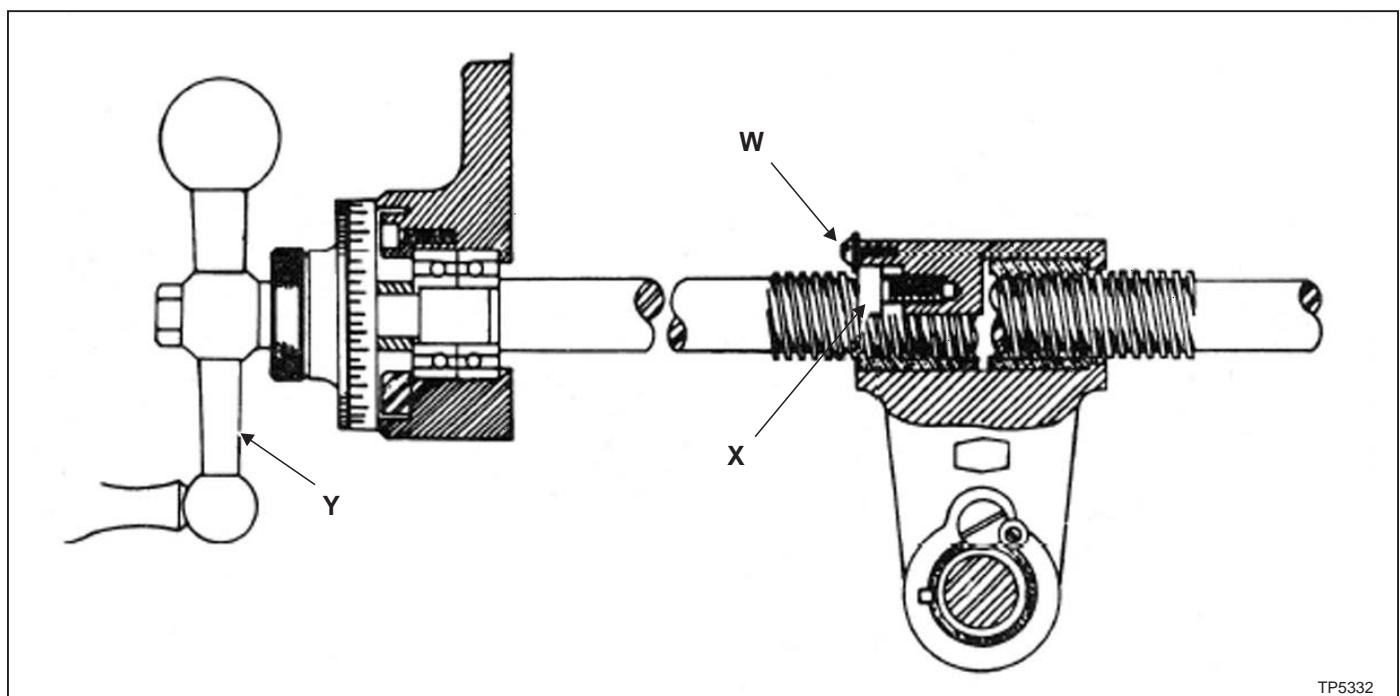
MAINTENANCE PROCEDURES

Backlash Adjustment

1. Crank the table to the lift.
2. Withdraw "W", Figure 3.13, half a turn.
3. Tighten screw "X" while slowly turning handle "Y" until minimum backlash is obtained over entire travel.
4. Finally, lock screw "W" on to "X".
5. Used only with old style nuts not new split nuts.
6. Backlash is set approximately .003" - .005" on new machines.
7. Backlash is set at .003" to .005" max.

- NOTE -

Older machines do not contain split nuts.



TP5332

Figure 3.13 - Backlash Adjustment

CROSS SCREW ASSEMBLY

MAINTENANCE PROCEDURES

Backlash Adjustment

1. Crank the saddle to mid position
2. Remove four socket head cap screws securing bracket "D", Figure 3.14, to knee.
3. Pull the saddle forward to expose screws "A" and "B" through hole in front of knee.
4. Loosen screw "A".
5. While slowly turning handle "C", tighten screw "B" until minimum backlash is obtained over entire travel.
6. Lock screw "A" onto "B".
7. Finally crank the saddle to the front of the knee and replace four screws securing bracket "D" to knee.
8. Backlash is set at .003" to .005" max.

- NOTE -

Older machines do not contain split nuts.

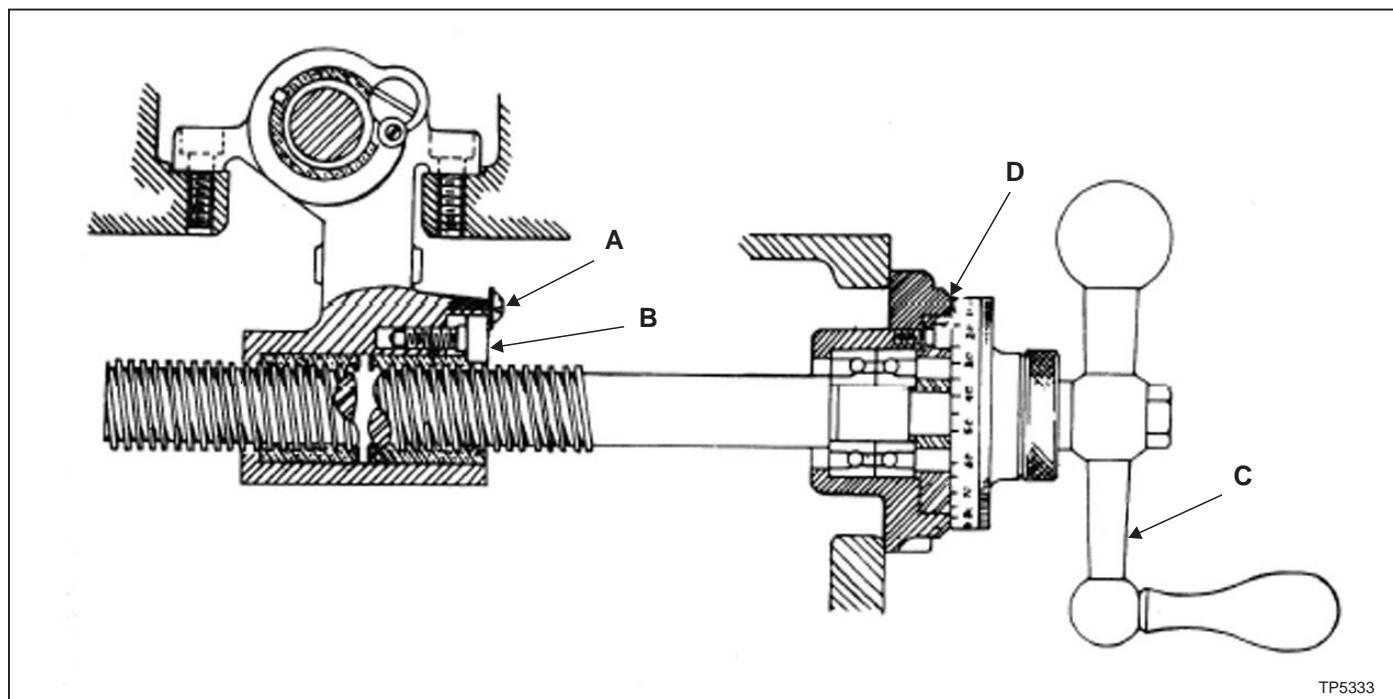


Figure 3.14 - Cross Screw Assembly

E-HEAD

MAINTENANCE PROCEDURES

- NOTE -

Add a few drops of Waylube #1180 oil or equivalent into oil cup "E", Figure 3.15, before operating unit

Changing the Gear Case Oil

Drain and refill the gear case with $\frac{1}{2}$ pint of Mobil 600W oil or equivalent after first two months of normal service and twice yearly thereafter. Oil should flow when both plugs are removed and attachment inverted in the vertical axis. Be sure to replace plugs in proper holes. Top plug "F", Figure 3.16, is drilled for vent.

- CAUTION -

Remove vent screw from plug "F" before operating machine.

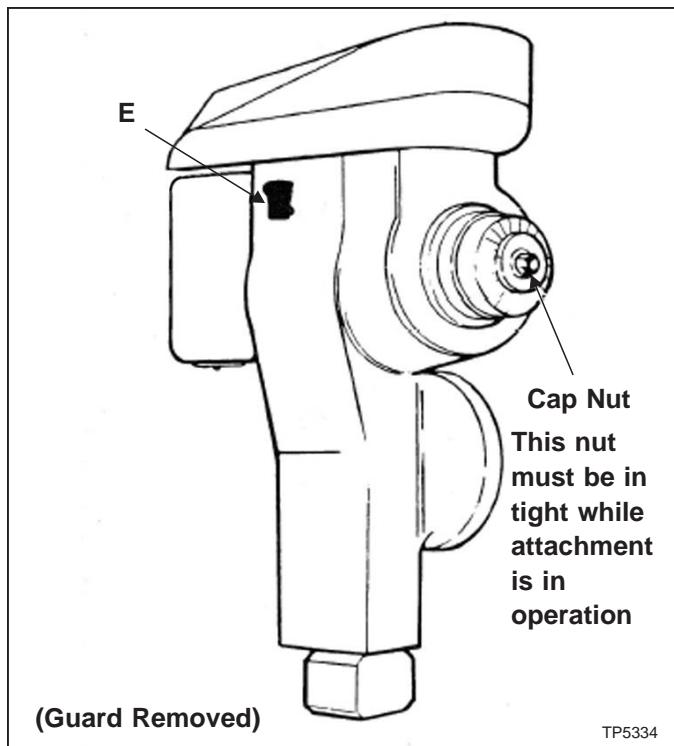


Figure 3.15 - Gear Case
(Left Side)

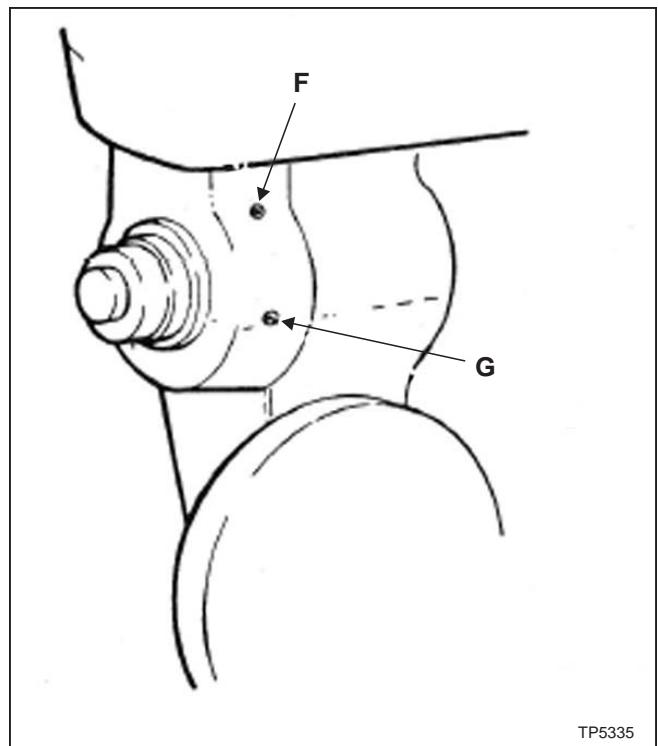


Figure 3.16 - Gear Case
(Right Side)

Removing Motor

1. Loosen the two hex nuts "H", Figure 3.17, on either side of belt housing.
2. Remove motor.

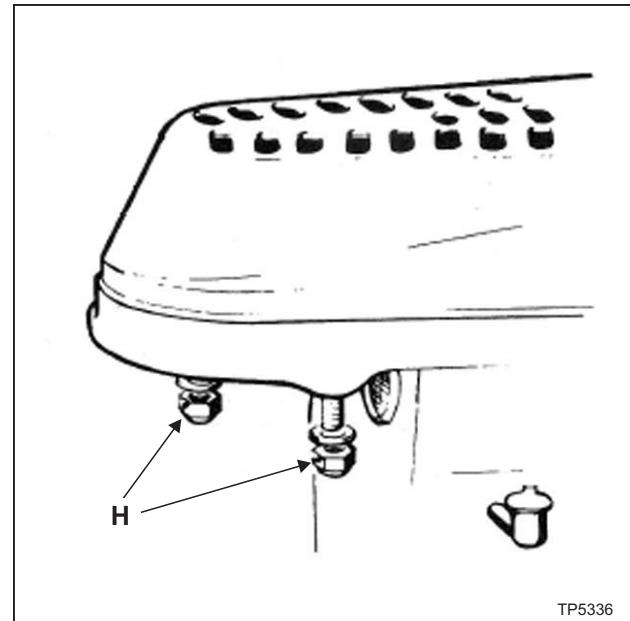


Figure 3.17 - E-Head Motor Removal

Changing Speed

1. To change speed loosen the two hex nuts "I", Figure 3.18, and move motor forward.
2. Open the belt housing cover "J" and change speed by moving belt "K", then re-tension.
3. Tighten the two hex nuts "I".

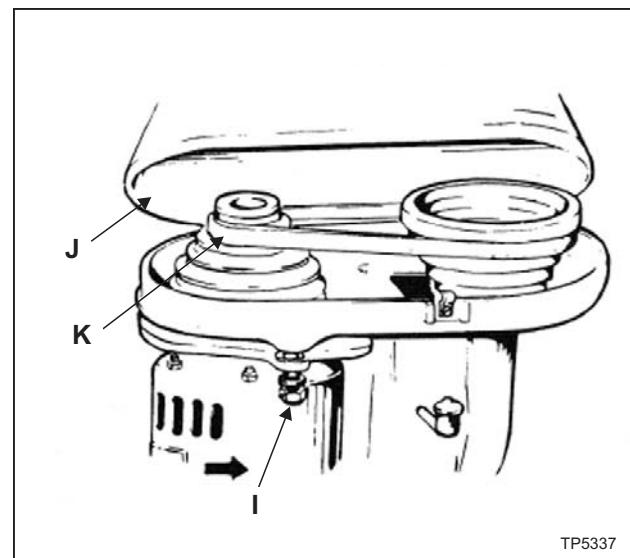


Figure 3.18 - E-Head Speed Adjustment

Removing Reduction Drive Unit or Ram

1. Loosen hex nuts "I", and remove motor.
2. Remove vee belt pulley "K", Figure 3.19.
3. Remove two screws "L", Figure 3.19, from air vent cover "M" and bring the top end of the connecting rod into view.
4. Remove two flat head screws "N" and bearing retaining washer "O".
5. Remove three socket screws "P", and split the gear housing from the ram housing.

The reduction drive unit may now be removed complete while the ram may be drawn out downwards from the clapper box end.

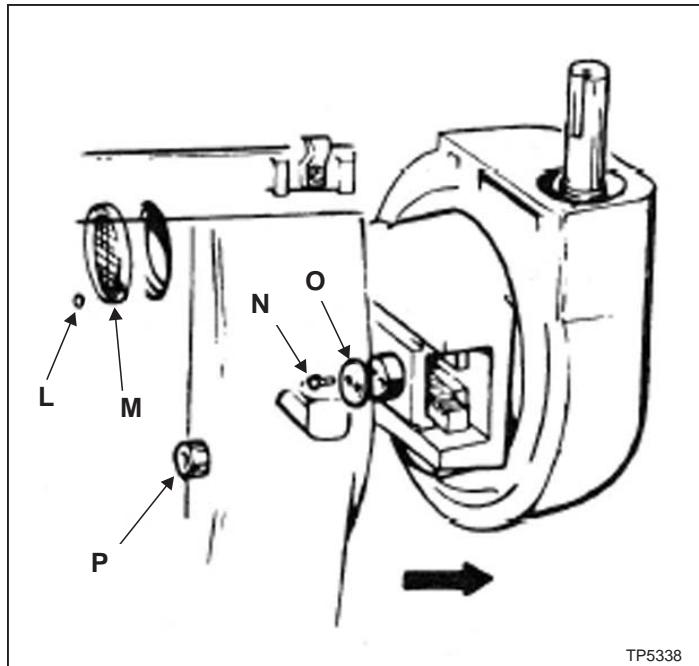
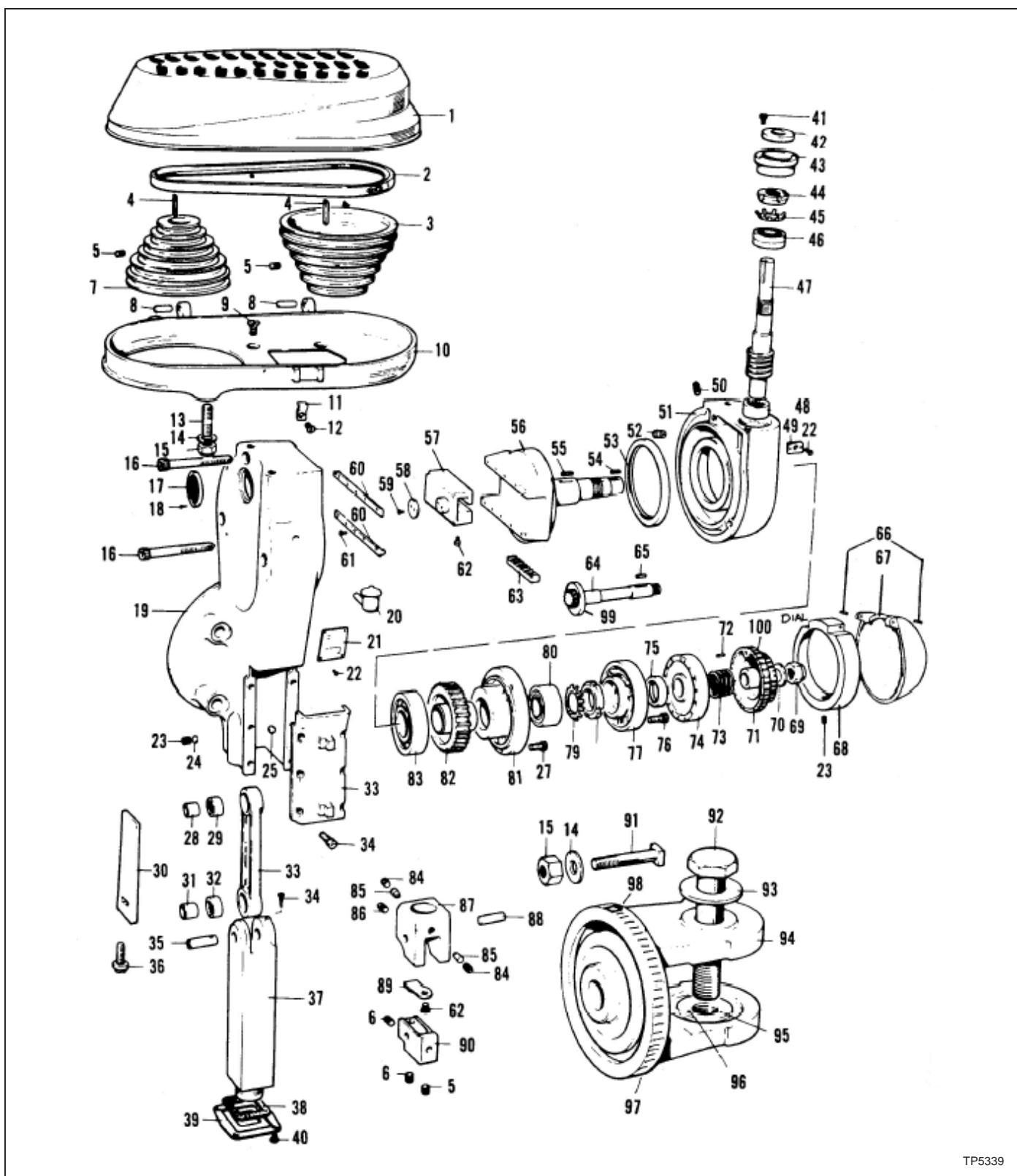


Figure 3.19 - E-Head Reduction Drive Unit Removal

- NOTES -

CHAPTER 4 - PARTS LISTINGS

E-HEAD



TP5339

Figure 4.1 - E-Head Assembly

E-HEAD

ITEM	CODE NO.	DESCRIPTION	QTY
1*	12240817	Cover, Belt Housing	1
2	11242104	Belt	1
3	12240023	Pulley Assembly	1
4	12240087	Key, .187" x 1.655"	2
5	11011240	Screw, Stainless Steel .312"-18 x .750" Cup	3
6	11011239	Screw, Stainless Steel .312"-18 x .635" Cup	2
7	12240811	Pulley, Motor	1
8	12240086	Pin	2
9	11011533	Screw, Flat Hd, .250"-20 x .500"	4
10*	12240817	Housing, Lower Belt	1
11	12240090	Clip, Belt Cover	1
12	11011590	Screw, Washer Hd Machine, #8-32 x .250"	1
13	11011850	Stud Motor Mtg Ring, .375" x 1.375"	2
14	12060122	Washer, Tee Bolt	8
15	11011720	Nut, Hex, .375"-16	4
16	11011061	Screw, Socket Hd Cap, .312"-18 x 2.750" Lg	3
17	12240079	Cover, Air Vent	1
18	11011592	Screw, Washer Hd Machine, #8-32 x .375"	2
18	12240050	Housing, Ram	1
20	11243107	Cup, Oil	1
21	11242808	Nameplate, Standard Spd	1
	11242806	Nameplate, Slow Spd	1
22	11011552	Screw, Drive, Type U, #0 x .250"	10
23	11011265	Screw, Stainless Steel, .250"-20 x .250" Lg	1
24	12200110	Plug, Brass	1
25	11242402	Plug, Felt	1
26	12240056	Cover, Ram	1
27	11011030	Screw, Socket Hd Cap, .250"-20 x .500"	9
28	11240307	Race, Inner	1
29	11240302	Bearing	1
30	12240057	Gib	1
31	11240305	Race, Inner	1
32	11240304	Bearing	1
33	12240067	Rod, Connecting	1
34	11011450	Screw, Ram Crank Pin Lock, #10-24 x 1.250"	1
35	12240072	Crank Pin, Ram	1
36	12249002	Screw, Gib	1
37	12240065	Ram	1
38	11242404	Felt, Wiper	1
39	12240078	Plate, Wiper	1
40	11011407	Screw, Round Hd, 5-40 x .250"	4
41	11011009	Screw, Cap, #10-24 x .375"	3
42	11243182	Seal, Oil	1
43	12240073	Cover, Worm Bearing	1
44	11241784	Locknut	1
45	11241932	Lockwasher	1
46	11240217	Ball Bearing	1
47	12240058	Shaft, Worm Standard Sp	1

ITEM	CODE NO.	DESCRIPTION	QTY
	12240092	Shaft, Worm Slow Spd	1
48	11240306	Bearing	1
49	11242805	Nameplate, Dial Rotating	1
50	12240091	Plug, Vent	1
51	12240051	Gear, Housing	1
52	11010782	Plug, Pipe, .125" NPT Sq Hd	1
53	11243180	Seal, Oil	1
54	12240082	Key, Sq, .125" x .230"	1
55	12240085	Key, Sq, .187" x 1.00"	1
56	12240063	Shaft, Crank	1
57	12240064	Block, Crank Pin	1
58	12240074	Washer, Bearing Retainer	1
59	11011502	Screw, Round Hd Machine, 5-40 x .250" Lg	1
60	12240070	Hold-Down, Crank Pin Block	1
61	11011515	Screw, Flat Hd, #10-24 x .375"	10
62	11011427	Screw, Round Hd, #8-32 x .375"	4
63	12240069	Rack, Pitch	1
64	12240080	Pinion, Gear and Shaft	1
65	12240084	Key, Sq, .125" x .667"	1
66	11010517	Pin, Roll,.125" x .750"	2
67	11240116	Cover, Stroke	1
68	11240115	Ring, Dial Cover	1
69	12240089	Nut, Acorn	1
70	12240088	Washer, Dial	1
71	11240055	Dial, Stroke Adjustment	1
72	12240083	Pin	1
73	11242050	Dial, Spring	1
74	12240066	Plate, Stroke Adjustment	1
75	11243181	Seal, Oil	1
76	11011033	Screw, Socket Hd Cap, .250"-20 x .750" Lg	3
77	12240068	Cover, Crank Bearing	1
78	11241786	Locknut	1
79	11241940	Lockwasher	1
80	11240216	Bearing, Ball	1
81	12240052	Cover, Gear Housing	1
82	12240071	Gear, Worm Standard Spd	1
	12240093	Gear, Worm Slow Spd	1
83	11240214	Bearing, Ball	1
84	11011270	Screw, Stainless Steel, .312"-18 x .312"	2
85	12240077	Pin, Clapper Box	2
**	12240024	Assembly, Clapper	
86	11011214	Screw, Stainless Steel, #10-24 x .250"	1
87**	12240075	Box, Clapper	1
88**	11010748	Pin	1
89**	12240062	Spring, Clapper	1
90**	12240076	Clapper	1
91	11241605	Bolt, Mounting	4
92	12060062	Bolt, Hex Lock Indexing Arm	1
93	12060063	Washer	1
94	12249000	Adapter, Back 'V'-Ram	1

ITEM	CODE NO.	DESCRIPTION	QTY
95	12060064	Locknut, Adapter	1
96	11010713	Pin, Dowel, .187" x .500"	1
97	11060603	Scale, Ram Adapter	1
98	11980426	Screw, Drive, Type U, #4 x .312"	2
99	12240081	Collar	1
100	11242804	Nameplate, Stroke Adj - Inch	1
	11242810	nameplate, Stroke Adj - Metric	1
	11011552	Screw, Drive, Type U, #0 x .250"	2
	12240135	Assembly, Motor (Not Shown)	1

*Items 1 and 10 sold as assembly only.

**Items 87, 88, 89 and 90 sold as assembly only.

2J-HEAD TOP HOUSING

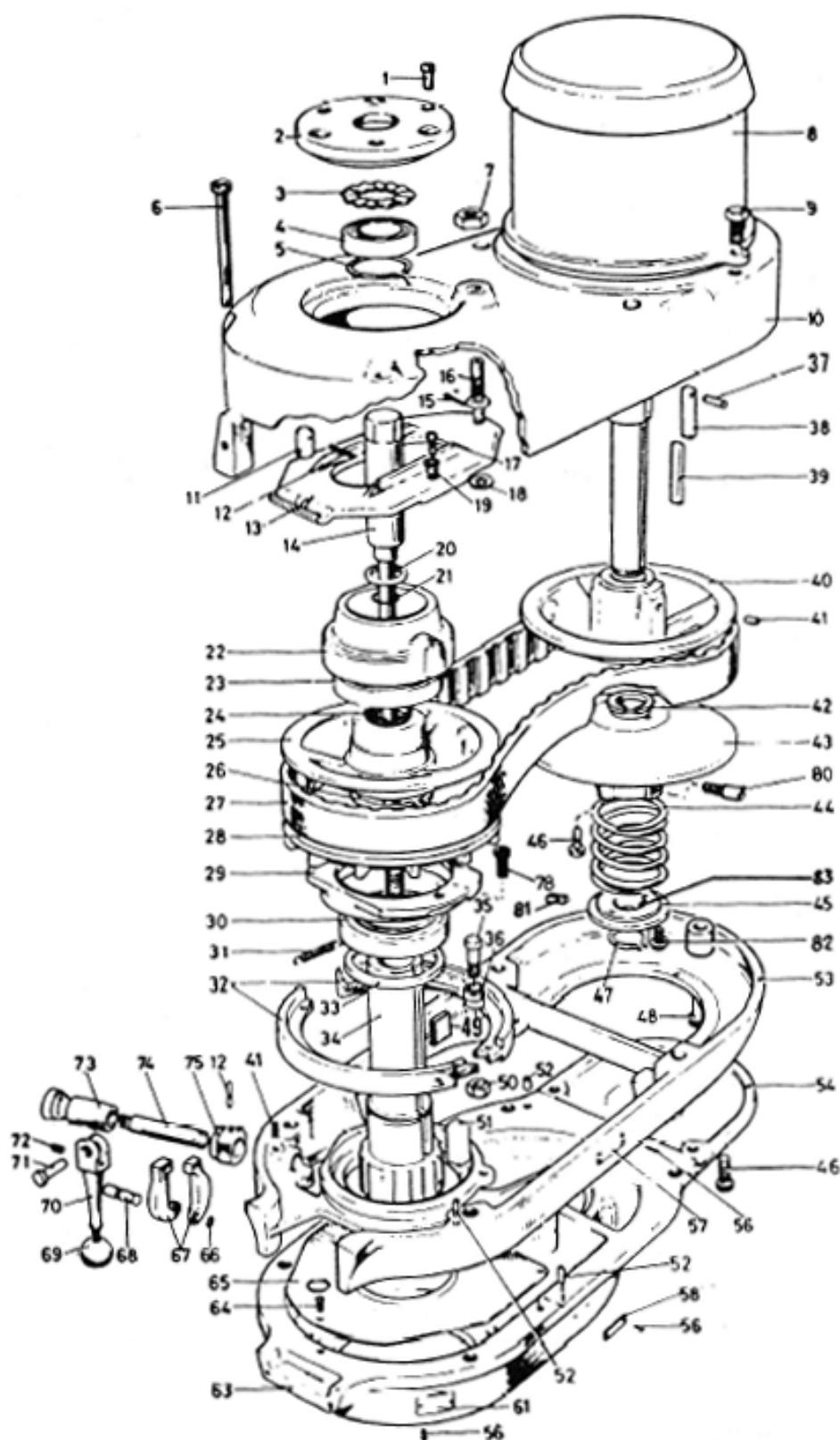


Figure 4.2 - 2J-Head Assembly

TP5340

2J-HEAD TOP HOUSING

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011033	Screw, Socket Hd Cap, .250"-20 x .750" Lg	3
2	12180094	Cap, Top Bearing	1
3	11181977	Washer, Wave Spring	1
4	11180252	Bearing, Ball, Fafnir #9107 NNP	1
5	11180848	Ring, Snap, #5100-137	1
6	11011069	Screw, Socket Hd Cap, .312"-18 x 6.00"	2
7	11011745	Nut, UNC Hex Jam, .375"-16	1
8	11550001	Motor, 2 HP, Multi Volt, 50/60	1
9	11011148	Screw, Hex Hd Cap, .375"-16 x 1.00"	2
10**	12180051	Housing, Upper Belt (see 12183923)	1
11	12180066	Stud, Speed Change Chain	1
12	11010535	Pin, Roll, .156"Ø x 1.00" Lg	2
13	11180058	Plate, Speed Change	1
14	12183920	Assembly, Drawbar	1
15	11010606	Pin, Cotter, .093"Ø x .750"	1
16	12180074	Stud, Speed Change Plate Pivot	1
17	11011020	Screw, Socket Hd Cap, #10-32 x .750"	2
18	11180095	Washer	1
19	12180089	Sleeve, Pivot	2
20	12180093	Washer, Drawbar	1
21	11180915	"O"-Ring, Parker # 2-14	1
22	12180056	Housing, Spindle Pulley Bearing Sliding	1
23	11170262	Bearing, #RM9110NPP	1
24	11182124	Insert, Plastic	2
25	12183934	Varidisc, Adjustable Drive A	1
26	11180855	Ring, Retaining, #5102-156	1
27	11182120	Belt, Varispeed	1
28	12180082	Varidisc, Stationary Drive	1
29	12180043	Cap, Brake and Bearing	1
30	11170262	Bearing, #RM9110NPP	1
31	11182081	Spring, Brake	2
32	12180073	Shoes, Brake	2
33	12180078	Spacer, Spindle Pulley	1
34	12180042	Assembly, Spindle Pulley Hub	1
35	11011138	Screw, Hex Hd Cap, .250"-20 x .750"	1
36	12180071	Sleeve, Brake Shoe Pivot Sleeve	1
37	11010513	Pin, Roll, .125" x .437"	1
38	12550007	Key, Drive, Fixed Varidisc	1
39	12550004	Assembly, Key, Drive, Varidisc	1
40	12550006	Varidisc, Stationary Motor	1
41	11011287	Screw, Stainless Steel, .250"-20 x .250"	2
42*	11182126	Insert, Plastic Replaceable Type	2
43	12550029	Assembly, Varidisc and Spring	1
44	11182083	Spring, Varidisc Motor Shaft	1
45	11550003	Collar, Adjustable Varidisc Spring	1
46	11011022	Screw, Socket Hd Cap, #10-24 x 1.00"	3
47	11150843	Ring, Snap	1
48	11011052	Screw, Socket Hd Cap, .132"-18 x .750" Lg	1

ITEM	CODE NO.	DESCRIPTION	QTY
49	11182122	Key, Plastic	1
50	11011707	Nut, Hex Jam, .250"-20	1
51	12180084	Key	1
52	12180107	Pin, Taper, #4 x 1.00"	4
53**	12180052	Base, Belt Housing (see 12183923)	1
54	12180088	Cover, Motor Pulley	1
56	11011552	Screw, Drive, Type U, #0 x .250"	4
58	11182893	Nameplate, Hi-Low Range	1
61	11182894	Nameplate, Quill Feed	1
63	12180053	Housing, Gear	1
64	11011443	Screw, Round Hd Machine, #10-24 x .375"	3
65	11185030	Plate, Gear Housing	1
66	11180818	Ring, Snap, #5100-25	1
67	11182306	Finger, Brake Operating	2
68	12180083	Stud, Brake Finger Pivot	1
69	11192151	Knob, Bakelite, .250"-20	1
70	12190133	Handle, Brake	1
71	12190134	Pin, Brake Lock	1
72	11011260	Screw, Stainless Steel, #10-32 UNF x .250"	1
73	12180104	Sleeve, Brake Lock Shaft	1
74	28025521	Shaft, Brake Lock	1
75	12180069	Cam, Brake Lock	1
78	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	1
80	11011019	Screw, Flat Hd Cap, #10-32 x .500"	1
82	11011006	Screw, Socket Hd Cap, #8-32 x .250"	1
83	12550008	Key	1

* Non-replaceable turcite bushing must be purchased as part of varidisc assembly #12550029.

**Items 10 and 53 sold as assembly only.

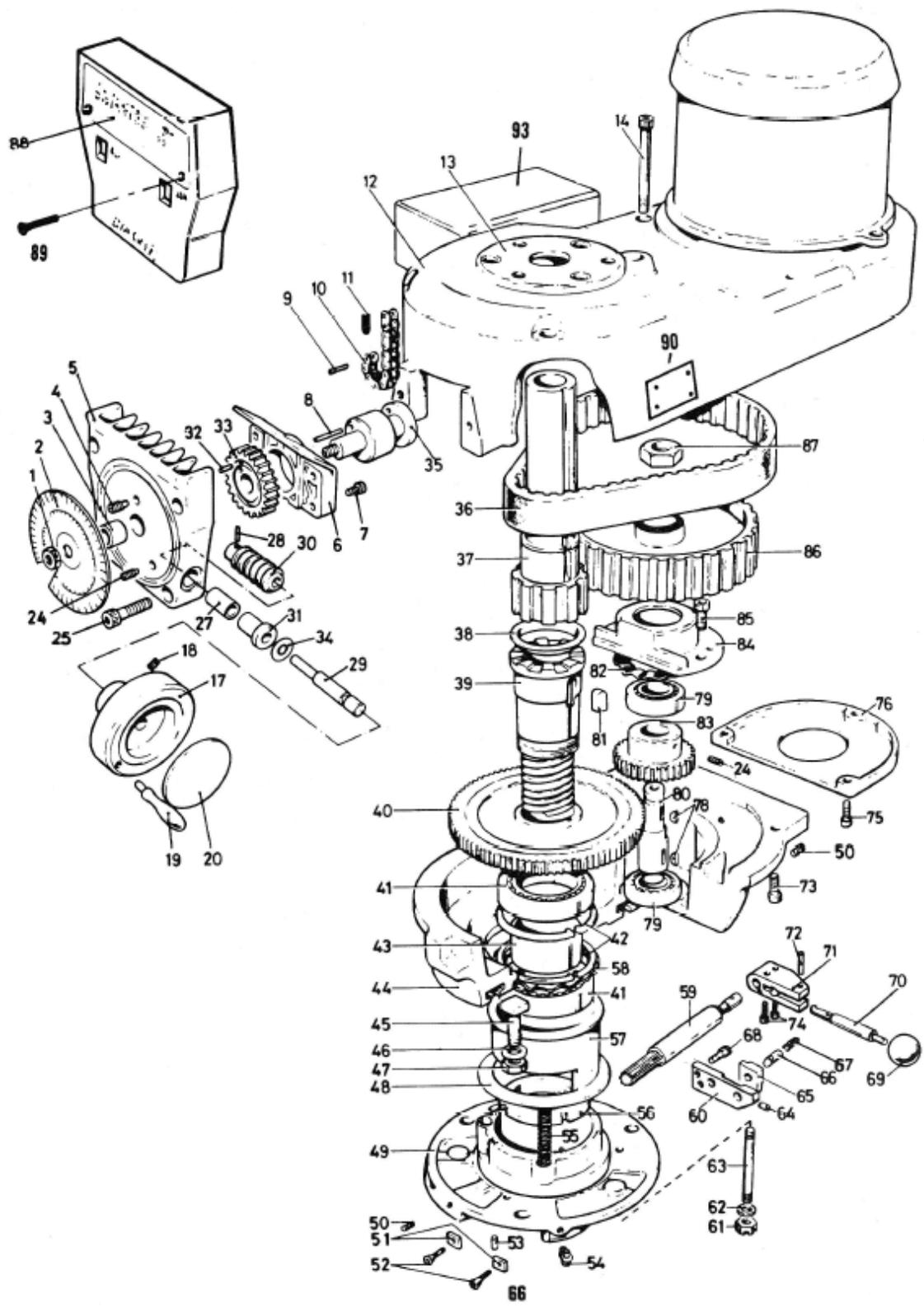
- NOTE -

IMPORTANT - for 1-1/2 HP, substitute the following parts.

ITEM	CODE NO.	DESCRIPTION	QTY
34	12182004	Assembly, Spindle Pulley Hub	1
37	11010513	Pin, Roll, .125" x .437"	1
38	12180102	Key, Pulley	1
39	11182121	Key, Plastic	1
40	12180080	Varidisc, Stationary Motor	1
42*	11182123	Insert, Plastic	2
43	12180165	Assembly, Varidisc and Spring	1
45	11182305	Collar, Adjustable Varidisc Spring	1
47	11180860	Ring, Snap	1

* Non-replaceable turcite bushing must be purchased as part of varidisc assembly #12180165.

2J-HEAD BACK GEAR



TP5341

FIGURE 4.3 - 2J-Head Back Gear Assembly

2J-HEAD BACK GEAR

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011710	Nut, Hex, .312"	1
2	11180133	Dial, Spindle Speed	1
3	11183646	Bushing, Bronze, .502" x .628" x 5.00"	1
4	11011380	Screw, Full Dog Socket Hd Set, .250"-20 x .500"	1
5	12180055	Housing, Speed Changer	1
6	12182003	Block, Plastic Bearing	1
7	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	4
8	11010516	Pin, Roll, .125" x .625" Lg	1
9	11010520	Pin, Roll, .125"Ø x 1.00" Lg	1
10	11183720	Chain, Speed Changer, Morse #35	1
11	12180066	Stud, Speed Change Chain	1
12	12180051	Housing, Belt (see 12183923)	1
13	12180094	Cap, Top Bearing	1
14	11011065	Screw, Socket Hd Cap, .312"-18 x 4.00"	1
17	12182001	Hub, Speed Change	1
18	11181233	Screw, Socket Hd Set, .250"-UNC x .375"	2
19	11182178	Handle, Machine, #3302	1
20	11182892	Plate, Caution	1
24	11011287	Screw, Stainless Steel, .250"-20 x .250"	2
25	11011037	Screw, Socket Hd Cap, .250"-20 x 1.250"	4
27	11183645	Bushing, Oilite	1
28	28300619	Pin, Roll, 2.5mm x 12mm Lg	1
29	28025716	Shaft, Speed Changer	1
30	28007307	Gear, Boston Worm	1
31	11180214	Bushing, Oilite Flanged, FB	1
32	11010539	Pin, Roll, .187"Ø x .375" Lg	1
33	12180090	Gear, Speed Changer Spur	1
34	11181923	Washer, Wavy Spring	1
35	12180065	Drum, Speed Change Chain	1
36	11552106	Belt, Timing	1
37*	12180042	Hub, Spindle Pulley	1
38*	12180064	Sleeve, Timing Pulley Clutch	1
39	12180059	Hub, Splined Gear	1
40**	12180062	Gear, Spindle Bull (see 12183933)	1
41	11180254	Bearing, Ball, Fafnir #RM9308NPP	2
42	11180803	Ring, Snap, #5000-244	2
43	12180063	Spacer, Bull Gear Bearing	1
44	12180053	Housing, Gear	1
45	11181650	Bolt, Tee	3
46	11181906	Washer, Flat, .469" ID x .938" OD x .063"	3
47	11011750	Nut, HDN Finished Hex Jam, .438"-14	3
48	11181986	Washer, Ball Bearing Gear Sleeve	3
49***	12183924	Bracket, Fixed Clutch	1
50	11011246	Screw, Socket Hd Set, .312"-18 x .312"	2
51	28025615	Guide	2
52	28025671	Screw, Flat Socket Hd Cap, #10-32 x .375"	2
53	11010511	Pin, Roll, .125" x .250" Lg	1
54	11183104	Cup, Oil, Gits #1202 Style L	1

ITEM	CODE NO.	DESCRIPTION	QTY
55	11182071	Spring, Compression, .375" OD x .300" Lg	3
56	11181794	Locknut, Bearing, #N-08	1
57***	12183924	Sleeve, Bearing	1
58	11181977	Washer, Wave Spring	1
59	12180067	Pinion, Bull Gear Shift	1
60	12180161	Plate, Hi-Low Detent	1
61	11181732	Nut, Hex, .375"-16	3
62	11151913	Lockwasher, .375"	3
63	12180085	Stud	3
66	12180100	Plunger, Hi-Low Detent	1
67	11182072	Spring, .750" x .032 x .563"	1
68	11011017	Screw, Socket Hd Cap, #10-32 x .500" Lg	2
69	11192151	Knob, Bakelite, .250"-20	1
70	12180099	Crank, Hi-Low Shift	1
71	12180096	Block, Hi-Low Pinion	1
72	11010516	Pin, Roll, .125" x .625" Lg	1
73	11011052	Screw, Socket Hd Cap, .132"-18 x .750" Lg	4
74	11181007	Screw, Socket Hd Cap, #8-32 x .625"	2
75	11011022	Screw, Socket Hd Cap, #10-24 x 1.00"	1
76	12180088	Cover, Motor Pulley	1
78	11013079	Key, Woodruff #9	2
79	11180235	Bearing, #203NPP-C8	2
80	12180075	Shaft, Bull Gear Pinion Counter	1
81	12180103	Key, Sq, .312" x .540"	1
82	11181975	Washer, Wave Spring	1
83**	12180077	Pinion, Bull Gear (see 12183933)	1
84	12180076	Cap, Bull Gear Pinion Bearing	1
85	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	2
86	12550016	Pulley, Timing Belt	1
87	11191738	Nut, Hex Jam, .625"-18	1
88	11182912	Nameplate, Speed Change	1
89	11011139	Screw, Flat Hd Machine, #8-32 x .750"	2
90	11182897	Plate, Lubrication	1
93	11598117	Assembly, Reversing Switch	1

*Items 37 and 38 sold as assembly only.

**Items 40 and 83 sold as assembly only.

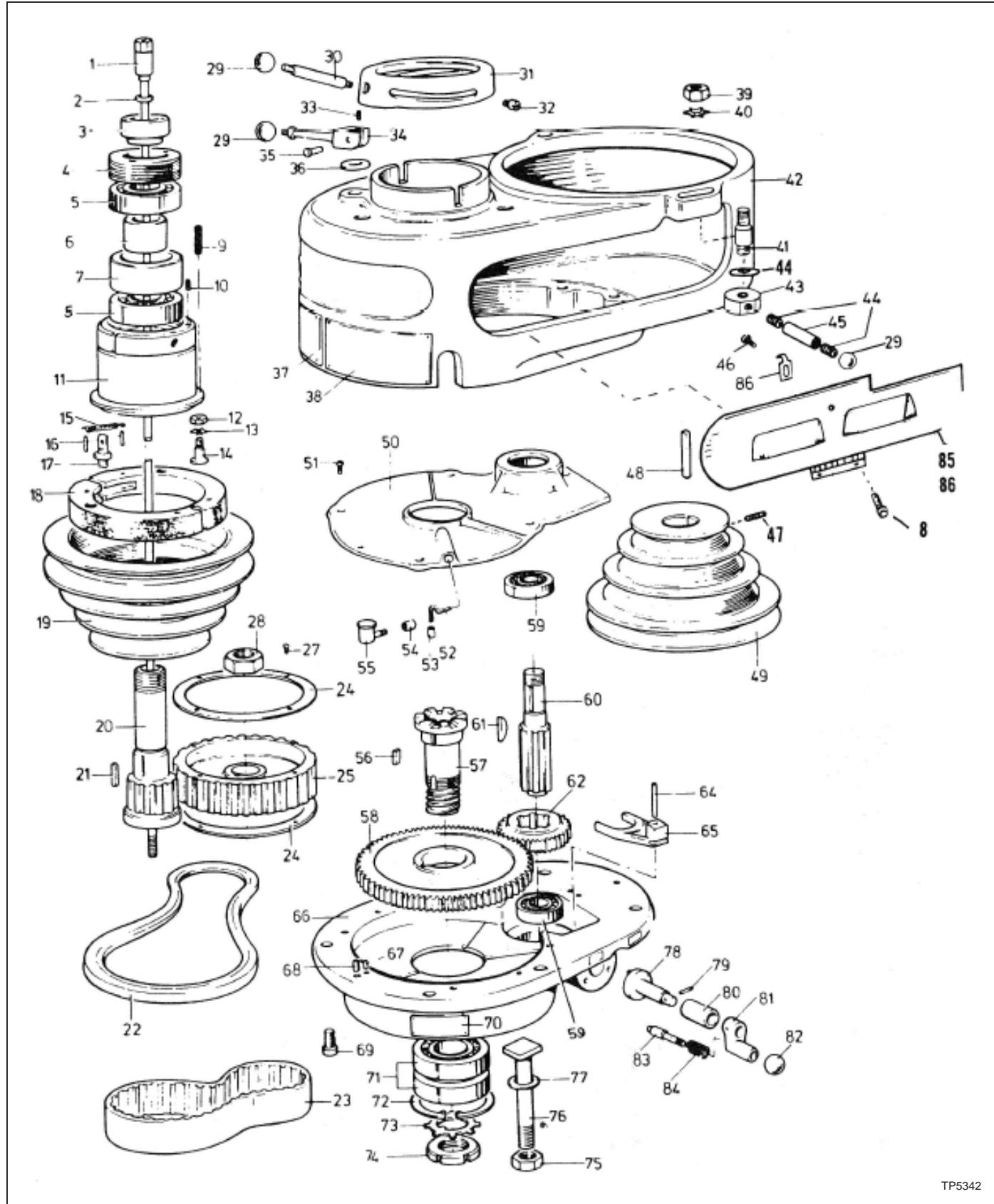
***Items 49 and 57 sold as assembly only.

- NOTE -

IMPORTANT - For 1-1/2 HP, substitute the following parts.

ITEM	CODE NO.	DESCRIPTION	QTY
36	11182106	Belt, Timing	1
37	12182004	Hub, Spindle Pulley	1
86	12180091	Pulley, Timing Belt	1

J-HEAD TOP HOUSING



TP5342

Figure 4.4 - J-Head Top Housing Assembly

J-HEAD TOP HOUSING

ITEM	CODE NO.	DESCRIPTION	QTY
1	12193502	Assembly, Drawbar	1
2	12180093	Washer, Drawbar	1
3	12190126	Locknut, Upper Bearing	1
4	12190125	Locknut, Bearing Sleeve	1
5	11190232	Bearing, #RM207 KDD-DB	2
6*	12193506	Spacer, Upper Bearing Small	1
7*		Spacer, Upper Bearing Large	1
8	11651199	Screw, Button Hd Cap, #10-32 x .500"	4
9	11192032	Spring, Compression	4
10	11011255	Screw, Socket Hd Set, #6-32-NC x .250" KP	1
11	12193512	Sleeve, Spindle Pulley Bearing	1
12	11011743	Nut, Jam, .312"-18	3
13	11191965	Lockwasher, External, .312"	3
14	12190130	Screw, Brake Ring	3
15	11192084	Spring, Extension	2
16	11010507	Pin, Roll, .093" x .625" Lg	4
17	12190131	Stud, Brake Shoe	1
18	11193620	Set, Brake Shoe (see 12193477)	1
19	12190055	Pulley, Spindle	1
20	12190118	Hub, Spindle Pulley (see 12193478)	1
21	12190122	Key, Spindle Pulley Sq, .250" x .820"	1
22	11192101	Belt, Vee	1
23	11182106	Belt, Timing	1
24	12190058	Flange, Timing Belt Pulley	2
25	12190057	Pulley, Timing Belt	1
27	11011506	Screw, Flat Hd, #6-32 x .375" Lg	8
28	11191738	Nut, Hex Jam, .625"-18	1
29	11192151	Knob, Bakelite, .250"-20	4
30	12190128	Lever, Spindle Clutch	1
31	12190127	Ring, Cam	1
32	12190129	Pin, Spindle Clutch Cam Ring	2
33	11011260	Screw, Stainless Steel, #10-32 UNF x .250"	1
34	12190133	Handle, Brake	1
35	12190134	Pin, Brake Lock	1
36	12190132	Washer, Brake Lock	1
37	11192810	Nameplate, Spindle Speed	1
38	11192835	Nameplate, J-Head Operating Instruction	1
39	11011713	Nut, Hex, .375"-24	2
40	11191922	Lockwasher, .375"	2
41	12190173	Stud, Motor Mounting	2
42	12190054	Housing, Belt	1
43	12190171	Locknut, Motor	2
44	12190174	Washer, Motor Mounting Stud	2
45	12190172	Motor Locknut Handle	2
47**	11011240	Screw, Set, .312"-18 x .750"	1
48**	12430068	Key, Square, .187" x 1.500"	1
49**	12190056	Pulley, Motor	1

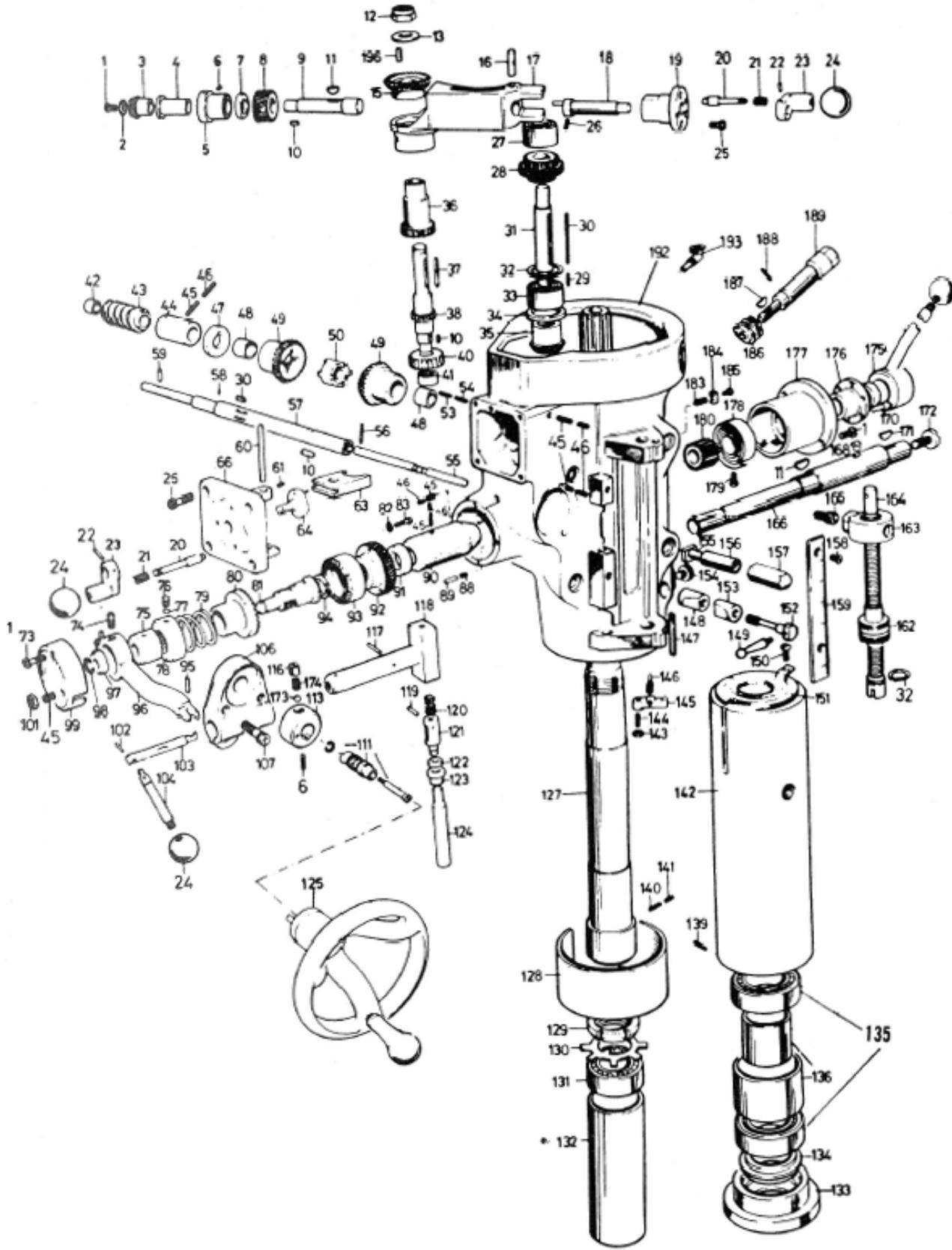
ITEM	CODE NO.	DESCRIPTION	QTY
50	12143452	Assembly, Gear Housing Cover (see 12193452)	1
	12190053	Cover, Gear Housing	1
51	11011445	Screw, Round Hd Machine, #10-24 x .375" Lg	5
52*	11195720	Wick, .125" OD (Common Pipe Cleaner)	1
53*	12190120	Tube, Oiler	1
54*	12190121	Plug, Oil	1
55	11193105	Cup, Oil, Gits #1207	1
56	12180103	Key, Sq, .312" x .540"	1
57	12190115	Hub, Splined Gear	1
58	12193548	Kit, Gear Bull, J-Belt Housing	1
59	11180235	Bearing, #203NNP-C8	1
60***	12193548	Kit, Gear Bull, J-Belt Housing	1
61	11013079	Key, Woodruff #9	1
62***	12193548	Kit, Gear Bull, J-Belt Housing	1
64	11010747	Pin, Dowel, .312" x 2.00"	1
65	12190062	Fork, Back Gear Shifter	1
66	12190052	Housing, Gear	1
67	11010540	Pin, Roll, .187" x .500" Lg	2
68	11010555	Pin, Roll, .250" x .750"	2
69	11011104	Screw, Socket Hd Cap, .312"-18 x .625" Lg	6
70	11192832	Nameplate, Disengage Feed Instruction	1
71	11190230	Bearing, Fafnir #RM208K-DB	2
72	11190806	Ring, Snap, #5000-315	1
73	11191944	Lockwasher, #W-08	1
74	11191793	Locknut, Bearing, #N-08 Sp .312" thk	1
75	11011718	Nut, Hardened Hex, .438"-14	1
76	11191615	Bolt, Vertical Tee	3
77	11190114	Washer, Vertical Tee	3
78	12190187	Crank, Back Gear Shift	1
79	11010517	Pin, Roll, .125" x .750"	1
80	12190186	Bushing, Back Gear Shift	1
81	12190064	Crank, Shift (see 12193443)	1
83	12190138	Pin, Shift	1
84	11192052	Spring, Compression	1
85	11190420	Guard, RH Belt	1
86	11190421	Guard, LH Belt	1
88	12190119	Collar, Pulley Hub	1
90	11598117	Assembly, Reversing Switch (Not Shown)	1
91	11190161	Motor, 1 HP, 230/460 (Not Shown)	1

*Items 6 and 7 sold as assembly only.

**Items 47, 48, and 49 part of assembly 12193508.

***Items 60 and 62 sold as assembly only.

2J- AND J-HEAD LOWER HOUSING



2J- AND J-HEAD LOWER HOUSING

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011445	Screw, Round Hd Machine, #10-24 x .375" Lg	3
2	12190163	Washer, Bevel Pinion	1
3	12190203	Gear, Feed Bevel Pinion	1
4	12190164	Sleeve, Feed Worm Gear Shaft	1
5	11192303	Bushing, Worm Cradle	1
6	11011287	Screw, Stainless Steel, .250"-20 x .250"	2
7	12190165	Spacer, Worm Gear	1
8	12190166	Gear, Feed Drive Worm	1
9	12190167	Shaft, Feed Drive Worm Gear	1
*	12193440	Assembly, Gear Drive Shaft	1
10*	12190162	Key, Worm Shaft, Sq, .125" x .312"	3
11	11013078	Key, Woodruff #7	3
12	11191796	Locknut, Flexlok, .375"-24	1
13	12190199	Washer, .375"	1
15	11192209	Gear, Feed Reverse Bevel	1
16	12190168	Pin, Feed Engage	1
17	12190059	Cradle, Worm Gear	1
18	12190169	Throw-Out, Worm Gear Cradle	1
19	12190170	Sleeve, Shift	1
20	12190138	Pin, Shift	2
21	11192052	Spring, Compression	2
22	11010517	Pin, Roll, .125" x .750"	2
23	12190064	Crank, Shift (see 12193443)	1
24	11192151	Knob, Bakelite, .250"-20	4
25	11011010	Screw, Socket Hd Cap, #10-24 x .500" Lg	7
26	11011258	Screw, Set, #10-24 x .375"	1
27	12190181	Bushing, Cluster Gear Shaft Upper	1
28	28007099	Assembly, Cluster Gear (see 12193504)	1
29	12190148	Key, Sq, .125" x 1.750"	1
*	12193544	Assembly, Bevel Feed Pinion	1
30*	12190175	Assembly, Key, Sq, .125" x .563"	2
31	28007106	Shaft, Cluster Gear	1
32**	11190836	Ring, External Retaining, #5100-62	2
33**	12190149	Bearing, Bevel Gear	1
34**	12190150	Spacer, Bevel Gear Thrust	1
35**	12190180	Pinion, Feed Reverse Bevel	1
36*	12190146	Gear, Feed Driving	1
37*	12190176	Key, Round End, Sq, .125" x .750"	1
38*	12190145	Shaft, Cluster Gear Input	1
40*	12190144	Gear, Feed Drive	1
41	11190310	Bearing, Needle, Torrington #B-66	1
42	11193637	Bushing	1
43	28007307	Gear, Worm Speed Control	1
44	12190155	Bushing, Feed Worm Shaft	1
45	11011268	Screw, Stainless Steel, Cup	6
46	11011542	Screw, Set, .312"-18 x .938"	5
47	11190152	Washer, Feed Worm Shaft Thrust	1

ITEM	CODE NO.	DESCRIPTION	QTY
*	12193435	Assembly, Bevel Feed Gear	1
48*	11183646	Bushing, Bronze, .502" x .628" x 5.00"	2
49*	12190151	Gear, Feed Reverse Bevel	2
50	12190153	Clutch, Feed Reverse	1
53	11011547	Lock, Screw, Stainless Steel, .312"-18 x .156"	1
54	11011375	Screw, Stainless Steel, .312"-18 x .312"	1
55	12190157	Rod, Reverse Clutch	1
56	11010509	Pin, Roll, .093" x .750"	1
57	12190198	Shaft, Feed Worm	1
58	12190200	Pin, .093" x .312" Lg	1
59	28007308	Pin, .100 x .438" Lg	1
60	12190179	Rod, Feed Shift	1
61	11011260	Screw, Stainless Steel, #10-32 UNF x .250"	1
63	11190061	Fork, Feed Gear Shift	1
64	12193446	Assembly, Cluster Gear Shift Crank	1
66	12190065	Cover, Cluster Gear	1
73	11011014	Screw, Cap, #10-24 x 1.500" Lg	2
74	12190188	Pin, Stop	2
75	12190098	Ring, Clutch	1
76	11011265	Screw, Stainless Steel, .250"-20 x .250" Lg	1
77	12190073	Plug, Brass, .187"Ø x .093"	1
78	12190105	Locknut, Overload Clutch	1
79	11192055	Spring, Safety Clutch	1
80	11192302	Clutch, Overload	1
81	12193549	Sleeve, Overload Clutch	1
82	11191920	Washer, Single Spring	3
83	11011431	Screw, Round Hd Machine, #8-32 x .625"	3
88	11192032	Spring, Compression, .250"Ø x 1.250"	1
89	12190096	Plunger, Overload Clutch Lever Spring	1
90	12190106	Bushing, Quill Pinion Shaft	1
91	12190104	Spacer, Pinion Shaft Worm Gear	1
92	11190103	Gear, Overload Clutch Worm	1
93	12190102	Ring, Overload Clutch	1
94	11190870	Ring, External Retaining	1
95	11010717	Pin, Dowel, .187" x .750"	1
96	12193427	Assembly, Overload Clutch Trip Lever	1
97	12190097	Washer, Overload Clutch	1
98	11190822	Ring, External Retaining, #5100-37	1
99	12190068	Cover, Clutch Arm	1
101	11011740	Nut, Hex Jam, .250"-20	1
102	11010717	Pin, Dowel, .187" x .750"	1
103	12190094	Rod, Cam	1
104	12190095	Handle, Trip	1
106	12190067	Bracket, Feed Trip	1
107	11011035	Screw, Socket Hd Cap, .250"-20 x 1.00"	1
111	12193433	Assembly, Reverse Knob	2
113	12190159	Assembly, Handwheel Clutch (see 12193519)	1
116	12190154	Assembly, Handwheel Clutch Spring	1
117	11010515	Pin, Roll, .125" x .562"	1
118	12190093	Assembly, Cam Rod Sleeve	1

ITEM	CODE NO.	DESCRIPTION	QTY
119	11010513	Pin, Roll, .125" x .437"	1
120	11192053	Spring, Compression	1
121	12190091	Plunger, Trip	1
122	12190092	Bushing, Feed Trip Plunger	1
123	12190090	Bushing, Trip Plunger	1
125	12190089	Plunger, Feed Trip	1
125	12193519	Assembly, Handwheel	1
127	12190191	Spindle	1
128	11190081	Skirt, Quill	1
129	11191790	Locknut, #06	1
130	11191942	Lockwasher, #W-06	1
131	11190237	Bearing, Spindle	1
132	12190197	Sleeve, Bearing	1
133	12190196	Nosepiece	1
134	12780915	Shield, Spindle Dirt	1
135	11190238	Bearing, Spindle, Set	1
136	12193513	Bearing, Spindle, Set	1
139	11011265	Screw, Stainless Steel, .250"-20 x .250" Lg	1
140	12193540	Screw, Set, R-8 Collet	1
141	11011545	Screw, Locking Set, .250"-32 x .125"	1
142*	12190192	Quill (See 12194541)	1
143	28300336	Nut, Steel, #6-32 NC	1
144	28300609	Screw, Stainless Steel, #6-32 x .750"	1
145	28007042	Lever, Feed Trip (see 12193498)	1
146	12190185	Pin, Trip Lever	1
147	12200103	Rod, Indicator	1
148	12190109	Sleeve, Quill Lock, Tapped	1
149	12200098	Handle, Lock	2
150	11011595	Screw, Washer Hd Machine, #10-32 x .375"	1
151	11192403	Strainer, Felt	1
152	12190111	Bolt, Quill Lock	1
153	12190110	Sleeve, Quill Lock, Untapped	1
154	12200102	Screw, Rod Indicator Thumb	4
155	12191620	Bolt, Tee, .500"	2
156	12190135	Spacer, Lower Clamping Bolt	2
157	12191736	Nut, Hex, .500" x 1.500"	2
158	11011411	Screw, Chem Black Round Hd Machine, #6-32 x .250"	1
159	11195306	Scale, Quill Micrometer Inch	1
162	12190344	Assembly, Quick Nut	1
163	12190082	Nut, Quill Stop	1
164	12190083	Screw, Quill Stop Micro	1
165	11011090	Screw, Socket Hd Cap, .375"-24 x .625" Lg	1
166	28007063	Shaft, Quill Pinion	1
168	12200111	Pin, Spring	1
170	11010541	Pin, Roll, .187" x .750" Lg	1
171	11013076	Key, Woodruff #3	1
172	12190182	Screw, Pinion Shaft Hub	1
173	11192165	Ball, Steel	1
174	11192054	Spring, Compression	1
175	12201033	Assembly, Quill Feed Handle	1

ITEM	CODE NO.	DESCRIPTION	QTY
176	12190079	Hub, Quill Pinion	1
177***	12190066	Cover, Spring	1
178***	11192020	Spring, Clock	1
179***	28007150	Pin, Outside Clock Spring	1
180	28007064	Pinion, Quill (see 12190108)	1
183	12190085	Lever, Reverse Trip Ball	1
184	12190086	Plunger, Feed Reverse Trip	1
185	12190087	Screw, Reverse Trip Ball Lever	1
186	11192207	Gear, Worm	1
187	11013077	Key, Woodruff #5	1
188	11011370	Screw, Socket Hd Set, .250"-UNC x 20 x .375"	1
189	12190850	Shaft, Adjustable Worm	1
192*	12190051	Housing, Quill (see 12194541)	1
193	11193111	Cup, Oil	1
196	12190162	Key, Worm Shaft, Sq, .125" x 5/16"	1

*Items 10, 36, 37 and 40 sold as assembly 12193440.

**Items 32, 33, 34 and 35 sold as assembly 12193544.

***Items 177, 178 and 179 sold as assembly 12193437

BASIC MACHINE

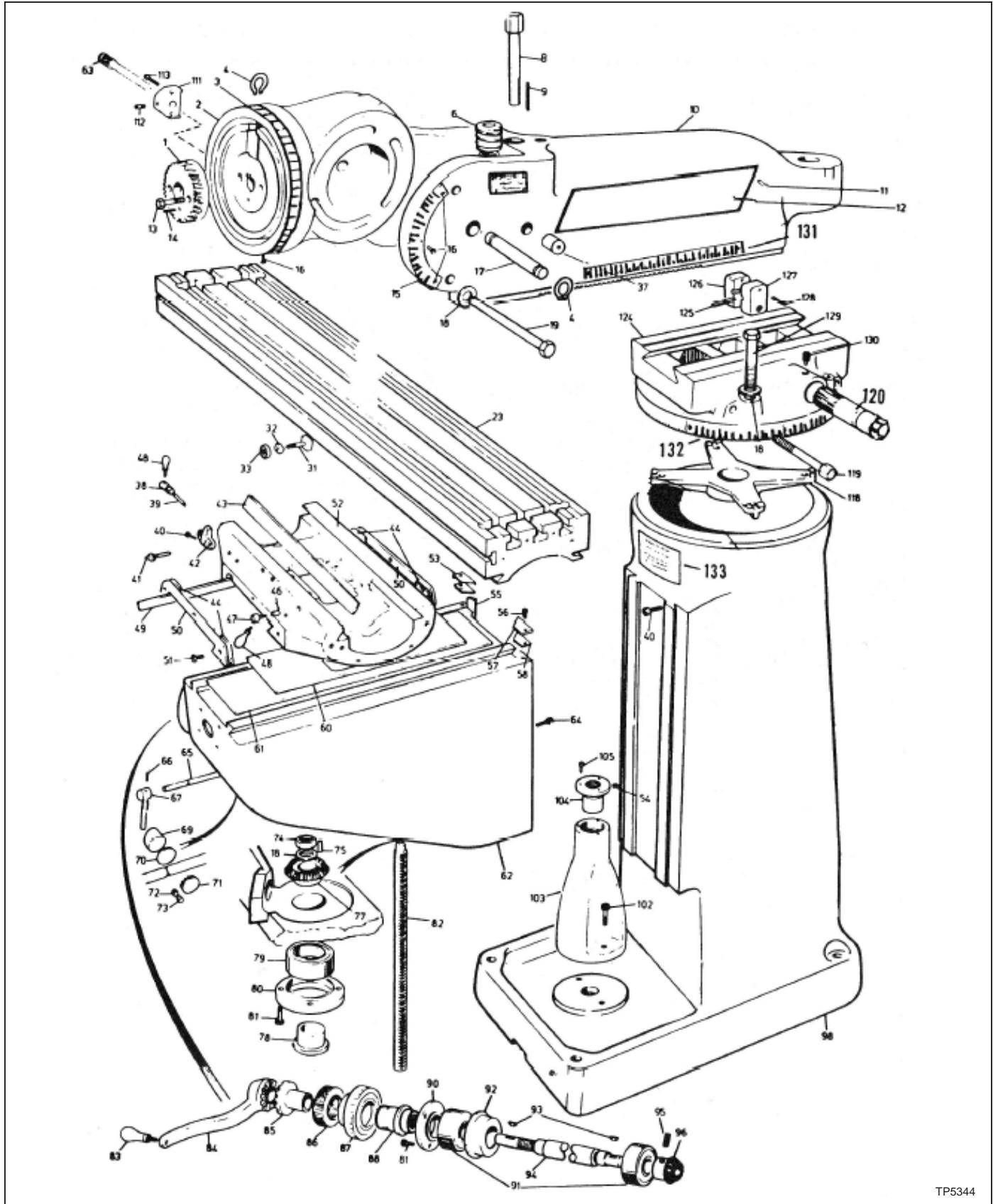


Figure 4.6 - Basic Machine Assembly

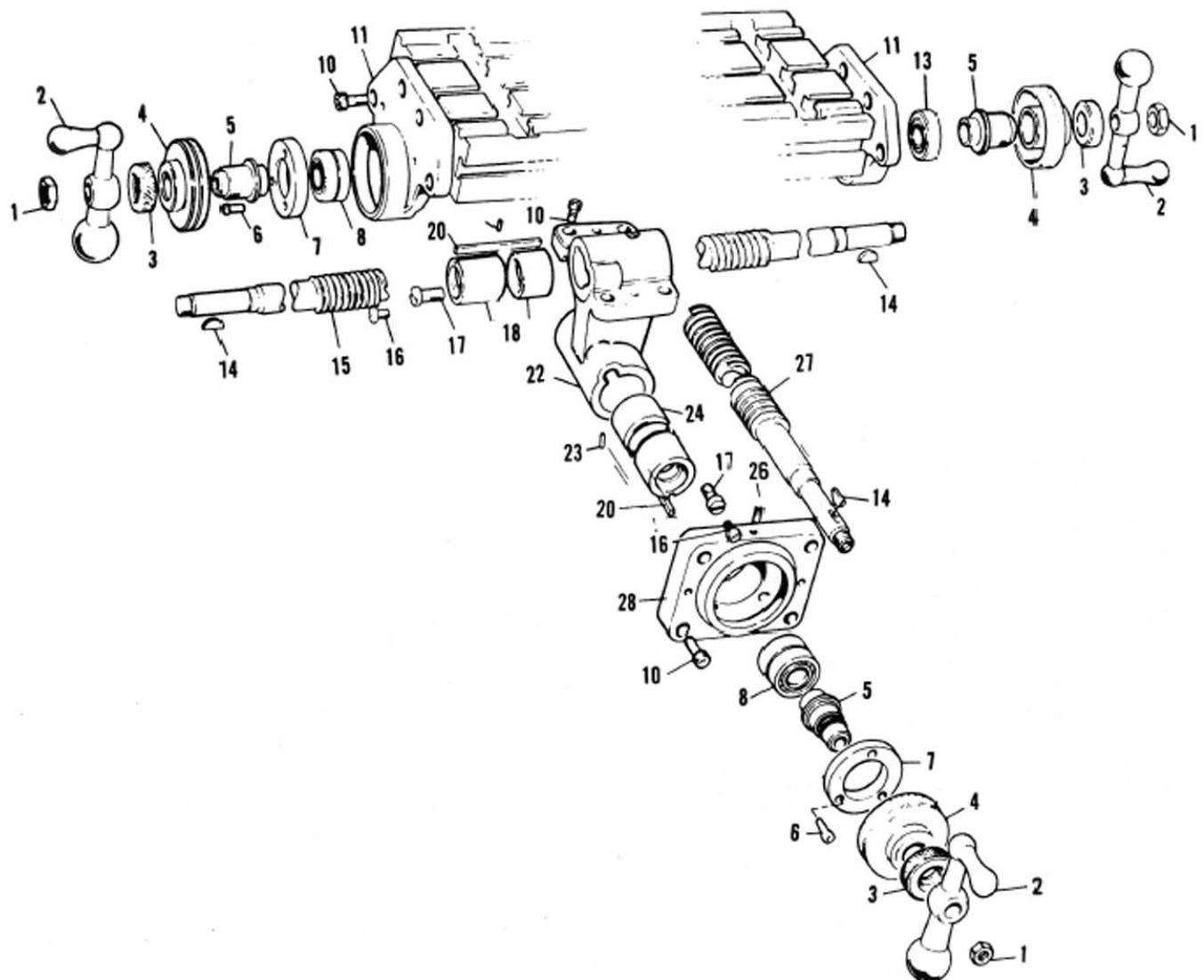
BASIC MACHINE

ITEM	CODE NO.	DESCRIPTION	QTY
1	12190178	Gear, Quill Housing Adj Tilting (see 12193500)	1
2	12069013	Assembly, Ram Adapter (see 12060129)	1
3	11060603	Scale, Adapter	1
4	11060892	Ring, External Retaining	2
6	11062206	Worm, Vertical Adjusting	1
8	12060130	Shaft, Vertical Adjusting Worm	1
9	12060138	Key, Sq, .187" x 1.938"	1
10	12060128	Ram	1
11	11011556	Screw, Drive, Type 0, 6 x .375"	4
12	11060502	Nameplate, Ram	2
13	11011035	Screw, Socket Hd Cap, .250"-20 x 1.00"	2
14	11010590	Pin, Roll, .312" x 1.500"	1
15	11062826	Plate, Graduated Angle	1
16	11011555	Screw, Round Hd Drive	5
17	12061028	Pin, Adapter Pivot	1
18	11200109	Washer, Chamfer, Hardened, .500" x .125" x 1.00"	2
19	11061180	Bolt, Adapter Locking, Hex Hd, .500"-13 x 7.25"	3
23	12060346	Table, 42" Lg	1
	12060347	Table, 48" Lg	1
31	11061602	Bolt, Square Hd, .375"-16 x 1.375"	1
32	11062301	Piece, Table Stop	2
33	11011720	Nut, Hex, .375"-16	3
34	12060122	Washer, Tee Bolt	2
37	12060328	Bushing, Clamping	1
38	12060119	Bolt, Saddle Lock	1
39	12060125	Plunger, Saddle Lock	1
40	11770252	Screw, Low Hd	2
41	11060088	Screw, Gib Adjusting	3
42	12060300	Bracket, Stop, Power Feed	1
43	12060117	Gib, Table, without Chrome	1
	12060482	Gib, Table, with Chrome	1
44	11062406	Wiper, Felt	4
46	12060118	Plug, Table Lock	2
47	12060119	Bolt, RH Table Lock	1
	12060114	Bolt, LH Table Lock	1
48	11062179	Handle, Table Lock	2
49	12060124	Gib, Saddle/Knee	1
50	12060123	Plate, Wiper, Knee	2
51	11011580	Screw, Oval Hd, #10-32 x .500"	6
52	12060097	Saddle, without Chrome	1
	12060487	Saddle, with Chrome	1
53	12060093	Holder, LH Column Wiper	1
55	12060146	Gib, Knee/Column	1
56	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	2
57	12060094	Holder, RH Column Wiper	1
58	11062405	Wiper, Felt	2
60	11060153	Guard, Upper Chip	1
61	11060152	Guard, Lower Chip	1

ITEM	CODE NO.	DESCRIPTION	QTY
62	12060206	Knee, without Chrome	1
	12060493	Knee, with Chrome	1
63	12069999	Pin, Head Rotation Stop	1
64	11770252	Screw, Low Hd	1
65	12060148	Shaft, Knee Lock (see 12061230)	1
66	11010409	Pin, Taper, #1 x 1.00"	1
67	12061230	Hub, Lock Shaft	1
69	12060089	Plunger, Knee Lock	1
70	12150131	Washer, Table Locking	1
71	11010786	Plug, Knee Binder, Plastic	1
72	11011375	Screw, Stainless Steel, .312"-18 x .312"	1
73	11011270	Screw, Stainless Steel, .312"-18 x .312"	1
74	11011755	Nut, Hex Jam, .500"-20	1
75	12060071	Key, .187" x .187" x .875"	1
77	11062204	Gear, Bevel	1
79	11060205	Bearing, #W306PP3	1
80	12060070	Ring, Bearing Retainer	1
81	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	6
82	12060069	Screw, Elevating Inch	1
83	12060060	Handle	1
84	11060080	Crank, Elevating	1
85	12060079	Clutch, Gearshaft	1
86	12060078	Nut, Dial Lock, Knurled	1
87	12060213	Dial, 100-Graduation	1
88	12060077	Holder, Dial	1
90	12060210	Ring, Bearing Retainer	1
91	11060204	Bearing, #H204KTT	2
92	11011030	Screw, Socket Hd Cap, .250"-20 x .500"	3
93	11013078	Key, Woodruff #7	2
94	12060147	Shaft, Z-Axis Elevating	1
95	11011220	Screw, Set, .250"-20 x .250" Lg	1
96	11062205	Gear, Bevel Pinion	1
98	12060209	Column	1
102	11011074	Screw, Socket Hd Cap, .375"-16 x 1.00"	2
103	12060207	Pedestal	1
104	12060051	Nut, Elevating Screw	1
105	11011195	Screw, Button Hd Cap, .250"-20 x 1.00"	3
111	12650180	Block, Head Rotation Stop	1
112	11152094	Plunger, Spring	1
113	11011017	Screw, Socket Hd Cap, #10-32 x .500" Lg	2
118	12060144	Spider	1
119	11060112	Stud, Ram Lock	2
120	12060255	Pinion, Ram	1
124	12060208	Turret	1
125	12060137	Bar, Ram Clamp	2
126	12060141	Clamp, Ram, Blank	2
127	12060113	Clamp, Ram, Tapped	2
128	11010619	Pin, Cotter	2
129	11061178	Bolt, Hex Hd, .500"-13 x 5.00"	4
130	12060140	Screw, Ram Pinion	1

ITEM	CODE NO.	DESCRIPTION	QTY
131	11060602	Scale, Ram	1
	11980426	Screw, Drive, Type U, #4 x .312"	2
132	11060601	Turret, Scale	1
	11989426	Screw, Drive	2
133	11010200	Nameplate, Warning	1
	11980426	Screw, Drive, Type U, #4 x .312"	4

LEAD SCREW ASSEMBLY



TP5345

Figure 4.7 - Lead Screw Assembly

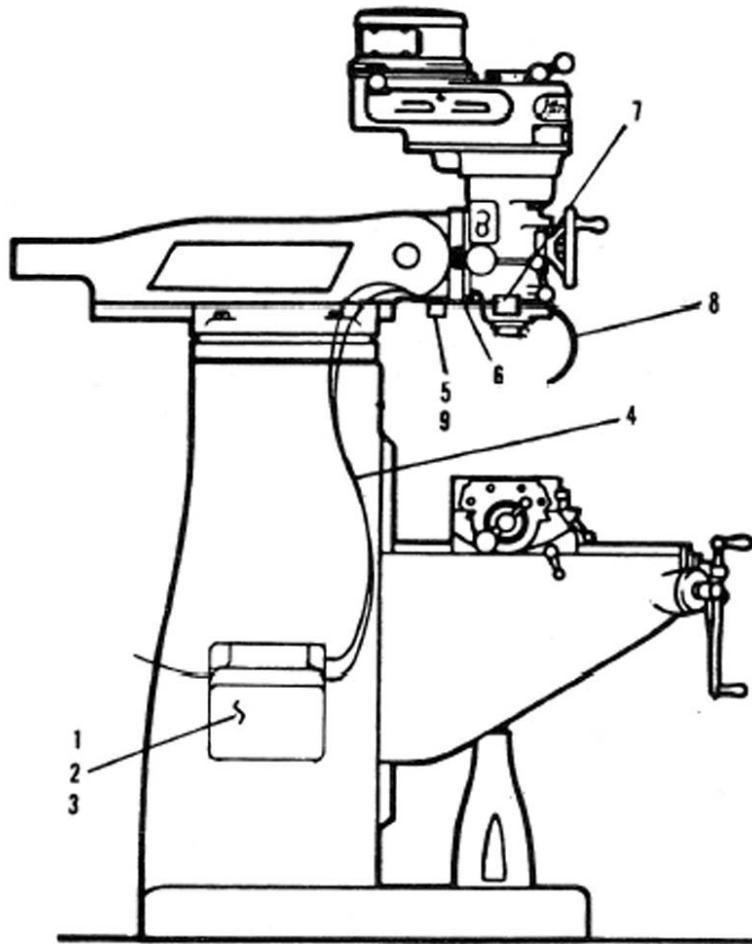
LEAD SCREW ASSEMBLY

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011755	Nut, Hex Jam, .500"-20	3
2	12060271	Handle, Ball Crank	3
	12150780	Assembly, Ball Crank, Quick Release	1
3	12060078	Nut, Dial Lock, Knurled	3
4	12060214	Dial, 200-Graduation	1
		Chrome, X- and Y-Axis Inch	3
5	12060084	Holder, Dial, Standard Handle Size	3
	12630301	Holder, Dial, Quick Release Handle Size	1
6	11011030	Screw, Socket Hd Cap, .250"-20 x .500"	6
7	11060075	Ring, Bearing Retainer	2
8	11060203	Bearing, #RM 204KT4-DB	2
10	11011074	Screw, Socket Hd Cap, .375"-16 x 1.00"	16
11	12060115	Bracket, Table End	2
13	11060204	Bearing, #H204KTT	1
14	11013078	Key, Woodruff #7	3
15*	12061222	Screw, Table Feed, 42" without Chrome	1
	12060458	Screw, Table Feed, 42" with Chrome	1
	12061223	Screw, Table Feed, 48" without Chrome	1
	12060459	Screw, Table Feed, 48" with Chrome	1
16	11011592	Screw, Washer Hd, #8-32 x .375"	3
17	11060100	Screw, Cross Feed Nut Retaining	2
18	12060630	Nut, Table Feed, Matched Set	1
20	12060099	Key, .187" x .187" x 2.500"	2
22*	12060628	Assembly, Feed Nut Bracket (see 12060632)	1
23	12060096	Pin, Nut Key	2
24	12060631	Nut, Cross Feed, Matched Set	1
26	12190188	Pin, Stop	1
27*	12061233	Screw, Cross Feed, without Chrome Inch	1
	12060485	Screw, Cross Feed, with Chrome Inch	1
28	11060082	Bracket, Cross Feed Bearing	1

*Complete Feed Nut Bracket Assembly (Including X- and Y-Axis Nut) can be purchased by #12060627.

Table Feed Screws are purchased with keys.

SPRAY MIST

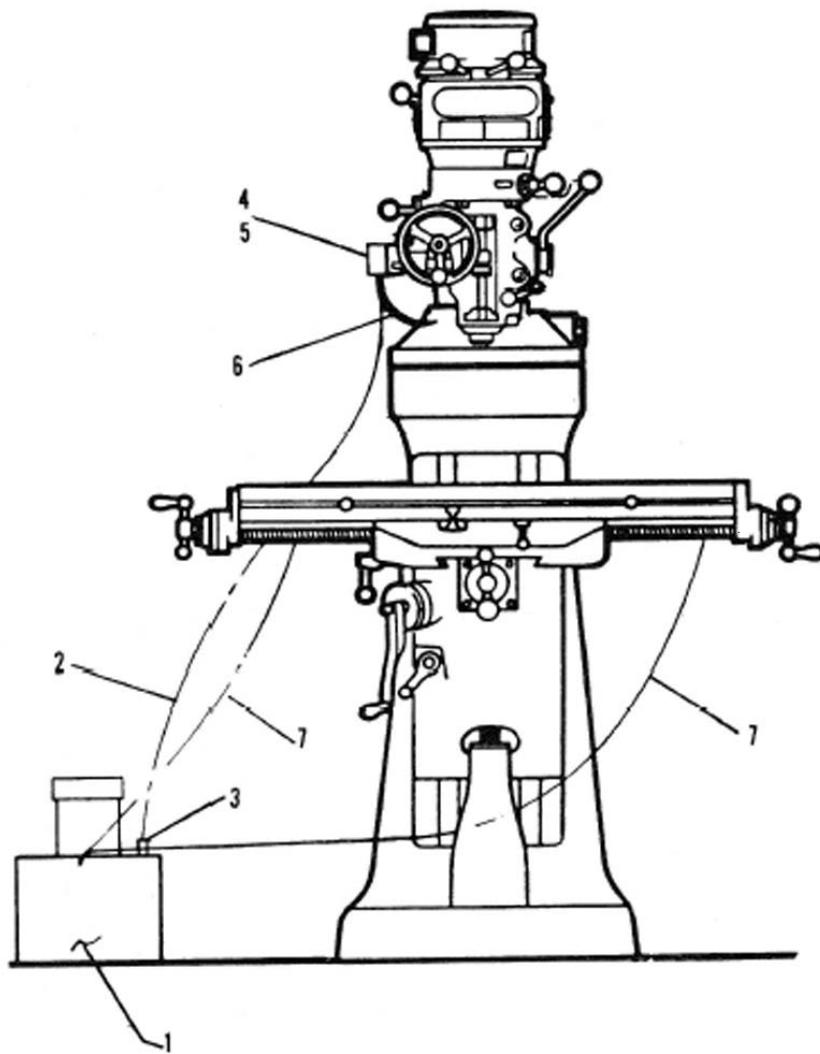


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Figure 4.8 - Spray Mist Assembly

ITEM	CODE NO.	DESCRIPTION	QTY
1	11560085	Tank, Spray Mist, 1 Gal Cap, 110-120v-50/60 Hz	1
1	11560095	Tank, Spray Mist, 5 Gal Cap, 110-120v-50/60 Hz	1
2	11151987	Washer	2
3	11011477	Screw, Round Hd Machine, .250"-20 x 1.00"	2
4	11560087	Assembly, Dual Hose, 6 ft	1
ONE NOZZLE			
7	11560091	Holder, Magnetic Jet	1
8	11560086	Jet, Flexible Extension	1
TWO NOZZLES			
5	11560092	Block, Tee	1
6	11560093	Hose, 24"	2
7	11560091	Holder, Magnetic Jet	2
8	11560086	Jet, Flexible Extension	2
9	11011040	Screw, Socket Hd Cap, .250"-20 x 1.750"	2

FLOOD COOLANT



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Figure 4.9 - Flood Coolant Assembly

ITEM	CODE NO.	DESCRIPTION	QTY
1	11713642	Tank, Pump and Motor	1
2	11715470	Tubing, Coolant Pressure Hose, Vinyl, .50"Ø x .625"	10 ft
3	11565476	Valve, Check	1
4	12561010	Block, Manifold	1
7	11565470	Tubing, Drain Hose, Vinyl, .750" x 1000"	15 ft

ONE NOZZLE

5	11563490	Valve, Shut-Off	1
6	11560264	Hose, Flexible Nozzle Coolant, 21" Lg	1

TWO NOZZLES

5	11563490	Valve, Shut-Off	2
6	11560264	Hose, Flexible Nozzle Coolant, 21" Lg	2

LUBRICATION SYSTEM

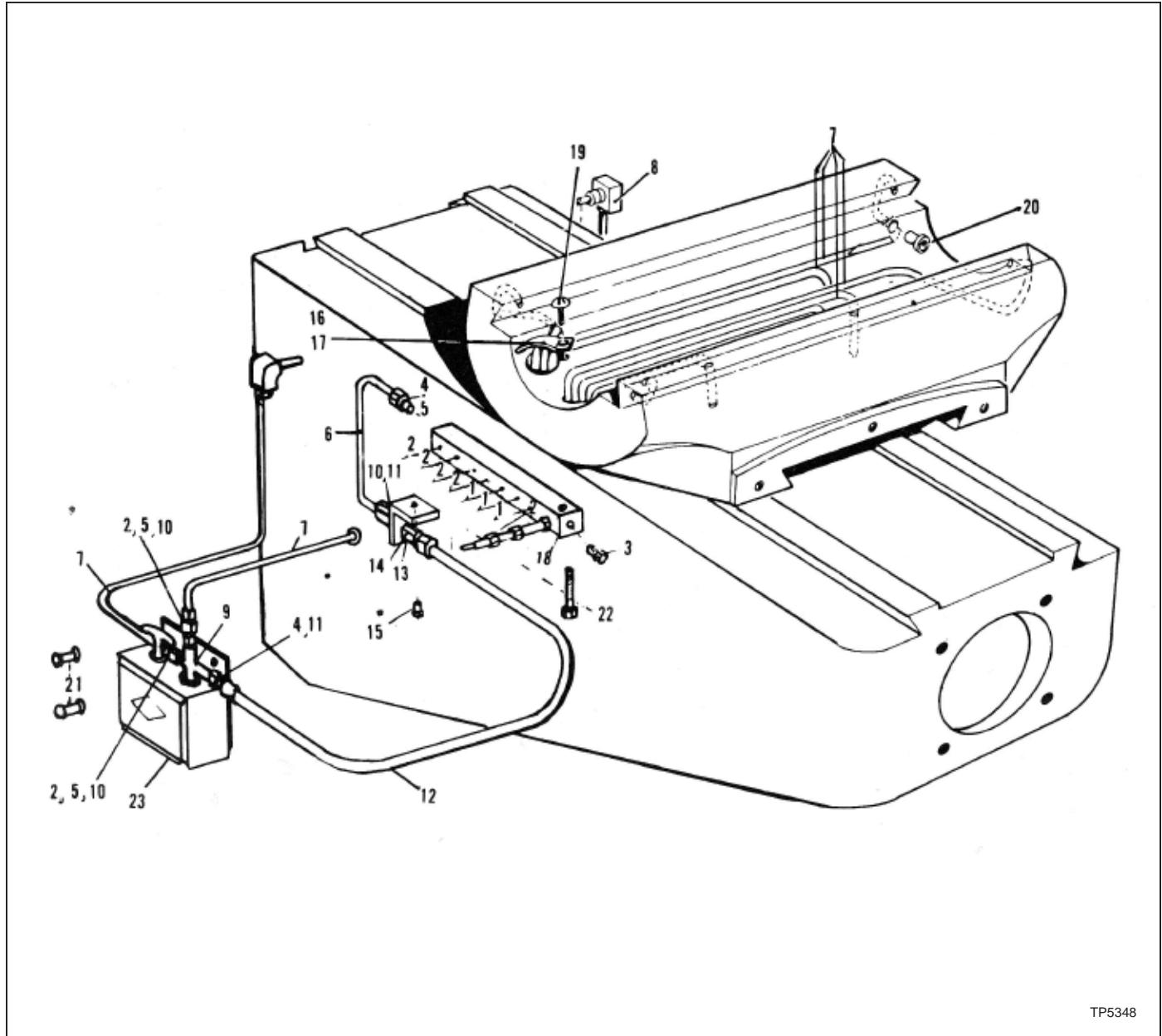


Figure 4.10 - Lubrication System Assembly

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LUBRICATION SYSTEM

ITEM	CODE NO.	DESCRIPTION	QTY
1*	11413210	Unit, Metering, Bijur #B-2495	3
2*	11413211	Unit, Metering, #FJB-1, B-2496	6
3	11413226	Plug, Closure, #B-3784	1
4	11413220	Bushing, Compression, Bijur #1371	11
5	11413221	Sleeve, Compression, Bijur #B-8272	11
6	11413224	Tubing, Brass, .156"	1
7	11413225	Tubing, Nylon, .156"	to
suit			
8	11413222	Connector, 90° EL	2
9	11410017	Junction, 4-Way	1
10	11413219	Nut, Compression	11
11	11413293	Bushing, Compression Sleeve	1
12	11410053	Hose, Flexible, 18" Lg	1
13	11413230	Bracket, Hose	1
14	11413233	Nut, Terminal	1
15	11011475	Screw, Round Hd Machine, .250"-20 x .500"	1
16	11413236	Clip, Tubing, #B-7535	2
17	11413290	Clip, Tubing, #A-2435	1
18	11410063	Junction, 10-Way	1
19	11011420	Screw, Round Hd Machine, #8-32 x .250"	3
20	11413235	Bushing, Drive	8
21	11011194	Screw, Button Hd Cap, .250"-20 x .5.00"	2
22	11011195	Screw, Button Hd Cap, .250"-20 x 1.00"	2
23	11413209	Pump, Auto Lube	1
	11410324	Pump, One Shot Lube, Manual	1

- CAUTION -

**When replacing metering units be sure you replace with correct number
meter units. A wrong installation will cause poor lubrication.**

POWER FEED Y-AXIS

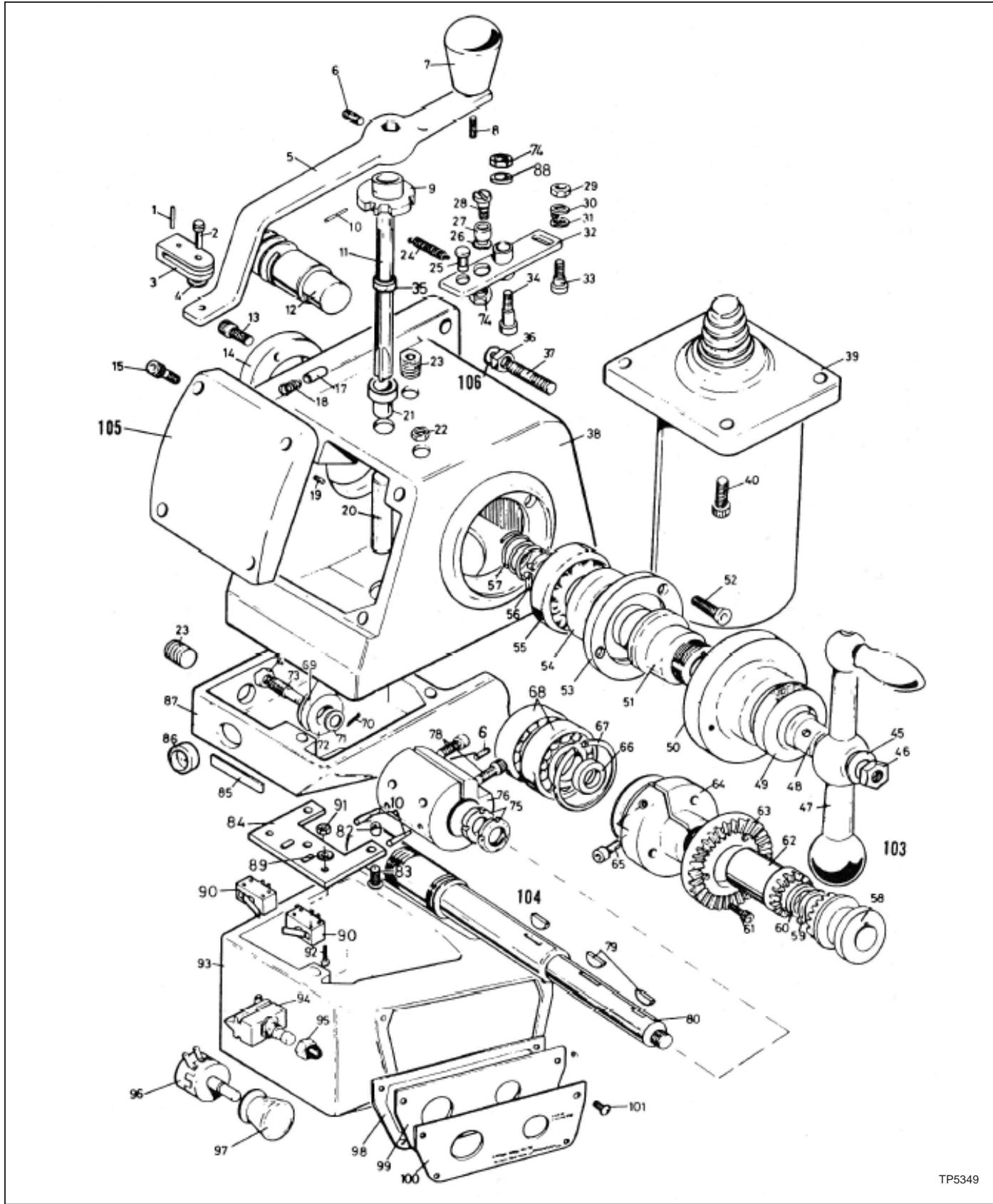


Figure 4.11 - Power Feed Y-Axis Assembly

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POWER FEED Y-AXIS

ITEM	CODE NO.	DESCRIPTION	QTY
1	11010507	Pin, Roll, .093" x .625" Lg	1
2	28001075	Pin, Fork	1
3	12630071	Fork, Stop Rod	1
4	28300093	Lockwasher	1
5	28002018	Lever, Polished Control,	1
6	11011268	Screw, Stainless Steel, Cup	1
7	11632152	Knob, Red Bakelite, .375"	1
8	11980336	Screw, Socket Hd Set, .375"-UNC x 16 x .750"	1
9	28006028	Cam, Clutch Detent	1
10	28300574	Pin, Taper #2, .193" x 1.500"	3
11	28002005	Shaft, Clutch and Limit Switch Actuating	1
12	12630321	Screw, Lead, Cross Feed, Y-Axis, with Chrome	1
	12630017	Screw, Lead, Cross Feed, Y-Axis, without Chrome	1
13	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	3
14	28002237	Cap, Bearing	1
15	11011010	Screw, Socket Hd Cap, #10-24 x .500" Lg	4
16	28002003	Cover, Power Feed Top Side	1
17	28006021	Pin, Detent	1
18	28006061	Spring, Detent Pin	1
19	28006031	Pin, Spring Retaining	1
20	28302029	Bearing, Bronze	1
21	28014617	Bearing, Oilite, .375"Ø x .500" x .375"	1
22	11011740	Nut, Hex Jam, .250"-20	3
23	28006071	Plug, Taper, .250"-NPTF x .375" Lg	1
24	28006024	Spring	1
25	28006032	Pin, Clutch Arm Spring	1
26	28300396	Lockwasher	1
27	28006030	Roller, Clutch Arm Detent	1
28	28006040	Pin, Detent Roller	1
29	28300338	Nut, Hex, #10-32 UNF	1
30	28300374	Lockwasher, #8	1
31	28300376	Washer, Chem Black, 187"	1
32	28006029	Arm, Clutch, with Adapter Bronze Bush	1
33	28302026	Bearing	1
34	28006086	Screw, Special Shoulder	1
35	28014677	Seal, Rubber	1
36	11011720	Nut, Hex, .375"-16	4
37	11010053	Stud, .375-16 x 1.625"	4
38	28002015	Housing, Main	1
39*	11630148	Motor, Standard Torque with Slinger, Fracmo	1
	28006140	Brush	2
	28006141	Holder, Brush	2
	28006142	Cap, Brush	2
	28600001	Motor, Standard Torque with Slinger (see 12631051), Baldor	1
	11632511	Brush	1
	11632512	Cap	1
40	28300160	Screw, Socket Hd Cap, .250"-UNC x .750"	4
45	28300379	Washer, .125" x 1.00" x .125"	1

ITEM	CODE NO.	DESCRIPTION	QTY
46	28300349	Nut, Hex Jam	1
47	11630158	Assembly, Handle, Power Feed	1
48	11630011	Crank, Handle Bush	1
49	28005069	Locknut, Dial	1
50	12060214	Dial, 200-Graduation	1
51	28006222	Holder, RH Dial	1
52	28300316	Screw, Socket Hd Cap, #10-24 x .500" Lg	3
53	28006044	Cap	1
54	28006020	Seal, Head Screw	1
55	28302027	Bearing	1
56	28300100	Ring, Retaining, #ST 100	1
57	28006033	Spring, Clutch	1
58	28006016	Driven, Clutch	1
59	28300094	Ring, Retaining, #ST 94	1
60	28006026	Washer, RH Thrust Bearing,	1
61	28300151	Screw, Socket Hd Cap, #10-32 x .375"	3
62	28006015	Driver, Clutch	1
63	28006022	Gear, Drive Shaft, Spiroid	1
64	28002430	Hub, Gear Mounting	1
65	28300467	Screw, Socket Hd Cap, .250"-20 x .250" Lg	1
66	28006048	Washer, LH Thrust	1
67	28000548	Ring, Retaining	1
68	28302016	Bearing, #RHP-MBU-011	2
69	28002227	Carrier, Spring Oil	1
70	28300107	Pin, Split, .062" x .750" Lg	1
71	28300376	Washer, Chem Black, .187"	1
72	28002231	Pulley, Roller	1
73	28002232	Pin, Roller	1
74	11011740	Nut, Hex Jam, .250"-20	3
75	11011714	Nut, Retaining, .750" x 16-UNF	2
76	11630130	Coupling	1
78	11011035	Screw, Socket Hd Cap, .250"-20 x 1.00"	2
79	11013078	Key, Woodruff #7	2
80	28002049	Shaft, Drive	1
82	28006019	Spacer, Switch Mounting Plate	2
83	28300250	Screw, Round Hd Machine, #10-24 x .625"	3
84	28006006	Plate, Switch Mounting	1
85	28006100	Plate, Lubrication	1
86	28006069	Sight, Oil	1
87	28002019	Sump, Oil	1
88	28300579	Washer, Steel, 6mm Bore	1
89	28300393	Washer, Steel, .125" Bore	4
90	28500630	Switch, Micro, Waterproof	2
91	28300327	Nut, Hex, #4-40	4
92	28300639	Screw, Pan Hd Machine, #4-40 x .750"	2
93	28002016	Box, Control	1
94	28500358	Switch, Rapid Traverse	1
95	11632506	Boot, Insul PB/Switch	1
96	11632618	Potentiometer, 500Ω, Log Taper	1
97	11632153	Knob, Black	1

ITEM	CODE NO.	DESCRIPTION	QTY
98	28006280	Gasket, Control Box	1
99	28006004	Cover, Control Box	1
100	28006281	Plate, Control Box Scale	1
101	28300206	Screw, Button Hd Cap, #8-32 x .500" Lg	4
102	12630033	Rod, Stop	1
103	11630224	Handle, Ball	1
104	11013089	Key, Woodruff #11	1
105	28014616	Gasket, Power Feed Cover	1
106	11181981	Washer, .875" x .375" x .064"	4

* Baldor Boehm motor assemblies are interchangeable with Fracmo motor assemblies.

POWER FEED Y-AXIS CONTROL BOX

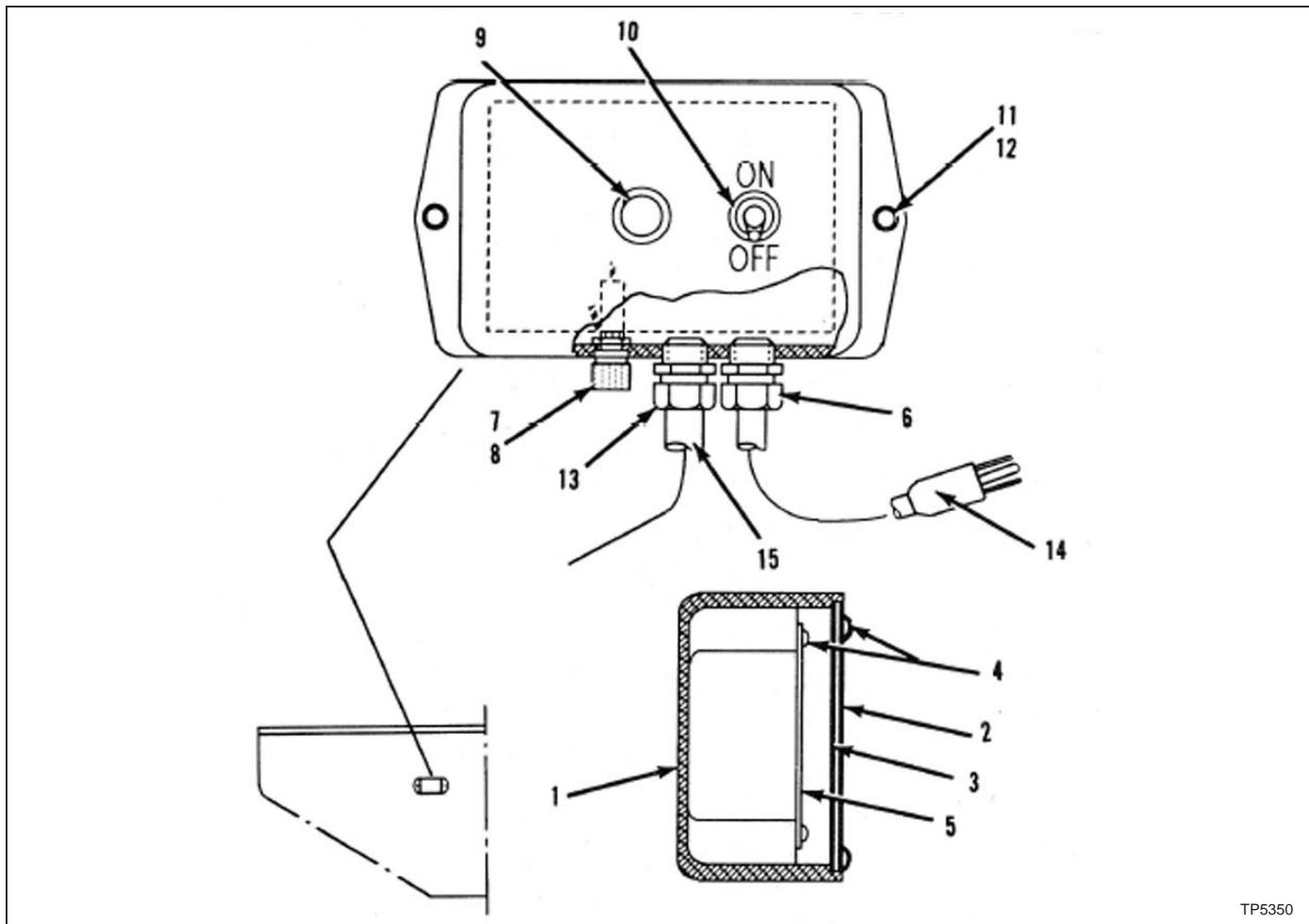
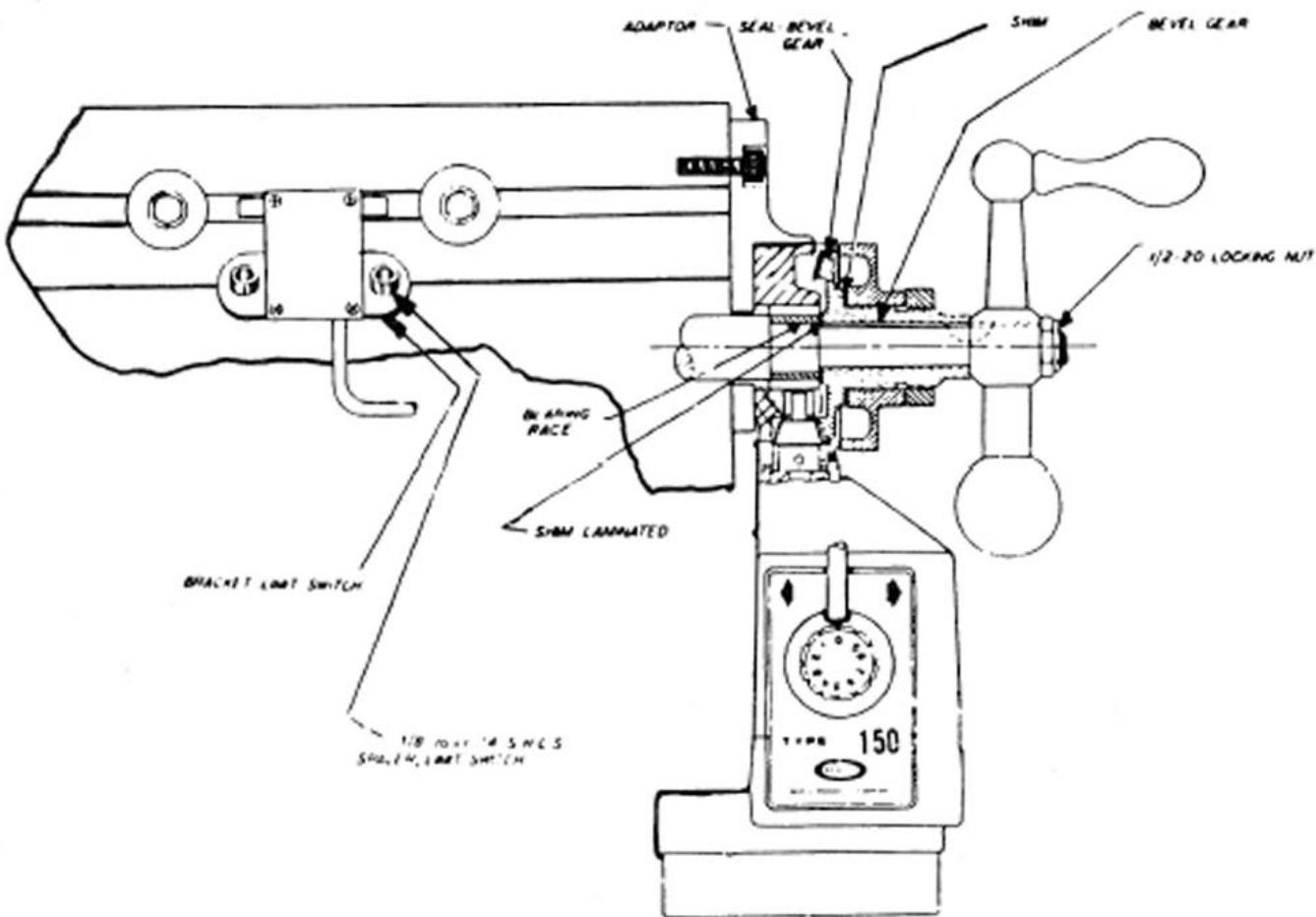


Figure 4.12 - Power Feed Y-Axis Control Box Assembly

ITEM	CODE NO.	DESCRIPTION	QTY
1	12630088	Housing, Control	1
2	11632504	Plate, Control Box Back Cover	1
3	11630032	Gasket, Cover	1
4	11011420	Screw, Round Hd Machine, #8-32 x .250"	8
5	11632568	Board, PC, Series I Power Feed	1
	11630417	Board, KB (for Models after 1989)	1
6	31501502	Connector, Cable Grip, .375"Ø	1
7	11632607	Fuseholder, Panel Mount	1
8	11632606	Fuse, 10 Amp	1
9	11632593	Light, Pilot	1
10	11632659	Switch, Toggle 2PST	1
11	11011033	Screw, Socket Hd Cap, .250"-20 x .750" Lg	2
12	11651943	Washer, EL	2
13	31506372	Connector, Cable Grip, .625"Ø	1
14	11632553	Cord, Power, 8"	1
15	31934792	Assembly, Cable	1
	31630509	Assembly, Y-Axis Harness (for Models after 1989)	1

POWER FEED TYPE (SERVO TYPE)

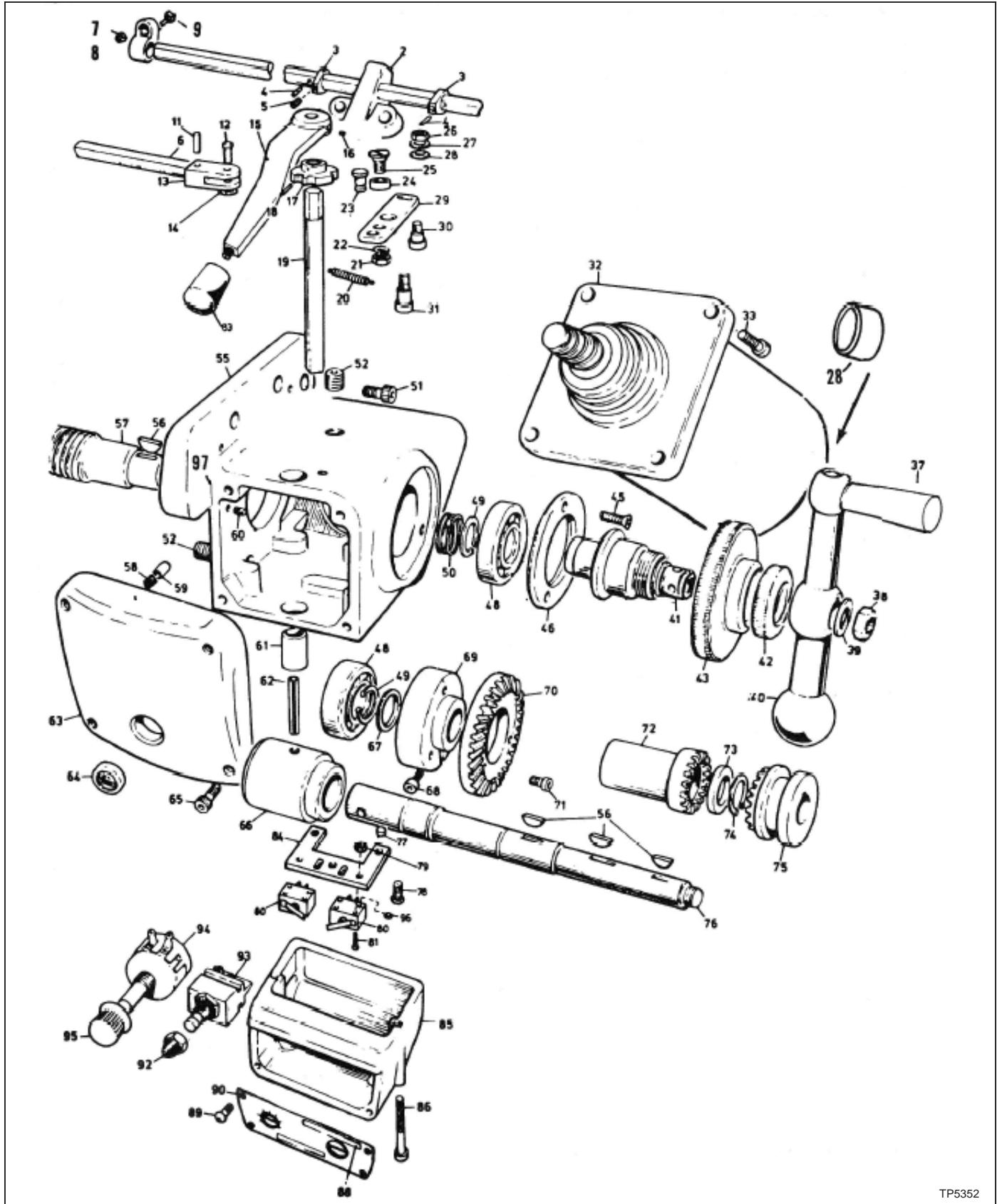


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Figure 4.13 - Power Feed Type Assembly

ITEM	CODE NO.	DESCRIPTION	QTY
11060200		Unit, Servo Power Feed, X-Axis	1
11060201		Unit, Servo Power Feed, Y-Axis	1
11060202		Unit, Servo Power Feed, Z-Axis	1

6F POWER FEED X-AXIS



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Figure 4.14 - 6F Power Feed X-Axis Assembly

6F POWER FEED X-AXIS

ITEM	CODE NO.	DESCRIPTION	QTY
1	11430097	Clamp, Stop Rod	1
2	12060300	Bracket, Stop, Power Feed	1
3	12632304	Collar, Stop	2
4	11010507	Pin, Roll, .093" x .625" Lg	2
5	11011265	Screw, Stainless Steel, .250"-20 x .250" Lg	2
6	12630079	Rod, Table Stop, 42"	1
	12630080	Rod, Table Stop, 48"	1
7	11011720	Nut, Hex, .375"-16	1
8	12060122	Washer, Tee Bolt	1
9	11061602	Bolt, Square Hd, .375"-16 x 1.375"	1
11	11010507	Pin, Roll, .093" x .625" Lg	1
12	11632470	Pin, Fork	1
13	12630071	Fork, Stop Rod	1
14	11630890	Ring, Retaining, #5115-18	1
15	12630065	Handle, Control Lever, Aluminum	1
16	12190162	Screw, Set, #10-24 x .25" Lg	1
17	12630072	Cam, Clutch Detent	1
18	11010516	Pin, Roll, .125" x .625" Lg	1
19	12636005	Shaft, Switch and Clutch	1
20	11630200	Spring	1
21	11011740	Nut, Hex Jam, .250"-20	1
23	11630076	Spring, Clutch Arm	1
24	12630074	Roller, Clutch Arm Detent	1
25	12630087	Pin, Detent Roller	1
26	11011705	Nut, Hex, #10-32	1
27	11631925	Lockwasher, #10	1
28	11633728	Cap, Motor End	1
29	12630231	Assembly, Clutch Arm	1
30	11630320	Follower, Cam	1
31	11011575	Screw, Self-Locking Shoulder, .312" x .625"-250"-20	1
32	12631051	Motor, Standard Torque with Slinger, Baldor	1
	28006140	Brush	2
	28006141	Holder, Brush	2
	28006142	Cap, Brush	2
	12636423	Motor, High Torque with Slinger, Baldor	1
	11632511	Brush	2
	11632512	Cap	2
33	11011033	Screw, Socket Hd Cap, .250"-20 x .750" Lg	4
38	11011755	Nut, Hex Jam, .500"-20	1
39	12150164	Spacer, Washer	1
40	11630158	Assembly, Handle, Power Feed	4
41	12630167	Holder, Dial	3
42	12060078	Nut, Dial Lock, Knurled	1
43	12060214	Dial, 200-Graduation	1
45	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	3
46	12630325	Cap, Take-Up	1
48	11630261	Bearing, Single Row, Loose Fit	2
49	11630814	Ring, Retaining, #5100-78	1

ITEM	CODE NO.	DESCRIPTION	QTY
50	11632074	Spring, Clutch	1
51	11011074	Screw, Socket Hd Cap, .375"-16 x 1.00"	3
52	11635040	Plug, Pipe, .250"-18 NPT x .375"	2
53	11013089	Key, Woodruff #11	1
54	11633638	Bushing, Bronze, #B-68-3	1
55	12630051	Housing, Power Feed Main	1
56	11013078	Key, Woodruff #7	3
57	12061305	Screw, Lead, 42" Table, without Chrome Inch	1
	12061304	Screw, Lead, 48" Table, without Chrome Inch	1
	12060452	Screw, Lead, 42" Table, with Chrome Inch	1
	12060453	Screw, Lead, 48" Table, with Chrome Inch	1
58	11632073	Spring, Compound, .1800Ø x .750" Lg	1
59	12630068	Pin, Detent	1
60	12630075	Pin, Spring	1
61	11633650	Bushing, Bronze, #M-68-12	1
62	11010411	Pin, Taper, #2 x 1.500"	1
63	12630053	Cover, Power Feed	1
64	11413280	Sight, Oil	1
65	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	4
66	12630060	Coupling	1
67	12630091	Washer, Thrust	1
68	11011128	Screw, Socket Hd Cap, .250"-20 x 1.250"	1
69	12632051	Hub, Gear Mounting	1
70	11632216	Gear, Drive Shaft, Standard Torque	1
	11632218	Gear, Drive Shaft, High Torque	1
71	11011016	Screw, Socket Hd Cap, #10-32 x .375"	3
72	12630062	Clutch, Drive (see 12632050)	1
73	12630070	Bearing, Thrust	1
74	11630838	Ring, Retaining, #5100-68	1
75	12630063	Clutch, Drive Shaft	1
76	12630015	Shaft, Drive, Power Feed	1
77	12630066	Spacer, Switch Mounting Plate	3
78	11631549	Screw, Slotted Round Hd Machine, #10-24 x .625"	3
79	11011701	Nut, Hex, #4-40	4
80	11630131	Micro Switch, Sealed	2
81	11011403	Screw, Round Hd Machine, #4-40 x .625" Lg	4
82	11770844	Washer, Flat	4
83	11632152	Knob, Red Bakelite, .375"	1
84	11636006	Plate, Micro Switch Mount	1
85	12630052	Box, Control	1
86	11011046	Screw, Socket Hd Cap, .250"-20 x 2.500"	2
89	11011190	Screw, Button Hd Cap, #8-32 x .250"	4
90	11632576	Cover, Control Box	1
92	11632506	Boot, Insul PB/Switch	1
93	11632620	Pushbutton, 1PST	1
94	11632618	Potentiometer, 500Ω, Log Taper	1
95	11632153	Knob, Black	1
97	11630134	Gasket, Power Feed Cover	1
98	11636413	Seal, Shaft	1

8F POWER FEED X-AXIS

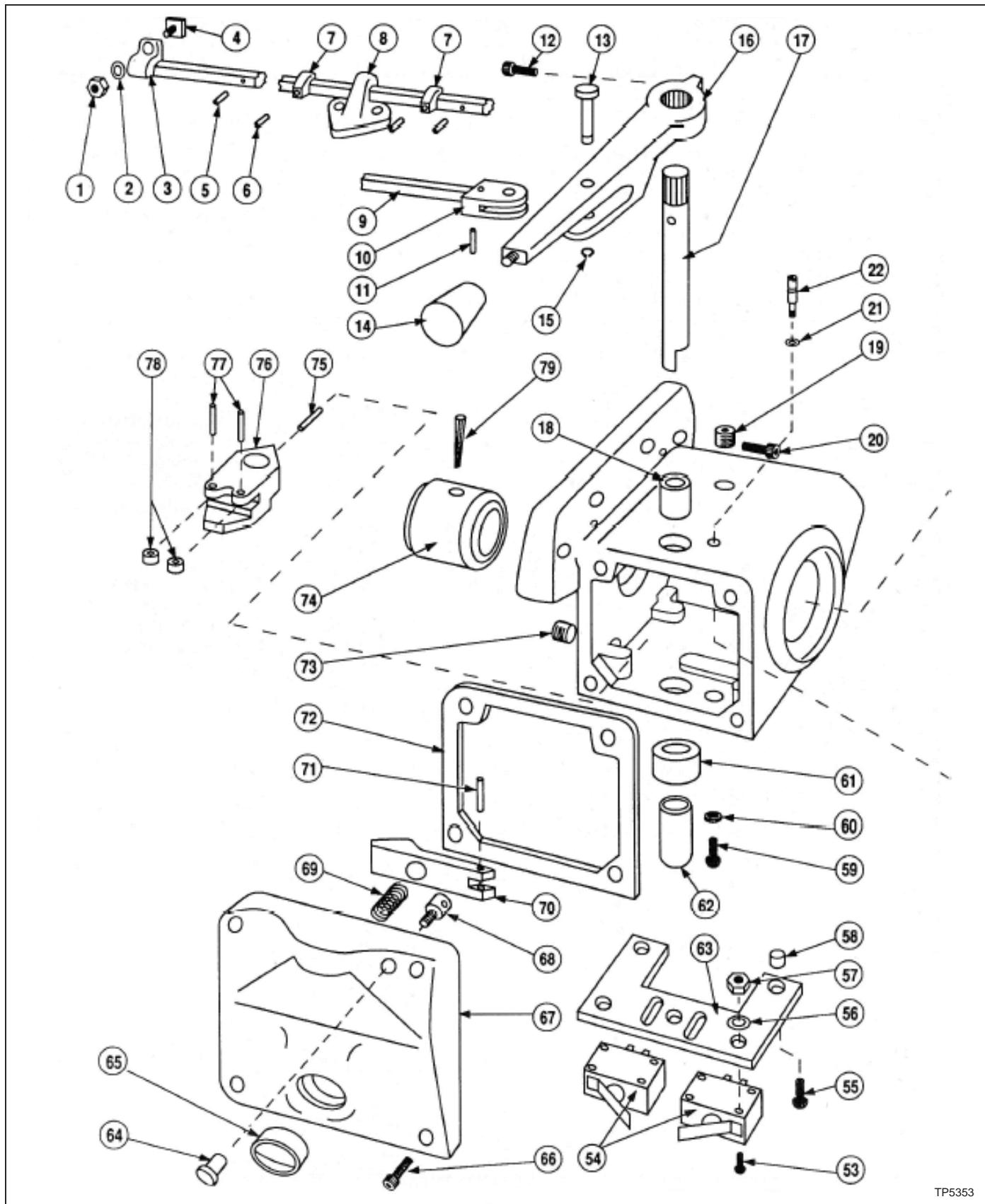


Figure 4.15 - 8F Power Feed X-Axis Assembly

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8F POWER FEED X-AXIS

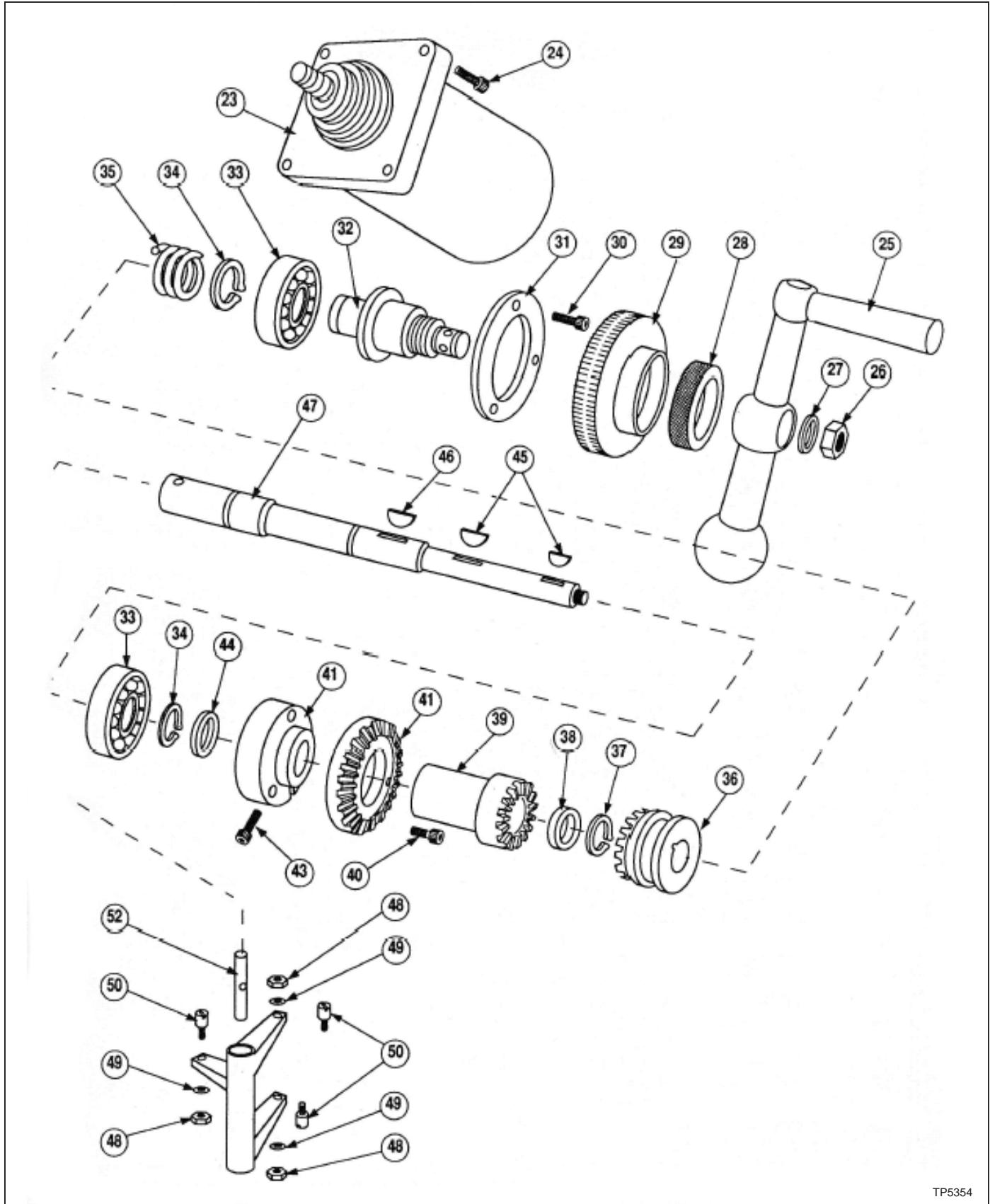


Figure 4.16 - 8F Power Feed X-Axis Assembly

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8F POWER FEED X-AXIS

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011720	Nut, Hex, .375"-16	1
2	12060122	Washer, Tee Bolt	1
3	11061602	Bolt, Square Hd, .375"-16 x 1.375"	1
4	12430097	Guide, Stop Rod	1
5	11010507	Pin, Roll, .093" x .625" Lg	1
6	11011265	Screw, Stainless Steel, .250"-20 x .250" Lg	1
7	12632304	Collar, Stop	1
8	12060300	Bracket, Stop, Power Feed	1
9	12630079	Rod, Table Stop, 42"	1
	12630080	Rod, Table Stop, 48"	1
10	12630071	Fork, Stop Rod	1
11	11010516	Pin, Roll, .125" x .625" Lg	1
12	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	1
13	11630426	Pin, Fork	1
14	11632152	Knob, Red Bakelite, .375"	1
15	11630890	Ring, Retaining, #5115-18	1
16	12630423	Lever, Control	1
17	12636618	Shaft, Clutch	1
18	11633638	Bushing, Bronze, #B-68-3	1
19	11635040	Plug, Pipe, .250"-18 NPT x .375"	1
20	11011074	Screw, Socket Hd Cap, .375"-16 x 1.00"	1
21	11420905	O-Ring	1
22	12636616	Pivot, Shoulder	1
23	12631051	Motor, Standard Torque, Fracmo	1
	8006140	Brush	2
	8006141	Holder, Brush	2
	8006142	Cap, Brush Holder	2
	12636423	Motor, High Torque with Slinger, Baldor	1
	11630149	Motor, High Torque without Slinger, Baldor	1
	11632511	Brush	2
	11632512	Cap	2
24	11011033	Screw, Socket Hd Cap, .250"-20 x .750" Lg	1
25	12150780	Assembly, Ball Crank, Quick Release	1
26	11011755	Nut, Hex Jam, .500"-20	1
27	12150108	Washer	1
28		Nut, Dial Lock, Knurled	1
29	12060214	Dial, 200-Graduation	1
30	11011010	Screw, Socket Hd Cap, #10-24 x .500" Lg	3
31	12630325	Cap, Take-Up	1
32	12150289	Holder, Dial	1
33	11630261	Bearing, Single Row, Loose Fit	2
34	11630814	Ring, Retaining, #5100-78	2
35	11633500	Spring	1
36	12636626	Clutch, Driven	1
37	11630838	Ring, Retaining, #5100-68	1
38	12630070	Bearing, Thrust	1
39	12636650	Assembly, Clutch Driver	1
40	11011016	Screw, Socket Hd Cap, #10-32 x .375"	3

ITEM	CODE NO.	DESCRIPTION	QTY
41	11632216	Gear, Drive Shaft, Standard Torque	1
	11632218	Gear, Drive Shaft, High Torque	1
42	12632051	Hub, Gear	1
43	11011128	Screw, Socket Hd Cap, .250"-20 x 1.250"	1
44	12630091	Washer, Thrust	1
45	11013078	Key, Woodruff #7	2
46	11013089	Key, Woodruff #11	1
47	12630015	Shaft, Drive, Power Feed	1
48	11011705	Nut, Hex, #10-32	3
49	11631925	Washer	3
50	11630320	Follower, Cam	3
51	12636610	Fork, Shifting	1
52	12636615	Shaft, Pivot	1
53	11011403	Screw, Round Hd Machine, #4-40 x .625" Lg	8
54	11630131	Switch, Limit	2
55	11631549	Screw, Pan Hd Machine, #10-24 x 1.250"	3
56	11981089	Washer, Star, #6	8
57	11011701	Nut, Hex, #4-40	8
58	12630066	Spacer, Switch Mounting Plate	3
59	11011200	Screw, Round Hd Machine, .250"-20 x .750"	1
60	11980089	Washer	1
61	11636413	Seal, Shaft	1
62	11633650	Bushing, Bronze, #M-68-12	1
63	11636006	Plate, Micro Switch Mount	1
64	11981315	Nut, Allen, #10-32	1
65	11313280	Sight, Oil Glass	1
66	11011011	Screw, Socket Hd Cap, #10-24 x .625" Lg	4
67	12636603	Cover	1
68	12636617	Pivot, Cam	1
69	11636625	Spring	1
70	12630429	Follower, Cam	1
71	11010516	Pin, Roll, .125" x .625" Lg	1
72	11630134	Gasket, Cover	1
73	11635040	Plug, Pipe, .250"-18 NPT x .375"	1
74	12630060	Coupling	1
75	11010517	Pin, Roll,.125" x .750"	1
76	12636609	Cam	1
77	11650706	Pin, Dowel	2
78	12630428	Roller, Cam	2
79	11010411	Pin, Taper, #2 x 1.500"	1

8F POWER FEED X-AXIS

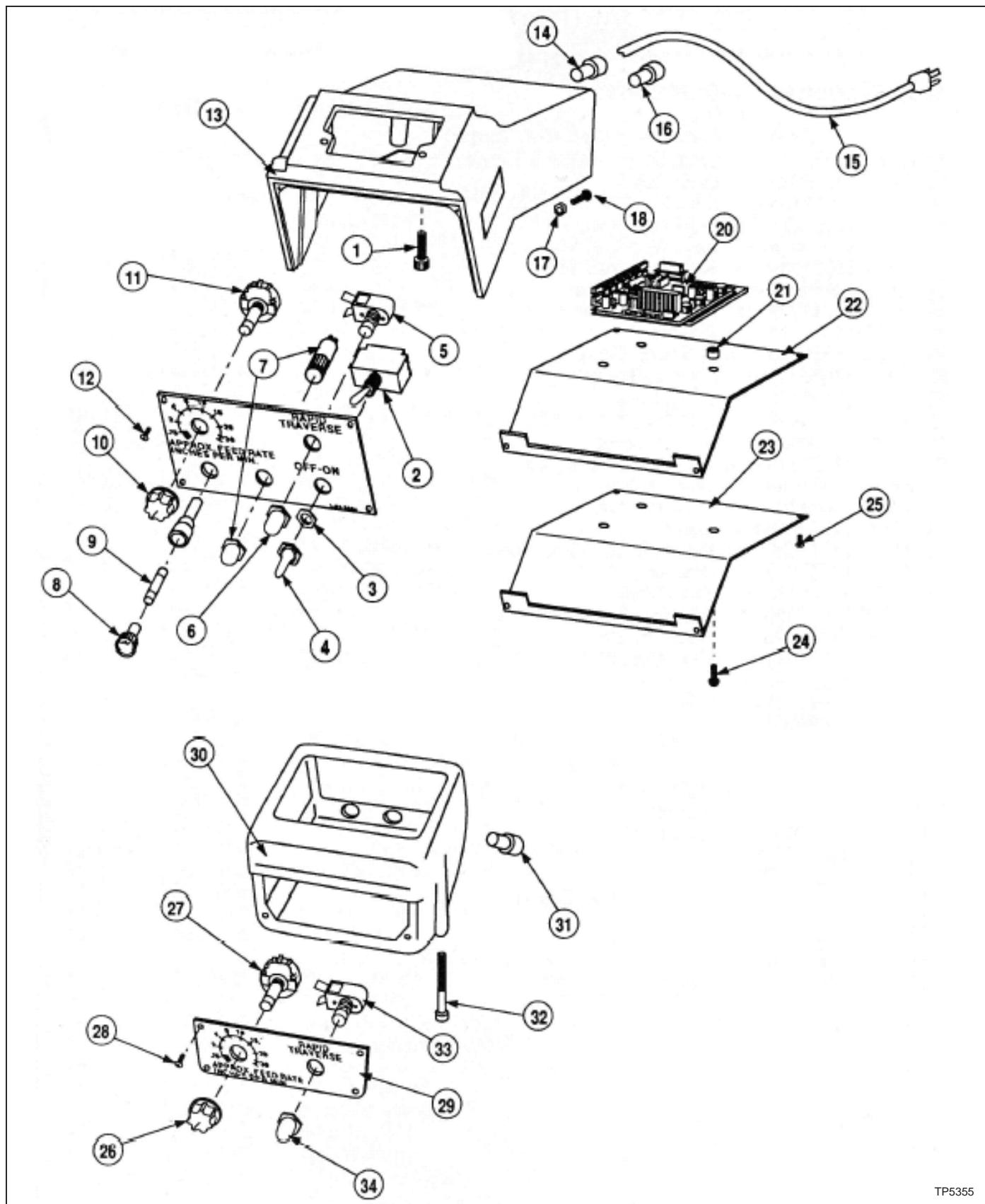


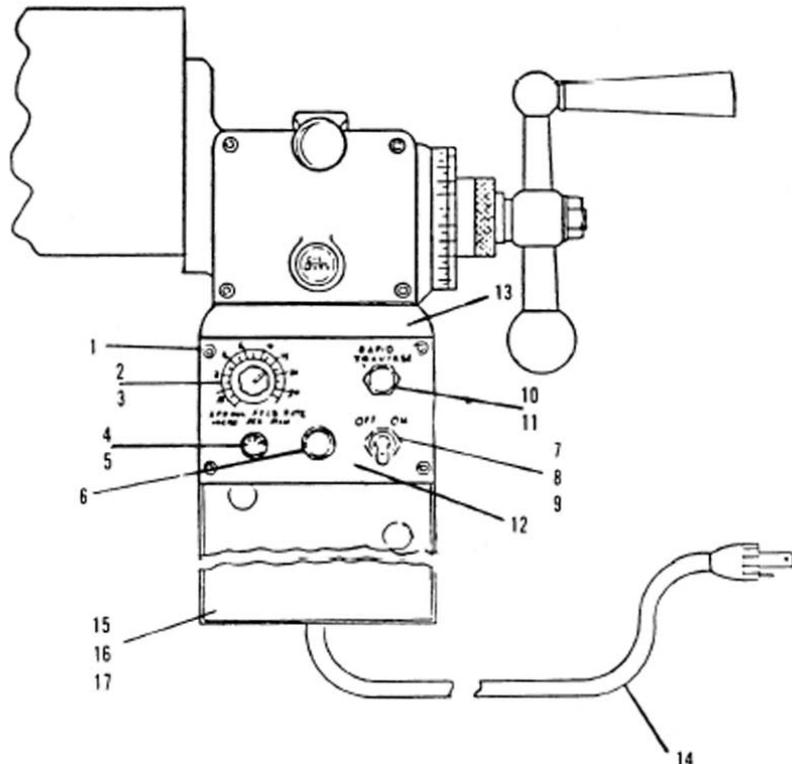
Figure 4.17 - 8F Power Feed X-Axis Control Assembly, Exploded View

TP5355

8F POWER FEED X-AXIS

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011031	Screw, Socket Hd Cap, .250"-20 x .625"	2
2	11632659	Switch, Toggle 2PST	1
3	11632599	Nut, Hex	1
4	11632628	Boot, Toggle Switch Insulator	1
5	11632620	Pushbutton, 1PST	1
6	11632506	Boot, Insul PB/Switch	1
7	11632593	Light, Pilot	1
8	11632607	Fuseholder, Panel Mount	1
9	11632606	Fuse, 10 Amp	1
10	11632153	Knob, Black	1
11	11630445	Potentiometer	1
12	11011189	Screw, Button Hd Cap, #6-32 x .250"	4
13	12636400	Box, Control	1
14	11636409	Grip, Cord	1
15	11636412	Cord, Power	1
16	11636410	Grip, Cord	1
17	11011704	Nut, Hex, #8-32	1
18	11011429	Screw, Round Hd Machine, #8-32 x .500"	1
19	11630417	Panel, Front	1
20	11630417	Board, Circuit	1
	32632751	Assembly, Harness, Power Feed	1
21	12630066	Spacer, Switch Mounting Plate	3
22	11630422	Gasket, Cover	1
23	11630421	Cover, Bottom	1
24	11011549	Screw, Pan Hd Machine, #10-32 x .500"	3
25	11011189	Screw, Button Hd Cap, #6-32 x .250"	2
26	11632152	Knob, Red Bakelite, .375"	1
27	11630445	Potentiometer, 5KΩ	1
28	11011189	Screw, Button Hd Cap, #6-32 x .250"	4
29	11632576	Cover, Control Box	1
30	12630052	Box, Control	1
31	11152446	Grip, Cord	1
32	11780064	Screw, Socket Hd Cap, .250"-20 x 3.500"	2
33	11632620	Pushbutton, 1PST	1
34	11632506	Boot, Insul PB/Switch	1

POWER FEED X-AXIS



TP5356

Figure 4.18 - Power Feed X-Axis Control Assembly, Front View

ITEM	CODE NO.	DESCRIPTION	QTY
1	11011189	Screw, Button Hd Cap, #6-32 x .250"	4
2	11632618	Potentiometer, 500Ω, Log Taper	1
	11630445	Potentiometer, 8F Power Feed	1
3	11632153	Knob, Black	1
4	11632607	Fuseholder, Panel Mount	1
5	11632606	Fuse, 10 Amp	1
6	11632593	Light, Pilot	1
7	11632659	Switch, Toggle 2PST	1
8	11632628	Boot, Insulator	1
9	11632599	Nut, Hex	1
10	11632620	Pushbutton, 1PST	1
11	11632506	Boot, Insul PB/Switch	1
12	11636404	Panel	1
13	12636400	Box, Control	1
14	11636412	Cord, Power	1
15	11636411	Cover, Bottom, 6F Power Feed	1
	11630421	Cover, Bottom, 8F Power Feed	1
16	11632568	Board, Printed Circuit, 6F Power Feed (Not Shown)	1
	11630417	Board, Circuit, 8F Power Feed (Not Shown)	1
17	11630416	Assembly, Plug-In Connector Type Harness, 6F	1
	32632751	Assembly, Harness, Power Feed	1

REPLACEMENT MOTOR ASSEMBLIES AVAILABLE

Motor Assembly J-Head 1 HP Unified without NFPA, Code No. 12190250

CODE NO.	DESCRIPTION	QTY
11011595	Screw, Washer Hd Machine, #10-32 x .375"	1
11012759	Marker, 208 Volts	1
11012760	Marker, 230 Volts	1
11012761	Marker, 380 Volts	1
11012762	Marker, 460 Volts	1
11012772	Marker, 416 Volts	1
11182556	Set, Cord, 14/4 600 Volts	1
11272643	Term, Wire B/A	3
11011713	Nut, Hex, .375"-24	2
11191922	Lockwasher, .375"	2
12190173	Stud, Motor Mounting	2
12190171	Locknut, Motor	2
12190174	Washer, Motor Mounting Stud	2
12190172	Handle, Motor Locknut	2
11192151	Knob, Bakelite, .250"-20	2
12193508	Assembly, Motor Pulley	1
11190161	Motor, 1 HP, 230/460	1
11192653	Switch, Drum	
11011475	Screw, Round Hd Machine, .250"-20 x .500"	2
11011476	Screw, Round Hd Machine, .250"-20 x .750"	2

Motor Assembly J-Head Unified with NFPA

Contact Sales Department for Code No.

Motor Assembly 2J-Head 2 HP Unified without NFPA, Code No. 12550150

CODE NO.	DESCRIPTION	QTY
11010514	Pin, Roll, .125" x .500"	1
11011595	Screw, Washer Hd Machine, #10-32 x .375"	1
11012759	Marker, 208 Volts	1
11012760	Marker, 230 Volts	1
11012761	Marker, 380 Volts	1
11012762	Marker, 460 Volts	1
11012770	Marker, 200 Volts	1
11012771	Marker, 400 Volts	1
11012772	Marker, 416 Volts	1
11150843	Ring, Retaining, #5100	1
11182556	Set, Cord, 14/4 600 Volts	1
11182557	Assembly, Cable, 600 Volts	1
11182655	Switch, Drum	1
11550001	Motor, 2 HP, Multi Volt, 50/60	1
11562534	Nut, Wire	1
12550029	Assembly, Varidisc and Spring	1
12550007	Key, Drive, Fixed Varidisc	1
12550006	Varidisc, Motor Stationary	1

Motor Assembly 2J-Head 2 HP Unified with NFPA

Contact Sales Department for Code No.

Motor Assembly 2J-Head 2 HP 575 Volts without NFPA, Code No. 12550020

CODE NO.	DESCRIPTION	QTY
11010514	Pin, Roll, .125" x .500"	1
11012763	Marker, 575 Volts	1
11150843	Ring, Retaining, #5100-118	1
11182556	Set, Cord, 14/4 600 Volts	1
11182557	Assembly, Cable, 600 Volts	1
11182655	Switch, Drum	1
11011595	Screw, Washer Hd Machine, #10-32 x .375"	1
11550101	Motor, 2 HP, 575-3-60	1
12550006	Varidisc, Motor Stationary	1
11562534	Connector, Wire Nut, M Type Y	3
12550007	Key, Drive, Fixed Varidisc	1
12550029	Assembly, Varidisc and Spring	1

Motor Assembly 2J-Head 2 HP 575 Volts with NFPA

Contact Sales Department for Code No.

Replacement Motors Available

CODE NO.	DESCRIPTION	QTY
11190161	Motor, 1 HP, 230/460	
11190162	J-Head 1 HP 575 Volts	
11550001	Motor, 2 HP, Multi Volt, 50/60	
11550101	Motor, 2 HP, 575-3-60	

Code No. 2203000 – M Milling Head – Spare Parts Kit

CODE NO.	DESCRIPTION	QTY
11202102	Drive Belt	1
11202021	Clockspring	1
11200202	Bearing, Spindle	4
11191942	Lockwasher	2

Code No. 2193000 – J Milling Head – Spare Parts Kit

CODE NO.	DESCRIPTION	QTY
11182120	Belt, Varispeed	1
11182106	Belt, Timing	1
12193477	Shoe, Brake	2
11182081	Spring, Brake	2
12193437	Assembly, Clockspring and Cover	1
12180117	Lubricant, Gear	1
11190238	Bearing, Spindle, Pair	1
11190237	Bearing, Spindle	1
11192403	Strainer, Felt	2
11191942	Lockwasher	2
11011392	Screw, Collet Aligning (see 12193540)	6

Code No. 2183000 – 2J Milling Head (1-1/2 HP) – Spare Parts Kit

CODE NO.	DESCRIPTION	QTY
11182120	Belt, Varispeed	1
11182106	Belt, Timing	1
12180073	Shoe, Brake, Set	1
11182081	Spring, Brake	1
11182121	Key, Motor	1
11182122	Key, Plastic	1
12193437	Assembly, Clockspring and Cover	1
12180117	Lubricant, Gear	1
11183147	Lubriplate	1
11190238	Bearing, Spindle, Pair	1
11190237	Bearing, Spindle	1
11192403	Strainer, Felt	2
11191942	Lockwasher	2
12193540	Screw, Set, R-8 Collet	6

Code No. 2553000 – 2J Milling Head (2 HP) – Spare Parts Kit

Same as above except:

CODE NO.	DESCRIPTION	QTY
11552106	Belt, Timing	1
12550004	Assembly, Key, Drive, Varidisc	1
11182122	Key, Plastic	1

Code No. 2062000 – Series I Standard Machine – Spare Parts Kit

CODE NO.	DESCRIPTION	QTY
11062405	Wiper, Felt	2
11062406	Wiper, Felt	4
12060631	Nut, Lead Screw Cross Feed Inch Matched	1
12060630	Nut, Lead Screw Feed, Inch Matched, Lg	1
12060123	Plate, Wiper, Knee	1

Lead Screws for Manually Operated Machines (without Keys)

Note: Keys for the Following Lead Screws are Code No. 11013078, Woodruff #7.

CODE NO.	DESCRIPTION	QTY
12061233	Y-Axis (Cross Feed) No Chrome Inch	
12060485	Y-Axis (Cross Feed) Chrome Inch	
12060182	Y-Axis (Cross Feed) No Chrome Metric	
12060486	Y-Axis (Cross Feed) Chrome Metric	
12060105	X-Axis (Longitudinal) No Chrome Inch, 42" Table	
12060450	X-Axis (Longitudinal) Chrome Inch, 42" Table	
12060177	X-Axis (Longitudinal) No Chrome Metric, 42" Table	
12060454	X-Axis (Longitudinal) Chrome Metric, 42" Table	
12060106	X-Axis (Longitudinal) No Chrome Inch, 48" Table	
12060451	X-Axis (Longitudinal) Chrome Inch, 48" Table	
12060179	X-Axis (Longitudinal) No Chrome Metric, 48" Table	
12060455	X-Axis (Longitudinal) Chrome Metric, 48" Table	

Lead Screws Available for Machines with Power Feeds (without Keys)

Note: Keys for the Following Lead Screws are Code No. 11013078, Woodruff #7.

CODE NO.	DESCRIPTION	QTY
12630017	Y-Axis (Cross Feed) No Chrome Inch	
12630321	Y-Axis (Cross Feed) Chrome Inch	
12630185	Y-Axis (Cross Feed) No Chrome Metric	
12630487	Y-Axis (Cross Feed) Chrome Metric	
12630084	X-Axis (Longitudinal) No Chrome Inch, 42" Table	
12060452	X-Axis (Longitudinal) Chrome Inch, 42" Table	
12630097	X-Axis (Longitudinal) No Chrome Metric, 42" Table	
12060456	X-Axis (Longitudinal) Chrome Metric, 42" Table	
12630085	X-Axis (Longitudinal) No Chrome Inch, 48" Table	
12060453	X-Axis (Longitudinal) Chrome Inch, 48" Table	
12630098	X-Axis (Longitudinal) No Chrome Metric, 48" Table	
12060457	X-Axis (Longitudinal) Chrome Metric, 48" Table	

METRIC CONVERSION KITS

Code No. 2204000 – M Head, Metric Conversion Kit

CODE NO.	DESCRIPTION	QTY
11202846	Scale	1
12209002	Screw, Stop	1
12199002	Nut, Micro	1
12202024	Nut, Stop	1

Code No. 2184000 – J- and 2J-Head, Metric Conversion Kit

CODE NO.	DESCRIPTION	QTY
11195307	Scale	1
12191013	Assembly, Stop	1

Code No. 2064001 – Metric Conversion Kits

Hand Feed Machines with 36" Tables

CODE NO.	DESCRIPTION	QTY
12060175	Screw, Lead, Table	1
12060183	Screw, Lead, Elevating	1
12060730	Nut, Table Feed	1
12060731	Nut, Saddle Feed	1
12060170	Nut, Elevating	1
12069016	Dial, Table and Saddle	3
12069015	Dial, Elevating Screw	1
12060182	Screw, Lead, Y-Axis, without Chrome, 12" Knee	1

Code No. 2064002 – Metric Conversion Kits

Hand Feed Machines with 42" Tables

CODE NO.	DESCRIPTION	QTY
12060177	Screw, Lead, X-Axis, Hand Feed, without Chrome, 42"	1
12060183	Screw, Lead, Elevating	1
12060730	Nut, Table Feed, X-Axis Feed, Matched Set	1
12060731	Nut, Saddle Feed, Y-Axis Feed, Matched Set	1
12060170	Nut, Elevating	1
12069016	Dial, Table and Saddle	3
12069015	Dial, Elevating Screw	1
12060182	Screw, Lead, Y-Axis, without Chrome, 12" Knee	1

Code No. 2064003 – Metric Conversion Kits

Hand Feed Machines with 48" Tables

CODE NO.	DESCRIPTION	QTY
12060179	Screw, Lead	1
12060183	Screw, Lead, Elevating	1
12060730	Nut, Table Feed	1
12060731	Nut, Saddle Feed	1
12060170	Nut, Elevating	1
12069016	Dial, Table and Saddle	3
12069015	Dial, Elevating Screw	1
12060182	Screw, Lead, Y-Axis, without Chrome, 12" Knee	1

6F Power Feed Field Conversion Kits For Machines without NFPA

Note: Field Conversion Kits DO NOT include Lead Screws

CODE NO.	DESCRIPTION	QTY
12630001	X-Axis (Longitudinal) for 36" Table, Standard Torque	
12636450	X-Axis (Longitudinal) for 42" Table, Standard Torque	
12636451	X-Axis (Longitudinal) for 42" Table, High Torque	
12636452	X-Axis (Longitudinal) for 48" Table, Standard Torque	
12636453	X-Axis (Longitudinal) for 48" Table, High Torque	
12630182	Y-Axis (Cross Feed) Standard Torque	

Note: Contact Sales Department For Machines with NFPA.

- NOTES -

- NOTES -

CHAPTER 5 - SPECIFICATIONS

MACHINE

PRINCIPLE DIMENSIONS

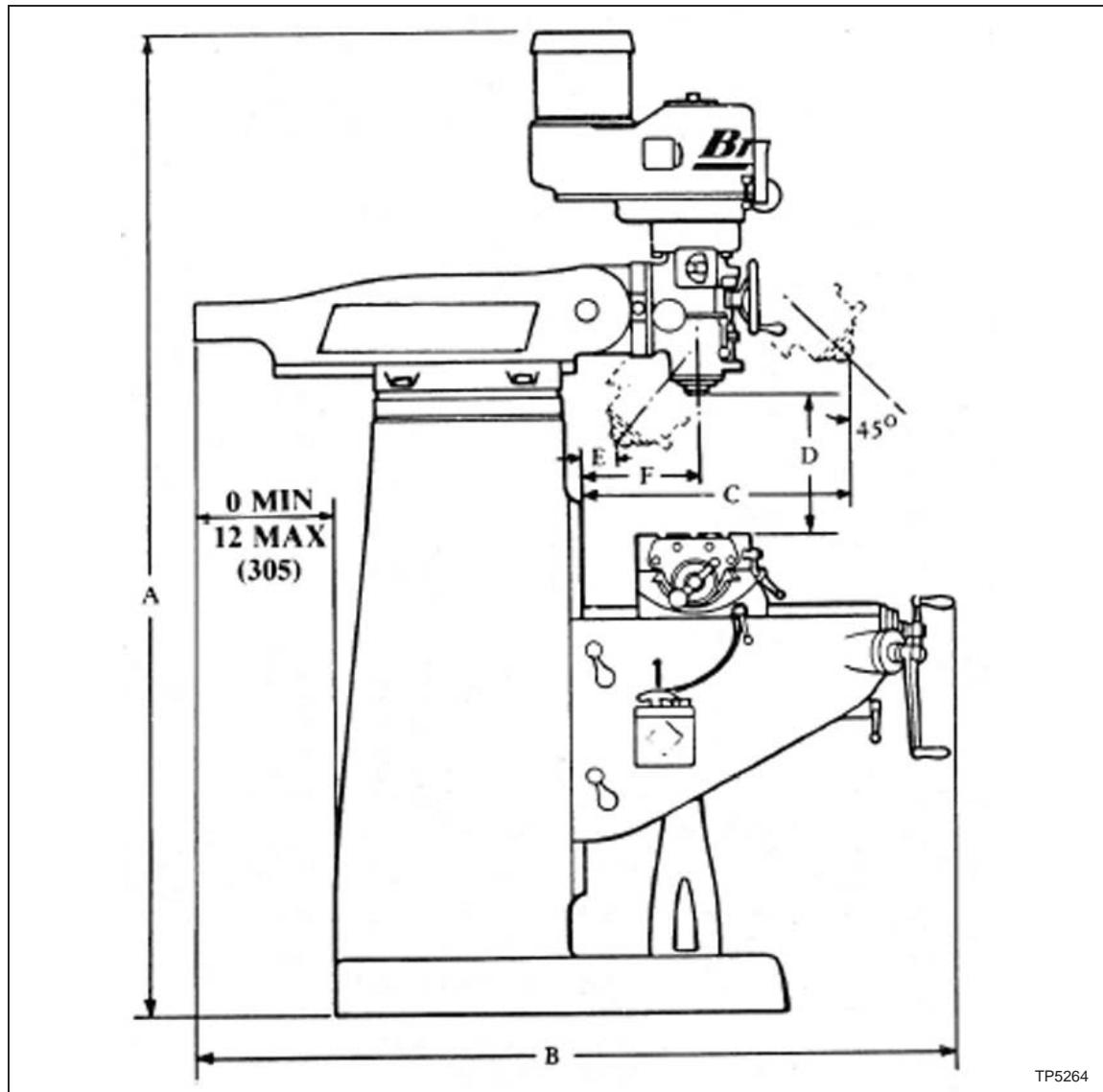


Figure 5.1 - Machine Principle Dimensions

TABLE TRAVEL

30" (762mm)
36" (914mm)

TABLE LENGTH

42" (1067mm)
48" (1219mm)

A

B

C

D

E

F

MIN	82" (2083)	51" (1295)	8.750" (222)	2.500" (64)	0	6.750" (171)
MAX	82" (2083)	63" (1600)	20.750" (527)	18.500" (470)	12" (305)	18.750" (476)

Note: Metric specifications in parenthesis

FLOOR PLAN INSTALLATION LAYOUT

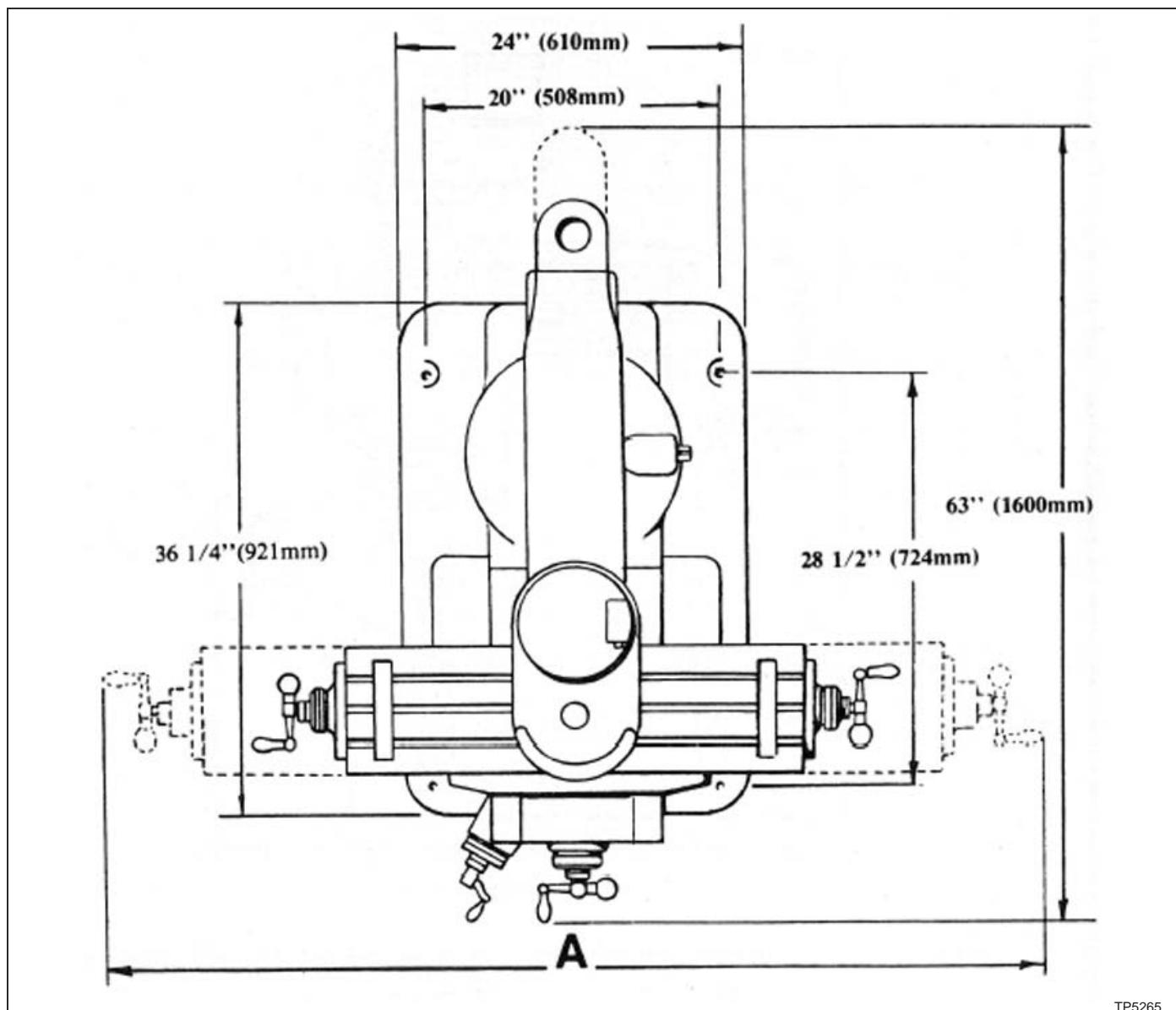


Figure 5.2 - Machine Specifications
Principle Dimensions

'A' DIMENSION

TABLE SIZE
42" (1067mm)
48" (1219mm)

PLAIN MACHINE
87" (2210mm)
93" (2362mm)

POWER FEED
91" (2311mm)
97" (2464mm)

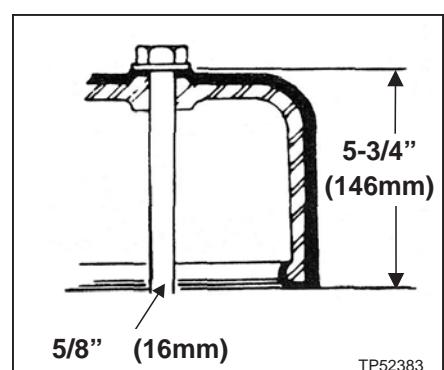


Figure 5.3 - Machine
Dimension - Hold-Down Bolt

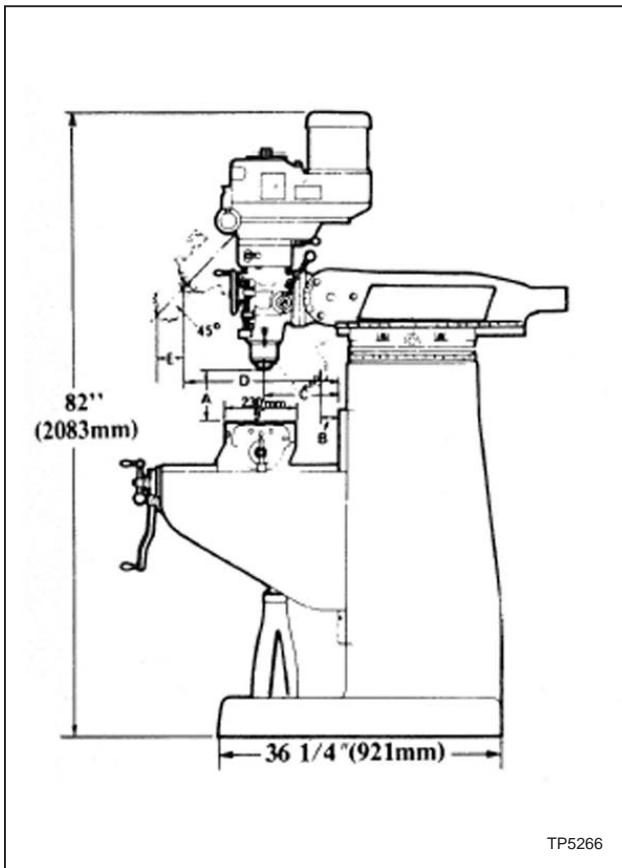


Figure 5.4 - Machine Specifications
Side View

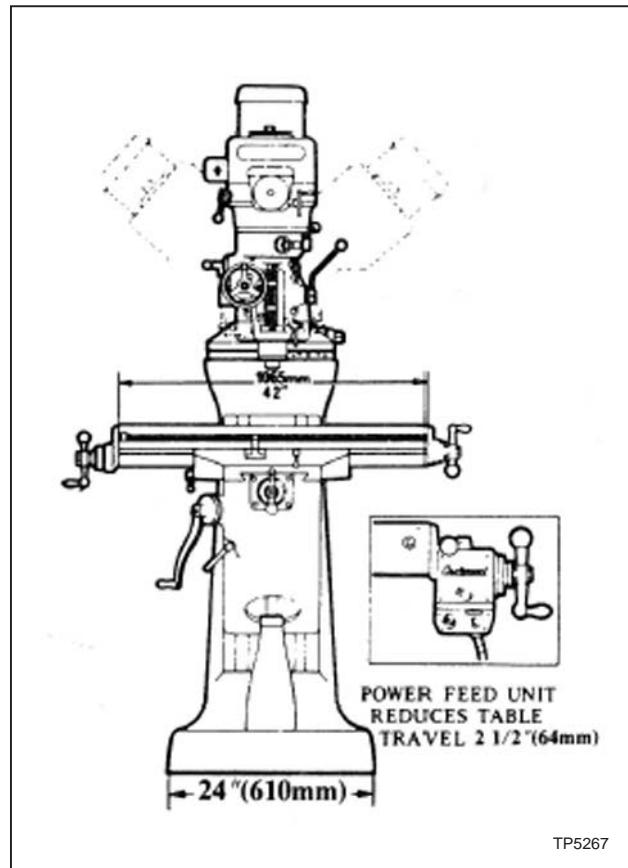


Figure 5.5 - Machine Specifications
Front View

Table Size	42" x 9"	1067mm x 229mm
Table Travel Hand Only	30"	762mm
Table Travel with Power Feed	27.500"	699mm
Saddle Travel	12"	305mm
Vertical Travel	16"	406mm
Number of Tee Slots	3	3
Width and Centers	.625" at 2.500"	15.9mm at 63.5mm
Ram Movement	12"	305mm
Spindle Speeds-RPM (Infinitely Variable)	60 – 4200	
Spindle Center to Column Face	6.750" – 18.750"	171mm – 476mm
Spindle to Table	2.500" – 18.500"	64mm – 470mm
Quill Feeds per Rev of Spindle	.0015" - .003" - .006"	.04mm, .08mm, .15mm
Shipping Particulars, Space Occupied	115 cu. Ft.	3.26 cu. M
Net Weight (Basic Machine)	1988 lb.	900 kg
Gross Weight (Basic Machine)	2604 lb.	1180 kg

Machines can also be fitted with a 48" x 9" (1219m x 228mm) table with a travel of 36" (914mm). If an X-Axis power feed unit is selected, the table travel is reduced by 2.500" (64mm).

MACHINE SPECIFICATIONS

RANGE

Table Travel (X-Axis)	30" (762mm) (42" Table)	36" (914mm) (48" Table)
Saddle Travel (Y-Axis)	12" (305mm)	
Quill Travel	5" (127mm)	
Knee Travel (Z-Axis Manual)	16" (406mm)	
Ram Travel	12" (305mm)	
Throat Distance (Minimum)	6.75" (171mm)	
(Maximum)	18.75" (476mm)	
Table to Spindle Nose Gage Line (Minimum)	2.25" (57mm)	
Maximum Weight of Workpiece	750 lb. (340kg)	

TABLE

Overall Sizes	9" x 42" (229mm x 1067mm)	9" x 48" (229mm x 1219mm)
T-Slots	3 on 2.5" (64mm) Centers	
T-Slot Size	.625" (16mm)	

Height Above Floor (Max.)

STD POWER FEED

(X) .750-35 IPM
(19-889mm/min)

HIGH TORQUE POWER FEED

(X) .375-15 IPM
(9.5-381mm/min)

SPACE AND WEIGHT

Floor Area	7' x 10' (2.1m x 3.1m)
Height	82" (2083mm)
Net Weight	1988 lb. (900kg)
Shipping Weight	2180 lb. (989kg)

POWER

Electric Supply – 60 Hz, 3-Phase 208/230/460/575v

COLOR

Standard Standard Machine Gray

*Power optional – power feed on X-table or Y cross feed is optional equipment.

HEAD

MILLING SPECIFICATIONS

*No longer available/part orders only

MODEL	M-HEAD	J-HEAD	J-HEAD HI-SPEED	2J-HEAD PRE-1977	2J-HEAD POST-1977
Power	.5 HP	1.0 HP	1.5 HP	1.5 HP	2.0 HP
Motor RPM	1200 RPM	1800 RPM	3600 RPM	1800 RPM	1800 RPM
Speed Ranges –RPM	6 Steps	8 Steps	8 Steps	Stepless	Stepless
Low	275 – 4550	80 – 325	160 – 660	60 – 500	60 – 500
High		660 – 2720	1320 – 5440	500 – 4200	500 – 420
Quill Travel	3.5" (88.9mm)	5.0" (127mm)	5.0" (127mm)	5.0" (127mm)	5.0" (127mm)
Quill Diameter	2.562" (65mm)	3.375" (86mm)	3.375" (86mm)	3.375" (86mm)	3.375" (86mm)
Spindle Taper	#2 Morse #7 B and S B-3	R-8 #30 QC	R-8 #30 QC	R-8 #30 QC	R-8 #30 QC
Spindle Diameter	1.437" (36.5mm)	1.865" (48mm)	1.875" (48mm)	1.875" (48mm)	1.875" (48mm)
Spindle Feed Rate	Manual	.0015/Rev .038mm .003/Rev .076mm .006/Rev .152mm	.0015/Rev .038mm .003/Rev .076mm .006/Rev .152mm	.0015/Rev .038mm .003/Rev .076mm .006/Rev .152mm	.0015/Rev .038mm .003/Rev .076mm .006/Rev .152mm
Drilling Capacity					
Manual	.50" Dia (12.7mm)	.75" Dia (19mm)	.75" Dia (19mm)	.75" Dia (19mm)	.87" Dia (22mm)
Power		.37" Dia (9.4mm)	.37" Dia (9.4mm)	.37" Dia (9.4mm)	.37" Dia (9.4mm)
Boring Capacity	1.50" Dia (38mm)	6.0" Dia (152.4mm)	6.0" Dia (152.4mm)	6.0" Dia (152.4mm)	6.0" Dia (152.4mm)
Milling Capacity	1.0" ³ /Min (16 cc/Min)	1.5" ³ /Min (24 cc/Min)	1.5" ³ /Min (24 cc/Min)	2.0" ³ /Min (32 cc/Min)	2.0" ³ /Min (32 cc/Min)
Spindle to Column					
Minimum	7.5" (190.5mm)	6.0" (152mm)	6.0" (152mm)	6.0" (152mm)	6.0" (152mm)
Maximum	19.0" (483mm)	23.0" (584mm)	23.0" (584mm)	23.0" (584mm)	23.0" (584mm)

RECOMMENDATIONS:

Use 2, 3 or 4 end mills. Eight-flute end mills are usually not 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 drills up to .375"Ø. Use manual feed for drills larger than .375"Ø.

2J-HEAD

GENERAL SPEED RECOMMENDATIONS

MATERIAL TO BE CUT	ROUGH CUT	FEET PER MINUTE		
		ROUGH AND FINISH	LIGHT AND FINISH CUT	
Cast Iron – Soft (Under 150 Brinnell)	70	80 – 90	120	
Cast Iron – Med (150-200 Brinnell)	55	60 – 70	90	
Cast Iron – Hard (Over 200 Brinnell)	40	50 – 60	70	
Steel (Chrome Nickel 40-45 Shore)	30	40	50	
Steel (Stainless)	60	80	90	
Steel (Low Carbon)	80	90	140	
Steel (High Carbon)	40	50	70	
Bronze (Medium)	90	120	150	
Bronze (Hard)	65	90	130	
Brass (Hard)	100	150	200	
Copper	150	200	300	
Duraluminum	400		600	
Aluminum	600		1000	

TABLE OF CUTTING SPEEDS AND FEEDS

Feet per Minute	15	20	25	30	40	50	60	70	80	90	100
REVOLUTIONS PER MINUTE											
in Inches											
.063"	917	1222	1528	1833	2445	3056	3667	4278			
.125"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056
.187"	306	407	509	611	815	1019	1222	1426	1630	1833	2037
.250"	229	306	382	458	611	764	917	1070	1375	1375	1528
.312"	183	244	306	367	489	611	733	856	978	1100	1222
.375"	153	204	255	306	407	509	611	713	815	917	1019
.438"	131	175	218	262	349	437	524	611	698	786	873
.500"	115	153	191	229	306	382	458	535	611	688	764
.625"	91	122	153	183	244	306	367	428	489	550	611
.750"	76	102	127	153	204	255	306	357	407	458	509
.875"	65	87	109	131	175	218	262	306	349	393	437
1.000"	60	76	95	115	153	191	229	267	306	344	382
1.125"		67	84	102	136	170	204	238	272	306	340
1.250"		61	76	91	122	153	183	214	244	275	306
1.375"			69	83	111	139	167	194	222	250	278
1.500"			63	76	102	127	153	178	204	229	255
1.625"			60	70	94	118	141	165	188	212	235
1.750"				65	87	109	131	153	175	196	218
1.875"				61	81	102	122	143	163	183	204
2.000"					76	95	115	134	153	172	191

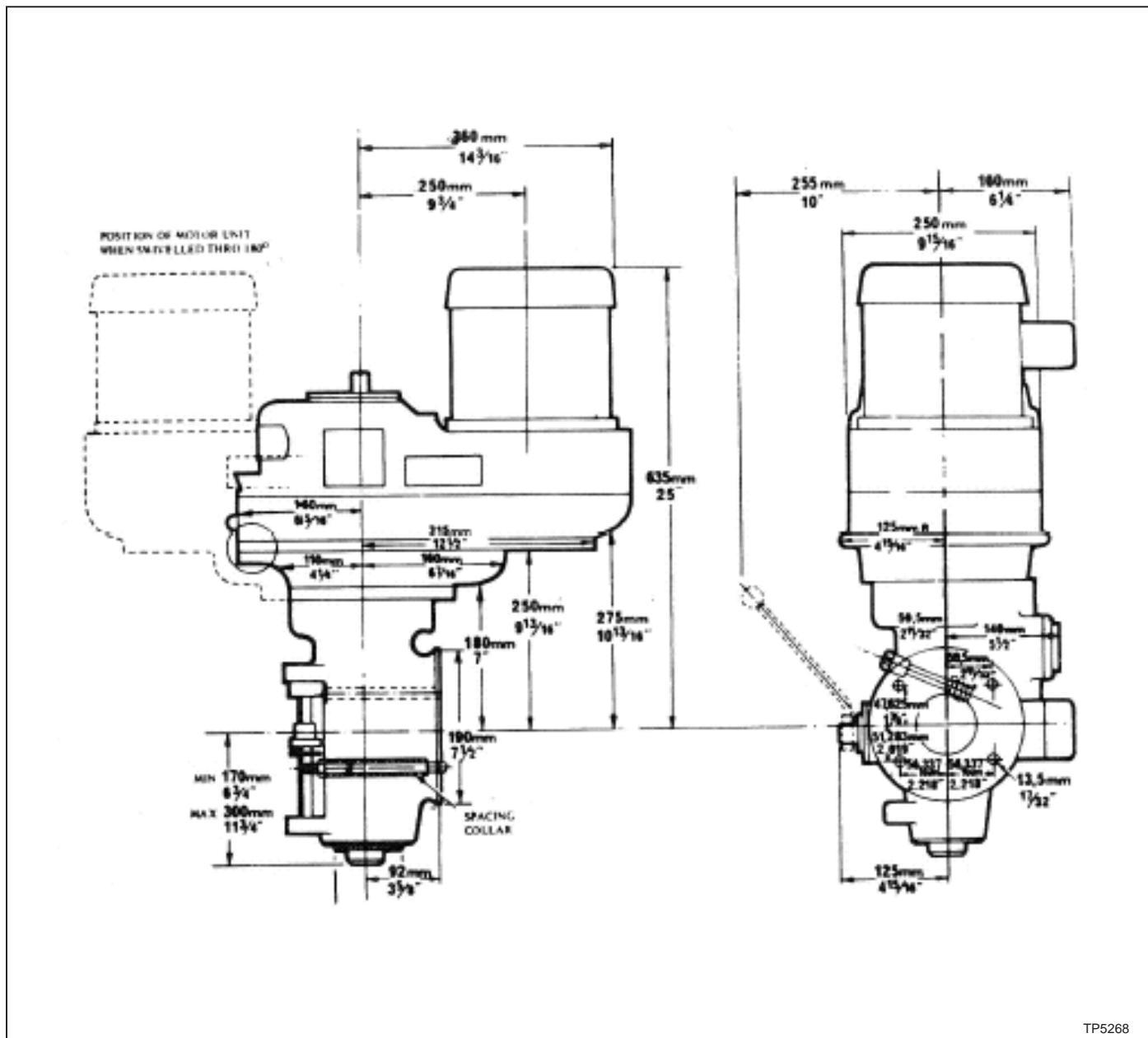


Figure 5.6 - 2J-Head Specifications

Spindle Taper	R8	R8
Spindle Speeds – RPM	60-4200	60-4200
Motor	*2 HP	1.5 kw
Quill Travel	5"	127mm
Power Feed of Quill per Rev of Spindle (3 Rates)	.0015" .003" .006"	.04mm .08mm .15mm
Collet Capacity	.125"-.750" x .063"	3 – 19mm x 1.5mm
Weight	196 lb.	89 kg

*2 HP Continuous – 3 HP Intermittent

J-HEAD

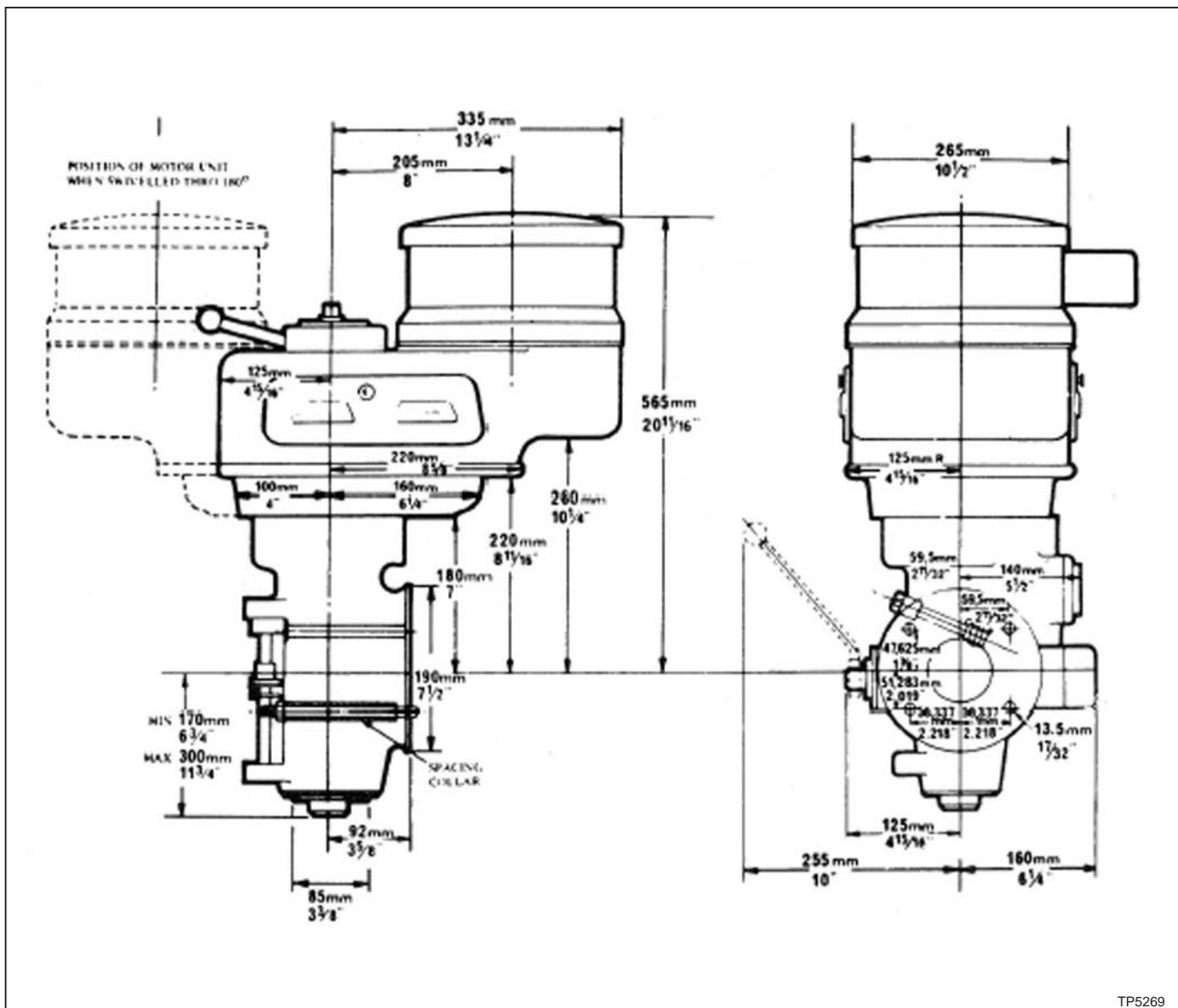


Figure 5.7 - J-Head Specifications

Spindle Taper
Spindle Speeds – RPM

R8
Low Range
80, 135, 210, 325

R8
High Range
660, 1115, 1750, 2720

Motor

1 HP

.750 kw

Quill Travel

5"

127mm

Power Feed of Quill
per Rev of Spindle (3 Rates)

.0015"
.003"
.006"

.05mm
.08mm
.15mm

Collet Capacity
Weight

.125" – .750"
168 lb

by .063" increments
76 kg

E-HEAD

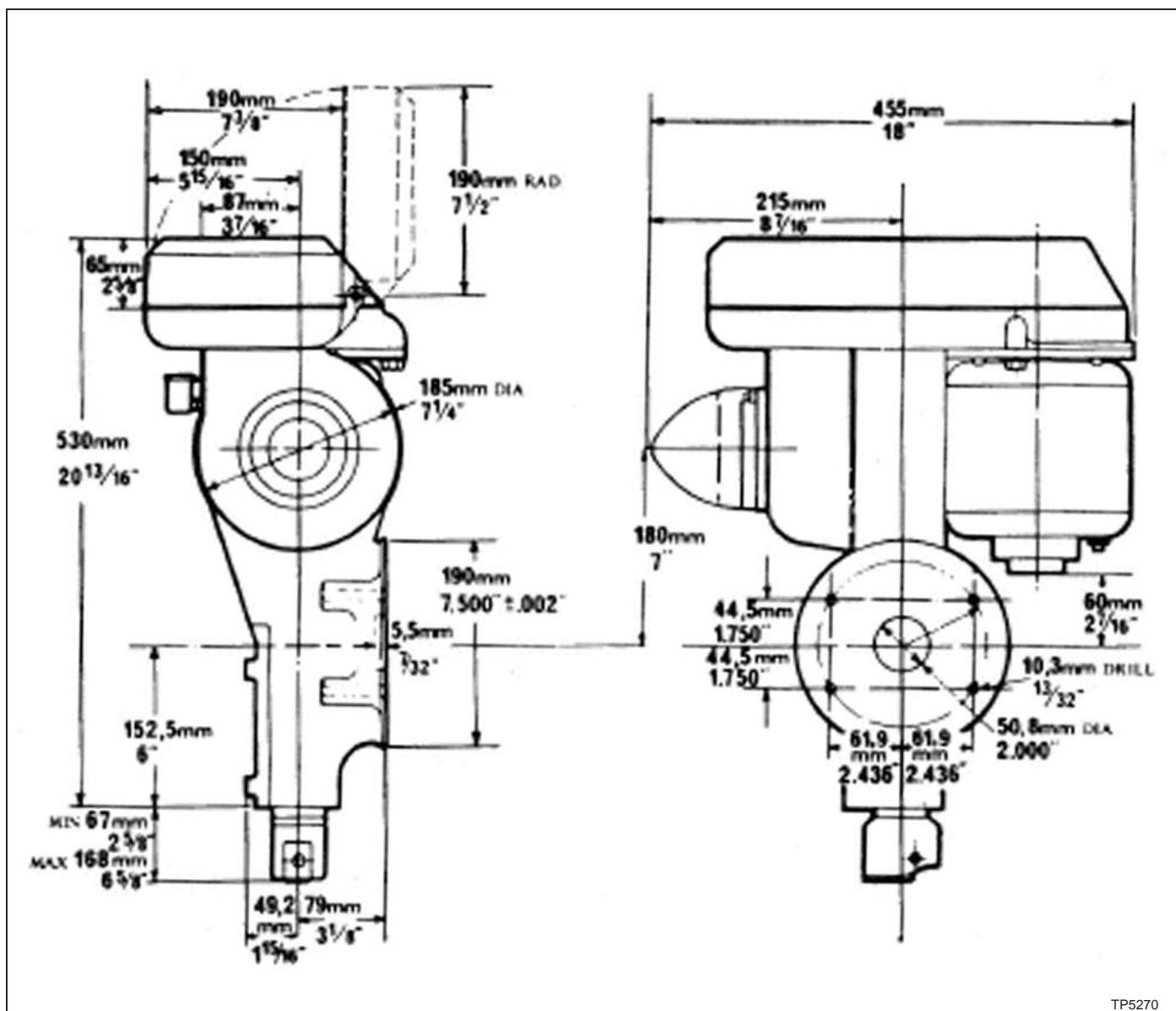


Figure 5.8 - E-Head Specifications

Oscillation Rate (Stroke per Minute)	60, 85, 120 170, 245, 350	
Motor	1/3 HP	.250 kw
Stroke Adjustment	.125" – 4"	3 - 100mm
Tool Capacity		
Horizontally Mounted	.375"	10mm
Vertically Mounted	.625"	16mm
Weight	112 lb	51 kg

6F POWER FEED

SCHEMATIC

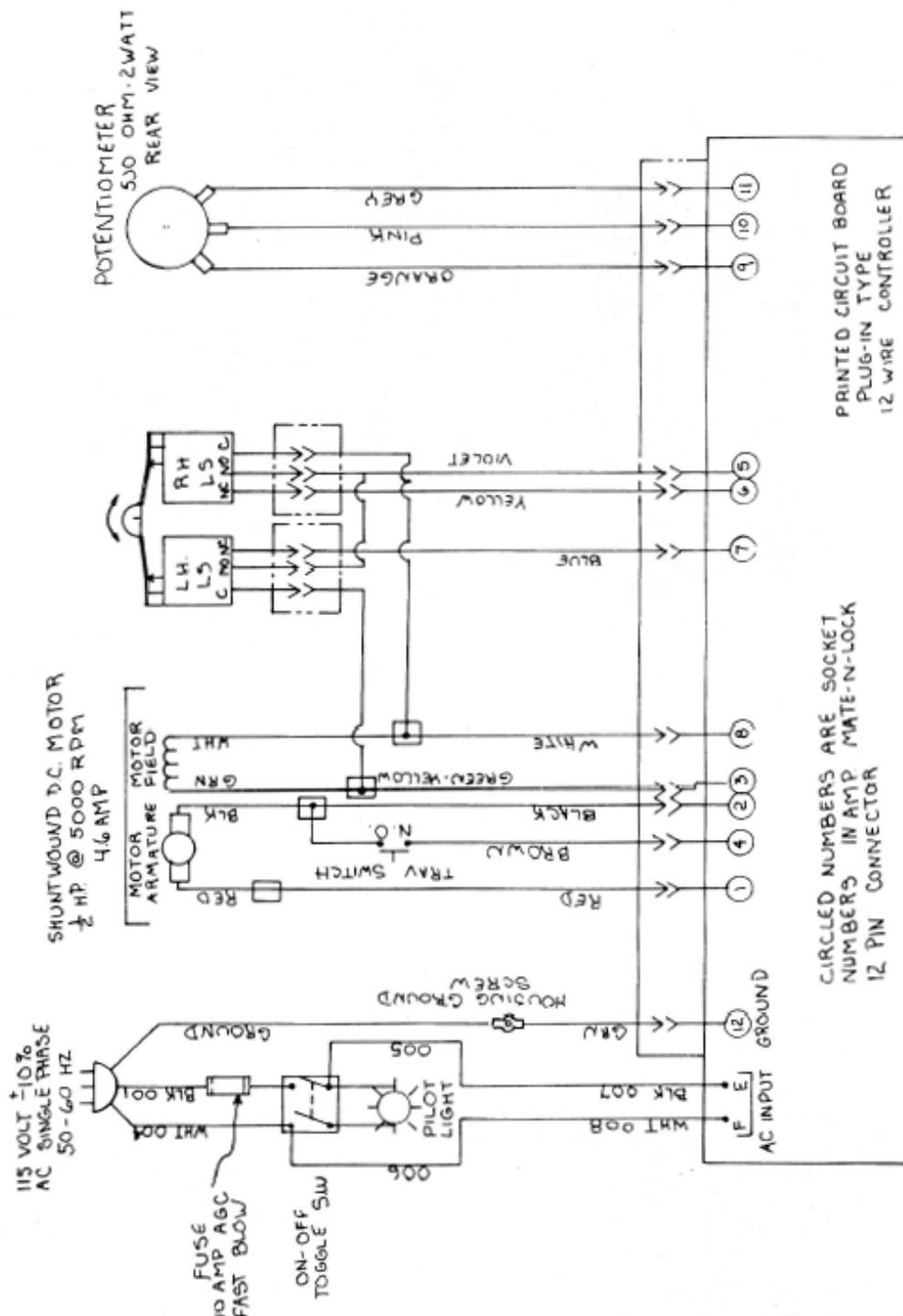
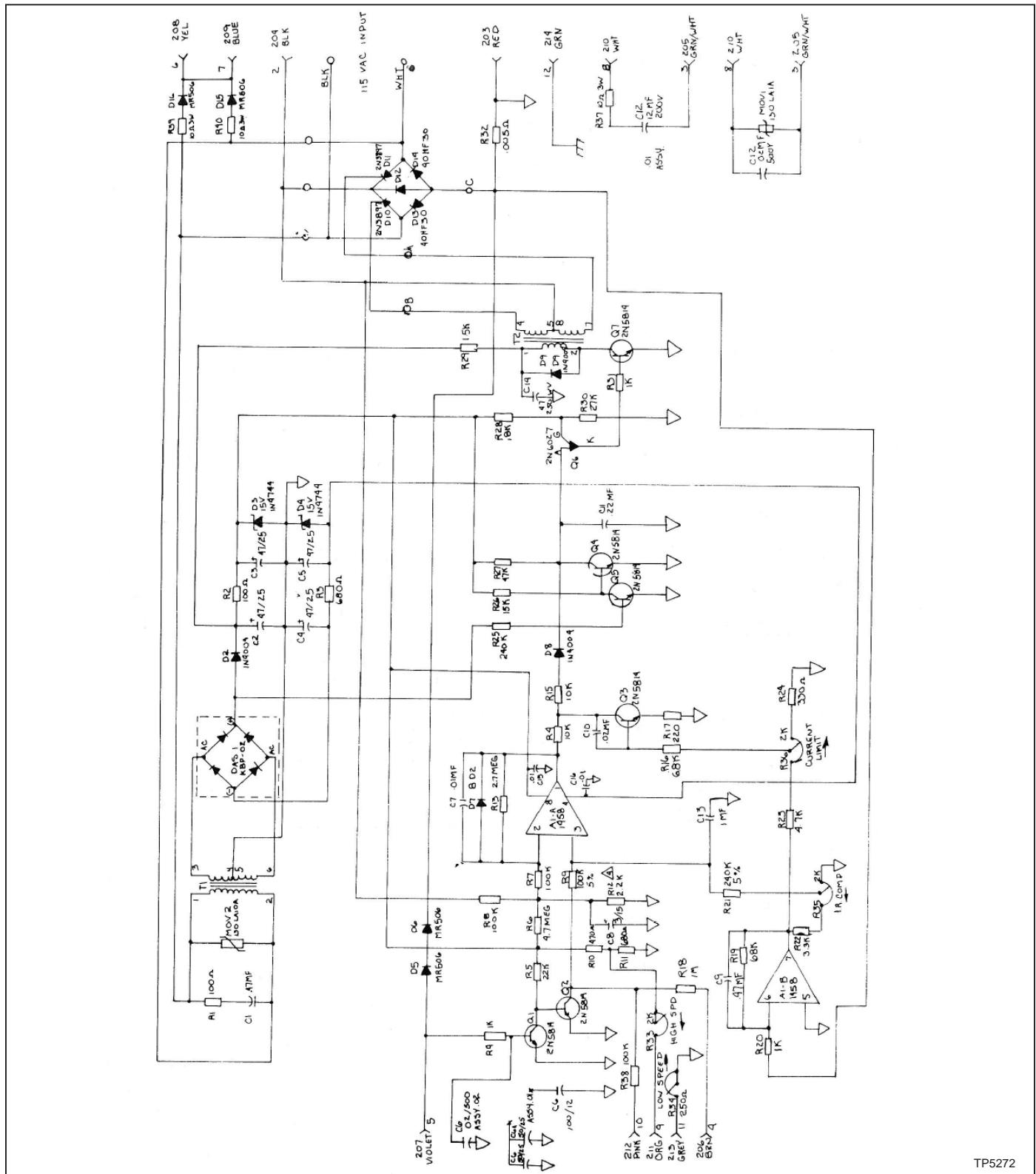


Figure 5.9 - 6F Power Feed Schematic

6F POWER FEED CIRCUIT BOARD



TP5272

Figure 5.10 - 6F Power Feed Circuit Schematic

8F POWER FEED

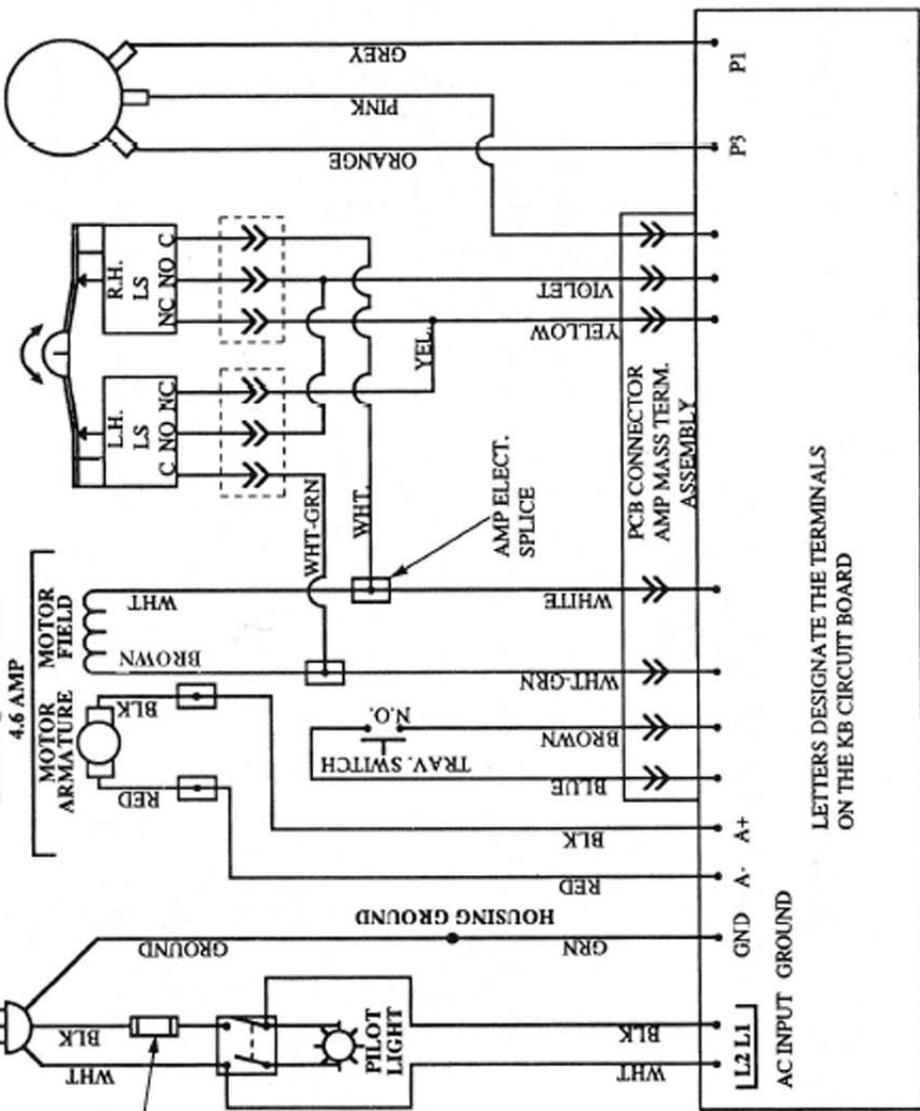
SCHEMATIC

NOTE:
For Y-axis power feed,
reverse wires for proper
axis direction.

Red A+
Black A-

115 VOLT $\pm 10\%$
A.C. SINGLE PHASE
50 - 60 Hz

SHUNTWOUND
D.C. MOTOR
1/2 H.P. @ 5000 R.P.M.
4.6 AMP



WIRE EQUIVALENTS FOR
FRACMO MOTORS

BOEHM	FRACMO
RED	BLACK/RED
BLACK	BLACK
*BROWN	BLUE
WHITE	BROWN
NO GROUND	GREEN/YELLOW

* Previous Boehm motors
used a green field wire.

LETTERS DESIGNATE THE TERMINALS
ON THE KB CIRCUIT BOARD

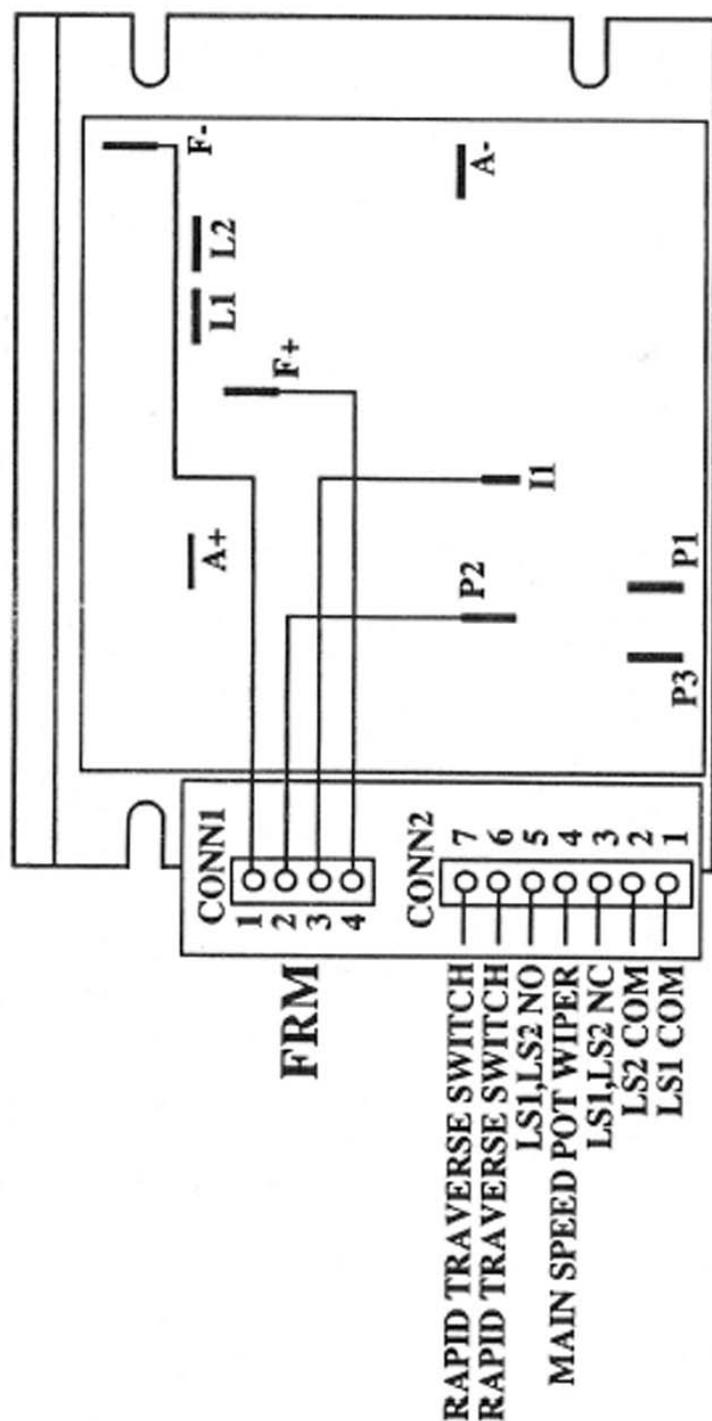
P3 P1

TP5273

Figure 5.11 - 8F Power Feed Schematic

8F POWER FEED CIRCUIT BOARD

KBIC-118

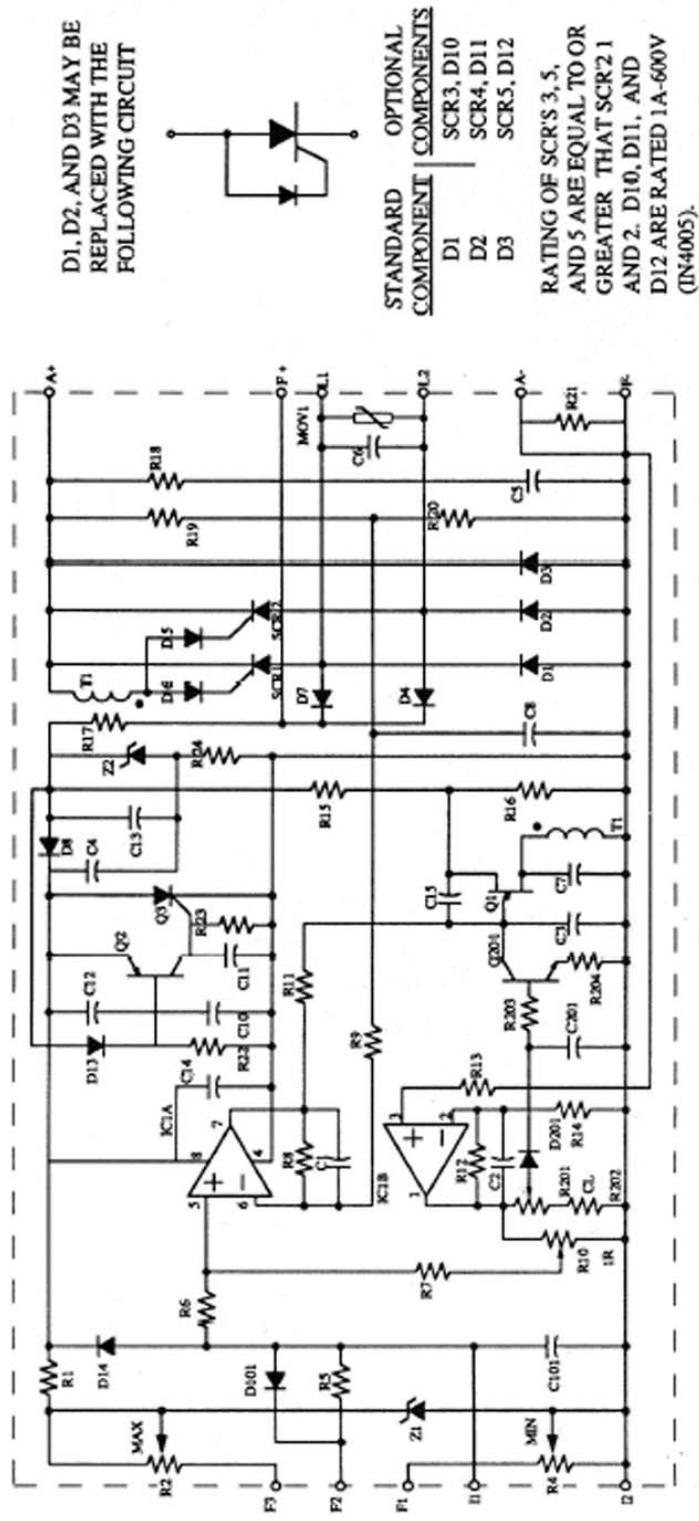


TP5274

Figure 5.12 - 8F Power Feed Circuit Board Schematic

8F POWER FEED SCHEMATIC

KBIC-L SCHEMATIC



NOTES:

1. THIS SCHEMATIC APPLIES TO THE FOLLOWING MODELS: KB1C-19, KB1C-125, KB1C-118, KB1C-120, KB1C-29, KB1C-225, KB1C-218, KB1C-240, AND KBPC WITH ONE OR MORE OF THE FOLLOWING SUFFIXES: A, T, U, S, AND PM.
2. R16 MAY BE CHANGED TO Z3 ON SOME MODELS.
3. R5 CAN BE A FIXED RESISTOR.
4. R IS USED ON SOME MODELS.
5. R21 MAY BE A PLUG-IN HORSEPOWER RESISTOR.

TP5275

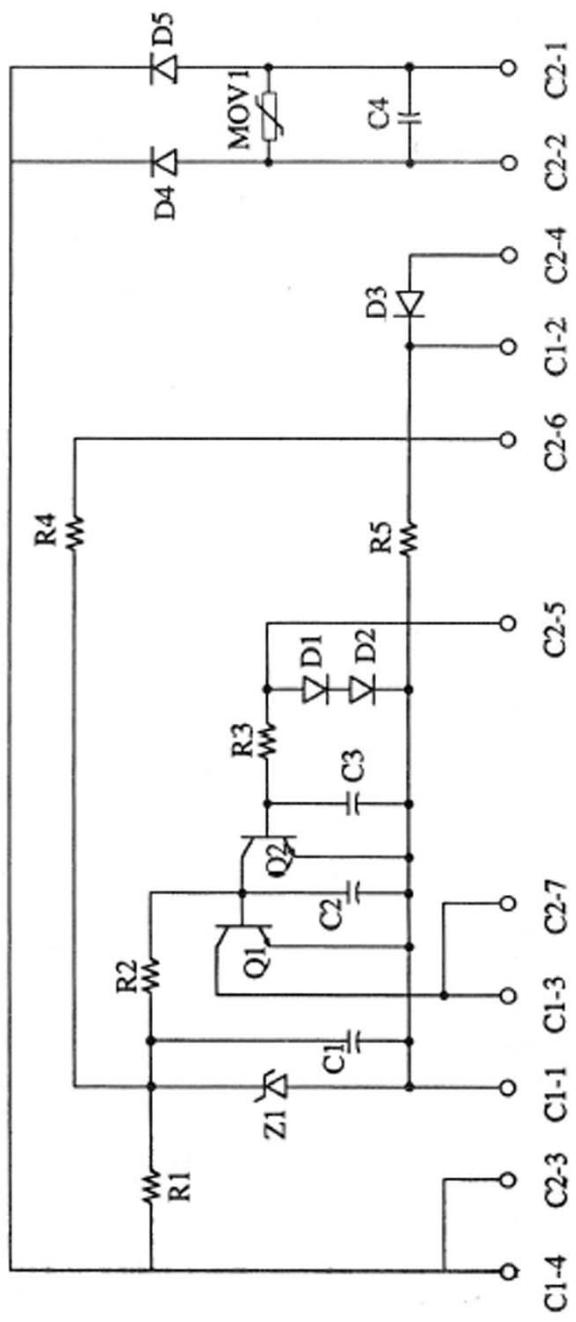
Figure 5.13 - 8F Power Feed Schematic

PARTS

8F POWER FEED SCHEMATIC

Circuit Ref	Value/Rating	Mfr Type	Function
C1	.22ufd – 100V		Capacitor
C2, 3, 8	.1ufd – 100V		Capacitor
C4	100ufd – 35V		Capacitor
C5, 6	.1ufd – 250V		Capacitor
C7	.0033ufd – 100V		Capacitor
C10, 11	4.7ufd – 25V		Capacitor
C12, 13, 15	.01ufd – 25V	Disc Ceramic	Capacitor
C14	.02ufd – 50V	Disc Ceramic	Capacitor
C101	4.2ufd – 25V		Capacitor
C201	.1ufd – 100V		Capacitor
D1, 2, 3	15A – 600V	D6015L	Power Diode
D4 – D14	1A – 600V	1N4005	Diode
D101, 201	1A – 500V	1N4005	Diode
IC1		CA358 or LM358	Dual Operational Amp
MOV1	130V – 10J	V130LA10A	Transient Suppressor
Q1		2N3646	Unijunction transistor
Q2	1A – 35V	2N4403	Transistor (AI)
Q3	.8A – 50V	S051E	Signal SCR
Q201	.5A – 35V	2N5089	Transistor (CL)
R1	2.2K – 1/4W – 10%		Resistor
R2	10K – 1/8E – 20%		Maximum Speed Trim
R3	5K – 2W – 20%		Main Speed Pot
R4	2.5K – 1/8W – 10%		Minimum Speed Trim
R5	100K – 1/4W – 10%		Resistor
R6	10K – 1/4W – 10%		Resistor
R7	150K – 1/4W – 10%		IRC Range
R8*, 203	3.3M – 1/4W – 10%		Resistor
R9	47K – 1/4W – 10%		Resistor
R10	50K – 1/8W – 10%		IR Compensation Trim
R11	33K – 1/4W – 10%		Resistor
R12	2.2M – 1/4W – 10%		Resistor
R13, 14	47K – 1/4W – 10%		Resistor
R15	3.3K – 1/4W – 10%		Resistor
R16	5.6K – 1/4W – 10%		Resistor
R17	4.7K – 3W – 10%		Resistor
R18	470 ohm – 1/4W – 10%	Flameproof	Resistor
R19	68K – 1/4W – 10%		Resistor
R20	3.9K – 1/4W – 10%		Resistor
R21	.01 – 1.0 ohm – 5W – 15%		Current Sensing Resistor
R22	47K – 1/4W – 10%		Resistor
R23	1K – 1/4W – 10%		Resistor
R201	50K – 1/8W – 10%		Current Limit Trim
R202	8.2K – 1/4W – 10%		Resistor
R204	4.7K – 1/4W – 10%		Resistor
SCR1, 2	15A – 200V	S2015L	Power SCR
T1	1:1	KB	Pulse Xfmr
Z1	12V – 1W – 5%		Zener Diode
Z2	22V – 1W – 5%		Zener Diode

FRM, SCHEMATIC DIAGRAM



TP5276

Figure 5.14 - 8F Power Feed Circuit Board Schematic

8F POWER FEED CIRCUIT BOARD

Circuit Ref	Value/Rating	Mfr Type	Function
C1, 3	10.0ufd - 35V	Electrolytic	Capacitor
C2	0.47ufd - 50V	Electrolytic	Capacitor
C4	0.022ufd - 250Vac /630Vdc	Mylar	Capacitor
Conn. 1		CE156F20-4	End Connector
D1, 2, 3	1A - 600V	1N4005GP	Diode
D4, 5	1.5A - 600V	1N5937GP	Diode
HDR1		MLSS156-4	PCB Header
HDR2		MLSS156-7	PCB Header
MOV1	150V	V150LA10AA	Transient Surge Supp
Q1, 3	0.6A - 1W - 5%	2N4401	Small Signal Transistor
R1	33K - 1W - 5%	MO-1	Resistor
R2	22K - 0.25W - 5%	Carbon Film	Resistor
R3, 4	10K - 0.25W - 5%	Carbon Film	Resistor
R5	33K - 0.25W - 5%	Carbon Film	Resistor

- NOTES -

- NOTES -

