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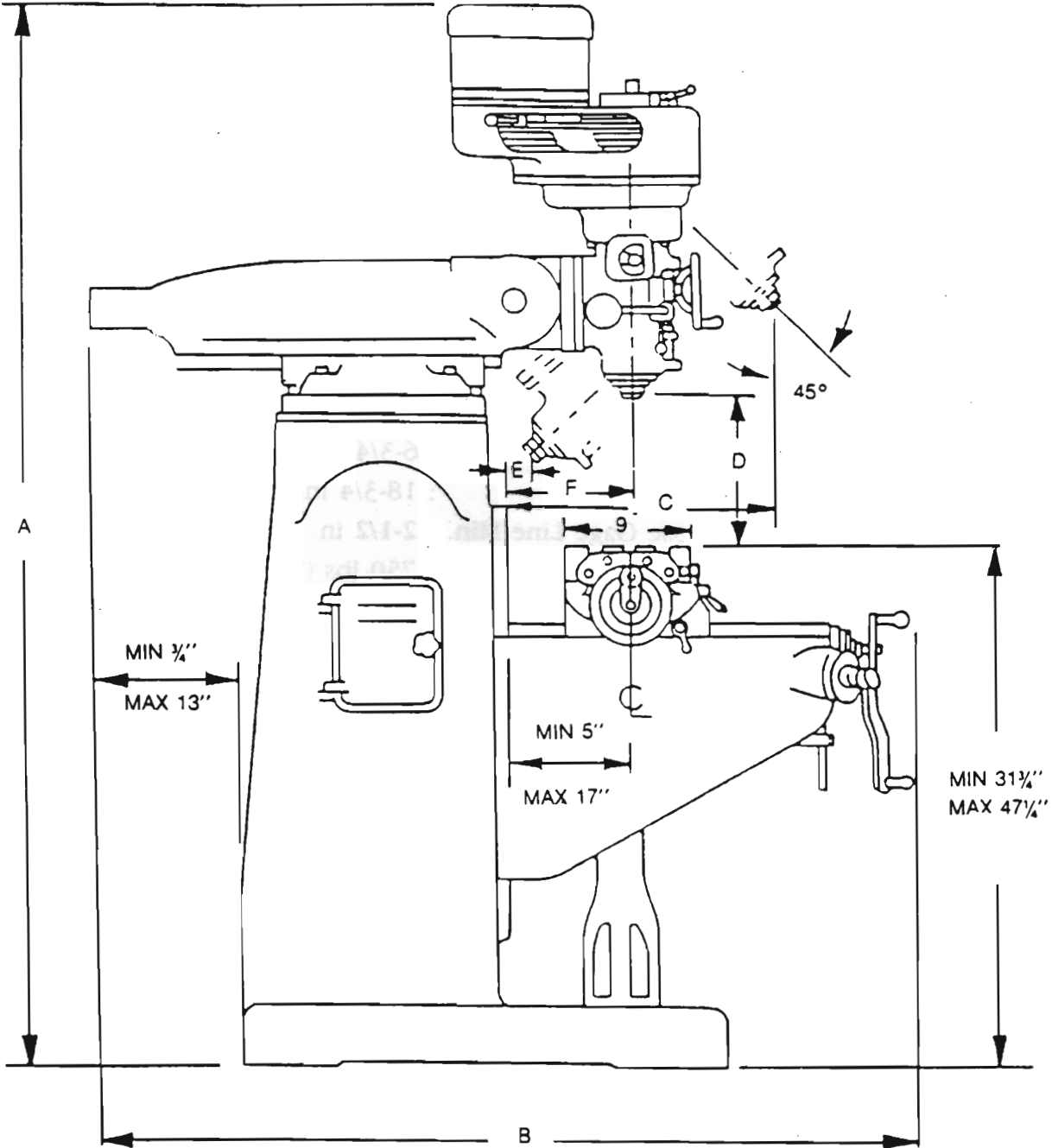
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1. SPECIFICATION

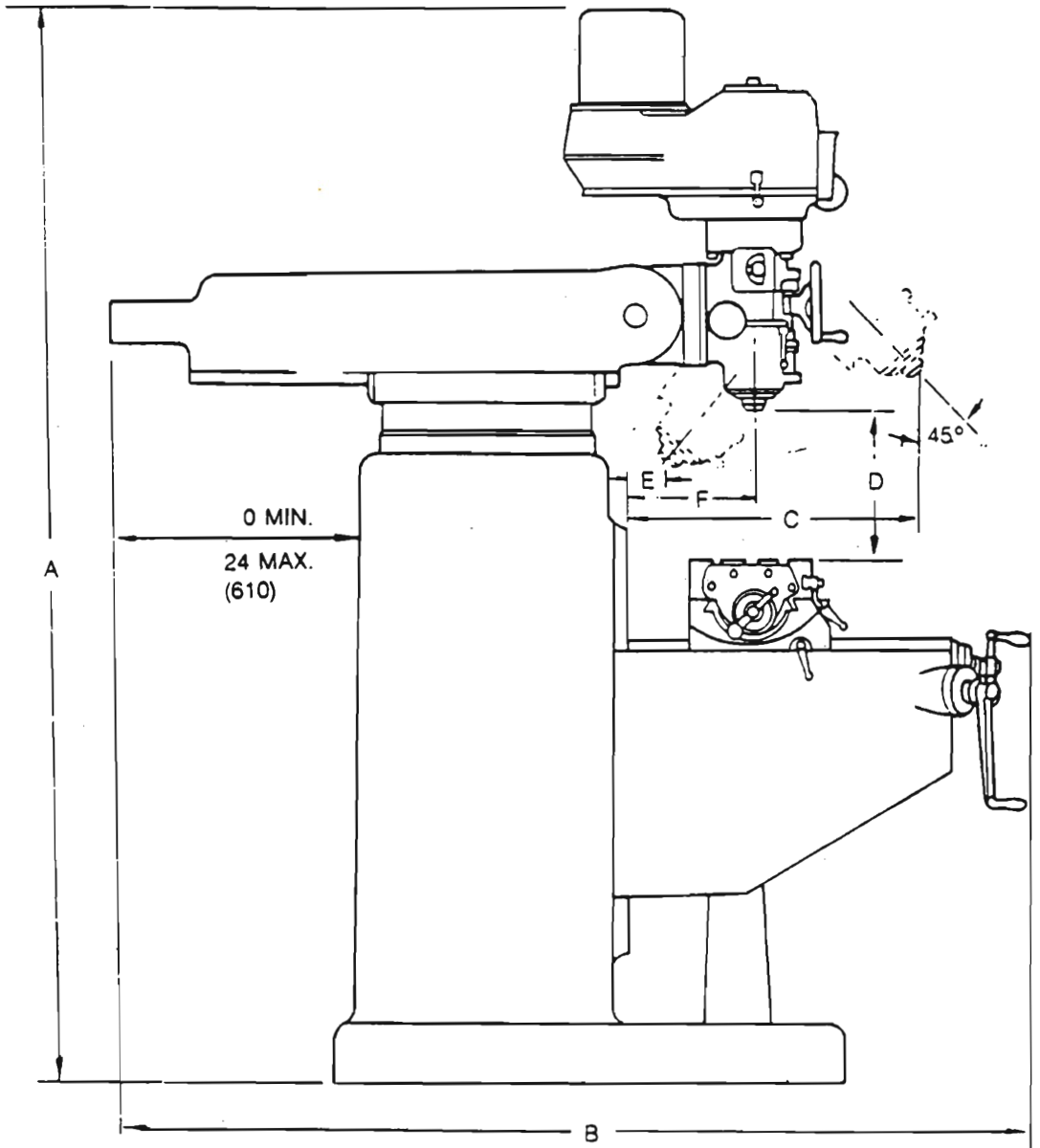
1-1 Machine Specification

2S



	A	B	C	D	E	F
MIN.		51" 1295mm	8-3/4" 222mm	2-1/2" 64mm	0	6-3/4" 171mm
MAX.	82-3/16" 2088mm	63" 1600mm	20-3/4" 527mm	18-1/2" 470mm	12" 305mm	18-3/4" 476mm

Figure 1. Principal Dimension of 2S



	A	B	C	D	E	F
MIN.		56" 1422mm	11-1/4" 285mm	2-1/2" 64mm	0	4-1/4" 108mm
MAX.	82-3/16" 2088mm	78" 1981mm	35-1/4" 895mm	18-1/2" 470mm	21" 533mm	28-1/4" 717mm

Figure 2. Principal Dimension Of 3VK

Features

- Spindle Motor: 3HP, Variable Spindle Speed.
- Rigid Meehanite GA-50 Castings.
- Travel Ways: X, Y-axes & Knee by Hardened & Ground Dovetail Way
- Chrome Plated and Ground Spindle Quill
- Super Precision Spindle with Abec-7 Angular Contact Ball Bearings

Range

Table Travel (X-axis)	: 34 in. (914mm)
Saddle Travel (Y-axis)	: 16 in. (406mm)
Quill Travel	: 5 in. (127mm)
Knee Travel (Z-axis)	: 16 in. (406mm)
Ram Travel	: 24 in. (610mm)
Throat Distance Min.	: 4-1/4 in. (171mm)
Max.	: 28-1/4 in. (476mm)
Table To Spindle Nose Gage Line Min.	: 2-1/2 in. (64mm)
Max. Weight Of Workpiece	: 850 lbs (386kgs)

Table

Overall Size	: 10 × 50 in. (254 × 1270mm)
T-Slots	: 3 on 2-1/2 in. (64mm) centers
T-Slot Size	: 5/8 in. (16mm)
Height Above Floor Max.	: 47-1/4 in. (1200mm)

Space and Weight

Floor Area	: 7 × 10 ft. (2.1 × 3.1m)
Height	: 82-3/16 in. (2088mm)
Net Weight	: 2420 lbs (1100kgs)
Shipping Weight	: 2684 lbs (1220kgs)

Power

Spindle Motor	: 3HP (2.25KW)
Electrical Supply	
3 Phase 60Hz	: 220/440V

Color

Standard Machine	: White/Burgundy Stripe
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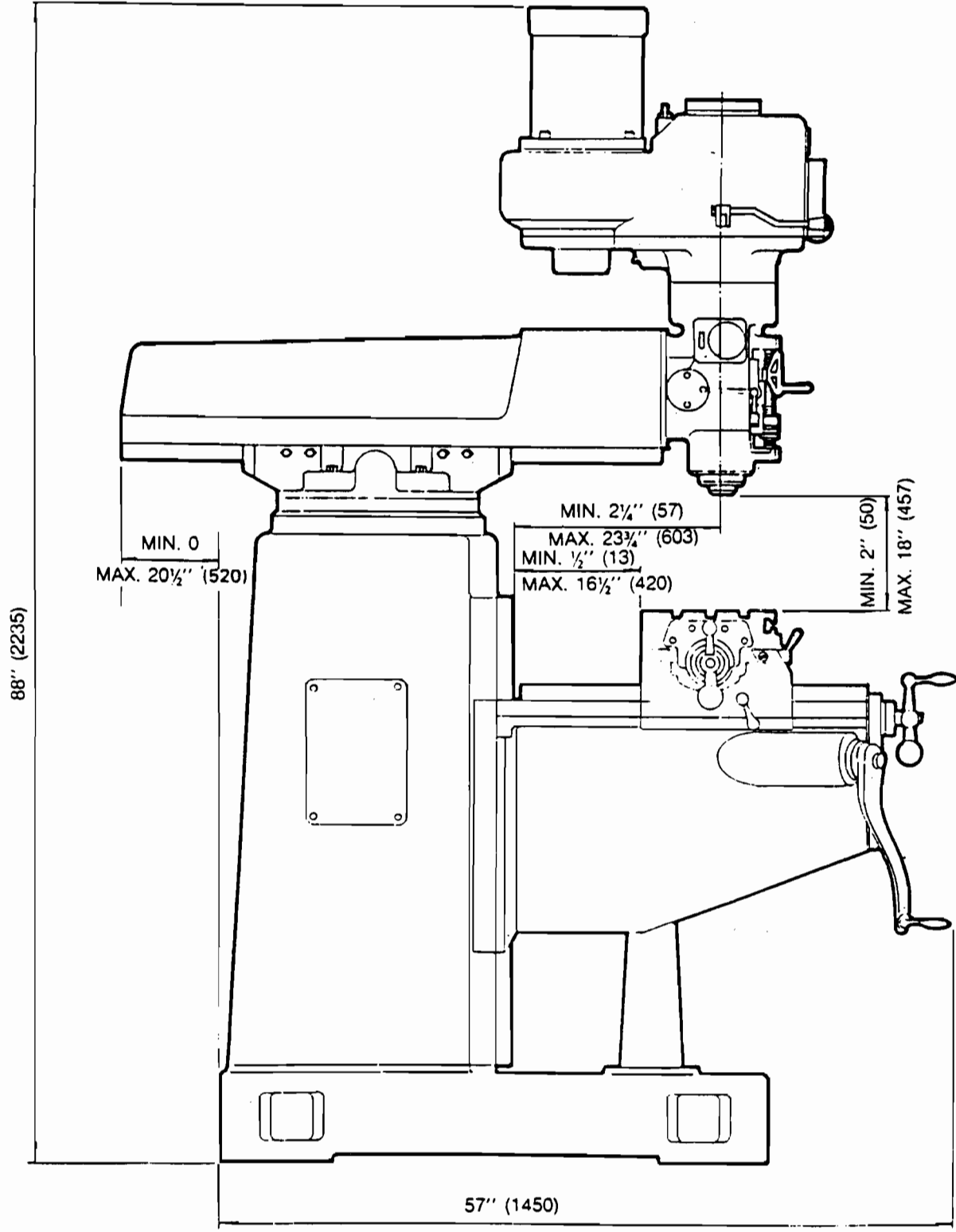


Figure 3. Principal Dimensions Of 4 VK

Features

- * Spindle Motor: 5HP, Variable Spindle Speed.
- * Travel Ways: X-axis by Hardened & Ground Dovetail Way.
Y-axis & Knee by Hardened & Ground Square Ways.
- * Rigid Meehanite GA-50 Castings.
- * Chrome Plated & Ground Spindle Quill
- * Super Precision Spindle with Abec-7 Angular Contact Ball Bearings.

Range

Table Travel (X-axis)	: 32 in. (914mm)
Saddle Travel (Y-axis)	: 16 in. (406mm)
Quill Travel	: 5 in. (140mm)
Knee Travel (Z-axis)	: 16 in. (406mm)
Ram Travel	: 21-1/2 in. (546mm)
Throat Distance Min.	: 2-1/2 in. (57mm)
Max.	: 23-3/8 in. (603mm)
Table To Spindle Nose Gage Line Min.	: 2 in. (50mm)
Max. Weight Of Workpiece	: 850 lbs (386kgs)

Table

Overall Size	: 10 × 50 in. (254 × 1270mm)
T-Slots	: 3 on 2-1/2 in. (63.5mm) centers
T-Slot Size	: 5/8 in. (16mm)
Height Above Floor Max.	: 50 in. (1270mm)

Space and Weight

Floor Area	: 7 × 10 ft. (2.1 × 3.1m)
Height	: 88 in. (2235mm)
Net Weight	: 3500 lbs (1600kgs)
Shipping Weight	: 3850 lbs (1750kgs)

Power

Spindle Motor	: 5HP (3.75KW)
Electrical Supply	
3 Phase 60Hz	: 220/440V

Color

Standard Machine	: White/Burgundy Stripe
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1-2 Milling Head Specification

MODEL	2S	3VS/3VK/3VKH	4 VK
Power	2.0HP/4P (1.5KW)	3 HP (2.25KW)	5 HP (3.75KW)
Motor RPM	1720RPM	1720RPM	1720RPM
Speed Range RPM LOW HIGH	16Steps 80-650 660-5440	Variable Speed 60-500 500-4200	Variable Speed 70-550 550-3600
Quill Travel	5 in. (127mm)	5 in. (127mm)	5 in. (127mm)
Quill Diameter	3.375in. (86mm)	3.375in. (86mm)	4.173in. (106mm)
Spindle Taper	R-8	R-8	1.S.O.40
Spindle Diameter	1.875in. (48mm)	2.677in. (68mm)	3-1/2in. (89mm)
Spindle Feed Rate	0.0015/Rev. (0.038mm) 0.003/Rev. (0.076mm) 0.006/Rev. (0.152mm)	0.0015/Rev. (0.038mm) 0.003/Rev. (0.076mm) 0.006/Rev. (0.152mm)	0.0017/Rev. (0.044mm) 0.0032/Rev. (0.083mm) 0.0054/Rev. (0.138mm)
Drilling Capacity Manual Power	3/4in. (19mm) Dia. 0.37in. (9.4mm) Dia.	7/8in. (22mm) Dia. 0.37in. (9.4mm) Dia.	1-1/4in. (32mm) Dia. 5/8in. (16mm) Dia.
Boring Capacity	6.0in. (152.4mm) Dia.	6.0in. (152.4mm) Dia.	8.0in. (200mm) Dia.
Milling Capacity	1.5in ³ /min	2.0in ³ /min	2.5in ³ /min
Spindle To Column Minimum Maximum	6.0in. (152mm) 23.0in. (584mm)	4-1/4in. (108mm) 28-1/4in. (717mm)	2-1/4in. (57mm) 23-3/4in. (603mm)

2. UNCRATING & CLEANING

Carefully remove protective crating so machine and parts are not marred or damaged. In the event of damage in transit, immediately notify the distributor from whom the machine was purchased, as well as the transportation company making delivery.

Machine should be lifted by placing a sling under the ram as illustrated on page 9,10,11.

Thoroughly clean protective coating from machine with suitable cleaning solution.

Do not move the table, knee, saddle or ram until all ways have been well cleaned and lubricated. Then, by hand, move table, saddle and knee to limit stop in one direction. Clean and lubricate exposed ways and then move each unit to the opposite limit stop and similarly clean and lubricate the exposed ways. Loosen bolts to unlock ram and move forward and backward the full length to clean and lubricate.

Warning: It's not recommended that gasoline or any other highly inflammable cleaning agent be used.

3. INSTALLATION

Loosen four locknuts in front of milling head, out to detent and rotate head to vertical position. Proceed with alignment of head as described on 3-5. Tighten nuts evenly, using normal pressure. Care should be taken to avoid excessive tightening since this will cause distortion in the quill. Tighten all nuts to 25 ft-lbs torque, then repeat to 50 ft-lbs.

3-1 Lifting Machine

The column and base are a one piece casting. Machine should be lifted by placing a sling under the ram.

Note position of ram and table when lifting with sling.

2S/3VS

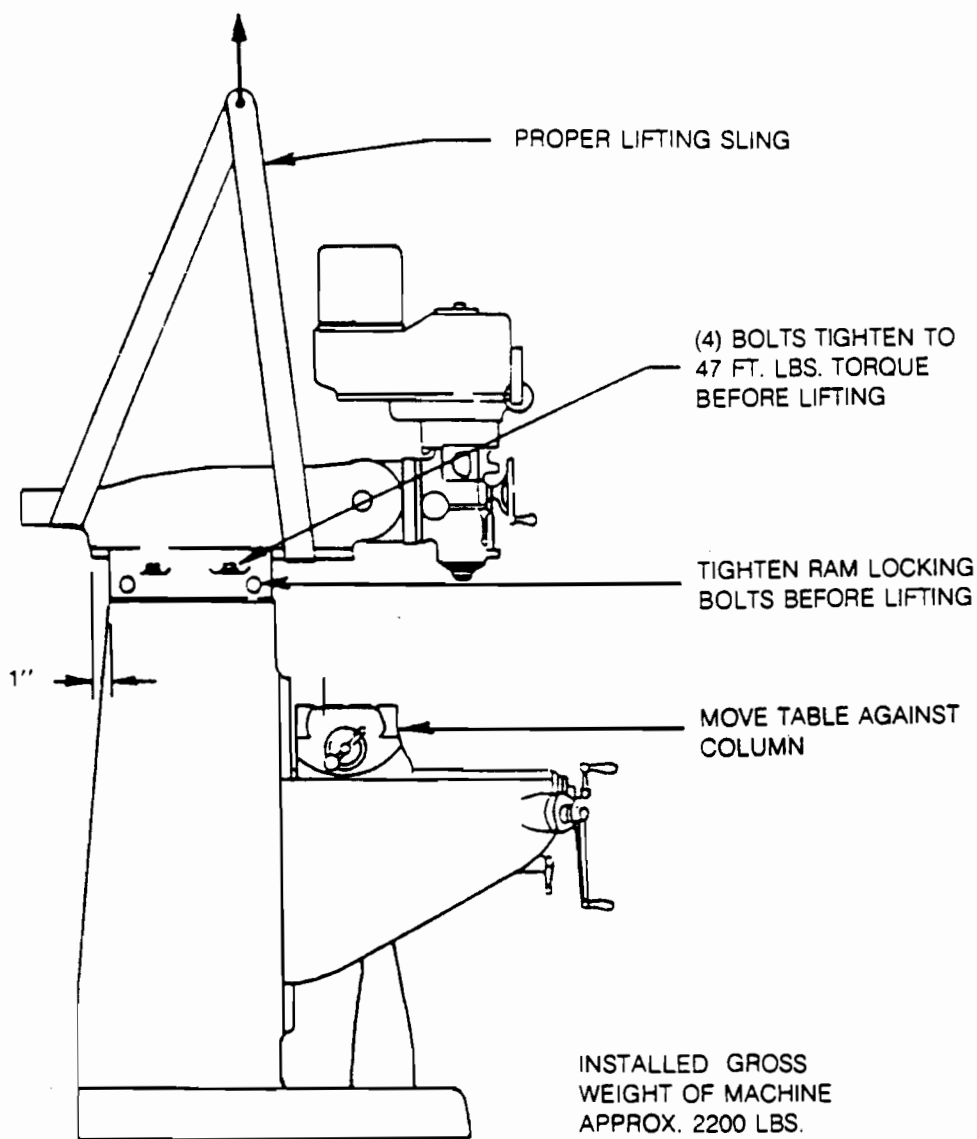


Figure 4. Lifting Method Of 2S/3VS

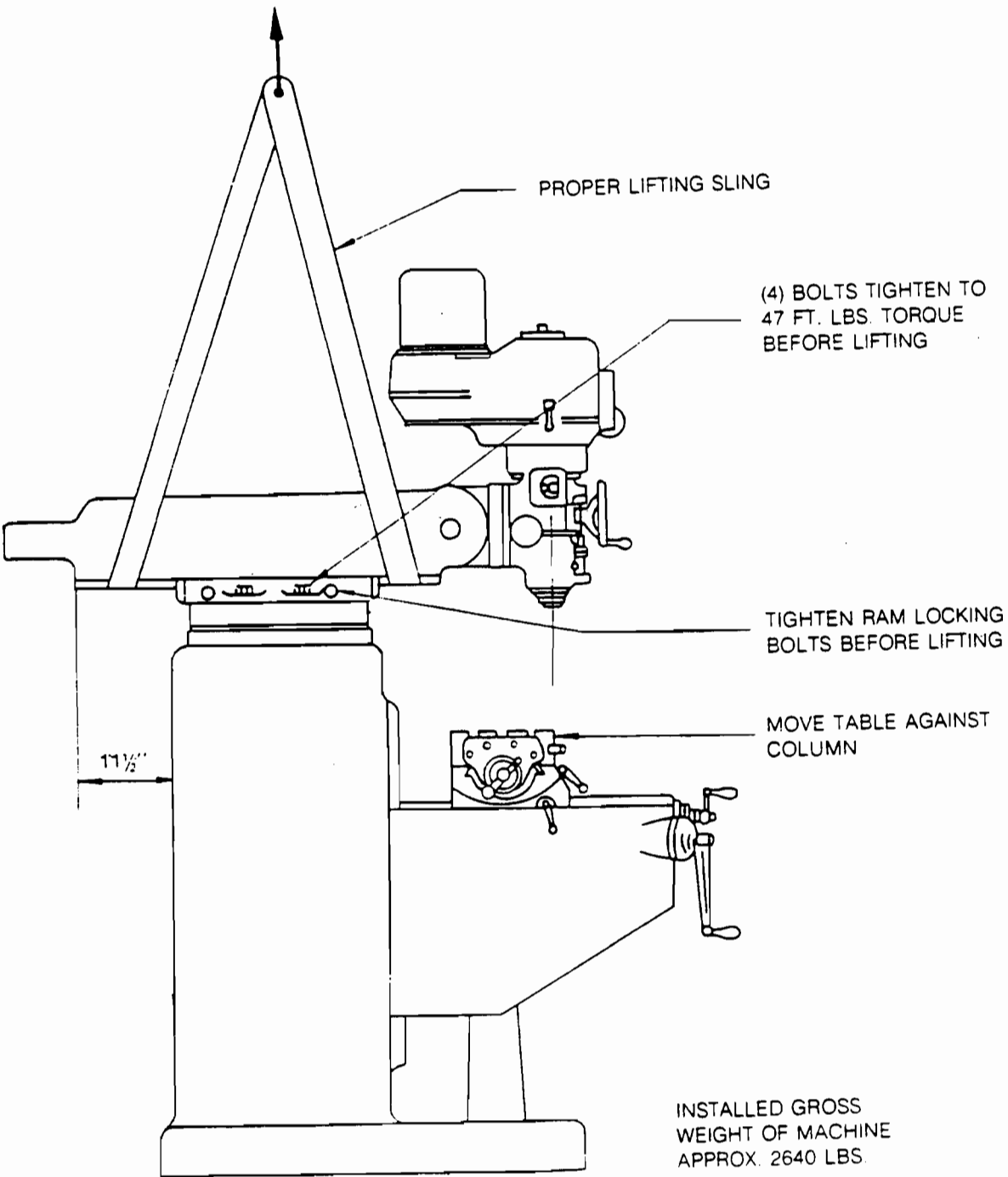


Figure 5. Lifting Method of 3VK

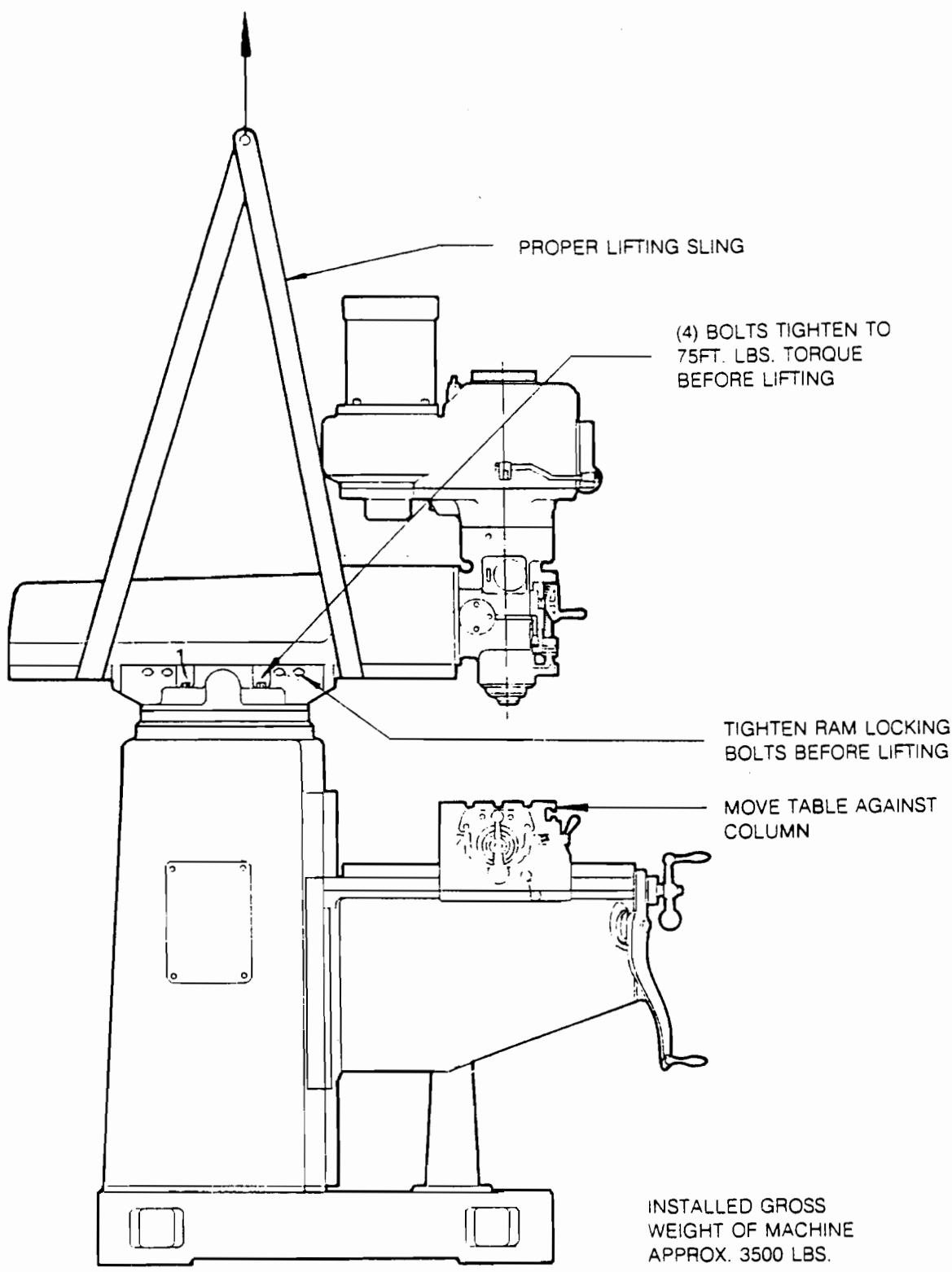


Figure 6. Lifting Method of 4VK/3VKH

3-2 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 that has any surface irregularities, shim should be used to correct this condition to the greatest extent possible.

See figure illustrated for installation layout.

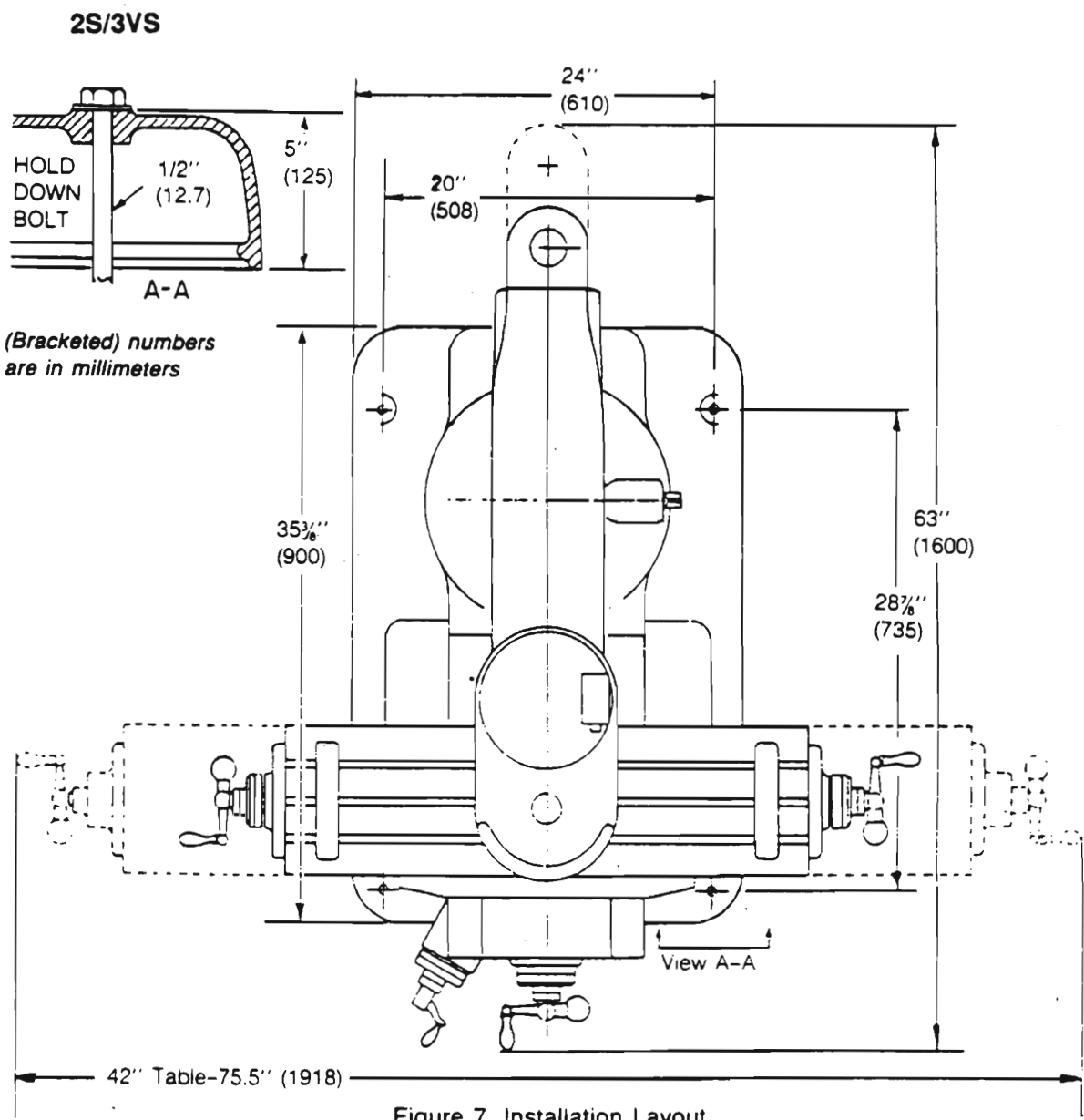


Figure 7. Installation Layout

Noted: It's recommended that the machine be secured to the floor to prevent movement or tipping due to off-center loading.

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

3VK

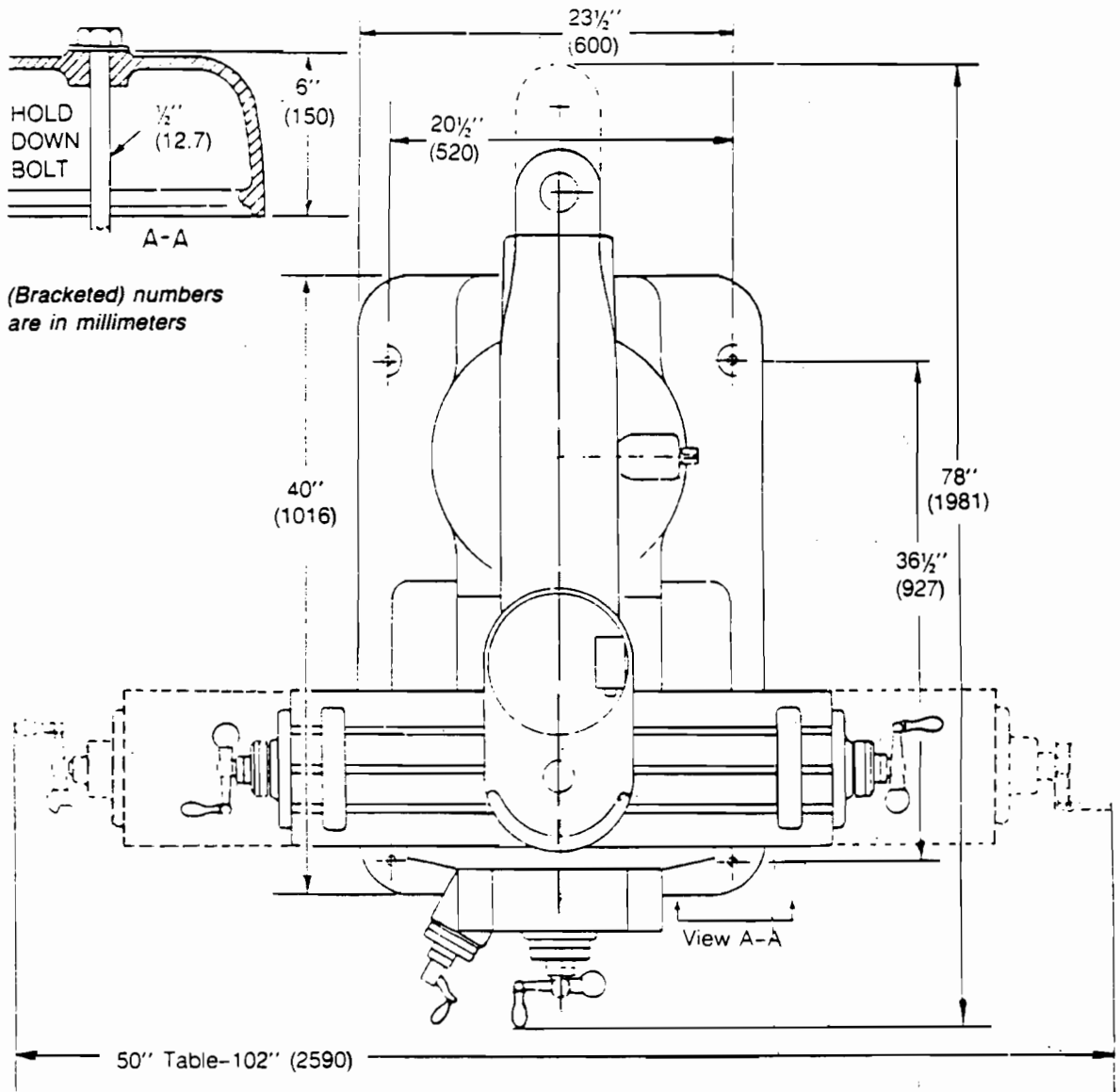


Figure 8. Installation Layout

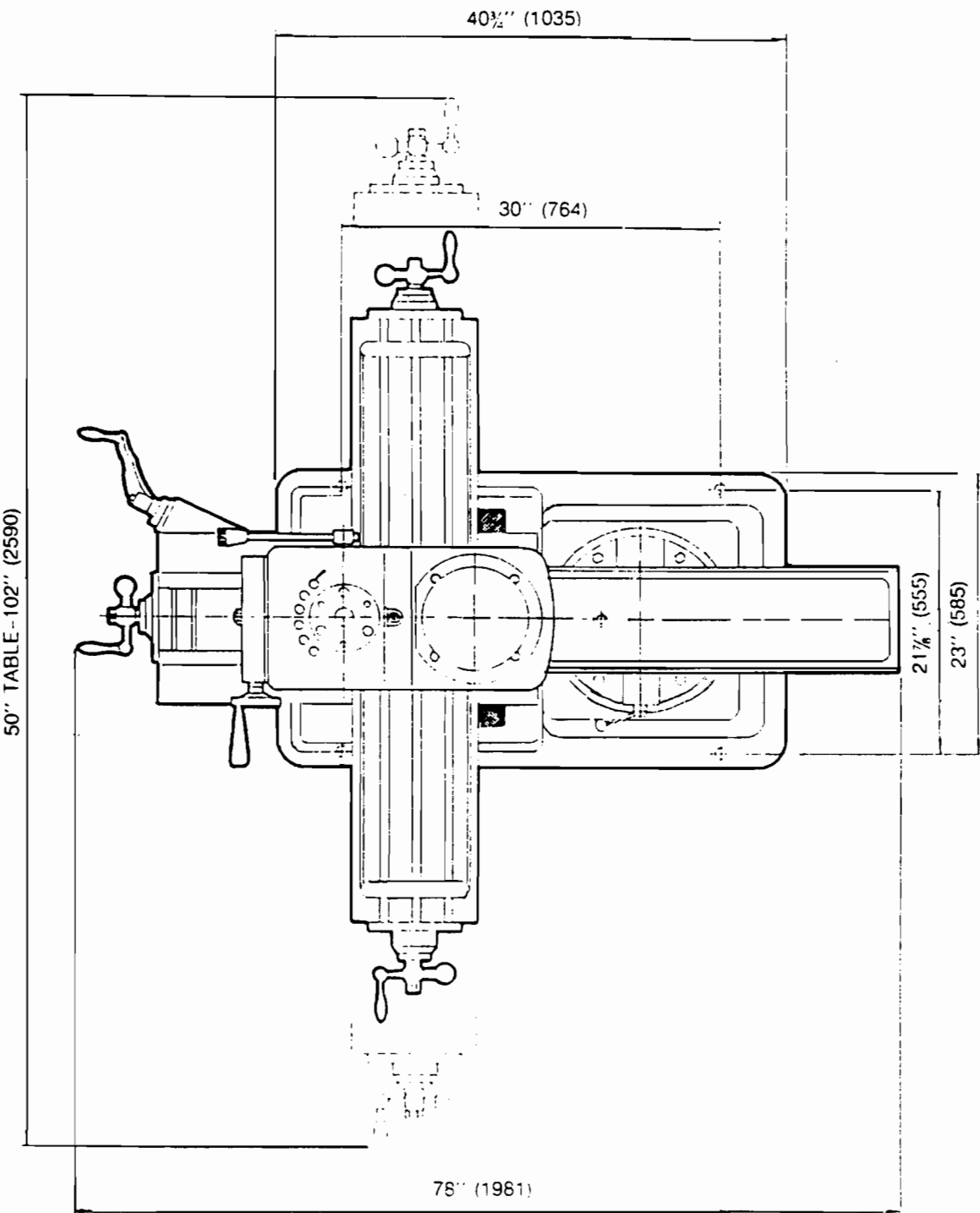
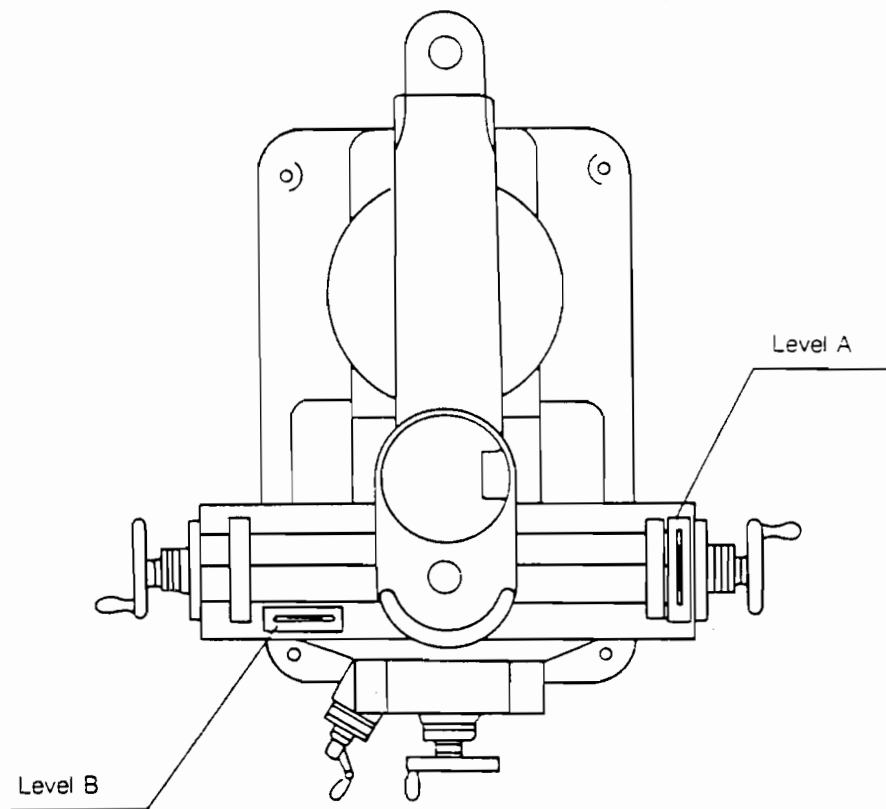


Figure 9. Installation Layout

3-3 Levelling Machine

Set machine by levelling the work table lengthwise and crosswise with a precision level.



3-4 Handles

When crating, the three ball crank handles are sometimes turned to face the machine. In these cases the handles should be reversed before operating.

3-5 Connecting power supply

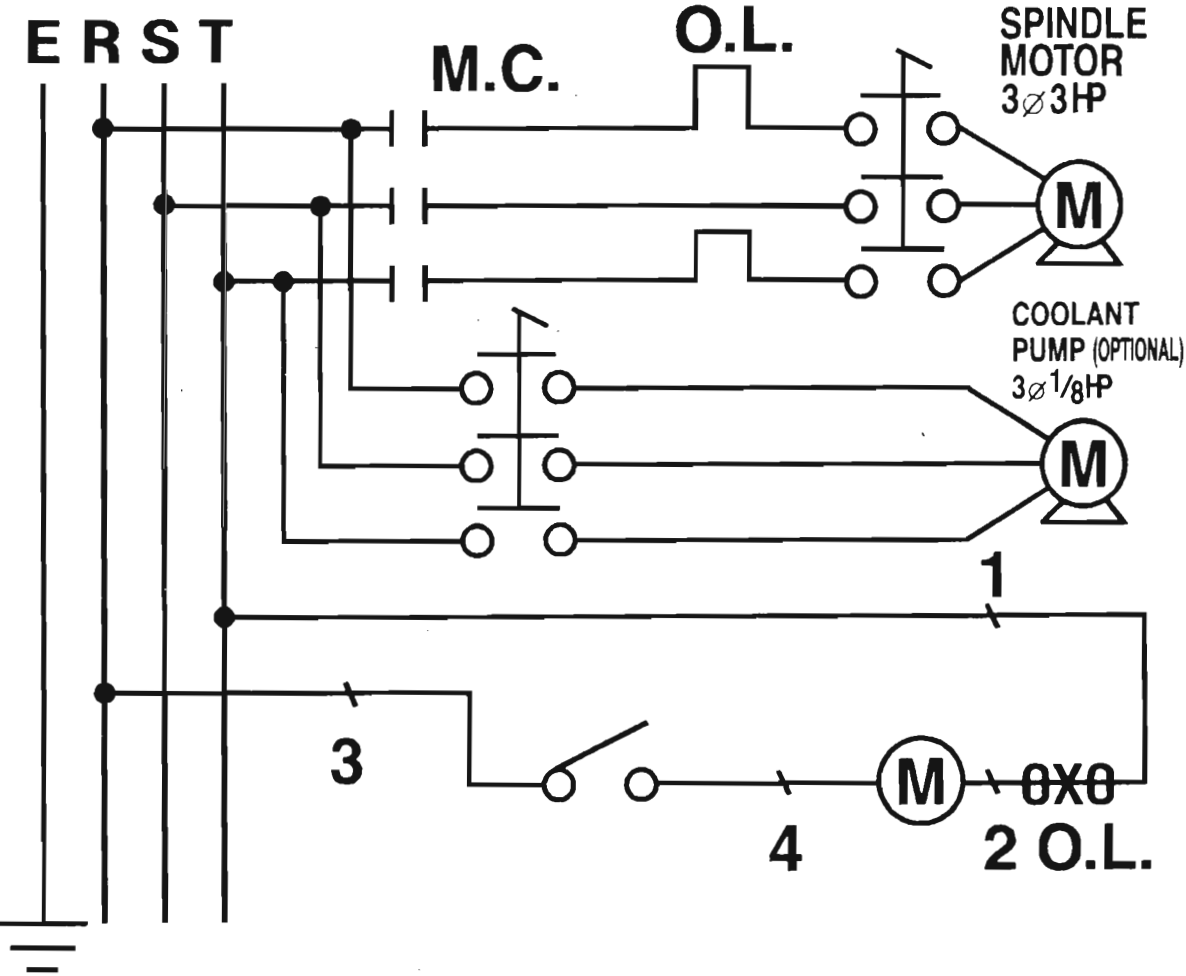
To connect the machine to the plant supply, have qualified electrician proceed as follows:

1. Check required machine voltage against power supply to ensure that they are compatible.
2. Connect machine wiring to power supply making sure connection is in compliance with local 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.

WIRING DIAGRAM

a) 3VS, 3VK, 3VKH, 4VK, 4VKII

3Ø230V OR 3Ø460V / 60HZ



3-6 Alignment Of Milling Head

In case of precision work where it is necessary to have head perfectly square with the table, Use method described below. To set head square to table, 3VS, 2S & 3VK/3VKH, see Figure 11; 4 VK, see Figure 12.

This must be done with Ram Adapter on Ram, by adjusting Ram Adapter through vertical adjusting worm shaft. Loosen four locknuts, But leave some drag on them for fine adjustment. To square head to table in the longitudinal axis, mount indicator as shown in Figure.

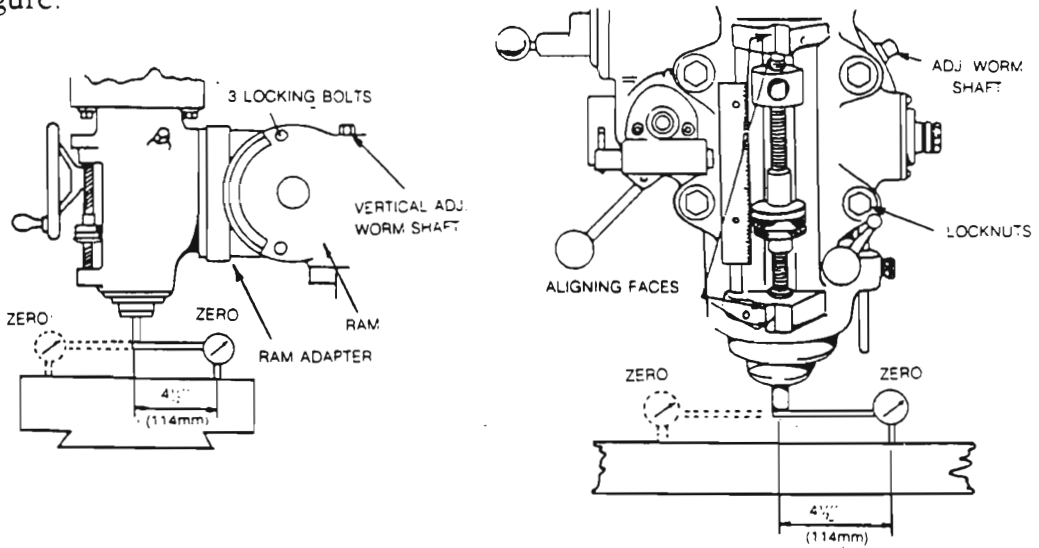
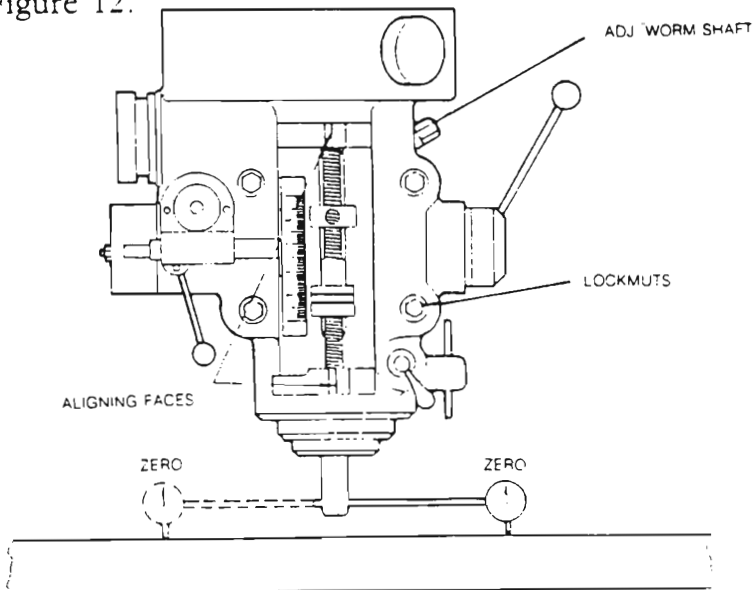


Figure 11. Head Alignment Y & X axis

Note: The table is fitted to be slightly higher in front, usually about 0.0005".

For model 4 VK, to set head square with table, loosen four locknuts, mount indicator as shown in Figure 12.

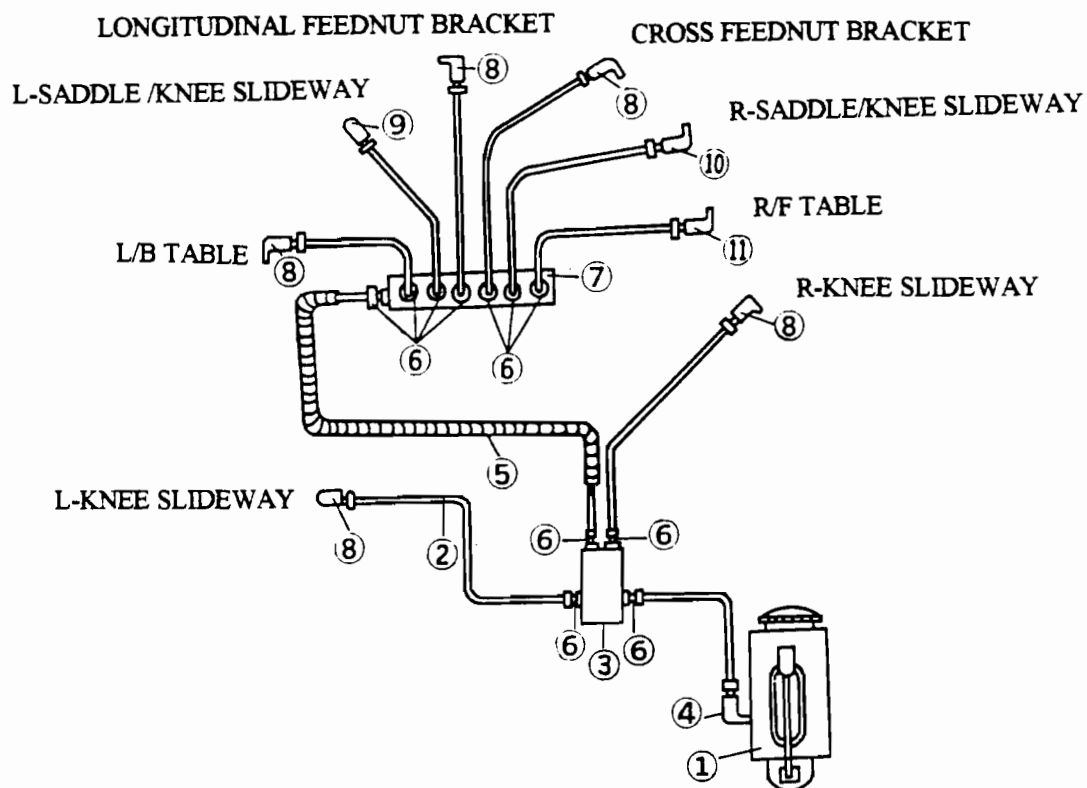


4. LUBRICATION

Do not operate until properly lubricated:

- (a) Way surfaces and lead screws:
SUNOCO waylube #80 or equivalent, one pump daily.
- (b) Milling head (Spindle Bearings)
S.A.E. 10 or 10W light oil, weekly.
- (c) Elevating screw
SHELL Carnea Oil 41, twice weekly.
- (d) Motor are greased for life of bearings.

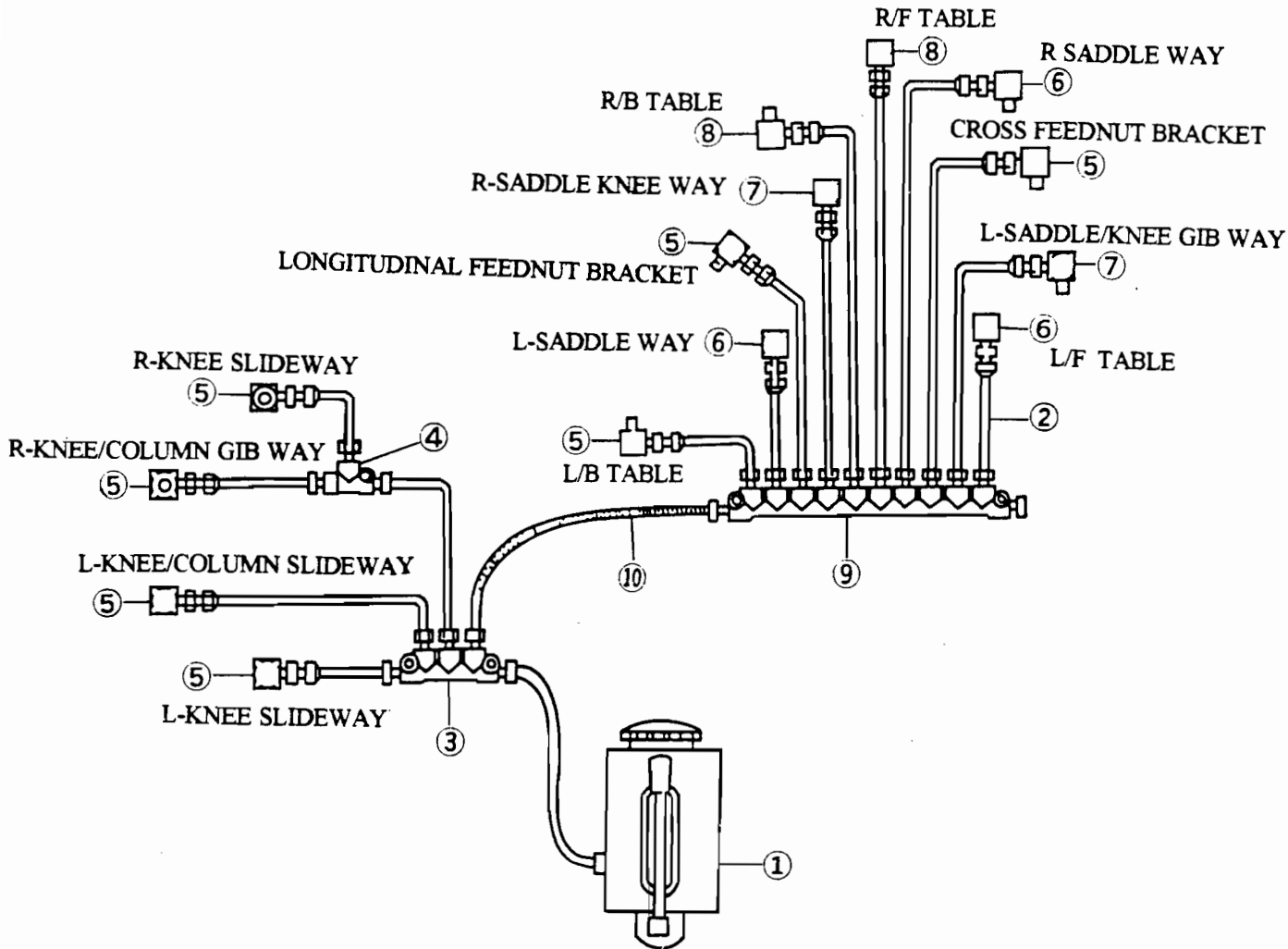
4-1 Lubrication System of 2S, 3VS and 3VK



ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1.	9001	Hand Oiler	2.	9002	Aluminum Pipe (4mm)
3.	9021	A4 Distributing Joint	4.	9022	Elbow Joint
5.	9006	Flexible Oil Tube	6.	9023	Straight Joint (M8.P 1.0)
7.	9024	A8 Distributing Joint	8.	9005	Oil Check Valve #1
9.	9008	Oil Check Valve #2	10	9007	Oil Check Valve #4
11.	9010	Oil Check Valve #5			

Figure 13. Oil Feeding System

4-2 Lubrication System of 3VKH, 4VK and 4VK II



ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1.	9001	Hand Oiler	2.	9002	Aluminum Pipe (4mm)
3.	9003	A5 Distributing Joint	4.	9004	A3 Distributing Joint
5.	9005	Oil Check Valve #1	6.	9008	Oil Check Valve #2
7.	9007	Oil Check Valve #4	8.	9010	Oil Check Valve #5
9.	9009	A12 Distributing Joint	10.	9006	Flexible Oil Tube

Figure 14. Oil Feeding System

5. OPERATION

5.1 Nomenclature

2S

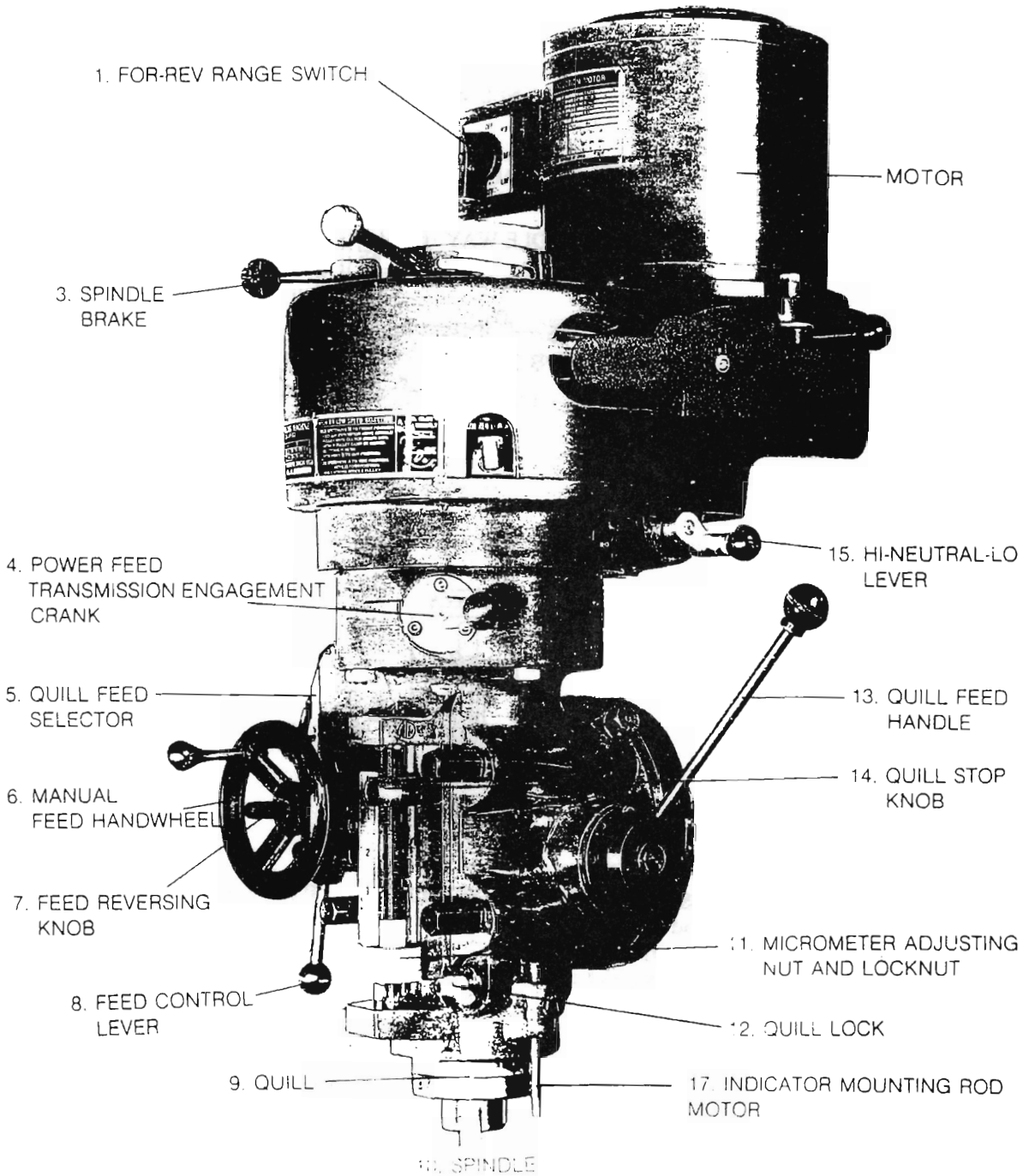


Figure 15. 2S Milling Head

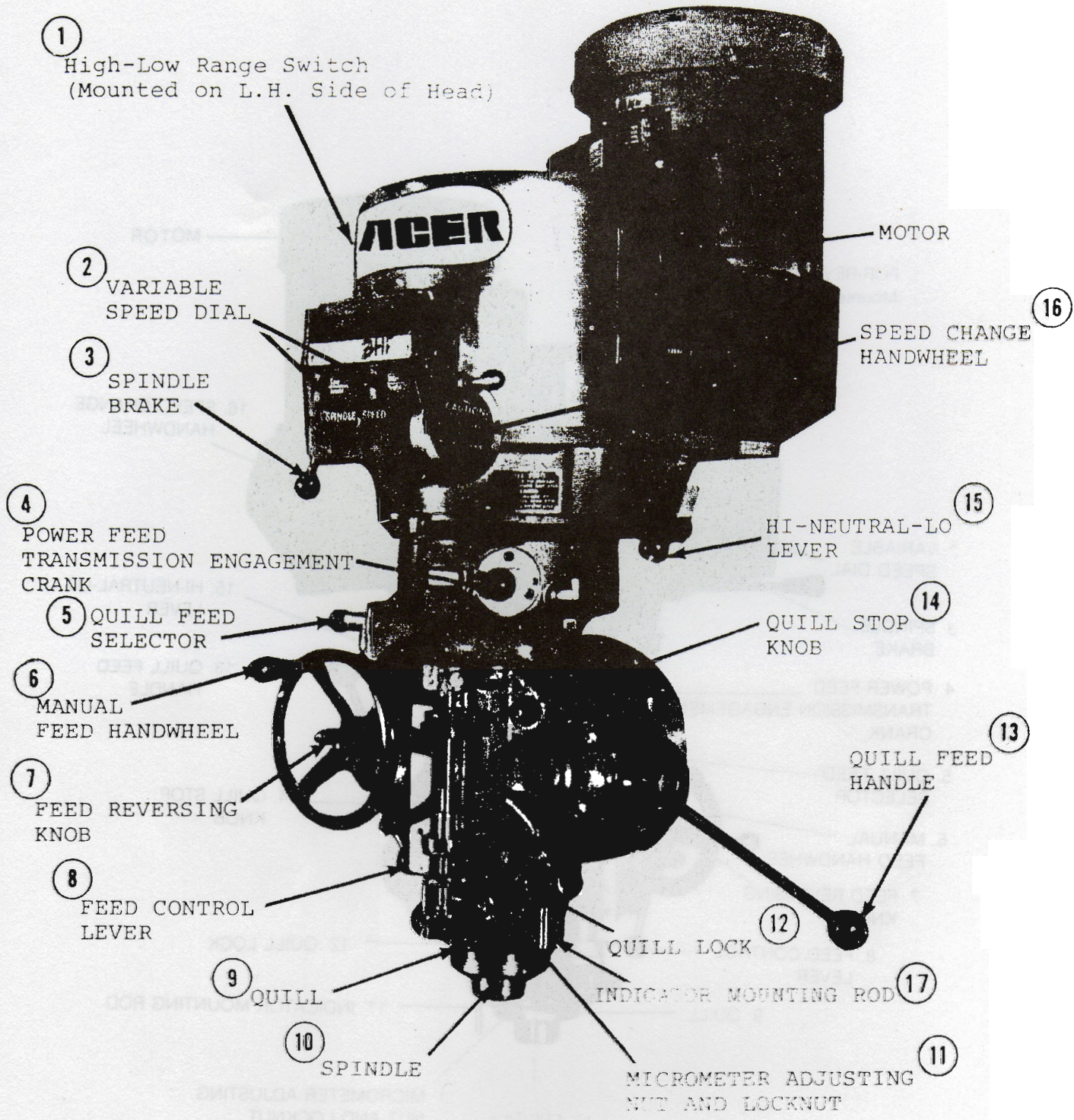


Figure 9. 3VS Milling Head

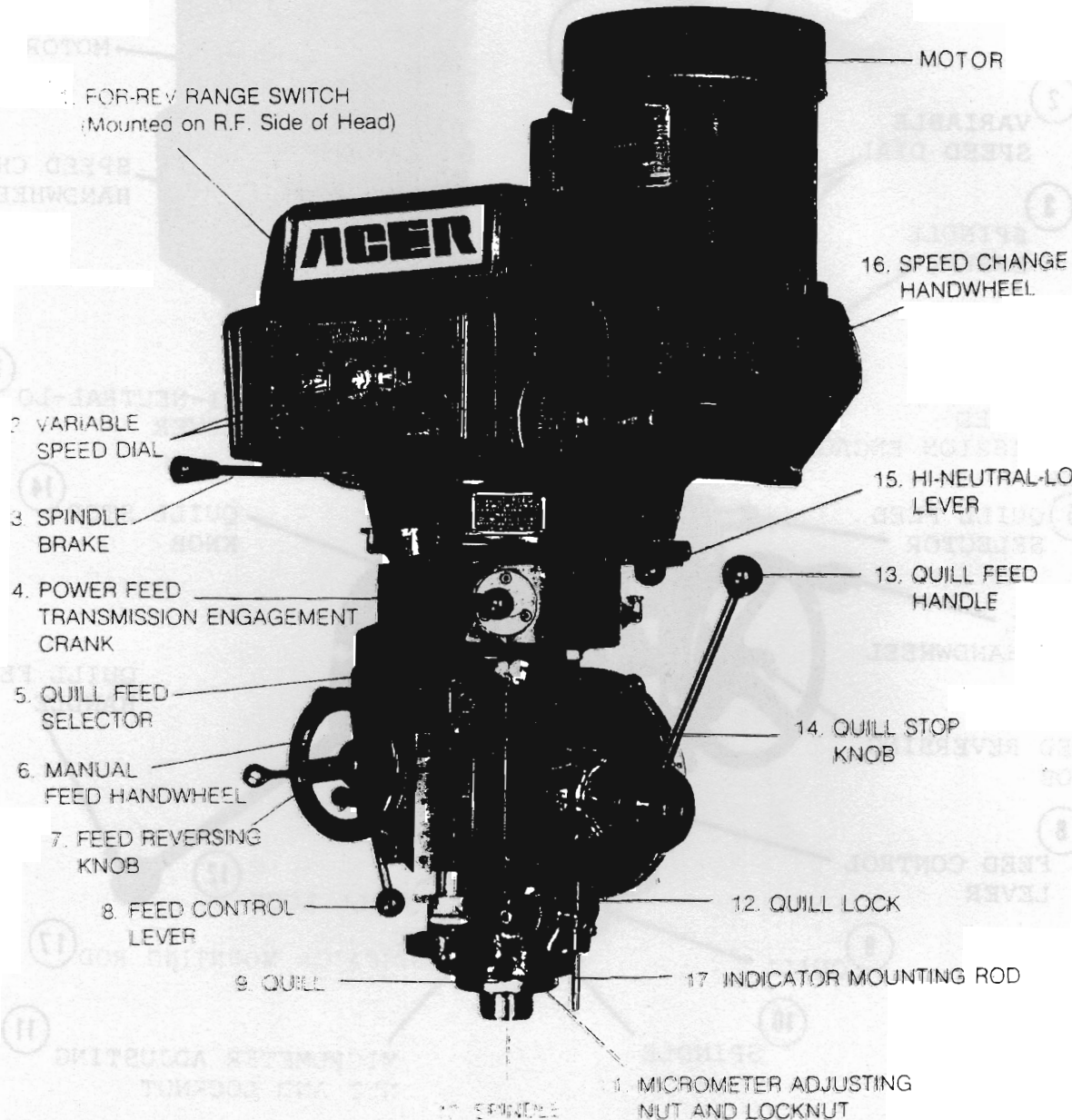


Figure 16 3VK/3VKH Milling Head

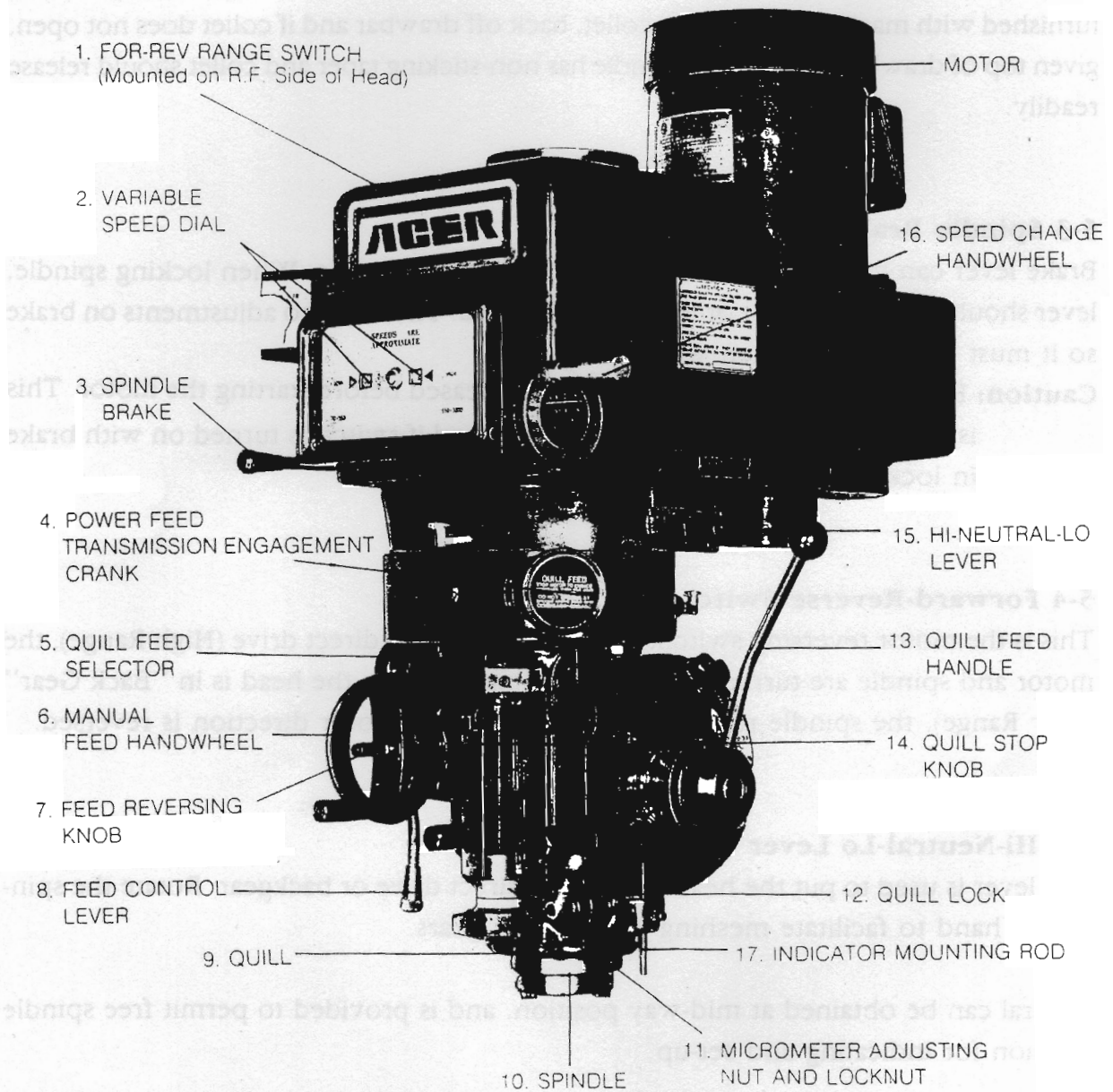


Figure 17. 4VK Milling Head

5-2 Draw Bar

When tightening or loosening the draw bar, it is necessary to lock the spindle. To do this, use the spindle brake (3) which is located on the left side of the belt housing, turning it either right or left until it binds. Make sure the quill is raised all the way.

Draw bar has 7/16"-20 right hand thread on model 2S & 3VK; 5/8"-11 right hand thread on model 4VK and should be tightened with normal pressure using wrench furnished with machine. To loosen collet, back off drawbar and if collet does not open, given top of drawbar a slight tap. Spindle has non-sticking taper and collet should release readily.

5-3 Spindle Brake (#3)

Brake lever can be moved in either direction to stop spindle. When locking spindle, lever should be moved right or left and then raised. There are no adjustments on brake so it must be replaced when worn out.

Caution: Be certain that the spindle brake is released before starting the motor. This is important as the motor can be damaged if switch is turned on with brake in locked position.

5-4 Forward-Reverse Switch (#1)

This is the motor reversing switch. When the head is in direct drive (High Range), the motor and spindle are turning the same direction. When the head is in "Back Gear" (Low Range), the spindle runs backwards unless the motor direction is reversed.

5-5 Hi-Neutral-Lo Lever (#15)

The lever is used to put the head into either direct drive or backgear. Rotate the spindle by hand to facilitate meshing of clutch or gears.

Neutral can be obtained at mid-way position, and is provided to permit free spindle rotation for indicating and set-up.

After an extended period of use, the neutral position may cause noise by allowing the clutch teeth to rub each other. This can be corrected by loosening set screw (#64, page 54/72), and reversing the position of the detent plate (#65, page 54/72).

In high speed (Direct Drive), the spindle is driven by tapered clutch teeth. If the clutch is not meshed tightly, clutch rattle will be heard. This can be corrected by moving the detent plate upwards as the clutch wears. This is also the reason for possible loss of neutral, requiring the reversal of detent plate.

Caution: Do not shift Hi-Lo lever while motor is running.

5-6 Power Feed Engagement Crank (#4)

Engage power feed worm gear. When lever is in right hand hole, power feed is engaged. To disengage, pull knob out and turn crank in clockwise or down direction and move to opposite position.

Note: Handle must be moved in clockwise direction to engage or disengage power feed. If handle is moved counter-clockwise, no damage will be done, but nothing will happen.

Caution: Power feed gear may be engaged while spindle is turning. However, it should be engaged slowly to avoid damage to the worm gear. The gear may be disengaged at any time. Do not use power feed at speed above 3000 RPM.

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

5-7 Quill Feed Selector (#5)

This crank is used to select the feed rate to be used. It is shifted by pulling knob out and turning from one position to another. Feed rates are stamped on cover below each hole. Feed is more readily engaged with spindle running.

5-8 Feed Reverse Knob (#7)

Position of this knob depends upon direction of spindle rotation. If boring with right hand cutting tools, pull feed handle towards operator until clutch becomes engaged.

Neutral position is between forward and reverse position. It is recommended that the handle be left in neutral position when not in use.

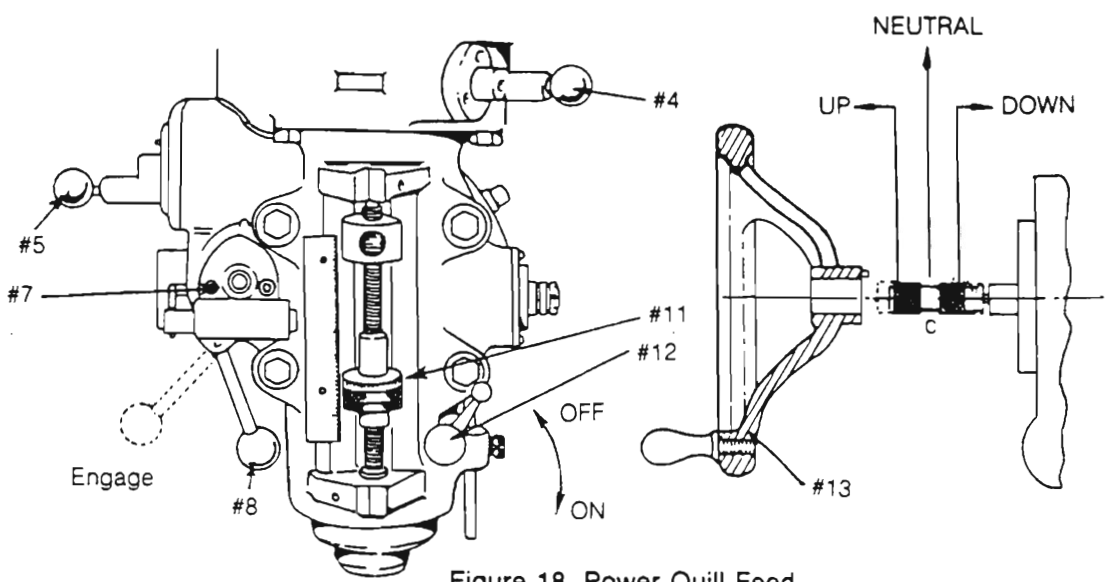


Figure 18. Power Quill Feed

5-9 Manual Feed Handwheel (#6)

Feed reversing knob should be in neutral position and feed control lever engaged. Clockwise rotation of handwheel moves quill down. Manual Feed Handwheel and quill feed handwheel may be disengaged by moving them outward approximately 1/8".

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 taken off when not in use.

5-10 Feed Control Lever (#8)

Engaged over-load clutch on pinion shaft when moved left and will stay engaged until either quill stop comes in contact with micrometer adjusting nut forcing Feed Control Lever to disengage automatically, or released manually by moving lever to right.

Note: The Feed Control Lever is carefully set at plant to disengage automatically when quill stop goes against micrometer adjusting nut or against throw out pin at top. However, if this should go out of adjustment, it may easily be brought back by regulating the socket set screw located at bottom of tripping rod (item no. 144, page 74 or item no. 161, page 102).

Caution: When adjusting the socket set screw, check automatic disengagement in both direction: That is, with quill stop nut against the feed trip lever for down position, and against reverse trip ball lever for the up position.

5-11 Quill Feed Handle (#13)

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

5-12 Quill Stop Knob (#14)

It used to disengage power feed in either direction as well as acting as a depth stop when working to a given depth.

5-13 Micrometer Adjusting Nut (#11)

This nut is used for setting of depths. Each graduation on nut indicates 0.001" of depth. It reads directly to scale mounted along side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

5-14 Quill Lock (#10)

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

5-15 Ram Position

Ram can be moved by loosening two ram lock studs on turret and moving to desired position.

Caution: Care should be taken to lock Ram securely after setting.

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

5-16 Clamping Table Saddle And Knee

When milling with longitudinal table feed only, it is advisable to clamp the knee to the column 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 saddle.

Excessive pressure can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently. (see Figure 19, 20)

The table clamping lever is located on front of saddle and should always be clamped when longitudinal movement is not required.

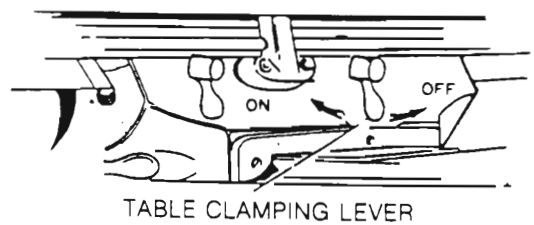
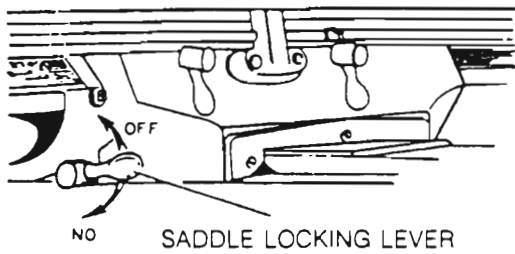


Figure 19. Table & Saddle Clamping Lever

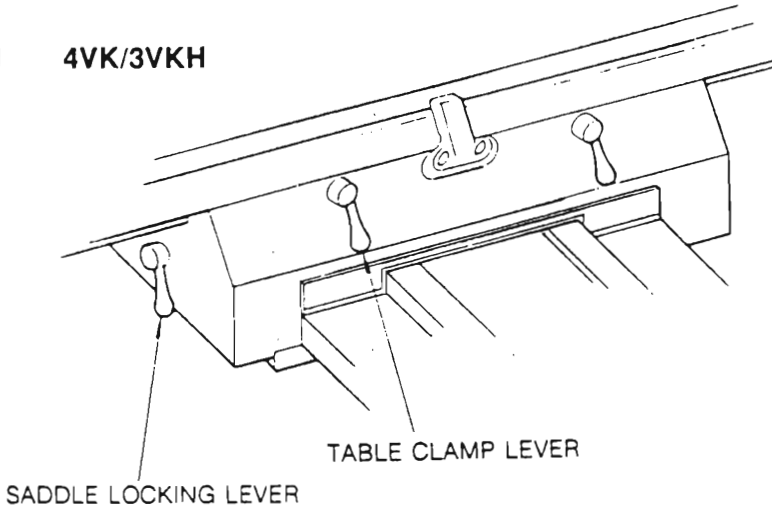


Figure 20. Table & Saddle Clamping Lever

The Knee clamping lever is at the left side of the knee and should be drawn upward to clamp the knee. This is only a tension brake and will not lock the knee completely. Leave clamped at all times unless using knee in operation.

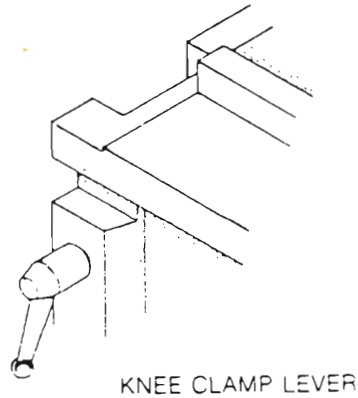
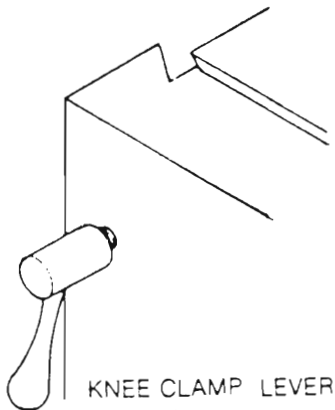


Figure 21. Knee Clamping Lever

5-17 Operation Recommendations

Use 2.3 or 4 flute end mills. 8 flute end mills are usually not as satisfactory for general milling. When using shell mills, face mills or any other tooling, proper machining practice should be observed.

For 3VS, 2S & 3VK, 3VKH

Power quill feed can be used for drills up to 3/8" diameter in mild tool steel. Overload clutch is preset to hold up to 200 lbs down pressure on quill. Use manual feed for drills over 3/8"

For 4VK

Power quill feed can be used for drills up to 5/8" diameter in mild tool steel. Overload clutch is preset to hold up to 300 lbs down pressure on quill.

There are two ranges: LOW SPEED RANGE and HIGH SPEED RANGE. Low speed is obtained through the backgear drive and is referred to as the low range. To engage the backgear, use the lever marked Hi-Neutral-Lo on the right rear side of the milling head. Move this lever to the "LO" position and use the low range on the down switch. When shifting to "LO", do not force the lever if the backgears do not mesh. Hold the lever so that the gears are clear of one another, rotate the spindle nose by hand until the gears line up, then put the unit in "LO".

High speed is obtained through direct drive and is the high range. The same lever and switch as above are used; selecting the "HI" range. When shifting to "HI", do not force the lever if the clutch teeth do not mesh. It is a simple matter to engage the brake and rotate the spindle nose by hand until the clutches engage.

For Variable Speed Model (3VS/3VK/3VKH/4VK) Only

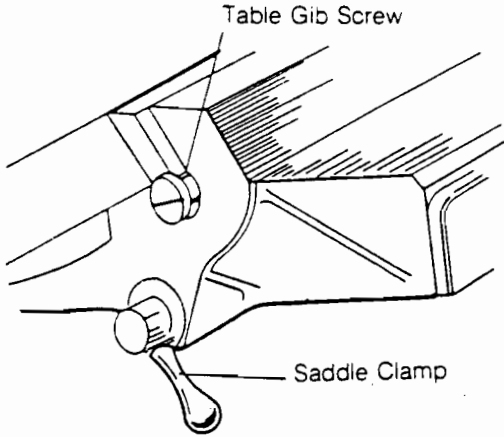
Wear on the vari-drive belt, will cause a slight change in the speeds to that shown in window on the dial. This can be corrected as follows: Crank the speed change hand-wheel snugly against the high speed stop. 3VK shows 4200 and 4VK shows 3600 on the dial. Use a tachometer to determine the spindle speed, then turn the pivot stud (#16, page 58/76), after loosening the jam nut (#7, page 58/76) tighten jam nut. Now reposition the speed dial plate to match the tachometer reading. This is done by loosening the Hex. nut (#1, page 52/70) until the spindle speed registers 3600/4200 on the tachometer, tighten jam nut.

6. MAINTENANCE

6-1 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. To take up gib, tighten gib adjusting screw slightly and repeat until a slight drag is felt when moving the table by hand.

2S, 3VS & 3VK



4VK/3VKH

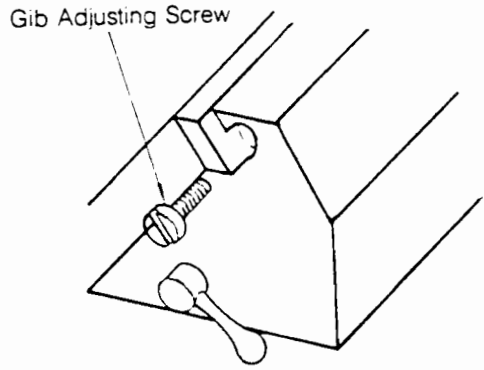


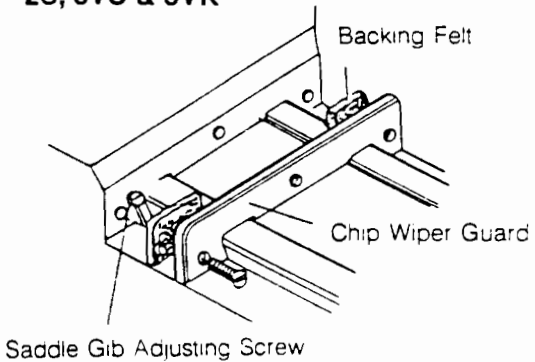
Figure 22. Saddle/Table Gib

6-2 Adjustment Of Saddle And Knee Gibs

Adjustment of saddle gib

A tapered gib is used for adjusting the saddle bearing on the knee. This forms a guide for the saddle. To tighten gib, remove chip wiper and use the same method as described above. Replace chip wiper after gib has been adjusted.

2S, 3VS & 3VK



4VK/3VKH

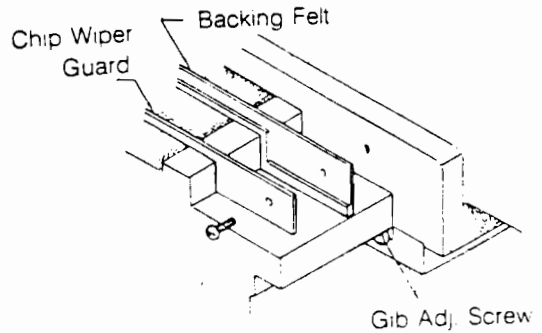
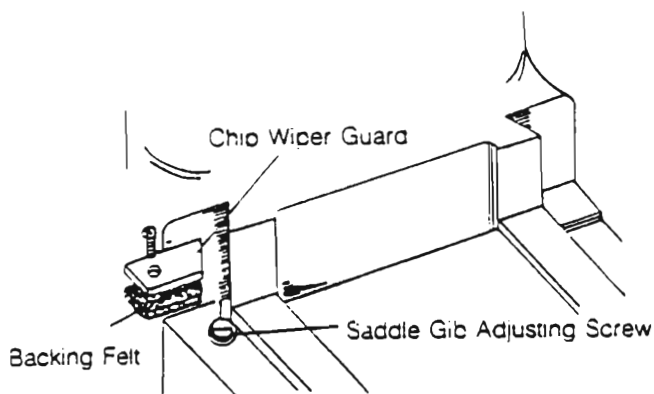


Figure 23. Saddle/Knee Gib

Adjustment of knee gib

Remove chip wiper and adjust screw until smooth movement is attained. Replace chip wiper.

2S, 3VS & 3VK



4VK/3VKH

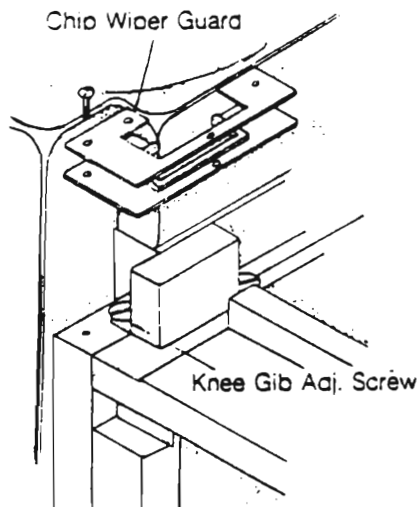


Figure 24. Knee/Column Gib

6-3 Removing Table & Saddle

Remove the following: ball crank, handles, dial holders and bearing brackets. Turn the leadscrew all the way out and slide the table from the saddle.

Follow the same procedures as removing table; however, it is necessary to remove the entire front bracket assembly. Next, remove the cross-feed nut bracket which can only be done by removing the table.

6-4 Lead-Screw Backlash Adjustment

For 2S

Table lead screw adjustment

Crank the table to the left, withdraw screw "A" half a turn, tighten screw "B" while slowly turning handle "C" until 0.004" or 0.005" is obtained. Lock screw "A" on to "B"

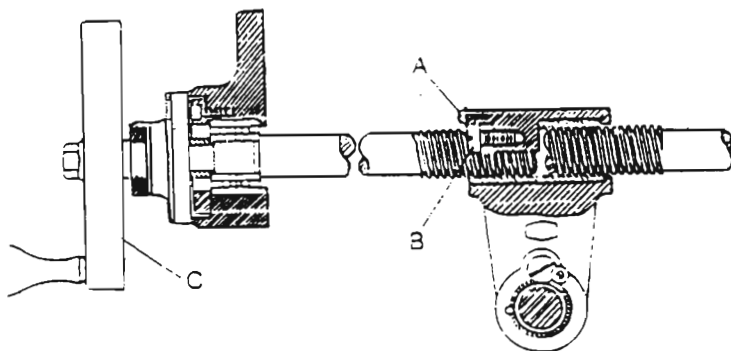


Figure 25. Table Lead Screw Assembly

Cross leadscrew adjustment

Crank the saddle to mid. position, withdraw 4 screws "D", pull the saddle forward to expose screws "A" & "B". Withdraw screw "A" half a turn, slowly turn handle "C" while tightening screw "B" until 0.004" or 0.005" is obtained. Lock screw "A" onto "B", move the saddle to front and replace 4 screws "D".

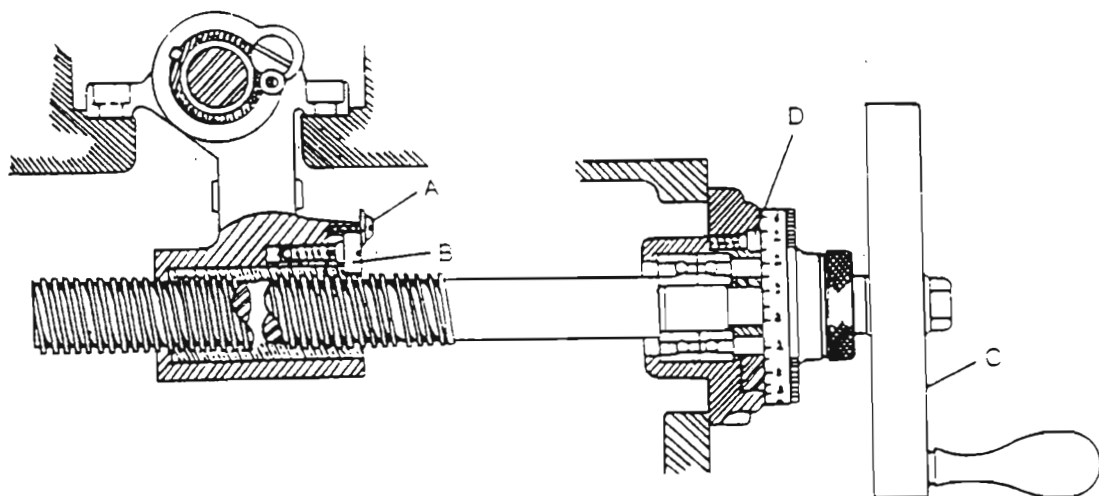


Figure 26. Cross leadscrew assembly

For 3VS, 3VK, 3VKH & 4VK

Table leadscrew adjustment

Crank the table to the left, loosen 3 screws, turn adjusting nut while slowly turn handle until 0.004" or 0.005" is obtained, tighten 3 screws again

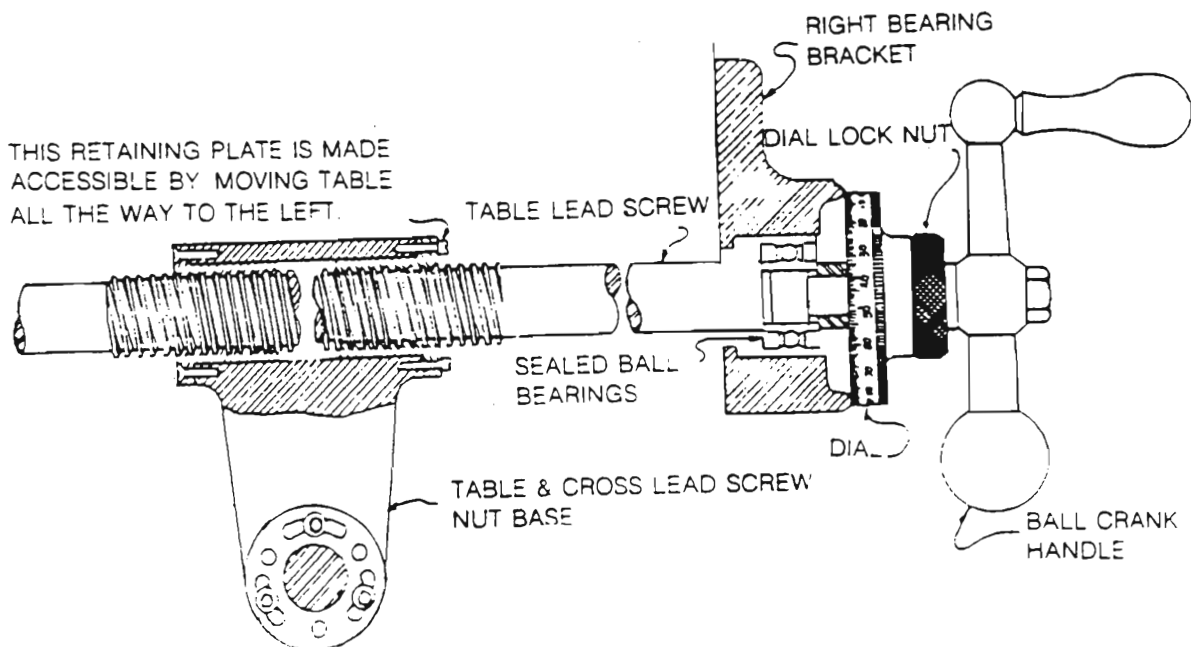


Figure 27. Table leadscrew assembly

Cross leadscrew adjustment

Same with 2S, but turn adjusting nut instead of screw "B" to obtain a better backlash.

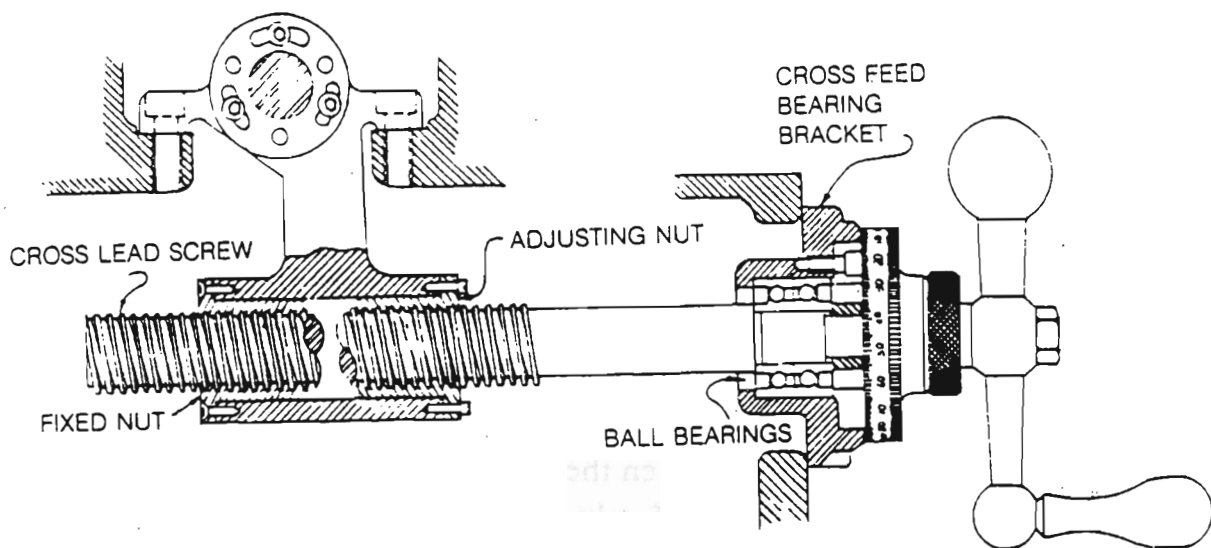


Figure 28. Cross leadscrew assembly

6-5 Belt Replacement Of 2S

Disconnect the power and remove drawbar and spindle motor. Lower quill to full extension, lock the quill lock and remove 6 screws "A", carefully remove housing "B" Tap to withdraw from dowels, now the belt can be changed.

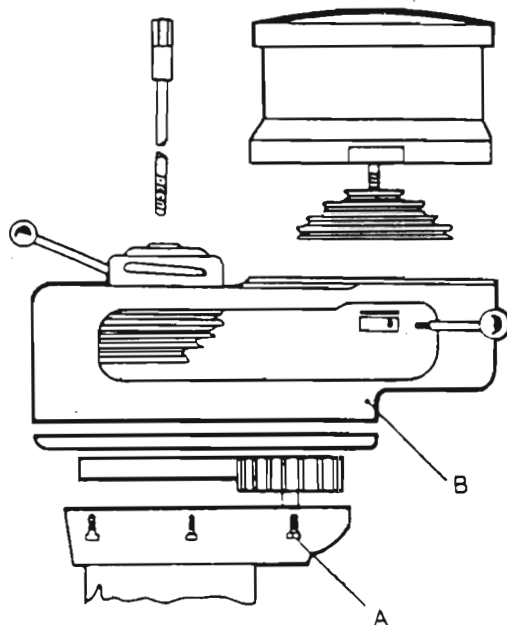


Figure 29. 2S Top housing

6-6 Removing Motor Of 3VS, 3VK, 3VKH & 4VK

Run the head to the lowest speed of either range and shut off the motor. This puts the Vari-Drive belt in the best position for disassembly.

1. Disconnect the power and then remove the switch from the side of the belt housing.
2. Remove the cover (B) at the lower end of the motor shaft. Use two cover screws (A) to fasten the spring (C) on the lower end of the motor shaft, to the lower motor vari-drive pulley. This will reduce the hazard of personal injury that is always present when a heavy spring is under compression. When the pulley, spring retainer and spring and securely fastened as a single unit, crank the speed change handwheel to top speed position.
3. Now remove the screws (D) that fasten the motor to the belt housing. The motor should be lifted slightly and pulled firmly away from the spindle and toward the rear of the belt housing. This will pull the vari-drive belt deeply into the spindle pulley providing the slack needed to slip the belt over the motor pulley.
4. Now lift the motor high enough to rest the motor base gently on the adjusting screw (E) seen directly in front of the motor flange. The belt can now be slipped over the lower pulley and the motor removed from the housing.

3VK/3VKH

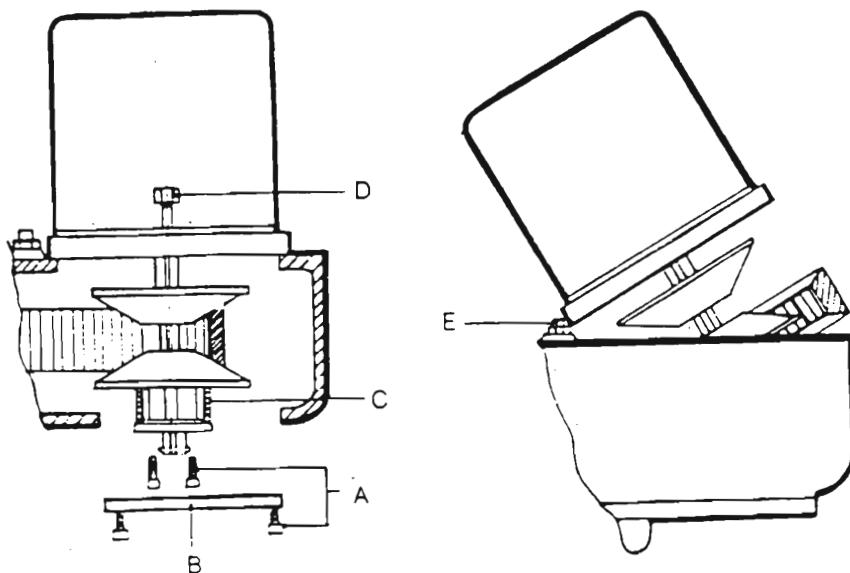


Figure 30. Removing the motor

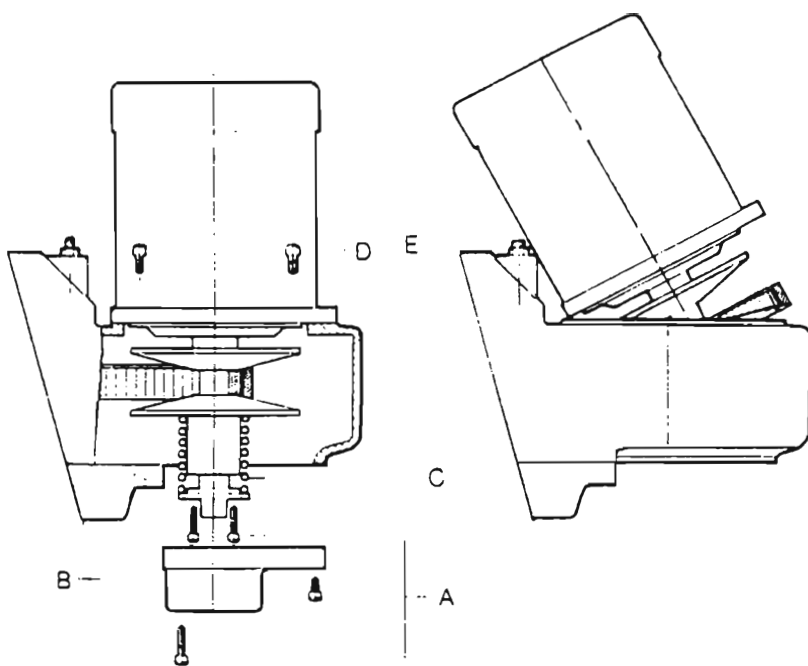


Figure 31. Removing the motor

6-7 Changing Vari-Speed Belt

Complete the previous procedures for removing the motor, then remove the three screws (A), and lift out the top bearing cap (B). Looking down inside of the housing, locate and remove two socket head cap screws (#17, page 58/76) and sleeves (C). Next, remove the six screws (D), then holding the belt housing (E) to the base.

Remove the old belt and replace it with a new belt. Do not use a substitute belt purchased from other than Bando Variable Belt 900 VC 38 × 30 for 4 VK. 875VS for 3VS, 3VK, 3VKH Vibration and heat could result from the use of the wrong belt.

3VS/3VK/3VKH

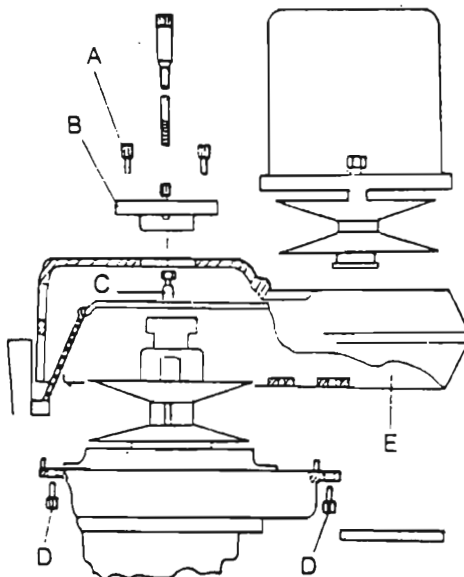


Figure 32. Changing Vari-Speed Belt

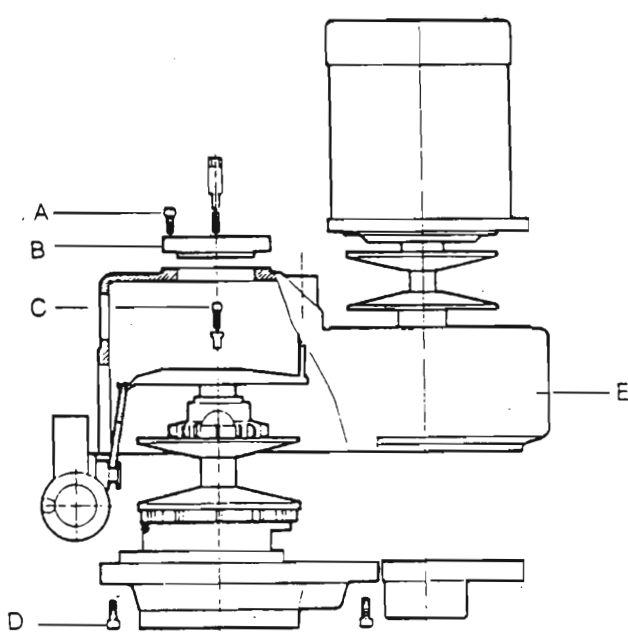


Figure 33. Changing Vari-Speed Belt

6-8 Changing Timing Belt

Complete the operation for removing the motor. Then put the Hi-Neutral-Lo lever in "Lo" position, remove the drawbar (A) and lower the spindle.

Remove screws (B) holding the upper and lower housings together including the two lower screws (C) in speed changer bracket just below the speed dial.

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

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

3VS/3VK/3VKH

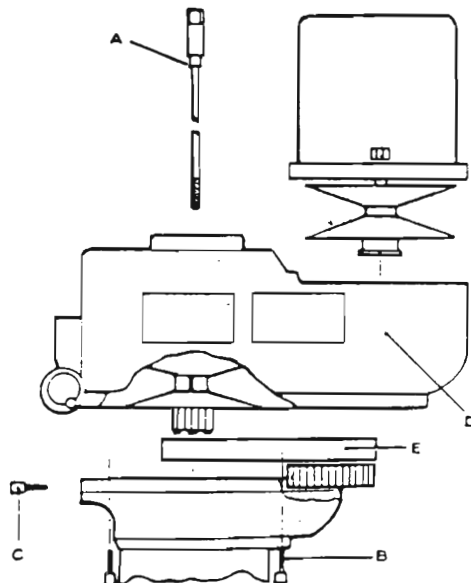


Figure 34. Changing Timing Belt

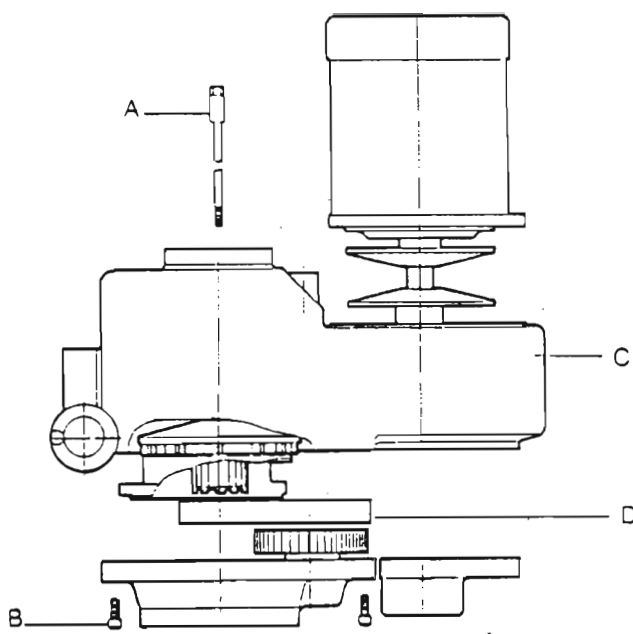


Figure 35. Changing Timing Belt

6-9 Returning Spring Replacement

Move quill to top position and, apply quill lock, remove screw (A), hub (B) and key (C) and screws (D), allowing housing to rotate slowly releasing spring tension. Lift end of spring from peg on the pinion shaft. Rotate housing (E) counter-clockwise from head casting, remove spring from housing. Refit spring to main housing casting turning housing clockwise until spring locates on peg in pinion shaft.

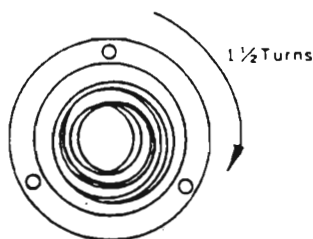
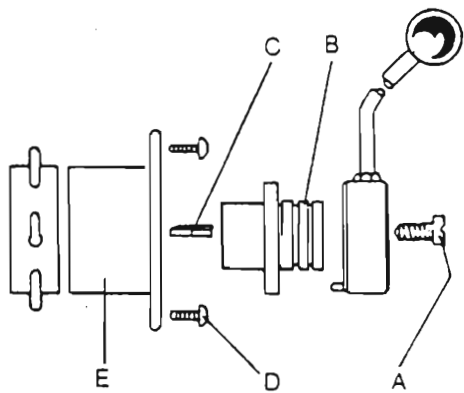
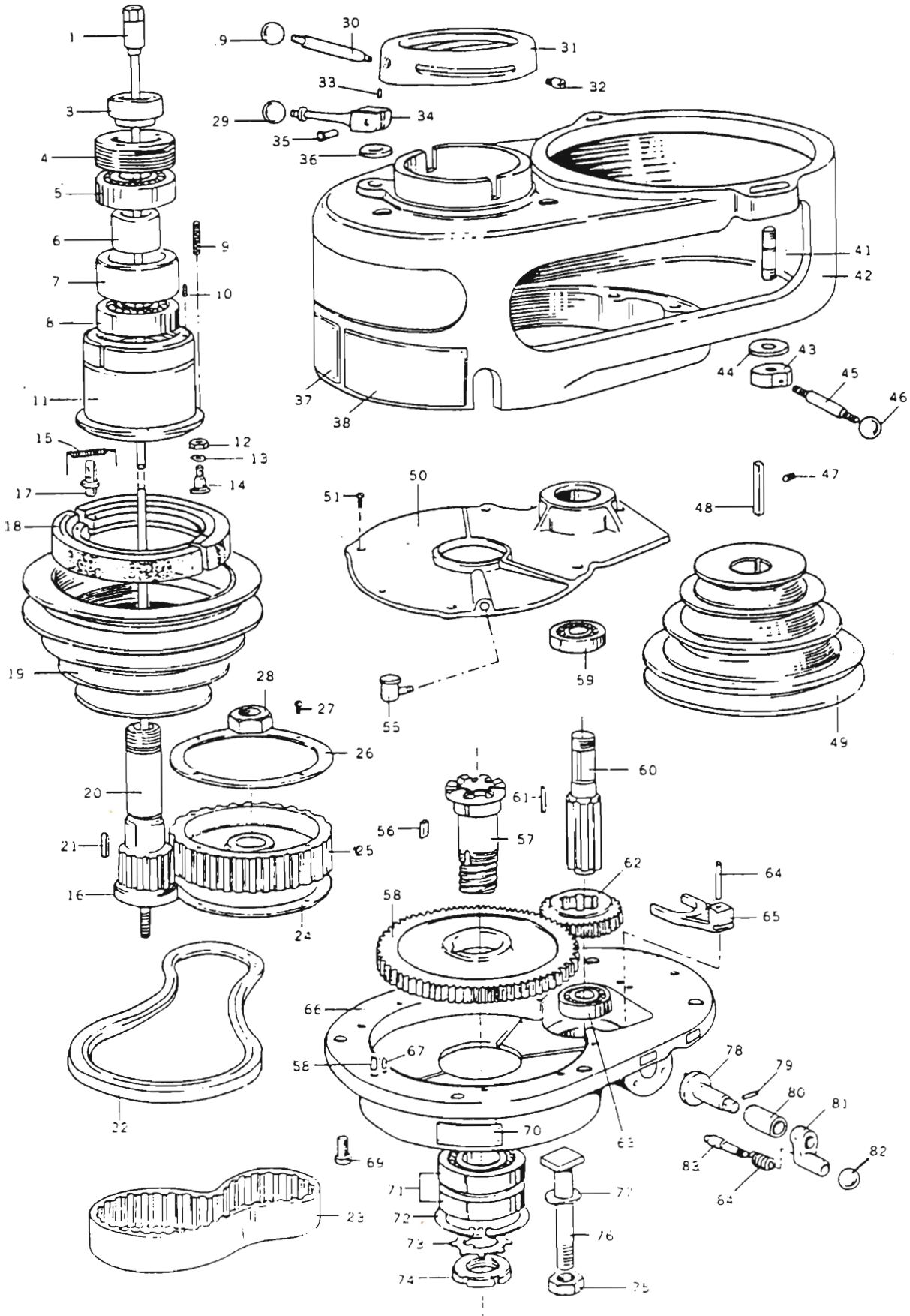


Figure 36. Spring Replacement

2S HEAD TOP HOUSING



2S HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	HA-072A	A146	Drawbar for R8	1
3	HA-071	A271	Upper Bearing Lock Nut	1
4	HA-070	A145	Bearing Sleeve Lock Nut	1
5		A134	Bearing #6207zz	1
6	HA-068	A133	Upper Bearing Spacer (small)	1
7	HA-069	A132	Upper Bearing Spacer (large)	1
8		A131	Bearing #6207zz	1
9	HA-169	A130	Compression Spring	4
10		A143	M 6x6 Socket Set Screw	2
11	HA-060	A129	spindle Pulley Bearing Sleeve	1
12		A150	5/16"- 18NC Nut	3
13		A150A	Spring Washer	3
14	HA-034	A149	Brake Ring Screw	3
15	HA-036	A148	External Spring	2
16	HA-063	A126A	Spindle Pulley Hub Ring	4
17	HA-037	A136	Brake Lock Stud	1
18	HA-035	A135	Brake Block	1
19	HA-065	A128	Spindle Pulley	1
20	HA-064A	A126A	Spindle Pulley Hub	1
21		A127	Key 6x6x25	1
22		A163	" V " Belt	1
23	HA-030	A035	Timing Belt 1 1/4" Wide 225L	1
24	HA-027	A036	Timing Belt Pulley Flange	1
25	HA-028A	A034	Timing Belt Pulley	1
26	HA-027	A036	Timing Belt Pulley Flange	1
27		A037	Flat Head Screw 1/8" x 3/8"	12
28	HA-029	A038	5/8" 18NF Nut	1
29	HA-006	A140	Black Plastic Ball 1" Dia	2
30	HA-074	A158	Spindle Clutch Lever	1
31	HA-073	A151	Cam Ring	1
32	HA-067	A142	Spindle Clutch Cam Ring Pin	2
33		A141	S 4x6 Socket Set Screw	1
34	HA-039	A139	Brake Lock Handle	1
35	HA-038	A138	Brake Lock Pin	1

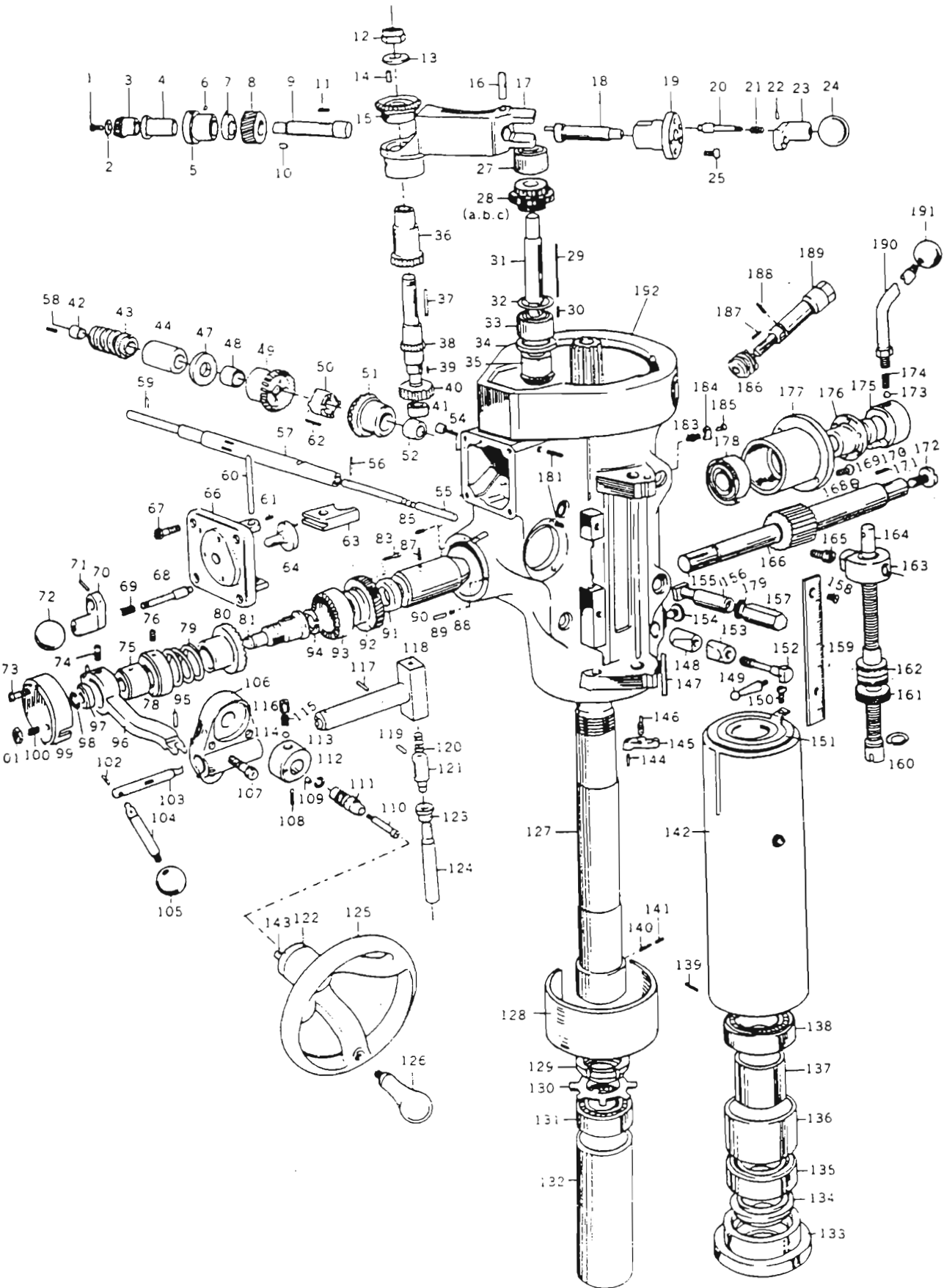
2S HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
36	HA-047	A137	Brake Lock Washer	1
37			Spindle Speed Plate	1
38			Operating Instruction Plate	1
41	HA-012	A004	Motor Mounting Studs	1
42	HA-015	A014	Belt Housing	1
43	HA-007	A005	Motor Lock Nut	1
44	HA-008		Motor Lock Nut Washer	1
45	HA-009	A006/A	Motor Lock Nut Handle	4
46	HA-006	A007/A	Black Plastic Ball 1" Dia	2
47			M 6x10 Socket Set Screw	1
48		A160	Key 7x7x25	3
49	HA-011	A162	Motor Pulley	3
50	HA-013	A015	Gear Housing Cover	3
51		A019	M 5x10 Socket Cap Screw	2
55		A124	Oil Cap	4
56		A121	Bull Gear Key 8x8x15	1
57	HA-062	A120	Spindle-Gear Hub	1
58	HA-061	A122	Spindle Bull Gear	1
59		A031	Bearing #6203 2RS	1
60	HA-026	A030	Counter Shaft	1
61		A033	Key 4x4x18	1
62	HA-025	A028	Counter Shaft Gear	1
63		A020	Bearing #6203 2RS	1
64	HA-032	A032	Dowel Pin	1
65	HA-031	A029	Back Gear Shaft Fork	1
66	HA-014	A013	Gear Housing	12
67			Spring Pin 5 ϕ x 20	1
68		A017	Spring Pin 6 ϕ x 20	2
69		A016	M 6x15 Socket Cap Screw	1
70			Disengage Feed Instruction Plate	1
71		A118.A119	Bearing Ball #6208	2
72		A117	Snap Ring B - 80mm	1
73	AB-003	A116	Lock Washer	1
74	HA-059	A115	Bearing Lock Nut	1

2S HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
75		A157	7/16" - 14NC Nut	3
76	HA-045	A159	Vertical Tee Bolt	3
77		A158	7/16" Spring Washer	3
78	HA-033	A027	Back Gear Shift Crank	1
79		A024	Spring Pin 3 § x 20	1
80	HA-044	A027A	Back Gear Sift Bushing	1
81	HA-003	A025 / B23	Shift Crank	1
82	HA-006	A021 / B24	Black Plastic Ball 1" Dia	1
83	HA-004	A023 / B20	Gear Shift Plunger	1
84	HA-005	A022 / B21	Compression Spring	1

MILLING HEAD



MILLING HEAD

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	6141	B1+17	RD. HD. Screw	1
2	6140		Bevel Pinion Washer	1
3	6139	B03	Feed Bevel Pinion	1
4	6183		Feed Worm Gear Shaft Sleeve	1
5	6137	B05	Worm Cradle Bushing	1
6	6123		Set Screw	1
7	6136		Worm Gear Spacer	4
8	6134	B08	Feed Drive Worm Gear	1
9	6133		Feed Drive Worm Gear Shaft	1
10	6142		Worm Shaft Key	1
11	6135		Key	1
12	6150		Lock Nut	1
13	6149		Washer	1
14	6147		Cluster Gear Key	1
15	6148	B15	Feed Reverse Bevel Gear	1
16	6122	B16	Feed Engage Pin	1
17	6121	B17	Worm Gear Cradle	1
18	6126	B18	Worm Gear Cradle Throw - out	1
19	6125	B19	Shift Sleeve	1
20	6169	B20	Gearshift Plunger	1
21	6170	B21	Compression Spring	1
22	6128		Roll Pin 3x20	1
23	6168	B23	Shift Crank	1
24	6131	B24	Black Plastic Ball	1
25	6132		Cap Screw 5x12	3
27	6157	B27	Cluster Gear Shaft Upper Bearing	1
28	6153	B28	Cluster Gear Assembly	1
29	6160		Cluster Gear Key 3x3x45	1
31	6151	B31+35	Cluster Gear Shaft	1
32	6158		Snap Ring 16	1
33	6156	B33	Bevel Gear Bearing	1
34	6159	B34	Bevel Gear Thrust Spacer	1
36	6143	B36+38	Feed Driving Gear	1
37	6145		Key	1

MILLING HEAD

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
40	6144	B1+17	Feed Drive Gear	1
41	6252		Needle Bearing #BA66	1
42	6227	B42	Bushing	1
43	6225	B43	Worm	1
44	6224	B44	Feed Worm Shaft Bushing	1
47	6223	B47	Feed Worm Shaft Thrust Washer	1
48	6221	B48	Bushing	1
49	6220	B49	Feed Reverse Bevel Gear	1
50	6222	B50	Feed Reverse Clutch	1
51	6220		Feed Reverse Bevel Gear	1
52	6221		Bushing	1
55	6216	B55	Reverse Clutch Rod	1
56	6217		Roll Pin 3x20	1
57	6209	B57	Feed Worm Shaft	1
59	6226		Pin 3x10	1
60	6163	B60	Feed Shift Rod	1
61	6164		KP. Set Screw 5x5	1
62	6230		Key	1
63	6162	B63	Feed Gear Shift Fork	1
64	6166	B64	Cluster Gear Shift Crank	1
66	6161	B66	Cluster Gear Cover	1
67	6165		Cap Screw 5x12	4
68	6169		Gear Shift Plunger	1
69	6170		Comperession Spring	1
70	6168		Shift Crank	1
71	6167		Roll Pin	1
72	6171		Black Plastic Ball	1
73	6206		Cap Screw	2
74	6202	B74	Clutch Ring Pin	2
75	6200	B75	Clutch Ring	1
76	6199		Socket Set Screw	1
77	6199-1		Brass Plug	1
78	6198	B78	Overload Clutch Lock Nut	1
79	6197	B79	Safety Clutch Spring	1

MILLING HEAD

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
80	6194	B80	Overload Clutch	1
81	6195	B81	Overload Clutch Sleeve	1
83	6189		Round Head Screw	3
84	6228		Mock-it Lock Screw	1
85	6228		Socket Set Screw	1
86	6246		Lock Screw	1
87	6246-1		Socket Set Screw	1
88	6191	B88	Compression Spring	1
89	6193	B89	Overload Clutch Lever Spring Plunger	1
90	6186	B90	Quill Pinion Shaft Bushing	1
91	6190	B91	Pinion Shaft Worm Gear Spacer	1
92	6187	B92	Overload Clutch Worm Gear	1
93	6188	B93	Overload Clutch Ring	1
94	6188-1		Snap Ring 15	1
95	6236-1	B95	Dowel Pin	1
96	6203	B96	Overload Clutch Trip Lever	1
97	6201	B97	Overload Clutch Washer	1
98	6195-1		Snap Ring 10	1
99	6205	B99	Clutch Arm Cover	1
100	6207		Socket Set Screw	1
101	6208		Chem Blacked Lock Nut	1
103	6239	B103	Cam Rod	1
104	6234	B104	Trip Handle	1
105	6233	B24	Black Plastic Ball	1
106	6231	B106	Feed Trip Bracket	1
107	6232		Cap Screw 6x20	2
108	6219		Socket Set Screw 6x6	1
109	6229		Key	1
110	6214	B110+111	Feed Reversd Knob Stud	1
111	6213	B110+111	Reverse Knob	1
112	6215	B110+111	Snap Ring " C "	1
113	6218	B113	Handwheel Clutch	1
114	6255		Steel Ball 3/16	1

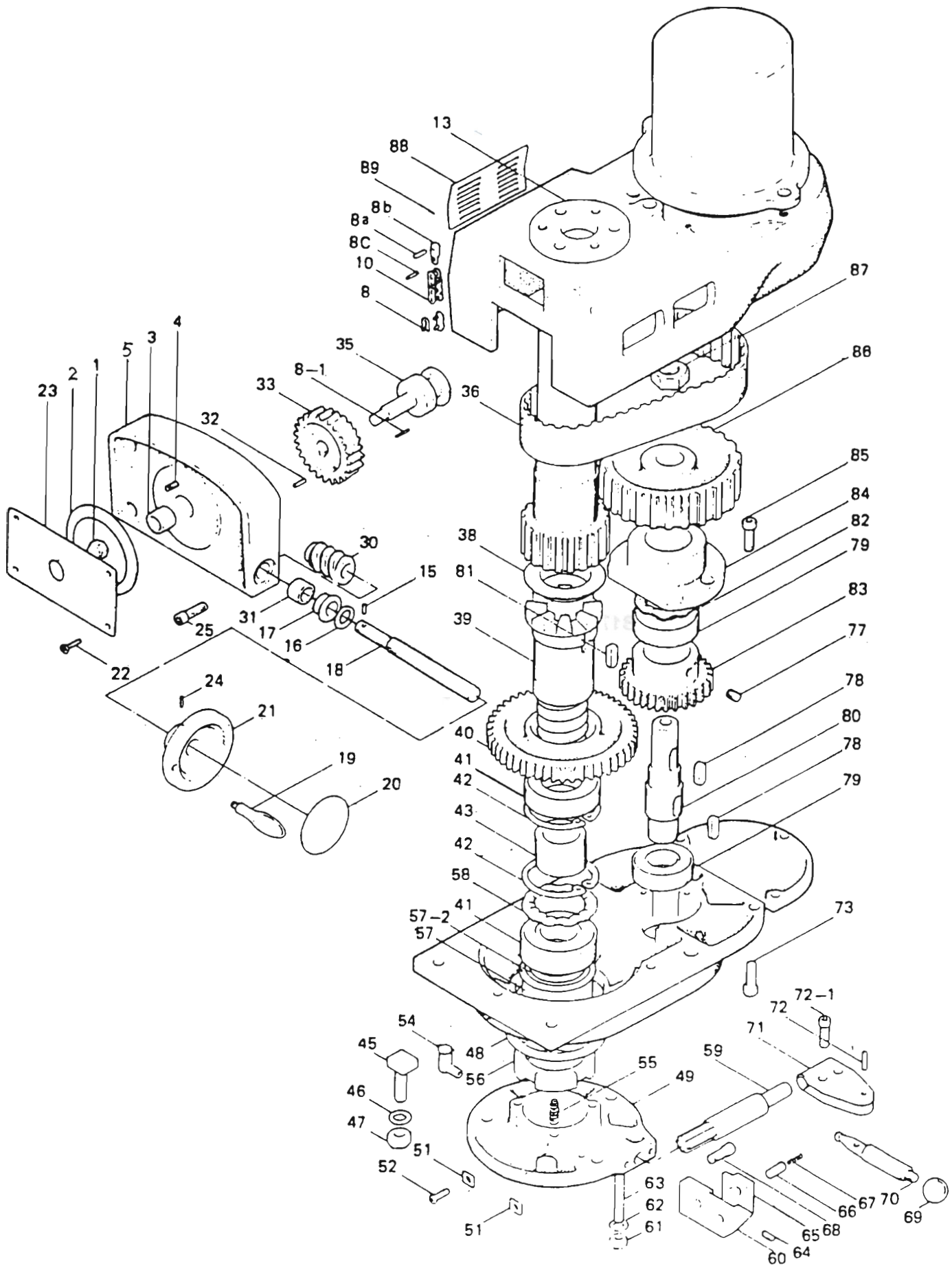
MILLING HEAD

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
115	6219-2	B115	Compression Spring	1
116	6219-1		Handwheel Clutch Spring Screw 8X6	1
117	6237		Roll Pin	1
118	6236	B118	Cam Rod Sleeve Assy	1
119	6241		Roll Pin	1
120	6242	B120	Compression Spring	1
121	6240	B121	Trip Plunger	1
123	6118-1		Trip Plunger Bushing	1
124	6118	B124	Feed Trip Plunger	1
125	6210	B125+126	Handwheel	1
127	6084	B127	Spindle	1
128	6086	B128	Quill Skirt	1
129	6090	B129	Lock Nut	1
130	6091		Lock Washer	1
131	6092		Bearing 6206	1
132	6094		Sleeve	1
133	6098	B133	Nose-piece	1
134	6097	B134	Spindle Dirt Shield	1
135	6093		Bearing 7207	1
136	6095	B136	Bearing Spacer-Large	1
137	6096	B137	Bearing Spacer-Small	1
138	6093		Bearing 7207	1
140	6253	B140	Special Socket Set Screw	1
141	6254		Collet Alignment Screw 6X6	1
142	6085	B142	Quill	1
144	6113		Socket Set Screw 4X20	1
145	6111	B145	Feed Trip Lever	1
146	6112	B146	Trip Lever Pin	1
148	6116-1	B148	Quill Lock Sleeve	1
149	6119	B149	Lock Handle	1
151	6088	B151	Felt Washer	1
152	6117	B152	Quick Lock Bolt	1
152 -1	6117-1	B152-1	Spring	1
153	6116	B153	Quill Lock Sleeve Tapped	1
155	5036	B155	T-Bolt Assy	1

MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
156	6120	B156	Lower Clamping Bolt Spacer	2
157	5038	B157	Lock Nut	1
158	6244		Chem Blacked RD.HD. Screws 16	2
159	6243	B159	Micrometer Scale	1
160	6115		Snap Ring 16	1
161	6108	B161	Quill Micro-stop Nut	1
162	6107	B162	Micrometer Nut	1
163	6105	B163	Quill Stop Knob	1
164	6104	B164	Quill Stop Micro-screw	1
165	6106		Screw 3/8	1
166	6172	B166	Quill Pinion Shaft	1
168	6185	B168	Spring Pin 5X12	1
169	6180-1		RD.Head Screw	1
170	6179		Roll Pin	1
171	6184		Key 3X3X20	1
172	6183	B172	Pinion Shaft Hub Screw	1
173	6176		Steel Ball	1
174	6175	B174	Compression Spring	1
175	6178	B175	Rack Feed Handle Hub	1
176	6182	B176	Pinion Shaft Hub Sleeve	1
177	6180	B177	Spring Cover	1
178	6181	B178	Clock Spring (Clock Spring Assy.)	1
181	6246-1		Socket Set Screw	1
182	6246		Lock Screw	1
183	6110	B183	Reverse Trip Ball Lever	1
184	6109	B184	Feed Reverse Trip Plunger	1
185	6114	B185	Reverse Trip Ball Lever Screw	1
186	5039	B186	Worm Gear	1
187	5041		Key 4X4X18	1
188	5042		Socket Set Screw	1
189	5040	B189	ADJ Worm Shaft	1
190	6174	B190	Pinion Shaft Hub Handle	1
191	6173	B191	Black Plastic Ball Handles 3/8	1
192	6101		Quill Housing	1
193	6101-1	B147	Adjust Shaft	1
194	6101-2	B154	Screw	1

3VK & 3VKH HEAD TOP HOUSING



3VK & 3VKH HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	H 7001	VS95	Hex Cap Nut	1
2	7002	VS16-3	Vari-Speed Dial	1
3	7003	VS19	Bronze Bearing	1
4	7004	VS18	Full Dog Socket Set Screw	1
5	H 7005	VS16	Speed Change Housing	1
8	7008		Chain Joint	1
8 -1	7008-1		Chain Joint 5x20	1
8 a	7008-a		Roll Pin 3x25	1
8 b	7008-b	VS35	Speed Change Stud	1
8 c	7008-c		Cotter Pin	1
10	7010	VS32	Speed Change Chain	1
13	7013	VS13	Top Bearing Cap	1
15	7015	VS26	Roll Pin 3x12	1
16	7016		Spring	1
17	7017	VS24	Bronze Bearing	1
18	H 7018	VS25	Speed Change Shaft	1
19	7019	VS28	Handle	1
20	7020	VS27-1	Caution Plate	1
21	H 7021	VS27	Speed Change Handwheel	1
22	7022		Flat HD. Cap Screw	4
23	H 7023	VS16-1	Plastic Face Plate	1
24	7024	VS18	Set Screw 6x8	1
25	H 7025	VS17	Socket HD Cap Screw 6x40	4
30	7030	B43	Worm Gear	1
31	7031	VS24	Bronze Bearing	1
32	7032		Roll Pin 4x8	1
33	7033	VS22	Speed Change Spur Gaer	1
35	H 7035	VS29	Speed Change Chain Drum	1
36	7036	VS63	Belt	1
38	7038	VS100	Timing Pulley Clutch Sleeve	1
39	7039	VS73	Splindle Gear Hub	1
40	7040	VS74	Spindle Bull Gear Assembly	1
41	7041	VS77	Ball Bearing #6908	2
42	7042	VS80	Snap ring	2

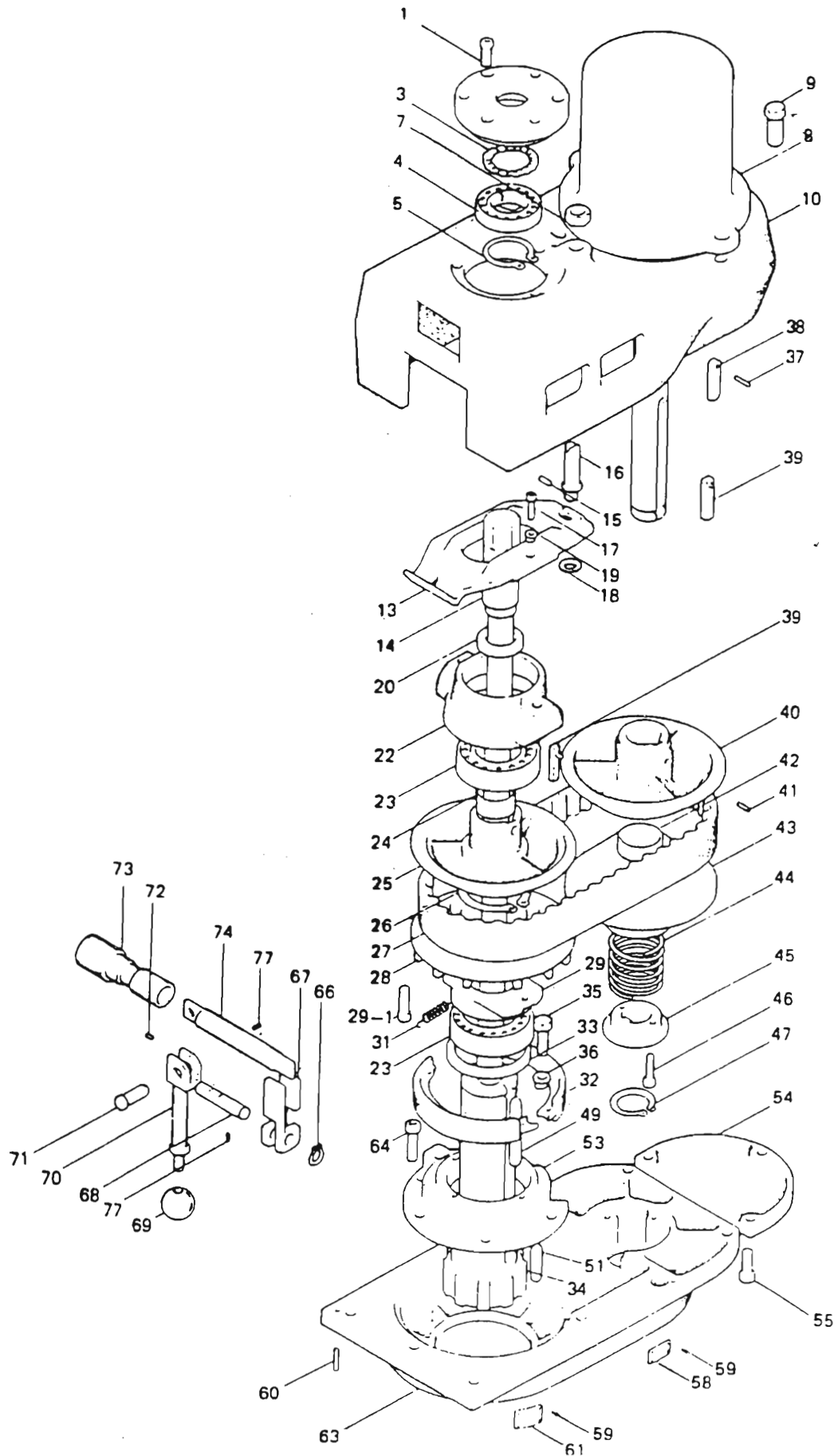
3VK & 3VKH HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
43	7043	VS78	Bull Gear Bearing Spacer	3
45	7045	VS86	Vert. Tee Bolts	3
46	7046		Steel Washer	3
47	7047		Nut	1
48	7048	VS76	Ball Bearing Gear Sleeve Washer	1
49	7049	VS83	Fixed Clutch Bracket (T49)	1
51	7051		Guide for Clutch Bracket	2
52	7052		Flat HD Socket Cap Screw	2
54	7054		Oil Cap 1/8	2
55	7055	VS84	Compression Spring	3
56	7056	VS81	Bearing Lock Nut	1
57	7057	VS75	Bearing Sleeve	1
57 -2	7057-2	VS105	Washer	1
58	7058	VS73-1	Wave Spring Washer #6908	1
59	7059	VS87	Bull Gear Shift Pinion	1
60	7060	VS89	HI-LOW Detent Plate	1
61	7061		Hex Nut 7/16	3
62	7062		Lock Washer 7/16	3
63	7063	VS85	Studs	3
64	7064		Socket Set Screw	1
65	7065	VS89-1	Adjustable Plate	1
66	7066	VS90	HI-LOW Detent Plunger	1
67	7067	VS91	Spring	1
68	7068	VS12	Socket Cap Screw 5x12	2
69	7069	B24	Bakelite Ball Handle	1
70	7070	VS94	HI-LOW Shift Crank	1
71	7071	VS92	HI-LOW Pinion Block	1
72	7072	VS88	Roll Pin 3x16	1
72 -1	7072-1		Socket HD Cap Screw 4x16	2
73	7073	VS51	Socket Cap Screw 6x20	2
77	7077	VS03	Socket Set Screw 8x8	1
78	7078	VS69	Key 5x15	2
79	7079	VS65	Ball Bearing #6203	2
80	7080	VS67	Bull Gear Pinion Counter Shaft	1

3VK & 3VKH HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
81	7081	VS72	Key 8x8x12	1
82	7082		Wave Spring Washer #6203	1
83	7083	VS66	Bull Gear Pinion	1
84	7084	VS64	Bull Gear Pinion Bearing Cap	1
85	7085	VS12	Socket HD Cap Screw 5x20	2
86	7086	VS62	Timing Belt Pulley	2
87	7087	VS61	Jam Nut 5/8NF	1
88	H 7088	VS101	Ventilator	2
89	H 7089		Round HD. Machine Screw	12

3VK & 3VKH HEAD BACK GEAR



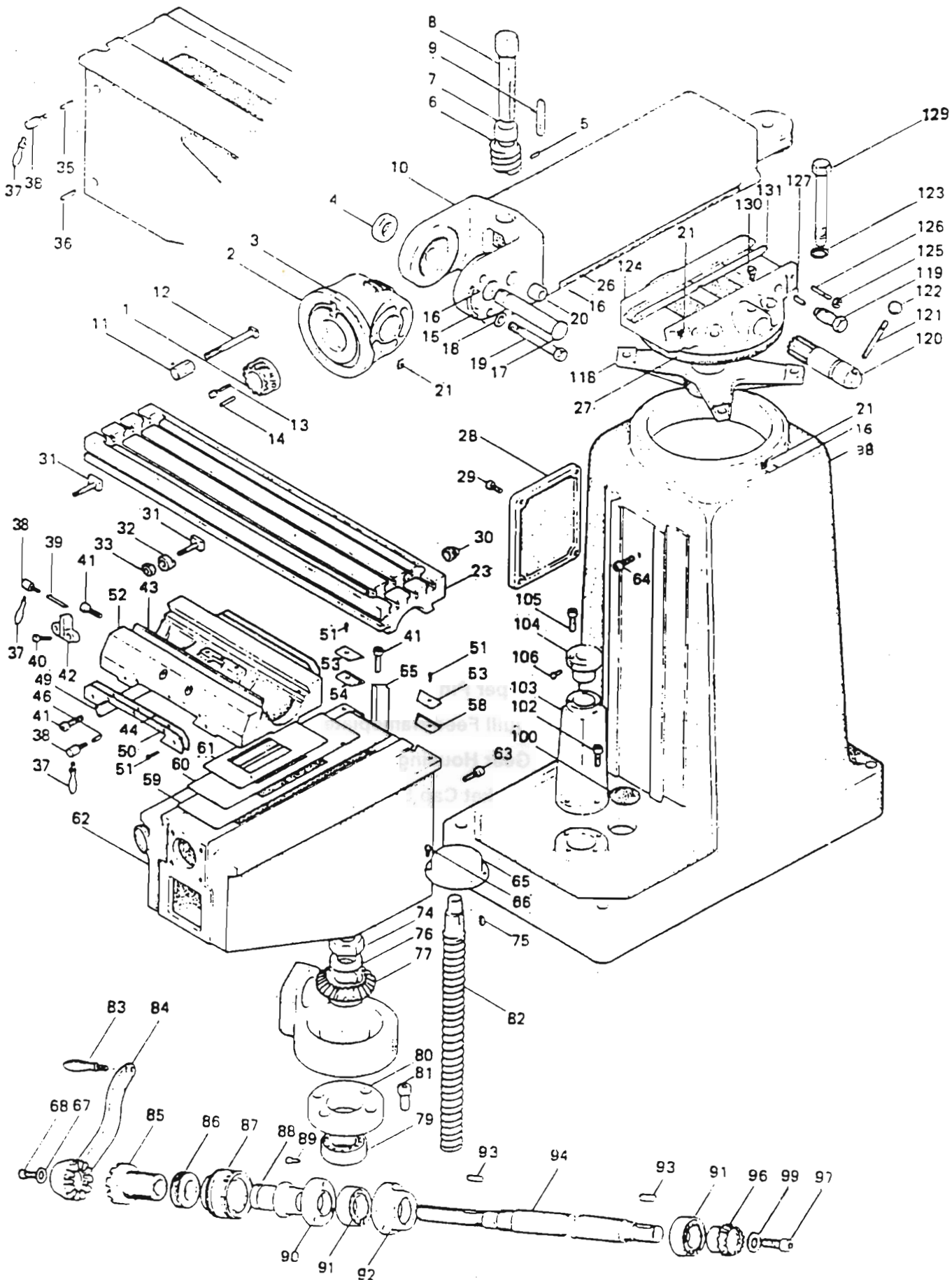
3VK & 3VKH HEAD BACK GEAR

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	8001	VS14	Socket Cap Screw 6x20	3
3	8003		Spring Washer #6207	1
4	8004	VS15	Ball Bearing 6207	1
5	8005	VS07	Snap Ring 35	1
7	8007	VS96	Hex Jam Nut 3/8	1
8	8008		Motor 3HP (complete unit) 230/460 3/60	1
9	8009		Hex HD Screw 3/8" x 1"	2
10	H 8010	VS01	Belt Housing	1
13	8013	VS36	Speed Change Plate	1
14	8014	VS1-2	Drawbar	1
15	8015	VS40	Cotter Pin	1
16	8016	VS39	Speed Change Plate Pivot Stud	1
17	8017	VS38	Socket HD Cap Screw 5x20	2
18	8018	VS41	Washer	1
19	8019	VS37	Pivot Sleeve	2
20	8020	A2	Draw Bar Washer	1
22	8022	VS42	Spindle Pulley Bearing Sliding Housing	1
23	8023	VS43	Ball Bearing 6010	2
24	8024	VS05	Plastic Insert	2
25	8025	VS44	Adjustable - Driven Varidisc	1
26	8026	VS97	Snap Ring 40	1
27	8027	VS04	Belt	1
28	8028	VS45	Stationary Driven Varidisc	1
29	8029	VS46	Brake Bearing Cap	4
29 -1	8029-1		Socket HD Cap Screw M6x20	2
31	8031	VS49	Brake Spring	2
32	8032	VS47	Brake Shoe Assembly	1
33	8033	VS98	Spindle Pulley Spacer	1
34	8034	VS70	Spindle Pulley Hub	1
35	8035	VS14	Hex HD Screw 5x20	1
36	8036	VS48	Brake Shoe Pivot Sleeve	1
37	8037		Roll Dowel Pin	1

3VK & 3VKH HEAD BACK GEAR

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
38	8038		Drive Key 7x25	1
39	8039	VS05-1	Key for ADJ Varidisc Motor Shaft	2
40	8040	VS02	Stationary Motor Varidisc	1
41	8041	VS03	Socket Set Screw	1
42	8042	VS06	Plastic Insert	2
43	8043	VS05	Adjustable Motor Varidisc Assembly	1
44	8044	VS08	Spring for Varidisc Motor Shaft	2
45	8045	VS09	Adjustable Motor Varidisc Spring Collar	1
46	8046		Socket HD Cap Screw 6x45	2
47	8047	VS10	Ret. Ring	1
48	8048		Socket Cap Screw	1
49	8049		Plastic Key	1
51	8051	VS71	Key 8x7x20	1
53	H 8053	VS50	Belt Housing Base	1
54	8054	VS11	Motor Pulley Cover	1
55	8055	VS12	Socket Cap Screw 6x20	3
58	8058	VS82-2	HI-LOW Range Nameplate	1
59	8059		Drive Screw	8
60	8060		Taper Pin	2
61	8061	VS82-1	Quill Feed Nameplate	1
63	H 8063	VS82	Gear Housing	1
64	H 8064	VS51	Socket Cap Screw 8x20	5
66	8066	VS60	Snap Ring 8	1
67	8067	VS59	Brake Operating Finger	2
68	8068	VS58	Brake Finger Pivot Stud	1
69	8069	B24	Bakelite Ball Handle	1
70	8070	VS56	Brake Lock Handle	1
71	8071	VS54	Brake Lock Pin 5x20	1
72	8072		Socket Set Screw M5x5	1
73	H 8073	VS52	Sleeve for Brake Lock Shaft	1
74	H 8074	VS53	Brake Lock Shaft	1
77	H 8077	VS99	Socket Set Screw	2
	7049-2	VS104	Brass Locating Plate	2

3VK BASIC MACHINE



3VK BASIC MACHINE

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5033	C01	Quill Housing ADJ. Gear	1
2	5019	C02	Ram Adapter	1
3	5016	C03	Ram Adapter Plate	1
4	5027	C04	Pivot Shaft Nut	1
5	5023	C05	Set Screw 6x8	1
6	5020	C06	Vertical Adjusting Worm	1
7	5022	C07-1	Worm Thrust Washer	1
8	5021	C08	Vertical Adjusting Worm Shaft 166L	1
9	5023-1	C09	Worm Key 5x5x50	1
10	H 5018	C10	Ram	1
11	5038	B157	Nut	4
12	5036	B155	Locking Bolt	4
13	5035	C13	Socket Cap Screw M8x35	2
14	5034	C14	Roll Dowel Pin 6x30	1
15	5043	C15	Angle Plate	1
16	5032	C16	Round HD Drive Screw	15
17	5026	C17	Adapter Pivot Pin	1
18	5029	C18	Chamfered & Hardened Washer 1/2	7
19	5028	C19	Adapter Locking Bolt 190L	3
20	H 5028-1	C10-1	Adapter Locking Bolt Washer	1
21	5031	C21	Plate	5
23	2001-50	C23	Table 50"	1
26	H 5044	C10-1	Ram Plate	1
27	5030	C126	Turret Plate	1
28	H 1002	C28	Column Cover	1
29	H 1003	C29	Socket Head Cap Screw 6x16	4
30	2035	C23-1	Plug	2
31	2031	C31	Stop Piece T - Bolt	2
32	2030	C32	Table Stop Bracket	2
33	2032	C33	Hex Nut 3/8	2
35	4043	C46	Knee Lock Plunger 61L	1
36	4044	C46	Knee Lock Plunger 64L	1
37	3031	C37	Table Lock Bolt Handle	5
38	3030	C38	Saddle Lock Bolt	5

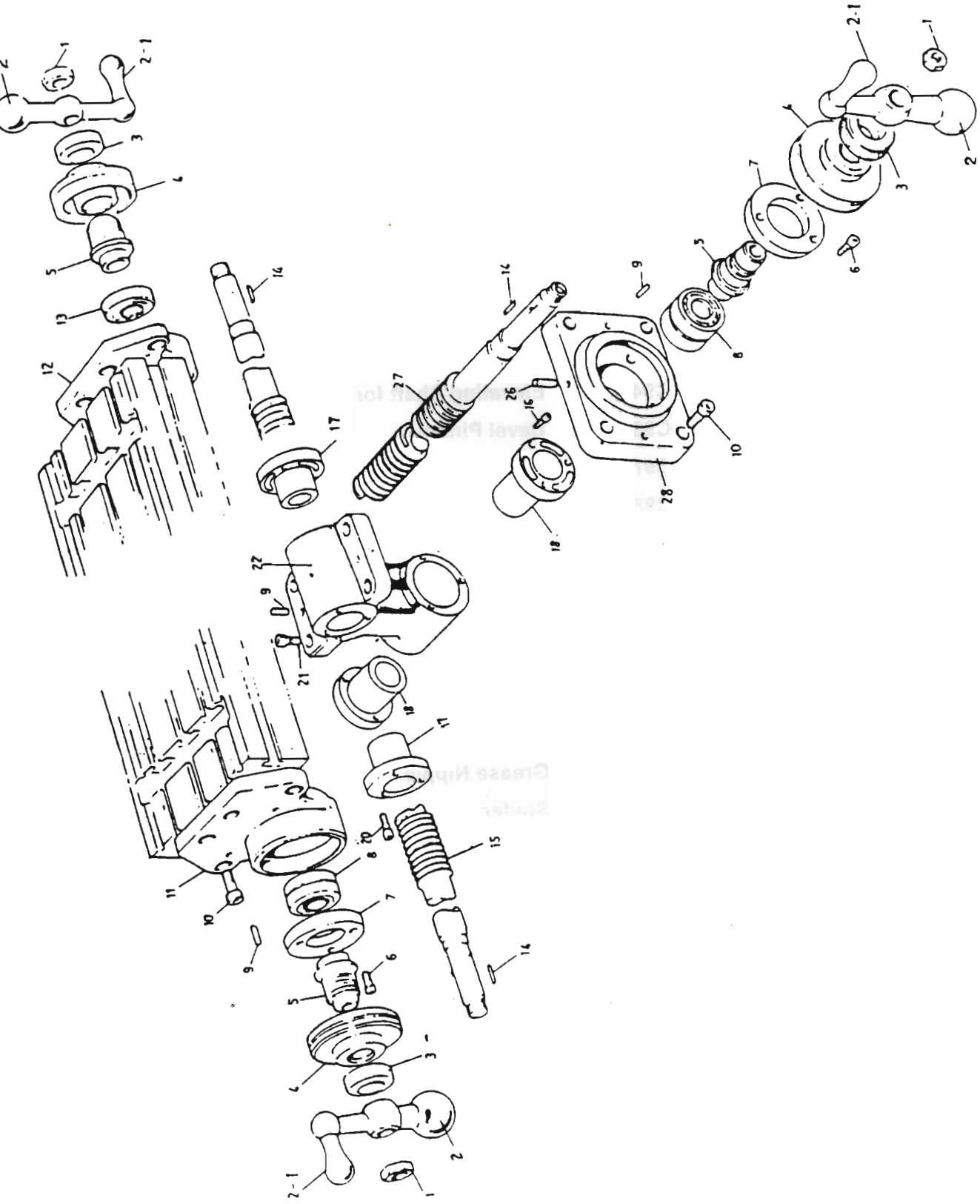
3VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
39	H 3032	C46	Saddle Lock Plunger	1
40	3036	C40	Socket HD Cap Screw 10x16	2
41	3028	C41	Gib Adjusting Screw	6
42	3035	C42	Table Stop Bracket	1
43	3026	C43	Saddle / Table Gib	1
44	3H 3037	C44	Felt Wipers	4
46	H 3029	C46	Table Lock Plunger 20L & 25L	1
49	3027	C49	Saddle / Knee Gib	1
50	3H 3037-1	C50	Saddle Knee Wiper Plate	4
51	3038	C51	Oval Head Screw 5x12	12
52	3H 3001	C52	Saddle	1
53	4028-1	C53	Left Hand Column Wiper Holder	2
54	4038	C54	Knee Wiper Felt	1
55	4038	C55	Knee / Column Gib	1
58	4028	C58	Knee Wiper Felt	1
59	H 3039	C60	Chip Guards 587L	1
60	H 3039-1	C60	Chip Guards 490L	1
61	H 3040	C60	Chip Guards 370L	1
62	3H 4001	C62	Knee 12"	1
63	1001-1	C63	Stop Screw	1
64	1001-2	C45	Stop Screw	1
65	4034		Bevel Gear Cover	1
66	4036		Socket Head Cap Screw	2
67	4004		Washer	1
68	4005		Socket Head Cap Screw 6x16	1
74	4023	C74	Jam Nut 1/2NF	1
75	4020	C75	Key 5x5x20	1
76	4022	C76	Washer	1
77	4019	C77	Bevel Gear	1
79	4040	C79	Sealed Ball Bearing 5305	1
80	8039	C80	Bearing Retainer Ring	1
81	4041	C81	Socket Head Cap Screw 8x20	4
82	4021	C82	Elevating Screw Assembly	1
83	4003	C83	Handle	1

3VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
84	4002	C84	Elevating Crank	1
85	4013	C85	Gearshift Clutch Insert	1
86	2016	C86	Dial Lock Nut	1
87	4010	C87	Dial With 100 Graduations	1
88	4011	C88	Dial Holder	1
89	4009	C89	Socket Head Cap Screw M6x16	3
90	2011	C90	Bearing Retaining Ring	1
91	2008	D8	Grease Sealed Bearing 6204	2
92	4006	C92	Bearing Cap	1
93	4015	C93	Key 3x3x18	2
94	H 4017	C94	Elevating Shaft for 12" Knee	1
96	4014	C96	Bevel Pinion	1
97	4042	C97	Set Screw	1
98	H 1001	C98	Column	1
99	4017-1		Washer	1
100	H 1004	C130	Filter	1
102	4027	C102	Socket Head Cap Screw	4
103	H 4026	C103	Pedestal	1
104	4024	C104	Elevating Screw Nut	1
105	4025	C105	Socket Head Cap Screw 6x16	3
106	4024-1	C106	Grease Nipple	1
118	5003	C118	Spider	1
119	H 5010	C108	Ram Lock Stud	2
120	5012	C120	Ram Pinion	1
121	5013	C121	Ram Pinion Handle	1
122	5014	C122	Plastic Ball	1
123	5005	C18	Chamfered x Hardened Washer	4
124	H 5001	C52	Turret	1
125	H 5007-1	C125	Gib Screw Nut 3/8	2
126	H 5007	C110	Gib Screw	2
127	H 5006	C125	Ram Lock Plunger	2
129	H 5004	C127	Locking Bolt	4
130	5015	C128	Ram Pinion Screw	1
131	H 5002	C111	Ram / Turret Gib	1

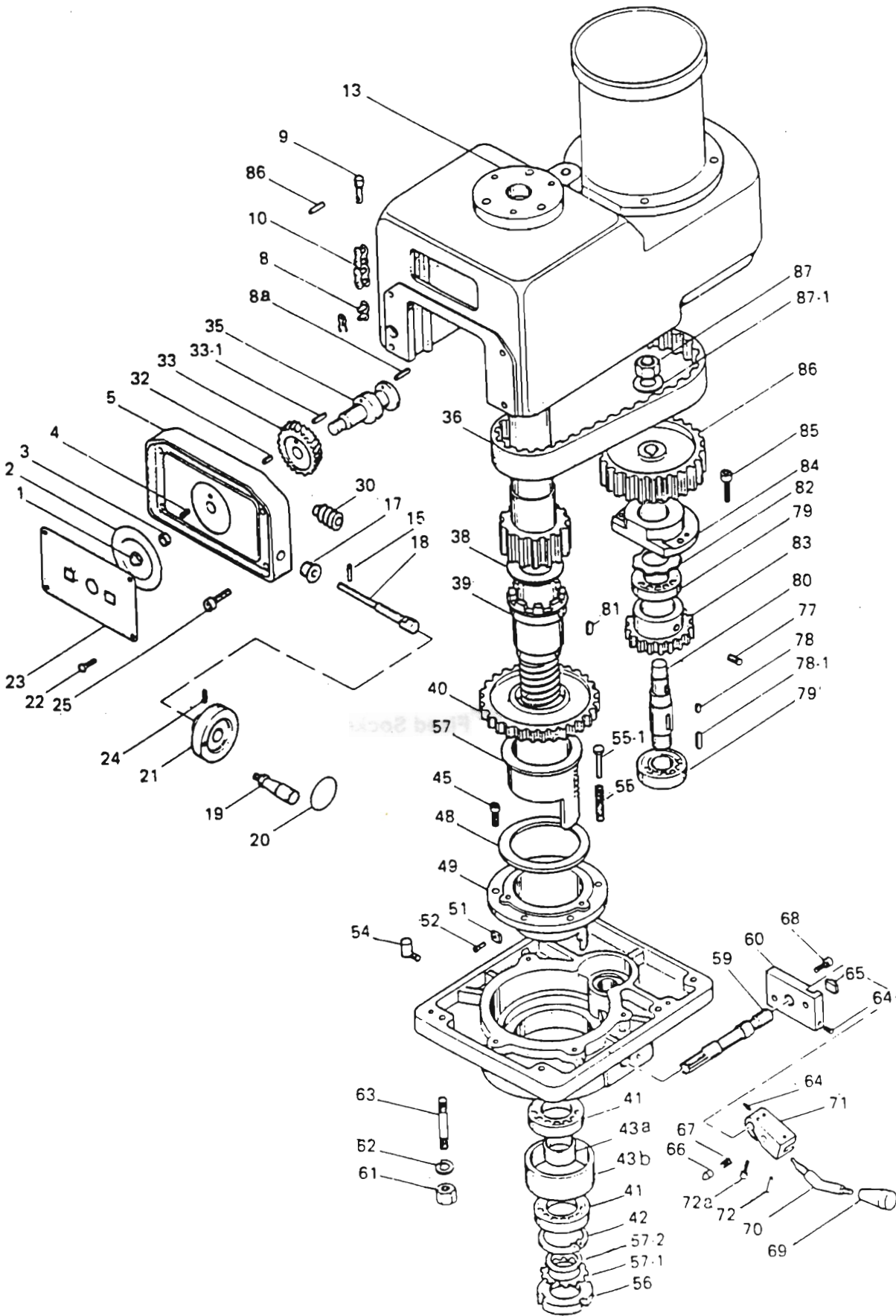
3VK LEADSCREW ASSEMBLY



3VK LEADSCREW ASSEMBLY

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
1	2004		Jam Nut 1/2NF	3
2	2018	D26	Ball Crank Handle	3
2 -1	2018-1	C83	Ball Crank Handle Grip	3
3	2016	D3	Dial Lock Nut	3
4	2012	D4-2	Dial With 200 Graduations	3
5	2014	D5	Dial Holder	3
6	2036		Socket Cap Screw	6
7	2011	C90	Bearing Retainer Ring	2
8	2008		Grease Sealed Ball Bearing 6204	2
9	2027		Roll Pin	10
10	2026		Socket Cap Screw	12
11	2006	D11	Left Bearing Bracket	1
12	2006	D12	Right Bearing Bracket	1
13	2008		Grease Sealed Ball Bearing 6204	1
14	2003		Key	3
15	2002	D15	Longitudinal Feed Screw 42"	1
15 -1	2002-1	D15-1	Longitudinal Feed Screw 49"	1
16	3021		Socket Screw	6
17	3020-1		Long Feed Nut	2
18	3020-2		Cross Feed Nut	2
20	3041		Fixed Socket Screw	6
21	3024	D22	Socket Cap Screw	4
22	3025		Feed Nut Bracket	1
26	3005-1		Stop Screw	1
27	3002		Cross Feed Screw for 12" Knee	1
28	3005	D28	Cross Feed Bearing Bracket	1
	2001	D29	Table Rubber Stop For Coolant System	1

ULTIMA-4VK HEAD TOP HOUSING



ULTIMA - 4VK HEAD TOP HOUSING

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5K- 7001	AK087 HVS95	Hex Cap Nut	1
2	5K- 7002	AK157L	Vari - Speed Dial	1
3	5K- 7001-1	HVS19	Bronze Bearing	1
4	5K- 7004	AK092	Full Dog Socket Set Screw	1
5	5K- 7005	AK005K HVS16	Speed Changer Housing	1
8	7008		Chani Joint	1
8 a	7008a	AK082	Roll Pin	1
8 b	7008b	AK067	Roll Pin	1
9	5K- 7009	AK068K HVS35	Speed Change Stud	1
10	7010	AK069K	Speed Change Chain	1
13	5K- 7013	AK042L HVS13	Top Bearing Cap	1
15	5K- 7015	AK072	Roll Pin	1
17	5K- 7017	HVS24	Bronze Bearing	1
18	5K- 7018	AK073K HVS25	Speed Change Shaft	1
19	5K- 7019	AK080 HVS28	Handle	1
20	7020	AK088	Caution Plate	1
21	5K- 7021	AK076 HVS27	Speed Change Handwheel	1
22	7022	AK163	Flat HD. Cap Screw	4
23	5K- 7023	AK162K-1	Face Plate	1
24	5K- 7024	AK075	Set Screw	1
25	5K- 7025	AK024K	Socket HD Cap Screw	4
30	5K- 7030	AK071 HVS21	Worm Gear	1
32	5K- 7032	AK086	Set Screw	2
33	5K- 7033	AK084 HVS22	Speed Changer Spur Gear	1
33 -1	5K- 7033-1		Roll Pin	1
35	5K- 7035	AK083 HVS29	Speed Change Chain Drum	1
36	5K- 7036	AK121	Belt 25 - 8M 560	1
38	5K- 7038	AK046L HVS100	Timing Pulley Clutch Sleeve	1
39	5K- 7039	AK101L HVS73	Spline Gear Hub	1
40	5K- 7040	AK100L HVS74	Spindle Bull Gear Assembly	1
41	5K- 7041	AK109L	Ball Bearing	2
42	5K- 7042	AK103L-1	Snap Ring	1
43	5K- 7043	AK111L HVS78 + 110L + 79	Ball Gear Bearing Spacer	1
45	5K- 7045		Socket Cap Screw	6

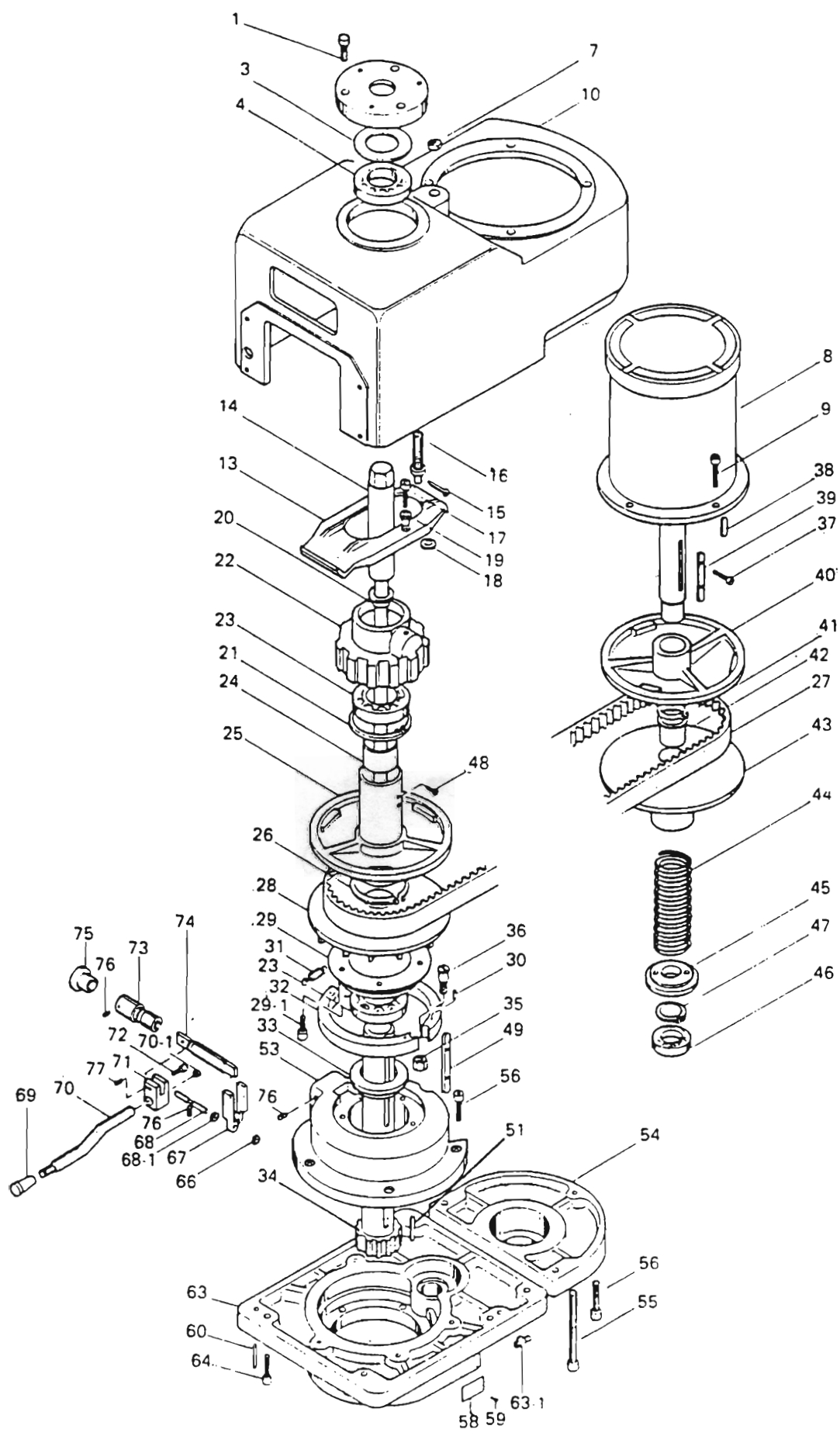
ULTIMA - 4VK HEAD TOP HOUSING

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
48	5K- 7048	HVS76	Ball Bearing Gear Sleeve Wahser	1
49	5K- 7049		Fixed Clutch Bracket	1
51	5K- 7051		Guide for Clutch Bracket	2
52	7052		Flat HD. Socket Cap Screw	2
54	7054		Oil Cup	1
55	5K- 7055	AK113 HVS84	Compression Spring	3
55 -1	7055-1	HVS102	Adjust Pin	3
56	5K- 7056	AK104L HVS81	Bearing Lock Nut	1
57	5K- 7057	AK105L HVS75	Bearing Sleeve	1
57 -1	5K- 7057-1	AK103L	Lock Washer	1
57 -2	5K- 7057-2	AK103L-1	Washer	1
59	5K- 7059	AK136 HVS87	Bull Gear Shift Pinion	1
60	5K- 7060	AK137 HVS89	HI-LOW Detent Plate	1
61	5K- 7061	AK108	Hex Nut	3
62	5K- 7062	AK107	Lock Washer	3
63	5K- 7063	AK106 HVS85	Socket Cap Screw	3
64	7064	AK139-1	Socket Set Screw	2
65	5K- 7065	AK138 HVS89-1	Adjustable Plate	1
66	5K- 7066	AK144 HVS90	HI-LOW Detent Plunger	1
67	5K- 7067	AK143 HVS91	Spring	1
68	5K- 7068	AK140	Socket Cap Screw	2
69	5K- 7069	AK146	Bakelite Ball Handle	1
70	5K- 7070	AK145 HVS94	HI-LOW Shift Crank	1
71	5K- 7071	AK141 HVS92	HI-LOW Pinion Block	1
72	5K- 7072	AK142	Roll Pin	1
72 a	5K- 7072a	AK139-2	Socket Cap Screw	1
77	5K- 7077	AK117A	Socket Set Screw	1
78	5K- 7078	AK116	Key	1
79	5K- 7079	AK118	Ball Bearing	2
80	5K- 7080	AK114 HVS67	Gear Shaft	1
81	5K- 7081	AK102	Key	1
82	5K- 7082		Wave Spring Washer	1
83	5K- 7083	AK117A HVS66	Bull Gear Pinion	1
84	5K- 7084	AK122 HVS64	Bull Gear Pinion Bearing	1

ULTIMA - 4VK HEAD TOP HOUSING

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
85	5K- 7085	AK123	Socket HD Cap Screw	2
86	5K- 7086	AK119 HVS62	Timing Belt Pulley	1
87	5K- 7087	AK120	Jam Nut	1
87 -1	5K- 7087-1		Spring Washer	1

ULTIMA-4VK HEAD BACK GEAR



ULTIMA - 4VK HEAD BACK GEAR

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5K- 8001	AK044	Socket Cap Screw	1
3	5K- 8003	AK003	Spring Washer	1
4	5K- 8004	AK043L	Ball Bearing 6009	1
7	5K- 8007	AK066	Hex Jam Nut	1
8	5K- 8008	AK007K	Motor 5HP	1
9	5K- 8009	AK026	Hex HD Screw	4
10	5K- 8010	AK001K	Belt Housing	1
13	5K- 8013	AK062 HVS36	Speed Change Plate	1
14	5K- 8014	AK147L	Drawbar	1
15	5K- 8015	AK064	Cotter Pin	1
16	5K- 8016	AK063 HVS39	Speed Change Plate Pivot Stud	1
17	5K- 8017	AK060	Socket HD Screw	2
18	5K- 8018	AK065	Washer	1
19	5K- 8019	AK061 HVS37	Pivot Sleeve	2
20	5K- 8020	AK149L	Draw Bar Washer	1
21	5K- 8021		Snap Ring 45	2
22	5K- 8022	AK059L HVS42	Spindle Pulley Bearing Sliding Housing	1
23	5K- 8023	AK057L	Ball Bearing 6912	2
24	5K- 8024		Plastic Insert	2
25	5K- 8025	AK054L HVS44	Adjustable - Driven Varidisc	1
26	5K- 8026	AK053L	Snap Ring 50	1
27	5K- 8027	AK158	Belt 900VC 3830	1
28	5K- 8028	AK051L HVS45	Stationary Driven Varidisc	1
29	5K- 8029	AK049L HVS46	Brake Bearing Cap	1
29 -1	8029-1	AK099A	Socket HD Cap Screw	5
31	5K- 8031	AK099A HVS49	Brake Spring	2
32	5K- 8032	AK095 HVS47	Brake Shoe Assembly	1
33	5K- 8033	HVS98	Spindle Pulley Spacer	1
34	5K- 8034	AK045L HVS70	Spindle Pulley Hub	1
35	5K- 8035	AK096	Jam Nut	1
36	5K- 8036	AK096	Brake Shoe Pivot Sleeve	1
37	5K- 8037	AK037-1	Socket Cap Screw	2
38	5K- 8038	AK030	Drive Key	1
39	5K- 8039	AK037	Key 8x8x30	1

ULTIMA - 4VK HEAD BACK GEAR

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
40	5K- 8040	AK032L HVS02	Stationary Motor Varidisc	1
41	5K- 8041		RET Ring 28	1
42	5K- 8042		Plastic Insert	2
43	5K- 8043	AK036L HVS05	Adjustable Motor Varidisc Assembly	1
44	5K- 8044	AK039	Spring for Varidisc Motor Shaft	1
45	5K- 8045	AK040K HVS09	Adjustable Varidisc Spring Collar	1
46	5K- 8046		Ball Bearing 6204	1
47	5K- 8047		RET Ring 32	1
48	5K- 8048		Socket Cap Screw	2
49	5K- 8049	AK055	Key 8x7x50	1
51	5K- 8051	AK015	Key 8x7x15	1
53	5K- 8053	AK002K	Belt Housing Base	1
54	5K- 8054	AK006K	Motor Pulley Cover	1
55	5K- 8055		Socket Cap Screw	2
56	5K- 8056	AK025	Socket Cap Screw	2
58	5K- 8058		HI-LOW Range Nameplate	1
59	5K- 8059		Drive Screw	2
60	5K- 8060		Taper Pin	2
63	5K- 8063	AK003K	Gear Housing	1
63 -1	5K- 8063-1		Grease Nipple	1
64	5K- 8064	AK014	Socket Cap Screw	6
66	5K- 8066		Snap Ring	1
67	5K- 8067	AK132 HVS59	Brake Finger Pivot Stud	2
68	5K- 8068	AK133K HVS58	Brake Operating Finger	1
68 -1	5K- 8068-1	AK135	Washer	1
69	3H- 7069	AK124	Bakelite Ball Handle	1
70	5K- 8070	AK125 HVS56	Brake Lock Handle	1
70 -1	5K- 8070-1	AK127	Jam Nut	1
71	5K- 8071	HVS54	Brake Lock Handle	1
72	5K- 8072	AK126	Socket Set Screw	1
73	5K- 8073	AK129K HVS52	Sleeve for Brake Lock Shaft	1
74	5K- 8074	AK128K HVS53	Brake Lock Shaft	1
75	5K- 8075		Rubber Busing	1
76	5K- 8076		Set Screw	3
77	5K- 8077		Set Screw	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5K- 6137	A197 HB5	Worm Cradle Bushing	1
2	5K- 6136	A198L HB7	Worm Gear Spacer	1
3	5K- 6134	A199L HB8	Feed Drive Worm Gear	1
4	5K- 6136-1		Worm Gear Bushing	1
5	5K- 6140		Snap Ring	1
6	5K- 6150	A125	Cap Screw	1
7	5K- 6149	A216 HB13	Washer	1
8	5K- 6147		Key	1
9	5K- 6148	A217 HB15	Feed Reverse Bevel Gear	1
10	5K- 6123		Set Screw	1
11	5K- 6122	A203 HB16	Feed Engage Pin	1
12	5K- 6139	A201 HB19	Feed Bevel Pinion	1
13	5K- 6135	A200	Key	1
14	5K- 6124		Cap Screw	1
15	5K- 6121	A202L HB17	Worm Gear Gradle	1
16	5K- 6126	A206 HB18	Worm Gear Cradle Throw - out	1
17	5K- 6125	A208 HB19	Shift Sleeve	1
18	5K- 6132	A207	Cap Screw	3
19	5K- 6127		Adj Block	1
20	5K- 6130		Cap Screw	7
21	5K- 6169		Set Screw	2
22	5K- 6168	FB66	Cluster Gear Cover	2
23	5K- 6170		Compression Spring	2
24	5K- 6128		Spring Screw	2
25	5K- 6129		Roll Pin	2
26	5K- 8061		Quill Feed Nameplate	1
27	5K- 6227	A239 HB42	Bushing	1
28	5K- 6226		Roll Pin	1
29	5K- 6225	A237 HB43	Worm	1
30	5K- 6224	A236 HB44	Feed Worm Shaft Bushing	1
31	5K- 6223	A235L HB47	Feed Worm Shaft Thrust Washer	1
32	5K- 6220	A241 HB48+49	Feed Reverse Bevel Gear	2
33	5K- 6217		Roll Pin	1
34	5K- 6222	A244 HB50	Feed Reverse Clutch	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
35	5K- 6209	A240 HB57	Feed Worm Shaft Bushing	1
36	5K- 6230	A242	Key	1
37	5K- 6216	A231L HB55	Reverse Clutch Rod	1
38	5K- 6143	A218 HB36	Feed Driving Gear	1
39	5K- 6145	A222	Key	1
40	5K- 6144	A221 HB40	Feed Drive Gear	1
41	5K- 6252	A223	Needle Bearing	1
42	5K- 6157	A062 HB27	Cluster Gear Shaft Upper Bearing	1
43	5K- 6153	A057.58.59 HB28	Cluster Gears Assembly	1
44	5K- 6151	A053 HB31+35	Cluster Gear Shaft	1
45	5K- 6160	A060	Cluster Gear Key	1
46	5K- 6158	A056	Snap Ring	1
47	5K- 6156	A055 HB33	Bevel Gear Bearing	1
48	5K- 6159	A054 HB34	Bevel Gear Thrust Spacer	1
49	5K- 6131		Grease Nipple	1
50	5K- 6133	A265	Oil Cup	1
51	5K- 5040	A156L HB189	ADJ Worm Shaft	1
52	5K- 5042	A156A	Socket Set Screw	1
53	5K- 5041	A155	Key	1
54	5K- 5039	A154 HB186	Worm Gear	1
55	5K- 6173	A164	Black Plastic Ball Handle	1
56	5K- 6174	A165 HB190	Pinion Shaft Hub Handle	1
57	5K- 6178	A166 HB175	Rack Feed Handle Hub	1
58	5K- 6182	A168 HB176	Pinion Shaft Hub Sleeve	1
59	5K- 6180-1	A175	Cap Screw	2
60	5K- 8180	A174L HB177	Spring Cover	1
61	5K- 6181	A173L HB178	Clock Spring	1
62	5K- 6176	A170	Steel Ball	1
63	5K- 6175	A170A	Compression Spring	1
64	5K- 6177	A170B	Set Screw	1
65	5K- 6114	A066 HB185	Reverse Trip Ball Lever Screw	1
66	5K- 6109	A274 HB184	Feed Reverse Trip Plunger	1
67	5K- 6110	A067 HB183	Reverse Trip Ball Lever	1
68	5K- 6183	A167 HB172	Pinion Shaft Hub Screw	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
69	5K- 6184	A169	Key	1
70	5K- 6172-1	A182A	Cap Screw	1
71	5K- 6172	A182L HB166	Quill Pinion Shaft	1
72	5K- 6161		Cluster Gear Cover	1
73	5K- 6256-1		Plate	1
74	5K- 6165		Cap Screw	4
75	5K- 6256		Vari - Speed Dial	1
76	5K- 6162	A047 HB63	Feed Gear Shift Fork	1
77	5K- 6166	A045 HB64	Cluster Gear Shift Crank	1
78	5K- 6167		ADJ Block	1
79	5K- 6163	A049 HB60	Feed Shift Rod	1
80	5K- 6164	A051	KP Set Screw	1
81	5K- 6228	A236A	Mock - it Lock Screw	1
82	5K- 6228-1	A236B	Socket Set Screw	1
83	5K- 6186	A176 HB90	Quill Pinion Shaft Bushing	1
84	5K- 6246	A175	Lock Screw	1
85	5K- 6246-1	A175A	Socket Set Screw	1
86	5K- 6190	A177 HB91	Pinion Shaft Worm Gear Spacer	1
87	5K- 6189	A179	Round Head Screw	3
88	5K- 6187	A178 HB92	Overload Clutch Worm Gear	1
89	5K- 6188	A180 HB93	Overload Clutch Ring	1
90	5K- 6188-1	A273	Sanp Ring	1
91	5K- 6196		Key	1
92	5K- 6195	A190 HB81	Overload Clutch Sleeve	1
93	5K- 6194	A181 HB80	Overload Clutch	1
94	5K- 6197	A183 HB79	Safety Clutch Spring	1
95	5K- 6198	A186 HB78	Overload Clutch Lock Nut	1
96	5K- 6199	A184	Socket Set Screw	1
97	5K- 6199-1	A185	Brass Plug	1
98	5K- 6201	A270 HB97	Overload Clutch Washer	1
99	5K- 6200	A187 HB75	Clutch Ring	1
100	5K- 6202	A188 HB74	Clutch Ring Pin	1
101	5K- 6204	A095	Pin	1
102	5K- 6236-1	A098 HB95	Dowel Pin	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
103	5K- 6231-2		Snap Ring	2
104	5K- 6203	A096L HB96	Overload Clutch Trip Lever	1
105	5K- 6195-1	A189	Snap Ring	1
106	5K- 6205	A094 HB99	Clutch Arm Cover	1
107	5K- 6207	A097	Socket Set Screw	1
108	5K- 6208	A097A	Chem Blacked Lock Nut	1
109	5K- 6206	A093	Cap Screw	2
110	5K- 6228		Socket Set Screw	1
111	5K- 6228-1		Mock - it Lock Screw	1
112	5K- 6246	A054A	Socket Set Screw	1
113	5K- 6246-1	A054A	Lock Screw	1
114	5K- 6191	A278 HB88	Compression Spring	1
115	5K- 6193	A277 HB89	Overload Clutch Lever Spring Plunger	1
116	5K- 6192	HB88-1	Compression Spring	1
117	5K- 6236	A085L HB118	Cam Rod Sleeve Assy	1
118	5K- 6242	A084 HB120	Compression Spring	1
119	5K- 6240	A082 HB121	Trip Plunger	1
120	5K- 6118-1	A276 HB123	Trip Plunger Bushing	1
121	5K- 6118	A080 HB124	Feed Trip Plunger	1
122	5K- 6237	A083 HB117	Roll Pin	1
123	5K- 6241	A086 HB119	Roll Rin	1
124	5K- 6231	A092 HB106	Feed Trip Bracket	1
125	5K- 6231-1	A090	Dowel Pin	1
126	5K- 6232	A091	Cap Screw	2
127	5K- 6239	A087L HB103	Cam Rod	1
128	5K- 6219-1	A268	Handwheel Clutch Spring Screw	1
129	5K- 6219-2	A267	Compression Spring	1
130	5K- 6255	A269	Steel Ball	1
131	5K- 6218	A233 HB113	Handwheel Clutch	1
132	5K- 6219	A234	Socket Set Screw	1
133	5K- 6229	A230	Key	1
134	5K- 6215	A228	Snap Ring	1
135	5K- 6213	A227 HB111	Reverse Knop	1
136	5K- 6214	A226 HB110	Feed Reverse Knob Stud	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
137	5K- 6210	A224+225 HB125	Handwheel	1
138	5K- 6234	A089 HB104	Trip Handle	1
139	3H- 7069	A189	Plastic Handle	1
140	5K- 6120	A069L	Lower Clamping Bolt Spacer	2
141	5K- 5036	A071L HB155	T - Bolt Assy	4
142	5K- 5037		Spring Washer	4
143	5K- 5038	A070L	Lock Nut	4
144	5K- 6243	A073 B159	Micrometer Scale	1
145	5K- 6244	A072	Chem Blacked RD. HD. Screws	2
146	5K- 6104	A068 HB164	Quill Stop Micro - Screw	1
147	5K- 6105	A065 HB163	Quill Stop Knob	1
148	5K- 6106	A064	Screw	1
149	5K- 6107	A074 HB162	Micrometer Nut	1
150	5K- 6108	A075 HB161	Quill Micro - Stop Nut	1
151	5K- 6115	A076	Snap Ring	1
152	5K- 6117-2		Spring Screw	1
153	5K- 6117-1		Spring	1
154	5K- 6119	A246L HB149	Lock Handle	1
155	5K- 6117	A248L HB152	Quick Lock Bolt	1
156	5K- 6116A	A247L HB153	Quill Lock Sleeve Tapped	1
157	5K- 6116-1		B152-1 Compression Spring	1
158	5K- 6116B		HB148 Quill Lock Sleeve	1
159	5K- 6112	A078 HB146	Trip Lever Pin	1
160	5K- 6111	A079 HB145	Feed Trip Lever	2
161	5K- 6113	A077 HB144	Socket Set Screw	1
162	5K- 6113-1		Chem Blacked Lock Nut	1
163	5K- 6084		HB127+129 Spindle 40#	1
164	5K- 6090	A113L	Snap Ring	1
165	5K- 6092	A112L	Bearing	2
166	5K- 6094	A114L	Nut	1
167	5K- 6094-1	A114L-1	Cap Screw	1
168	5K- 6093	A108L	Bearing	2
169	5K- 6096	A107L HB137	Bearing Spacer - Small	1
170	5K- 6095	A106L HB136	Bearing Spacer - Large	1

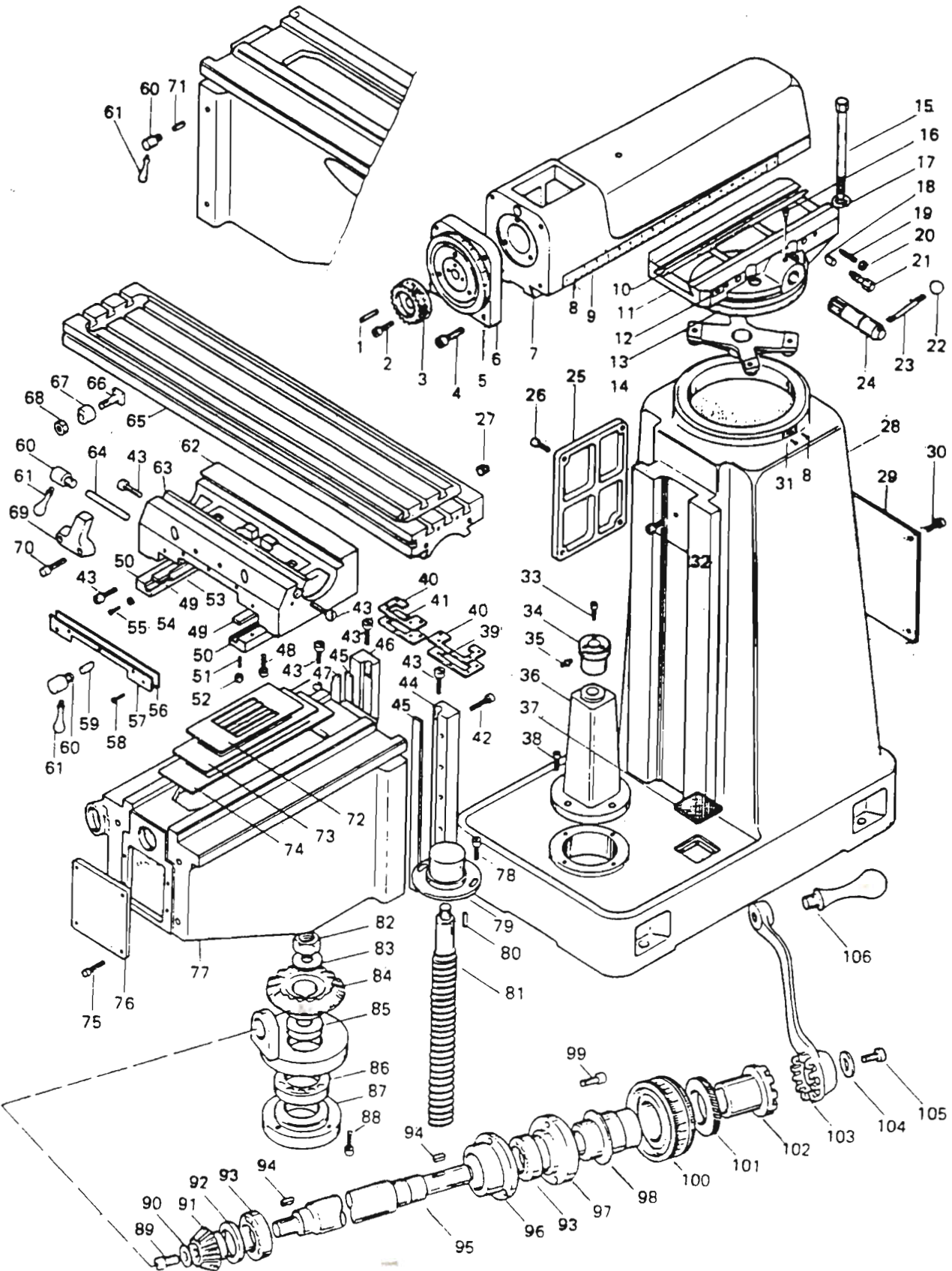
ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
137	5K- 6210	A224+225	HB125 Handwheel	1
138	5K- 6234	A089	HB104 Trip Handle	1
139	3H- 7069	A189	Plastic Handle	1
140	5K- 6120	A069L	Lower Clamping Bolt Spacer	2
141	5K- 5036	A071L	HB155 T - Bolt Assy	4
142	5K- 5037		Spring Washer	4
143	5K- 5038	A070L	Lock Nut	4
144	5K- 6243	A073	B159 Micrometer Scale	1
145	5K- 6244	A072	Chem Blacked RD. HD. Screws	2
146	5K- 6104	A068	HB164 Quill Stop Micro - Screw	1
147	5K- 6105	A065	HB163 Quill Stop Knob	1
148	5K- 6106	A064	Screw	1
149	5K- 6107	A074	HB162 Micrometer Nut	1
150	5K- 6108	A075	HB161 Quill Micro - Stop Nut	1
151	5K- 6115	A076	Snap Ring	1
152	5K- 6117-2		Spring Screw	1
153	5K- 6117-1		Spring	1
154	5K- 6119	A246L	HB149 Lock Handle	1
155	5K- 6117	A248L	HB152 Quick Lock Bolt	1
156	5K- 6116A	A247L	HB153 Quill Lock Sleeve Tapped	1
157	5K- 6116-1		B152-1 Compression Spring	1
158	5K- 6116B		HB148 Quill Lock Sleeve	1
159	5K- 6112	A078	HB146 Trip Lever Pin	1
160	5K- 6111	A079	HB145 Feed Trip Lever	2
161	5K- 6113	A077	HB144 Socket Set Screw	1
162	5K- 6113-1		Chem Blacked Lock Nut	1
163	5K- 6084		HB127+129 Spindle 40#	1
164	5K- 6090	A113L	Snap Ring	1
165	5K- 6092	A112L	Bearing	2
166	5K- 6094	A114L	Nut	1
167	5K- 6094-1	A114L-1	Cap Screw	1
168	5K- 6093	A108L	Bearing	2
169	5K- 6096	A107L	HB137 Bearing Spacer - Small	1
170	5K- 6095	A106L	HB136 Bearing Spacer - Large	1

ULTIMA - 4VK MILLING HEAD

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
171	5K- 6097	A103L HB134	Spindle Dirt Shield	1
172	5K- 6098	A102L HB133	Nose - Piece	1
173	3H- 6088-1	A101.261	Felt Washer Screw	2
174	5K- 608	A260 B151	Felt Washer	1
175	5K- 6086	A104L HB128	Quill Skirt	1
176	5K- 6085	A109L HB142	Quill	1
177	5K- 6099	B127-1	Keeper Key	1
178	5K- 60100		Cap Screw	1
179	5K- 6101		Quill Housing	1
180	5K- 6251	HB147	Set Bar	1
181	5K- 6253		Cap Screw	1
182	5K- 6085-1	A102L-3	Set Screw	1

ULTIMA-4VK BASIC MACHINE



ULTIMA - 4VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5K- 5034		Roll Pin	1
2	5K- 5035		Socket Cap Screw	2
3	5K- 5033	C01	Quill Housing Adj. Gear	1
4	5K- 5028		Socket Cap Screw	7
5	5K- 5016		Ram Adapter Plate	1
6	5K- 5019		Ram Adapter	1
7	5K- 5018		Ram	1
8	5032		Roung HD Drive Screw	23
9	H- 5044	C10-2	Ram Plate	1
10	5K- 5002		Ram / Turret Gib	1
11	5K- 5001		Turret	1
12	5031		Plate	1
13	5K- 5030	C126	Turret Plate	1
14	5K- 5003		Spider	1
15	5K- 5004		Locking Bolt	4
16	5K- 5015	C128	Ram Pinion Screw	1
17	5K- 5005		Chamfered & Hardened Washer 5/8	1
18	H- 5006	FC100	Ram Lock Plubger	2
19	H- 5007	FC110	Gib Screw	2
20	H- 5007-1		Gib Screw Nut	2
21	H- 5010	C108	Ram Lock Stud	2
22	5K- 5014		Plastic Ball	1
23	5K- 5013		Ram Pinion Handle	1
24	5K- 5012		Ram Pinion	1
25	H- 1002		Column Cover	1
26	H- 1003		Socket Head Cap Screw	4
27	2035		Plug	2
28	4H- 1001		Column	1
29	4H- 1002		Column Cover	1
30	4H- 1003		Cap Screw	4
31	5031		Plate	5
32	4H- 1001-1	C45	Stop Screw	1
33	4025		Socket Hand Cap Screw	3
34	4H- 4024		Elevating Screw Nut	1

ULTIMA - 4VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
35	4024-1		Grease Nipple	1
36	4H- 4026		Pedestal	1
37	4H- 1004	C130	Filter	2
38	4027		Socket Head Cap Screw	4
39	4H- 4028	C54H	Knee Wiper Felt	1
40	4H- 4028-2	C53H	Wiper Holder	2
41	4H- 4028-1	C58H	Knee Wiper Felt	1
42	4H- 4052		Socket Head Cap Screw	10
43	3028		Gib Adj-Screw	10
44	4H- 4051		Knee / Column Gib Support	1
45	4H- 4053		Knee / Column Gib	2
46	4H- 4050		Knee / Column Gib Support	1
47	4H- 4038		Knee / Column Gib	1
48	4H- 3052		Socket Head Cap Screw	8
49	4H- 3027-1		Saddle / knee Gib	2
50	4H- 3050		Saddle / Table Gib Support	2
51	4H- 3050-1		Set Screw	8
52	4H- 3050-2		Jam Nut	8
53	4H- 3027		Saddle / knee Gib	1
54	4H- 3050-3		Washer	4
55	4H- 3050-4		Socket Cap Screw	4
56	4H- 3037	C44H	Felt Wipers	2
57	4H- 3037-1	C50H	Saddle Knee	2
58	3038		Oval Head Screw	10
59	H- 3029	C46	Table Lock Plunger	2
60	3030	C37	Saddle Lock Bolt	5
61	3031	C38	Table Lock Bolt Handle	5
62	4H- 3001		Saddle	1
63	3026		Saddle / Table Gib	1
64	4H- 3032	C39	Saddle Lock Plunger	1
65	2001-50	C23	Table 50"	1
66	2031	C31	Stop Piece T - Bolt	2
67	2030	C32	Table Stop Bracket	2
68	2032		Hex Nut	2

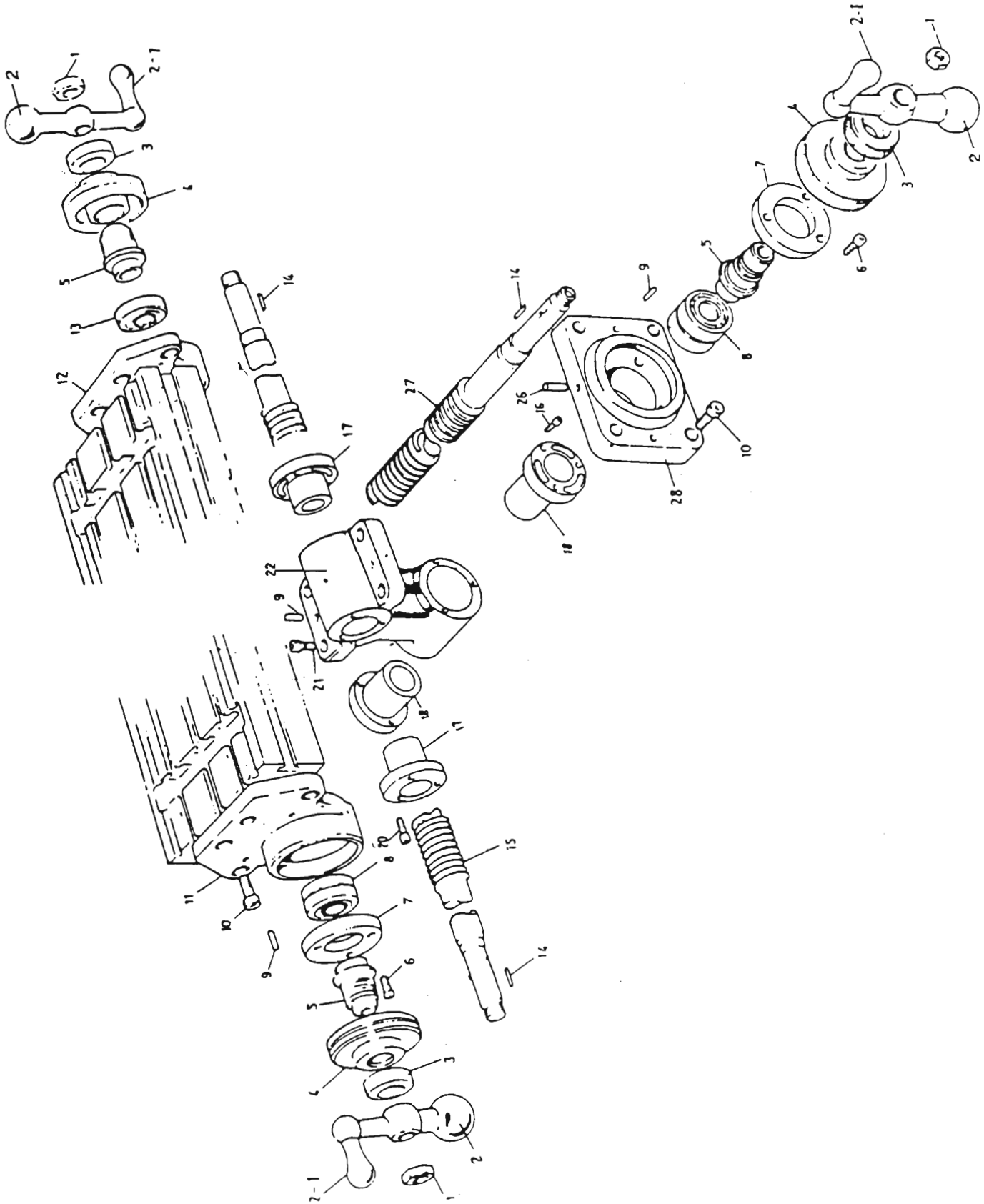
ULTIMA - 4VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
69	3035	C42	Table Stop Bracket	1
70	3036		Socket HD Cap Screw	2
71	4H- 4043		Knee Lock Plunger	2
72	H- 3040	C60-370	Chip Guards	1
73	H- 3039-1	C60-490	Chip Guards	1
74	4H- 3039	C60-627	Chip Guards	1
75	3B- 1005-1		Cap Screw	4
76	3B- 1005		Knee Cover	1
77	4H- 4001		Knee	1
78	4036		Socket Head Cap Screw	2
79	4034		Bevel Gear Cover	1
80	4020		Key	1
81	4H- 4021		Elevating Screw Assembly	1
82	4023		Jam Nut	1
83	4019-1	C76	Washer	1
84	4019	C77	Bevel Gear	1
85	4022		Bevel Gear Spacer	1
86	4040		Bearing 5305	1
87	4039	C80	Bearing Retainer Ring	1
88	H- 4041		Socket Head Cap Screwe	3
89	4042		Socket Head Cap Screwe	1
90	4017-1		Washer	1
91	4014	C96	Bevel Gear	1
92	4014-1	C77-1	Bevel Gear Spacer	1
93	4007		Bearing 6204	2
94	4015		Key	2
95	4H- 4017	C94	Elevating Shaft	1
96	4006	C92	Bearing Cap	1
97	2011	C90	Bearing Retainer Ring	1
98	4011	C88	Dial Holder	1
99	4009		Socket Head Cap Screwe	3
100	4010	C87	Dial With 100 Graduation	1
101	2016	C86	Dial Lock Nut	1
102	4013	C85	Gearshaft Clutch Insert	1

ULTIMA - 4VK BASIC MACHINE

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
103	4002	C84	Elevating Crank	1
104	4004		Washer	1
105	4005		Socket Head Cap Screwe	1
106	4003	C83	Handle	1

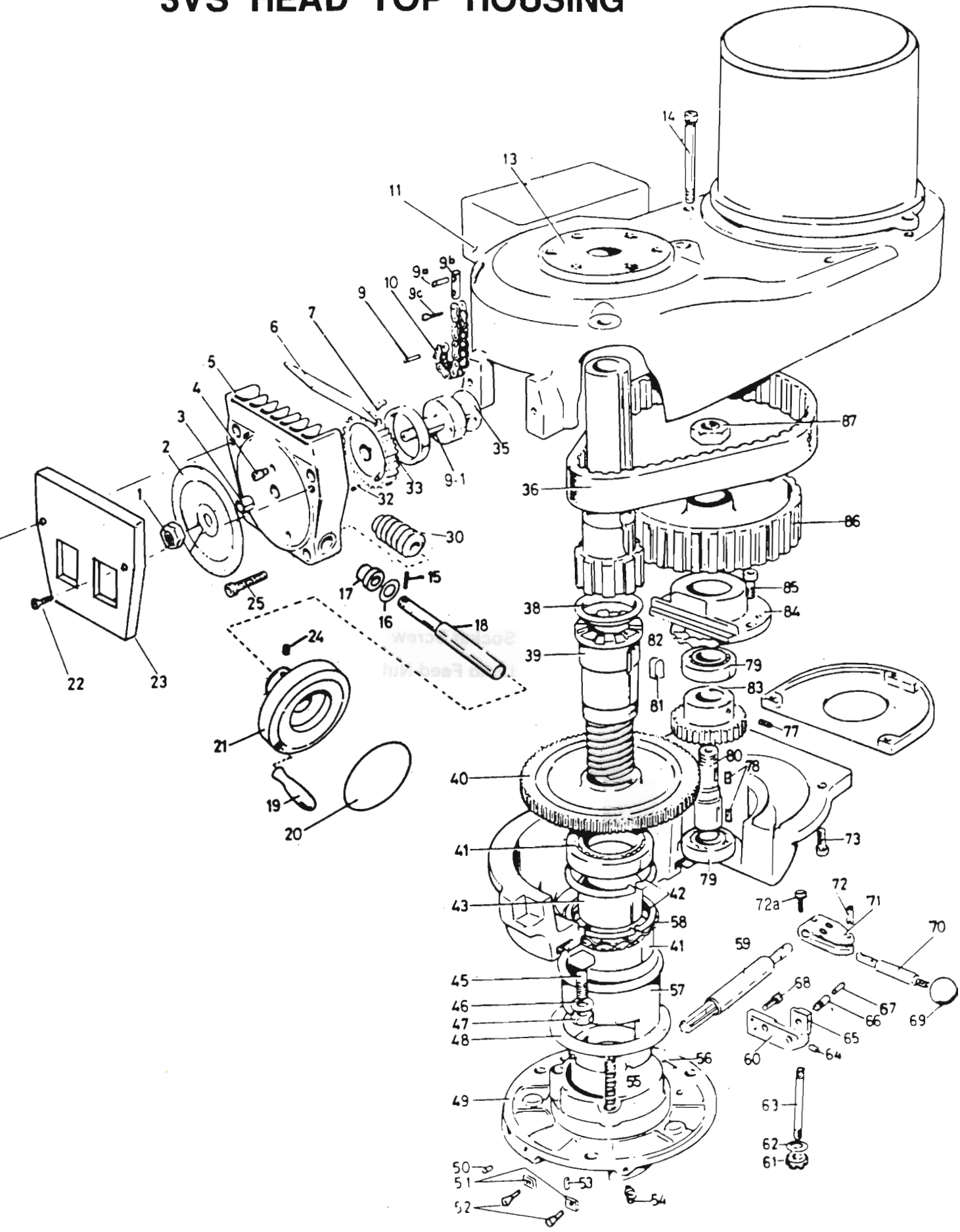
ULTIMA-4VK LEADSCREW ASSEMBLY



ULTIMA-4VK LEADSCREW ASSEMBLY

ITEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	2004		Jam Nut 1/2NF	3
2	2018	D26	Ball Crank Handle	3
2 -1	2018-1	C83	Ball Crank Handle Grip	3
3	2016	D3	Dial Lock Nut	3
4	2012	D4-2	Dial With 200 Graduations	3
5	2014	D5	Dial Holder	3
6	2036		Socket Cap Screw	6
7	2011	C90	Bearing Retainer Ring	2
8	2008		Grease Sealed Ball Bearing 6204	2
9	2027		Roll Pin	10
10	2026		Socket Cap Screw	12
11	2006	D11	Left Bearing Bracket	1
12	2006	D12	Right Bearing Bracket	1
13	2008		Grease Sealed Ball Bearing 6204	1
14	2003		Key	3
15	2002	D15	Longitudinal Feed Screw 42"	1
15 -1	2002-1	D15-1	Longitudinal Feed Screw 49"	1
16	3021		Socket Screw	6
17	3020-1		Long Feed Nut	2
18	3020-2		Cross Feed Nut	2
20	3041		Fixed Socket Screw	6
21	3024	D22	Socket Cap Screw	4
22	3025		Feed Nut Bracket	1
26	3005-1		Stop Screw	1
27	3002		Cross Feed Screw for 12" Knee	1
28	3005	D28	Cross Feed Bearing Bracket	1
	2001	D29	Table Rubber Stop For Coolant System	1

3VS HEAD TOP HOUSING



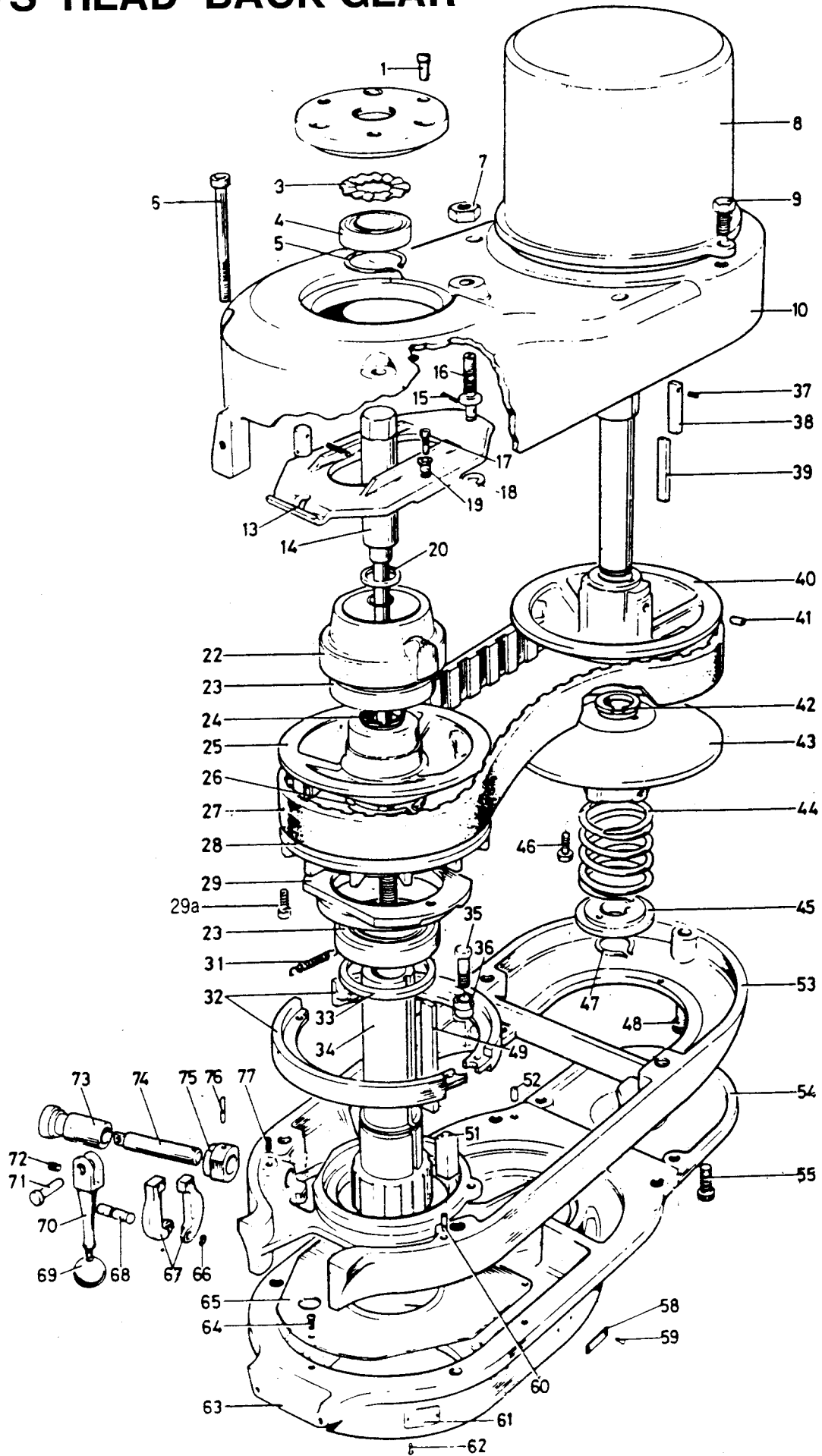
3VS HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	H 7001	VS95	Hex Cap Nut	1
2	7002	VS16-3	Vari-Speed Dial	1
3	7003	VS19	Bronze Bearing	1
4	7004	VS18	Full Dog Socket Set Screw M5X15 M5X5	1
5	7005	VS16	Speed Change Housing	1
6	7006		Speed Chang. Chip Shield	1
7	7007		Machine Screw	2
9	7009		Roll Pin	1
9 -1	7009-1		Spring Pin 5x20	1
9 a	7009-a		Spring Pin 3x25	1
9 b	7009-b	VS35	Speed Change Stud	1
9 c	7009-c		Cotter Pin	1
10	7010-1	VS32	Speed Change Chain	1
11	7011		Drum Switch	1
13	7013	VS13	Top Bearing Cap	1
14	7014		Socket HD Cap Screw	2
15	7015	VS26	Spring Pin 3x12	1
16	7016		Spring Washer	1
17	7017-1	VS24	Bronze Bearing	1
18	7018	VS25	Speed Change Shaft	1
19	7019	VS28	Handle	1
20	7020	VS27-1	Caution Plate	1
21	H 7021	VS27	Speed Change Handwheel	1
22	7022		Flat Head Cap Screw	4
23	7023	VS16-1	Plastic Face Plate	1
24	7024	VS18	Socket Set Screw M6x8	1
25	H 7025	VS17	Socket HD Cap Screw M6x40	4
30	7030	B43	Worm Gear	1
32	7032		Spring Pin 4x8	1
33	7033	VS22	Speed Change Spur Gaer	1
35	H 7035	VS29	Speed Change Chain Drum	1
36	7036	VS63	Timing Belt	1
38	7038	VS100	Timing Pulley Clutch Sleeve	1
39	7039	VS73	Splindle Gear Hub	1
40	7040	VS74	Spindle Bull Gear Assembly	1
41	7041	VS77	Ball Bearing #6908 2RS	2
42	7042	VS80	Snap Ring	2
43	7043	VS78	Bull Gear Bearing Spacer	1
45	7045	VS86	Vertical T - Bolts	3
46	7046		Spring Washer	3
47	7047		Nut	3

3VS HEAD TOP HOUSING

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
48	7048	VS76	Ball Bearing Gear Sleeve Washer	1
49	7049	VS83	Fixed Clutch Bracket	1
50	7050		Oil Cup	1
51	7051		Guide For Clutch Bracket	2
52	7052		Flath HD Socket Cap Screw	2
54	7054		Oil Cup	2
55	7055	VS84	Compression Spring	3
56	7056	VS81	Bearing Lock Nut	1
57	7057	VS75	Bearing Sleeve	1
58	7058	VS73-1	Wave Spring Washer	1
59	7059	VS87	Bull Gear Shift Pinion	1
60	7060	VS89	HI-LOW Detent Plate	1
61	7061		Hex Nut 7/16"	3
62	7062		Lock Washer	3
63	7063	VS85	Studs	3
64	7064		Socket Set Screw M4x8	1
65	7065	VS89-1	Adjustable Palte	1
66	7066	VS90	HI-LOW Detent Plunger	1
67	7067	VS91	Spring	1
68	7068	VS12	Socket HD Cap Screw M5x12	2
69	7069	B24	Bakelite Ball Handle	1
70	7070	VS94	HI-LOW Shift Crank	1
71	7071	VS92	HI-LOW Pinion Block	1
72	7072	VS88	Spring Pin 3X16	1
72 a	7072-1		Socket HD Cap Screw M4X16	2
	7072-2	VS93	Socket Set Screw M5X5	1
73	7073	VS51	Socket HD Cap Screw M6X20	6
77	7077	VS03	Socket Set Screw M8X8	1
78	7078	VS69	Key 5X5X15	2
79	7079	VS65	Ball Bearing 6203ZZ	2
80	7080	VS67	Bull Gear Pinion Counter Shaft	1
81	7081	VS72	Key 8X8X12	1
82	7082		Wave Spring Washer	1
83	7083	VS66	Bull Gear Pinion	1
84	7084	VS64	Bull Gear Pinion Bearing Cap	1
85	7085	VS12	Socket HD Cap Screw M5X20	3
86	7086	VS62	Timing Belt Pulley	1
87	7087	VS61	Jam Nut 5/8"	1
	7087-1		Spring Washer	1

3VS HEAD BACK GEAR



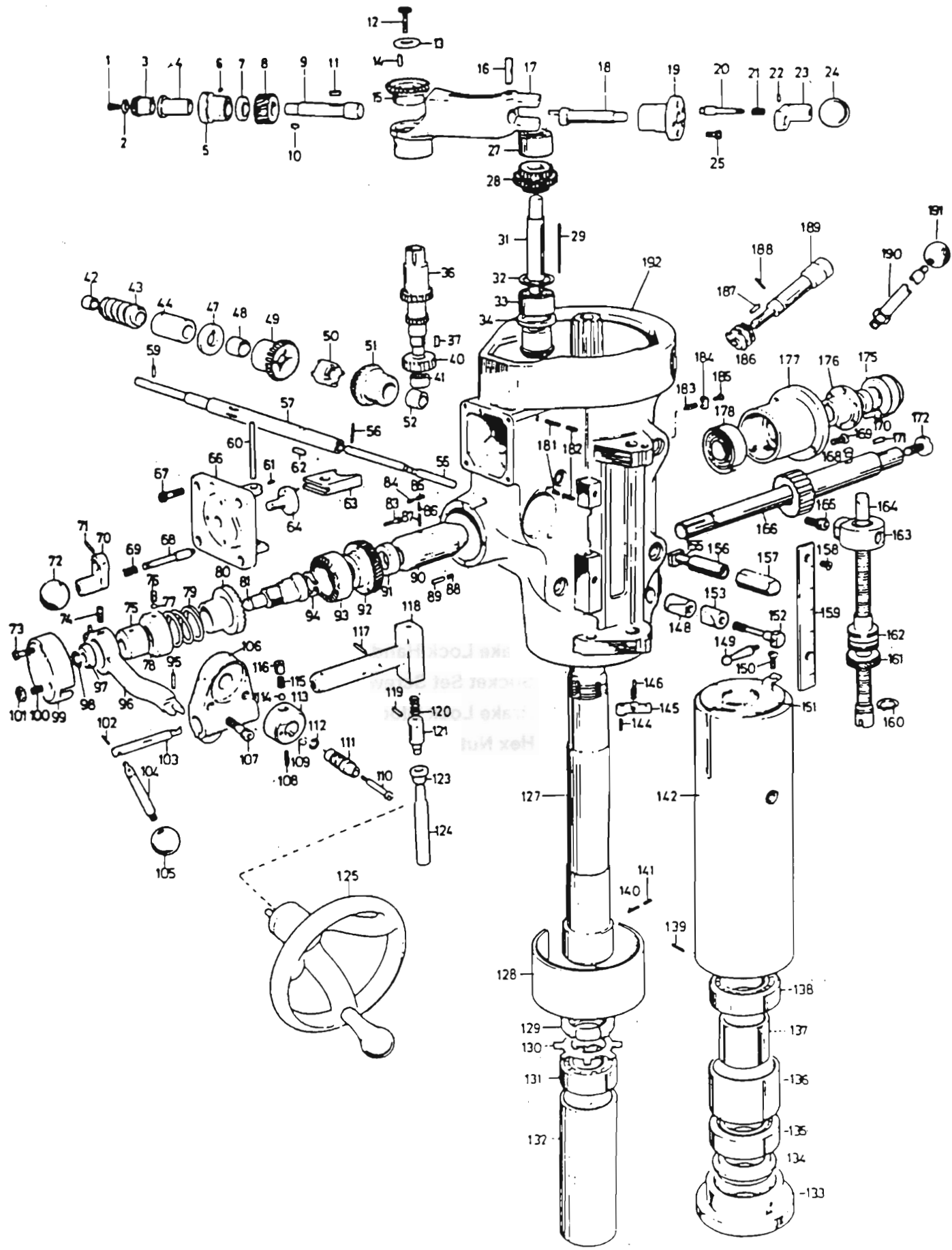
3VS HEAD BACK GEAR

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	8001	VS14	Socket HD Cap Screw M6x20	3
3	8003		Spring Washer #6207	1
4	8004	VS15	Ball Bearing 6207	1
5	8005	VS07	Snap Ring 35	1
7	8007	VS96	Hex Jam Nut 3/8"	1
8	8008		Motor 3HP (complete unit) 230/460 3/60	1
9	8009		Hex HD Screw 3/8" x 1"	2
9 -1	8009-1		Spring Washer	2
10	8010	VS01	Belt Housing	1
13	H 8013	VS36	Speed Change Plate	1
14	8014	VS1-2	Drawbar	1
15	8015	VS40	Cotter Pin	1
16	8016	VS39	Speed Change Plate Pivot Stud	1
17	8017	VS38	Socket HD Cap Screw M5x20	2
18	8018	VS41	Washer	1
19	8019	VS37	Pivot Sleeve	2
20	8020	A2	Draw Bar Washer	1
22	8022	VS42	Spindle Pulley Bearing Sliding Housing	1
23	8023	VS43	Ball Bearing 6010	2
24	8024	VS06	Plastic Insert	2
25	8025	VS44	Adjustable - Driven Varidisc	1
26	8026	VS97	Snap Ring 40	1
27	8027	VS04	Vari-speed Belt	1
28	8028	VS45	Stationary Driven Varidisc	1
29	8029	VS46	Brake Bearing Cap	4
29 a	8029-1		Socket HD Cap Screw M6x20	2
31	8031	VS49	Brake Spring	2
32	8032	VS47	Brake Shoe Assembly	1
33	8033	VS98	Spindle Pulley Spacer	1
34	8034	VS70	Spindle Pulley Hub	1
35	8035	VS14	Hex HD Screw 5x20	1
36	8036	VS48	Brake Shoe Pivot Sleeve	1
37	8037		Roll Dowel Pin	1
38	8038		Drive Key 7X25	1
39	8039	VS05-1	Key for ADJ Varidisc Motor Shaft	1
40	8040	VS02	Stationary Motor Varisisc	1
41	8041	VS03	Socket Set Screw	1
42	8042	VS06	Plastic Insert	2
43	8043	VS05-1	Adjustable Motor Varidisc Assembly	1
44	8044	VS08	Spring for Varidisc Motor Shaft	1

3VS HEAD BACK GEAR

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
45	8045	VS09	Adjustable Varidisc Spring Collar	1
46	8046		Socket HD Cap Screw M6X45	2
47	8047	VS10	Snap Ring	1
48	8048		Socket Cap Screw	1
49	8049		Plastic Key	1
51	8051	VS71	Key 8X7X20	1
53	8053	VS50	Belt Housing Base	1
54	8054	VS11	Motor Pulley Cover	1
55	8055	VS12	Socket HD Cap Screw M6X20	3
58	8058	VS82-2	HI-LOW Range Nameplate	1
59	8059		Drive Screw	10
60	8060		Taper Pin	2
61	8061	VS82-1	Quill Feed Nameplate	1
62	8062		Rivets	4
63	8063	VS82	Gear Housing	1
64	H 8064	VS51	Socket HD Cap Screw M8X20	3
66	8066	VS60	Snap Ring	1
67	8067	VS59	Brake Operating Finger	2
68	8068	VS58	Brake Finger Pivot Stud	1
69	8069	B24	Bakelite Ball Handle	1
70	8070	VS56	Brake Lock Handle	1
72	8072		Socket Set Screw M5X5	1
70 -1	8071		Brake Lock Block	1
70 -2	8070-2		Hex Nut	1
71	8071	VS54	Brake Lock Screw	1
73	8073	VS52	Sleeve For Brake Lock Shaft	1
74	H 8074	VS53	Brake Lock Shaft	1
75	8076		Snap Ring	1
77	H 8077	VS99	Socket Set Screw	2

3VS MILLING HEAD



3VS MILLING HEAD

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	6141	B1+17	RD. HD. Screw	1
2	6140		Bevel Pinion Washer	1
3	6139	B03	Feed Bevel Pinion	1
4	6183		Feed Worm Gear Shaft Sleeve	1
5	6137	B05	Worm Cradle Bushing	1
6	6123		Set Screw	1
7	6136		Worm Gear Spacer	4
8	6134	B08	Feed Drive Worm Gear	1
9	6133		Feed Drive Worm Gear Shaft	1
10	6142		Worm Shaft Key	1
11	6135		Key	1
12	6150		Lock Nut	1
13	6149		Washer	1
14	6147		Cluster Gear Key	1
15	6148	B15	Feed Reverse Bevel Gear	1
16	6122	B16	Feed Engage Pin	1
17	6121	B17	Worm Gear Cradle	1
18	6126	B18	Worm Gear Cradle Throw - out	1
19	6125	B19	Shift Sleeve	1
20	6169	B20	Gearshift Plunger	1
21	6170	B21	Compression Spring	1
22	6128		Roll Pin 3x20	1
23	6168	B23	Shift Crank	1
24	6131	B24	Black Plastic Ball	1
25	6132		Cap Screw 5x12	3
27	6157	B27	Cluster Gear Shaft Upper Bearing	1
28	6153	B28	Cluster Gear Assembly	1
29	6160		Cluster Gear Key 3x3x45	1
31	6151	B31+35	Cluster Gear Shaft	1
32	6158		Snap Ring 16	1
33	6156	B33	Bevel Gear Bearing	1
34	6159	B34	Bevel Gear Thrust Spacer	1
36	6143	B36+38	Feed Driving Gear	1
37	6145		Key	1

3VS MILLING HEAD

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
40	6144		Feed Drive Gear	1
41	6252		Needle Bearing #BA66	1
42	6227	B42	Bushing	1
43	6225	B43	Worm	1
44	6224	B44	Feed Worm Shaft Bushing	1
47	6223	B47	Feed Worm Shaft Thrust Washer	1
48	6221	B48	Bushing	1
49	6220	B49	Feed Reverse Bevel Gear	1
50	6222	B50	Feed Reverse Clutch	1
51	6220		Feed Reverse Bevel Gear	1
52	6221		Bushing	1
55	6216	B55	Reverse Clutch Rod	1
56	6217		Roll Pin 3x20	1
57	6209	B57	Feed Worm Shaft	1
59	6226		Pin 3x10	1
60	6163	B60	Feed Shift Rod	1
61	6164		KP. Set Screw 5x5	1
62	6230		Key	1
63	6162	B63	Feed Gear Shift Fork	1
64	6166	B64	Cluster Gear Shift Crank	1
66	6161	B66	Cluster Gear Cover	1
67	6165		Cap Screw 5x12	4
68	6169		Gear Shift Plunger	1
69	6170		Comperession Spring	1
70	6168		Shift Crank	1
71	6167		Roll Pin	1
72	6171		Black Plastic Ball	1
73	6206		Cap Screw	2
74	6202	B74	Clutch Ring Pin	2
75	6200	B75	Clutch Ring	1
76	6199		Socket Set Screw	1
77	6199-1		Brass Plug	1
78	6198	B78	Overload Clutch Lock Nut	1
79	6197	B79	Safety Clutch Spring	1

MILLING HEAD

TEM NO	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
80	6194	B80	Overload Clutch	1
81	6195	B81	Overload Clutch Sleeve	1
83	6189		Round Head Screw	3
84	6228		Mock-it Lock Screw	1
85	6228		Socket Set Screw	1
86	6246		Lock Screw	1
87	6246-1		Socket Set Screw	1
88	6191	B88	Compression Spring	1
89	6193	B89	Overload Clutch Lever Spring Plunger	1
90	6186	B90	Quill Pinion Shaft Bushing	1
91	6190	B91	Pinion Shaft Worm Gear Spacer	1
92	6187	B92	Overload Clutch Worm Gear	1
93	6188	B93	Overload Clutch Ring	1
94	6188-1		Snap Ring 15	1
95	6236-1	B95	Dowel Pin	1
96	6203	B96	Overload Clutch Trip Lever	1
97	6201	B97	Overload Clutch Washer	1
98	6195-1		Snap Ring 10	1
99	6205	B99	Clutch Arm Cover	1
100	6207		Socket Set Screw	1
101	6208		Chem Blacked Lock Nut	1
103	6239	B103	Cam Rod	1
104	6234	B104	Trip Handle	1
105	6233	B24	Black Plastic Ball	1
106	6231	B106	Feed Trip Bracket	1
107	6232		Cap Screw 6x20	2
108	6219		Socket Set Screw 6x6	1
109	6229		Key	1
110	6214	B110+111	Feed Reversd Knob Stud	1
111	6213	B110+111	Reverse Knob	1
112	6215	B110+111	Snap Ring " C "	1
113	6218	B113	Handwheel Clutch	1
114	6255		Steel Ball 3/16	1

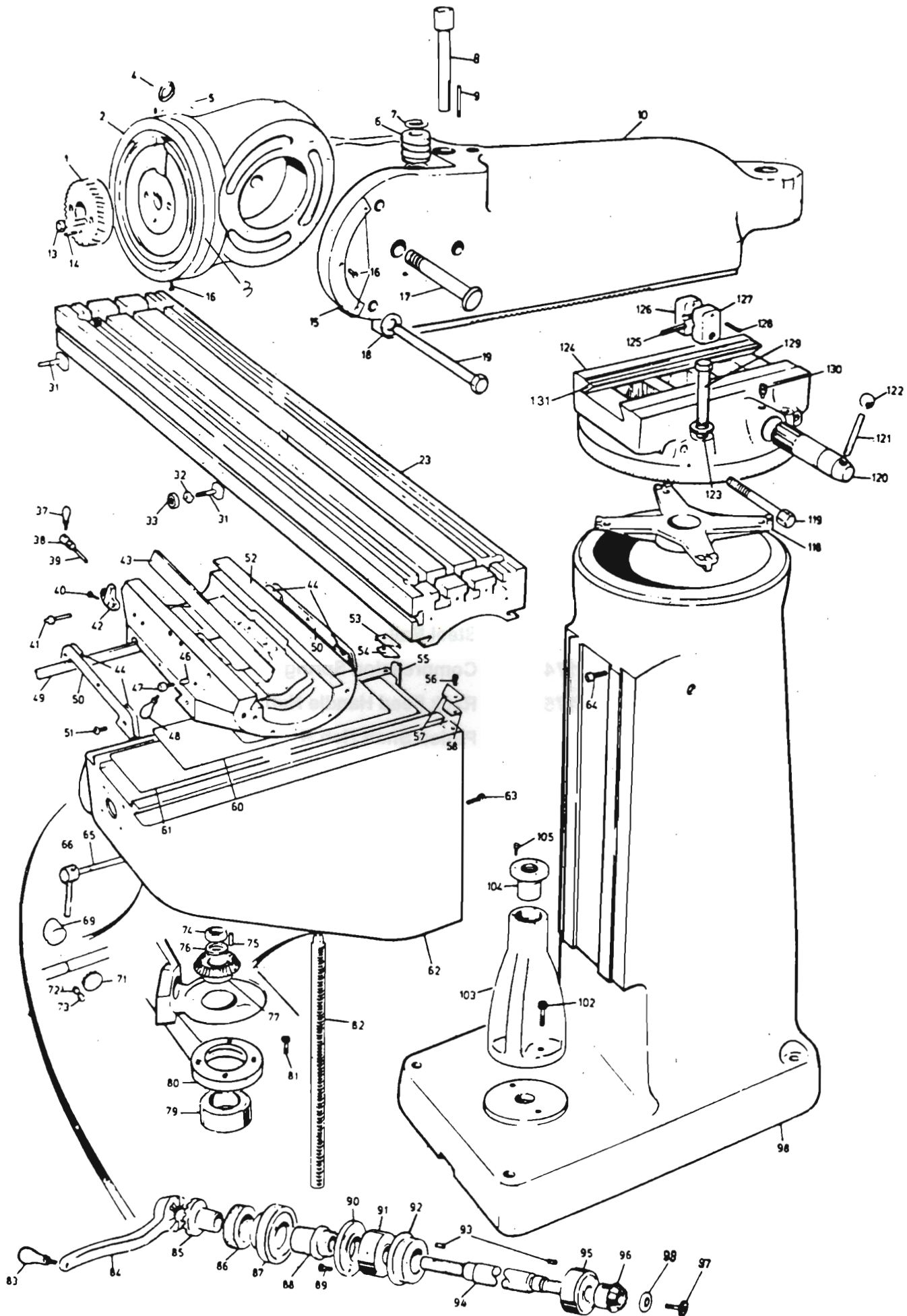
3VS MILLING HEAD

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
115	6219-2	B115	Compression Spring	1
116	6219-1		Handwheel Clutch Spring Screw 8X6	1
117	6237		Roll Pin	1
118	6236	B118	Cam Rod Sleeve Assy	1
119	6241		Roll Pin	1
120	6242	B120	Compression Spring	1
121	6240	B121	Trip Plunger	1
123	6118-1		Trip Plunger Bushing	1
124	6118	B124	Feed Trip Plunger	1
125	6210	B125+126	Handwheel	1
127	6084	B127	Spindle	1
128	6086	B128	Quill Skirt	1
129	6090	B129	Lock Nut	1
130	6091		Lock Washer	1
131	6092		Bearing 6206	1
132	6094		Sleeve	1
133	6098	B133	Nose-piece	1
134	6097	B134	Spindle Dirt Shield	1
135	6093		Bearing 7207	1
136	6095	B136	Bearing Spacer-Large	1
137	6096	B137	Bearing Spacer-Small	1
138	6093		Bearing 7207	1
140	6253	B140	Special Socket Set Screw	1
141	6254		Collet Alignment Screw 6X6	1
142	6085	B142	Quill	1
144	6113		Socket Set Screw 4X20	1
145	6111	B145	Feed Trip Lever	1
146	6112	B146	Trip Lever Pin	1
148	6116-1	B148	Quill Lock Sleeve	1
149	6119	B149	Lock Handle	1
151	6088	B151	Felt Washer	1
152	6117	B152	Quick Lock Bolt	1
152 -1	6117-1	B152-1	Spring	1
153	6116	B153	Quill Lock Sleeve Tapped	1
155	5036	B155	T- Bolt Assy	1

3VS MILLING HEAD

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
156	6120	B156	Lower Clamping Bolt Spacer	2
157	5038	B157	Lock Nut	1
158	6244		Chem Blacked RD.HD. Screws 16	2
159	6243	B159	Micrometer Scale	1
160	6115		Snap Ring 16	1
161	6108	B161	Quill Micro-stop Nut	1
162	6107	B162	Micrometer Nut	1
163	6105	B163	Quill Stop Knob	1
164	6104	B164	Quill Stop Micro-screw	1
165	6106		Screw 3/8	1
166	6172	B166	Quill Pinion Shaft	1
168	6185	B168	Spring Pin 5X12	1
169	6180-1		RD.Head Screw	1
170	6179		Roll Pin	1
171	6184		Key 3X3X20	1
172	6183	B172	Pinion Shaft Hub Screw	1
173	6176		Steel Ball	1
174	6175	B174	Compression Spring	1
175	6178	B175	Rack Feed Handle Hub	1
176	6182	B176	Pinion Shaft Hub Sleeve	1
177	6180	B177	Spring Cover	1
178	6181	B178	Clock Spring (Clock Spring Assy.)	1
181	6246-1		Socket Set Screw	1
182	6246		Lock Screw	1
183	6110	B183	Reverse Trip Ball Lever	1
184	6109	B184	Feed Reverse Trip Plunger	1
185	6114	B185	Reverse Trip Ball Lever Screw	1
186	5039	B186	Worm Gear	1
187	5041		Key 4X4X18	1
188	5042		Socket Set Screw	1
189	5040	B189	ADJ Worm Shaft	1
190	6174	B190	Pinion Shaft Hub Handle	1
191	6173	B191	Black Plastic Ball Handles 3/8	1
192	6101		Quill Housing	1
193	6101-1	B147	Adjust Shaft	1
194	6101-2	B154	Screw	1

3VS BASIC MACHINE



3VS BASIC MACHINE

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	5033	C01	Quill Housing ADJ. Gear	1
2	5019	C02	Ram Adapter	1
3	5016	C03	Ram Adapter Plate	1
4	5027	C04	Pivot Shaft Nut	1
5	5023	C05	Set Screw 6x8	1
6	5020	C06	Vertical Adjusting Worm	1
7	5022	C07-1	Worm Thrust Washer	1
8	5021	C08	Vertical Adjusting Worm Shaft 166L	1
9	5023-1	C09	Worm Key 5x5x50	1
10	5018	C10	Ram	1
11	5038	B157	Nut	4
12	5036	B155	Locking Bolt	4
13	5035	C13	Socket Cap Screw M8x35	2
14	5034	C14	Roll Dowel Pin 6x30	1
15	5043	C15	Angle Plate	1
16	5032	C16	Round HD Drive Screw	15
17	5026	C17	Adapter Pivot Pin	1
18	5029	C18	Chamfered & Hardened Washer 1/2	7
19	5028	C19	Adapter Locking Bolt 190L	3
20	H 5028-1	C10-1	Adapter Locking Bolt Washer	1
21	5031	C21	Plate	3
23	2001-50	C23	Table 50"	2
26	H 5044	C10-1	Ram Plate	1
27	5030	C126	Turret Plate	1
28	H 1002	C28	Column Cover	1
29	H 1003	C29	Socket Head Cap Screw 6x16	4
30	2035	C23-1	Plug	2
31	2031	C31	Stop Piece T - Bolt	2
32	2030	C32	Table Stop Bracket Piece	2
33	2032	C33	Hex Nut 3/8	2
35	4043	C46	Knee Lock Plunger 61L	1
36	4044	C46	Knee Lock Plunger 64L	1
37	3031	C37	Table Lock Bolt Handle	6
38	3030	C38	Saddle Lock Bolt	6
39	3032	C46	Saddle Lock Plunger	1
	3032-1	C46	Saddle Lock Plunger	1
40	3036	C40	Socket HD Cap Screw 10x16	2
41	3028	C41	Gib Adjusting Screw	6
42	3035	C42	Table Stop Bracket	1
43	3026	C43	Saddle / Table Gib	1

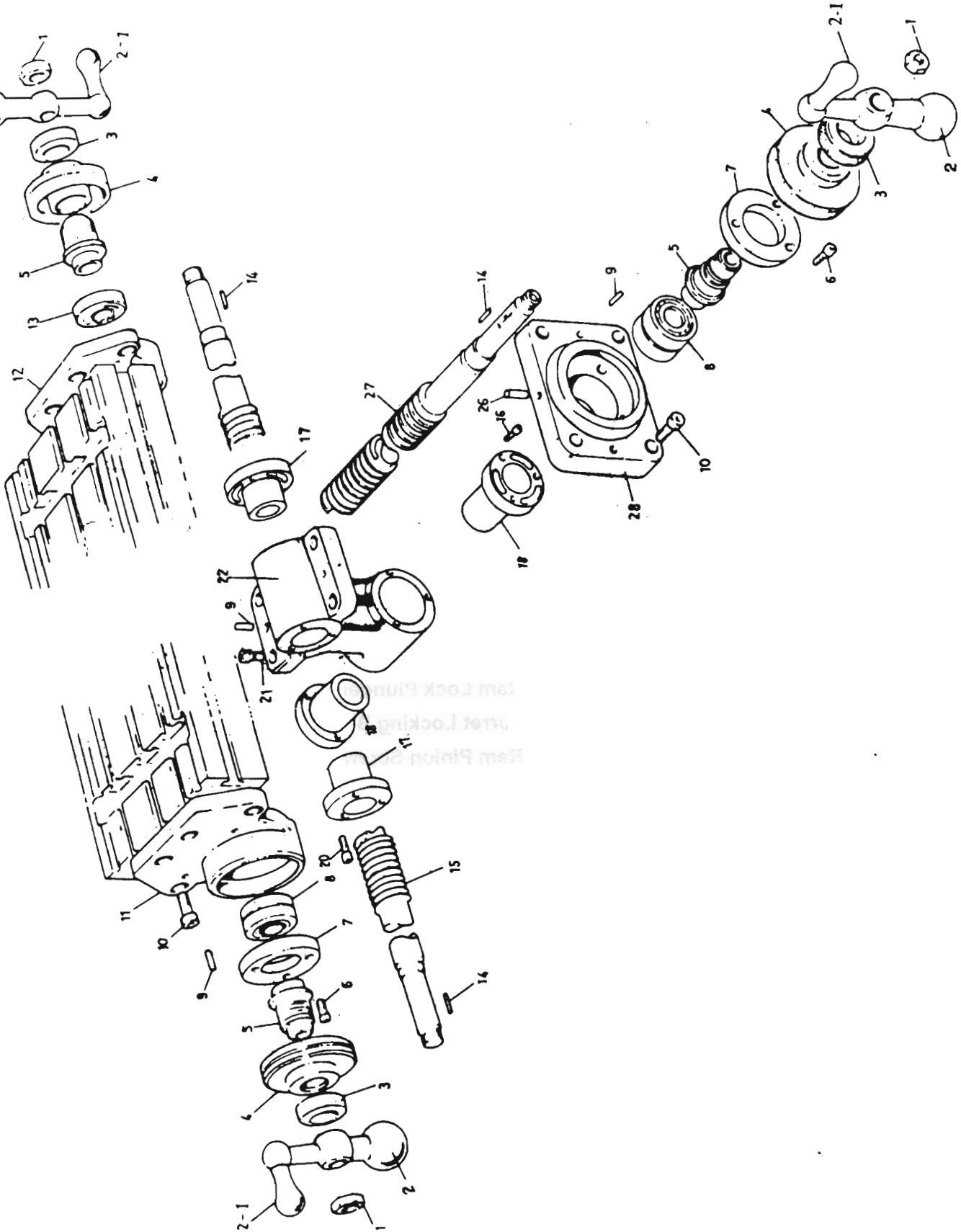
3VS BASIC MACHINE

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
44	3037	C44	Felt Wipers	2
46	3029	C46	Table Lock Plunger 20L	1
	3029-1	C46	Table Lock Plunger 25L	1
47	3030	C47	Table Lock Bolt	6
48	3031	C48	Table Lock Bolt Handle	6
49	3027	C49	Saddle / Knee Gib	1
50	3037-2	C50	Saddle Knee Wiper Plate	2
51	3038	C51	Oval Head Screw 5x12	12
52	3001	C52	Saddle	1
53	4028-2	C53	Left Hand Column Wiper Holder	1
54	4028-1	C54	Knee Wiper Felt	1
55	4038	C55	Knee / Column Gib	1
56	4029	C56	Oval Head Screw	2
57	4028-3	C57	Right knee Wiper Plate	1
58	4028	C58	Knee Wiper Felt	1
60	3040	C59	Chip Guards Plate Upper	1
61	3039	C61	Chip Guards Plate Lower	1
62	4001	C62	Knee 16"	1
63	1001-1	C63	Stop Screw	1
64	1001-2	C45	Stop Screw	1
65	3030	C38	Knee Lock Bolt	2
66	3031	C37	Knee Lock Bolt Handle	2
69	4001-1	C46	Knee Lock Plunger	2
74	4023	C74	Jam Nut 1/2NF	1
75	4020	C75	Key 5x5x20	1
76	4022	C76	Washer	1
77	4019	C77	Bevel Gear	1
79	4040	C79	Sealed Ball Bearing 5305	1
80	8039	C80	Bearing Retainer Ring	1
81	4041	C81	Socket Head Cap Screw 8x20	3
82	4021	C82	Elevating Screw Assembly	1
83	4003	C83	Handle	1
84	4002	C84	Elevating Crank	1
85	4013	C85	Gearshift Clutch Insert	1
86	2016	C86	Dial Lock Nut	1
87	4010	C87	Dial With 100 Graduations	1
	4010-1		Spacers	
88	4011	C88	Dial Holder	1
	4011-1		Set Screw	
89	4009	C89	Socket Head Cap Screw M6x16	3
90	2011	C90	Bearing Retaining Ring	1
91	2008	D8	Grease Sealed Bearing 6204	3
92	4006	C92	Bearing Cap	1
93	4015	C93	Key 3x3x18	2

3VK BASIC MACHINE

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
94	4017	C94	Elevating Shaft for 12" Knee	1
95	4016	C95	Sealed Ball Bearing 6204ZZ	2
96	4014	C96	Bevel Pinion Gear	1
97	4042	C97	Set Screw	1
98	1001	C98	Column	1
99	4017-1		Spacer Washer	1
102	4027	C102	Socket Head Cap Screw M10X35	2
103	4026	C103	Pedestal	1
104	4024	C104	Elevating Screw Nut	1
105	4025	C105	Socket Head Cap Screw 6x16	3
106	4024-1	C106	Grease Nipple	1
118	5003	C118	Spider	1
119	5009-1	C119	Ram Lock Stud	2
120	5012	C120	Ram Pinion	1
121	5013	C121	Ram Pinion Handle	1
122	5014	C122	Plastic Ball	1
123	5005	C18	Chamfered x Hardened Washer 1/2"	4
124	5001	C52	Turret	1
125	H 5007-1	C125	Gib Screw Nut 3/8	2
126	H 5007	C110	Gib Screw	2
127	H 5006	C125	Ram Lock Plunger	2
129	5004	C127	Turret Locking Bolt	4
130	5015	C128	Ram Pinion Screw	1
	5015-1		Spring Washer	1
131	5002	C111	Ram / Turret Gib	1

3VS LEADSCREW ASSEMBLY



3VS LEADSCREW ASSEMBLY

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	2004		Jam Nut 1/2NF	3
2	2018	D26	Ball Crank Handle	3
2 -1	2018-1	C83	Ball Crank Handle Grip	3
3	2016	D3	Dial Lock Nut	3
4	2012	D4-2	Dial With 200 Graduations	3
5	2014	D5	Dial Holder	3
6	2036		Socket Cap Screw	6
7	2011	C90	Bearing Retainer Ring	2
8	2008		Grease Sealed Ball Bearing 6204	2
9	2027		Roll Pin	10
10	2026		Socket Cap Screw	12
11	2006	D11	Left Bearing Bracket	1
12	2006	D12	Right Bearing Bracket	1
13	2008		Grease Sealed Ball Bearing 6204	1
14	2003		Key	3
15	2002	D15	Longitudinal Feed Screw 42"	1
15 -1	2002-1	D15-1	Longitudinal Feed Screw 49"	1
16	3021		Socket Screw	6
17	3020-1		Long Feed Nut	2
18	3020-2		Cross Feed Nut	2
20	3041		Fixed Socket Screw	6
21	3024	D22	Socket Cap Screw	4
22	3025		Feed Nut Bracket	1
26	3005-1		Stop Screw	1
27	3002		Cross Feed Screw for 12" Knee	1
28	3005	D28	Cross Feed Bearing Bracket	1
	2001	D29	Table Rubber Stop For Coolant System	1

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DESCRIPTION

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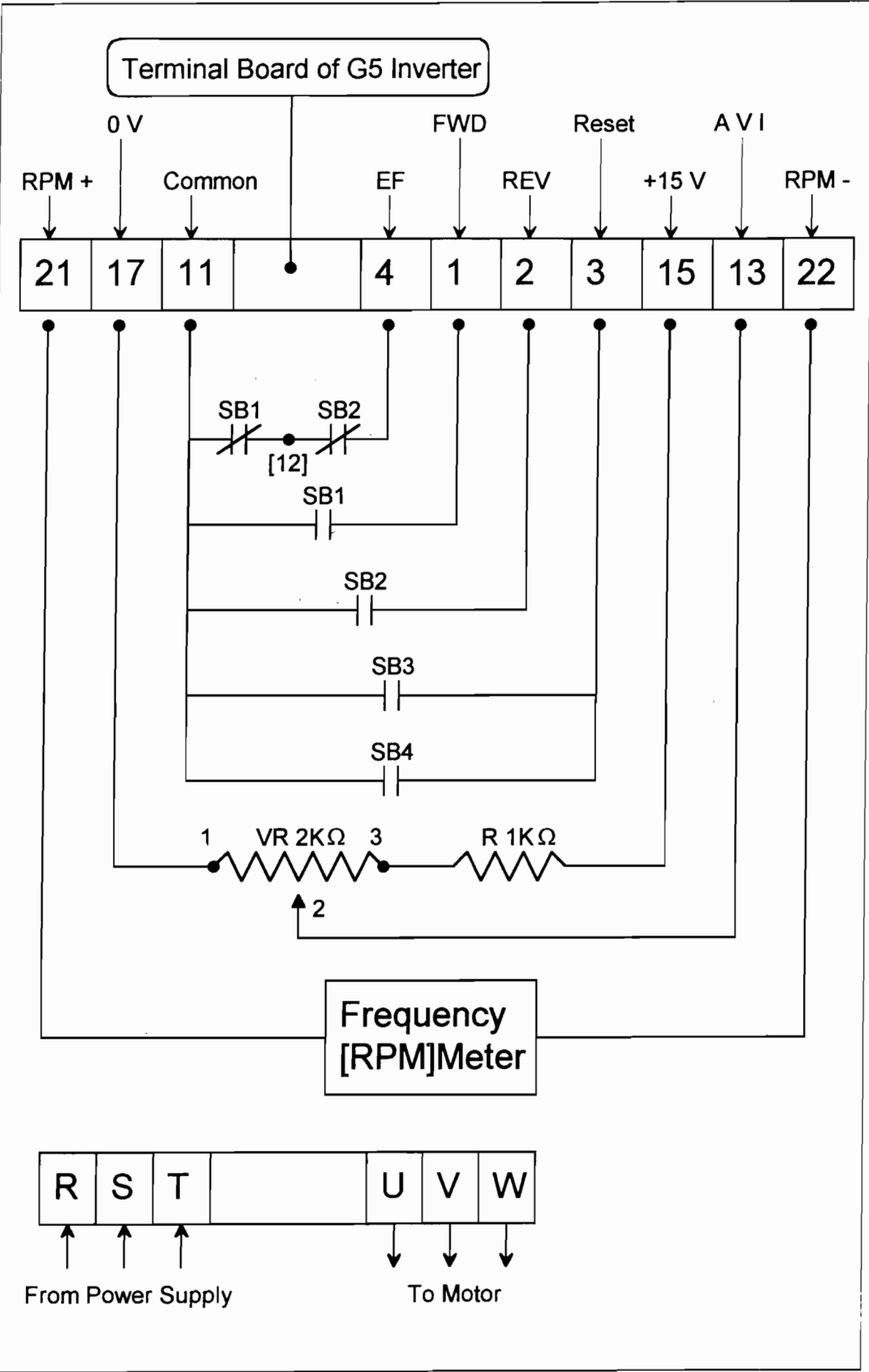
A. 3HP EVS Wiring Diagram	2
B. 3HP EVS Head Top Housing	5
C. 3HP EVS Head Back Gear	10

NOTE: WHEN ORDERING PARTS, PLEASE MENTION:

- 1. MACHINE MODEL & SERIAL NUMBER.**
- 2. ITEM NUMBER.**
- 3. PART NUMBER AND DESCRIPTION.**
- 4. YEAR OF PRODUCTION.**
- 5. QUANTITY.**

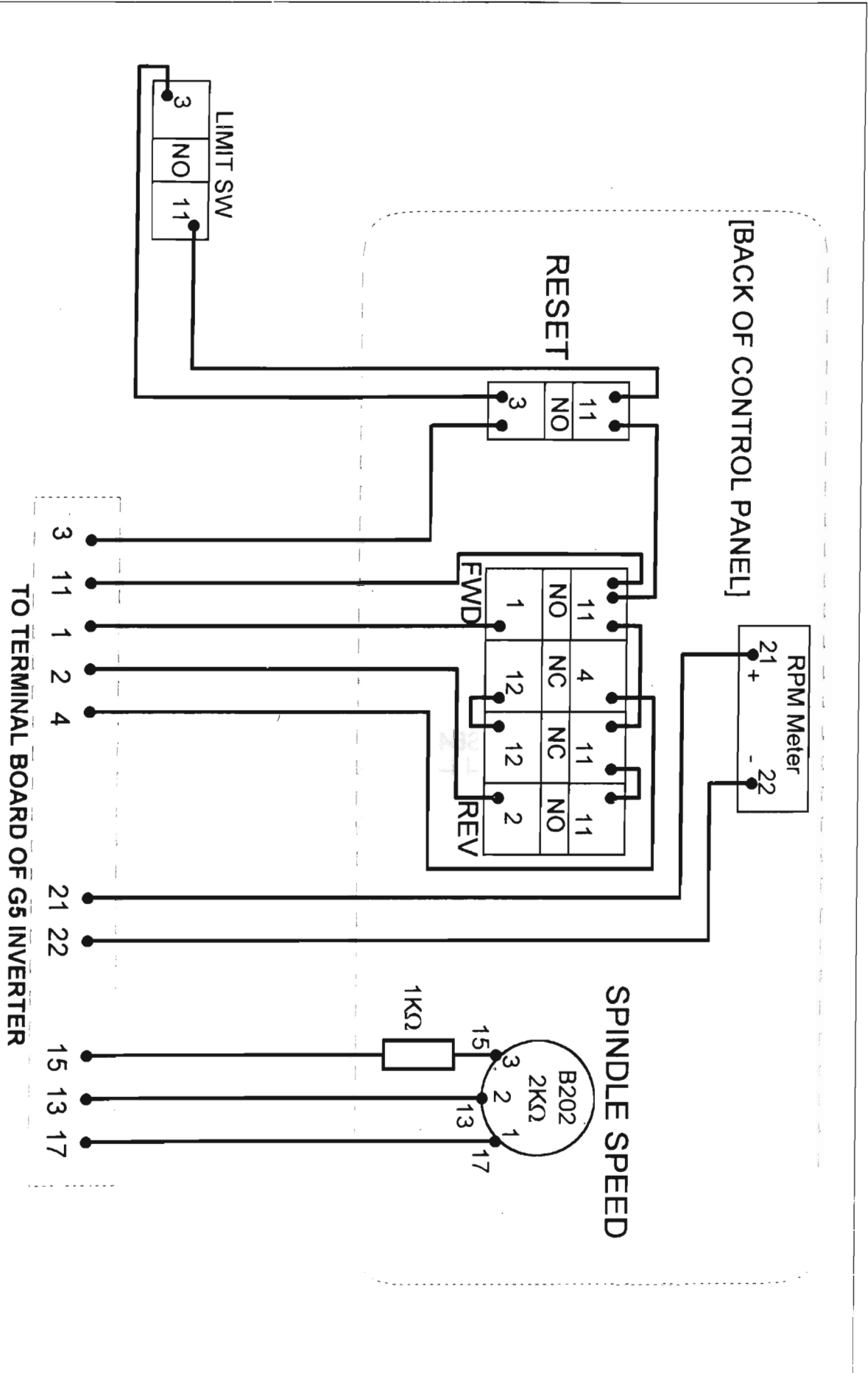
3HP EVS WIRING DIAGRAM

3HP EVS WIRING DIAGRAM



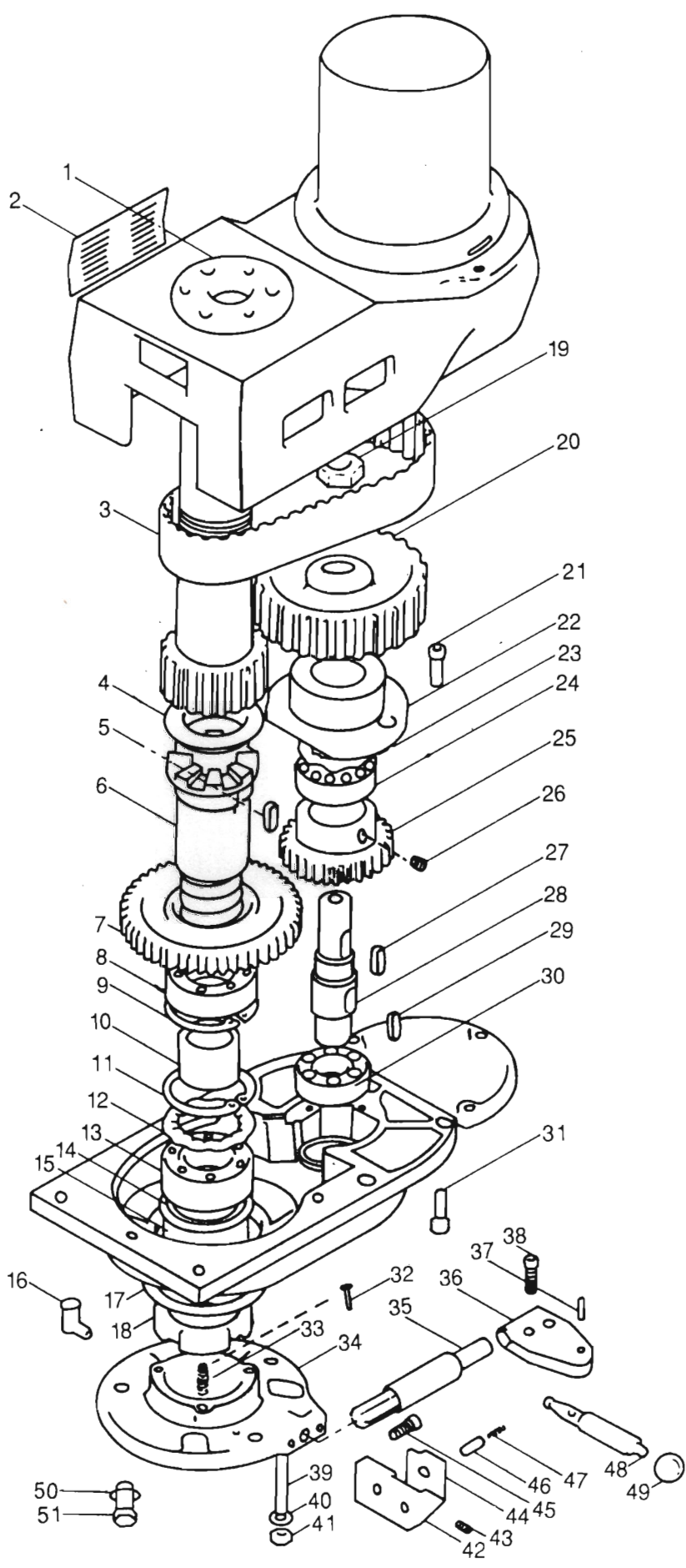
The Circuit Diagram

3HP EVS WIRING DIAGRAM



3HP EVS HEAD TOP HOUSING

3HP EVS HEAD TOP HOUSING



3HP EVS HEAD TOP HOUSING

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
1	7013	VS13	Top Bearing Cap	1
2	H 7088	VS101	Ventilator	2
3	7036	VS63	Timing Belt	1
4	7038	VS100	Timing Pulley Clutch Sleeve	1
5	7081	VS72	Key 8X8X12	1
6	7039	VS73	Spindle Gear Hub	1
7	7040	VS74	Spindle Bull Gear	1
8	7041	VS77	Bearing 6908ZZ	1
9	7042	VS80	Snap Ring	1
10	7043	VS78	Bull Gear Bearing Spacer	1
11	7042	VS80	Snap Ring	1
12	7058	VS73-1	Wave Spring Washer	1
13	7041	VS77	Bearing 6908ZZ	1
14	7057-2	VS105	Washer	1
15	7057	VS75	Bearing Sleeve Spacer	1
16	7054	VS82-1	Oil Cup 1/8	1
17	7048	VS76	Ball Bearing Gear Sleeve	1
18	7056	VS81	Bearing Lock Nut	1
19	7087	VS61	Jam Nut	1
20	7086	VS62	Timing Belt Pulley	1
21	7085	VS12	Socket HD Cap Screw	3
22	7084	VS64	Bull Gear Pinion Bearing Cap	1
23	7082	VS64-1	Wave Spring Washer #6203	1
24	7079	VS65	Ball Bearing 6203ZZ	1
25	7083	VS66	Bull Gear Pinion 3X16	1
26	7077	VS03	Socket Set Screw 8X8	1
27	7078	VS69	Key 5X15	1
28	7080	VS67	Bull Gear Pinion Counter Shaft	1
29	7078	VS69	Key 5X15	1
30	7079	VS65	Ball Bearing 6203ZZ	1
31	7073	VS51	Socket HD Cap Screw 6X20	6
32	7055-1	VS102	T - Tip Pin	3
33	7055	VS84	Compression Spring	3
34	7049	VS83	Fixed Clutch Bracket (T49)	1
35	7059	VS87	Bull Gear Shift Pinion Shaft	1

3HP EVS HEAD TOP HOUSING

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
36	7071	VS92	HI-LOW Pinion Block	1
37	7072	VS88	Spring Pin 3x16	1
38	7072-1	VS92-1	Socket HD Cap Screw 4x16	2
39	7063	VS85	Stud	3
40	7062	VS85-1	Spring Washer 7/16	3
41	7061	VS85-2	Hex Nut 7/16	3
42	7060	VS89	HI-LOW Detent Plate	1
43	7064		Socket Set Screw	1
44	7065	VS89-1	Adjustable Plate	1
45	7068	VS12	Socket HD Cap Screw 5x12	2
46	7066	VS90	HI-LOW Detent Plunger	1
47	7067	VS91	Spring	1
48	7070	VS94	HI-LOW Shaft Crank	1
49	7069	B24	Bakelite Ball	1
50	7045	VS86	Hex Cap Screw	3
51	7046	VS86-1	Spring Washer	3

3HP EVS HEAD BACK GEAR

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
1	7022-1	VS17-1	Round + Cap Screw	4
2	9500		Emergency Switch	1
3	9501		F/R Switch	1
4	9502		Variable Resistor	1
5	9503		RPM Meter	1
6	H 7023-1	VS16-5	Chromed Face Plate	1
7	H 7005-1	VS16-6	Speed Changer Housing	1
8	H 7025	VS17	Socket HD Cap Screw 6X40	4
9	9504		Control Wire Cable	1
10	9505		Limit Switch W/Cable	1
11	H 8010-1	VS1-4	ACER Name Plate	1
12	H 8010-2	VS1-5	Limit Switch Bracket Plate	1
13	7022-2		Round Socket Cap Screw	2
14	7022-3		Spring Washer	2
15	7022-4		Hex Nut	2
16	7022-5		Socket HD Cap Screw 6X20	2
17	8001	VS14	Socket HD Cap Screw	3
18	7013	VS13	Top Bearing Cap	1
19	8003	VS13-1	Wave Spring Washer #6207	1
19 -1	8004	VS15	Ball Bearing 6207	1
20	H 7088-1	VS101-1	Round Cap Wooden Screw	12
21	H 7088	VS101-1	Ventilator	2
22	H 8010-3	VS1-6	Round Socket Cap Screw	2
23	H 8010-4	VS1-7	Covering Plate	1
24	H 8010-5	VS1-8	Round HD Screw	4
25	8034-1	VS70-2	Spindle Pulley Hub Lock Nut	1
26	8028-1	VS45-1	Stationary Driven Pulley	1
27	H 8073	VS52	Sleeve for Brake Lock Shaft	1
28	H 8074	VS53	Brake Lock Shaft	1
29	8068	VS58	Brake Finger Pivot Stud	1
30	8066-1	VS60-1	Snap Ring	1
31	8067	VS59	Brake Operating Finger	2
32	8066	VS60-1	Snap Ring 8	1
33	H 8077	VS99	Socket Set Screw	2
34	8072	VS54-1	Socket Set Screw M5x5	1

3HP EVS HEAD BACK GEAR

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QT'Y
35	8069	VS57	Bakelite Ball Handle	1
36	8070	VS56	Brake Lock Handle	1
37	8071-1	VS55-1	Socket HD Cap Screw	1
38	8070-1	VS56-1	Hex Nut	1
39	8070-2	VS54-1	Brake Handle Block	1
40	8033	S98	Spindle Pulley Spacer	1
41	7038	VS100	Timing Pulley Clutch Sleeve	1
42	H 8063	VS82	Gear Housing	1
43	8060	VS82-1	Taper Pin	1
44	H 8063-1	VS82-3	Oil Add Name Plate	1
45	8061	VS82-1	Quill Feed Name Plate	1
46	8059		Drive Screw	4
47	8008-1		3HP Spindle Motor	1
48	8009		Socket HD Cap Screw 3/8" x 1"	2
49	8009-1		Spring Washer	2
50	8009-2		Washer	1
51	H 8010	VS01	Belt Housing	1
52	8040-2	VS02-2	V - Belt Pulley Sleeve	1
53	8040-3	VS02-3	Hex HD Screw	2
54 -1	8039	VS05-1	Key	1
55	8040-1	VS02-1	V - Belt Pulley	1
56	8034-2	VS70-3	Socket Set Screw	2
57	8034-3	VS70-4	Round Copper Tip	2
58	8023	VS43	Ball Bearing 6010ZZ	1
59	H 8053-1	VS50-1	Snap Ring	1
60	8035	VS14	Round Socket Cap Screw 5x20	1
61	8032	VS47	Brake Shoe Assembly	1
62	8036	VS48	Brake Shoe Pivot Sleeve	1
63	8032-1	VS47-1	Round Cap Screw	4
64	8031	VS49	Brake Spring	2
65	H 8053-2	VS50-2	Belt Housing Base	1
66	H 8064	VS51	Socket HD Cap Screw 8x20	3
67	8034-5	VS70-1	Spindle Pulley Hub	1
68	8027-1	VS04-1	V Belt	1
69	8049-1	VS71-1	Key	1

3HP EVS HEAD BACK GEAR

ITEM NO.	PARTS NO.	FACTORY NO.	DESCRIPTION	QTY
70	8063-2	VS01-1	Grease Add Name Plate	1
71	8059		Drive Screw	2
72	8063-3	VS82-4	Grease Nibble	1
73	8054	VS11	Motor Pulley Cover	1
74	8055	VS12	Socket HD Cap Screw 6x20	3
75	8063-2	VS01-1	Grease Add Name Plate	1
76	8059		Drive Screw	2
77	8058	VS82-2	HI-LOW Range Nam Plate	1
78	8059		Drive SCrew	2

Note: To order parts for milling head, basic machine and table assembly, please search the main manual for the right part number.