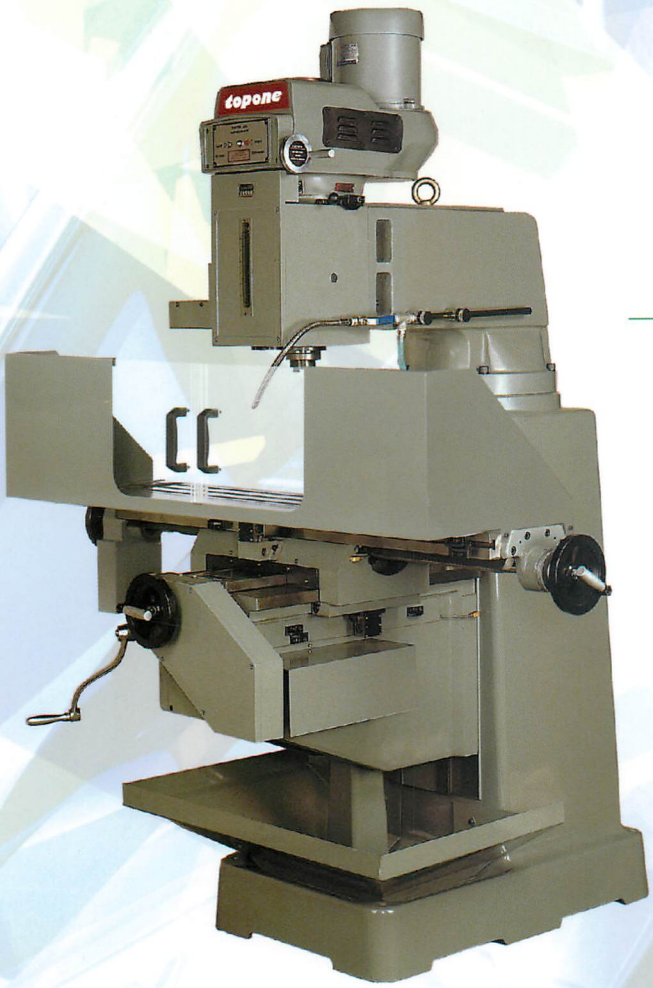
3VK NC FRAME PARTS LIST



3VK
3-AXIS

3VK
2-AXIS

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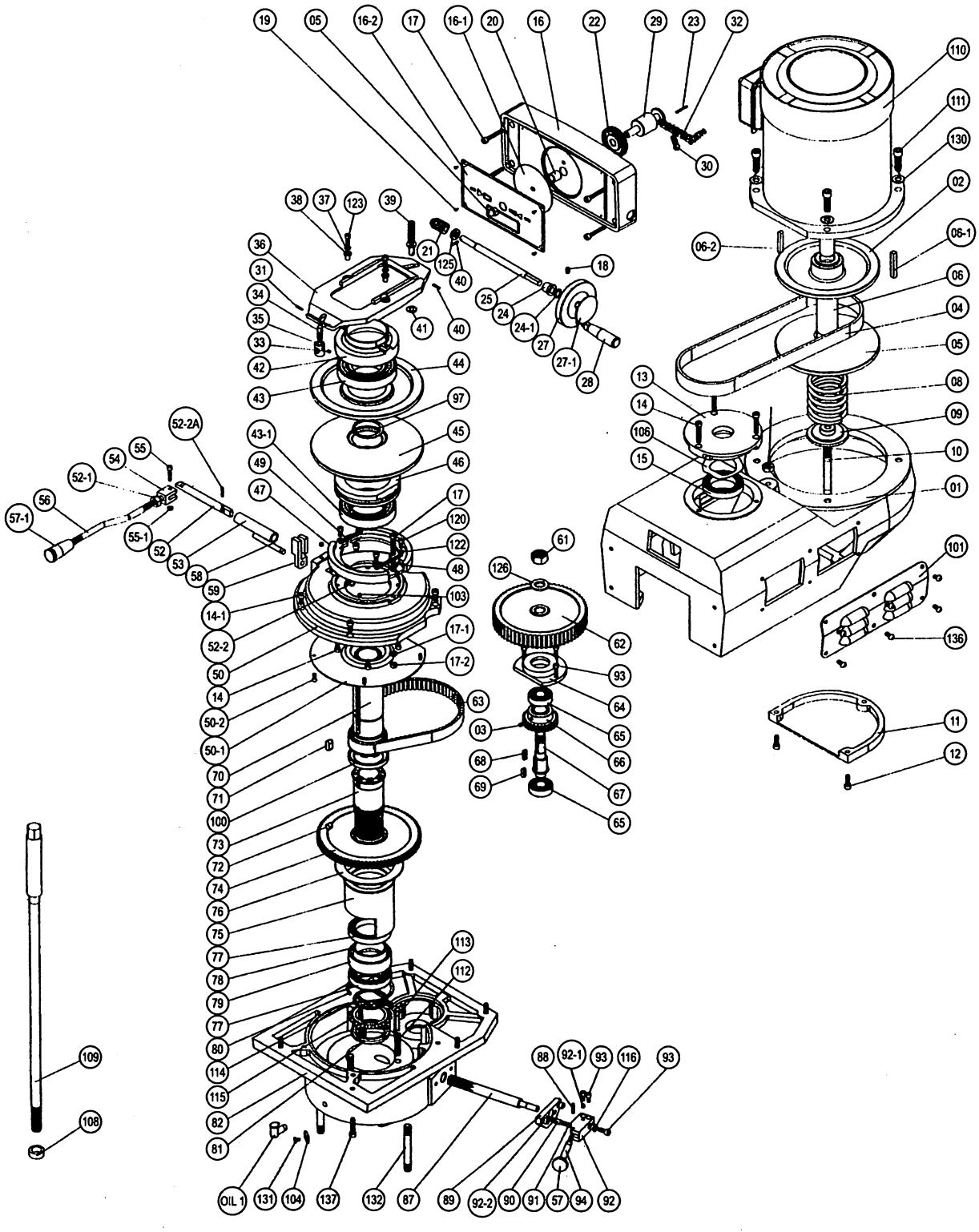
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2VSG,3VHG,4VK,5VK,3VK(NC)
HEAD TOP HOUSING(VS)

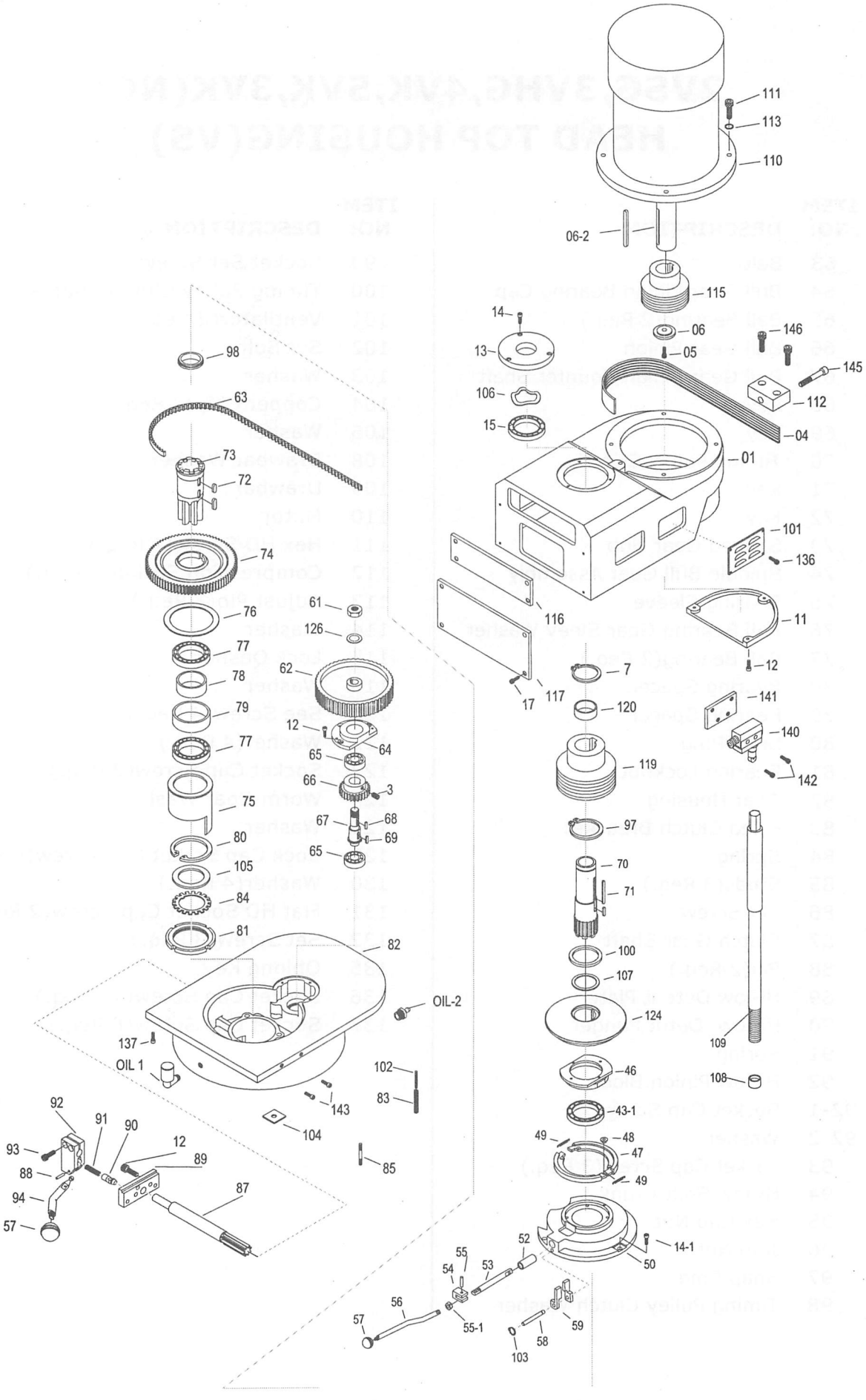
ITEM NO:	DESCRIPTION
1	Belt Housing
2	Stationary Motor Varidisc
3	Socket Set Screw
4	Belt
5	Adjustable Motor Varidisc Assembly
6	Bushing
6-2	Key
06-1	Key
7	Snap Ring
8	Spring For Varidisc Motor Shaft
9	Adjustable Varidisc Spring Collar
10	Socket Cap Screw
11	Motor Pulley Cover
12	Socket Cap Screw(2 Req.)
13	Top Bearing Cap
13-1	Waves Waser
14	Socket Cap Screw(3 Req.)
14-1	Socket Cap Screw(3 Req.)
15	Ball Bearing
16	Speed Change Housing
16-1	Vari-speed Dial
16-2	Face Plate
17	Socket Cap Screw(4 Req.)
17-1	Washer
17-2	Nut
18	Full Dog Socket Set Screw
19	Copper Bushing
20	Bushing
21	Worm Gear
22	Speed Changer Spur Gear
23	Pin
24	Copper Bushing
24-1	Washer
25	Speed Change Shaft
26	Fix Pin
27	Speed Change Handwheel
28	Handle
29	Speed Change Chain Drum

ITEM NO:	DESCRIPTION
30	Set Screw
31	Pin
32	Chain
33	Chain Front Screw
34	Nut
35	Chain End Screw
36	Speed Change Plate
37	Washer(2 Req.)
38	Pivot sleeve(2 Req.)
39	Speed Change Plate Pivot Stud
40	Cotter Pin
41	Washer
42	Spindle Pulley Bearing Sliding Housing
43	Ball Bearing
43-1	Ball Bearing
44	Adjustable-driven Varidisc
45	Stationary Driven Varidisc
46	Brake Bearing Cap
47	Brake Sheo Assembly
48	Brake Sheo Pivot Sleeve
49	Brake Spring(2 Req.)
50	Belt Housing Base
50-1	Gear Cover
50-2	Cap Screw(3 Req.)
51	Set Screw(2 Req.)
52	Brake Lock Bushing
52-2	Spring Pin
53	Brake Lock Shaft
54	Handle Fix Block
55	Spring Pin
56	Brake Lock Handle
57	Bakelite Ball Handle
57-1	Plastic Handle
58	Turning Block Shaft
59	Finger Pivot Stud(2 Req.)
60	Set Screw
61	Jam Nut
62	Timing Belt Pulley

2VSG,3VHG,4VK,5VK,3VK(NC)
HEAD TOP HOUSING(VS)

ITEM NO:	DESCRIPTION
63	Belt
64	Bull Gear Pinion Bearing Cap
65	Ball Bearing(2 Req.)
66	Bull Gear Pinion
67	Bull Gear Pinion Counter Shaft
68	Key
69	Key
70	Timing Pulley Clutch
71	Key
72	Key
73	Splined Gear Hub
74	Spindle Bull Gear Assembly
75	Bearing Sleeve
76	Ball Bearing Gear Sleev Washer
77	Ball Bearing(2 Req.)
78	Bearing Spacer
79	Bearing Spacer
80	Snap Ring
81	Bearing Locknut
82	Gear Housing
83	Fixed Clutch Breacket
84	Spring
85	Studs(3 Req.)
86	Set Screw
87	Clutch Gear Shaft
88	Pin(2 Req.)
89	Hi-low Detent Plate
90	Hi-low Detnt Punger
91	Spring
92	Hi-low Pinion Block
92-1	Socket Cap Screw
92-2	Washer
93	Locket Cap Screw(3 Req.)
94	Hi-low Shift Crank
95	Hex Cap Nut
96	Jam Nut
97	Snap Ring
98	Timing Pulley Clutch Washer

ITEM NO:	DESCRIPTION
99	Socket Set Screw
100	Timing Pulley Clutch Snap Ring
101	Ventilator(2 Req.)
102	Set Bolt
103	Washer
104	Copper Chip(2 Req.)
105	Washer
108	Drawbar Washer
109	Drawbar
110	Motor
111	Hex HD Screw(4 Req.)
112	Compression Spring(3 Req.)
113	Adjust Pin(3 Req.)
114	Washer
115	Lock Qasher
116	Washer
120	See Screw(4 Req.)
122	Washer(4 Req.)
123	Socket Cap Screw(2 Req.)
125	Worm Gear Washer
126	Washer
129	Sock Cap Scrket Cap Screw(6 Req.)
130	Washer(4 Req.)
131	Flat HD Socket Cap Screw(2 Req.)
132	Set Screw(3 Req.)
135	Oblong Key
136	Socket Cap Screw(12 Req.)
137	Socket Cap Screw(6 Req.)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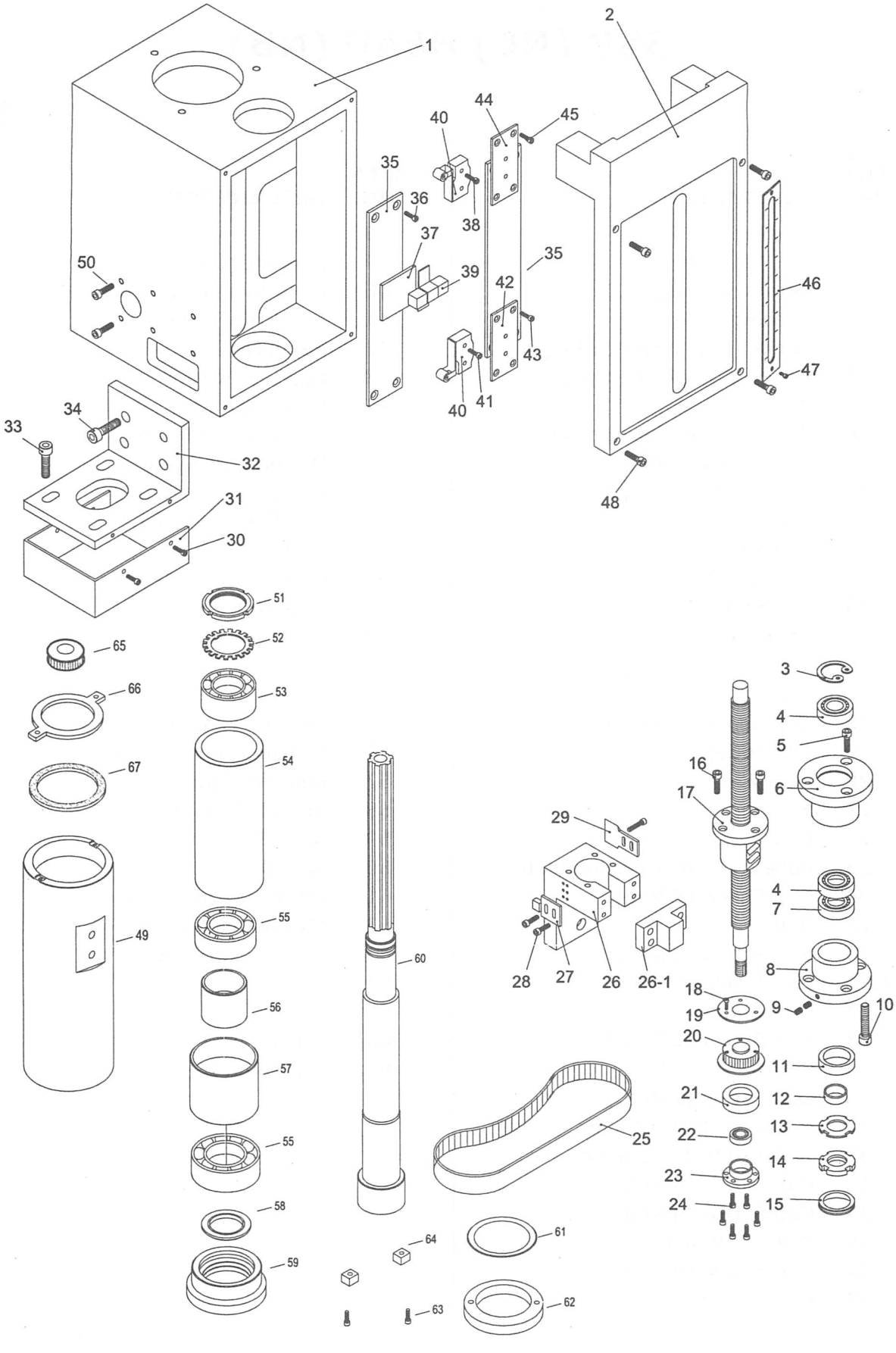
3VK,4VK,5VK (NC)
INVERTER HEAD TOP HOUSING

ITEM NO:	DESCRIPTION
1	Be1t Housing
3	Socket Set Screw
4	Be1t
5	Socket Cap Screw
6	End Cover
06-2	Key
7	C Ring
11	Motor Pulley Cover
12	Socket Cap Screw
13	Top Bearing Cap
14	Socket Cap Screw (3 Req.)
14-1	Ocket Cap Screw
15	Ball Bearing
17	Socket Cap Screw
43	Ball Bearing
46	Ball Bearing Housing
47	Brake Sheo Assembly
48	Brake Sheo Pivot Sleeve
49	Spring
50	Be1t Housing Base
52	Brake Lock Bushing
53	Brake Lock shaft
54	Hand1e Fix Block
55	Pin Spring
55-1	Nut
56	Brake Lock Hand1e
57	Brake Ball Hand1e
58	Turning Block Shaft
59	Finger Pivot Stud
61	Jam Nut
62	Timing Pulley
63	Be1t
64	Bull Gear Pinion Gear Cap
65	Ball Bearing(2 Req.)
66	Bull Gear Pinion
67	Bull Gear Pinion Counter Shaft
68	Key
69	Key

ITEM NO:	DESCRIPTION
70	Timing Pulley C1utch
71	Key
72	Key
73	Spind1e Gear Hub
74	Spind1e Bull Gea
75	Bearing Sleeve
76	Washer
77	Ball Bearing
78	Bearing Spacer
79	Bearing Spacer
80	C Ring
81	Lock Nut
82	Gear Housing
83	Spring (3 Req.)
84	Lock Washer
85	Bolt (3 Req.)
87	C1utch Gear Gear
88	Pin
89	Hi-Low Pinion Block
90	Hi-Low Detent Punger
91	Spring
92	Hi-Low Pinion Block
93	Socket Cap Screw (2 Req)
94	Hi-Low Shaft Crank
97	C Ring
98	Washer
100	Snap. Ring
101	Ventilator
102	Set Belt
103	C Ring
104	Copper Chip (2 Req.)
105	Washer
106	Plastic Washer
107	Copper Chip
108	Collar
109	Draw Bar
110	Motor
111	Socket Cap Screw

3VK,4VK,5VK (NC)
INVERTER HEAD TOP HOUSING

ITEM NO:	DESCRIPTION
112	Block
113	Washer (4 Req.)
115	Motor Pulley
116	Plate
117	Plate
119	Puelley
120	Washer
124	Brake Disk
126	Washer
136	Socket Cap Screw
137	Socket Cap Screw (4 Req.)
140	Limit Switch(1 Req.)
141	Limit Switch Plat
142	Set Cap Screw
143	Set Cap Screw (2 Req.)
145	Set Cap Screw
146	Set Cap Screw (2 Req.)
OIL 1	Oil
OIL 2	Oiler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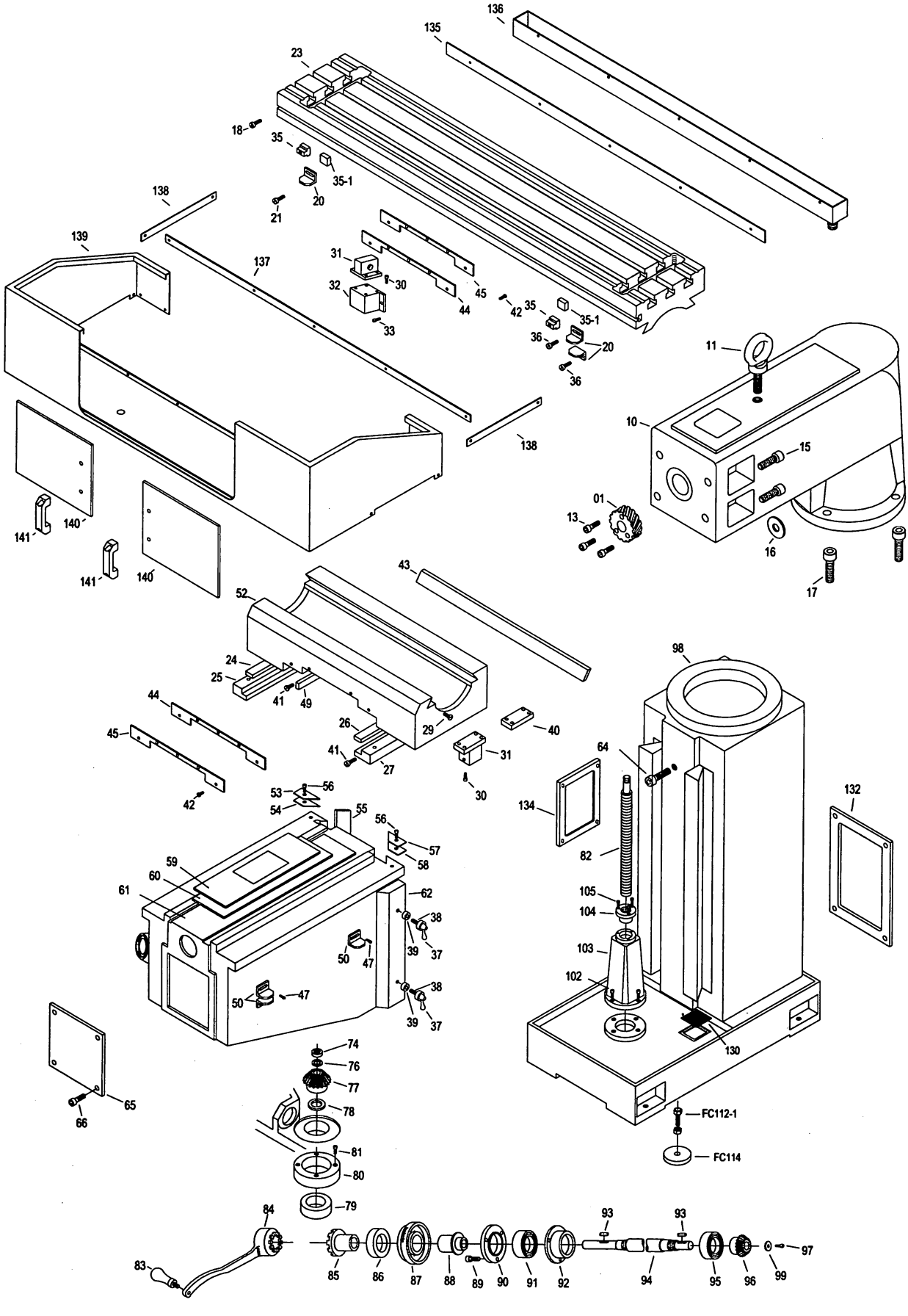
3VK (NC) HEAD (NB)

ITEM NO:	DESCRIPTION
1	NC-Head
2	NC-Head Cover
3	Retaining Ring
4	Bearing (2 Req.)
5	Socket Cap Screw (3 Req.)
6	Bearing Bed Plate-Upper
7	Bearing
8	Bearing Bed Plate-Lower
9	Cap Screw (2 Req.)
10	Cap Screw (4 Req.)
11	Spacer
12	Spacer
13	Lock Washer
14	Ball Screw Nut
15	Bearing Cap
16	Cap Screw (4 Req.)
17	Ball Screw
18	Cap Screw (6 Req.)
19	Pulley Cap
20	Pulley
21	Bushing
22	Bearing
23	Pulley Clamp Ring Bed Plate
24	Cap Screw (6 Req.)
25	Belt
26	Ball Screw Bracker
26-1	Fixed Indicated Plate
27	Coordinate
28	Cap Screw (2 Req.)
29	Sign
30	Cap Screw (2 Req.)
31	Z-Sservo Motor Cover
32	Z-Servo Motor Bracket
33	Cap Screw (4 Req.)
34	Cap Screw (4 Req.)
35	Plate (2 Req.)
36	Cap Screw (4 Req.)
37	Bakelite Plate

ITEM NO:	DESCRIPTION
38	Cap Screw (2 Req.)
39	Zero-Return
40	Limit Switch (2 Req.)
41	Cap Srew (2 Req.)
42	Bakelite Plate
43	Cap Screw (4 Req.)
44	Bakelite Plate
45	Cap Screw (4 Req.)
46	Micrometer Scale
47	Cap Screw (2 Req.)
48	Cap Screw (4 Req.)
49	Quill
50	Cap Screw (4 Req.)
51	Lock Nut
52	Washer
53	Bearing
54	Sleeve
55	Bearing (2 Req.)
56	Bearing Spacer-Small
57	Bearing Spacer-Large
58	Spindle Dirt Shield
59	Nose-Piece
60	Spindle
61	ANtidust Rubber Washer
62	ANtidust Ring
63	Set Screw (2 Req.)
64	Key
65	Pulley
66	Felt Washer
67	Felt Pad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FC112-1
FC114

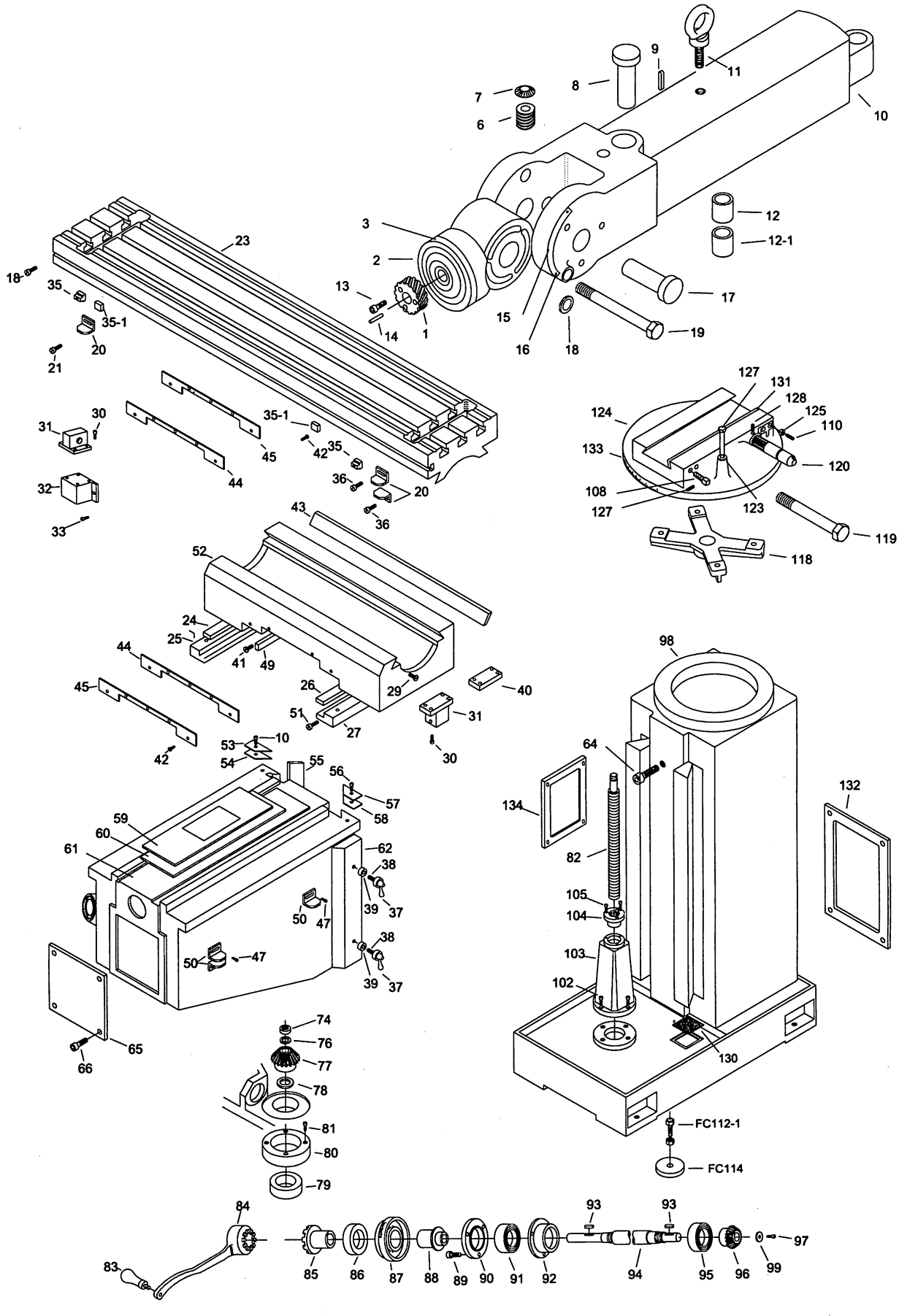
3VK (NC) BASIC MACHINE FOR X,Y,Z-AXIS NC(NC)

ITEM NO:	DESCRIPTION
1	Quill Housing ADJ. Gear
10	Ram
11	Hanger Blot
13	Scojer Cap Screw
15	Bolt (4 Req.)
16	Washer
17	Bolt (4 Req.)
18	Cap Screw
20	X-Dog (3 Req.)
21	Cap Screw
23	Table
24	Gib (Y-Axis)
25	Gib Block
26	Gib (Y-Axis)
27	Gib Block
29	Saddle Screw
30	Cap Screw (8 Req.)
31	Limit Switch(2 Req.)
32	Limit Switch Plate
33	Cap Screw
35	T Nut.(2 Req.)
35-1	Block (2 Req.)
36	Cap Screw
37	Lock Blot Handle (2 Req.)
38	Lock Blot (2 Req.)
39	Lock Plunger (2 Req.)
40	Limit Switch Plate
41	Gib Screw
42	Cap Screw
43	Gib (X-Axis)
44	Rubber Felt Wipers
45	Iron Felt Wipers
46	Y Dog
47	Cap Screw (2 Req.)
49	Gib
50	Y-Dog(2)
52	Saddle
53	Left Hand Column Wiper Holder
54	Knee Rubber Felt Wiper

ITEM NO:	DESCRIPTION
55	Gib (Z-Axis)
56	All Cap Screw
57	Right Hand Column Wiper Holder
58	Knee Rubber Felt Wiper
59	Chip Guards-Upper
60	Chip Guards-Middle
61	Chip Guards-Lower
62	Knee
64	Cap Screw
65	Knee Plate
66	Cap Screw
74	Jam Nut
76	Washer
77	Bevel Gear
78	Washer
79	Sealed Ball Bearing
80	Bearing Retainer Ring
81	Cap Screw
82	Elevating Screw Assembly
83	Handle
84	Evelating Crank
85	Gear Shaft Clutch Insert
86	Dial Lock Nut
87	Dial With 100 Graduations
88	Dial Holder
89	Socket Head Cap Screw
90	Bearing Retaining Ring
91	Greasae Sealed Bearing
92	Bearing Cap
93	Key
94	Elevating Shaft
95	Grease Sealed Bearing
96	Bevel Pinion
97	Cap Screw
98	Column
99	Washer
102	Socker Head Cap Screw
103	Pedestal
104	Elevating Screw Nut

3VK (NC) BASIC MACHINE FOR X,Y,Z-AXIS NC(NC)

ITEM NO:	DESCRIPTION
105	Cap Screw
130	Filter Plate
132	Colunm Plate
134	Left Cover
135	Rubber Pad
136	Cover Protecting
137	Rubber Pad
138	Rubber Pad (2 Req.)
139	Table Guard
140	Baffle Plate (2 Req.)
141	Handle (2 Req.)
FC112-1	Adjust Bolt (4 Req.)
FC114	Pad (4 Req.)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FC112-1
FC114

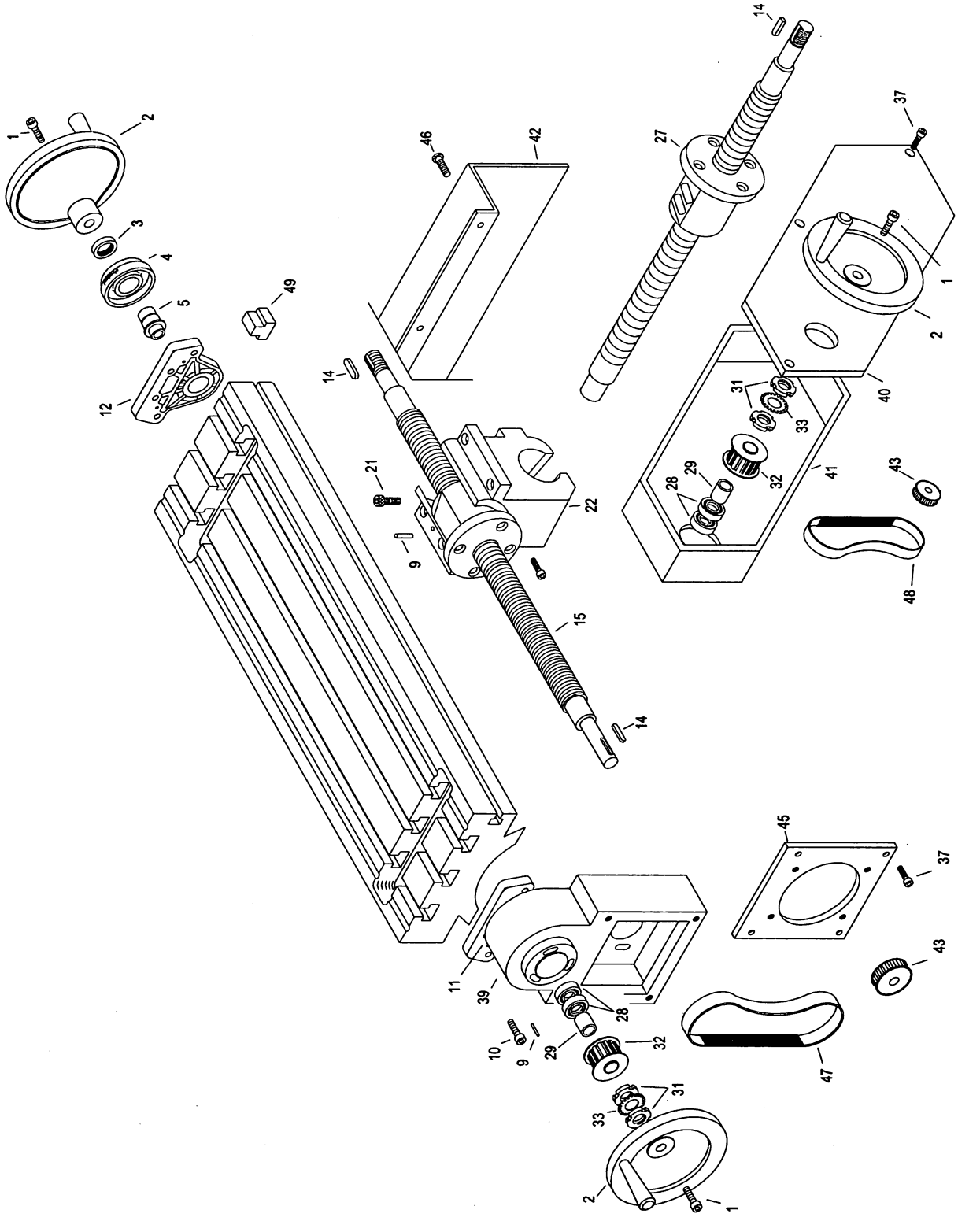
TOM-2SG,2VSG,3HG,3VHG
BASE MACHINE FOR X,Y-AXIS NC

ITEM NO:	DESCRIPTION
1	Quill Housing ADJ Gear
2	Ram Adapter
3	Ram Adapter Angle Plate
6	Vertical Adjusting Worm
7	Worm Thrust Washer
8	Vertical Adjusting Worm Shaft
9	Worm Key
10	Ram
11	Hanger Bolt
12	Washer
12-1	Washer
13	Socket Cap Screw
14	Roll Dowel Pin
15	Angle Plate
16	Round HD Drive Screw
17	Adapter Pivot Pin
18	Cap Screw
19	Adapter Locking Bolt (3Req.)
20	X-Dog (3 Req.)
21	Cap Screw
23	Table
24	Gib (Y-Axis)
25	Gib Block
26	Gib (Y-Axis)
27	Gib Block
29	Saddle Screw
30	Cap Screw (8 Req.)
31	Limit Switch (2 Req.)
32	Limit Switch Plate
33	Cap Screw
35	T Nut (2 Req.)
35-1	Block (2 Req.)
36	Cap Screw
37	Lock Blot Handle (2 Req.)
38	Lock Blot (2 Req.)
39	Lock Plunger (2 Req.)
40	Limit Switch Plate
41	Gib Screw

ITEM NO:	DESCRIPTION
42	Cap Screw
43	Gib (X-Axis)
44	Rubber Felt Wipers
45	Iron Felt Wipers
46	Y Dog
47	Cap Screw (2 Req.)
48	Gib
50	Y-Dog (2 Req.)
52	Saddle
53	Left Hand Column Wiper Holder
54	Knee Rubber Felt Wiper
55	Gib (Z AXIS)
56	Cap Screw
57	Right Hand Column WIPER Holder
58	Knee Rubber Felt Wiper
59	Chip Guards-Upper
60	Chip Guards-Middle
61	Chip Guards-Lower
62	Knee
64	Cap Screw
65	Knee Plate
66	Cap Screw
74	Jam Nut
76	Washer
77	Bevel Gear
78	Washer
79	Sealed Ball Bearing Elevating
80	Bearing Retainer Ring
81	Cap Screw
82	Elevating Screw Assembly
83	Handle
84	Elevating Crank
85	Gear Shaft Clutch Insert
86	Dial Lock Nut
87	Dial With 100 Graduations
88	Dial Holder
89	Socket CAP Screw
90	Bearing Retaining Ring

TOM-2SG,2VSG,3HG,3VHG
BASE MACHINE FOR X,Y-AXIS NC

ITEM NO:	DESCRIPTION
91	Grease Seal Bearing
92	Bearing Cap
93	Key
94	Elevating Shaft
95	Grease Seal Bearing
96	Bevel Pinion
97	Cap Screw
98	Colunm
99	Washer
102	Scoket Cap Screw
103	Pedestal
104	Elevating Screw Nut
105	Cap Screw
108	Lock Blot
110	Gib Screw
118	Spider
119	Ram Lock Stud
120	Ram Pinion
123	Chamfered x Hardend Washer
124	Turret
125	Gib Screw Nut
127	Locking Bolt
128	Screw
130	Filter Plate
131	Ram/Turret Gib
132	Column Piate
133	Graduations Ruler
134	Left Cover
FC112-1	Adjust Blot (4 Req.)
FC114	Pad (4 Req.)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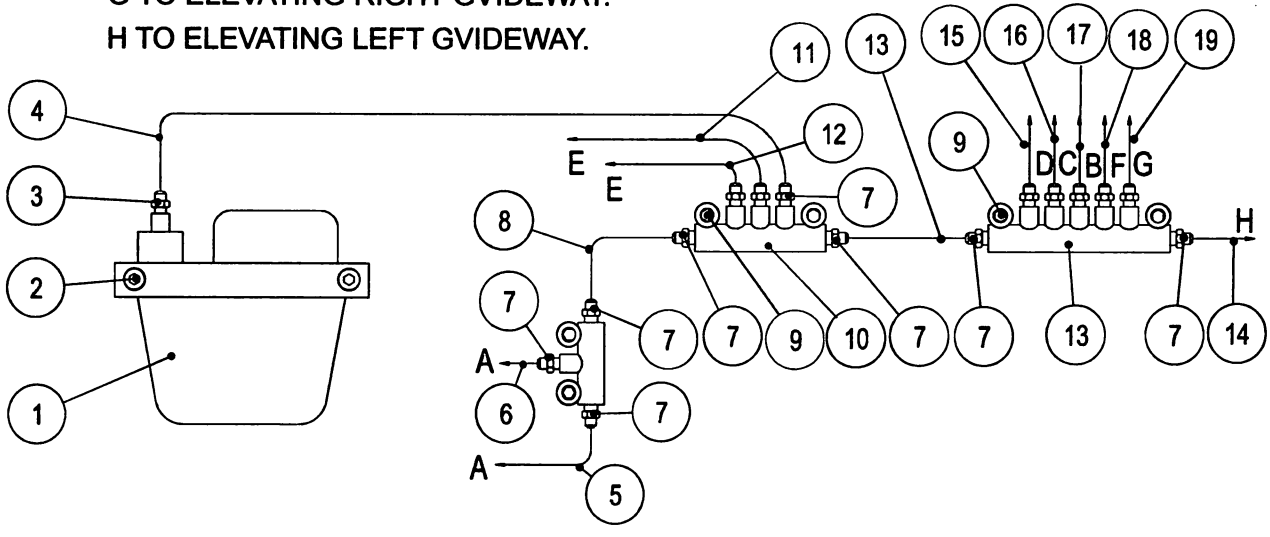
3VK (NC) BALLSCREW ASSEMBLY(ND)

ITEM NO:	DESCRIPTION
1	Cap Screw (3Req.)
2	Handle (3 Req.)
3	Lock Nut
4	Dial
5	Dial Holder
9	Roll Pin (6 Req.)
10	Scoket Cap Screw (8 Req.)
11	Left Bearing Bracket
12	Right Bearing Bracket
14	Key (2 Req.)
15	Ballscrew (X-Axis)
21	Scoket Cap Screw (4 Req.)
22	Longitudinal Feed Nut Bracket
27	Ballscrew (Y-Axis)
28	Bearing (4 Req.)
29	Bearing Spacer (2 Req.)
31	Ballscrew Nut (4 Req.)
32	Pulley (2Req.)
33	Washer (2 Req.)
37	Cap Screw (8 Req.)
45	Servo Motor Cover(X-Axis)
39	Servo Motor Bracket(X-Axis)
40	Servo Motor Cover(Y-Axis)
41	Servo Motor Bracket(Y-Axis)
42	Servo Motor Protect Cover(Y-Axis)
43	Pulley (2 Req.)
46	Cap Screw (3 Req.)
47	Belt (X-Axis)
48	Belt (Y-Axis)
49	T Stopper (6 Req.)

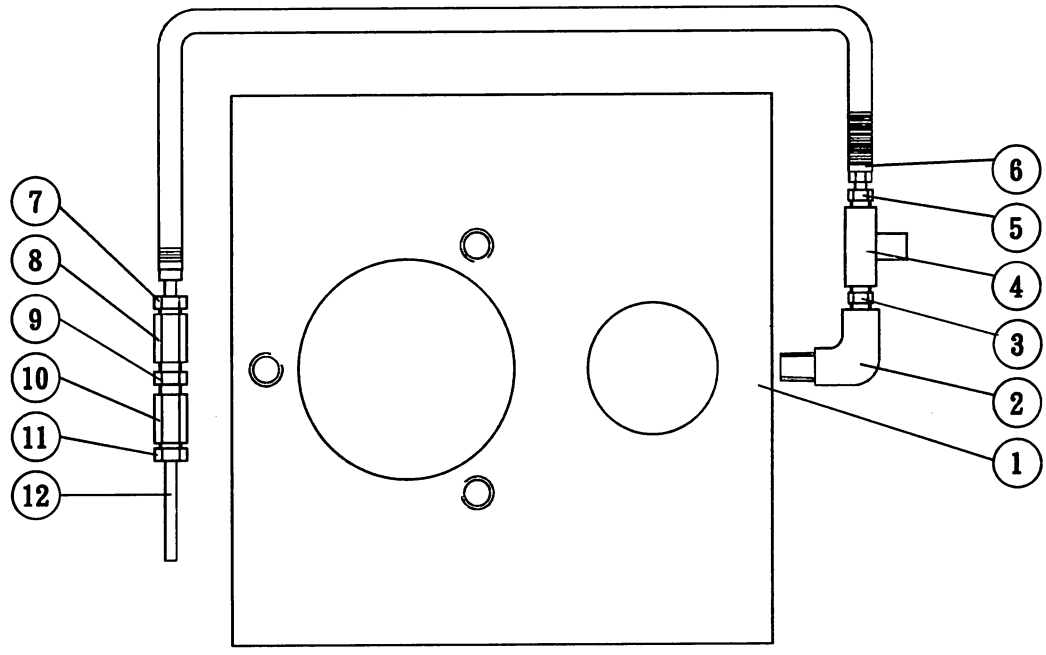
LUBRICATION SYSTEM

A TO KNEE AND SADDLE LEFT GVIDEWAY.
B TO TABLE SCREW.
C TO TABLE AND SADDLE FORNT GVIDEWAY.
D TO CROSS SCREW.
E TO KNEE AND SADDLE RIGHT GVIDEWAY.
F TO TABLE AND SADDLE REAR GVIDEWAY.
G TO ELEVATING RIGHT GVIDEWAY.
H TO ELEVATING LEFT GVIDEWAY.



NO	PART NO	PART NAME	QTY	REMARK
1		LUB. PUMP	1	
2		SOCKET HD. SCREW	2	
3		PIPE LOCK NUT	1	
4		ALUMINUN PIPE(Φ4)		
5		ALUMINUN PIPE(Φ4)		
6		ALUMINUN PIPE(Φ4)		
7		PIPE LOCK NUT (PA-4)PIPE JOINT PB-4	8	
8		ALUMINUN PIPE(Φ4)		
9		SOCKET HD. SCREW	2	
10		OIL DISTRIBUTOR	1	
11		ALUMINUN PIPE(Φ4)		
12		ALUMINUN PIPE(Φ4)	1	
13		OIL DISTRIBUTOR		
14		ALUMINUN PIPE(Φ4)		
15		ALUMINUN PIPE(Φ4)		
16		ALUMINUN PIPE(Φ4)		
17		ALUMINUN PIPE(Φ4)		
18		ALUMINUN PIPE(Φ4)		
19		ALUMINUN PIPE(Φ4)		

HEAD STOCK SPINDLE LUBRICATION SYSTEM



NO	PART NO	PART NAME	QTY	REMARK
1		NC Head		
2		Oil Connection		
3		Pipe Lock Nut		
4		Oil Distributor		
5		Pipe Lock Nut PA-4 Pipe Joint PB-4		
6		Spring Oil Distributing Pipe Φ4		
7		Pipe Lock Nut PA-4 Pipe Joint PB-4		
8		Oil Feeding Stocket		
9		Oil Connection		
10		Oil Feeding Stocket		
11		Pipe Lock Nut PA-4 Pipe Joint PB-4		
12		Plastlc Oil Distributing Pipe Φ4		

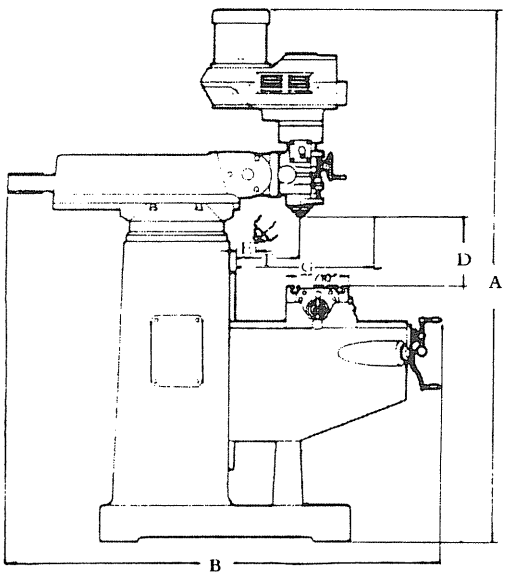
This manual should be studied and understood by each operator before they install,use, or, maintain this machine tool. It is solely the responsibility of the purchaser to properly train and educate each machine operator. And the employer has total responsibility to provide point of operation safeguarding.

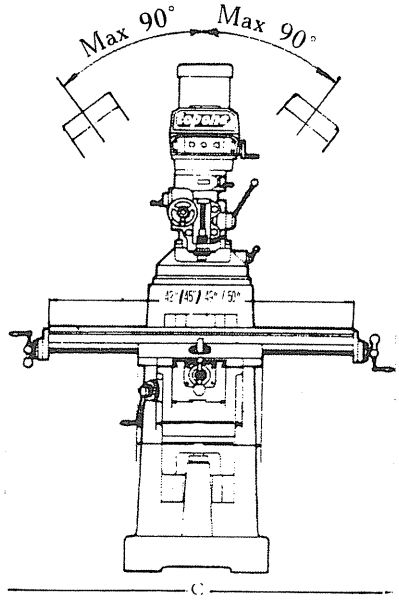
Please place this manual near the machine, and take care of it in any time. If you have any troubles or questions about the machine, please welcome to connect to us or to our appropriate overseas agent.

TABLE OF CONTENTS

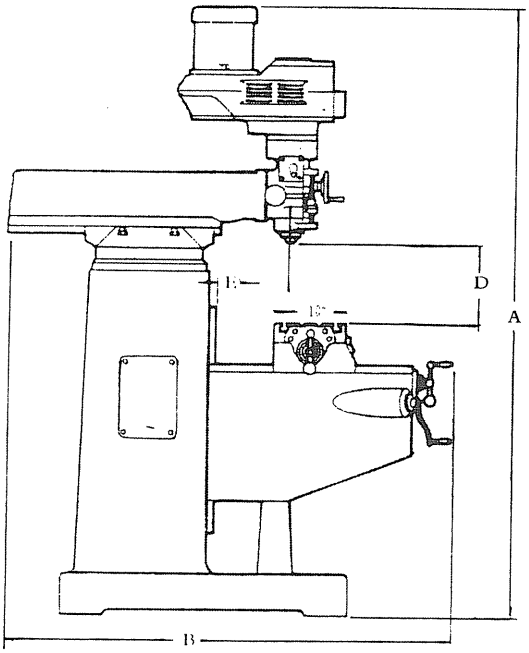
MAIN DIMENSIONS :

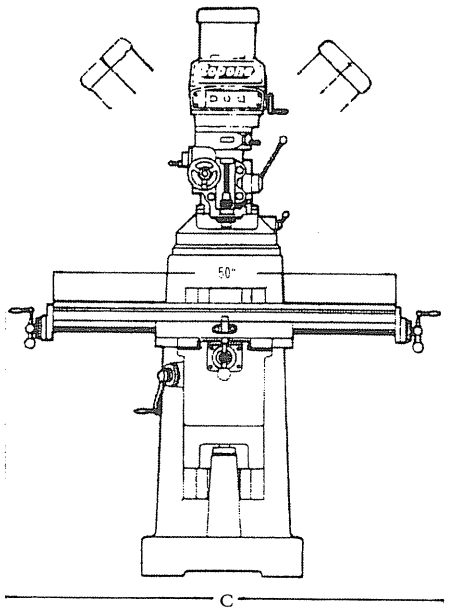
TOM-2SG,2VSG,3HG,3VHG





TOM-4K,4VK,5K,5VK





Model / SIZE	TOM-2SG,TOM-2VSG	TOM-3HG,TOM-3VHG	TOM-4K,TOM-4VK	TOM-5K,TOM-5VK
A	2100mm(83")	2200mm(83")	2450mm(96.5")	2550mm(100.5")
B	1600mm(63")	1750mm(69")	2000mm(79")	2000mm(79")
C	1450mm(57")	1700mm(67")	1700mm(67")	1700mm(67")
D	0-406mm(0"-16")	0-406mm(0"-16")	0-420mm(0"-16.5")	0-508mm(0"-20")
E	0-305mm(0"-12")	0-610mm(0"-24")	0-610mm(0"-24")	0-610(0"-24")
F	171-482mm(7"-19")	255-720mm(10.5"-28.5")	—	—
G	228-533mm(9"-21)	254-864mm(10"-34")	—	—

SPECIFICATOONS :

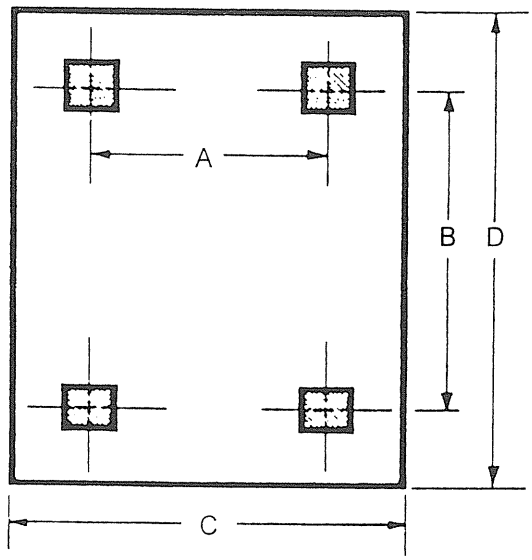
MODEL	TOM-2SG	TOM-2VSG	TOM-3HG	TOM-3VHG	TOM-4K	TOM-4VK	TOM-5K	TOM-5VK
Spindle motor	3HP	3HP	3HP	3HP	5HP	5HP	5HP	5HP
Spindle taper	R8(NST30)	R8(NST30)	R8(NST30)	R8(NST30)	NST40	NST40	NST40	NST40
Quill diameter	Φ85.725mm(3.37")	Φ85.725mm(3.37")	Φ85.725mm(3.37")	Φ85.725mm(3.37")	Φ100mm(3.93")	Φ100mm(3.93")	Φ105mm(4.13")	Φ105mm(4.13")
Spindle speeds	80-2720RPM (8 Speeds standard) 160-5440RPM (16 Speeds optional)	60-4200RPM (Variable)	80-2720RPM (8 Speeds standard) 160-5440RPM (16 Speeds optional)	60-4200RPM (Variable)	70-3600RPM (10 Speeds)	70-3900RPM (Variable)	70-3600RPM (10 Speeds)	70-3900RPM (Variable)
Quill feeds	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")	0.04mm (0.0015") 0.08mm (0.0030") 0.15mm (0.0060")
Head tilt	45° Forward & Back 90° Right & Left		45° Forward & Back 90° Right & Left		90° Right & Left		90° Right & Left	
T -slot (width × trough number × pitch)	16mm × 3 × 64mm		16mm × 3 × 65mm		16mm × 3 × 65mm		16mm × 3 × 65mm	
Max weight of work piece	350kgs (770lbs)		400kgs (880lbs)		500kgs (1100lbs)		600kgs (1320lbs)	
Table size	1067 × 230mm (42" × 9") Standard 1244 × 230mm (49" × 9") Optional		1143 × 254mm (45" × 10") Standard 1270 × 254mm (50" × 10") Optional		1270 × 254mm (50" × 10") Standard		1270 × 254mm (50" × 10") Standard	
Logitudinal travel (X)	762mm (30") 914mm (36")		914mm (36")		800mm (31.5")		620mm(650mm Saddle) (24.4") 760mm(510mm Saddle) (30")	
Cross travel (Y)	305mm (12")		406mm (16")		420mm (16.5")		420mm (16.5")	
Vertical travel (Z)	406mm (16")		406mm (16")		420mm (16.5")		508mm (20")	
Ram travel	305mm (12")		610mm (24")		610mm (24")		610mm (24")	
Machine dimension (L×W×H)	1600 × 1450 × 2200mm		1750 × 1700 × 2200mm		2000 × 1700 × 2450mm		2000 × 1700 × 2550mm	
Machine weight	1000kgs (2201bs)		1280kgs (2816lbs)		1650kgs (3630lbs)		2000kgs (4400lbs)	
Packing dimension	1450 × 1450 × 1900mm		1500 × 1650 × 1980mm		1500 × 1650 × 2100mm		1500 × 1650 × 2200mm	

△Color:Standard-Machine Gray.

△Power:50HZ/60HZ, 3phase, 110V/220V/230V/380V/415V/440V

INSTALLATION :

Read and understand this entire installation section before beginning the installation procedure.
Floor Plan, Layout and Space requirements.



Model / SIZE	TOM-2SG,TOM-2VSG	TOM-3HG,TOM-3VHG	TOM-4K,TOM-4VK	TOM-5K,TOM-5VK
A	555mm (21.85")	555mm (21.85")	580mm (22.83")	590mm (23.23")
B	740mm (29.13")	755mm (29.72")	840mm (33.07")	840mm (33.07")
C	615mm (24.21")	615mm (24.21")	630mm (24.80")	640mm (25.20")
D	950mm (37.40")	985mm (38.78")	1080mm (42.52")	1095mm (43.11")

UNCRATING :

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

SHORTAGES :

Check shipment carefully, against the itemized packing list. In case of shortages, report them IMMEDIATELY to the distributor from whom the machine was purchased.

CLEANING :

Thoroughly clean protective coating from machine with suitable cleaning solution.

WARNING

IT IS NOT RECOMMENDED THAT GASOLINE OR ANY OTHER GIGRLY INFLAMMABLE
CLEANING AGENT BE USED.

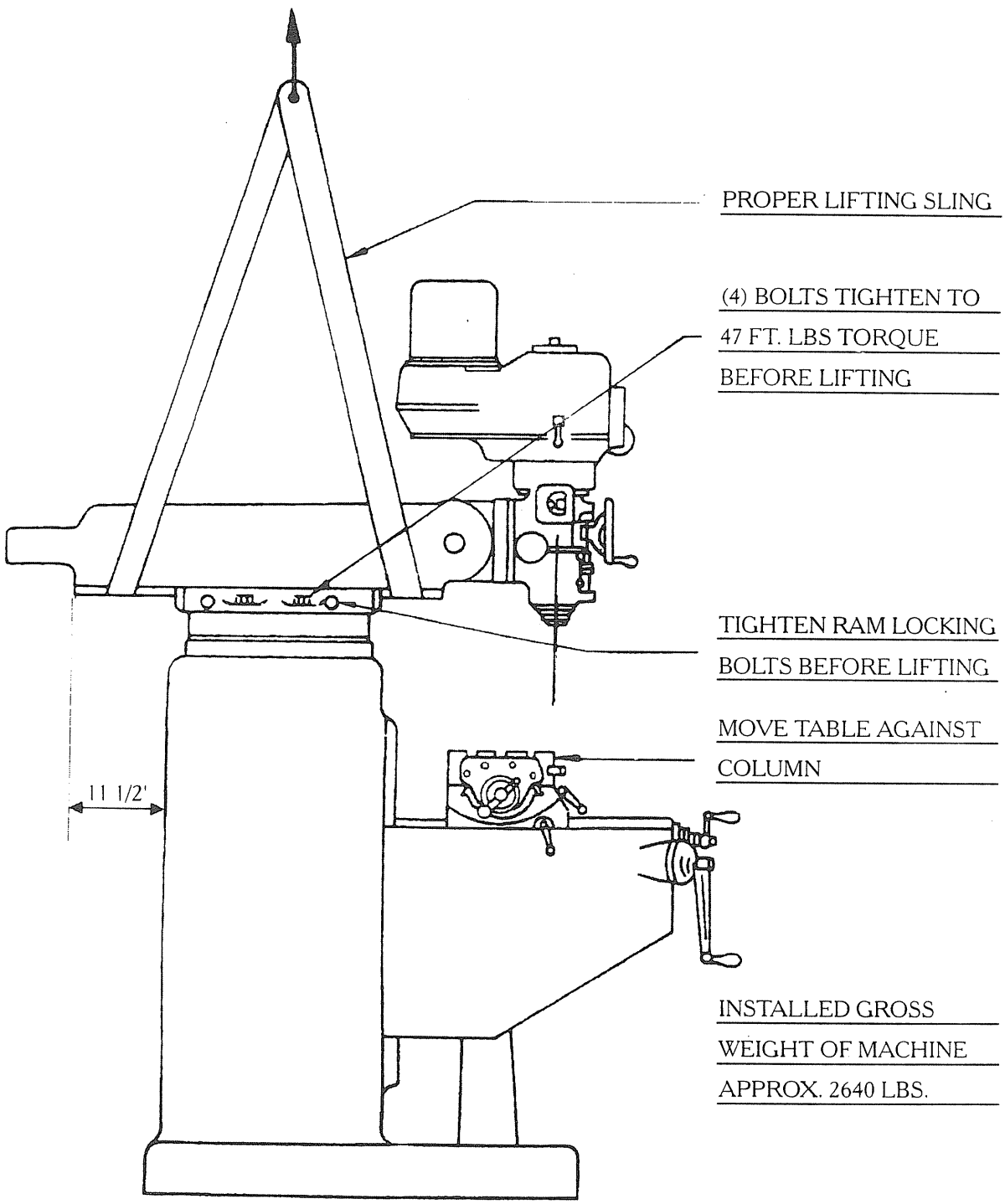
Do not move the table, knee, saddle or ram until all ways have been well cleaned and lubricated. Then, by hand, move table, saddle, and knee to limit stop in one direction. Clean and lubricate exposed ways and then move each unit to the opposite limit stop and similarly clean and lubricate the exposed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

POSITIONING HEAD UPRIGHT :

Loosen four locknuts (#157, page 35), out to detent and rotate head to vertical position. Proceed with alignment of head as described on page 9. Tighten nuts evenly, using normal pressure. Care should be taken to avoid excessive tightening since this will cause distortion in the quill. Tighteen all nuts to 25 ft. lbs. torque, then repeat to 5. ft. Lbs.

LIFTING THE MACHINE

Note position of ram and table when lifting with sling.



LIFTING AND PLACING ON SOLID FOUNDATION :

Machine should be lifted by placing a sling under the ram as illustrated on page 6.
The column and base are a one piece casting. 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 is uneven, shims should be used to correct this condition. See Figure 2 for installation layout.

NOTE

IT IS RECOMMENDED THAT THE MACHINE BE SECURED TO THE FLOOR TO PREVENT MOVEMENT OR TIPPING DUE TO OFF-CENTER LOADING.

Before securing machine to floor (i.e. tightening hold down bolts)' make certain all four corners are making contact with floor or shims, after machine is leveled. If this is not done, it is possible to twist the column and put a bind in the ways.

LEVELING MACHINE :

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

HANDLES :

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

CONNECTING POWER SUPPLY :

To connect the power have a qualified delectrician proceed as follows:

1. Check motor wiring to ensure it is compatible with power supply.
2. Connect machine wiring to power supply making sure connection complies to all local electrical code.
3. Check for correct spindle rotation. In the **HIGH SPEED** range, the spindle should rotate clockwise when viewed from the top of the machine.

NOTE

DRUM SWITCH AND HI-NEUTRAL-LO LEVER MUST BE IN HI RANGE

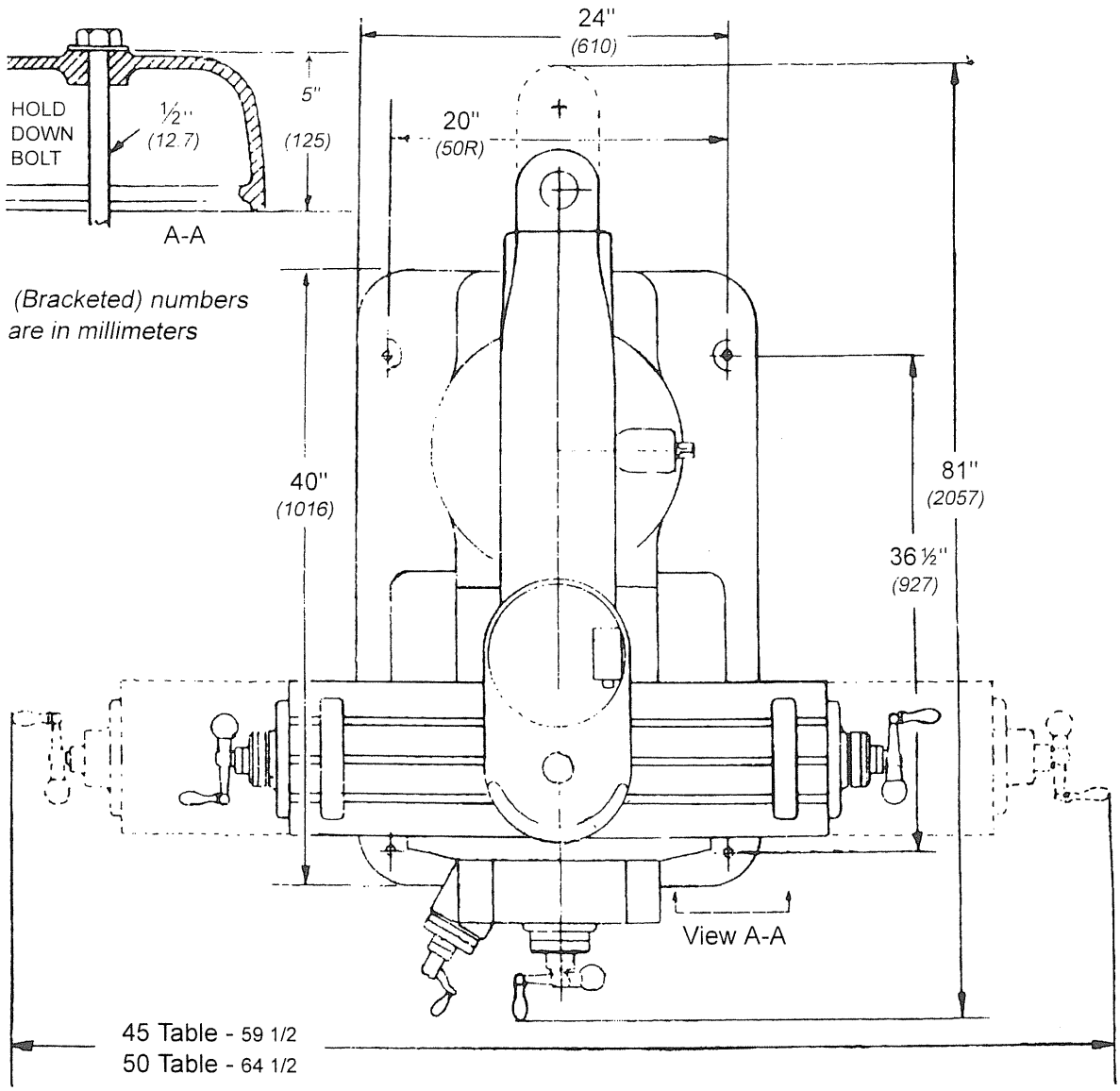


Figure 2. Installation Layout

ALIGNMENT OF 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 with table, see Figures 3 & 4. This must be done with ram adapter (#2, page 28) on ram (#10, page 28), by adjusting ram adapter through vertical adjusting wormshaft (#8, page 28). Loosen four locknuts (#157, page 36), but leave some drag on them for fine adjustment. To square head to table in the longitudinal axis, mount indicator as shown in Figure 4.

NOTE

WHEN INDICATING AS IN FIGURE 3. IT SHOULD BE NOTED THAT THE TABLE IS FITTED TO BE SLIGHTLY HIGHER IN FRONT, USUALLY ABOUT 0005"

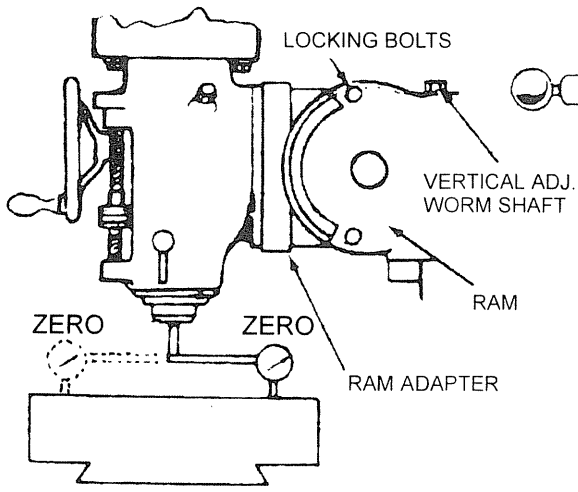


Figure 3. Head Alignment Y Axis

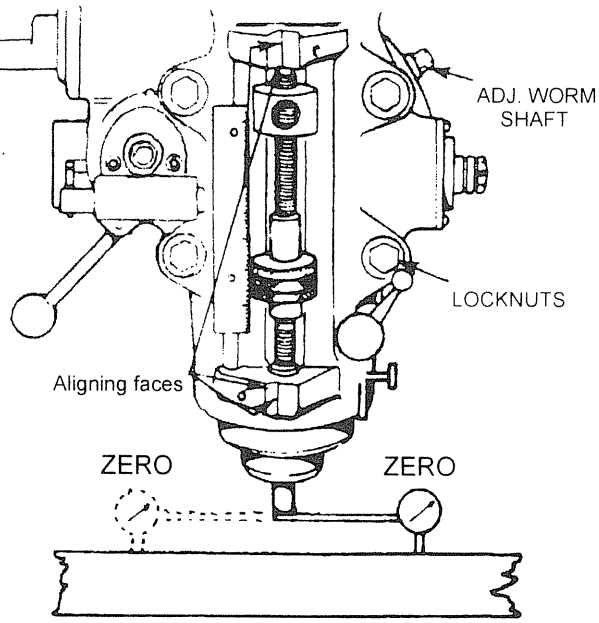


Figure 4. Head Alignment Y Axis

LUBRICATION :

Do not operate until properly lubricated:

(A) Way surfaces and lead screws
Sunoco waylube #80 or equivalent.

(B) Milling Heads(Spindle Bearings)
S.A.E. 10 or 10W light oil.

(C) Motors are greased for life of bearings.

ADJUSTMENT OF TABLE GIB.

The table is provided with a full length tapered gib (#43, page 28) in the saddle, and an adjusting screw on the left side. To take up gib, tighten gib adjusting screw (#41, page 28) slightly and repeat until a slight drag is felt when moving the table by hand.

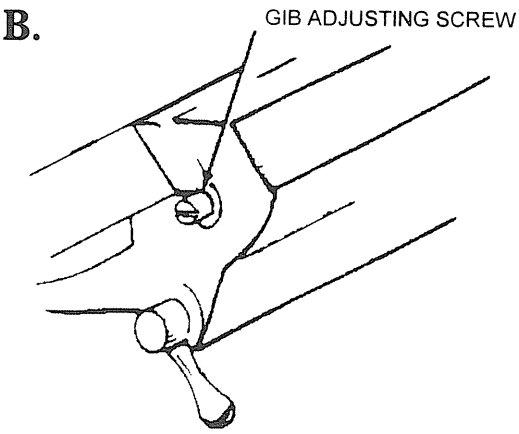


Figure 5.Saddle/Table Gib
(#43, page 28)

ADJUSTMENT OF SADDLE GIB.

A tapered gib (#49, page 28) 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.

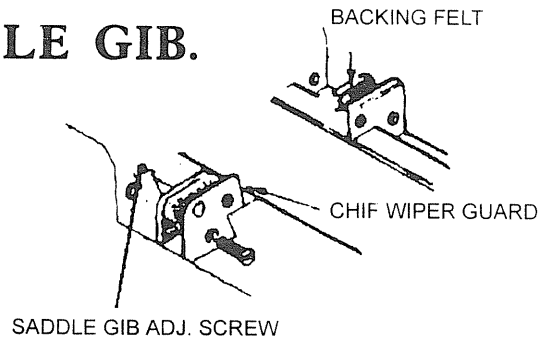


Figure 6.Saddle-Knee Gib
(#49, page 28)

ADJUSTMENT OF KNEE GIB.

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

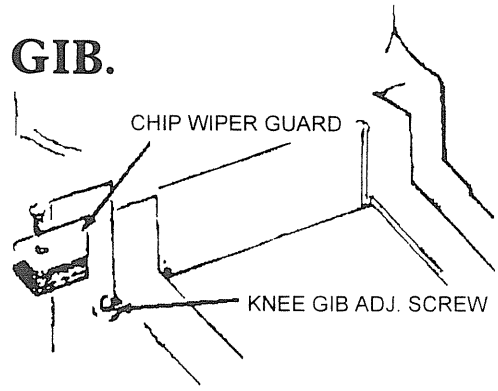
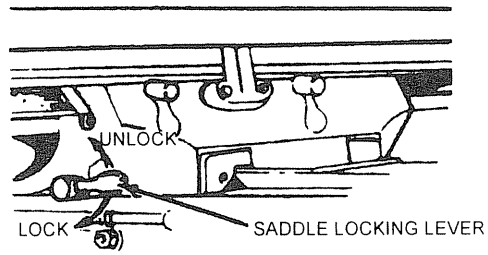


Figure 7, Knee-Columm Gib
(#55, page 28)

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.

The table clamp levers are located on the front of saddle and should always be clamped when longitudinal movement is not required.

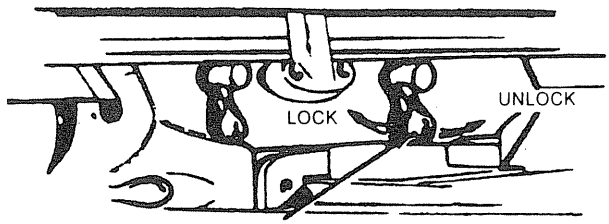
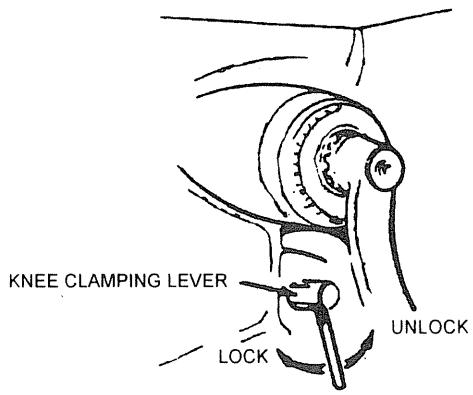


TABLE CLAMP LEVER

The knee clamping levers are at the left front of the knee. Below the elevating crank, and on the left side of the knee back alongside the column. The clamp on the front of knee is only a tension brake and should be left clamped unless the knee is being raised or lowered. This clamp will not lock the knee completely. The two clamps on the left rear of the knee should only be used when the knee will not be moved.



REMOVING TABLE :

Remove the following: ball crank, handles, dial holders and bearing brackets. Tum the lead screw all the way out and slide the table from the saddle. See Fig.8.

REMOVING 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. See Fig. 8.

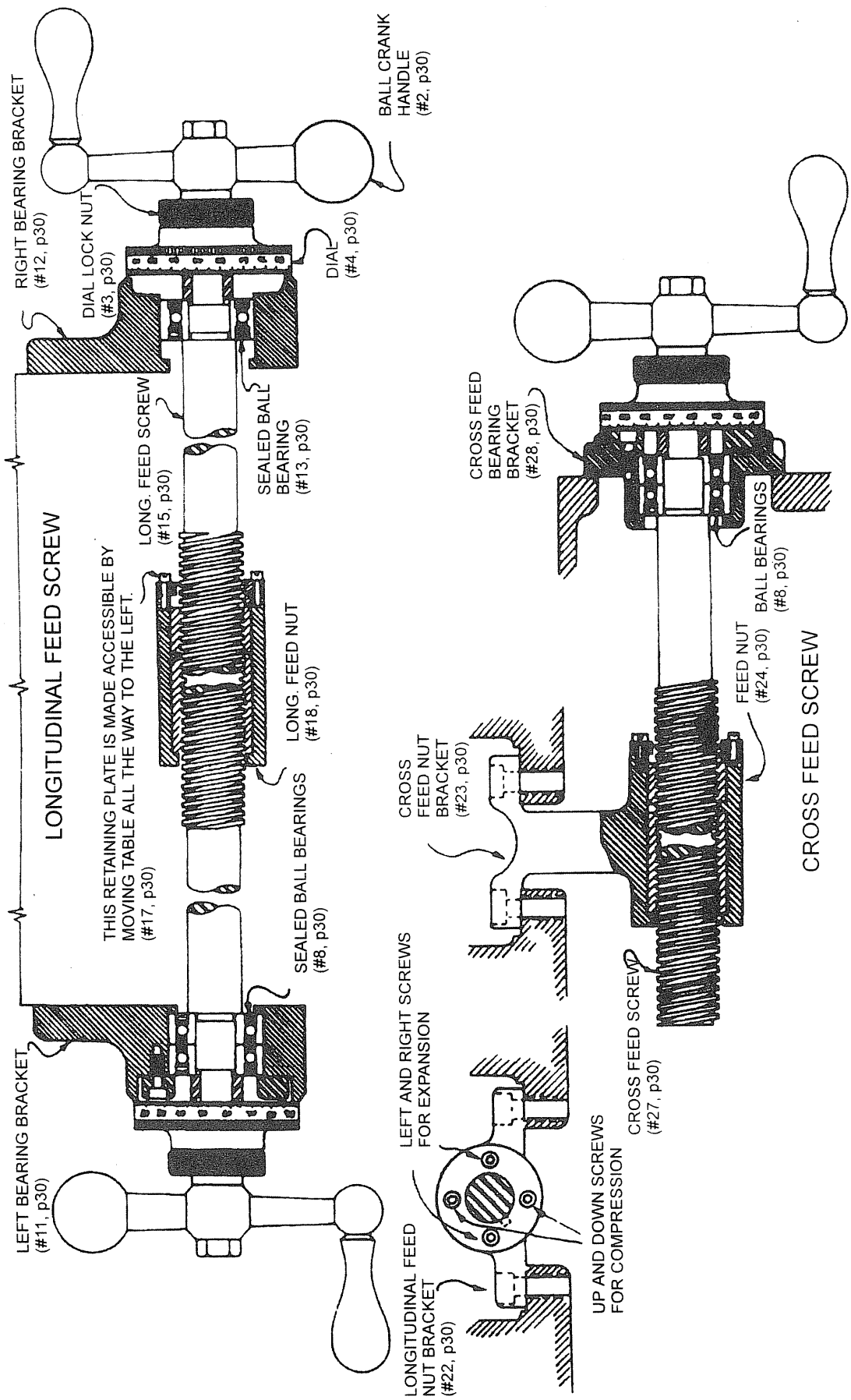


Figure 8. Longitudinal and Cross Feed Assembly

ASSEMBLY INSTRUCTIONS FOR MOUNTING 2VSG VARIDRIVE HEAD TO RAM ADAPTOR

Insert the four (4) tee bolts into the ram adaptor and position them to match the bolt holes in the head.

Slide the head onto the bolts, insert the spacers and washers and secure with the nuts.

Tighten all nuts to 25 ft. lbs. Of torque, and then repeat to 50 ft. lbs.

CAUTION

IMPROPER TIGHTENING OF THESE COULD CAUSE A CHOPPY QUILL MOVEMENT

LUBRICATION :

The useful life of the 2VSG Head will be determined to a large extent by whether proper lubrication methods are followed. Carefully follow the lube plate recommendations and avoid substitutions.

OPERATING INSTUCTIONS :

SPEED CHANCH HAND WHEEL (16, Figure 9) :

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

When tightening or loosening the drawbar (#109, page 37), 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.

Drawber (#14, page 37) has 7/16-20 right hand thread 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.

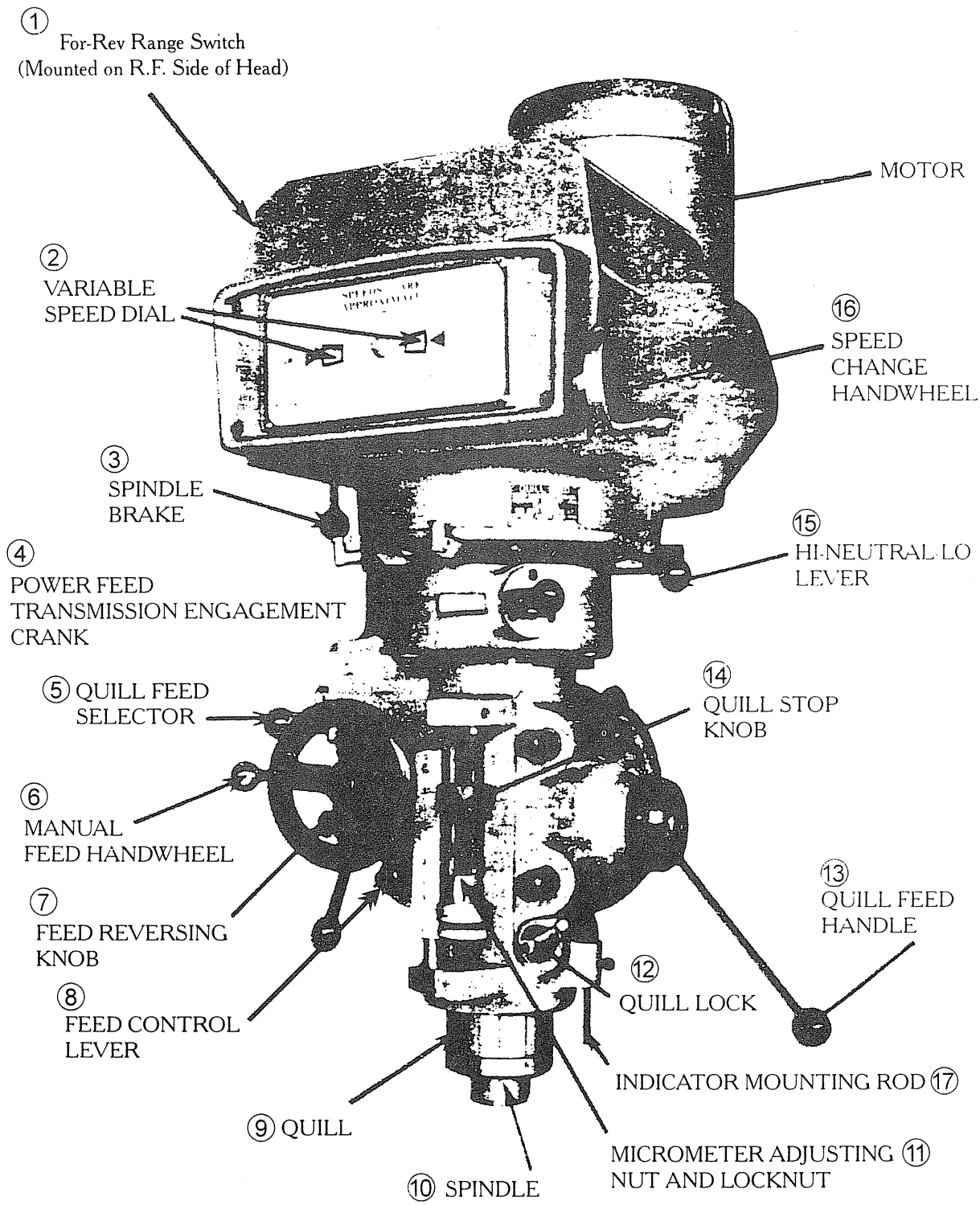


Figure 9. 2VSG 3VHG(4VK)Milling Aitachment

SPINDLE BRAKE(#3, Figure 9) :

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 worm 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.

FORWARD-REVERSE SWITCH (#1, Fig. 9) :

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.

HI-NEUTRAL-LO LEVER (#15, Fig. 9) :

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 cltuch teeth to rub each other. This can be corrected by loosening set screw (#50-2, page 37), and reversing the position of the detent plate (#50-1, page 37).

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

CAUTION

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

POWER FEED ENGAGEMENT CRANK (#4, Fig. 9) :

Engages 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.

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

QUILL FEED SELECTOR (#5, Fig. 9) :

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.

FEED REVERSE KNOB (#7, Fig. 9) :

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

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

MANUAL FEED HANDWHEEL (#6, Fig. 9) :

Feed reversing knob should be in neutral position and feed control lever (#8, Fig. 9) engaged. Clockwise rotation of handwheel moves quill down. Manual Feed Handwheel and quill feed handwheel may be disengaged by moving them out ward 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.

FEED CONTROL LEVER (#8. Fig. 9) :

Engages 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 35).

CAUTION

WHEN ADJUSTING THE SOCKET SET SCREW, CHECK AUTOMATIC DISENGAGEMENT IN BOTH DIRECTIONS: THAT IS WITH QUILL-STOP NUT (#161, PAGE 35) AGAINST THE FEED TRIP LEVER (#145, PAGE36) FORE DOWN POSITION. AND AGAINST REVERSE TRIP BALL LEVER (#183, PAGE 35) FOR THE UP POSITION.

QUILL FEED HANDLE (#13, Fig. 9) :

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

QUILL STOP KNOB (#14, Fig. 9) :

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

MICROMETER NUT (#11, Fig. 9) :

This nut is used for setting of depths. Each graduation on nut indicates. 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.

QUILL LOCK (#10, Fig. 9) :

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.

RAM POSITION :

Ram can be moved by loosening two ram lock studs (#119, page 27) on turret (#124, page 27) 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.

RECOMMENDATIONS :

Use 2,3, or 4 flute end mills. Eight flute end mills are usually not as satisfactory for general milling. When using shell mills, face mills or any other tooling, proper machining practice should be observed.

Power feed can be used for 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".

CAUTION

THIS CLUTCH SHOULD NOT BE TAMPERED WITH IN THE FIFLD.

OPERATING INSTRUCTIONS

CAUTION

DO NOT TRY TO CHANGE SPINDLE SPEED ON 2VSG VARIDRIVE HEAD UNTIL MOTOR IS RUNNING. THIS COULD CAUSE PARTS BREAKAGE.

Spindle Feeds are adjusted by turning speed change handwheel (#27, page 37) on the front of the belt housing. There are two ranges shown; 60 to 500 and 500 to 4200.

60-500RPM is obtained through the back-gear drive and is referred to as low range. To engage the back-gears, use the lever marked Hi-Neutral-Lo on the right side of the head. Move this lever to the "LO" position and use low range on the variable speed dial.

When shifting to "LO." DO NOT FORCE THE LEVER if the back gears 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" (back gear).

500-4200RPM is direct drive and is the high range. The same procedure as previously described is used to select this range except the Hi-Neutral-Lo lever is set in the Hi position.

Wear on the vari-drive belt will cause a slight change in the speeds to that shown in windows (#16-2, page 37) on the dial. This can be corrected as follows. Crank the speed change handwheel (#16, Figure 9) snugly against the high speed stop. (This will be near the 4200 reading on the dial.)Use a techometer to determine the spindle speed, then turn the pivot stud (#39, page 37), after loosening the jam nut (Item #96 page 37) until the spindle speed registers 4200 on the tachometer;tighten jam nut.

Now reposition the speed dial plate to match the tachometer reading. This is done by loosening the Hex nut (#14, page 37) until the spindle speed registers 4200 on the tachometer; tighten jam nut.

CAUTION

DO NOT SHIFT THE HI-NEUTRAL-LO LEVER WHEN THE FEED GEAR IS ENGAGED.

REMOVING THE MOTOR (See Fig. 10) :

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 (#50-1, page 37) (B. Figure 10) at the lower end of the motor shaft. Use two cover screws (#50-2, page 37) (A) to fasten the spring (#8, page 37) (C) on the lower the motor shaft, to the lower motor vari-drive pulley (#45, page 37). This will reduce the hazard of personal injury that is always present when a heavy spring is under compression. When the pulley, spring retainer (#9, page 37) and spring are securely fastened as a single unit, crank the speed change handwheel (#16, Figure 9) to top speed position.
3. Now remove the screws (#111, page 37) (D) that faster 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 (#4, page 37) deeply into the spindle pulley (#44, page 37) providing the slack needed to ship the belt over the motor pulley (#45, page 37).
4. Now lift the motor high enough to rest the motor base GENTLY on the adjusting screw (#39, page 37) (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.

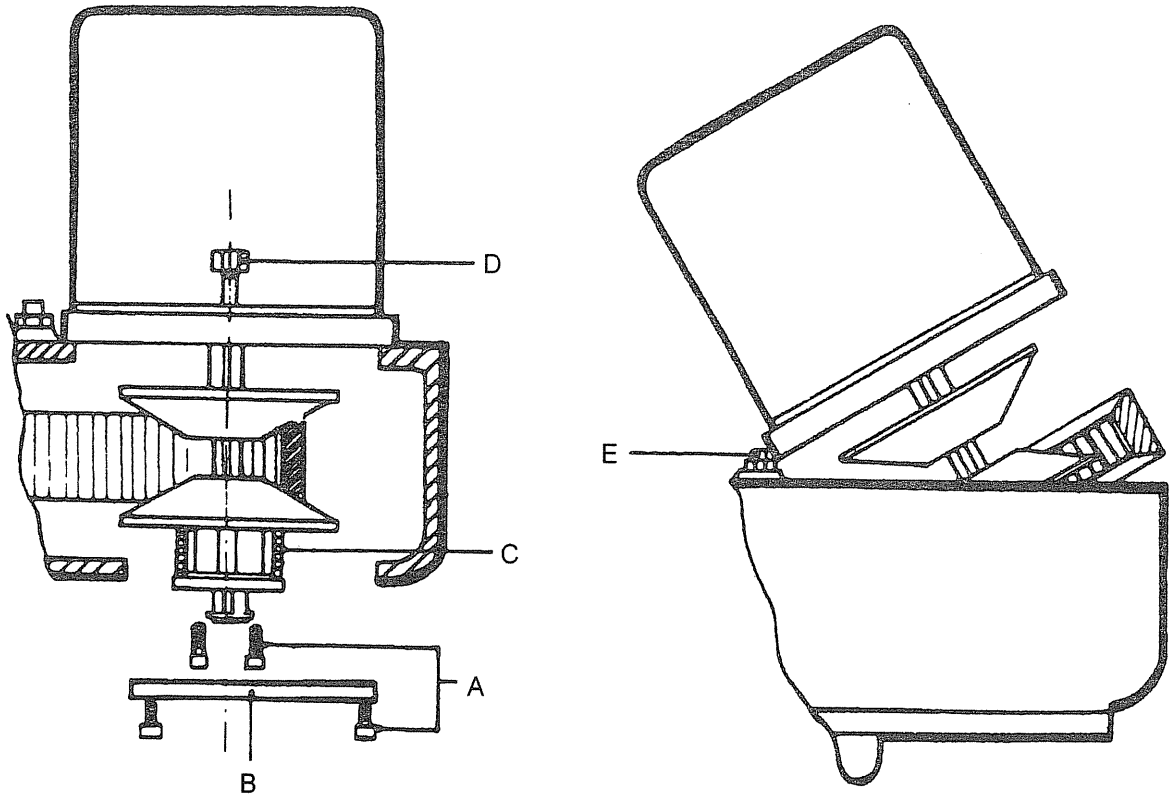


Figure 10. Removing the Motor (Side View)

CHANGING VARI-DRIVE BELT (Figure 11)

Complete the previous procedures for removing the motor, then remove the three screws (#14, page 37) (A. Fig. 11) and lift out the top bearing cap (#13, page 37) (B). Looking down inside of the housing, locate and remove two socket head cap screws (#123, page 37) and sleeves (#38, page 37) (C). Next, remove the six screws (#137, page 37) (D), then holding the belt housing (E) to the base (#50 page 37).

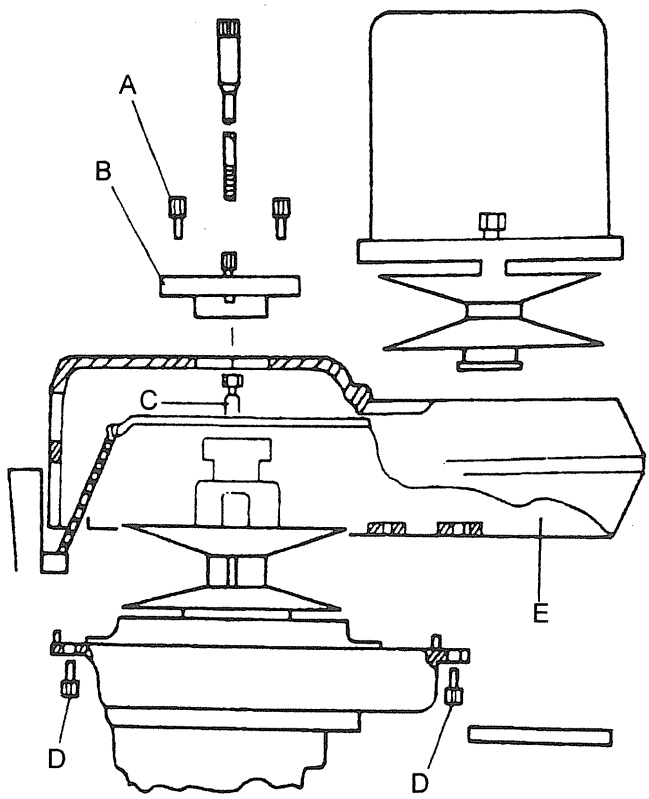


Figure 11. Removing the Var-Drive Belt

Remove the old belt (#4, page 37) and replace it with a new belt. Do not use a substitute belt purchased from other than a # 383032B-13 of Bando V/S Belt. Vibration and heat could result from the use of the wrong belt.

CHANGING TIMING BELT (Figure 12)

Complete the operation for removing the motor. Then put the Hi-Neutral-Lo lever (#15, Figure 9) in the Lo position, remove the drawbar (#109, page 37) (A, Figure 12) and lower the spindle.

Remove screws (#12, page 37) (B) holding the upper and lower housings (#82, page 37) together, including the two lower screws (C) in speed changer bracket just below the speed dial.

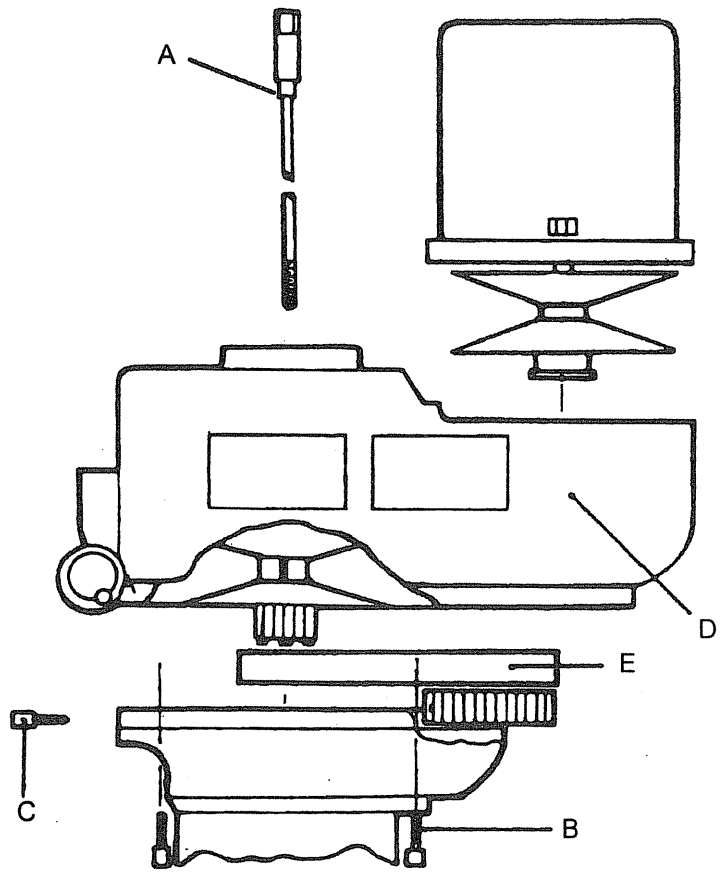


Figure 12. Removing Timing Belt

A slight blow under the speed changer bracket (#16 page 37) may be needed to separate the upper housing (D) form its base.

As the housings are being separated, the HTD belt (E) (#63, page 37) still connects them, resisting the separating movement. The separation can be assisted by gently pushing the belt off the large pulley (#62, page 37) as the upper housing is being raised.

Remove the old belt and replace with a new belt.

GENERAL SPEED RECOMMENDATIONS

Moterial to be Cut	Feet Per Minute		
	Rough Cut	Rough and Finish	Light and Finish Cut
Cost iron-Soft-(Under 200 Brinnell)	70	80-90	120
Cost iron-Med-(200-300 Brinnell)	55	60-70	90
Cost iron-Hard-(Over 200 Brinnell)	40	50-60	70
Steel(Chrome Nickel 40-45 Shore)	30	40	50
Steel(Stainless)	60	80	90
Steel(Low Carbon)	80	90	140
Steel(High Carbon)	40	50	70
Bronze(Medium)	90	120	150
Bronze(Hard)	65	90	130
Brass(Hard)	100	150	200
Copper	150	200	300
Duraluminum	400	----	600
Aluminum	600	----	1000

TABLE OF CUTTING SPEEDS AND FEEDS

Feet Per Minute	15	20	25	30	40	50	60	70	80	90	100
Diameter, Inches	Revolutions Per Minute										
1/16"	917	1222	1528	1833	2445	3056	3667	4278	4889	5500	6112
1/8"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056
3/16"	306	407	509	611	815	1019	1222	1426	1630	1833	2037
1/4"	229	306	382	458	611	764	917	1070	1375	1375	1528
5/16"	183	244	306	367	489	611	733	856	978	1100	1222
3/8"	153	204	255	306	407	509	611	713	815	917	1019
7/16"	131	175	218	262	349	437	524	611	698	786	873
1/2"	115	153	191	229	306	382	458	535	611	688	764
5/8"	91	122	153	183	244	306	367	428	489	550	611
3/4"	76	102	127	153	204	255	306	357	407	458	509
7/8"	65	87	109	131	175	218	262	306	349	393	437
1"	57	76	95	115	153	191	229	267	306	344	382
11/8"	50	67	84	102	136	170	204	238	272	306	340
11/4"	45	61	76	91	122	153	183	214	244	275	306
13/8"	41	55	69	83	111	139	167	194	222	250	278
11/2"	38	50	63	76	102	127	153	178	204	229	255
15/8"	35	47	58	70	94	118	141	165	188	212	235
13/4"	32	43	54	65	87	109	131	153	175	196	218
17/8"	30	40	50	61	81	105	122	143	163	183	204
2"	28	38	47	57	76	95	115	134	153	172	199

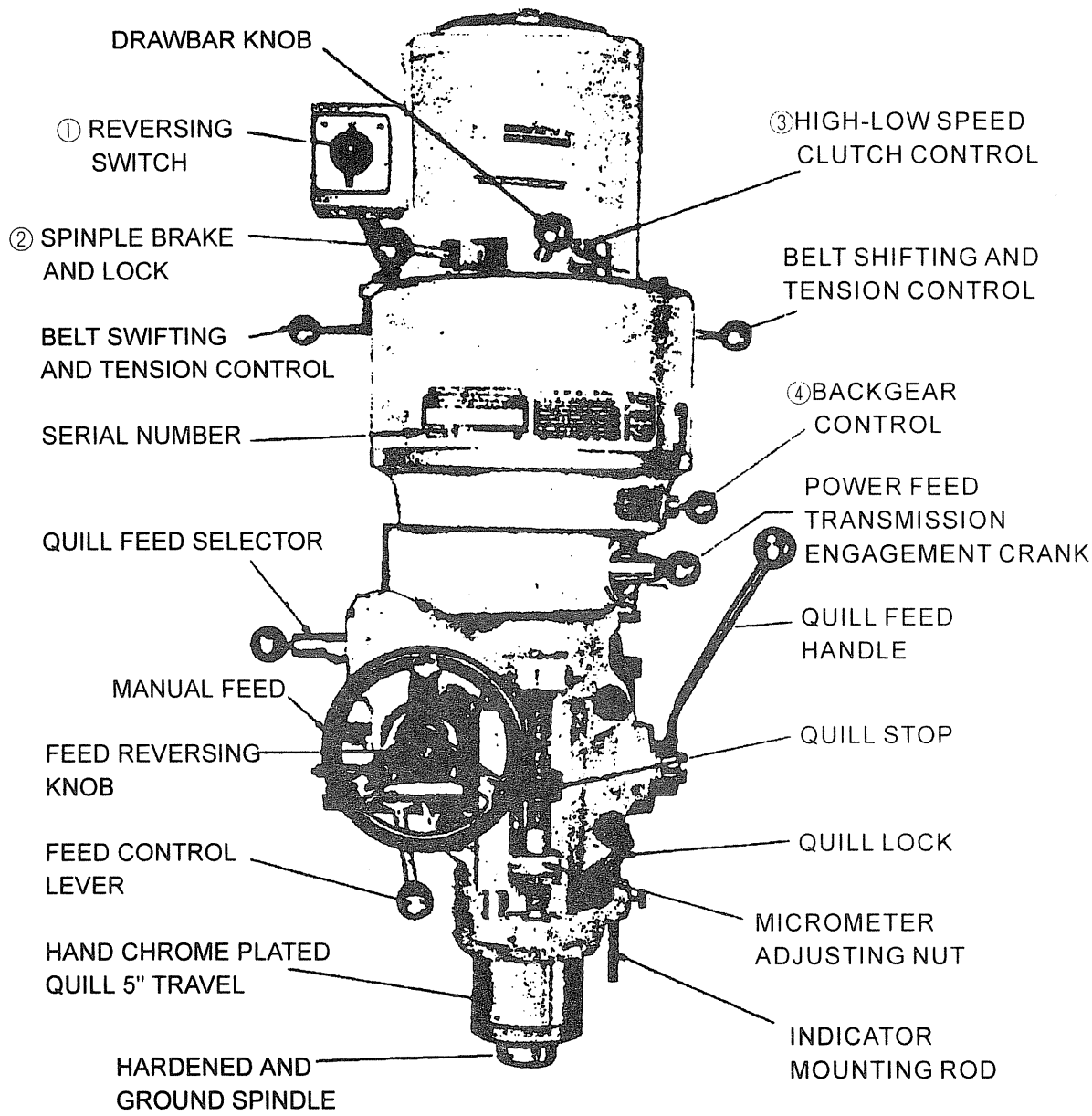


Figure 13, 2SG, 3HG Milling Head

1. REVERSING SWITCH is used to obtain clockwise or counter clockwise rotation of spindle.
   Note: Due to back gear construction, when machine is running in low speed range; spindle rotation is opposite to that of high speed range. Therefore forward on your reversing switch becomes reverse switch in low speed range.

2. SPINDLE BRAKE
   Lever con be moved in either direction to stop spindle; however, when locking spindle, lever should be moved to right or left and then raised.
   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 left on with brake in locked position.

3. HIGH LOW SPEED CLUTCH CONTROL is cirectly in front of motor. When knob is in position, as shown on picture, clutch is in high speed position. To put clutch into low speed position turn lever to the extreme right. It is necessary to rotate spindle while engaging high speed clutch. This can be accomplished by either turning spindle nose by hand or by turning drawbar knob using wrench, providing drawbar is pulled up tightly.
   CAUTION : Do not shift clutch while motor is running.

4. BACK GEAR CONTROL is used in conjunction with the high low speed clutch control above back gear control handle is stamped IN and OUT. When back gear control handle is in OUT position, which is the position furthest from face of machine, then HIGH LOW speed clutch control should be locatd as illustrated in photograph. With these controls in position as explained, head is set for operation in high speed range (660-2720 RPM). When back gear control lever moved to IN position and HIGH LOW speed clutch control moved to extreme right then the head is ready for operation in the low speed range (80-325 RPM).