

OPERATION MANUAL

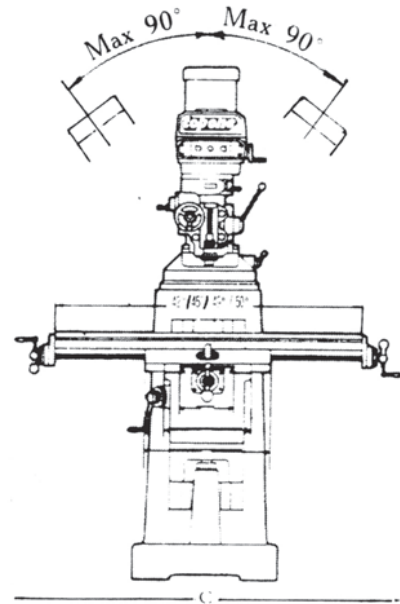
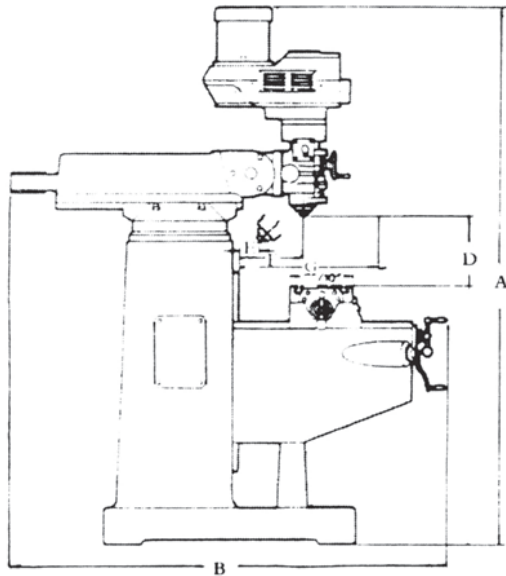
2EV



3EV



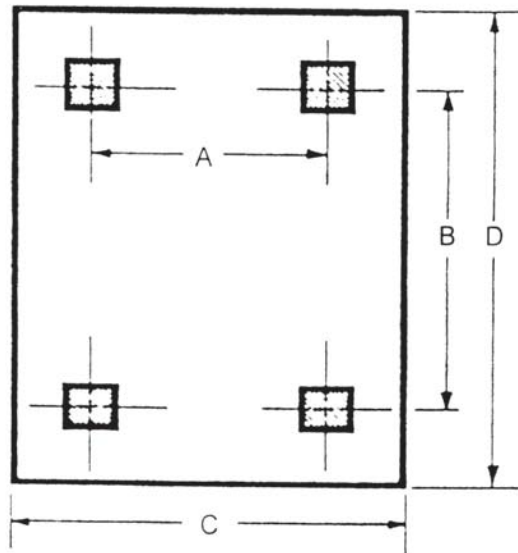
MAIN DIMENSIONS :



Model SIZE	2EV	3EV
A	2100mm(83")	2200mm(83")
B	1600mm(63")	1750mm(69")
C	1450mm(57")	1700mm(67")
D	0-406mm(0"-16")	0-406mm(0"-16")
E	0-305mm(0"-12")	0-610mm(0"-24")
F	171-482mm(7"-19")	255-720mm(10.5"-28.5")
G	228-533mm(9"-21")	254-864mm(10"-34")

INSTALLATION :

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



Model SIZE	2EV	3EV
A	555mm (21.85")	555mm (21.85")
B	740mm (29.13")	755mm (29.72")
C	615mm (24.21")	615mm (24.21")
D	950mm (37.40")	985mm (38.78")

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 HIGHLY 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.

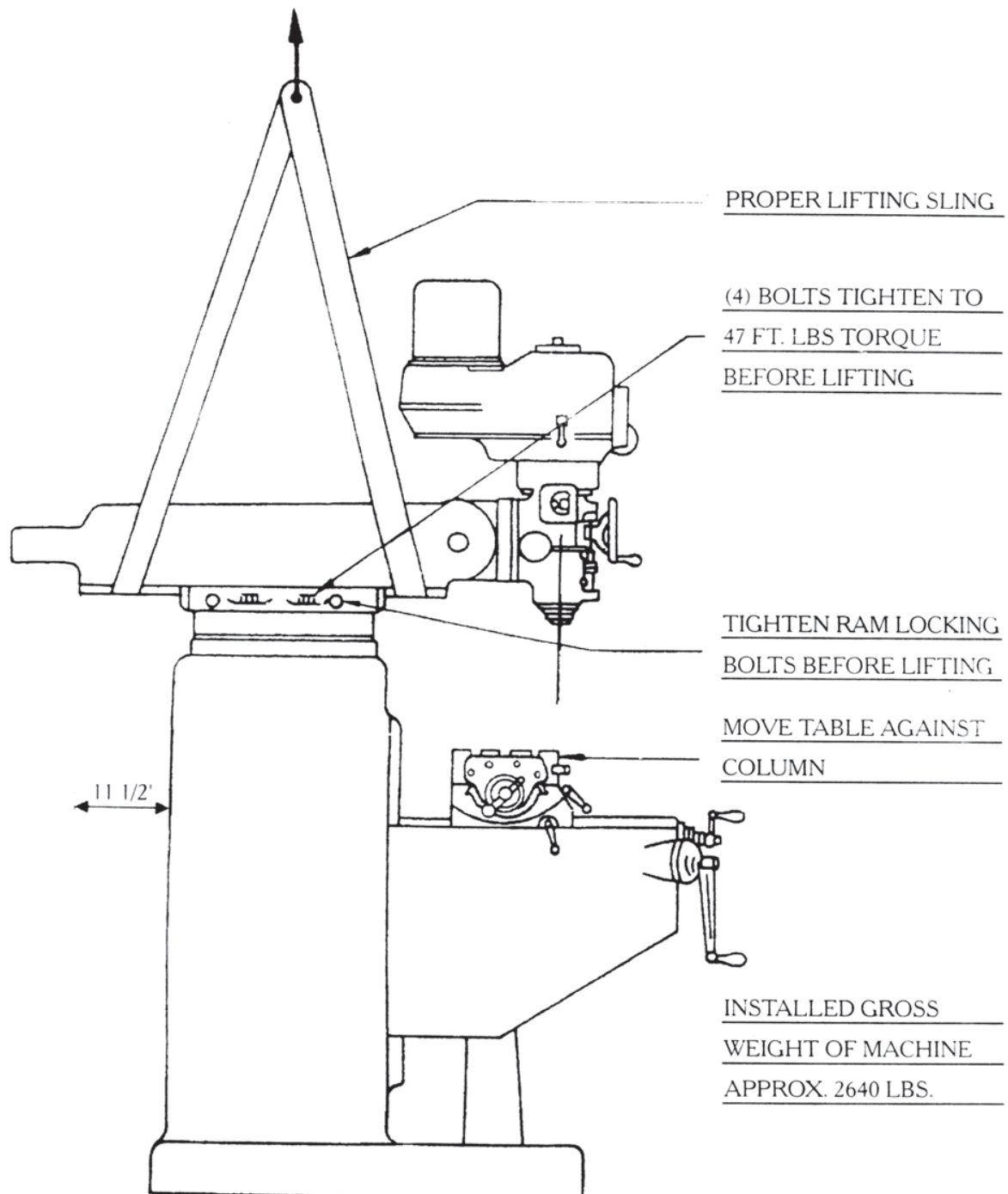
POSITIONING HEAD UPRIGHT :

Loosen four locknuts (#157), 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. Tighten 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

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 handles are sometimes turned to face the machine. In these cases the handles should be reversed before 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

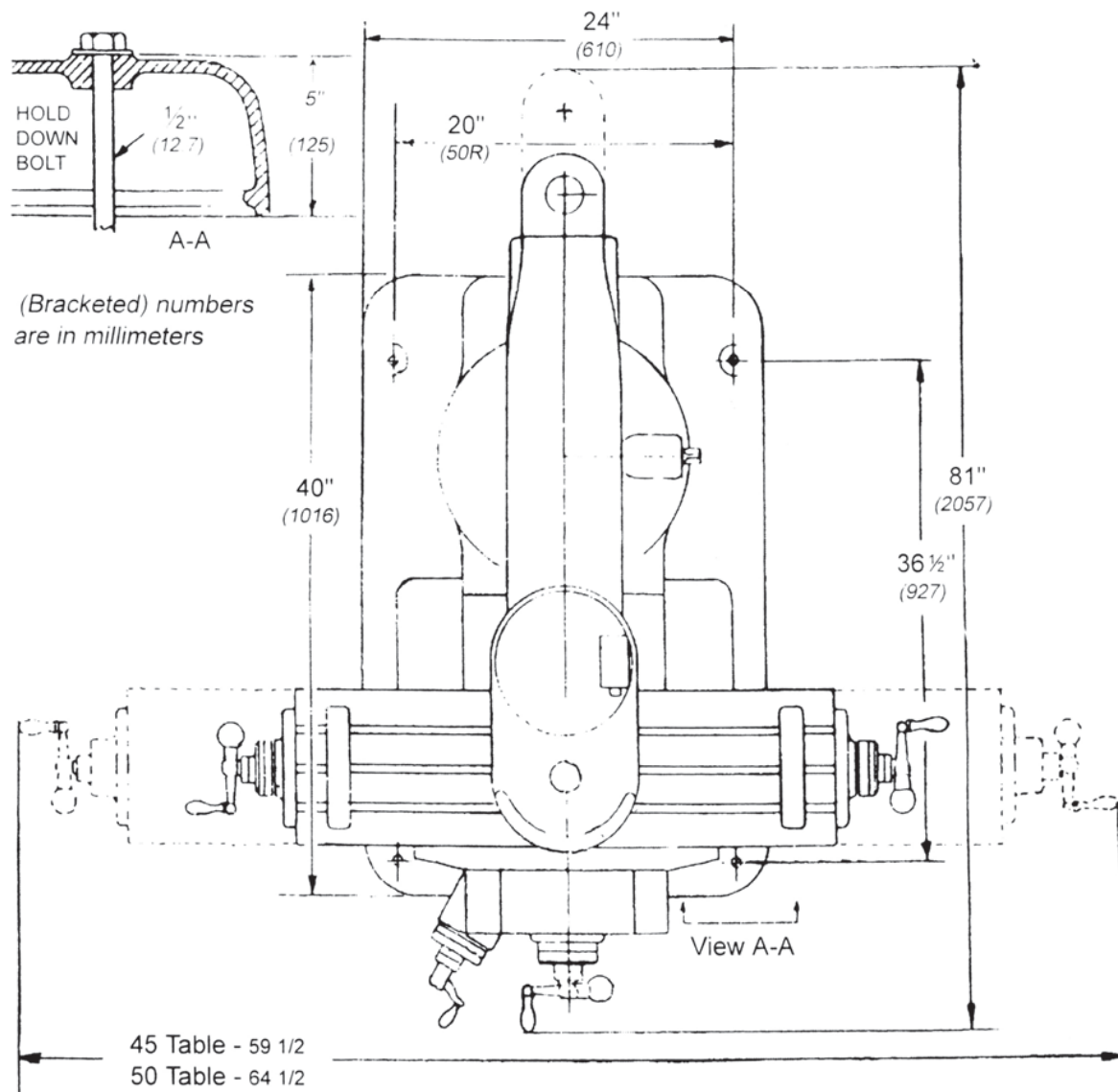


Figure 2. Installation Layout

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 on ram, by adjusting ram adapter through vertical adjusting wormshaft (#8.). Loosen four locknuts (#157), 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"

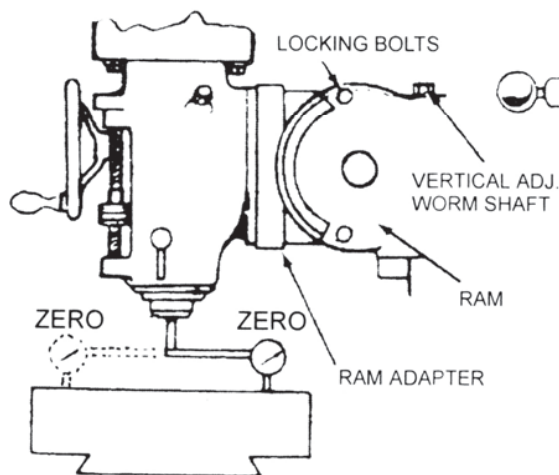


Figure 3. Head Alignment Y Axis

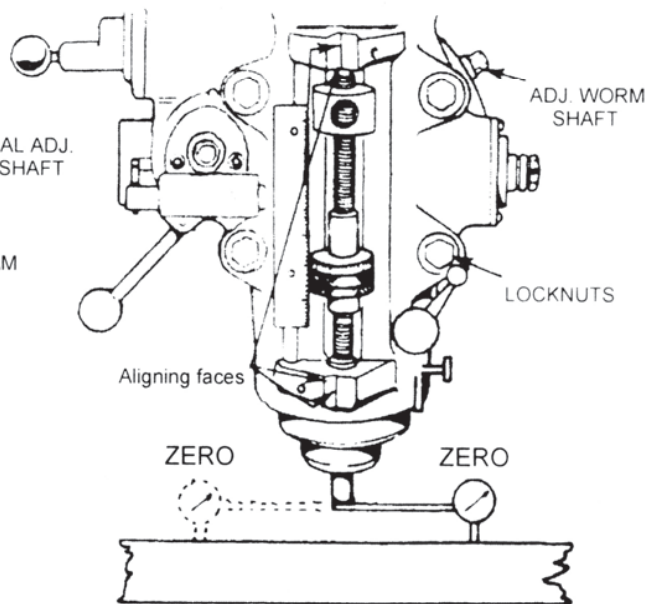


Figure 4. Head Alignment Y Axis

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) in the saddle, and an adjusting screw on the left side. To take up gib, tighten gib adjusting screw (#41) slightly and repeat until a slight drag is felt when moving the table by hand.

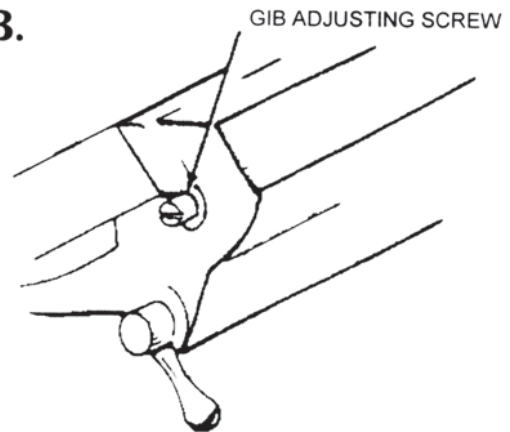


Figure 5.Saddle/Table Gib
(#43)

ADJUSTMENT OF SADDLE GIB.

A tapered gib (#49) 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.

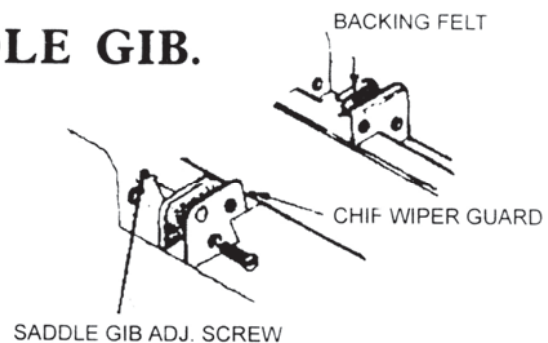


Figure 6.Saddle-Knee Gib
(#49)

ADJUSTMENT OF KNEE GIB.

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

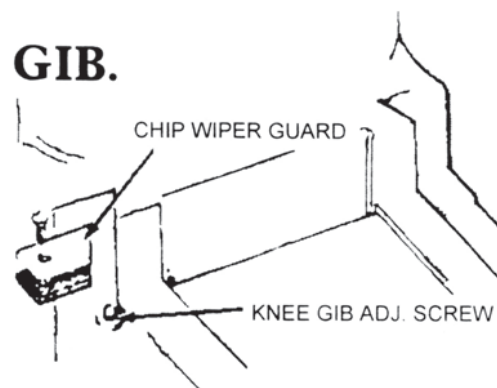
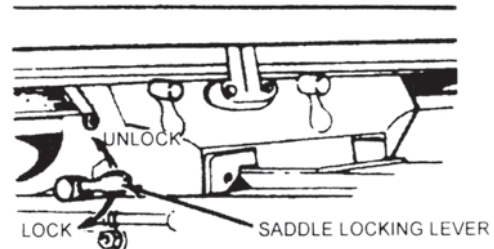


Figure 7, Knee-Column Gib
(#55)

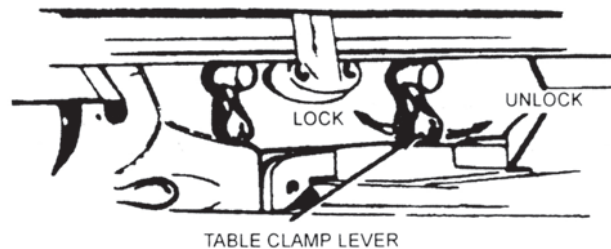
CLAMPING TABLE, SADDLE AND KNEE :

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

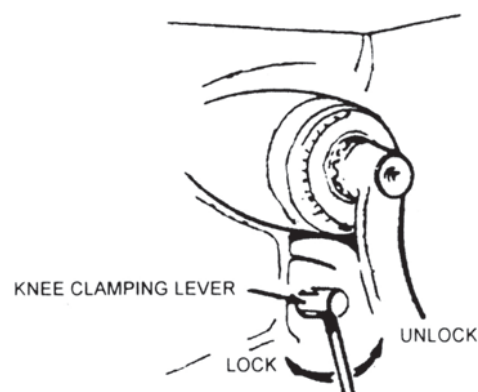
Excessive pressure can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.



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



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. Turn 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.

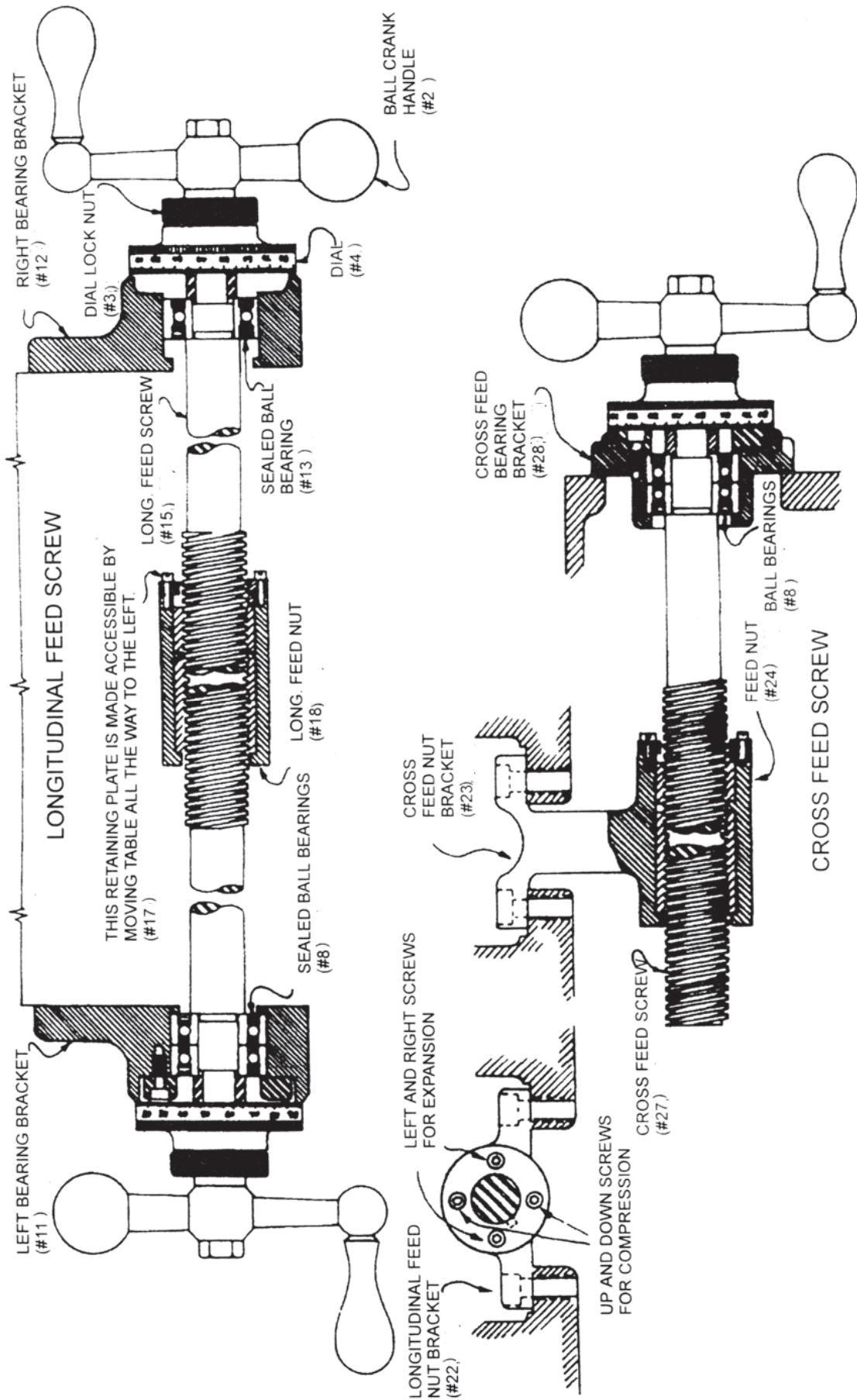


Figure 8. Longitudinal and Cross Feed Assembly

ASSEMBLY INSTRUCTIONS FOR MOUNTING 2EV 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.

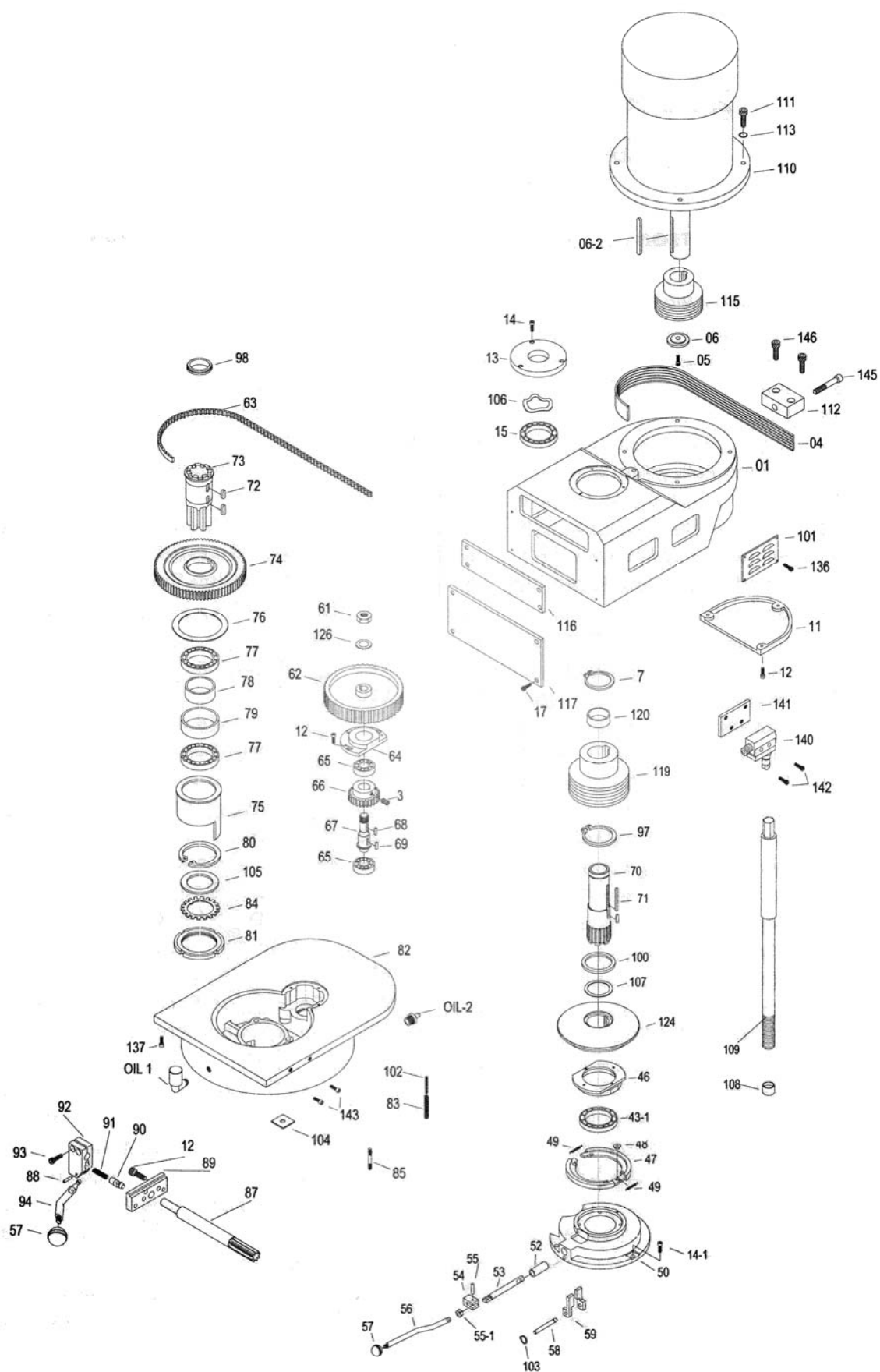
CAUTION

IMPROPER TIGHTENING OF THESE COULD CAUSE A CHOPPY
QUILL MOVEMENT

LUBRICATION :

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

PARTS LIST



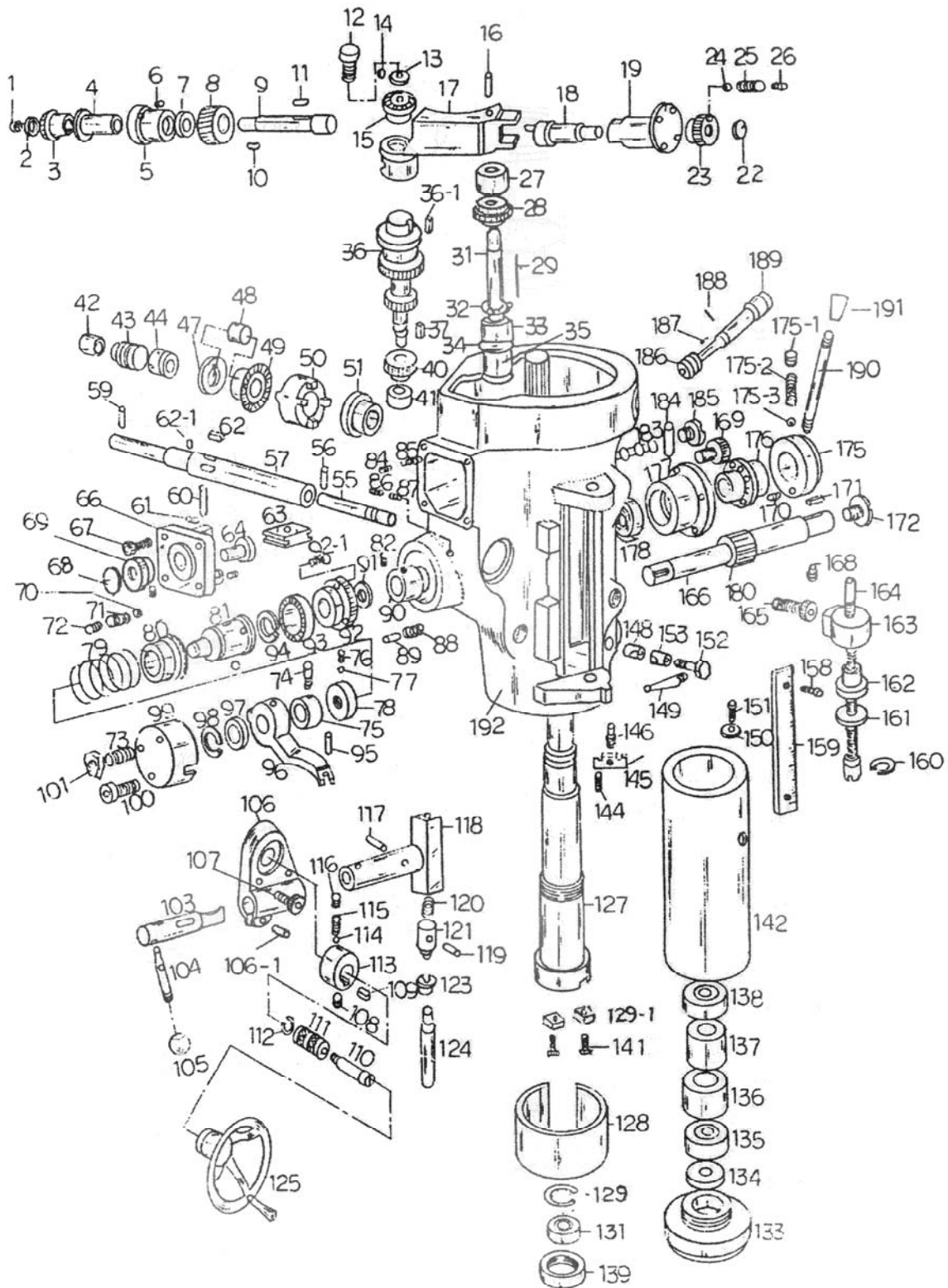
INVERTER HEAD TOP HOUSING (VS)

ITEM NO:	DESCRIPTION	ITEM NO:	DESCRIPTION
1	Be1t Housing	70	Timing Pulley C1utch
3	Socket Set Screw	71	Key
4	Be1t	72	Key
5	Socket Cap Screw	73	Spind1e Gear Hub
6	End Cover	74	Spind1e Bull Gea
06-2	Key	75	Bearing Sleeve
7	C Ring	76	Washer
11	Motor Pulley Cover	77	Ball Bearing
12	Socket Cap Screw	78	Bearing Spacer
13	Top Bearing Cap	79	Bearing Spacer
14	Socket Cap Screw (3 Req.)	80	C Ring
14-1	Ocket Cap Screw	81	Lock Nut
15	Ball Bearing	82	Gear Housing
17	Socket Cap Screw	83	Spring (3 Req.)
43	Ball Bearing	84	Lock Washer
46	Ball Bearing Housing	85	Bolt (3 Req.)
47	Brake Sheo Assemb1y	87	C1utch Gear Gear
48	Brake Sheo Pivot Sleeve	88	Pin
49	Spring	89	Hi-Low Pinion Block
50	Be1t Housing Base	90	Hi-Low Detent Punger
52	Brake Lock Bushing	91	Spring
53	Brake Lock shaft	92	Hi-Low Pinion Block
54	Hand1e Fix Block	93	Socket Cap Screw (2 Req)
55	Pin Spring	94	Hi-Low Shaft Crank
55-1	Nut	97	C Ring
56	Brake Lock Hand1e	98	Washer
57	Brake Ball Hand1e	100	Snap. Ring
58	Turning Block Shaft	101	Ventilator
59	Finger Pivot Stud	102	Set Belt
61	Jam Nut	103	C Ring
62	Timing Pulley	104	Copper Chip (2 Req.)
63	Be1t	105	Washer
64	Bull Gear Pinion Gear Cap	106	Plastic Washer
65	Ball Bearing(2 Req.)	107	Copper Chip
66	Bull Gear Pinion	108	Collar
67	Bull Gear Pinion Counter Shaft	109	Draw Bar
68	Key	110	Motor
69	Key	111	Socket Cap Screw

INVERTER HEAD TOP HOUSING(VS)

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

PARTS LIST



HEAD(B)

ITEM NO: DESCRIPTION

1	RD. HD. Screw
2	Bevel Pinion Washer
3	Feed Bevel Pinion
4	Feed Worm Gear Shaft Sleeve
5	Worm Cradle Bushing
6	Set Screw
7	Worm Gear Spacer(4 Req.)
8	Feed Drive Worm Gear
9	Feed Drive Worm Gear Shaft
10	Worm Shaft Key
11	Key
12	Locknut
13	Washer
14	Cluster Gear Key
15	Feed Reverse Bevel Gear
16	Feed Engage Pin
17	Worm Gear Cradle
18	Worm Gear Cradle Throw-out
19	Shaft
20	Plate
21	Cap Screw
22	Set Screw
23	Shift Crank
24	Steel Ball
25	Set Screw
26	Set Screw
27	Cluster Gear Shaft Upper Bearing
28	Cluster Gear Assembly
29	Cluster Gear Key
31	Cluster Gear Shaft
32	Snap Ring
33	Bevel Gear Bearing
34	Bevel Gear Thrust Spacer
36	Feed Driving Gear
37	Key
40	Feed Drive Gear
41	Needle Bearing
42	Bushing
43	Worm
44	Feed Worm Shaft Bushing
47	Feed Worm Shaft Thrust Washer
48	Bushing
49	Feed Reverse Bevel Gear

ITEM NO: DESCRIPTION

50	Feed Reverse Clutch
51	Feed Reverse Bevel Gear
52	Bushing
55	Reverse Clutch Rod
56	Roll Pin
57	Feed Worm Shaft
59	Pin
60	Feed Shift Rod
61	Kp.set Screw
62	Key
63	Feed Gear Shift Fork
64	Cluster Gear Shift Crank
66	Cluster Gear Cover
67	Cap Screw
68	Set Screw
69	Shift Crank
70	Steel Ball
71	Set Screw
72	Set Screw
73	Cap Screw(2 Req.)
74	Clutch Ring Pin(2 Req.)
75	Clutch Ring
76	Socket Set Screw
77	Brass Plug
78	Overload Clutch Locknut
79	Safety Clutchspring
80	Overload Clutch
81	Overload Clutch Sleeve
83	Roung Head Screw
84	Mock-it Lockscrew
85	Socket Set Screw
86	Lockscrew
87	Socket Set Screw
88	Compression Spring
89	Overload Clutch Lever Spring Plunger
90	Quill Pinion Shaft Bushing
91	Pinion Shaft Worm Gear Spacer
92	Overload Clutch Worm Gear
93	Overload Clutch Ring
94	Snap Ring
95	Dowel Pin
96	Overload Clutch Trip Lever
97	Overload Clutch Washer

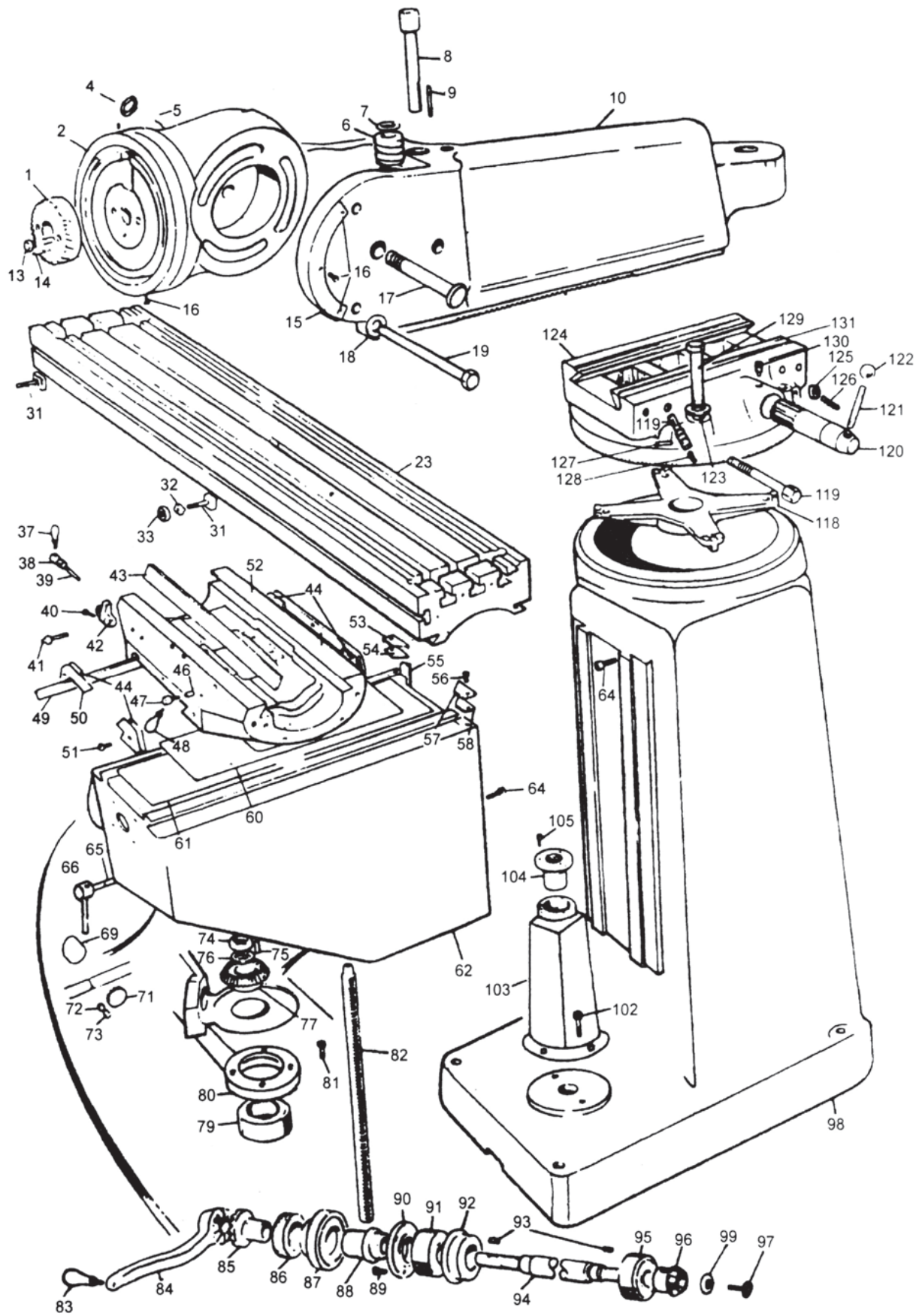
HEAD (B)

ITEM NO: DESCRIPTION

98	Snap Ring
99	Clutch Arm Cover
100	Socket Set Screw
101	Chem Blacked Locknut
102	Pin
103	Cam Rod
104	Trip Handle
105	Black Plastic Ball
106	Feed Trip Bracket
107	Cap Screw
108	Socket Set Screw
109	Key
110	Feed Reverse Knob Stud
111	Reverse Knob
112	Snap Ring
113	Handwheel Clutch
114	Steel Ball
115	Compression Spring
116	Handwheel Clutch Spring Screw
117	Roll Pin
118	Cam Rod Sleeve Assy
119	Roll Pin
120	Compression Spring
121	Trip Plunger
123	Trip Plunger Bushing
124	Feed Trip Plunger
125	Handwheel
127	Spindle
128	Quill Skirt
129-1	Quill Lock
131	Bearing
133	Nose-piece
134	Spindle Dirt Shield
135	Bearung
136	Bearing Spacer
137	Bearing Spacer
138	Bearing
139	Spindle Dirt Shield
140	Spindle Nut
141	Screw
142	Quill
144	Snap Ring

ITEM NO: DESCRIPTION

145	Spindle Block(2 Req.)
146	Set Screw(2 Req.)
148	Quill Lock Sleeve
149	Lock Handle
151	Felt Washer
152	Quick Lock Bolt
153	Quill Lock Sleeve Tapped
155	T-bolt Assy
156	Lower Clamping Bolt Spacer(2 Req.)
157	Locknut
158	Chem Blacked RD.HD. Screws(2 Req.)
159	Micrometer Scale
160	Snap Ring
161	Quill Micro-stop Nut
162	Micromete Nut
163	Quill Stop Knob
164	Quill Stop Micro-screw
165	Screw
166	Quill Pinion Shaft
168	Spring Pin
169	RD. Head Screw(2 Req.)
170	Roll Pin
171	Key
172	Pinion Shaft Hub Screw
173	Steel Ball
174	Compression Spring
175	Rack Feed Handle Hub
176	Pinion Shaft Hub Sleeve
177	Spring Cover
178	Clock Spring (clock Spring Assy.)
181	Socket Set Screw
182	Lockscrew
183	Reverse Trip Ball Lever
184	Feed Reverse Trip Plunger
185	Reverse Trip Ball Lever Screw
186	Worm Gear
187	Key
188	Socket Set Screw
189	ADJ Worm Shaft
190	Pinion Shaft Hub Handle
191	Black Plastic Ball Handles
192	Quill Housing



BASIC MACHINE (C)

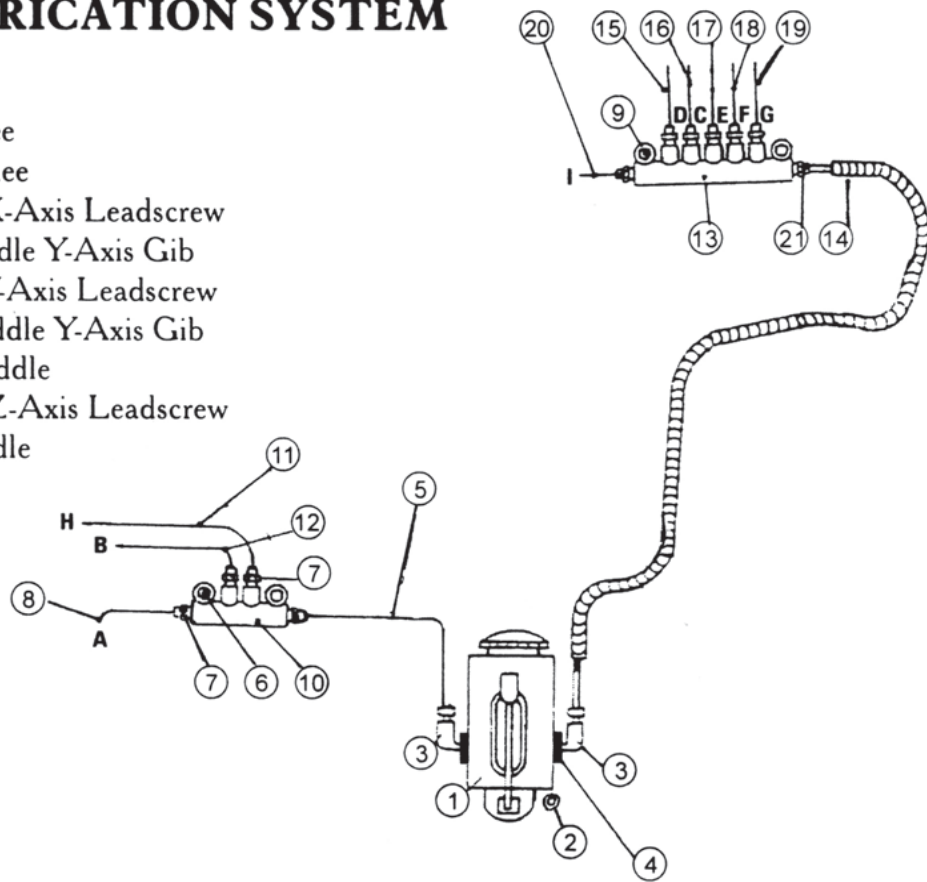
ITEM No:	PARTS No:	DESCRIPTION	ITEM No:	PARTS No:	DESCRIPTION
1	5033	Quill Housing Adjusting Gear	69	4001-1	Knee Lock Plunger
2	5019	Ram Adapter	71	4045	Knee Binder Plug(Plastic)
4	5027	Nut	72	4049	Dog Point Set Screw
6	5020	Vertical Adjusting Worm	73	4049	Set Screw
7	5022	Worm Thrust Washer(2 Req.)	74	4023	Jam Nut
8	5021	Vertical Adjusting Worm Shaft	75	4020	Key
9	5023	Worm Key	76	4022	Washer
10	5018	Ram	77	4019	Bevel Gear
13	5035	Socket Cap Screw(2 Req.)	79	4040	Sealed Ball Bearing
14	5034	Roll Dowel Pin	80	4039	Bearing Retainer Ring
15	5043	Angle Plate	81	4041	Socket Head Cap Screw
16	5032	Round HD Drive Screw(5 Req.)	82	4021	Elevating Screw Assembly
17	5026	Adapter Pivot Pin	83	4003	Handle
18	5029	Chamfered & Hardened Washer (7 Req.)	84	4002	Elevating Crank
19	5028	Adapter Locking Bolt(3 Req.)	85	4013	Gearshaft Clutch Insert
23	2001	Table 42" or 48"	86	2016	Dial Lock Nut
			87	4010	Dial with 100 Graduations
			88	4011	Dial Holder
31	2031	Stop Piece T-Bolt(3 Req.)	89	4009	Socket Head Cap Screw
32	2030	Table Stop Piece(2 Req.)	90	2011	Bearing Retaining Ring
33	2032	Hex Nut(3 Req.)	91	2008	Grease Sealed Bearing
37	3031	Table Lock Bolt Handle	92	4006	Bearing Cap
38	3030	Saddle Lock Bolt	93	4015	Key
39	3032	Saddle Lock Plunger	94	4017	Elevating Shaft for 12" Knee
40	3036	Socket HD Cap Screw(2 Req.)	95	2008	Grease Sealed Bearing
41	3028	Gib Adjusting Screw(3 Req.)	96	4014	Bevel Pinion
42	3035	Table Stop Bracket	97	4042	Set Screw
43	3026	Saddle/Table Gib	98	1001	Column
44	3037	Felt Wipers(4 Req.)	99	4017-1	Washer
46	3029	Table Lock Plunger	102	4027	Socket Head Cap Screw
47	3030	Table Lock Bolt	103	4026	Pedestal
48	3031	Table Lock Bolt Handle	104	4024	Elevating Screw Nut
49	3027	Saddle/Knee Gib	105	4025	Socket Head Cap Screw
50	3027-2	Saddle Knee Wiper Plate(4 Req.)	118	5003	Spider
51	3038	Oval Head Screw(8 Req.)	119	2010	Ram Lock Stud
52	3001	Saddle	120	5012	Ram Pinion
53	4028-2	Left Hand Column Wiper Holder	121	5013	Ram Pinion Handle
54	4028-1	Knee Wiper Felt	122	5014	Plastic Ball
55	4038	Knee/Column Gib	123	5005	Chamfered Hardened Washer
56	4029	Allen Cap Screw(2 Req.)	124	5001	Turret
57	4028-3	Right Hand Column Wiper Holder	125	5007-1	Gib Screw Nut
58	4028	Knee Wiper Felt	126	5007	Gib Screw
60	3040	Chip Guards-Upper	127	5009	Lock Bar
61	3039	Chip Guards-Lower	128	5009-1	Screw
62	4001	Knee 12"	129	5004	Locking Bolt
64	1001-1	Stop Screw	130	5015	Ram Pinion Screw
65	4048	Knee Lock Shaft Assembly	131	5002	Ram/Turret Gib

LEADSCREW ASSEMBLY (D)

ITEM NO:	PARTS NO:	DESCRIPTION
<hr/>		
1	2004	Jam Nut(3 Req.)
2	2018	Ball Crank Handle(3 Req.)
3	2016	Dial Lock Nut(3 Req.)
4	2012	Dial with 2000 Graduations(3 Req.)
5	2014	Dial Holder(3 Req.)
6	2036	Socket Cap Screw(6 Req.)
7	2011	Bearing Retainer Ring(2 Req.)
8	2008	Grease Sealed Ball Bearings(2 Req.)
9	2027	Roll Pin(10 Req.)
10	2026	Socket Cap Screw(12 Req.)
11	2006	Left Bearing Bracket
12	2006	Right Bearing Bracket
13	2008	Grease Seal Ball Bearing
14	2003	Key(3 Req.)
15	2002	Longitudinal Feed Screw 42" 、 49" 、 50"
16	3021	Socket Cap Screw(8 Req.)
17	3019	Cross Feed Nut Retaining Plate(2 Req.)
18	3020	Longitudinal Feed Nut
20	3041	Key(2 Req.)
21	3024	Socket Cap Screw(8 Req.)
22	3023	Longitudinal Feed Nut Bracket
23	3022	Cross Feed Nut Bracket
24	3020	Cross Feed Nut
26	3005-1	Stop Screw
27	3002	Gross Feed Screw for 12" Knee
28	3005	Cross Feed Bearing Bracket

SHOT LUBRICATION SYSTEM

- A. Left Knee
- B. Right Knee
- C. Saddle X-Axis Leadscrew
- D. Left Saddle Y-Axis Gib
- E. Saddle Y-Axis Leadscrew
- F. Right Saddle Y-Axis Gib
- G. Front Saddle
- H. Saddle Z-Axis Leadscrew
- I. Back Saddle



Item NO.	Parts NO.	Description	Q.T.Y.
1	9001A	Shot Lubricator	1
2	9008	Socket Head Cap Screw	4
3	9003	Thimble Set	7
4	9014	Washer	2
5	9002	Aluminum Pipe	1
6	9008	Socket Head Cap Screw	2
7	9005	Elbow Joint	3
8	9002	Aluminum Pipe	1
9	9008	Socket Head Cap Screw	2
10	9004	A Type Distributor	1
11	9013	Nylon Tubing	1
12	9002	Aluminum Pipe	1
13	9006	A Type Distributor	1
14	9007	Outside Steel Wire Soft Tube	1
15	9002	Aluminum Pipe	1
16	9002	Aluminum Pipe	1
17	9002	Aluminum Pipe	1
18	9002	Aluminum Pipe	1
19	9002	Aluminum Pipe	1
20	9002	Aluminum Pipe	1
21	9009	Washer	19
22	9010	Pipe Chip	19
23	9011	Joint of Ratio Distribution	6