

VM15A Mechanical

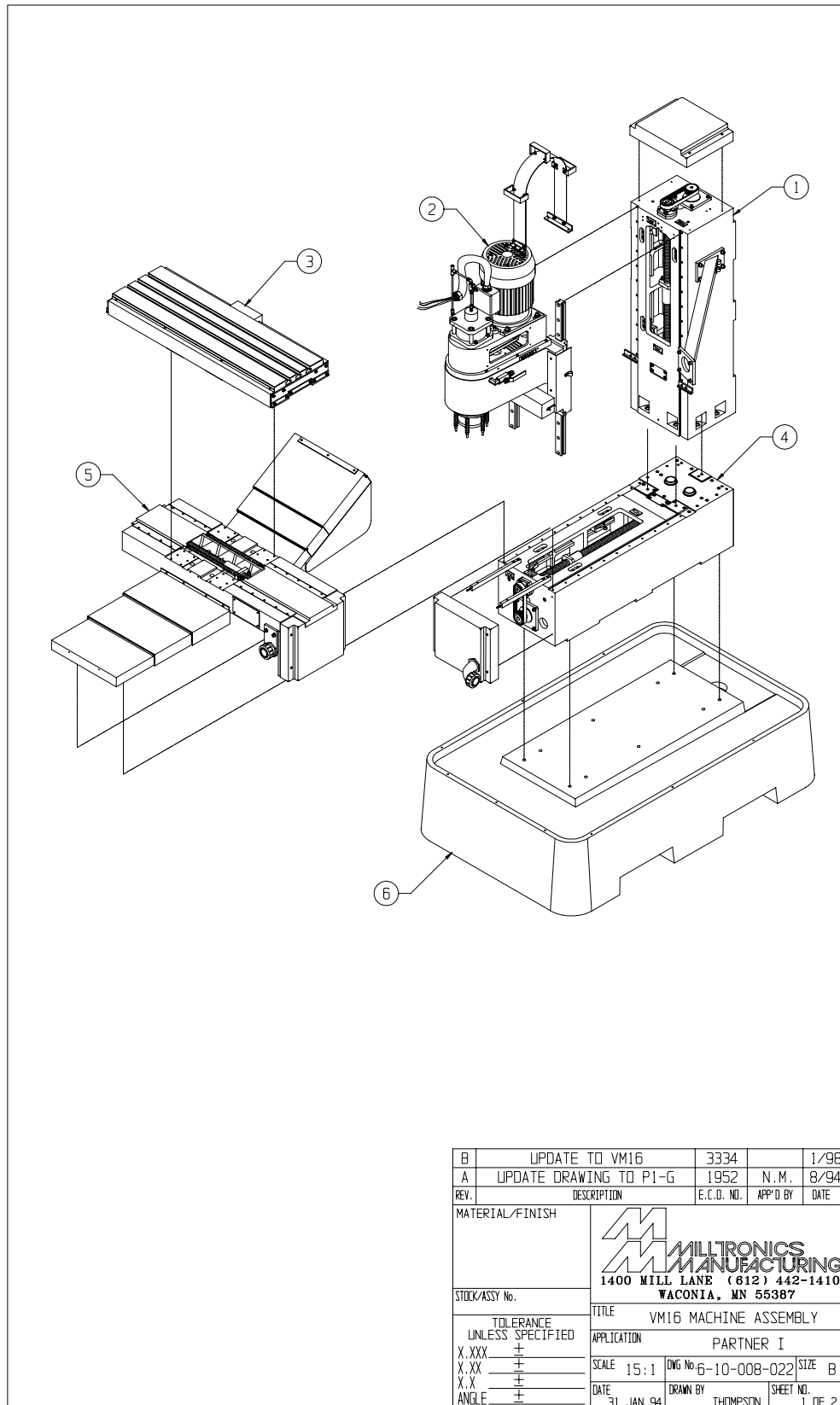
11-17-99
Rev 2

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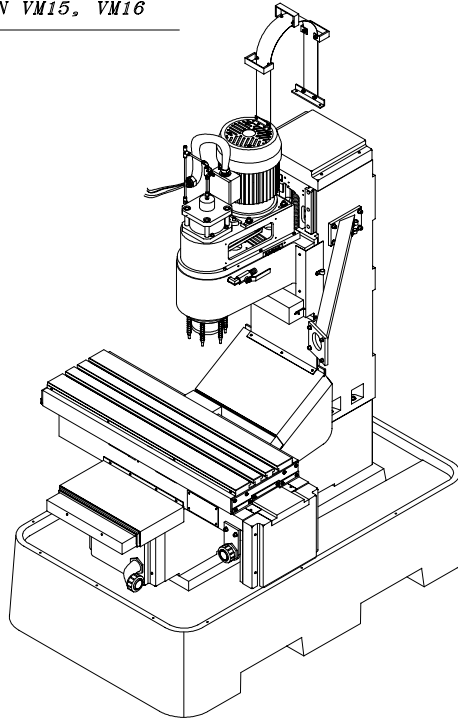
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Manual Discrepancy Sheet

Basic Machine Assembly



THIS ASSEMBLY USED ON VM15, VM16



PARTS LIST

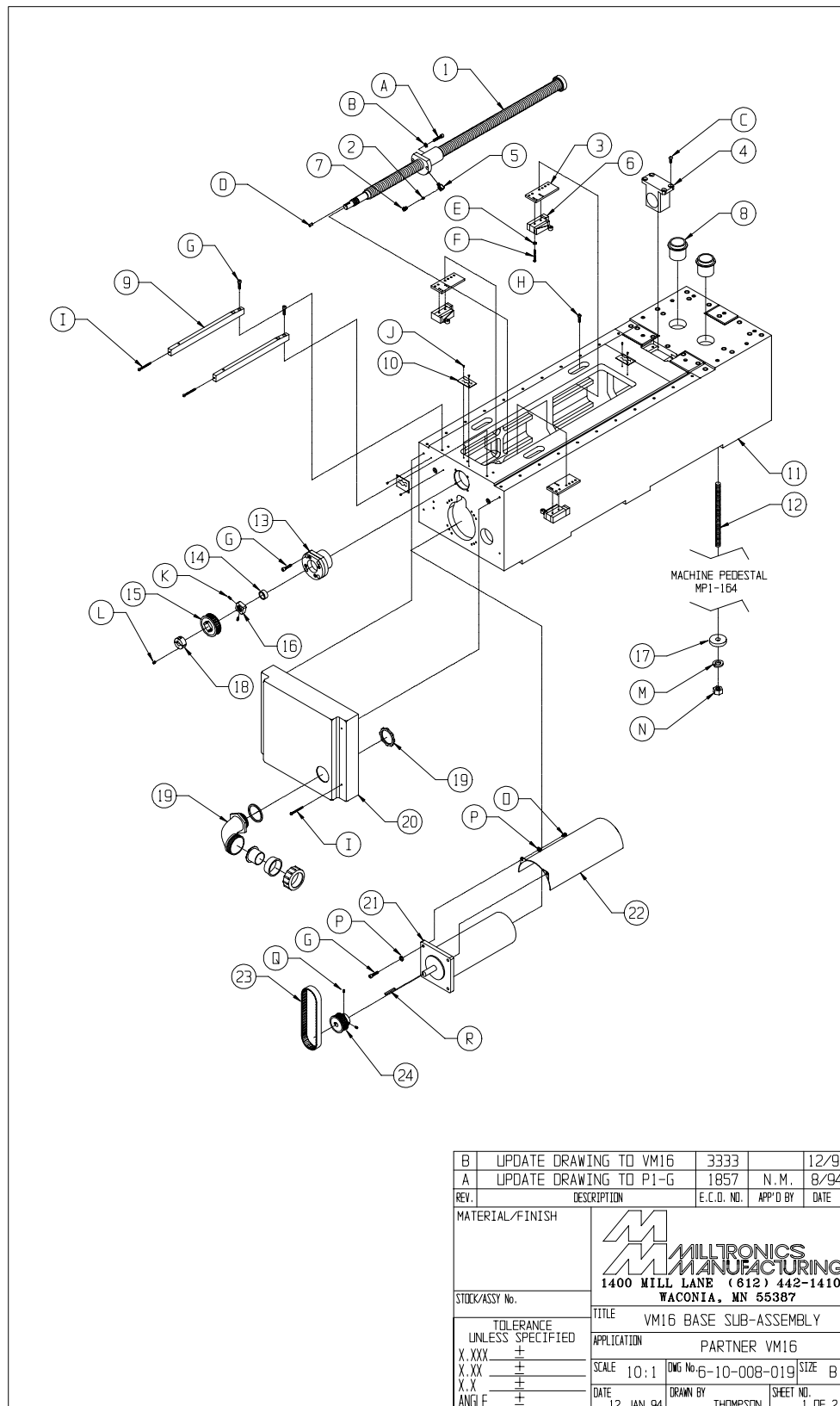
No.	DRAWING No.	DESCRIPTION
1	6-10-008-020	VM16 COLUMN SUB-ASSEMBLY
2	6-10-008-005	HEAD ASSEMBLY
3	SEE TABLE	TABLE SUB-ASSEMBLY
4	6-10-008-019	VM16 BASE SUB-ASSEMBLY
5	6-10-008-047	VM16 SADDLE & WAY COVER SUB-ASSEMBLY
6	6-01-008-218	MACHINE PEDESTAL, MP1-164

TABLE ASSEMBLIES

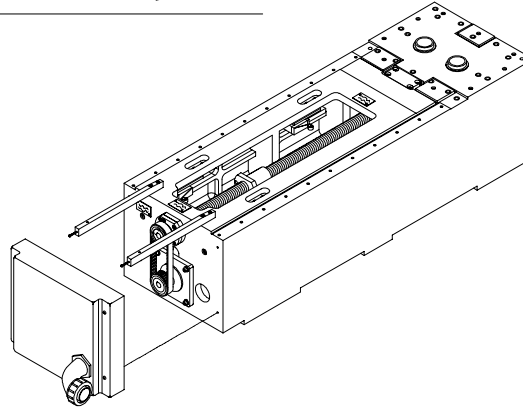
No.	DRAWING No.	DESCRIPTION
1	6-10-008-033	VM16 TABLE SUB-ASSEMBLY
2	6-10-008-048	VM16 30" TRAVEL TABLE SUB-ASSEMBLY

B	UPDATE TO VM16		3334	1/98	
A	UPDATE DRAWING TO P1-G		1952	N.M.	8/94
REV.	DESCRIPTION		E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH			 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.					
TOLERANCE UNLESS SPECIFIED			TITLE VM16 MACHINE ASSEMBLY		
X .XXX ±			APPLICATION PARTNER I		
X .XX ±			SCALE 15:1 DWG No 6-10-008-022 SIZE B		
X .X ±			DATE 31 JAN 94 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE ±					

Machine Base Assembly



THIS ASSEMBLY USED ON VM15, VM16



PARTS LIST

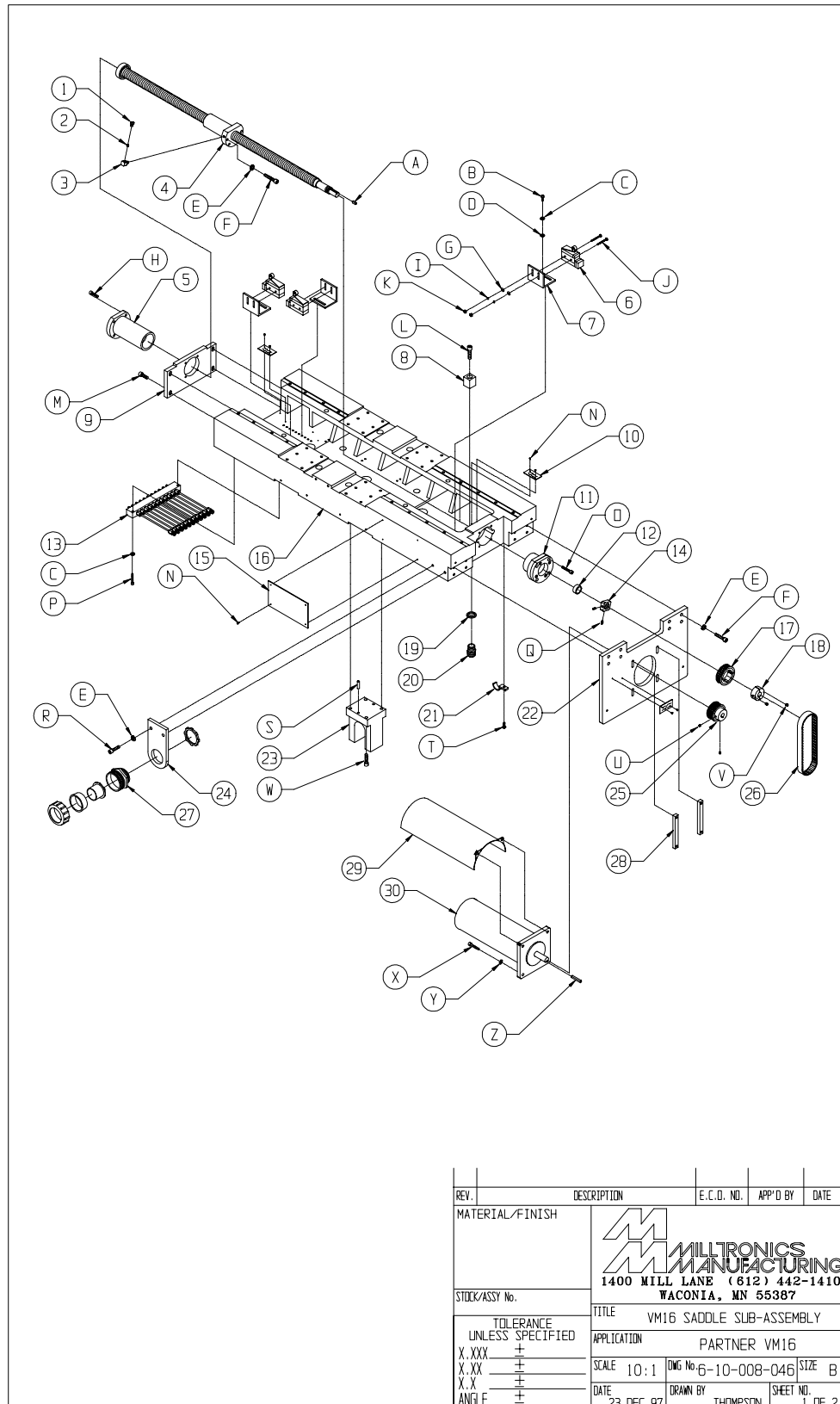
No.	QTY	STOCK No.	DESCRIPTION
1	1	6-10-018-027	BALL SCREW ASSEMBLY
2	1	NU-38	FERRULE DOUBLE
3	3	MPT-36	X-AXIS SWITCH PLATE
4	1	MX1-28	Y&Z BALL SCREW RADIAL SUPPORT-MACHINED
5	1	NU-118	1/8 NPT-5/16-24 ELBOW
6	3	SW-149	LIMIT SWITCH
7	1	NU-108	COMPRESSION FITTING
8	2	MP-56	PVC COUPLING
9	2	MP6-91	Y-AXIS WAY COVER BRACKET
10	3	LB-27	MOTOR PULLEY WARNING LABEL
11	1	MX1-34	35 mm. BASE - MACHINED
12	10	HD-60	1/2-13 x 9 3/8 THREADED ROD
13	1	6-10-018-029	BEARING CUP ASSEMBLY
14	1	MP1-107	BEARING LOCK NUT SPACER
15	1	PY-126	TB20LD75 PULLEY (1008)
16	1	MP1-94	BALL SCREW LOCK NUT
17	10	MP-138	PEDESTAL REINFORCING PLATE
18	1	PY-34	5/8 I.D. 1008 BUSHING
19	1	WX-218	1-1/2 IN. 90° R/A FITTING
20	1	VM1-08	MOTOR PULLEY COVER
21	1	MD-02	26 IN-Lb. MOTOR
22	1	MM-16	MOTOR DRIP COVER
23	1	BT-09	187LD75 BELT TIMING BELT
24	1	PY-125	16LD75 W/5/8 ID 3/16 KEY MPB

HARDWARE LIST

No.	QTY	DESCRIPTION
A	2	5/16-18 x 1 1/4 SHCS
B	2	5/16 LOCK WASHER
C	4	1/4-20 x 5/8 BHCS
D	1	3/16 x 3/16 x 1/2 KEY
E	6	No. 8 LOCK WASHER
F	6	8-32 x 1 BHCS
G	12	1/4-20 x 1 SHCS
H	6	1/4-20 x 3/4 BHCS
I	6	10-32 x 2 1/4 BHCS
J	6	1/4 DRIVE RIVET
K	2	10-32 x 3/16 BRASS TIPPED SHSS
L	2	1/4-20 x 1/2 SHSS
M	10	1/2 LOCK WASHER
N	10	1/2-13 HEX NUT
O	2	1/4-20 x 1/2 BHCS
P	6	1/4 LOCK WASHER
Q	2	1/4-20 x 1/4 SHSS
R	1	3/16 x 3/16 x 1 1/2 KEY

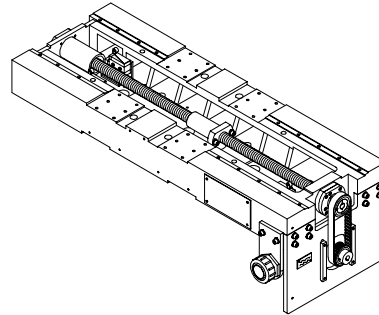
B	UPDATE DRAWING TO VM16	3333		12/97
A	UPDATE DRAWING TO P1-G	1857	N.M.	8/94
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLIRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 BASE SLB-ASSEMBLY		
X.XXX + - X.XX + - X.X + - ANGLE + -		APPLICATION PARTNER VM16		
		SCALE 10:1 DWG No. 6-10-008-019 SIZE B		
		DATE 12 JAN 94 DRAWN BY THOMPSON SHEET NO. 2 OF 2		

Machine Saddle Assembly



HARDWARE LIST		
No.	QTY	DESCRIPTION
A	1	3/16 x 3/16 x 1/2 KEY
B	6	10-32 x 5/8 SHCS
C	8	No. 10 LOCK WASHER
D	6	No. 10 FLAT WASHER
E	12	5/16 LOCK WASHER
F	10	5/16-18 x 1 1/4 SHCS
G	6	No. 8 FLAT WASHER
H	4	1/4-20 x 5/8 SHCS
I	6	No. 8 LOCK WASHER
J	6	8-32 x 1 1/4 BHCS
K	6	No. 8 NUT
L	1	3/8-16 x 1 1/4 SHCS
M	4	5/16-18 x 3/4 SHCS
N	10	1/4 DRIVE RIVET
O	4	1/4-20 x 1 SHCS
P	2	10-32 x 1 1/4 SHCS
Q	2	10-32 x 3/16 BRASS TIPPED SHSS
R	2	5/16-18 x 1 SHCS
S	2	1/4 x 1 DOWEL PIN
T	1	1/4-20 x 1/2 BHCS
U	2	1/4-20 x 1/4 SHSS
V	2	1/4-20 x 1/2 SHSS
W	4	5/16-18 x 1 1/2 SHCS
X	4	1/4-20 x 1 1/2 SHCS
Y	4	1/4 LOCK WASHER
Z	1	3/16 x 3/16 x 1 1/2 KEY

THIS ASSEMBLY USED ON VM15, VM16

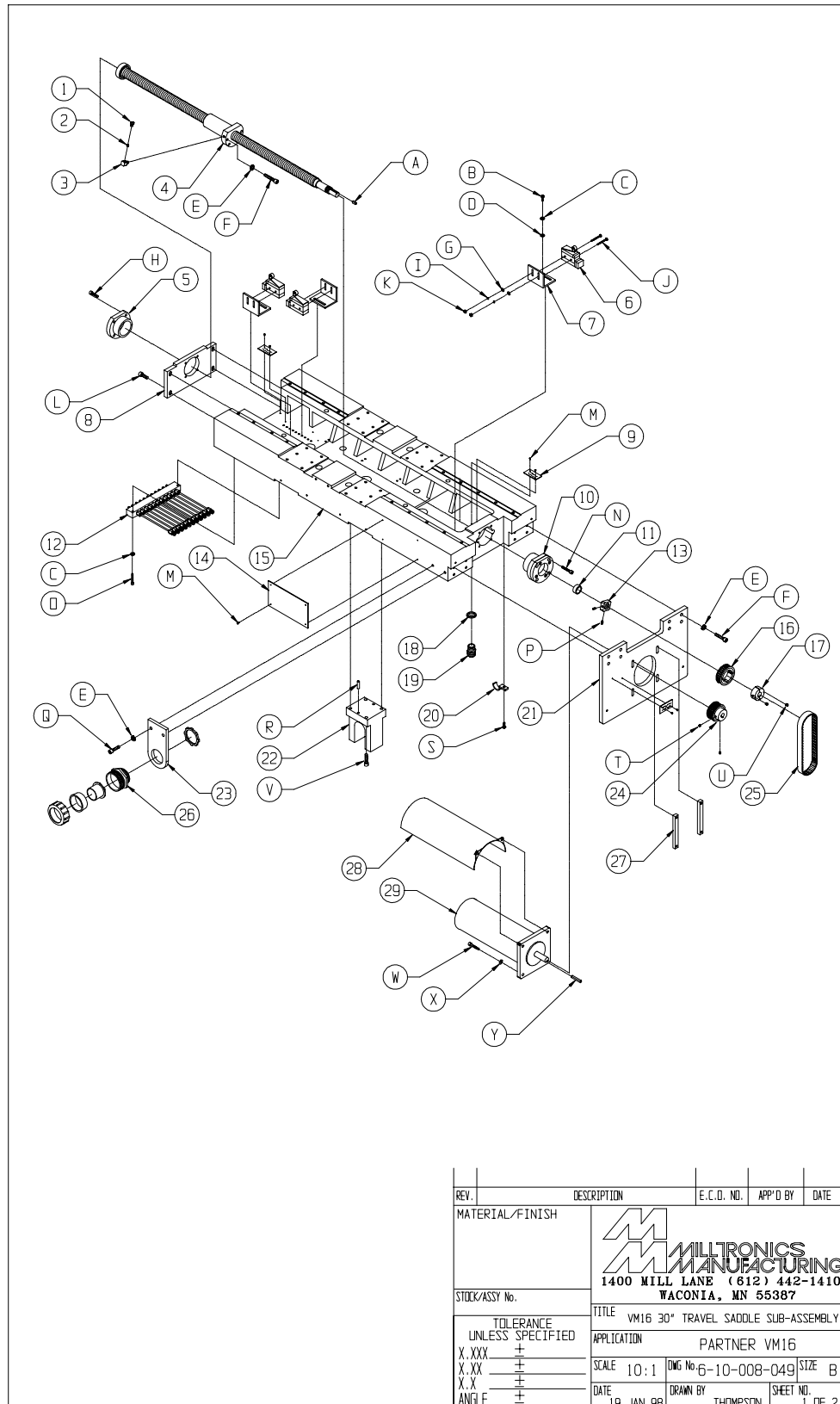


MANIFOLD ASSEMBLY	
DRAWING No.	DESCRIPTION
6-10-018-043	X & Y AXIS GREASE MANIFOLD ASSEMBLY
6-10-018-047	X & Y AIR/OIL MANIFOLD ASSEMBLY
6-10-018-049	VM X & Y AXIS OIL MANIFOLD ASSEMBLY

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-108	COMPRESSION FITTING
2	1	NU-38	FERRULE DOUBLE
3	1	NU-118	1/8 NPT 5/16-24 ELBOW
4	1	6-10-018-027	BALL SCREW ASSEMBLY
5	1	MP6-43	X-AXIS RADIAL SUPPORT
6	3	SW-149	LIMIT SWITCH
7	3	MP1-96	LIMIT SWITCH MOUNTING BRACKET
8	1	MP1-76	X-AXIS HARD STOP
9	1	MP6-40	X-AXIS RADIAL SUPPORT BRACKET
10	3	LB-27	PULLEY MOTOR WARNING LABEL
11	1	6-10-018-029	BEARING CUP ASSEMBLY
12	1	MP1-107	BEARING LOCK NUT SPACER
13	1	SEE TABLE	X & Y AXIS MANIFOLD ASSEMBLY
14	1	MP1-94	BALL SCREW LOCK NUT
15	1	LB-83	CHIP/SWarf CAUTION LABEL
16	1	MX6-15	SADDLE MACHINED
17	1	PY-126	TB20L075 1008 PULLEY
18	1	PY-34	5/8 I.D. 1008 BUSHING
19	1	WX-38	O-RING, 1/2 IN.
20	1	WX-23	CORD GRIP, 1/2 IN.
21	1	WX-126	1/2 IN. CLAMP
22	1	MP6-35	X-AXIS MOTOR MOUNT PLATE
23	1	MX1-11	BALL SCREW CARRIER - MACHINED
24	1	MPT-78	SEALTITE SADDLE BRACKET
25	1	PY-125	16L075 W/ 5/8 I.D. 3/16 KEY MPB
26	1	BT-09	187L075 TIMING BELT
27	1	WX-172	1-1/2 IN. ULTRAFLEX STRAIGHT
28	2	MP-68	MOTOR MOUNT BRACKETS
29	1	MM-16	MOTOR DRIP COVER
30	1	MD-02	26 IN-LB MOTOR

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 SADDLE SUB-ASSEMBLY		
X.XXX +		APPLICATION PARTNER VM16		
X.XX +		SCALE 10:1	DWG No. 6-10-008-046	SIZE B
X.X +		DATE 5 JAN 98	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
ANGLE +				

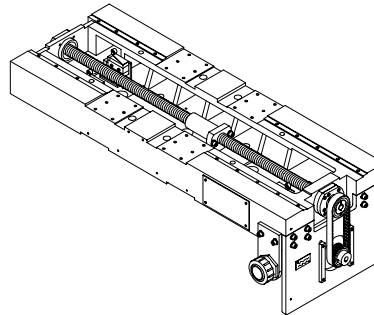
Machine Saddle Assembly – 30 Inch Travel



HARDWARE LIST

No.	QTY	DESCRIPTION
A	1	3/16 x 3/16 x 1/2 KEY
B	6	10-32 x 5/8 SHCS
C	8	No. 10 LOCK WASHER
D	6	No. 10 FLAT WASHER
E	12	5/16 LOCK WASHER
F	10	5/16-18 x 1 1/4 SHCS
G	6	No. 8 FLAT WASHER
H	4	1/4-20 x 5/8 SHCS
I	6	No. 8 LOCK WASHER
J	6	8-32 x 1 1/4 BHCS
K	6	8-32 HEX NUT
L	4	5/16-18 x 3/4 SHCS
M	10	1/4 DRIVE RIVET
N	4	1/4-20 x 1 SHCS
O	2	10-32 x 1 1/4 SHCS
P	2	10-32 x 3/16 BRASS TIPPED SHSS
Q	2	5/16-18 x 1 SHCS
R	2	1/4 x 1 DOWEL PIN
S	1	1/4-20 x 1/2 BHCS
T	2	1/4-20 x 1/4 SHSS
U	2	1/4-20 x 1/2 SHSS
V	4	5/16-18 x 1 1/2 SHCS
W	4	1/4-20 x 1 1/2 SHCS
X	4	1/4 LOCK WASHER
Y	1	3/16 x 3/16 x 1 1/2 KEY

THIS ASSEMBLY USED ON VM15, VM16



MANIFOLD ASSEMBLY

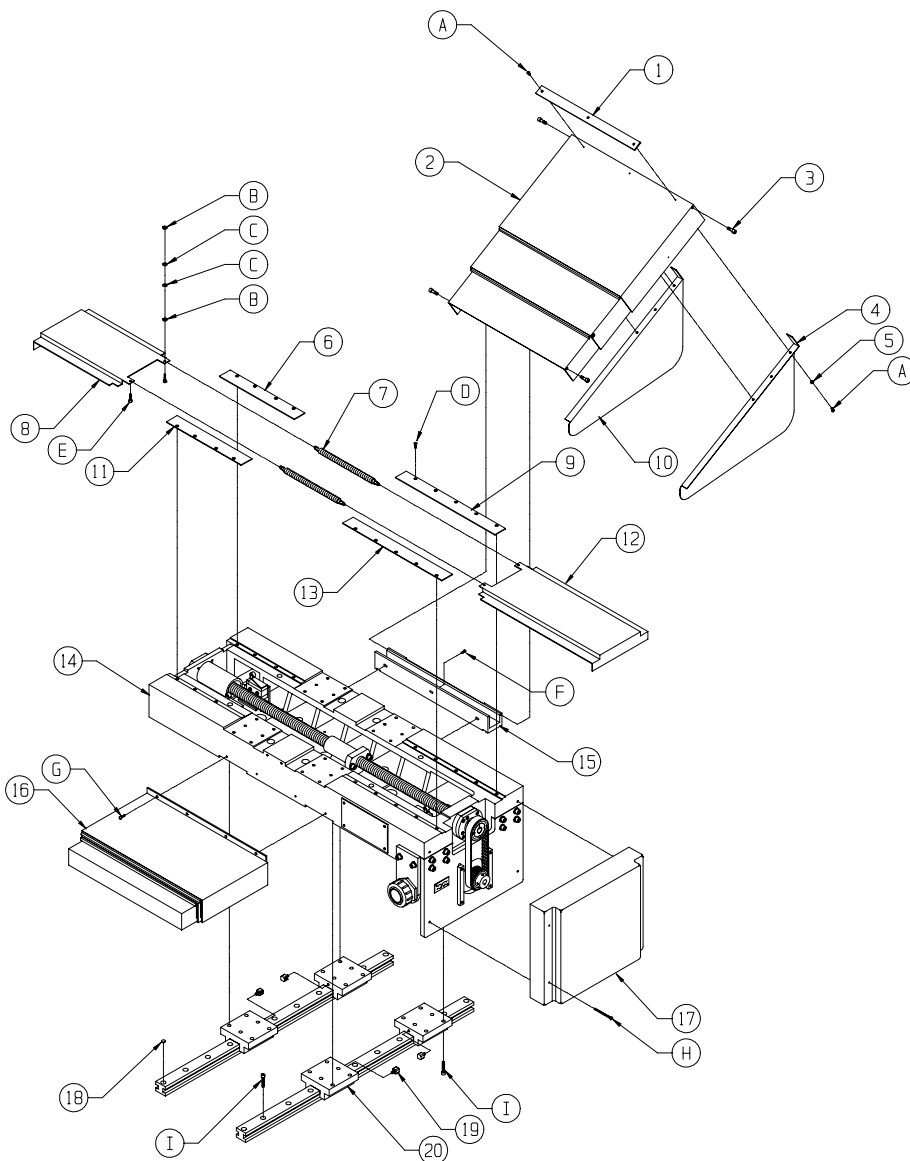
DRAWING No.	DESCRIPTION
6-10-018-043	X & Y AXIS GREASE MANIFOLD ASSEMBLY
6-10-018-047	X & Y AIR/OIL MANIFOLD ASSEMBLY
6-10-018-049	VM X & Y AXIS OIL MANIFOLD ASSEMBLY

PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-108	COMPRESSION FITTING
2	1	NU-38	FERRULE DOUBLE
3	1	NU-118	1/8 NPT 5/16-24 ELBOW
4	1	6-10-018-027	BALL SCREW ASSEMBLY
5	1	MP6-42	30" RADIAL SUPPORT
6	3	SW-149	LIMIT SWITCH
7	3	MP1-96	LIMIT SWITCH MOUNTING BRACKET
8	1	MP6-40	X-AXIS RADIAL SUPPORT BRACKET
9	3	LB-27	PULLEY MOTOR WARNING LABEL
10	1	6-10-018-029	BEARING CUP ASSEMBLY
11	1	MP1-107	BEARING LOCK NUT SPACER
12	1	SEE TABLE	X & Y AXIS MANIFOLD ASSEMBLY
13	1	MP1-94	BALL SCREW LOCK NUT
14	1	LB-83	CHIP/SWarf CAUTION LABEL
15	1	MX6-15	SADDLE MACHINED
16	1	PY-126	TB20LD75 1008 PULLEY
17	1	PY-34	5/8 I.D. 1008 BUSHING
18	1	WX-38	O-RING, 1/2 IN.
19	1	WX-23	CORD GRIP 1/2 IN.
20	1	WX-126	1/2 IN. CLAMP
21	1	MP6-35	X-AXIS MOTOR MOUNT PLATE
22	1	MX1-11	BALL SCREW CARRIER - MACHINED
23	1	MPT-78	SEALTITE SADDLE BRACKET
24	1	PY-125	16LD75 W/ 5/8 I.D. 3/16 KEY MPB
25	1	BT-09	187LD75 TIMING BELT
26	1	WX-172	1-1/2 IN. ULTRAFLEX, STRAIGHT
27	2	MP-68	MOTOR MOUNT BRACKETS
28	1	MM-16	MOTOR DRIP COVER
29	1	MD-02	26 IN-LB MOTOR

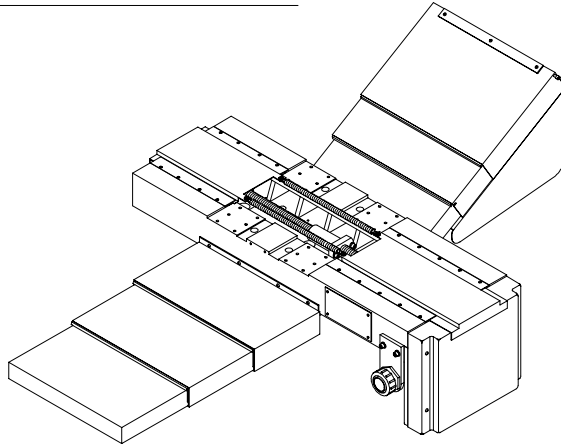
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 30" TRAVEL SADDLE SUB-ASSEMBLY		
X .XXX ±		APPLICATION PARTNER VM16		
X .XX ±		SCALE 10:1	DWG No. 6-10-008-049	SIZE B
X .X ±		DATE 19 JAN 98	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
ANGLE ±				

Saddle & Way Cover Assembly



REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SADDLE & WAY COVER SUB-ASSEMBLY		
X .XXX X .XX X .X ANGLE		APPLICATION PARTNER VM16		
± ± ± ±		SCALE 10:1 DWG No 6-10-008-047 SIZE B		
		DATE 6 JAN 98 DRAWN BY THOMPSON SHEET NO. 1 OF 2		

THIS ASSEMBLY USED ON VM15, VM16



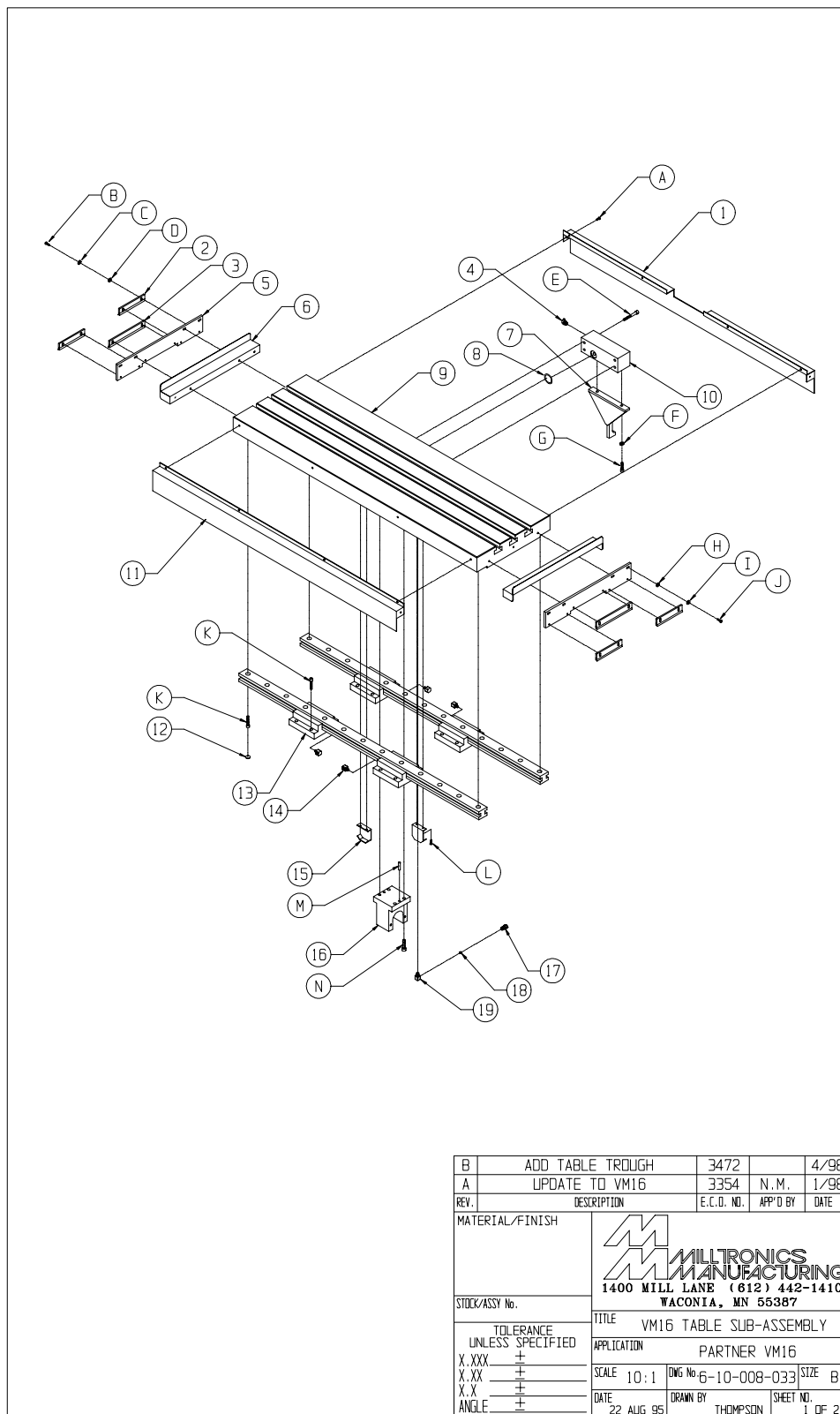
PARTS LIST				
No.	QTY	STOCK No.	DESCRIPTION	
1	1	MP1-72	Y WAY COVER SADDLE MOUNT	
2	1	MP1-217	REAR Y-AXIS WAY COVER - TELEFLEX	
3	4	HD-44	1/4 x 3/8 SHOULDER BOLT	
4	1	MP1-202	REAR Y-AXIS SIDE COVER - RIGHT	
5	6	HD-58	RUBBERIZED WASHER	
6	1	MP6-65	X-AXIS WAY COVER BRACKET LEFT REAR	
7	2	HD-33	X-AXIS WAY COVER SPRING	
8	1	MP6-39	X-AXIS WAY COVER LEFT	
9	1	MP6-37	X-AXIS WAY COVER BRACKET RIGHT REAR	
10	1	MP1-203	REAR Y-AXIS SIDE COVER - LEFT	
11	1	MP6-36	X-AXIS WAY COVER BRACKET LEFT FRONT	
12	1	MP6-38	X-AXIS WAY COVER RIGHT	
13	1	MP6-66	X-AXIS WAY COVER BRACKET RIGHT FRONT	
14	1	SEE TABLE	SADDLE SUB-ASSEMBLY	
15	1	MP1-200	SADDLE WAY COVER BRACKET	
16	1	MP1-167	Y-AXIS WAY COVER - TELEFLEX	
17	1	VM1-08	MOTOR COVERS	
18	22	MP6-13	HSR35 RAIL PLUG	
19	4	NU-107	OIL FITTING	
20	2	MP1-171	HSR35CB2SSC0820L-II RAILS	

SADDLE ASSEMBLY OPTIONS	
DRAWING No.	DESCRIPTION
6-10-008-046	VM16 SADDLE SUB-ASSEMBLY
6-10-008-049	VM16 30" TRAVEL SADDLE SUB-ASSEMBLY

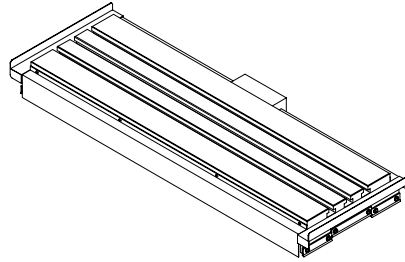
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	9	8-32 x 1/4 BHCS
B	8	10-32 HEX NUT
C	8	No. 10 FLAT WASHER
D	18	8-32 x 1/4 FHMS
E	4	10-32 x 5/8 SHCS
F	3	8-32 x 1/2 BHCS
G	4	10-24 x 1/2 BHCS
H	4	10-32 x 2 1/4 BHCS
I	46	M8-1.25 x 30 mm. SHCS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SADDLE & WAY COVER SUB-ASSEMBLY		
X .XXX ±		APPLICATION PARTNER VM16		
X .XX ±		SCALE 10:1	DWG No 6-10-008-047	SIZE B
X .X ±		DATE 6 JAN 98	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
ANGLE ±				

Milling Table Assembly



THIS ASSEMBLY USED ON VM15, VM16



PARTS LIST

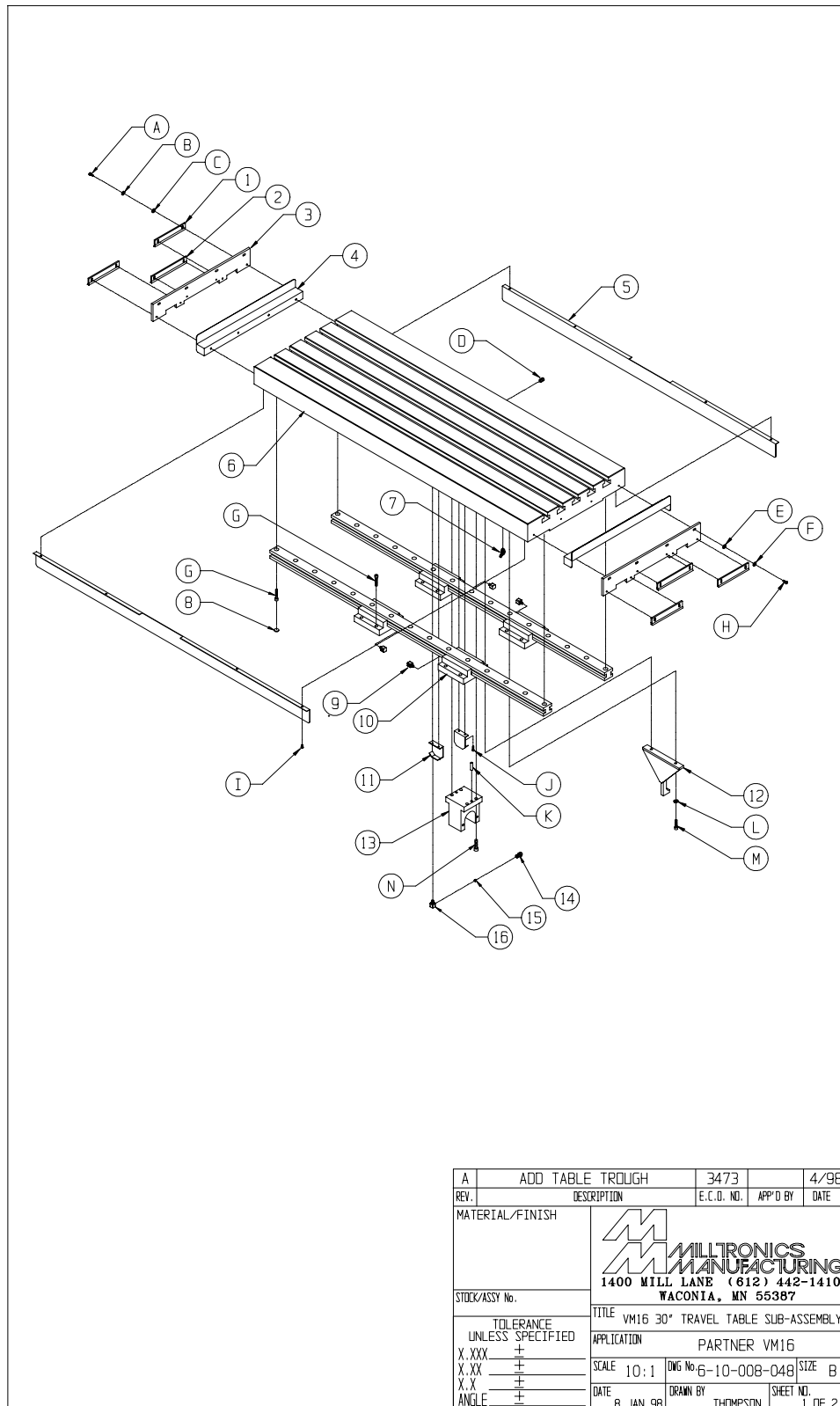
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-206	REAR X-AXIS TABLE & SADDLE COVER
2	4	MP1-244	VM16 SADDLE WIPER
3	2	MP1-248	VM17 SADDLE WIPER - UPPER
4	1	NU-145	1/8 NPT GREASE FITTING
5	2	MP1-243	VM16 WIPER PLATE
6	2	MP-406	12 In. TABLE TROUGH
7	1	MP1-204	SADDLE WAY COVER BRACKET SWEEPER
8	1	WX-161	O-RING
9	1	MX1-40	METRIC 12 x 40 TABLE-MACHINED
10	1	MP1-205	25 In. SWEEPER ATTACHMENT BLOCK
11	1	MP1-159	X-AXIS TABLE & SADDLE COVER
12	26	MP6-13	HSR35 RAIL PLUGS
13	2	MP6-06	HSR35CB2SSC01000L-II RAIL
14	4	NU-107	OIL FITTING
15	2	MP6-45	EXTENDED TRAVEL X-AXIS DOG
16	1	MX6-16	X-AXIS BALL CARRIER
17	1	NU-108	COMPRESSION FITTING
18	1	NU-38	FERRULE DOUBLE
19	1	NU-118	1/8 NPT 5/16-24 ELBOW

HARDWARE LIST

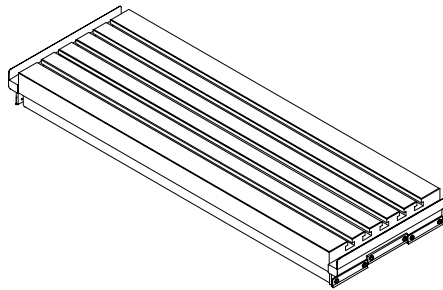
No.	QTY	DESCRIPTION
A	8	8-32 x 3/8 BHCS
B	12	10-32 x 1/2 BHCS
C	12	No. 10 LOCK WASHER
D	12	No. 10 FLAT WASHER
E	4	1/4-20 x 2 SHCS
F	2	1/4 LOCK WASHER
G	2	1/4-20 x 3/4 SHCS
H	8	No. 8 FLAT WASHER
I	8	No. 8 LOCK WASHER
J	8	8-32 x 5/8 BHCS
K	50	M8-1.25 x 30 mm. SHCS
L	4	6-32 x 1/4 BHCS
M	2	1/4 x 1 DOWEL PIN
N	4	5/16-18 x 1 1/4 SHCS

B	ADD TABLE TROUGH	3472		4/98
A	UPDATE TO VM16	3354	N. M.	1/98
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 TABLE SUB-ASSEMBLY		
X.XXX	±	APPLICATION PARTNER VM16		
X.XX	±	SCALE 10:1	DWG No 6-10-008-033	SIZE B
X.X	±	DATE 22 AUG 95	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
ANGLE	±			

Milling Table Assembly – 30 Inch Travel



THIS ASSEMBLY USED ON VM15, VM16



PARTS LIST

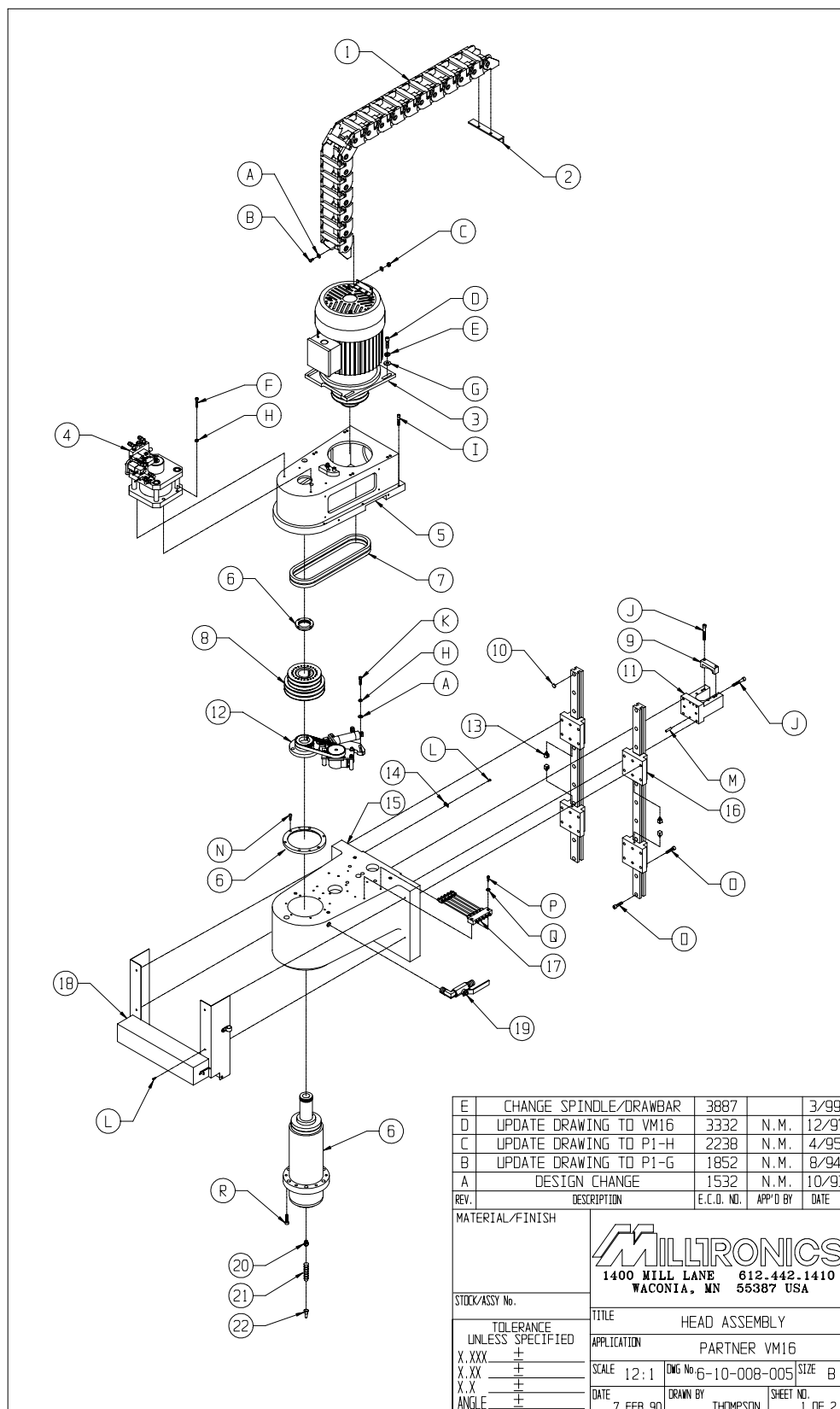
No.	QTY	STOCK No.	DESCRIPTION
1	4	MP1-247	VM17 SADDLE WIPER - LOWER
2	2	MP1-248	VM16/17 SADDLE WIPER - UPPER
3	2	MP1-246	VM17 WIPER PLATE - LEFT
4	2	MP-407	16 IN. TABLE - TROUGH
5	2	MP1-113	30 IN. FRONT EXT. TABLE PLATE
6	1	MX6-32	METRIC 45 x 16 TABLE - MACHINED
7	1	NU-145	1/8 NPT GREASE FITTING
8	30	MP6-13	HSR35 RAIL PLUGS
9	4	NU-107	OIL FITTING
10	2	MP6-41	HSR35CB2SSC0124QL-II RAIL
11	2	MP6-45	EXTENDED TRAVEL X-AXIS DOG
12	1	MP1-204	SADDLE WAY COVER BRACKET SWEEPER
13	1	MX6-16	X-AXIS BALL CARRIER
14	1	NU-108	COMPRESSION FITTING
15	1	NU-38	FERRULE DOUBLE
16	1	NU-118	1/8 NPT 5/16-24 ELBOW

HARDWARE LIST

No.	QTY	DESCRIPTION
A	12	10-32 x 1/2 BHCS
B	12	No. 10 LOCK WASHER
C	12	No. 10 FLAT WASHER
D	1	1/8-27 SHPP
E	8	No. 8 FLAT WASHER
F	8	No. 8 LOCK WASHER
G	54	M8-1.25 x 30 mm. SHCS
H	8	8-32 x 5/8 BHCS
I	8	8-32 x 1/4 BHCS
J	4	6-32 x 1/4 BHCS
K	2	1/4 x 1 DOWEL PIN
L	2	1/4 LOCK WASHER
M	2	1/4-20 x 3/4 SHCS
N	4	5/16-18 x 1 1/4 SHCS

A	ADD TABLE TROUGH	3473		4/98
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 30" TRAVEL TABLE SUB-ASSEMBLY		
		APPLICATION PARTNER VM16		
X.XXX	±	SCALE 10:1		DWG NO 6-10-008-048
X.XX	±			SIZE B
X.X	±	DATE 8 JAN 98		DRAWN BY THOMPSON
ANGLE	±			SHEET NO. 2 OF 2

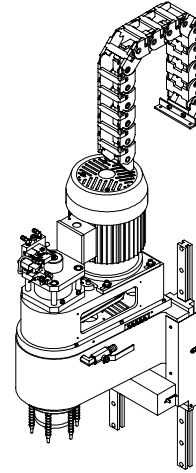
Machine Head Assembly



THIS ASSEMBLY USED ON VM15, VM16, VM17

PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	MP-484	SPINDLE CABLE TRACK
2	1	MP-316	SPINDLE CABLE SUPPORT BRACKET
3	1	6-10-018-071	5/6K RPM 7 H.P. MOTOR ASSEMBLY
4	1	6-10-018-062	NU-182 DRAWBAR CYLINDER ASSEMBLY
5	1	6-10-018-024	BELT HOUSING ASSEMBLY
6	1	6-10-018-067	SETCO SPINDLE ASSEMBLY
7	1	BT-35	A33 MATCHED BELTS
8	1	PY-161	SPINDLE PULLEY 7 1/2 H.P.
9	1	MP-109	Z BALL SCREW SAFETY CATCH
10	22	MP6-13	HSR35 RAIL PLUGS
11	1	MX1-11	Z-AXIS CARRIER - MACHINED
12	1	6-10-018-068	SETCO SPINDLE ORIENT, RIGID TAP ASSY.
13	4	NU-107	OIL FITTING
14	4	NU-36	5/32 OILER CLAMP
15	1	MX1-39	7011 MACHINE HEAD - MACHINED
16	2	MP1-171	HSR35CB2SSC0820L-II RAILS
17	1	SEE TABLE	Z-AXIS MANIFOLD ASSEMBLY
18	1	6-10-018-028	ROLLER SHADE ASSEMBLY
19	1	6-10-008-038	VM16 FLOOD HANDLE SUB-ASSEMBLY
20	6	NU-111	1/4 LOCK LINK 1/8 NPT
21	24	MA-22	LOCK LINK HOSE
22	6	MA-21	1/8 NOZZLE



Z-AXIS MANIFOLD ASSEMBLIES

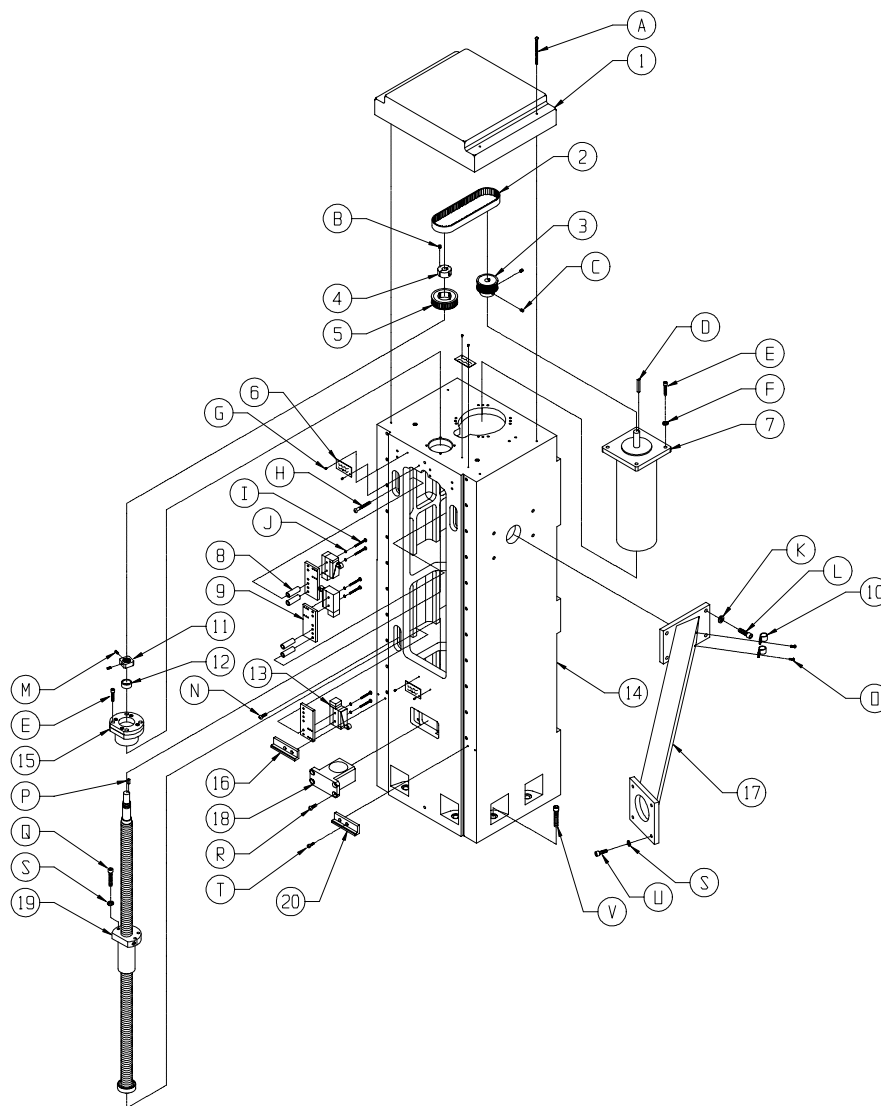
DRAWING No.	DESCRIPTION
6-10-018-044	Z-AXIS GREASE MANIFOLD ASSEMBLY
6-10-018-050	VM Z-AXIS OIL MANIFOLD ASSEMBLY
6-10-018-048	Z-AXIS AIR/OIL MANIFOLD ASSEMBLY

HARDWARE LIST

No.	QTY	DESCRIPTION
A	7	1/4 FLAT WASHER
B	4	1/4-20 x 3/4 BHCS
C	4	1/4-20 NYLOCK NUT
D	4	3/8-16 x 1 1/4 SHCS
E	4	3/8 LOCK WASHER
F	4	1/4-20 x 1 1/4 SHCS
G	4	3/8 FLAT WASHER
H	7	1/4 LOCK WASHER
I	6	1/4-20 x 1 1/2 SHCS
J	6	5/16-18 x 1 1/2 SHCS
K	3	1/4-20 x 1 SHCS
L	8	8-32 x 3/8 BHCS
M	2	1/4 x 1 DOWEL PIN
N	6	1/4-20 x 3/4 SHCS
O	46	M8-1.25 x 30 mm SHCS
P	2	10-32 x 5/8 SHCS
Q	2	No. 10 LOCK WASHER
R	6	5/16-18 x 1 1/4 SHCS

E	CHANGE SPINDLE/DRAWBAR	3887		3/99
D	UPDATE DRAWING TO VM16	3332	N.M.	12/97
C	UPDATE DRAWING TO P1-H	2238	N.M.	4/95
B	UPDATE DRAWING TO P1-G	1852	N.M.	8/94
A	DESIGN CHANGE	1532	N.M.	10/93
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE HEAD ASSEMBLY		
X .XXX ±		APPLICATION PARTNER VM16		
X .XX ±		SCALE 12:1 DWG No. 6-10-008-005 SIZE B		
X .X ±		DATE 7 FEB 90 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE ±				

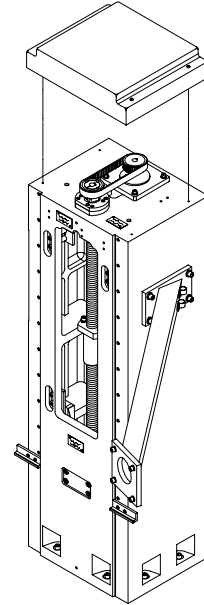
Machine Column Assembly



C	UPDATE DRAWING TO VM16	3330		12/97
B	UPDATE DRAWING TO P1-H	2250	N.M.	5/95
A	UPDATE DRAWING TO P1-G	1856	N.M.	8/94
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 COLUMN SUB-ASSEMBLY		
		APPLICATION PARTNER VM16		
X.XXX	±	SCALE 10:1		DWG No 6-10-008-020
X.XX	±			SIZE B
X.X	±	DATE 7 SEP 93		DRAWN BY THOMPSON
ANGLE	±			SHEET NO. 1 OF 2

THIS ASSEMBLY USED ON VM15, VM16

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	VM1-08	MOTOR PULLEY COVER
2	1	BT-09	187L075 TIMING BELT
3	1	PY-125	16L075 W/5/8 ID 3/16 KEY MPB
4	1	PY-34	5/8 I.D. 1008 BUSHING
5	1	PY-126	TB20L075 1008 PULLEY
6	3	LB-27	PULLEY MOTOR WARNING LABEL
7	1	MD-70	40 IN-LB MOTOR WITH BRAKE
8	4	SP-83	Z-AXIS LIMIT GRID SPACER
9	3	MPT-36	SWITCH PLATE
10	2	WX-196	1 IN. CABLE CLAMP
11	1	MP1-94	BALL SCREW LOCK NUT
12	1	MP1-107	BEARING LOCK NUT SPACER
13	3	SW-149	LIMIT SWITCH
14	1	MX1-35	35 mm. COLUMN - MACHINED
15	1	6-10-018-029	BEARING CLIP ASSEMBLY
16	1	MP1-199	COLUMN WAY COVER BRACKET - LEFT
17	1	MM-47	CONTROL BOX MOUNTING ARM
18	1	MX1-28	Y&Z RADIAL BALL SCREW SUPRT-MACH.
19	1	6-10-018-027	BALL SCREW ASSEMBLY
20	1	MP1-201	COLUMN WAY COVER BRACKET - RIGHT

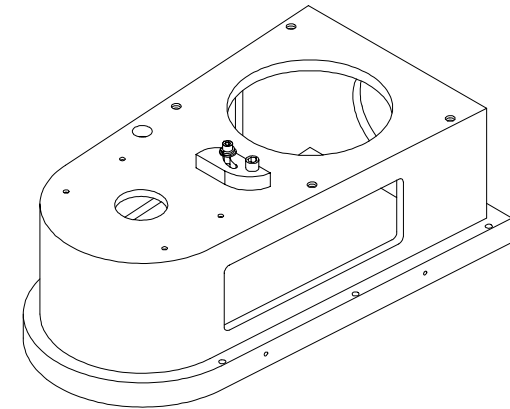
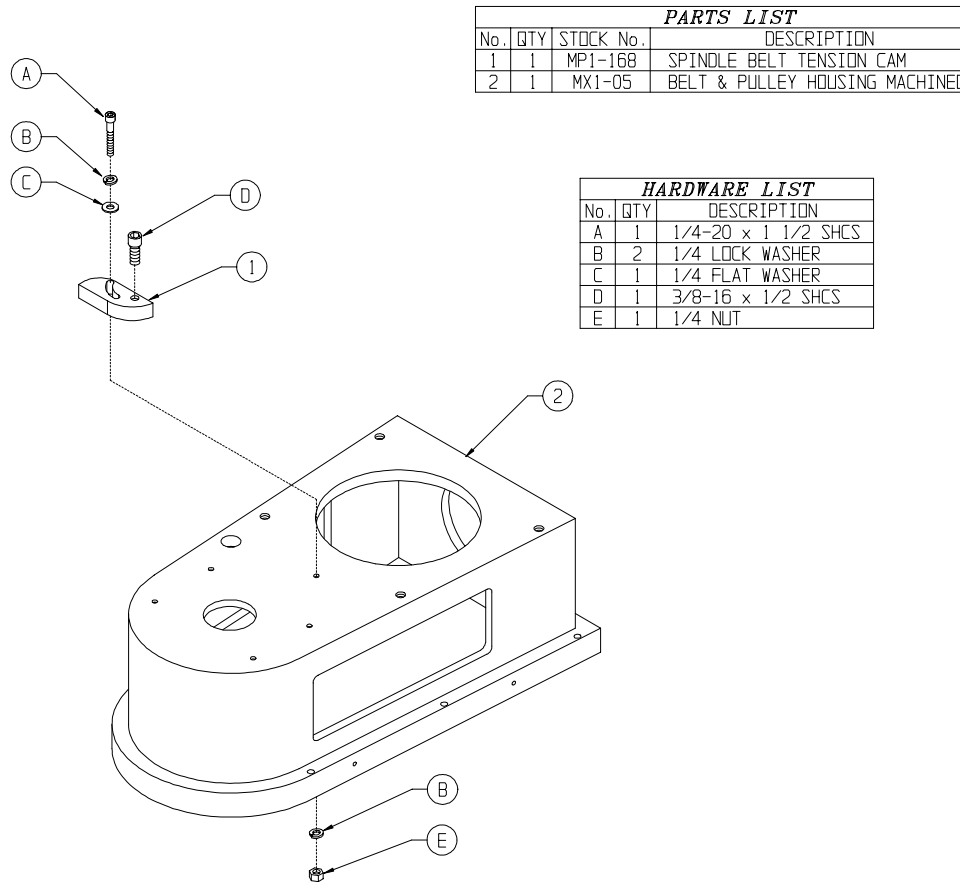


HARDWARE LIST			
No.	QTY	DESCRIPTION	
A	4	10-32 x 2 1/4 BHCS	
B	2	1/4-20 x 1/2 SHSS	
C	2	1/4-20 x 1/4 SHSS	
D	1	3/16 x 3/16 x 1 1/2 KEY	
E	8	1/4-20 x 1 SHCS	
F	4	1/4 LOCK WASHER	
G	6	3/8 DRIVE RIVET	
H	4	1/4-20 x 2 1/4 BHCS	
I	6	8-32 x 1 BHCS	
J	6	No. 8 LOCK WASHER	
K	4	3/8 LOCK WASHER	
L	4	3/8-16 x 1 1/4 SHCS	
M	2	10-32 x 3/16 BRASS TIPPED SHSS	
N	2	1/4-20 x 3/4 BHCS	
O	2	8-32 x 3/8 BHCS	
P	1	3/16 x 3/16 x 1/2 KEY	
Q	2	5/16-18 x 1 1/4 SHCS	
R	4	1/4-20 x 5/8 BHCS	
S	6	5/16 LOCK WASHER	
T	4	10-32 x 1/2 SHCS	
U	4	5/16-18 x 3/4 SHCS	
V	9	1/2-13 x 2 SHCS	

C	UPDATE DRAWING TO VM16	3330		12/97
B	UPDATE DRAWING TO P1-H	2250	N.M.	5/95
A	UPDATE DRAWING TO P1-G	1856	N.M.	8/94
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 COLUMN SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM16		
X.XX ±		SCALE 10:1 DWG No. 6-10-008-020 SIZE B		
X.X ±		DATE 7 SEP 93 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE ±				

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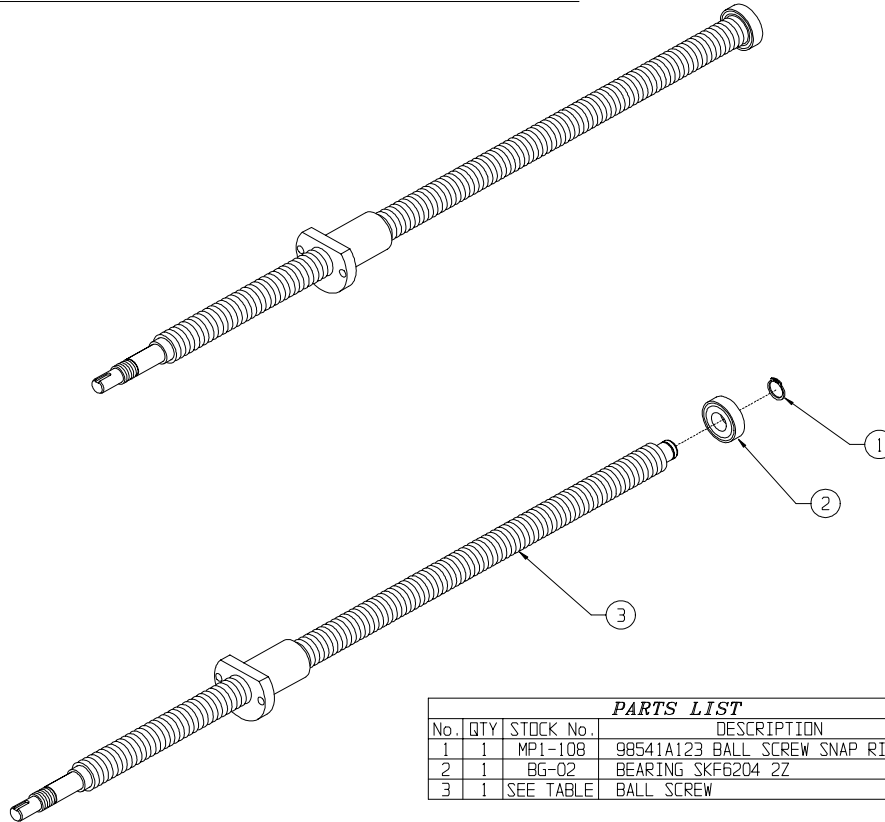
Belt Housing Assembly



REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 7870 PARK DRIVE (612) 474-8100 CHANHASSEN, MN 55317		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE BELT HOUSING ASSEMBLY		
X.XXX	± .005	APPLICATION GENERAL PRODUCTS		
X.XX	± .010	SCALE 4:1	DWG NO 6-10-018-024	SIZE B
X.X	± .030	DATE 11 AUG 95	DRAWN BY THOMPSON	SHEET NO. 1 OF 1
ANGLE	± 1.0°			

Ball Screw Assembly

*THIS ASSEMBLY USED ON
VM16, VM17, VM24, VM25, VM30C, VM30D, VMD30*



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-108	98541A123 BALL SCREW SNAP RING
2	1	BG-02	BEARING SKF6204 2Z
3	1	SEE TABLE	BALL SCREW

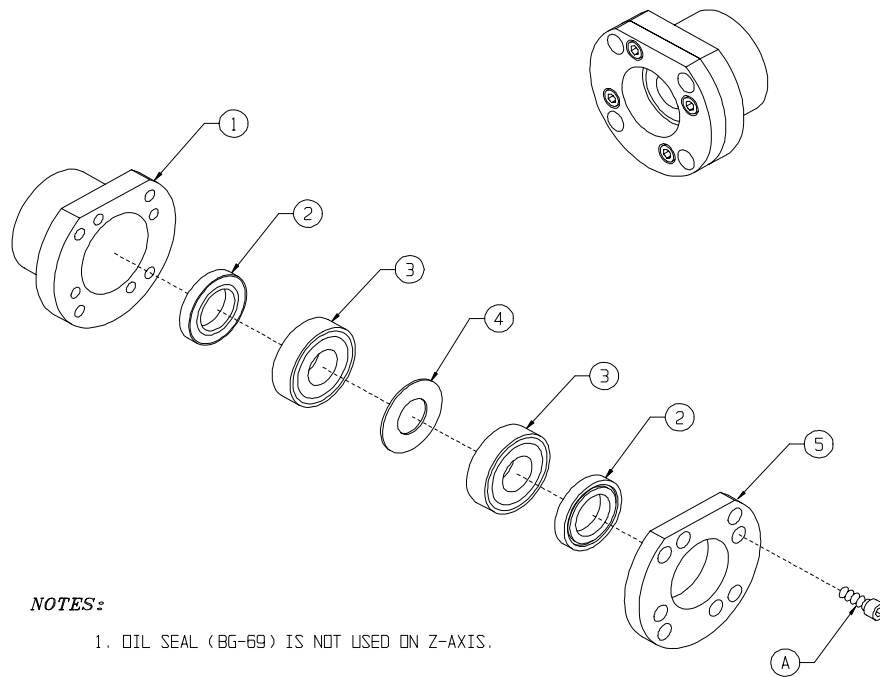
BALL SCREW TABLE								
STOCK No.	DESCRIPTION	VM15/16	VM17	VM24	VM25	VM30C	VM30D	VMD30
MP1-145	5 PITCH BALL SCREW, 25" TRAVEL							
MP1-146	5 PITCH BALL SCREW, 30" TRAVEL							
MP-294	4 PITCH BALL SCREW, 30" TRAVEL	X OPT.	X			Y		
MP-295	4 PITCH BALL SCREW, 45" TRAVEL		X OPT.					
MP-274	4 PITCH BALL SCREW, 40" TRAVEL			X		X		
MP-293	4 PITCH BALL SCREW, 25" TRAVEL	X, Y, Z	Y, Z	Y, Z		Z		Z
MP-444	1 1/2" BALL SCREW, 25" TRAVEL				Y, Z		Z	
MP-445	1 1/2" BALL SCREW, 30" TRAVEL						Y	
MP-446	1 1/2" BALL SCREW, 50" TRAVEL				X		X	

D	ADD 1 1/2" DIA. SCREWS	3859		3/99
C	CHANGE VM16 TO 4 PITCH	3357	N. M.	1/98
B	ADD VMD30 COLUMN	3183	N. M.	7/97
A	ADD BALL SCREW TABLE	3052	N. M.	4/97
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE BALL SCREW ASSEMBLY		
X .XXX ±		APPLICATION GENERAL PRODUCTS		
X .XX ±		SCALE 4:1	DWG No 6-10-018-027	SIZE B
X .X ±		DATE 16 AUG 95	DRAWN BY THOMPSON	SHEET NO. 1 OF 1
ANGLE ±				

X,Y,& Z Axis Bearing Cup Assembly

THIS ASSEMBLY USED ON VM16, VM17, & BR'S

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	1/4-20 x 5/8 SHCS



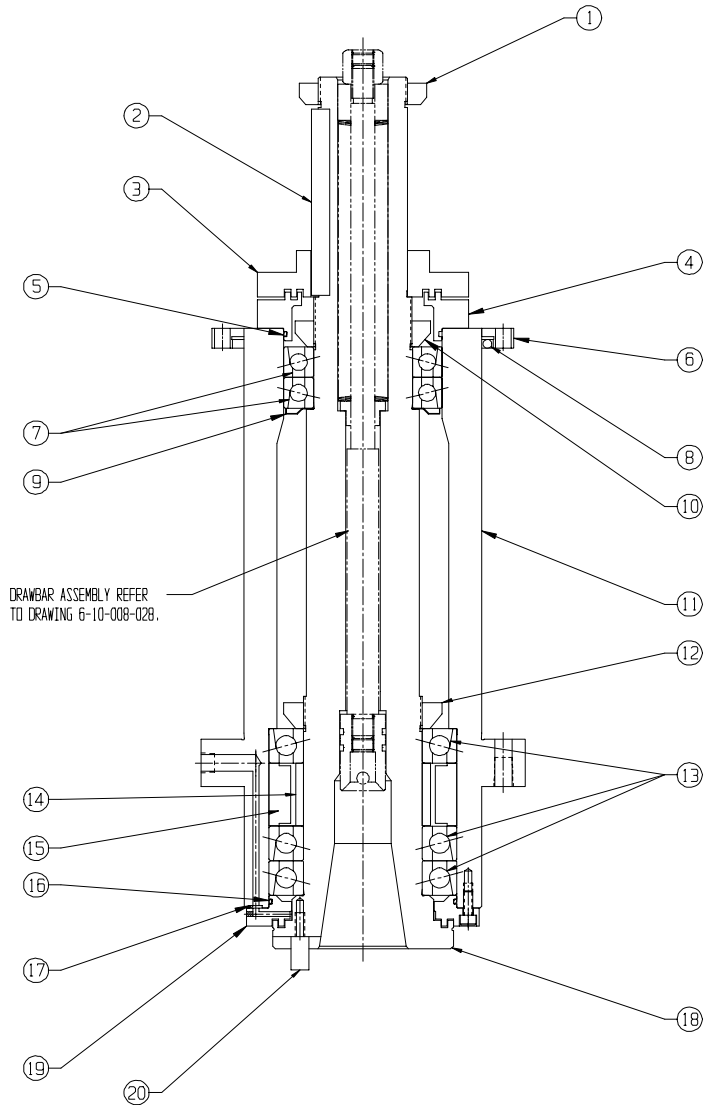
NOTES:

1. OIL SEAL (BG-69) IS NOT USED ON Z-AXIS.

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-89	BALL SCREW BEARING BLOCK
2	2	BG-69	091592TB-H BEARING CUP OIL SEAL
3	2	BG-01	BEARING NSK 7204BYG
4	1	HD-46	1 1/4 x 1 3/4 x .002 ROUND SHIM
5	1	MP1-88	BALL SCREW BEARING CAP

A	ADD OIL SEAL	3344		12/97
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No. 4450		TITLE BEARING CUP ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION GENERAL PRODUCTS		
X .XXX ±		SCALE 2:1		DWG No. 6-10-018-029
X .XX ±		DATE 22 AUG 95		SIZE B
X .X ±		DRAWN BY THOMPSON		SHEET NO. 1 OF 1
ANGLE ±				

Setco Spindle Assembly



REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SETCO 5/6K SPINDLE ASSEMBLY		
X .XXX +/-		APPLICATION GENERAL PRODUCTS		
X .XX +/-		SCALE 2:1 DWG No. 6-10-018-067 SIZE B		
X .X +/-		DATE 02 MAR 99 DRAWN BY DAHLKE SHEET No. 1 OF 2		
ANGLE +/-				

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	BG-40	N09 SPINDLE LOCKNUT
2	1	MP-490	PULLEY DRIVE KEY
3	1	6-10-018-068	ORIENT DISC
4	1	MP-488	REAR SEAL
5	1	WX-251	O-RING 76mm
6	1	MP-489	CARTRIDGE END CAP
7	1	BG-79	7010 DUPLEX BEARING SET
8	1	WX-182	O-RING FOR FLOOD SEAL
9	1	BG-82	7010 NILOS RETAINING RING
10	1	BG-80	N10 SPINDLE LOCKNUT
11	1	MP-486	CARTRIDGE HOUSING
12	1	BG-81	N12 SPINDLE LOCKNUT
13	1	BG-78	7012 TRIPLEX BEARING SET
14	1	MP-491	INNER SPACER
15	1	MP-492	OUTER SPACER
16	1	WX-252	O-RING 91mm
17	1	WX-250	O-RING 2.9mm
18	1	MP-485	SPINDLE ARBOR
19	1	MP-487	FRONT SEAL
20	1	MP-50	SPINDLE DRIVE KEY

NOTES:-

IT IS NOT RECOMMENDED TO CHANGE INDIVIDUAL PARTS OF THE SPINDLE, IT SHOULD BE REPLACED OR REBUILT AND BALANCED AS AN ASSEMBLY.

SPINDLE ASSEMBLY WITH 6K RPM USE PART No. 9078

SPINDLE ASSEMBLY WITH 8K RPM USE PART No. MP-457

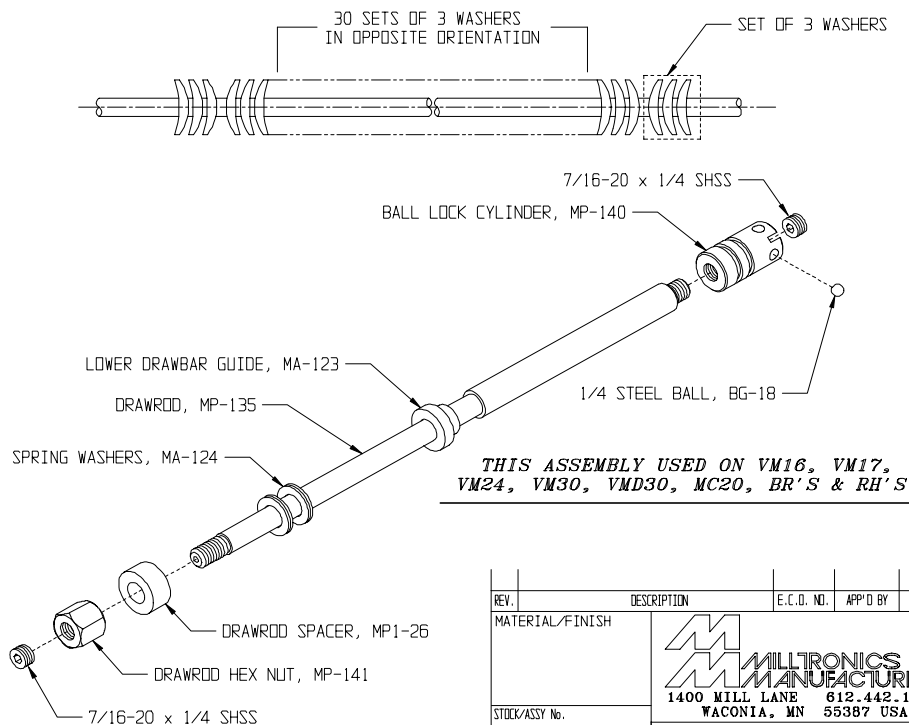
SPINDLE ASSEMBLY WITH 12K RPM USE PART No. MP-428

REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH	 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA			
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED	TITLE SETCO 5/6K SPINDLE ASSEMBLY			
X.XXX +/-	APPLICATION GENERAL PRODUCTS			
X.XX +/-	SCALE 2:1	DWG No. 6-10-018-067	SIZE B	
X.X +/-	DATE 02 MAR 99	DRAWN BY DAHLKE	SHEET No. 2 OF 2	
ANGLE +/-				

Power Drawbar Assembly & Instructions

- INSTRUCTIONS FOR ASSEMBLY -

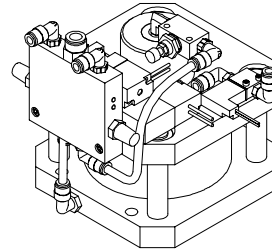
1. EACH SPINDLE VARIES SLIGHTLY IN THE SIZE OF THE DRAWBAR BORE I.D. THE LOWER GUIDE, (MA-123), AND THE DRAWROD SPACER, (MP1-26), MUST FIT IN THE SPINDLE BORE WITH A TOLERANCE OF $-.0005/-0.0010$ TO INSURE THAT OPERATION OF THE DRAWBAR IS MAINTAINED.
2. SLIDE THE LOWER DRAWBAR GUIDE, (MA-123) AND SPRING WASHERS, (MA-124), ON THE DRAWROD, (MP-135), AS SHOWN IN THE ILLUSTRATION. OBSERVE THE ORIENTATION OF THE SPRING WASHERS CLOSELY. SLIDE THE DRAWROD SPACER, (MP1-26), ONTO THE DRAWROD. THEN THREAD THE DRAWROD NUT, (MP-141), TWO FULL TURNS ONTO THE END OF THE DRAWROD AND LOCK IT IN PLACE WITH A 7/16-20 SETSCREW.
3. PREPARE THE BALL LOCK CYLINDER, (MP-140), FOR INSTALLATION. INSERT THE FOUR BALLS, (BG-18), INTO THE POCKETS ON THE BALL LOCK CYLINDER. BE SURE THAT THEY MOVE FREELY IN THE POCKETS. LUBRICATE ALL OF THE BALLS AND FILL THE GROOVES WITH HIGH PRESSURE GREASE.
4. LOWER THE ASSEMBLED PORTION OF THE DRAWBAR DOWN INTO THE SPINDLE BORE.
5. INSERT A 1/8 x 7/8 x 6 PIECE OF BAR STOCK INTO THE SLOTS ON THE END OF THE BALL LOCK CYLINDER AND PUSH IT UP INTO THE SPINDLE. THEN TIGHTEN THE BALL LOCK CYLINDER UNTIL IT LANDS ON THE SHOULDER OF THE DRAWROD. LOCK IT IN PLACE WITH A 7/16-20 SETSCREW. ALUMINUM STOCK IS RECOMMENDED FOR THIS PROCEDURE TO AVOID POSSIBLE DAMAGE TO THE SPINDLE.
6. WHILE HOLDING THE DRAWROD NUT IN PLACE, REMOVE IT'S SETSCREW. HOLD THE BALL LOCK CYLINDER WITH THE BAR STOCK OR WITH A LONG "T-HANDLE" INSERTED INTO THE SETSCREW AT THE BALL LOCK CYLINDER, AND THEN TIGHTEN THE DRAWROD NUT BY HAND UNTIL ALL FREE-PLAY HAS BEEN TAKEN OUT OF THE SPRING WASHERS. THIS CONDITION IS KNOWN AS 'FREE HEIGHT'.
7. ONCE FREE HEIGHT HAS BEEN ESTABLISHED, TIGHTEN THE DRAWROD NUT AN ADDITIONAL 4-1/2 TO 5 TURNS AND REPLACE THE SETSCREW IN THE DRAWROD NUT. THIS WILL SET THE PRELOAD TO THE DRAWBAR ASSEMBLY.
8. INSTALL THE AIR CYLINDER UNIT ON TOP OF THE SPINDLE HOUSING. THE DRAWBAR SHOULD BE FLUSH OR BELOW THE TOP OF THE SPINDLE HOUSING. ADJUST THE STRIKE ON THE CYLINDER SO THAT THE TOOL IS BEING PUSHED OUT OF THE TAPER .030 AND LOCK ADJUSTING NUT IN PLACE.
9. TO TEST THE DRAWBAR FOR PROPER FUNCTION, MEASURE THE HEIGHT OF THE DRAWBAR WITH A TOOL HOLDER IN THE SPINDLE TAPER, AND AGAIN WITHOUT A TOOL HOLDER. THE DIFFERENCE BETWEEN THE TWO MEASUREMENTS MUST BE APPROXIMATELY .02 IN.



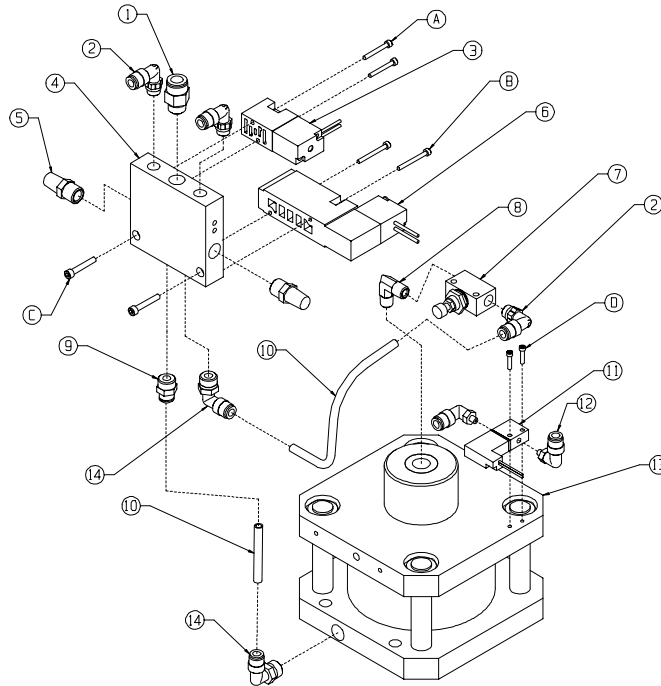
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH	 MILLTRONICS MANUFACTURING 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA			
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED	TITLE DRAWBAR W/BLOWOUT ASSEMBLY			
X.XXX ±	APPLICATION PARTNER I			
X.XX ±	SCALE 2:1 Dwg No 6-10-008-028 SIZE B			
X.X ±	DATE 13 OCT 94 DRAWN BY THOMPSON SHEET NO. 1 OF 1			
ANGLE ±				

Power Drawbar Cylinder Assembly

PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-95	MALE STRAIGHT 1/4 NPT - 3/8 TUBE
2	3	NU-187	SWIVEL ELBOW 1/8 NPT - 1/4 TUBE
3	1	NU-185	ORIENT - AIR VALVE
4	1	NU-184	MANIFOLD
5	2	NU-79	MUFFLER
6	1	NU-183	DRAW BAR - AIR VALVE
7	1	NU-190	FLOW CONTROL FOR BLOW OUT
8	1	NU-189	MALE ELBOW 1/8 NPT
9	1	NU-32	MALE STRAIGHT 1/4 NPT - 1/4 TUBE
10	2	NU-25	1/4" TUBING
11	1	NU-191	AIR PURGE - AIR VALVE
12	2	NU-192	SWIVEL ELBOW 10-32 - 1/4 TUBE
13	1	NU-200	DRAW BAR AIR CYLINDER
14	2	NU-186	SWIVEL ELBOW 1/4 NPT - 1/4 TUBE



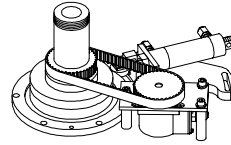
HARDWARE LIST		
ITEM	QTY	DESCRIPTION
A	2	M3-.5 x 25mm SHCS
B	2	M3-.5 x 30mm SHCS
C	2	8-32 x 1 SHCS
D	2	4-40 x 1/2 SHCS



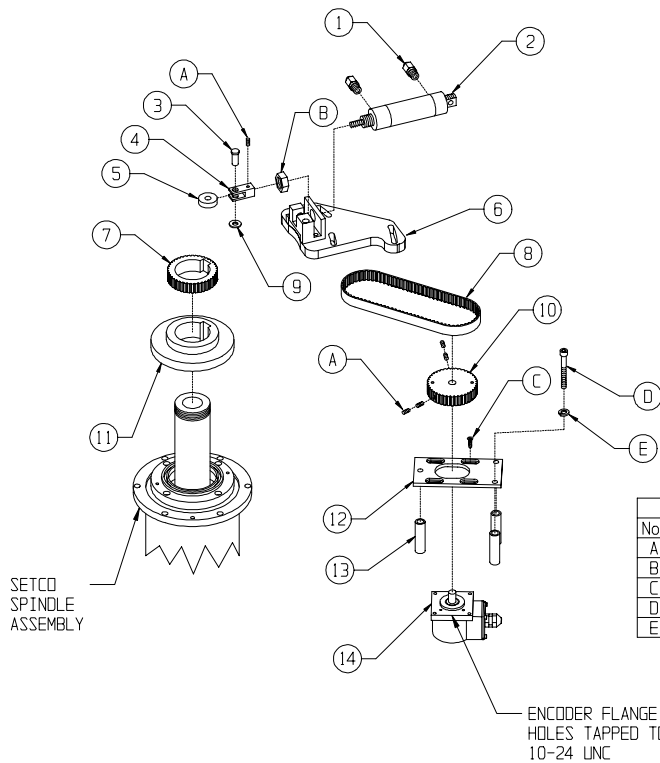
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X .XXX	+/-			
X .XX	+/-	TITLE NU-182 DRAW BAR ASSEMBLY APPLICATION GENERAL PRODUCTS SCALE 3:1 DWG No. 6-10-018-062 SIZE B DATE 19 FEB 99 DRAWN BY DAHLKE SHEET NO. 1:1		
X .X	+/-			
ANGLE	+/-			

Setco Spindle Orient, Rigid Tap Assembly

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	2	NU-17	1/8 NPT 1/4 TUBE MALE STRAIGHT
2	1	NU-02	CYLINDER
3	1	HD-13	SPINDLE ORIENT CLEVIS PIN
4	1	HD-15	MACHINED CLEVIS
5	1	BG-37	ORIENT BEARING
6	1	MP-221	PLUNGER ORIENT GUIDE
7	1	PY-149	RIGID TAP PULLEY
8	1	BT-25	180XLD37 BELT
9	1	HD-14	PUSH NUT
10	1	PY-47	ENCODER PULLEY
11	1	SEE TABLE	ORIENT DISC - MACHINING
12	1	MP1-84	SPINDLE ENCODER MOUNTING PLATE
13	3	SP-79	RIGID TAP SPACER
14	1	EO-29	ENCODER



*THIS ASSEMBLY USED ON VM15,
VM16, VM17, VM24, VM30, VMD30,
MC20, & BR'S*



HARDWARE LIST		
No.	QTY	DESCRIPTION
A	5	10-32 x 3/16 SHSS
B	1	5/8-18 JAM NUT
C	4	10-24 x 5/8 FHCS
D	3	1/4-20 x 2 3/4 SHCS
E	3	1/4 LOCK WASHER

VM ORIENT DISC LIST		
MX-34	68°	VM16 12 ATC
MX-35	90°	VM15, 16 20 ATC
MX-36	102°	VM17, 24, 30, D30, MC20 20 ATC
MX-37	118°	BRIDGE MACHINES 20 ATC
MX-40	40°	VM24, 25, 30, D30, 24 ATC

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X.XXX			
	X.XX			
	X.X			
	ANGLE			

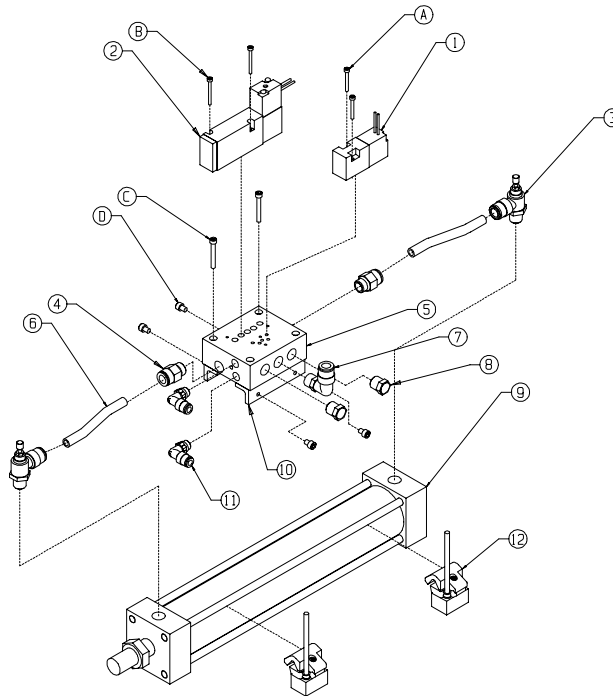
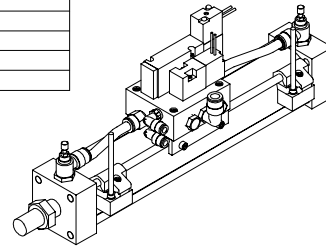
MILLTRONICS MANUFACTURING
1400 MILL LANE (612) 442-1410
WACONIA, MN 55387

TITLE SETCO SPINDLE ORIENT, RIGID TAPPING ASSEMBLY
APPLICATION GENERAL PRODUCTS
SCALE 5:1 ENG No 6-10-018-068 SIZE B
DATE 08 MAR 99 DRAWN BY DAHLKE SHEET NO. 1 OF 1

20 Pocket ATC Air Cylinder Assembly

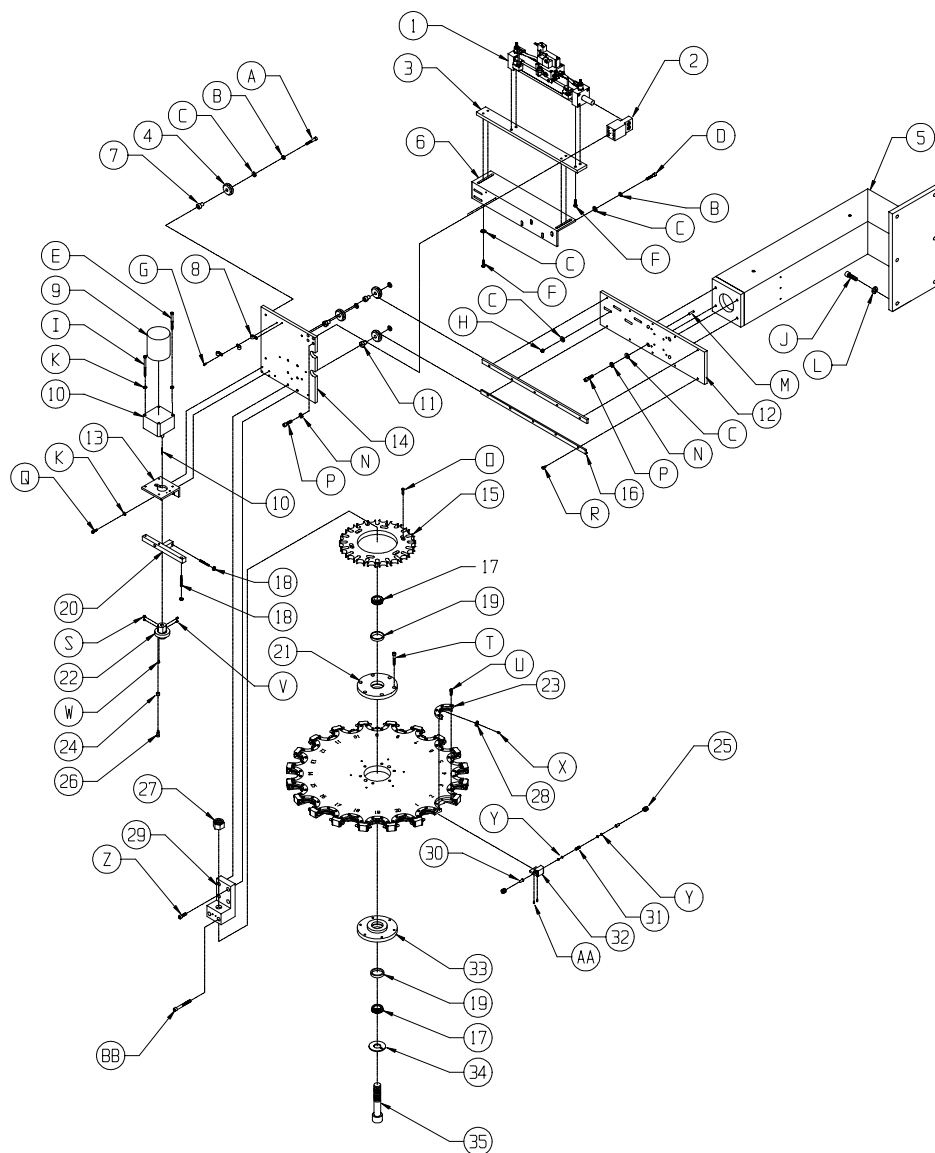
PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-185	AIR VALVE - DOOR - OPEN/CLOSE
2	1	NU-183	AIR VALVE - CAROUSEL - IN/OUT
3	2	NU-180	FLOW CONTROL
4	2	NU-95	MALE STRAIGHT CONNECTOR 1/4 NPT - 3/8 TUBE
5	1	NU-194	MANIFOLD
6	2	NU-78	3/8 NYLON TUBING
7	1	NU-199	SWIVEL ELBOW 1/4 NPT - 3/8 TUBE
8	2	NU-79	MUFFLER
9	1	NU-167	9" AIR CYLINDER
10	2	NU-195	MANIFOLD BRACKET
11	2	NU-187	SWIVEL ELBOW 1/8 NPT - 1/4 TUBE
12	2	SW-158	REED SWITCH

HARDWARE LIST		
ITEM	QTY	DESCRIPTION
A	2	M3-.5 x 25mm SHCS
B	2	M3-.5 x 30mm SHCS
C	4	8-32 x 1 1/4 SHCS
D	4	10-32 x 1/4 SHCS

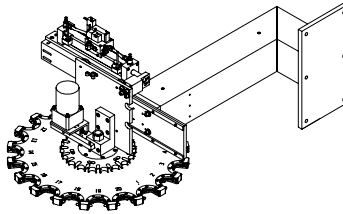


REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MILLTRONICS 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
MATERIAL/FINISH		TITLE NU-193 - 9" AIR CYLINDER ASSEMBLY		
STOCK/ASSY No.		APPLICATION GENERAL PRODUCTS		
TOLERANCE UNLESS SPECIFIED		SCALE 4:1	DWG No. 6-10-018-063	SIZE B
X.XXX +/-		DATE 19 FEB 99	DRAWN BY DAHLKE	SHEET NO. 1:1
X.XX +/-				
X.X +/-				
ANGLE +/-				

20 Pocket Rotary Tool Changer Assembly



E	ADD NU-193 ASSEMBLY	3852		2/99
D	CHANGED CYLINDER LENGTH	3593	N.M.	7/98
C	ADD PAGE 2	3150	N.M.	7/97
B	UPDATE DRAWING	2977	N.M.	2/97
A	UPDATE DRAWING	2068	N.M.	12/94
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 20 POCKET ATC		
X.XXX ±		APPLICATION GENERAL PRODUCTS		
X.XX ±		SCALE 15:1		DWG No 6-10-018-014
X.X ±		DATE 18 AUG 94		SIZE B
ANGLE ±		DRAWN BY THOMPSON		SHEET NO. 1 OF 2



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	6-10-018-063	NU-193 9" AIR CYLINDER ASSEMBLY
2	1	MP-427	9 IN. AIR CYLINDER CLEVIS
3	1	MP-426	9 IN. AIR CYLINDER PLATE
4	4	MP-143	V-RAIL GUIDE WHEEL
5	1	SEE TABLE	20 POCKET ARM
6	1	MP-117	20 POCKET AIR CYLINDER MOUNTING BRACKET
7	2	MP-145	STATIONARY BUSHING
8	3	WX-82	3/8 IN. CABLE CLAMP
9	1	MD-72	GENEVA MOTOR
10	1	MD-71	GEAR BOX W/KEY
11	2	MP-144	ADJUSTABLE BUSHING
12	1	MP-142	V-RAIL PLATE
13	1	MP1-117	GENEVA WHEEL MOTOR MOUNT
14	1	MP-123	20 POCKET CAROUSEL SLIDING PLATE
15	1	MP-120	20 POSITION GENEVA WHEEL
16	2	MX-12	20 POCKET LINEAR V-RAIL MODS.
17	2	BG-33	CONE TAPERED BEARING
18	2	PR-19	SWITCH PROX
19	2	BG-34	CUP TAPERED BEARING
20	1	MP-466	HOME/GENEVA PROX BRACKET
21	1	MP-116	UPPER CAROUSEL BEARING CUP
22	1	MX-10	20 PKT ATC DRIVE CAM - MACHINED
23	20	SEE TABLE	20 POCKET INSERT
24	1	HD-39	1/2 x 5/16 DRILL BUSHING
25	40	MP1-140	PUSH PIN GUIDE
26	1	HD-38	5/16 x 3/8 SHOULDER BOLT
27	1	HD-07	1-8 UNC NYLOCK NUT
28	20	SEE TABLE	20 POCKET TOOL CHANGE KEY
29	1	MP-124	20 POCKET CAROUSEL MOUNTING BRACKET
30	40	MP1-144	PUSH PIN
31	20	MP1-141	COIL SPRING
32	20	MP-121	20 ATC LOCKING PIN BLOCK
33	1	MP-115	LOWER CAROUSEL BEARING CUP
34	1	HD-10	1 IN. HARDENED SERIES 'N' WASHER
35	1	HD-09	1-8 x 5 1/2 UNC SHCS BOLT

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	5/16-18 x 1 5/8 SHCS
B	8	5/16 LOCK WASHER
C	20	5/16 HARDENED FLAT WASHER
D	4	5/16-18 x 1 1/2 SHCS
E	2	1/4-20 x 3 SHCS
F	8	5/16-24 x 3/4 BHCS
G	2	8-32 x 1/2 BHCS
H	4	5/16-18 HEX NUT
I	2	1/4-20 x 3 1/2 SHCS
J	6	1/2-13 x 2 SHCS
K	8	1/4 LOCK WASHER
L	6	1/2 LOCK WASHER
M	4	1/4 x 1 DOWEL PIN
N	8	3/8 LOCK WASHER
O	6	1/4-20 x 3/4 BHCS
P	8	3/8-16 x 1 1/4 SHCS
Q	4	1/4-20 x 7/8 SHCS
R	10	1/4-20 x 5/8 BHCS
S	2	5/16-18 x 1/4 SHSS
T	6	5/16-18 x 1 3/4 SHCS
U	80	1/4-20 x 3/4 SHCS
V	2	1/4-20 x 1/4 SHSS
W	1	8-32 x 1/4 BHCS
X	20	8-32 x 1/4 SHCS
Y	80	No. 6 FLAT WASHER
Z	4	3/8-16 x 1 SHCS
AA	40	10-32 x 3/16 BRASS TIPPED SHSS
BB	2	3/8-16 x 3 SHCS

* Y IS REMOVED FOR V-FLANGE OPTION *

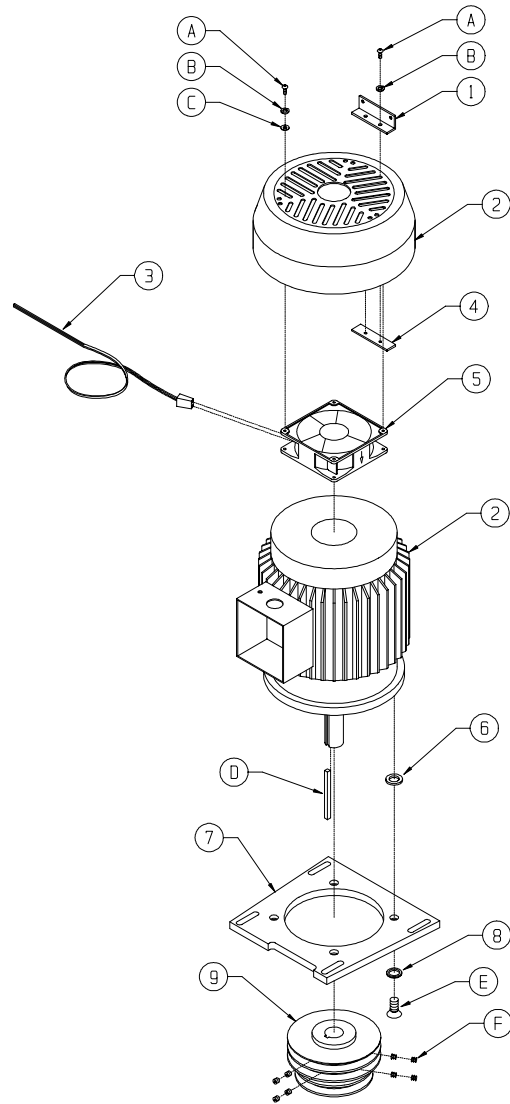
20 POCKET ARM CHART	
MACHINE	STOCK No.
VM15/16D	MP1-193
VM-17	MP1-327
VM-24	MP6-126
VM-30	MP7-61
VMD-30	MP7-61
MC-20	MPS-05

20 POCKET TOOL CHANGE KEY CHART	
V-FLANGE	MP1-45
BT	MP1-121

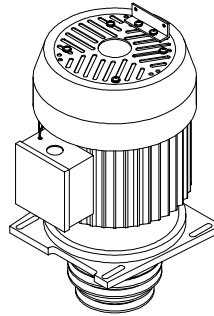
20 POCKET INSERT CHART	
V-FLANGE	MX-11
BT	MX-13

E	ADD NU-193 ASSEMBLY	3852		2/99
D	CHANGED CYLINDER LENGTH	3593	N.M.	7/98
C	ADD PAGE 2	3150	N.M.	7/97
B	UPDATE DRAWING	2977	N.M.	2/97
A	UPDATE DRAWING	206B	N.M.	12/94
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 20 POCKET ATC		
X .XXX	±	APPLICATION GENERAL PRODUCTS		
X .XX	±	SCALE 15:1 DWG No 6-10-018-014 SIZE B		
X .X	±	DATE 18 AUG 94 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE	±			

7 1/2 HP 5/6 K RPM Motor Assembly



REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 5/6K RPM 7 H.P. MOTOR ASSEMBLY		
X.XXX ± .005		APPLICATION GENERAL PRODUCTS		
X.XX ± .010		SCALE 6:1 DWG No 6-10-018-071 SIZE B		
X.X ± .030		DATE 23 MAR 99 DRAWN BY DAHLKE SHEET NO. 1 OF 2		
ANGLE ± 1.0°				

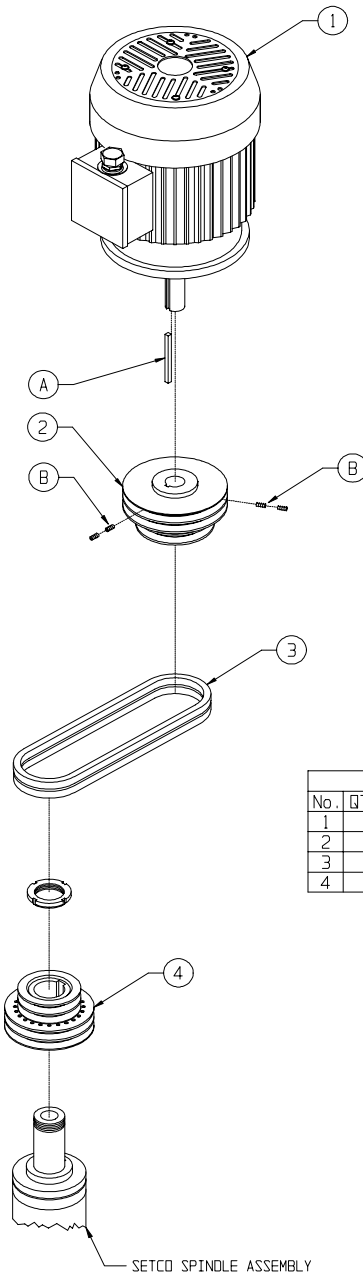


PARTS LIST				
No.	QTY	STOCK No.	DESCRIPTION	
1	1	MP-280	VM16 MOTOR CABLE SUPPORT BRACKET	
2	1	MD-73	7-1/2 H.P. MOTOR	
3	1	FA-03	24 FAN CORD	
4	1	MP1-253	VM16 MOTOR CABLE SUPPORT BRACKET STRAP	
5	1	FA-01	4" FAN	
6	4	WX-162	3/4 HOSE WASHER	
7	1	MP1-190	SPINDLE MOTOR MOUNT W/BLOWOUT	
8	4	WX-161	O-RING	
9	1	PY-162	5/6K RPM MOTOR PULLEY	

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	10-32 x 1/2 BHCS
B	6	No. 10 LOCK WASHER
C	4	No. 10 FLAT WASHER
D	1	1/4 x 1/4 x 3 1/2 KEY STOCK
E	4	1/2-13 x 1 FHCS
F	8	5/16-18 x 1/4 SHSS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 5/6K RPM 7 H.P. MOTOR ASSEMBLY		
X .XXX ± .005		APPLICATION GENERAL PRODUCTS		
X .XX ± .010		SCALE 6:1 DWG No 6-10-018-071 SIZE B		
X .X ± .030		DATE 23 MAR 99 DRAWN BY DAHLKE SHEET NO. 2 OF 2		
ANGLE ± 1.0°				

7 1/2 HP 5/8 K RPM Pulley Assembly



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MD-73	7-1/2 H.P. MOTOR
2	1	PY-86	5K/8K RPM MOTOR PULLEY 7 H.P.
3	1	BT-56	A31 MATCHED V BELT SET
4	1	PY-154	SETCO 5/7 HP SPINDLE PULLEY

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	1	1/4 x 1/4 x 3 1/2 KEY STOCK
B	8	1/4-20 x 1/4 SHSS

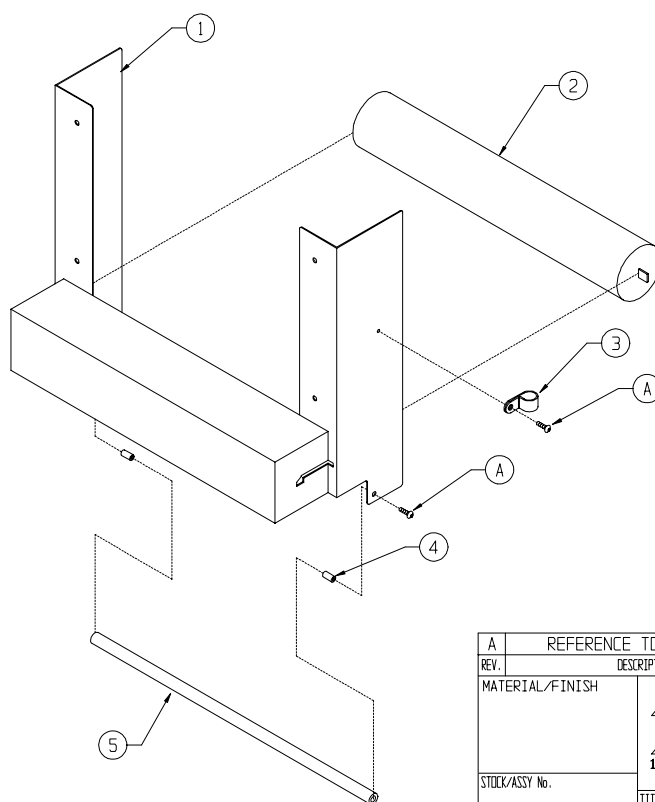
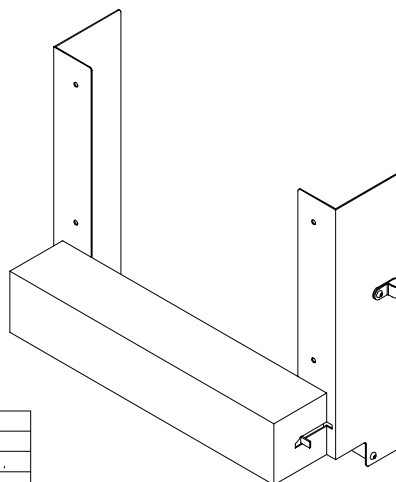
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 7 1/2 H.P. 5/8K PULLEY ASSEMBLY RPM		
X.XXX ± .005		APPLICATION GENERAL PRODUCTS		
X.XX ± .010		SCALE 6:1 DWG No 6-10-018-073 SIZE B		
X.X ± .030		DATE 26 MAR 99 DRAWN BY DAHLKE SHEET NO. 1 OF 1		
ANGLE ± 1.0°				

Roller Shade Assembly

THIS ASSEMBLY USED ON VM15, VM16

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	3	8-32 x 1/2 BHCS

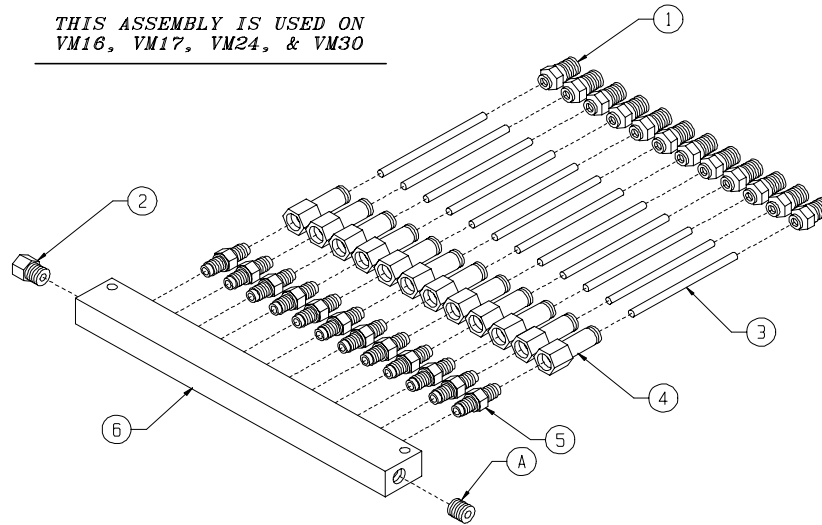
PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-181	Z ROLLER SHADE HOUSING, 35 mm.
2	1	MP1-31	14 x 51 Y, Z ROLLER SHADE
3	1	WX-196	1 IN. CABLE CLAMP
4	2	SP-84	8-32 x 1/2 RD THREADED STANDOFF
5	1	MP1-180	Z-AXIS ROLLER BAR, 35 mm.



A	REFERENCE TO E.C.O.	3360	1/98	
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE ROLLER SHADE ASSEMBLY		
X.XXX ±		APPLICATION GENERAL PRODUCTS		
X.XX ±		SCALE 4:1 DWG No 6-10-018-02B SIZE B		
X.X ±		DATE 16 AUG 95 DRAWN BY THOMPSON SHEET NO. 1 OF 1		
ANGLE ±				

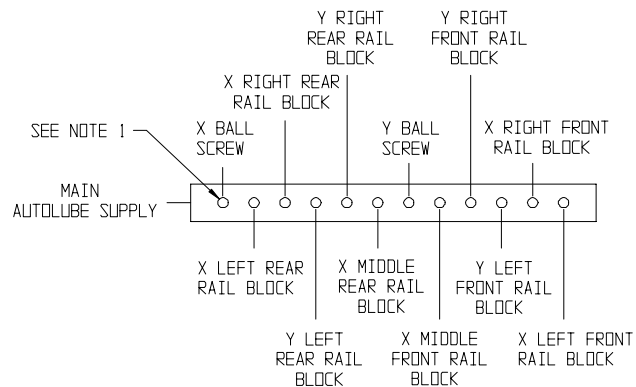
X & Y Axis Autolube Manifold Assembly

THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, & VM30



NOTES:

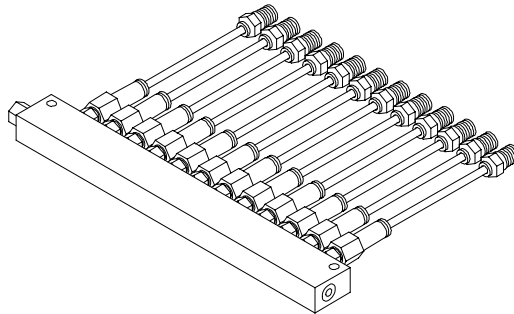
1. ON VM16 & VM17 MACHINES NU-154, NU-155, & NU-157 ARE REPLACED WITH NU-110 & NU-63 (#2 OIL METER).



AUTOLUBE LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X .XXX			
	X .XX			
	X .X			
	ANGLE			
				
	1400 MILL LANE (612) 442-1410 WACONIA, MN 55387			
	TITLE	X & Y AXIS		
	APPLICATION	AUTOLUBE MANIFOLD ASSEMBLY		
	SCALE	2:1	DWG No 6-10-018-049	SIZE B
	DATE	25 JUL 97	DRAWN BY THOMPSON	SHEET NO. 1 OF 2

THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, & VM30



PARTS LIST

No.	QUANTITY	STOCK No.	DESCRIPTION
1	12	NU-154	5/32 TUBE 1/8 NPT M/S
2	1	NU-110	1/8 NPT-M8-1 OIL FITTING
3	SEE TABLE	NU-117	5/32 NYLON TUBING
4	12	NU-157	5/32 TUBE-1/8 NPT FEM.
5	-	SEE TABLE	OIL METER
6	1	MP-356	X & Y AIR/OIL LUBE MANIFOLD

NU-117 TUBING LENGTH

CONNECTION	VM16	VM17	VM24	VM30	OIL METER
X LEFT REAR RAIL BLOCK	20	20	24	24	#3
X RIGHT REAR RAIL BLOCK	27	27	44	44	#3
Y LEFT REAR RAIL BLOCK	12	12	24	24	#3
Y RIGHT REAR RAIL BLOCK	24	30	44	44	#3
X MIDDLE REAR RAIL BLOCK	-	-	38	38	#3
Y BALL SCREW	32	26	39	39	#2
X MIDDLE FRONT RAIL BLOCK	-	-	38	38	#3
Y RIGHT FRONT RAIL BLOCK	24	30	44	44	#3
Y LEFT FRONT RAIL BLOCK	12	12	24	24	#3
X RIGHT FRONT RAIL BLOCK	27	27	44	44	#3
X LEFT FRONT RAIL BLOCK	20	20	24	24	#3
X BALL SCREW	-	-	60	60	#2

Oil Meter Part
Numbers

#2 = NU-155

#3 = NU-156

ALL MEASUREMENTS ARE IN INCHES

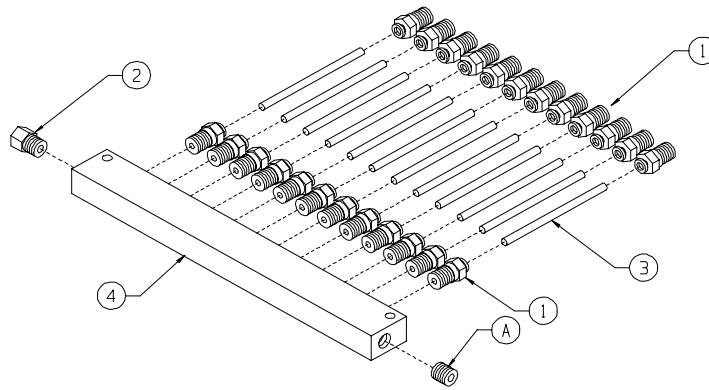
HARDWARE LIST

No.	QTY	DESCRIPTION
A	1	1/8-27 NPT SHPP

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X .XXX ± X .XX ± X .X ± ANGLE ±				
TITLE		X & Y AXIS AUTOLUBE MANIFOLD ASSEMBLY		
APPLICATION		GENERAL PRODUCTS		
SCALE	2:1	DWG No	6-10-018-049	SIZE B
DATE	25 JUL 97	DRAWN BY	THOMPSON	SHEET NO. 2 OF 2

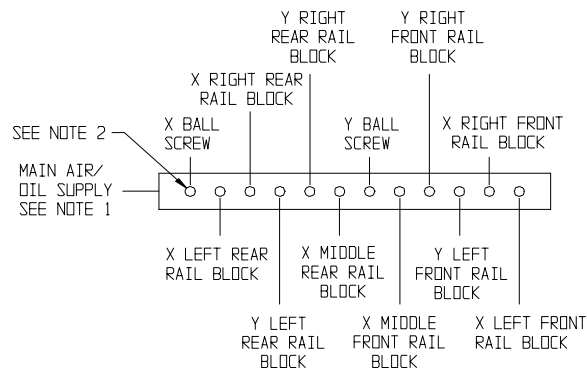
X & Y Axis Air/Oil Manifold Assembly

THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, & VM30



NOTES:

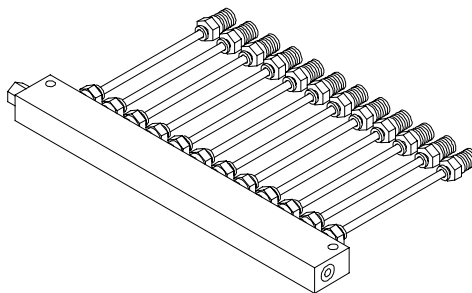
1. ON VM24 & VM30 "2" IS REPLACED WITH NU-161, 1/8 NPT 5/32 TUBE ELBOW.
2. ON VM16 & VM17 THE NU-154 IS REPLACED BY NU-110



AIR/OIL LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE X & Y AXIS AIR/OIL MANIFOLD ASSEMBLY		
X.XXX ±		APPLICATION GENERAL PRODUCTS		
X.XX ±		SCALE 2:1 DWG No 6-10-018-047 SIZE B		
X.X ±		DATE 30 JUL 97 DRAWN BY THOMPSON SHEET NO. 1 OF 2		
ANGLE ±				

THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, & VM30



PARTS LIST

PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	24	NU-154	5/32 TUBE 1/8 NPT M/S
2	1	NU-110	1/8 NPT-M8-1 OIL FITTING
3	SEE TABLE	NU-117	5/32 NYLON TUBING
4	1	MP-356	X & Y AIR/OIL LUBE MANIFOLD

NU-117 TUBING LENGTH

NU-117 TUBING LENGTH				
CONNECTION	VM16	VM17	VM24	VM30
X LEFT REAR RAIL BLOCK	20	20	24	24
X RIGHT REAR RAIL BLOCK	27	27	44	44
Y LEFT REAR RAIL BLOCK	12	12	24	24
Y RIGHT REAR RAIL BLOCK	24	30	44	44
X MIDDLE REAR RAIL BLOCK	-	-	38	38
Y BALL SCREW	32	26	39	39
X MIDDLE FRONT RAIL BLOCK	-	-	38	38
Y RIGHT FRONT RAIL BLOCK	24	30	44	44
Y LEFT FRONT RAIL BLOCK	12	12	24	24
X RIGHT FRONT RAIL BLOCK	27	27	44	44
X LEFT FRONT RAIL BLOCK	20	20	24	24
X BALL SCREW	-	-	60	60

ALL MEASUREMENTS ARE IN INCHES

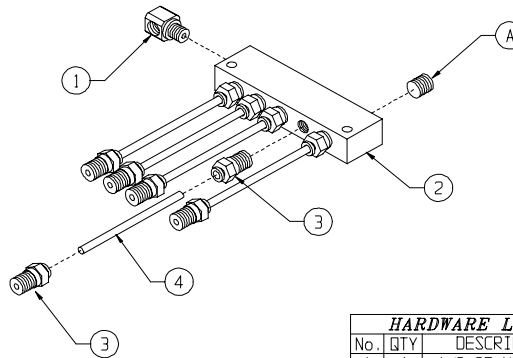
HARDWARE LIST

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	1	1/8-27 NPT SHPP

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.		TITLE X & Y AXIS AIR/OIL MANIFOLD ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION GENERAL PRODUCTS		
X .XXX	±	SCALE 2:1	OWG NO 6-10-018-047	SIZE B
X .XX	±	DATE 30 JUL 97	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
X .X	±			
ANGLE	±			

Z-Axis Air/Oil Manifold Assembly

*THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, VM30, & VMD30*



HARDWARE LIST		
No.	QTY	DESCRIPTION
A	1	1/8-27 NPT SHPP

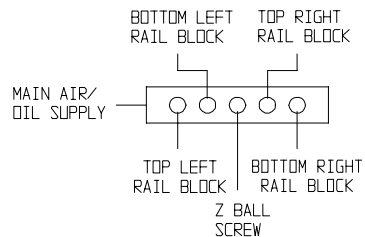
NOTES:

- ON VM17 "1" & "A" POSITIONS ARE REVERSED.
- ON VM24, VM30 & VMD30 "1" IS REPLACED WITH NU-161, 1/8 NPT 5/32 TUBE MALE ELBOW.

PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	1	NU-118	1/8-27 NPT 5/16-24 ELBOW
2	1	MP-357	Z-AXIS AIR/OIL LUBE MANIFOLD
3	10	NU-154	5/32 TUBE-1/8 NPT M/S
4	SEE TABLE	NU-117	5/32 NYLON TUBING

NU-117 TUBING LENGTH				
CONNECTION	VM16	VM17	VM24	VM30
TOP LEFT RAIL BLOCK	18	20	27	27
BOTTOM LEFT RAIL BLOCK	35	13 1/4	28	38
Z BALL SCREW	24	14 3/4	14 3/4	14 3/4
BOTTOM RIGHT RAIL BLOCK	35	7 1/2	36 1/2	36 1/2
TOP RIGHT RAIL BLOCK	18	10 1/8	25	25

ALL MEASUREMENTS ARE IN INCHES



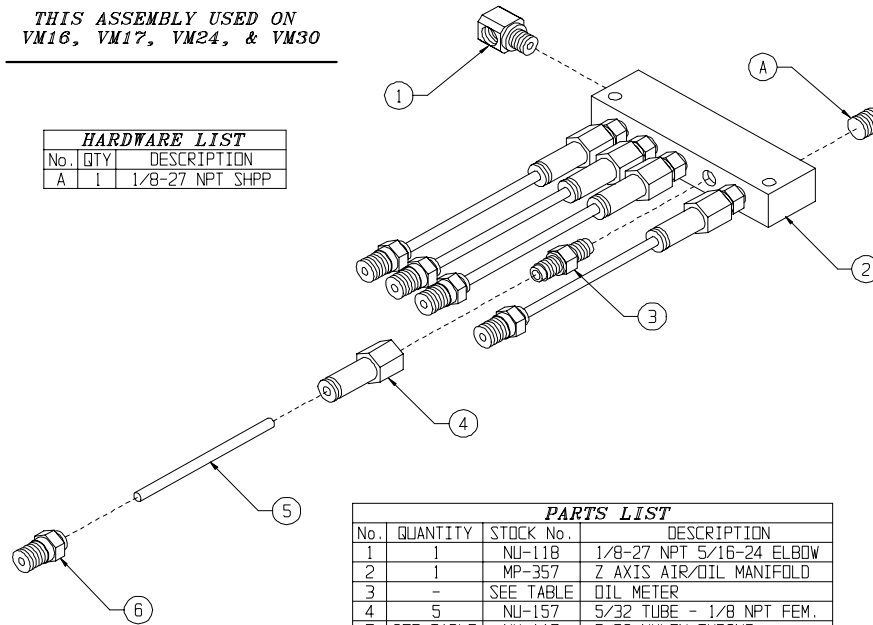
AIR/OIL LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. TOLERANCE UNLESS SPECIFIED X.XXX ± X.XX ± X.X ± ANGLE ± MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387 TITLE Z AXIS AIR/OIL MANIFOLD ASSEMBLY APPLICATION GENERAL PRODUCTS SCALE 2:1 DATE 20 AUG 97 DWG No 6-10-018-048 DRAWN BY THOMPSON SHEET NO. 1 OF 1				

Z-Axis Autolube Manifold Assembly

THIS ASSEMBLY USED ON
VM16, VM17, VM24, & VM30

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	1	1/8-27 NPT SHPP



PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	1	NU-118	1/8-27 NPT 5/16-24 ELBOW
2	1	MP-357	Z AXIS AIR/OIL MANIFOLD
3	-	SEE TABLE	OIL METER
4	5	NU-157	5/32 TUBE - 1/8 NPT FEM.
5	SEE TABLE	NU-117	5/32 NYLON TUBING
6	5	NU-154	5/32 TUBE-1/8 NPT M/S

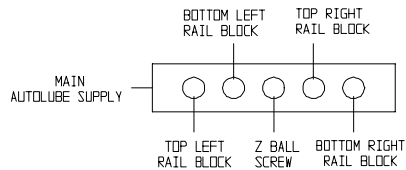
NU-117 TUBING LENGTH					OIL METER
CONNECTION	VM16	VM17	VM24	VM30	
TOP LEFT RAIL BLOCK	18	20	27	27	No.3
BOTTOM LEFT RAIL BLOCK	35	13 1/4	28	38	No.3
Z BALL SCREW	24	14 3/4	14 3/4	14 3/4	No.2
BOTTOM RIGHT RAIL BLOCK	35	7 1/2	36 1/2	36 1/2	No.3
TOP RIGHT RAIL BLOCK	18	10 1/8	25	25	No.3

Oil Meter Part Numbers
#2 = NU-155
#3 = NU-156

ALL MEASUREMENTS ARE IN INCHES

NOTES:

- ON VM17 "1" & "A" POSITIONS ARE REVERSED.
- ON VM24, VM30 & VMD30 "1" IS REPLACED WITH NU-161, 1/8 NPT 5/32 TUBE MALE ELBOW.



AUTOLUBE LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X.XXX ±			
	X.XX ±			
	X.X ±			
	ANGLE ±			

MILLTRONICS MANUFACTURING
1400 MILL LANE (612) 442-1410
WACONIA, MN 55387

TITLE Z AXIS AUTOLUBE MANIFOLD ASSEMBLY

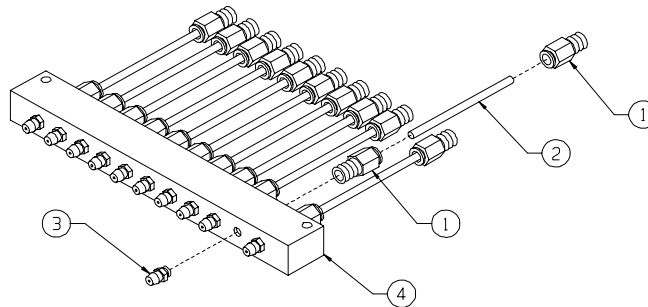
APPLICATION GENERAL PRODUCTS

SCALE 1.5:1 DWG No. 6-10-018-050 SIZE B

DATE 20 AUG 97 DRAWN BY THOMPSON SHEET NO. 1 OF 1

X & Y Axis Grease Manifold Assembly

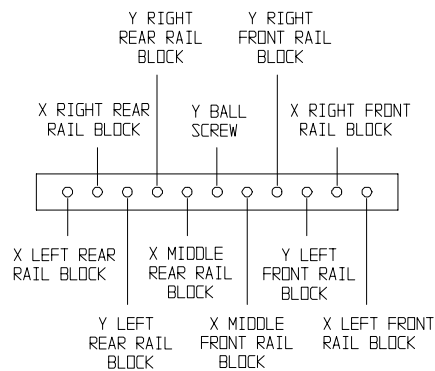
*THIS ASSEMBLY IS USED ON
VM16, VM17, VM24, & VM30*



PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	22	NU-154	5/32 TUBE 1/8 NPT M/S
2	SEE TABLE	NU-117	5/32 NYLON TUBING
3	11	NU-146	GREASE ZERK
4	1	MP-301	X & Y AXIS GREASE MANIFOLD

NU-117 TUBING LENGTH				
CONNECTION	VM16	VM17	VM24	VM30
X LEFT REAR RAIL BLOCK	20	20	24	24
X RIGHT REAR RAIL BLOCK	27	27	44	44
Y LEFT REAR RAIL BLOCK	12	12	24	24
Y RIGHT REAR RAIL BLOCK	24	30	44	44
X MIDDLE REAR RAIL BLOCK	-	-	38	38
Y BALL SCREW	32	26	39	39
X MIDDLE FRONT RAIL BLOCK	-	-	38	38
Y RIGHT FRONT RAIL BLOCK	24	30	44	44
Y LEFT FRONT RAIL BLOCK	12	12	24	24
X RIGHT FRONT RAIL BLOCK	27	27	44	44
X LEFT FRONT RAIL BLOCK	20	20	24	24

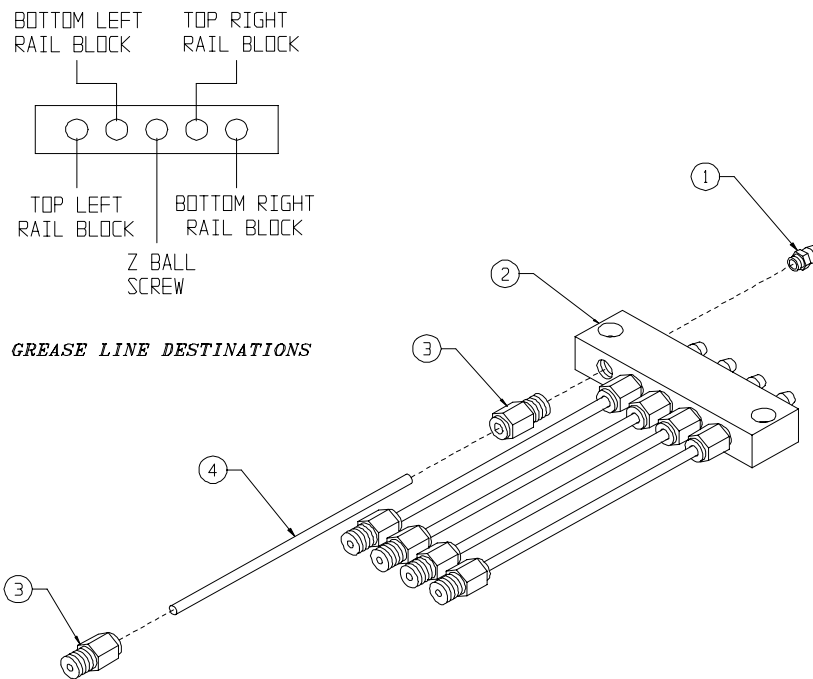
ALL MEASUREMENTS ARE IN INCHES



GREASE LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE X & Y AXIS GREASE MANIFOLD ASSEMBLY		
X .XXX X .XX X .X ANGLE		APPLICATION GENERAL PRODUCTS		
		SCALE 2:1 DWG No 6-10-018-043 SIZE B		
		DATE 15 JUL 97 DRAWN BY THOMPSON SHEET NO. 1 OF 1		

Z-Axis Grease Manifold Assembly



GREASE LINE DESTINATIONS

PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	5	NU-146	GREASE ZERK
2	1	MP-302	Z AXIS GREASE MANIFOLD
3	10	NU-154	5/32 TUBE-1/8 NPT M/S
4	SEE TABLE	NU-117	5/32 NYLON TUBING

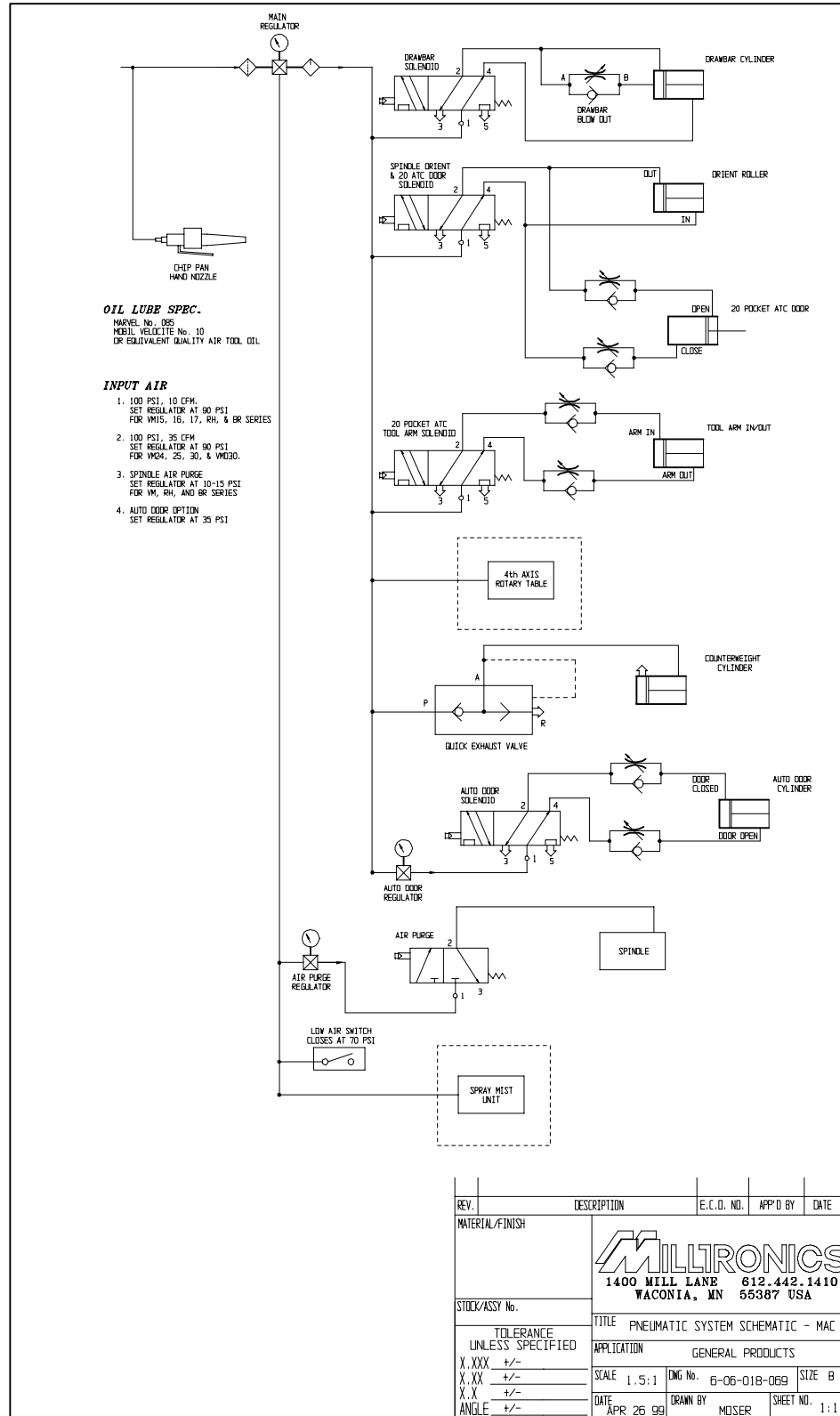
NU-117 TUBING LENGTH				
CONNECTION	VM16	VM17	VM24	VM30
TOP LEFT RAIL BLOCK	18	20	27	27
BOTTOM LEFT RAIL BLOCK	35	13 1/4	28	38
Z BALL SCREW	24	14 3/4	14 3/4	14 3/4
BOTTOM RIGHT RAIL BLOCK	35	7 1/2	36 1/2	36 1/2
TOP RIGHT RAIL BLOCK	18	10 1/8	25	25

ALL MEASUREMENTS ARE IN INCHES

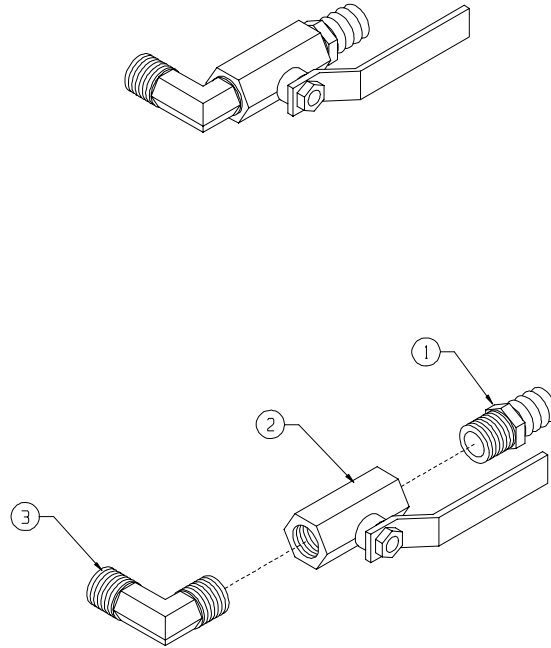
THIS ASSEMBLY USED ON VM16, VM17, VM24, & VM30

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE Z AXIS GREASE MANIFOLD ASSEMBLY		
X.XXX ±		APPLICATION GENERAL PRODUCTS		
X.XX ±		SCALE 1.5:1		
X.X ±		DATE 14 JUL 97		
ANGLE ±		DRAWN BY THOMPSON		
		SHEET NO. 1 OF 1		

Pneumatic System Schematic



Flood Coolant Valve Handle Assembly



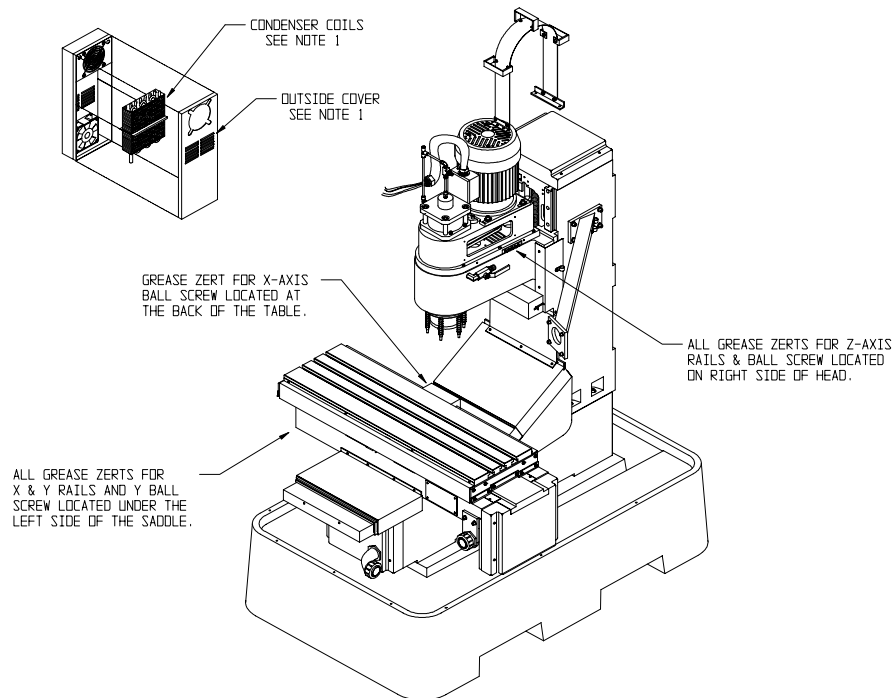
PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-66	BRASS HOSE, 3/4 IN., 125HBL-12-8
2	1	NU-64	BRASS BALL, 1/2 IN., 21-041
3	1	NU-140	1/2 NPT MALE ELBOW

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 FLOOD HANDLE SUB-ASSEMBLY		
X. XXX	±	APPLICATION PARTNER VM16		
X. XX	±	SCALE 2:1 DWG No 6-10-008-038 SIZE B		
X. X	±	DATE 29 APR 97 DRAWN BY THOMPSON SHEET NO. 1 OF 1		
ANGLE	±			

Machine Lubrication Instructions

NOTES:

1. IF YOUR MACHINE HAS A HEAT EXCHANGER, CLEAN IT EVERY MONTH BY REMOVING THE MOUNTING HARDWARE ON THE BOTTOM AND REMOVE THE OUTSIDE COVER. REMOVE THE CONDENSER COILS AND CLEAN IT WITH AN AIR NOZZLE AND REASSEMBLE.
2. USE MOBILITH AW SERIES MULTIPURPOSE EP GREASE OR OTHER EQUIVALENT FOR ALL LUBE POINTS. MACHINE SHOULD BE SERVICED ONCE A MONTH FOR PROPER OPERATION AND ACCURACY OF MACHINE. SEE PAGE TWO FOR SPECIFICATIONS.
3. CLEAN AND FILL AIR FILTER / REGULATOR / OILER EVERY WEEK FOR PROPER OPERATION OF ALL PNEUMATIC PARTS. FILL WITH MARVEL No. 085 MOBIL ALMO 525, MOBIL VELOCITE No. 10 OR OTHER EQUIVALENT QUALITY AIR TOOL OIL. SEE PAGE TWO FOR SPECIFICATIONS.
4. MACHINES WITH AUTOLUBE OPTION USE MOBIL OIL VACTRA 2, AMOCO WAYTAC No. 68, SUNDOL SUNWAY LUBE No. 1180, OR EQUIVALENT QUALITY WAY OIL. SEE PAGE TWO FOR SPECIFICATIONS.



A	CHANGE GREASE SPECS.	3410		2/98
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (812) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16 LUBRICATION DRAWING		
X .XXX X .XX X .X ANGLE		APPLICATION PARTNER I		
		SCALE 15:1 DWG NO 6-10-008-050 SIZE B		
		DATE 21 JAN 98 DRAWN BY THOMPSON SHEET NO 1 OF 2		

THIS ASSEMBLY USED ON VM15, VM16

MOBILITH AW SERIES, MULTIPURPOSE EP GREASE	
PRODUCT NUMBER	64352-8
NLGI GRADE	1
COLOR	GREEN
STRUCTURE	SMOOTH/TACKY
SOAP TYPE	LITHIUM COMPLEX
MINERAL OIL VISCOSITY	
cST AT 40°C	150
cST AT 100°C	13
SUS AT 100°F	750
SUS AT 210°F	70
ISO VISCOSITY GRADE	150
PENETRATION AT 23°C (77°F), WORKED	325
DROPPING POINT, ASTM D 2265, °F	475
TIMKEN OK LOAD, ASTM D 2509, lb	40
FOUR-BALL EP TEST, ASTM D 2596,	
WELD LOAD, kg	250
LOAD WEAR INDEX	40
FOUR-BALL WEAR TEST, ASTM D 2266,	
SCAR DIAMETER, mm, MAX	0.5
CORROSION PREVENTION, ASTM D 1743	PASS
WHEEL BEARING TEST, ASTM D 4290	
MODIFIED, LEAKAGE, GRAM	5

MOBIL VELOCITE OIL No. 10	
PRODUCT NUMBER	60068-4
GRAVITY, API	32.0
POUR, °C (°F), max.	-4 (25)
FLASH, °C (°F), min.	182 (360)
VISCOSITY	
cST AT 40° C	22.0
cST AT 100° C	4.0
SUS AT 100° F	115
SUS AT 210° F	40
ISO VG	22
VISCOSITY INDEX	95
COLOR, ASTM D 1500	2.0
RUST PROTECTION, ASTM D 665	PASS
CINCINNATI MILACRON SPECIFICATION	P-45

MOBIL VACTRA OIL No. 2	
PRODUCT NUMBER	60049-4
SPECIFIC GRAVITY, 60/60F	0.88
POUR POINT, °C (°F), max.	-9 (16)
FLASH POINT, °C (°F), min.	244 (472)
VISCOSITY	
cST AT 40°C	68
cST AT 100°C	8.6
SUS AT 100°F	356
SUS AT 210°F	55
VISCOSITY INDEX	97
ISO VG	68
COLOR, ASTM D 1500	4
FZG, PASS STAGES	11
4 BALL WELD, kg, ASTM D 2783	160
4 BALL WEAR, mm, ASTM D 4172	0.22
COPPER CORROSION, ASTM D 130	1B
RUST, D665A	PASS
VICKERS V-104C, ng D 2882 (MOD)	-
CMCD, P-SPEC, APPROVAL	P-47
BIJUR PT 37-1 APPROVAL	PASS
OKUMA APPROVAL	PASS

MOBIL ALMO No. 525	
PRODUCT NUMBER	60318-3
GRAVITY, API	27.7
SPECIFIC GRAVITY	0.8888
FLASH POINT, °C (°F)	188 (370)
POUR POINT, °C (°F)	-29 (-20)
VISCOSITY	
cST AT 40° C	45
cST AT 100° C	6.5
SUS AT 100° F	230
SUS AT 210° F	48
VISCOSITY INDEX	90
ISO VG	46
COLOR, ASTM D 1500	3.0
RUST PROTECTION, ASTM D 665,	
A & B	PASS
ACID WATER RUST TEST	PASS
ALMEN PIN LOAD TEST	PASS
FALEX LOAD TEST,	
ASTM D 2670	PASS

A	CHANGE GREASE SPECS.	3410		2/98
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.		TITLE VM16 LUBRICATION DRAWING		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
X.XXX	±	SCALE 15:1	DWG No 6-10-008-050	SIZE B
X.XX	±	DATE 21 JAN 98	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
X.X	±			
ANGLE	±			

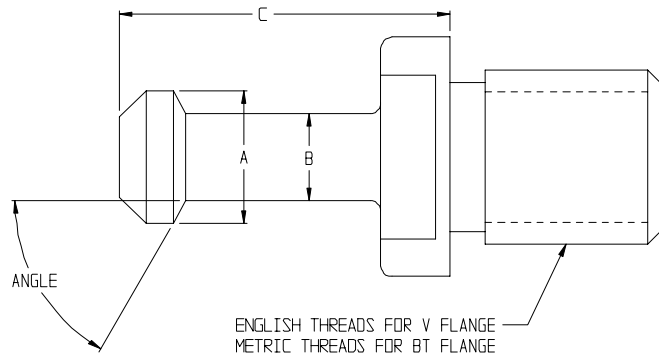
Retention Knob Chart

RETENTION KNOBS STYLE V-FLANGE

V-FLANGE TAPER	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.
40	A	B	C	ANGLE	RH20, RH25, RH30, BR50, BR60, BR80 PARTNER VM15, VM16, VM17, VMG17, VM24, VM25, VM30, VMD30	RB4E-0002	RK31114A	PT-532-60

RETENTION KNOBS STYLE BT-FLANGE

BT-FLANGE TAPER	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.
40	A	B	C	ANGLE	RH20, RH25, RH30, BR50, BR60, BR80 PARTNER VM15, VM16, VM17, VMG17, VM24, VM25, VM30, VMD30	RB4M-0002	RK31113A	PT-444-60



Notes:

1. COMMAND CORPORATION
TEL - 1.800.328.2197
FAX - 1.612.576.6911
2. KENAMETAL
TEL - 1.800.445.7738
FAX - 1.800.962.4910
3. VALENITE
TEL - 1.800.544.3336
FAX - 1.800.488.0695

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH	 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA			
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED	TITLE RETENTION KNOB CHART			
X.XXX +/-	APPLICATION GENERAL PRODUCTS			
X.XX +/-	SCALE 1:1	DWG No. 6-11-018-054	SIZE 8	
X.X +/-	DATE 30 APR 99	DRAWN BY DAHLKE	SHEET NO. 1	OF 1
ANGLE +/-				