

VM16F Mechanical

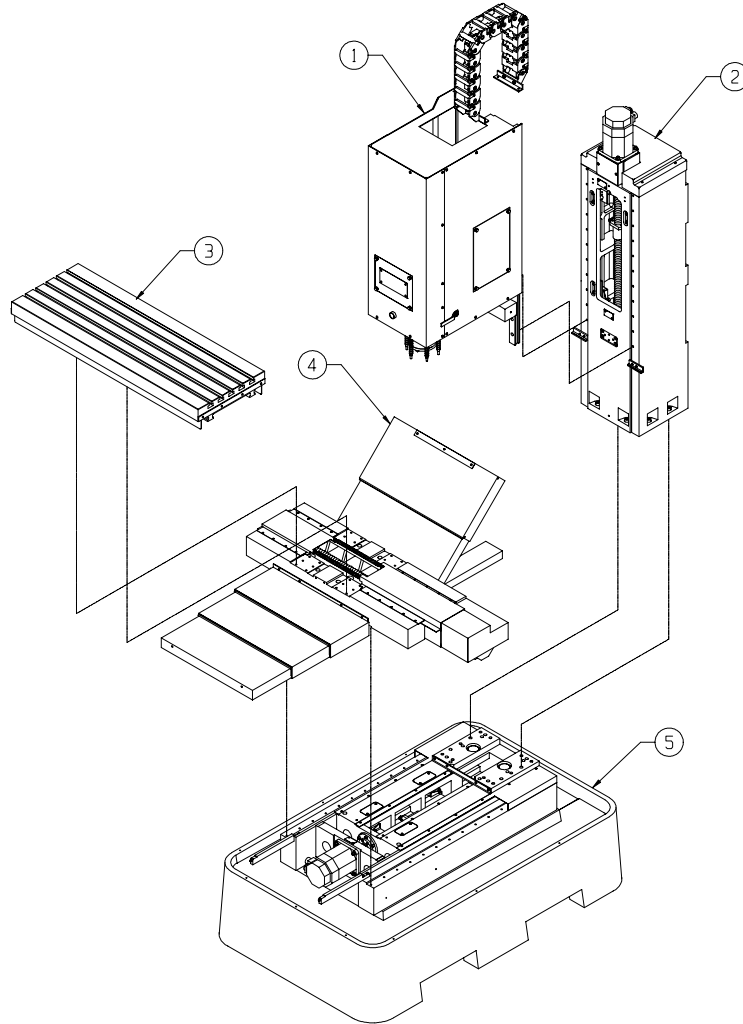
4-12-99
Rev 1

Table of Contents

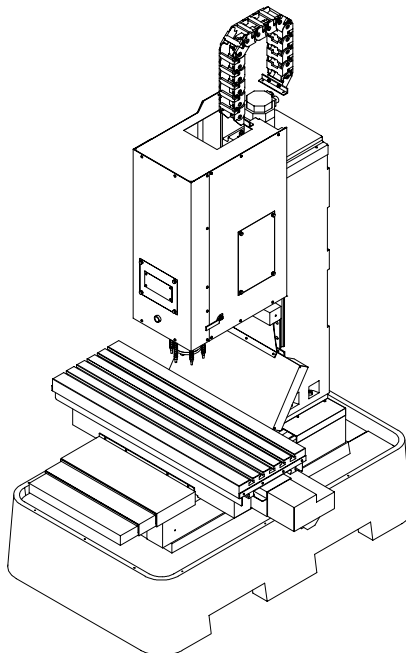
Table of Contents.....	iii
Manual Discrepancy Sheet	1
Basic Machine Assembly	2
Machine Base Assembly.....	4
Machine Saddle Assembly.....	6
Saddle & Way Cover Assembly	8
Milling Table Assembly	10
Machine Head Assembly	12
Machine Column Assembly – AC Drives	14
Flood Coolant Valve Handle Assembly.....	16
Ball Screw Assembly	17
X & Z Axis Bearing Cup Assembly.....	18
Y Axis Bearing Cup Assembly	19
Setco Spindle Assembly	20
Power Drawbar Assembly & Instructions	22
Power Drawbar Cylinder Assembly.....	23
Setco Spindle Orient, Rigid Tap Assembly	24
20 Pocket Air Cylinder Assembly	25
20 Pocket Rotary Tool Changer Assembly	26
20 Pocket ATC Cover Assembly.....	28
20 Pocket ATC With 4” Riser Block Option.....	29
10 HP Spindle Motor Assembly	30
10 HP, 8K/12K RPM Pulley Assembly	32
15 Hp 6K RPM Pulley Assembly.....	34
15 HP 8K RPM Pulley Assembly	35
Chip Pan Door Assembly	36
Coolant Trough Assembly.....	38
X & Y Axis Autolube Manifold Assembly.....	40
X & Y Axis Air/Oil Manifold Assembly	42
Z-Axis Air/Oil Manifold Assembly	44
Z-Axis Autolube Manifold Assembly.....	45
X & Y Axis Grease Manifold Assembly	46
Z-Axis Grease Manifold Assembly	47
Machine Lubrication Instructions.....	48
Pneumatic System Schematic	50
Air Regulator & Lubricator Assembly	51
Retention Knob Chart	52

Manual Discrepancy Sheet

Basic Machine Assembly



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 VM16E MACHINE ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM16		
X.XX ±		SCALE 17:1 DWG NO 6-10-008-054 SIZE B		
X.X ±		DATE 08 JUN 99 DRAWN BY DAHLKE SHEET NO. 1 OF 2		
ANGLE ±				



PARTS LIST

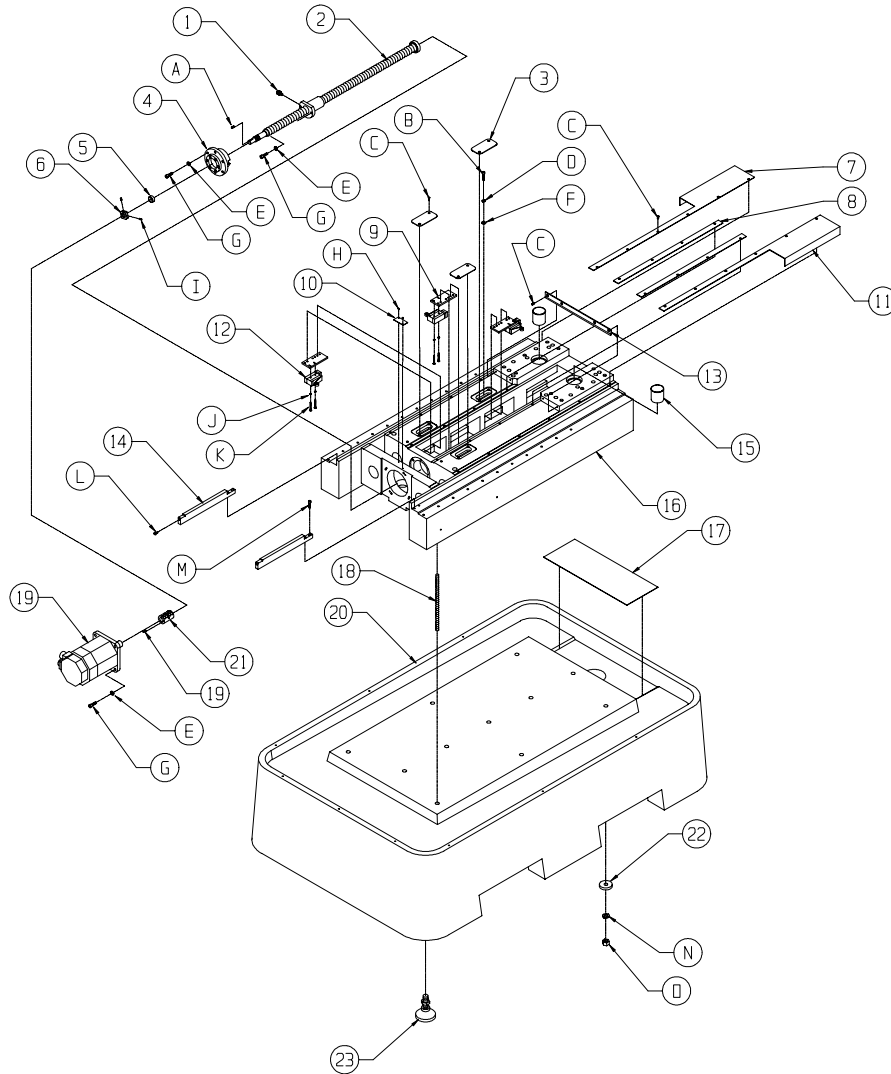
No.	DRAWING No.	DESCRIPTION
1	6-10-008-034	HEAD SUB-ASSEMBLY
2	SEE TABLE	COLUMN SUB-ASSEMBLY
3	6-10-008-036	TABLE SUB-ASSEMBLY
4	6-10-008-057	SADDLE SUB-ASSEMBLY
5	6-10-008-052	VM16E BASE SUB-ASSEMBLY

COLUMN ASSEMBLY

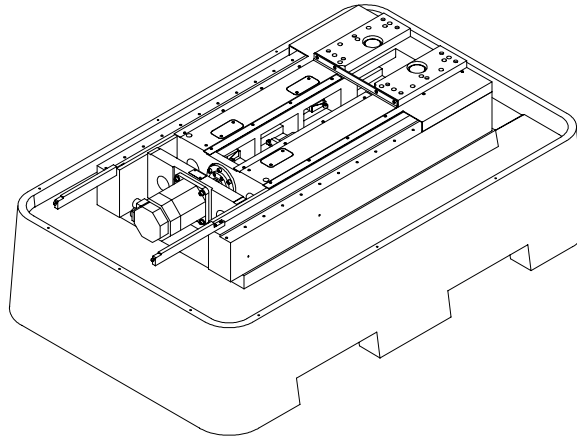
AC	6-10-008-031
DC	6-10-008-055

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 VM16E MACHINE ASSEMBLY		
X .XXX ±		APPLICATION PARTNER VM16		
X .XX ±		SCALE 17:1 DWG No 6-10-008-054 SIZE B		
X .X ±		DATE 08 JUN 99 DRAWN BY DAHLKE SHEET NO. 2 OF 2		
ANGLE ±				

Machine Base Assembly



REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	±			
X.XX	±			
X.X	±			
ANGLE	±			
TITLE		VM16E BASE SUB-ASSEMBLY		
APPLICATION		PARTNER VM16		
SCALE		15:1	DWG No 6-10-008-052	SIZE B
DATE		26 MAY 99	DRAWN BY DAHLKE	SHEET NO. 1 OF 2



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-118	1/8 NPT 5/16-24 ELBOW
2	1	6-10-018-027	BALL SCREW ASSEMBLY
3	3	MP-236	Y-AXIS SWITCH SLOT COVER
4	1	6-10-018-064	VM BEARING CUP ASSEMBLY
5	1	MP-429	BEARING LOCK NUT SPACER
6	1	MP1-94	BALL SCREW LOCKNUT
7	1	MP1-264	Y-AXIS RAIL WAY COVER BRACKET - LEFT
8	2	MP1-208	Y-AXIS BALL SCREW WAY COVER BRACKET
9	3	MPT-36	SWITCH PLATE
10	1	LB-27	PULLEY MOTOR WARNING LABEL
11	1	MP1-263	Y-AXIS FRONT WAY COVER BRACKET - RIGHT
12	3	SW-149	LIMIT SWITCH
13	1	MP1-224	COLUMN WIPER
14	2	MP1-218	Y-AXIS FRONT WAY COVER BRACKET
15	2	MP-56	PVC COUPLING/LINER
16	1	MX1-42	VM SERIES BASE - MACHINED
17	1	MP6-44	FLOOD COOLANT SCREEN
18	11	HD-59	1/2-13 x 7 THREADED ROD
19	1	SEE TABLE	AXIS MOTOR
20	1	MP1-222	VM17 MACHINE PEDESTAL
21	1	SEE TABLE	MOTOR COUPLER
22	11	MP-138	PEDESTAL REINFORCING PLATE
23	6	MP1-29	LEVELING PADS

MOTOR OPTIONS

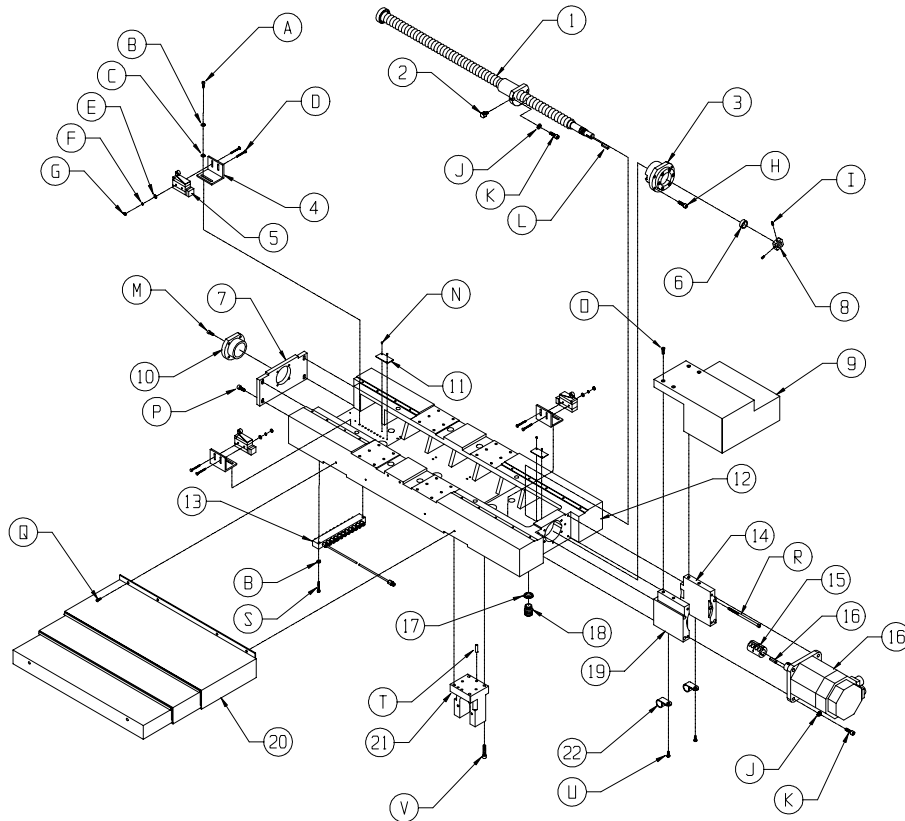
DESCRIPTION	DC	AC
MOTOR	MD-02	MD-94
MOTOR COUPLER	MA-176	MA-177

HARDWARE LIST

No.	QTY	DESCRIPTION
A	1	3/16 x 3/16 x 1/2 BALL SCREW KEY
B	6	1/4-20 x 1 1/2 SHCS
C	30	8-32 x 3/8 FHCS
D	6	1/4 LOCK WASHER
E	12	5/16 LOCK WASHER
F	6	1/4 FLAT WASHER
G	12	5/16-18 x 1 1/4 SHCS
H	2	1/4 DRIVE PIN
I	2	10-32 x 3/16 BRASS TIPPED SHSS
J	6	No. 8 LOCK WASHER
K	6	8-32 x 1 BHCS
L	2	1/4-20 x 3/8 BHCS
M	4	1/4-20 x 3/4 SHCS
N	11	1/2 LOCK WASHER
O	11	1/2-13 HEX NUT

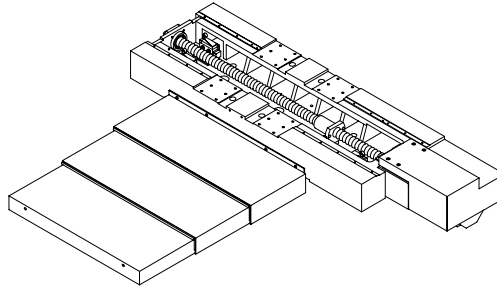
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 812.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM16E BASE SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM16		
X.XX ±		SCALE 12:1	DWG No. 6-10-008-052	SIZE B
X.X ±		DATE 26 MAY 99	DRAWN BY DAHLKE	SHEET NO. 2 OF 2
ANGLE ±				

Machine Saddle Assembly



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 VM16E SADDLE SUB-ASSEMBLY		
X.XXX	±	APPLICATION PARTNER VM16		
X.XX	±	SCALE 12:1 DWG No 6-10-008-056 SIZE B		
X.X	±	DATE 09 JUN 99 DRAWN BY DAHLKE SHEET NO. 1 OF 2		
ANGLE	±			

THIS ASSEMBLY USED ON VM16, VM17



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	6-10-018-027	BALL SCREW ASSEMBLY
2	1	NU-118	1/8 NPT-5/16-24 ELBOW
3	1	6-10-018-066	BEARING CUP ASSEMBLY
4	3	MP1-96	LIMIT SWITCH MOUNTING BRACKET
5	3	SW-149	LIMIT SWITCH
6	1	MP-429	BEARING LOCKNUT SPACER
7	1	MP6-40	X-AXIS RADIAL SUPPORT BRACKET
8	1	MP1-94	BALL SCREW LOCKNUT
9	1	SEE TABLE	X-AXIS MOTOR COVER
10	1	MP6-42	30 IN. TRAVEL RADIAL SUPPORT
11	2	LB-27	PULLEY MOTOR WARNING LABEL
12	1	MX1-41	VM SERIES SADDLE - MACHINED
13	1	SEE TABLE	X & Y MANIFOLD ASSEMBLIES
14	1	SEE TABLE	MOTOR SPACER - RIGHT
15	1	SEE TABLE	MOTOR COUPLER
16	1	SEE TABLE	AXIS MOTOR
17	1	WX-38	O-RING, 1/2 IN.
18	1	WX-23	CORD GRIP, 1/2 IN.
19	1	SEE TABLE	MOTOR SPACER - LEFT
20	1	MP1-226	VM17 FRONT WAY COVER
21	1	MX1-43	Y-AXIS BALL SCREW CARRIER - MACHINED
22	1	WX-82	CABLE CLAMP

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

HARDWARE LIST

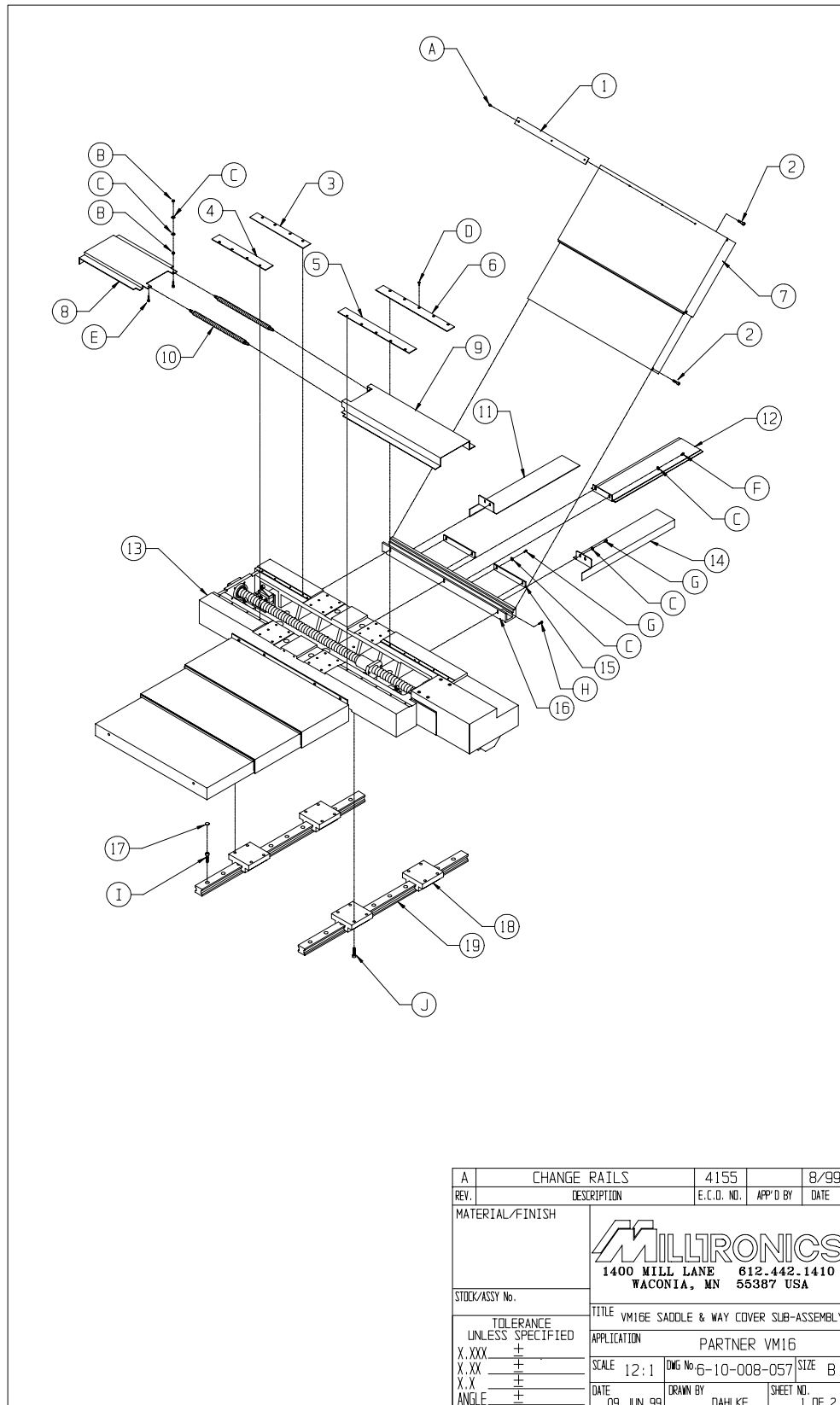
No.	QTY	DESCRIPTION
A	6	10-32 x 5/8 SHCS
B	8	No. 10 LOCK WASHER
C	6	No. 10 FLAT WASHER
D	6	8-32 x 1 1/4 BHCS
E	6	No. 8 LOCK WASHER
F	6	No. 8 FLAT WASHER
G	6	8-32 HEX NUT
H	5	1/4-20 x 1 SHCS
I	2	10-32 x 3/16 BRASS TIPPED SHSS
J	6	5/16 LOCK WASHER
K	6	5/16-18 x 1 1/4 SHCS
L	1	3/16 x 3/16 x 1/2 KEY
M	4	1/4-20 x 5/8 SHCS
N	4	1/4 DRIVE RIVET
O	4	8-32 x 3/8 FHCS
P	4	5/16-18 x 3/4 SHCS
Q	4	10-24 x 1/2 BHCS
R	6	1/4-20 x 5 SHCS
S	2	10-32 x 1 1/4 SHCS
T	2	1/4 x 1 DOWEL PIN
U	2	8-32 x 1/2 BHCS
V	4	5/16-18 x 1 1/2 SHCS

MOTOR OPTIONS

No.	AC	DC
9	MM-52	MM-58
14	MP1-235	MP1-233
15	MA-177	MA-176
16	MD-94	MD-02
19	MP1-236	MP1-234

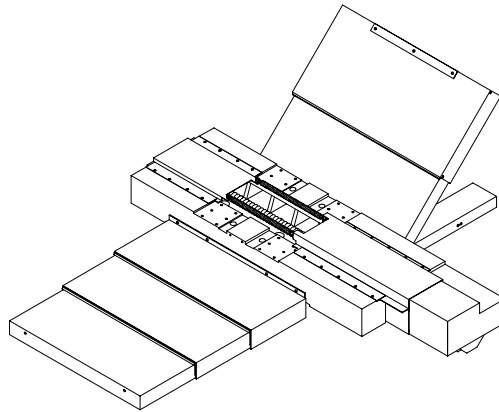
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. TOLERANCE UNLESS SPECIFIED X .XXX ± X .XX ± X .X ± ANGLE ±  1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA TITLE VM16E SADDLE SUB-ASSEMBLY APPLICATION PARTNER VM16 SCALE 12:1 DWG No. 6-10-008-056 SIZE B DATE 09 JUN 99 DRAWN BY DAHLKE SHEET NO. 2 OF 2				

Saddle & Way Cover Assembly



A	CHANGE RAILS	4155		8/99
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 SADDLE & WAY COVER SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM16		
X.XX ±		SCALE 12:1 DWG No 6-10-008-057 SIZE B		
X.X ±		DATE 09 JUN 99 DRAWN BY DAHLKE SHEET NO. 1 OF 2		
ANGLE ±				

THIS ASSEMBLY USED ON VM16, VM17



PARTS LIST

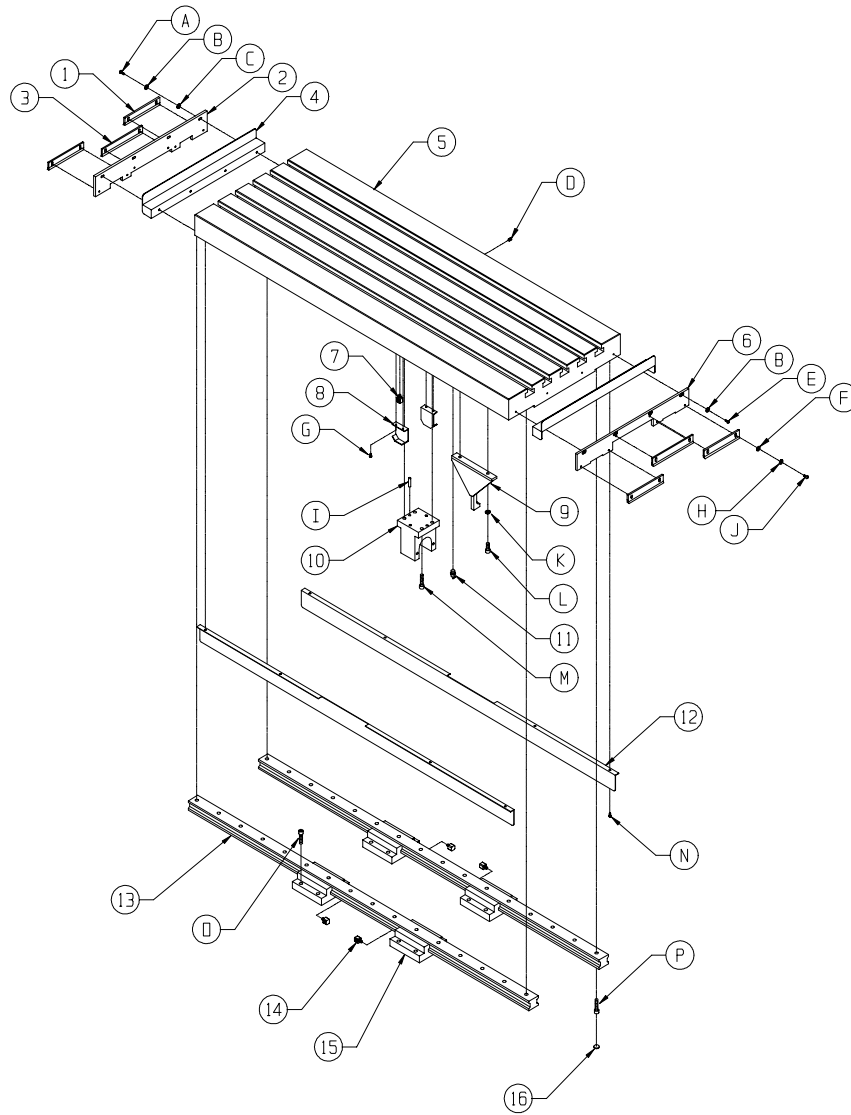
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-72	Y WAY COVER SADDLE MOUNT
2	4	HD-44	1/4 x 3/8 SHOULDER BOLT
3	1	MP6-65	X-AXIS WAY COVER BRACKET - LEFT REAR
4	1	MP6-36	X-AXIS WAY COVER BRACKET - LEFT FRONT
5	1	MP6-66	X-AXIS WAY COVER BRACKET RIGHT FRONT
6	1	MP6-37	X-AXIS WAY COVER BRACKET - RIGHT REAR
7	1	MP1-227	REAR WAY COVER
8	1	MP6-39	X-AXIS WAY COVER LEFT
9	1	MP1-232	VM X-AXIS WAY COVER - RIGHT
10	2	HD-33	X-AXIS WAY COVER SPRING
11	1	MP1-261	Y RAIL WAY COVER - LEFT
12	1	MP1-207	Y-AXIS BALL SCREW WAY COVER
13	1	6-10-008-056	VM 16 SADDLE SUB-ASSEMBLY
14	1	MP1-262	Y RAIL WAY COVER - RIGHT
15	2	MP1-228	TROUGH WIPER
16	1	MP1-225	VM 17 SADDLE TROUGH
17	22	MP-550	RAIL PLUGS
18	4	MP-545	35 mm RAIL BLOCK
19	2	MP1-343	35 mm 820 RAILS

HARDWARE LIST

No.	QTY	DESCRIPTION
A	3	8-32 x 1/4 BHCS
B	4	10-32 HEX NUT
C	16	No. 10 FLAT WASHER
D	18	8-32 x 3/8 FHCS
E	2	10-32 x 5/8 SHCS
F	2	10-32 x 1/4 BHCS
G	10	10-32 x 3/8 BHCS
H	3	10-24 x 1/2 BHCS
I	22	M8-1.25 x 40 mm. SHCS
J	16	M8-1.25 x 30 mm. SHCS

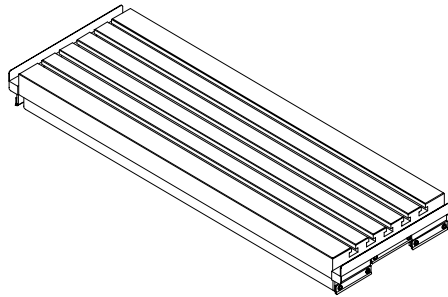
A	CHANGE RAILS	4155		8/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE VM16E SADDLE & WAY COVER SUB-ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER VM16		
X .XXX		SCALE 12:1 DWG No. 6-10-008-057 SIZE B		
X .XX		DATE 09 JUN 99 DRAWN BY DAHLKE SHEET NO. 2 OF 2		
X .X				
ANGLE				

Milling Table Assembly



C	CHANGE RAILS	4154		8/99
B	ADD TABLE WIPERS	3430	N.M.	2/98
A	CHANGE STOCK No.	3310	N.M.	11/97
REV.	DESCRIPTION	E.C.O. 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 USA				
TITLE VM17 TABLE SUB-ASSEMBLY				
APPLICATION PARTNER VM17				
SCALE 10:1		DWG No 6-10-008-036		SIZE B
DATE 23 APR 97	DRAWN BY THOMPSON	SHEET NO. 1 OF 2		

THIS ASSEMBLY USED ON VM16, VM17

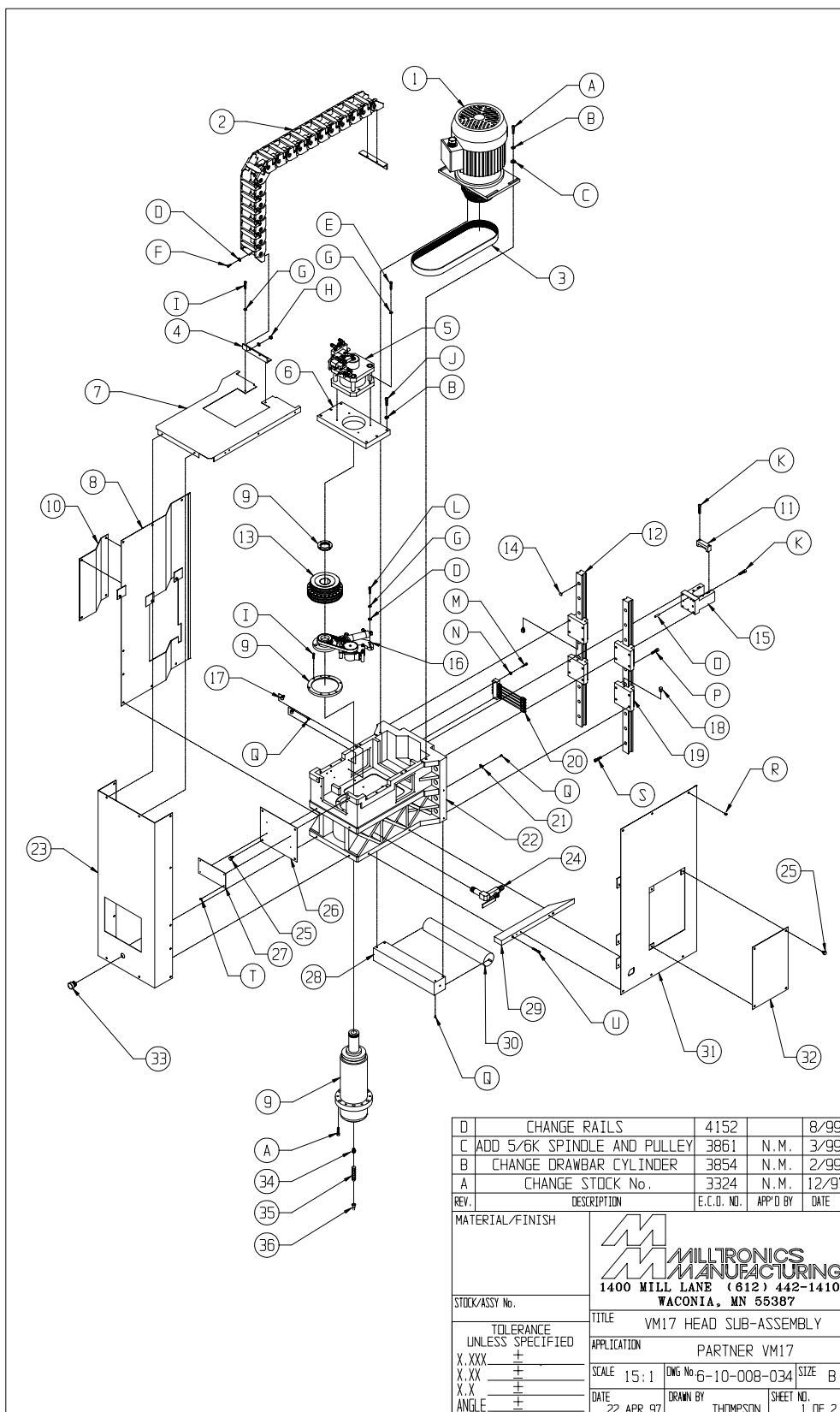


PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	4	MP1-247	VM17 SADDLE WIPER - LOWER
2	1	MP1-246	VM17 WIPER PLATE - LEFT
3	2	MP1-248	VM17 SADDLE WIPER - UPPER
4	2	MP-407	16" TABLE - TROUGH
5	1	MX6-32	METRIC 45 x 16 TABLE - MACHINED
6	1	MP1-245	VM17 WIPER PLATE - RIGHT
7	1	NU-118	1/8 NPT -5/16-24 ELBOW
8	2	MP6-45	EXTENDED TRAVEL X-AXIS DOG
9	1	MP1-231	VM17 SADDLE SWEEPER
10	1	MX6-16	X-AXIS BALL SCREW CARRIER
11	1	NU-145	1/8 NPT GREASE FITTING
12	2	MP1-113	30" FRONT EXT. TABLE PLATE
13	2	MP-544	35 mm 1240 RAILS
14	4	NU-107	OIL FITTING
15	4	MP-545	35 mm RAIL BLOCK
16	30	MP-550	RAIL PLUGS

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	8-32 x 5/8 BHCS
B	8	# 8 LOCK WASHER
C	4	# 8 FLAT WASHER
D	1	1/8-27 NPT SHPP
E	4	8-32 x 1/2 BHCS
F	12	# 10 FLAT WASHER
G	4	6-32 x 1/4 BHCS
H	12	# 10 LOCK WASHER
I	2	1/4 x 1 DOWEL PIN
J	12	10-32 x 1/2 BHCS
K	2	1/4 LOCK WASHER
L	2	1/4-20 x 3/4 SHCS
M	4	5/16-18 x 1 1/4 SHCS
N	8	8-32 x 1/4 BHCS
O	16	M8-1.25 x 30 mm. SHCS
P	30	M8-1.25 x 40 mm. SHCS

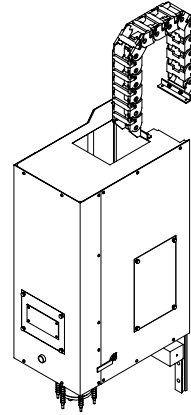
C	CHANGE RAILS	4154		8/99
B	ADD TABLE WIPERS	3430	N.M.	2/98
A	CHANGE STOCK No.	3310	N.M.	11/97
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM17 TABLE SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM17		
X.XX ±		SCALE 10:1 DWG No 6-10-008-036 SIZE B		
X.X ±		DATE 23 APR 97 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE ±				

Machine Head Assembly



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	6-10-018-069	10 H.P. POLY V SPINDLE MOTOR ASSEMBLY
2	1	MP-443	SPINDLE CABLE TRACK
3	1	BT-48	375L6 POLY V BELT
4	2	MP-316	SPINDLE CABLE SUPPORT BRACKET
5	1	6-10-018-062	NU-182 DRAWBAR CYLINDER ASSEMBLY
6	1	MP-284	PDB AIR CYLINDER MOUNT PLATE
7	1	MP1-334	HEAD COVER W/FLOOD - TOP
8	1	MP1-215	HEAD COVER - LEFT
9	1	6-10-018-067	SETCO SPINDLE ASSEMBLY
10	1	MP-306	LEFT SIDE ACCESS HEAD COVER
11	1	MP-109	Z-AXIS BALL SCREW SAFETY CATCH
12	2	MP1-343	35 mm 820 RAILS
13	1	PY-145	5/6K 10 H.P. SPINDLE PULLEY
14	22	MP-550	RAIL PLUGS
15	1	MX1-11	Z-AXIS BALL SCREW CARRIER - MACH.
16	1	6-10-018-068	SETCO SPINDLE ORIENT RIGID TAPPING ASSY.
17	2	WX-82	WIRE TIE DOWN
18	4	NU-107	OIL FITTING
19	4	MP-545	35 mm RAIL BLOCK
20	1	SEE TABLE	Z-AXIS MANIFOLD ASSEMBLY
21	5	NU-36	CLAMP 5/32 OILER
22	1	MX-15	VM SERIES HEAD - MACHINED
23	1	MP-529	HEAD COVER W/FLOOD - FRONT
24	1	6-10-008-039	VM 17 FLOOD HANDLE SUB-ASSEMBLY
25	12	WX-160	KNURLED THUMB SCREW
26	1	MP-307	FRONT ACCESS HEAD COVER
27	1	LB-01	SAFETY STICKER
28	1	MP1-223	VM ROLLER SHADE HOUSING
29	1	MP-533	HEAD COVER W/FLOOD SPACER
30	1	MP1-31	ROLLER SHADE
31	1	MP1-336	HEAD COVER W/FLOOD - RIGHT
32	1	MP-530	RIGHT SIDE ACCESS COVER
33	1	SW-67	TOOL OUT SWITCH
34	6	NU-111	1/4 LOCKLINK 1/8 NPT
35	24	MA-22	LOCKLINK HOSE
36	6	MA-21	1/8 NOZZLE



HARDWARE LIST

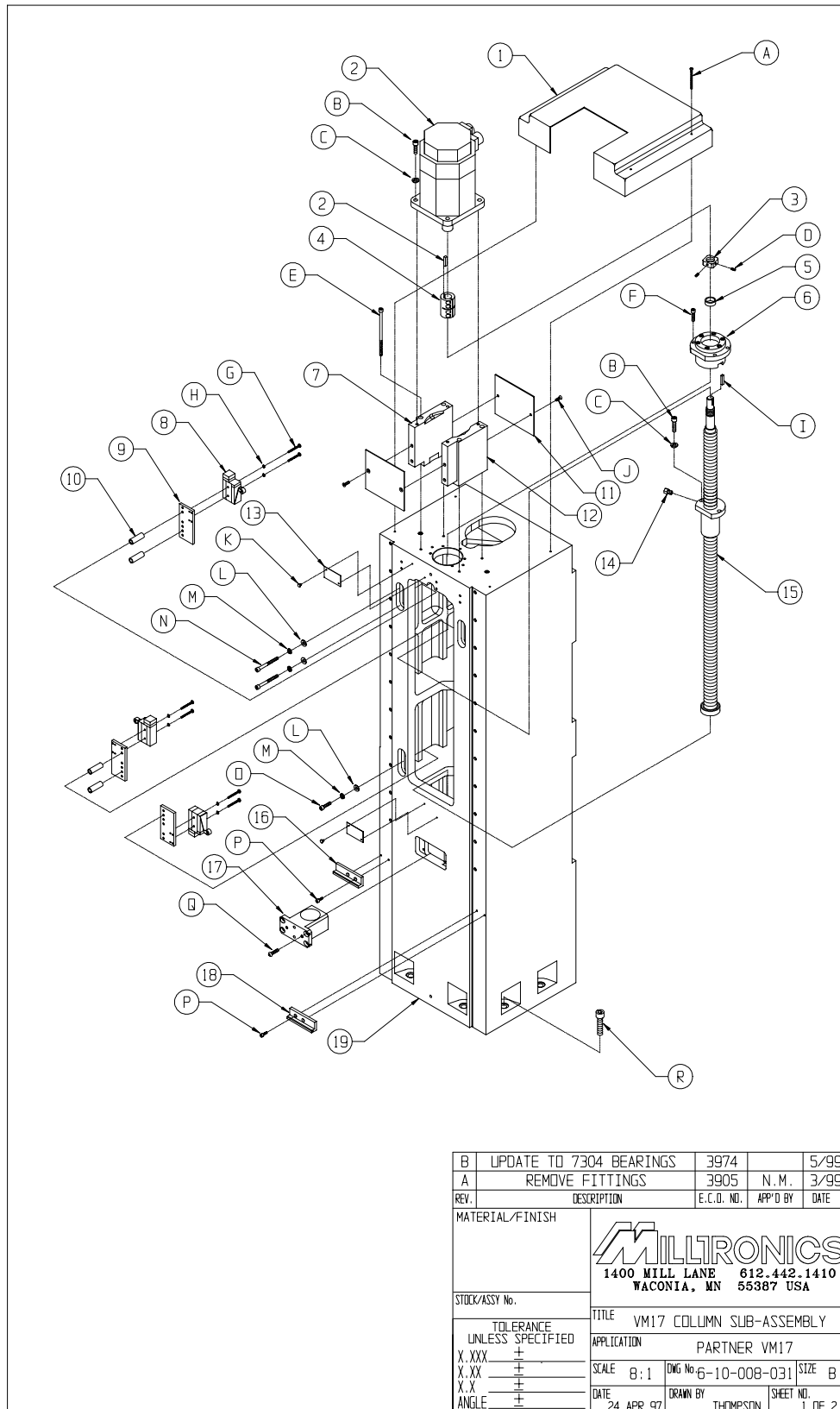
No.	QTY	DESCRIPTION
A	14	5/16-18 x 1 1/4 SHCS
B	14	5/16 LOCK WASHER
C	8	5/16 HARDENED FLAT WASHER
D	11	1/4 FLAT WASHER
E	4	1/4-20 x 1 1/4 SHCS
F	4	1/4-20 x 3/4 BHCS
G	11	1/4 LOCK WASHER
H	4	1/4-20 NYLOCK NUT
I	10	1/4-20 x 3/4 SHCS
J	6	5/16-18 x 1 3/4 SHCS
K	6	5/16-18 x 1 1/2 SHCS
L	3	1/4-20 x 1 SHCS
M	2	10-32 x 1 SHCS
N	2	# 10 LOCK WASHER
O	2	1/4 x 1 DOWEL PIN
P	16	M8-1.25 x 30 mm. SHCS
Q	11	8-32 x 3/8 BHCS
R	30	1/4-20 x 3/8 BHCS
S	22	M8-1.25 x 40 mm SHCS
T	4	6-32 x 1/4 BHCS
U	2	1/4-20 x 1 1/2 SHCS

Z-AXIS MANIFOLD ASSEMBLIES

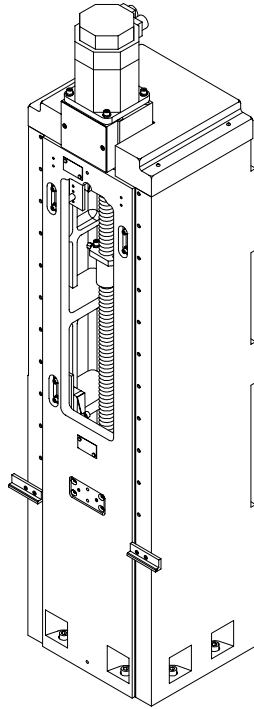
DRAWING No.	DESCRIPTION
6-10-018-044	Z-AXIS GREASE MANIFOLD ASSEMBLY
6-10-018-050	VM Z-AXIS OIL MANIFOLD ASSEMBLY
6-10-018-048	Z-AXIS AIR/OIL MANIFOLD ASSEMBLY

D	CHANGE RAILS	4152		8/99
C	ADD 5/6K SPINDLE AND PULLEY	3861	N.M.	3/99
B	CHANGE DRAWBAR CYLINDER	3854	N.M.	2/99
A	CHANGE STOCK No.	3324	N.M.	12/97
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 VM17 HEAD SUB-ASSEMBLY		
X .XXX X .XX X .X ANGLE		APPLICATION PARTNER VM17		
		SCALE 15:1 DATE 22 APR 97		
		DWG No 6-10-008-034 DRAWN BY THOMPSON		
		SIZE B SHEET NO. 2 OF 2		

Machine Column Assembly – AC Drives



THIS ASSEMBLY USED ON VM16, VM17



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	VM1-08	Z-AXIS MOTOR COVER
2	1	MD-95	48 IN-LB MOTOR W/BRAKE
3	1	MP1-94	BALL SCREW LOCK NUT
4	1	MA-177	5/8 x 19 mm. COUPLER
5	1	MP-429	BEARING LOCK NUT SPACER
6	1	6-10-018-066	AXIS BEARING CUP ASSEMBLY
7	1	MP1-235	YASKAWA MOTOR SPACER RIGHT
8	3	SW-149	LIMIT SWITCH
9	3	MPT-36	SWITCH PLATE
10	4	SP-83	Z-AXIS LIMIT/GRID SPACER
11	2	MP1-237	Z-AXIS YASKAWA SPACER COVER
12	1	MP1-236	YASKAWA MOTOR SPACER LEFT
13	2	LB-27	PULLEY MOTOR WARNING LABEL
14	1	NU-154	1/8 NPT MS 5/32 TUBE
15	1	6-10-018-027	4 PITCH 25 IN. BALL SCREW
16	1	MP1-199	COLUMN WAY COVER BRACKET - LEFT
17	1	MX1-28	Y & Z RADIAL SUPPORT, 44 IN.
18	1	MP1-201	COLUMN WAY COVER BRACKET - RIGHT
19	1	MX1-45	VM17 COLUMN - MACHINED

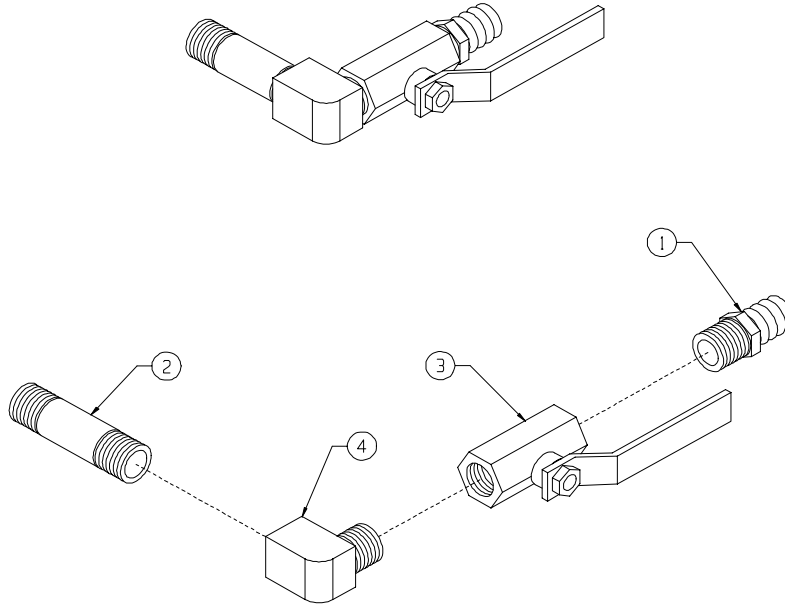
HARDWARE LIST

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

B	UPDATE TO 7304 BEARINGS	3974		5/99
A	REMOVE FITTINGS	3905	N.M.	3/99
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	±	TITLE VM17 COLUMN SUB-ASSEMBLY		
X.XX	±	APPLICATION PARTNER VM17		
X.X	±	SCALE 8:1 DWG NO 6-10-008-031 SIZE B		
ANGLE	±	DATE 24 APR 97 DRAWN BY THOMPSON SHEET NO. 2 OF 2		

Flood Coolant Valve Handle Assembly

THIS ASSEMBLY USED ON VM16, VM17, VM24, VM30, VMD30, & MC20



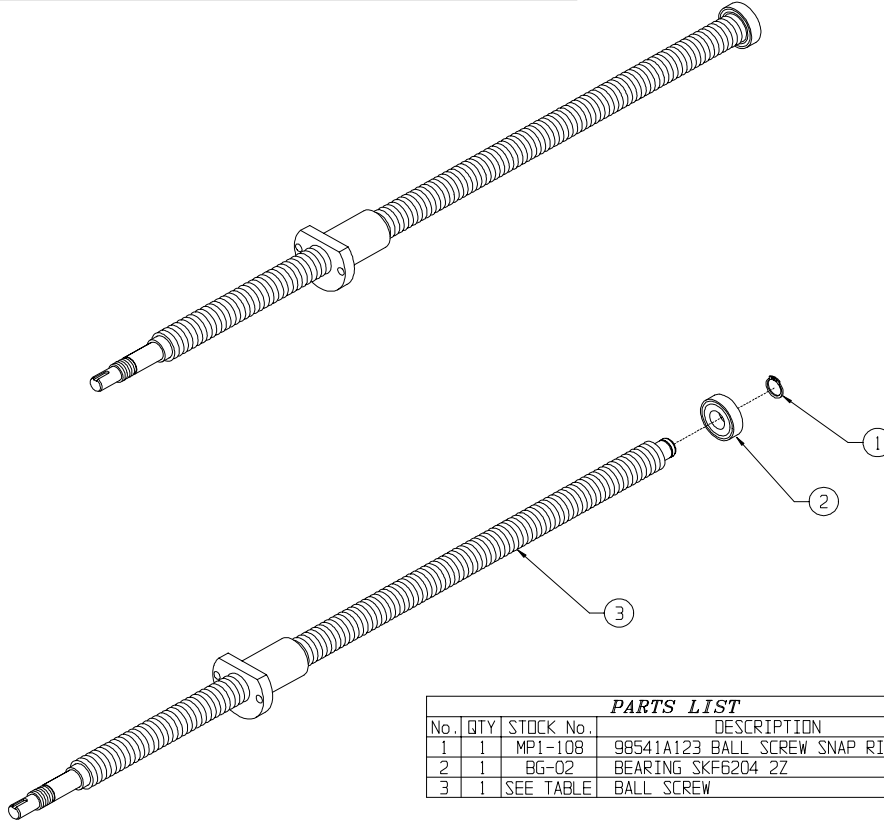
PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-66	3/4" BARB FITTING
2	1	NU-181	3 IN. PIPE NIPPLE
3	1	NU-64	1/2" BRASS BALL VALVE
4	1	NU-125	STREET ELBOW

A	CHANGE PIPE NIPPLE	3851		2/99
REV.	DESCRIPTION	E.C.O. 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 VM17 FLOOD HANDLE SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER I		
X.XX ±		SCALE 2:1		DWG No 6-10-008-039 SIZE B
X.X ±		DATE 29 APR 97		DRAWN BY THOMPSON
ANGLE ±				SHEET NO. 1 OF 1

Ball Screw Assembly

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

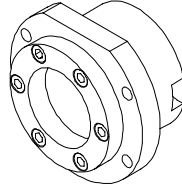


PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-108	98541A123 BALL SCREW SNAP RING
2	1	BG-02	BEARING SKF6204 2Z
3	1	SEE TABLE	BALL SCREW

BALL SCREW TABLE								
STOCK No.	DESCRIPTION	VM16	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.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 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		
X.X ±		SIZE B		
ANGLE ±		DATE 16 AUG 95 DRAWN BY THOMPSON SHEET NO. 1 OF 1		

X & Z Axis Bearing Cup Assembly



*THIS ASSEMBLY USED ON
VM15, VM16, VM17*

NOTES:

1. OIL SEAL (BG-76) IS NOT USED ON Z-AXIS.

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	1/4-20 x 5/8 SHCS

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-338	7304 AXIS BEARING CLIP - SMALL
2	2	BG-76	BEARING CUP OIL SEAL
3	1	HD-73	ROUND SHIM
4	2	BG-75	7304BYG BEARING NSK
5	1	MP-432	7304 AXIS BEARING CLIP RETAINER

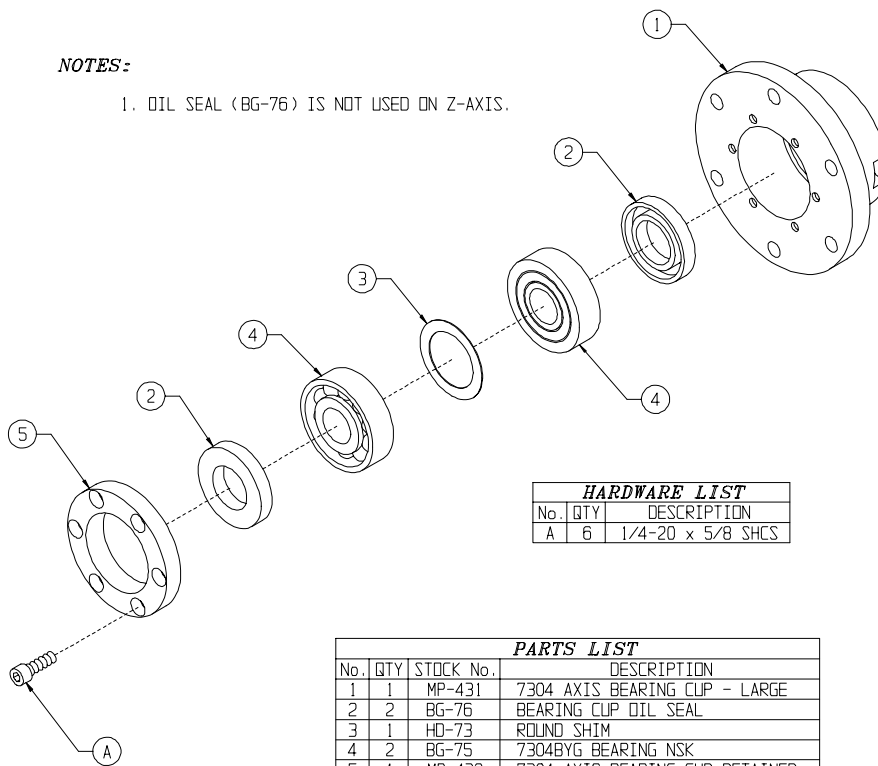
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.	3B4B			
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/- .005			
X.XX	+/- .010			
X.X	+/- .030			
ANGLE	+/- 1.0°			
MILLIRONICS		1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
TITLE		7304 BEARING CUP ASSEMBLY - SMALL		
APPLICATION		GENERAL PRODUCTS		
SCALE		2:1	DWG No. 6-10-018-066	SIZE B
DATE		23 FEB 99	DRAWN BY DAHLKE	SHEET No. 1 OF 1

Y Axis Bearing Cup Assembly

*THIS ASSEMBLY USED ON
VM16, VM17, VM24*

NOTES:

1. OIL SEAL (BG-76) IS NOT USED ON Z-AXIS.

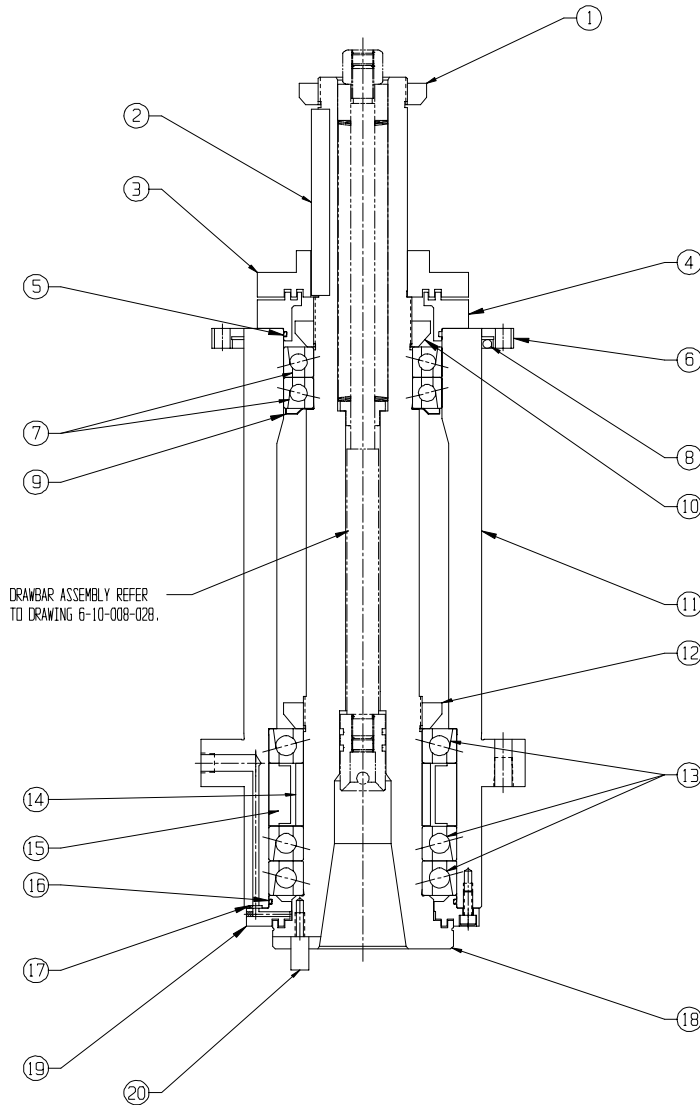


HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	1/4-20 x 5/8 SHCS

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP-431	7304 AXIS BEARING CUP - LARGE
2	2	BG-76	BEARING CUP OIL SEAL
3	1	HD-73	ROUND SHIM
4	2	BG-75	7304BYG BEARING NSK
5	1	MP-432	7304 AXIS BEARING CUP RETAINER

REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE	
MATERIAL/FINISH		 1400 MILL LANE WACONIA, MN 55387 USA 7304 BEARING CUP ASSEMBLY - LARGE			
STOCK/ASSY No. 3849					
TITLE					
TOLERANCE UNLESS SPECIFIED		APPLICATION GENERAL PRODUCTS			
X .XXX	+/- .005	SCALE 2:1		DWG No. 6-10-018-064	SIZE B
X .XX	+/- .010	DATE 19 FEB 99		DRAWN BY DAHLKE	SHEET No. 1 OF 1
X .X	+/- .030				
ANGLE	+/- 1.0°				

Setco Spindle Assembly



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/BK 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

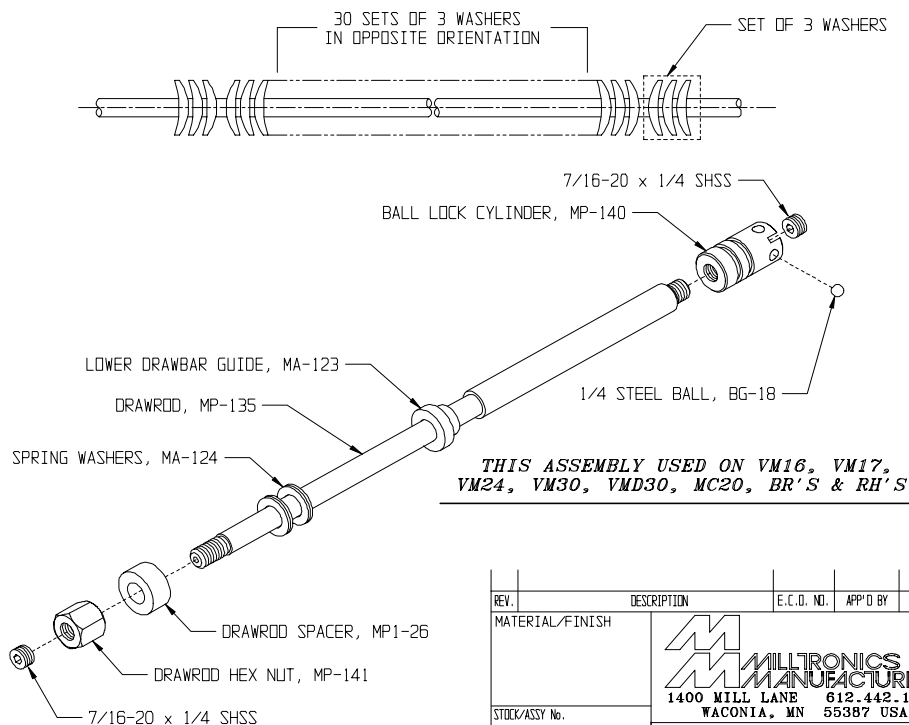
SPINDLE ASSEMBLY WITH 12K RPM USE PART No. MP-428

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.

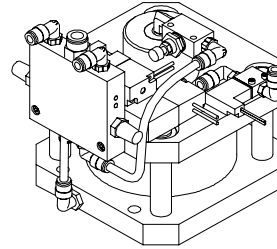


REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE DRAWBAR W/BLOWOUT ASSEMBLY		
X.XXX ±		APPLICATION PARTNER I		
X.XX ±		SCALE 2:1 DWG No 6-10-008-028		SIZE B
X.X ±		DATE 13 OCT 94 DRAWN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

Power Drawbar Cylinder Assembly

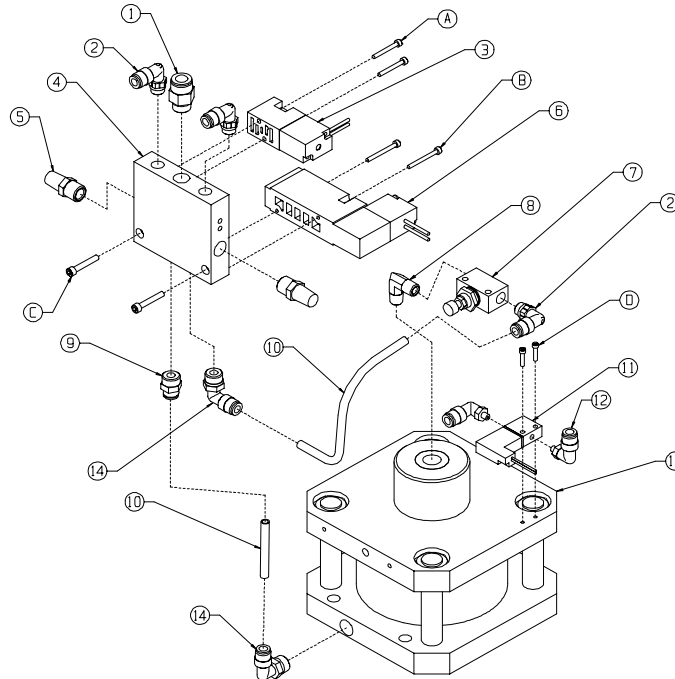
PARTS LIST

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

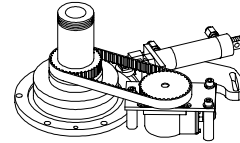
ITEM	QTY	DESCRIPTION
A	2	M3-.5 x 25mm SHCS
B	2	M3-.5 x 30mm SHCS
C	2	8-32 x 1 SHCS
D	2	4-40 x 1/2 SHCS



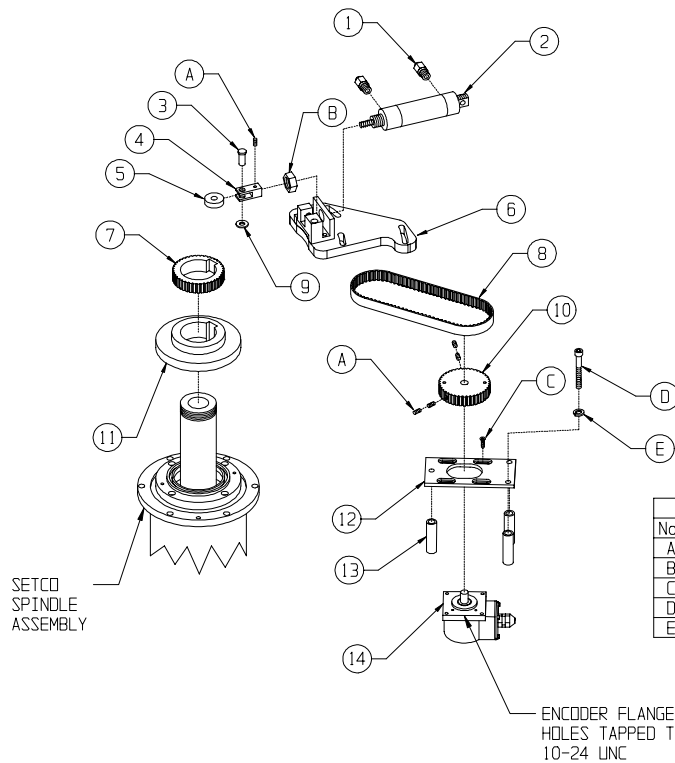
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. TOLERANCE UNLESS SPECIFIED X.XXX +/- X.XX +/- X.X +/- ANGLE +/-  1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA TITLE APPLICATION SCALE 3:1 DATE 19 FEB 99 NU-182 DRAW BAR ASSEMBLY GENERAL PRODUCTS DWG No. 6-10-018-062 DRAWN BY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

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	180XL037 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	EQ-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		 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SETCO SPINDLE ORIENT, RIGID TAPPING ASSEMBLY		
X.XXX ±		APPLICATION GENERAL PRODUCTS		
X.XX ±		SCALE 5:1	DWG No 6-10-018-068	SIZE B
X.X ±		DATE 08 MAR 99	DRAWN BY DAHLKE	SHEET NO. 1 OF 1
ANGLE ±				

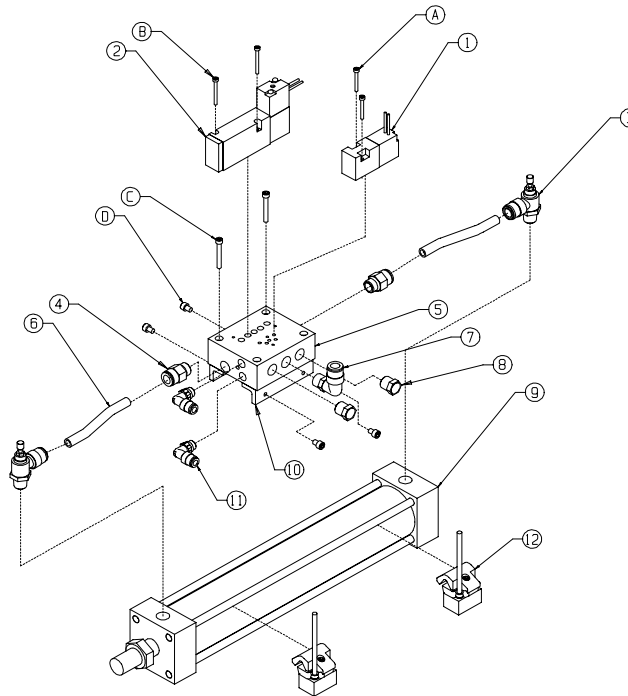
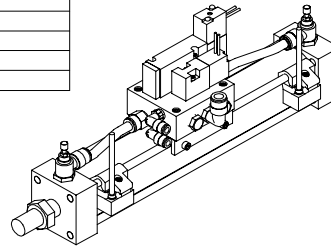
20 Pocket Air Cylinder Assembly

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

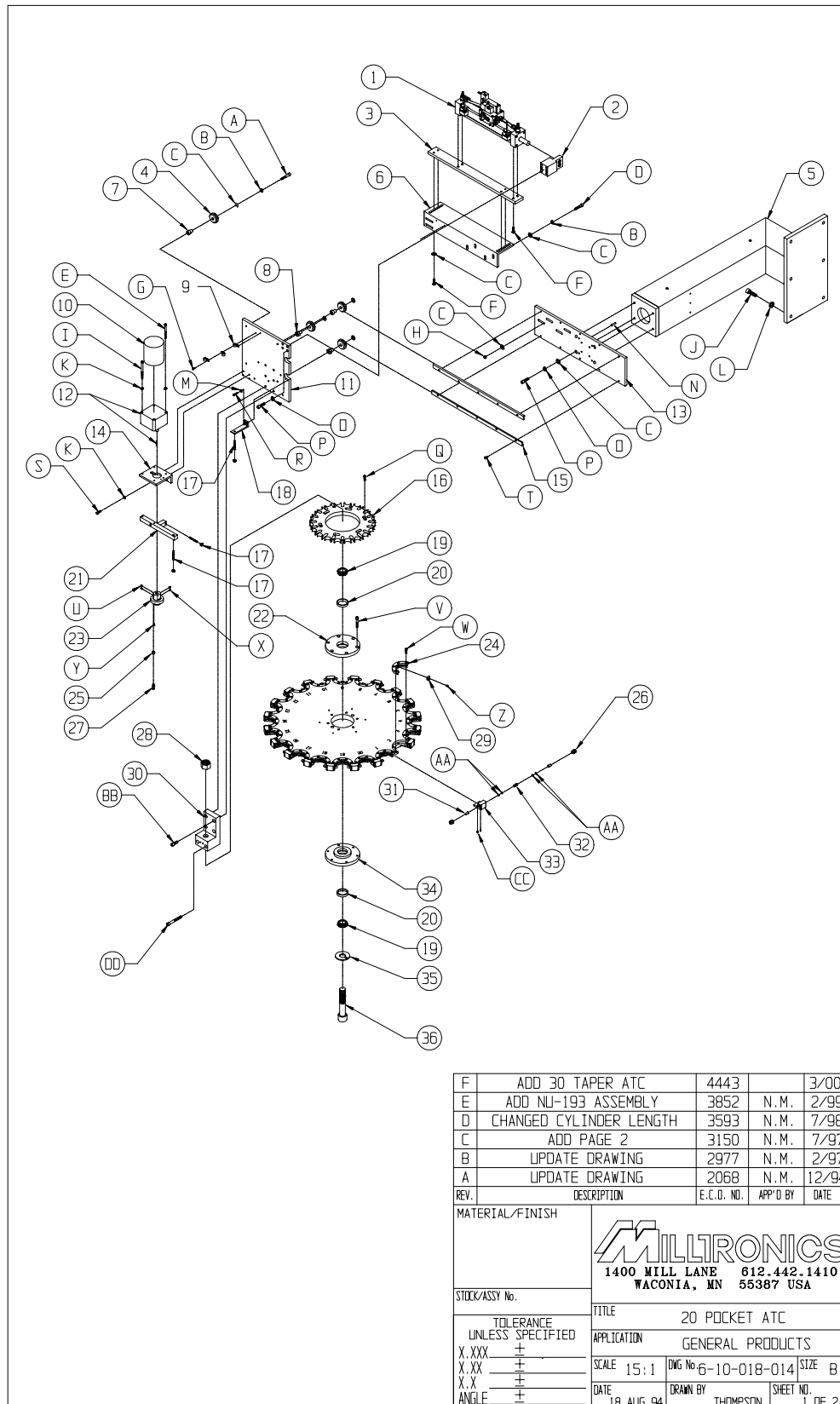
HARDWARE LIST

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

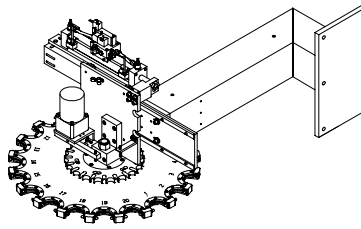


REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X.XXX	+/-		
	X.XX	+/-		
	X.X	+/-		
	ANGLE	+/-		
				
	1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA			
	TITLE	NU-193 - 9" AIR CYLINDER ASSEMBLY		
	APPLICATION	GENERAL PRODUCTS		
	SCALE	4:1	DWG No. 6-10-018-063	SIZE B
	DATE	T9 FEB 99	DRAWN BY DAHLKE	SHEET NO. 1:1

20 Pocket Rotary Tool Changer Assembly



F	ADD 30 TAPER ATC	4443		3/00
E	ADD NU-193 ASSEMBLY	3852	N.M.	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		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
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. 1 OF 2
ANGLE ±				



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	2	MP-144	ADJUSTABLE BUSHING
9	3	WX-82	3/8 IN. CABLE CLAMP
10	1	MD-72	GENEVA MOTOR
11	1	MP-123	20 POCKET CAROUSEL SLIDING PLATE
12	1	MD-71	GEAR BOX W/KEY
13	1	MP-142	V-RAIL PLATE
14	1	MP1-117	GENEVA WHEEL MOTOR MOUNT
15	2	MX-12	20 POCKET LINEAR V-RAIL MODS.
16	1	MP-120	20 POSITION GENEVA WHEEL
17	3	PR-19	SWITCH PROX
18	1	BR-130	TOOL CHANGER PROX. SWITCH BRACKET
19	2	BG-33	CONE TAPERED BEARING
20	2	BG-34	CUP TAPERED BEARING
21	1	MP-466	HOME/GENEVA PROX BRACKET
22	1	MP-116	UPPER CAROUSEL BEARING CUP
23	1	MX-10	20 PKT ATC DRIVE CAM - MACHINED
24	20	SEE TABLE	20 POCKET INSERT
25	1	HD-39	1/2 x 5/16 DRILL BUSHING
26	40	MP1-140	(^) PUSH PIN GUIDE
27	1	HD-38	5/16 x 3/8 SHOULDER BOLT
28	1	HD-07	1-8 UNC NYLOCK NUT
29	20	SEE TABLE	(^) 20 POCKET TOOL CHANGE KEY
30	1	MP-124	20 POCKET CAROUSEL MOUNTING BRACKET
31	40	MP1-144	(^) PUSH PIN
32	20	MP1-141	(^) COIL SPRING
33	20	MP-121	20 ATC LOCKING PIN BLOCK
34	1	MP-115	LOWER CAROUSEL BEARING CUP
35	1	HD-10	1 IN. HARDENED SERIES 'N' WASHER
36	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	2	#10 FLAT WASHER
N	4	1/4 x 1 DOWEL PIN
O	8	3/8 LOCK WASHER
P	8	3/8-16 x 1 1/4 SHCS
Q	6	1/4-20 x 3/4 BHCS
R	2	10-32 x 3/4 BHCS
S	4	1/4-20 x 7/8 SHCS
T	10	1/4-20 x 5/8 BHCS
U	2	5/16-18 x 1/4 SHSS
V	6	5/16-18 x 1 3/4 SHCS
W	80	1/4-20 x 3/4 SHCS
X	2	1/4-20 x 1/4 SHSS
Y	1	8-32 x 1/4 BHCS
Z	20	(^) 8-32 x 1/4 SHCS
AA	80	(^)(*) No. 6 FLAT WASHER
BB	4	3/8-16 x 1 SHCS
CC	40	10-32 x 3/16 BRASS TIPPED SHSS
DD	2	3/8-16 x 3 SHCS

20 POCKET ARM CHART

MACHINE	STOCK No.
VM15/16D	MP1-193
VM16E/VM-17	MP1-327
VM-24	MP6-126
VM-30	MP7-61
VMD-30	MP7-61
RH-20	MPS-05
RH25	MPS-200
RH30	MPS-207

(*) IS USED FOR BT FLANGE OPTION ONLY

(^) IS REMOVED FOR 30 TAPER ATC SEE NOTE 1

20 POCKET TOOL CHANGE KEY CHART

V-FLANGE	MP1-45
BT	MP1-121

20 POCKET INSERT CHART

V-FLANGE	MX-11
BT	MX-13
30 TAPER	MX-41

NOTES:

- ON 30 TAPER OPTION, 40 QTY. HD-76 SPRING PLUNGERS REPLACE MP1-140, MP1-141, MP1-144, AND TOOL CHANGE KEYS.

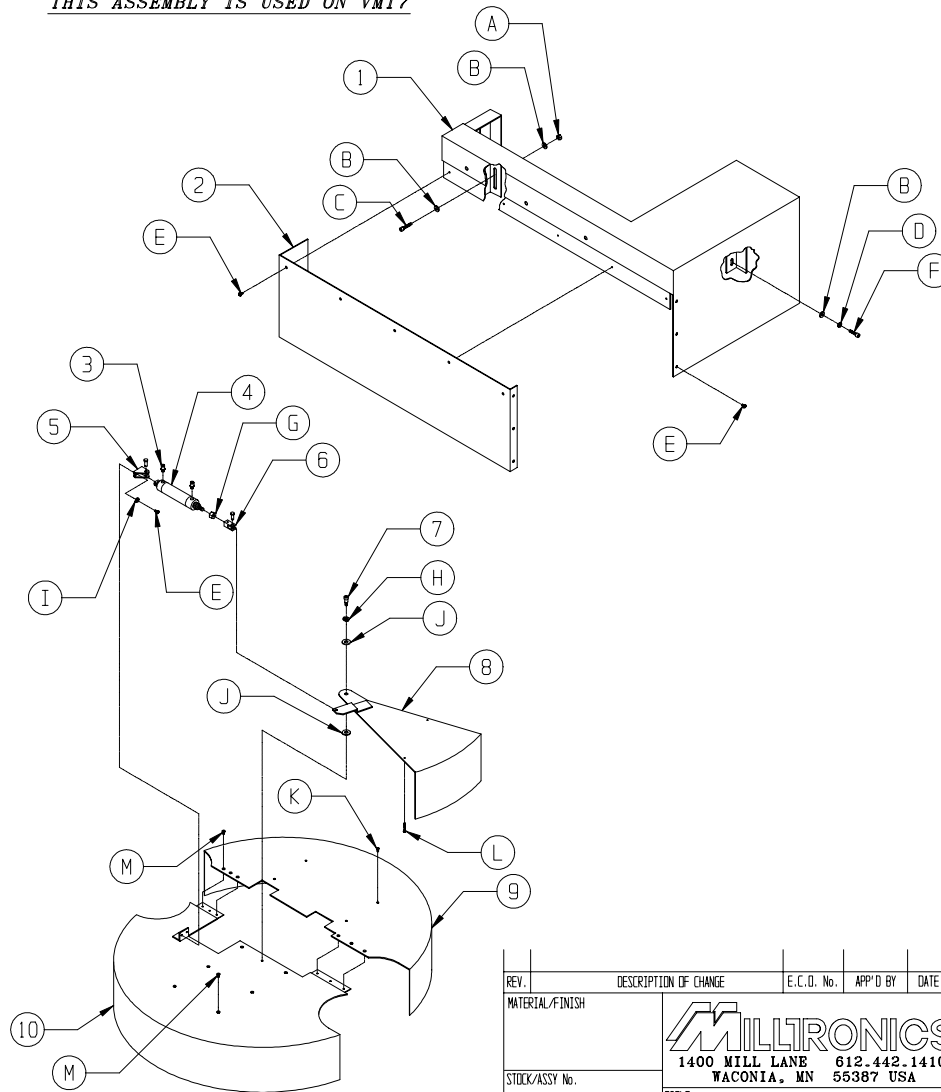
F	ADD 30 TAPER ATC	4443		3/00
E	ADD NU-193 ASSEMBLY	3852	N.M.	2/99
D	CHANGED CYLINDER LENGTH	3593	N.M.	7/98
C	ADD PAGE 2	3150	N.M.	7/97
B	UPDATE DRAWING	2977	N.M.	2/97
A	UPDATE DRAWING	2068	N.M.	12/94
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	±			
X.XX	±			
X.X	±			
ANGLE	±			
MILLIRONICS				
1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
TITLE 20 POCKET ATC				
APPLICATION GENERAL PRODUCTS				
SCALE 15:1 DWG No 6-10-018-014 SIZE B				
DATE 18 AUG 94		DRAWN BY THOMPSON		SHEET NO. 2 OF 2

20 Pocket ATC Cover Assembly

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	2	1/4-20 NYLOCK HEX NUT
B	7	1/4 FLAT WASHER
C	2	1/4-20 x 1 SHCS
D	3	1/4 LOCK WASHER
E	10	10-32 x 3/8 BHCS
F	3	1/4-20 x 3/4 SHCS
G	1	5/16-24 JAM NUT
H	1	5/16 LOCK WASHER
I	2	#10 LOCK WASHER
J	2	5/16 FLAT WASHER
K	4	8-32 x 3/8 BHCS
L	2	6-32 x 1/8 RHMS NYLON
M	12	8-32 x 3/8 FHCS

PARTS LIST		
No.	Qty	PART No. DESCRIPTION
1	1	MP1-364 TOP COVER ASSEMBLY - VM17
2	1	MP1-363 TOP COVER FRONT - VM17
3	2	NU-201 FLOW CONTROL
4	1	NU-129 AIR CYLINDER 1"x2"
5	1	NU-04 CYLINDER BASE AND PIN
6	1	NU-03 CYLINDER CLEVIS AND PIN
7	1	HD-38 5/16 x 3/8 SHOULDER BOLT
8	1	MM-64 CAROUSEL DOOR
9	1	MM-63 CAROUSEL COVER REAR
10	1	MM-62 CAROUSEL COVER FRONT

THIS ASSEMBLY IS USED ON VM17



REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/-			
X.XX	+/-			
X.X	+/-			
ANGLE	+/-			
DATE		20 DEC 99	DRAWN BY DAHLKE	SHEET No. 1 OF 1

MILLIRONICS
1400 MILL LANE 612.442.1410
WACONIA, MN 55387 USA

TITLE 20 POCKET ATC COVER - VM17
APPLICATION PARTNER I

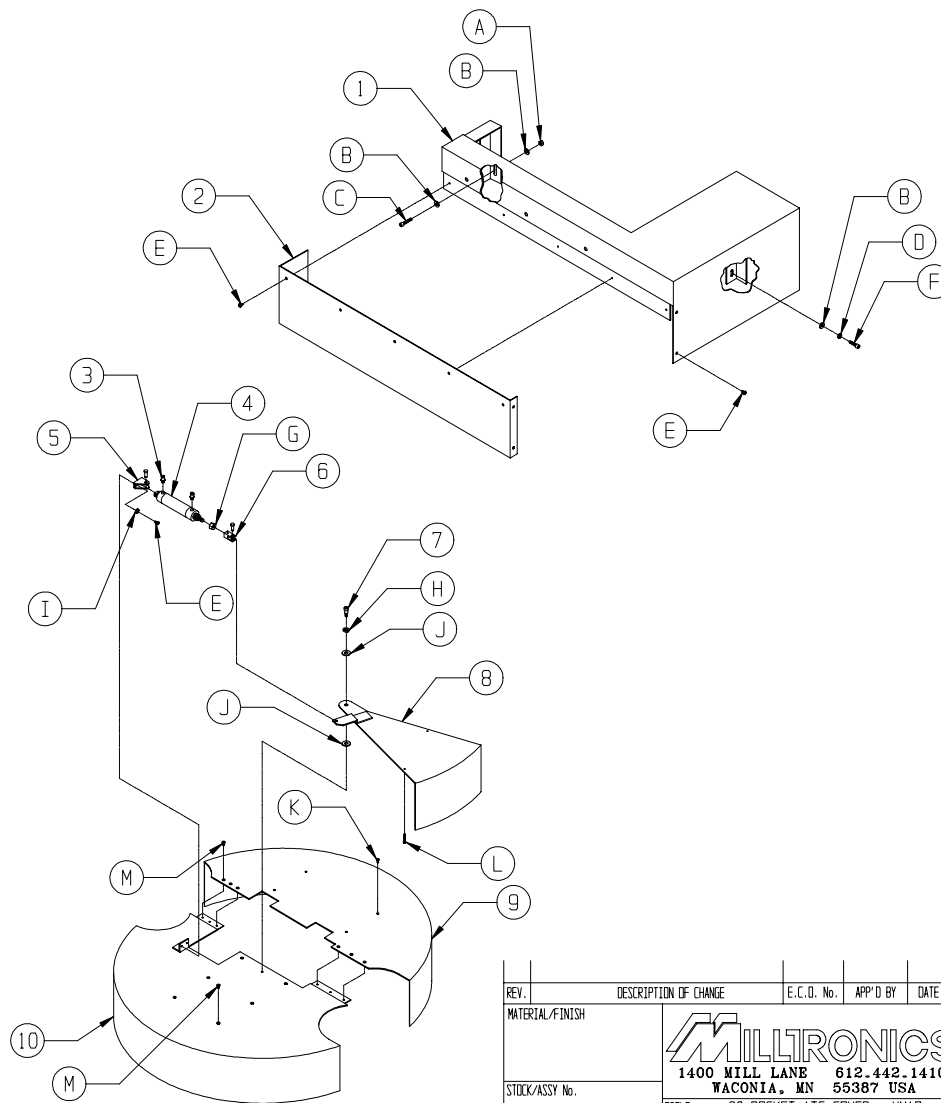
SCALE 10:1 DWG No. 6-10-008-063 SIZE B

20 Pocket ATC With 4" Riser Block Option

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	2	1/4-20 NYLOCK HEX NUT
B	7	1/4 FLAT WASHER
C	2	1/4-20 x 1 SHCS
D	3	1/4 LOCK WASHER
E	9	10-32 x 3/8 BHCS
F	3	1/4-20 x 3/4 SHCS
G	1	5/16-24 JAM NUT
H	1	5/16 LOCK WASHER
I	2	#10 LOCK WASHER
J	2	5/16 FLAT WASHER
K	4	8-32 x 3/8 BHCS
L	2	6-32 x 1/8 RHMS NYLON
M	12	8-32 x 3/8 FHCS

PARTS LIST		
No.	Qty.	PART No. DESCRIPTION
1	1	MP1-361 TOP COVER ASSEMBLY - VM17 W/ 4" RISER
2	1	MP1-360 TOP COVER FRONT - VM17 W/ 4" RISER
3	2	NU-201 FLOW CONTROL
4	1	NU-129 AIR CYLINDER 1"x2"
5	1	NU-04 CYLINDER BASE AND PIN
6	1	NU-03 CYLINDER CLEVIS AND PIN
7	1	HD-38 5/16 x 3/8 SHOULDER BOLT
8	1	MM-64 CAROUSEL DOOR
9	1	MM-63 CAROUSEL COVER REAR
10	1	MM-62 CAROUSEL COVER FRONT

THIS ASSEMBLY IS USED ON VM17 W/ 4" RISER



REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/-			
X.XX	+/-			
X.X	+/-			
ANGLE	+/-			
DATE		21 DEC 99	DRAWN BY DAHLKE	SHEET No. 1 OF 1

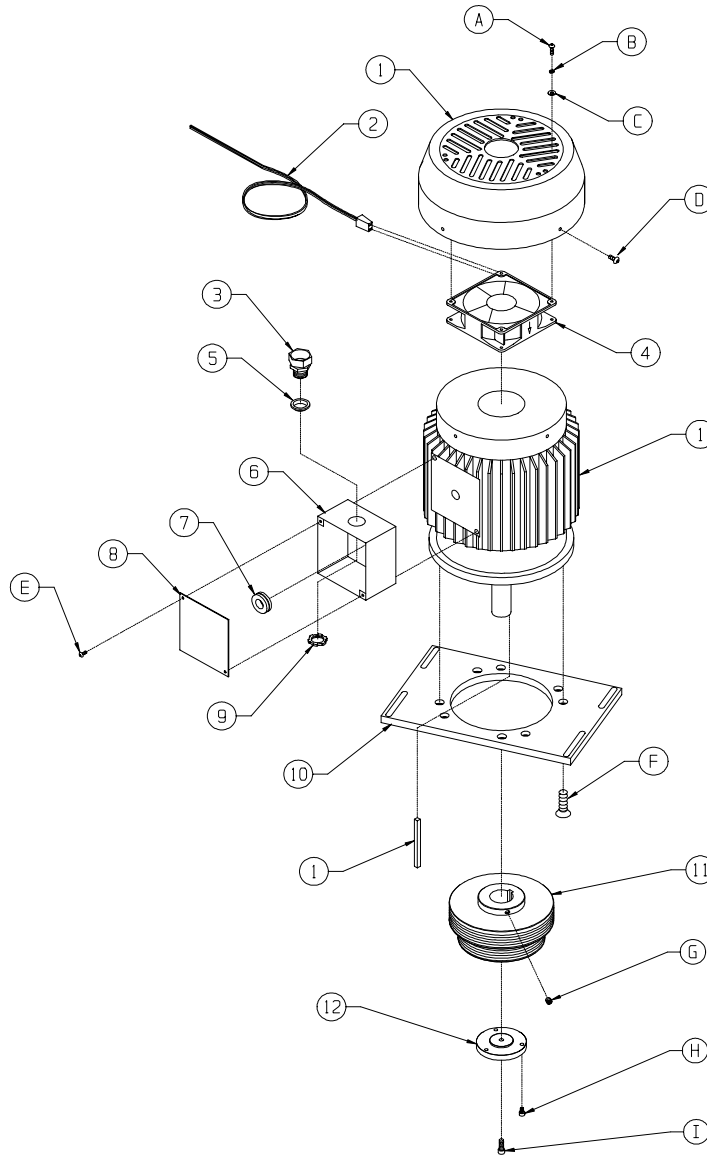
MILLIRONICS
1400 MILL LANE 612.442.1410
WACONIA, MN 55387 USA

TITLE 20 POCKET ATC COVER - VM17
W/ 4" RISER

APPLICATION PARTNER I

SCALE 10:1 DWG No. 6-10-008-064 SIZE B

10 HP Spindle Motor Assembly



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			
	TITLE			
	APPLICATION			
	SCALE			
	DATE			
	DRAWN BY			
	SHEET NO.			

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

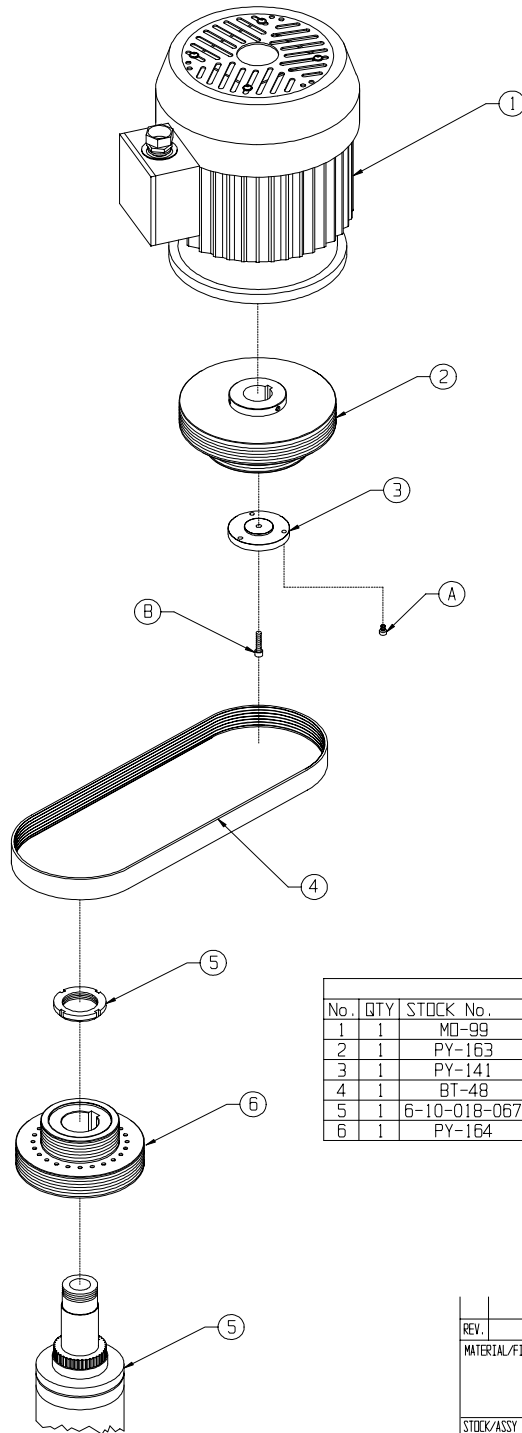
TITLE 10 H.P. POLY V SPINDLE MOTOR ASSEMBLY
APPLICATION GENERAL PRODUCTS
SCALE 6:1 DWG No 6-10-018-069 SIZE B
DATE 05 MAR 99 DRAWN BY DAHLKE SHEET NO. 1 OF 2

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MO-99	10 H.P. SPINDLE MOTOR
2	1	FA-03	FAN CORD
3	1	WX-22	SEALTITE FITTING 1/2" STRAIGHT
4	1	FA-01	4 IN. FAN
5	1	WX-38	O-RING, 1/2 IN.
6	1	WX-213	OUTLET BOX
7	1	WX-197	RUBBER GROMMET
8	1	WX-212	OUTLET BOX COVER
9	1	WX-96	LOCKING NUT
10	1	MP-299	10 H.P. SPINDLE MOTOR MOUNT
11	1	PY-117	POLY V MOTOR PULLEY
12	1	PY-141	MOTOR PULLEY PLATE

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	10-32 x 1/2 BHCS
B	4	No. 10 LOCK WASHER
C	4	No. 10 FLAT WASHER
D	4	1/4-20 x 3/8 BHCS
E	2	8-32 x 1/2 RHMS
F	4	1/2-13 x 1 1/4 FHCS
G	3	5/16-18 x 1/4 SHSS
H	3	M5-.8 x 20mm SHCS
I	1	1/4-20 x 3/4 SHCS

Rev.1

10 HP, 8K/12K RPM Pulley Assembly



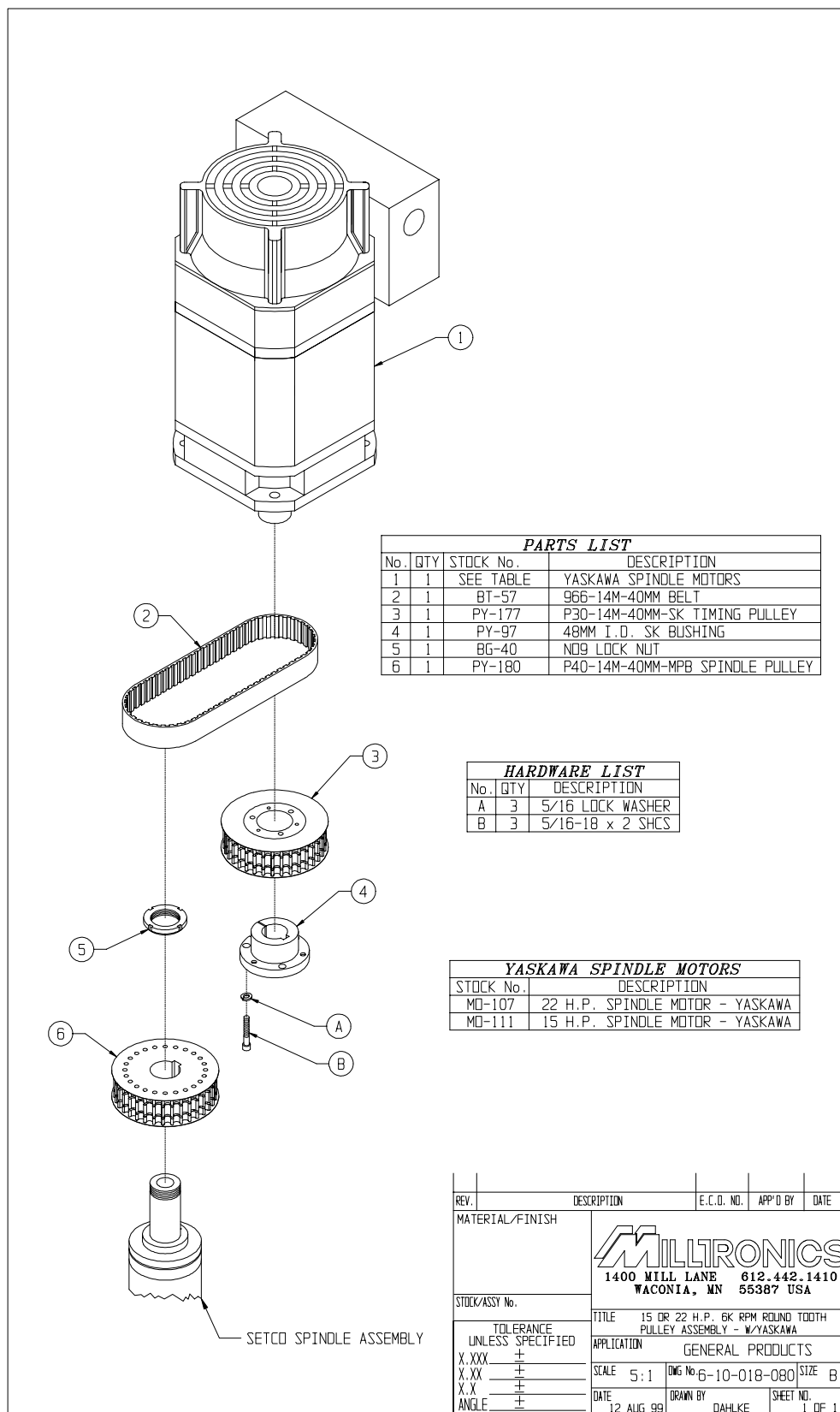
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	3	M5- .8 x 20mm SHCS
B	1	1/4-20 x 3/4 SHCS

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MD-99	10 H.P. SPINDLE MOTOR
2	1	PY-163	5/8K, 5/12K SPINDLE MOTOR PULLEY
3	1	PY-141	10 H.P. MOTOR PULLEY PLATE
4	1	BT-48	375L6 POLY V-BELT
5	1	6-10-018-067	SETCO 5/6K SPINDLE ASSEMBLY
6	1	PY-164	5/8K, 5/12K SPINDLE PULLEY

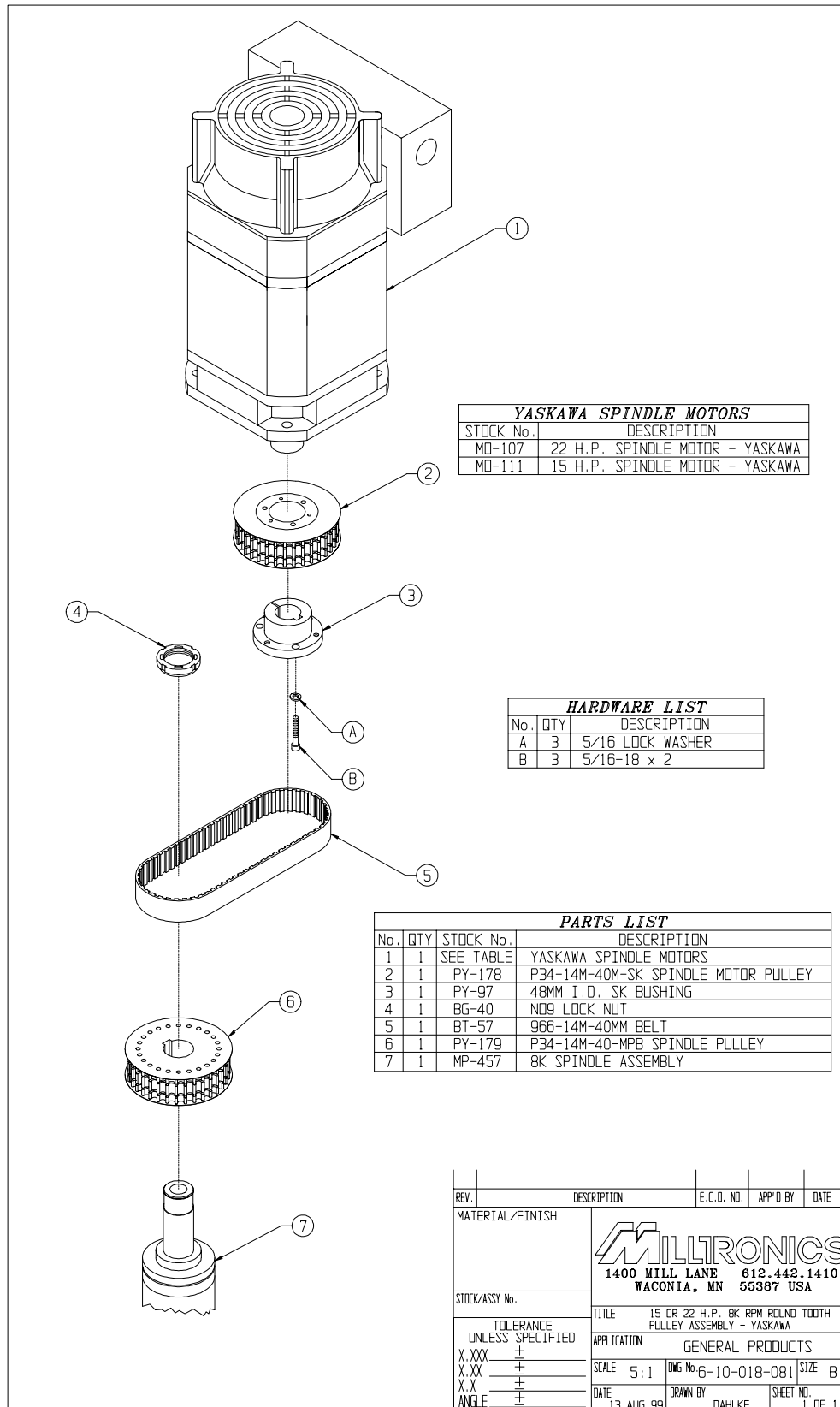
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 10 H.P. 5/8K, 5/12K RPM PULLEY ASSEMBLY		
X.XXX +/- .005		APPLICATION GENERAL PRODUCTS		
X.XX +/- .010	SCALE 5:1	DWG No. 6-10-018-070		SIZE B
X.X +/- .030				
ANGLE +/- 1.0°	DATE 15 MAR 99	DRAWN BY DAHLKE		SHEET No. 1 OF 1

This page intentionally left blank

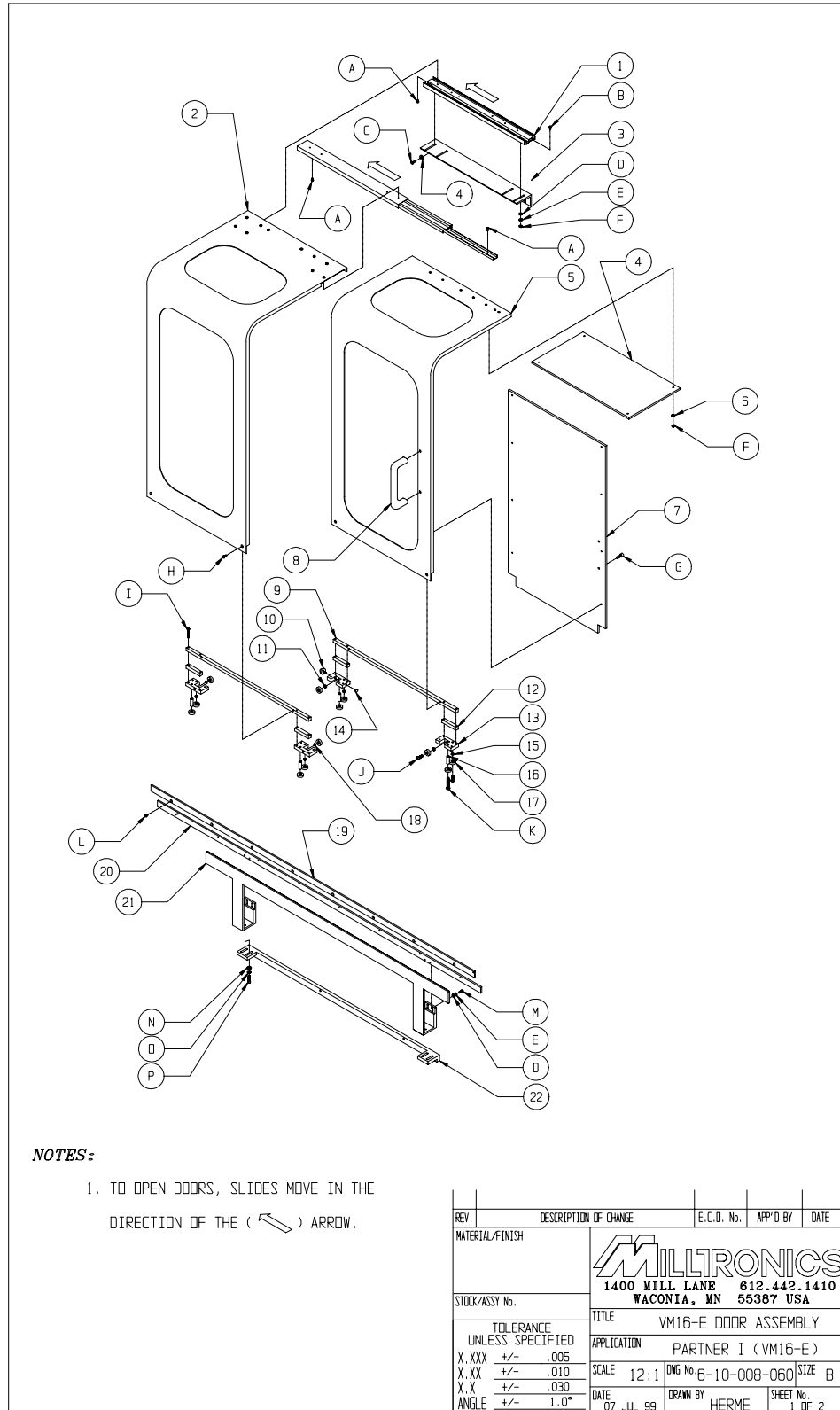
15 Hp 6K RPM Pulley Assembly

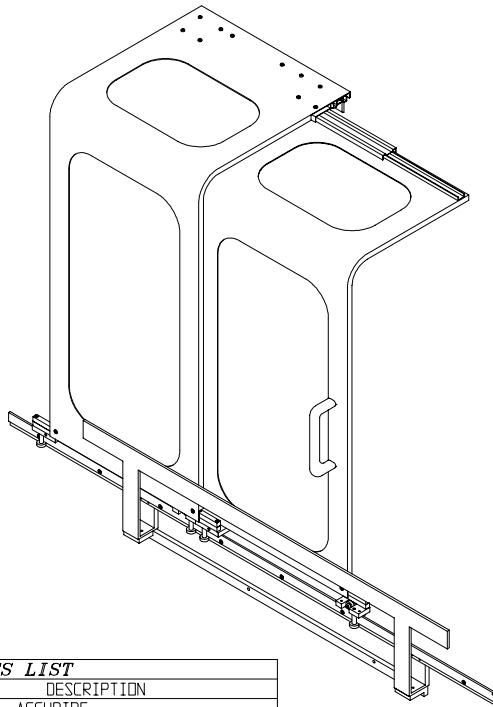


15 HP 8K RPM Pulley Assembly



Chip Pan Door Assembly





PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	MP-481	SLIDE - ACCURIDE
2	1	MP1-290	DOOR - OUTSIDE
3	1	MP1-297	BRACKET - UPPER ACCURIDE SLIDE
4	2	MP-156	LEXAN - DOOR TOP
5	1	MP1-291	DOOR - INSIDE
6	28	HD-12	1/4 RUBBERIZED WASHER
7	2	MP-239	LEXAN - DOOR LOWER
8	1	WX-230	HANDLE - DOOR
9	2	MP1-270	MOUNTING BAR - WHEEL BEARING BLOCK
10	1	WX-156	BUMPER - BLACK
11	2	SP-101	ROUND SPACER .180 LONG
12	4	MP1-296	1/2" SPACER BAR
13	4	MP-517	WHEEL BEARING BLOCK
14	1	WX-202	BUMPER - RUBBER
15	4	SP-100	ROUND SPACER .120 LONG
16	4	SP-99	ROUND SPACER 1.200 LONG
17	12	BG-37	BEARING
18	2	SP-102	ROUND SPACER .040 LONG
19	1	MP1-267	DOOR RAIL - TOP FIBERGLASS
20	1	MP1-266	DOOR RAIL - BOTTOM FIBERGLASS
21	1	MP1-344	DOOR RAIL LOWER BRACKET - TOP
22	1	MP1-345	DOOR RAIL LOWER BRACKET - BOTTOM

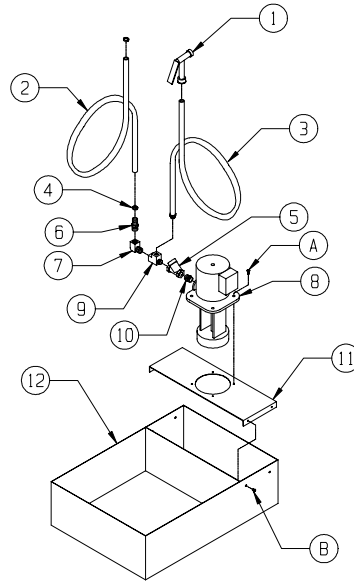
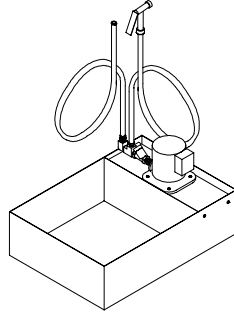
HARDWARE LIST

No.	QTY	DESCRIPTION
A	17	10-32 X 3/8 BHCS
B	4	10-32 X 5/8 BHCS
C	4	1/4-20 X 3/4 BHCS
D	8	#10 FLAT WASHER
E	8	#10 LOCK WASHER
F	28	10-32 HEX NUT
G	2	M8-1.25 X 20 mm BHCS
H	4	10-32 X 1/2 FHCS
I	8	10-32 X 1 1/2 BHCS
J	8	5/16-18 X 3/4 BHCS
K	4	5/16-18 X 1 3/4 BHCS
L	8	10-32 X 3/8 FHCS
M	4	10-32 X 1/2 SHCS
N	4	1/4 FLAT WASHER
O	4	1/4 LOCK WASHER
P	4	1/4-20 X 1 SHCS

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.		TITLE VM16-E DOOR ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I (VM16-E)		
X.XXX	+/- .005	SCALE 9:1	DWG No. 6-10-008-030	SIZE B
X.XX	+/- .010			
X.X	+/- .030			
ANGLE	+/- 1.0°	DATE 07 JUL 99	DRAWN BY HERME	SHEET No. 2 OF 2

Coolant Trough Assembly

*THIS IS USED ON ASSEMBLY
FOR VM15, VM16, VM17.*



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-124	WATER HOSE NOZZLE
2	20'	NU-69	3/4" NYLOBRAID HOSE
3	1	NU-130	WASHDOWN HOSE ASSEMBLY
4	2	NU-141	1" HOSE CLAMP
5	1	NU-128	1/2" SWING CHECK VALVE
6	1	NU-66	HOSE BRASS 3/4"
7	1	NU-125	1/2" ELBOW-STREET
8	1	MA-162	FLOOD PUMP 1/4 HP MOTOR
9	1	NU-127	1/2" STREET T
10	1	NU-65	1/2" NIPPLE
11	1	MP1-24	FLOOD PUMP MOUNTING PLATE
12	1	MP1-21	FLOOD CONTAINER

HARDWARE LIST

No.	QTY	DESCRIPTION
A	4	1/4-20 x 5/8 BHCS
B	4	1/4-20 x 3/8 BHCS

REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X .XXX	+/-	.005		
X .XX	+/-	.010		
X .X	+/-	.030		
ANGLE	+/-	1.0°		

MILLIRONICS
1400 MILL LANE 952-442-1410
WACONIA, MN 55387 USA

TITLE COOLANT TROUGH ASSEMBLY

APPLICATION PARTNER I

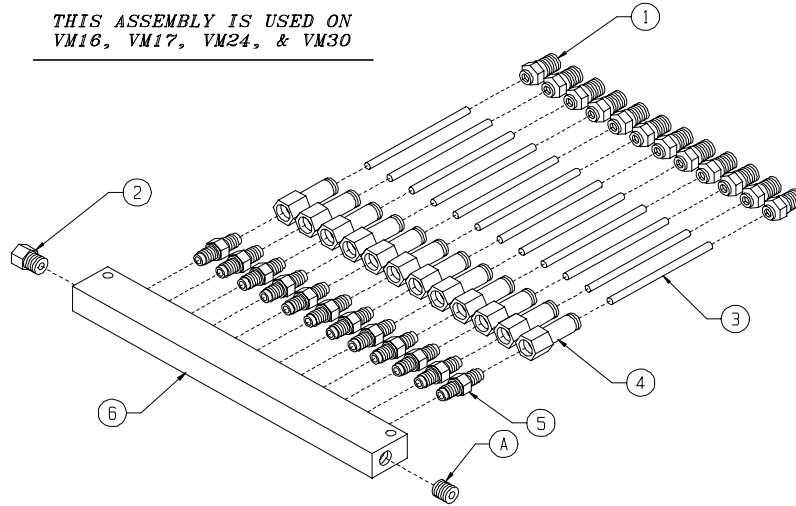
SCALE 15:1 DWG No. 6-10-008-066 SIZE B

DATE 10 APR 00 DRAWN BY DAHLKE SHEET No. 1 OF 1

This page intentionally left blank

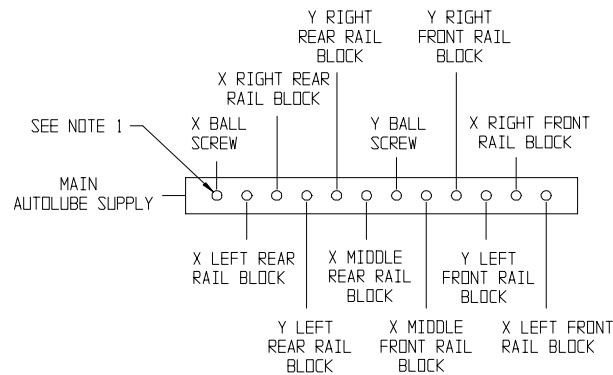
X & Y Axis Autolube Manifold Assembly

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



NOTES:

- 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		 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE X & Y AXIS AUTOLUBE MANIFOLD ASSEMBLY		
X .XXX ±		APPLICATION GENERAL PRODUCTS		
X .XX ±		SCALE 2:1		
X .X ±		DATE 25 JUL 97		
ANGLE ±		DRAWN BY THOMPSON		
		SHEET NO. 1 OF 2		

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					OIL METER
CONNECTION	VM16	VM17	VM24	VM30	
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

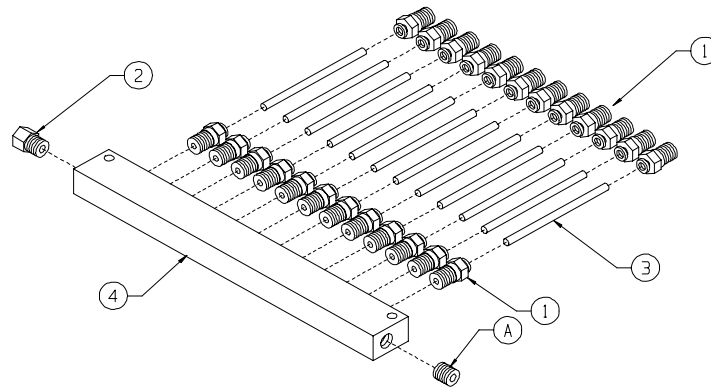
ALL MEASUREMENTS ARE IN INCHES

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.		TITLE X & Y AXIS AUTOLUBE MANIFOLD ASSEMBLY APPLICATION GENERAL PRODUCTS		
TOLERANCE UNLESS SPECIFIED		SCALE 2:1	DWG NO 6-10-018-049	SIZE B
X .XXX	±	DATE 25 JUL 97	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
X .XX	±			
X .X	±			
ANGLE	±			

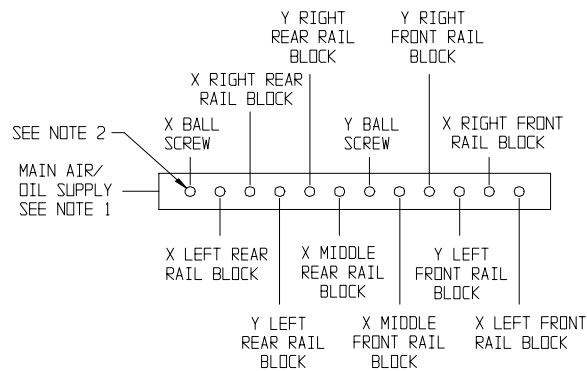
X & Y Axis Air/Oil Manifold Assembly

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



NOTES:

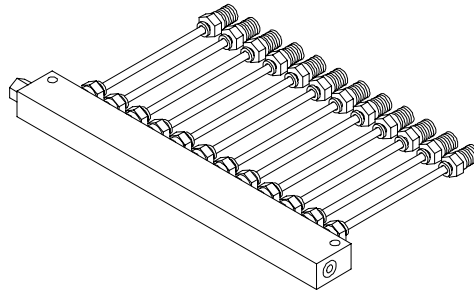
1. ON VM24 & VM30 "2" IS REPLACED WITH NU-161, 1/8 NPT 5/32 TUBE ELBOW.
2. ON VM16 & VM17 THE NU-154 IS REPLACED BY NU-110



AIR/OIL LINE DESTINATIONS

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLIRONICS 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

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

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

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

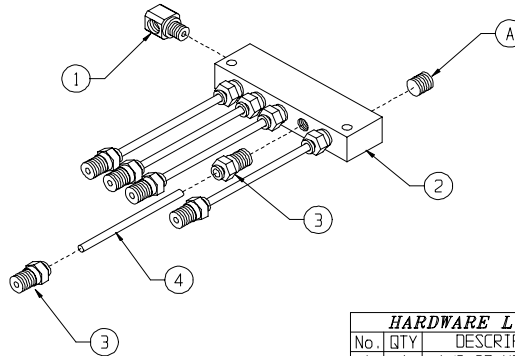
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X, XXX			
	X, XX			
	X, X			
	ANGLE			
	TITLE			
	APPLICATION			
	SCALE			
	DATE			
	DRAWN BY			
	SHEET NO.			

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

TITLE X & Y AXIS
AIR/OIL MANIFOLD ASSEMBLY
APPLICATION GENERAL PRODUCTS
SCALE 2:1 DWG No 6-10-018-047 SIZE B
DATE 30 JUL 97 DRAWN BY THOMPSON SHEET NO. 2 OF 2

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

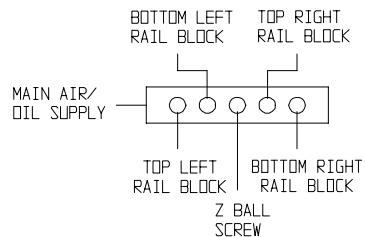
NOTES:

- 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



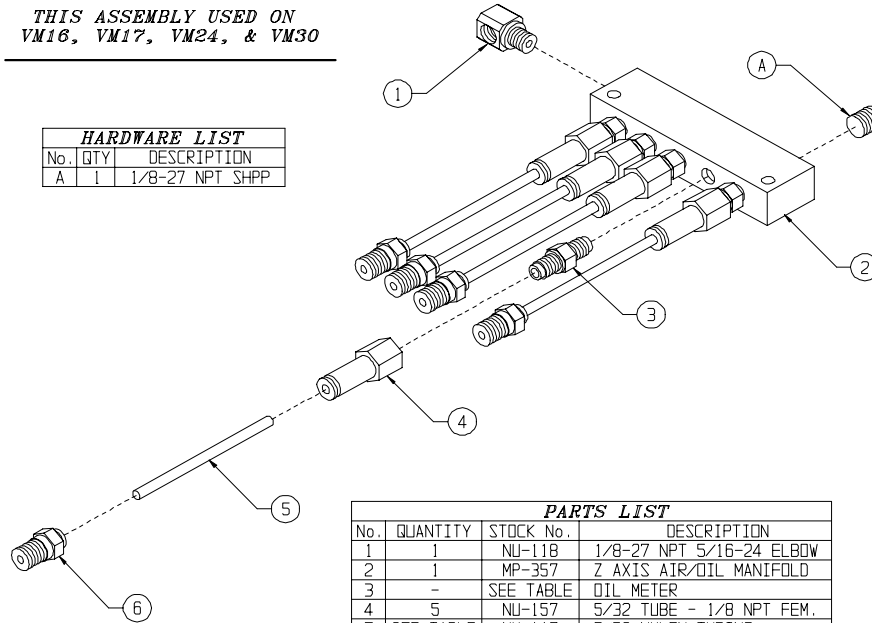
AIR/OIL LINE DESTINATIONS

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 ± MILLIRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387 TITLE Z AXIS AIR/OIL MANIFOLD ASSEMBLY APPLICATION GENERAL PRODUCTS SCALE 2:1 DWG No 6-10-018-048 SIZE B DATE 20 AUG 97 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



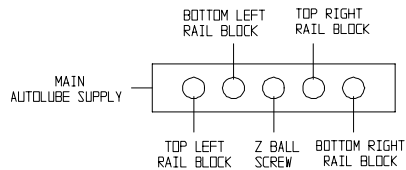
PARTS LIST				
No.	QUANTITY	STOCK No.	DESCRIPTION	
1	1	NU-118	1/8-27 NPT 5/16-24 ELBOW	
2	1	MP-357	Z AXIS AIR/OIL MANIFOLD	
3	-	SEE TABLE	OIL METER	
4	5	NU-157	5/32 TUBE - 1/8 NPT FEM.	
5	SEE TABLE	NU-117	5/32 NYLON TUBING	
6	5	NU-154	5/32 TUBE-1/8 NPT M/S	

NU-117 TUBING LENGTH					OIL METER	
CONNECTION	VM16	VM17	VM24	VM30	No. 3	Oil Meter Part Numbers. #2 = NU-155 #3 = NU-156
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	

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



TITLE Z AXIS AUTOLUBE MANIFOLD ASSEMBLY

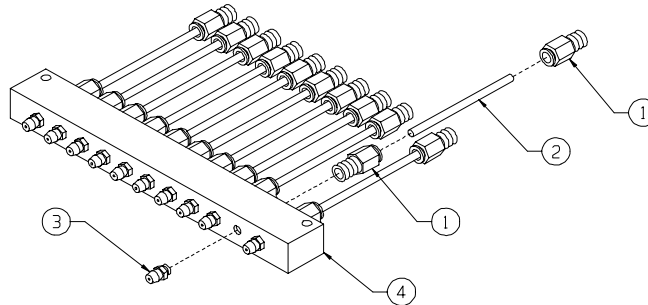
APPLICATION GENERAL PRODUCTS

SCALE 1.5:1 ENG 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*



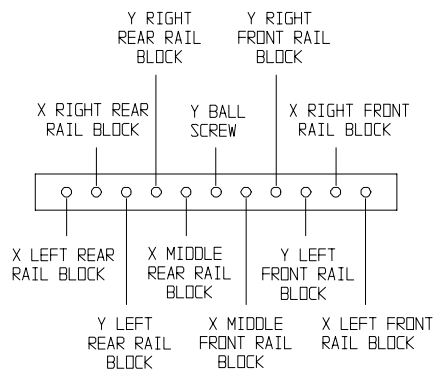
PARTS LIST

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

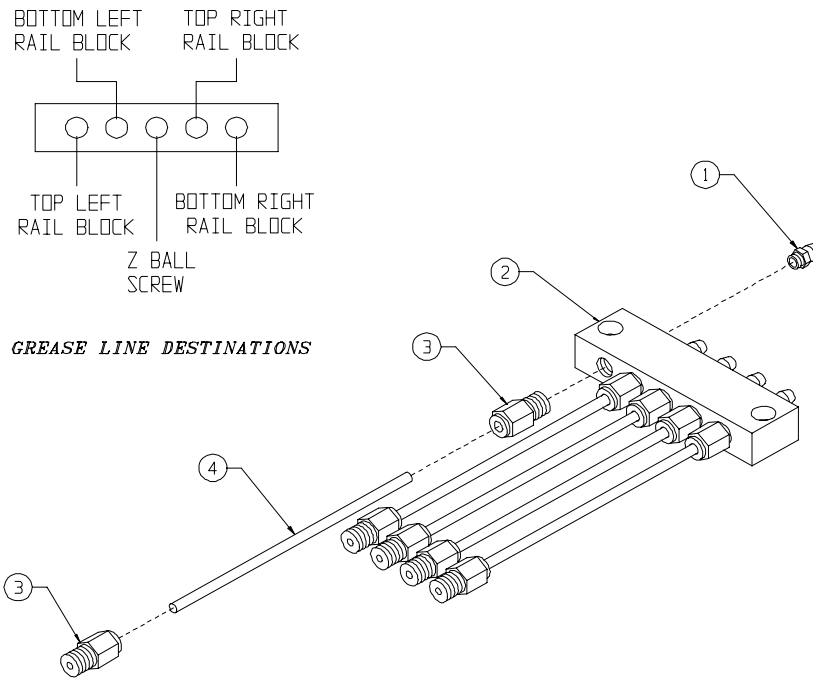
ALL MEASUREMENTS ARE IN INCHES



GREASE LINE DESTINATIONS

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

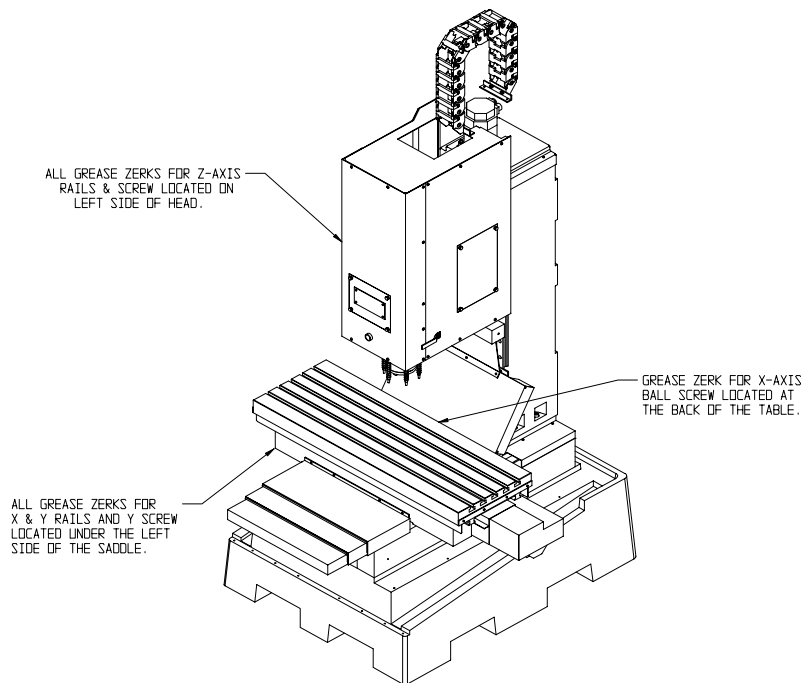
THIS ASSEMBLY USED ON VM16, VM17, VM24, & VM30

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. TOLERANCE UNLESS SPECIFIED X.XXX ± X.XX ± X.X ± ANGLE ±  MILLIRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387 TITLE Z AXIS GREASE MANIFOLD ASSEMBLY APPLICATION GENERAL PRODUCTS SCALE 1.5:1 DATE 14 JUL 97 DWG No. 6-10-018-044 SIZE B DRAWN BY THOMPSON SHEET NO. 1 OF 1				

Machine Lubrication Instructions

NOTES:-

1. 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.
2. 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.
3. MACHINES WITH AUTOLUBE OPTION USE MOBIL OIL VACTRA 2, AMOCO WAYTAC No. 68, SUNOCO SUNWAY LUBE No. 1180, OR EQUIVALENT QUALITY WAY OIL SEE PAGE TWO FOR SPECIFICATIONS.



C	REMOVE HEAT EXCHANGER	3909		3/99
B	CHANGE GREASE SPECS.	3411	N.M.	2/98
A	ADD SPECIFICATIONS	3133	N.M.	6/97
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 VM17 LUBRICATION DRAWING		
X.XXX	±	APPLICATION PARTNER VM17		
X.XX	±	SCALE 15:1 DWG No. 6-10-008-044 SIZE B		
X.X	±	DATE 2 JUN 97 DRAWN BY THOMPSON SHEET NO. 1 OF 2		
ANGLE	±			

THIS ASSEMBLY USED ON VM16, VM17

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

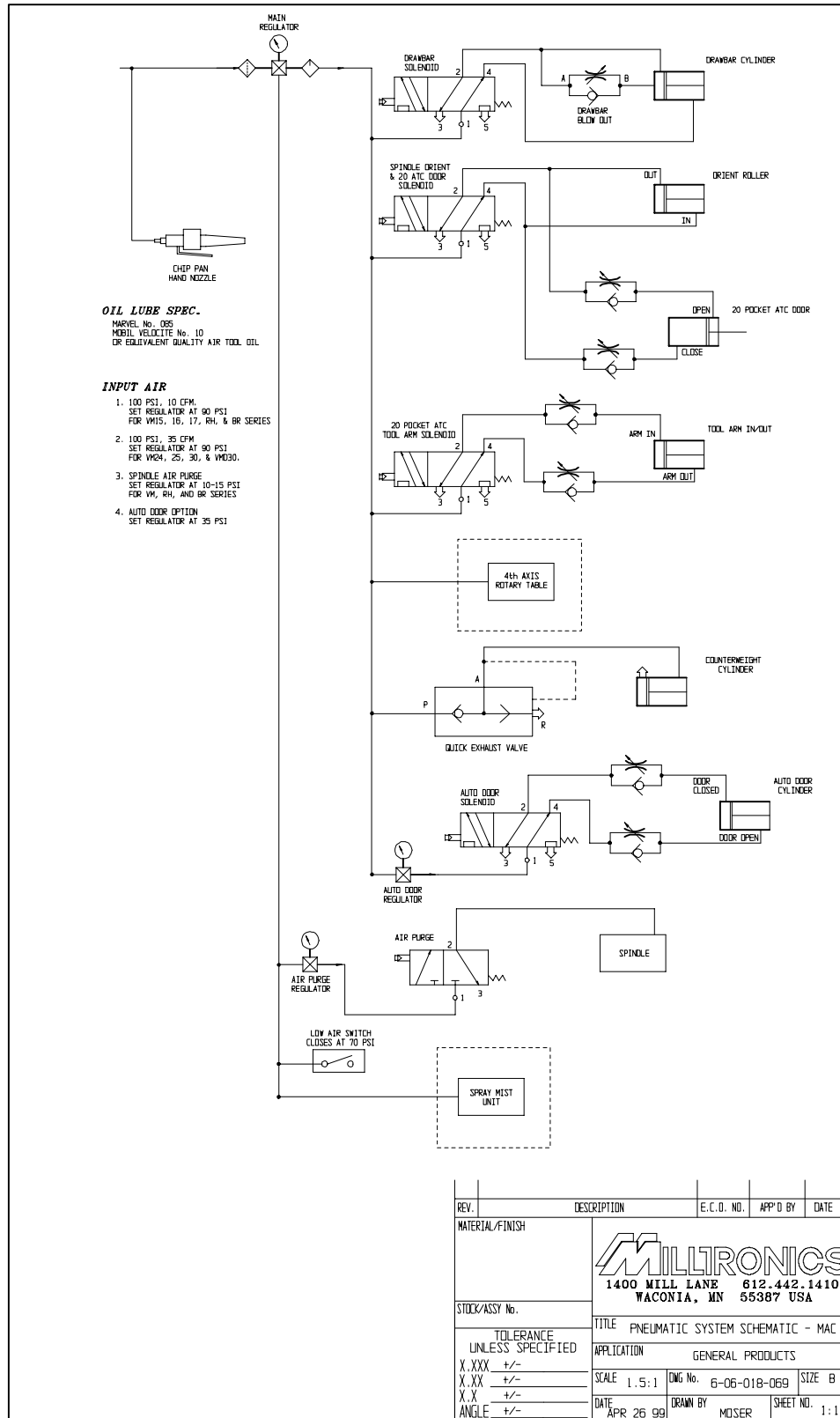
MOBIL VELOCITE OIL No. 10	
PRODUCT NUMBER	60068-4
GRAVITY, API	32.0
POUR, °C (°F), max.	-4 (25)
FLASH, °C (°F), min.	182 (360)
VISCOSITY	
cST AT 40° C	22.0
cST AT 100° C	4.0
SUS AT 100° F	115
SUS AT 210° F	40
ISO VG	22
VISCOSITY INDEX	95
COLOR, ASTM D 1500	2.0
RUST PROTECTION, ASTM D 665	PASS
CINCINNATI 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, mg D 2882 (MOD)	-
CMCO, 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

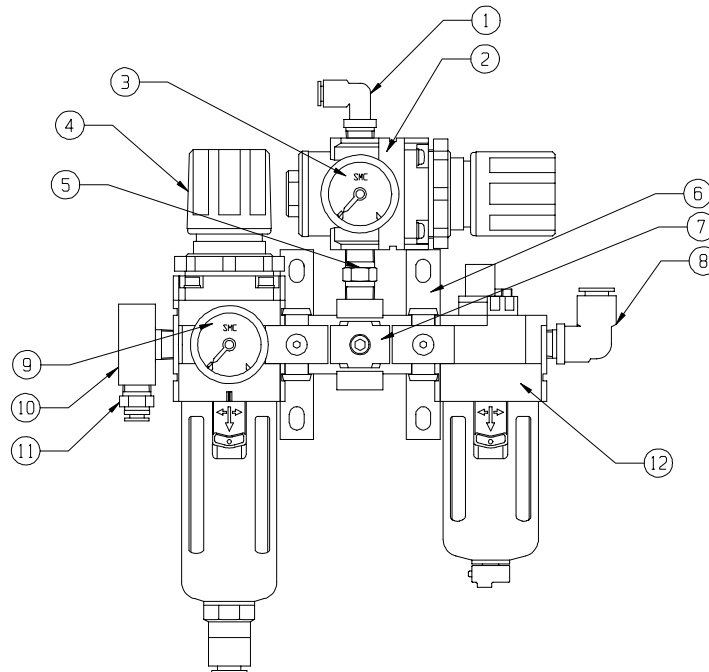
C	REMOVE HEAT EXCHANGER	3909		3/99
B	CHANGE GREASE SPECS.	3411	N.M.	2/98
A	ADD SPECIFICATIONS	3133	N.M.	6/97
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE VM17 LUBRICATION DRAWING		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER VM17		
X.XXX	±	SCALE 15:1	DWG No 6-10-008-044	SIZE B
X.XX	±	DATE 2 JUN 97	DRAWN BY THOMPSON	SHEET NO. 2 OF 2
X.X	±			
ANGLE	±			

Pneumatic System Schematic



Air Regulator & Lubricator Assembly

PARTS LIST				
ITEM	QTY	STOCK No.	DESCRIPTION	
1	1	NU-186	1/4 NPT 1/4 TUBE SWIVEL ELBOW	
2	1	NU-214	LOW PRESSURE REGULATOR	
3	1	NU-216	LOW PRESSURE GAUGE	
4	1	NU-212	LARGE FILTER/HIGH PRESSURE REGULATOR	
5	1	NU-30	1/4 NPT PIPE NIPPLE	
6	2	NU-210	LARGE MOUNTING SPACER	
7	1	NU-211	LARGE MANIFOLD SPACER	
8	1	NU-199	1/4 NPT 3/8 TUBE SWIVEL ELBOW	
9	1	NU-208	AIR GAUGE WITH PRESSURE SWITCH	
10	1	NU-219	1/4 NPT BRANCH TEE	
11	1	NU-32	1/4 NPT 1/4 TUBE MALE STRAIGHT	
12	1	NU-209	LARGE LUBRICATOR	



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 NU-232 FRL ASSEMBLY		
X .XXX +/-		APPLICATION GENERAL PRODUCTS		
X .XX +/-		SCALE 3:1	DWG No. 6-10-018-085	SIZE B
X .X +/-		DATE 14 JAN 00	DRAWN BY DAHLKE	SHEET NO. 1:1
ANGLE +/-				

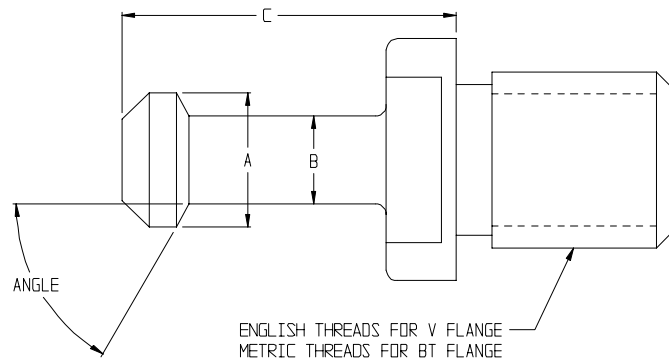
Retention Knob Chart

RETENTION KNOBS STYLE V-FLANGE

V-FLANGE TAPER	DIMENSIONS				MILLIRONICS 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				MILLIRONICS 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. KENNAMETAL
TEL - 1.800.446.7738
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.	TITLE RETENTION KNOB CHART			
TOLERANCE UNLESS SPECIFIED	APPLICATION GENERAL PRODUCTS			
X.XXX +/-	SCALE 1:1			
X.XX +/-	DATE 30 APR 99			
X.X +/-	DRAWN BY DAHLKE			
ANGLE +/-	SHEET NO. 1 OF 1			