

VM16J Mechanical

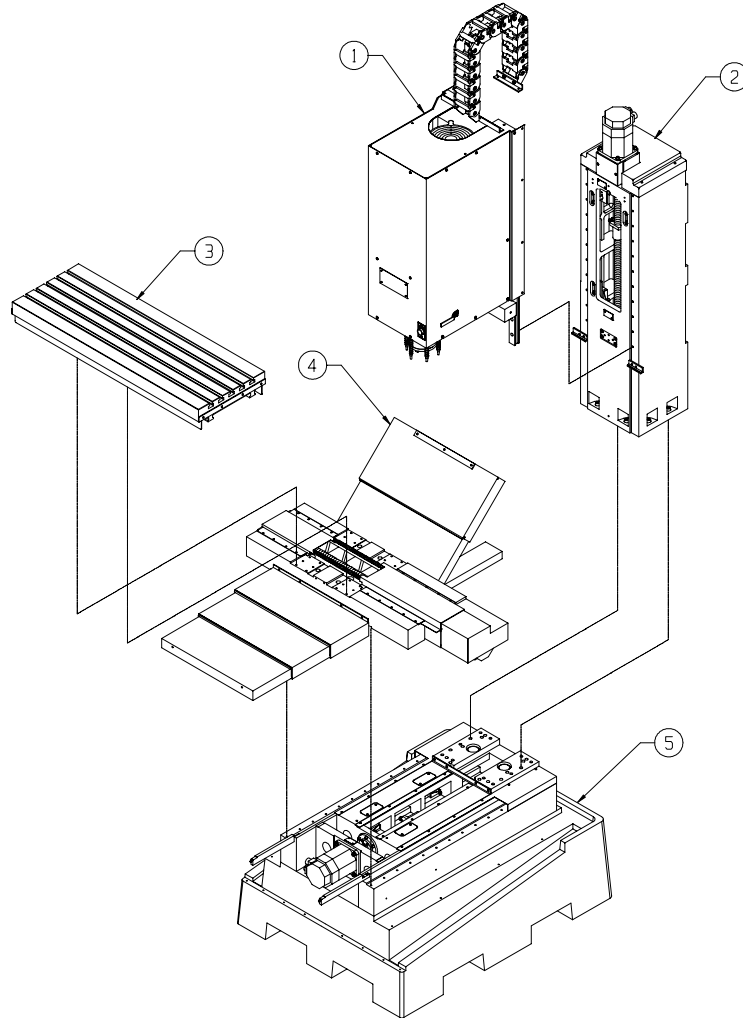
6-10-2002
Rev 7

Table of Contents

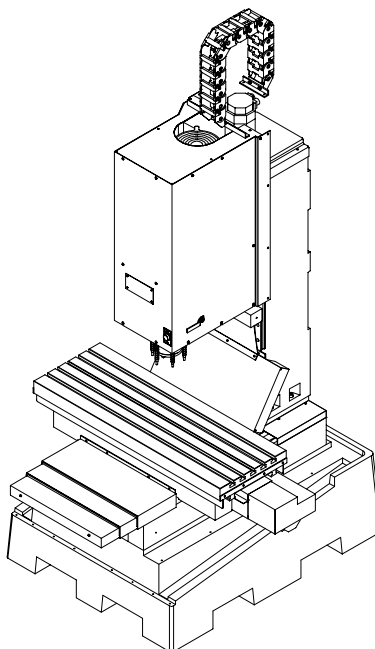
Table of Contents	iii
Manual Discrepancy Sheet	1
Basic Machine Assembly	2
Machine Base Assembly	4
Machine Saddle Assembly	6
Saddle & Way Cover Assembly	8
Milling Table Assembly.....	10
Machine Head Assembly.....	12
Machine Column Assembly.....	14
X & Z Axis Bearing Cup Assembly	16
Y Axis Bearing Cup Assembly.....	17
Power Drawbar Cylinder Assembly	18
20 Pocket Air Cylinder Assembly	19
20 Pocket Rotary Tool Changer Assembly.....	20
Chip Pan Door Assembly	22
Flood Coolant Valve Handle Assembly	24
20 Pocket ATC Cover Assembly	25
Coolant Trough Assembly	26
Auger Assembly	27
Washdown Coolant Trough Assembly	28
X & Y Axis Autolube Manifold Assembly	30
X & Y Axis Air/Oil Manifold Assembly.....	32
Z-Axis Air/Oil Manifold Assembly	34
Z-Axis Autolube Manifold Assembly.....	36
Spindle Motor and Pulley Assembly.....	37
Machine Lubrication Instructions.....	38
Pneumatic System Schematic.....	40
Air Regulator & Lubricator Assembly.....	41
Retention Knob Chart.....	42

Manual Discrepancy Sheet

Basic Machine Assembly



B	CHANGED HEAD COVERS		5019		3/01
A	UPDATE ASSEMBLY		3908	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			TITLE VM17 MACHINE ASSEMBLY		
X.XXX ±			APPLICATION PARTNER VM17		
X.XX ±			SCALE 17:1 DWG No 6-10-008-043 SIZE B		
X.X ±			DATE 12 MAY 97 DRAWN BY THOMPSON SHEET NO. 1 OF 2		
ANGLE ±					

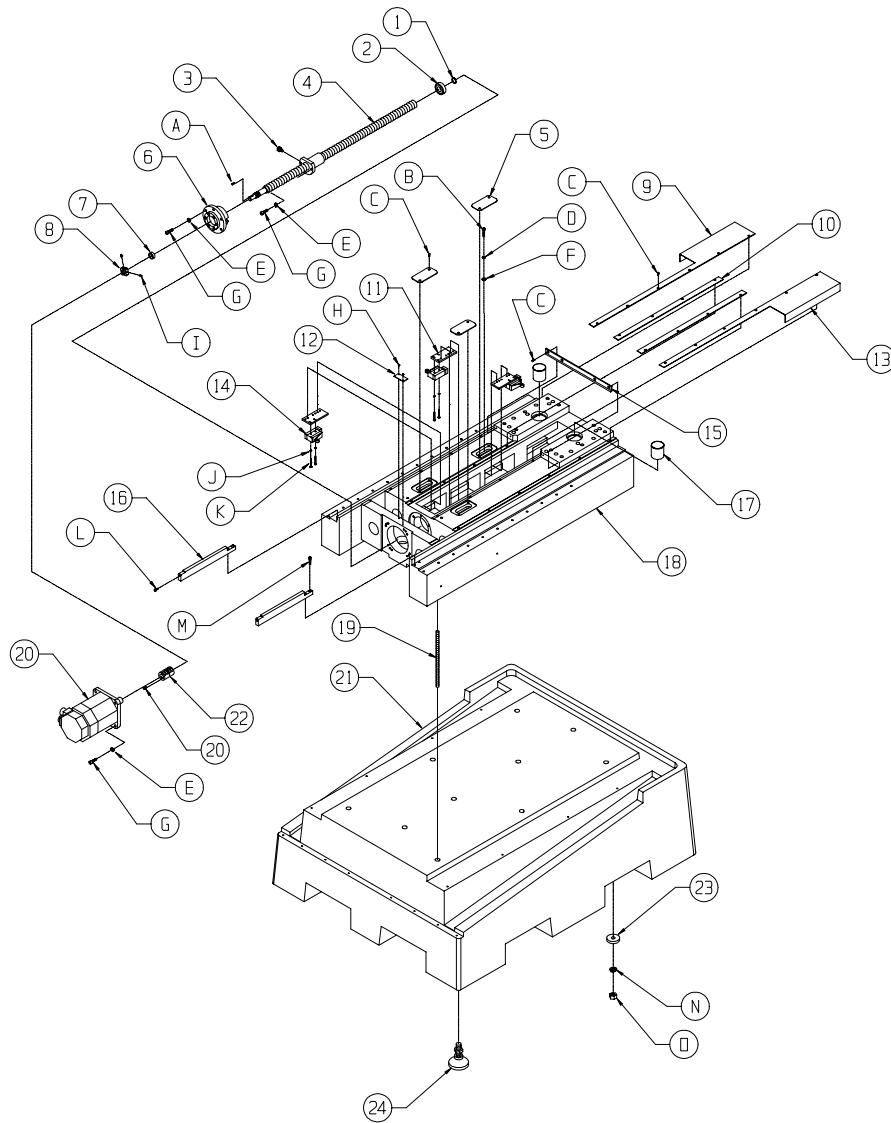


PARTS LIST

No.	DRAWING No.	DESCRIPTION
1	6-10-008-034	VM17 HEAD SUB-ASSEMBLY
2	6-10-008-031	VM17 COLUMN SUB-ASSEMBLY
3	6-10-008-036	TABLE SUB-ASSEMBLIES
4	6-10-008-037	SADDLE SUB-ASSEMBLIES
5	6-10-008-030	VM17 BASE SUB-ASSEMBLY

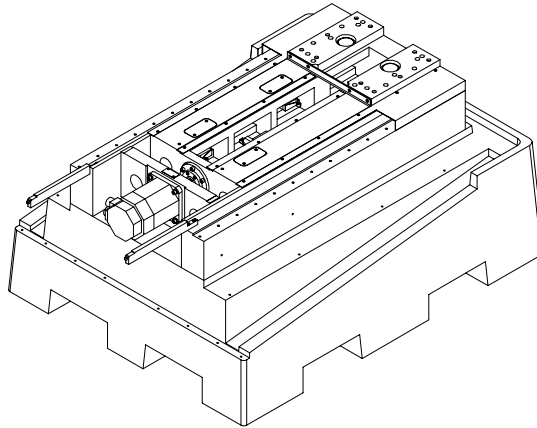
B	CHANGED HEAD COVERS	5019		3/01
A	UPDATE ASSEMBLY	3908	N.M.	3/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM17 MACHINE ASSEMBLY		
X.XXX	±	APPLICATION PARTNER VM17		
X.XX	±	SCALE 17:1 DWG NO 6-10-008-043 SIZE B		
X.X	±	DATE 12 MAY 97 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE	±			

Machine Base Assembly



E	SIGMA II MOTORS	5163		09/01
D	CHANGE STOCK NUMBER	4798	N.M.	11/00
C	CHANGE BALLSCREW	4715	N.M.	10/00
B	UPDATE TO 7304 BEARINGS	3971	N.M.	05/99
A	CHANGE PEDISTAL	3907	N.M.	03/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM17 BASE SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER VM17		
X.XX ±		SCALE 15:1 DWG No 6-10-008-030 SIZE B		
X.X ±		DATE 25 APR 97 DRAWN BY THOMPSON SHEET NO. 1 OF 2		
ANGLE ±				

THIS ASSEMBLY USED ON VM16, VM17



PARTS LIST

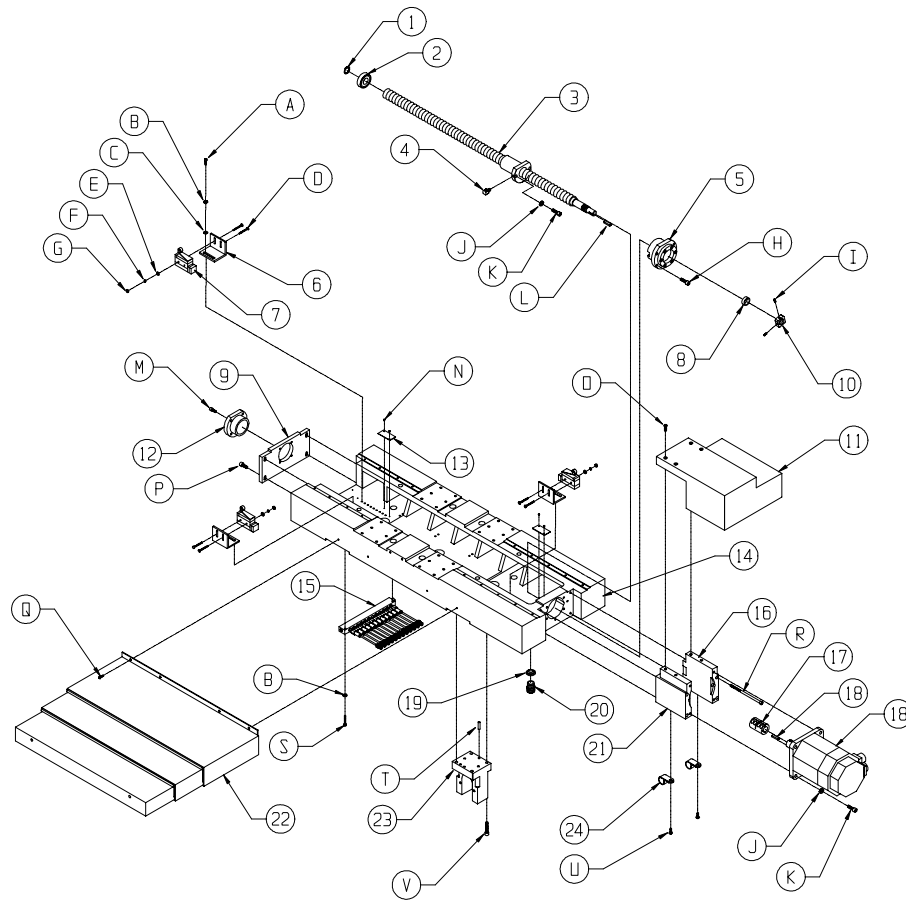
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-108	SNAPRING
2	1	BG-02	6204 BEARING
3	1	NU-118	1/8 NPT 5/16-24 ELBOW
4	1	MP-568	Y-BALL SCREW
5	3	MP-236	Y-AXIS SWITCH SLOT COVER
6	1	6-10-018-064	VM BEARING CUP ASSEMBLY
7	1	MP-429	BEARING LOCK NUT SPACER
8	1	MP1-94	BALL SCREW LOCKNUT
9	1	MP1-264	Y-AXIS RAIL WAY COVER BRACKET - LEFT
10	2	MP1-208	Y-AXIS BALL SCREW WAY COVER BRACKET
11	3	MPT-36	SWITCH PLATE
12	1	LB-27	PULLEY MOTOR WARNING LABEL
13	1	MP1-263	Y-AXIS RAIL WAY COVER BRACKET - RIGHT
14	3	SW-149	LIMIT SWITCH
15	1	MP1-224	COLUMN WIPER
16	2	MP1-218	Y-AXIS FRONT WAY COVER BRACKET
17	2	MP-56	PVC COUPLING/LINER
18	1	MX1-42	VM SERIES BASE - MACHINED
19	11	HD-59	1/2-13 x 7 THREADED ROD
20	1	MD-123	48 IN-LB MOTOR
21	1	MP1-251	VM17 MACHINE PEDESTAL
22	1	MA-177	5/8 x 19 mm. MOTOR COUPLER
23	11	MP-138	PEDESTAL REINFORCING PLATE
24	6	MP1-29	LEVELING PADS

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

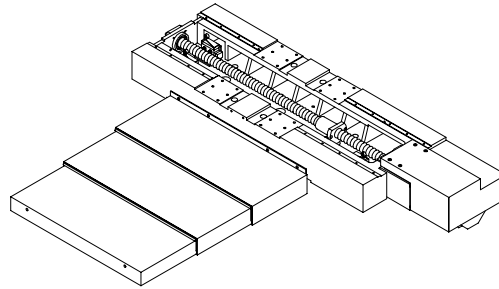
E	SIGMA II MOTORS	5163		09/01
D	CHANGE STOCK NUMBER	4798	N.M.	11/00
C	CHANGE BALLSCREW	4715	N.M.	10/00
B	UPDATE TO 7304 BEARINGS	3971	N.M.	05/99
A	CHANGE PEDISTAL	3907	N.M.	03/99
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH				
 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+			
X.XX	+			
X.X	+			
ANGLE	+			
TITLE VM17 BASE SUB-ASSEMBLY				
APPLICATION PARTNER VM17				
SCALE 12:1	DWG No. 6-10-008-030	SIZE B		
DATE 25 APR 97	DRAWN BY THOMPSON	SHEET NO. 2 OF 2		

Machine Saddle Assembly



E	SIGMA II MOTORS	5162		09/01
D	CHANGED MANIFOLD ASSEMBLY	5050	N.M.	04/01
C	CHANGE STOCK NUMBER	4799	N.M.	11/00
B	CHANGE BALLSCREW	4716	N.M.	10/00
A	UPDATE TO 7304 BEARING	3973	N.M.	05/99
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH				
 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+			
X.XX	+			
X.X	+			
X	+			
ANGLE	+			
TITLE VM17 SADDLE SUB-ASSEMBLY				
APPLICATION PARTNER VM17				
SCALE 12:1 DWG No. 6-10-008-032 SIZE B				
DATE 28 APR 97		DRAWN BY THOMPSON		SHEET NO. 1 OF 2

THIS ASSEMBLY USED ON VM16, VM17



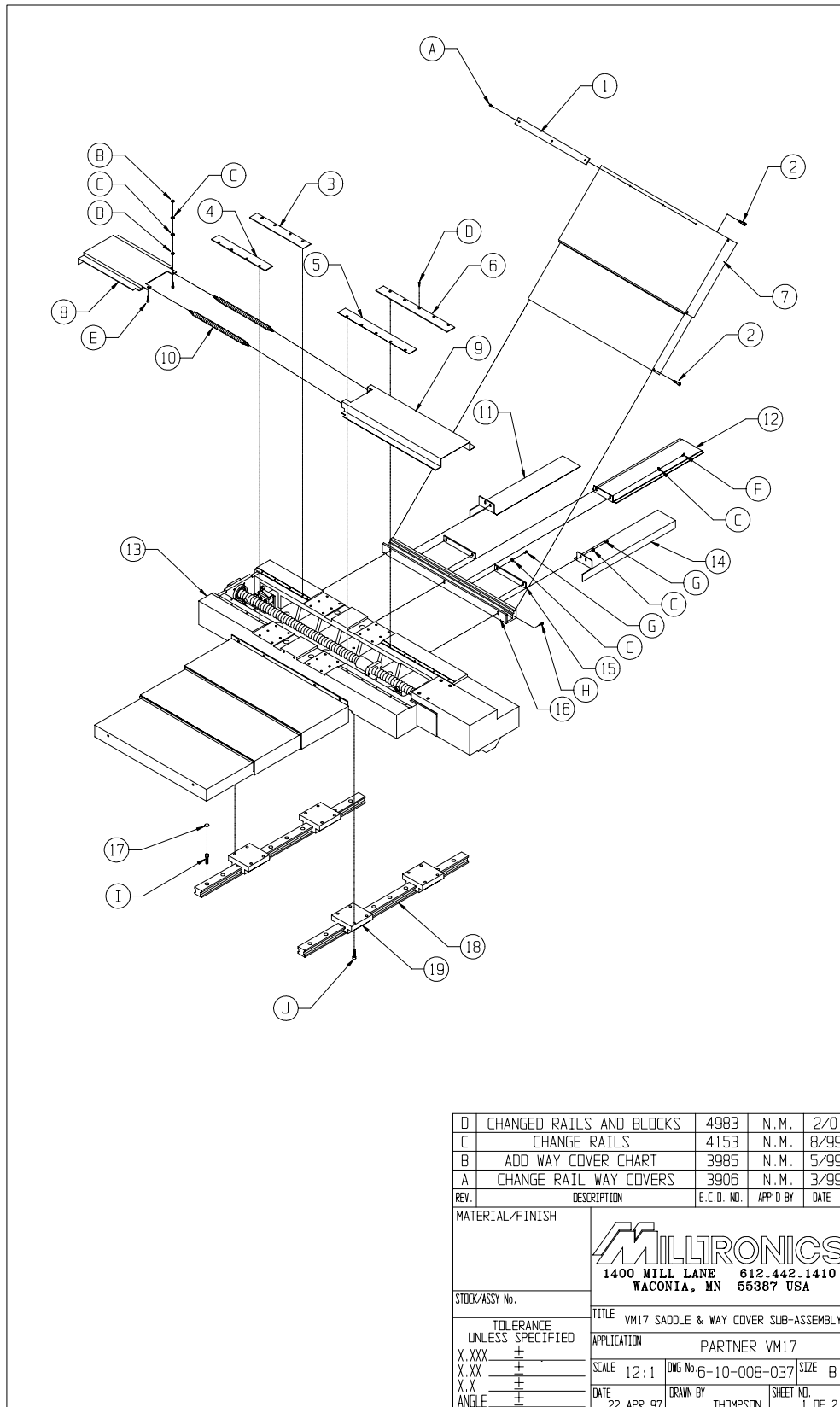
PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-108	SNAPRING
2	1	BG-02	6204 BEARING
3	1	MP-569	10mm x 39.72L BALL SCREW
4	1	NL-118	1/8 NPT-5/16-24 ELBOW
5	1	6-10-018-066	BEARING CUP ASSEMBLY
6	3	MP1-96	LIMIT SWITCH MOUNTING BRACKET
7	3	SW-149	LIMIT SWITCH
8	1	MP-429	BEARING LOCKNUT SPACER
9	1	MP6-40	X-AXIS RADIAL SUPPORT BRACKET
10	1	MP1-94	BALL SCREW LOCKNUT
11	1	MM-75	YASKAWA X-AXIS MOTOR COVER
12	1	MP6-42	30 IN. TRAVEL RADIAL SUPPORT
13	2	LB-27	PULLEY MOTOR WARNING LABEL
14	1	MX1-41	VM SERIES SADDLE - MACHINED
15	1	SEE TABLE	X & Y MANIFOLD ASSEMBLIES
16	1	MP1-235	YASKAWA MOTOR SPACER - RIGHT
17	1	MA-177	5/8 x 19 mm. MOTOR COUPLER
18	1	MD-123	48 IN-LB MOTOR
19	1	WX-38	O-RING, 1/2 IN.
20	1	WX-23	CORD GRIP, 1/2 IN.
21	1	MP1-236	YASKAWA MOTOR SPACER - LEFT
22	1	MP1-226	VM17 FRONT WAY COVER
23	1	MX1-43	Y-AXIS BALL SCREW CARRIER - MACHINED
24	2	WX-82	CABLE CLAMP

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	M5-.8 x 16mm SHCS
B	8	5mm LOCK WASHER
C	6	5mm FLAT WASHER
D	6	M4-.7 x 30mm BHCS
E	6	4mm LOCK WASHER
F	6	4mm FLAT WASHER
G	6	M4-.7 HEX NUT
H	5	M6-1 x 25mm SHCS
I	2	10-32 x 3/16 BRASS TIPPED SHSS
J	6	8mm LOCK WASHER
K	6	M8-1.25 x 30mm SHCS
L	1	3/16 x 3/16 x 1/2 KEY
M	4	M6-1 x 16mm SHCS
N	4	1/4 DRIVE RIVET
O	4	M4-.7 x 10mm FHCS
P	4	M8-1.25 x 20mm SHCS
Q	4	M5-.8 x 12mm BHCS
R	6	M6-1 x 125mm SHCS
S	2	M5-.8 x 30mm SHCS
T	2	1/4 x 1 DOWEL PIN
U	2	M4-.7 x 12mm BHCS
V	4	M8-1.25 x 35mm SHCS

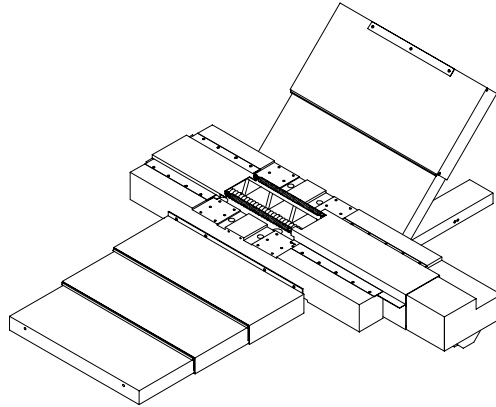
MANIFOLD ASSEMBLY		
DRAWING No.	DESCRIPTION	
6-10-008-058	X & Y AIR/OIL MANIFOLD ASSEMBLY	
6-10-018-049	VM X & Y AXIS OIL MANIFOLD ASSEMBLY	

E	SIGMA II MOTORS	5162		09/01
D	CHANGED MANIFOLD ASSEMBLY	5050	N.M.	04/01
C	CHANGE STOCK NUMBER	4799	N.M.	11/00
B	CHANGE BALLSCREW	4716	N.M.	10/00
A	UPDATE TO 7304 BEARING	3973	N.M.	05/99
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH				
 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
STOCK/ASSY No.		TITLE VM17 SADDLE SUB-ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER VM17		
X.XXX	±	SCALE 12:1		DWG No 6-10-008-032
X.XX	±	DATE 22 APR 97		SIZE B
X.X	±	DRAWN BY THOMPSON		SHEET NO. 2 OF 2
ANGLE	±			

Saddle & Way Cover Assembly



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	SEE TABLE	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	6-10-008-032	VM 17 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	2	MP-640	35 mm 820 RAILS
19	4	MP-641	35 mm RAIL BLOCKS

HARDWARE LIST

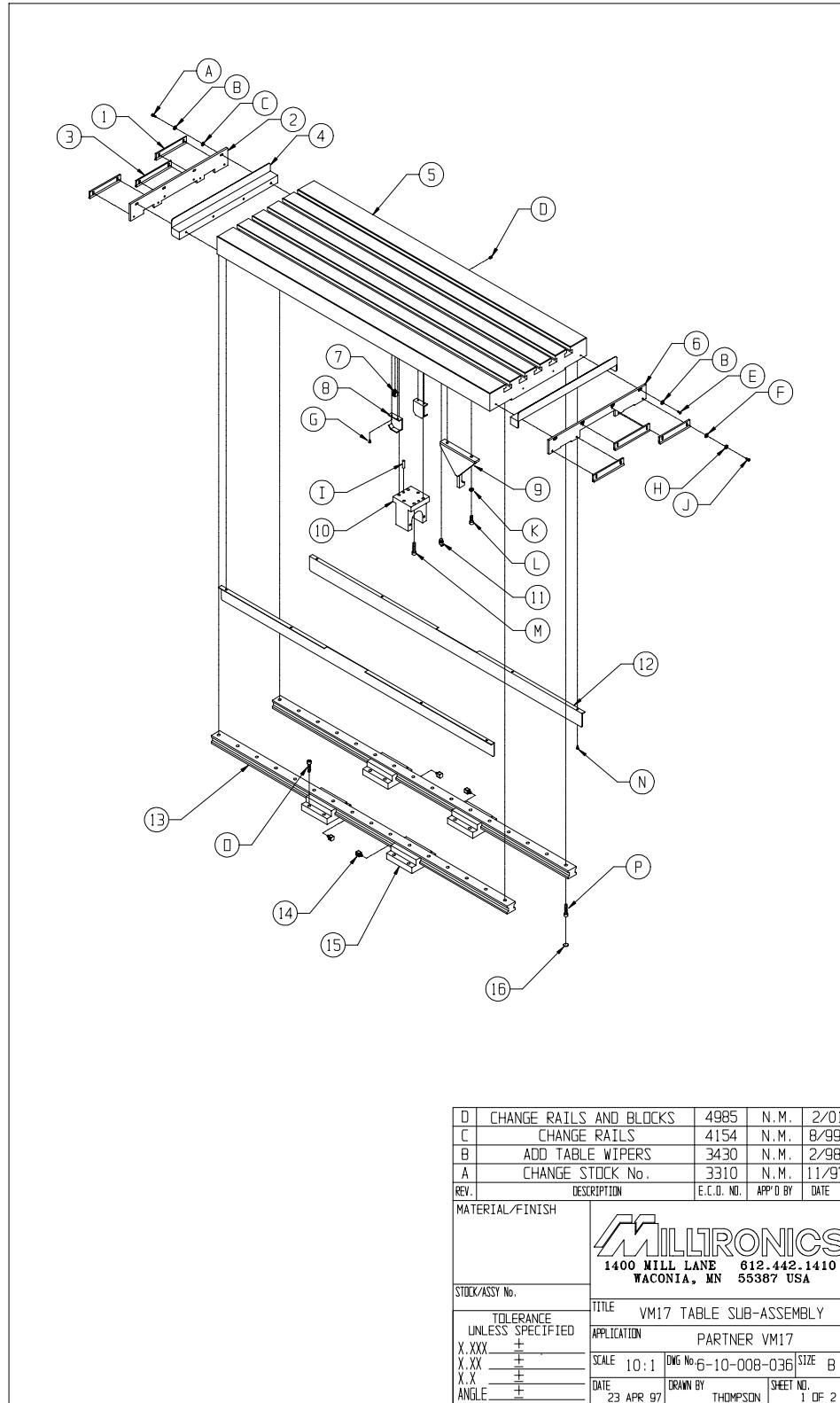
No.	QTY	DESCRIPTION
A	3	8-32 x 1/4 BHCS
B	4	10-32 HEX NUT
C	16	No. 10 FLAT WASHER
D	18	8-32 x 3/8 FHCS
E	2	10-32 x 5/8 SHCS
F	2	10-32 x 1/4 BHCS
G	10	10-32 x 3/8 BHCS
H	3	10-24 x 1/2 BHCS
I	22	MB-1.25 x 40 mm. SHCS
J	16	MB-1.25 x 30 mm. SHCS

REAR WAY COVER CHART

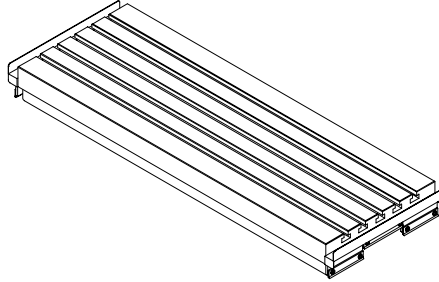
VM16D	MP1-326
VM17	MP1-227

D	CHANGE RAILS AND BLOCKS	4983	N.M.	2/01
C	CHANGE RAILS	4153	N.M.	8/99
B	ADD WAY COVER CHART	3985	N.M.	5/99
A	CHANGE RAIL WAY COVERS	3906	N.M.	3/99
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.				
TOLERANCE UNLESS SPECIFIED		TITLE VM17 SADDLE & WAY COVER SUB-ASSEMBLY		
X. XXX ±		APPLICATION PARTNER VM17		
X. XX ±		SCALE 12:1		DWG NO 6-10-008-037
X. X ±		DATE 22 APR 97		SIZE B
ANGLE ±		DRAWN BY THOMPSON		SHEET NO. 2 OF 2

Milling Table Assembly



THIS ASSEMBLY USED ON VM16, VM17

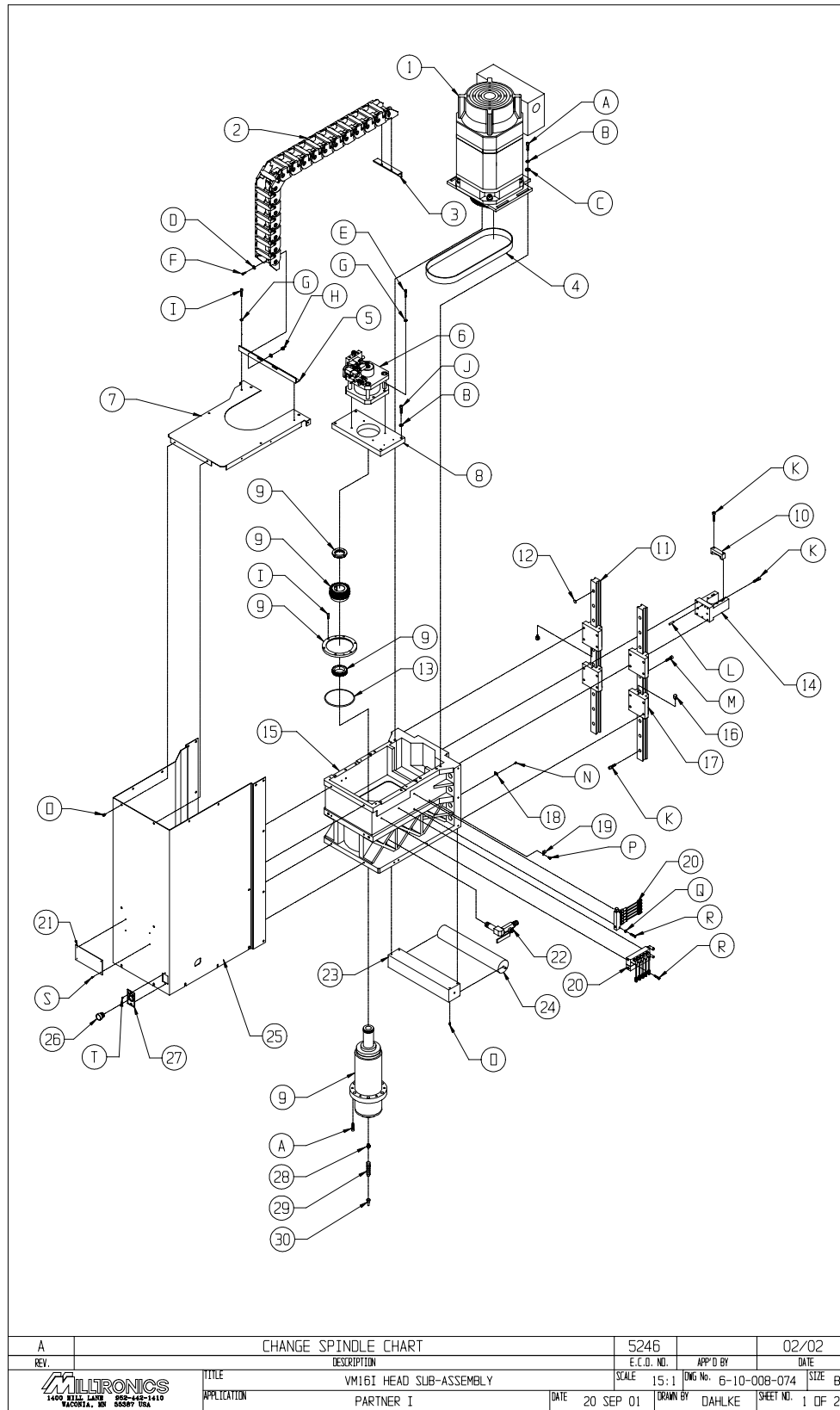


PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	4	MP1-247	VM17 SADDLE WIPER - LOWER
2	1	MP1-246	VM17 WIPER PLATE - LEFT
3	2	MP1-248	VM17 SADDLE WIPER - UPPER
4	2	MP-407	16" TABLE - TROUGH
5	1	MX6-32	METRIC 45 x 16 TABLE - MACHINED
6	1	MP1-245	VM17 WIPER PLATE - RIGHT
7	1	NU-118	1/8 NPT -5/16-24 ELBOW
8	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-642	35 mm 1240 RAILS
14	4	NU-107	OIL FITTING
15	4	MP-641	35 mm RAIL BLOCK
16	30	MP-550	RAIL PLUGS

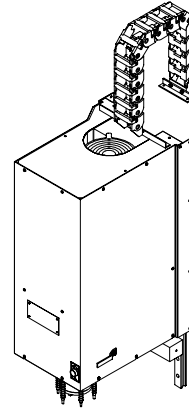
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	8-32 x 5/8 BHCS
B	8	# 8 LOCK WASHER
C	4	# 8 FLAT WASHER
D	1	1/8-27 NPT SHPP
E	4	8-32 x 1/2 BHCS
F	12	# 10 FLAT WASHER
G	4	6-32 x 1/4 BHCS
H	12	# 10 LOCK WASHER
I	2	1/4 x 1 DOWEL PIN
J	12	10-32 x 1/2 BHCS
K	2	1/4 LOCK WASHER
L	2	1/4-20 x 3/4 SHCS
M	4	5/16-18 x 1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

D	CHANGE RAILS AND BLOCKS	4985	N.M.	2/01
C	CHANGE RAILS	4154	N.M.	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		
		APPLICATION PARTNER VM17		
X.XXX	±	SCALE 10:1		DWG No 6-10-008-036 SIZE B
X.XX	±	DATE 23 APR 97		DRAWN BY THOMPSON SHEET NO. 2 OF 2
X.X	±			
ANGLE	±			

Machine Head Assembly



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	6-10-018-089	SPINDLE MOTOR ASSEMBLY
2	1	MP-443	SPINDLE CABLE TRACK
3	1	MP-316	SPINDLE CABLE SUPPORT BRACKET
4	1	BT-62	SPINDLE BELT
5	1	MP-664	VM SPINDLE CABLE SUPPORT BRACKET
6	1	6-10-018-099	TRIPLE STACK DRAWBAR CYLINDER ASSEMBLY
7	1	MP-639	UNIVERSAL HEADCOVER - TOP
8	1	MP-284	PDB AIR CYLINDER MOUNT PLATE
9	1	SEE TABLE	SPINDLE ASSEMBLY
10	1	MP-109	Z-AXIS BALL SCREW SAFETY CATCH
11	2	MP-640	35mm 820 RAILS
12	22	MP-550	RAIL PLUGS
13	1	WX-182	O' RING REAR SEAL
14	1	MX1-11	Z-AXIS BALL SCREW CARRIER - MACH.
15	1	MX-54	60mm HEAD - MACHINED
16	4	NU-107	OIL FITTING
17	4	MP-641	35mm RAIL BLOCK
18	5	NU-36	CLAMP 5/32 OILER
19	1	WX-82	WIRE TIE DOWN
20	1	SEE TABLE	Z-AXIS MANIFOLD ASSEMBLY
21	1	LB-01	SAFETY STICKER
22	1	6-10-008-039	VM17 FLOOD HANDLE SUB-ASSEMBLY
23	1	MP1-223	VM ROLLER SHADE HOUSING
24	1	MP1-31	ROLLER SHADE
25	1	MP-635	UNIVERSAL HEADCOVER
26	1	SW-67	TOOL OUT SWITCH
27	1	LB-181	BOLT ON TOOL OUT LABEL
28	6	NU-111	1/4 LOCKLINK 1/8 NPT
29	24	MA-22	LOCKLINK HOSE
30	6	MA-21	1/8 NOZZLE



Z-AXIS MANIFOLD ASSEMBLY	
DRAWING No.	DESCRIPTION
6-10-018-050	VM Z-AXIS OIL MANIFOLD ASSEMBLY
6-10-008-059	Z-AXIS AIR/OIL MANIFOLD ASSEMBLY

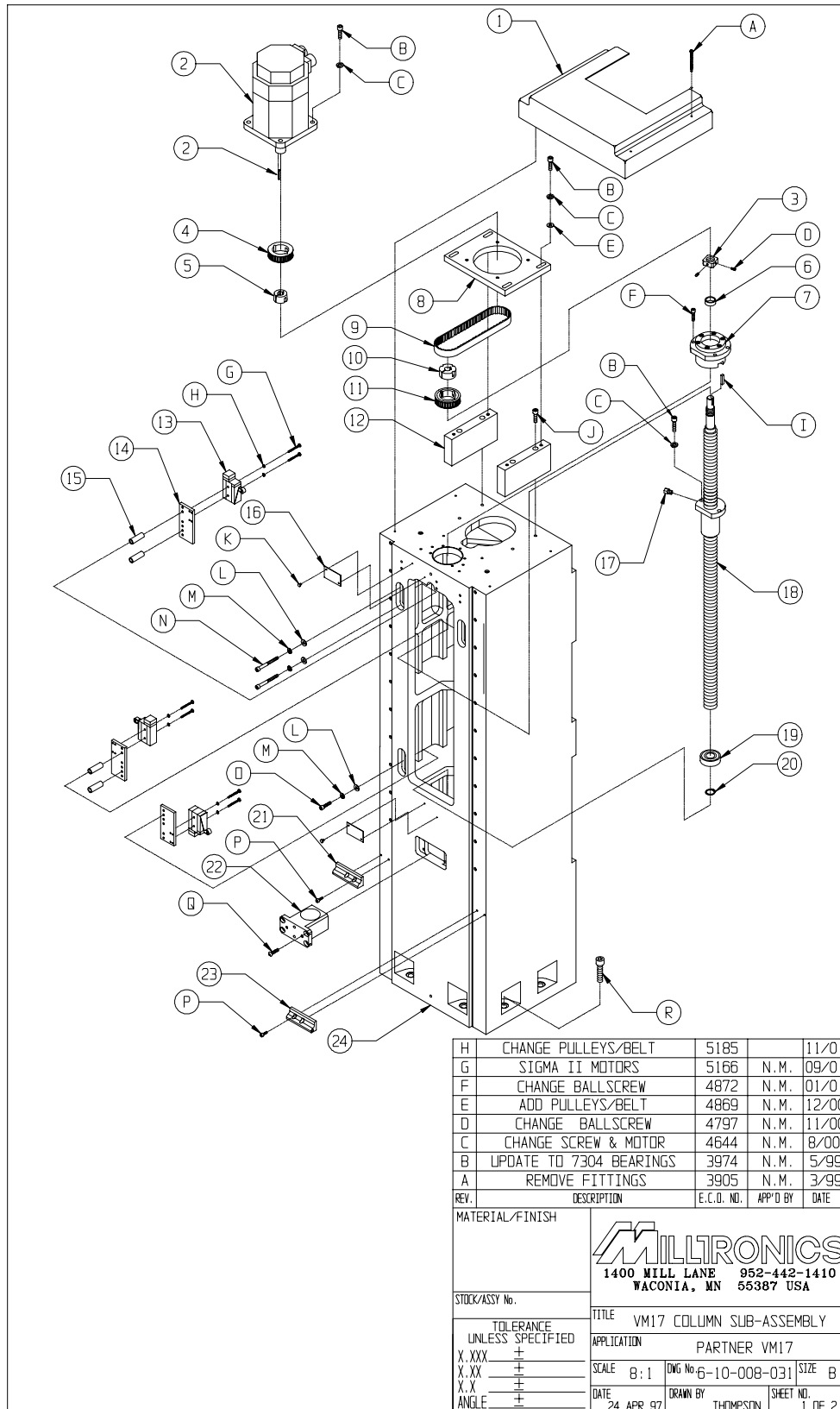
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	14	M8-1.25 x 30mm SHCS
B	12	8mm LOCK WASHER
C	8	8mm HARDENED FLAT WASHER
D	6	6mm FLAT WASHER
E	4	M6-1 x 30mm SHCS
F	4	M6-1 x 20mm BHCS
G	8	6mm LOCK WASHER
H	4	M6-1 NYLOCK NUT
I	8	M6-1 x 20mm SHCS
J	4	M8-1.25 x 45mm SHCS
K	28	M8-1.25 x 40mm SHCS
L	2	1/4 x 1 DOWEL PIN
M	16	M8-1.25 x 30mm SHCS
N	11	M4-.7 x 10mm BHCS
O	21	M6-1 x 10mm BHCS
P	1	M5-.8 x 12mm BHCS
Q	2	5mm LOCK WASHER
R	2	M5-.8 x 40mm SHCS
S	4	M3-.5 x 6mm BHCS
T	2	M4-.7 x 8mm BHCS

SPINDLE ASSEMBLY		
RPM	10/15 HP	15/20 HP
1 SPEED	2 SPEED	
6K	9897	9900
8K	9897-1	9900-1
12K	9899-4	9899-4
15K	9899-5	9899-5

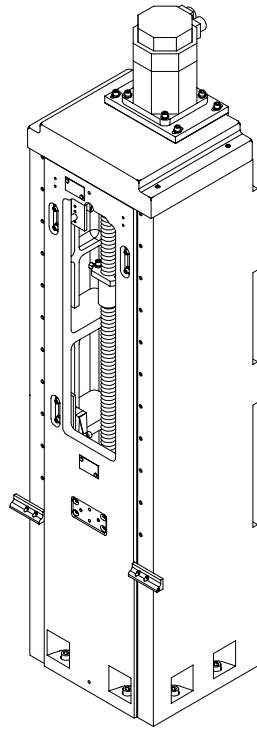
A	CHANGE SPINDLE CHART		5246		02/02
REV.	DESCRIPTION		E.C.D. NO.	APP'D BY	DATE
	TITLE		SCALE	15:1	DATE
	VM16I HEAD SUB-ASSEMBLY			DATE	06-10-008-074
	APPLICATION		DATE	20 SEP 01	SHEET NO. 2 OF 2
	PARTNER I			DAHLKE	



Machine Column Assembly



THIS ASSEMBLY USED ON VM16, VM17



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	VM1-08	Z-AXIS MOTOR COVER
2	1	MD-128	74 IN-LB MOTOR W/BRAKE
3	1	MP1-94	BALL SCREW LOCK NUT
4	1	PY-204	P24-8MGT-30 PULLEY
5	1	PY-206	22mm ID 1108 BUSHING
6	1	MP-429	BEARING LOCK NUT SPACER
7	1	6-10-018-066	AXIS BEARING CUP ASSEMBLY
8	1	MP-631	YASKAWA Z AXIS MOTOR PLATE
9	1	BT-73	560-8MGT-30 TIMING BELT
10	1	PY-32	5/8 ID 1210 BUSHING
11	1	PY-205	P32-8MGT-30 PULLEY
12	2	MP1-374	Z AXIS MOTOR SPACER
13	3	SW-149	LIMIT SWITCH
14	3	MPT-36	SWITCH PLATE
15	4	SP-83	Z-AXIS LIMIT/GRID SPACER
16	2	LB-27	PULLEY MOTOR WARNING LABEL
17	1	NU-154	1/8 NPT MS 5/32 TUBE
18	1	MPB-02	10 mm x 36 IN. Z BALL SCREW
19	1	BG-02	6204 BEARING
20	1	MP1-108	SNAP RING
21	1	MP1-199	COLUMN WAY COVER BRACKET - LEFT
22	1	MX1-28	Y & Z RADIAL SUPPORT, 44 IN.
23	1	MP1-201	COLUMN WAY COVER BRACKET - RIGHT
24	1	MX1-45	VM17 COLUMN - MACHINED

#9 BT-70 option

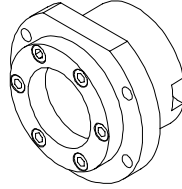
HARDWARE LIST

No.	QTY	DESCRIPTION
A	4	10-32 x 2 1/4 BHCS
B	10	5/16-18 x 1 1/4 SHCS
C	10	5/16 LOCK WASHER
D	2	10-32 x 3/16 BRASS TIPPED SHSS
E	4	5/16 FLAT WASHER
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	5/16-18 x 2 SHCS
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	2	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

H	CHANGE PULLEYS/BELT	5185		11/01
G	SIGMA II MOTORS	5166	N.M.	09/01
F	CHANGE BALLSCREW	4872	N.M.	01/01
E	ADD PULLEYS/BELT	4869	N.M.	12/00
D	CHANGE BALLSCREW	4797	N.M.	11/00
C	CHANGE SCREW & MOTOR	4644	N.M.	8/00
B	UPDATE TO 7304 BEARINGS	3974	N.M.	5/99
A	REMOVE FITTINGS	3905	N.M.	3/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE

MATERIAL/FINISH	 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.	TITLE VM17 COLUMN SUB-ASSEMBLY		
TOLERANCE UNLESS SPECIFIED	APPLICATION PARTNER VM17		
X.XXX	+	SCALE 8:1	DWG No 6-10-008-031
X.XX	+	DATE 24 APR 97	SHEET NO. 2 OF 2
X.X	+	DRAWN BY THOMPSON	
ANGLE	±		

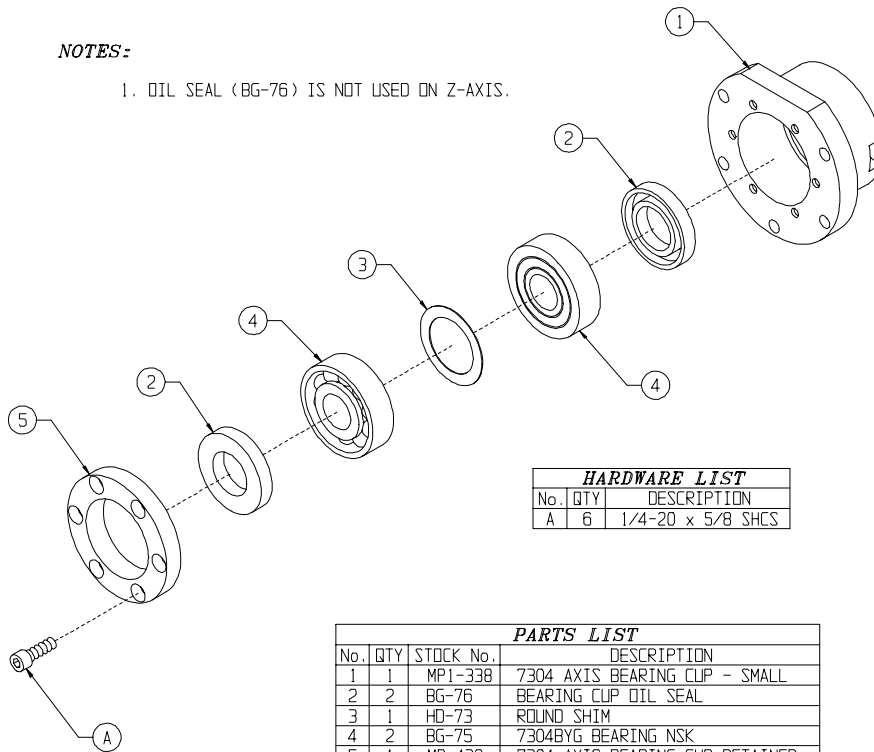
X & Z Axis Bearing Cup Assembly



*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 CUP - 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 CUP RETAINER	

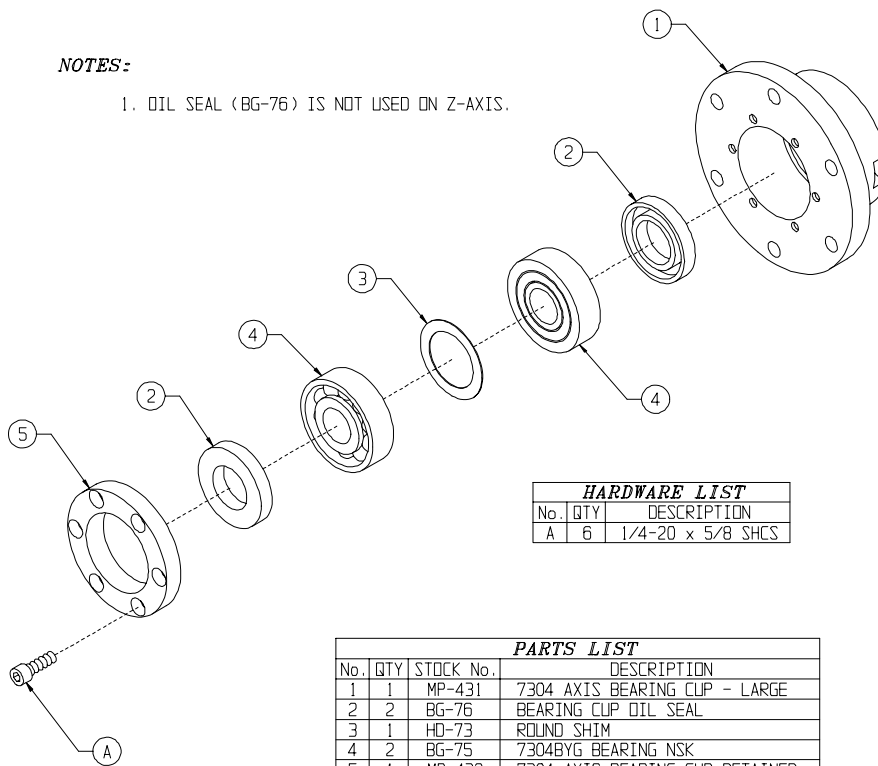
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. 3B4B TOLERANCE UNLESS SPECIFIED X.XXX +/- .005 X.XX +/- .010 X.X +/- .030 ANGLE +/- 1.0° MILLIRONICS 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA TITLE 7304 BEARING CUP ASSEMBLY - SMALL APPLICATION GENERAL PRODUCTS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

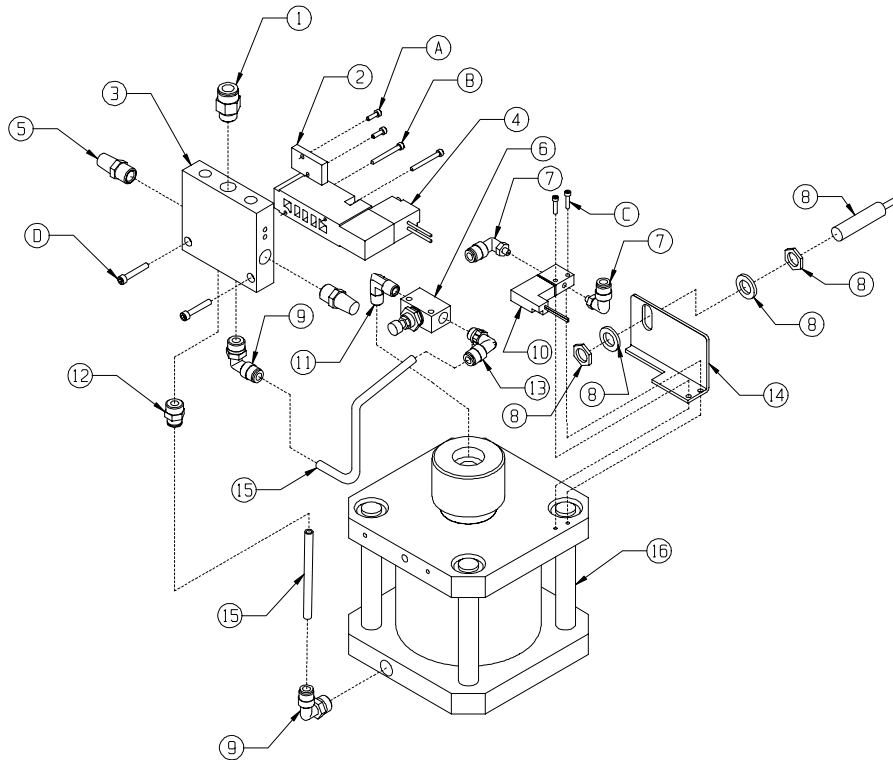
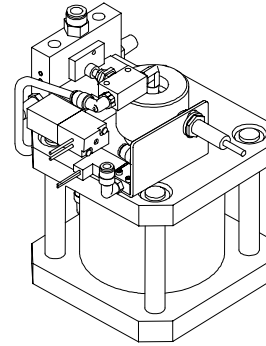
PARTS LIST				
No.	QTY	STOCK No.	DESCRIPTION	
1	1	MP-431	7304 AXIS BEARING CUP - LARGE	
2	2	BG-76	BEARING CUP OIL SEAL	
3	1	HD-73	ROUND SHIM	
4	2	BG-75	7304BYG BEARING NSK	
5	1	MP-432	7304 AXIS BEARING CUP RETAINER	

REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No. 3849				
TOLERANCE UNLESS SPECIFIED		TITLE 7304 BEARING CUP ASSEMBLY - LARGE		
X, XXX +/- .005		APPLICATION GENERAL PRODUCTS		
X, XX +/- .010		SCALE 2:1 DWG No. 6-10-018-064 SIZE B		
X, X +/- .030		DATE 19 FEB 99 DRAWN BY DAHLKE SHEET No. 1 OF 1		
ANGLE +/- 1.0°				

Power Drawbar Cylinder Assembly

PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-95	MALE STRAIGHT 1/4 NPT - 3/8 TUBE
2	1	NU-240	MAC BLANKING PLATE
3	1	NU-184	MANIFOLD
4	1	NU-183	DRAW BAR - AIR VALVE
5	2	NU-79	1/4 NPT MUFFLER
6	1	NU-190	FLOW CONTROL FOR BLOW OUT
7	2	NU-192	SWIVEL ELBOW 10-32 - 1/4 TUBE
8	1	PR-33	DRAWBAR PROX SWITCH
9	2	NU-186	SWIVEL ELBOW 1/4 NPT - 1/4 TUBE
10	1	NU-191	AIR PURGE - AIR VALVE
11	1	NU-189	MALE ELBOW 1/8 NPT
12	1	NU-32	MALE STRAIGHT 1/4 NPT - 1/4 TUBE
13	1	NU-187	SWIVEL ELBOW 1/8 NPT - 1/4 TUBE
14	1	BR-143	DRAWBAR PROX SWITCH BRACKET
15	4"	NU-25	1/4" TUBING
16	1	NU-255	TRIPLE STACK DRAW BAR AIR CYLINDER

HARDWARE LIST		DESCRIPTION
ITEM	QTY	
A	2	M3-.5 x 10mm SHCS
B	2	M3-.5 x 30mm SHCS
C	2	4-40 x 5/8 SHCS
D	2	8-32 x 1 SHCS

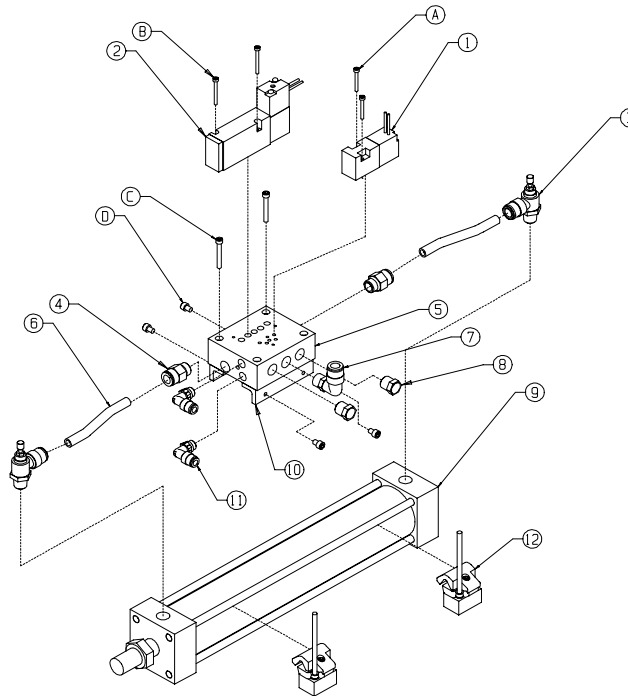
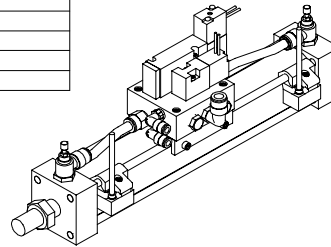


REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA TITLE NU-278 DRAW BAR ASSEMBLY APPLICATION GENERAL PRODUCTS SCALE 3:1 DWG No. 6-10-018-099 SIZE B DATE 09 JUL 01 DRAWN BY DAHLKE SHEET No. 1 OF 1				
MATERIAL/FINISH STOCK/ASSY No. TOLERANCE UNLESS SPECIFIED X.XXX +/- X.XX +/- X.X +/- ANGLE +/- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16				

20 Pocket Air Cylinder Assembly

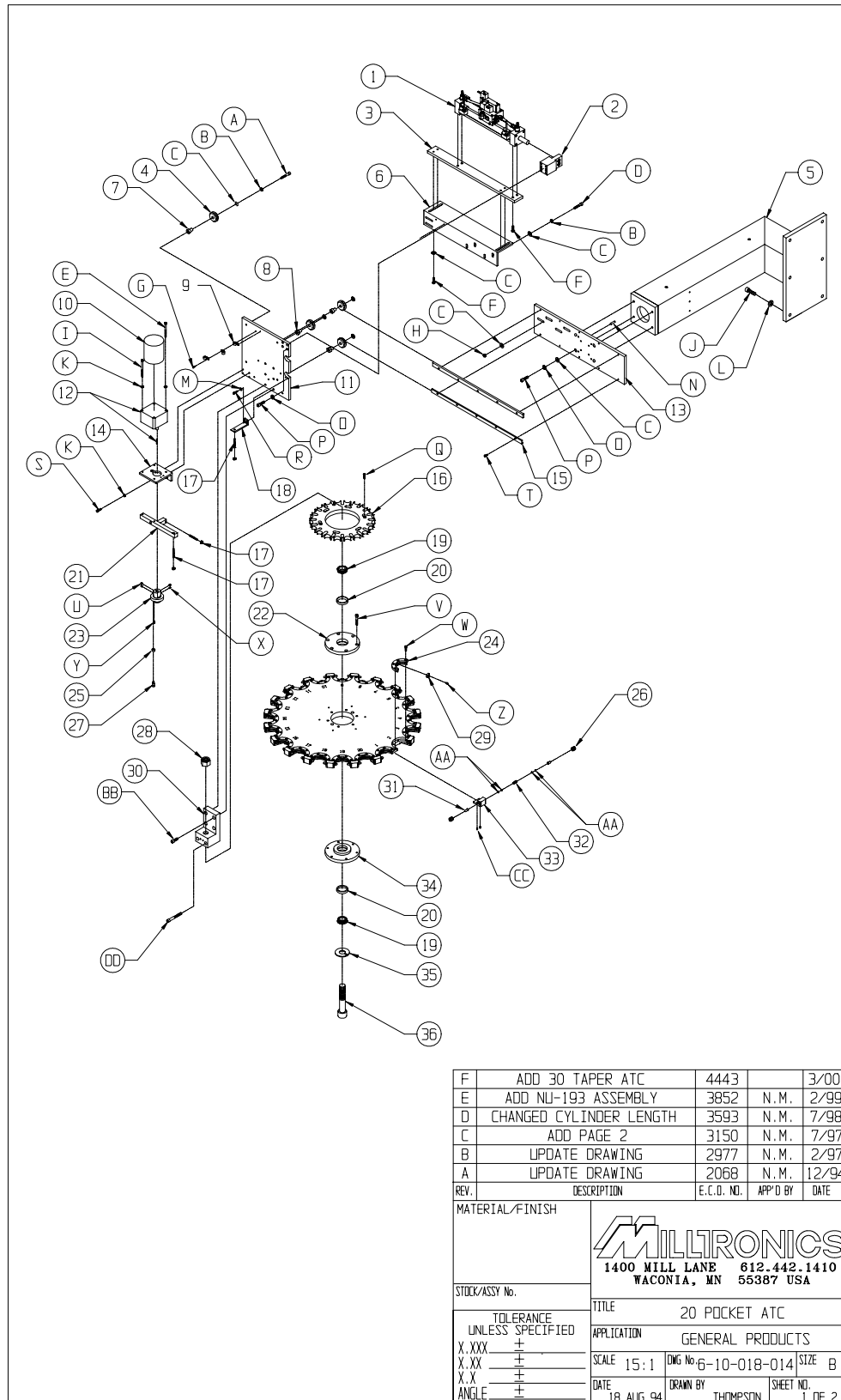
PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-185	AIR VALVE - DOOR - OPEN/CLOSE
2	1	NU-183	AIR VALVE - CAROUSEL - IN/OUT
3	2	NU-180	FLOW CONTROL
4	2	NU-95	MALE STRAIGHT CONNECTOR 1/4 NPT - 3/8 TUBE
5	1	NU-194	MANIFOLD
6	2	NU-78	3/8 NYLON TUBING
7	1	NU-199	SWIVEL ELBOW 1/4 NPT - 3/8 TUBE
8	2	NU-79	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

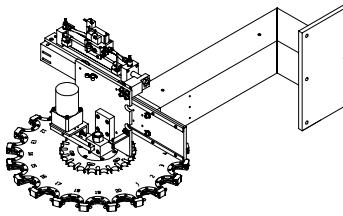
HARDWARE LIST		
ITEM	QTY	DESCRIPTION
A	2	M3-.5 x 25mm SHCS
B	2	M3-.5 x 30mm SHCS
C	4	8-32 x 1 1/4 SHCS
D	4	10-32 x 1/4 SHCS



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

20 Pocket Rotary Tool Changer Assembly





PARTS LIST				HARDWARE LIST			
No.	QTY	STOCK No.	DESCRIPTION	No.	QTY	DESCRIPTION	
1	1	6-10-018-063	NU-193 9" AIR CYLINDER ASSEMBLY	A	4	5/16-18 x 1 5/8 SHCS	
2	1	MP-427	9 IN. AIR CYLINDER CLEVIS	B	8	5/16 LOCK WASHER	
3	1	MP-426	9 IN. AIR CYLINDER PLATE	C	20	5/16 HARDENED FLAT WASHER	
4	4	MP-143	V-RAIL GUIDE WHEEL	D	4	5/16-18 x 1 1/2 SHCS	
5	1	SEE TABLE	20 POCKET ARM	E	2	1/4-20 x 3 SHCS	
6	1	MP-117	20 POCKET AIR CYLINDER MOUNTING BRACKET	F	8	5/16-24 x 3/4 BHCS	
7	2	MP-145	STATIONARY BUSHING	G	2	8-32 x 1/2 BHCS	
8	2	MP-144	ADJUSTABLE BUSHING	H	4	5/16-18 HEX NUT	
9	3	WX-82	3/8 IN. CABLE CLAMP	I	2	1/4-20 x 3 1/2 SHCS	
10	1	MD-72	GENEVA MOTOR	J	6	1/2-13 x 2 SHCS	
11	1	MP-123	20 POCKET CAROUSEL SLIDING PLATE	K	8	1/4 LOCK WASHER	
12	1	MD-71	GEAR BOX W/KEY	L	6	1/2 LOCK WASHER	
13	1	MP-142	V-RAIL PLATE	M	2	#10 FLAT WASHER	
14	1	MP1-117	GENEVA WHEEL MOTOR MOUNT	N	4	1/4 x 1 DOWEL PIN	
15	2	MX-12	20 POCKET LINEAR V-RAIL MODS.	O	8	3/8 LOCK WASHER	
16	1	MP-120	20 POSITION GENEVA WHEEL	P	8	3/8-16 x 1 1/4 SHCS	
17	3	PR-19	SWITCH PROX	Q	6	1/4-20 x 3/4 BHCS	
18	1	BR-130	TOOL CHANGER PROX. SWITCH BRACKET	R	2	10-32 x 3/4 BHCS	
19	2	BG-33	CONE TAPERED BEARING	S	4	1/4-20 x 7/8 SHCS	
20	2	BG-34	CUP TAPERED BEARING	T	10	1/4-20 x 5/8 BHCS	
21	1	MP-466	HOME/GENEVA PROX BRACKET	U	2	5/16-18 x 1/4 SHSS	
22	1	MP-116	UPPER CAROUSEL BEARING CUP	V	6	5/16-18 x 1 3/4 SHCS	
23	1	MX-10	20 PKT ATC DRIVE CAM - MACHINED	W	80	1/4-20 x 3/4 SHCS	
24	20	SEE TABLE	20 POCKET INSERT	X	2	1/4-20 x 1/4 SHSS	
25	1	HD-39	1/2 x 5/16 DRILL BUSHING	Y	1	8-32 x 1/4 BHCS	
26	40	MP1-140	([^]) PUSH PIN GUIDE	Z	20	([^]) 8-32 x 1/4 SHCS	
27	1	HD-38	5/16 x 3/8 SHOULDER BOLT	AA	80	([^]) (*) No. 6 FLAT WASHER	
28	1	HD-07	1-8 UNC NYLOCK NUT	BB	4	3/8-16 x 1 SHCS	
29	20	SEE TABLE	([^]) 20 POCKET TOOL CHANGE KEY	CC	40	10-32 x 3/16 BRASS TIPPED SHSS	
30	1	MP-124	20 POCKET CAROUSEL MOUNTING BRACKET	DD	2	3/8-16 x 3 SHCS	
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				

(*) 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

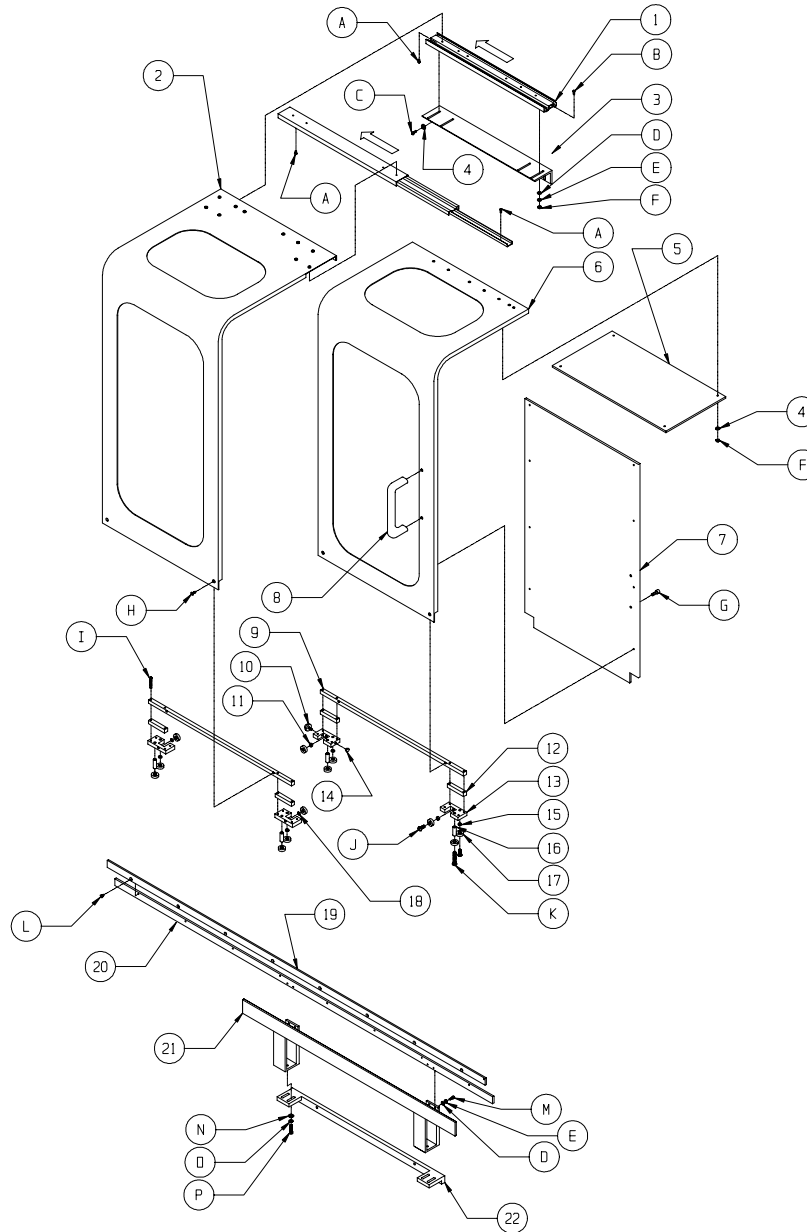
NOTES:

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

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

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. 2 OF 2		
ANGLE ±				

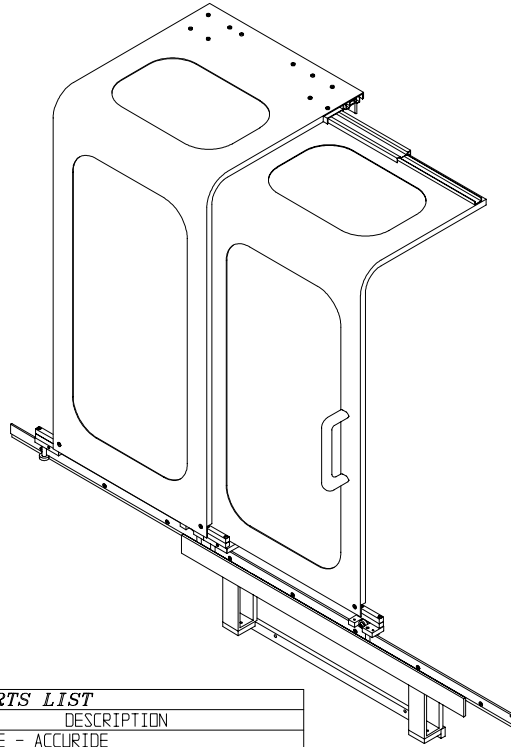
Chip Pan Door Assembly



NOTES:

1. TO OPEN DOORS, SLIDES MOVE IN THE DIRECTION OF THE () ARROW.

D	ADDED DOOR & HOW	3914		4/99
C	ADDED ITEMS	3787	D.H.	1/99
B	ITEM #4 NEW PART NUMBER	3739	D.H.	11/98
A	UPDATED & DELETED PARTS	3719	D.H.	10/98
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 DOOR RAIL ASSEMBLY - FIBERGLASS		
X.XXX +/- .005		APPLICATION PARTNER I		
X.XX +/- .010		SCALE 12:1		DWG No. 6-10-008-051
X.X +/- .030		DATE 6 OCT 98		SIZE B
ANGLE +/- 1.0°		DRAWN BY HCFM		SHEET No. 1 OF 2



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	28	HD-12	1/4 RUBBERIZED WASHER
5	2	MP-156	LEXAN - DOOR TOP
6	1	MP1-291	DOOR - INSIDE
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	MP1-265	DOOR RAIL BRACKET - FIBERGLASS
22	1	MP1-295	DOOR RAIL LOWER BRACKET - FIBERGLASS

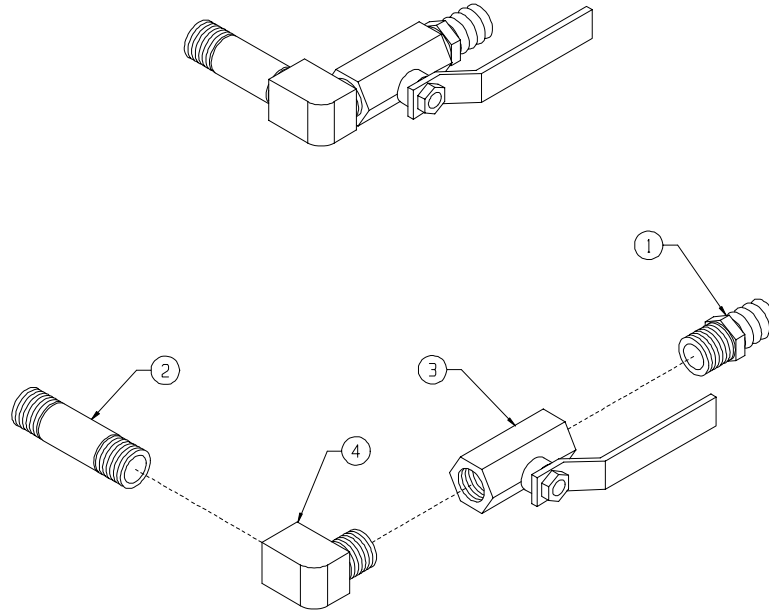
HARDWARE LIST

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

D	ADDED DOOR & HDW	3914		4/99
C	ADDED ITEMS	3787	D.H.	1/99
B	ITEM #4 NEW PART NUMBER	3739	D.H.	11/98
A	UPDATED & DELETED PARTS	3719	D.H.	10/98
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 DOOR RAIL ASSEMBLY - FIBERGLASS		
X.XXX	+/- .005	APPLICATION PARTNER I		
X.XX	+/- .010	SCALE 9:1 DWG No. 6-10-008-051 SIZE B		
X.X	+/- .030	DATE 6 OCT 98 DRAWN BY HERME SHEET 2 OF 2		
ANGLE	+/- 1.0°			

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

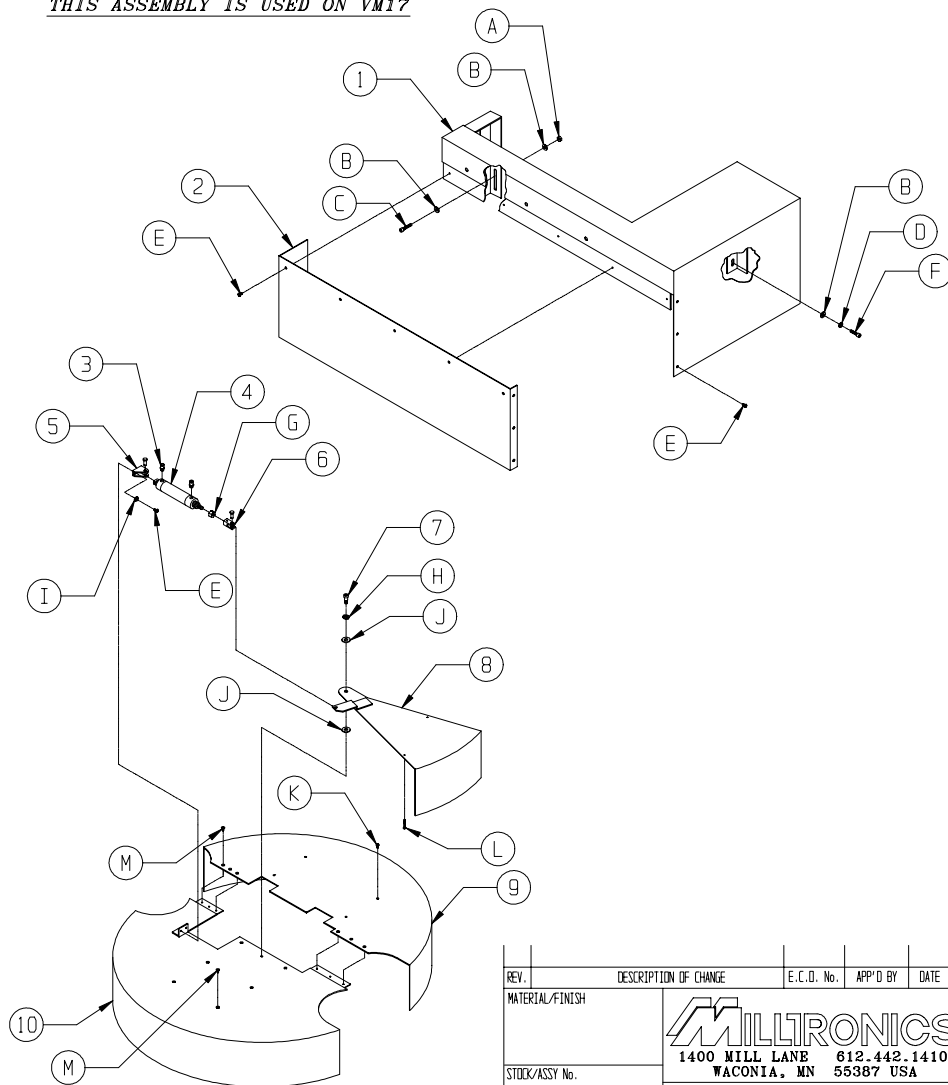
A	CHANGE PIPE NIPPLE	3851		2/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLIRONICS MANUFACTURING 1400 MILL LANE (612) 442-1410 WACONIA, MN 55387		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM17 FLOOD HANDLE SUB-ASSEMBLY		
X.XXX ±		APPLICATION PARTNER I		
X.XX ±		SCALE 2:1	DWG No 6-10-008-039	SIZE B
X.X ±		DATE 29 APR 97	DRAWN BY THOMPSON	SHEET NO. 1 OF 1
ANGLE ±				

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



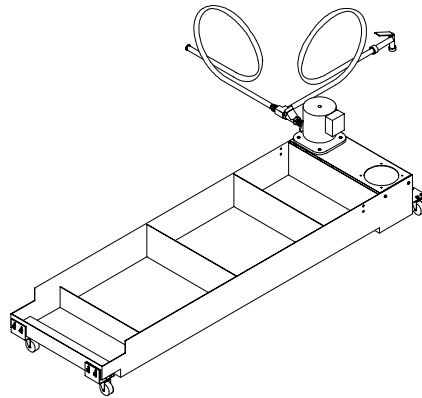
REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X .XXX	+/-			
X .XX	+/-			
X .X	+/-			
ANGLE	+/-			



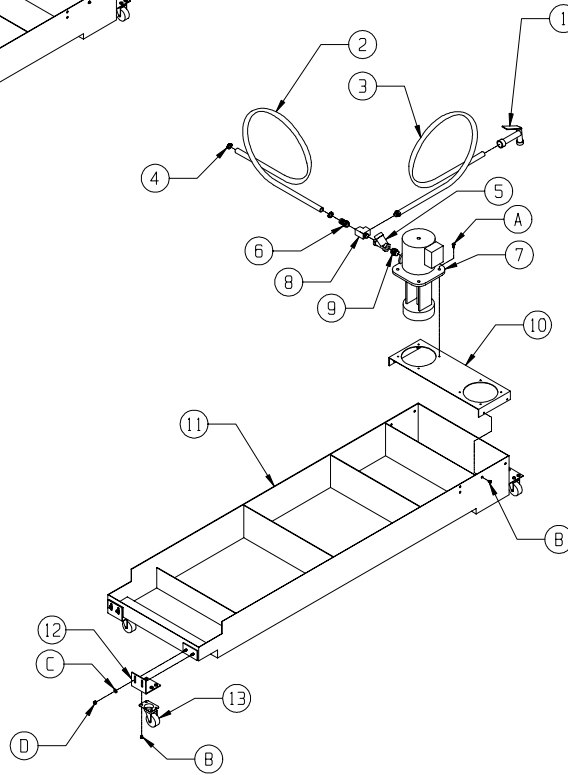
1400 MILL LANE 612.442.1410
WACONIA, MN 55387 USA

TITLE	20 POCKET ATC COVER - VM17
APPLICATION	PARTNER I
SCALE	10:1
DATE	20 DEC 99
DRAWN BY	DAHLKE
SHEET No.	1 OF 1

Coolant Trough Assembly



*THIS IS USED ON ASSEMBLY
FOR VM16, VM17, VM24*



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	MA-162	FLOOD PUMP 1/4 HP MOTOR
8	1	NU-127	1/2" STREET T
9	1	NU-65	1/2" NIPPLE
10	1	MP-390	COOLANT TROUGH PUMP MOUNTING PLATE
11	1	MP-397	COOLANT TROUGH
12	2	BR-117	FRONT CASTER MOUNTING BRACKET
13	4	EL-88	CASTER

HARDWARE LIST			
No.	QTY	DESCRIPTION	
A	4	1/4-20 x 5/8 BHCS	
B	20	1/4-20 x 3/8 BHCS	
C	4	1/4 FLAT WASHER	
D	4	1/4-20 NYLOCK HEX NUT	

B	UPDATE TABLE	4386		2/00
A	CHANGE COOLANT TROUGH	4379	N.M.	2/00
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 COOLANT TROUGH ASSEMBLY		
X.XXX +/- .005		APPLICATION GENERAL PRODUCTS		
X.XX +/- .010		SCALE 15:1 DWG No. 6-10-018-086		SIZE B
X.X +/- .030		DATE 26 JAN 00 DRAWN BY DAHLKE SHEET No. 1 OF 1		
ANGLE +/- 1.0°				

PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	MP-400	4" DIAMETER AUGER 85.25" LONG
2	1	MP1-289	VM17 REMOVABLE CHUTE
3	1	MP1-273	VM17 REMOVABLE TROUGH
4	1	MP1-272	VM17 DRIP TRAY FIBERGLASS
5	18	HD-12	RUBBERIZED WASHER
6	1	BG-76	BEARING CUP OIL SEAL
7	1	MP-440	BROTHER AUGER MOTOR MTG BRACKET
8	1	MP-441	BROTHER AUGER DRIVE SHAFT
9	2'	NU-25	1/4" NYLON TUBING
10	1	NU-16	MALE ELBOW 1/8 NPT 1/4 TUBE
11	1	MD-120	AUGER MOTOR

HARDWARE LIST

No.	QTY	DESCRIPTION
A	8	10-32 x 3/8 BHCS
B	12	1/4-20 x 3/4 BHCS
C	10	1/4-20 x 1/2 BHCS
D	4	1/4 FLAT WASHER
E	2	5/16-18 x 2 SHCS
F	2	10-32 x 1/4 SHSS
G	4	1/4 LOCK WASHER
H	2	5/16 LOCK WASHER
I	2	5/16-18 HEX NUT
J	4	1/4-20 x 1 SHCS

REVISIONS

REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
1	DESCRIPTION OF CHANGE			

MATERIAL/FINISH

STOCK/ASSY No.

TOLERANCE UNLESS SPECIFIED

X.XXX	+/-
X.XX	+/-
X.X	+/-
ANGLE	+/-

DATE 26 OCT 00

DRAWN BY DAHL KF

SHEET No. 1 OF 1

DATE 26 OCT 00

SCALE 20:1

APPLICATION PARTNER I

ENGINEERING 6-10-008-070

SIZE B

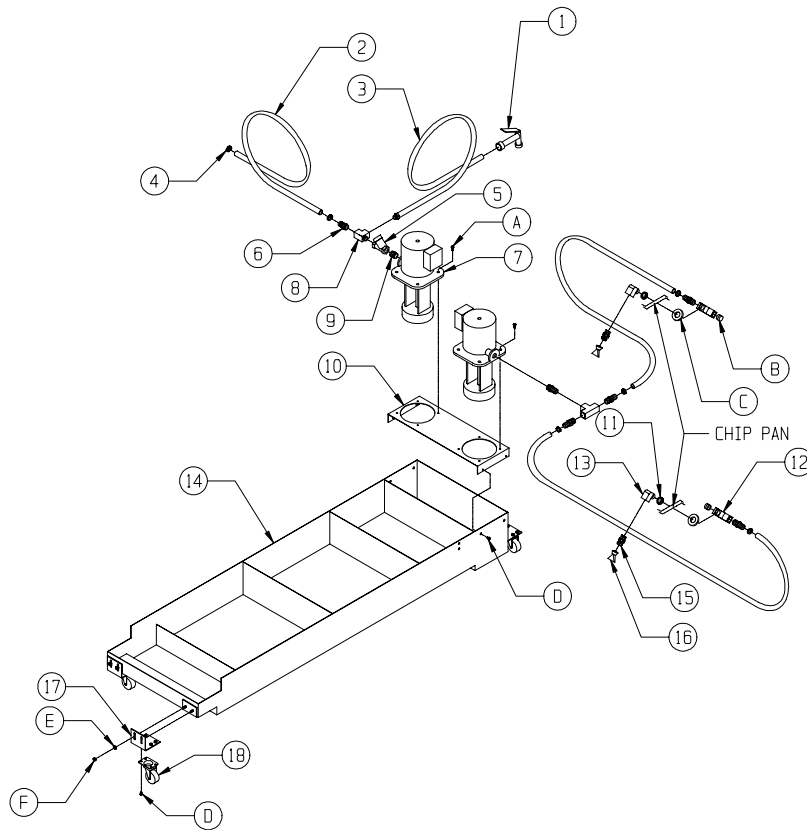
WACONIA, MN 55387 USA

1400 MILL LANE 952-442-1410

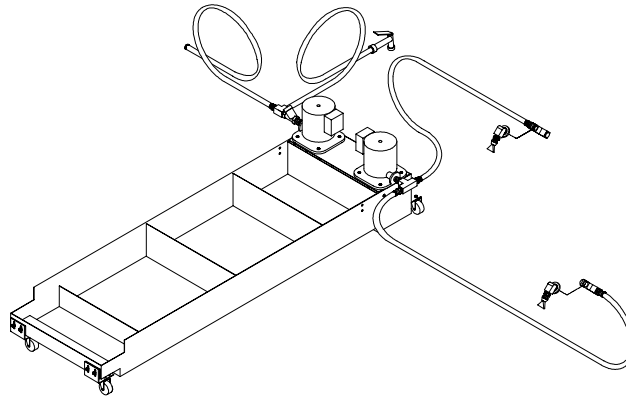
MILLTRONICS

TITLE VM17 AUGER ASSEMBLY

Washdown Coolant Trough Assembly



REV.	DESCRIPTION OF CHANGE	E.C.O. 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 WASHDOWN TROUGH ASSEMBLY APPLICATION PARTNER I SCALE 15:1 DATE 25 JUL 00 DWG No. 6-10-008-067 DRAWN BY DAHLKE SHEET No. 1 OF 2 SIZE B				



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-124	WATER HOSE NOZZLE
2	30'	NU-69	3/4" NYLOBRAID HOSE
3	1	NU-130	WASHDOWN HOSE ASSEMBLY
4	6	NU-141	1" HOSE CLAMP
5	1	NU-128	1/2" SWING CHECK VALVE
6	5	NU-66	1/2 NPT - 3/4 BARB FITTING
7	2	MA-162	FLOOD PUMP 1/4 HP MOTOR
8	1	NU-127	1/2" STREET T
9	1	NU-65	1/2" NIPPLE
10	1	MP-515	COOLANT PUMP MOUNTING PLATE
11	2	WX-38	O' RING
12	3	NU-61	1/2" FEMALE T
13	2	NU-125	1/2" STREET ELBOW
14	1	MP-397	COOLANT TANK
15	2	NU-176	1/2" CONNECTOR
16	2	NU-175	1 1/4" FLARE NOZZLE
17	2	BR-117	FRONT CASTER MOUNTING BRACKET
18	4	EL-88	CASTER

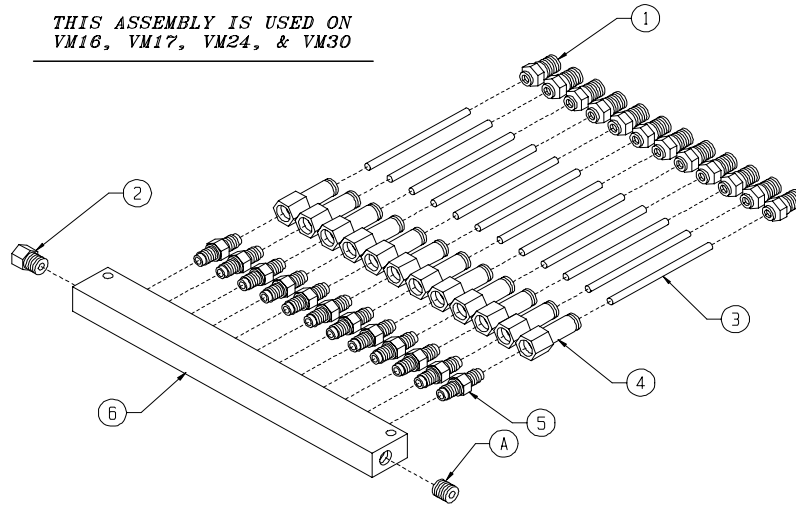
HARDWARE LIST

No.	QTY	DESCRIPTION
A	4	1/4-20 x 5/8 BHCS
B	2	1/2 NPT SHPP
C	2	7/8 FLAT WASHER 3/8 THICK
D	20	1/4-20 x 3/8 BHCS
E	4	1/4 FLAT WASHER
F	4	1/4-20 NYLOCK HEX NUT

REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
MATERIAL/FINISH		TITLE WASHDOWN TROUGH ASSEMBLY		
STOCK/ASSY No.		APPLICATION PARTNER I		
TOLERANCE UNLESS SPECIFIED X.XXX +/- .005 X.XX +/- .010 X.X +/- .030 ANGLE +/- 1.0°		SCALE 15:1	DATE 25 JUL 00	DWG No. 6-10-008-067 DRAWN BY DAHLKE SHEET No. 2 OF 2

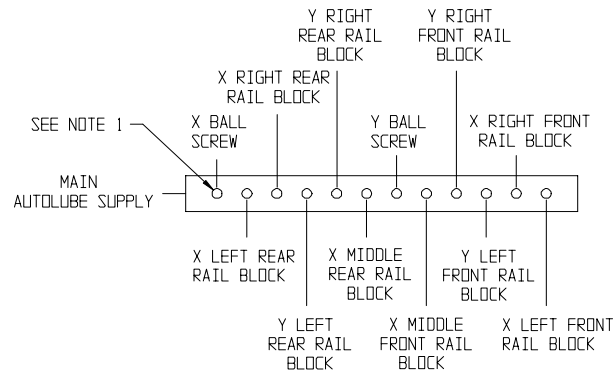
X & Y Axis Autolube Manifold Assembly

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



NOTES:

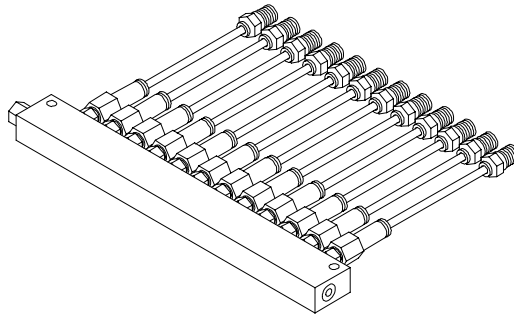
1. ON VM16 & VM17 MACHINES NU-154, NU-155, & NU-157 ARE REPLACED WITH NU-110 & NU-63 (#2 OIL METER).



AUTOLUBE LINE DESTINATIONS

REV.	DESCRIPTION	E.C.O. 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		

*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

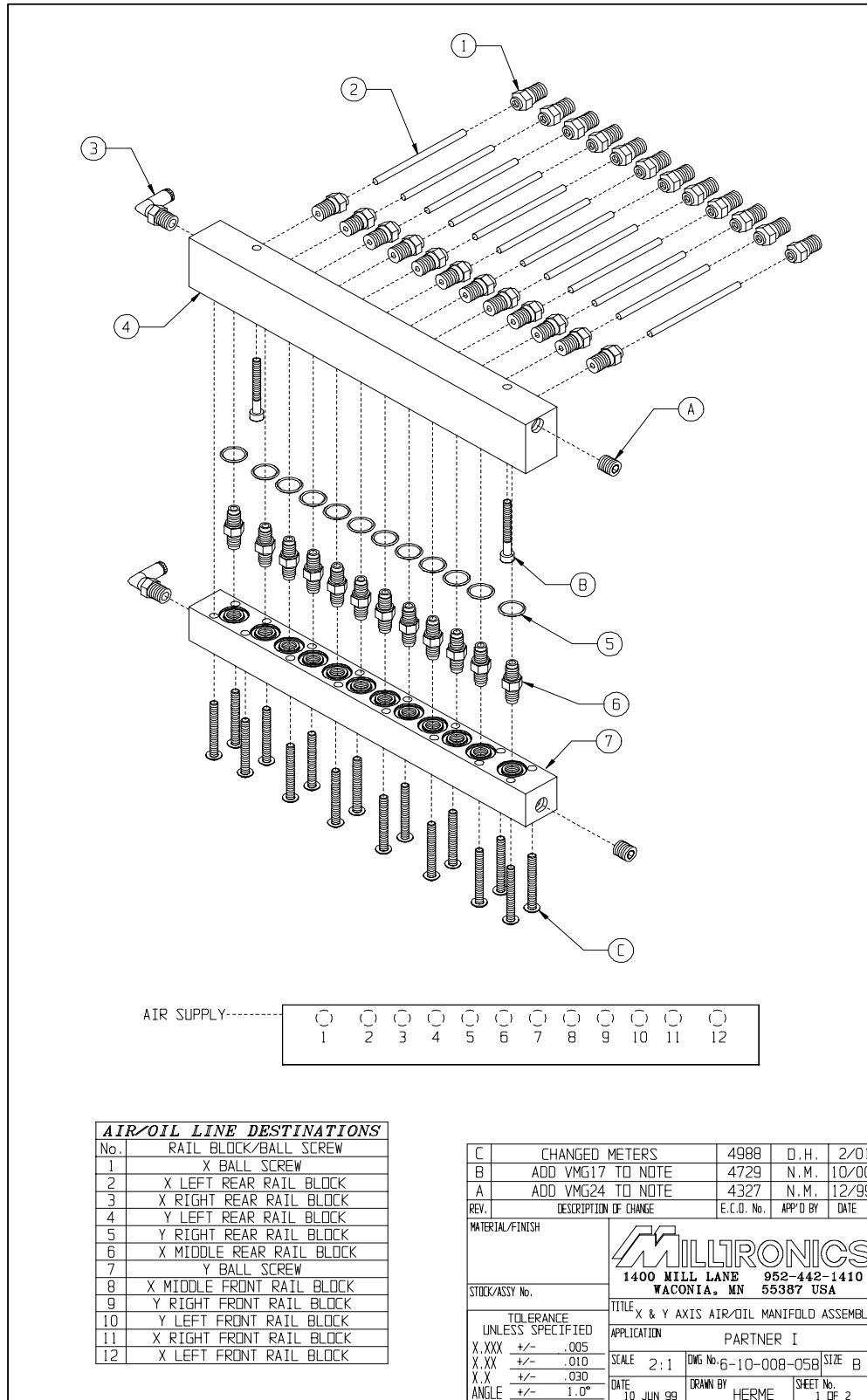
ALL MEASUREMENTS ARE IN INCHES

HARDWARE LIST

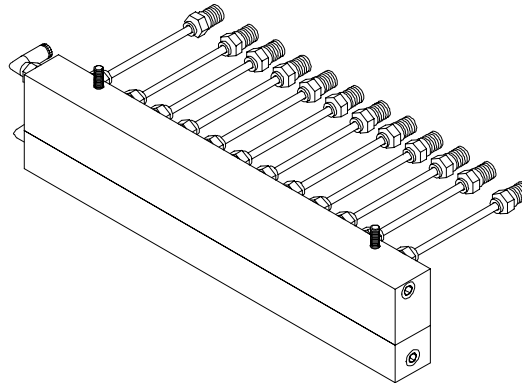
No.	QTY	DESCRIPTION
A	1	1/8-27 NPT SHPP

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLIRONICS 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		
APPLICATION		AUTOLUBE MANIFOLD ASSEMBLY		
SCALE		2:1		
DATE		25 JUL 97		
DRAWN BY		THOMPSON		
SHEET NO.		2 OF 2		

X & Y Axis Air/Oil Manifold Assembly



THIS ASSEMBLY IS USED ON VMG17, VMG24.



PARTS LIST

No.	QUANTITY VMG17/VMG24	STOCK No.	DESCRIPTION
1	20 24	NU-154	5/32 TUBE 1/8 NPT M/S
2	SEE TABLE	NU-117	5/32 NYLON TUBING
3	2 2	NU-161	ELBOW - SWIVEL 5/32 TUBE 1/8 NPT
4	1 1	MP6-183	X & Y AIR/OIL MANIFOLD - AIR
5	10 12	WX-248	O-RING BUNA 1/2 ID x 5/8 OD
6	- -	SEE TABLE	OIL METER
7	1 1	MP-661	12 PORT 1/8 NPT MANIFOLD - OIL

NU-117 TUBING LENGTH

CONNECTION	VMG17	VMG24	OIL METER
X BALL SCREW	40	60	#2 (NU-155)
X LEFT REAR RAIL BLOCK	20	24	#3 (NU-156)
X RIGHT REAR RAIL BLOCK	27	44	#3 (NU-156)
Y LEFT REAR RAIL BLOCK	13	24	#3 (NU-156)
Y RIGHT REAR RAIL BLOCK	33	44	#3 (NU-156)
X MIDDLE REAR RAIL BLOCK	SEE NOTE 1	38	#3 (NU-156)
Y BALL SCREW	26	39	#2 (NU-155)
X MIDDLE FRONT RAIL BLOCK	SEE NOTE 1	38	#3 (NU-156)
Y RIGHT FRONT RAIL BLOCK	30	44	#3 (NU-156)
Y LEFT FRONT RAIL BLOCK	12	24	#3 (NU-156)
X RIGHT FRONT RAIL BLOCK	27	44	#3 (NU-156)
X LEFT FRONT RAIL BLOCK	20	24	#3 (NU-156)

ALL MEASUREMENTS ARE IN INCHES

NOTES:

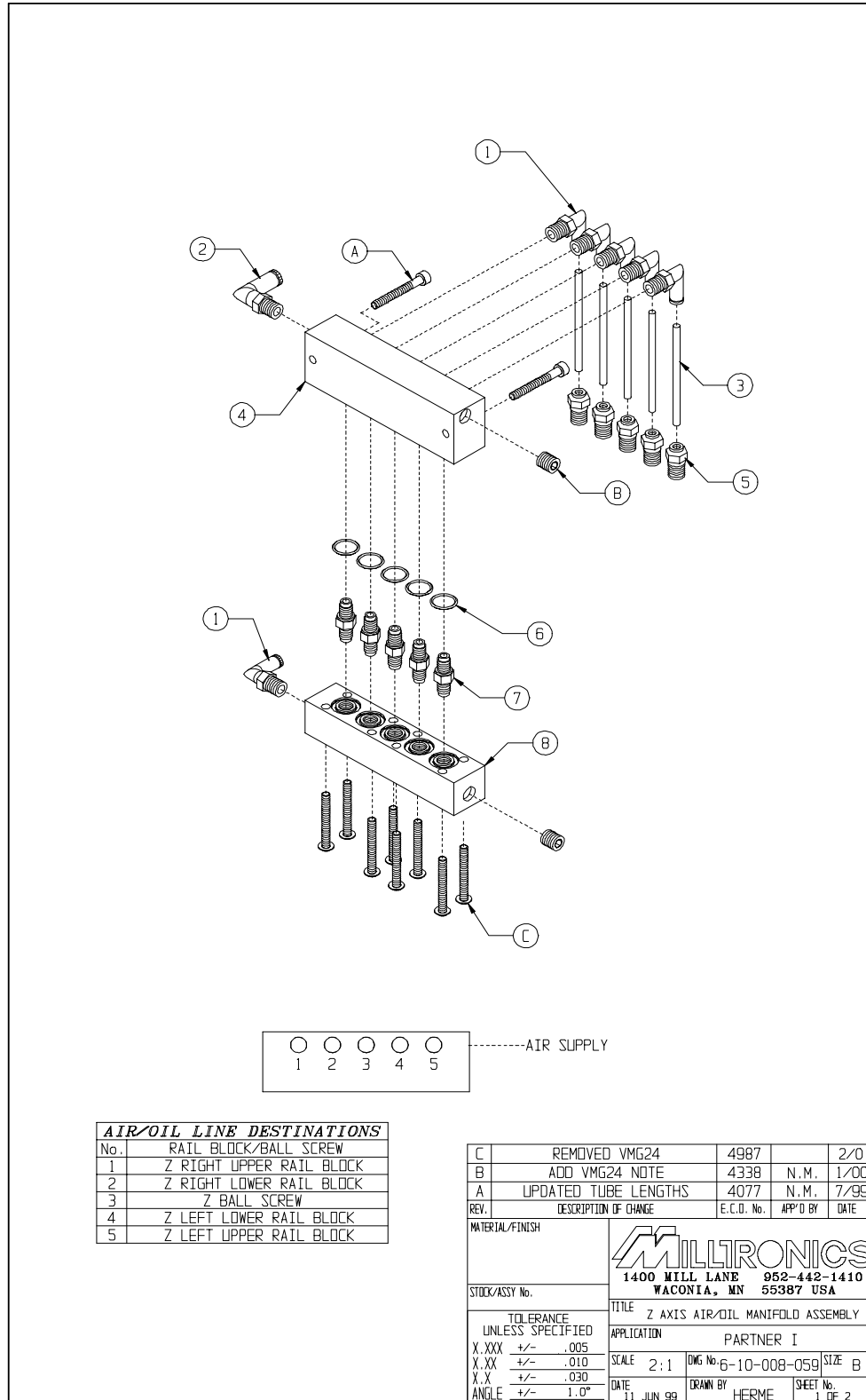
1. PLUG AIR/OIL LINE HOLE AND OIL METER HOLE
IN MANIFOLD WITH 1/8 NPT PLUG.

HARDWARE LIST

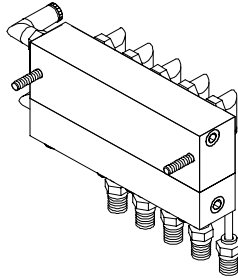
No.	QTY	DESCRIPTION
A	2	1/8-27 NPT SHPP
B	2	10-32 x 1 1/2 SHCS
C	16	10-32 x 1 1/4 BHCS

C	CHANGED METERS	4988	D.H.	2/01
B	ADD VMG17 TO NOTE	4729	N.M.	10/00
A	ADD VMG24 TO NOTE	4327	N.M.	12/99
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE X & Y AXIS AIR/OIL MANIFOLD ASSEMBLY		
X.XXX +/- .005		APPLICATION PARTNER I		
X.XX +/- .010		SCALE 2:1 DWG No. 6-10-008-058 SIZE B		
X.X +/- .030		DATE 10 JUN 99 DRAWN BY HERME SHEET No. 2 OF 2		
ANGLE +/- 1.0°				

Z-Axis Air/Oil Manifold Assembly



THIS ASSEMBLY IS USED ON VM17



PARTS LIST

No.	QUANTITY	STOCK No.	DESCRIPTION
1	6	NU-161	ELBOW-SWIVEL 5/32 TUBE 1/8 NPT
2	1	NU-171	ELBOW - SWIVEL 1/4 TUBE 1/8 NPT
3	SEE TABLE	NU-117	5/32 NYLON TUBING
4	1	MP1-301	Z AIR/OIL MANIFOLD - AIR
5	5	NU-154	5/32 TUBE 1/8 NPT M/S
6	5	WX-248	O-RING Buna 1/2 ID x 5/8 OD
7	-	SEE TABLE	OIL METER
8	1	MP-660	Z AIR/OIL MANIFOLD - OIL

NU-117 TUBING LENGTH

CONNECTION	VM17	OIL METER
Z LEFT UPPER RAIL BLOCK	37	#3 (NU-156)
Z LEFT LOWER RAIL BLOCK	31	#3 (NU-156)
Z RIGHT UPPER RAIL BLOCK	29	#3 (NU-156)
Z RIGHT LOWER RAIL BLOCK	23	#3 (NU-156)
Z BALL SCREW	26	#2 (NU-155)

ALL MEASUREMENTS ARE IN INCHES

HARDWARE LIST

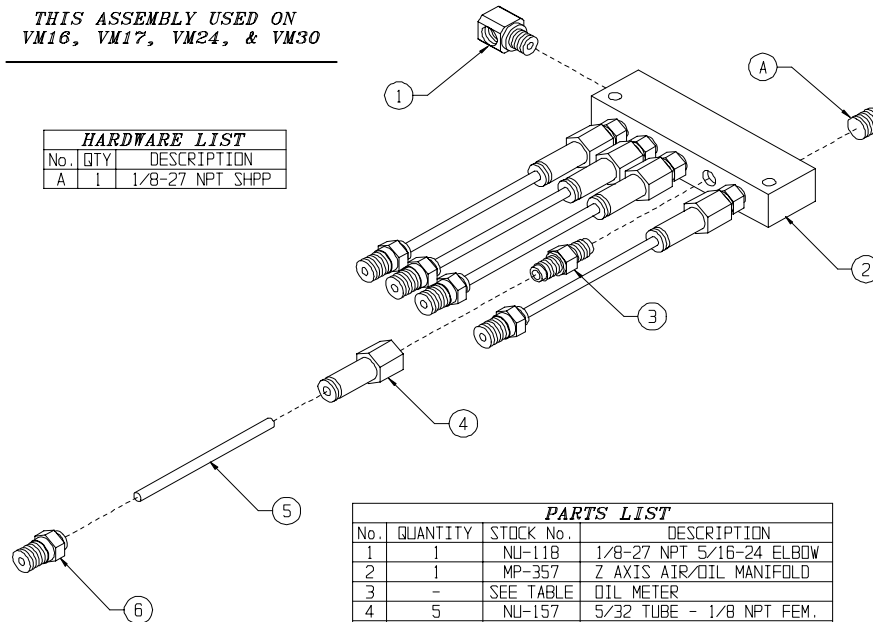
No.	QTY	DESCRIPTION
A	2	10-32 x 1 1/2 SHCS
B	2	1/8-27 NPT SHPP
C	8	10-32 x 1 1/2 BHCS

C	REMOVED VMG24	4987		2/01
B	ADD VMG24 NOTE	4338	N.M.	1/00
A	UPDATED TUBE LENGTHS	4077	N.M.	7/99
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE Z AXIS AIR/OIL MANIFOLD ASSEMBLY		
X.XXX	+/- .005	APPLICATION PARTNER I		
X.XX	+/- .010	SCALE 2:1		
X.X	+/- .030	DWG No. 6-10-008-059		
ANGLE	+/- 1.0°	SIZE B		
DATE 11 JUN 99		DRAWN BY HERME		SHEET No. 2 OF 2

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



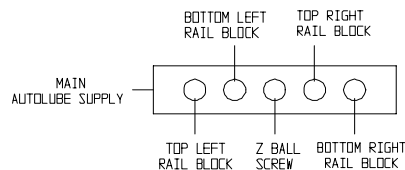
PARTS LIST				
No.	QUANTITY	STOCK No.	DESCRIPTION	
1	1	NU-118	1/8-27 NPT 5/16-24 ELBOW	
2	1	MP-357	Z AXIS AIR/OIL MANIFOLD	
3	-	SEE TABLE	OIL METER	
4	5	NU-157	5/32 TUBE - 1/8 NPT FEM.	
5	SEE TABLE	NU-117	5/32 NYLON TUBING	
6	5	NU-154	5/32 TUBE-1/8 NPT M/S	

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

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				

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

TITLE Z AXIS AUTOLUBE MANIFOLD ASSEMBLY

APPLICATION GENERAL PRODUCTS

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

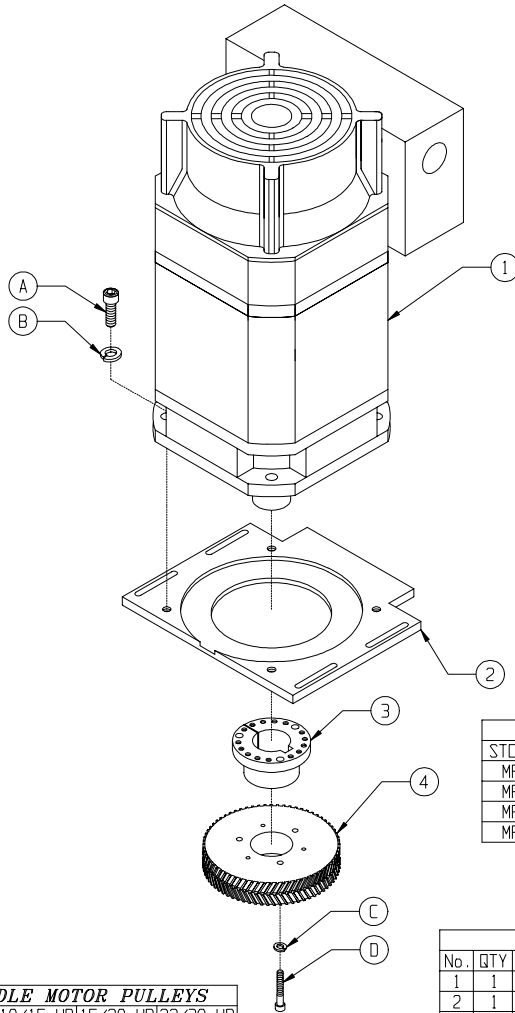
DATE 20 AUG 97

DRAWN BY THOMPSON

SHEET NO. 1 OF 1

Spindle Motor and Pulley Assembly

BT-70 Posa or
BT-62



SPINDLE MOTOR PULLEYS				
RPM	10/15 HP 1 SPEED	15/20 HP 2 SPEED	22/30 HP 2 SPEED	
6K/8K	PY-201	PY-192	PY-192	
12K/15K	PY-188	PY-188	PY-188	

MOTOR PLATES	
STOCK No.	DESCRIPTION
MP-548	15 H.P. & 22 H.P.
MP-587	10 H.P.
MPB-45	10 H.P. (BRIDGE MILL ONLY)
MPB-40	15 H.P. (BRIDGE MILL ONLY)

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	SEE TABLE	YASKAWA SPINDLE MOTORS
2	1	SEE TABLE	MOTOR PLATES
3	1	SEE TABLE	BUSHINGS
4	1	SEE TABLE	SPINDLE MOTOR PULLEYS

BUSHINGS	
STOCK No.	DESCRIPTION
PY-97	48mm ID SK BUSHING (USED WITH MD-131, MD-132 SPINDLE MOTOR)
PY-184	32mm ID SK BUSHING (USED WITH MD-114 SPINDLE MOTOR)

YASKAWA SPINDLE MOTORS	
STOCK No.	DESCRIPTION
MD-132	22 H.P. SPINDLE MOTOR - YASKAWA
MD-131	15 H.P. SPINDLE MOTOR - YASKAWA
MD-114	10 H.P. SPINDLE MOTOR - YASKAWA

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	4	1/2-13 x 1 1/4 SHCS
B	4	1/2 LOCK WASHER
C	3	5/16 LOCK WASHER
D	3	5/16-18 x 2 SHCS

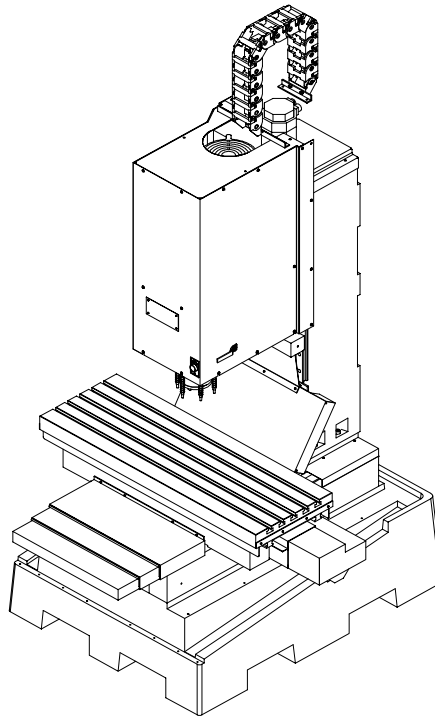
D	CHANGE 15 HP SPINDLE MOTOR	5257		02/02
C	CHANGE MOTOR/PULLEY CHARTS	5251	N.M.	02/02
B	CHANGE 6K & 8K MOTOR PULLEY	5197	N.M.	12/01
A	ADD MOTOR PLATE TO CHART	5058	N.M.	04/01
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE

MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE GOODYEAR MOTOR AND PULLEY ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION GENERAL PRODUCTS		
X.XXX	±	SCALE 5:1 DWG No. 6-10-018-089 SIZE B		
X.XX	±	DATE 04 AUG 00 DRAWN BY DAHLKE SHEET NO. 1 OF 1		
X.X	±			
ANGLE	±			

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 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.
4. MACHINES WITH 15,000 RPM AIR/OIL OPTION USE MOBIL OIL DTE 24, OR EQUIVALENT QUALITY SPINDLE OIL.



E	CHANGED HEAD COVERS	5021		3/01
D	ADD DTE 24 TABLE	4703	N.M.	10/00
C	REMOVE HEAT EXCHANGER	3909	N.M.	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 952-442-1410 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 02 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

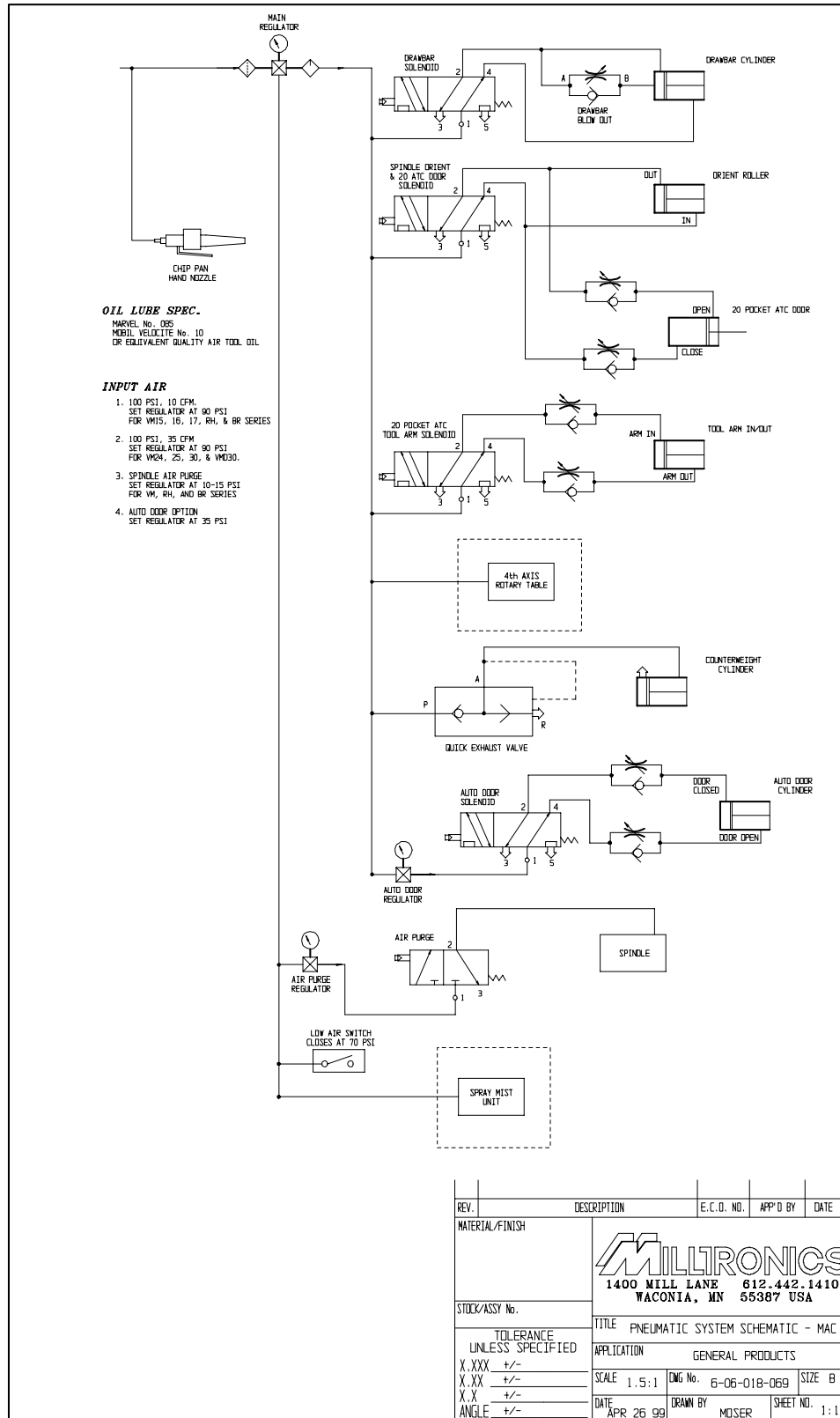
MOBIL VELOCITE OIL No. 10	
PRODUCT NUMBER	60068-4
GRAVITY, API	32.0
POUR, °C (°F), max.	-4 (25)
FLASH, °C (°F), min.	182 (360)
VISCOSITY	
cST AT 40° C	22.0
cST AT 100° C	4.0
SUS AT 100° F	115
SUS AT 210° F	40
ISO VG	22
VISCOSITY INDEX	95
COLOR, ASTM D 1500	2.0
RUST PROTECTION, ASTM D 665	PASS
CINCINNATI 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)	-
CMCQ, P-SPEC, APPROVAL	P-47
BIJUR PT 37-1 APPROVAL	PASS
OKUMA APPROVAL	PASS

MOBIL DTE 24	
PRODUCT NUMBER	60262-3
98 CMCS CODE (DRUM)	98020E
SPECIFIC GRAVITY	0.871
POUR POINT, °C (°F), max	-18 (0)
FLASH POINT, °C (°F), min	200 (392)
VISCOSITY	
cST AT 40°C	32
cST AT 100°C	5.3
SUS AT 100°F	165
SUS AT 210°F	44
ISO VISCOSITY GRADE	32
VISCOSITY INDEX	95
RUST PROTECTION,	PASS
ASTM D 665, A & B	
COLOR, ASTM D1500, max	3.5
FZG GEAR TEST STAGES	12
PASSED DIN 51534	

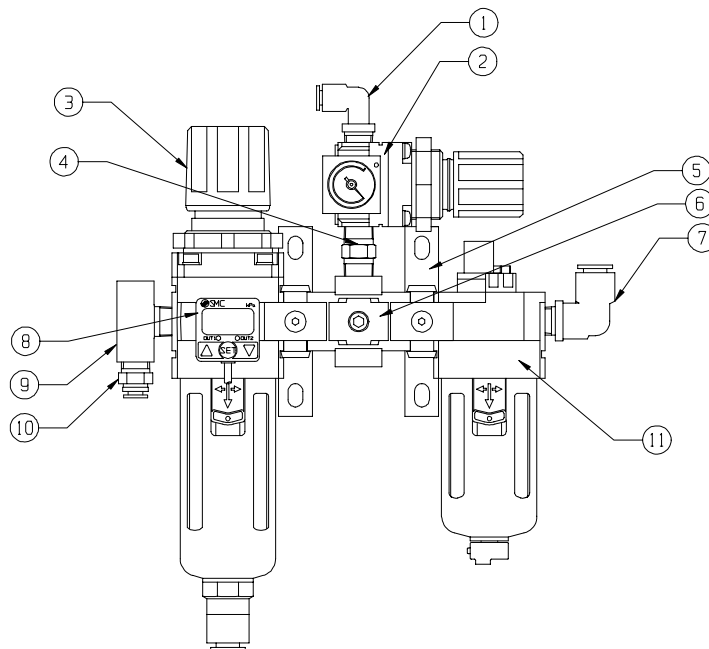
E	CHANGED HEAD COVERS	5021		3/01
D	ADD DTE 24 TABLE	4703	N.M.	10/00
C	REMOVE HEAT EXCHANGER	3909	N.M.	3/99
B	CHANGE GREASE SPECS.	3411	N.M.	2/98
A	ADD SPECIFICATIONS	3133	N.M.	6/97
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY 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 02 JUN 97		
X.X	±	DRAWN BY THOMPSON		
ANGLE	±	SHEET NO. 2 OF 2		

Pneumatic System Schematic



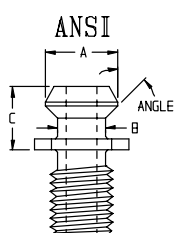
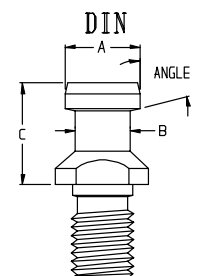
Air Regulator & Lubricator Assembly

PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-186	1/4 NPT 1/4 TUBE SWIVEL ELBOW
2	1	NU-262	LOW PRESSURE REGULATOR W/GAGE
3	1	NU-212	LARGE FILTER/HIGH PRESSURE REGULATOR
4	1	NU-30	1/4 NPT PIPE NIPPLE
5	2	NU-210	LARGE MOUNTING SPACER
6	1	NU-211	LARGE MANIFOLD SPACER
7	1	NU-199	1/4 NPT 3/8 TUBE SWIVEL ELBOW
8	1	NU-259	DIGITAL AIR GUAGE WITH PRESSURE SWITCH
9	1	NU-219	1/4 NPT BRANCH TEE
10	1	NU-32	1/4 NPT 1/4 TUBE MALE STRAIGHT
11	1	NU-209	LARGE LUBRICATOR



B	ADD DIGITAL GAGE	4860		12/00
A	CHANGE STOCK NUMBER	4813	N. M.	12/00
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 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
ANGLE +/-				

Retention Knob Chart

ANSI RETENTION KNOBS STYLE V-FLANGE 50 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
N/A	1.14	.83	1.00	45°	RW30B	RC6E-0001	DWG RK11144	N/A	C50-STD
ANSI RETENTION KNOBS STYLE BT-FLANGE 50 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
N/A	1.14	.83	1.00	45°	RW30B	RS6M-0105	DWG RK11144A	N/A	N/A
ANSI RETENTION KNOBS STYLE V-FLANGE 40 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4836	.74	.49	.64	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RC4E-0001	RK11122	PT-475C	C40-STD
ANSI RETENTION KNOBS STYLE BT-FLANGE 40 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4837	.74	.49	.75	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4M-0115	RK11126A	N/A	B40-FADAL
DIN 69872 RETENTION KNOBS STYLE V-FLANGE 40 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4838	.75	.55	1.02	75°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4E-0114-C	DWG RK71125	N/A	C40-1500
DIN 69872 RETENTION KNOBS STYLE DIN-FLANGE 40 TAPER									
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4839	.75	.55	1.02	75°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4M-0114-C	DWG RK71124	N/A	B40-1500
 									
ANSI					DIN				
ENGLISH THREADS FOR V-FLANGE METRIC THREADS FOR BT-FLANGE					ENGLISH THREADS FOR V-FLANGE METRIC THREADS FOR DIN-FLANGE				
D	ADD RH/RW12 & RH19						5146		09/01
C	ADD RETENTION KNOBS TO CHART						4859	N.M.	12/00
B	CHANGE 70mm BT-FLANGE CHART						473D	N.M.	10/00
A	ADD LYNDEX CORP. IN CHART						4351	N.M.	1/00
REV.	DESCRIPTION						E.C.O. NO.	APP'D BY	DATE
							SCALE 1:1	DWG No. 6-11-01B-054	SHEET B
	TITLE RETENTION KNOB CHART APPLICATION GENERAL PRODUCTS						DATE 30 APR 99	DRAWN BY DAHLKE	SHEET NO. 1 OF 2

ANSI RETENTION KNOBS STYLE V-FLANGE 50 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
N/A	1.14	.83	1.00	45°	RW30B	RC6E-0001	DWG RK11144	N/A	C50-STD

ANSI RETENTION KNOBS STYLE BT-FLANGE 50 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
N/A	1.14	.83	1.00	45°	RW30B	RS6M-0105	DWG RK11144A	N/A	N/A

ANSI RETENTION KNOBS STYLE V-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
4836	.74	.49	.64	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RC4E-0001	RK11122	PT-475C	C40-STD

ANSI RETENTION KNOBS STYLE BT-FLANGE 40 TAPER

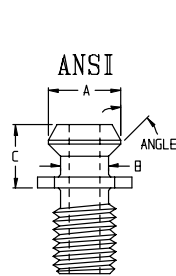
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
4837	.74	.49	.75	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4M-0115	RK11126A	N/A	B40-FADAL

DIN 69872 RETENTION KNOBS STYLE V-FLANGE 40 TAPER

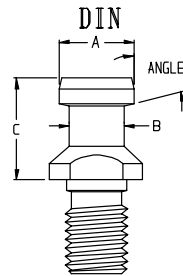
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
4838	.75	.55	1.02	75°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4E-0114-C	DWG RK71125	N/A	C40-1500

DIN 69872 RETENTION KNOBS STYLE DIN-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
	A	B	C	ANGLE					
4839	.75	.55	1.02	75°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RS4M-0114-C	DWG RK71124	N/A	B40-1500



↑
ENGLISH THREADS FOR V-FLANGE
METRIC THREADS FOR BT-FLANGE



↑
ENGLISH THREADS FOR V-FLANGE
METRIC THREADS FOR DIN-FLANGE

D	ADD RH/RW12 & RH19	5146		09/01
C	ADD RETENTION KNOBS TO CHART	4859	N.M.	12/00
B	CHANGE 70mm BT-FLANGE CHART	4730	N.M.	10/00
A	ADD LYNDEX CORP. IN CHART	4351	N.M.	1/00
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
	RETENTION KNOB CHART	SCALE 1:1	DWG No. 6-11-01B-054	SHEET B
	APPLICATION GENERAL PRODUCTS	DATE 30 APR 99	DRAWN BY DAHLKE	SHEET NO. 1 OF 2

