

VM15C Mechanical

11-11-2005
11-18-2010
Rev 5

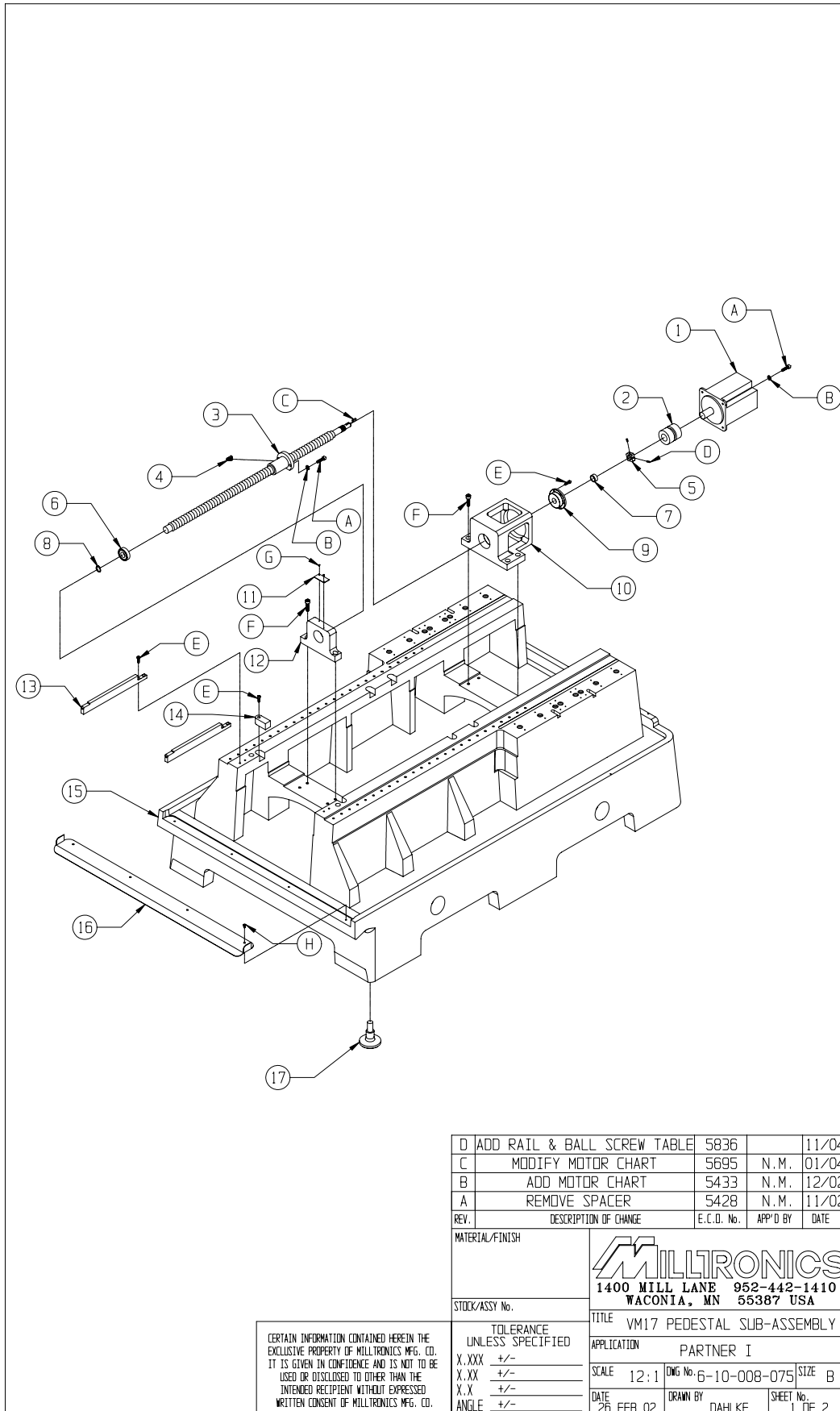
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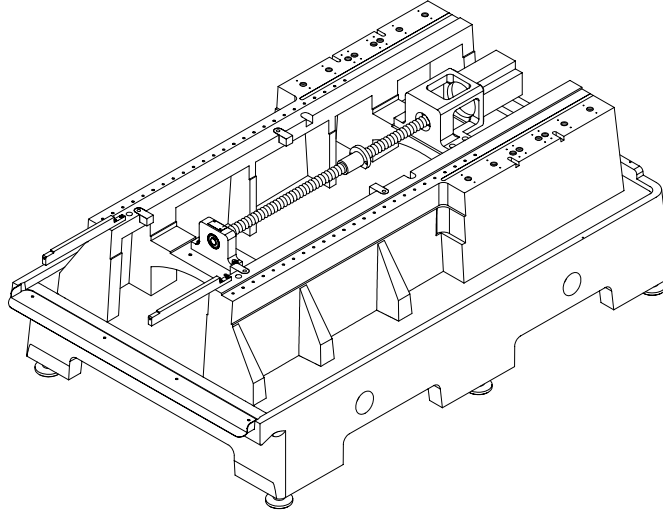
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Manual Discrepancy Sheet

1. 11-11-05 - Page 5 item 33 is MP1-500

Machine Base Assembly





BALL SCREWS		
3	STANDARD RAPIDS	MPB-02
	HIGH SPEED OPTION	MP-801

PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	SEE TABLE	AXIS MOTOR
2	1	SEE TABLE	MOTOR COUPLER
3	1	SEE TABLE	Y - AXIS BALL SCREW
4	1	NU-161	1/8 NPT 4mm SWIVEL ELBOW
5	1	MP1-94	BALL SCREW LOCK NUT
6	1	BG-02	BEARING 6204
7	1	MP1-107	BEARING LOCK NUT SPACER
8	1	MP1-108	BALL SCREW SNAP RING
9	1	BG-94	BALL SCREW SUPPORT BEARING
10	1	9800-91	Y - AXIS REAR MOTOR MOUNT
11	1	LB-27	PULLEY MOTOR WARNING LABEL
12	1	MP-680	FRONT BALL SCREW RADIAL MOUNT
13	2	SEE TABLE	Y - AXIS FRONT WAY COVER BRACKET
14	4	MP-707	HARD STOP BLOCK
15	1	MX1-61	VM17 PEDESTAL - MACHINED
16	1	MP1-473	PEDESTAL DRIP LIP
17	6	MP1-29	LEVELING PAD

FRONT WAY COVER BRACKET		
13	BALL RAIL STANDARD	MP1-391
	ROLLER RAIL OPTION	MP1-472

MOTOR & COUPLER LIST			
No.	YASKAWA	FANUC	SIEMENS
1	MD-123 (.5kw)	4Nn A06B-0223-B200	6Nn 1FK7060-5AF71-1EA0
	MD-125 (1.0kw)		
	MD-127 (1.5kw)	8Nn A06B-0227-B200	11Nn 1FK7063-5AF71-1EA0
2	MA-242 (.5kw/1.0kw)	MA-242	MA-260
	MA-241 (1.5kw)		

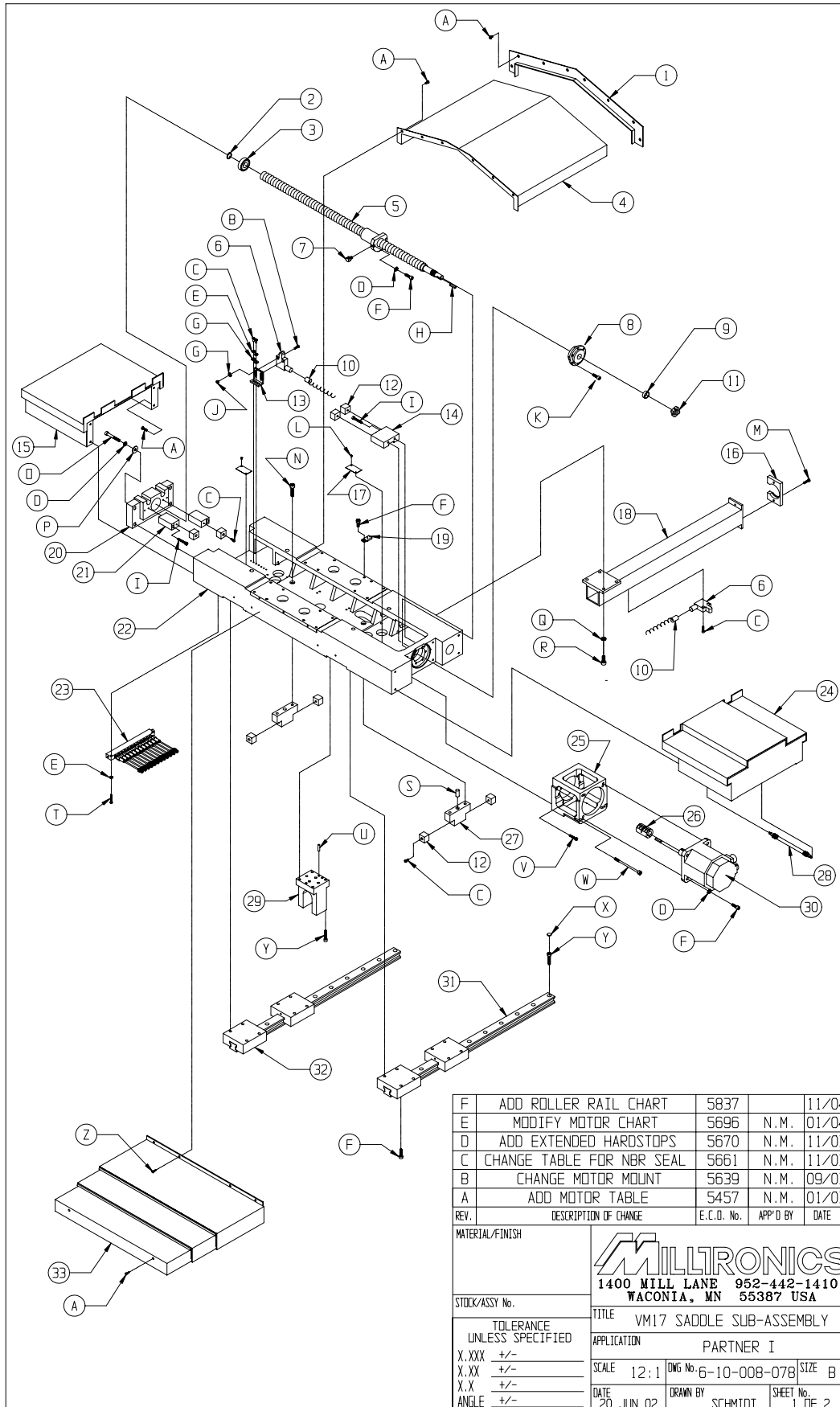
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	M8-1.25 x 30mm SHCS
B	6	M8 LOCK WASHER
C	1	3/16 x 3/16 x 1/2 KEY
D	2	10-32 x 3/16 BRASS TIPPED SHSS
E	14	M6-1 x 20mm SHCS
F	6	M10-1.5 x 30mm SHCS
G	2	1/4 DRIVE PIN
H	4	M6-1 x 10mm BHCS

D	ADD RAIL & BALL SCREW TABLE	5836		11/04
C	MODIFY MOTOR CHART	5695	N.M.	01/04
B	ADD MOTOR CHART	5433	N.M.	12/02
A	REMOVE SPACER	5428	N.M.	11/02
REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE

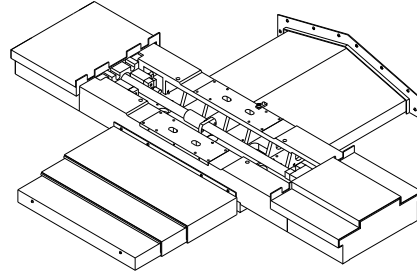
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA			
STOCK/ASSY No.		TITLE VM17 PEDESTAL SUB-ASSEMBLY			
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I			
X.XXX	+/-	SCALE 12:1		DWG No 6-10-008-075	SIZE B
X.XX	+/-	DATE 26 FEB 02		DRAWN BY DAHLKE	SHEET No 2 OF 2
X.X	+/-				
ANGLE	+/-				

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Machine Saddle Assembly



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-383	REAR WAYCOVER WIPER
2	1	MP1-108	SNAP RING
3	1	BG-02	6204 BEARING
4	1	SEE TABLE	REAR WAYCOVER
5	1	SEE TABLE	X AXIS BALL SCREW
6	2	SW-193	HOME SWITCH
7	1	NU-161	1/8 NPT SWIVEL ELBOW 4mm TUBE
8	1	BG-94	BALLSCREW SUPPORT BEARING
9	1	MP1-107	BEARING LOCKNUT SPACER
10	2	SW-191	X AXIS SWITCH CORD
11	1	MP1-94	BALL SCREW LOCKNUT
12	8	MP-718	PDM HARD STOP BUMPER
13	1	MP1-387	HOME SWITCH BRACKET
14	1	MP1-446	HARD STOP BLOCK RIGHT
15	1	SEE TABLE	X AXIS WAY COVER - LEFT
16	1	BR-111	VM17 CONDUIT BRACKET
17	2	LB-27	PULLEY MOTOR WARNING LABEL
18	1	MP1-388	VM17 Y AXIS CABLE BRACKET
19	1	MP1-418	OIL LINE BRACKET
20	1	MP1-389	X AXIS RADIAL SUPPORT BRACKET
21	2	MP1-447	HARD STOP BLOCK LEFT
22	1	SEE TABLE	VM17 SADDLE
23	1	SEE TABLE	VM17 X & Y AXIS MANIFOLD ASSEMBLY
24	1	SEE TABLE	X AXIS WAY COVER - RIGHT
25	1	9800-90	MOTOR MOUNT
26	1	SEE TABLE	MOTOR COUPLER
27	2	MP1-410	VM17 SADDLE HARD STOP BLOCK
28	4	SEE TABLE	X AXIS WAYCOVER SPRING
29	1	9800-21	Y/Z AXIS BALL SCREW CARRIER - MACHINED
30	1	SEE TABLE	AXIS MOTOR
31	2	SEE TABLE	35mm Y AXIS RAIL
32	4	SEE TABLE	35mm RAIL BLOCKS
33	1	MP1-384	FRONT WAYCOVER



MOTOR & COUPLER LIST			
No.	YASKAWA	FANUC	SIEMENS
26	MA-242 (.5/1.0kw)	MA-242	MA-260
	MA-241 (1.5kw)		
30	MD-123 (.5kw)	4Nn A06B-0223-B200	6Nn 1FK7060-5AF71-1EA0
	MD-125 (1.0kw)	8Nn A06B-0227-B200	11Nn 1FK7063-5AF71-1EA0
	MD-127 (1.5kw)		

MANIFOLD ASSEMBLY		
No.	DRAWING No.	DESCRIPTION
23	6-10-008-058	X & Y AIR/OIL MANIFOLD ASSEMBLY
	6-10-018-049	VM X & Y AXIS OIL MANIFOLD ASSEMBLY

* THESE PARTS REMOVED FOR 30" & 40" X - AXIS TRAVEL

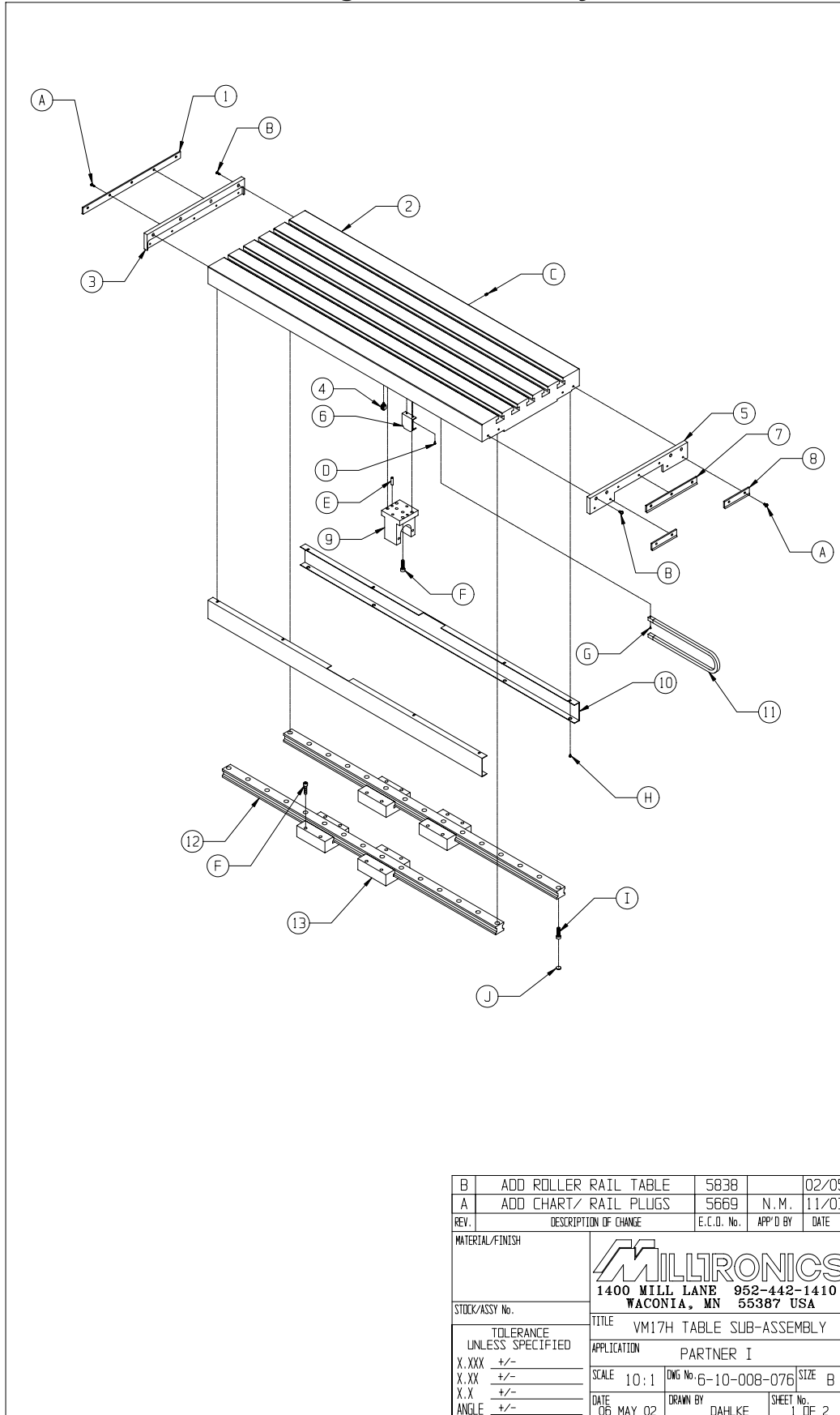
MACHINE VARIATION TABLE					
No.	DESCRIPTION	VM15/16/17 PART No.		VM20 PART No.	
		25" TRAVEL	30" TRAVEL	30" TRAVEL	40" TRAVEL
4	REAR WAYCOVER	MP1-382	MP1-382	MP1-462	MP1-462
5	X AXIS BALL SCREW STANDARD	MP-569	MP-569	MP-569	MP-570
	X AXIS BALL SCREW RAPID	-	MP-802	MP-802	MP-821
15	X AXIS WAY COVER - LEFT	MP1-385	MP1-385	MP1-385	MP1-455
22	VM17 SADDLE	MX1-55	MX1-55	MX1-55	MX1-63
24	X AXIS WAY COVER - RIGHT	MP1-442	MP1-442	MP1-442	MP1-454
28	X AXIS WAYCOVER SPRING	HD-62	HD-62	HD-62	HD-33
31	BALL RAIL	MP-640 (820)	MP-640 (820)	MPB-47 (1000)	MPB-47 (1000)
	ROLLER RAIL	-	MP-831 (844)	MP-811 (1024)	MP-811 (1024)
32	BALL RAIL BLOCK	MP-774	MP-774	MP-774	MP-774
	ROLLER RAIL BLOCK	-	MP-815	MP-815	MP-815

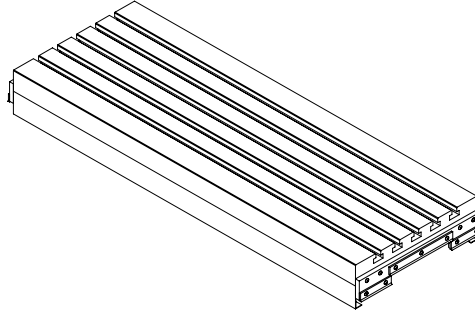
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	24	M6-1 x 12mm BHCS
B	2	M5-.8 x 20mm SHCS
C	12	M5-.8 x 16mm SHCS
D	10	M8 LOCK WASHER
E	4	M5 LOCK WASHER
F	23	M8-1.25 x 30mm SHCS
G	4	M5 FLAT WASHER
H	1	3/16 x 3/16 x 1/2 KEY
I	4	M6-1 x 40mm SHCS
J	2	M5-.8 HEX NUT
K	6	M6-1 x 20mm SHCS
L	4	1/4 DRIVE RIVIT
M	2	M6-1 x 25mm BHCS
N	4	M10-1.5 x 40mm SHCS
O	4	M8-1.25 x 45mm SHCS
P	4	M8 FLAT WASHER
Q	4	M10 LOCK WASHER
R	4	M10-1.5 x 30mm SHCS
S	2	12mm x 25mm DOWEL PIN
T	2	M5-.8 x 25mm SHCS
U	2	1/4 x 1 DOWEL PIN
V	4	M6-1 x 30mm SHCS
W	2	M6-1 x 130mm SHCS
X	28	RAIL PLUGS
Y	28	M8-1.25 x 40mm SHCS
Z	4	M5-.8 x 10mm BHCS

30" RAIL CORRECTIONS 11/10

F	ADD ROLLER RAIL CHART	5837		11/04
D	MODIFY MOTOR CHART	5696	N.M.	01/04
E	ADD EXTENDED HARDSTOPS	5670	N.M.	11/03
C	CHANGE TABLE FOR NBR SEAL	5661	N.M.	11/03
B	CHANGE MOTOR MOUNT	5639	N.M.	09/03
A	ADD MOTOR TABLE	5457	N.M.	01/03
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.		TITLE VM17 SADDLE SUB-ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
X.XXX	+/-	SCALE 15:1	DWG No. 6-10-008-078	SIZE B
X.XX	+/-	DATE 20 JUN 02	DRAWN BY SCHMIDT	SHEET No. 2 OF 2
X.X	+/-			
ANGLE	+/-			

Milling Table Assembly





PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	9800-79	VM17 WIPER - LEFT
2	1	SEE TABLE	TABLE - MACHINED
3	1	MP1-419	X-AXIS WIPER PLATE - LEFT
4	2	NU-161	SWIVEL ELBOW 1/8NPT - 4mm TUBE
5	1	MP1-420	X-AXIS WIPER PLATE - RIGHT
6	1	MP6-45	EXTENDED TRAVEL X-AXIS DOG
7	1	9800-78	VM17 WIPER - UPPER
8	2	9800-77	VM17 WIPER - LOWER
9	1	9800-28	X-AXIS BALL SCREW CARRIER
10	2	SEE TABLE	TABLE PLATE
11	1	MA-245	X-AXIS CABLE TRACK
12	2	SEE TABLE	35mm RAILS
13	4	SEE TABLE	35mm RAIL BLOCK

HARDWARE LIST

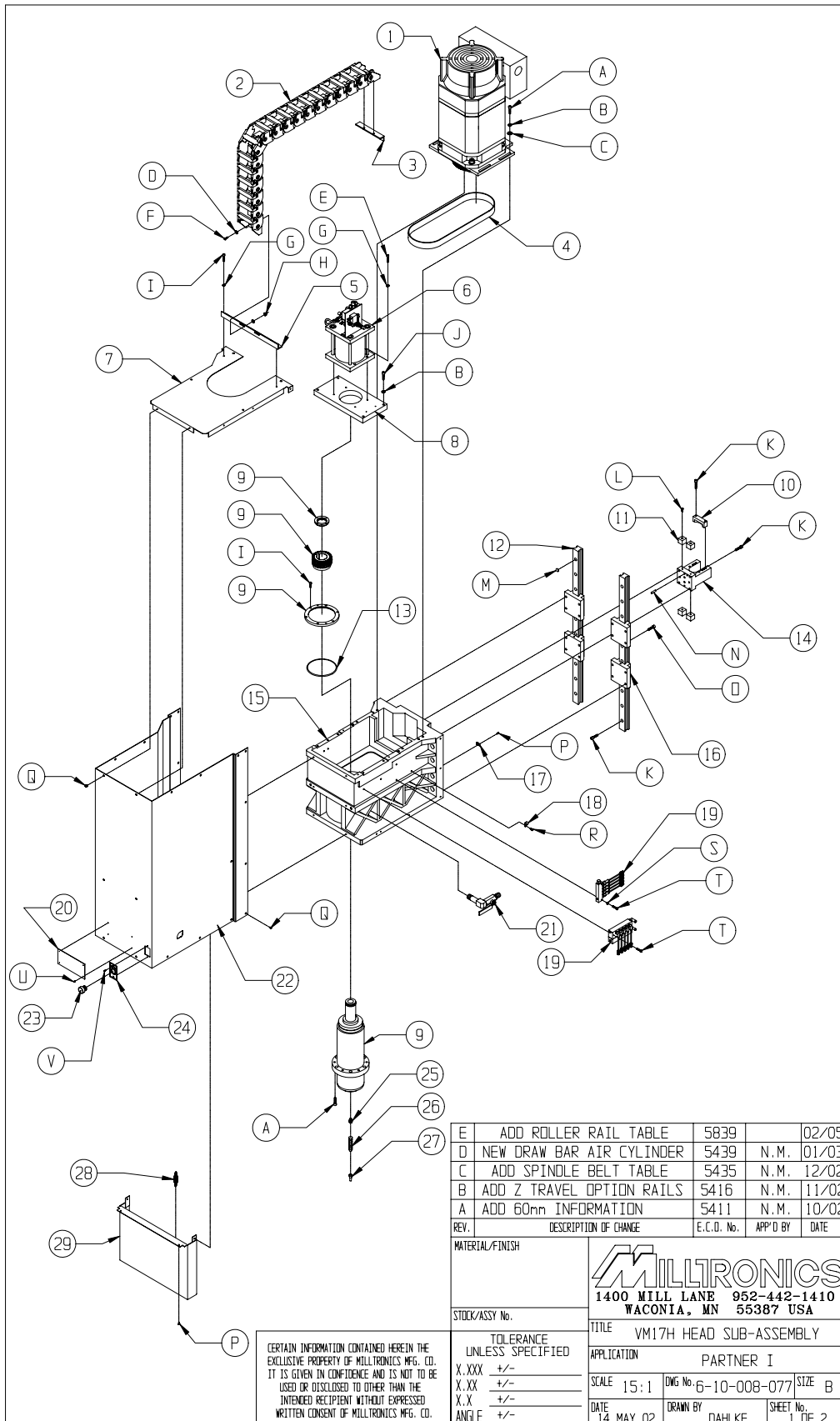
No.	QTY	DESCRIPTION
A	12	M6-1 x 12mm BHCS
B	8	M6-1 x 25mm BHCS
C	1	1/8-27 NPT SHPP
D	2	M3-.5 x 6mm BHCS
E	2	1/4 x 1 DOWEL PIN
F	22	M8-1.25 x 30mm SHCS
G	4	M3-.5 x 20mm BHCS
H	8	M4-.7 6mm BHCS
I	30	M8-1.25 x 40mm SHCS
J	30	RAIL PLUGS

TABLE TRAVEL

No.	DESCRIPTION	25" TRAVEL	30" TRAVEL
2	TABLE - MACHINED	MX1-60	MX1-56
10	TABLE PLATE	MP1-448	MP1-392
12	BALL RAIL	MPB-47	MP-732
	ROLLER RAIL	-	MP-812
13	BALL RAIL BLOCK	MP-641	MP-641
	ROLLER RAIL BLOCK	MP-815	MP-815

B	ADD ROLLER RAIL TABLE	5838		02/05
A	ADD CHART/ RAIL PLUGS	5669	N.M.	11/03
REV.	DESCRIPTION OF CHANGE	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 VM17H TABLE SUB-ASSEMBLY		
X .XXX +/-		APPLICATION GENERAL PRODUCTS		
X .XX +/-		SCALE 10:1		
X .X +/-		DWG No. 6-10-008-076		
ANGLE +/-		SIZE B		
DATE 06 MAY 02		DRAWN BY DAHLKE		SHEET No. 2 OF 2

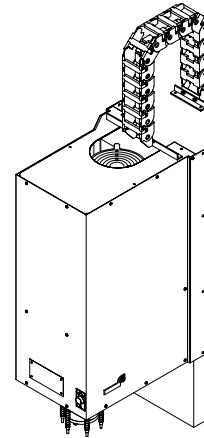
Machine Head Assembly



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	SEE TABLE	SPINDLE BELT
5	1	MP-664	VM SPINDLE CABLE SUPPORT BRACKET
6	1	6-10-018-100	NU-313 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	4	MP-718	PDM HARD STOP BUMPER
12	2	SEE TABLE	LINEAR RAILS
13	1	SEE TABLE	O' RING REAR SEAL
14	1	9800-21	Z-AXIS BALL SCREW CARRIER - MACH.
15	1	SEE TABLE	60mm OR 70mm HEAD - MACHINED
16	4	SEE TABLE	35mm RAIL BLOCK
17	5	NU-36	CLAMP 5/32 OILER
18	1	WX-82	WIRE TIE DOWN
19	1	SEE TABLE	Z-AXIS MANIFOLD ASSEMBLY
20	1	LB-01	SAFETY STICKER
21	1	6-10-008-039	VM 17 FLOOD HANDLE SUB-ASSEMBLY
22	1	MP-635	UNIVERSAL HEADCOVER
23	1	SW-67	TOOL OUT SWITCH
24	1	LB-181	BOLT ON TOOL OUT LABEL
25	6	NU-111	1/4 LOCKLINK 1/8 NPT
26	24	MA-22	LOCKLINK HOSE
27	6	MA-216	1/4 NOZZLE
* 28	2	HD-62	WAYCOVER SPRING
29	1	SEE TABLE	Z-AXIS WAYCOVER

* - THIS IS ONLY USED WITH THE MP1-425 2 BOX WAYCOVER



SPINDLE BELT

No.	STOCK No.	DESCRIPTION
4	BT-62	W-896 SPINDLE BELT
	BT-70	800-5GT-30 SPINDLE BELT

O-RING & HEAD TABLE

No.	DESCRIPTION	60mm	70mm
13	O-RING REAR SEAL	WX-182	WX-270
15	HEAD - MACHINED	MX-54	MX-43

SPINDLE ASSEMBLY SELECTION

HP	RPM	60mm SPINDLE				70mm SPINDLE			
		6000	8000	12000	15000	6000	8000	12000	15000
7.5kw	SINGL SPEED	9897	9897-1	9899-4	9899-5	9899	9899-1		
11kw	SINGL SPEED	9897	9897-1	9899-4	9899-5	9899	9899-1		
7.5kw	DUAL SPEED	9900	9900-1	9899-4	9899-5	9899	9899-1	9899-2	9899-3
11kw	DUAL SPEED	9900	9900-1	9899-4	9899-5	9899	9899-1		
18kw	DUAL SPEED	9900	9900-1	9899-4	9899-5	9899	9899-1		

Z-AXIS MANIFOLD ASSEMBLY

No.	DRAWING No.	DESCRIPTION
19	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	8	6mm FLAT WASHER
E	4	M6-1 x 30mm SHCS
F	4	M6-1 x 20mm BHCS
G	6	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	30	M8-1.25 x 40mm SHCS
L	4	M5-.8 x 16mm SHCS
M	22	RAIL PLUGS
N	2	1/4 x 1 DOWEL PIN
O	16	M8-1.25 x 30mm SHCS
P	7	M4-.7 x 10mm BHCS
Q	23	M6-1 x 10mm BHCS
R	1	M5-.8 x 12mm BHCS
S	2	5mm LOCK WASHER
T	2	M5-.8 x 40mm SHCS
U	4	M3-.5 x 6mm BHCS
V	2	M4-.7 x 8mm BHCS

LINEAR RAIL TABLE

No.	DESCRIPTION	20" TRAVEL	26" TRAVEL
12	BALL RAIL	MP-640	MPB-47
	ROLLER RAIL	MP-831	MP-811
16	BALL RAIL BLOCK	MP-641	MP-641
	ROLLER RAIL BLOCK	MP-815	MP-815
29	Z-AXIS WAYCOVER	MP1-424	MP1-425

E	ADD ROLLER RAIL TABLE	5839		02/05
D	NEW DRAW BAR AIR CYLINDER	5439	N.M.	01/03
C	ADD SPINDLE BELT TABLE	5435	N.M.	12/02
B	ADD Z TRAVEL OPTION RAILS	5416	N.M.	11/02
A	ADD 60mm INFORMATION	5411	N.M.	10/02
REV.	DESCRIPTION OF CHANGE	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 952-442-1410
WACONIA, MN 55387 USA

TITLE VM17H HEAD SUB-ASSEMBLY

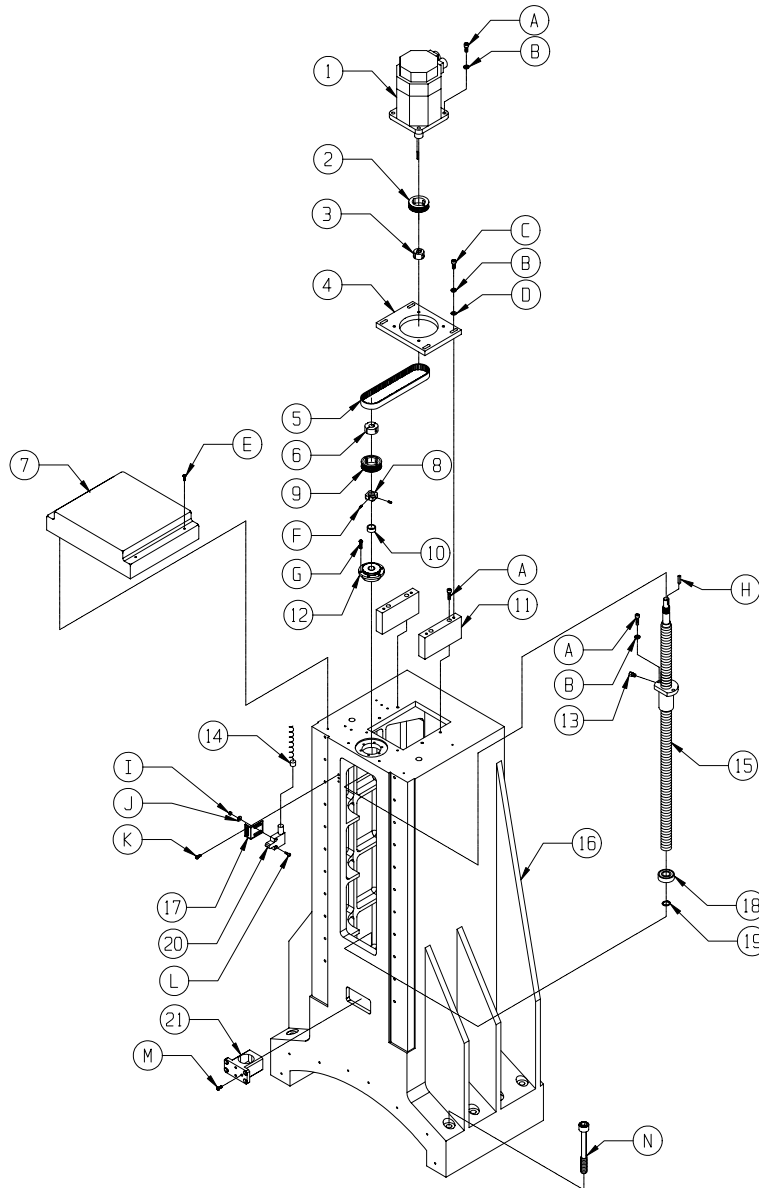
APPLICATION PARTNER I

SCALE 15:1 DWG No. 6-10-008-077 SIZE B

DATE 14 MAY 02 DRAWN BY DAHLKE SHEET No. 2 OF 2

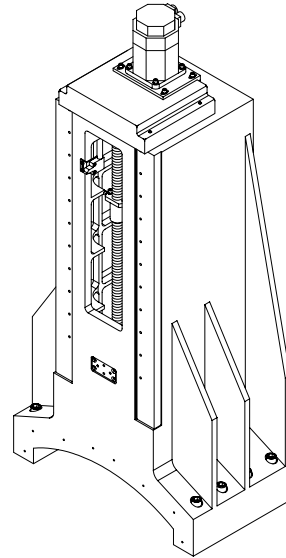
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Machine Column Assembly



C	EDIT TABLE	5841		02/05
B	ADD MOTOR TABLE	5707	N.M.	01/04
A	CHANGE COLUMNS	5434	N.M.	12/02
REV.	DESCRIPTION OF CHANGE	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 VM17H COLUMN SUB-ASSEMBLY		
X.XXX +/-		APPLICATION PARTNER I		
X.XX +/-		SCALE 12:1		
X.X +/-		DWG NO. 6-10-008-079		
ANGLE +/-		SIZE B		
		DATE 18 JUN 02		
		DRAWN BY SCHMIDT		
		SHEET No. 1 OF 2		

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HARDWARE LIST		
No.	QTY	DESCRIPTION
A	10	M8-1.25 x 30mm SHCS
B	10	M8 LOCK WASHER
C	4	M8-1.25 x 40mm SHCS
D	4	M8 FLAT WASHER
E	4	M5-.8 x 60mm BHCS
F	2	10/32 x 3/16 BRASS TIPPED SHSS
G	6	M6-1 x 20mm SHCS
H	1	3/16 x 3/16 x 1/2 BALL SCREW KEY
I	2	M5-.8 HEX NUT
J	2	M5 FLAT WASHER
K	2	M6-1 x 12mm BHCS
L	2	M5-.8 x 20mm SHCS
M	4	M6-1 x 15mm BHCS
N	8	3/4-10 x 7" SHCS

PARTS LIST		
No.	QTY	STOCK No. DESCRIPTION
1	1	SEE TABLE Z AXIS MOTOR W/BRAKE
2	1	PY-204 P24-8MGT-30 PULLEY
3	1	SEE TABLE MOTOR BUSHING
4	1	MP-631 YASKAWA Z AXIS MOTOR PLATE
5	1	BT-73 560-8MGT-30 TIMING BELT
6	1	PY-32 5/8 ID 1210 BUSHING
7	1	VM1-08 Z-AXIS MOTOR COVER
8	1	MP1-94 BALL SCREW LOCK NUT
9	1	PY-205 P32-8MGT-30 PULLEY
10	1	MP1-107 BEARING LOCK NUT SPACER
11	2	MP1-374 Z AXIS MOTOR SPACER
12	1	BG-94 BALLSCREW SUPPORT BEARING
13	1	NU-154 1/8 NPT MS 5/32 TUBE
14	1	SW-191 X AXIS SWITCH 24 PKT CORD
15	1	MPB-02 10mm Z AXIS BALL SCREW
16	1	SEE TABLE COLUMN - MACHINED
17	1	MP1-387 X & Y LIMIT SWITCH MTG BRACKET
18	1	BG-02 6204 BEARING
19	1	MP1-108 SNAP RING
20	1	SW-193 X AXIS SWITCH
21	1	9800-61 Y-Z RADIAL SUPPORT BRACKET

VM17 COLUMN	
STOCK No.	DESCRIPTION
MX1-57	50" x 16" RIBBED COLUMN - MACHINED
MX1-58	56" x 16" RIBBED COLUMN - MACHINED

MOTOR & BUSHING TABLE		
No.	YASKAWA	FANUC
1	MD-128 (1.5Kw)	8Nm A06B-0227-B200
3	PY-206	PY-212

C	EDIT TABLE	5841		02/05
B	ADD MOTOR TABLE	5707	N.M.	01/04
A	CHANGE COLUMNS	5434	N.M.	12/02
REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE VM17H COLUMN SUB-ASSEMBLY		
TOLERANCE UNLESS SPECIFIED X.XXX +/- X.XX +/- X.X +/- ANGLE +/-		APPLICATION PARTNER I		
		SCALE 12:1	DWG No. 6-10-008-079	SIZE B
		DATE 18 JUN 02	DRAWN BY SCHMIDT	SHEET No. 2 OF 2

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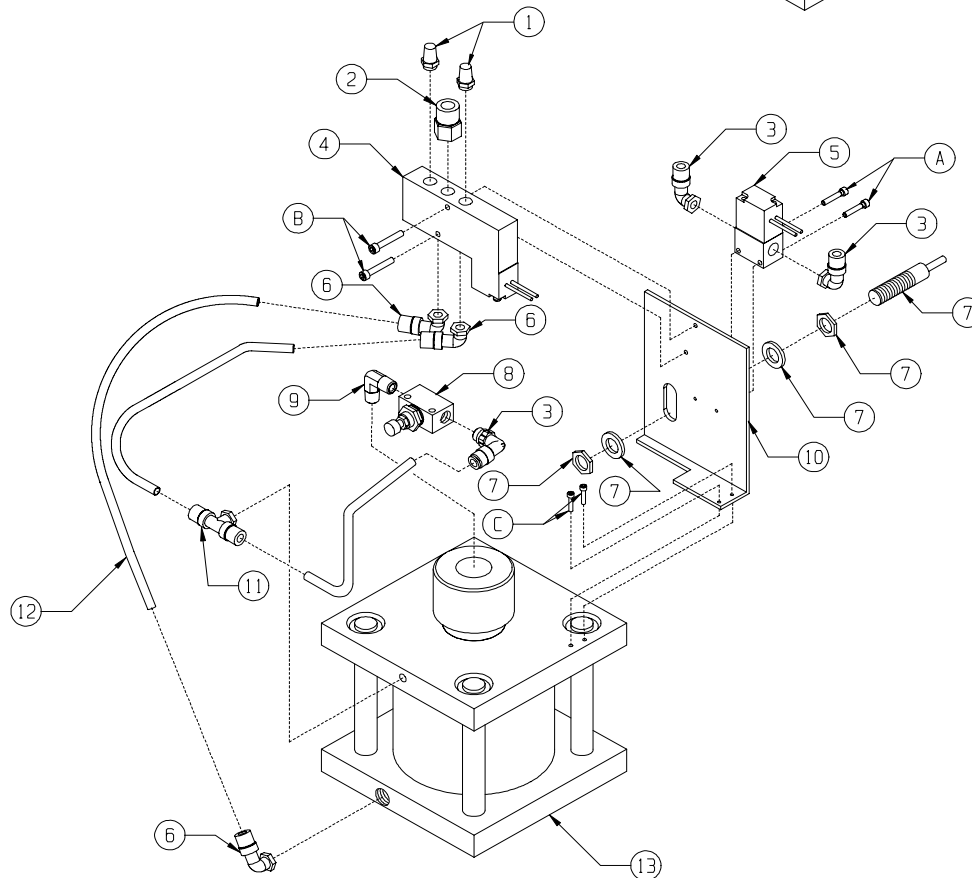
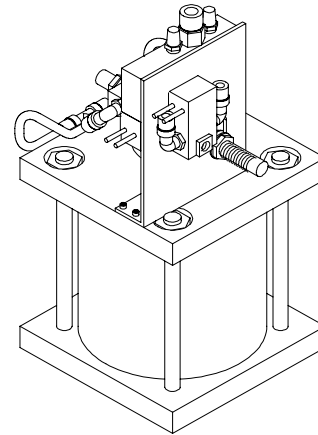
Power Drawbar Cylinder Assembly

PARTS LIST

ITEM	QTY	STOCK No.	DESCRIPTION
1	2	NU-177	1/8 NPT MUFFLER
2	1	NU-95	MALE STRAIGHT 1/4 NPT - 3/8 TUBE
3	3	NU-187	SWIVEL ELBOW 1/8 NPT - 1/4 TUBE
4	1	NU-179	DRAW BAR - AIR VALVE
5	1	NU-320	AIR PURGE - AIR VALVE
6	3	NU-186	SWIVEL ELBOW 1/4 NPT - 1/4 TUBE
7	1	PR-33	DRAWBAR PROX SWITCH
8	1	NU-190	FLOW CONTROL FOR BLOW OUT
9	1	NU-189	MALE ELBOW 1/8 NPT
10	1	BR-145	DRAWBAR PROX SWITCH BRACKET
11	1	NU-321	SWIVEL T CONNECTOR - 1/4 TUBE
12	26"	NU-25	1/4" TUBING
13	1	NU-319	TRIPLE STACK DRAW BAR AIR CYLINDER

HARDWARE LIST

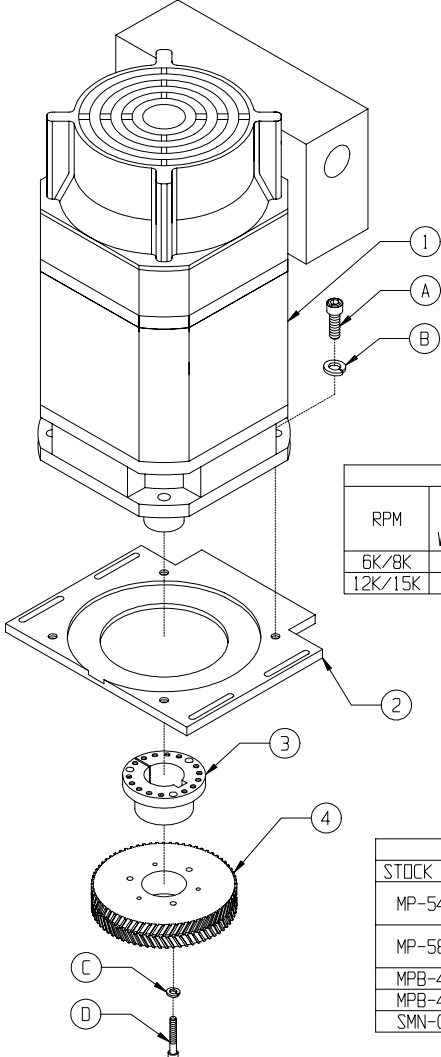
ITEM	QTY	DESCRIPTION
A	2	6-32 x 3/4 SHCS
B	2	8-32 x 1 SHCS
C	2	8-32 x 3/8 SHCS



REV.	DESCRIPTION OF CHANGE	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 NU-313 DRAW BAR ASSEMBLY		
X.XXX +/-		APPLICATION GENERAL PRODUCTS		
X.XX +/-		SCALE 3:1	DWG No. 6-10-018-100	SIZE B
X.X +/-		DATE 13 JAN 03	DRAWN BY DAHLKE	SHEET No. 1 OF 1
ANGLE +/-				

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Spindle Motor and Pulley Assembly



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

RPM	7.5kw SINGL WINDING	11kw SINGL WINDING	7.5kw DUAL WINDING	11kw DUAL WINDING	18kw DUAL WINDING	FANUC	SIEMENS
6K/8K	PY-201	PY-201	PY-192	PY-192	PY-192	PY-192	PY-192
12K/15K	PY-188	PY-188	PY-188	PY-188	PY-188	PY-188	PY-188

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

STOCK No.	DESCRIPTION
MP-548	7.5, 11, 18kw DUAL WINDING YASKAWA (11 & 30 H.P. DUAL WINDING - FANUC)
MP-587	7.5, 11kw SINGL WINDING YASKAWA (11 H.P. SINGL WINDING FANUC)(12 H.P. SIEMENS)
MPB-45	7.5, 11kw SINGL WINDING YASKAWA (BRIDGE MILL ONLY)
MPB-40	7.5, 11kw DUAL WINDING YASKAWA (BRIDGE MILL ONLY)
SMN-08	23.5 H.P. SIEMENS

STOCK No.	DESCRIPTION
PY-97	48mm ID SK BUSHING(USED WITH MD-121, MD-131, MD-132, MD-150 SPINDLE MOTOR X 11 H.P. SINGL FANUC)
PY-184	32mm ID SK BUSHING(USED WITH MD-114 YASKAWA SPINDLE MOTOR)
PY-215	55mm ID SK BUSHING(USED WITH 11, 30 H.P. DUAL WINDING SPINDLE MOTOR - FANUC)
PY-216	38mm ID SK BUSHING(USED WITH 12 H.P. SPINDLE MOTOR) - SIEMENS
PY-217	42mm ID SK BUSHING(USED WITH 23.5 H.P. SPINDLE MOTOR) - SIEMENS

STOCK No.	DESCRIPTION
MD-121	18kw SPINDLE MOTOR - YASKAWA DUAL WINDING
MD-132	11kw SPINDLE MOTOR - YASKAWA DUAL WINDING
MD-131	7.5kw SPINDLE MOTOR - YASKAWA DUAL WINDING
MD-114	7.5kw SPINDLE MOTOR - YASKAWA SINGL WINDING
MD-150	11kw SPINDLE MOTOR - YASKAWA SINGL WINDING
FANUC	11 H.P. SINGL WINDING - A06B-1407-B103
FANUC	11 H.P. DUAL WINDING - A06B-1456-B113
FANUC	30 H.P. DUAL WINDING - A06B-1451-B103
SIEMENS	12 H.P. 1PH7107-2NF02-0CA0
SIEMENS	23.5 H.P. 1PH7137-2ND02-0LDD

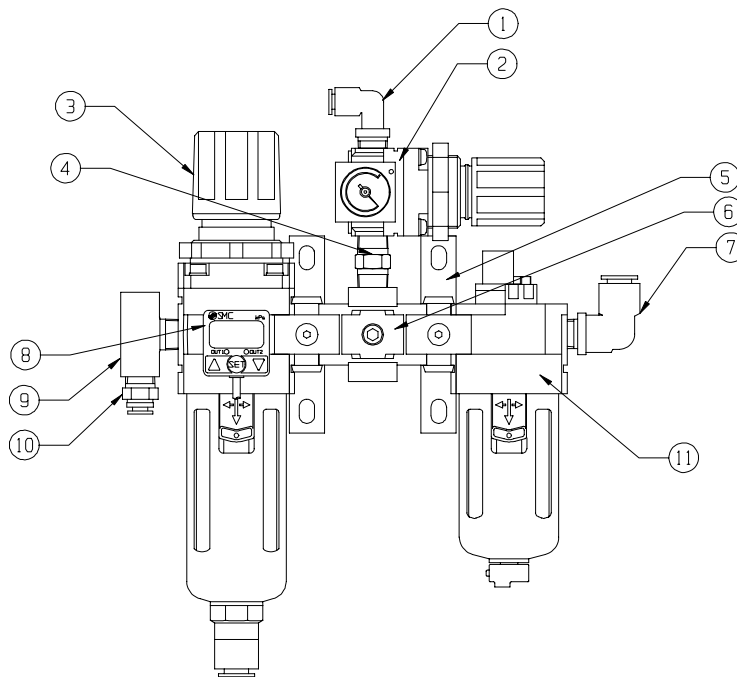
H	EDIT CHART	5953		05/05
G	ADD MD-150	5826	N.M.	11/04
F	MODIFY CHART	5697	N.M.	01/04
E	ADD MD-121 MOTOR	5509	N.M.	03/03
D	CHANGE 15 HP SPINDLE MOTOR	5257	N.M.	02/02
C	CHANGE MOTOR/PULLEY CHARTS	5251	N.M.	02/02
B	CHANGE 6K & 8K MOTOR PULLEY	5197	N.M.	12/01
A	ADD MOTOR PLATE TO CHART	5058	N.M.	04/01
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE

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

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Air Filter / Lubricator / Filter Assembly

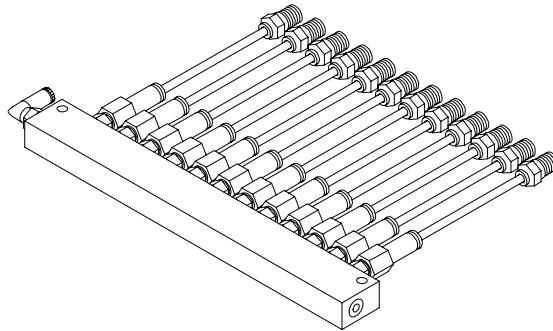
PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-186	1/4 NPT 1/4 TUBE SWIVEL ELBOW
2	1	NU-262	LOW PRESSURE REGULATOR W/GAGE
3	1	NU-212	LARGE FILTER/HIGH PRESSURE REGULATOR
4	1	NU-30	1/4 NPT PIPE NIPPLE
5	2	NU-210	LARGE MOUNTING SPACER
6	1	NU-211	LARGE MANIFOLD SPACER
7	1	NU-199	1/4 NPT 3/8 TUBE SWIVEL ELBOW
8	1	NU-259	DIGITAL AIR GAUGE 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. 1:1
ANGLE +/-				

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THIS ASSEMBLY IS USED ON
VM15, VM16, VM20, VM25 & VM30



PARTS LIST

No.	QUANTITY	STOCK No.	DESCRIPTION
1	12	NU-154	5/32 TUBE 1/8 NPT M/S
2	1	NU-161	1/8 NPT-.156 SWIVEL 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	VM15-16	VM20	VM22	VM25/30(50)	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	26	32	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	40	40	60	60	#2

Oil Meter Part Numbers.

#2 = NU-155

#3 = NU-156

ALL MEASUREMENTS ARE IN INCHES

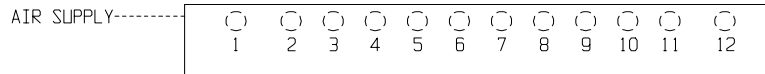
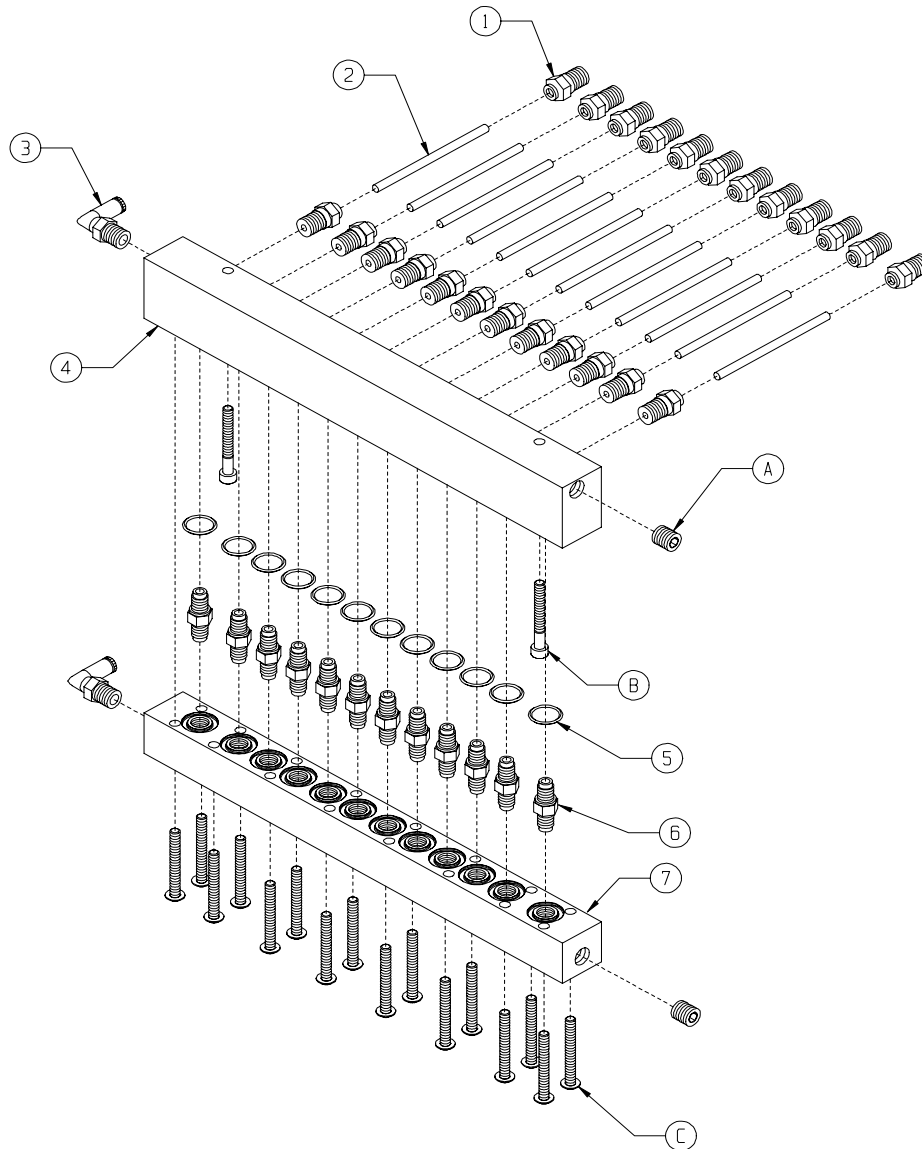
HARDWARE LIST

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

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A	ADD FRAMES TO CHART	5996		08/05
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 X & Y AXIS AUTOLUBE MANIFOLD ASSEMBLY		
X .XXX ±		APPLICATION GENERAL PRODUCTS		
X .XX ±		SCALE 2:1 DWG No 6-10-018-049 SIZE B		
X .X ±		DATE 25 JUL 97 DRAWN BY THOMPSON SHEET NO. 2 OF 2		
ANGLE ±				

X & Y Axis Air/Oil Manifold Assembly

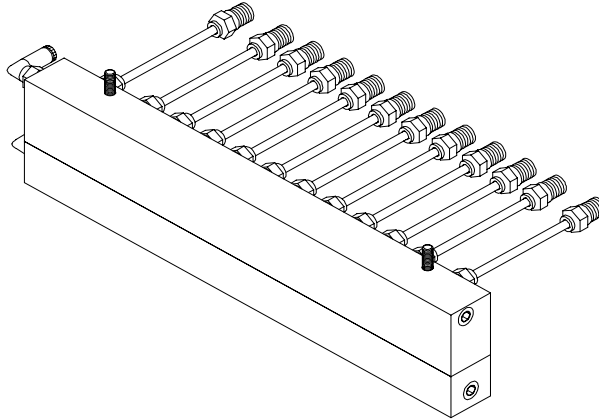


AIR/OIL LINE DESTINATIONS

No.	RAIL BLOCK/BALL SCREW
1	X BALL SCREW
2	X LEFT REAR RAIL BLOCK
3	X RIGHT REAR RAIL BLOCK
4	Y LEFT REAR RAIL BLOCK
5	Y RIGHT REAR RAIL BLOCK
6	X MIDDLE REAR RAIL BLOCK
7	Y BALL SCREW
8	X MIDDLE FRONT RAIL BLOCK
9	Y RIGHT FRONT RAIL BLOCK
10	X LEFT FRONT RAIL BLOCK
11	X RIGHT FRONT RAIL BLOCK
12	X LEFT FRONT RAIL BLOCK

D	ADD FRAMES	5995		08/05
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.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 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		
ANGLE +/- 1.0°		DRAWN BY HERME SHEET No. 1 OF 2		

THIS ASSEMBLY IS USED ON VM15, VM16, VM17, VM20, VM22, VM25/30(50)



PARTS LIST

No.	QUANTITY	STOCK No.	DESCRIPTION
1	32	NU-154	5/32 TUBE 1/8 NPT M/S
2	SEE TABLE	NU-117	5/32 NYLON TUBING
3	2	NU-161	ELBOW - SWIVEL 5/32 TUBE 1/8 NPT
4	1	MP6-183	X & Y AIR/OIL MANIFOLD - AIR
5	16	WX-248	O-RING Buna 1/2 ID x 5/8 OD
6	-	SEE TABLE	OIL METER
7	1	MP-661	16 PORT 1/8 NPT MANIFOLD - OIL

NU-117 TUBING LENGTH

	VM15/16	VM20	VM22	VM25/30(50)	VM25/30(60)	OIL METER
X LEFT REAR RAIL BLOCK	20	20	24	24	32	#3 (NU-156)
X RIGHT REAR RAIL BLOCK	27	27	44	44	60	#3 (NU-156)
Y LEFT REAR RAIL BLOCK	13	12	24	24	25	#3 (NU-156)
Y RIGHT REAR RAIL BLOCK	33	30	44	44	55	#3 (NU-156)
X MIDDLE REAR RAIL BLOCK	-	-	38	38	46	#3 (NU-156)
Y BALL SCREW	26	32	39	39	42	#2 (NU-155)
X MIDDLE FRONT RAIL BLOCK	-	-	38	38	46	#3 (NU-156)
Y RIGHT FRONT RAIL BLOCK	30	30	44	44	55	#3 (NU-156)
Y LEFT FRONT RAIL BLOCK	12	12	24	24	25	#3 (NU-156)
X RIGHT FRONT RAIL BLOCK	27	27	44	44	60	#3 (NU-156)
X LEFT FRONT RAIL BLOCK	20	20	24	24	32	#3 (NU-156)
X BALL SCREW	40	40	60	60	60	#2 (NU-155)

ALL MEASUREMENTS ARE IN INCHES

NOTES:

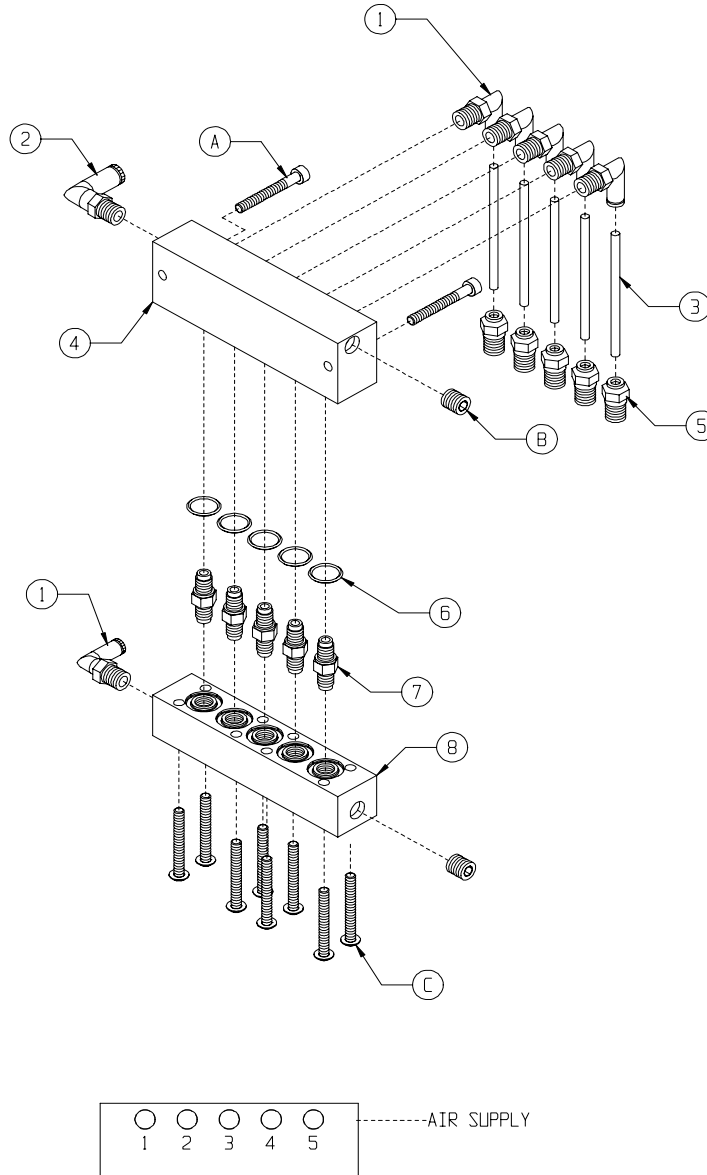
- IF REFERENCED WITH A (-) PLUG AIR/OIL LINE HOLE AND OIL METER HOLE IN MANIFOLD WITH 1/8 NPT PLUG.

HARDWARE LIST

No.	QTY	DESCRIPTION
A	2	1/8-27 NPT SHPP
B	2	10-32 x 1 1/2 SHCS
C	20	10-32 x 1 1/4 BHCS

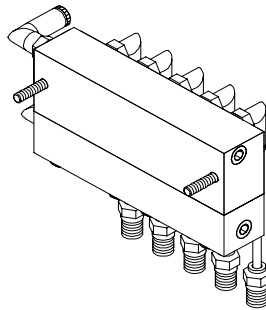
D	ADD FRAMES	5995		08/05
C	CHANGED METERS	4988	D.H.	02/01
B	ADD VMG17 TO NOTE	4729	N.M.	10/00
A	ADD VMG24 TO NOTE	4327	N.M.	12/99
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 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		
ANGLE +/- 1.0°		DRAWN BY HERME		
		SHEET No. 2 OF 2		

Z-Axis Air/Oil Manifold Assembly



AIR/OIL LINE DESTINATIONS	
No.	RAIL BLOCK/BALL SCREW
1	Z RIGHT UPPER RAIL BLOCK
2	Z RIGHT LOWER RAIL BLOCK
3	Z BALL SCREW
4	Z LEFT LOWER RAIL BLOCK
5	Z LEFT UPPER RAIL BLOCK

D	CHANGE TO ALL FRAMES	6002		11/05
C	REMOVED VMG24	4987	N.M.	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.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 Z AXIS AIR/OIL MANIFOLD ASSEMBLY		
X.XXX +/- .005		APPLICATION PARTNER I		
X.XX +/- .010		SCALE 2:1		
X.X +/- .030		DATE 11 JUN 99		
ANGLE +/- 1.0°		DRAWN BY HERME		
		SHEET No. 1 OF 2		



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	ALL FRAMES	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

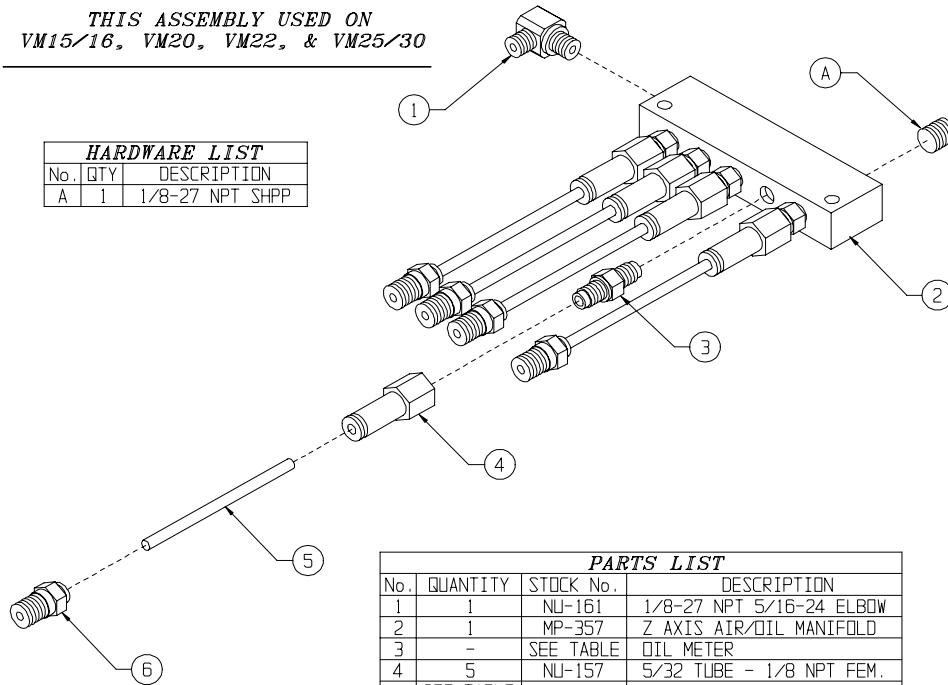
No.	QTY	DESCRIPTION
A	2	10-32 x 1 1/2 SHCS
B	2	1/8-27 NPT SHPP
C	8	10-32 x 1 1/2 BHCS

D	CHANGE TO ALL FRAMES	6002		11/05
C	REMOVED VMG24	4987	N.M.	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.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 Z AXIS AIR/OIL MANIFOLD ASSEMBLY		
X.XXX +/- .005		APPLICATION PARTNER I		
X.XX +/- .010		SCALE 2:1	DWG No 6-10-008-059	SIZE B
X.X +/- .030		DATE 11 JUN 99	DRAWN BY HERME	SHEET No. 2 OF 2
ANGLE +/- 1.0°				

Z-Axis Autolube Manifold Assembly

THIS ASSEMBLY USED ON
VM15/16, VM20, VM22, & VM25/30

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



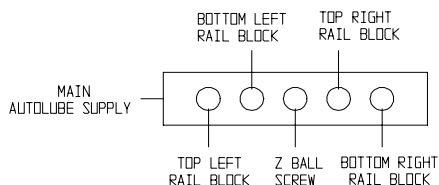
PARTS LIST					
No.	QUANTITY	STOCK No.	DESCRIPTION		
1	1	NU-161	1/8-27 NPT 5/16-24 ELBOW		
2	1	MP-357	Z AXIS AIR/OIL MANIFOLD		
3	-	SEE TABLE	OIL METER		
4	5	NU-157	5/32 TUBE - 1/8 NPT FEM.		
5	SEE TABLE	NU-117	5/32 NYLON TUBING		
6	5	NU-154	5/32 TUBE-1/8 NPT M/S		

NU-117 TUBING LENGTH					OIL METER	
CONNECTION	VM15/16	VM20	VM22	VM25/30	No.	
TOP LEFT RAIL BLOCK	18	20	30	30	No. 3	Oil Meter Part Numbers. #2 = NU-155 #3 = NU-156
BOTTOM LEFT RAIL BLOCK	35	14	42	42	No. 3	
Z BALL SCREW	24	15	30	30	No. 2	
BOTTOM RIGHT RAIL BLOCK	35	8	42	42	No. 3	
TOP RIGHT RAIL BLOCK	18	11	30	30	No. 3	

ALL MEASUREMENTS ARE IN INCHES

NOTES:

1. USED ON ASSEMBLY No.



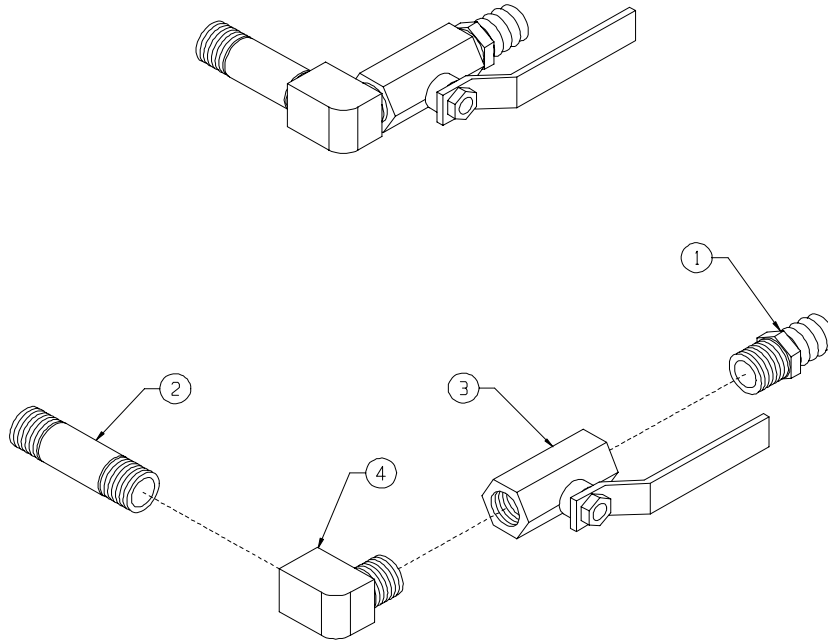
AUTOLUBE LINE DESTINATIONS

A	ADD FRAMES TO CHART	6001		08/05
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 Z AXIS AUTOLUBE MANIFOLD ASSEMBLY		
X .XXX ±		APPLICATION GENERAL PRODUCTS		
X .XX ±		SCALE 1.5:1 DWG No. 6-10-018-050 SIZE B		
X .X ±		DATE 20 AUG 97 DRAWN BY THOMPSON SHEET NO. 1 OF 1		
ANGLE ±				

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Flood Coolant Valve Handle Assembly

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



PARTS LIST

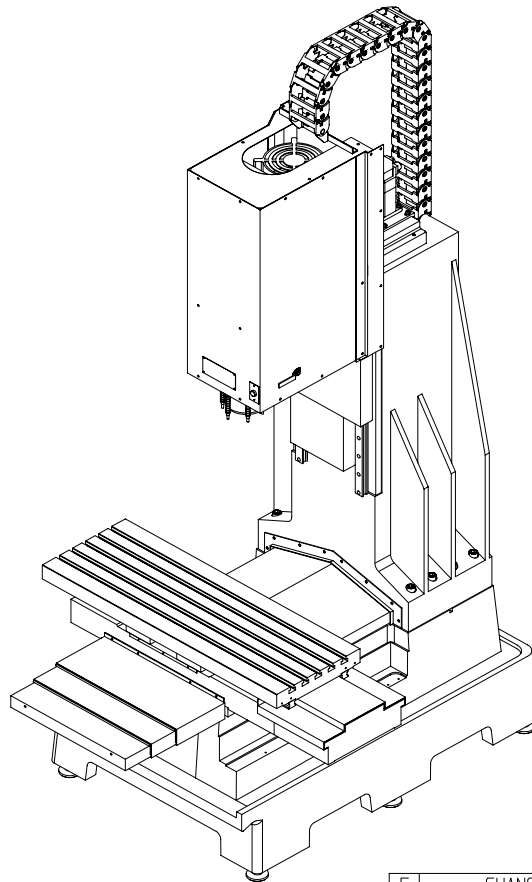
No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-66	3/4" BARB FITTING
2	1	NU-257	3 IN. PIPE NIPPLE
3	1	NU-64	1/2" BRASS BALL VALVE
4	1	NU-125	STREET ELBOW

B	CHANGE PIPE NIPPLE	4778		11/00
A	CHANGE PIPE NIPPLE	3851	N.M.	2/99
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		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 ±				

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.



F	CHANGE FRAME	5671		12/03	
E	CHANGED HEAD COVERS	5021	N.M.	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 X.XXX ± X.XX ± X.X ± ANGLE ±		TITLE VM17 LUBRICATION DRAWING			
		APPLICATION PARTNER VM17			
		SCALE 15:1	DWG No 6-10-008-044	SIZE B	
		DATE 02 JUN 97	DRAWN BY THOMPSON	SHEET NO. 1 OF 2	

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

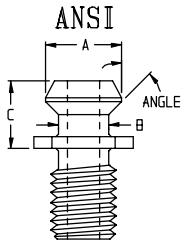
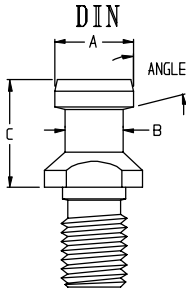
MOBIL VELOCITE OIL No. 10	
PRODUCT NUMBER	60068-4
GRAVITY, API	32.0
POUR, °C (°F), max.	-4 (25)
FLASH, °C (°F), min.	182 (360)
VISCOSITY	
cST AT 40° C	22.0
cST AT 100° C	4.0
SUS AT 100° F	115
SUS AT 210° F	40
ISO VG	22
VISCOSITY INDEX	95
COLOR, ASTM D 1500	2.0
RUST PROTECTION, ASTM D 665	PASS
CINCINNATI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

F	CHANGE FRAME	5671		12/03
E	CHANGED HEAD COVERS	5021	N.M.	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				
STOCK/ASSY No.		1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
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		
ANGLE	±	DRAWN BY THOMPSON SHEET NO. 2 OF 2		

Retention Knob Chart

<i>ANSI RETENTION KNOBS STYLE V-FLANGE 50 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.
N/A	1.14	.83	1.00	45°	RW30B	RC6E-0001	DWG RK11144	N/A
								C50-STD
<i>ANSI RETENTION KNOBS STYLE BT-FLANGE 50 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE PART No.
N/A	1.14	.83	1.00	45°	RW30B	RS6M-0105	DWG RK11144A	N/A
								N/A
<i>ANSI RETENTION KNOBS STYLE V-FLANGE 40 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE 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
<i>ANSI RETENTION KNOBS STYLE BT-FLANGE 40 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE 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
<i>DIN 69872 RETENTION KNOBS STYLE V-FLANGE 40 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE 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
<i>DIN 69872 RETENTION KNOBS STYLE DIN-FLANGE 40 TAPER</i>								
RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENNAMETAL PART No.	VALENITE 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.
B	CHANGE 70mm BT-FLANGE CHART						4730	N.M.
A	ADD LYNDEN CORP. IN CHART						4351	N.M.
REV.	DESCRIPTION						E.C.O. NO.	DATE
	RETENTION KNOB CHART						SCALE 1:1	DWG No. 6-11-01B-054
	GENERAL PRODUCTS						DATE 30 APR 99	DRAWN BY DAHLKE
								SHEET NO. 1 OF 2

MAS RETENTION KNOBS STYLE V-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4831	.59	.39	1.27	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C, RW20A* VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RB4E-0001	RK31114	PT-532-45	C40-4500

MAS RETENTION KNOBS STYLE BT-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4832	.59	.39	1.38	45°	RH20F, RH25D, RH30D, BR50C, BR60C, BR80C, RW20A* VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RB4M-0001	RK31113	PT-444-45	B40-4500

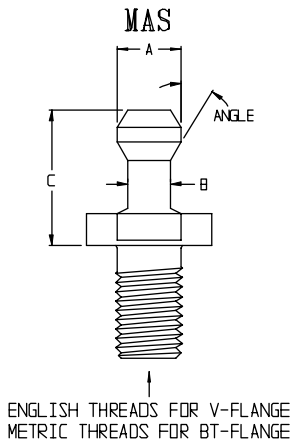
MAS RETENTION KNOBS STYLE V-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4833	.59	.39	1.27	60°	RH12, RH19, RH20F, RH25D, RH30D, RW12, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RB4E-0002	RK31114A	PT-532-60	C40-6000

MAS RETENTION KNOBS STYLE BT-FLANGE 40 TAPER

RET. KNOB ASSEMBLY SELECTION	DIMENSIONS				MILLTRONICS MACHINE	COMMAND PART No.	KENAMETAL PART No.	VALENITE PART No.	LYNDEX PART No.
4834	.59	.39	1.38	60°	RH12, RH19, RH20F, RH25D, RH30D, RW12, BR50C, BR60C, BR80C VM16G, VM17E, VMG17D, VM24E, VMG24B, VM25C, VM30F, VMD30E	RB4M-0002	RK31113A	PT-444-60	B40-6000

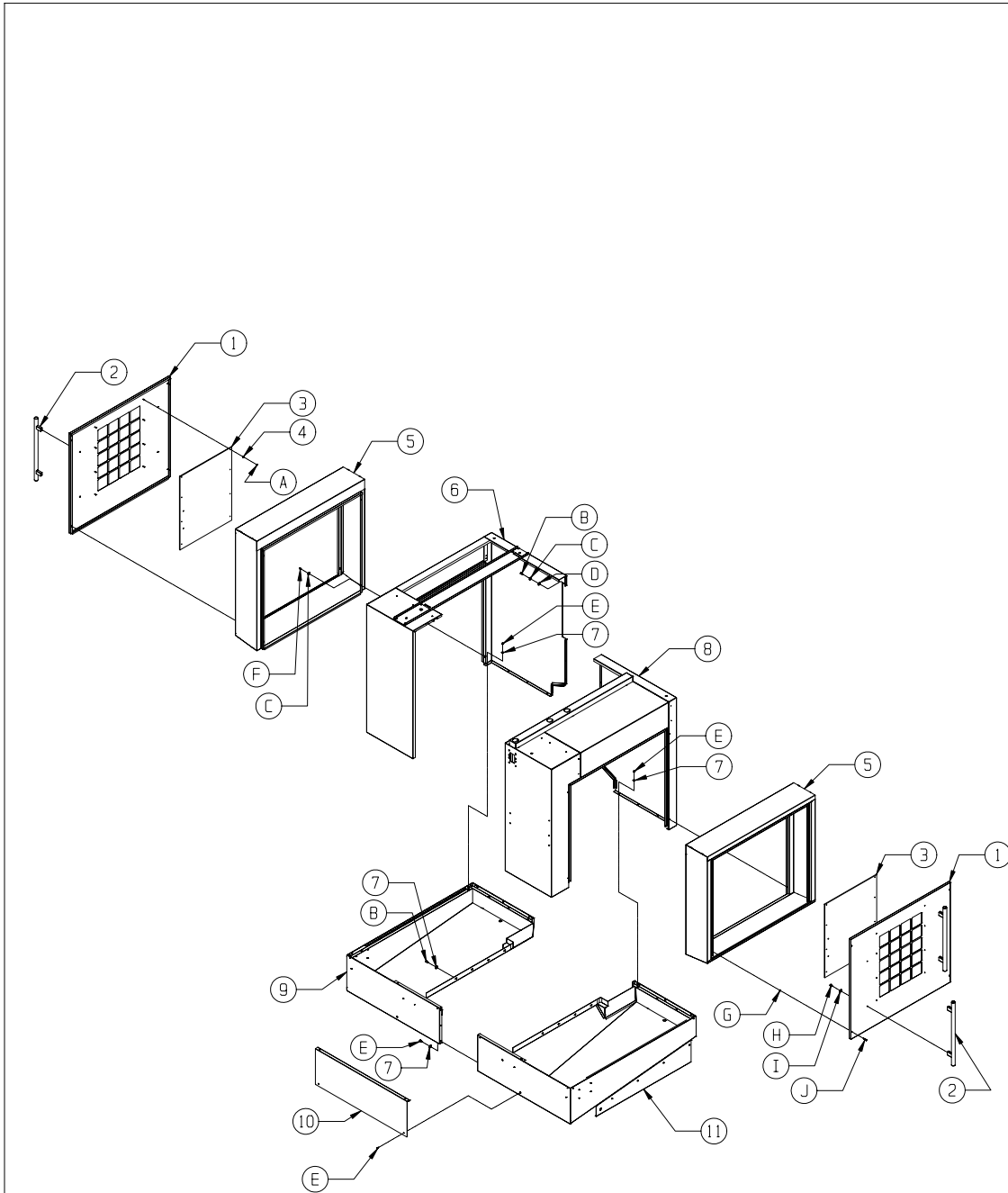
NOTES:



1. FOR SPINDLES OF 8000 RPM AND GREATER YOU MUST USE BALANCED TOOLING TO A G2.5 SPEC. OR IT WILL VOID THE SPINDLE WARRANTY.
 2. CHART IS GOOD FOR ALL MACHINE VERSIONS LISTED AND ALL FUTURE VERSIONS.
 3. COMMAND CORPORATION
TEL: 1-800-328-2197
FAX: 1-763-576-6911
 4. KENAMETAL
TEL: 1-800-446-7738
FAX: 1-800-962-4910
 5. VALENITE
TEL: 1-800-544-3336
FAX: 1-800-488-0695
 6. LYNDEX CORPORATION
TEL: 1-800-543-6237
FAX: 1-847-509-2909
- * RW20 ONLY COMES WITH ONE RETENTION KNOB. NO RETENTION KNOB ASSEMBLY SELECTION IS USED.

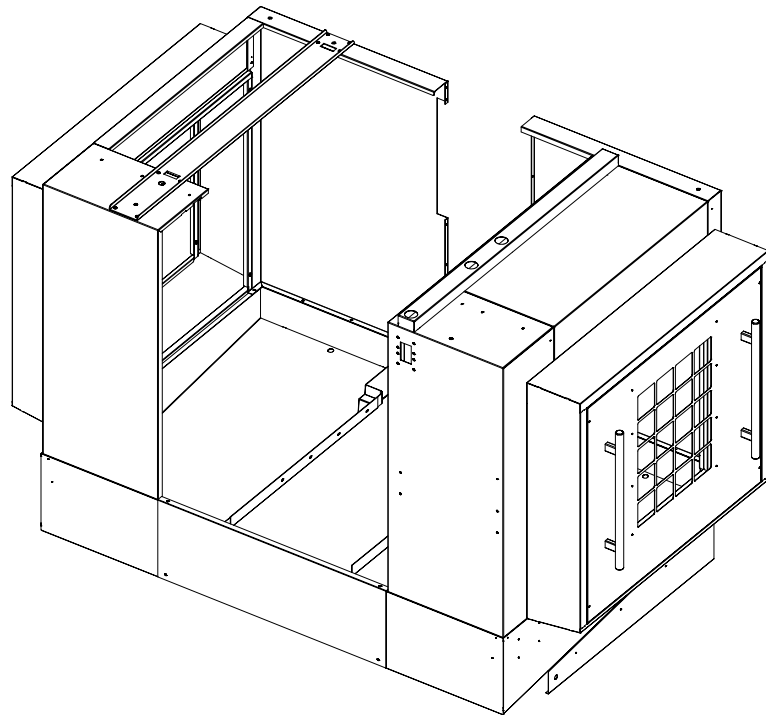
D	ADD RH/RW12 & RH19	5146		09/01
C	ADD RETENTION KNOBS TO CHART	4859	N.M.	12/00
B	CHANGE 70mm BT-FLANGE CHART	4730	N.M.	10/00
A	ADD LYNDEX CORP. IN CHART	4351	N.M.	1/00
RET.	DESCRIPTION	E.C.B. NO.	APP'D BY	DATE
MILLTRONICS 1400 STEEL LANE MILLVILLE, MO 65705-1001		RETENTION KNOB CHART		
APPLICATION GENERAL PRODUCTS		SCALE 1:1	DWG No. 6-11-01B-054	SHEET 2 OF 2
DATE 30 APR 99		DRAWN BY DAHLKE		

Enclosure Assembly



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REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
TITLE VM20 CHIP PAN				
APPLICATION PARTNER I				
SCALE 30:1		DWG No. 6-10-008-086		SIZE B
DATE 27 MAY 05		DRAWN BY DAHLKE		SHEET No. 1 OF 2



HARDWARE LIST			
No.	QTY	STOCK NO.	DESCRIPTION
1	2	MP1-483	SIDE DOOR
2	4	WX-297	25" HANDLE
3	2	MP6-163	SIDE DOOR LEXAN
4	16	HD-58	M5 RUBBERIZED WASHER
5	2	MP1-490	ENCLOSURE BUMP-OUT
6	1	MP1-479	ENCLOSURE-LEFT
7	27	HD-12	M6 RUBBERIZED WASHER
8	1	MP1-480	ENCLOSURE-RIGHT
9	1	MP1-477	CHIP PAN BOTTOM-LEFT
10	1	MP1-485	CENTER STAINLESS STEEL
11	1	MP1-478	CHIP PAN BOTTOM-RIGHT

* USE ONLY ON 40" TRAVEL

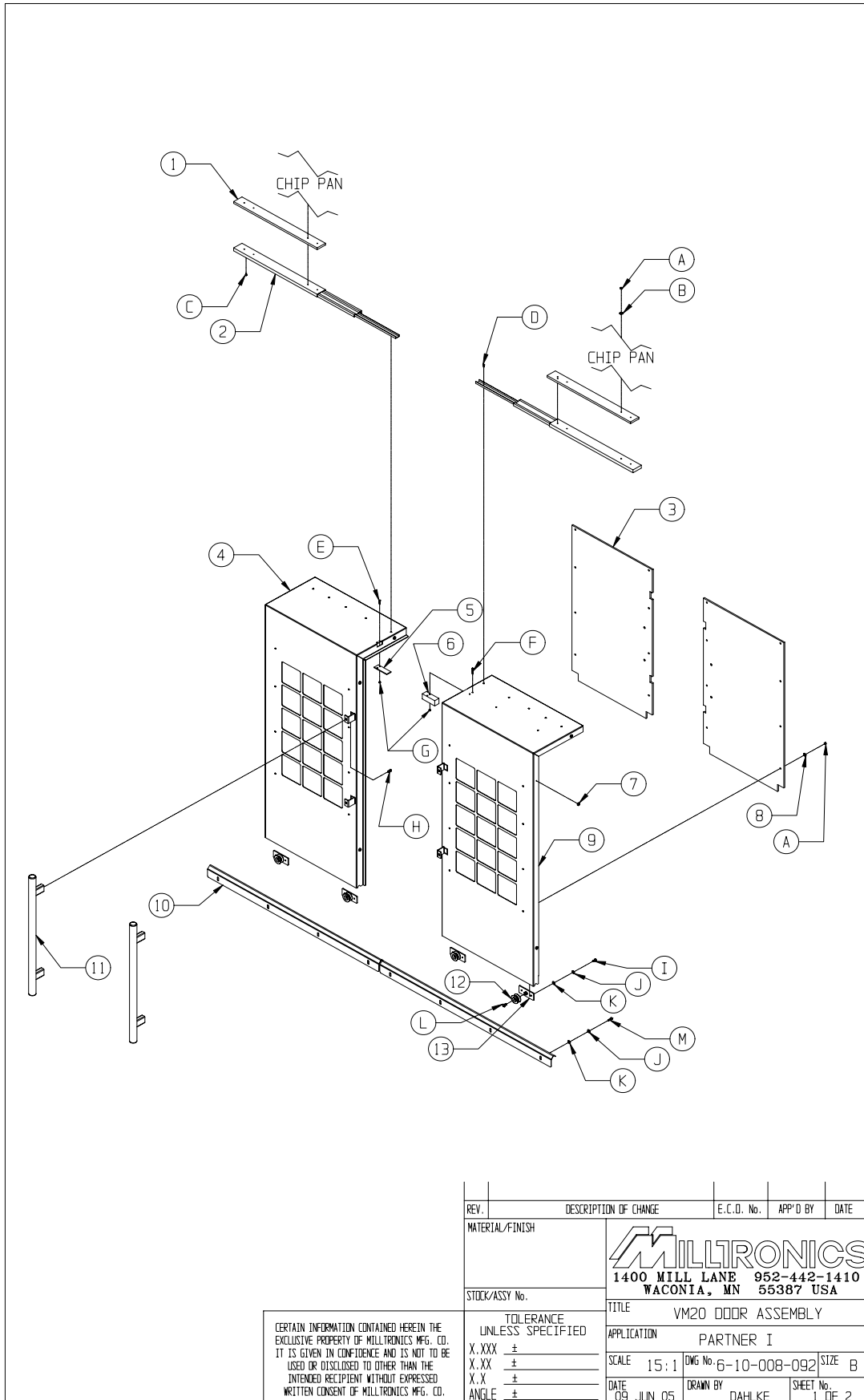
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	16	M5-.8 NYLOCK NUT
B	9	M6-1 x 20mm SHCS
C	17	M6 LOCK WASHER
D	9	M6 FLAT WASHER
E	23	M6-1 x 12mm BHCS
F	8	M6-1 x 12mm SHCS
G	8	M6-1 NYLOCK NUT
H	8	M8-1.25 x 20mm BHCS
I	8	M8 FLAT WASHER
J	8	M6-1 x 30mm SHCS

*

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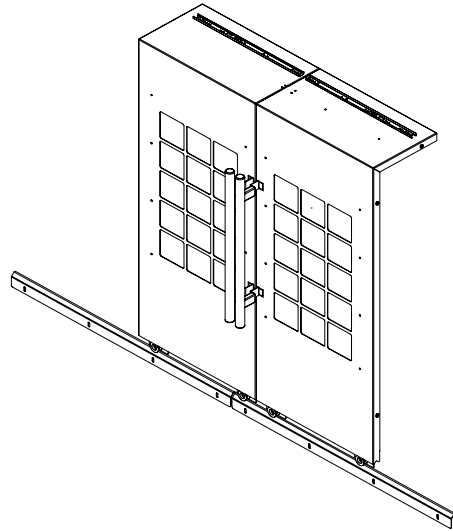
REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE VM20 CHIP PAN		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
X.XXX	±	SCALE 16:1	DWG No. 6-10-008-086	SIZE B
X.XX	±	DATE 27 MAY 05	DRAWN BY DAHLKE	SHEET No. 2 OF 2
X.X	±			
ANGLE	±			

Enclosure Door Assembly



CERTAIN INFORMATION CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF MILLIRONICS MFG. CO. IT IS GIVEN IN CONFIDENCE AND IS NOT TO BE USED OR DISCLOSED TO OTHER THAN THE INTENDED RECIPIENT WITHOUT EXPRESSED WRITTEN CONSENT OF MILLIRONICS MFG. CO.

REV.	DESCRIPTION OF CHANGE	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 952-442-1410 WACONIA, MN 55387 USA				
TITLE VM20 DOOR ASSEMBLY				
APPLICATION PARTNER I				
SCALE 15:1		DWG No. 6-10-008-092		SIZE B
DATE 09 JUN 05		DRAWN BY DAHLKE		SHEET No. 1 OF 2



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	2	MP1-501	SLIDE SPACER
2	2	MP-838	SLIDE
3	2	MP-239	LEXAN
4	1	MP1-482	FRONT DOOR - LEFT
5	1	SW-244	SWITCH KEY
6	1	SW-243	DOOR SWITCH
7	9	WX-310	BUMPER
8	16	HD-58	M5 RUBBERIZED WASHER
9	1	MP1-481	FRONT DOOR - RIGHT
10	2	MP1-484	VM20 LOWER DOOR TRACK
11	2	WX-297	HANDLE
12	4	MP1-495	ROLLER
13	4	MP1-496	FRONT DOOR ROLLER PLATE

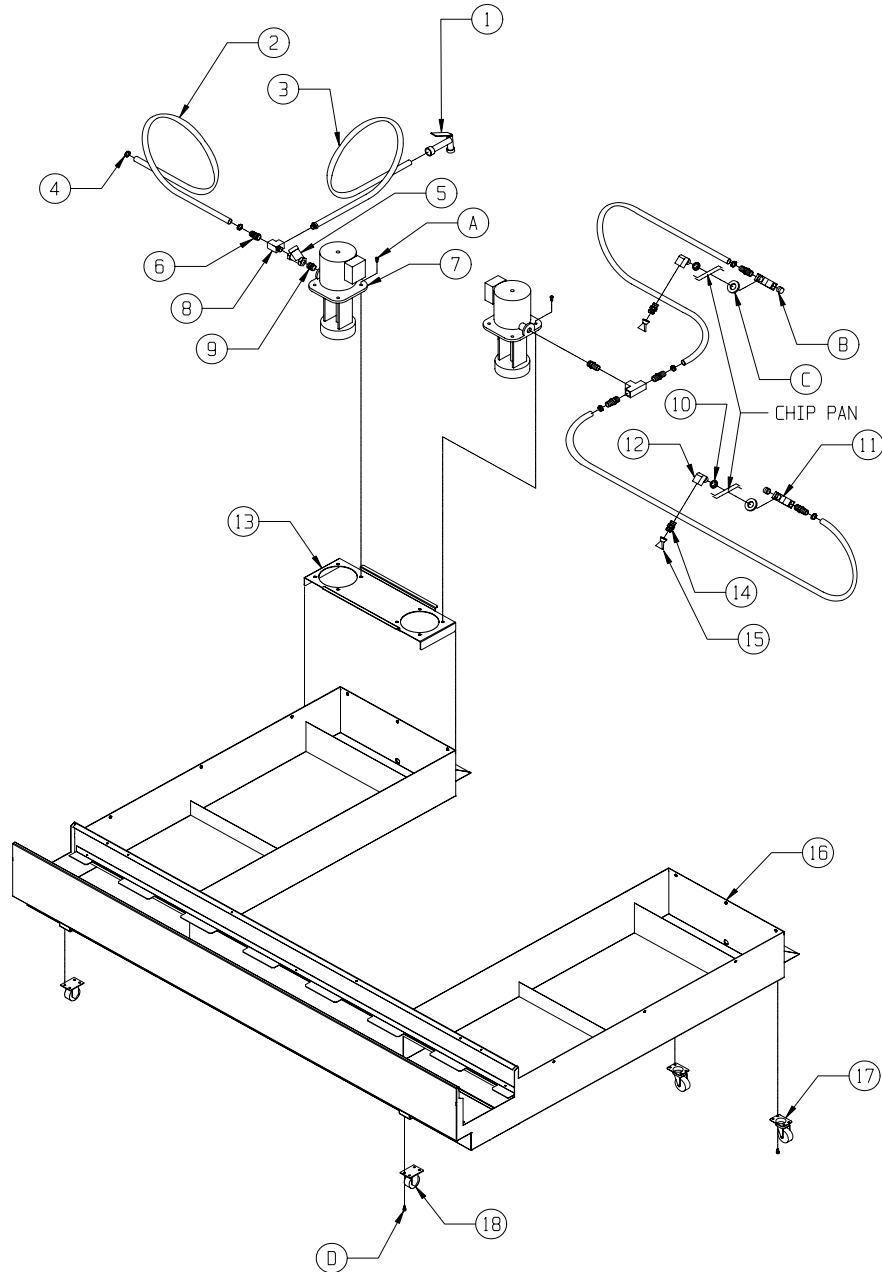
HARDWARE LIST

No.	QTY	DESCRIPTION
A	24	M5 NYLOCK NUT
B	8	M5 FLAT WASHER
C	8	M5-.8 x 20mm BHCS
D	10	M4-.7 x 10mm BHCS
E	2	M4-.7 x 20mm BHCS
F	2	M4-.7 x 35mm BHCS
G	4	M4-.7 NYLOCK NUT
H	4	M8-1.25 x 20mm BHCS
I	8	M6-1 x 12mm BHCS
J	16	M6 LOCK WASHER
K	16	M6 FLAT WASHER
L	4	M8-1.25 x 16mm BHCS
M	8	M6-1 x 12mm SHCS

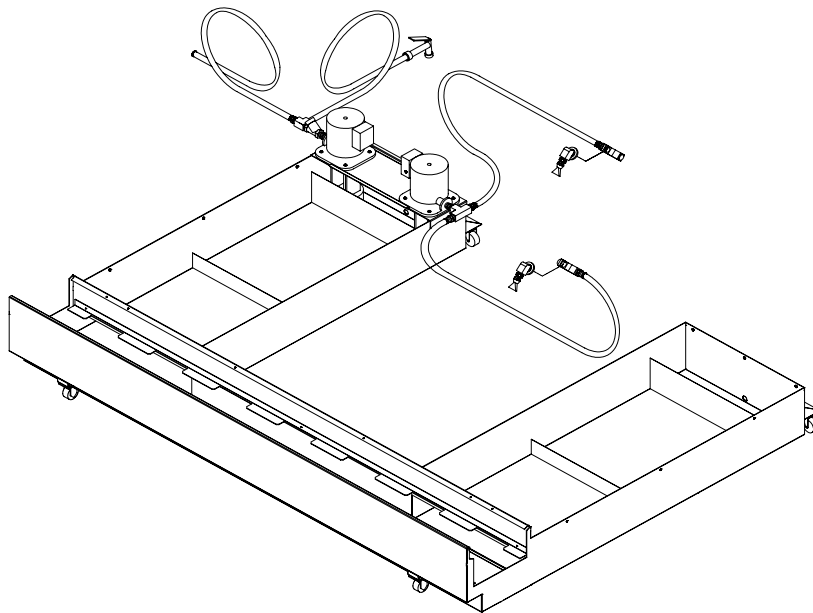
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REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE VM20 DOOR ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
		SCALE 15:1	DWG No. 6-10-008-092	SIZE B
		DATE 09 JUN 05	DRAWN BY DAHLKE	SHEET No. 2 OF 2

Flood Tank W/Washdown Assembly



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.		TITLE VM20 FLOOD TANK W/WASHDOWN ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
X .XXX	+/-	SCALE 15:1		DWG NO 6-10-008-085
X .XX	+/-	DATE 27 MAY 05		SIZE B
X .X	+/-	DRAWN BY DAH KE		SHEET No. 1
ANGLE	+/-			OF 2



PARTS LIST

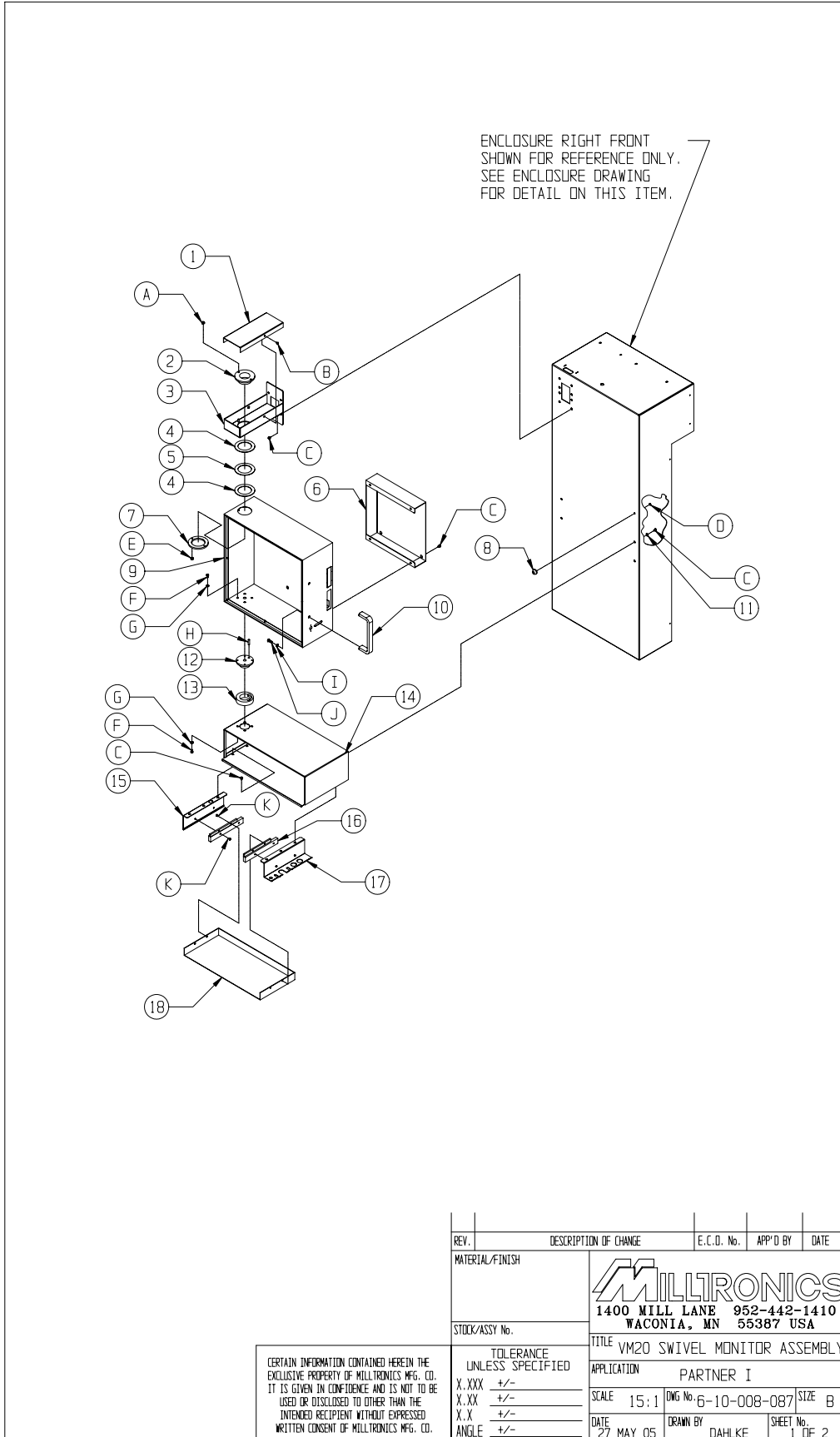
No.	QTY	STOCK No.	DESCRIPTION
1	1	NU-124	WATER HOSE NOZZLE
2	30'	NU-69	3/4" NYLOBRAID HOSE
3	1	NU-130	WASHDOWN HOSE ASSEMBLY
4	6	NU-141	1" HOSE CLAMP
5	1	NU-128	1/2" SWING CHECK VALVE
6	5	NU-66	1/2 NPT - 3/4 BARB FITTING
7	2	MA-162	FLOOD PUMP 1/4 HP MOTOR
8	1	NU-127	1/2" STREET T
9	1	NU-65	1/2" NIPPLE
10	2	WX-38	O' RING
11	3	NU-61	1/2" FEMALE T
12	2	NU-125	1/2" STREET ELBOW
13	1	MP1-489	COOLANT PUMP MOUNTING PLATE
14	2	NU-176	1/2" CONNECTOR
15	2	NU-175	1 1/4" FLARE NOZZLE
16	2	MP1-486	ONE PIECE COOLANT TANK
17	4	EL-88	CASTER - SWIVEL
18	2	EL-98	CASTER - RIGID

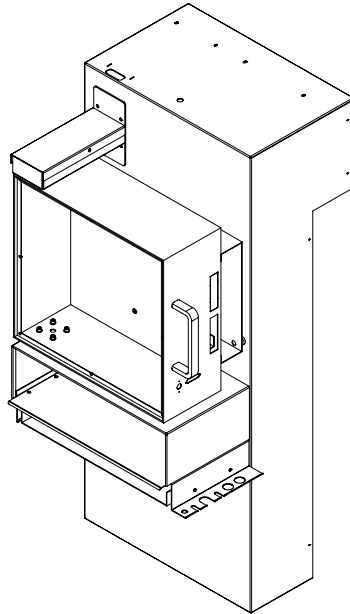
HARDWARE LIST

No.	QTY	DESCRIPTION
A	8	M6-1 x 12mm BHCS
B	2	1/2-14 NPT SHPP
C	2	7/8 FLAT WASHER 3/8 THICK
D	12	M6-1 x 12mm SHCS

REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 MILLIRONICS 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE VM20 FLOOD TANK W/WASHDOWN ASSEMBLY		
X.XXX +/-		APPLICATION PARTNER I		
X.XX +/-		SCALE 15:1 DWG No. 6-10-008-085 SIZE B		
X.X +/-		DATE 27 MAY 05 DRAWN BY DAHLKE SHEET No. 2 OF 2		
ANGLE +/-				

Enclosure Swivel Monitor Assembly





PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	1	MP1-494	COVER SWIVEL MONITOR UPPER SUPPORT ARM
2	1	MP-663	FLANGED BUSHING - SWIVEL MONITOR
3	1	MP1-491	UPPER SUPPORT ARM - SWIVEL MONITOR
4	2	WX-295	WASHER - SWIVEL MONITOR
5	1	MP3D-12	WAVE WASHER
6	1	MP-653	3-RING BINDER POCKET - SWIVEL MONITOR
7	1	MP-647	COLLAR - SWIVEL MONITOR
8	1	WX-156	BLACK BUMPER
9	1	SEE TABLE	SWIVEL MONITOR BOX
10	1	WX-230	HANDLE
11	4	HD-12	RUBBERIZED WASHER
12	1	MP-648	SWIVEL PIVOT BUSHING
13	1	MP-649	SWIVEL PIVOT BASE
14	1	MP-492	SWIVEL MONITOR BASE
15	1	MP1-498	BRACKET - SWIVEL MONITOR DRAWER OPTION
16	1	MP-654	8" FULL EXTENSION ACCURIDE SLIDE
17	1	MP1-497	UTILITY TRAY - SWIVEL MONITOR
18	1	MP-626	TRAY - KEYBOARD PULL-OUT

PARTS LIST

No.	QTY	DESCRIPTION
A	2	M6-1 NYLOCK NUT
B	2	M5-.8 x 10mm BHCS
C	18	M6-1 x 10mm BHCS
D	1	8-32 NYLOCK NUT
E	2	M5-.8 NYLOCK NUT
F	8	M6-1 x 10mm SHCS
G	8	M6 LOCK WASHER
H	1	1/4 x .5 DOWEL PIN
I	2	M8 FLAT WASHER
J	2	M8-1.25 x 20mm BHCS
K	8	M3-.5 x 10mm BHCS

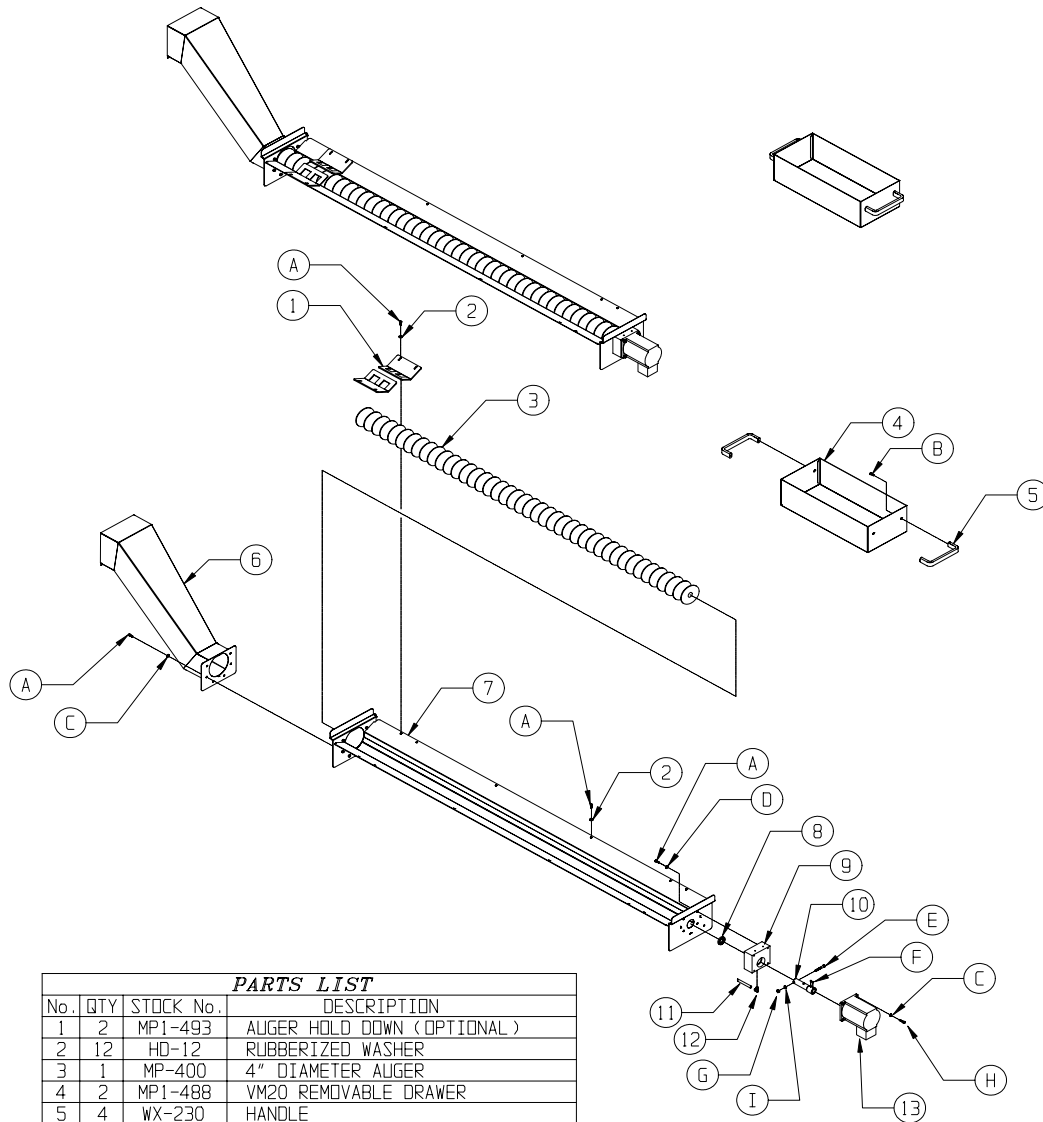
SWIVEL BOX TABLE

No.	CENT.	INT. CONTROL
9	MM-80	MPIC-03

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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 VM20 SWIVEL MONITOR ASSEMBLY		
X.XXX +/-		APPLICATION PARTNER I		
X.XX +/-		SCALE 10:1	DWG No. 6-10-008-087	SIZE B
X.X +/-		DATE 27 MAY 05	DRAWN BY DAHLKE	SHEET No. 2 OF 2
ANGLE +/-				

Chip Pan Drawer/Auger Assembly



PARTS LIST

No.	QTY	STOCK No.	DESCRIPTION
1	2	MP1-493	AUGER HOLD DOWN (OPTIONAL)
2	12	HD-12	RUBBERIZED WASHER
3	1	MP-400	4" DIAMETER AUGER
4	2	MP1-488	VM20 REMOVABLE DRAWER
5	4	WX-230	HANDLE
6	1	MP1-413	REMOVABLE CHUTE
7	1	MP1-487	REMOVABLE TROUGH
8	1	BG-69	BEARING CUP OIL SEAL
9	1	MP-440	BROTHER AUGER MOTOR MTG BRACKET
10	1	MP-441	BROTHER AUGER DRIVE SHAFT
11	1'	NU-25	1/4" NYLON TUBING
12	1	NU-16	MALE ELBOW 1/8 NPT 1/4 TUBE
13	1	MO-120	AUGER MOTOR

HARDWARE LIST

No.	QTY	DESCRIPTION
A	22	M6-1 x 15mm BHCS
B	8	M8-1.25 x 20mm BHCS
C	10	M6 LOCK WASHER
D	4	M6 FLAT WASHER
E	2	M8-1.25 x 50mm SHCS
F	2	10-32 x 1/4 SHSS
G	2	M8-1.25 HEX NUT
H	4	M6-1 x 25mm SHCS
I	2	M8 LOCK WASHER

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 952-442-1410 WACONIA, MN 55387 USA				
TITLE VM20 DRAWER/AUGER ASSEMBLY				
APPLICATION PARTNER I				
SCALE 20:1				
DATE 08 JUN 05				
DRAWN BY DAHLKE				
SHEET No. 1 OF 1				

