



MILLTRONICS
C N C M A C H I N E S

HM20 B Mechanical

6-12-2012
Rev 3

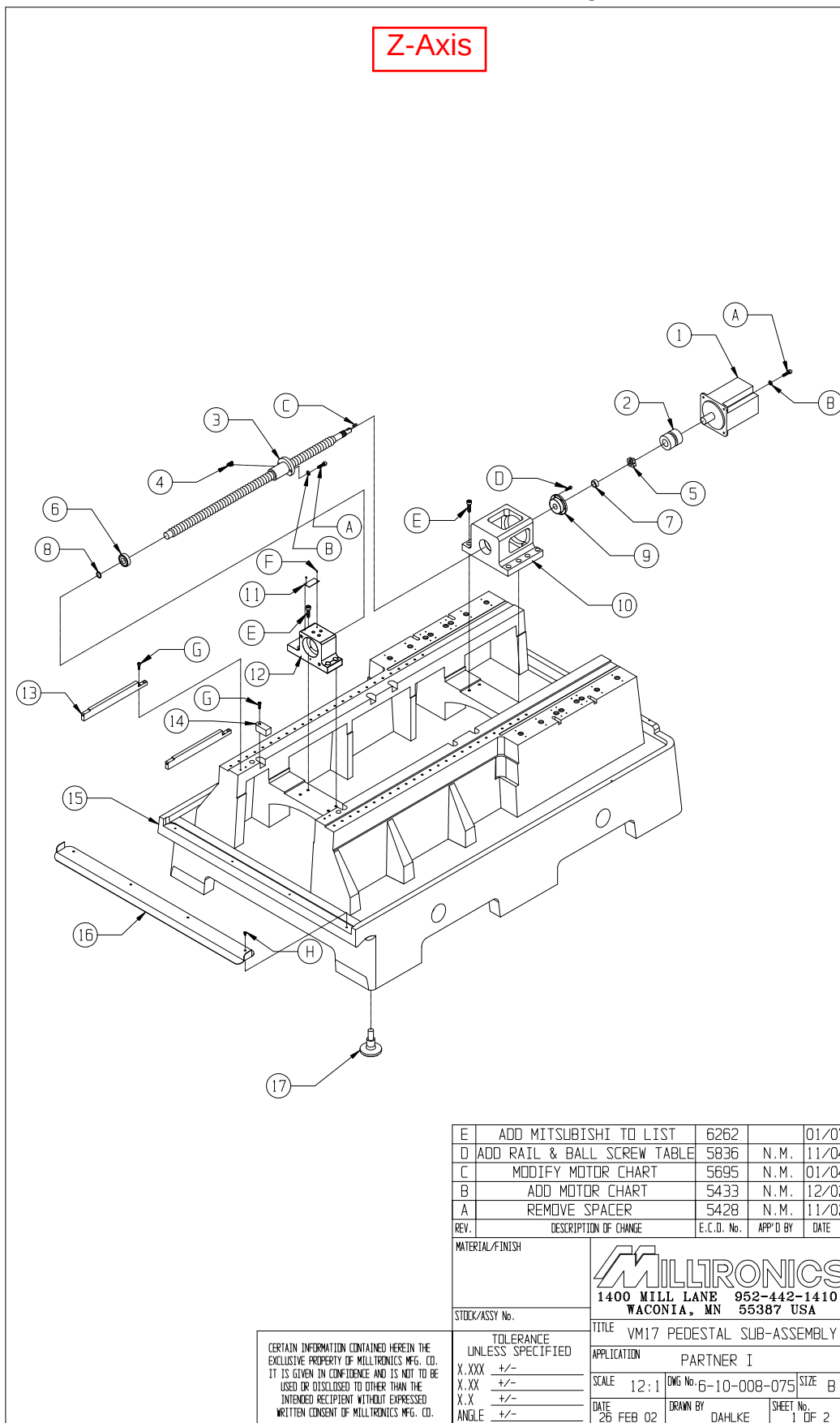
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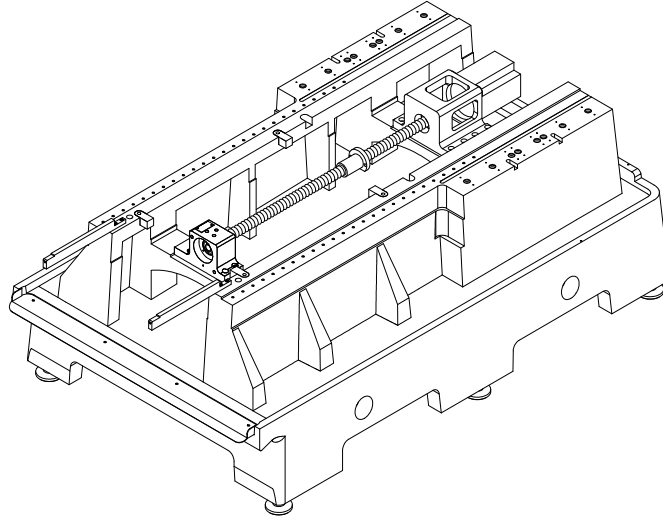
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Manual Discrepancy Sheet

1. On page 8, #3 ballscrew assembly is MP-570 and not MP-274. #8 motor plate options are MXH0009 and MXH0007 as shown.

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	z - 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	MX-51	z - AXIS REAR MOTOR MOUNT
11	1	LB-27	PULLEY MOTOR WARNING LABEL
12	1	MX-64	FRONT BALL SCREW RADIAL MOUNT
13	2	SEE TABLE	z - AXIS FRONT WAY COVER BRACKET
14	4	MP-707	HARD STOP BLOCK
15	1	MX1-61	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	MITSUBISHI
1	MD-123 (.5kw) MD-125 (1.0kw) MD-127 (1.5kw)	4Nm A06B-0223-B200 8Nm A06B-0227-B200	6Nm 1FK7060-5AF71-1EA0 11Nm 1FK7063-5AF71-1EA0	MD-184
2	MA-242 (.5kw/1.0kw) MA-241 (1.5kw)	MA-242	MA-260	MA-260

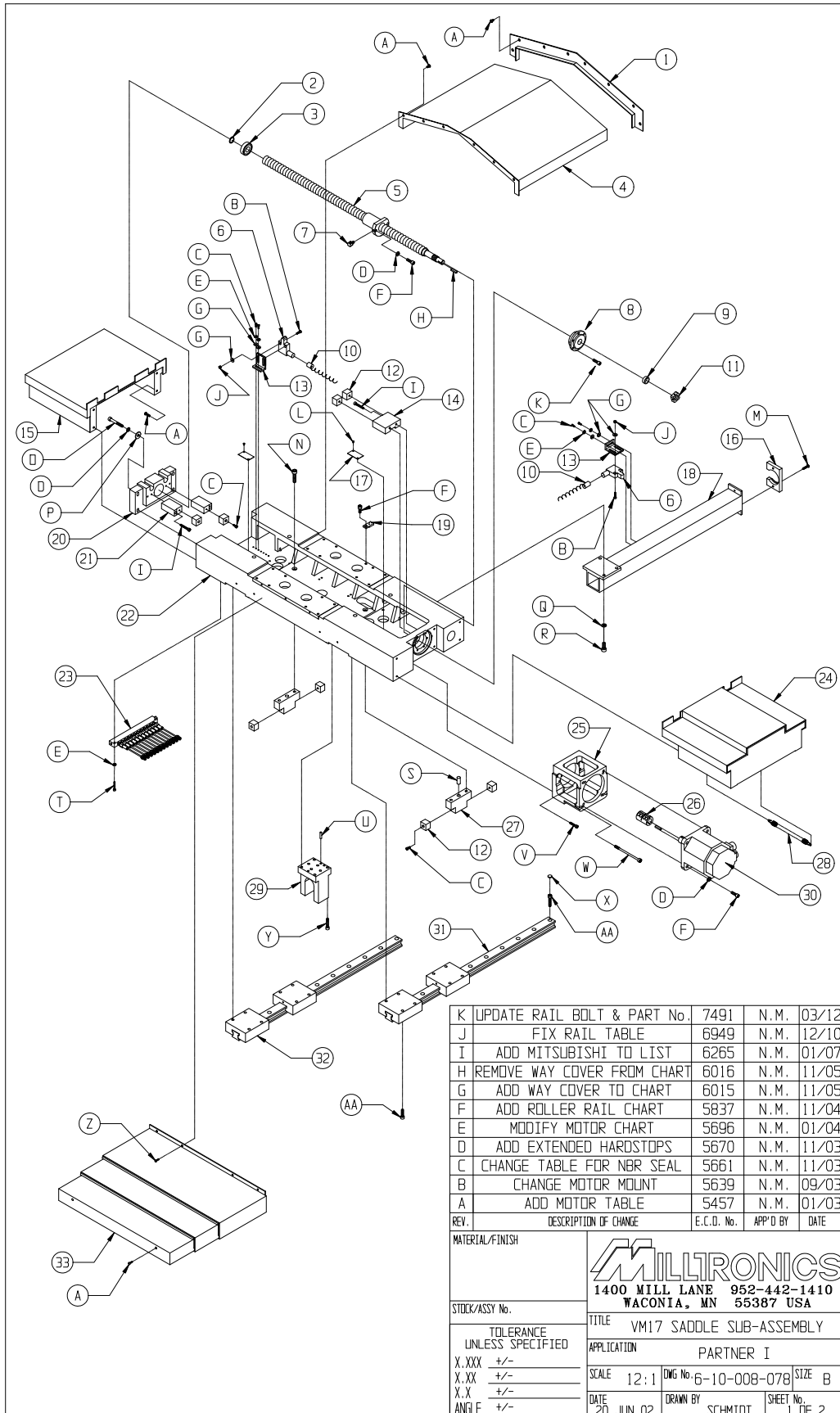
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	6	M8-1.25 x 30mm SHCS
B	6	M8 LOCK WASHER
C	1	3/16 x 3/16 x 1/2 KEY
D	6	M6-1 x 25mm SHCS
E	8	M10-1.5 x 30mm SHCS
F	2	1/4 DRIVE PIN
G	8	M6-1 x 20mm SHCS
H	4	M6-1 x 10mm BHCS

E	ADD MITSUBISHI TO LIST	6262		01/07
D	ADD RAIL & BALL SCREW TABLE	5836	N.M.	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			
X .XX +/-	DWG No 6-10-008-075			
X .X +/-	SIZE B			
ANGLE +/-	DATE 26 FEB 02			
	DRAWN BY DAHLKE			
	SHEET No. 2 OF 2			

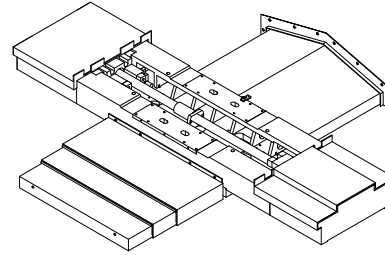
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Machine Saddle Assembly



Home switch cable SW-238

PARTS LIST		
No.	QTY	STOCK No. DESCRIPTION
1	1	MP10383 REAR WAY COVER WIPER
2	1	MP10108 SNAP RING
3	1	BG00002 6204 BEARING
4	1	SEE TABLE REAR WAY COVER
5	1	SEE TABLE X AXIS BALL SCREW
6	2	SW00193 HOME SWITCH
7	1	NJ00161 1/8 NPT SWIVEL ELBOW 4nn TUBE
8	1	BG00094 BALLSCREW SUPPORT BEARING
9	1	MP10107 BEARING LOCKNUT SPACER
10	2	SW00191 X AXIS SWITCH CORD
11	1	MP10094 BALL SCREW LOCKNUT
12	8	MP00718 POM HARD STOP BUMPER
13	2	MP10387 HOME SWITCH BRACKET
14	1	MP10446 HARD STOP BLOCK RIGHT
15	1	SEE TABLE X AXIS WAY COVER - LEFT
16	1	BR00111 CONDUIT BRACKET
17	2	LB00027 PULLEY MOTOR WARNING LABEL
18	1	MP10388 Y AXIS CABLE BRACKET
19	1	MP10418 DIL LINE BRACKET
20	1	MP10389 X AXIS RADIAL SUPPORT BRACKET
21	2	MP10447 HARD STOP BLOCK LEFT
22	1	SEE TABLE SADDLE
23	1	SEE TABLE X & Y AXIS MANIFOLD ASSEMBLY
24	1	SEE TABLE X AXIS WAY COVER - RIGHT
25	1	MX10059 MOTOR MOUNT
26	1	SEE TABLE MOTOR COUPLER
27	2	MP10410 SADDLE HARD STOP BLOCK
28	4	SEE TABLE X AXIS WAY COVER SPRING
29	1	MX10011 Y/Z AXIS BALL SCREW CARRIER - MACHINED
30	1	SEE TABLE AXIS MOTOR
31	2	SEE TABLE 35nn Y AXIS RAIL
32	4	SEE TABLE 35nn RAIL BLOCKS
33	1	MP10500 FRONT WAY COVER



MANIFOLD ASSEMBLY		
No.	DRAWING No.	DESCRIPTION
23	10008058	X & Y AIR/OIL MANIFOLD ASSEMBLY
	10018049	VM X & Y AXIS DIL MANIFOLD ASSEMBLY

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

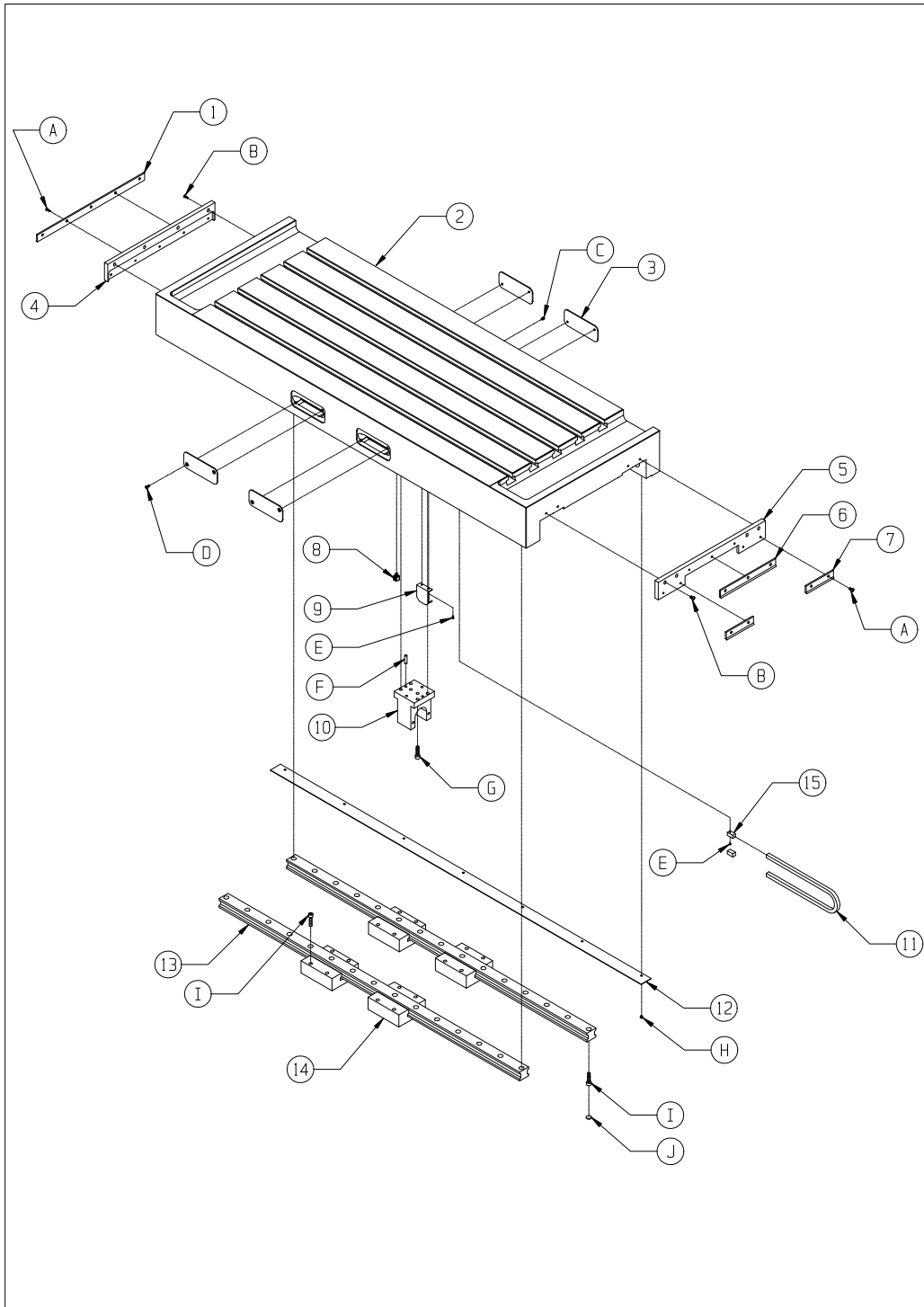
MOTOR & COUPLER LIST			
No.	YASKAWA	FANUC	SIEMENS
26	MA00242 (.5/1.0kW)	MA00242	MA00260
	MA00241 (1.5kW)		MA00260
30	MD00123 (.5kW)	4Nn A06B-0223-B200	6Nn 1FK7060-5AF71-1EA0
	MD00125 (1.0kW)	8Nn A06B-0227-B200	11Nn 1FK7063-5AF71-1EA0
	MD00127 (1.5kW)		MD00184 (1.5kW)

MACHINE VARIATION TABLE				
No.	DESCRIPTION	VM15/16/17 PART No.		VM20 PART No.
		25" TRAVEL	30" TRAVEL	30" TRAVEL 40" TRAVEL
4	REAR WAY COVER	MP10382	MP10382	MP10462
5	X AXIS BALL SCREW STANDARD	MP00569	MP00569	MP00569
	X AXIS BALL SCREW RAPID	-	MP00802	MP00802
15	X AXIS WAY COVER - LEFT	MP10385	MP10385	MP10385
22	SADDLE - MACHINED	MX10055	MX10055	MX10055
24	X AXIS WAY COVER - RIGHT	MP10442	MP10442	MP10442
28	X AXIS WAY COVER SPRING	HD00062	HD00062	HD00062
31	BALL RAIL	MP00640 (820)	MP00640 (820)	MPB0047 (1000)
	ROLLER RAIL	-	MP00831 (844)	MP00811 (1024)
32	BALL RAIL BLOCK	MP00641	MP00641	MP00641
	ROLLER RAIL BLOCK	-	MP00815	MP00815

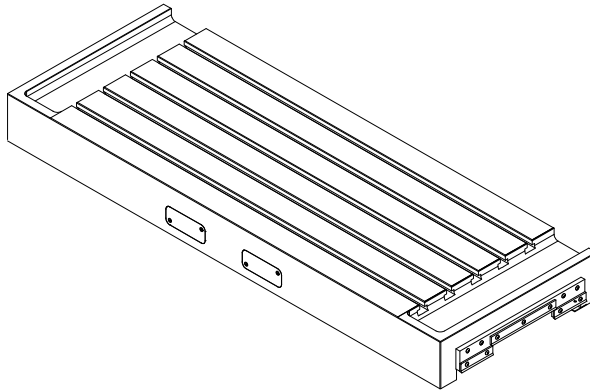
HARDWARE LIST		
No.	QTY	DESCRIPTION
A	24	M6-1 x 12nn BHCS
B	4	M5-.8 x 20nn SHCS
C	12	M5-.8 x 16nn SHCS
D	10	M8 LOCK WASHER
E	6	M5 LOCK WASHER
F	7	M8-1.25 x 30nn SHCS
G	8	M5 FLAT WASHER
H	1	3/16 x 3/16 x 1/2 KEY
I	4	M6-1 x 40nn SHCS
J	4	M5-.8 HEX NUT
K	6	M6-1 x 25nn SHCS
L	4	1/4 DRIVE RIVIT
M	2	M6-1 x 25nn BHCS
N	4	M10-1.5 x 40nn SHCS
O	4	M8-1.25 x 45nn SHCS
P	4	M8 FLAT WASHER
Q	4	M10 LOCK WASHER
R	4	M10-1.5 x 30nn SHCS
S	2	12nn x 25nn DOWEL PIN
T	2	M5-.8 x 25nn SHCS
U	2	1/4 x 1 DOWEL PIN
V	4	M6-1 x 30nn SHCS
W	2	M6-1 x 130nn SHCS
X	22	RAIL PLUGS MP00640 (820) BALL RAIL
	42	RAIL PLUGS MP00831 (844) ROLLER RAIL
	26	RAIL PLUGS MPB0047 (1000) BALL RAIL
	50	RAIL PLUGS MP00811 (1024) ROLLER RAIL
Y	6	M8-1.25 x 40nn SHCS
Z	4	M5-.8 x 10nn BHCS
AA	44	M8-1.25 x 30nn SHCS MP00640 (820) BALL RAIL
	66	M8-1.25 x 35nn SHCS MP00831 (844) ROLLER RAIL
	48	M8-1.25 x 30nn SHCS MPB0047 (1000) BALL RAIL
	72	M8-1.25 x 35nn SHCS MP00811 (1024) ROLLER RAIL

K	UPDATE RAIL BOLT & PART No.	7491	N.M.	03/12
J	FIX RAIL TABLE	6949	N.M.	12/10
I	ADD MITSUBISHI TO LIST	6265	N.M.	01/07
H	REMOVE WAY COVER FROM CHART	6016	N.M.	11/05
G	ADD WAY COVER TO CHART	6015	N.M.	11/05
F	ADD ROLLER RAIL CHART	5837	N.M.	11/04
E	MODIFY MOTOR CHART	5696	N.M.	01/04
D	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				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/-			
X.XX	+/-			
X.X	+/-			
ANGLE	+/-			
				
1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA				
TITLE VM17 SADDLE SUB-ASSEMBLY				
APPLICATION PARTNER I				
SCALE	15:1	DWG No.	6-10-008-078	SIZE B
DATE	20 JUN 02	DRAWN BY	SCHMIDT	SHEET No. 2 OF 2

Milling Table Assembly



A	UPDATE RAIL BOLT & PART No.	7488		03/12
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 TABLE SUB-ASSEMBLY		
X.XXX	+/-	APPLICATION PARTNER I		
X.XX	+/-	SCALE 10:1	DWG No. 6-10-008-088	SIZE B
X.X	+/-	DATE 06 JUN 05	DRAWN BY DAHLKE	SHEET No. 1 OF 2
ANGLE	+/-			



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MP10423	VM17 WIPER - LEFT
2	1	SEE TABLE	TABLE - MACHINED
3	4	MP00315	TABLE SLOT COVER
4	1	MP10419	X-AXIS WIPER PLATE - LEFT
5	1	MP10420	X-AXIS WIPER PLATE - RIGHT
6	1	MP10422	VM17 WIPER - UPPER
7	2	MP10421	VM17 WIPER - LOWER
8	2	NJ00161	SWIVEL ELBOW 1/8NPT - 4mm TUBE
9	1	MP60045	EXTENDED TRAVEL X-AXIS DOG
10	1	MX60016	X-AXIS BALL SCREW CARRIER
11	1	MP00844	X-AXIS CABLE TRACK - 33 LINKS
12	1	SEE TABLE	TABLE PLATE
13	2	SEE TABLE	35mm RAILS
14	4	SEE TABLE	35mm RAIL BLOCK
15	1	MP00845	X-AXIS CABLE TRACK - ENDS

X axis home switch cable SW-238

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	8	M4-.7 x 8mm FHCS
E	6	M3-.5 x 6mm BHCS
F	2	1/4 x 1 DOWEL PIN
G	6	M8-1.25 x 35mm SHCS
H	7	M5-.8 x 12mm BHCS
I	46	M8-1.25 x 30mm SHCS - BALL RAIL 30"
	74	M8-1.25 x 35mm SHCS - ROLLER RAIL 30"
	52	M8-1.25 x 30mm SHCS - BALL RAIL 40"
	86	M8-1.25 x 35mm SHCS - ROLLER RAIL 40"
J	30	RAIL PLUG - BALL RAIL 30"
	58	RAIL PLUG - ROLLER RAIL 30"
	36	RAIL PLUG - BALL RAIL 40"
	70	RAIL PLUG - ROLLER RAIL 40"

TABLE TRAVEL			
No.	DESCRIPTION	30" TRAVEL	40" TRAVEL
2	TABLE - MACHINED	MX10064	MX10065
12	TABLE PLATE	MP10463	MP10464
13	BALL RAIL	MP00732	MP00823
	ROLLER RAIL	MP00812	MP00824
14	BALL RAIL BLOCK	MP00641	MP00641
	ROLLER RAIL BLOCK	MP00815	MP00815

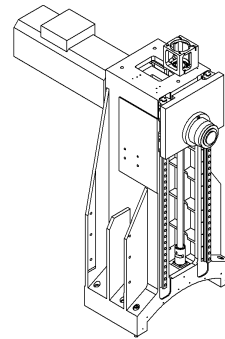
A UPDATE RAIL BOLT & PART No.		7488		03/12
REV.	DESCRIPTION OF CHANGE		E.C.D. No.	APP'D BY
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/-			
X.XX	+/-			
X.X	+/-			
ANGLE	+/-			
TITLE		VM20 TABLE SUB-ASSEMBLY		
APPLICATION		PARTNER I		
SCALE		10:1	DWG No. 6-10-008-088	SIZE B
DATE		06 JUN 05	DRAWN BY DAHLKE	SHEET No. 2 OF 2

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

Machine Column/Head Assembly

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Y-Axis



SPINDLE MOTOR MOUNTING PLATE			
ITEM No.	QTY.	PART No.	DESCRIPTION
8	1	MXH0009	7.5kw MOTOR PLATE
	1	MXH0007	11kw MOTOR PLATE

SPINDLE MOTOR TABLE			
ITEM No.	QTY.	PART No.	DESCRIPTION
9	1	MO00166	7.5kw SPINDLE MOTOR
	1	MO00167	11kw SPINDLE MOTOR

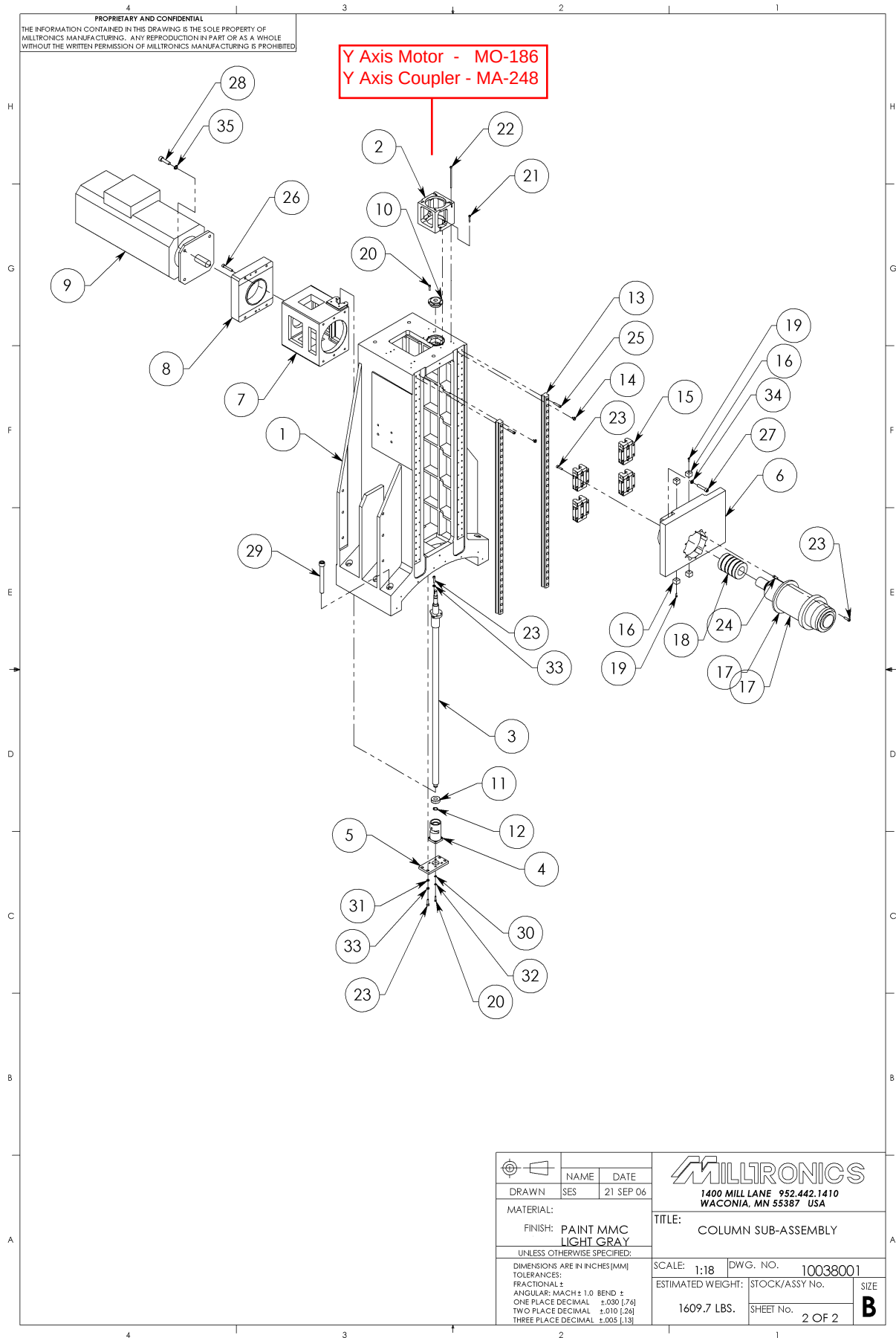
ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	MXH0002	COLUMN MACHINING
2	1	MX10059	Y MOTOR MOUNT MACHINED
3	1	MP-570	50" BALL SCREW ASSEMBLY
4	1	MPH0022	BALL SCREW END SUPPORT
5	1	MPH0002	SUPPORT PLATE
6	1	MXH0003	SPINDLE MOTOR MOUNT
7	1	MXH0004	Y MOTOR MOUNT MACHINED
8	1	SEE TABLE	SPINDLE MOTOR MOUNTING PLATE
9	1	SEE TABLE	SPINDLE MOTOR
10	1	BG00094	BALL SCREW SUPPORT BEARING
11	1	BG00002	BEARING NACHI 6204ZZ
12	1	MP10108	RETAINING RING EXTERNAL 19mm X 1.3mm
13	2	SEE TABLE	RAIL 45"
14	32	HD00090	MITEEBITE CLAMP
15	4	SEE TABLE	RAIL BLOCK
16	4	MP00718	POM HARDSTOP BLOCK
17	1	SEE TABLE	SPINDLE
18	1	MA00369	MOTOR COUPLER
19	4	SHCS M5-0.8 x 16	M5 - 0.8 x 16mm SHCS
20	10	SHCS M6-1.0 x 25	M6-1.0 X 25mm SHCS
21	4	SHCS M6-1.0 x 30	M6-1.0 x 30 SHCS
22	2	SHCS M6-1.0 x 130	SHCS M6-1.0 x 130mm
23	28	SHCS M8-1.25 x 30	M8-1.25 x 30mm SHCS
24	6	SHCS M6-1.0 x 20	M6-1.0 x 20 SHCS
25	62	SHCS M8-1.25 x 40	M8 - 1.25 x 40mm SHCS
26	6	SHCS M10-1.5 x 60	M10 - 1.5 x 60 SHCS
27	6	SHCS M12-1.75 x 60	M12-1.75 x 60 SHCS
28	4	SHCS M14-2.0 x 55	M14-2.0 x 45mm SHCS
29	8	SHCS .75-10 X 7.00	SHCS 3/4-10 X 7.00
30	4	WASHER FLAT M6	M6 FLAT WASHER
31	4	WASHER FLAT M8	M8 FLAT WASHER
32	4	WASHER LOCK M6	M6 LOCK WASHER
33	6	WASHER LOCK M8	M8 LOCK WASHER
34	6	WASHER LOCK M12	M12 LOCK WASHER
35	4	WASHER LOCK M14	M14 LOCK WASHER

RAIL BLOCK TABLE			
ITEM No.	QTY.	PART No.	DESCRIPTION
15	4	MP00641	BALL RAIL BLOCK
	4	MP00815	ROLLER RAIL BLOCK

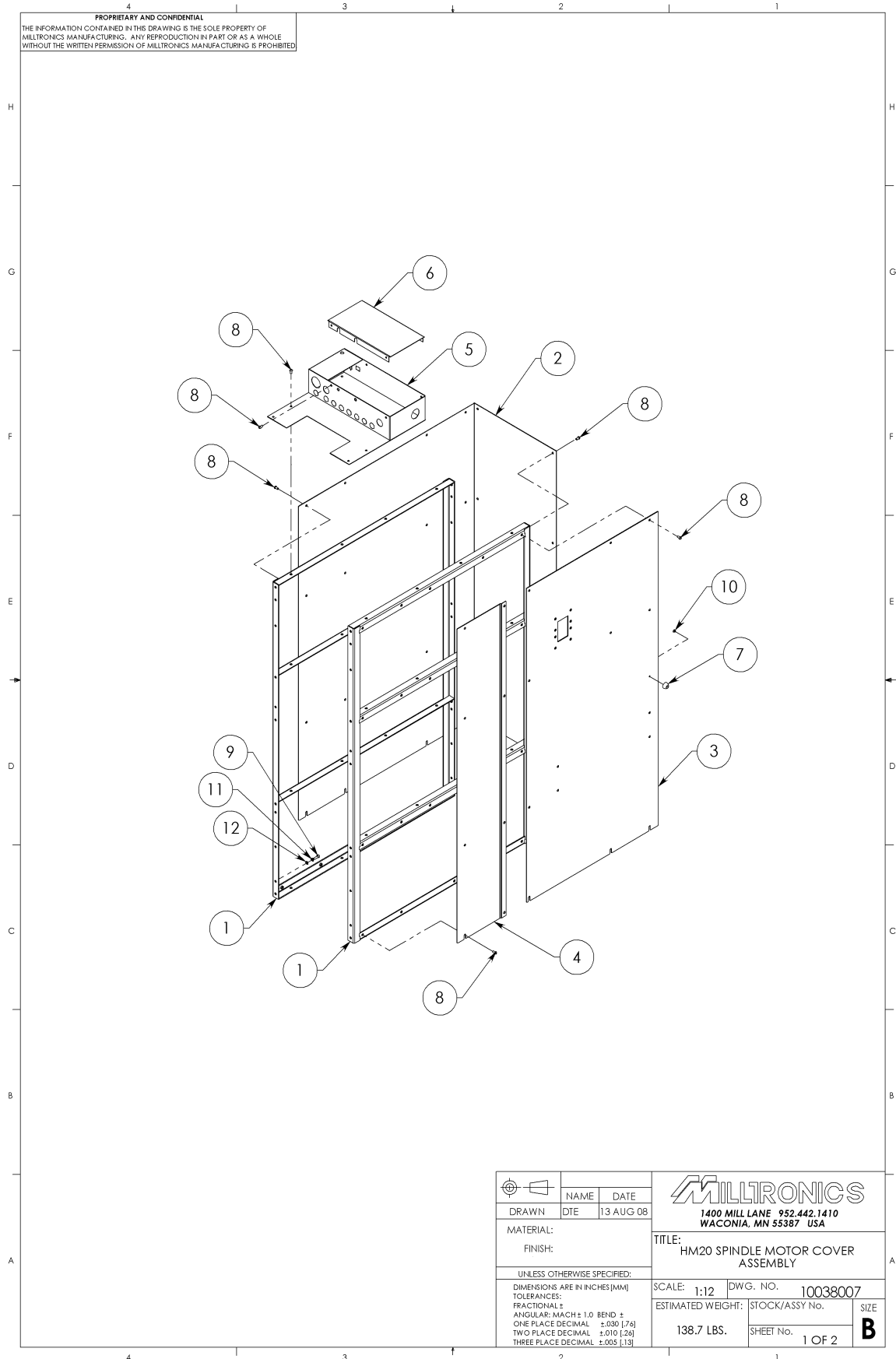
RAIL TABLE			
ITEM No.	QTY.	PART No.	DESCRIPTION
13	2	MP00642	BALL RAIL
	2	MP00829	ROLLER RAIL

SPINDLE TABLE			
ITEM No.	QTY.	PART No.	DESCRIPTION
17	1	MP00864	10000 RPM SPINDLE
	1	MP00865	15000 RPM SPINDLE

 DRAWN: SES DATE: 21 SEP 06	MILLTRONICS 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA	
	MATERIAL: FINISH: PAINT MMC LIGHT GRAY UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]	
TITLE: COLUMN SUB-ASSEMBLY		SCALE: 1:24 DWG. NO. 10038001 ESTIMATED WEIGHT: STOCK/ASSY No. 1609.7 LBS.
SHEET No. 1 OF 2		SIZE B



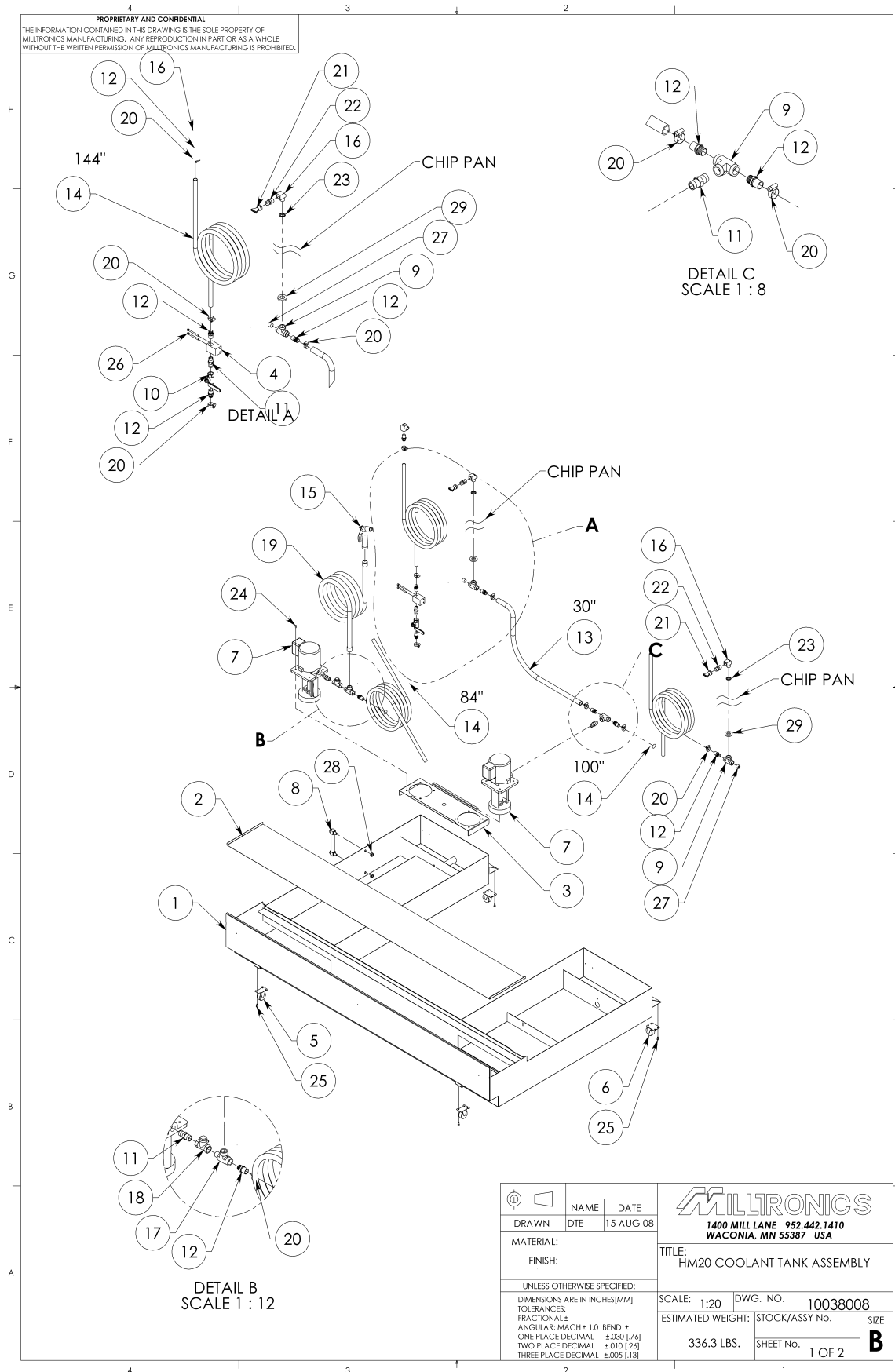
Spindle Motor Cover Assembly



ITEM NO.	SPINDLE MOTOR COVER/QTY.	PART NUMBER	DESCRIPTION
1	2	MPH0059	SPINDLE MOTOR COVER, FRAME
2	1	MPH0061	SPINDLE MOTOR COVER BACK
3	1	MPH0060	SPINDLE MOTOR COVER SIDE
4	1	MPH0080	SPINDLE MOTOR COVER ACCESS PANEL
5	1	MPH0077	SPINDLE MOTOR COVER-JUNCTION BOX
6	1	MPH0078	JUNCTION BOX COVER
7	1	WX00156	BUMPER
8	50	BHCS M6-1.0 x 12	M6 - 1.0 x 12 BHCS
9	14	SHCS M6-1.0 x 20	M6-1.0 x 20 SHCS
10	1	NUT HEX NYLOCK 8-32	8-32 NYLOCK HEX NUT
11	14	WASHER LOCK M6	M6 LOCK WASHER
12	14	WASHER FLAT M6	M6 FLAT WASHER

	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	DRAWN	DTE	
MATERIAL:		TITLE:	
FINISH:		HM20 SPINDLE MOTOR COVER ASSEMBLY	
UNLESS OTHERWISE SPECIFIED:		SCALE: 1:24	DWG. NO. 10038007
DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]		ESTIMATED WEIGHT:	STOCK/ASSY No.
		138.7 LBS.	SHEET No. 2 OF 2
			SIZE B

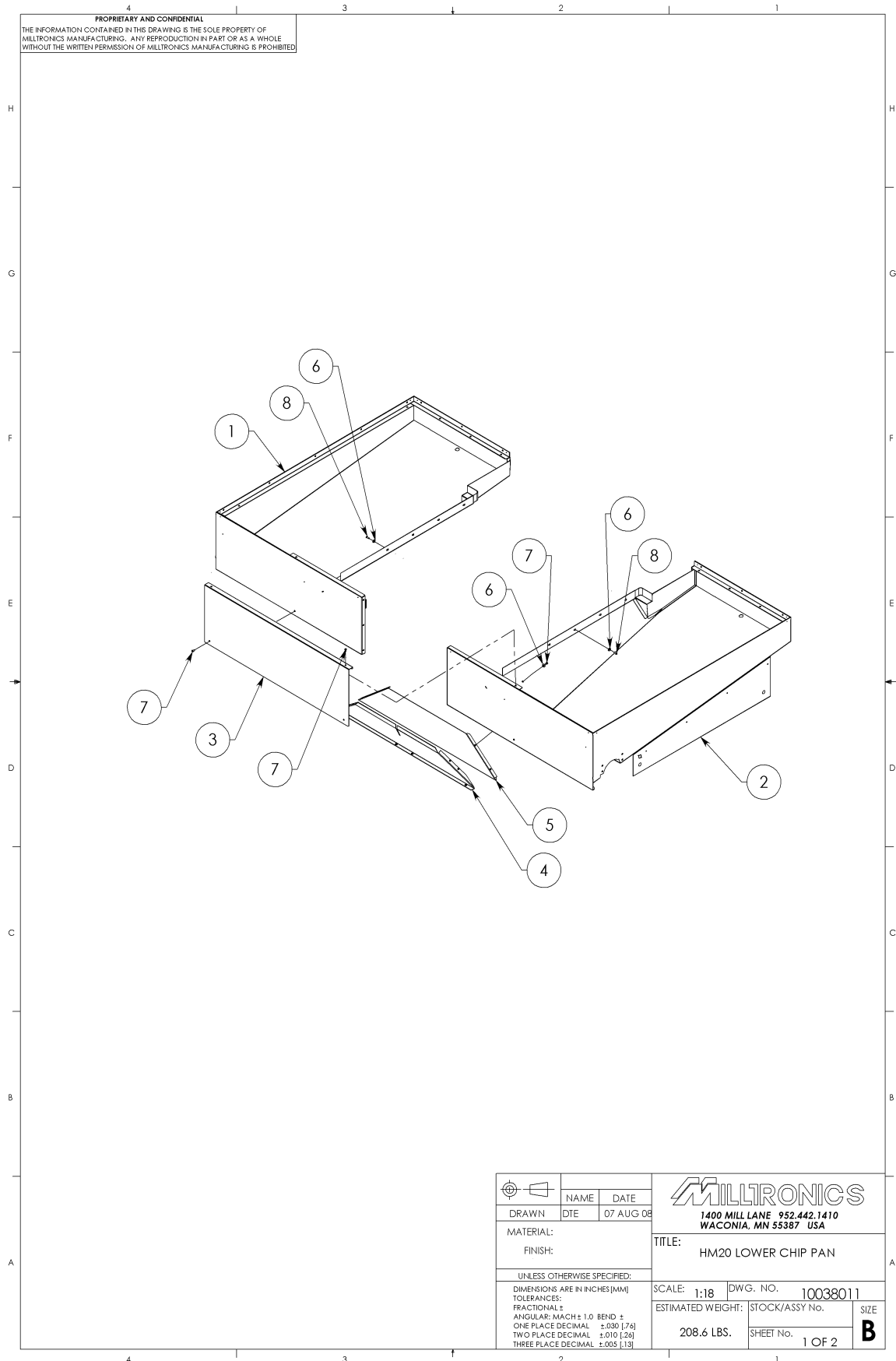
Flood Tank W/Washdown Assembly

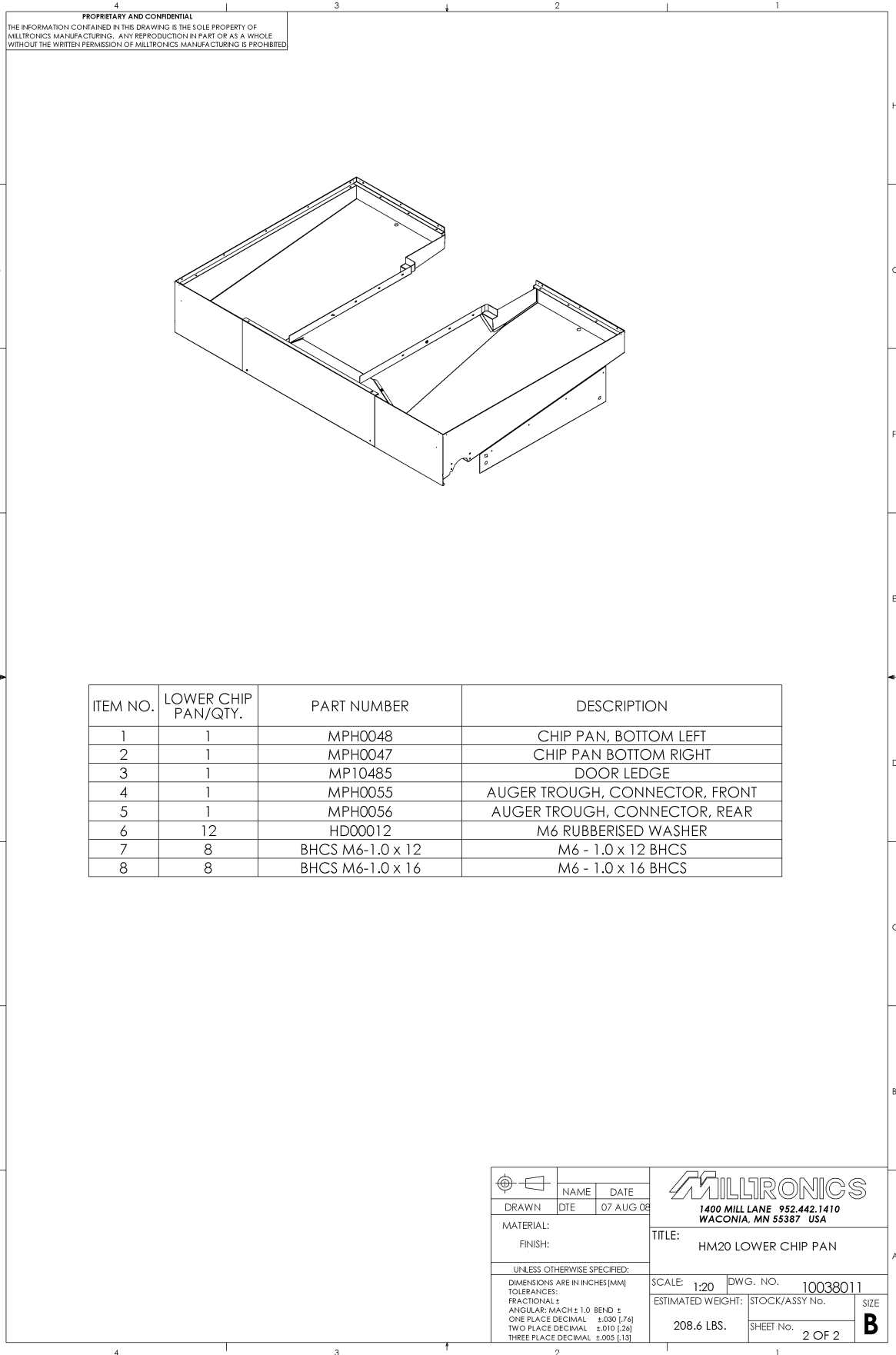


ITEM NO.	COOLANT TANK/QTY.	PART NUMBER	DESCRIPTION
1	1	MPH0057	COOLANT TANK
2	1	MPH0058	COOLANT TANK SCREEN
3	1	MP10489	PUMP PLATE
4	1	MPH0106	COOLANT VALVE BLOCK
5	2	EL00098	STRAIGHT CASTER
6	4	EL00088	WHEEL CASTER
7	2	MA00162	FLOOD PUMP MOTOR
8	1	MP001035	COOLANT LEVEL GAUGE
9	3	NU00061	1/2" FEMALE T
10	1	NU00064	1/2"NPT BALL VALVE
11	3	NU00065	1/2-14 NPT MALE/MALE NIPPLE
12	8	NU00066	FITTING 1/2NPT - 3/4 BARB
13	1	NU00069	NYLABRAID 3/4" 4511-0751 30"
14	1	NU00069	NYLABRAID 3/4" 4511-0751 84"
15	1	NU00069	NYLABRAID 3/4" 4511-0751 100"
16	1	NU00069	NYLABRAID 3/4" 4511-0751 144"
17	1	NU00124	NOZZEL WATER HOSE
18	3	NU00125	1/2" STREET ELBOW
19	1	NU00127	TEE 1/2"NPT STREET 2225P-8
20	1	NU00128	1/2" SWING CHECK VALVE
21	1	NU00130	WASHDOWN HOSE ASSEMBLY 20'
22	8	NU00141	1" HOSE CLAMP
23	2	NU00175	1-1/4" FLARE NOZZLE
24	2	NU00176	1/2" CONNECTOR
25	2	WX00038	O-RING .5"
26	8	BHCS M6-1.0 x 12	M6 - 1.0 x 12 BHCS
27	12	SHCS M6-1.0 x 12	M6-1.0 x 12 SHCS
28	2	SHCS M6-1.0 X 65	M6-1.0 X 65 SHCS
29	2	SHPP .50-14 NPT	1/2-14 NPT SHPP
30	2	NUT HEX JAM .50-20	1/2-20 HEX JAM NUT
31	2	WASHER FLAT .875	7/8" X .25 THICK FLAT WASHER

	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	DRAWN	DTE	
MATERIAL:		TITLE:	
FINISH:		HM20 COOLANT TANK ASSEMBLY	
UNLESS OTHERWISE SPECIFIED:		SCALE: 1:24 DWG. NO. 10038008	
DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 (.76) TWO PLACE DECIMAL ±.010 (.26) THREE PLACE DECIMAL ±.005 (.13)		ESTIMATED WEIGHT: 339.7 LBS.	STOCK/ASSY No. SHEET No. 2 OF 2
			SIZE B

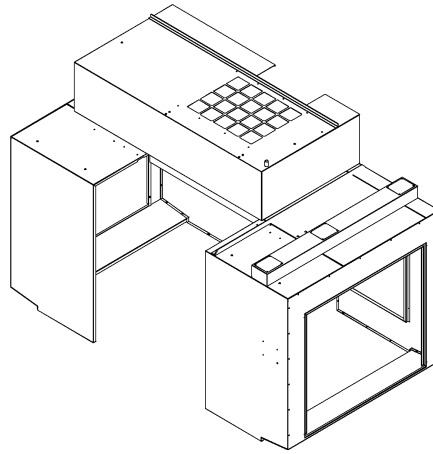
Enclosure Bottom Assembly





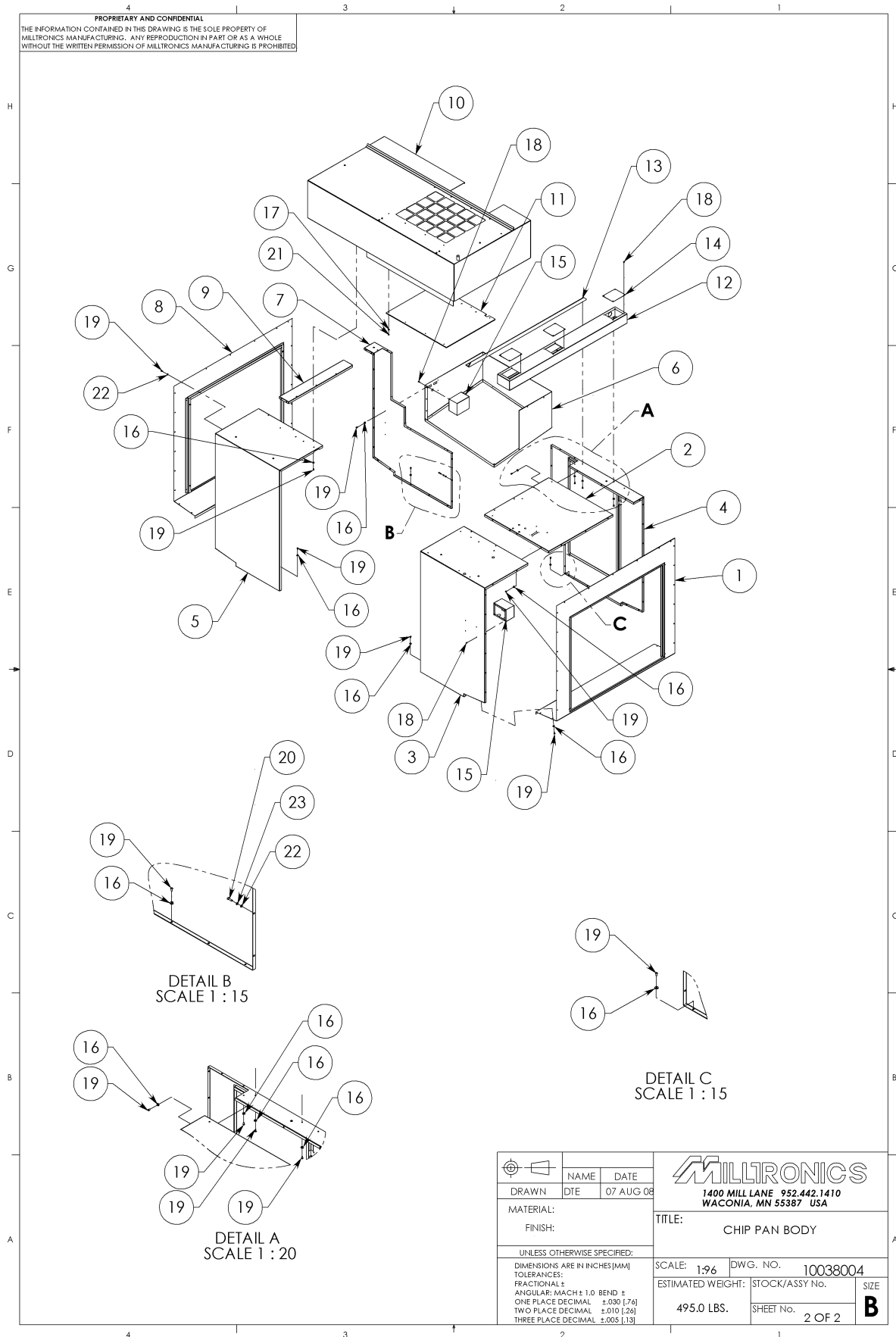
Enclosure Top Assembly

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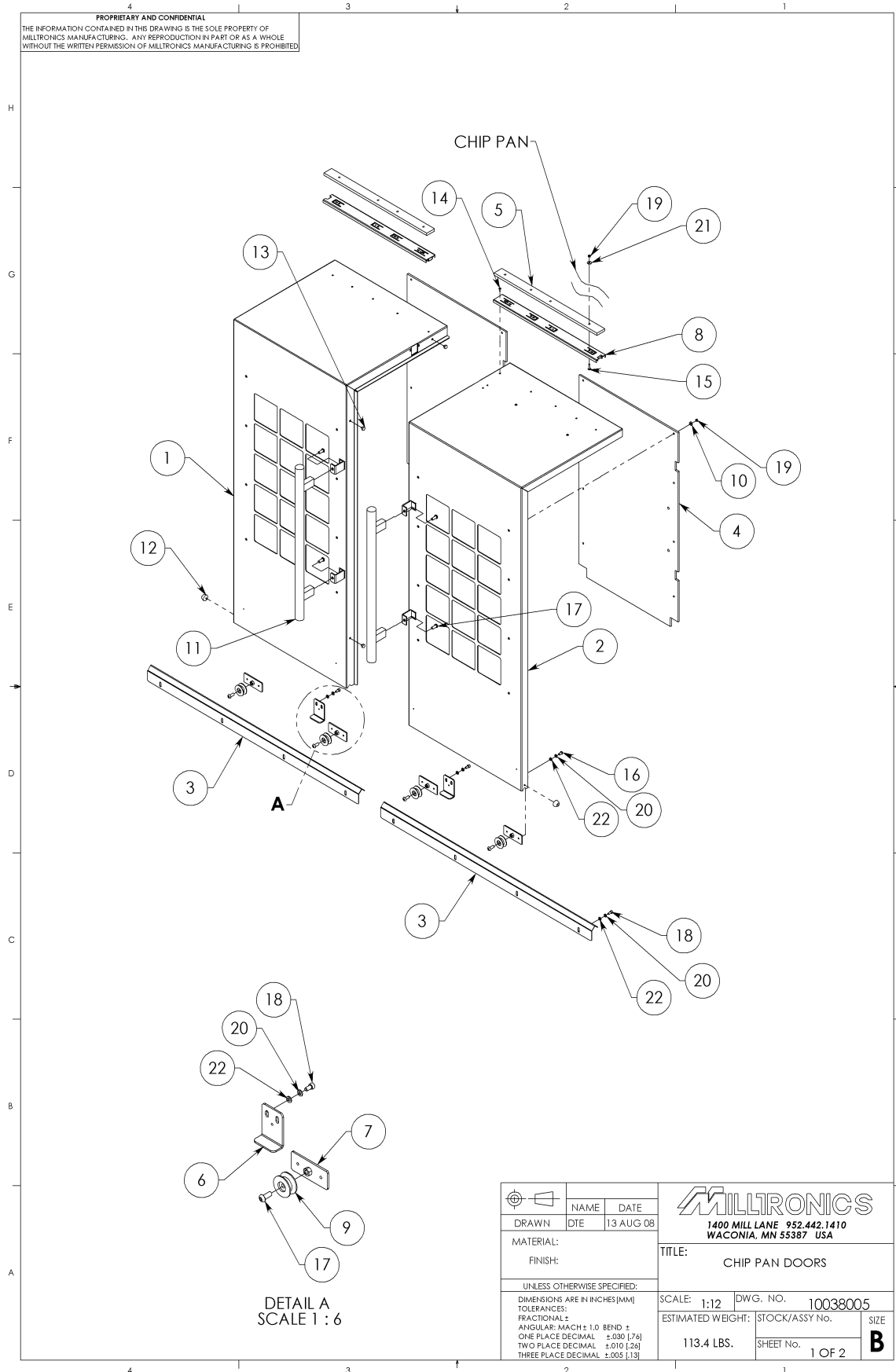


ITEM NO.	HM20 CHIP PAN/QTY.	PART NUMBER	DESCRIPTION
1	1	MPH0043	CHIP PAN RIGHT SIDE
2	1	MPH0041	CHIP PAN RIGHT TOP
3	1	MPH0040	CHIP PAN RIGHT FRONT
4	1	MPH0042	CHIP PAN RIGHT, REAR
5	1	MPH0049	CHIP PAN LEFT FRONT
6	1	MPH0053	ATC REAR DRAIN PAN
7	1	MPH0051	CHIP PAN LEFT REAR
8	1	MPH0052	CHIP PAN LEFT SIDE
9	1	MPH0050	CHIP PAN LEFT TOP
10	1	MPH0038	TOP COVER
11	1	MP60163	OPERATOR DOOR - LEXAN
12	1	MPH0079	TOP WIRE CHANNEL
13	1	MPH0071	HMC20 CHIP PAN TOP STIFFENER
14	3	MPH0079	COVER PLATE
15	2	MPH0075	REMOTE SWITCH BOX
16	61	HD00012	M6 RUBBERISED WASHER
17	8	HD00058	M5 RUBBERIZED WASHER
18	20	BHCS M5-0.8 x 10	M5-0.8 x 10 BHCS
19	97	BHCS M6-1.0 x 12	M6 - 1.0 x 12 BHCS
20	8	SHCS M6-1.0 x 20	M6-1.0 x 20 SHCS
21	8	NUT HEX M5-0.8	M5 - 0.8 NYLOCK HEX NUT
22	23	WASHER FLAT M6	M6 FLAT WASHER
23	8	WASHER LOCK M6	M6 LOCK WASHER

	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	DRAWN	DTE 07 AUG 08	
MATERIAL:		TITLE: CHIP PAN BODY	
FINISH:		SCALE: 1:96 DWG. NO. 10038004	
UNLESS OTHERWISE SPECIFIED:		ESTIMATED WEIGHT: STOCK/ASSY No.	
DIMENSIONS ARE IN INCHES (MM)		495.0 LBS.	
TOLERANCES:		SHEET No. 1 OF 2	
FRACTIONAL ±		SIZE B	
ANGULAR: MACH ± 1.0 BEND ±			
ONE PLACE DECIMAL ±.030 [76]			
TWO PLACE DECIMAL ±.010 [26]			
THREE PLACE DECIMAL ±.005 [13]			



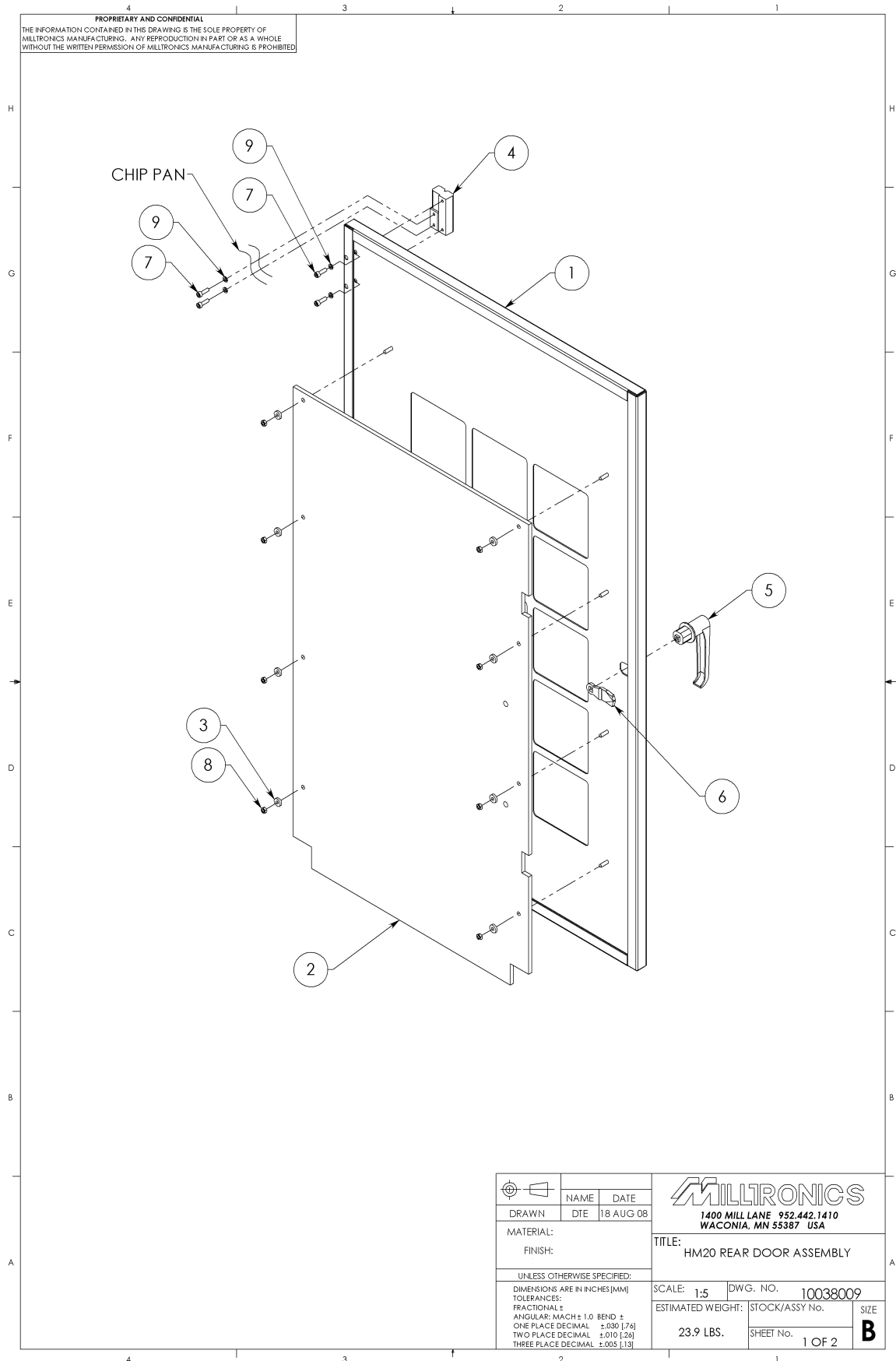
Enclosure Front Door Assembly



ITEM NO.	HM20 CHIP PAN/QTY.	PART NUMBER	DESCRIPTION
1	1	MPH0046	CHIP PAN, FRONT DOOR, LEFT
2	1	MPH0045	CHIP PAN, FRONT DOOR, RIGHT
3	2	MP10484	LOWER DOOR TRACK
4	2	MP00239	OPERATOR DOOR - LEXAN
5	2	MP10501	VM20 DOOR SLIDE SPACER
6	2	MP00748	DOOR STOP
7	4	MP10496	WHEEL BRACKET, FRONT DOORS
8	2	MP00838	20" K&V 100lb 8400 SLIDE
9	4	MP10495	ROLLER, VM20/RW CHIP PAN DOOR
10	1	HD00058	M5 RUBBERIZED WASHER
11	2	WX00297	HANDLE
12	2	WX00156	BUMPER
13	3	WX00310	BUMPER
14	10	BHCS M4-0.7 x 10	M4-0.7 x10 BHCS
15	8	BHCS M5-0.8 x 20	M5-0.8 x 20 BHCS
16	1	BHCS M6-1.0 x 12	M6 - 1.0 x 12 BHCS
17	8	BHCS M8-1.25 x 16	M8 - 1.25 x 16 BHCS
18	12	SHCS M6-1.0 x 12	M6-1.0 x 12 SHCS
19	24	NUT HEX M5-0.8	M5 - 0.8 NYLOCK HEX NUT
20	20	WASHER LOCK M6	M6 LOCK WASHER
21	8	WASHER FLAT M5	M5 FLAT WASHER
22	20	WASHER FLAT M6	M6 FLAT WASHER

 DRAWN DTE 13 AUG 08	NAME	DATE
	MATERIAL: FINISH:	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 (.76) TWO PLACE DECIMAL ±.010 (.25) THREE PLACE DECIMAL ±.005 (.13)		
TITLE: CHIP PAN DOORS		SCALE: 1:24 DWG. NO. 10038005 ESTIMATED WEIGHT: 113.4 LBS.
STOCK/ASSY No.		SHEET No. 2 OF 2 SIZE B

Enclosure Rear Door Assembly



ITEM NO.	REAR DOOR/ QTY.	PART NUMBER	DESCRIPTION
1	1	MPH0044	CHIP PAN REAR DOOR
2	1	MP00239	OPERATOR DOOR - LEXAN
3	8	HD00058	M5 RUBBERIZED WASHER
4	2	WX00350	HM20 CONCEALED HINGE MOUNT
5	1	WX00348	NON LOCKING HANDLE
6	1	WX00349	1/4 TURN CAM LATCH
7	8	SHCS 10-32 x .625	10-32 x .625 SHCS
8	8	NUT HEX M5-0.8	M5 - 0.8 NYLOCK HEX NUT
9	8	WASHER LOCK #10	WASHER LOCK #10

	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	DRAWN	DTE 18 AUG 08	
MATERIAL:		TITLE: HM20 REAR DOOR ASSEMBLY	
FINISH:		SCALE: 1:8 DWG. NO. 10038009	
UNLESS OTHERWISE SPECIFIED:		ESTIMATED WEIGHT: 23.9 LBS.	
DIMENSIONS ARE IN INCHES [MM] TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]		STOCK/ASSY No.	SIZE
		SHEET No. 2 OF 2	B

4 3 2 1

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H
G
F
E
D
C
B
A

The diagram illustrates the assembly of the HM20 side door. Component 1 is the main door panel, which features a grid of 16 rectangular openings arranged in 4 rows and 4 columns. Component 2 is a top rail or frame piece. Components 3, 4, 5, 6, 7, 8, and 9 are various hardware items including bolts, washers, and mounting brackets used to secure the door panel and its frame. Dashed lines indicate the alignment and assembly path for these components.

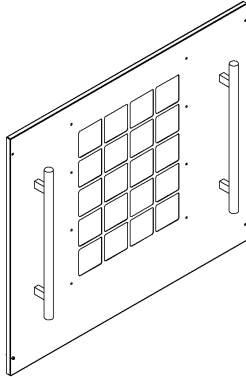
	NAME	DATE
	DRAWN	DTE
MATERIAL:		
FINISH:		
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [MM] TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ± .030 [.76] TWO PLACE DECIMAL ± .010 [.25] THREE PLACE DECIMAL ± .005 [.13]		
SCALE: 1:8		DWG. NO. 10038010
ESTIMATED WEIGHT: 55.3 LBS.		STOCK/ASSY No. SHEET No. 1 OF 2

MILLTRONICS
1400 MILL LANE 952.442.1410
WACONIA, MN 55387 USA

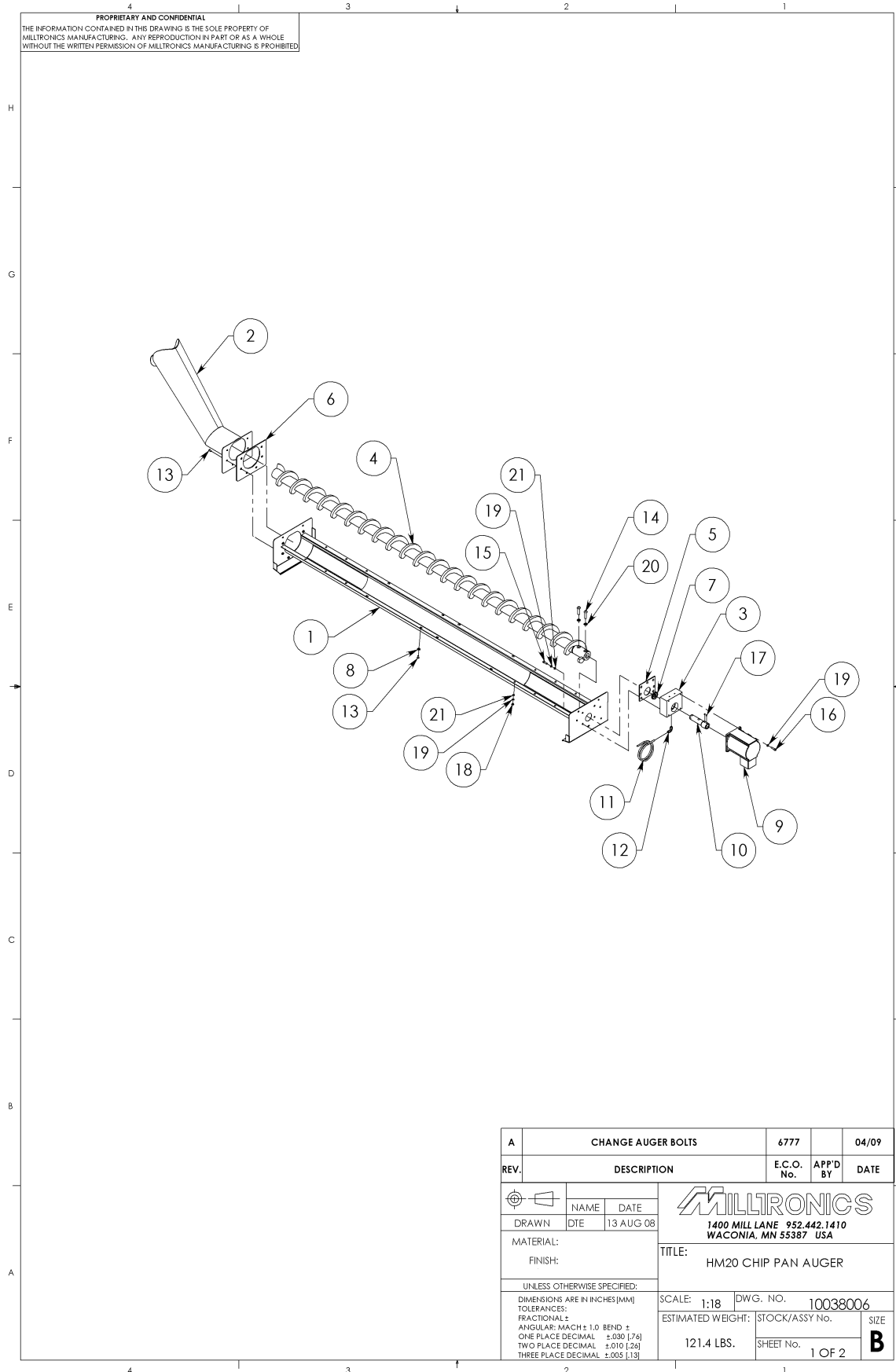
TITLE: HM20 SIDE DOOR ASSEMBLY

SIZE **B**

4 3 2 1

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<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 10%;">ITEM NO.</th> <th style="width: 15%;">SIDE DOOR/QTY.</th> <th style="width: 30%;">PART NUMBER</th> <th style="width: 45%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td><td>MP10483</td><td>DOOR, SIDE</td></tr> <tr><td>2</td><td>1</td><td>MP60163</td><td>OPERATOR DOOR - LEXAN</td></tr> <tr><td>3</td><td>2</td><td>WX00297</td><td>HANDLE</td></tr> <tr><td>4</td><td>8</td><td>HD00058</td><td>M5 RUBBERIZED WASHER</td></tr> <tr><td>5</td><td>8</td><td>NUT HEX M5-0.8</td><td>M5 - 0.8 NYLOCK HEX NUT</td></tr> <tr><td>6</td><td>4</td><td>WASHER FLAT M8</td><td>M8 FLAT WASHER</td></tr> <tr><td>7</td><td>4</td><td>BHCS M8-1.25 x 16</td><td>M8-1.25 x 16 BHCS</td></tr> <tr><td>8</td><td>4</td><td>SHCS M6-1.0 x 30</td><td>M6-1.0 x 30 SHCS</td></tr> <tr><td>9</td><td>4</td><td>NUT HEX NYLOCK M6-1.0</td><td>M6-1.0 NYLOCK HEX NUT</td></tr> </tbody> </table>				ITEM NO.	SIDE DOOR/QTY.	PART NUMBER	DESCRIPTION	1	1	MP10483	DOOR, SIDE	2	1	MP60163	OPERATOR DOOR - LEXAN	3	2	WX00297	HANDLE	4	8	HD00058	M5 RUBBERIZED WASHER	5	8	NUT HEX M5-0.8	M5 - 0.8 NYLOCK HEX NUT	6	4	WASHER FLAT M8	M8 FLAT WASHER	7	4	BHCS M8-1.25 x 16	M8-1.25 x 16 BHCS	8	4	SHCS M6-1.0 x 30	M6-1.0 x 30 SHCS	9	4	NUT HEX NYLOCK M6-1.0	M6-1.0 NYLOCK HEX NUT
ITEM NO.	SIDE DOOR/QTY.	PART NUMBER	DESCRIPTION																																								
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">  </td> <td style="width: 10%;">NAME</td> <td style="width: 10%;">DATE</td> <td rowspan="2" style="width: 40%; text-align: center; vertical-align: middle;">  1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA </td> <td rowspan="2" style="width: 30%; text-align: center; vertical-align: middle;"> TITLE: HM20 SIDE DOOR ASSEMBLY </td> </tr> <tr> <td>DRAWN</td> <td>DTE</td> <td>16 SEP 08</td> </tr> <tr> <td colspan="3">MATERIAL:</td> <td colspan="2" rowspan="2"></td> </tr> <tr> <td colspan="3">FINISH:</td> </tr> <tr> <td colspan="3" style="font-size: 0.7em;"> UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.25] THREE PLACE DECIMAL ±.005 [.13] </td> <td style="width: 15%;">SCALE: 1:16</td> <td style="width: 15%;">DWG. NO. 10038010</td> </tr> <tr> <td colspan="3"></td> <td style="width: 15%;">ESTIMATED WEIGHT: 55.3 LBS.</td> <td style="width: 15%;">STOCK/ASSY No.</td> </tr> <tr> <td colspan="3"></td> <td style="width: 15%;">SHEET No. 2 OF 2</td> <td style="width: 15%; text-align: center; font-size: 1.5em;"> B </td> </tr> </table>					NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA	TITLE: HM20 SIDE DOOR ASSEMBLY	DRAWN	DTE	16 SEP 08	MATERIAL:					FINISH:			UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.25] THREE PLACE DECIMAL ±.005 [.13]			SCALE: 1:16	DWG. NO. 10038010				ESTIMATED WEIGHT: 55.3 LBS.	STOCK/ASSY No.				SHEET No. 2 OF 2	B									
	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA	TITLE: HM20 SIDE DOOR ASSEMBLY																																							
DRAWN	DTE	16 SEP 08																																									
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			SHEET No. 2 OF 2	B																																							

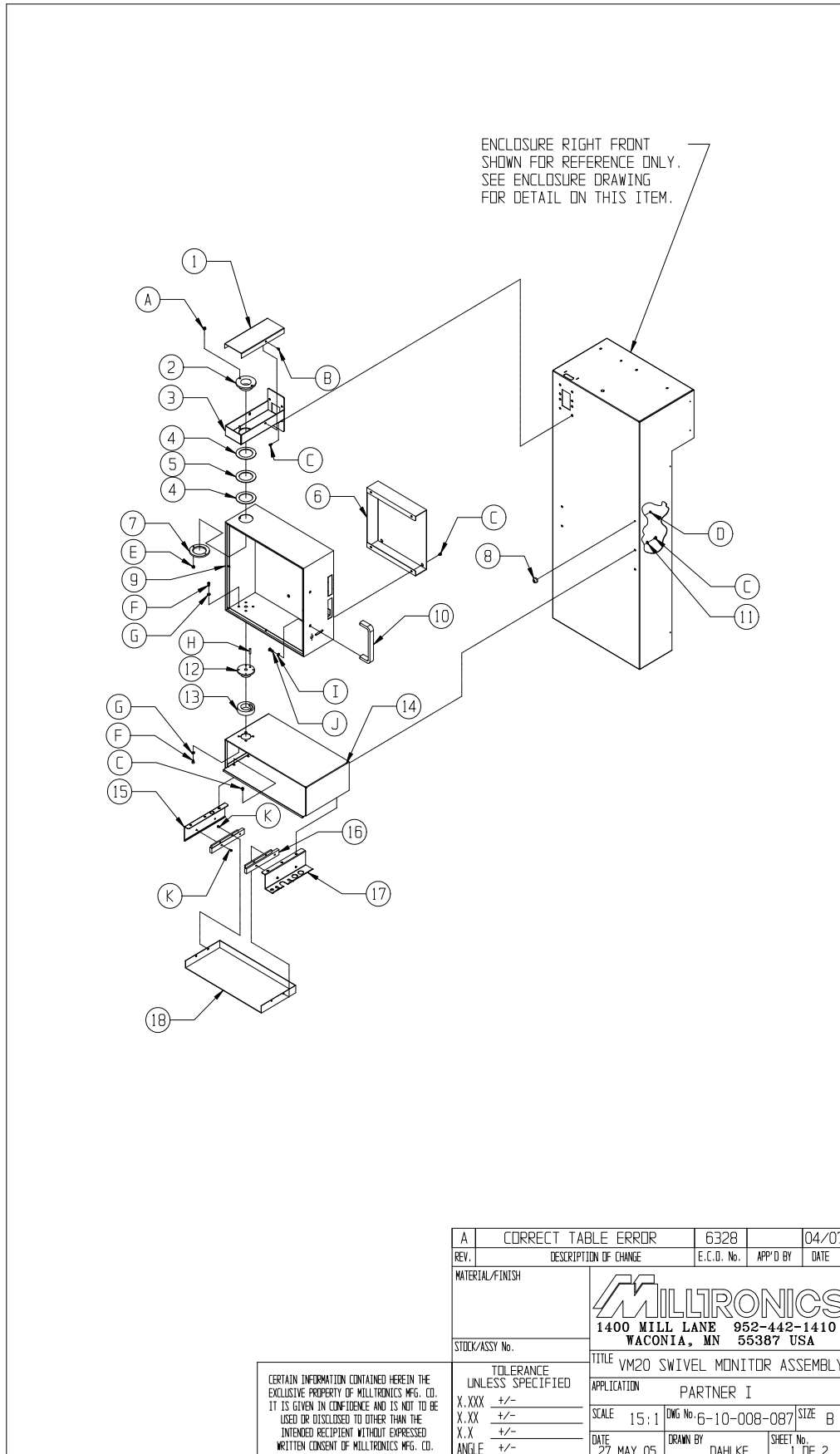
Chip Auger Assembly

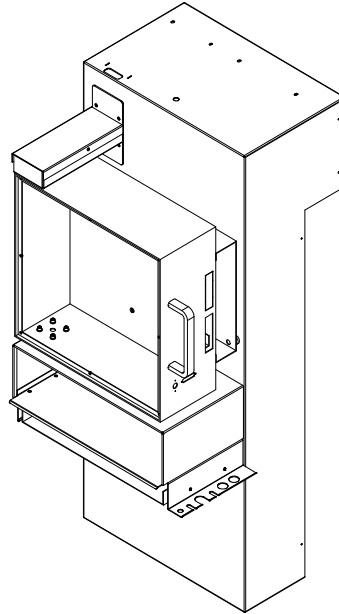


ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	MPH0054	AUGER TROUGH
2	1	MP00757	AUGER CHUTE
3	1	MP00440	BROTHER AUGER MOTOR MOUNTING BRACKET
4	1	MP00440	4" DIA. AUGER
5	1	WX00313	AUGER MOTOR PLATE GASKET
6	1	WX00361	AUGER CHUTE GASKET - (MP00757)
7	1	BG00069	BEARING CUP OIL SEAL
8	8	HD00012	M6 RUBBERIZED WASHER
9	1	MO00120	AUGER MOTOR
10	1	MP00441	BROTHER AUGER DRIVE SHAFT
11	1	NU00025	1/4" NYLON TUBING (12" LENGTH)
12	1	NU00171	ELBOW - M/S 1/4 TUBE x 1/4NPT
13	14	BHCS M6-1.0 x 12	M6 - 1.0 x 12mm BHCS
14	2	BHCS M10-1.5 x 40	M10-1.5 x 40mm BHCS
15	4	SHCS M6-1.0 x 20	M6-1.0 x 20mm SHCS
16	4	SHCS M6-1.0 x 25	M6-1.0 x 25mm SHCS
17	2	SHSS 10-32 x .25	10-32 x .25 SHSS
18	12	NUT HEX NYLOCK M6-1.0	M6-1.0 NYLOCK HEX NUT
19	20	WASHER LOCK M6	M6 LOCK WASHER
20	2	WASHER LOCK M10	M10 LOCK WASHER
21	16	WASHER FLAT M6	M6 FLAT WASHER

A	CHANGE AUGER BOLTS		6777	-	04/09					
REV.	DESCRIPTION		E.C.O. No.	APP'D BY	DATE					
 <table border="1"> <tr> <td>NAME</td> <td>DATE</td> </tr> <tr> <td>DRAWN</td> <td>DTE</td> </tr> <tr> <td colspan="2">13 AUG 08</td> </tr> </table>		NAME	DATE	DRAWN	DTE	13 AUG 08		 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA		
NAME	DATE									
DRAWN	DTE									
13 AUG 08										
MATERIAL:		TITLE: HM20 CHIP PAN AUGER								
FINISH:										
UNLESS OTHERWISE SPECIFIED:										
DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 (.76) TWO PLACE DECIMAL ±.010 (.26) THREE PLACE DECIMAL ±.005 (.13)		SCALE: 1:32	DWG. NO.	10038006						
		ESTIMATED WEIGHT:	STOCK/ASSY No.		SIZE					
		121.4 LBS.	SHEET No.		B					
				2 OF 2						

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	MP1-492	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

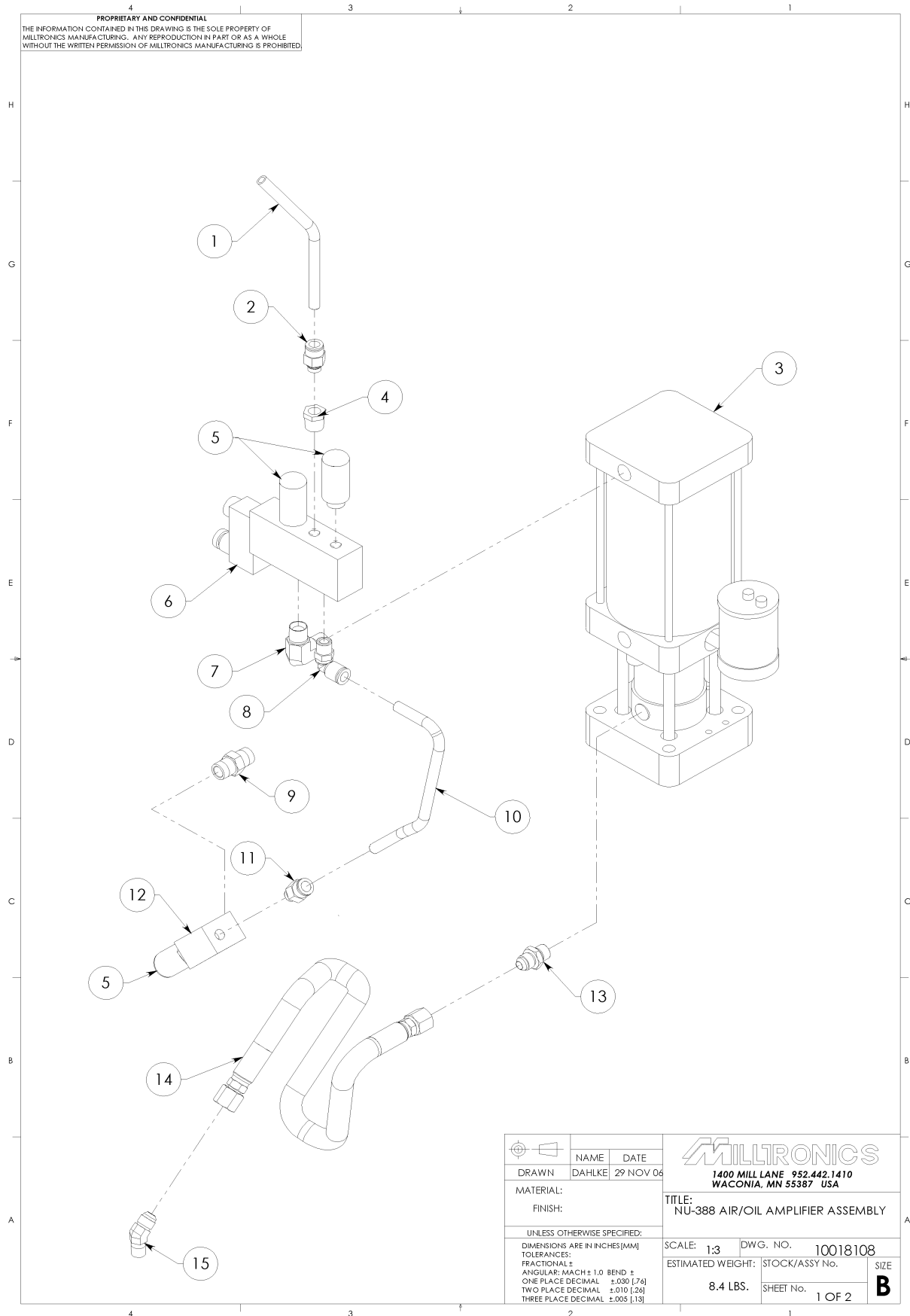
PARTS LIST		
No.	QTY	DESCRIPTION
A	2	M6-1 NYLOCK NUT
B	2	M5-.8 x 10mm BHCS
C	18	M6-1 x 10mm BHCS
D	1	8-32 NYLOCK NUT
E	2	M5-.8 NYLOCK NUT
F	8	M6-1 x 10mm SHCS
G	8	M6 LOCK WASHER
H	1	1/4 x .5 DOWEL PIN
I	2	M8 FLAT WASHER
J	2	M8-1.25 x 20mm BHCS
K	8	M3-.5 x 10mm BHCS

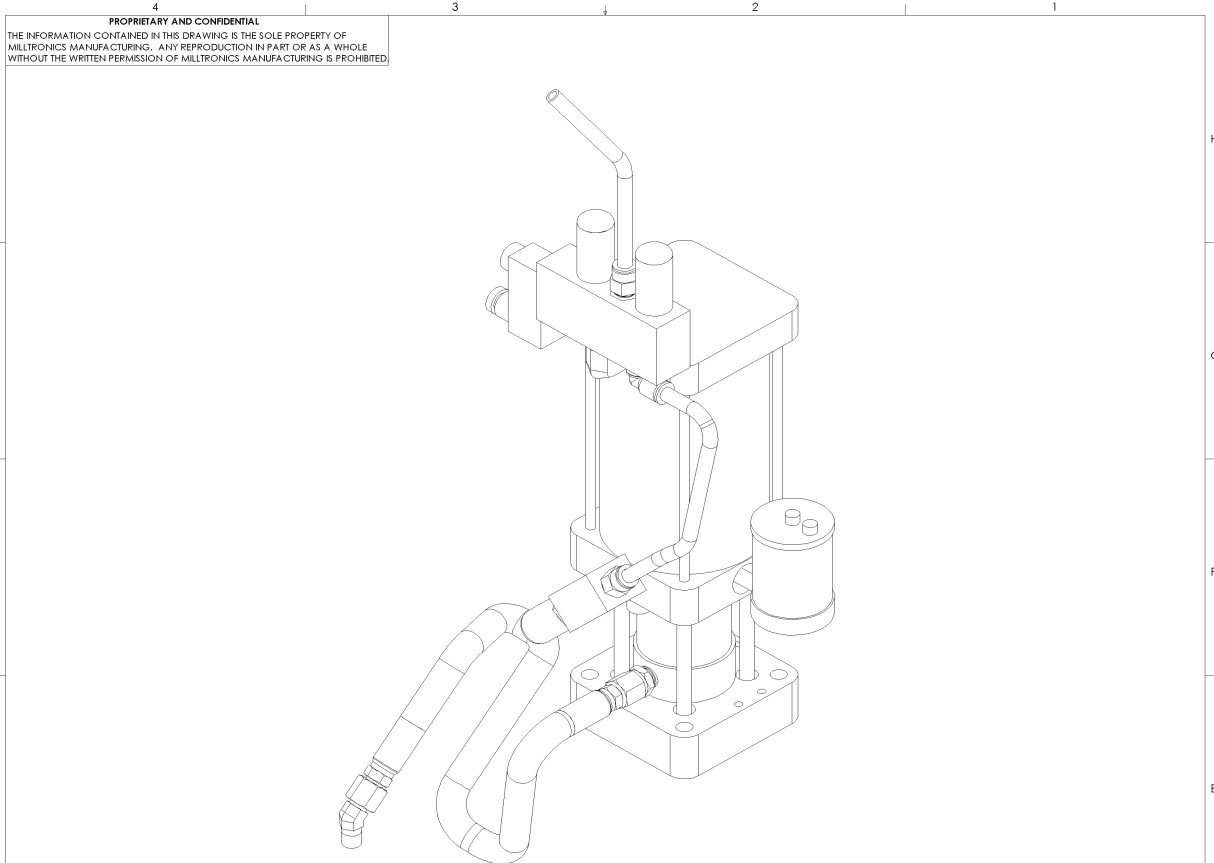
SWIVEL BOX TABLE		
No.	CENT. 7	INT. CONTROL
9	MM-80	MPIC-03

A	CORRECT TABLE ERROR	6328		04/07
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
X.X +/-		DATE 27 MAY 05		SIZE B
ANGLE +/-		DRAWN BY DAHLKE		SHEET No. 2 OF 2

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Power Drawbar Cylinder Assembly





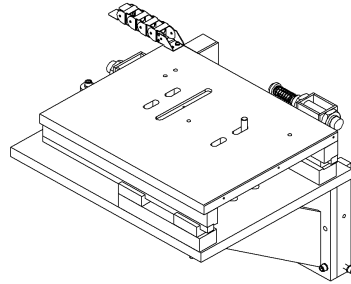
ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	NU00078	3/8 AIR LINE
2	1	NU00095	TUBE CONNECTOR - M/S 3/8 TUBE 1/4NPT
3	1	NU00408	AIR/OIL AMPLIFIER SYSTEM
4	1	NU00027	REDUCER - 3/8 x 1/4NPT
5	3	NU00375	MUFFLER
6	1	NU00293	SOLENOID VALVE
7	1	NU00292	MALE ELBOW - 3/8NPT
8	1	NU00412	SWIVEL ELBOW - M/S 10mm TUBE 3/8NPT
9	1	NU00235	NIPPLE - 3/8NPT
10	1	NU00306	10mm AIR LINE
11	1	NU00297	TUBE CONNECTOR - M/S 10mm TUBE 3/8NPT
12	1	NU00402	EXHAUST VALVE
13	1	NU00409	FLARE FITTING - 3/8NPT
14	1	NU00403	19" INLINE AMPLIFIER HOSE
15	1	NU00410	ELBOW FLARE FITTING - 1/8NPT x 45°

 DRAWN DAHLKE/29 NOV 06	NAME	DATE	 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	MATERIAL: FINISH:		
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]			SCALE: 1:3 DWG. NO. 10018108 ESTIMATED WEIGHT: 8.4 LBS. STOCK/ASSY No. SHEET No. 2 OF 2

SIZE **B**

Tool Changer Slide/Bracket Assembly

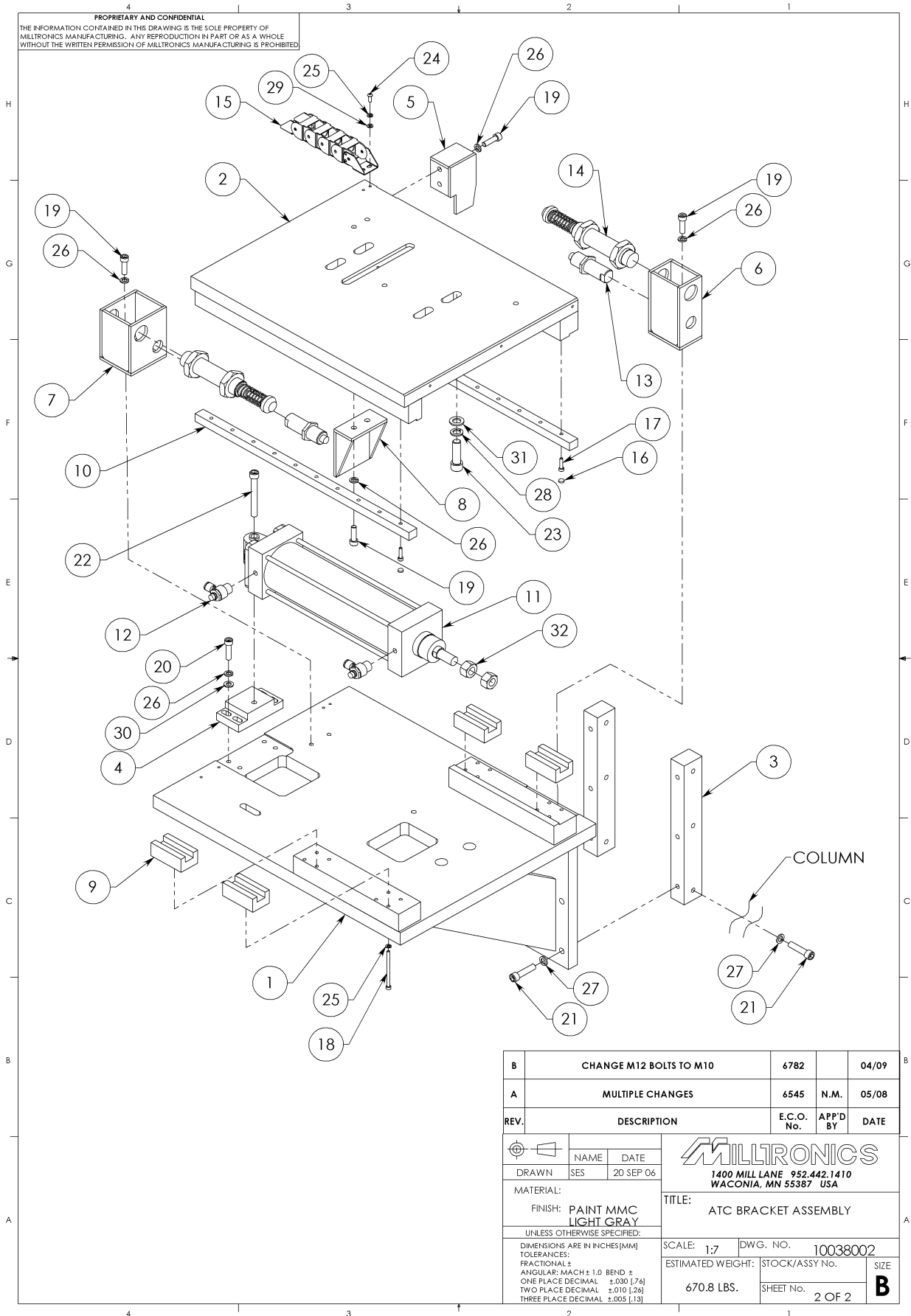
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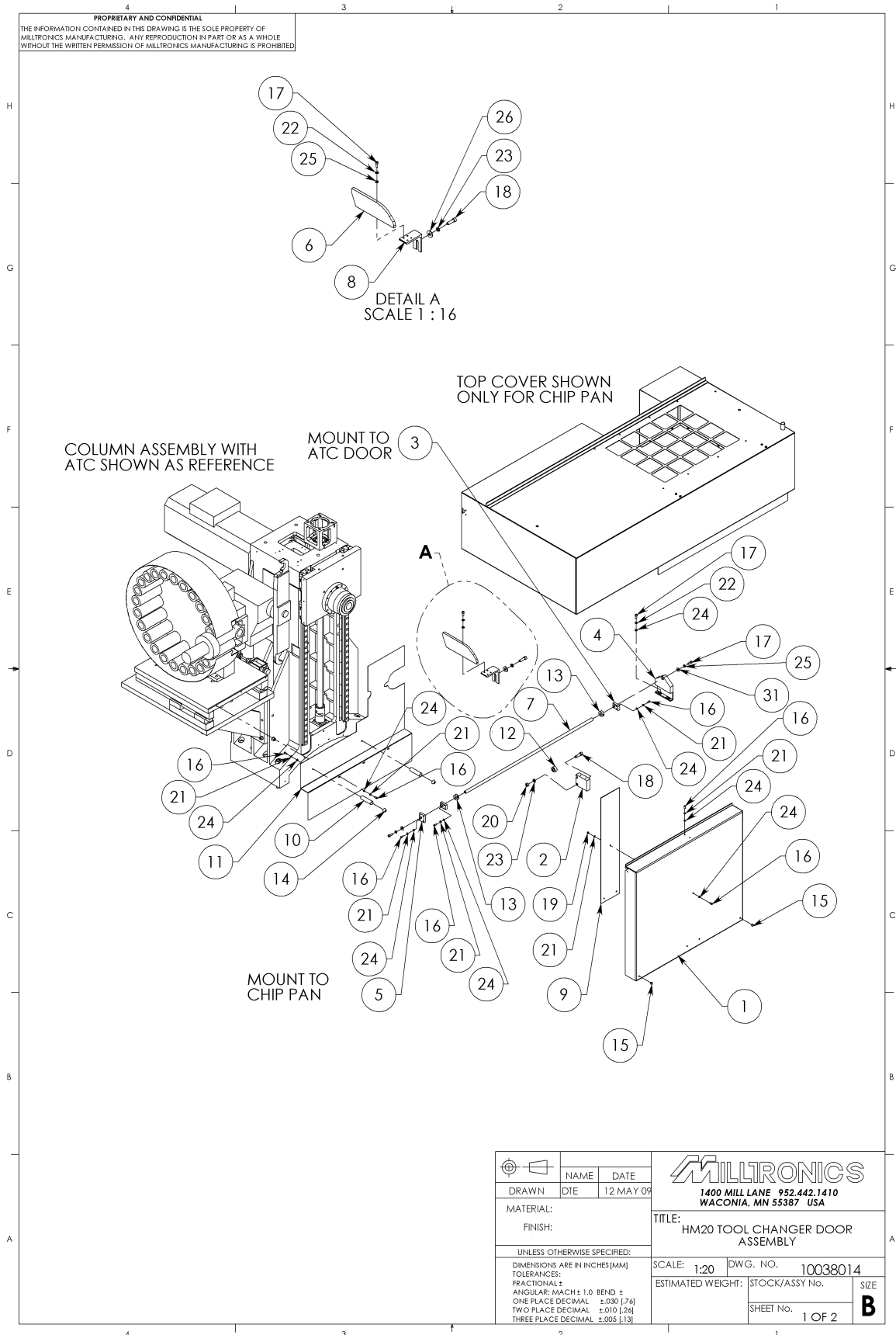
ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	MPH0021	ATC AIR CYLINDER BRACKET
2	1	MPH0023	ATC MOUNT BRACKET
3	2	MPH0019	ATC AIR CYLINDER COLUMN BRACKET
4	1	MPH0111	HM20 CYLINDER BLOCK-ATC
5	1	MPH0109	EXTEND STOP BRACKET
6	1	MPH0110	SHOCK BRACKET
7	1	MPH0107	STOP-SHOCK MOUNT
8	1	MPH0108	RETRACT STOP BRACKET
9	4	MPH0028	ATC MOUNT RAIL BLOCK
10	2	MPH0027	ATC MOUNT RAIL
11	1	NU00422	CYLINDER ASSEMBLY
12	2	NU00423	FLOW CONTROL VALVE
13	2	HD00100	SHOCK STOP & NUT
14	2	HD00098	CUSHION SHOCK & NUTS
15	1	MP60220	CABLE TRACK ASSEMBLY
16	20	RAIL PLUG 11mm	11mm RAIL PLUG
17	20	SHCS M6-1.0 x 25	M6-1.0 x 25mm SHCS
18	16	SHCS M6-1.0 x 90	M6-1.0 x 90mm SHCS
19	8	SHCS M10-1.5 x 35	10-1.5 x 35mm SHCS
20	4	SHCS M10-1.5 x 40	M10-1.5 x 40mm SHCS
21	12	SHCS M12-1.75 x 50	M12-1.75 x 50mm SHCS
22	1	SHCS M12-1.75 x 100	M12-1.75 x 100mm SHCS
23	4	SHCS M16-2.0 x 55	M16-2.0 x 55mm SHCS
24	4	BHCS M6-1.0 x 16	M6 - 1.0 x 16mm BHCS
25	20	WASHER LOCK M6	M6 LOCK WASHER
26	12	WASHER LOCK M10	M10 LOCK WASHER
27	12	WASHER LOCK M12	M12 LOCK WASHER
28	4	WASHER LOCK M16	M16 LOCK WASHER
29	4	WASHER FLAT M6	M6 FLAT WASHER
30	4	WASHER FLAT M10	M10 FLAT WASHER
31	4	WASHER FLAT M16	M16 FLAT WASHER
32	2	HEX NUT M20-1.5	M20-1.5 HEX NUT

Not shown, NU00382, 4-Way Air Valve

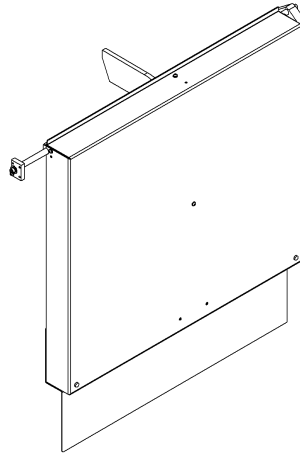
B	CHANGE M12 BOLTS TO M10	6782		04/09
A	MULTIPLE CHANGES	6545	N.M.	05/08
REV.	DESCRIPTION	E.C.O. No.	APP'D BY	DATE
		 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA		
DRAWN	NAME	DATE	TITLE:	
SES		20 SEP 06	ATC BRACKET ASSEMBLY	
MATERIAL:		FINISH: PAINT MMC LIGHT GRAY		
UNLESS OTHERWISE SPECIFIED:				
DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]				
SCALE: 1:12		DWG. NO. 10038002		SIZE B
ESTIMATED WEIGHT: 670.8 LBS.		STOCK/ASSY No.		
		SHEET No. 1 OF 2		



Tool Changer Door Assembly



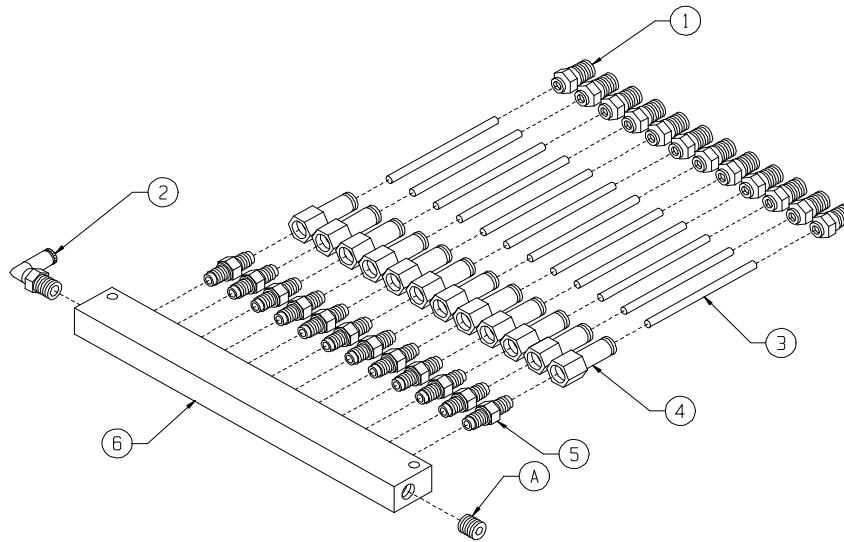
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ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	MPH0099	HM20 ATC DOOR
2	1	MPH0100	ATC DOOR-CENTER FOLLOWER BRACKET
3	2	MPH0101	ATC DOOR-CORNER BUSHING
4	1	MPH0102	ATC DOOR-COLUMN BRACKET
5	1	MPH0103	ATC DOOR-END BUSHING
6	1	MPH0104	ATC DOOR - DOOR GUIDE PLATE TOP
7	1	MPH0105	HM20 ATC DOOR-PIVOT SHAFT
8	1	MPH0115	ATC DOOR GUIDE PLATE BOTTOM
9	1	MPH0116	DOOR BACKER PLATE
10	2	MPH0117	ATC DOOR BUMPER SPACER
11	1	MPH0039	ATC MAIN SHIELD
12	1	BG00193	5201ZZ, BEARING
13	2	MPH0132	2 PIECE SPLIT COLLAR
14	2	WX00156	BUMPER
15	2	WX00310	BUMPER FRONT DOOR ENCLOSURE
16	18	BHCS M6-1.0 x 16	M6 - 1.0 x 16mm BHCS
17	8	SHCS M8-1.25 x 20	M8-1.25 x 20 SHCS
18	3	SHCS M12-1.75 x 40	M12-1.75 x 40 SHCS
19	3	NUT HEX NYLOCK M6-1.0	M6-1.0 NYLOCK HEX NUT
20	1	NUT HEX M12-1.75	M6 LOCK WASHER
21	18	WASHER LOCK M6	M6 LOCK WASHER
22	6	WASHER LOCK M8	M8 LOCK WASHER
23	3	WASHER LOCK M12	M12 LOCK WASHER
24	18	WASHER FLAT M6	M6 FLAT WASHER
25	6	WASHER FLAT M8	M8 FLAT WASHER
26	2	WASHER FLAT M12	M12 FLAT WASHER
31	2	WASHER FLAT .312	5/16 FLAT WASHER

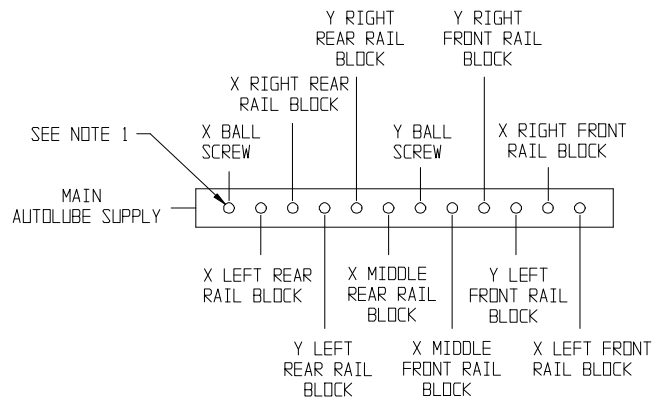
	NAME _____ DATE _____		
	DRAWN DTE	12 MAY 09	
MATERIAL:		TITLE:	
FINISH:		HM20 TOOL CHANGER DOOR ASSEMBLY	
UNLESS OTHERWISE SPECIFIED:		SCALE: 1:48	DWG. NO. 10038014
DIMENSIONS ARE IN INCHES (MM)		ESTIMATED WEIGHT: 2899.5 LBS.	STOCK/ASSY NO.
TOLERANCES:		SHEET No. 2 OF 2	
FRACTIONAL ±		SIZE B	
ANGULAR: MACH ± 1.0° BEND ±			
ONE PLACE DECIMAL ±.030 [.76]			
TWO PLACE DECIMAL ±.010 [.25]			
THREE PLACE DECIMAL ±.005 [.13]			

X & Y Axis Autolube Manifold Assembly



NOTES:-

1. X MIDDLE RAILBLOCK PORTS, FRONT AND REAR ARE PLUGGED IF NOT USED.



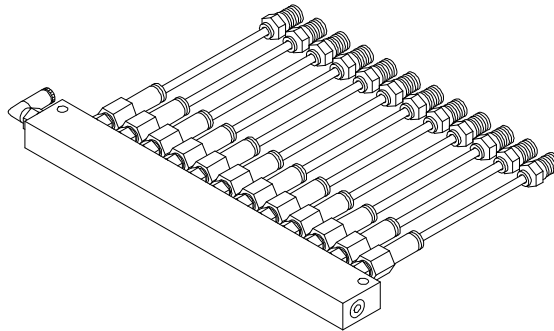
AUTOLUBE LINE DESTINATIONS

B	UPDATE OIL METER FITTINGS	6760		03/09
A	ADD FRAMES TO CHART	5996	N.M.	08/05
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA				
TITLE X & Y AXIS				
AUTOLUBE MANIFOLD ASSEMBLY				
APPLICATION GENERAL PRODUCTS				
SCALE 2:1		DWG No 6-10-018-049		SIZE B
DATE 25 JUL 97		DRAWN BY THOMPSON		SHEET NO. 1 OF 2

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TOLERANCE
UNLESS SPECIFIED
X.XXX ±
X.XX ±
X.X ±
ANGLE ±

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 (NU-156)
X RIGHT REAR RAIL BLOCK	27	27	44	44	#3 (NU-156)
Y LEFT REAR RAIL BLOCK	12	12	24	24	#3 (NU-156)
Y RIGHT REAR RAIL BLOCK	24	30	44	44	#3 (NU-156)
X MIDDLE REAR RAIL BLOCK	-	-	38	38	#3 (NU-156)
Y BALL SCREW	26	32	39	39	#2 (NU-155)
X MIDDLE FRONT RAIL BLOCK	-	-	38	38	#3 (NU-156)
Y RIGHT FRONT RAIL BLOCK	24	30	44	44	#3 (NU-156)
Y LEFT FRONT RAIL BLOCK	12	12	24	24	#3 (NU-156)
X RIGHT FRONT RAIL BLOCK	27	27	44	44	#3 (NU-156)
X LEFT FRONT RAIL BLOCK	20	20	24	24	#3 (NU-156)
X BALL SCREW	40	40	60	60	#2 (NU-155)

ALL MEASUREMENTS ARE IN INCHES

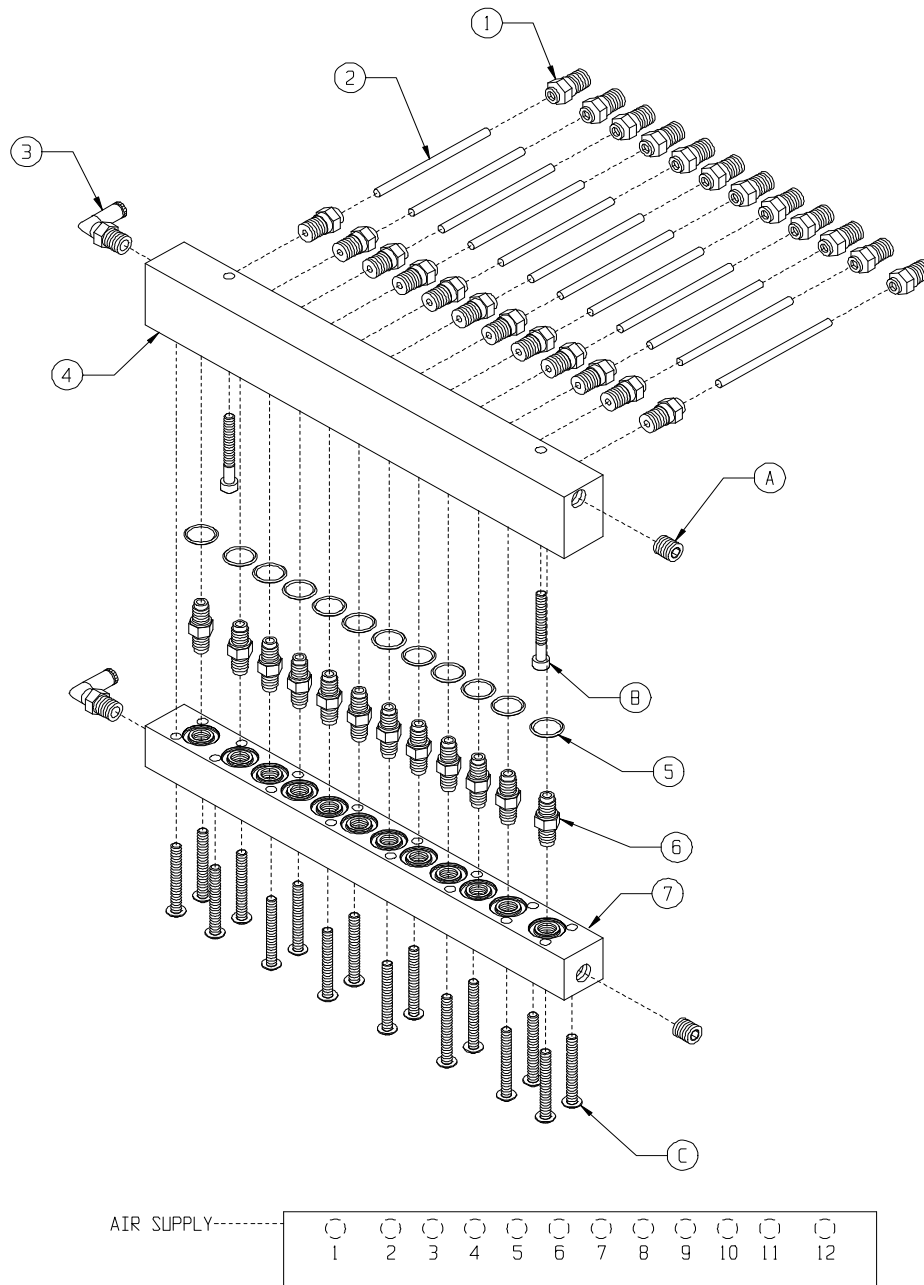
HARDWARE LIST

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

B	UPDATE OIL METER FITTINGS	6760		03/09
A	ADD FRAMES TO CHART	5996	N.M.	08/05
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 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 ±				

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X & Y Axis Air/Oil Manifold Assembly

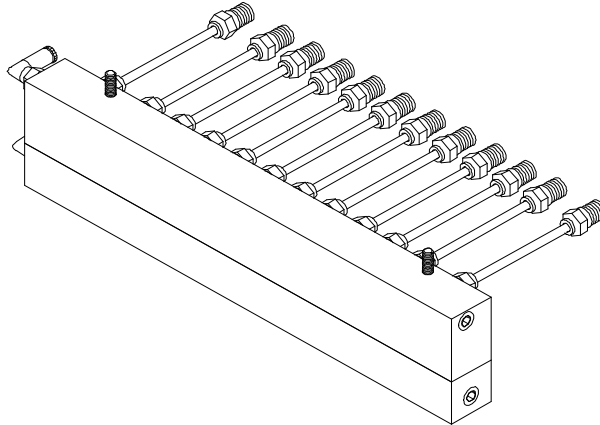


AIR/OIL LINE DESTINATIONS

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	Y LEFT FRONT RAIL BLOCK
11	X RIGHT FRONT RAIL BLOCK
12	X LEFT FRONT RAIL BLOCK

E	CHANGE TABLE	6060		01/06
D	ADD FRAMES	5995	N.M.	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.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. 1 OF 2		
ANGLE +/- 1.0°				

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)	OIL METER
X LEFT REAR RAIL BLOCK	20	20	24	24	#3 (NU-156)
X RIGHT REAR RAIL BLOCK	27	27	44	44	#3 (NU-156)
Y LEFT REAR RAIL BLOCK	13	12	24	24	#3 (NU-156)
Y RIGHT REAR RAIL BLOCK	33	30	44	44	#3 (NU-156)
X MIDDLE REAR RAIL BLOCK	-	-	38	38	#3 (NU-156)
Y BALL SCREW	26	32	39	39	#2 (NU-155)
X MIDDLE FRONT RAIL BLOCK	-	-	38	38	#3 (NU-156)
Y RIGHT FRONT RAIL BLOCK	30	30	44	44	#3 (NU-156)
Y LEFT FRONT RAIL BLOCK	12	12	24	24	#3 (NU-156)
X RIGHT FRONT RAIL BLOCK	27	27	44	44	#3 (NU-156)
X LEFT FRONT RAIL BLOCK	20	20	24	24	#3 (NU-156)
X BALL SCREW	40	40	60	60	#2 (NU-155)

ALL MEASUREMENTS ARE IN INCHES

NOTES:

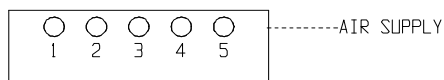
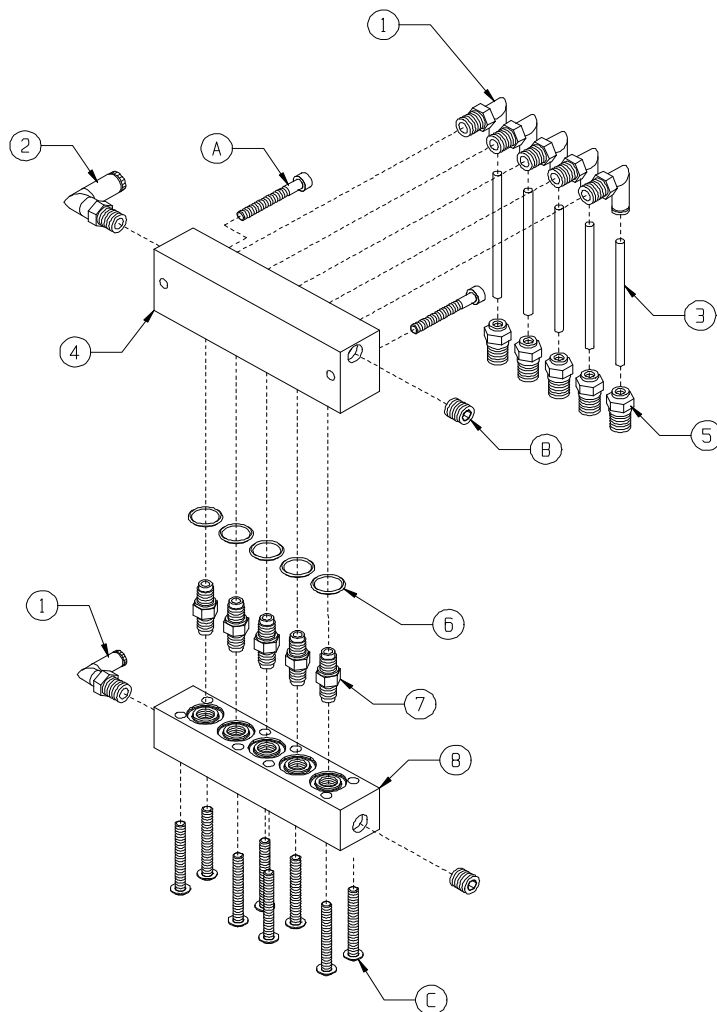
- IF REFERENCED WITH A (-) PLUG AIR/OIL LINE HOLE AND OIL METER HOLE IN MANIFOLD WITH 1/8 NPT PLUG.

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

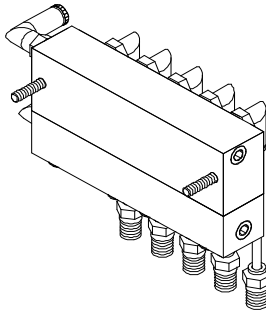
E	CHANGE TABLE	6060		01/06
D	ADD FRAMES	5995	N.M.	08/05
C	CHANGED METERS	4988	D.H.	02/01
B	ADD VMG17 TO NOTE	4729	N.M.	10/00
A	ADD VMG24 TO NOTE	4327	N.M.	12/99
REV.	DESCRIPTION OF CHANGE	E.C.O. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.		TITLE X & Y AXIS AIR/OIL MANIFOLD ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER I		
X .XXX	+/- .005	SCALE 2:1		DWG No. 6-10-008-058
X .XX	+/- .010	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.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	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

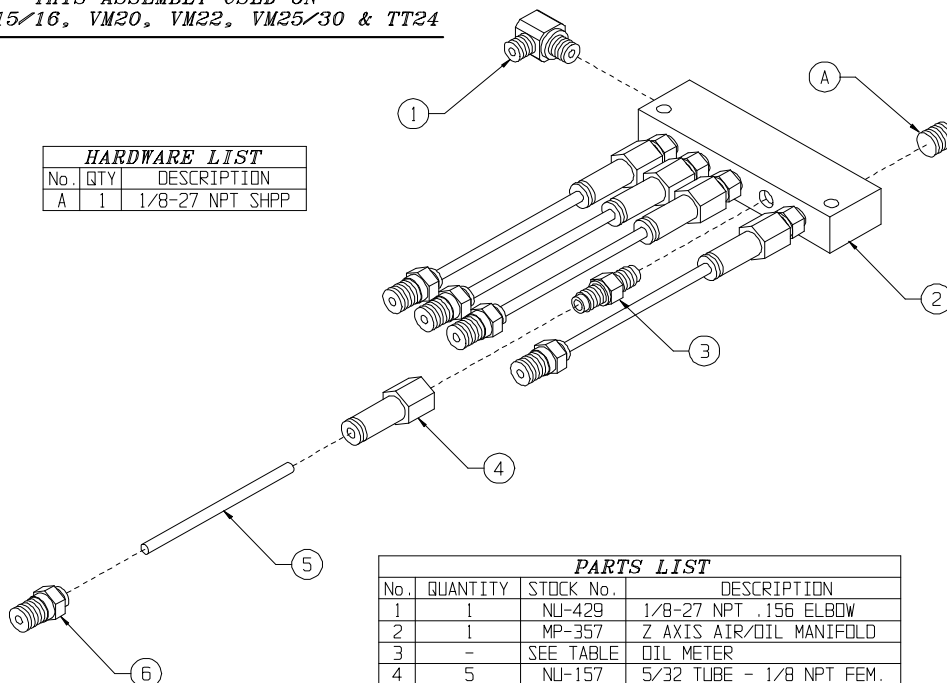
No.	QTY	DESCRIPTION
A	2	10-32 x 1 1/2 SHCS
B	2	1/8-27 NPT SHPP
C	8	10-32 x 1 1/2 BHCS

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 & TT24

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



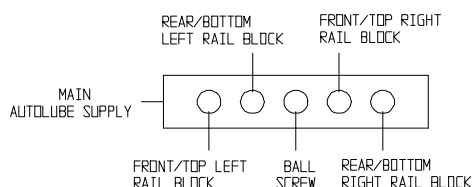
PARTS LIST			
No.	QUANTITY	STOCK No.	DESCRIPTION
1	1	NU-429	1/8-27 NPT .156 ELBOW
2	1	MP-357	Z AXIS AIR/OIL MANIFOLD
3	-	SEE TABLE	OIL METER
4	5	NU-157	5/32 TUBE - 1/8 NPT FEM.
5	SEE TABLE	NU-117	5/32 NYLON TUBING
6	5	SEE TABLE	5/32 TUBE-1/8 NPT M/S

NU-117 TUBING LENGTH						OIL METER
CONNECTION	VM15/16	VM20	VM22	VM25/30	TT24	
FRONT/TOP LEFT RAIL BLOCK	18	20	30	30	10	No.3 (NU-156)
REAR/BOTTOM LEFT RAIL BLOCK	35	14	42	42	20	No.3 (NU-156)
BALL SCREW	24	15	30	30	8	No.2 (NU-155)
REAR/BOTTOM RIGHT RAIL BLOCK	35	8	42	42	20	No.3 (NU-156)
FRONT/TOP RIGHT RAIL BLOCK	18	11	30	30	10	No.3 (NU-156)

ALL MEASUREMENTS ARE IN INCHES

No.	DESCRIPTION	VM15/16	VM20	VM22	VM25/30	TT24
6	ROLLER RAIL	NU-315	NU-315	NU-315	NU-315	NU-315
	BALL RAIL	NU-315 NU-154	NU-315	NU-315	NU-315	NU-315

AUTOLUBE LINE DESTINATIONS



NOTES:

1. USED ON ASSEMBLY No.

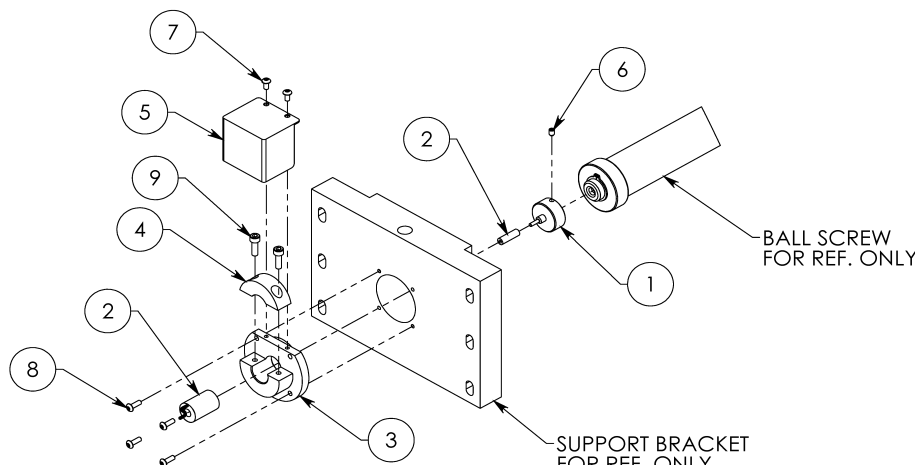
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B	ADD TT24	6750		03/09
A	ADD FRAMES TO CHART	6001	N.M.	08/05
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE 5 PORT AUTOLUBE MANIFOLD 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 ±				

Thermal Compensation Assembly

PROPRIETARY AND CONFIDENTIAL

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ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	MP00858	THERMAL BALL SCREW CAP
2	1	PR00043	THERMAL COMP SENSOR
3	1	MP00848	THERMAL SENSOR RING
4	1	MP00849	THERMAL SENSOR - CLAMP
5	1	MP00886	X AXIS THERMAL COVER
6	1	SHSSBT 10-32 x .188	10/32 x 3/16 BRASS TIPPED SHSS
7	2	BHCS M4-0.7 x 8	M4-0.7 x 8mm BHCS
8	4	BHCS M4-0.7 x 12	M4-0.7 x 12mm BHCS
9	2	SHCS M5-0.8 x 16	M5-0.8 x 16mm SHCS

NOTES:

1. ITEMS 3 & 4 ARE REVERSED ON SOME AXES
2. ITEMS 5 & 7 ARE NOT USED ON SOME AXES

	NAME	DATE
	DRAWN	JRD
MATERIAL:		
FINISH:		
UNLESS OTHERWISE SPECIFIED:		
DIMENSIONS ARE IN INCHES[MM] TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]		



MILLTRONICS
 CNC MACHINES
 1400 MILL LANE 952.442.1410
 WACONIA, MN 55387 USA

TITLE: THERMAL COMP ASSEMBLY

SCALE: 1:4 DWG. NO. 10018111

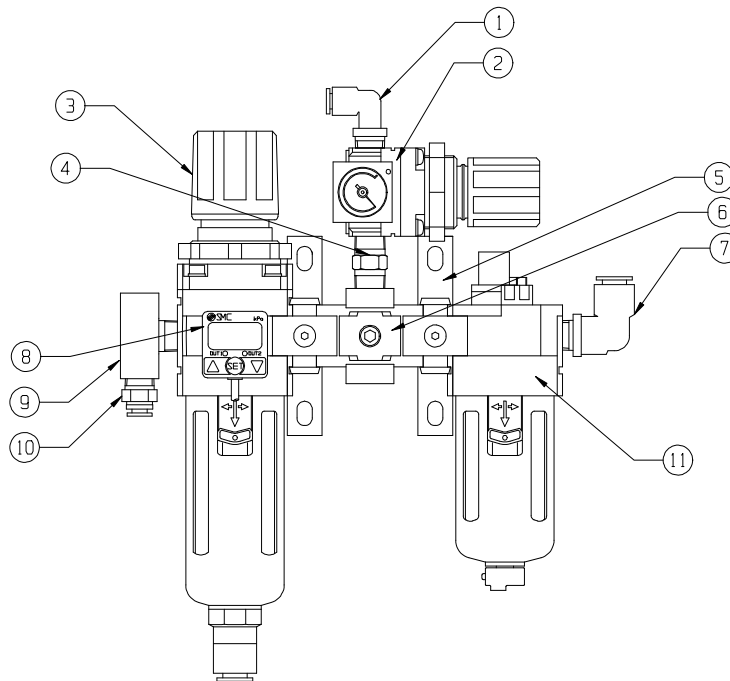
ESTIMATED WEIGHT: 16.0 Lbs.

STOCK/ASSY NO. SIZE

SHEET NO. 1 OF 1 B

Air Filter / Lubricator / Filter Assembly

PARTS LIST			
ITEM	QTY	STOCK No.	DESCRIPTION
1	1	NU-199	1/4 NPT 3/8 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-430	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

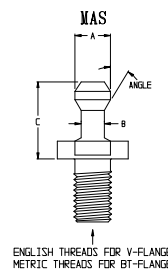


REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 952-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE NU-417 FRL ASSEMBLY		
X .XXX +/-		APPLICATION GENERAL PRODUCTS		
X .XX +/-		SCALE 3:1		
X .X +/-		DWG No. 6-10-018-112		
ANGLE +/-		SIZE B		
		DATE 14 APR 08		
		DRAWN BY DAHLKE		
		SHEET NO. 1:1		

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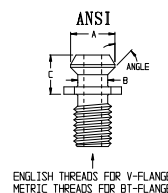
NOTE: STANDARD RETENTION KNOBS FOR 40 TAPER SPINDLES WITHOUT CTS

MAS RETENTION KNOBS STYLE CT-FLANGE 40 TAPER



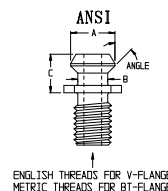
NOTE: STANDARD RETENTION KNOBS FOR 40 TAPER SPINDLES WITH CTS

ANSI RETENTION KNOBS STYLE CT-FLANGE 40 TAPER



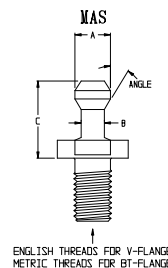
NOTE: STANDARD RETENTION KNOBS FOR 50 TAPER SPINDLES WITH OR WITHOUT CTS

ANSI RETENTION KNOBS STYLE CT-FLANGE 50 TAPER

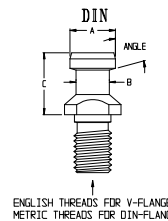


NOTE: OPTIONAL RETENTION KNOBS FOR 40 TAPER SPINDLES

MAS RETENTION KNOBS STYLE CT-FLANGE 40 TAPER



DIN 69872 RETENTION KNOBS STYLE CT-FLANGE 40 TAPER



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 FROM ECO DATE REV. G ON THIS DRAWING.

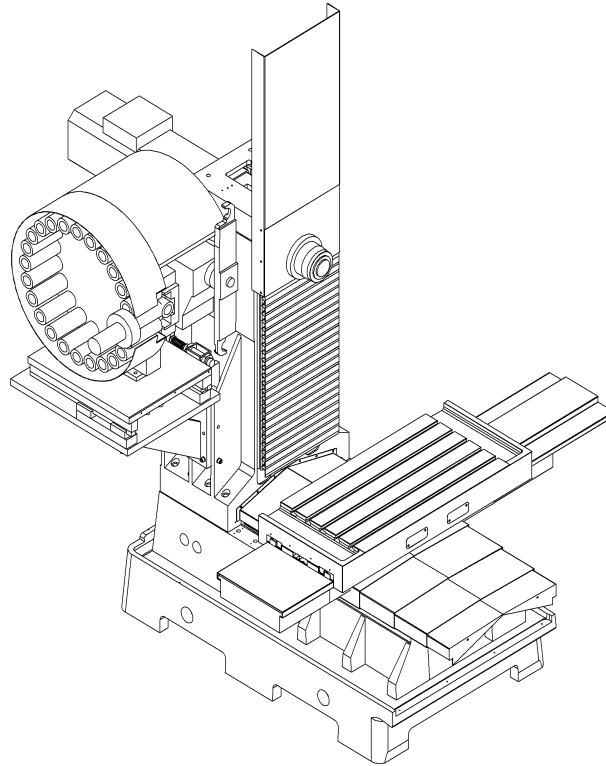
H	ADD VM22XP, RH33XP FRAMES TO 50 TAPER	6715			01/09		
G	ADD MM18 AND MOVE HMC70 FRAMES TO 50 TAPER	6193	N.M.		10/06		
F	ADD VMC, TT, AND HMC FRAMES	6175	N.M.		09/06		
E	UPDATE CHART	5992	M.N.		08/05		
D	ADD RH/RW12 & RH19	5146	N.M.		09/01		
C	ADD RETENTION KNOBS TO CHART	4859	N.M.		12/00		
B	CHANGE 70mm BT-FLANGE CHART	4730	N.M.		10/00		
A	ADD LYNDX CDRP. IN CHART	4351	N.M.		1/00		
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY		DATE		
		TITLE		RETENTION KNOB CHART	SCALE 1.75:1	ENG NO. 6-11-08-054	SIZ B
1400 WILL LANE WATVILA, NY 06097-0701 860-448-1410		APPLICATION		GENERAL PRODUCTS	DATE 30 APR 99	DRAWN BY DAHLKE	SHEET NO. 1 OF 1

Machine Lubrication Instructions

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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 WAYTEC 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. SEE PAGE TWO FOR SPECIFICATIONS.
5. USE MOBIL OIL DTE 24 OR EQUIVALENT OIL FOR THE DRAWBAR AIR/OIL INTENCIFIER. SEE PAGE TWO FOR SPECIFICATIONS
6. USE MOBILGEAR 627 FOR THE AUTOMATIC TOOL CHANGER GEAR BOX. SEE PAGE TWO FOR SPECIFICATIONS.



	NAME	DATE	
	DRAWN	DTE	
MATERIAL:			TITLE: HM20 LUBRICATION DRAWING
FINISH:			
UNLESS OTHERWISE SPECIFIED:			SCALE: 1:18 DWG. NO. 10038013
DIMENSIONS ARE IN INCHES (MM)			ESTIMATED WEIGHT: STOCK/ASSY No.
TOLERANCES:			SHEET No. 1 OF 2
FRACTIONAL ±			SIZE B
ANGULAR: MACH ± 1.0 BEND ±			
ONE PLACE DECIMAL ±.030 [.76]			
TWO PLACE DECIMAL ±.010 [.26]			
THREE PLACE DECIMAL ±.005 [.13]			

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

MOBIL 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 MILACROM SPECIFICATION	P-45

MOBIL GEAR 627	
ISO VISCOSITY GRADE	100
VISCOSITY, ASTM D 445	
cST @ 40 °C	100
cST @ 100 °C	12.0
VISCOSITY INDEX, ASTM D 2270	98
POUR POINT, °C, ASTM D 97	-27
FLASH POINT, °C, ASTM D 92	235
DENSITY AT 15.6 °C, ASTM D 4052, kg/l	0.89
TIMKEN OK LOAD, ASTM D 2782, lb	65
4-BALL EP TEST, ASTM D 2783	
WELD LOAD, kg	250
LOAD WEAR INDEX, kfg	48
FZG SCUFFING, DIN 51534, A/8.3/90, FAIL STAGE	12+
RUST PROTECTION, ASTM D 665, SEA WATER	PASS
COPPER STRIP CORROSION, ASTM D 130, 3hr. AT 100 °C	1B
DEMULSIBILITY, ASTM D 1401 AT 54 °C TIME TO 3ml EMULSION, MINUTES AT 82 °C	30
FOAM TEST, ASTM D 892, SEQ I AND II, TENDENCY/STABILITY, ml/ml	0/0

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 ASTM D, A & B	PASS
COLOR, ASTM D1500, max	3.5
FZG GEAR TEST STAGES PASSED DIN 51534	12

 DRAWN: DTE DATE: 11 NOV 06	NAME: _____ DATE: _____		 1400 MILL LANE 952.442.1410 WACONIA, MN 55387 USA
	MATERIAL: _____ FINISH: _____		
TITLE: HM20 LUBRICATION DRAWING		SCALE: 1:18 DWG. NO. 10038013	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± 1.0 BEND ± ONE PLACE DECIMAL ±.030 [.76] TWO PLACE DECIMAL ±.010 [.26] THREE PLACE DECIMAL ±.005 [.13]		ESTIMATED WEIGHT: STOCK/ASSY NO.	SIZE SHEET No. 2 OF 2

Tool pre-setter
mount MPH-26