



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

## ***VM16IL B Mechanical***

10-17-2012  
Rev 3



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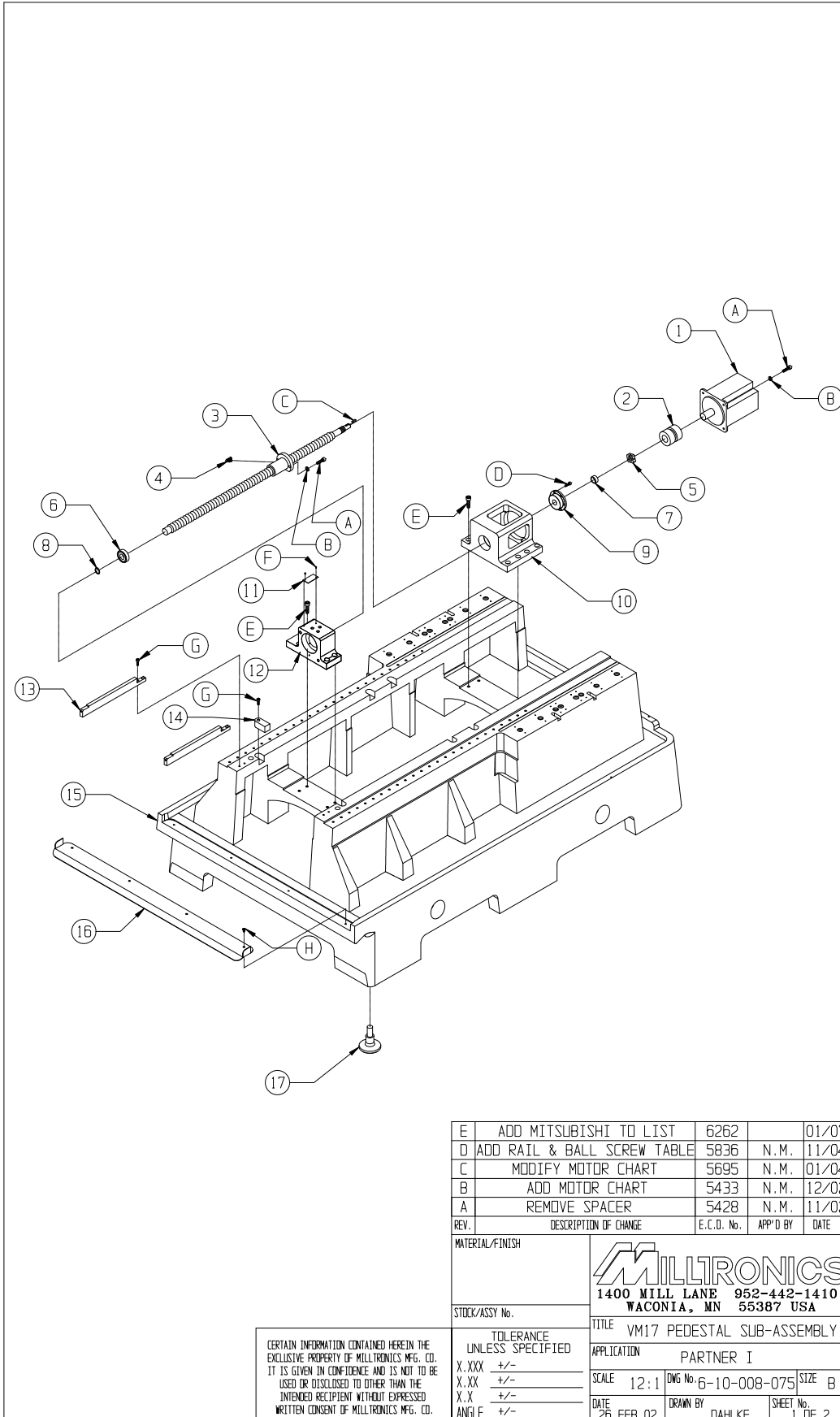
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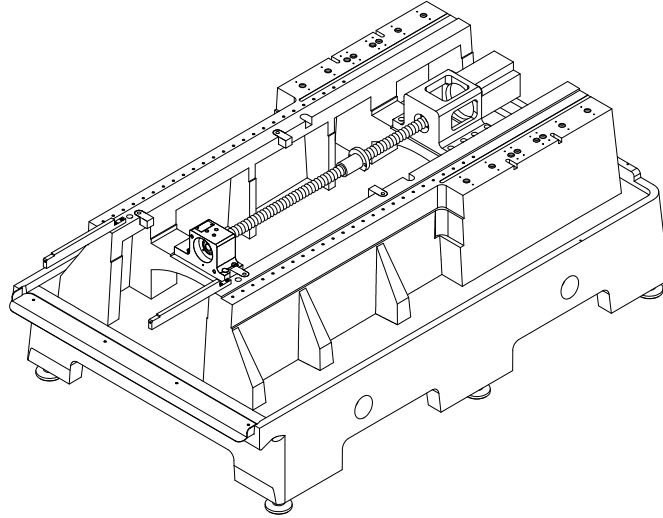


## Manual Discrepancy Sheet

1. On page 5 Item #19 is 01018834 as shown.
2. On page 7 Item #11 is MP-844&845 as shown.
3. On page 13 #K is M5.8x12mm, #C is M8-1.25x35mm as shown.
4. On page 15 #L is M5.8x12mm as shown.
5. On page 36 #9 & #16 are qty 2 & 1 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 | 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   | MX-51     | Y - 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 | Y - 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)<br>MD-125 (1.0kw)<br>MD-127 (1.5kw) | 4Nm A06B-0223-B200<br>8Nm A06B-0227-B200 | 6Nm 1FK7060-5AF71-1EA0<br>11Nm 1FK7063-5AF71-1EA0 | MD-184     |
| 2                    | MA-242 (.5kw/1.0kw)<br>MA-241 (1.5kw)             | MA-242                                   | MA-260                                            | MA-260     |

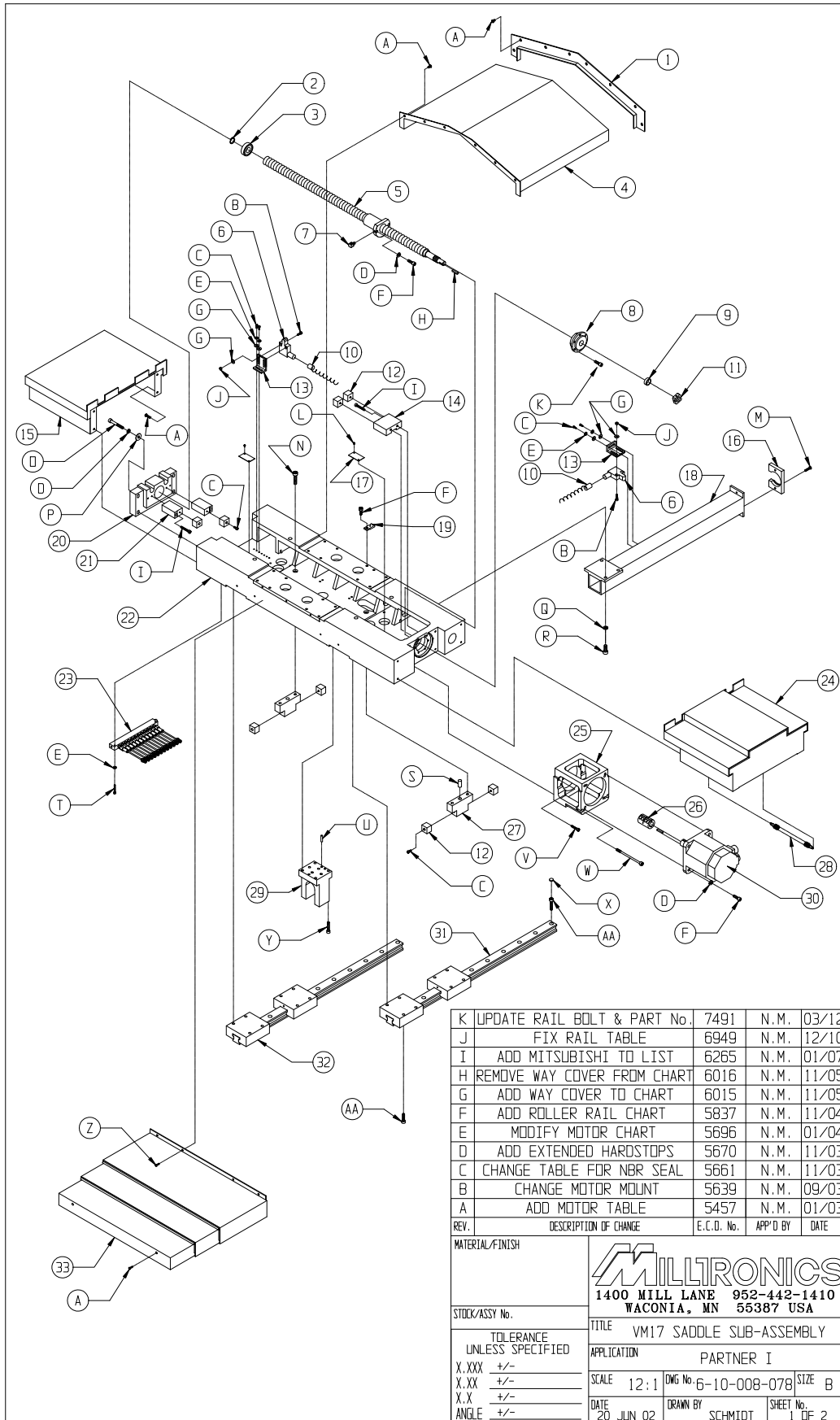
| HARDWARE LIST |     |                       |
|---------------|-----|-----------------------|
| No.           | QTY | DESCRIPTION           |
| A             | 6   | M8-1.25 x 30mm SHCS   |
| B             | 6   | M8 LOCK WASHER        |
| C             | 1   | 3/16 x 3/16 x 1/2 KEY |
| D             | 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.D. No. | APP'D BY | DATE  |

|                               |     |                                                                                                                                               |  |                      |                  |
|-------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------|------------------|
| MATERIAL/FINISH               |     | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |  |                      |                  |
| STOCK/ASSY No.                |     | TITLE VM17 PEDESTAL SUB-ASSEMBLY                                                                                                              |  |                      |                  |
| TOLERANCE<br>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                          | +/- |                                                                                                                                               |  |                      |                  |
| X .X<br>ANGLE                 | +/- |                                                                                                                                               |  |                      |                  |

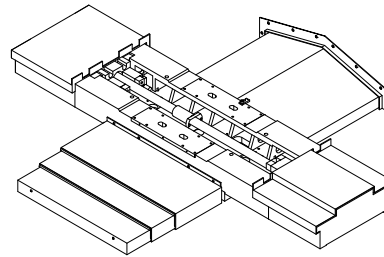
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## Machine Saddle Assembly



## 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   | NU00161   | 1/8 NPT SWIVEL ELBOW 4nn TUBE          |
| 8   | 1   | BG00094   | BALL SCREW SUPPORT BEARING             |
| 9   | 1   | MP10107   | BEARING LOCKNUT SPACER                 |
| 10  | 2   | SW00191   | X AXIS SWITCH CORD                     |
| 11  | 1   | MP10094   | BALL SCREW LOCKNUT                     |
| 12  | 8   | MP00718   | PDM 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   | 01018834  | 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/DIL 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                 | MITSUBISHI      |
|-----|--------------------|--------------------|-------------------------|-----------------|
| 26  | MA00242 (.5/1.0kW) | MA00242            | MA00260                 | MA00260         |
|     | MA00241 (1.5kW)    |                    |                         |                 |
|     | MD00123 (.5kW)     | 4Nn A06B-0223-B200 | 6Nn 1FK7060-5AF71-1EA0  |                 |
| 30  | MD00125 (1.0kW)    | 8Nn A06B-0227-B200 | 11Nn 1FK7063-5AF71-1EA0 | MD00184 (1.5kW) |
|     | MD00127 (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        | MP10462        |
| 5   | X AXIS BALL SCREW STANDARD | MP00569             | MP00569       | MP00569        | MP00570        |
|     | X AXIS BALL SCREW RAPID    | -                   | MP00802       | MP00802        | MP00821        |
| 15  | X AXIS WAY COVER - LEFT    | MP10385             | MP10385       | MP10385        | MP10455        |
| 22  | SADDLE - MACHINED          | MX10055             | MX10055       | MX10055        | MX10063        |
| 24  | X AXIS WAY COVER - RIGHT   | MP10442             | MP10442       | MP10442        | MP10454        |
| 28  | X AXIS WAY COVER SPRING    | HD00062             | HD00062       | HD00062        | HD00033        |
| 31  | BALL RAIL                  | MP00640 (820)       | MP00640 (820) | MPB0047 (1000) | MPB0047 (1000) |
|     | ROLLER RAIL                | -                   | MP00831 (844) | MP00811 (1024) | MP00811 (1024) |
| 32  | BALL RAIL BLOCK            | MP00641             | MP00641       | MP00641        | MP00641        |
|     | ROLLER RAIL BLOCK          | -                   | MP00815       | MP00815        | MP00815        |

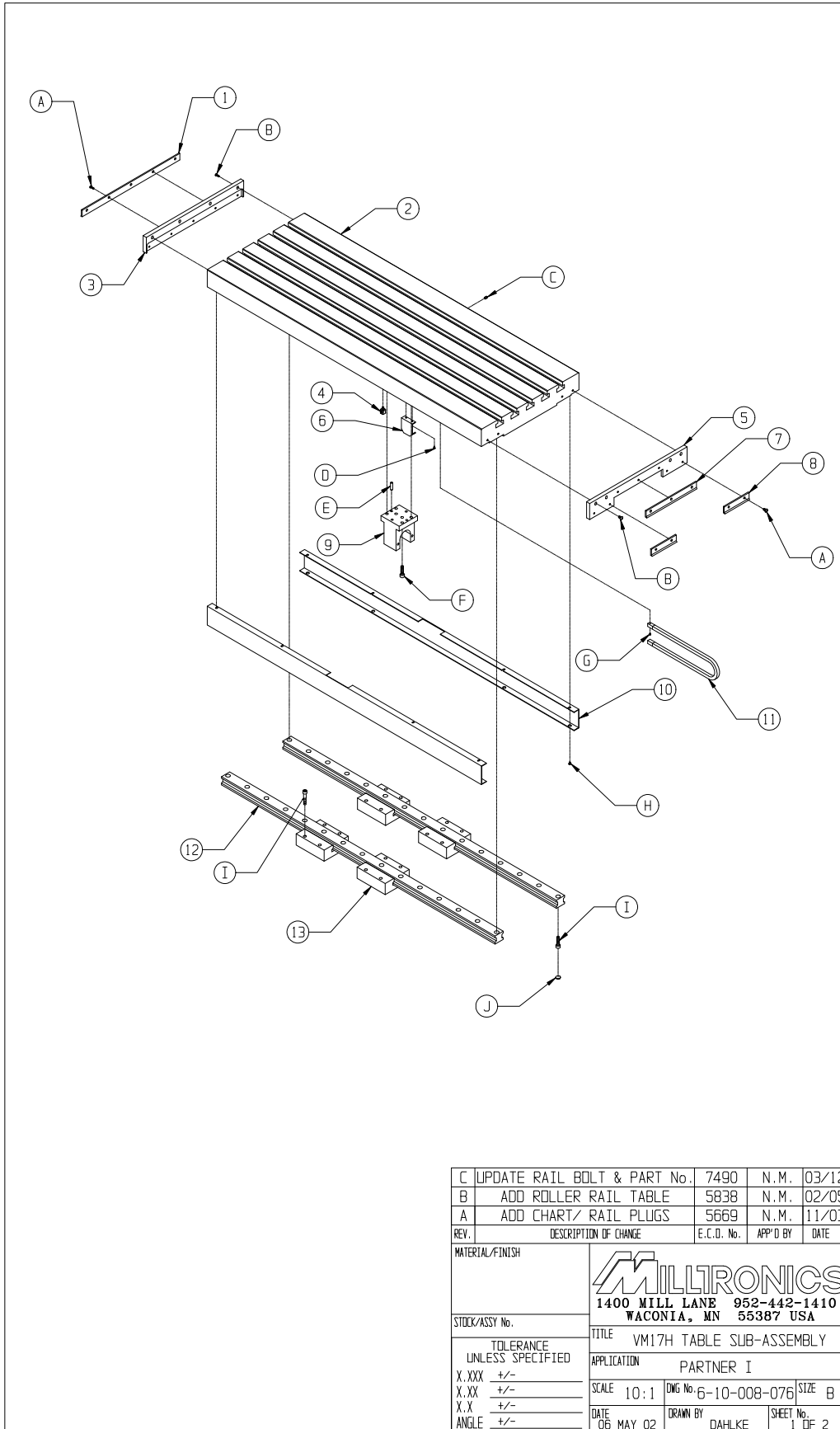
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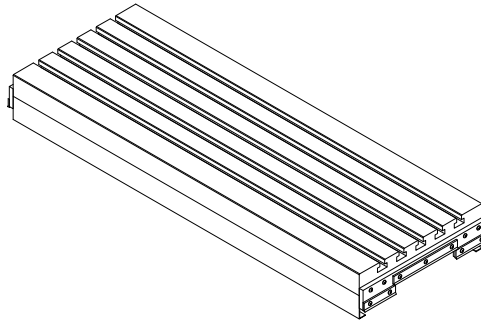
| No. | QTY | DESCRIPTION                                    |
|-----|-----|------------------------------------------------|
| A   | 24  | M6-1 x 12nn BHCS                               |
| B   | 4   | M5-.8 x 20nn SHCS                              |
| C   | 12  | M5-.8 x 16nn SHCS                              |
| 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 RIVET                                |
| 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.             | <b>1400 MILL LANE 952-442-1410</b><br><b>WACONIA, MN 55387 USA</b>                    |                  |                  |  |
| TOLERANCE UNLESS SPECIFIED | <b>TITLE VM17 SADDLE SUB-ASSEMBLY</b>                                                 |                  |                  |  |
| X.XXX +/-                  | <b>APPLICATION PARTNER I</b>                                                          |                  |                  |  |
| X.XX +/-                   | <b>SCALE 15:1</b>                                                                     |                  |                  |  |
| X.X +/-                    | <b>DWG No. 6-10-008-078</b>                                                           |                  |                  |  |
| ANGLE +/-                  | <b>SIZE B</b>                                                                         |                  |                  |  |
|                            | DATE 20 JUN 02                                                                        | DRAWN BY SCHMIDT | SHEET No. 2 OF 2 |  |

## Milling Table Assembly




**PARTS LIST**

| No. | QTY | STOCK No.       | DESCRIPTION                    |
|-----|-----|-----------------|--------------------------------|
| 1   | 1   | MP10423         | VM17 WIPER - LEFT              |
| 2   | 1   | SEE TABLE       | TABLE - MACHINED               |
| 3   | 1   | MP10419         | X-AXIS WIPER PLATE - LEFT      |
| 4   | 2   | NU00161         | SWIVEL ELBOW 1/8NPT - 4mm TUBE |
| 5   | 1   | MP10420         | X-AXIS WIPER PLATE - RIGHT     |
| 6   | 1   | MP60045         | EXTENDED TRAVEL X-AXIS DOG     |
| 7   | 1   | MP10422         | VM17 WIPER - UPPER             |
| 8   | 2   | MP10421         | VM17 WIPER - LOWER             |
| 9   | 1   | MX60016         | X-AXIS BALL SCREW CARRIER      |
| 10  | 2   | SEE TABLE       | TABLE PLATE                    |
| 11  | 1   | MP-844 & MP-845 | X-AXIS CABLE TRACK             |
| 12  | 2   | SEE TABLE       | 35mm RAILS                     |
| 13  | 4   | SEE TABLE       | 35mm RAIL BLOCK                |

**HARDWARE LIST**

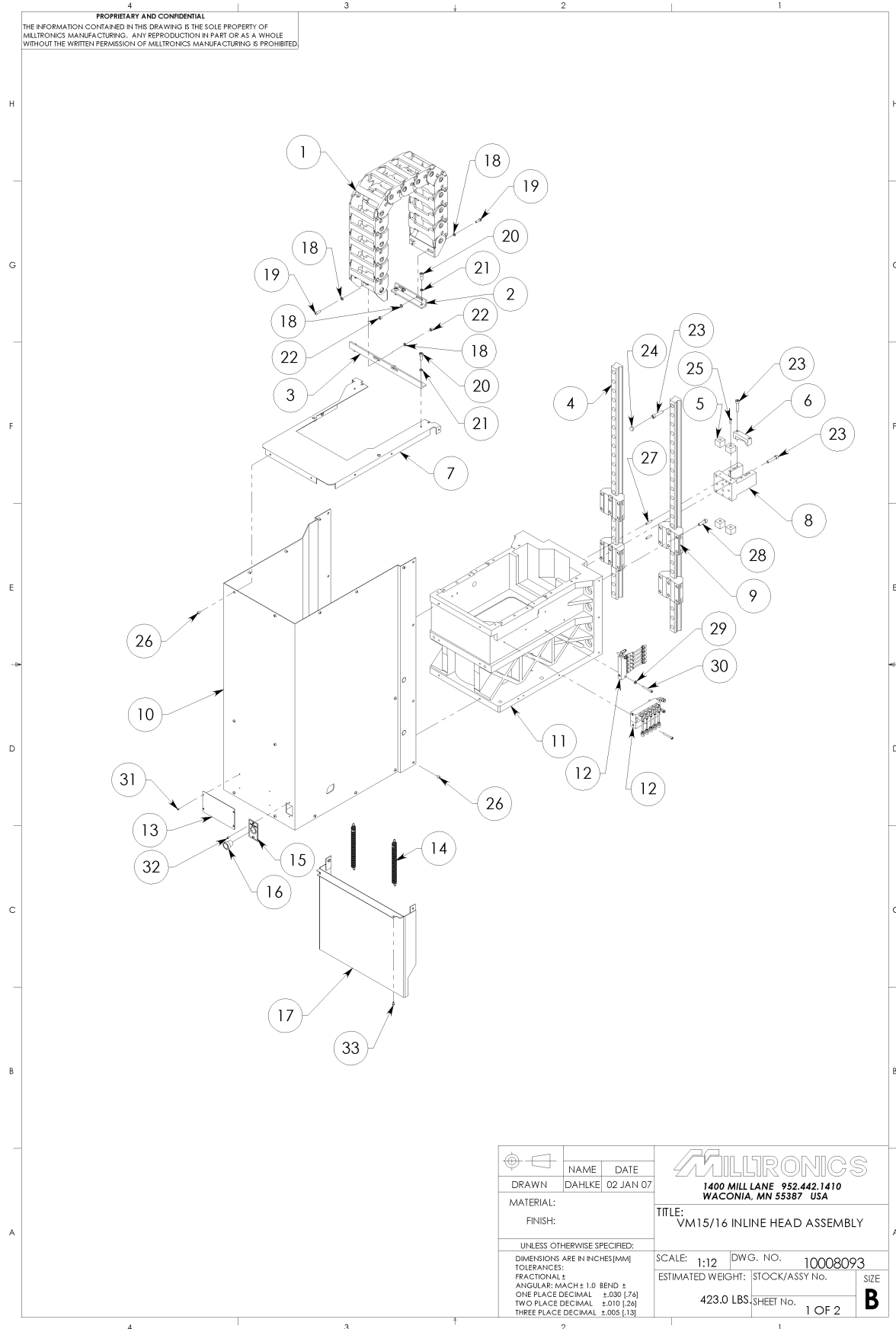
| No. | QTY | DESCRIPTION                           |
|-----|-----|---------------------------------------|
| A   | 12  | M6-1 x 12mm BHCS                      |
| B   | 8   | M6-1 x 25mm BHCS                      |
| C   | 1   | 1/8-27 NPT SHPP                       |
| D   | 2   | M3-.5 x 6mm BHCS                      |
| E   | 2   | 1/4 x 1 DOWEL PIN                     |
| F   | 6   | M8-1.25 x 35mm SHCS                   |
| G   | 4   | M3-.5 x 20mm BHCS                     |
| H   | 8   | M4-.7 x 6mm BHCS                      |
| I   | 42  | M8-1.25 x 30mm SHCS - 25" BALL RAIL   |
|     | 46  | M8-1.25 x 30mm SHCS - 30" BALL RAIL   |
|     | 74  | M8-1.25 x 35mm SHCS - 30" ROLLER RAIL |
| J   | 26  | RAIL PLUG - 25" BALL RAIL             |
|     | 30  | RAIL PLUG - 30" BALL RAIL             |
|     | 58  | RAIL PLUG - 30" ROLLER RAIL           |

**TABLE TRAVEL**

| No. | DESCRIPTION       | 25" TRAVEL | 30" TRAVEL |
|-----|-------------------|------------|------------|
| 2   | TABLE - MACHINED  | MX10060    | MX10056    |
| 10  | TABLE PLATE       | MP10448    | MP10392    |
| 12  | BALL RAIL         | MPB0047    | MP00732    |
|     | ROLLER RAIL       | -          | MP00812    |
| 13  | BALL RAIL BLOCK   | MP00641    | MP00641    |
|     | ROLLER RAIL BLOCK | -          | MP00815    |

|                            |                             |                                                                                                                                                             |                      |                  |
|----------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|
| C                          | UPDATE RAIL BOLT & PART No. | 7490                                                                                                                                                        | N.M.                 | 03/12            |
| B                          | ADD ROLLER RAIL TABLE       | 5838                                                                                                                                                        | N.M.                 | 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            |                             | <br><b>1400 MILL LANE 952-442-1410</b><br><b>WACONIA, MN 55387 USA</b> |                      |                  |
| STOCK/ASSY No.             |                             |                                                                                                                                                             |                      |                  |
| TOLERANCE UNLESS SPECIFIED |                             | TITLE VM17H TABLE SUB-ASSEMBLY                                                                                                                              |                      |                  |
| X.XXX +/-                  |                             | APPLICATION GENERAL PRODUCTS                                                                                                                                |                      |                  |
| X.XX +/-                   |                             | SCALE 10:1                                                                                                                                                  | DWG No. 6-10-008-076 | SIZE B           |
| X.X +/-                    |                             | DATE 05 MAY 02                                                                                                                                              | DRAWN BY DAHL KE     | SHEET No. 2 OF 2 |
| ANGLE +/-                  |                             |                                                                                                                                                             |                      |                  |

## Machine Head Assembly



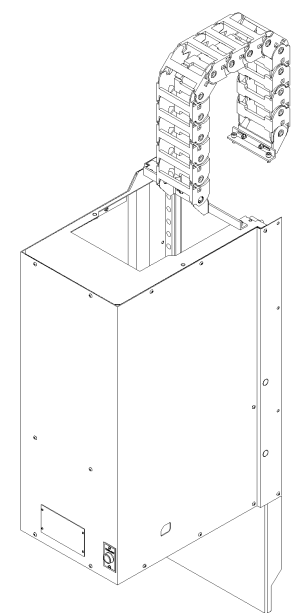
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3
2
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| ITEM No. | QTY  | PART NO.            | DESCRIPTION                       |
|----------|------|---------------------|-----------------------------------|
| 1        | 1    | MP00850             | SPINDLE CABLE TRACK               |
| 2        | 1    | MP00316             | SPINDLE CABLE SUPPORT BRACKET     |
| 3        | 1    | MP00664             | VM SPINDLE CABLE SUPPORT BRACKET  |
| 4        | 2    | SEE TABLE           | LINEAR RAILS                      |
| 5        | 4    | MP00718             | POM HARD STOP                     |
| 6        | 1    | MP00109             | Z AXIS BALL SCREW SAFETY CATCH    |
| 7        | 1    | MP00639             | UNIVERSAL HEADCOVER - TOP         |
| 8        | 1    | MX10011             | Z AXIS BALLSCREW CARRIER          |
| 9        | 4    | SEE TABLE           | 35mm RAIL BLOCK                   |
| 10       | 1    | MP00635             | UNIVERSAL HEAD COVER              |
| 11       | 1    | MX00043             | 70mm HEAD-CASTING                 |
| 12       | 1    | SEE TABLE           | Z AXIS AUTOLUBE MANIFOLD ASSEMBLY |
| 13       | 1    | LB00001             | SAFETY STICKER                    |
| 14       | 2    | SEE TABLE           | WAY COVER SPRING                  |
| 15       | 1    | LB00181             | TOOL-OUT LABEL                    |
| 16       | 1    | SW00067             | TOOL OUT SWITCH                   |
| 17       | 1    | SEE TABLE           | Z-AXIS WAYCOVER                   |
| 18       | 8    | WASHER FLAT M6      | M6 FLAT WASHER                    |
| 19       | 4    | BHCS M6-1.0 x 20    | M6 - 1.0 x 20 BHCS                |
| 20       | 4    | SHCS M6-1.0 x 20    | M6-1.0 x 20 SHCS                  |
| 21       | 4    | WASHER LOCK M6      | M6 LOCK WASHER                    |
| 22       | 4    | NUT M6-1            | M6-1 NYLOCK NUT                   |
| 23       | **30 | SHCS M8-1.25 x 40   | M8-1.25 x 40 SHCS                 |
| 24       | **22 | RAIL PLUG           | RAIL PLUG                         |
| 25       | 4    | SHCS M5-0.8 x 16    | M5-0.8 x 16 SHCS                  |
| 26       | 23   | BHCS M6-1.0 x 10    | M6-1.0 x 10 BHCS                  |
| 27       | 2    | DOWEL PIN .25 x 1.0 | .25 x 1.0 DOWEL PIN               |
| 28       | 16   | SHCS M8-1.25 x 30   | M8-1.25 x 30 SHCS                 |
| 29       | 2    | WASHER LOCK M5      | M5 LOCK WASHER                    |
| 30       | 2    | SHCS M5-0.8 x 40    | M5-0.8 x 40 SHCS                  |
| 31       | 4    | BHCS M3-0.5 x 5     | M3-0.5 x 5 BHCS                   |
| 32       | 2    | BHCS M4-0.7 x 8     | M4-0.7 x 8 BHCS                   |
| 33       | 2    | BHCS M4-0.7 x 10    | M4-0.7 x10 BHCS                   |

\*\* ROLLER RAILS USE AN ADDITIONAL 20 RAIL PLUGS & 20 M8-1.25 x 40 SHCS.



| No. | DESCRIPTION       | 20" TRAVEL | 26" TRAVEL |
|-----|-------------------|------------|------------|
| 4   | BALL RAIL         | MP00640    | MPB0047    |
|     | ROLLER RAIL       | MP00831    | MP00811    |
| 9   | BALL RAIL BLOCK   | MP00641    | MP00641    |
|     | ROLLER RAIL BLOCK | MP00815    | MP00815    |
| 14  | WAY COVER SPRING  | -          | HD00062    |
| 17  | Z AXIS WAY COVER  | MP1-424    | MP10425    |

| No. | DRAWING No.  | DESCRIPTION                      |
|-----|--------------|----------------------------------|
| 12  | 6-10-018-050 | VM Z AXIS OIL MANIFOLD ASSEMBLY  |
|     | 6-10-008-059 | Z AXIS AIR/OIL MANIFOLD ASSEMBLY |

|                                                                                                                                                                                                                                |              |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
|                                                                                                                                             | NAME         | DATE      |
|                                                                                                                                                                                                                                | DRAWN DAHLKE | 02 JAN 07 |
| MATERIAL:                                                                                                                                                                                                                      |              |           |
| FINISH:                                                                                                                                                                                                                        |              |           |
| UNLESS OTHERWISE SPECIFIED:<br>DIMENSIONS ARE IN INCHES (MM)<br>TOLERANCES:<br>FRACTIONAL ±<br>ANGULAR: MACH ± 1.0 BEND ±<br>ONE PLACE DECIMAL ±.030 [.76]<br>TWO PLACE DECIMAL ±.010 [.26]<br>THREE PLACE DECIMAL ±.005 [.13] |              |           |

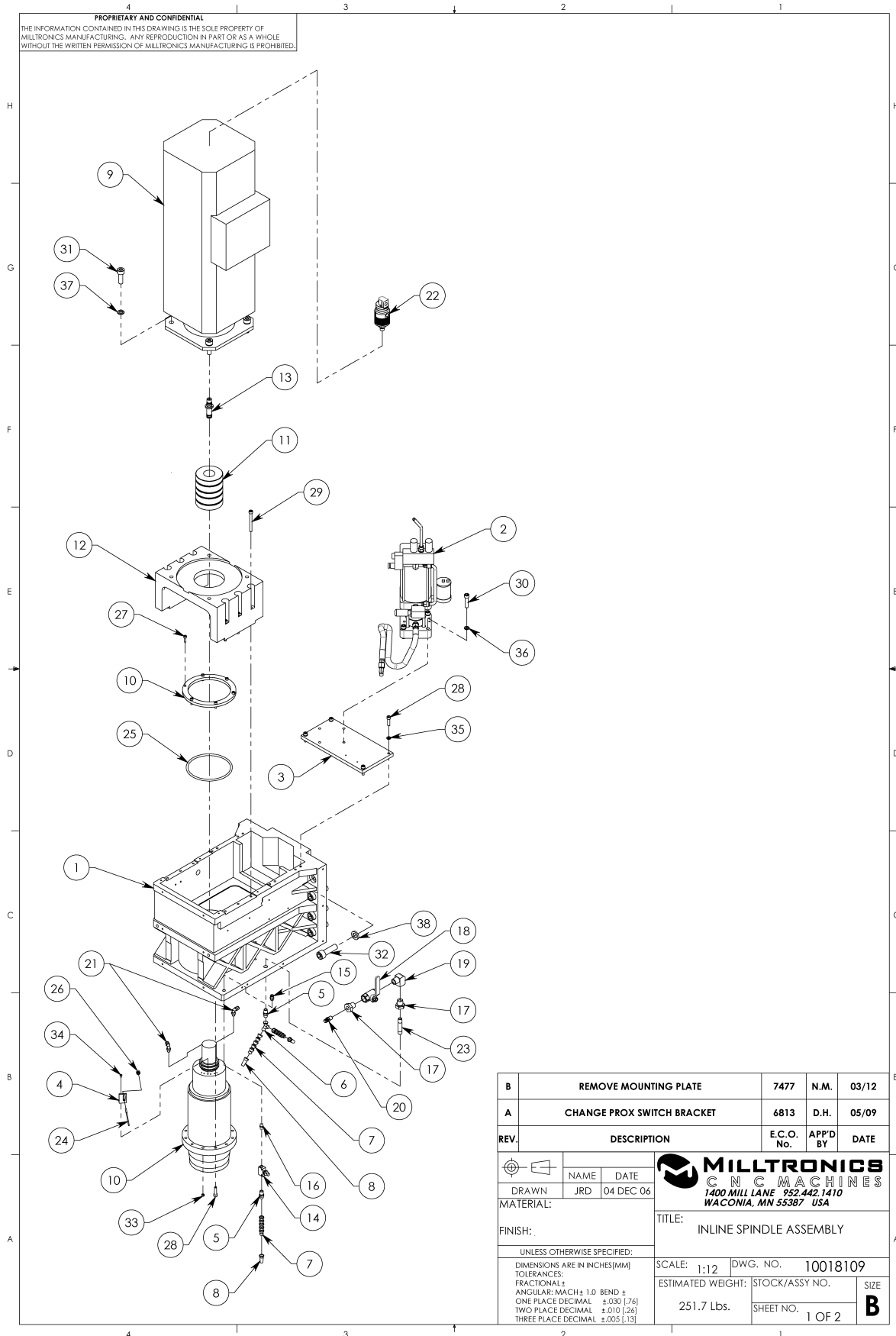


1400 MILL LANE 952.442.1410  
WACONIA, MN 55387 USA

|                                     |                   |
|-------------------------------------|-------------------|
| TITLE: VM15/16 INLINE HEAD ASSEMBLY |                   |
| SCALE: 1:12                         | DWG. NO. 10008093 |
| ESTIMATED WEIGHT: 423.0 LBS         | STOCK/ASSY No.    |
| SHEET No. 2 OF 2                    |                   |

B

## Inline Spindle Assembly



| SPINDLE MOTOR TABLE |           |             |
|---------------------|-----------|-------------|
| ITEM NO.            | STOCK NO. | DESCRIPTION |
| 10                  | MP001023  | 10K RPM     |
|                     | MP001129  | 15K RPM     |

| MOTOR COUPLER TABLE |                              |                                |
|---------------------|------------------------------|--------------------------------|
| ITEM NO.            | MOTOR-END<br>HUB 1 DIA. (MM) | SPINDLE-END<br>HUB 2 DIA. (MM) |
| 11                  | 24                           | 50                             |
|                     | 28                           | 50                             |
|                     | 32                           | 50                             |
|                     | 38                           | 50                             |
|                     | 40                           | 50                             |
|                     | 42                           | 50                             |
|                     | 48                           | 50                             |
|                     | 50                           | 50                             |
| 55                  | 50                           |                                |

| ITEM NO. | QTY. | PART NUMBER       | DESCRIPTION                                    |
|----------|------|-------------------|------------------------------------------------|
| 1        | 1    | MX00043           | 70mm HEAD - CASTING                            |
| 2        | 1    | 10018108          | AIR/OIL AMPLIFIER SYSTEM                       |
| 3        | 1    | MP00951           | AIR OIL AMPLIFIER (NU00388) MOUNTING PLATE     |
| 4        | 1    | BR00166           | SPINDLE PROX SWITCH BRACKET                    |
| 5        | 2    | MA00019           | CONNECTOR LOC LINE .25"                        |
| 6        | 1    | MA00020           | SNAP LOC 1/4" Y                                |
| 7        | 15   | MA00022           | LOC-LINE LINKS 1/4                             |
| 8        | 3    | MA00216           | LOC-LINE NOZZLE 1/4                            |
| 9        | 1    | SEE TABLE         | SPINDLE MOTOR                                  |
| 10       | 1    | SEE TABLE         | SPINDLE ASSEMBLY                               |
| 11       | 1    | SEE TABLE         | MOTOR COUPLER                                  |
| 12       | 1    | SEE TABLE         | MOTOR CASTING MITSUBISHI AND FANUC             |
| 13       | 1    | MP00958           | CTS SPINDLE MOTOR CONNECTING TUBE (CTS OPTION) |
| 14       | 1    | NU00007           | AIR RESTRICTOR                                 |
| 15       | 1    | NU00017           | 1/8"NPT X 1/4 TUBE M/S                         |
| 16       | 1    | NU00024           | 1/8 NPT BRASS NIPPLE UNION                     |
| 17       | 2    | NU00028           | 1/2" NPT (MALE) - 1/4" NPT(FEMALE)             |
| 18       | 1    | NU00064           | 1/2" NPT BALL VALVE                            |
| 19       | 1    | NU00125           | 1/2" STREET ELBOW                              |
| 20       | 1    | NU00139           | FITTING 1/4NPT-1/2 BARB                        |
| 21       | 2    | NU00171           | ELBOW - M/S 1/4 TUBE x 1/8NPT                  |
| 22       | 1    | NU00226           | DEUBLIN COOLANT UNION                          |
| 23       | 1    | NU00263           | NIPPLE .25NPT x 2.50                           |
| 24       | 1    | PR00050           | PROX SWITCH                                    |
| 25       | 1    | WX00270           | 70mm REAR CARTRIDGE SEAL O-RING                |
| 26       | 1    | WX00358           | PROX SWITCH RESTRAINT                          |
| 27       | 6    | SHCS M6-1.0 x 20  | M6-1.0 x 20mm SHCS                             |
| 28       | 10   | SHCS M8-1.25 x 30 | M8-1.25 x 30mm SHCS                            |
| 29       | 6    | SHCS M8-1.25 x 80 | M8-1.25 x 80mm SHCS                            |
| 30       | 4    | SHCS M10-1.5 x 45 | M10-1.5 x 45mm SHCS                            |
| 31       | 4    | SHCS M14-2.0 x 45 | M14-2.0 x 45mm SHCS                            |
| 32       | 8    | SHCS 3/4-10 x 2.5 | 3/4-10 x 2.5 SHCS                              |
| 33       | 6    | SHPP 1/8-28 BSPP  | 1/8-28 BSPP SHPP                               |
| 34       | 2    | BHCS M4-0.7 x 8   | M4-0.7 x 8mm BHCS                              |
| 35       | 4    | WASHER LOCK M8    | M8 LOCK WASHER                                 |
| 36       | 4    | WASHER LOCK M10   | M10 LOCK WASHER                                |
| 37       | 4    | WASHER LOCK M14   | M14 LOCK WASHER                                |
| 38       | 8    | WASHER LOCK .75   | 3/4 LOCK WASHER                                |

| SPINDLE MOTOR TABLE |                     |             |
|---------------------|---------------------|-------------|
| ITEM NO.            | STOCK NO.           | DESCRIPTION |
| 9                   | A06B-1477-B133#0121 | FANUC       |
|                     | A06B-1479-B133#0221 | FANUC       |
|                     | MO00166             | MITSUBISHI  |
|                     | MO00167             | MITSUBISHI  |
|                     | 1PM 6137            | SIEMENS     |
|                     | 1PM 6105            | SIEMENS     |
| 1PM 6133            | SIEMENS             |             |

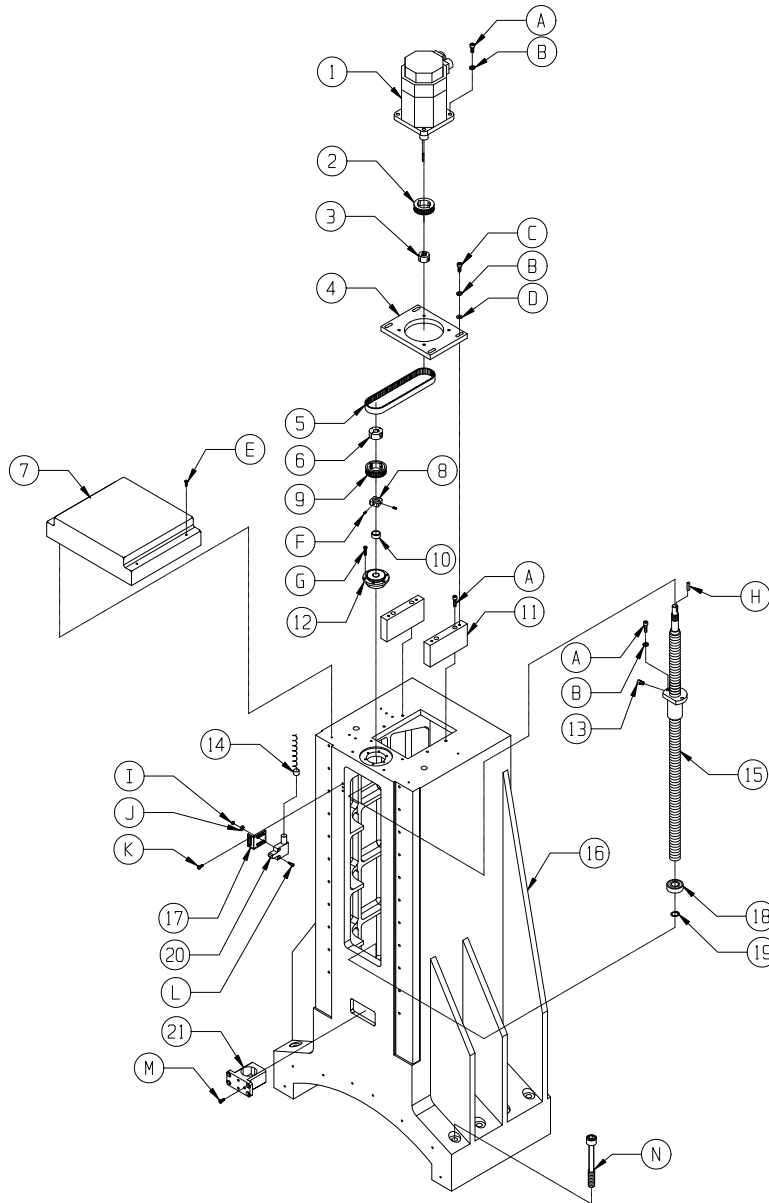
  

| SPINDLE MOTOR MOUNTING PLATE TABLE |           |                                |
|------------------------------------|-----------|--------------------------------|
| ITEM NO.                           | STOCK NO. | DESCRIPTION                    |
| 12                                 | MX00081   | 7.5kW MITSUBISHI/FANUC/SIEMENS |
|                                    | MX00082   | 11.0kW MITSUBISHI/FANUC        |
|                                    | MXS0005   | 11.0kW SIEMENS                 |

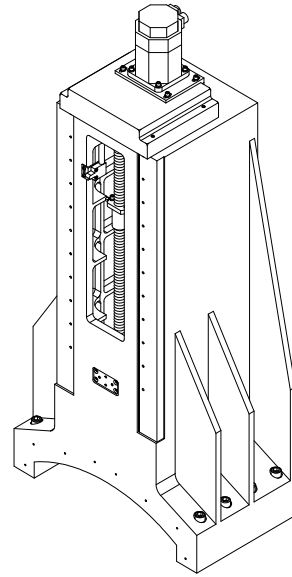
  

| B                                                                                   | REMOVE MOUNTING PLATE      | 7477                                                                                                                                                                             | N.M.     | 03/12 |
|-------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| A                                                                                   | CHANGE PROX SWITCH BRACKET | 6813                                                                                                                                                                             | D.H.     | 05/09 |
| REV.                                                                                | DESCRIPTION                | E.C.O. No.                                                                                                                                                                       | APP'D BY | DATE  |
|  |                            |  <b>MILLTRONICS</b><br>CNC MACHINES<br>1400 MILL LANE 952.442.1410<br>WACONIA, MN 55387 USA |          |       |
| DRAWN: JRD 04 DEC 06<br>MATERIAL: _____<br>FINISH: _____                            |                            | TITLE: INLINE SPINDLE ASSEMBLY<br>SCALE: 1:17 DWG. NO. 10018109<br>ESTIMATED WEIGHT: 251.7 Lbs. STOCK/ASSY NO. _____ SIZE B<br>SHEET NO. 2 OF 2                                  |          |       |

## Machine Column (Belt Drive) 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                                                                    |                       | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |          |                  |
|                                                                                    |                       |                                                                                                                                               |          |                  |
| STOCK/ASSY No.                                                                     |                       | TITLE VM17H COLUMN SUB-ASSEMBLY                                                                                                               |          |                  |
| TOLERANCE<br>UNLESS SPECIFIED<br><br>X.XXX +/-<br>X.XX +/-<br>X.X +/-<br>ANGLE +/- |                       | APPLICATION PARTNER I                                                                                                                         |          |                  |
|                                                                                    |                       | SCALE 12:1                                                                                                                                    |          |                  |
|                                                                                    |                       | DWG No. 6-10-008-079                                                                                                                          |          |                  |
|                                                                                    |                       | SIZE B                                                                                                                                        |          |                  |
|                                                                                    |                       | DATE 18 JUN 02                                                                                                                                |          |                  |
|                                                                                    |                       | DRAWN BY SCHMIDT                                                                                                                              |          | SHEET No. 1 OF 2 |



| HARDWARE LIST |     |                                  |
|---------------|-----|----------------------------------|
| No.           | QTY | DESCRIPTION                      |
| A             | 10  | M8-1.25 x 30mm SHCS              |
| B             | 10  | M8 LOCK WASHER                   |
| C             | 4   | M8-1.25 x 35mm 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   | M5-.8x12mm 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     |

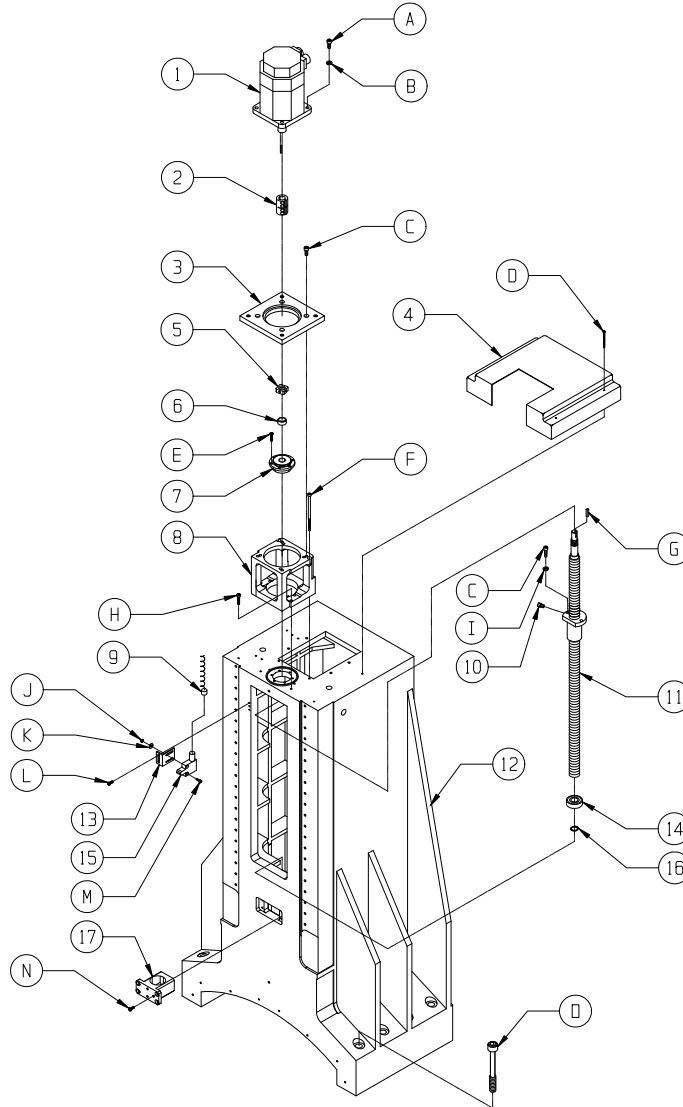
| VM17 COLUMN |                                    |  |
|-------------|------------------------------------|--|
| STOCK No.   | DESCRIPTION                        |  |
| MX1-57      | 50" x 16" RIBBED COLUMN - MACHINED |  |
| MX1-58      | 56" x 16" RIBBED COLUMN - MACHINED |  |

| 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               |                       | <div><br/>1400 MILL LANE 952-442-1410<br/>WACONIA, MN 55387 USA</div> |                      |                  |
|                               |                       |                                                                                                                                                            |                      |                  |
| STOCK/ASSY No.                |                       | TITLE VM17H COLUMN SUB-ASSEMBLY                                                                                                                            |                      |                  |
| TOLERANCE<br>UNLESS SPECIFIED |                       | 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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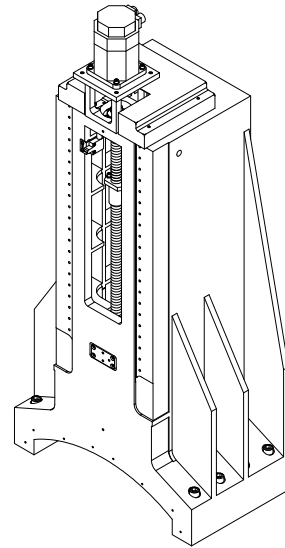
## Machine Column (Direct Drive) Assembly



|                                                                                                                                                             |                        |                      |          |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------|----------|------------------|
| B                                                                                                                                                           | ADD MITSUBISHI TO LIST | 6266                 |          | 01/07            |
| A                                                                                                                                                           | ADD BALL SCREW TABLE   | 5840                 | N.M.     | 02/05            |
| REV.                                                                                                                                                        | DESCRIPTION OF CHANGE  | E.C.O. No.           | APP'D BY | DATE             |
| MATERIAL/FINISH                                                                                                                                             |                        |                      |          |                  |
| STOCK/ASSY No.                                                                                                                                              |                        |                      |          |                  |
| <br><b>1400 MILL LANE 952-442-1410</b><br><b>WACONIA, MN 55387 USA</b> |                        |                      |          |                  |
| TITLE VM17H DIRECT DRIVE COLUMN SUB-ASSEMBLY                                                                                                                |                        |                      |          |                  |
| APPLICATION PARTNER I                                                                                                                                       |                        |                      |          |                  |
| SCALE 12:1                                                                                                                                                  |                        | DWG No. 6-10-008-084 |          | SIZE B           |
| DATE 13 JAN 04                                                                                                                                              |                        | DRAWN BY DAHLKE      |          | SHEET No. 1 OF 2 |

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



| HARDWARE LIST |     |                                  |
|---------------|-----|----------------------------------|
| No.           | QTY | DESCRIPTION                      |
| A             | 4   | M12-1.75 x 35mm SHCS             |
| B             | 4   | M12 LOCK WASHER                  |
| C             | 6   | M8-1.25 x 30mm SHCS              |
| D             | 4   | M5-.8 x 60mm BHCS                |
| E             | 6   | M6-1 x 25mm SHCS                 |
| F             | 2   | M6-1 x 130mm SHCS                |
| G             | 1   | 3/16 x 3/16 x 1/2 BALL SCREW KEY |
| H             | 4   | M6-1 x 30mm SHCS                 |
| I             | 2   | M8 LOCK WASHER                   |
| J             | 2   | M5-.8 HEX NUT                    |
| K             | 2   | M5 FLAT WASHER                   |
| L             | 2   | M5-.8x12mm BHCS                  |
| M             | 2   | M5-.8 x 20mm SHCS                |
| N             | 4   | M6-1 x 15mm BHCS                 |
| O             | 8   | 3/4-10 x 7" SHCS                 |

| PARTS LIST |     |                                             |
|------------|-----|---------------------------------------------|
| No.        | QTY | STOCK No. DESCRIPTION                       |
| 1          | 1   | SEE TABLE AXIS MOTOR W/BRAKE                |
| 2          | 1   | SEE TABLE MOTOR COUPLER                     |
| 3          | 1   | SEE TABLE Z AXIS MOTOR PLATE                |
| 4          | 1   | VM1-08 Z AXIS MOTOR COVER                   |
| 5          | 1   | MP1-94 BALL SCREW LOCK NUT                  |
| 6          | 1   | MP1-107 BEARING LOCK NUT SPACER             |
| 7          | 1   | BG-94 BALLSCREW SUPPORT BEARING             |
| 8          | 1   | MX1-59 Z MOTOR MOUNT                        |
| 9          | 1   | SW-191 X AXIS SWITCH CORD                   |
| 10         | 1   | NU-154 1/8 NPT MS 5/32 TUBE                 |
| 11         | 1   | SEE TABLE Z AXIS BALL SCREW                 |
| 12         | 1   | SEE TABLE COLUMN - MACHINED                 |
| 13         | 1   | MP1-387 X/Y/Z LIMIT SWITCH MOUNTING BRACKET |
| 14         | 1   | BG-02 6204 BEARING                          |
| 15         | 1   | SW-193 Z AXIS SWITCH                        |
| 16         | 1   | MP1-108 SNAP RING                           |
| 17         | 1   | MX1-28 Y-Z RADIAL SUPPORT BRACKET           |

| VM17 COLUMN |           |                                    |
|-------------|-----------|------------------------------------|
| No.         | STOCK No. | DESCRIPTION                        |
| 12          | MX1-57    | 50" x 16" RIBBED COLUMN - MACHINED |
|             | MX1-58    | 56" x 16" RIBBED COLUMN - MACHINED |

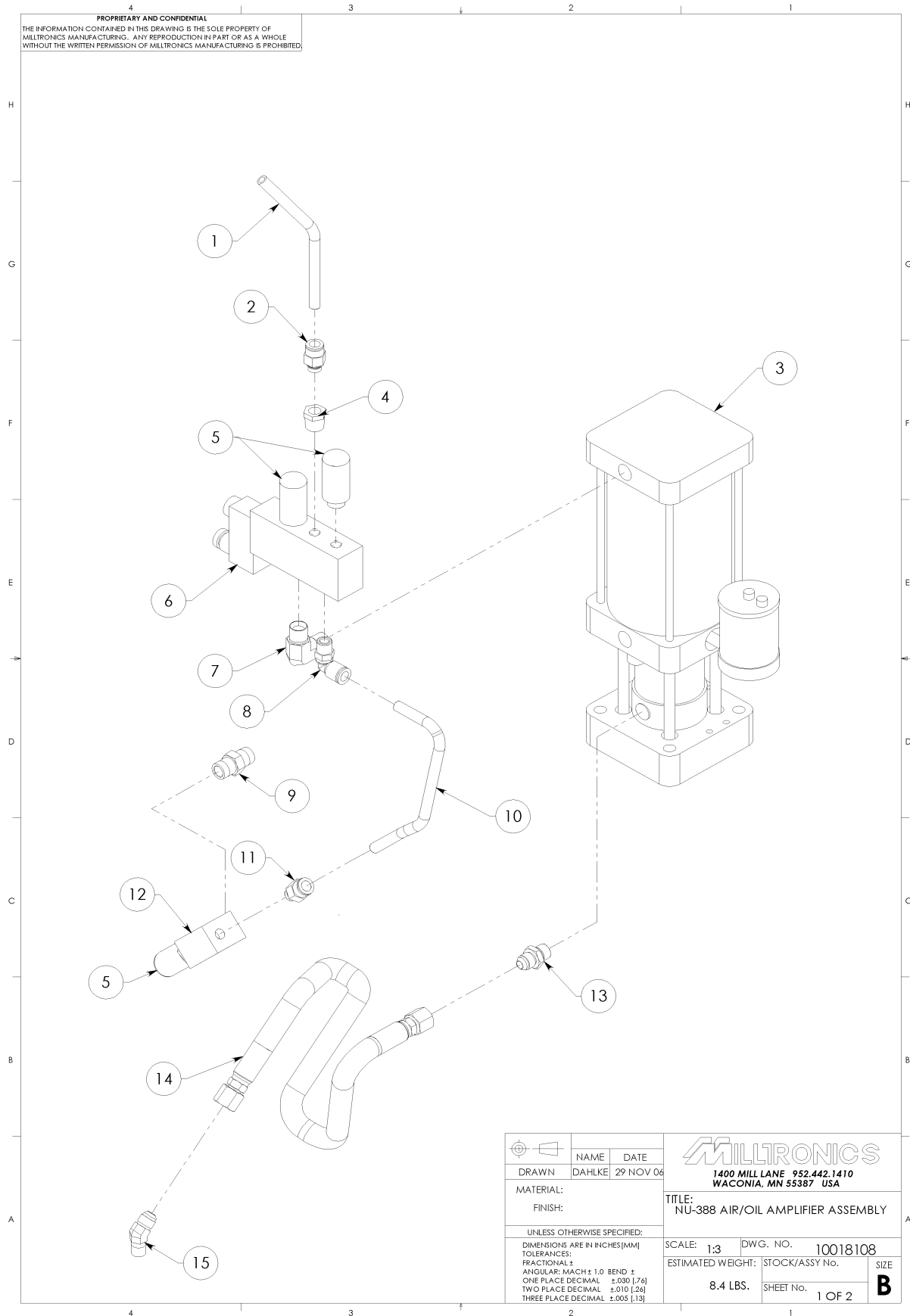
| AXIS MOTOR, COUPLER & MOTOR PLATE TABLE |              |                      |                                                      |                                |
|-----------------------------------------|--------------|----------------------|------------------------------------------------------|--------------------------------|
| No.                                     | YASKAWA      | FANUC                | SIEMENS                                              | MITSUBISHI                     |
| 1                                       | MD-138 (3kw) | 12 Nm A06B-0243-B500 | 11 Nm 1FK7063-5AF71-1EB0<br>18 Nm 1FK7100-5AF71-1FB0 | MD-186 (3.5kw)<br>MD-188 (5kw) |
| 2                                       | MA-248       | MA-248               | MA-260 (11Nm)<br>MA-261 (16Nm)                       | MA-248                         |
| 3                                       | MP1-453      | MP1-453              | - (11Nm)<br>SMN-09 (18Nm)                            | MP1-453                        |

| BALL SCREW TABLE |                  |          |
|------------------|------------------|----------|
| No.              | DESCRIPTION      | PART No. |
| 11               | STANDARD RAPID   | MPB-02   |
|                  | HIGH SPEED RAPID | MP-801   |

|                            |                        |                                                                                                                                               |          |       |
|----------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| B                          | ADD MITSUBISHI TO LIST | 6266                                                                                                                                          |          | 01/07 |
| A                          | ADD BALL SCREW TABLE   | 5840                                                                                                                                          | N.M.     | 02/05 |
| REV.                       | DESCRIPTION OF CHANGE  | E.C.O. No.                                                                                                                                    | APP'D BY | DATE  |
| MATERIAL/FINISH            |                        | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |          |       |
| STOCK/ASSY No.             |                        |                                                                                                                                               |          |       |
| TOLERANCE UNLESS SPECIFIED |                        | TITLE VM17H DIRECT DRIVE COLUMN SUB-ASSEMBLY                                                                                                  |          |       |
| X.XXX ±                    |                        | APPLICATION PARTNER I                                                                                                                         |          |       |
| X.XX ±                     |                        | SCALE 12:1 DWG No. 6-10-008-084 SIZE B                                                                                                        |          |       |
| X.X ±                      |                        | DATE 13 JAN 04 DRAWN BY DAHLKE SHEET No. 2 OF 2                                                                                               |          |       |
| ANGLE ±                    |                        |                                                                                                                                               |          |       |

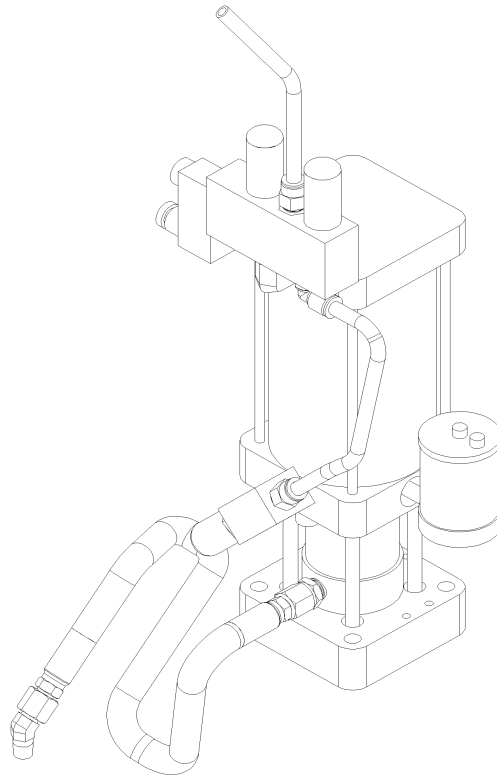
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## Power Drawbar Cylinder Assembly



4 3 2 1

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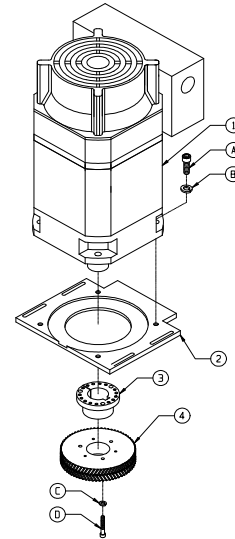


| ITEM NO. | QTY | PART NO. | DESCRIPTION                           |
|----------|-----|----------|---------------------------------------|
| 1        | 1   | NU00078  | 3/8 AIR LINE                          |
| 2        | 1   | NU00095  | TUBE CONNECTOR - M/S 3/8 TUBE 1/4NPT  |
| 3        | 1   | NU00408  | 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°    |

|                                                                                     |       |                                   |                                                                                       |
|-------------------------------------------------------------------------------------|-------|-----------------------------------|---------------------------------------------------------------------------------------|
|  | NAME  | DATE                              |  |
|                                                                                     | DRAWN | DAHLKE                            |                                                                                       |
| MATERIAL:                                                                           |       | TITLE:                            |                                                                                       |
| FINISH:                                                                             |       | NU-388 AIR/OIL AMPLIFIER ASSEMBLY |                                                                                       |
| UNLESS OTHERWISE SPECIFIED:                                                         |       | SCALE: 1:3                        | DWG. NO. 10018108                                                                     |
| DIMENSIONS ARE IN INCHES (MM)                                                       |       | ESTIMATED WEIGHT: 8.4 LBS.        | STOCK/ASSY No.                                                                        |
| TOLERANCES:                                                                         |       | SHEET No. 2 OF 2                  |                                                                                       |
| FRACTIONAL ±                                                                        |       | SIZE <b>B</b>                     |                                                                                       |
| ANGULAR: MACH ± 1.0 BEND ±                                                          |       |                                   |                                                                                       |
| ONE PLACE DECIMAL ±.030 [.76]                                                       |       |                                   |                                                                                       |
| TWO PLACE DECIMAL ±.010 [.25]                                                       |       |                                   |                                                                                       |
| THREE PLACE DECIMAL ±.005 [.13]                                                     |       |                                   |                                                                                       |

## Spindle Motor and Pulley Assembly

| SPINDLE MOTORS |           |                                 |
|----------------|-----------|---------------------------------|
| No.            | STOCK No. | DESCRIPTION                     |
| 1              | MD00121   | 18 kW UAASKD-19LYA41 - YASKAWA  |
|                | MD00132   | 11 kW UAASKD-11LYA41 - YASKAWA  |
|                | MD00131   | 7.5 kW UAASKD-08LYA21 - YASKAWA |
|                | MD00114   | 7.5 kW UAASKA-08FZ1 - YASKAWA   |
|                | MD00150   | 11 kW UAASKA-11LYA31 - YASKAWA  |
|                | FANUC     | 8 kW A06B-1407-B103             |
|                | FANUC     | 12 kW A06B-1428-B103            |
|                | FANUC     | 22 kW A06B-1451-B113            |
|                | FANUC     | 8 kW A06B-1477-B133             |
|                | FANUC     | 15 kW A06B-1479-B133            |
|                | SIEMENS   | 11 kW 1PH7131-2QF02-OLKO        |
|                | SIEMENS   | 12 kW 1PH7163-2QB03-OLKO        |
|                | SIEMENS   | 16 kW 1PH7167-2QB03-OLKO        |
|                | SIEMENS   | 7.5 kW 1PM6105-2LF81-1AR1-Z     |
|                | SIEMENS   | 11 kW 1PM6133-2LF81-1AR1-Z      |
|                | SIEMENS   | 18.5 kW 1PM6137-2LF81-1AR1-Z    |



| MOTOR PLATES |           |                                                                |
|--------------|-----------|----------------------------------------------------------------|
| No.          | STOCK No. | DESCRIPTION                                                    |
| 2            | MP00548   | MD00121 & MD00131 & MD00132 - YASKAWA<br>12 kW & 22 kW - FANUC |
|              | MP00587   | MD00114 & MD00150 - YASKAWA<br>(8 kW - FANUC)                  |
|              | MPB0045   | MD00114 & MD00150 - YASKAWA (BRIDGE MILL ONLY)                 |
|              | MPB0040   | MD00131 & MD00132 - YASKAWA (BRIDGE MILL ONLY)                 |
|              | SMN0008   | 11 kW - SIEMENS                                                |
|              | SMN0061   | 7.5 kW - SIEMENS & 8 kW - FANUC                                |
|              | SMN0062   | 11 kW & 18.5 kW - SIEMENS                                      |
|              | MPTT045   | 15 kW - FANUC                                                  |

| BUSHINGS |           |                                                                                                   |
|----------|-----------|---------------------------------------------------------------------------------------------------|
| No.      | STOCK No. | DESCRIPTION                                                                                       |
| 3        | PY00097   | 48mm ID SK BUSHING(USED WITH MD00121, MD00131, MD00132, MD00150 - YASKAWA) (8 kW & 12 kW - FANUC) |
|          | PY00184   | 32mm ID SK BUSHING(USED WITH MD00114 - YASKAWA)                                                   |
|          | PY00215   | 55mm ID SK BUSHING(USED WITH 16 kW - SIEMENS & 22 kW - FANUC)                                     |
|          | PY00216   | 38mm ID SK BUSHING(USED WITH 7.5 kW - SIEMENS & 8 kW - FANUC)                                     |
|          | PY00217   | 42mm ID SK BUSHING(USED WITH 11 kW & 18.5 kW - SIEMENS)                                           |
|          | PY00280   | TLK 110-48-62 BUSHING (USED ON 50 TAPER MACHINES)                                                 |

| SPINDLE MOTOR PULLEYS |         |                   |                  |                   |                  |                  |         |         |          |
|-----------------------|---------|-------------------|------------------|-------------------|------------------|------------------|---------|---------|----------|
| No.                   | RPM     | 7.5 kW<br>MD00114 | 11 kW<br>MD00150 | 7.5 kW<br>MD00131 | 11 kW<br>MD00132 | 18 kW<br>MD00121 | FANUC   | SIEMENS | 50 TAPER |
| 4                     | 6K/8K   | PY00201           | PY00201          | PY00192           | PY00192          | PY00192          | PY00192 | PY00192 | PY00281  |
|                       | 12K/15K | PY00188           | PY00188          | PY00188           | PY00188          | PY00188          | PY00188 | PY00188 | -        |

| PARTS LIST |     |           |                       |
|------------|-----|-----------|-----------------------|
| 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 |

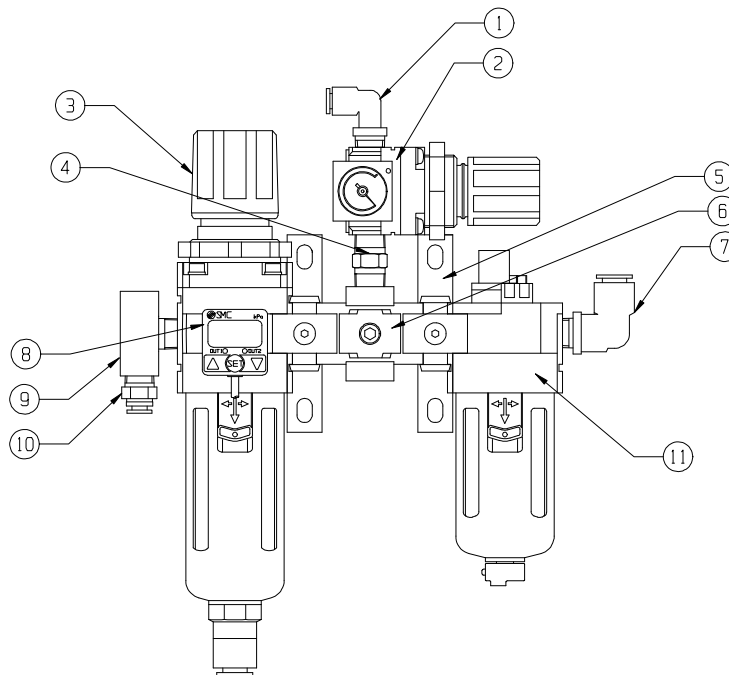
| HARDWARE LIST |     |                     |
|---------------|-----|---------------------|
| No.           | QTY | DESCRIPTION         |
| A             | 4   | 1/2-13 x 1 1/4 SHCS |
| B             | 4   | 1/2 LOCK WASHER     |
| C             | 3   | 5/16 LOCK WASHER    |
| D             | 3   | 5/16-18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

|                                                                            |                             |                                                                                                                                                                                                                               |          |       |
|----------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| J                                                                          | ADD 50 TAPER TO CHART       | 7078                                                                                                                                                                                                                          |          | 05/11 |
| I                                                                          | ADD FANUC/SIEMENS TO CHART  | 6314                                                                                                                                                                                                                          | N.M.     | 03/07 |
| H                                                                          | EDIT CHART                  | 5953                                                                                                                                                                                                                          | N.M.     | 05/05 |
| G                                                                          | ADD MD00150                 | 5826                                                                                                                                                                                                                          | N.M.     | 11/04 |
| F                                                                          | MODIFY CHART                | 5697                                                                                                                                                                                                                          | N.M.     | 01/04 |
| E                                                                          | ADD MD00121 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.D. NO.                                                                                                                                                                                                                    | APP'D BY | DATE  |
| MATERIAL/FINISH                                                            |                             | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA                                                                                 |          |       |
| STOCK/ASSY No.                                                             |                             | <b>TITLE</b> GOODYEAR MOTOR AND PULLEY ASSEMBLY<br><b>APPLICATION</b> GENERAL PRODUCTS<br><b>SCALE</b> 10:1 <b>DWG No.</b> 6-10-018-089 <b>SIZE</b> B<br><b>DATE</b> 04 AUG 00 <b>DRAWN BY</b> DAHLKE <b>SHEET NO.</b> 1 OF 1 |          |       |
| <b>TOLERANCE</b> UNLESS SPECIFIED<br>X.XXX ±<br>X.XX ±<br>X.X ±<br>ANGLE ± |                             |                                                                                                                                                                                                                               |          |       |

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## 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               |             | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |          |                      |
| STOCK/ASSY No.                |             |                                                                                                                                               |          |                      |
| TOLERANCE<br>UNLESS SPECIFIED |             | TITLE NU-417 FRL ASSEMBLY                                                                                                                     |          |                      |
| X .XXX +/-                    |             | APPLICATION GENERAL PRODUCTS                                                                                                                  |          |                      |
| X .XX +/-                     |             | SCALE 3:1                                                                                                                                     |          | DWG NO. 6-10-018-112 |
| X .X +/-                      |             | DATE 14 APR 08                                                                                                                                |          | SIZE B               |
| ANGLE +/-                     |             | DRAWN BY DAHLKE                                                                                                                               |          | SHEET NO. 1:1        |

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## Waylube Pump MA00458

The on time and off time can be adjusted using MISC control parameters “Way Lube ON time (sec)”, and “Way Lube OFF time (min)”.

### Oiler Comparison

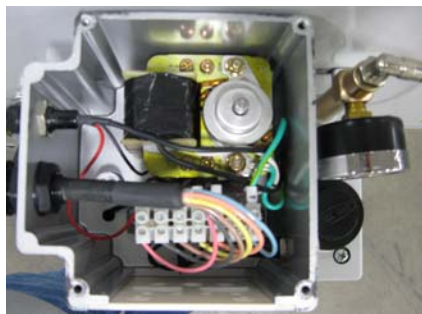
|                               | <b>Old style</b>  | <b>New style</b> |
|-------------------------------|-------------------|------------------|
| <b>Model #</b>                | CESD              | CEN01            |
| <b>Part #</b>                 | MA00219           | MA00458          |
| <b>Timer function ON/OFF</b>  | Built-in controls | Via CNC #66      |
| <b>Audible alarm</b>          | YES               | NO               |
| <b>Oil pressure gauge</b>     | NO                | YES              |
| <b>Manual override button</b> | YES               | YES              |

### Software & control

All 8200 versions have the functionality. 7200 version 77401 or higher is required to have the functionality.

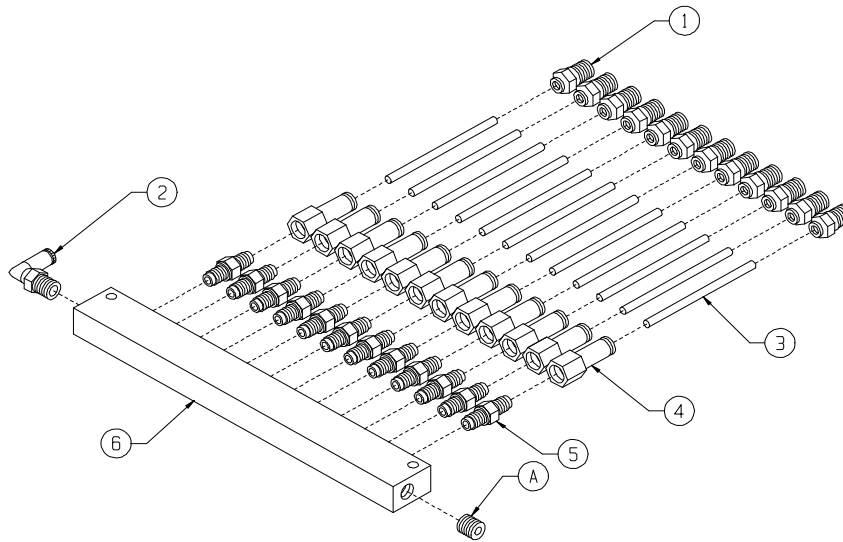
The oiler timer is functional only when the “Grease Cycle Time” parameter is set to Zero, and the Way Lube ON and OFF time parameters are non-zero.

### Pictures of MA00458



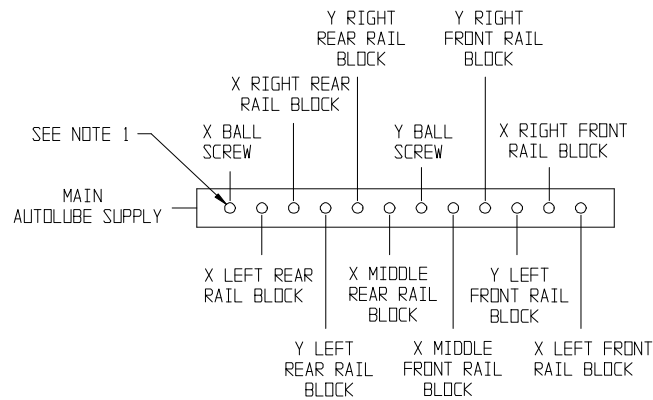
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## X & Y Axis Autolube Manifold Assembly



### 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.O. NO. | APP'D BY | DATE  |

MATERIAL/FINISH

STOCK/ASSY No.



TITLE X & Y AXIS AUTOLUBE MANIFOLD ASSEMBLY

APPLICATION GENERAL PRODUCTS

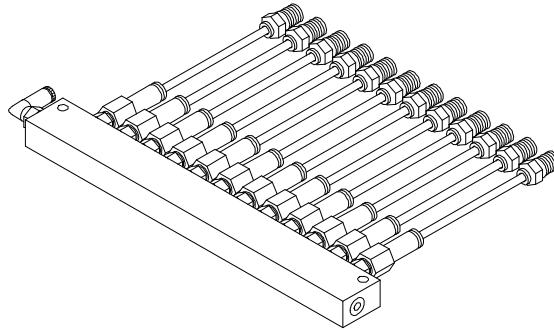
SCALE 2:1 DWG No. 6-10-018-049 SIZE B

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

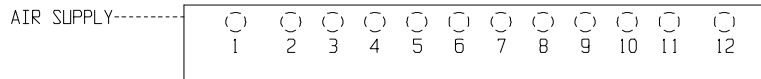
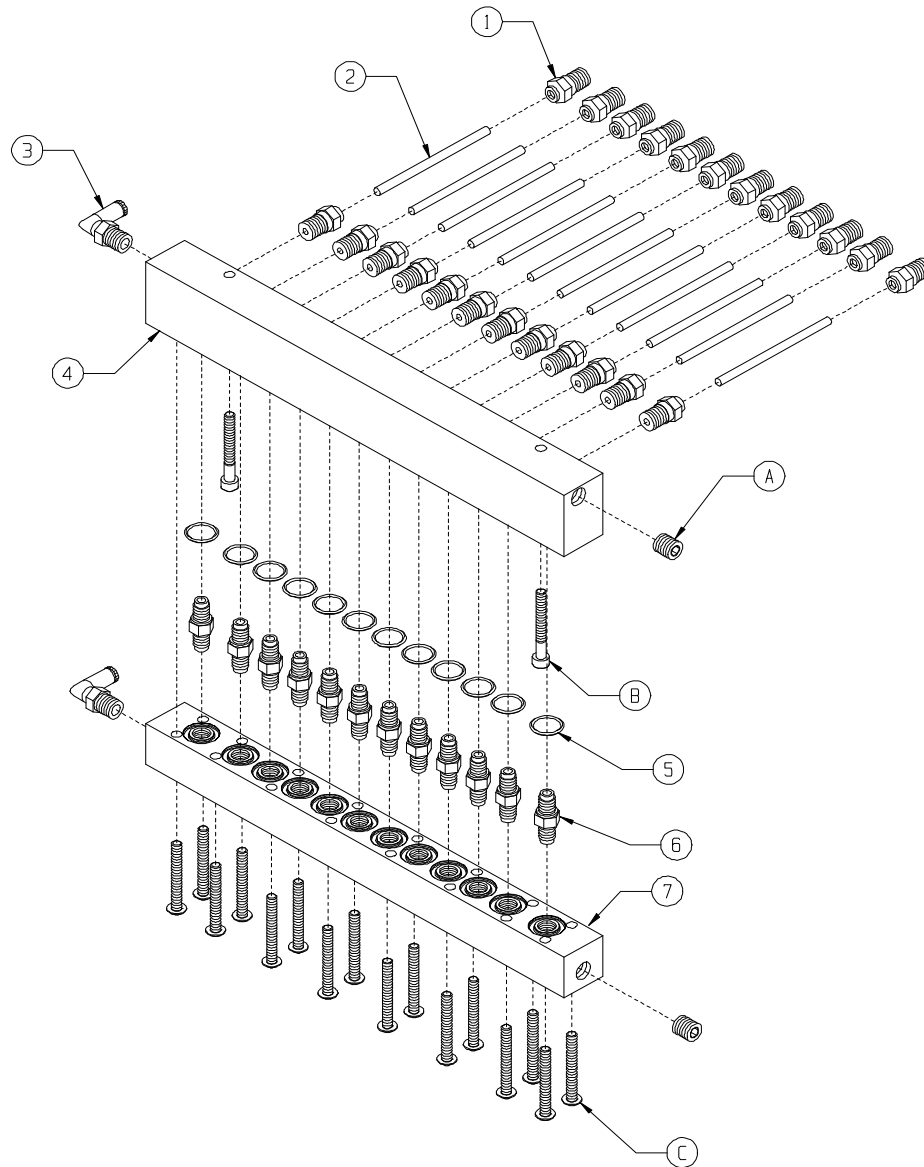
| No. | QTY | DESCRIPTION     |
|-----|-----|-----------------|
| A   | 1   | 1/8-27 NPT SHPP |

|                               |                           |                                                                                                                                               |          |       |
|-------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| 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               |                           | <br>1400 MILL LANE 952.442.1410<br>WACONIA, MN 55387 USA |          |       |
| STOCK/ASSY No.                |                           |                                                                                                                                               |          |       |
| TOLERANCE<br>UNLESS SPECIFIED |                           | TITLE<br>X & Y AXIS<br>AUTOLUBE MANIFOLD ASSEMBLY                                                                                             |          |       |
| X .XXX ±                      |                           | APPLICATION<br>GENERAL PRODUCTS                                                                                                               |          |       |
| X .XX ±                       |                           | SCALE 2:1                                                                                                                                     |          |       |
| X .X ±                        |                           | DWG No. 6-10-018-049                                                                                                                          |          |       |
| ANGLE ±                       |                           | SIZE B                                                                                                                                        |          |       |
|                               |                           | DATE 25 JUL 97                                                                                                                                |          |       |
|                               |                           | DRAWN BY THOMPSON                                                                                                                             |          |       |
|                               |                           | SHEET NO. 2 OF 2                                                                                                                              |          |       |

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| TOLERANCE<br>UNLESS SPECIFIED |
|-------------------------------|
| X, XXX                        |
| X, XX                         |
| X, X                          |
| ANGLE                         |

## X & Y Axis Air/Oil Manifold Assembly

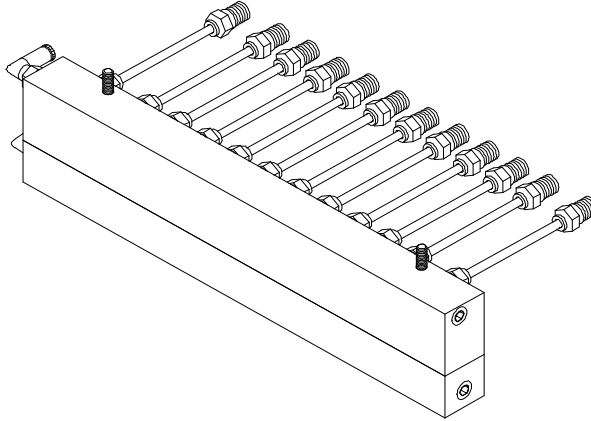


### AIR/OIL LINE DESTINATIONS

|     |                           |
|-----|---------------------------|
| 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  | 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            |                       | <br>1400 MILL LANE 952-442-1410<br>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:**

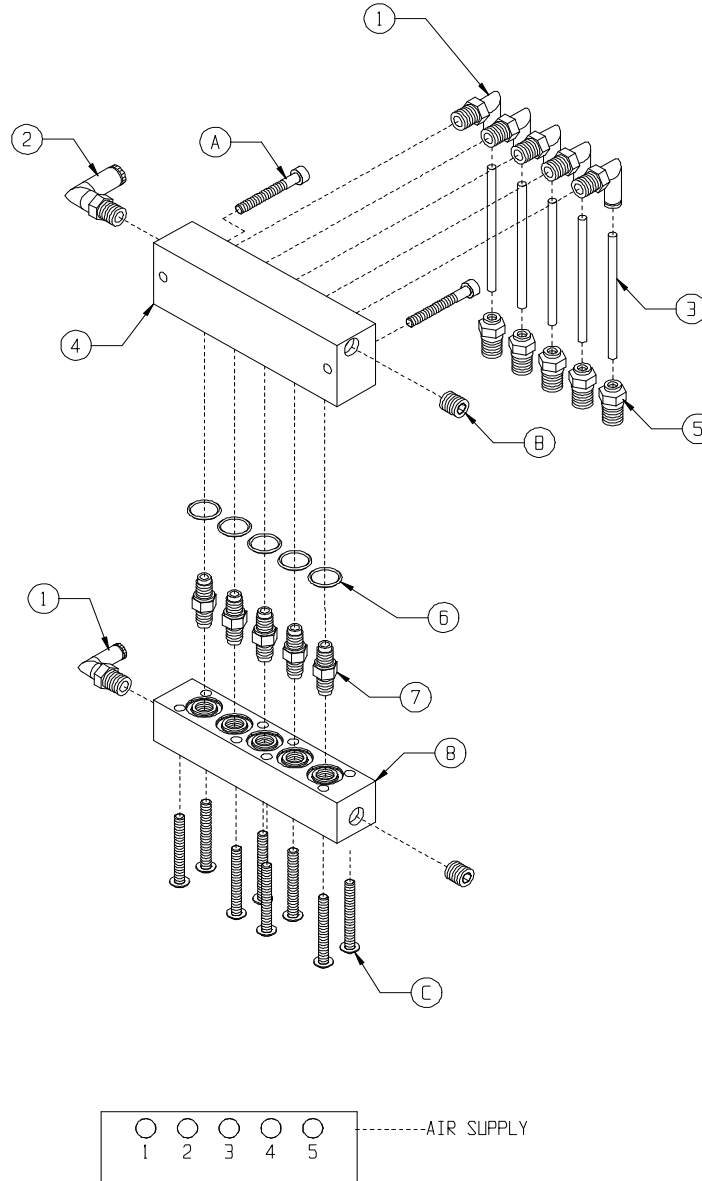
- IF REFERENCED WITH A (-) PLUG AIR/OIL LINE HOLE AND OIL METER HOLE IN MANIFOLD WITH 1/8 NPT PLUG.

**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 |

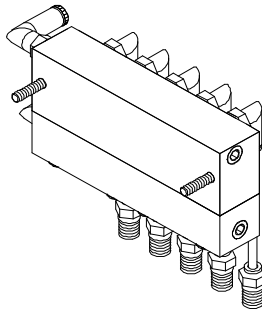
|                            |                       |                                                                                                                                               |          |       |
|----------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| 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.D. No.                                                                                                                                    | APP'D BY | DATE  |
| MATERIAL/FINISH            |                       | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |          |       |
| STOCK/ASSY No.             |                       |                                                                                                                                               |          |       |
| TOLERANCE UNLESS SPECIFIED |                       | TITLE X & Y AXIS AIR/OIL MANIFOLD ASSEMBLY                                                                                                    |          |       |
| X .XXX +/- .005            |                       | APPLICATION PARTNER I                                                                                                                         |          |       |
| X .XX +/- .010             |                       | SCALE 2:1 DWG No. 6-10-008-058 SIZE B                                                                                                         |          |       |
| X .X +/- .030              |                       | DATE 10 JUN 99 DRAWN BY HERME SHEET No. 2 OF 2                                                                                                |          |       |
| ANGLE +/- 1.0°             |                       |                                                                                                                                               |          |       |

## Z-Axis Air/Oil Manifold Assembly



| <b>AIR/OIL LINE DESTINATIONS</b> |                          |
|----------------------------------|--------------------------|
| 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               |                       | <br><b>1400 MILL LANE      952-442-1410</b><br><b>WACONIA, MN      55387 USA</b> |                      |                     |
| STOCK/ASSY No.                |                       |                                                                                                                                                                       |                      |                     |
| TOLERANCE<br>UNLESS SPECIFIED |                       | TITLE<br>Z AXIS AIR/OIL MANIFOLD ASSEMBLY                                                                                                                             |                      |                     |
| X.XXX    +/-    .005          |                       | APPLICATION<br>PARTNER I                                                                                                                                              |                      |                     |
| X.XX     +/-    .010          |                       | SCALE    2:1                                                                                                                                                          | DWG No. 6-10-008-059 | SIZE    B           |
| 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**

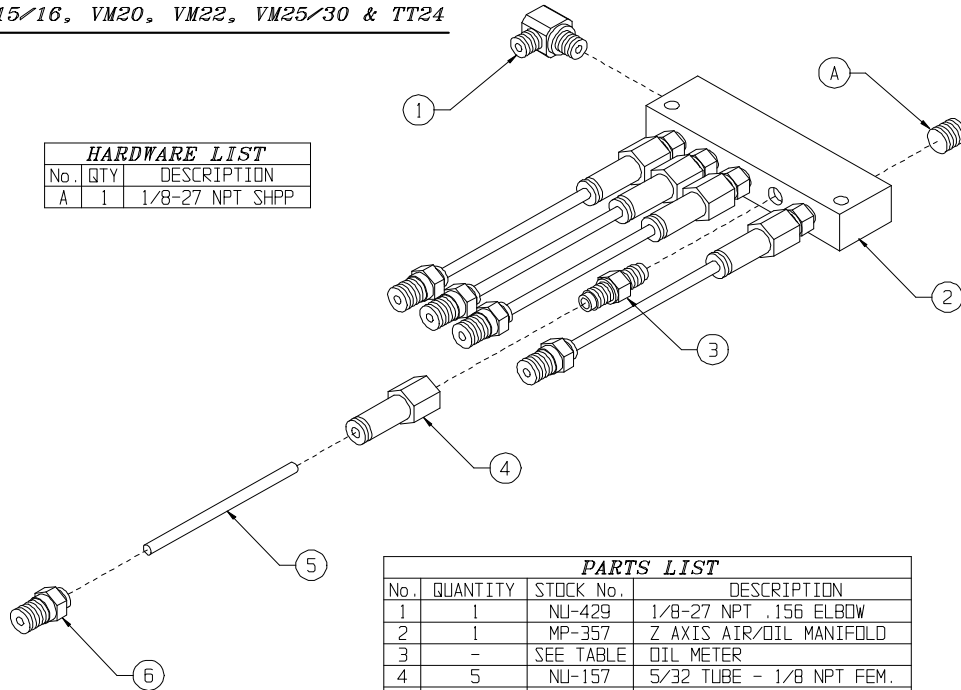
| No. | QTY | DESCRIPTION        |
|-----|-----|--------------------|
| A   | 2   | 10-32 x 1 1/2 SHCS |
| B   | 2   | 1/8-27 NPT SHPP    |
| C   | 8   | 10-32 x 1 1/2 BHCS |

|                            |                       |                                                                                                                                               |                      |                  |
|----------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|
| 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            |                       | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |                      |                  |
| STOCK/ASSY No.             |                       |                                                                                                                                               |                      |                  |
| TOLERANCE UNLESS SPECIFIED |                       | TITLE Z AXIS AIR/OIL MANIFOLD ASSEMBLY                                                                                                        |                      |                  |
|                            |                       | APPLICATION PARTNER I                                                                                                                         |                      |                  |
| X.XXX                      | +/- .005              | SCALE 2:1                                                                                                                                     | DWG No. 6-10-008-059 | SIZE B           |
| X.XX                       | +/- .010              |                                                                                                                                               |                      |                  |
| X.X                        | +/- .030              |                                                                                                                                               |                      |                  |
| ANGLE                      | +/- 1.0°              | DATE 11 JUN 99                                                                                                                                | DRAWN BY HERME       | SHEET No. 2 OF 2 |

## 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 |



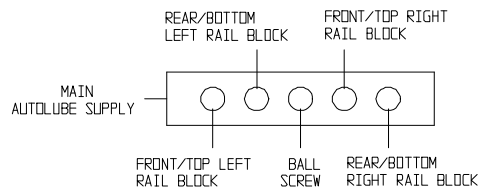
| PARTS LIST |           |           |                          |
|------------|-----------|-----------|--------------------------|
| No.        | QUANTITY  | STOCK No. | DESCRIPTION              |
| 1          | 1         | NU-429    | 1/8-27 NPT .156 ELBOW    |
| 2          | 1         | MP-357    | 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<br>NU-154 | NU-315 | NU-315 | NU-315  | NU-315 |

### AUTOLUBE LINE DESTINATIONS



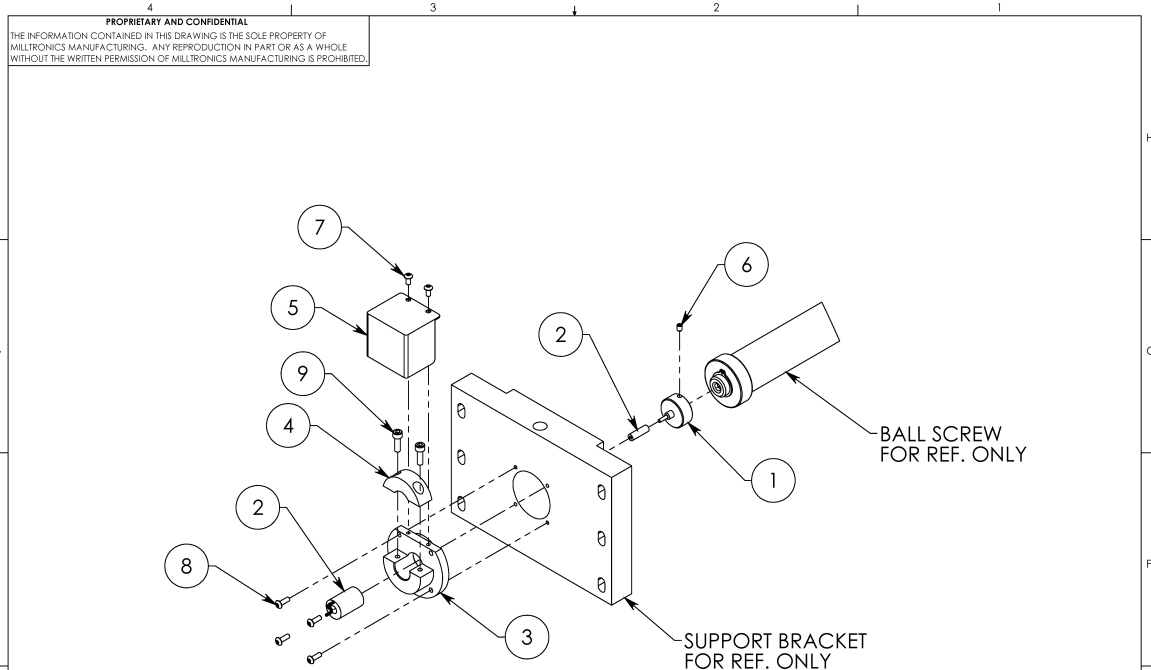
### NOTES:

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.D. NO.                                                                                                                                    | APP'D BY | DATE  |
| MATERIAL/FINISH            |                     |             | <br>1400 MILL LANE 952.442.1410<br>WACONIA, MN 55387 USA |          |       |
|                            |                     |             |                                                                                                                                               |          |       |
| STOCK/ASSY No.             |                     |             | TITLE 5 PORT AUTOLUBE MANIFOLD ASSEMBLY                                                                                                       |          |       |
| TOLERANCE UNLESS SPECIFIED |                     |             | APPLICATION GENERAL PRODUCTS                                                                                                                  |          |       |
| X .XXX ±                   |                     |             | SCALE 1.5:1 DWG No. 6-10-018-050 SIZE B                                                                                                       |          |       |
| X .XX ±                    |                     |             | DATE 20 AUG 97 DRAWN BY THOMPSON SHEET NO. 1 OF 1                                                                                             |          |       |
| X .X ±                     |                     |             |                                                                                                                                               |          |       |
| ANGLE ±                    |                     |             |                                                                                                                                               |          |       |

## Thermal Compensation Assembly



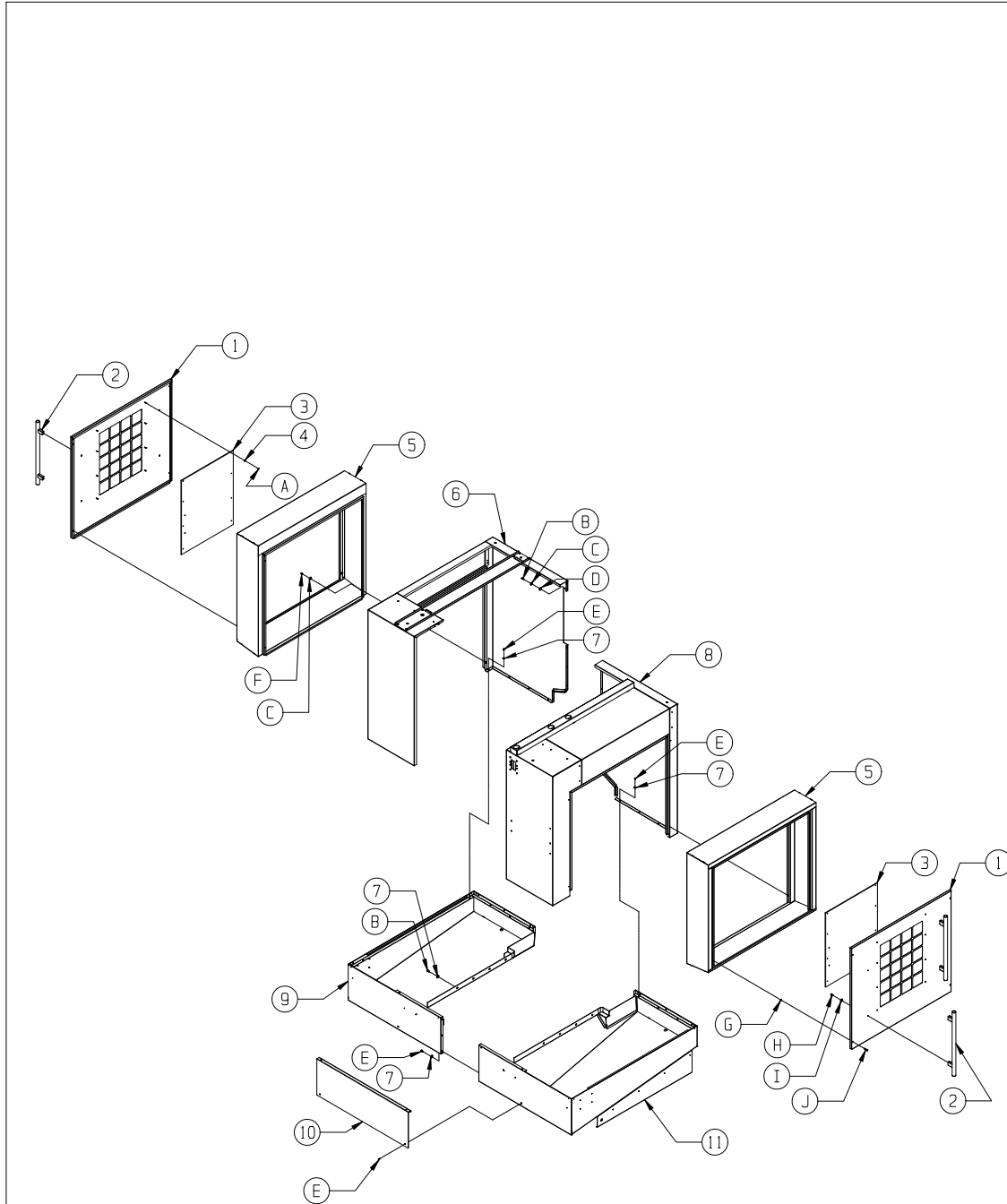
| ITEM NO. | QTY | PART NUMBER         | DESCRIPTION                    |
|----------|-----|---------------------|--------------------------------|
| 1        | 1   | MP00858             | THERMAL BALL SCREW CAP         |
| 2        | 1   | PR00043             | THERMAL COMP SENSOR            |
| 3        | 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:

- ITEMS 3 & 4 ARE REVERSED ON SOME AXES
- ITEMS 5 & 7 ARE NOT USED ON SOME AXES

|                                                                                     |       |      |                                                                                       |
|-------------------------------------------------------------------------------------|-------|------|---------------------------------------------------------------------------------------|
|  | NAME  | DATE |  |
|                                                                                     | DRAWN | JRD  |                                                                                       |
| MATERIAL:                                                                           |       |      | TITLE: THERMAL COMP ASSEMBLY                                                          |
| FINISH:                                                                             |       |      | SCALE: 1:4 DWG. NO. 10018111                                                          |
| UNLESS OTHERWISE SPECIFIED:                                                         |       |      | ESTIMATED WEIGHT: 16.0 Lbs.                                                           |
| DIMENSIONS ARE IN INCHES [MM]                                                       |       |      | STOCK/ASSY NO.                                                                        |
| TOLERANCES:                                                                         |       |      | SHEET NO. 1 OF 1                                                                      |
| FRACTIONAL: ±                                                                       |       |      | SIZE <b>B</b>                                                                         |
| ANGULAR: MACH ± 1.0 BEND ±                                                          |       |      |                                                                                       |
| ONE PLACE DECIMAL ±.050 [1.27]                                                      |       |      |                                                                                       |
| TWO PLACE DECIMAL ±.010 [0.25]                                                      |       |      |                                                                                       |
| THREE PLACE DECIMAL ±.005 [0.13]                                                    |       |      |                                                                                       |

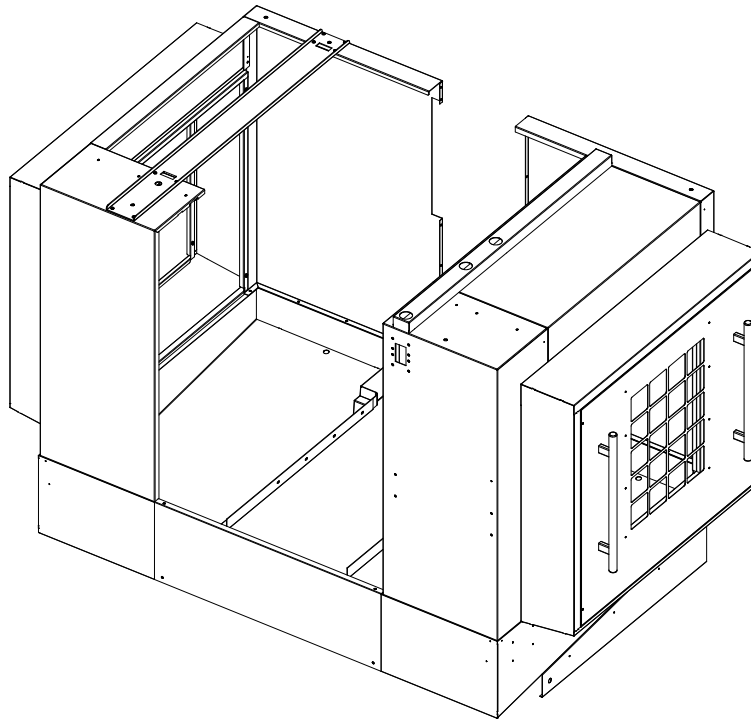
## Enclosure Assembly



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

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


**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

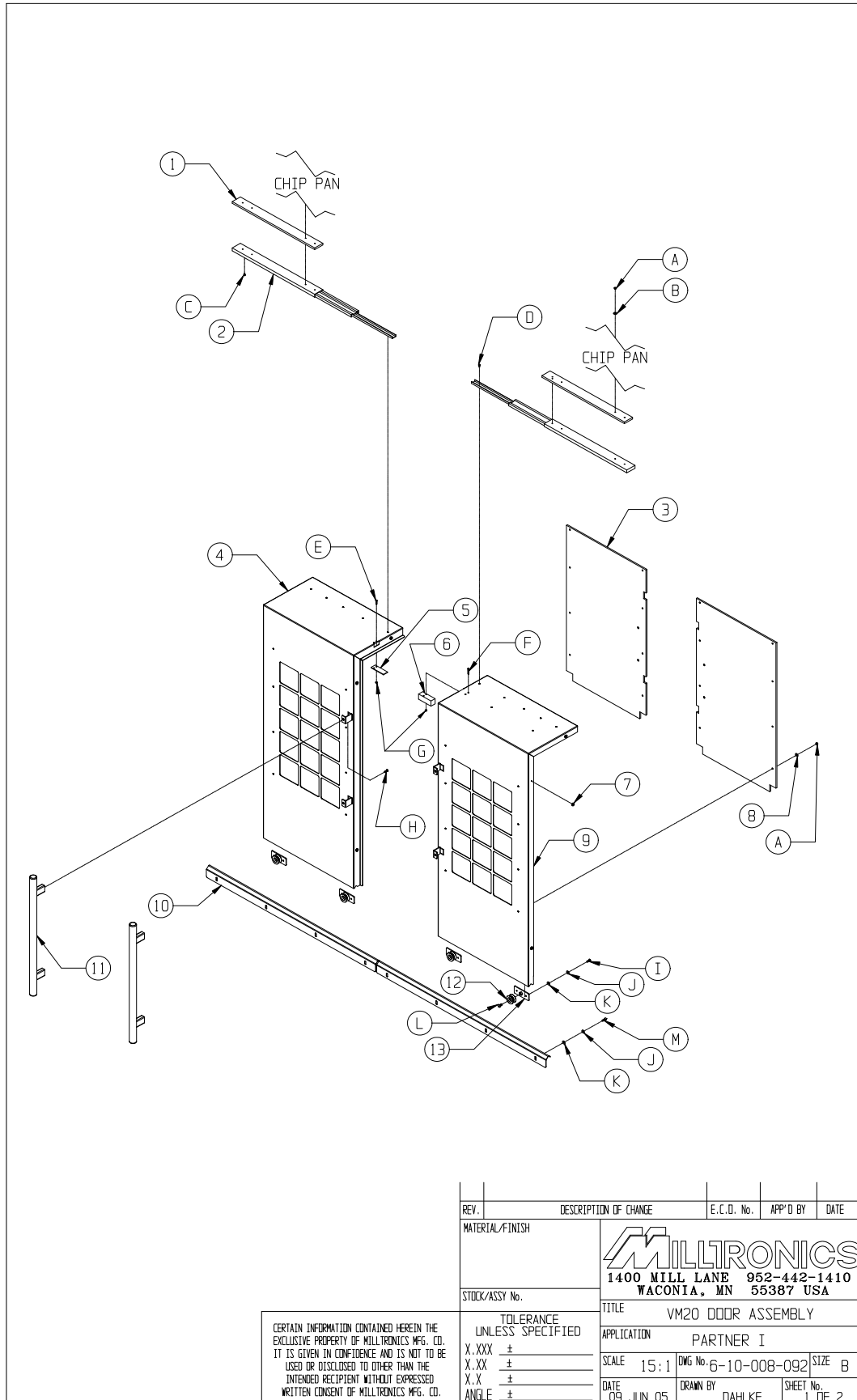
**HARDWARE LIST**

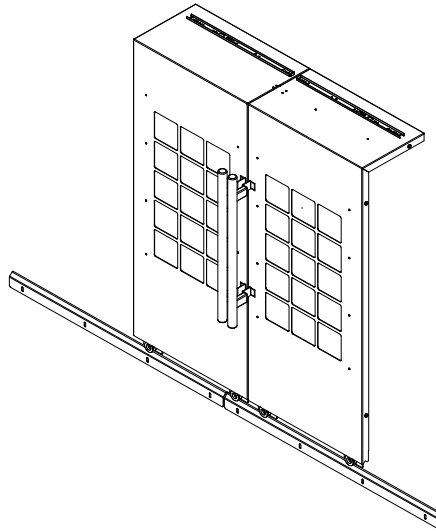
| No. | QTY | DESCRIPTION         |
|-----|-----|---------------------|
| A   | 16  | M5-.8 NYLOCK NUT    |
| B   | 9   | M6-1 x 20mm SHCS    |
| C   | 17  | M6 LOCK WASHER      |
| D   | 9   | M6 FLAT WASHER      |
| E   | 23  | M6-1 x 12mm BHCS    |
| * F | 8   | M6-1 x 12mm SHCS    |
| G   | 8   | 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.D. No.                                                                                                                                                 | APP'D BY  | DATE   |
| MATERIAL/FINISH            |                       | <div><br/>1400 MILL LANE 952-442-1410<br/>WACONIA, MN 55387 USA</div> |           |        |
| 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




**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 |

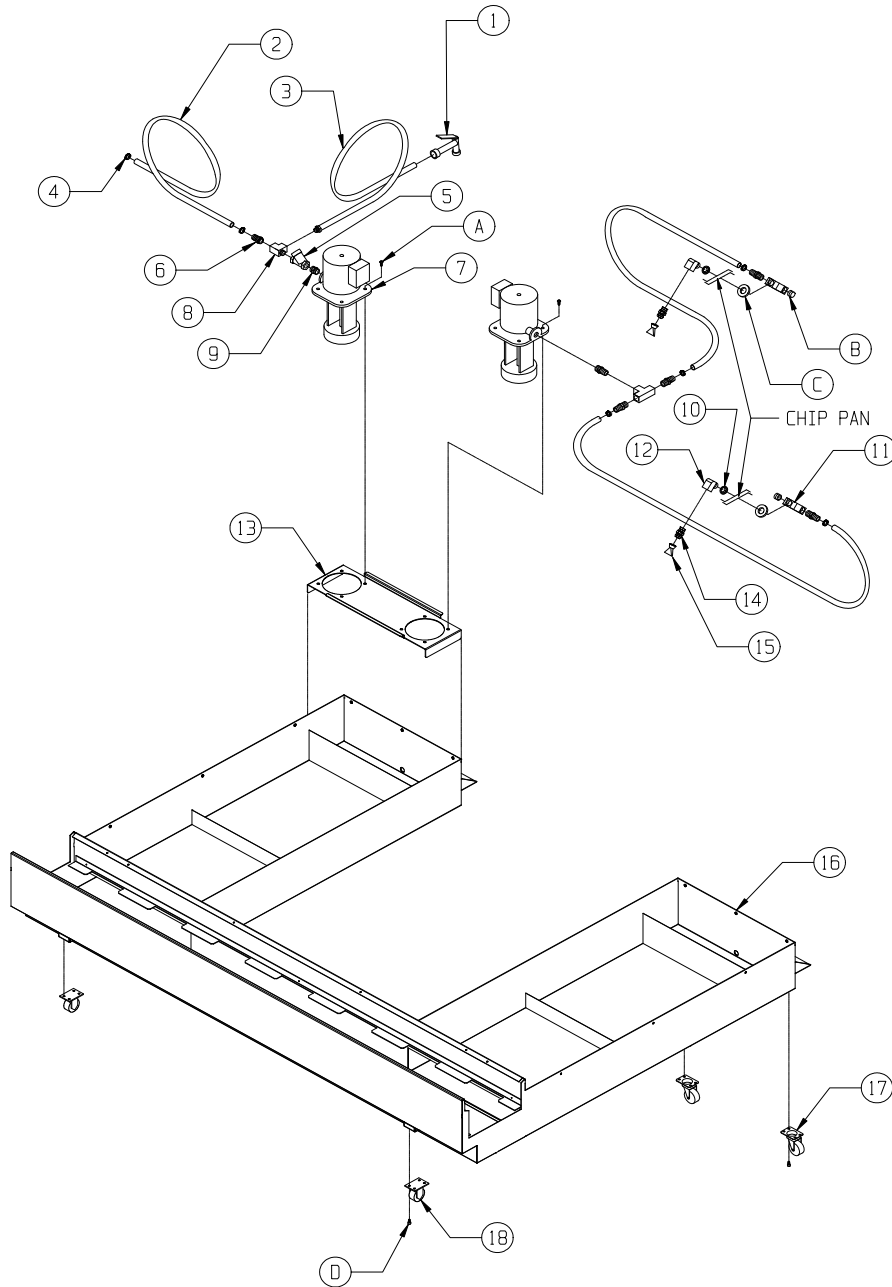
**HARDWARE LIST**

| 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    |

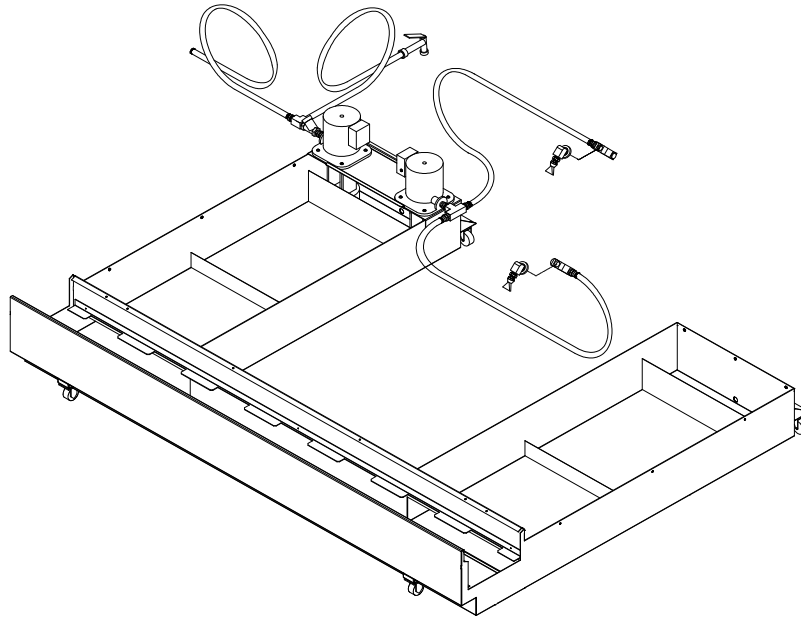
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|                            |                       |                                                                                                                                                             |          |      |
|----------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|
| REV.                       | DESCRIPTION OF CHANGE | E.C.D. No.                                                                                                                                                  | APP'D BY | DATE |
| MATERIAL/FINISH            |                       | <br><b>1400 MILL LANE 952-442-1410</b><br><b>WACONIA, MN 55387 USA</b> |          |      |
| STOCK/ASSY No.             |                       |                                                                                                                                                             |          |      |
| TOLERANCE UNLESS SPECIFIED |                       | TITLE                                                                                                                                                       |          |      |
| X .XXX ±                   |                       | VM20 DOOR ASSEMBLY                                                                                                                                          |          |      |
| X .XX ±                    |                       | APPLICATION                                                                                                                                                 |          |      |
| X .X ±                     |                       | PARTNER I                                                                                                                                                   |          |      |
| ANGLE ±                    |                       | SCALE 15:1                                                                                                                                                  |          |      |
|                            |                       | DATE 09 JUN 05                                                                                                                                              |          |      |
|                            |                       | DRAWN BY DAHLKE                                                                                                                                             |          |      |
|                            |                       | SHEET No. 2 OF 2                                                                                                                                            |          |      |

## Flood Tank W/Washdown Assembly



| REV.                       | DESCRIPTION OF CHANGE | E.C.O. No.                                                                                                                                                 | APP'D BY | DATE                             |
|----------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|
| MATERIAL/FINISH            |                       | <div><br/>1400 MILL LANE 952-442-1410<br/>WACONIA, MN 55387 USA</div> |          |                                  |
| 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. 1 OF 2 |
| ANGLE                      | +/-                   |                                                                                                                                                            |          |                                  |



### PARTS LIST

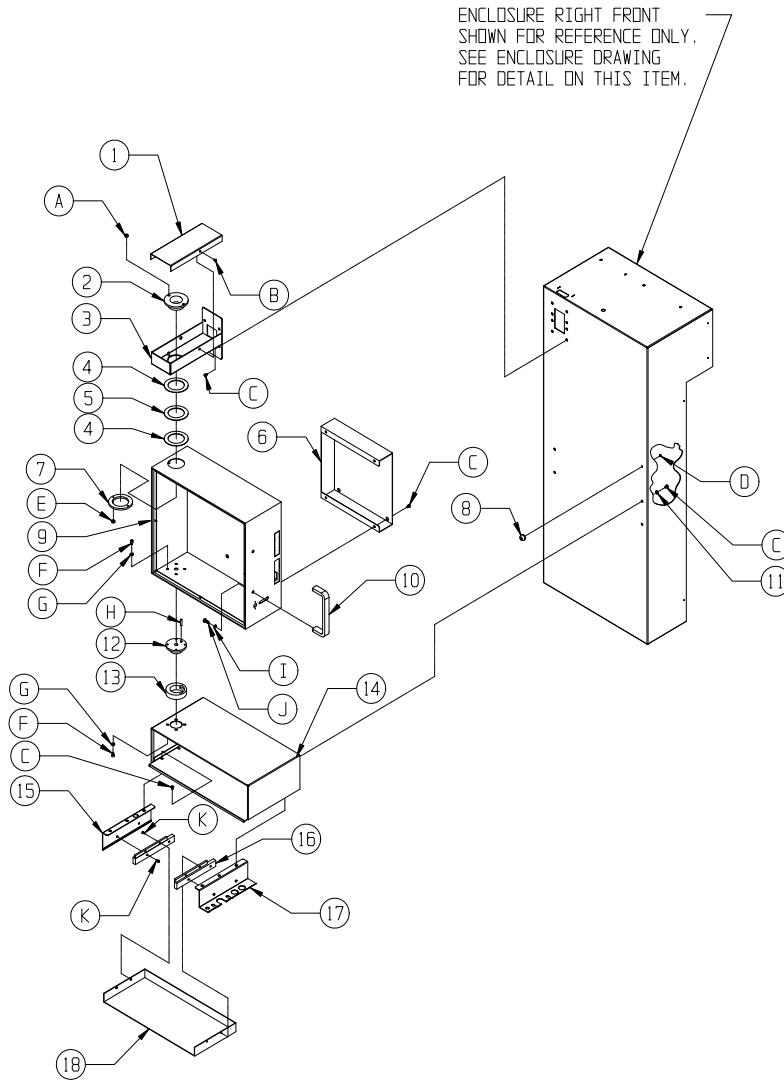
| No. | QTY | STOCK No. | DESCRIPTION                 |
|-----|-----|-----------|-----------------------------|
| 1   | 1   | NU-124    | WATER HOSE NOZZLE           |
| 2   | 30' | NU-69     | 3/4" NYLOBRAID HOSE         |
| 3   | 1   | NU-130    | WASHDOWN HOSE ASSEMBLY      |
| 4   | 6   | NU-141    | 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   | 2   | 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  | 1   | 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          |

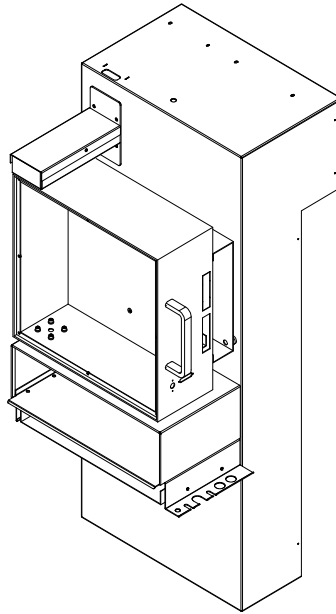
| REV.                                                                                                                                                            | DESCRIPTION OF CHANGE | E.C.O. No.                                | APP'D BY | DATE |
|-----------------------------------------------------------------------------------------------------------------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

## Enclosure Swivel Monitor Assembly



|                            |                       |                                                                                                                                               |          |                      |
|----------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------|
| A                          | CORRECT TABLE ERROR   | 6328                                                                                                                                          |          | 04/07                |
| REV.                       | DESCRIPTION OF CHANGE | E.C.O. No.                                                                                                                                    | APP'D BY | DATE                 |
| MATERIAL/FINISH            |                       | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |          |                      |
| STOCK/ASSY No.             |                       |                                                                                                                                               |          |                      |
| TOLERANCE UNLESS SPECIFIED |                       | TITLE VM20 SWIVEL MONITOR ASSEMBLY                                                                                                            |          |                      |
| X.XXX +/-                  |                       | APPLICATION PARTNER I                                                                                                                         |          |                      |
| X.XX +/-                   |                       | SCALE 15:1                                                                                                                                    |          | DWG No. 6-10-008-087 |
| X.X +/-                    |                       | DATE 27 MAY 05                                                                                                                                |          | SIZE B               |
| ANGLE +/-                  |                       | DRAWN BY DAHLKE                                                                                                                               |          | SHEET No. 1 OF 2     |

CERTAIN INFORMATION CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF MILLTRONICS 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 MILLTRONICS MFG. CO.


**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   | MP30-12   | 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   |

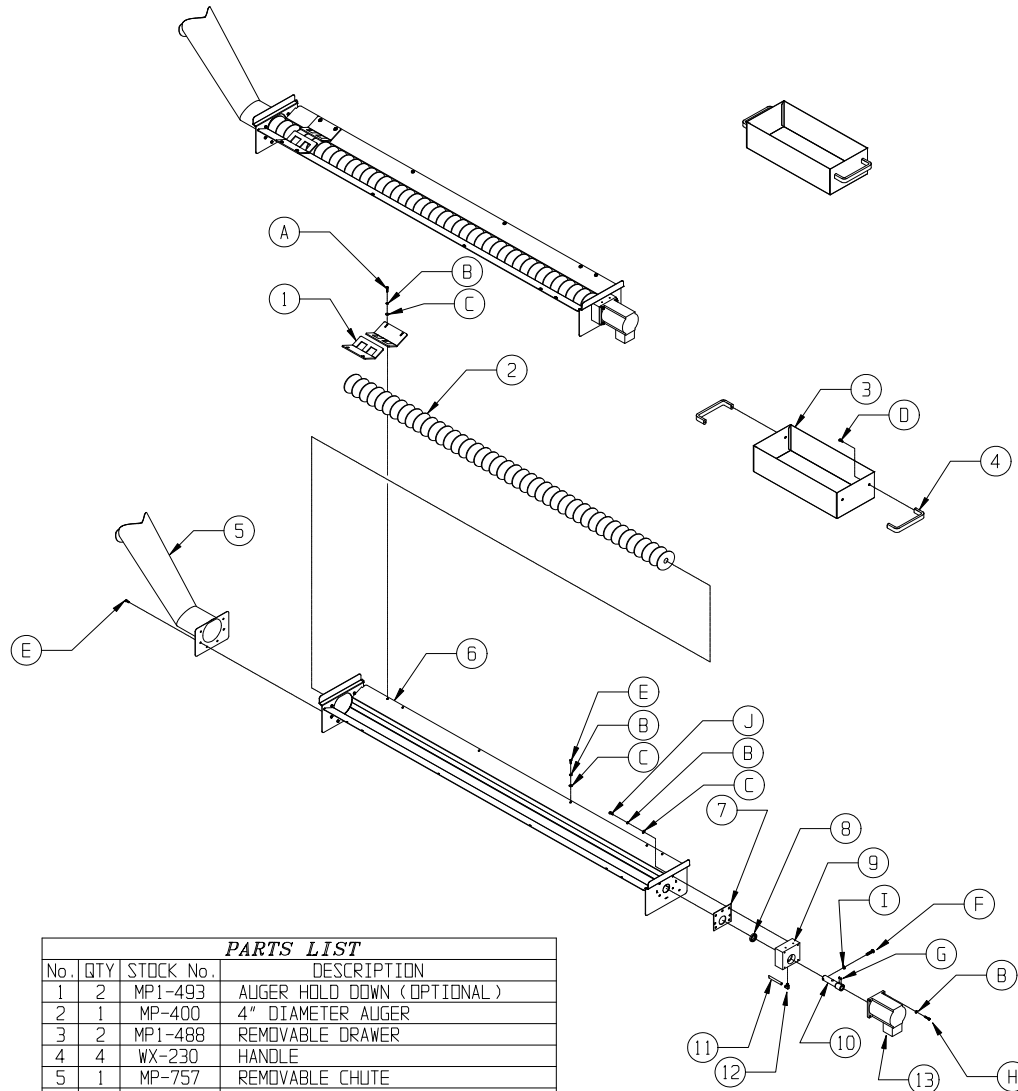
**SWIVEL BOX TABLE**

| No. | CENT. | 7 | INT.    | CONTROL |
|-----|-------|---|---------|---------|
| 9   | MM-80 |   | MPIC-03 |         |

|                            |                                                                                                                                               |                       |          |       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------|-------|
| A                          | CORRECT TABLE ERROR                                                                                                                           | 6328                  |          | 04/07 |
| REV.                       | DESCRIPTION OF CHANGE                                                                                                                         | E.C.O. No.            | APP'D BY | DATE  |
| MATERIAL/FINISH            | <br>1400 MILL LANE 952-442-1410<br>WACONIA, MN 55387 USA |                       |          |       |
| STOCK/ASSY No.             | TITLE VM20 SWIVEL MONITOR ASSEMBLY                                                                                                            |                       |          |       |
| TOLERANCE UNLESS SPECIFIED |                                                                                                                                               | APPLICATION PARTNER I |          |       |
| X.XXX +/-                  |                                                                                                                                               | SCALE 10:1            |          |       |
| X.XX +/-                   |                                                                                                                                               | DATE 27 MAY 05        |          |       |
| X.X +/-                    |                                                                                                                                               | DRAWN BY DAHLKE       |          |       |
| ANGLE +/-                  |                                                                                                                                               | SHEET No. 2 OF 2      |          |       |

CERTAIN INFORMATION CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF MILLTRONICS 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 MILLTRONICS MFG. CO.

## Chip Pan Drawer/Auger Assembly



### PARTS LIST

| No. | QTY | STOCK No. | DESCRIPTION                     |
|-----|-----|-----------|---------------------------------|
| 1   | 2   | MP1-493   | AUGER HOLD DOWN (OPTIONAL)      |
| 2   | 1   | MP-400    | 4" DIAMETER AUGER               |
| 3   | 2   | MP1-488   | REMOVABLE DRAWER                |
| 4   | 4   | WX-230    | HANDLE                          |
| 5   | 1   | MP-757    | REMOVABLE CHUTE                 |
| 6   | 1   | MP1-487   | REMOVABLE TROUGH                |
| 7   | 1   | WX-313    | AUGER MOTOR PLATE GASKET        |
| 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-171    | MALE ELBOW 1/8 NPT 1/4 TUBE     |
| 13  | 1   | MD-120    | AUGER MOTOR                     |

### HARDWARE LIST

| No. | QTY | DESCRIPTION         |
|-----|-----|---------------------|
| A   | 4   | M6-1 x 16mm BHCS    |
| B   | 20  | M6 LOCK WASHER      |
| C   | 16  | M6 FLAT WASHER      |
| D   | 8   | M8-1.25 x 16mm BHCS |
| E   | 14  | M6-1 x 12mm BHCS    |
| F   | 2   | M10-1.5 x 40mm BHCS |
| G   | 2   | 10-32 x 1/4 SHSS    |
| H   | 4   | M6-1 x 25mm SHCS    |
| I   | 2   | M10 LOCK WASHER     |
| J   | 4   | M6-1 x 20 SHCS      |

|      |                        |            |          |       |
|------|------------------------|------------|----------|-------|
| D    | CHANGE AUGER BOLTS     | 6753       |          | 03/09 |
| C    | CHANGE AUGER BOLT SIZE | 6751       | N.M.     | 03/09 |
| B    | UPDATE HARDWARE LIST   | 6256       | N.M.     | 01/07 |
| A    | ADD AUGER GASKET       | 6144       | N.M.     | 07/06 |
| 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

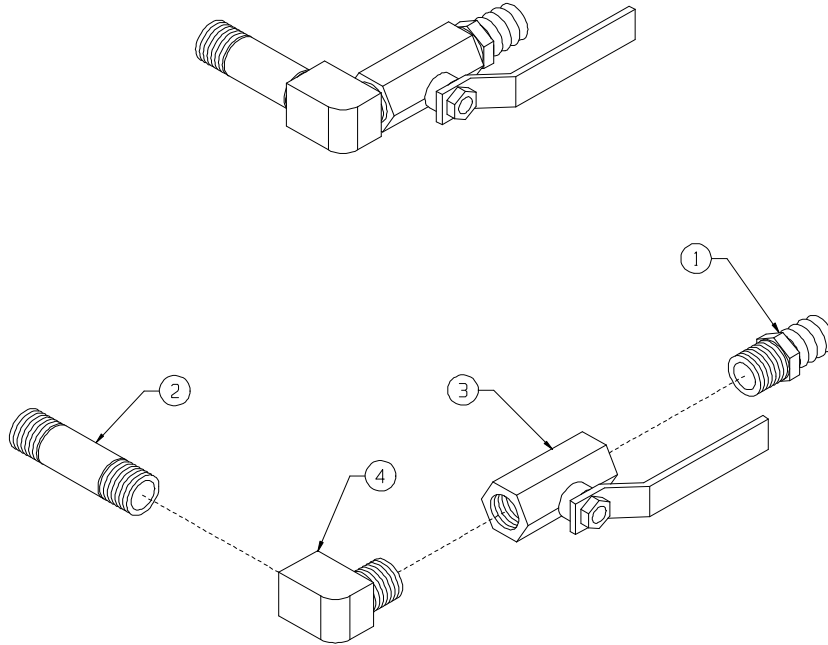
APPLICATION PARTNER I

SCALE 20:1 DWG No 6-10-008-089 SIZE B

DATE 08 JUN 05 DRAWN BY DAHLKE SHEET No. 1 OF 1

## Flood Coolant Valve Handle Assembly

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



### PARTS LIST

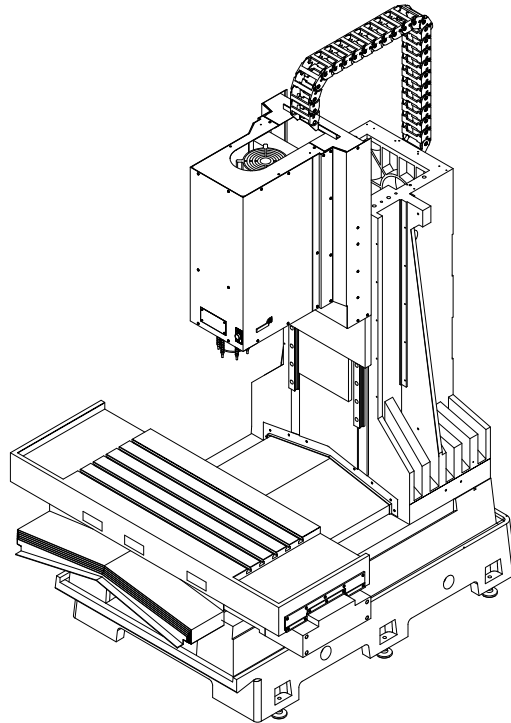
| No. | QTY | STOCK No. | DESCRIPTION           |
|-----|-----|-----------|-----------------------|
| 1   | 1   | NJ-66     | 3/4" BARB FITTING     |
| 2   | 1   | NJ-257    | 3 IN. PIPE NIPPLE     |
| 3   | 1   | NJ-64     | 1/2" BRASS BALL VALVE |
| 4   | 1   | NJ-125    | STREET ELBOW          |

|                            |                    |                                                                                                                                               |          |       |
|----------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|
| B                          | CHANGE PIPE NIPPLE | 4778                                                                                                                                          |          | 11/00 |
| A                          | CHANGE PIPE NIPPLE | 3851                                                                                                                                          | N.M.     | 2/99  |
| REV.                       | DESCRIPTION        | E.C.D. NO.                                                                                                                                    | APP'D BY | DATE  |
| MATERIAL/FINISH            |                    | <br>1400 MILL LANE 952-442-1410<br>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.



|                               |             |                                                                                                                                                            |                      |                  |
|-------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|
| REV.                          | DESCRIPTION | E.C.O. NO.                                                                                                                                                 | APP'D BY             | DATE             |
| MATERIAL/FINISH               |             | <div><br/>1400 MILL LANE 952-442-1410<br/>WACONIA, MN 55387 USA</div> |                      |                  |
| STOCK/ASSY No.                |             |                                                                                                                                                            |                      |                  |
| TOLERANCE<br>UNLESS SPECIFIED |             | TITLE LUBRICATION DRAWING                                                                                                                                  |                      |                  |
| X .XXX ±                      |             | APPLICATION PARTNER VI                                                                                                                                     |                      |                  |
| X .XX ±                       |             | SCALE 20:1                                                                                                                                                 | DWG No. 6-11-027-004 | SIZE B           |
| X .X ±                        |             | DATE 17 DEC 03                                                                                                                                             | DRAWN BY DAHLKE      | SHEET NO. 1 OF 2 |
| ANGLE ±                       |             |                                                                                                                                                            |                      |                  |

| <b>MOBILITH AW SERIES, MULTIPURPOSE EP GREASE</b> |                 |
|---------------------------------------------------|-----------------|
| 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               |

| <b>MOBIL VELOCITE OIL No. 10</b>  |           |
|-----------------------------------|-----------|
| 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      |

| <b>MOBIL VACTRA OIL No. 2</b>   |           |
|---------------------------------|-----------|
| 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      |

| <b>MOBIL DTE 24</b>       |           |
|---------------------------|-----------|
| 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          |           |

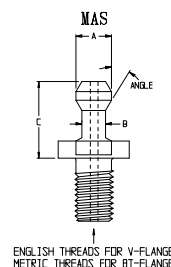
| REV. | DESCRIPTION                                                                                                                                                 | E.C.O. NO.          | APP'D BY            | DATE             |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|------------------|
|      | MATERIAL/FINISH                                                                                                                                             |                     |                     |                  |
|      | STOCK/ASSY No.                                                                                                                                              |                     |                     |                  |
|      | TOLERANCE UNLESS SPECIFIED                                                                                                                                  |                     |                     |                  |
|      | X.XXX                                                                                                                                                       | ±                   |                     |                  |
|      | X.XX                                                                                                                                                        | ±                   |                     |                  |
|      | X.X                                                                                                                                                         | ±                   |                     |                  |
|      | ANGLE                                                                                                                                                       | ±                   |                     |                  |
|      | <br><b>1400 MILL LANE 952-442-1410</b><br><b>WACONIA, MN 55387 USA</b> |                     |                     |                  |
|      | TITLE                                                                                                                                                       | LUBRICATION DRAWING |                     |                  |
|      | APPLICATION                                                                                                                                                 | PARTNER VI          |                     |                  |
|      | SCALE                                                                                                                                                       | 15:1                | DWG No 6-11-027-004 | SIZE B           |
|      | DATE                                                                                                                                                        | 17 DEC 03           | DRAWN BY DAHLKE     | SHEET NO. 2 OF 2 |

## Retention Knob Chart

NOTE: STANDARD RETENTION KNOBS FOR 40 TAPER SPINDLES

| MAS RETENTION KNOBS STYLE CT-FLANGE 40 TAPER |    |      |       |                                                                                                                                      |                                                                                                                                                                                         |              |  |           |                     |                  |                |
|----------------------------------------------|----|------|-------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--|-----------|---------------------|------------------|----------------|
| DIMENSIONS                                   |    |      |       | MILL/TURNING MACHINE                                                                                                                 |                                                                                                                                                                                         |              |  | CMDRAW    | KENNAMETAL PART No. | VALENTE PART No. | LYNDEX PART No |
| A                                            | B  | C    | ANGLE | 60mm SPINDLE                                                                                                                         |                                                                                                                                                                                         | 70mm SPINDLE |  |           |                     |                  |                |
| 59                                           | 39 | 1.27 | 60°   | BR50, BR60, BR80, MM18, RH20, RH30, RH33, RH35, RW15, VM15, VM16, VM20, VM22, VM35, VM36, VM20B, VM15, VM16, VM30, VM18, VM25, VM30. | BR50, BR60, BR80, MM20, HK35, RH20, RH30, RH33, RH35, T124, T140, T160, T180, VM16, VM20, VM22, VM35, VM30, VM324, VM424, VM630, VM104, T140, T160, T180, VM16, VM20, VM22, VM35, VM30. |              |  | R94E-0002 | RK31114A            | PT-532-60        | C40-6000       |

| NAS RETENTION KNOBS STYLE BT-FLANGE 40 TAPER |    |      |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| DIMENSIONS                                   |    |      |       | MILLITRONS MACHINE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |              |  | COMMAND           |                  |                 |
| A                                            | B  | C    | ANGLE | 60mm SPINDLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  | 70mm SPINDLE |  | KENMETAL PART No. | VALENTE PART No. | LYNDEX PART No. |
| 59.                                          | 39 | 1.39 | 6°16' | BR50, BR60, BR80, MM18, RH20, RH30, RH33, RH35, RW15, VM15, VM16, VM22, VM25, VM30, VM32, VM35, VM38, VM40, VM42, VM45, VM48, VM50, VM52, VM55, VM58, VM60, VM62, VM65, VM68, VM70, VM72, VM75, VM78, VM80, VM82, VM85, VM88, VM90, VM92, VM95, VM98, VM100, VM102, VM105, VM108, VM110, VM112, VM115, VM118, VM120, VM122, VM125, VM128, VM130, VM132, VM135, VM138, VM140, VM142, VM145, VM148, VM150, VM152, VM155, VM158, VM160, VM162, VM165, VM168, VM170, VM172, VM175, VM178, VM180, VM182, VM185, VM188, VM190, VM192, VM195, VM198, VM200, VM202, VM205, VM208, VM210, VM212, VM215, VM218, VM220, VM222, VM225, VM228, VM230, VM232, VM235, VM238, VM240, VM242, VM245, VM248, VM250, VM252, VM255, VM258, VM260, VM262, VM265, VM268, VM270, VM272, VM275, VM278, VM280, VM282, VM285, VM288, VM290, VM292, VM295, VM298, VM300, VM302, VM305, VM308, VM310, VM312, VM315, VM318, VM320, VM322, VM325, VM328, VM330, VM332, VM335, VM338, VM340, VM342, VM345, VM348, VM350, VM352, VM355, VM358, VM360, VM362, VM365, VM368, VM370, VM372, VM375, VM378, VM380, VM382, VM385, VM388, VM390, VM392, VM395, VM398, VM400, VM402, VM405, VM408, VM410, VM412, VM415, VM418, VM420, VM422, VM425, VM428, VM430, VM432, VM435, VM438, VM440, VM442, VM445, VM448, VM450, VM452, VM455, VM458, VM460, VM462, VM465, VM468, VM470, VM472, VM475, VM478, VM480, VM482, VM485, VM488, VM490, VM492, VM495, VM498, VM500, VM502, VM505, VM508, VM510, VM512, VM515, VM518, VM520, VM522, VM525, VM528, VM530, VM532, VM535, VM538, VM540, VM542, VM545, VM548, VM550, VM552, VM555, VM558, VM560, VM562, VM565, VM568, VM570, VM572, VM575, VM578, VM580, VM582, VM585, VM588, VM590, VM592, VM595, VM598, VM600, VM602, VM605, VM608, VM610, VM612, VM615, VM618, VM620, VM622, VM625, VM628, VM630, VM632, VM635, VM638, VM640, VM642, VM645, VM648, VM650, VM652, VM655, VM658, VM660, VM662, VM665, VM668, VM670, VM672, VM675, VM678, VM680, VM682, VM685, VM688, VM690, VM692, VM695, VM698, VM700, VM702, VM705, VM708, VM710, VM712, VM715, VM718, VM720, VM722, VM725, VM728, VM730, VM732, VM735, VM738, VM740, VM742, VM745, VM748, VM750, VM752, VM755, VM758, VM760, VM762, VM765, VM768, VM770, VM772, VM775, VM778, VM780, VM782, VM785, VM788, VM790, VM792, VM795, VM798, VM800, VM802, VM805, VM808, VM810, VM812, VM815, VM818, VM820, VM822, VM825, VM828, VM830, VM832, VM835, VM838, VM840, VM842, VM845, VM848, VM850, VM852, VM855, VM858, VM860, VM862, VM865, VM868, VM870, VM872, VM875, VM878, VM880, VM882, VM885, VM888, VM890, VM892, VM895, VM898, VM900, VM902, VM905, VM908, VM910, VM912, VM915, VM918, VM920, VM922, VM925, VM928, VM930, VM932, VM935, VM938, VM940, VM942, VM945, VM948, VM950, VM952, VM955, VM958, VM960, VM962, VM965, VM968, VM970, VM972, VM975, VM978, VM980, VM982, VM985, VM988, VM990, VM992, VM995, VM998, VM1000, VM1002, VM1005, VM1008, VM1010, VM1012, VM1015, VM1018, VM1020, VM1022, VM1025, VM1028, VM1030, VM1032, VM1035, VM1038, VM1040, VM1042, VM1045, VM1048, VM1050, VM1052, VM1055, VM1058, VM1060, VM1062, VM1065, VM1068, VM1070, VM1072, VM1075, VM1078, VM1080, VM1082, VM1085, VM1088, VM1090, VM1092, VM1095, VM1098, VM1100, VM1102, VM1105, VM1108, VM1110, VM1112, VM1115, VM1118, VM1120, VM1122, VM1125, VM1128, VM1130, VM1132, VM1135, VM1138, VM1140, VM1142, VM1145, VM1148, VM1150, VM1152, VM1155, VM1158, VM1160, VM1162, VM1165, VM1168, VM1170, VM1172, VM1175, VM1178, VM1180, VM1182, VM1185, VM1188, VM1190, VM1192, VM1195, VM1198, VM1200, VM1202, VM1205, VM1208, VM1210, VM1212, VM1215, VM1218, VM1220, VM1222, VM1225, VM1228, VM1230, VM1232, VM1235, VM1238, VM1240, VM1242, VM1245, VM1248, VM1250, VM1252, VM1255, VM1258, VM1260, VM1262, VM1265, VM1268, VM1270, VM1272, VM1275, VM1278, VM1280, VM1282, VM1285, VM1288, VM1290, VM1292, VM1295, VM1298, VM1300, VM1302, VM1305, VM1308, VM1310, VM1312, VM1315, VM1318, VM1320, VM1322, VM1325, VM1328, VM1330, VM1332, VM1335, VM1338, VM1340, VM1342, VM1345, VM1348, VM1350, VM1352, VM1355, VM1358, VM1360, VM1362, 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VM1990, VM1992, VM1995, VM1998, VM2000, VM2002, VM2005, VM2008, VM2010, VM2012, VM2015, VM2018, VM2020, VM2022, VM2025, VM2028, VM2030, VM2032, VM2035, VM2038, VM2040, VM2042, VM2045, VM2048, VM2050, VM2052, VM2055, VM2058, VM2060, VM2062, VM2065, VM2068, VM2070, VM2072, VM2075, VM2078, VM2080, VM2082, VM2085, VM2088, VM2090, VM2092, VM2095, VM2098, VM2100, VM2102, VM2105, VM2108, VM2110, VM2112, VM2115, VM2118, VM2120, VM2122, VM2125, VM2128, VM2130, VM2132, VM2135, VM2138, VM2140, VM2142, VM2145, VM2148, VM2150, VM2152, VM2155, VM2158, VM2160, VM2162, VM2165, VM2168, VM2170, VM2172, VM2175, VM2178, VM2180, VM2182, VM2185, VM2188, VM2190, VM2192, VM2195, VM2198, VM2200, VM2202, VM2205, VM2208, VM2210, VM2212, VM2215, VM2218, VM2220, VM2222, VM2225, VM2228, VM2230, VM2232, VM2235, VM2238, VM2240, VM2242, VM2245, VM2248, VM2250, VM2252, VM2255, VM2258, VM2260, VM2262, VM2265, VM2268, VM2270, VM2272, VM2275, VM2278, VM2280, VM2282, VM2285, VM2288, VM2290, VM2292, VM2295, VM2298, VM2300, 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VM3240, VM3242, VM3245, VM3248, VM3250, VM3252, VM3255, VM3258, VM3260, VM3262, VM3265, VM3268, VM3270, VM3272, VM3275, VM3278, VM3280, VM3282, VM3285, VM3288, VM3290, VM3292, VM3295, VM3298, VM3300, VM3302, VM3305, VM3308, VM3310, VM3312, VM3315, VM3318, VM3320, VM3322, VM3325, VM3328, VM3330, VM3332, VM3335, VM3338, VM3340, VM3342, VM3345, VM3348, VM3350, VM3352, VM3355, VM3358, VM3360, VM3362, VM3365, VM3368, VM3370, VM3372, VM3375, VM3378, VM3380, VM3382, VM3385, VM3388, VM3390, VM3392, VM3395, VM3398, VM3400, VM3402, VM3405, VM3408, VM3410, VM3412, VM3415, VM3418, VM3420, VM3422, VM3425, VM3428, VM3430, VM3432, VM3435, VM3438, VM3440, VM3442, VM3445, VM3448, VM3450, VM3452, VM3455, VM3458, VM3460, VM3462, VM3465, VM3468, VM3470, VM3472, VM3475, VM3478, VM3480, VM3482, VM3485, VM3488, VM3490, VM3492, VM3495, VM3498, VM3500, VM3502, VM3505, VM3508, VM3510, VM3512, VM3515, VM3518, VM3520, VM3522, VM3525, VM3528, VM3530, VM3532, VM3535, VM3538, VM3540, VM3542, VM3545, VM3548, VM3550, 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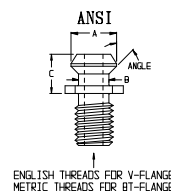
ENGLISH THREADS FOR V-FLANGE  
METRIC THREADS FOR RT-FLANGE

NOTE: STANDARD RETENTION KNOBS FOR 50 TAPER SPINDLES

ANSI RETENTION KNOBS STYLE CT-FLANGE 50 TAPER

| DIMENSIONS |     |      |       | MILLITRONICS<br>MACHINE                                                                 | COMMAND<br>PART No. | KENNAMETAL<br>PART No. | VALENTE<br>PART No. | LYNDEX<br>PART No |
|------------|-----|------|-------|-----------------------------------------------------------------------------------------|---------------------|------------------------|---------------------|-------------------|
| A          | B   | C    | ANGLE |                                                                                         |                     |                        |                     |                   |
| 1.14       | .83 | 1.00 | 45°   | HB110, RH33XP, RH35XP, TT40XP, VM22XP, VM25XP, VM30XP, TT40XP, VMC22XP, VM25XP, VM30XP, | RCBE-0001           | ONG<br>RK11144         | N/A                 | CSO-STO           |

| ANSI RETENTION KNOBS STYLE BT-FLANGE 50 TAPER |     |      |       |                                                                                          |           |              |          |         |
|-----------------------------------------------|-----|------|-------|------------------------------------------------------------------------------------------|-----------|--------------|----------|---------|
| DIMENSIONS                                    |     |      |       | MILLTRENICS                                                                              | COMMAND   | KENNA        | VALENTE  | LYNDEX  |
| A                                             | B   | C    | ANGLE | MACHINE                                                                                  | PART No.  | PART No.     | PART No. | PART No |
| 1.14                                          | .83 | 1.00 | 45°   | HB110, RH33XP, RH35XP, TT40XP, VM22XP, VM25XP, VM30XP, TT40XP, VMC22XP, VMC25XP, VM30XP, | R5BM-0105 | DWG RK11144A | N/A      | N/A     |



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

NOTE: OPTIONAL RETENTION KNOBS FOR 40 TAPER SPINDLES

| ANSI RETENTION KNOBS STYLE CT-FLANGE 40 TAPER |     |     |                      |                         |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| DIMENSIONS                                    |     |     | MILLITRONICS MACHINE |                         |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  | COMMAND<br>PART No. | KENNAMETAL<br>PART No. | VALENITE<br>PART No. | LYNDE<br>PART No |
| A                                             | B   | C   | ANGLE                | 50mm SPINDLE            |  | 70mm SPINDLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                     |                        |                      |                  |
| .74                                           | .49 | .64 | 45°                  | SELECTION NOT AVAILABLE |  | BR50, BR60, BR80, RH35, RH40, RH50, RH60, RH70, RH80, RH90, RH100, RH110, RH120, RH130, RH140, RH150, RH160, RH170, RH180, RH190, RH200, RH210, RH220, RH230, RH240, RH250, RH260, RH270, RH280, RH290, RH300, RH310, RH320, RH330, RH340, RH350, RH360, RH370, RH380, RH390, RH400, RH410, RH420, RH430, RH440, RH450, RH460, RH470, RH480, RH490, RH500, RH510, RH520, RH530, RH540, RH550, RH560, RH570, RH580, RH590, RH600, RH610, RH620, RH630, RH640, RH650, RH660, RH670, RH680, RH690, RH700, RH710, RH720, RH730, RH740, RH750, RH760, RH770, RH780, RH790, RH800, RH810, RH820, RH830, RH840, RH850, RH860, RH870, RH880, RH890, RH900, RH910, RH920, RH930, RH940, RH950, RH960, RH970, RH980, RH990, RH1000, RH1010, RH1020, RH1030, RH1040, RH1050, RH1060, RH1070, RH1080, RH1090, RH1100, RH1110, RH1120, RH1130, RH1140, RH1150, RH1160, RH1170, RH1180, RH1190, RH1200, RH1210, RH1220, RH1230, RH1240, RH1250, RH1260, RH1270, RH1280, RH1290, RH1300, RH1310, RH1320, RH1330, RH1340, RH1350, RH1360, RH1370, RH1380, RH1390, RH1400, RH1410, RH1420, RH1430, RH1440, RH1450, RH1460, RH1470, RH1480, RH1490, RH1500, RH1510, RH1520, RH1530, RH1540, RH1550, RH1560, RH1570, RH1580, RH1590, RH1600, RH1610, RH1620, RH1630, RH1640, RH1650, RH1660, RH1670, RH1680, RH1690, RH1700, RH1710, RH1720, RH1730, RH1740, RH1750, RH1760, RH1770, RH1780, RH1790, RH1800, RH1810, RH1820, RH1830, RH1840, RH1850, RH1860, RH1870, RH1880, RH1890, RH1900, RH1910, RH1920, RH1930, RH1940, RH1950, RH1960, RH1970, RH1980, RH1990, RH2000, RH2010, RH2020, RH2030, RH2040, RH2050, RH2060, RH2070, RH2080, RH2090, RH2100, RH2110, RH2120, RH2130, RH2140, RH2150, RH2160, RH2170, RH2180, RH2190, RH2200, RH2210, RH2220, RH2230, RH2240, RH2250, RH2260, RH2270, RH2280, RH2290, RH2300, RH2310, RH2320, RH2330, RH2340, RH2350, RH2360, RH2370, RH2380, RH2390, RH2400, RH2410, RH2420, RH2430, RH2440, RH2450, RH2460, RH2470, RH2480, 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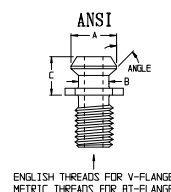
| ANSI RETENTION KNOBS STYLE BT-FLANGE 40 TAPER |     |     |                      |                         |  |  |                                                                                                                                                                                                         |  |  |
|-----------------------------------------------|-----|-----|----------------------|-------------------------|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| DIMENSIONS                                    |     |     | MILLITRONICS MACHINE |                         |  |  |                                                                                                                                                                                                         |  |  |
| A                                             | B   | C   | ANGLE                | 60mm SPINDLE            |  |  | 70mm SPINDLE                                                                                                                                                                                            |  |  |
| .74                                           | .49 | .75 | 45°                  | SELECTION NOT AVAILABLE |  |  | BR50, BR60, BR80, RH20, HK35, RH30, RH30,<br>RH33, RH35, TT24, TT40, TT60, TT80, VW16,<br>VW18, VW22, VW25, VW30, VW32A, VW22A,<br>VW16, HK35, TT24, TT40, TT60, TT80,<br>VW16, VW20, VW22, VW25, VW30. |  |  |
|                                               |     |     |                      | RS4M-0115               |  |  | KX11126A<br>N/A<br>B40-FADAL                                                                                                                                                                            |  |  |

| NAS RETENTION KNOBS STYLE CT-FLANGE 40 TAPER |     |      |       |                         |                                                                                                                                                                                                                |                     |                        |                      |                    |
|----------------------------------------------|-----|------|-------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|----------------------|--------------------|
| DIMENSIONS                                   |     |      |       | MILLITRONICS MACHINE    |                                                                                                                                                                                                                | COMMAND<br>PART No. | KENNAMETAL<br>PART No. | VALENITE<br>PART No. | LYNDEX<br>PART No. |
| A                                            | B   | C    | ANGLE | 60mm SPINDLE            | 70mm SPINDLE                                                                                                                                                                                                   |                     |                        |                      |                    |
| .59                                          | .39 | 1.27 | 45°   | SELECTION NOT AVAILABLE | BR50, BR60, BR80, HX30, HX35, RH20, RH30,<br>RH33, RH35, TT24, TT40, TT60, TT80, VW16,<br>VW22, VMC20, VMC25, VM30, VM32Z4, VM42Z4,<br>VMC20, VM35, TT24, TT40, TT60, TT80,<br>VMC16, VM20, VM22, VMC25, VM30. | RB4E-0001           | KR3111A                | PT-532-45            | C40-4500           |

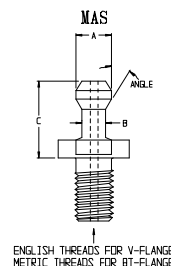
| NAS RETENTION KNOBS STYLE BT-FLANGE 40 TAPER |      |       |                         |  |              |  |           |                     |                   |                 |
|----------------------------------------------|------|-------|-------------------------|--|--------------|--|-----------|---------------------|-------------------|-----------------|
| DIMENSIONS                                   |      |       | MILLITRONICS MACHINE    |  |              |  | COMMAND   | KENNAMETAL PART No. | VALENITE PART No. | LYNDEX PART No. |
| A                                            | B    | ANGLE | 60mm SPINDLE            |  | 70mm SPINDLE |  |           |                     |                   |                 |
| 59.39                                        | 1.38 | 45°   | SELECTION NOT AVAILABLE |  |              |  | RB4M-0001 | RK31113             | PT-444-45         | B40-4500C       |

[illegible]

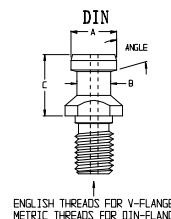
| DIN 89872 RETENTION KNOBS STYLE DIN-FLANGE 40 TAPER |     |      |       |                      |  |                                                                                                                                                                                                         |  |             |                |          |          |
|-----------------------------------------------------|-----|------|-------|----------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------|----------------|----------|----------|
| DIMENSIONS                                          |     |      |       | MILLITRONICS MACHINE |  |                                                                                                                                                                                                         |  | COMMAND     | KENAMETAL      | VALENTE  | LYNDE    |
| A                                                   | B   | C    | ANGLE | 60mm SPINDLE         |  | 70mm SPINDLE                                                                                                                                                                                            |  | PART No.    | PART No.       | PART No. | PART No. |
| .75                                                 | .55 | 1.02 | 75°   | AVAILABLE            |  | BR50, BR60, BR80, HK30, HK35, RH20, RH30, RH43, RH39, TT24, TT40, TT60, TT80, VW16, VW20, VW22, VW25, VW30, VW32A, VW22A, VW24, VW28, TT24, TT40, TT60, TT80, VW16, VW20, VW22, VW25, VW30, VW32, VW30. |  | R54M-0114-C | DWG<br>RK71124 | N/A      | B40-1500 |



ENGLISH THREADS FOR V-FLANGE  
METRIC THREADS FOR RT-FLANGE



ENGLISH THREADS FOR V-FLANGE  
METRIC THREADS FOR RT-FLANGE



ENGLISH THREADS FOR V-FLANGE  
METRIC THREADS FOR PIN-FLANGE

**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. IN-LINE SPINDLES, IN THEIR RESPECTIVE FRAME SIZE, USE THE SAME RETENTION KNOB AS THE NON IN-LINE SPINDLES

|                                                                                                                                                                  |                                                                               |                                                                                                               |          |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------|-------|
| I                                                                                                                                                                | ADD VM2016, VM3224, VM4224, TT60, TT80, TT40XP, TTC24, TTC40, TTC40XP, HBM110 | 7573                                                                                                          | N.M.     | 07/12 |
| H                                                                                                                                                                | ADD VM22XP, RH33XP FRAMES TO 50 TAPER                                         | 6715                                                                                                          | N.M.     | 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                                                                                                          | N.M.     | 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 LYNDEX CORP. IN CHART                                                     | 4351                                                                                                          | N.M.     | 1/00  |
| REV.                                                                                                                                                             | DESCRIPTION                                                                   | E.C.D. NO.                                                                                                    | APP'D BY | DATE  |
|  <b>MILLITRONICS</b><br>1480 BILL LANE 905-142-1410<br>WACONIA, MN 55392-1302 |                                                                               | TITLE RETENTION KNOB CHART<br>APPLICATION GENERAL PRODUCTS<br>DATE 30 APR 99 DRAWN BY DAHLKE SHEET NO. 1 OF 1 |          |       |
|                                                                                                                                                                  |                                                                               | SCALE 1.75:1 DWG No. 6-11-018-054 SIZE B                                                                      |          |       |

