

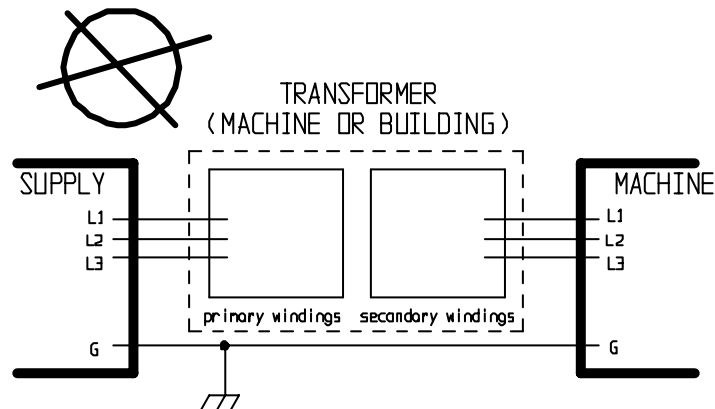
# ***Electrical Manual***

## ***SL8***

Rev.5  
5-6-03

#### \*\*\*\*\* CAUTION \*\*\*\*\*

DRIVES WILL BE DAMAGED BY INCORRECT POWER CONNECTION



Disconnect transformer entirely from power supply.

Check resistance between transformer ground wire and each secondary leg.

If resistance is more than 1 or 2 ohms, then the transformer ground wire is not connected to a neutral point within the secondary windings.

or

Disconnect transformer entirely from power supply.

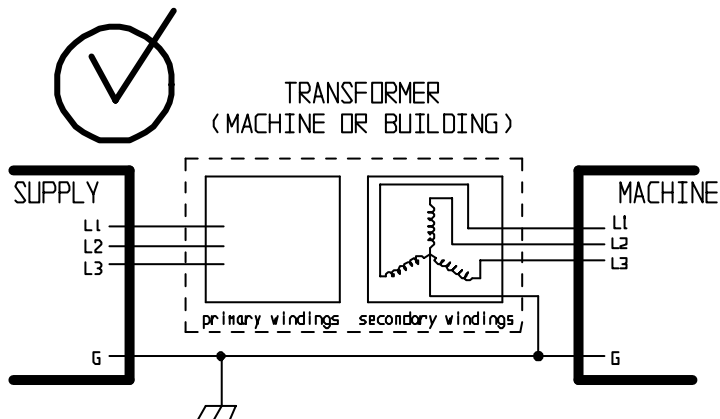
Remove transformer cover and follow transformer ground wire to determine if it is merely a case ground or if it actually goes to a neutral point within the secondary windings.

or

Check voltages between each secondary leg and ground.

If they are not equal, the secondary windings are "floating" with respect to ground.

THE GROUND WIRE GOING INTO THE MACHINE MUST BE CONNECTED TO A NEUTRAL POINT WITHIN THE SECONDARY WINDINGS AND TO EARTH GROUND.



The secondary windings must be grounded.

Voltages between each secondary leg and ground should be equal, half the voltage between secondary legs.

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## **Electrical Safety Rules**

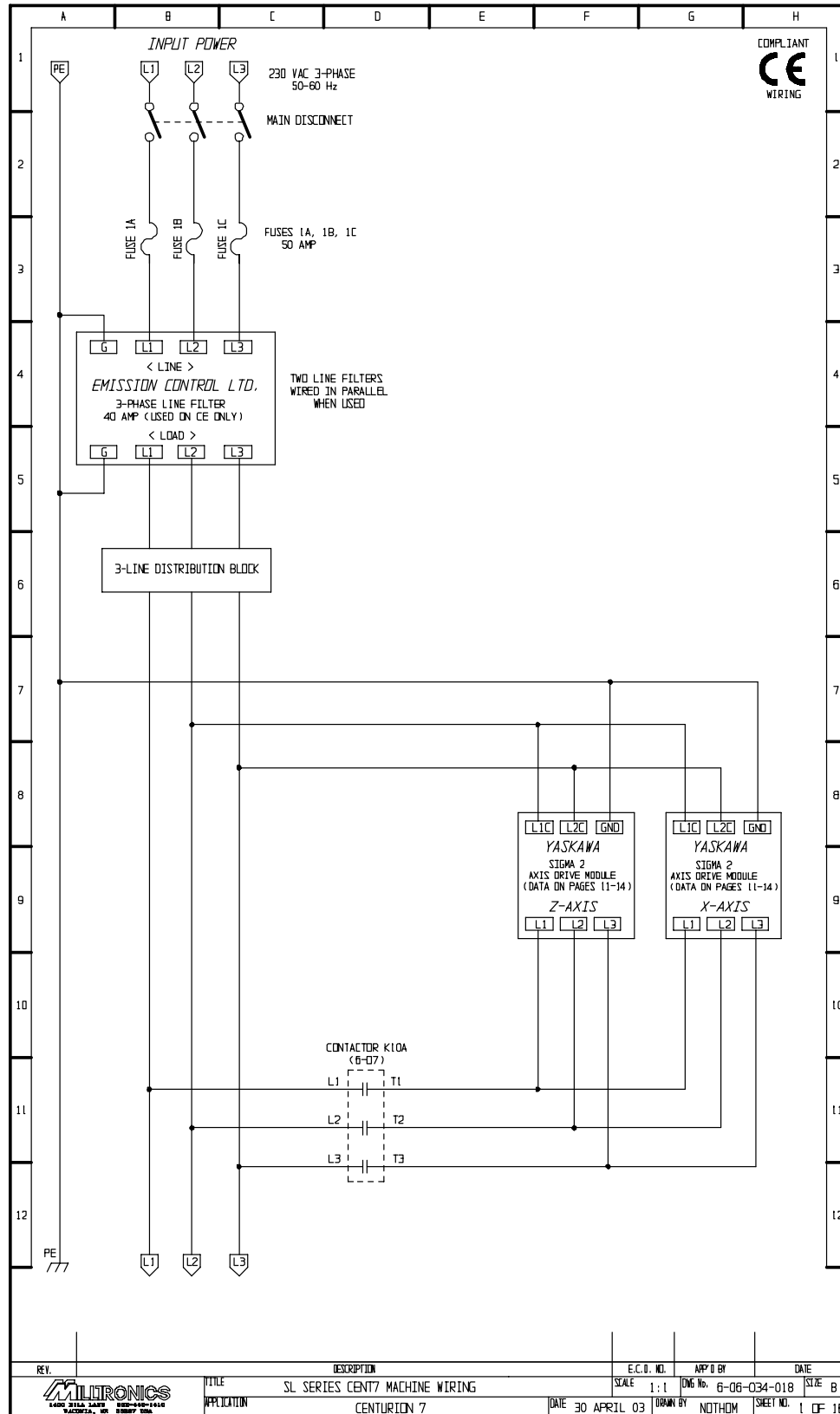
Read and understand the following list of cautions before attempting to perform service on this equipment. **Failure to observe these rules can result in death or serious injury.**

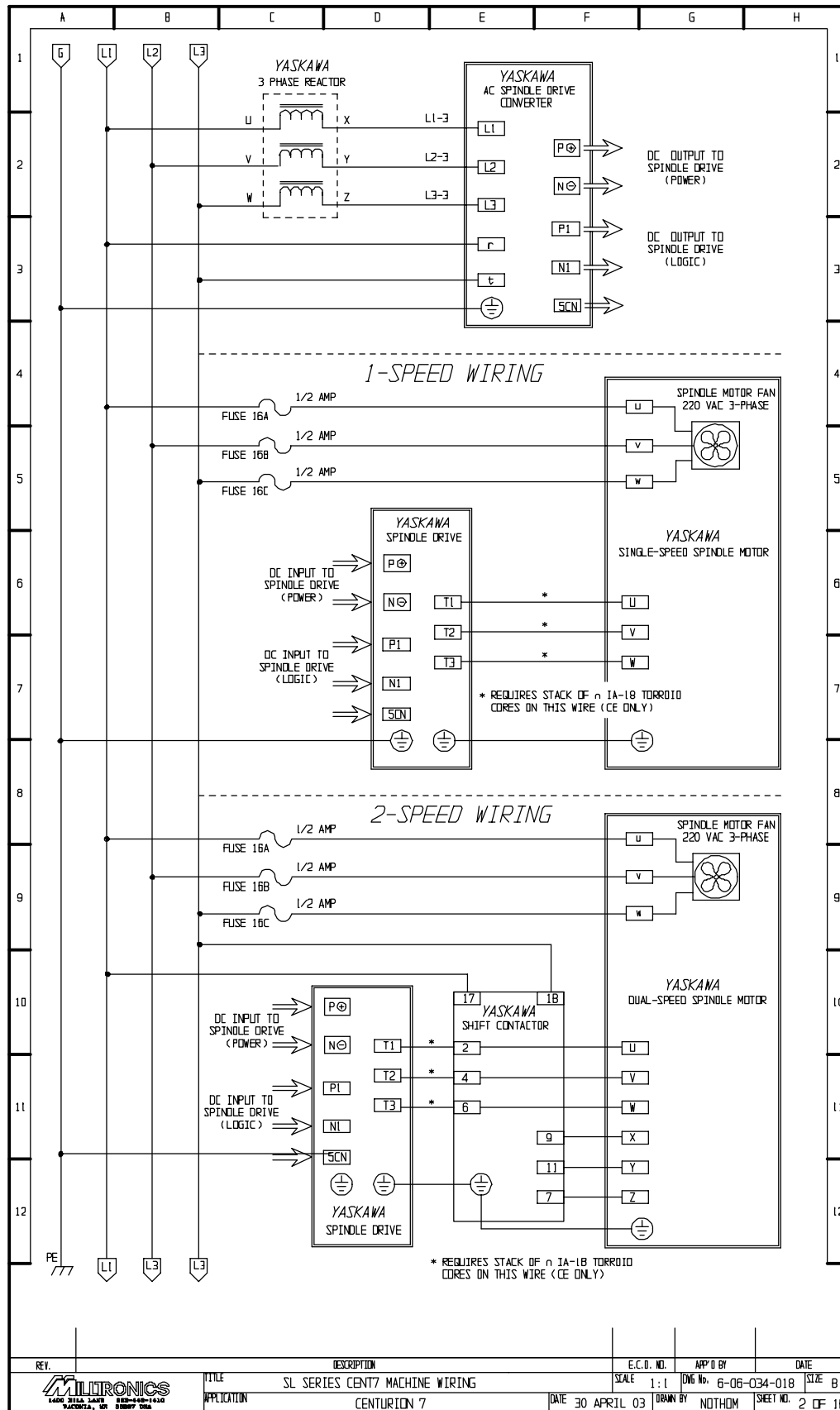
### **Caution**

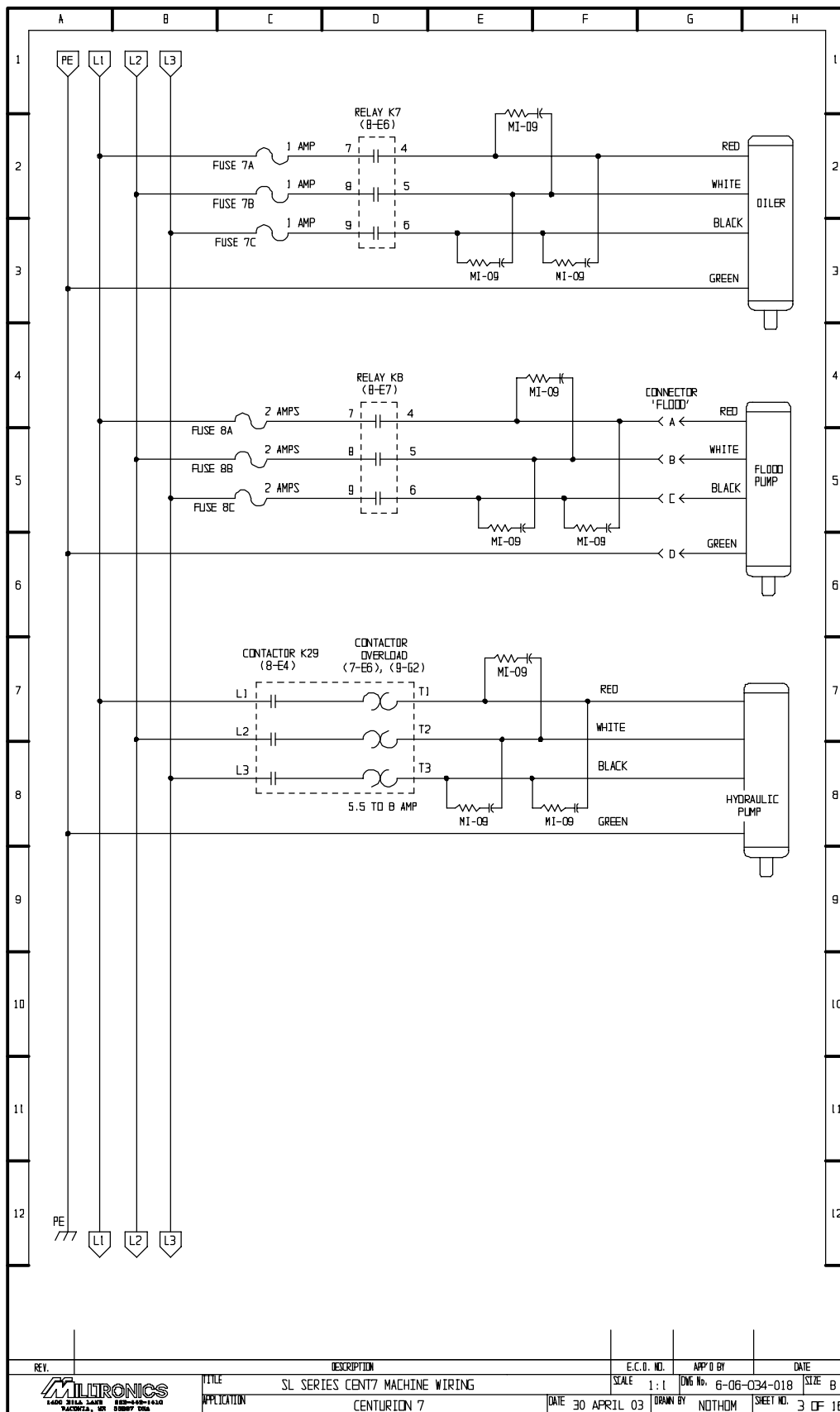
- Beware of High Voltage present within the machine's electrical cabinet
- Do not attempt to service electrical components unless you are qualified to work on them safely
- Only qualified personnel should attempt to make current and voltage readings
- Always turn the main power off before servicing components within the electrical cabinet
- Always keep hands and fingers away from live electrical terminals
- Remove jewelry while servicing the machine to avoid shorting any electrical circuits
- Allow all components to discharge before servicing them, wait at least 15 seconds after powering off, before servicing

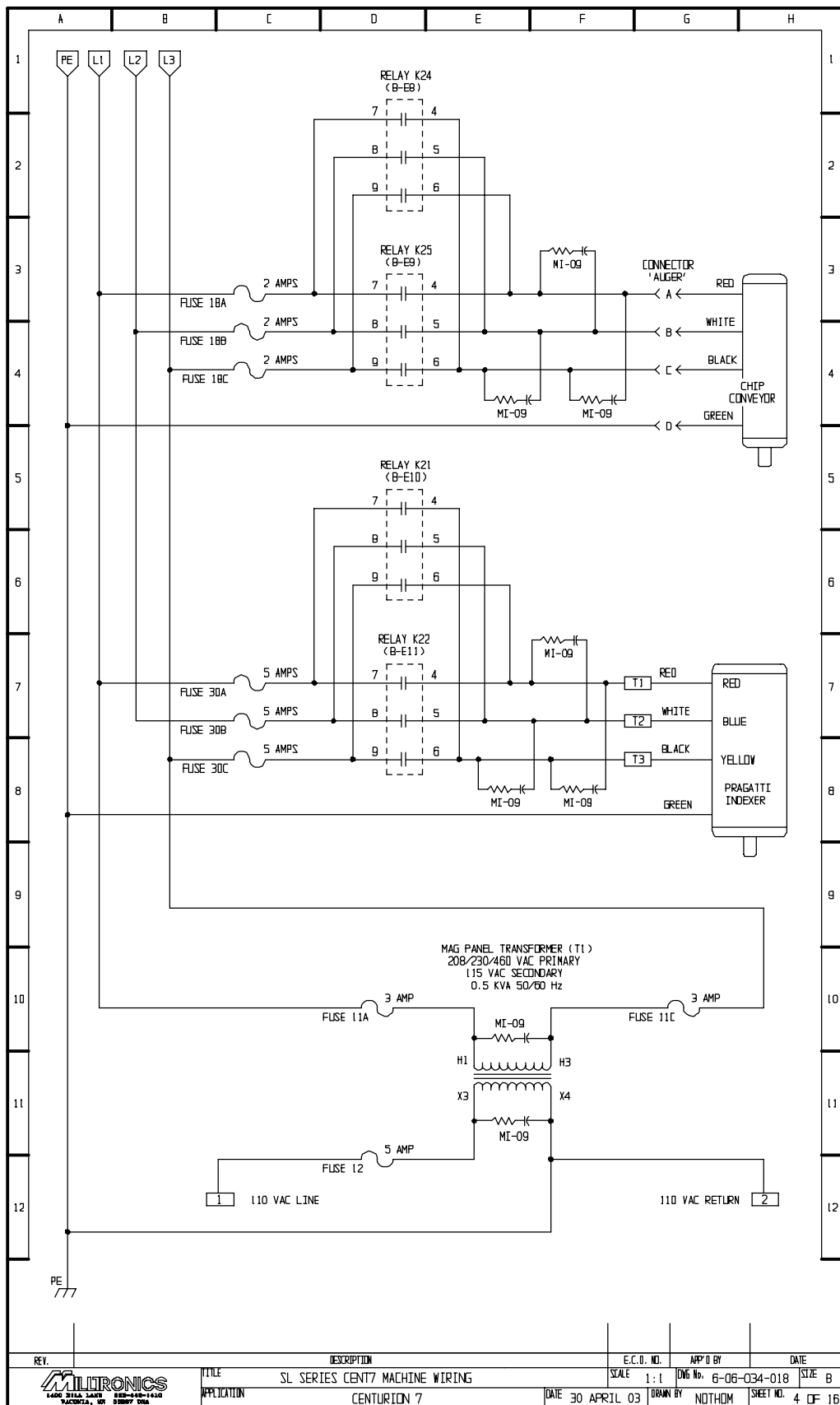
**FAILURE TO FOLLOW THESE RULES CAN RESULT IN SERIOUS INJURY OR DEATH**

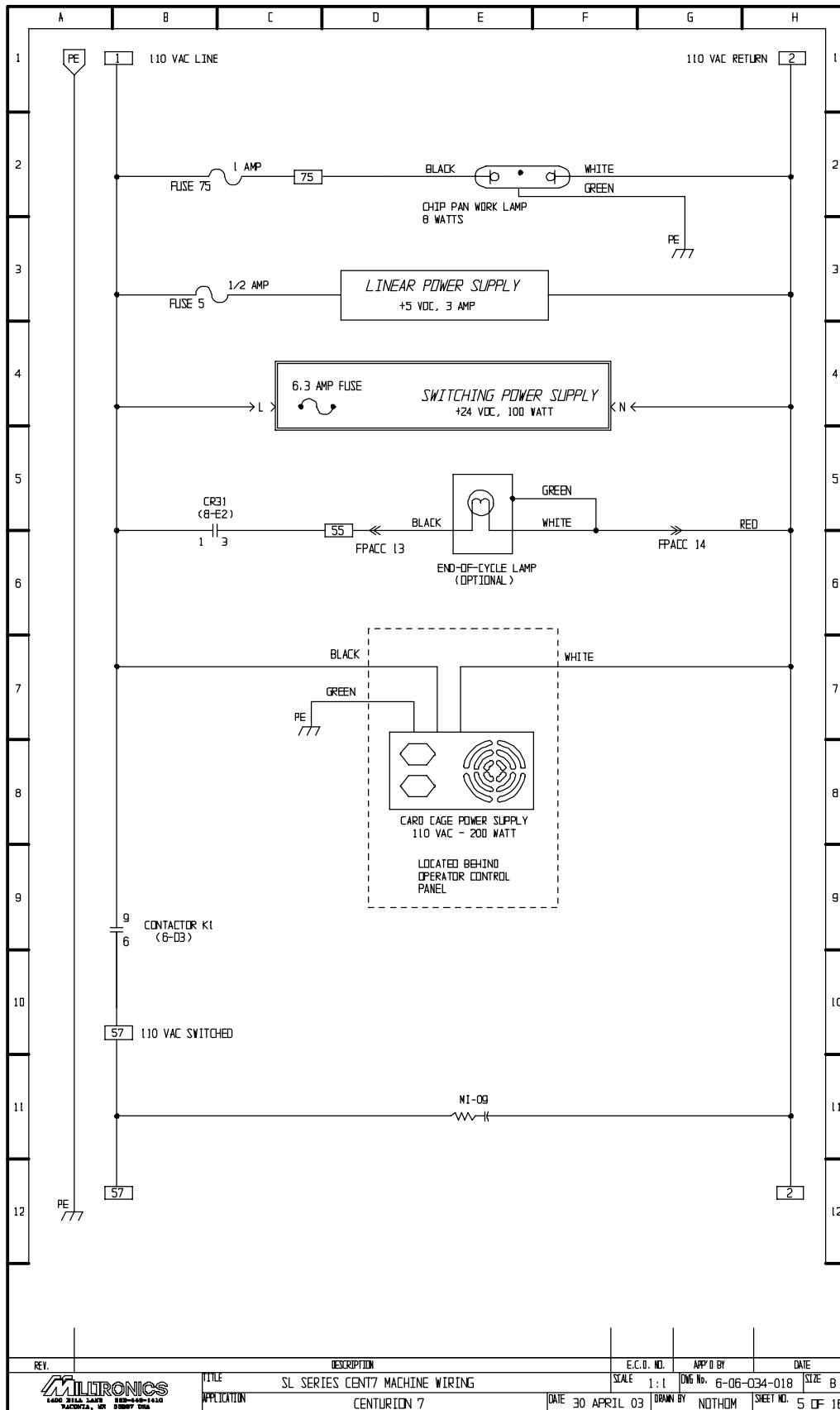
### Machine Schematic

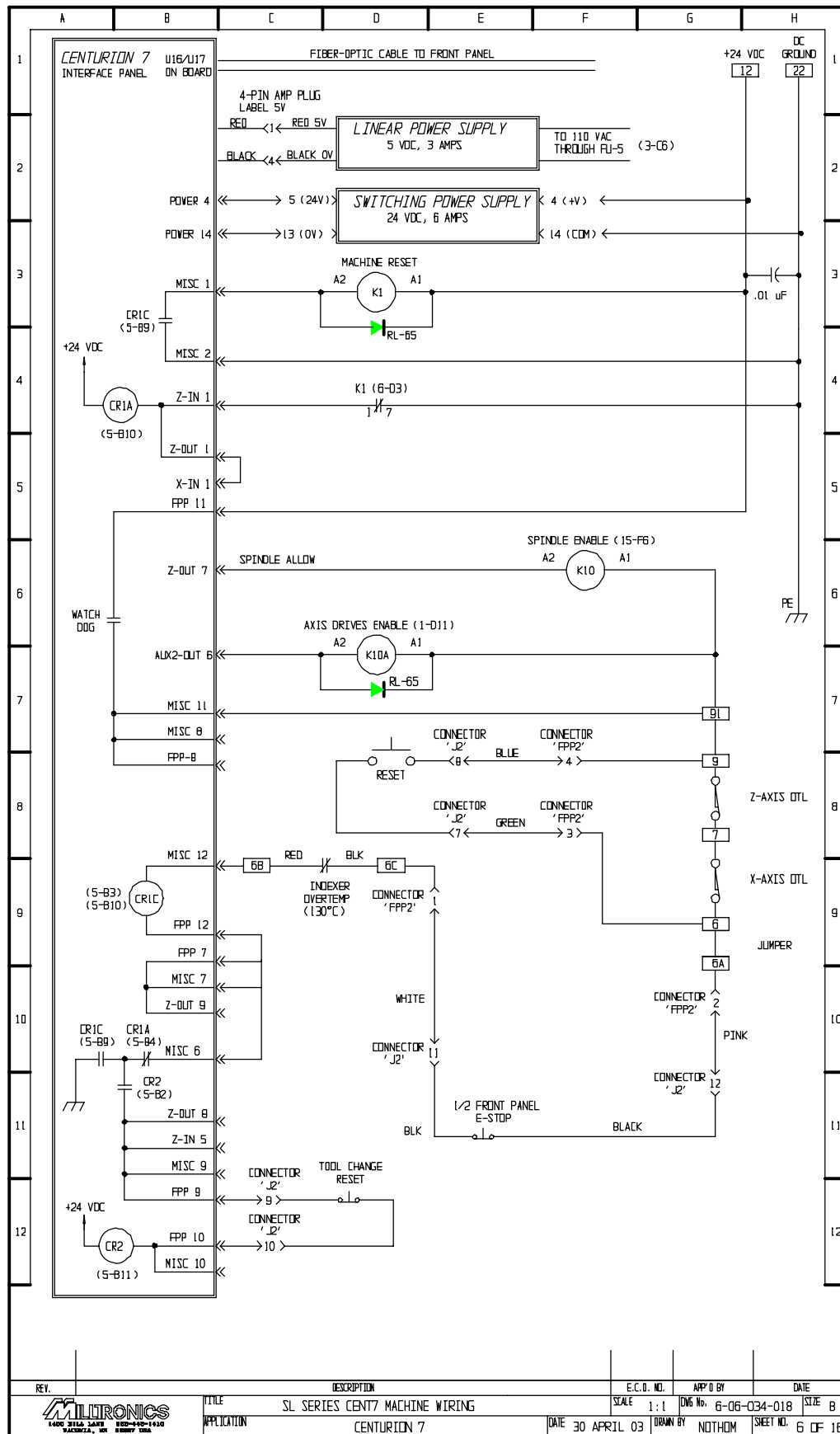


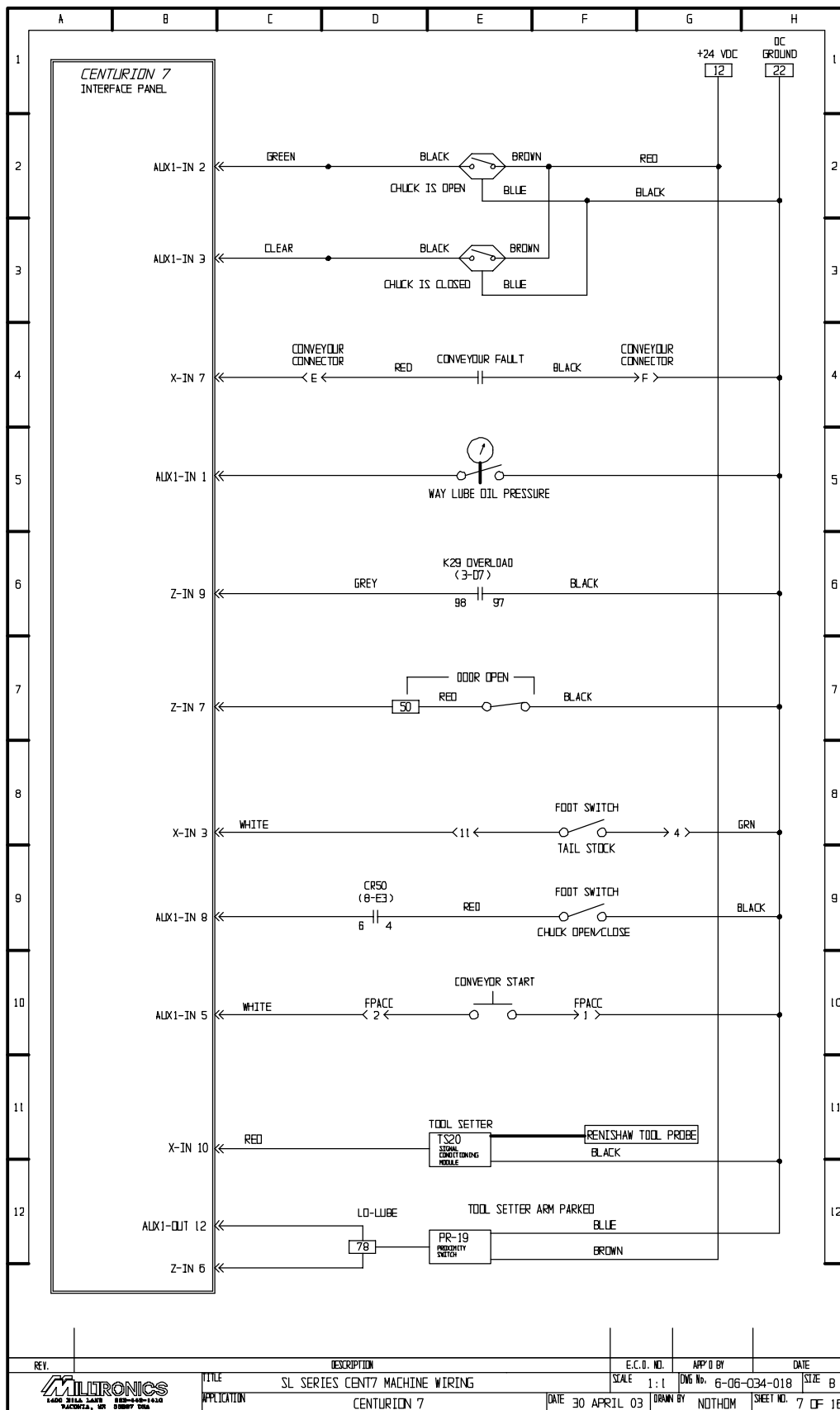


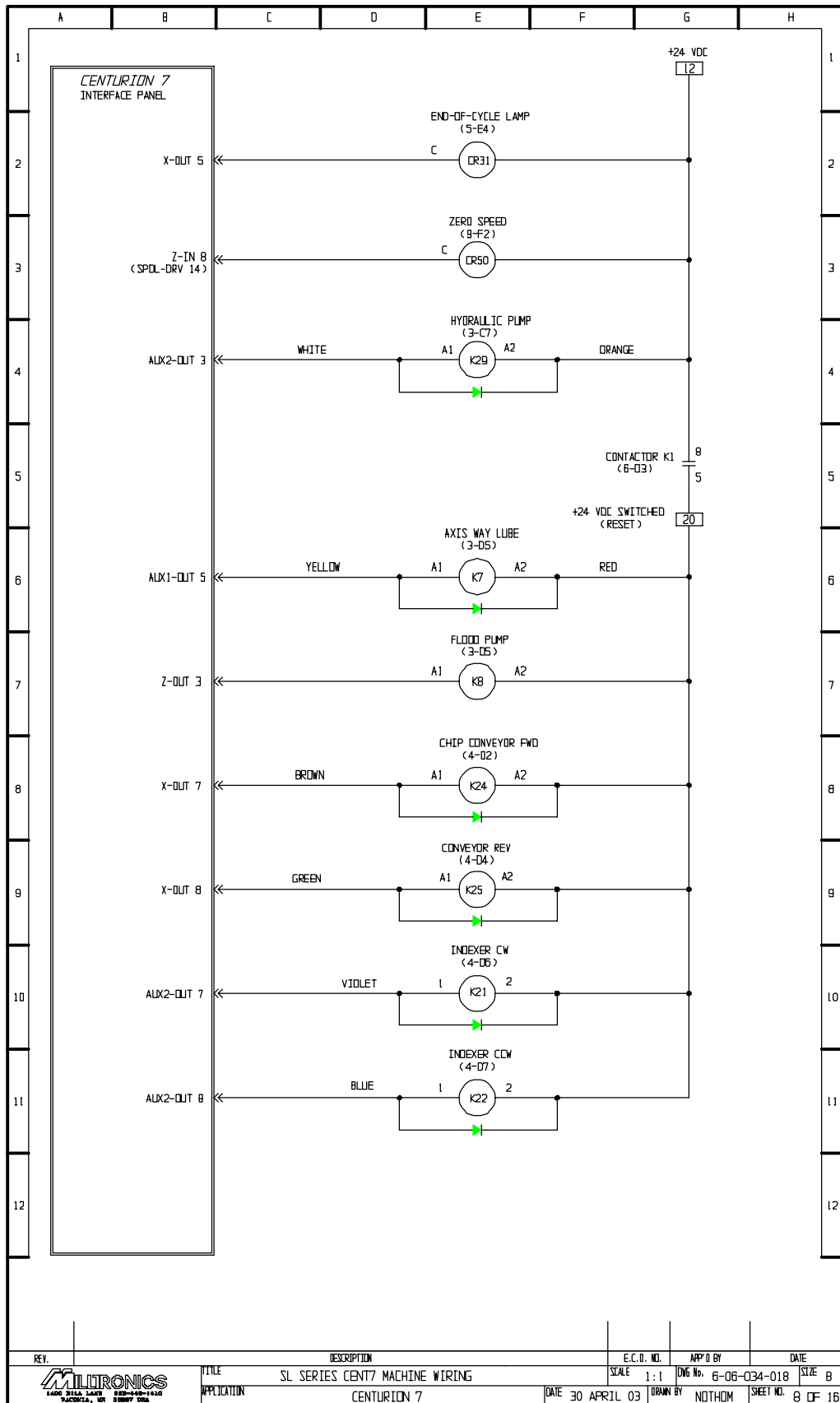












REV. \_\_\_\_\_

**MILLIRONICS**  
1400 STEEL LANE  
MILWAUKEE, WI 53207 USA

DESCRIPTION: SL SERIES CENT7 MACHINE WIRING

APPLICATION: CENTURION 7

E.C.D. NO. \_\_\_\_\_

SCALE: 1:1

DATE: 30 APRIL 03

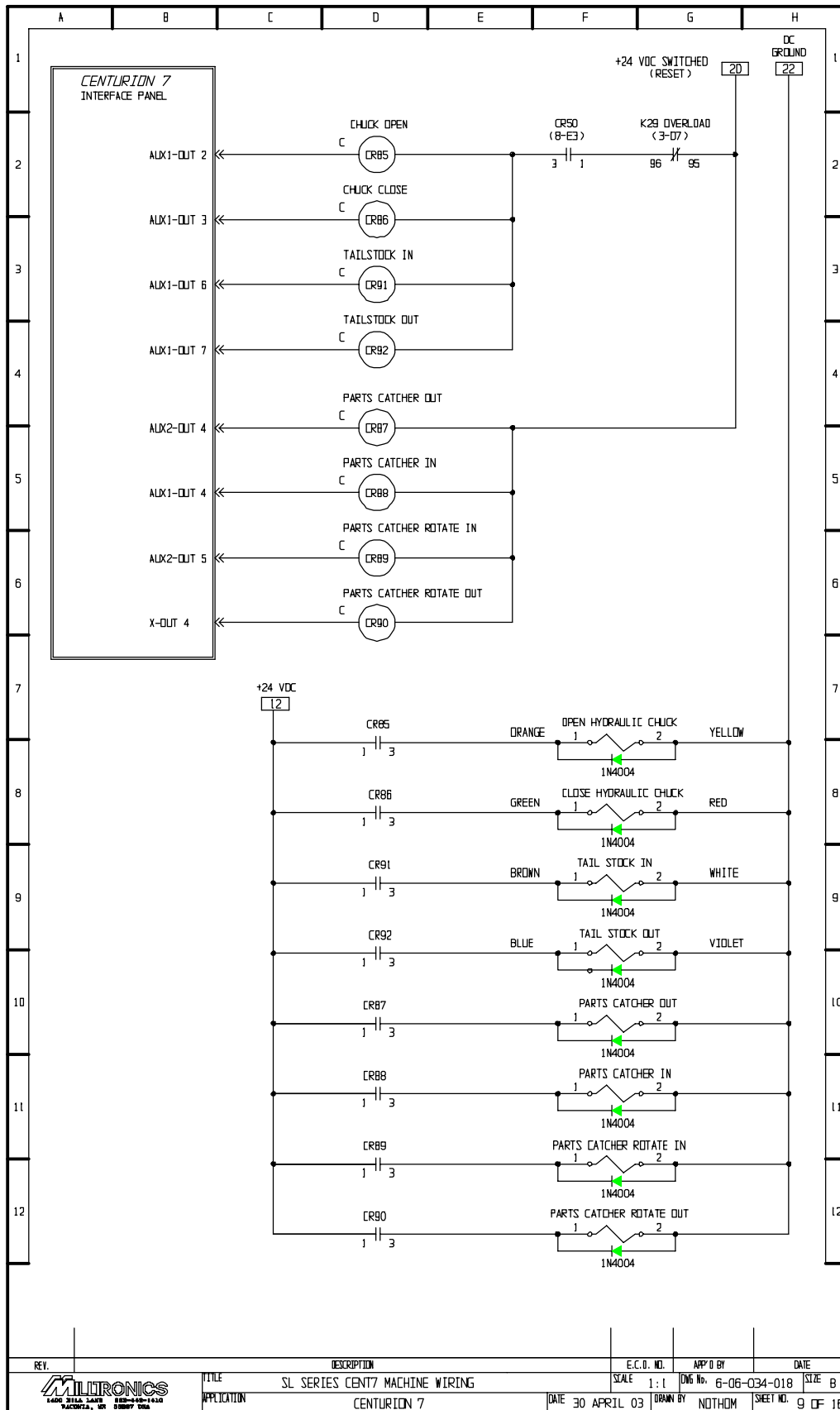
APP'D BY: \_\_\_\_\_

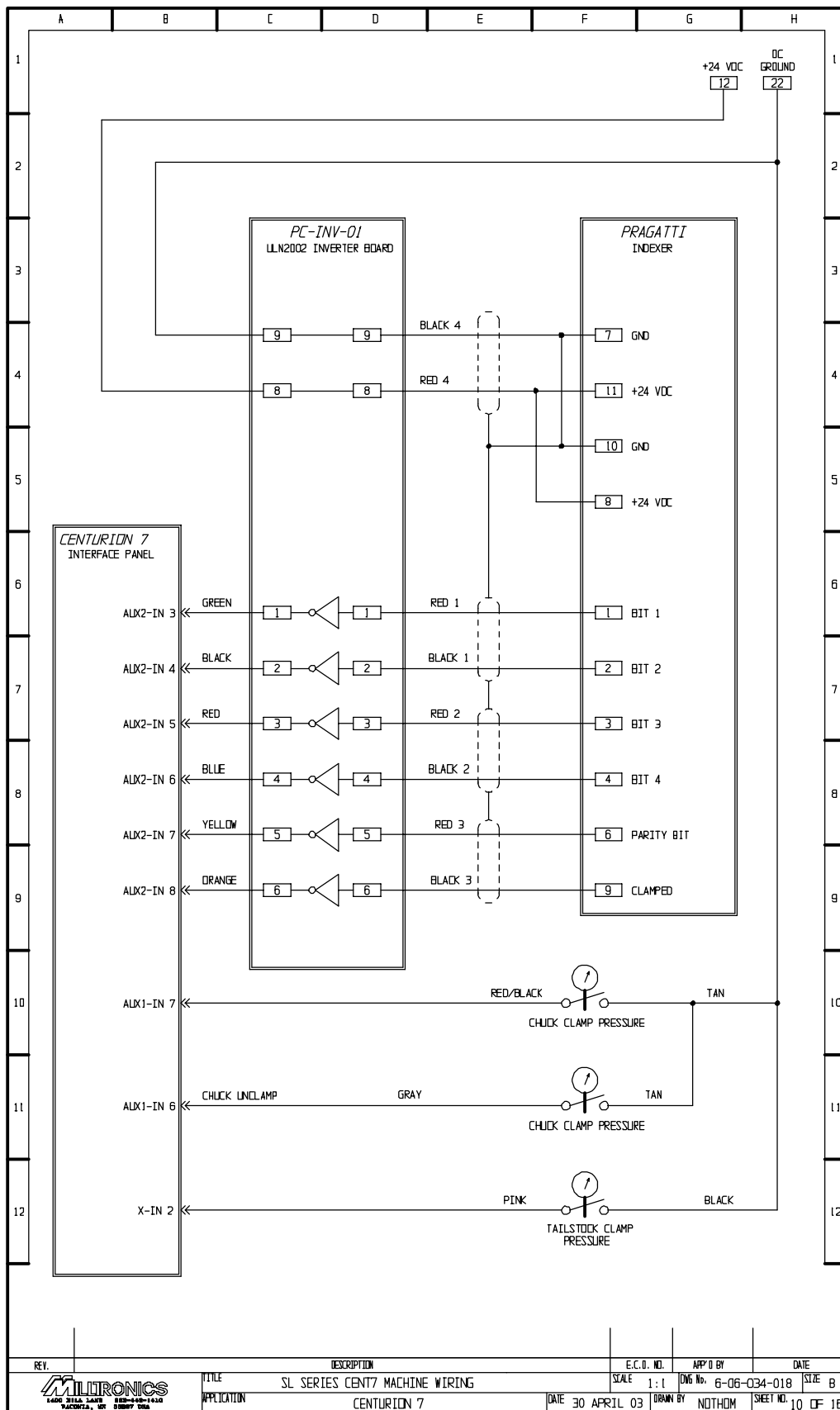
DWG No. 6-06-034-018

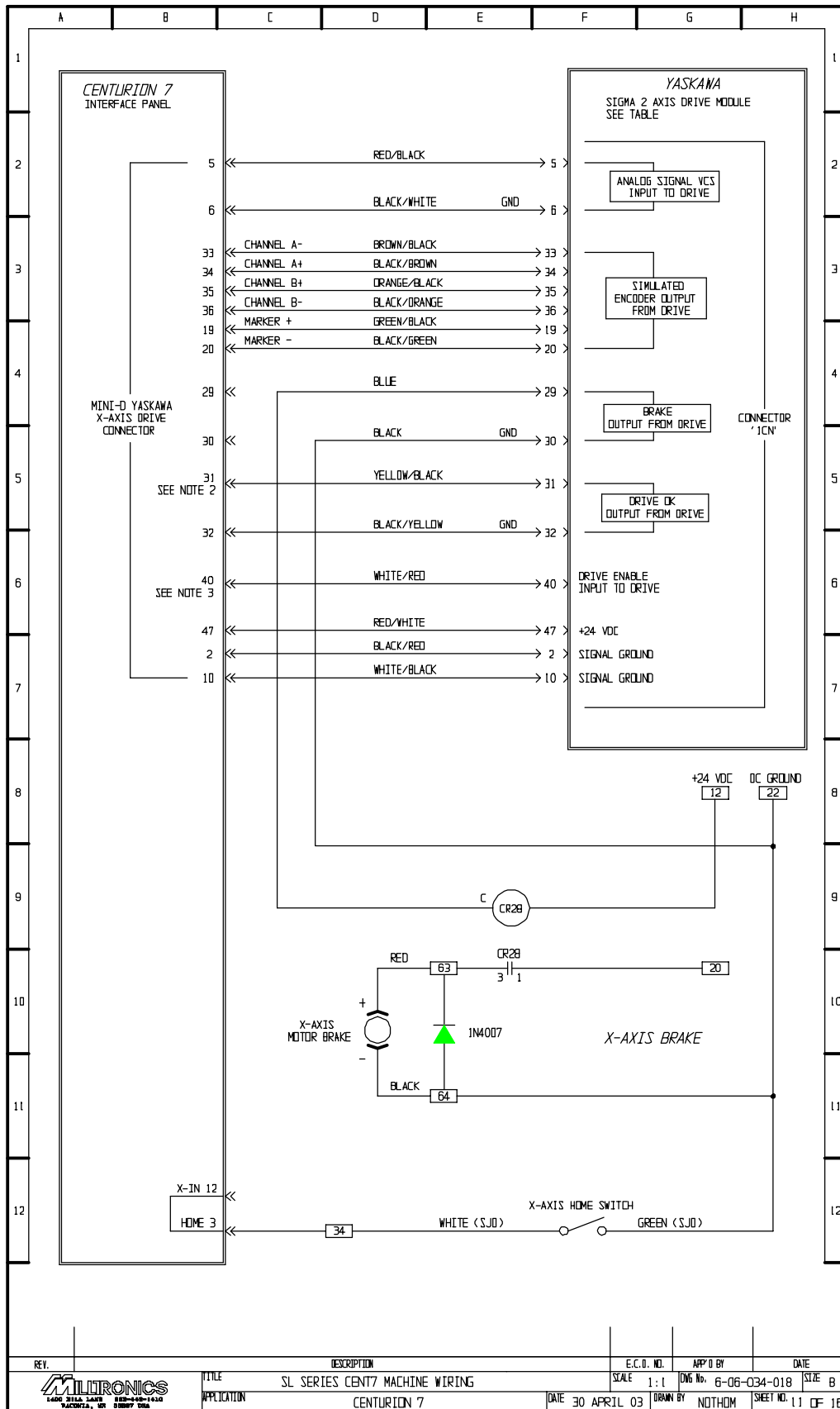
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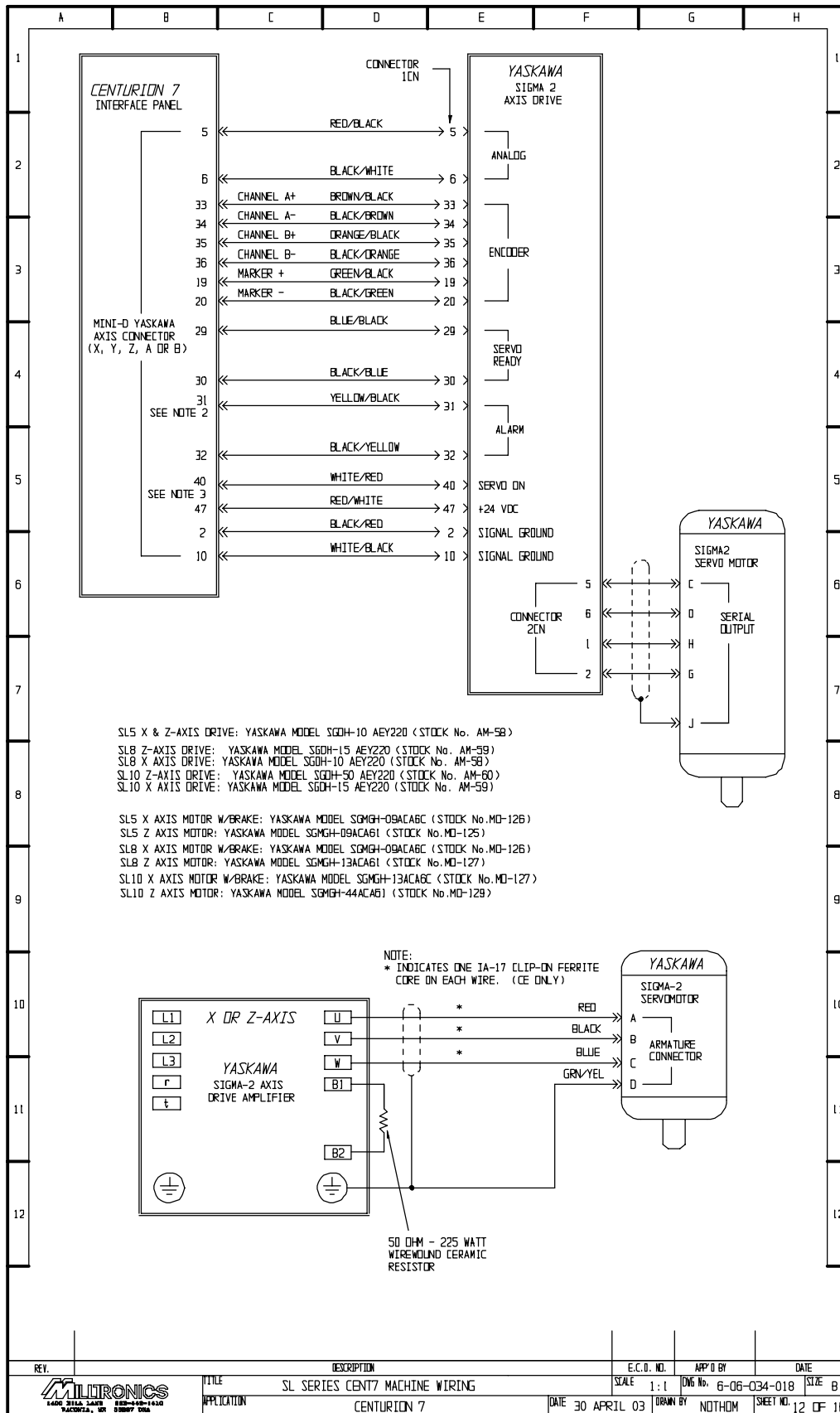
DATE: \_\_\_\_\_

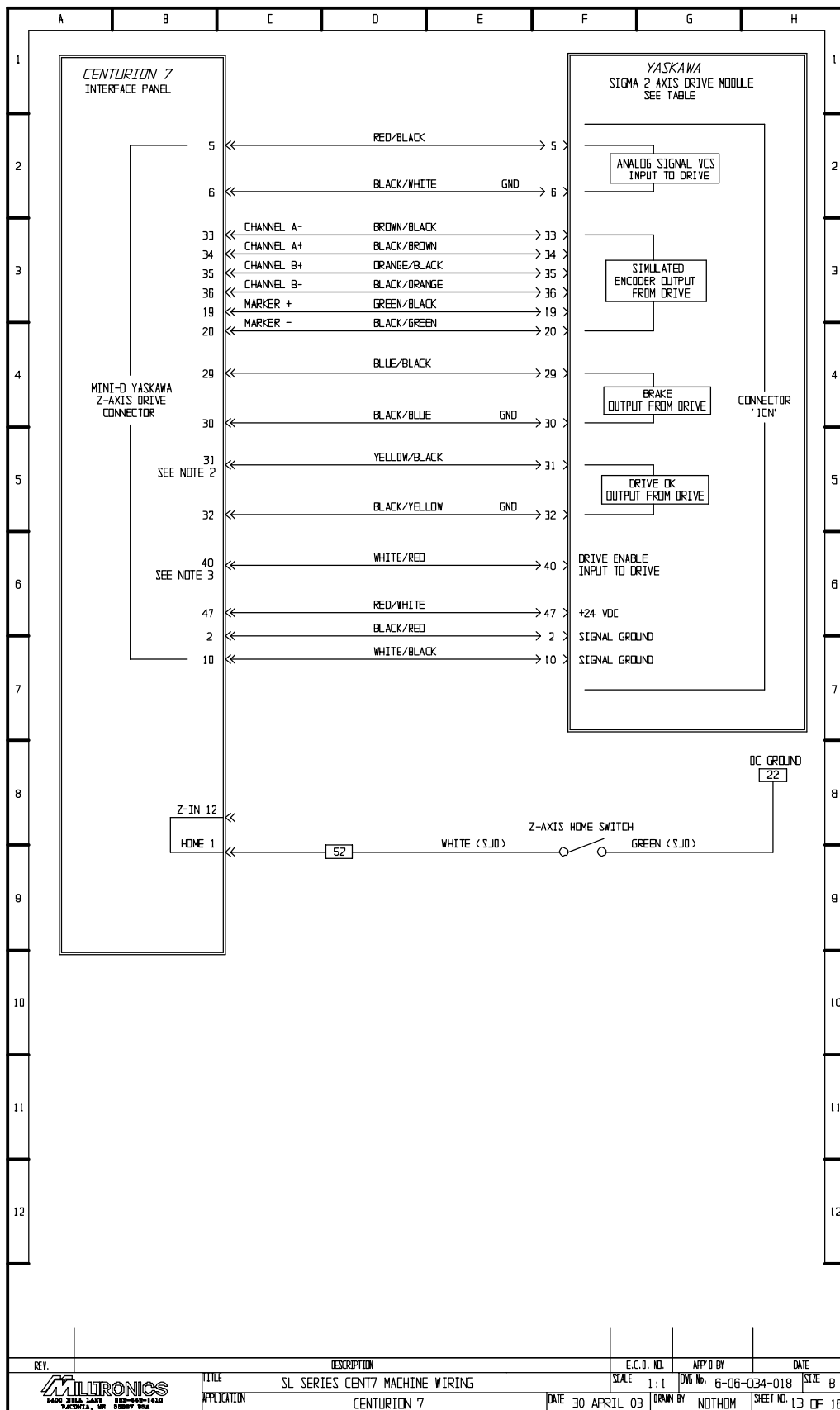
SHEET NO. 8 OF 16

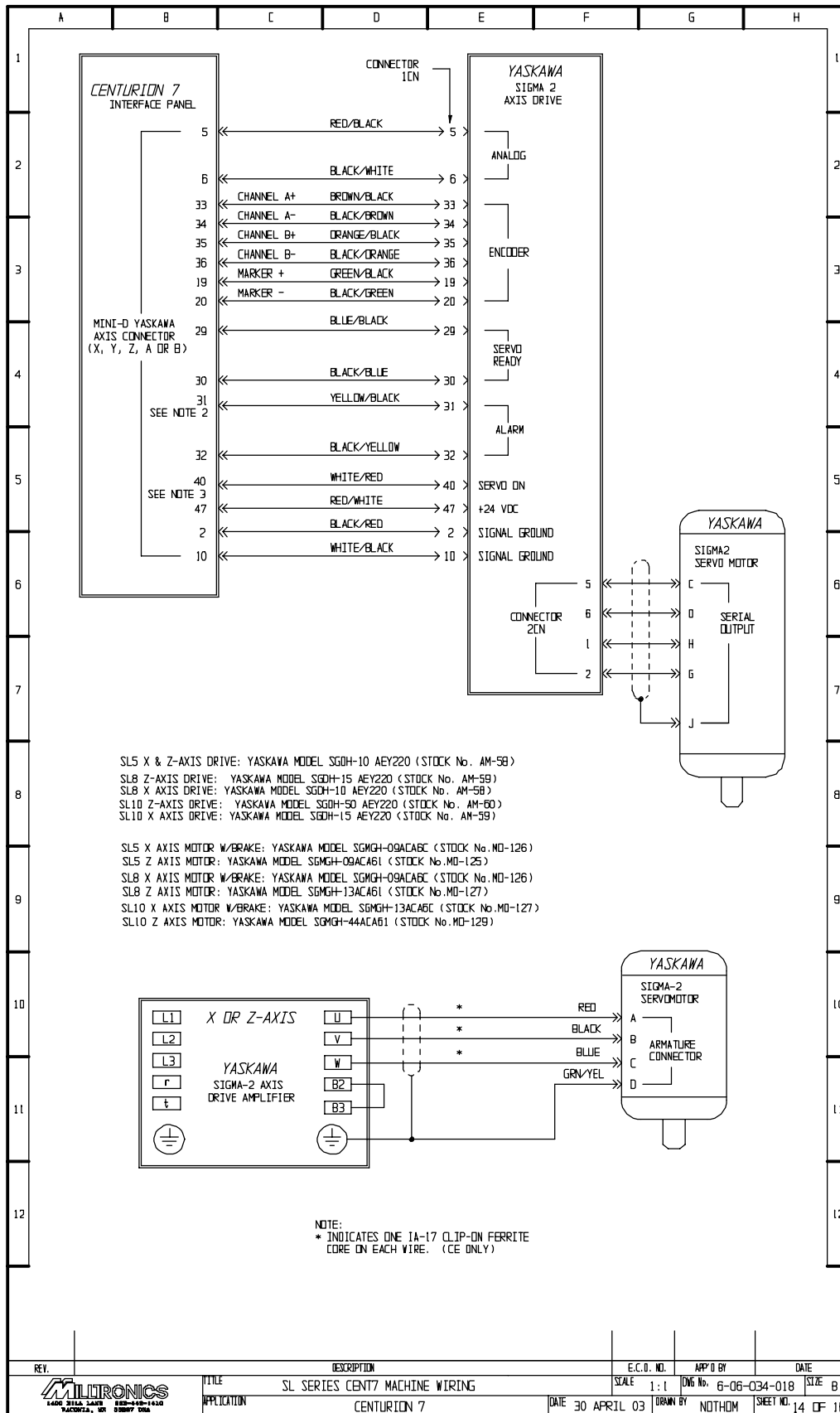


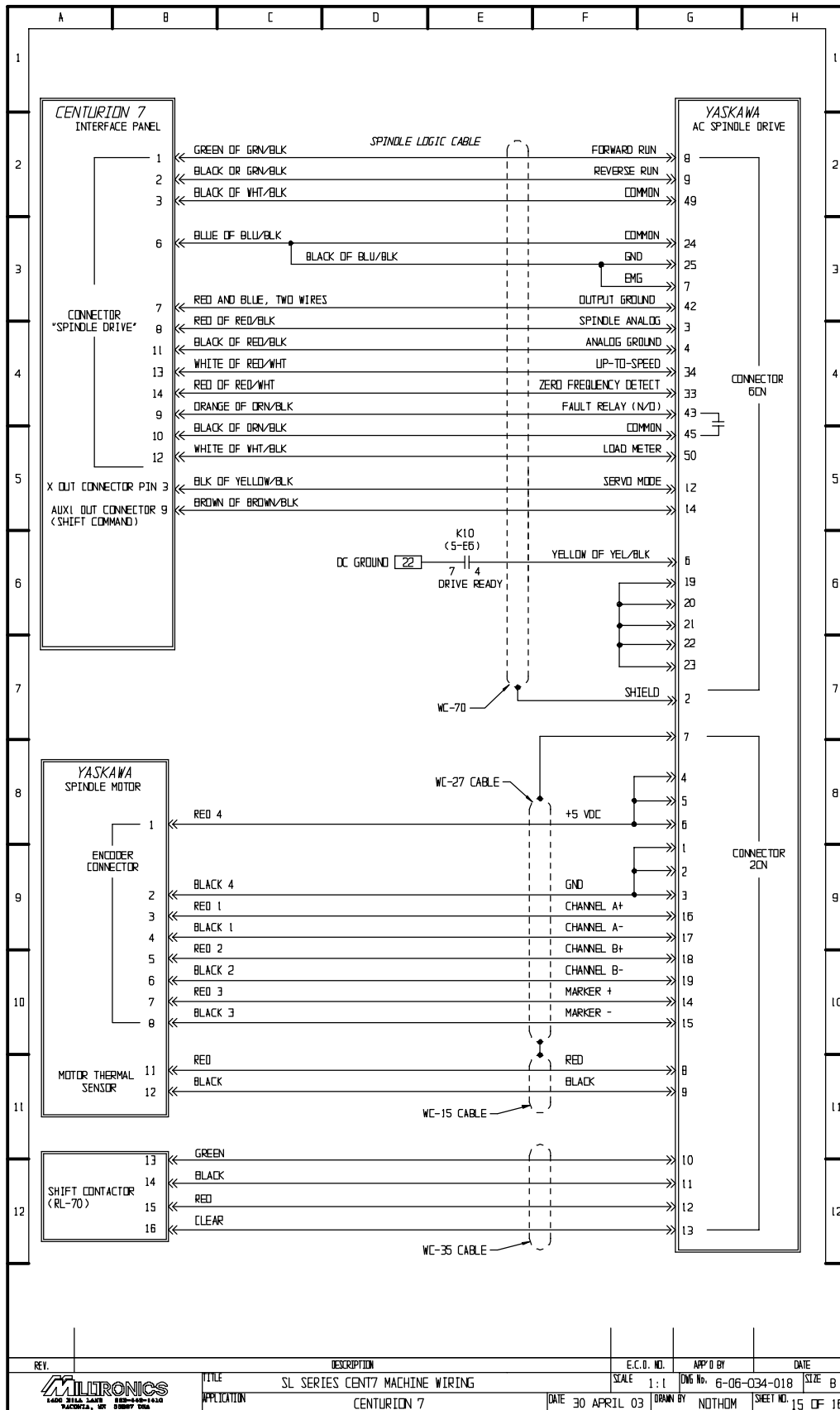


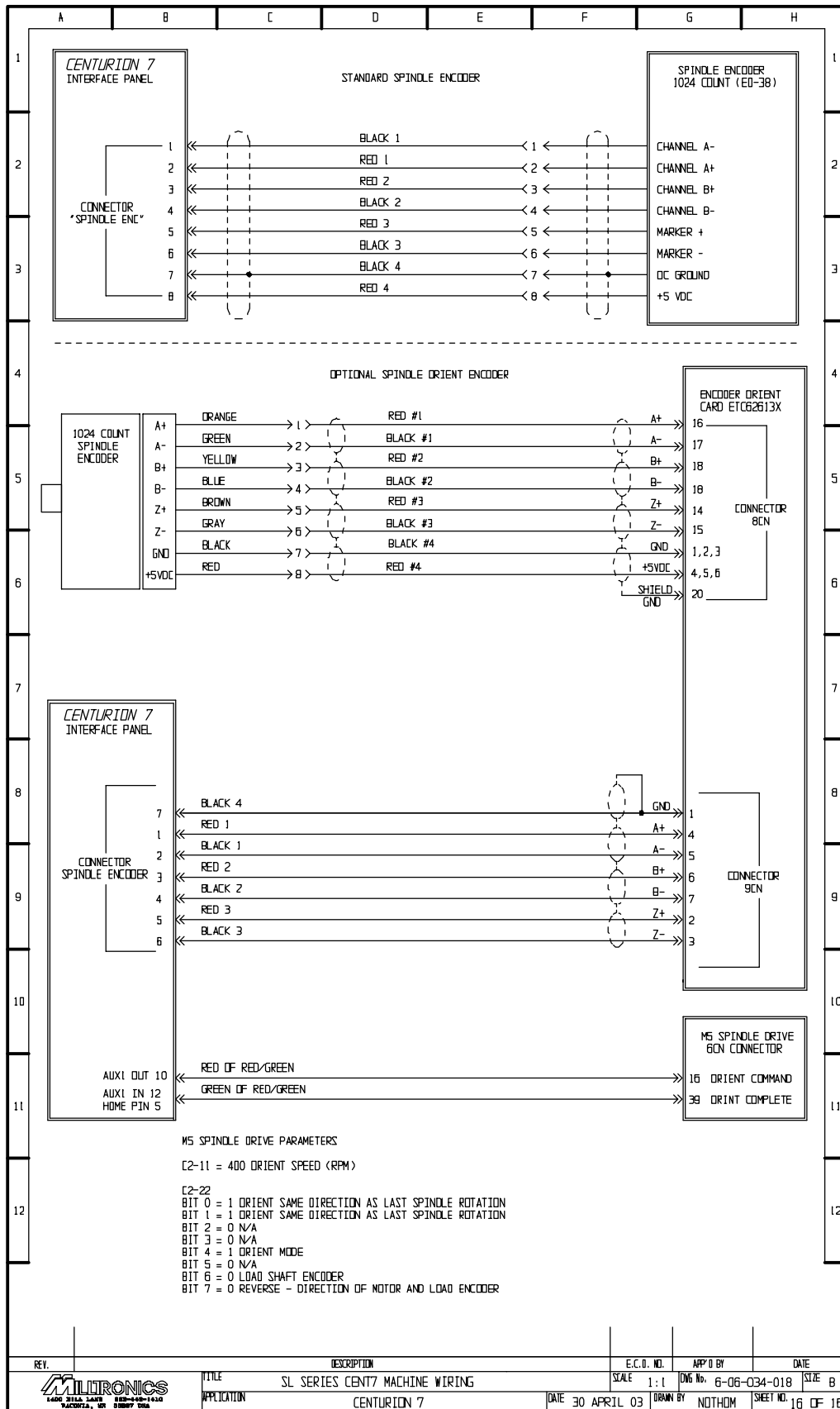




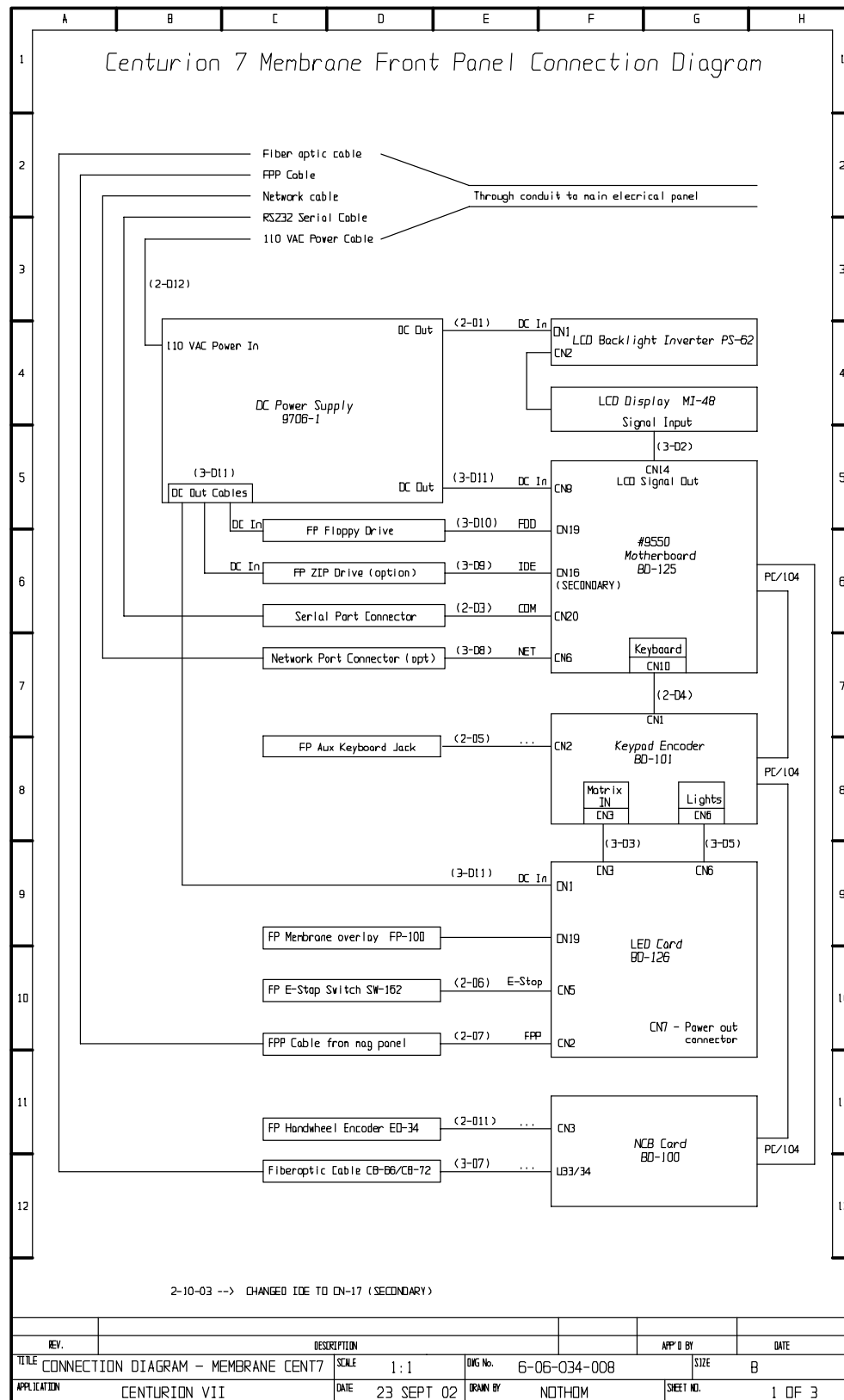


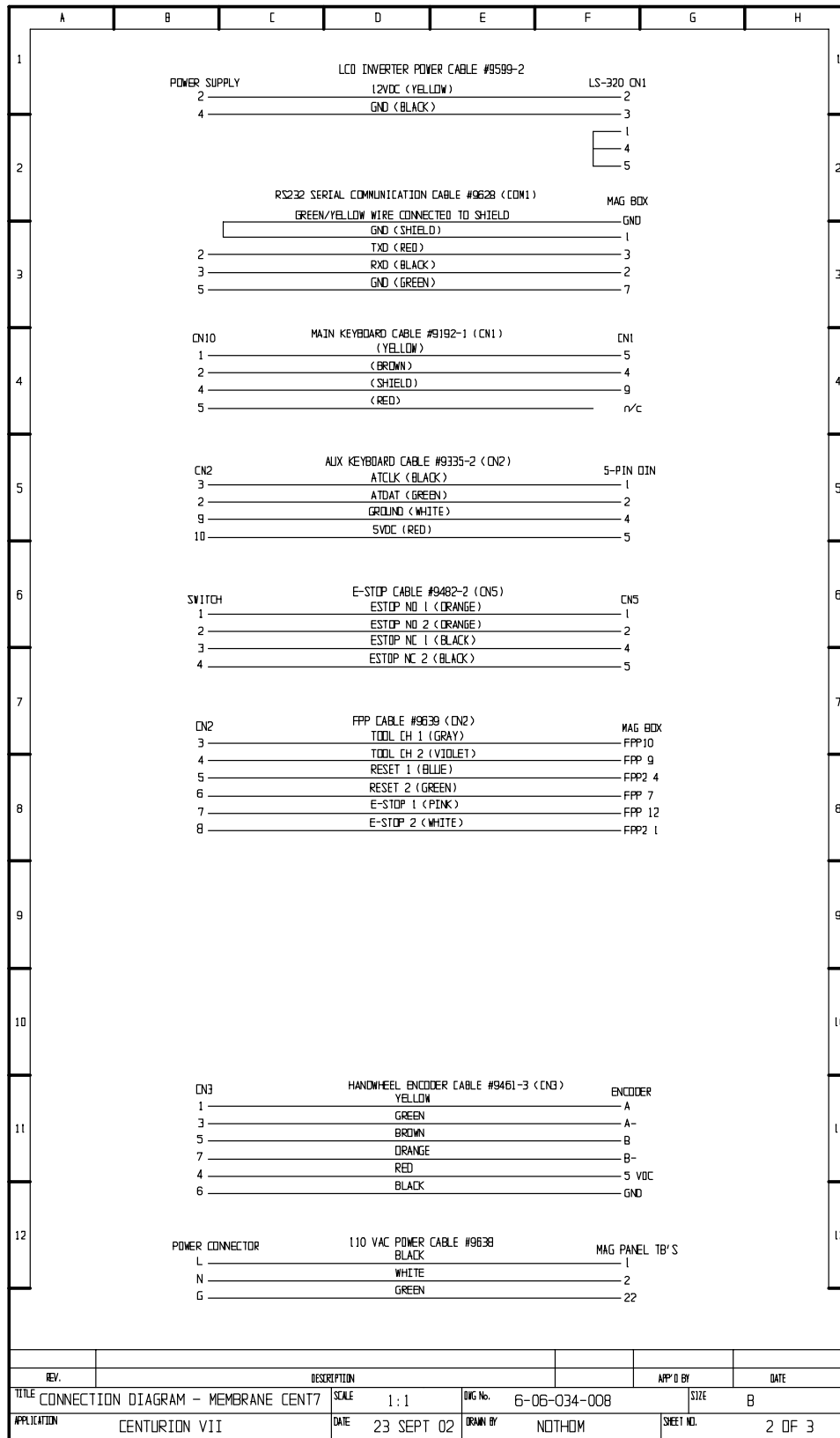


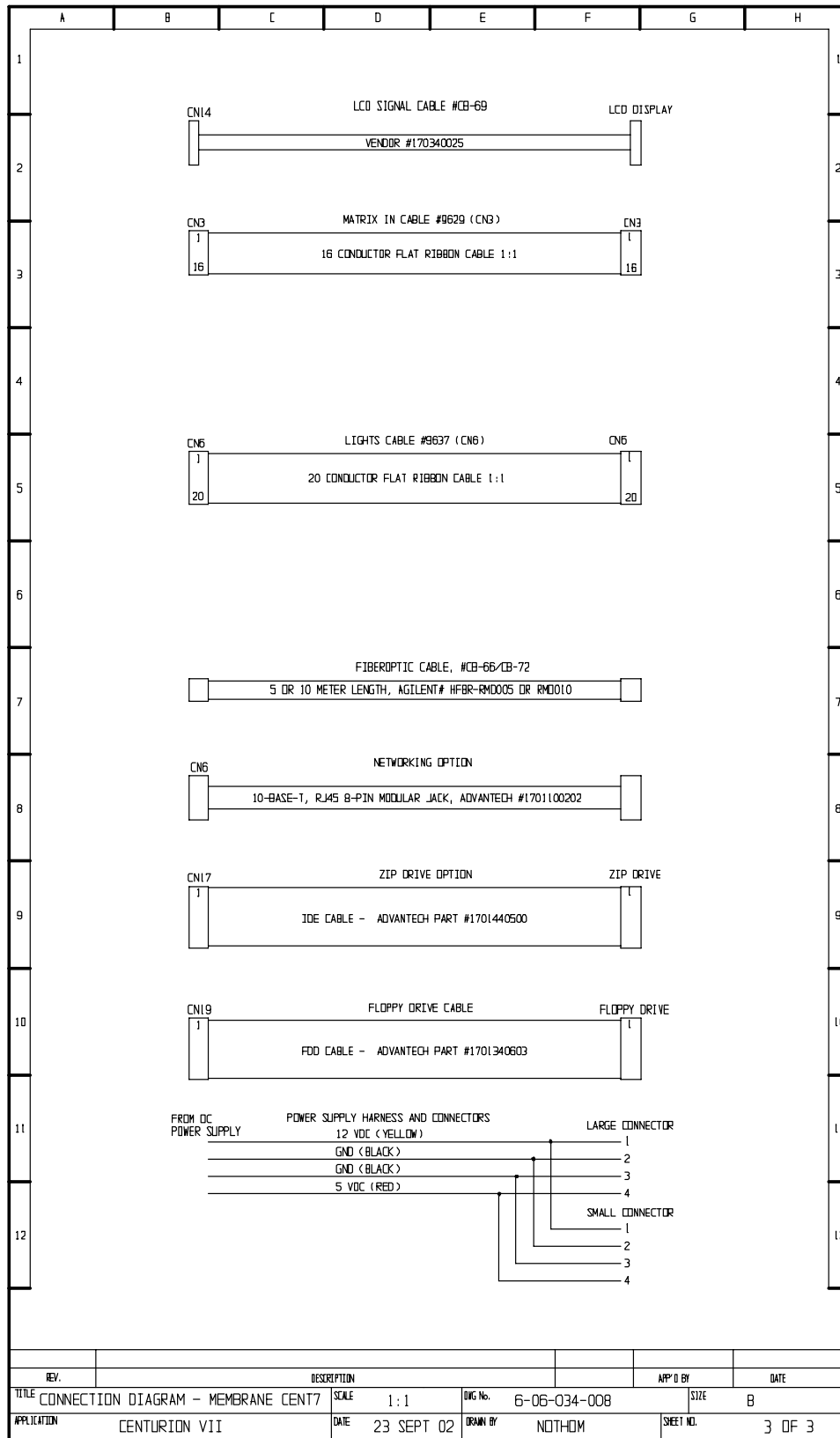




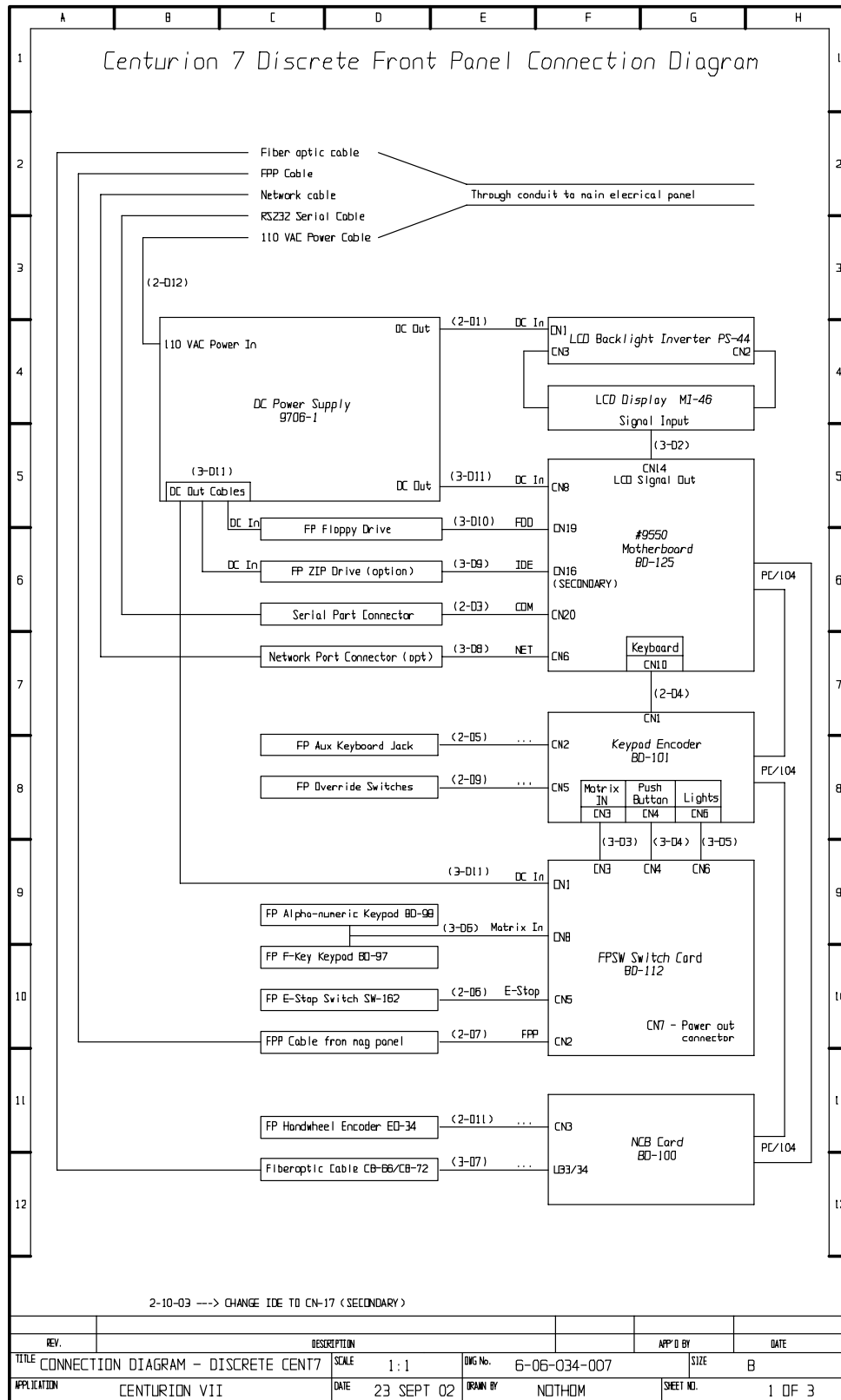
## Centurion 7 Front Panel Connections - Tactile

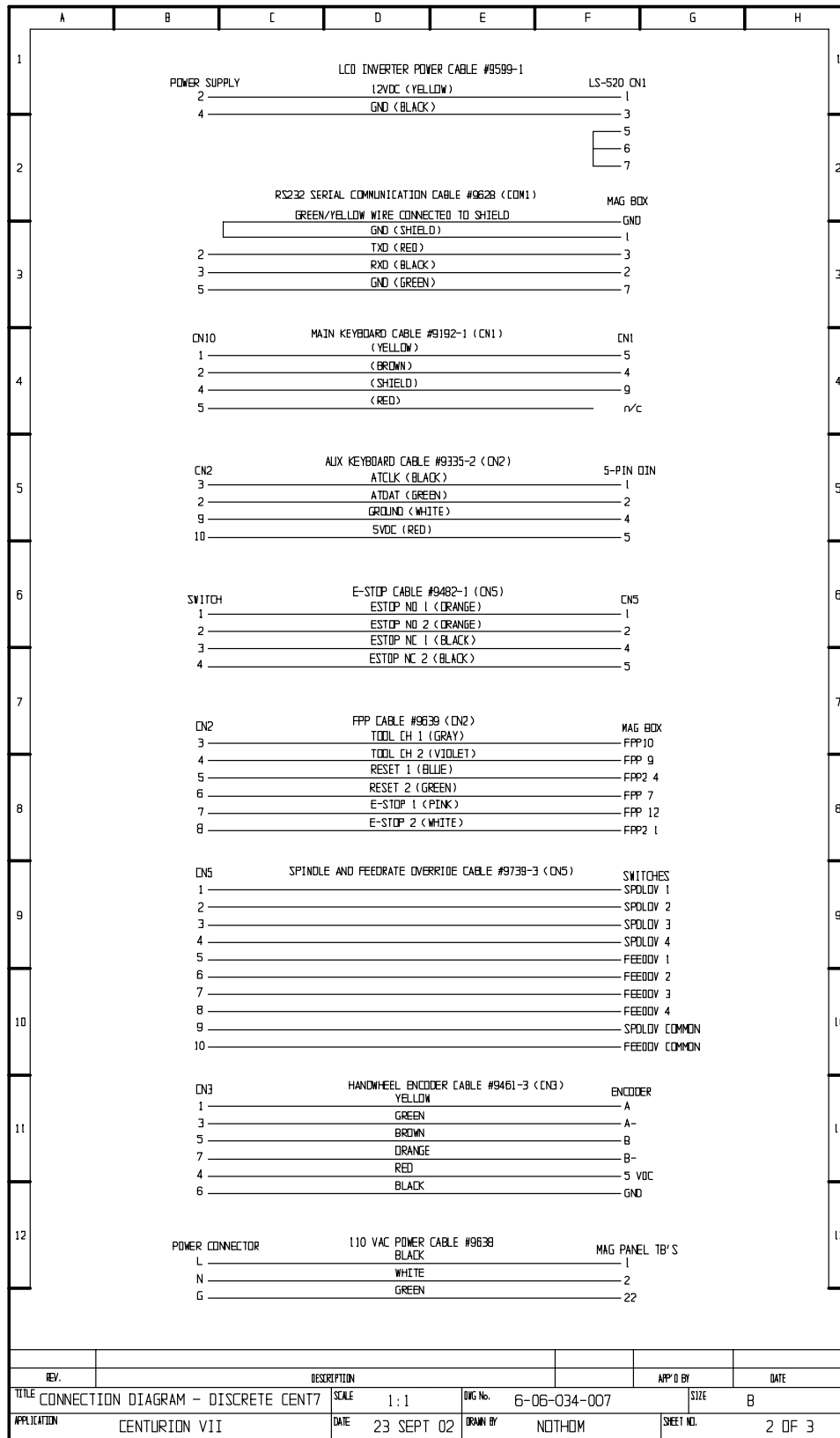




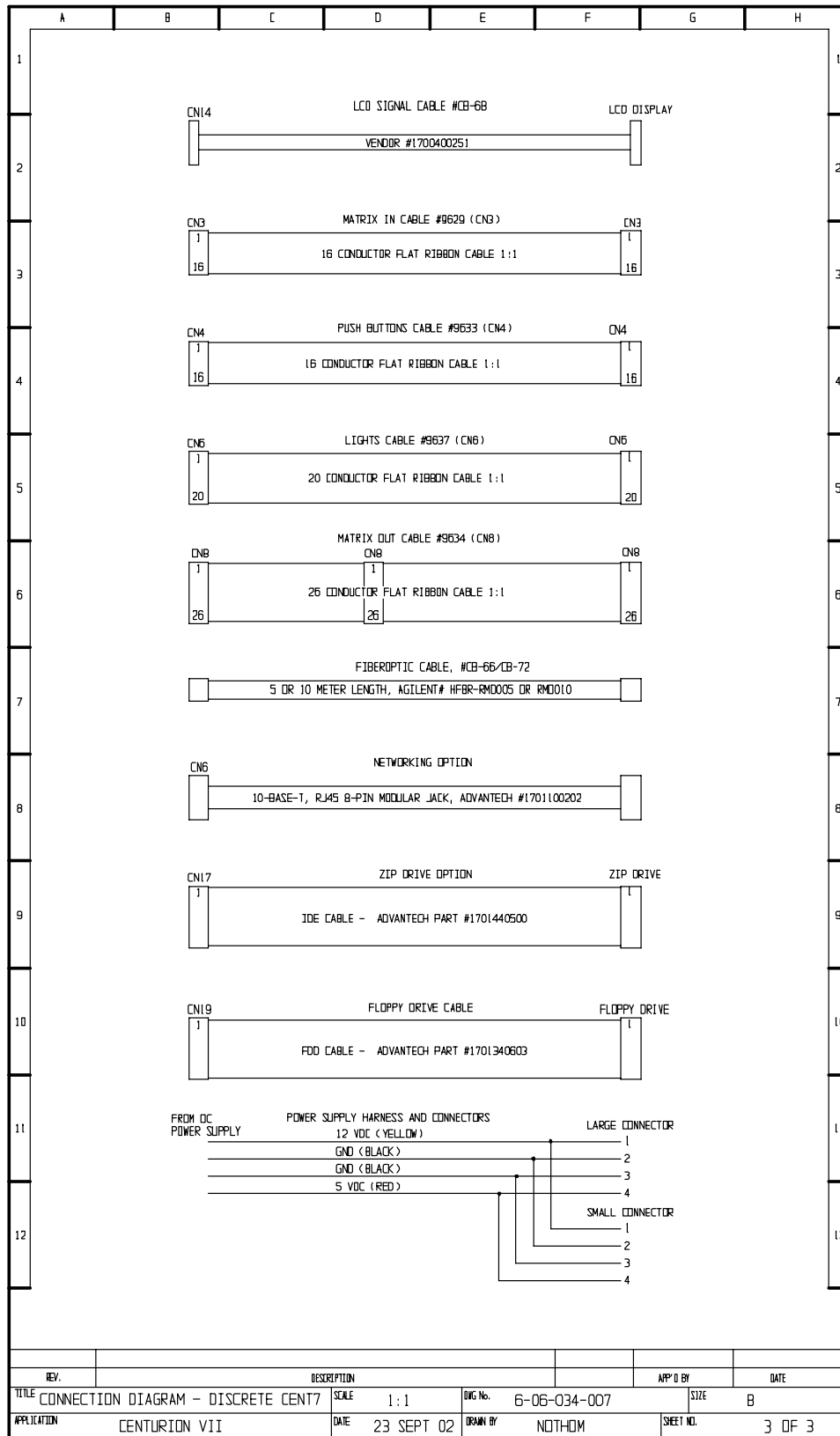


### Centurion 7 Front Panel Connections - Discrete



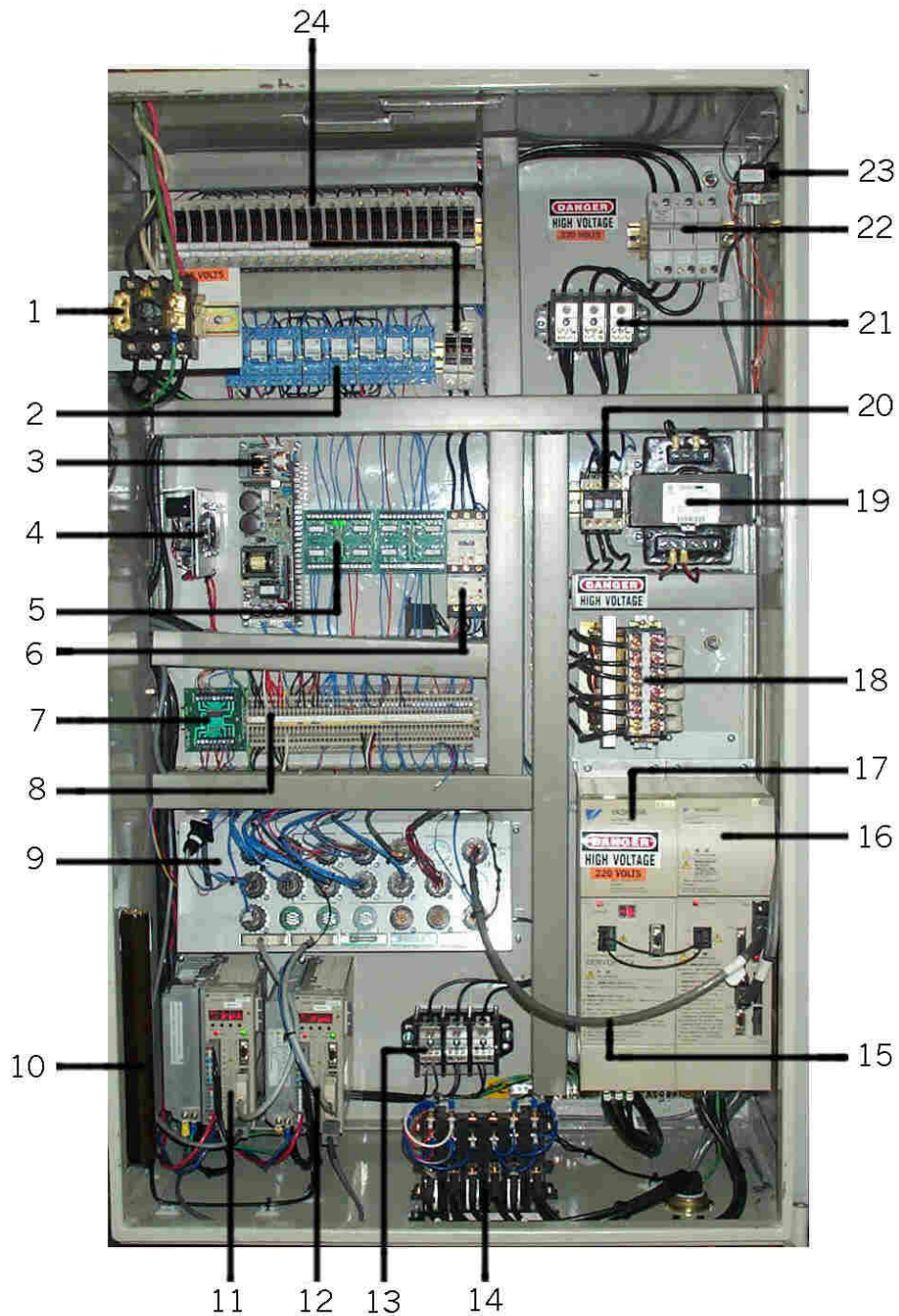


| REV.        | DESCRIPTION                               | SCALE           | DWG No.         | APP'D BY  | DATE   |
|-------------|-------------------------------------------|-----------------|-----------------|-----------|--------|
|             | TITLE CONNECTION DIAGRAM - DISCRETE CENT7 | 1:1             | 6-06-034-007    |           |        |
| APPLICATION | CENTURION VII                             | DATE 23 SEPT 02 | DRAWN BY NOTHOM | SHEET NO. | 2 OF 3 |



## Panel Layout – SL8

### SL8 Centurion 7 Mag Panel



**SL8 Electrical Parts List**

| ITEM | STOCK NO. | DESCRIPTION                                | QTY  | REMARKS         |
|------|-----------|--------------------------------------------|------|-----------------|
| 1    | SW-199    | P3-63/V/SVB 60AMP MOELLER                  | 1    |                 |
| 2    | RL-82     | CONTROL RELAY – K8                         | 1    |                 |
|      | RL-83     | SOCKET BASE                                | 1    |                 |
| 3    | PS-52     | REGULATED POWER SUPPLY, +24 VDC, 2-150-24  | 1    |                 |
| 4    | PS-61     | REGULATED POWER SUPPLY, 5VDC, 3 AMPS       | 1    |                 |
| 5    | 9107      | M-FUNCTION QUAD RELAY BOARD                | 2    |                 |
| 6    | RL-61     | LA1-DN22 2N0/2NC AUX CONTACTOR             | 1    |                 |
|      | RL-89     | LRD12 8 AMP OVERLOAD                       | 1    |                 |
| 7    | 7030      | ULN2002 LATHE INVERTER BOARD               | 1    |                 |
| 8    | TB-30     | TERMINAL BLOCK 4-POSN, TOP ENTRY           | 53   |                 |
|      | TB-31     | TERMINAL BLOCK END PIECE                   | 2    |                 |
|      | TB-32     | TERMINAL BLOCK JUMPER, 10 POSN.            | 2.2  |                 |
|      | TB-33     | TERMINAL BLOCK LABEL TAB, SHEET OF 100     | 0.82 |                 |
| 9    | 7537-3    | CENTURION 7 INTERFACE PANEL                | 1    |                 |
| 10   | RE-106    | 225 OHM RESISTOR                           | 1    |                 |
| 11   | AM-58     | AXIS DRIVE MODULE YASKAWA NO. SGD-10AEY220 | 1    | X-AXIS DRIVE    |
| 12   | AM-59     | AXIS DRIVE MODULE YASKAWA NO. SGD-15AEY220 | 1    | Z-AXIS DRIVE    |
| 13   | TB-20     | POWER DISTRIBUTION TERMINAL BLOCK          | 1    |                 |
| 14   | RL-70     | CONTACTOR, HV-75AP3 YASKAWA                | 1    |                 |
| 15   | 9849      | CABLE, SPINDLE LOGIC                       | 1    |                 |
| 16   | PS-53     | 7.5Kw M5A27P50 INVERTER                    | 1    |                 |
| 17   | PS-54     | 7.5Kw M5A275 CONVERTER                     | 1    |                 |
| 18   | IA-20     | 7.5Kw M5 REACTOR                           | 1    | CODE NO.X010060 |
| 19   | TR-46     | TRANSFORMER, 0.56 KVA, 50/60 HZ            | 1    |                 |
| 20   | RL-64     | LP1D1810BD 18AMP CONTACTOR                 | 1    |                 |
| 21   | TB-20     | POWER DISTRIBUTION TERMINAL BLOCK          | 1    |                 |
| 22   | FU-78     | MAIN FUSE HOLDER                           | 1    |                 |
|      | FU-80     | MAIN FUSE, 50 AMP                          | 3    |                 |
| 23   | MA-154    | HOUR METER, CUB3T110 RED LION              | 1    |                 |
| 24   | FU-77     | FUSE BLOCK, SINGLE 10 x 38                 | 13   |                 |

## Yaskawa M5 Spindle Drive Parameters For SL10

2-12-02

| PARAMETER          | DESCRIPTION                             |  |  | SL10 |
|--------------------|-----------------------------------------|--|--|------|
| <b>C1-01</b>       | P Gain / High gear                      |  |  | 230  |
| <b>C1-02</b>       | I Gain / High gear                      |  |  | 40   |
|                    |                                         |  |  |      |
| <b>C1-03</b>       | Proportional Gain / Low gear            |  |  | 175  |
| <b>C1-04</b>       | I Gain / Low gear                       |  |  | 75   |
|                    |                                         |  |  |      |
| <b>C1-05</b>       | Proportional Gain / SV Mode / High gear |  |  | 200  |
| <b>C1-06</b>       | I Gain / SV Mode / High gear            |  |  | 40   |
|                    |                                         |  |  |      |
| <b>C1-07</b>       | Proportional Gain / SV Mode / Low gear  |  |  | 65   |
| <b>C1-08</b>       | I Gain / SV Mode / Low gear             |  |  | 75   |
|                    |                                         |  |  |      |
| <b>C1-09</b>       | Torque Filter                           |  |  | 1    |
| <b>C1-10</b>       | Soft Start Time                         |  |  | 3.5  |
|                    |                                         |  |  |      |
| <b>C1-19</b>       | Zero Speed Detect                       |  |  | 5    |
|                    |                                         |  |  |      |
| <b>C1-25</b>       | Motor Code                              |  |  | 08F  |
|                    |                                         |  |  |      |
| <b>C1-26</b>       | Max RPM (in Motor RPM)                  |  |  | 5920 |
|                    |                                         |  |  |      |
| <b>C1-31</b>       | High gear motor flux level in SV mode   |  |  | 5920 |
|                    |                                         |  |  |      |
| <b>C1-33</b>       | Low gear motor flux level in SV mode    |  |  | 5920 |
|                    |                                         |  |  |      |
| <b>C1-35</b>       | Zero Speed Brake Time                   |  |  | 0    |
|                    |                                         |  |  |      |
| <b>C1-36 Bit 3</b> | SV Mode Enabled                         |  |  | 1    |
| <b>C1-38 Bit 1</b> | Load Meter Filter                       |  |  | 1    |
|                    |                                         |  |  |      |
|                    |                                         |  |  |      |
|                    | <b>C2 parameters for orient only</b>    |  |  |      |
| <b>C2-01</b>       | Orient Position / set as required       |  |  | N/A  |
|                    |                                         |  |  |      |
| <b>C2-05</b>       | Speed Control P Gain                    |  |  | N/A  |
| <b>C2-06</b>       | Speed Control I Time Constant           |  |  | N/A  |
|                    |                                         |  |  |      |
| <b>C2-11</b>       | Orientation Speed                       |  |  | N/A  |
|                    |                                         |  |  |      |
| <b>C2-16</b>       | Flux Level                              |  |  | N/A  |
|                    |                                         |  |  |      |
| <b>C2-22 bit 4</b> | Tune-up Operation Disabled              |  |  | N/A  |
| <b>C2-22 bit 6</b> | Encoder Selection – Motor               |  |  | N/A  |
|                    |                                         |  |  |      |

This listing contains the spindle drive parameters that have been changed by Milltronics Manufacturing. All other parameters remain unchanged and are the factory default settings by Yaskawa.

## Yaskawa M5 Spindle Drive Parameters For SL5

The parameters exist in the spindle drive only for SL8 and there is no record at Milltronics.

These parameters need to be extracted from the drive in the machine

| PARAMETER          | DESCRIPTION                 | SL5  |  |  |
|--------------------|-----------------------------|------|--|--|
| <b>C1-01</b>       | P Gain                      | 150  |  |  |
| <b>C1-02</b>       | I Gain                      | 250  |  |  |
|                    |                             |      |  |  |
| <b>C1-05</b>       | Proportional Gain / SV Mode | 85   |  |  |
| <b>C1-06</b>       | I Gain / SV Mode            | 170  |  |  |
|                    |                             |      |  |  |
| <b>C1-09</b>       | Torque Filter               | 1.0  |  |  |
| <b>C1-10</b>       | Soft Start Time             | .1   |  |  |
|                    |                             |      |  |  |
| <b>C1-19</b>       | Zero Speed Detect           | 10   |  |  |
|                    |                             |      |  |  |
| <b>C1-25</b>       | Motor Code                  | 003  |  |  |
|                    |                             |      |  |  |
| <b>C1-26</b>       | Max RPM (in Motor RPM)      | 5319 |  |  |
|                    |                             |      |  |  |
| <b>C1-36 Bit 3</b> | SV Mode Enabled             | 1    |  |  |
| <b>C1-38 Bit 1</b> | Load Meter Filter           | 1    |  |  |
|                    |                             |      |  |  |
|                    |                             |      |  |  |

This listing contains the spindle drive parameters that have been changed by Milltronics Manufacturing. All other parameters remain unchanged and are the factory default settings by Yaskawa.

## **Sigma 2 Axis Drive Parameters For SL8**

5-5-03

The following table lists the axis drive parameters changed by Milltronics. All other parameters remain set to the Yaskawa factory default settings.

| P#  | <b>Model SL8</b> |          |
|-----|------------------|----------|
|     | <b>X</b>         | <b>Z</b> |
| 000 | 0001H            | 0000H    |
| 100 | 60               | 55       |
| 101 | 510              | 410      |
| 102 | 30               | 40       |
| 103 | 125              | 118      |
| 110 | 0012H            | 0012H    |
| 201 | 3150             | 3150     |
| 300 | 766              | 771      |
| 401 | 53               | 47       |
| 408 | n/a              | 0001H    |
| 409 | 520              | 500      |
| 40A | 150              | 300      |
| 40B |                  | 1566     |
| 40C |                  | 90       |
| 40D |                  | 730      |
| 40E |                  | 75       |
| 506 | 10               | N/a      |
| 50A | 8100H            | 8100H    |
| 50B | 6548H            | 6548H    |
| 600 | 10               | 0        |

## **Procedure: Setting up gains for Centurion 6's**

### **Card Cage Gain Setting Procedure**

The motion control cards are pre-adjusted in the assembly area by commanding a move of 0.2048" and adjusting the gain pot so the analog is **5** volts. This adjustment can be made on the machine as well, but some parameters should be noted before making the adjustments.

**Note 1:** Before making any adjustments on the Centurion 6 make sure that the AXIS parameters "Velocity Gain" are set to zero and the machine is re-homed.

**Note 2:** The offset pots should be adjusted to show zero following error when the machine is at rest before making gain adjustments.

The gain adjustments done in the assembly area are done for moves on axes that have 10,000 pulses/inch. If the PPU on the machine is something other than 10,000 you must move a different distance. The **5** volts should be tuned in for a 2,048 pulse move.

#### **Example 1:**

A rotary axis has 500 pulses/degree. You should see **5** volts after a move of 4,096 degrees, (I.E.  $10,000/500 \times 0.2048$ )

#### **Example 2:**

A machine has a PPU of 10,160. You should see **5** volts after moving 0.2016 inches (I.E.  $10,000/10,160 \times 0.2048$ ). In most cases this small difference is not significant.

**Note 3:** The encoder multiplier parameter will have no affect on the above adjustments.

## Drive Setting Procedure

After the motion control cards have been adjusted, the drives are tuned.

1. In AXIS parameters, check once again that Velocity Gain values are 0 (see above); check that Excess Error is set to 0.500; **re-home** the machine.
2. Use the hand-held digital operator to set CN-03 on Yaskawa axis drives. The correct value on all VM machines is 328. CN-03 is the equivalent of a gain pot. Move an axis at 100 ipm and observe the following error. It should be **0.050 for all axes on all machines**, except rotary axes. Tweak the motion control card gain pot for final adjustment, to get as close to 0.050 as necessary.
3. If the machine has analog drives, then adjust the drive gain pot to set the following error at 100 ipm to 0.050 **for all axes on all machines**. Once again, the final adjustment may be made by tweaking the motion control card gain pot, if necessary.
4. If the axis PPU is something other than 10,000 you must tune the drives accordingly.  
Example: A rotary axis has a PPU of 500. You should move the axis at 2,000 degrees per minutes (I.E.  $10,000/500 \times 100$ ) and tune the drive so you see a following error of 1.000 degree (I.E.  $10,000/500 \times \mathbf{0.050}$ ).
5. Test that you can achieve max rapid and that the following error at max rapid is correct. Check in AXIS parameters to see the value for max rapid, then use the following formula:

Following error at max rapid = max rapid/100 x **0.050**.

Example: A VM24 has max rapids of 800 ipm. You should see a following error of .400 at full rapid (I.E.  $800/100 \times \mathbf{0.050} = .400$ ).

6. Go back into AXIS parameters and set Velocity Gain to 100. **Re-home** machine.

## Centurion 6 CNC Connector Signal Listing

### Connector X-Input

|                                   |                                              |
|-----------------------------------|----------------------------------------------|
| Pin 1 - Machine emergency stopped | Pin 8 - Spindle zero speed                   |
| Pin 2 - Spare                     | Pin 9 - Spindle drive fault                  |
| Pin 3 - Spare                     | Pin 10 - Spool Reverse                       |
| Pin 4 - Spindle up-to-speed       | Pin 11 - Digitizing probe signal             |
| Pin 5 - Tool Change               | Pin 12 - Key (jumped to Home-1 and X-axis10) |
| Pin 6 - Lube Fault (oiler empty)  | Pin 13 - No connect                          |
| Pin 7 - CNC wait channel          | Pin 14 - No connect                          |

### Connector Y-Input

|                                                              |                                              |
|--------------------------------------------------------------|----------------------------------------------|
| Pin 1 - Air pressure                                         | Pin 8 - Tool out switch pushed – (requested) |
| Pin 2 - Tool carousel at home (jumped to TCH-8)              | Pin 9 - Chip pan door is open (feedhold)     |
| Pin 3 - Tool carousel at pocket (jumped to TCH-9)            | Pin 10 - Set-up button                       |
| Pin 4 - Tool changer arm is in (jumped to TCH-10)            | Pin 11 - Edit switch (keylock)               |
| Pin 5 - Tool changer arm is out (jumped to TCH-11)           | Pin 12 - Key (jumped to Home-3)              |
| Pin 6 - Spare Y-axis 10)                                     | Pin 13 - No connect                          |
| Pin 7 - Orient roller is in - prox signal (jumped to TCH-12) | Pin 14 - No connect                          |

### Connector Z-input

|                                      |                                               |
|--------------------------------------|-----------------------------------------------|
| Pin 1 - Remote HW Enable             | Pin 8 - Tool Setting                          |
| Pin 2 - Remote FOV1                  | Pin 9 - High/Low Gear                         |
| Pin 3 - Remote FOV2                  | Pin 10 - Arm Parked                           |
| Pin 4 - OverTemp                     | Pin 11 - Auger Switch                         |
| Pin 5 - Top (on arm tool changer)    | Pin 12 - Key (jumped to home 5 and Z-axis 10) |
| Pin 6 - Middle (on arm tool changer) | Pin 13 - No connect                           |
| Pin 7 - Bottom (on arm tool changer) | Pin 14 - No connect                           |

### Connector A-Input

|                                                                        |                                               |
|------------------------------------------------------------------------|-----------------------------------------------|
| Pin 1 - X-axis Yaskawa drive OK/Fault (jumped through JS3 to X-axis 9) | Pin 8 - Remote HW Coord 1                     |
| Pin 2 - Y-axis Yaskawa drive OK/Fault (jumped through JS3 to Y-axis 9) | Pin 9 - Remote HW Coord 2                     |
| Pin 3 - Z-axis Yaskawa drive OK/Fault (jumped through JS3 to Z-axis 9) | Pin 10 - Remote HW Coord 3                    |
| Pin 4 - A-axis Yaskawa drive OK/Fault(jumped through JS3 to A-axis 9)  | Pin 11 - Remote HW set Coord                  |
| Pin 5 - B-axis Yaskawa drive OK/Fault (jumped through JS3 to B-axis 9) | Pin 12 - Key (jumped to home 7 and A-axis 10) |
| Pin 6 - Remote HW Axis 1                                               | Pin 13 - No connect                           |
| Pin 7 - Remote HW Axis 2                                               | Pin 14 - No connect                           |

### Connector X-Output

|                                             |                        |
|---------------------------------------------|------------------------|
| Pin 1 - Excess Error                        | Pin 8 - Tool change    |
| Pin 2 - Spray mist coolant                  | Pin 9 - Allow Reset    |
| Pin 3 - Flood coolant                       | Pin 10 - Delayed reset |
| Pin 4 - Spindle clockwise                   | Pin 11 - Spindle latch |
| Pin 5 - Spindle counter clockwise           | Pin 12 - Rotary clamp  |
| Pin 6 - Spindle drive OK                    | Pin 13 - Key           |
| Pin 7 - Drawbar Enable (VK5 & MB-Auto only) | Pin 14 - No connect    |

## Centurion 6 CNC Connector Signal Listing

### Connector Y-Output

|                                                           |                                                        |
|-----------------------------------------------------------|--------------------------------------------------------|
| Pin 1 - Creep speed                                       | Pin 8 - Blowoff/Drumdoor/FeedHold (jumped to TCH-Yin9) |
| Pin 2 - Tool changer arm in/ pot down (jumped to TCH-1)   | Pin 9 - Gear 1 of 4 Gear                               |
| Pin 3 - Power drawbar (jumped to TCH-2)                   | Pin 10 - Low range - Gear 2 of 4                       |
| Pin 4 - Tool carousel clockwise (jumped to TCH-3)         | Pin 11 - Medium range - Gear 3 of 4                    |
| Pin 5 - Tool carousel counter clockwise (jumped to TCH-4) | Pin 12 - High range - Gear 4 of 4                      |
| Pin 6 - Spindle enable                                    | Pin 13 - Key                                           |
| Pin 7 - Orient roller (jumped to TCH-5)                   | Pin 14 - No connect                                    |

### Connector Z-Output

|                                               |                                     |
|-----------------------------------------------|-------------------------------------|
| Pin 1 - MC1G / Optical Probe On               | Pin 8 - Miscellaneous M-code No. 2  |
| Pin 2 - MC1D / Hard Tap (For no ramps on CSM) | Pin 9 - Miscellaneous M-code No. 3  |
| Pin 3 - MC1C / Auger for Chip removal M38/M39 | Pin 10 - Miscellaneous M-code No. 4 |
| Pin 4 - MC1B                                  | Pin 11 - Miscellaneous M-code No. 5 |
| Pin 5 - MC1A                                  | Pin 12 - Spindle reverse            |
| Pin 6 - Miscellaneous M-code No. 1            | Pin 13 - Key                        |
| Pin 7 - End-of-cycle lamp                     | Pin 14 - No connect                 |

### Connector A-Output

|                                                               |                          |
|---------------------------------------------------------------|--------------------------|
| Pin 1 - X-Axis drive enable (jumped through JS3 to X-axis 13) | Pin 8 - Spare            |
| Pin 2 - Y-Axis drive enable (jumped through JS3 to Y-axis 13) | Pin 9 - Spare            |
| Pin 3 - Z-Axis drive enable (jumped through JS3 to Z-axis 13) | Pin 10 - Spindle Running |
| Pin 4 - A-Axis drive enable (jumped through JS3 to A-axis 13) | Pin 11 - Door Open       |
| Pin 5 - B-Axis drive enable (jumped through JS3 to B-axis 13) | Pin 12 - Door Close      |
| Pin 6 - Axis drives enable                                    | Pin 13 - Key connect     |
| Pin 7 - Arm (on Swing-Arm TlChngr)                            | Pin 14 - No              |

### Connectors X, Y, Z, A and B Axis (DC Brush Drives)

|                     |                                                                |
|---------------------|----------------------------------------------------------------|
| Pin 1 - Channel A + | Pin 8 - +5 VDC                                                 |
| Pin 2 - Channel A - | Pin 9 - Axis fault/OK (jumped through JS3 to A-Input)          |
| Pin 3 - Channel B + | Pin 10 - Axis home switch (also found on Home Connector)       |
| Pin 4 - Channel B - | Pin 11 - Axis analog signal                                    |
| Pin 5 - Marker -    | Pin 12 - Axis analog ground                                    |
| Pin 6 - Marker +    | Pin 13 - Axis Enable/Disable (jumped through JS3 to A- Output) |
| Pin 7 - DC ground   | Pin 14 - Key                                                   |

### Connectors X, Y, Z, A and B Axis (Yaskawa Brushless Drives)

|                            |                       |                               |
|----------------------------|-----------------------|-------------------------------|
| Pin 1 - 0 VDC              | Pin 20 - Marker -     | Pin 34 - Channel A -          |
| Pin 2 - 0 VDC              | Pin 29 - Servo ready  | Pin 35 - Channel B +          |
| Pin 5 - Axis analog signal | Pin 30 - 0 VDC        | Pin 36 - Channel B -          |
| Pin 6 - 0 VDC              | Pin 31 - Alarm output | Pin 40 - Servo ON             |
| Pin 10 - 0 VDC             | Pin 32 - 0 VDC        | Pin 47 - +24 VDC              |
| Pin 19 - Marker +          | Pin 33 - Channel A +  | All other pins are no connect |

### Axis Home Connector

|                                                                      |                                                                      |
|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Pin 1 - X-axis home switch signal (jumped to X-axis 10 & X-input 12) | Pin 8 - A-axis home switch ground                                    |
| Pin 2 - X-axis home switch ground                                    | Pin 9 - B-axis home switch signal (jumped to B-axis 10 & A-input 11) |
| Pin 3 - Y-axis home switch signal (jumped to Y-axis 10 & Y-input 12) | Pin 10 - B-axis home switch ground                                   |
| Pin 4 - Y-axis home switch ground                                    | Pin 11 - Key                                                         |

## Centurion 6 CNC Connector Signal Listing

|                                                                      |                     |
|----------------------------------------------------------------------|---------------------|
| Pin 5 - Z-axis home switch signal (jumped to Z-axis 10 & Z-input 12) | Pin 12 - No connect |
| Pin 6 - Z-axis home switch ground                                    | Pin 13 - No connect |
| Pin 7 - A-axis home switch signal (jumped to A-axis 10 & A-input 12) | Pin 14 - No connect |

### Spindle Drive Connector

|                                         |                                                           |
|-----------------------------------------|-----------------------------------------------------------|
| Pin 1 - Forward Run (jumped to X-out 4) | Pin 8 - Spindle analog signal (jumped to Misc-13)         |
| Pin 2 - Reverse Run (jumped to X-out 5) | Pin 9 - Spindle fault contacts (jumped to X-in 9)         |
| Pin 3 - Ground                          | Pin 10 - Ground                                           |
| Pin 4 - Key                             | Pin 11 - Spindle analog signal ground (jumped to Misc-14) |
| Pin 5 - Creep speed (jumped to Y-out 1) | Pin 12 - Spindle load meter (jumped to Misc-3)            |
| Pin 6 - Ground                          | Pin 13 - Up-to-speed (jumped to X-in 4)                   |
| Pin 7 - Ground                          | Pin 14 - Zero speed (jumped to X-in 8)                    |

### Spindle Encoder Connector

|                     |                     |                    |
|---------------------|---------------------|--------------------|
| Pin 1 - Channel A + | Pin 6 - Marker +    | Pin 11 - DC ground |
| Pin 2 - Channel A - | Pin 7 - DC ground   | Pin 12 - DC ground |
| Pin 3 - Channel B + | Pin 8 - +5 VDC      | Pin 13 - DC ground |
| Pin 4 - Channel B - | Pin 9 - DC ground   | Pin 14 - Key       |
| Pin 5 - Marker -    | Pin 10 - No connect |                    |

### Miscellaneous Connector (Misc)

|                                        |                                   |
|----------------------------------------|-----------------------------------|
| Pin 1 - Machine reset - CR1C (+24 VDC) | Pin 8 - Reset 2 (jumped to FPP-8) |
| Pin 2 - Machine reset - K1 coil        | Pin 9 - Tool change 1             |
| Pin 3 - Load meter analog              | Pin 10 - Tool change 2            |
| Pin 4 - DC ground                      | Pin 11 - E-stop 1                 |
| Pin 5 - Key                            | Pin 12 - E-stop 2                 |
| Pin 6 - Excess error latch             | Pin 13 - Spindle analog           |
| Pin 7 - Reset 1 (jumped to FPP-7)      | Pin 14 - DC ground                |

### Front Panel Connector (FPP) and J2 on keyboard encoder card

|                                                     |                                                                   |
|-----------------------------------------------------|-------------------------------------------------------------------|
| Pin 1 - No connect                                  | Pin 8 - Front panel reset switch (jumped to Misc-8)               |
| Pin 2 - Front panel DC ground                       | Pin 9 - Front panel tool change reset switch (jumped to Misc-9)   |
| Pin 3 - Key                                         | Pin 10 - Front panel tool change reset switch (jumped to Misc-10) |
| Pin 4 - Front panel +24 VDC                         | Pin 11 - Front panel emergency stop switch (jumped to Misc-11)    |
| Pin 5 - Front panel +12 VDC                         | Pin 12 - Front panel emergency stop switch (jumped to Misc-12)    |
| Pin 6 - No connect                                  | Pin 13 - No connect                                               |
| Pin 7 - Front panel reset switch (jumped to Misc-7) | Pin 14 - No connect                                               |

### Power Connector

|                    |                    |                    |
|--------------------|--------------------|--------------------|
| Pin 1 - +5 VDC     | Pin 6 - +12 VDC    | Pin 11 - DC ground |
| Pin 2 - +5 VDC     | Pin 7 - -12 VDC    | Pin 12 - DC ground |
| Pin 3 - +5 VDC     | Pin 8 - No connect | Pin 13 - DC ground |
| Pin 4 - +24 VDC    | Pin 9 - Key        | Pin 14 - DC ground |
| Pin 5 - No connect | Pin 10 - DC ground |                    |

### Connector Handwheel for remote handwheel option

|                     |                     |                    |
|---------------------|---------------------|--------------------|
| Pin 1 - Channel A + | Pin 6 - No connect  | Pin 11 - DC ground |
| Pin 2 - Channel A - | Pin 7 - DC ground   | Pin 12 - DC ground |
| Pin 3 - Channel B + | Pin 8 - +5 VDC      | Pin 13 - DC ground |
| Pin 4 - Channel B - | Pin 9 - DC ground   | Pin 14 - Key       |
| Pin 5 - No connect  | Pin 10 - No connect |                    |

## Centurion 6 CNC Connector Signal Listing

### Connector Tool Changer

|                                                                  |                                                       |
|------------------------------------------------------------------|-------------------------------------------------------|
| Pin 1 - Tool changer arm in (jumped to Y-out 2)                  | Pin 8 - Tool carousel at home prox (jumped to Y-in 2) |
| Pin 2 - Power drawbar (jumped to Y-out 3)                        | Pin 9 - Tool carousel at pocket (jumped to Y-in 3)    |
| Pin 3 - Tool carousel clockwise (jumped to Y-out 4)              | Pin 10 - Tool changer arm in (jumped to Y-in 4)       |
| Pin 4 - Tool carousel counter clockwise (jumped to Y-out 5)      | Pin 11 - Tool changer arm out (jumped to Y-in 5)      |
| Pin 5 - Tool carousel orient roller cylinder (jumped to Y-out 7) | Pin 12 - Tool carousel orient prox (jumped to Y-in 7) |
| Pin 6 - 20 pocket tool changer door open (jumped to Y-out 8)     | Pin 13 - No connect                                   |
| Pin 7 - Key                                                      | Pin 14 - No connect                                   |

### Connector COM1 (Card Cage)

|                |            |
|----------------|------------|
| Pin 2 -        | TXD        |
| Pin 3 -        | RXD        |
| Pin 5 -        | DC ground  |
| All other pins | no connect |

### Connector COM2 For rigid tapping option

|                     |                     |                    |
|---------------------|---------------------|--------------------|
| Pin 1 - Channel A + | Pin 4 - Channel B - | Pin 7 - +5 VDC     |
| Pin 2 - Channel A - | Pin 5 - Marker +    | Pin 8 - DC Ground  |
| Pin 3 - Channel B + | Pin 6 - Marker -    | Pin 9 - No connect |

### Connector Floppy Disk

Standard IBM personal computer floppy disk drive data port

### Connector CRT (Video)

|                                            |                                            |
|--------------------------------------------|--------------------------------------------|
| Pin 1 - VGA red signal return              | Pin 14 - VGA red signal                    |
| Pin 2 - VGA green signal return            | Pin 15 - VGA green signal                  |
| Pin 3 - VGA blue signal return             | Pin 16 - VGA blue signal                   |
| Pin 4 - Digital ground                     | Pin 17 - VGA vertical synch.               |
| Pin 5 - VGA synch. Return                  | Pin 18 - VGA horizontal synch.             |
| Pin 6 - No connect                         | Pin 19 - No connect                        |
| Pin 7 - No connect                         | Pin 20 - No connect                        |
| Pin 8 - Serial I/O TXD                     | Pin 21 - Serial I/O RXD                    |
| Pin 9 - Front panel handwheel channel A +  | Pin 22 - Front panel handwheel channel A - |
| Pin 10 - Front panel handwheel channel B + | Pin 23 - Front panel handwheel channel B - |
| Pin 11 - Cable shield                      | Pin 24 - Keyboard ATCLK                    |
| Pin 12 - DC ground                         | Pin 25 - Keyboard ATDAT                    |
| Pin 13 - DC ground                         |                                            |

## Connectors in the CNC control box

### Connector CRT (Monitor Power)

|                                 |                              |
|---------------------------------|------------------------------|
| Pin 1 -                         | Monitor power 110 VAC line   |
| Pin 3 -                         | Monitor power 110 VAC return |
| Pin 14 -                        | Monitor chassis ground       |
| (All other pins are no connect) |                              |

### Connector FPACC

|                                            |                                           |
|--------------------------------------------|-------------------------------------------|
| Pin 1 - Front panel fan +24 VDC            | Pin 8 - Front panel emergency stop common |
| Pin 2 - Front panel fan DC ground          | Pin 9 - Setup switch signal               |
| Pin 3 - Chip pan door open feedhold signal | Pin 10 - Setup switch common              |
| Pin 4 - Chip pan door open ground          | Pin 11 - Chip pan door open 110 VAC       |
| Pin 5 - Tool out switch signal             | Pin 12 - Chip pan door open 110 return    |

## Centurion 6 CNC Connector Signal Listing

- |                                           |                                   |
|-------------------------------------------|-----------------------------------|
| Pin 6 - Tool out switch common            | Pin 13 - End-of-cycle lamp signal |
| Pin 7 - Front panel emergency stop signal | Pin 14 - End-of-cycle lamp common |

### Connector P2

- |                                           |                        |
|-------------------------------------------|------------------------|
| Pin 1 - Front panel handwheel channel A + | Pin 6 - Serial I/O RXD |
| Pin 2 - Front panel handwheel channel A - | Pin 7 - Keyboard ATCLK |
| Pin 3 - Front panel handwheel channel B + | Pin 8 - Keyboard ATDAT |
| Pin 4 - Front panel handwheel channel B - | Pin 9 - DC ground      |
| Pin 5 - Serial I/O TXD                    | Pin 10 - DC ground     |

### Keyboard DIN Connector (J1)

- |                        |                   |
|------------------------|-------------------|
| Pin 1 - Keyboard EXCLK | Pin 4 - DC ground |
| Pin 2 - Keyboard EXDAT | Pin 5 - +5 VDC    |
| Pin 3 - No connect     |                   |

## Connectors in the Mag Box

### Connectors ATC1 and 1-1E

- |                                                         |                                                   |
|---------------------------------------------------------|---------------------------------------------------|
| Pin 1 - Tool changer carousel power – return            | Pin 9 - Tool changer arm out prox                 |
| Pin 2 - Tool changer carousel power – clockwise         | Pin 10 - Tool arm in/tool arm out prox            |
| Pin 3 - Tool changer carousel power - counter clockwise | DC ground                                         |
| Pin 4 - Home/at pocket prox DC ground                   | Pin 11 - Key                                      |
| Pin 5 - Home/at pocket prox +24 VDC                     | Pin 12 - Tool changer arm in/out signal           |
| Pin 6 - Tool carousel home prox                         | Pin 13 - 20 pocket tool changer door open signal  |
| Pin 7 - Tool carousel at pocket prox                    | Pin 14 - Tool changer arm & door solenoids common |
| Pin 8 - Tool changer arm in prox                        |                                                   |

### Connector ATC2

- |                                         |                                             |
|-----------------------------------------|---------------------------------------------|
| Pin 1 - Spindle orient solenoid signal  | Pin 8 - Spindle orient prox chassis ground  |
| Pin 2 - Power drawbar solenoid signal   | Pin 9 - Drawbar solenoid chassis ground     |
| Pin 3 - Spray mist air solenoid signal  | Pin 10 - Key                                |
| Pin 4 - Spindle orient solenoid +24 VDC | Pin 11 - Spray mist solenoid chassis ground |
| Pin 5 - Power drawbar solenoid +24 VDC  | Pin 12 - Spindle orient prox signal         |
| Pin 6 - Tool Out switch                 | Pin 13 - Spindle orient prox +24 VDC        |
| Pin 7 - Spray mist air solenoid +24 VDC | Pin 14 - Spindle orient prox DC ground      |

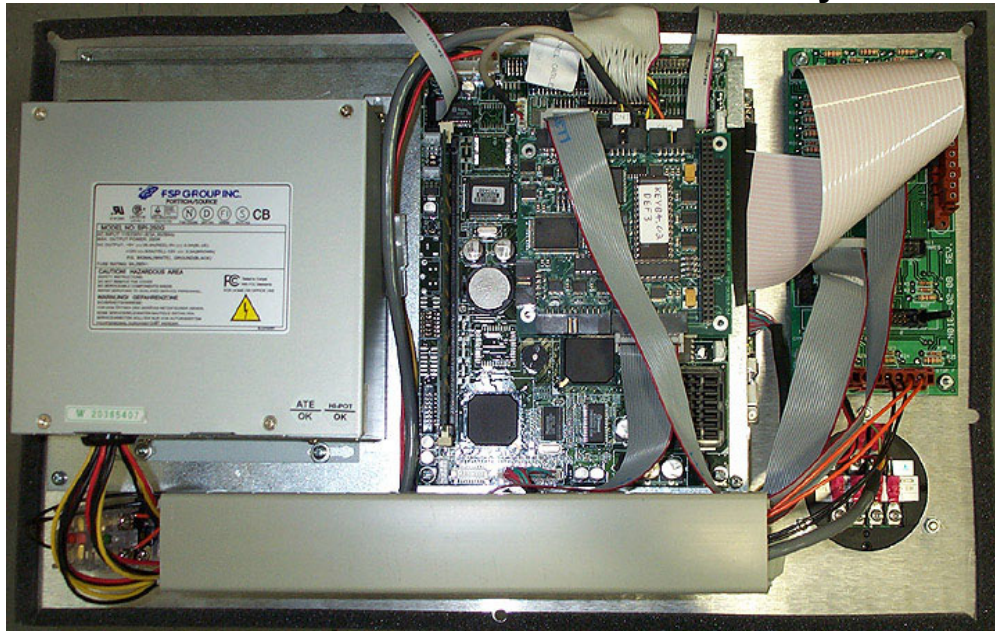
### Connector on +24 VDC Regulated Power Supply

- |                        |                     |
|------------------------|---------------------|
| Pin 1 - 110 VAC line   | Pin 8 - No connect  |
| Pin 2 - 110 VAC return | Pin 9 - No connect  |
| Pin 3 - No connect     | Pin 10 - No connect |
| Pin 4 - +24 VDC        | Pin 11 - DC ground  |
| Pin 5 - +24 VDC        | Pin 12 - DC ground  |
| Pin 6 - Key            | Pin 13 - DC ground  |
| Pin 7 - No connect     | Pin 14 - DC ground  |

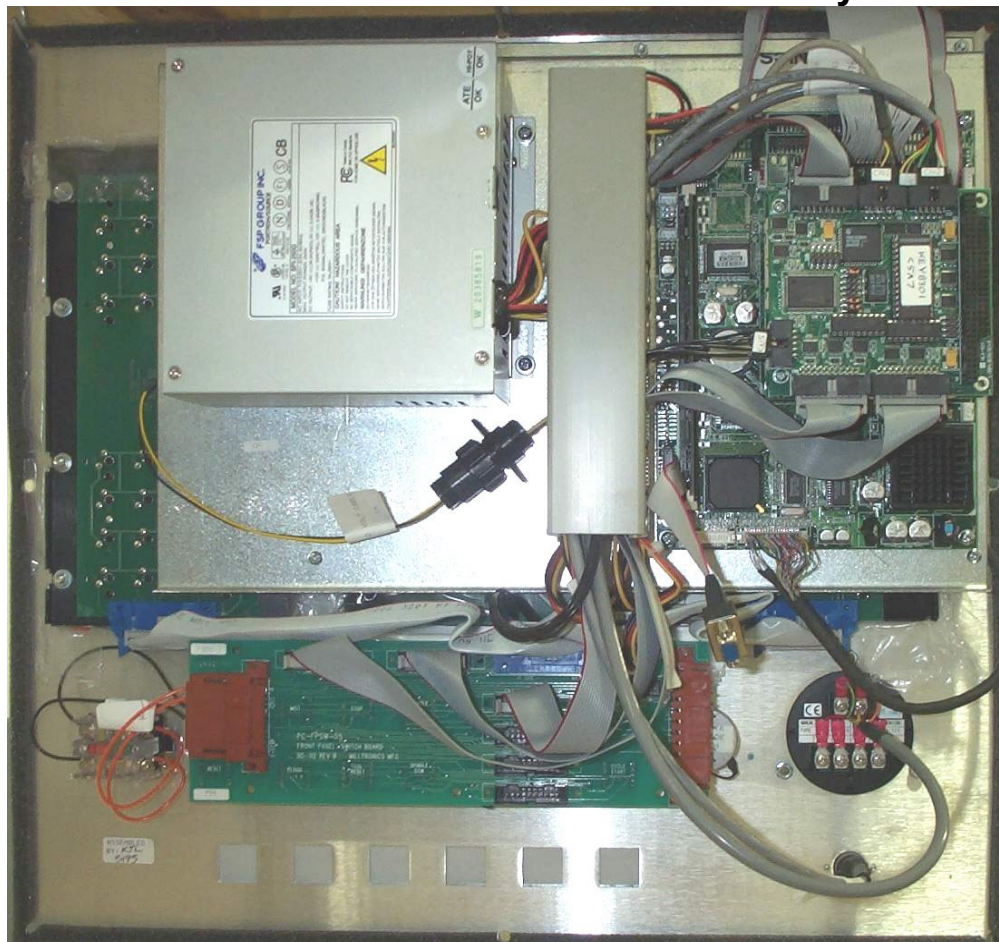
### Connector COM1 (on Mag Panel)

- Pin 2 - RXD  
Pin 3 - TXD  
Pin 7 - Ground  
All other pins no connect

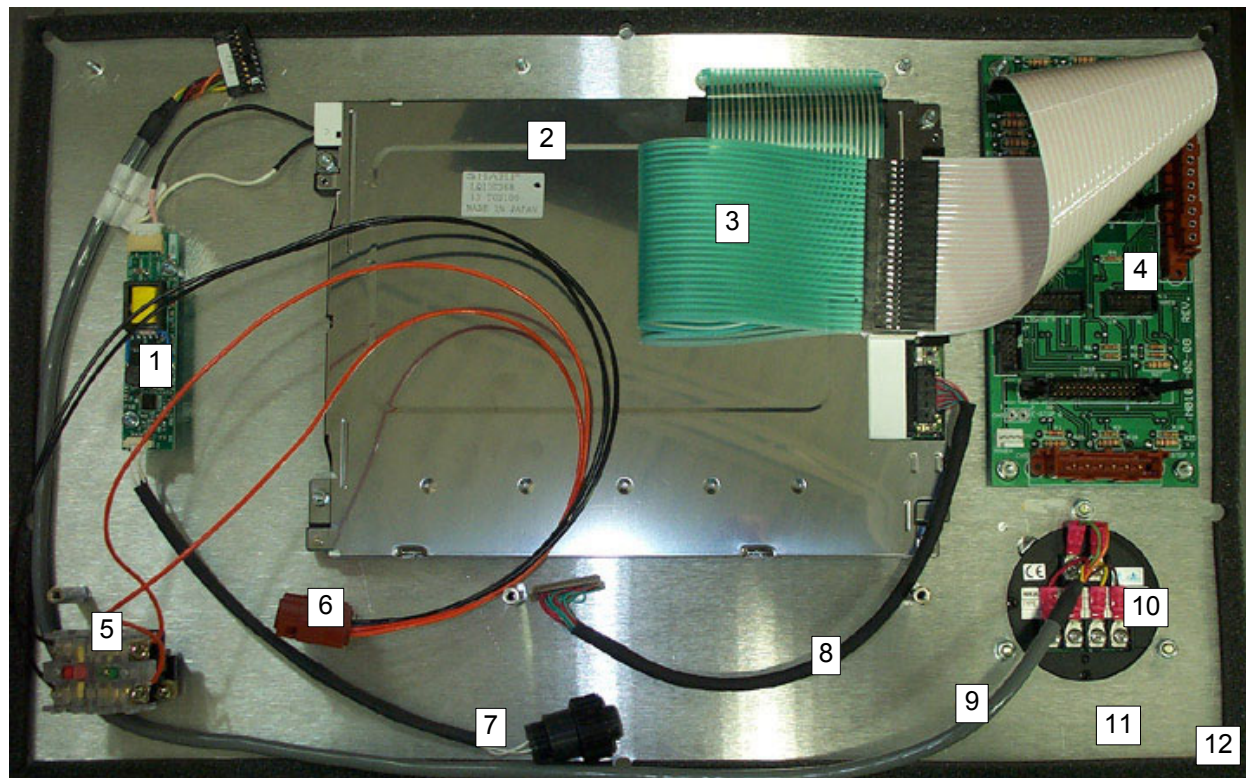
## Centurion 7 Tactile Control Assembly



## Centurion 7 Discrete Control Assembly

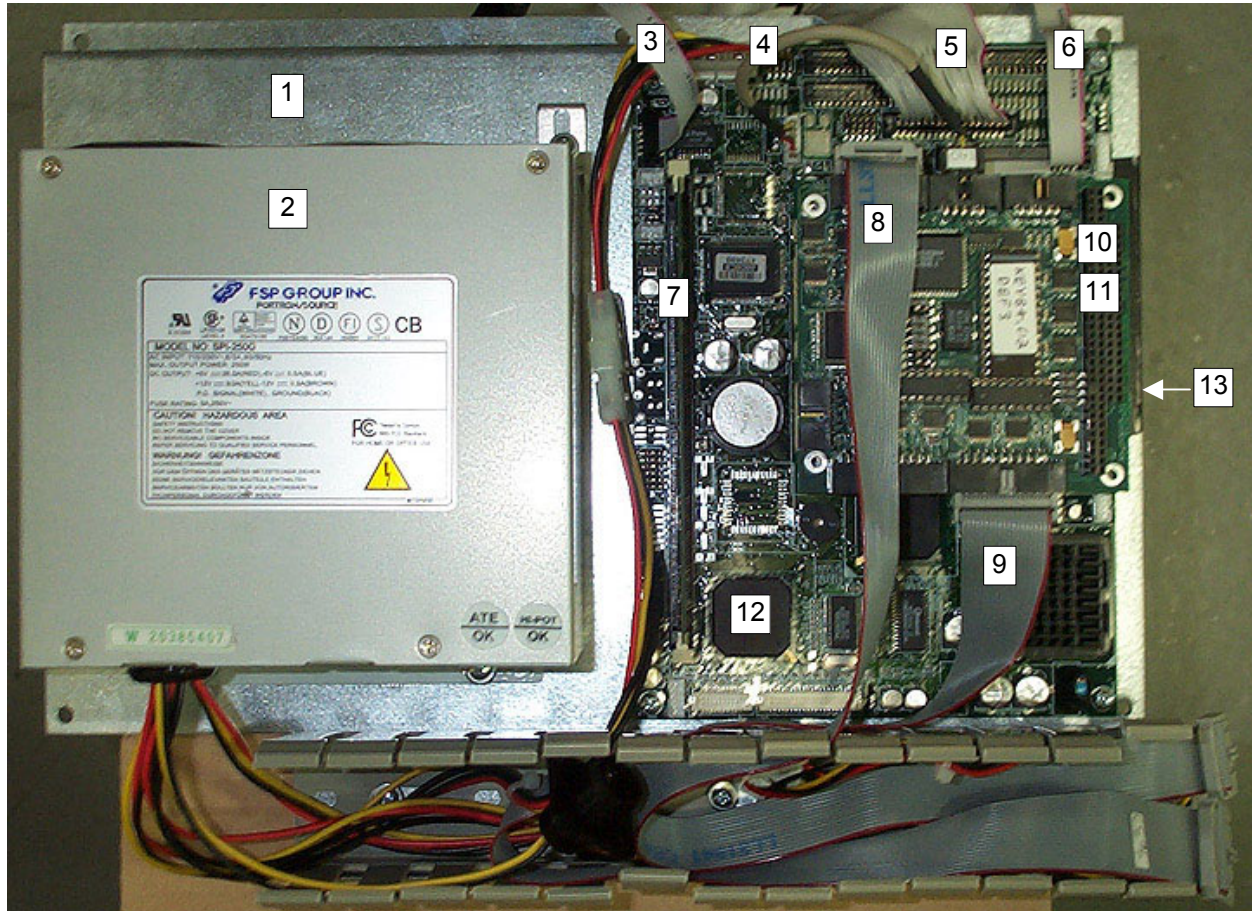


## Centurion 7 Tactile Control Front Panel Assembly



| Item | Part # | Assembly # 5193 Parts List               | Qty | Remarks |
|------|--------|------------------------------------------|-----|---------|
| 1    | PS-62  | LS-320 Backlight Inverter                | 1   |         |
| 2    | MI-48  | 10" LCD Display, Sharp LQI0D368          | 1   |         |
| 3    | FP-100 | Membrane Front Panel Overlay             | 1   |         |
| 4    | BD-126 | LED Board For Centurion 7 Membrane Panel | 1   |         |
| 5    | SW-162 | Twist To Release E-Stop Button           | 1   |         |
|      | SW-39  | V-40 Contact Block, N/C                  | 1   |         |
|      | SW-40  | V-50 Contact Block, N/O                  | 1   |         |
| 6    | 9482-2 | E-Stop Cable, CN5                        | 1   |         |
| 7    | 9599-2 | LCD Power Cable                          | 1   |         |
| 8    | CB-69  | LDC Signal Cable                         | 1   |         |
| 9    | 9461-3 | Handwheel Cable                          | 1   |         |
| 10   | EO-34  | Handwheel Encoder                        | 1   |         |
| 11   | FP-99  | Front Panel Metalwork                    | 1   |         |
| 12   | FP-77  | Front Panel Gasket                       | 1   |         |
|      |        |                                          |     |         |

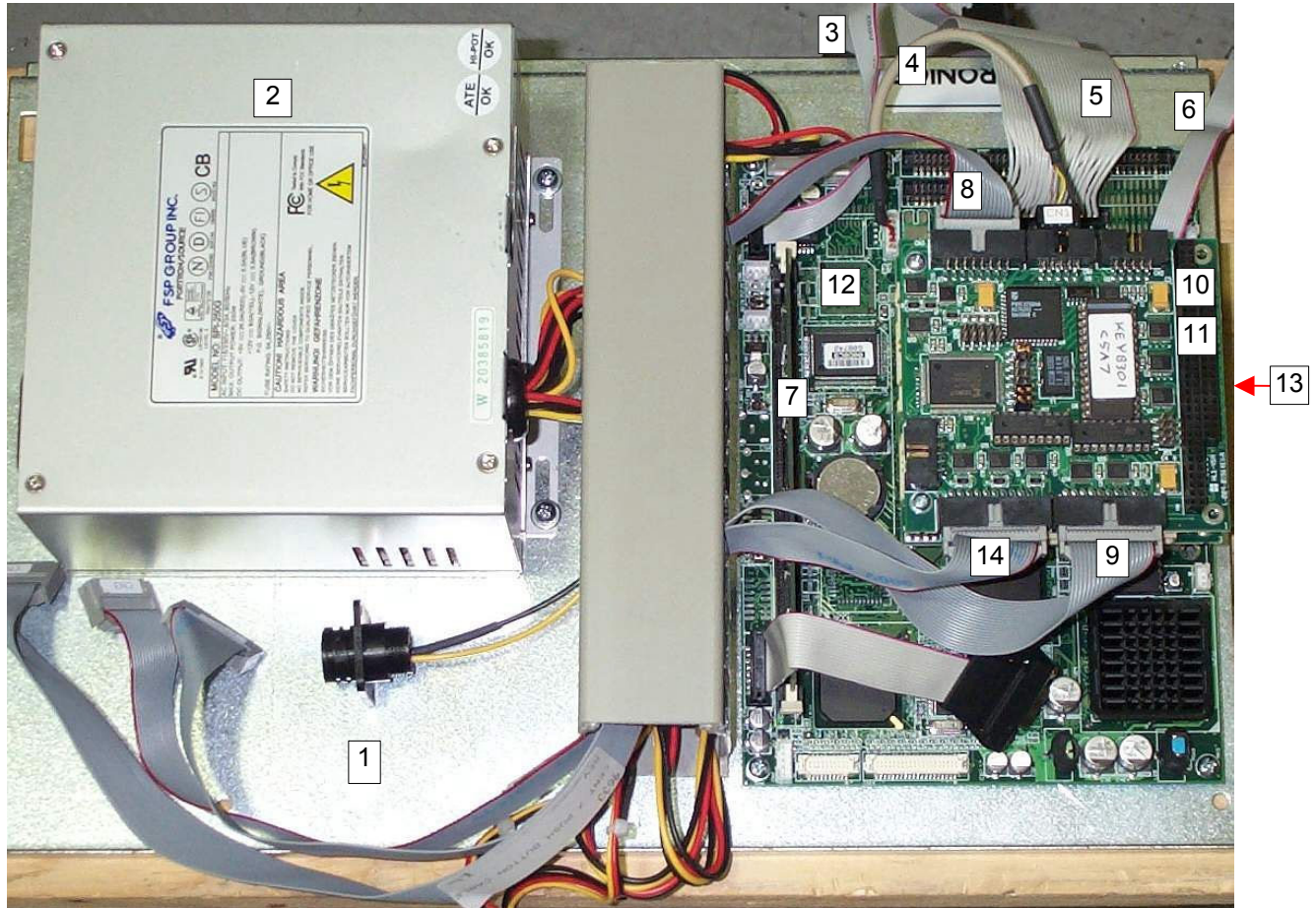
### Centurion 7 Tactile Control Power Supply Panel Assembly



| Item | Part # | Assembly # 5194 Parts List              | Qty | Remarks              |
|------|--------|-----------------------------------------|-----|----------------------|
| 1    | PL-80  | Centurion 7 Sub Panel Metalwork         | 1   |                      |
| 2    | 9706-1 | Centurion 7 Power Supply                | 1   |                      |
| 3    | ---    | Network Adaptor Cable                   | 1   | Supplied with BD-125 |
| 4    | 9192-1 | Centurion 7 Keyboard Cable, CN1         | 1   |                      |
| 5    | ---    | Floppy Drive Data Cable                 | 1   | Supplied with BD-125 |
| 6    | ---    | Com Port Cable                          | 1   | Supplied with BD-125 |
| 7    | ---    | Ram Module                              | 1   | Supplied with BD-125 |
| 8    | 9629   | Matrix In Cable, CN3                    | 1   |                      |
| 9    | 9637   | Lights Cable, CN6                       | 1   |                      |
| 10   | BD-101 | Centurion 7 Keyboard Card               | 1   |                      |
| 11   | BD-100 | Centurion 7 NCB II Motion Control Card  | 1   |                      |
| 12   | BD-125 | Centurion 7 Motherboard                 | 1   | See 3, 5, 6, 7       |
| 13   | IC-192 | 8 MB Disk On Chip, IC-??? ? MB Optional | 1   | Not visible          |



### Centurion 7 Discrete Control Power Supply Panel Assembly



| Item | Part # | Assembly # 5196 Parts List              | Qty | Remarks              |
|------|--------|-----------------------------------------|-----|----------------------|
| 1    | PL-80  | Centurion 7 Sub Panel Metalwork         | 1   |                      |
| 2    | 9706-1 | Centurion 7 Power Supply                | 1   |                      |
| 3    | ---    | Network Adaptor Cable                   | 1   | Supplied with BD-125 |
| 4    | 9192-1 | Centurion 7 Keyboard Cable, CN1         | 1   |                      |
| 5    | ---    | Floppy Drive Data Cable                 | 1   | Supplied with BD-125 |
| 6    | ---    | Com Port Cable                          | 1   | Supplied with BD-125 |
| 7    | ---    | Ram Module                              | 1   | Supplied with BD-125 |
| 8    | 9629   | Matrix In Cable, CN3                    | 1   |                      |
| 9    | 9637   | Lights Cable, CN6                       | 1   |                      |
| 10   | BD-101 | Centurion 7 Keyboard Card               | 1   |                      |
| 11   | BD-100 | Centurion 7 NCB II Motion Control Card  | 1   |                      |
| 12   | BD-125 | Centurion 7 Motherboard                 | 1   | See 3, 5, 6, 7       |
| 13   | IC-192 | 8 MB Disk On Chip, IC-??? ? MB Optional | 1   | Not visible          |
| 14   | 9633   | Push Buttons Cable, CN4                 | 1   |                      |