

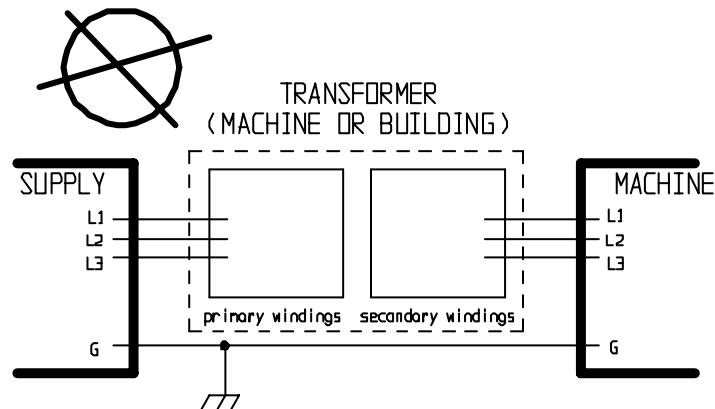
Electrical Manual

SL10

Rev.2
9-05-01

***** 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.

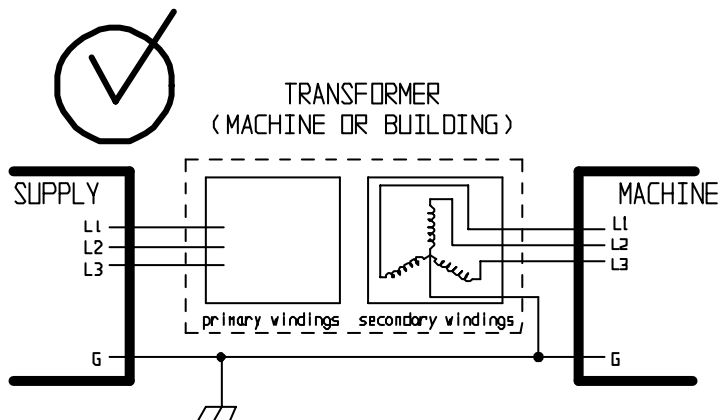
Remove transformer cover and follow transformer ground wire to determine if it is merely a case ground or if it actually goes to a neutral point within the secondary windings.

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.

Table of Contents

Electrical Safety Rules.....	0
Machine Schematic	1
Panel Layout.....	19
Auxiliary Panel	22
MC5 Spindle Drive Parameters.....	23
Yaskawa Axis Drive Parameters for SL10	26
Procedure: Setting up gains for Centurion 6's.....	27
Card Cage Gain Setting Procedure	27
Drive Setting Procedure.....	28
Centurion 6 CNC Connector Signal Listing	29
Connector X-Input.....	29
Connector Y-Input.....	29
Connector Z-input	29
Connector A-Input.....	29
Connector X-Output.....	29
Connector Y-Output.....	30
Connector Z-Output	30
Connector A-Output.....	30
Connectors X, Y, Z, A and B Axis (DC Brush Drives)	30
Connectors X, Y, Z, A and B Axis (Yaskawa Brushless Drives).....	30
Axis Home Connector	30
Spindle Drive Connector	31
Spindle Encoder Connector.....	31
Miscellaneous Connector (Misc).....	31
Front Panel Connector (FPP) and J2 on keyboard encoder card	31
Power Connector	31
Connector Handwheel for remote handwheel option	31
Connector Tool Changer	32
Connector COM1 (Card Cage).....	32
Connector COM2 For rigid tapping option.....	32
Connector Floppy Disk	32
Connector CRT (Video)	32
Connectors in the CNC control box.....	32
Connector CRT (Monitor Power)	32
Connector FPACC	32
Connector P2.....	33
Keyboard DIN Connector (J1)	33
Connectors in the Mag Box	33
Connectors ATC1 and 1-1E.....	33
Connector ATC2	33
Connector on +24 VDC Regulated Power Supply.....	33
Connector COM1 (on Mag Panel)	33
Card Cage Assembly.....	34
LCD Front Panel Assembly	40
LCD Chassis Assembly.....	42

Electrical Safety Rules

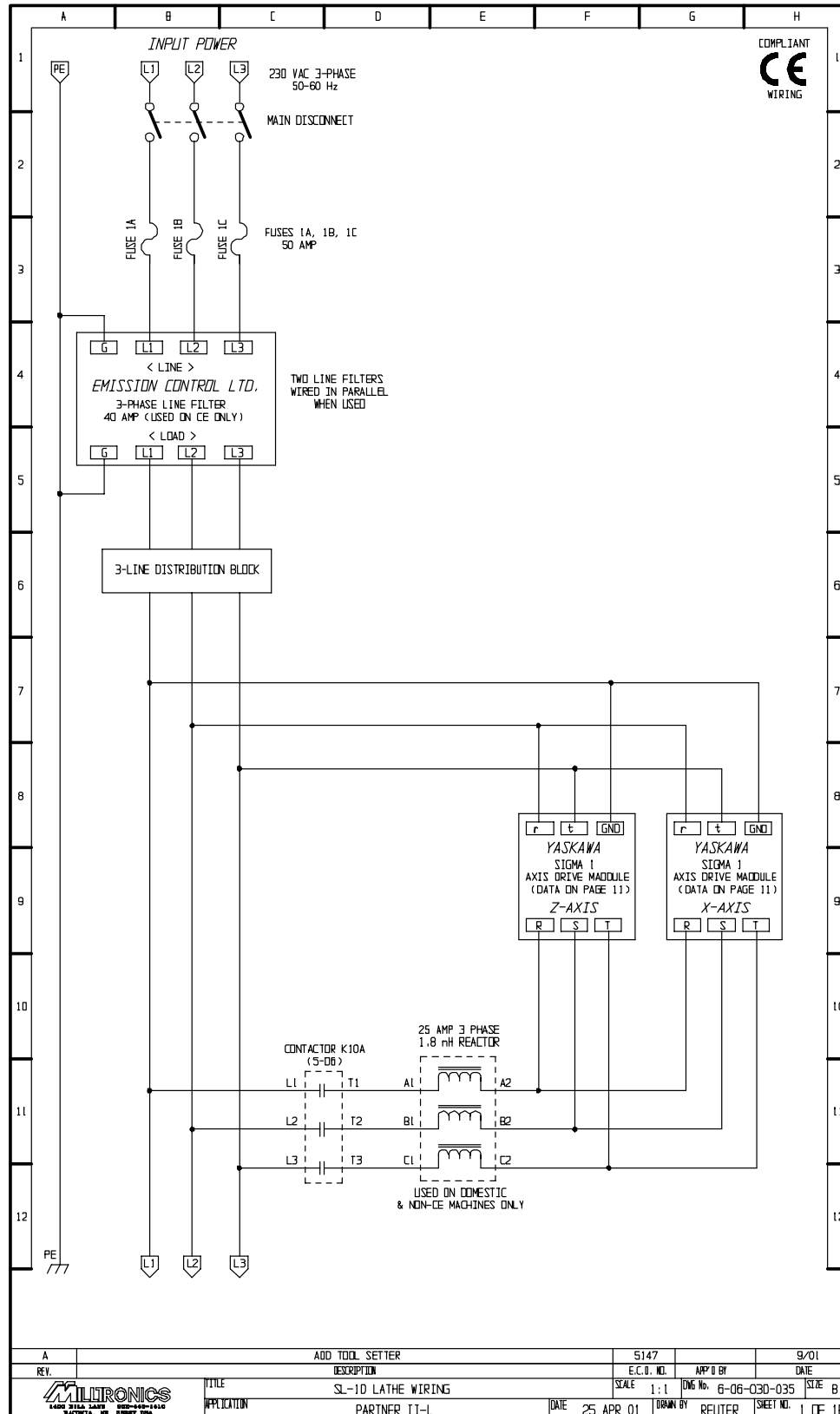
Read and understand the following list of cautions before attempting to perform service on this equipment. **Failure to observe these rules can result in death or serious injury.**

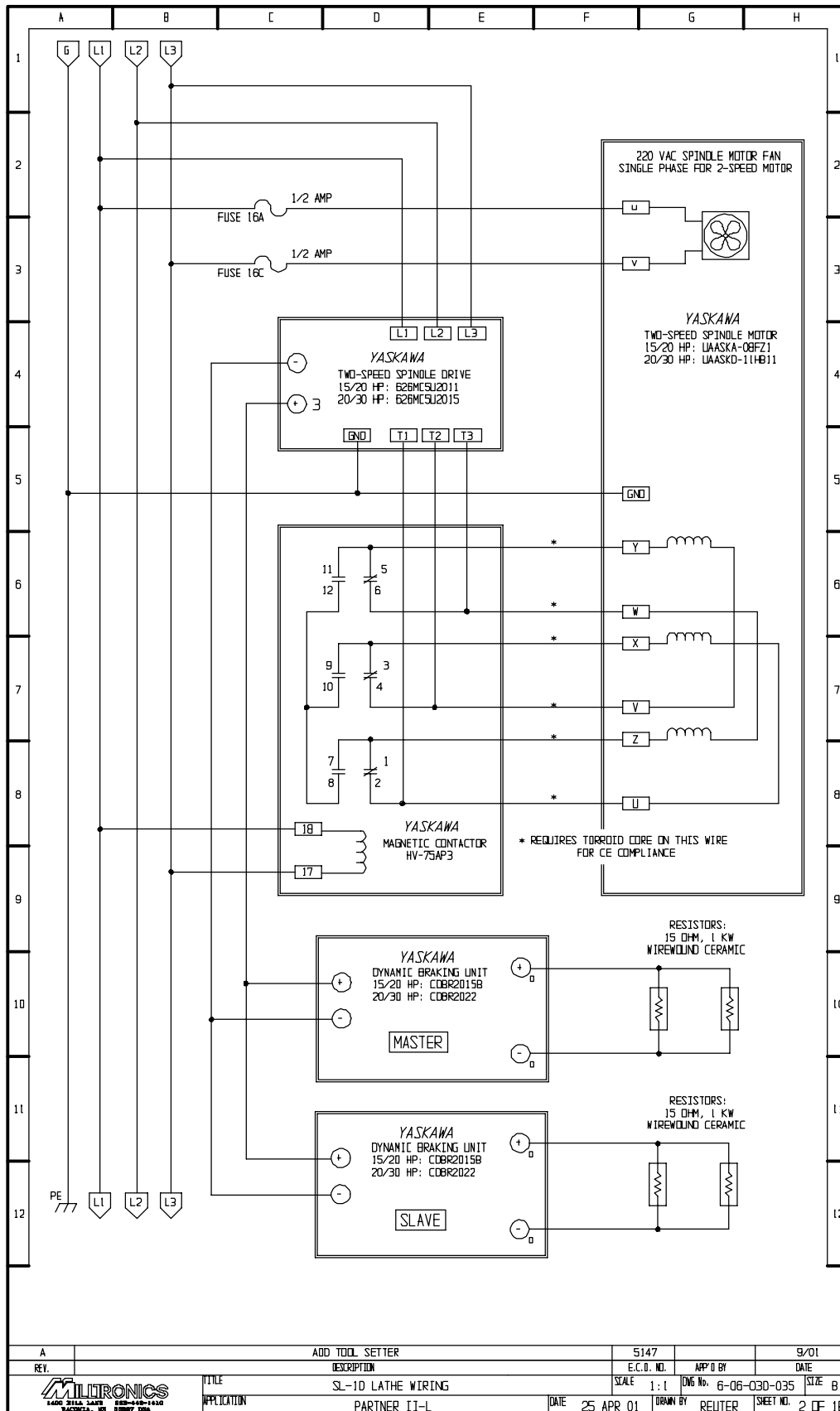
Caution

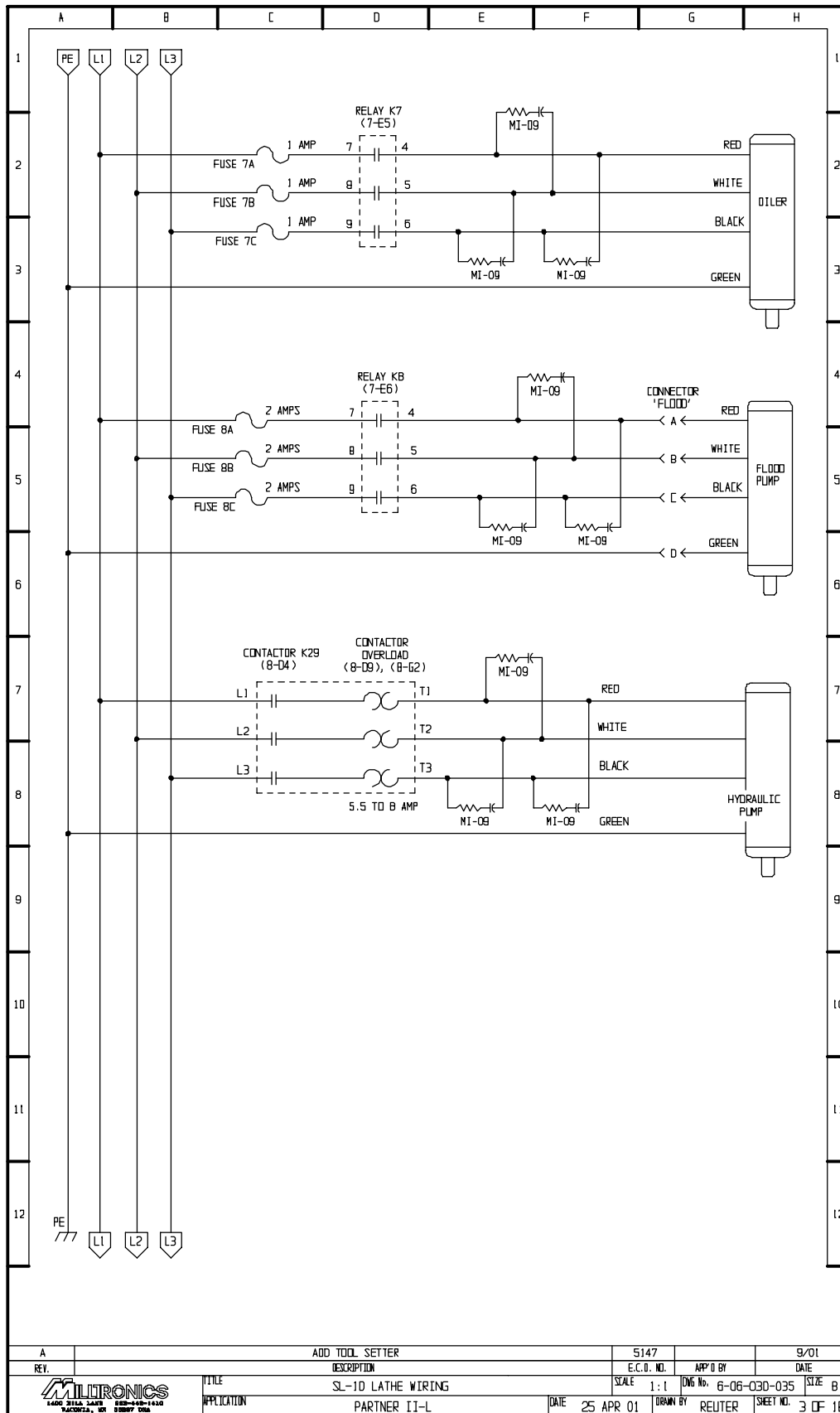
- Beware of High Voltage present within the machine's electrical cabinet
- Do not attempt to service electrical components unless you are qualified to work on them safely
- Only qualified personnel should attempt to make current and voltage readings
- Always turn the main power off before servicing components 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

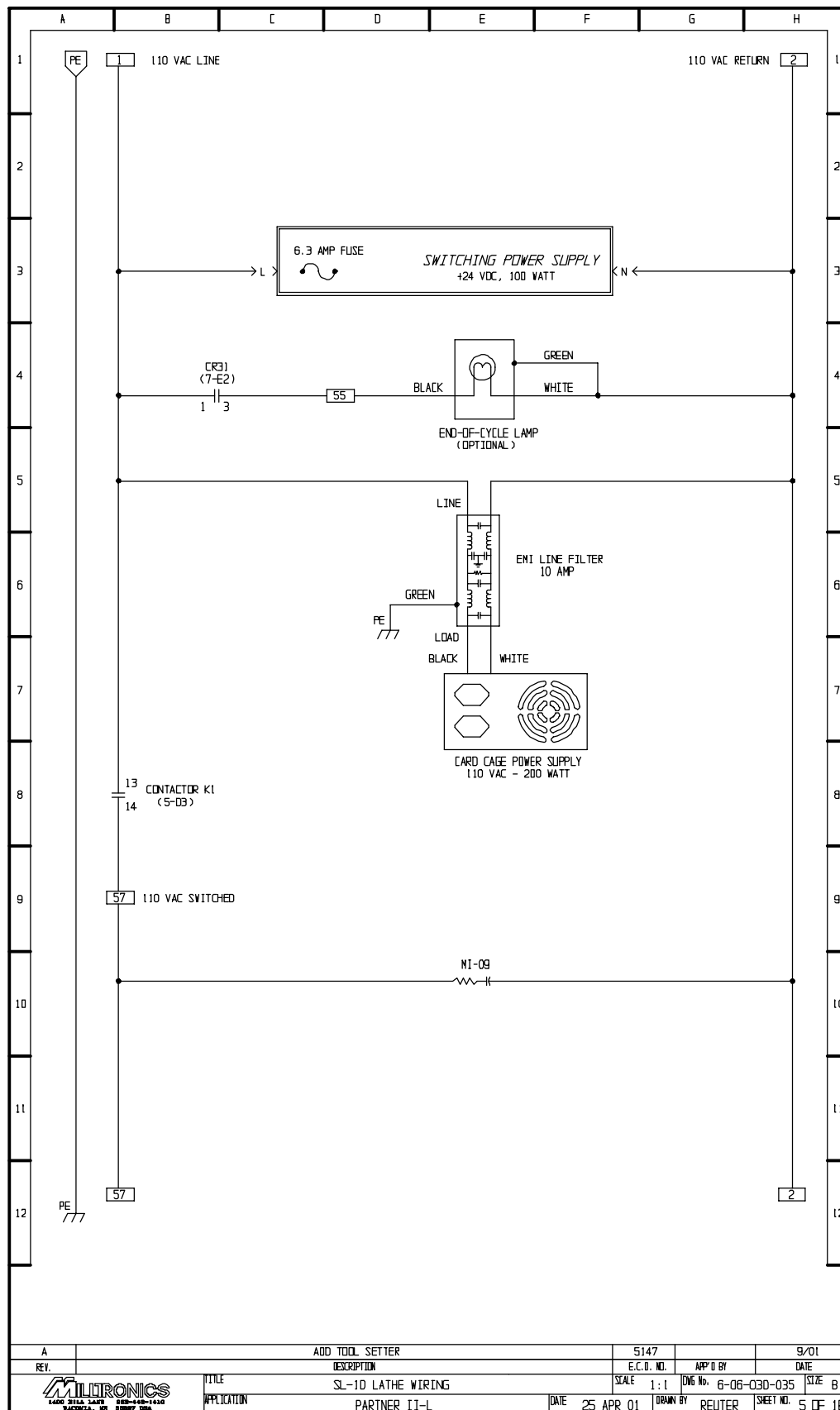
Machine Schematic



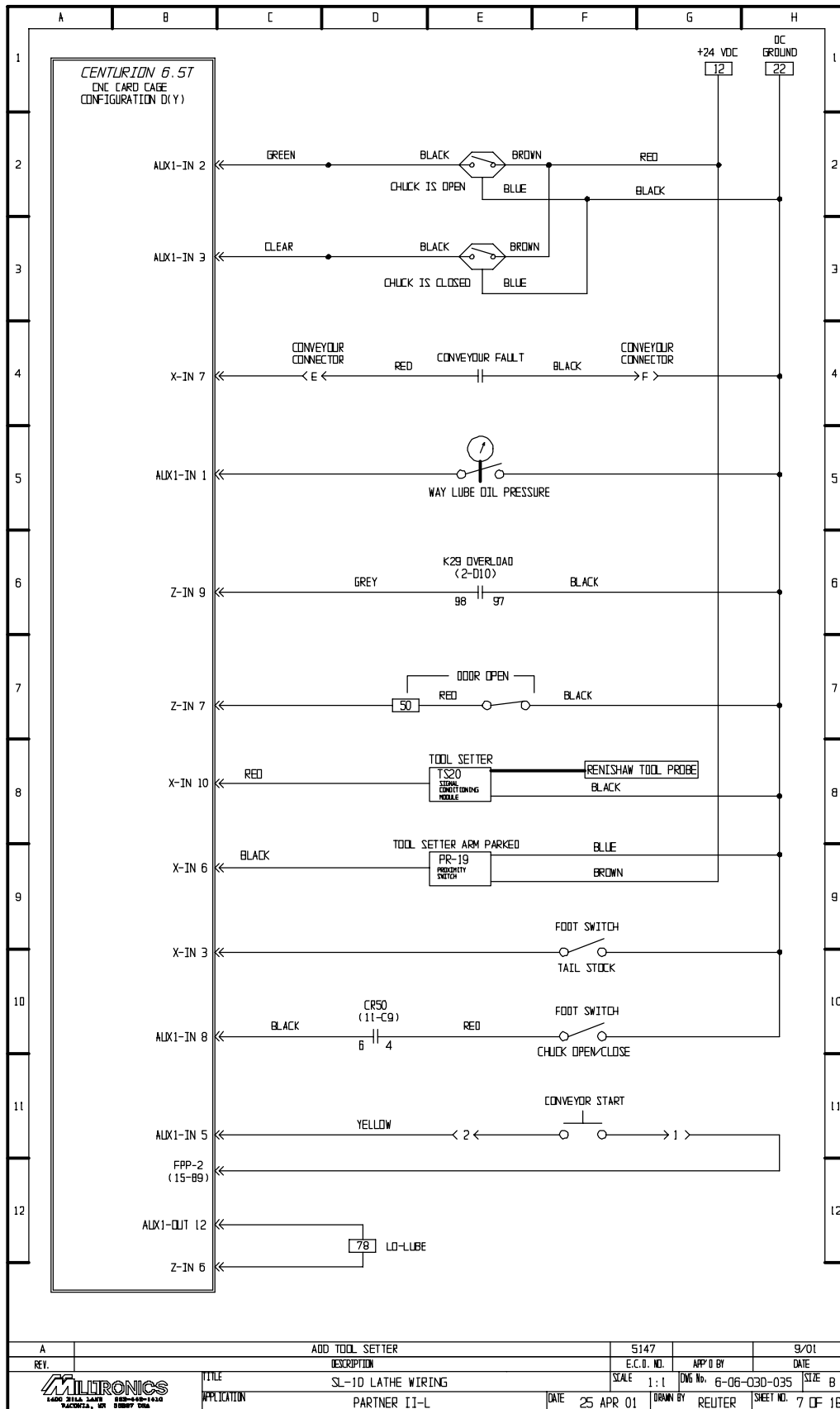


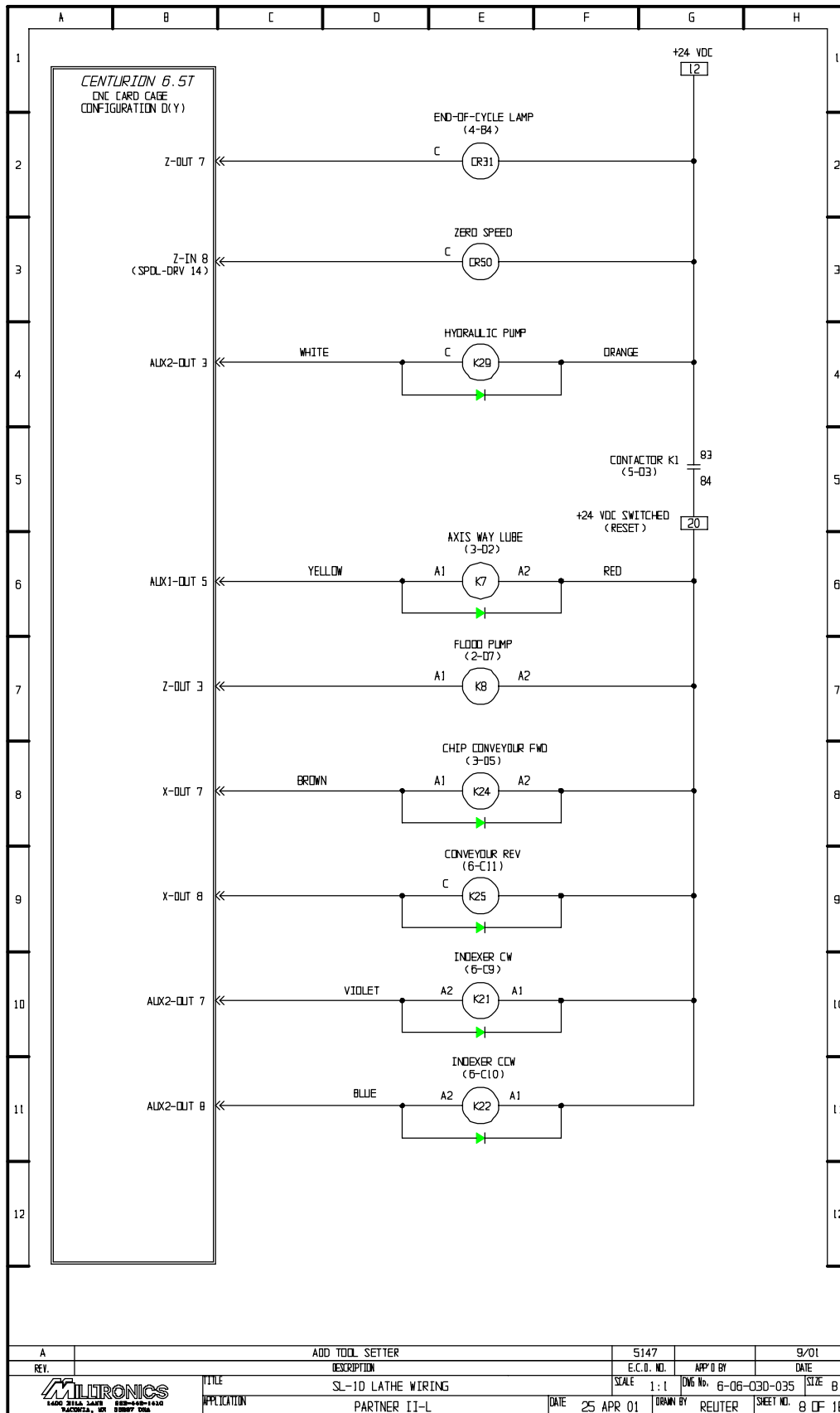


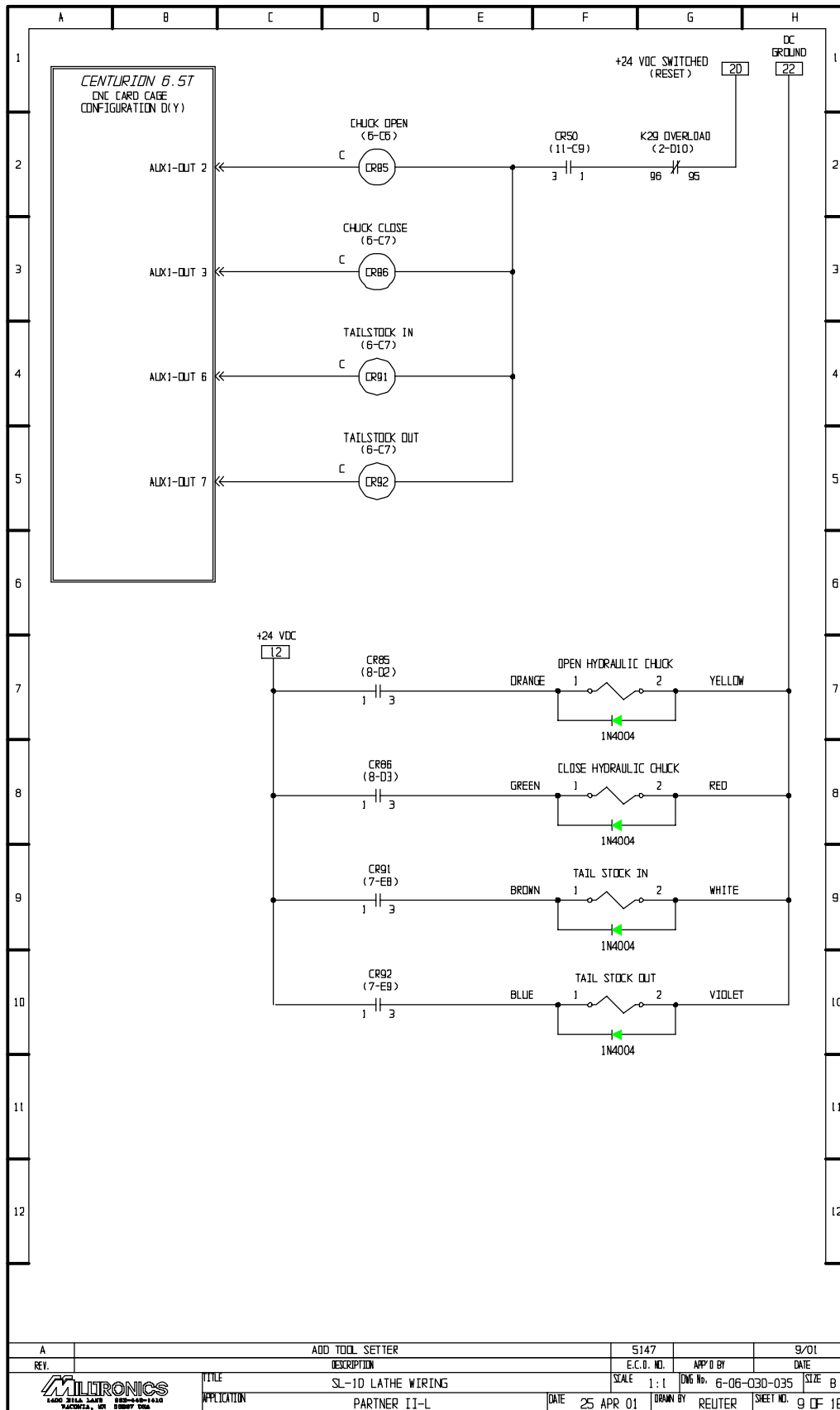


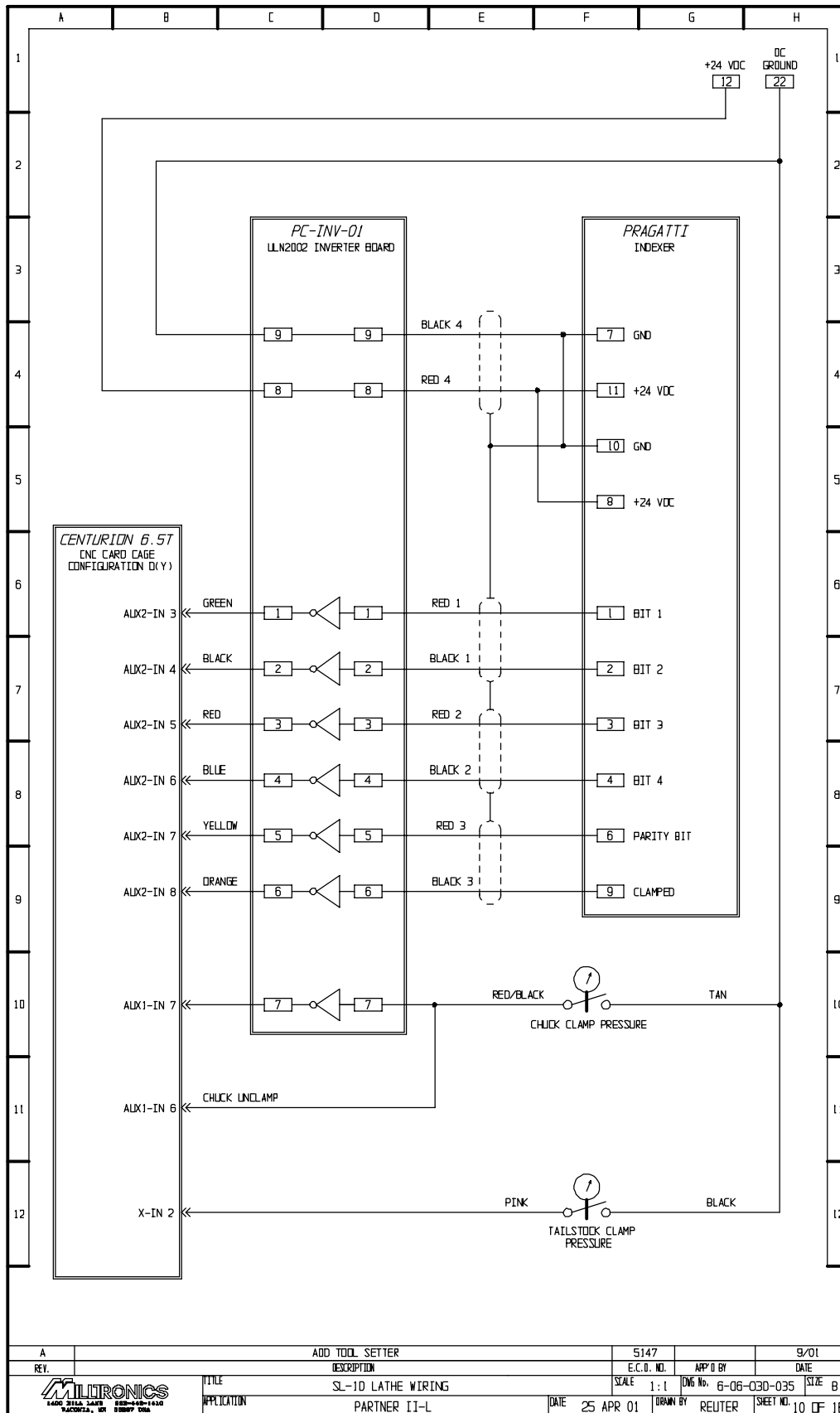


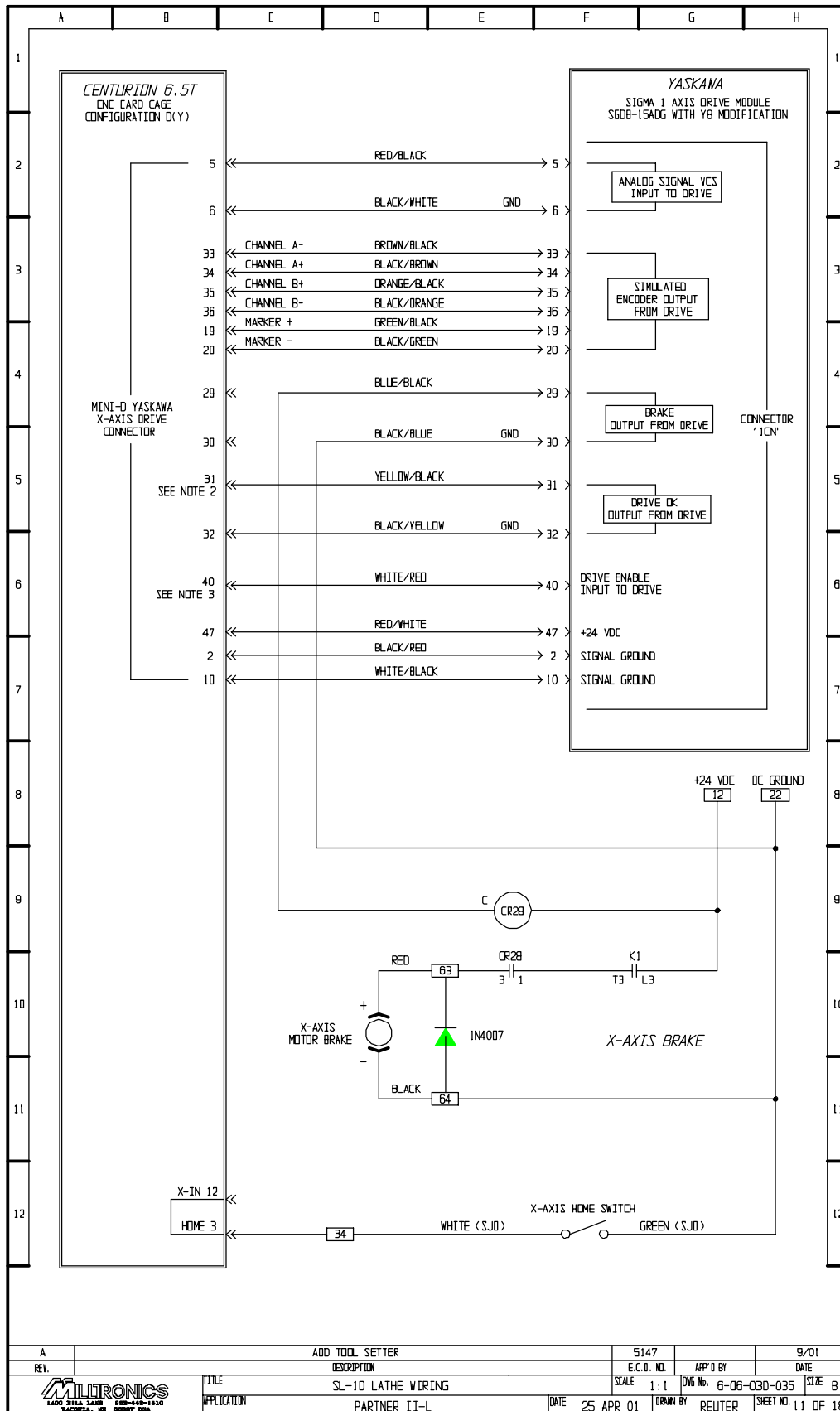


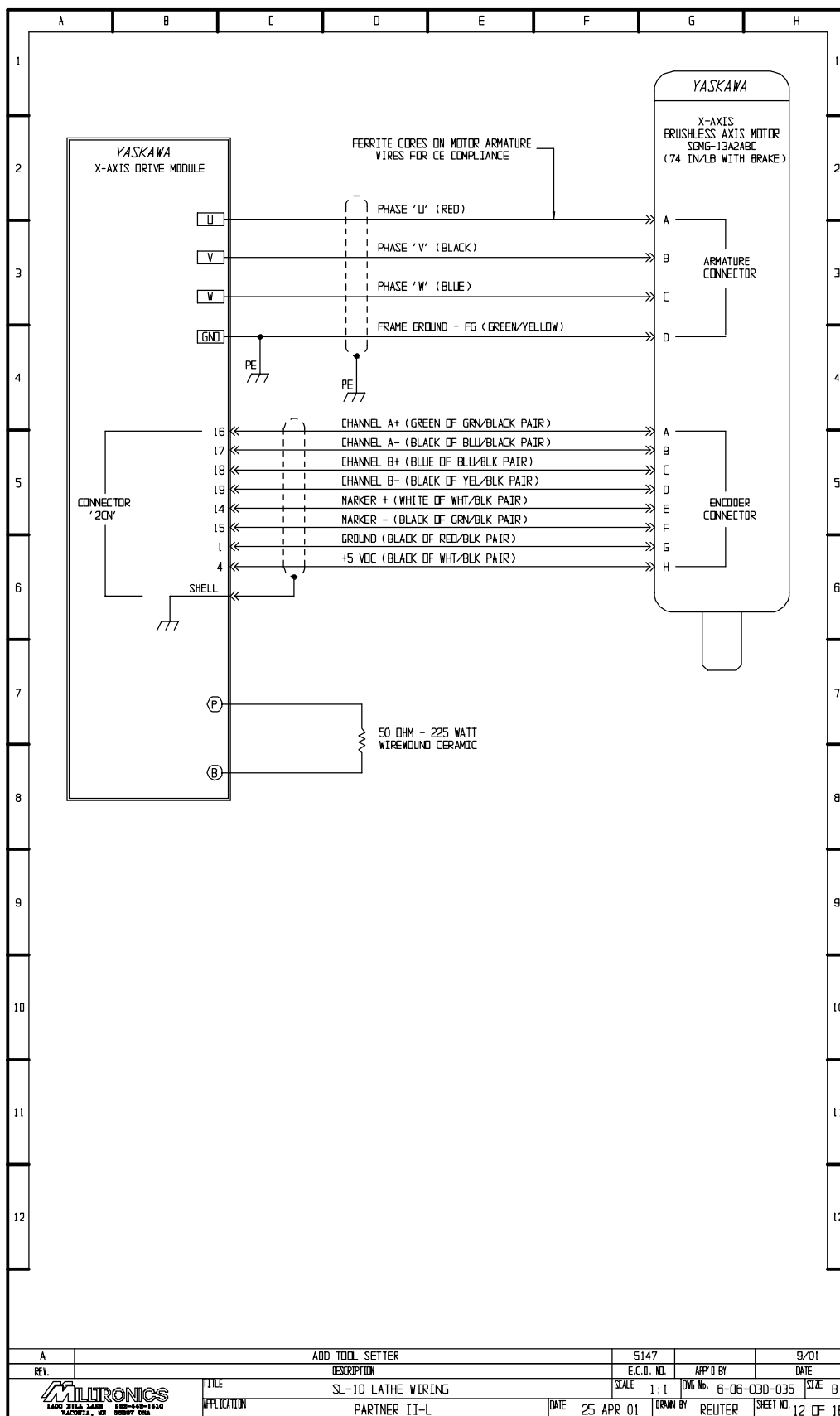


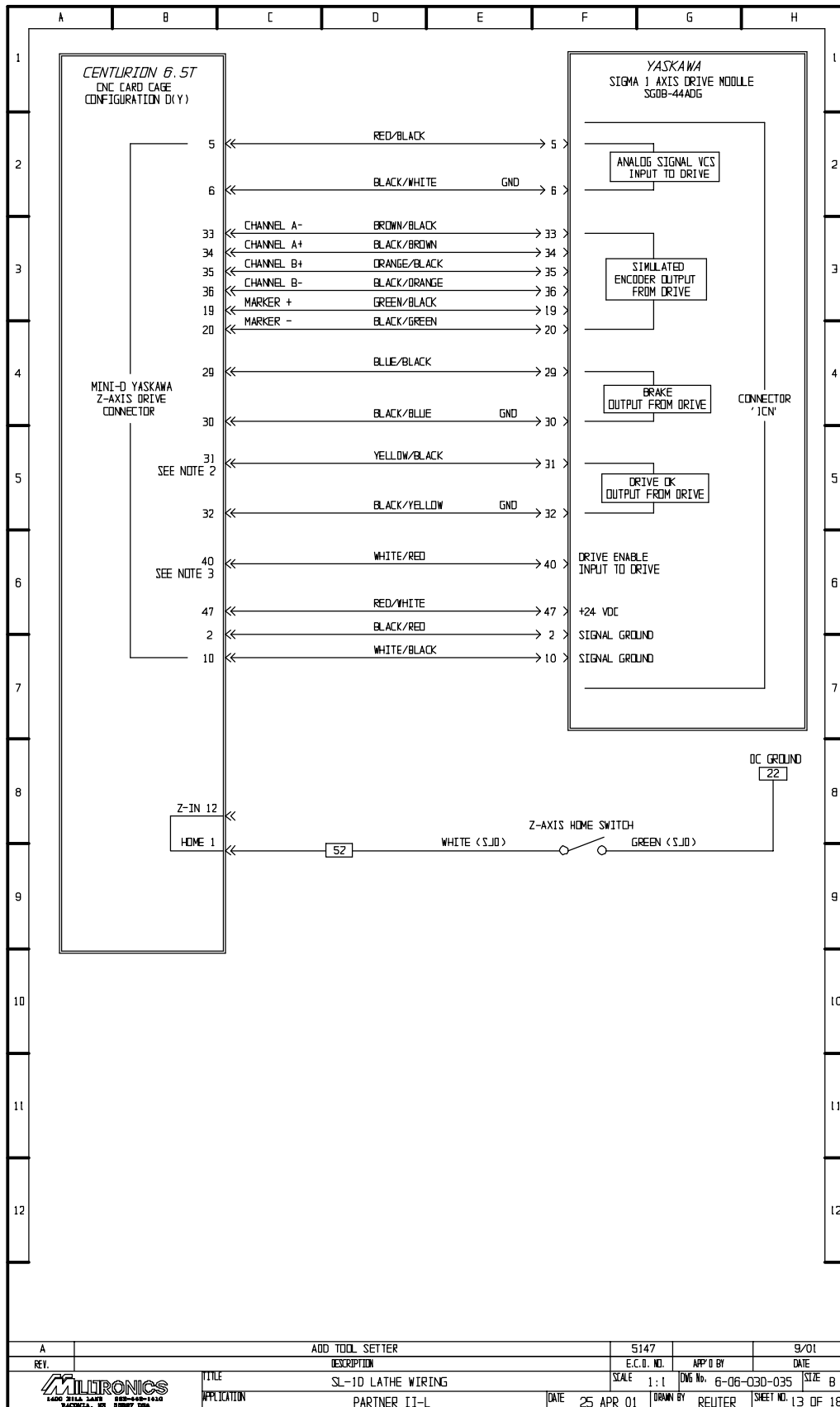


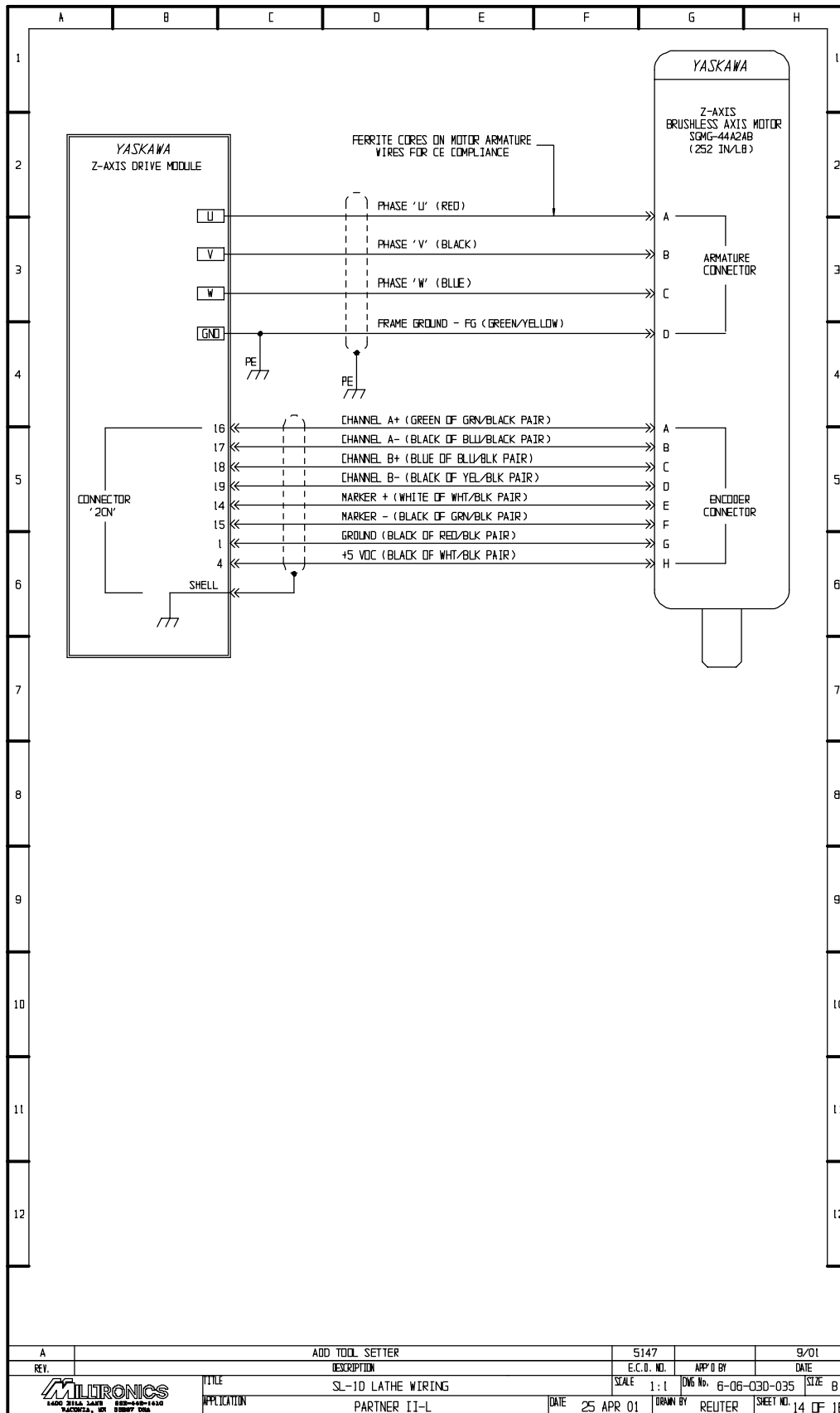


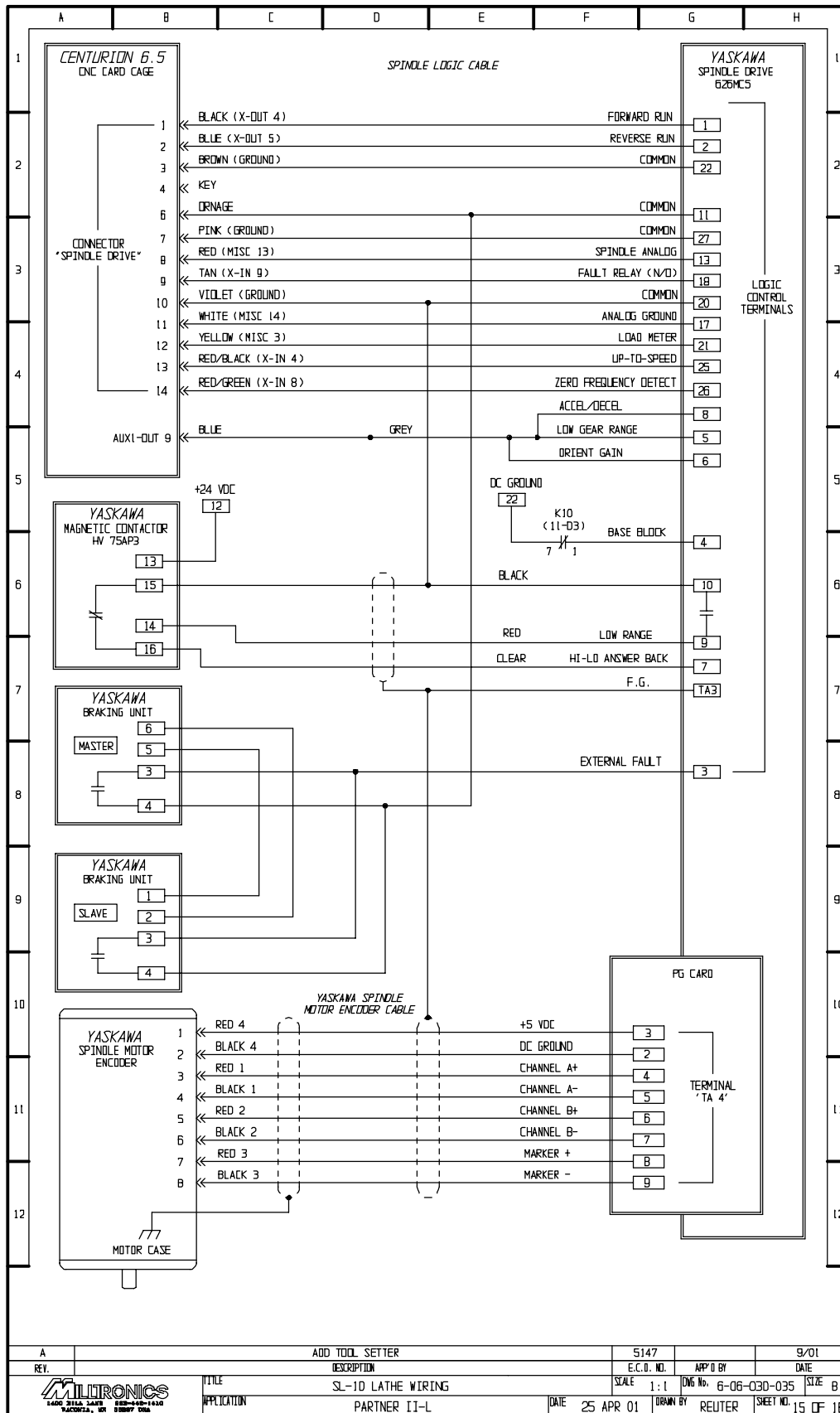


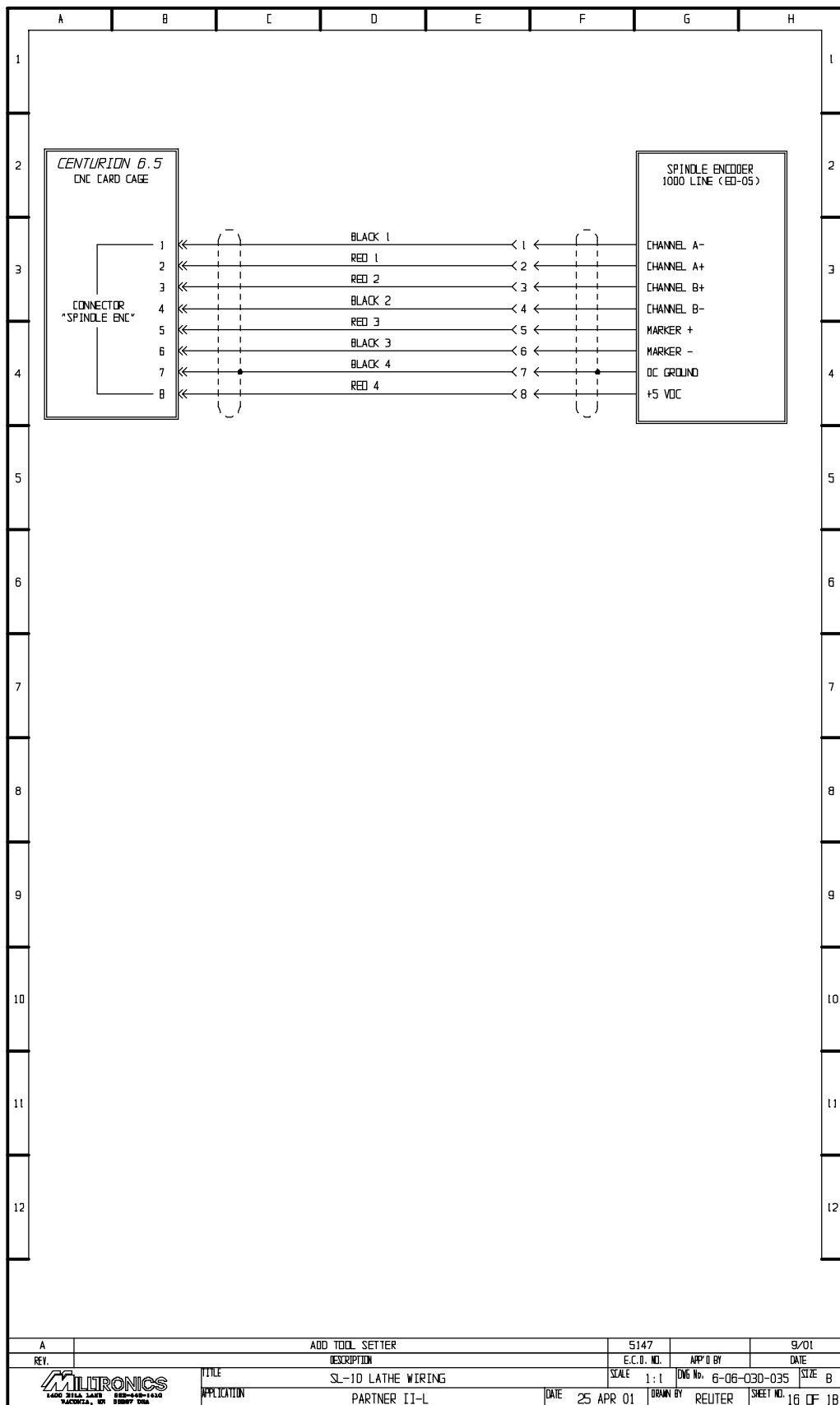


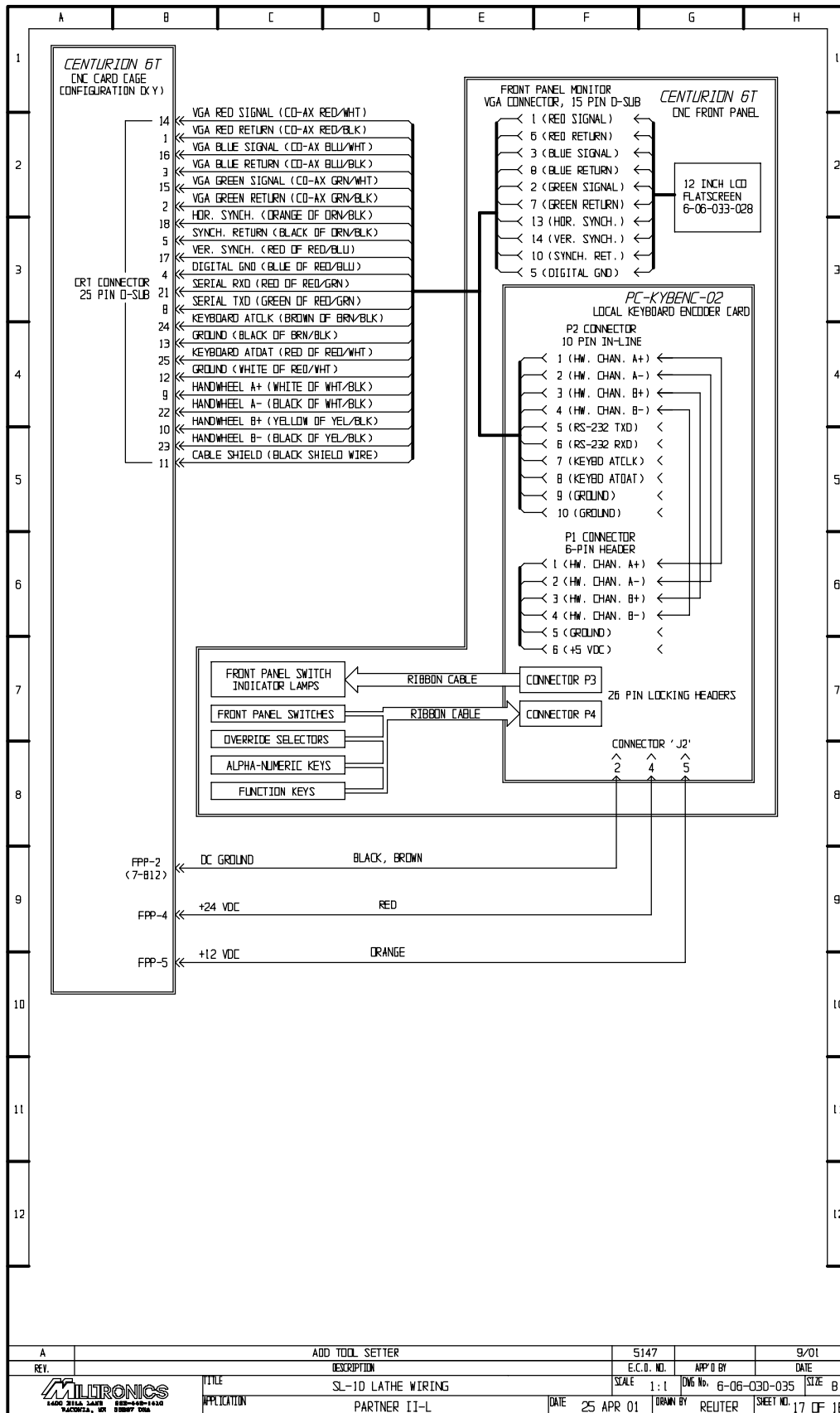


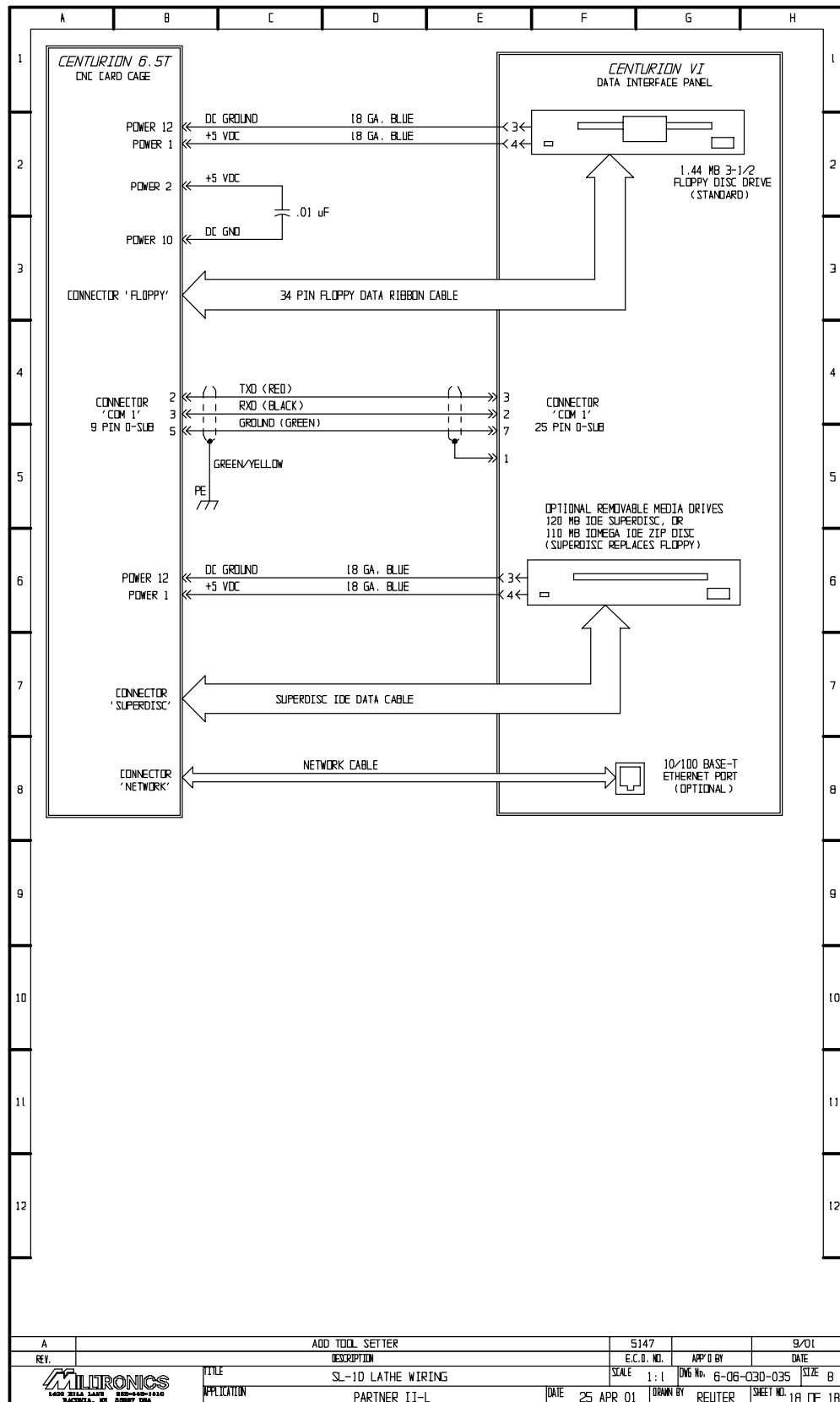




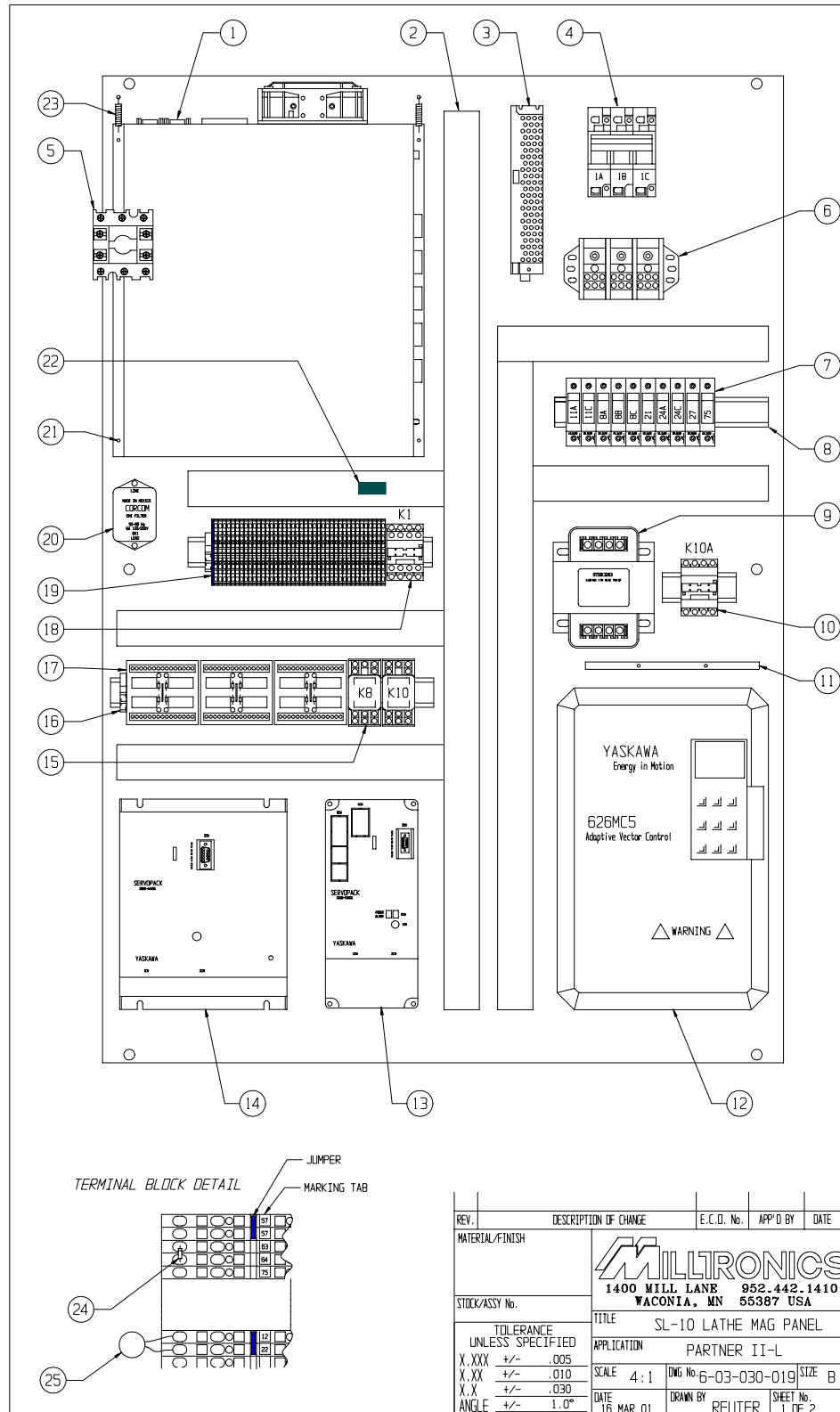








Panel Layout



- PARTS LIST -

ITEM	STOCK No.	DESCRIPTION	QTY	HOW	REMARKS
1	7530	CENTURION 6.5 CNC CARD CAGE	1		SEE ITEMS 25 & 27
2	WC-65	WIRE DUCT, 2 x 2 IN.	72 IN.	B	
	WC-66	WIRE DUCT COVER, 2 IN.	72 IN.		
3	PS-52	SWITCHING POWER SUPPLY, +24 VDC, 100 WATT	1	C	
4	FU-78	FUSE BLOCK, 3 POSN. FNG	1	B	
	FU-	FUSE, 30 AMP, FNG	3		
5	SW-	DISCONNECT SWITCH	1		
6	TB-20	3-LINE DISTRIBUTION BLOCK	1	C	
7	FU-77	FUSE HOLDER, SINGLE FNG	1		
	FU-	FUSE, 1 AMP, FNG	3		
8	WX-167	7.5 x 35 mm DIN RAIL, 3 IN. PIECE	8	B	
9	TR-14	TRANSFORMER, 0.5 VKA, 220-110 V, 50/60 Hz	1	E	
10	RL-68	CONTACTOR RELAY, DC COIL, 5 HP TELEMECANIQUE No. LP101810	1	H	CONTACTOR K10A
	RL-65	CONTACTOR NOISE SUPPRESSOR DIODE TELEMECANIQUE No. LA4DC1U	1	J	
11	BU-04	GROUNDING BUS BAR	1	G	
12	PS-36	AC SPINDLE CONTROLLER, 15/20 HP YASKAWA MCS02011	1	E	
13	AM-43	AXIS DRIVE MODULE YASKAWA No. SG0B-10ADG	1	D	
14	AM-45	AXIS DRIVE MODULE YASKAWA No. SG0B-44ADG	1	D	
15	RL-48	CONTROL RELAY, +24 VDC COIL, 10 AMP, 3PDT	2		RELAYS K8, K10, K21 & K22 K28 FOR SWING-ARM ATC ONLY
	RL-06	RELAY SOCKET BASE	2	H	
16	TB-35	TERMINAL BLOCK END STOP	2	H	
17	9107	QUAD RELAY BOARD	1	H	
	RL-68	CONTACTOR RELAY, DC COIL, 3 HP TELEMECANIQUE No. LP101210	1	H	CONTACTOR K1
18	RL-61	CONTACTOR AUXILIARY, 2-N/O, 2-N/C TELEMECANIQUE No. LA10N22	1	J	
	RL-65	CONTACTOR NOISE SUPPRESSOR DIODE TELEMECANIQUE No. LA4DC1U	1	J	
19	TB-30	TERMINAL BLOCK, 4-POSN., TOP ENTRY	39	H	
	TB-32	TERMINAL BLOCK JUMPER, 10 POSN.	2.8	K	
	TB-33	TERMINAL BLOCK LABEL TAB, SHEET OF 100	.39	K	
	TB-31	TERMINAL BLOCK END PIECE	1	K	
20	MI-10	LINE FILTER, 110 VAC, 10 AMP	1	B	
21	WX-129	RUBBER SHOCK MOUNT, 8-32 UNC M/F	4	M	
22	MI-09	NOISE SUPPRESSOR, 600 VOLT	6	I	INSIDE WIRE TRACK
23	HD-63	CARD CAGE SPRING HANGER	2	N	
24	DI-20	DIODE, 1N4007	1	K	
25	CA-61	CAPACITOR, .1uF CERAMIC DISC	2	K	ALSO ON CARD CAGE

HARDWARE SPECIFICATION

- A - 6-32 x 3/8 RHMS
- B - 8-32 x 5/16 RHMS WITH No. 8 INTERNAL LOCKWASHER
- C - 8-32 x 1/2 RHMS WITH No. 8 INTERNAL LOCKWASHER
- D - 10-32 x 1/2 RHMS WITH No. 10 INTERNAL LOCKWASHER
- E - 1/4-28 x 3/4 HHCS WITH 1/4 LOCKWASHER FROM BOTTOM AND 1/4 LOCKWASHER AND 1/4-28 NUT ON TOP
- F - 1/4-28 x 1 HHCS WITH 1/4 LOCKWASHER FROM BOTTOM AND 1/4 LOCKWASHER AND 1/4-28 NUT ON TOP
- G - HARDWARE INCLUDED WITH PART
- H - DIN RAIL MOUNTED COMPONENT
- I - USE CYANOACRYLATE ADHESIVE, (SUPER GLUE)
- J - ATTACHES TO CONTACTOR
- K - ATTACHES TO TERMINAL BLOCK
- L - 8-32 x 3/4 SHCS AND No. 8 INTERNAL LOCKWASHER FROM BOTTOM AND No. 8 INTERNAL LOCKWASHER & NUT ON TOP
- M - No. 8 INTERNAL LOCKWASHER AND 8-32 NUT ON BOTTOM
- N - 10-32 x 5/8 SHCS WITH No. 10 INTERNAL LOCKWASHER FROM BOTTOM AND TWO 10-32 NUTS WITH THREE No. 10 INTERNAL LOCKWASHERS ON TOP.

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SL-10 LATHE MAG PANEL		
X.XXX +/-		APPLICATION PARTNER II-L		
X.XX +/-		SCALE 1:1		
X.X +/-		DATE 16 MAR 01		
ANGLE +/-		DRAWN BY REUTER		
		SHEET NO. 2 OF 3		

- TERMINAL BLOCK DIRECTORY -

TERMINAL BLOCKS LISTED LEFT TO RIGHT

1 (x3 JUMPED) 110 VAC LINE
 2 (x4 JUMPED) 110 VAC RETURN
 55 END OF CYCLE LAMP
 57 (x2 JUMPED) 110 VAC SWITCHED
 75 CHIP PAN WORKLAMPS
 77 AXIS WAYS OILER
 <DIVIDER>
 12 x4 JUMPED) +24 VDC
 20 (x2 JUMPED) +24 VDC SWITCHED - RESET
 22 (x5 JUMPED) DC GROUND
 <DIVIDER>
 6B
 6C
 6A
 6 FAULT CIRCUIT, SPINDLE FAULT/X-AXIS OTL
 7 FAULT CIRCUIT, X-AXIS OTL/Y-AXIS OTL
 8 FAULT CIRCUIT, Y-AXIS OTL/Z-AXIS OTL
 9 FAULT CIRCUIT, Z-AXIS OTL
 13 SPARE M-FUNCTION, COMMON
 14 SPARE M-FUNCTION, N/C
 15 SPARE M-FUNCTION, N/O
 25
 34
 49
 50
 52
 63 Z-AXIS BRAKE +
 64 Z-AXIS BRAKE -
 78 AXIS LUBE FAULT
 83 SETUP BUTTON
 91 (x2 JUMPED) WATCHDOG-SWITCHED +24 VDC

- RELAY & CONTACTOR DIRECTORY -

CONTACTORS

K1 MACHINE RESET
 K10A AXIS DRIVES ENABLE

CONTROL RELAYS

K8 FLOOD PUMP
 K10 SPINDLE BASE BLOCK
 K21 TOOL CAROUSEL CW
 K22 TOOL CAROUSEL CCW
 K28 ARM SEQUENCE (SWING-ARM ATC ONLY)

CRB RELAYS

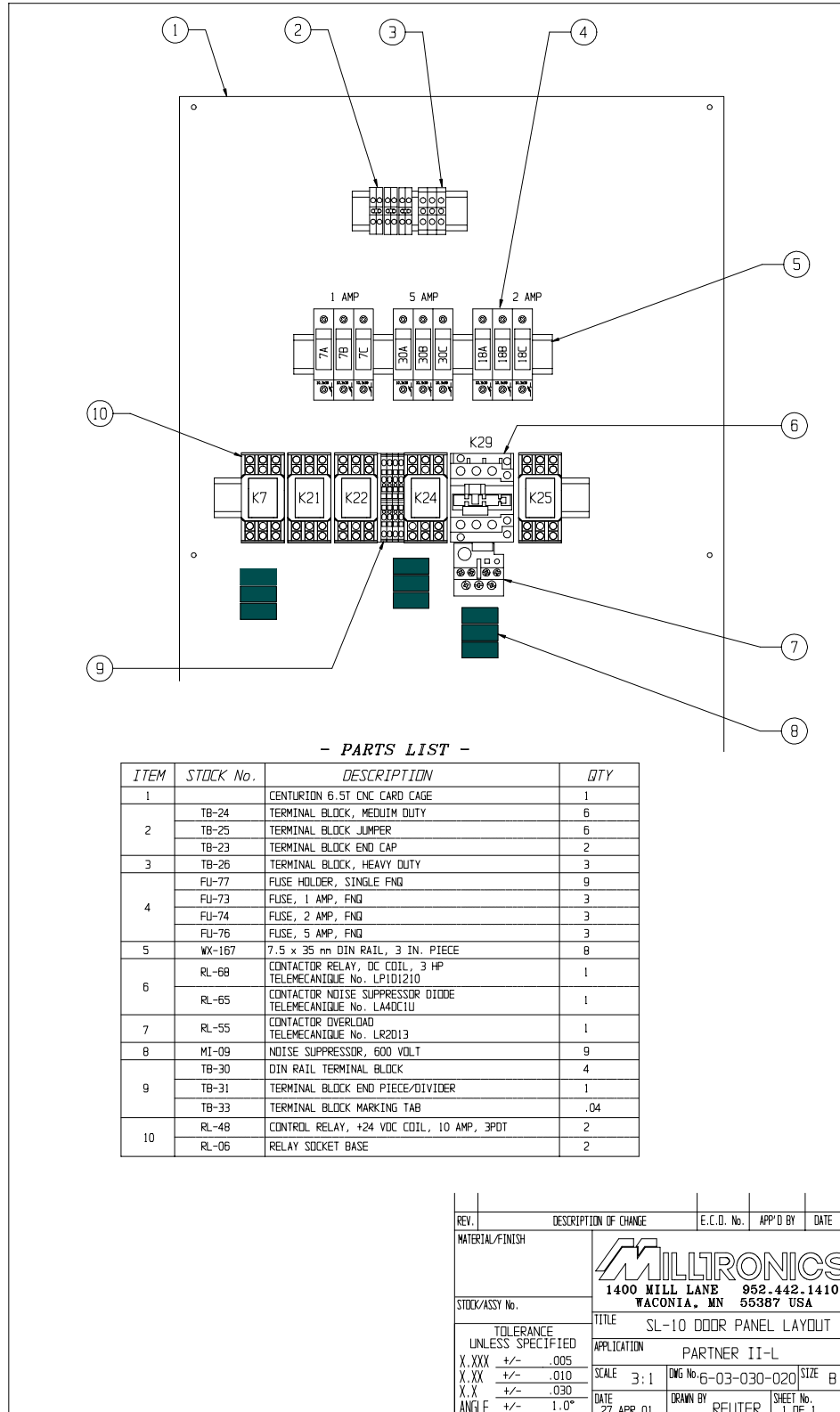
CR12 SPARE M-FUNCTION
 CR28 DELAYED RESET
 CR29 WATCHDOG
 CR31 END-OF-CYCLE LAMP

- FUSE DIRECTORY -

FUSE 1A - MAIN DISCONNECT SWITCH L1 (50 AMP)
 FUSE 1B - MAIN DISCONNECT SWITCH L2 (50 AMP)
 FUSE 1C - MAIN DISCONNECT SWITCH L3 (50 AMP)
 FUSE BA - FLOOD PUMP, L1 (2 AMP)
 FUSE BB - FLOOD PUMP, L2 (2 AMP)
 FUSE BC - FLOOD PUMP, L3 (2 AMP)
 FUSE 11A - TRANSFORMER PRIMARY, L1 (3 AMP)
 FUSE 11C - TRANSFORMER PRIMARY, L3 (3 AMP)
 FUSE 12 - TRANSFORMER SECONDARY (5 AMP)
 FUSE 16A - SPINDLE MOTOR FAN L1 (1/2 AMP)
 FUSE 16C - SPINDLE MOTOR FAN L3 (1/2 AMP)
 FUSE 27 - 110 VAC AXIS WAYS OILER (2 AMP)
 FUSE 75 - CHIP PAN WORK LAMPS (1 AMP)

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE SL-10 LATHE MAG PANEL		
X .XXX +/-		APPLICATION PARTNER II-L		
X .XX +/-		SCALE 1:1		
X .X +/-		DWG No. 6-03-030-019		
ANGLE +/-		SHEET NO. 3 OF 3		
		DATE 16 MAR 01		
		DRAWN BY REUTER		

Auxiliary Panel



MC5 Spindle Drive Parameters

for
SL10
4-30-01

		S/N 6829	MC5 2011	MC5 2015	
Parameter	Name	30/22 HP	20/15HP	30/22 HP	Unit
			19 KVA	24 KVA	
INITIALIZE CONSTANTS		Belted Head	Belted Head	Belted Head	
A1-01	Access Level	4			
A1-02	Control Method	3			
PROGRAM CONSTANTS					
B1-01	Reference Selection	1			
B1-07	LOC/REM RUN Sel	0			
B1-02	Operation Method	.5			
B2-03	D/C Injection Braking	.25			
AUTO TUNING CONSTANTS					
C1-01*	Accel Time 1	1.1			sec
C1-02*	Decel Time 1	1.5			sec
C1-03*	Accel Time 2	.2			sec
C1-04*	Decel Time 2	.5			sec
C1-07*	Accel Time 4	.3			sec
C1-08*	Decel Time 4	.7			sec
C1-11	Acc/Dec SW Freq	130.			Hz
C2-01	SCrv Acc @ Start	0			
C2-02	SCrv Acc @ End	0			
C2-03	SCrv Dec @ Start	.1			
C2-04	SCrv Dec @ End	0			
C5-01*	ASR P Gain	100			
C5-02*	ASR I Gain	.3			
C5-03*	ASR P Gain 2	10			
C5-04*	ASR I Time 2	.35			sec
C5-06	ASR Delay Time	.004			
C6-01	Carrier Freq Max	4.0			KHz
C8-02	Special				
C8-03	Special				
C8-04	Special				%
C8-06	Special				Ms
C8-07	Special				%
C8-27	Inverse rate current				A
C8-28	DCCT Gain				
D1-09	Jog Reference	1.00			Hz
MOTOR CONSTANTS					
E1-02	Motor Selection	1			
E1-04*	Max Frequency	197.1			Hz
E1-05	Max Voltage	122.4			V
E1-06	Base Frequency	40			Hz
E1-13	Base Voltage	118.7			V
E2-01	Motor Rated FLA	87.5			A
E2-02	Motor Rated Slip	.56			Hz
E2-03	No-load Current	32.4			A
E2-04	Number of Poles	4			

		S/N 6829	MC5 2011	MC5 2015	
Parameter	Name	30/22 HP	20/15HP	30/22 HP	Unit
E2-05	Term Resistance	.156			Ohm
E2-06	Leak Inductance	9.4			%
E2-07	Saturation Comp1	.4			
E2-08	Saturation Comp2	0.69			
E3-01	Control Method	3			
E4-01	Max Frequency 2	50.0			Hz
E4-02	Max Voltage 2	115.3			VAC
E4-03	Base Frequency 2	20			Hz
E5-01	Motor Rated FLA2	81.5			A
E5-02	Mot Rated Slip2	.86			Hz
E5-03	No-load Current 2	23.5			A
E5-05	Term Resistance2	.29			Ohm
E5-06	Leak Inductance2	14.2			%
OPTION CONSTANTS					
F1-01	FG Constant	1024			
F1-02	PG Fdbk Loss Sel	1			
F1-03	PG Overspeed Sel	1			
F1-04	PG Deviation Sel	3			
F1-05	PG Rotation Sel	1			
F1-06	PG Output Ratio	1			
F1-08	PG Overspd Level	115%			
F1-11	PG Deviate Time	.5			
F1-14	PGO Time	2			
F4-03	A0 Ch2 Select	5			
INPUTS					
H1-01	Terminal 3 Sel	24			
H1-02	Terminal 4 Sel	8			
H1-03	Terminal 5 Sel	80			
H1-04	Terminal 6 Sel	77			
H1-05	Terminal 7 Sel	82			
H1-06	Terminal 8 Sel	7			
OUTPUTS					
H2-01	Terminal 9 and10 Sel	1C			
H2-02	Terminal 25 Sel	13			
H2-03	Terminal 26 Sel	1			
H3-01	Terminal 13 Sel	0			
H3-02	Terminal 13 Sel	100%			
H3-05	Terminal 16 Sel	0			
H4-01	Terminal 21 Sel	3			
RS 232					
H5-01	Serial Comm Adr	1F			
H5-02	Serial Comm Sel	3			
H5-03	Serial Corn Sel	0			
H5-04	Serial Fault Sel	3			
H5-05	Serial Flt Dtct	1			
L1-01	Motor Protect OFF	1			
L3-04	Stall P Decel Sel	0			
L8-05	Ph Loss In Sel	0			
L8-07	Ph Loss Out Sel	0			
WINDING CHANGE					

		S/N 6829	MC5 2011	MC5 2015	
Parameter	Name	30/22 HP	20/15HP	30/22 HP	Unit
CONSTANTS					
P1-02	Frequency Width	6.0			Hz
P1-03	Ansback Det Time	0.50			Sec
P1-04	Wye Winding Sel	1			
P1-05	CASE Param 5				
ELECTRONIC ORIENT CONSTANTS					
P3-01**	Orient Position				
P3-02	Position Gain H				
P3-05	Ore Set Pulse				
P3-06	Ore Reset Pulse				
P3-07*	Orient Speed				
P3-08	Gear Ratio				
P3-11	Gear Direction				
P3-12	Dither Level				

***Parameters will vary depending on RPM option of machine**

**** Orient Position will vary on every machine.**

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 from Yaskawa.

Consult Milltronics Manufacturing for current parameters.

Yaskawa Axis Drive Parameters for SL10**X-Axis**

Cn-01=008CH
Cn-02=0001H
Cn-03=00160
Cn-04=00080
Cn-05=00600
Cn-06=00800
Cn-07=00000
Cn-08=00800
Cn-09=00800
Cn-0A=03150
Cn-0B=00020
Cn-0C=00800
Cn-0D=00000
Cn-0E=00000
Cn-0F=00000
Cn-10=00100
Cn-11=08192
Cn-12=00050
Cn-13=00034
Cn-14=10000
Cn-15=03000
Cn-16=00010
Cn-17=00010
Cn-18=00100
Cn-19=00100
Cn-1A=00028
Cn-1B=00007
Cn-1C=00000
Cn-1D=00000
Cn-1E=01024
Cn-1F=00100
Cn-20=00200
Cn-21=00300
Cn-22=00006
Cn-23=00000
Cn-24=00004
Cn-25=00001
Cn-26=00000
Cn-27=00000
Cn-28=00000
Cn-29=00002
Cn-2A=00144
Cn-2B=00000
Cn-2C=52500
Cn-2D=00410

Z-Axis

Cn-01=008CH
Cn-02=0000H
Cn-03=00160
Cn-04=00060
Cn-05=00500
Cn-06=00800
Cn-07=00000
Cn-08=00800
Cn-09=00800
Cn-0A=03150
Cn-0B=00020
Cn-0C=00200
Cn-0D=00000
Cn-0E=00000
Cn-0F=00000
Cn-10=00110
Cn-11=08192
Cn-12=00050
Cn-13=00030
Cn-14=10000
Cn-15=03000
Cn-16=00010
Cn-17=00010
Cn-18=00100
Cn-19=00100
Cn-1A=00040
Cn-1B=00007
Cn-1C=00000
Cn-1D=00000
Cn-1E=01024
Cn-1F=00120
Cn-20=00120
Cn-21=00120
Cn-22=00010
Cn-23=00000
Cn-24=00004
Cn-25=00001
Cn-26=00000
Cn-27=00000
Cn-28=00000
Cn-29=00010
Cn-2A=00147
Cn-2B=00000
Cn-2C=52500
Cn-2D=00410

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

6-SLOT ISA PASSIVE BACKPLANE
STOCK No. B0-109

UPPER CARD MOUNTING BRACKET
STOCK No. M-66

6-32 x 1/4 PHMS (2 EACH)

CARD CAGE POWER SUPPLY
110 VAC/200 WATT
STOCK No. PS-23
POWER SUPPLY MUST BE MODIFIED
PRIOR TO INSTALLATION

SBC CNC CARD CAGE, CENTURION VI
STOCK No. M-65

INTERFACE PANEL, STANDARD VERSION
INSTALL FOR DC BRUSH TYPE AXIS DRIVES

INTERFACE PANEL, YASKAWA VERSION
INSTALL FOR AC BRUSHLESS TYPE AXIS DRIVES

6-32 x 1/4 PHMS

6-32 x 1-3/4 PHMS

NO. 6 FLAT WASHER

NO. 6 INTERNAL LOCKWASHER

COOLING FAN, 110 VAC
STOCK No. FA-01
WITH MATCHING FAN GRILLE
STOCK No. FA-04

FAN MOUNTING HARDWARE
4 SETS

INTERFACE PANEL MOUNTING
HARDWARE - 4 SETS

POWER SUPPLY MOUNTING
HARDWARE - 4 SETS

USE ORIGINAL SCREW FROM POWER SUPPLY

BACKPLANE

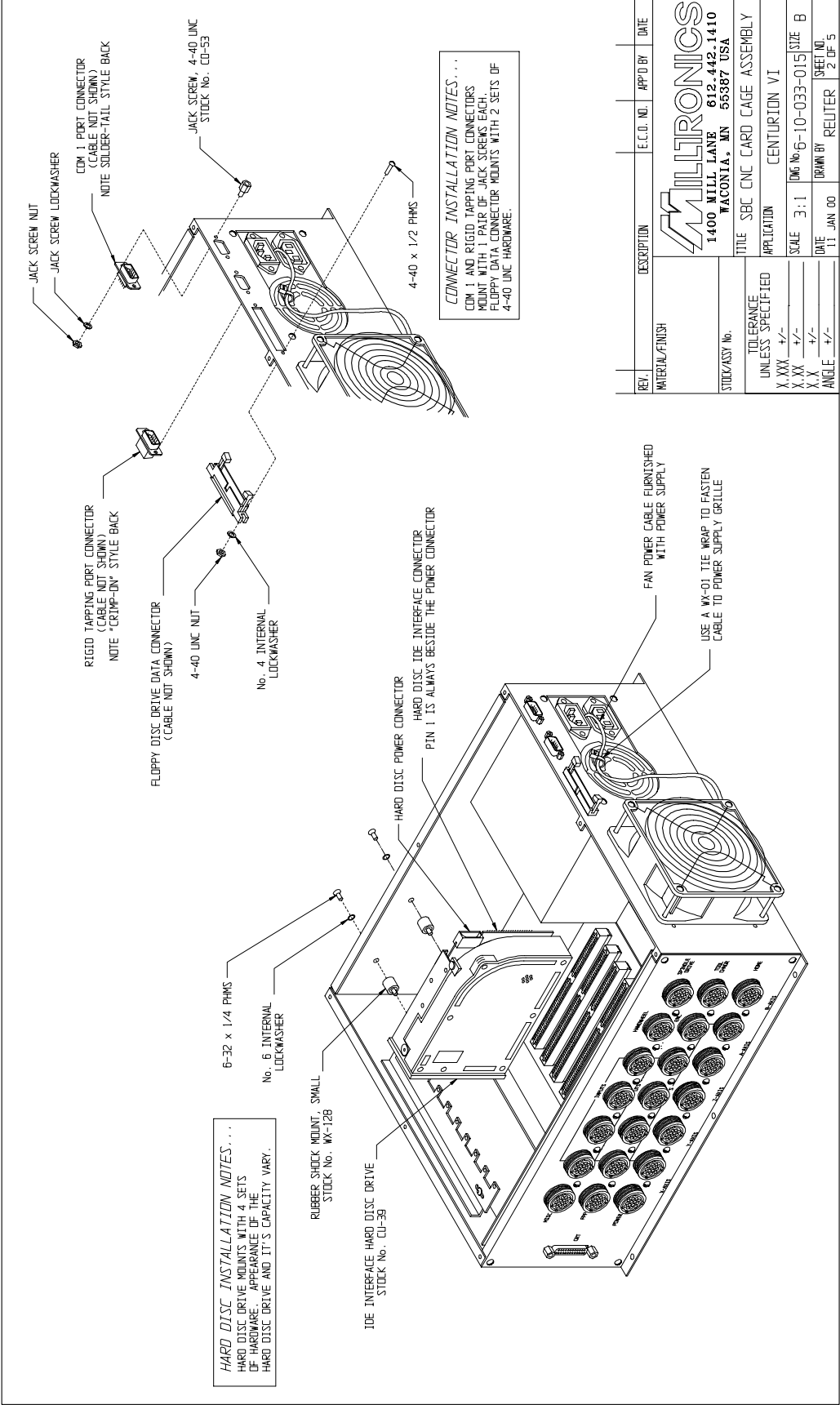
4-40 x 3/8 FHMS

4-40 x 3/8 FHMS

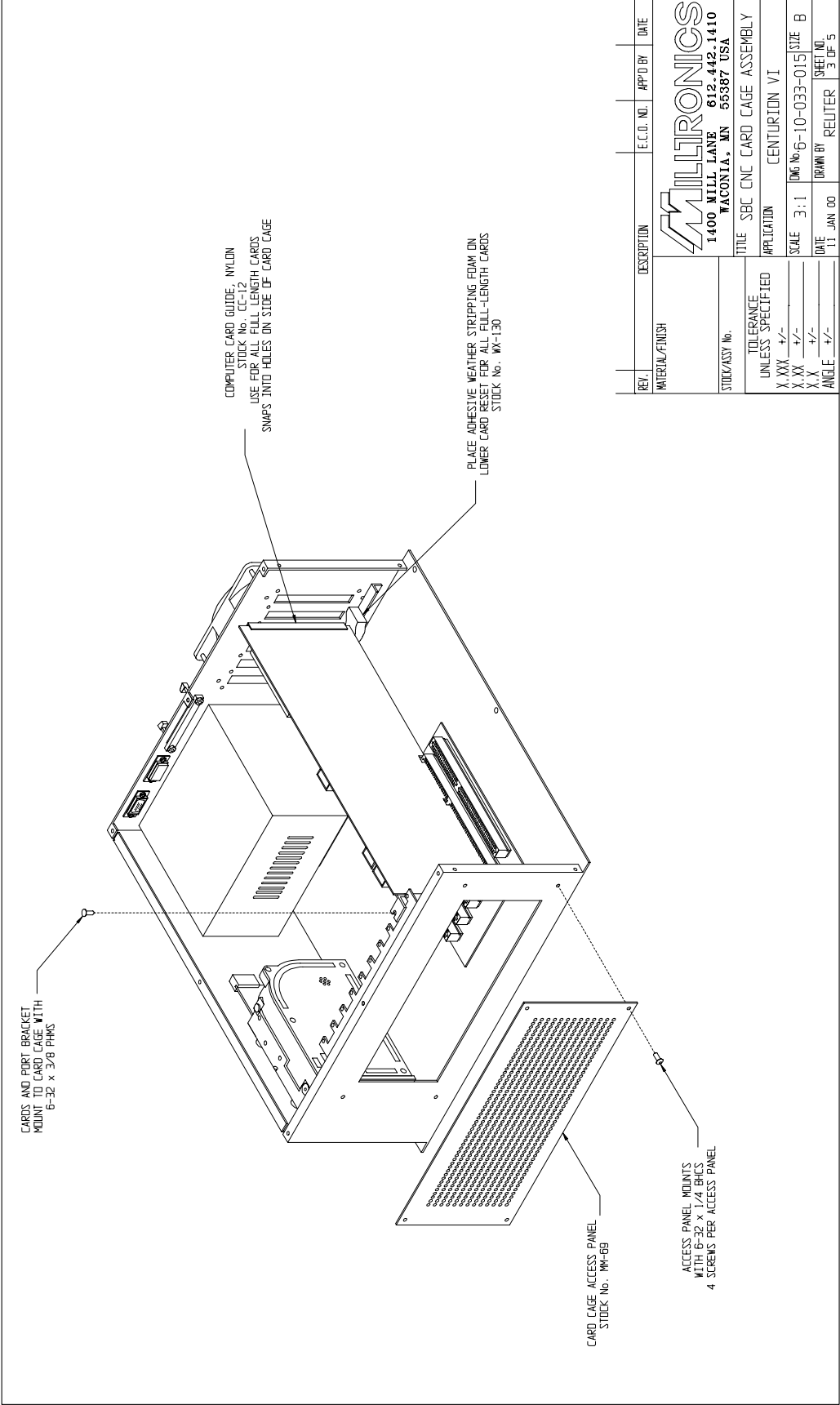
THREADED HEX SPACER,
4-40 UNC x 3/4 IN.
STOCK No. SP-76

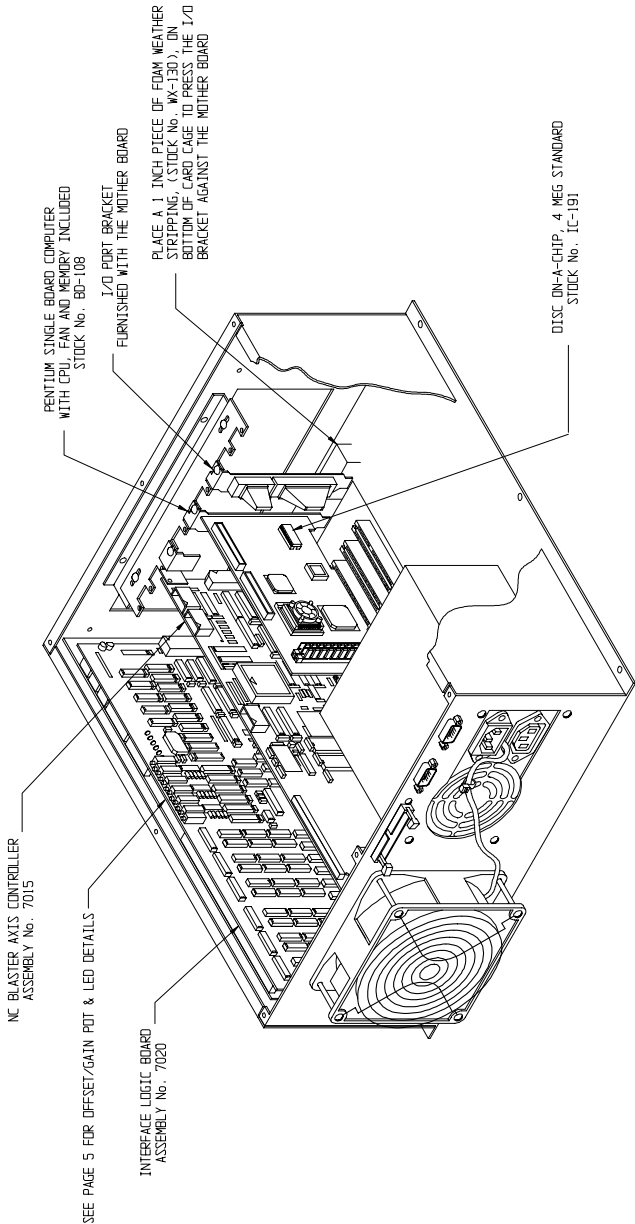
BACKPLANE INSTALLATION DETAIL

BOTTOM OF CARD CAGE

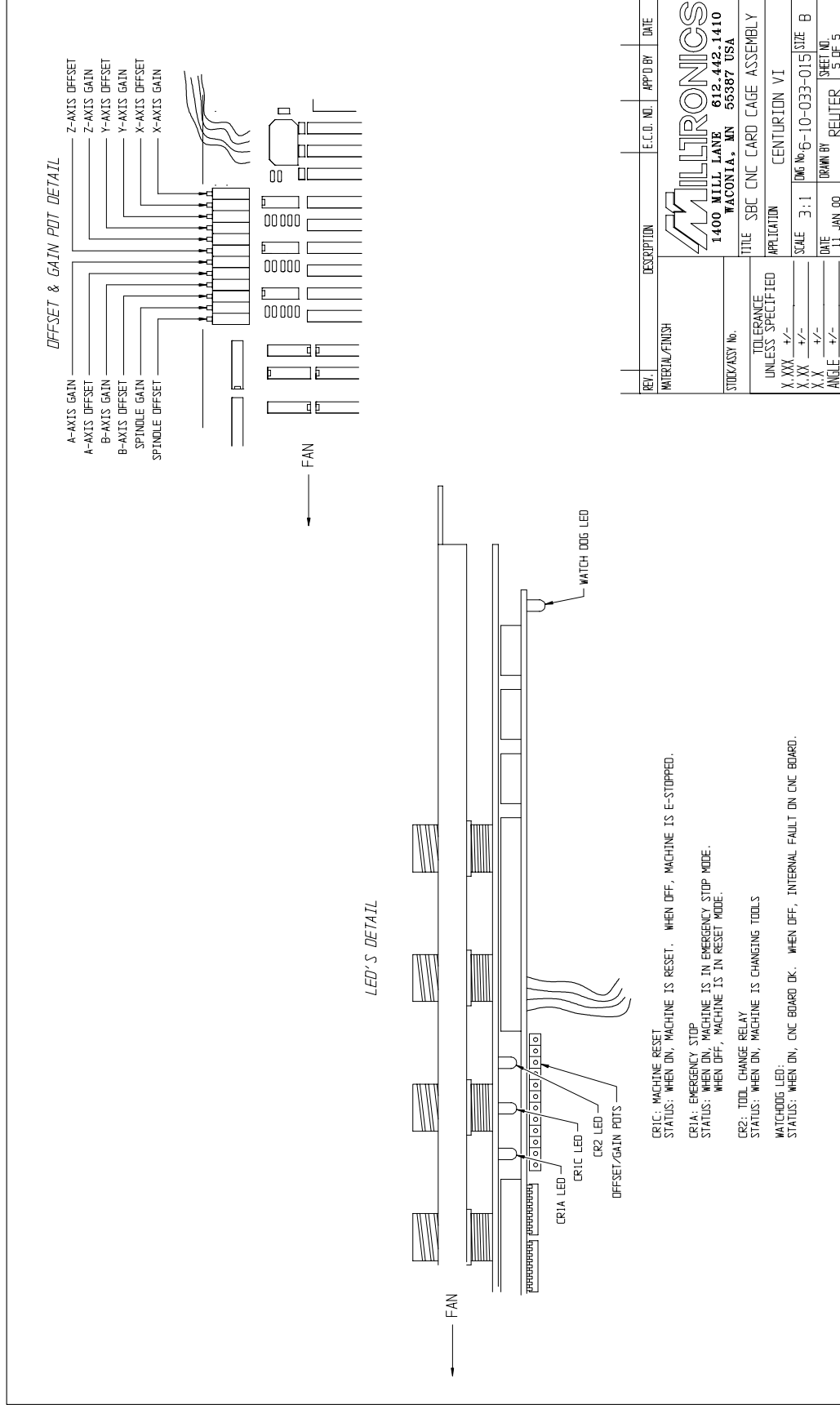


REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
	MATERIAL/FINISH			
	STOCK/ASSY No.			
	TOLERANCE UNLESS SPECIFIED			
	X .XX	+/-		
	X .XX	+/-		
	X .X	+/-		
	ANGLE	+/-		
MILLTRONICS 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
TITLE SBC CNC CARD CAGE ASSEMBLY				
APPLICATION CENTURION VI				
SCALE 3:1 Dwg No 6-10-033-015 SIZE B				
DATE 11 JAN 00 DRAWN BY REUTER SHEET NO. 2 OF 5				



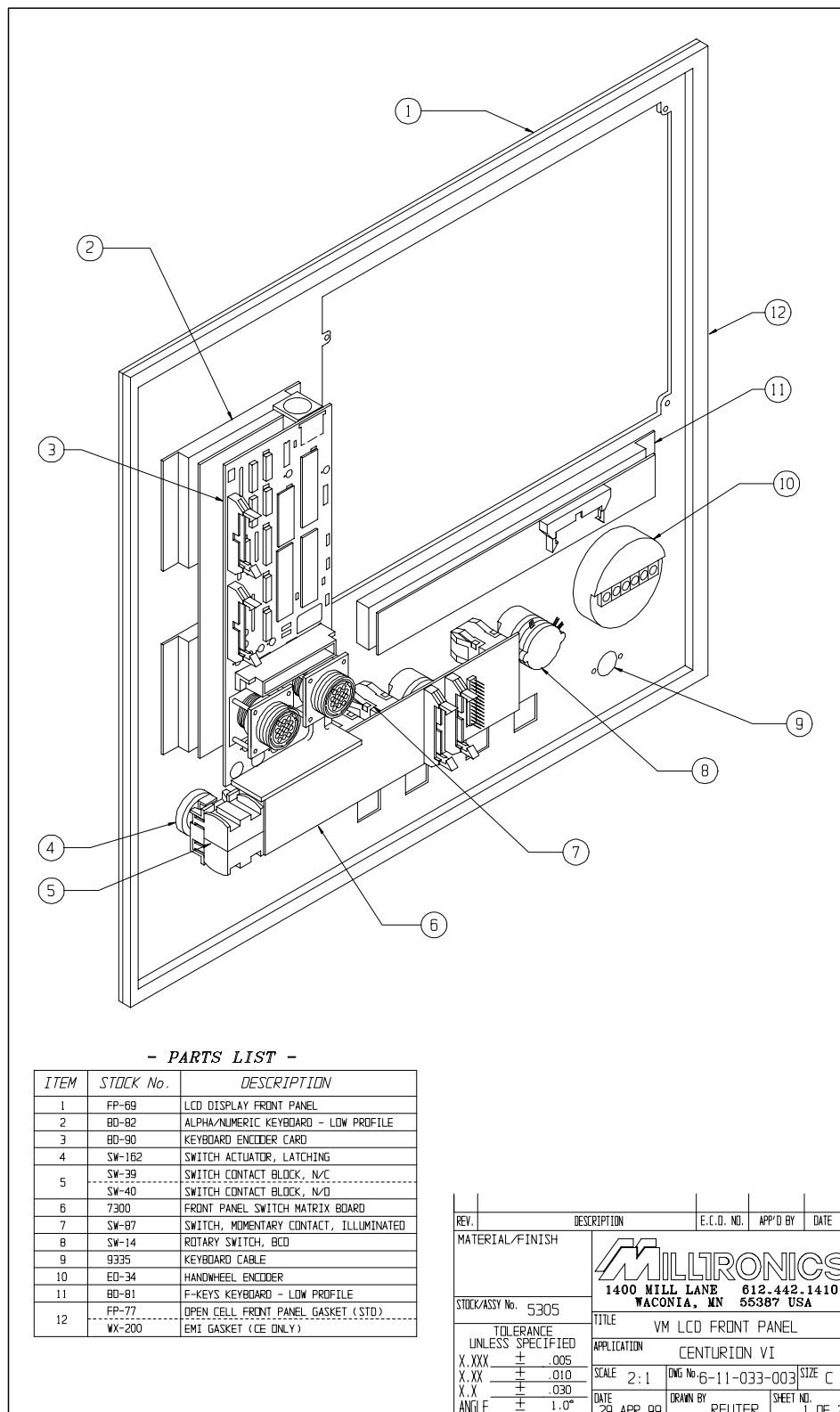


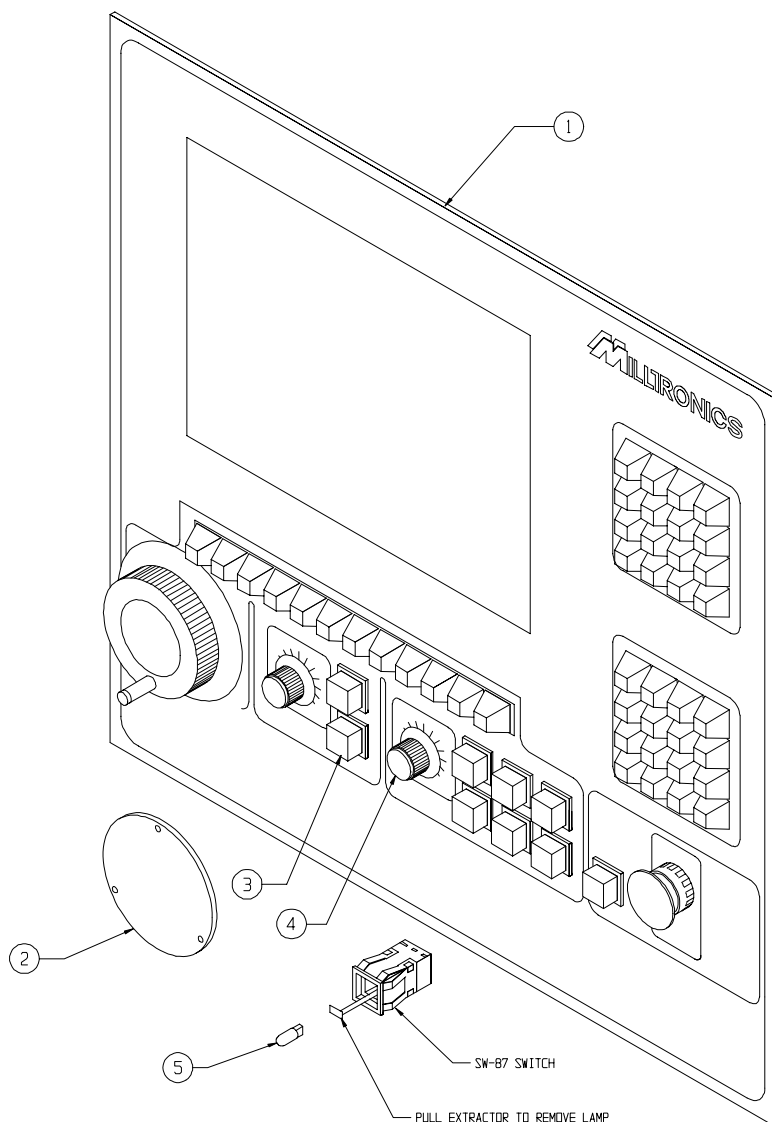
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED				
X.XXX +/-				
X.XX +/-				
X.X +/-				
ANGLE +/-				
MILLTRONICS 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
TITLE	SBC CNC CARD CAGE ASSEMBLY			
APPLICATION	CENTURION VI			
SCALE	3:1	DWG No	6-10-033-015	SIZE B
DATE	11 JAN 00	DRAWN BY	REUTER	SHEET NO. 4 OF 5



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LCD Front Panel Assembly





- PARTS LIST -

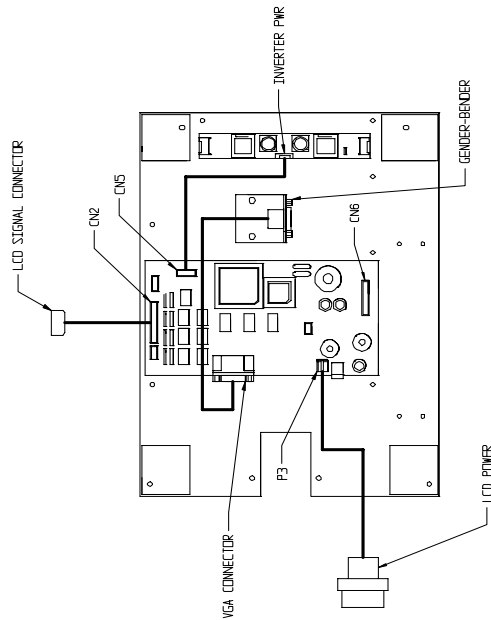
ITEM	STOCK No.	DESCRIPTION
1	FP-74	VM FRONT PANEL OVERLAY
2	MP-70	ENCODER HOLE COVER (WHEN USED)
3	SW-89	SQUARE KEYTOP, RED
	SW-88	SQUARE KEYTOP, GREEN
	SW-90	SQUARE KEYTOP, WHITE
5	SW-35	SWITCH KNOB
5	SW-92	SWITCH LAMP, 24 VOLT

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH STOCK/ASSY No. 5305 TOLERANCE UNLESS SPECIFIED X.XXX $\pm$.005 X.XX $\pm$.010 X.X $\pm$.030 ANGLE $\pm$ 1.0°  1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA				
TITLE APPLICATION SCALE 2:1 DATE 29 APR 99 VM LCD FRONT PANEL CENTURION VI DWG No 6-11-033-003 DRAWN BY REUTER SIZE C SHEET NO. 2 OF 2				

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
 MILLTRONICS MANUFACTURING 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		DEM ANALOG LCD CHASSIS ASSEMBLY		
TITLE TOLERANCE UNLESS SPECIFIED X .XX .05 X .XX .010 X .X .030 X .1 0"		APPLICATION CENTURION V1 SCALE 2.25:1 DATE 2.25.1 DRAWN BY QUOTED SHEET NO.		
PART/ASSY NO. 6230		TENG NO. 6-10-033-005 SIZE B		

- INSTRUCTIONS -

1. MOUNT THE VGA GENDER-BENDER TO THE CHASSIS WITH 6-32 x 1/2 RHMS AND NO. 8 LOCKWASHERS.
2. PLACE THE WX-242 INSULATOR SO IT LIES UNDER THE DIGITAL VIEW BOARD. INDEX THE INSULATOR WITH THE MOUNTING STANDOFFS FOR THE PC BOARD.
3. INSTALL THE ANALOG-TO-DIGITAL CONVERSION BOARD. THE WIRES FROM THE VGA GENDER-BENDER MUST LIE ON TOP OF THE CONVERSION BOARD. USE 4-40 x 1/4 RHMS AND LOCKWASHERS TO MOUNT THE BOARD. ATTACH THE OTHER END OF THE VGA GENDER-BENDER TO THE VGA CONNECTOR ON THE CONVERSION BOARD AND SECURE WITH THE CONNECTOR SCREWS.
4. MOUNT THE LGCT INVERTER BOARD TO THE CHASSIS WITH 6-32 x 1/2 RHMS AND LOCKWASHERS. CONNECT THE LGCT INVERTER POWER X 1/4 RHMS AND LOCKWASHERS TO THE LGCT INVERTER. CONNECT THE OTHER END TO THE CONVERSION BOARD CONNECTOR 'CN5'. THESE PLUGS ARE KEPT TO FIT ONLY ONE WAY ON EITHER BOARD'S CONNECTORS.
5. PLUG THE ANALOG LCD POWER CABLE (2-PIN END), INTO THE 'P3' CONNECTOR ON THE CONVERSION BOARD.
6. CONNECT THE DUAL IN-LINE END OF THE LCD SIGNAL CABLE INTO 'CN2' CONNECTOR ON THE CONVERSION BOARD. THIS CONNECTOR IS KEPT AND WILL FIT ONLY ONE WAY. CONTAIN THE LOOSE WIRES OF THE CABLE WITH WX-01 TIE WRAPS.
7. PLACE NO. 6 INTERNAL LOCKWASHERS ON THE 6-32 STUDS. THESE ARE THE ONLY STUDS ON THE CHASSIS. THEN SCREW ON THE SP-5B SPACERS.
8. PLACE THE LCD CHASSIS COVER ON THE COMPLETED ASSEMBLY AND USE 6-32 x 1/4 RHMS AND LOCKWASHERS TO SECURE IT IN PLACE.



- PARTS LIST -

ITEM	STOCK No.	DESCRIPTION
1	PL-63	LCD CHASSIS BACK COVER DNG No. 6-01-033-042
2	SP-5B	6-32 x 1-1/4 FEMALE/FEMALE HEX SPACER
3	CB-42	DV/SHARP LCD SIGNAL CABLE DIGITAL VIEW No. 23430
4	9496	ANALOG LCD POWER CABLE DNG No. 6-04-033-079
5	BR-95	12 IN. LCD DISPLAY CARRIER DNG No. 6-01-033-029
6	9497	ANALOG VGA GENDER-BENDER ASSEMBLY DNG No. 6-04-033-080
7	CB-41	HL014034/SS20 POWER CABLE DIGITAL VIEW No. 420800170
8	WX-242	DIGITAL VIEW PCB INSULATOR DNG No. 6-01-033-047
9	PS-44	LGCT BACKLIGHT INVERTER XENTER No. 13520
10	BD-80	ANALOG LCD DISPLAY CONVERSION BOARD DIGITAL VIEW MODEL No. AC-5611 v.3

REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
	MATERIAL FINISH			
	1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA			
	STOCK/ASY No. 6230	TITLE	DEM ANALOG LCD CHASSIS ASSEMBLY	
	UNLESS SPECIFIED	APPLICATION	CENTURION VI	
	X.XX +/- .005	SCALE	2.25:1	DWG No 6-10-033-005
	X.XX +/- .010	SIZE	B	
	X.XX +/- .030	DWG	BY	REUTER
	ANGLE +/- 1.0°	DATE	24 JUN 98	SHEET NO. 2 OF 2