

Electrical Manual
VM15,16,17,24,25,30
Single Winding Spindle

Rev 7
18 DEC 2000

Table Of Contents

Transformer Connection Alert	v
Electrical Safety Rules.....	vi
Machine Schematic	1
Remote Hand Controller Operation Notes	21
Panel Layout.....	22
Yaskawa Varispeed-616G5 Spindle Drive Parameters	25
Spindle Drive Parameter List.....	26
For Yaskawa 616G5	26
Yaskawa Axis Drive Parameters	33
Partner VM17 All Drives Model SGDB-10ADG	33
Partner VM24 All Drives Model SGDB-10ADG	34
Partner VM25 All Drives Model SGDB-15ADG	35
Partner VM30b&c All Drives Model SGDB-10ADG	36
Partner VM30d&e All Drives Model SGDB-15ADG	37
Yaskawa Axis Drive Parameters for Troyke Indexers	38
Card Cage Gain Setting Procedure.....	39
Drive Setting Procedure	40
Centurion 6 CNC Connector Signal Listing	41
Connector X-Input.....	41
Connector Y-Input.....	41
Connector Z-input	41
Connector A-Input.....	41
Connector X-Output.....	41
Connector Y-Output.....	41
Connector Z-Output	42
Connector A-Output.....	42
Connectors X, Y, Z, A and B Axis (DC Brush Drives)	42
Connectors X, Y, Z, A and B Axis (AC Brushless Drives)	42
Axis Home Connector	43
Spindle Drive Connector	43
Spindle Encoder Connector	43
Miscellaneous Connector "Misc".....	43
Front Panel Connector "FPP" (and J2 on keyboard encoder card).....	43
Connector "Power".....	44
LCD Power Connector J2A on keyboard encoder card.....	44
Connector Handwheel for remote handwheel option	44
Connector Tool Changer	44
Connector COM1 (Card Cage)	44
Connector COM2 (For rigid tapping option)	44
Connector Floppy Disk.....	44
Connector CRT (Video)	45
Connectors in the CNC control box.....	45
Connector FPACC	45
Connector P2.....	45
Keyboard DIN Connector (J1)	45
Connectors in the Mag Box	45
Connector on +24 VDC Regulated Power Supply.....	45
Connector COM1 (on Mag Panel)	45
Card Cage Assembly.....	46
LCD Front Panel Assembly	52
LCD Chassis Assembly.....	54

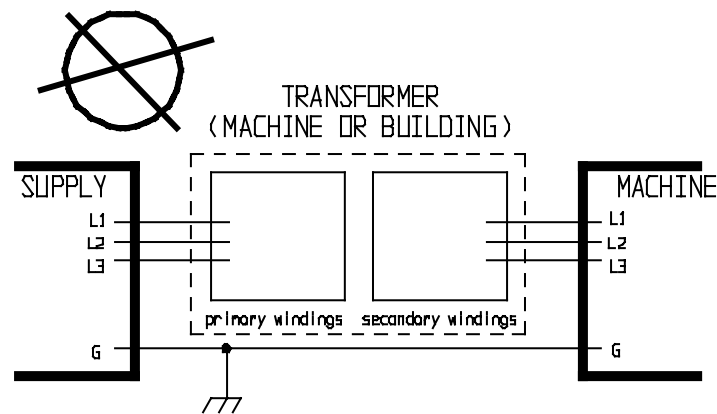
History

4-21-99	Original version
6-03-99	Update to rev D electrical schematic (reactors added)
7-12-99 Rev 2	Added front panel drawing
7-28-99 Rev 3	Added Auger / Flush circuit and updated mag panel drawing
12-17-99 Rev 4	Updated chip flush / auger schematic to rev G.
1-31-00 Rev 5	Update to SBC card cage, add electrical safety caution
2-4-00 Rev 6	Update to revE electrical schematics, ECO # 4387
7-23-0	Change pages to include VM15,16
18 DEC 00 Rev. 7	Change to single speed spindle

Transformer Connection Alert

***** 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.

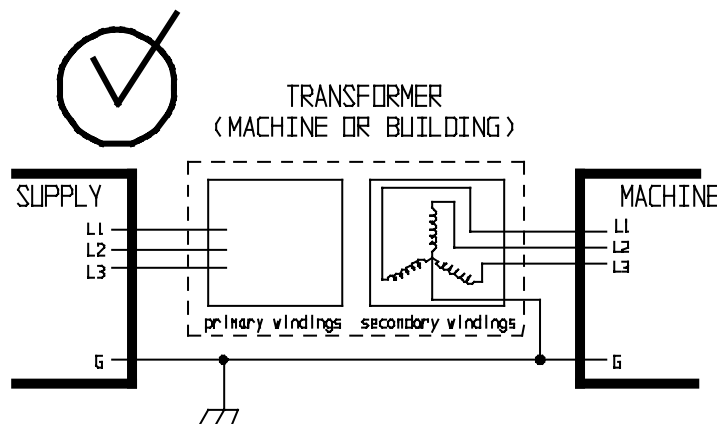
Remove transformer cover and follow transformer ground wire to determine if it is merely a case ground or if it actually goes to a neutral point within the secondary windings.

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.

Electrical Safety Rules

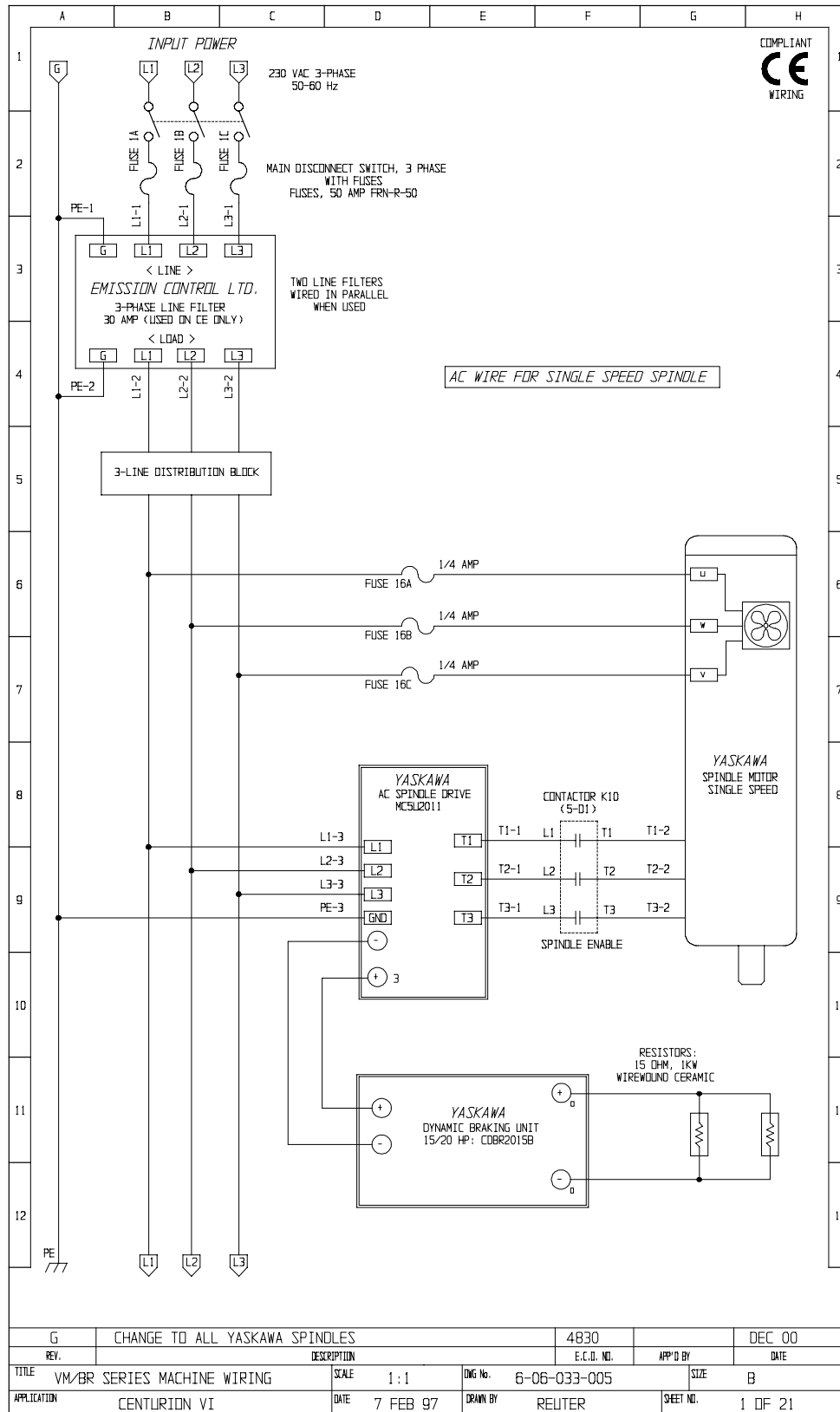
Read and understand the following list of cautions before attempting to perform service on this equipment. **Failure to observe these rules can result in death or serious injury.**

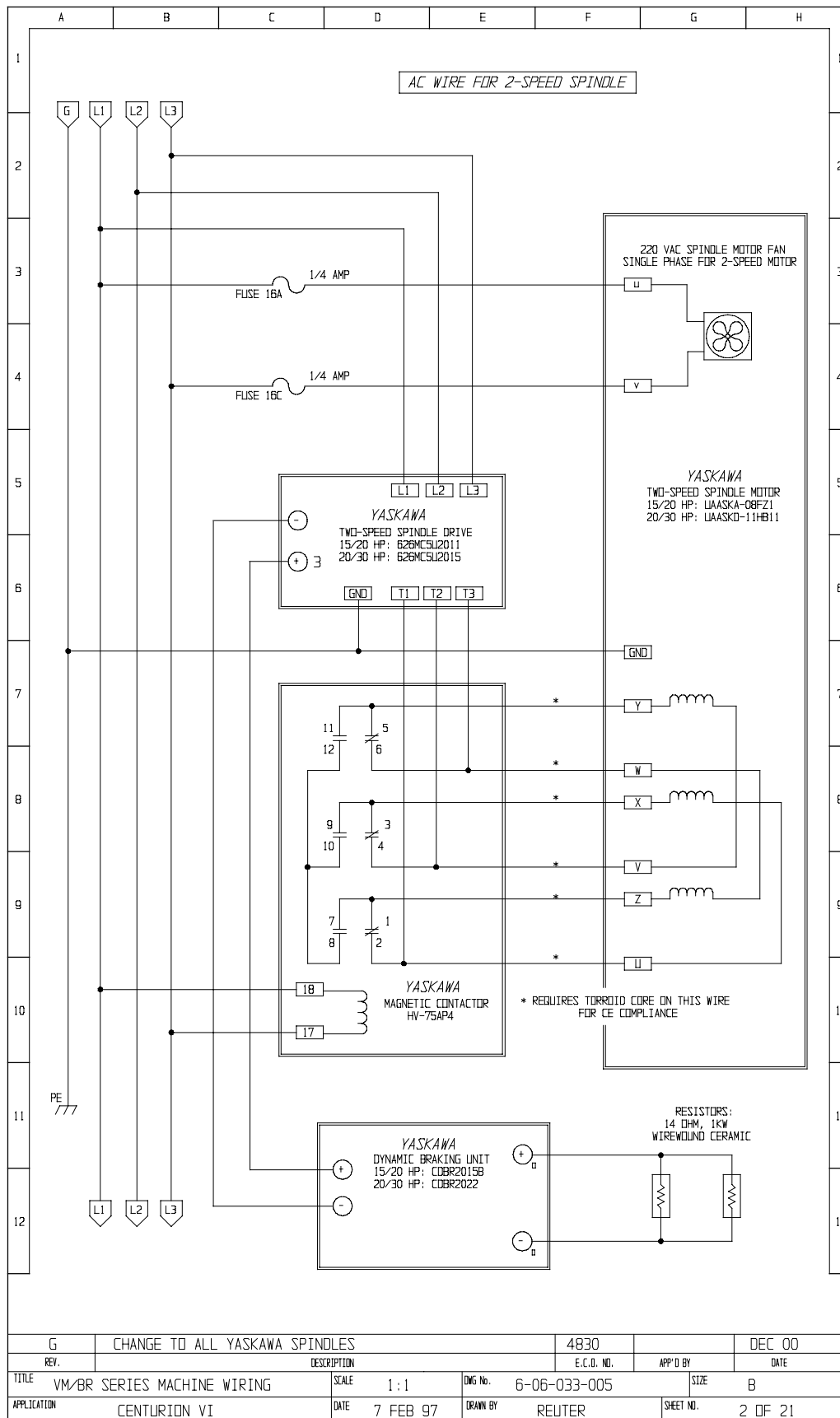
Caution

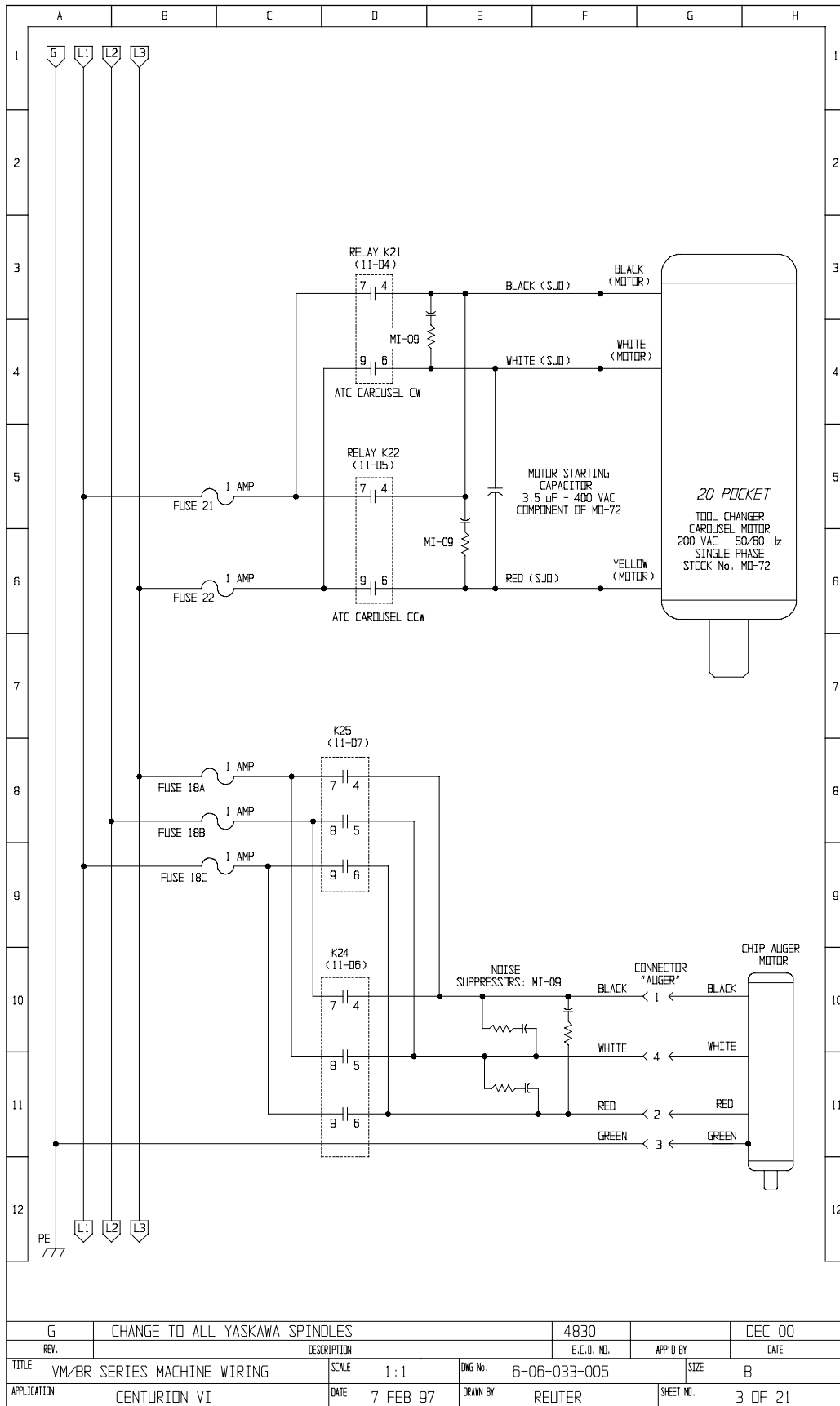
- Beware of High Voltage present within the machine's electrical cabinet
- Do not attempt to service electrical components unless you are qualified to work on them safely
- Only qualified personnel should attempt to make current and voltage readings
- Always turn the main power off before servicing components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

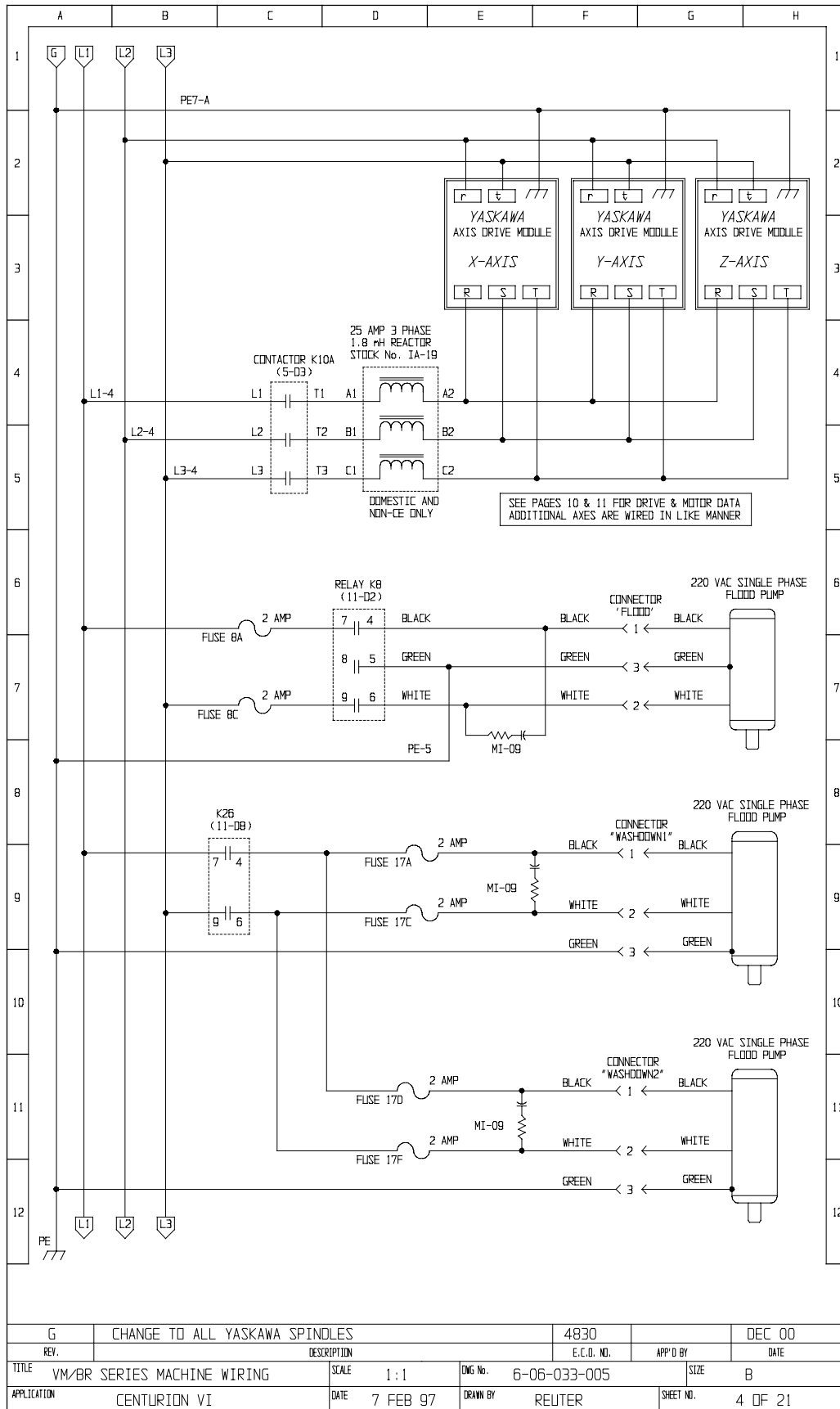
FAILURE TO FOLLOW THESE RULES CAN RESULT IN SERIOUS INJURY OR DEATH

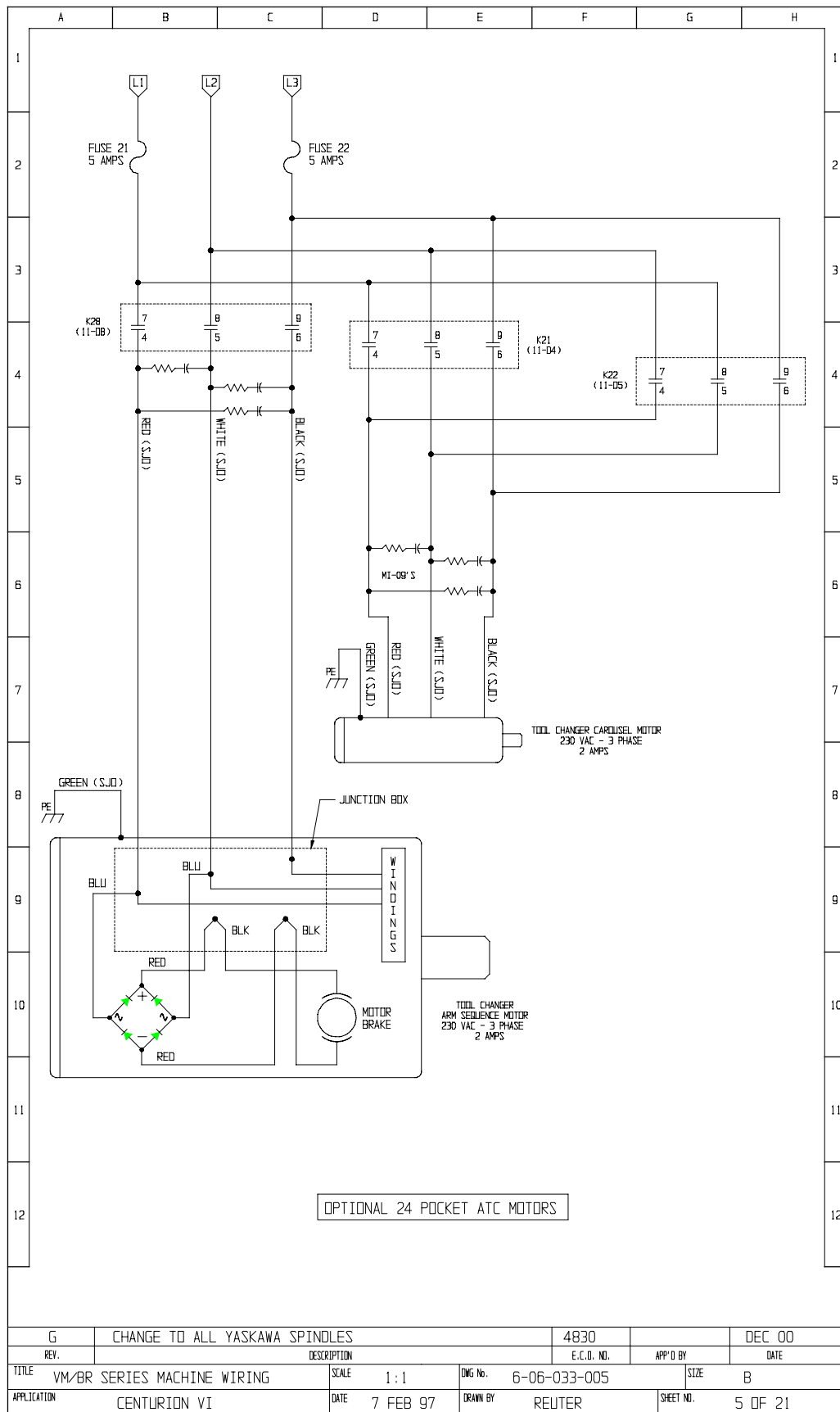
Machine Schematic

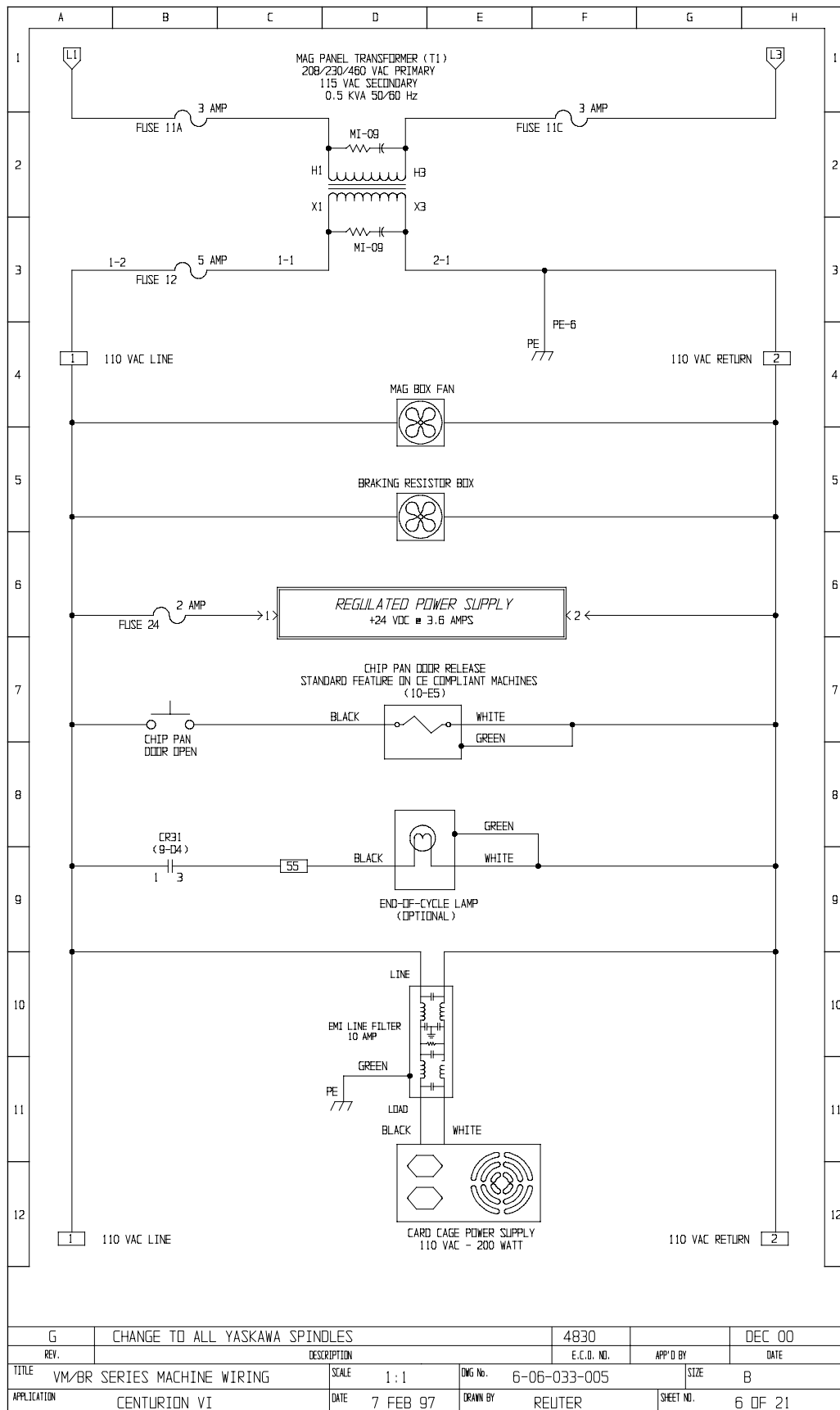


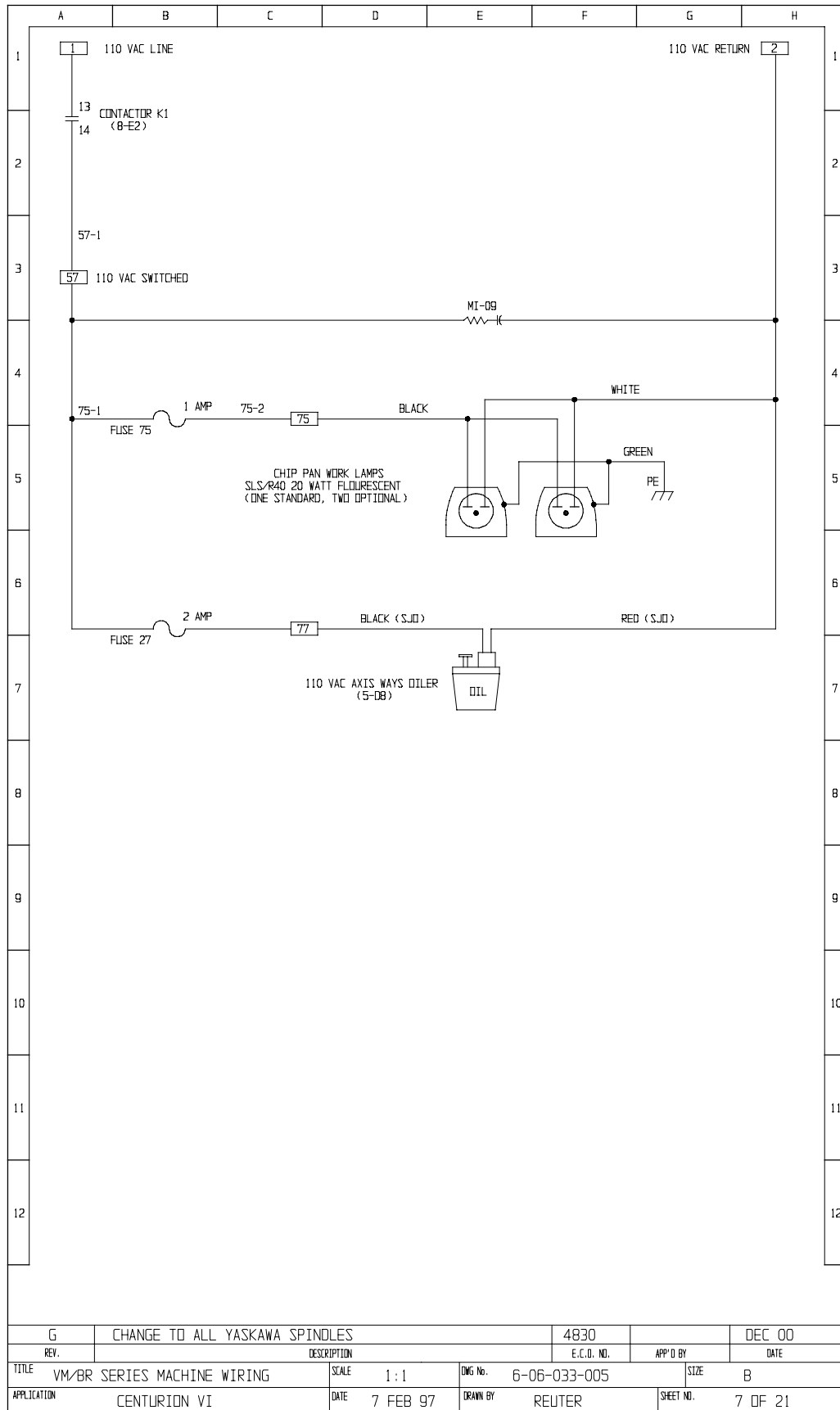


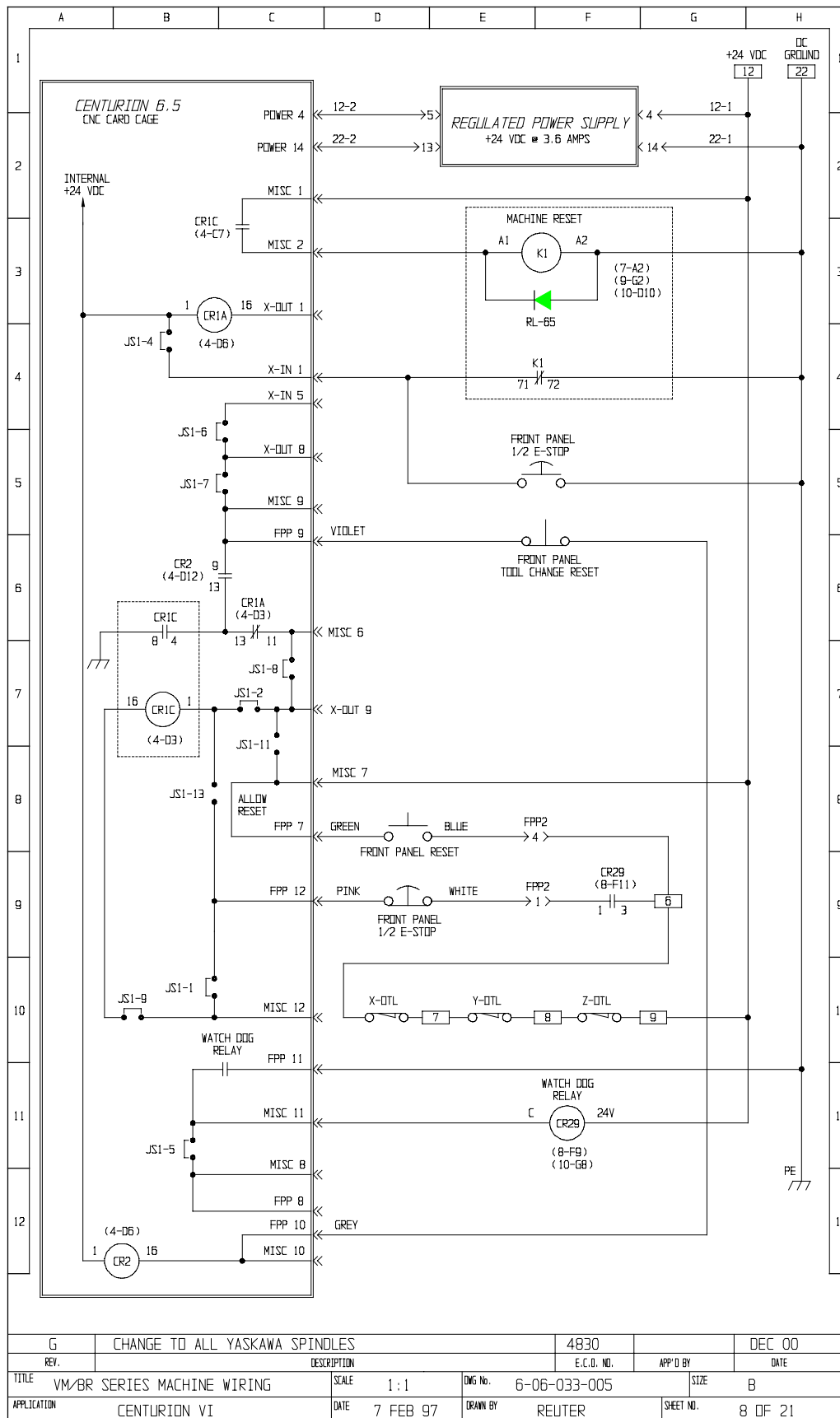


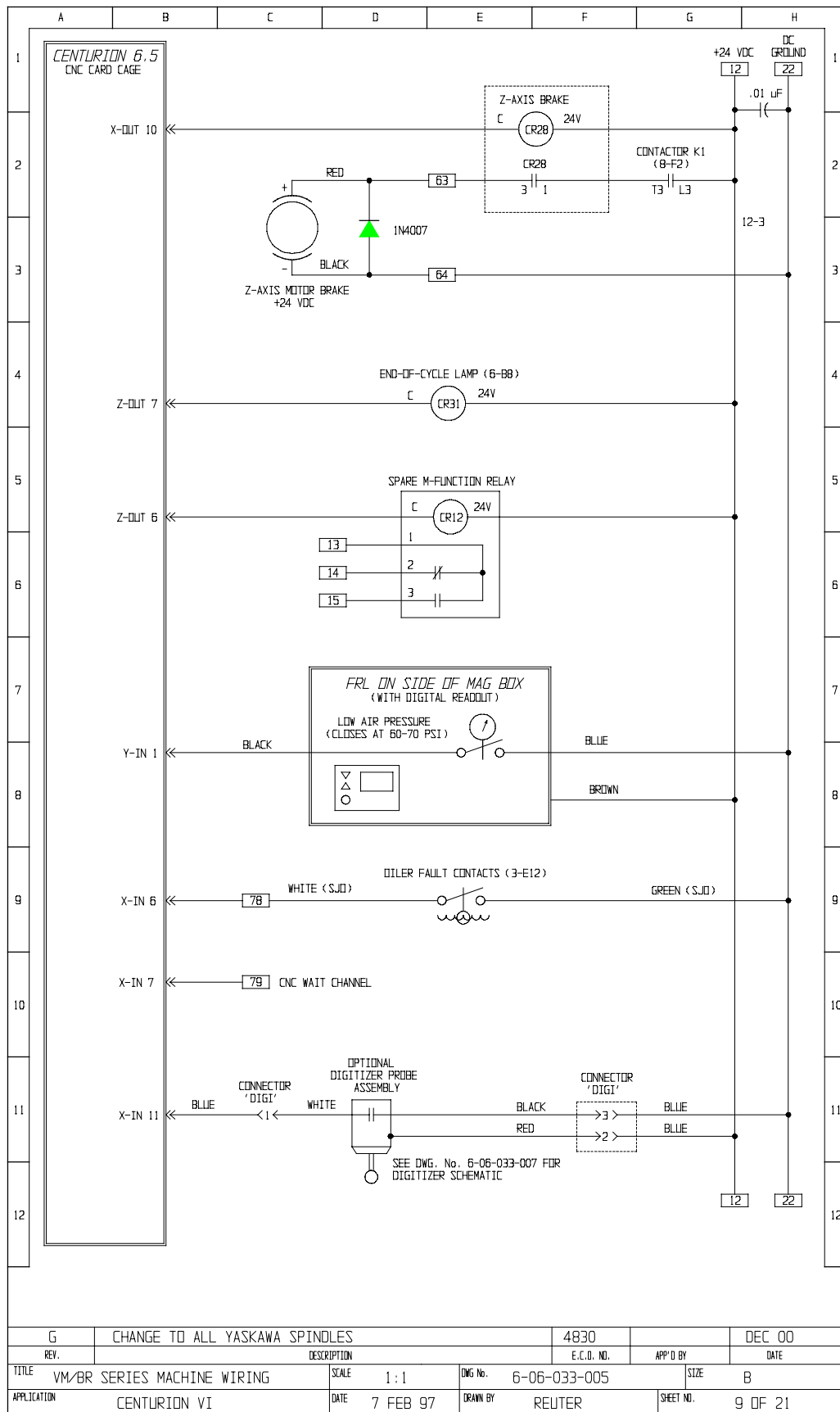


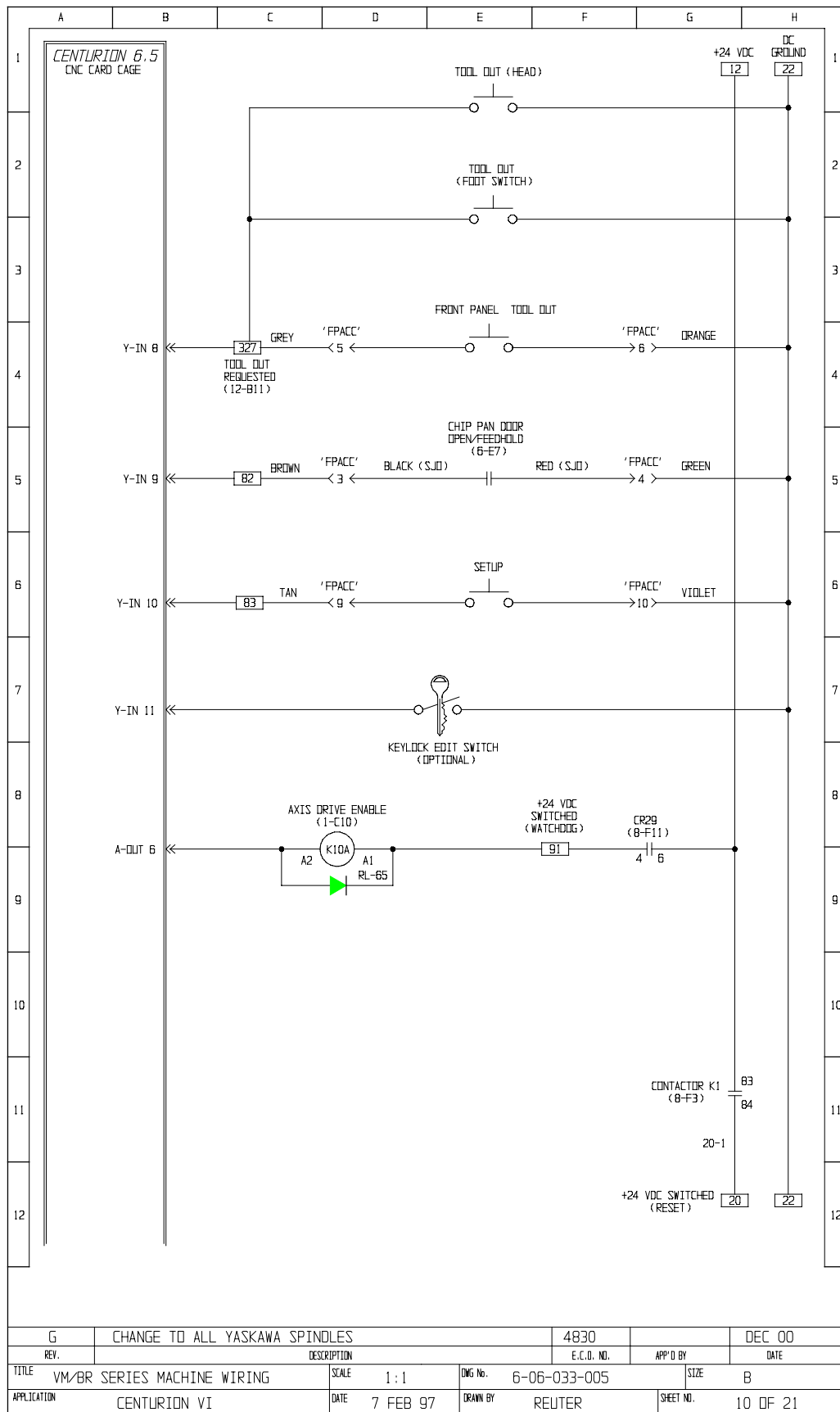


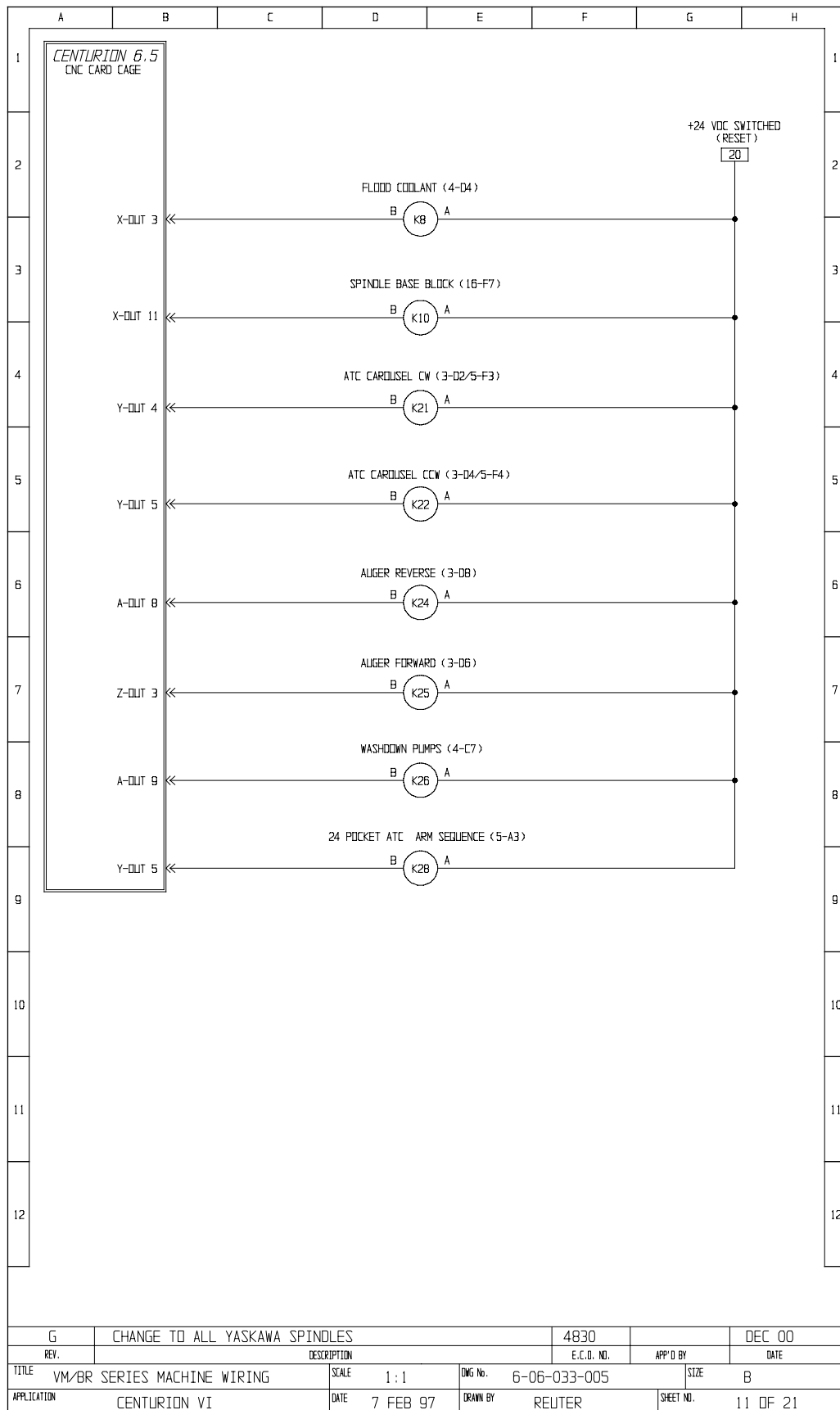


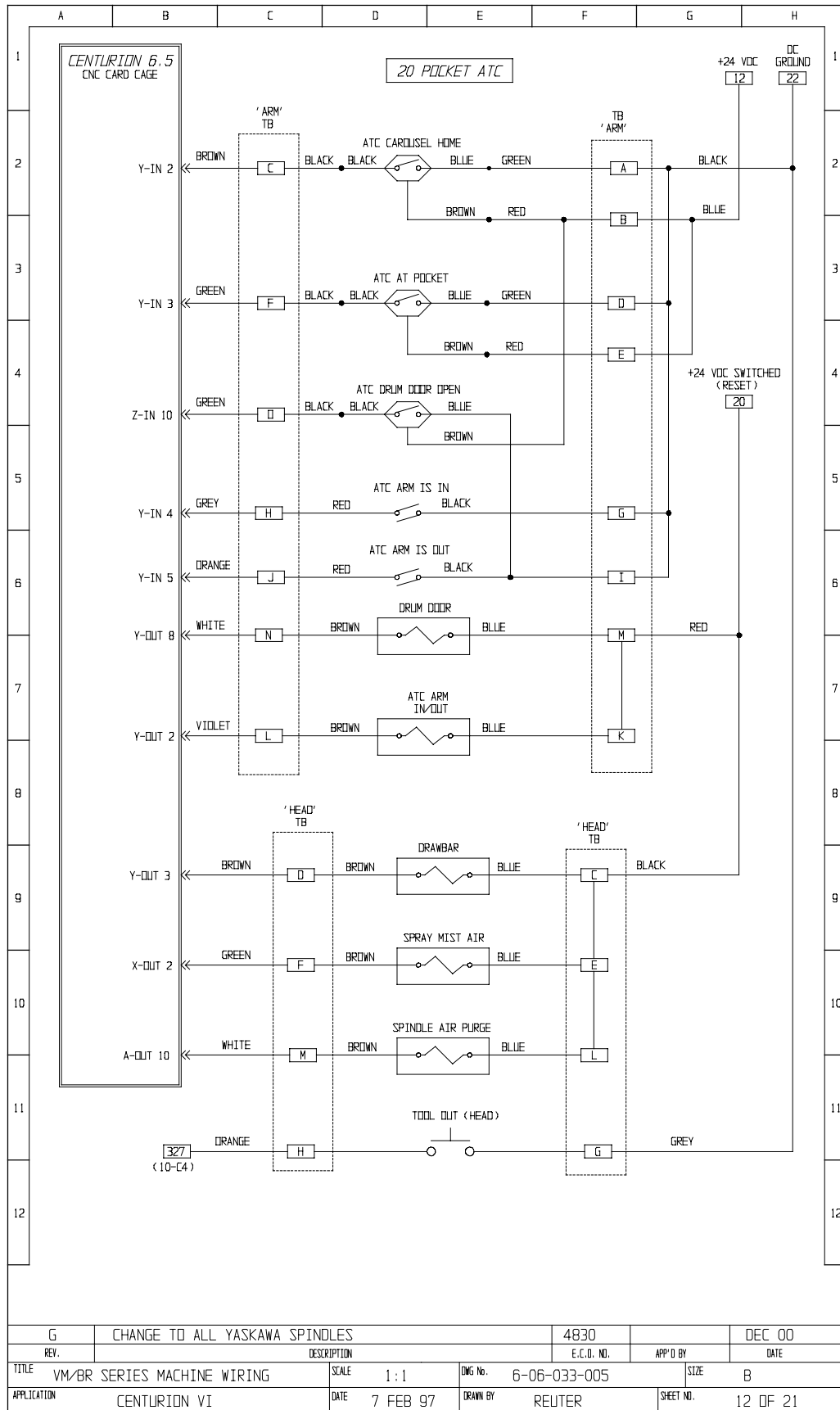


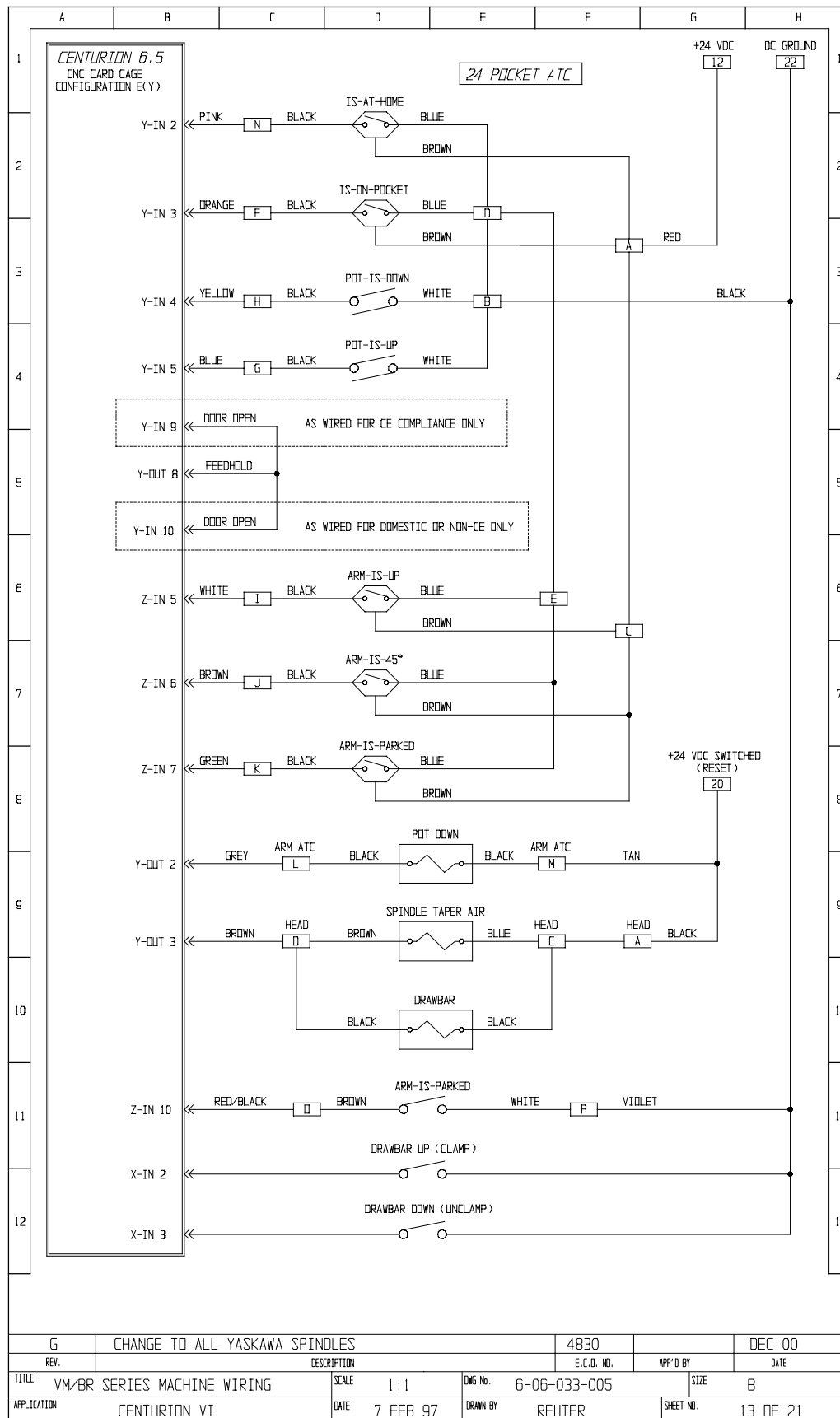


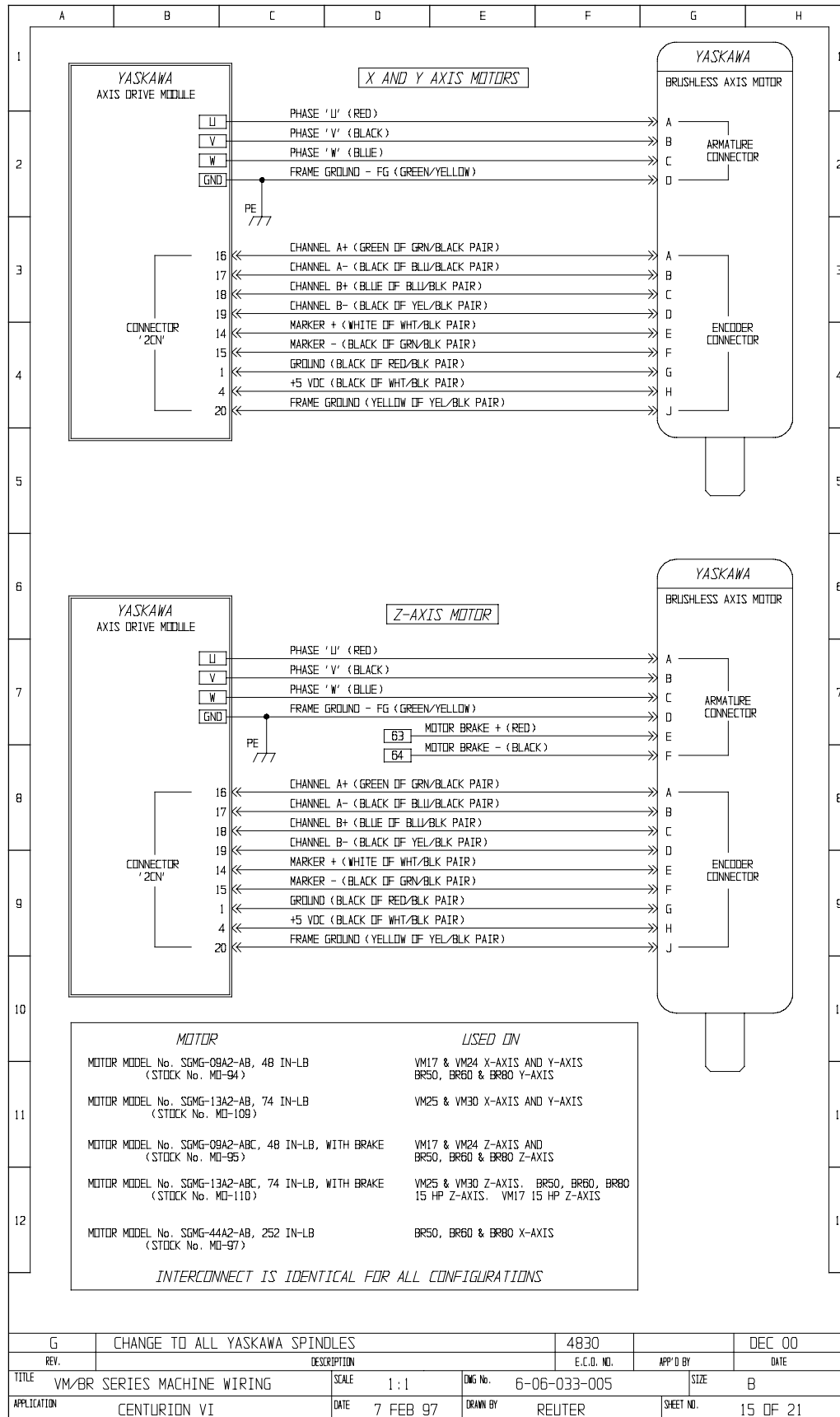


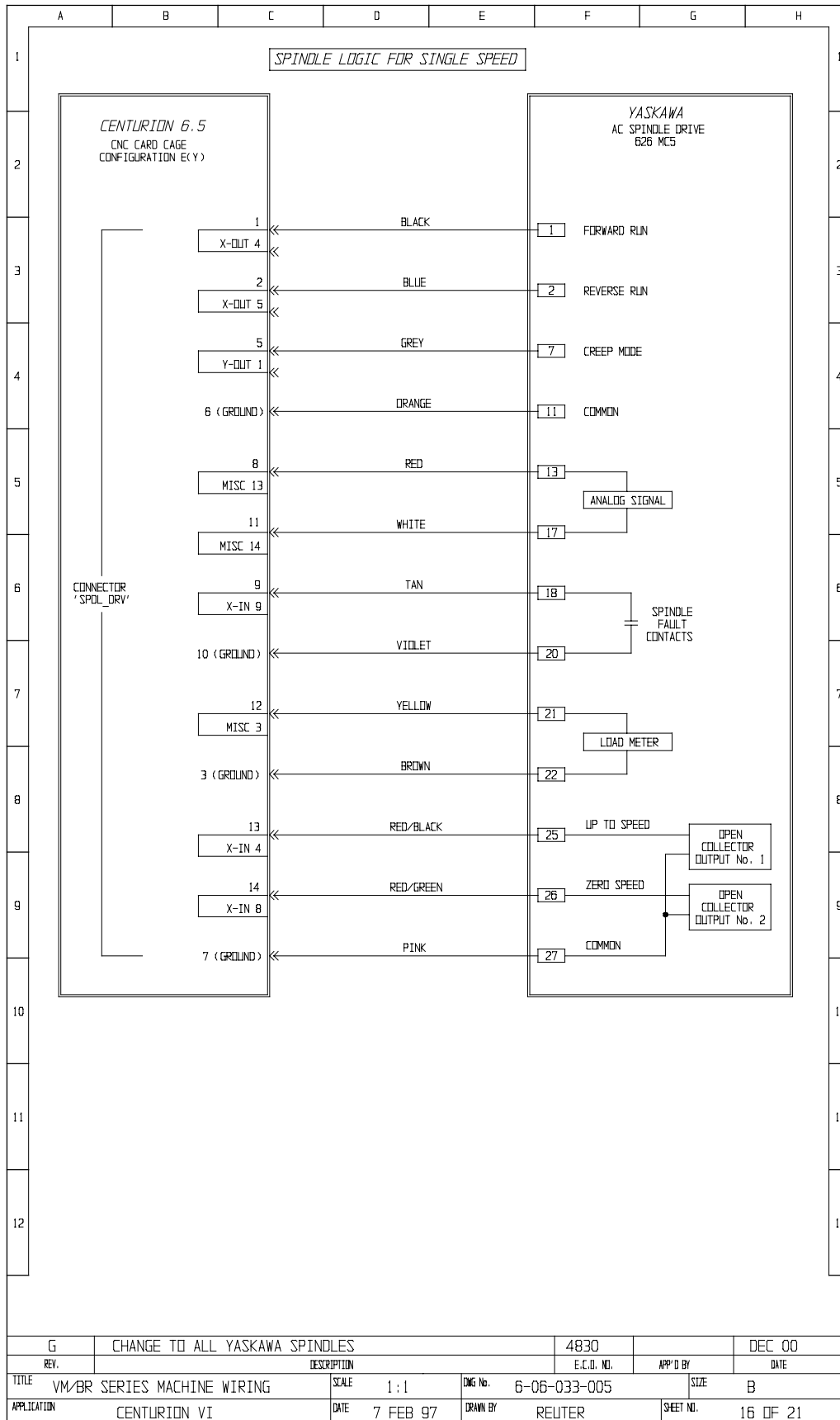


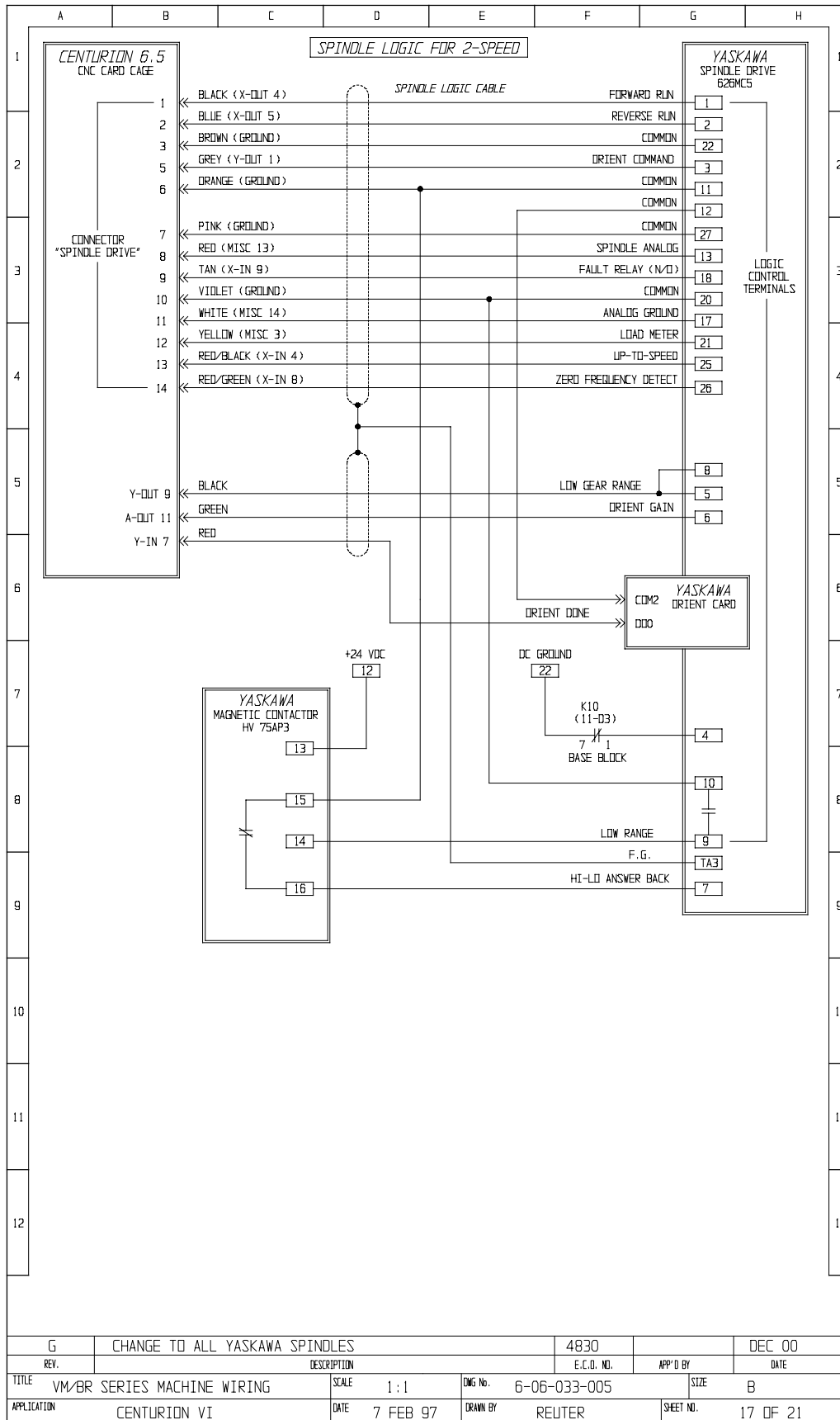


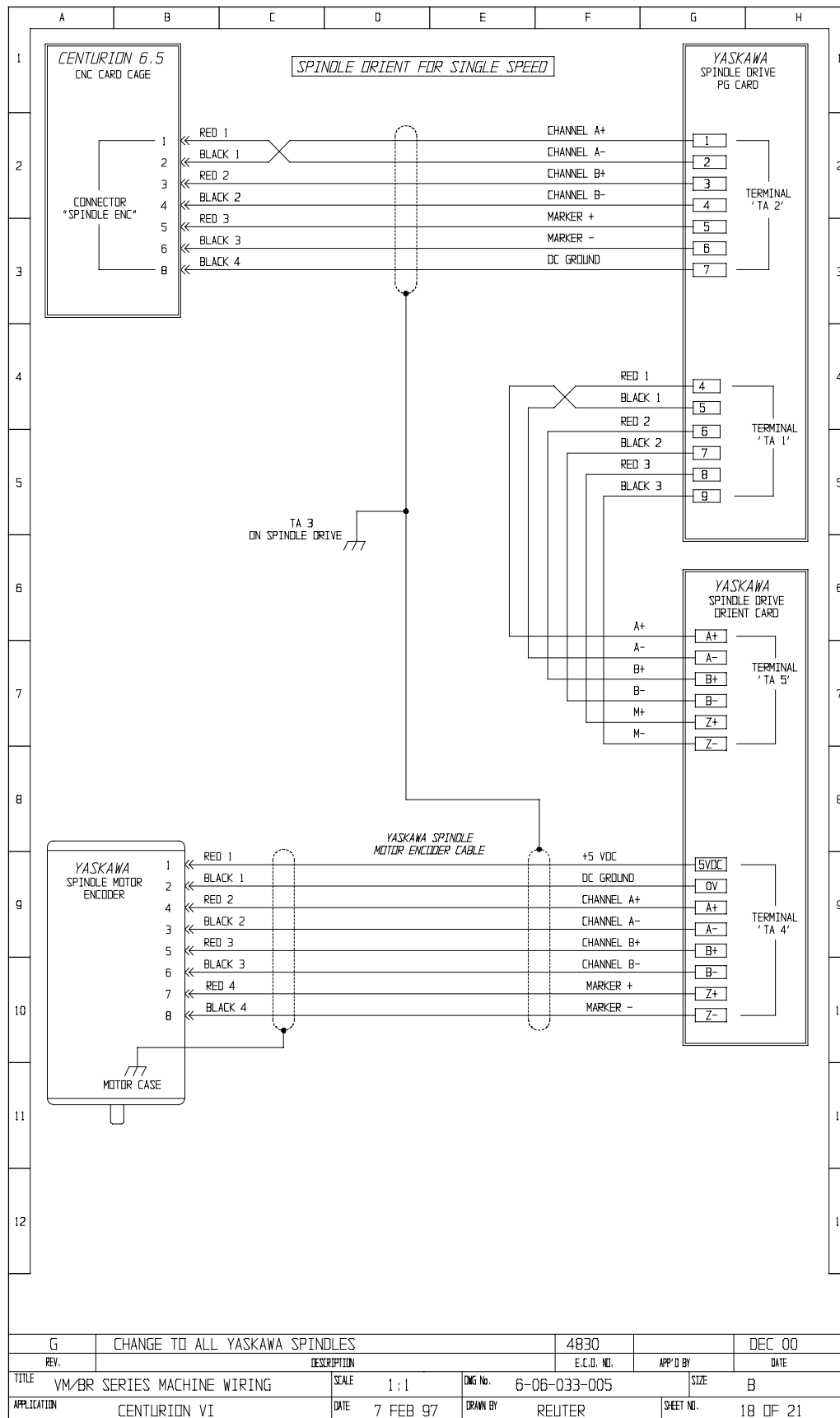


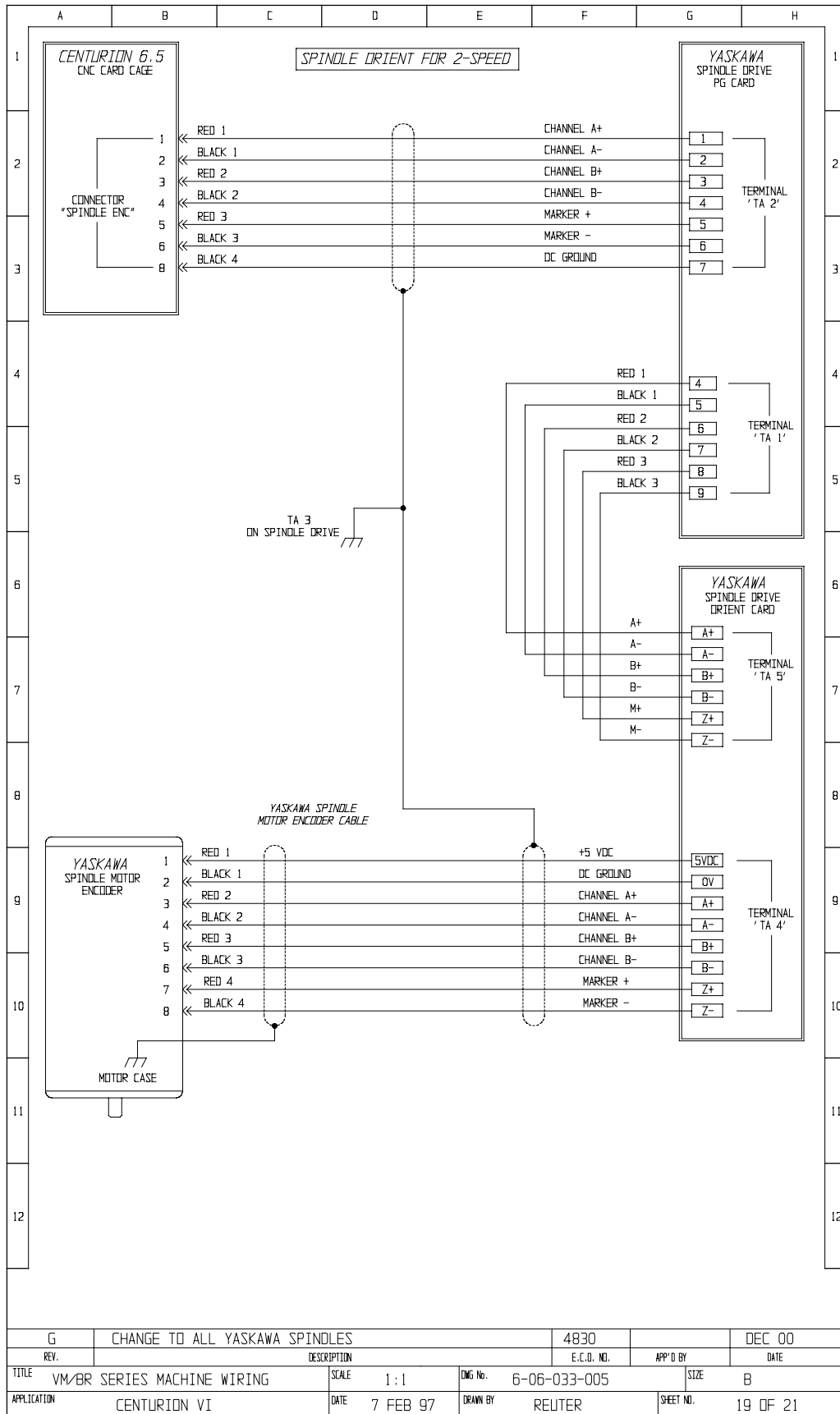


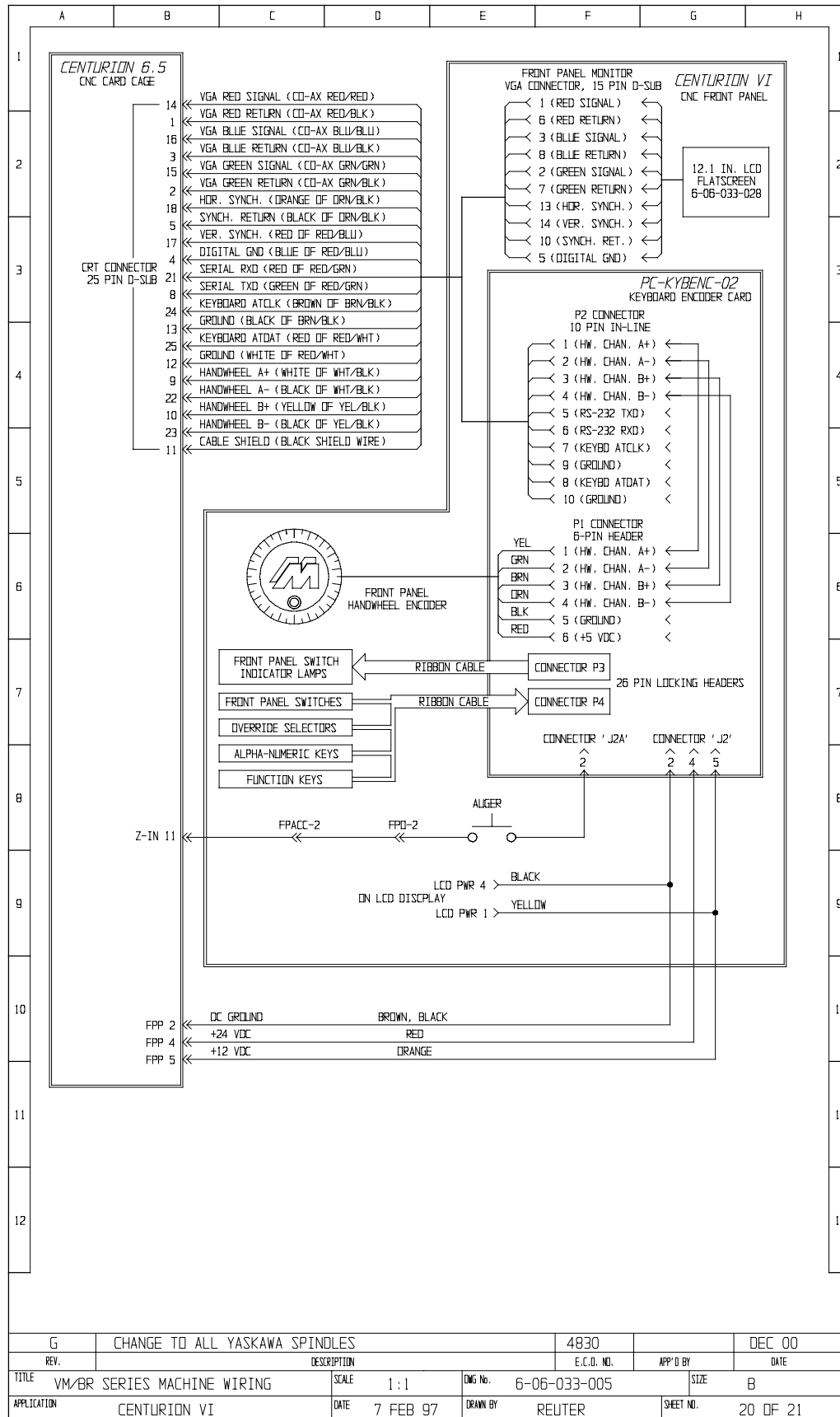


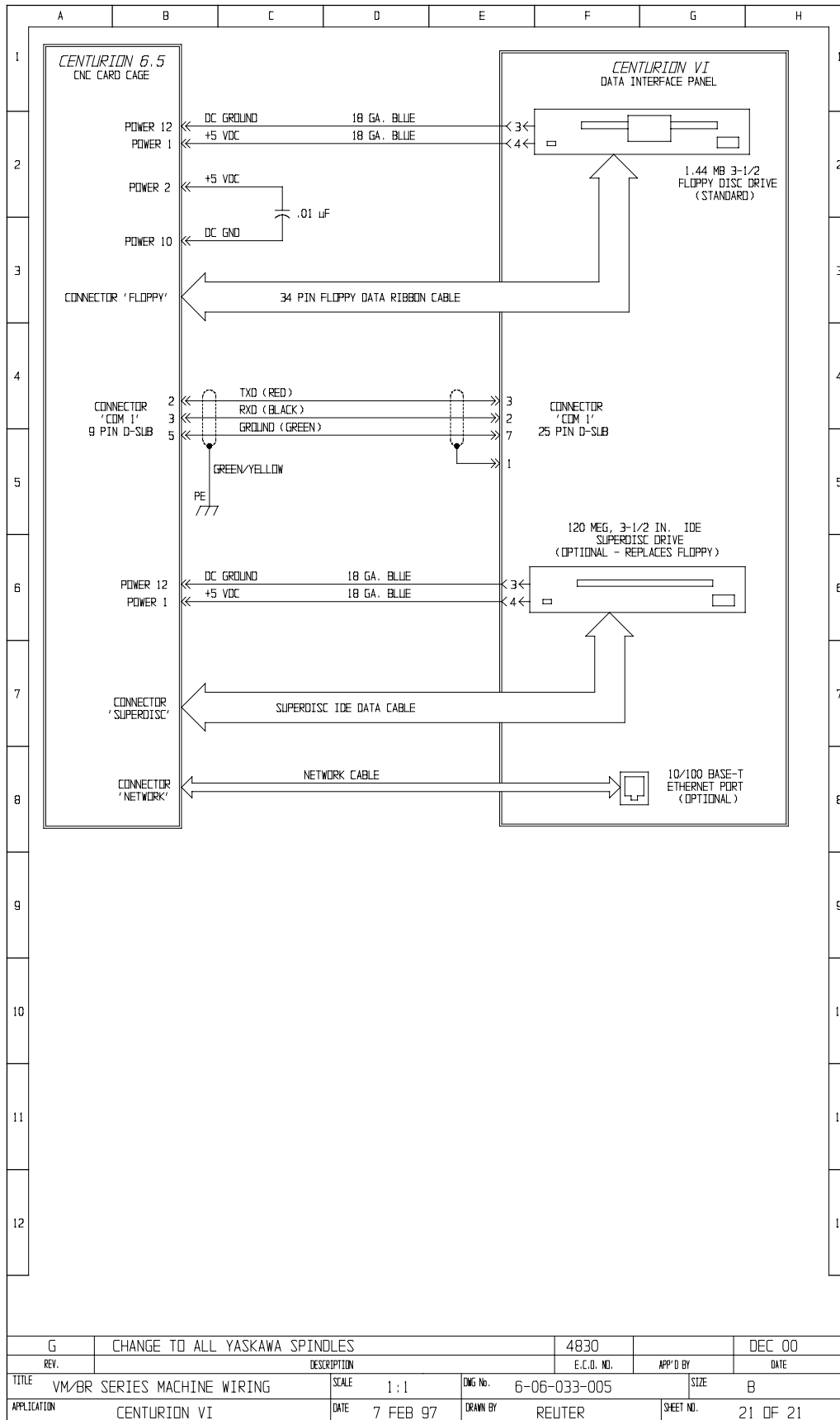












Remote Hand Controller Operation Notes

Remote Handwheel Option

The remote option is only available on a Cent6 mill with software version of CNC6.6121 or higher. The remote can be used to control the X, Y, Z, and A axes independently. The reason that an optional fifth axis cannot be cranked is that the remote uses the B-axis encoder channel for the input from the hand crank. Another stipulation on the remote working is that the optional dual handwheel must be disabled. To do this, the power parameters, 2nd and 3rd Handwheel Encoder Axis, must be set to zero.

On the remote are two four-position switches, one six-position switch, one momentary switch, a handwheel crank, an enable button and an E-Stop button. To enable the remote handwheel, the user must be in the handwheel mode and press the "Enable" button on the side of the box. With the remote enabled, the only buttons on the front panel that can be used are the Z-Tool button for setting tool length offsets and the ESC button to exit out of the handwheel mode.

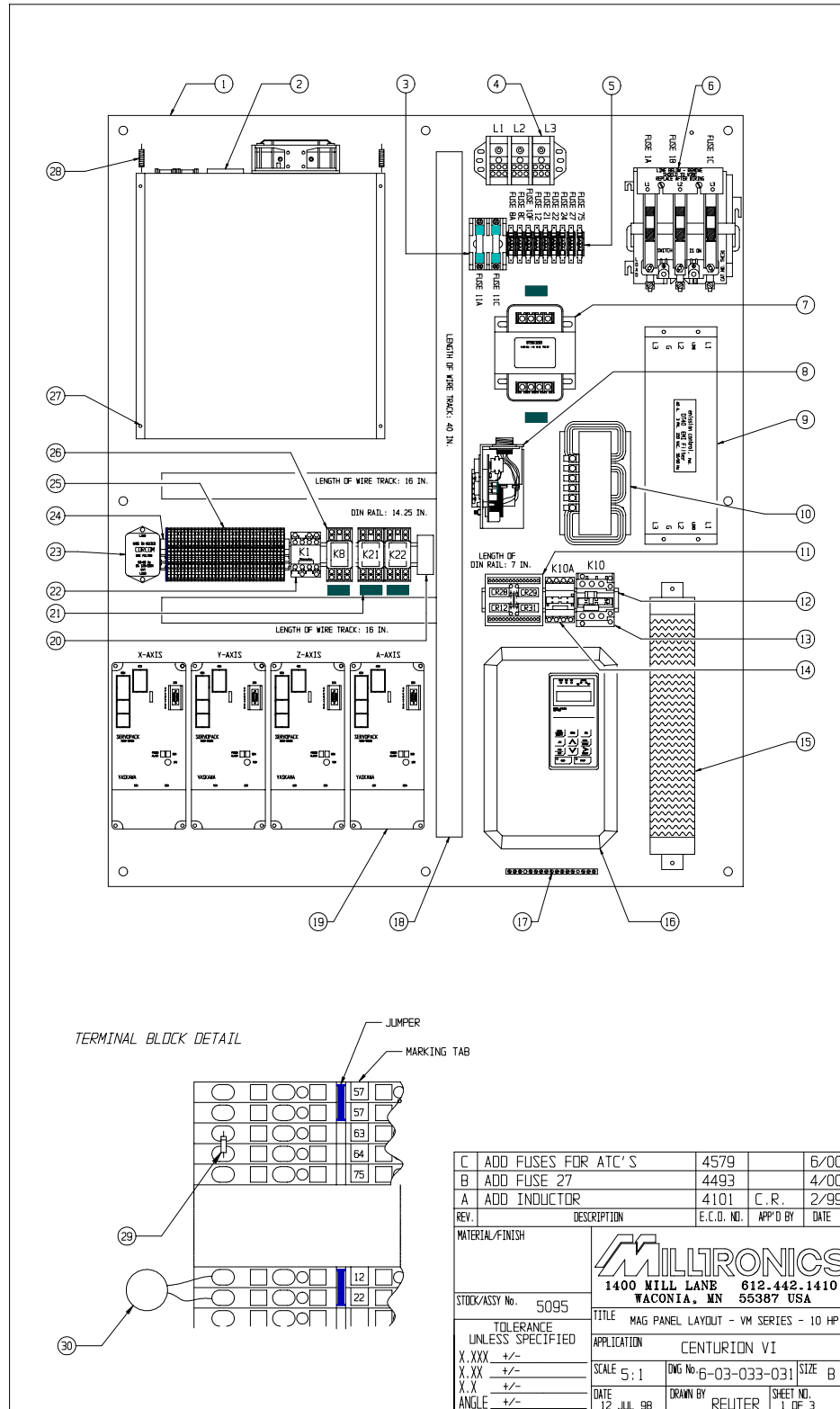
One of the four-position switches is used to select the axis to be cranked. To select the axis to crank, the user switches the "Axis select" switch until the desired axis is chosen. The selected axis will be the highlighted axis on the screen. As the switch is moved to a different axis, the control will update the screen accordingly. If the remote is enabled, the buttons on the front panel for changing the axis to crank are disabled. As stated earlier there are only four options available for axes to handwheel.

The other four-position switch is used to change the feedrate override. The options are 10, 20, 40, and 50%. As with the axis select, the feedrate override on the remote will lock out the feedrate override that is present on the front panel.

The six-position switch is used to change the work coordinate that the user wishes to set. With the six-position switch the user has six options for choosing the work coordinate system, G54-G59. Just like the axis select, the control will update the screen and display the coordinate system that the user selected with the remote handwheel.

The momentary switch is used for actually setting the work coordinate. When the user has found the position in the appropriate work coordinate system that is to be set to zero, the button for setting the work coordinate is to be pushed. To set the G54-X the axis select must be set to X. To then change the G54-Y, the axis select must be changed to Y followed by pressing the coordinate set switch. If there is an optional fourth axis, the axis select switch must be set to A, followed by pressing the coordinate set button. For precautionary purposes, an E-stop button has been placed on the side opposite the enable button.

Panel Layout



- PARTS LIST -

ITEM	STOCK No.	DESCRIPTION	QTY	HOW	REMARKS
1	PL-54	37 x 45 PLATED MAG PANEL 6-01-033-007	1	G	
2	7530	CENTURION VI CNC CARD CAGE	1		SEE ITEMS 27 & 28
3	FU-04	FUSE BLOCK, DOUBLE FRN-R SMALL	1	B	
	FU-33	FUSE, FRN-R-3, 3 AMP	2		FUSES 11A & 11C
4	TB-20	3-LINE DISTRIBUTION BLOCK	1	C	
	FU-09	FUSE CLIP, SINGLE MOL/MDA	8	A	
	FU-28	FUSE, 2 AMP MOL GLASS	3		FUSES 6A & 6C
	FU-01	FUSE, 5 AMP MOL GLASS	1 or 3		FUSE 12 AND FUSES 21 & 22 FOR 20 POCKET ATC
5	FU-48	FUSE, 1 AMP MOL GLASS	2 or 4		FUSES 24 & 75 AND FUSES 21 & 22 FOR SWING-ARM ATC
	SW-42	SWITCH, MAIN DISCONNECT	1	C	
6	FU-35	SWITCH FUSE CLIP KIT	1	G	
	FU-30	FUSE, FRN-R-30, 30 AMP	3		FUSES 1A, 1B, 1C
7	TR-14	TRANSFORMER, 0.5 VKA, 220-110 V, 50/60 Hz	1	E	
8	PS-36	REGULATED POWER SUPPLY, +24 VDC @ 3.6 AMPS	1	C	
9	MT-40	LINE FILTER, 220 VAC 3 PHASE, 40 AMP, 2-STAGE	0 or 1	E	FOR CE COMPLIANT MACHINES ONLY
10	1A-19	3-PHASE REACTOR, 25 AMP, 1.8 mH	0 or 1	E	FOR DOMESTIC/NON-CE MACHINES ONLY
11	9107	DIAD RELAY BOARD	1	H	
12	WX-167	7.5 x 35 mm DIN RAIL, 3 IN. PIECE	8	B	
	RL-67	CONTACTOR RELAY, DC COIL, 10 HP TELEMECANIQUE No. LP10D10	1	H	
13	RL-65	CONTACTOR NOISE SUPPRESSOR DIODE TELEMECANIQUE No. LA0DCLU	1	J	CONTACTOR K10
	RL-64	CONTACTOR RELAY, DC COIL, 5 HP TELEMECANIQUE No. LP10D10	1	H	
14	RL-65	CONTACTOR NOISE SUPPRESSOR DIODE TELEMECANIQUE No. LA0DCLU	1	J	CONTACTOR K10A
15	9547-1	RESISTOR, WIRE WOUND CERAMIC, 15 OHM - 1000 WATT	1	E	
16	PS-36	AC SPINDLE CONTROLLER, 10 HP YASKAWA G5U27P51	1	E	
17	BU-04	GROUNDING BUS BAR	1	G	
18	WC-65	WIRE DUCT, 2 x 2 IN.	72 IN.	B	
	WC-66	WIRE DUCT COVER, 2 IN.	72 IN.		
19	AM-43	AXIS DRIVE MODULE YASKAWA No. SCSB-10A0G		D	USED ON ALL AXIS OF VM16/17/24
	AM-53	AXIS DRIVE MODULE YASKAWA No. SCSB-15A0G		D	USED ON Z-AXIS OF VM25 & 30 ONLY
20	MD-72	ATC MOTOR CAPACITOR, 3.5 uF / 400 V	1	C	
21	MT-09	NOISE SUPPRESSOR, 600 VOLT	6	I	
	RL-68	CONTACTOR RELAY, DC COIL, 3 HP TELEMECANIQUE No. LP10D10	1	H	
22	RL-61	CONTACTOR AUXILIARY, 2-N/O, 2-N/C TELEMECANIQUE No. LA10K22	1	J	CONTACTOR K1
	RL-65	CONTACTOR NOISE SUPPRESSOR DIODE TELEMECANIQUE No. LA0DCLU	1	J	
23	MT-10	LINE FILTER, 110 VAC, 10 AMP	1	B	
24	TB-35	TERMINAL BLOCK END STOP	2	H	
	TB-30	TERMINAL BLOCK, 4-POSN., TOP ENTRY	.38	H	
25	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	
26	RL-48	CONTROL RELAY, +24 VDC COIL, 10 AMP, 3POT	3		RELAYS K8, K21 & K22
	RL-06	RELAY SOCKET BASE	3	H	
27	WX-129	RUBBER SHOCK MOUNT, 8-32 LINE M/F	4	M	
28	HD-63	CARD CAGE SPRING HANGER	2	N	
29	DI-20	DIODE, 1N4007	1	K	
30	CA-61	CAPACITOR, .1uF CERAMIC DISC	2	K	

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 RHCS WITH 1/4 LOCKWASHER FROM BOTTOM
 AND 1/4 LOCKWASHER AND 1/4-28 NUT ON TOP
 F - 1/4-28 x 1 INCH 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.

C	ADD FUSES FOR ATC'S	4579		6/00
B	ADD FUSE 27	4493		4/00
A	ADD INDUCTOR	4101	C.R.	2/99
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK/ASSY No. 5095				
TOLERANCE UNLESS SPECIFIED				
X.XXX	+/-			
X.XX	+/-			
X.X	+/-			
ANGLE	+/-			
TITLE		MAG PANEL LAYOUT - VM SERIES - 10 HP		
APPLICATION		CENTURION VI		
SCALE		1:1		
DATE		12 JUL 98		
DRAWN BY		REUTER		
SHEET NO.		2 OF 3		



- **TERMINAL BLOCK DIRECTORY** -
TERMINAL BLOCKS LISTED LEFT TO RIGHT

<TERMINAL BLOCK END STOP>
<TERMINAL BLOCK END PIECE>
1 (x3 JUMPED) 110 VAC LINE
2 (x4 JUMPED) 110 VAC RETURN
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
12 (x4 JUMPED), +24 VDC
13 SPARE M-FUNCTION, COMMON
14 SPARE M-FUNCTION, N/C
15 SPARE M-FUNCTION, N/O
20 (x2 JUMPED), +24 VDC SWITCHED
22 (x6 JUMPED), DC GROUND
51 SPINDLE MOTOR FAN
55 END-OF-CYCLE LAMP
57 (x2 JUMPED), 110 VAC SWITCHED
63 Z-AXIS BRAKE +
64 Z-AXIS BRAKE -
75 CHIP PAN WORK LAMPS
77 110 VAC AXIS WAYS OILER
78 AXIS LUBE FAULT
79 CNC WAIT CHANNEL
82 CHIP PAN DOOR OPEN/FEEDHOLD
83 SETUP BUTTON
91 WATCHDOG-SWITCHED +24 VDC
327 TOOL OUT REQUESTED
<TERMINAL BLOCK END STOP>

- **RELAY & CONTACTOR DIRECTORY** -

CONTACTORS

K1 MACHINE RESET
K10 SPINDLE ENABLE
K10A AXIS DRIVES ENABLE

CONTROL RELAYS

K8 FLOOD PUMP
K21 TOOL CAROUSEL CW
K22 TOOL CAROUSEL CCW

DRB RELAYS

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

- **FUSE DIRECTORY** -

FUSE 1A - MAIN DISCONNECT SWITCH L1 (30 AMP)
FUSE 1B - MAIN DISCONNECT SWITCH L2 (30 AMP)
FUSE 1C - MAIN DISCONNECT SWITCH L3 (30 AMP)
FUSE 8A - FLOOD PUMP, L1 (2 AMP)
FUSE 8C - FLOOD PUMP, L3 (2 AMP)
FUSE 10F - SPINDLE MOTOR FAN (1 AMP)
FUSE 11A - TRANSFORMER PRIMARY, L1 (3 AMP)
FUSE 11C - TRANSFORMER PRIMARY, L3 (3 AMP)
FUSE 12 - TRANSFORMER SECONDARY (5 AMP)
FUSE 21 - TOOL CAROUSEL CW
1 AMP FOR 20 POCKET
5 AMP FOR SWING-ARM
FUSE 22 - TOOL CAROUSEL CCW
1 AMP FOR 20 POCKET
5 AMP FOR SWING-ARM
FUSE 24 - +24 VDC POWER SUPPLY (1 AMP)
FUSE 27 - 110 VAC AXIS WAYS OILER (2 AMP)
FUSE 75 - CHIP PAN WORK LAMPS (1 AMP)

C	ADD FUSES FOR ATC'S	4579		6/00
B	ADD FUSE 27	4493		4/00
A	ADD INDUCTOR	4101	C.R.	2/99
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 612.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No. 5095				
TOLERANCE UNLESS SPECIFIED		TITLE MAG PANEL LAYOUT - VM SERIES - 10 HP		
X.XXX +/-		APPLICATION CENTURION VI		
X.XX +/-		SCALE 1:1	DWG No. 6-03-033-031	SIZE B
X.X +/-		DATE 12 JUL 98	DRAWN BY REUTER	SHEET NO. 3 OF 3
ANGLE +/-				

Yaskawa Varispeed-616G5 Spindle Drive Parameters

Parameters Modified For Toshiba 10 HP spindle motor

Set parameter A1-01 to 4 (parameter access level = advanced) to give you access to all the parameters.

PARAMETER	DESCRIPTION	VALUE	Units
B2-01	DC Injection Braking start frequency	10	Hz
B2-02	DC Injection Brake Current	100	%
B2-04	DC injection Brake at Stop	.25	sec
C1-01*	Acceleration Time 1	1.0	sec
C1-02*	Deceleration Time 1	3.0	sec
D1-09	Jog Frequency Reference (Creep)	1.50	Hz
E1-04	Maximum Output Frequency	180	Hz
E1-09	Minimum Output Frequency	1	Hz
E2-01	Full Load Current (FLA)	26.6	Amps
E2-02	Rated Slip	.8	Hz
E2-03	No Load Current	11.9	Amps
E2-05	Line-to-line Resistance	.36	Ohms
E2-06	Inductance Leakage	15.5	%
E2-07	Saturation Coefficient 1	.38	
E2-08	Saturation Coefficient 2	.58	
H2-02	Terminal 25 Select	2	(up-to-speed)
H2-03	Terminal 26 Select	1	(zero speed)
		5.25	
H4-01	Terminal 21 Select	3	(load meter)
		5.23	
L1-01	Motor OL Protection	0	(disabled)
L3-04	Deceleration Stall Prevent	0	(disabled)
L8-05	Input Open Phase Detection	1	(enabled)

* For single-phase operation, set both C1-01 and C1-02 to 6 seconds.

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.

Spindle Drive Parameter List For Yaskawa 616G5

Parameter	Function	Default
A1-00	Language Selection	0
A1-01	Parameter Access Level	2
A1-02	Control Method Selection	2
A1-03	Initialize Parameters	0000
A1-04	Enter Password	0000
B1-01	Reference Selection	1
B1-02	Operation Method Selection	1
B1-03	Stopping Method Selection	0
B1-04	Reverse Operation Prohibit	0
B1-05	Zero Speed Operation	0
B1-06	Logic Input Scan Rate	1
B1-07	Local/Remote Run Selection	0
B2-01	DC Injection Braking Start Frequency	.5
B2-02	DC Injection Braking Current	50
B2-03	DC Injection Braking Time at Start	0.00
B2-04	DC Injection Braking Time at Stop	0.00
B3-01	Speed Search Selection	0
B3-02	Speed Search Current	150
B3-03	Speed Search Deceleration Time	2.0
B4-01	Timer Function Timer ON-delay Time	0.0
B4-02	Timer Function Timer OFF-delay Time	0.0
B5-01	PID Control Mode Selection	0
B5-02	PID Proportional Gain	1.00
B5-03	PID Integral Time	1.0
B5-04	PID Integral Limit	100.0
B5-05	PID Differential Time	0.00
B5-06	PID Output Limit	100.0
B5-07	PID Offset Adjustment	0.0
B5-08	PID Primary Delay Time Constant	0.00
B6-01	Dwell Frequency at Start	0.0
B6-02	Dwell Time at Start	0.0
B6-03	Dwell Frequency at Stop	0.0
B6-04	Dwell Time at Stop	0.0
B7-01	Droop Control Gain	0.0
B7-02	Droop Control Delay Time	0.05
B8-01	Energy-Saving Gain	80
B8-02	Energy-Saving Frequency	0.0
B9-01	Zero-Servo Gain	5
B9-02	Zero-Servo Completion Width	10
C1-01	Acceleration Time 1	10.0
C1-02	Deceleration Time 1	10.0
C1-03	Acceleration Time 2	10.0
C1-04	Deceleration Time 2	10.0
C1-05	Acceleration Time 3	10.0
C1-06	Deceleration Time 3	10.0
C1-07	Acceleration Time 4	10.0

Parameter	Function	Default
C1-08	Deceleration Time 4	10.0
C1-09	Fast Stop Deceleration Time	10.0
C1-10	Accel/Decel Time Setting Unit	1
C1-11	Accel/Decel Time Switching Frequency	0.0
C2-01	S-Curve Characteristic at Accel. Start	0.20
C2-02	S-Curve Characteristic at Accel. End	0.20
C2-03	S-Curve Characteristic at Decel. Start	0.20
C2-04	S-Curve Characteristic at Decel. End	0.20
C3-01	Slip Compensation Gain	1.0
C3-02	Slip Compensation Primary Delay Time	200
C3-03	Slip Compensation Limit	200
C3-04	Slip Compensation Selection During recognition	0
C4-01	Torque Compensation Gain	1.00
C4-02	Torque Compensation Time Constant	20
C5-01	ASR Proportional Gain 1	20.00
C5-02	ASR Integral time 1	0.500
C5-03	ASR Proportional Gain 2	20.00
C5-04	ASR Integral time 2	0.500
C5-05	Automatic Speed Regulator, (ASR), Integral limit	5.0
C5-06	ASR Primary Delay Time	0.004
C5-07	ASR Switching Frequency	0.0
C6-01	Carrier Frequency Upper Limit	15.0
C6-02	Carrier Frequency Lower Limit	15.0
C6-03	Carrier Frequency Proportional Gain	0
C7-01	Hunting Prevention Selection	1
C7-02	Hunting Prevention Gain	1.00
C8-08	AFR Gain	1.00
C8-30	Carrier Frequency During Auto-tuning	0
D1-01	Frequency Reference 1	0.00
D1-02	Frequency Reference 2	0.00
D1-03	Frequency Reference 3	0.00
D1-04	Frequency Reference 4	0.00
D1-05	Frequency Reference 5	0.00
D1-06	Frequency Reference 6	0.00
D1-07	Frequency Reference 7	0.00
D1-08	Frequency Reference 8	0.00
D1-09	Jog Frequency Reference	6.00
D2-01	Frequency Reference Upper Limit	100.0
D2-02	Frequency Reference Lower Limit	0.0
D3-01	Critical Frequency Rejection 1	0.0
D3-02	Critical Frequency Rejection 2	0.0
D3-03	Critical Frequency Rejection 3	0.0
D3-04	Critical Frequency Rejection Width	1.0
D4-01	Frequency Reference Hold Function Selection	0
D4-02	+/- Speed Limits	10

Parameter	Function	Default
D5-01	Torque Control Selection	0
D5-02	Torque Reference Delay Time	0
D5-03	Speed Limit Selection	1
D5-04	Speed Limit	0
D5-05	Speed Limit Bias	10
D5-06	Speed/Torque Control Switching Timer	0
E1-01	Input Voltage Setting	230
E1-02	Motor Selection	0
E1-03	V/f Pattern Selection	F
E1-04	Maximum Output Frequency	60.0
E1-05	Maximum Voltage	230.0
E1-06	Base Frequency	60.0
E1-07	Mid. Output Frequency A	0.0
E1-08	Mid. Output Voltage A	0.0
E1-09	Minimum Output Frequency	0.5
E1-10	Minimum Output Voltage	0.0
E1-11	Mid. Output Frequency B	0.0
E1-12	Mid. Output Voltage B	0.0
E1-13	Base Voltage	0.0
E2-01	Motor Rated Current	19.60
E2-02	Motor Rated Slip	1.50
E2-03	Motor No-load Current	5.10
E2-04	Number of Motor Poles	4
E2-05	Motor Line-to-line Resistance	.399
E2-06	Motor Leakage Inductance	18.2
E2-07	Motor Iron Core Saturation Coefficient 1	0.50
E2-08	Motor Iron Core Saturation Coefficient 2	0.75
E2-09	Motor Mechanical Loss	0.0
F1-01	Encoder (PG) Constant	1024
F1-02	Operation Selection at PG Open Circuit	1
F1-03	Operation Selection at Over speed	1
F1-04	Operation Selection at Speed Deviation	3
F1-05	PG Rotation	0
F1-06	PG Division Rate (PG Pulse Monitor)	1
F1-07	Integral Value During Accel/Decel Selection	0
F1-08	Over speed Detection Level	115
F1-09	Over speed Detection Delay Time	0.0
F1-10	Excessive Speed Deviation Detection Level	10
F1-11	Excessive Speed Deviation Detection Delay Time	0.5
F1-12	Number of PG Gear Teeth 1	0
F1-13	Number of PG Gear Teeth 2	0
F1-14	PGo Detect Time	2.0
F2-01	AI-14 Bi-Polar or Uni-Polar Input Selection	0
F3-01	DI-16 Digital Input Option	0
F4-01	AO-08 / AO-12 Channel 1 Monitor Selection	2
F4-02	AO-08 / AO-12 Channel 1 Gain	1.00
F4-03	AO-08 / AO-12 Channel 2 Monitor Selection	3
F4-04	AO-08 / AO-12 Channel 2 Gain	0.50

Parameter	Function	Default
F5-01	DO-02 Channel 1 Output Selection	0
F5-02	DO-02 Channel 2 Output Selection	1
F6-01	DO-08 Output Mode Selection	0
F7-01	PO-36F Frequency Multiple Selection	1
H1-01	Multi-Function Input Terminal 3	24
H1-02	Multi-Function Input Terminal 4	14
H1-03	Multi-Function Input Terminal 5	3
H1-04	Multi-Function Input Terminal 6	4
H1-05	Multi-Function Input Terminal 7	6
H1-06	Multi-Function Input Terminal 8	8
H2-01	Multi-Function Output Terminal 9 & 10	0
H2-02	Multi-Function Output Terminal 25-27	1
H2-03	Multi-Function Output Terminal 26-27	2
H3-01	Auto Speed Reference Signal Level Selection Terminal 13	0
H3-02	Auto Speed Reference Signal Gain Terminal 13	100.0
H3-03	Auto Speed Reference Signal Bias Terminal 13	0.0
H3-04	Multi-Function Analog Input 1 Signal Level Selection Terminal 16	0
H3-05	Multi-Function Analog Input 1 Selection Terminal 16	0
H3-06	Multi-Function Analog Input 1 Gain Terminal 16	100.0
H3-07	Multi-Function Analog Input 1 Bias Terminal 16	0.0
H3-08	Multi-Function Analog Input 2 Signal Level Selection Terminal 14	2
H3-09	Multi-Function Analog Input 2 Selection Terminal 14	1F
H3-10	Multi-Function Analog Input 2 Gain Terminal 14	100.0
H3-11	Multi-Function Analog Input 2 Bias Terminal 14	0.0
H3-12	Analog Input Filter Time Constant	0.000
H4-01	Multi-Function Analog Monitor 1 Selection Terminal 21	2
H4-02	Multi-Function Analog Monitor 1 Gain Terminal 21	1.00
H4-03	Multi-Function Analog Monitor 1 Bias Terminal 21	0.0
H4-04	Multi-Function Analog Monitor 2 Selection Terminal 23	3
H4-05	Multi-Function Analog Monitor 2 Gain Terminal 23	0.50
H4-06	Multi-Function Analog Monitor 2 Bias Terminal 23	0.0
H4-07	Multi-Function Analog Monitor Signal Level Selection Terminal 21 & 23	0

Parameter	Function	Default
H5-01	Serial Comm. Station Address	1F
H5-02	Serial Comm. Baud Rate	3
H5-03	Serial Comm. Parity Rate	0
H5-04	Stopping Method After Serial Comm. Error	3
H5-05	Serial Comm. Error Detection	1
L1-01	Motor Overload Protection Selection	0
L1-02	Motor Overload Protection Time constant	1.0
L2-01	Momentary Power Loss Detection Selection	0
L2-02	Momentary Power Loss Ride-Thru Time	2.0
L2-03	Momentary Power Loss Min. Base Block Time	0.7
L2-04	Momentary Power Loss Recovery Ramp Time	0.3
L2-05	Under voltage Detection Level	190
L2-06	KEB Frequency	0.0
L3-01	Stall Prevention Selection During Accel	1
L3-02	Stall Prevention Level During Accel	150
L3-03	Stall Prevention Limit During Accel (CHP)	100
L3-04	Stall Prevention Selection During Decel	1
L3-05	Stall Prevention Selection During Running	1
L3-06	Stall Prevention Level During Running	160
L4-01	Speed Coincidence Frequency	0.0
L4-02	Speed Coincidence Width	2.0
L4-03	Speed Coincidence Frequency (+/-)	0.0
L4-04	Speed Coincidence Width (+/-)	2.0
L4-05	Frequency Reference Loss Detection	0
L5-01	Number of Auto Restart Attempts	0
L5-02	Auto Restart Operation Selection	0
L6-01	Torque Detection Selection 1	0
L6-02	Torque Detection Level 1	150
L6-03	Torque Detection Time 1	0.1
L6-04	Torque Detection Selection 2	0
L6-05	Torque Detection Level 2	150
L6-06	Torque Detection Time 2	0.1
L7-01	Forward Torque Limit	200
L7-02	Reverse Torque Limit	200
L7-03	Forward Regenerative Torque Limit	200
L7-04	Reverse Regenerative Torque Limit	200
L8-01	Internal Dynamic Braking Resistor Protection	0
L8-02	Overheat Protection Alarm Level	95
L8-03	Operation Selection After Overheat Pre-alarm	3
L8-05	Input Open-phase Protection Selection	0
L8-07	Output Open-phase Protection Selection	0
o1-01	Monitor Selection	6
o1-02	Monitor Selection After Power-up	1
o1-03	Digital Operator Display Selection	0
o1-04	Digital Operator Display Units	0
o1-05	Parameter Address Display Selection	0

Parameter	Function	Default
o2-01	LOCAL/REMOTE Key Selection	1
o2-02	STOP Key Function During Remote Run	1
o2-03	User Parameter Default Value	0
o2-04	kVA Selection (Drive Model Number)	5
o2-05	Digital Operator "Motor Operated Pot"	0
o2-06	Operation Selection When Digital Operator is Disconnected	1
o2-07	Elapsed Operating Hour Timer Set	0
o2-08	Elapsed Operating Hour Timer Selection	0
o2-09	Initial Mode Selection	1
U1-01	Frequency Reference	
U1-02	Output Frequency	
U1-03	Output Current	
U1-04	Control Method	
U1-05	Motor Speed	
U1-06	Output Voltage	
U1-07	DC Bus Voltage	
U1-08	Output Power	
U1-09	Torque Reference	
U1-10	Input Terminal Status	
U1-11	Output Terminal Status	
U1-12	Operation Status	
U1-13	Elapsed Operation Time	
U1-14	Software Version (Flash I.D. No.)	
U1-15	Control Circuit Terminal 13 Input Voltage	
U1-16	Control Circuit Terminal 14 Input Voltage	
U1-17	Control Circuit Terminal 16 Input Voltage	
U1-18	Motor Secondary Current (Iq)	
U1-19	Motor Exciting Current	
U1-20	Output Frequency After Soft-start	
U1-21	Automatic Speed Regulator Input	
U1-22	Automatic Speed Regulator Output	
U1-23	Speed Deviation Regulator Input	
U1-24	PID Feedback Amount	
U1-25	DI-16H Input Status	
U1-26	Output Voltage Reference (Vq)	
U1-27	Output Voltage Reference (Vd)	
U1-28	Software Number (CPU I.D. No.)	
U1-32	ACR (q-Axis) Output	
U1-33	ACR (d-Axis) Output	
U1-34	OPE Detected	
U2-01	Current Fault	
U2-02	Last Fault	
U2-03	Frequency Reference	
U2-04	Output Frequency	
U2-05	Output Current	
U2-06	Motor Speed	
U2-07	Output Voltage	
U2-08	DC Bus Voltage	
U2-09	Output Kilowatts	
U2-10	Torque Reference	
U2-11	Input Terminal Status	
U2-12	Output Terminal Status	

Parameter	Function	Default
U2-13	Inverter Status	
U2-14	Elapsed Time	
U3-01	Last Fault	
U3-02	Fault Message 2	
U3-03	Fault Message 3	
U3-04	Fault Message 4	
U3-05	Elapsed Time 1	
U3-06	Elapsed Time 2	
U3-07	Elapsed Time 3	
U3-08	Elapsed Time 4	

Yaskawa Axis Drive Parameters
Partner VM17 All Drives Model SGDB-10ADG

X-Axis	Y-Axis	Z-Axis
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0000H	Cn-02=0001H	Cn-02=0001H
Cn-03=00328	Cn-03=00328	Cn-03=00328
Cn-04=00028	Cn-04=00030	Cn-04=00028
Cn-05=00500	Cn-05=00500	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01250	Cn-0A=01250	Cn-0A=01250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00800	Cn-0C=00200	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00034	Cn-13=00034	Cn-13=00030
Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00020	Cn-17=00020	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00143	Cn-2A=00143	Cn-2A=00143
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Partner VM24 All Drives Model SGDB-10ADG

X-Axis	Y-Axis	Z-Axis
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0000H	Cn-02=0001H	Cn-02=0001H
Cn-03=00328	Cn-03=00328	Cn-03=00328
Cn-04=00030	Cn-04=00035	Cn-04=00028
Cn-05=00500	Cn-05=00500	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01250	Cn-0A=01250	Cn-0A=01250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00200	Cn-0C=00200	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00030	Cn-13=00030	Cn-13=00030
Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00020	Cn-17=00020	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00143	Cn-2A=00143	Cn-2A=00143
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Partner VM25 All Drives Model SGDB-15ADG

X-Axis	Y-Axis	Z-Axis
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0200H	Cn-02=0001H	Cn-02=0001H
Cn-03=00328	Cn-03=00328	Cn-03=00328
Cn-04=00030	Cn-04=00035	Cn-04=00028
Cn-05=00400	Cn-05=00500	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01250	Cn-0A=01250	Cn-0A=01250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00200	Cn-0C=00200	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00030	Cn-13=00030	Cn-13=00034
Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00013	Cn-17=00020	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00144	Cn-2A=00144	Cn-2A=00144
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Partner VM30b&c All Drives Model SGDB-10ADG

X-Axis	Y-Axis	Z-Axis
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0000H	Cn-02=0001H	Cn-02=0001H
Cn-03=00328	Cn-03=00328	Cn-03=00328
Cn-04=00030	Cn-04=00035	Cn-04=00028
Cn-05=00500	Cn-05=00500	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01250	Cn-0A=01250	Cn-0A=01250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00200	Cn-0C=00200	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00030	Cn-13=00030	Cn-13=00030
Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00020	Cn-17=00020	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00143	Cn-2A=00143	Cn-2A=00143
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Partner VM30d&e All Drives Model SGDB-15ADG

X-Axis	Y-Axis	Z-Axis
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0200H	Cn-02=0001H	Cn-02=0001H
Cn-03=00328	Cn-03=00328	Cn-03=00328
Cn-04=00030	Cn-04=00035	Cn-04=00028
Cn-05=00400	Cn-05=00500	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01250	Cn-0A=01250	Cn-0A=01250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00200	Cn-0C=00200	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00030	Cn-13=00030	Cn-13=00034
Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00013	Cn-17=00020	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00144	Cn-2A=00144	Cn-2A=00144
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Yaskawa Axis Drive Parameters for Troyke Indexers

6 in.	9 in.	10 in.	20 in.
Cn-01=008CH	Cn-01=008CH	Cn-01=008CH	Cn-01=008CH
Cn-02=0001H	Cn-02=0001H	Cn-02=0001H	Cn-02=0000H
Cn-03=00408	Cn-03=00409	Cn-03=00818	Cn-03=00819
Cn-04=00028	Cn-04=00028	Cn-04=00028	Cn-04=00028
Cn-05=02000	Cn-05=02000	Cn-05=02000	Cn-05=02000
Cn-06=00800	Cn-06=00800	Cn-06=00800	Cn-06=00800
Cn-07=00000	Cn-07=00000	Cn-07=00000	Cn-07=00000
Cn-08=00800	Cn-08=00800	Cn-08=00800	Cn-08=00800
Cn-09=00800	Cn-09=00800	Cn-09=00800	Cn-09=00800
Cn-0A=01000	Cn-0A=00500	Cn-0A=00500	Cn-0A=00250
Cn-0B=00020	Cn-0B=00020	Cn-0B=00020	Cn-0B=00020
Cn-0C=00800	Cn-0C=00800	Cn-0C=00800	Cn-0C=00800
Cn-0D=00000	Cn-0D=00000	Cn-0D=00000	Cn-0D=00000
Cn-0E=00000	Cn-0E=00000	Cn-0E=00000	Cn-0E=00000
Cn-0F=00000	Cn-0F=00000	Cn-0F=00000	Cn-0F=00000
Cn-10=00100	Cn-10=00100	Cn-10=00100	Cn-10=00100
Cn-11=08192	Cn-11=08192	Cn-11=08192	Cn-11=08192
Cn-12=00050	Cn-12=00050	Cn-12=00050	Cn-12=00050
Cn-13=00034	Cn-13=00034	Cn-13=00034	Cn-13=00034
Cn-14=10000	Cn-14=10000	Cn-14=10000	Cn-14=10000
Cn-15=03000	Cn-15=03000	Cn-15=03000	Cn-15=03000
Cn-16=00010	Cn-16=00010	Cn-16=00010	Cn-16=00010
Cn-17=00030	Cn-17=00030	Cn-17=00030	Cn-17=00030
Cn-18=00100	Cn-18=00100	Cn-18=00100	Cn-18=00100
Cn-19=00100	Cn-19=00100	Cn-19=00100	Cn-19=00100
Cn-1A=00028	Cn-1A=00028	Cn-1A=00028	Cn-1A=00028
Cn-1B=00007	Cn-1B=00007	Cn-1B=00007	Cn-1B=00007
Cn-1C=00000	Cn-1C=00000	Cn-1C=00000	Cn-1C=00000
Cn-1D=00000	Cn-1D=00000	Cn-1D=00000	Cn-1D=00000
Cn-1E=01024	Cn-1E=01024	Cn-1E=01024	Cn-1E=01024
Cn-1F=00100	Cn-1F=00100	Cn-1F=00100	Cn-1F=00100
Cn-20=00200	Cn-20=00200	Cn-20=00200	Cn-20=00200
Cn-21=00300	Cn-21=00300	Cn-21=00300	Cn-21=00300
Cn-22=00006	Cn-22=00006	Cn-22=00006	Cn-22=00006
Cn-23=00000	Cn-23=00000	Cn-23=00000	Cn-23=00000
Cn-24=00004	Cn-24=00004	Cn-24=00004	Cn-24=00004
Cn-25=00001	Cn-25=00001	Cn-25=00001	Cn-25=00001
Cn-26=00000	Cn-26=00000	Cn-26=00000	Cn-26=00000
Cn-27=00000	Cn-27=00000	Cn-27=00000	Cn-27=00000
Cn-28=00000	Cn-28=00000	Cn-28=00000	Cn-28=00000
Cn-29=00002	Cn-29=00002	Cn-29=00002	Cn-29=00002
Cn-2A=00143	Cn-2A=00143	Cn-2A=00143	Cn-2A=00143
Cn-2B=00000	Cn-2B=00000	Cn-2B=00000	Cn-2B=00000
Cn-2C=52500	Cn-2C=52500	Cn-2C=52500	Cn-2C=52500
Cn-2D=00410	Cn-2D=00410	Cn-2D=00410	Cn-2D=00410

Card Cage Gain Setting Procedure

Note: Perform only at the advice of a factory representative.

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

Note: Perform only at the advise of a factory representative.

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. $10,000/500 \times 0.050$).
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. $800/100 \times .050 = .400$).

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

Centurion 6 CNC Connector Signal Listing

Issued 7 June 1999

Connector X-Input

- | | |
|---|--|
| Pin 1 - Machine is emergency stopped
Pin 2 - Drawbar off (RW20 only)
Pin 3 - Drawbar on (RW20 only)
Pin 4 - Spindle up-to-speed
Pin 5 - Tool change

Pin 6 - Lube fault (oiler empty)
Pin 7 - CNC wait channel | Pin 8 - Spindle zero speed
Pin 9 - Spindle drive fault
Pin 10 - Spindle reverse
Pin 11 - Digitizing probe signal
Pin 12 - Key/Home (jumped to Home-1 and X-axis10)
Pin 13 - No connect
Pin 14 - No connect |
|---|--|

Connector Y-Input

- | | |
|--|--|
| Pin 1 - Air pressure
Pin 2 - Tool carousel at home (jumped to TCH-8)
Pin 3 - Tool carousel at pocket (jumped to TCH-9)
Pin 4 - Tool changer arm is in (jumped to TCH-10)
Or tool pot down on arm-type ATC's
Pin 5 - Tool changer arm is out (jumped to TCH-11)
Or tool pot up on arm-type ATC's
Pin 6 - Spare
Pin 7 - Orient roller is in - prox signal (jumped to TCH-12) | Pin 8 - Tool out switch pushed - (requested)
Pin 9 - Chip pan door is open (feedhold)
Pin 10 - Set-up button
Pin 11 - Edit switch (keylock)

Pin 12 - Key/Home (jumped to Home-3)

Pin 13 - No connect
Pin 14 - No connect |
|--|--|

Connector Z-input

- | | |
|---|--|
| Pin 1 - Remote handwheel enable
Pin 2 - Remote feedrate override 1
Pin 3 - Remote feedrate override 2
Pin 4 - Pentium CPU over temp
Pin 5 - Arm tool changer top prox
Pin 6 - Arm tool changer middle prox
Pin 7 - Arm tool changer bottom prox | Pin 8 - Tool setter
Pin 9 - High/Low gear (for backgear heads)
Pin 10 - Arm parked
Pin 11 - Auger switch
Pin 12 - Key (jumped to home 5 and Z-axis 10)
Pin 13 - No connect
Pin 14 - No connect |
|---|--|

Connector A-Input

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

Connector X-Output

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

Connector Y-Output

- | | |
|---------------------|--|
| Pin 1 - Creep speed | Pin 8 - Blowoff/Drumdoor/FeedHold (jumped to TCH-Yin9) |
|---------------------|--|

Centurion 6 CNC Connector Signal Listing

Issued 7 June 1999

- | | |
|---|---|
| Pin 2 - Tool changer arm in (jumped to TCH-1)
Or tool pot down on arm-type ATC's
Pin 3 - Power drawbar (jumped to TCH-2)
Pin 4 - Tool carousel clockwise (jumped to TCH-3)
Pin 5 - Tool carousel counter clockwise (jumped to TCH-4)
Pin 6 - Spindle enable
Pin 7 - Orient roller (jumped to TCH-5) | Pin 9 - Gear 1 of 4 gear

Pin 10 - Low range - gear 2 of 4
Pin 11 - Medium range - gear 3 of 4
Pin 12 - High range - gear 4 of 4
Pin 13 - Key
Pin 14 - No connect |
|---|---|

Connector Z-Output

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

Connector A-Output

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

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

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

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

- | | | |
|--|--|--|
| Pin 1 - 0 VDC
Pin 2 - 0 VDC
Pin 5 - Axis analog signal
Pin 6 - 0 VDC
Pin 10 - 0 VDC
Pin 19 - Marker + | Pin 20 - Marker -
Pin 29 - Servo ready
Pin 30 - 0 VDC
Pin 31 - Alarm output
Pin 32 - 0 VDC
Pin 33 - Channel A + | Pin 34 - Channel A -
Pin 35 - Channel B +
Pin 36 - Channel B -
Pin 40 - Servo ON
Pin 47 - +24 VDC
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
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

Connector "Power"

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	

LCD Power Connector J2A on keyboard encoder card

Pin 1 - DC ground	Pin 8 - +24 VDC
Pin 2 - DC ground	Pin 9 - +12 VDC
Pin 3 - DC ground	Pin 10 - +24 VDC switched
Pin 4 - +24 VDC	Pin 11 - DC ground
Pin 5 - +12 VDC	Pin 12 - +24 VDC
Pin 6 - +24 VDC switched	Pin 13 - Key
Pin 7 - DC ground	Pin 14 - +24 VDC switched

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	

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 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
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

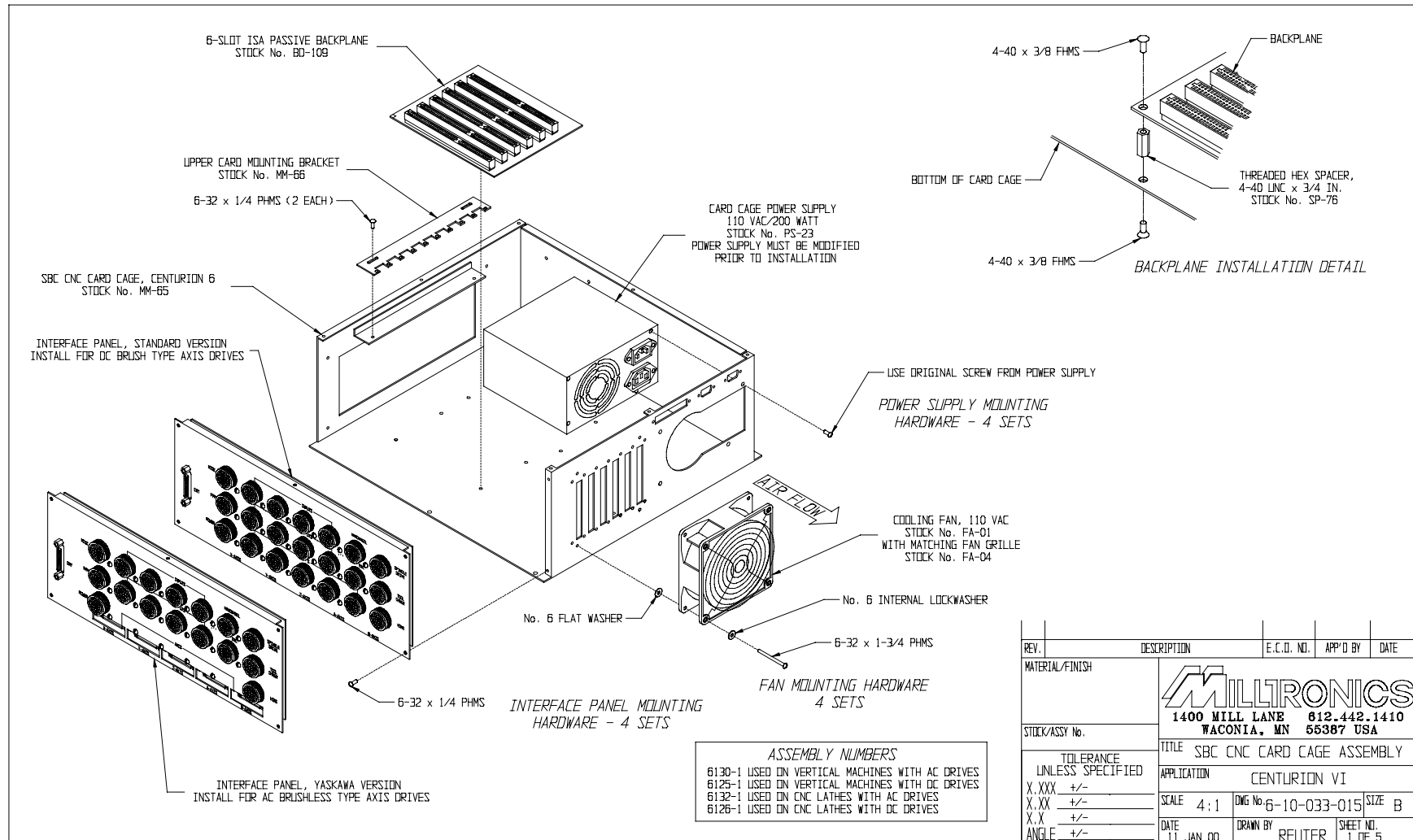
Connector on +24 VDC Regulated Power Supply

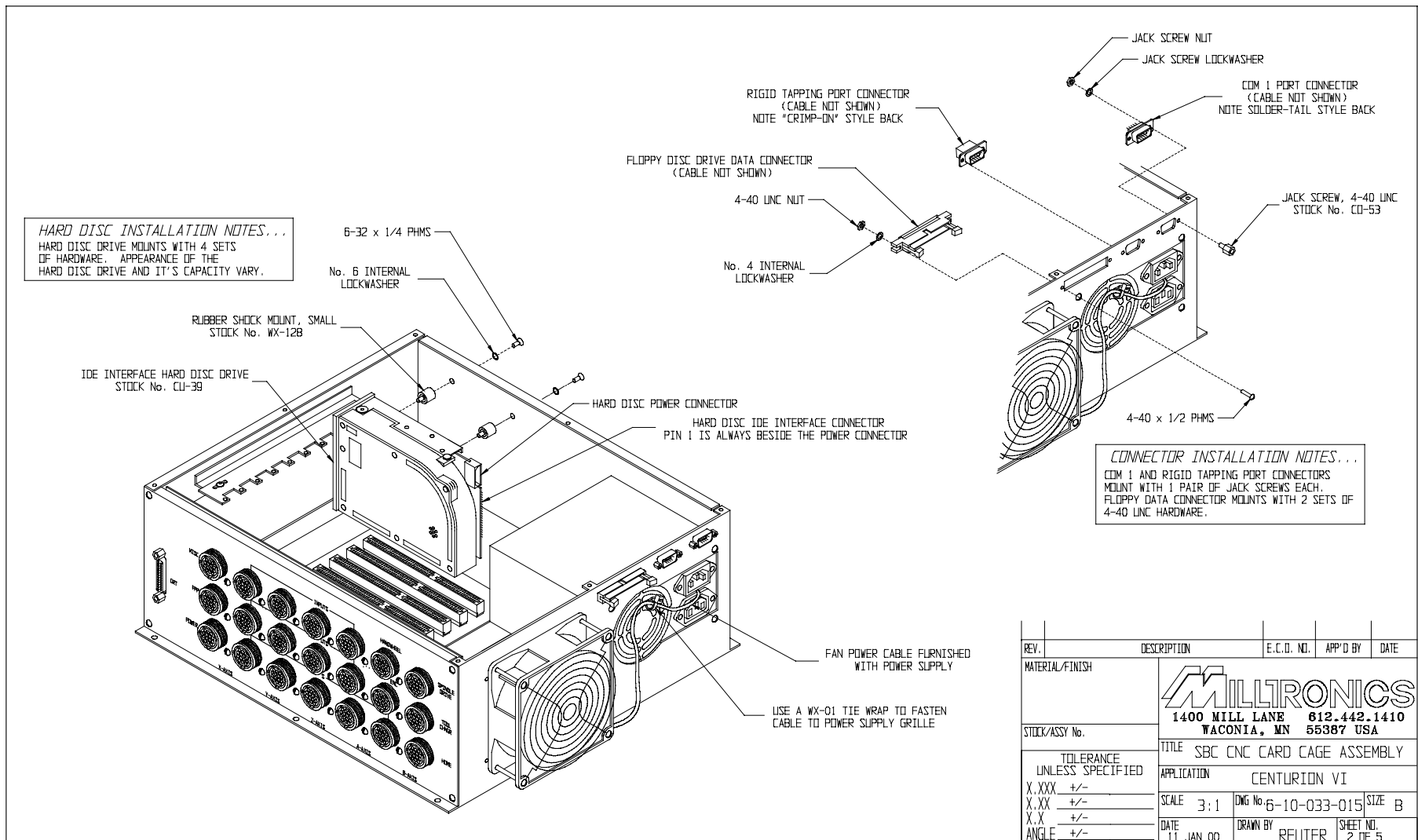
Pin 1 - 110 VAC line	Pin 8 - No connect
Pin 2 - 110 VAC return	Pin 9 - No connect
Pin 3 - No connect	Pin 10 - No connect
Pin 4 - +24 VDC	Pin 11 - DC ground
Pin 5 - +24 VDC	Pin 12 - DC ground
Pin 6 - Key	Pin 13 - DC ground
Pin 7 - No connect	Pin 14 - DC ground

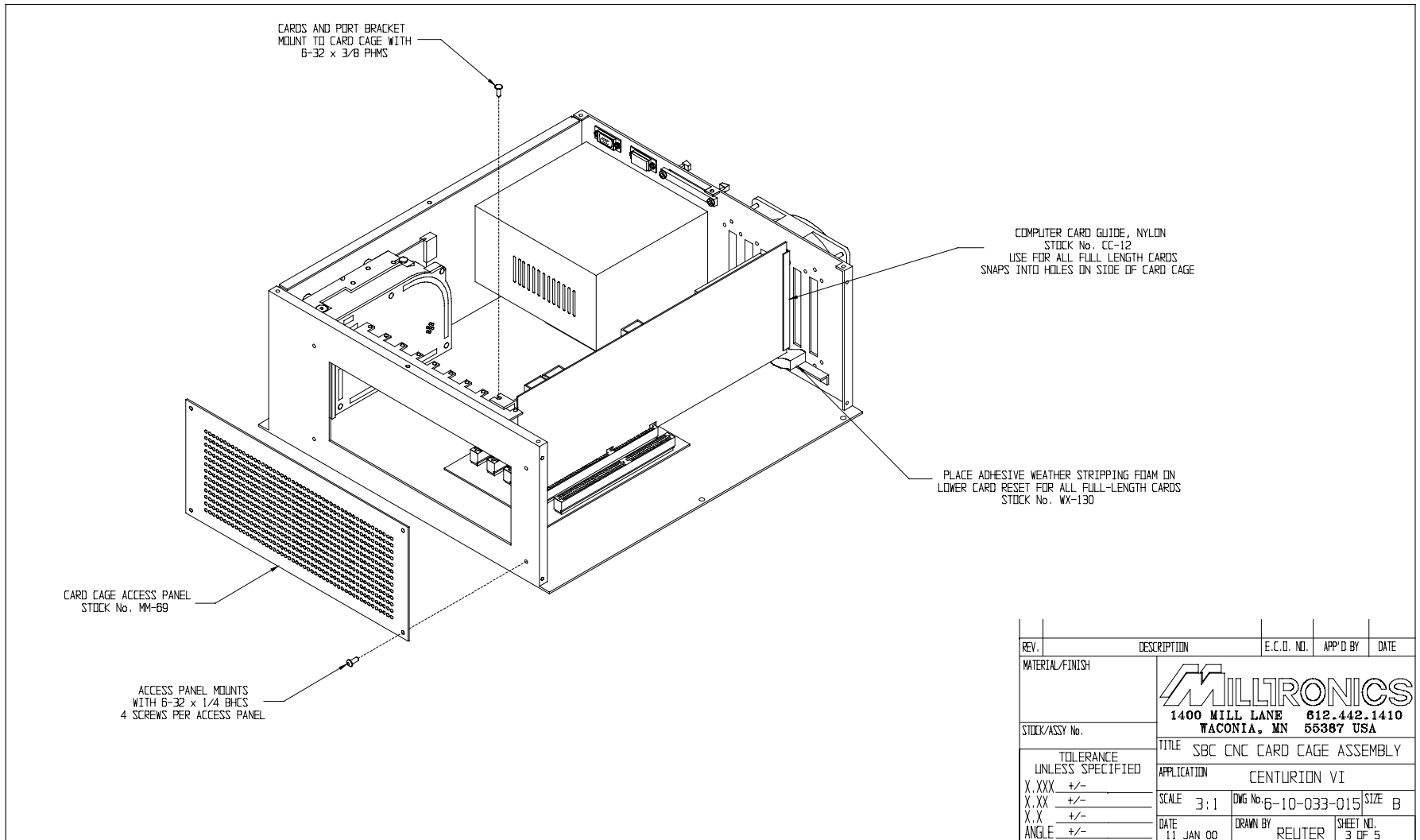
Connector COM1 (on Mag Panel)

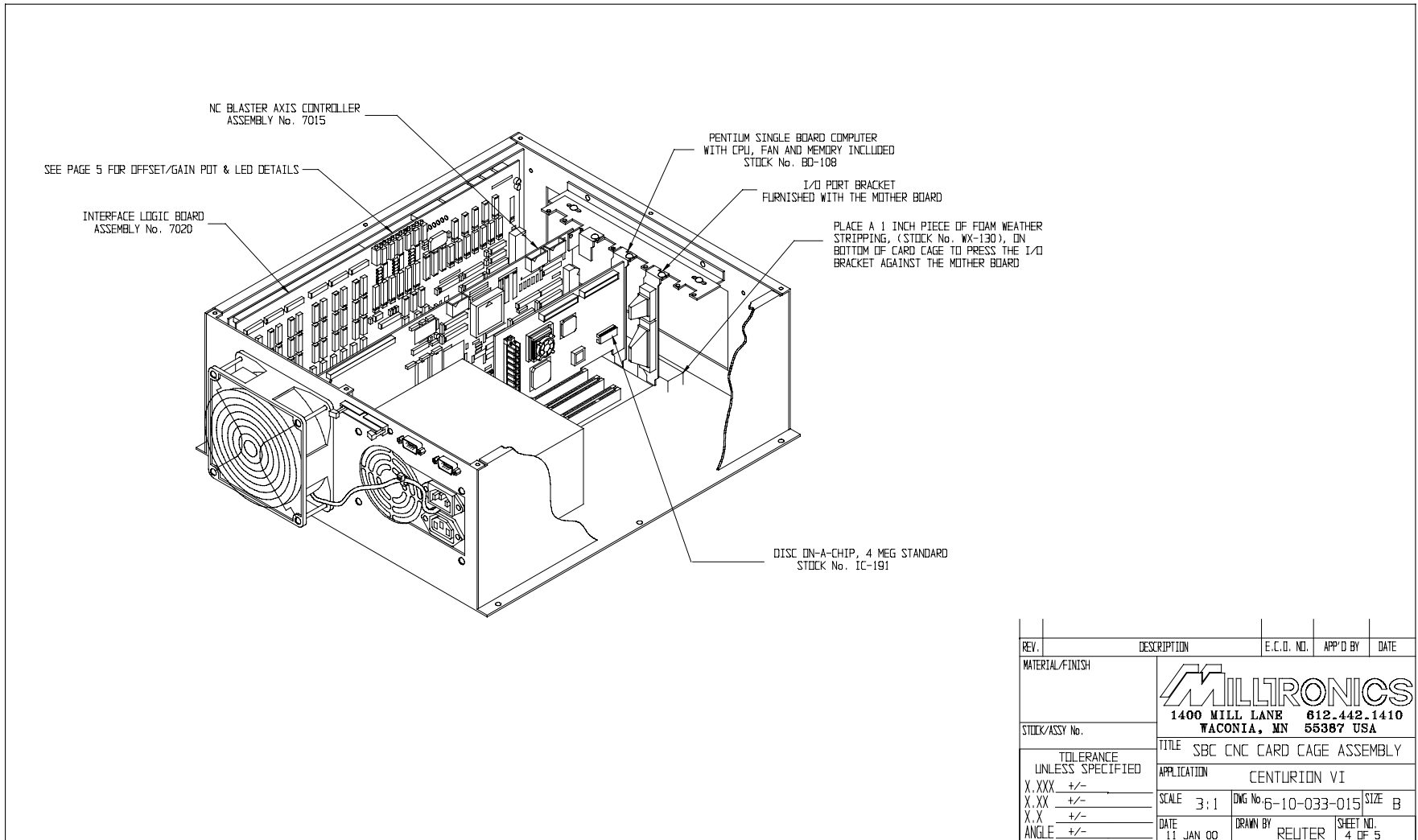
Pin 2 - RXD
Pin 3 - TXD
Pin 7 - Ground
All other pins no connect

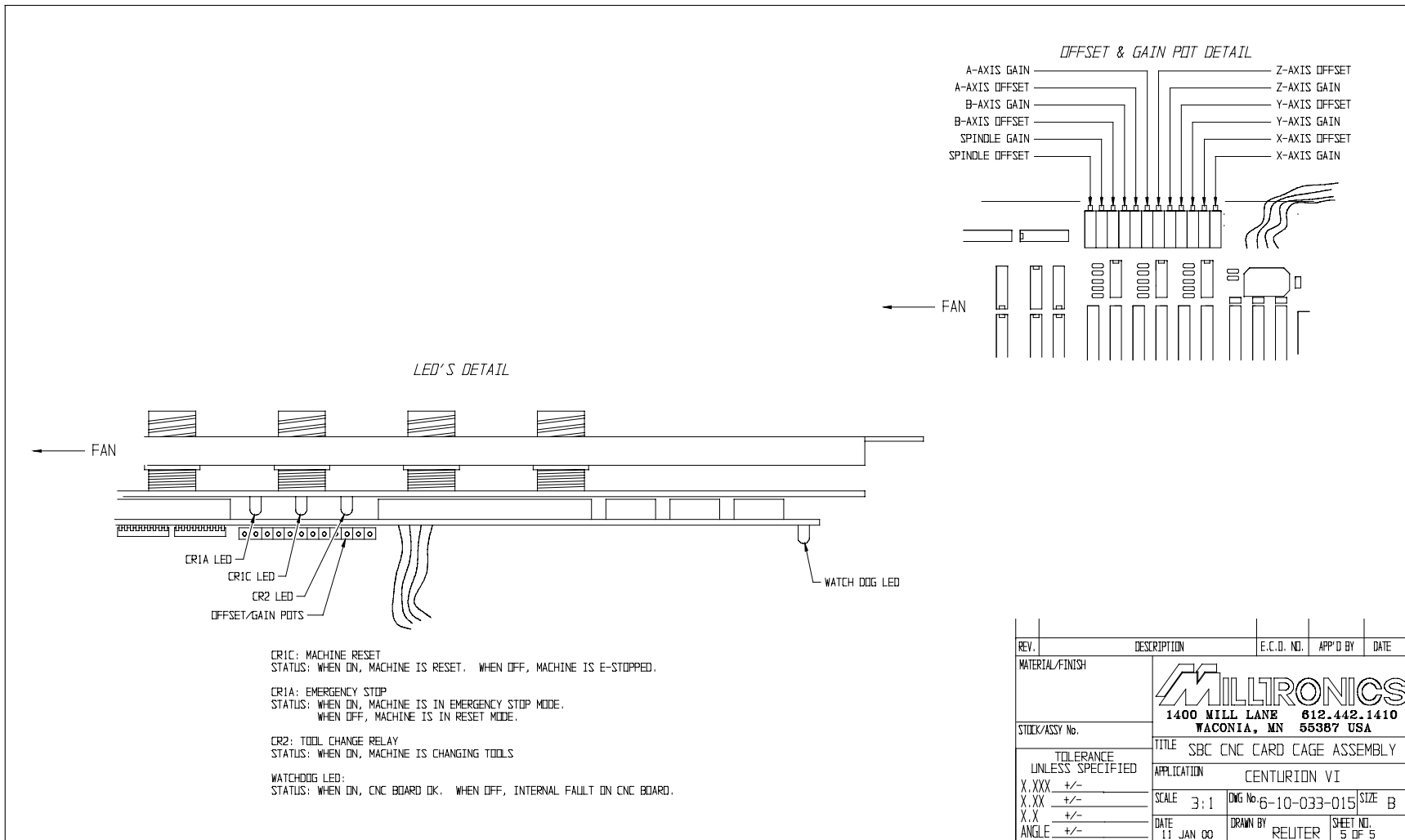
Card Cage Assembly





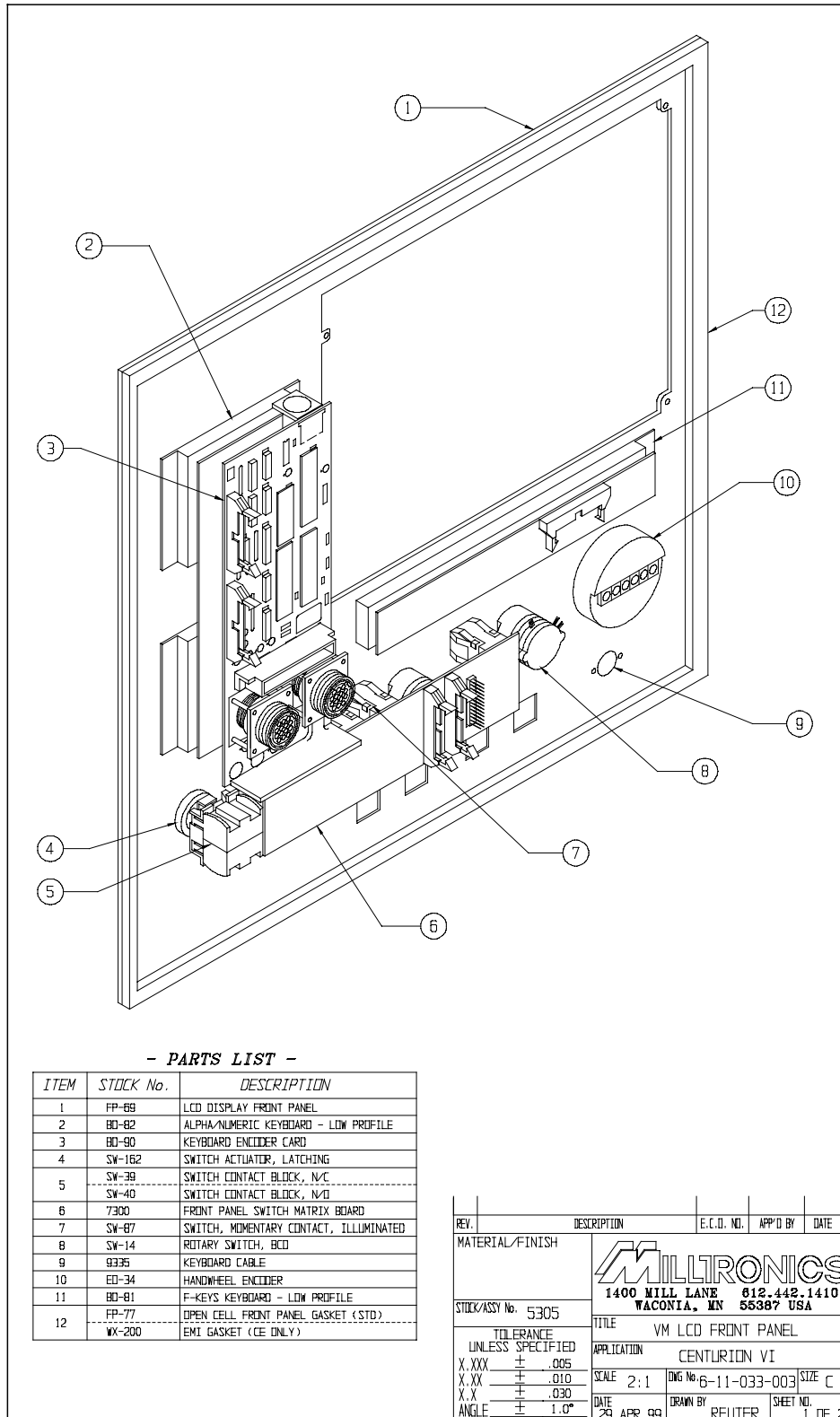


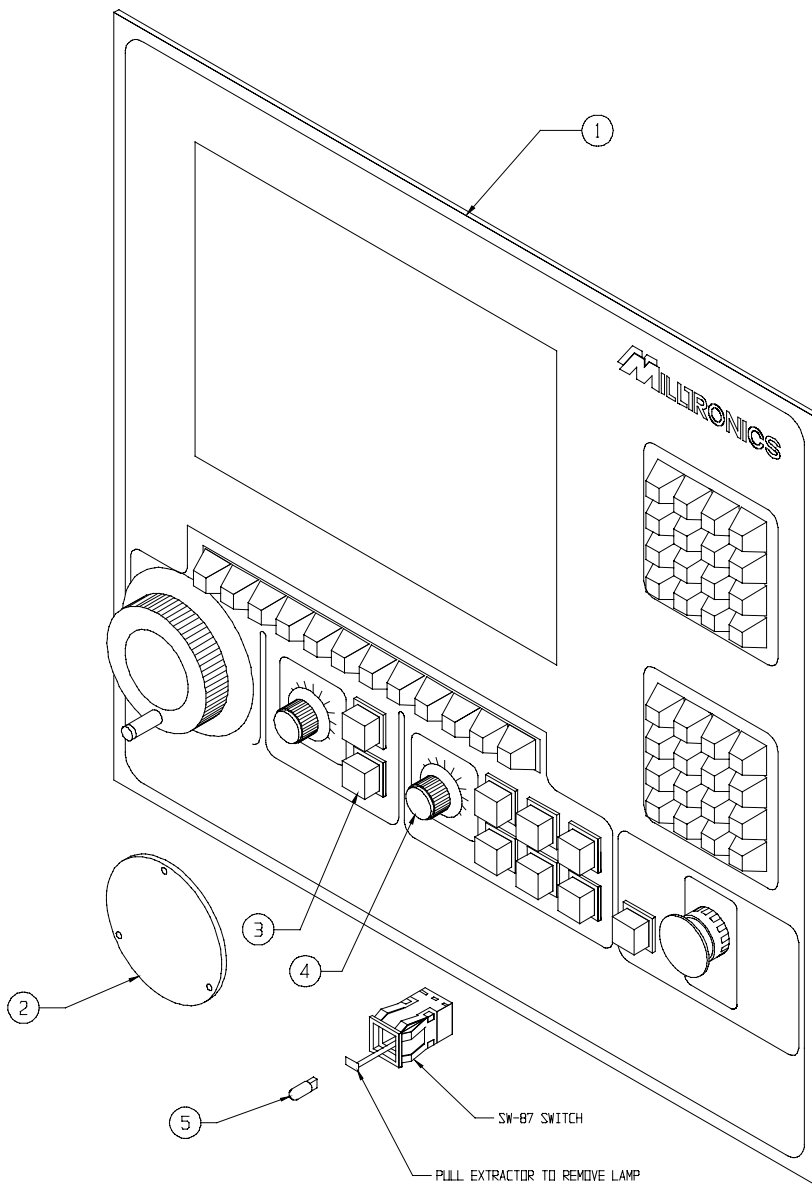




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LCD Front Panel Assembly



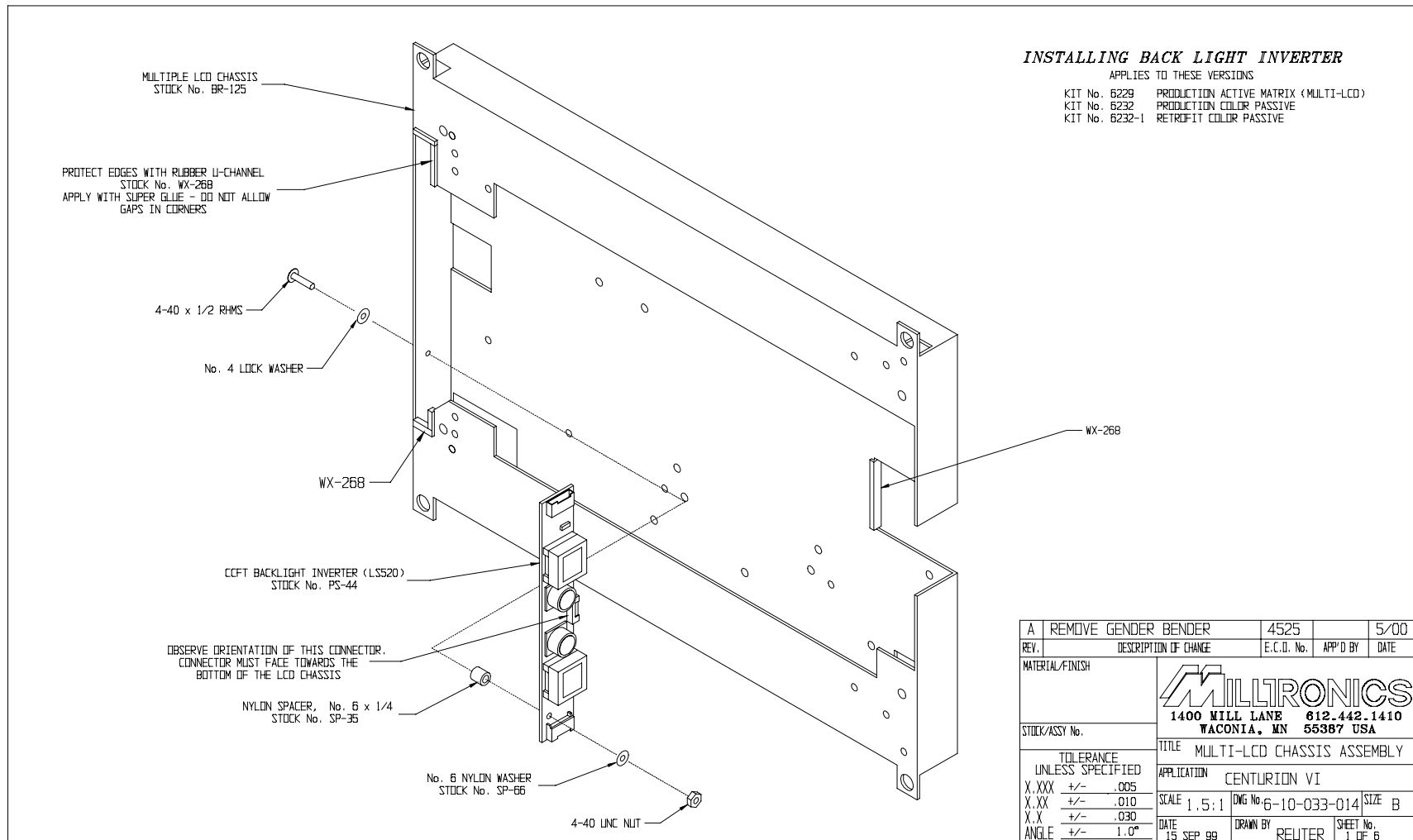


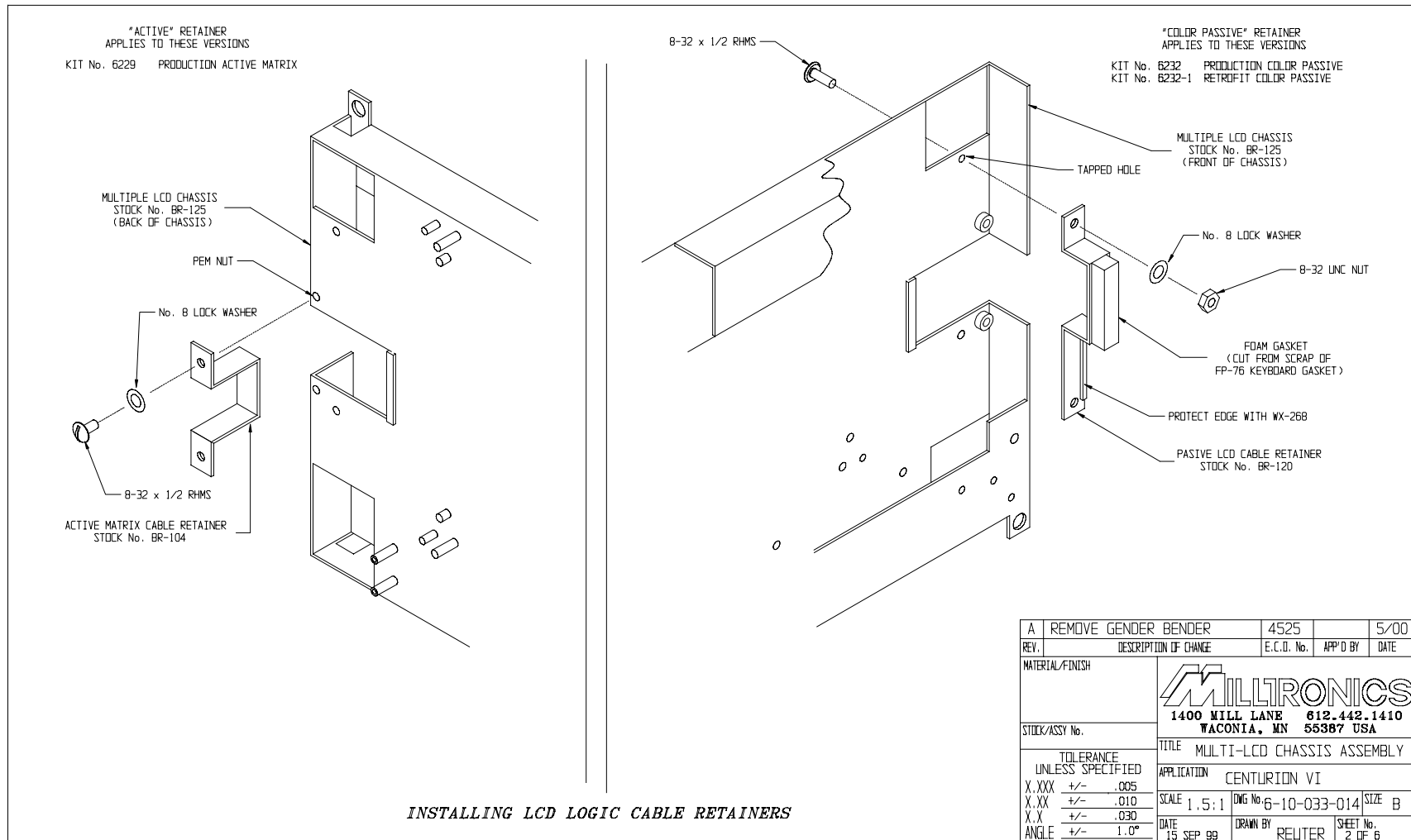
- PARTS LIST -

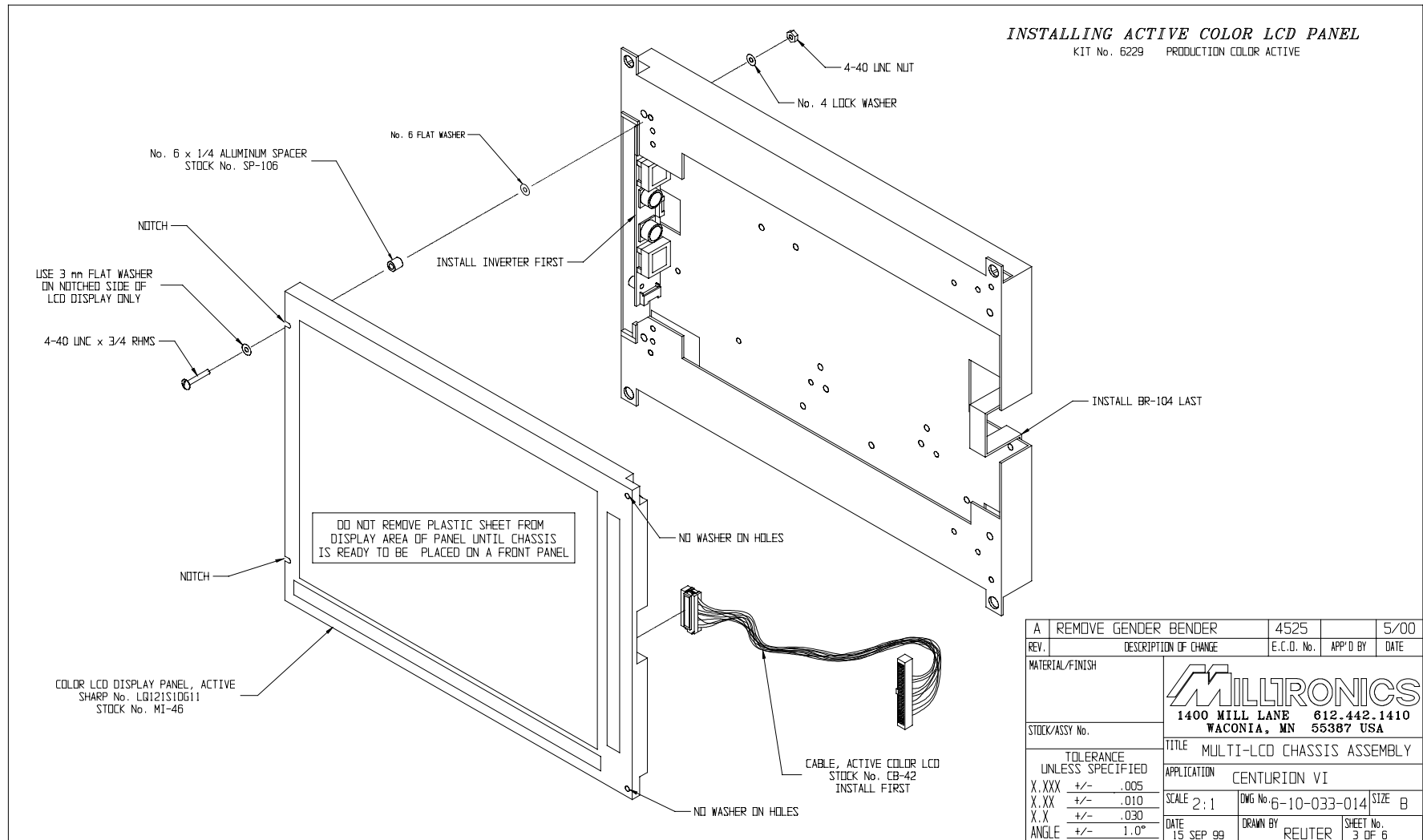
ITEM	STOCK No.	DESCRIPTION
1	FP-74	VM FRONT PANEL OVERLAY
2	MP-70	ENCODER HOLE COVER (WHEN USED)
3	SW-89	SQUARE KEYTOP, RED
	SW-88	SQUARE KEYTOP, GREEN
	SW-90	SQUARE KEYTOP, WHITE
5	SW-35	SWITCH KNOB
5	SW-92	SWITCH LAMP, 24 VOLT

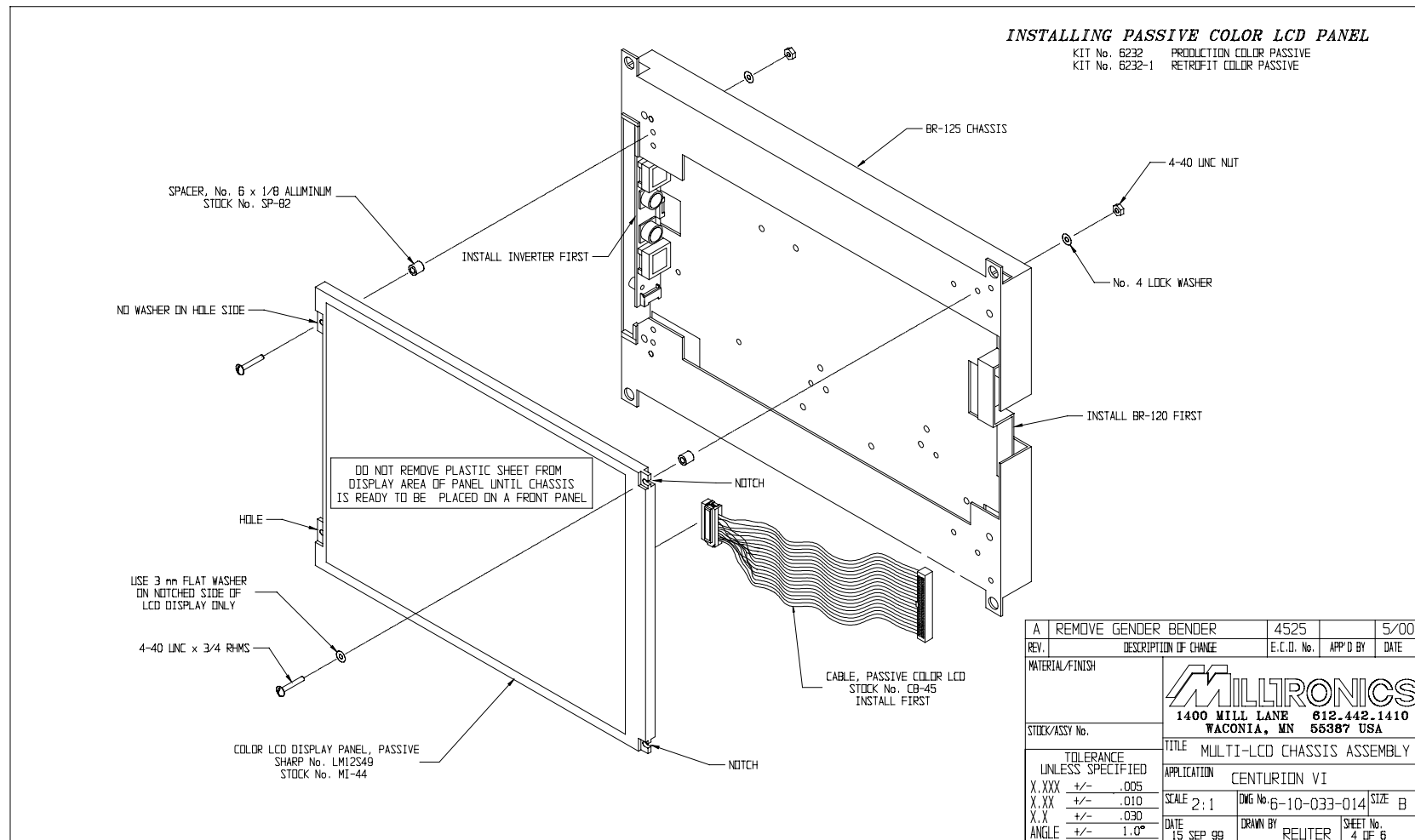
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 812.442.1410 WACONIA, MN 55387 USA		
STOCK/ASSY No. 5305		TITLE VM LCD FRONT PANEL		
TOLERANCE UNLESS SPECIFIED		APPLICATION CENTURION VI		
X.XXX	± .005	SCALE 2:1	DWG No. 6-11-033-003	SIZE C
X.XX	± .010	DATE 29 APR 99	DRAWN BY REUTER	SHEET NO. 2 OF 2
X.X	± .030			
ANGLE	± 1.0°			

LCD Chassis Assembly



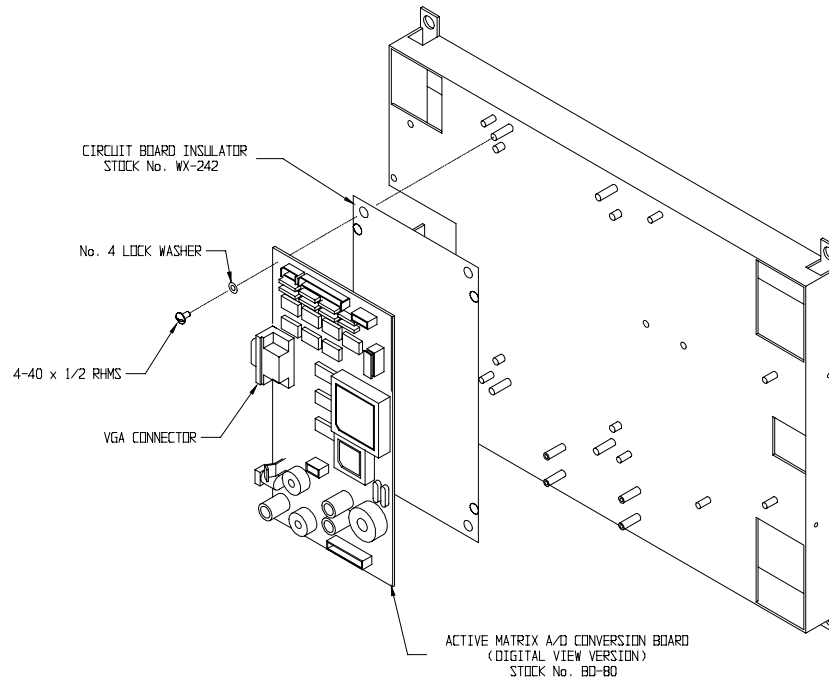






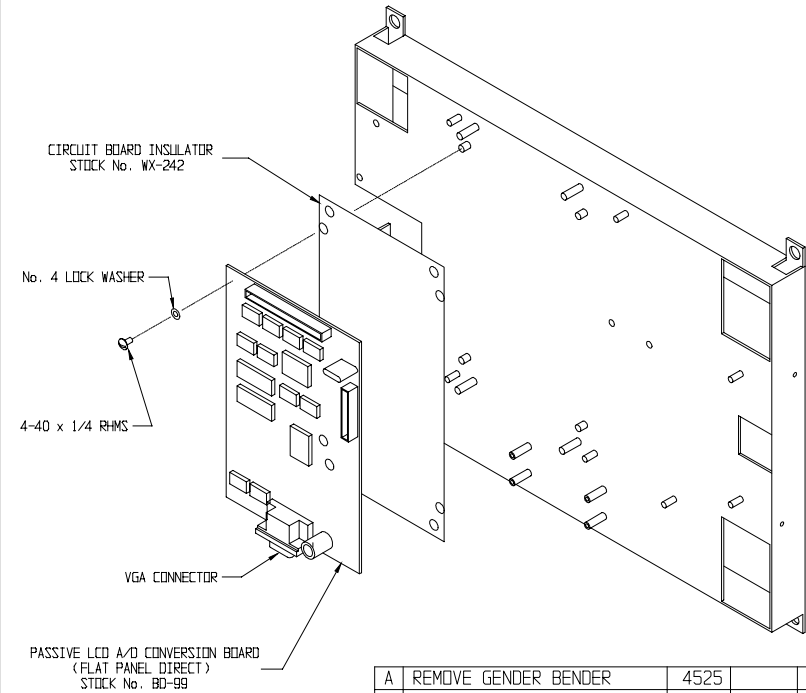
INSTALLING ACTIVE COLOR A/D CONVERSION BOARD

KIT No. 6229 PRODUCTION COLOR ACTIVE



INSTALLING PASSIVE COLOR A/D CONVERSION BOARD

KIT No. 6232 PRODUCTION COLOR PASSIVE
KIT No. 6232-1 RETROFIT COLOR PASSIVE



A	REMOVE GENDER BENDER	4525		5/00
REV.	DESCRIPTION OF CHANGE	E.C.D. No.	APP'D BY	DATE
MATERIAL/FINISH		 1400 MILL LANE 812-442-1410 WACONIA, MN 55387 USA		
STOCK/ASSY No.				
TOLERANCE UNLESS SPECIFIED		TITLE MULTI-LCD CHASSIS ASSEMBLY		
X.XXX +/- .005		APPLICATION CENTURION VI		
X.XX +/- .010		SCALE 2.25:1		
X.X +/- .030		DIG No 6-10-033-014		
ANGLE +/- 1.0°		DATE 15 SEP 99		
		DRAWN BY REUTER		
		SHEET No. 5 OF 6		

