

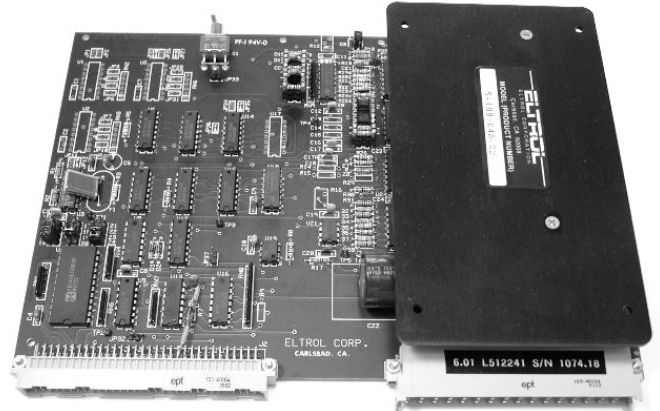
EUROCARD SERIES 41 PHASE LOCK SERVO CONTROLLER

FEATURES

- Speed regulation of $< \pm 0.001\%$ can be achieved with precision spindles and feedback devices
- Controls brushless motors over a wide speed range - 100 to over 50,000 RPM
- Switching frequency of 24 to 80KHz allows operation with low inductance motors
- Accepts external or internal frequency (speed) command
- Frequency synthesizer circuits provide a programmable frequency (speed) command from a precise crystal reference
- Velocity feedback can be derived from the motor commutation sensors, incremental encoder, or a laser scanner
- Digital inputs for Enable/Reset, Brake, Internal/External frequency command, and Direction of rotation
- A low air pressure interlock input will disable the motor drive when controlling externally pressurized air bearings
- Operates from one low cost unregulated DC power supply

APPLICATIONS

- Laser scanners
- High-speed air bearing spindles
- High accuracy machining and grinding
- Memory disk and head testers
- Wafer spinners
- Centrifuge



PRODUCT DESCRIPTION

This size 6U EUROCARD provides precise phase lock loop control of the speed of permanent magnet brushless DC motors.

The controller was designed to provide easy setup. The servo loop gain and compensation are pre-configured at the factory for the most demanding applications. Plug able jumpers can set many of the operating features.

The high efficiency switch mode power output stage employs a four-quadrant PWM drive scheme, which minimizes EMI in noise sensitive applications. It also improves motor efficiency by reducing copper and iron losses in the motor. A switching frequency of 24 to 80KHz excludes audible noise, and allows a wide control bandwidth in the current feedback loop.

The controller employs time dependent peak current limiting. A trim potentiometer allows adjustment of the peak current up to the maximum value.

Fault protection circuits will detect and disable the power output stage for over temperature, over speed, over voltage, current overload, and motor stall. Logic output signals and LED indicators provide fault indication.

EUROCARD SERIES 41 PHASE LOCK SERVO CONTROLLER

GENERAL SPECIFICATIONS

MODEL	5-198-048-00	5-198-028-00
Input Power Bus (Vbus) ³	40 to 56 VDC	26 to 36 VDC
Continuous Output Power (Max.)	265 Watts ¹	165 Watts ¹
Continuous Output Current	5 Amps ¹	5 Amps ¹
Peak Output Current	10 Amps (3 Sec) ¹	10 Amps (3 Sec) ¹
Out Voltage @ Continuous Output Current	Vbus - 3 volts	Vbus - 3 volts
Minimum load inductance	200 uH	100Uh
Maximum Heat Sink Temperature	Drive Disables if >70 ° C	
Power Amplifier	Switch Mode Drive	
Switching Frequency	Adjustable from 24KHz to 80KHz	
Current Loop Bandwidth	2 KHz Typical	
Operating Temperature	0 to 50 ° C	
Logic Supply	5 VDC developed internally	
Weight	.52 Kg (1.15 Lb)	

OPERATING CONTROL SIGNALS and INDICATORS

Speed command is proportional to input internal or external frequency	5V Square wave - Scale Factor in RPM/Hz
BCD input programs internal frequency Command	5V logic
Select internal or external frequency command	5V logic
Select velocity feedback source	5V logic
Select direction of rotation	5V logic
Peak current limit	Adjustable
Drive Enable/Reset	5V logic
Air Pressure Interlock	5V logic
Speed @ Lock	5V logic signal and LED
Brake Command ²	5V logic
Brake and/or Fault Status	5V logic signal and LED
Current Fault	5V logic
Temperature Fault	5V logic signal and LED
Over Voltage	5V logic signal and LED

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AUXILIARY OUTPUTS

Motor current monitor:	Analog Signal, S.F. in volt/Amp
Motor velocity:	5V Square wave. Frequency Proportional to motor RPM
Motor velocity:	Analog Signal, S.F. in volt/RPM

FAULT PROTECTION CIRCUITS

Controller over temperature
Current overload
Illegal Hall sensor input
Under voltage
Over speed
Motor Stall

Notes:

1. Depends on ambient operating temperature and heat sink. For the rated continuous power output, forced convection cooling with a minimum airflow of 100 CFM is required. Consult factory for assistance.
2. Actuating brake at high motor speeds may damage the controller or motor. Consult factory for details. Ground for normal operation.
3. The user should protect the Amplifier and any external circuits from a catastrophic failure by fusing the input power connections to the amplifier. See Application Note Supplementary Fuse Protection.

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EXTERNAL SIGNALS AND INTERCONNECTIONS

EDGE CONNECTOR J1 IS A 48 POLE DIN 41612 SERIES F
(REF EPT P/N 109-40064) or (FCI P/N 5159009486394111)

TERMINAL	SIGNAL NAME	DESCRIPTION
J1-2D, B, Z	MTR PHASE A	OUTPUT TO MOTOR PHASE A WINDING
J1-4D, B, Z	VDC POWER BUS RETURN	POWER SUPPLY RETURN
J1-6D, B, Z	MTR PHASE B	OUTPUT TO MOTOR PHASE B WINDING
J1-8D, B, Z	VDC POWER BUS IN	POWER SUPPLY INPUT, <18>
J1-10D, B, Z	MTR PHASE C	OUTPUT TO MOTOR PHASE C WINDING
J1-12D	V+	+24 VDC INTERNAL ANALOG SUPPLY
J1-12B	NC	NO CONNECTION
J1-12Z	MTR SHIELD	MOTOR SHIELD GND
J1-14D	NC	NO CONNECTION
J1-14B	MTR CUR	MOTOR CURRENT MONITOR, SF=SEE FUNC DIAG
J1-14Z	OVER VOLTAGE	LOGIC 0= OVER VOLTAGE, <1>, <5>
J1-16D	NC	NO CONNECTION
J1-16B	NC	NO CONNECTION
J1-16Z	"R" REFERENCE	+12VDC ANALOG REFERENCE
J1-18D	NC	NO CONNECTION
J1-18B	NC	NO CONNECTION
J1-18Z	NC	NO CONNECTION
J1-20D	NC	NO CONNECTION
J1-20B	VELOCITY COUNT OUT	5V SQ WAVE, RPM = (120F)/P <6>
J1-20Z	NC	NO CONNECTION
J1-22D	S2 HALL SENSOR IN	5V LOGIC
J1-22B	NC	NO CONNECTION
J1-22Z	S1 ALL SENSOR IN	5V LOGIC
J1-24D	DC RTN	BOARD GND
J1-24B	S3 ALL SENSOR IN	5V LOGIC
J1-24Z	HALL SENSOR SHIELD	HALL CABLE SHIELD GND
J1-26D	NC	NO CONNECTION
J1-26B	NC	NO CONNECTION
J1-26Z	NC	NO CONNECTION
J1-28D	HALL SENSOR POWER RTN	DC RTN
J1-28B	HALL SENSOR POWER	5 VDC OUT, 20 MILLIAMPS MAX LOAD
J1-28Z	Vcc OUT	NO CONNECTION
J1-30D	Vcc RTN OUT	5VDC RTN OUT
J1-30B	Vcc RTN OUT	5VDC RTN OUT
J1-30Z	NC	NO CONNECTION
J1-32D	NC	NO CONNECTION
J1-32B	NC	NO CONNECTION
J1-32Z	VELOCITY OUT	ANALOG SIGNAL, SF = V/RPM

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EXTERNAL SIGNALS AND INTERCONNECTIONS

EDGE CONNECTOR J2 IS A 96 POLE DIN 41612 TYPE C
(REF EPT P/N 103-40064)

TERMINAL	SIGNAL NAME	DESCRIPTION
J2-1, 2.A, B, C	NC	NO CONNECTION
J2-3A	SPEED LOCK	LOGIC 0 = SPEED LOCK <4>
J2-3B	NC	NO CONNECTION
J2-3C	AIR PRESSURE LED	5V LED SINK, 0 = AIR PRESSURE FAULT
J2-4A	FAULT &/OR BRAKE OUT	LOGIC 0 = FAULT &/OR BRAKE ON <4>
J2-4B	NC	NO CONNECTION
J2-4C	CURRENT FAULT	LOGIC 1 = CURRENT FAULT <7>
J2-5A	ENABLE/RESET	LOGIC 0 = ENABLE <1><2>
J2-5B	TEMP FAULT	LOGIC 1 = TEMP FAULT <7>
J2-5C	AIR PRES INTLK	LOGIC 1 = FAULT <8>
J2-6A	RPM FREQUENCY	5V SQ WAVE, FREQUENCY PROPORTIONAL TO RPM <9>
J2-6B	NC	NO CONNECTION
J2-6C	FREQ. F/B (SPEED) MONITOR	5V SQ WAVE, FREQUENCY FEEDBACK <4>
J2-7A	EXT FREQ. (SPEED) COMMAND	5V SQ WAVE, SCALE FACTOR IN RPM/HZ <1>
J2-7B	NC	NO CONNECTION
J2-7C	SPEED LOCK LED	5V LED SINK, 0 = SPEED LOCK
J2-8A	TEMP FAULT LED	5V LED SINK, 0 = TEMP FAULT
J2-8B	NC	NO CONNECTION
J2-8C	ENABLE LED	5V LED SINK, 0 = ENABLE
J2-9A	BRAKE COMMAND	LOGIC 1 = BRAKE <1><3>
J2-9B	NC	NO CONNECTION
J2-9C	CURRENT FAULT LED	5V LED SINK, 0 = CURRENT FAULT
J2-10A, B, C	NC	NO CONNECTION
J2-11A	SELECT VELOCITY F/B	LOGIC 0 = F/B FROM ENCODER, POLYGON, OTHER <10>
J2-11B	NC	NO CONNECTION
J2-11C	VELOCITY F/B INPUT	5V SQ WAVE VELOCITY F/B INPUT <11>
J2-12A	NC	NO CONNECTION
J2-12B	ENC Z INVERT	ENCODER Z INVERT OUT
J2-12C	ENC B INPUT	ENCODER B INPUT <12>
J2-13A, B	NC	NO CONNECTION
J2-13C	ENC Z	ENCODER Z INPUT <12>
J2-14A, B, C	ENC 5V POWER	ENCODER 5VDC POWER OUT <13>
J2-15A, B, C	ENC POWER RTN	ENCODER 5VDC RTN OUT
J2-16A, B, C	ENC SHIELD	ENCODER SHIELD GND
J2-17A, C	NC	NO CONNECTION
J2-17B	ENC B INVERT	ENCODER BZ INVERT OUT
J2-18, 19A, B, C	NC	NO CONNECTION
J2-20A, B	NC	NO CONNECTION
J2-20C	SELECT D.O.R.	LOGIC SIGNAL SELECT DIRECTION OF ROTATION <14><1>
J2-21A	SELECT INT/EXT FREQ CMD	LOGIC 0 = EXTERNAL FREQUENCY COMMAND <1><15>
J2-21B, C	NC	NO CONNECTION
J2-22, 23A, B, C	NC	NO CONNECTION
J2-24, 25A, B, C	NC	NO CONNECTION
J2-26A, B	NC	NO CONNECTION
J2-26C	FREQ. CMD (SPEED) MONITOR	5V SQ WAVE, FREQUENCY COMMAND SF=RPM/HZ <16>
J2-27A	S1-2	BCD SWITCH INPUT <1><17>
J2-27B	S1-8	BCD SWITCH INPUT <1><17>
J2-27C	S1-4	BCD SWITCH INPUT <1><17>

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EXTERNAL SIGNALS AND INTERCONNECTIONS

J2-28A	S3-2	BCD SWITCH INPUT <1><17>
J2-28B	S1-1	BCD SWITCH INPUT <1><17>
J2-28C	S3-1	BCD SWITCH INPUT <1><17>
J2-29A	S2-4	BCD SWITCH INPUT <1><17>
J2-29B	S3-4	BCD SWITCH INPUT <1><17>
J2-29C	S2-8	BCD SWITCH INPUT <1><17>
J2-30A	S2-1	BCD SWITCH INPUT <1><17>
J2-30B	S3-8	BCD SWITCH INPUT <1><17>
J2-30C	S2-2	BCD SWITCH INPUT <1><17>
J2-31, 32A, B, C	NC	NO CONNECTION

NOTES:

- <1> INTERNAL 100K PULL-UP RESISTOR TO 5VDC.
- <2> SWITCH S1 ON PCB IS IN SERIES WITH THIS LOGIC INPUT CMD. INSTALLATION OF JUMPER JP33 WILL DISABLE THE EXTERNAL CMD.
- <3> WHEN ACTIVE, THE MOTOR WINDINGS ARE SHORTED TOGETHER. IF THE BRAKE FEATURE IS NOT REQUIRED, INSTALL JUMPER JP36. CAUTION: BRAKE CMD AT HIGH SPEED MAY DAMAGE MOTOR AND/OR CONTROLLER. CONSULT FACTORY FOR ASSISTANCE.
- <4> OUTPUT FROM CMOS TYPE 4049 BUFFER.
- <5> OVER VOLTAGE COMPARATOR SET FOR 60 ± 4 VOLTS FOR P/N.5-198-048-00, AND 36 ± 1 VOLT FOR P/N 5-198-028-00.
- <6> F = FREQUENCY IN HERTZ, P = NUMBER OF MOTOR POLES.
- <7> OUTPUT FROM CMOS TYPE 4013 F/F GATE.
- <8> INTERNAL 4.7K PULL-UP RESISTOR R9. THIS FEATURE IS DISABLED WHEN R9 IS OPEN.
- <9> OPTIONAL OUTPUT FOR RPM DISPLAY ON A DPM.
- <10> LOGIC INPUT FROM USER. INTERNAL 10K PULL-UP RESISTOR. WHEN VELOCITY FEEDBACK SIGNAL IS ABSENT, AND THE INPUT IS A LOGIC "1", THE CONTROLLER WILL SWITCH TO A VEL F/B SIGNAL DERIVED FROM THE MOTOR'S HALL DEVICES.
- <11> VELOCITY FEEDBACK FROM ENCODER, POLYGON, OR OTHER DEVICE.
- <12> OPTIONAL INPUTS NOT REQUIRED FOR NORMAL OPERATION.
- <13> +5VDC FROM CONTROLLER SERIES REGULATOR. USE AN EXTERNAL +5V SUPPLY WHEN MORE THAN 50 MILLIAMPS ARE REQUIRED.
- <14> LOGIC INPUT TO CHANGE THE DIRECTION OF MOTOR ROTATION. LOGIC "1" IS THE INTERNAL DEFAULT STATE. GROUND THIS INPUT OR INSTALL JUMPER JP32 TO CHANGE THE DIRECTION OF ROTATION. DO NOT CHANGE WHILE MOTOR IS ROTATING.
- <15> LOGIC INPUT TO SELECT INTERNAL OR EXTERNAL FREQUENCY (SPEED) COMMANDS. LOGIC "1" IS THE DEFAULT STATE. GROUND THIS INPUT OR INSTALL JUMPER JP37 TO PROGRAM THE LOGIC TO ACCEPT AN EXTERNAL INPUT FREQUENCY (SPEED) COMMAND.
- <16> OUTPUT FROM CMOS TYPE 4070 LOGIC GATE.
- <17> LOGIC INPUTS, TYPICALLY FROM A BCD TYPE SWITCH. IT CAN BE USED TO PROGRAM AN OPTIONAL CRYSTAL REFERENCE FREQUENCY DIVIDER FOR AN INTERNALLY DERIVED FREQUENCY (SPEED) COMMAND. THIS OPTION CAN ALSO BE SET BY INSTALLING PROGRAM JUMPERS JP13 - JP24
- <18> SEE APPLICATION NOTE SUPPLEMENTARY FUSE PROTECTION.

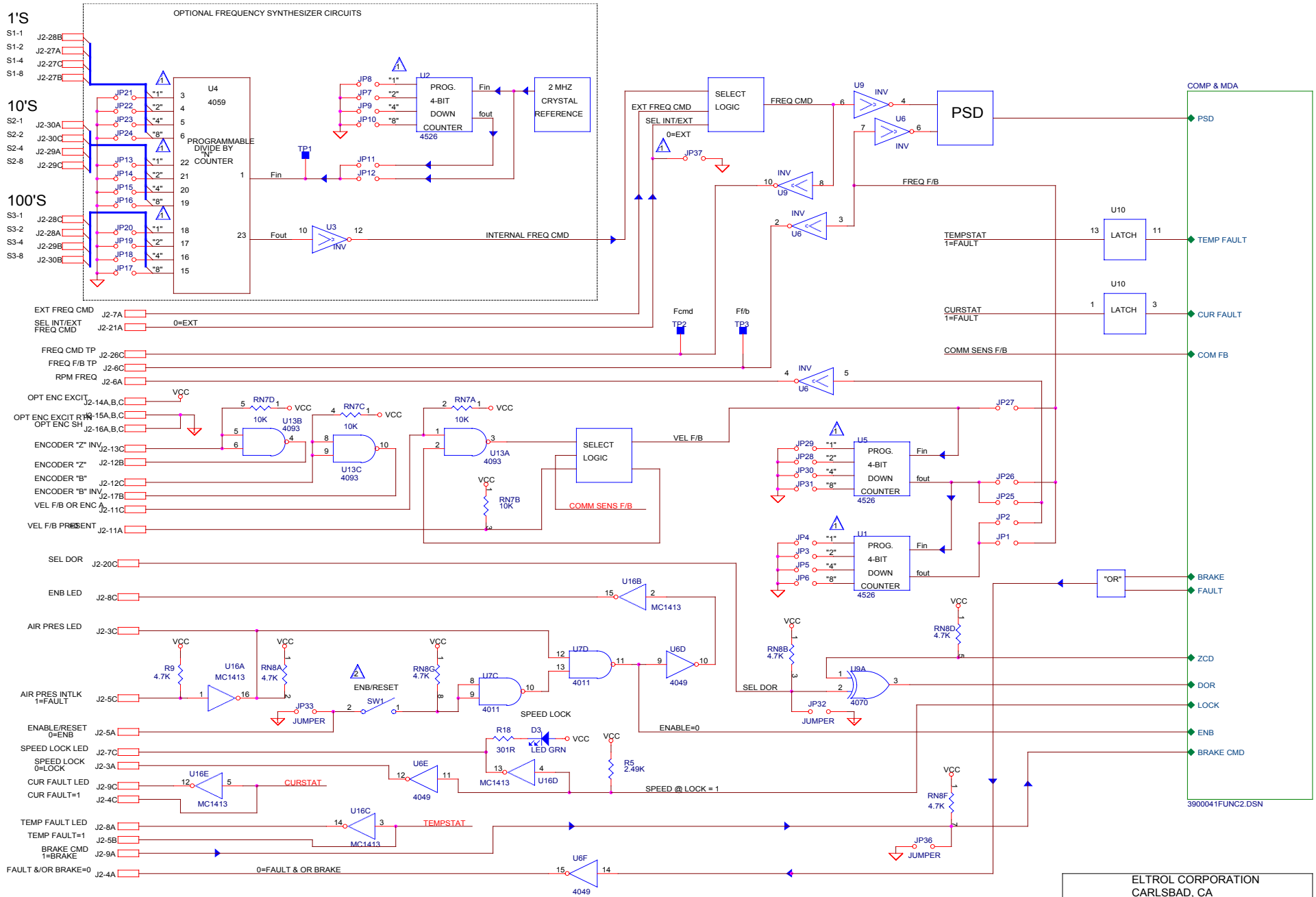


FIGURE 1

- ENABLE WHEN SW1 BAT IS TOWARDS BOARD CENTER
- INTERNAL 100K PULL-UP RESISTOR

NOTES:

ELTROL CORPORATION CARLSBAD, CA		
Title SERIES 41 PLS FUNCTIONAL DIAGRAM		
Size	Document Number	Rev
C	3900041FUNC.DSN	A
Date:	Tuesday, July 16, 2002	Sheet 1 of 2

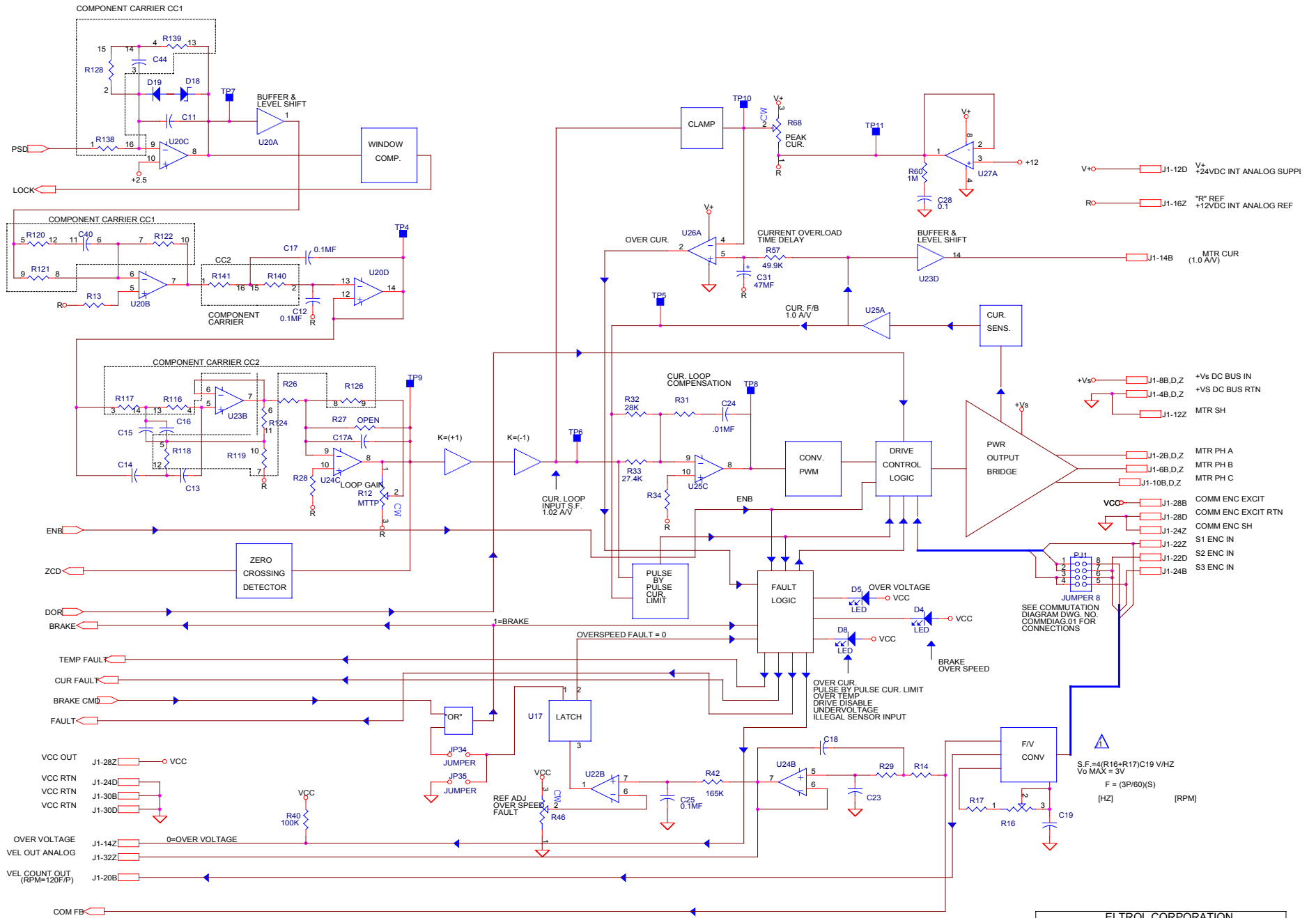


FIGURE 2

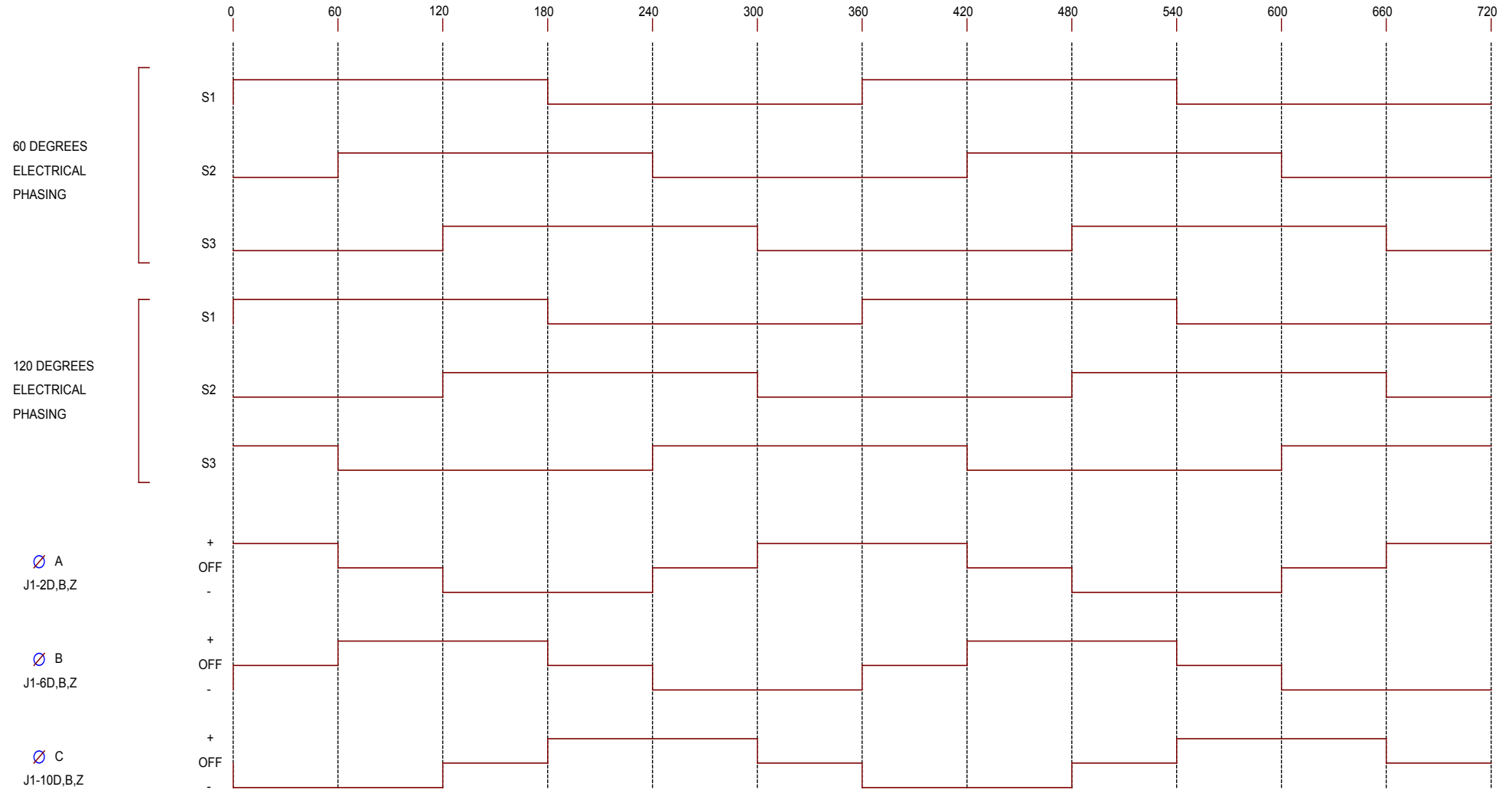
F/V CONV COUNTS EDGES OF COMMUTATION SENSORS

NOTES:

ELTROL CORPORATION CARLSBAD, CA		
Title: SERIES 41 PLS FUNCTIONAL DIAGRAM		
Size: C	Document Number: 3900041FUNC.DSN	Rev: A
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COMMUTATION DIAGRAM

ROTOR POSITION ELECTRICAL DEGREES



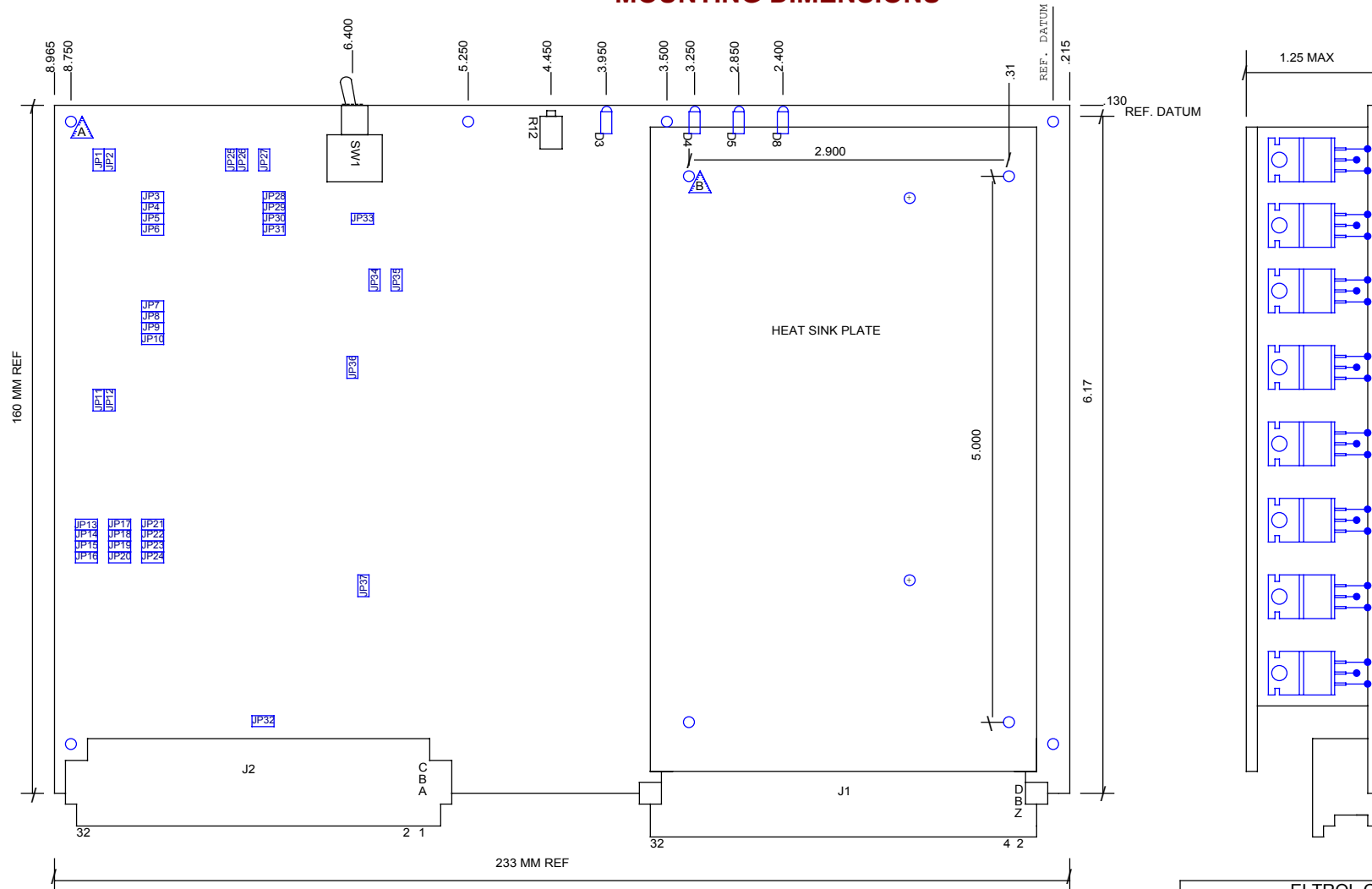
PJ1 JUMPER CONNECTIONS

SENSOR ELECTRICAL PHASING	1&8	2&7	3&6	4&5
60 DEGREE SPACING		X		X
120 DEGREE SPACING	X		X	

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Title COMMUTATION DIAGRAM		
Size B	Document Number 41 SERIES COMMDIAG.02	Rev
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EUROCARD SERIES 41 PHASE LOCK SERVO CONTROLLER

MOUNTING DIMENSIONS



4.  4 HOLES .136 DIA.

3.  6 HOLES .120 DIA.

2. TOLERANCES FOR 3 DECIMALS ARE +/- .005 AND +/- .02 FOR 2 DECIMALS.

NOTES: 1. DIMENSIONS IN INCHES, DO NOT SCALE.

ELTROL CORPORATION CARLSBAD, CA		
Title	SERIES 41 DATA SHEET OUTLINE DWG	
Size	Document Number	Rev
B	3900041 OUTLINE.SCH	
Date:	Tuesday, July 02, 2002	Sheet 1 of 1