ELTROL CORPORATION

Rev 01/09

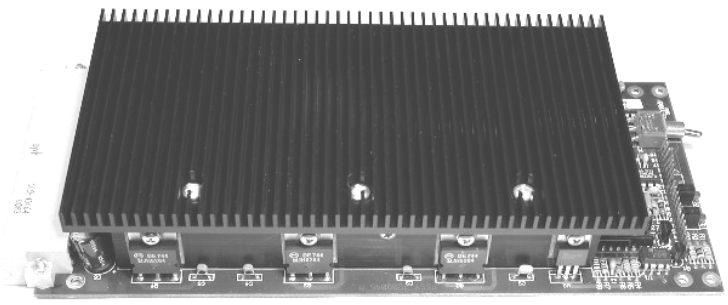
EUROCARD SERIES 45 LINEAR SINE DRIVE SERVO AMPLIFIER

FEATURES

- **High performance Linear Servo Amplifier controls brushless linear or rotary motor force or torque**
- **Linear operating mode does not emit EMI, has high servo stiffness, and no dead zone**
- **Sinusoidal commutation signals are derived from two linear Hall devices integral to the motor**
- **Proprietary circuits derive sinusoidal A, B, and C motor currents from the Hall devices**
- **Sinusoidal control of the motor current minimizes force or torque ripple. This provides very smooth velocity**
- **Precise nanometer position accuracy can be obtained with sinusoidal control of a linear motor's current**
- **Operates with low inductance motors**
- **A differential amplifier accepts a +/- 10V analog current command from a motion control board**
- **Current loop bandwidth and the transconductance, amps/volt scale factor, are adjustable**
- **Fault protection for amplifier over temperature, current overloads, and motor shorts**

APPLICATIONS

- **Linear stages, air bearings, and gantry systems**
- **Integrated circuit manufacturing and inspection**
- **High accuracy electronic assembly**
- **High accuracy measurement**
- **Laser Machining**



PRODUCT DESCRIPTION

This size 3U EUROCARD provides closed loop four quadrant force or torque control of brushless linear or rotary motors.

Sinusoidal commutation signals are derived from two linear Hall devices. The Hall devices are precisely aligned with the motor's sinusoidal torque or force constant waveform. The result is the generation of nearly constant ripple free torque or force that is a linear function of the input voltage command.

The linear operating mode is highly advantageous for noise sensitive applications because it does not generate EMI. PWM switching noise is difficult to eliminate from sensitive sensors and transducers. This degrades velocity and position accuracy.

The controller employs two-stage current limiting. The first stage is a peak level with a time limit, then the second stage activates for a lower continuous current limit. A jumper selects the option of disabling the output when the continuous current limit is tripped. A trim potentiometer allows adjustment of the peak current up to the maximum value.

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EUROCARD SERIES 45 LINEAR SINE DRIVE SERVO AMPLIFIER

GENERAL SPECIFICATIONS

MODEL	5-100-055-03	5-100-035-04	5-100-033-03
Peak Output Power	800 Watts [1]	500 Watts [1]	250 Watts [1]
Peak Output Current	18 Amps (0.5 Sec)	18 Amps (0.5 Sec)	9 Amps (0.5 Sec)
Continuous Output current	Note 1	Note 1	Note 1
Max. Controller Dissipation	110 Watts [1]	110 Watts [1]	100 Watts [1]
Input Power Bus [3]	26 to 56 VDC	26 to 36 VDC	26 to 36 VDC
Out Voltage @ Peak Current	Vbus - 7 volts	Vbus - 7 volts	Vbus - 7 volts

Power Amplifier	Linear Mode Drive
Current Loop Bandwidth	Adjustable 0.5 to 4 KHz Typical
Operating Temperature	0 to 50 Degrees C
Logic Supply	5 VDC developed internally
Size 3U Eurocard	100 W x 220 L x 36 H mm
Weight	.55 Kg (1.2 Lb)

OPERATING CONTROL SIGNALS and INDICATORS

Input analog control signal: ± 10V differential
Peak current limit: adjustable
Continuous current limit: adjustable
Drive enable/reset: 5V logic
(+) Limit: 5V logic
(-) Limit: 5V logic
Brake: [2] 5V logic
Fault and/or brake status: 5V logic
Fault indicator: LED

AUXILIARY OUTPUTS

Motor current monitor: Analog Signal

FAULT PROTECTION CIRCUITS

Controller over temperature
Over current

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GENERAL SPECIFICATIONS

1. Depends on ambient operating temperature and heat sink. For the maximum controller power dissipation forced convection cooling with a minimum airflow of 100 CFM is required. Derate at 2.0 watts/degree C for ambient greater than 25 degrees C. Maximum controller dissipation occurs when the power out is minimum (motor stalled). It can be calculated as follows:

Pd = Pin - Pmtr
Pin = (Vs)(Io)
Pmtr = 1.5(Io)^2(Rt/2)

Where

Pd is controller dissipation in watts
Pin in input power
Pmtr is motor dissipation in watts
Vs is supply voltage
Io is output current in amps
Rt is motor terminal-to-terminal resistance for wye winding in ohms.

Consult factory for assistance.

The controller employs two stage current limiting. The first stage is a peak level with a time limit, then the second stage activates for a lower continuous current limit.

2. Actuating brake at high motor speeds may damage the controller or motor. Consult factory for details.

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, <9>
J1-10D, B, Z	MTR PHASE C	OUTPUT TO MOTOR PHASE C WINDING
J1-12D	NC	NO CONNECTION
J1-12B	NC	NO CONNECTION
J1-12Z	MTR SHIELD	MOTOR SHIELD GND
J1-14D	(+) LIMIT	LOGIC 1= (+) LIMIT, <1>, <3>
J1-14B	MTR CUR	MOTOR CURRENT MONITOR, SF=SEE FUNC DIAG
J1-14Z	NC	NO CONNECTION
J1-16D	BRAKE CMD	LOGIC 1= BRAKE, <1>, <5>, <8>
J1-16B	ENABLE/RESET	LOGIC 0=ENABLE, <1>, <2>
J1-16Z	Vcc OUT	5VDC OUT
J1-18D	(-) LIMIT	LOGIC 1= (-) LIMIT, <1>, <4>
J1-18B	NC	NO CONNECTION
J1-18Z	NC	NO CONNECTION
J1-20D	V+ OUT	REF 24VDC OUT
J1-20B	CURRENT FAULT OUT	LOGIC 1= CUR FAULT, <7>
J1-20Z	FAULT &/OR BRAKE OUT	LOGIC 1= FAULT AND, OR BRAKE ON
J1-22D	HGA V(+)	HALL GEN A IN (+)
J1-22B	"R" REF OUT	REF 12VDC OUT
J1-22Z	HGA V(-)	HALL GEN A IN (-)
J1-24D	HGB SHIELD	HALL GEN B SHIELD
J1-24B	HGB V(+)	HALL GEN B IN (+)
J1-24Z	HGA SHIELD	HALL GEN A SHIELD
J1-26D	CMD (+)	DIFFERENTIAL ANALOG ± 10V INPUT COMMAND, <6>
J1-26B	CMD (-)	DIFFERENTIAL ANALOG ± 10V INPUT COMMAND, <6>
J1-26Z	HGB V(-)	HALL GEN B IN (-)
J1-28D	HG IC (+)	HALL GEN CONTROL CURRENT
J1-28B	HG IC (-)	HALL GEN CONTROL CURRENT
J1-28Z	NC	NO CONNECTION
J1-30D,B	Vcc RTN OUT	5VDC RTN OUT
J1-30Z	NC	NO CONNECTION
J1-32D	CONT CUR FAULT	CONTINUOUS CURRENT FAULT, LOGIC 1=CC FAULT
J1-32B	TEMPERATURE FAULT	LOGIC 1=TEMPERATURE FAULT
J1-32Z	NC	NO CONNECTION

NOTES:

<1> INTERNAL 4.7K PULL-UP RESISTOR TO 5VDC.

<2> SWITCH S1 ON PCB IS IN SERIES WITH THIS LOGIC INPUT CMD. INSTALLATION OF JUMPER JP6 WILL DISABLE THE EXTERNAL CMD.

<3> (+) LIMIT IS THE TRAVEL LIMIT THE MOTOR WILL DRIVE TOWARD WHEN THE SIGNAL AT CMD (+) IS POSITIVE WITH RESPECT TO CMD (-). INSTALLATION OF JUMPER JP5 WILL DISABLE THIS FEATURE.

<4> (-) LIMIT IS THE TRAVEL LIMIT THE MOTOR WILL DRIVE TOWARD WHEN THE SIGNAL AT CMD (+) IS NEGATIVE WITH RESPECT TO CMD (-). INSTALLATION OF JUMPER JP4 WILL DISABLE THIS FEATURE.

<5> WHEN ACTIVE, THE MOTOR WINDINGS ARE SHORTED TOGETHER. IF THE BRAKE FEATURE IS NOT REQUIRED, INSTALL JUMPER JP1. CAUTION: BRAKE CMD AT HIGH SPEED MAY DAMAGE MOTOR AND/OR CONTROLLER. CONSULT FACTORY FOR ASSISTANCE.

<6> COMMAND POLARITY DETERMINES DIRECTION OF ROTATION, SIGNAL AND SIGNAL RETURN CAN BE EXCHANGED. SEE <3>, <4>.

<7> OUTPUT FROM CMOS PLD.

<8> WE RECOMMEND THAT THE BRAKE CMD BE APPLIED FOR "POWER UP"' AND THEN REMOVED FOR NORMAL OPERATION.

<9> SEE APPLICATION NOTE SUPPLEMENTARY FUSE PROTECTION.

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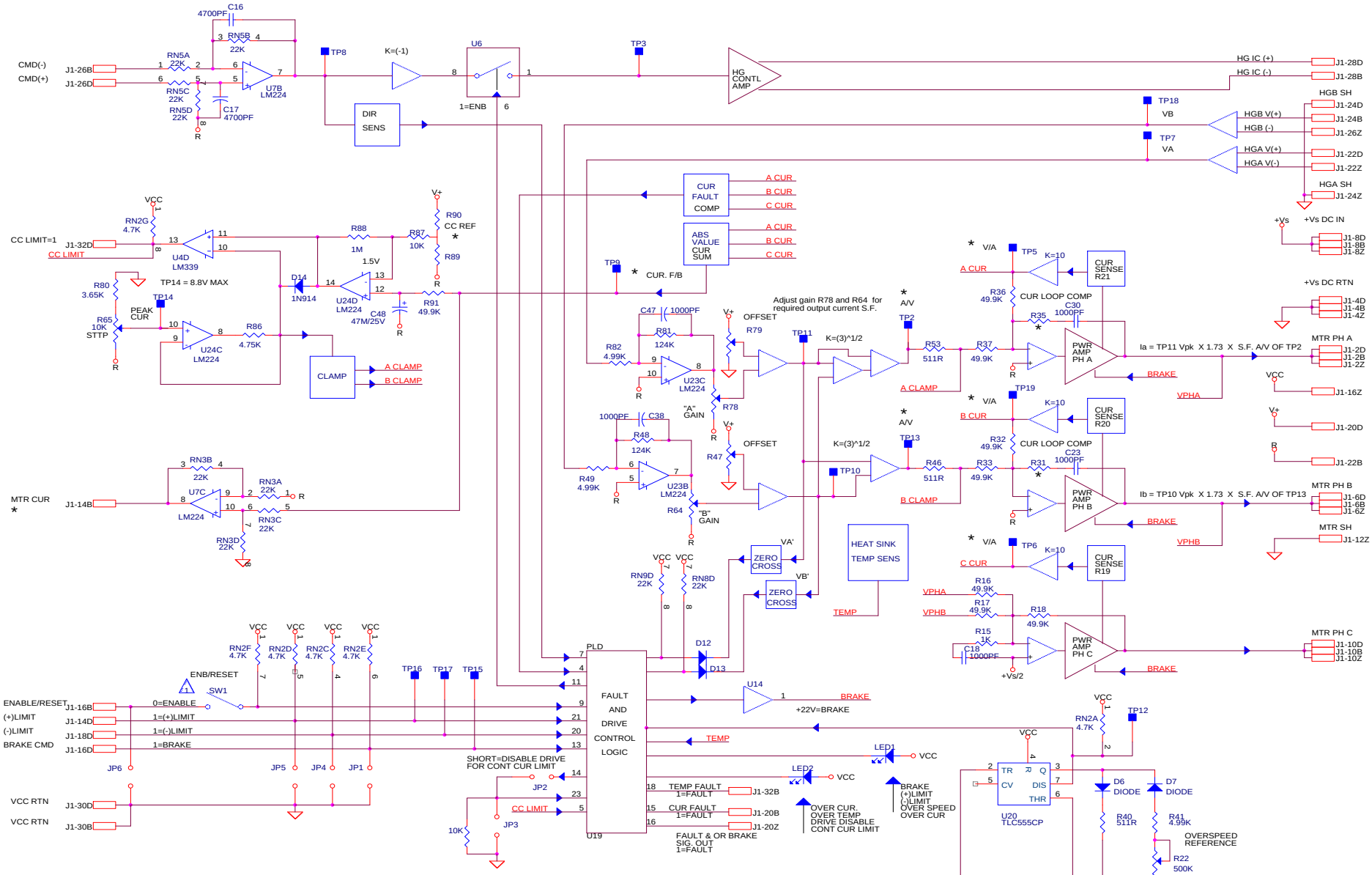


* REF TABLE

REF	MODEL	TP2,13	TP5,6,19	TP9	J1-14B	CC REF	R31,R35
LPSINE	5-100-033-03	1A/V	1V/A	1V/A	1A/V	3.0V	249K
HPSINE	5-100-035-04	2A/V	.5V/A	0.5V/A	2A/V	1.5V	100K
HVSINE	5-100-055-03	2A/V	.5V/A	0.5V/A	2A/V	1.5V	402K

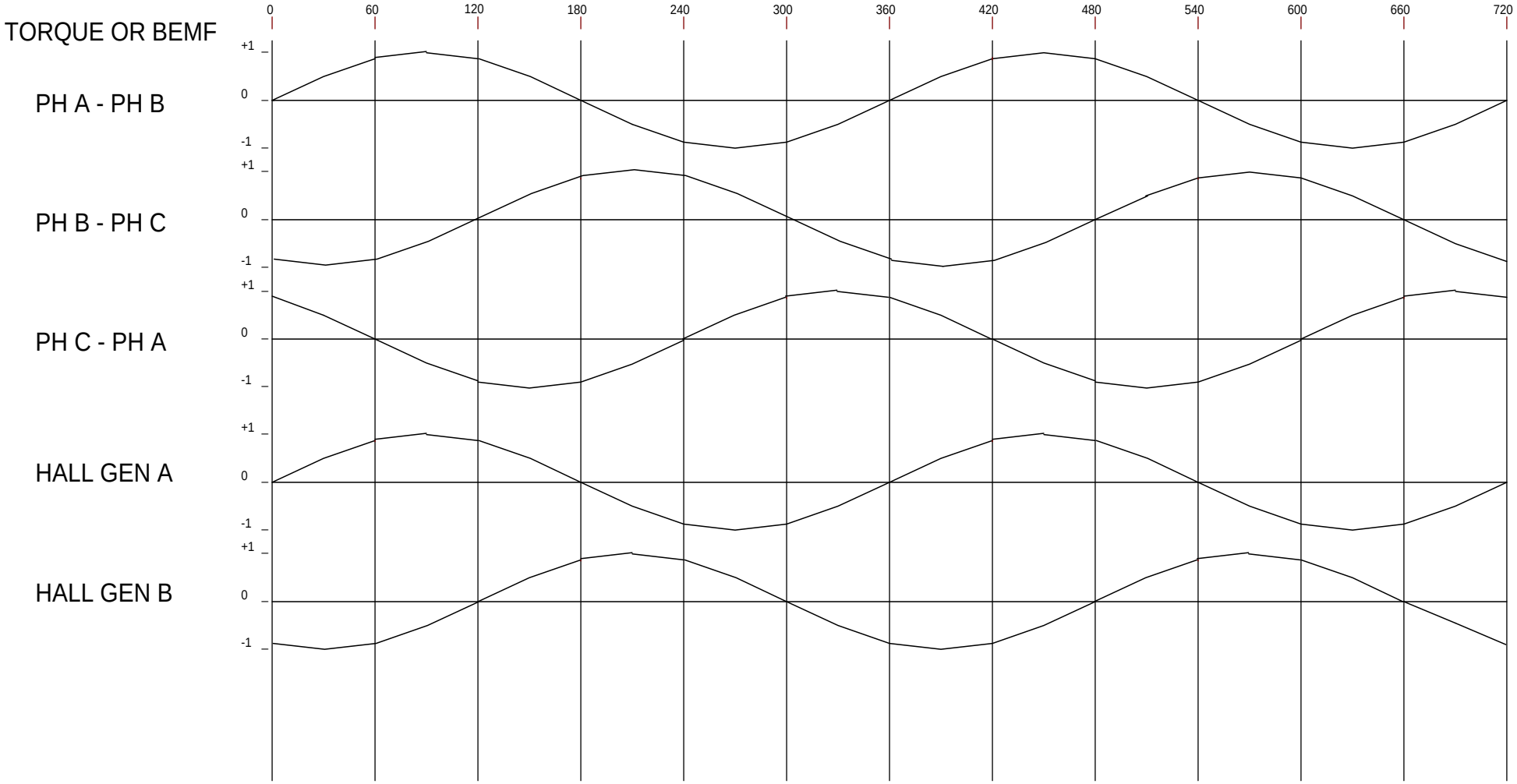
2. ALL VOLTAGE MEASUREMENTS ARE REFERENCED TO TP4

NOTES: 1. ⚠1 ENB WHEN SW1 BAT IS TOWARDS BOARD CENTER

ELTROL CORPORATION CARLSBAD, CA	
Title: FUNCTIONAL DIAGRAM SERIES 45 AMPLIFIER	
Size: C	Document Number: 3900045.FNC — Rev: NC
Date: Tuesday, January 20, 2009	Sheet 1 of 1

PHASING DIAGRAM

ROTOR POSITION ELECTRICAL DEGREES



1. ALIGN HALL GENERATOR A & B OUTPUT TO CORRESPOND WITH PHASING DIAGRAM AS SHOWN

NOTES:

ELTROL CORPORATION CARLSBAD, CA		
Title: SINE DRIVE PHASING DIAGRAM		
Size: B	Document Number: 3900036T.05	Rev
Date: Wednesday, June 06, 2001	Sheet 1 of 1	

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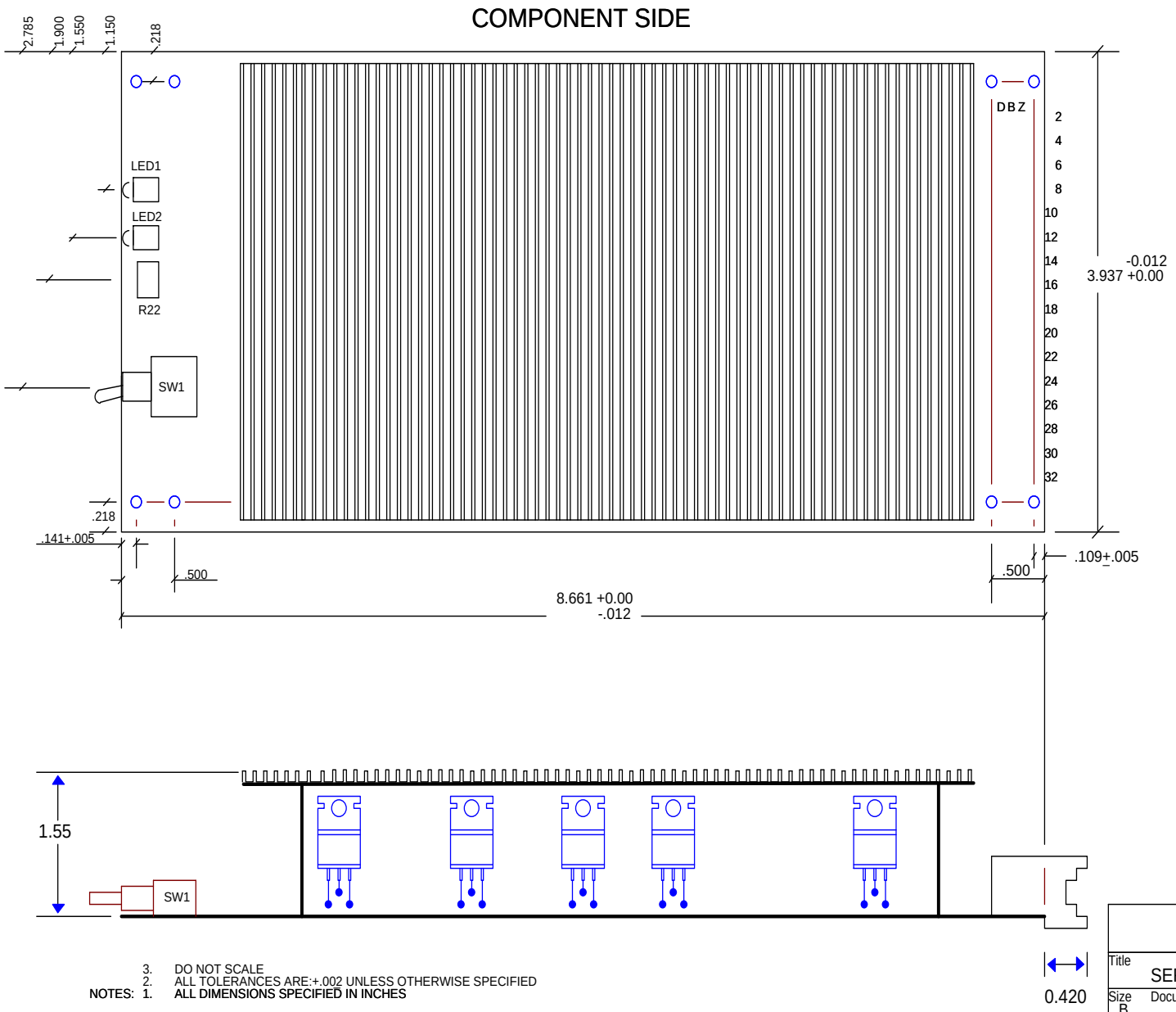
MOUNTING DIMENSIONS



NOTES:
1. ALL DIMENSIONS SPECIFIED IN INCHES
2. ALL TOLERANCES ARE:+.002 UNLESS OTHERWISE SPECIFIED
3. DO NOT SCALE

ELTROL CORPORATION CARLSBAD, CA	
Title: SERIES 45 DATA SHEET OUTLINE	
Size: B	Document Number: 3900045 OUTLINE.SCH — Rev:
Date: Friday, August 10, 2001	Sheet 1 of 1