

TABLE OF CONTENTS

Section		Page
1.0	General Description	1
2.0	Specifications	1
3.0	Operation	2
4.0	Servicing & Maintenance	2
5.0	Installation	4
6.0	Turn On	4

APPENDIX

Fig. 1	Mechanical Features	6
	Description of a Typical CAMAC Supply Type CP-1	
	Index of Drawings	

CAMAC POWER SUPPLY 1510

1.0 GENERAL DESCRIPTION

The Model 1510 power supply is designed for use with the CAMAC Modular Instrumentation System for Data Handling. The 1510 supply is a combined unit providing both power and cooling air to the system electronics. Except as specified herein the performance specifications of the Model 1510 meet or exceed the intent of the draft titled "Specification for a Typical CAMAC Power Supply", by the U.S. CAMAC Mechanical and Power Supply Working Group.

2.0 SPECIFICATIONS

This instruction manual contains, as part of its specifications, a copy of the appropriate dated draft from the U.S. CAMAC Mechanical and Power Supply Working Group. This draft is accompanied by schematics and mechanical drawings to insure proper installation, maintenance and operation of a typical CAMAC System.

2.1 OUTPUTS

+6.00 volts at 0 to 42 amps
-6.00 volts at 0 to 25 amps
+24.00 volts at 0 to 6 amps
-24.00 volts at 0 to 6 amps

the four outputs are simultaneously available but the \pm 6.0v supplies operate on a current sharing basis such that the total combined current outputs are limited to 42 amps. Likewise, the \pm 24v supplies are current shared and are limited to a total combined current output of 9 amps. ✓

2.2 POWER DE-RATING :

The maximum output power of the 1510 supply is 375 watts at 25 degrees centigrade ambient, de-rated to 300 watts at 50 degrees centigrade ambient. Excessive power draw will result in either a blown input fuse or the Hi-Temp. warning lamp will light.

2.3 REGULATION

The \pm 6.0v outputs shall not vary more than \pm 0.5% for line voltage changes of +10% and -12% and for load changes of 0 to 25 amps, nor more than \pm 0.8% for load changes of 0 to 42 amps.

3.0 OPERATION

The regulators used are the conventional series pass type utilizing integrated circuit regulators and discrete current control and over-voltage circuits. The current controls are of the fold-back type, factory set a 110% min.

3.1 BLOWER SECTION:

Contains blowers to provide cooling air for both the power supply and the crate electronics and a PC board with metering elements and switches for DC metering. The blower section may be removed from the main chassis in the same manner the power supply is removed from the crate.

3.2 Main Chassis:

Right side contains the transformer, rectifiers, bulk capacitors and other components to provide unregulated DC power to the regulator side. The regulator side (left from the rear) contains 4 regulator boards, a bias supply board (control board), and a single heat sink on which are mounted all the series pass elements.

3.3 Thermal Switches:

Two thermal switches are employed, one to indicate a high temperature condition (see spec) and one to remove AC power if temperature exceeds maximum safe operating level. The location and settings may vary from unit to unit and are shown on the schematic shipped with each unit.

4.0 Servicing and Maintenance:

The unit is designed in modular form in order to facilitate repair and maintenance.

If qualified personnel are not available, remove suspected assembly from unit and return to factory for repair. Replacement assemblies can normally be obtained within three days by air freight.

4.1 Regulators:

All regulators are plug-in modules and are easily removed and replaced. Series pass elements are mounted on a single heat sink mounted below the regulator boards. (to remove heat sink, first remove the lower guide support plate).

4.2 Fans and Filter:

Fans are of the lifetime lubricated type. Filter should be inspected periodically and cleaned by immersion in soap and warm water.

4.3 Fuses:

F1 and F2 are AC power line fuses. F3 thru F6 are regulator protection fuses, and will blow only if current limit or regulator circuits are inoperative. Replace only once as repeated replacement may cause further damage to the regulator board or series pass elements.

4.4 Test Points:

Test points are provided, on the front panel of the supply, for all output voltages. These points bypass meter circuitry and are direct regulator outputs.

4.5 Voltage Adjust:

4.5.1

Voltage adjust pots are provided on each regulator printed circuit card. The 6 & 24V adjustments are accessible through the top of the power supply. Optional voltage adjust pots are accessible from the left (facing the rear) of the supply, through holes provided in housing. Access to the positive dual regulator requires removal of the negative dual regulator card.

4.5.2

Positive & negative control voltage adjust pots are located on the control P.C. card. Proper settings are $30V \pm 1.V.$

4.6 Current Limit Adjust:

4.6.1

Overcurrent foldback points are set by pots located on each regulator card. Consult appropriate regulator layout drawing for location of pots.

4.6.2

Set foldback point by adjusting pot "high", load supply to 110% (min.) of full rated current, then reduce pot setting to a point just before the output voltage starts to drop off.

4.7 Overvoltage:

4.7.1

The overvoltage point is factory set. See Dwg. #105002. The ratio of divider R15 & R25 referenced to CR-2 offsets the differential amplifier (Q6 & Q7) & controls the overvoltage SCR (Q2) turn on point.

This circuit is typical of all regulators. Changing the divider ratio will change the overvoltage trip point.

4.7.2

Overvoltage condition is indicated by (a) very low output voltage and (b) current indication of 2-8 amps on meter.

4.7.3

Overvoltage may occur if sense leads are not terminated properly.

5.0 Installation:

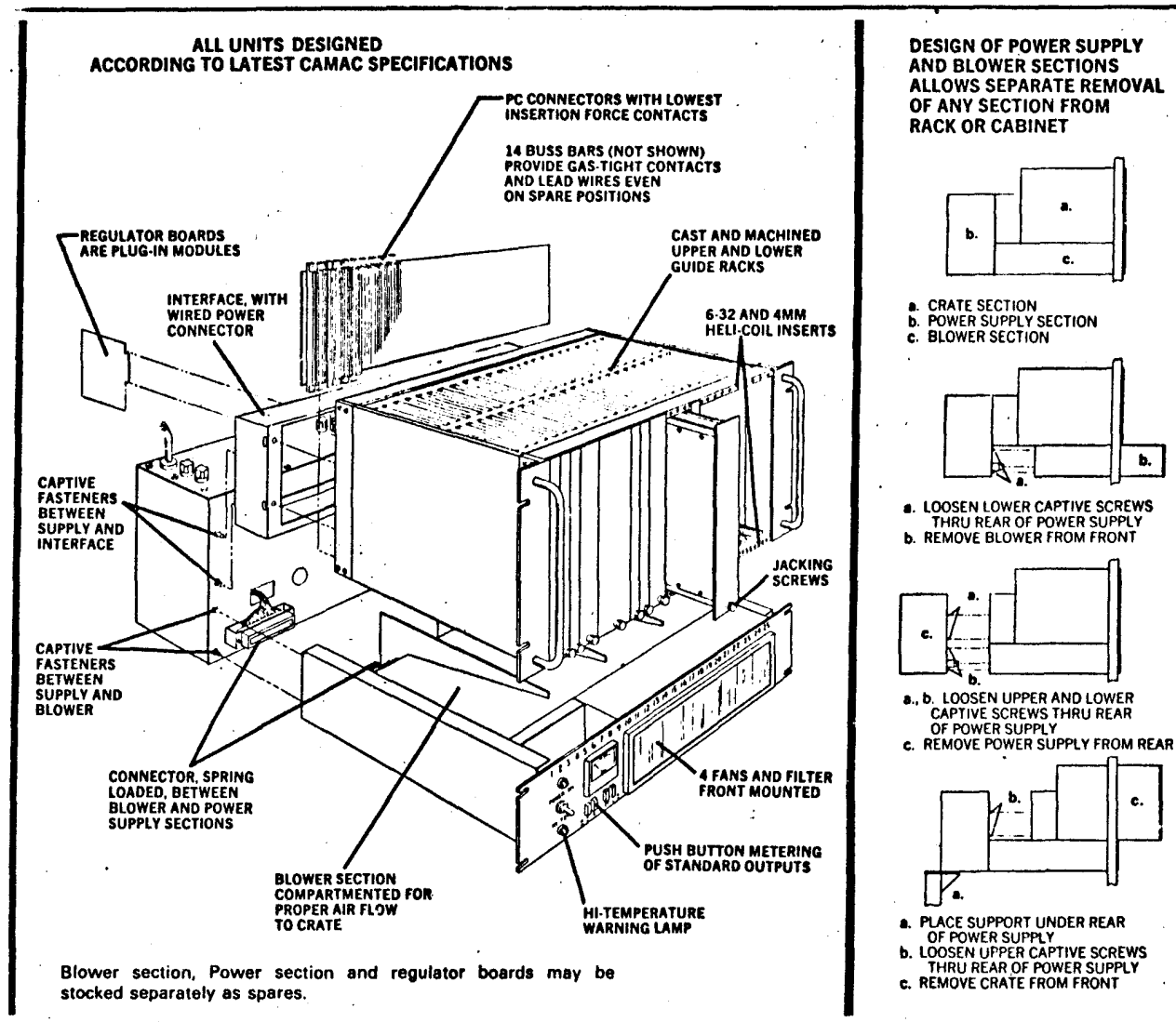
The installation of the Model 1410S and 1510 power supply and other CAMAC products manufactured by Standard Engineering Corporation is shown in Figure 1. All products are manufactured to the strictest CAMAC specifications and are compatible with other products manufactured to the same specifications.

6.0 Turn-on:

Do not turn power supply on unless the sense leads are properly connected to the output leads (see specifications for connections). Although no damage will result, the regulators may go into over-voltage and place an unnecessary strain on the circuitry due to improper forced air flow resulting from operation without a crate.

Plug power cord in 117V 60Hz receptacle and turn power switch to on with no loads applied to outputs. Amber lamp should light and output voltages may be checked with metering on front panel. If any outputs read low, check for current on meter, if current flow is indicated, that output is probably in over-voltage. Turn power off and on again after a thirty second wait. If condition persists, check all output connections.

Standard Engineering Corporation does not warrant the operation of the Model 1410 power supply on initial turn-on when connected to a multilayer board not wired and tested by Standard Engineering Corporation.



MECHANICAL FEATURES

Fig. 1

Appendix E

Description of a Typical CAMAC Power Supply

Type CP-1

A. General

The power supply described herein is suitable for use with the CAMAC Module Instrumentation System for Data Handling.

This description is written in the form of a specification for the convenience of those who wish to use it for that purpose.

Due to the high operational reliability required, only the highest quality components should be employed. All semiconductor components shall be silicon, and shall be encapsulated in metal or ceramic, hermetically sealed, cases. Components shall not be used beyond their design ratings. The supply shall be designed with a life expectancy of at least 5 years. See Fig. E1 for block diagram. Wiring to the right of PG-26 is not considered part of the power supply.

B. Input

The input voltage shall be the nominal line voltage, +10% to -12%, at nominal line frequency ± 3 Hz. In the U.S. the nominal line voltage is 117V and the nominal line frequency is 60 Hz.

C. Output

The supply is to provide four d.c. outputs with at least the following current ratings:

<u>Voltage Volts</u>	<u>Current Amperes</u>
+ 6.00	0 to 25
- 6.00	0 to 25
+ 24.00	0 to 6
- 24.00	0 to 6

The four outputs shall be simultaneously available but the currents may be limited to a minimum total output power of 294 watts. The $\pm 6.0V$ supplies shall operate on a current sharing basis, such that the total combined current outputs may be limited to 25A. Likewise, the $\pm 24V$ supplies shall be current shared, and may be limited to a total combined current output of 6A. Rated output current shall also be available to loads connected between the positive outputs and the negative outputs.

If the output power demanded should exceed a safe operating value, the supply shall protect itself.

Remote sensing shall be utilized on all outputs of this power supply. Remote sense points can be expected to be within 305 mm of the crate connector, PG-27. All wiring shall be in accordance with Fig. E1.

D. Regulation and Stability

1. During a 24-hour period the $\pm 6.0V$ outputs shall vary by not more than $\pm 0.5\%$ due to changes of input voltage and output current within the specified ranges.

2. During a 24-hour period the $\pm 24V$ outputs shall vary by not more than $\pm 0.2\%$ due to changes of input voltage and output current within the specified ranges.

3. The long-term stability shall be such that, after a 24-hour warmup, over a 6-month period for constant load, line, and ambient temperature conditions, the $\pm 6.0V$ output shall drift not more than $\pm 0.5\%$; the $\pm 24V$ outputs shall drift not more than $\pm 0.3\%$.

E. Noise and Ripple

Noise and ripple, as measured on an oscilloscope of d.c. to 50 MHz band-width, shall not exceed 15 mV peak-to-peak.

F. Temperature and Temperature Coefficient

The ambient temperature range is from $0^{\circ}C$ to $50^{\circ}C$ without derating. Ambient temperature as used throughout this specification shall be taken at a location that is not affected by the temperature of the power supply.

The output voltage coefficients for changes in ambient temperatures between $0^{\circ}C$ and $50^{\circ}C$ shall not exceed $0.02\%/^{\circ}C$.

G. Voltage Adjustment

The output voltage shall be adjustable over a nominal range of at least $\pm 2\%$ by means of screw-driver adjustments accessible through the rear or top of the supply. The maximum error in resetting each output voltage shall be $\pm 0.5\%$.

H. Recovery Time and Turn-on - Turn-off Transients

The outputs shall recover to within $\pm 0.2\%$ of their steady state values within 1 ms for any change within the specified input voltage and for a 50% rated load current change. The peak output excursions during 1 ms shall not exceed $\pm 5\%$ of rated voltage for such line or load changes, and shall be proportionately less for smaller changes.

Response to input voltage changes or to $\pm 5\%$ bus-line voltage changes shall be non-oscillatory.

From turn-on the power supply output shall stabilize to within $\pm 1\%$ of its final value within one minute for constant line, load, and ambient temperature. The turn-on and turn-off transients shall not exceed 20% of the nominal voltage.

I. Magnetic Field Effects

A magnetic field of 50 gauss in any direction shall not cause performance characteristic variations of more than $\pm 0.5\%$.

J. Power Transformers

The power transformers shall be constructed with an electrostatic shield which is connected to the core.

K. Terminals

All wiring shall be as shown in Fig. E1.

- (1) When designed for use with 117V a.c. mains, a three-wire power cord of approximately 1.5 meters in length shall be included. It shall have a NEMA CAP, 5-15P. The power cord may be permanently attached to the power supply, or alternatively, may terminate in a NEMA CONNECTOR BODY 5-15R, mating with a NEMA INLET 5-15P on the Power Supply.
- (2) The d.c. output power shall be supplied via a connector (PG26) as designated in Fig. E1, or mating equivalent. Wire size, socket types, and pin assignments are specified in Fig. E1.

L. Protection

- (1) The input of the supply shall be protected with a fuse of adequate rating in each side of the line. The fuses shall be readily accessible.
- (2) The output of the supply shall be short-circuit protected by means of an electronic circuit. The current limiting threshold shall be set at least 0.2 ampere above the specified maximum output currents. The output voltage shall be resumed after the short has been removed. A continuous short circuit shall not damage the supply or blow a fuse.
- (3) The output shall be protected by limiting circuits so that under no conditions will the +24V outputs exceed 34V or the +6.0V outputs exceed 7.5V. Operation of the over-voltage protection shall not damage the power supply.
- (4) In no case shall a failure of any supply cause an increase in voltage of any other supply by more than 20%.
- (5) The power supply shall not damage itself and the conditions of L(3) shall apply if the power supply is turned on with any or all pins of PG-26 disconnected.
- (6) Thermal protection circuits shall be provided to disable the supply when the temperature exceeds a safe operating value.

The maximum safe operating temperature, as measured at the thermal switch, shall be specified on the schematic circuit diagram.

M. Crate Ventilation

This power supply shall include fans and mechanical assembly to provide forced air ventilation of a CAMAC crate. Air flow of at least 12 CFM shall be directed into each of four equal crate sections extending from front-to-back. The air flow impedance of densely packed CAMAC modules in all twenty-five stations shall be considered in determining the minimum air flow rate.

Air shall be drawn from directly in front of the rack in which the assembly is mounted. Air filters allowing a visual inspection from the front, shall be included. The air shall be channelled in such a way that it does not experience an appreciable temperature rise due to the heat of the power supply. The unit shall include a POWER ON-OFF switch which simultaneously provides power to both the fans and to the power supply.

N. Mounting

The supply shall be constructed for rack mounting immediately below a CAMAC crate in such a fashion that the ventilation requirements of this specification are achieved.

- (1) Fig. E2 specifies several outline dimensions and component locations to which the unit must adhere.
- (2) Interface housing units (see Fig. E5) mechanically adapt CAMAC crates from various sources to this power supply. They also house and protect PG-27, power bussing, and the data-way connectors.

An interface housing unit is not a part of this specification. The power supply shall, however, be provided with four #10-32 captive screws in the positions shown in Fig. E2 as a means of securing to an interface housing unit.

- (3) The panel height of the supply is not specified. Panel height is at a premium in rack space. Trade offs between panel height and power supply costs should be optimized.

O. Monitoring

- (1) Front panel metering shall be provided to monitor the four d.c. voltages and their current loads. The metering shall be accurate to $\pm 2.5\%$ full scale.

The meter scales shall be calibrated with full scales of 8 and 30, and shall have labeled markers at nominal voltage values and at rated current values.

- (2) A front panel neon lamp (or suitable solid state indicator) wired as shown in Fig. E1 shall be provided to indicate the a.c. power on condition.
- (3) A front panel thermal warning light, wired as shown in Fig. E1 shall be provided. It shall light whenever the temperature within the supply exceeds a value 20°C below the maximum safe operating temperature.

P. Mechanical Construction

- (1) Insulating materials such as printed wiring boards shall be flame retardant.
- (2) All components shall be accessible for testing and replacement.
- (3) All integrated circuits shall be mounted in high quality I.C. sockets.
- (4) Markings: Major components such as solid state devices, transformers (including leads) large capacitors, controls, and terminals shall be marked in the most readable position in the unit with respect to their identification on the schematic diagram.

Q. Circuit Diagram

Two copies of the schematic circuit diagram, which include component values, shall be provided with each supply. All semiconductor components shall be designated by EIA numbers or in nomenclature commonly used by semiconductor manufacturers or shall be

directly replaceable by the same. Where special types are used, the schematic diagram or instruction book shall recommend a semiconductor manufacturer's equivalent that will provide satisfactory performance.

R. Finish

All front panel metal surfaces shall be finished with a baked-on enamel or with an equally hard, chip-resistant, material. All surfaces not seen from the front may be finished similarly, or may be finished with cadmium plate, nickel plate, or iridite.

Numerals 1 through 25, representing station numbers in a CAMAC crate, and to identify modules inserted into a crate which may be mounted immediately above the supply, shall be printed on the front panel near the top edge. They shall be in consecutive order from left to right as viewed from the front with the numeral 13 at the front panel centerline, and shall be positioned at 17.2mm intervals. The numerals shall be at least 4mm in height.

S. Test Conditions

305 mm of lead shall be used to simulate crate wiring between PG27 and the dataway power bus. Sense leads and test-load leads shall be attached at this distance from PG27, and measurements to determine adherence to these specifications shall be made at this point. Users are alerted to the fact that, in practice, performance will depend upon the actual positions of sense points and the reactive nature of loads.

T. Optional Feature - STATUS BIT

A STATUS BIT to indicate whether the power unit is functioning normally may be provided. This optional feature, when provided, shall be standardized as follows:

- (1) The STATUS BIT source shall be a relay which provides contact closure when in the alarm condition; shorting the STATUS BIT line to the power-unit chassis. Under normal operating conditions, the STATUS BIT line shall be an "open circuit" in the power unit.

Contact rating shall be minimally 50V, 500 ma.

- (2) The STATUS BIT alarm condition shall indicate that any one of the following conditions exist:
 - a. Any one of the voltages supplied by the unit is outside of specified voltage range.
 - b. Any one or combination of supplies is being loaded beyond specified current range.
 - c. The thermal warning switch is in the alarm condition.

The STATUS BIT may indicate additional alarm conditions at the option of the manufacturer, but a., b. and c. must minimally be included.

- (3) In the power unit, the STATUS BIT shall be wired to contact K of PG26 and to a front panel 50CM coaxial connector.

FIGURES

- FIG. E1 INTERCONNECTION BLOCK DIAGRAM
- FIG. E2 MAXIMUM OUTLINE DIMENSIONS AND ILLUSTRATIVE UNIT
- FIG. E3 +6V, TIME AND VOLTAGE CHARACTERISTICS
- FIG. E4 +24V, TIME AND VOLTAGE CHARACTERISTICS
- FIG. E5 INTERFACE HOUSING UNIT, #10-32 TAPPED HOLE LOCATIONS (See note below)
- FIG. E6 POWER BUSSES AND POWER RETURN BUS, FEED AND SENSE WIRING (See note below)

NOTE:

The information on Figures E5 and E6 indicate preferred practice for fabrication and assembly of CAMAC crate wiring and the interface housing unit. It is presented in this DESCRIPTION OF A TYPICAL CAMAC POWER SUPPLY because of the intimate relationship between these items and the power supply and ventilation unit.

NOTES:-

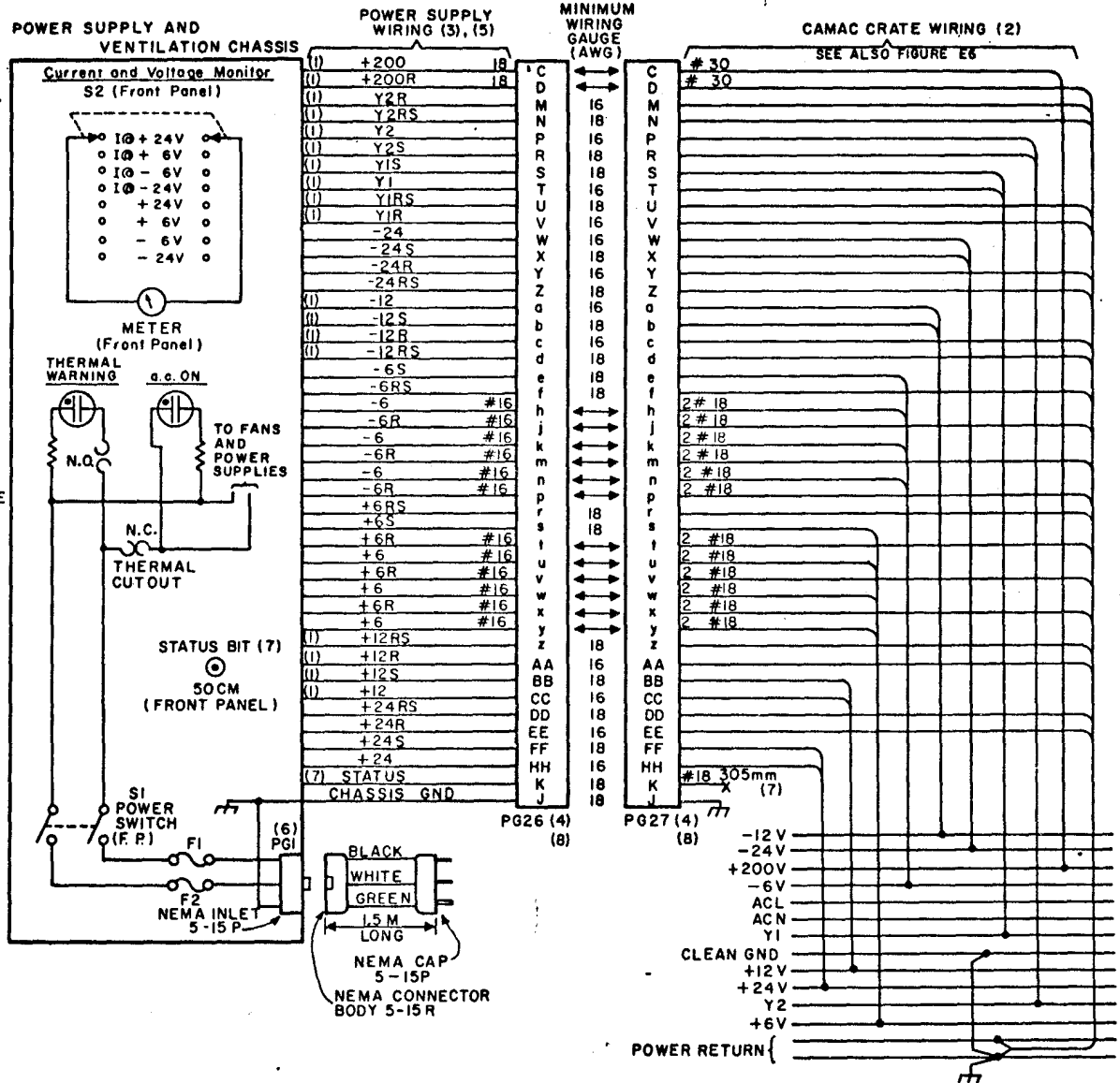
- OPTIONAL VOLTAGES. PINS RESERVED FOR OPTIONAL VOLTAGES NOT SUPPLIED BY THIS UNIT. IF WIRED, MINIMUM WIRE GAUGES SHOWN PERTAIN.
- ALL PINS WIRED AS SHOWN, PG27 AND CAMAC CRATE WIRING ARE NOT PROVIDED WITH THIS POWER SUPPLY.
- SUFFICIENT LENGTH, POSITIONING, AND FLEXIBILITY TO MATE WITH CRATE CONNECTOR MOUNTED AS SHOWN IN FIG. E2 (MINIMUM LENGTH, 305 mm).
- PG26 AMP BLOCK 200277-4, WITH SIZE 16 SOCKET CONTACTS:
PG27 AMP BLOCK 201358-3, WITH SIZE 16 PIN CONTACTS:

AWG WIRE GAUGE	USEABLE AMP CONTACTS			
	TYPE II		TYPE III+	
	PIN	SOCKET	PIN	SOCKET
ONE #16 OR #18	202507	202508	66098	66100
ONE #30	201555	-----	66425	-----
TWO #18	202725	-----	66359	-----

OTHER CONNECTORS FULLY MATEABLE WITH THESE AND WITH AT LEAST 13 AMPERES PER CONTACT RATING MAY BE USED.

- 24 INDICATES 24 VOLT LINE
24 R " 24 VOLT RETURN LINE
24 S " 24 VOLT SENSE LINE
24 RS " 24 VOLT RETURN SENSE LINE
Etc FOR OTHER VOLTAGES
- PG1 OPTIONAL
- OPTIONAL FEATURE, SECTION T.
- POLARIZATION OF CONNECTORS PG26 AND PG27 IS TO BE PROVIDED BY THE USE OF TWO GUIDE PINS IN THE CORNER HOLES OF ONE END AND TWO GUIDE SOCKETS IN THE CORNER HOLES OF THE OTHER END OF EACH CONNECTOR BLOCK, AS SHOWN BELOW:

BLOCK	AMP GUIDE PIN AND GUIDE SOCKET PART NUMBERS	
	PG26	PG27
BLOCK END A, B	200833 (GP)	200835 (GS)
BLOCK END FF, HH	200835 (GS)	200833 (GP)



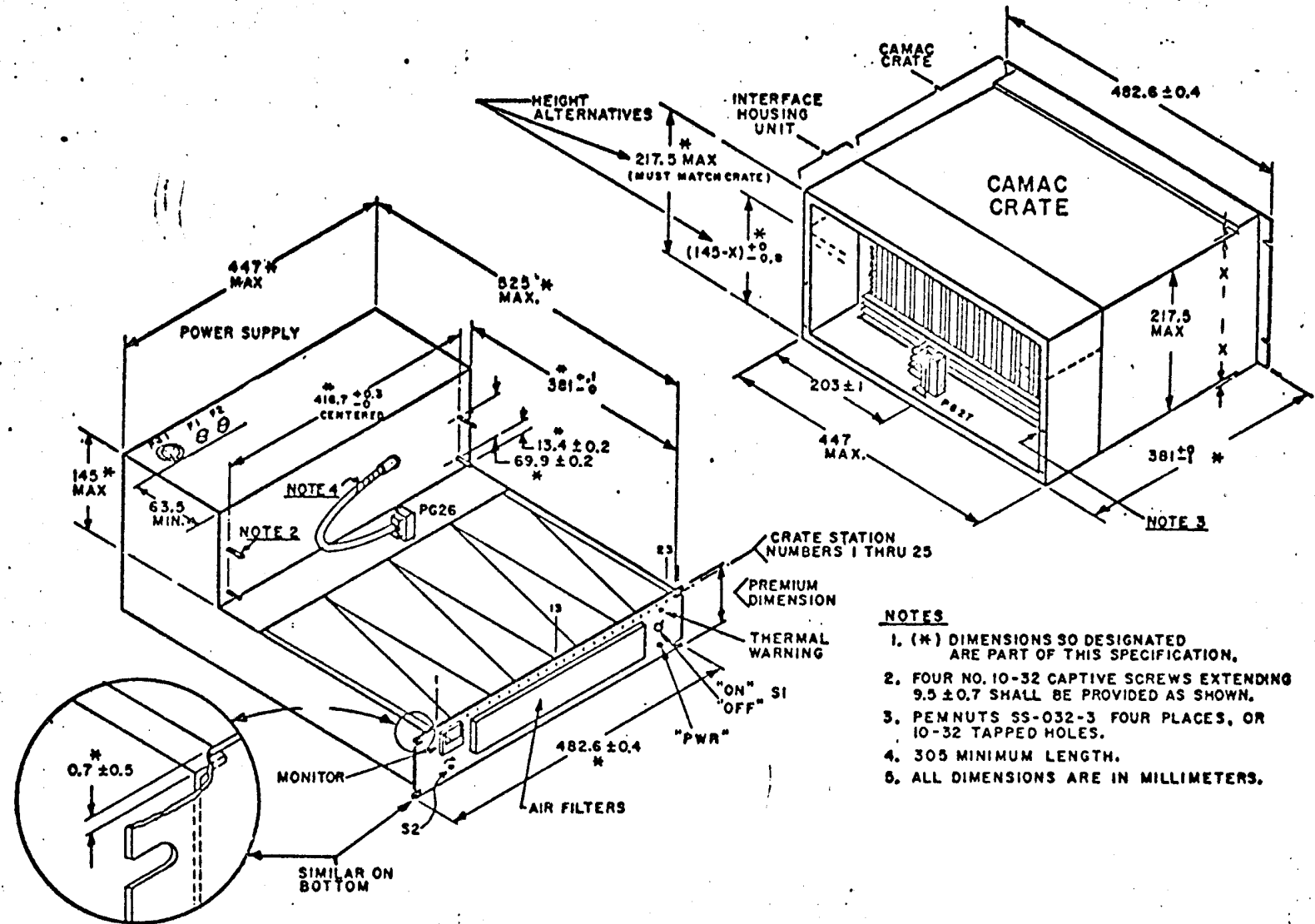


Fig. E2. Maximum Outline Dimensions and Illustrative Unit

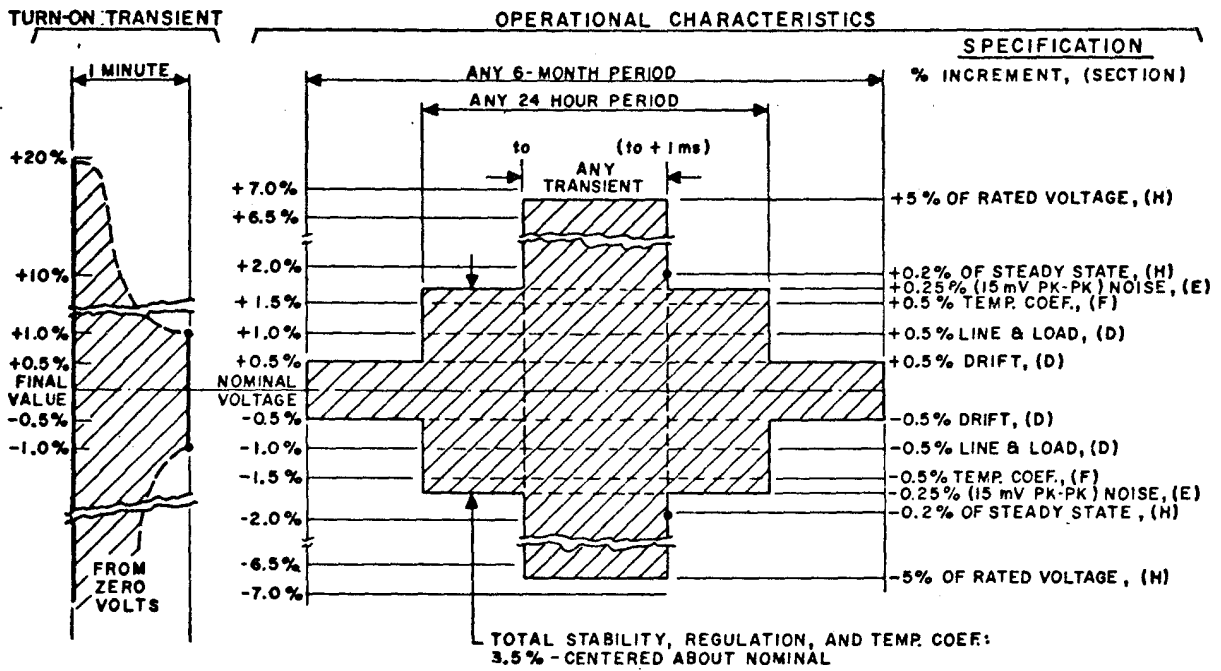


Fig. E3. $\pm 6V$, Time and Voltage Characteristics

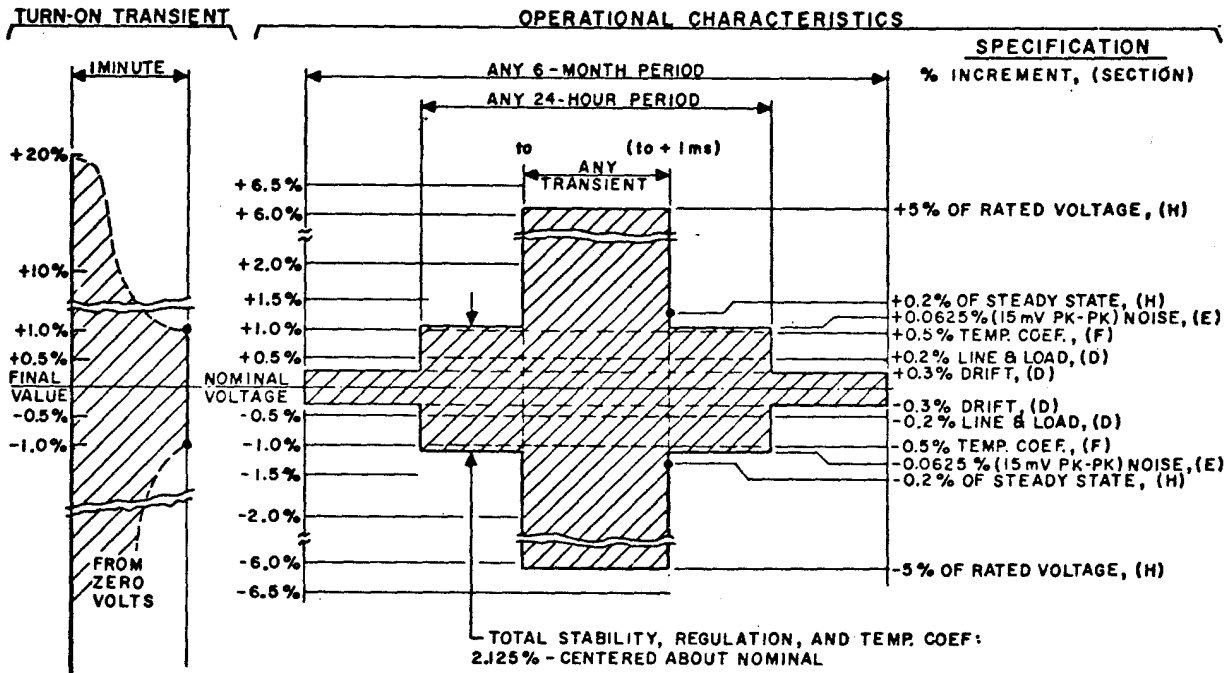
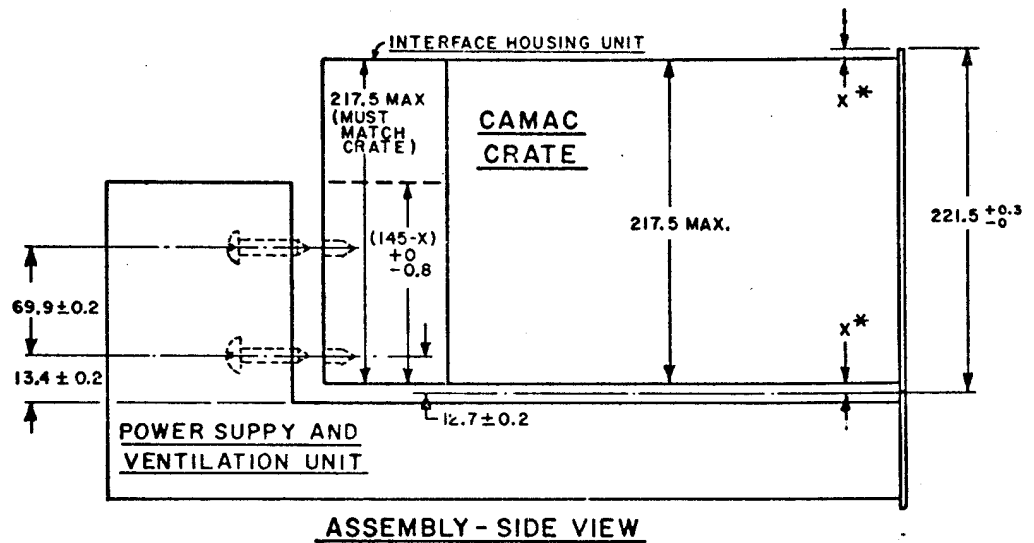
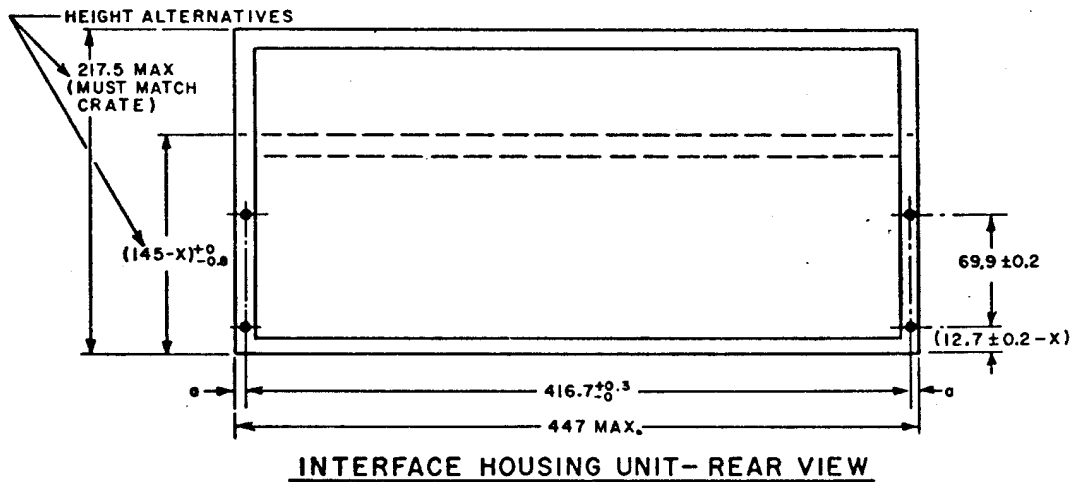


Fig. E4. $\pm 24V$, Time and Voltage Characteristics



ASSEMBLY - SIDE VIEW



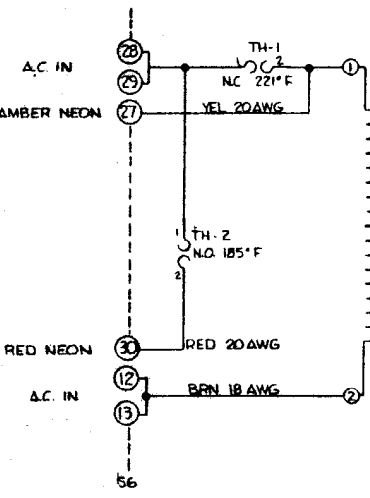
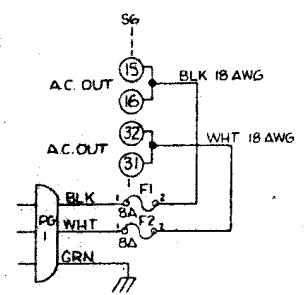
INTERFACE HOUSING UNIT - REAR VIEW

* X DIMENSION VARIES WITH CRATES FROM DIFFERENT MANUFACTURERS. SKETCHES NOT TO SCALE.

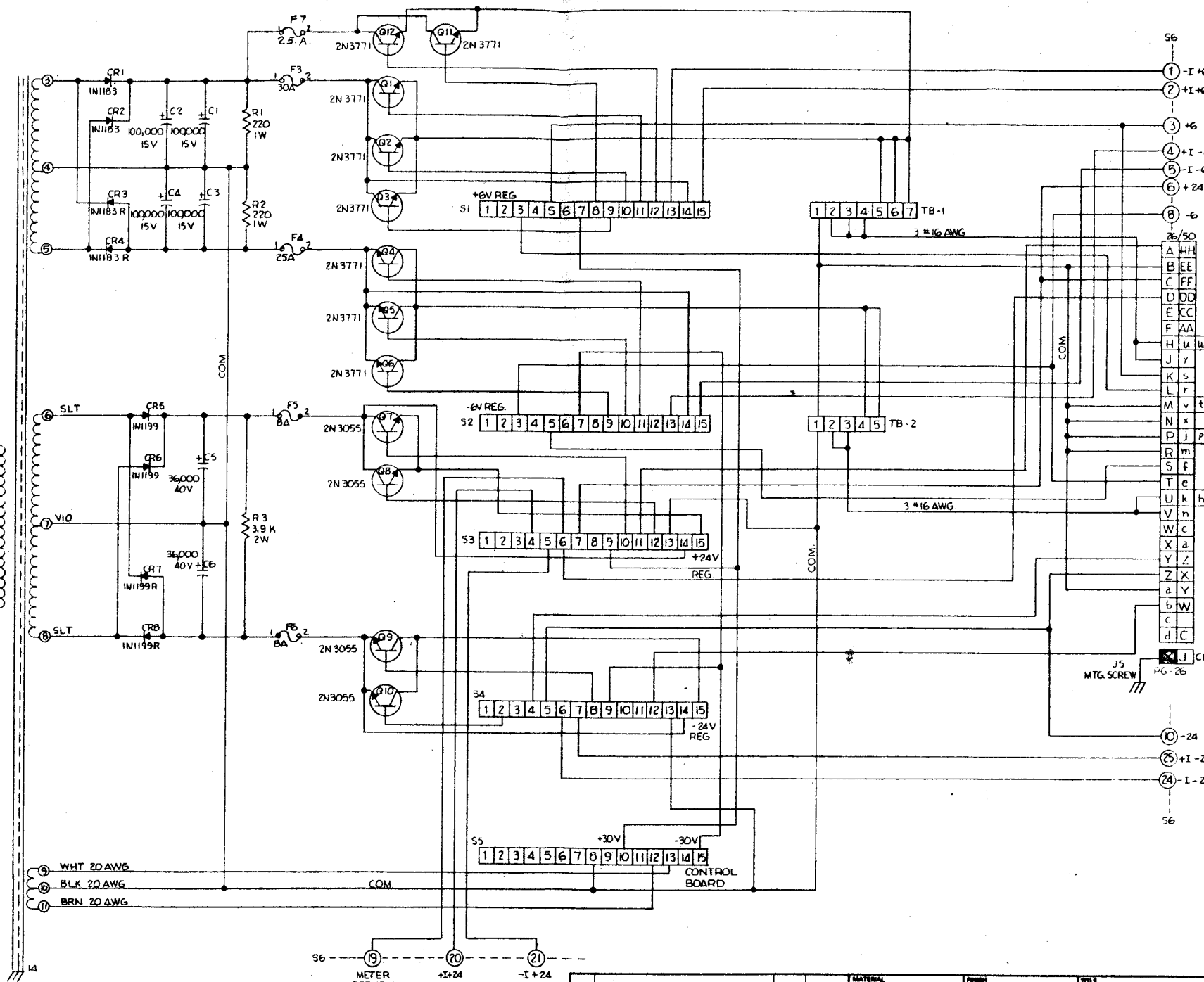
Fig. E5. Interface Housing Unit, #10-32 Tapped Hole Locations

INDEX OF DRAWINGS - 1510/42A

<u>Title</u>	<u>Drawing No.</u>
1. Schematic, Main Chassis	105212
2. Schematic, Blower Section	105004
3. Layout, Neg. 24V Regulator	105013
4. Schematic, Neg. 24V Regulator	105006
5. Layout, Neg. 6V Regulator	105011
6. Schematic, Neg. 6V Regulator	105007
7. Layout, Control Board	105010
8. Schematic, Control Board	105005
9. Layout, Pos. 6V Regulator	105217
10. Schematic, Pos. 6V Regulator	105216
11. Layout, Pos. 24V Regulator	105009
12. Schematic, Pos. 24V Regulator	105002
13. Layout, Meter Board	105014
14. Schematic, Meter Circuit	105003
15. Main Chassis Component Identification	105049

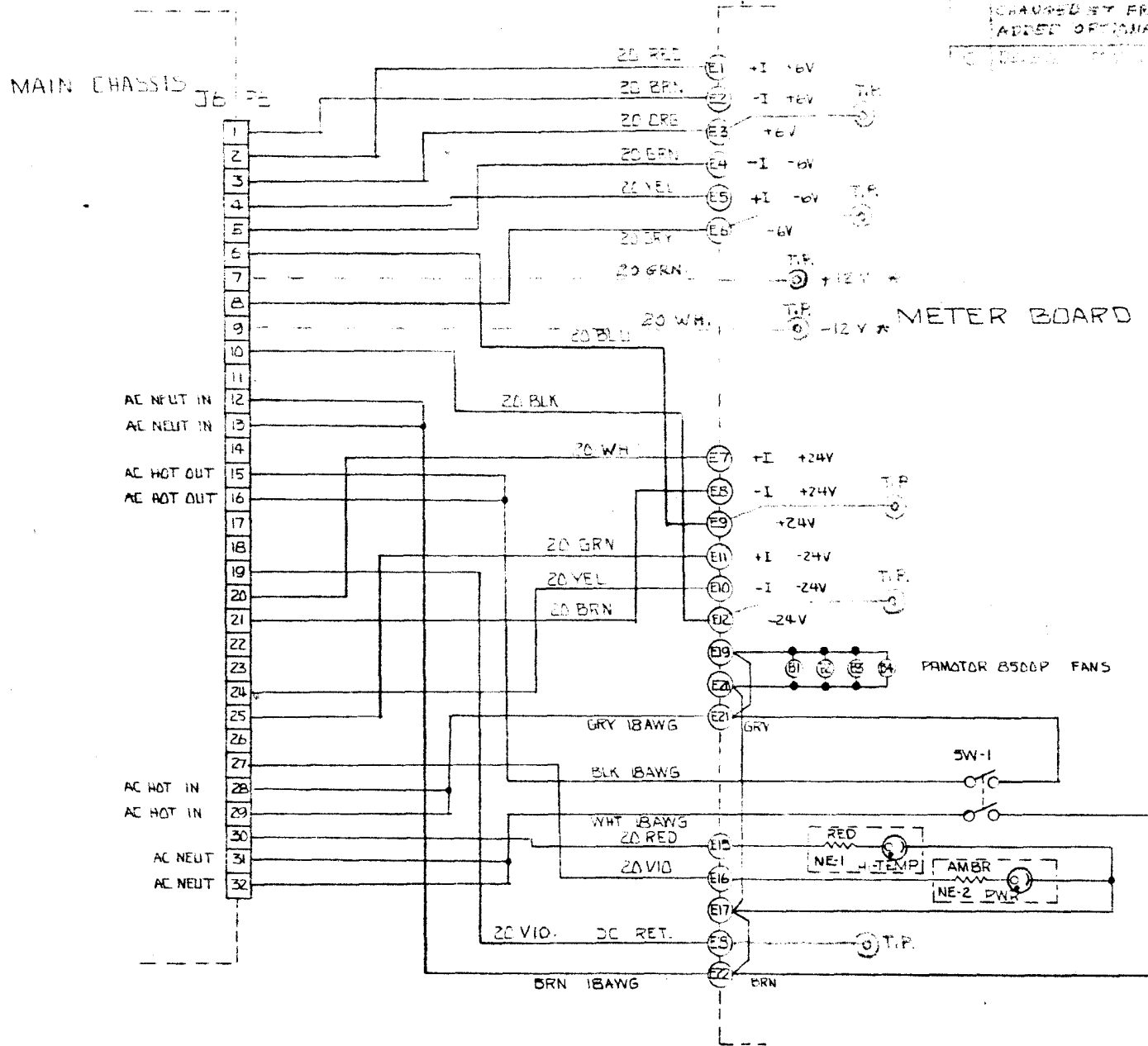


- NOTES: UNLESS OTHERWISE SPECIFIED -
- 1 (2) 56 TO BLOWER SECTION
 - 2 (3) XFMR DESIGNATIONS
 - 3 (4) PG-26 DESIGNATIONS TO CRATE
 - 4 ALL RESISTORS ARE OHMS
 - 5 ALL CAPACITORS ARE IN MF
 - 6 (1) THRU (12) MOUNTED ON COMMON HEAT SINK (# 103215)
 - 7 TH-1 AND TH-2 MOUNTED ON T1



MATERIAL		FINISH		TITLE	
HEAT TREAT		DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		SCHEMATIC MAIN CHASSIS 1410 1510/44V, 42A OPTION	
WEIGHT		TOL		DESIGN	
ANSC		TOL		DETAIL	
SYN		NEXT ASSY		CHECK	
DESCRIPTION		DATE		DATE	
REVISIONS		APPROVAL		DATE	
				LOU DEN	
				DATE	
				DATE	
				DATE	

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVA
A	CORRECT EIS MISTAKE W/ P...	10/21/54	JW
B	CHANGED E17 FROM YEL. TO GRN. CHANGED E17 FROM 24V TO 12V. ADDED OPTIONAL WIRING *	3-57	JW
C

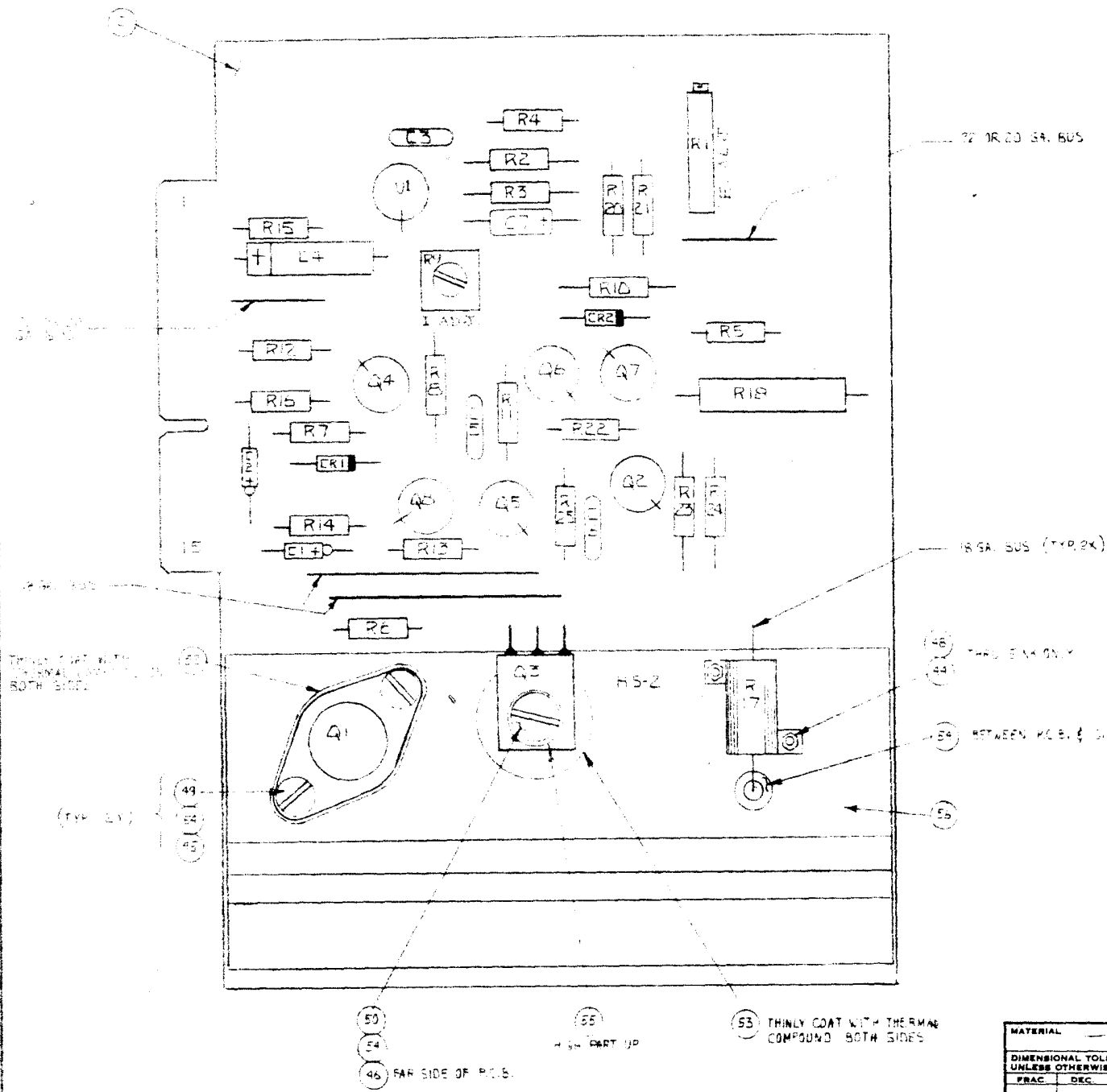


* = OPTIONAL WIRING
T.P. = PANEL TEST POINT

MATERIAL			FINISH			HEAT TREAT		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			TITLE			WEIGHT		
FRAC.	DEC.	ANG.	SCHEMATIC BLOWER SECT.			JAMES WHITE		
±	—	±				P. O. BOX 4097		
—	—	—				FREMONT, CALIF. 94538		
SCALE NONE NO REQ.			DRAWN			DATE		
NEXT ASSY.			CHECKED			DATE		
			APPROVED			DATE		
						SIZE	DRAWING NUMBER	ISSUE
							105004	C

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL



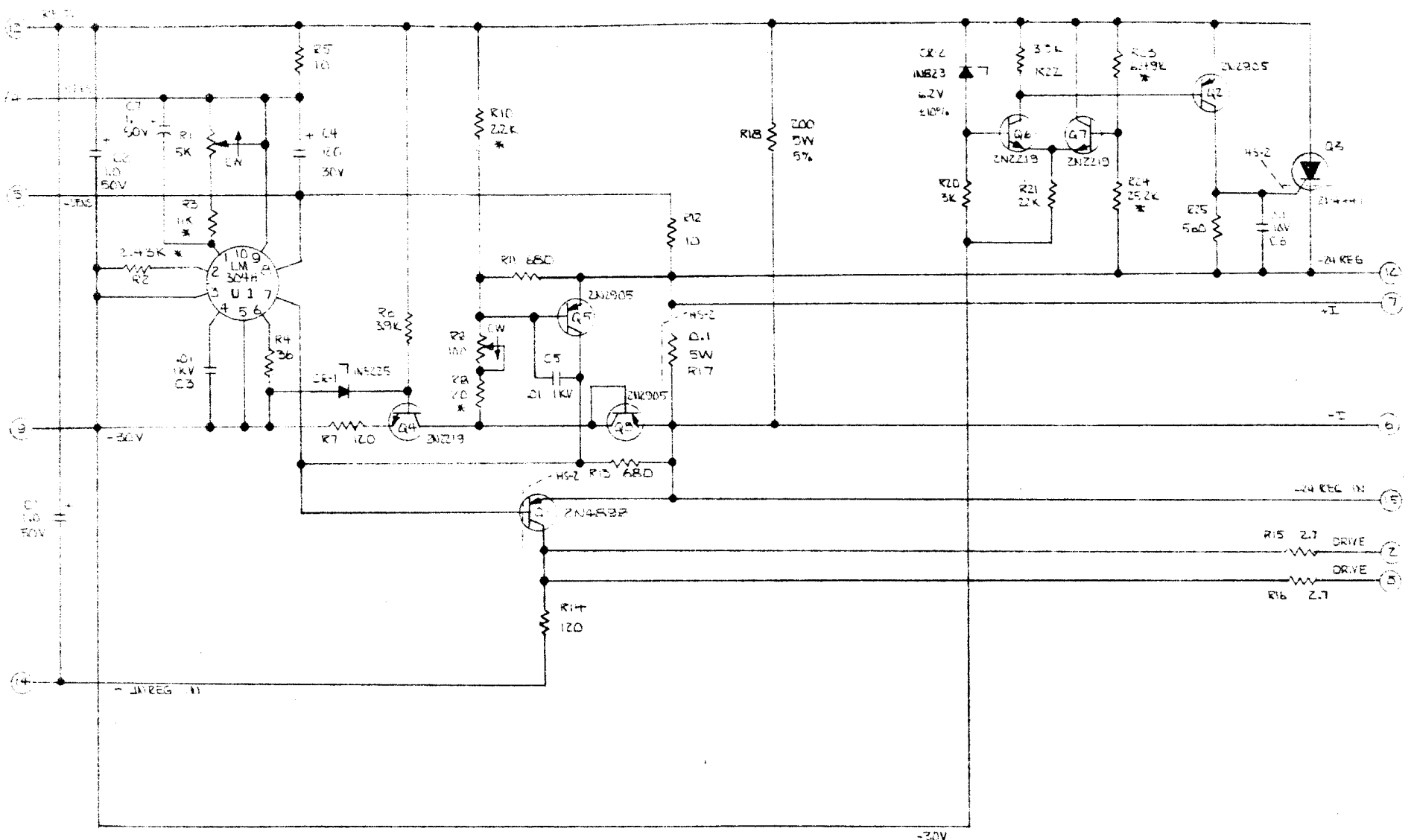
- NOTES:
1. R5 & R12 MOUNT .062 OFF PCB.
 2. R18 MOUNTS .125 OFF PCB.

MATERIAL			FINISH			HEAT TREAT		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			TITLE			WEIGHT		
FRAC	DEC	ANG.						
±	±	±						
SCALE	NO. REQS.	DRAWN	DATE	SIZE	DRAWING NUMBER	ISSUE		
NEXT ASSY		CHECKED	DATE					
		APPROVED	DATE					



STANDARD
ENGINEERING
CORPORATION

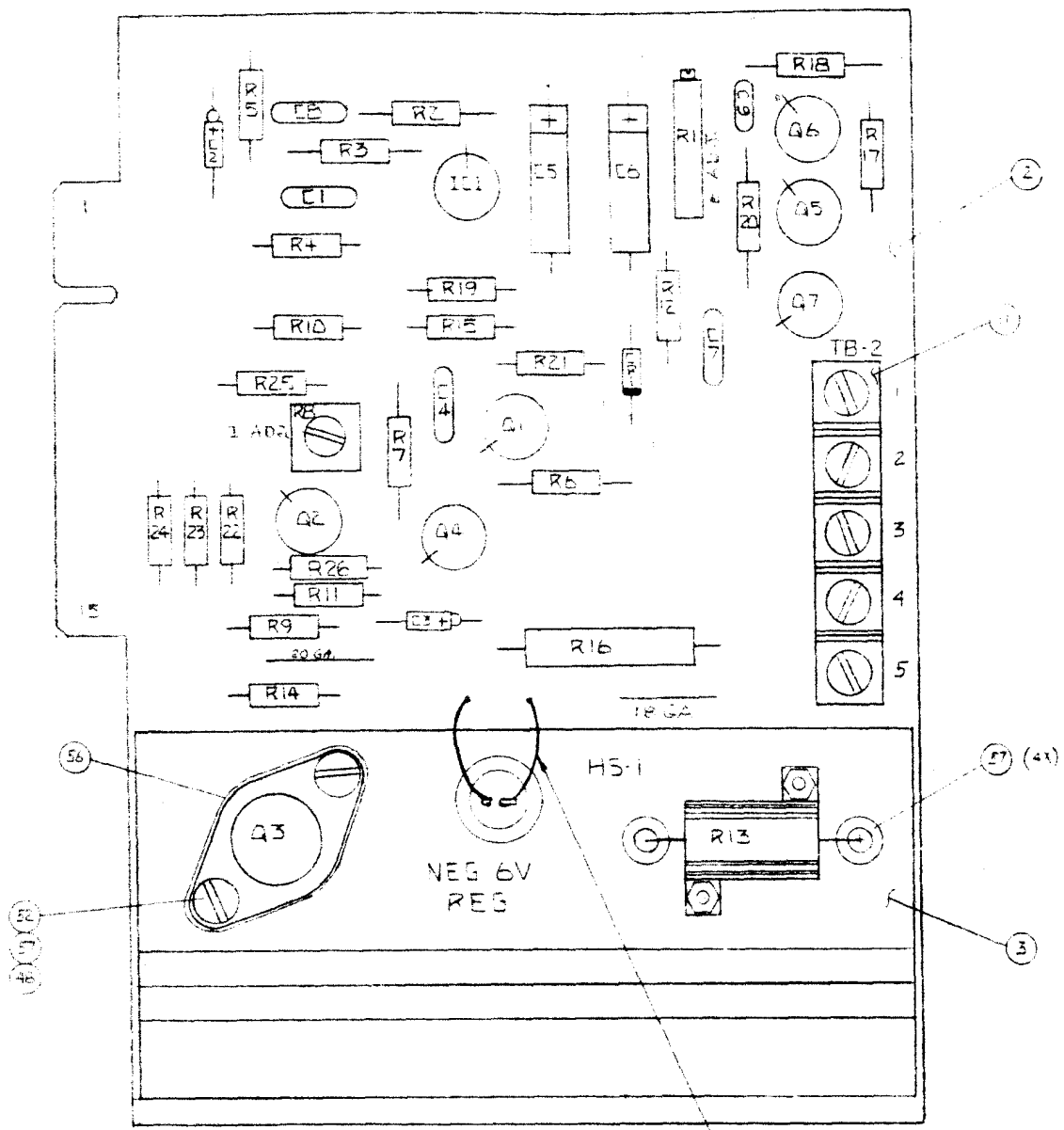
REVISIONS	
BY	DESCRIPTION



- NOTE 5, UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS 1/2W 5% CC
 2. * RESISTORS 1/4W 1% MF
 3. (6) J4 DESIGNATIONS
 - 4.
 - 5.


MATERIAL		FINISH		HEAT TREAT	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		TITLE		WEIGHT	
FRAC.	DEC.	ANG.	SCHEMATIC		STANDARD ENGINEERING CORPORATION
±	±	±	NEG 24V REG		
SCALE	NO. REQD.	DRAWN	DATE	SIZE	DRAWING NUMBER
NEXT ASSY		CHECKED	DATE		05006
		APPROVED	DATE		ISSUE

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	ADD 500 WIRE BLENDED	2/1/4	

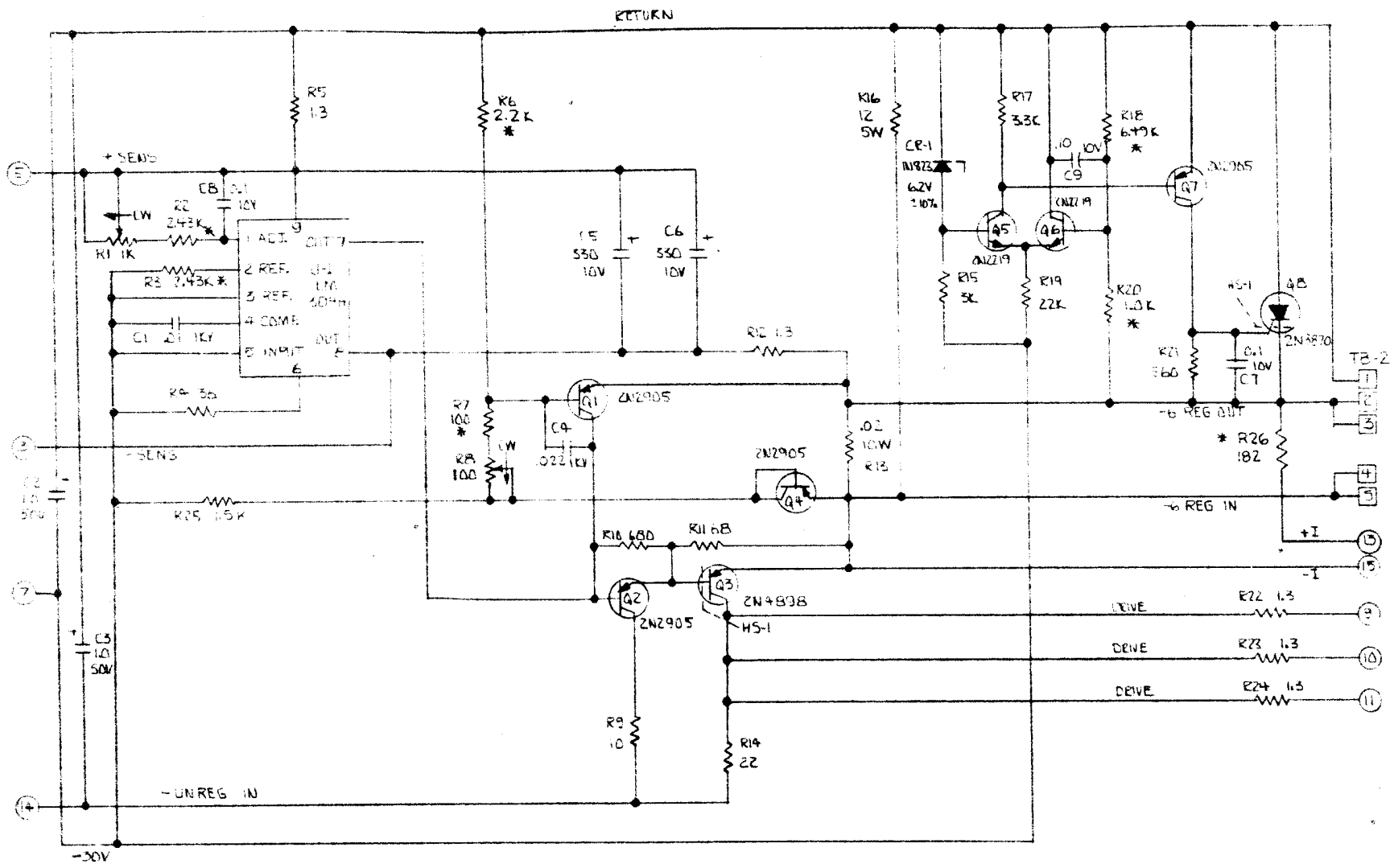


- NOTES:
1. R5 & R2 MOUNT $\frac{1}{16}$ OFF PCB.
 2. R16 MOUNTS $\frac{1}{8}$ OFF PCB.
 3. ASSEMBLE LOWEST PROFILE COMPONENTS FIRST, HIGHEST LAST.

18 GA BUS (2X)

MATERIAL			FINISH			HEAT TREAT		
UNLESS OTHERWISE NOTED			TITLE			WEIGHT		
FRAC.	DEC.	ANG.	LAYOUT			 STANDARD ENGINEERING CORPORATION		
±	±	±	NEG 6V REG					
SCALE	NO. REQ.	DATE	DRAWN	DATE	SIZE	DRAWING NUMBER	ISSUE	
NEXT ASSY			CHECKED	DATE				
			APPROVED	DATE				

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

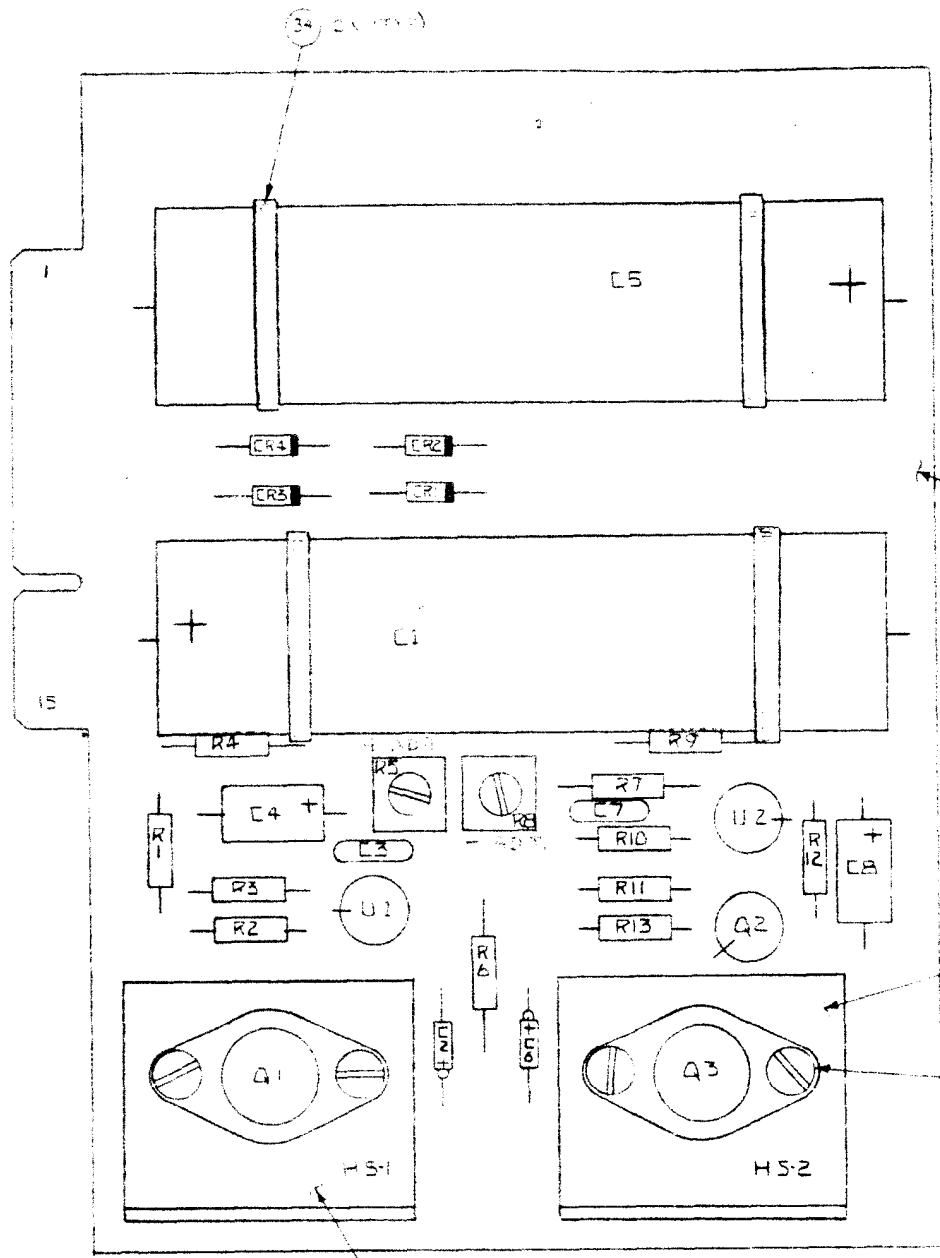


- NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS 1/2 W 5% LE
 2. * RESISTORS 1/4 W 1% MF
 3. [⊕] PZ DESIGNATIONS
 4. [⊙] JZ DESIGNATIONS
 - 5.

MATERIAL		FINISH		HEAT TREAT	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		TITLE		WEIGHT	
FRAC.	DEC.	ANG.	SCHEMATIC		
±	±	±	NEG 6V REG.		
±	±	±	DRAWN		
±	±	±	DATE		
SCALE	NO REQD	CHECKED		DATE	SIZE
		APPROVED		DATE	DRAWING NUMBER
					ISSUE
					105007



REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED



NOTES
 1. ASSEMBLE IN SEQUENCE OF LOWEST PROFILE COMPONENTS FIRST - HIGHEST LAST.

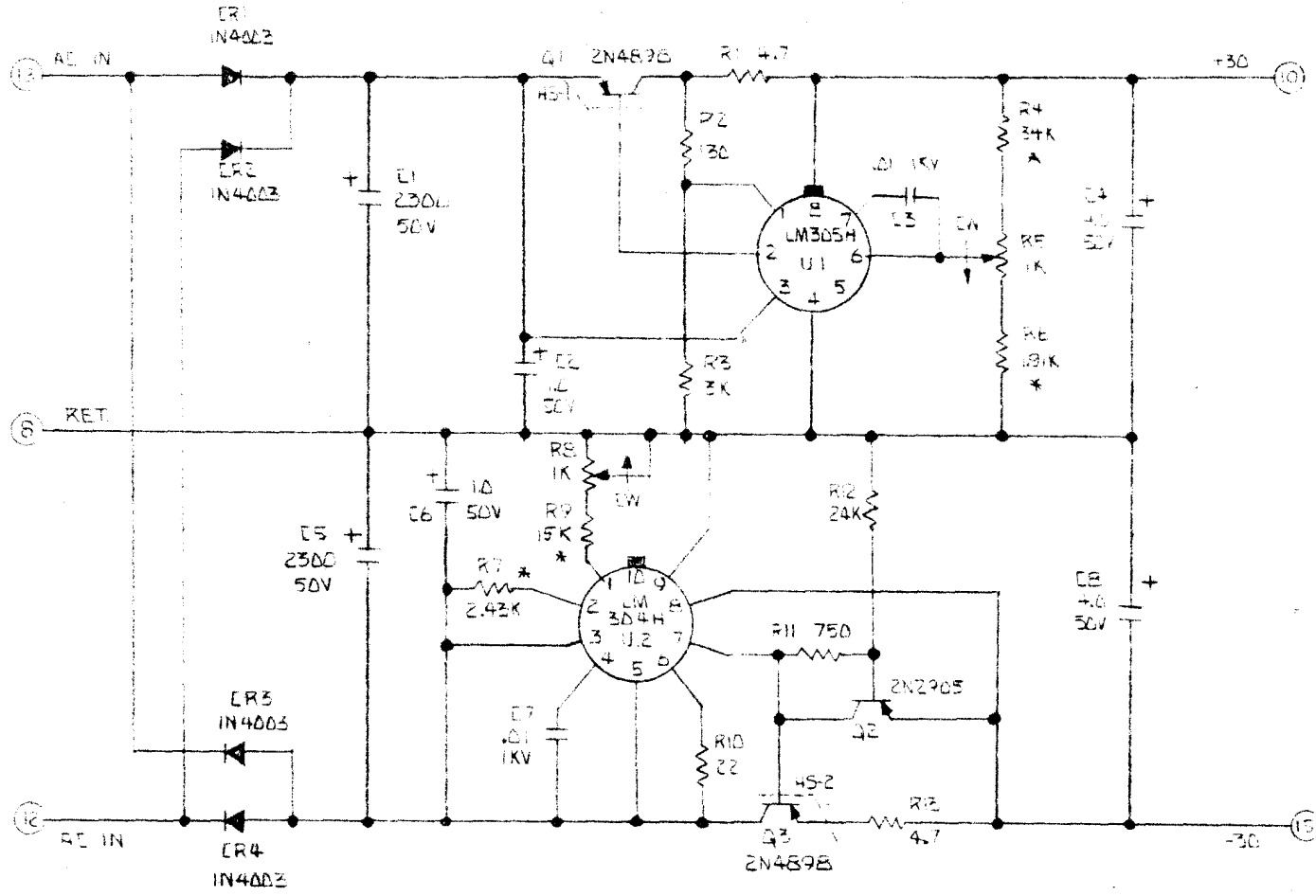
- (31)
- (32) (TYP)
- (33) (TYP)
- (34) BETWEEN SINK & PCB - SHOULDER IN SINK (TYP)

(31)

MATERIAL			FINISH			HEAT TREAT		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			TITLE			WEIGHT		
PRAC.	DEC.	ANG.	LAYOUT			STANDARD ENGINEERING CORPORATION		
±	±	±	CONTROL BO.					
SCALE	NO. REQD.	DRAWN	DATE	SIZE	DRAWING NUMBER	ISSUE		
NEXT ASSY.		CHECKED	DATE	APPROVED	DATE			

REVISIONS

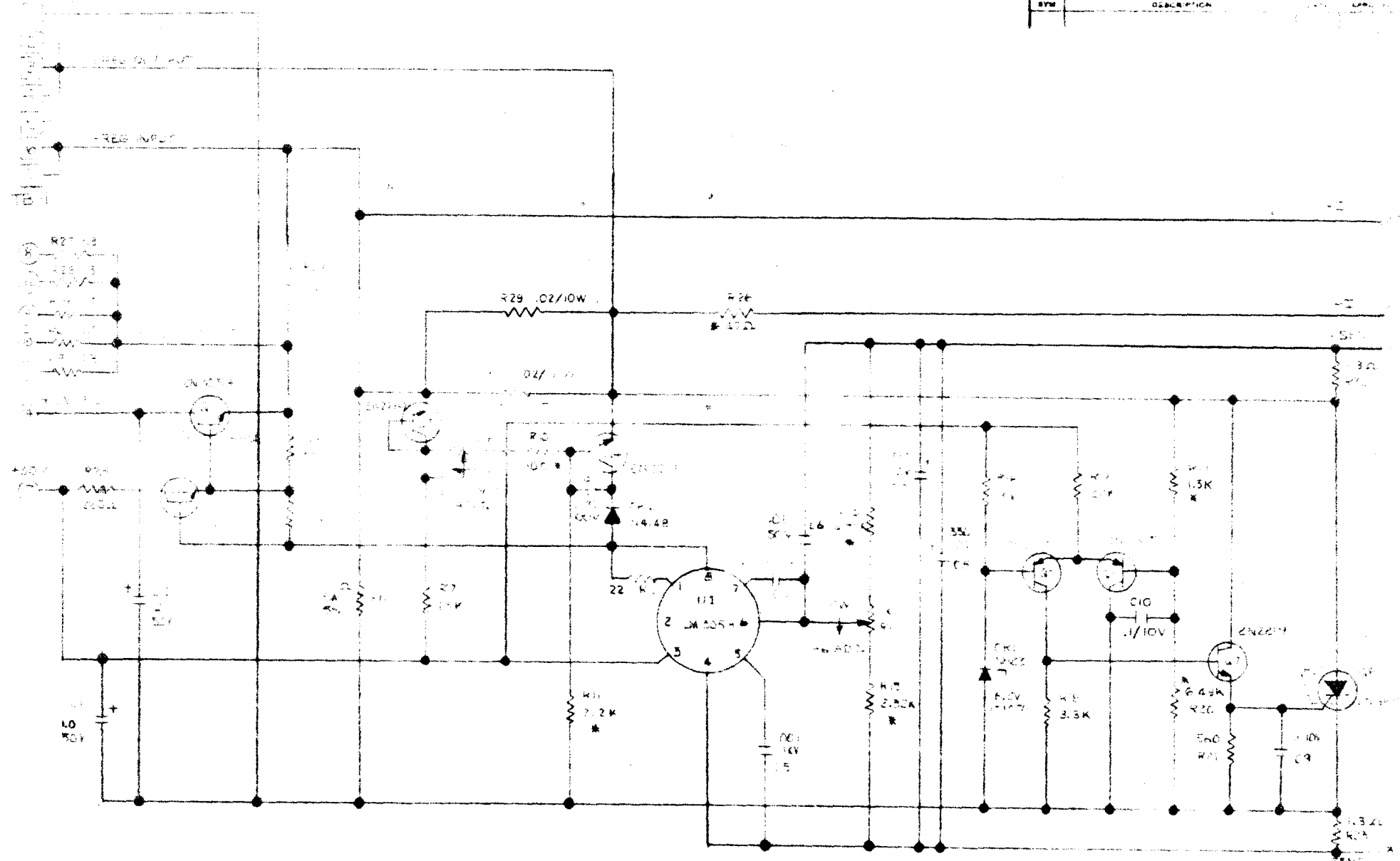
BY	DESCRIPTION	DATE	APPROVAL



NOTES... UNLESS OTHERWISE SPECIFIED...

1. ALL RESISTORS 1/2 W 5% CL
2. * RESISTORS 1/4 W 1% MF
3. (C) C'S DESIGNATIONS
- 4.
- 5.

MATERIAL			FINISH			HEAT TREAT		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			TITLE SCHEMATIC					
FRAC.	DEC.	ANG.	CONTROL BOARD					
±	±	±	STANDARD ENGINEERING CORPORATION					
SCALE	NO. REQD.	DRAWN	DATE	SIZE	DRAWING NUMBER	ISSUE		
		CHECKED	DATE					
NEXT ASSY		APPROVED	DATE					

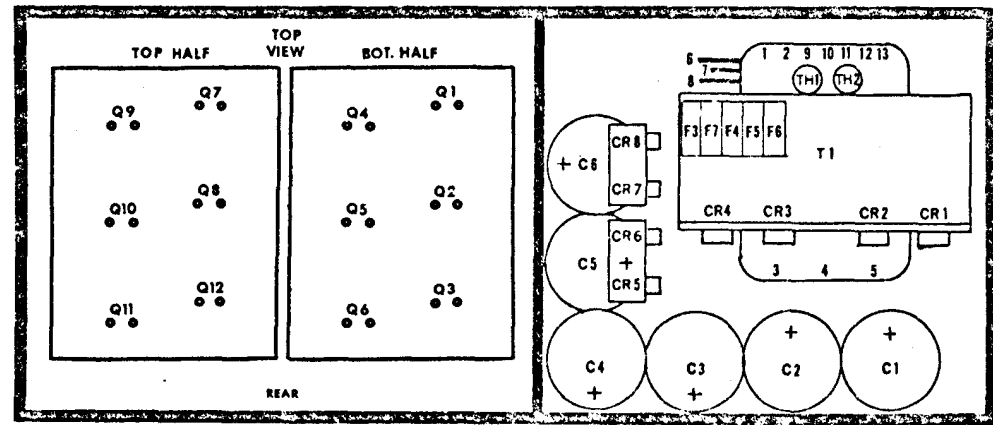


NOTES... UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS 1/4W 5% TL
2. * 1/4W 1% KN400
3. (R) RESISTOR DESIGNATION
4. (C) CAPACITOR DESIGNATION

MATERIAL		FINISH		HEAT TREAT	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED					
FRAC	DEC	ANG		WEIGHT	
1	2	3	4	STANDARD ENGINEERING CORPORATION	
SCALE	NO. RECD	DRAWN	LDJEN	DATE	DEC 1973
NEXT ASSY	CHECKED	DATE	DATE	SITE	DRAWING NUMBER

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



MATERIAL			FINISH:			HEAT TREAT		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			TITLE			WEIGHT		
FRAC.	DEC.	ANG.	COMPONENT IDENT. MAIN CHASSIS, P.S.			1410 & 1510/42		
±	±	±						
SCALE 2:1	NO. RECD.		DRAWN T1	DATE 1-10-71	SIZE	DRAWING NUMBER	ISSUE	
NEXT ASSY.			CHECKED	DATE	B	105049		
			APPROVED	DATE				

DETROIT CORPORATION 1411 WILMINGTON STREET SAN FRANCISCO CALIFORNIA 94107