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MK 25/2500 **SOLID STATE STEREO AMPLIFIER** **SERVICE MANUAL**



Components for the Connoisseur

Price \$2.00

SPECIFICATIONS MARK 25/2500

RMS (Min) CONTINUOUS POWER OUTPUT
PER CHANNEL 20Hz TO 20kHz (BOTH
CHANNELS DRIVEN) INTO 8 OHMS..... 300 Watts @ 0.05% Total Harmonic Distortion

THD (TOTAL HARMONIC DISTORTION)
FROM 20 Hz TO 20 kHz AT 250mW TO
RATED POWER AT 8 OHMS..... 0.05% Max.

IM (INTERMODULATION DISTORTION)
FROM 250mW TO RATED POWER AT
8 OHMS WITH ANY 2 MIXED FREQUEN-
CIES BETWEEN 20 Hz AND 20 kHz AT
4/1 VOLTAGE RATIO 0.05% Max.

FREQUENCY RESPONSE AT RATED
POWER +0.25dB, 20 Hz TO 20kHz

NOISE Greater than 100dB below rated power

TRANSIENT RESPONSE OF ANY
SQUARE WAVE 2.5 micorseconds rise and fall

SLEW RATE 40 Volts per microsecond

STABILITY Unconditionally stable with any type of load or no load
including full-range electrostatic loudspeakers

DAMPENING FACTOR 150 Min. (100Hz)

INPUT SENSITIVITY 1.84V RMS for rated output at 8 Ohms

INPUT IMPEDANCE..... 50K Ohms

SEMICONDUCTOR COMPLEMENT..... 46 transistors, 49 diodes

OVERLOAD PROTECTION 1. Low impedance electronic-sensing circuit limits with
output current below 2 Ohms without limiting with
4 Ohms or higher (or reactive loads).
2. Thermal sensing of inadequate ventilation
3. Internal B+, B- supply fuses.

LOUDSPEAKER PROTECTION Relay circuit protects loudspeakers from low frequency
oscillations and plus or minus D.C. output. Five second
turn on/off delay eliminates on/off disturbances.

POWER REQUIREMENTS 110-125V, 50Hz/60Hz 100 Watts @ idling to 1100
Watts @ rated output.

SHIPPING WEIGHT 68 pounds (30.9Kg)

DIMENSIONS..... Front panel: 19 in. (48.3cm) W x 7 in. (17.8cm) H
Chassis: 15.75 in. (40cm) D (excluding handles, controls
and connections).

WALNUT CABINET WC-25 (not included)

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DISASSEMBLY:

1) To remove top cover, unscrew 16 screws (6 on top, 3 on each end, and 4 on rear).

2) To remove the amp module, unscrew 13 screws: 3 on the bottom of the chassis, and 5 on either side. Remove 4 slip terminal leads on fuse blocks going to amp module, unscrew bridge rectifier, unscrew amp module ground wires from capacitor ground bus, unplug gain and meter wires, and unscrew thermal switch leads from AC terminal block.

3) The transistor covers may be removed by unscrewing fan (2 screws on inside and 2 on rear of heatsink), remove AC plug from fan, and unscrew 6 screws on transistor covers.

4) The drive board may be removed by unscrewing 2 screws fastening to heatsink assembly.

5) The pre-drive board may be removed by unscrewing 2 screws, and unplug input and gain wires.

6) The relay board may be removed by 1 thumb screw.

REPAIRING:

1) If the amplifier is not operating properly or blew the B supply fuses or blew the power fuse, use an Ohmmeter to measure the resistance from the NPN output transistor collector (s) (Q20, Q21) to the output before the relay at the output choke (L3) of the appropriate channel. When making this measurement connect the positive lead of the Ohmmeter to the output coil (L3) and have all boards inserted in module. These readings should be higher than 3K Ohms for the inside transistor(s) (Q22, Q23), and higher than 1.8K Ohms for the slave transistor(s) (Q20, Q21). If any of these resistance readings is less than 3K Ohms or 1.8K Ohms, it is likely that the driver transistor(s) or output transistor(s) is defective and should be replaced. Repeat with the PNP output transistors, but this time connect the positive lead of the Ohmmeter to the transistor collector case (Q26 or Q27).

2) To evaluate the condition of the bias regulator, short the input jacks and monitor the D.C. voltage across the regulator by measuring from collector-to-collector of the driver transistors (Q1, Q3). If the voltage is greater than 2.25V then the regulator is probably open and should be replaced. Also see that the regulator voltage can be adjusted with the control (R61) on the bottom of the PC board from a minimum of 1.5V to a maximum of 2.25V. This D.C. voltage should not exceed 2.25V when the amplifier is operated with full-line voltage. When a circuit malfunction is suspected, use a Variac to apply only 10% (approx.) of the full supply voltage (12-15V) to check for this condition. Also check the pre-driver transistor condition as described in step 3 below.

3) Check for burned resistors on the Pre-drive circuit board, especially the 62 Ohm resistors (R35, R36) and the 10 Ohm resistors (R30, R31). If any resistors appear faulty, then use an Ohmmeter to check the condition of the driver stages (Q1, Q3, Q5, Q7) and the protection stages (Q2, Q4) for either collector-to-emitter or base-to-collector shorts (each resistance reading should exceed 500 Ohms). If any resistance reading is unreasonably low, replace the faulty transistor.

4) With no output load on the amplifier, increase the supply line voltage to rated voltage. Now measure the amplifier output D.C. offset voltage. This voltage should be zero, if not, check to see that the D.C. offset adj. (R37) is properly adjusted. If this adjustment does not correct the problem, first check the 10 Ohm ground resistors (R34) to see if they are open. If defective, replace this resistor. If excessive offset voltage still persists, check the input differential-amplifier pair (Q9, Q10, Q11, Q12), the D.C. level shifters (Q6, Q8) and associated diodes (D5, D6) to verify that none are defective. After correcting the problem, go back and readjust the D.C. offset adjust (R37) for zero voltage on the amplifier-output terminals.

5) Check each output transistor for proper series voltage division. The outside pairs should read +95V on collector(s) (Q20, Q21), -95V on collector(s) (Q26, Q27), +47.5V on collector(s) (Q22, Q23), and -47.5V on collector(s) (Q24, Q25). If these voltages on Q22, Q23 or Q24, Q25 are not 1/2 of the supply voltage (+95V), check for faulty driver transistors (Q13, Q14, Q15, Q16), voltage dividing resistors (R39 thru R47) or capacitors (C26, C27, C31, C32).

6) Carefully check the D.C. quiescent current adjustment by measuring with a Voltmeter from +95V supply to collector of the protection transistor (Q4). It should read 2.1V which is equivalent to a current of 30mA. If not, readjust the Quiescent Current Adj. (R38) for proper reading. If the current is low, and not adjustable, first check the Zener diode (D11) for 51V. If this voltage is correct, check both differential transistor pairs one at a time. After the fault is corrected, recheck quiescent current. Adjust R38 if necessary.

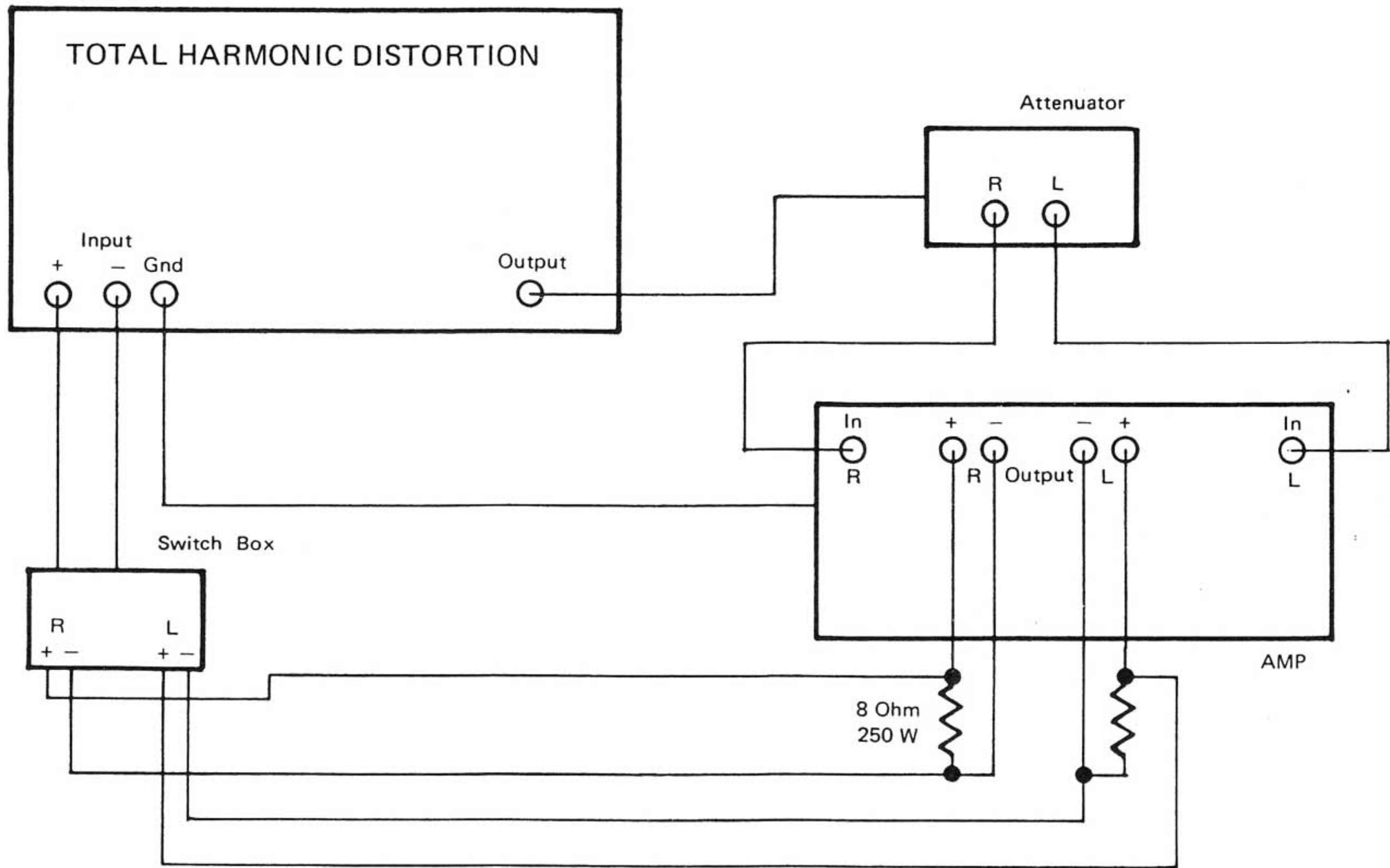
7) Adjust the output-transistor bias control (R61) for 2.1V D.C. measured from collector-to-collector of the driver transistors (Q1, Q3). If possible, the bias should also be re-adjusted to achieve between .03% to .04% harmonic distortion at 20KHz with an 8 Ohm load at 1 Watt (2.8V RMS) output.

8) When replacing output transistors, care must be taken that silicone heat-transfer compound (20-0045) is applied to both sides of the plastic or mica transistor insulator (18-0075). Only a thin film is required; however, it is important that the entire surface area is covered. It is also important that the area beneath the transistor be kept clean (except for the heat compound) so that there are no foreign objects such as metal filings which might puncture the plastic insulator. Finally, tighten the output transistor securely to the heatsink. To insure that the heat sink performs its heat-transfer function properly, retighten the transistor screws after the amplifier has been allowed to become warm after operating under power.

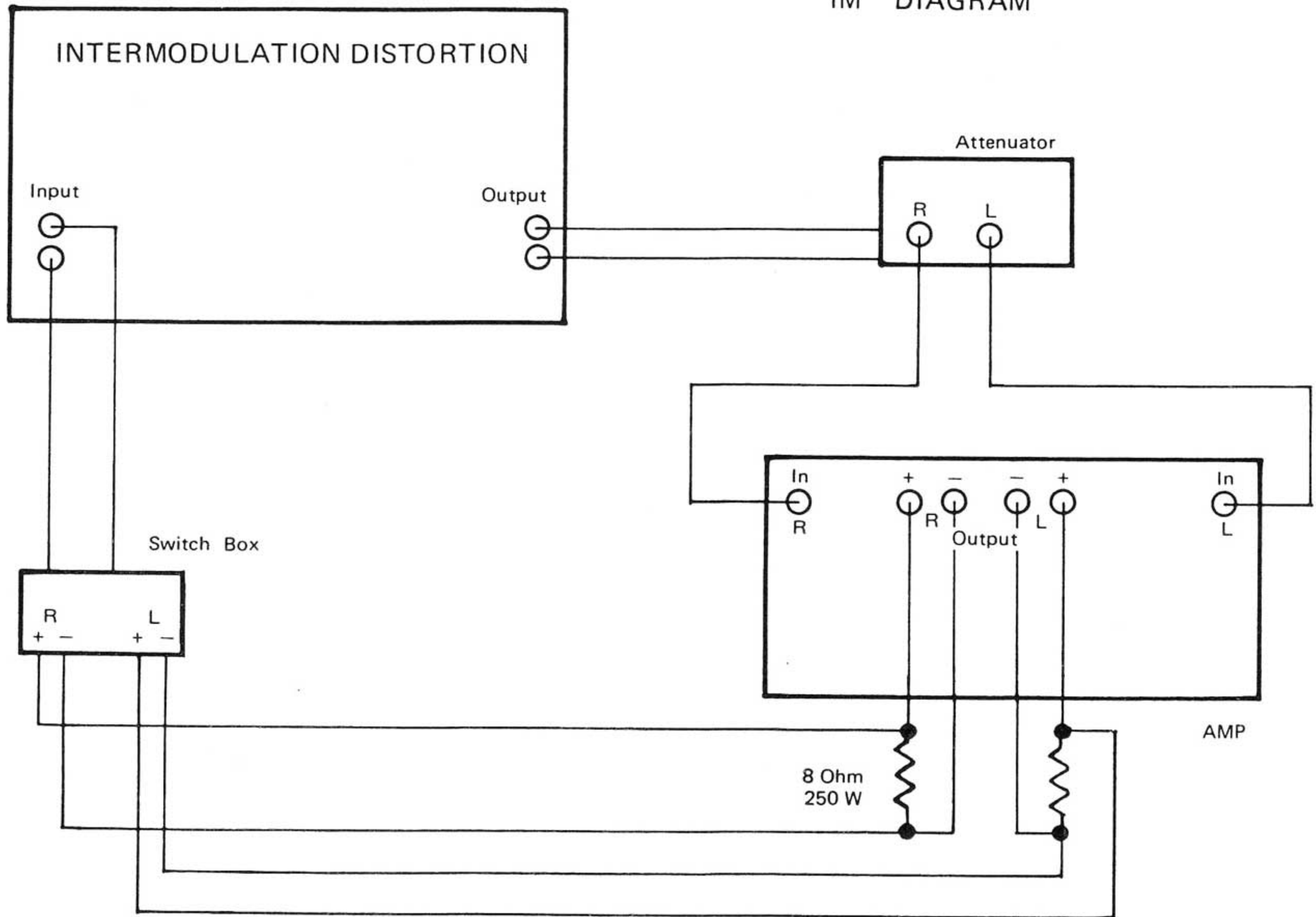
NOTE: Due to the extremely wide bandwidth of the amplifier, 200kHz R.F. fed directly into the inputs may destroy the output transistors. Therefore, under no circumstances, should the input cable be plugged into the Mark25/2500 input while the amplifier is operated. Under no circumstances should the amplifiers be checked to ascertain if it is operating by touching the input lead with your finger. Your body acts as an efficient antenna and can transfer an excessive amount of R.F. to the amplifier.

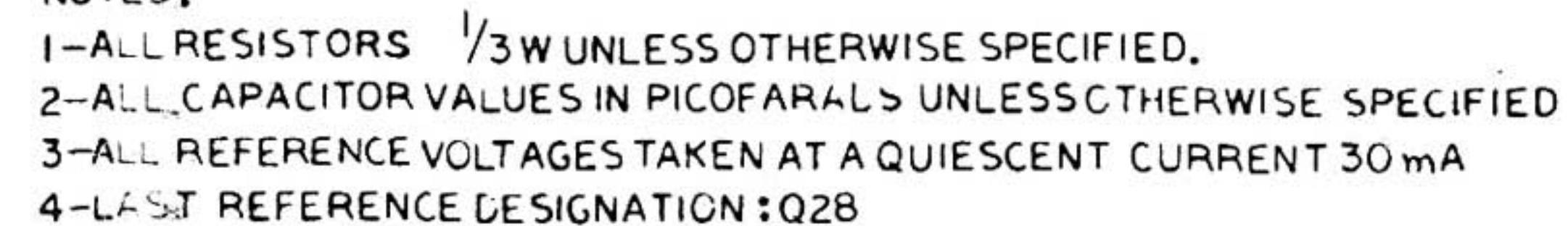
RECOMMENDED TEST SET-UP


THD DIAGRAM

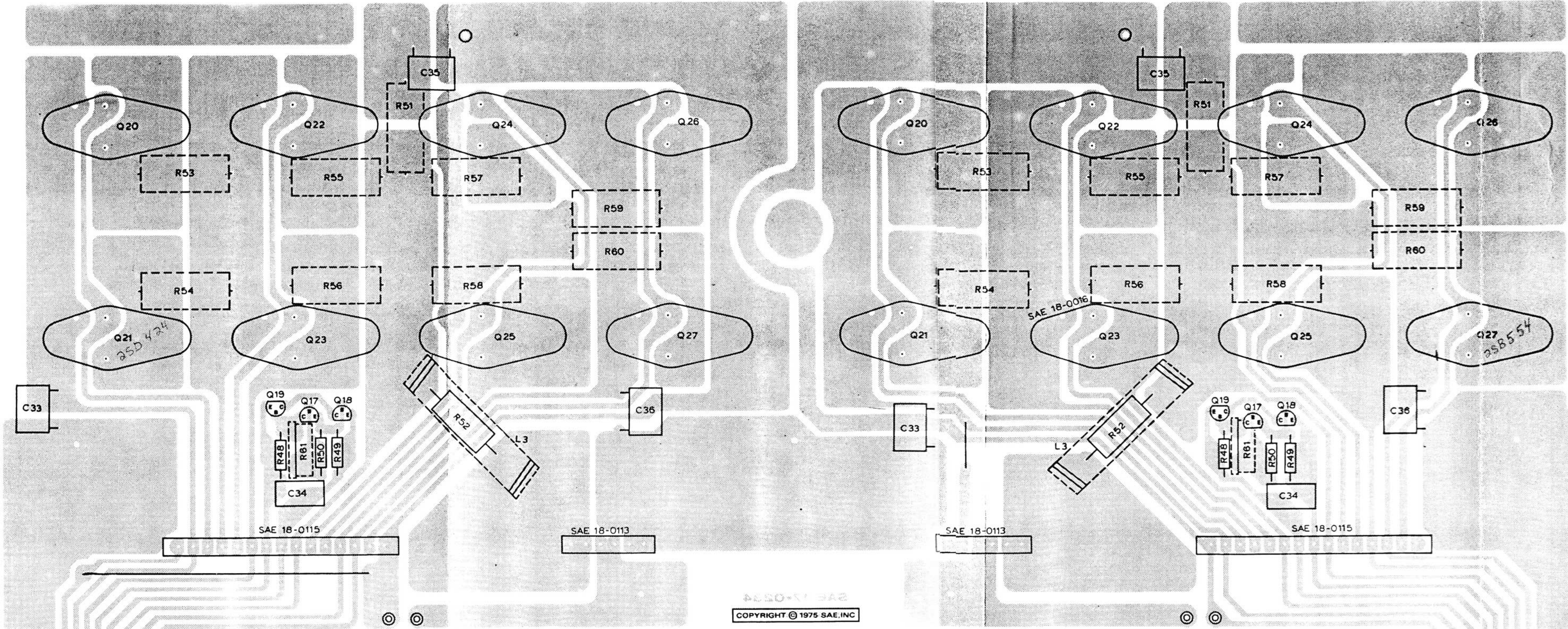


IM DIAGRAM



BIAS REGULATOR
NETWORK

		SCIENTIFIC AUDIO ELECTRONICS, INC. 701 E. MACY ST. LOS ANGELES, CALIF. 90001			
TOLERANCE (UNLESS NOTED OTHERWISE) FRACTIONAL 1/64 ANGLES 1/2°		TITLE MK 25 (2500 SCHEMATIC			
		MATERIAL		FINISH	
SCALE	DATE	DESIGNED BY	APP. BY	APP. BY	DWG NO.
NONE	5-275	ORAW			50-0073
					REV.



MAIN BOARD (22-0092)

REF. NO.	SAE PART NO.	DESCRIPTION
RESISTORS		
R48,49	02-0018	510 Ohm 5% 1/3W
R50	02-0024	1K Ohm 5% 1/3W
R51	04-0044	10 Ohm 10% 5W
R52	04-0064	2.2 Ohm 2% 2W
R53,54,55,56,57,58,59,60	04-0072	0.2 Ohm 10% 5W
R61	06-0003	Pot: 500 Ohm
CAPACITORS		
C33,34,35,36	08-0024	Mylar 0.1µF 10% 250V
SEMICONDUCTORS		
Q17,18	11-0044-M	Tstr NPN BC237B
Q19	11-0117M	Tstr PNP BC307B
CHOKES		
L3	15-0088	Choke (wire)
QTY.		
HARDWARE & MISC.		
16	17-0022	Insulator, No. 1809
16	18-0016	Tstr Socket TO-3
4	18-0105	Terminal, male
2	18-0113	Wafer Connector, 6 pin
2	18-0114	Wafer Connector, 8 pin
2	18-0115	Wafer Connector, 15 pin
2	21-0178	Jumper, 1/2"
1	21-0188	Jumper, 3"

Q20,21,22,23 (11-0139) Tstr NPN SAE 101 = 2SD424
Q24,25,26,27 (11-0140) Tstr PNP SAE 202 = 2SA554

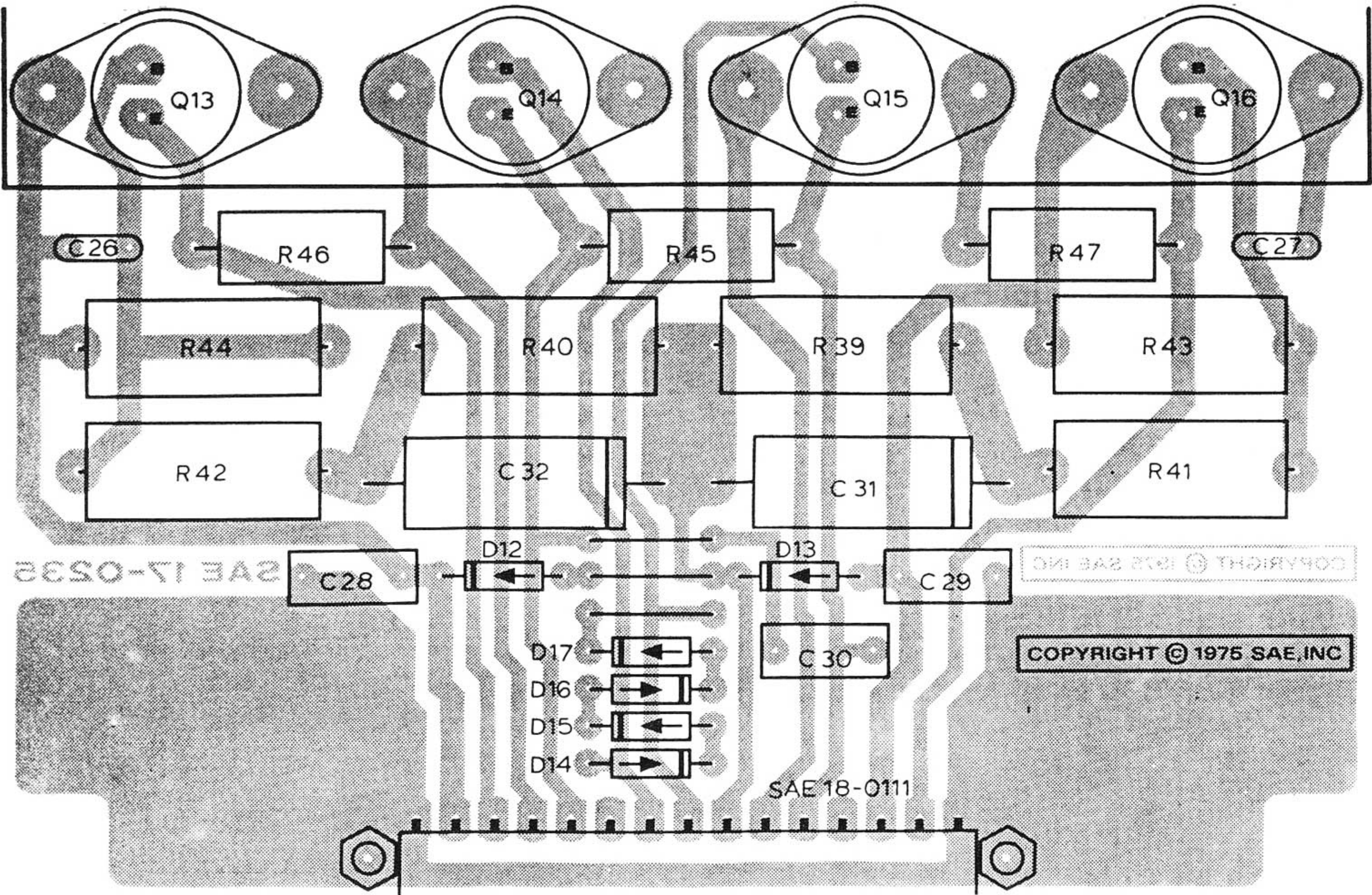
SAE 22-0093 MK 25/2500 DRIVE BD. PARTS ASSBLY.
17-0235

2SC783

2SA483

2SA483

2SC783

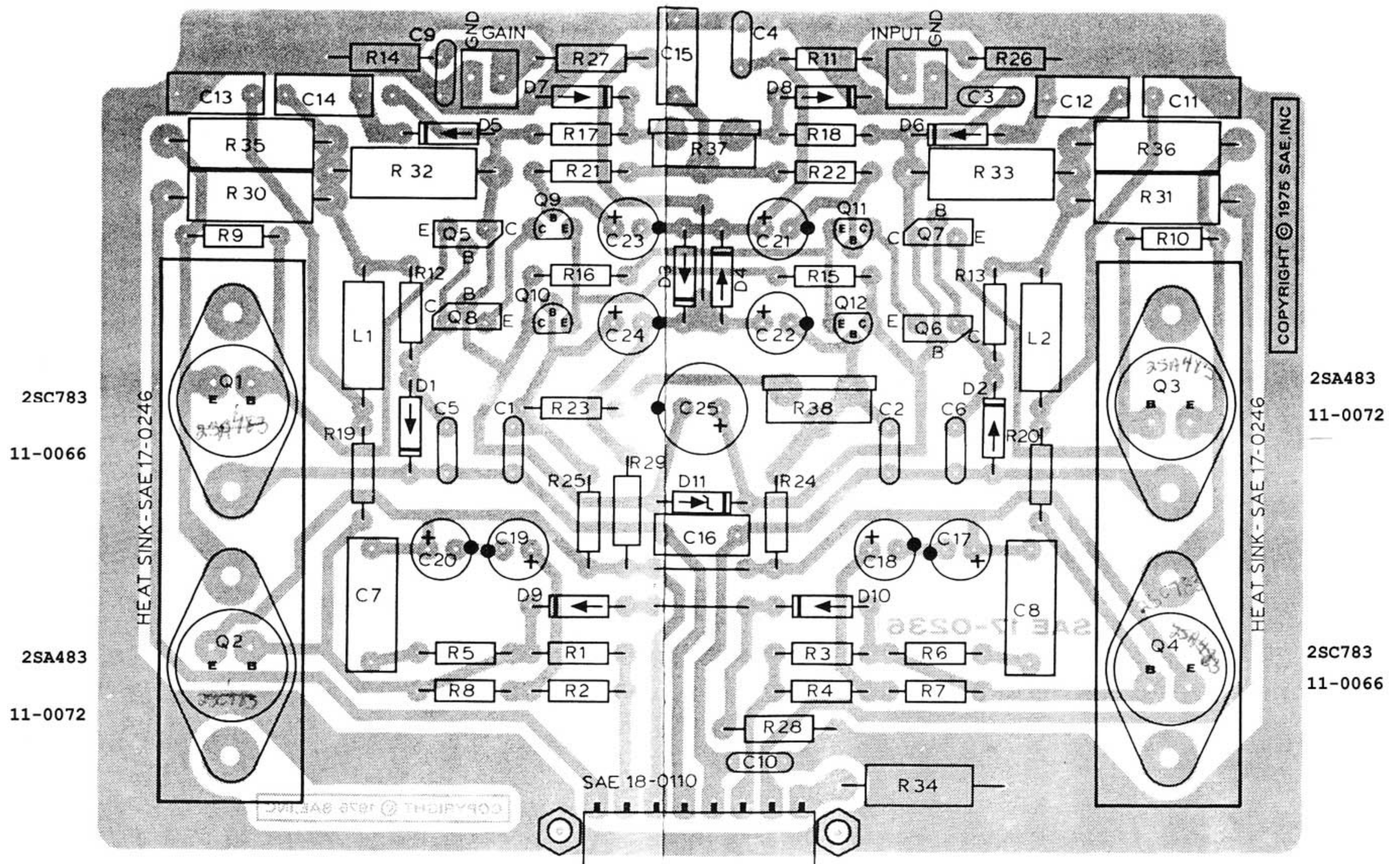


DRIVE BOARD (22-0093)

REF. NO.	SAE PART NO.	DESCRIPTION
RESISTORS		
R39,40	04-0014	300 Ohm 3% 5W
R41,42	04-0015	750 Ohm 3% 5W
R43,44	04-0016	1K Ohm 3% 5W
R45	04-0070	62 Ohm 2% 1W
R46,47	04-0071	100 Ohm 2% 1W
CAPACITORS		
C26,27	08-0021	Mylar .0033μF 10% 100V
C28,29,30	08-0024	Mylar 0.1μF 10% 250V
C31,32	09-0032	Electrolytic 220μF 16V
SEMICONDUCTORS		
Q13,14	11-0066	Tstr Si NPN SAE107
Q15,16	11-0072	Tstr Si PNP SAE208
D12,13,14,15,16,17	11-0094	Diode Si IN4004
QTY.		
HARDWARE & MISC.		
4	18-0008	Insulator, Mica TO-66
1	18-0111	P.C. Connector, 15 pin
2	19-0081	Standoff, 1/4" x 6-32 x 1/4"
3	21-0178	Jumper, 1/2"

2SC783
2SA483

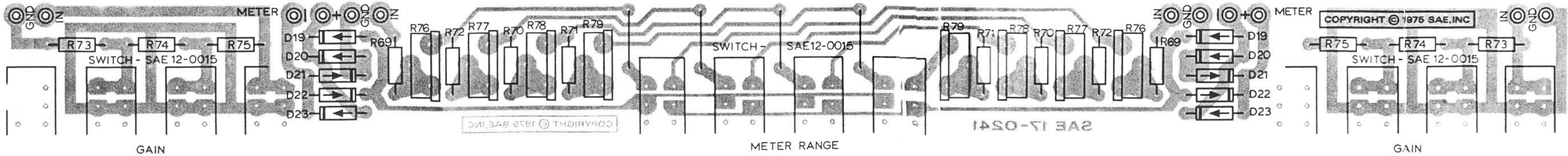
SAE 22-0091 MK 25/2500 PRE-DRIVE BD. PARTS ASSBLY.
17-0236



PRE-DRIVE BOARD (22-0091)

REF. NO.	SAE PART NO.	DESCRIPTION
RESISTORS		
R1,2,3,4	02-0007	100 Ohm 5% 1/3W
R5,6	02-0008	150 Ohm 5% 1/3W
R7	02-0016	390 Ohm 5% 1/3W
R8	02-0017	470 Ohm 5% 1/3W
R9,10	02-0020	620 Ohm 5% 1/3W
R11	02-0024	1K Ohm 5% 1/3W
R12,13	02-0028	1.8K Ohm 5% 1/3W
R14	02-0028S	1.8K Ohm 5% 1/3W
R15,16	02-0038	5.1K Ohm 5% 1/3W
R17,18	02-0041	8.2K Ohm 5% 1/3W
R19,20	02-0053	56K Ohm 5% 1/3W
R21,22,23	02-0056	100K Ohm 5% 1/3W
R24,25	02-0063	270K Ohm 5% 1/3W
R26	02-0071	1M Ohm 5% 1/3W
R27	03-0003	240 Ohm 2% 1/2W
R28	03-0055	3.9K Ohm 5% 1/2W
R29	03-0061S	6.8K Ohm 5% 1/2W
R30,31	04-0023	10 Ohm 5% 2W
R32,33	04-0042	5.6K Ohm 2% 2W
R34	04-0069	10 Ohm 5% 1W
R35,36	04-0070	62 Ohm 2% 1W
R37	06-0004	Pot: 1K Ohm PC (blk)
R38	06-0021	Pot: 250K Ohm PC (red)
CAPACITORS		
C1,2	07-0007	Cer. Disc 22pF 10% 500V
C3	07-0016	Cer. Disc 470pF 10% 500V
C4	07-0018	Cer. Disc 680pF 10% 100V
C5,6	07-0035	Cer. Disc 47pF 10% 500V
0	08-0018	Mylar 1μF 10% 100V
	08-0022	Mylar .001μF 10% 100V
C11,12,13,14,15,16,17,18,19,20,21,22,23,24	08-0024	Mylar 0.1μF 10% 100V
C23,24	09-0027	Electrolytic 100μF 10V
C25	09-0028	Electrolytic 100μF 50V

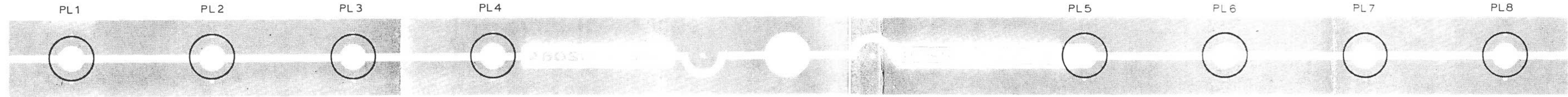
SEMICONDUCTORS		
Q11,12	11-0044M	Tstr NPN BC237B
Q1,2 (Q1,4)	11-0066	Tstr Si NPN SAE107
Q3,4 (Q2,3)	11-0072	Tstr Si PNP SAE208
Q5,6	11-0080-A	Tstr SAE801 S1375
Q7,8	11-0083-A	Tstr SAE902 S1376
Q9,10	11-0117M	Tstr PNP BC307B
D1,2	11-0091	Diode UG2101
D3,4,5,6,7,8,9,10	11-0096	Diode Si IN4148
D11	11-0135	Diode Zener IN5878C 51V
CHOKES		
L1,2	15-0055	Choke 1mH
QTY.		
HARDWARE & MISC.		
2	17-0246	Drive Bd. heat sink
4	18-0008	Insulator, Mica TO-66
1	18-0110	P.C. Connector 8 pin
2	18-0112	Wafer Connector
2	19-0081	Standoff 1/4" x 6-32 x 1/4"
3	21-0178	Jumper, 1/2"



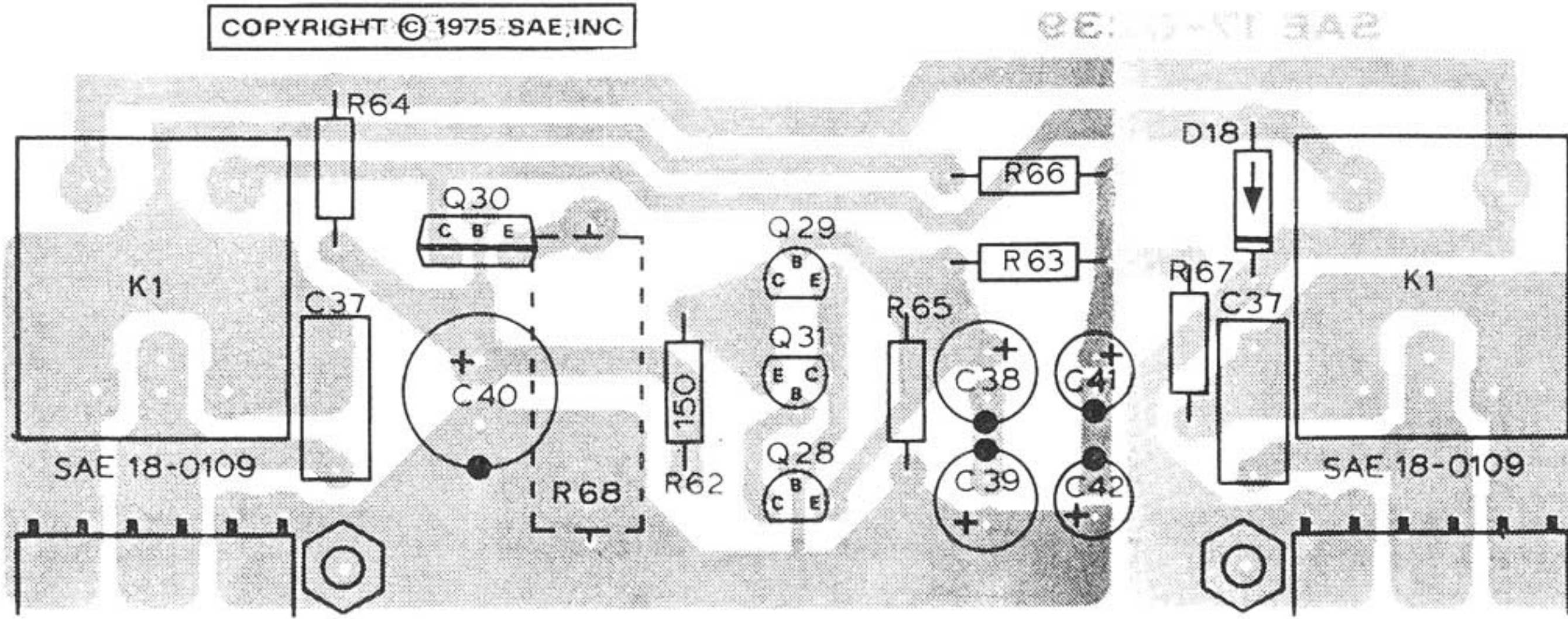
SAE 22-0094 MK 25/2500 METER BD. PARTS ASSBLY.
17-0241

LITE BOARD (22-0080)		
QTY. OR REF. NO.	SAE PART NO.	DESCRIPTION
PL1,2,3,4,5,6,7,8	16-0002	Lamp, No. 47 6.3V
8	18-0019	Socket, 7-35
2	18-0105	Terminal, male

METER BOARD (22-0094)		
REF. NO.	SAE PART NO.	DESCRIPTION
RESISTORS		
R69	02-0026	1.5K Ohm 5% 1/3W
R70	02-0040	6.8K Ohm 5% 1/3W
R71	02-0043	12K Ohm 5% 1/3W
R72	02-0080	7.5K Ohm 5% 1/3W
R73	03-0001	110 Ohm 2% 1/2W
R74	03-0002	200 Ohm 2% 1/2W
R75	03-0117	1.3K Ohm 2% 1/2W
R76	06-0004	Pot: 1K Ohm PC (blk)
R77	06-0005	Pot: 5K Ohm PC (blu)
R78	06-0007	Pot: 15K Ohm (org)
R79	06-0008	Pot: 25K Ohm (yel)
SEMICONDUCTORS		
D19,20,21,22	11-0092	Diode, Ger. IN283
D23	11-0096	Diode, Si IN4148
QTY. OR REF. NO.		
HARDWARE & MISC.		
S1,2,3	12-0015	Switch, 4 button
12	18-0105	Terminal, male
6	19-0092	Standoff, 1/4" x 6-32 x 1/4"
4	21-0178	Jumper, 1/2"



SAE 22-0080 MK 25/2500 LIGHT BD. PARTS ASSBLY.
17-0208 A



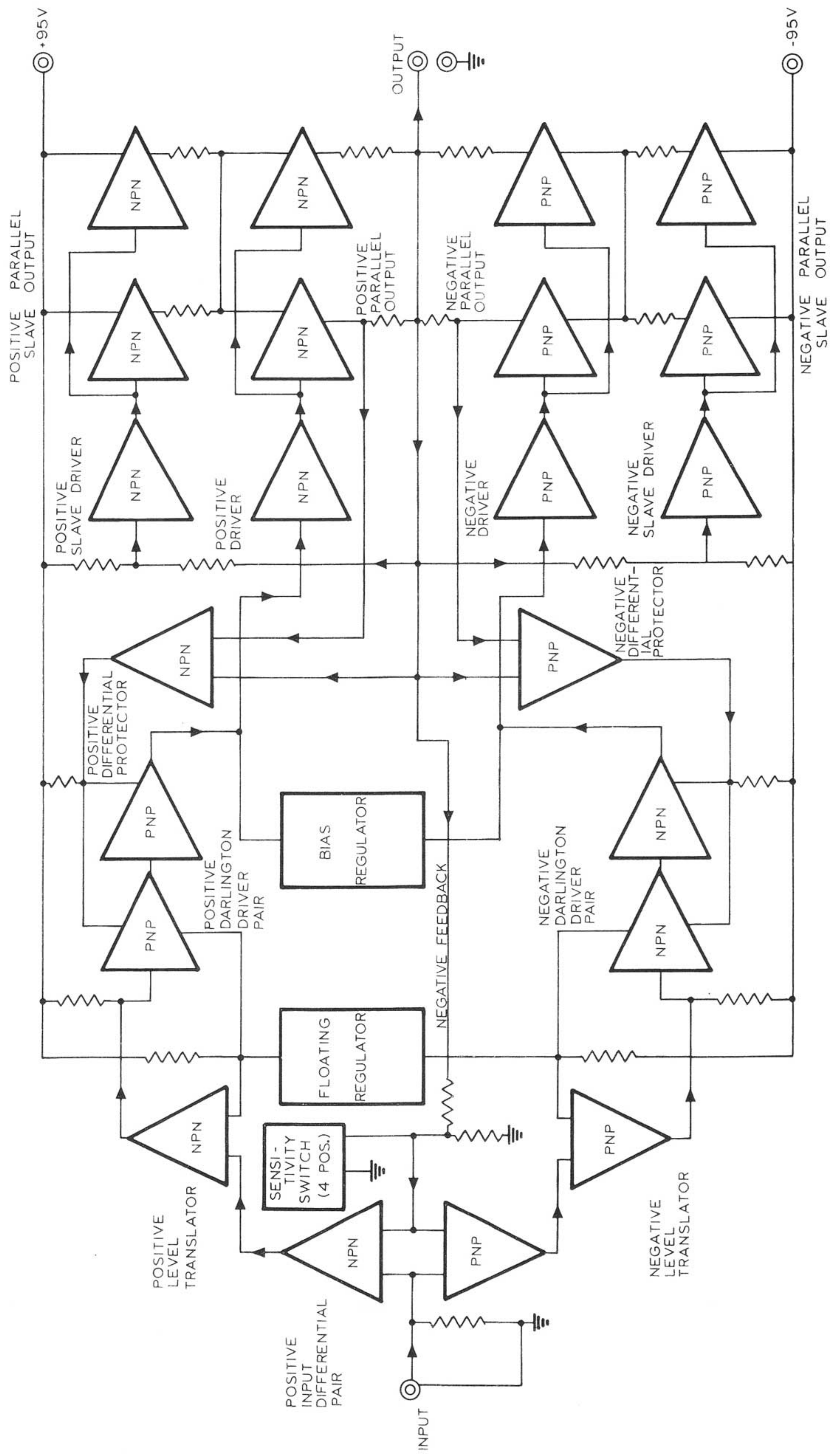
SAE 22-0095 MK 25/2500 RELAY BD. PARTS ASSBLY.
17-0239

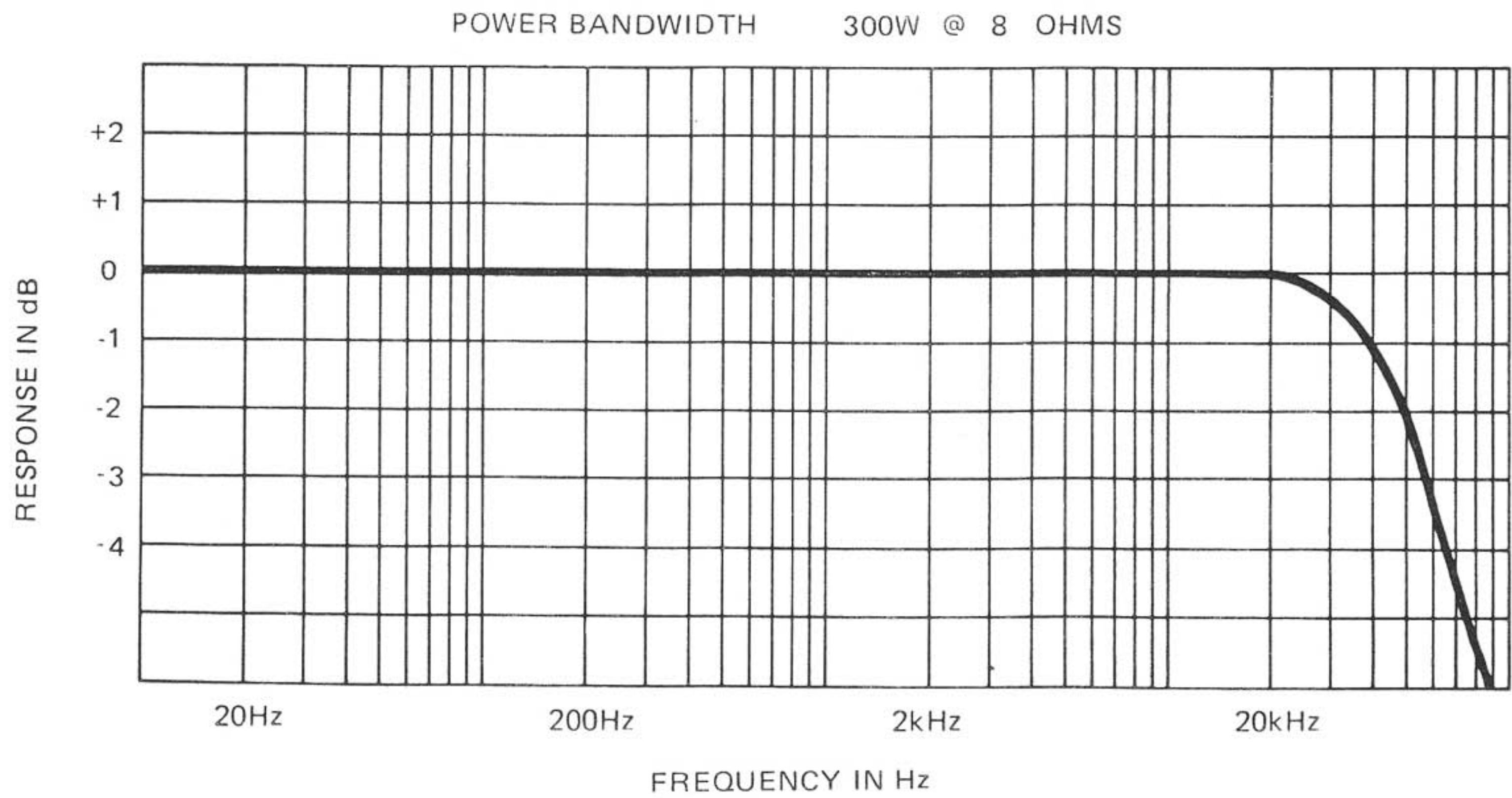
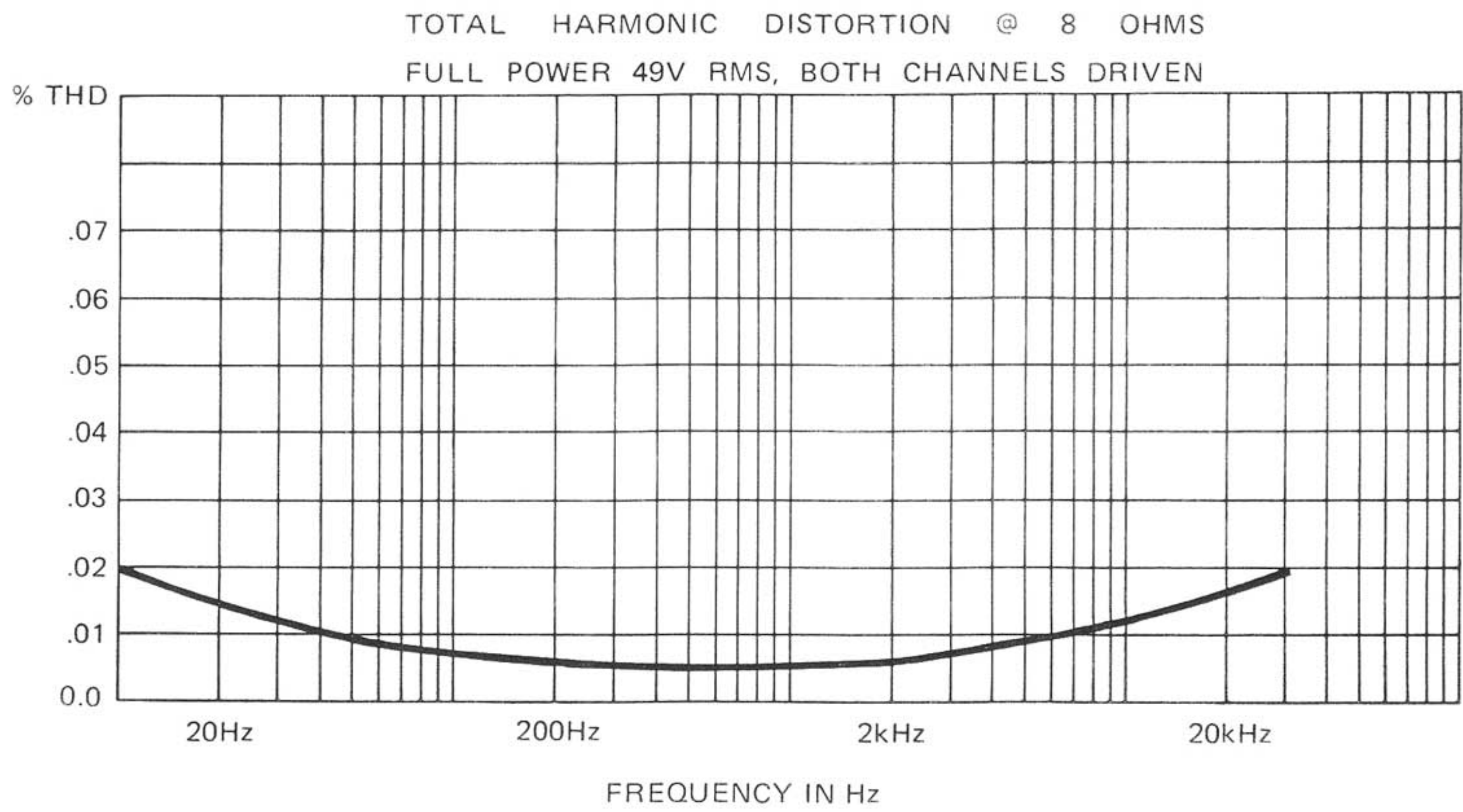
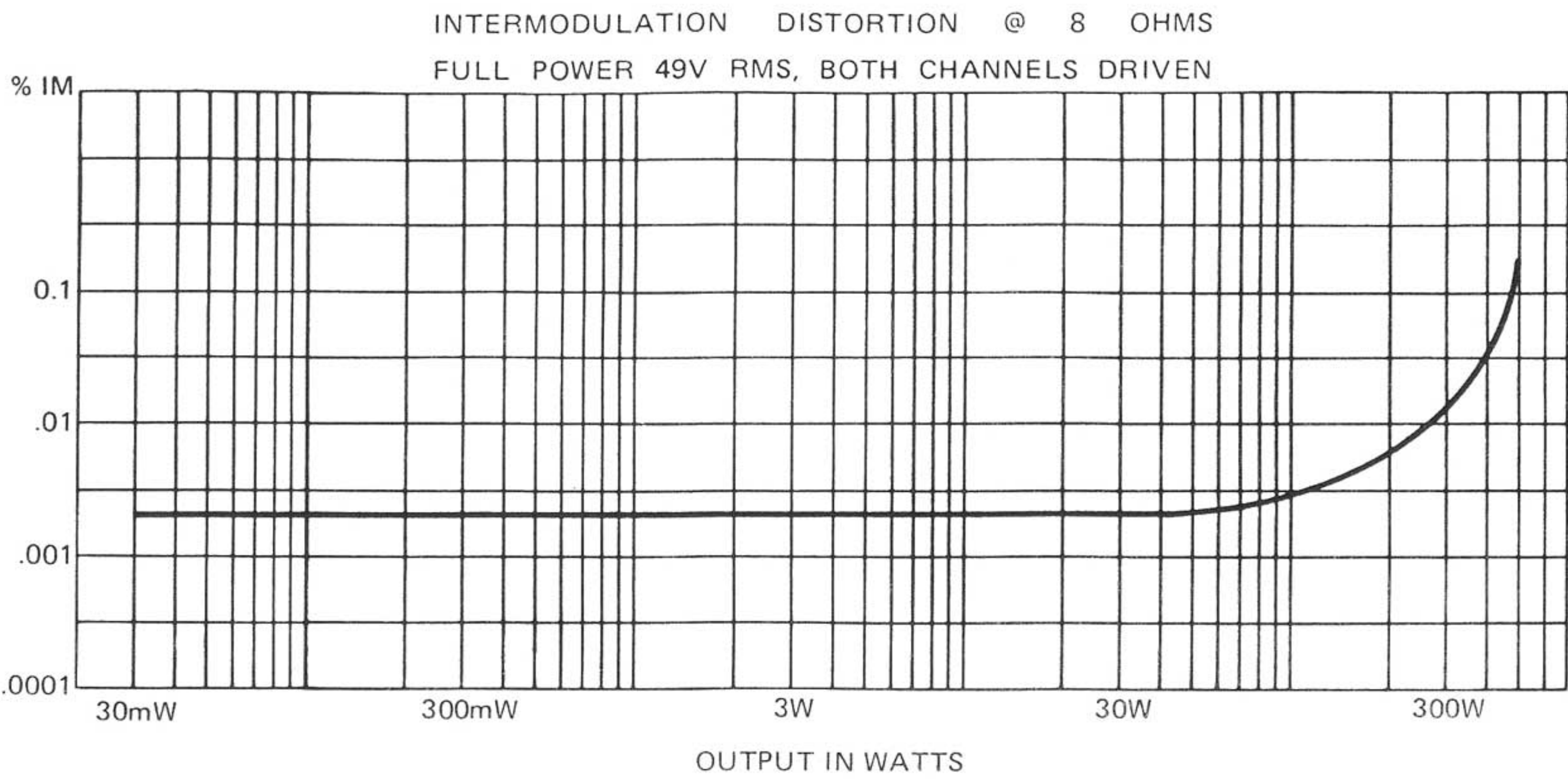
RELAY BOARD (22-0095)		
REF. NO.	SAE PART NO.	DESCRIPTION
RESISTORS		
R62	02-0008	150 Ohm 5% 1/3W
R63	02-0042	10K Ohm 5% 1/3W
R64,65,66,67	02-0056	100KOhm 5% 1/3W
R68	04-0034	1KOhm 2% 2W
CAPACITORS		
C37	08-0024	Mylar 0.1µF 10% 250V
C38,39	09-0027	Electrolytic 100µF 10V
C40	09-0028	Electrolytic 100µF 50V
C41,42	09-0054	Electrolytic 1µF 50V
SEMICONDUCTORS		
Q28,29	11-0044	Tstr NPN BC237B
Q30	11-0080 A	Tstr SAE801 S1375
Q31	11-0117	Tstr PNP BC307B
D18	11-0094	Diode Si IN4004
QTY. OR REF. NO.		
HARDWARE & MISC.		
K1	12-0050	Relay, 10 Amp
2	18-0109	P.C. Connector, 6 pin
2	19-0081	Standoff 1/4" x 6-32x 1/4"

MISCELLANEOUS PARTS

QTY. OR REF. NO.	SAE PART NO.	DESCRIPTION
C43 C44,45,46,47 1 Q20,21,22,23 Q24,25,26,27 1 4 1 2 1 2	08-0025 09-0048 11-0085 11-0139 11-0140 12-0022 12-0051 12-0052 16-0022 17-0089 17-0090	Mylar Cap. 0.1µF 20% 400V Electrolytic Cap. 9800µF 100V Bridge Rectifier: 200V, 25A Tstr NPN SAE101 Tstr PNP SAE202 Switch, power Fuse: 8 Amp AGC Thermostat: 100 DEG Meter, power 300W Meter bkt., blk. (B) Meter lens (A)
1 1 1 1 4 1 2 2 2 2 2 2	17-0221 17-0222 17-0223 17-0224 17-0225 17-0228 17-0229 17-0230 17-0231 17-0232 17-0245	Bottom cover, blk. Top cover, blk. Rear panel, blk. Front sub-panel, clr. alodine Transformer mtg. bkt. Heat sink, 5.180in. W, blk. Heat sink, 1.812in. W, blk. Air stream deflector Heat sink mtg. bkt. Transistor cover Fuse block mtg. plate
1 1 1 1 2 2 2 1 1 2 2	17-0248 17-0249 17-0251 17-0252 17-0253 17-0254 17-0255 17-0258 18-0030 18-0031 18-0032	Main Bd. mtg. angle (right) Main Bd. mtg. angle (left) Ground plate Transformer shield Transformer end bell Drive Bd. gnd plate Fan mtg. bkt. Insulator Fuse holder, 30 Amp Terminal post, blk. Terminal post, red
2 8 1 4 1 6 7 6 8 4 1	18-0065 18-0073 18-0074 18-0084 18-0117 19-0081 19-0082 19-0087 19-0092 19-0122 21-0113	Phono jack Strain relief cable Strain relief line cord Clamp, capacitor mtg. AC terminal strip Standoff 1/4" x 6-32 x 1/4" Standoff 1/4" Hex 6-32 x 1/2" Standoff 1/4" Hex 6-32 x 1 1/2" Standoff 1/4" Rd 6-32 x 1/4" Mtg. feet, blk. Line cord, 3 wire
2 1 1 1 1 1 1 1 1	21-0121 21-0123 21-0179 12-0012 15-0085 17-0226 17-0226-A 17-0227 17-0227-A	Audio cable Line cord, fan Fan, low speed Fuse: 10 Amp Power transformer Front panel, gold (MK25) Front panel, blk. (MK2500) Overlay, blk. (MK 25) Overlay, blk. (MK2500)

SAE MK 25/2500
TRIPLE - COMPLEMENTARY
STEREO POWER AMPLIFIER
(1 CHANNEL ONLY SHOWN)





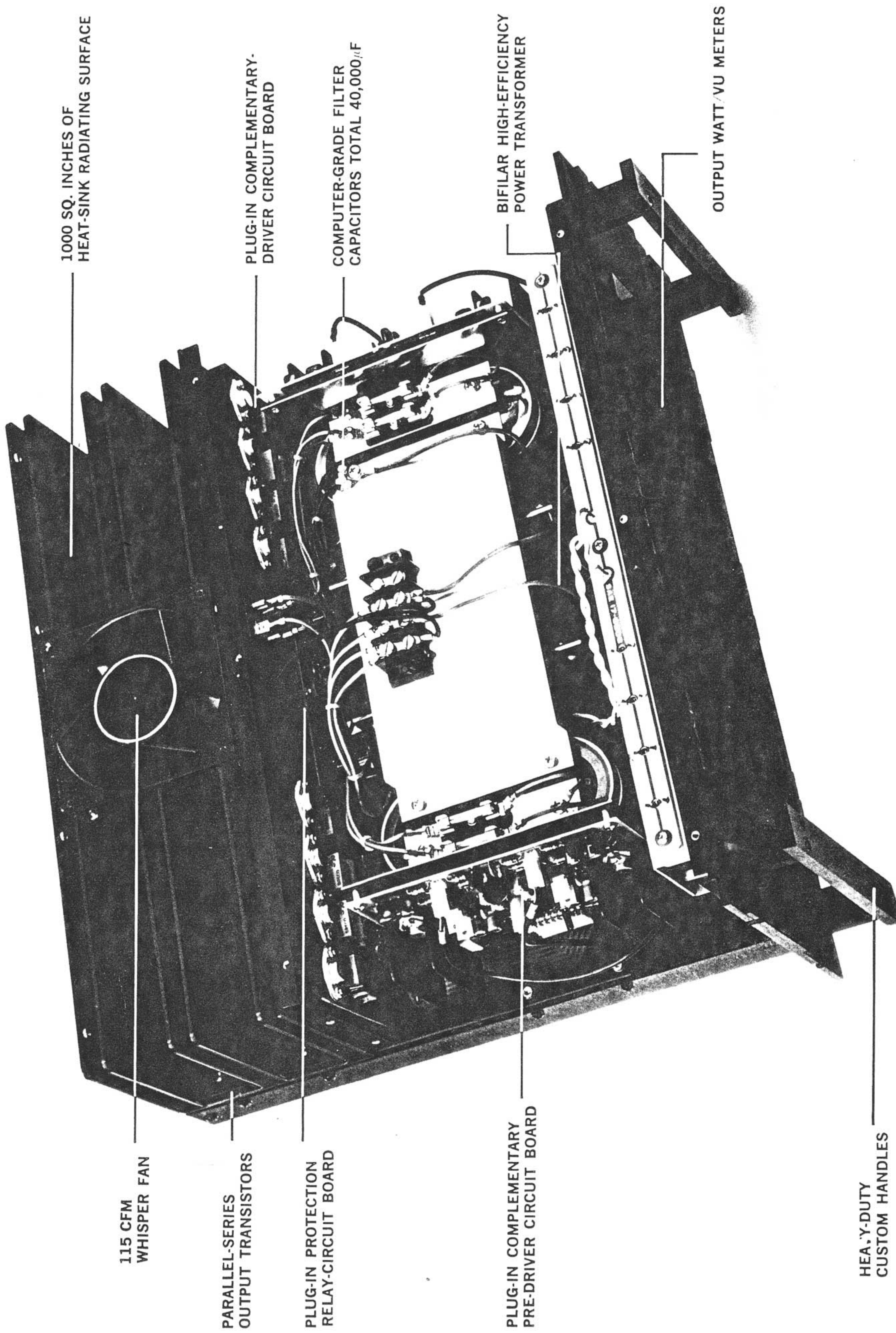


FIGURE 5. Internal View of Professional Model