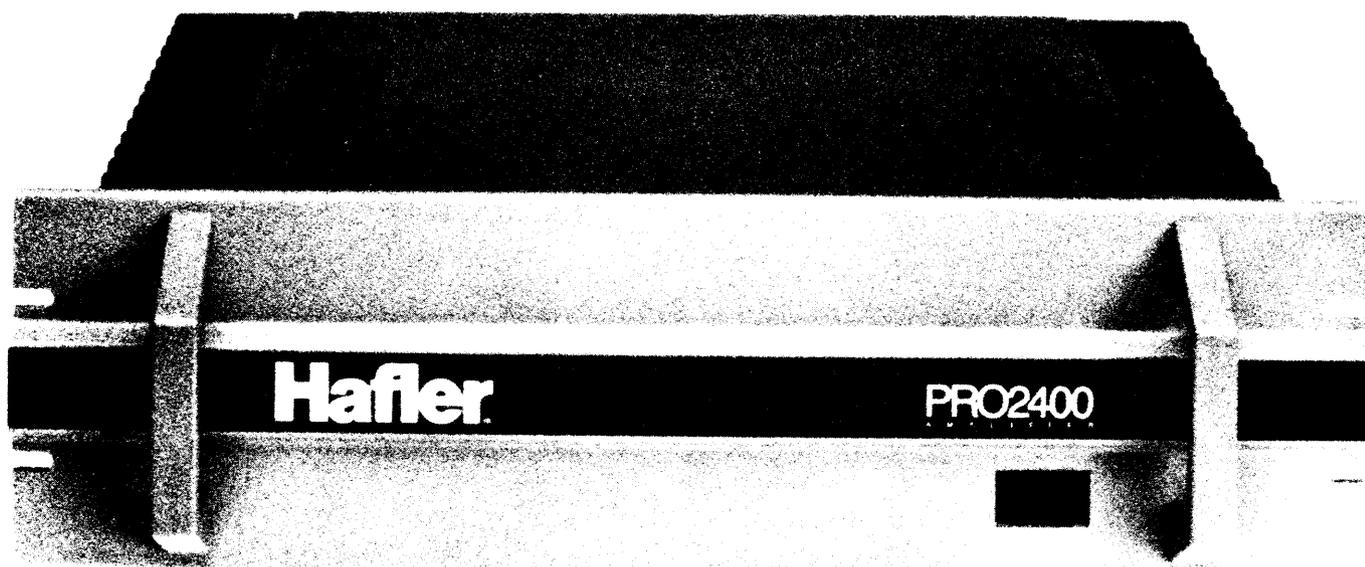


Hafler PRO2400

Professional Power Amplifier



INSTALLATION

And

OPERATION

Please refer to this serial number in all communications regarding this equipment.

SPECIFICATIONS

POWER RATING:

120 watts per channel into 8 Ohms at less than 0.05% THD from 20Hz to 20kHz with both channels driven.

200 watts per channel into 4 Ohms at less than 0.05% THD from 20Hz to 20kHz with both channels driven.

400 watts into 8 Ohms (mono bridged) at less than 0.05% THD from 20Hz to 20kHz.

IM DISTORTION (IHF):

Less than 0.005% from 1 to 120 watts, each channel, into 8 Ohms.

TYPICAL THD AT 120 WATTS INTO 8 OHMS:

20 Hz: 0.003%

1 kHz: 0.002%

20 kHz: 0.02%

FREQUENCY RESPONSE INTO 8 OHMS:

-3dB, 4Hz to 100kHz at 1 watt.

+0dB, -0.5dB, 10Hz to 40kHz at 120 watts.

SIGNAL TO NOISE RATIO, "A" WEIGHTED:

Exceeds 100dB referred to 120 watts into 8 Ohms.

INPUT IMPEDANCE:

Unbalanced: 47,000 Ohms.

Balanced: 47,000 Ohms per phase.

INPUT SENSITIVITY for 120 watts into 8 Ohms:

Unbalanced: 2.25 volts RMS

Balanced: 1.125 volts RMS per phase.

DAMPING FACTOR:

300 to 1kHz into 8 Ohms, 200 to 10kHz into 8 Ohms.

POWER CONSUMPTION:

9 Amps at 120 watts into 8 Ohms.

SIZE: 5 1/4" high plus 1/2" feet, 19" wide, 10 1/2" deep.

NET WEIGHT: 27 lbs.

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

INTRODUCTION

The Hafler PRO2400 is a two channel medium power audio amplifier which has been engineered to meet high performance and reliability standards while maintaining affordability.

The amplifier employs a sonically proven circuit topology driving MOSFET output devices. These devices provide exceptional reliability as a result of their inherent ruggedness and resistance to abusive operating conditions. Consequently, the PRO2400 is capable of delivering high current into low impedance loads, and generally the amplifier will not be damaged in the case of accidental short circuit at the output. The drive circuitry is a simple and effective arrangement using high quality components to ensure longevity and, above all, sonic excellence.

INSTALLATION

VENTILATION

Adequate air flow is important to the continuing reliability of any power amplifier. Cool air must be able to circulate freely through the perforations in the cover and under the chassis, and around the heatsinks. It is expected that the amplifier will always be resting on its feet, which should be on a hard enough surface that air flow underneath will not be obstructed. If the amplifier is mounted in a rack, or through a panel, the feet may be removed so long as adequate ventilation is provided through the bottom openings. It is normal for the cover and heatsinks to become warm during use.

MOUNTING

The front panel is designed to fit a standard 19" rack at 5.25" intervals or alternatively the unit may be stacked. The feet may also be removed if desired when rack mounting.

LINE CONNECTIONS AND SWITCHING

The PRO2400 is normally wired for use on 120V AC power lines, as in the USA. If your line voltage is different, alternate connections are available inside the amplifier for 100, 120, and 230 VAC. Consult the schematic and/or the factory. Units wired for 230 VAC may be operated over a range of 220-240 VAC with no compromise in safety or performance. Be sure your amplifier is wired for your line voltage before you plug it in.

The PRO2400's power switch may be left on, and the amplifier switched remotely by connecting its line cord to a pre-amplifier (or other control center) which provides a switched 3-way AC outlet. Make sure that the control device can supply a current of 10 Amperes to the PRO2400, in addition to the current required by any other switched units. You may instead connect the amplifier directly to a wall outlet and control it with its own front panel power switch.

NOTICE - IMPORTANT SAFETY INFORMATION

DO NOT DISPOSE OF - KEEP FOR FUTURE REFERENCE

Safety Instructions

1. **Read Instructions**
All the safety and operating instructions of your Hafler equipment should be read before power is applied to the equipment.
2. **Retain Instructions**
These safety and operating instructions should be held for future reference.
3. **Heed Warnings**
All warnings on the equipment and in the operating instructions are important and should be followed.
4. **Follow Instructions**
All operating and use instructions are important and should be followed.
5. **Heat**
The equipment should be kept away from areas of high temperature, such as heater vents, radiators, stoves/ovens, fireplaces, etc.
6. **Ventilation**
The equipment should be used in an area suitable for proper ventilation. Care should be taken to not impede airflow in and around the cabinet. Do not mount on a carpeted shelf or in an enclosure consisting of more than five sides. Allow for proper clearance above the equipment.
7. **Water and Moisture**
The equipment should not be used in or around water – such as a bathtub, sink, or swimming area. Also, the equipment should not be used in areas prone to flooding – such as a basement.
8. **Power Sources**
The equipment should be connected only to a power source of the same voltage and frequency as that listed on the rear panel near the power cord entry point.
9. **Power Cord Protection**
Power cords should be run so that they do not interfere with the movement of objects in the room - people, fan blades, utility carts, etc. Also, care should be taken that the cord is not pinched or cut, and placed so that it is not in danger of being pinched or cut, as in under a rug, around a tight corner, etc.
10. **Grounding and Polarization**
The power supply cord is of a polarized type designed to reduce the risk of electric shock sustained from a live cabinet. It is assumed to be of a suitable length for most uses of the equipment. The use of extension cords and power strips is discouraged unless they are of suitable rating to deliver the required current for safe equipment operation and can be used so that the polarization of the plug is not defeated. If an extension cord is required, it is important that the blades of the plug be able to insert fully into the receptacle. Professional amplifiers with a 3-conductor line cord must never have the ground pin of the plug defeated.
11. **Non-Use Periods**
During extended periods of non-use the power supply cord should be kept unplugged from the power source.
12. **Cleaning**
The equipment should be cleaned only as detailed by the owners manual.
13. **Object and Liquid Entry**
Care should be taken so that objects and/or liquids, such as cleaning fluids, are not spilled into the enclosure of the equipment.
14. **Damage Requiring Service**
Hafler equipment should be serviced by qualified service personnel when:
 - A. The power supply cord or plug has been damaged; or
 - B. Objects have fallen, or liquid has been spilled into the equipment; or
 - C. The equipment has been exposed to rain; or
 - D. The equipment does not appear to operate normally or exhibits a marked change in performance; or
 - E. The equipment has been dropped, or the enclosure damaged.
15. **Servicing**
The user should not attempt to service the equipment beyond that which is described in the manual. All other service should be referred to qualified service personnel.

16. **Carts and Stands**

The equipment should be used only with a cart or stand of sufficient strength and stability for the use intended.

16A. An equipment and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the equipment and cart combination to topple.

17. **Power Lines**

An outdoor antenna should be located away from power lines.

18. **Outdoor Antenna Grounding**

If an outside antenna is to be used with the Hafler Tuner, be sure that the antenna system is grounded so as to provide some protection against voltage surges and built up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1984, provides information with respect to the proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connections to grounding electrodes, and requirements for the grounding electrode. See Figure 1.

EXAMPLE OF ANTENNA GROUNDING AS PER NATIONAL ELECTRICAL CODE

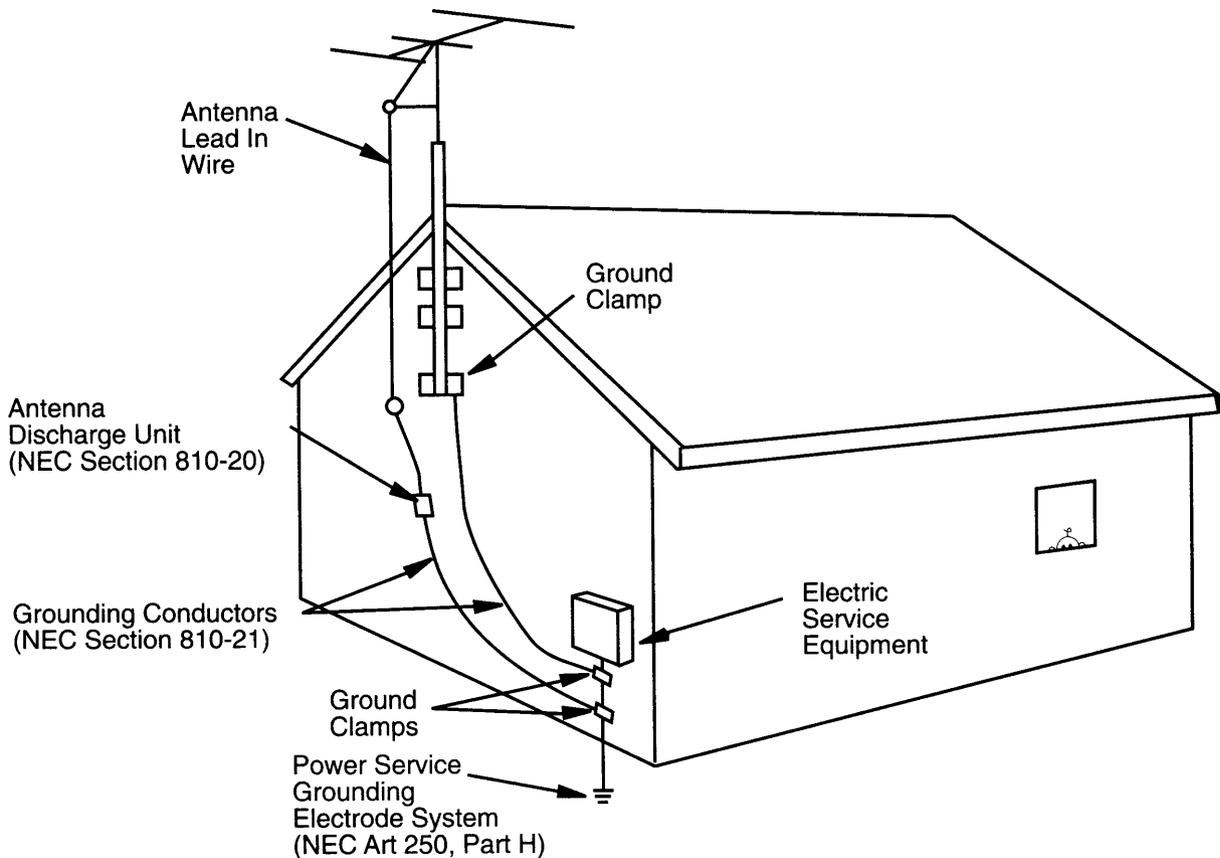


FIGURE 1

CONNECTING CABLES

SIGNAL INPUT

Both 1/4" phone and XLR balanced connectors are provided on the back panel. These connectors are wired in parallel for each channel, so that either may be used with no further switching. The unused connector may be used to "daisy chain" other amplifiers from the same source using the appropriate cables.

To achieve maximum noise rejection, balanced lines should be used for the inputs (two out-of-phase signal conductors plus a ground shield). The XLR connectors are wired for the IEC international standard, which connects the #1 pin to the ground shield; the #2 pin as the non-inverting or "hot" signal; and the #3 pin as the inverting or "return" signal. The phone jacks are wired with the sleeve as the ground shield; the tip as the non-inverting signal; and the ring as the inverting signal. Note that in other equipment the two signal connectors are sometimes interchanged from what is stated here—it is therefore wise to check for consistency among the equipment being installed.

For an unbalanced input line (one signal conductor and a ground shield), connect the signal conductor to the non-inverting input, and connect the ground shield to the input ground AND the inverting input of the amplifier. Note that with a two conductor 1/4" phone jack, this connection is automatically made, assuming that the sleeve (which is longer than that of a three circuit phone jack and includes the ring) is the ground shield and the tip is the signal. In this case, simply insert the phone jack fully into the input of the amplifier.

For bridged mono operation, only use the channel B input and set the mono/stereo switch to mono. Make no connection to the channel A input jacks. In this mode the channel B gain control determines the gain of the amplifier. See below for a description of loudspeaker connection in this mode.

To prevent noise or hum, it is essential that all input connections are secure, and that the cables are not frayed or loosely connected to the plug.

OUTPUT:

The wires which connect the speakers to the amplifier should be of sufficient size to preserve the PRO2400's high damping factor. Standard #18 gauge lamp cord is satisfactory for up to 15 feet if your speakers are of 8 Ohms or higher impedance. A heavier gauge (#16 or larger) wire should be used with 4 Ohm speakers or 8 Ohm speakers at a greater distance. Special loudspeaker cables which have adequate thickness to accommodate long runs are usually available from audio dealers. The PRO2400's red and black outputs accept standard banana plug connectors, including the

double ones with 3/4" spacing. These are the most convenient to use if you will be disconnecting the speakers occasionally. The terminals will also clamp a spade lug, or a bare wire through the hole in the center post. Be sure there are no frayed wire ends which could touch adjacent terminals or the chassis. Tin bare wire ends with solder to secure all strands.

PHASING

Consistent phase relationships are important when connecting speakers in order to enable full bass reproduction as well as midrange and high frequency time alignment. To be sure all speakers in a system are wired in phase to the amplifier, each ground or - speaker terminal should be connected to its black ground terminal on the PRO2400, and the speakers + terminal to the corresponding red terminal. Speaker connecting cable identifies one wire from the other by color of the wire, or by marking or coloring the insulation. NOTE: In the special case of monophonic operation of the PRO2400, (described later) different speaker connections are employed.

GROUNDING

The black output terminals of the PRO2400 are connected together internally. This facilitates the use of external devices which use a common ground connection, such as some headphone junction boxes. You must be sure that the ground or shield connection from such a device goes to a black terminal on the PRO2400. NOTE: no such connection may be made when the PRO2400 is connected for bridged mono operation.

The back panel of the PRO2400 also contains a chassis/float ground switch for ground isolation. This switch should be set for minimum system hum and/or noise.

CONVENTIONAL STEREO CONNECTIONS

It is best to make all connections with the PRO2400 switched off. Each of the stereo speakers connects to one horizontal pair of red and black outputs, as identified A or B on back of the PRO2400. The input signals connect to the corresponding input jacks, and the mono/stereo switch should be set to stereo.

CONNECTIONS FOR MONOPHONIC OPERATION

When you wish to drive a single loudspeaker with increased power capability, the PRO2400 can be operated in a bridged mode which drives both channels with the same signal and combines their output to deliver more than 400 watts into 8 Ohms. In this arrangement, the speaker is

connected only to the two red output terminals. The B red terminal is + and the A red terminal is the - connection. NO CONNECTIONS MAY BE MADE TO ANY BLACK TERMINALS!! Set the mono/stereo switch to mono, and connect the input signal to the B channel input only. IMPORTANT NOTE: Never use a speaker with an impedance of less than 8 Ohms when operating the PRO2400 in the bridged mono mode. The increased current could cause the amplifier to overheat.

OPERATION

The power lamp in the power switch will glow whenever power is applied to the PRO2400. If it does not light, check for a blown AC line fuse.

The PRO2400 is equipped with a unique protection system that constantly monitors the temperature of the output devices and takes corrective action to prevent damage to the amplifier as a result of excessive overheating. Under most conditions, the PRO2400 heatsinks will dissipate the heat required to maintain safe operating temperatures, and the unit will play continuously. If the amplifier is driven at high volumes into speakers with an impedance of less than 8 Ohms, and/or there is inadequate ventilation, the heatsinks could heat to a level that would cause the protection circuitry to shut off the amplifier for a short time (normally less than 15 seconds) to prevent damage. The PRO2400 will return to normal operation, and if the overheating condition is still present, the cycle will repeat. In this case, check the surroundings of the unit to insure sufficient air flow around the heatsinks and through the vent holes. Otherwise, check the load impedance connected to the outputs to see if it is far below 8 Ohms.

FUSES:

The PRO2400 is supplied with a 10 Ampere Slo-Blo AC line fuse and four power supply fuses. If one of these fails, it is usually indicative of a fault which will require professional service.

FACTORY SERVICE AND LIMITED WARRANTY

If you encounter any difficulty or have any questions concerning your PRO2400 Amplifier, please call our Customer Service Department weekdays, 8 a.m. to 3:30 p.m., Mountain Standard Time, at 602-967-3565.

Should you have any doubts as to whether the amplifier is malfunctioning and requires service, please call us before sending in for repair. All units being returned (regardless of warranty status) must receive a Return Authorization (RA) number. In addition, we can offer troubleshooting assistance that may simplify or even eliminate the need for factory service.

The Hafler PRO2400 Amplifier is warranted to the original owner (non-transferrable) for three years from the date of purchase, including parts, labor, and return shipping costs within the continental United States, Alaska, and Hawaii. This warranty applies only to products sold in the United States of America.

For warranties outside the U.S.A., please contact your local agent.

It is the owner's responsibility to pay shipping (preferably United Parcel Service, UPS) to the factory: collect shipments will not be accepted. Units under warranty should be accompanied by a copy of the dated Bill of Sale. Use the original carton and all packing material, with the RA number clearly marked on the outside of the package. Be sure to include a return address, the RA number, a daytime telephone number, and a brief description of the difficulty, including whether it occurs continuously or intermittently.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

CHASSIS PARTS LIST

DESIGNATOR	PART DESCRIPTION	PART #	DESIGNATOR	PART DESCRIPTION	PART #
T1	Universal Transformer	TT-P2400	S2	Grounding Switch	SWH-103
BR1	Diode Bridge, 25A	SSH-609	C40	.01 UF, 1KV	CD-103/20
F5	10A Slo-Blo, AGC/3AB	FS-010B	C41	.01 UF, 1KV	CD-103/20
F6	5A Slo-Blo, AGC/3AB (export)	FS-005B	J101, J102	5-Way Binding Post	CCH-106
S1	Power Switch	SWH-144	C42	.01 UF, 250 VAC	CD-103A

PC70 PARTS LIST
DESIGNATOR: "B" Channel ("A" Channel)

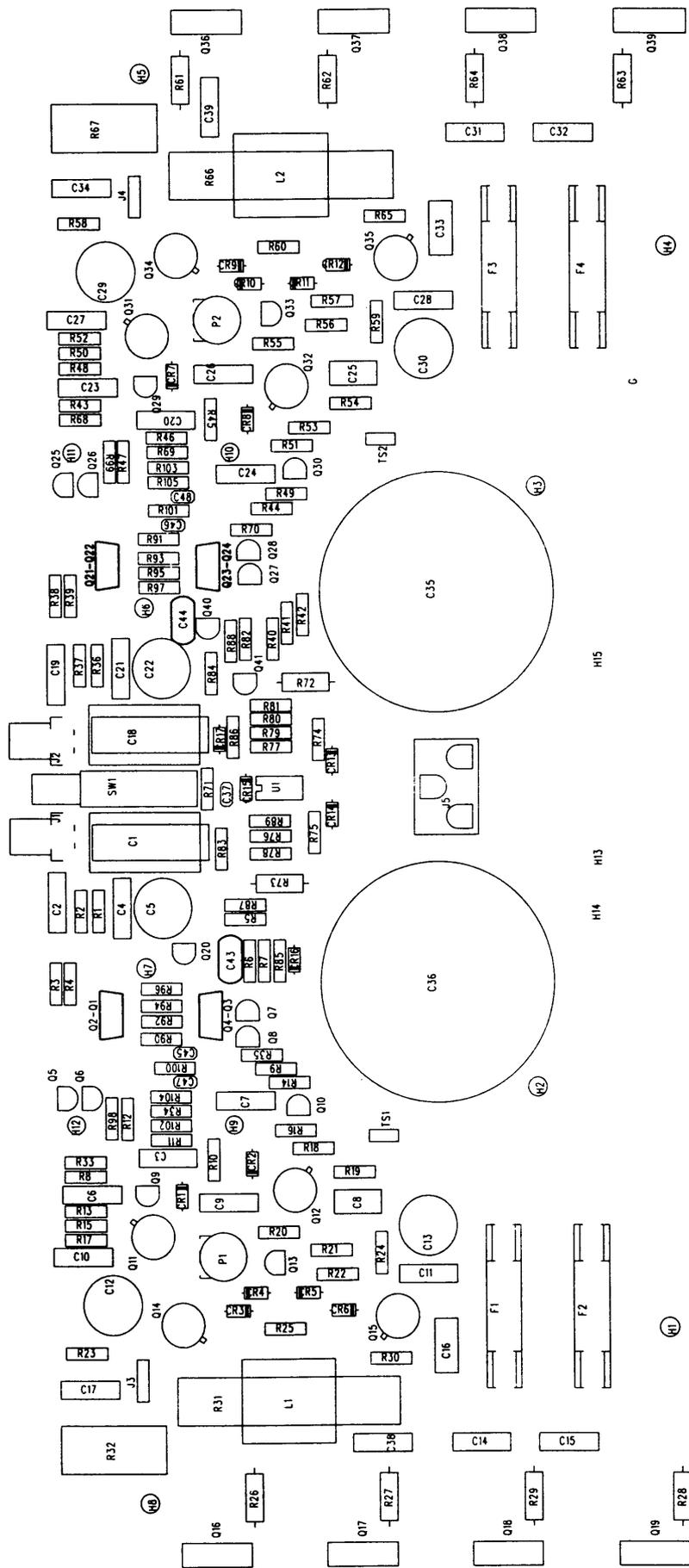
DESIGNATOR	PART DESCRIPTION	PART #	DESIGNATOR	PART DESCRIPTION	PART #
R1 (R13)	1.0M Ohms, 1/4w, 1%, Metal Film	RMP/4-1004	C3 (C13)	0.1 mfd, 100v, 10% Polycarbonate	CPC-104
R2 (R14)	1.0M Ohms, 1/4w, 1%, Metal Film	RMP/4-1004	C4 (C14)	10mfd, 16v, Nonpolar Electro	CERNP-106
R3 (R15)	2.0k Ohms, 1/4w, 1%, Metal Film	RMP/4-2001	C5 (C15)	10mfd, 16v, Nonpolar Electro	CERNP-106
R4 (R16)	2.0k Ohms, 1/4w, 1%, Metal Film	RMP/4-2001	C6 (C16)	0.1 mfd, 100v, 10% Polycarbonate	CPC-104
R5 (R17)	47.5k Ohms, 1/4w, 1%, Metal Film	RMP/4-4752	C7	0.01 mfd, 100v, 10% Polyester	CP-103
R6 (R18)	47.5k Ohms, 1/4w, 1%, Metal Film	RMP/4-4752	C8	0.01 mfd, 100v, 10% Polyester	CP-103
R7 (R19)	2.74k Ohms, 1/4w, 1%, Metal Film	RMP/4-2741	C9	100 mfd, 35v, 20% Polar/Electro	CER-107B
R8 (R20)	2.74k Ohms, 1/4w, 1%, Metal Film	RMP/4-2741	C10	100 mfd, 35v, 20% Polar/Electro	CER-107B
R9 (R21)	1.82k Ohms, 1/4w, 1%, Metal Film	RMP/4-1801	CR1	1N5240B 10v, 1/2w, 5% Zener	SSH-600
R10 (R22)	2.0k Ohms, 1/4w, 1%, Metal Film	RMP/4-2001	CR2	1N5240B 10v, 1/2w, 5% Zener	SSH-600
R11	1.5k Ohms, 5w, 10%, Wire Wound	RW5152	CR3	1N5240B 10v, 1/2w, 5% Zener	SSH-600
R12	1.5k Ohms, 5w, 10%, Wire Wound	RW5152	CR4	1N5240B 10v, 1/2w, 5% Zener	SSH-600
R23	475 Ohms, 1/4w, 1%, Metal Film	RMP/4-4750	J1 (J3)	PC Mount XLR Connector	CCH-209
R24	475 Ohms, 1/4w, 1%, Metal Film	RMP/4-4750	J2 (J4)	PC Mount Phone Jack	CCH-208
RV1 (RV3)	500 Ohms, Trim Pot	RVH-501A	J5 (J6)	3 Pin Male Connector	CCH-137
RV2 (RV4)	50k Ohms, Single Type Pot	RVH-503H	J7	3 Pin Male Connector	CCH-137
C1 (C11)	150 PFD, 500V, 5% Dipped Mica	CM-151	J8	3 Pin Male Connector	CCH-137
C2 (C12)	150 PFD, 500V, 5% Dipped Mica	CM-151	U1 (U3)	TL082 Dual Op-Amp	SSH-655
			U2	NE5532 Dual Op-Amp	SSH-667

PC65 PARTS LIST
DESIGNATOR: "B" Channel ("A" Channel)

DESIGNATOR	PART DESCRIPTION	PART #	DESIGNATOR	PART DESCRIPTION	PART #
R1 (R36)	2.43k Ohms, 1/4w, 1%, Metal Film	RMP/4-2431	C3 (C20)	10 pfd, 500v, 10%, Dip/Mica	CM-100
R2 (R37)	47k Ohms, 1/4w, 1%, Metal Film	RMP/4-4702	C4 (C21)	0.1 mfd, 100v, 10%, Polycarbonate	CPC-104
R3 (R38)	47 Ohms, 1/4w, 5%, Carbon Film	RC/4-470	C5 (C22)	100 mfd, 6.3v, Non/Polar Radial	CERNP-107
R4 (R39)	47 Ohms, 1/4w, 5%, Carbon Film	RC/4-470	C6 (C23)	0.001 mfd, 250v, 10%, Polypropylene	CPP-102
R5 (R40)	68 Ohms, 1/4w, 5%, Carbon Film	RC/4-680	C7 (C24)	0.001 mfd, 250v, 10%, Polypropylene	CPP-102
R6 (R41)	47 Ohms, 1/4w, 5%, Carbon Film	RC/4-470	C8 (C25)	220 pfd, 75v, 10%, Polypropylene	CPP-221
R7 (R42)	47 Ohms, 1/4w, 5%, Carbon Film	RC/4-470	C9 (C26)	0.1 mfd, 100v, 10%, Polycarbonate	CPC-104
R8 (R43)	1k Ohms, 1/4w, 1%, Metal Film	RMP/4-1001	C10 (C27)	0.1 mfd, 100v, 10%, Polycarbon	CPC-104
R9 (R44)	1k Ohms, 1/4w, 1%, Metal Film	RMP/4-1001	C11 (C28)	0.1 mfd, 100v, 10%, Polycarbon	CPC-104
R10 (R45)	6.8k Ohms, 1/4w, 5%, Carbon Film	RC/4-682	C12 (C29)	100 mfd, 100v, Polar/Electrolytic	CER-107D
R11 (R46)	47k Ohms, 1/4w, 1%, Metal Film	RMP/4-4752	C13 (C30)	100 mfd, 100v, Polar/Electrolytic	CER-107D
R12 (R47)	2.43k Ohms, 1/4w, 1%, Metal Film	RMP/4-2431	C14 (C31)	0.1 mfd, 100v 10% Polycarbon	CPC-104
R13 (R48)	270 Ohms, 1/4w, 5%, Carbon Film	RC/4-271	C15 (C32)	0.1 mfd, 100v, 10%, Polycarbon	CPC-104
R14 (R49)	270 Ohms, 1/4w, 5%, Carbon Film	RC/4-271	C16 (C33)	0.01 mfd, 160v, 3%, Polypropylene	CPP-103A
R15 (R50)	1k Ohms, 1/4w, 1%, Metal Film	RMP/4-1001	C17 (C34)	0.1 mfd, 100v, 10%, Polycarbon	CPC-104
R16 (R51)	1k Ohms, 1/4w, 1%, Metal Film	RMP/4-1001	C35	15000 mfd, 75v, 20%, Polar/Electrolytic	CER-159
R17 (R52)	100 Ohms, 1/4w, 5%, Carbon Film	RC/4-101	C36	15000 mfd, 75v, 20%, Polar/Electrolytic	CER-159
R18 (R53)	100 Ohms, 1/4w, 5%, Carbon Film	RC/4-101	C37	0.01 mfd, ECQ-V1H103JZ	CYV-103
R19 (R54)	47k Ohms, 1/4w, 1%, Metal Film	RMP/4-4752	C38 (C39)	680 pfd, 500v, Mica/Dip	Not Used
R20 (R55)	560 Ohms, 1/4w, 5%, Carbon Film	RC/4-561	C43 (C44)	0.47mfd "V" Series	CYV-474
R21 (R56)	470 Ohms, 1/4w, 5%, Carbon Film	RC/4-471	C45 (C46)	0.01mfd, Polypropylene	CPP-103A
R22 (R57)	10 Ohms, 1/4w, 5%, Carbon Film	RC/4-100	C47 (C48)	0.01mfd, Polypropylene	CPP-103A
R23 (R58)	47 Ohms, 1/4w, 5%, Carbon Comp.	RC/4-470C	Q1 (Q21)	2SK163	SSH-614T
R24 (R59)	47 Ohms, 1/4w, 5%, Carbon Comp.	RC/4-470C	Q2 (Q22)	2SK163	SSH-614T
R25 (R60)	220 Ohms, 1/4w, 5%, Carbon Film	RC/4-221	Q3 (Q23)	2SJ74	SSH-617DT
R26 (R61)	470 Ohms, 1/2w, 5%, Carbon Film	RC/2-471	Q4 (Q24)	2SJ74	SSH-617DT
R27 (R62)	470 Ohms, 1/2w, 5%, Carbon Film	RC/2-471	Q5 (Q25)	2N5550	SSH-613
R28 (R63)	220 Ohms, 1/2w, 5%, Carbon Film	RC/2-221	Q6 (Q26)	2N5550	SSH-613
R29 (R64)	220 Ohms, 1/2w, 5%, Carbon Film	RC/2-221	Q7 (Q27)	2N5401	SSH-708
R30 (R65)	10 Ohms, 1/4w, 5%, Carbon Film	RC/4-100	Q8 (Q28)	2N5401	SSH-708
R31 (R66)	1 Ohm, 10w, 10%, Wire Wound	RW10-010	Q9 (Q29)	2N5401	SSH-708
R32 (R67)	10 Ohms, 5w, 5%, Wire Wound	RW5-100	Q10 (Q30)	2N5550	SSH-613
R33 (R68)	47k Ohms, 1/4w, 5%, Carbon Film	RC/4-473	Q11 (Q31)	2N5415	SSH-616
R34 (R69)	33k Ohms, 1/4w, 5%, Carbon Film	RC/4-333	Q12 (Q32)	2N3440	SSH-612
R35 (R70)	47k Ohms, 1/4w, 5%, Carbon Film	RC/4-473	Q13 (Q33)	2N2222	SSH-611
R71	47k Ohms, 1/4w, 5%, Carbon Film	RC/4-473	Q14 (Q34)	2N3440	SSH-612
R72	7.5k Ohms, 1/2w, 5% Carbon Film	RC/2-752	Q15 (Q35)	2N5415	SSH-616
R73	7.5k Ohms, 1/2w, 5% Carbon Film	RC/2-752	Q16 (Q36)	2SK1057	SSH-719T
R74	100k Ohms, 1/4w, 1%, Metal Film	RMP/4-1003	Q17 (Q37)	2SK1057	SSH-719T
R75	10k Ohms, 1/4w, 1%, Metal Film	RMP/4-1002	Q18 (Q38)	2SJ161	SSH-717T
R76	18.2k Ohms, 1/4w, 1%, Metal Film	RMP/4-1822	Q19 (Q39)	2SJ161	SSH-717T
R77	18.2k Ohms, 1/4w, 1%, Metal Film	RMP/4-1822	Q20 (Q40)	2N7000	SSH-724
R78	330k Ohms, 1/4w, 5%, Carbon Film	RC/4-334	Q41	MPS6523	SS-210
R79	330k Ohms, 1/4w, 5%, Carbon Film	RC/4-334	CR1 (CR7)	FDH400 Silicon Diode	SSH-163
R80	1k Ohm	RMP/4-1001	CR2 (CR8)	FDH400 Silicon Diode	SSH-163
R81	68.1k Ohm	RMP/4-6812	CR3 (CR9)	1N4148 Silicon Diode	SSH-162
R82	33.2k Ohm	RMP/4-3322	CR4 (CR10)	1N5245B Silicon Diode	SSH-212
R83 (R84)	100k Ohm	RMP/4-1003	CR5 (CR11)	1N5245B Silicon Diode	SSH-212
R85 (R86)	4.75M Ohm	RMP/4-4754	CR6 (CR12)	1N4148 Silicon Diode	SSH-162
R87 (R88)	1k Ohm	RMP/4-1001	CR13	1N5245B Silicon Diode	SSH-212
R89	33.2k Ohm	RMP/4-3322	CR14	1N5245B Silicon Diode	SSH-212
R90 (R91)	100 Ohm	RMP/4-1000	CR15	1N4148 Silicon Diode	SSH-162
R92 (R93)	100 Ohm	RMP/4-1000	CR16(CR17)	1N4148 Silicon Diode	SSH-162
R94 (R95)	100 Ohm	RMP/4-1000	L1 (L2)	1.4 Microhenry Choke	TT-1.4
R96 (R97)	100 Ohm	RMP/4-1000	F1 (F3)	7A AGC/3AG	FS-007
R98 (R99)	1M Ohm	RMP/4-1004	F2 (F4)	7A AGC/3AG	FS-007
R100 (R101)	1M Ohm	RMP/4-1004	P1 (P2)	1k Ohms Trim Pot	RVH-102
R102 (R103)	1M Ohm	RMP/4-1004	SW1	Bridging Switch	SWH-510
R104 (R105)	1M Ohm	RMP/4-1004	TS1 (TS2)	Thermistor	SSH-215
C1 (C18)	2.2 mfd, 50v, 20%, Polypropylene	CPP-205C	U1	LM393N Dual Comparator	SS-207
C2 (C19)	330 pfd, 630v, 3%, Polypropylene	CPP-331			

Parts values and types subject to change without prior notice.

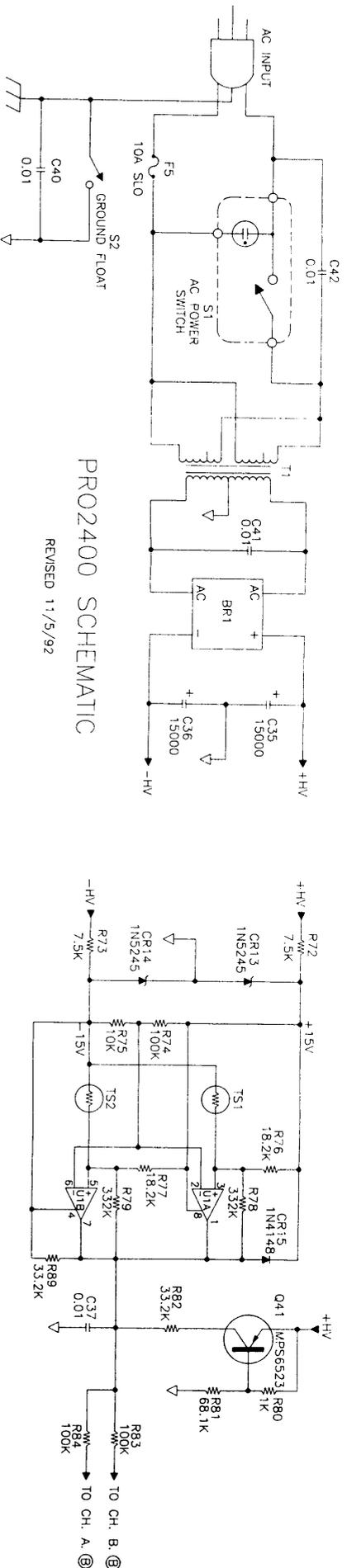
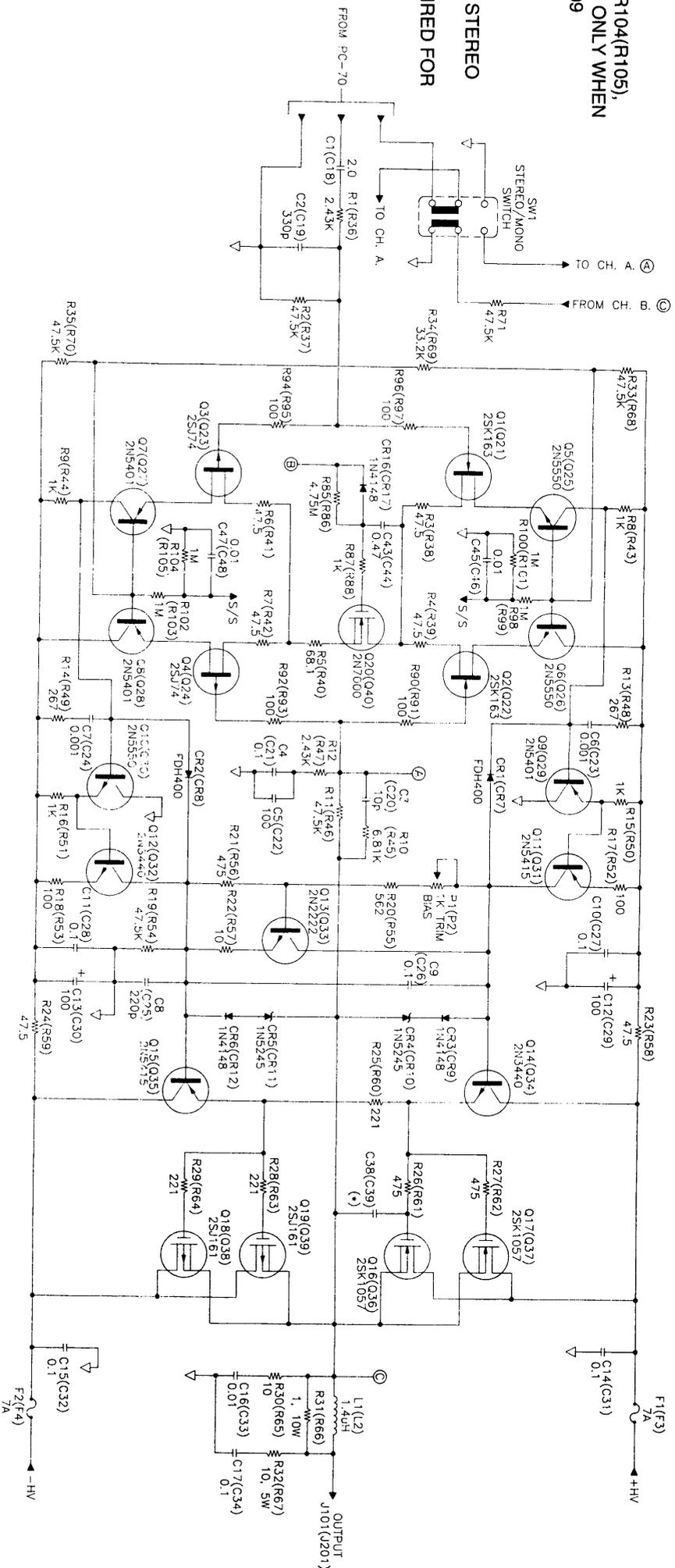
PC65 BOARD LAYOUT



PC65 SCHEMATIC DIAGRAM

NOTE: UNLESS SPECIFIED OTHERWISE

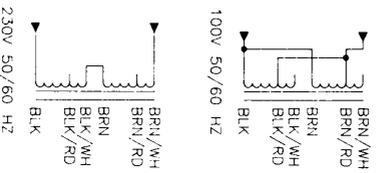
1. ALL RESISTORS IN OHMS
2. ALL CAPACITORS IN MICROFARADS
3. "B" CHANNEL SHOWN
"A" CHANNEL DESIGNATORS IN PARENTHESIS
4. Q1(Q21) & Q2(Q22) USE TWO SINGLE 2SK163 JFET'S OR ONE 2SK389 DUAL JFET
5. Q3(Q23) & Q4(Q24) USE TWO SINGLE 2SJ74 JFET'S OR ONE 2SJ109 DUAL JFET
6. R98(R99), R100(R101), R102(R103), R104(R105), C45(C46) & C47(C48) ARE PRESENT ONLY WHEN USING DUAL JFETS 2SK389 & 2SJ109 (FOR SUBSTRATE BIASING)
7. C38 (C39) NOT USED
8. STEREO/MONO SWITCH SHOWN IN STEREO
9. POWER TRANSFORMER SHOWN WIRED FOR 115/120VAC



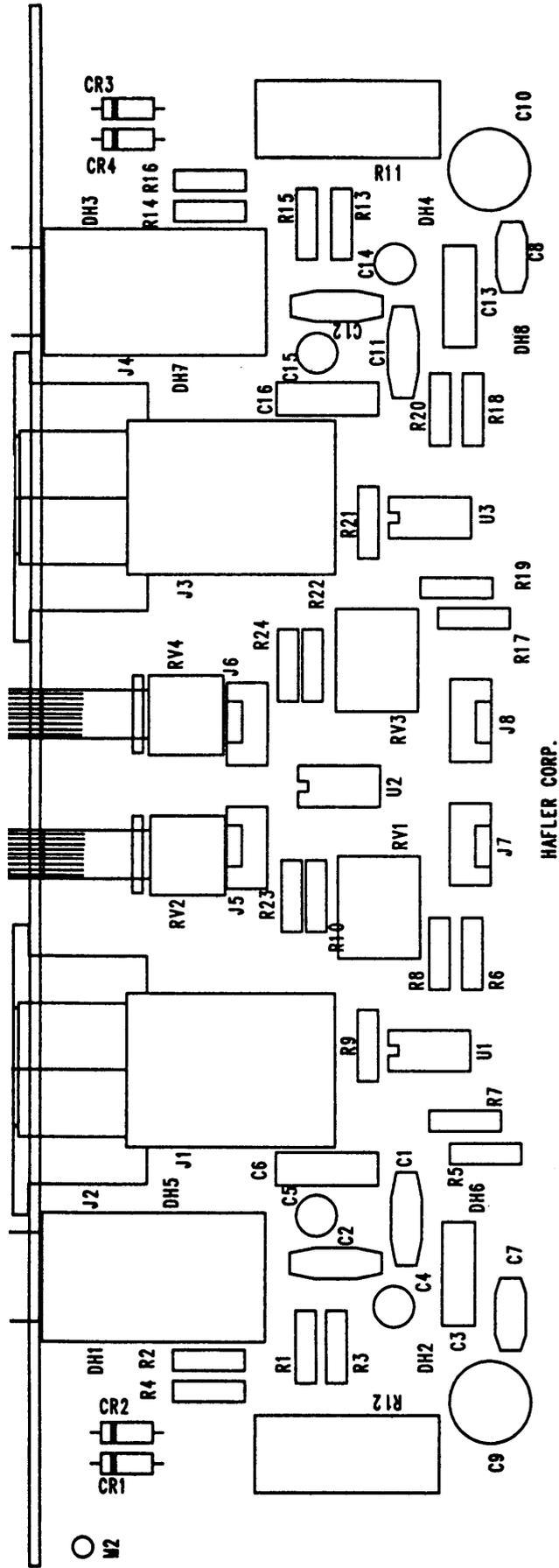
PRO2400 SCHEMATIC

REVISED 11/5/92

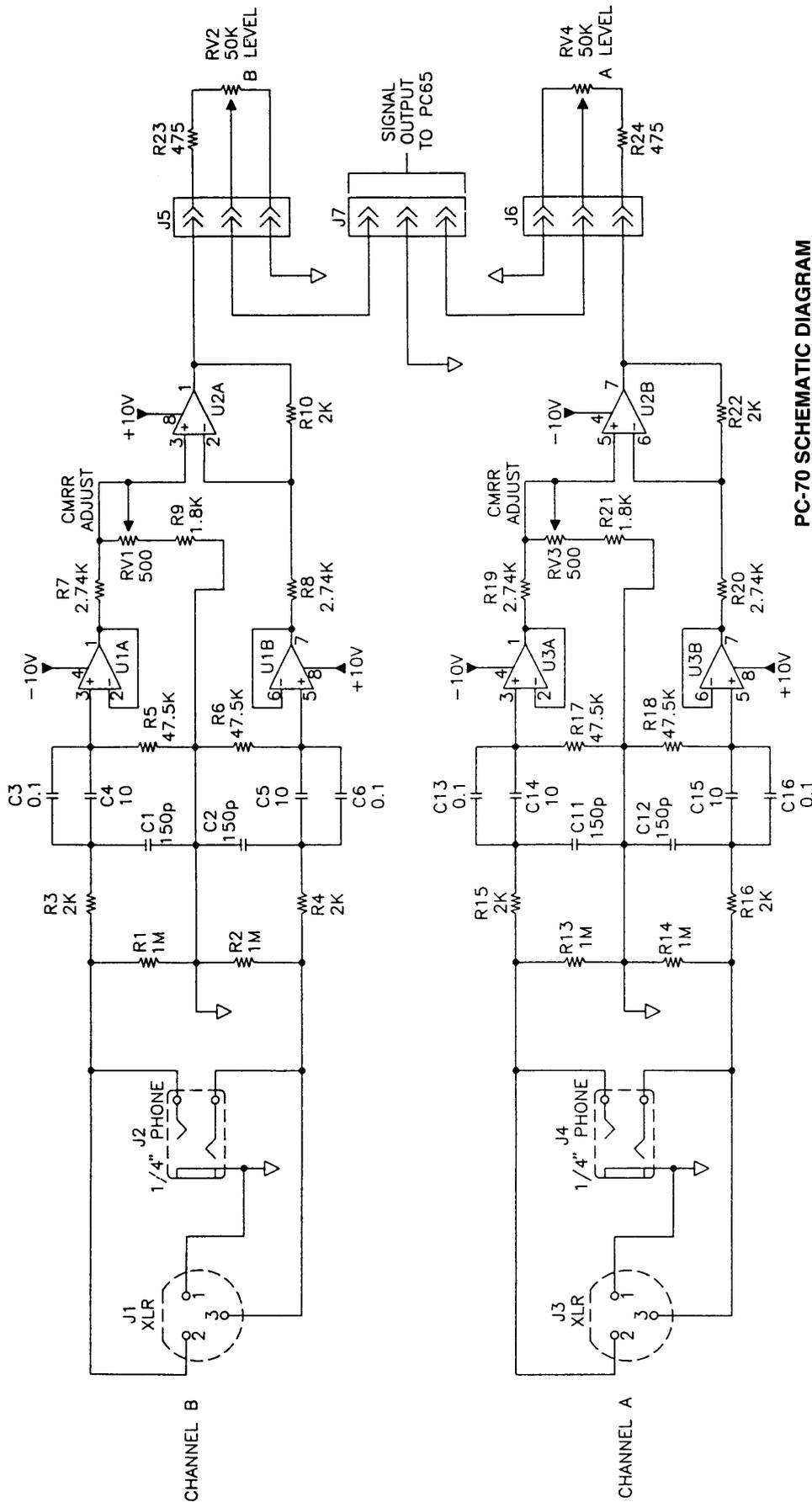
ALTERNATE TRANSFORMER PRIMARY CONNECTIONS
USE 5 AMP FUSE (F5) FOR 230 VAC



PC70 BOARD LAYOUT



HAFLEER CORP.



PC-70 SCHEMATIC DIAGRAM

1. ALL RESISTORS IN OHMS
1/4 WATT, 1%, METAL-FILM
2. ALL CAPACITORS IN MICROFARADS
3. U1, U3 ARE TLO82's
4. U2 IS NE5532
5. CR1-CR4 ARE IN5240B's

