

# BOSE 4401

BOSE CORPORATION · THE MOUNTAIN · FRAMINGHAM, MASS. 01701

## SOLID STATE FOUR CHANNEL PREAMPLIFIER



### SPECIFICATIONS

The 4401 preamplifier offers four independent channels from input to output with a capability of matrix decoding, discrete four-channel, or stereo operation. Signals from all current program sources, both stereo and quadraphonic, can be processed by the 4401.

The 4401 incorporates unique phono preamp circuitry, utilizing MET™ (Minimum Effective Temperature) circuitry accounting for the ultra-quiet operation of the phono preamp.

Optional circuitry for the SQ decoder and the CD-4 demodulator is contained on easily-installed, plug-in modules.\*

Internal provisions for an additional four-channel module are provided for yet-to-be-developed four-channel systems.

The tone control circuits, as well as the high and low filters, can be used to process a signal prior to recording. Recordings can be made on two tape recorders simultaneously, and tapes can be copied from either tape recorder.

The 4401 provides separate jacks for the connection of external equalizers. A rear channel equalizer by-pass switch allows equalization of only the front channels without the use of jumper cables for the rear channels.

### GENERAL

Separate left/right balance controls for both front and rear channels.

Independent front and rear channel tone controls.

Baxendall tone control circuits for optimum frequency contour control.

Output amplifiers capable of driving both low and high impedance headphones.

Time delay circuitry eliminating turn-on transients.

Two-position phono capacitance switch for optimum matching of conventional or CD-4 phono cartridges.

Optional SQ decoder and CD-4 demodulator plug-in modules.\*

Optional remote balance/volume control.

### ELECTRONIC

#### Input Sensitivity:

Phono 1	2mv@1kHz
Phono 2	2mv@1kHz
Tuner	200mv
Aux.	200mv
Tape 1	200mv
Tape 2	200mv

#### Rated Output:

2v RMS.	Minimum 7v RMS before overload.
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#### Output Impedance:

600 ohms.

#### Input Impedance:

High Level	100k ohms
Phono (except CD-4 mode)	47k ohms
Phono (CD-4 mode)	100k ohms

#### Frequency Response:

High Level-20-20,000Hz	±0.2db
RIAA Phono-Equalization	±1db

#### Distortion:

Harmonic Distortion	≤ 0.2%, 20-20,000 Hz at rated output.
IM Distortion	≤ 0.2% at rated output.

#### Hum and Noise:

High Level	Minimum 80db below rated output. Noise typically 90db down.
Phono	500 μV A weighted. (Unweighted, typically less than 1 mV.)

#### Low Filter:

-3db@70Hz, 6db per octave attenuation.

#### High Filter:

-3db@7kHz, 12db per octave attenuation.

#### Tone Control Range:

Bass	±15db@50Hz
Treble	±15db@20kHz
Volume Muting	-20db

### POWER REQUIREMENTS

Voltage	105-130 Vac or 210-260 Vac
Frequency	50-60 Hz (ac only)
Maximum power consumption	30 watts

### MECHANICAL

#### Dimensions:

6" high x 18" wide x 13 1/8" deep.

#### Weight:

12 pounds.

8/75 107143

\* SQ is a trademark of CBS Labs, Inc., and CD-4 is a trademark of JVC America, Inc.

## SERVICE MANUAL

## Section 1

# DISASSEMBLY PROCEDURE

## I. Removing the Phono Board

- A. Remove the four screws holding the top cover in place.
- B. Locate the three interboard supports holding the phono board in place. Using needle-nose pliers, squeeze the locking pin of the interboard support and gently slide the board over the top of each support. It is suggested that the board be lifted to the point of just keeping the support from locking again. Do not attempt to remove the board until all three pins have been unlocked.
- C. Gently slide the phono preamp board up and off the interconnect points of J12 and J1 after releasing all three pins.

**Special Note:** When reassembling the phono preamp circuit to the upper board, be certain to align the pins of J1 first. Then, by rotating the preamp board sideways, easy alignment of the J12 pins can be accomplished, using the three interboard supports as guides for the reconnection of the printed circuit board.

## II. CD-4 Four-Channel Decoding Board

After removing the top cover, locate the three interboard supports. Using needle-nose pliers, gently squeeze the locking pin of the interboard supports (as described in section IB) and slide the board up over the locking pins. (Do not attempt to remove the board until all three locking pins have been released.) Then gently pull the board towards the volume control side of the preamp, sliding the board away from the J201 connection pins.

## III. Servicing the Top Board

- A. After removing the four screws holding the top cover in place, remove the top cover.
- B. If service of the section of the top board located under the phono preamp is required, see Section I above.
- C. If service of the other components of the top board is required, locate the section of the circuit by using the appropriate diagram.

## IV. Access to the Lower Printed Circuit Board [Exposed Foil Section]

- A. Remove the seven screws holding the bottom cover in place.
- B. If service to the power transformer or ac switched and unswitched outlets is required, voltage conversion, or other similar service, remove the power supply shield by unscrewing the rear chassis screw holding the shield in place. (This is necessary for voltage conversion changes as well.)
- C. Access to all exposed components located on the lower board is now possible.

## V. Access to Decoder Module

- A. Access to the bottom board is obtained as indicated in Section IV. Repair of either module can be accomplished by simply removing the screws holding the module to the rear chassis bracket assembly and sliding the module off its respective pin assembly (J101 or J102).

## VI. Service of Foil [Etch] of Upper or Lower Board

- A. Remove the seven screws holding the bottom cover in place.
- B. Remove the decoder module(s) plugged into the bottom board (at connection Points J101 or J102).
- C. Remove the top cover by removing the four screws holding it in place.
- D. Locate the stud coming from front panel (above the source push button) and remove the nut, lock-washer, and flat-washer.
- E. Remove the knobs (not the push buttons) from the front panel. Be certain, when removing the knobs, to maintain the order and location of these knobs as they have been matched to each control for proper appearance and operation. (If difficulty is experienced in removing the knob, try using either insulated wire or heavy twine wrapped around the knob.)
- F. Very carefully, remove the headphone locking nut found on the front panel. Extreme care should be taken to not scratch the front panel.
- G. Remove the four ½ inch locking nuts holding the front panel in place.
- H. Remove the two screws holding the lower pc board bracket assembly to the side chassis. These two screws are located near the front of the chassis on either side of the preamplifier.
- I. On the upper board, locate the six interconnect pin assemblies, J2, 3, 5, 6, 7, 8. (do not remove J4.) Remove these six interconnect pin assemblies connecting the upper board to the lower board by gently pulling the pin assembly upward until they are disengaged from the lower board. (Needle-nose pliers may be used to lift the interconnect pin assemblies away from the connector on the upper pc board. Do not remove the pins from the upper board.)
- J. Unlock the four interboard supports found near the rear edge of the lower pc board using needle-nose pliers. Do not attempt to raise the board off the supports, but rotate the board toward the front of the unit, releasing Connector J4 and the four interboard supports.
- K. With the preamp laying on its top with the volume control nearest the bench, lift the lower pc board out of the chassis assembly and lay it to your left. This completes major disassembly for service to the foil side of both printed-circuit boards.

**Special Note #1:** Care should be taken when extending the power transformer and headphone cables so that no tension is placed on the cable assemblies. It is unnecessary to unplug the power transformer when servicing the unit.

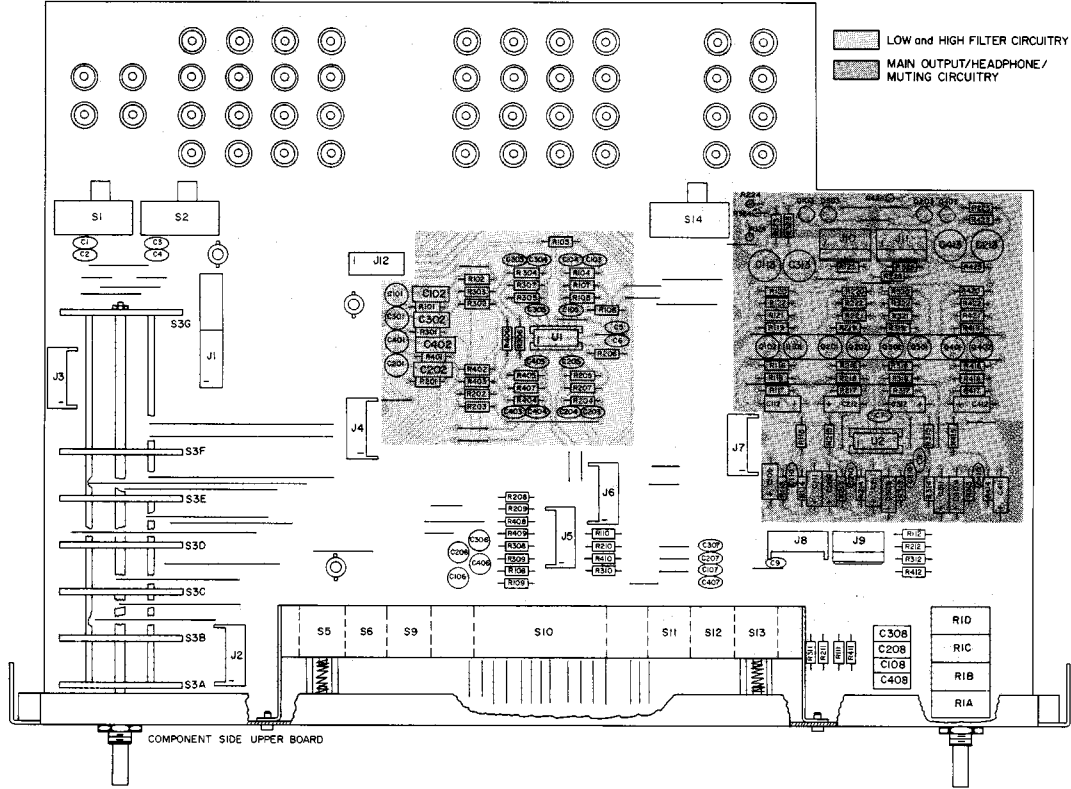
**Special Note #2:** When reassembling the preamp, make certain that interconnect board locking pins are secure when repositioning the board assemblies. Also, J4 interboard can be reinserted using a flat-blade screwdriver.

# PARTS LIST

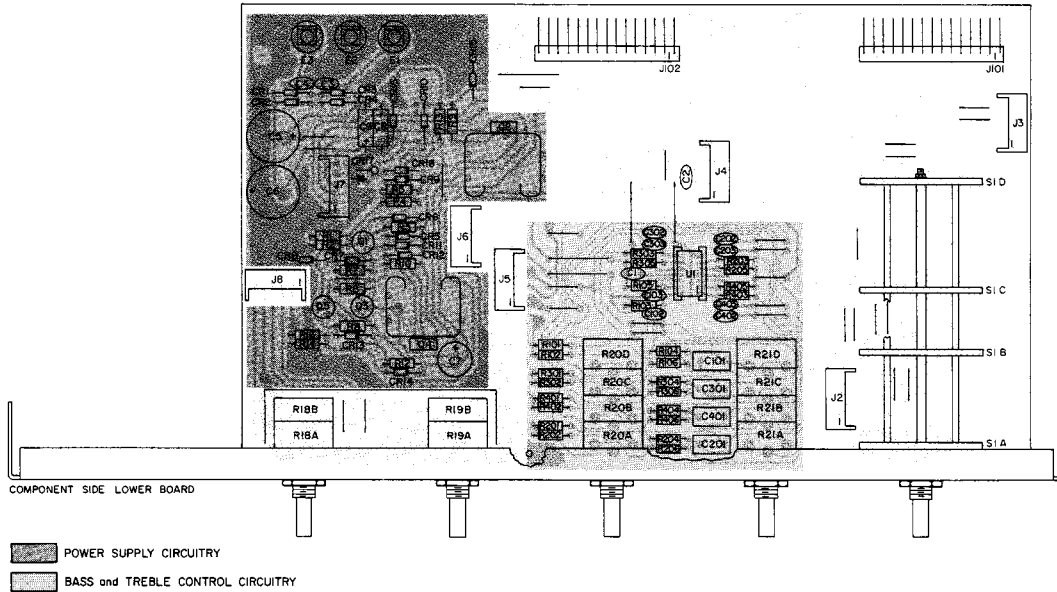
<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
<b><u>CHASSIS &amp; FRONT PANEL ASSEMBLY</u></b>			<b><u>UPPER PC BOARD (Cont'd.)</u></b>		
<b><u>Capacitors</u></b>			<b><u>Capacitors</u></b>		
	0.0047 $\mu$ f, 1.4 kV Disc	103447	C1, 2, 3, 4, 105, 205, 305, 405	270 pf, 10%, 200 V, Disc	103727
	<b><u>Inductors</u></b>		C9, 103, 104, 203, 204, 303, 304, 403, 404	0.001 $\mu$ f, 10%, 200 V, Disc	103729
T-1	Power Transformer	103883	C5, 6, 7, 8	0.01 $\mu$ f, Disc	103730
	<b><u>Miscellaneous</u></b>		C102, 202, 302, 402	0.022 $\mu$ f, 10%, 50 V, Mylar	103731
	Front & Rear Headphone Plug-In Assy	104965	C108, 208, 308, 408	0.047 $\mu$ f, 10%, 50 V, Mylar	103732
	Internal Headphone Washer	103769	C101, 201, 301, 401, 106, 206, 306, 406	5 $\mu$ f, Nonpolar, 15 V, Electrolytic	103737
	Internal Headphone Hex Nut	103033	C113, 213, 313, 413	15 $\mu$ f, 25 V, Nonpolar, Electrolytic	103946
	Front Panel Headphone Knurled Nut	103545	<b><u>Semiconductors</u></b>		
	Pushbutton Sleeve	104547	U1, U2	Quad Op Amp, RC4136DP	103848
	Locking Interboard Support	103924-10	Q101, 201, 301, 401	2N3569	103850
	Pilot Light Socket	103834	Q102, 202, 302, 402	2N3644	103851
	Locking Phono Board Support	104870-18	Q103, 203, 303, 403	N Channel FET, E111	104019
S-15	On/Off Switch Bracket	104510	<b><u>Miscellaneous</u></b>		
	On/Off Switch	103847	J2, 3, 4, 5, 6, 7, 8	Phono Jack, PC Mounted	103832
	Power Switch Screw	103150-03	J9, 10, 11	6-Circuit PC Connector, Top Insert	103838
	Lamp #1847	102580	J1(2), 2, 3, 4, 5, 6, 7, 8, 12	5-Circuit Interconnect Pin	103839
	Knob, Large	104327	U1, U2	6-Circuit Interconnect Pin	103841
	Knob, Small	104328	S5, 6, 9, 10, 11, 12, 13	IC Terminal Strip	103922
	Knob, Inner	104329	S1, 2, 14	Nylon IC Nest	103923
	Knob, Outer	104330	<b><u>Resistors</u></b>		
	Knob, Pushbutton	103877	R3	1/2 W, Comp, 62, 5%	102942-620
	Left Side Panel	103863	R5	1/2 W, Comp, 750, 5%	102942-751
	Right Side Panel	103864	R18	Pot, Front/Back Balance Control	103741
	Side Panel Screws	103122-05	R19	Pot, Left/Right Balance Control	103742
	Top Cover	103871	R20, 21	Pot, 4-Section Tone Control	103907
	Bottom Cover	103872	<b><u>Capacitors</u></b>		
	Bottom & Top Cover Screws	103122-05	C8, 9	5 $\mu$ f, 25 V, Electrolytic	100260-1
	Jewel, Pilot Light	103460	C103, 203, 303, 403	22 pf, 20%, 200 V, Disc	103725
F-1	Fuse 1/2A, Slow Blo 250 V	104714-050	C102, 202, 302, 402	220 pf, 10%, 200 V, Disc	103728
	Rubber Foot	103887	C1, 2, 3, 4	0.01 $\mu$ f, Disc	103730
	Rubber Foot Screw	103122-08	C5, 6	1000 $\mu$ f, 35 V, Electrolytic	103736
	Chassis Ground Post	103862	C101, 201, 301, 401	0.068 $\mu$ f, 5%, 50 V, Mylar	103948
	Remote Balance Receptacle	103844	C7	47 $\mu$ f, 50, V Electrolytic	104016
	Fuse Holder	102707	<b><u>Semiconductors</u></b>		
	Accessory Outlet	103830	Q2	PNP PWR TIP-30	102016-1
	Headphone Jack	104570	CR1, 2, 3, 4, 15, 16	1N4002	102020-1
			U1	Quad Op Amp, RC4136DP	103848
			Q4	NPN PWR TIP-29	103849
			Q1, 3, 5	2N3644	103851
			CR5, 6, 7, 9, 10, 11, 12, 13, 14, 18	Diode 1N4148	102410
			CR8, 17	Diode, Zener, 15 V	103763
			<b><u>Miscellaneous</u></b>		
			J2, 3, 4, 5, 6, 7, 8	Heat Sink	103859
			J101, 102	6-Circuit PC Connector, Bottom Insert	103837
			U1	Right-Angle Connector, 15-Circuit	103842
			U1	IC Terminal Strip	103922
			U1	Nylon IC Nest	103923
			S1	Mode Switch	103815
				Locking Interboard Support	103924-10
			<b><u>COMPLETE ASSEMBLIES</u></b>		
			Phono Board		103662
			Front Panel Assy		103654
			Upper Board Assy		103660
			Lower Board Assy		103661
			Carton Assy		104723
			Owner's Manual		104296
<b><u>PHONO BOARD</u></b>			<b><u>LOWER PC BOARD</u></b>		
	<b><u>Resistors</u></b>			<b><u>Resistors</u></b>	
R104, 304	1/2 W, Comp, 360, 5% Low Noise	102943-361	R3	1/2 W, Comp, 62, 5%	102942-620
R2	1/4 W, Film, 10.0 K, 1%	104095-1002	R5	1/2 W, Comp, 750, 5%	102942-751
R102, 302	1/4 W, Film, 28.7 K, 1%	104095-2872	R18	Pot, Front/Back Balance Control	103741
R103, 303	1/4 W, Film, 365 K, 1%	104095-3653	R19	Pot, Left/Right Balance Control	103742
R1	1/4 W, Film, 4.99 K, 1%	104095-4991	R20, 21	Pot, 4-Section Tone Control	103907
	<b><u>Capacitors</u></b>			<b><u>Capacitors</u></b>	
C108, 308	0.01 $\mu$ f Disc	103730	C8, 9	5 $\mu$ f, 25 V, Electrolytic	100260-1
C1, 2, 106, 306	5 $\mu$ f, 25 V, Electrolytic	103735	C103, 203, 303, 403	22 pf, 20%, 200 V, Disc	103725
C103, 105, 303, 305	0.0027 $\mu$ f, 5%, 50 V, Mylar	103914	C102, 202, 302, 402	220 pf, 10%, 200 V, Disc	103728
C101, 301	1 $\mu$ f, 25 V, Electrolytic	104015	C1, 2, 3, 4	0.01 $\mu$ f, Disc	103730
C3	47 $\mu$ f, 50 V, Electrolytic	104016	C5, 6	1000 $\mu$ f, 35 V, Electrolytic	103736
C102, 107, 302, 307	130 pf, 300 V, 10% Disc	104017	C101, 201, 301, 401	0.068 $\mu$ f, 5%, 50 V, Mylar	103948
C104, 304	0.0091 $\mu$ f, 5%, 50 V, Mylar	104018	C7	47 $\mu$ f, 50, V Electrolytic	104016
C109, 309	0.47 $\mu$ f, 25 V, Electrolytic	104817	<b><u>Semiconductors</u></b>		
	<b><u>Semiconductors</u></b>		Q2	PNP PWR TIP-30	102016-1
Q101, 103, 301, 303	Transistor, NPN, Low Noise, BC239C	102437-2	CR1, 2, 3, 4, 15, 16	1N4002	102020-1
Q102, 104, 302, 304	2N5086	103925	U1	Quad Op Amp, RC4136DP	103848
Q105, 305	N Channel FET, E111	104019	Q4	NPN PWR TIP-29	103849
	<b><u>Miscellaneous</u></b>		Q1, 3, 5	2N3644	103851
J1 (2), 12	6-Circuit PC Connector, Bottom Insert	103837	CR5, 6, 7, 9, 10, 11, 12, 13, 14, 18	Diode 1N4148	102410
J201	Right-Angle Connector, 15-Circuit	103842	CR8, 17	Diode, Zener, 15 V	103763
<b><u>UPPER PC BOARD</u></b>			<b><u>Miscellaneous</u></b>		
	<b><u>Resistors</u></b>		J2, 3, 4, 5, 6, 7, 8	Heat Sink	103859
R1	Potentiometer, 4-Section Volume Control	103740	J101, 102	6-Circuit PC Connector, Bottom Insert	103837
	<b><u>Capacitors</u></b>		U1	Right-Angle Connector, 15-Circuit	103842
C109, 111, 209, 211, 309, 311, 409, 411, 112, 212, 312, 412	5 $\mu$ f, 25 V, Electrolytic	100260-1	U1	IC Terminal Strip	103922
C110, 210, 310, 410	22 pf, 10%, 200 V, Disc	103725	U1	Nylon IC Nest	103923
C107, 207, 307, 407,	220 pf, 10%, 200 V, Disc	103726	S1	Mode Switch	103815

NOTE: All parts not listed are readily available from local parts supply houses.

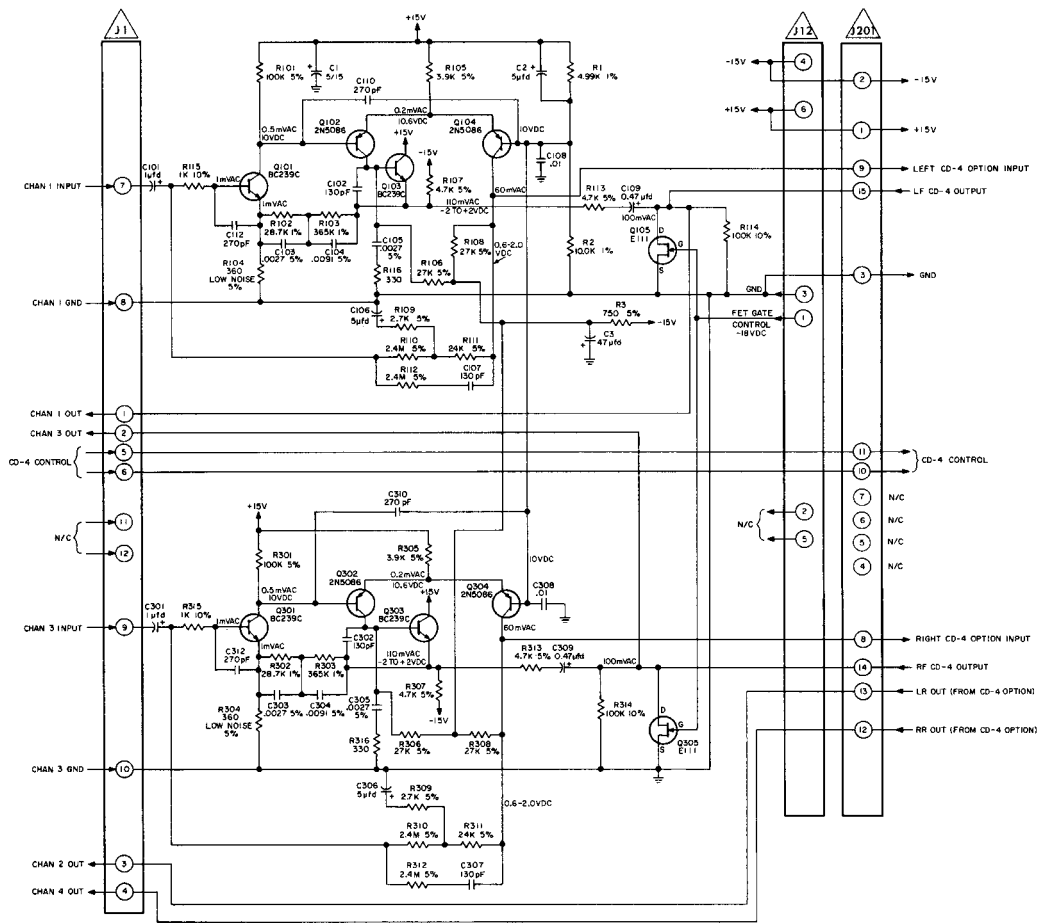
# UPPER BOARD



# LOWER BOARD



# PHONO BOARD



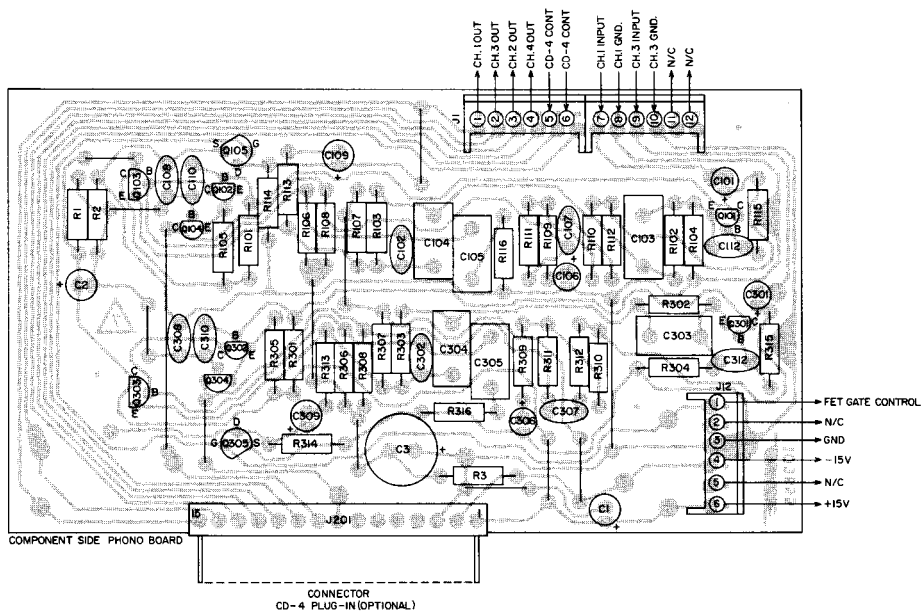
**NOTES:**

- UNLESS OTHERWISE SPECIFIED:  
ALL RESISTORS ARE 1/2 WATT, 10%  
ALL CAPACITORS ARE IN MFD.
- AC SIGNAL TRACKING MEASUREMENTS OF THE PHONO  
PREAMP BOARD ARE MADE WITH A SINE WAVE  
AT 1KHZ and AT 1 MILLIVOLT INPUT.
- TYPICAL DC VOLTAGES ARE SHOWN ON THE SCHEMATIC  
AT SIGNIFICANT POINTS OF THE CIRCUIT.  
10 PERCENT VARIANCE OF THESE VOLTAGES CAN  
BE CONSIDERED NORMAL.
- AC and DC VOLTAGES ARE BOTH SHOWN ON CHANNEL 1  
ON THE PHONO PREAMP SCHEMATIC.

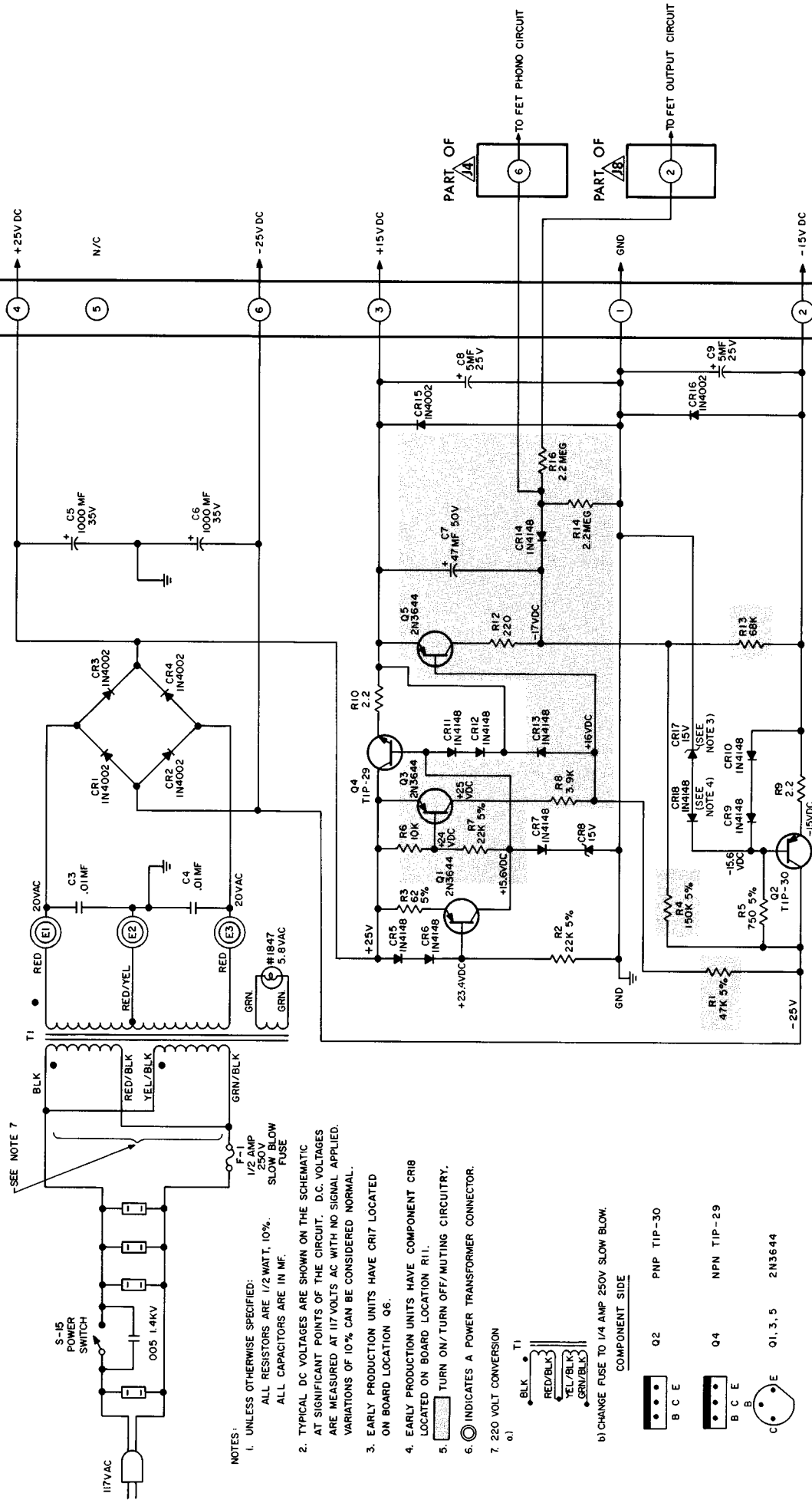


INDICATES AN INTERBOARD CONNECTOR

COMPONENT SIDE	
	Q101, Q3, 301, 303 BC239C
	Q102, 104, 302, 304 2N5086
	Q105, 305 FET E111



# POWER SUPPLY



- NOTES:**
- UNLESS OTHERWISE SPECIFIED:  
ALL RESISTORS ARE 1/2 WATT, 10%.  
ALL CAPACITORS ARE IN MF.

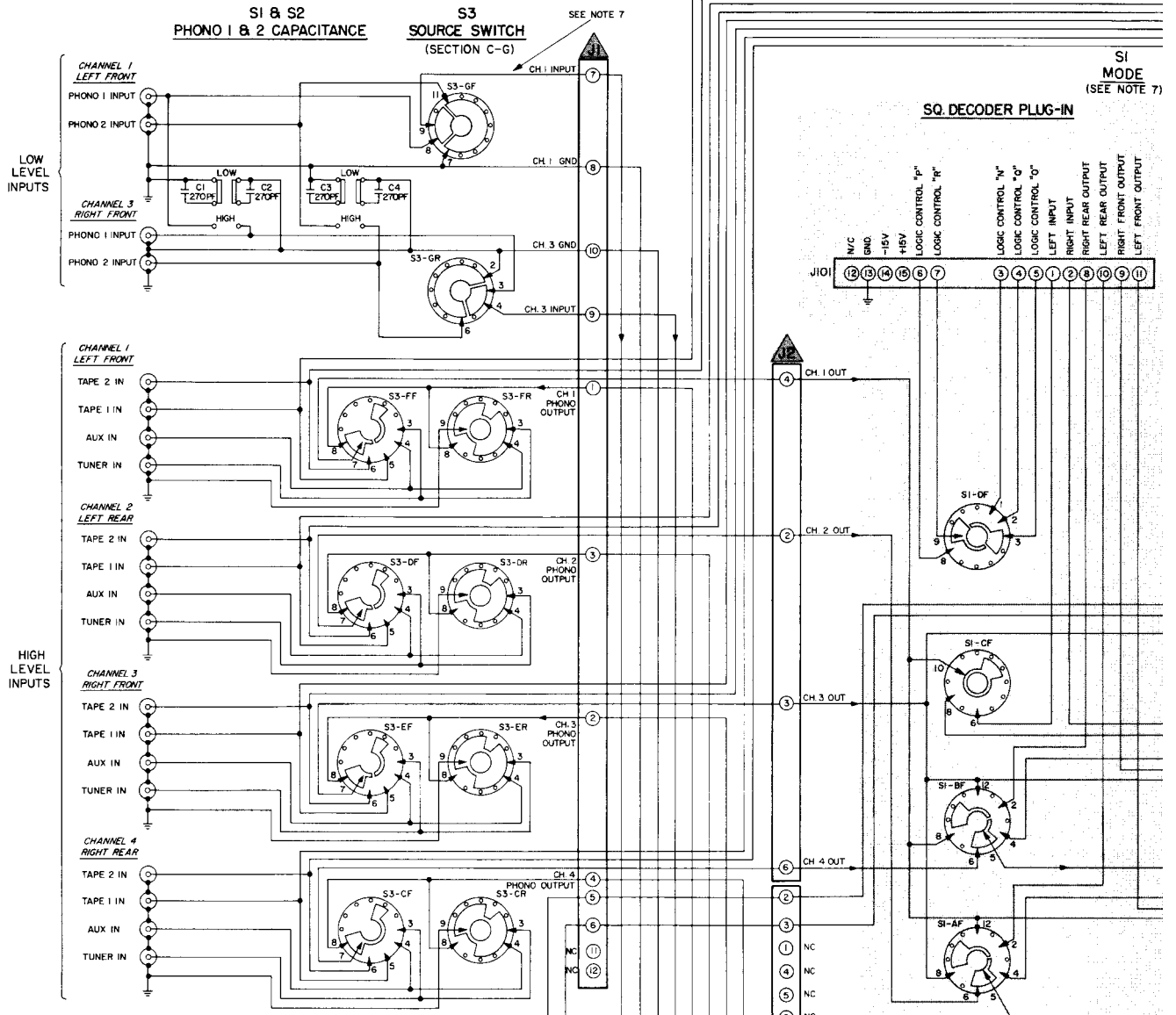
- TYPICAL DC VOLTAGES ARE SHOWN ON THE SCHEMATIC AT SIGNIFICANT POINTS OF THE CIRCUIT. D.C. VOLTAGES ARE MEASURED AT 117 VOLTS AC WITH NO SIGNAL APPLIED. VARIATIONS OF 10% CAN BE CONSIDERED NORMAL.
- EARLY PRODUCTION UNITS HAVE CR17 LOCATED ON BOARD LOCATION Q6.
- EARLY PRODUCTION UNITS HAVE COMPONENT CR18 LOCATED ON BOARD LOCATION R11.
- TURN ON/TURN OFF/MUTING CIRCUITRY.
- INDICATES A POWER TRANSFORMER CONNECTOR.
- 220 VOLT CONVERSION



b) CHANGE FUSE TO 1/4 AMP 250V SLOW BLOW.

### COMPONENT SIDE

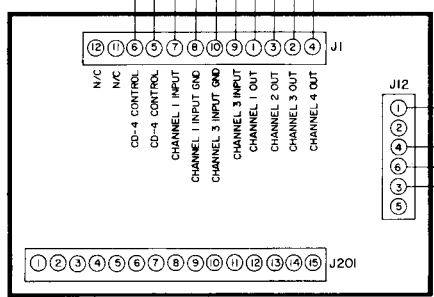
- |  |          |            |
|--|----------|------------|
|  | Q2       | PNP TIP-30 |
|  | Q4       | NPN TIP-29 |
|  | Q1, 3, 5 | 2N3644     |



- NOTES:**
- UNLESS OTHERWISE SPECIFIED:
    - A. RESISTORS ARE 1/2 WATT, 10%
    - B. CAPACITORS ARE IN MFD.
  - TYPICAL DC VOLTAGES ARE SHOWN ON THE SCHEMATIC AT SIGNIFICANT POINTS OF THE CIRCUIT. VARIATIONS OF 10% or 100mVDC CAN BE CONSIDERED NORMAL.
  - AC and DC VOLTAGES ARE BOTH SHOWN ON CHANNEL 1.
  - SIGNAL TRACING:
    - SET CONTROLS OF 440I PREAMP AS FOLLOWS: SOURCE-AUXILIARY, MODE-DISCRETE, LOW and HIGH FILTERS-OUT, TONE CONTROLS-IN, TAPE MONITOR-SOURCE, EXTERNAL EQUALIZER-OUT, LOUD-OUT, MUTING-OUT. SET ALL BALANCE AND TONE CONTROLS TO "O" MARK. INSERT 100 MILLIVOLTS SINE WAVE AT 1 kHz INTO AUXILIARY INPUT. SET VOLUME CONTROL FULLY CLOCKWISE.

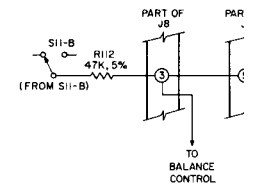
**COMPONENT SIDE**

U1,2	RC4136DP	INDICATES AN INTERBOARD CONNECTOR
Q101, 201, 301, 401	2N3569	INDICATES A PRINTED CIRCUIT BOARD PLUG CONNECTOR
Q102, 202, 302, 402	2N3644	INDICATES CIRCUITRY FOUND ON LOWER BOARD
Q103, 203, 303, 403	FET E111	



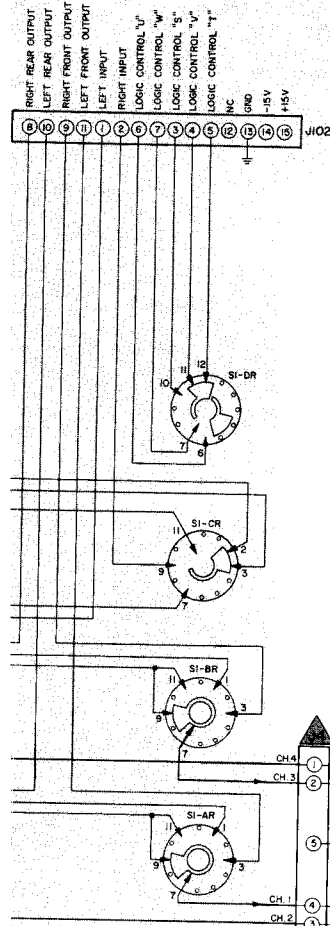
**PHONO PREAMP**  
(SEE SCHEMATIC FOR FURTHER DETAILS)

- NOTES CONT'D:**
- SOURCE and MODE SWITCH SHOWN IN CCW POSITION.
  - S/N 1366 and ABOVE HAVE MODIFIED VOLUME CONTROL AT ZERO VOLUME BY 6 dB.

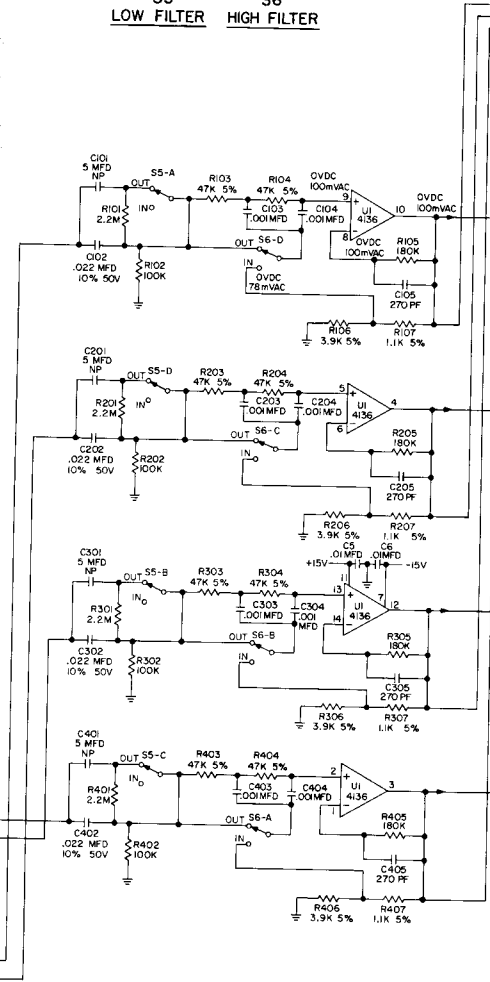


CONSUMERS CONCERNED WITH HIGH ZERO VOLUME NOISE SHOULD FIRST BE REQUESTED TO ADJUST THEIR HIGH FIDELITY SYSTEM FOR OPTIMUM SYSTEM NOISE PERFORMANCE. START BY SETTING THE 440I VOLUME CONTROL AT ZERO AND THE POWER AMP GAIN CONTROL AT FULL VOLUME. IF NOISE IS HEARD IN THE SPEAKERS, REDUCE THE POWER AMP GAIN CONTROL UNTIL THE NOISE JUST BECOMES INAUDIBLE. ALTERNATIVELY, UNITS CAN BE RETURNED TO BOSE FOR THE WARRANTY MODIFICATION, SHOWN ON THE ABOVE SCHEMATIC.

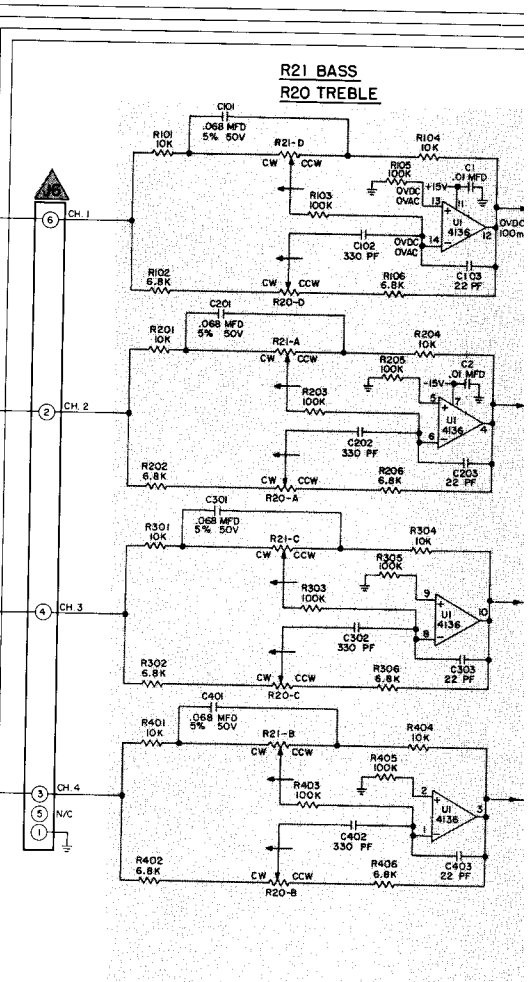
OPTIONAL DECODER PLUG-IN



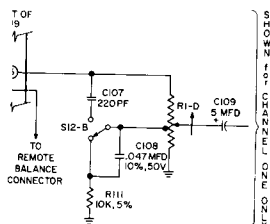
S5 LOW FILTER S6 HIGH FILTER



R21 BASS R20 TREBLE



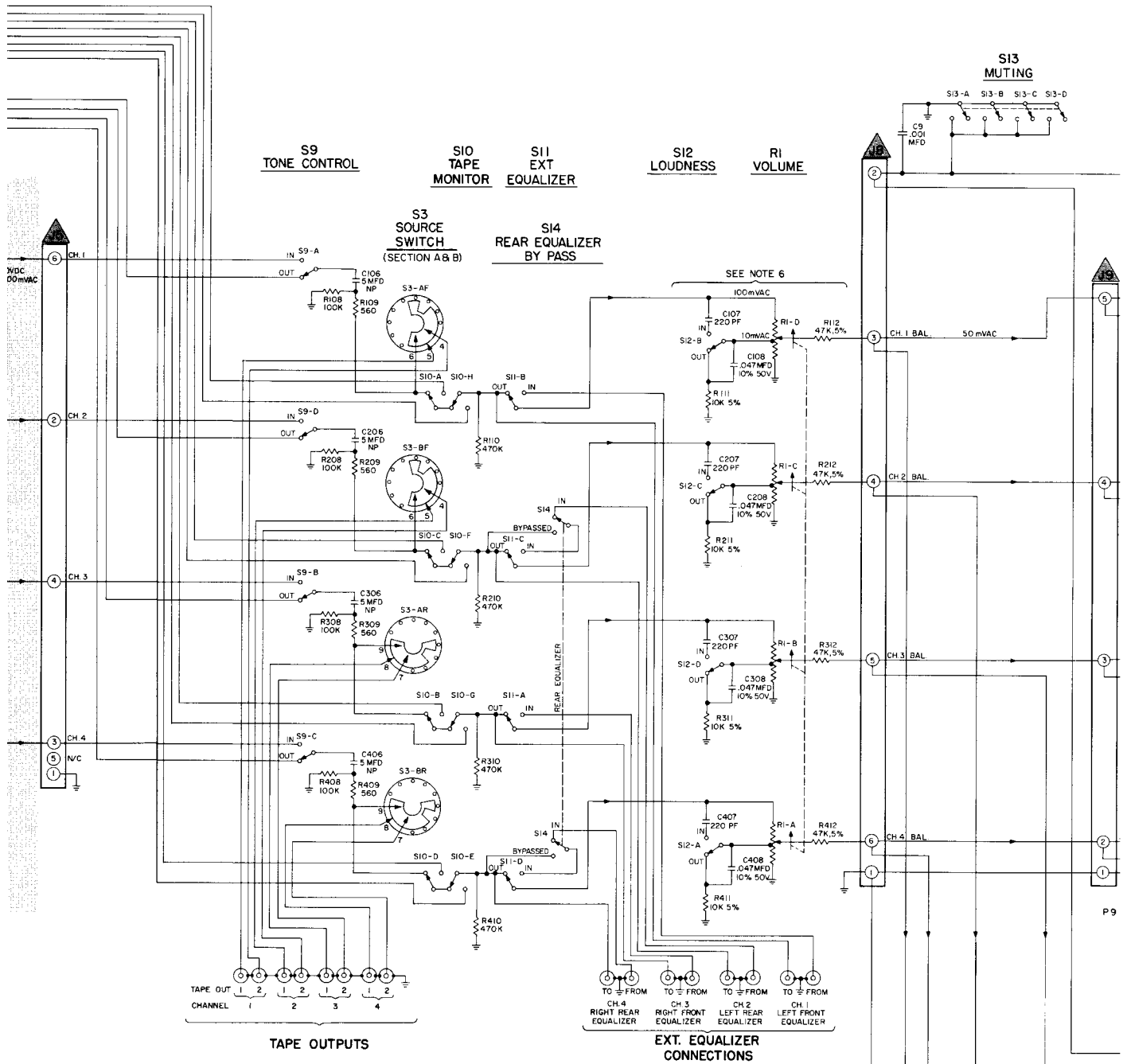
CIRCUITRY LOWERING OUTPUT NOISE



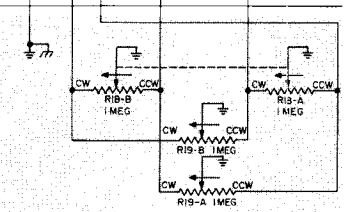
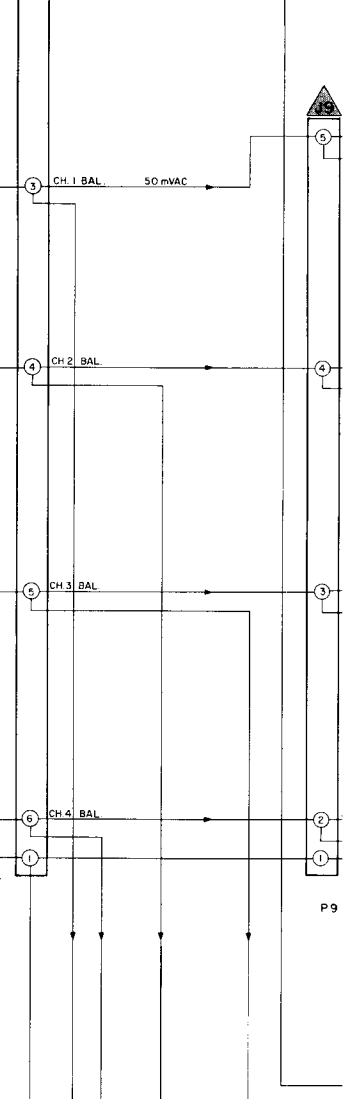
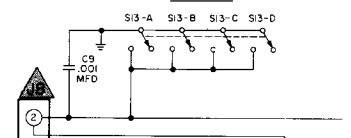
NOTES CONT'D

7 S/N 1275 AND ABOVE HAVE CENTRALAB PBL LUBRICANT APPLIED TO BOTH MODE AND SOURCE SWITCHES TO IMPROVE THEIR LONGTERM EASE OF OPERATION IF EITHER SWITCH BECOMES DIFFICULT TO TURN, USE THE ABOVE LUBRICANT OR TUN-O-BRITE LUBRICANT (MADE BY CHEMTRONICS INC.) ON BOTH SIDES OF EACH SWITCH DECK.

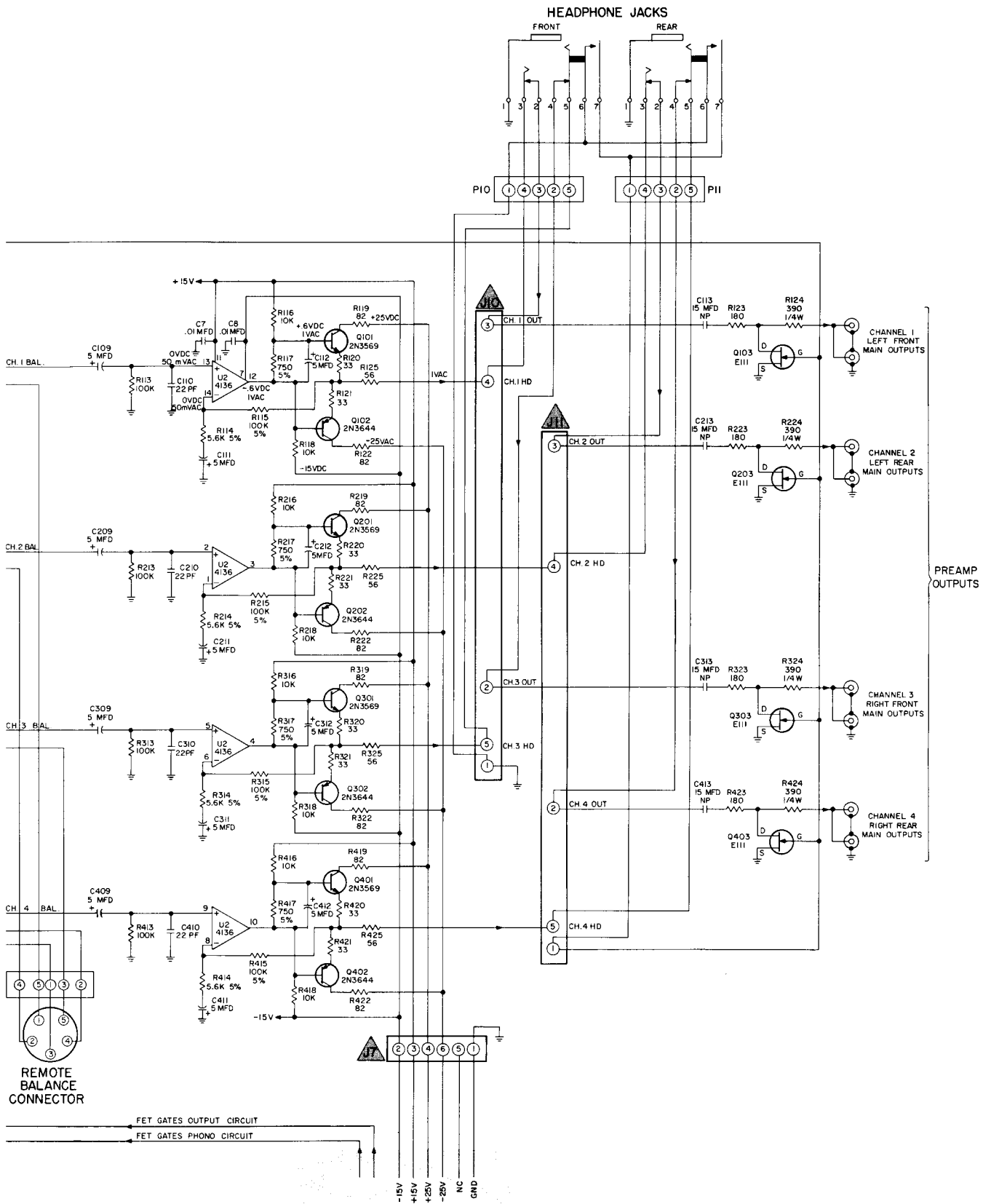




**S13 MUTING**



**BALANCE CONTROLS (Lower Board)**  
 R18 FRONT-REAR BALANCE (DUAL)  
 R19 LEFT-RIGHT BALANCE (CONCENTRIC)



**POWER SUPPLY (Lower Board)**  
 (SEE SCHEMATIC FOR FURTHER DETAILS)