

# McIntosh

## C 28

*PREAMPLIFIER*



## SERVICE INFORMATION

FROM SERIAL NO. 10X01 TO 91X49

## ELECTRICAL SPECIFICATIONS

## FREQUENCY RESPONSE

+0 to 0.5 dB from 20 Hz to 20,000 Hz.

## DISTORTION

Less than 0.1% at each output at rated output level, 20 Hz to 20,000 Hz.

## INPUT SENSITIVITY AND IMPEDANCE

Phono 1 and Phono 2  
2 millivolts at 47k ohms (1,000 Hz)

Aux, Tuner, Tape 1 and Tape 2  
0.25 volts at 250k ohms

Microphone  
2.5 millivolts at 500k ohms

Tape Head  
2 millivolts at 500k ohms (500 Hz)

## HUM AND NOISE

Aux, Tuner, Tape 1 and Tape 2  
90 dB below rated output

Phono 1, Phono 2 and Tape Head  
78 dB below 10 millivolt input, equivalent to less than 1.2 microvolts at the input terminals.

Microphone  
Less than 1.5 microvolts at the input terminals.

## OUTPUT LEVEL AND IMPEDANCE

Main Output  
2.5 volts with rated input, less than 100 ohms source impedance, to operate into 47k ohm or greater load.

Tape Output  
0.25 volts with rated input. Less than 150 ohm source impedance, to operate into 47k ohm or greater load.

Headphone/Line Output  
0.75 volts into 8 ohm load or 3.0 volts into 600 ohm line. Less than 0.2 ohms source impedance. Level controls provided.

Center Channel  
0.7 volts with rated input to both channels. Level control provided.

## BASS CONTROL

+  
±20 dB at 20 Hz.

## TREBLE CONTROL

±18 dB at 20,000 Hz.

## L.F. FILTER

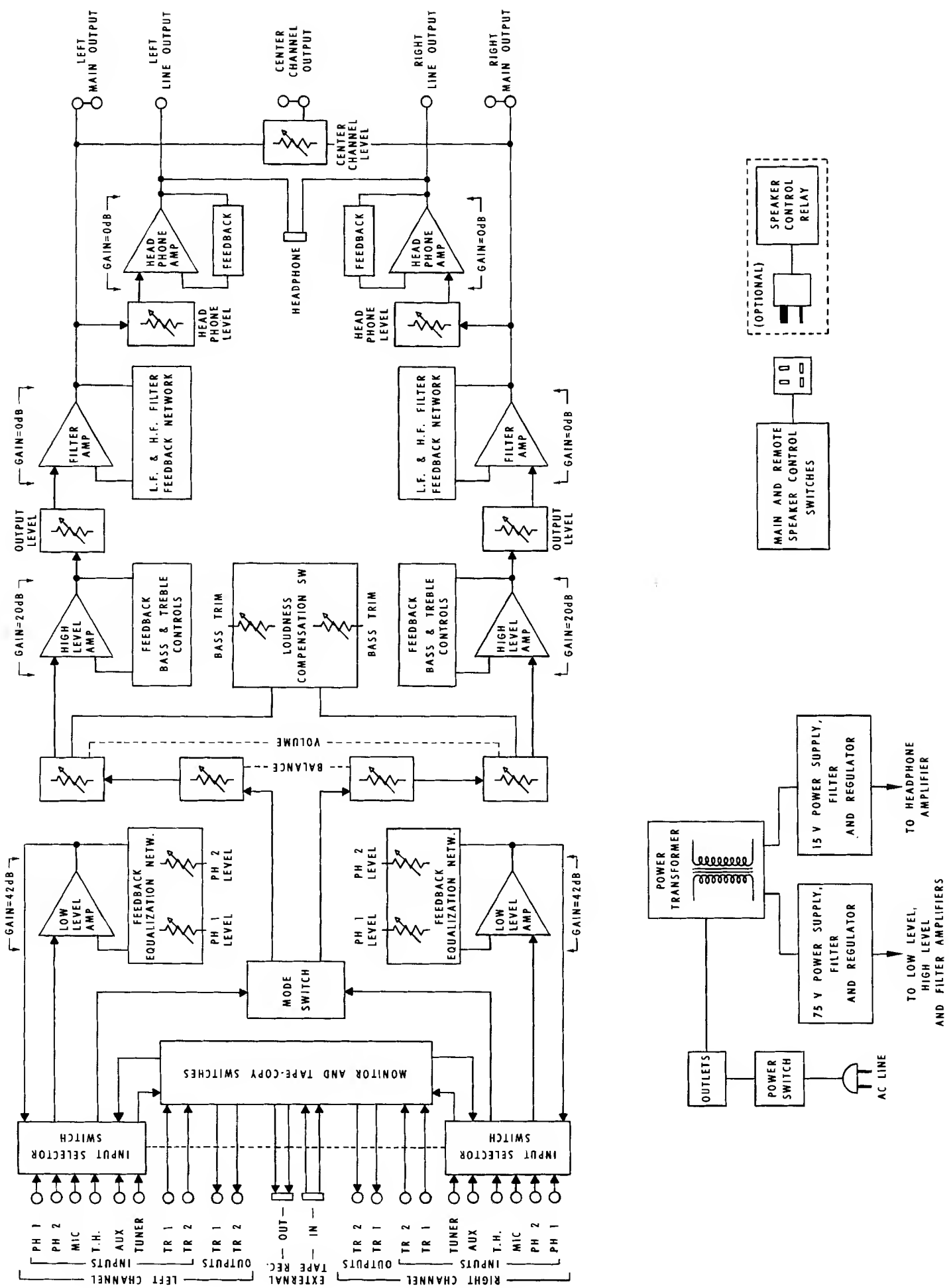
Flat or roll off below 50 Hz, active filter 12 dB/octave down 18 dB at 20 Hz.

## H.F. FILTER

Flat or roll off above 7,000 Hz, active filter 12 dB/octave down 20 dB at 20,000 Hz.

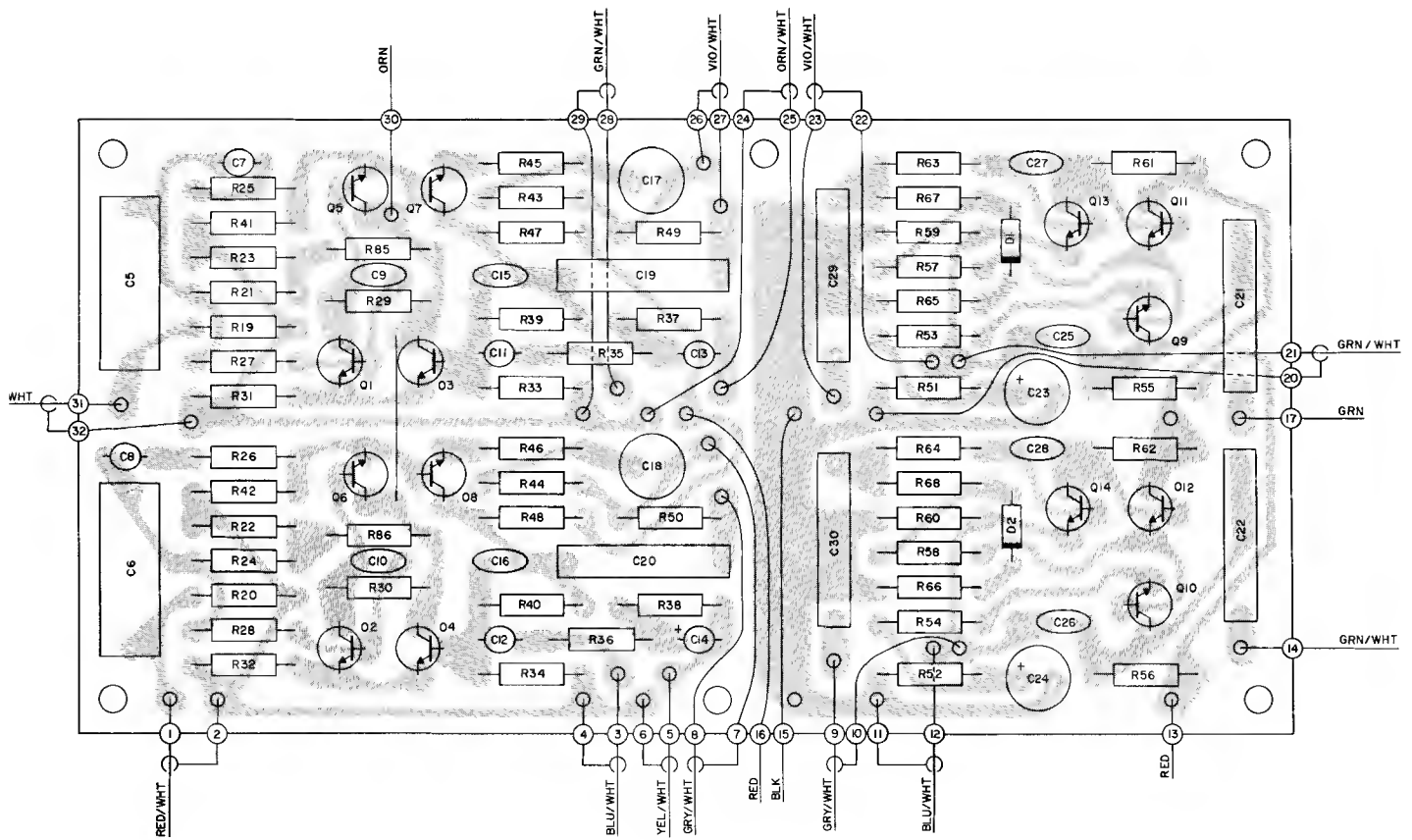
## POWER REQUIREMENT

117 volts, 50/60 Hz, 45 watts.

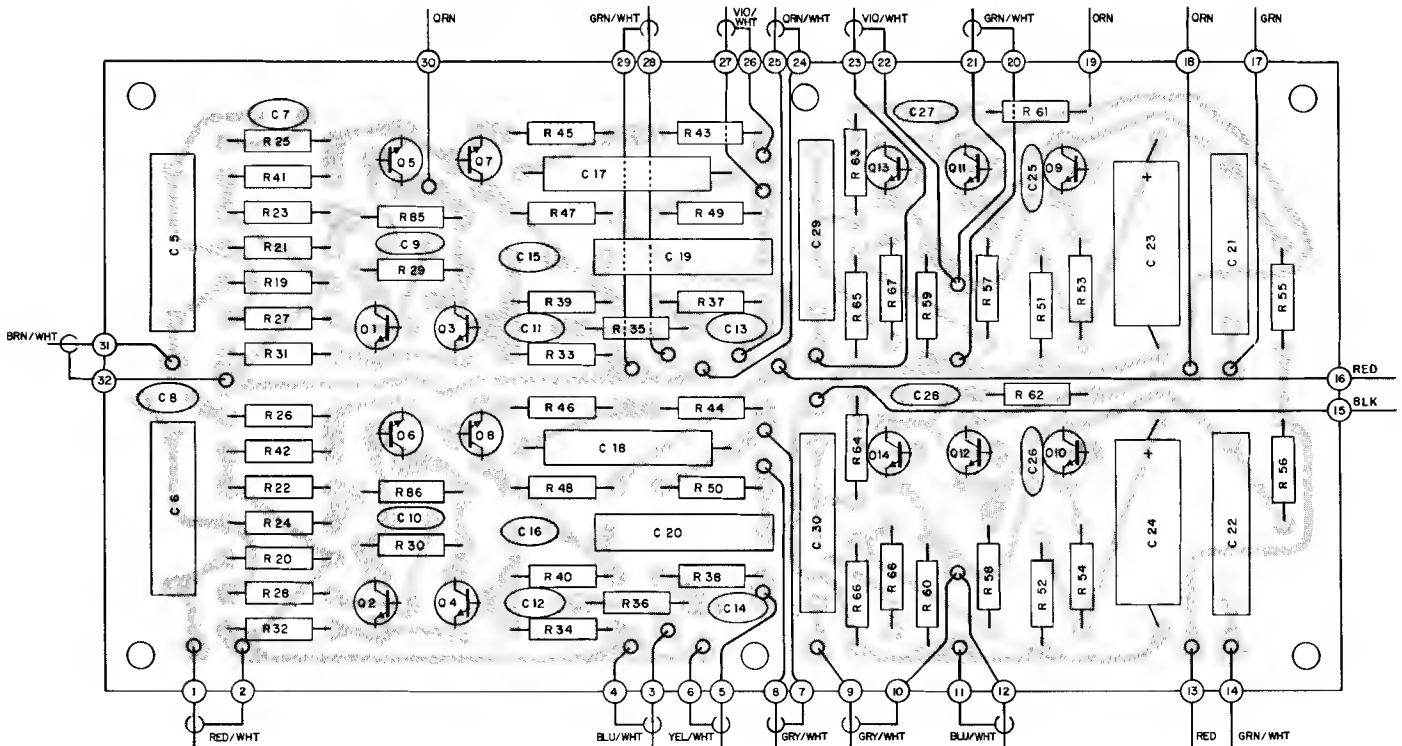


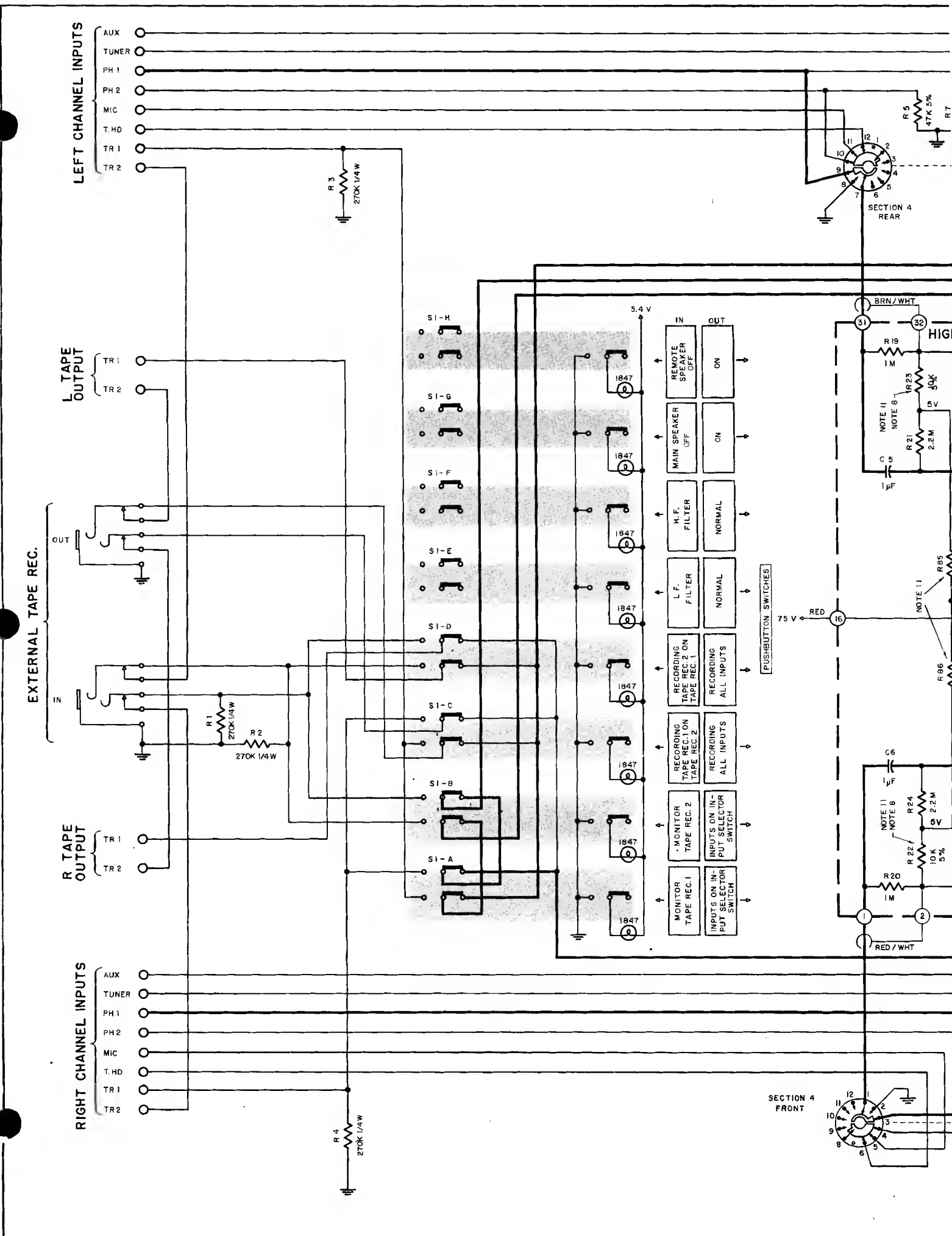
C 28 BLOCK DIAGRAM

HIGH 8. LOW LEVEL PC BOARD 044-309



HIGH & LOW LEVEL PRINTED CIRCUIT BOARD FOR UNITS WITH SERIAL NOS. BELOW 30X00





LEFT CHANNEL INPUTS

L TAPE OUTPUT

EXTERNAL TAPE REC.

R TAPE OUTPUT

RIGHT CHANNEL INPUTS

SECTION 4 REAR

SECTION 4 FRONT

HIGH

NOTE 11

NOTE 8

NOTE 11

NOTE 8

NOTE 11

NOTE 8

NOTE 11

NOTE 8

NOTE 11

NOTE 8

NOTE 11

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NOTE 11

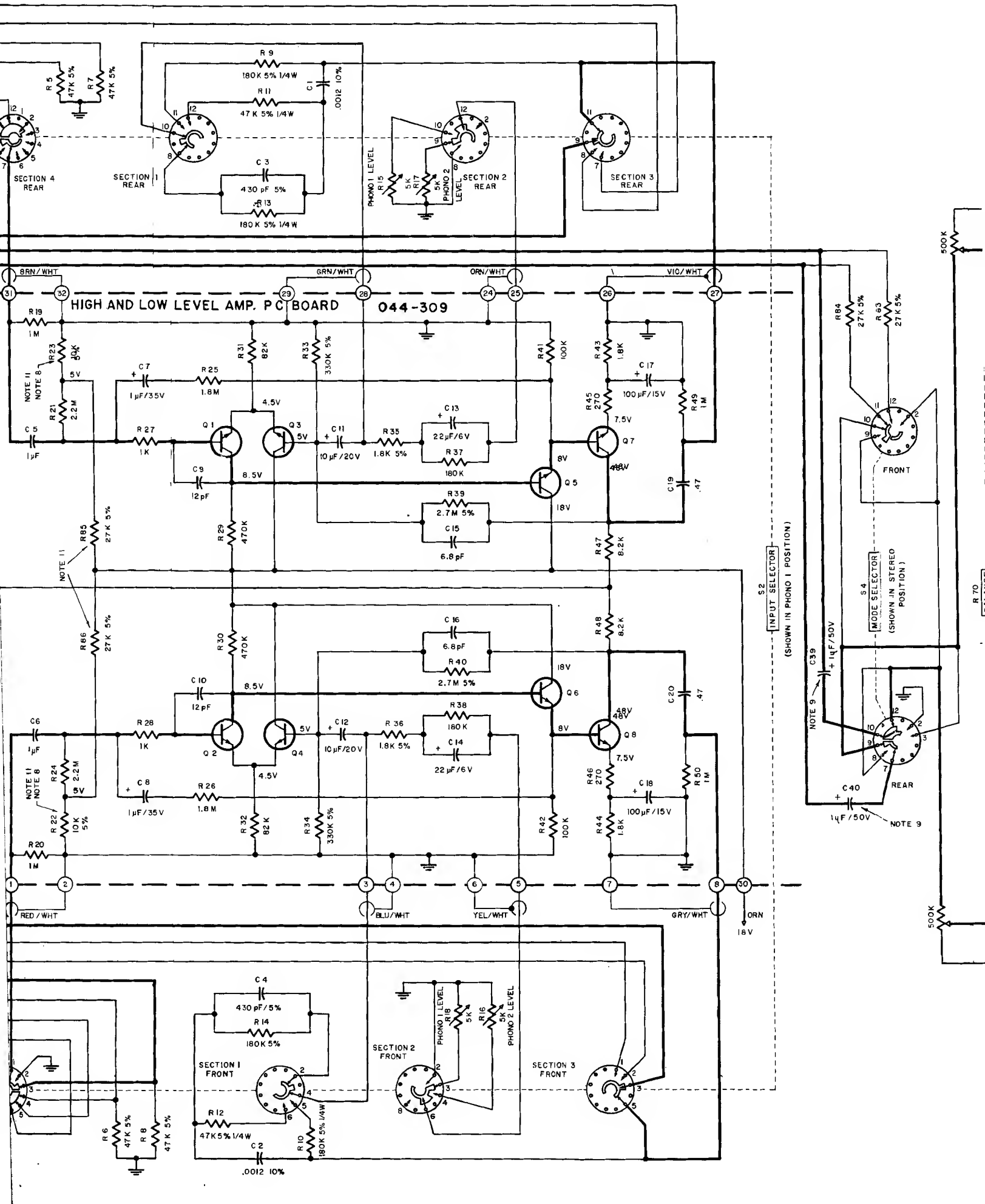
NOTE 8

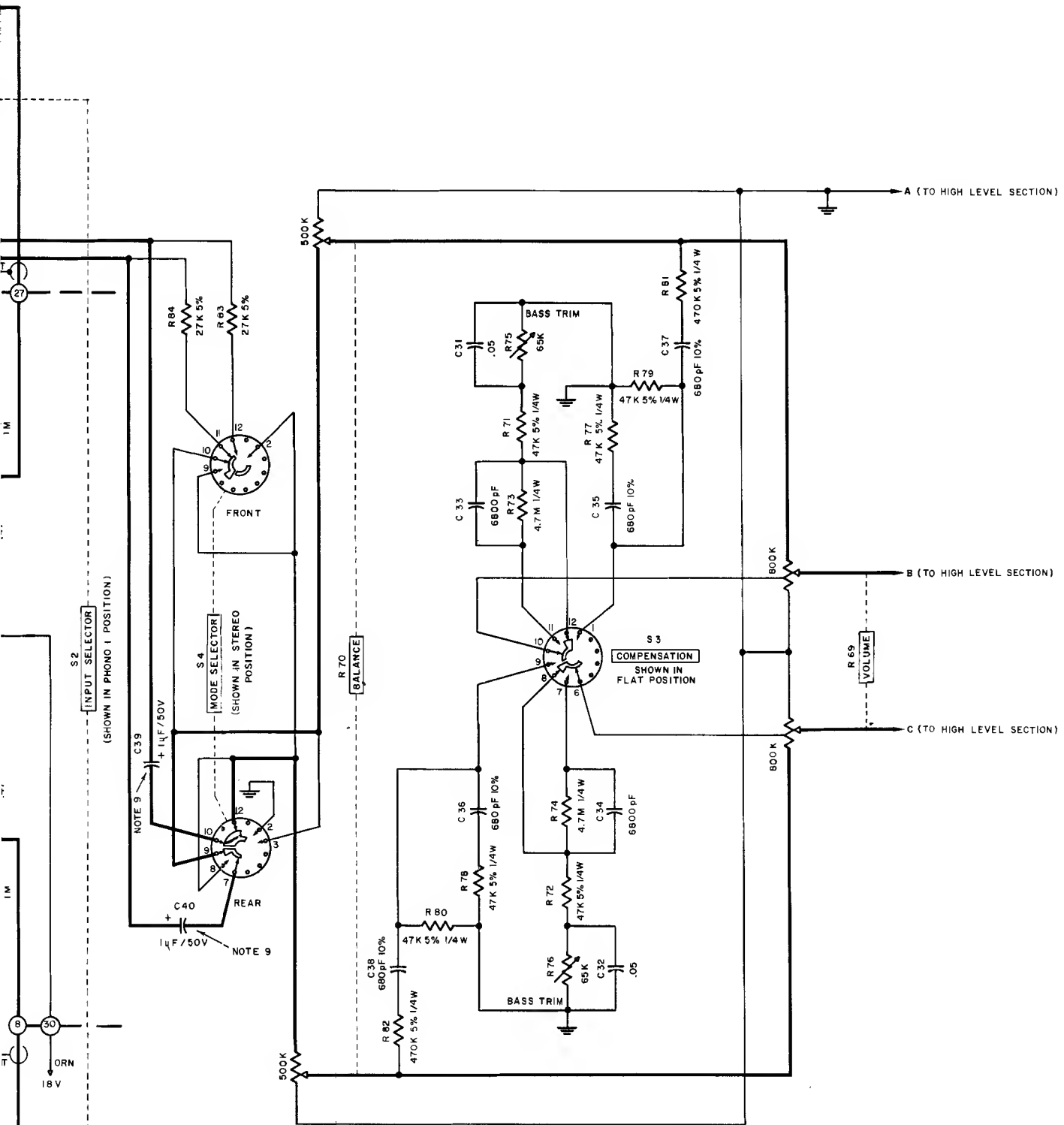
NOTE 11

NOTE 8

NOTE 11

NOTE 8





LOW LEVEL SECTION

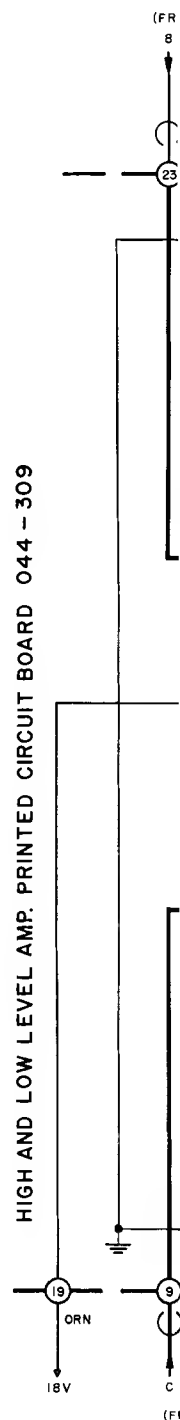
## SCHEMATIC NOTES

1. Unless otherwise specified: Resistance values are in ohms, 1/2 watt, and 10% tolerance; capacitance values smaller than 1 are in microfarads ( $\mu\text{F}$ ); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries ( $\mu\text{H}$ ).
2. Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers around the dotted lines correspond to the numbers on the PC Board layouts.
3. The heavy lines on the schematics denote the primary signal path.
4. The terminal numbering of rotary switches is for reference only.
5. All voltages indicated on the schematics are measured under the following conditions:
  - a. Use of an 11 megohm input impedance VTVM.
  - b. All voltages  $\pm 10\%$  with respect to chassis ground.
  - c. No signal at input terminals.
  - d. AC input at 117 volts, 50/60 Hz.
  - e. Front panel controls at:
 

Volume	Fully CCW, but with power switch on
Mode	Stereo
Input selector	Phono 1
Loudness	Flat

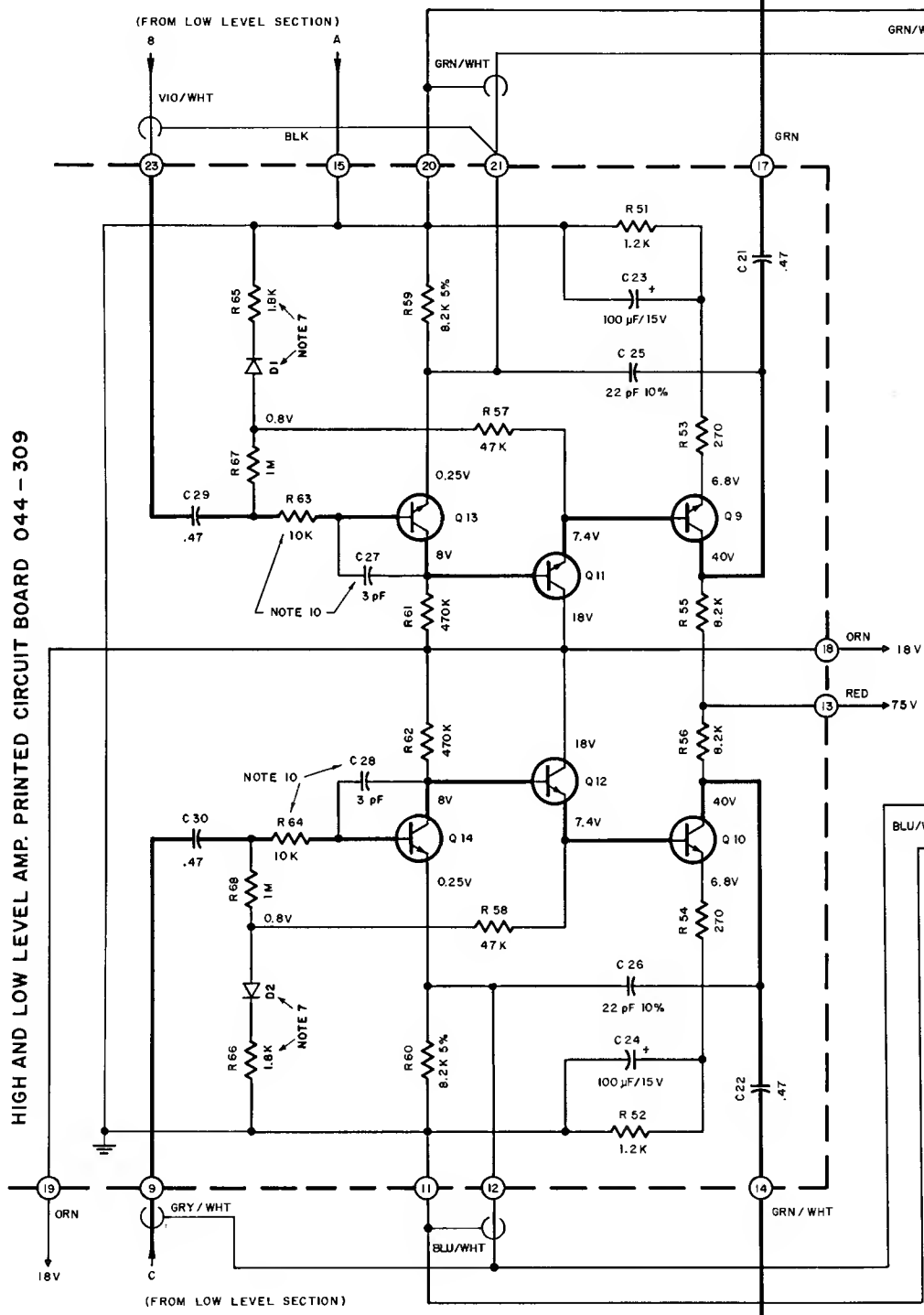
 All other controls at normal positions.
6. In units with Serial No.'s below 23X01, S302 is SPST switch (McIntosh Part No. 148-017); R303 is 10% tolerance and R304 is 8.2k.
7. In units with Serial No.'s below 17X01: R65 & R66 are 4.7k, and D1 & D2 are not used.
8. In units with Serial No.'s below 19X44: R22 & R23 are 12 $\Omega$ .
9. In units with Serial No.'s below 32X44: C39 & C40 are not used.
10. In units with Serial No.'s below 33X73: C27 & C28 are 12pF; R219 & R220 are 56k; and R63 & R64 are 3.3k.
11. In units with Serial No.'s below 36X82: R22, R23, R85, and R86 are 10% resistors.
12. In units with Serial No.'s below 50X33: R243 and R244 are 4.7k; R235 and R236 are used.
13. In units with Serial No.'s below 56X57: R243 and R244 are 4.7k.

HIGH AND LOW LEVEL AMP. PRINTED CIRCUIT BOARD 044 - 309

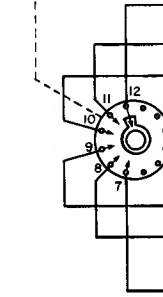
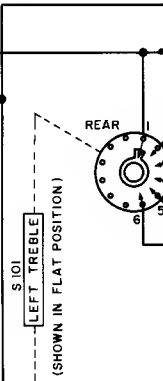


HIGH LEVEL S



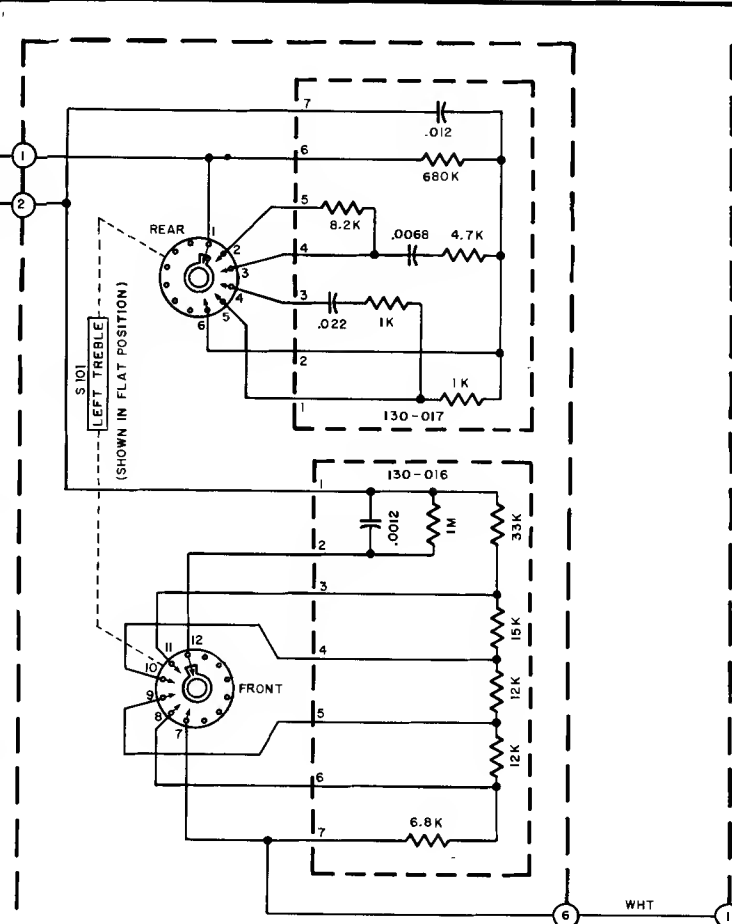


HIGH AND LOW LEVEL AMP. PRINTED CIRCUIT BOARD 044 - 309

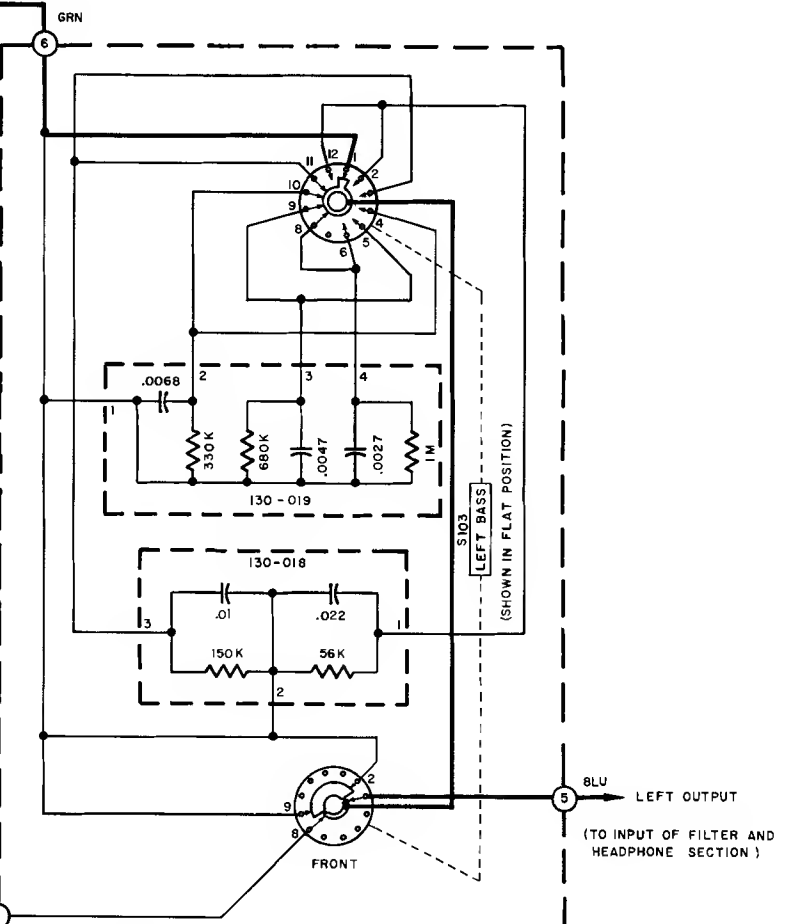


TREBLE P.C.

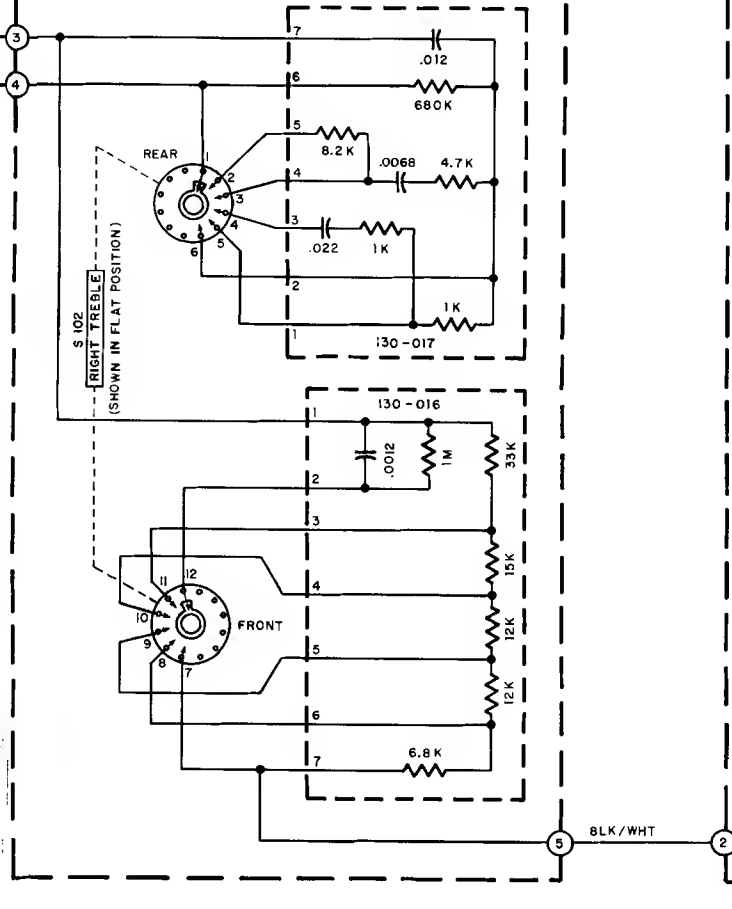
HIGH LEVEL SECTION



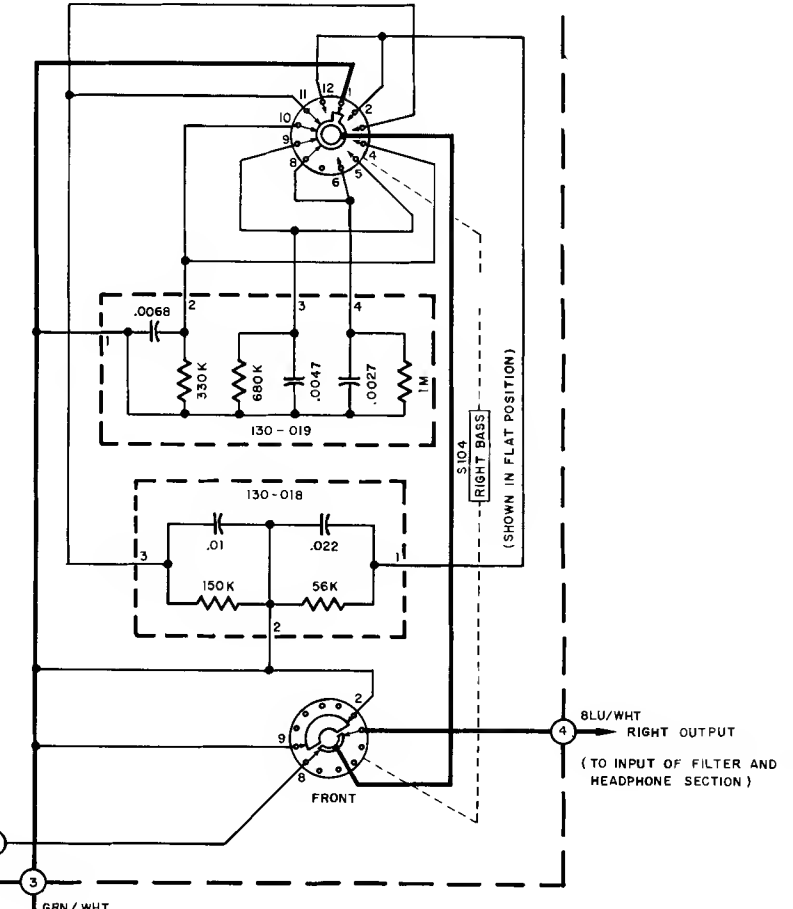
TREBLE P.C. BOARD 044 - 065



BASS P.C. BOARD 044 - 066

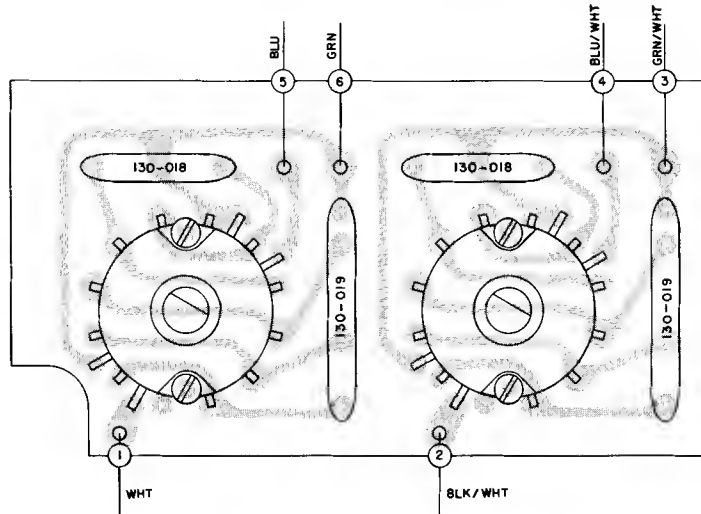


TREBLE P.C. BOARD 044 - 065

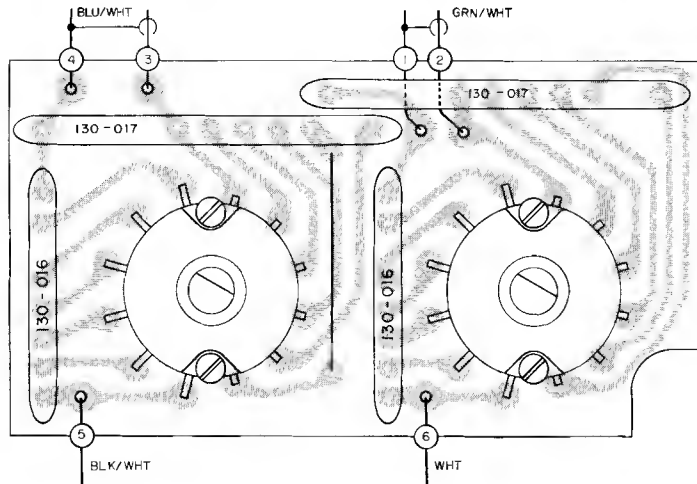


BASS P.C. BOARD 044 - 066

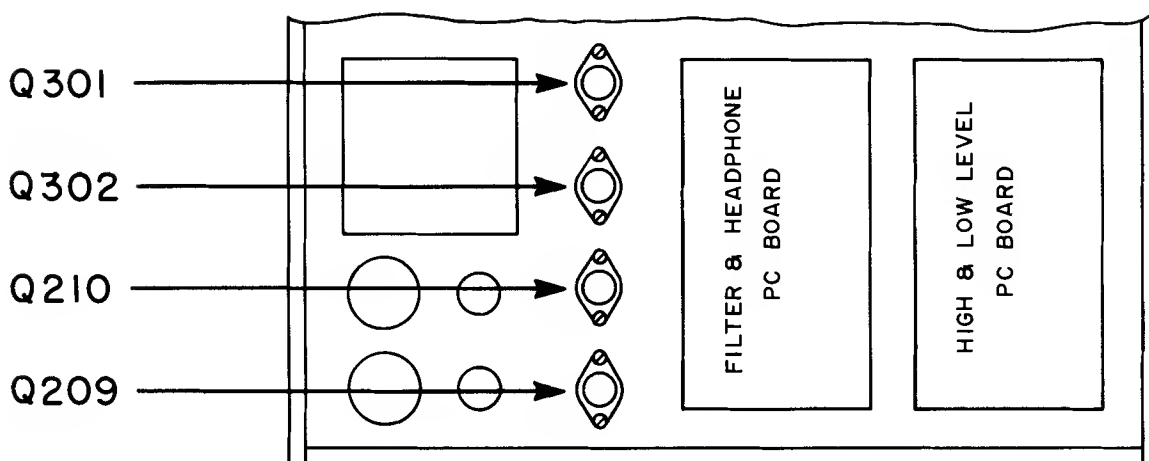
BASS PRINTED CIRCUIT BOARD 044-066



TREBLE PRINTED CIRCUIT BOARD 044-065



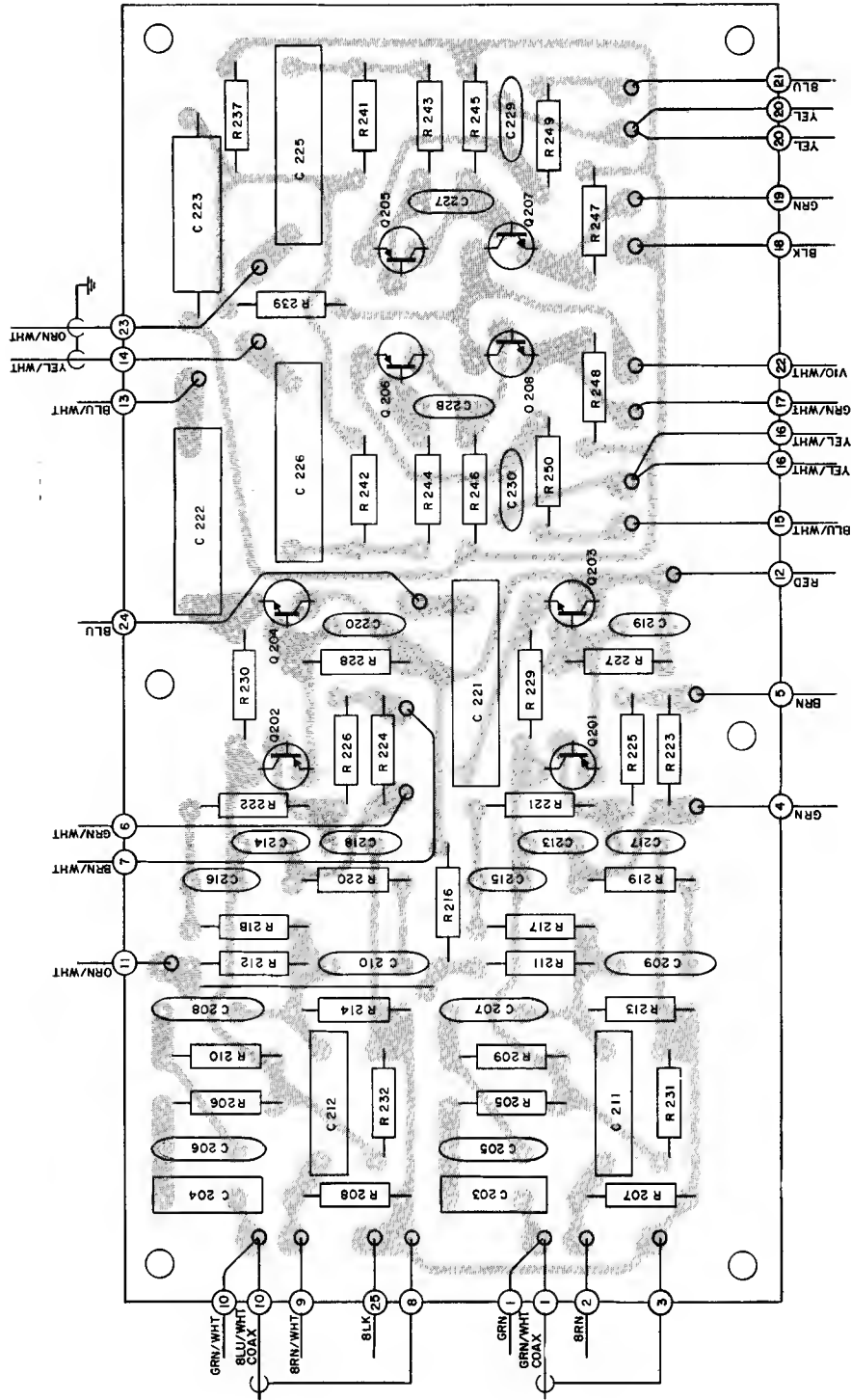
TOP VIEW

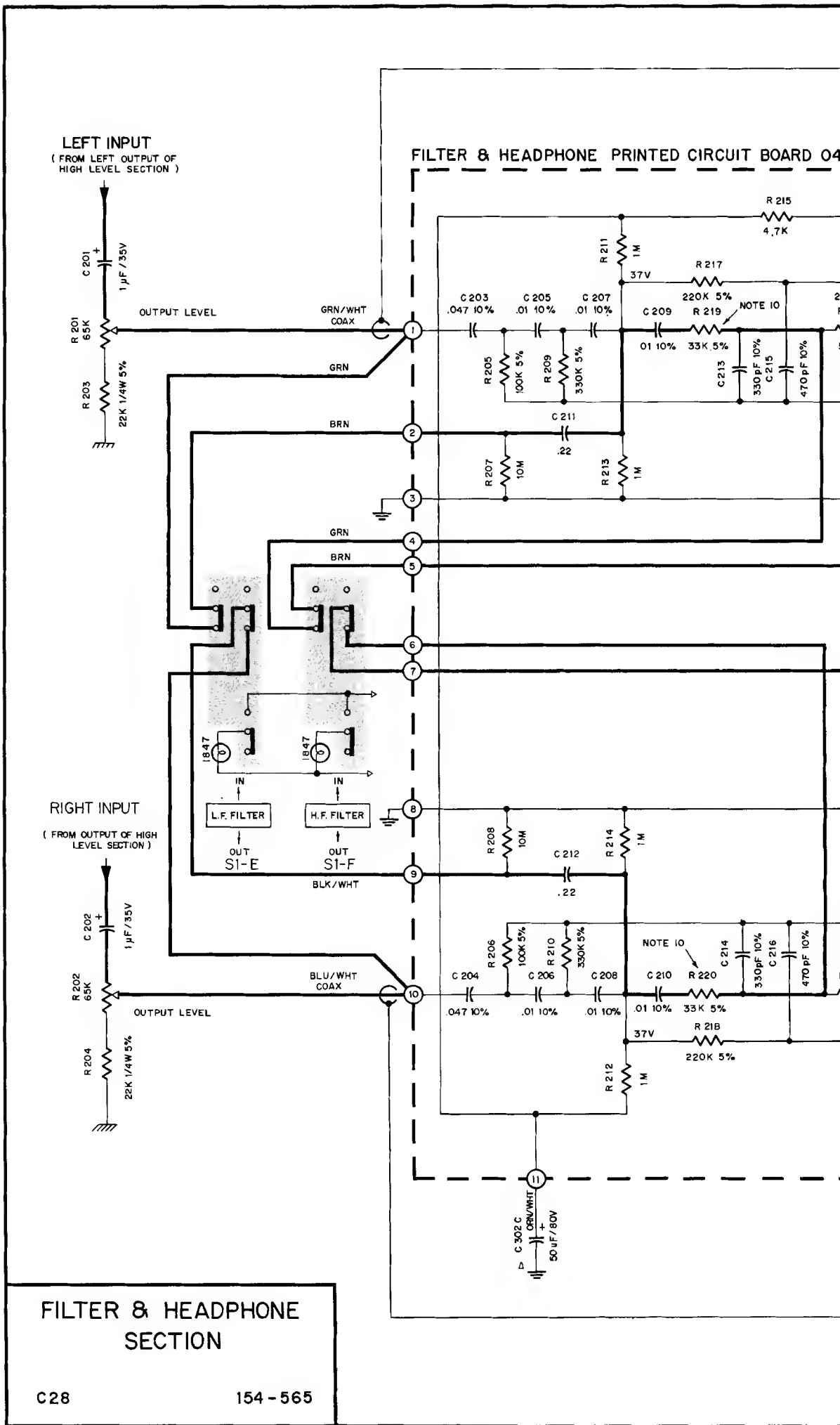


REAR OF UNIT

LOCATION OF TRANSISTORS NOT ON PRINTED CIRCUIT BOARDS

FILTER & HEADPHONE PRINTED CIRCUIT BOARD 044-064

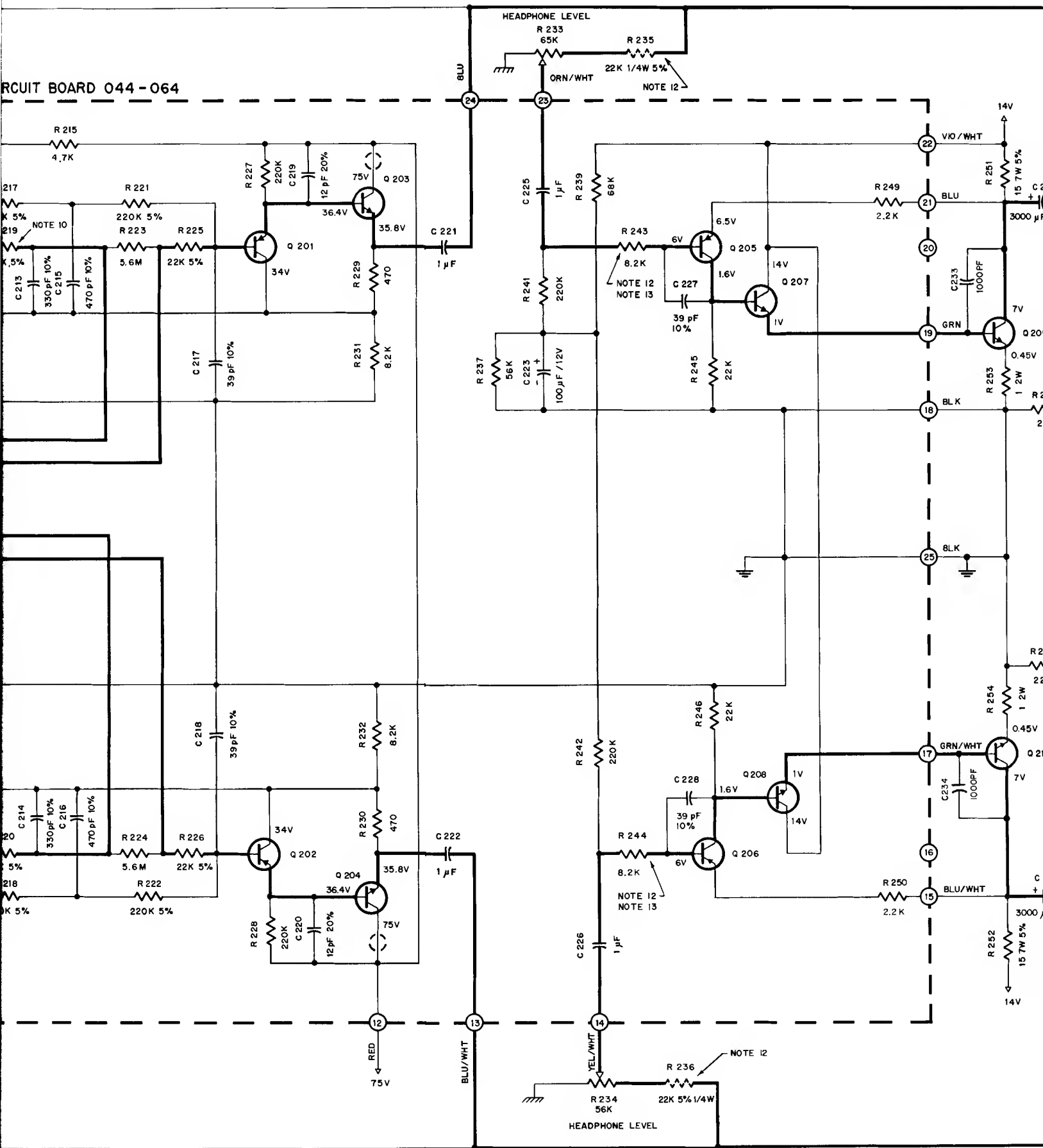


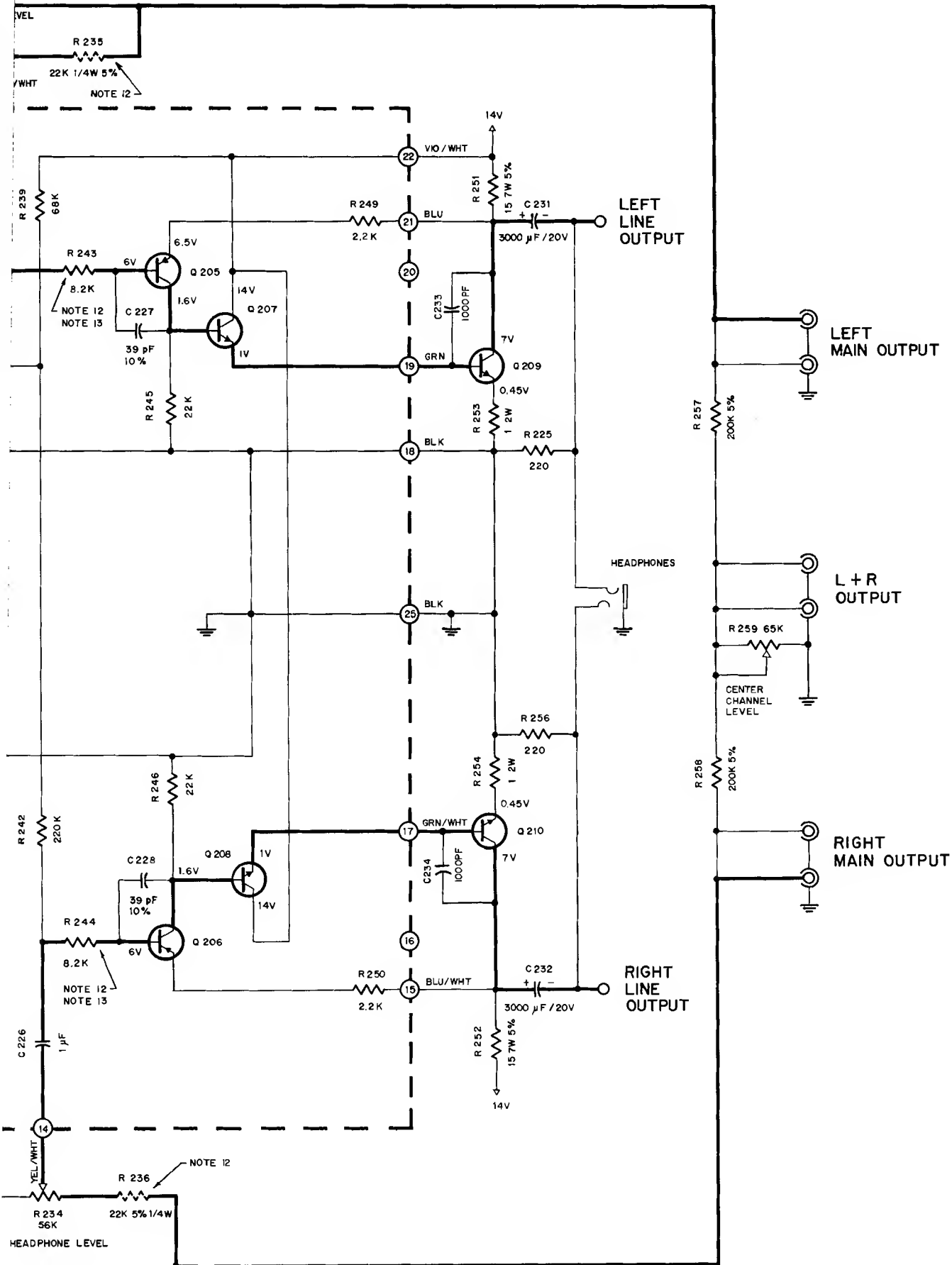


**FILTER & HEADPHONE SECTION**

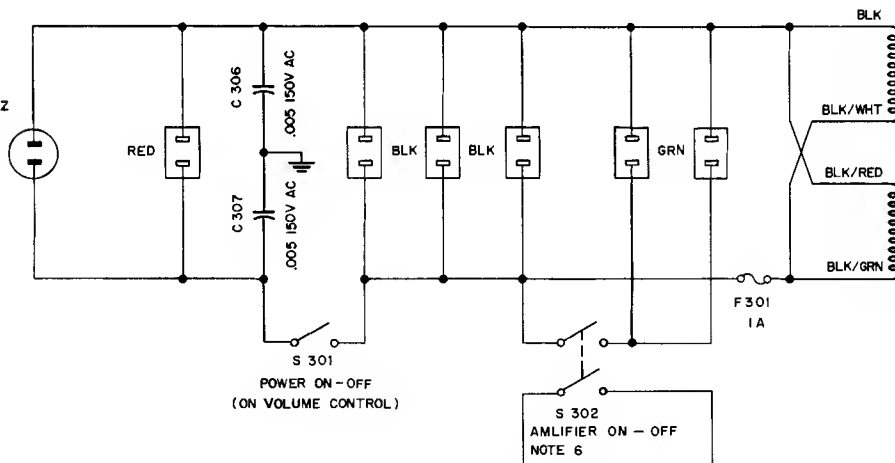
C 28                      154 - 565

CIRCUIT BOARD 044-064

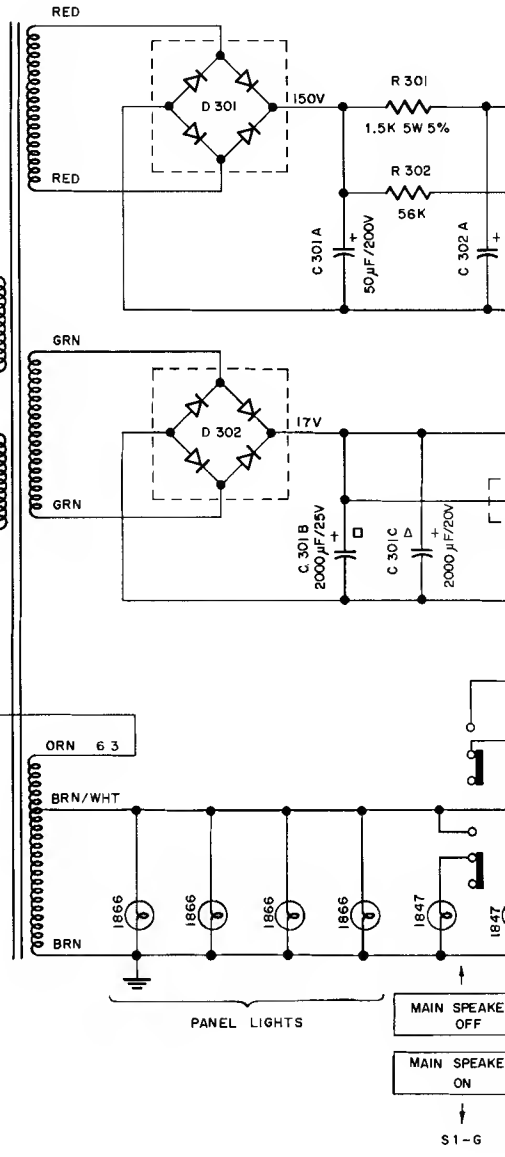




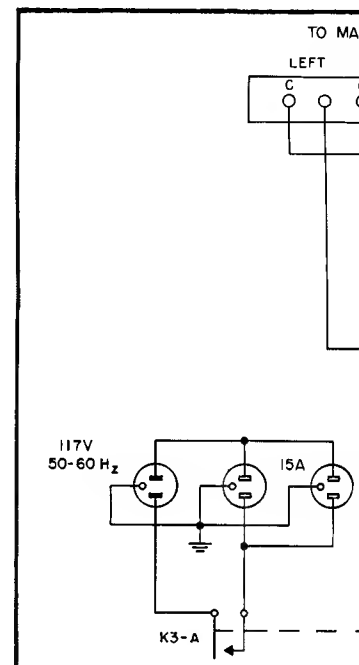
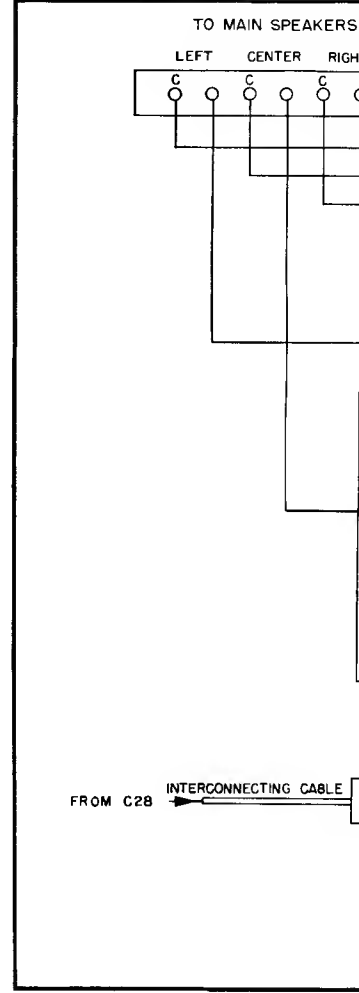
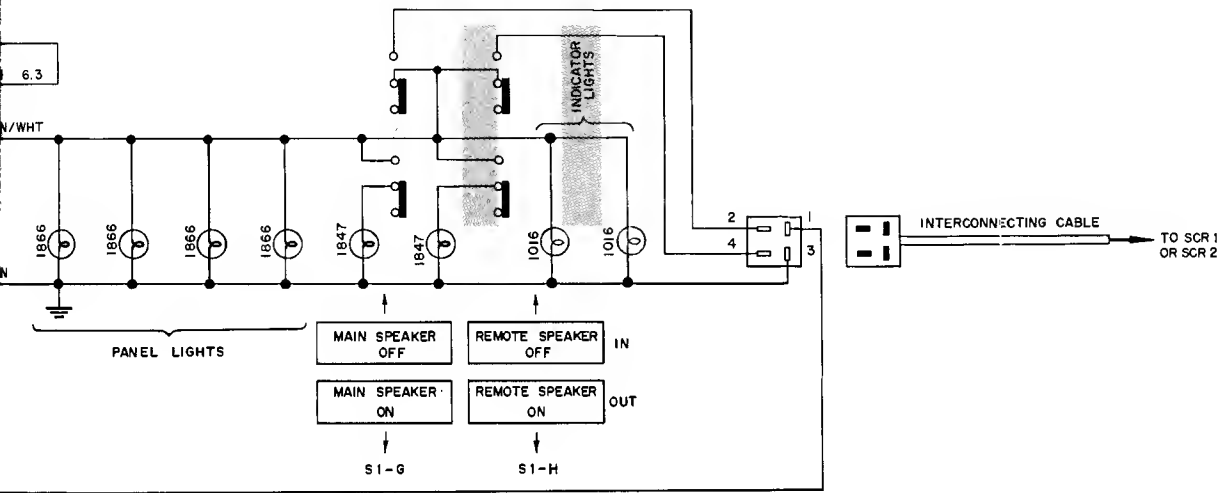
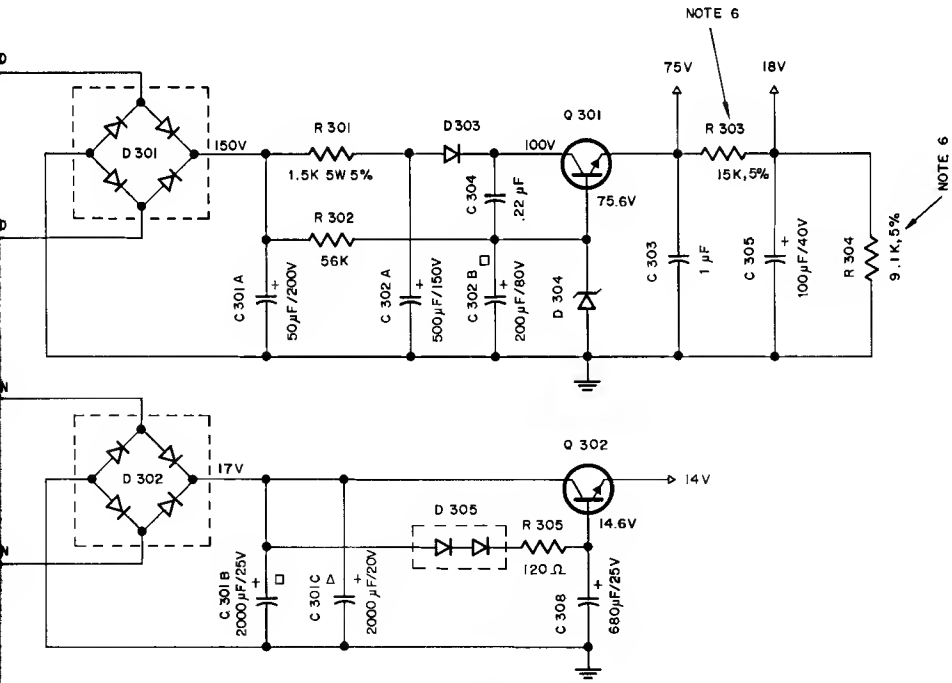
117V  
50-60 HZ



T 301

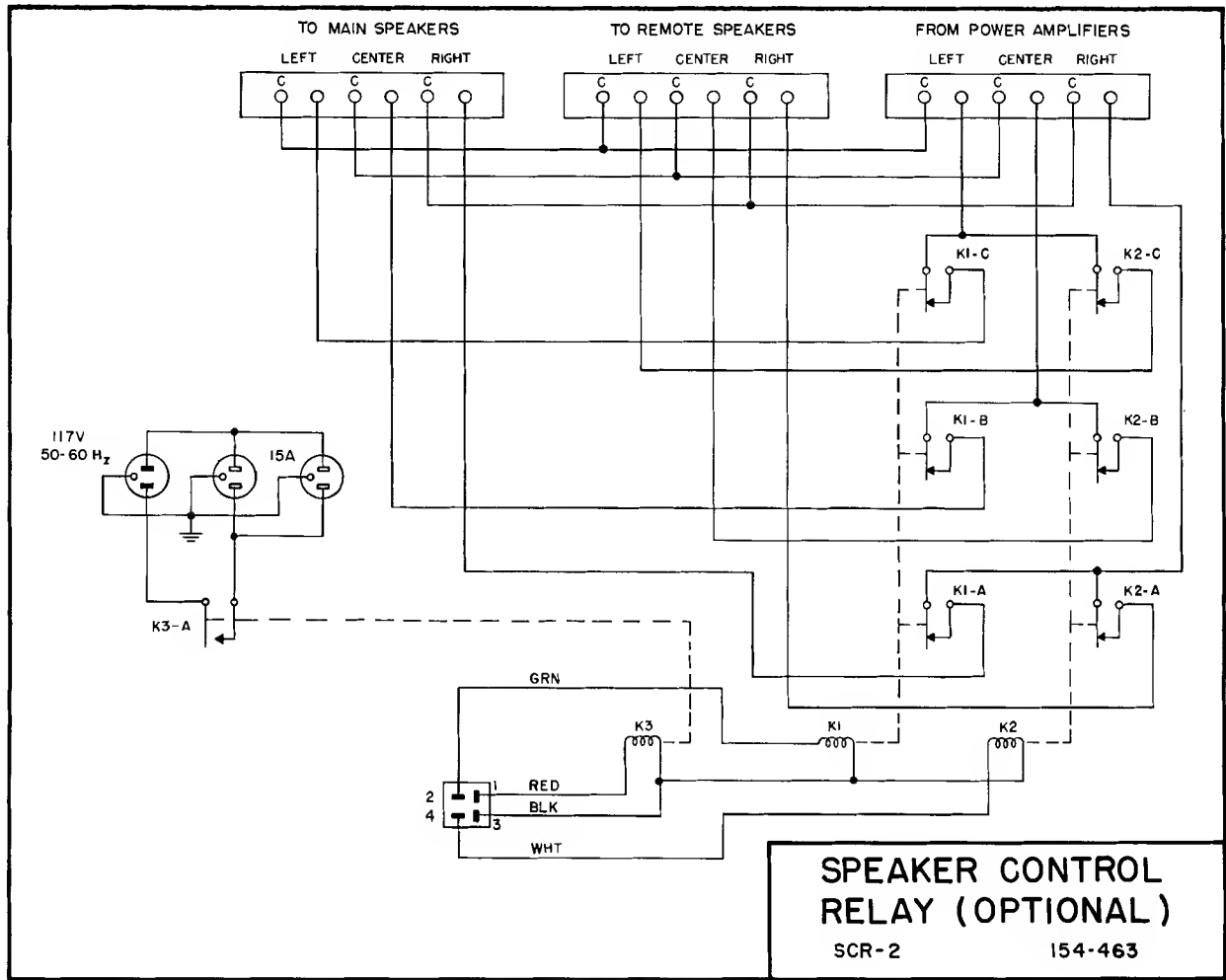
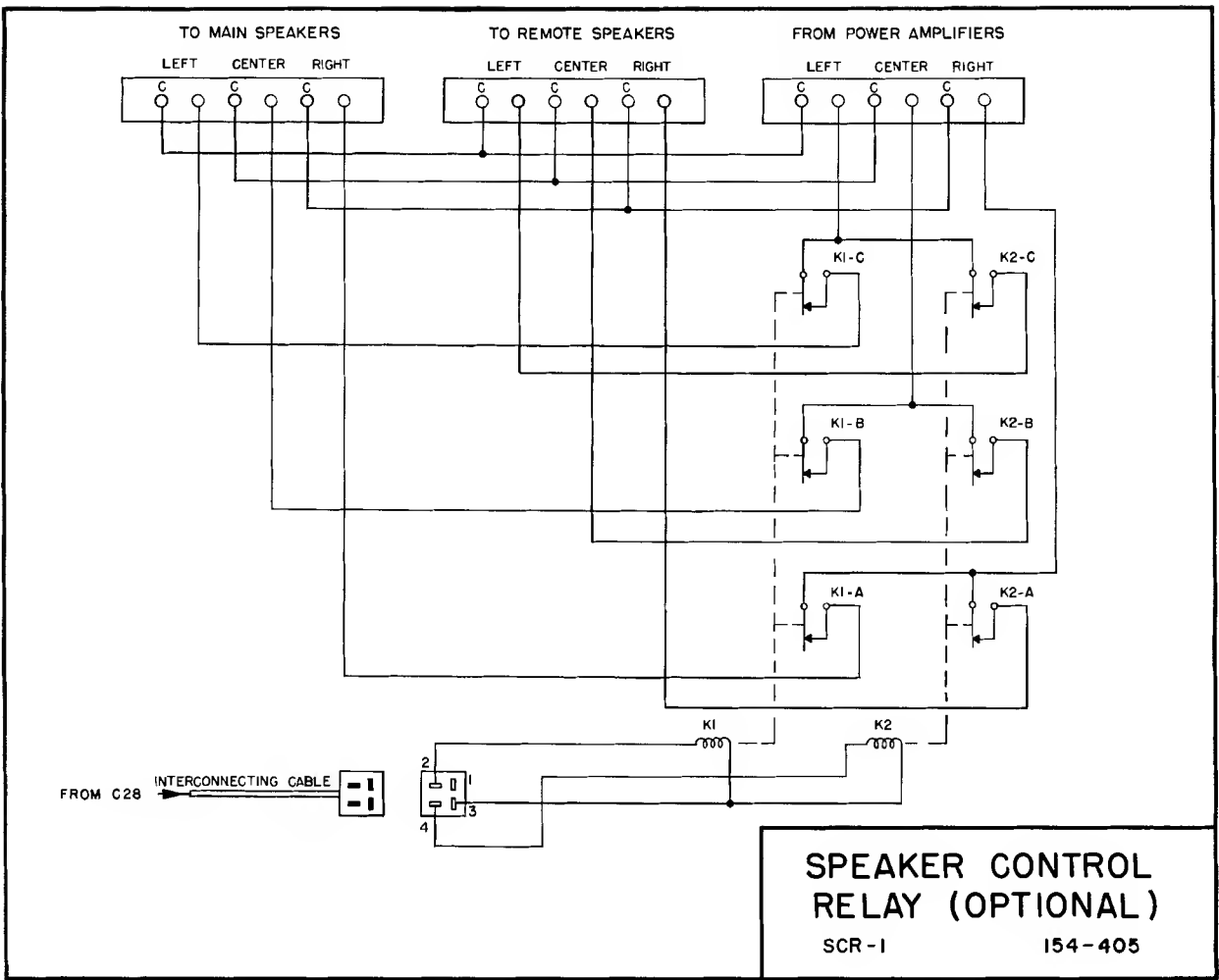






**POWER SUPPLY SECTION**

C28 154-540



CABLE TO SCR 1 OR SCR 2

APPLY ON

## REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.  
Customer Service Department  
2 Chambers Street  
Binghamton, New York 13903  
(telephone 607-723-3512)

## CAPACITORS

Symbol Number	Description	Part Number
C5,6	Mylar 1 $\mu$ F 250V	064-088
C7,8	Elect. 1 $\mu$ F 35V	066-147
C11,12	Elect. 10 $\mu$ F 20V	066-149
C13,14	Elect. 22 $\mu$ F 6V	066-151
C17,18	Elect. 100 $\mu$ F 16V	066-177
C19,20	Mylar .47 $\mu$ F 250V	064-069
C21,22	Mylar .47 $\mu$ F 250V	064-069
C23,24	Elect. 100 $\mu$ F 16V	066-177
C29,30	Mylar .47 $\mu$ F 250V	064-069
C201,202	Elect. 1 $\mu$ F 35V	066-147
C203,204	Mylar .047 $\mu$ F 250V	064-085
C205,206	Mylar .01 $\mu$ F 250V	064-040
C207,208	Mylar .01 $\mu$ F 250V	064-040
C209,210	Mylar .01 $\mu$ F 250V	064-040
C211,212	Mylar .22 $\mu$ F 250V	064-068
C221,222	Mylar 1 $\mu$ F 250V	064-088
C223	Elect. 100 $\mu$ F 15V	066-127
C225,226	Mylar 1 $\mu$ F 250V	064-088
C231,232	Elect. 3000 $\mu$ F 20V	066-130
C301	Elect. 50/2000/2000 $\mu$ F 200/25/20V	066-132
C302	Elect. 500/200/50 $\mu$ F 150/80/80V	066-131
C303	Mylar 1 $\mu$ F 250V	064-104
C304	Mylar .22 $\mu$ F 250V	064-043
C305	Elect. 100 $\mu$ F 40V	066-176
C308	Elect. 640 $\mu$ F 25V	066-135

## DIODES

D1,2	Si. Signal Diode	070-047
D301	Full Wave Bridge 400V	070-044
D302	Full Wave Bridge 50V	070-045
D303	Si. Rectifier	070-031
D304	Zener Diode 75V	070-025
D305	Bias Diode	070-046

F301	Fuse, 1 ampere	089-002
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## TRANSISTORS

Q1,2	Si. NPN transistor	132-105
Q3,4	Si. NPN transistor	132-093
Q5,6	Si. NPN transistor	132-093
Q7,8	Si. NPN transistor	132-095
Q9,10	Si. NPN transistor	132-095
Q11,12	NPN transistor	132-092
Q13,14	Si. NPN transistor	132-105
Q201,202	Si. PNP transistor	132-096
Q203,204	Si. NPN transistor	132-095
Q205,206	Si. PNP transistor	132-096
Q207,208	Si. NPN transistor	132-092
Q209,210	Si. NPN transistor	132-065
Q301	Si. NPN transistor	132-028
Q302	Si. NPN transistor	132-065

## POTENTIOMETERS

R15,16	Phono level control	134-219
R17,18	Phono level control	134-219
R69	Volume control	134-210
R70	Balance control	134-209
R75,76	Bass trim control	134-186
R201,202	Output level control	134-186
R233,234	Headphone level control	134-186
R259	Center channel level	134-186

## RESISTORS

R251,252	Wirewound 15 $\Omega$ 5% 7W	139-073
R253,254	Wirewound 1 $\Omega$ 10% 2W	139-075
R301	Wirewound 1.5k 5% 5W	139-074

## SWITCHES

S1	Pushbutton switch	150-005
S2	Input selector switch	146-131
S4	Mode selector switch	146-134
S101,102	Treble control switch	146-133
S103,104	Bass control switch	146-132
S302	Power amp. switch	148-028

## TRANSFORMERS

T301	Power transformer	044-062
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## MODULES

	Tone control (treble)	130-016
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# McIntosh SERVICE BULLETIN

## ELIMINATION OF TURN-ON AND TURN-OFF NOISE

MODEL: C 28 Preamplifier

PURPOSE OF MODIFICATION: To eliminate the "shhhh" type of noise when initially turned-on, or a second or two after being turned off.

WHAT UNITS ARE AFFECTED: Serial No. 10X01 to 17X01 only.

WHEN MODIFICATION SHOULD BE MADE: When the customer specifically complains of the noise.

McINTOSH MODIFICATION KIT NUMBER: No kit available.

### PARTS REQUIRED:

QUANTITY	PART NUMBER	DESCRIPTION
2	070-022	Diode
2	136-121	1.8k 1/2W 10% resistor

PROCEDURE: (Refer to diagram on reverse side)

- Step 1: Remove top cover.
- Step 2: Remove R65 and R66 (4.7k resistors).
- Step 3: Install the new diode and resistor as shown.

(over)



ASSURE GROUND CONNECTION TO LOW LEVEL INPUTS

MODEL: C 28 Preamplifier

PURPOSE OF MODIFICATION: To assure that the high and low level amp. PC board 044-309 will always have a positive ground return.

WHAT UNITS ARE AFFECTED: All units with Serial No's. below AS 1660

WHEN MODIFICATION SHOULD BE MADE: When intermittent or complete loss of a channel is experienced in any of the low-input-level modes- or when units are being serviced for any other reason.

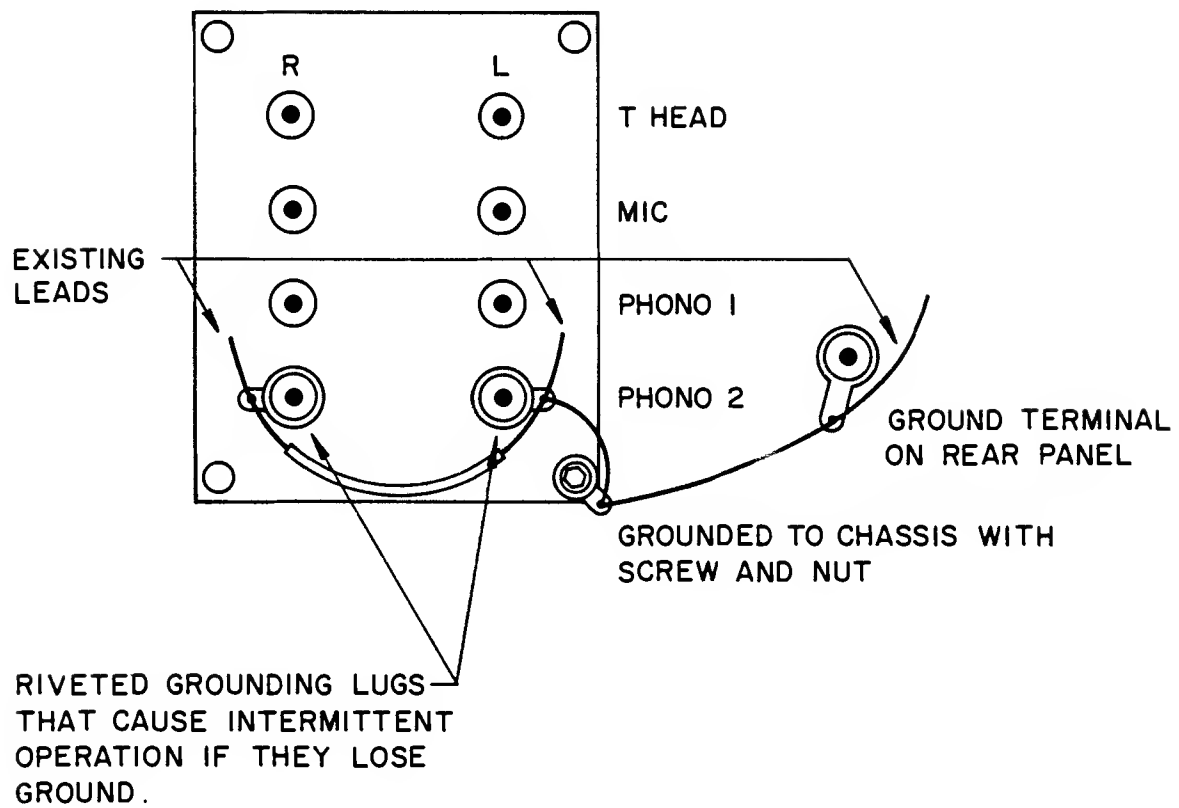
## PARTS REQUIRED:

QUANTITY	PART NUMBER	DESCRIPTION
2-1/2"	-	#22 Bare hookup wire
1	-	Solder lug, lockwasher type
1"	-	Sleeving

- PROCEDURE:
1. Remove top and bottom covers.
  2. Unscrew screw and nut and place solder lug between plate and rear panel. Tighten screw.
  3. Solder bare wire between ground terminal lug on rear panel to newly mounted lug, then another piece of bare wire to riveted solder lug at Phono 2 left.
  4. Then solder sleeved bare wire between phono 2 left solder lug and phono 2 Right solder lug.
  5. Replace top and bottom covers.

(over)

BACKSIDE OF LOW LEVEL INPUT PLATE



# SERVICE BULLETIN

## ELIMINATION OF RADIO FREQUENCY INTERFERENCE

Model: C 28

Purpose of Modification: To eliminate radio interference caused by Citizens Band Transceivers and other transmitters.

When Modification Should Be Made: When customer complains of this type of interference.

Parts Required:

<u>Quantity</u>	<u>Part No.</u>	<u>Description</u>
12	136296	Resistor: 1K $\Omega$ , 1/4W, 10%
6	061128	Capacitor, disc: 470pF
2	061023	Capacitor, disc: 100pF

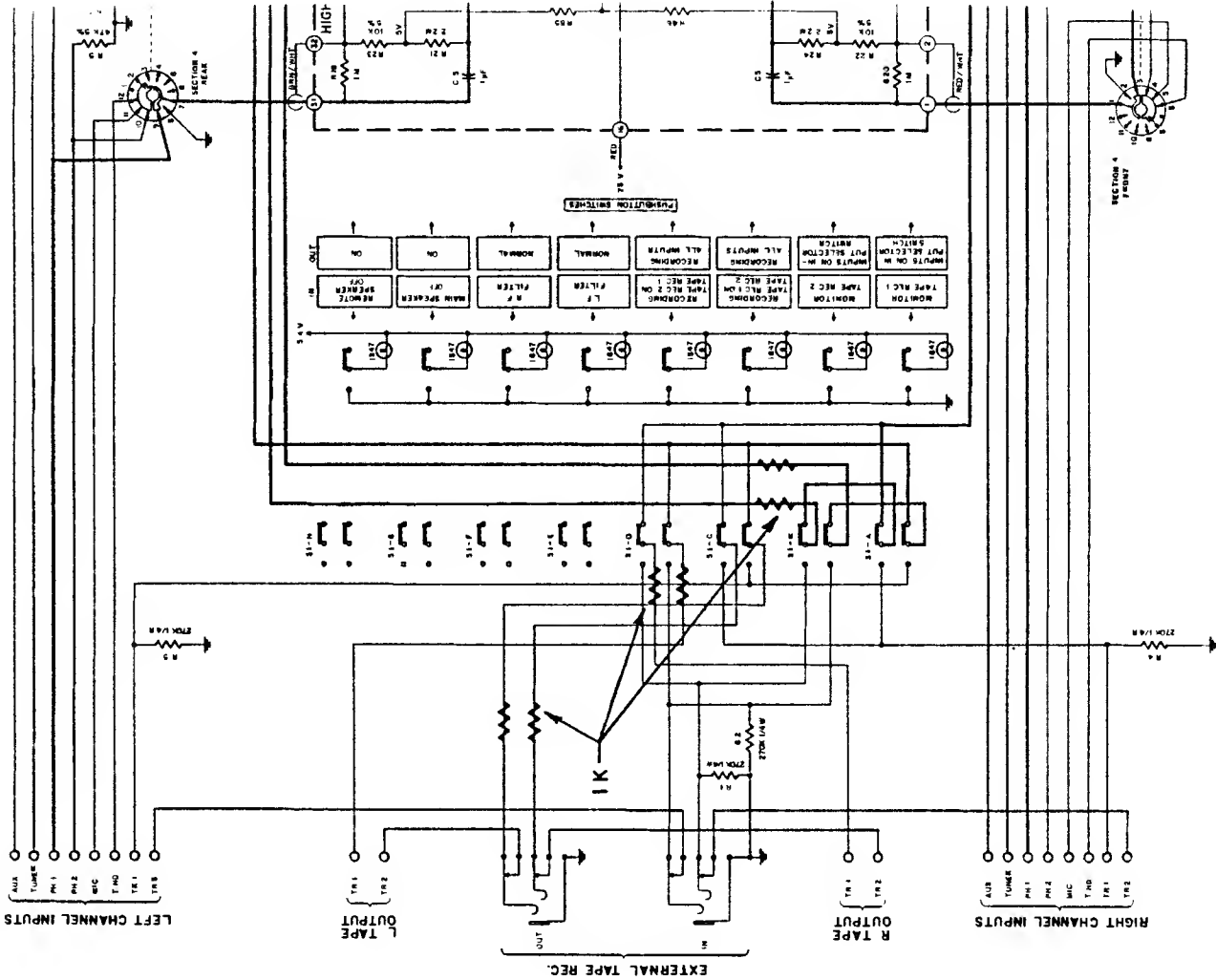
Procedure:

1. Remove top and bottom covers.
2. Remove the screws holding the level set panel in place.
3. Referring to diagram 1 and with the C 28 upside down, locate the four coaxial cables that connect to push button switches, S1-B and S1-D. Insert the 1K $\Omega$  resistors in series with each coaxial cable right at the switch terminal.
4. Referring to diagram 1 and with the C 28 upside down, replace each of the two wires (Blue and Blue/white) that connect the front panel "Tape-Output" jack with push button switch S1-B, with 1K $\Omega$  resistor. Provide sleeving on both resistor leads.
5. Referring to diagram 2 and with the C 28 right side up, locate Section 3 - wafer (front and rear) of the input selector switch. Locate the coaxial cables connected to lugs 9-rear and 3-front. Insert a 1K $\Omega$  resistor in series with each cable right at the switch lugs.
6. Referring to diagram 3 and with the C 28 right side up, locate the volume control underneath the level set panel. Locate the coaxial cables connected to the center lugs of the volume control. Insert a 1K $\Omega$  resistor in series with each cable right at the control lugs. Use sleeving to prevent shorting to panel.
7. Referring to diagram 4 and 5 and with the C 28 upside down locate the 044309 high and low level PC board. Connect a 100pF and a 470pF capacitor for each channel as indicated on the PC board diagram 4 and schematic diagram 5. Capacitor leads should not exceed 1/4 inch.

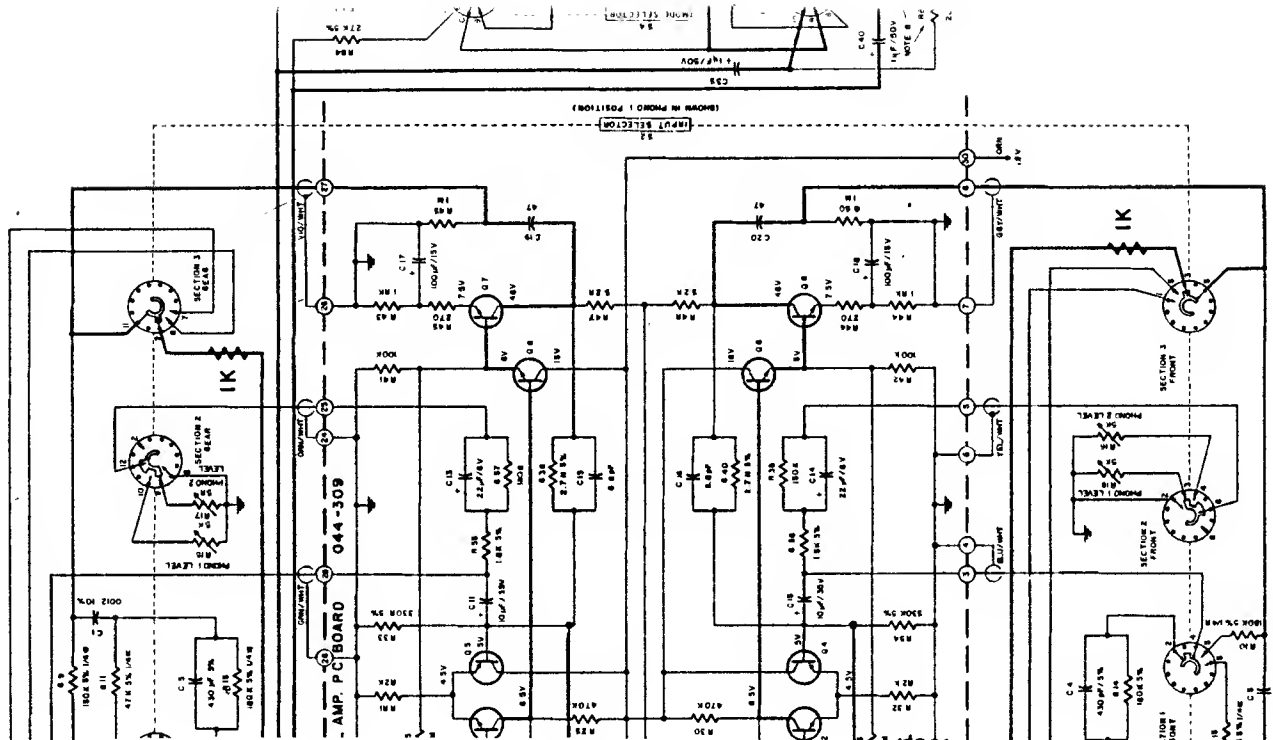
(OVER)



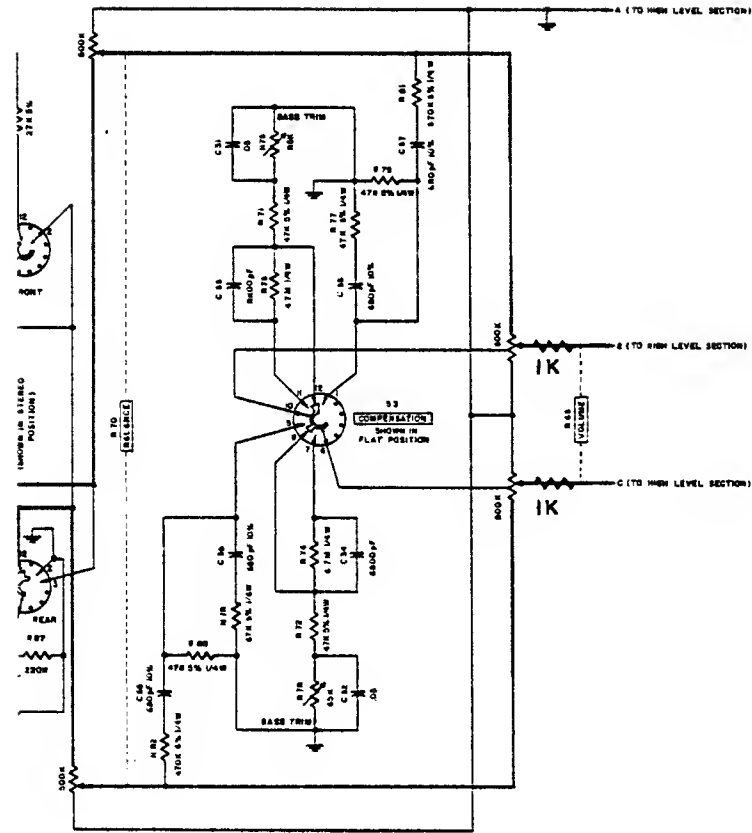
8. Referring to diagram 6 and with the C 28 upside down, locate the filter and headphone PC board- 044509. Insert a  $1K\Omega$  resistor in series with the blue wire connected to pin 24 and the blue/white wire connected to pin 13. Both resistors to be inserted right at the pins.
9. Referring to diagram 6 and with the C 28 upside down, locate the filter and headphone PC board- 044509. Connect 2 each 470pF for each channel as indicated on the diagrams. Capacitor leads should not exceed  $1/4$  inch.
10. Referring to diagram 7 and with the C 28 right side up, locate the blue/white and green/white coaxial cables that connects to the right and left output level controls on the level set panel. Disconnect the blue shield - wire of the blue/white coaxial cable from the terminal strip and reconnect it to an adjacent lug of the same terminal strip. This lug is already occupied by a yellow wire. Disconnect the green shield - wire of the green/white coaxial cable from the terminal strip and reconnect it to an adjacent lug of the same terminal strip, already occupied by a yellow wire. The net effect of this would be as shown on diagram 7.
11. Replace level set panel and top and bottom covers. Test for proper function of all inputs and outputs. Check specifications.



DIAG. 1

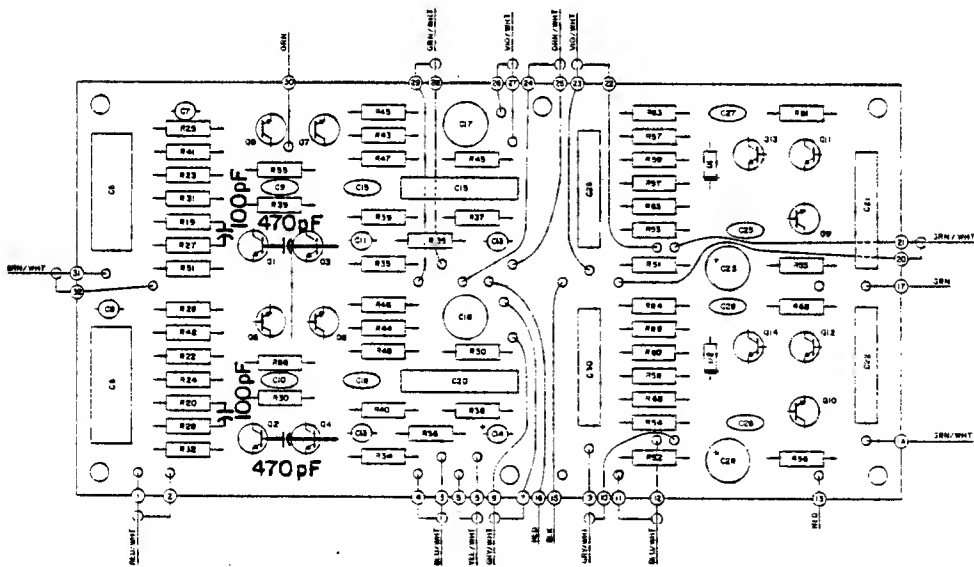


DIAG. 2

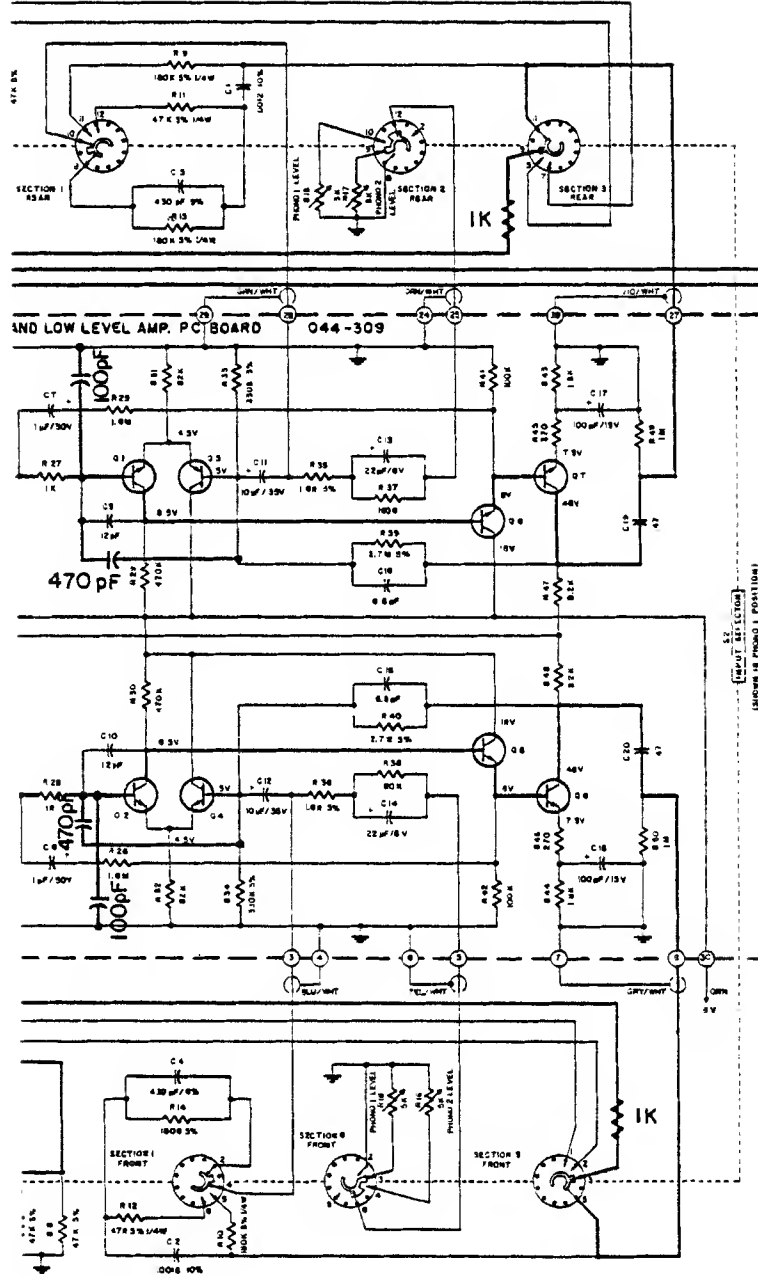


DIAG. 3

HIGH & LOW LEVEL PC BOARD 044-309

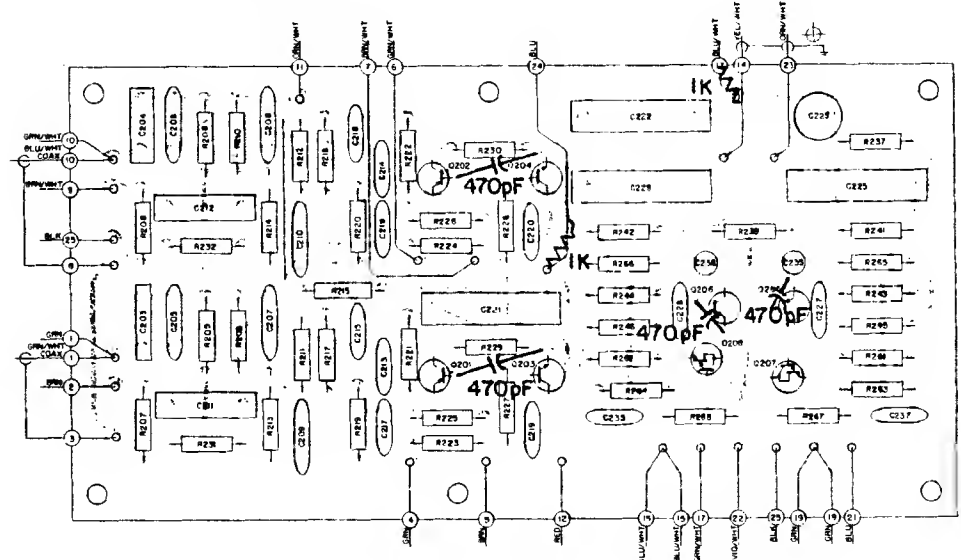


DIAG. 4

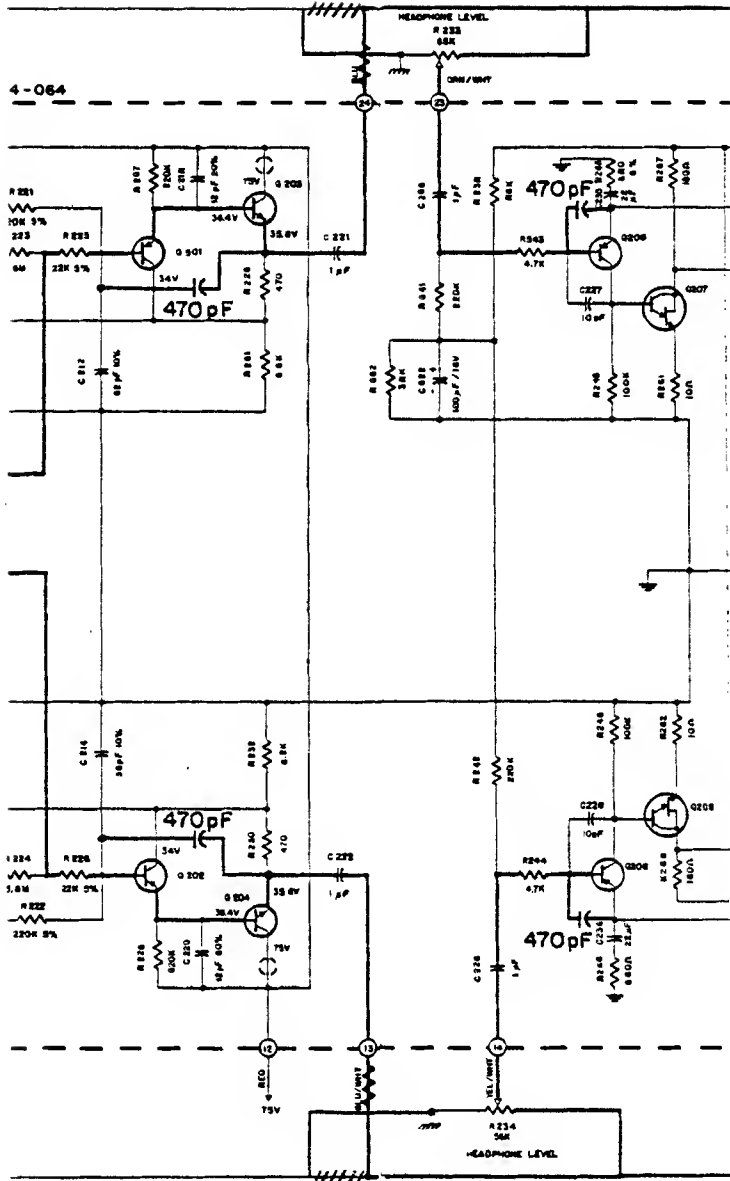


DIAG. 5

FILTER & HEADPHONE PRINTED CIRCUIT BOARD 044-509



DIAG. 6



DIAG. 7

Tone control (treble)	130-017
Tone control (bass)	130-018
Tone control (bass)	130-019

## LAMPS

#1866 (Front Panel)	058-014
#1847 (Pushbutton Lamps)	058-008
Indicator Lamp	058-041

## FRONT PANEL &amp; TRIM

Front panel	044-067
Front panel end caps	018-120
Volume control knob	044-372
Mode selector knob	044-372
Input selector knob	044-372
Left bass knob	044-371
Right bass knob	044-371
Left treble knob	044-371
Right treble knob	044-371
Balance knob	090-100
Comp. knob	044-375
Pushbutton	017-128
Bass trim knob	090-010
Phono level knob	090-010
Headphone level knob	090-010
Output level knob	090-010
Center channel knob	090-010

## MOUNTING SYSTEM

Shelf Bracket (right)	043-622
Shelf Bracket (left)	043-623
Mounting Template #100	038-179
Hardware Package	043-792

## MISCELLANEOUS ITEMS

Line Cord	170-021
Fuseholder	178-001
Shipping carton	044-082
Plastic feet	017-041
Shorting plug	127-001
Audio cable (6')	170-015
Owners manual	038-628

REPLACEMENT PARTS  
FOR SCR 1

K1,2	Relay 3PST	087-011
	Terminal Block	074-003
	Interconnecting Cable	170-062

REPLACEMENT PARTS  
FOR SCR 2

K1,2	Relay 3PST	087-011
K3	Relay SPST	087-009
	Terminal Block	074-003
	AC Power Cord	170-068
	Interconnecting Cable	170-067