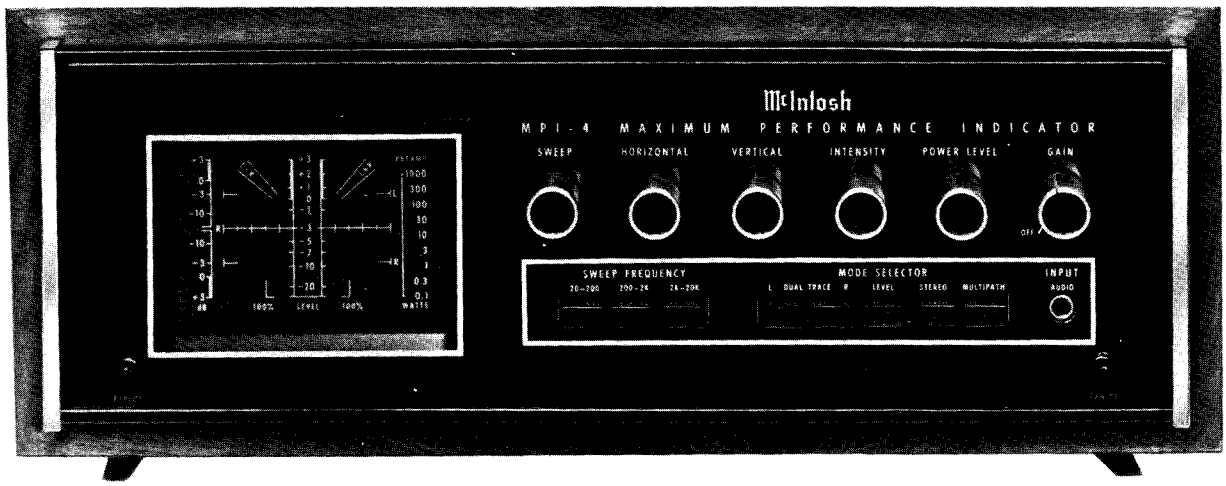
McIntosh

MPI-4

MAXIMUM PERFORMANCE INDICATOR



SERVICE INFORMATION

STARTING WITH SERIAL NO. AF1001

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MPI—4

PERFORMANCE LIMITS

MULTIPATH MODE OF OPERATION

Sensitivity: 100mV/cm

Frequency Response: DC to 50,000Hz (-3dB)

Input Impedance: 250kΩ

Signal Strength Polarity: Selectable positive or negative

STEREO MODE OF OPERATION

Sensitivity - L (Vertical Amp.): 1.75mV rms/cm (5mV P-P/cm)

- R (Horizontal Amp.): 1.75mV rms/cm (5mV P-P/cm)

Frequency Response: 5Hz to 50,000Hz (-3dB)

Input Impedance: 250kΩ

POWER LEVEL MODE OF OPERATION

Sensitivity: 0.1 to 1000 average watts for full scale indication (+3dB) in 9 calibrated steps.

Frequency Response: 5Hz to 100,000Hz (-3dB)

Input Impedance: 75kΩ

Calibration: For bridging 4, 8 or 16 ohm speaker loads

PREAMP LEVEL MODE OF OPERATION

Sensitivity: 15mV rms for +3dB indication

Frequency Response: 5Hz to 50kHz

Input Impedance: 250kΩ

SWEEP MODE OF OPERATION

Display modes: Left, right, or both (dual trace)

Sensitivity: 1.6mV rms/cm (4.5mV P-P/cm)

Frequency Response: 5Hz to 50kHz (-3dB)

Input Impedance: 250kΩ

Sweep Frequency: 20Hz to 20kHz in 3 Decade ranges

Sweep Expansion: .25X to 5X

Sweep Trigger: The sweep is triggered only in the presence of an input signal.

In the single trace mode it is triggered by the displayed waveform.

In the dual trace mode the trigger is selectable: Left channel, right channel, or line frequency.

LEVEL INDICATION MODE

Normal: 250μs rise time
500ms decay time

Peak: 250μs rise time
100 sec decay time

Manual reset

LOW PASS FILTER

16kHz L. P. Filter for stereo and sweep modes

19kHz and 38kHz rejected by at least 30dB

RETICLE LIGHTING

Selectable: On-Off

CRT

3 inch round tube, calibrated 5 x 6cm

1kV accelerating potential

AUTOMATIC INTENSITY CONTROL: In the absence of a horizontal signal, the intensity is reduced to prevent phosphor damage.

SEMICONDUCTOR COMPLEMENT:

2 integrated circuits

23 Transistors

10 Light emitting diodes

29 Diodes

POWER SUPPLIES

All are regulated to give equivalent performance for line voltages of 100 to 135 volts.

POWER REQUIREMENTS

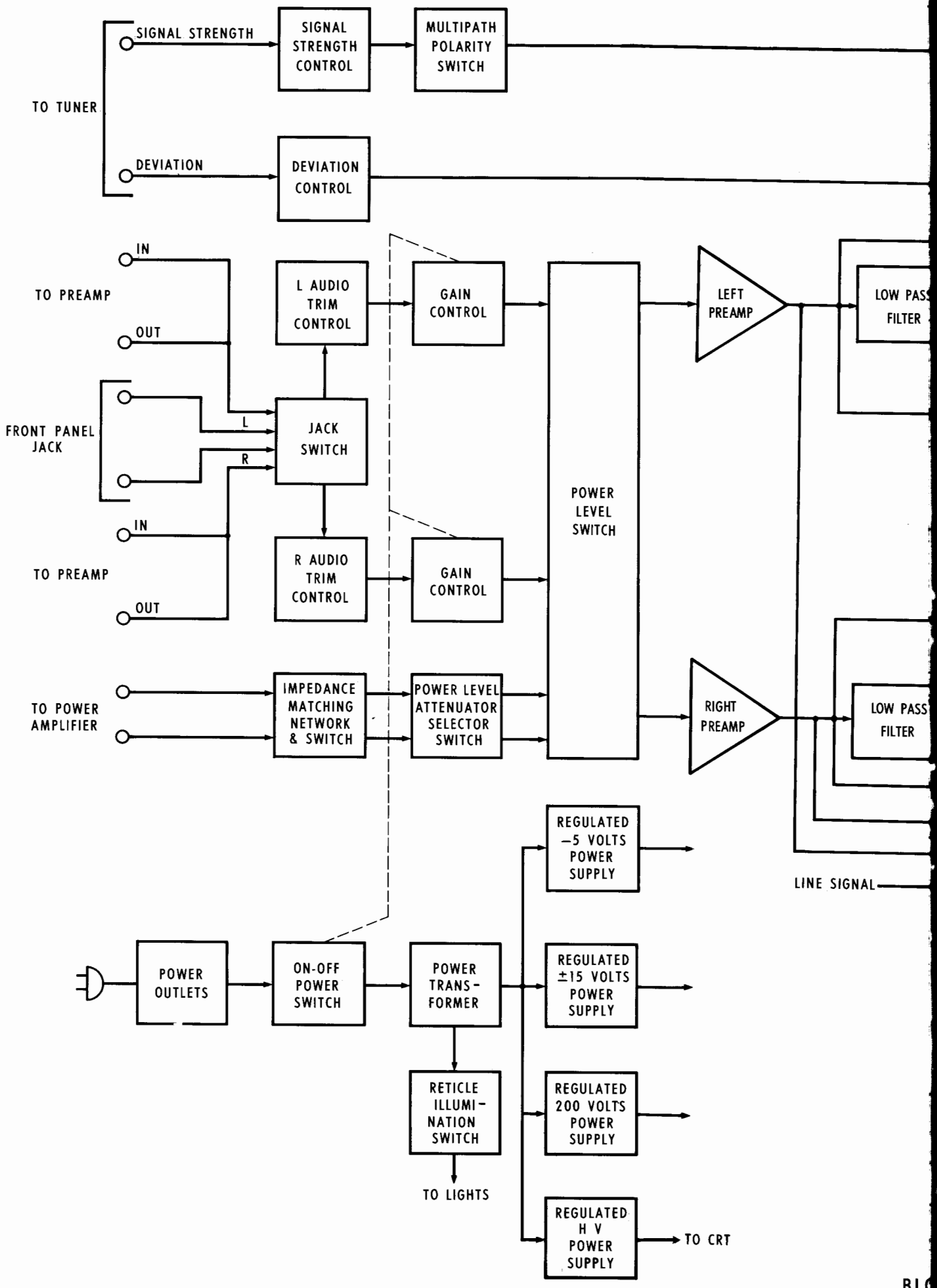
120 volts 50/60Hz 50 watts

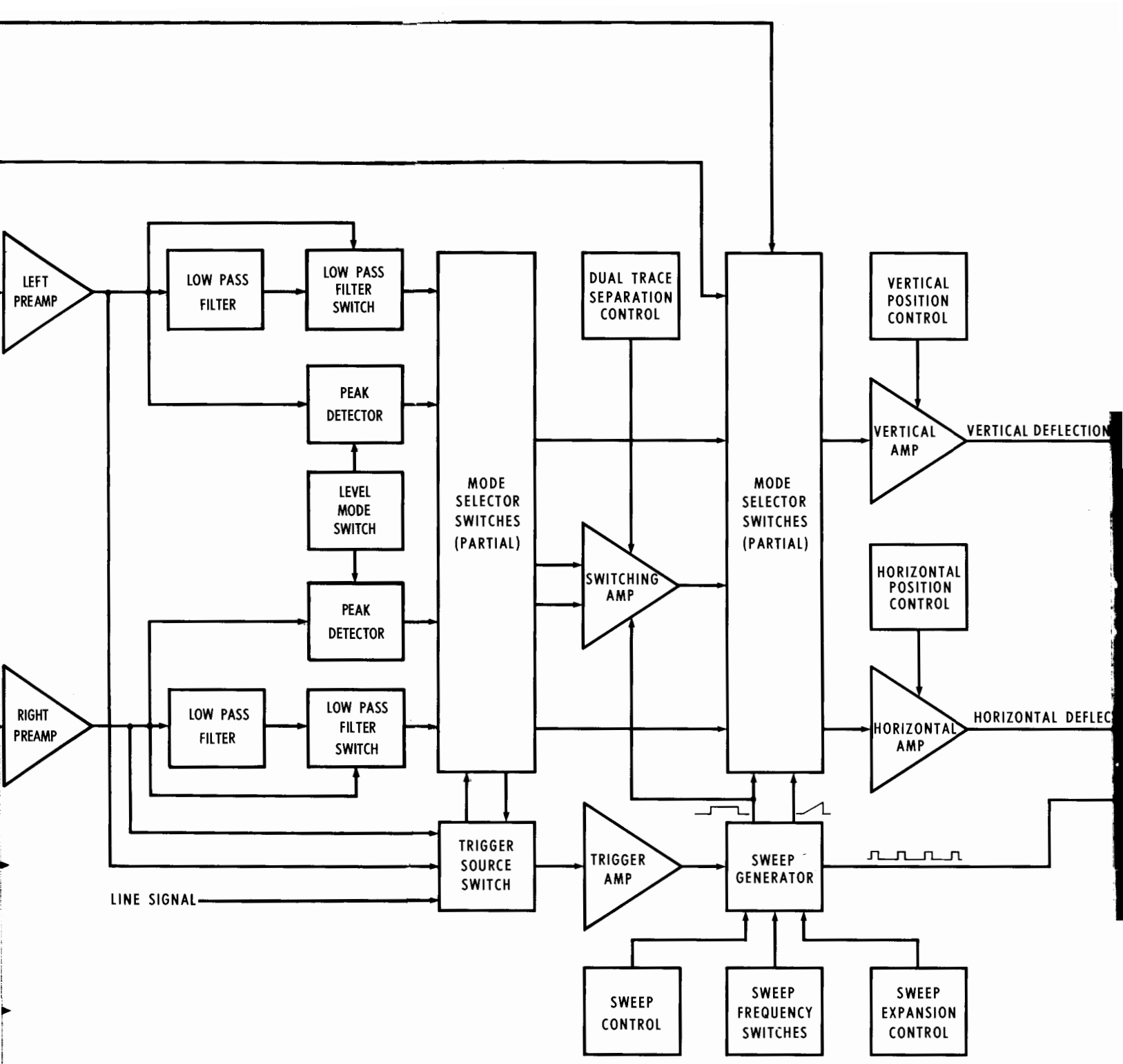
SIZE

Front panel, 16 inches (40.65cm) wide by 5-7/16 (13.8cm) high. Chassis, 15 inches (38.1cm) wide by 5 inches (12.7cm) high by 13 inches (33.1cm) deep. Knob clearance required, 1-1/2 inches (3.85cm) in front of mounting panel.

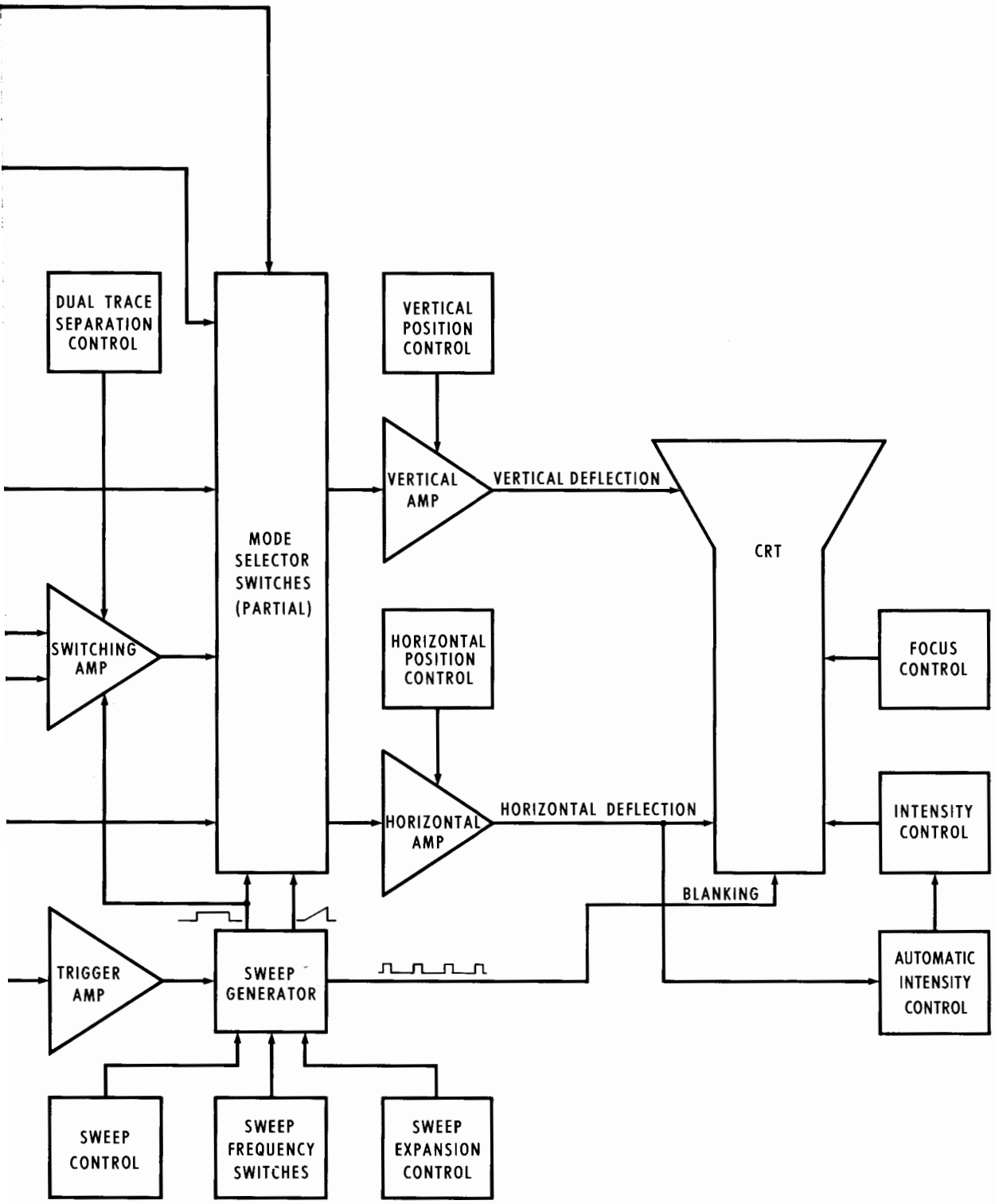
WEIGHT

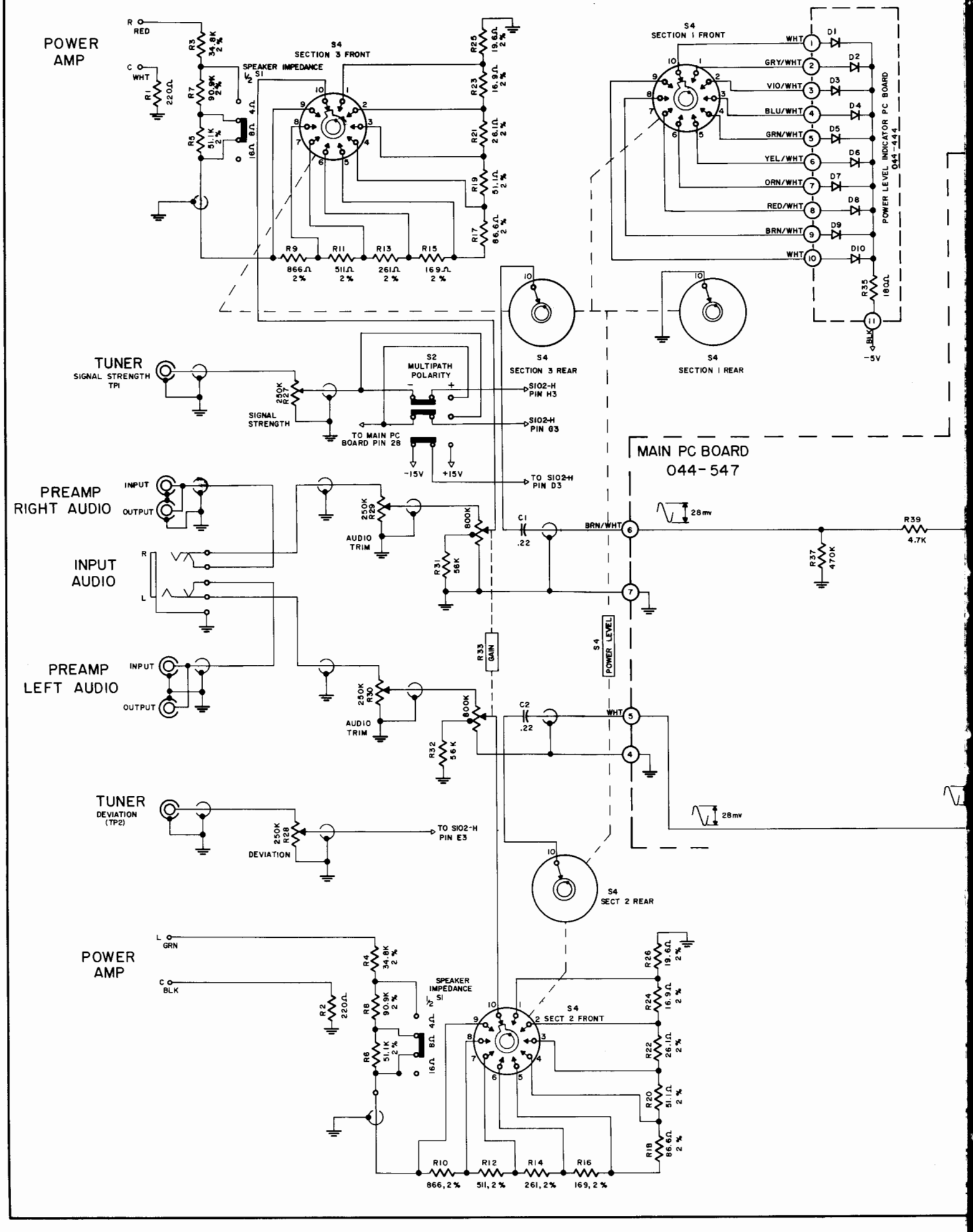
21 pounds (9.55kg) Net, 33 pounds (15kg) shipping.

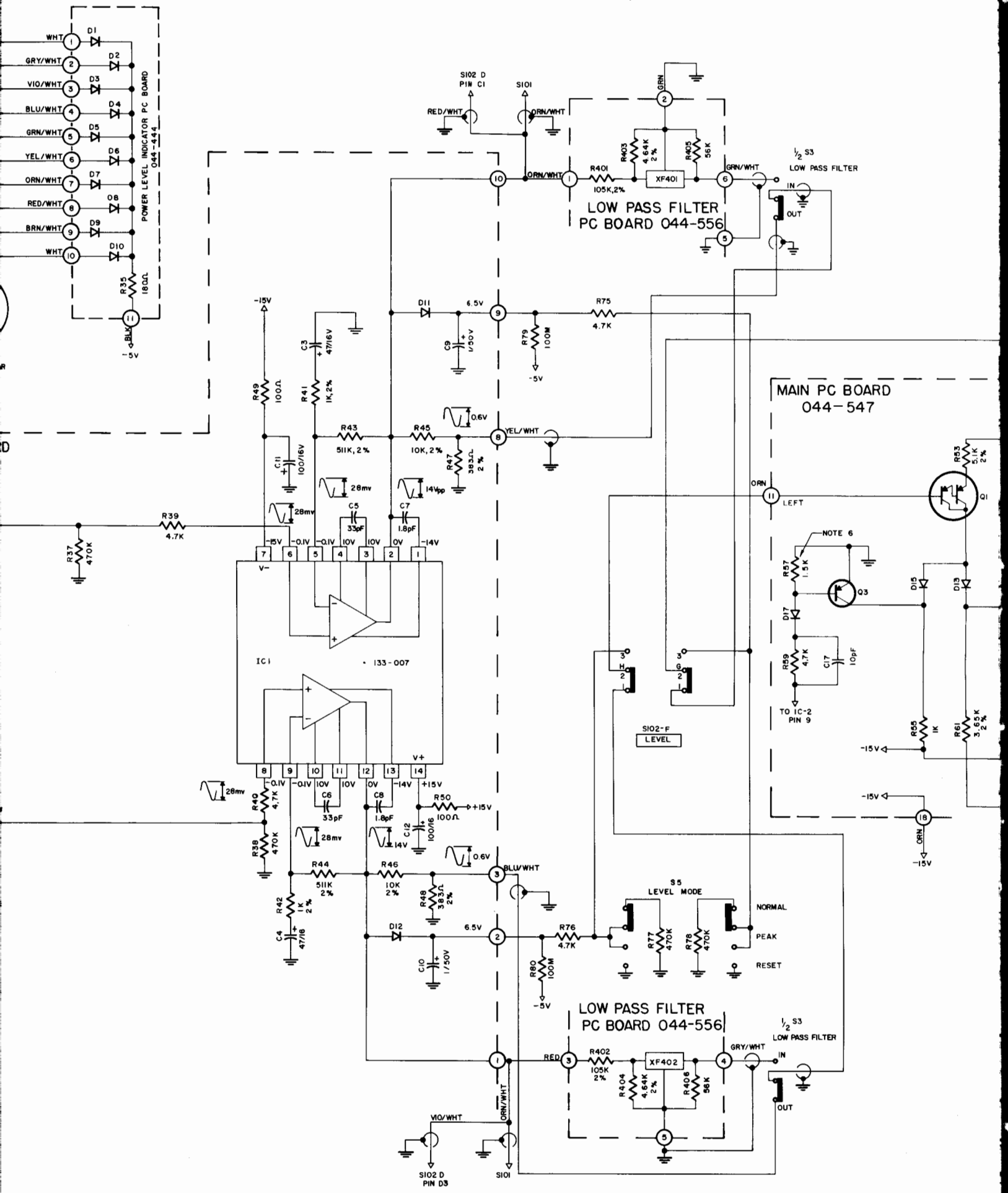

SIGNAL STRENGTH
SIGNAL STRENGTH CONTROL
MULTIPATH POLARITY SWITCH
TO TUNER
DEVIATION
DEVIATION CONTROL
IN
TO PREAMP
OUT
L AUDIO TRIM CONTROL
GAIN CONTROL
LEFT PREAMP
LOW PASS FILTER
FRONT PANEL JACK
L
R
JACK SWITCH
POWER LEVEL SWITCH
IN
TO PREAMP
OUT
R AUDIO TRIM CONTROL
GAIN CONTROL
TO POWER AMPLIFIER
IMPEDANCE MATCHING NETWORK & SWITCH
POWER LEVEL ATTENUATOR SELECTOR SWITCH
RIGHT PREAMP
LOW PASS FILTER
REGULATED −5 VOLTS POWER SUPPLY
LINE SIGNAL
POWER OUTLETS
ON-OFF POWER SWITCH
POWER TRANS-FORMER
REGULATED ±15 VOLTS POWER SUPPLY
RETICLE ILLUMI-NATION SWITCH
REGULATED 200 VOLTS POWER SUPPLY
TO LIGHTS
REGULATED H V POWER SUPPLY
TO CRT

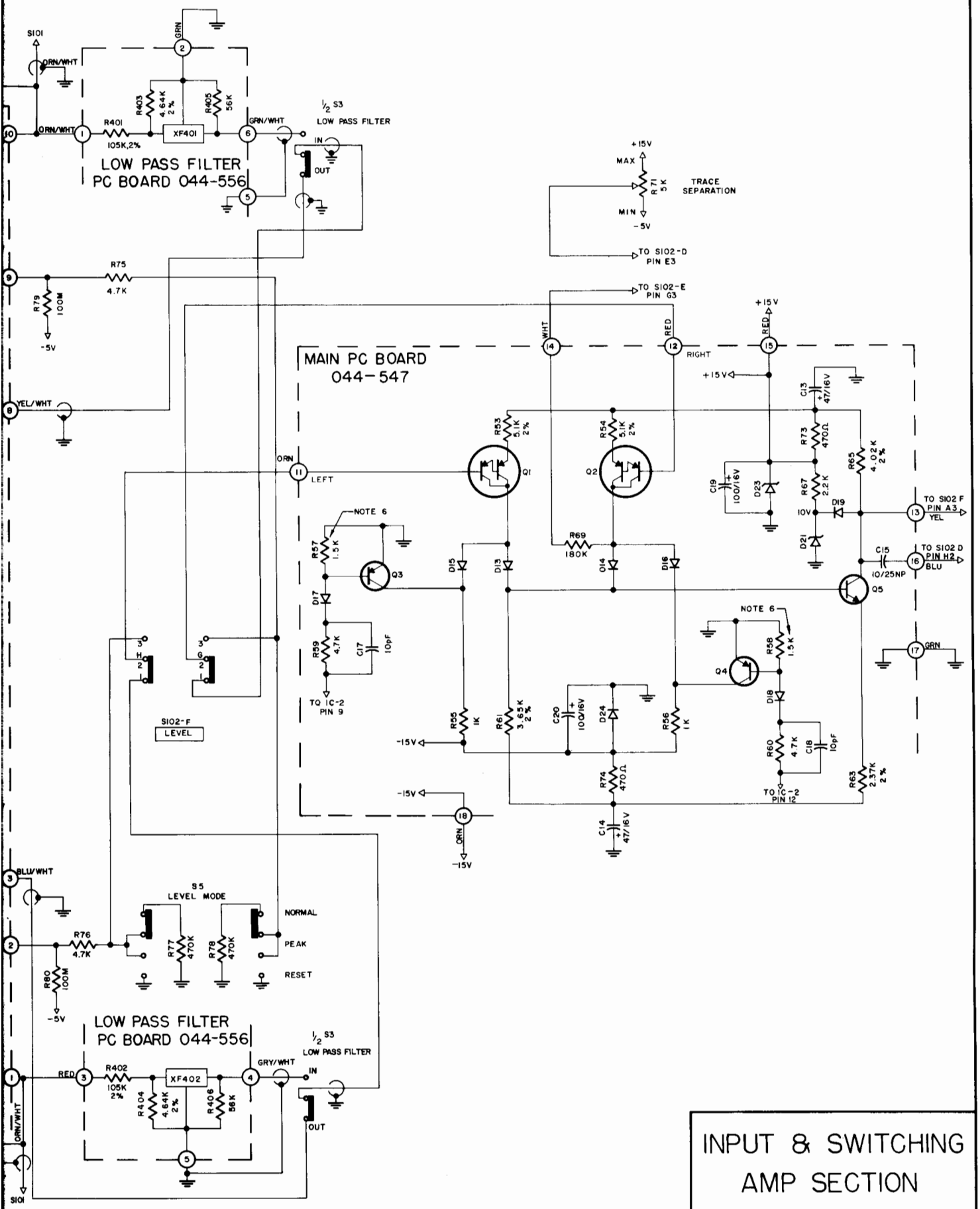


BLOCK DIAGRAM


DUAL TRACE SEPARATION CONTROL
MODE SELECTOR SWITCHES (PARTIAL)
VERTICAL POSITION CONTROL
VERTICAL AMP
VERTICAL DEFLECTION
CRT
SWITCHING AMP
HORIZONTAL POSITION CONTROL
FOCUS CONTROL
HORIZONTAL AMP
HORIZONTAL DEFLECTION
INTENSITY CONTROL
BLANKING
TRIGGER AMP
SWEEP GENERATOR
AUTOMATIC INTENSITY CONTROL
SWEEP CONTROL
SWEEP FREQUENCY SWITCHES
SWEEP EXPANSION CONTROL


POWER AMP
R RED
C WHT
R1 220Ω
R3 34.8K 2%
R7 90.9K 2%
R5 51.1K 2%
SPEAKER IMPEDANCE S1
4Ω 8Ω 16Ω
S4 SECTION 3 FRONT
R25 19.6Ω 2%
R23 16.9Ω 2%
R21 26.1Ω 2%
R19 51.1Ω 2%
R17 86.6Ω 2%
R9 866Ω 2%
R11 511Ω 2%
R13 261Ω 2%
R15 169Ω 2%
S4 SECTION 1 FRONT
WHT D1
GRY/WHT D2
VIO/WHT D3
BLU/WHT D4
GRN/WHT D5
YEL/WHT D6
ORN/WHT D7
RED/WHT D8
BRN/WHT D9
WHT D10
POWER LEVEL INDICATOR PC BOARD 044-444
R35 180Ω
BLK -5V
S4 SECTION 3 REAR
S4 SECTION 1 REAR
TUNER SIGNAL STRENGTH TP1
250K R27 SIGNAL STRENGTH
S2 MULTIPATH POLARITY
S102-H PIN H3
S102-H PIN G3
TO MAIN PC BOARD PIN 28
-15V +15V
TO S102-H PIN D3
MAIN PC BOARD 044-547
PREAMP RIGHT AUDIO
INPUT OUTPUT
250K R29 AUDIO TRIM
800K
C1 .22
BRN/WHT 6
28mv
R39 4.7K
R37 470K
R31 56K
INPUT AUDIO
R L
7
R33 GAIN
S4 POWER LEVEL
PREAMP LEFT AUDIO
INPUT OUTPUT
250K R30 AUDIO TRIM
800K
C2 .22
WHT 5
4
R32 56K
TUNER DEVIATION (TP2)
250K R28 DEVIATION
TO S102-H PIN E3
28mv
S4 SECT 2 REAR
POWER AMP
L GRN
C BLK
R2 220Ω
R4 34.8K 2%
R8 90.9K 2%
R6 51.1K 2%
SPEAKER IMPEDANCE S1
4Ω 8Ω 16Ω
S4 SECT 2 FRONT
R26 19.6Ω 2%
R24 16.9Ω 2%
R22 26.1Ω 2%
R20 51.1Ω 2%
R18 86.6Ω 2%
R10 866, 2%
R12 511, 2%
R14 261, 2%
R16 169, 2%

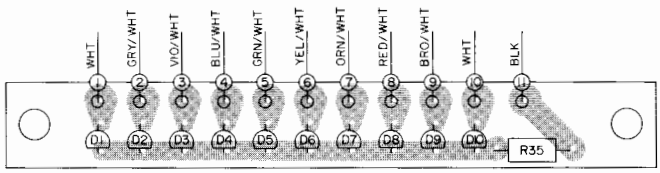

POWER LEVEL INDICATOR PC BOARD 044-444
WHT
GRY/WHT
VIO/WHT
BLU/WHT
GRN/WHT
YEL/WHT
ORN/WHT
RED/WHT
BRN/WHT
WHT
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
R35 180Ω
BLK
-15V
S102 D PIN C1
S101
RED/WHT
ORN/WHT
GRN
R403 4.64K 2%
R405 56K
R401 105K,2%
XF401
GRN/WHT
½ S3 LOW PASS FILTER
IN
OUT
LOW PASS FILTER PC BOARD 044-556
D11
6.5V
C9 1/50V
R79 100M
-5V
R75 4.7K
C3 47/16V
R49 100Ω
R41 1K,2%
R43 511K, 2%
R45 10K, 2%
R47 383Ω 2%
0.6V
YEL/WHT
C11 100/16V
28mv
14Vpp
C5 33pF
C7 1.8pF
R39 4.7K
R37 470K
-15V -0.1V -0.1V 10V 10V 0V -14V
V-
IC1 · 133-007
V+
-0.1V -0.1V 10V 10V 0V -14V +15V
R40 4.7K
R38 470K
C6 33pF
C8 1.8pF
R50 100Ω
+15V
C12 100/16
14V
R44 511K 2%
R46 10K 2%
R48 383Ω 2%
R42 1K 2%
C4 47/16
BLU/WHT
D12
6.5V
C10 1/50V
R80 100M
-5V
R76 4.7K
S5 LEVEL MODE
R77 470K
R78 470K
NORMAL
PEAK
RESET
MAIN PC BOARD 044-547
R53 5.1K 2%
Q1
ORN
LEFT
NOTE 6
R57 1.5K
Q3
D15
D13
D17
R59 4.7K
C17 10pF
TO IC-2 PIN 9
S102-F LEVEL
R55 1K
R61 3.65K 2%
-15V
ORN
LOW PASS FILTER PC BOARD 044-556
½ S3 LOW PASS FILTER
RED
R402 105K 2%
XF402
GRY/WHT
IN
OUT
R404 4.64K 2%
R406 56K
VIO/WHT
ORN/WHT
S102 D PIN D3
S101



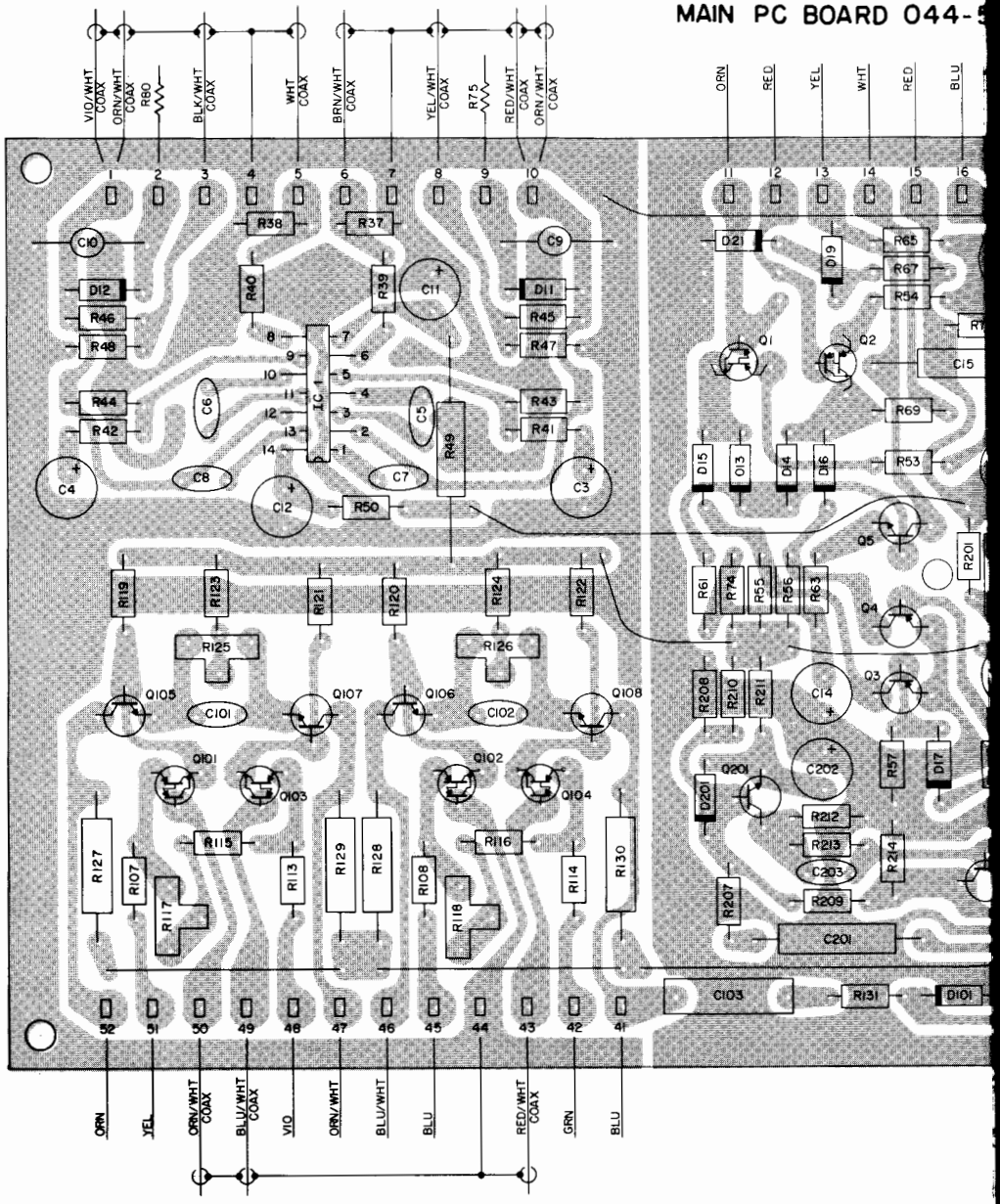
INPUT & SWITCHING AMP SECTION

MPI-4 154-665

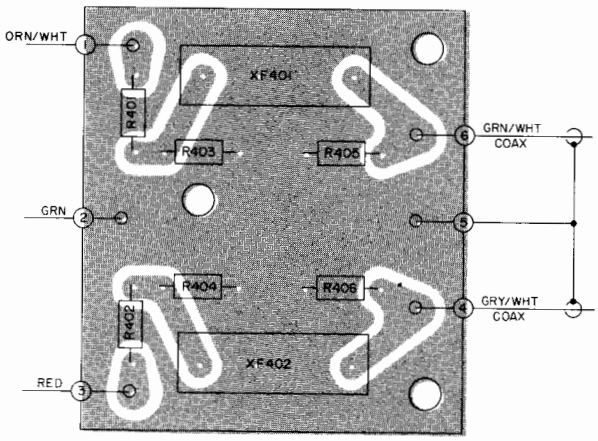
POWER LEVEL PC BOARD 044-444



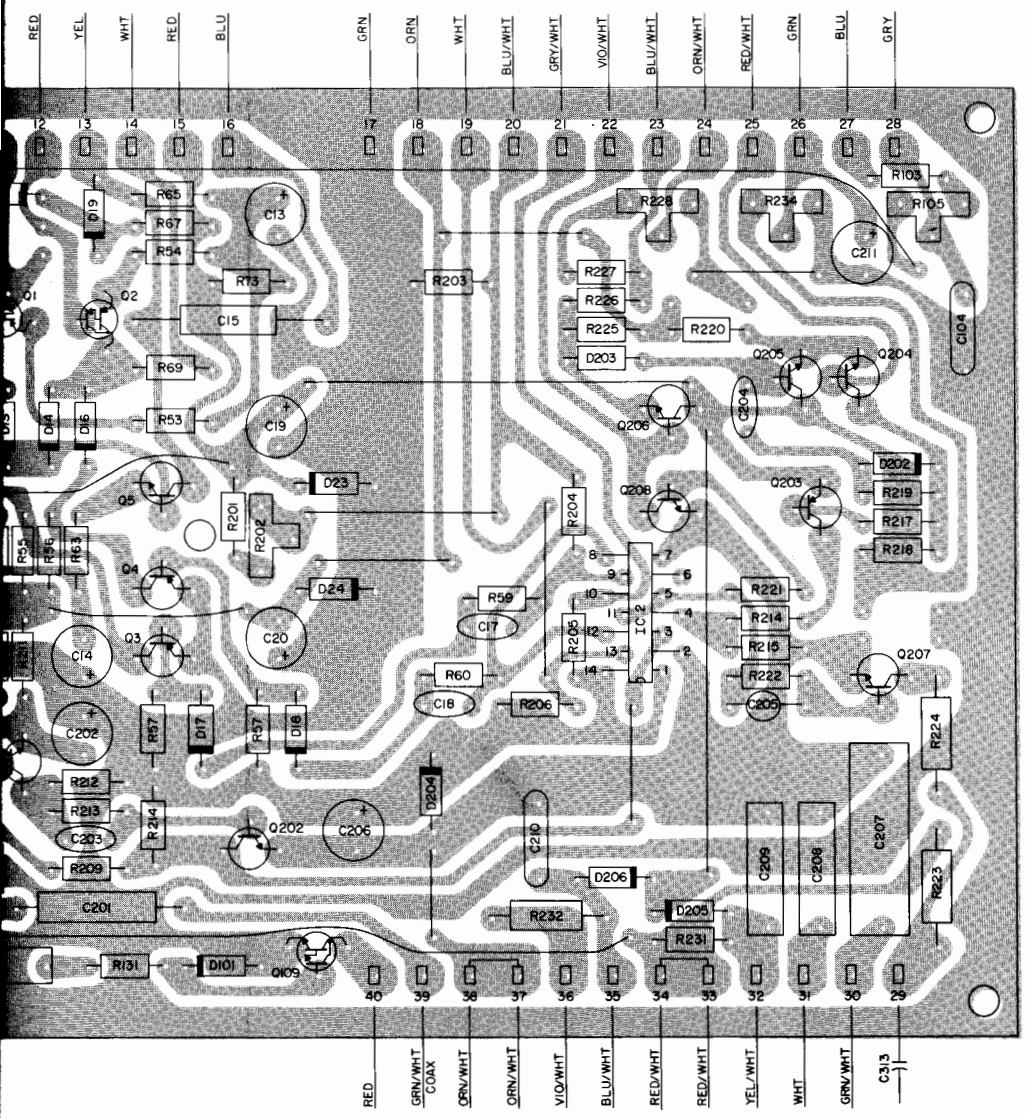
MAIN PC BOARD 044-5

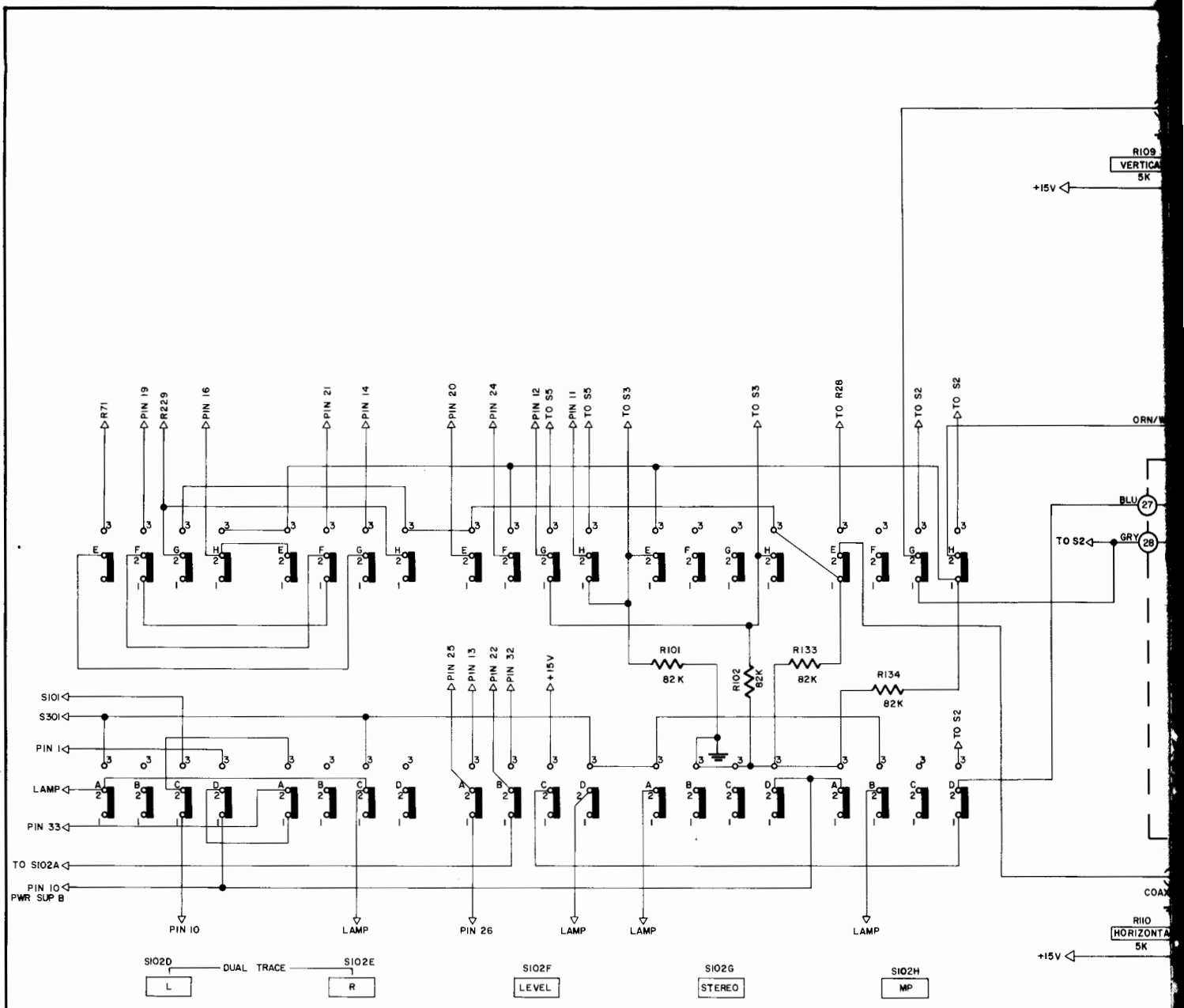


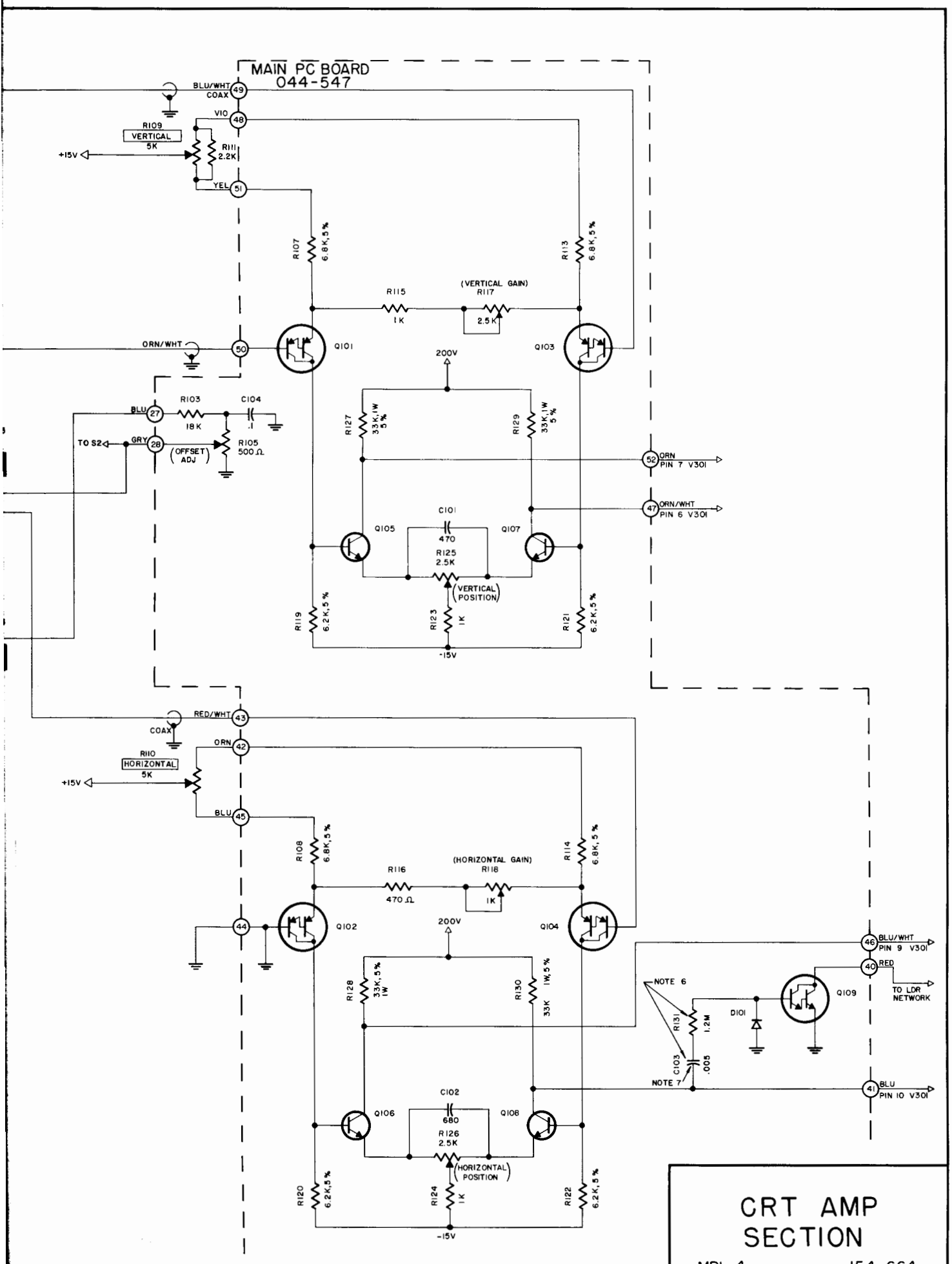
LOW PASS FILTER PC BOARD 044-556



PC BOARD 044-547

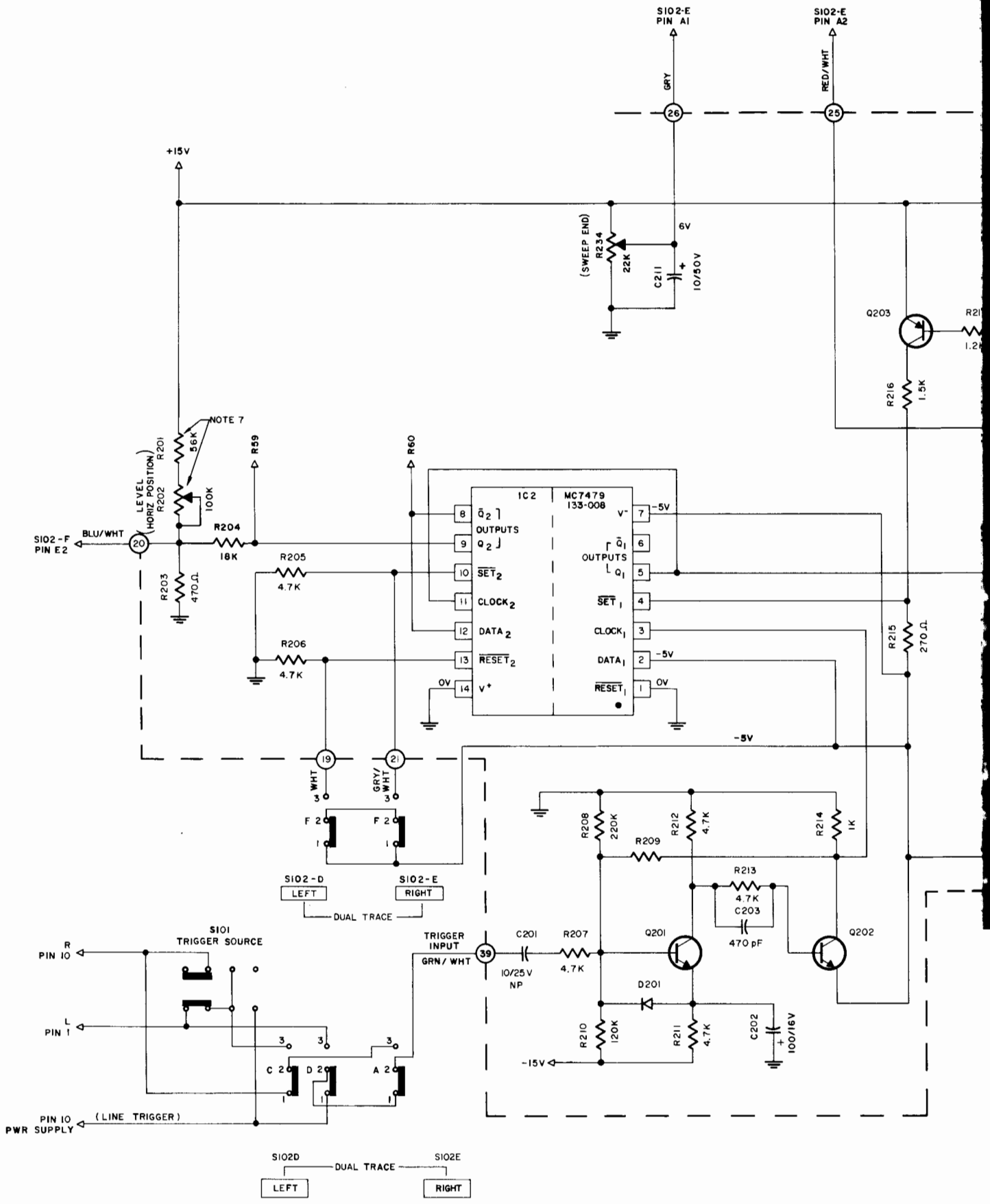


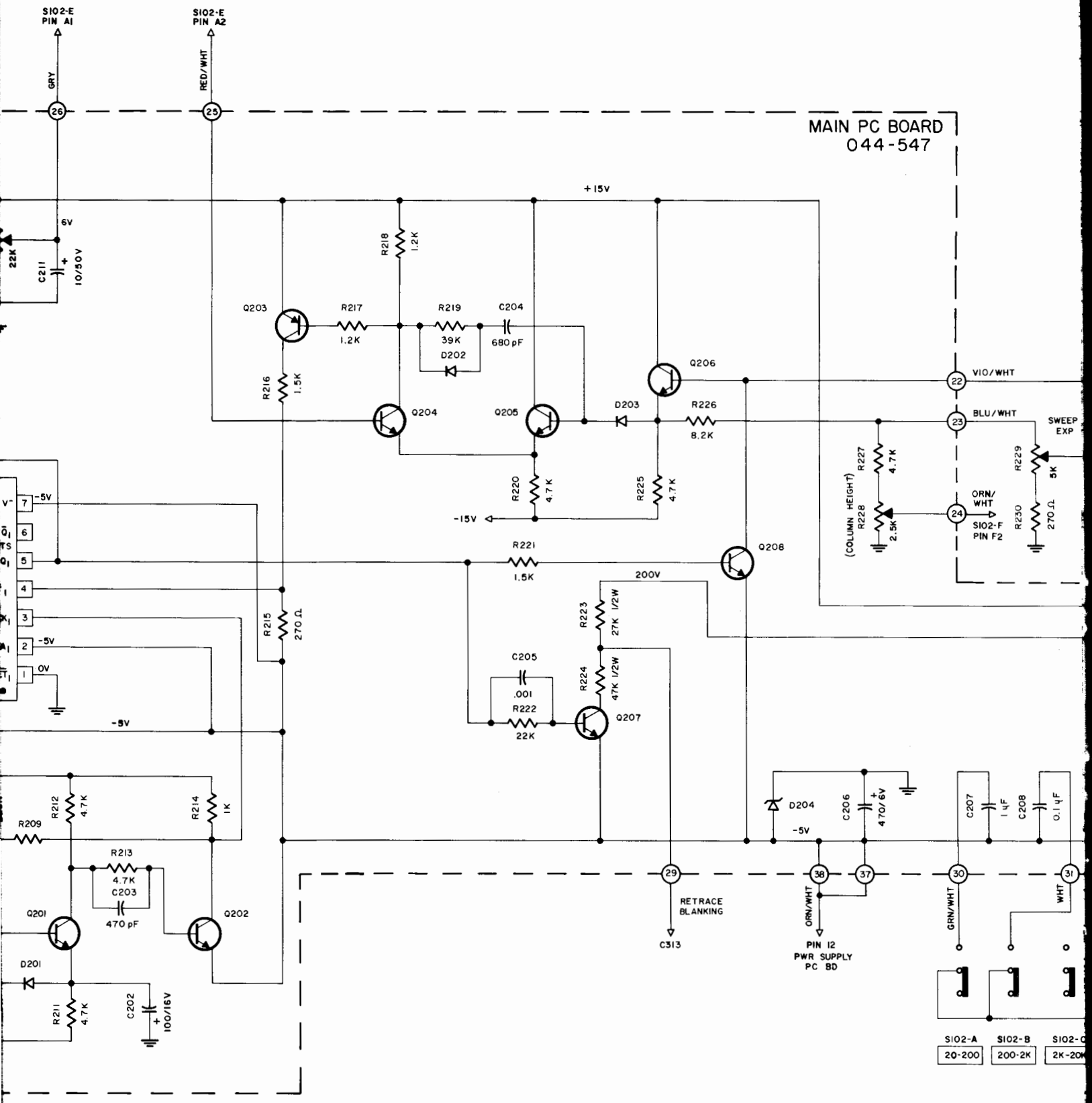

R109
VERTICA
5K
+15V
R71
PIN 19
R229
PIN 16
PIN 21
PIN 14
PIN 20
PIN 24
PIN 12
TO S5
PIN 11
TO S5
TO S3
TO S3
TO R28
TO S2
TO S2
ORN/W
BLU
27
TO S2
GRY
28
R101
82K
R102
82K
R133
82K
R134
82K
PIN 25
PIN 13
PIN 22
PIN 32
+15V
TO S2
S101
S301
PIN 1
LAMP
PIN 33
TO S102A
PIN 10
PWR SUP B
COAX
R110
HORIZONTA
5K
+15V
PIN 10
LAMP
PIN 26
LAMP
LAMP
LAMP
S102D
DUAL TRACE
S102E
L
R
S102F
LEVEL
S102G
STEREO
S102H
MP

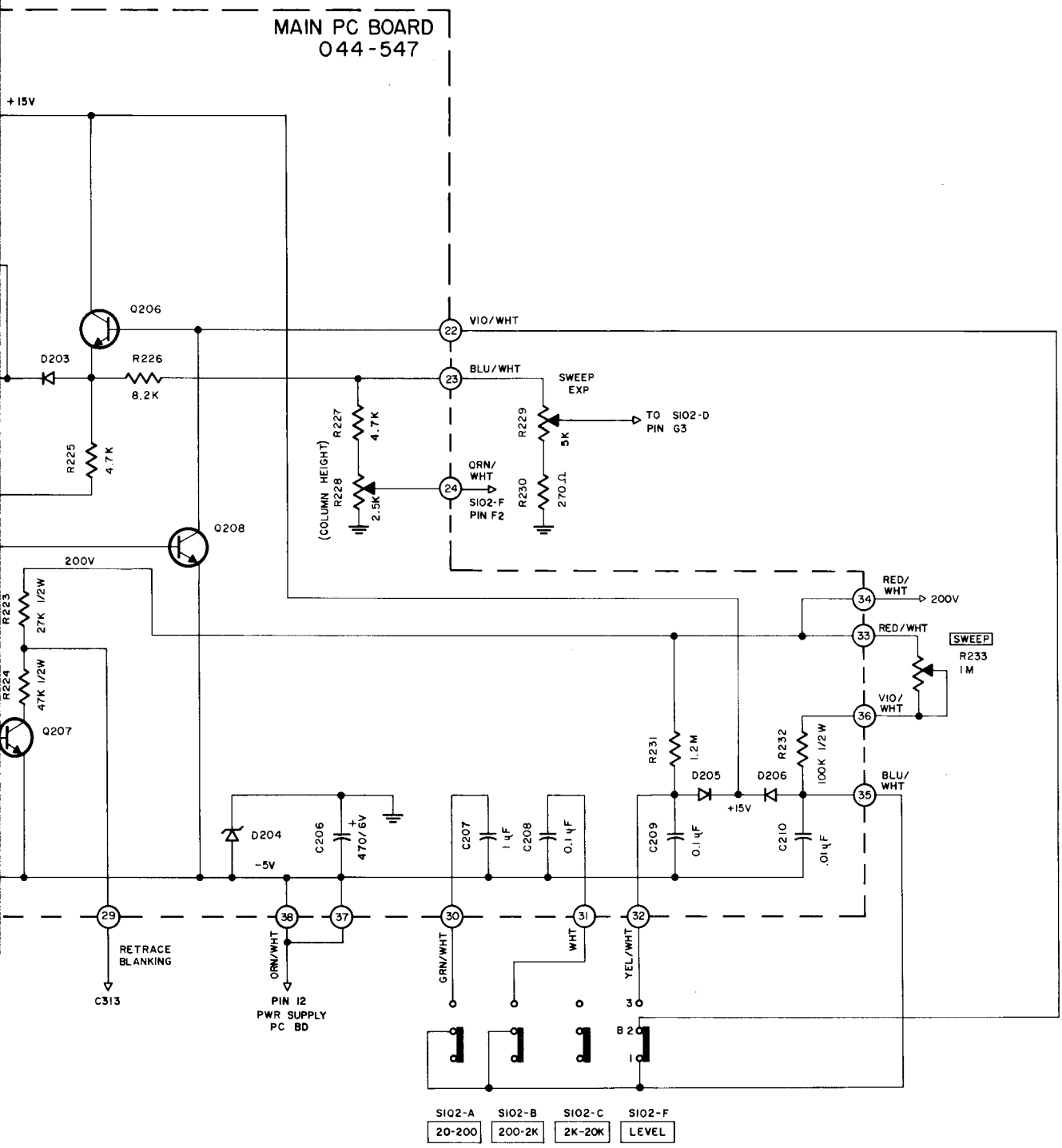


CRT AMP SECTION

MPI-4 154-664

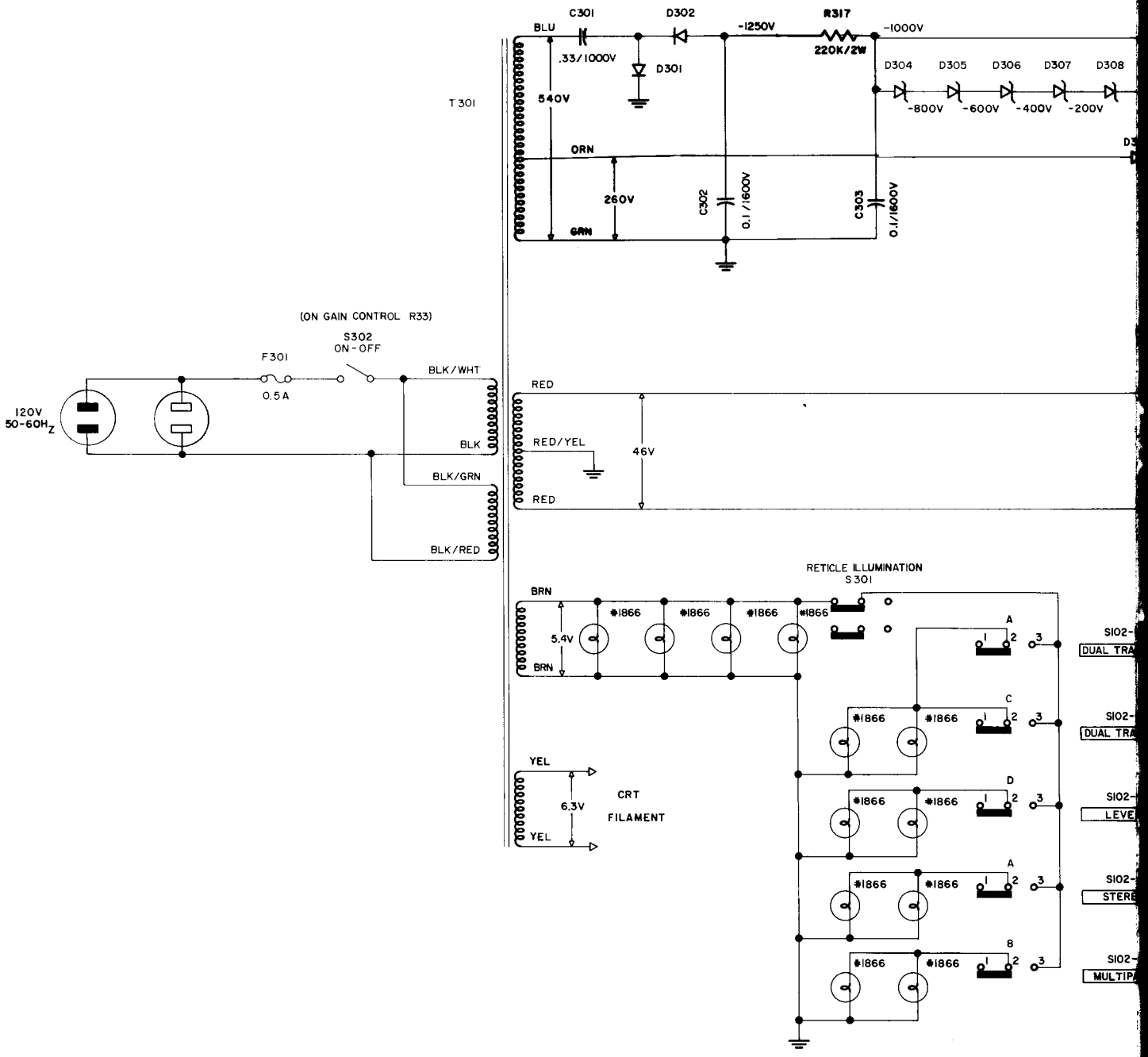

S102-E PIN A1
S102-E PIN A2
GRY
RED/WHT
26
25
+15V
(SWEEP END)
R234
22K
6V
C211
10/50V
Q203
R216
1.5K
NOTE 7
R201
56K
LEVEL (HORIZ POSITION)
R202
100K
R59
R60
S102-F PIN E2
BLU/WHT
20
R204
18K
R205
4.7K
R206
4.7K
R203
470Ω
IC2
MC7479
133-008
OUTPUTS
SET2
CLOCK2
DATA2
RESET2
V+
V-
SET1
CLOCK1
DATA1
RESET1
-5V
0V
R215
270Ω
19
21
WHT
GRY/WHT
F 2
S102-D
LEFT
S102-E
RIGHT
DUAL TRACE
R208
220K
R209
R212
4.7K
R214
1K
R213
4.7K
C203
470 pF
Q202
S101
TRIGGER SOURCE
R
PIN 10
L
PIN 1
TRIGGER INPUT
GRN/WHT
39
C201
10/25V NP
R207
4.7K
Q201
D201
C 2
D 2
A 2
R210
120K
R211
4.7K
C202
100/16V
-15V
PIN 10
PWR SUPPLY
(LINE TRIGGER)
S102D
DUAL TRACE
S102E
LEFT
RIGHT

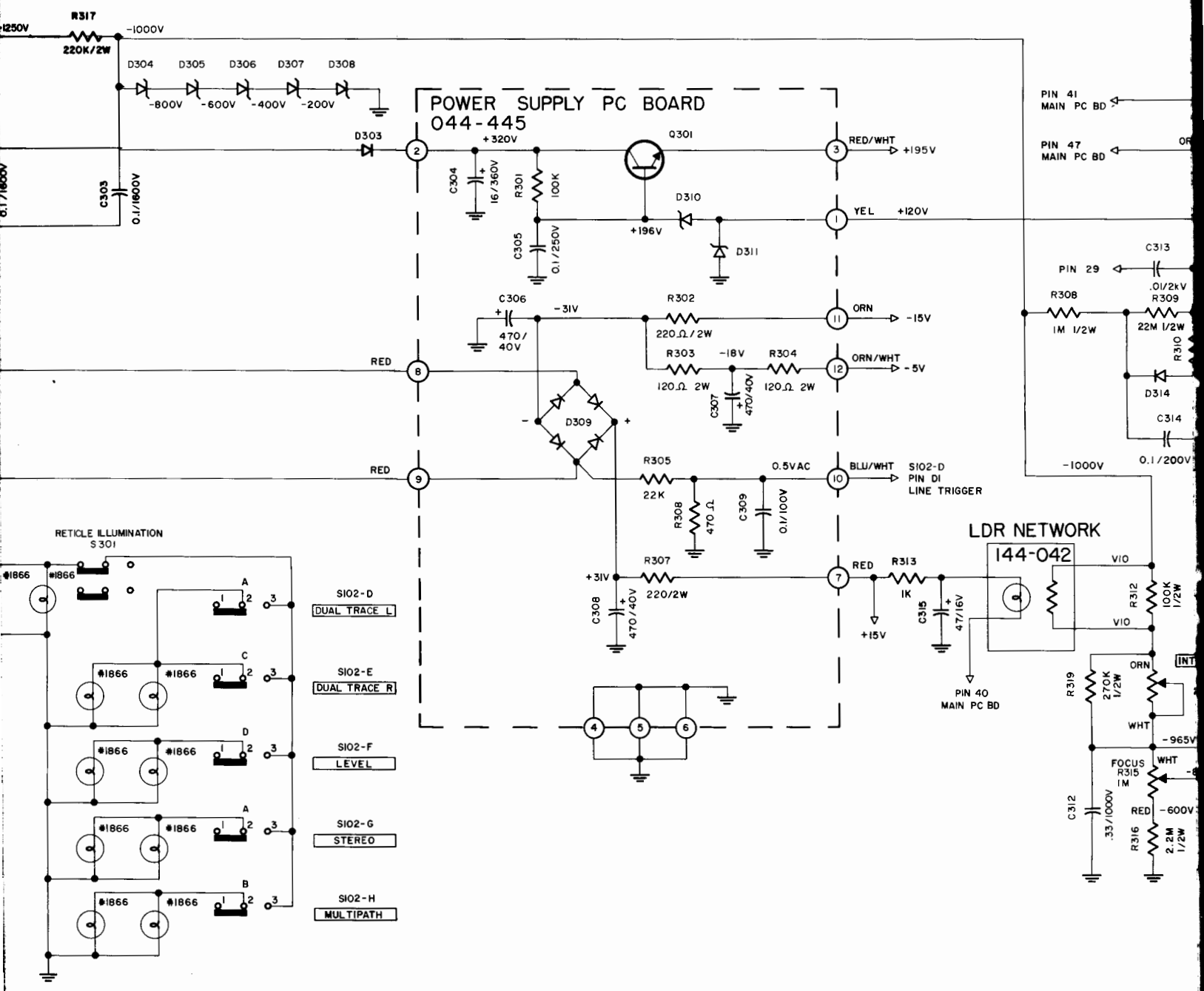

S102-E PIN A1
S102-E PIN A2
GRY
RED/WHT
26
25
MAIN PC BOARD
044-547
+15V
6V
22K
C211
10/50V
R218
1.2K
Q203
R217
1.2K
R219
39K
D202
C204
680 pF
R216
1.5K
Q204
Q205
Q206
D203
R226
8.2K
22
VIO/WHT
23
BLU/WHT
SWEEP EXP
R227
4.7K
(COLUMN HEIGHT)
R228
2.5K
R229
5K
ORN/WHT
24
S102-F PIN F2
R230
270Ω
R220
4.7K
R225
4.7K
-15V
-5V
R221
1.5K
Q208
200V
R223
27K 1/2W
C205
.001
R222
22K
R224
47K 1/2W
Q207
R215
270Ω
D204
C206
470/6V
C207
1μF
C208
0.1μF
R209
R212
4.7K
R214
1K
R213
4.7K
C203
470 pF
Q201
Q202
D201
R211
4.7K
C202
100/16V
29
RETRACE BLANKING
C313
38
37
ORN/WHT
PIN 12 PWR SUPPLY PC BD
30
31
GRN/WHT
WHT
S102-A
20-200
S102-B
200-2K
S102-C
2K-20K

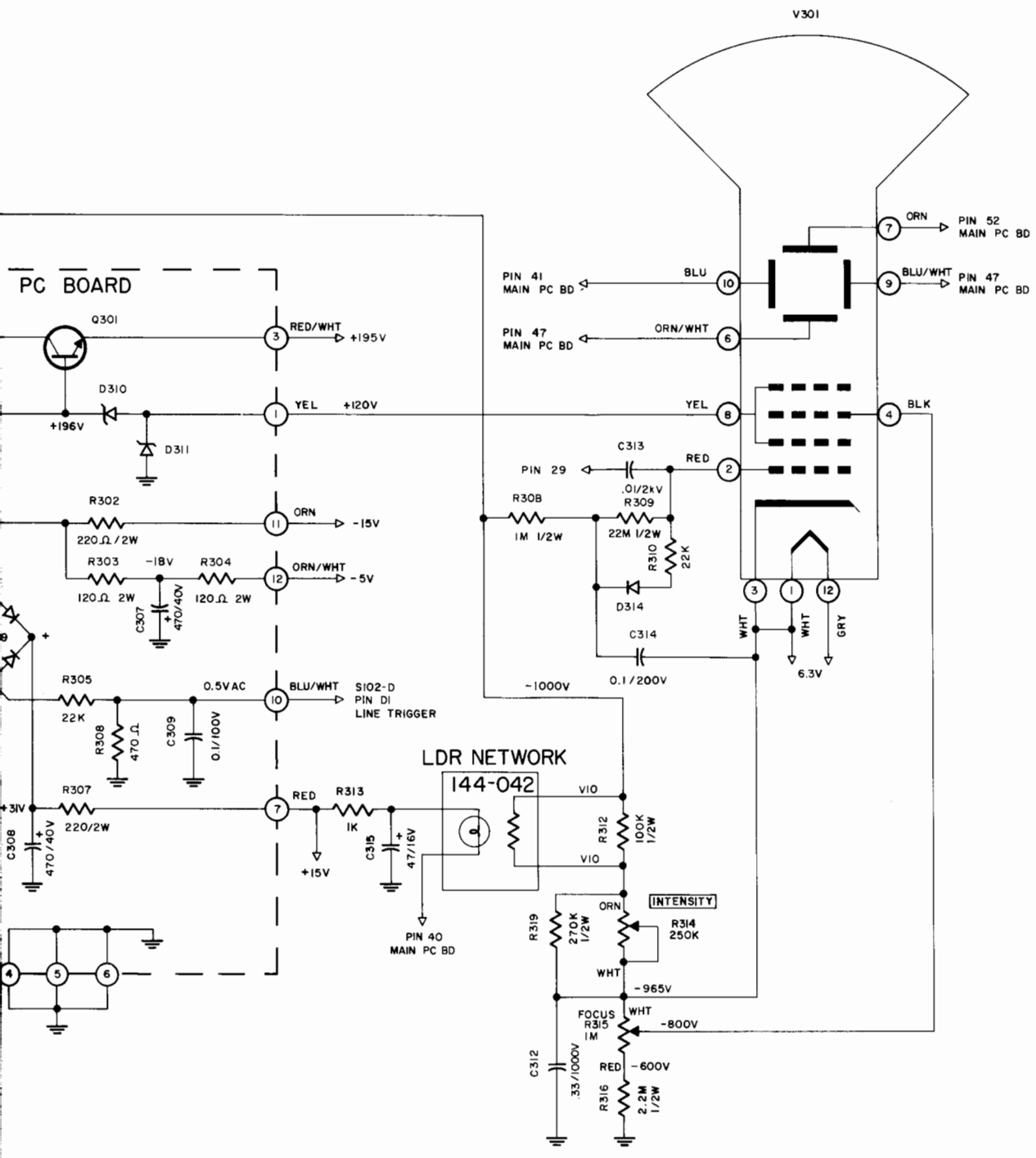


SWEEP SECTION

MPI-4 154-663


C301
D302
R317
BLU
-1250V
-1000V
.33/1000V
220K/2W
D301
D304
D305
D306
D307
D308
T301
540V
-800V
-600V
-400V
-200V
ORN
260V
C302
0.1/1600V
C303
0.1/1600V
GRN
(ON GAIN CONTROL R33)
S302
ON-OFF
F301
0.5A
BLK/WHT
120V
50-60Hz
BLK
BLK/GRN
BLK/RED
RED
RED/YEL
46V
RED
RETICLE ILLUMINATION
S301
BRN
#1866
5.4V
BRN
A
C
D
A
B
SI02-
DUAL TRA
DUAL TRA
LEVE
STERE
MULTIP
YEL
6.3V
YEL
CRT
FILAMENT

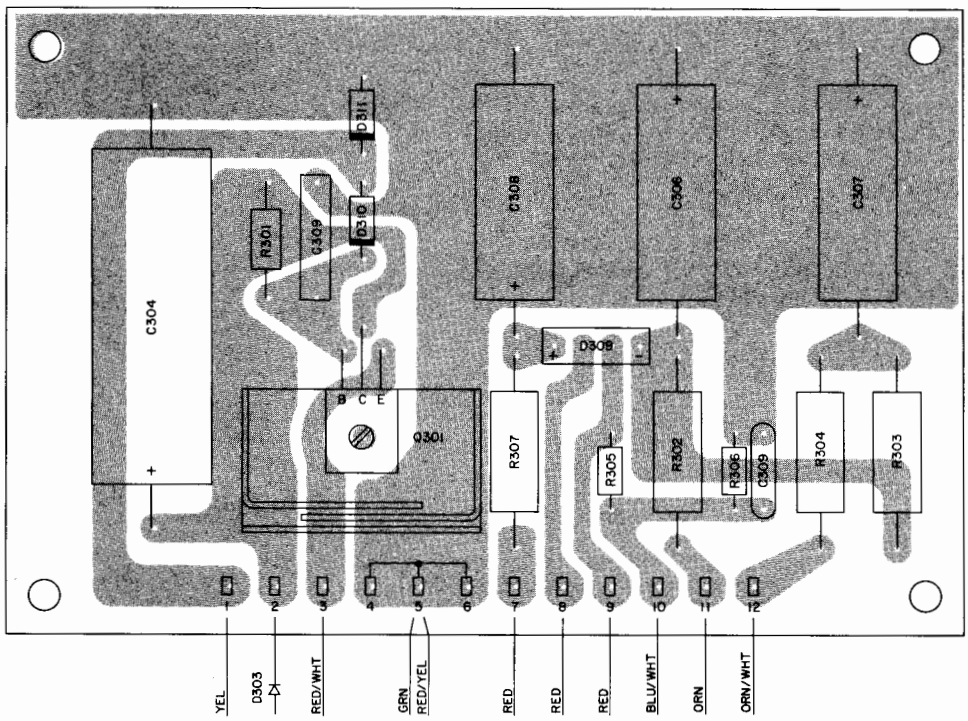

R317
220K/2W
-1000V
D304
D305
D306
D307
D308
-800V
-600V
-400V
-200V
D303
C303
0.1/1600V
POWER SUPPLY PC BOARD
044-445
+320V
C304
16/360V
R301
100K
Q301
D310
+196V
C305
0.1/250V
D311
RED/WHT
+195V
YEL
+120V
PIN 41
MAIN PC BD
PIN 47
MAIN PC BD
C313
PIN 29
.01/2kV
R308
1M 1/2W
R309
22M 1/2W
R310
D314
C314
0.1/200V
-1000V
C306
470/40V
-31V
R302
220Ω/2W
ORN
-15V
R303
120Ω 2W
-18V
R304
120Ω 2W
ORN/WHT
-5V
C307
470/40V
RED
D309
R305
22K
0.5VAC
BLU/WHT
S102-D
PIN DI
LINE TRIGGER
R308
470Ω
C309
0.1/100V
RETICLE ILLUMINATION
S301
#1866
#1866
A
C
D
A
B
S102-D
DUAL TRACE L
S102-E
DUAL TRACE R
S102-F
LEVEL
S102-G
STEREO
S102-H
MULTIPATH
+31V
R307
220/2W
C308
470/40V
RED
R313
1K
C315
47/16V
+15V
LDR NETWORK
144-042
VIO
R312
100K 1/2W
VIO
PIN 40
MAIN PC BD
R319
270K 1/2W
ORN
INT
WHT
-965V
FOCUS
R315
1M
WHT
C312
.33/1000V
RED
-600V
R316
2.2M 1/2W



POWER SUPPLY SECTION

MPI-4 154-600

POWER SUPPLY PC BOARD 044-445



ALIGNMENT INSTRUCTIONS

Vertical Position: (R125)

STEREO With the front panel verticle control in the middle of its range adjust R125 so that the spot is located in the center of the reticle. (Fig. 1)

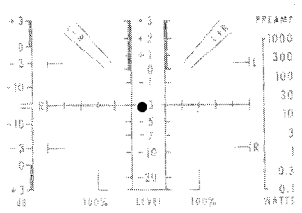


FIG. 1

Horizontal Position: (R126)

STEREO With the front panel horizontal control in the middle of its range adjust R126 so that the spot is located in the center of the reticle. (Fig. 1)

"Level" Horizontal Position: (R202)

LEVEL Adjust R202 so that the two level lines are equally spaced about the center. (Fig. 2)

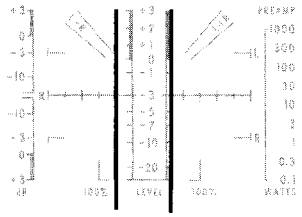


FIG. 2

Horizontal Gain: (R118)

LEVEL Adjust R118 so that the two level lines are located outside the calibration lines and inside the first marks on the Horizontal scale. (R126 may have to be readjusted to bring the spot to the center again) (Fig. 2)

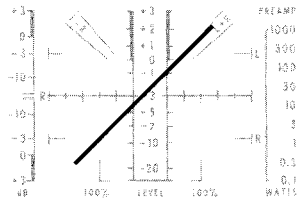


FIG. 3

Vertical Gain: (R117)

STEREO For a monophonic input adjust R117 so that the diagonal falls between the "L+R" limit lines. If the preamp input is used, it is best to have both the trim controls and the gain control fully clockwise. (R125 may have to be readjusted to bring the spot to the center again) (Fig. 3)

Offset Adjustment: (R105)

LEVEL With no input and the level mode in its "normal" position adjust R105 so that the tops of the two level lines are even with the bottom of the level scale. (This control also determines the offset for the multipath). (Fig. 4)

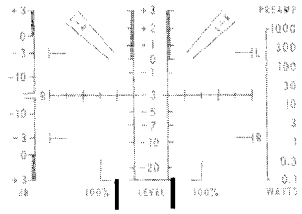


FIG. 4

Column Height: (R228)

LEVEL With the input over driven adjust R228 so that the tops of the two level lines are even with the +3 mark on the level scale. (R105 may have to be readjusted) (Fig. 5)

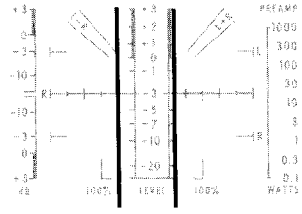


FIG. 5

Sweep End: (R234)

DUAL TRACE

L R With the trigger set to "line" and no input, set the sweep expansion control (level set panel) so that the sweep starts at the left boundary, then adjust R234 so that the sweep stops at the right boundary. (Fig. 6)

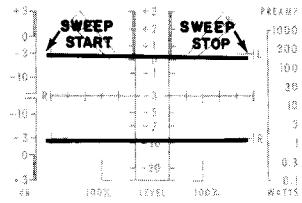


FIG. 6

MAIN PC BOARD

PINS 1 THRU 10 SEE SCHEMATIC

PIN	DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
11	0V  0.6V			6.5V	0V  0.6V	
12	0V  0.6V			6.5V	0V  0.6V	
13	-0V  0.8V	0V  0.6V		7.5V	0V  0.6V	
14	5V	-12V	4V	-10V	-4V	-12V
15	+15V					
16	-0V  0.8V	0V  0.6V		0 - 10V	0V  0.6V	
17	0V GND					
18	-15V					
19	0V	-5V	0V			
20	0V  0.15V	-0.07V	+0.07V	0V  0.15V	0V	
21	0V		-5V	0V		
22	 10V -5V				-5V	
23	 2V -2V				-2V	
24	 0.4V -0.3V				-0.3V	
25	6V			7V	6V	
26	6V					
27	0V			15V	0V	+15V / -15V
28	0V			0.26V	0V	+0.26V / -0.26V
29	195V  200V 125V			160V  200V 125V	125V	
30	0.5V  +7V -5V			+15V	-5V	
31	0V - IF 200-2K BUTTON NOT PRESSED OTHERWISE SIMILAR TO PIN 30					
32	+15V			-1.8V  +8V -5V	+15V	
33	+200V					
34	+200V					
35	0.5V  +7V -5V			+15V	-5V	
36	200V FOR SWEEP CONTROL CW 20V FOR SWEEP CONTROL CCW					
37	-5V					
38	-5V					
39	0V  15V			0V  1.5V	0V	
40	5V  10V					15V
41	120V  90V			120V  22V	120V  90V	120V
42	11V (DEPENDENT ON HORIZONTAL CONTROL [10V - 15V])					
43	0V  0.5V			0V  0.15V	0.0V  0.6V	0V
44	0V GND					
45	11V (DEPENDENT ON HORIZONTAL CONTROL [10V - 15V])					
46	120V  100V			120V  22V	120V  100V	120V
47	110V  80V	110V  60V		140V  50V	110V  50V	130V
48	12V (DEPENDENT ON VERTICAL CONTROL [11V - 15V])					
49	0V			0.2V	0V	0V (-MP POLARITY) 0.2V (+MP POLARITY)
50	0V 0.7V	0V 0.6V		-0.1V  0.5V	0V  0.5V	-0.2V (-MP POLARITY) 0V (+MP POLARITY)
51	12V (DEPENDENT ON VERTICAL CONTROL [12V - 15V])					
52	110V 70V	110V 60V		80V 50V	110V 50V	90V

TSTR		DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
Q1	C	-8.4V  -4V -12V	-4.3V  0.4V	-12V  0.1V	 -8V -13V	-4.3V OR -12.3V  0.1V OR 0.4V	
	B	0V  0.6V			6.5V	0V  0.6V	
	E	1.1V  0.6V			7.3V	1.1V  0.6V	
Q2	C	-4V -12V	-12.3V  0.1V	-4.3V  0.4V	 -8V -13V	-4.3V OR -12.3V  0.1V OR 0.4V	
	B	0V  0.6V			6.5V	0V  0.6V	
	E	1.1V  0.6V			7.3V	1.1V  0.6V	
Q3	C	-6.5V  0V -13V	-0.2V	-13V  0.1V	-7V  0V -14V	0V OR -13V	
	B	-0.4V  0V -0.7V	-0.7V	0V	-0.4V  0V -0.7V	0V OR -0.7V	
	E	0V GND					
Q4	C	-6.5V  0V -13V	-13V  0.1V	-0.2V	-7V  0V -14V	0V OR -13V	
	B	0.4V  0V -0.7V	0V	-0.7V	-0.4V  0V -0.7V	0V OR -0.7V	
	E	0V GND					
Q5	C	-0V  0.8V	0V  0.6V		7.5V	0V  0.6V	
	B	-5V  0.5V	-5V 0.4V		-9.5V	-5V  0.4V	
	E	-5.7V  0.5V	-5.7V 0.4V		-10.2V	-5.7V  0.4V	
Q101	C	-5V  3.5V	-5V 2.5V		-4V  +3.5V -6V	-5V 2.5V	-4.5V
	B	0V 0.7V	0V 0.6V		-0.1V 0.5V	0V 0.5V	-0.2V(-MP POLARITY) 0V (+MP POLARITY)
	E	1.1V 0.8V	1.1V 0.6V		1V 0.5V	1.1V 0.5V	1.1V
Q102	C	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	B	0V GND					
	E	1.1V 0.03V			1.1V 0.01V	1.1V 0.03V	1.1V
Q103	C	-5.3V 3.5V	-5.3V 2.5V		-6.5V 2V	-5.3V 2V	-6V
	B	0V	0V	0V	0.2V	0V	0V (-MP POLARITY) 0.2V(+MP POLARITY)
	E	1.1V 0.03V	1.1V 0.02V		1.1V 0.02V	1.1V 0.02V	1.1V
Q104	C	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	B	0V 0.5V			0V 0.15V	0.0V 0.6V	0V
	E	1.1V 0.5V			1.1V 0.15V	1.1V 0.5V	1.1V
Q105	C	110V 70V	110V 60V		80V 50V	110V 50V	90V
	B	-5V 3.5V	-5V 2.5V		-4V 3.5V -6V	-5V 2.5V	-4.5V
	E	-5.7V 3.5V	-5.7V 2.5V		-4.5V 2.5V	-5.7V 2.5V	-5V
Q106	C	120V 100V			120V 22V	120V 100V	120V
	B	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	E	-5.8V 3.5V			-5.8V 1V	-5.8V 4V	-5.8V
Q107	C	110V 80V	110V 60V		140V 50V	110V 50V	130V
	B	-5.3V 3.5V	-5.3V 2.5V		-6.5V 2V	-5.3V 4V	-6V
	E	-5.8V 3V	-5.8V 2V		-7V 2V	-5.8V 2V	-6.5V
Q108	C	120V 90V			120V 22V	120V 90V	120V
	B	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	E	-5.8V 4V			-5.8V 1V	-5.8V 4V	-5.8V
Q109	C	5V			10V		15V
	B	0.4V +1.5V -0.5V			0.4V +1.5V -0.5V	0.4V +1.5V -0.5V	0V
	E	0V GND					

TSTR		DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
Q201	C	-6V  8V				-7.5V	
	B	-10V  1.5V			-10V  1V	-7V	
	E	-10V  0.01V			-10V  0.1V	-7.6V	
Q202	C	 0V -5V			60Hz  0V -5V	0V	
	B	-7V  6V				-7.5V	
	E	-5V					
Q203	C	+14V  +15V -5V			14.5V  +15V -5V	+15V	
	B	14.5V  0.8V				14.5V	
	E	+15V					
Q204	C	12V 3V				12V	
	B	5.5V			7.2V	5.5V	
	E	5V  2.5V			6.5V 2.5V	5V	
Q205	C	+15V					
	B	3V 5V				0V	
	E	5V 2.5V			6.5V 2.5V	5V	
Q206	C	+15V					
	B	 +10V -5V				-5V	
	E	0V +13V			-2.3V 14V	-5.5V	
Q207	C	185V +196V -5V			95V +196V -5V	-5V	
	B	-5V 0.5V			-4.6V 0.5V	-4.4V	
	E	-5V					
Q208	C	 10V -5V				-5V	
	B	-5V  0.6V			-4.6V  0.6V	-4.3V	
	E	-5V					

IC-2	DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
1	0V					
2	-5V					
3	 0V -5V			60Hz  0V -5V	0V	
4	 -2V -5V				-2V	
5	 -2V -5V			 -2V -5V	-2V	
6	 0V -5V			 0V -5V	-5V	
7	-5V					
8	 0V -5V	0V	-5V	 0V -5V	-5V OR 0V	
9	 0V -5V	-5V	0V	 0V -5V	-5V OR 0V	
10	0V		-5V	0V		
11	 -2V -5V			 -2V -5V	-2V	
12	0V -5V	0V	-5V	0V -5V	-5V OR 0V	
13	0V	-5V	0V			
14	0V					

SCHEMATIC NOTES

1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; Capacitance values smaller then 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries (μH).

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 terminal numbering of rotary switches is for reference only.

4. All voltages indicated are measured under the following conditions:

   a. Use of an 11 megohm input impedance VTVM.

   b. Tuner Input: None

   c. Preamp Input: 10 MV rms, 1kHz (Left & Right)

   d. Power Amp Input: None

   e. Controls At:

Sweep:	Fully clockwise	Filter:	Out
Vertical:	Center	Trigger Source:	Left
Horizontal:	Center	Trace Separation:	Normal
Intensity:	Normal	Sweep Expansion:	Normal (X1)
Power Level:	Preamp	Trim:	Fully clockwise
Gain:	Fully clockwise	Sweep Frequency:	20 - 200
Level Mode:	Normal		

   Mode Selector: Refer to "Voltage and Waveform" chart for voltages at PC Board, transistor and IC pins. Voltages change with the positions of the mode selector pushbutton switch. Voltages that are not affected by the mode selector are on the schematic diagram.

   All voltages are D.C. except those shown with an A.C. signal. If a pin has both a D.C. voltage and an A.C. signal the D.C. voltage is written first.

5. The voltages shown are typical and will not necessarily be the same for every unit. Variations of ±25% are not unusual.

6. In units with Serial No's below AF2175 R57 & R58 are 1K; R131 is 220K and C103 is .022μF.

7. In units with Serial No's below AF1588 C103 is .22μF; R201 is 33K and R202 is 500K.

All par
able fr

Replace
by PART

Symbol Number
C1,2
C3,4
C9,10
C11,12
C13,14
C15
C103
C201
C202
C206
C207
C208,209
C210
C211
C301
C302,303
C304
C305
C306,307
C308
C310,311
C312
C314
C315
D1,2
D3,4
D5,6
D7,8
D9,10
D11,12
D13,14

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
C1,2	Mylar	.22μF	200V	064-043
C3,4	Elect	47μF	16V	066-182
C9,10	Tant Elect	1μF	50V	066-242
C11,12	Elect	100μF	16V	066-226
C13,14	Elect	47μF	16V	066-182
C15	Elect	10μF	50V	066-222
C103	Mylar	.22μF	250V	064-068
C201	Elect	10μF	50V	066-222
C202	Elect	100μF	16V	066-226
C206	Elect	470μF	6V	066-197
C207	Mylar	1μF	250V	064-088
C208,209	Mylar	.1μF	250V	064-067
C210	Mylar	.01μF	250V	064-101
C211	Elect	10μF	50V	066-221
C301	Paper	.33μF	1000V	064-109
C302,303	Paper	.1μF	1600V	064-110
C304	Elect	16μF	350V	066-196
C305	Mylar	.1μF	250V	064-067
C306,307	Elect	470μF	40V	066-134
C308	Elect	470μF	40V	066-134
C310,311	Elect	100μF	16V	066-226
C312	Paper	.33μF	1000V	064-109
C314	Mylar	.1μF	200V	064-067
C315	Elect	47μF	16V	066-182

DIODES

D1,2	Light emitting diode		070-056
D3,4	Light emitting diode		070-056
D5,6	Light emitting diode		070-056
D7,8	Light emitting diode		070-056
D9,10	Light emitting diode		070-056
D11,12	Si. signal diode		070-047
D13,14	Si. signal diode		070-047
D15,16	Si. signal diode		070-047
D17,18	Si. signal diode		070-047
D19	Si. signal diode		070-047
D21	Zener diode	10V	070-024
D101	Si. signal diode		070-047
D201,202	Si. signal diode		070-047
D203	Si. signal diode		070-047
D204	Zener diode	4.7V	070-057
D205,206	Si. signal diode		070-047
D301,302	Diode	2000V	070-058
D303	Diode	800V	070-059
D302,305	Zener diode	200V	070-060
D306,307	Zener diode	200V	070-060
D308	Zener diode	200V	070-060
D309	Bridge Rectifier		070-044
D310	Zener diode	75V	070-025
D311	Zener diode	120V	070-062
D312,313	Zener diode	15V	070-061
D314	Si. signal diode		070-047

TRANSISTORS

Q1,2	Si. PNP transistor		132-100
Q3,4	Si. PNP transistor		132-096
Q5	Si. NPN transistor		132-092
Q101,102	Si. PNP transistor		132-100
Q103,104	Si. PNP transistor		132-100
Q105,106	Si. NPN transistor		132-102
Q107,108	Si. NPN transistor		132-102
Q109	Si. NPN transistor		132-090
Q201,202	Si. NPN transistor		132-092
Q203	Si. PNP transistor		132-096
Q204,205	Si. NPN transistor		132-092
Q206	Si. NPN transistor		132-092
Q207	Si. NPN transistor		132-102
Q208	Si. NPN transistor		132-042
Q301	Si. NPN transistor		132-102

FUSES

F301	Fuse	1/2A	089-009

POTENTIOMETERS

R27	Signal strength control	134-252
R28	Deviation control	134-252
R29	Audio trim control	134-252
R30	Audio trim control	134-252
R33	Gain control	134-251

R71	Trace separation control	134-219
R109	Vertical control	134-244
R110	Horizontal control	134-244
R233	Sweep control	134-250
R229	Sweep expansion control	134-219
R314	Intensity control	134-248
R315	Focus control	134-249
	SWITCHES	
S1	Speaker impedance	148-033
S2	Multipath polarity	148-032
S3	Lo Pass filter	148-031
S4	Power level switch	146-161
S5	Level mode	148-034
S101	Trigger source	148-033
S102	Mode selector	150-011
S301	Reticle illumination	148-031
	TRANSFORMERS	
T301	Power transformer	159-091
	TUBES	
V301	Cathode ray tube	165-062
	INTEGRATED CIRCUITS	
IC1	Integrated circuit	133-007
IC2	Integrated circuit	133-008
	LAMPS	
#1866	Front panel	058-014
#1866	Reticle illumination	058-014
	FRONT PANEL & TRIM	
	Front panel	044-439
	Front panel end caps	018-160
	Sweep knob	044-429
	Horizontal knob	044-429
	Vertical knob	044-429
	Intensity knob	044-429
	Power level knob	044-429
	Gain knob	044-430
	Focus knob	090-122
	trace separation knob	090-121
	Sweep expansion knob	090-121
	Signal strength knob	090-121
	Audio trim knob	090-121
	Pushbutton	017-128

MISCELLANEOUS ITEMS	
Plastic feet	017-156
Shipping carton	044-538
Push terminal strip	074-030
Owners manual	038-788
AC line cord	170-021
Fuse holder	170-033
Audio cable	176-135
MOUNTING SYSTEM	
Shelf bracket (right)	043-622
Shelf bracket (left)	043-623
Mounting template #100	038-179
Hardware package	044-440
MODULES	
LDR Network	144-042