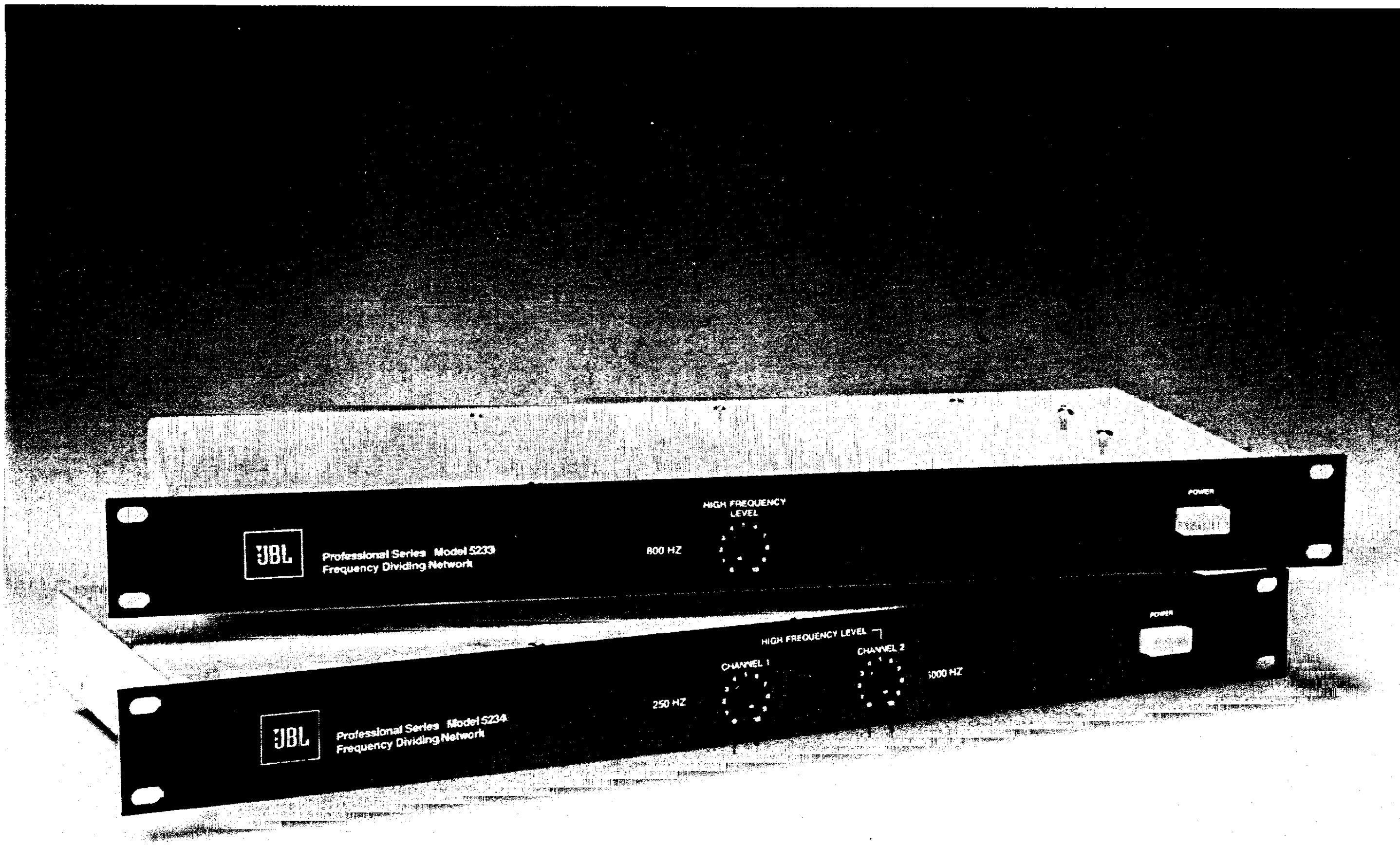
Professional Series

Installation and Service Manual

Electronic Frequency Dividing Networks

5233 Single Channel
5234 Dual Channel



OWNER'S INSTRUCTIONS

WARNING —
To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

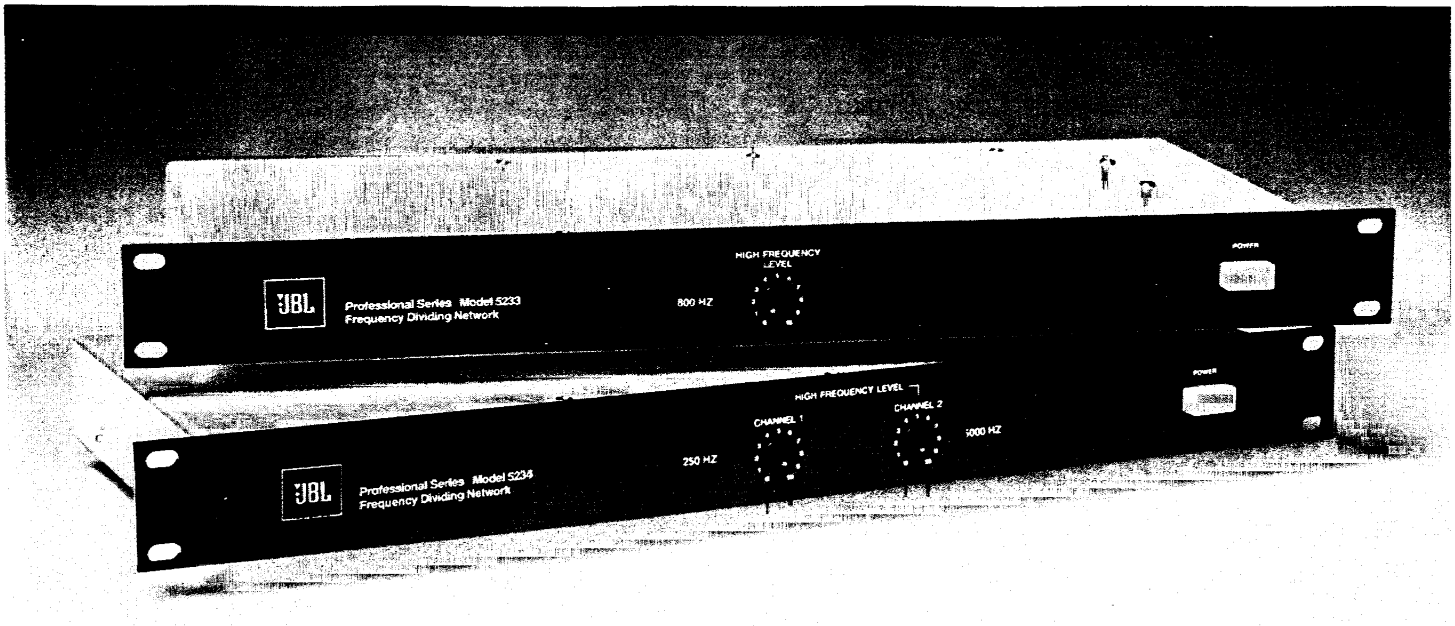
Specifications

Gain	0 dB in the passband
Rated Output	6.2 V (+18 dB ref. 0.775V)
Distortion	Less than 0.5% THD, 20-20,000 Hz at rated output Less than 0.2% THD, 20-20,000 Hz at +10 dB ref. 0.775 V
Frequency Response	±0.5 dB, 20-20,000 Hz
Crossover Frequency	Selectable by plug-in module, 3 dB crossover point ±10%
Filter Slope	12 dB or 18 dB per octave
Input Impedance	Greater than 50 kΩ
Load Impedance	600 Ω or greater
Output Impedance	47 Ω
Channel Isolation	Greater than 60 dB, 20-20,000 Hz
Signal/Noise Ratio	Greater than 90 dB, 20-20,000 Hz equivalent bandwidth
Controls	High Frequency Level (each channel) Power Supply Voltage Select
Power Requirement	5 W 120/240 V AC, 50/60 Hz
Operating Temperature	Up to 55°C (132°F)
Dimensions	44 mm x 483 mm x 194 mm deep 1¾ x 19 x 7⅝ in deep
Mounting	1 EIA standard rack space
Panel Finish	Semi-gloss non-glare baked enamel, dark gray
Net Weight	1.8 kg (4 lb) either unit with accessory crossover card(s) installed.
Shipping Weight	3.0 kg (6.5 lb) either unit

Accessories

Crossover Cards	51-5130	Blank Card, Unloaded 18 dB/Octave
(one required	51-5132	500 Hz 18 dB/Octave
per channel)	51-5133	800 Hz 18 dB/Octave
	52-5120	Blank Card, Unloaded 12 dB/Octave
	52-5121	250 Hz 12 dB/Octave
	52-5122	500 Hz 12 dB/Octave
	52-5123	800 Hz 12 dB/Octave
	52-5124	1200 Hz 12 dB/Octave
	52-5125	5000 Hz 12 dB/Octave
	52-5127	7000 Hz 12 dB/Octave
	52-5140	For 4343 and 4350 Studio Monitors

JBL continually engages in research related to product improvement. New materials, production methods and design refinements are introduced into existing products without notice as a routine expression of that philosophy. For this reason, any current JBL product may differ in some respect from its published description but will always equal or exceed the original design specifications unless otherwise stated.



Owner's Instructions

The 5233 and 5234 are designed for use with studio monitor or sound reinforcement loudspeaker systems where bi-amplification or tri-amplification is desirable. The 5233 (single channel) and 5234 (dual channel) feature differential high impedance inputs, unity gain in the passband, and unbalanced low impedance outputs. The 5233 will provide a single channel crossover. The 5234 provides two separate channels with independent crossover action (as in a stereo installation).

The power switch and pilot light for the unit and a high frequency level control for each channel are located on the front panel for easy access. The crossover frequency at which each channel is operating is indicated through a front panel window. A voltage change switch is located on the rear panel. Either model can be mounted in one EIA standard rack space.

Crossover cards are available for most commonly used frequencies. Filter slopes are 12 dB or 18 dB per octave with high and low frequency output attenuated 3 dB at the crossover point. Cards are also available with the specific crossover characteristics required for the JBL 4343 or 4350 bi-amplified studio monitors. In addition, blank cards can be obtained for construction of crossover networks for other frequencies.

Installation

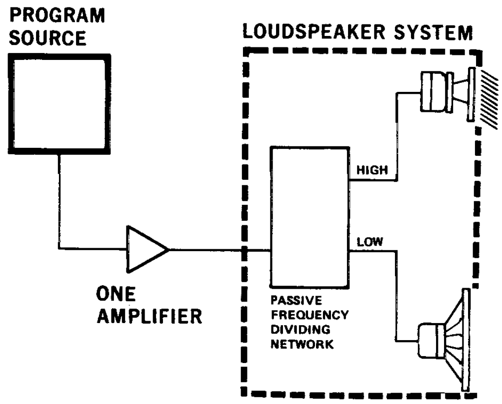
The electronic frequency dividing network receives the program signal from a line level source—preamplifier, studio console, or portable mixer—and separates the signal into high and low frequency bands. Outputs from the network feed the appropriate power amplifiers, which in turn drive their respective loudspeaker system components. Input connections may be balanced or unbalanced, output connections are unbalanced; shielded cable is required. If output cable lengths are greater than 4.5 to 6 m (15 to 20 ft), isolation transformers (600 Ω: 600 Ω) are recommended at each output to reduce the possibility of radio frequency interference or hum. The outputs can deliver +18 dB (6.2 V into 600 Ω) and will drive the line inputs of conventional amplifiers. Two or more power amplifiers can be driven from each output.

The 5234 dual channel network can be used to tri-amplify a loudspeaker system by connecting the low frequency output of channel 2 to the input of channel 1. (Twist two unshielded wires together or use shielded cable for this connection.) The channel 1 outputs can then be used to drive the midrange and low frequency amplifiers. Typical installations are diagrammed in Figure 1.

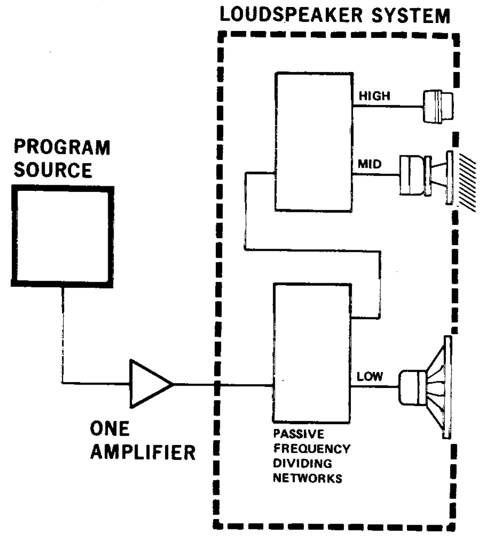
Whenever a midrange or high frequency driver is connected directly to a power amplifier, a series capacitor is recommended to attenuate unwanted low frequency "on-off" switching transient signals which can damage the driver.

It is possible to construct a system using an electronic low frequency transition and a conventional passive network for the midrange or high frequency crossover. The JBL 4350 Studio Monitor, diagrammed in Figure 2, is such a system. If a pair of 4350s are to be used, a single 5234 can accommodate both systems. Note that the passive, high level frequency dividing networks used in all JBL studio monitors designed for bi-amplification already incorporate the required attenuation capacitors to protect the midrange and high frequency drivers.

Conventional Passive Networks

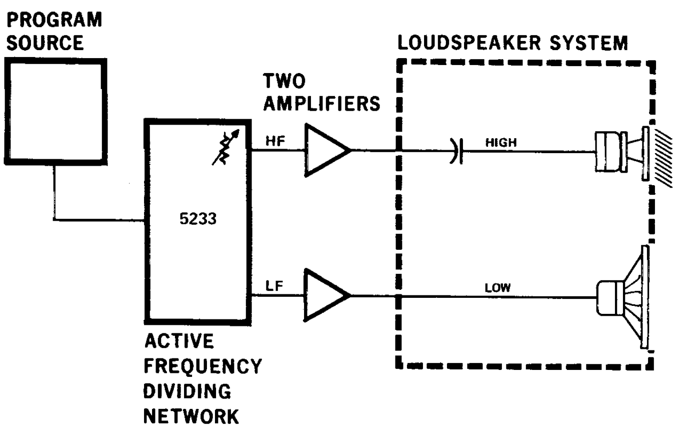


Two-Way System

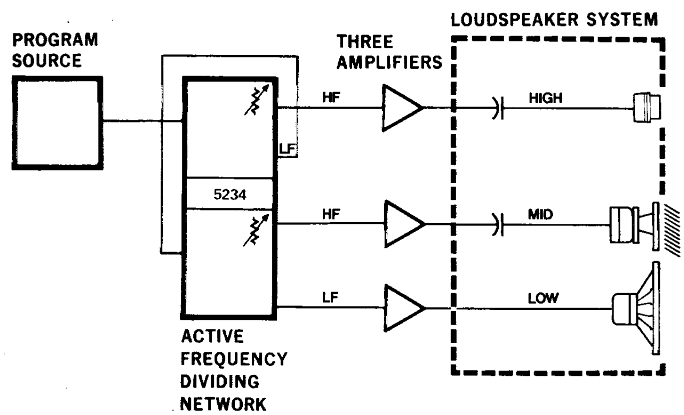


Three-Way System

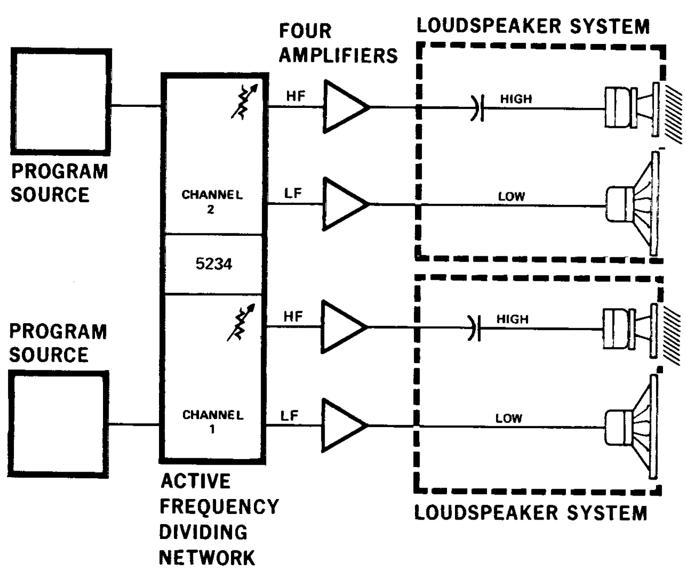
Electronic Networks



Two-Way System with Single Channel Active Crossover



Three-Way System with Dual Channel Active Crossover



Two Independent Two-Way Systems with Dual Channel Active Crossover

Figure 1. *Typical Installations of the 5233 and 5234 Compared to Conventional Passive Networks*

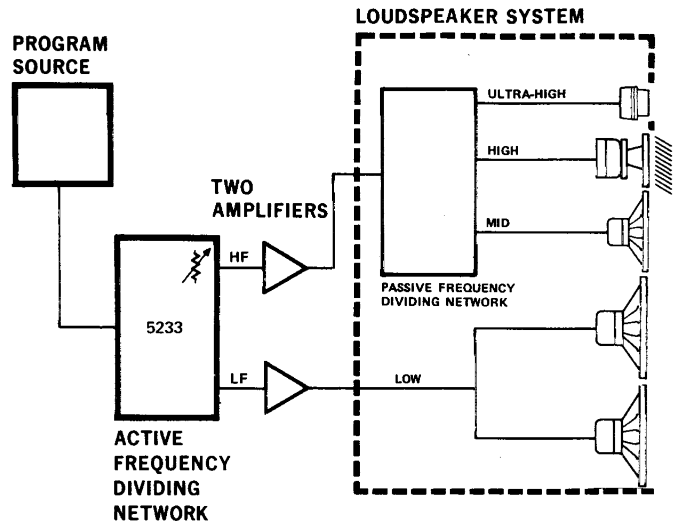


Figure 2. *Combining Electronic and Passive Frequency Dividing Networks*

Mounting

The 5233 or 5234 can be mounted in a single EIA standard rack space without additional bracing or ventilation. All external connections are made on the rear panel. Mounting hardware is supplied with each unit.

Connections

Shielded cable is necessary for all input and output connections. Make certain that the shield is properly connected, as shown in Figures 3 and 4.

Input connections—Inputs to the 5233 and 5234 are for a line level source, balanced or unbalanced. Screw terminals on the rear panel are provided for connection of each input and are clearly identified. Balanced connections are shown in color exchanging HI and LO conductors will result in phase reversal.

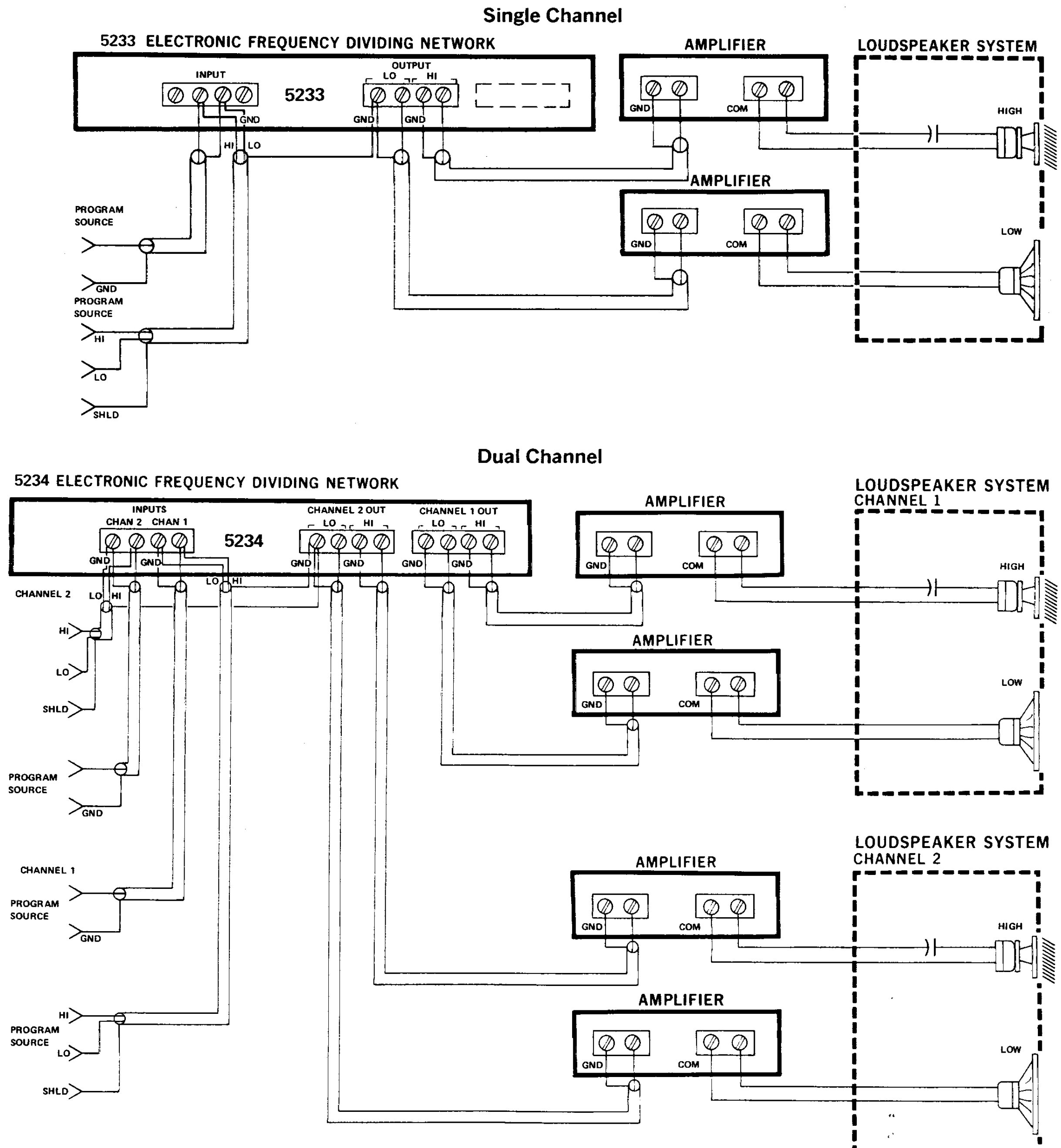


Figure 3. *Wiring Diagram for Bi-Amplification*

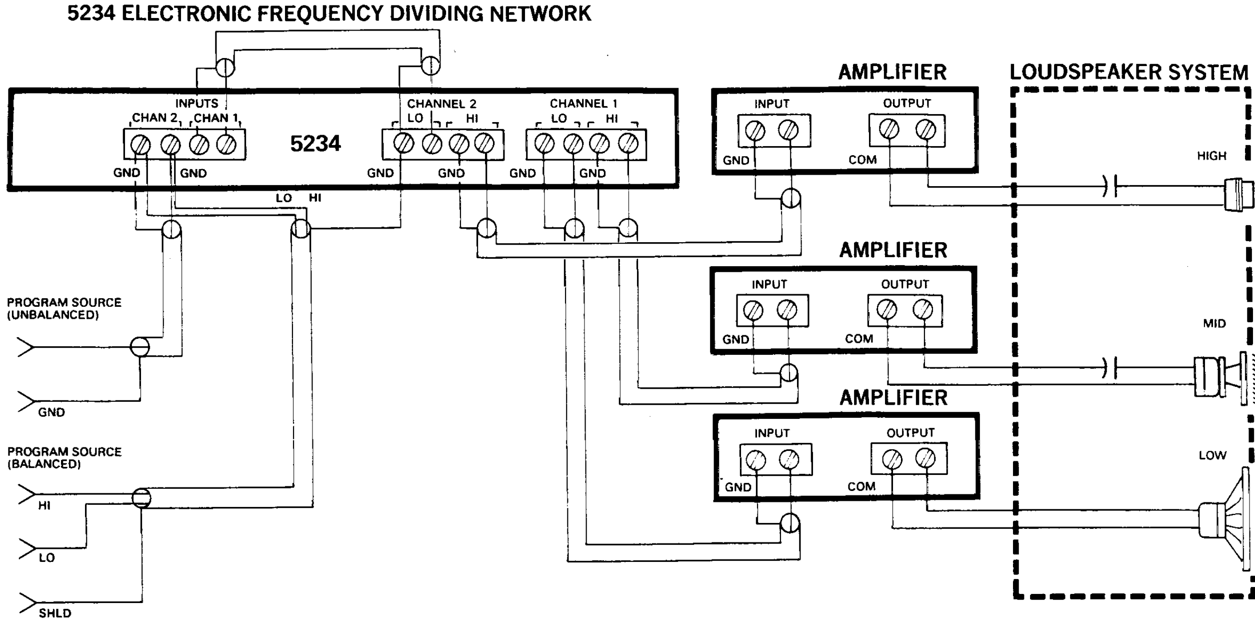


Figure 4. *Wiring Diagram for Tri-Amplification*
Shielded cable is necessary for all input and output connections, as shown. Make certain that the shield is properly connected to the ground terminal.

Output Connections—Each output channel can deliver 6.2 V into 600 Ω or greater (+18 dB ref. 0.775 V). A separate pair of screw terminals, located on the rear panel, is provided for the low and high frequency output of each channel. Outputs will drive the line input of any conventional amplifier. Typically, the impedance of a bridging input is at least 5 kΩ (usually 10 kΩ or more); therefore two or more power amplifiers can be driven by a single electronic frequency dividing network.

Operation

Verification of System Wiring

It is imperative that each output of the electronic frequency dividing network be properly connected. Inadvertent exchange of low and high frequency output connections—at the network, power amplifiers, or transducers—may result in severe damage to midrange or high frequency loudspeaker system components.

The following procedure should be followed for each program channel prior to operation.

1. With all power off, set the High Frequency Level control at "2" and adjust the program source level to minimum. (The source material may be wideband noise or music.) If the power amplifiers are equipped with level controls, adjust them to approximately one quarter power.

2. Turn on the program source, network, and amplifiers for the channel under test.

3. Gradually increase the program source volume level until audible. If the sound comes mainly from the mid-range or high frequency driver, shut power off immediately and check all wiring. If the low frequency loudspeaker produces bass, gradually advance the High Frequency Level control. Correct system wiring will be verified if the treble component of the program material increases in level while coming simultaneously from the midrange and high frequency drivers.

Transducer Phasing

One important factor in the natural sound character of a loudspeaker system is the phase relationship of the transducers for an octave below and above each crossover frequency. Two suitable methods for establishing proper phase of the components in a two-way system are described in the following paragraphs. Either one may be used, depending on the availability of test equipment. A three- or four-way system should be treated in a similar manner by first establishing the proper phase for the transducers of the low frequency transition and then progressing to the midrange, high frequency, or ultra-high frequency transducers, as applicable.

Objective Method—A real time third octave analyzer, condenser microphone, and a pink noise source can be used to establish proper phase of the loudspeaker system components as follows:

1. Using pink noise as program material, adjust system volume for comfortable listening and set the levels of the individual transducers to display flattest overall frequency response on the real time analyzer.

2. Reverse polarity of the high frequency driver and observe the effect on frequency response through the crossover region. Proper phasing of the transducers is indicated by the flattest frequency response through the crossover region as shown on the real time analyzer.

Subjective Method—If test instrumentation is not available, proper results can be obtained as follows:

1. Adjust volume level for comfortable listening and set approximate system balance using pink noise or the noise heard between stations of an FM tuner.

2. Listen to a recording of a male voice long enough to become accustomed to the performance of the loudspeaker system.

3. Reverse polarity of the high frequency loudspeaker, which will produce a change in voice character. When the transducers are properly phased, a recorded male voice should sound natural and exhibit presence (or an "up front" quality), in contrast to the undesirable "hollow" sound heard when transducers are out of phase.

Note: If the crossover frequency lies above 2 kHz, reversing polarity of the high frequency component will create little (if any) perceptible difference in system performance. The "correct" polarity in such a case will be that which yields the most natural quality with a variety of program material.

Once proper phase among the transducers of a loudspeaker system has been determined, other loudspeaker systems in the installation (assuming they are the same model) may be phased accordingly. If different loudspeaker systems are used, establish common phase among the low frequency drivers and follow the above procedures for each system.

Level Control Adjustment

In most instances, manufacturers of multi-amplified loudspeaker systems provide instructions for balancing levels of the individual drivers of the system. In the absence of formal instructions, or in the case of custom loudspeaker systems, balance can be established by adjusting levels to achieve the flattest response on a real time analyzer, as described above, or on the basis of subjective evaluation of familiar program material (or, more accurately, by using pink noise or the noise between FM stations) as described in the following paragraphs.

Each program channel should be adjusted individually; subjective evaluation should be made while seated in the normal listening location. If subjective analysis is to be used, and the power amplifiers are equipped with level controls, initially adjust the controls to one half of their full rotation and then regulate as necessary.

Subjective Adjustment of Bi-Amplified Systems—The following applies to a 5233 or to each channel of a 5234 used in dual channel bi-amplification.

1. With the High Frequency Level control at "0," adjust program source level for comfortable listening.

2. Rotate the network control clockwise until a satisfactory high frequency balance has been obtained in the program material. If necessary, trim source or amplifier levels.

Subjective Adjustment of Tri-Amplified Systems—When both channels of a 5234 are used for a tri-amplified loudspeaker system, it is generally installed so that the Channel 1 level control regulates the output of the midrange driver and the Channel 2 level control governs only the high frequency driver.

1. With both High Frequency Level controls at "0," adjust the source level for comfortable listening.

2. Rotate the Channel 1 level control clockwise until a satisfactory midrange level has been obtained in the program material. If necessary, adjust source or amplifier levels as appropriate.

3. Increase the Channel 2 level until a satisfactory high frequency balance has been obtained. It may be necessary to readjust midrange, source, or amplifier levels to achieve the most desirable overall balance of the loudspeaker system. Once high frequency and amplifier output levels have been established, readjustment is not generally needed. Some method of marking or locking the power amplifier level controls is recommended.

Service Instructions

The dividing networks are shipped with a 52-5120 crossover card with two 1000 ohm resistors installed in each channel, as in Figure 5. This card converts each channel into a one-input, two-output unity gain distribution amplifier. Two of these specially loaded cards will convert the 5234 to two independent direct amplifiers, each having one input and two outputs, or the network inputs can be paralleled to provide four outputs from a single source. The "high frequency" channel will be at unity gain when the level control is set at maximum. The control can be turned down if loss is desired.

The 52-5120 crossover card must be removed before installing the frequency selection card needed for the particular application. To install a new crossover card:

1. Place the 5233 or 5234 upside down on a soft surface, remove the two Phillips-head screws from either side of the case, and lift the bottom cover from the chassis.

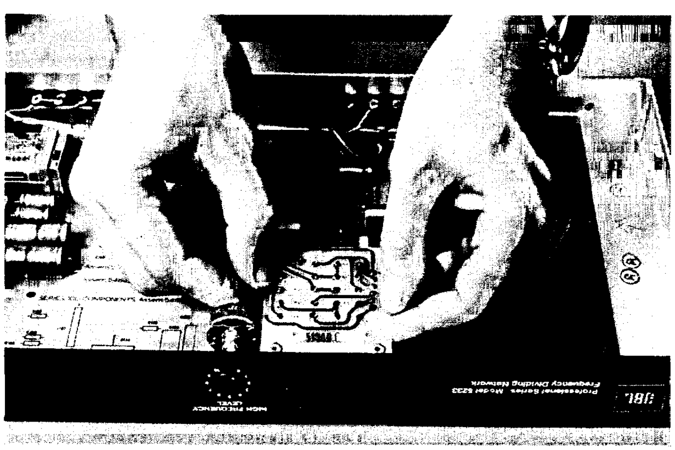
2. Remove the old crossover card by lifting gently.

3. Align the three holes in each new crossover card with the corresponding mounting pins on the main printed circuit board. The components on the card should face toward the chassis with the frequency designation label toward the front panel.

4. As the card is gently pressed against the mounting pin stops (roughly 6 mm, ¼ in), electrical connection will be made between the card connector and six pins on the printed circuit board.

5. Replace the bottom cover and secure it with the four screws. The unit is now ready for mounting and connection of the various inputs and outputs.

NOTE: Operation of the 5233 or 5234 without a crossover card will not damage the unit.



The crossover card is pressed on to mounting pins as shown. Note the use of two hands to maintain proper alignment for installation or removal of the card.

WARNING: This section of the manual contains service instructions for use by qualified service personnel only.

Voltage Conversion

The 5233 and 5234 can be operated from either a 100-120 V AC or 200-240 V AC, 50/60 Hz source. The SUPPLY VOLTAGE SELECT switch, S301, converts the unit from one operating voltage range to the other. Use the following procedures to convert the preamplifier to a different voltage range.

1. Disconnect the unit from the power source.

2. Slide the SUPPLY VOLTAGE SELECT switch to the appropriate line voltage range.

3. Change the line cord and attachment plug to match the power source receptacle or use a 120-to-240 V adapter (not provided). The attachment plug and/or line cord used for 240 V AC mode in the U.S. and Canada is U.L. listed and C.S.A. Certified. For use in other countries line cord selection should be based on local regulations governing 240 V AC 50/60 Hz supply source.

Table 1.
Voltage Wiring Code

	Switch S301 Terminal 1	Switch S201 Terminal 1	Ground, E401
U.S.A.	Black	White	Green
Europe	Blue	Brown	Green/Yellow

CAUTION: This unit may be damaged if operated with the supply voltage select switch set incorrectly for the line voltage applied.

Blank Crossover Card Assembly

In addition to the standard crossover cards, circuits for other crossover frequencies may be assembled on blank crossover cards using standard components. Filter slopes (12 or 18 dB per octave) are identical to those of the standard crossover cards. The crossover frequency can be written on the card bracket and will appear through the front panel window of the network.

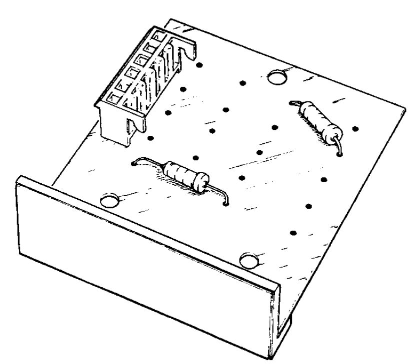


Figure 5. *Direct Amplifier Modification*
Using two 1 kΩ, ½ W, 10% resistors on a 52-5120 blank crossover card as shown, and installing the card, will convert a crossover channel to a unity gain amplifier having one input and two outputs.

Table 2.
12 dB/Octave
Blank Crossover Card
Component Values

Resistors are all ¼ W, 5% tolerance. Capacitors are all 5% tolerance, metalized polyester.

Crossover Frequency (Hz)	Capacitors C1'-C5' (μF)	Resistors R1'-R5' (kΩ)
50	.22	10
70	.22	7.5
100	.22	4.7
200	.12	4.7
300	.082	4.7
400	.055	5.1
600	.039	4.7
700	.032	5.1
900	.027	4.7
1100	.022	4.7
1500	.012	6.2
2000	.012	4.7
2500	.0082	5.6
3000	.0068	5.6
3500	.0068	4.7
4000	.0056	5.1
4500	.0039	6.2
5500	.0033	6.2
6000	.0033	5.6
6500	.0033	5.1
7500	.0027	5.6
8000	.0027	5.1
8500	.0012	11
9000	.0022	5.6
9500	.0012	10
10000	.0022	5.1

The component values for other crossover frequencies can be calculated using the formula $RC = \frac{0.1125}{F}$ where R is the resistance in kΩ, C is the capacitance in μF, and F is the frequency in Hz. The recommended minimum value for R is 4.7 kΩ.

WARNING: This section of the manual contains service instructions for use by qualified service personnel only.

Table 3.
18 dB/Octave
Blank Crossover Card
Component Values

Resistors are all ¼ W, 5% tolerance. Capacitors are all 5% tolerance, metalized polyester.

Crossover Frequency	Capacitors	Resistors
30 Hz (High Pass Only)	C1'-N/A C2'-N/A C3'-N/A C4'-.33 μF C5'-.33 μF C6'-.33 μF	R1'-N/A R2'-N/A R3'-N/A R4'-11 kΩ R5'-4.3 kΩ R6'-75 kΩ
250 Hz	C1'-.015 μF C2'-.39 μF C3'-.022 μF C4'-.039 μF C5'-.039 μF C6'-.039 μF	R1'-5.6 kΩ R2'-5.6 kΩ R3'-5.6 kΩ R4'-12 kΩ R5'-4.7 kΩ R6'-82 kΩ
500 Hz	Same as JBL Crossover Card 51-5132. See Table 5. for values.	
800 Hz	Same as JBL Crossover Card 51-5133. See Table 5. for values.	
1200 Hz	C1'-.039 μF C2'-.10 μF C3'-.0056 μF C4'-.0082 μF C5'-.0082 μF C6'-.0082 μF	R1'-4.7 kΩ R2'-4.7 kΩ R3'-4.7 kΩ R4'-12 kΩ R5'-4.7 kΩ R6'-82 kΩ
5500 Hz	C1'-.0068 μF C2'-.018 μF C3'-.001 μF C4'-.0018 μF C5'-.0018 μF C6'-.0018 μF	R1'-5.6 kΩ R2'-5.6 kΩ R3'-5.6 kΩ R4'-12 kΩ R5'-4.7 kΩ R6'-82 kΩ
8000 Hz	C1'-.0056 μF C2'-.015 μF C3'-820 pF C4'-.0012 μF C5'-.0012 μF C6'-.0012 μF	R1'-4.7 kΩ R2'-4.7 kΩ R3'-4.7 kΩ R4'-12 kΩ R5'-4.7 kΩ R6'-82 kΩ

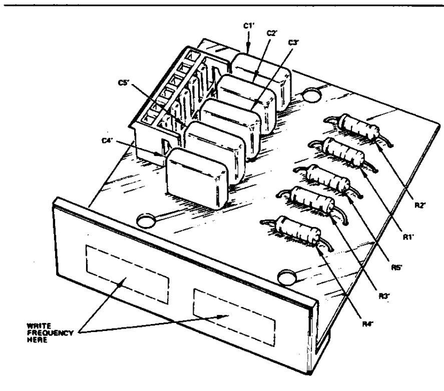


Figure 6. *12 dB/Octave Blank Crossover Card (JBL Model 52-5120)*
Component values for the various frequencies are listed in Table 2. Components should rest against the printed circuit board. Leads should be soldered and cut flush.

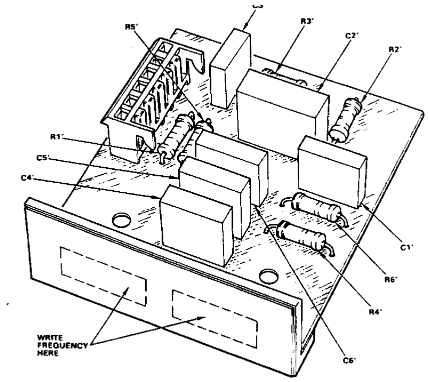


Figure 7. *18 dB/Octave Blank Crossover Card (JBL Model 51-5130)*
Component values for various frequencies are listed in Table 3. Components should rest against the printed circuit board. Leads should be soldered and cut flush.

Table 4.
JBL 12 dB/Octave Crossover Card Component Values

Model Number	Crossover Frequency (Hz)	Capacitors C1'-C5' (μF)	JBL Part Number	Resistors R1'-R5' (k Ω)	JBL Part Number
52-5121	250	.018	48481	24	35757
52-5122	500	.015	48480	15	35752
52-5123	800	.022	48482	6.2	35743
52-5124	1200	.0082	48947	11	35749
52-5125	5000	.0015	48927	15	35752
52-5127	7000	.0015	48927	11	35749
52-5140[1]		.018	48481	27[2]	10255

1. Crossover characteristics of the 52-5140 are tailored specifically for the 4343 and 4350 Studio Monitors.
2. R1' and R2' only. The value for R3', R4', and R5' is 22 kΩ, JBL part number 10944.

Table 5.
JBL 18 dB/Octave Crossover Card Component Values

Model Number	Crossover Frequency (Hz)	Capacitors (μF)	JBL Part Number	Resistors (kΩ)	JBL Part Number
51-5132	500	C1'-.082	48489	R1'-5.1	11461
		C2'-.22	48494	R2'-5.1	11461
		C3'-.012	48479	R3'-5.1	11461
		C4'-.033	48484	R4'-6.8	11604
		C5'-.033	48484	R5'-2.7	12817
		C6'-.033	48484	R6'-47	12260
51-5133	800	C1'-.056	48487	R1'-4.7	10074
		C2'-.15	53068	R2'-4.7	10074
		C3'-.0082	53052	R3'-4.7	10074
		C4'-.012	48479	R4'-12	10077
		C5'-.012	48479	R5'-4.7	10074
		C6'-.012	48479	R6'-82	12598

WARNING: This section of the manual contains service instructions for use by qualified service personnel only.

Driver Protection

Whenever a midrange or high frequency driver is connected directly to a power amplifier, a series capacitor is recommended to attenuate unwanted low frequency "on-off" switching transient signals which can damage the driver. Specific capacitor values are given in Table 6.

Table 6.
Maximum Values
for Low Frequency Attenuation Capacitors
(given in μF)

Crossover Frequency	Driver Impedance 4 Ω	8 Ω	16 Ω
250 Hz to 500 Hz	150	80	40
500 Hz to 5 kHz	80	40	20
Above 5 kHz	8	5	2

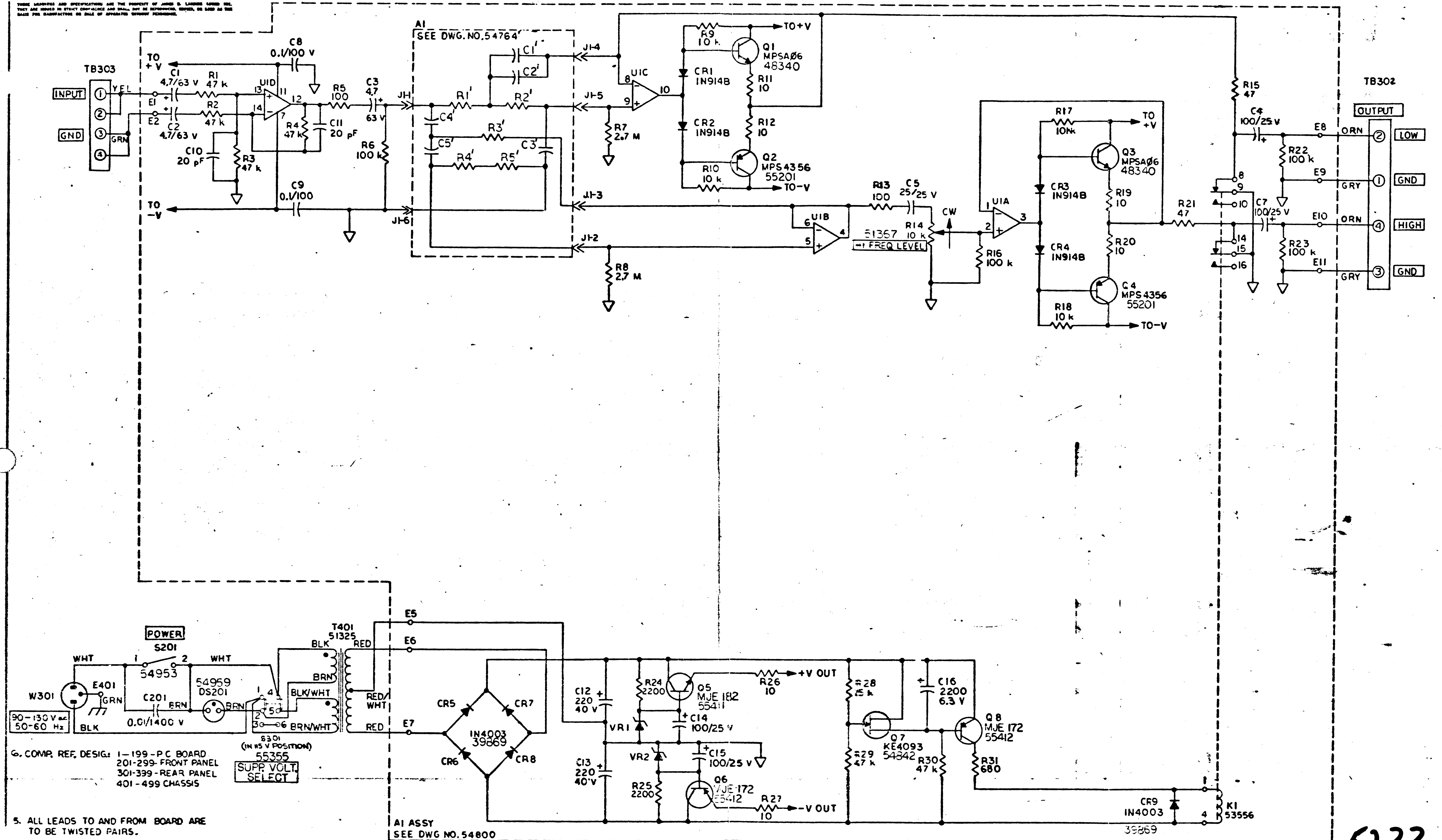
Capacitor working voltages should be at least 50 V. Do not use polarized electrolytic capacitors; paper or Mylar capacitors are acceptable. A 50 W resistor having a value of two to three times the rated impedance of the driver should also be connected across the driver terminals to shunt the reactive component of the driver's impedance below horn cutoff. These parts are available from electronic parts suppliers. A listing of capacitors that can be obtained from JBL is provided in Table 7. Note: Below the cutoff frequency of the capacitor, the power amplifier will be unterminated. If the power amplifier has an output transformer, a 20 W resistor equal to ten times the driver impedance should be installed across the amplifier output terminals.

Table 7.
Capacitors Available From JBL

The following 10% tolerance, non-polarized electrolytic capacitors are suitable for driver protection and may be ordered from a JBL professional products dealer or directly from JBL.

Value (μF)	JBL Part Number	For Optimum Results At 16 Ω	8 Ω	4 Ω
72	52938	275 Hz	550 Hz	1100 Hz
52	52939	400	750	1500
20	53881	1000	2000	4000
16.5	10358	1200	2500	5000
13.5	10359	1500	3000	6000
12	10434	1700	3500	7000
8	10391	2500	5000	10000
7	57529	3000	6000	11000
6	10296	3500	7000	13000
4	41040	5000	10000	–
3	11937	7000	13000	–

The optimum value cited above assumes that the capacitor is active at approximately one octave below the listed crossover frequency for minimum acoustical interference with crossover region performance. Smaller capacitor values may be required for additional protection in high-power reinforcement.



6. COMP. REF. DESIG: 1–199 - P.C. BOARD
201-299 - FRONT PANEL
301-399 - REAR PANEL
401-499 CHASSIS

5. ALL LEADS TO AND FROM BOARD ARE TO BE TWISTED PAIRS.

4. ZENER DIODES ARE 1N4746, 18 V, PART NO. 52225.

3. IC'S ARE TYPE 4136 NO. 52546.

2. ALL CAPACITOR VALUES IN μF.

1. ALL RESISTOR VALUES IN Ω, 1/4 W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

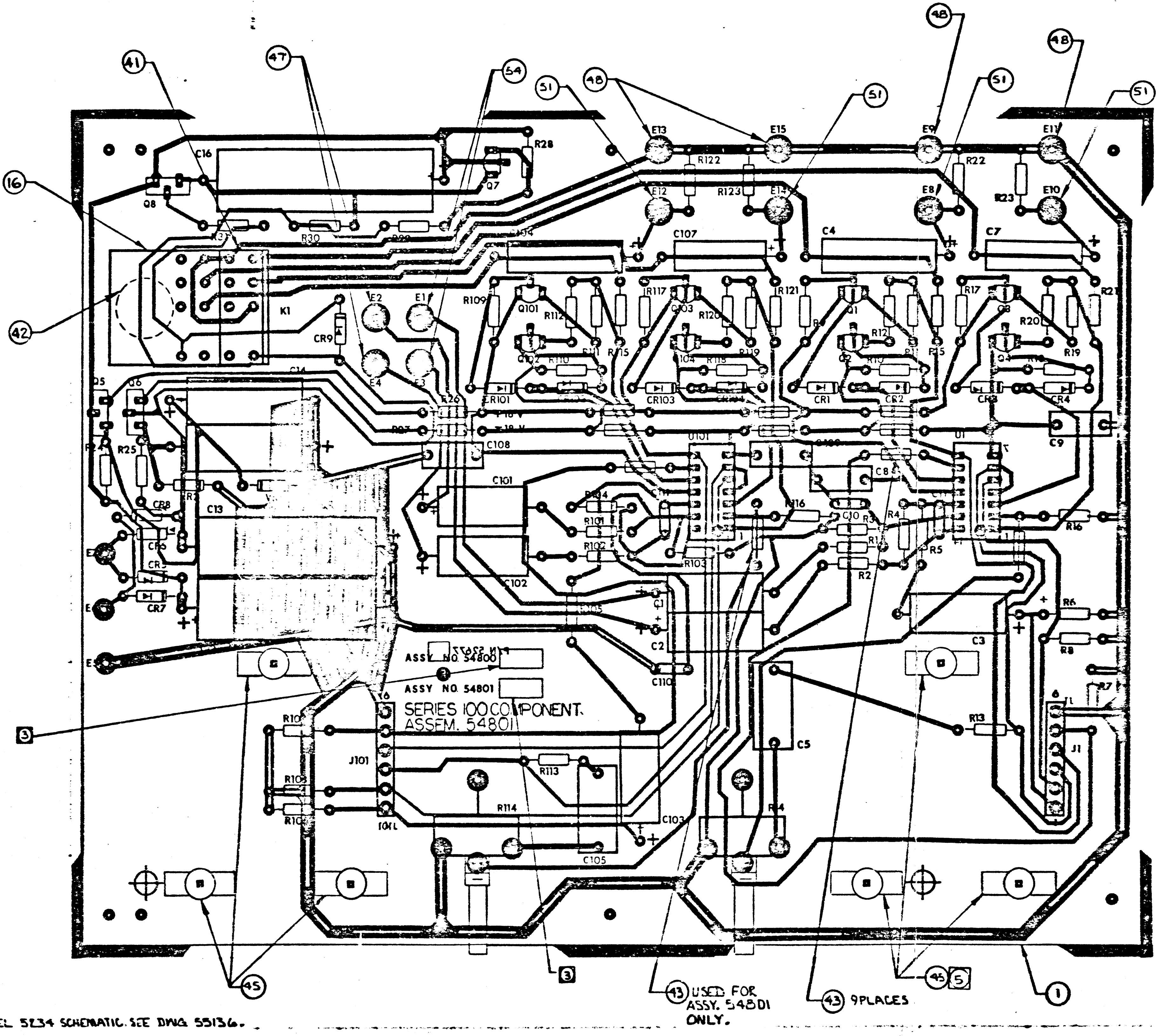
LAST REF. DESIG USED			
A1			TB303
C16	DS201	R31	TB401
	E11	S201	U1
C201	E401	S301	VR2
CR9	Q8	T401	W301

ELECTRONIC CROSSOVER - 5237

5233

ITEM	ASSY P/N	REV	DESCRIPTION	MODEL	APPL. NOTES
60	54800	E	P.C. BOARD. CROSSOVER	5233	3 5 8
61	54801	E	P.C. BOARD. CROSSOVER	5234	3 6 9

5233, 5234 PARTS LIST



ITEM	REF. DESIG.	PART NO.	DESCRIPTION	QTY USED ON ASSY. 54800	QTY USE ON ASSY. 54801	REMA
54		49405	WIRE - YEL - 3" - 22 GA.	1	2	MRD 4'
53						
52						
51		49360	WIRE - ORN - 5½" - 22 GA.	2	4	MRD 49400
50						
49						
48		49260	WIRE - GRY - 5½" - 22 GA.	2	4	MRD 49300
47		49205	WIRE - GRN - 3" - 22 GA.	1	2	MRD 49250
46						
45		51631	STANDOFF	3	6	
44						
43		51430	JUMPER 5/8"	9	10	
42		20537	FELT PAD	1	1	
41	XK1	54827	SOCKET, RELAY	1	1	
40						
39	VR1, 2	52225	ZENER 18 V. 1 W - IN4746	2	2	
38						
37	U1, 101	52546	I.C. QUAD AMPL RC4136DP	1	2	
36						
35	R31	36453	RES. 680 Ω. ¼ W. 5%	1	1	MRD 36409
34	R28	36485	15 kΩ.	1	1	
33	R24, 25	36465	2200 Ω.	2	2	
32	R15, 21, 115+121	36425	RES. 47 Ω. ¼ W. 5%	2	4	MRD 36409
31	R14, 114	51367	POT. 10 kΩ, LOG	1	2	
30	R11, 12, 19, 20, 26, 27, 111, 112, 119+120	36410	RES. 10 Ω. ¼ W. 5%	6	10	MRD 36409
29	R9, 10, 17, 18, 109, 110, 117+118	36481	10 kΩ,	4	8	
28	R7, 8, 107+108	36533	2.7 MΩ.	2	4	
27	R6, 16, 22, 23, 106, 116, 122+123	35621	100 kΩ,	4	8	
26	R5, 13, 105+113	35549	100 Ω,	2	4	
25	R1, 2, 3, 4, 101, 102, 103, 104, 29+30	36497	RES. 47 kΩ. ¼ W 5%	6	10	MRD 36409
24						
23	Q7	54842	TSTR - FET - N-CH - KE4093	1	1	
22	Q6, 8	55412	TSTR - PNP - MJE172	2	2	
21	Q5	55411	TSTR - NPN - MJE182	1	1	
20	Q2, 4, 102+104	55201	TSTR - PNP - 500 mW - MPS4356	2	4	
19	Q1, 3, 101+103	48340	TSTR - NPN - 500 mW - MPSA06	2	4	
18						
17						
16	K1	53556	RELAY 48 Vdc, 2500 Ω	1	1	
15	J1, 101	52599	CONN., P.C. 6 PIN	1	2	
14						
13	CR5, 6, 7, 8+9	39869	DIODE 200 PIV 1A IN4003	5	5	
12	CR1-CR4+101-104	52544	DIODE 75 PIV FR IN914B	4	8	
11						
10	C16	54840	CAP 2200 μF @ 6.3 V, ELEC.	1	1	MRD 36178
9	C12, 13	54839	220 μF @ 40 V, ELEC.	2	2	MRD 36178
8	C10, 11, 110+111	48433	20 pF. @ 500 V 5% MICA	2	4	MRD 48418
7						
6	C8, 9, 108+109	54998	0.1 μF @ 100 V	2	4	MRD 48417
5	C5, 105	11397	25 μF @ 25 V, ELEC	1	2	MRD 48417
4	C4, 7, 14, 15, 104+107	48504	100 μF @ 25 V, ELEC.	4	6	MRD 36178
3	C1, 2, 3, 101, 102+103	48141	CAP. 4.7 μF @ 6.3 V, ELEC.	3	6	MRD 36178
2						
1		52677	P.C. BOARD	1	1	

BILL OF MATERIAL 5233 5234

NOTES:

9 MODEL 5234 SCHEMATIC. SEE DWG 55136.

8 MODEL 5233 SCHEMATIC. SEE DWG 55135.

7. J.B.L. RESERVES THE RIGHT TO MAKE MINOR COMPONENT CHANGES WITHOUT NOTICE.

6 DELETED

5 3 OF ITEM 45 USED ON 5233 ASSY AS NOTED.

4 DELETED

3 INDICATE PERMANENT REVISION "LETTER" IN APPROPIATE REV. BLOCK OF ASSEMBLY NO.

2. CIRCUITRY SHOWN FOR REF ONLY. SEE ARTWORK FOR CORRECT PATTERN.

1. REFERENCE DESIGNATION NUMBERS IN 100 SERIES FOR ASSY. 54801 ONLY.

5233

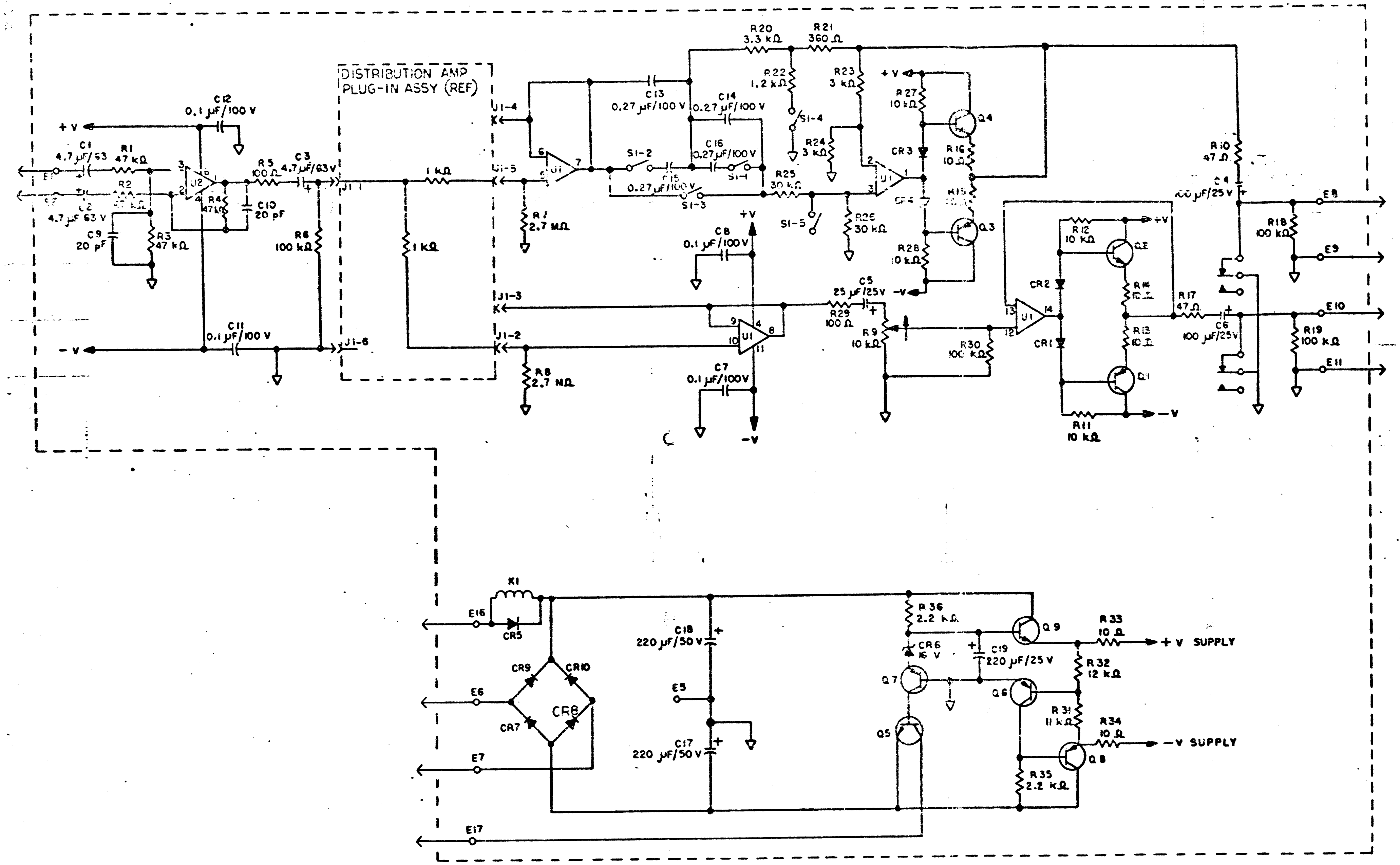
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TITLE: P.C. BOARD ASSY, CROSSOVER

D MRD 54800 E

REVISIONS

CHG	LTR	DESCRIPTION	DRFT	CHK	DATE	APPR
[illegible]	A	[illegible] PROTOTYPE RUN [illegible]				
E-0174	B	RELEASE FOR PRODUCTION			5-29-81	



5233 A

ITEM	PART NO.	DESCRIPTION	QTY	REMARKS
		BILL OF MATERIAL		PAGE 1 OF 2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES WITH INCH SIZES IN BRACKETS. BREAK SHARP EDGES 0.4 mm .016 inch

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMALS — ANGULAR
X.XXX ± 0.13 .005 inch
X.XX ± 0.25 .010 inch
X.X ± 0.5 .020 inch
FRACTIONAL U.S. DIMENSIONS ± 1/32

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE DRAWING

MATERIAL —
FINISH —
MODELS USED ON: 5233A, 5234A

DRAWN 9-10-80
CHECKED 12-2-80
DESIGN
ENGR
APPR

JAMES B. LANSING SOUND, INC.
A Harman International Company
Northridge California 91329 USA

TITLE: SCHEMATIC P.C. BOARD

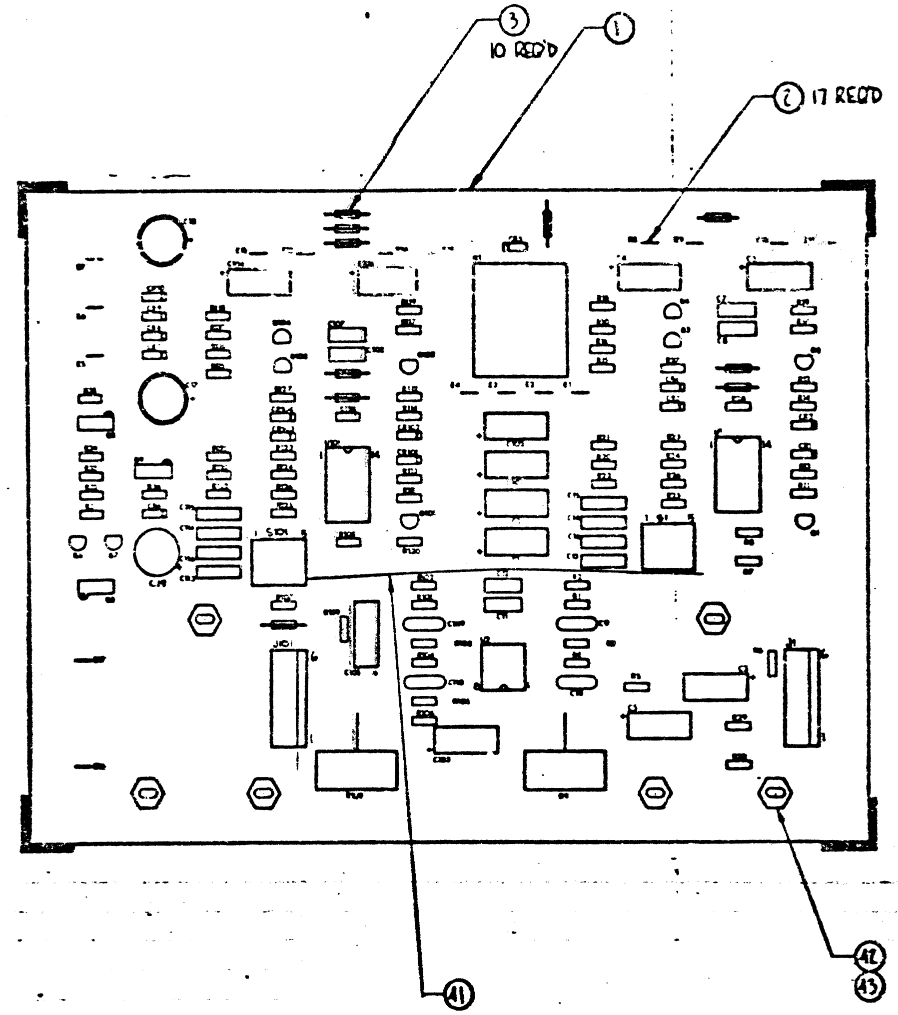
SIZE: A1 | DRAWING NO: 61294-01 | REV: B
SCALE — | SHEET 1 OF 1

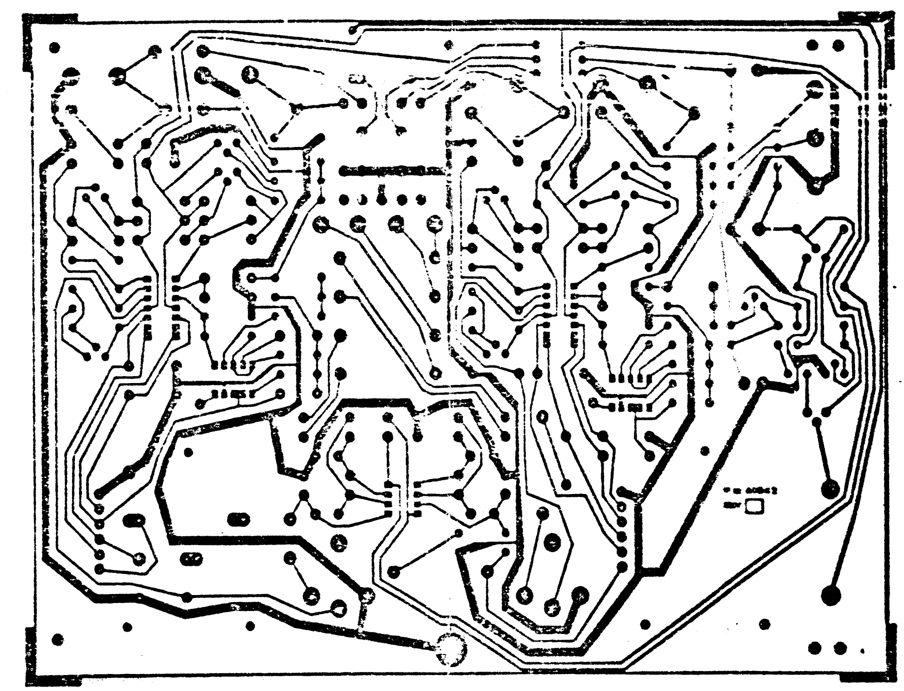
61294-01

NOTES: CH 2 is same as Ch 1 on 5234A

REVISIONS

CHG	LTR	DESCRIPTION	DRFT	CHK	DATE	APPR
X-0174	A	[illegible]	[illegible]	[illegible]	8 Oct 80	R Wagner
188 / E-0174	B	ADDED ITEMS 42, 43, NOTES 4, 5 AND PIN IDENT / RELEASE FOR PRODUCTION	[illegible]	[illegible]	5-21-8	[illegible]





wochirt.

5233 A

PAGE 2 OF 2

ITEM	PART NO.	DESCRIPTION		QTY	REMARKS
43	59848	SCREW, #6 X 3/8		6	
42	61647	STANDOFF, P.C. BOARD		6	
41	45679	JUMPER 22 AWG SOLID INSULATED	48800	1	[illegible]
40	48433	CAPACITOR	48418	4	C9,10,109,110
39	61322	RELAY		1	K1
38	61323	SWITCH		2	S1,101
37	61325	IC, TL082CP, DUAL OP AMP		1	U2
36	59028	IC TL074CN QUAD OP AMP		2	U1,101
35	61324	DIODE, ZENER 16 V, 1 W, 5%		1	CR6
34	39669	DIODE, (IN 4003)		5	CR5,7,8,9,10
33	52544	DIODE, PIV IN 914B		8	CR1,2,3,4,101,102,103,104
32	294745	SOLDER		A/R	
31	55412	TRANSISTOR		1	Q8
30	55411	TRANSISTOR		2	Q5,9
29	45340	TRANSISTOR		4	Q2,4,102,104
28	55201	TRANSISTOR		6	Q1,3,6,7,101,103
27	58730-2206	CAPACITOR, ELECTROLYTIC - 220 μF, 25 V	58730	1	C19
26	58725-2206	, ELECTROLYTIC - 220 μF, 50 V	58735	2	C17,18
25	59127	, MET. POLY - .27 μF, 100 V	48417	8	C13,14,15,16,113,114,115,116
24	54998	, MET. POLY - 0.1 μF, 100 V		6	C7,8,11,12,107,108
23	11397	, ELECTROLYTIC - 25 μF, 25 V		2	C5,105
22	48504	, ELECTROLYTIC - 100 μF, 25 V	36178	4	C4,6,104,106
21	48141	CAPACITOR, ELECTROLYTIC - 4.7 μF, 63 V		6	C1,2,3,101,102,103
20	36465	RESISTOR, CARBON FILM - 2200 Ω, 1/4 W, 5%	36409	2	R35,36
19	36483	12 KΩ,		1	R32
18	36482	11 KΩ,		1	R31
17	36410	10 Ω,		10	R3-6,33,34,113-116
16	36481	10 KΩ,		8	R11,12,27,28,111,112,127,128
15	36425	47 Ω,		4	R10,17,110,117
14	35549	100 Ω,		4	R5,29,105,129
13	36538	2.7 MΩ		4	R7,8,107,108
12	35621	RESISTOR, CARBON FILM - 100 KΩ, 1/4 W, 5%		8	R6,18,19,30,106,118,119,130
11	51367	POT, TRIM 10 KΩ		2	R9,109
10	58683-3002	RESISTOR, METAL FILM - 30 KΩ, 1/4 W, 2%	58683	4	R25,26,125,126
9	58683-3001	3 KΩ,		4	R23,24,123,124
8	58683-1201	1.2 KΩ,		2	R22,122
7	58683-3600	360 Ω,		2	R21,121
6	58683-3301	3.3 KΩ,		2	R20,120
5	58683-4702	RESISTOR, METAL FILM - 47 KΩ, 1/4 W, 2%		8	R1-4,101-104
4	52599	CONNECTOR PC - 6 PIN		2	J1,101
3	51430	JUMPER		10	
2	60285	TERMINAL, MALE		17	E1-17
1	61042	P.C. BOARD		1	

BILL OF MATERIAL

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. CIRCUITRY SHOWN FOR REF ONLY.
2. FOR SCHEMATIC SEE DWG 61295-01.
3. COMPONENT LEAD SPACING PER ESD 2002.
4. ALL COMPONENTS MAY BE FLOW SOLDERED.
5. ALL COMPONENTS EXCEPT K1 MAY BE CLEANED USING STANDARD VAPOR DEGREASER.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES WITH INCH SIZES IN BRACKETS

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONAL U.S. DIMENSIONS ± 1/32

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE DRAWING

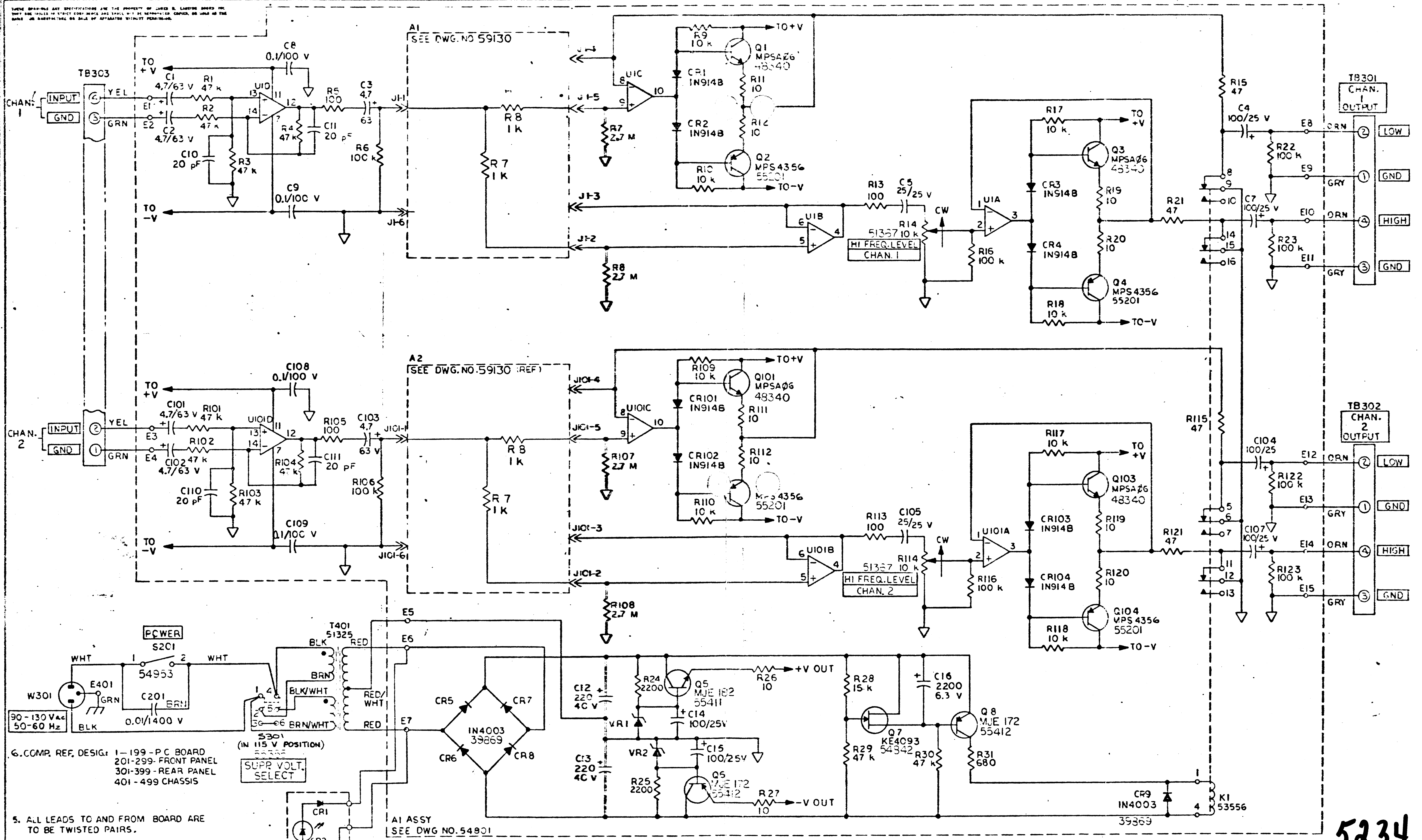
JAMES B. LANSING SOUND, INC.

P.C.B. ASSY, 5234 A

SIZE	DRAWING NO	REV
A1	61295	B

SCALE 1/1 SHEET 1 OF 1

61295



6. COMP. REF. DESIG: 1-199 - P.C BOARD
201-299 - FRONT PANEL
301-399 - REAR PANEL
401-499 CHASSIS

5. ALL LEADS TO AND FROM BOARD ARE TO BE TWISTED PAIRS.

4. ZENER DIODES ARE IN4746, 18 V, PART NO. 52225

3. IC'S ARE TYPE 4136 NO. 52546.

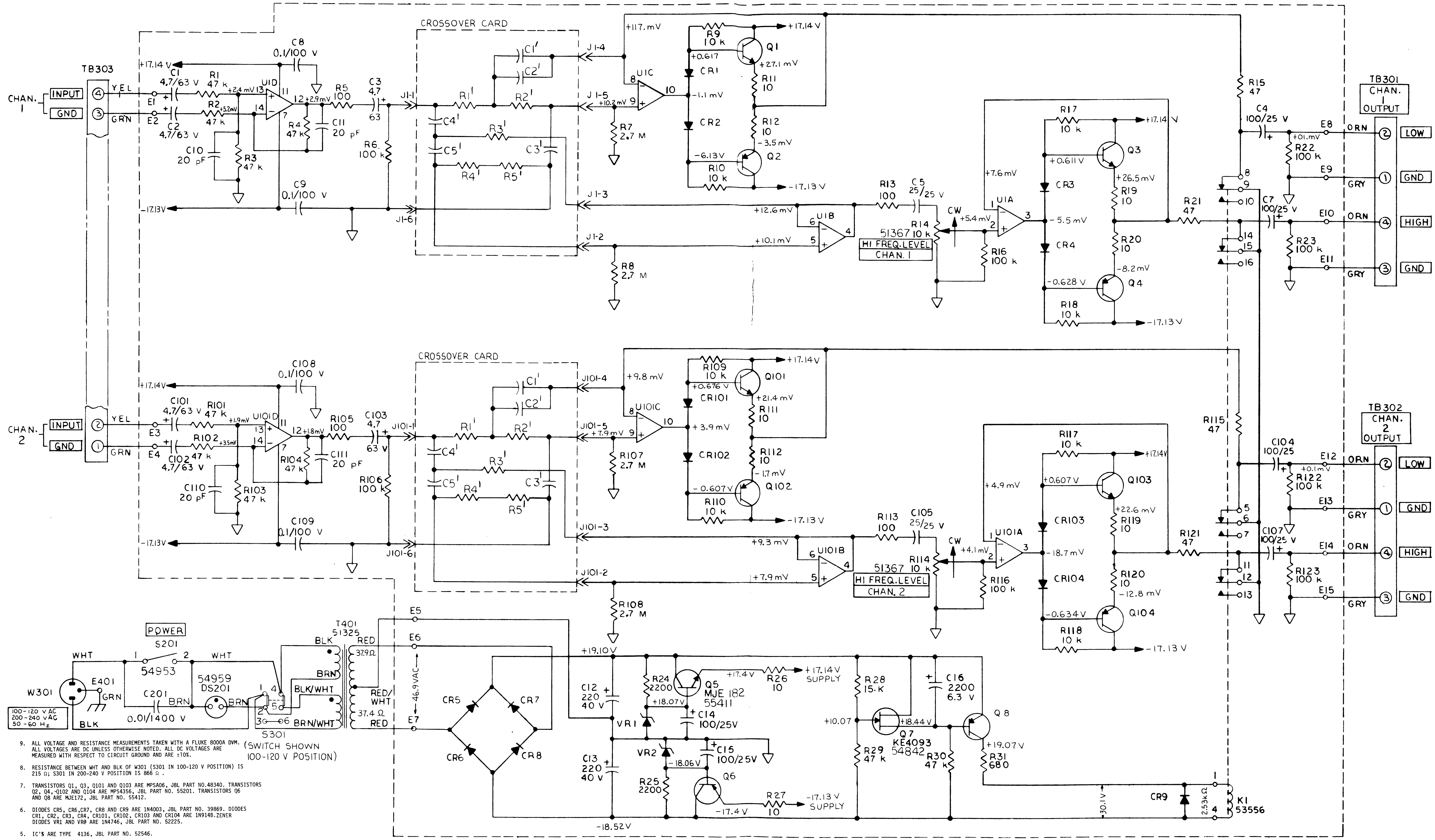
2. ALL CAPACITOR VALUES IN µF.

1. ALL RESISTOR VALUES IN Ω, 1/4 W, 5%

NOTES: UNLESS OTHERWISE SPECIFIED

LAST REF. DESIG USED				
A2	CR104	Q104	TB303	
C16	DS201	R31	TB401	E3 D
C111	E15	R123	U1	U101
C201	E401	S201	VR2	
CR9	Q8	T401	W301	

SCHEMATIC
ELECTRONIC CROSSOVER - 5234
SIZE D



9. ALL VOLTAGE AND RESISTANCE MEASUREMENTS TAKEN WITH A FLUKE 8000A DVM. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED. ALL DC VOLTAGES ARE MEASURED WITH RESPECT TO CIRCUIT GROUND AND ARE ±10%.

8. RESISTANCE BETWEEN WHT AND BLK OF W301 (S301 IN 100-120 V POSITION) IS 215 Ω; S301 IN 200-240 V POSITION IS 866 Ω .

7. TRANSISTORS Q1, Q3, Q101 AND Q103 ARE MPSA06, JBL PART NO.48340. TRANSISTORS Q2, Q4, Q102 AND Q104 ARE MPS4356, JBL PART NO. 55201. TRANSISTORS Q6 AND Q8 ARE MJE172, JBL PART NO. 55412.

6. DIODES CR5, CR6,CR7, CR8 AND CR9 ARE 1N4003, JBL PART NO. 39869. DIODES CR1, CR2, CR3, CR4, CR101, CR102, CR103 AND CR104 ARE 1N914B.ZENER DIODES VR1 AND VR@ ARE 1N4746, JBL PART NO. 52225.

5. IC'S ARE TYPE 4136, JBL PART NO. 52546.

4. ALL LEADS TO AND FROM CIRCUIT BOARD TO BE TWISTED PAIRS.

3. ALL CAPACITOR VALUES IN μF.

2. ALL RESISTOR VALUES IN Ω, 1/4 W, 5%.

1. JBL RESERVES THE RIGHT TO MAKE COMPONENT CHANGES WITHOUT NOTICE.

NOTES: UNLESS OTHERWISE SPECIFIED

James B. Lansing Sound, Inc.
8500 Balboa Boulevard, Northridge, California 91324

JBL SCHEMATIC OF 5234

50716 5233/34 6/78 PRINTED IN U. S. A.