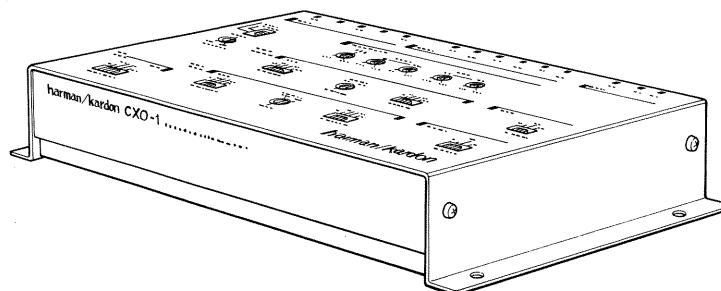


The Harman Kardon Model CXO-1

Manual 111A

ACTIVE CROSSOVER/SYSTEM CONTROLLER

Technical Manual



SPECIFICATIONS

		Nominal	Limit			Nominal	Limit
Input Sensitivity at 1V Output	: Front MID	1.0dBV	± 1.0dB	High Limit Filter Response	MID 6.3kHz	6.3kHz	- 3dB ± 1.5dB
	: Front HI	1.0dBV	± 1.0dB		MID 12.6kHz	12.6kHz	- 10dB ± 2dB
	: Rear MID	1.0dBV	± 1.0dB		MID 4kHz	4kHz	- 3dB ± 1.5dB
	: Rear HI	1.0dBV	± 1.0dB		MID 8kHz	8kHz	- 10dB ± 2dB
	: SUB STEREO	1.0dBV	± 1.0dB		MID 2.5kHz	2.5kHz	- 3dB ± 1.5dB
	: SUB MONO	1.5dBV	± 1.0dB		MID 5kHz	5kHz	- 10dB ± 2dB
Input Impedance	: Front	26kΩ	± 3kΩ		SUB 200Hz	200Hz	- 3dB ± 1.5dB
	: Rear	26kΩ	± 3kΩ		SUB 400Hz	400Hz	- 10dB ± 2dB
	: Rear BRGD	13kΩ	± 1.5kΩ		SUB 125Hz	125Hz	- 3dB ± 1.5dB
	: SUB	26kΩ	± 3kΩ		SUB 250Hz	250Hz	- 10dB ± 2dB
Signal-to-Noise Ratio	: Front MID	130dB	≥ 120dB		SUB 80Hz	80Hz	- 3dB ± 1.5dB
	: Rear MID	130dB	≥ 120dB		SUB 160Hz	160Hz	- 10dB ± 2dB
Channel Separation	: MID	70dB	≥ 67dB	SUB 50Hz	50Hz	- 3dB ± 1.5dB	
	: HI	73dB	≥ 70dB	SUB 100Hz	100Hz	- 10dB ± 2dB	
Maximum Output Level at 0.1% THD	: MID	1.9V	≥ 1.3V	200Hz Notch Filter Max. Reduction			9dB ± 2dB
	: HI	1.9V	≥ 1.3V	50Hz Boost	: Max. Boost		13dB ± 2dB
	: SUB STEREO	1.9V	≥ 1.3V	Power Supply	: DC + 13.8V (11V - 16V usable), negative ground		
	: SUB MONO	1.8V	≥ 1.3V	DIMENSIONS (W × H × D)	: 10-5/8" × 1-5/8" × 6-3/8" (270 × 42 × 162 mm)		
THD at 1V	: MID 20Hz	0.05%	≤ 0.18%	Weight	: 2.6 lbs. (1.2kg)		
	: 1kHz	0.013%	≤ 0.03%				
	: HI 20Hz	0.016%	≤ 0.03%				
	: 20kHz	0.01%	≤ 0.03%				
	: SUB STEREO	0.037%	≤ 0.06%				
	: SUB MONO	0.035%	≤ 0.06%				
Low Limit Filter Response	MID 80Hz	: 80Hz	- 3dB ± 1.5dB				
	MID 40Hz	: 40Hz	- 10dB ± 2dB				
	MID 125Hz	: 125Hz	- 3dB ± 1.5dB				
	MID 63Hz	: 63Hz	- 10dB ± 2dB				
	MID 200Hz	: 200Hz	- 3dB ± 1.5dB				
	MID 100Hz	: 100Hz	- 10dB ± 2dB				
	HI 6.3kHz	: 6.3kHz	- 3dB ± 1.5dB				
	HI 3.2kHz	: 3.2kHz	- 10dB ± 2dB				
	HI 4kHz	: 4kHz	- 3dB ± 1.5dB				
	HI 2kHz	: 2kHz	- 10dB ± 2dB				
	HI 2.5kHz	: 2.5kHz	- 3dB ± 1.5dB				
	HI 1.25kHz	: 1.25kHz	- 10dB ± 2dB				

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

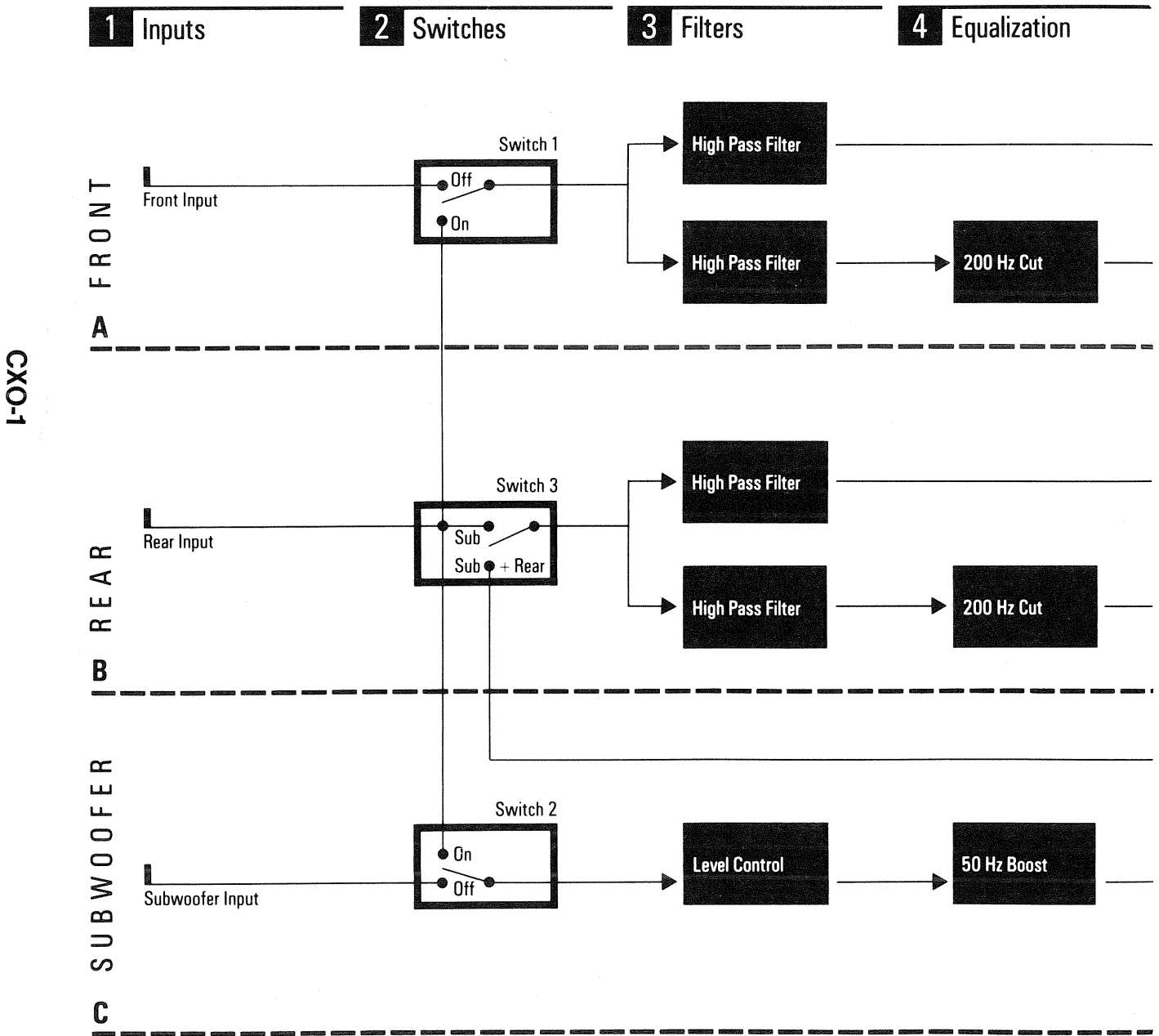
harman/kardon

240 Crossways Park West, Woodbury, N.Y. 11797
1112-3152111A5 P-088703 1200 Printed in Japan

HOW THE HARMAN KARDON CXO-1 WORKS

The Harman Kardon CXO-1 incorporates unique circuit features which make it different (and more useful) from any other autosound electronic crossover. In order to make full use of these special fea-

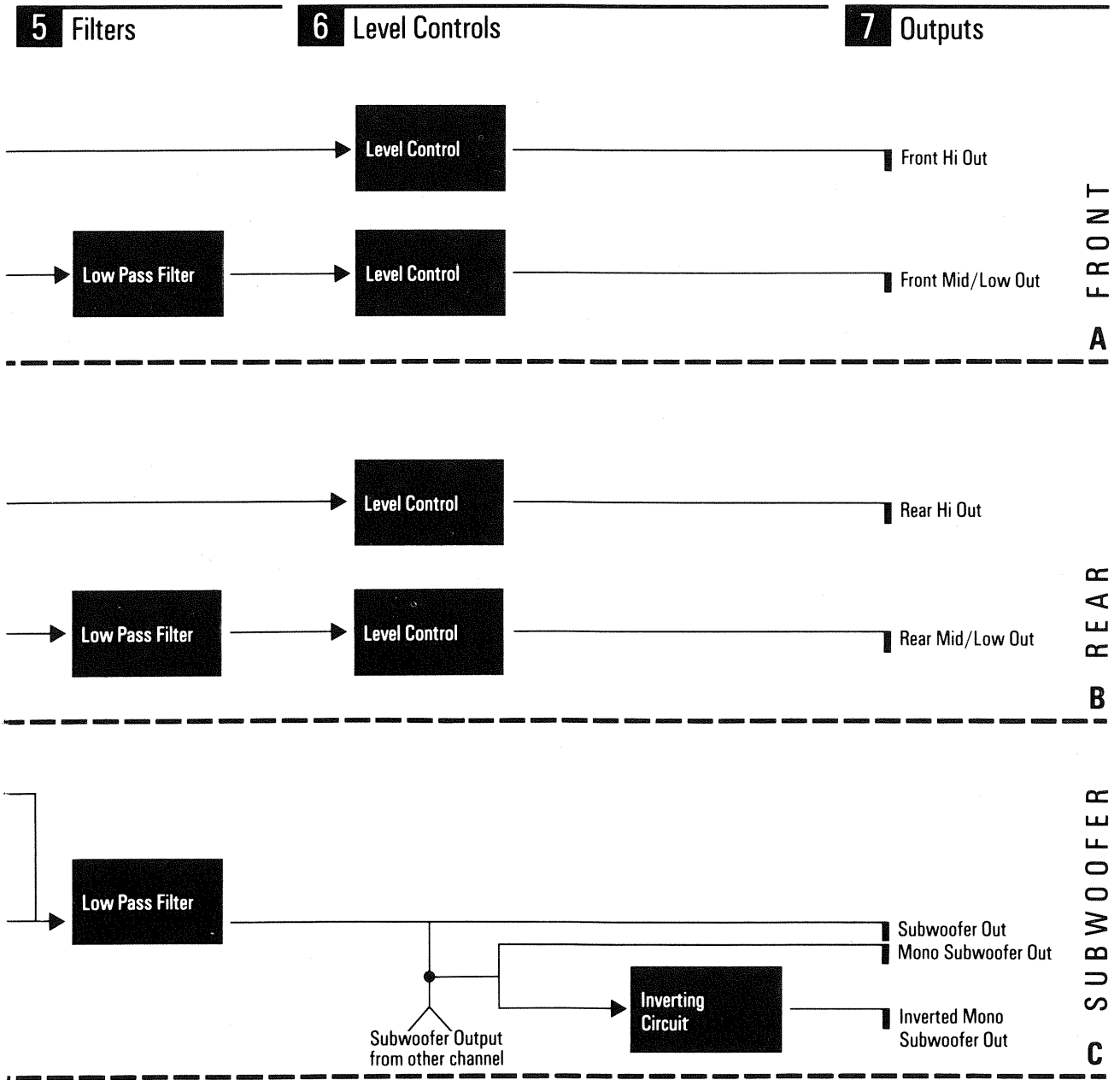
tures, you should become familiar with the CXO-1's operation by tracing the signal path through one channel in the following block diagram.



Harman Kardon CXO-1 block diagram

Don't be daunted by all the boxes and dotted lines. The signal path is relatively simple. You're really looking at three different electronic components: One each for front, rear and subwoofer speakers (labeled

A,B, and C in the block diagram). Each of these sections have many functions in common. These are labeled Parts 1-7.



The CXO-1 Section by Section

Let's start with Part 1, **Inputs**. Each channel of the Harman Kardon CXO-1 has inputs for front and rear speakers as well as a low bass subwoofer. Now, very few head end units have three sets of pre-amp outputs. How do you take advantage of the circuitry in all three Harman Kardon CXO-1 inputs?

By using Part 2, **Switches**. The two switches located between the CXO-1's input jacks allow you to route one or two inputs from the head unit to two or three sections of the CXO-1.

Switch 1 (located between FRONT INPUT and REAR INPUT) lets you send input only to the front speakers, or share the one input with front *and* rear speakers.

Switch 2 (located between REAR INPUT and SUB INPUT) routes input exclusively to the rear channel or share the one input with rear speakers *and* subwoofer.

Switch 3 (labeled SUB ONLY/SUB + REAR) will be covered farther on.

While they may seem complicated now when discussed in the abstract, you will soon see that these switches give you extreme flexibility, as well as the ability to easily add extra amps and speakers later on. Charts of switch settings are included in the next major section of this manual in conjunction with sample hook-ups.

Parts 3A and 3B, **High Pass Filters**, are circuits which cut low frequencies and "pass" only high frequencies. Along with Parts 5A, B and C, **Low Pass Filters**, they comprise the actual crossover portion of the Harman Kardon CXO-1. The exact crossover frequencies you will use are determined by another set of switches on the top of the unit.

In-between the high and low pass filters are three circuits which add greatly to the usefulness of the CXO-1. Part 4, **Equalization**, gives you the ability to solve two common equalization problems found in car stereo acoustic environments without adding extra add-on graphic equalizers. Because of the relatively small interior volume of most cars, frequencies around 200Hz are unnaturally boosted, causing a "boomy" sound. The CXO-1 lets you soften (reduce) the octave centered at 200Hz variably from 0dB to -8dB. The only time you don't need at least a small amount of this 200Hz notch filter reduction is if you are installing the CXO-1 in a van, where the larger acoustic volume causes a boost at lower frequencies, or in a convertible where the boost is not created in the first place.

The CXO-1's 50Hz boost circuit lets you enhance low bass output of rear speakers when you're not using an additional subwoofer. Depending on how much low bass you like, it can also be used with a subwoofer to enhance lower octave bass which is reduced in cassette tapes, FM broadcasts and even many Compact Discs. Unlike the bass tone control on your head unit, the 50Hz boost circuit allows precise enhancement of just the lowest octaves instead of higher bass bands, too.

Part 6 (and 3C), **Level Controls** are used to adjust the relative volumes of front, rear and subwoofer speakers to achieve a natural sound balance.

Line level outputs to your power amplifiers are represented in Part 7, **Outputs**. Remember that because of the CXO-1's switching system, you won't necessarily need to use all five outputs to get all their benefits, although they're there if you want to take advantage of them.

Exploring the CXO-1's Switches and Controls

Exterior Connections. Across the top of the CXO-1 are the labels for the inputs, outputs and power connections on the side of the unit. Each is discussed further on.

Output Level. These rotary controls determine the relative levels of front, rear and subwoofer sections. You will adjust them by ear (with a screwdriver) as the final operation during installation.

50Hz Equalizer Section includes a rotary control for varying the amount of boost, and the SUB ONLY/SUB + REAR switch (Switch 3) which determines which channels receive the equalization.

High and Low Limit Switches. Next are the actual crossover controls which determine what frequencies are passed to each speaker. **Low Limit**

determines the lowest frequency which the midranges and tweeters will reproduce. **High Limit** sets maximum frequency which will be sent to the midrange and subwoofer. By setting these switches, you effectively set the upper and lower frequency limits for each speaker. Since crossover points are determined by the specific speakers you have chosen to use, you should consult with your Harman Kardon dealer, or the specifications of the speakers to determine each High and Low Limit switch setting. **200Hz Notch Filters.** Two rotary controls are provided to vary the amount of cut you wish to apply at 200Hz. They should be set flat during initial crossover level adjustments and then applied by ear in the final stage of installation.

Putting the CXO-1's Flexibility to Work for You

Because of the Harman Kardon CXO-1's unique input/output switching ability, you can make use of its features in many different ways. For example:

- Want to be able to control the amount of ultra-low subwoofer bass from a head unit with just 2 pre-amp outputs and fader/balance control? Connect one pre-amp output to the front channel input of the CXO-1 and the other to its subwoofer input. Switch 1 then lets you route the same front channel input to the rear channel, too. Adjusting the head unit's control lets you balance the subwoofer vs. front-and-rear speakers.
- Want front-to-back fader control on a 2 pre-amp output head unit? Connect one pre-amp output to the CXO-1's front input and one pre-amp output to the rear input. Switch 2 is then used to route rear input to the subwoofer section, too. Adjusting the head unit fader/balance control now controls the amount of front vs. rear-and-subwoofer output.

- But what if you want to use a subwoofer with a head unit that has only one pre-amp output? Connect it to the CXO-1's rear input and close Switches 1 and 2. Now you can connect amps to the front, rear *and* subwoofer outputs.

- How about a simpler system with just front and rear speaker systems? In this case, the rear speakers will be doing the work of a subwoofer, so that 50Hz boost circuit would be especially helpful. Just close Switches 2 and 3. The signal is first routed through the 50Hz boost circuit, then enters the rear channel circuits.

The next section will elaborate on these and other possibilities.

Subwoofer Outputs

A subwoofer is a special bass speaker specifically designed to handle ultra-low bass. It is driven by its own power amplifier and is usually crossed over at 200Hz or lower. While only rarely found in home systems, subwoofers are a common and very effective way to generate bone-crushingly realistic bass in a car.

Note that there are three subwoofer outputs on the Harman Kardon CXO-1 instead of one. These allow great flexibility in type of subwoofer and amplifier employed.

The **Subwoofer** output lets you send separate left and right low bass channels to a stereo power amplifier. At that point you can either connect the amp's output to left and right subwoofers, or connect both amp channels to a single subwoofer speaker which has dual voice coils.

The **Mono Subwoofer** output is designed for mono power amplifiers. A stereo subwoofer is not absolutely necessary since there is less differing left and right information below 100Hz.

The **Inverted Mono Subwoofer** output lets you use a stereo power amplifier as a mono unit to drive a single subwoofer. This is called "bridging" or "strapping" and combines both channels of the stereo amp into a single output. **IMPORTANT:** Some stereo amplifiers are not designed for bridging and can be damaged by doing so. Consult the stereo power amplifier's manual to determine if the unit can be bridged for mono output before connecting the CXO-1's Inverted Mono Subwoofer outputs. Also, some stereo power amplifiers have built-in "bridged mono" capability. In this case, the inverted mono output needn't be used.

CXO - 1 FINAL ADJUSTMENT

You are now ready to adjust the sound balance between the front, rear and subwoofer speakers. There is no magic formula for this. It depends on your ear and your own audio preferences. Some people like lots of low bass. Others are especially concerned with treble clarity, etc. In fact, one of the reasons for having a CXO-1 is the ability to tailor yet another facet of your car stereo system to your own tastes.

Final adjustment will require 1) A well-recorded tape with full-range sound (i.e. balanced amounts of bass, midrange and treble), 2) a small screw driver, 3) careful reading of the step-by-step instructions in this section of the manual, 4) an assistant (optional, but very helpful).

A. Head Unit Settings

1. Set the tone controls on your cassette/receiver or cassette/tuner to neutral, defeat any loudness circuits and make sure that noise reduction and tape settings are correct for the test tape you are using.
2. Defeat any graphic equalizers or other signal processing devices which are in the signal path to the CXO-1.
3. Set the head unit's balance controls to their center position.
4. If the head unit has a front-to-rear power fader, set it to full "forward"; if it has a pre-amp fader control, set it to the center position for equal balance between the two pre-amp outputs.

B. CXO-1 Settings

5. Set the 50Hz and 200Hz equalization controls on the CXO-1 to their FLAT position.
6. Set those output level controls *being used* to their full MAXIMUM settings (clockwise). Turn all *unused* output level controls completely OFF (fully counter-clockwise).

C. Listening

7. Enter the vehicle and close all doors and windows. This is very important to ensure the proper acoustic environment.
8. Take a deep breath and play your test tape at a comfortable listening level.

9. Confirm that all speakers are working properly.
10. Note which speakers, if any, are too loud in relation to the overall sound mix. Is bass too heavy? Is treble too shrill and fatiguing?

D. CXO-1 Level Adjustment

11. One at a time, reduce the CXO-1 level controls which correspond to the speakers which sound too loud. This should be done in several increments for each speaker, backing the controls off slowly. (Here is where an assistant and vigorous gesturing comes in handy, so that you don't have to make multiple trips back and forth from the trunk to the passenger compartment.)

Remember that lowering the level of one control may cause a change in the overall tone balance that may necessitate other adjustments.

12. When you are satisfied with the sound, check the CXO-1's output level controls. **AT LEAST ONE CONTROL *must* remain in the full-on position.**

If, in the heat of adjustment, all the controls in use got turned down various amounts, it will be necessary to raise each of them until one is at full output.

E. Aftermath

13. Adjust the CXO-1's 200Hz and 50Hz equalization controls as needed. You have now adjusted the *constant* level and tone components of your system. These settings will remain constant for the life of the system.
14. Re-engage any head unit or graphic equalizer tone controls. These can now be freely used to adjust the sound of individual program material such as tapes and FM.
15. Fill out the Harman Kardon CXO-1 warranty card and mail it back to us.
16. **IMPORTANT:** Save your sales slip and put it in a secure place. It will be necessary for warranty and insurance purposes, perish the thought.

You are now ready to enjoy the benefits of multiple amplifiers and the CXO-1 Active Crossover/System Controller. Once again, thank you for choosing Harman Kardon.

A B C D E

GENERAL UNIT
EXPLODED VIEW

1

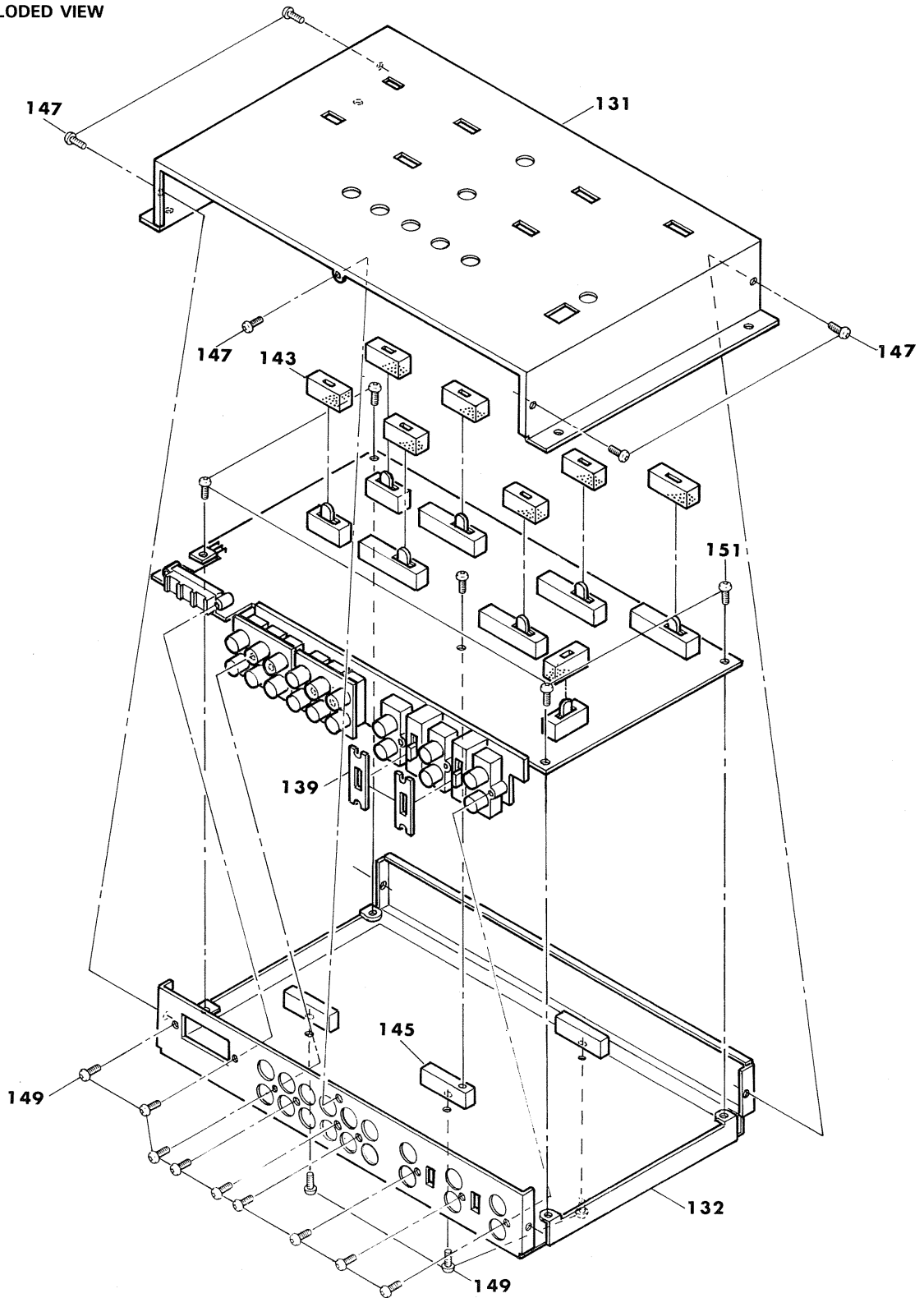
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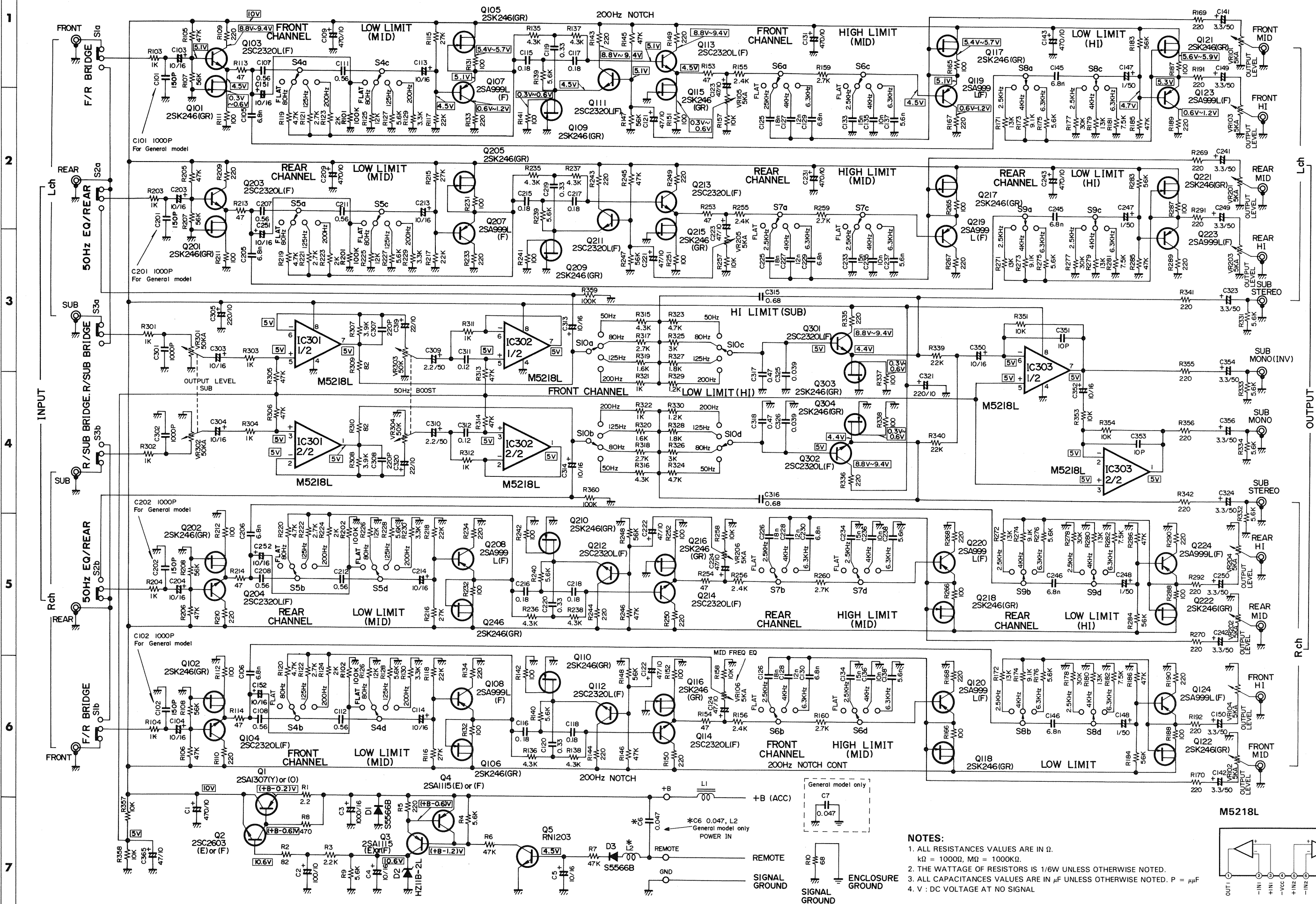


PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
131	1414-08601	CABINET TOP	151	2347-300627	SCREW BND T+ (3×6mm)
132	1424-21201	CABI BACK, BOTTOM		1111-J30251	OWNER GUIDE
139	2240-7225	HOLDER		1111-J30252	OWNER GUIDE (G)
141	2111-11756	FELT		2310-7034	Mounting Screws and Washers (1 Set) (Accessory)
143	2112-0054	SPONGE		1221-717197	PACKING BOX
145	2132-7149	SPACER		1222-7285	PACKING CUSHION, LEFT
147	2347-3006K7	SCREW BND T+ (3×6mm)		1222-7286	PACKING CUSHION, RIGHT
149	2347-3008K6	SCREW BND T+ (3×8mm)			

7

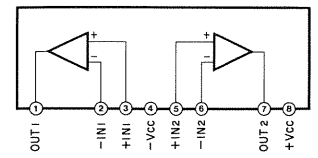
SCHEMATIC DIAGRAM



NOTES:

1. ALL RESISTANCES VALUES ARE IN Ω .
k Ω = 1000 Ω , M Ω = 1000k Ω .
2. THE WATTAGE OF RESISTORS IS 1/6W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μ F UNLESS OTHERWISE NOTED. P = μ F
4. V : DC VOLTAGE AT NO SIGNAL

M5218L



WIRING DIAGRAM

1

2

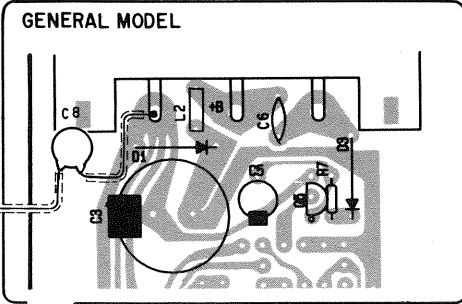
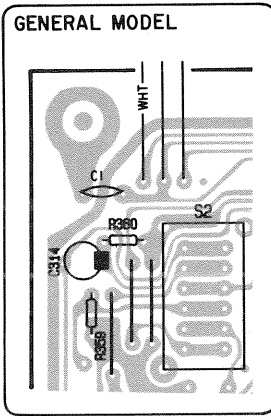
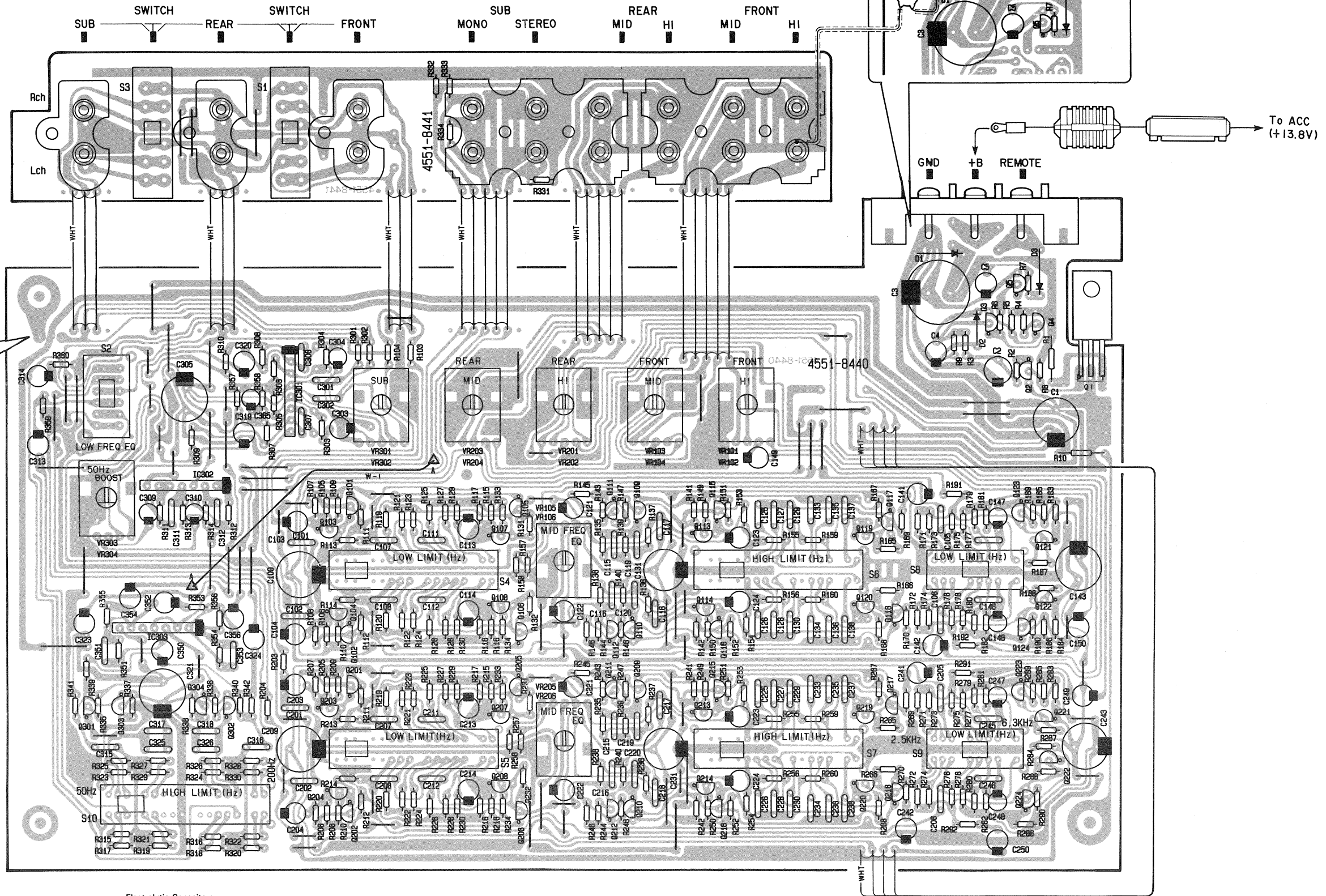
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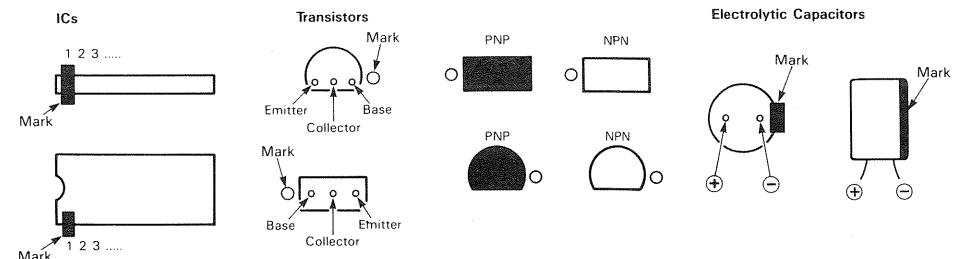
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7



NOTE:
In the figures of the P. C. Boards, a mark is provided on the base side of the transistor.



ELECTRICAL PARTS LIST

Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
PCB-1 MAIN P.C.BOARD							
CAPACITORS							
532	C1	5345-477-10	CAP, MINI ELE 470u/10V	543	C233	5354-153J1HM	CAP, MYL .015u
530	C2	5345-107-10	CAP, MINI ELE 100u/10V	543	C234	5354-153J1HM	CAP, MYL .015u
533	C3	5345-108-16	CAP, MINI ELE 1000u/16V	544	C235	5354-103J1HM	CAP, MYL .01u
528	C4	5345-106-16	CAP, MINI ELE 10u/16V	544	C236	5354-103J1HM	CAP, MYL .01u
528	C5	5345-106-16	CAP, MINI ELE 10u/16V	545	C237	5354-562J1HM	CAP, MYL 5600p
041A	C6	5361-473ZF	CAP, CER .047u	545	C238	5354-562J1HM	CAP, MYL 5600p
041A	C7	5361-473ZF	CAP, CER .047u	522	C241	5345-335F0951	CAP, MINI ELE 3.3u/50V
041A	C8	5361-473ZF	CAP, CER .047u	522	C242	5345-335F0951	CAP, MINI ELE 3.3u/50V
550	C101	5359-1515851	CAP, PPP 150p	526	C243	5345-477B0962	CAP, MINI ELE 470u/10V
550A	C101	5359-1025851	CAP, PPP 1000p	536	C245	5354-682J1HM	CAP, MYL 6800p
550	C102	5359-1515851	CAP, PPP 150p	536	C246	5354-682J1HM	CAP, MYL 6800p
550A	C102	5359-1025851	CAP, PPP 1000p	519	C247	5345-105F0951	CAP, MINI ELE 1u/50V
518	C103	5345-106C0951	CAP, MINI ELE 10u/16V	519	C248	5345-105F0951	CAP, MINI ELE 1u/50V
518	C104	5345-106C0951	CAP, MINI ELE 10u/16V	522	C249	5345-335F0951	CAP, MINI ELE 3.3u/50V
536	C105	5354-682J1HM	CAP, MYL 6800p	522	C250	5345-335F0951	CAP, MINI ELE 3.3u/50V
536	C106	5354-682J1HM	CAP, MYL 6800p	534	C251	5345-106C0951	CAP, MINI ELE 10u/16V
538	C107	5354-564593	CAP, MYL .56u	534	C252	5345-106C0951	CAP, MINI ELE 10u/16V
538	C108	5354-564593	CAP, MYL .56u	551	C301	5359-1025851	CAP, PPP 1000p
526	C109	5345-477B0962	CAP, MINI ELE 470u/10V	551	C302	5359-1025851	CAP, PPP 1000p
538	C111	5354-564593	CAP, MYL .56u	524	C303	5345-106C0951	CAP, MINI ELE 10u/16V
538	C112	5354-564593	CAP, MYL .56u	524	C304	5345-106C0951	CAP, MINI ELE 10u/16V
518	C113	5345-106C0951	CAP, MINI ELE 10u/16V	531	C305	5345-227-10	CAP, MINI ELE 220u/10V
518	C114	5345-106C0951	CAP, MINI ELE 10u/16V	552	C307	5359-2215851	CAP, PPP 220p
539	C115	5354-184593	CAP, MYL .18u	552	C308	5359-2215851	CAP, PPP 220p
539	C116	5354-184593	CAP, MYL .18u	521	C309	5345-225F0951	CAP, MINI ELE 2.2u/50V
539	C117	5354-184593	CAP, MYL .18u	521	C310	5345-225F0951	CAP, MINI ELE 2.2u/50V
539	C118	5354-184593	CAP, MYL .18u	546	C311	5354-124593	CAP, MYL .12u
540	C119	5354-334593	CAP, MYL .33u	546	C312	5354-124593	CAP, MYL .12u
540	C120	5354-334593	CAP, MYL .33u	524	C313	5345-106C0951	CAP, MINI ELE 10u/16V
525	C121	5345-476B0951	CAP, MINI ELE 47u/10V	524	C314	5345-106C0951	CAP, MINI ELE 10u/16V
525	C122	5345-476B0951	CAP, MINI ELE 47u/10V	547	C315	5354-684593	CAP, MYL .68u
525	C123	5345-476B0951	CAP, MINI ELE 47u/10V	547	C316	5354-684593	CAP, MYL .68u
525	C124	5345-476B0951	CAP, MINI ELE 47u/10V	548	C317	5354-474593	CAP, MYL .47u
537	C125	5354-183J1HM	CAP, MYL .018u	548	C318	5354-474593	CAP, MYL .47u
537	C126	5354-183J1HM	CAP, MYL .018u	520	C319	5345-226B0951	CAP, MINI ELE 22u/10V
541	C127	5354-123J1HM	CAP, MYL .012u	520	C320	5345-226B0951	CAP, MINI ELE 22u/10V
541	C128	5354-123J1HM	CAP, MYL .012u	531	C321	5345-227-10	CAP, MINI ELE 220u/10V
542	C129	5354-682J1HM	CAP, MYL 6800p	522	C323	5345-335F0951	CAP, MINI ELE 3.3u/50V
542	C130	5354-682J1HM	CAP, MYL 6800p	522	C324	5345-335F0951	CAP, MINI ELE 3.3u/50V
526	C131	5345-477B0962	CAP, MINI ELE 470u/10V	549	C325	5354-393593	CAP, MYL .039u
543	C133	5354-153J1HM	CAP, MYL .015u	549	C326	5354-393593	CAP, MYL .039u
543	C134	5354-153J1HM	CAP, MYL .015u	524	C350	5345-106C0951	CAP, MINI ELE 10u/16V
544	C135	5354-103J1HM	CAP, MYL .01u	554	C351	5353-100934	CAP, MCA 10p
544	C136	5354-103J1HM	CAP, MYL .01u	524	C352	5345-106C0951	CAP, MINI ELE 10u/16V
545	C137	5354-562J1HM	CAP, MYL 5600p	554	C353	5353-100934	CAP, MCA 10p
545	C138	5354-562J1HM	CAP, MYL 5600p	522	C354	5345-335F0951	CAP, MINI ELE 3.3u/50V
522	C141	5345-335F0951	CAP, MINI ELE 3.3u/50V	522	C356	5345-335F0951	CAP, MINI ELE 3.3u/50V
522	C142	5345-335F0951	CAP, MINI ELE 3.3u/50V	529	C365	5345-476-10	CAP, MINI ELE 47u/10V
526	C143	5345-477B0962	CAP, MINI ELE 470u/10V				
536	C145	5354-682J1HM	CAP, MYL 6800p				
536	C146	5354-682J1HM	CAP, MYL 6800p				
519	C147	5345-105F0951	CAP, MINI ELE 1u/50V				
519	C148	5345-105F0951	CAP, MINI ELE 1u/50V				
522	C149	5345-335F0951	CAP, MINI ELE 3.3u/50V				
522	C150	5345-335F0951	CAP, MINI ELE 3.3u/50V				
534	C151	5345-106C0951	CAP, MINI ELE 10u/16V				
534	C152	5345-106C0951	CAP, MINI ELE 10u/16V				
550	C201	5359-1515851	CAP, PPP 150p				
550A	C201	5359-1025851	CAP, PPP 1000p				
550	C202	5359-1515851	CAP, PPP 150p				
550A	C202	5359-1025851	CAP, PPP 1000p				
518	C203	5345-106C0951	CAP, MINI ELE 10u/16V				
518	C204	5345-106C0951	CAP, MINI ELE 10u/16V				
536	C205	5354-682J1HM	CAP, MYL 6800p				
536	C206	5354-682J1HM	CAP, MYL 6800p				
538	C207	5354-564593	CAP, MYL .56u				
538	C208	5354-564593	CAP, MYL .56u				
526	C209	5345-477B0962	CAP, MINI ELE 470u/10V				
538	C211	5354-564593	CAP, MYL .56u				
538	C212	5354-564593	CAP, MYL .56u				
518	C213	5345-106C0951	CAP, MINI ELE 10u/16V				
518	C214	5345-106C0951	CAP, MINI ELE 10u/16V				
539	C215	5354-184593	CAP, MYL .18u				
539	C216	5354-184593	CAP, MYL .18u				
539	C217	5354-184593	CAP, MYL .18u				
539	C218	5354-184593	CAP, MYL .18u				
540	C219	5354-334593	CAP, MYL .33u				
540	C220	5354-334593	CAP, MYL .33u				
525	C221	5345-476B0951	CAP, MINI ELE 47u/10V				
525	C222	5345-476B0951	CAP, MINI ELE 47u/10V				
525	C223	5345-476B0951	CAP, MINI ELE 47u/10V				
525	C224	5345-476B0951	CAP, MINI ELE 47u/10V				
537	C225	5354-183J1HM	CAP, MYL .018u				
537	C226	5354-183J1HM	CAP, MYL .018u				
541	C227	5354-123J1HM	CAP, MYL .012u				
541	C228	5354-123J1HM	CAP, MYL .012u				
542	C229	5354-682J1HM	CAP, MYL 6800p				
542	C230	5354-682J1HM	CAP, MYL 6800p				
526	C231	5345-477B0962	CAP, MINI ELE 470u/10V				
				601	R1	5135-2R2583	RES, CBN 1/2P 2.2
				575	R2	5232-820J16P	RES, CBN 1/6P 82
				596	R3	5232-222J16P	RES, CBN 1/6P 2.2K
				584	R4	5232-562J16P	RES, CBN 1/6P 5.6K
				569	R5	5232-221J16P	RES, CBN 1/6P 220
				580	R6	5232-473J16P	RES, CBN 1/6P 47K
				580	R7	5232-473J16P	RES, CBN 1/6P 47K
				559	R8	5232-471J16P	RES, CBN 1/6P 470
				584	R9	5232-562J16P	RES, CBN 1/6P 5.6K
				602	R10	5135-680583	RES, CBN 1/2P 68
				555	R101	5232-104J16P	RES, CBN 1/6P 100K
				555	R102	5232-104J16P	RES, CBN 1/6P 100K
				556	R103	5232-102J16P	RES, CBN 1/6P 1K
				556	R104	5232-102J16P	RES, CBN 1/6P 1K
				561	R105	5232-473J16P	RES, CBN 1/6P 47K
				561	R106	5232-473J16P	RES, CBN 1/6P 47K
				564	R107	5232-563J16P	RES, CBN 1/6P 56K
				564	R108	5232-563J16P	RES, CBN 1/6P 56K
				567	R109	5232-221J16P	RES, CBN 1/6P 220
				567	R110	5232-221J16P	RES, CBN 1/6P 220
				571	R111	5232-101J16P	RES, CBN 1/6P 100
				571	R112	5232-101J16P	RES, CBN 1/6P 100
				560	R113	5232-470J16P	RES, CBN 1/6P 47
				560	R114	5232-470J16P	RES, CBN 1/6P 47
				566	R115	5232-273J16P	RES, CBN 1/6P 27K
				566	R116	5232-273J16P	RES, CBN 1/6P 27K
				563	R117	5232-223J16P	RES, CBN 1/6P 22K
				563	R118	5232-223J16P	RES, CBN 1/6P 22K
				589	R119	5232-472J16P	RES, CBN 1/6P 4.7K
				589	R120	5232-472J16P	RES, CBN 1/6P 4.7K
				590	R121	5232-272J16P	RES, CBN 1/6P 2.7K
				590	R122	5232-272J16P	RES, CBN 1/6P 2.7K
				591	R123	5232-202J16P	RES, CBN 1/6P 2K
				591	R124	5232-202J16P	RES, CBN 1/6P 2K
				592	R125	5232-123J16P	RES, CBN 1/6P 12K
				592	R126	5232-123J16P	RES, CBN 1/6P 12K
				598	R127	5232-562J16P	RES, CBN 1/6P 5.6K
				598	R128	5232-562J16P	RES, CBN 1/6P 5.6K
				593	R129	5232-332J16P	RES, CBN 1/6P 3.3K
				593	R130	5232-332J16P	RES, CBN 1/6P 3.3K
				571	R131	5232-101J16P	RES, CBN 1/6P 100
				571	R132	5232-101J16P	RES, CBN 1/6P 100


Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
567	R133	5232-221J16P	RES, CBN 1/6P 220	572	R241	5232-101J16P	RES, CBN 1/6P 100
567	R134	5232-221J16P	RES, CBN 1/6P 220	572	R242	5232-101J16P	RES, CBN 1/6P 100
594	R135	5232-432J16P	RES, CBN 1/6P 4.3K	568	R243	5232-221J16P	RES, CBN 1/6P 220
594	R136	5232-432J16P	RES, CBN 1/6P 4.3K	568	R244	5232-221J16P	RES, CBN 1/6P 220
594	R137	5232-432J16P	RES, CBN 1/6P 4.3K	562	R245	5232-473J16P	RES, CBN 1/6P 47K
594	R138	5232-432J16P	RES, CBN 1/6P 4.3K	562	R246	5232-473J16P	RES, CBN 1/6P 47K
584	R139	5232-562J16P	RES, CBN 1/6P 5.6K	565	R247	5232-563J16P	RES, CBN 1/6P 56K
584	R140	5232-562J16P	RES, CBN 1/6P 5.6K	565	R248	5232-563J16P	RES, CBN 1/6P 56K
571	R141	5232-101J16P	RES, CBN 1/6P 100	568	R249	5232-221J16P	RES, CBN 1/6P 220
571	R142	5232-101J16P	RES, CBN 1/6P 100	568	R250	5232-221J16P	RES, CBN 1/6P 220
567	R143	5232-221J16P	RES, CBN 1/6P 220	572	R251	5232-101J16P	RES, CBN 1/6P 100
567	R144	5232-221J16P	RES, CBN 1/6P 220	572	R252	5232-101J16P	RES, CBN 1/6P 100
561	R145	5232-473J16P	RES, CBN 1/6P 47K	560	R253	5232-470J16P	RES, CBN 1/6P 47
561	R146	5232-473J16P	RES, CBN 1/6P 47K	560	R254	5232-470J16P	RES, CBN 1/6P 47
564	R147	5232-563J16P	RES, CBN 1/6P 56K	574	R255	5232-242J16P	RES, CBN 1/6P 2.4K
564	R148	5232-563J16P	RES, CBN 1/6P 56K	574	R256	5232-242J16P	RES, CBN 1/6P 2.4K
567	R149	5232-221J16P	RES, CBN 1/6P 220	577	R257	5232-103J16P	RES, CBN 1/6P 10K
567	R150	5232-221J16P	RES, CBN 1/6P 220	577	R258	5232-103J16P	RES, CBN 1/6P 10K
571	R151	5232-101J16P	RES, CBN 1/6P 100	595	R259	5232-272J16P	RES, CBN 1/6P 2.7K
571	R152	5232-101J16P	RES, CBN 1/6P 100	595	R260	5232-272J16P	RES, CBN 1/6P 2.7K
560	R153	5232-470J16P	RES, CBN 1/6P 47	572	R265	5232-101J16P	RES, CBN 1/6P 100
560	R154	5232-470J16P	RES, CBN 1/6P 47	572	R266	5232-101J16P	RES, CBN 1/6P 100
574	R155	5232-242J16P	RES, CBN 1/6P 2.4K	568	R267	5232-221J16P	RES, CBN 1/6P 220
574	R156	5232-242J16P	RES, CBN 1/6P 2.4K	568	R268	5232-221J16P	RES, CBN 1/6P 220
577	R157	5232-103J16P	RES, CBN 1/6P 10K	558	R269	5232-221J16P	RES, CBN 1/6P 220
577	R158	5232-103J16P	RES, CBN 1/6P 10K	558	R270	5232-221J16P	RES, CBN 1/6P 220
595	R159	5232-272J16P	RES, CBN 1/6P 2.7K	582	R271	5232-133J16P	RES, CBN 1/6P 13K
595	R160	5232-272J16P	RES, CBN 1/6P 2.7K	582	R272	5232-133J16P	RES, CBN 1/6P 13K
571	R165	5232-101J16P	RES, CBN 1/6P 100	583	R273	5232-912J16P	RES, CBN 1/6P 9.1K
571	R166	5232-101J16P	RES, CBN 1/6P 100	583	R274	5232-912J16P	RES, CBN 1/6P 9.1K
567	R167	5232-221J16P	RES, CBN 1/6P 220	584	R275	5232-562J16P	RES, CBN 1/6P 5.6K
567	R168	5232-221J16P	RES, CBN 1/6P 220	584	R276	5232-562J16P	RES, CBN 1/6P 5.6K
558	R169	5232-221J16P	RES, CBN 1/6P 220	586	R277	5232-303J16P	RES, CBN 1/6P 30K
558	R170	5232-221J16P	RES, CBN 1/6P 220	586	R278	5232-303J16P	RES, CBN 1/6P 30K
582	R171	5232-133J16P	RES, CBN 1/6P 13K	587	R279	5232-133J16P	RES, CBN 1/6P 13K
582	R172	5232-133J16P	RES, CBN 1/6P 13K	587	R280	5232-133J16P	RES, CBN 1/6P 13K
583	R173	5232-912J16P	RES, CBN 1/6P 9.1K	588	R281	5232-752J16P	RES, CBN 1/6P 7.5K
583	R174	5232-912J16P	RES, CBN 1/6P 9.1K	588	R282	5232-752J16P	RES, CBN 1/6P 7.5K
584	R175	5232-562J16P	RES, CBN 1/6P 5.6K	565	R283	5232-563J16P	RES, CBN 1/6P 56K
584	R176	5232-562J16P	RES, CBN 1/6P 5.6K	565	R284	5232-563J16P	RES, CBN 1/6P 56K
586	R177	5232-303J16P	RES, CBN 1/6P 30K	562	R285	5232-473J16P	RES, CBN 1/6P 47K
586	R178	5232-303J16P	RES, CBN 1/6P 30K	562	R286	5232-473J16P	RES, CBN 1/6P 47K
587	R179	5232-133J16P	RES, CBN 1/6P 13K	572	R287	5232-101J16P	RES, CBN 1/6P 100
587	R180	5232-133J16P	RES, CBN 1/6P 13K	572	R288	5232-101J16P	RES, CBN 1/6P 100
588	R181	5232-752J16P	RES, CBN 1/6P 7.5K	569	R289	5232-221J16P	RES, CBN 1/6P 220
588	R182	5232-752J16P	RES, CBN 1/6P 7.5K	569	R290	5232-221J16P	RES, CBN 1/6P 220
564	R183	5232-563J16P	RES, CBN 1/6P 56K	558	R291	5232-221J16P	RES, CBN 1/6P 220
564	R184	5232-563J16P	RES, CBN 1/6P 56K	558	R292	5232-221J16P	RES, CBN 1/6P 220
561	R185	5232-473J16P	RES, CBN 1/6P 47K	556	R301	5232-102J16P	RES, CBN 1/6P 1K
561	R186	5232-473J16P	RES, CBN 1/6P 47K	556	R302	5232-102J16P	RES, CBN 1/6P 1K
571	R187	5232-101J16P	RES, CBN 1/6P 100	556	R303	5232-102J16P	RES, CBN 1/6P 1K
571	R188	5232-101J16P	RES, CBN 1/6P 100	556	R304	5232-102J16P	RES, CBN 1/6P 1K
569	R189	5232-221J16P	RES, CBN 1/6P 220	580	R305	5232-473J16P	RES, CBN 1/6P 47K
569	R190	5232-221J16P	RES, CBN 1/6P 220	580	R306	5232-473J16P	RES, CBN 1/6P 47K
558	R191	5232-221J16P	RES, CBN 1/6P 220	579	R307	5232-392J16P	RES, CBN 1/6P 3.9K
558	R192	5232-221J16P	RES, CBN 1/6P 220	579	R308	5232-392J16P	RES, CBN 1/6P 3.9K
555	R201	5232-104J16P	RES, CBN 1/6P 100K	575	R309	5232-820J16P	RES, CBN 1/6P 82
555	R202	5232-104J16P	RES, CBN 1/6P 100K	575	R310	5232-820J16P	RES, CBN 1/6P 82
556	R203	5232-102J16P	RES, CBN 1/6P 1K	556	R311	5232-102J16P	RES, CBN 1/6P 1K
556	R204	5232-102J16P	RES, CBN 1/6P 1K	556	R312	5232-102J16P	RES, CBN 1/6P 1K
562	R205	5232-473J16P	RES, CBN 1/6P 47K	580	R313	5232-473J16P	RES, CBN 1/6P 47K
562	R206	5232-473J16P	RES, CBN 1/6P 47K	580	R314	5232-473J16P	RES, CBN 1/6P 47K
565	R207	5232-563J16P	RES, CBN 1/6P 56K	594	R315	5232-432J16P	RES, CBN 1/6P 4.3K
565	R208	5232-563J16P	RES, CBN 1/6P 56K	594	R316	5232-432J16P	RES, CBN 1/6P 4.3K
568	R209	5232-221J16P	RES, CBN 1/6P 220	595	R317	5232-272J16P	RES, CBN 1/6P 2.7K
568	R210	5232-221J16P	RES, CBN 1/6P 220	595	R318	5232-272J16P	RES, CBN 1/6P 2.7K
572	R211	5232-101J16P	RES, CBN 1/6P 100	597	R319	5232-162J16P	RES, CBN 1/6P 1.6K
572	R212	5232-101J16P	RES, CBN 1/6P 100	597	R320	5232-162J16P	RES, CBN 1/6P 1.6K
560	R213	5232-470J16P	RES, CBN 1/6P 47	556	R321	5232-102J16P	RES, CBN 1/6P 1K
560	R214	5232-470J16P	RES, CBN 1/6P 47	556	R322	5232-102J16P	RES, CBN 1/6P 1K
566	R215	5232-273J16P	RES, CBN 1/6P 27K	581	R323	5232-472J16P	RES, CBN 1/6P 4.7K
566	R216	5232-273J16P	RES, CBN 1/6P 27K	581	R324	5232-472J16P	RES, CBN 1/6P 4.7K
563	R217	5232-223J16P	RES, CBN 1/6P 22K	578	R325	5232-302J16P	RES, CBN 1/6P 3K
563	R218	5232-223J16P	RES, CBN 1/6P 22K	578	R326	5232-302J16P	RES, CBN 1/6P 3K
589	R219	5232-472J16P	RES, CBN 1/6P 4.7K	557	R327	5232-182J16P	RES, CBN 1/6P 1.8K
589	R220	5232-472J16P	RES, CBN 1/6P 4.7K	557	R328	5232-182J16P	RES, CBN 1/6P 1.8K
590	R221	5232-272J16P	RES, CBN 1/6P 2.7K	600	R329	5232-122J16P	RES, CBN 1/6P 1.2K
590	R222	5232-272J16P	RES, CBN 1/6P 2.7K	600	R330	5232-122J16P	RES, CBN 1/6P 1.2K
591	R223	5232-202J16P	RES, CBN 1/6P 2K	569	R335	5232-221J16P	RES, CBN 1/6P 220
591	R224	5232-202J16P	RES, CBN 1/6P 2K	569	R336	5232-221J16P	RES, CBN 1/6P 220
592	R225	5232-123J16P	RES, CBN 1/6P 12K	573	R337	5232-101J16P	RES, CBN 1/6P 100
592	R226	5232-123J16P	RES, CBN 1/6P 12K	573	R338	5232-101J16P	RES, CBN 1/6P 100
598	R227	5232-562J16P	RES, CBN 1/6P 5.6K	599	R339	5232-223J16P	RES, CBN 1/6P 22K
598	R228	5232-562J16P	RES, CBN 1/6P 5.6K	599	R340	5232-223J16P	RES, CBN 1/6P 22K
593	R229	5232-332J16P	RES, CBN 1/6P 3.3K	558	R341	5232-221J16P	RES, CBN 1/6P 220
593	R230	5232-332J16P	RES, CBN 1/6P 3.3K	558	R342	5232-221J16P	RES, CBN 1/6P 220
572	R231	5232-101J16P	RES, CBN 1/6P 100	577	R351	5232-103J16P	RES, CBN 1/6P 10K
572	R232	5232-101J16P	RES, CBN 1/6P 100	577	R353	5232-103J16P	RES, CBN 1/6P 10K
568	R233	5232-221J16P	RES, CBN 1/6P 220	577	R354	5232-103J16P	RES, CBN 1/6P 10K
568	R234	5232-221J16P	RES, CBN 1/6P 220	558	R355	5232-221J16P	RES, CBN 1/6P 220
594	R235	5232-432J16P	RES, CBN 1/6P 4.3K	558	R356	5232-221J16P	RES, CBN 1/6P 220
594	R236	5232-432J16P	RES, CBN 1/6P 4.3K	577	R357	5232-103J16P	RES, CBN 1/6P 10K
594	R237	5232-432J16P	RES, CBN 1/6P 4.3K	577	R358	5232-103J16P	RES, CBN 1/6P 10K
594	R238	5232-432J16P	RES, CBN 1/6P 4.3K	576	R359	5232-104J16P	RES, CBN 1/6P 100K
584	R239	5232-562J16P	RES, CBN 1/6P 5.6K	576	R360	5232-104J16P	RES, CBN 1/6P 100K
584	R240	5232-562J16P	RES, CBN 1/6P 5.6K				

Ser. No.	Ref. No.	Part No.	Description
INTEGRATED CIRCUIT			
516	IC301	5652-M5218L	IC, MONO
516	IC302	5652-M5218L	IC, MONO
516	IC303	5652-M5218L	IC, MONO
TRANSISTORS			
508	Q1	5611-1307(Y)	XISTOR, PNP R OR(O)
503	Q2	5613-2603(E)	XISTOR, NPN R OR(F)
507	Q3	5611-1115(E)	XISTOR, PNP R OR(F)
507	Q4	5611-1115(E)	XISTOR, PNP R OR(F)
504	Q5	5613-RN1203	XISTOR, NPN R
509	Q101	5616-2SK246GR	FET, N-CH
509	Q102	5616-2SK246GR	FET, N-CH
501	Q103	5613-2320L(F)	XISTOR, NPN R
501	Q104	5613-2320L(F)	XISTOR, NPN R
509	Q105	5616-2SK246GR	FET, N-CH
509	Q106	5616-2SK246GR	FET, N-CH
505	Q107	5611-999L(F)	XISTOR, PNP R
505	Q108	5611-999L(F)	XISTOR, PNP R
509	Q109	5616-2SK246GR	FET, N-CH
509	Q110	5616-2SK246GR	FET, N-CH
501	Q111	5613-2320L(F)	XISTOR, NPN R
501	Q112	5613-2320L(F)	XISTOR, NPN R
501	Q113	5613-2320L(F)	XISTOR, NPN R
501	Q114	5613-2320L(F)	XISTOR, NPN R
509	Q115	5616-2SK246GR	FET, N-CH
509	Q116	5616-2SK246GR	FET, N-CH
509	Q117	5616-2SK246GR	FET, N-CH
509	Q118	5616-2SK246GR	FET, N-CH
505	Q119	5611-999L(F)	XISTOR, PNP R
505	Q120	5611-999L(F)	XISTOR, PNP R
509	Q121	5616-2SK246GR	FET, N-CH
509	Q122	5616-2SK246GR	FET, N-CH
505	Q123	5611-999L(F)	XISTOR, PNP R
505	Q124	5611-999L(F)	XISTOR, PNP R
510	Q201	5616-2SK246GR	FET, N-CH
510	Q202	5616-2SK246GR	FET, N-CH
501	Q203	5613-2320L(F)	XISTOR, NPN R
501	Q204	5613-2320L(F)	XISTOR, NPN R
510	Q205	5616-2SK246GR	FET, N-CH
510	Q206	5616-2SK246GR	FET, N-CH
505	Q207	5611-999L(F)	XISTOR, PNP R
505	Q208	5611-999L(F)	XISTOR, PNP R
510	Q209	5616-2SK246GR	FET, N-CH
510	Q210	5616-2SK246GR	FET, N-CH
501	Q211	5613-2320L(F)	XISTOR, NPN R
501	Q212	5613-2320L(F)	XISTOR, NPN R
501	Q213	5613-2320L(F)	XISTOR, NPN R
501	Q214	5613-2320L(F)	XISTOR, NPN R
510	Q215	5616-2SK246GR	FET, N-CH
510	Q216	5616-2SK246GR	FET, N-CH
510	Q217	5616-2SK246GR	FET, N-CH
510	Q218	5616-2SK246GR	FET, N-CH
505	Q219	5611-999L(F)	XISTOR, PNP R
505	Q220	5611-999L(F)	XISTOR, PNP R
510	Q221	5616-2SK246GR	FET, N-CH
510	Q222	5616-2SK246GR	FET, N-CH
505	Q223	5611-999L(F)	XISTOR, PNP R
505	Q224	5611-999L(F)	XISTOR, PNP R
501	Q301	5613-2320L(F)	XISTOR, NPN R
501	Q302	5613-2320L(F)	XISTOR, NPN R
511	Q303	5616-2SK246GR	FET, N-CH
511	Q304	5616-2SK246GR	FET, N-CH

DIODES

513	D1	5632-S5566B	DIODE, RECT
514	D2	5635-HZ11B-2L	DIODE, ZENER
513	D3	5632-S5566B	DIODE, RECT

COILS

042A	L2	5597-45502	CORE, BEADS 
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SWITCHES

613	S2	4421-0420130	SWITCH, SLIDE
611	S4	4421-064013	SWITCH, SLIDE
611	S5	4421-064013	SWITCH, SLIDE
611	S6	4421-064013	SWITCH, SLIDE
611	S7	4421-064013	SWITCH, SLIDE
612	S8	4421-0430116	SWITCH, SLIDE
612	S9	4421-0430116	SWITCH, SLIDE
611	S10	4421-064013	SWITCH, SLIDE

CONTROLS

621	VR101	5112-5020120	RES, V CBN 12 5K
621	VR102	5112-5020120	RES, V CBN 12 5K
621	VR103	5112-5020120	RES, V CBN 12 5K
621	VR104	5112-5020120	RES, V CBN 12 5K
622	VR105	5112-5020420	RES, V CBN 12 5K
622	VR106	5112-5020420	RES, V CBN 12 5K
621	VR201	5112-5020120	RES, V CBN 12 5K
621	VR202	5112-5020120	RES, V CBN 12 5K
621	VR203	5112-5020120	RES, V CBN 12 5K
621	VR204	5112-5020120	RES, V CBN 12 5K
622	VR205	5112-5020420	RES, V CBN 12 5K
622	VR206	5112-5020420	RES, V CBN 12 5K
623	VR301	5112-5030220	RES, V CBN 12 50K

Ser. No.	Ref. No.	Part No.	Description
623	VR302	5112-5030220	RES, V CBN 12 50K
624	VR303	5112-5030320	RES, V CBN 12 50K
624	VR304	5112-5030320	RES, V CBN 12 50K

PCB-2 PIN JACK P.C.BOARD

RESISTORS

585	R331	5232-562J16P	RES, CBN 1/6P 5.6K
585	R332	5232-562J16P	RES, CBN 1/6P 5.6K
585	R333	5232-562J16P	RES, CBN 1/6P 5.6K
585	R334	5232-562J16P	RES, CBN 1/6P 5.6K

JACKS

616	J1	4482-7128	PIN JACK, 2P
616	J2	4482-7128	PIN JACK, 2P
616	J3	4482-7128	PIN JACK, 2P
617	J4	4486-16	PIN JACK, 6P
617	J5	4486-16	PIN JACK, 6P

SWITCHES

614	S1	4421-0427126	SWITCH, SLIDE
614	S3	4421-0427126	SWITCH, SLIDE

ABBREVIATIONS IN PARTS LIST

CAPACITORS

CAP, MINI ELE	: Electrolytic
CAP, CER	: Ceramic
CAP, PPP	: Polypropylene
CAP, MYL	: Mylar
CAP, MCA	: Mica
	470u : 470μF
	6800p : 6800pF
	.047u : 0.047μF

RESISTORS

RES, CBN	: Carbon
	2.2K : 2.2kΩ
	220 : 220Ω

TRANSISTORS


XISTOR	: Transistor
FET	: Field Effect Transistor

CONTROLS

RES, V CBN	: Variable Carbon Resistor
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NOTE

Parts with the following mark is used only in the model intended for particular market :

 : General model