

MODEL

AS-105 Two-Way Bookshelf

Speaker System

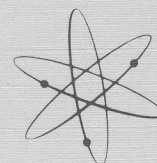
HEATHKIT®

ASSEMBLY MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN



PRICE \$2.00



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595-1385-03

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During your first 90 days of ownership, any parts which we find are defective, either in materials or workmanship, will be replaced or repaired free of charge. And we'll pay shipping charges to get those parts to you — anywhere in the world.

If we determine a defective part has caused your Heathkit electronic product to need other repair, through no fault of yours, we will service it free — at the factory, at any retail Heathkit Electronic Center, or through any of our authorized overseas distributors.

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What happens after warranty? We won't let you down. If your Heathkit electronic product needs repairs or you need a part, just write or call the factory, your nearest retail Heathkit Electronic Center, or any Heath authorized overseas distributor. We maintain an inventory of replacement parts for each Heathkit model at most locations — even for many models that no longer appear in our current product line-up. Repair service and technical consultation are available through all locations.

We hope you'll never need our repair or replacement services, but it's nice to know you're protected anyway — and that cheerful help is nearby.

Sincerely,

HEATH COMPANY
Benton Harbor, Michigan 49022

Assembly
and
Operation
of the



**TWO-WAY
BOOKSHELF
SPEAKER SYSTEM**

MODEL AS-105

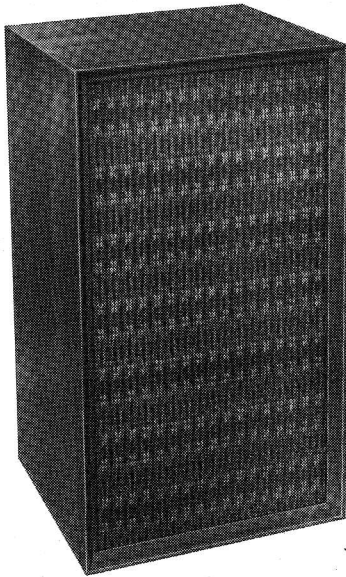


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HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

INTRODUCTION

The Heathkit Model AS-105 Two-Way Bookshelf Speaker System will accurately reproduce all frequencies from 20 Hz to 18 kHz. Even at high volume levels this System will operate properly with negligible distortion.

A 10" acoustic suspension low frequency speaker, and a 3-1/2" high frequency speaker are used in this System. The low frequency speaker incorporates a one-pound Alnico magnet and compliant rubber suspension to produce low distortion bass response over a range of volume levels. The high frequency speaker is a ring-damped cone unit which acts like a dome speaker at high frequencies, but uses the entire cone at midrange frequencies. A control on the rear of

the enclosure allows you to adjust the volume level of the high frequency speaker.

The low and high frequency speakers are mounted in a specially designed airtight enclosure that is loosely filled with acoustic padding. The AS-105W enclosure is enhanced by its rich, oiled-walnut exterior. The AS-105U enclosure comes to you unfinished, enabling you to apply a finish that will match your decor. Both cabinets come with a removable grille cloth front. These features make the AS-105 Speaker System a worthy companion for any music system.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering and step-by-step assembly procedures.

UNPACKING

This Speaker System is shipped in two separate cartons. The larger carton contains the enclosure, grille, and acoustic padding. The other carton contains the electronic components, hardware, and other miscellaneous parts of the System. The bass and treble speakers in the smaller carton

are individually packed in separate cartons. To protect these speakers and the enclosure, do not remove them from their cartons until they are called for in a step. Unpack the other parts and check them against the "Parts List" and the "Parts Pictorial."

PARTS LIST

The key numbers refer to the corresponding numbers on the Parts Pictorial.

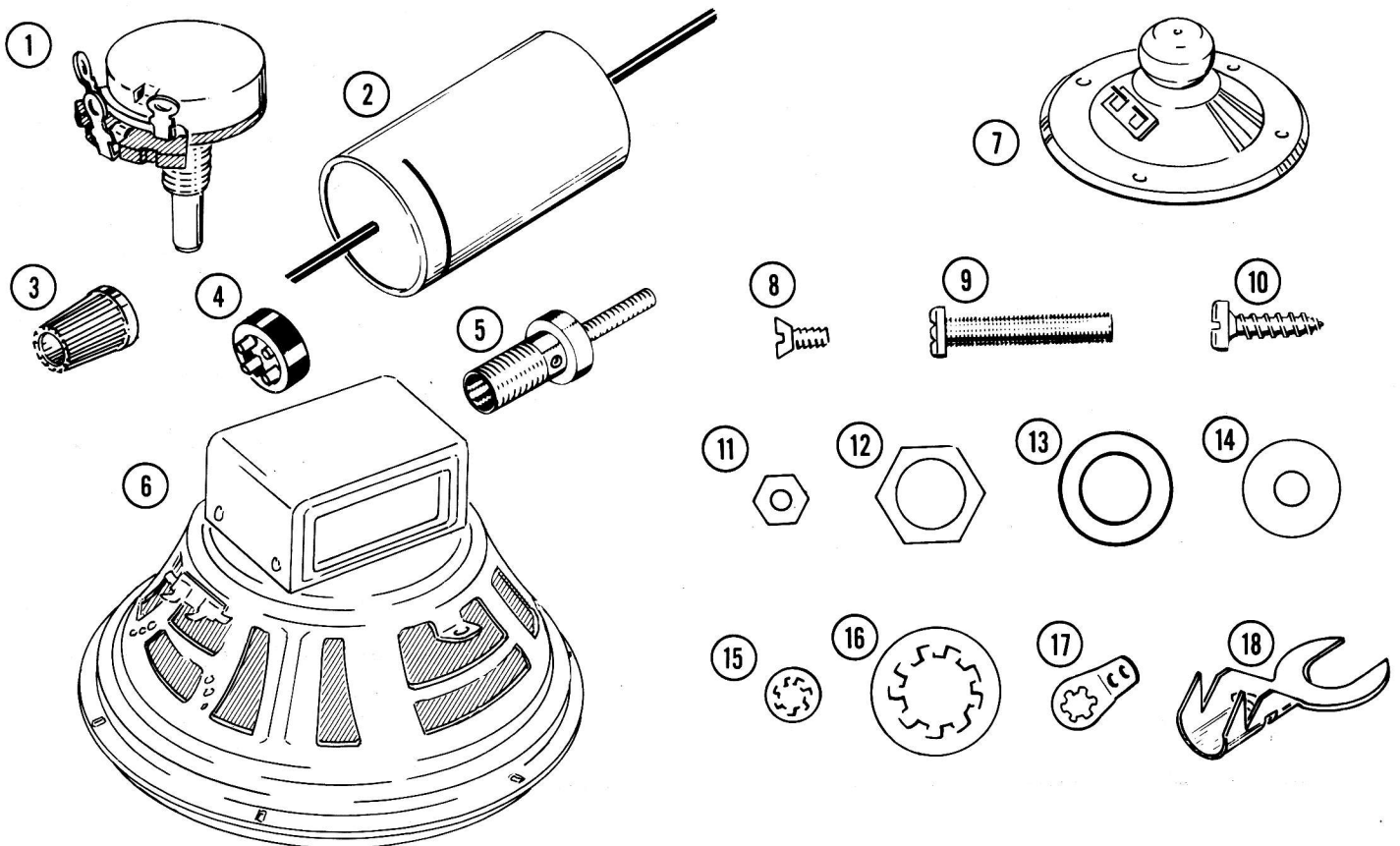
To order replacement parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to the "Replacement Parts" section in the "Kit Builders Guide."

KEY PART No	KEY PART No	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	KEY PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each
CIRCUIT COMPONENTS					HARDWARE				
1	11-122	1	Control	1.00	8	250-327	1	6-32 x 1/4" flat head screw	.05
2	23-106	1	8 μ F capacitor	3.45	9	250-385	12	8-32 x 7/8" screw	.10
3	100-16-2	1	Black binding post cap	.10	10	250-410	8	#8 x 1/2" sheet metal screw	.05
3	100-16-18	1	Red binding post cap	.10	11	252-3	5	6-32 nut	.05
4	75-17	4	Binding post insulator	.10	12	252-7	1	Control nut	.05
5	427-3	2	Binding post base	.10	13	253-10	1	Control flat washer	.05
6	401-158	1	Low frequency speaker	16.55	14	253-45	12	Flat washer	.05
7	401-141	1	High frequency speaker	3.05	15	254-1	3	Small lockwasher	.05
	344-2	1	Black wire	.05/ft	16	254-35	1	Control lockwasher	.20
	344-3	1	Red wire	.05/ft	17	259-1	2	Solder lug	.05
					18	259-7	2	Spade lug	.05

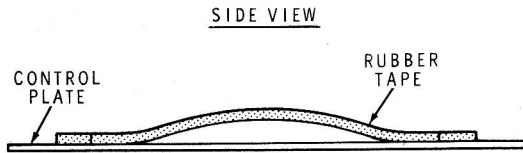
KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
MISCELLANEOUS				Miscellaneous (cont'd.)			
73-77	1	Rubber tape	.10	462-17	1	Knob	.15
73-116	1	Large plastic gasket	.25	490-5	1	Nut starter	.10
73-118	1	Small plastic gasket	.15	597-260	1	Parts Order Form	
91-228	1	Finished speaker enclosure (including grille and acoustic padding)	36.00	597-308	1	Kit Builders Guide	
91-230	1	Unfinished speaker enclosure (including grille and acoustic padding)	33.00	391-34	1	Blue and white label Assembly Manual (see front cover for part number).	2.00
205-845-1	1	Control plate	.80			Solder (additional 3' rolls of solder, #331-6, can be ordered for 15 cents each.)	
208-6	1	Capacitor mounting clip	.10				

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from a Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

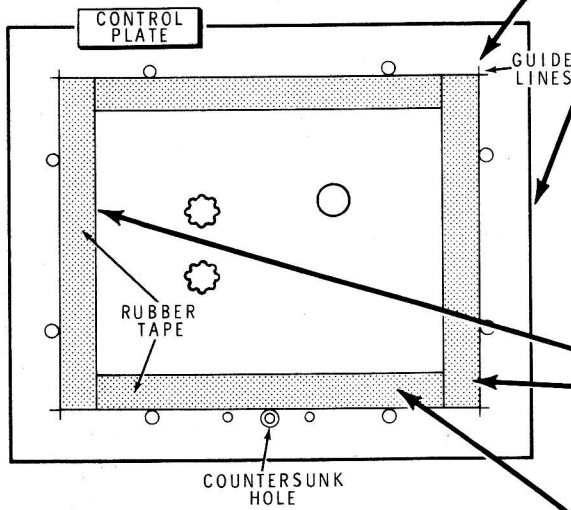
PARTS PICTORIAL



STEP-BY-STEP ASSEMBLY



Detail 1A



PICTORIAL 1

NOTE: Before you start to assemble this kit, read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedures.

() Note the eight holes shown in the Pictorial. Draw guide lines on the inside edges of the holes.

() Position the control plate lettered side up. Note the position of the countersunk hole.

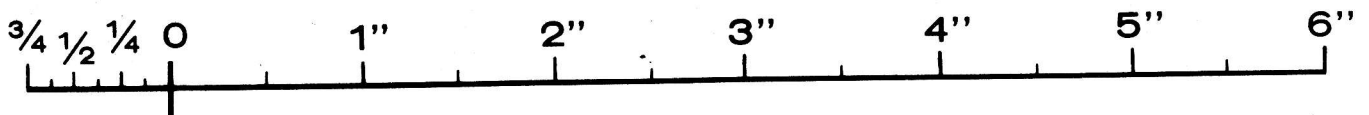
() Cut four 4" lengths of rubber tape.

NOTE: The following lengths of rubber tape should be placed on the control plate so they form a continuous gasket seal. Make sure there are no gaps between any two pieces of tape.

() Remove the paper backing from two lengths of rubber tape and install the tapes on the control plate. Do not cover the holes in the control plate.

() Refer to the side view in Detail 1A and install the other two lengths of rubber tape.

() Turn the control plate over and press down on the plate to make sure the tape strips are securely attached.



() Position the control plate lettered side down.

NOTE: Use the plastic nut starter supplied with this kit to hold and start 6-32 nuts on screws. Refer to Page 3 of the "Kit Builders Guide" for further information.

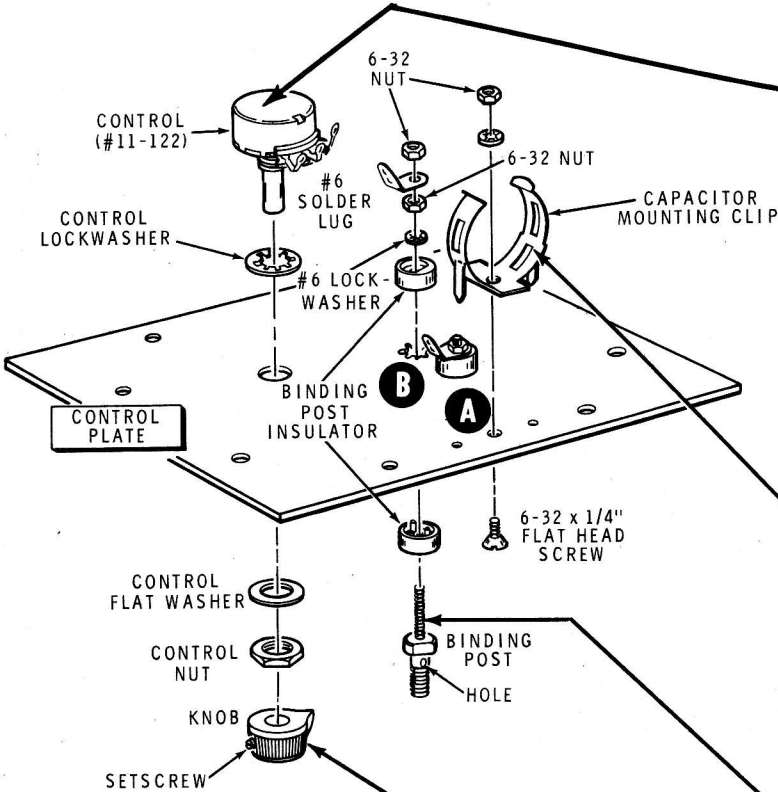
() Mount the control (#11-122). Use a control lockwasher, a control flat washer, and a control nut. Make sure the lugs are positioned as shown.

() Turn the shaft of this control fully clockwise (viewed from the shaft side of the control plate).

() Mount the capacitor mounting clip. Use a 6-32 x 1/4" flat head screw, a #6 lockwasher, and a 6-32 nut.

() Mount binding posts at A and B. Use two binding post insulators, a #6 lockwasher, a #6 solder lug, and two 6-32 nuts on each post. Note the position of the hole in the binding post.

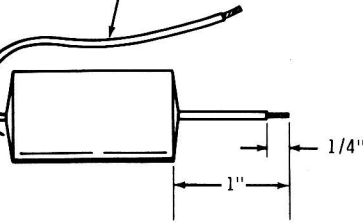
() Position the knob on the control shaft so its pointer faces binding post A. Then tighten the setscrew in the knob.



PICTORIAL 2

() Cut one lead of the 8 μ F capacitor to a length of 1". Then remove 1/4" of insulation from the end of the lead and twist together the fine wire strands.

DO NOT CUT THIS LEAD

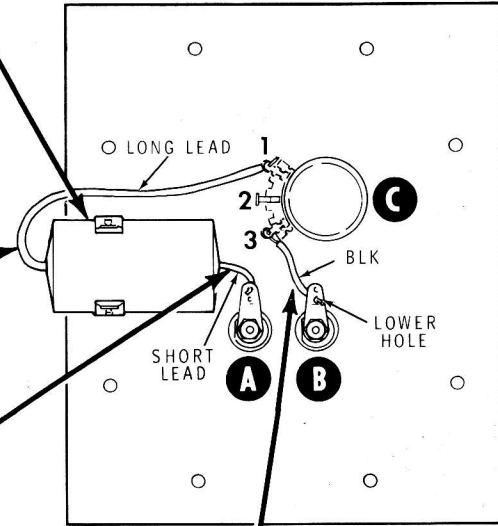


Detail 3A

() Push the capacitor into the capacitor mounting clip with the short lead toward solder lug A.

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

() Connect the long capacitor lead to lug 1 of control C (S-1).



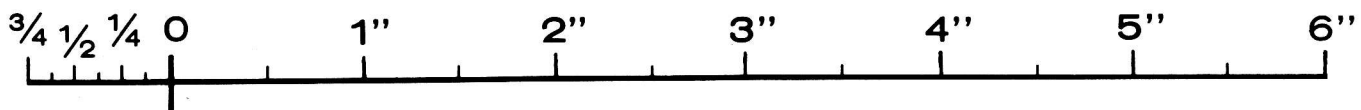
PICTORIAL 3

() Connect the short capacitor lead to solder lug A (NS).

() Prepare the following lengths of wire. Cut each wire to the length indicated; then remove 1/4" of insulation from each end of each wire and twist the fine wire strands.

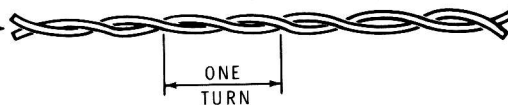
1-1/2" black	25" black
19" black	25" red
19" red	

() Connect a 1-1/2" black wire from lug 3 of control C (S-1) to the lower hole in solder lug B (S-1).





() Twist the 19" black and 19" red wire to form a twisted pair with one turn per inch.

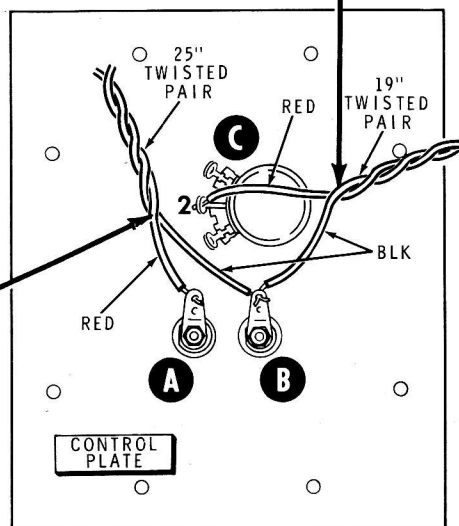


Detail 4A

() At one end of this twisted pair, connect the black wire to the upper hole in solder lug B (NS). Connect the red wire to lug 2 of control C (S-1).

() Twist the 25" black and 25" red wires to form a twisted pair with one full turn per inch.

() At one end of this twisted pair, connect the black wire to the upper hole in solder lug B (S-2) and the red wire to solder lug A (S-2).



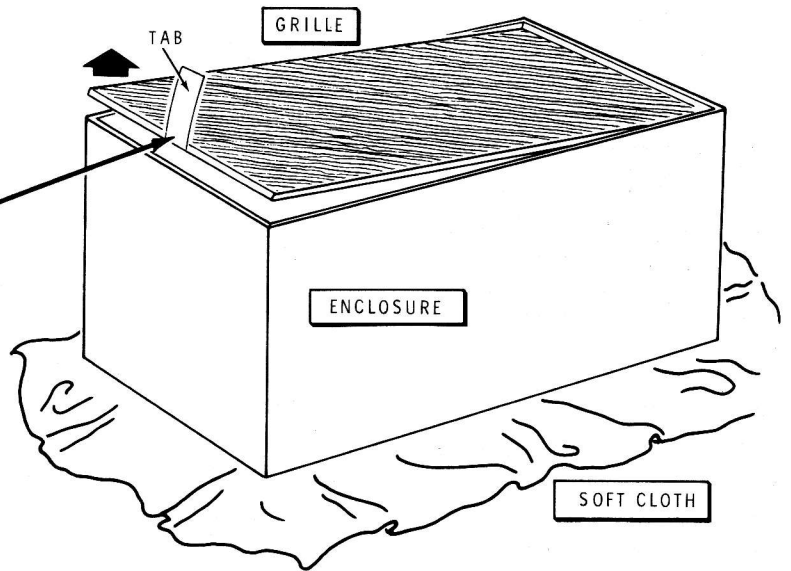
PICTORIAL 4

The other end of these wires will be connected later. Temporarily lay the control plate aside.

() Open the remaining shipping carton and carefully remove the speaker enclosure. Place it grille side up on a soft cloth to protect the finish.

() Pull up on the grille tab to remove the grille. You may hear a ripping sound as you pull up on the grille.

() Remove the sheets of acoustic padding from the enclosure. Lay this padding aside until it is called for.



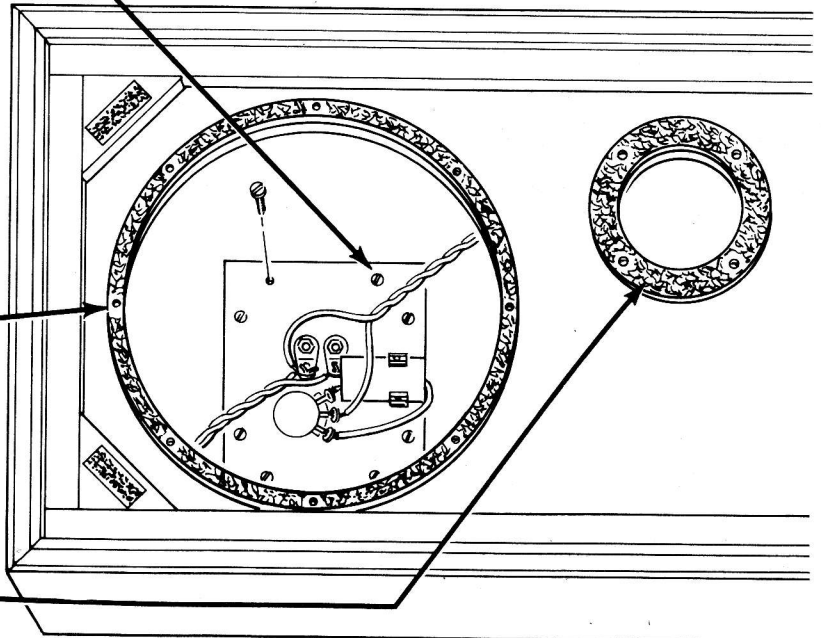
Detail 5A

() Mount the control plate in the enclosure. Use eight #8 x 1/2" sheet metal screws. Be sure the plate is positioned as shown and the screws are tight.

NOTE: A plastic gasket will be used around the openings where the speakers will be mounted. These gaskets provide an airtight seal between the speaker and the enclosure. Make sure all the gasket holes are clear.

() Place the large plastic gasket around the large hole.

() Place the small plastic gasket around the small hole.



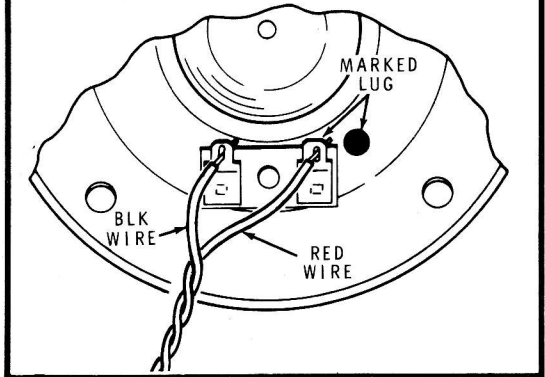
PICTORIAL 5



NOTE: Be careful when you unpack the speakers from their cartons. The dark paper cone at the front of the speaker is the sound producing part of the speaker. Any damage to this cone will ruin the speaker. Open a carton only when the speaker is called for.

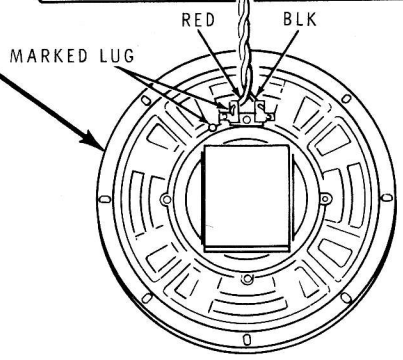
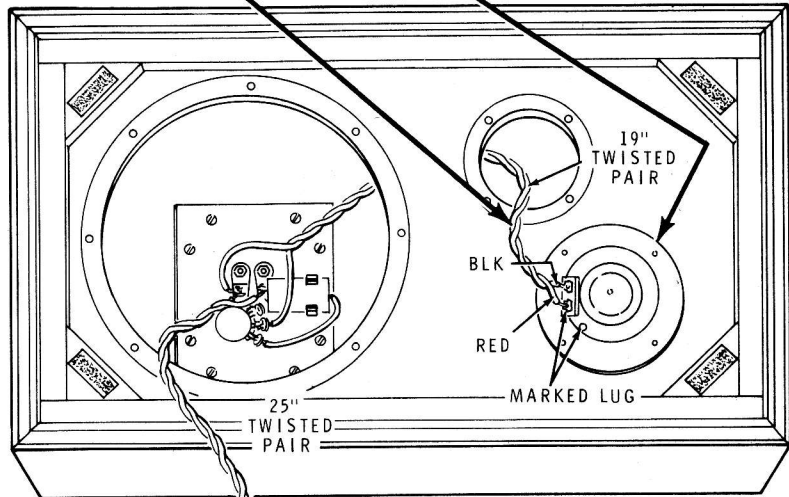
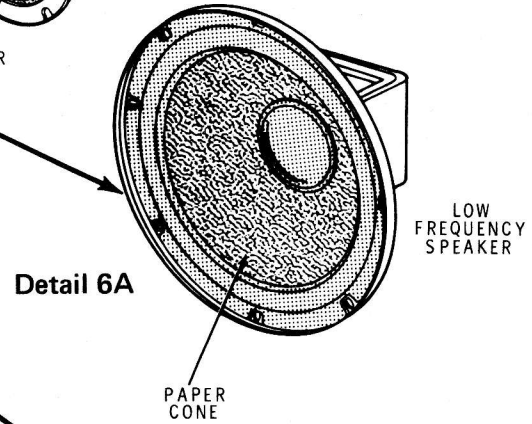
() Remove the high frequency speaker (#401-141) from its carton and place the speaker on the enclosure.

() Route the 19" twisted pair through the small speaker hole. Then connect the red wire to the marked speaker lug (S-1) and the black wire to the other lug (S-1).



() Remove the low frequency speaker (#401-158) from its carton and place the speaker near the enclosure.

() Connect the red wire from the 25" twisted pair to the marked speaker lug (S-1) and the black wire to the other lug (S-1).



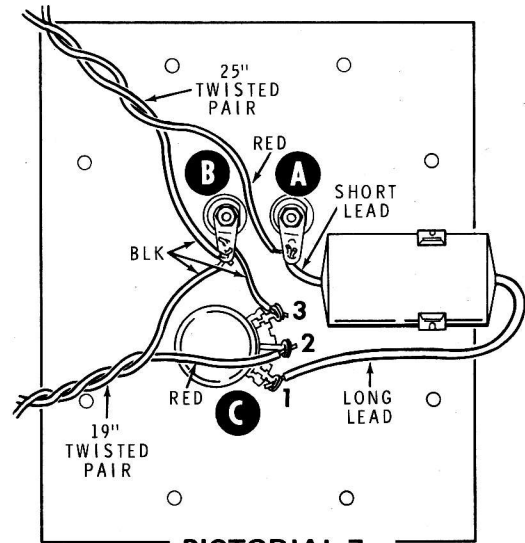
PICTORIAL 6

Proceed to "Final Wiring Check."

FINAL WIRING CHECK

After the speakers have been installed it would be difficult to get at the wiring connections if you should encounter trouble. Therefore, before the acoustic padding and speakers are installed, recheck your wiring as directed in the following steps. Refer to Pictorial 7 to make sure that each wire is connected to its proper point and that each connection is properly soldered. Reheat any connections that do not appear properly soldered.

- Short capacitor lead to solder lug A.
- Long capacitor lead to lug 1 of control C.
- Black wire between lug 3 of control C and solder lug B.
- Red wire of long twisted pair to solder lug A.
- Black wire of long twisted pair to solder lug B.
- Red wire of short twisted pair to lug 2 of control C.
- Black wire of short twisted pair to solder lug B.
- Short twisted pair to the high frequency speaker.



PICTORIAL 7

- Long twisted pair to the low frequency speaker.
- Red wire of each twisted pair to the marked lug of the speaker.

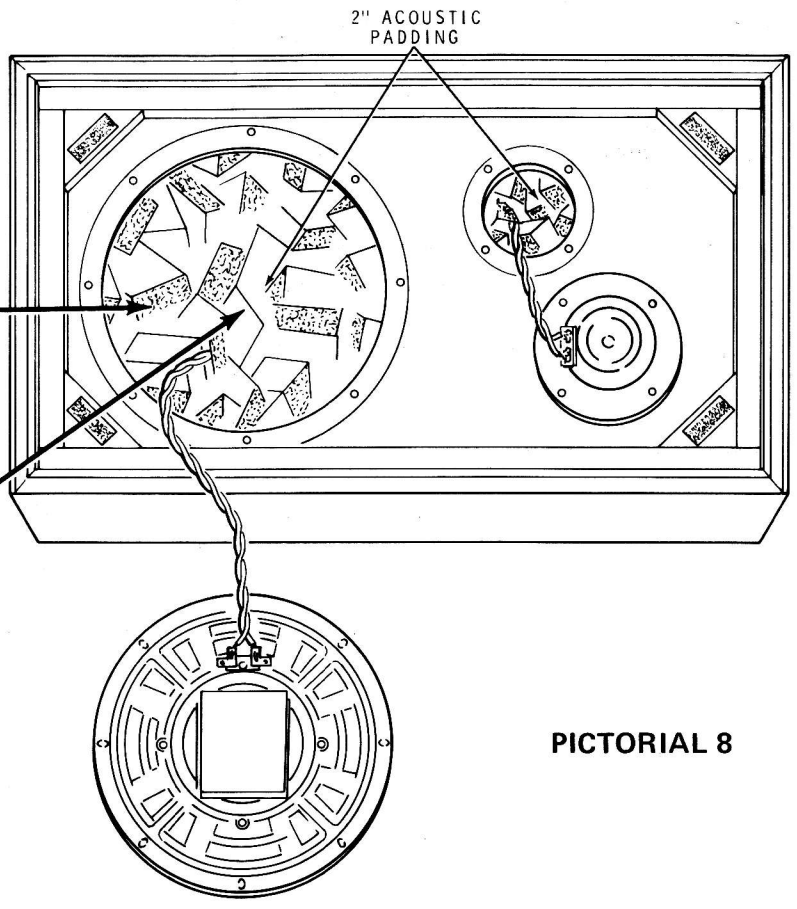
Proceed to "Final Assembly."

FINAL ASSEMBLY

() Tear the six sheets of acoustic padding into pieces about 2" square.

() Loosely pack the small pieces of acoustic padding in the enclosure. Fill all corners and the area around the control plate.

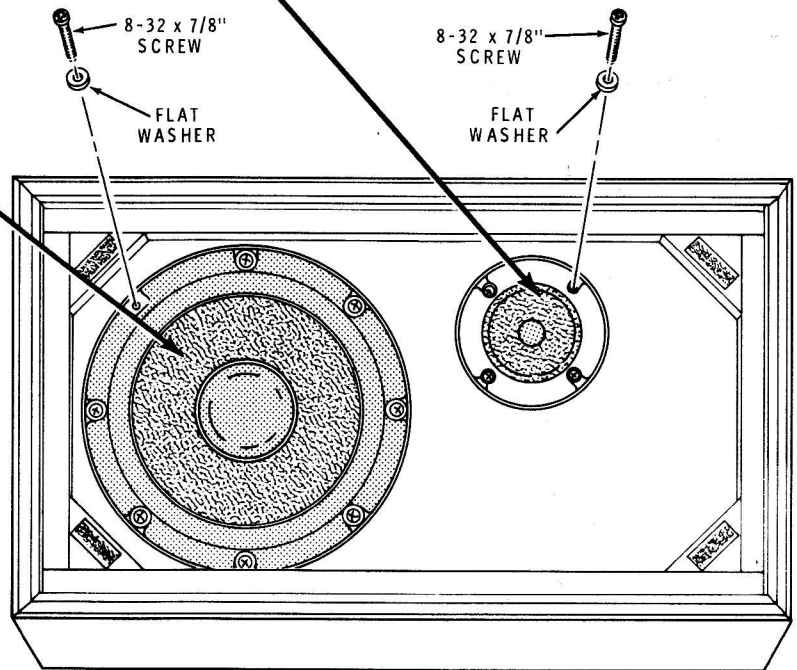
() Hollow out an area directly below the large opening in the enclosure.



PICTORIAL 8

() Carefully position the high frequency speaker into the small hole. Secure the speaker to the enclosure with four 8-32 x 7/8" screws and four flat washers.

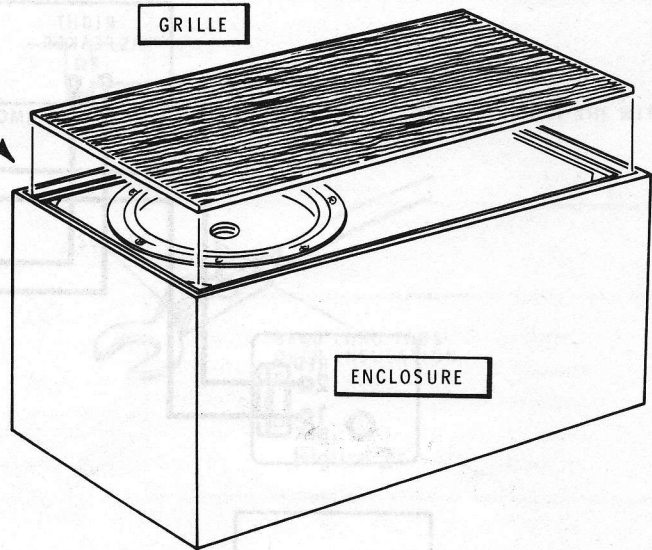
() Carefully position the low frequency speaker into the large hole. Secure the speaker to the enclosure with eight 8-32 x 7/8" screws and eight flat washers.



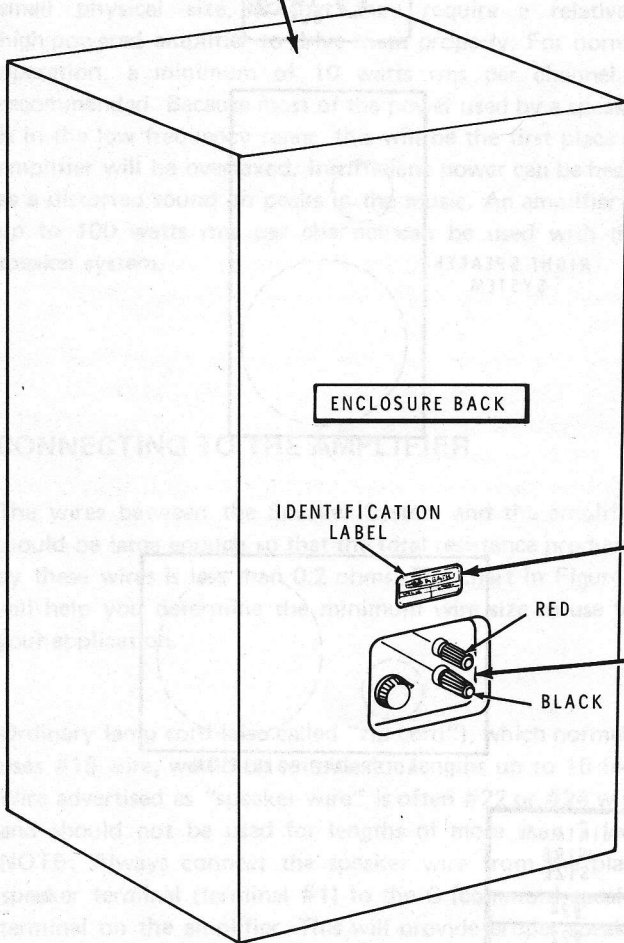
PICTORIAL 9

() Place the grille into the front of the enclosure. Then press it into place.

() Position the enclosure up on end with the low frequency speaker (heaviest end) on the bottom.



Detail 10A



() Carefully peel the backing paper from the blue and white identification label. Then press the label to the back of the enclosure. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

() Turn the red and black binding post caps onto the binding posts. Be sure to put the red cap on the proper binding post.

PICTORIAL 10

This completes the assembly of your Two-Way Bookshelf Speaker System.

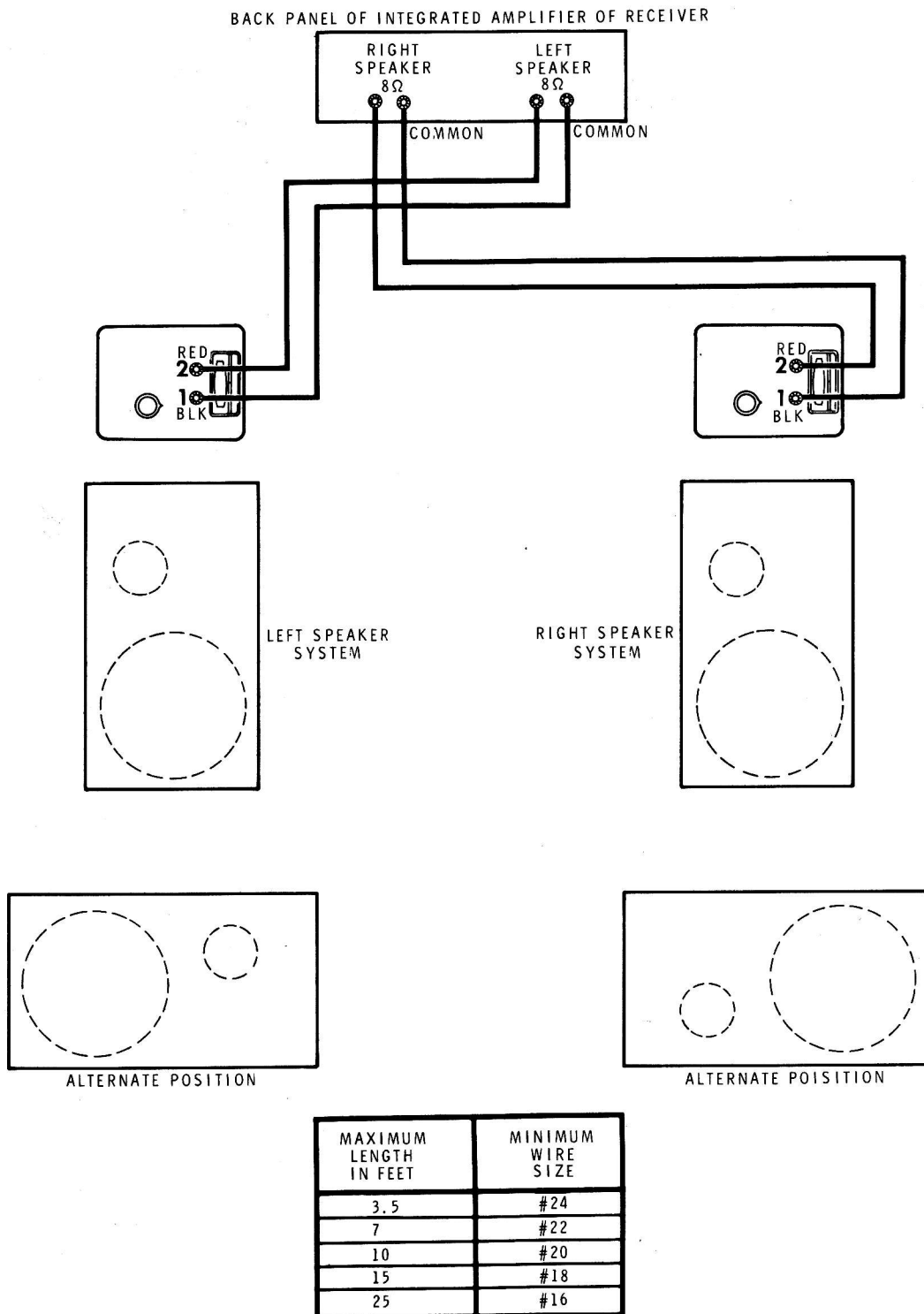


Figure 1

OPERATION

INTRODUCTION

NOTE: This Speaker System has a nominal impedance of 8 ohms. If your amplifier has output terminals marked C, 4 Ω , 8 Ω , and 16 Ω , connect the speaker to the C (common) and 8 Ω terminals. If your amplifier is transistorized, you may have only two terminals marked OUTPUT. These are the terminals to use. If you have any questions regarding speaker matching, refer to the operating manual for your amplifier.

A characteristic of all acoustic suspension speaker systems, in addition to their high fidelity music reproduction and small physical size, is that they require a relatively high-powered amplifier to drive them properly. For normal operation, a minimum of 10 watts rms per channel is recommended. Because most of the power used by a speaker is in the low frequency range, this will be the first place an amplifier will be overtaxed. Insufficient power can be heard as a distorted sound on peaks in the music. An amplifier of up to 100 watts rms per channel can be used with this speaker system.

CONNECTING TO THE AMPLIFIER

The wires between the Speaker System and the amplifier should be large enough so that the total resistance produced by these wires is less than 0.2 ohms. The chart in Figure 1 will help you determine the minimum wire size to use for your application.

Ordinary lamp cord (also called "zip cord"), which normally uses #18 wire, would be suitable for lengths up to 15 feet. Wire advertised as "speaker wire" is often #22 or #24 wire, and should not be used for lengths of more than 7 feet. **NOTE:** Always connect the speaker wire from the black speaker terminal (terminal #1) to the C (common) speaker terminal on the amplifier. This will provide proper speaker phasing when more than one Speaker System is being used.

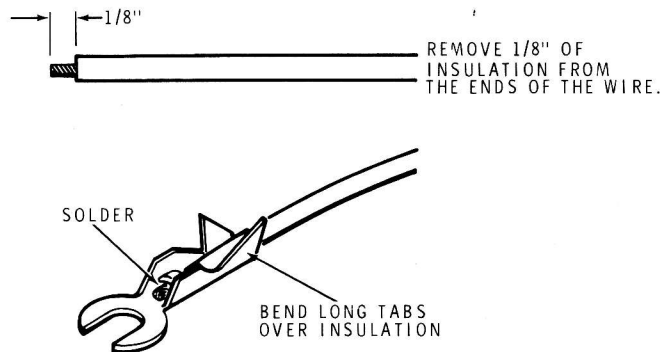


Figure 2

Refer to Figure 2 to install the spade lugs on the ends of the wires which go to the enclosure.

SYSTEM PLACEMENT

This System may be operated in an upright or a horizontal position. When used in an upright position, place the low frequency speaker on the bottom. This will be the heavier end of the Speaker System. The System should not be used or stored for a length of time with the grille facing up or down.

Good stereo results will be obtained from two of these Speaker Systems placed six to ten feet apart along the same wall. Diagonal placement in adjacent corners of a room will allow the natural acoustics of the room to enhance the bass response of each Speaker System. The Systems should not be too close together or the stereo effect will be ruined. They should also not be so far apart that they sound like two separate sound sources.

Note the dot above the High Frequency Level control. When the control is set to this point, the best overall balance of sound will be produced for the normal room size. If the sound is too dull, turn the control clockwise, if the sound is too bright, turn the control counterclockwise.



IN CASE OF DIFFICULTY

Perform the following checks to locate any troubles you may encounter.

1. Make a careful visual check of the complete unit for any obvious errors, such as improperly soldered connections, wires connected to the wrong lugs, or bare wires touching together. Carefully check all
2. Repeat the "Final Wiring Check" on Page 10.
3. About 90% of the kits that are returned for repair do not function properly due to poor solder connections. Therefore, many troubles can be eliminated by reheating all of the connections.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) Or, if you wish, you can deliver your kit to a nearby Heathkit Electronic Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heathkit Electronic Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heathkit Electronic Center, please ship it to the factory at Benton Harbor, Michigan and observe the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan 49022.

Check the equipment to see that all parts and screws are in place. Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022



SPECIFICATIONS

Minimum Amplifier Power (rms)	10 watts.
Maximum Music Power	100 watts.
Impedance	8 ohms nominal, 6 ohms minimum.
Frequency Response	30 Hz to 18,000 Hz.
System Resonance	46 Hz.
Power Handling	60 watts rms from 30 Hz to 500 Hz. 30 watts rms from 500 Hz to 20 kHz.
Harmonic Distortion (typical)	
1 watt level	Less than 1% at 50 Hz. 1% at 40 Hz. 2% at 30 Hz. 6% at 20 Hz.
10 watt level	1% at 50 Hz. 2% at 40 Hz. 4% at 30 Hz. 12% at 20 Hz.
Crossover	Woofer: Mechanical at 1 kHz. Tweeter: Capacitive at 1 kHz.
Speaker Complement	One 10" acoustic suspension low frequency driver (woofer); 1 lb. Alnico V magnet. One 3-1/2" ring-damped, shallow-cone high frequency driver (tweeter); 1.3 oz. magnet.
Enclosure	Finish: Oiled walnut veneered, or unfinished birch. Type: Sealed infinite baffle. Dimensions: 24" high x 13-1/2" wide x 11-1/2" deep.
Net Weight	34 pounds.

Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

ACOUSTIC SUSPENSION THEORY

The main components in this acoustic suspension System are the low frequency speaker; a sealed, airtight enclosure; and sound absorbent padding inside the enclosure. The principle involved here is that the air in a sealed enclosure makes an almost perfect spring. To take advantage of this principle, a speaker with a highly flexible cone suspension must be used. When this type of speaker is mounted in an airtight enclosure, the flexible suspension of the speaker cone will allow the cone the considerable back and forth movement that is necessary for good bass response.

LOW FREQUENCY SPEAKER (WOOFER)

The cone construction of the low frequency speaker (woofer) tends to reduce the acoustic output above 1000 Hz and its impedance begins to increase at the same time. This

is called a "mechanical crossover," a crossover method that is becoming more popular than low-frequency electrical crossovers because there are less phase problems at the crossover frequency. Also, since series inductors are not used, damping problems are reduced and inductor saturation problems are eliminated.

HIGH FREQUENCY SPEAKER (TWEETER)

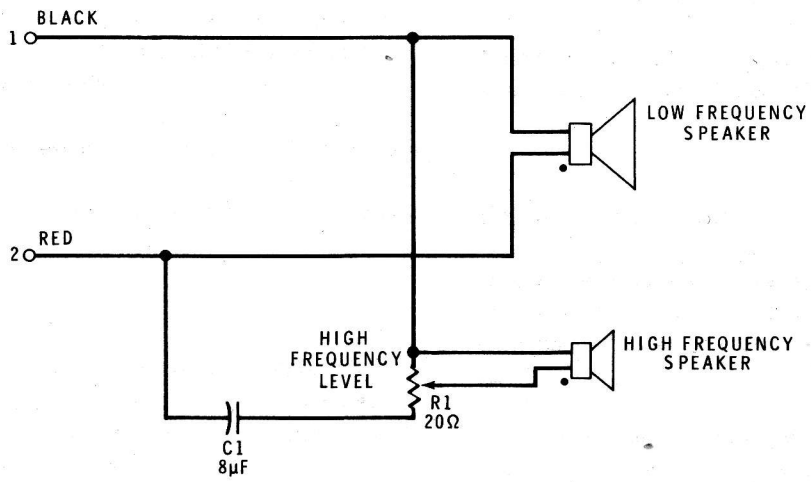
The high frequency speaker (tweeter) in this system is a cone type speaker with a gradual "roll off" at the lower end of its range. This slow roll-off permits a 6 dB per octave crossover to be used. This high frequency speaker employs a single capacitor crossover circuit.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while you read the following circuit description.

Audio signals are coupled to the Speaker System through terminals 1 and 2. From terminal 2, the signals are coupled

directly to the low frequency speaker and through capacitor C1 and High Frequency Level control R1 to the high frequency speaker. High frequency audio signals are coupled through capacitor C1 to the high frequency speaker. The level of the high frequency signal is controlled by R1.



SCHEMATIC DIAGRAM

CUSTOMER SERVICE

REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- Part number and description as shown in the Parts List.
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

Please do not return parts to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

TECHNICAL CONSULTATION

Need help with your kit?.... Self-Service?.... Construction?.... Operation?.... Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . . please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022