ASSEMBLING AND USING YOUR . . . . . Heathkit

AUDIO AMPLIFIERS

MODEL A-7B and A-7C

595-57

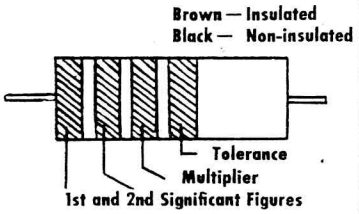
HEATH COMPANY
BENTON HARBOR, MICHIGAN

PRICE $1.00

STANDARD COLOR CODE — RESISTORS AND CAPACITORS

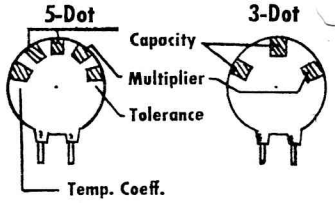
INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier
BLACK	0	0	None
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	,000
YELLOW	4	4	0,000
GREEN	5	5	00,000
BLUE	6	6	000,000
VIOLET	7	7	0,000,000
GRAY	8	8	00,000,000
WHITE	9	9	000,000,000

AXIAL LEAD RESISTOR

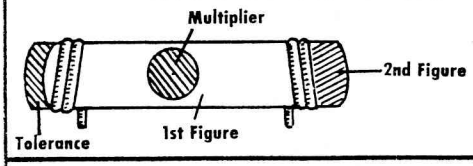


Wire wound resistors have 1st digit band double width

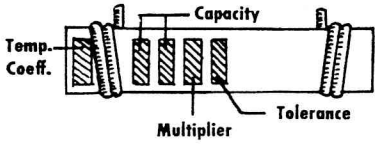
DISC CERAMIC RMA CODE



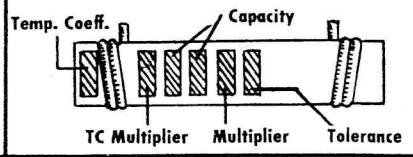
RADIAL LEAD DOT RESISTOR



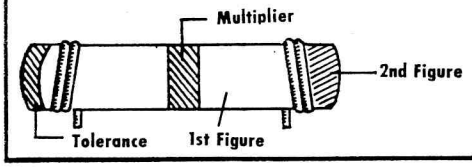
5-DOT RADIAL LEAD CERAMIC CAPACITOR



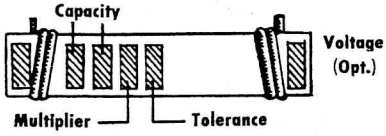
EXTENDED RANGE TC CERAMIC HICAP



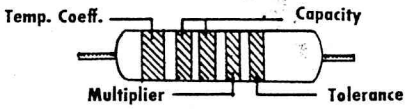
RADIAL LEAD (BAND) RESISTOR



BY-PASS COUPLING CERAMIC CAPACITOR



AXIAL LEAD CERAMIC CAPACITOR

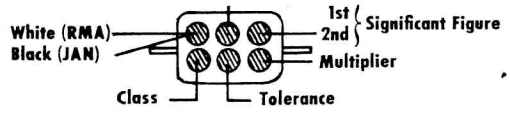


The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by the wattage rating. Carbon resistors most commonly used in Heathkits are ½ watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors ½ watt, 1 or 2 watt may be color coded but the first band will be double width.

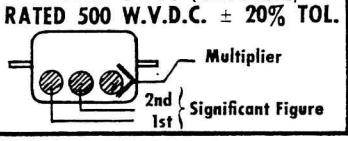
MOLDED MICA TYPE CAPACITORS

CURRENT STANDARD CODE

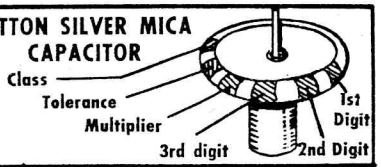


JAN & 1948 RMA CODE

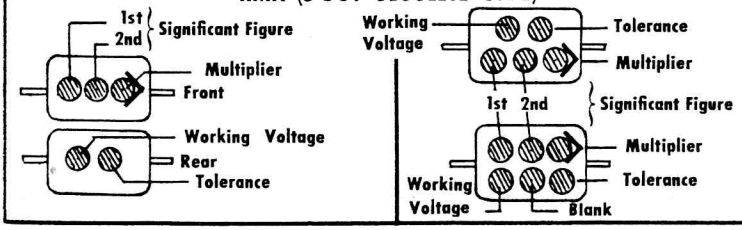
RMA 3-DOT (OBSOLETE) RATED 500 W.V.D.C. ± 20% TOL.



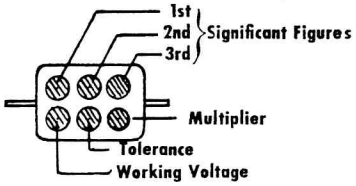
BUTTON SILVER MICA CAPACITOR



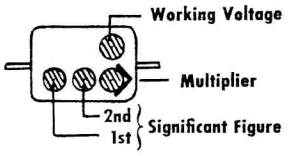
RMA (5-DOT OBSOLETE CODE)



RMA 6-DOT (OBSOLETE)

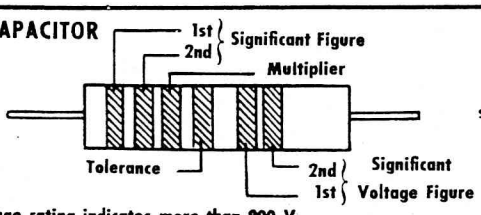


RMA 4-DOT (OBSOLETE)



MOLDED PAPER TYPE CAPACITORS

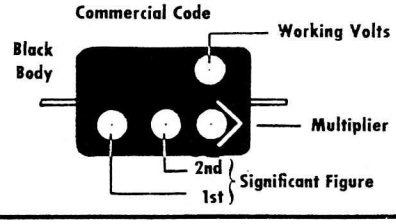
TUBULAR CAPACITOR



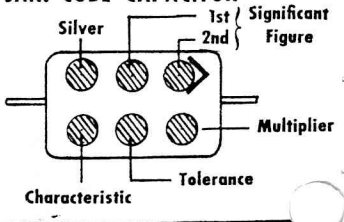
Normally stamped for value

A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.

MOLDED FLAT CAPACITOR



JAN. CODE CAPACITOR



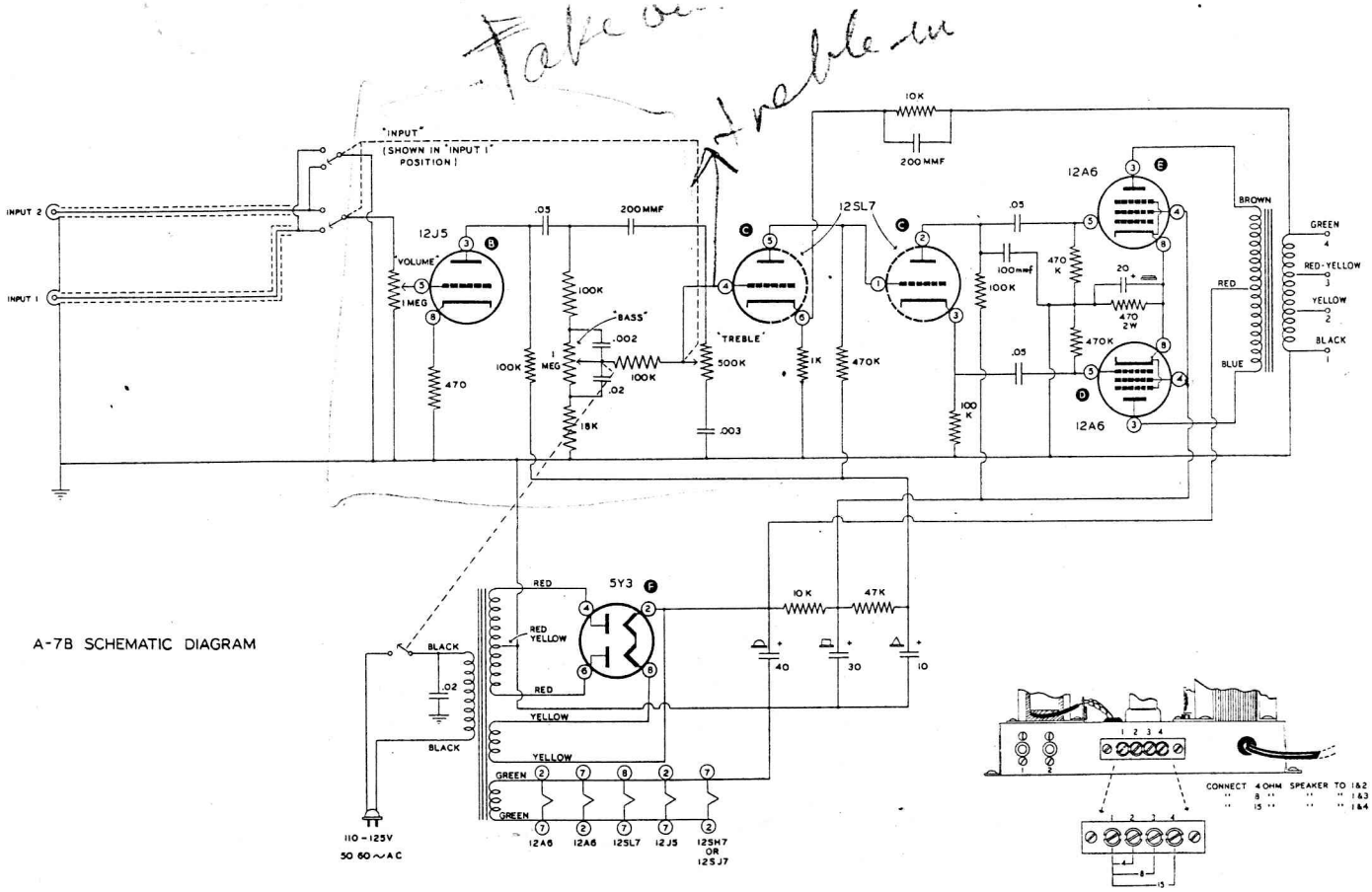
The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

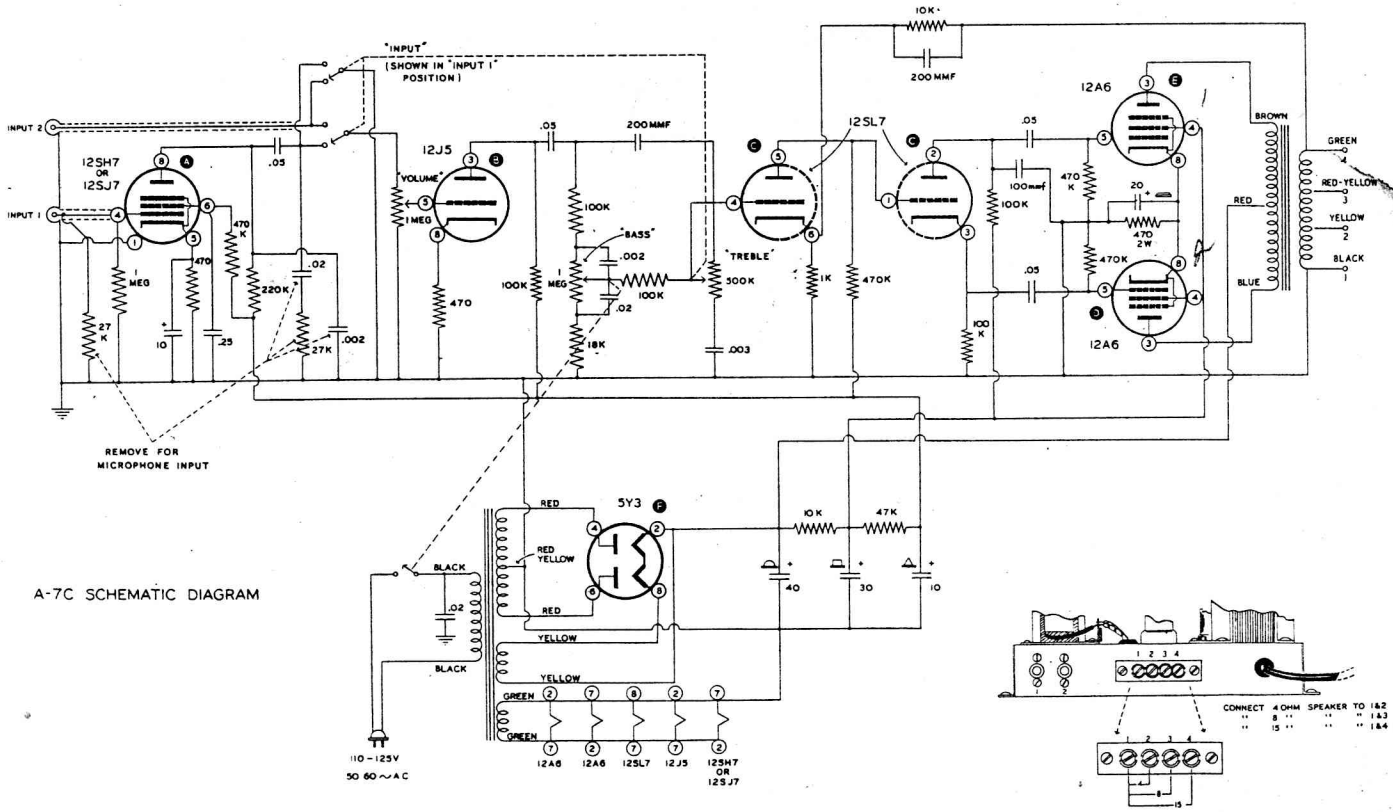
ASSEMBLY and OPERATION of the HEATHKIT MODEL A-7B and A-7C AUDIO AMPLIFIERS

SPECIFICATIONS

Frequency Response	±1.5 db 20 to 20,000 cps
Power Output	6 watts
Tube Complement	1 - 12J5 First Amplifier 1 - 12SL7 Second Amplifier and Phase Splitter 2 - 12A6 Beam Power Output 1 - 5Y3 Rectifier 1 - 12SH7 or 12SJ7 Preamplifier (A-7C only)
Output Impedance	4, 8, or 15 ohms
Input Voltage	110-125 volts AC 50/60 cycles
Physical Specifications	11 1/2" wide, 5 1/4" high, 6 1/2" deep
Shipping Weight	10 lbs.



A-7B SCHEMATIC DIAGRAM



A-7C SCHEMATIC DIAGRAM

INTRODUCTION

Although low in price, the Heathkit Model A-7B and A-7C Amplifiers are soundly engineered units capable of performance far beyond that indicated by their modest cost. Careful chassis layout, straightforward circuit design, and specially selected components contribute to this result. The two models are identical except for input circuits.

The model A-7B may be operated from any source having a signal output voltage of 0.5 to 1 volt RMS. A conventional crystal or ceramic phonograph pickup, an AM tuner, or an FM tuner are all suitable inputs. The amplifier is designed so that two such inputs may be connected, and either one selected by means of a switch on the treble tone control.

The model A-7C similarly provides for two inputs. However, one of these inputs is designed to work out of a reluctance or magnetic phonograph pickup. An extra stage of amplification is used since the output voltage of these devices is very low. Frequency compensation is provided to correct the frequency response of the additional stage for turn-over and roll-off characteristics for LP and modern 78 and 45 rpm recordings. Instructions are furnished to eliminate these compensating circuits should you wish to use the A-7C as a high-gain microphone amplifier. The second input channel is identical to those provided in the A-7B, and is suitable for devices producing 0.5 to 1.0 volt RMS signals.

Both amplifiers are equipped with full-range tone controls capable of an unlimited combination of settings. These controls may be set to the user's personal preference for tone balance at the volume level normally utilized. They are also useful in eliminating scratch from old or worn records, reducing acoustic feedback in public address applications, and for compensating for lower speaker efficiency at the extremes of the frequency range.

Both amplifiers are furnished with an output transformer to match loads of 4, 8, or 15 ohms. These output impedances are commonly used for high-fidelity speaker systems and small public address installations.

CIRCUIT DESCRIPTION

Model A-7B Two high-impedance inputs are connected to a double-pole double-throw switch on the treble tone control shaft. The active input is connected to the grid of the 12J5 first amplifier through a volume control. The unused input is always grounded to prevent cross-talk. The 12J5 operates as a straight resistance-coupled amplifier and drives the first section of the 12SL7 through the tone-control circuits. The output of this stage is direct-coupled to the second half of the 12SL7 which is used as a phase inverter; its plate is coupled to the grid of one 12A6 output amplifier, and its cathode is connected to the other 12A6 grid. The push-pull output transformer matches the 12A6 plates to 4, 8, or 15 Ω output loads. Inverse feedback is applied to the cathode of the first 12SL7 section to extend the frequency range of the amplifier, increase its stability, reduce hum and noise, and improve the damping factor. The power supply is a conventional full-wave rectifier and resistance-capacity filter system.

Model A-7C This amplifier is identical to the Model A-7B except that one input is connected to a 12SH7 (or 12SJ7) used as a preamplifier. This replaces one of the two inputs on the A-7B. The stage, as shown on the schematic and pictorial diagrams, includes the necessary load resistor for a reluctance phonograph pickup. Also, the output of the preamplifier has been compensated to correct the output of such pickups when played with LP or recent 45 and 78 rpm recordings.

When the Model A-7C is to be used for a microphone amplifier, these compensating circuits may be removed. The response of the preamplifier is then essentially flat throughout its range. The components involved are clearly shown in the schematic diagram and the pictorials.

TESTING THE COMPLETED AMPLIFIER

Before connecting the amplifier to the AC outlet, check the following points:

1. Be sure the 5Y3 rectifier is not in its socket.
2. Connect a speaker (or a 5 watt resistor of about the same resistance of the speaker to be used) to the output terminals on the rear chassis apron. If the speaker is 4 ohms nominal impedance, use terminals L1 and L2. If an 8 ohm speaker is to be used, connect it to terminals L1 and L3. If a 15 ohm speaker is to be used, connect it to terminals L1 and L4. (See Figure 10 for further information.)
3. If possible, check the DC resistance from terminal 2 on socket F to ground. The reading should be at least 100,000 ohms. If lower, carefully recheck wiring for an error.
4. Be sure the line switch is off by rotating the BASS control to its full counterclockwise position.

Connect the line cord to a 110 to 125 volt 50/60 cycle AC outlet. DO NOT CONNECT THIS AMPLIFIER TO A D-C (DIRECT CURRENT) LINE. SERIOUS DAMAGE TO THE POWER TRANSFORMER WILL RESULT. No attempt should be made to use this amplifier on 25 cycle AC lines, since the transformer may be seriously damaged, and the amplifier will not operate.

Turn the amplifier on by rotating the BASS control clockwise until a click is heard. The filaments of the 12SL7 and the 12J5 tubes should light. Now insert the 5Y3 tube in its socket. This tube should also show filament color. If the 5Y3 plates show a red color or if the tube shows a bright violet color, turn the amplifier off immediately and recheck the wiring for an error.

Rotate the volume control to its full clockwise position. The speaker should now produce a slight hum or rushing sound. Vary the bass and treble tone controls and note if the background noise varies accordingly. If so, you may assume that the amplifier is working properly.

INSTALLATION AND OPERATION OF THE AMPLIFIER

As mentioned in the introduction to this manual, the amplifier may be installed within an enclosure and the control shafts brought through a decorative front panel. Excess shaft length may be broken off. Sufficient ventilation should be provided to dissipate the heat generated by the equipment, which is about the equivalent of a 75 watt lamp bulb.

If the amplifier is used in conjunction with a television receiver, it is well to place a sheet of aluminum foil underneath the chassis to reduce the probability of hum and noise produced by the television power supply and deflection circuits. These circuits generate relatively high level noise fields which may cause trouble.

Connect the input source to the input sockets N and O. Most record changers and phonograph pickup arms are terminated in a standard phono plug which fits these input sockets. Two additional plugs are furnished with your kit. All input leads should be well shielded and the shield soldered to the shell of the input plug.

Arrange the inputs as follows:	A-7B	A-7C
Magnetic or reluctance phonograph pickups	Not suitable	Input 1 (N)
Ceramic or crystal phonograph pickups	Input 1 or 2 (N or O)	Input 2 (O)
Crystal microphone	Not suitable	Input 1 (N)
AM or FM Tuner	Input 1 or 2 (N or O)	Input 2 (O)
Tape recorder	Input 1 or 2 (N or O)	Input 2 (O)
Musical instrument contact microphones	Not suitable	Input 1 (N)

Operation of the tone controls and volume control is obvious. The input switching circuit is operated by the treble tone control. To select Input 1, turn this control full counterclockwise until a click is heard. The tone control may then be operated throughout its range without affecting the input circuit. Similarly, to select Input 2, rotate the control full clockwise until it clicks. Then return the control to the desired setting for tone control action.

NEVER OPERATE THE AMPLIFIER WITHOUT A SPEAKER CONNECTED. To do so may cause serious damage to the output transformer. Determine the nominal impedance of the speaker system to be used. This information is usually stamped on the name plate of the speaker itself, or it may be obtained from catalog descriptions or directly from the manufacturer. The A-7B and A-7C amplifiers are suitable for use with speakers having impedances of 4, 8, or 15 ohms. Connect the speaker to the output terminal strip as shown in Figure 10 below.

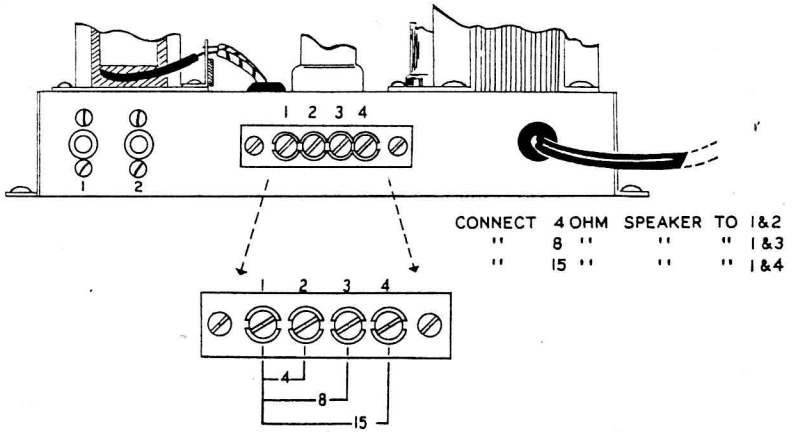


FIGURE 10
SELECTION OF ACCESSORY COMPONENTS FOR YOUR AMPLIFIER

There is a wide range of equipment now available for use with the A-7B and A-7C. We have incorporated within the amplifier those characteristics which make it adaptable to the accessories with lasting acceptance. It should be pointed out that the reproduction of music or other program material is not a function of the amplifier alone, but rather the combined result of the performance of the amplifier, its input sources, and probably most important, the loud-speaker with which it is used.

For phonograph reproduction, we seriously recommend that a reluctance or magnetic cartridge be used. If at all possible, purchase a cartridge with a replaceable stylus with either a sapphire or diamond tip. Long playing records, with their microgrooves, are particularly susceptible to damage by worn styli. Pickering, General Electric, Fairchild, and Clarkstan are all cartridges of this type.

Magnetic and reluctance pickups are highly susceptible to magnetic fields. If they are used, the turntable or record changer should be one especially designed to limit the magnetic field of the drive motor.

In the speaker field, the price range is even wider and in general the performance of the speaker will be in direct proportion to its cost. Jim Lansing, Electro-Voice, Altec-Lansing, Jensen, and University all offer a wide range of speakers and speaker systems of excellent performance. Follow the speaker manufacturer's recommendations carefully regarding baffling or enclosing the speaker.

Further discussion of the problem of accessory components is beyond the scope of this manual. We recommend, for a serious and comprehensive review of this subject, the book, "The Saturday Review Home Book of Recorded Music and Sound Reproduction," published by Prentice Hall, Inc., New York.

IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the pictorial as it is followed in the amplifier. Most cases of difficulty result from wrong connections. (Often having a friend check the wiring will reveal a mistake consistently overlooked.)

2. Compare tube socket voltages with those shown in table. The readings should be within 20% of those tabulated if a vacuum tube voltmeter is used. Other type meters may give lower readings. If a voltage reading fails to compare with the value shown, check further into the circuit involved by checking the various components (resistors, condensers, tubes, etc.)

SOCKET VOLTAGES

Socket	Tube Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
A	12SH7	NR	Fil.	NC	NS	0.45	30	Fil.	11
B	12J5	NC	Fil.	33	NC	NS	NC	Fil.	0.7
C	12SL7	36	280	40	NS	36	0.3	Fil.	Fil.
D	12A6	NR	Fil.	375	325	NS	NC	Fil.	21.5
E	12A6	NR	Fil.	375	325	NS	NC	Fil.	21.5
F	5Y3	NC	385*	NC	325 AC	NC	325 AC	NC	385*

All readings taken with a Heathkit vacuum tube voltmeter. All readings are DC voltages measured to chassis, unless otherwise specified.

NC - No connection to this contact
NS - Not significant

*Voltage between pins 2 and 8 - 5.0 AC

NR - No reading
Fil. - Voltage between two terminals so marked approximately 12 v. AC
Line Voltage - 115 v. 60~

3. If the socket voltages are within 20% of the values indicated, and trouble still persists, remove all the tubes and have them checked by a competent radio serviceman.

4. Carefully recheck the color codes on resistors and transformer leads. If there is a question concerning the color of a transformer lead, scraping the insulation lightly with a knife may help to identify the color quickly.

5. If the amplifier operates, but sounds distorted and mushy, check for oscillation in the output stage. A simple and easy way to do this is to measure the voltage across the 470 KΩ grid resistors connected from pin 5 to pin 1 on the 12A6 sockets. If the stage is oscillating, several volts will be developed across these resistors.

6. High hum levels may be caused by placing the amplifier in a strong AC static field, such as near a television receiver. In these cases, a sheet of aluminum foil under the chassis usually will correct the trouble.

7. Always reverse the line cord in the outlet for minimum hum.

PARTS LIST

MODEL A-7B and A-7C AMPLIFIERS

When ordering replacement parts, be sure to specify the part number below.

PART No.	QUANTITY A-7B	QUANTITY A-7C	DESCRIPTION
Resistors			
1-6	1	2	470 Ω 1/2 watt
1-9	1	1	1 KΩ 1/2 watt
1-20	2	2	10 KΩ 1/2 watt
1-69	1	1	18 KΩ 1/2 watt
1-23	0	2	27 KΩ 1/2 watt
1-25	1	1	47 KΩ 1/2 watt
1-26	5	5	100 KΩ 1/2 watt
1-29	0	1	220 KΩ 1/2 watt
1-33	3	4	470 KΩ 1/2 watt
1-35	0	1	1 megohm 1/2 watt
1-12B	1	1	470 Ω 2 watt
Condensers			
21-9	1	1	100 μμfdisc ceramic
20-3	2	2	200 μμfmica
23-18	1	2	.002 μfd tubular
23-26	1	1	.003 μfd tubular
23-8	2	3	.02 μfd tubular
23-10	3	4	.05 μfd tubular
23-13	0	1	.25 μfd tubular
25-4	0	1	10 μfd
25-18	1	1	40-30-10-20 μfd
Controls			
19-22	1	1	500 KΩ Control with switch ("Treble")
19-7	1	1	1 megohm Control with switch ("Bass")
10-20	1	1	1 megohm Control ("Volume")
Transformers			
51-18	1	1	Output transformer
54-3	1	1	Power transformer
Tubes			
411-3	1	1	5Y3 Tube
411-21	2	2	12A6 Tube
411-48	1	1	12J5 Tube
411-27	0	1	12SH7 or 12SJ7 Tube
411-39	1	1	12SL7 Tube

PART No.	QUANTITY A-7B	QUANTITY A-7C	DESCRIPTION
Sockets and Terminal Strips			
434-2	5	6	Octal tube socket
434-18	2	2	Phono socket
431-1	2	2	1 lug Terminal strip
431-2	1	1	2 lug Terminal strip
431-3	1	1	3 lug Terminal strip
431-5	1	1	4 lug Terminal strip
431-13	1	1	4 screw Terminal strip
438-4	2	2	Phono plug
Hardware			
73-1	5	5	3/8" Rubber grommet
250-9	25	26	6-32 Machine screw
250-18	4	4	8-32 Machine screw
250-43	3	3	8-32 Set screw
252-3	25	26	6-32 Hex nut
252-4	4	4	8-32 Hex nut
252-7	3	3	Control nut
253-10	3	3	Control washer
254-1	25	26	#6 Lockwasher
254-2	4	4	#8 Lockwasher
254-4	3	3	Control lockwasher
261-1	4	4	Rubber feet
Miscellaneous			
89-1	1	1	Line cord
200-M44F	1	1	Chassis
205-M11F51	1	1	Control plate
342-1	1	1	length Shielded wire
344-1	1	1	length Hookup wire
346-1	1	1	length Sleeving
462-19	3	3	Skirted knob
481-3	1	1	Condenser mounting wafer
485-1	1	0	Plug Button
595-57	1	1	Instruction manual

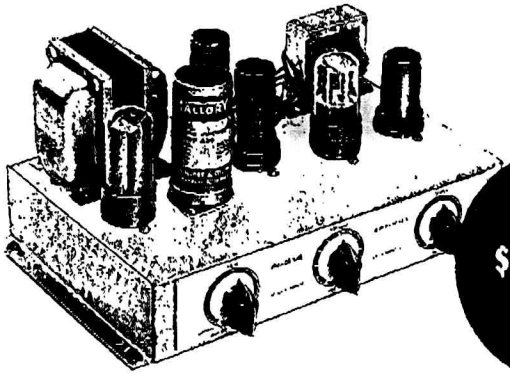
HEATH COMPANY

BENTON HARBOR, MICHIGAN

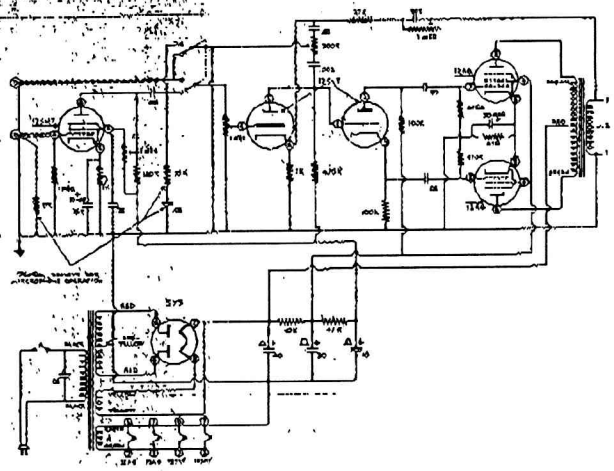
THE WORLD'S *Finest* TEST EQUIPMENT IN KIT FORM

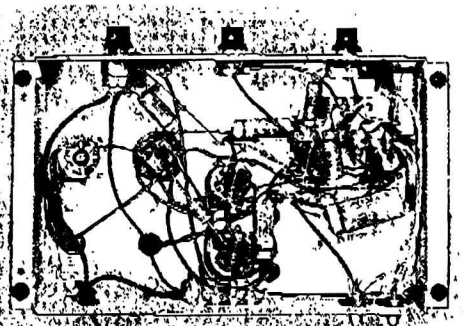
5/3/55

HEATHKIT ECONOMY 6 WATT AMPLIFIER KIT



MODEL A-7
$14.50
SHIPPING WT 10 LBS.





The Heathkit Model A-7 Amplifier offers many unusually fine outstanding features not normally expected in this low price range. The Amplifier is transformer operated and the power supply is extremely well filtered to eliminate hum difficulties. Two input circuits may be individually switch selected for phono or tuner operation. Separate bass and treble tone controls readily permit the degree of tonal adjustment to meet individual listening requirements. Control shafts are of the break off type adjustable length for convenience in custom installation. The tapped output transformer offers the choice of 4, 8 or 15 ohms output impedance. The Amplifier output stage features beam power tubes in a push pull circuit for balanced reproduction. All components are of high quality and the layout as well as the actual construction of the Amplifier has been greatly simplified. The heavy gauge steel chassis is finished in an attractive hammertone grey finish and a separate lettered control panel provides the necessary finishing touch. The complete circuit uses a 12SL7 tube as an amplifier and phase splitter with a pair of 12A6 beam power output tubes. Operating voltages are furnished by a 5Y3 operated power supply system. Excellent voltage gain characteristics, good frequency response and a full 6 watt power output all represent a truly tremendous kit value at this remarkable low price.

MODEL A-7A Amplifier incorporates a pre-amplifier stage (12SH7) with special compensated network to provide the necessary gain for operation with the variable reluctance or low output level phono cartridge. Circuit is properly compensated for microphone operation in a moderate powered sound system. **$16.50**

SPECIFICATIONS

Frequency Response	± 1½ db from 20 to 20,000 cycles.
Power Output	6 watts
Tube Complement	1—12SL7 Amplifier and Phase Splitter 2—12A6 Beam Power Output 1—5Y3 rectifier 1—12SH7 Preamplifier (A-7A only)
Output Impedances	4, 8 and 16 ohms
Input Voltage	110-125 volts AC 50/60 cycles
Physical Specifications	11½" wide x 5¼" high x 6½" deep

HEATHKIT MANUALS

When the first Heathkits were developed in 1947, the instruction information furnished with the kit consisted of a few sheets of mimeographed paper stapled to a blue print schematic. While the information was adequate, it represented a far cry from the highly specialized kit manual now offered. Present Heathkit manuals are written in a clear, informative, step-by-step construction manner which permits the kit builder to check off each assembly step as it is completed. For additional information, pictorials or exploded views of kit construction details are also supplied. Large scale schematics and large scale pictorials provide additional assistance. On the inside covers of the construction manual, information regarding color codes and their interpretation will be found along with general construction information. Truly, the present Heathkit manuals, with their distinctive bright yellow cover, today have set a high level in instruction information for the entire electronic industry.

SPEAKERS

AR-1 and BR-1 Receiver Kits— 401-3 5" speaker, voice coil impedance 4 ohms, shipping weight 2 lbs. **$2.75**

A-7 and A-7A Amplifier Kits— 401-5 12" speaker, voice coil impedance 4 ohms, shipping weight 7 lbs. **$6.95**

A-8 and A-8A Amplifier Kits— 401-6 12" speaker, voice coil impedance 8 ohms, shipping weight 7 lbs. **$7.50**