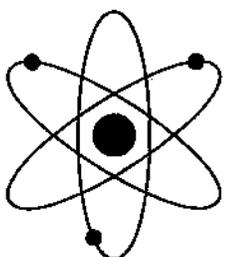


**Assembling  
and Using Your . . .**

# Heathkit

**PINK/WHITE NOISE  
GENERATOR**

**MODEL AD-1309**



595-2998

**HEATH COMPANY  
BENTON HARBOR, MICHIGAN**

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information ..... (616) 982-3411  
 Credit ..... (616) 982-3561  
 Replacement Parts ..... (616) 982-3571

*Technical Assistance Phone Numbers*

*8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only*

R/C, Audio, and Electronic Organs ..... (616) 982-3310  
 Amateur Radio ..... (616) 982-3296  
 Test Equipment, Weather Instruments and  
 Home Clocks ..... (616) 982-3315  
 Television ..... (616) 982-3307  
 Aircraft, Marine, Security, Scanners, Automotive,  
 Appliances and General Products ..... (616) 982-3496  
 Computers — Hardware ..... (616) 982-3309  
 Computers — Software:  
 Operating Systems, Languages, Utilities ..... (616) 982-3860  
 Application Programs ..... (616) 982-3884  
 Heath Craft Wood Works ..... (616) 982-3423

## YOUR HEATHKIT 90-DAY LIMITED WARRANTY

### Consumer Protection Plan for Heathkit Consumer Products

Welcome to the Heath family. We believe you will enjoy assembling your kit and will be pleased with its performance. Please read this Consumer Protection Plan carefully. It is a "LIMITED WARRANTY" as defined in the U.S. Consumer Product Warranty and Federal Trade Commission Improvement Act. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

#### Heath's Responsibility

**PARTS** — Replacements for factory defective parts will be supplied free for 90 days from date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. You can obtain warranty parts direct from Heath Company by writing or telephoning us at (616) 982-3571. And we will pay shipping charges to get those parts to you ... anywhere in the world.

**SERVICE LABOR** — For a period of 90 days from the date of purchase, any malfunction caused by defective parts or error in design will be corrected at no charge to you. You must deliver the unit at your expense to the Heath factory, any Heathkit Electronic Center (units of Veritechnology Electronics Corporation), or any of our authorized overseas distributors.

**TECHNICAL CONSULTATION** — You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

**NOT COVERED** — The correction of assembly errors, adjustments, calibration, and damage due to misuse, abuse, or negligence are not covered by the warranty. Use of corrosive solder and/or the unauthorized modification of the product or of any furnished component will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, loss of use, customer assembly, set-up time, or unauthorized service.

This warranty covers only Heath products and is not extended to other equipment or components that a customer uses in conjunction with our products.

**SUCH REPAIR AND REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF HEATH FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORSEEABLE.**

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

#### Owner's Responsibility

**EFFECTIVE WARRANTY DATE** — Warranty begins on the date of first consumer purchase. You must supply a copy of your proof of purchase when you request warranty service or parts.

**ASSEMBLY** — Before seeking warranty service, you should complete the assembly by carefully following the manual instructions. Heathkit service agencies cannot complete assembly and adjustments that are customer's responsibility.

**ACCESSORY EQUIPMENT** — Performance malfunctions involving other non-Heath accessory equipment, (antennas, audio components, computer peripherals and software, etc.) are not covered by this warranty and are the owner's responsibility.

**SHIPPING UNITS** — Follow the packing instructions published in the assembly manuals. Damage due to inadequate packing cannot be repaired under warranty.

If you are not satisfied with our service (warranty or otherwise) or our products, write directly to our Director of Customer Service, Heath Company, Benton Harbor MI 49022. He will make certain your problems receive immediate, personal attention.



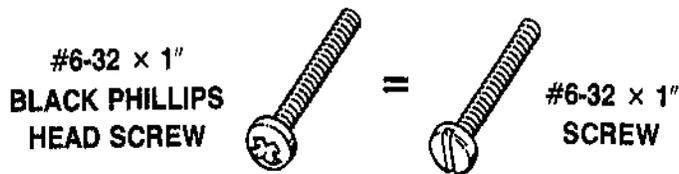
HEATH COMPANY - BENTON HARBOR, MICHIGAN 49022  
TLX 72-9421

## IMPORTANT NOTICE

Dear Customer:

We are in the process of changing the standardization of screws from slotted head to phillips head. The new screws will also be black or stainless steel instead of zinc.

If some of the screws in your kit do not match the description in the Manual, use the screws that match the size, thread and length of the description as shown in the following example.



### EXAMPLE

Thank you,

HEATH COMPANY

**Heathkit<sup>®</sup>** P-0

GENERAL  
591-3851

# Heathkit® Manual

*for the*

## **PINK/WHITE NOISE GENERATOR** Model AD-1309

595-2998

HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022

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## INTRODUCTION

Your Heathkit Model AD-1309 Pink/White Noise Generator produces white noise that has nearly constant energy per Hz and pink noise that has nearly constant energy per octave across the 20 Hz to 20 kHz audio range. This Generator is designed to be used with any real time or swept filter spectrum analyzer. A special circuit suppresses turn-on and turn-off transient voltages that could damage a

speaker system. A 9-volt alkaline battery (not supplied) typically provides 25-30 hours of operation.

You can use this compact and light instrument nearly anywhere that you need a noise source. It has been carefully designed to provide you with long, reliable performance for your laboratory, work bench, or portable applications.

## ASSEMBLY NOTES

### TOOLS

You will need these tools to assemble your kit.



PLIERS



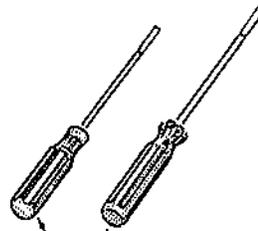
LONG-NOSE  
PLIERS



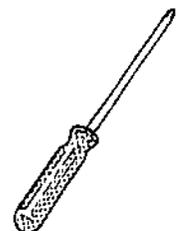
DIAGONAL  
CUTTERS



WIRE  
STRIPPERS



1/8" & 1/4"-BLADE  
SCREWDRIVERS

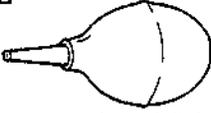


PHILLIPS  
SCREWDRIVER

**OTHER HELPFUL TOOLS**



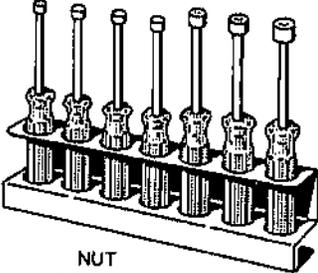
NUT STARTER  
(May Be Supplied  
With Kit)



DESOLDERING  
BULB\*

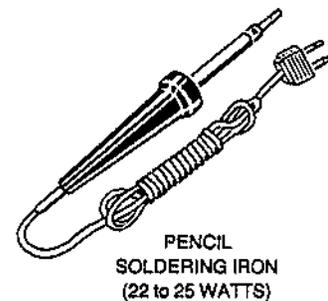


DESOLDERING  
BRAID\*



NUT  
DRIVERS

\*To Remove Solder From Circuit Connections.



PENCIL  
SOLDERING IRON  
(22 to 25 WATTS)

### ASSEMBLY

1. Follow the instructions carefully. Read the entire step before you perform each operation.
2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.
3. Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.
4. Position all parts as shown in the Pictorials.
5. Solder a part or a group of parts only when you are instructed to do so.

6. Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:
- In the Parts List,
  - At the beginning of each step where a component is installed,
  - In some illustrations,
  - In the Schematic,
  - In the section at the rear of the Manual.
7. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

**SAFETY WARNING: Avoid eye injury when you cut off excessive lead lengths. Hold the leads so they cannot fly toward your eyes.**

## SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

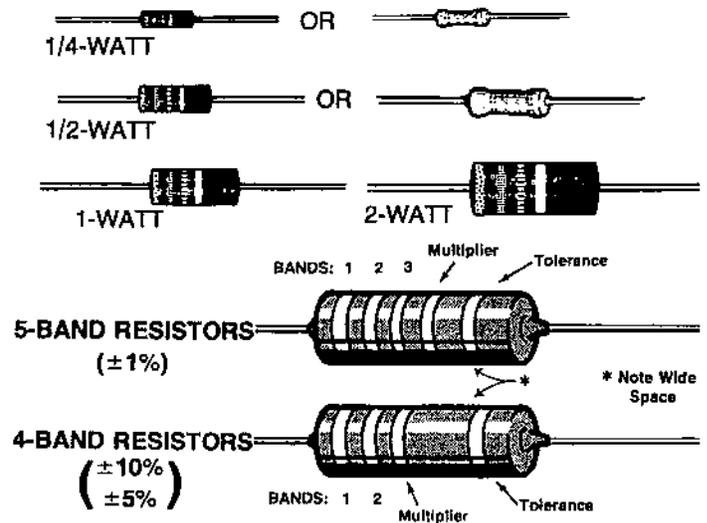
It is easy to make a good solder connection if you follow a few simple rules:

1. Use the right type of soldering iron. A 22 to 25-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

NOTE: Always use rosin core, radio-type solder (60:40 tin-lead content) for all of the soldering in this kit. This is the type we have supplied with the parts. The Warranty will be void and we will not service any kit in which acid core solder or paste has been used.

## PARTS

Resistors are identified in Parts Lists and steps by their resistance value in  $\Omega$  (ohms),  $k\Omega$  (kilohms), or  $M\Omega$  (megohms). They are usually identified by a color code and four or five color bands, where each color represents a number. These colors (except for the last band, which indicates a resistor's "tolerance") will be given in the steps in their proper order. Therefore, the following color code is given for information only. NOTE: Occasionally, a "precision" or "power" resistor may have the value stamped on it.



Band 1 1st Digit		Band 2 2nd Digit		Band 3 (if used) 3rd Digit		Multiplier		Resistance Tolerance	
Color	Digit	Color	Digit	Color	Digit	Color	Multiplier	Color	Tolerance
Black	0	Black	0	Black	0	Black	1	Silver	$\pm 10\%$
Brown	1	Brown	1	Brown	1	Brown	10	Gold	$\pm 5\%$
Red	2	Red	2	Red	2	Red	100	Brown	$\pm 1\%$
Orange	3	Orange	3	Orange	3	Orange	1,000		
Yellow	4	Yellow	4	Yellow	4	Yellow	10,000		
Green	5	Green	5	Green	5	Green	100,000		
Blue	6	Blue	6	Blue	6	Blue	1,000,000		
Violet	7	Violet	7	Violet	7	Silver	0.01		
Gray	8	Gray	8	Gray	8	Gold	0.1		
White	9	White	9	White	9				

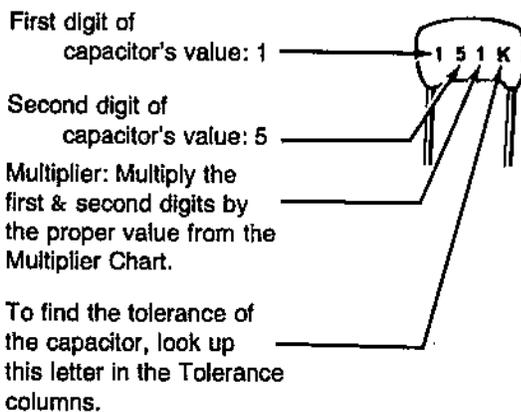
Capacitors will be called out by their capacitance value in  $\mu F$  (microfarads) or  $pF$  (picofarads) and type: ceramic, Mylar\*, electrolytic, etc. Some capacitors may have their value printed in the following manner:

EXAMPLES:

$$151K = 15 \times 10 = 150 pF$$

$$759 = 75 \times 0.1 = 7.5 pF$$

NOTE: The letter "R" may be used at times to signify a decimal point: as in:  $2R2 = 2.2 (pF \text{ or } \mu F)$ .



MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER:	MULTIPLY BY:	10 pF OR LESS	LETTER	OVER 10 pF
0	1	$\pm 0.1 pF$	B	
1	10	$\pm 0.25 pF$	C	
2	100	$\pm 0.5 pF$	D	
3	1000	$\pm 1.0 pF$	F	$\pm 1\%$
4	10,000	$\pm 2.0 pF$	G	$\pm 2\%$
5	100,000		H	$\pm 3\%$
			J	$\pm 5\%$
8	0.01		K	$\pm 10\%$
9	0.1		M	$\pm 20\%$

\*DuPont Registered Trademark

## PARTS LIST

Unpack your kit and check each part against the following list. Do not remove any component that is supplied on a tape from the tape until you use it in a step. Return any part that is packed in an individual envelope (which has the part number printed on it) back to the envelope after you identify it. Keep these parts in their envelopes until they are called for in a step. Do NOT throw away any packing material until you account for all the parts.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual. For prices, refer to the separate "Heath Parts Price List."

## TAPED COMPONENTS

Refer directly to the enclosed "Taped Component Chart." Follow the instructions at the top of that chart to check the following components.

HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>RESISTORS</b>				<b>Resistors (cont'd.)</b>			
<b>1/4-Watt, 1%</b>				6-101-12	2	100 $\Omega$ (brn-blk-brn)	R9, R37
				6-561-12	2	560 $\Omega$ (grn-blu-brn)	R7, R35
				6-102-12	2	1000 $\Omega$ (brn-blk-red)	R12, R39
				6-222-12	1	2200 $\Omega$ (red-red-red)	R6
				6-472-12	1	4700 $\Omega$ (yel-viol-red)	R2
				6-562-12	4	5600 $\Omega$ (grn-blu-red)	R8, R13, R36, R41
				6-153-12	1	15 k $\Omega$ (brn-grn-org)	R31
				6-473-12	4	47 k $\Omega$ (yel-viol-org)	R11, R15, R38, R43
				6-124-12	2	120 k $\Omega$ (brn-red-yel)	R4, R5
				6-474-12	2	470 k $\Omega$ (yel-viol-yel)	R14, R42
				<b>DIODES</b>			
				56-56	6	1N4149	D2, D3, D4, D5, D6, D7
				57-65	1	1N4002	D1
<b>1/4-Watt, 5%</b>							
				<b>NOTE: The following resistors have four color bands. The last band, which is gold, will not be called out.</b>			
6-2002-12	1	20 k $\Omega$ (red-blk-blk-red)	R19				
6-1003-12	2	100 k $\Omega$ (brn-blk-blk-org)	R23, R27				
6-1503-12	6	150 k $\Omega$ (brn-grn-blk-org)	R17, R18, R22, R26, R32, R33				
6-1803-12	2	180 k $\Omega$ (brn-gry-blk-org)	R21, R34				
6-2003-12	1	200 k $\Omega$ (red-blk-blk-org)	R16				
6-3203-12	2	320 k $\Omega$ (org-red-blk-org)	R24, R28				
6-3603-12	2	360 k $\Omega$ (org-blu-blk-org)	R25, R29				

**NON-TAPED PARTS**

The following parts are not taped on strips. The key numbers correspond to the numbers on the "Parts Pictorial" (Illustration Booklet, Page 1).

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

**CONTROLS**

A1	10-1184	1	15 kΩ control	R1
A2	19-754	1	10 kΩ control with switch	R3/SW1

**CAPACITORS**

**Mica**

B1	20-103	3	150 pF	C13, C14, C15
----	--------	---	--------	---------------

**Electrolytic**

B2	25-820	3	10 μF/10 V nonpolarized	C5, C8, C16
B3	25-917	4	10 μF/25 V (polarized)	C1, C4, C7, C18
B3	25-915	3	47 μF (polarized)	C2, C6, C17

**Mylar**

B4	27-226	1	.0022 μF	C3
B4	27-136	3	.015 μF	C9, C11, C12

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

**TRANSISTORS — INTEGRATED CIRCUIT (ICs)**

NOTE: Transistors and integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number. (On Integrated circuits, use **only** those numbers and letters in **BOLD** print. Disregard any other numbers or letters.)
3. Part number and type number.
4. Part number with a type number other than the one shown.

C1	417-864	1	MPSA05 transistor	Q1
C1	417-874	2	2N3906 transistor	Q2, Q4
C1	417-875	2	2N3904 transistor	Q3, Q5
C2	442-743	1	<b>HA-4741 IC</b>	U2
C2	442-760	1	<b>5437 IC</b>	U1

KEY HEATH No.	Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------------	----------	------	-------------	----------------------

**CONNECTOR - SOCKETS**

D1	432-134	2	Wire socket	J1, J2
D2	432-798	1	Battery connector	
D3	434-107	2	Phono socket	
D4	434-230	1	8-pin IC socket	
D4	434-298	1	14-pin IC socket	

**SHIELDED CABLE-WIRE**

343-15	12"	Shielded cable
344-90	6"	Black wire
344-91	6"	Brown wire
344-92	6"	Red wire
344-93	6"	Orange wire

**HARDWARE**

E1	250-1414	6	4-40 × 1/4" screw
E2	250-1408	4	#4 × 3/8" self-tapping screw
E3	250-33	1	6-32 × 1/8" setscrew
E4	252-2	2	4-40 nut
E5	254-9	4	#4 lockwasher
E6	254-42	2	1/4" lockwasher
E7	255-770	2	4-40 × 3/8" spacer

KEY HEATH No.	Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------------	----------	------	-------------	----------------------

**MISCELLANEOUS**

	85-2809-1	1	Circuit board	
F1	95-659	1	Cabinet	
F2	200-1438	1	Chassis	
F3	203-1866	1	Rear panel	
F4	203-2158-1	1	Front panel	
F5	208-48	1	Battery holder	
F6	261-49	4	Plastic foot	
F7		1	Blue and white label	
F8	462-1166	1	Knob	
	597-260	1	Parts Order Form	
		1	Taped Component Chart	
			Assembly Manual (See Page 1 for Part Number)	
			Solder	

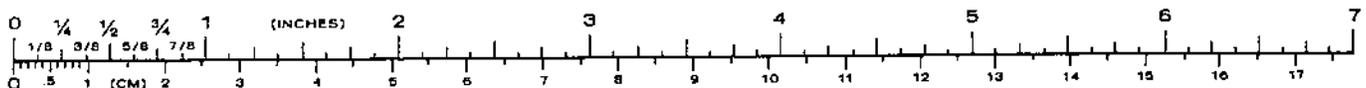
**BATTERY**

You should purchase the following battery at this time for use in your kit:

One 9-volt transistor battery, NEDA #1604.

Representative manufacturers and their type numbers are:

Eveready #216, P3  
 Burgess #2V6  
 Mallory #TR-146X (long life)  
 RCA #VS323  
 Hellesens #410  
 Varta #438  
 CEI #6F22  
 Ray-O-Vac #D1604-1 (long life)



## STEP-BY-STEP ASSEMBLY

### CIRCUIT BOARD

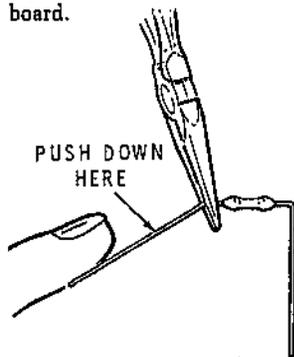
#### START

In the following steps, you will be given detailed instructions on how to install and solder the first part on the circuit board. Read and perform each step carefully. Then use the same procedure whenever you install parts on a circuit board.

- ( ) Position the circuit board as shown with the printed side (not the foil side) up.

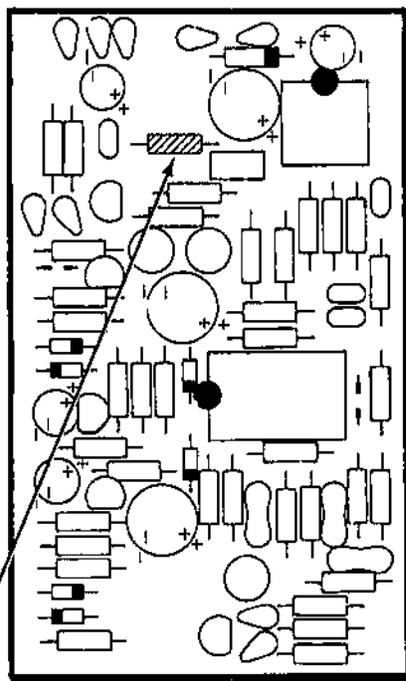
**NOTE:** When you install a component that has its value printed on it, position the value marking up, so it can be easily read. Diodes should be mounted with their types or part number up, if possible.

- ( ) Hold a 4700  $\Omega$  (yel-viol-red) resistor with long-nose pliers and bend the leads straight down to fit the hole spacing on the circuit board.



- ( ) R2: Push the leads through the holes at the indicated location on the circuit board. The end with color bands may be positioned either way.

- ( ) Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.

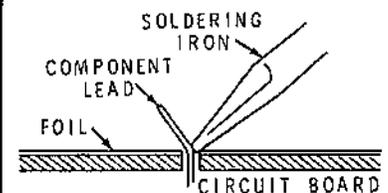


PICTORIAL 1-1

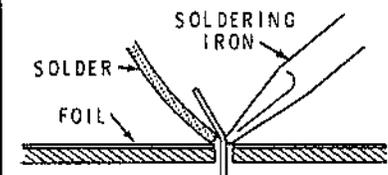
#### CONTINUE

- ( ) Turn the circuit board over and solder the resistor leads to the foil as follows:

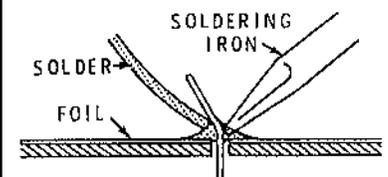
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat both for two or three seconds.



2. Then apply solder to the other side of the connection. **IMPORTANT:** Let the heated lead and the circuit board foil melt the solder.



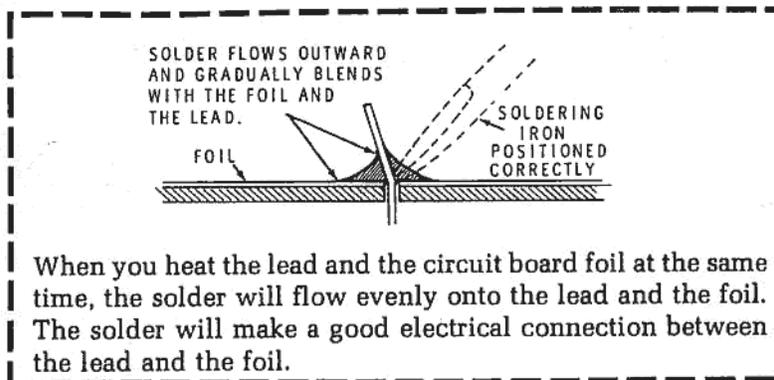
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



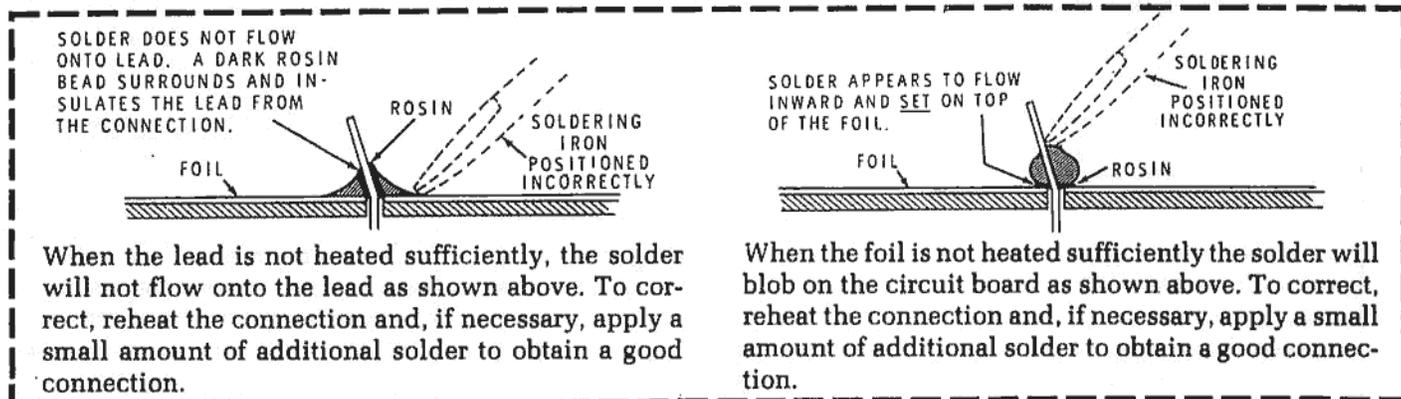
- ( ) Cut off the excess lead lengths close to the connection. **WARNING:** Clip the leads so the ends will not fly toward your eyes.

- ( ) Check each connection. Compare it to the illustrations on Page 10. After you have checked the solder connections, proceed with the assembly on Page 11. Use the same soldering procedure for each connection.

### A GOOD SOLDER CONNECTION



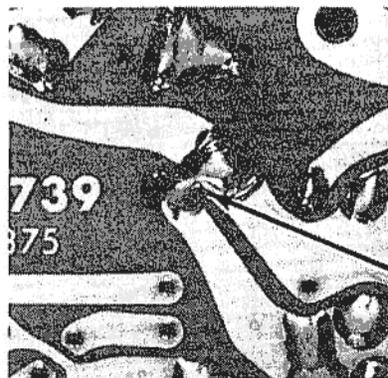
### POOR SOLDER CONNECTIONS



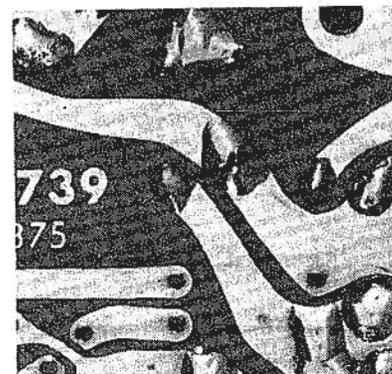
### SOLDER BRIDGES

A solder bridge between two adjacent foils is shown in photograph A. Photograph B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is: always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together. NOTE: It is alright for solder to bridge two connections on the same foil.

Use only enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil-side-down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. NOTE: The foil side of most circuit boards has a coating on it called "solder resist." This is a protective insulation to help prevent solder bridges.



**A**  
**SOLDER BRIDGE**



**B**

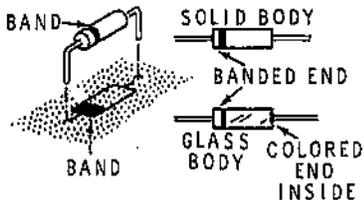
**START** 

( ) Position the circuit board as shown with the printed side (not the foil side) up.

( ) Be sure you installed resistor R2 in Pictorial 1-1.

NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board. A DIODE WILL NOT WORK PROPERLY IF IT IS INSTALLED BACKWARDS. See Detail 1-2A.

If your diode has a solid body, the band is clearly defined. If your diode has a glass body, do not mistake the colored end inside the diode for the banded end. Look for a band painted on the outside of the glass.

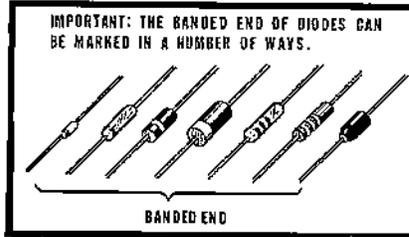


CAUTION: ALWAYS POSITION THE BANDED END OF A DIODE AS SHOWN ON THE CIRCUIT BOARD.

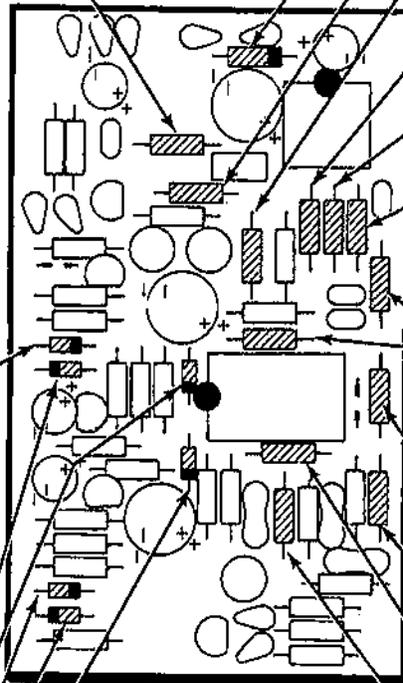
Install six 1N4149 diodes (#56-56) at the following locations:

- ( ) D3 .....
- ( ) D4 .....
- ( ) D2 .....
- ( ) D6 .....
- ( ) D7 .....
- ( ) D5 .....

( ) Solder the leads to the foil and cut off the excess lead lengths.



Detail 1-2A



PICTORIAL 1-2

**CONTINUE** 

( ) D1: 1N4002 diode (#57-65).

( ) R4: 120 kΩ (brn-red-yel).

( ) R16: 200 kΩ, 1% (red-blk-blk-org).

( ) R17: 150 kΩ, 1% (brn-grn-blk-org).

( ) R18: 150 kΩ, 1% (brn-grn-blk-org).

( ) R21: 180 kΩ, 1% (brn-gry-blk-org).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R24: 320 kΩ, 1% (org-red-blk-org).

( ) R22: 150 kΩ, 1% (brn-grn-blk-org).

( ) R25: 360 kΩ, 1% (org-blu-blk-org).

( ) R26: 150 kΩ, 1% (brn-grn-blk-org).

( ) R31: 15 kΩ (brn-grn-org).

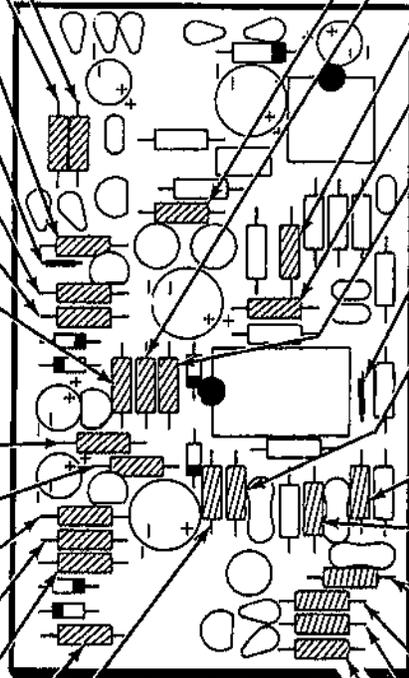
( ) R32: 150 kΩ, 1% (brn-grn-blk-org).

( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: Save two cutoff leads for use later.

**START** 

- ( ) R6: 2200  $\Omega$  (red-red-red).
- ( ) R5: 120 k $\Omega$  (brn-red-yel).
- ( ) R15: 47 k $\Omega$  (yel-viol-org).
- ( ) Bare wire at J. Use a cutoff component lead.
- ( ) R8: 5600  $\Omega$  (grn-blu-red).
- ( ) R14: 470 k $\Omega$  (yel-viol-yel).
- ( ) R13: 5600  $\Omega$  (grn-blu-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R9: 100  $\Omega$  (brn-blk-brn).
- ( ) R39: 1000  $\Omega$  (brn-blk-red).
- ( ) R37: 100  $\Omega$  (brn-blk-brn).
- ( ) R38: 47 k $\Omega$  (yel-viol-org).
- ( ) R36: 5600  $\Omega$  (grn-blu-red).
- ( ) R41: 5600  $\Omega$  (grn-blu-red).
- ( ) R35: 560  $\Omega$  (grn-blu-brn).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



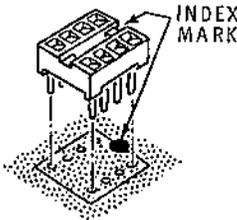
PICTORIAL 1-3

**CONTINUE** 

- ( ) R7: 560  $\Omega$  (grn-blu-brn).
- ( ) R11: 47 k $\Omega$  (yel-viol-org).
- ( ) R19: 20 k $\Omega$ , 1% (red-bik-bik-red).
- ( ) R23: 100 k $\Omega$ , 1% (brn-blk-blk-org).
- ( ) R12: 1000  $\Omega$  (brn-blk-red).
- ( ) Bare wire at J. Use a cutoff component lead.
- ( ) R34: 180 k $\Omega$ , 1% (brn-gry-bik-org).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R29: 360 k $\Omega$ , 1% (org-blu-blk-org).
- ( ) R27: 100 k $\Omega$ , 1% (brn-blk-blk-org).
- ( ) R28: 320 k $\Omega$ , 1% (org-red-bik-org).
- ( ) R33: 150 k $\Omega$ , 1% (brn-grn-blk-org).
- ( ) R43: 47 k $\Omega$  (yel-viol-org).
- ( ) R42: 470 k $\Omega$  (yel-viol-yel).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

**START** →

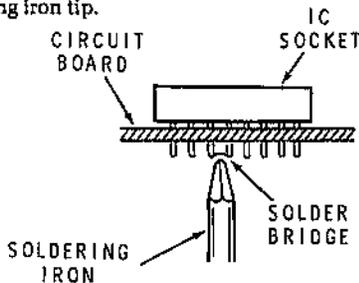
NOTE: Each of the IC sockets that you will install in the following steps will have either an open or solid center strip. The socket with the solid center strip will have an identification mark on one end (an arrow, a dot, or a notch). Position this end of the socket toward the index mark on the circuit board.



Solder the socket pins to the foil after you install each socket.

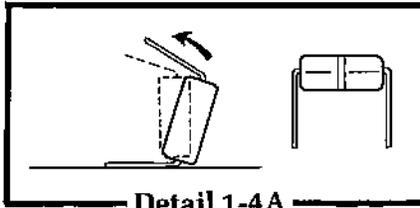
NOTE: It is very easy to form a solder bridge between foils on the circuit board. After each solder step, carefully inspect the foil for solder bridges and remove any that have formed.

If a solder bridge exists, hold the circuit board foil-side-down as shown, and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip.

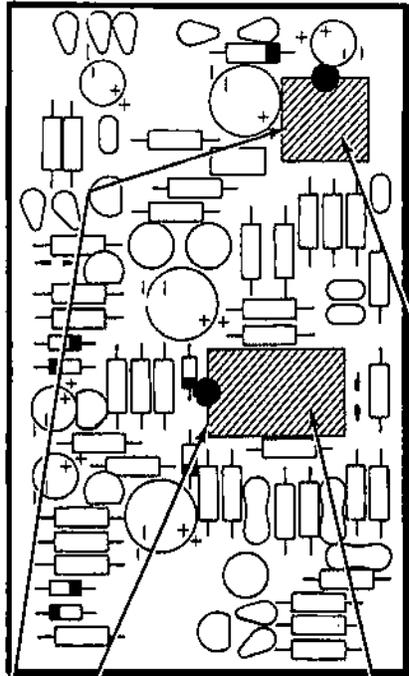


( ) 8-pin IC socket at U1.

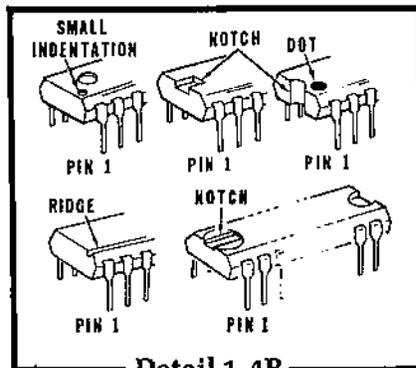
( ) 14-pin IC socket at U2.



Detail 1-4A



PICTORIAL 1-4



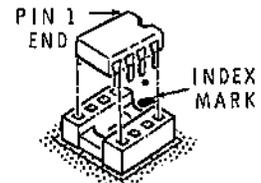
Detail 1-4B

**CONTINUE** →

NOTE: Use the following installation procedure (steps 1 through 6) for protected ICs. For non-protected ICs, start with step 5.

CAUTION: When you install the following protected IC (mounted on a foam pad), be sure it does not get damaged by static electricity. Once you remove the foam pad, do not let go of the IC. Install it as follows. Read the entire step before you pick up the IC.

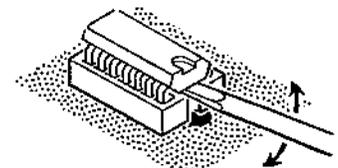
1. Pick up the IC and touch the foam pad with both hands.
2. Hold the IC with one hand and remove the foam pad with the other hand.
3. Refer to Detail 1-4A and continue to hold the IC with one hand and roll the IC pins onto a flat surface to make sure they are parallel.
4. Pick up the circuit board in your other hand.
5. See Detail 1-4B and align the pin 1 end of the IC with the index mark on the circuit board.
6. Then push the IC pins into the IC socket. Once in the socket, the IC is protected.



( ) U1: 5437 IC (#442-760).

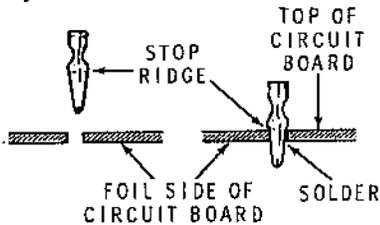
( ) U2: 4741 IC (#442-743).

Should it ever become necessary to remove an IC, use the blade of a small screwdriver. Insert the blade beneath the IC; then gently rock the blade up and down to lift the IC.



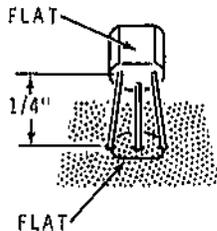
**START**

NOTE: Install wire sockets as shown below. Solder each socket to the foil as you install it.



( ) Two wire sockets at C3.

NOTE: Install each of the following transistors as shown below. First line up the flat on the transistor with the outline of the flat on the circuit board. Insert the transistor leads into the corresponding circuit board holes. Position the bottom of the transistor 1/4" above the circuit board. Then solder each lead to the circuit board foil and cut off the excess lead lengths.



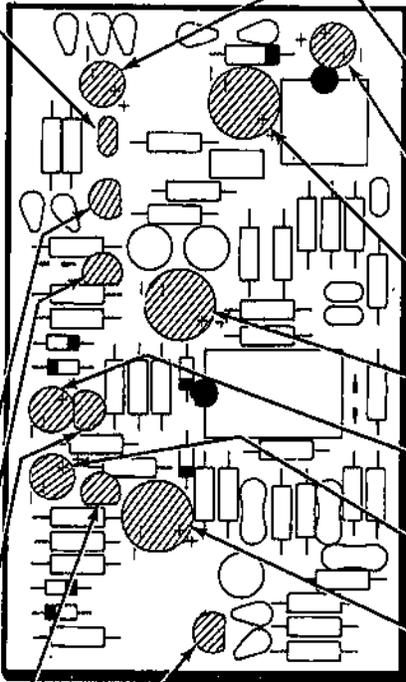
( ) Q1: MPSA05 transistor (#417-864).

( ) Q3: 2N3904 transistor (#417-875).

( ) Q2: 2N3906 transistor (#417-874).

( ) Q4: 2N3906 transistor (#417-874).

( ) Q5: 2N3905 transistor (#417-875).

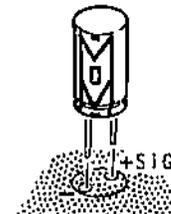


PICTORIAL 1-5

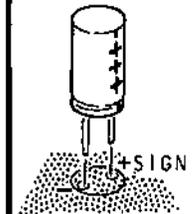
**CONTINUE**

NOTE: When you install a polarized electrolytic capacitor, be sure to match the positive (+) mark on the capacitor with the positive (+) mark on the circuit board, or match the negative (-) mark on the capacitor with the negative (-) mark on the circuit board.

IDENTIFIED  
LEAD IS  
NEGATIVE (-)



IDENTIFIED  
LEAD IS  
POSITIVE (+)



( ) C4: 10  $\mu$ F/25 V polarized electrolytic.

( ) C1: 10  $\mu$ F/25 V polarized electrolytic.

( ) C2: 47  $\mu$ F electrolytic.

( ) C6: 47  $\mu$ F electrolytic.

( ) C7: 10  $\mu$ F/25 V polarized electrolytic.

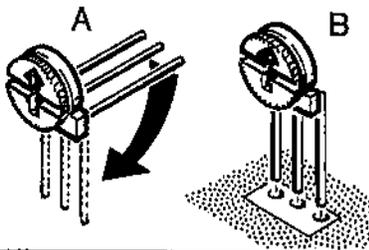
( ) C18: 10  $\mu$ F/25 V polarized electrolytic.

( ) C17: 47  $\mu$ F electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

**START** ↘

( ) R1: 15 kΩ control (#10-1184).  
 First bend the three leads of the control down as shown in A below. Match the leads on the control with the holes in the circuit board as shown in B. Then push the control down so it is positioned against the circuit board. Solder the leads to the foil and cut off the excess lead lengths. If necessary, reposition the 120 kΩ (brn-red-yel) resistor next to the control.



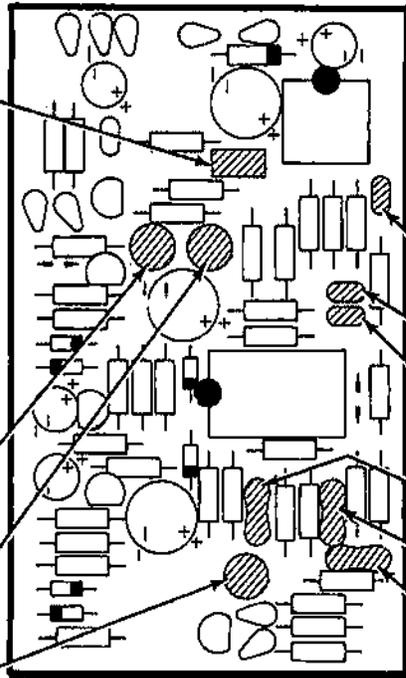
NOTE: When you install a non-polarized electrolytic capacitor, as in the following step, you may install it either way on the circuit board.

( ) C5: 10 μF nonpolarized electrolytic.

( ) C8: 10 μF nonpolarized electrolytic.

( ) C16: 10 μF nonpolarized electrolytic.

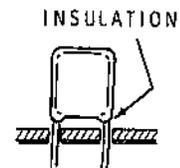
( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 1-6

**CONTINUE** ↘

NOTE: When you install Mylar capacitors, do not push the insulated portion of the leads into the circuit board holes. This could make it difficult to solder the leads to the foil. The leads of these capacitors may be coated with a clear film. If you have any problem soldering the leads of these capacitors, apply more heat to the leads to melt this film.



( ) C9: .015 μF Mylar.

( ) C11: .015 μF Mylar.

( ) C12: .015 μF Mylar.

( ) C15: 150 pF mica.

( ) C14: 150 pF mica.

( ) C13: 150 pF mica.

( ) Solder the leads to the foil and cut off the excess lead lengths.

At this time, you will have a .0022 μF Mylar capacitor left over. Save this capacitor for use later.

Refer to Pictorial 1-7 (Illustration Booklet, Page 2) for the following steps.

NOTE: In the following steps, you will prepare lengths of wire. To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from both ends. Then twist the fine strands tightly together and apply a small amount of solder to hold the strands in place. The wires are listed in the order in which they will be used.

( ) Prepare the following lengths of wire:

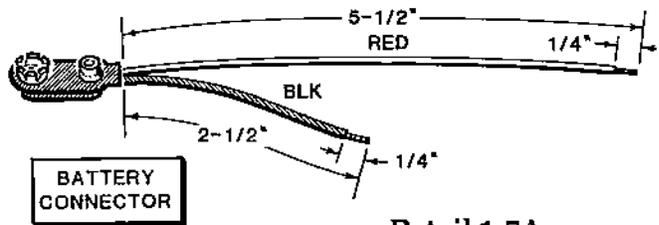
- 4-1/2" red      5-1/2" orange
- 5-1/2" brown    5-1/2" black

NOTES:

1. In each of the following four steps, you will be instructed to connect only one end of a wire. Do not be concerned about any unconnected wire ends. They will be connected later.
2. In the following steps "S-" with a number, such as (S-1), means to solder the connection. The number following the "S" tells how many wires are at the connection.
3. Make sure you cut the excess wire lengths from the foil side of the circuit board after you solder the connections.

Connect the prepared wires to the circuit board as follows:

- ( ) 4-1/2" red wire to hole A (S-1).
- ( ) 5-1/2" brown wire to hole C (S-1).
- ( ) 5-1/2" orange wire to hole D (S-1).
- ( ) 5-1/2" black wire to hole E (S-1).
- ( ) Twist the black, brown, and orange wires together.
- ( ) Refer to Detail 1-7A and cut the battery connector wires to the indicated lengths. Prepare the free end of each wire.



Detail 1-7A

- ( ) Connect the black battery connector wire to circuit board hole B (S-1). Cut off the excess wire length. NOTE: You will connect the red battery connector wire later.
- ( ) Cut a 3" and a 4" length of shielded cable.
- ( ) Refer to Detail 1-7B and remove 3/4" of the outer insulation and 1/4" of insulation from the center lead at both ends of each of the two shielded cables. NOTE: Be careful not to pull the center lead out of the cable when you prepare the ends, since that is easy to do. (If necessary, grip the center lead with pliers.)

Connect one end of the 3" shielded cable to the circuit board as follows:

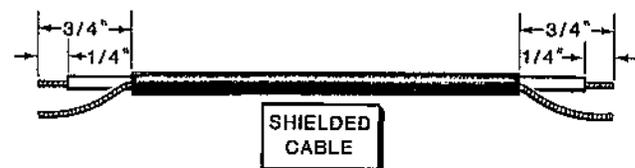
- ( ) Center lead to hole F (S-1).
- ( ) Shield lead to hole S (S-1).

NOTE: You will connect the free end of this cable later.

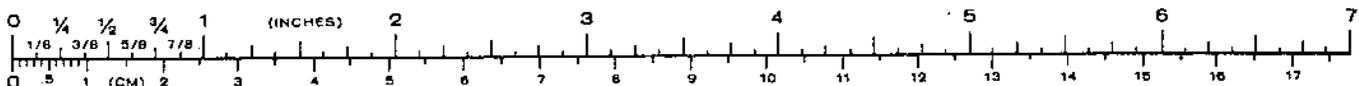
Connect one end of the 4" shielded cable to the circuit board as follows:

- ( ) Center lead to hole G (S-1).
- ( ) Shield lead to hole S (S-1).

NOTE: You will connect the free end of this cable later.



Detail 1-7B



## CIRCUIT BOARD CHECKOUT

Carefully inspect the foil side of the circuit board for the following most commonly made errors.

- ( ) Unsoldered connections.
- ( ) Poor solder connections.
- ( ) Solder bridges between foil patterns.
- ( ) Protruding leads which could touch together when the circuit board is installed later.

Refer to the illustration where the parts are installed as you make the following visual checks.

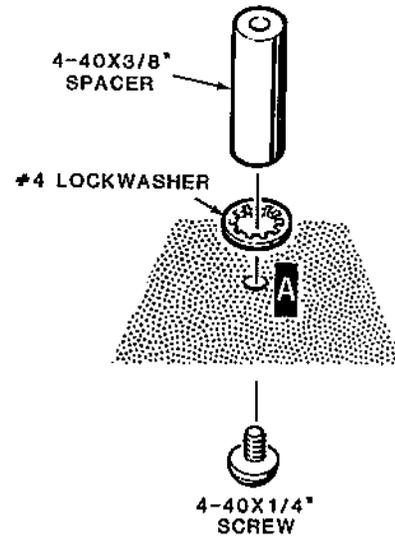
- ( ) Diodes for the proper type and installation.
- ( ) Transistors for the proper type and installation.
- ( ) ICs for the proper installation.
- ( ) Electrolytic capacitors for the proper type and correct position of the lead marked with the positive (+) sign.

Set the circuit board aside temporarily.

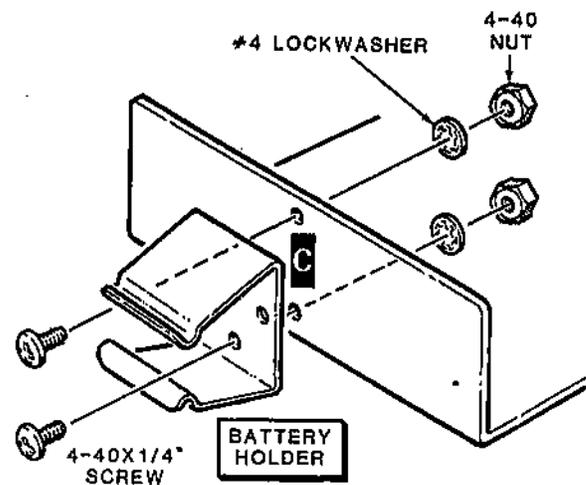
## GENERAL ASSEMBLY AND WIRING

Refer to Pictorial 2-1 (Illustration Booklet, Page 2) for the following steps.

- ( ) Position the chassis as shown in the Pictorial.
- ( ) Refer to Detail 2-1A and loosely mount a 4-40 × 3/8" spacer at A on the inside of the chassis. Use a 4-40 × 1/4" screw and a #4 lockwasher.
- ( ) Similarly, mount another 4-40 × 3/8" spacer on the chassis at B.
- ( ) Refer to Detail 2-1B and mount a battery holder at C on the outside of the chassis. Use a 4-40 × 1/4" screw, a #4 lockwasher, and a 4-40 nut at each of the two mounting holes.



Detail 2-1A



Detail 2-1B

- ( ) Place the circuit board assembly inside the chassis at an angle by placing the rear edge of the circuit board between the two mounting screws at C. Line up spacers A and B with the corresponding holes in the circuit board. Then secure the circuit board to the spacers at A and B by using two 4-40 × 1/4" screws.
  - ( ) Turn the chassis upside down and tighten the screws at A and B.
  - ( ) Locate the front panel, two phono sockets, and two 1/4" lockwashers.
  - ( ) J2: Line up the front panel holes with the corresponding chassis holes. Then loosely mount a phono socket at J2. Use a 1/4" lockwasher in addition to the hardware that is supplied with the phono socket.
  - ( ) J1: Similarly, mount a phono socket at J1 on the front panel.
  - ( ) R3/SW1: Install the 10 kΩ control with switch (#19-754) at R3/SW1 on the front panel. Position the switch tab in the corresponding chassis hole before you tighten the nut.
  - ( ) Position the solder lugs at phono sockets J1 and J2 as shown in the Pictorial. Then, using an open-end wrench or other suitable tool, tighten the control nut for each phono socket.
  - ( ) Bend both solder lugs out slightly as shown in the Pictorial.
- ( ) Route the 4-1/2" red wire coming from circuit board hole A along the front edge of the circuit board. Then connect this wire to control with switch R3/SW1 lug 5 (S-1). Be careful that you do not bridge the lug to the case tab.
  - ( ) Similarly, route the red battery connector wire along the front edge of the circuit board. Then connect this wire to control with switch R3/SW1 lug 4 (S-1). Be careful that you do not bridge the lug to the case tab.

Connect the free end of the shielded cable coming from circuit board holes F and S to phono socket J1 as follows:

- ( ) Center lead to lug 1 (S-1).
- ( ) Shield lead to lug 2 (S-1).

Connect the free end of the shielded cable coming from circuit board holes G and S to phono socket J2 as follows:

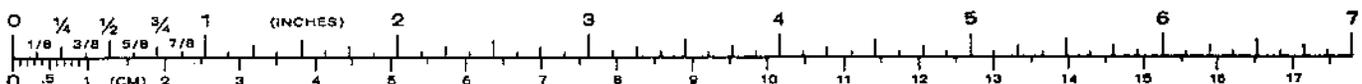
- ( ) Center lead to lug 1 (S-1).
- ( ) Shield lead to lug 2 (S-1).

Connect the free end of each of the three remaining wires coming from the circuit board to control with switch R3/SW1 as follows:

- ( ) Black wire to lug 1 (S-1).
- ( ) Orange wire to lug 2 (S-1).
- ( ) Brown wire to lug 3 (S-1).

Refer to Pictorial 2-2 (Illustration Booklet, Page 3) for the following steps.

Proceed to "Operational Checks."



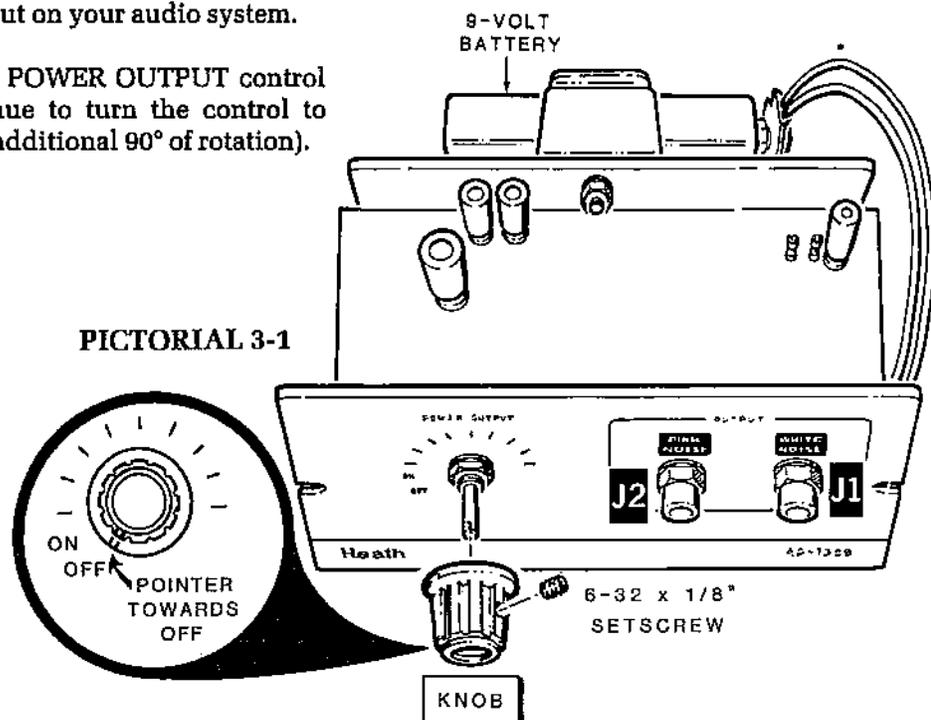
## OPERATIONAL CHECKS

The purpose of this section of the Manual is to make sure your Generator operates properly. If you have any difficulty in the following steps, turn the front panel knob fully counterclockwise (to OFF) and disconnect the battery. Then refer to the "In Case of Difficulty" section on Page 22.

Refer to Pictorial 3-1 for the following steps.

- ( ) Position the unit as shown in the Pictorial.
- ( ) Turn the front panel control shaft fully counterclockwise until it clicks.
- ( ) Turn a 6-32 × 1/8" setscrew into the knob as shown. Place the knob onto the control shaft. Position the knob pointer directly at "OFF", space the knob a little away from the front panel; then tighten the setscrew.
- ( ) Plug the battery connector onto the 9-volt battery (not supplied).
- ( ) Install the battery in the holder on the rear of the chassis. Make sure the two wires exit from the battery connector as shown in the Pictorial.
- ( ) Connect a shielded cable (not supplied) from the WHITE NOISE OUTPUT jack (J1) to the auxiliary (AUX) input on your audio system.
- ( ) Turn the Generator POWER OUTPUT control to ON; then continue to turn the control to its midrange (or an additional 90° of rotation).
- ( ) Turn your audio system on and adjust its volume control for a pleasant listening level. You should hear the sound characteristics caused by the white noise.
- ( ) Vary the setting of the Generator POWER OUTPUT control. The sound level from your speakers should vary accordingly.
- ( ) Return the Generator POWER OUTPUT control to its midrange setting.
- ( ) Turn your audio system off.
- ( ) Disconnect the shielded cable from the WHITE NOISE OUTPUT jack. Instead, connect it to the PINK NOISE OUTPUT jack (J2).
- ( ) Turn your audio system on. You should hear the sound characteristics generated by the pink noise. This second level should be comparable to the level generated by the white noise. However, the bass frequencies should be stronger while the high frequencies should be weaker.
- ( ) Turn your Generator and audio system off.

This completes the "Operational Checks." Proceed to "Calibration."



## CALIBRATION

**NOTE:** You need to complete this section of the Manual **only** if you intend to use your Noise Generator with a real-time spectrum analyzer.

This section of the Manual contains instructions that will enable you to match your Noise Generator's high frequency response with the response of the spectrum analyzer you plan to use with your Generator.

Refer to Pictorial 4-1 for the following steps.

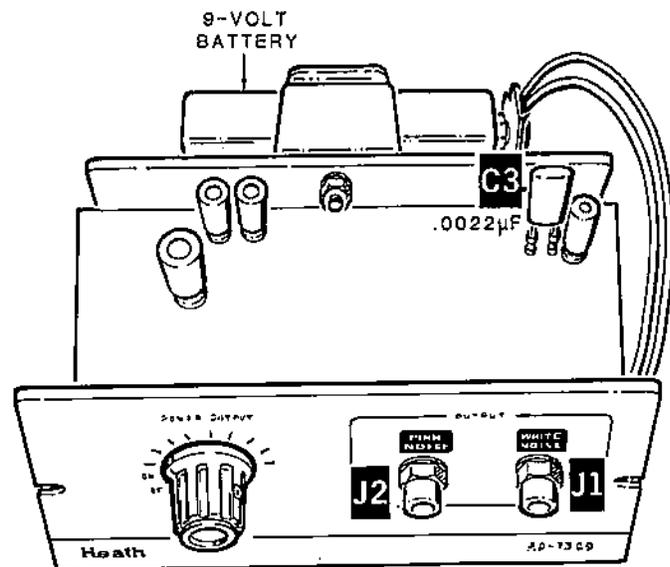
- ( ) Turn your spectrum analyzer on and allow it time to stabilize, if necessary.
- ( ) Connect a suitable shielded cable from the Generator PINK NOISE OUTPUT jack (J2) to the analyzer external input connector.
- ( ) Turn your Noise Generator on. Then turn its POWER OUTPUT control clockwise until you have a meaningful display on your analyzer. If necessary, change the attenuator setting of your analyzer.
- ( ) Select the 1 dB/div. scale of your Analyzer.
- ( ) Observe the display on your analyzer. If the response is flat at 20 kHz as compared to 1 kHz, there is no need for you to calibrate your Noise Generator. However, if you notice a high-frequency rolloff that exceeds what you feel is acceptable, complete the following steps.

**NOTE:** With capacitor C3 installed on the circuit board, the level of the noise at the highest frequencies (about 20 kHz) will be boosted. By adjusting circuit board mounted control R1, you control the amount of high frequency boost. It is possible, however, to produce too much high frequency boost by installing this capacitor, regardless of the setting of control R1. In that case, leave C3 out of the circuit.

- ( ) C3: Locate the .0022  $\mu$ F Mylar capacitor that was left over after you completed the circuit board assembly. Then cut both leads of the capacitor to 1/4" and install it in the two wire sockets on the circuit board.

- ( ) Slowly turn circuit board mounted control R1 through its range until you obtain the flattest possible frequency response displayed on your analyzer.
- ( ) If the frequency response obtained in the last step is an improvement over what you had without capacitor C3 installed, leave the capacitor in the wire sockets. If, however, the addition of C3 produced too much high frequency boost, remove C3 from the wire sockets.
- ( ) Turn your Noise Generator and spectrum analyzer off and disconnect the cable connected between these two units.
- ( ) If you intend to leave the .0022  $\mu$ F Mylar capacitor in the circuit board wire sockets, solder each capacitor lead to its socket.

This completes the "Calibration." Proceed to "Final Assembly."



PICTORIAL 4-1

## FINAL ASSEMBLY

Refer to Pictorial 5-1 (Illustration Booklet, Page 3) for the following steps.

- ( ) Position the rear panel, numbered side inward, into the smaller end of the cabinet and secure it in place with two #4 × 3/8" self-tapping screws.
- ( ) Install the unit into the cabinet as shown. Secure the panel with two #4 × 3/8" self-tapping screws.
- ( ) Using a damp cloth, wipe off the underside of the generator cabinet to remove any oily residue from this surface.
- ( ) Remove the paper backing from each of the four plastic feet. Then press the feet in place

at the four corners on the underside of the generator cabinet.

NOTE: The blue and white label you will install in the following step shows the Model number and Production Series number of your kit. Refer to these numbers in any communications you have with the Heath Company about this kit.

- ( ) Carefully peel away the paper backing from the blue and white label. Then press the label in place in the center of the underside of the cabinet.

This completes the "Step-By-Step Assembly" of your Noise Generator.

## OPERATION

**CAUTION:** To prevent possible damage to the tweeters in your speaker system when you use white noise, make sure you initially set the Generator POWER OUTPUT control just clockwise past the ON position. Then advance the control until you obtain the desired sound level from your speakers. Because white noise exhibits constant energy per Hz, the tweeters will dissipate much more power than the other drivers in your speaker system.

### GENERAL

Your Noise Generator is designed to be connected to an audio system at the "line" input levels. However, its output may be routed through a preamplifier or mixer, or connected directly to the inputs of most power amplifiers.

### PINK NOISE TESTING

Pink noise, which has constant energy per octave, is used to test the frequency response of an audio system with a real-time spectrum analyzer, such as the Heathkit Model AD-1308 Analyzer. Pink noise

is used to produce a flat response indication on the analyzer display. To obtain the highest accuracy, check the frequency response of the analyzer you are using by connecting your Noise Generator to it. Note any deviation from a flat response.

The low frequencies of a pink noise source will vary in amplitude as compared to the high frequencies when they are displayed on a real-time analyzer. This is due to the random energy nature of noise and is normal. Some analyzers have an accumulate mode that will reduce these variations. Note the peaks as a reference on other analyzers you may be using that do not have the accumulate mode. Use the average response mode when you are making measurements using pink noise.

## WHITE NOISE TESTING

White noise, which has constant energy per Hz, is used to test systems with swept filter-type analyzers.

## BATTERY LIFE

Your Generator is designed to operate on an inexpensive 9-volt battery (NEDA 1604). If you use an alkaline battery, you can expect a typical operating

life of up to 30 hours. The expected life using a zinc-carbon battery is only about 50-75% of that indicated for an alkaline battery.

**CAUTION:** Replace the battery annually or when it is discharged to protect your Generator from battery leakage or rupture. Several battery manufacturers will repair any device damaged by their batteries; it is advisable to use a battery with such a guarantee. It is further advisable to remove the battery during extended storage.

## IN CASE OF DIFFICULTY

**NOTE:** It is important that you read the entire "General Troubleshooting Information" section, which follows, before you attempt to service your Generator.

This section of the Manual is divided into three parts. The first section, "General Troubleshooting Information," tells you what to do about the difficulties that may arise right after your Generator is assembled.

The second section, "Troubleshooting Precautions," points out the care that is required when you service the Generator to prevent damage to the components.

The third section, "Troubleshooting Chart," is provided to assist you in servicing the Generator if the "General Troubleshooting Information" fails to clear up the problem, or if difficulties develop after your Generator has been in use for some time. The "Troubleshooting Chart" lists a number of possible difficulties that could arise along with several possible solutions to those difficulties. Refer to the "Circuit Board X-Ray View" on Page 28 for the physical location of parts on the circuit board.

Try to analyze the symptoms of any problem you might have before you start any troubleshooting procedure. A review of the "Operational Checks" and "Calibration," and "Operation" sections, as well as the "Circuit Description," may help your analysis.

### General Troubleshooting Information

1. Check the wires and shielded cables that are connected to the circuit board. It is often helpful to have a friend check your work. Someone who is not familiar with the unit may notice an error you consistently overlooked.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, you can eliminate many troubles by checking all connections to make sure that they are soldered properly. Reheat the connections, if necessary, but be careful so you do not create any solder bridges.
3. Check the values of all the parts. Be sure that the proper part has been installed at each location on the circuit board. Refer to the "Circuit Board X-Ray View" for the physical location of parts on the circuit board.
4. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the components on the circuit board.
5. Check very carefully to be sure there are no solder bridges between different circuit board foils. If you are not sure that a solder bridge exists, compare the circuit board foil with the

“Circuit Board X-Ray View”. Remove any solder bridges by holding a clean, hot soldering iron tip between the two points that are bridged until the excess solder flows down onto the tip.

If you still cannot locate and correct the trouble after you have completed the checks listed above, and if a voltmeter is available, check the voltages in the Generator against the Schematic. A review of the “Circuit Description” and Schematic may also help you to locate any difficulties in the kit.

In an extreme case where you are unable to resolve a difficulty, refer to the “Customer Service” information inside the rear cover of this Manual. Your Warranty is located inside the front cover.

### Troubleshooting Precautions

- Integrated circuit U1 is a CMOS (complimentary metal-oxide semiconductor) device that can be damaged by static electricity. Therefore,

make sure that you handle this IC in the same manner that you did when you installed it. Refer to Page 13 for the correct technique.

- Be sure that you do not short any adjacent terminals or foils when you make tests or voltage measurements. If a probe or test lead slips, for example, and shorts together two adjacent connections, it is very likely to cause damage to one or more ICs, transistors or diodes.
- Be especially careful when you test any circuit that contains an IC or a transistor. Although these components have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current than many other parts.
- In several areas of the circuit board, the foil patterns are quite narrow. When you unsolder a part to check or replace it, avoid excessive heat while you remove the part. A suction-type desoldering tool will make removal considerably easier.

## Troubleshooting Chart

This chart lists the conditions and possible causes of several malfunctions. If a particular part is mentioned (U1 for example) as a possible cause, check that part to see if it was installed correctly. Also check it and the parts connected to it for poor connections. It is also possible, on rare occasions, for a part to be faulty and require replacement.

PROBLEM	POSSIBLE CAUSE
1. No output from either white or pink noise jacks.	A. Dead battery. B. U1. C. SW1. D. D1. E. Open wiring to battery.
2. Output from only the white noise jack.	A. U2. B. Q4 or Q5. C. D5, D6, or D7. D. Check wiring of shielded cable from holes G and S to phone socket J2.
3. Output from only the pink noise jack.	A. Q2 or Q3. B. D2, D3, D4. C. Check wiring of shielded cable from holes F and S to phone socket J1.

## SPECIFICATIONS

### PINK NOISE SECTION

Frequency Response . . . . .	$\pm 1$ dB from 20 Hz* to 20 kHz.
Output Level	
rms average . . . . .	>350 mV.
peak . . . . .	>1.5 V.

### WHITE NOISE SECTION

Frequency Response . . . . .	$\pm 3$ dB from 20 Hz* to 20 kHz.
Output Level	
rms average . . . . .	>350 mV.
peak . . . . .	>1.5 V.
Power Requirement . . . . .	9-volt battery (NEDA 1604) @ 18 mA max.
Dimensions . . . . .	2-9/16" (H) $\times$ 4-1/8" (W) $\times$ 4-1/16" (D) (6.5 $\times$ 10.5 $\times$ 10.3 cm).
Weight . . . . .	11 oz. with battery (300 g).

\* Long integration times must be used to accurately measure low-frequency response.

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

## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (Illustration Booklet, Page 4) as you read the following "Circuit Description."

The heart of the pink/white noise generator is integrated circuit U1, a digital noise generator that supplies a white noise output signal. This signal is fed through an equalization circuit (consisting of control R1, resistor R2, and capacitor C3), before it is applied across level control R3. Control R1 may be set to adjust the high frequencies for the most accurate response with most real-time analyzers.

From control R3, the signal is routed to emitter-follower Q1, which isolates the high impedance of Level control R3 from any loading caused by the pink noise filter circuit and the white noise output circuit. From transistor Q1, the signal is routed to the pink noise filter circuit and to white noise output jack J1.

The pink noise filter circuit is made up of four sections, using quad operational amplifier U2. This circuit rolls off the frequency response of the white noise at the rate of 3 dB per octave to produce a pink noise spectral balance. The overall gain of this circuit is set so that the output at a frequency of 1 kHz is kept the same for both the pink and white noise signals.

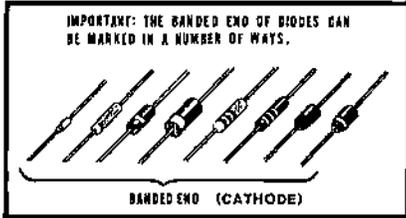
The output circuits for both the pink and white noise signals include a protection circuit that will mute the output at both turn-on and turn-off. Each circuit protects the external loudspeaker system against damage from DC transients. Since both these circuits are identical, only the circuit at the output for the white noise signal will be discussed in detail in the following paragraphs.

When power is first turned on, no voltage is present across capacitor C6. This causes the supply voltage to be dropped across resistor R8, diode D3, and the base-emitter junction of transistor Q3. This will turn on transistor Q3, causing it to short the output line to ground. As C6 charges, Q3 will turn off when the current through the capacitor drops to zero and the voltage at the base of Q3 drops below .7 VDC; thus releasing the output line from ground.

When the power is turned off, the voltage applied across resistor R9 will be removed, causing transistor Q2 to turn on and voltage applied to the base of Q3. This results in transistor Q3 being turned on and the output being muted. The stored charge on capacitor C7, which is isolated from the power supply line by diode D2, will keep transistors Q2 and Q3 turned on long enough for the voltage to the noise circuitry to decay, thereby eliminating any transients. Diode D4 protects the base of transistor Q3 from the voltage across capacitor C6. This voltage may go negative when the battery voltage is removed.

## SEMICONDUCTOR IDENTIFICATION CHARTS

### DIODES

CIRCUIT COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION
D2 - D7	56-56	1N4149	
D1	57-65	1N4002	

### TRANSISTORS

CIRCUIT COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION
Q1	417-864	MPSA05	
Q2, Q4	417-874	2N3906	
Q3, Q5	417-875	2N3904	

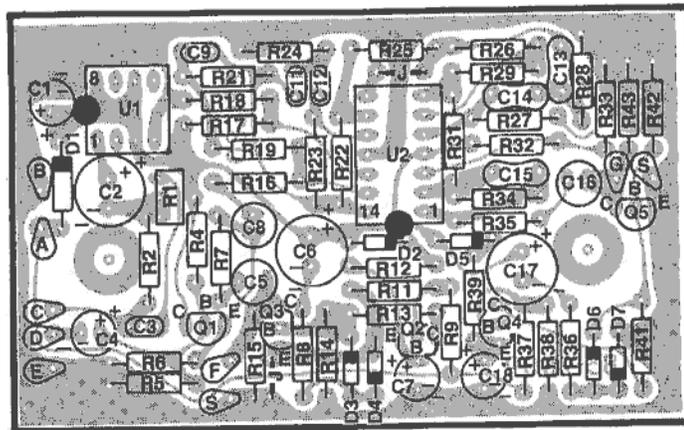
INTEGRATED CIRCUITS

CIRCUIT COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION (TOP VIEW)
U2	442-743	4741	
U1	442-760	5437	

## CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

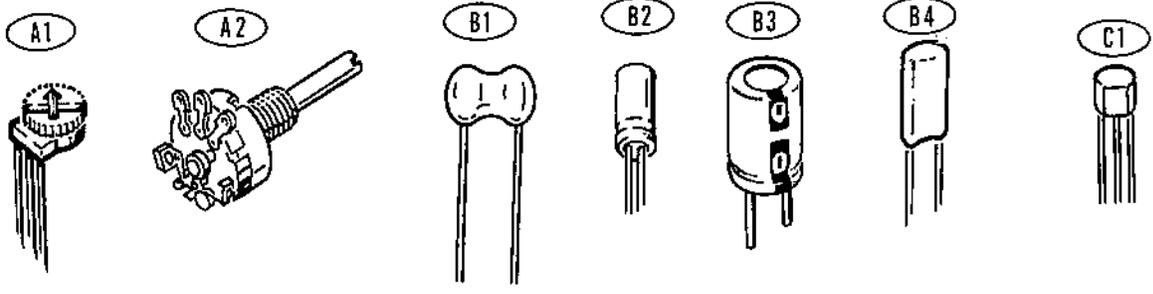
- A. Find the circuit component number (R5, C3, etc.) on the X-Ray View.
- B. Locate this same number in the "Circuit Component Number" column of the "Parts List" in the front of this Manual.
- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



(Viewed from the component side.)

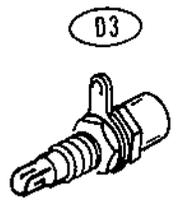
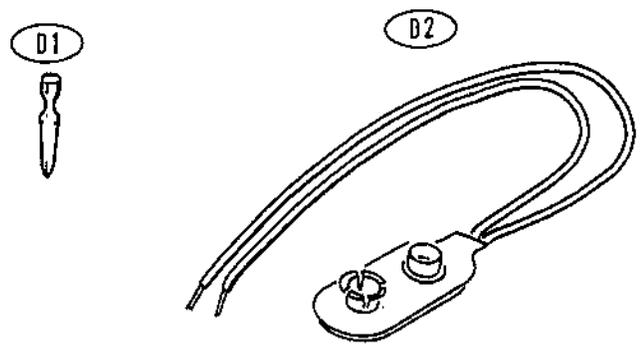
# ILLUSTRATION E

## PARTS PICTORIAL



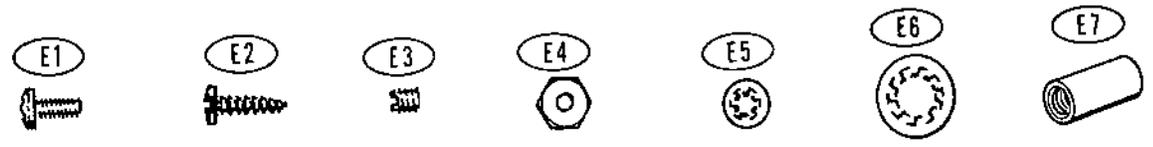
C2

ALWAYS IDENTIFY AN I.C. BY THE PART NUMBER OR TYPE NUMBER  
NOTE: THE STYLE MAY BE SLIGHTLY DIFFERENT THAN SHOWN.



D4

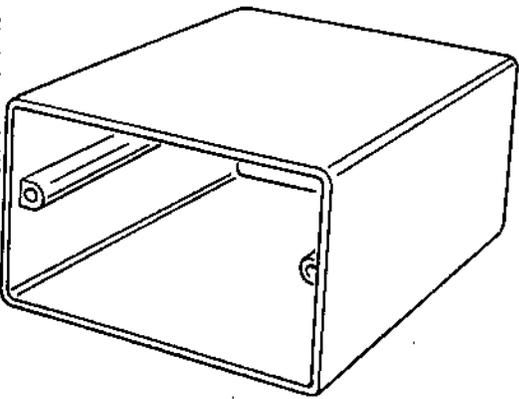
ALWAYS IDENTIFY AN I.C. SOCKET BY COUNTING ITS PINS.  
NOTE: THE STYLE MAY BE SLIGHTLY DIFFERENT THAN SHOWN.



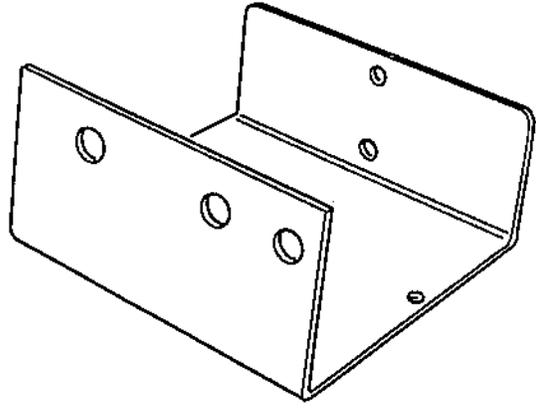
# BOOKLET

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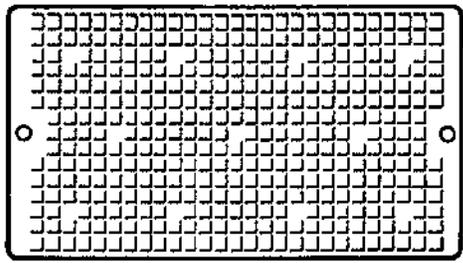
F1



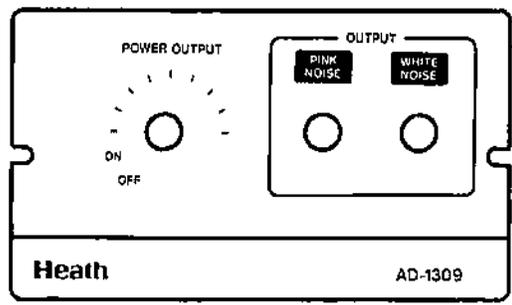
F2



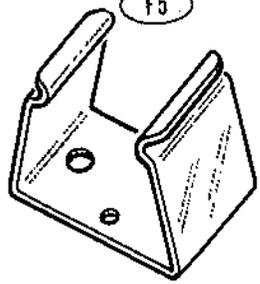
F3



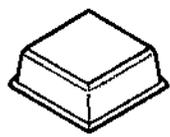
F4



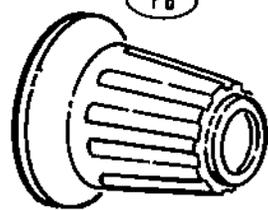
F5



F6



F8

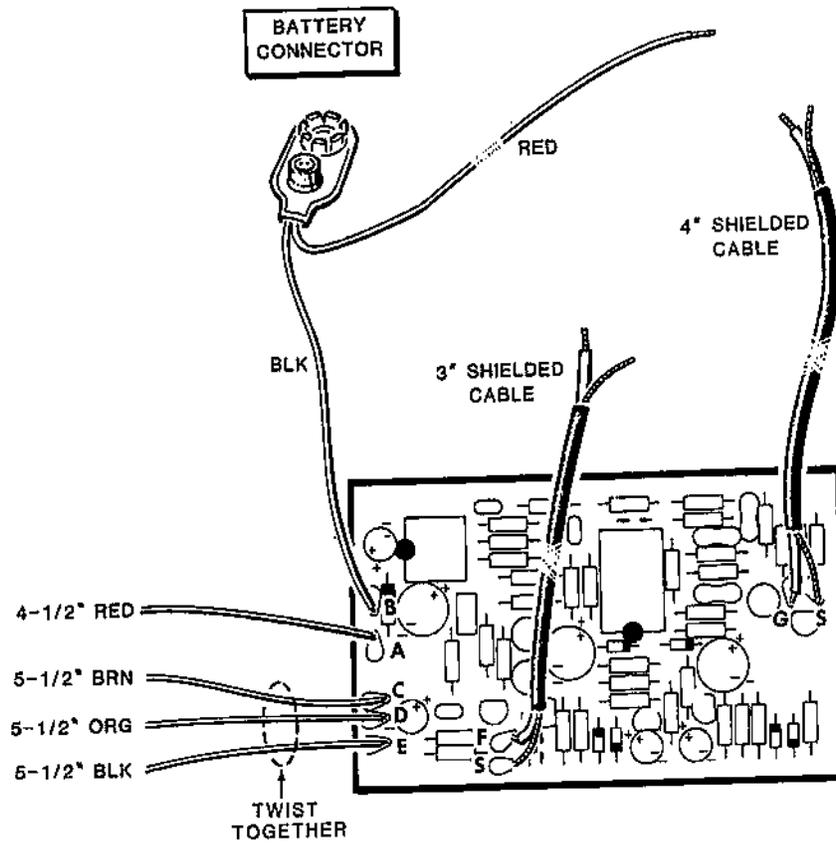


F7

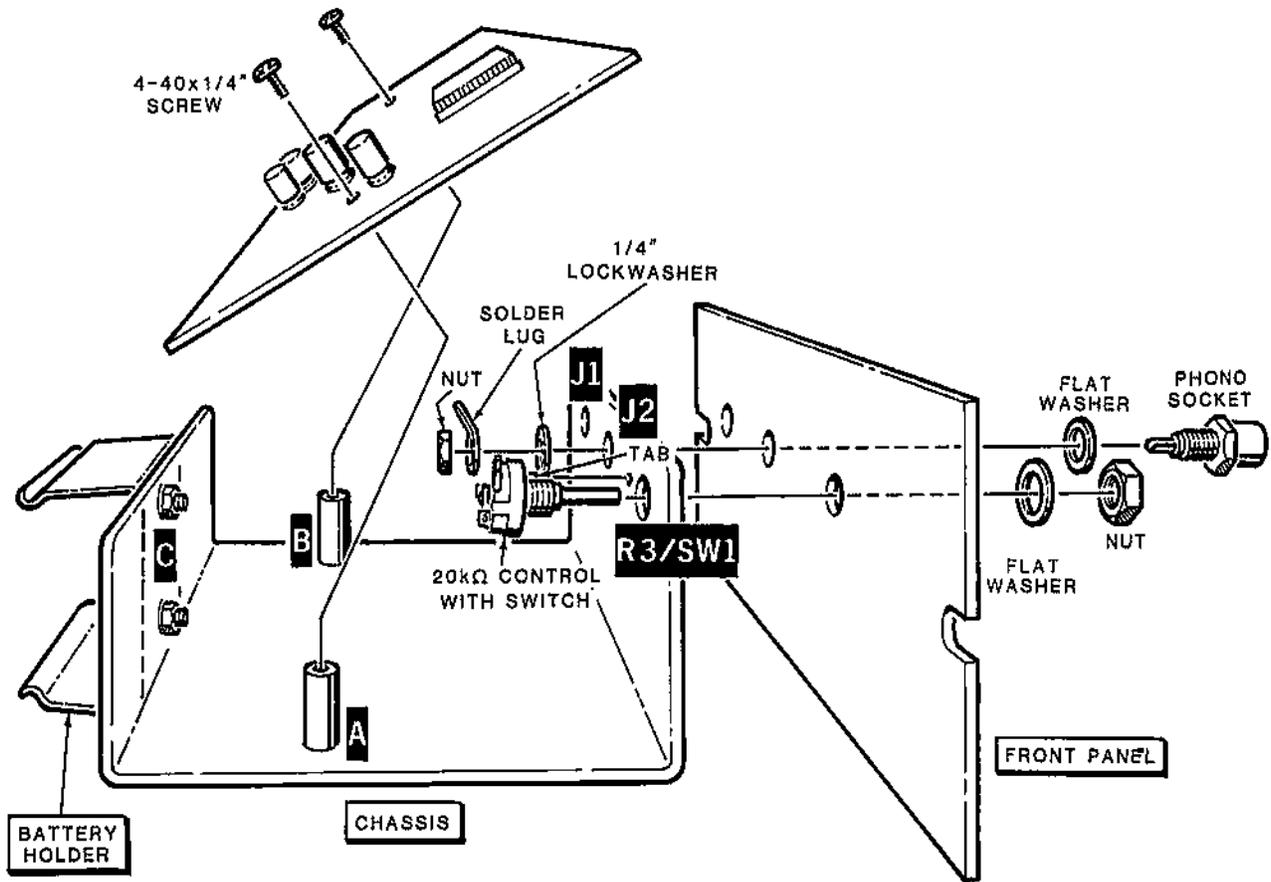


Model AD-1309

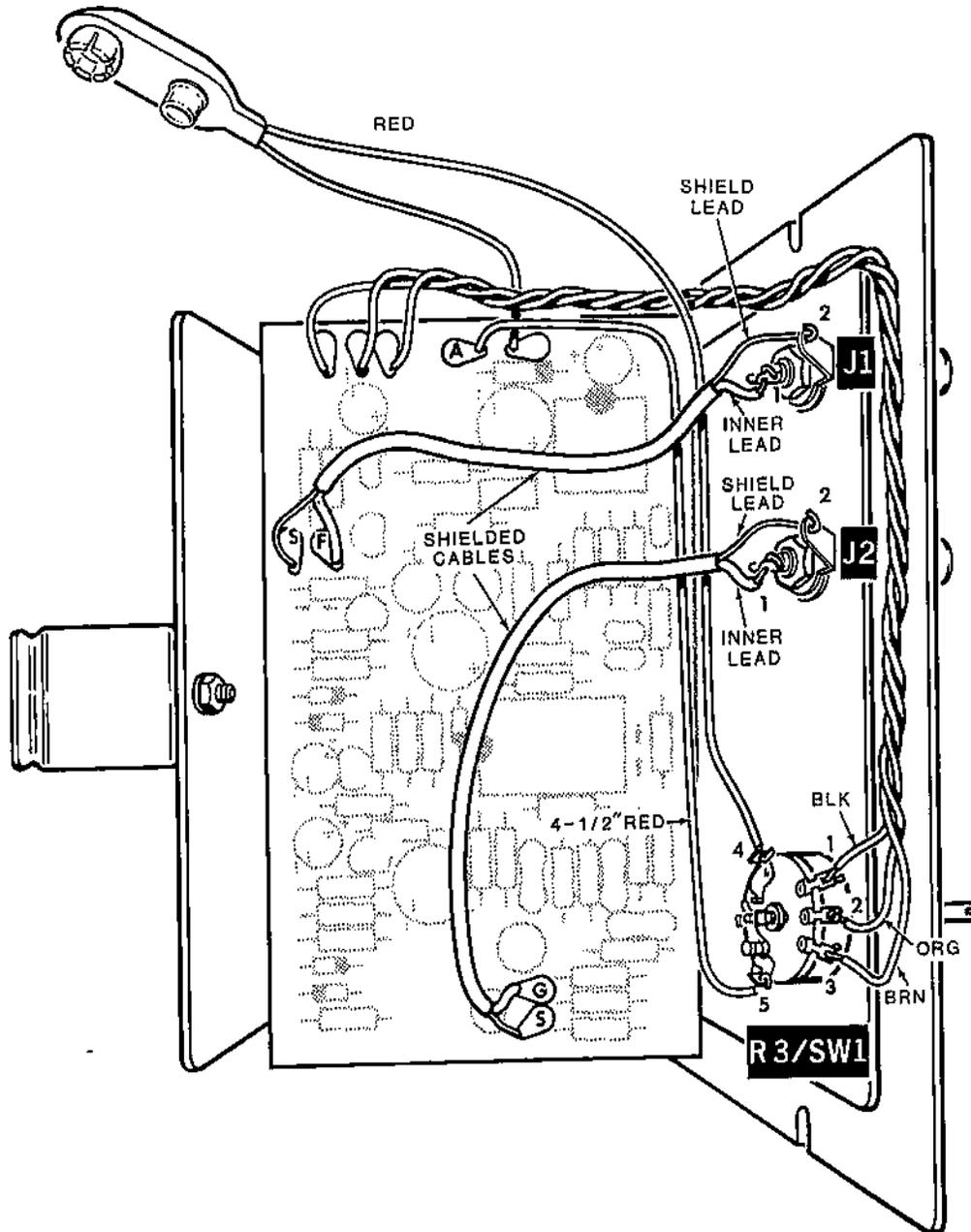
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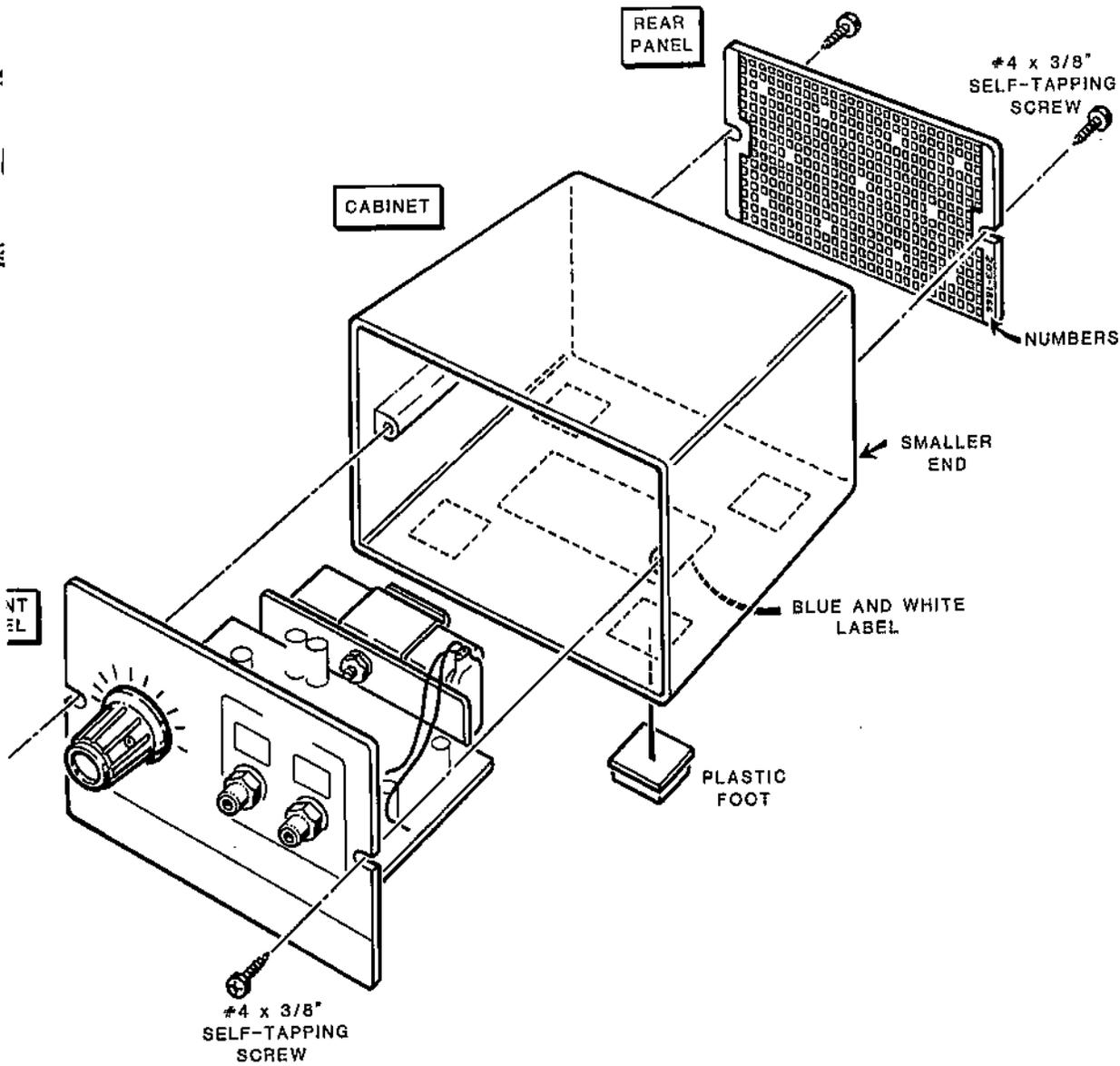
PICTORIAL 1-7



PICTORIAL 2-1



PICTORIAL 2-2

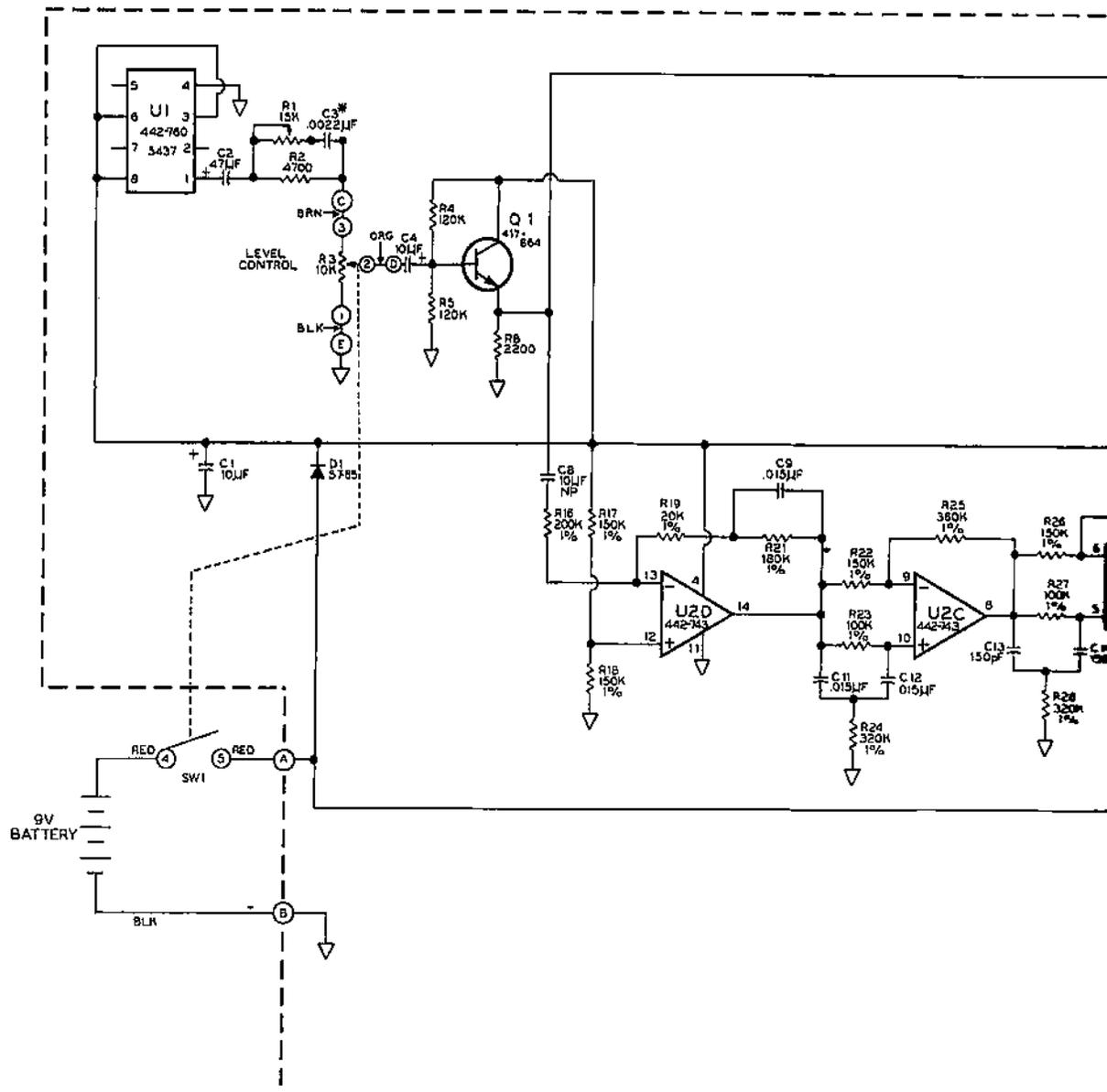


PICTORIAL 5-1

**SCHEMATIC OF  
HEATHKIT  
PINK/WHITE NOISE GENERATOR  
MODEL AD-13**

NOTES:

1. REFER TO THE "CIRCUIT BOARD X-RAY" FOR THE LOCATION OF PARTS.
2. RESISTOR VALUES ARE IN OHMS (k=1000)
3. \* INDICATES A CALIBRATION PART
4. ○ INDICATES A WIRE CONNECTION TO ANOTHER BOARD
5. ▽ INDICATES A CIRCUIT BOARD GROUND



**CHEMATIC OF THE  
HEATHKIT®  
WHITE NOISE GENERATOR  
MODEL AD-1309**

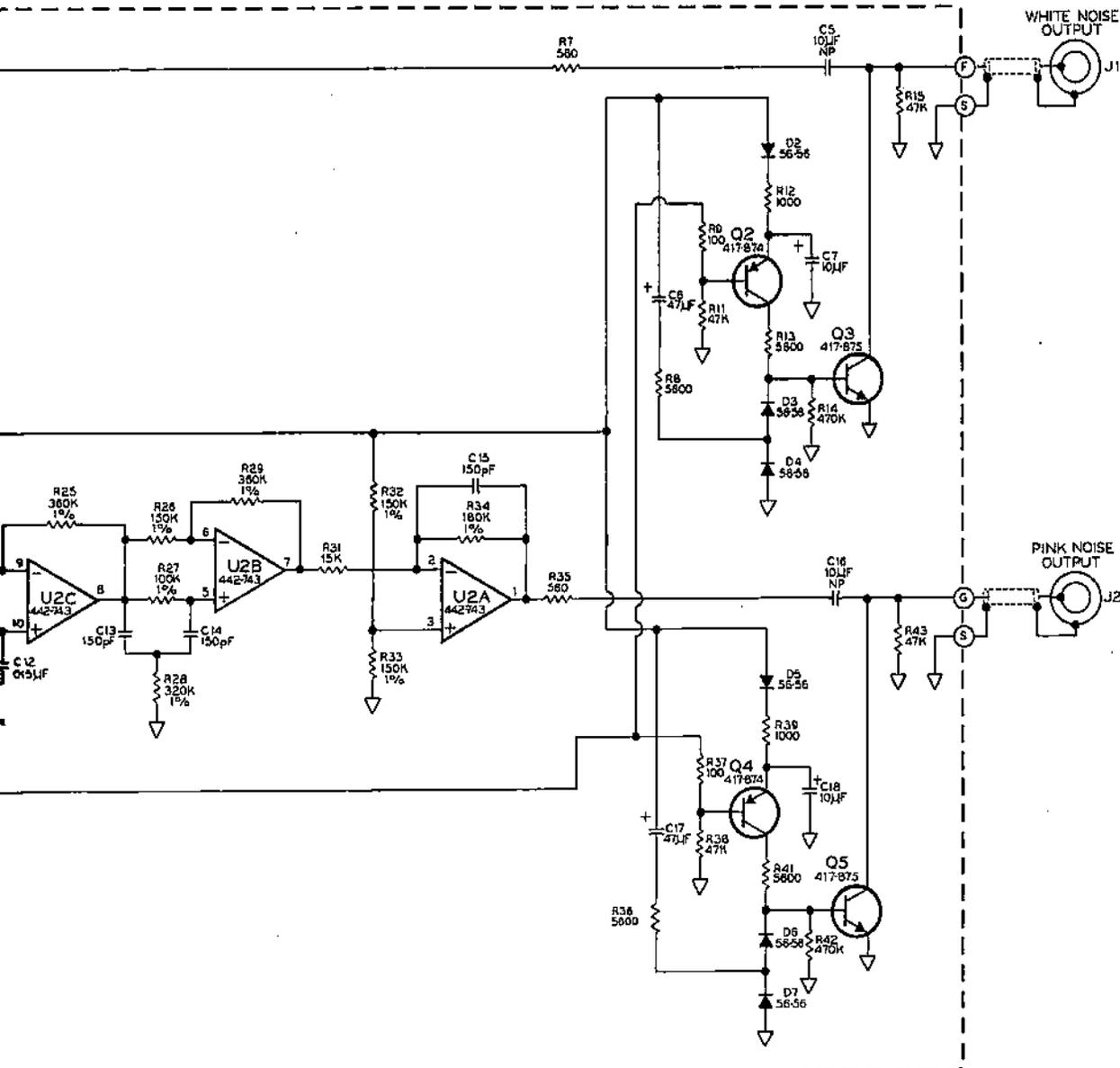
"CIRCUIT BOARD X-RAY VIEW" FOR THE PHYSICAL PARTS.

RESISTORS ARE IN OHMS (k=1000).

RESISTOR VALUES ARE IN OHMS (k=1000).

WIRE CONNECTION TO THE CIRCUIT

CIRCUIT BOARD GROUND.



**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

**INSTRUCTIONS**

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, \$3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.  
Total enclosed \$ \_\_\_\_\_
- If you prefer COD shipment, check the COD box and mail this card. COD

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # \_\_\_\_\_ Invoice # \_\_\_\_\_  
Date Purchased \_\_\_\_\_ Location Purchased \_\_\_\_\_

LIST HEATH PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE

TOTAL FOR PARTS	
HANDLING AND SHIPPING	
MICHIGAN RESIDENTS ADD 4% TAX	
<b>TOTAL AMOUNT OF ORDER</b>	

SEND TO: **HEATH COMPANY**  
BENTON HARBOR  
MICHIGAN 49022  
**ATTN: PARTS REPLACEMENT**

Phone (Replacement parts only): 616 982-3571

**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

**INSTRUCTIONS**

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
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Total enclosed \$ \_\_\_\_\_
- If you prefer COD shipment, check the COD box and mail this card. COD

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

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Model # \_\_\_\_\_ Invoice # \_\_\_\_\_  
Date Purchased \_\_\_\_\_ Location Purchased \_\_\_\_\_

LIST HEATH PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE

TOTAL FOR PARTS	
HANDLING AND SHIPPING	
MICHIGAN RESIDENTS ADD 4% TAX	
<b>TOTAL AMOUNT OF ORDER</b>	

SEND TO: **HEATH COMPANY**  
BENTON HARBOR  
MICHIGAN 49022  
**ATTN: PARTS REPLACEMENT**

Phone (Replacement parts only): 616 982-3571

CUT ALONG DOTTED LINE

## CUSTOMER SERVICE

### REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the HEATH part number exactly as it appears in the parts list.

### ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616-982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company  
Benton Harbor  
MI 49022  
Attn: Parts Replacement

**Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.**

### OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

### 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 and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD 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. Do not include the kit Manual.) 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

*HEATH*  
*ZENITH*

**HEATH COMPANY . BENTON HARBOR, MICHIGAN**

*THE WORLDS FINEST ELECTRONIC EQUIPMENT IN KIT FORM*