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ADDITIONAL 3 FT ROLLS OF SOLDER, #331-6, CAN BE ORDERED FOR 25 CENTS EACH.

PART NUMBER PRICE \* PART NUMBER PRICE \* PART NUMBER PRICE \* PART NUMBER PRICE

|           |       |            |      |
|-----------|-------|------------|------|
| 6-103-12  | .30   | * 250-201  | .05  |
| 6-104-12  | .30   | * 250-420  | .05  |
| 6-105-12  | .30   | * 252-1    | .05  |
| 6-203-12  | .30   | * 252-3    | .05  |
| 6-223-12  | .30   | * 254-1    | .05  |
| 6-273-12  | .30   | * 254-7    | .05  |
| 6-275-12  | .30   | * 255-13   | .15  |
| 6-333-12  | .30   | * 255-29   | .15  |
| 6-472-12  | .30   | * 344-21   | .05  |
| 6-473-12  | .30   | * 390-1306 | 1.80 |
| 6-474-12  | .30   | * 417-283  | .70  |
| 6-680-12  | .30   | * 417-801  | .50  |
| 6-681-12  | .30   | * 434-148  | .50  |
| 10-60     | 1.75  | * 490-5    | .35  |
| 21-17     | .25   |            |      |
| 21-48     | .45   |            |      |
| 21-70     | .60   |            |      |
| 25-54     | .45   |            |      |
| 25-98     | .45   |            |      |
| 25-123    | .60   |            |      |
| 25-157    | .85   |            |      |
| 25-199    | .35   |            |      |
| 27-47     | .45   |            |      |
| 27-61     | .75   |            |      |
| 27-73     | .35   |            |      |
| 27-74     | .30   |            |      |
| 27-128    | .35   |            |      |
| 40-20     | 5.35  |            |      |
| 54-177    | 5.65  |            |      |
| 56-26     | .45   |            |      |
| 56-56     | .60   |            |      |
| 56-57     | .75   |            |      |
| 56-58     | .75   |            |      |
| 57-65     | .50   |            |      |
| 60-1      | .70   |            |      |
| 69-50     | 4.60  |            |      |
| 75-52     | .05   |            |      |
| 75-71     | .15   |            |      |
| 75-179    | .70   |            |      |
| 85-1217-2 | 6.95  |            |      |
| 89-23     | 12.05 |            |      |
| 93-14     | 10.20 |            |      |
| 100-1777  | 17.95 |            |      |
| 202-604-3 | 2.15  |            |      |
| 202-626   | .85   |            |      |
| 203-1448  | 2.95  |            |      |
| 250-49    | .05   |            |      |
| 250-56    | .05   |            |      |
| 250-106   | .05   |            |      |
| 250-162   | .05   |            |      |

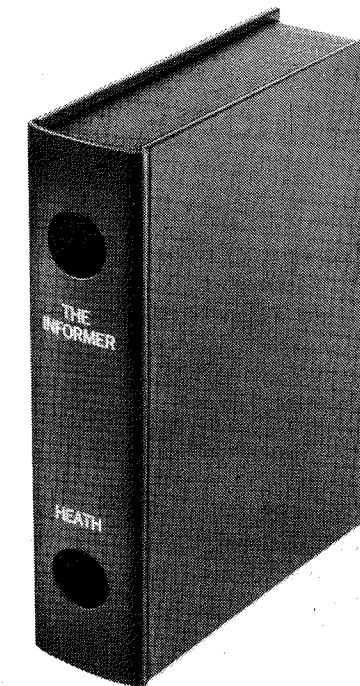
\*\*\*\*\* WRITE HEATH COMPANY FOR PRICE INFORMATION.  
@ PRICE PER FOOT.

# Heathkit® Manual

for

## THE INFORMER® ULTRASONIC INTRUSION ALARM Model GD-49

595-2451-01



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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022

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## INTRODUCTION

The Heathkit "The Informer®" Ultrasonic Alarm, Model GD-49, is primarily intended to provide a warning when a specific area has been penetrated by an intruder. This ability to detect movement within an area can also be used as an automatic light switch for your garage, basement, attic, or other place where you want entry into the area to turn on the light. It can be used to sound a buzzer when movement occurs, such as a child leaving its bed.

The Intrusion Alarm is completely inclosed by metal and can be installed anywhere that an electric outlet is available. It is also provided with a case which simulates a book cover, which will help to disguise the identity of the device.

When the Intrusion Alarm has been installed to survey an area, varying the ultrasonic waves by movement causes a

"lamp" socket to be switched on. Approximately 30 seconds later, an "alarm" socket is switched on. The two sockets can be switched to automatically turn off after 30 seconds, or to remain on until the Alarm is turned off. The devices attached to the two sockets are furnished by the user, and may be of any description, subject only to a total current limitation of three amperes AC from the two sockets.

The Intrusion Alarm is simple to build and install. Its solid state circuitry should provide many years of trouble-free, economical service. The two outlets permit you to tailor the protection to the needs of your home or business.

Refer to the "Kit Builders Guide" for information on tools, wiring, soldering, resistors, and capacitors.



## PARTS LIST

This "Parts List" contains all of the parts used in the assembly of the kit. Some parts may be packaged in envelopes with the part number of the contents printed on the outside. Except for the initial parts check, retain these parts in their envelopes until they are called for in the assembly steps. When more than one number is on a package, disregard all but the part number listed in the "Parts List."

Check each part against the following list. The key numbers correspond to the numbers on the Parts Pictorial (Illustration Booklet, Page 1).

To order a replacement part, 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 the Manual. For prices, refer to the separate "Heath Parts Price List."

| KEY PART No. | PARTS No. | PARTS Per Kit | DESCRIPTION |
|--------------|-----------|---------------|-------------|
|--------------|-----------|---------------|-------------|

### RESISTORS, 1/4-WATT

#### 5% Tolerance (4th band gold)

|    |          |    |                               |
|----|----------|----|-------------------------------|
| A1 | 6-680-12 | 3  | 68 Ω (blue-gray-black)        |
| A1 | 6-681-12 | 7  | 680 Ω (blue-gray-Brown)       |
| A1 | 6-272-12 | 1  | 2700 Ω (red-violet-red)       |
| A1 | 6-472-12 | 4  | 4700 Ω (yellow-violet-red)    |
| A1 | 6-103-12 | 11 | 10 kΩ (brown-black-orange)    |
| A1 | 6-203-12 | 4  | 20 kΩ (red-black-orange)      |
| A1 | 6-223-12 | 4  | 22 kΩ (red-red-orange)        |
| A1 | 6-333-12 | 4  | 33 kΩ (orange-orange-orange)  |
| A1 | 6-473-12 | 6  | 47 kΩ (yellow-violet-orange)  |
| A1 | 6-104-12 | 6  | 100 kΩ (brown-black-yellow)   |
| A1 | 6-474-12 | 2  | 470 kΩ (yellow-violet-yellow) |
| A1 | 6-105-12 | 3  | 1 MΩ (brown-black-green)      |
| A1 | 6-275-12 | 1  | 2.7 MΩ (red-violet-green)     |

### CONTROL

|    |       |   |        |
|----|-------|---|--------|
| A2 | 10-60 | 1 | 500 kΩ |
|----|-------|---|--------|

| KEY PART No. | PARTS No. | PARTS Per Kit | DESCRIPTION |
|--------------|-----------|---------------|-------------|
|--------------|-----------|---------------|-------------|

### CAPACITORS

#### Disc

|    |       |   |                |
|----|-------|---|----------------|
| A3 | 21-17 | 3 | 270 pF         |
| A4 | 21-70 | 2 | .01 μF, 1.4 KV |
| A4 | 21-48 | 2 | .05 μF         |

#### Electrolytic

|    |        |   |             |
|----|--------|---|-------------|
| A5 | 25-123 | 4 | 2 μF        |
| A5 | 25-54  | 2 | 10 μF       |
| A6 | 25-98  | 4 | 50 μF       |
| A7 | 25-157 | 1 | 500 μF, 15V |
| A7 | 25-199 | 1 | 500 μF, 25V |

#### Mylar\*

|    |        |   |                |
|----|--------|---|----------------|
| A8 | 27-74  | 3 | .01 μF (.01 K) |
| A8 | 27-128 | 2 | .022 μF        |
| A8 | 27-73  | 3 | .047 μF        |
| A9 | 27-47  | 1 | .1 μF          |

#### Other

|     |       |   |                    |
|-----|-------|---|--------------------|
| A10 | 27-61 | 1 | .47 μF polystyrene |
|-----|-------|---|--------------------|

### DIODES

|    |       |   |                                  |
|----|-------|---|----------------------------------|
| B1 | 56-26 | 2 | 1N191 (brown-white-brown)        |
| B1 | 56-58 | 3 | 1N709A                           |
| B1 | 56-57 | 1 | 1N716A (violet-brown-blue-brown) |
| B1 | 57-65 | 4 | 1N4002                           |
| B1 | 56-56 | 2 | 1N4149                           |

\*DuPont Company Registered Trademark



| KEY PART No. | PARTS No. | DESCRIPTION |
|--------------|-----------|-------------|
|--------------|-----------|-------------|

**TRANSISTORS**

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

1. Part number.
2. Transistor type number.
3. Part number and type number.
4. Part number with a type other than the one listed.

|    |         |    |         |
|----|---------|----|---------|
| B2 | 417-801 | 17 | MPSA20  |
| B2 | 417-283 | 2  | SM07275 |

**HARDWARE**

**#3 Hardware**

|    |         |    |                   |
|----|---------|----|-------------------|
| B3 | 250-49  | 4  | 3-48 x 1/4" screw |
| B4 | 250-201 | 6  | 3-48 x 1/2" screw |
| B5 | 252-1   | 10 | 3-48 nut          |
| B6 | 254-7   | 10 | #3 lockwasher     |

**#6 Hardware**

|    |         |   |                                |
|----|---------|---|--------------------------------|
| C1 | 250-56  | 6 | 6-32 x 1/4" screw              |
| C2 | 250-106 | 1 | 6-32 x 3/8" self-tapping screw |
| C3 | 250-162 | 2 | 6-32 x 1/2" screw              |
| C4 | 252-3   | 2 | 6-32 nut                       |
| C5 | 254-1   | 2 | #6 lockwasher                  |

**Other**

|    |         |   |                               |
|----|---------|---|-------------------------------|
| C6 | 250-420 | 8 | 2-32 x 1/4" sheet metal screw |
| C7 | 255-29  | 6 | Small spacer                  |
| C8 | 255-13  | 2 | Large spacer                  |

| KEY PART No. | PARTS No. | DESCRIPTION |
|--------------|-----------|-------------|
|--------------|-----------|-------------|

**GROMMET-INSULATORS**

|     |        |   |                         |
|-----|--------|---|-------------------------|
| C9  | 73-180 | 2 | Grommet for 1-1/8" hole |
| C10 | 75-52  | 1 | Switch insulator        |
| C11 | 75-71  | 1 | Strain relief           |
|     | 75-179 | 2 | Fish paper              |

**COVERS-PANELS**

|    |           |   |                  |
|----|-----------|---|------------------|
| D1 | 203-1448  | 2 | Cover            |
| D2 | 202-604-3 | 1 | Control panel    |
| D3 | 202-626   | 1 | Transducer panel |
| D4 | 93-14     | 1 | Book-style cover |

**MISCELLANEOUS**

|    |           |   |  |
|----|-----------|---|--|
|    | 54-177    | 1 | Power transformer  |
| E1 | 60-1      | 2 | Slide switch   |
| E2 | 69-50     | 2 | Relay  |
|    | 85-1217-2 | 1 | Circuit board  |
|    | 89-23     | 1 | Line cord  |
|    | 344-21    | 1 | Red wire   |
| E3 | 434-148   | 2 | AC socket  |
| E4 | 100-1777  | 1 | Transducer set consists of:<br><i>Transducer (matched pair)</i><br><b>HANDLE CAREFULLY</b><br><i>Variable inductor</i> |
| E5 | 490-5     | 1 | Nut starter  |
|    | 390-1306  | 1 | Security label   |
|    |           | 1 | Blue and white label   |
|    | 597-260   | 1 | Parts order form   |
|    | 597-308   | 1 | Kit Builders Guide   |
|    |           | 1 | Manual (See Page 1 for part number.)   |
|    |           | 1 | Solder   |
|    | 390-1924  | 1 | 240V label   |

**STEP-BY-STEP ASSEMBLY**

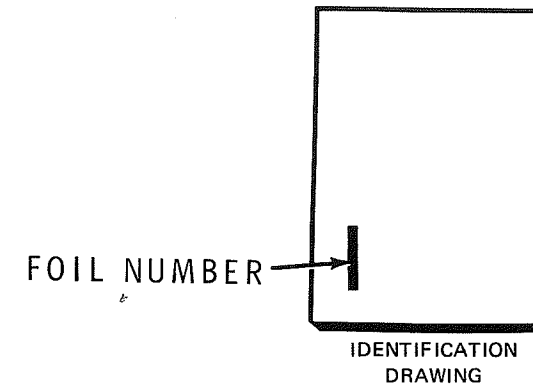
Before starting to assemble this kit, read the "Kit Builders Guide" for information on wiring and soldering.

Resistors are designated by the color code and the resistance value. The symbol  $\Omega$  means ohms (K or  $k\Omega$  indicates 1,000 ohms, and  $M\Omega$  means 1,000,000 ohms). Capacitors are designated by their value and type. The symbol  $\mu F$  means microfarad, and pF means picofarad.

Use the utmost care to prevent solder bridges between

adjacent foil areas on the circuit board. A soldering iron rated at 15 to 25 watts is adequate.

Most parts will be installed on the top side of the circuit board (the side with the component outlines) and the leads will be soldered to the foil (other) side. Solder the leads only to the foil side of the board unless specifically instructed to do otherwise. Before you cut off the excess length of each lead (as shown in the "Kit Builders Guide") look at the foil to make sure the lead has been soldered.



**START**

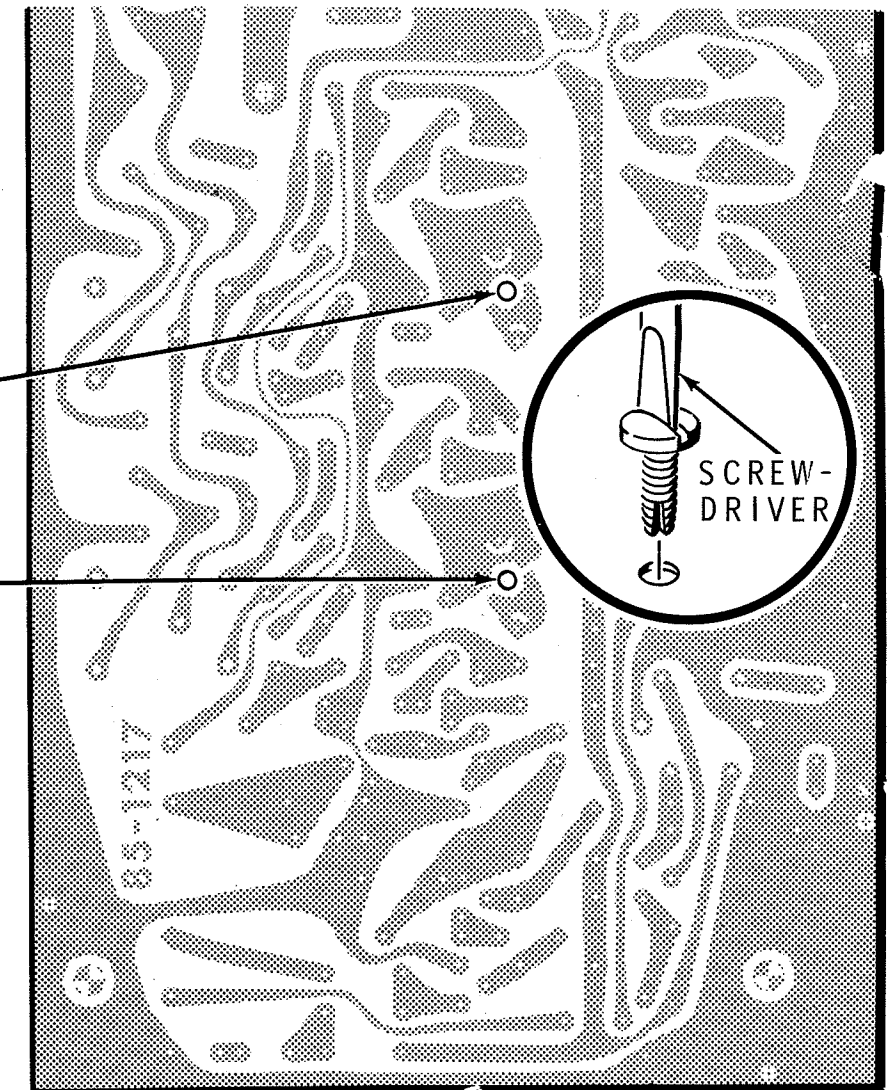
Turn the circuit board foil-side-up with the foil number positioned as shown in the identification drawing to the right.

**IMPORTANT:** In the following step, it is important that you keep the screw straight up-and-down. Provide adequate clearance for the end of the screw to come through the circuit board.

(✓) Place the point of the 6-32 x 3/8" self-tapping screw into the indicated hole. Turn the screw slowly in a clockwise direction; keep a small amount of downward pressure on the screwdriver. When the under side of the screw head is about 1/16" from the circuit board, back it out of the hole. The hole will now be tapped for a 6-32 screw.

(✓) Tap the remaining hole in the same way. Then discard the self-tapping screw.

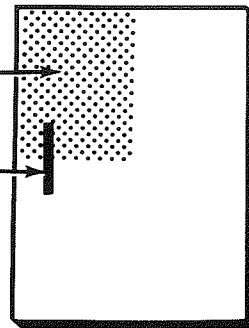
(✓) From the same side of the circuit board, turn 6-32 x 1/4" screws into the two tapped holes. Turn each screw until the underside of the screw head touches the circuit board foil. **DO NOT** overtighten the screws as the circuit board threads can be easily damaged.



**PICTORIAL 1**

The steps performed in this Pictorial are in this area of the circuit board.

PART NUMBER



IDENTIFICATION DRAWING

**START**

NOTE: Only part of the circuit board is shown in the following Pictorials. An identification drawing at the top of each Pictorial shows the area of the circuit board to be assembled.

Position the circuit board with the top side up as shown in the identification drawing. Then complete each step on Pictorial 2 through 10.

(✓) 100 kΩ (brown-black-yellow).

(✓) 1 MΩ (brown-black-green).

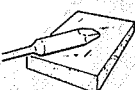
(✓) 10 kΩ (brown-black-orange).

(✓) 47 kΩ (yellow-violet-orange).

(✓) 4700 Ω (yellow-violet-red).

(✓) 1 MΩ (brown-black-green).

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



**SAFETY WARNING:** Avoid eye injury when you clip off excess leads. We suggest that you wear glasses, or at least clip the leads so the ends will not fly toward your eyes.

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

(✓) 100 kΩ (brown-black-yellow).

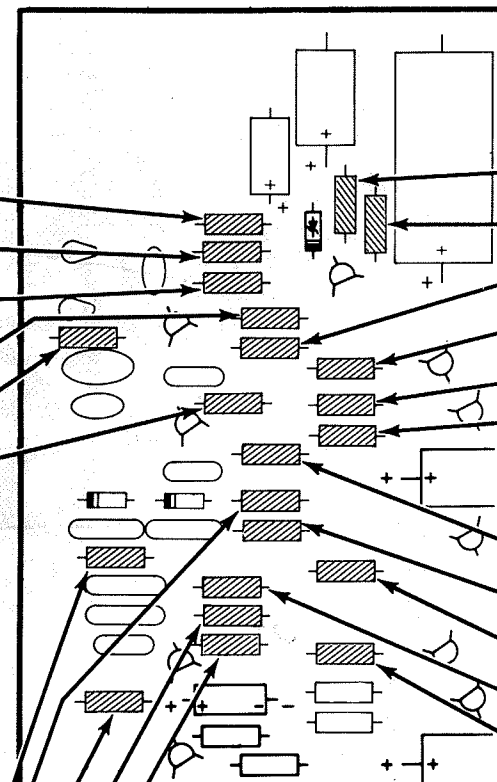
(✓) 2.7 MΩ (red-violet-green).

(✓) 20 kΩ (red-black-orange).

(✓) 33 kΩ (orange-orange-orange).

(✓) 33 kΩ (orange-orange-orange).

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



PICTORIAL 2

**CONTINUE**

(✓) 680 Ω (blue-gray-brown).

(✓) 2700 Ω (red-violet-red).

(✓) 10 kΩ (brown-black-orange).

(✓) 20 kΩ (red-black-orange).

(✓) 47 kΩ (yellow-violet-orange).

(✓) 470 kΩ (yellow-violet-yellow).

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

(✓) 4700 Ω (yellow-violet-red).

(✓) 100 kΩ (brown-black-yellow).

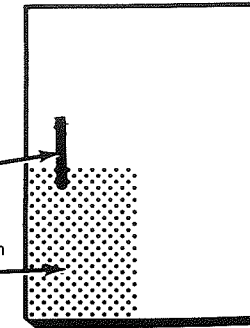
(✓) 10 kΩ (brown-black-orange).

(✓) 33 kΩ (orange-orange-orange).

(✓) 20 kΩ (red-black-orange).

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

PART NUMBER



IDENTIFICATION DRAWING

The steps performed in this Pictorial are in this area of the circuit board.

**START**

(✓) 1 MΩ (brown-black-green).

(✓) 10 kΩ (brown-black-orange).

(✓) 10 kΩ (brown-black-orange).

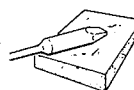
( ) 20 kΩ (red-black-orange).

(✓) 47 kΩ (yellow-violet-orange).

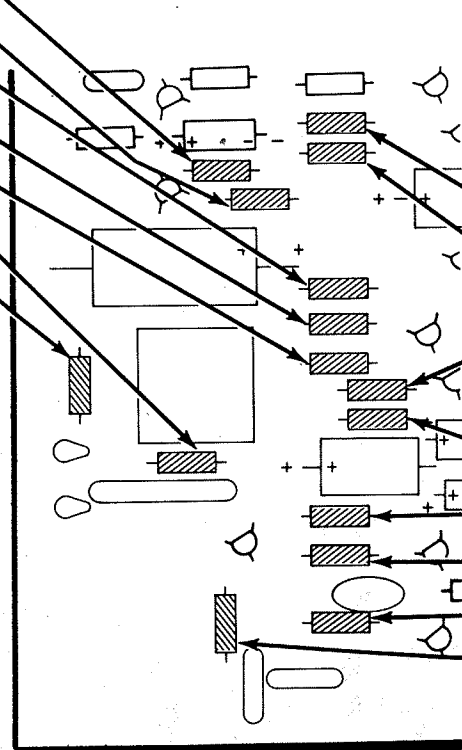
(✓) 68 Ω (blue-gray-black).

(✓) 4700 Ω (yellow-violet-red).

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



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



PICTORIAL 3

**CONTINUE**

(✓) 47 kΩ (yellow-violet-orange).

(✓) 470 kΩ (yellow-violet-yellow).

(✓) 680 Ω (blue-gray-brown).

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

(✓) 100 kΩ (brown-black-yellow).

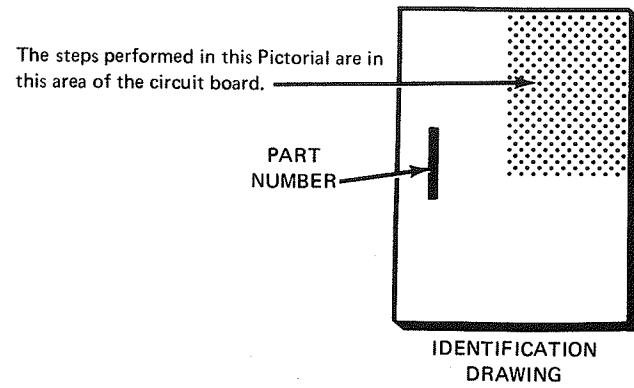
(✓) 22 kΩ (red-red-orange).

(✓) 680 Ω (blue-gray-brown).

(✓) 22 kΩ (red-red-orange).

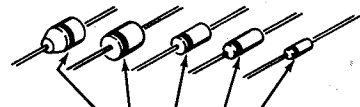
(✓) 100 kΩ (brown-black-yellow).

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



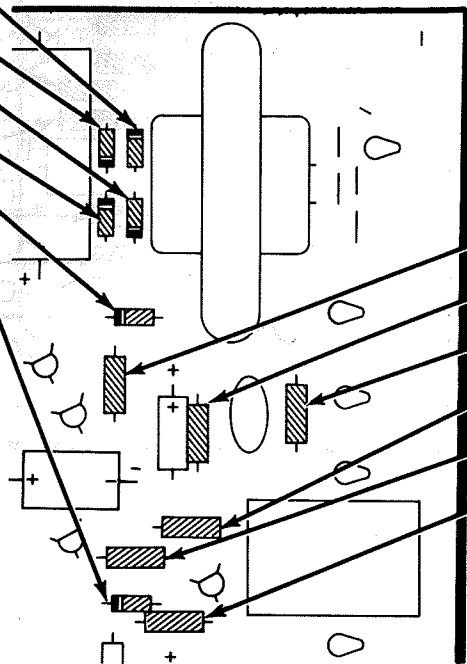
**START**

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.



- ( / ) 1N4002 diode (#57-65) at D11.
- ( / ) 1N4002 diode (#57-65) at D10.
- ( / ) 1N4002 diode (#57-65) at D12.
- ( / ) 1N4002 diode (#57-65) at D9.
- ( / ) 1N709A diode (#56-58) at D7.
- ( / ) 1N709A diode (#56-58) at D6.

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

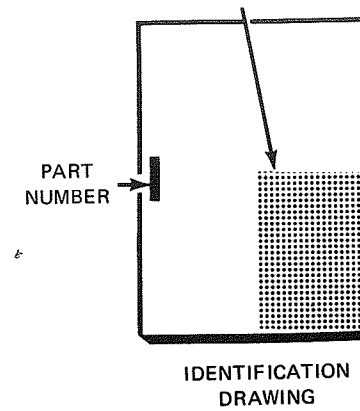


**CONTINUE**

- ( / ) 10 kΩ (brown-black-orange).
- ( / ) 680 Ω (blue-gray-brown).
- ( / ) 68 Ω (blue-gray-black).
- ( / ) 680 Ω (blue-gray-brown).
- ( / ) 47 kΩ (yellow-violet-orange).
- ( / ) 22 kΩ (red-red-orange).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4

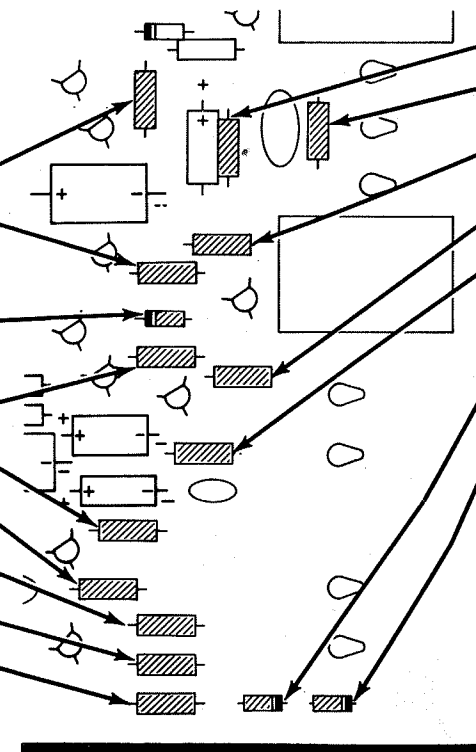
The steps performed in this Pictorial are in this area of the circuit board.



**CONTINUE**

**START**

- ( / ) 10 kΩ (brown-black-orange).
- ( / ) 47 kΩ (yellow-violet-orange).
- ( / ) 1N709A diode (#56-58) at D5. Be sure to match the banded end of the diode to the band on the circuit board.
- ( / ) 10 kΩ (brown-black-orange).
- ( / ) 10 kΩ (brown-black-orange).
- ( / ) 100 kΩ (brown-black-yellow).
- ( / ) 10 kΩ (brown-black-orange).
- ( / ) 33 kΩ (orange-orange-orange).
- ( / ) 10 kΩ (brown-black-orange).
- ( / ) Solder the leads to the foil and cut off the excess lead lengths.

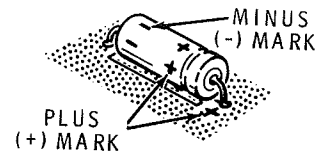


- ( / ) 680 Ω (blue-gray-brown).
- ( / ) 68 Ω (blue-gray-black).
- ( / ) 680 Ω (blue-gray-brown).
- ( / ) 22 kΩ (red-red-orange).
- ( / ) 4700 Ω (yellow-violet-red).
- ( / ) 1N4149 diode (#56-56) at D3.
- ( / ) 1N4149 diode (#56-56) at D4.
- ( / ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 5

START

NOTE: Before you install an electrolytic capacitor, look at it and identify the leads. One lead will have a plus (+) mark or a minus (-) mark near it. Be sure to install the positive lead in the positive-marked hole. Be careful; only the negative lead may be marked.



( / ) 50  $\mu$ F electrolytic.

( / ) 10  $\mu$ F electrolytic.

Before you install a disc capacitor, remove from its leads any excess body coating material which could protrude through the circuit board and cause a poor solder connection to the foil.



( / ) 270 pF disc.

( / ) .05  $\mu$ F disc.

( / ) 270 pF disc.

( / ) .01  $\mu$ F Mylar (.01k).

( / ) .01  $\mu$ F Mylar (.01k).

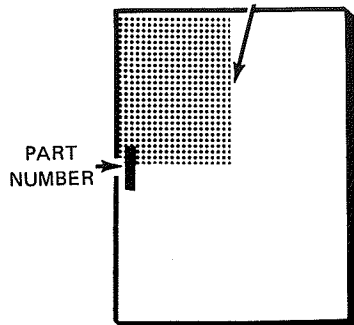
( / ) 1N191 diode (#56-26, brown-white-brown) at D1. NOTE: The color bands on this diode are closer to one end than the other. Make sure you position the end with the color bands toward the band mark on the circuit board.

( / ) .047  $\mu$ F Mylar.

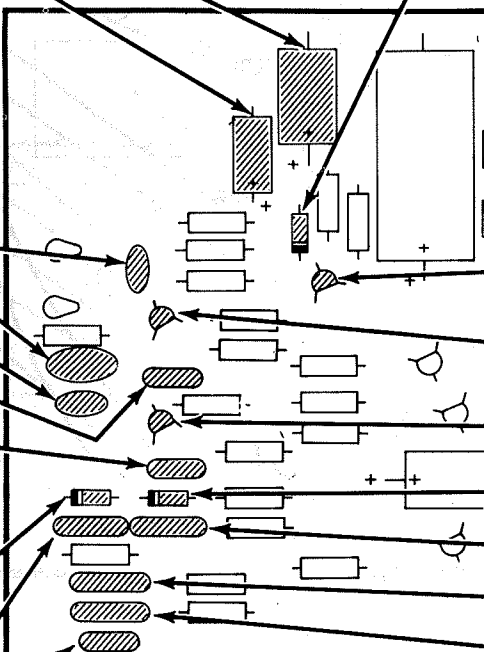
( / ) .01  $\mu$ F Mylar (.01k).

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

The steps performed in this Pictorial are in this area of the circuit board.



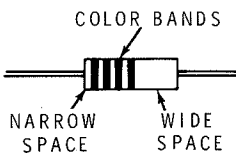
IDENTIFICATION DRAWING



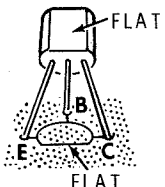
PICTORIAL 6

CONTINUE

( / ) 1N716A diode (#56-57) at D8. NOTE: This diode may be supplied with the part number stamped on it and with a single band, or it may have four color bands (violet-brown-blue-brown). If it has a single band, position the band toward the band mark on the circuit board. If the diode has color bands, position the end that has the narrow space toward the band mark on the circuit board.



NOTE: Insert the transistor leads into the corresponding E, B, and C holes in the circuit board as shown. Solder the leads to the foil and cut off the excess lead lengths.



( / ) Transistor MPSA20 (#417-801) at Q18.

( / ) Transistor SM07275 (#417-283) at Q1.

( / ) Transistor SM07275 (#417-283) at Q2.

( / ) 1N191 diode (#56-26, brown-white-brown) at D2.

( / ) .047  $\mu$ F Mylar.

( / ) .022  $\mu$ F Mylar.

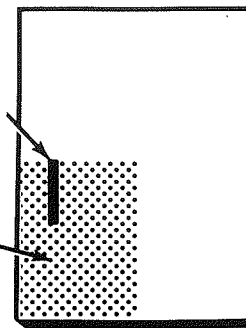
( / ) .022  $\mu$ F Mylar.

NOTE: In the following step, save two of the long capacitor leads for use later.

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

PART NUMBER

The steps performed in this Pictorial are in this area of the circuit board.

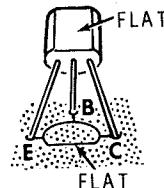


IDENTIFICATION DRAWING

CONTINUE

START

NOTE: Insert the transistor leads into the corresponding E, B, and C holes in the circuit board as shown.



( / ) Transistor MPSA20 (#417-801) at Q3.

( / ) Transistor MPSA20 (#417-801) at Q4.

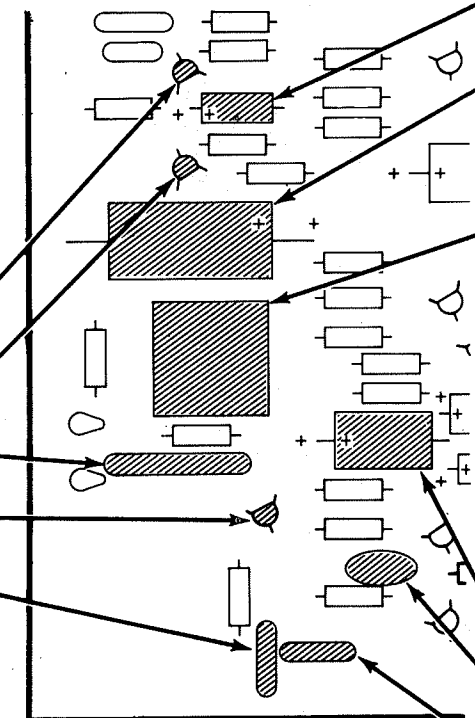
( / ) .47  $\mu$ F polystyrene.

( / ) Transistor MPSA20 (#417-801) at Q19.

( / ) .047  $\mu$ F Mylar.

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

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

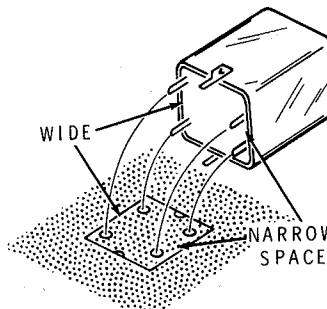


( / ) 2  $\mu$ F electrolytic. Be sure to match the "+" marks on the capacitor to the "+" mark on the circuit board.

( / ) 500  $\mu$ F electrolytic (#25-157), 15V.

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

( / ) Variable inductor. Solder each pin to the foil. NOTE: Disregard any numbers on the board at this location.



( / ) 50  $\mu$ F electrolytic.

( / ) .05  $\mu$ F disc.

( / ) .1  $\mu$ F Mylar.

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

PICTORIAL 7



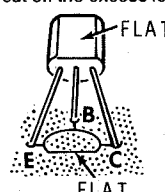
The steps performed in this Pictorial are in this area of the circuit board.

**START**

IDENTIFICATION DRAWING

500  $\mu$ F electrolytic (#25-199), 25V. Solder the leads to the foil and cut off the excess lead lengths.

NOTE: Insert the transistor leads into the corresponding E, B, and C holes in the circuit board as shown. Solder each lead to the foil and cut off the excess lead lengths.



Transistor MPSA20 (#417-801) at Q17.

Transistor MPSA20 (#417-801) at Q16.

50  $\mu$ F electrolytic. Solder the leads to the foil and cut off the excess lead lengths.

Transistor MPSA20 (#417-801) at Q15.

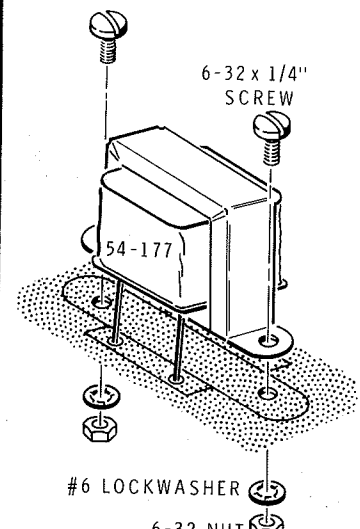
Transistor MPSA20 (#417-801) at Q14.

Transistor MPSA20 (#417-801) at Q13.

Check to make sure all leads have been soldered to the foil.

**CONTINUE**

Power transformer. Push the six bare leads into the six holes. Secure the transformer with 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts, as shown. Solder the leads to the foil and cut off the excess lead lengths.



6-32 x 1/4" SCREW

54-177

#6 LOCKWASHER

6-32 NUT

.01  $\mu$ F disc.

2  $\mu$ F electrolytic.

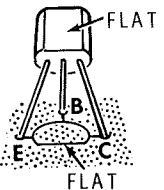
Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 8

The steps performed in this Pictorial are in this area of the circuit board.

**START**

NOTE: Insert the transistor leads into the corresponding E, B, and C holes in the circuit board as shown. Solder each lead to the foil and cut off the excess lead lengths.



Transistor MPSA20 (#417-801) at Q12.

50  $\mu$ F electrolytic. Match the "+" marks on the capacitor to the "+" mark on the board. Solder the leads to the foil and cut off the excess lead lengths.

Transistor MPSA20 (#417-801) at Q11.

Transistor MPSA20 (#417-801) at Q10.

Transistor MPSA20 (#417-801) at Q9.

Transistor MPSA20 (#417-801) at Q8.

Transistor MPSA20 (#417-801) at Q6.

Transistor MPSA20 (#417-801) at Q5.

Check to see that all the leads have been soldered to the foil.

IDENTIFICATION DRAWING

2  $\mu$ F electrolytic.

.01  $\mu$ F disc.

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

Transistor MPSA20 (#417-801) at Q7.

10  $\mu$ F electrolytic.

270 pF disc.

2  $\mu$ F electrolytic.

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

**CONTINUE**

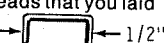
PICTORIAL 9

**START**

**TRANSFORMER PRIMARY WIRING**

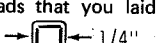
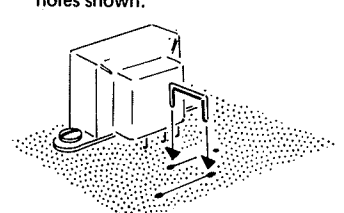
This Intruder Alarm can be wired to operate from either 120 VAC or 240 VAC, 50/60 Hz line voltage. Therefore, two sets of steps are given for the wiring of the power transformer. Follow only the steps that agree with the line voltage in your area. If you do not know your line voltage, call your electrical power company.

**120 VAC Wiring**

- ( ) Form two jumpers from the two cutoff capacitor leads that you laid aside earlier.  1/2"
- ( ) One jumper over the indicated line J.
- ( ) One jumper over the other line J.
- ( ) Solder the wires to the foil and cut off the excess wire ends.
- ( ) Inspect the circuit board carefully to make sure that all the leads have been soldered, that all excess lead lengths have been cut off, and that there are no solder bridges between foils.

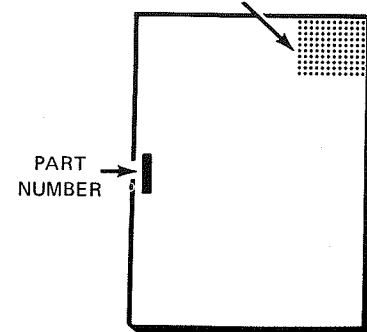
Lay the circuit board aside temporarily.

**240 VAC Wiring**

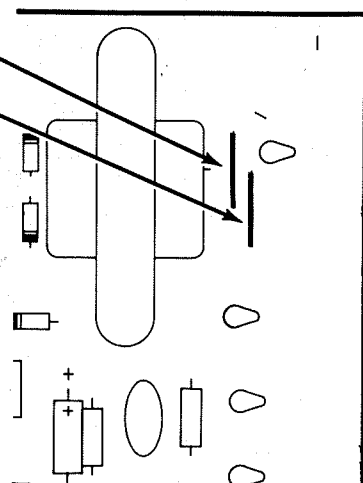
- ( ) Form a jumper from one of the cutoff resistor leads that you laid aside earlier.  1/4"
- ( ) Install the jumper between the two holes shown. 
- ( ) Solder the wire to the foil and cut off the excess wire ends.
- ( ) Inspect the circuit board carefully to make sure that all the leads have been soldered, that all excess lead lengths have been cut off, and that there are no solder bridges between foils.

Lay the circuit board aside temporarily.

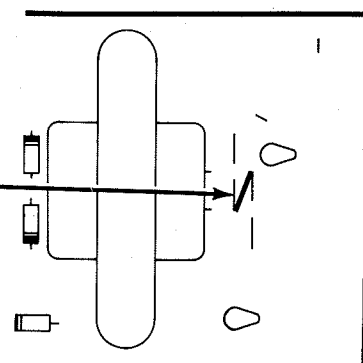
The steps performed in this Pictorial are in this area of the circuit board.



IDENTIFICATION DRAWING



PICTORIAL 10



**CHASSIS NOTES**

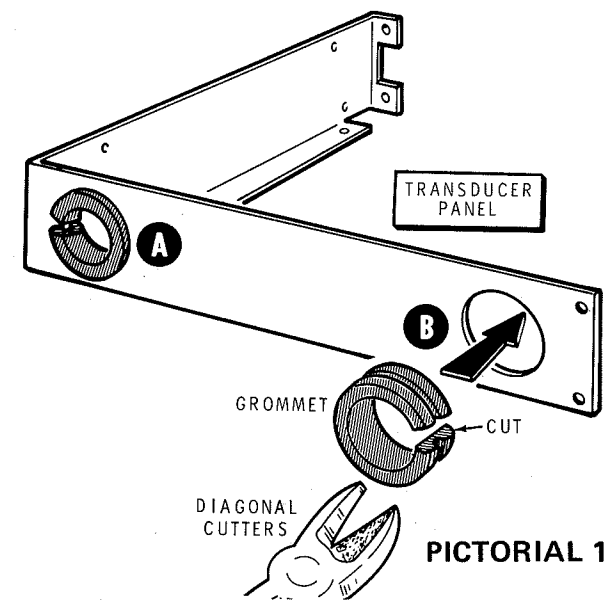
The illustrations in this section of the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details are used in addition to the Pictorials to illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.

Look at the "Chassis Photos" (Page 36) from time to time to see the actual positions of wires and components.

Lockwashers and nuts will be used with most screws when mounting parts. Consequently, the steps will call out only the size and type of hardware used. For example, the phrase "Use 6-32 x 1/4" hardware" means to use 6-32 x 1/4" screws, one or more #6 lockwashers, and 6-32 nuts. Refer to the Details for the proper installation of hardware. Be sure to position the parts as shown in the Pictorials. Read the entire step before performing the operation and follow the instructions carefully.

A plastic nut starter has been provided with this kit. Use it to hold and start 6-32 and 3-48 nuts on screws. Refer to the "Kit Builders Guide" for more information.

**CHASSIS PARTS MOUNTING**



PICTORIAL 11

Refer to Pictorial 11 for the following steps.

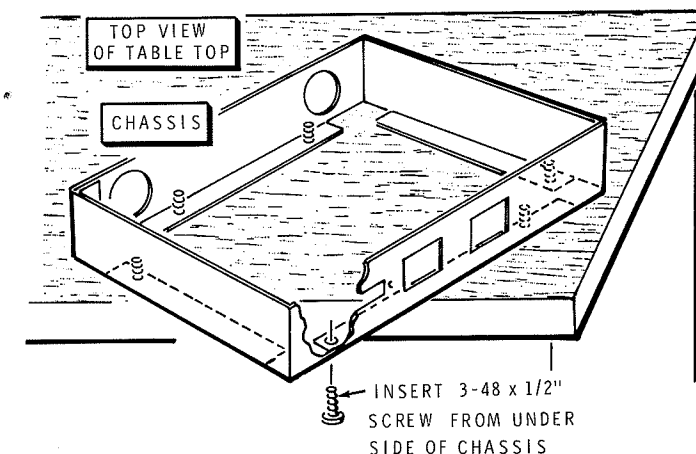
- ( ) Using diagonal cutters, cut a grommet and then push it into hole B in the transducer panel (#202-626). Look at both sides of the panel to make sure the grommet is correctly seated.
- ( ) Similarly, install the remaining grommet into hole A in the transducer panel.

Refer to Pictorial 12 (Illustration Booklet, Page 3) for the following steps.

- ( ) Refer to Detail 12A (Illustration Booklet, Page 3) and fasten the control panel to the transducer panel. Use 3-48 x 1/4" hardware. Start the nuts with the plastic nut starter. This assembly forms the chassis.

NOTE: The following steps tell you how to install the circuit board mounting hardware. As you rotate the chassis to insert successive screws, be very careful that all holes with inserted screws are kept over the table top so the screws will not fall out.

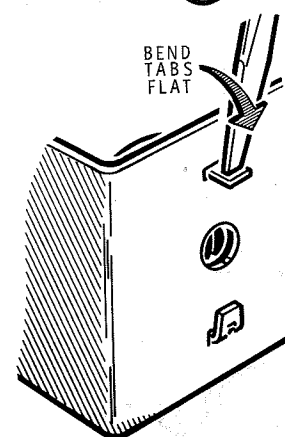
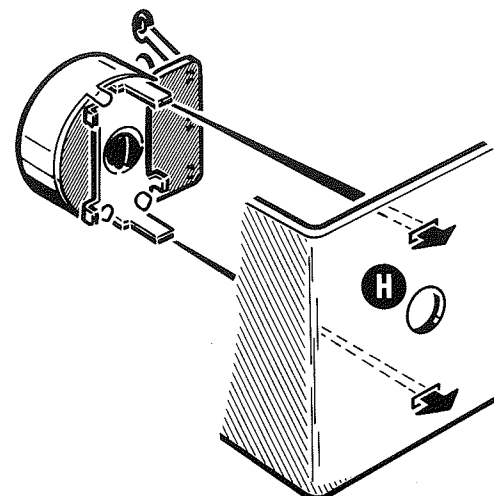
You may prefer to place a 1" strip of adhesive tape over each screw head until the circuit board is secured in place, after which time the tape can be removed and discarded.



Detail 12B

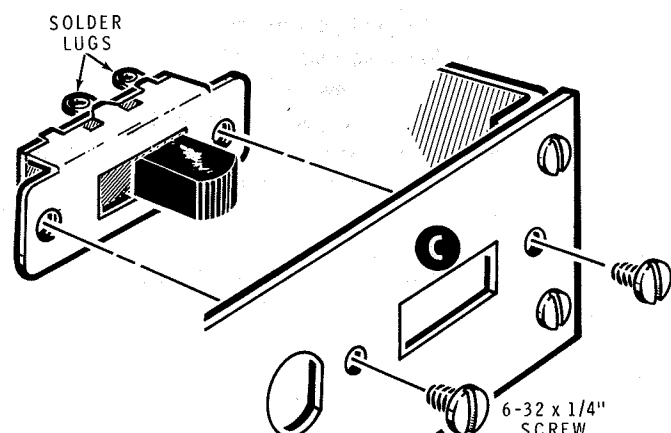
- ( ) Refer to Detail 12B and position the chassis with the mounting lips down against a table top, as shown. Insert a 3-48 x 1/2" screw in a mounting hole. Hold the screw in place with your finger and rotate the chassis so the screw head is held in place by the table top and the next open hole is available, as shown.
- ( ) Repeat the above step until all six mounting screws have been installed, and all are held in place by the table top.
- ( ) Refer to Detail 12C (Illustration Booklet, Page 4) and place a small spacer on each of the six screws.
- ( ) As shown in Detail 12C (Illustration Booklet, Page 4), position the circuit board so the transformer is near C and lower the circuit board onto the six screws. Secure the board with 3-48 nuts and #3 lockwashers.
- ( ) Remove the six pieces of adhesive tape (if used) and tighten the hardware.





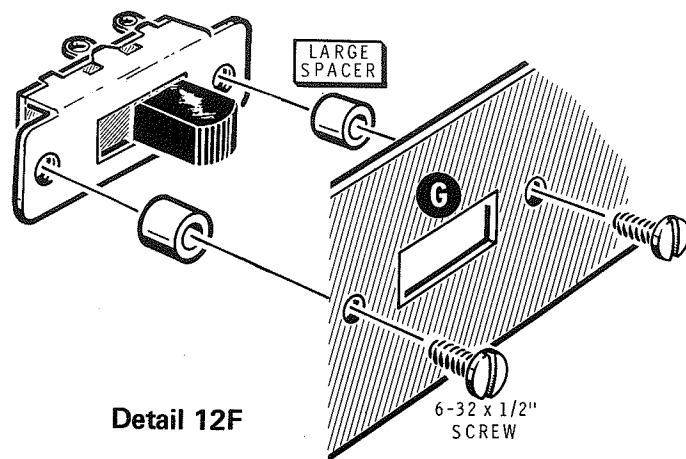
Detail 12D

- ( / ) Refer to Detail 12D and mount the control at H on the control panel. Secure the control by bending over both mounting lugs toward hole H.



Detail 12E

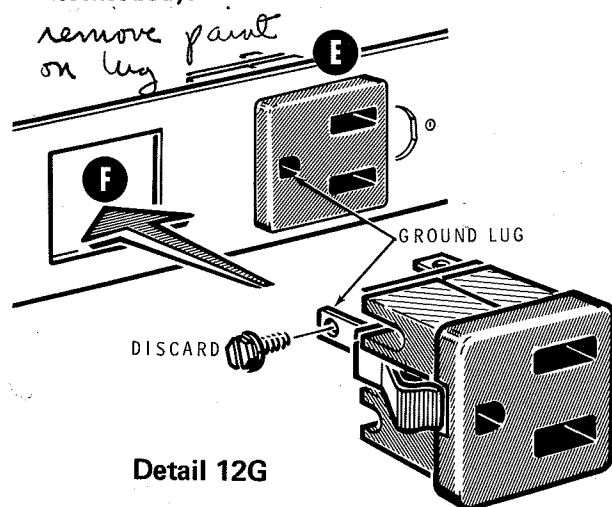
- ( / ) Refer to Detail 12E and mount a slide switch on the control panel at C. Position the solder lugs to the right as shown in the Pictorial. Use 6-32 x 1/4" screws.



Detail 12F

- ( / ) Refer to Detail 12F and mount a slide switch on the control panel at G. Position the solder lugs to the right, as shown. Use 6-32 x 1/2" screws and the large spacers.

- ( / ) Remove and discard the screw from the ground lug of each AC socket as shown in Detail 12G. DO NOT remove the screw which holds the ground lug to the socket body.



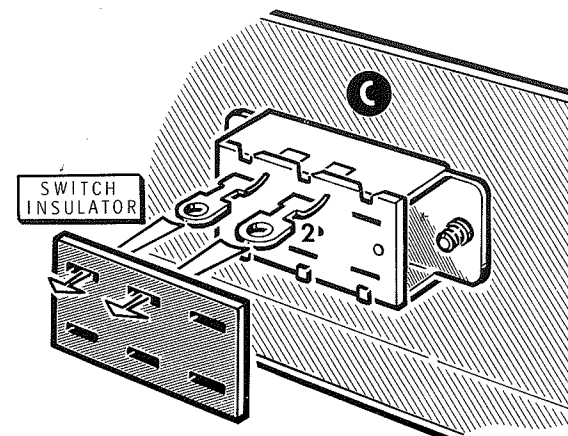
Detail 12G

- ( / ) Refer to Detail 12G and position an AC socket in hole F of the control panel so the ground lug is toward the words "Ultrasonic Alarm" on the panel. Push the socket firmly so its two spring clips hold the socket securely to the panel.

- ( / ) Similarly, position an AC socket in hole E of the control panel so its ground lug is toward the word "Alarm," and push the socket firmly into place.

- ( / ) Prepare eleven 1-3/4" lengths of red wire by removing 1/4" of insulation from both ends of each wire.

NOTE: In the following steps, you will install eleven red wires between the circuit board and the parts mounted on the control panel.



Detail 12H

- ( ) Refer to Detail 12H and place a switch insulator on the lugs of switch C. NOTE: If the lugs are in the center of the switch, discard the insulator; it is not required on this type of switch.

Refer to Pictorial 12 for the following steps.

NOTE: In the following steps, "S-" with a number, such as (S-3), means to solder the connection. The number following the "S" tells how many wires are at the connection.

- ( / ) Connect a red wire from hole A in the circuit board (S-1) to lug 2 of switch C on the control panel (S-1).

- ( ) Connect a red wire from hole C (S-1) to lug 3 of socket E (S-1).

NOTE: When you connect wires to holes D, E, and G in the following steps, make sure the wires do not protrude over the outlines of RL1 and RL2. Relays will be mounted there later.

- ( / ) Connect a red wire from hole D (S-1) to lug 2 of socket E (S-1).

- ( / ) Connect a red wire from hole B (S-1) to lug 1 of socket E (S-1).

- ( / ) Connect a red wire from hole F (S-1) to lug 3 of socket F (S-1).

- ( / ) Connect a red wire from hole G (S-1) to lug 2 of socket F (S-1).

- ( / ) Connect a red wire from hole E (S-1) to lug 1 of socket F (S-1).

- ( / ) Connect a red wire from hole H (S-1) to lug 1 of switch G (S-1).

- ( / ) Connect a red wire from hole J (S-1) to lug 2 of switch G (S-1).

NOTE: Lug 1 of control H will not be used.

- ( ) Connect a red wire from hole K (S-1) to lug 2 of control H (S-1).

- ( ) Connect a red wire from hole L (S-1) to lug 3 of control H (S-1).

- ( ) On the foil side of the circuit board, cut off all excess lead lengths from the eleven wires previously installed.

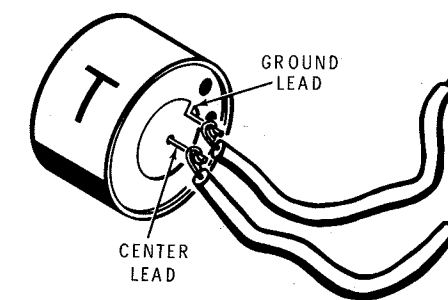
- ( ) Prepare four 3-3/4" red wires.

Refer to Detail 12J and connect two of the prepared wires to a transducer as follows:

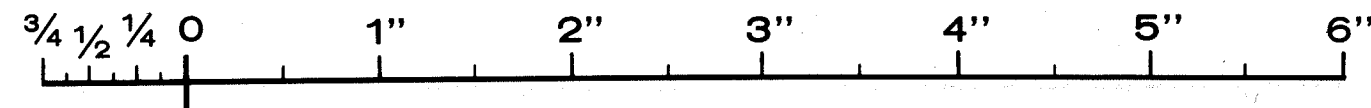
- ( / ) Connect one wire to the center lug (S-1).

- ( / ) Connect the other wire to the ground lug (S-1).

- ( ) In a similar manner, connect the other two prepared wires to the remaining transducer.

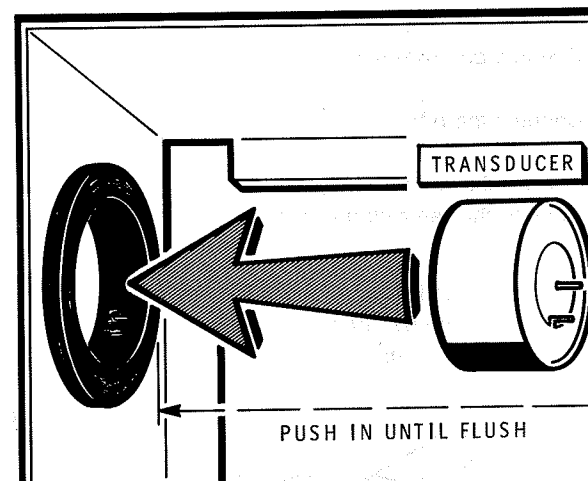


Detail 12J

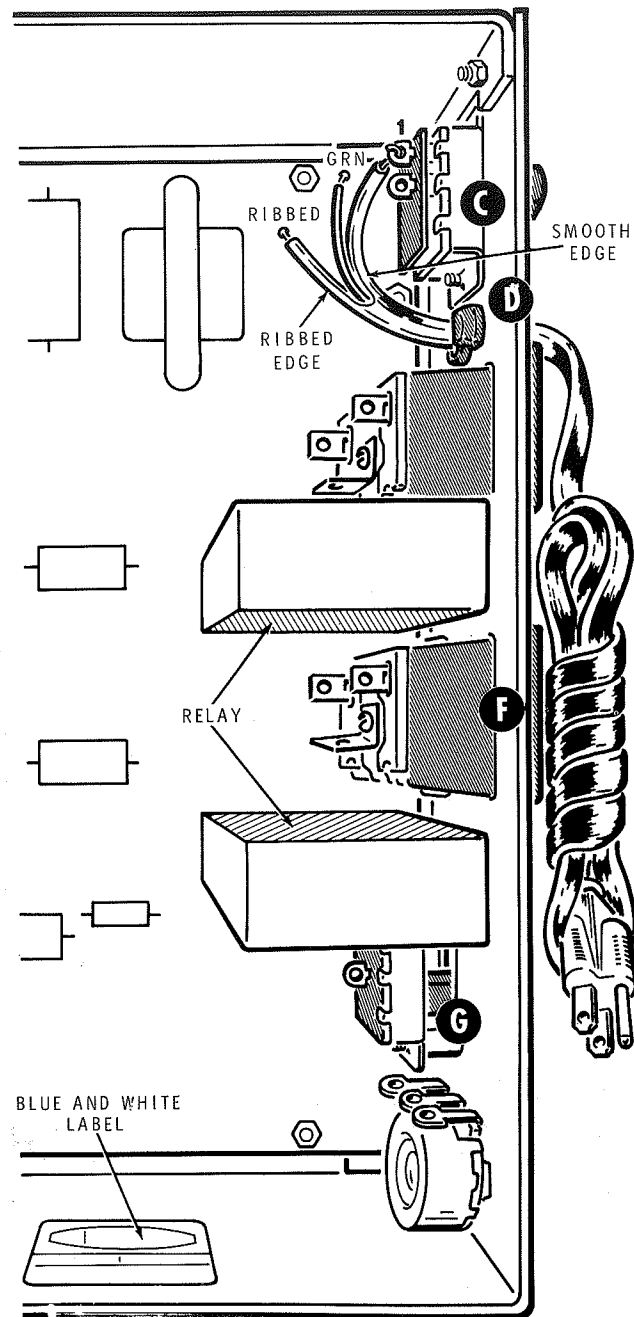


As shown in Detail 12J, one of the transducers is marked with the letter "T". Be sure to use this transducer in the next step.

- ( ) Connect the center lead from the "T"-marked transducer to hole N in the circuit board (S-1) and the other lead to hole M in the circuit board (S-1).
- ( ) Connect the center lead from the other transducer to hole P (S-1) and the other lead to hole R (S-1) in the circuit board.
- ( ) On the foil side of the circuit board, cut off any excess lead lengths from the four wires connected above.
- ( ) Refer to Detail 12K and, from the back, push a transducer into each of the two large grommets until the back of the transducer is flush with the back of the grommet.



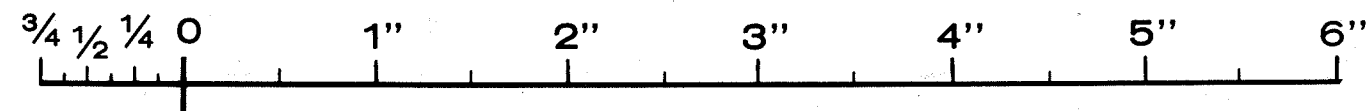
Detail 12K



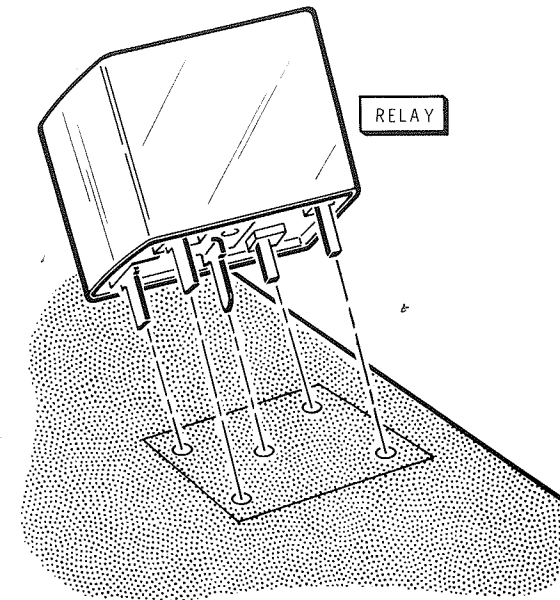
PICTORIAL 13

Refer to Pictorial 13 for the following steps.

- ( ) Refer to Detail 13A and install a relay on the circuit board between the two AC sockets. If necessary bend the relay pins to fit into the five holes. Make sure the relay is down against the circuit board before you solder (S-5).

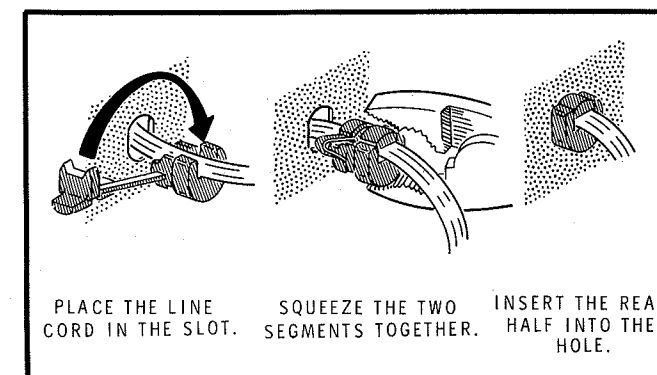
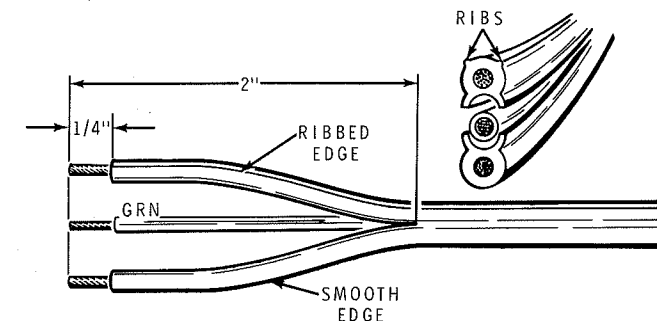


Refer to Detail 13B for the following steps:



Detail 13A

- ( ) Similarly, install the other relay between AC socket F and switch G (S-5).
- ( ) Cut off the excess lead lengths from the center pin of each of the relays, which may otherwise cause a short circuit when the chassis cover is installed.



Detail 13B

- ( ) Cut off the line cord so the wires are separated for a distance of 2" and remove 1/4" of insulation from the end of each wire. At the end of each wire, twist the fine strands of wire tightly together and melt a small amount of solder on each end.

- ( ) Place the strain relief on the line cord 2-1/2" from the end. Then insert the free end of the line cord into hole D from the outside of the control panel, with the ribbed edge positioned as shown. Use pliers to compress the strain relief and insert it into hole D.

Refer to Pictorial 13 and connect the line cord wires as follows:

- ( ) Connect the green wire to hole "green" in the circuit board (S-1).
- ( ) Connect the line cord wire with the ribbed edge to hole "ribbed" in the circuit board (S-1).
- ( ) Connect the line cord wire with the smooth edge to lug 1 of switch C (S-1).
- ( ) Cut off the excess lead lengths from the line cord wires connected above.

NOTE: The blue and white label shows the model and series numbers of your kit. Refer to these numbers in any communications with the Heath Company.

- ( ) Refer to Pictorial 13 and install the blue and white identification label. Carefully peel away the backing paper. Then press the label into position. You will avoid smearing the numbers on the label if you will put the piece of waxed backing paper on top of the label and then rub on it instead of directly on the label.

**CAUTION**

Use extreme care during initial testing and all subsequent maintenance of this Intrusion Alarm. While this device is designed for maximum safety, never lose respect for the high voltage present in this unit. Protect yourself always against lethal or severe electric shock.

HEATH COMPANY

**TESTS AND ADJUSTMENTS**

A time delay between the times the two output sockets are powered has been designed into this unit.

There are only two adjustments which can be made; one is a temporary shortening of the time delay for use when testing the device, and the other is a permanent change in the length of the time delay.

**OPERATIONAL TEST**

**CAUTION:** When you are instructed to "tighten" the adjusting screws, turn them clockwise just enough so the underside of the screw heads will contact the two foil surfaces. Overtightening the screws may strip the threads from the circuit board.

- ( ) Make sure the two adjusting screws on the foil side of the circuit board are tight (to shorten the time delay).

Refer to Figure 1 (Illustration Booklet, Page 4) for the following steps.

- ( ) Set the AUTO RESET-HOLD switch to AUTO RESET and the POWER switch to OFF.

- ( ) Turn the SENSITIVITY control fully clockwise.

- ( ) Turn on a small table lamp. Then unplug the lamp from the electric outlet while the lamp is still turned on.

**CAUTION:** If you wired your Intrusion Alarm for operation from a 240 VAC power source, any device connected to the ALARM or LAMP sockets must be designed for this same voltage.

- ( ) Insert the lamp plug into the LAMP socket on the Intrusion Alarm.

**DANGER:** Whenever the line cord is connected to an AC outlet, dangerous voltages will be present above and below the circuit board, even when the switch is in the OFF position. Except when an insulated tool is used, do not handle or work on this instrument when the covers are removed until the line cord has been disconnected. Refer to "High Voltage Areas" in the "Chassis Photographs" on Page 36.

NOTE: A line cord adapter, if you should need one, can be obtained at any hardware or electrical supply store.

- ( ) With the POWER switch OFF, plug the line cord of the Intrusion Alarm into your electric outlet and push the POWER switch to ON. If your electric outlet will not accept the 3-prong line cord plug, use a line cord adapter between the line cord and the electric outlet.

NOTE: In any of the following tests, if the lamp does not turn on and off as described, and you are sure the lamp switch is in the ON position, refer to the "In Case of Difficulty" section on Page 26. All steps should be performed, however, as a possible aid in localizing the trouble.

- ( ) Push the POWER switch to ON, wait about 30 seconds, and then pass your hand across the front of the two transducers. The table lamp should turn on for about one second and then turn off. If the unit does not respond within 20 seconds, tighten the adjustment screws slightly.

- ( ) Push the POWER switch to OFF.

- ( ) Remove the lamp plug from the LAMP socket and connect it to the ALARM socket. Then repeat the preceding two steps.

- ( ) If the lamp turns on and off as described in both tests, loosen each of the two adjusting screws 1/2 turn.

- ( ) Repeat the tests with the lamp plugged into each of the two sockets. When the lamp is plugged into the LAMP socket, it should turn on one second after movement occurs, and remain on for about 50 seconds. When the lamp is plugged into the ALARM socket, it should turn on within 20 to 30 seconds after movement occurs and should remain on for about 30 seconds. See "Basic Operation" on Page 23 for operation of the AUTO RESET-HOLD switch.

- ( ) If all tests are satisfactory, loosen both adjustment screws and then proceed to "Final Assembly."

**PERMANENT DELAY ADJUSTMENT**

Refer to Figure 2 for the following paragraphs.

The "lamp to alarm," "alarm to reset," and "turn on" delay times can be altered (within limits) by changing the value of R45, R55, or C1. The amount of "lamp to alarm" delay can be altered by changing the value of R45. The amount of "alarm to reset" delay time can be altered by changing the value of R55. The new values of R45 or R55 should not be less than 10 k $\Omega$  nor greater than 2 M $\Omega$ . To determine the value of R45 or R55, use the formula  $R = \frac{T}{C}$  where:

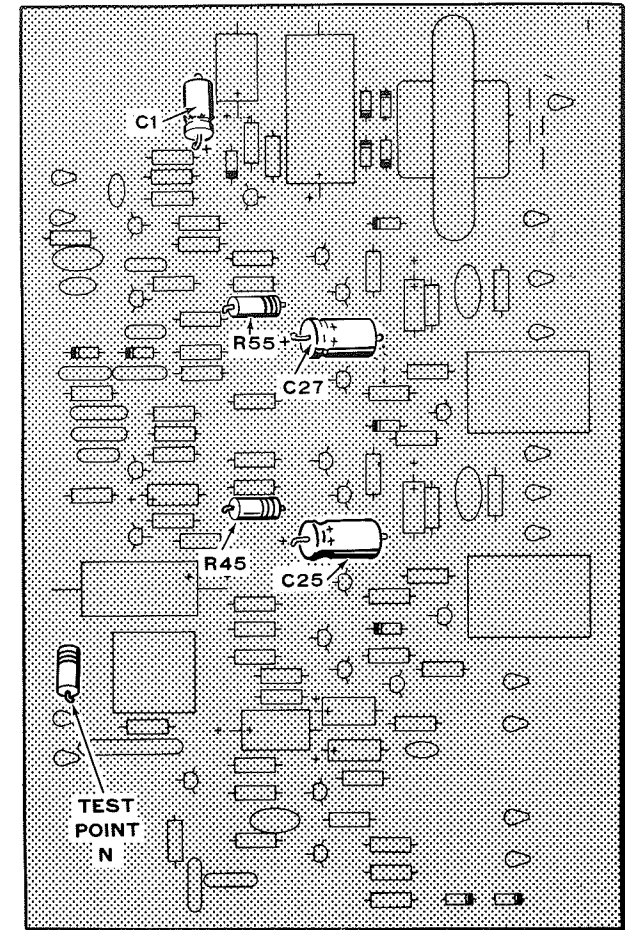


Figure 2

R = value of R45 or R55 in megohms  
T = desired time delay in seconds  
C = 50  $\mu$ F\* (value of C25 or C27)

\*NOTE: Do NOT change the value of C25 or C27 for the above applications.

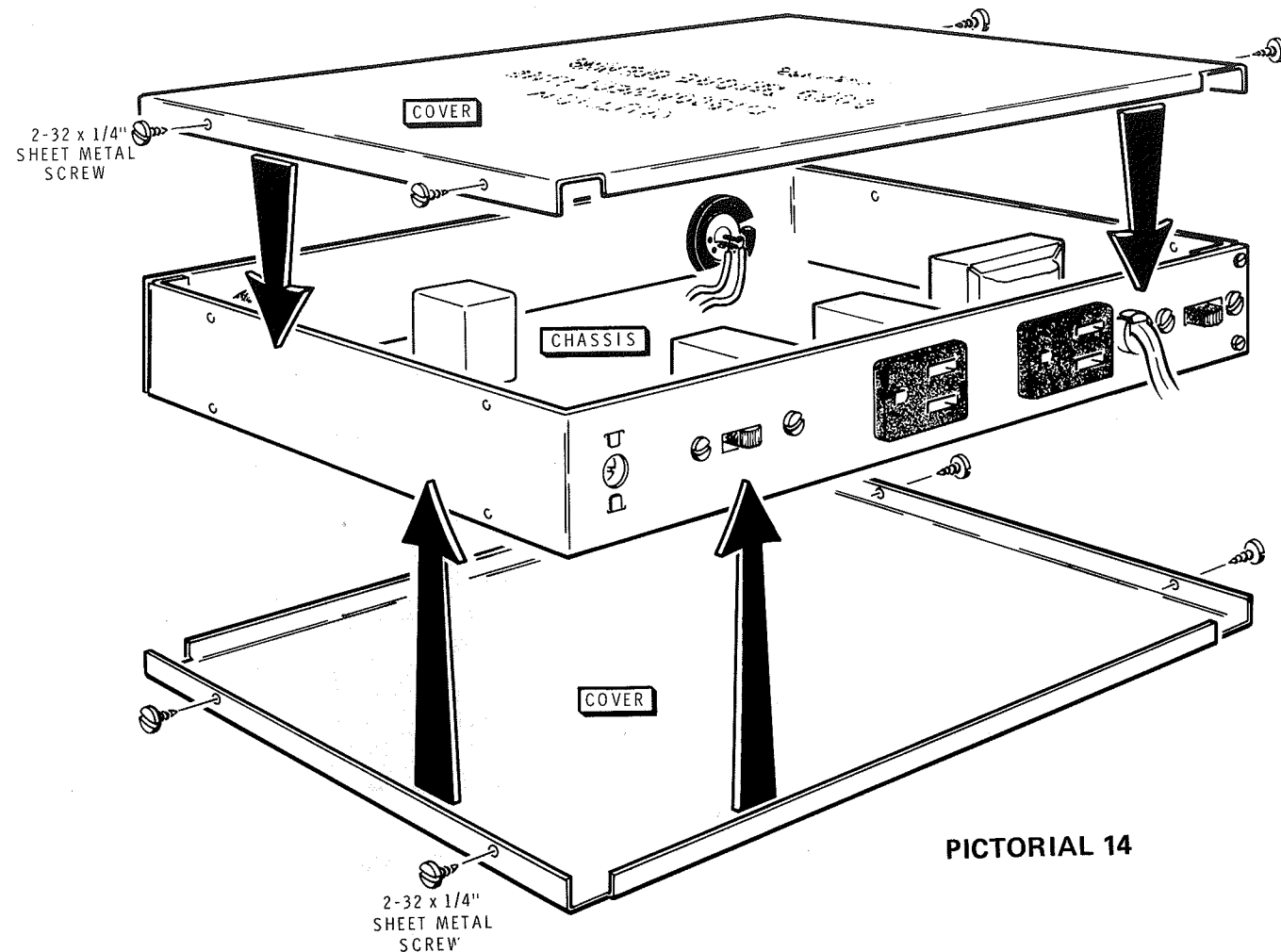
**"Turn On" Delay Adjustment**

NOTE: The "turn on" delay time is determined by an R/C network consisting of resistors R1, R2, R4 and capacitor C1. CAUTION: If any change in the "turn on" delay time is to be made, it MUST be accomplished by changing the value of C1.

For a delay time of approximately 10 seconds, C1 should be 10  $\mu$ F; for approximately 25 seconds, C1 should be 25  $\mu$ F; for approximately 50 seconds, C1 should be 50  $\mu$ F.

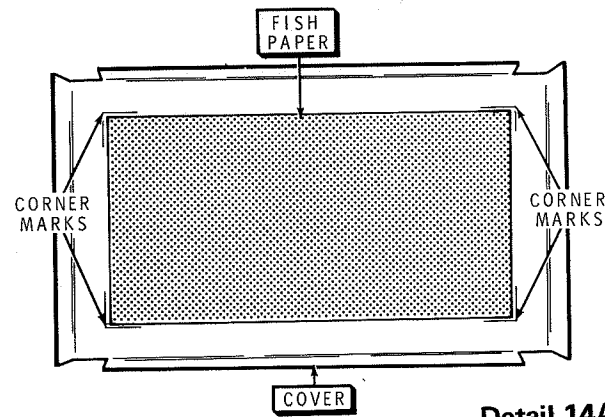
NOTE: The appropriate capacitor or resistors may be procured from any local electronic equipment supply store.

## FINAL ASSEMBLY



PICTORIAL 14

Refer to Pictorial 14 for the following steps.



Detail 14A

( ) Refer to Detail 14A and remove the white, protective covering from the fish paper. Lower the adhesive side of the paper carefully onto the inside of the cover. Use

the "corner marks" as a guide. Rub the paper so it adheres smoothly to the cover.

- ( ) Similarly, apply the remaining piece of fish paper to the second cover.
- ( ) Inspect the foil side of the circuit board and cut off any lead which extends more than 3/16" above the surface of the circuit board.
- ( ) Refer to Pictorial 14 and attach one of the covers to the chassis to cover the component side of the circuit board. Use 2-32 x 1/4" sheet metal screws.
- ( ) Similarly, attach the second cover to the other side of the chassis. You may wish to use only one screw on each end of the cover at this time as it will be temporarily removed after the Intrusion Alarm is installed.

## INSTALLATION

( ) Read the instructions on the security label. Then apply the label to a window where it will be most prominently displayed.

Before deciding upon the installation location for your Intrusion Alarm, you must first understand how your Alarm operates.

### BASIC OPERATION

Refer to Figure 1 (Illustration Booklet, Page 4) for the location of the parts mentioned in the following paragraphs.

Immediately after the POWER switch is pushed to ON, there is a time span of approximately 10 seconds during which movement will not be detected. Within this time, you can leave the surveillance area without triggering the Alarm. After this time, any movement within the surveillance area will activate the LAMP socket within one second, and the ALARM socket within 20 to 30 seconds thereafter.

After the Intrusion Alarm has been triggered, the position of the AUTO RESET-HOLD switch on the control panel determines whether the device will automatically reset or not. In the AUTO RESET position, the Alarm will reset to its initial state approximately 30 seconds after the ALARM socket has been activated. In the HOLD position, the two sockets will remain activated until the Intrusion Alarm is manually turned off.

The total current drawn from both the LAMP and ALARM sockets must not exceed three amperes. For example, a 100-watt lamp operating on 120 VAC connected to the LAMP socket will draw about .83 amperes (100 watts ÷ 120 volts) and leave approximately 2.17 amperes which can be drawn from the ALARM socket. If the devices to be controlled by the Intrusion Alarm draw more than a total of three amperes, one device (or both) should be controlled by a relay.

Either socket, or both, may be used according to your protection plan. Horns, bells, flashing lights, and sirens are some of the alarm devices which can be used.

Refer to Figure 3 (Illustration Booklet, Page 2) for examples of how to wire 120 volt AC lamps and alarms to one or more Intrusion Alarms. **WARNING:** When using a relay-operated alarm, DO NOT attempt to operate a single relay from more than one Intrusion Alarm. To do so may create a fire hazard. ALWAYS use a 110-130 volt AC, single pole, normally-open relay for each Intrusion Alarm.

The 20 to 30 second delay between the "lamp on" and "alarm on" functions permits you to enter the surveillance area and turn off the Intrusion Alarm before the ALARM socket is activated.

### LOCATION

There are several considerations to keep in mind while you select the installation location for your Intrusion Alarm:

1. The Intrusion Alarm is for indoor use only.
2. Avoid areas subject to heavy vibrations, such as shelves on a wall near a heavily traveled street, a railroad, or a wall containing an air conditioner. Use an interior, load-bearing wall.
3. Avoid pointing the transducers directly at any surface subject to heavy vibration such as a large outside window. See Figure 4 (Illustration Booklet, Page 4).
4. Hard surfaces, which reflect the ultrasonic waves, enhance the coverage, but absorbent surfaces such as drapes and rugs have little reflecting effect and may reduce the effective coverage area. However, drapes which may be blown by air currents, will probably trigger the Alarm.
5. A strong air movement directly into or past the transducers may cause the Alarm to be tripped.
6. If there is an area in which an intruder would certainly move, such as an entry hall or near an exterior door or window, it is ideal to include this location in the surveillance area. The door to a safe, or a piece of furniture where valuables are kept, can be monitored.
7. If a pet may be moving on the floor in the surveillance area, aim the unit higher to avoid tripping the alarm.
8. A source of line voltage must be available to the installation location. Wires can be run to other locations for lamps and alarm devices.
9. The Alarm may be used in a horizontal or a vertical position, and with or without the book-style cover furnished. This cover will help make the alarm inconspicuous to an intruder.
10. Either the Lamp or the Alarm socket can be used singly, if desired. Remember that the Alarm socket is activated 20 to 30 seconds after the movement in the surveillance area, whereas the Lamp socket is activated immediately. As examples of only a few uses, the Alarm could be wired to turn on a garage light when the garage door is opened, to turn on a light when an infirm person gets out of bed at night, or to sound a buzzer in the parent's bedroom if a youngster gets out of bed.
11. After the Alarm has been placed in its final position, make the following operational test.

## Operational Test

**CAUTION:** If you wired your Intrusion Alarm for operation from a 240 VAC power source, any device connected to the ALARM or LAMP sockets must be designed for this same voltage.

- ( ) Make sure the adjusting screws are tight (to speed up the operation of the alarm).
- ( ) Plug a table lamp (with the switch on) into the Lamp socket and another lamp into the Alarm socket.
- ( ) Turn the Alarm on and walk beyond the limits of the intended surveillance area. After 15 seconds make movements and see if the lamp lights. If not, move a little closer and repeat the movements. By moving about and making movements, you can determine the limits of the surveillance area.
- ( ) If the operating range is greater than desired, reduce it by turning the SENSITIVITY control counterclockwise and again conducting the movement experiments. Always use the minimum sensitivity to reduce the possibility of a false alarm.

**NOTE:** Maximum range depends upon the configuration of the area and its reflectivity for 40 kHz signals, as well as temperature, humidity, and barometric pressure.

- ( ) When the surveillance area has been determined, turn the Alarm OFF and unplug the line cord.

## Final Cover Installation

- ( ) Make sure the line cord is disconnected.
- ( ) Remove the cover over the foil side of the circuit board in which you used only two screws.
- ( ) Turn each of the two adjusting screws in the circuit board 1/2-turn counterclockwise. There will now be 20 to 30 seconds delay between the times the two sockets receive power and between Alarm and Reset.
- ( ) Replace the cover, using four 2-32 x 1/4" sheet metal screws.
- ( ) If desired, place the Intrusion Alarm into the book-style cover furnished, which will cause the Alarm to simulate a book and disguise its identity. Wedge the chassis into the cover with thin cardboard sheets tight enough so it will not fall out, but not so tightly that it cannot be removed by pulling on the line cord.
- ( ) Replace the Intrusion Alarm in its intended position and make the necessary electrical connections.

This completes the assembly, adjustments, and installation of your Intrusion Alarm.

## OPERATION

The Intrusion Alarm has only three controls. (See Figure 1, Illustration Booklet, Page 4).

1. The POWER switch turns the device ON and OFF.
2. The AUTO RESET-HOLD switch.
  - a. AUTO RESET automatically resets the Intrusion Alarm to its initial state about 30 seconds after the Alarm socket has been activated.
  - b. HOLD. After the sockets are activated (powered) they will remain activated until the POWER switch is turned OFF or the switch is pushed to Auto-Reset.
3. SENSITIVITY. Rotation of this control, as described in the "Installation" section, controls the sensitivity of the device to movement, and therefore the operating range. It is not normally used after installation.

To use the Intrusion Alarm, turn it ON and then leave the surveillance area in less than 10 seconds. Any movement in the surveillance area after the initial 10-second delay will activate the Lamp socket. Approximately 20 to 30 seconds later the Alarm socket will be activated. This 20 to 30 second delay allows you to enter the surveillance area and turn off the device so the alarm will not be activated.

If you desire to alter the time delay between "lamp on" and "alarm on," refer to Permanent Delay Adjustment in the "Test and Adjustment" section.

**WARNING:** As television remote control devices and the Intruder Alarm operate on or near the same frequencies, false triggering of the remote control circuits may occur when the television set and the Intruder Alarm are both turned ON at the same time.

If your television set is equipped with a wireless remote control device, turn your television set OFF when the Intruder Alarm is turned ON. It is also IMPORTANT that you turn the television set off at its main power switch instead of using the remote control. Otherwise, the remote control circuits of the television set may be damaged.

## ALARM DEVICES

There are many types of alarm devices you can use with your Intrusion Alarm. You can purchase the Model GDA-39-1 Buzzer Alarm (for indoor use) or the Model GDA-39-2 Bell (for outdoor use) from Heath Company. If you use any other alarm device, it must be designed for either 120-volt or 240-volt 50/60 Hz operation, depending on your line voltage. Also, all devices plugged into the Intrusion Alarm must have a total combined current drain of less than 3 amperes.

Some alarm devices have an intermittent duty rating. A device of this type could overheat if you exceed this rating by leaving the AUTO RESET - HOLD switch in the HOLD position, or if it is rapidly triggered over and over again. Therefore, make sure the alarm device you use is fused or otherwise protected from overheating in case of failure or prolonged operation.





## IN CASE OF DIFFICULTY

1. The majority of the kits that are returned for repair, do not function properly due to poor connections and soldering. You can eliminate many troubles by carefully reheating all connections to make sure that they are properly soldered as described in the "Kit Builders Guide."
2. Some causes of nonfunctioning or improper functioning, are:
  - A. No power from your electrical outlet. Check your house fuse for this circuit.
  - B. Power switch in the Intrusion Alarm is in the Off position.
  - C. Power rectifier diodes (D9 through D12) installed backward. The bands on the diodes must match the bands on the circuit board.
  - D. The Sensitivity control has not been turned clockwise enough to provide adequate sensitivity.
  - E. Auto Reset-Hold switch is in the Hold position.
  - F. One or more transistors are installed with leads in the wrong holes.
3. Check the values of the parts. Be sure that the proper part has been wired into the circuit as shown in the Pictorial Diagrams and as designated in the wiring instructions. For example, it would be easy to install a 4700  $\Omega$  (yellow-violet-red) resistor instead of a 47 k $\Omega$  (yellow-violet-orange) resistor.
4. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring.
5. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.
6. Make sure no solder has become lodged across two foils to cause a "solder bridge." Sometimes a fine "hair strand" of solder, visible only with a magnifying glass, will form a solder bridge.
7. If you have, or can borrow a voltmeter and an ohmmeter, perform the checks in the following "Troubleshooting Chart."
8. Refer to the voltage chart on Page 37 and check the voltages in the chart against those in your Alarm. Any variance should not exceed 20%.
9. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

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



## Troubleshooting Tests

The following checks, which give you a systematic way to find out what is wrong with an inoperative unit, require the use of a high input impedance voltmeter and an ohmmeter. Connect the common lead of the meter to the chassis and the other lead to the points indicated. Begin with step #1.

### POWER SUPPLY VOLTAGE TESTS

| CONNECT METER POSITIVE LEAD TO: | VOLTAGE READING           | COMMENT  |
|---------------------------------|---------------------------|--|
| 1. + lead of C31.               | A. 15 VDC or more.        | Transformer and D9 thru D12 OK.  |
|                                 | B. Less than 15 VDC.      | One or more diodes installed backward. Check transformer primary and secondary wiring for open circuits. Check transformer primary wiring connections on circuit board.  |
| 2. + lead of C28.               | A. Between 10 and 15 VDC. | Regulator circuit OK.  |
|                                 | B. Over 15 VDC.           | Check wiring and components connected to base (B) of Q18.  |
|                                 | C. Less than 10 VDC.      | Disconnect line cord from power source and measure resistance from + lead of C28 to chassis: <ol style="list-style-type: none"> <li>1. Under 1000 <math>\Omega</math>: check all power wiring to find short circuit or incorrect part installed.</li> <li>2. Over 1000 <math>\Omega</math>: C28 is OK. Check circuit of Q18 base (B) for D8 or C29 installed backward, or wrong resistor installed.</li> </ol> |

### RECEIVER RESPONSE TESTS

|                   |   |   |
|-------------------|---|---|
| 3. + lead of C19. | A. Voltage varies with movement across front of transducers.    | Transmitter and receiver OK.              |
|                   | B. Voltage varies when TR1* is tapped (sensitivity at maximum). | Receiver is OK but transmitter is faulty. |
|                   | C. Voltage does not vary with movement or tapping.              | Make check #4.                            |

NOTE: Make check #4 ONLY under check #3C conditions.  
 \* Refer to "Chassis Photograph" on Page 36 for the location of TR1.



| CONNECT METER POSITIVE LEAD TO:                                | VOLTAGE READING   | COMMENT   |
|--|---|---|
| 4. Collector (C) of Q5.  | A. Voltage reading varies when you tap TR1.*                          | Receiver OK. Check wiring and parts connected to Q6.  |
|  | B. Voltage reading higher than 1 VDC and does not vary with movement. | D3 or D4 (or both) installed backward.  |
|  | C. Voltage reading less than 1 VDC and does not vary with movement.   | Make check #5.  |
| NOTE: Make check #5 only under check #4C conditions.           |   |   |
| 5. Collector (C) of Q4.  | A. Voltage reading varies when you tap TR1.*                          | Receiver OK. Check all wiring and parts connected to Q5.  |
|  | B. No voltage variation when TR1 is tapped.                           | Check all parts and wiring between Q4 and TR1.  |
| 6. Transducer check.   | A. Interchange two transducers and repeat check #4A.                  | Both transducers are OK if voltage reading varies in check #4A when either transducer is installed in TR1 position. |
| *Refer to "Chassis Photograph" on Page 36 for location of TR1. |   |   |

## TRANSMITTER TESTS

|   |  |   |
|---|--|---|
| 7. Test Point N (Figure 2, Page 21).  | A. 11 VDC $\pm$ 1V.                      | Leave meter leads connected for checks B and C that follow. |
|   | B. Reading should increase .1 or .2 VDC. | When base (B) of Q19 is shorted to chassis.                 |
|   | C. Reading should decrease .2 or .3 VDC. | When emitter (E) of Q19 is shorted to chassis.              |
| NOTE: If voltages do not change as stated, make sure all parts have been correctly installed and all controls, switches, and sockets have been correctly wired. |  |   |

## SPECIFICATIONS

|                                |   |
|--------------------------------|---|
| Operating Range . . . . .      | Varies with installation. Typical maximum range is 25 feet.   |
| Operating Times . . . . .      | Turn-on delay: Approximately 10 seconds.<br>Alarm delay: 20 to 30 seconds (lamp-on time).<br>Automatic reset delay: 20 to 30 seconds (alarm-on time). |
| Ultrasonic Frequency . . . . . | Approximately 41 kHz.   |
| Power Outlets . . . . .        | Two AC sockets: One for Lamp, one for Alarm.  |
| Power Outlet Current . . . . . | Three amperes total for both sockets (360 watts at 120 volts).  |
| Power Requirements . . . . .   | 110-130 or 220-260 VAC, 50/60 Hz, 1-1/2 watts.  |
| Dimensions . . . . .           | Chassis only, 2" wide x 9-1/4" high x 7" deep (approximately). In book-style cover, 2-3/8" wide x 10-1/8" high x 7-1/2" deep (approximately).         |
| Net Weight . . . . .           | Approximately 3 lbs. in book-style cover; approximately 2-1/4 lbs. without cover.   |

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 5) as you read this "Circuit Description."

### GENERAL

An RF signal is transmitted by transducer TR2. The receiving transducer, TR1, receives the transmitted signal and monitors it for a change in amplitude. If a change is detected (produced by a moving object), then the Lamp and Alarm outlets are switched on until they are reset either automatically or manually.

### TRANSMITTER

A Colpitts oscillator circuit (Q19 and associated components) provide the basic drive for the transmitting transducer, TR2. The signal voltage developed at the collector is stepped up through autotransformer action in coil L1. The widely varying reactance of the transducer near resonance is partially isolated from the oscillator by a series resistor, R22. The transducer exerts a strong influence on the final frequency because it "pulls" the oscillator toward its own resonant frequency.

If a frequency counter is available, the oscillator frequency can be checked across the emitter resistor, R21. Use a DC blocking capacitor.

### RF RECEIVER AND DETECTOR

The receiving transducer, TR1, is direct-coupled to transistor Q1, the first amplifier, through an AC low-pass filter capacitor C2 and resistor R3. A large capacitor, C1, provides

turn-on delay by offering a large time constant for the base bias voltage. Another resistor, R2, keeps the large capacitor from shorting out the signal.

The second stage (transistor Q2) is an amplifier feeding the voltage-doubler type of detector, diodes D1 and D2. Some forward bias is applied through resistor R9 to these diodes for greater sensitivity to small signals.

### LF AMPLIFIER AND DETECTOR

Variations in the rectified RF carrier level constitute a modulation of the signal, whether attributed to a variation in reflected signal strength, or a sideband differing slightly in frequency from the carrier (Doppler effect). Such demodulated signals are passed through a low-pass filter (R13, R14, R15, C9, C11, and C12) to the LF amplifier (transistors Q3 and Q4), an emitter follower and a voltage amplifier. The input and output coupling time constants are chosen to give a roll-off for low frequencies such that the overall characteristic yields a bandpass suitable for the range of frequencies generated by normal human movement within the acoustic field (approximately 50 to 150 Hz).

The LF detector, transistor Q5, is normally saturated by a stable bias. The stage is barely saturated, and any signal coupled to the base leads to momentary reduction of the effective bias. This results in positive voltage pulses in the collector circuit.

The sensitivity can be reduced by adjusting control R25 to attenuate the signal. A larger signal from transistor Q4 is therefore required to produce an output in the Q5 collector circuit.

## CONTROL AND TIMING CIRCUITS

Schmitt trigger circuits are used to modify the analog type input signals. The Schmitt trigger circuit output is either "high" or "low" and these levels depend upon whether the analog input voltage is above or below certain levels. The normal bias for the first of the three Schmitt triggers is set by resistors R31 and R32, which form a voltage divider.

These Schmitt triggers have a wide range of permissible input levels (a large amount of hysteresis) as shown by the space between voltage levels "A" and "B" in Figure 8. Input signals higher than level "A" will drive the output level "high," and signals lower than level "B" will drive the output "low." The output retains its high or low level until driven to the opposite level, as shown. The output level transitions are sharp and result in a squared waveform in the output.

The pulses from the LF detector are coupled to transistor Q6, which is connected across the upper leg of the voltage divider. Thus, any signal pulse turns on the transistor and momentarily shorts out resistor R31, the upper leg of the divider. This raises the voltage input to the Schmitt trigger and turns it on. Because instant response to a single random signal is not desirable, an integrating type of delay (capacitor C19) is added across the lower leg of the divider. Further delay is provided by an RC low-pass filter (R33 and C22) between the voltage divider and Schmitt trigger #1.

"Reset" is obtained by shorting the Schmitt trigger #1 input to common through a reset transistor, Q7. Resistor R34 between the RC filter and the Schmitt trigger limits the current in the reset transistor and shortens the "off" time in the presence of an incoming signal.

The output of Schmitt trigger #1 is DC coupled through zener diode D5 to transistor Q10, the relay control transistor. The relay current is taken from the unregulated

supply, and is limited by resistor R41. Inductive behavior of the relay coil is neutralized by a paralleled circuit, R42 and C24.

When Q10, the relay control transistor, is turned on, it removes the forward bias of transistor Q11, which shorted the timing capacitor, C25. That capacitor can now charge up through the timing resistor, R45, and turn on Schmitt trigger #2. It will charge slowly for normal use, or rapidly for testing purposes by turning the adjusting screw (SW2) tight. This places R44 in parallel with R45 and alters the time delay.

At the moment Schmitt trigger #2 turns on, it closes relay RL2. The second timing capacitor, C27, is unshorted. It charges and turns on Schmitt trigger #3, Q16 and Q17. This provides the signal to drive Q7, the reset transistor, providing switch SW4 is in the "Auto Reset" position. If the switch is in the Hold position, both relays will remain tripped until SW4 is returned to Auto-Reset, or the Power switch is placed at Off.

A quick chain reaction follows the reset of Schmitt trigger #1: RL1 opens, the timing capacitor is shorted, Schmitt trigger #2 resets, etc., until the original condition is re-established.

## POWER SUPPLY

The power transformer primary can be wired for either 120 VAC or 240 VAC nominal voltages by means of wire jumpers on the circuit board.

Electric line power is supplied through the relay contacts to two AC outlet sockets. The relay contacts are shunted with RC arc suppressors (C32-R62 and C33-R63).

The power transformer secondary feeds a bridge rectifier, D9 through D12. The rectifier output supplies the relay coils as well as Q18, the B+ regulator, which uses a zener reference, D8.

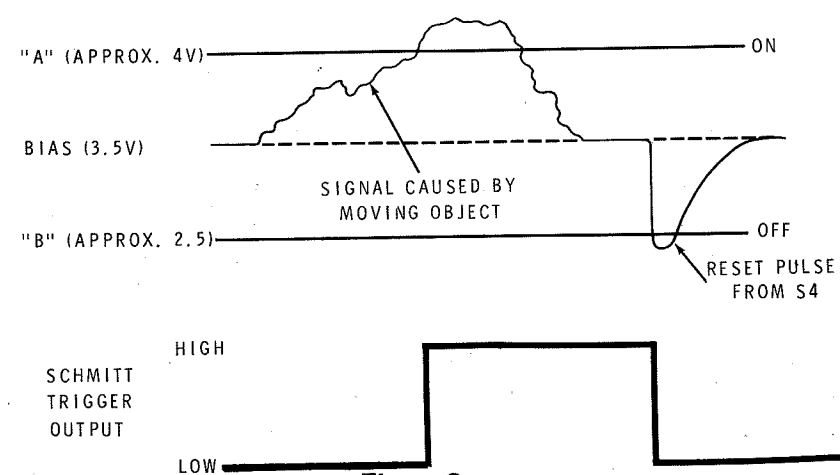


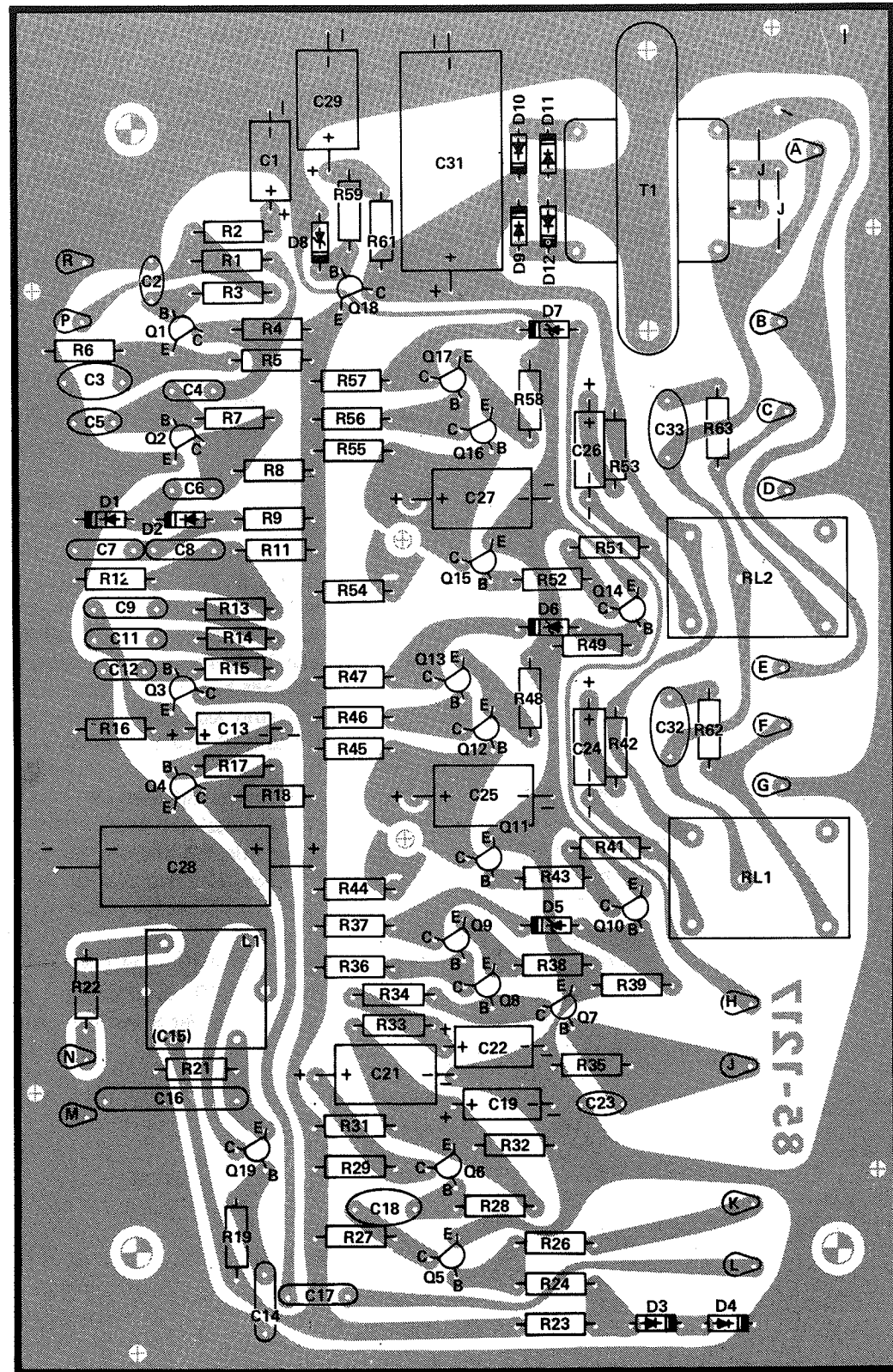
Figure 8

## CIRCUIT BOARD X-RAY VIEWS

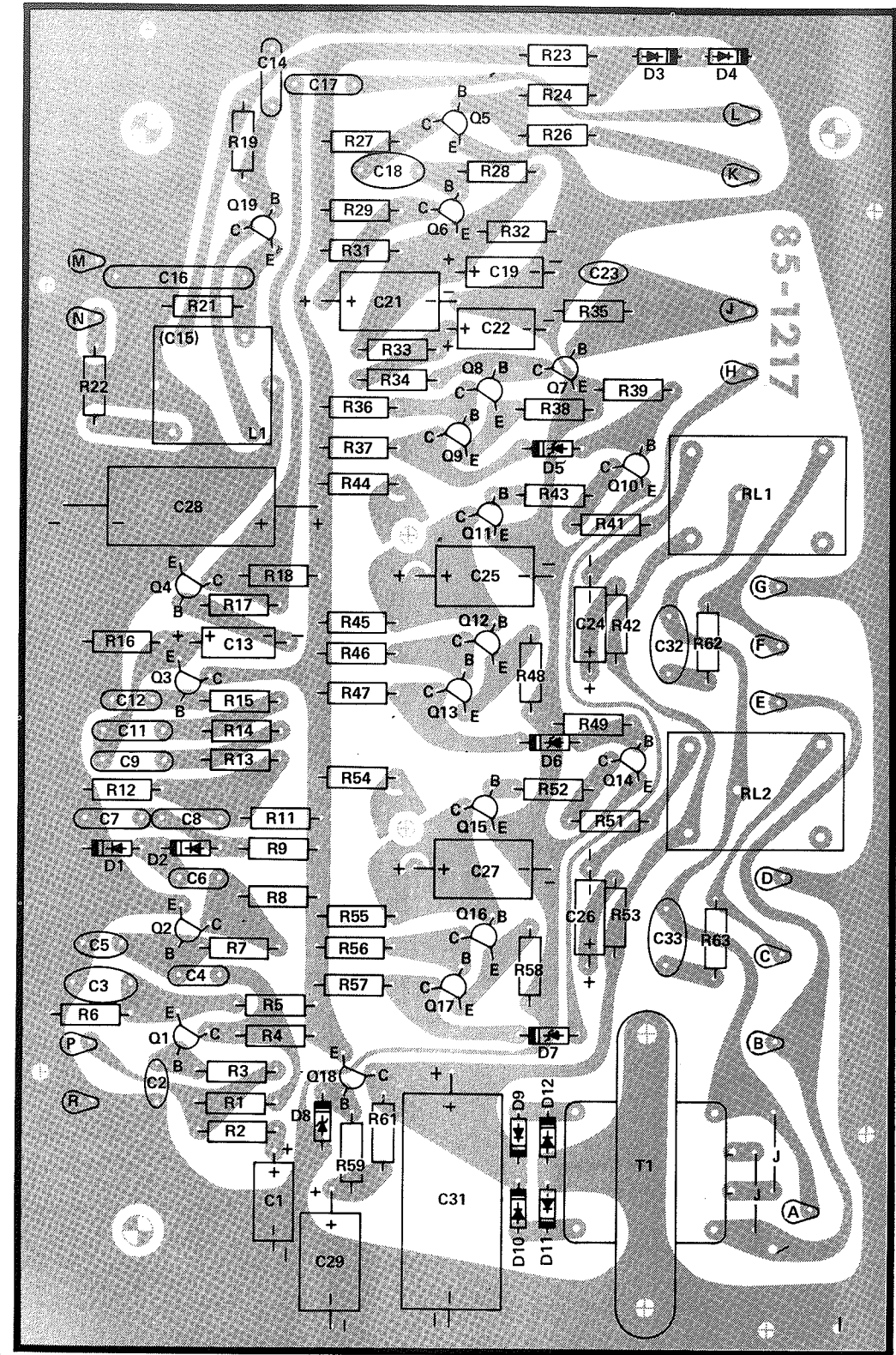
NOTE: To identify a part shown in one of these Views, (shown on Pages 34 and 35) so you can order a replacement, proceed in either of the following ways:

1. A. Refer to the place where the part is installed in the Step-by-Step instructions and note the "Description" of the part (for example: 22 k $\Omega$ , .05  $\mu$ F, or 2N2712).
- B. Look up this Description in the "Parts List."

2. A. Note the identification number of the part (R-number, C-number, etc.).
- B. Locate the same identification number (next to the part) on the Schematic. Except for solid state devices, the "Description" of the part will also appear near the part.
- C. Look up this Description in the "Parts List." Refer to "Transistor and Diode Identification" on Page 38, for these devices.



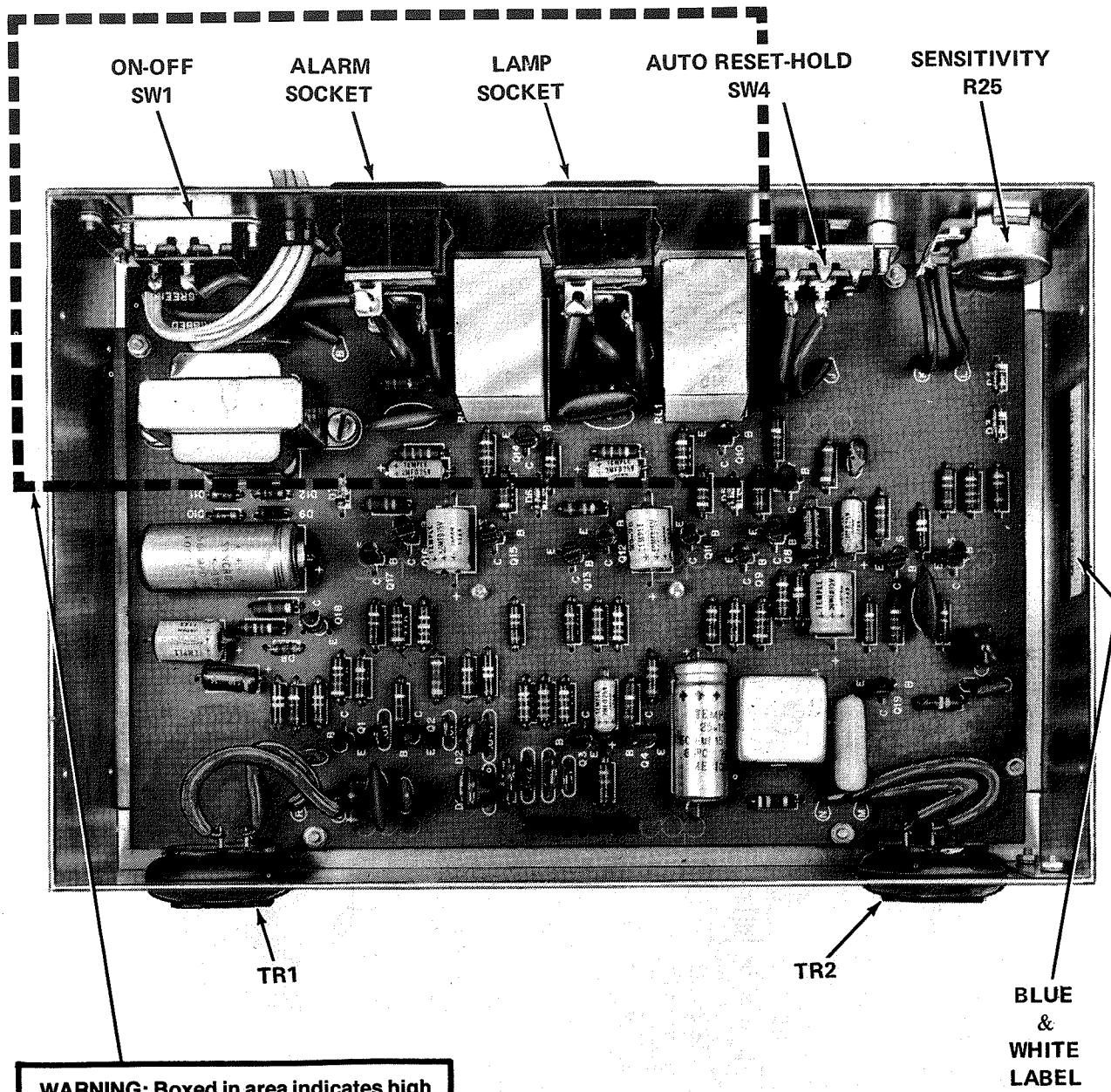
(Viewed from component side)



(Viewed from foil side)



## CHASSIS PHOTOGRAPH



**WARNING: Boxed in area indicates high voltage locations.**

BLUE & WHITE LABEL

## VOLTAGE CHARTS

Use a high input impedance voltmeter. Voltages may vary 20%.

- LONG = Adjusting screws backed out.
- SHORT = Adjusting screws tight.
- UT = Relays untripped.
- T = Relays tripped.
- U = Voltage under:
- + = Voltage over:
- E = Emitter.
- B = Base.
- C = Collector.
- H = Auto Reset-Hold switch at Hold.

\*No signal. Transmitter disabled by shorting emitter resistor R21.

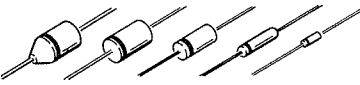
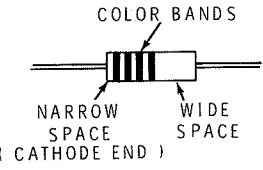
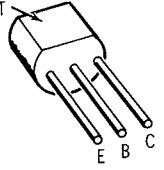
\*\*No signal. Transmitter disabled. May respond to acoustic signals.

#May respond to high frequency acoustic signals.

|   | E     | B     | C     |
|---|-------|-------|-------|
| Q1                                      | 4.2   | 4.7   | 5.4   |
| Q2                                      | —     | *0.6  | *4.6  |
| Q3                                      | 4.5   | 5.0   | —     |
| Q4                                      | —     | 0.6   | 5.8   |
| Q5                                      | —     | **0.6 | **0.1 |
| Q6                                      | **3.5 | **3.5 | 11    |
| Q8                                      | —     | **3.4 | —     |
| Q18                                     | 11.2  | 11.8  | —     |
| Q19                                     | 0.3   | 0.7   | —     |
| D2 Anode                                |       |       | *0.1  |
| D9 & D10 cathodes                       |       |       | 18    |
| Test Point N (See Figure 2 on Page 21.) |       |       | 11    |

| DEVICE                    | LEAD | LONG  |        | SHORT |
|---------------------------|------|-------|--------|-------|
|                           |      | UT    | T      | T     |
| <u>Schmitt Trigger #1</u> |      |       |        |       |
| Q8                        | C    | 5.2   | **2.2# |       |
| Q9                        | C    | U 5.5 | + 5.5  |       |
| Q8 & Q9                   | E    | 4.6   | **2.1# |       |
| Q10                       | B    | U 0.5 | + 0.6  |       |
| Q11                       | B    | + 0.6 | U 0.5  |       |
| <u>Schmitt Trigger #2</u> |      |       |        |       |
| Q12                       | C    | 5.2   | 2.2    | 5.8   |
| Q13                       | C    | U 5.5 | + 5.5  | + 5.5 |
| Q12 & Q13                 | E    | 4.6   | 2.1    | 5.8   |
| Q14                       | B    | U 0.5 | + 0.6  | + 0.6 |
| Q15                       | B    | + 0.6 | U 0.5  | U 0.5 |
| <u>Schmitt Trigger #3</u> |      |       |        |       |
| Q16                       | C    | 5.2   | H 2.2  | H 5.8 |
| Q17                       | C    | U 5.5 | + 5.5  | + 5.5 |
| Q16 & Q17                 | E    | 4.6   | 2.1    | 5.8   |
| Q7                        | B    | U 0.5 | 0      | 0     |

## TRANSISTOR AND DIODE IDENTIFICATION

| COMPONENT         | HEATH PART NUMBER | REPLACEMENT TYPE                 | IDENTIFICATION   |
|-------------------|-------------------|----------------------------------|--|
| D1, D2            | 56-26             | 1N191 (BROWN-WHITE-BROWN)        | HEATH PART NUMBERS OR THE TYPE NUMBERS ARE STAMPED ON MOST DIODES.<br><br>NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.<br><br><br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">BAND OR BANDS</div> |
| D3, D4            | 56-56             | 1N4149                           |  |
| D5, D6, D7        | 56-58             | 1N709A                           |  |
| D9, D10, D11, D12 | 57-65             | 1N4002                           |  |
| D8 *              | 56-57             | 1N716A (VIOLET-BROWN-BLUE-BROWN) |    |
| Q1, Q2            | 417-283           | SM07275                          |   |
| Q3 THRU Q19       | 417-801           | MPSA20                           |  |

\* THIS DIODE MAY BE MARKED WITH COLOR BANDS OR WITH THE HEATH PART NUMBER.

## IMPORTANT NOTICE

Please make the following changes in your Assembly Manual before you start to assemble your kit.

Page 4 — Right column, under "Miscellaneous." Add the following item at the bottom of the column, just below "solder":

390-1924 1 240 V label

Page 15 — Right column. Add the following note and step at the bottom of the column:

NOTE: Perform the next step only if you wired your circuit board for 240 VAC.

( ) Carefully peel the backing paper from the 240 V label. Then press the label onto the chassis in the area shown. NOTE: This label should cover the similar 120 V label that is printed on the chassis.

Page 16 — Right column. After the second step, add:

NOTE: Be sure to remove any paint or coating that may be on the ground (middle) lugs with a knife or sandpaper. This will insure a good solder connection.

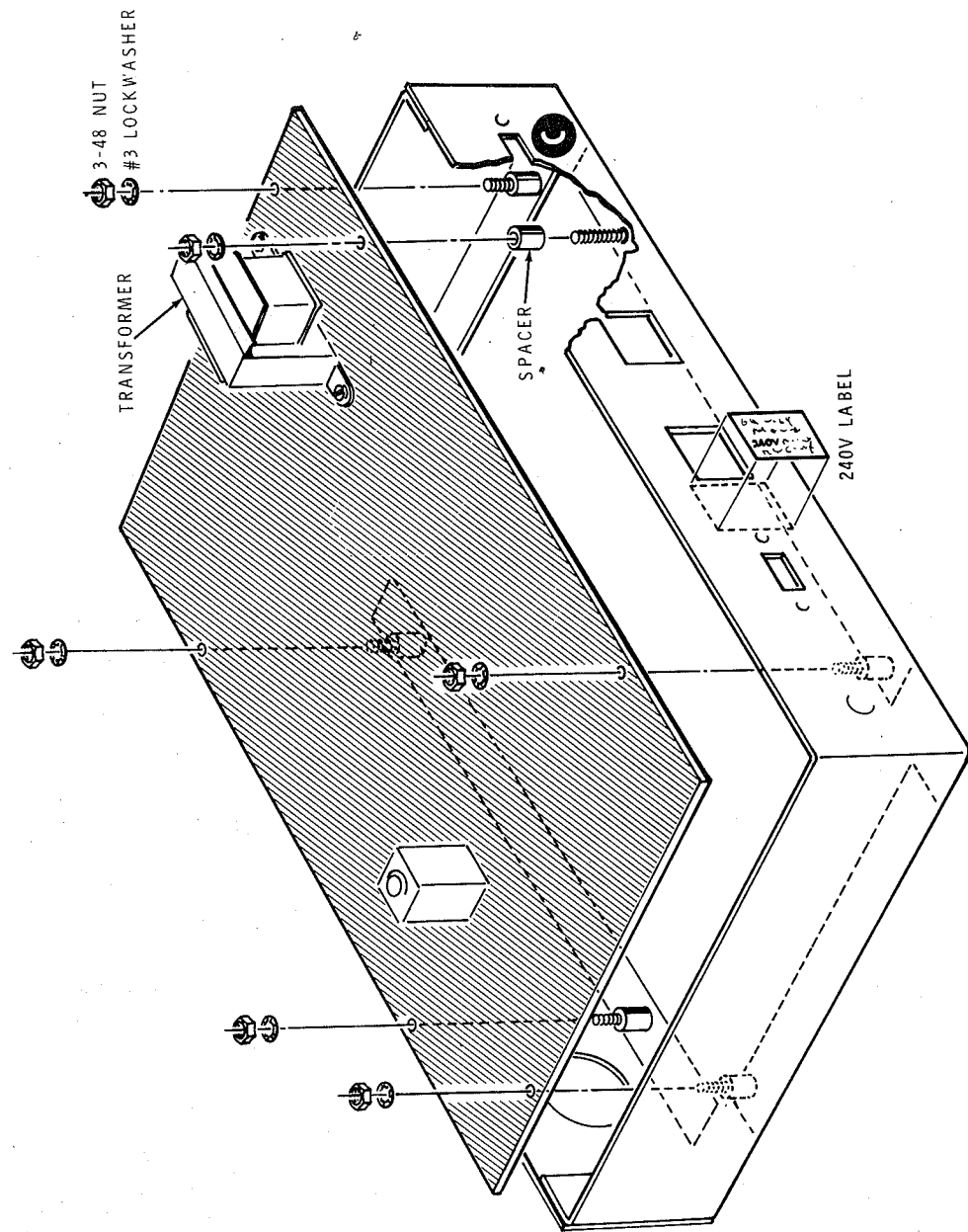
## IN THE ILLUSTRATION BOOKLET

Page 4 — Tape the new Detail 12C on the back of this Notice over Detail 12C in your Illustration Booklet.

Thank you,

HEATH COMPANY

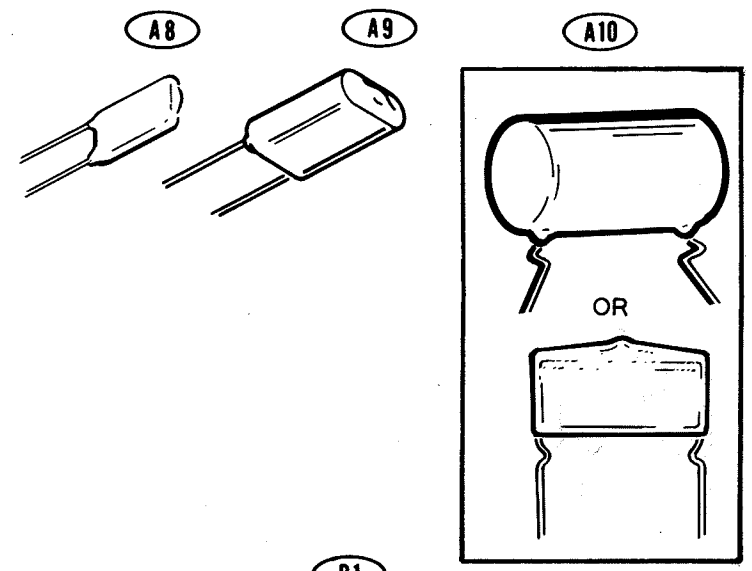
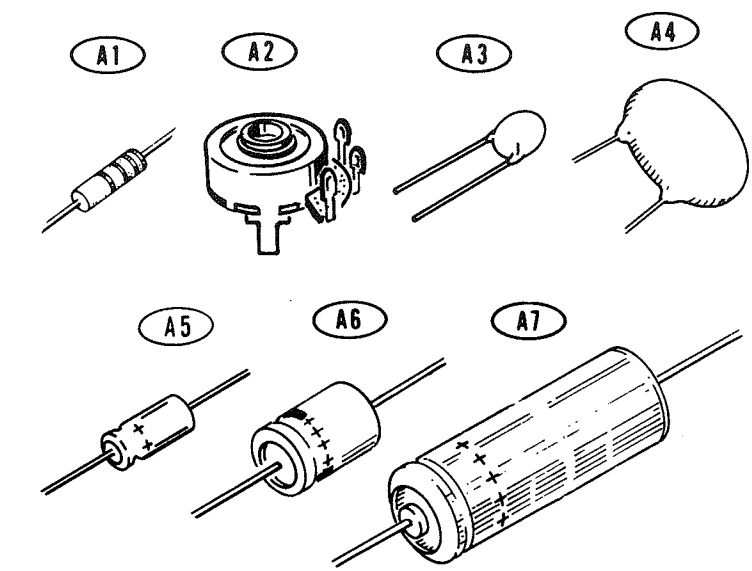




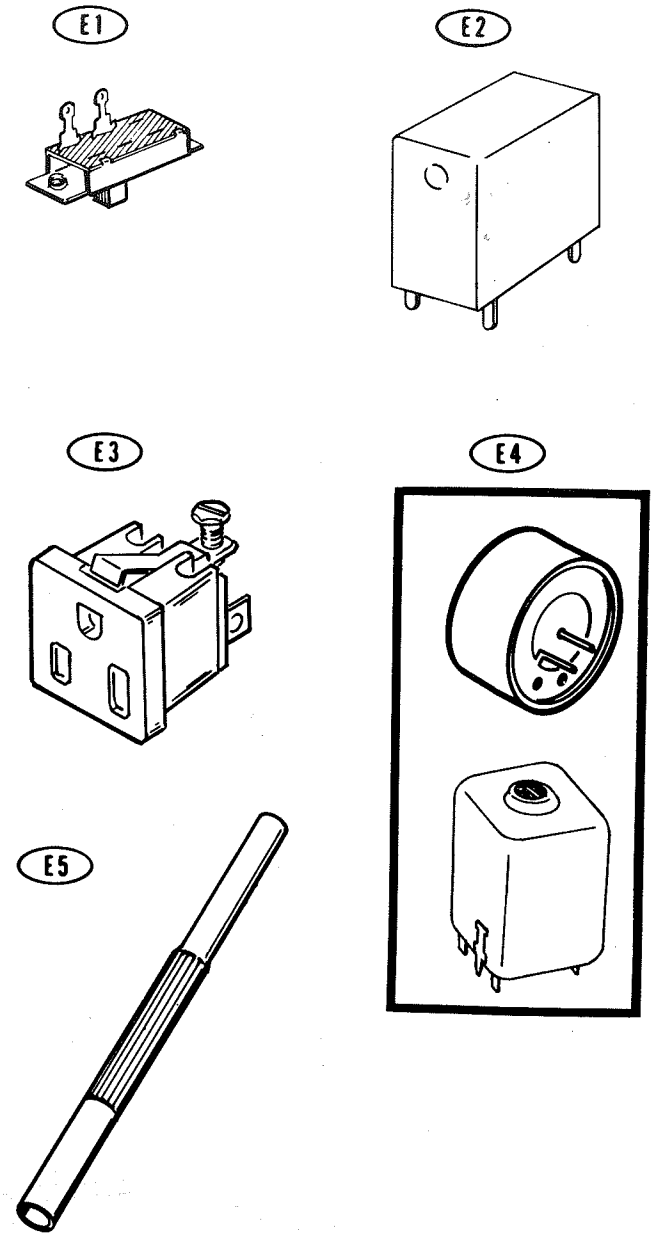
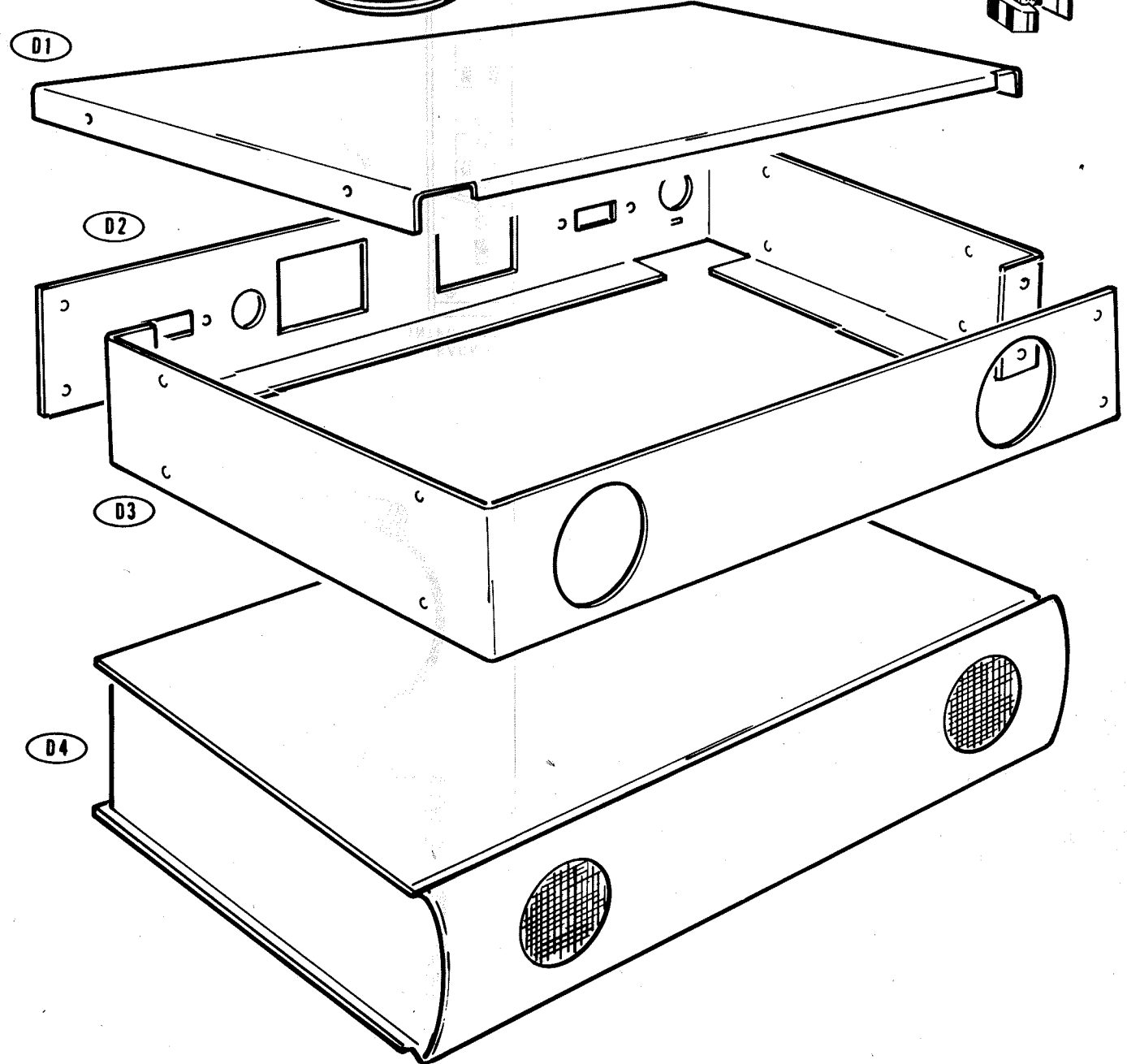
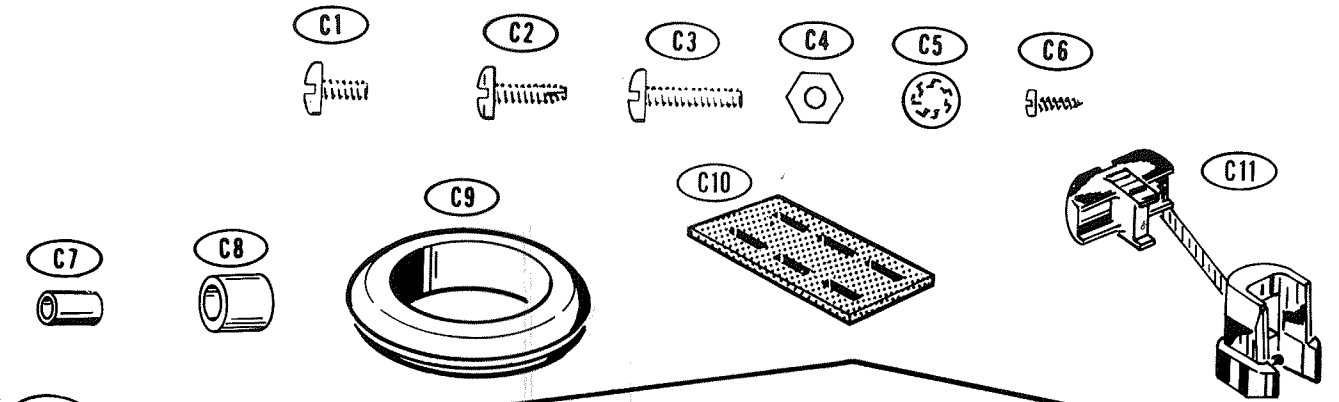
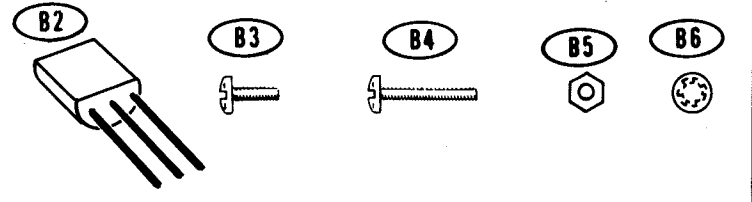
Detail 12C

# ILLUSTRATION BOOKLET

## PARTS PICTORIAL



NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.



Model GD-49

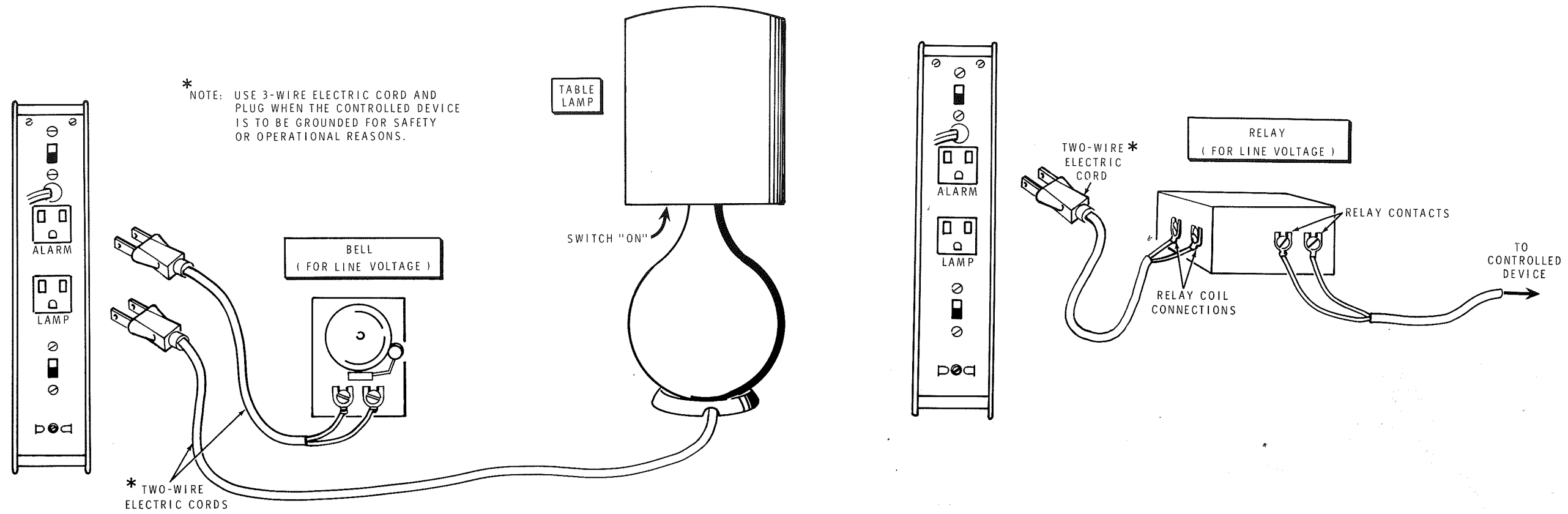
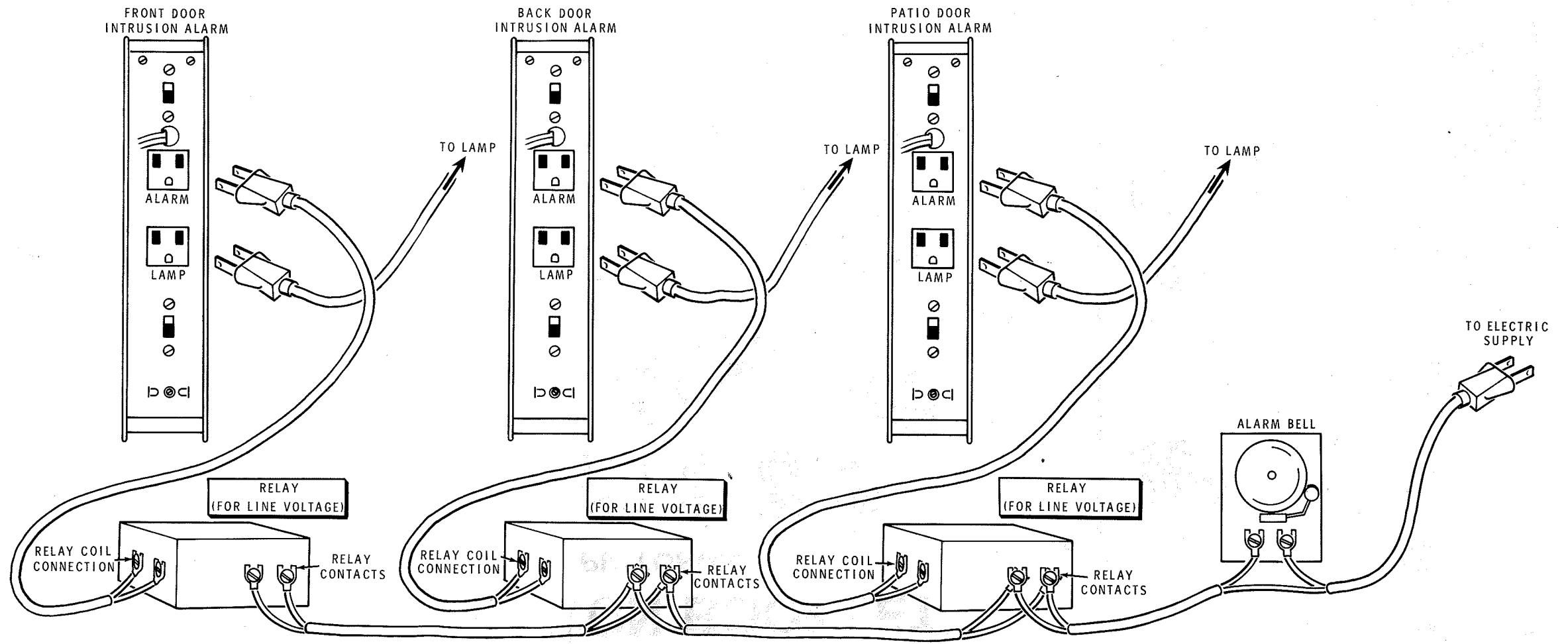
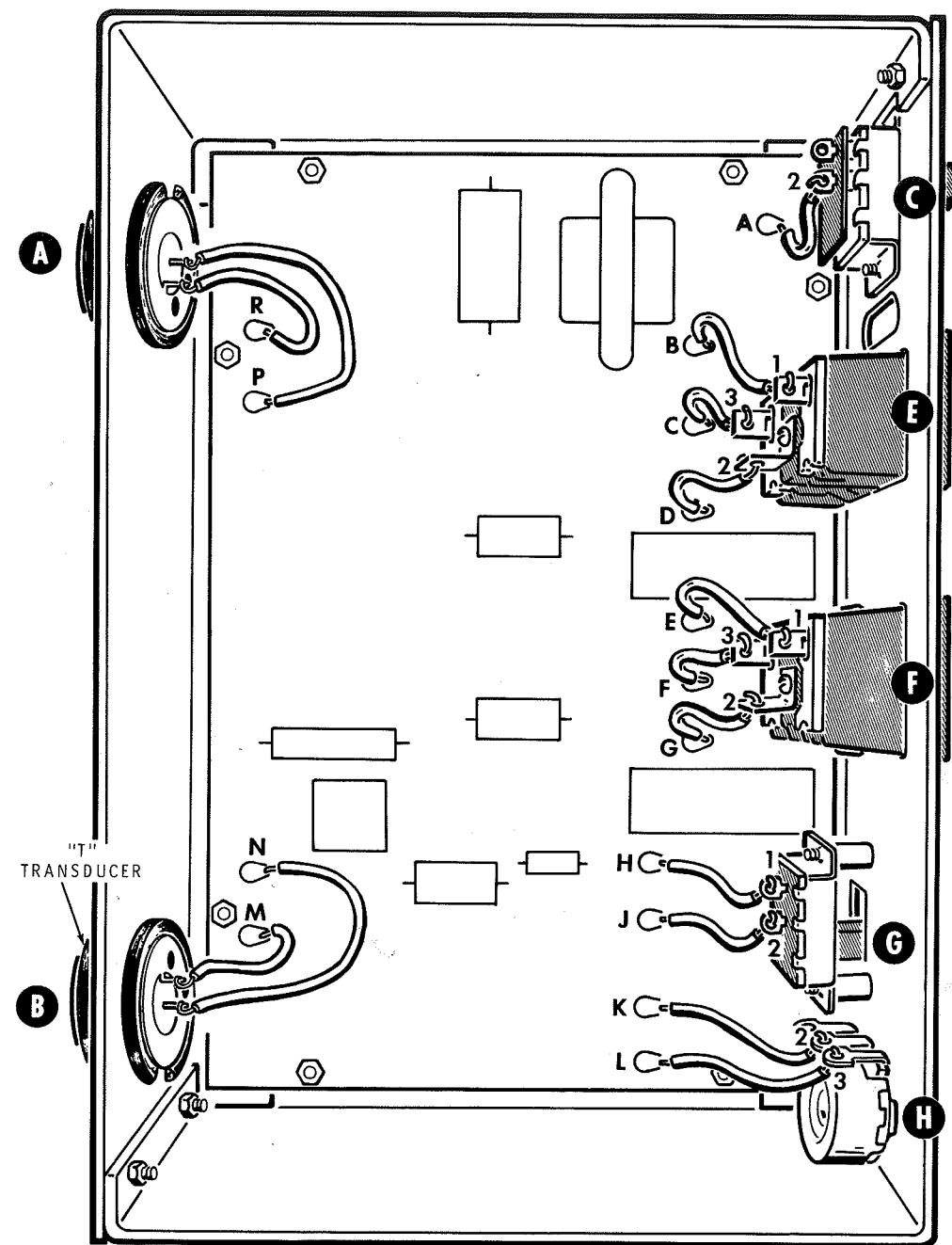
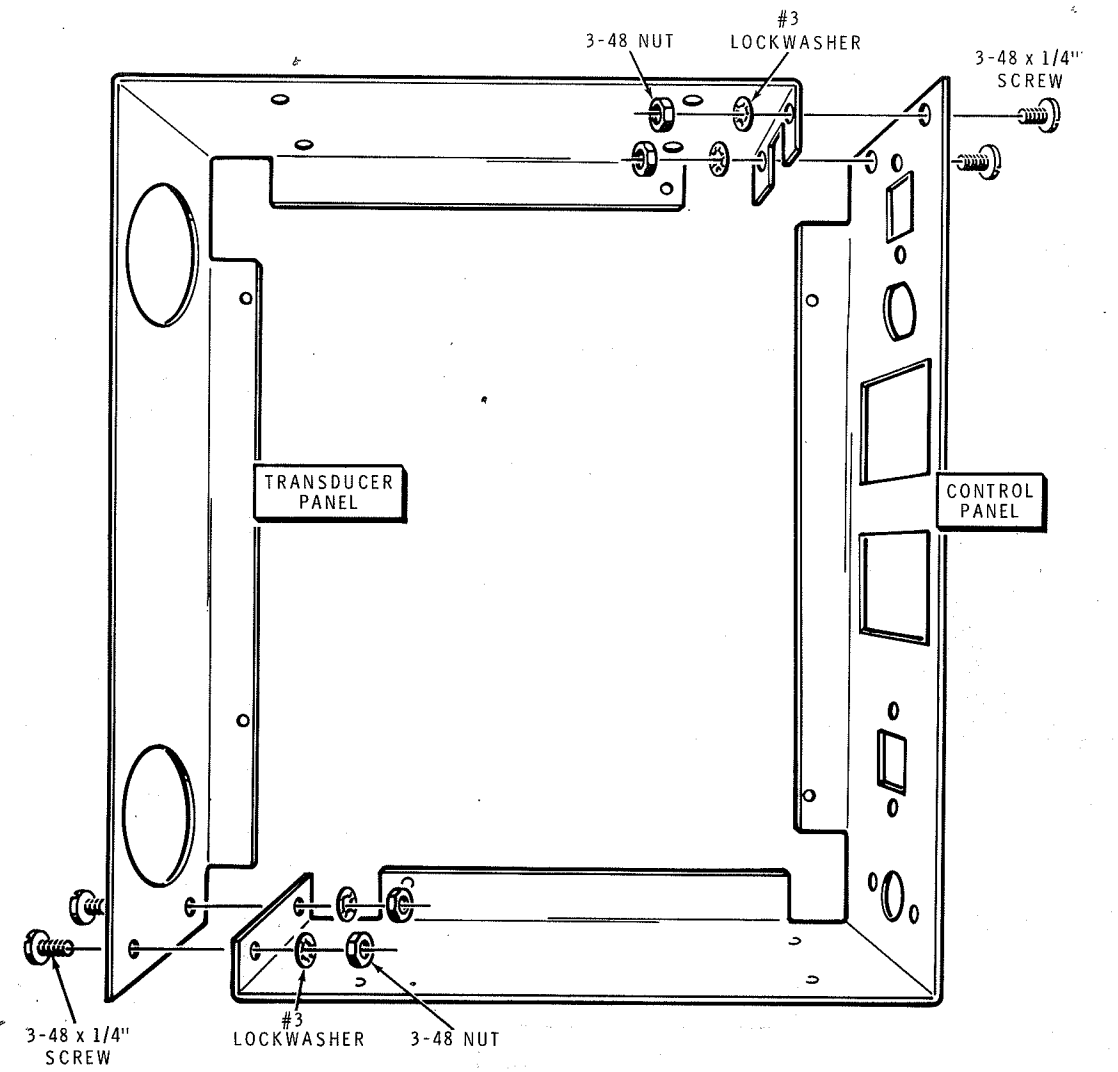


Figure 3





**PICTORIAL 12**



**Detail 12A**

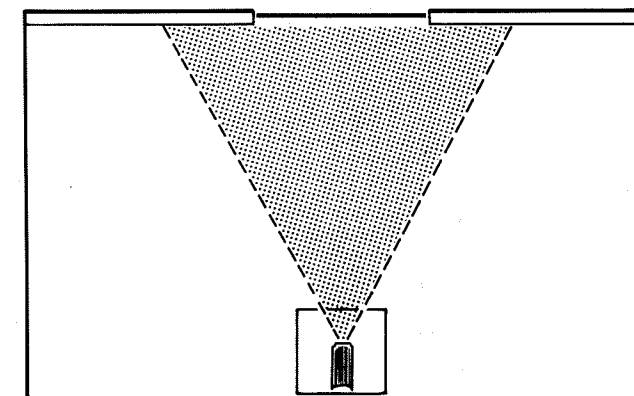
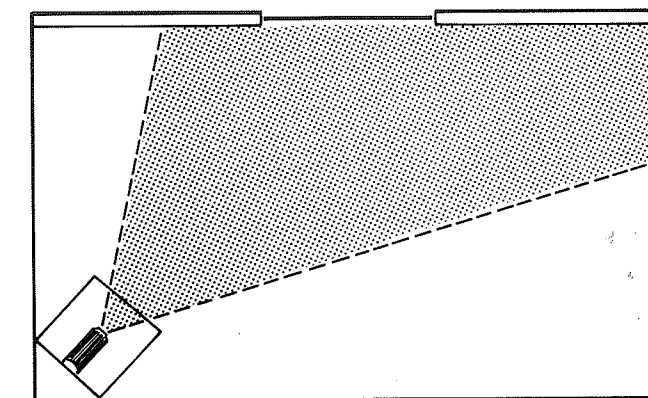
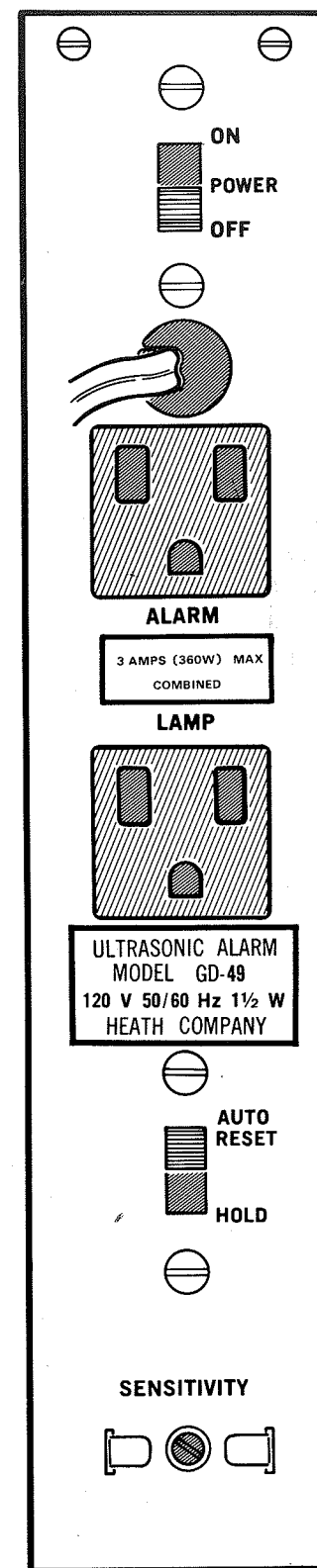
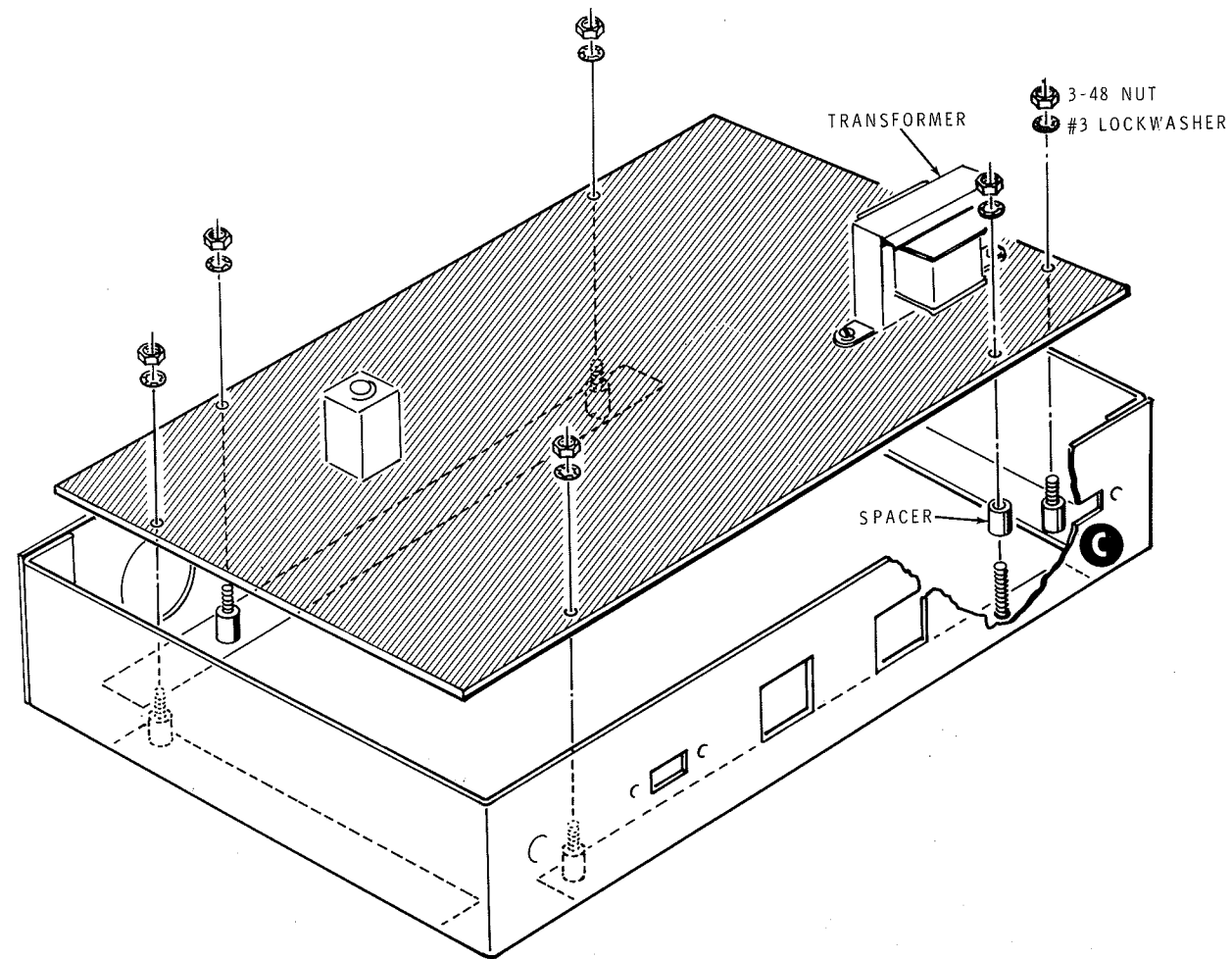
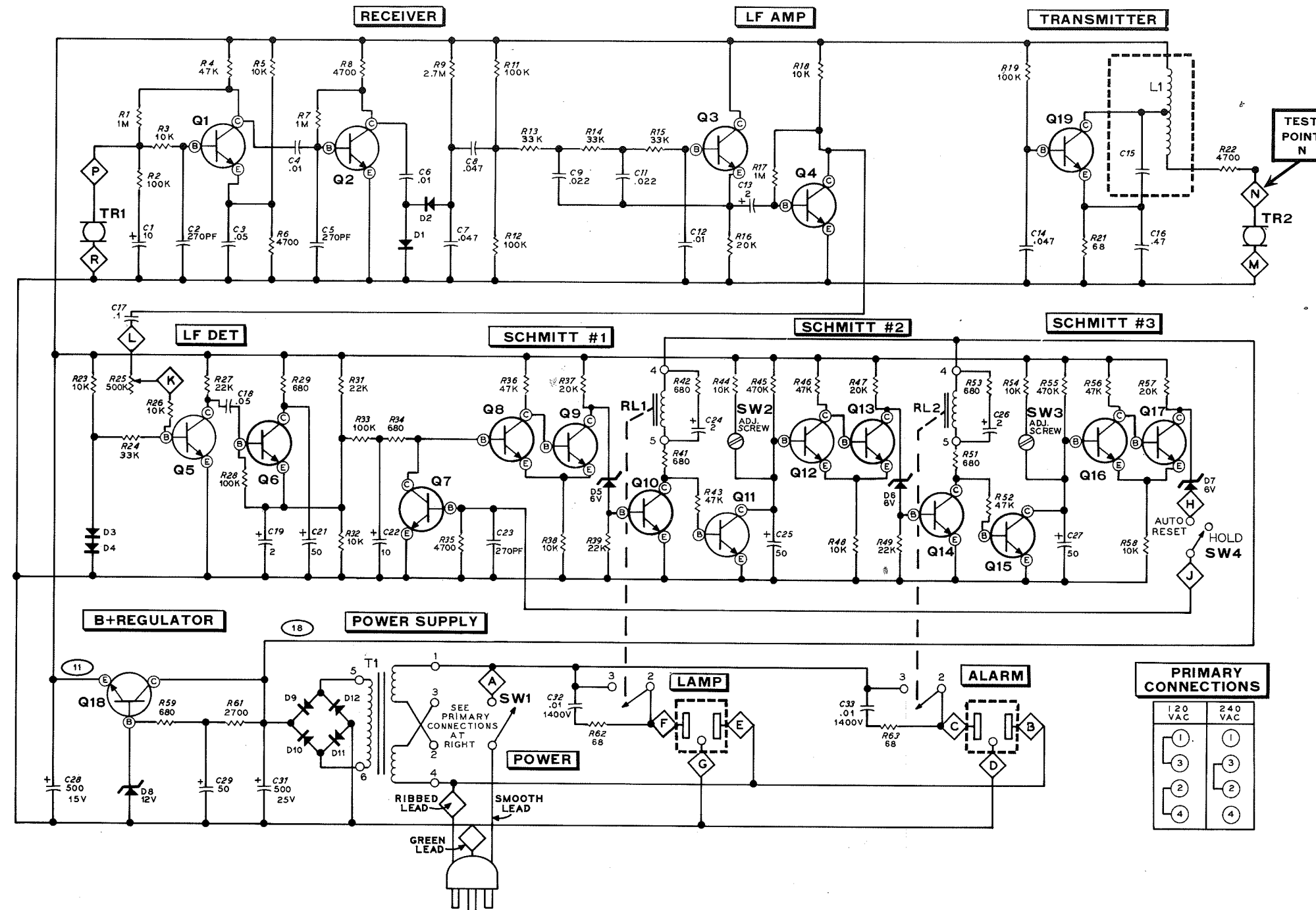


Figure 4

**SCHEMATIC OF THE  
HEATHKIT®  
MODEL GD-49  
THE INFORMER®  
ULTRASONIC INTRUSION ALARM**



NOTE:

1. ALL RESISTORS ARE 1/4-WATT 5%. RESISTOR VALUES ARE IN OHMS (K=1,000; M=1,000,000).
2. ALL CAPACITOR VALUES ARE IN  $\mu$ F UNLESS OTHERWISE MARKED.
3. SYMBOLS:
  - A CIRCUIT BOARD CONNECTION HOLE. A LETTER IN THE SQUARE IS THE LETTER PRINTED ON THE CIRCUIT BOARD.
  - TRANSDUCER.
  - A DC VOLTAGE OF THE SAME VALUE AS THE CONTAINED FIGURE.
  - AC SOCKET.
4. REFER TO THE TRANSISTOR AND DIODE IDENTIFICATION CHART FOR IDENTIFICATION INFORMATION OF THESE DEVICES.
5. REFER TO THE X-RAY VIEWS AND THE CHASSIS PHOTOGRAPHS FOR THE PHYSICAL LOCATION OF PARTS.
6. REFER TO THE VOLTAGE CHART FOR VOLTAGES AT TRANSISTOR AND DIODE LEADS.

| PRIMARY CONNECTIONS |         |
|---------------------|---------|
| 120 VAC             | 240 VAC |
| 1                   | 1       |
| 3                   | 3       |
| 2                   | 2       |
| 4                   | 4       |