

# **Heathkit HN-31 Cantenna Manual**

**Courtesy of VE9GC**

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permitted.**

Assembly  
and  
Operation  
of the



"CANTENNA"  
DUMMY  
RF LOAD  
MODEL HN-31

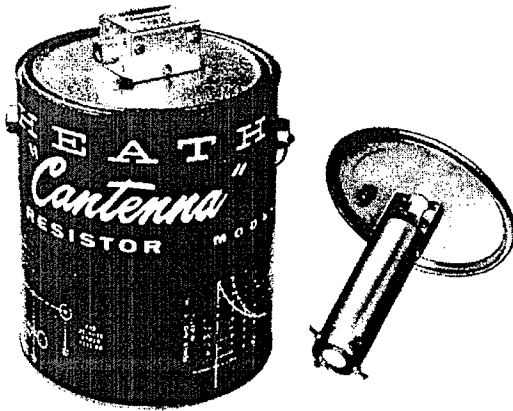


TABLE OF CONTENTS

Specifications. . . . .	2
Circuit Description. . . . .	2
Schematic. . . . .	3
Construction Notes. . . . .	3
Parts List. . . . .	4
Step-By-Step Assembly. . . . .	5
Parts Mounting. . . . .	5
Component Wiring. . . . .	8
Initial Operation Check. . . . .	9
Final Assembly. . . . .	9
Operation. . . . .	10
In Case Of Difficulty. . . . .	10
Warranty . . . . .	Inside front cover
Customer Service . . . . .	Inside rear cover

HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022



## SPECIFICATIONS

Impedance. . . . .	50 $\Omega$ .
Voltage Standing Wave Ratio (VSWR). . . . .	Less than 1.5 up to 300 mc.
	Less than 2.0 up to 400 mc.
Power Dissipation Capability. . . . .	1 kilowatt maximum (ICAS).
Size. . . . .	8-7/8" high x 7" diameter, overall.
Net Weight. . . . .	1-1/2 lbs (oil not included).

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

## CIRCUIT DESCRIPTION

The Model HN-31 "Antenna" Dummy RF Load was designed as a small convenient package capable of handling a kilowatt of power. (See Figure 1). The oil-cooled, temperature-stable resistive element provides a very low VSWR (voltage standing wave ratio) up to 400 megacycles. A special circuit is incorporated to provide a DC voltage for monitoring relative output power.

Refer to the Schematic Diagram on Page 3 for a better understanding of the following description.

When power is applied to the circuit, R1, the 50

$\Omega$  resistor element (dummy load), absorbs this power and converts it into heat. The heat is dissipated into and stabilized by the oil bath which envelops the resistor element.

The output circuit, used for monitoring, is isolated from the 50  $\Omega$  resistor element (input circuit) by R2. This relatively high impedance separation allows only a portion of the input voltage to pass to R3 of the output circuit. The voltage developed across R3 is presented to D1. (Keep in mind that this voltage is relative to the input RF power). Half-wave diode rectifier D1, combined with filter capacitor C1, presents a DC output voltage for monitoring purposes.

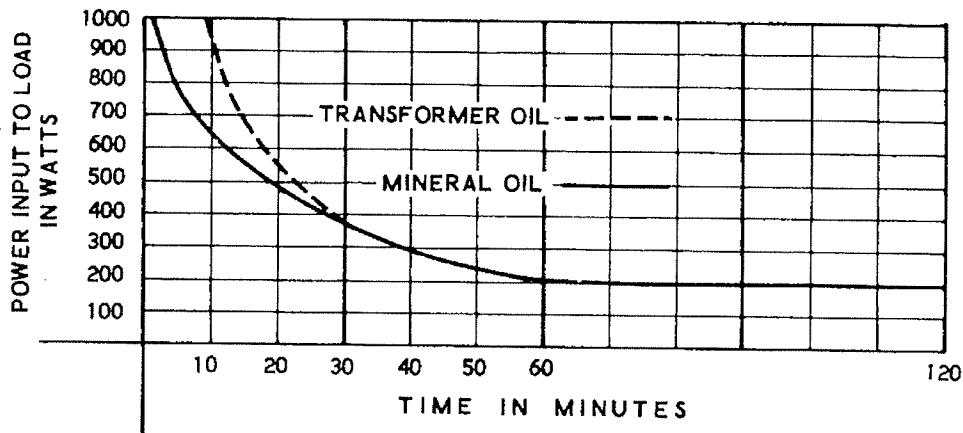
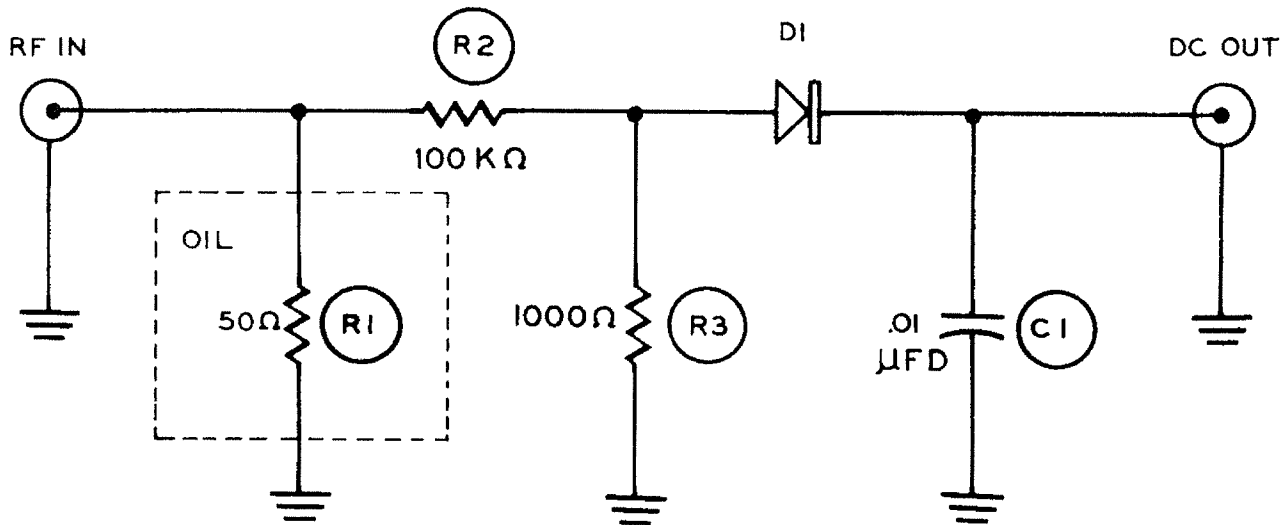


Figure 1



**SCHEMATIC OF THE  
HEATHKIT®  
"CANTENNA"  
DUMMY RF LOAD  
MODEL HN-31**

## CONSTRUCTION NOTES

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation

"S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. (In cases where a lead passes through a terminal or lug and then connects to another point, it will count as two leads, one entering and one leaving the terminal.)

Position the work, if possible, so that gravity will help to keep the solder where you want it. The joint to be soldered should be heated with the flat side of the soldering iron tip sufficiently to melt the solder. Apply only enough solder to the heated terminal to thoroughly wet the junction. Remove the solder and then the iron when a smooth solder junction appears. Do not move the leads until the solder is solidified.

ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60:40 or 50:50 TIN-LEAD CONTENT) RADIO TYPE SOLDER.

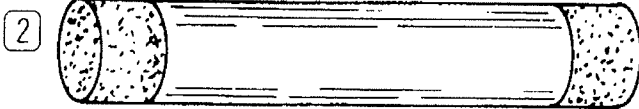
# PARTS LIST

Unpack the kit carefully and check each part against the Parts List. The numbers in front of the part number correspond to the picture of that part for quick and positive identification.

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

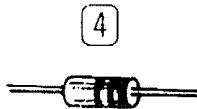
### RESISTORS

- |        |   |   |
|--------|---|---|
| 1-9    | 1 | 1000 Ω 1/2 watt<br>(brown-black-red)    |
| 1-26   | 1 | 100 KΩ 1/2 watt<br>(brown-black-yellow) |
| 1-2-10 | 1 | 50 Ω resistor element<br>(dummy load)   |



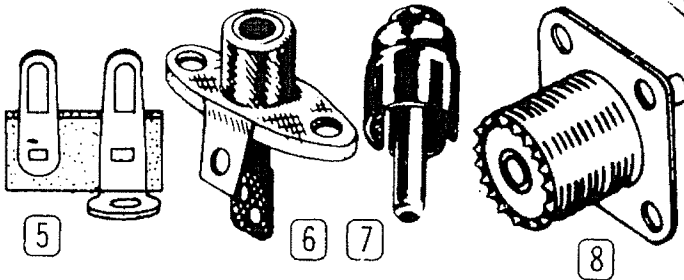
### CAPACITOR-DIODE

- |       |   |                                   |
|-------|---|-----------------------------------|
| 21-16 | 1 | .01 μfd disc ceramic capacitor    |
| 56-26 | 1 | Crystal diode (brown-white-brown) |



### TERMINAL STRIP-CONNECTOR

- |        |   |                   |
|--------|---|-------------------|
| 431-14 | 1 | Terminal strip    |
| 434-42 | 1 | Phono socket      |
| 438-4  | 1 | Phono plug        |
| 436-5  | 1 | Coaxial connector |



### SHEET METAL PARTS

- |         |   |         |
|---------|---|---------|
| 204-468 | 2 | Bracket |
|---------|---|---------|

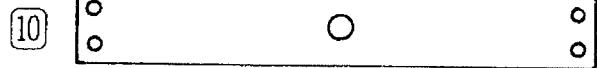


To order a replacement part, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

PART No.	PARTS Per Kit	DESCRIPTION
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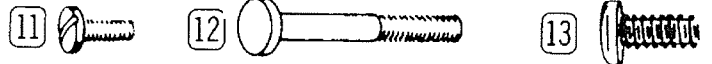
### Sheet Metal Parts (cont'd.)

- |          |   |                             |
|----------|---|-----------------------------|
| 206-191  | 1 | Shield base                 |
| 206-192  | 1 | Cover                       |
| 212-17   | 3 | Brass strip (silver plated) |
| 214-57   | 1 | Pail                        |
| 214-58-1 | 1 | Pail lid                    |
| 206-193  | 1 | Shield tube (5" long)       |



### HARDWARE

- |         |    |                             |
|---------|----|-----------------------------|
| 250-49  | 12 | 3-48 x 1/4" screw           |
| 250-120 | 1  | #5 x 7/8" stud screw        |
| 250-89  | 5  | 6-32 x 3/8" screw           |
| 250-134 | 4  | 6-32 x 3/4" brass screw     |
| 250-170 | 6  | #6 x 1/4" sheet metal screw |



- |        |    |          |
|--------|----|----------|
| 252-1  | 12 | 3-48 nut |
| 252-3  | 17 | 6-32 nut |
| 252-40 | 2  | 5-40 nut |



- |       |   |                       |
|-------|---|-----------------------|
| 253-1 | 2 | Fiber washer          |
| 253-2 | 1 | Fiber shoulder washer |
| 254-7 | 8 | #3 lockwasher         |
| 254-1 | 7 | #6 lockwasher         |
| 259-1 | 1 | Solder lug            |



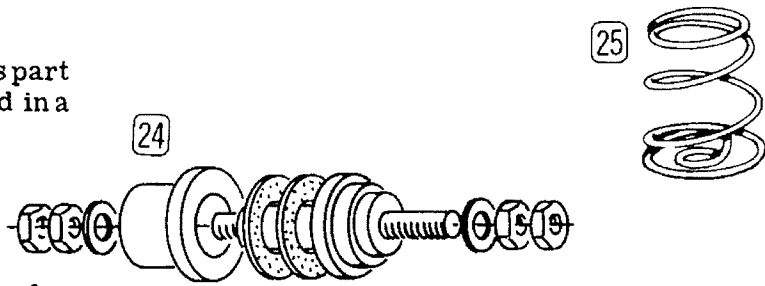
- |       |   |                       |
|-------|---|-----------------------|
| 253-1 | 2 | Fiber washer          |
| 253-2 | 1 | Fiber shoulder washer |
| 254-7 | 8 | #3 lockwasher         |
| 254-1 | 7 | #6 lockwasher         |
| 259-1 | 1 | Solder lug            |



PART No.	PARTS Per Kit	DESCRIPTION
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**MISCELLANEOUS**

71-2	1	Ceramic insulator (This part may come disassembled in a plastic bag.)
258-30	1	Spring
211-25	1	Handle
597-308	1	Kit Builders Guide
597-260	1	Parts Order Form
	1	Manual (See front cover for part number.)
		Solder

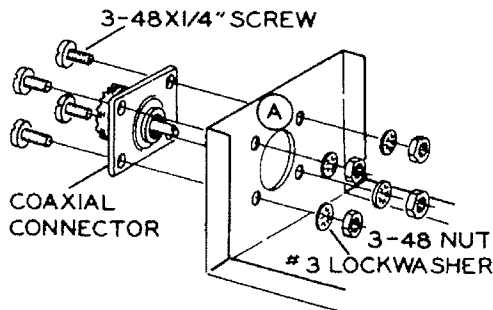


**STEP-BY-STEP ASSEMBLY**

**PARTS MOUNTING**

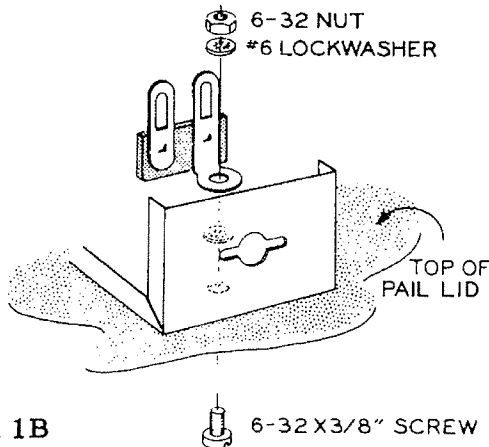
Refer to Pictorial 1 for the following steps.

- ( ) Mount the coaxial connector to the shield base at A as shown in Pictorial 1. Use 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts as illustrated in Detail 1A.



Detail 1A

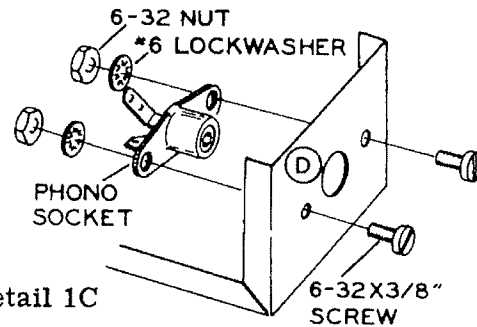
- ( ) Mount the shield base to the top of the pail lid, using a 6-32 x 3/8" screw, #6 lockwashers, a terminal strip, and a 6-32 nut at



Detail 1B

C, as shown in Detail 1B. Position the shield base so that its three holes are in line with the three associated holes in the pail lid. Make sure the terminal strip is positioned as shown in Pictorial 1.

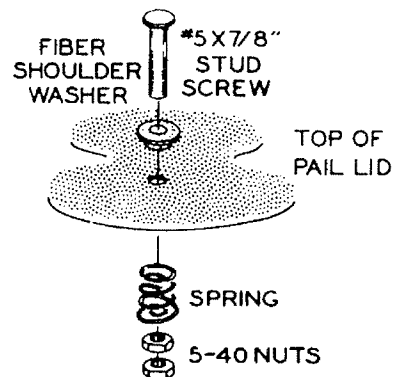
- ( ) Mount the phono socket at D, using 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts as shown in Detail 1C. Bend the center conductor up 45 degrees.



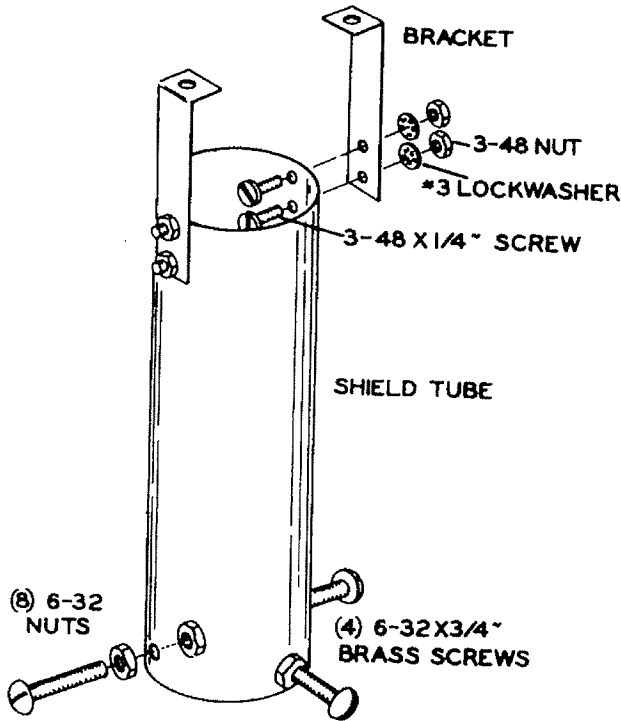
Detail 1C

- ( ) Assemble the relief valve at E, using a #5 x 7/8" stud screw, fiber shoulder washer, spring, and 5-40 nuts as shown in Detail 1D. The 5-40 nuts should be tightened to the stud screw shoulder.

Set this pail lid assembly aside temporarily.



Detail 1D



Pictorial 2

Refer to Pictorial 2 for the following steps.

- (\ ) Mount four 6-32 x 3/4" brass screws and eight 6-32 nuts to the inside and outside of the shield tube as shown. Do not let the brass screws protrude more than 1/8" past the 6-32 nuts inside the shield tube. Do not tighten yet.
- (\ ) Mount two brackets to the shield tube, using 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts as shown.

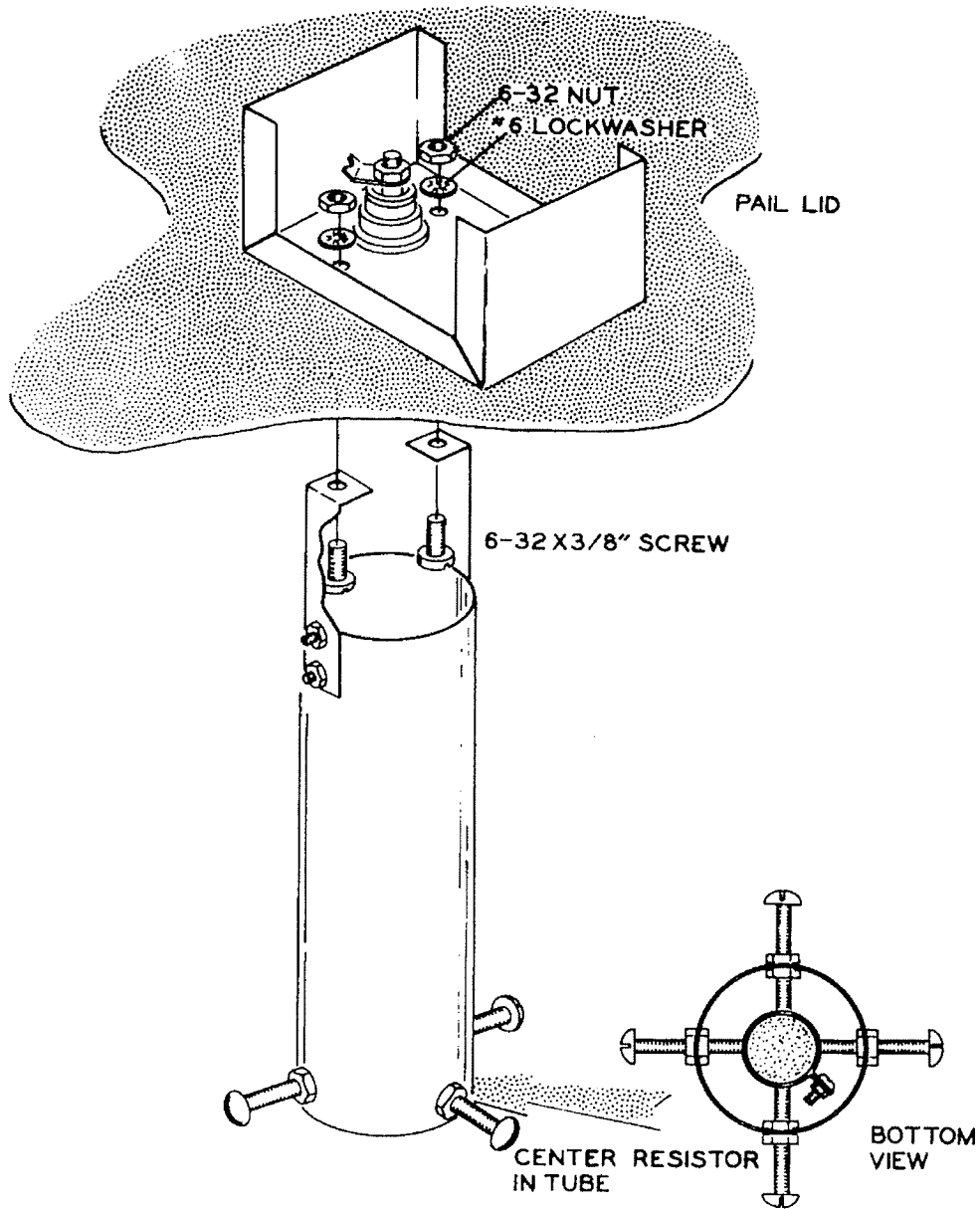
Set this shield tube assembly aside.

Refer to Pictorial 3 for the following steps.

- (\ ) Shape the ends of one of the silver plated brass strips as shown in inset #2. Wrap this strip around one end of the 50  $\Omega$  resistor element. Use 3-48 x 1/4" screws, and 3-48 nuts to tie the end of this strip together but leave the hardware as loose as possible.
- (\ ) Shape another brass strip to the dimensions shown in inset #1. Push the ends of this strip between the resistor element and the loosely wrapped strip. It may be necessary to form the end of the second brass strip to conform to the round resistor element. Leave a 5/8" gap between the resistor element and this strip before tightening the hardware securely. Pictorial 3 shows the correct installation.
- (\ ) Shape the remaining silver-plated brass strip to the dimensions shown in inset #2. Wrap it around the other end of the resistor element and securely tighten it with 3-48 x 1/4" screws and 3-48 nuts.

NOTE: Discard the four nuts packed with the ceramic insulator. In place of these nuts, use four 6-32 nuts from the kit hardware pack.

- (\ ) R1. Mount the resistor assembly to the pail lid and shield base at B. Use the ceramic insulator and its hardware along with two fiber washers, a #6 lockwasher, and a solder lug as shown. The insulator screw should protrude equally at each end. The solder lug should be straightened out with the end of it cut off at the second hole as shown. Position the cut off end of the solder lug under and touching the inner conductor of the coaxial connector.



Pictorial 4

Refer to Pictorial 4 for the following steps.

(1) Mount the shield tube assembly to the pail lid and shield base, using 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts as shown. It may be necessary to loosen and re-tighten the insulator assembly to allow the brass strip connection on the bottom of

the resistor to center between two of the brass screws.

(2) Adjust the four brass screws so that the 50  $\Omega$  resistor is centered as shown in the bottom view, then tighten securely. The 6-32 nuts on the brass screws should be tight against the shield tube.