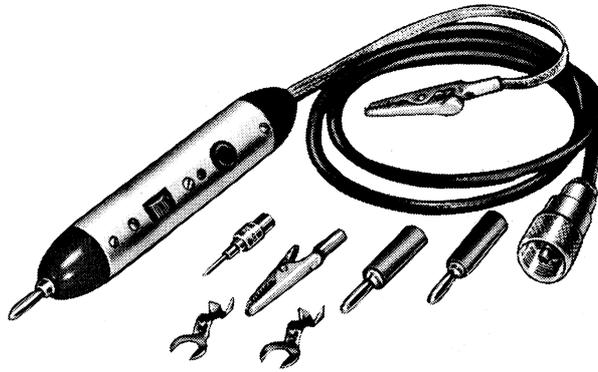


# instructions

FOR THE  
HEATHKIT UNIVERSAL OSCILLOSCOPE PROBE  
MODEL PK-1



## SPECIFICATIONS

Input Impedance. . . . .	Direct position: 2.4 megohms shunted by 100 pf. X10 position: 2.4 megohms shunted by 20 pf when wired for use with 3.6 megohms input, 10 megohms shunted by 20 pf when wired for use with a 1 megohm input.
Maximum DC Voltage. . . . .	600 volts.

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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.

## INTRODUCTION

The Heathkit Model PK-1 Universal Oscilloscope Probe permits you to observe signals that would otherwise be affected by the relatively high input capacitance of an oscilloscope and its coaxial input lead. The signal attenuation in the X10 position is accurate to within 5% when the Probe is used with an oscilloscope with the proper input impedance (either 3.6 megohm or 1 megohm, depending upon the wiring of the Probe). Several different types of connectors are supplied for the other end of the coaxial cable to

make the Probe universally adaptable to a wide variety of oscilloscopes.

NOTE: This manual uses the new IEEE (Institute of Electrical and Electronic Engineers) and international standard term "hertz" as the basic unit of frequency. The terms are used as follows:

Hz (hertz) = cps (cycles per second).  
kHz (kilohertz) = kc (kilocycles per second).  
MHz (megahertz) = mc (megacycles per second).

## PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
2-52	1	9 megohm 1/2 watt 1% precision resistor	259-7	2	Spade lug
1-37	1	2.2 megohm 1/2 watt 10% resistor (red-red-green)	260-1	2	Alligator clip
1-99	1	240 K $\Omega$ 1/2 watt 5% resistor (red-yellow-gold)	343-2	1	Coaxial cable
31-6	1	5-20 pf trimmer capacitor	344-59	1	Hookup wire
60-7	1	Slide switch	345-1	1	Flat braid
70-5	1	Nylon sleeve for banana plug, black	438-9	1	Coaxial plug
70-6	1	Nylon sleeve for banana plug, red	438-12	1	Coaxial plug insert
73-4	1	3/16" rubber grommet	438-13	3	Banana plug
75-27	1	Terminal board	459-2	1	Probe end, red
250-212	4	2-56 x 1/8" self-tapping screw	459-3	1	Probe end, black
250-4	2	4-40 x 3/8" screw	476-12	1	Probe body
			477-3	1	Solderless phone tip
			331-6		Solder
			597-356	1	Instruction sheet

## STEP-BY-STEP ASSEMBLY

- ( ) Fasten the slide switch (#60-7) and the ceramic trimmer (#31-6) together with a 4-40 x 3/8" screw as shown in Figure 1. Be sure to position the switch as shown.
- ( ) Place the phenolic board over the capacitor and switch lugs as shown in Figure 1. Bend the lugs slightly outward to hold the switch in place on the board.

**NOTE:** If the Probe is to be used with an oscilloscope that has a 3.6 megohm input impedance, such as the Heathkit Model IO-12, follow the steps on Figure 2. If the Probe is to be used with an oscilloscope that has a 1 megohm input impedance, such as the Heathkit Model IO-14, follow the steps on Figure 3.

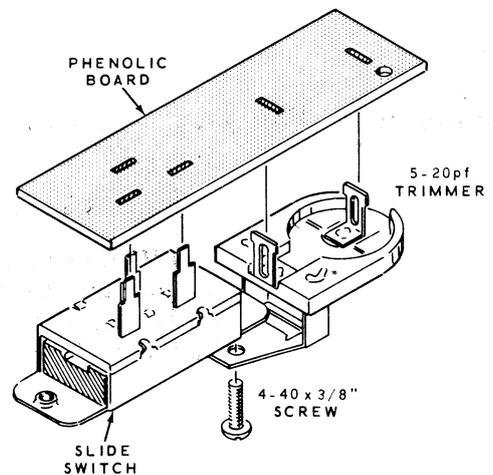


Figure 1

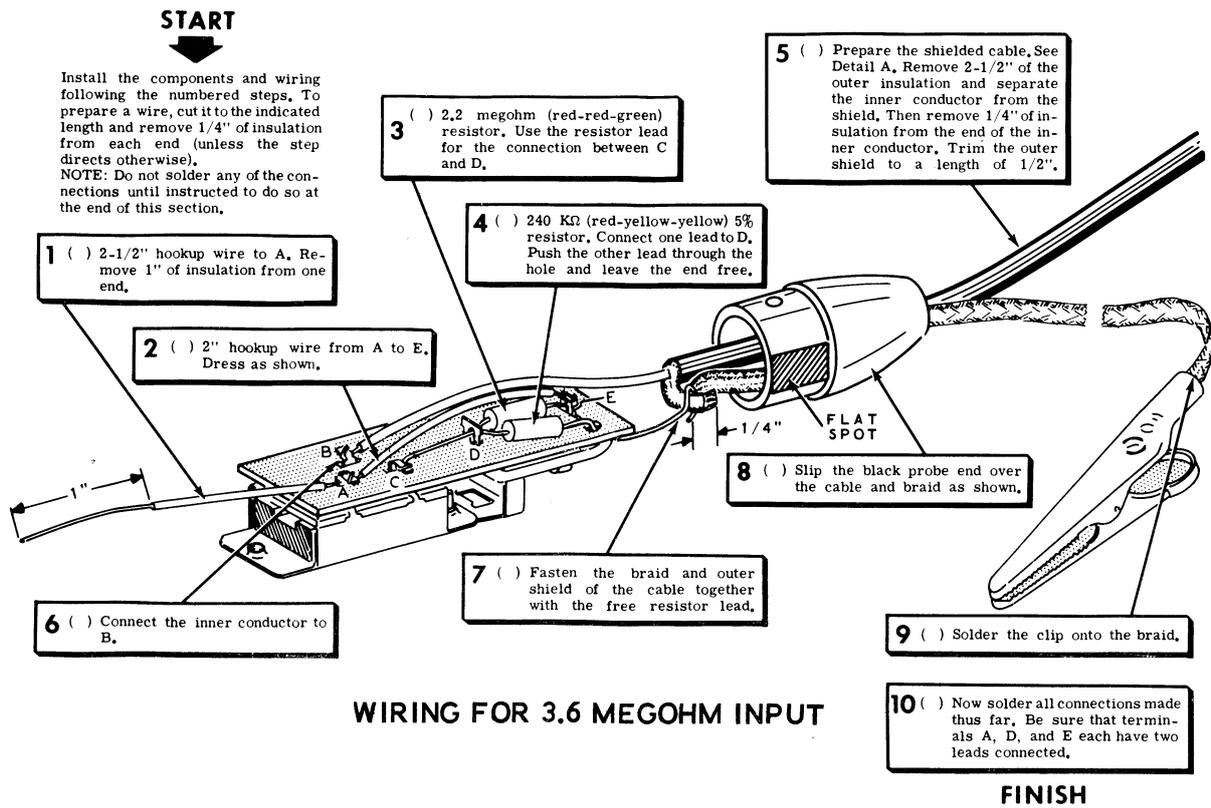


Figure 2

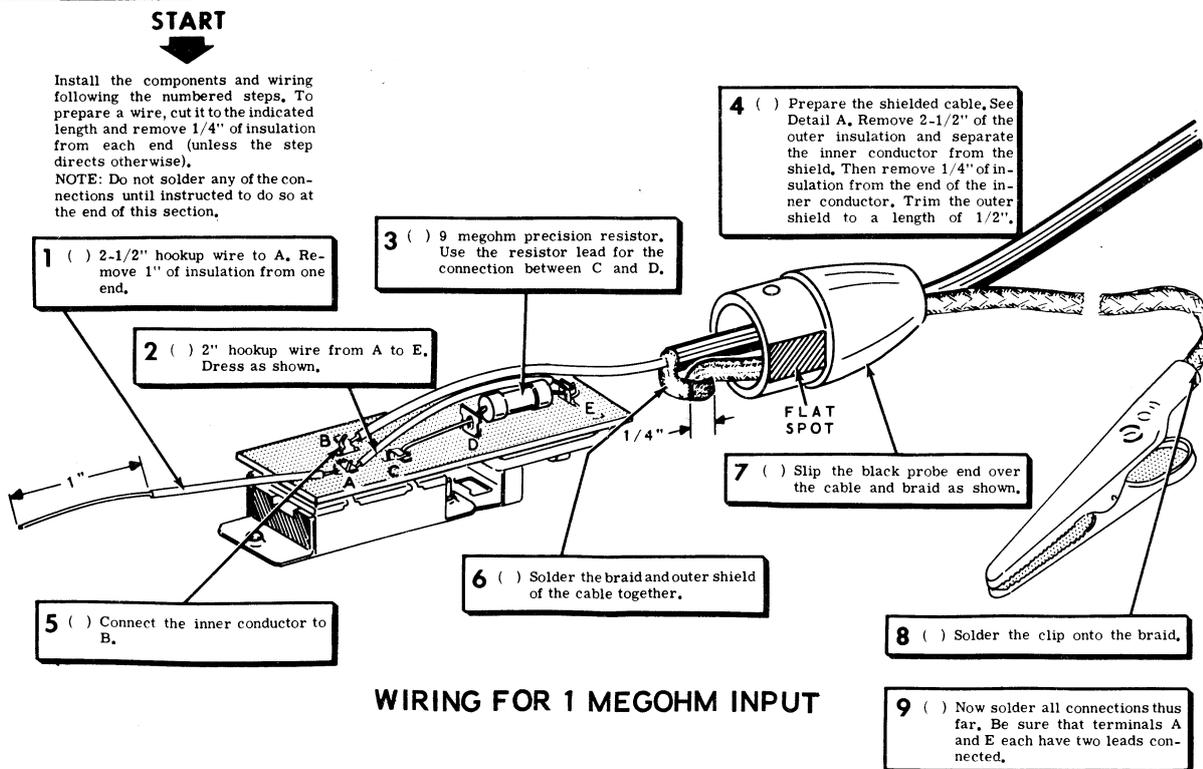


Figure 3

- ( ) Remove the screw used to hold the switch and trimmer together during assembly.
- ( ) Now slip the completed switch-trimmer assembly into the probe body and secure the switch with two 4-40 x 3/8" screws.
- ( ) Secure the black probe end to the probe body with two 2-56 self-tapping screws. Be sure the ends of the shielded lead and flat braid are between the black probe end and the probe body, to provide a ground connection for the probe body. The "flat spot" on the probe end will provide the necessary clearance. (Refer to Figures 2, 3, and 4.)
- ( ) Install the rubber grommet in the trimmer adjustment hole.

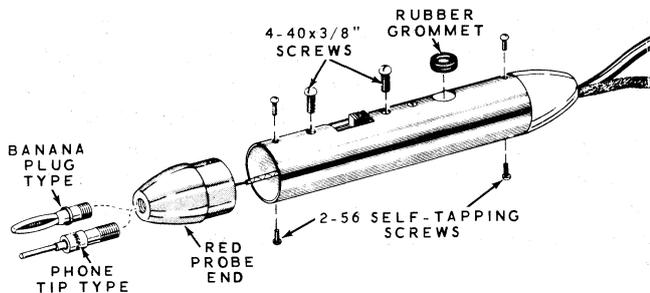
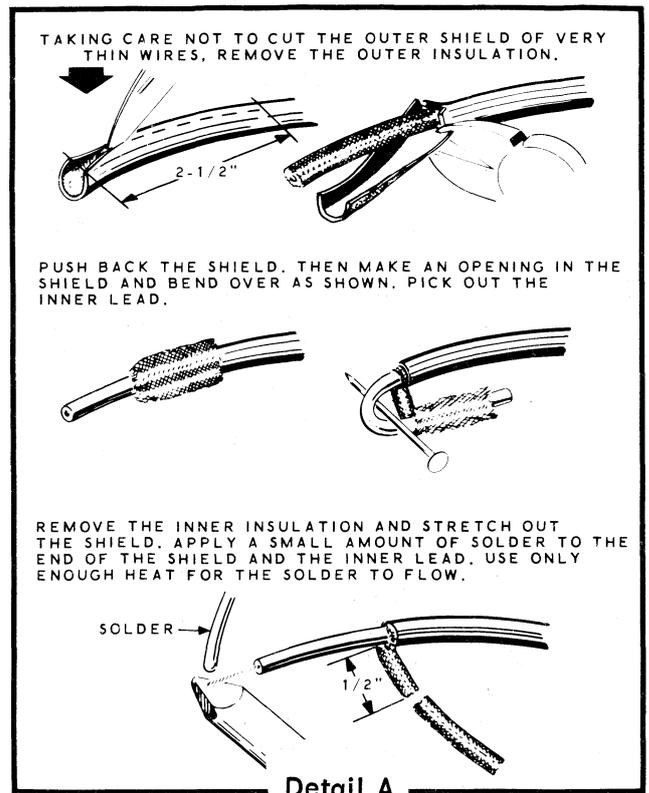


Figure 4

NOTE: Two different types of tips can be installed in the red probe end. Determine which type you wish to use and follow the appropriate step below.

#### Phone Tip Type

- ( ) Screw the phone tip securely into the red probe end. Remove the knurled collar and thread the bare lead protruding from the front of the probe through the hole in the center of the phone tip as you push the probe end into place. Secure with two 2-56 self-tapping screws. Reinstall the knurled collar, and tighten to secure the lead.



#### Banana Plug Type

- ( ) Screw the banana plug about halfway into the red probe end and, as you push the probe end into place, thread the bare lead protruding from the front of the probe through the hole in the center of the banana plug. Secure with two 2-56 self-tapping screws. Now bend the lead around the base of the banana plug and tighten the plug, securing the lead between the banana plug base and the probe end.

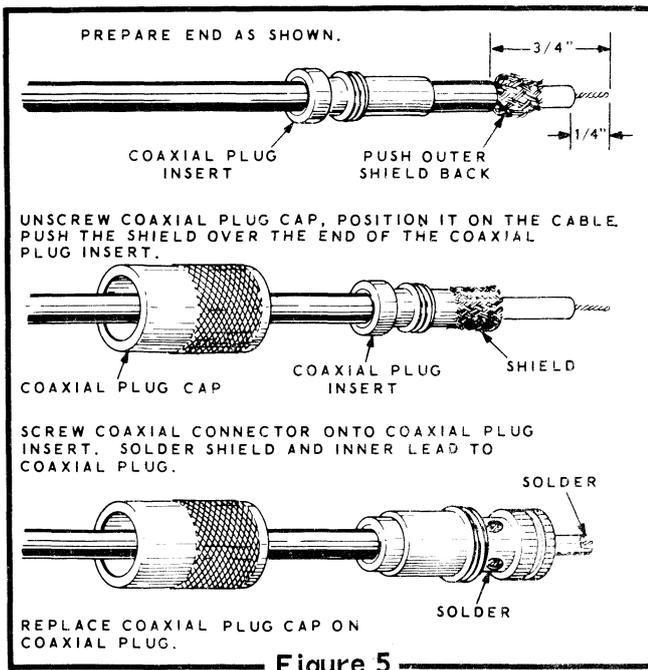


Figure 5

( ) Three different types of output connectors have been supplied with your Probe. Determine which type will work best with your Oscilloscope. Then refer to Figure 5 to install a coaxial connector or to Figure 6 for installing banana plugs or spade lugs.

This completes the assembly of your Heathkit Universal Oscilloscope Probe.

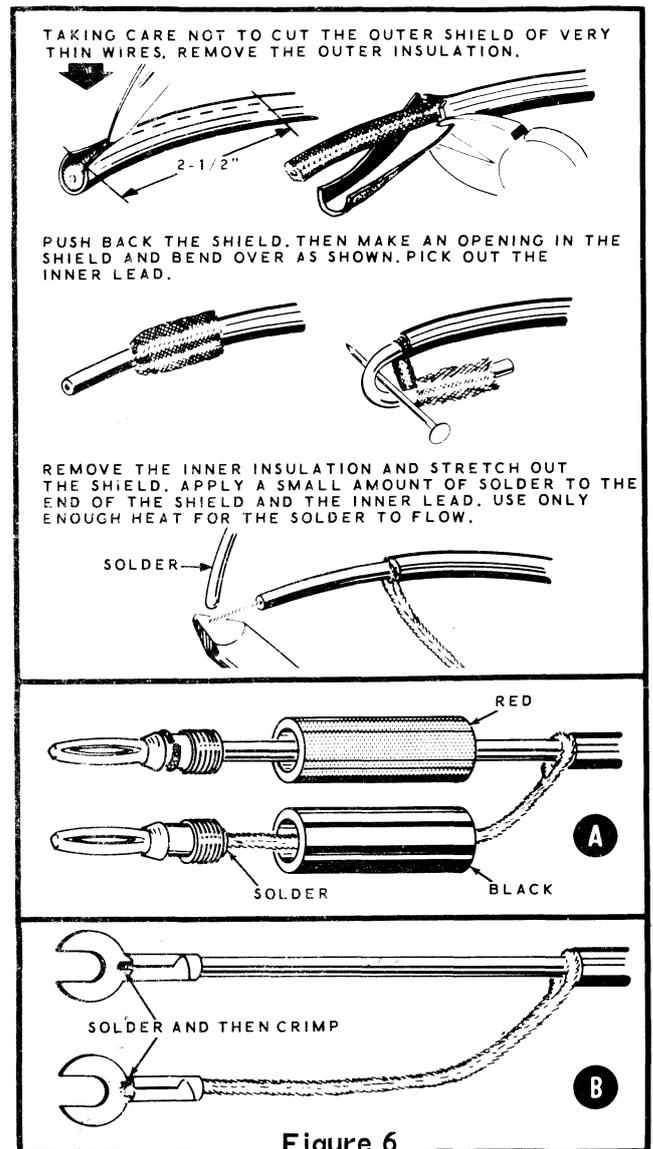


Figure 6

## TEST AND CALIBRATION

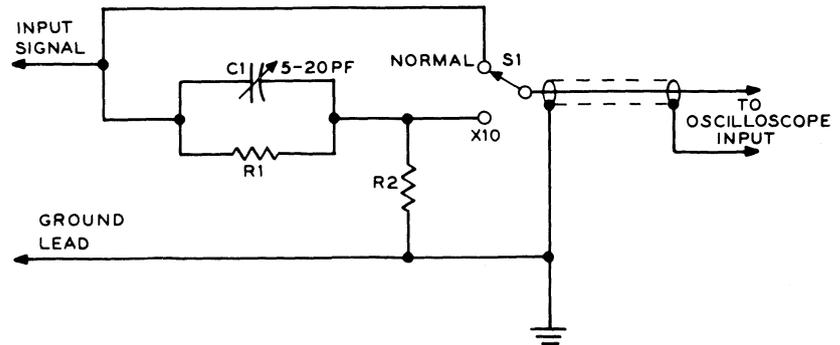
Connect the Probe to your oscilloscope and slide the switch in the Probe to its Normal position, toward the probe tip. This is the direct or unattenuated position. Connect the Probe to a source of 1 kHz square waves\* and observe the pattern. Now switch to the X10 position and adjust the trimmer in the probe body for an identical wave shape; remember that the amplitude will be only one tenth of the original signal. Your Probe is now completed and may be put into service.

\* If a suitable square wave signal is not available and you have a Heathkit Model IO-12 or

similar oscilloscope, you may use the sawtooth voltage generated within your oscilloscope. (This is not possible, however, with the Heathkit Model IO-14 Oscilloscope.) An easy place to obtain this signal is from the horizontal deflection plate connections on the cathode ray tube socket. Adjust the oscilloscope's sweep frequency controls to produce a sweep of approximately 1000 Hz. With the horizontal and vertical gain controls properly adjusted, a diagonal line will result. With the Probe in the X10 position, carefully observe the ends of this diagonal line as you adjust the trimmer. The point which gives the straightest diagonal line is the proper setting.

## CIRCUIT DESCRIPTION

A signal at the input of the Probe is applied directly to the input of the oscilloscope when switch S1 is in the Normal position. When S1 is in the X10 position, the signal at the junction of resistors R1 and R2 is applied to the input of the oscilloscope. The values of R1 and R2 have been selected so that 9/10 of the signal is dropped across R1 and 1/10 across R2. When the Probe is wired for use with a 1 megohm input oscilloscope, R2 is actually the input resistance of the Oscilloscope.



NOTE:

NOTES: THE VALUE OF RESISTORS R1 AND R2 DEPEND ON DESIRED OUTPUT IMPEDANCE. SEE CHART BELOW:

3.6 MEGOHM	1 MEGOHM
R1 = 2.2 MΩ	R1 = 9 MΩ
R2 = 240 KΩ	R2 = NOT USED

### SCHEMATIC DIAGRAM

Capacitor C1 is one leg of a capacitive voltage divider; the capacitance of the coaxial cable and the oscilloscope input forms the other leg. When C1 is properly adjusted, 9/10 of the signal is across C1 and 1/10 is across the capacitance of the coaxial cable and the oscilloscope input.

## REPLACEMENTS

Replacement parts for your kit can be obtained by writing to the Heath Company. Mention part number, kit model number, and date of purchase; give the reason for requesting the replacement part. Do not return the original part until requested to do so.

## SERVICE

If the unit does not function properly, recheck the wiring and solder connections. Also check the connector (s) on the end of the cable. Be sure the connections are made correctly and that there are no short circuits. If necessary, the completed instrument may be returned to the Heath Company Service Department for repair. You will be charged a nominal service fee plus the price of any replacement parts not covered by the Warranty.

## WARRANTY

The Heath Company warrants that the parts supplied in its kits (except batteries) shall be free of defects in materials and workmanship under normal conditions of use and service. The obligation of Heath under this warranty is limited to replacing or repairing any such part upon verification that it is defective in this manner. This obligation is further limited to such defective parts for which Heath is notified of the defect within a period of ninety (90) days from the original date of shipment of the kit.

The obligation of Heath under this warranty does not include either the furnishing or the expense of any labor in connection with the installation of such repaired or replacement parts. The obligation of Heath with respect to transportation expenses is limited to the cost of shipping the repaired or replacement parts to the buyer, provided such repair or replacement comes within the terms of this warranty.

The foregoing warranty extends only to the original buyer and is expressly in lieu of all other warranties, expressed or implied. The foregoing warranty is further in lieu of all other obligations or liabilities on the part of Heath and in no event shall the Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or use of the kit product or components thereof.

The foregoing warranty shall be deemed completely void if acid core solder or paste flux or other corrosive solders or fluxes have been used in assembling or repairing the kit product. Heath will not replace or repair any parts of any kit products in which such corrosive solders or fluxes have been used.

This warranty applies only to Heath products sold and shipped to points within the continental United States and to APO and FPO shipments. Warranty replacement for Heath products sold or shipped outside the United States is on an f.o.b. factory basis. Contact the Heath authorized distributor in your country or write: Heath Company, International Division, Benton Harbor, Michigan, U.S.A.

**HEATH COMPANY**

## REPLACEMENT PARTS PRICE LIST

PART No.	PRICE Each	DESCRIPTION	PART No.	PRICE Each	DESCRIPTION
2-52	.35	9 megohm 1/2 watt 1% pre- cision resistor	438-12	.20	Coaxial plug insert
1-37	.10	2.2 megohm 1/2 watt 10% resistor	438-13	.20	Banana plug
1-99	.15	240 K $\Omega$ 1/2 watt 5% resistor	459-2	.15	Probe end, red
31-6	1.20	5-20 pf trimmer capacitor	459-3	.10	Probe end, black
60-7	.20	Slide switch	476-12	.55	Probe body
70-5	.10	Nylon sleeve for banana plug, black	477-3	.15	Solderless phone tip
70-6	.10	Nylon sleeve for banana plug, red	331-6	.10	Solder
73-4	.10	3/16" rubber grommet	597-356		Instruction sheet
75-27	.10	Terminal board			
250-212	.05	2-56 x 1/8" self-tapping screw			
250-4	.05	4-40 x 3/8" screw			
259-7	.05	Spade lug			
260-1	.15	Alligator clip			
343-2	.10/ft	Coaxial cable			
344-59	.05/ft	Hookup wire			
345-1	.10/ft	Flat braid			
438-9	.75	Coaxial plug			

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Selling prices elsewhere in U.S.A. may be slightly higher to offset transportation and local taxes. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.