



Heathkit of the Month #80:
by Bob Eckweiler, AF6C

AMATEUR RADIO - SWL

The Heathkit K-1
Three-Tube All-Wave Beginner's Receiver

Some K-1 All-Wave Receiver History:

The first piece of radio equipment using the *Heathkit* name is the K-1 "Three-Tube All-Wave Beginner's Radio" (Figure 1). It was introduced in the March 1948 Heath Flyer (Figure 2) and soon after in ads in the April issue of *Popular Mechanics* and May issue of *Radio News*. Prior to that, Heath advertised in *Radio News* for three months (January through March) an Amateur Transmitter with the *Heathkit* name (Figure 3). The model number is unknown, as is whether any were ever delivered. None have been found as

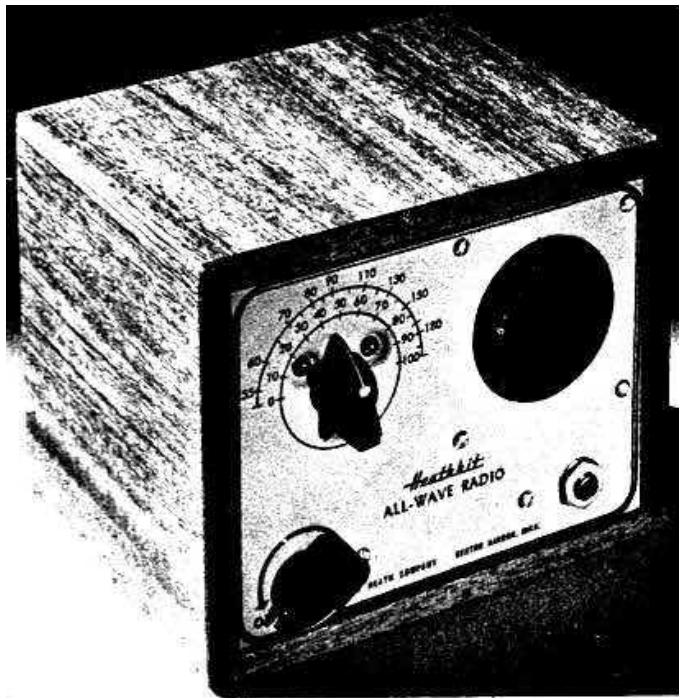


Figure 1: The Heathkit K-1: 3-Tube All Wave Receiver shown with optional mahogany cabinet that became available after January 1949 (Heath Co. photo)

HEATHKIT 3 TUBE •• BEGINNERS
ALL-WAVE RADIO

This Heathkit was developed to provide a simple interesting means of starting in radio. It has many of the features of large complex sets, yet the design has been simplified and the instructions prepared to allow a beginner to achieve success. The kit uses 3 metal tubes, has a 110 V.A.C. power transformer power supply. Two plug in coils are supplied covering 500 Kc. to over 6,000 Kc. The panel is calibrated in the broadcast band.

Foreign broadcasts, police, amateur and aircraft broadcasts are all covered with the coils supplied.

This kit with a few tools will provide months of useful entertainment and good training for boys 12 years or older. In addition, it frees the family radio the constant series of boys' programs. This kit is complete less loud speaker or phones, all parts supplied, all metal parts drilled, punched, printed and plated. Detailed pictorial diagrams and instructions. A battery type (2 tubes as it requires no rectifier) is available where no house current is available.

Heathkit Beginners' Radio 110 volt type..... \$8.75
Heathkit Beginners' Radio, battery type
(2 tubes, no rectifiers)..... \$8.75
Headphones for either type ES 30 per set..... \$1.00
2 1/2" permanent magnet loudspeaker for either type..... \$1.95
Batteries, complete kit for battery type set..... \$3.25

\$8.75

Figure 2: The first Heathkit K-1 ad from the March 1948 Heath Flyer. Do you notice anything wrong with this ad?

of yet, so it is not being considered as the first piece of *Heathkit* radio equipment. While the ad appeared in some magazines between January and March of 1948, this transmitter kit never appeared in a Heath flyer.

HEATHKIT
TRANSMITTER KIT

A best buy in an amateur transmitter kit. Circuit uses latest post war improvements, can be assembled to cover 80-40-20-10 meters with 25 Watt output. Comes complete with 80 meter crystal, modulator, 80 meter coil, four tubes, cabinet, beautiful panel and all additional parts needed less power supply. Blueprints and instructions included. Power supply kit \$10.00 additional. Shipping weight 20 pounds; 8 pounds for power supply.

\$19.50

Figure 3: The "Mystery" Heathkit Transmitter from March ad in *Radio News*. At 20 lbs. shipping weight (less power supply) it must have had some serious iron inside.

**110V.-A.C. MILITARY RECEIVER
POWER SUPPLY KIT**



\$5.95

Ideal way to convert military sets. 110V 60 cy. transformer operated. Supplies 24 Volts for filament — no wiring changes inside radio. Also supplies 250V D.C. plate voltage of 50-60 MA. Connections direct to dynamotor input. Complete with all parts and detailed instructions. Shipping wt. 6 lbs.

**110V.-A.C. TRANSMITTER
POWER SUPPLY KIT**

\$14.50

For BC-645, 223, 522, 274N's, etc. Ideal for powering military transmitters. Supplies 500 to 600 Volts at 150 to 200 MA plate, 6.3 C.T. at 4 Amps, 6.3 at 4 Amps, and 12V at 4 Amps. Can be combined to supply 3-6-9-12 or 24 Volts at 4 Amperes. Kit supplied complete with husky 110V 60 cycle power transformer, 5U4 rectifier, oil filled condensers, cased choke, punched chassis, and all other parts, including detailed instructions. Complete — nothing else to buy. Shipping Wt. 22 lbs.



Figure 4: Two popular Heath kits that never received *Heathkit* status. Generally these were kits associated with war surplus (Ad from *Radio News* Jan. 1949)

The K-1 was followed by the K-2 sometime in 1949. The date of that change is controversial in the Heathkit community, but my research believes it to be after April 1949 and before September 1949. The K-2 stopped being advertised at the end of 1949. Why is the date of a kit so hard to determine? To answer that, one needs to realize a few things about the early Heath ads. Heath almost never gave model numbers to the kits in their ads. The model number might appear on the manual and/or schematic, and often on the equipment itself, but looking at an ad you have nothing to go on but the kit name and appearance. Sometimes, when they updated a kit they gave it a “New” status, but they also sometimes kept the “New” status as part of the ad so long that another change occurred. The O-2 to O-3 transition is such an example. Heathkit ads

often took time to propagate from engineering to the flyers, to the magazine ads. That time could be up to three months, and some changes never did show up in the ads. Also, Heath sold some kits that it never gave the *Heathkit* name to. These were often related to surplus equipment. Two such examples are two power supplies, the “110V A.C. Military Receiver Power Supply Kit” and the “110V A.C. Transmitter Power Supply Kit”, both which ran in ads for many months (Figure 4).

The picture in the ad of Figure 2 appears in the March 1948 Heath Flyer and twice in Heath ads in *Radio News* (May and June). In this picture the speaker grill is made up of many (29) holes and is on the left of the front panel. But the photo of Figure 1 shows a single speaker hole on the right, with a grill screen covering the opening. What isn't obvious in the ad of Fig. 2 is that the image is printed in reverse¹. A high resolution scan of the March Flyer reveals this clearly. See figure 5.

Why is this important? Originally some Heath historians believed that the speaker



Figure 5: A closeup of Figure 1 shows the image has been flipped horizontally before printing. Thus the speaker is on the right. The metal tubes, 2 ea. 12A6 and one 12C8 (with the grid cap) define the K-1 radio.

HOM rev. new

position defined whether the radio was a K-1 or a K-2. However it turns out that all the radios really had the speaker on the right. Also, the picture with the multi-hole speaker grill may have been a prototype, as none have shown up with the feature. What really defines the difference between the K-1 and the K-2 is the tube lineup, which is different between models. Heath continued to show the reversed image of the radio in their flyers and ads until June of 1948 when the image was corrected in the flyer (Figure 6); by July the magazine ads had been corrected too. This updated image shows the single hole speaker grill and has the correct orientation.

Another question surrounding the K-1 is its price. The first appearance of the radio was in the March 1948 Heath flyer (Fig. 2). It was priced at \$8.75. However, the first time it was advertised in the May ad in *Radio News* the selling price was \$5.95. This quickly changed the next month where the identical two-page ad appeared again, but with one correction, the All-Wave radio price increased to \$8.75. In *Popular Mechanics* the All-Wave Radio appeared in the April and May 1948 Heath ad at \$5.95, rising to \$8.75 in June.



Figure 7: Front view of the K-1 All-Band Radio from the collection of Erich Brueschke. Photo by Chuck Penson.

Heath of the Month #80 - K-1 All-Wave Receiver

An advertisement for the "Heathkit Beginners Radio Kit". The ad features a photograph of the radio kit and a list of prices for accessories. The main price is \$8.75. The text describes it as an ideal gift for boys, a complete 3-tube transformer operated receiver covering broadcast and short waves to 6000 Kc. It includes a complete less speaker or phones. Shipping weight is 3 lbs. Accessories listed include headphones for \$1.00 and a 2 1/2 inch PM Loud Speaker for \$1.95.

Heathkit Beginners Radio Kit
\$8.75
An ideal boy's gift.
Complete 3 tube transformer operated from 110V 60 cycle AC. Covers broadcast and short waves to 6000 Kc. Complete less speaker or phones. Shipping Wt. 3 lbs.
Headphones (extra).....\$1.00
2 1/2" PM Loud Speaker (extra)..... 1.95

Figure 6: Ad from the June 1948 Heath Flyer. For the first time the radio appeared correctly oriented and with the single hole speaker grill.

The K-1 All-Wave Receiver:

The K-1 originally came in two models. One is a three-tube transformer operated 110 VAC 60 cycle powered receiver and the other is a two-tube battery powered receiver. Since the battery powered unit didn't need the power transformer nor rectifier tube, it is surprising they were both priced the same. A battery set was available as an accessory for the battery powered receiver for \$3.25. Other accessories were headphones (HS-30) for \$1.00, and a speaker for \$1.95 that mounted behind the grill. Two coils came with the K-1, one covering the broadcast band and the other the shortwave band up to 6 mc. No cab-



Figure 8: Front view of the K-1 All-Band Radio from the collection of Erich Brueschke. Photo by Chuck Penson.

inet was initially available, but one was announced in the January 1949 Heath Flyer and began appearing in magazine ads around April. Offered at the same time as the cabinet were two additional plug-in coils: The long-wave coil for 200 kc to 500 kc and a second short-wave coil for 6,000 kc to 21,000 kc. The battery version of the K-1 disappeared after only a few months, last seen in the July 1948 Heath ad in Radio News. Advertising for the accessory coils also disappeared after a few months though they may have still been available from the factory. Available coils are shown in Table III.

The K-1 controls are very simple (See Figure 7). There is a tuning condenser with two scales, one for the broadcast band covering 550 kc to 1,800 kc and a logging scale from 0 to 100. This condenser mounts near the top left of the front panel. Below it at the bottom left is the **VOLUME** control which has a switch that turns the radio off when fully counterclockwise. This control actually controls the regeneration level of the receiver tube. Changing bands requires changing coils which mount in an octal tube socket. The cutout and grill for the optional 2-1/2" speaker is in the upper right and below it in the lower right is a standard 1/4" headphone jack.

The K-1 Layout:

Most of the K-1 components mount on a U shaped chassis. A flat plate front panel mounts to the chassis by the volume control and earphone jack, as well as by two screws

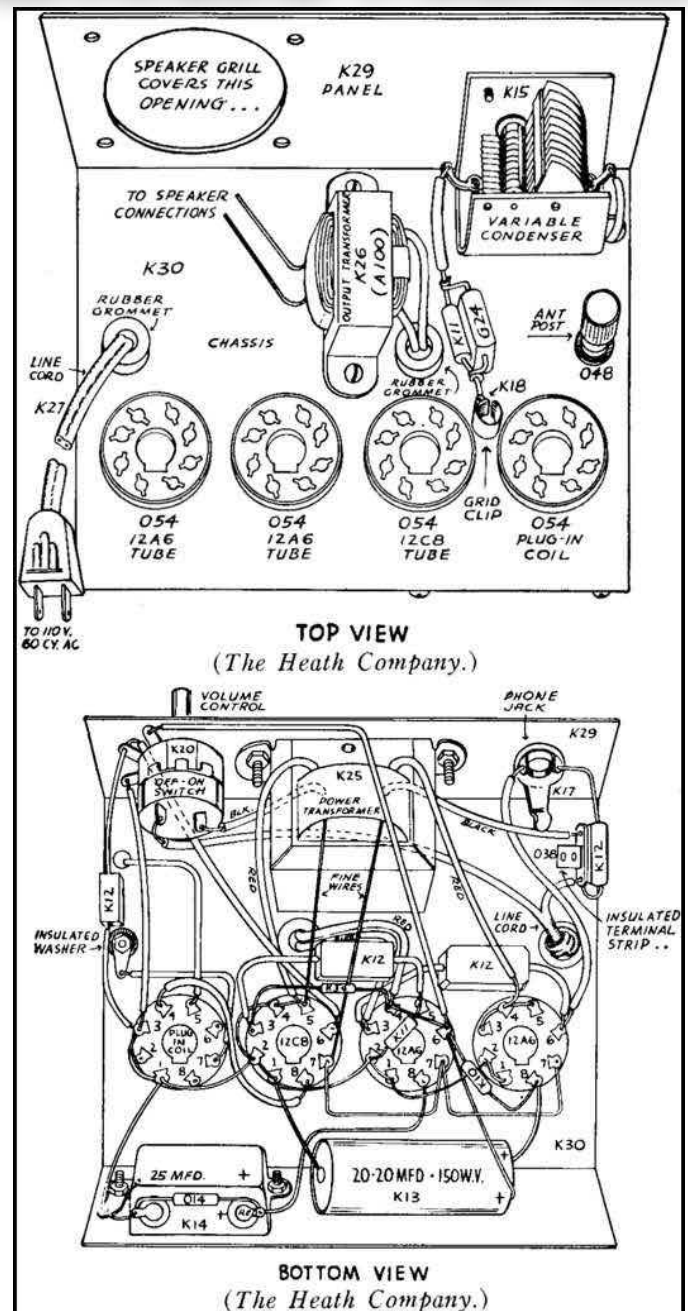


Figure 9: Chassis Layout for the K-1 All-Wave Receiver from a copy found of parts of the K-1. (Heathkit Manual)

| # | Tube | Type | Function |
|---|------|--|-----------------------|
| 1 | 12C8 | Pentode Dual-Diode Metal Octal w/grid cap | Regenerative Receiver |
| 2 | 12A6 | Beam Power Pentode Metal Octal | Audio Output |
| 3 | 12A6 | Pentode (wired as a diode) Metal Octal | Half-wave Rectifier |

Table I: K-1 All-Wave Radio Tube Line-up

that also mount the power transformer. Four octal tube sockets mount across the back of the top of the chassis. These hold, from left to right, as viewed in Figure 8, the 12A6 rectifier tube, the 12A6 audio amplifier tube, the 12C8 receiver tube, and the plug-in coil; in Figure 8 the two plug in coils, that come

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mounted in octal tube bases, are taped head-to-head, hence the unused coil's pins sticking up. The tubes are all metal-cased and the 12C8 has a grid cap atop. The antenna attaches to a binding post that is on the top of the chassis near the socket for the plug-in coil (Figure 9). The remaining components that mount to the chassis are the audio output transformer atop the chassis and a 25 μ f bathtub style condenser that mounts on the inside rear flange. The 365 μ f tuning condenser mounts to the front panel using short screws. The front panel has concave dimples to prevent the mounting screws from interfering with the knob movement. Chassis drawings are shown in Figure 9.

The K-1 Circuit:

The K-1 is a simple regenerative receiver using three tubes as shown in Table I. One feature of the AC powered K-1 is its use of a power transformer to provide operation from the AC mains, while preventing all the safety issues of AC-DC operation with direct connections to the AC line. The short-lived battery version of the K-1 is operated by an extra cost battery set; one battery supplying filament voltage and the other supplying plate voltage.

The rectifier circuit is a bit unusual, but something that Heath engineers have done more than once; a beam power pentode 12A6 is used as a half-wave diode by tying the screen and control grids to the plate. Evidently the war-surplus 12A6 tubes were cheap on the market and Heath had bought a lot of them. The rectified DC is filtered by a dual 20 μ f electrolytic and 470 Ω resistor providing about 210 VDC. Most of the power was used for the audio amplifier, especially if it was driving the optional speaker.

Regenerative receivers were very popular for ham and SWL activities in the early years of radio. By using positive feedback (regeneration) the gain of a tube can be significantly

Heath of the Month #80 - K-1 All-Wave Receiver

| # | Tube | Type | Function |
|---|------|--|--------------------------|
| 1 | 1626 | Triode Glass Octal | Regenerative Receiver |
| 2 | 12A6 | Beam Power Pentode Metal Octal | Audio Output |
| 3 | 1626 | Triode (wired as a diode) Glass Octal | Half-wave Rectifier |

Table II: K-2 All-Wave Radio Tube Line-up

increased. Thus, fewer tubes are required, and tubes were expensive in the day. The coils each consist of three coupled windings. The antenna winding couples the signal to the tuned grid winding, the third "tickler" winding couples the amplified signal from the cathode to the grid coil, providing regeneration. There are many ways to control the level of regeneration. In the K-1 it is controlled by the control marked VOLUME that varies the screen voltage on the receiver tube.

Audio from the receiver tube is coupled to another 12A6 tube that is used more conventionally as an audio amplifier. The [then] new beam powered pentode easily can drive

HEATHKIT 3 TUBE ALL WAVE RADIO KIT
No. K-1. Enjoy the thrill of building your own set which receives broadcast, police, aircraft, amateur, marine and foreign stations. Simple easy instructions make assembly fun. Every part included — **\$8.75**
coils for 550 to 6000 Kc. tubes, 110 Volt power transformer, ready punched chassis, calibrated dial. Has power output tube operates loudspeaker (not included). Ideal start in radio. Shipping weight 3 lbs.
Loudspeaker 2 1/2" PM (extra) **1.95**
Headphones **\$1.00**

Figure 10: Ad from February 1949 Popular Mechanics Magazine. This is one of the rare early ads that gives a model number.

Heathkit 3 TUBE ALL-WAVE RADIO KIT
(Cabinet) EXTRA

An ideal way to learn radio. This kit is complete ready to assemble with tubes and all other parts. Operates from 110V. AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit. Operates loud speaker. **Model K-2**

Shipping Wt. 4 lbs.

HS30 Headphones, per set..... \$1.00
Shipping Wt. 1 lb.

No. 303 2 1/2" Permanent Magnet Loud-speaker..... \$1.95
Shipping Wt. 2 lbs.

Mahogany Cabinet..... \$2.95
Shipping Wt. 2 lbs.

\$87 1/2

Shipping Wt. 4 lbs. **Model K-2**

Figure 11: Ad shown on the RigReference website for the K-2. Ad shows model number and an increase in shipping weight to four lbs. Source for this ad is unknown - see text.

headphones or the optional speaker. The schematic for the K-1 is shown in Figure 13.

The K-2 All-Wave Receiver (Figure 12):

Figure 10 leads us to believe that the K-1 was still selling in February of 1949. In the January 1950 Heath ads no reference was made to an all wave radio, nor did the K-1 or K-2 ever appear again to my knowledge. Thus, sometime after February and before 1950, the K-2 replaced the K-1. Another clue might come from an ad on the RigReference.com website (Figure 11). Instead of a photograph of a K-2 they show an ad with the comment *Heathkit K-2 - Magazine Ad*. Unfortunately no magazine or date were given. A search for this ad has, so far, not turned up anything. What makes the ad unique is that it states: Model K-2. One thing of note is that the shipping weight changed to 4 lbs. in this ad. Looking over the ads from Radio Craft and Radio News the weight never seemed to have been updated through the end of December 1949. However the September 1949 Heath flyer does show the updated weight so I'm assuming the K-2 was being sold by then.

From the front, the K-2 looks almost identical to the K-1. The model is included on the front panel of (at least some of) the K-2s. The few K-2s I've seen in photos also seem to have a different knob and possibly a vernier for the tuning capacitor. This likely is a user add-on. Out of the case, or from the rear, it is easy to tell the K-1 from the K-2. The K-2 has a different tube line-up. A single metal 12A6 audio amplifier tube remains in between two glass 1626 triodes. These tubes replace the 12A6 used as a rectifier and the 12C8 receiver tube in the K-1. (Table II). One of the 1626 tubes is now wired as a diode for power rectification. I have not seen a K-2 schematic, but the change from a pentode to a triode must result in changes to the receiver tube wiring including how the VOLUME (regeneration) control functions.

Operating the K-1 or K-2:

Before operating the K-1 or K-2 an aerial must be connected to the binding post near the tuning condenser. A wire about 20' long is okay for local stations but a longer aerial (50' - 100'), up 20' or more is recommended



Figure 12: Photo of a K-2 from the Antique Wireless Association Museum. Note model number on front panel (lower center) and the two 1626 glass tubes that replace the 12C8 and one of the 12A6 tubes used in the K-1 Photo posted by Jim - N2EY on QRZ.

| # | Coil Name | Low Frequency | High Frequency | Cost |
|---|--------------|---------------|----------------|-------------------|
| 1 | Long Wave * | 200 kc | 500 kc | 90¢ |
| 2 | AM Broadcast | 500 kc | 2,000 kc | Included with kit |
| 3 | Short Wave | 2,000 kc | 6,000 kc | Included with kit |
| 4 | Short Wave * | 6,000 kc | 21,000 kc | 90¢ |
| * Optional coil advertised from Nov. 1948 till Feb. 1949 in Heath Flyers Only | | | | |
| Table III: K-1 and K-2 Plug-in Band Coil Data | | | | |

for DX. If the radio has the optional speaker installed you are all set. If not, or if you want to do some private listening, a pair of high impedance (~2,000 Ω) earphones needs to be plugged into the headphone jack on the front panel.

To operate the regenerative radio first decide what band you want and install the proper coil in the octal coil socket. Once installed and the AC line cord is plugged in, the radio is turned on by advancing the VOLUME control clockwise until the switch clicks. After a short wait for the tubes to warm up the VOLUME control can be advanced and a station tuned in. Continue to introduce regeneration until a whistle is heard. At this point back off the volume until the oscillation stops. This is the most sensitive setting. Any significant frequency change may require readjusting the regeneration. To receive CW

you may increase the VOLUME until oscillation begins; this oscillation acts as a BFO and gives the CW signal a tone. A skilled operator can use this feature to actually receive SSB; but it takes a lot of practice.

One caveat: when the receiver is oscillating it is radiating a signal to the antenna. Many a want-a-be ham, in the early days, would hear a CW signal and turn up the regeneration and key the receiver for their first QSO. Many better regenerative receivers had an RF amplifier stage in front of the regenerative stage to isolate the receiver from the antenna, eliminating radiation. In the early days of radio receiver regeneration leakage was a major source of QRM.

Summary:

This article is the result of reviewing dozens of Heath ads from many different magazines. Only a handful of K-1s seem to exist today and even fewer K-2s. Heath, not using model numbers for their ads, further makes researching early Heath history more complex. Sometimes a model would change without the ad being updated and the only clue would be that the item drawing changed in some slight way.

73, from AF6C



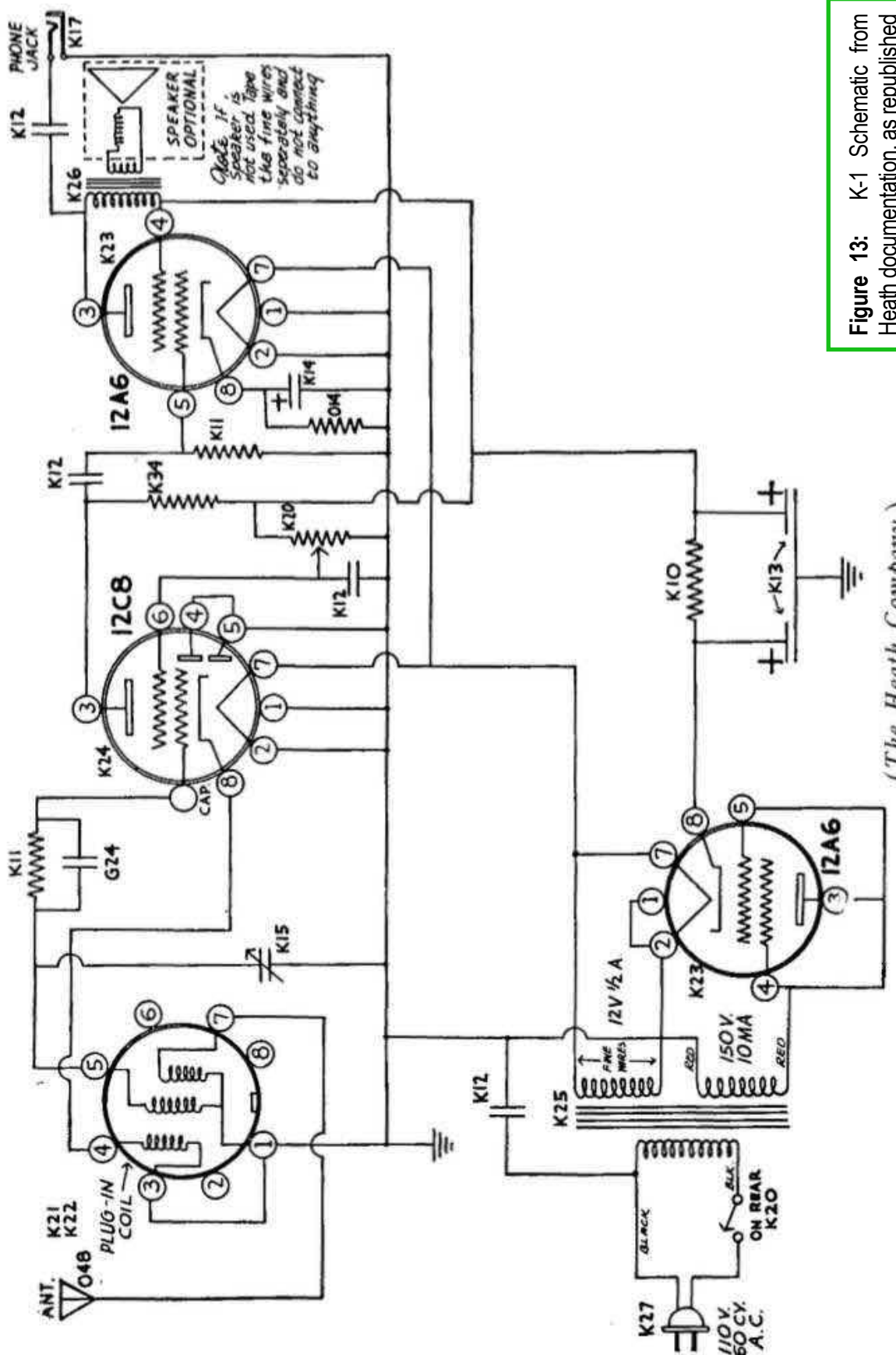
Note 1:

The reversing of an image is something Heath did on occasion in their advertising. In the Dec. 1947 *Radio News* ad that introduced the V-1 VTVM, the meter needle was at full scale. This continued each month until the March ad where the image was shown properly. I mentioned this to Chuck Penson - WA7ZZE and he showed me that the photos on the front and back cover of the Fall - Winter 1960 - 1961 Heathkit Catalog were printed backwards. It is hard to tell, as there is no text large enough to read. The kits shown are flipped, and the biggest clue is that the two tone Heathkit emblem on two of the kits are reversed, with the red on the left. There is no readable text (without magnification) to give the reversal away. Even knowing this, K-1 speaker position at first.

This article originally appeared in the November 2017 issue of RF, the newsletter of the Orange County Amateur Radio Club - W6ZE.

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

Thanks - AF6C



(The Heath Company.)

Figure 13: K-1 Schematic from Heath documentation, as republished in the ninth edition of the Fredrick Collins Radio Amateur's Handbook; also the source for Figures 1 and 9.