AWA Review

The Earliest Heathkits and a Database for 1947 - 1956

ABSTRACT

It is not possible to estimate the positive influence Heathkits had on generations of technical-minded individuals. Not only did Heath make devices available at much lower prices than commercially available units, the dimensions of understanding achieved through the assembly process they added were invaluable. Early on, employees were few; later there were hundreds or even thousands but with little recall of the past. This article is intended to add to that knowledge for historians and collectors. The first two years of kits, a time of rapid change, is treated in greater detail, and a database of the first ten years is provided in this article. Early changes, even if short lived, are of interest to historians and collectors. There were other kit makers, but only one Heathkit.

The purpose of this article is to provide historians and radio collectors with additional information on the earliest couple of years of Heathkits beyond that readily available at the present. A comprehensive listing of all Heathkit products for the first ten years is included to allow for a better understanding of the changes in kits sold from 1947 to 1956. The methods used to acquire the reference information are outlined in Heathkit Assignment of Model Numbers below. I felt that a better understanding of the early Heathkits is appreciated by discussing the factors affecting assembly manuals, model numbers, parts availability, and so forth. This is done in the following sections. Finally, photographs of a number of the specific early kits are included to help understand the design changes that are helpful for identification within a given kit, as well as early influences of parts availability such as surplus electronic sales. In the database tables I felt it important

Fig. 1. Edward Heath and his Baby Bullet airplane

to include in a brief description, information on the timeframe each kit was advertised, and price. In the Supplement, provision is made for a checklist to record whether or not one has a given item or manual. The alphanumeric table (Table III) is in the Supplement as a quick reference to aid in locating a given Heathkit if the model number is known.

It is unlikely that we fully appreciate the role of Heathkits in helping engineers, scientists, technicians and amateurs understand how things work and the relationship among components through the kit building process. My interest is in early Heathkits and their variations, a time in the history of the Heath Company when employees were few, only about 45 persons, later to number hundreds to thousands. Subsequent employees had little or no memory of the early days. This complicates the job of historians.

HEATHKIT HISTORY

The company was started in 1926 by Edward Heath, a former barnstormer, with the first products being airplane parts and kits, especially the Parasol airplane (Fig. 1). Heath died February 1, 1931 in a test flight crash. The company was purchased by Howard E. Anthony in 1935 and moved into surplus sales and electronic kits. Anthony was the driving force behind the development of the Heathkit electronic kits we know today (Fig. 2). He was in charge during the important early years of 1947 to 1950 and thereafter. He guided the company through the government surplus years of tubes and parts, to the era of higher production and more sophisticated instruments and assembly techniques. As described in a 1955 catalog (Ref. 1), he was "Mr. Heathkit." Tragically, he died in an airplane crash on July 23, 1954. The 1955 catalog gave a detailed history of Anthony and should be read by anyone interested in the history of Heathkits. Additional history of Heathkit, as well as the era of Anthony, has been well documented by others, especially Chuck Penson (Ref. 2), Ron Grossman (Ref. 3), Terry Perdue (Ref. 4), and John Dilks (Ref. 5). After 45 years of operation, the maker of Heath electronic kits closed its doors in 1992, but continued with a line of educational products.

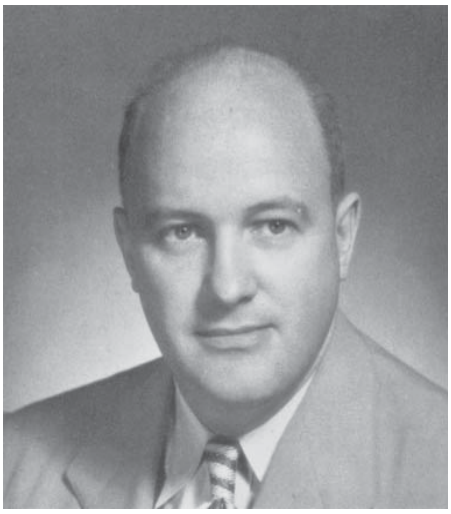


Fig. 2. Howard E. Anthony

MY OWN EXPERIENCES

My own venture into Heathkits started back in 1948 when I ordered a Heathkit battery operated All Wave Radio for $8.75. That price doesn't sound like much, but I was born and raised on a farm in South Dakota and in 1948 we had no electricity, which was typical for the time in our rural area. I earned the $8.75 trapping muskrats that I sold to Sears Roebuck in St. Louis for 75¢ to 95¢ each after the usual pelt preparation, which was a lot of work. I was pretty excited about getting the All Wave, but when it

arrived, I was depressed to find that they had sent the AC type. Included was a personal letter stating they were all out of the battery powered All Waves so they sent the AC type instead. To say I was disappointed was an understatement, and I sent the kit back. However, the personal letter was typical of Heathkit. My current efforts as described herein reveal that the K-2 All Wave battery type was advertised for only one month in Radio News, in July 1948. Today I wonder if they actually ever produced that battery version at all.

My next Heathkit was an M-1 Handitester I purchased in September 1949 for $13.50. This was almost half the cost of the popular Triplett meters of the same type. It was a beautiful multimeter which was easy to assemble. Still lacking electricity, which we didn't get until the Federal REA came in the area in the 1950's, I heated the soldering iron with a blow torch, which every farmer and rancher had. I loved that meter. However, as an engineering student in 1952, I sold the M-1 for $10.00 since I needed the money. I'm sure many reading this will appreciate doing such things in times of need. When my finances improved later in my career, I looked for years at flea markets and hamfests to find a Handitester replacement, but I was never successful. With the advent of eBay, I did find and buy one, which I still have. In fact, I bought quite a few on eBay until I gained control of myself.

I've lost track of how many Heathkits I built over the years. The last was an IO-10 oscilloscope many years ago. I never had the courage to take on the big stuff like their color TV kit. But I still remember ordering the Heathkits, anticipating the mail, unpacking the small packages of parts, assembling the instrument, and best of all - when I turned on the device it worked!

EARLIEST YEARS – THE WAR SURPLUS ERA

When one examines the earliest Heathkits, such as the O-2 Oscilloscope, the V-1 VTVM and others, the kits used surplus metal vacuum tubes, surplus CRT's and, initially, oil filled capacitors (military grade). It also is apparent that as the availability of these parts dried up, the Heath Company switched to less expensive items, such as from toggle switches to slide switches or more available items such as from JAN military tubes to commercial glass tubes. Remarkably, Heath, as a rule, did not increase prices except for the K-1 All Wave Radio, which may have been underpriced at $5.95 when introduced in May 1948.

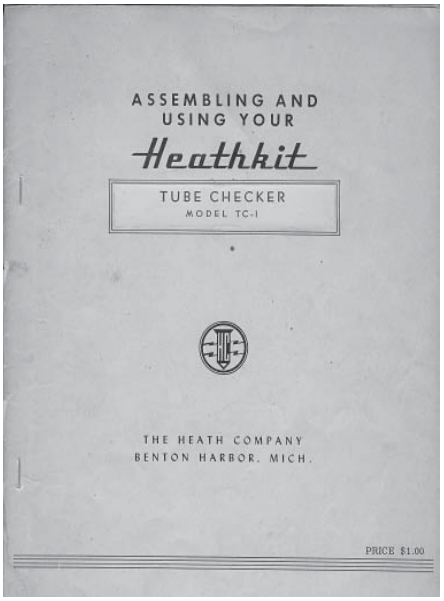
Government surplus electronic sales ended March 1, 1948, according to a notice in *Radio News* for March 1948, page 191. Heathkits were priced about one-half of comparable commercial instruments. Early on, surplus sales undoubtedly played an important part in price, but later high volume enabled Heath to hold the line on prices. For a while, Heath probably also had a sufficient reserve of parts such as the surplus General Radio potentiometers used in IB-1 Impedance Bridges, first advertised starting in June 1948, as well as oscilloscopes and VTVM's.

CHANGES IN INSTRUCTION SHEETS AND MANUALS WITH TIME

In their first kits, such as the O-1 Oscilloscope, Heath made it clear you should have experience in building electronic apparatus. However, within a few months, although such knowledge helped,

one didn't have to know how to read a circuit diagram or schematic to build a Heathkit. Few things have been so well written in the electronic literature as the manuals produced by Heath. As it ends up, it was an iterative process starting with schematics and narrative description of what to do and then evolving into step-by-step instructions with numerous drawings to fulfill the reported Heathkit motto, "We will not let you fail."

This required the hiring of professional technical writers and developing internal techniques to verify the accuracy of the manuals before large-scale production. One of these techniques was to have an employee build a kit using the manual and then having the result evaluated by the engineering department and technical writers. The following briefly outlines manual and instruction sheet design and evolution (Fig. 3):



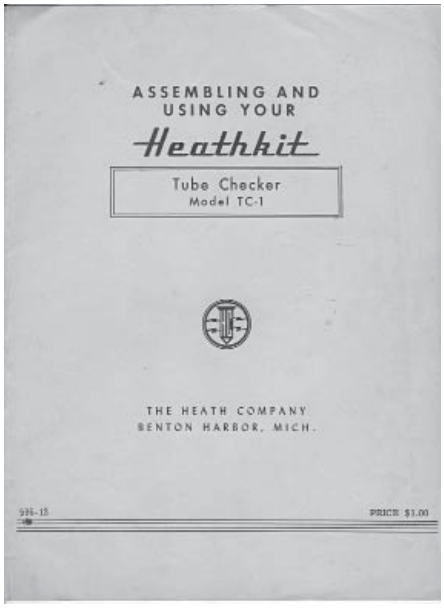


Fig. 3. Early Heathkit Manuals (A) Blue-green colored manual with pasted-on label (B) Blue-green colored manual with printed label (C) Yellow-colored assembly manual.

1) No step-by-step instruction: Schematics, simple line drawings of component placement, parts list, and an instruction sheet. Used for the O-1 and O-2 Oscilloscopes.

2) Blue-green colored assembly manuals with a pasted on paper label showing name and model number and some narrative, a schematic, parts list and step-by-

step instructions. Used for early V-1 VTVM, O-3 Oscilloscopes and some others.

3) As production levels increased, the paper label was replaced by blue-green manual covers printed directly with the name and model of the Heathkit.

4) Early yellow-colored assembly manuals.

5) Yellow-colored assembly manuals with large fold-out drawings. Sophisticated step-by-step instructions with sub-drawings. More detailed descriptions of how the kit worked and the use of the device appeared. Check off provisions were in the manual to help builders follow progress. Later this was the most common type used.

6) Still later, the yellow-colored assembly manuals had different artwork on the cover and, as the devices became more complex, multiple manuals appeared for a given kit.

A photograph of the external appearance of a given instrument did not appear in early manuals, but there were photographs of the interior. When external photographs did appear in the later manuals, they frequently were not changed as the model's appearance changed. Early parts lists did not use part numbers. Later, Heathkit numbers were assigned for every part.

CHANGES IN APPEARANCE – A CLUE TO AGE

Early kits set the stage for later devices with respect to color schemes, knobs, meters and so forth. The exception is the O-1 Oscilloscope that, in some respects, had a different panel layout from subsequent models. For all early Heathkits, it appears that most of the circuit designs were from existing manuals and handbooks, as well as reverse engineering of more complex devices. Early Heathkits tended to have short production runs. Exceptions, like the TC-1 Tube Checker were advertised for many years (March 1949 to August 1953).

New Handles. The first Heathkit, the O-1, had a painted brass handle. An advertisement in the April 1948 *Radio News* shows four test equipment kits, all with the earliest khaki painted brass handle. These kits are the O-2, G-1, G-2, and V-1. None are identified by model number in the advertisements, but all had the model number on the actual instruments. Under "Tips and Comments" on page 3 of the March 1948 *Heath Flyer*, it is noted that there are new handles for Heathkits. It is stated that starting April 1, 1948, a new, modern polished aluminum handle is to be furnished with all Heathkits. In the May 1948 *Radio News*, on page 102, Heath advertised the new T-1 Signal Tracer and the C-1 Condenser Checker. Both the T-1 and the C-1 are shown with the new polished aluminum die cast handle. Even later, Heath cast the words "Heathkit Precision" in the aluminum handles. Eventually, Heath replaced these with molded plastic handles, probably as a cost-saving measure. The first oscilloscope with an aluminum handle was the O-3, first advertised in the July 1948 *Radio News*.

New Binding Posts and Knobs. The first Heath knobs were sculpted black Bakelite with some being plain black with straight sides. In 1952, Heath came out with new binding posts and black knobs with biconcave sides to allow finger tip operation (Fig. 4). A rectangular section opposite the pointer gives the knob "balance and proportion" according to Heath. The binding post (Fig. 4) was designed to accommodate

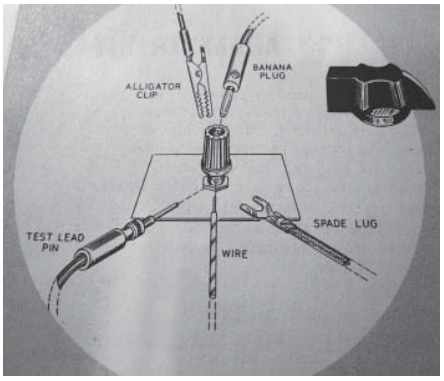


Fig. 4. New Binding Posts and Knobs (Heath Flyer for October 1952, page 10)

an alligator clip, banana plug, test lead pin, wire, and spade lug. The cap is plastic insulated on the outside with flutes for easy grip. As far as I can tell, this knob was first used on the V-5A VTVM.

Cases. Cases are of little value in determining age since all oscilloscopes in the O-Series used almost the same case. The G-1, C-1, T-1 and G-5 also used the same grey-colored case.

Panel Color. Except for the O-1, which may have been shades of black similar to the AT-1 Amateur Transmitter, all early Heathkit panels were beige with a surrounding red stripe, the so called "red-face." Later many models were changed to charcoal grey in color with no other physical changes. Still later, Heathkits had distinctive knobs, cases and colors.

HEATHKIT ASSIGNMENT OF MODEL NUMBERS

A number of problems arise in chronicling Heathkit models. This has to do with available source materials and peculiarities in model number assignments made by Heath. Since it represents the broadest source of Heath advertisements, I chose *Radio News*, which later became *Radio and Television News* starting in September 1948, as a basic source for advertisements. Early on in 1947, the first Heath ads were not included every month. Later, they ran to 10 or 11 continuous pages of Heathkits. Problems with sources include:

1) Items sold but never advertised, such as the V-2A VTVM and the G-4 HF-AM Signal Generator.

2) Items advertised but possibly never sold, such as the V-3 Battery Powered VTVM.

3) Major change made but panel unchanged, such as the V-5 and V-5A VTVM. The V-5A uses a different tube and circuit, and the assembly manual says V-5A, but the panel still shows V-5.

4) Prototypes used in advertisements such as the TC-1 Type 1 Tube Checker.

5) A series may or may not be the same type of instrument. The V-Series (V-1, V-2, etc) are all vacuum tube voltmeters, whereas the G-Series are all different.

6) Heath *Flyers* were not identified as to month or year, only stating such as "Fall *Flyer*" for example.

7) Heath did not identify model numbers in early ads.

8) Heath dated kit schematic drawings the first year or so, and then stopped.

9) Heath would use the old version of the ad. For example, the January 1949 *Heath Flyer* has information on the new V-2 VTVM, but shows a picture of the V-1 VTVM (which has 5 ranges), whereas the V-2 has 6 ranges.

10) Sometimes an ad showed a reversed left to right image of the device.

Therefore, one cannot simply use common advertising sources, but must also consult schematics, assembly manuals, parts lists, and actual items in collections.

Most variations in a given model in the early years depended on two factors: (1) availability of surplus materials and (2) circuit improvements. Later model changes were due mainly to circuit changes or more sensitive components such as meters. For example, the V-2 VTVM used six, rather than five, ranges and regular flashlight batteries rather than the original and more expensive 3-volt B2FP Battery used in the V-1 VTVM.

THE HEATHKIT MULTI-YEAR DATABASE

With knowledge comes discrimination—the fundamental difference between the collector and the accumulator or hoarder. The collector or historian wants to know the origins, the differences, the variations and the quality issues. In general, the collector wants the best examples or museum quality, and they want to understand the reasoning behind changes. The accumulator wants all they can get, even if some are of poor quality. However, the accumulator often helps discover changes and variations that are important. Thus both collectors and accumulators help preserve history, especially those who are a little bit of both, like many of us.

From the printed documentation and observations of existing equipment, a table was created containing the following information: Model number, description, first advertised or probable date of introduction, date last advertised, and price.

Table I covers the 10 years of electronic kit manufacture and is chronological. Table II is the same data as an alphanumeric list that makes it easier to find a given Heathkit if you know the model number. Table I is at the end of this article, and Table II is intended to be located on the AWA website.

SPECIFIC EARLIEST HEATHKITS

O-1 Oscilloscope. The first Heathkit was the O-1 Oscilloscope, which was first advertised in *Radio News* in the July 1947 issue in a small ad with few details. This was followed by an ad in the September 1947 issue of *Radio News*, showing the price at $39.50 and a small picture of the O-1. A subsequent ad in the November 1947 *Radio News* on page 102 shows the O-1 with a display of the parts (Fig. 5). Many parts for the O-1 were war surplus, especially the 5BP1 cathode ray tube (CRT). It is said that Howard Anthony purchased a railroad car load of these at a very low price. The lowest price I found for a 5BP1 CRT was in a Lafayette Radio ad in the August 1948 *Radio News*, on page 114. They were selling the CRT for $1.39, which the ad stated was "about one-tenth of the list price." Apparently the demand for the O-1 was brisk. It is unknown how many were produced—perhaps only a few hundred. No O-1 Oscilloscopes have surfaced at this time in any museum or private collection.

We are not even sure about the O-1 panel color, but it did have a painted brass handle identical to those for later Heathkits such as the V-1 VTVM, the earliest G-1 Signal Generator, the earliest Sine and Square Wave Generator kit model G-2 (*Radio News*, June 1948, p. 86) and the O-2 Oscilloscope.

At the Dayton Hamfest on May 20, 2005, I chanced onto a packet of information on the O-1. The packet included three blueprint drawings: an original schematic dated September 8, 1947 (Fig. 6), two pictorial original assembly drawings (Figs. 7 and 8), a typed construction sheet, and a typed

Fig. 5. First Heathkit Advertisement Showing O-1 Oscilloscope and Parts (*Radio News*, November 1947, pg. 102).

parts list. Except for the schematic, all were undated.

A fourth sheet, also undated, that was included was titled simply "Heathkit 5" Oscilloscope" and included specifications and weight. Stapled to the left lower portion of this sheet was a small black and white photograph (Fig. 9) of what we now call the O-1 Oscilloscope. The photograph is high quality and about 1 1/8" wide by 2 3/16" tall. The photograph depicts the earliest type handle (same as sub-

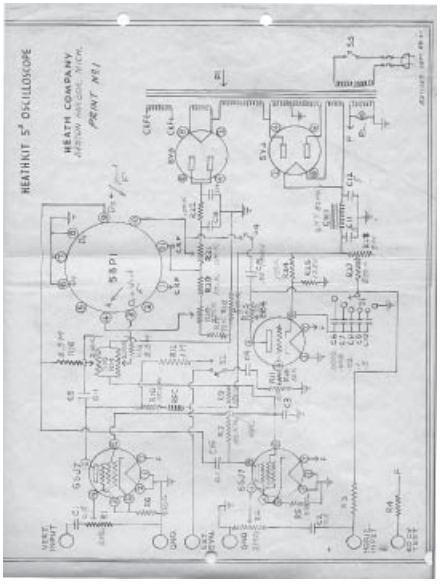


Fig. 6. Schematic of O-1 Oscilloscope Print No. 1.

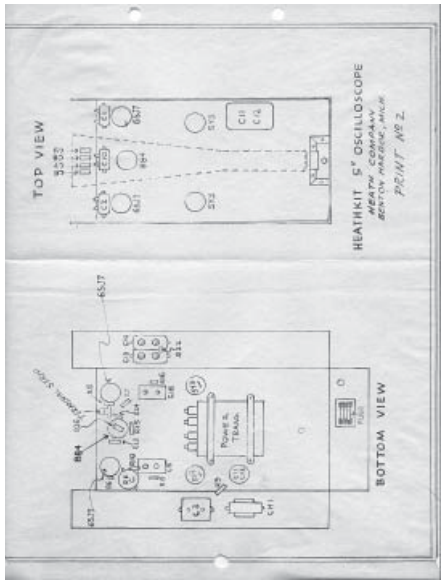


Fig. 7. Bottom and Top View Pictorial of O-1 Oscilloscope Print No. 2.

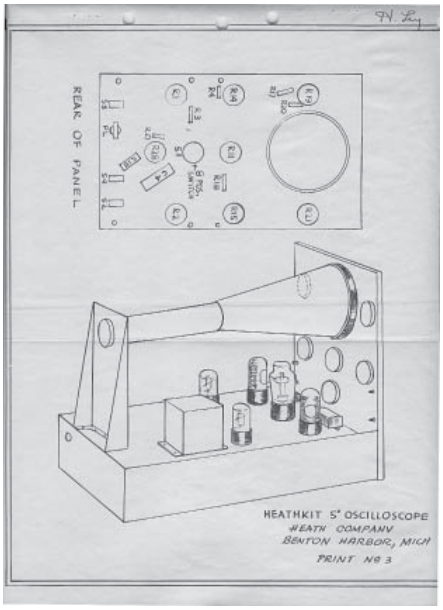


Fig. 8. Rear of Panel and Isometric Pictorial of O-1 Oscilloscope Print No. 3.

sequently used on the O-2).

The tube complement is one 5BP1 Cathode Ray Tube, 2x 6GSJ7 Amplifiers, 2 5Y3 Rectifiers and

Fig. 9. Copy of my O-1 Oscilloscope Photo.

and 884 triode gas thyratron, (same as 6Q5) for the Sweep Generator. The O-1 contains two 5 µfd 600V Pyranol GE condensers and two 1000v oil-filled condensers. The handle was khaki painted brass. The step frequency switch had 6 contacts as shown in the September 8, 1947 blueprint schematic, one of which was a connection to chassis ground. The sweep frequency range was 15 Hz to 30 KHz. The copy of the O-1 photograph in the author's collection (Fig. 9) appears to have 7 switch positions.

Nowhere in any of the drawings, instructions or lists was the oscilloscope referred to as an O-1. Although it has some features similar to the O-2 and later oscilloscopes, the design is distinctive. It appears, in my opinion, to have a paint scheme somewhat in keeping with the AT-1 Amateur Transmitter, which was first advertised much later, in May 1953.

O-2 Oscilloscope. The O-2 Oscilloscope was advertised for five months, starting in February 1948 through June 1948. It had a khaki painted brass handle and toggle switches (Fig. 10). The external appearance of the O-2 was strikingly different from the O-1. It had a line around the outside of the panel, the so-called "red-face" design, and all binding posts were moved to the lower part of the panel. It had the same tube complement as the O-1. The sweep frequency control was changed to 5 positions. The assembly information was changed to one schematic blueprint (dated January 8, 1948), one layout drawing blueprint (dated January 8, 1948), one construction sheet (dated January 12, 1948), and one parts list (dated January 27, 1948). All of these are in the author's collection. A fuse block was added to the power input, as was a bypass

Fig. 10. O-2 Oscilloscope, note earliest handle

condenser. A number of circuit changes were also made to improve performance.

O-3 Oscilloscope. The O-3 Oscilloscope was advertised starting July 1948 for nine months and priced at $39.50 (Fig. 11). This is the first Heathkit oscilloscope with the new polished aluminum handle. It was made in two versions. The first (Type 1) has toggle switches, and the second (Type 2) has slide switches. The Type 2 (Fig. 12) was probably produced at the end of the O-3 production run in March 1949.

The O-3 Oscilloscope has provisions on the front panel to switch the horizontal and vertical amplifiers directly to the CRT deflection plates (Fig. 12). For the first time, it had a connection at the rear of the oscilloscope chassis near the power cord to intensity modulate the CRT. The O-3 had a green assembly booklet with a pasted on paper label "Oscilloscope Model O-3."

A kit (Heathkit #315) to convert

Fig. 11. O-3 Oscilloscope, Type 1 Aluminum handle. Note "AMP. PLATES" on both gain controls.

the O-3 and O-4 oscilloscopes to the push-pull amplifiers circuit found in the O-5 was made available for $12.50 in September 1949. The O-4 Oscilloscope was the first to use electrolytic capacitors in its filter circuit.

V-1 VTVM. The V-1 VTVM was the second Heathkit and was advertised in *Radio News* starting in December 1947, continuing for 16 months. The Heathkit V-1 VTVM uses a balanced bridge type circuit using two triode sections of a 6SN7 tube. Its 11 megohm input resistance prevents loading

Fig. 12. O-3 Oscilloscope, Type 2 Slide switches

Fig. 13. V-1 VTVM, Type 1, 5 ranges, toggle

of circuits under test. The meter is a 500 microampere movement, and the circuit uses 1% precision resistors. The ohmmeter measures one tenth of an ohm to one billion ohms. It came in three types, only two of which were advertised. The Type 1 has the khaki painted brass handle, a toggle on-off switch and 5 ranges. It was advertised December 1947 through June 1948 (Fig. 13). The Type 2 had a polished aluminum handle and a longer bat-handle toggle switch on most. The Type 2 was advertised for nine months, starting in July 1948. The Type 3 was like the Type 2 except it has a slide on-off switch (Fig. 14). I believe it was produced at the end of the V-1 production run, probably in March 1949. It was never advertised but is in my collection and that of Jay Whipple, Jr. The V-1 was AC powered and used a Type B2FP 3-volt battery (no longer available) mounted on the chassis. A picture of the interior of a V-1 VTVM Type 2 is shown on page 2 of the June 1948 *Heath Flyer*. This view shows the type B2FP 3-volt battery used only in the V-1's mounted on the chassis.

V-2 and V-2A VTVMs. The V-2 VTVM appears similar to the V-1 Type 3 except it has 6 ranges. It is AC powered, like all V-Series VTVM's except the V-3. The V-2 used 2 D-size flashlight batteries mounted on the back of the case for the ohms circuit. It was advertised April 1949 through November 1949 (Fig. 15). On the first page of the January 1949 *Flyer*, Heath states that there are no yearly models, but models

Fig. 14. V-1 VTVM, Type 3, Slide on-off switch, has polished aluminum handle.

"change as improvements are made." In the same *Flyer*, Heath illustrates the rationale behind the development of the V-2. It included a special battery tray using two flashlight D cells for the ohm meter, thus eliminating the special and expensive B2FP 3-volt battery. Savings enabled the purchase of two additional precision resistors, allowing the addition of a sixth range, a 10 v.a.c. and v.d.c. range and an R x 10 range, giving a total of 24 ranges. The meter was changed from 500 μa to 200 μa, increasing the sensitivity. The early photographs announcing the new V-2 show the old V-1 Type 2 (see Tables) with 5 ranges. This is not unusual since the art department and marketing were sometimes out of sync, or possibly Heath sought to save money by reusing artwork.

A V-2A version was made probably in November 1949, but it was never advertised. It had a larger meter than the V-2 (Fig. 15). The V-2A was replaced by the V-4 (with a larger meter) starting in December 1949 at the same $24.50 price.

V-3 VTVM. The V-3 VTVM was battery powered and was advertised starting in March 1949 for three consecutive months (Fig. 16). It is interesting to note that the V-3 was first advertised one month prior to the V-2. The V-3 was to sell for $34.50. No V-3 has surfaced in any collection to my knowledge, however the fact that it was advertised for three months suggests it was produced and sold.

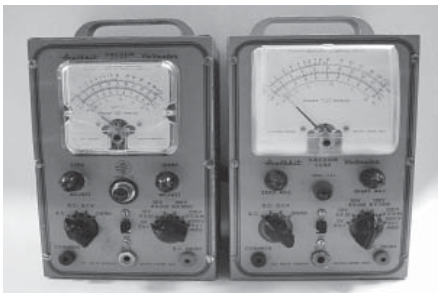


Fig. 15. V-2 VTVM 6 Ranges and V-2A with Larger Meter. (J. Whipple, Jr. collection)

G-1 Signal Generator. The G-1 Signal Generator was introduced in January 1948, just one month after the V-1 VTVM. This Heathkit signal generator provides fundamentals from 150 kHz to 30 megahertz with good harmonics to over 100 megahertz. The instrument produces 400 Hz audio as well. The G-1 uses a 6SN7 RF oscillator and amplifier and is transformer operated. Most of these G-1's work when found because of the use of oil filled capacitors and other war surplus parts. It was produced in three types (Type 1 in Fig. 17). See Table I. Unlike the V-Series where each is a VTVM, each member of the G-Series is a different kind of instrument except for the G-5 which is a Model G-1 with a vernier main control and a few circuit changes.

Fig. 16. V-3 Battery Powered VTVM (Radio News, March 1949, pg. 73)

G-2 Sine and Square Wave Audio Generator. Advertised as a companion instrument to the Heathkit Oscilloscope, the G-2 Sine and Square Wave Audio Generator covers 20 to 20,000 Hz. The instrument uses 5 tubes, a 6SJ7 and 6K6 in the oscillator circuit, a 6SL7 square wave clipper, a 6SN7

cathode follower output and a 5Y3 as the rectifier for the transformer power supply. The cabinet is grey crackle painted with a "red-face" panel that matches other Heathkit instruments (Fig. 18). The G-2 was produced in three types. See Table I.

G-3 Sweep Generator . The G-3 Sweep Generator was first advertised October 1948 through March 1949 (Fig. 19) for $24.50. It covers 2 megahertz to 226 megahertz either RF or FM with a variable sweep width from 0 to approximately 10 megahertz. It was replaced by the TS-1 TV Alignment Generator in April 1949.

Fig. 18. G-2 Sine and Square Wave Audio Generator, Type 2, Toggle Switch

Fig. 19. G-3 Sweep Signal Generator

G-4 High Frequency AM Signal Generator. Thought by some to not exist since it was never advertised, I obtained a G-4 from eBay on September 21, 2003 (Fig. 20). I do not know the original Heathkit selling price, but I was, surprisingly, able to purchase a copy of the manual from a company online on April 11, 2009. The schematic is dated April 1, 1949.

G-5 Signal Generator. The G-5 Signal Generator is very similar to the G-1 Signal Generator

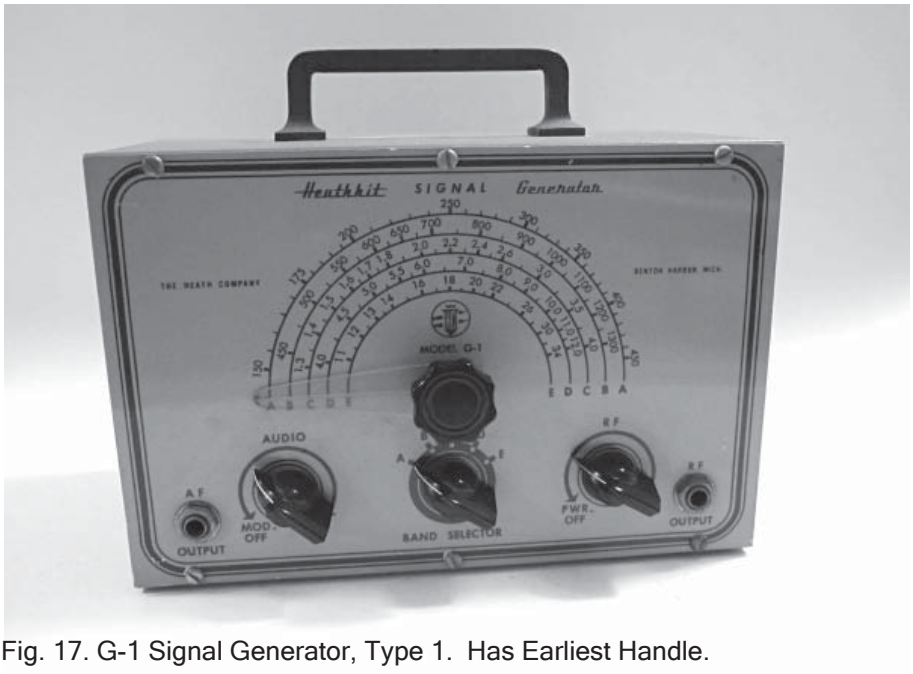
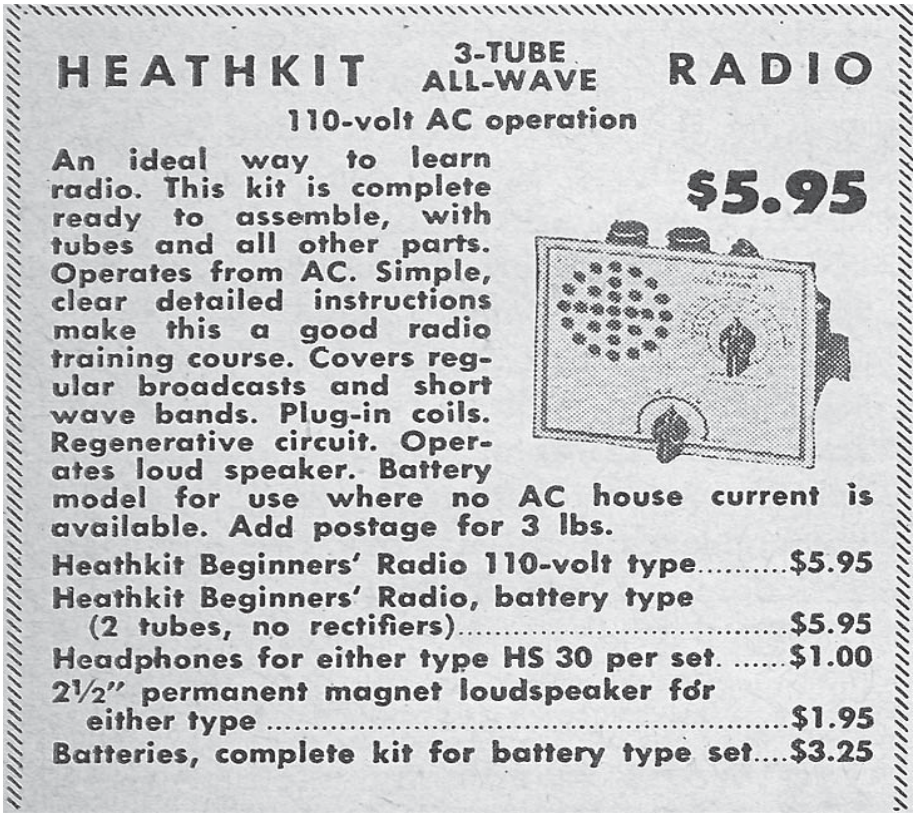


Fig. 17. G-1 Signal Generator, Type 1. Has Earliest Handle.

Fig. 20. G-4 HF-AM Signal Generator

except it has some circuit changes and the main tuning dial is a vernier, thus facilitating adjustment. It was the last of the G-Series and was advertised September 1949 through August 1950 for $19.50. It was replaced by the SG-6 Signal Generator in September 1950 (see Table I).

K-1 All Wave and K-2 All Wave Radios. Heathkit's first radio was a 3-tube All Wave Radio Kit first advertised in *Radio News* in May 1948 for $5.95 with a speaker to the left (Fig. 21). The price was increased in June 1948 to $8.75. A 2-tube battery version was introduced at the same time which was advertised in May 1948 and June 1948 at the same price with the same price increase as the AC version. The All Wave was not advertised in *Radio News* after June 1948. Some sources indicate that this was model K-1. Model HS-30 headphones were advertised May 1948 to December 1949 for $1.00. A 2.5" PM speaker was optional and was advertised for this and the later K-2 All Wave from May 1948 to December 1949



HEATHKIT 3-TUBE ALL-WAVE RADIO

110-volt AC operation

$5.95

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from 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. Battery model for use where no AC house current is available. Add postage for 3 lbs.

Heathkit Beginners' Radio 110-volt type.....$5.95
Heathkit Beginners' Radio, battery type (2 tubes, no rectifiers).....$5.95
Headphones for either type HS 30 per set. $1.00
2½" permanent magnet loudspeaker for either type $1.95
Batteries, complete kit for battery type set....$3.25

Fig. 21. K-1 All Wave Radio (Radio News, May 1948, pg. 103)

for $1.95. To my knowledge, no K-1 All Wave, either AC or battery type has survived. Since the K-1 was advertised only two months, there is some question as to whether it was actually produced.

The Heathkit K-2 All Wave is another matter. These survive in my collection (Fig. 22) and at least two others. The tube complement of my K-2 is one VT-169 (12C8) and two VT-134 (12A6) JAN war surplus tubes. The front panel is 6" by 4 5/8", and the set is 4 5/8" deep. The hole for the speaker grill is 2 1/8" in diameter. An obvious difference between the K-1 and the K-2 All Waves is that the speaker is on the right side and has a provision for a grill on the K-2 whereas it has 29 perforations instead of a hole on the K-1. Although the speaker itself was an option at $1.95, all of the K-2's that I have seen have a speaker in place. Further, some of the K-2's, identified by a speaker on the right, have K-2 written on the panel while others do not. The K-2 came with two coils housed within regular bakelite octal tube sockets, one for the broadcast band and one for short wave (1500 Kc to 6000 Kc). The coil with the built up winding is the broadcast band. The coil with the flat wider winding is the short wave coil. The K-2 All Wave Radio was advertised in *Radio News* from July 1948 through December 1949. A 2-tube battery version was also advertised but only for one month, in July 1948. To my knowledge, none of these have survived. In fact, this may have been the radio I ordered as a high school student and which never arrived as described earlier.

Several accessories made available for the K-2 All Wave were also for the K-1 All Wave, such as the 2.5

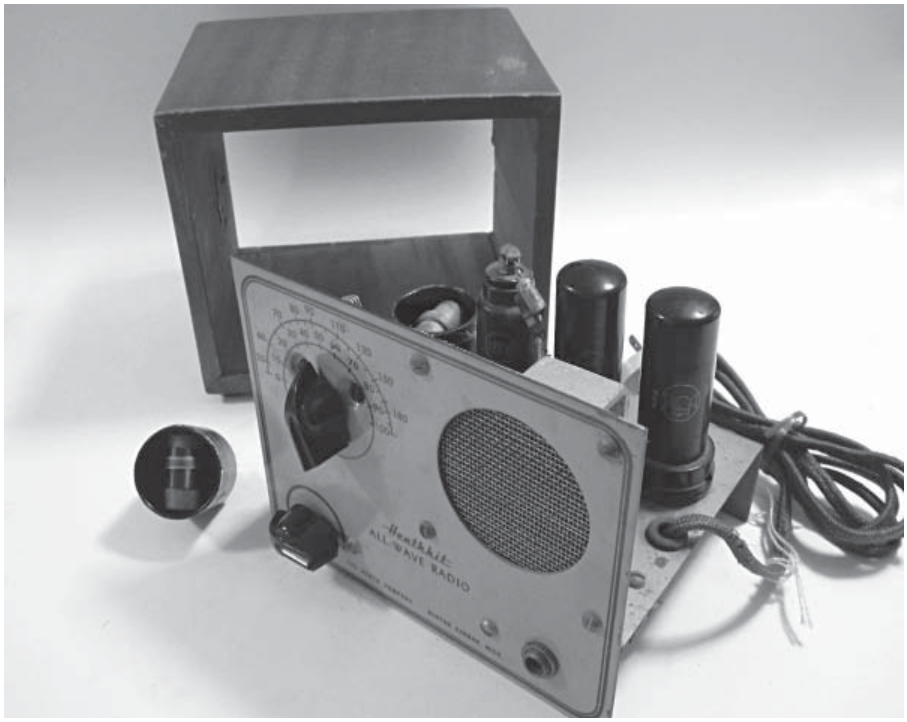


Fig. 22. K-2 All Wave. Note case, broadcast and short wave coils, war surplus tubes.

inch PM speaker, the HS-30 headphones, the Battery Set for $3.25 advertised May 1948 through July 1948 and the mahogany cabinet advertised January 1949 through December 1949 for $2.95. This cabinet may have fit both the K-1 and K-2, but was advertised after the K-1 was discontinued.

Of special interest is a set of accessory coils for the K-2 advertised only in the November 1948 *Heath Flyer* (Fig. 23) for 90¢ each. One coil was a long wave coil for 200 to 500 Kc and the other was a short wave coil for 6000 to 21,000 Kc. I have never seen either coil.

Based on a K-2 All Wave in the collection of Jay Whipple, Jr., later versions, or perhaps the last version, of the K-2 had a different tube complement of glass tubes (two 1626s and one 12A6) and a slightly higher front panel, 5 ¼ inches rather than 4 5/8 inches. This was probably done to accommodate the taller glass tubes. Also, this K-2 had a plastic dial pointer with an acorn style control knob (part no. V48) similar to that

Fig. 24. Probable Last Version of K-2 with vernier tuning. Jay Whipple, Jr. collection.

used in earlier Heathkit VTVM's (Fig. 24). This was coupled to a variable condenser with a vernier drive similar in principle to that used in the G-5 Signal Generator first advertised in the September 1949 *Radio News*. This vernier planetary drive system allowed for much better station selection, especially on short waves. Jay Whipple, Jr.'s K-2 manual states:

"Do not allow set to whistle as this interferes with neighbors radios. If trouble is experienced, consult your local radio service man and have him assist you in

Fig. 23. Photo of Ad with K-2 All Wave Accessory Coils (Heath Flyer November 1948, pg. 6 or Heath Flyer, January 1949, pg. 1)

checking the wiring."

This whistle of course was due to the regenerative circuit used in these radios. As one can see, this "contact your service man" evolved into better assembly manuals and a Heath policy of allowing builders to send in kits for repair, as well as an active approach of answering kit building questions.

T-1 Signal Tracer. The first Heathkit Signal Tracer was the model T-1 (Fig. 25). It was first advertised in May 1948 for 10 months at $19.50. This had a polished aluminum handle and, like all others up to this time, was a "red-face." This signal tracer uses an IN34 Crystal Diode probe that allows the input signal to be traced from antenna to speaker. The kit contains 3 tubes, a power transformer, and a 4" PM speaker.

Fig. 25. T-1 Signal Tracer

The size is 9" by 6" by 4 ¾". Intended for use in a radio service shop, this was replaced by the T-2 Signal Tracer in April 1949.

IB-1 Impedance Bridge. The Heathkit IB-1 Impedance Bridge was first advertised in *Radio News* in June 1948 and last advertised August 1953. The bridge is a conventional 4-arm impedance bridge that is self-contained with its own 1000 Hz tone source. The bridge is direct reading over a wide range of resistance, capacitance, dissipation factor, inductance, and storage factor. It has a built-in 200 μa (100-0-100) galvanometer for resistance measurements and headphones for a-c measurements of capacitance and inductance. The layout and appearance was a virtual copy of the General Radio 650-A Impedance Bridge that sold in 1956 for $270.00 (Reference 4, and Fig. 26). The General Radio 650-A was powered by four No. 6 Dry Cells in the top end of the cabinet. The Heathkit IB-1 was powered by one 6-volt Lantern Battery strapped inside the sloped birch cabinet.

Fig. 26. IB-1 with General Radio 630-A. The IB-1 has 10-0 main dial and C-R-L below the main dial and multiplier switch.

The Heathkit uses ½% precision resistors, precision potentiometers made by General Radio or The Muter Company, and a General Radio microphone hummer to produce the 1000 Hz tone.

Three versions of the IB-1 were produced. The earliest version, the IB-1 (Fig. 26) has a main dial calibrated 10-0 and C-R-L printed on the panel in two places, below the main dial and below the multiplier switch and a nonlinear potentiometer by The Muter Company. The IB-1A (Fig. 27) does not have IB-1A on the panel but can be identified by the main dial being calibrated 0-10 and L-R-C printed on the panel. The

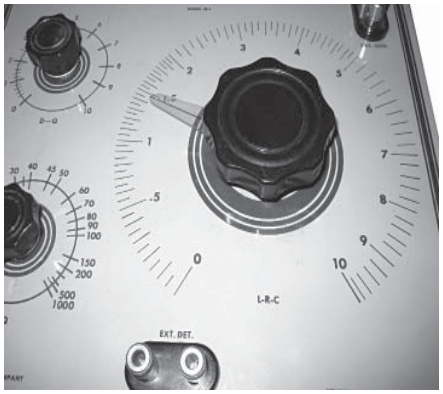


Fig. 27. IB-1A 0-10 main dial and L-R-C below main dial and the multiplier switch.

Fig. 28. IB-1B 0-10 main dial and C-R-L below main dial and multiplier switch.

non-linear potentiometer is by the General Radio Company. The third version, the IB-1B (Fig. 28), has IB-1B printed on the panel. The main dial is calibrated 0-10, and the panel shows C-R-L. The non-linear potentiometer was by The Muter Company. I believe all these versions were related to the type of non-linear main precision potentiometer available, probably from the surplus market.

C-1 Condenser Checker. This was the first Heathkit with a magic eye indicator. In addition to checking paper, mica and electrolytic condensers, it will measure resistance. The schematic and assembly manual are dated June 22, 1948. In the manual, Heath offered to adjust any C-1 against a General Radio 1% standard for $3.00 plus shipping. Heath would also check and put into operating condition any C-1 for $3.00 plus parts. The C-1 Condenser Checker came in two versions. The first or Type 1 (Fig. 29), had a toggle switch and was available September 1948 through March 1949 for

Fig. 29. C-1 Condenser Checker, Type 1. Toggle on-off switch.

$19.50. The Type 2 used a slide switch and was advertised from April through December 1949 for the same price. Thus the C-1 Condenser Checker was advertised for 16 months.

S-1 Electronic Switch. The S-1 Electronic Switch came in two versions, Type 1 with toggle switches advertised September through November 1948 and Type 2 with slide switches advertised December 1948 through March 1950 (Fig. 30). The device is intended to display two signals at once on an oscilloscope screen. Each signal trace is controlled independently, and the position of the trace may be varied. For example, the input and output traces of an amplifier may be observed one over the other illustrating any changes occurring in the amplifier. The S-1 was priced at $34.50.

BE-1 Battery Eliminator. The BE-1 Battery Eliminator (Fig. 31) produces 10 amperes over a

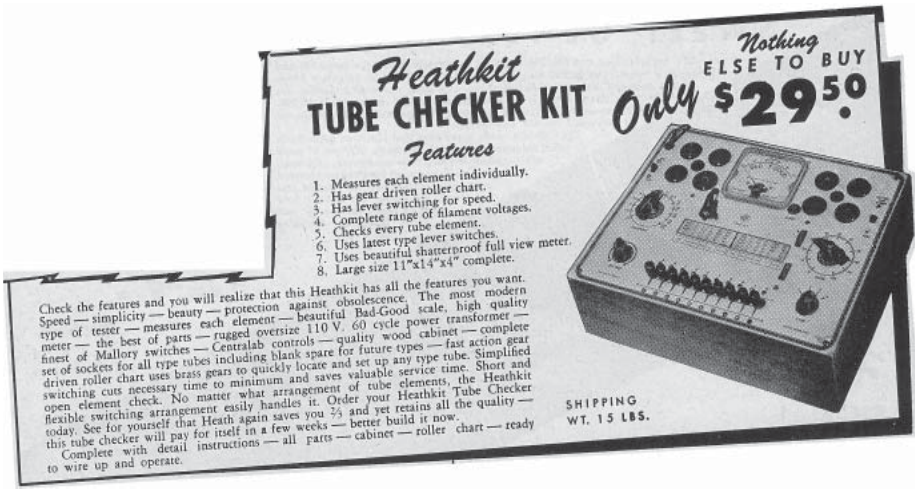
Fig. 30. S-1 Electronic Switch, Type 2. Slide switch.

Fig. 31. BE-1 Battery Eliminator

range of 5 to 7 ½ volts. It has a heavy choke and a 4000 µfd electrolytic filter. It was used mainly for automobile radio servicing and battery charging. The heavy duty output terminals each have molded rubber caps that are frequently missing. It was advertised March 1946 through August 1950 and was priced at $22.50. It was replaced by the BE-1A in August 1950.

TC-1 Tube Checker. The TC-1 Tube Checker was very popular and was first advertised in March 1949 for $29.50. Based on my study of numerous TC-1's, it came in five types. Type 1, which was advertised for three months starting March 1949, may have been a prototype (Fig. 32). This TC-1 had double rollers (two rollers on the right side) rather than the one roller used in all subsequent advertisements. A Type 1 has not been found.

The TC-1 did not have an illuminated roll chart, but an update kit to upgrade to the TC-2 was later available. Multiple sockets were on the front panel with a blank socket to allow user customization. A rheostat compensated for line voltage changes. This control does not work very well today since present line voltage is 120 volts AC versus 110 volts AC in the 1940's. In subsequent years, roll chart updates



Heathkit
TUBE CHECKER KIT
Nothing ELSE TO BUY
Only $29.50

Features

1. Measures each element individually.
2. Has gear driven roller chart.
3. Has lever switching for speed.
4. Complete range of filament voltages.
5. Checks every tube element.
6. Uses latest type lever switches.
7. Uses beautiful shatterproof full view meter.
8. Large size 11"x14"x4" complete.

Check the features and you will realize that this Heathkit has all the features you want. Speed — simplicity — beauty — protection against obsolescence. The most modern type of tester — measures each element — beautiful Bad-Good scale, high quality meter — the best of parts — rugged oversize 110 V. 60 cycle power transformer — finest of Mallory switches — Centralab controls — quality wood cabinet — complete set of sockets for all type tubes including blank spare for future types — fast action gear driven roller chart uses brass gears to quickly locate and set up any type tube. Simplified switching cuts necessary time to minimum and saves valuable service time. Short and open element check. No matter what arrangement of tube elements, the Heathkit flexible switching arrangement easily handles it. Order your Heathkit Tube Checker today. See for yourself that Heath again saves you ⅔ and yet retains all the quality — this tube checker will pay for itself in a few weeks — better build it now.

Complete with detail instructions — all parts — cabinet — roller chart — ready to wire up and operate.

SHIPPING WT. 15 LBS.

Fig. 32. TC-1 Tube Tester, Type 1 Double Rollers (Radio News March 1949, pg. 73)

and update pamphlets for settings were made available.

I believe the changes in the TC-1 were all made in the first month or so, with the exception of Type 5, and were based mainly on the type of filament control switch used which may have been war surplus. One could ask, why put such emphasis on a switch? This is because this switch is reflected in panel changes, circuit changes, and the presence of an "off" on the panel. To a collector, these identify the earliest instruments and are very important.

The TC-1 Type 2 has a 15 position filament switch with an "off" position (Fig. 33). It also has the Heathkit logo (the letters HC in a circle) below the meter. The Type 3 has the same panel as the Type 2 but has a 14 position switch that will not go to the "off" position. The Type 4 has no "off" position

Fig. 34. TC-1 Tube Tester, Type 4, No "off," with Logo

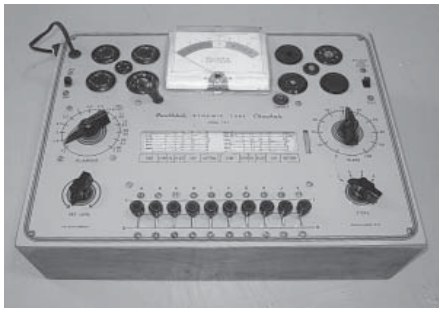


Fig. 35. TC-1 Tube Tester, Type 5, No Logo and Larger Meter

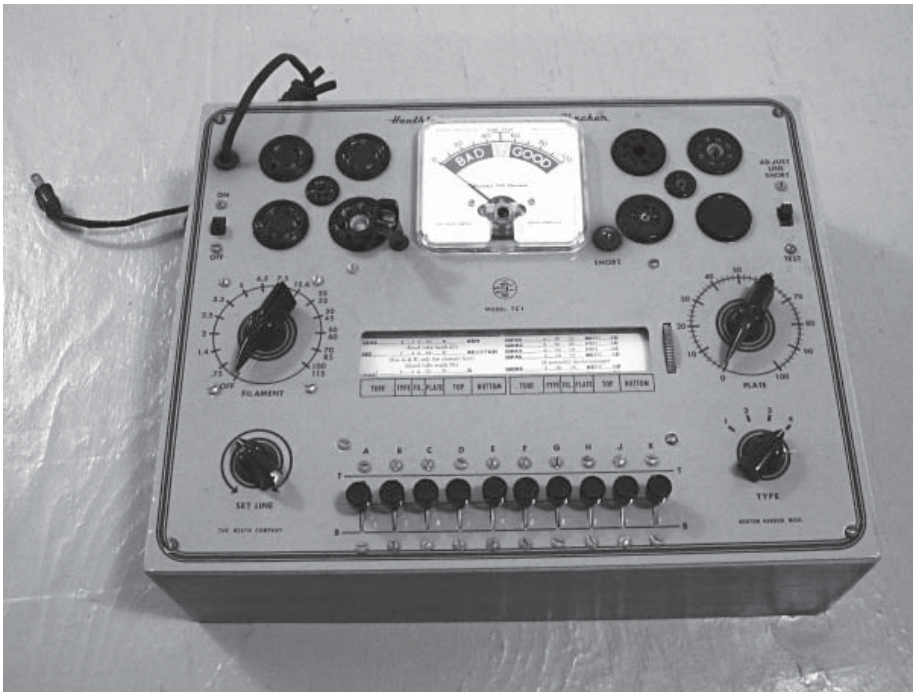


Fig. 33. TC-1 Tube Tester, Type 2, 15 Position with "off" (see text)

on the panel but still has a Heathkit logo (Fig. 34). The Type 5 has no logo and has a larger meter (Fig. 35) and was advertised from November 1952 through August 1953. It was replaced by the TC-2 in Septmeber 1953, still at $29.50.

TS-1 TV Alignment Generator. The TS-1 TV Alignment Generator (Fig. 36) was a major departure from the previous G-3 Signal Generator. The frequency of the television signal was varied by a clever circuit using a permanent magnet audio speaker to mechanically vary a tuned circuit. The TS-1 was advertised for nine months starting in April 1949 and sold for $39.50. It was replaced by the TS-1A in January 1950.

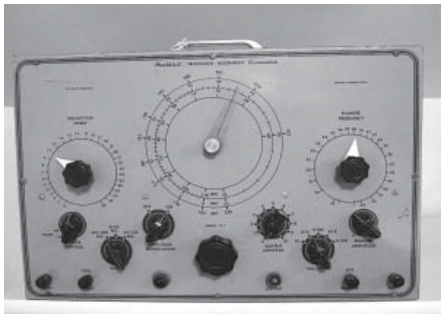


Fig. 36. TS-1 TV Alignment Generator

M-1 Handitester. The M-1 Handitester was the first multimeter made by Heathkit, and the first Heathkit I purchased, in 1949. This is a beautiful instrument (Fig. 37) using precision resistors and an Assembly Products meter. The black Bakelite case was also used in several later Heathkits, such as the BT-1 Battery Tester and the CR-1 Crystal Radio. As time went by, the No. M-36 29 ohm resistor in the ohms circuit would drift or burn out. This resistor, when open, disabled the "Lo" ohms circuit. The earliest M-1's had a wire wound 29 ohm resistor and did not have this problem. The M-1 was introduced in September 1949 for $13.50, as compared to the Triplett Model 666-R at $24.50 (*Radio-Electronics*, October 1949). It was produced for many years. A larger multimeter, the MM-1 was introduced in September 1953.

CONCLUSION

This documentation of Heathkits is intended to provide additional data for those interested in the history of radio. These data are based on advertised sources and direct observation of completed kits, assembly manuals, and instruction sheets. Society tracks and values accomplishments of artists, but we do less well with technology development including the history of communications. Heathkits have helped us understand the way things work and how things are put together. This has helped us get to where we are today. We have cell phones, computers, and flat screen TV's, but we are losing our

Fig. 37. M-1 Handitester

personal ability to understand and appreciate the relative simplicity of the past, as well as understand the present. Much has been gained by advances, but something also has been lost. Radio collectors and radio historians help correct this for the benefit of our future.

REFERENCE NOTES

1. Heathkit 1955 Catalog, "Mr. Heathkit" pp. 2 and 3.
2. Chuck Penson WA7ZZE, *Heathkit – A Guide to Amateur Radio Products*, 2nd Edition, CQ Communications, Inc., Hicksville, New York, 2003. This is an excellent resource on early Heath people, the history of Heath, and the evolution of specific products. Also included is detailed information on all Heathkit amateur radio products with photographs and descriptions of each.
3. Ron Grossman, Pulling the Plug, *Radio Age*, Volume 17, No. 9, p. 2-4, September 1992. Source: *The Chicago Tribune*, May 3, 1992, *Radio Age* editors Donald and Norma Patterson, Augusta, Georgia. The *Radio Age* article is taken from the *Tribune* article. A very nice article on Heathkit history and events surrounding the discontinuation of kits in 1992.
4. *Heathkit Nostalgia*, Terry Perdue, 1992 (privately printed, but widely available). A brief history of the Heath Company, including photographs of the Heath Parasol airplane and interviews of many early persons responsible for Heathkit. A must-read for anyone with interests in Heathkit collecting and the persons who made it all possible.
5. John Dilks, "Old Radio – Heathkit", *QST*, p. 86 and 87, August 2004. Provides a nice history of Edward Heath and Howard Anthony, and the early history of the Heath Company and Heathkits.
6. *General Radio Company Catalog D*, 257 pages, Cambridge, Massachusetts, June 1956. Type 650-A Impedance Bridge, 650-A Battery Type $270.00, p. 28.

ACKNOWLEDGEMENTS

I want to thank Jay Whipple, Jr. for access to his significant Heathkit collection, Patricia B. McGroarty for assembling the manuscript and tables, Susan E. Golebiowski for her photographic expertise and assistance, the encouragement of William Ross, and my wife Frances for her endless patience and support as I spent years on the kitchen table going over reference sources. Without the help of these five individuals, this article would still be a work in progress.

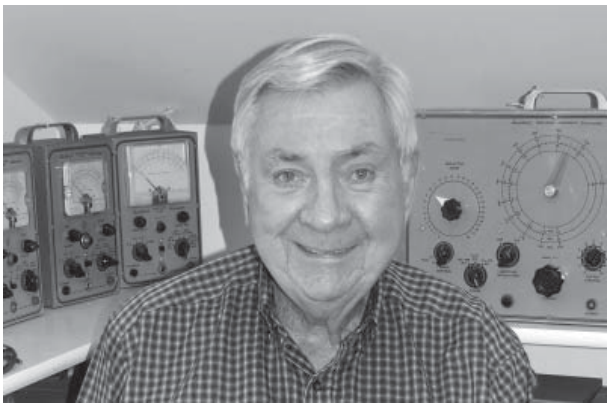
PHOTO CREDITS

Photos by Susan E. Golebiowski.

ABOUT THE AUTHOR

Erich E. Brueschke BSEE, M.D., FAAFP, KC9ACE currently holds an Extra Class amateur radio license. He held the call WØBPS from 1948 when he was in high school. He has a B.S. in Electrical Engineering from the South Dakota School of Mines and Technology. He worked for the Hughes Research and Development Laboratories in Culver City, California for five years, specializing in magnetics and in the effects of high vacuum on outer space components. His last Hughes effort was on the Surveyor spacecraft in 1961-1962, which landed on the moon in 1966. He left Hughes to go to medical school at Temple University School of Medicine in Philadelphia. After training, he was a captain in the U.S. Air Force at the Aerospace Medical Research Laboratories at Wright Patterson Air Force Base in Dayton, Ohio. He subsequently practiced family medicine in California and then

joined the IIT Research Institute in Chicago, where he worked on artificial internal organs, including powering the artificial heart, for seven years. He then joined Rush Medical College in Chicago where he was Chairman of Family Medicine and subsequently became Dean of Rush Medical College for six years. He retired as Dean in 2000. He is currently the Distinguished Professor of Medicine at Rush Medical College of Rush University in Chicago. He has two patents issued and has published numerous papers in engineering, medical, and the scientific literature, and is a member of numerous professional societies. His major collecting and restoration interests are early scientific and medical instruments, early battery radios and Heathkits. He has collected radios and scientific devices for over 27 years. He has been a member of the AWA for 20 years.



Erich Brueschke

Table I: Heathkit Database 1947-1956 - By Date First Advertised or Probable Introduction

Source: *Radio News* / *Radio and Television News* 1947-1956

Model	Description	Date First Advertised ("Probable" estimates date introduced since not advertised)	Date Last Advertised (through Dec-56)	Price
O-1	5" Oscilloscope (First Pictured Sep-47), First Heathkit Instrument	Jul-47	Jan-48	39.50
V-1 Type 1 of 3	VTVM (Painted Handle, Toggle Switch, 5 Ranges)	Dec-47	Jun-48	24.50
301	Pocket Tester Kit	1948 *Heath Surplus Flyer* Only		3.95
A-1	25 Watt Amplifier 4-Tube	Jan-48	Mar-48	14.95
G-1 Type 1 of 3	Signal Generator, Painted Handle	Jan-48	Jun-48	19.50
None	Transmitter Kit	Jan-48	Mar-48	19.50
None	12" PM Speaker for A-1 or A-2	Feb-48	Dec-49	6.95
O-2	5" Oscilloscope, Toggle Switches (Painted Handle)	Feb-48	Jun-48	39.50
None	Midget Amateur Transmitter	Mar-48	Aug-48	3.95
None	Midget Amateur Transmitter Key	Mar-48	Aug-48	1.00
None	Midget Amateur Transmitter Battery	Mar-48	Aug-48	3.25
A-2	24 Watt Amplifier	Apr-48	Dec-49	14.50
G-2 Type 1 of 3	Sine and Square Wave Audio Generator, Toggle Switch, Terminals on Right - [:] Painted Handle	Apr-48	Jun-48	34.50
HS-30	Headphones for K-1 or K-2	May-48	Dec-49	1.00
K-1	All-Wave, Left Speaker, 3-Tube, AC Price increased to $8.75 Jun-48	May-48	Jun-48	5.95

K-1	All-Wave, Left Speaker, Battery 2-Tube Price increased to $8.75 Jun-48	May-48	Jun-48	5.95
K-1 or K-2 Accessory	2.5" PM Speaker for K-1 or K-2	May-48	Dec-49	1.95
K-1 or K-2 Accessory	Battery Set for K-1 or K-2	May-48	Jul-48	3.25
IP-1*	Interphone 2-Way Call System	May-48	Mar-49	14.50
T-1	Signal Tracer	May-48	Mar-49	19.50
IB-1	Impedance Bridge 10-0 Main Dial, C-R-L	Jun-48 Probable		69.50
IB-1A	Impedance Bridge 0-10 Main Dial, L-R-C	Jun-48	Mar-51	69.50
G-1 Type 2 of 3	Signal Generator, Aluminum Handle	Jul-48	Dec-48	19.50
G-2 Type 2 of 3	Sine and Square Wave Audio Generator, Toggle Switch, Terminals on Lower Right - [..]	Jul-48	Mar-49	34.50
K-2	All-Wave, Right Speaker, AC	Jul-48	Dec-49	8.75
K-2	All-Wave, Right Speaker, Battery	Jul-48	Jul-48	8.75
O-3 Type 1 of 2	5" Oscilloscope, Toggle Switches (Aluminum Handle)	Jul-48	Mar-49	39.50
V-1 Type 2 of 3	VTVM (Aluminum Handle, Toggle Switch)	Jul-48	Mar-49	24.50
C-1 Type 1 of 2	Condenser Checker, Toggle Switch	Sep-48	Mar-49	19.50
S-1 Type 1 of 2	Electronic Switch (Toggle Switch)	Sep-48	Nov-48	34.50
G-3	Sweep Generator	Oct-48	Mar-49	24.50
None	Photo Timer	Oct-48 *Flyer* Only		8.75
K-2 Accessory	Long Wave Coil for K-2, 200-500 Kc	Nov-48 *Flyer*	Jan-49 *Flyer*	0.90
K-2 Accessory	Short Wave Coil for K-2, 6000-21000 Kc	Nov-48 *Flyer*	Jan-49 *Flyer*	0.90
None	Mahogany Speaker Cabinet A-2	Dec-48	Dec-49	8.75

S-1 Type 2 of 2	Electronic Switch (Slide Switch)	Dec-48	Mar-50	34.50
G-1 Type 3 of 3	Signal Generator, No Logo	Jan-49	Aug-49	19.50
K-2 Accessory	Mahogany Cabinet	Jan-49	Dec-49	2.95
216	Miniature Headphones	Feb-49 *Flyer* Only		1.00
309	RF Crystal Probe for VTVM Price reduced to $5.50 Jan-51	Mar-49	Apr-53	6.50
310	10,000 HV Test Probe for VTVM	Mar-49	Aug-50	4.50
312	Tool Kit	Mar-49	Dec-49	5.95
BE-1	Battery Eliminator	Mar-49	Aug-50	22.50
FM-1	FM Tuner	Mar-49	Dec-49	14.75
None	FM Tuner Cabinet	Mar-49	Dec-49	3.75
O-3 Type 2 of 2	5" Oscilloscope (Slide Switch)	Mar-49 Probable		39.50
TC-1 Type 1 of 5	Tube Checker (Double Rollers), May Be Prototype	Mar-49	May-49	29.50
TC-1 Type 2 of 5	15 pos Filament Switch with "off," Has Logo	Mar-49 Probable		29.50
TC-1 Type 3 of 5	14 pos Filament Switch with "off," Has Logo	Mar-49 Probable		29.50
V-1 Type 3 of 3	VTVM (Slide Switch for "on-off")	Mar-49 Probable		24.50
V-3	VTVM Battery	Mar-49	May-49	34.50
C-1 Type 2 of 2	Condenser Checker, Slide Switch	Apr-49	Dec-49	19.50
G-2 Type 3 of 3	Sine and Square Wave Audio Generator, Slide Switch, Terminals on Lower Right	Apr-49	Mar-51	34.50
G-4	HF-AM Signal Generator	Apr-49 Probable		Unknown
O-4	5" Oscilloscope (Slide Switch)	Apr-49	Aug-49	39.50
T-2	Signal Tracer	Apr-49	Aug-52	19.50
TS-1	TV Alignment Generator	Apr-49	Dec-49	39.50
V-2	VTVM First with 6 Ranges	Apr-49	Nov-49	24.50
TC-1 Type 4 of 5	No Filament Switch "off," Has Logo	Jun-49	Oct-52	29.50
315	Converts O-3 or O-4 to O-5	Sep-49	Aug-50	12.50
316	Conversion Kit G-1 to G-5 (Vernier)	Sep-49	Aug-50	4.50

G-5	Signal Generator (Vernier Version of G-1)	Sep-49	Aug-50	19.50
M-1	Handitester Price increased to $14.50 Sep-53	Sep-49	After Dec-56	13.50
O-5	5” Oscilloscope (Push-Pull Circuit)	Sep-49	Aug-50	39.50
None	8” Hi Fi Speaker for BR-1	Sep-49 *Flyer* Only		8.50
V-2A	VTVM (Larger Meter) No Logo	Nov-49 Probable		24.50
320	5” PM Speaker for AR-1 or BR-1	Dec-49	Mar-51	2.75
335	Metal Cabinet for AR-1 or BR-1	Dec-49	Jul-51	4.50
AR-1	3-Band Receiver	Dec-49	Aug-53	23.50
BR-1	Broadcast Receiver	Dec-49	Aug-53	23.50
V-4	VTVM (Larger Meter)	Dec-49	Aug-50	24.50
A-3	Amplifier	Jan-50 Probable		Unknown
A-4	6 Watt Amplifier	Jan-50	Mar-52	12.50
C-2	Condenser Checker	Jan-50	Aug-52	19.50
None	12” Speaker for A-4 (Becomes 304)	Jan-50	Aug-50	6.95
TS-1A	TV Alignment Generator	Jan-50	Aug-50	39.50
None	7” Raytheon TV Receiver Kit	Jul-50	Jul-50	34.50
None	7” Raytheon TV Receiver Kit - 18 Tubes	Jul-50	Jul-50	20.00
None	7” Raytheon TV Receiver Kit - Mahogany Cabinet	Jul-50	Jul-50	20.00
None	7” Raytheon TC Receiver Kit, 18 Tubes and Mahogany Cabinet	Jul-50	Jul-50	69.50
BE-1A	Battery Eliminator	Aug-50 Probable		22.50
304	12” Speaker for A-4	Sep-50	Mar-52	6.95
326	12” 20 Watt Speaker	Sep-50	Mar-51	7.50
336	Or 3366 - 30,000 VDC Probe VTVM	Sep-50	After Dec-56	5.50
345	Birch Cabinet for AR-1 or BR-1	Sep-50	Jul-51	4.95
350	FM Tuner Cabinet - Birch	Sep-50	Jul-51	4.95
A-5	20 Watt Amplifier	Sep-50	Mar-52	21.50

A-5A	20 Watt Amplifier with Preamplifier	Sep-50	May-51	23.50
BE-2	Battery Eliminator	Sep-50	Oct-51	22.50
FM-2	FM Tuner	Sep-50	May-55	24.50
O-6	5" Oscilloscope	Sep-50	Aug-51	39.50
PS-1 Type 1 of 2	Variable Power Supply (Screw Terminals)	Sep-50	Aug-52	29.50
RD-1	Resistance Decade 1/2%	Sep-50	Aug-52	19.50
S-2	Electronic Switch Price increased to $23.50 Jan-54	Sep-50	Aug-55	19.50
SG-6	Signal Generator	Sep-50	Aug-52	19.50
TS-2	TV Alignment Generator	Sep-50	Aug-53	39.50
V-4A	VTVM (Change in AC Balance Ckt)	Sep-50	Aug-51	23.50
AG-7	Sine and Square Wave Audio Generator	Apr-51	Aug-52	34.50
IB-1B	Impedance Bridge 0-10 Main Dial, C-R-L	Apr-51	Aug-53	69.50
A-6	20 Watt Amplifier	May-51	May-51	33.50
A-6A	20 Watt Amplifier with Preamplifier	May-51	Mar-52	35.50
AF-1	Audio Frequency Meter	Sep-51	Mar-54	34.50
AV-1	A.C. VTVM	Sep-51	Aug-52	29.50
IM-1	Intermodulation Analyzer	Sep-51	Mar-54	39.50
O-7	5" Oscilloscope	Sep-51	Aug-52	43.50
SQ-1	Square Wave Generator	Sep-51	Mar-54	29.50
V-5	VTVM	Sep-51	Apr-52	24.50
BE-3	Battery Eliminator	Nov-51	Aug-53	24.50
A-7	6 Watt Amplifier	Apr-52	Aug-53	14.50
A-7A	A-7 with Preamplifier	Apr-52	Aug-53	16.50
A-8	20 Watt Amplifier	Apr-52	Aug-53	33.50
A-8A	A-8 with Preamplifier	Apr-52	Aug-53	35.50
WA-A1	Williamson Amp with Preamp	Apr-52	Oct-52	69.50
WA-B1	Williamson Amp Only	Apr-52	Oct-52	49.75
WA-P1	Preamplifier Only	Apr-52	Mar-54	19.75
V-5A	VTVM (Change in Tube Compliment)	May-52	Aug-52	24.50

PS-1 Type 2 of 2	Variable Power Supply (Binding Posts)	Aug-52 Probable		29.50
337	Scope Demodulator Probe	Sep-52	Apr-53	4.50
338	Peak to Peak Probe for VTVM	Sep-52	Apr-53	6.50
339	Intensifier Kit for O-8	Sep-52	Apr-53	7.50
355	TV Picture Tube Adapter for TC-1 or TC-2	Sep-52	After Dec-56	4.50
AG-8	Audio Generator	Sep-52	After Dec-56	29.50
AO-1	Sine and Square Wave Audio Oscillator	Sep-52	After Dec-56	24.50
AV-2	A.C. VTVM	Sep-52	Aug-56	29.50
BT-1	Battery Tester	Sep-52	Mar-54	7.50
C-3	Condenser Checker	Sep-52	Dec-56	19.50
DC-1	DC-1 Decade Condenser 1%	Sep-52	After Dec-56	16.50
DR-1	Decade Resistor 1%	Sep-52	After Dec-56	19.50
GD-1	Grid Dip Meter with 6 Coils	Sep-52	Apr-53	19.50
O-8	5” Oscilloscope	Sep-52	Aug-53	43.50
PS-2	Regulated Power Supply	Sep-52	May-54	29.50
QM-1	“Q” Meter	Sep-52	After Dec-56	39.50
RS-1	Resistance Substitution Box	Sep-52	After Dec-56	5.50
SG-7	Signal Generator	Sep-52	Aug-53	19.50
T-3	Signal Tracer	Sep-52	After Dec-56	4.40
V-6	VTVM, 7 Ranges	Sep-52	Aug-54	24.50
VC-1	Voltage Calibrator	Sep-52	Apr-53	9.50
VT-1 Type 1 of 2	Vibrator Tester (No Socket Labels)	Sep-52	After Dec-56	14.50
VT-1 Type 2 of 2	Vibrator Tester (With Socket Labels)	Oct-52 Probable		14.50
W-1	Amplifier	Oct-52 Probable		Unknown
365	Portable Birch Cabinet for TC-1	Nov-52	Aug-53	7.50
TC-1 Type 5 of 5	Larger Meter, No Logo	Nov-52	Aug-53	29.50
TC-1P	TC-1 in Birch Portable Cabinet	Nov-52	Aug-53	34.50
W-2	Williamson Amp with WA-P1 Pre Amp	Nov-52	Aug-54	69.50
W-2M	Williamson Amp Only	Nov-52	Aug-54	49.75

W-3	Williamson Amp with WA-P1 Pre Amp Price increased to $71.50 Sep-56	Nov-52	After Dec-56	69.50
W-3M	Williamson Amp Only	Nov-52	After Dec-56	49.75
None	Planning Service Shop	Mar-53	Apr-53	0.00
None	Establishing Ind. Elec. Lab	Mar-53	Apr-53	0.00
None	Basic Service Shop (7 Kits)	Mar-53	Apr-53	149.50
None	Typical Laboratory (11 Kits)	Mar-53	Apr-53	263.50
AW-1	Audio Wattmeter	Apr-53	After Dec-56	29.50
IB-2	Impedance Bridge	Apr-53	After Dec-56	59.50
AT-1	Amateur Transmitter CW	May-53	After Dec-56	29.50
BG-1	Bar Generator	May-53	May-55	14.50
GD-1A	Grid Dip Meter with 5 Coils (see 341)	May-53	Aug-53	19.50
VC-2	Voltage Calibrator	May-53	Aug-55	11.50
A-7C	A-7B with Preamplifier	Jul-53	Aug-55	17.50
A-9	Amplifier	Jul-53 Probable		Unknown
A-9A	20 Watt Amplifier	Jul-53	Mar-54	35.50
RP-1	Dual Record Player	Jul-53	Dec-53	59.50
A-7B	6 Watt Amplifier	Aug-53	Aug-55	15.50
341	Low Frequency Coils for GD-1A	Sep-53	May-55	3.00
342	Low Capacity Probe (Scope)	Sep-53	After Dec-56	3.50
362	Heathkit Binding Posts (20 ea)	Sep-53	Mar-54	4.00
309B	RF Probe for VTVM	Sep-53	Mar-54	3.50
337B	Scope Demodulator Probe	Sep-53	Mar-54	3.50
338B	Peak to Peak Probe for VTVM	Sep-53	Mar-54	5.50
91-8	Portable Tube Checker Cabinet (see 365)	Sep-53	Aug-55	7.50
91-9	Cabinet for BR-2 with Panel	Sep-53	Jul-56	4.50
AC-1	Antenna Coupler	Sep-53	After Dec-56	14.50
AM-1	Antenna Impedance Meter	Sep-53	After Dec-56	14.50
AR-2	Communications Receiver	Sep-53	Aug-55	25.50
BE-4	Battery Eliminator	Sep-53	After Dec-56	31.50
BR-2	Broadcast Band Receiver Price increased to $19.25 Sep-56	Sep-53	After Dec-56	17.50

GD-1B	Grid Dip Meter with 5 Coils (see also 341A)	Sep-53	After Dec-56	19.50
IT-1	Variable Voltage Isolation Transformer	Sep-53	After Dec-56	16.50
LG-1	Laboratory Generator	Sep-53	After Dec-56	39.50
MM-1	Multimeter	Sep-53	After Dec-56	26.50
None	Tech. App. Bulletin	Sep-53	Mar-54	2.00
None	Service Shop Notes	Sep-53	Mar-54	0.00
O-9	5” Oscilloscope	Sep-53	Aug-54	59.50
SG-8	Signal Generator	Sep-53	After Dec-56	19.50
TC-2	Tube Checker (Lighted Chart)	Sep-53	After Dec-56	29.50
TC-2P	Portable TC-2	Sep-53	After Dec-56	34.50
TS-3	TV Alignment Generator	Sep-53	Mar-55	44.50
91-10	Cabinet with Aluminum Panel for AR-2	Oct-53	Dec-55	4.50
RP-2	Dual Record Player	Jan-54	Mar-54	69.50
A-9B	20 Watt Amplifier	Apr-54	After Dec-56	35.50
W-4	Amplifier with Preamp	Apr-54	Aug-55	59.50
W-4M	Amplifier Only	Apr-54	Aug-55	39.75
WA-P2	Preamplifier Price increased to $21.75 Sep-56	Apr-54	After Dec-56	19.75
PS-3	Regulated Power Supply	Jun-54	After Dec-56	35.50
OL-1	5” Oscilloscope	Aug-54	Aug-56	29.50
OM-1	5” Oscilloscope	Aug-54	Aug-56	39.50
309C	RF Probe	Sep-54	After Dec-56	3.50
337C	Scope Demodulator Probe	Sep-54	After Dec-56	3.50
338C	Peak to Peak Probe for VTVM	Sep-54	After Dec-56	5.50
341A	Low Frequency Coils for GD-1B	Sep-54	May-55	3.00
CS-1	Condenser Substitution Box	Sep-54	After Dec-56	5.50
O-10	5” Oscilloscope	Sep-54	Aug-56	69.50
V-7	VTVM, 7 Ranges	Sep-54	Aug-55	24.50
VF-1	VFO (Matches AT-1)	Sep-54	After Dec-56	19.50
TS-4	TV Alignment Generator	Apr-55	Aug-56	49.50
AA-1	Audio Analyzer	Jun-55	After Dec-56	59.50
CM-1	Direct Reading Capacity Meter	Jun-55	Dec-56	29.50
DX-100	Phone and CW Transmitter	Jun-55	After Dec-56	189.50

HD-1	Harmonic Distortion Meter	Jun-55	After Dec-56	49.50
W-5M	Amplifier Only	Jun-55	After Dec-56	59.75
A-7D	7 Watt Amplifier Price increased to $18.65 Sep-56	Sep-55	After Dec-56	16.95
AG-9	Audio Generator	Sep-55	After Dec-56	34.50
AR-3	All Band Receiver Price Increased to $30.75 Sep-56	Sep-55	After Dec-56	27.95
CC-1	CRT Tube Checker	Sep-55	Dec-56	22.50
FM-3	FM Tuner with Cabinet - Gold	Sep-55	Aug-56	24.50
LP-1	Linearity Pattern Generator	Sep-55	Jun-56	22.50
QF-1	“Q” Multiplier	Sep-55	After Dec-56	9.95
V-7A	VTVM (Last of V Series), 7 Ranges	Sep-55	After Dec-56	24.50
W-4A	Amplifier with WA-P2 Preamp Price increased to $61.50 Sep-56	Sep-55	After Dec-56	59.50
W-4AM	Amplifier	Sep-55	After Dec-56	39.75
91-15A	AR-3 Cabinet Price increased to $4.95 Sep-56	Jan-56	After Dec-56	4.50
W-5	W-5M Amp plus WA-P2 Preamp Price increased to $81.50 Sep-56	Jun-56	After Dec-56	79.50
BC-1	AM Tuner Price increased to $26.95 Sep-56	Jul-56	After Dec-56	24.50
CR-1 Type 1 of 2	Crystal Receiver with Headphones Price increased to $8.75 Sep-56	Jul-56	Dec-56	7.95
DX-35	Phone and CW Transmitter	Jul-56	After Dec-56	56.95
ET-1	Enlarger Timer	Jul-56	After Dec-56	11.50
LP-2	Linearity Pattern Generator	Jul-56	After Dec-56	22.50
None	FM-3, A-7E, and SS-1	Jul-56	After Dec-56	82.95
RC-1	Radiation Counter	Jul-56	After Dec-56	79.95
S-3	Electronic Switch	Jul-56	After Dec-56	21.95
SS-1	Speaker System	Jul-56	After Dec-56	39.95
SS-1B	Range Extending Speaker	Jul-56	After Dec-56	99.95

91-9A	Proxylin Cabinet for BR2	Sep-56	After Dec-56	4.95
A-7E	A-7D with Preamplifier Price increased to $20.35 Sep-56	Sep-56	After Dec-56	18.50
AV-3	A.C. VTVM	Sep-56	After Dec-56	29.50
FM-3A	FM Tuner	Sep-56	After Dec-56	26.95
O-11	5” Oscilloscope	Sep-56	After Dec-56	69.50
OM-2	5” Oscilloscope	Sep-56	After Dec-56	42.50
TS-4A	TV Alignment Generator	Sep-56	After Dec-56	49.50
VC-3	Voltage Calibrator	Sep-56	After Dec-56	12.50
XO-1	Electronic Cross-Over	Sep-56	After Dec-56	18.95
CR-1 Type 2 of 2	Crystal Receiver, Daystrom on Panel, with Headphones Price increased to $8.75 Sep-56	After Dec-56		7.95
* IP-1 model also shown in November 1948 *Popular Mechanics*, p 293				