

Heathkit of the Month #111:
by Bob Eckweiler, AF6C



AMATEUR RADIO - SWL

Heathkit HW-2026
Synthesized 2-Meter Transceiver (Recalled)

Introduction:

Well, it's again the month of April and time to review a Heathkit from an unusual, esoteric or troubled group. This HotM article will discuss what is probably Heathkit's biggest kit disaster. The HW-2026 was Heath's first attempt at a synthesized 2-meter FM transmitter, See **Figure 1**. What could go wrong?

The \$289.95 HW-2026 holds the distinction of being the only Heathkit, in the forty-plus years of the company, to be recalled! The kit was introduced in the Christmas 1975 catalog with a comment in the President's Letter ¹ and an ad marked "Available November" ².

Shortly after the first production run was complete on November 15th, Heathkit began getting calls from hams experiencing problems that can happen due to spurious output from the radio. Hams were being heard where they weren't, repeaters were keying up unwarranted, etc.

After carefully examining the radio and troublesome spurs, Heath engineers decided the possibly of a quick fix was not viable.

Here is a link to the index of Heathkit of the Month (HotM) articles:

http://www.w6ze.org/Heathkit/Heathkit_Index.html

1. Notes are located on page 8.



Figure 1: One of the few remaining recalled Heathkit HW-2026 Synthesized 2-Meter Transceivers. Photo by the Author.

Heathkit took the 'high' but expensive road and recalled the radio days before Christmas.

The Heathkit HW-2026 Recall:

The recall procedure varied slightly depending on whether your radio purchase was from the factory or a Heathkit Electronic Center:

If the radio was bought from the factory you were sent a letter dated December 23rd, 1975 from Heathkit's President, David Nurse (**Figure 2**). Included with the letter was a shipping label and return form. One of the questions on the form asked whether the kit was fully assembled or not.

If the radio was bought at a Heathkit Center, the buyer would receive a letter from Schlumberger Products (who managed the Heathkit stores) with Dave Nurse's letter attached. No shipping label or return form was included, as you were expected to bring your recalled radio back to the store. However, the store letter did say that if you wanted to ship to the store, they would send a shipping label and return form.

In either case, upon receipt of the radio, Heathkit would mail you a full refund in-

HEATH COMPANY
BENTON HARBOR, MICHIGAN

D. W. NURSE
PRESIDENT

December 23, 1975

Dear OM:

It is "back to the breadboard" stage for us at Heath. With our pride a bit dented, faces slightly red, but with complete confidence, we are going to redesign the HW-2026. This time it will be a rig both of us can be proud of - that is the assurance I give all of you.

This is my way of saying that we are recalling all HW-2026's - each and every one. Included is a shipping label and a return form for your use. Please indicate on the form whether your kit was completely or only partially assembled.

Upon receipt of your unit we will mail you a full refund, including the full postage you paid. If you purchased on our Heath revolving charge plan, your account will be fully credited for the purchase, including any interest paid.

In addition, we will include a gift certificate for \$50.00 if your unit was fully assembled, and \$25.00 if it is returned unassembled or partially assembled. You may wish to apply this to the purchase of an HW-202 so you can get back on the air. However, it may be used for any kit of your choice. The only restriction is that I would like you to use it within the next 60 days.

Should you have any questions, please contact our Marketing Services Manager, Matt Cutter, by writing him direct or by telephone at (616) 982-3264.

In our long history, this is our first recall of a product. Not only that, but our timing could not have been worse. We suspect many of you have received the HW-2026 as a Christmas present, and for that reason we are especially sorry. Aside from this difficult problem, I would like to sincerely wish you and yours the best of everything in the new year.

Figure 2: The letter sent to owners of the Heathkit HW-2026. Note the date and the greeting. this letter was actually sent to a "Laverne" so perhaps Dear OM / YL would have been more appropriate?

73



David Nurse
W8GCD

cluding any postage you paid. If the radio was purchased on the Heath revolving charge plan, any payments and interest also would be refunded. As a bonus, Heathkit would send the returnees of fully assembled HW-2026 radios a \$50 Heathkit Gift Certificate, and returnees of partially or unbuilt radios a \$25 gift certificate. (One wonders how many hams stayed up late into the night to finish their radio before returning it?)

What Happened?:

I'm sure many people were asking that question at Heathkit in December. How did this product slip through? It is a good question, but any answer today would be full of speculation. One fact: In the HR Report for December 26th 1975³ (Published by Ham Radio Magazine) it was noted that: *"The Heath [HW-2026] radio did meet its -45 dB spur spec – which, incidentally, is also the international and only applicable spur specification for 2-meter amateur transmitters – comfortably..."*

One area of speculation is that there was a push to get the radio out for Christmas sales, which was approaching quickly. A few details of this period were provided in an EDN article by a former Heathkit employee Terry Perdue which adds some light to the situation. In his February 21, 2018 article⁴ titled ***"Heathkit transceiver recalled After Meeting Specs!"*** Terry comments that the project engineer had been promoted at a critical time in the rollout and didn't get to interface with various departments, especially the Evaluation department.

This department ensures design specifications and selects employees to build kits, verify instruction manuals and report any anomalies. They are given their finished kit and encouraged, in this case, to put them on the air. Exactly how much of this was ac-

complished with the project engineer gone is not mentioned, but I'm sure there were many ham employees wanting to build and use one of the radios. And it was probably thoroughly put through the evaluation cycle(s).

Evidently, the problem wasn't so much the numerous low-level spurs, all below the legal specifications, it was more that the frequency of many of these spurs coincided with simplex and repeater input frequencies for the two-meter band plan in certain crowded areas.

The complaints that started to appear in mid-November of 1975 were most often from areas of dense ham activity and areas with high mountain-top repeaters. NYC, LA and the Bay Area, part of which was already being known as Silicon Valley, were three problem areas. (Heathkit used the Bay Area later to conduct its tests for the replacement HW-2036.) Rural users of the radio didn't experience the interference as widely. Perhaps this is why some owners never did heed the recall, and thus a few HW-2026s are still out there, fast being gathered by collectors.

In researching the HW-2026, the author came across numerous comments such as the FCC demanding Heath recall the radios, serious interference to the aircraft band, etc. Nowhere was it found that the FCC was involved in the recall, and they surely would have been if aircraft band interference were the case (especially since the radio's spurs met the then current specifications). Others claimed the spurs were a product of poor lead dress by the builder.

One rumor worth mentioning, as it spread around the Heath facility among employees, involved what happened to the recalled radios and remaining stock. The rumor was that Heathkit took them out to an undis-

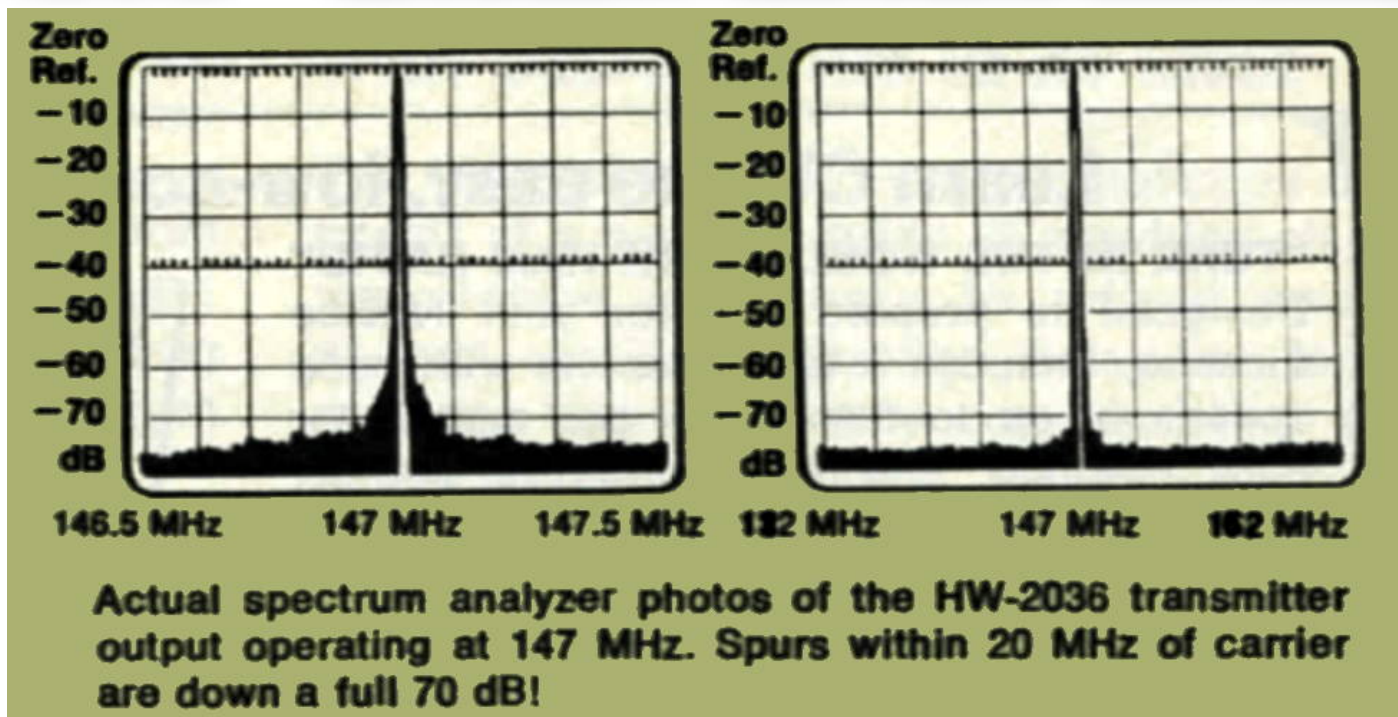


Figure 3: Two photos that accompanied the Christmas 1976 release of the HW-2036 replacement radio. They show a really clean signal for the new radio both near its frequency and 15 MHz on either side.

closed location on Lake Michigan and dumped them into the depths.

While this may seem outlandish, if some sort of product insurance was claimed by Heath or even for the big tax write-off they likely claimed, it would be important to be sure the radios were destroyed and didn't end up on some surplus market either as kits or parts.

In the aerospace industry structures such as, wings, empennages, fuselages, etc. that have gone through fatigue testing, often for the equivalent of multiple lifetimes, are destroyed to prevent these items ending up on flying aircraft. Often these structures are stripped of any environmentally bad items cut up and dumped into the ocean to act as artificial reefs.

The HW-2036 2-Meter Synthesized FM Radio: What a difference a year makes. One year after Heathkit announced the disaster that

was the HW-2026, Heathkit, in its 1976 Christmas catalog, announced the replacement HW-2036. The full-page catalog announcement⁵ includes actual spectrum photos showing two very clean signals. One scan covers ± 500 kHz from the signal and the other ± 15 MHz. (See **Figure 3**). The new HW-2036 actually sold for \$20 less than its recalled predecessor.

The HW-2036 became a successful product for Heathkit. Perhaps its biggest weakness is that it would only cover any two-megahertz portion of 2-meters without a realignment. In 1978 this weakness was removed with the HW-2036A, which continued as a success for Heathkit for an additional two years when it was replaced by the VF-7401 which introduced a scanning capability.

The Recalled HW-2026 Synthesized FM Radio: Let's take a short look at this ill fated radio. **Figure 4**, from the 1975 Christmas catalog

New synthesized 2-meter transceiver joins



Meet the new Heathkit HW-2026 — the best value in synthesized 2-M rigs... only 289.95

- Built-in synthesizer • Built-in continuous and burst tone encoders • Automatic transmitter offset • Channel activity indicator • Synthesizer lock indicator • Lever-switched channel selection with digital readout • 5 kHz channel spacing • 8-pole IF crystal filter • Built-in speaker • Microphone & gimbal mount included

Available November



Built-in frequency synthesizer. Flip the lever switches to the channel you want... frequency readout is digital.



SYNTH LOCK
Synthesizer lock indicator warns that synthesizer is not locked on frequency & transmitter will not key.



Built-in continuous & burst tone encoders are standard equipment, not extra-cost options.



8-pole IF crystal filter gives ideally shaped bandpass for reduced adjacent channel interference.

the growing Heathkit VHF FM line

New Heathkit HW-2026 — the transceiver that gets you on 2 with synthesis for up to 50% less

This is the one you've been waiting for. State-of-the-art technology and exceptional operating ease... all in one easy-to-build kit that can save you hundreds of dollars. Compare and you'll agree.

True Digital Frequency Synthesizer. This is the way to go — no half-way schemes, no crystals to buy, no channel limitations. The HW-2026 uses digital technology with a voltage controlled oscillator (VCO) and 1 MHz crystal time base each of whose outputs are divided down to 5 kHz and compared in a phase detector. You control the divisor and therefore the frequency of the VCO from the front panel lever switches.

Lever-switched channel selection with digital readout. Just flip the levers on the front panel to select any frequency in any 2 MHz segment of the 144 to 147.995 operating range. You select the last four digits, three with the lever switches which display the frequency directly, and the last with the 0/5 kHz miniature toggle switch. The lever switches are easier to use than the usual thumbwheels and the 5 kHz steps make all 2-meter frequencies available to you. And if you inadvertently dial up an out-of-band frequency, don't worry — the transmitter won't key outside of the band.

LED status lights signal you that the synthesizer is "locked" on the frequency you dialed up and whether that channel is in use. Convenient. **Automatic repeater offset plus built-in tone encoder** means you can work any open repeater. Use simplex or the -600 kHz offset, or add a crystal to the "Aux." position for offset. The encoder has both burst and continuous modes for access to most closed repeaters.

10 watts output & infinite VSWR without failure. That's a *minimum* of 10 watts out and it's circuitry-protected from high VSWR. (For more output, see the HA-202 amplifier below). True FM means great audio quality too.

A hot receiver with superior audio. 0.5 μ V sensitivity... Schmitt-Trigger squelch with a threshold of 0.3 μ V or less... diode protected dual gate MOSFETS in the front end... IC I.F.... dual conversion... 8 pole crystal filter... linear audio response for a sound so natural you'll think the op. you're working is sitting in the room with you. Built-in, big 2" x 6" speaker plus jack for an external speaker.

One of the smallest synthesized rigs, yet easy to build with 5 circuit boards. Alignment requires only a VTVM... a freq. counter helps but alternate methods are described. Get the best value going in synthesized 2-M; get the new HW-2026.

Kit HW-2026, 12 lbs., mailable 289.95

Kit HWA-202-1, AC supply, 7 lbs., mailable 32.95

HW-2026 SPECIFICATIONS — RECEIVER — Sensitivity: .5 μ V for 12 dB SINAD (or 15 dB of quieting). Squelch Threshold: .3 μ V or less. Audio Output: 2 watts (typical) at less than 10% THD (5 kHz deviation). Image Rejection: Greater than 45 dB. Spurious Rejection: Greater than 50 dB. IF Rejection: Greater than 80 dB. Internally Generated Spurious: Below 1 μ V equivalent, except at 146.87, 146.90, 147.46, 147.53, and 147.80 MHz. Bandwidth: 6 dB: 15 kHz, min. 60 dB: 30 kHz max. Modulation Acceptance: 7.5 kHz, minimum. **TRANSMITTER —** Power Output: 10 watts, minimum. Spurious Output: -40 dB within 2 MHz of carrier; -45 dB elsewhere. Modulation: FM, 0 to 7.5 kHz adjustable. Duty Cycle: 100%, with ∞ VSWR. Tone Encoder: Burst mode: 1800 to 2500 Hz, 6 kHz deviation. Continuous Mode: 70 to 200 Hz, 0.7 kHz deviation. **GENERAL —** Frequency Coverage: 144.000 to 147.995 MHz (any 2 MHz segment). Frequency Increments: 5 kHz. Frequency Stability: $\pm 0.015\%$. Transmitter Offset: 0 and -600 kHz supplied, provision for 1 additional. Operating Temperature Range: -10 to +50°C. Current Consumption: Receive: (squelched): 700 mA, max. Transmit: 2.5 A, max. Operating Voltage: 12.6 to 16.0 VDC, 13.8 VDC nominal. Dimensions: 2.75" H x 8.25" W x 9.875" D. Weight: 6 lbs.

Figure 4: The original introduction of the HW-2026 in the 1975 Christmas Catalog, which came out in October.

shows the original ad. Heathkit also sold a separate AC power supply for the radio (HWA-202-1 \$32.95). This is a proven power supply designed for the HW-202.

Table I shows the specifications for the HW-2026. Two things stand out: the radio,

even with its fancy thumbwheel switch frequency selector, can only operate over half the band (any 2 MHz segment). A major realignment is needed to change the segment. And second, the only repeater split is -600 kc, though there is a place for an optional

Heathkit HW-2026 Specifications (1975)**Receiver:**

Sensitivity:	12 dB SINAD at 0.5 μ V.
Squelch Threshold:	0.3 μ V or less.
Audio Output:	2 Watts (typ.) <10% THD, 5 kHz deviation.
Image Rejection:	-45 dB
Spurious Rejection:	-50 dB
IF Rejection:	-80 dB
Internally Generated Spurious Signals:	Below 1 μ V except at 146.87, 146.90, 147.46, 147.53 & 147.67
Bandwidth:	6 dB @ 15 kHz, 60 dB @ 30 kHz
Modulation Acceptance:	7.5 kHz minimum.

Transmitter:

Power Output	10 W minimum into 50 Ω
Harmonic and Spurious Output	-40 dB within 2 MHz of carrier -45 dB elsewhere.
Modulation:	FM, 0 - 7.5 kHz, adjustable.
Duty Cycle	100% with infinite SWR.
Tone Encoder	
Burst Mode:	1800 to 2500 Hz. 6 kHz dev.
Continuous Mode:	70 to 200 Hz, 700 Hz deviation.
Transmitter Offset:	0 and -600 kHz xtals supplied. Provision for one additional offset crystal.

General:

Frequency Coverage:	Any 2 MHz segment from 144.000 to 147.995 MHz
Frequency Increments:	5 KHz.
Frequency Stability:	\pm 0.0015%
Operating Temp. Range:	15 to 125° F (-10 to 50° C).
Operating Voltage Range:	12.6 to 16 VDC (13.8 V nom.)
Current Consumption	
Receive Mode	700 mA maximum, squelched
Transmit Mode:	2.5 amperes maximum
Dimensions:	2 $\frac{3}{4}$ H x 8 $\frac{1}{4}$ W x 9 $\frac{7}{8}$ D (7.1 cm x 21 cm x 24.5 cm).
Weight:	6 lbs. (2.7 kg).

TABLE I

crystal (not supplied) for a second split. This probably was okay at the time for use in less populated areas, but major city locales were already becoming crowded.

The radio puts out a healthy 10 - 12 watts by all reports. It also includes CTCSS as well as tone burst for repeater operation.

Heathkit HW-2026 Assembly:

A majority of the radio construction resides on five printed circuit boards. In the order of board assembly, there is the VCO board, Transmitter board, Power Amplifier board, Synthesizer board and Receiver board.

Construction of the Power Amplifier board includes its installation to the rear panel. In a cost savings step seven holes on the rear panel (4 #6 and 3 #4) come untapped. Heath supplied with the kit seven self-tapping screws, one for each hole, that is used to thread that hole. Upon completion these seven self-tapping screws are discarded, and the threads are cleaned up with a knife or file. The two Amplifier power transistors are treated with silicon heat compound prior to being attached to the rear panel. Two 'U' shaped heat sinks get added to the rear panel later, in the final assembly.

On the synthesizer board the nine dual in-line (DIP) ICs mount in sockets, as do the five DIP ICs on the transmitter board and the single DIP on the receiver board. Sockets make for easy repair but can be a problem after years of operation. It is a good idea to reseat such ICs if intermittent problems start to appear later in the life of the device.

Once the Power Amplifier board assembly and four other boards are completed, chassis assembly begins. The first task is preparing the prefabricated wiring harness by placing PC board connectors and connector pins on desig-

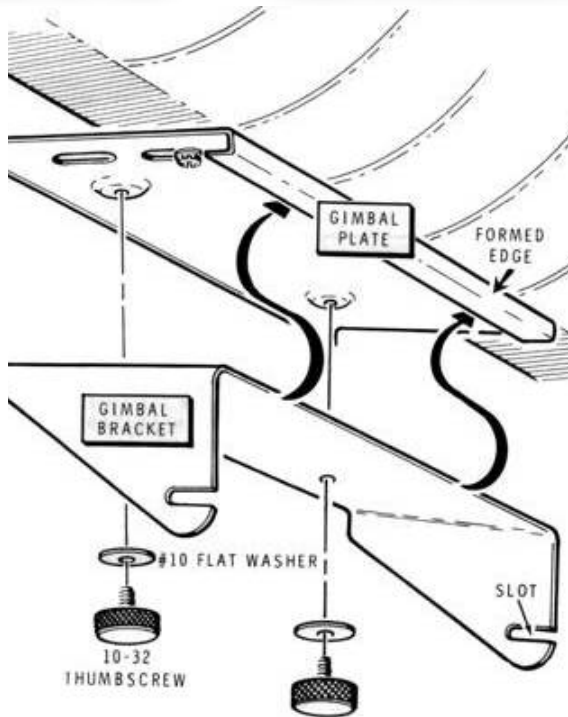


Figure 5: HW-2026 under-dash mounting bracket.

nated harness wire ends. With that out of the way, controls, switches, the speaker, the meter, brackets and insulators, etc. are assembled to the chassis. The wiring harness is then wired to the components on the chassis.

Front panel assembly is next. The thumbwheel frequency switch is assembled and ten short wires are prepared with a PCB connector on one end. These wires are then soldered to ten switch terminals and the switch is mounted. Final wiring of the chassis is then conducted; and the fused power lead with strain relief is added.

The circuit boards are installed next, starting with the Transmitter board, VCO board, Receiver board and Synthesizer board. Then the rear panel with the Power Amplifier board is in-

stalled, and the boards are connected up. Most of the board connections are push-on connectors making the boards easier to remove if repair is necessary.

Checkout and alignment come next, before the final covers are put in place. Alignment requires a frequency counter or receiver capable of receiving WWV, an alignment tool (supplied), a 50Ω dummy load and a 51Ω alignment load (both assembled from parts provided in the kit), and a VTVM. Receiver alignment can be done with a frequency counter or an on-air signal, preferably from a repeater. Modulation deviation adjustment can be done with a deviation meter or by on-air adjustment monitored by another station. Tone burst and CTCSS tone adjustments require a frequency counter.

The manual covers setting up the radio for mobile and home use. The radio came with a gimbal plate that bolts under the dash of a typical mid-seventies automobile. (Figure 5). The radio, with or without the gimbal bracket, can easily be removed using two large thumbscrews. (See Figures 5 and 6.)

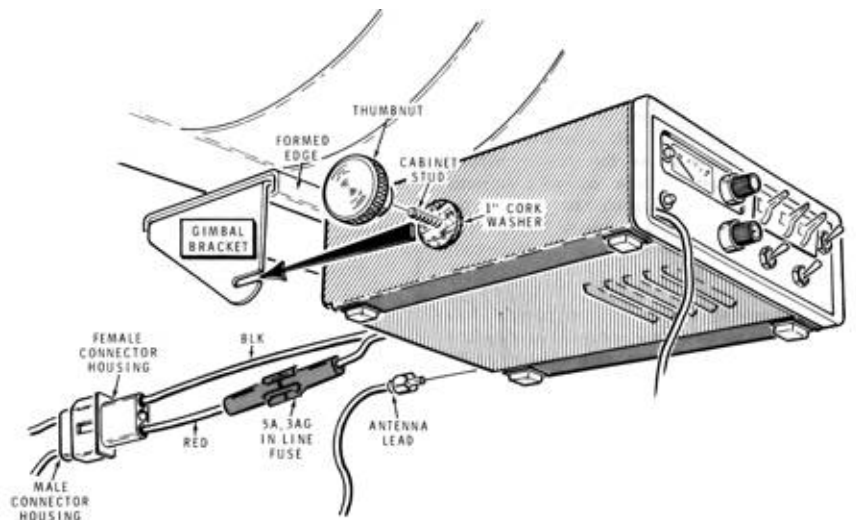
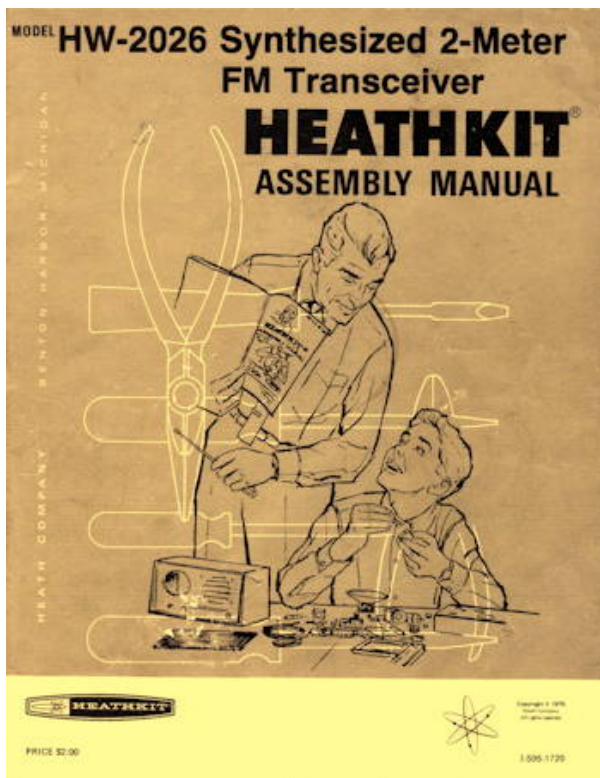


Figure 6: HW-2026 to gimbal bracket mounting.

Notes:

1. The President's Letter in Christmas Heathkit catalog #806 page 51. (Catalog issued late September 1975):
"In this catalog we introduce three new transceivers, the HW-104 5-band SSB, the HW-2021 2-meter hand-held, and the HW-2026 synthesized 2-meter fixed or mobile rig."
2. Christmas Catalog 1975 #806 pages 86, and 87.
3. A copy of the full HR News article will be posted in an online addendum on the Heathkit of the Month website. The link should appear under the HotM #111 listing.
4. Terry Perdue's article is available online at:
<https://www.edn.com/heathkit-transceiver-recalled-after-meeting-specs/>
5. Christmas Catalog 1976 #813 page 74. A scan of the page will appear in the online addendum (See note 3).



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

This article is copyright 2022, and originally appeared in the April issue of 'RF', the newsletter of the Orange County Amateur Radio Club - W6ZE.

Thanks - AF6C

Sadly, these radios never made it into use. But the later HW-2036 and HW-2036A released a year later became popular. These later radios came with both ± 600 kHz splits along with an auxiliary crystal socket for a third, non-standard, repeater split. The 2-MHz useable bandwidth limit continued for the HW-2036 but the later 'A' version covered all 4 MHz of the 2-meter band.

Final Comments on the HW-2026:

There is no doubt the HW-2026 failure came as an expensive shock to the Heath Company. However, their determination to right the wrong and to come out with a solid replacement for the radio shows there was backbone behind the "We will not let you fail" motto that Heath worked hard to keep true.

What's Happening at HotM?:

The home of HotM is now sporting new double pane environmental windows. The change is amazing from the old drafty windows. Prep for new exterior paint is being started as I write this. I was tempted to paint the house Heathkit green with Heathkit gray trim. But alas, my current choice tends towards medium light gray ("Silver Bullet") with off-white trim ("Cool December").

The Heathkit web pages need to be updated, but I'd lost FTP access, without a lot of hassle, and the rewriting of numerous scripts, so I postponed any updates until the promised fix occurred; it did at the end of March. I do have a big update to HotM #110 covering the Deluxe Service Bench VTVMs. It's been awaiting posting, but is up now.

73, from AF6C

