



The author's amateur radio station.

The Experiences of a (Relatively) Young Ham with Vintage Radios

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(Photos courtesy of the author)

I earned my amateur radio Novice license in 1978, when I was fifteen years old. Although I've now been licensed for about 38 years, by current amateur radio demographics, I'm a relatively young ham. While most of the gear I've owned and used wasn't terribly new, little of it could be considered "vintage" until fairly recently.

My primary HF transceivers are both low-power transceivers by Elecraft: a K2 and a KX3. The K2 is my go-to rig for most of the operating I do in my ham shack and the KX3 is my go-to rig for all of my outdoor operating. Both are extraordinary radios and the KX3 is truly cutting-edge. However, I have come to develop a real interest in vintage tube-type radios.

Given that I own and enjoy using state-of-the-art (or nearly state-of-the-art) radios, why would I develop an interest in radios that were first designed and sold when I was a young child, or even decades before I was born?

- I want to experience, in at least a small way, what amateur radio was like for hams of previous generations;
- I want at least one HF rig that will remain serviceable for decades; with all modern commercially-manufactured radios

using components that are unlikely to be available even in the used market or New-Old-Stock (NOS) over the coming years, simple, functional, fully analog equipment built with discrete components is likely to remain fixable for many years to come;

- Peer-pressure—some of my best friends are big-time fans of vacuum-tube gear and their enthusiasm is contagious!

Heathkit HW-16 Novice Transceiver

The first vintage HF transceiver I purchased and actually put on the air was a Heathkit HW-16.

The HW-16 was the Heathkit Company's offering when Novice licensees were required to use crystal-controlled transmitters and it was available from 1967 through 1976. The HW-16 offered variable-frequency receive and crystal-controlled CW-only transmit operation on the amateur bands Novices of that time were permitted to use: 15-meters, 40-meters, and 80-meters.

The HW-16 was an all-tube design—it has no semi-conductors. In 1969, the HW-16 sold for \$109.95 (\$724 in



The author's Heathkit HW-16.

today's money), and was available only in kit form. The HW-16 was designed to allow the addition of an external VFO (Variable Frequency Oscillator) so that after a Novice licensee upgraded to a General-class license, he could continue to use his HW-16 but with VFO-control of the transmit frequency. After the Federal Communications Commission changed the rules to allow Novices to use VFO-controlled transmitters, the market for transceivers such as the HW-16 quickly dried up. Because I earned my Novice license after the rules change, I was never required to use crystal-controlled transmit, and my first station was not an HW-16.

Nevertheless, I had seen so many HW-16s at the uncounted hamfests I had attended as a kid with my father, W8EOG, that the HW-16 just looked right to me and eventually I decided an HW-16 would be a good "first vintage rig" to add to my station, which I did in 2008, with the purchase of a clean HW-16 and a clean HG-10B VFO at a regional hamfest.

Somewhat surprisingly, both the HW-16 and the HG-10B VFO were put back on the air with very little work. For the HW-16, I replaced the electrolytic capacitors with a kit purchased from Hayseed Hamfest; fixed a non-functional transmitter sidetone by replacing a neon bulb, and performed an alignment. For the HG-10B VFO, I had to undo some simple modifications a previous owner had made to enable him to use the VFO with an older Heathkit DX-40 transmitter, and I had to make a pair of suitable cables to connect the HG-10B to the HW-16. The modifications to the HG-10B were very easy to undo and I found everything I needed to know in the HG-10B manual.

I've been told by good judges that my HW-16 transmitter produces a very pure, stable, drift-free CW signal which is a pleasure to listen to, both using a crystal to set the transmit frequency and using the HG-10B VFO to set the transmit frequency. Unfortunately, signals in the HW-16 receiver have an annoying intermittent "warble" I'm still trying to diagnose. I've used the HW-16 as a transceiver as it was intended to be used, and I've used the HW-16 as just a transmitter, while using my Elecraft K2 as a receiver, switching between

receive to transmit using a mechanical Transmit/Receive (T/R) switch. I've purchased and built an electronic T/R switch kit but haven't yet interfaced it to the HW-16 because about the time I was ready to do that, a Drake 2-C receiver and a Drake 2-NT transmitter entered my life.

The Drake Novice Station: 2-NT Transmitter & 2-C Receiver

When I was a young lad, my father had two stations centered on the well-respected equipment made by the R.L. Drake Company of Miamisburg, Ohio. Initially, he had a Drake TR-4 transceiver. The TR-4 was one of the first commercially available, fully featured amateur HF transceivers.

The T-4X/R-4 combination provided all of the integration of the transceiver in the more traditional (for the era) "two box" format and accommodated split-frequency operation, something the TR-4 didn't offer. From the early 1960s through the early 1970s, all the Drake HF radios had a very distinct family look: a gray and white front panel and a black cabinet.

Later, he upgraded to the Drake 4-Line Twins: a Drake T-4X transmitter and Drake R-4 receiver. Probably because of my father's stations, I have long been drawn to Drake radios of this period and in 2016 I finally put together my own Drake station consisting of a 2-NT transmitter and a 2-C receiver.

The R.L. Drake Company offered their 2-NT transmitter from 1966 through 1974. The 2-NT, like Heathkit's HW-16, was designed specifically for use by Novice licensees and offered crystal-controlled, CW-only operation on not only the 15-meter, 40-meter, and 80-meter amateur bands but also on the 10-meter and 20-meter bands, the idea being that once a Novice upgraded to General, he could use his 2-NT transmitter on all of the HF amateur bands of the time.

The 2-NT is a hybrid design, using three vacuum tubes and twelve semiconductors and it offered useful features such as built-in electronic T/R-switching; circuitry for receiver-muting during transmit; a "spot" function to allow



Author's Drake 2-NT transmitter and 2-C receiver.

the operator to find his transmit signal in his receiver without sending a signal to the antenna, and a sidetone oscillator so the operator could hear the CW he was sending. In 1966, a Drake 2-NT transmitter would have sold for \$130, fully assembled (\$969 in today's money).

To match the 2-NT transmitter, both in features and in appearance, Drake offered the 2-C receiver over the same time period. The 2-C offered reception of CW, SSB, and AM signals on all the HF amateur bands of the time: 10-meters, 15-meters, 20-meters, 40-meters, and 80-meters. The 2-C was also a hybrid design, with five vacuum tubes and fourteen semiconductors. The 2-C offered four switchable receive-bandwidths suitable for CW, SSB, and AM. An optional external 2-CQ "Q-Multiplier"/speaker was available that provided a notch-filter and additional control over receive-bandwidth. (Alas, I don't yet own a 2-CQ.) In 1966, the Drake 2-C receiver was available for \$230 (\$1,714 in today's money).

Used together, the Drake 2-NT transmitter and Drake 2-C receiver (with or without the 2-CQ) provided the well-heeled Novice licensee of the era with a fully integrated, high-end Novice station.

I found my Drake 2-C receiver at the 2016 Athens (Ohio) Hamfest. It was very clean inside and out and the only work I had to do to it to get it working again was to clean switch contacts and rear panel RCA sockets with DeoxIT. Initially, I used the 2-C receiver with my HW-16 as transmitter, using a manual T/R switch, and the pair worked very well together—so long as I remembered to throw the manual T/R switch before starting to send CW.

I went to the 2016 Dayton Hamvention with the hope of finding a Drake 2-NT transmitter. At that Hamvention I saw more gray, white, and black Drake gear than I've ever seen at a Hamvention before—it was everywhere!—but I had to walk through nearly all of the huge flea-market area before I found what was probably the only 2-NT transmitter at the

whole show. The seller was selling it for an estate, untested, but it was very clean inside and out, the asking price wasn't unreasonable, and the seller accepted my counter-offer.

Back at the hotel that evening, I opened the 2-NT cabinet to examine my treasure and discovered that—not surprisingly—both of the large electrolytic capacitors were leaking electrolyte. Through the magic of the Internet, I was immediately able to learn not only that Hayseed Hamfest offers a re-cap kit for the 2-NT but that Hayseed Hamfest was at the 2016 Hamvention in the flea-market. The very first thing I did the following morning upon arriving at the Hamvention venue was to make a bee-line to the Hayseed Hamfest space in the flea-market to buy the 2-NT re-cap kit. Back home following the end of Hamvention 2016, I replaced the electrolytic capacitors in the 2-NT, a process that turned out to be fairly easy once I thought to snap digital photos beforehand so I could confirm that I was installing the new caps correctly after removing the old ones.

Having little experience with tube-type equipment I didn't want to power-up the re-capped transmitter without the support of a knowledgeable mentor so I arranged a visit with Rich Post KB8TAD. Rich made a thorough visual examination of the transmitter and then made several safety-checks with a multimeter before applying power to the transmitter. Rich discovered that the oscillator wasn't working but was able to find a modification a previous owner had made and undo that modification to allow the oscillator to function again. [See the sidebar "Beware the Mods; Drake 2NT Transmitter" for details on what Rich found and did when I took the 2-NT to his house for help.]

To integrate the 2-NT transmitter with the 2-C receiver, three cables are required to interconnect the two units, as seen in the accompanying diagram. Fully integrated, with built-in electronic T/R switching, receiver muting on transmit, and CW sidetone, the 2-NT / 2-C combo feels very much like a transceiver except for the fact that the transmit-



Author's Hallicrafters HA-5 variable frequency oscillator.



Inside the Drake 2-C receiver.

ter frequency remains crystal-controlled. I have purchased a vintage Hallicrafters HA-5 VFO to use with the 2-NT transmitter but I haven't tested it yet nor have I connected it to the 2-NT.

In using the 2-NT/2-C station over the past few months, I've learned that the 2-NT transmitter produces a very pure, stable, drift-free CW signal, that the single tune-control is very easy to use to tune the transmitter to the frequency band I will be using, and that I can smoothly adjust the power output from almost zero watts to about 20 watts using the front-panel "Power Set" knob. I've learned that the 2-C receiver is sensitive, has pleasant audio when driving the right speaker, and that the built-in bandwidth filter-widths are sufficient for casual operation. Unfortunately, I've also learned that my 2-C receiver does have an intermittent audio problem that I need to diagnose and fix, and I've discovered that the AGC circuit—which Drake called "AVC"—either isn't up to modern standards or—probably more likely—some components within the circuit have drifted enough in value that the circuit isn't operating as it was designed. Eventually, I will look into both of these issues.

While working on and operating the HW-16 station and the 2-NT / 2-C station, I've learned some other things. First and most importantly, lurking within the cabinets of these relatively simple radios is high-voltage, voltage high enough kill, and certainly high enough to produce a painful jolt—ask me how I know! Another thing I've learned is that unlike modern transceivers which put a very low DC voltage across the CW key contacts, both the 2-NT and the HW-16 place a DC voltage of more than 100 volts across the key; I've learned to handle my CW key gingerly when using either of these transmitters but even so I still get a tingle on my fingers from time to time. I plan to build an external universal keying circuit that will place only a very low voltage across the CW key, a device that can be used with either of these stations. The kit available from HamGadgets.com (see

below) might be what I end up building.

While using these vintage radios I've also learned that I really like the "warm tube smell" that fills the hamshack after an hour-long CW conversation. I like the look of the big, lighted dials on the old radios, and I like seeing the glowing tubes inside the cabinets.

I'm not likely to use either the HW-16 station or the 2-NT / 2-C station to chase rare DX stations or to participate in any major contests—my Elecraft K2 and KX3 rigs are far superior for these activities—but for a laid-back CW conversation with a good friend, I've found the tube rigs to be hard to beat.

Note: sharp-eyed readers will have noticed a Heathkit HW-29 "Sixer" 6-meter AM transceiver and a Gonset Communicator IV 6-meter AM transceiver in the photo at the top of this article. Both of these are products of the early 1960s and are fully tube-type radios. I use these radios to participate in the local weekly 6-meter "hollow-state" net. Both of these transceivers feature variable receiver-tuning but crystal-controlled transmit. The HW-29 Sixer was actually the first vintage tube-type I purchased and put on the air but I was fortunate in that it required no repairs or even an alignment. The Gonset Communicator IV was given to me as a long-term loan by the net's primary net-control operator after other net participants complained they couldn't hear my Sixer's meager 1.5-watt signal; the Communicator IV's 15-watt output is much more easily heard by the others participating in the net. As was the case with the Sixer, the Communicator IV was delivered to me in perfect working order—I haven't even opened the cabinet to look inside it. Because both of these rigs worked as-delivered, I've not been able to learn much from them about how to repair tube-type equipment. In using them in the weekly net, however, I've learned quite a bit about what life was like for hams in the years before FM repeaters on 2-meter and 70-centimeters for local communications became ubiquitous.



Eric's Drake 2-NT transmitter on the KB8TAD bench.

Beware the Mods: Drake 2NT Transmitter

Text and photo by Rich Post, KB8TAD

Fellow ham and friend Eric WD8RIF had just purchased a Drake 2NT transmitter to go with the matching 2C receiver purchased a few weeks earlier. He carefully replaced the obviously leaky electrolytics with nice new ones purchased from N0JMY's Hayseed Hamfest. Not wanting to take a chance on his new acquisition, he asked if I would help with the first power up. I said of course! I had my isolated Variac, volt and wattmeter, RF power meter, dummy load, Fluke multimeter, and portable frequency counter ready. His job of soldering the electrolytics was excellent. The first unpowered check confirmed a typical problem of no continuity for the power switch, a problem quickly solved by a squirt of DeoxIT.

We then dutifully followed the procedure in the manual for tune up but there was no indication on the power meter. OK, let's step through this slowly. Is the oscillator working? No indication on my little hand-held frequency counter with heat-shrink on its little antenna, despite using a known good crystal. The relay contacts were cleaned and checked—all good. It pulled in properly on both the spot position and the transmit position with the key depressed. The oscillator tube was pulled and DeoxIT applied to the socket. The tube was reseated but still no oscillation.

The oscillator circuit components are crowded around a vertical terminal strip attached to the tube socket making measurements and repairs difficult. My first clue to a possible modification was a resistor tacked across the RF choke on the cathode of the 6EA8 pentode section used as

the oscillator. It was the wrong color code according to the schematic, 4700 ohms in place of 680. That would not show up as a resistance change because the parallel RF choke is a near short circuit at DC. But that parallel resistor passes RF, which the choke does not. We checked the manual for any suggested changes in the circuitry for use with a VFO but found none. An online check also did not turn up any VFO modification. This would not be instant gratification. The transmitter obviously needed some time on the bench.

The next day, I tested the 6EA8 tube and swapped in another just in case. I hunted up a proper resistor, a bit larger than 680 ohms, since I planned just to tack it across the existing 4700 in case that was a legitimate mod for VFO operation. The oscillator was still dead but checking around the very crowded terminal strip revealed a 0.01-uFD ceramic cap bypass on that cathode choke. There were two such caps on one side of the choke, which are supposed to be there according to the schematic. But it suddenly dawned on me that this cap was on the tube side of the choke! Sure enough, on checking after cutting the cap lead to the cathode, the oscillator was suddenly singing a proper 40-meter tune as indicated on the frequency counter.

With what I assume were VFO mods now fixed, it was time to check the zero indication on the cathode current meter. Using my VOM to check the 15-ohm cathode resistor at the final output tube, the cathode current meter moved a bit indicating the meter circuit was functioning. Pulling the final tube cage, continuity checks confirmed the plate was firmly connected to the B+ source. The tube filament was fine. While the tube was out, some DeoxIT was spritzed on the socket. On power-up testing, there was still no meter movement. That left the screen circuit. The 2NT uses a separate screen voltage source. That voltage can be varied using a front panel potentiometer called the "Power Set." The circuitry is such that there is always a minimum current on the final tube, but if there was no screen voltage, the final output tube would show zero current, explaining the indication on the meter. Was the screen control open or shorted? After shutting down power, a VOM resistance test indicated the control was fine. Tracing the screen current supply back to its source, my VOM finally found the problem, a bad solder joint on one side of the screen current diode.

Resoldering the diode connection solved the screen current problem. I was finally able to get the transmitter to function as intended. Note to self: Document any modifications for future users!

Footnotes:

N0JMY's Hayseed Hamfest: <https://hayseedhamfest.com>

Hamvention: <http://hamvention.org>

HamGadgets Universal Keying Adapter 3+ Kit: <http://www.hamgadgets.com/UKA-3>

TSM