

Heathkit of the Month:
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**The Heath RX-1
"Mohawk" Ham Band Receiver**

Introduction:

Though Heathkit has been selling ham transmitter kits since their first AT-1 in 1951, their line of ham receivers was limited. Their AR-1 through AR-3 receivers were for general SWL coverage and had none of the features needed for a good ham radio receiver.

In 1958 Heathkit introduced the TX-1 Apache transmitter to replace the DX-100B. At that time Heathkit also released its first real ham receiver, the RX-1 Mohawk, a companion receiver for the Apache. The Mohawk sold for \$274.95 in 1958. It remained in production until 1964, some months after their new SB-300 receiver was introduced.



Heathkit TX-1 Apache Transmitter

The Mohawk is physically almost identical to the Apache in appearance. Controls are similarly located on the front panel and both units use the same cabinet which measures 19-1/2" W x 11-5/8" H x 16" D (Heath Part # 90-82). The Mohawk weighs in at 52 lbs. assembled. Shipping weight of the kit was 66 lbs.

Frequency coverage of the Mohawk is ham band only except that it also covers the (then new) citizen's band, as well as a continuous

4 mc band for use with optional VHF converters:

| | | | |
|---------|----------|----|-----------|
| 160M | 1.80 mc | to | 2.00 mc |
| 80/75M | 3.50 mc | to | 4.00 mc |
| 40M | 7.00 mc | to | 7.30 mc |
| 20M | 14.00 mc | to | 14.35 mc |
| 15M | 21.00 mc | to | 21.45 mc |
| 11M | 26.96 mc | to | 27.23 mc |
| 10M | 28.00 mc | to | 29.70 mc |
| 6M & 2M | 22.00 mc | to | 26.00 mc* |

*Separate converters, the Heathkit XC-6 and XC-2, allow coverage of the six and two meter VHF bands. The converters have an output of 22 mc to 26 mc.

The Mohawk has a dial-rule frequency display that utilizes a rotating drum so that only one band's scale is visible at a time. A scale for the six and two meter VHF bands is also on the drum. The drum turns with the band switch showing the dial scale for the proper band.

Electrically, the fifteen-tube Mohawk includes many of the features found in more expensive receivers of the time including dual conversion, five levels of selectivity from 5 kc down to 0.5 kc., a notch filter for reducing heterodyne interference, delayed AGC, an S-meter, a long dial for more accurate tuning with a weighted main tuning knob for smooth tuning, a 100 kc crystal oscillator, a dual crystal-controlled second oscillator for easy sideband selection, and many other features.

The 15-tube lineup is:

| | |
|-------|--|
| 6BZ6 | RF Amplifier |
| 6CS6 | First Mixer |
| 12AT7 | HF Oscillator / Buffer |
| 6BA6 | First IF (1682 kc) |
| 12AT7 | Dual Second Xtal Oscillator (1632 kc / 1732 kc) |
| 6CS6 | Second Mixer |
| 6BA6 | First 50 kc IF |
| 6BA6 | Second 50 kc IF |
| 6BJ7 | AM detector / AVC / ANL |
| 6CS6 | Product Detector |
| 12AT7 | Audio Amp / S-meter Amp |

- 6AQ5 Audio Output
- 6BA6 100 kc Crystal Calibrator
- 0A2 Voltage Regulator
- 5V4 Power Supply Rectifier

On the front panel (L to R):

Top Front Panel Controls & Indicators:

- S-Meter (Lighted)
- Slide-rule Tuning Dial (Lighted)

Middle Front Panel Controls:

(three toggle switches - top to bottom)

- ANL / OFF Toggle Switch
- OFF / AVC Toggle Switch
- CW-SSB / AM Toggle Switch

- BFO Control
- STANDBY / RECEIVE Toggle Switch
- NOTCH TUNE Control
- CALIBRATE Push Button
- LSB / USB Rotary Switch
- TUNING Tuning Knob
- CALIBRATE Capacitor
- ANT TUNING Capacitor

Bottom Front Panel Controls:

- OFF / AFG(ain) Control w/switch
- RFG(ain) Control
- NOTCH DEPTH Control
- IFG(ain) Control
- SELECTIVITY: 5 - 3 - 2 - 1 - 0.5 kc Rotary Switch
- BAND: 160 - 80 - 40 - 20 - 15 - 11 - 10 - CONV. Rotary Switch
- PHONES 1/4" Phone Jack

Circuit Operation:

The Mohawk's Front end including RF amplifier, 1st mixer and 1st Oscillator and buffer come factory assembled and aligned. The antenna input is designed for 50 - 75 ohm unbalanced or 150 - 300 ohm balanced input. Both an UHF coaxial and a screw-terminal strip antenna connector are present on the back panel. The signal is passed to a tuned grid - tuned plate RF amplifier and to the first mixer. The first oscillator uses 1/2 of a dual 12AT7 triode;

the other half is a buffer to isolate the oscillator for stability. The oscillator tunes with the main tuning control and operates on a different frequency range for each band.



Heathkit RX-1 Mohawk Ham Receiver

Output from the first mixer is at 1682 kc where the signal is amplified in the first IF and fed into the second mixer. The oscillator for the second mixer consists of a dual triode, with each triode a separate crystal oscillator. The lower sideband oscillator runs at 1632 kc and the upper sideband oscillator runs at 1732 kc. The correct oscillator is selected by the LSB-USB toggle switch on the front panel. The second mixer output is at 50-kc.

The 50-kc second IF consists of two stages of amplification. Gain in these stages is secondary to selectivity. High-'Q' coils are used instead of IF transformers. The loading and coupling of these coils are switched to change the bandwidth of the second IF from between 5 and 0.5 kc in 5 steps. A tunable 50-kc bridge T-notch filter is located between the IF stages. It may be switched in to eliminate or reduce heterodynes. One feature not found in very many receivers is a separate IF-gain control. This control varies the gain of the first IF and the last amplifier stage in the second IF. It is normally left fully up, but can be reduced to improve strong CW and SSB reception. The 50-kc second IF is actually aligned slightly above 50-kc to improve unwanted sideband suppression.

A product detector is used for SSB and CW detection. The oscillator section of the detector is not crystal controlled, but is tunable. It is normally set directly on 50 kc.

One diode of a triple-diode tube provides detection in the AM mode. The other two diodes are used for AVC (automatic volume control - also known as AGC) and as a selectable noise limiter. The triple-diode also feeds the S-meter amplifier that drives the S-meter. The S-meter amp is half of a dual-triode. The second half of the tube is the audio amplifier, which drives the audio output stage. Audio output is about two watts maximum. Audio is available at 500 ohms and 8 ohms on the back panel. The phone jack on the front panel supplies 500-ohm audio for headphones. The 8-ohm output normally drives a speaker like the optional Heathkit AK-5 speaker. When a plug is inserted, the 8-ohm output on the rear panel (but not the 500 ohm output) is muted.

Construction:

As one can surmise from the size and weight of the RX-1, it is a rugged piece of equipment. The chassis is a frame that divides the circuitry into different compartments for shielding and isolation between circuits. The mechanical tuning and band-switching design, while not as complex as the Collins 51J4, is well thought out with gears and coupling links. For the avid kit builder, this offered a break from soldering tasks and made the kit even more fun to build. Like the typical Heathkit, the mechanical designs work as well as the electrical designs and were as easy to assemble. The manual with its clear step-by-step instructions and diagrams made assembly a pleasure – as typical with Heathkits.

A Bit of Personal History:

In my early general-class ham days in the early sixties I was the proud young teenage owner of an Apache transmitter. My dream was to have the matching Mohawk receiver. I never got to own one, but a friend, who was a year behind me in high school, got one as a present from his reluctant father who worried that the kit would never work. My friend assembled the kit and invited his father to see it "fire up" for the first time. That expression turned out to be literal; as the Mohawk was turned on for the first time

smoke almost immediately billowed out of it. My friend's father was furious, and my friend called me for help.

The receiver was brought over to the basement workshop in my parent's home and I took a look. The kit was very neatly put together, and the soldering was clean. My friend had done an excellent job assembling the kit - almost. What had burned was obvious; insulation had melted off all the filament wiring. An examination showed that the filament wire string, at the last tube socket, was connected to the wrong terminal, which was a ground. Luckily my friend has been smart enough to turn the receiver off before destroying the filament winding of the transformer. I replaced the filament wiring, which was a chore as it ran right against the chassis and under most of the other wiring and components. When that was done the rest of the kit was checked one instruction at a time. No other errors were found.

With a bit of trepidation I turned the receiver on; the lamps lighted, as did the tube filaments. The receiver was then aligned per the Heathkit manual, and for a test I brought it up to the shack and put it in place of my NC-88 receiver for a good checkout. The checkout went better than I had ever imagined. By bedtime I had doubled my DXCC worked count, on both CW and AM. I called my friend and told him the good news, and that I thought it best I keep it for a few more days to burn it in and realign it.

That next week was a DXer's dream to me. It was near the peak of a record sunspot cycle and the bands were alive. I could finally hear the stations that were calling me. I even got a chance to try the receiver on SSB when Marty - K2MDL dropped off his Heathkit SB-10 Sideband Adapter to give me a chance to try it with my Apache.

Alas, all good things come to an end. I returned Marty's SB-10, and took the receiver back to my friend's house. We took it down to his basement ham shack, and when it was turned on and worked my friend's father was joyous.

Conclusion:

The Mohawk has a few weaknesses. The selectivity skirts are not as steep as receivers that use mechanical filters and crystal filters. Yet, they did offer five bandwidths. Mechanical filters were very expensive in those days as were crystal bandpass filters. One filter was required for each bandwidth. Heathkit went to the crystal bandpass filter in their SB-300 receiver in 1963.

In use, the weaknesses of the RX-1 Mohawk were reported to be frequency stability, poor AVC and ANL action, and audio distortion. In my few weeks with the RX-1 Mohawk, I could not honestly say I noticed any of them. Numerous fixes were published to cure these shortcomings. Compared to my inexpensive National NC-88 receiver, the Mohawk was a dream receiver!

73, from AF6C



Remember if you come across any old Heathkit Manuals or Catalogs that you do not need, please pass them along to me.

Thanks - AF6C

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