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Classic Radio

The Signal One CX-7 Complete Station

The Signal One CX-7 (see Figures 1 and 2) all-in-one transceiver had many accessories that could be used with a transceiver in a well-equipped amateur radio station. The only commonly used accessories missing from the Signal One were a linear amplifier and an antenna tuner. The Signal One was first advertised in *QST* in 1969 for $1,595, but most initial units were delivered in 1970.

Signal One Background

Richard Ehrhorn, W4EA (ex-W4ETO), and Don Fowler, W4YET, created Signal One. Signal One was initially located in Saint Petersburg, Florida, and was a part of Electronic Computer International, which was owned by National Cash Register (NCR) Company. Initially, the developers of the Signal One CX-7 thought it had a big future in government and military service, but that aspect of the CX-7's appeal did not pan out.

The CX-7 was upgraded several times. It became the CX-7A and then the CX-7B (see Figure 3). Later, it became the CX-11 and came with seven-segment LED readout devices designed into the frequency counter. The CX-11 version cost $2,600, then rose to $5,900. It was distributed by Payne Radio in September 1974, but they did not yet own the Signal One Company, as they later did.

CX-7 Operation

The Signal One CX-7 operated on 160, 80/75, 40, 20, 15, and 10 meters, plus three optional bands could be added by supplying optional crystals. The ranges were 2 – 4 MHz, 4 – 7 MHz, and 8 – 18 MHz. The CX-7 predated the addition of the World Administrative Radio Conference (WARC) bands, so it did not cover them. The Signal One ran 300 W peak envelope power (PEP) on SSB and CW. A speaker was included in the radio, as was an ac power supply, operating from 120 or 240 V ac.

The Signal One CX-7 had many built-in accessories. For transmitting, the CX-7 had a CW keyer variable from 5 to 60 words per minute, full-break-in CW operation, a transmit speech compressor to increase talk power, and broadband transmitter operation with no tune-up. For receive operation, it had a noise blanker, passband tuning, intermediate frequency (IF) shift, digital frequency readout, and the ability to receive on two different frequencies in the same band at the same time.

Split-Frequency and Dual-Receive

The first major innovation in the Signal One was the use of two VFO assemblies, which gave the CX-7 the ability to receive and transmit on two different frequencies in the same band or to transceive on one frequency. The VFOs each covered a full 1 MHz, so 10 meters was the only band covered where the two VFOs could not reach any

▲**Figure 1** — The front panel of the Signal One CX-7. [Dennis Kidder, W6DQ, photo]

▼**Figure 2** — The rear view of the Signal One CX-7. [Dennis Kidder, W6DQ, photo]

part of the band. The two VFOs could also be used to receive two different spots in the same band. In the dual-receive mode, the ratio of RF gain between the two receive signals could be adjusted, so one signal would not override the other.

Figure 3 — A modified CX-7 from the CX-7A and CX-7B upgrades. The modified one shown incorporates the CX-7B's power supply and LED keyer and counter board. [Dennis Kidder, W6DQ, photo]

IFs and Filters

The Signal One CX-7 upconverted the covered bands to 39 to 40 MHz, an early example of amateur radio upconversion. The final intermediate frequency was 8.8 MHz, which was unique to the CX-7 and its later versions. The radio was supplied with a crystal lattice filter at 8.8 MHz optimized for single-sideband (SSB) signals. Also available were two filters for CW use, a lower-cost 400 Hz wide filter, and a premium 300 Hz filter with a better shape factor for rejecting strong off-frequency signals. For radioteletype (RTTY) use, a 1,200 Hz wide filter was offered. The Signal One could accommodate two additional filters in addition to the SSB filter. The filtering for SSB used 16 poles for much better off-frequency rejection.

Frequency Counter and Display

The Signal One CX-7 had a built-in precision frequency counter. The display read down to the nearest 100 Hz, using neon Nixie tube readout devices. Later models of the original CX-7 used LED seven-segment readout devices adapted to replace the Nixie tubes. Even later versions were retrofitted to use the LED seven-segment display. The display automatically read the frequency of the VFO currently in use. Flicker of the 100 Hz digit was not an issue for the Signal One CX-7 (like it was for the Heathkit SB-104).

The Nixies are quite easy to read, but they are essentially impossible to find new now. The only way to get a replacement is to salvage a suitable Nixie tube from a donor piece of test equipment or an electronic calculator.

The Power Supply

The internal ac power supply operated from 120 or 240 V ac. No power supply for mobile use was included, because the CX-7 was a size and weight that made it inappropriate for mobile service. The choice of 120 or 240 V ac was made by the wiring of the detachable power cord. The supply delivered 1,500 V dc for the final amplifier tube plate supply, 300 V dc for the driver stage and the final amplifier screen, 60 V dc for final amplifier grid bias, and 34, 24, or 5 V for the solid-state stages and also ± 15 V dc.

The Driver and Final Amplifier Stages

The final amplifier used a type-8072 conduction-cooled tetrode. This tube was made by RCA's Transmitting Tube Division, and it was the conduction-cooled version of the axial forced air-cooled 8122 tube, which was used in the National Radio NCL-2000 and NCX-1000 and the Hallicrafters SR-2000 Hurricane transceiver.

The Transcom SBT-3 was the only amateur transceiver that had a solid-state driver stage for a vacuum-tube final. The CX-7 used two TRW RF power amplifier transistors, with one driving the other one. They were stud-mounted RF power transistors.

Broadband RF Power Amplifier Tuning

The final amplifier may be manually tuned for use with antennas having a voltage standing-wave ratio (VSWR) above 1.5:1. If the VSWR is below 1.5:1, a broadband mode, which required no operator tuning, could be used. The broadband tuning for vacuum-tube electronics was first seen on the mid-1950s Central Electronics vacuum-tube 100 V and 200 V SSB transmitters and the 600L linear amplifier.

The Transceiver Circuitry

Analog integrated circuits (ICs) made by RCA were used in many places in the receiver and transmitter circuitry of the Signal One. The RCA CA3028A and CA3053 linear ICs were used in many locations. Getting replacements today is not an easy task, because RCA has not made one in well over 40 years.

Beryllium Oxide Warning for Final Amplifier

The conduction-cooled final amplifier tube, an RCA type-8072 dissipating 150 W, is attached thermally with parts made of beryllium oxide — which is a deadly poison — and a heatsink compound that is nearly as hazardous.[1] The Signal One uses an RCA transmitting tube type 8072. This is a derivative of their type-8122 axially cooled tube, which has 400 W of plate dissipation.

[1]Penson, C., *Heathkit: A Guide to the Amateur Radio Products*, CQ Communications, Inc., 2003, pp. 232 – 233. See Penson's warning about beryllium oxide in his discussion about the Heathkit SB-230 linear amplifier, which also used a conduction-cooled tube.