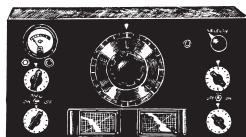


THE COMMUNICATIONS RECEIVER

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The Hallicrafters SX-28 Super Skyriders

By Jim Hanlon, W8KGI

It is with pleasure that I welcome Jim Hanlon to the ranks of contributors to The OTB. No novice at writing about short-wave communications gear, he has been featured prominently in Electric Radio for a number of years. His subject here is the famous Hallicrafters SX-28 receiver, a work-horse with the WWII U.S. Army.—W2DGB

In the decade before WWII, the communications receiver made great technical progress. Prior to 1932 it typically consisted of a regenerative detector and one audio stage, perhaps with an RF amplifier; for example the National SW-3. In 1933 the first, basic, plug-in-coil superhets were marketed and the crystal filter was introduced with the Comet Pro, AGS, AGX, FB7, and FBX. RME (Radio Manufacturing Engineers) introduced bandswitching and the one-RF, two-IF, crystal filter and S-meter receiver design (which was destined to become a standard with most manufacturers in 1933) with their

RME-9. They added uncalibrated bandspread in 1934 with the RME-9D and RME 69.

The same year, National's legendary HRO offered two RFs, two IFs and a crystal filter, plus chart-calibrated general coverage and bandspread tuning. However, it still used plug-in coils and an external power pack. Hammarlund's 1936 Super Pro had two RFs, three IFs with a crystal filter, an IF bandwidth variable to 16 Kc, bandswitching, and uncalibrated bandspread. Several manufacturers introduced audio noise limiters in 1938 with sets like the NC-100, the RME70, the SX17 and the HQ120X.

The pre-war receiver that put it all together was the 1940 Hallicrafters SX-28 Super Skyriders. It featured six switched bands from 550 Kc to 40 mc, two RF and two IF amplifiers, three settings of crystal filter selectivity and three of variable IF bandwidth, directly calibrated main tuning and amateur bandspread on back-lit dials, a James Lamb IF noise blanker, 8 watts of push-pull, high-fidelity 6V6 audio with a tone control and bass boost, and a built-in power supply.



Author's rack-mounted Super Skyriders has conventional "leatherette"-finish front panel.

All of this came in a magnificent 10"x20"x15" art-deco style cabinet with aluminum side-louvers and a black, simulated-leather front panel. It weighed in at a mere 75 pounds. When the SX-28 first hit the market, it sold for \$159.50; wartime inflation took the SX-28A up to \$238 by 1946.

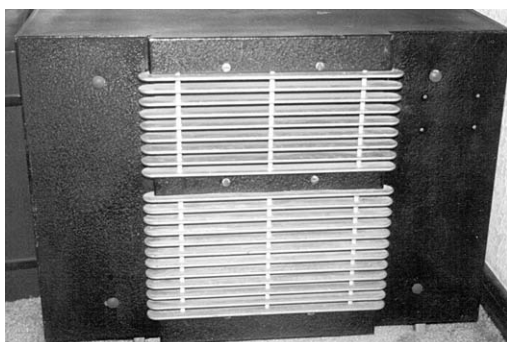
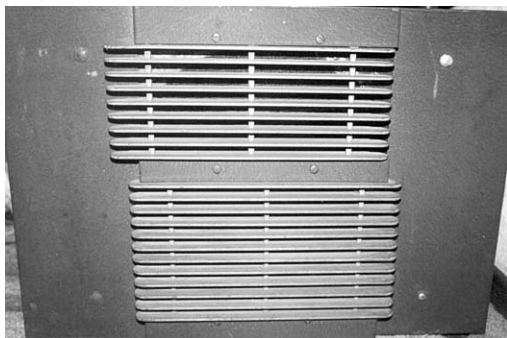
The accompanying ten-inch PM-23 speaker was an equally impressive 11"x16"x10 1/2" box with front louvers that in some models were rakishly offset. Indeed, this last of the line to proudly bear the Super Skyrider name was the epitome of the handsome and "powerful" radio of its era.

The US Military gave the SX-28 a potent power transformer for the war and called it the AN/GRR-2. Chuck Dachis, "The Hallicrafters Collector," thinks that England used a number of them during the war as well. Fred Osterman, author of *Shortwave Receivers Past & Present*, reports that "a large number of SX-28s were sent to Russia as part of the World War II Lend-Lease Act. When they reached Russia they were modified to accommodate Russian tubes. They are plentiful on the Russian used market."

Altogether about 50,000 of the SX-28 and SX-28A models were built (as estimated by Chuck Dachis), which would suggest that they should be still readily available to acquire and enjoy even today. I acquired my first SX-28 back in 1980 before I realized that I was becoming a "collector." I had kept a weekly schedule with W9EBB from my high school station, W8GYH, from 1952 to 1956, and I had admired their SX-28 from afar. The \$25 price via a classified ad in the Columbus (Ohio) Dispatch was right, even if the receiver was not in the best shape.

The set was not working, and its S-meter had been replaced by a generic, round, 0 to 1 milliamp meter. I found a shorted power bypass capacitor on the second RF stage screen grid, buried beneath the bandswitch. I could see it but I couldn't touch it with a soldering iron, so I had to remove the bandswitch to get at it. This receiver was definitely not designed for easy servicing!

When I was going through the final alignment, the power transformer developed an internal short! I replaced it with two transformers from my junk box: one for high voltage and the other for filaments. But they squeezed out the room allotted for the 5Z3 rectifier, so I used a pair of silicon diodes and a 100-ohm series resistor as a substitute. With these patches and repairs, my SX-28 came back to life.



PM-23 speaker that accompanied author's original smooth-finish SX-28 has offset louver panels above; later acquisition at right has in-line panels. Also known is a version with the Hallicrafters "h" logo.

Somewhat later I found an illuminated S-meter at the Dayton Hamvention flea market. It is not a Hallicrafters meter (the seller thought it might have come from a 75A1 or 75A2), but its shade of sepia was close to that of the tuning dials on the SX-28 and it was calibrated like a real S-meter. That was the good news. The bad news was that its zero-current resting point was on the right hand side at S-0 rather than at the left-hand side as on the original SX-28 meter. So I consulted the ARRL Handbook for an S-meter circuit that worked with this type of meter and modified the SX-28 accordingly. The result was a working S-meter and a decided cosmetic improvement in my old Super Skyrider.

My second SX-28, a rack-mount "A" model, came four years ago via an ad in the Sandia (National Laboratories) News for a very reasonable \$50. A retiree was cleaning out a few of his excess boatanchors and as usual I had room for just one more prize. This radio had been built during the war as evidenced by copious amounts of Glyptol lacquer that covered and sealed most of the parts and the chassis. Its owner had acquired it just after the war and had used it in low-hu-

midity Albuquerque, New Mexico ever since, so it was a fully functional, operating receiver with all original parts. In particular, all of the original paper bypass capacitors are still good as I verified by measuring the B+ levels at each of them and by checking their running temperatures with my fingertip. Nine of the original 15 tubes measured in the red zone on my Hickok 533, and I replaced them.

To put it into first-class condition, I also performed a touch-up alignment and replaced the dial cord that drives the band-in-use indicator pointers. By the way, Jim Hawkins, WA2WHV's web page at <http://www.qsl.net/wa2whv/hallicrafters.shtml> has excellent information on replacing that dial cord. This information is missing from the receiver's instruction manual. It is well worth checking out if you need to do the job.

As you can gather from my discussion, there are two versions of the SX-28: the original 1940 model and the electrically identical SX-28A made from 1944 to 1946. The SX-28A uses a sub-chassis in the RF front-end that puts the coils in somewhat different positions and makes servicing easier. Most, if not all, of the "A" models are labeled "SX-28" on the front panel, but Chuck Dachis advises that the "A"s can be identified by an external fuse holder on the rear apron.

Another identifier may be in the spokes on the tuning knobs. On my rack model SX-28A the webbing between the spokes is solid, while on my SX-28 there is no webbing and the spokes are open. Of course my SX-28 is also somewhat unusual in having a smooth, dark gray front panel rather than the standard black, leather-grained finish. So its knobs could be a little strange as well. (NOTE: Ray Moore in his book *Communication Receivers* also lists a model SX-28FCC manufactured for the Federal Communications Commission. If you run across an SX-28 with a special label under the main dial, take a good look. You may have a rare receiver. Ed.)

I can recommend two good sources of technical information about the SX-28. The original Hallicrafters instruction manual contains a comprehensive description of the circuits and features as well as the usual schematic, alignment and operating instructions. There is also an article in the June 1990 Electric Radio magazine by Bill Kleronomous, KD0HG. Bill reports on his SX-28 as follows. He measured stability after a 90-minute warm-up. At 7 mc drift was five Hz after five minutes and 50 Hz after ten minutes. At 14 mc it was unmeasurable after ten minutes and only 25 Hz after 20 minutes. The BFO drifted 200 Hz in the first ten minutes of opera-

tion and settled down after that.

AM sensitivity, measured at the 10 dB S+N/N point, at 1, 4, 14 and 30 mc came in at 2 uv, 2 uv, 0.7 uv and 1 uv respectively - but Bill was using a 6AC7 in the first RF amplifier instead of the original 6AB7. Image rejection was 30 dB at 30 mc, 40 dB at 14 mc, and 55 dB at 7 mc. The 6 dB-down selectivity in the "Broad" position was 14 Kc and 5 Kc in "Sharp." In the "Broad Xtal" position it was 3 Kc, narrowing in the "Sharp Xtal" position to only 30 Hz and with a 70 dB phasing notch rejection of signals on the other side of zero beat!

Audio bandwidth with the "Bass" switch on, the tone control set for maximum highs, and selectivity on "Broad" was down 2 dB at 6 Kc and 10 dB at 8 Kc. On the bass side it was down 3 dB at 200 Hz and 10 dB at 50 Hz. Audio distortion was 3% or less up to 500-mw output, rising to 5% at eight watts. The noise limiter, an IF blanker circuit, was able to totally eliminate an S9 +10 pulse noise generated by an SCR light dimmer and to make an S9 broadcast station completely readable with very little distortion! In my experience, however, the noise limiter doesn't do nearly as well as the audio limiters in my NC-200, HRO-50 and RME-70 on lightning-static QRN.

Potential owners should be aware of one peculiarity of the SX-28: its 500-/5000-ohm audio output impedances. The 5000-ohm output is intended to match the 5000 ohm-to-voice-coil transformer that is standard in the Matching PM-23 speaker. This output is automatically cut off when a plug is inserted into the headphone jack. The 500-ohm output was commonly used to drive a remote speaker line, and the headphone plug does not cut off this output. These days it is much easier to find a 500 or 600 ohm-to-voice-coil transformer, and it's easy to change the wiring on the phone jack to switch the 500-ohm line rather than the 5000-ohm line. So if you do not have an original Hallicrafters speaker, you do have other options. In a real pinch a 12.6-volt "filament" transformer from Radio Shack could be used to transform a 4-ohm speaker to about 363 ohms or an 8-ohm speaker to about 726 ohms. Just don't expect it to have "high-fidelity" frequency response.

On the air, as you might expect from Bill Kleronomous' report, the SX-28 is even today a thoroughly competent communications receiver. If you are looking for a solid, pre-1950 receiver to use in the Link Cundall Memorial Contest or the Classic Exchange, or you'd just like to use a handsome boatanchor to listen to the short waves, an SX-28 or SX-28A would be an excellent choice. 