The Oak Hills Research OHR 100A Transceiver

In the rush to embrace the "digital world," today's QRPers often overlook a selection of analog radios that often outperform their flashier digitized counterparts. One such product line is the Oak Hills Research analog transceivers. These are all "purist" QRP rigs, set up to work exclusively CW. Narrow IF passbands, low noise receivers, smooth break-in (QSK) T/R switching, and ease of construction and maintenance are the big drawing points for this fine series of rigs.

Recently I had the good fortune to acquire an Oak Hills Research OHR 100A monoband transceiver kit for 30 meters. Having never built an OHR kit before, I jumped at the chance to explore their product line. Oak Hills Research was the brainchild of the late Doug DeMaw, W1FB, who started the company in 1987. Doug produced some well designed QRP kits and accessories for a few years, and then sold it to Dick Witzke, KE8KL, around 1990. In 1999, Dick sold the OHR product line to Marshall Emm, N1FN, owner of Milestone Technologies and Morse Express. You can check out the various products in the Oak Hills lineup at **www.ohr.com** or write Oak Hills Research, 2460 S Moline Way, Aurora, CO 80014, tel 303-752-3382; e-mail **qrp@ohr.com**.

Here is a front ¾ view of my 30 meter OHR 100A transceiver. Notice how the controls are all nicely arranged—this is a very "comfortable" radio.

Four Bands/Four Versions

The OHR 100A is a single band (in this case 30 meters) CW transceiver capable of 4 to 5 W output over a 70 kHz tuning range. This kit is offered in 40, 30, 20 and 15-meter versions. Marshall Emm, N1FN, told me that the 40-meter version was a favorite of the foxhunting group on QRP-L (**www.qrp-l@lehigh.edu**), owing to its very quiet receiver section. A quiet receiver is definitely needed for digging out the weak ones from the band noise. The 100A has built-in receiver incremental tuning (RIT) that covers ±1 kHz of receiver tuning range. The superhet receiver features a 9 MHz IF and a local oscillator (LO) running at 14.1 MHz, which places any mixing products well outside the passband of the receiver. The VFO is very tame and runs at 5 MHz. The receiver incorporates a 4-pole Cohn crystal filter; the crystals are hand-matched and the bandwidth is continuously variable from 1200 to 400 Hz. There is no RF amplifier ahead of the first receiver mixer (an SA-602). The bandpass filter feeding this mixer serves to reject unwanted signals.

The OHR 100A also incorporates a very smooth QSK (break-in keying) T/R keying circuit and has a nice sounding sine wave sidetone when keyed. RF power output is adjustable from 0 to full output via an output control on the rear panel. The SA-602 transmit mixer's output is filtered and fed into a 2N5179 buffer amplifier. From there it heads into the 2N3866 driver and finally into the 2SC2078 power amplifier. Front panel controls including RF and AF gain, RIT and IF bandwidth are nicely spaced for those of us with big fingers. The main tuning dial is easy to read. The tuning is a bit fast for my personal taste, but OHR offers an optional 10-turn tuning pot.

My overall impression of this kit was very positive. The large PC board offered plenty of room to work. Silk-screening was very crisp and detailed. The directions are reminiscent of "Heathkit style"—very concise and easy to follow. The case was roomy, offering lots of space for modifications and additions (more on this later). In all, I was well pleased with the ORH 100A kit. One thing I definitely liked were the large pages of the parts inventory, parts placement overlay and schematic diagrams.

The only thing about the documentation I would change would be to have the parts overlay and schematic diagrams of the transmitter and receiver printed on single-sided paper to reduce the constant page flipping when troubleshooting. Incorporating a block diagram of the radio along with an operational description of the various circuits and a listing of the specifications into the manual would be a nice touch for those who want to fully understand the rig's theory of operation. The documentation is stapled together, which is a good thing, as this lets the builder pull the pages apart for easy access on the bench. Once the project is completed, the documentation can be bound or punched and placed in a binder.

His First Kit

Assembly took about 13½ hours and alignment took about four hours. While I wanted to do the actual construction, I had decided ahead of time to farm this kit out to an Amateur Radio newcomer whom I was trying to entice into the QRP fold. George, while not a QRPer or an active ham, was an experienced electronic technician. He had never built a kit, so he became my guinea pig. I gave the kit to George with specific instructions to document his progress to include the time he spent on the various stages of the project. Here are his findings: 1.5 hours to thoroughly read the manual and inventory all the parts; 2.5 hours to sort and install all the resistors; 2 hours to sort and install the capacitors; 2.5 hours to install transformers, jacks and controls; 2.5 hours to install the 30-meter frequency pack (this includes winding all seven toroidal inductors); and, finally, 2.5 hours for final assembly. The alignment took about 4.5 hours, including some assistance that I provided.

Time from start to finish was about 18 hours—not bad for a first-time kit builder.

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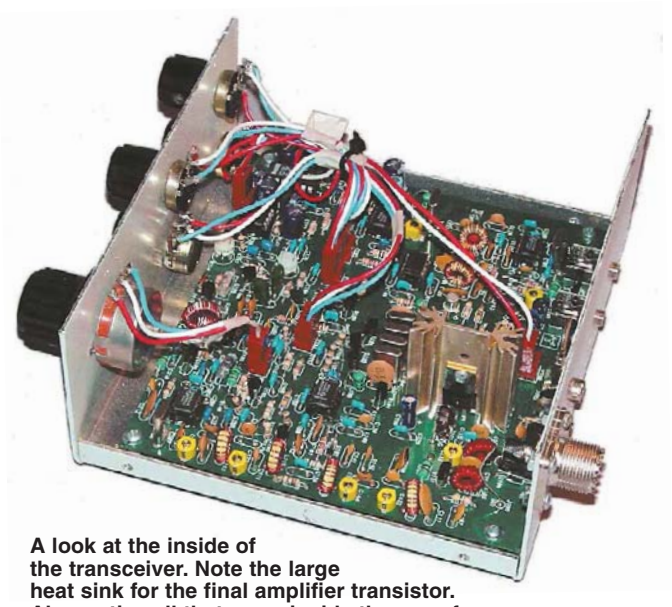
At the rear are jacks for (l-r) antenna, 12 V power, oscillator output (for frequency counter or digital dial), key line, power adjustment, speaker and headphones.



A look at the inside of the transceiver. Note the large heat sink for the final amplifier transistor. Also notice all that room inside the case for optional accessories and/or modifications.

When I told him about it, Marshall Emm admonished me, saying he usually recommends against a transceiver kit as a "first kit" for the inexperienced builder. George's familiarity with electronics and construction techniques accounts for his lack of problems in building this kit. Incidentally, the radio worked the first time it was fired up—an outstanding testimonial to George's abilities and the excellent documentation.

George brought the OHR 100A to me for final peaking and tweaking. One thing we noticed right from the start was that it produced nearly 4 W at the high end of the dial and less than 1 W at the bottom end. It seemed like no matter how we adjusted C120 and C122 the transmitter output was rolling off the lower edge of the low-pass filter passband, causing attenuation in the lower frequencies. We got the answer after a call to Marshall at Oak Hills: The transmitter output was rolling off the lower edge of the low-pass filter passband, causing attenuation in the lower frequencies. Hmm, where had I heard that before?

Marshall advised us to reposition the turns on inductors L104 and L105 on the output of the NE-602 mixer (U100) going into the base of Q103, a 2N5179. This is usually enough to get the proper power output. We tried this but still could not obtain maximum output (4-5 W) from the low to high end of the tuning range of the VFO. Then I decided to have George lift L104 and L105 from the PC board, remove all 21 turns and rewind the coils using 23 turns. My thinking was that I would be able to remove one turn if needed. With 23 turns on both cores, we got obligatory 5 W output across the entire tuning range of the VFO. The added inductance widened the passband enough to allow the proper output. A check of the transmitter on a spectrum analyzer showed a nice clean output with no nasty spurs or harmonics.

Testing the Transceiver

On-air tests revealed a very quiet receiver. Keeping the IF filter at about 700 Hz bandwidth allowed me to hear stations slightly off frequency while concentrating on the station I was in communication with. All too often we QRPers tend to cinch the IF bandwidth way down, really narrow, in hopes of attenuating all the signals to each side of our target station. When the IF is this "tight" we can't hear stations that are not quite zero-beat with our radio, and thereby miss out on possible contacts. I prefer to leave the IF opened up a bit (600-700 Hz) and let my brain become the CW filter, which allows me to hear off-frequency stations. This technique is especially helpful in QRP contests where congestion around the QRP calling frequency is very dense and an extremely narrow IF filter would be more of a hindrance than a help.

The transmitter sounded very clean, according to the operators I contacted while using the OHR 100A. The QSK circuitry worked great, and there was no thumping as the rig was keyed at speeds in excess of 20 WPM. Tuning was a bit sharp and could benefit from an addition of the optional 10-turn pot offered by OHR. While dial markings are approximate, one worthwhile modification would be the inclusion of a Small Wonder Labs FreqMite audio frequency counter/digital dial (**smallwonderlabs.com/swl_frq.htm**). For $20 (as this is written) you can't go wrong. One touch of a button and your operating frequency is read out in Morse code. If you prefer, the OHR rigs all offer an oscillator output jack on the back where you can plug in a frequency counter or digital dial similar to the OHR DD-1 to give an accurate frequency readout. The DD-1 is an external digital dial and standalone frequency counter in a matching OHR enclosure featuring bright red LEDs.

And in Sum...

How do I like the OHR 100A for 30 meters? It is a superbly capable kit radio that plays very well. The extremely quiet receiver in the 100A is a wonderful departure from its noisier digital counterparts. One thing I *really* like about it is its size. Over the last six or seven years we have been treated to a number of really small, compact, highly portable rigs that defy easy modification or internal add-ons. Thankfully, Oak Hills Research has not succumbed to this packaging trend—you can actually work on this radio! What a pleasure. Cost of an OHR 100A kit (in your choice of bands) is $129.95 plus shipping. Don't forget the host of other available OHR products, including the OHR 500 five-band transceiver kit, the DD-1 digital dial, the WM-2 QRP wattmeter and the OHR dummy load. Oak Hills Research is in the business of providing serious gear for the serious CW operator. All the OHR rigs are optimized for ease of construction, operator comfort features and performance. When you talk to Marshall don't forget to tell him where you read about his great little radio. QST