

A REVIEW OF THE KENWOOD R-5000

By Don Moore
With Technical Comments by Kent Willis

Why choose a Kenwood R-5000? Among the three current top-of-the-line communications receivers (ICOM R-71A, JRC NRD-525, and the R-5000), the Kenwood seems to be the least used by North American DXers, if DX club contributors lists are any indication. Two years ago, when I realized I would soon be financially able to buy a replacement for my hardy FRG-7, I decided to carefully look over the three choices. Whichever I chose would be my main receiver for at least five or six years. I quickly dropped the ICOM from consideration when ICOM had to drop passband tuning from the receiver. Of the remaining two, I tried each of them out in showroom conditions, and pored over everything I could find on them, especially Larry Magne's White Papers. Principally based on Magne's writings, I came to the conclusion that, with their own relative pluses and minuses, the R-5000 and NRD-525 were equal as DX receivers. The Kenwood, however, had two important advantages. First, it was reputed to have superb audio quality. Secondly, the stock model was \$350 cheaper than the NRD-525.

After moving and settling into a new home in Michigan, I finally got the receiver in August, 1989. Since then, I've given it almost a year of very heavy use. Dual VFOs, memories, and stable easy-to-use ECSSB reception (that doesn't offset frequency when switching between USB/LSB) have revolutionized my DXing, and added a lot of stations to my totals. The excellent audio has made listening to DX more enjoyable than ever before. The R-5000 is not perfect, but its drawbacks are minor. In short, I believe I chose the right receiver for me, and I believe more DXers should consider it when purchasing a top-notch communications rig. So, let's take a in-depth look at the R-5000.

SOME BASIC OBSERVATIONS

In my view, the R-5000's crisp and clean audio section is its shining star. After all, it doesn't matter what the rest of the receiver does if the end product isn't easy to understand—especially when trying to pick out IDs in foreign languages. There is practically no hiss or other background noise like so many other receivers I've tried. I like the R-5000 audio so much, that I still haven't gotten around to hooking it up to my graphic equalizer. Still, it wouldn't be a bad idea, since Kenwood neglected to put a tone control on the R-5000. There is an audio notch filter deep



enough to eliminate most hets. The notch helps in pulling weak signal audio out of the mud.

The R-5000 is a very sensitive receiver; I have been impressed with how well it handles weak signals. When sharing tips via phone with other DXers, I have been amazed at how much better I am hearing a particular station. What's more, the audio section makes weak signals readable. If no major QRM/QRN is present, an S-1 signal can be made 50-60% readable with a little tweaking of the controls. That has helped me ID a number of otherwise hopelessly weak signals, such as Latin harmonics and 100 milliwatt MedFER beacons on the 1600 khz band. For example, last New Year's Eve I was tuning through the 2 MHz band, looking for harmonics. There seemed to be audio on 2060, but it was hard to tell with a ute just above the frequency. I was already on the 2.4 khz filter, so I switched from AM to LSB. The interference was gone, but the signal was still a bit muddy. A little adjustment of the notch filter and I could understand most of what the announcer was saying, despite a signal strength that barely budged the S-meter. The station turned out to be the harmonic of an Ecuadorian MW station. I called up a DX friend a few hundred miles away, and tuning in he agreed there was some sort of weak signal there, but couldn't get any usable audio out of it.

Like most modern communications receivers, sensitivity is intentionally reduced on the MW broadcast band. I find that frustrating, since I live in a rural area without nearby high power stations. Overall MW reception seems weak when using a wire antenna, such as a beverage. I believe that some firms modify the R-5000 so that the better SW sensitivity also works on MW. I will eventually have that done. At least in rural locations, the receiver's three step attenuator should be adequate for any overloading problems.

"Excellent sensitivity is maintained through very low noise design. A review of the complete schematic indicates very careful selection of all discrete semiconductors, especially diodes, and FETs. The RF amplifier, mixer preamplifier, first mixer, mixer postamplifier, and voltage controlled oscillators (which provide inputs to the mixer from the VFO) use only low-noise FETs as opposed to ordinary bipolar junction transistors. Front end selectivity is achieved through a parallel combination of 10 separate bandpass filters which greatly reduce overloading. For a given frequency range, the design of the bandpass filters permit only a minimal amount of out of band signal energy from reaching the RF amplifier, maintaining the high overall image rejection.

"Don has mentioned the intentionally reduced AM sensitivity for the BCB, listed as less than 32 microvolts for the 500 khz to 1.8 MHz range in most advertising literature (the service manual claims 16 microvolts). Many solid state receivers have difficulty handling bonecrushing AM BCB signals which are often present when listeners live near 50 kw transmitters. Reducing sensitivity certainly will help to prevent overloading, but there is much more to strong signal handling capability than sensitivity reduction. The 10 to 30 dB attenuator should prevent overloading under virtually all conditions." (Willis)

TUNING

There are several ways to tune the R-5000. First, there is the old-fashioned "big round knob" in the center, which I use most of the time. It has a good smooth "feel" to it, and the "drag" is easily adjusted. There are dual VFOs, chosen by an "A/B" button. An "A=B" button makes it easy to temporarily save a frequency while checking on something else. Readout is to the nearest 10 Hz, but is varied by a "step" control. With the step control on, the receiver tunes in 100 Hz increments in AM, SSB, & CW at about 50 kHz per dial revolution. With step off, it tunes in 1 kHz increments in AM at 20kHz per revolution and 10 Hz ones in SSB/CW at 10kHz per revolution. Because tuning is via digital steps, it is not possible to tune any finer than within 10 Hz. Generally I keep step on, unless fine-tuning in SSB. In AM, I find the 20 kHz per revolution tuning rate to be annoyingly slow when tuning in 1 kHz increments. If the dial is spun fast enough (3 revolutions per second according to Kenwood) the tuning rate will increase geometrically in accordance to dial rotation speed. I'm not sure if it's possible turn the knob that fast, since it lacks a finger dimple. Fast tuning up and down the band is also accomplished by plus/minus 1 MHz slewing buttons, which may be held down until the desired MHz frequency is reached. Sometimes I wish that were switchable to plus/minus 100 kHz, but I know of no receivers which offer that feature.

Tuning may also be accomplished by direct keypad entry. The multi-function keypad serves for direct frequency entry, and as push buttons for mode change and antenna choice. The default position is for mode and antennas,

which means before entering a frequency, one must push the "ent" button, telling the receiver that modes are not being switched. In practice, this is simple, quickly learned, and no problem. The R-5000 keypad is, however, annoying in two ways. First, initial zeros must be entered. For example, to keypad tune 4975 kHz, one must hit "Ent-0-4-9-7-5-0-0". Trailing zeros do not need to be entered, if one rehits the enter button instead, e.g. "Ent-0-4-9-7-5-Ent". When I want to go from 60 to 90 meters, I usually hit "Ent-0-3-3-Ent" for 3300 khz. With keypad entry to the nearest 10Hz, I see why all these extra zeros are necessary. If the R-5000 used a floating decimal, like Sony receivers, I would complain about having to punch in the trailing two zeros after the decimal point. However, I think everything would be simpler and just as useful if keypad tuning was with a floating decimal, but only to the nearest 1 kHz. Anything finer than that is easily done by hand. The second annoyance of the keypad is the arrangement of the numbers in a "2x5" bank. That is, there is a row of keys numbered 1-5 over a row of keys numbered 6-0. Punching in a frequency like 2060 or 4607 Khz requires a lot of back and forth finger movement. This arrangement seems to be harder to learn than the more standard 3x3+1. I still can't accurately punch in a frequency without looking at the keypad. Still, despite these annoyances, I find keypad entry useful and usable in checking out specific frequencies. Also, when going from 5 to 15 MHz, it is a lot faster than using the slew buttons.

The keypad is also used in setting and selecting the R-5000's 100 memory channels. This is less than some other receivers, but I have yet to need them all. I use about 50 for DX frequencies, about 20 for working memories, and a few for WWV and RCI. Each channel saves the exact frequency, mode, and antenna choice. To use a memory channel, first the "VFO/M" button is pushed. This switches the receiver from the current VFO to whatever the last memory channel used was. Pushing it again will bring back the VFO.

Once in memory mode, memory channels are easily selected by one of three methods. To get to a specific channel, the actual memory number, e.g. 54, may be entered in the keypad. Alternatively, the entire memory bank, or a portion of it, may be "tuned" by turning the main tuning knob. Similarly, in memory mode the 1 MHz up/down slewing buttons instead tune up and down through the memory channels. Either method is very useful for quickly checking out a select group of scattered frequencies. For example, I keep a number of evening Bolivian frequencies in the 50s range, and a sample group of Indos in the 40s range. It is also possible to use either of these methods to scroll through the memories while listening to something else via the VFO circuit. As Larry Magne points out in his review, the R-5000's memories are not tunable. However, that is no big deal. They become tunable by pushing the M>V button which transfers the memory data to the current VFO, switching to VFO mode at the same time. I use that method a lot of times to get to 60 meters, going via my 5MHz WWV memory.

The R-5000 has a scanning function, which can either scan preset banks of ten memory channels or a set range of frequencies. Although scanning is generally not useful on SW, I thought it might be nice in listening to 2 MHz Coast Guard channels, where stations go on and off a lot like VHF/UHF stations. However, the scanner stops at each scanned channel for a full 5 seconds, taking almost a minute to go through a bank of 10 memories. A quick message can take less than half that time. When a station is encountered, scan still automatically goes on at the end of five seconds. Universal offers a carrier option that will allow the scanner to stop on a frequency when a station is heard, but I don't believe it will speed up the scanner. I didn't get the option because it requires use of the dimmer switch, which I wanted to keep. Perhaps the modification could use the nearby voice switch instead (unless the optional voice synthesizer unit is added).

SELECTIVITY

The stock R-5000 comes with two filters, a 6 khz AM filter and a 2.4 khz "wide" SSB/"narrow" AM filter, and accomodates a total of four. According to Magne, the wide filter's skirt selectivity is "disgraceful", while the narrow one is quite good. Kenwood offers two optional voice bandwidth filters, at 6 kHz and 1.8 kHz for "narrow" SSB and AM, as well as several very narrow CW filters. Universal (and maybe some other dealers) offers an optional 4 khz filter. According to Magne, these are good to excellent. What really gladdens the heart of the DXer is that all filters are individually selectable in any mode. No being forced to use SSB in order to use a narrow filter. Alternately, the filters may be switched to "auto", which automatically uses the wide filter for AM, the 2.4 kHz for SSB, and any narrower one for CW.

"One of the most impressive features of the R-5000 is the IF filter circuitry. Many receivers with multiple bandwidth selection have a parallel filter arrangement. After passing through a mixer, the signal at the IF frequency enters only the selected filter of the desired bandwidth without

passing through any other wider or narrower filters. In contrast, the R-5000 employs a series (cascaded) filter arrangement. For example, if we have selected the 2.4 khz bandwidth, the mixer output signal would have first passed through the 6 khz filter. The wider filter(s) ahead of the final selected filter passes the signal with essentially no attenuation. This "prefiltering" introduces a negligible time delay, but no other undesirable side effects. The advantage of such a scheme is increased attenuation of interference outside of the selected filter passband. This is how Kenwood achieves the very high guaranteed minimum attenuation of 80 dB, for example, within about 10 khz of the received frequency with the optional YK-88A-1 6 khz AM filter. With a little circuit board "chop and swap" and manipulation of some programming jumper wires, just about any cascaded filter combination is possible.

"No mechanical AM filters are available for the Kenwood because of the very high and unique second IF frequency of 8.830 MHz. Communication receivers that either contain or accommodate mechanical filters use a 500 khz or lower (typically 455 khz) last IF frequency. There are no mechanical filters for such high frequencies. Mechanical filters with a center frequency higher than about 1 MHz can not be produced with existing technology." (Willis)

When I purchased my R-5000, I hoped to get the stock wide filter replaced with Kenwood's 6 khz filter, and add the 4 khz and 1.8 khz filters to fill in the four slots. Unfortunately, because of the technical arrangement of the filters, at that time Universal could not put in both the 6 khz and 4 khz filters. Each could only go in the emptied 6 khz slot. Being primarily a DXer, I choose the narrow 4 khz filter, leaving me with three selectivity options. The 6 khz filter would probably have been better for general SWL use. I am glad I choose the 4 khz filter. I was worried that it would be too narrow to adequately appreciate the Kenwood's superb audio quality in the general listening that I do. To the contrary, it is as pleasant to listen to as is my Sony. Moreover, because it is relatively narrow, it is usable in real DX situations. Even listening to very weak signals is enjoyable, if they are free enough of QRM to use this filter. The 4 khz filter is a good choice for the serious DXer who doesn't do a lot of SWLing. Still, I'm sure the 6 khz filter would be better yet for general listening, and wish I had been able to add it. Universal has recently been supplied with some new technical data, showing how both the 6 khz and 4 khz filters could be added. I know they have done this to at least one receiver.

The 2.4 khz filter does a great job of eliminating nearby QRM. With it, I can listen to Radio Reloj on 4832 with hardly a trace of QRM from Tachira on 4830 and Tezulutlan on 4835. What's more, the audio quality is still pleasant to listen to, and very understandable. The 1.8 khz filter performs similarly well. However, in my opinion, it is redundant. The difference between it and the 2.4 filter is minimal. What is gained in selectivity is lost in the less listenable narrower audio bandwidth. In seven months of use, I have found only one or two cases of SWBC DX where the 1.8 khz filter made a significant positive difference over the 2.4 khz one. I'm so hardboiled that I don't believe that's worth eighty bucks. Even in SSB ute DXing, I haven't found the 1.9 khz filter particularly useful. I wish now that I would have gotten a CW filter instead.

In sum, the best arrangement would be to replace the stock 6 khz filter with the optional 6 khz one, and add a 4 khz filter. Serious DXers who want to keep the cost down a bit, could consider just getting the 4 khz filter. Those with an interest in CW may want a narrow CW filter.

"Pass-band tuning is accomplished through circuitry which permits shifting of the IF passband approximately +/- 1 khz without changing receiver center frequency. The fact that you can shift the IF passband by almost 2 khz with rapid attenuation is proof of the very steep skirt of the overall IF passband filtering circuit. The audio response will also shift from a highpass to lowpass mode as this control is rotated. Unfortunately the stock model does not permit using this very powerful interference reducing technique in the AM or FM modes. Of course, utility and SWBC DXers who use ECSSB techniques will love this feature." (Willis)

CONTROLS AND MORE

When Theresa first saw my new R-5000 unpacked and setting on my desk, her first comment was "Oh, it's cute!" She always thought my large, clunky, utilitarian FRG-7 was ugly. The bright display colors and compact size may give the R-5000 a certain cuteness, but that doesn't mean it's not solidly built. Not only does it "feel" solid, but

Universal told me that, excluding non-receiver fault problems like power surges, they get fewer R-5000s back for repairs than anything else they sell.

"The mechanical packaging is impressive. It contains separate removable and replaceable printed circuit board subassemblies for each of the major units including the RF, IF, PLL and switching control modules. Such a design simplifies fault isolation and repair and contributes to the very high degree of reliability attested to by several major SW equipment dealers. Consequently, malfunctions should be few, but when they do occur, repair costs will be reasonable." (Willis)

Unfortunately, that solidly-built compact size also contributes to the R-5000's most serious drawback: most of the controls are small and closely spaced together. I have long narrow fingers, yet still occasionally hit the wrong button, or grab the wrong ring on the two-function concentric knobs. DXers with large "ham" hands may well want to try out an R-5000 before purchase. But, one can't complain about the convenience of what all these fancy buttons and knobs do.

Under the frequency display there is a series of small lights which indicate whether various functions, such as the notch filter, are being used. These are very useful in remembering to turn off or switch functions. One of my little pet peeves with the R-5000, however, is that there is no indicator light to remind the user when the IF shift is engaged. Thus, after using it to flush out some rare DX, I frequently go about bandscanning with the IF shift off center.

The R-5000 comes with two adjustable noise-blankers. The first one is for pulse noises, such as ignition. I occasionally get a pulse-type noise on the tropical bands in the evening from a neighbor. I push the button and it's gone. I've never even had to adjust it. The second noise-blanker is for dealing with the "woodpecker". I haven't yet had to try this one, since I do most of my listening in the tropical bands. The R-5000 includes a clock, or actually two clocks which share the same display. The two clocks are chosen via a slide switch; a third position is "off", with no clock displayed. Unlike, for example, the NRD-525, the clock does not share display with the frequency. If the receiver is turned off, the clock is still displayed until either the clock is switched off or the receiver unplugged. On the negative side, the clock, however, does not display seconds. Clock one can be used to turn both the receiver and an outboard taperecorder on and off. I have yet to use this function, but believe it will only control a taperecorder via the DC remote control jack, unlike, for example the old FRG-7000 that controled via the AC plug. This makes it impossible to remote record with a stereo tape deck.

When the receiver is unplugged, the clock and memory channels are kept alive by a built-in rechargeable NiCad battery. Kenwood says a full charge should last about ten days. A fanatic about lightning protection, I normally unplug the receiver when not in use, yet I have had no problem in keeping the charge up. The receiver even kept its charge despite being unplugged for a month while I was out of the country. Note that the acutal software that runs the receiver is permanent, so no worries like with the ICOM R-71A!

Two seperate antenna hookups on the rear allow for some antenna flexibility. Hookup one is a coax jack for a balanced input. Hookup two allows either a 50 or 500 Ohm unbalanced hookup. I connect various outdoor antennas via a B&W switch to the coax input, and my ferrite loop to the unbalanced connection. Antennas are switched via two of the keypad buttons. There are two dial indicator lights which display which is currently in use. There are jacks on the front panel for headphones (1/4") and a taperecorder (1/8"). The tape level is just right for both my cheapo Radio Shack recorder and my old Technics cassette deck. There is a 1/8" jack on the rear of the receiver for attaching a seperate speaker. The inboard speaker is in the top of the receiver, so sounds a bit muffled, especialy with a shelf just three inches above it. Kenwood sells an optional speaker, but I bought a Radio Shack Miinimus-7 on sale, which sounds fine.

"I use an external speaker with an Autek QF-1A audio filer. The QF-1A is used to satisfy the minimum power input requirements of my Realistic Minimus-3.5 speaker as well as compensate somewhat for the different frequency response of my external speaker. The optional matching speaker for the R-5000 has only one advantage in my opinion. It matches. In my opinion, it sounds worse than the internal top-mounted speaker and isn't worth \$65. I recommend an external high efficiency speaker with good mid and high frequency response. The R-5000 can

supply approximately 1.5 watts into a nominal 8 ohm load, but you could connect anything with a 4 to 16 ohm impedance with a corresponding power loss due to the impedance mismatch. The compact size, top mounted speaker, optional under dash mounting bracket and 12 VDC input capability all indicate the R-5000 is well suited for mobile applications." (Willis)

Optional RS-232C interfaces are available for connections between the R-5000 and a personal computer. Several companies offer software control programs designed for IBM-PC/compatible machines as well as Apple Macintosh computers which can control the receiver.

Finally, the R-5000 comes with a detailed manual that clearly explains everything there is to know about operating the receiver. I believe in reading and following the instructions on anything I buy, and have high standards on how an instruction manual should teach the reader. The R-5000 manual is the only set of instructions that I've seen in years where I haven't ended up cussing out the writers. Kenwood should give classes in instruction writing to other companies!

CONCLUSION

The R-5000 is a good choice for the serious DXer, especially if he/she also wants to enjoy great audio. I enjoy listening to it so much, that I probably spend more time DXing than I would otherwise. A new R-5000 is a bargain for about \$1000 with two added filters. Anyone looking for a new receiver and who expects value for their money should give the R-5000 strong consideration.