The NRD 525 Versus the R5000

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EARLY IMPRESSIONS OF THE JAPAN RADIO COMPANY NRD-525 AND KENWOOD R-5000 RECEIVERS -- PART ONE (*dpn*) Last summer, I purchased an NRD-525 receiver from Universal Shortwave in Reynoldsburg, Ohio; shortly thereafter, I was able to borrow a Kenwood R-5000 receiver for a couple of months. Here are a few observations on the quality and function of these receivers, and how they compare. First, however, I'll discuss why I decided on the NRD-525 over the R-5000; the choice seems to be a tough one for some people, even though the '525 is considerably more expensive than the '5000.

Why I Chose What I Chose

"Fred, does adjusting the NRD-525's **BFO** control change the receiver's frequency display?" In the end, my choice between the NRD-525 and R-5000 hinged entirely on this question. I put it to ***Fred Osterman*** via UBIX, Universal Shortwave's computer bulletin board. Next time I logged onto the board, I had my answer: "No, adjustment of that control does not change the frequency display." "Sold!" says I. But why should this have been so important to me?

I do quite a bit of listening to radiotelegraph (Morse code, CW, A1 or A1A, depending on what you prefer to call it) signals -- weak shortwave broadcast carriers included -- and I wanted my new receiver to perform *very well* during CW reception. Part of that performance had to include two things: (1) the facility to adjust received-signal pitch to a frequency considerably lower -- say, 400 Hz -- than the earsplitting 800-Hz pitch unfortunately standard in almost all Japanese shortwave receivers and transceivers; and (2) correct display of the signal frequency regardless of the pitch setting. The R-5000 fails both of these tests, as far as I have been able to ascertain from reading its ***Service*** and ***Owner's Manuals***: Unlike its seeming-sibling TS-440S transceiver (in which cutting a diode lowers the pitch of at-IF-center signals from 800 to 400 Hz), the R-5000 does not afford adjustment of pitch of received signals *if you want its frequency display to indicate correctly with the signal properly tuned (at IF center).* Inclusion of an **RIT** (receiver incremental tuning) control on the R-5000 might well have resulted -- after a fashion -- in such pitch-adjustment capability: As long as the **RIT** control didn't change the receiver's frequency display, adjusting RIT *and* using the receiver's **IF SHIFT** control could allow pitch adjustment. Nothing doing, though: No RIT on the R-5000. You *can* tune in a signal on the R-5000 and move **IF SHIFT** to center the signal in the passband, but then the frequency display is incorrect. Big deal, huh? Well, it is to *me*. I don't intend to buy another "latest and greatest" radio for quite a few years, and I wanted to get it *right*.

The NRD-525's **BFO** control allows adjustment of the radio's beat-frequency oscillator over quite a range above and below IF center -- *only* during CW reception. And adjusting this control does *not* shift the '525's frequency display. As a result, you can tune in a signal of known frequency -- say, WWV -- until the display shows that frequency, and adjust the **BFO** control for the pitch you want. Because you can adjust the BFO frequency above *and* below IF center, you cana also choose "upper-" or "lower-sideband" CW reception. (You're not really choosing a CW sideband, of course, but you are choosing how the pitch of received signals changes as you tune in a particular direction. I prefer a receiver in which received pitches *fall* as I tune *upward* in frequency. Sometimes, however, I can dodge interference more effectively if can choose which CW "sideband" I'm listening to.) By cracky, here's a receiver in which CW reception is taken *seriously*!

Another reason I chose the NRD-525 over the R-5000 is the '5000's ridiculous non-standard keypad, complete with nearly-invisible numbers. Sure, out of the box, the '5000 emits beeps and Morse-code letters (depending on the keypad mode) when you hit those keys, but I want to know what a key is *before* I press it, not after! The NRD-525 has a standard -- like a calculator, adding-machine or telephone -- keypad. True, the feel of the 525's keypad buttons can best be described as cheesy, but I don't have to relearn the position of its keys every time I enter a frequency as I do with the R-5000.

The third main reason I chose the NRD-525 is that I felt better about buying a product at the low end of a classy product line than I did about buying a product at the high end of a friend-to-all-and-stranger-to-none product line. I've owned five pieces of Kenwood equipment, and all worked quite well. Yet, I wanted something a cut above what I have long accepted as good enough. (*to be continued*)

EARLY IMPRESSIONS OF THE JAPAN RADIO COMPANY NRD-525 AND KENWOOD R-5000 RECEIVERS -- PART TWO (*dpn*; Part One appeared on pp ER0346-0347) Okay, so I bought a Japan Radio Company NRD-525 last summer. I also purchased the optional 0.5- and 1.0-kHz IF filters; these I installed at the 525's **NARROW** and **AUX** selectivity positions, respectively.

The Kenwood R-5000 I borrowed came with uninstalled 0.5-kHz (YK-88C) and 6-kHz (YK-88A-1) filters. Despite the admonitions sprinkled through ***The R-5000 Owner's*** and ***Service Manuals*** -- to have this work, and any other work involving intelligence, done only by those fabulous creatures called Qualified Service Personnel -- I easily installed these two filters myself. You're correct if you're assuming that the ***Owner's Manual*** contains no instructions for filter installation.

The ***Service Manual*** *does* contain filter-installation information -- in addition to the admonition that you not use that information yourself! Apparently, the ***Service Manual*** is marketed merely as a collectible for those who must have "the whole set."

Comparing the Two

"AM" detection. The '525 does not make use of rectification for "AM" detection. Rather, the receiver's product-detector IC -- an SN75614 -- is left connected to the last IF-amplifier stage, and the BFO -- necessary in product detection -- is turned off. In place of the BFO signal, the incoming AM signal -- at IF -- is amplified, amplitude limited until only the carrier remains, and fed to the BFO port on the SN75614. This is true exalted carrier reception. ***Larry Magne*** -- following advertising terminology devised by the R. L. Drake Company -- insists on calling it "synchrophase detection," whatever the hell *that* is. (Drake used this exalted-carrier technique in its R-7, and I suppose R-4245, receivers. This detection technique is also used in some television receivers for video demodulation; such video detectors are sometimes erroneously termed "synchronous" by equipment reviewers, admen and spec-sheet writers.)

Bottom line on the '525's exalted-carrier AM detector: I don't like how it sounds compared to a properly-implemented diode rectification detector. Under some conditions, the detector distorts during modulation peaks on very strong AM signals. This may be detector overdrive -- and, therefore, poor AGC design -- but it's there nonetheless.

And **I don't like how the '525's AM detector sounds compared to the R-5000's AM detector**, which uses a bipolar transistor as a rectifier/amplifier. Larry Magne has written that the '5000's AM detector sometimes suffers from "breakup distortion"; I heard this with the R-5000 only when I misadjusted one of the radio's noise blankers during reception of strong AM signals. **The R-5000 sounds very smooth during rectification detection of AM signals; the NRD-525 doesn't sound quite so smooth, especially during selective fading.** (By the way, I made this comparison using whatever each radio offers for **AM WIDE** selectivity. No high-quality communications receiver should be expected to provide useful audio with rectification detection of double-sideband AM broadcast signals through an SSB bandwidth! Such techniques seem to have worked reasonably well with older -- and cheaper modern -- receivers, mainly [I reason] because their SSB-bandwidth skirt selectivities were mediocre to terrible, allowing enough carrier leakage to keep distortion tolerable during rectification detection with SSB receiving bandwidths.)

Heterodyne ("product") detection. Good on both receivers for SSB voice. It sounds to me like nonsynchronous heterodyne reception of very strong SWBC signals sometimes results in overdrive to the NRD-525's product detector; I can't duplicate this effect with the R-5000.

The R-5000 is audibly inferior to the NRD-525 for CW reception. I don't know if it's happening the '5000's audio filtering -- there is some -- or audio-power-amplifier IC, but the R-5000 sounds *crummy* during product detection of weak CW signals received with the YK-88C (500-Hz) IF filter. The pure pitch of the received signal intermodulates with incoming noise and is harmonically distorted in addition. If I owned one of these receivers, I'd modify this problem out or sell the radio. This distortion probably occurs during CW reception with the SSB filter -- and during SSB reception -- but is masked by the wider-bandwidth noise recovered with the wider filter.

The NRD-525 sounds fine during CW reception through its 500-Hz IF filter. Audio distortion and intermodulation distortion akin to that of the R-5000 do not exist in the '525. I couldn't have known this when I bought the '525; the difference in CW-audio quality in the radios was not so much a pleasant surprise with the '525 as a shock with the '5000. No radio costing circa $800 should sound like that.

FM reception sounds fine to me with both receivers. If you don't order the optional VHF (R-5000) or VHF/UHF (NRD-525) converter with the receiver you decide on, you won't use its FM capability much. Two possibilities: tune 1600-1800 kHz for cordless phones -- a favorite pastime of mine; such verity beats certain forms of Art all hollow -- and try circa 29.6 MHz for radio amateurs working FM. (The NRD-525 *does* give you 30-34 MHz reception; there *are* a few safety and paging services in there; these use FM.)

Audio oddities. The R-5000 handles stereo and monaural headphones well. **The headphone jack on the stock NRD-525 is wired incorrectly for proper stereo-headphone operation.** The problem is related to making a stereo jack compatible with monaural and stereo headphones. Kenwood solves this problem by using a complicated jack. JRC *tries* to solve this problem by using a simple jack: The sleeve ("common") of the jack floats above ground; audio connections are made to the tip and ring terminals of the jack. This is just peachy for monaural headphones, but it results in stereo headphones being driven *out of phase*. (Plugged into the NRD-525, stereo earphones end up in series instead of in parallel; the monaural audio image is indistinct and spread, as opposed to the "straight ahead of you" sound afforded by parallel connection of stereo earphones to a monaural source.) The audible effect of this is distracting. I rewired the '525's headphone jack within a week of the receiver's arrival -- the warranty can go fish.

The NRD-525 does not "power up" gracefully: When you flip its **POWER** switch on, the set produces a loud *thump* in the speaker (or headphones, if you're wearing them). As you'd expect from a company that also markets audio equipment, the R-5000 powers up quietly.

The NRD-525's headphone/speaker audio output is plagued by a high-pitched whine -- about 13 kHz, I learned with the help of an audio spectrum analyzer -- that is strongest at turn-on and diminishes as the receiver warms up. It's there regardless of the setting of the **AF GAIN** control, although it seems to increase with the setting of the control at the high end of the control range. The analyzer also shows that the third harmonic of this signal is present, suggesting that the noise is digital in nature (square waves, according to electronics theory, consist of a

fundamental and *odd* harmonics). But I don't think the set's logic circuitry is the culprit: I suspect that the whine is coming from the dc-to-dc converter used in conjunction with the '525's fluorescent display. I intend to get rid of the noise, but it'll take some doing, and time I don't have right now. The noise is *not* present in the '525's line audio output.

The NRD-525's audio **LINE OUTPUT** is adjustable in level; the R-5000's **RECORD OUT** level is not adjustable.

What about an audio *input*? Both the R-5000 and NRD-525s are expected to be used with transmitters; both have **MUTING** terminals for shutting 'em up during transmit. If you're going to transmit CW when when your receiver is muted, though, you need something called a *sidetone* so you can hear the code you send. (Many transmitters and electronic keyers generate the necessary audio signal simultaneously with keying.) The NRD-525's rear-panel **SIDETONE** jack allows injection of a sidetone signal into the receiver audio chain; there's even a trimmer potentiometer for setting the sidetone level! With the R-5000, however, it's a case of "Guess *again*, banana-nose!" **The R-5000 has no facility for the injection of sidetone!** (Nor does the R-1000 or R-2000. The bilateral nature of the R-1000's **REC** output circuitry, however, allows injection of sidetone into the '1000 there; in the R-2000 and R-5000, buffer amplifiers render the **REC** line *uni*lateral. Sorry, Charlie!) If I owned an R-5000, I'd remedy this at once -- right around the same time I solved the '5000's audio-IMD-during-CW-reception problem.

The R-5000's audio **NOTCH** control works, but its action is of limited usefulness for two reasons: (1) Because the notch circuitry operates at AF, an incoming heterodyne has already acted on the receiver's AGC circuitry by the time it hits the notch, and (2) its tuning range (500-2600 Hz) doesn't allow attenuation of 5-kHz heterodynes during shortwave-broadcast reception.

The NRD-525's **NOTCH** control works at IF, and is quite effective. Like the R-5000's notch, however, it works only for heterodynes pitched at a couple of kilohertz at most; with 5-kHz heterodynes, you're on your own.

IF shift/passband tuning. This facility works well in both receivers. The R-5000's IF shift facility does not work during "AM" detection; the NRD-525's passband shift *does* work during AM reception. In both radios, passband shift works regardless of the filter selected; in both radios, the shift works only within one sideband (you may be able to sneak across zero beat during CW reception with one or both of these radios, but not very far). For those who belly-ache that this facility does not work during "AM" (rectification) reception: The value of passband tuning is that it allows *tuning the passband* in situations where *tuning the receiver* would cause *an unwanted shift in the pitch of received signals*. Now, ask yourself this: During "AM" detection, does the pitch (that is, pitches in audio) of received AM signals vary *when you tune the receiver*? No, they don't. This means that *tuning the receiver during "AM" reception accomplishes exactly the same thing as shifting the passband during heterodyne reception.* During envelope (rectification) detection, the only difference between tuning the receiver and tuning the passband is that tuning the receiver alters the frequency display -- and the frequency display isn't very accurate during envelope detection (with a filter more than a few hundred hertz wide), anyway.

Selectivity switching. The NRD-525 and R-5000 allow independent selection of "mode" and IF selectivity -- it's about time! The R-5000 offers an additional choice: "auto" selection of selectivity with mode (6 kHz for "AM," 2.4 kHz for SSB and so on). This is nice to have. With the NRD-525, you're on your own: If, for instance, you've been listening to CW with the 500-Hz filter, choosing the "AM" mode gives you exalted-carrier reception with a 500-Hz IF bandwidth. So, changing "modes" is often a two-button operation with the '525 -- no big deal to me.

The R-5000's **SELECTIVITY** selector is a rotary switch; the NRD-525's < and > **MODE** buttons allow you to step through narrow, intermediate, wide and auxiliary selectivity options bidirectionally.

AGC and AGC switching. The R-5000 offers choices of **SLOW** and **FAST**. The NRD-525 offers choices of **OFF**, **FAST** and **SLOW**. Pushing the **AGC** button steps the receiver through these choices *in one direction. This* I don't much like. If you've got the '525 in "slow" AGC and you want to get to "fast," you've got to pass through "off"! If you're wearing headphones, this procedure tempts disaster: Will an overloaded '525 clip well enough to protect my ears? I *don't* intend to research this!

For reception of desired signals, AGC attack time seems adequate in both receivers. Each responds differently to noise pulses, however. Strong noise pulses or signal peaks sometimes cause the R-5000's AGC to "hang" until you reset it by cycling the **AGC SLOW/FAST** button. Conversely, the 525's AGC-detector response time seems to be too slow to respond to such pulses, causing receiver overload for the duration of each pulse. This results in annoying high-pitched-and-distorted pops in recovered audio. I use the '525's noise blanker to minimize this effect. (The R-5000's AGC seems to hang even with its noise blanker[s] in use.) Like the R-5000, the '525's "slow" AGC is far too slow if you're doing a bandscan: The receiver comes back to full gain so slowly after being hit by a strong signal that you'll tend to miss weakies unless you leave the AGC in "fast." The R-5000 manual suggests leaving its AGC set to "fast" during rapid bandscans for the same reason. **The difference between "slow" AGC in the two radios is mainly that the '525's "slow" AGC doesn't hang on strong, sharp noise pulses, while the '5000's "slow" AGC does.**

If you like the heavy compression of Kenwood AGC, you'll like R-5000's AGC characteristic. The NRD-525's AGC does not seem to compress recovered audio into as narrow an amplitude range as does the R-5000's, and I like this. (JRC specifies the NRD-525's AGC characteristic as "Change of output is 10 dB or less when the antenna input changes by 3 microvolts to 100 millivolts." 10 dB is a pretty wide swing if it's really there -- enough to let you hear signal dynamics. Although I haven't measured it, I'll bet the R-5000's output change is between 1 and 3 dB over a similar

range; that's how Kenwood has designed communications- and ham-receiver AGC for at least 10 years.)

Memories and VFOs. The R-5000 is touted as having "dual digital VFOs." As I've written before in *ER*, this isn't really the case; the R-5000's "dual VFOs" are really tunable memories capable of storing frequency, mode and antenna selection (one of two choices). In addition to this information, the R-5000's 100 *non*-tunable memories remember whether or not a given channel is locked out (passed over) during memory scanning. When the R-5000 is in its VFO mode, its keypad can be used to select antennas, modes and frequencies by direct entry; its tuning dial acts like a frequency tuning dial; and its **UP** and **DOWN** buttons move the tuned frequency in 1-MHz hops. In memory mode, the R-5000's keypad selects memory channels; the tuning dial selects memory channels; the **UP** and **DOWN** buttons select memory channels. If you want to change anything in a memory channel, you must first transfer the contents of that memory to one of the VFOs.

The NRD-525 has only one "VFO," if that term must be used. That VFO is engaged when the '525's **FREQ** button is pressed. In this mode, the '525's **UP** and **DOWN** buttons tune the receiver in 1- or 10-kHz steps, depending on whether or not the **RUN** button is pressed first; the tuning dial changes the received frequency in 0.01- or 0.1-kHz steps, again depending on whether or not the **RUN** button is pressed first; the keypad can be used for direct frequency entry to 0.01 kHz. Pressing **CHANNEL** puts the NRD-525 into its memory mode. In this mode, the tuning dial stays a tuning dial; the **UP** and **DOWN** buttons step up or down through memory channels; the keypad selects memory channels. Each memory stores frequency, selectivity, mode, AGC and input-attenuator setting. **Each of the NRD-525's 200 memories is tunable.** In fact, *all* stored data are variable while the NRD-525 is in memory mode. **The only thing I really miss on the '525 over the R-5000 in this regard is the '525's lack of a "VFO A/B" switch.** Comparing two signals for parallelism is therefore easier on the R-5000 than the NRD-525; in the '525, you have to put the two frequencies in adjacent memory channels and use the receiver's **UP** and **DOWN** buttons to jump between them. With the '5000, you merely hit **VFO A/B** to toggle between the two frequencies. I still maintain that you really need *two separate receivers* to fully ascertain signal parallelism, but having togglable "VFOs" is also valuable for keeping close watch on two frequencies as sign-on, -off or ID time approaches.

In practice, I like the NRD-525's memory system better, however. I like being able to tune a memory -- "tuning" including altering mode, selectivity, frequency and AGC -- at will. (The memory contents are not rewritten unless you choose to do so. So, if you want to return to the stored data after having tuned away, changed mode or whatever, hitting **ENT/kHz** restores everything to the original data.)

Antenna selection. The R-5000's **ANT 1** and **ANT 2** selector buttons are quite an improvement over those little rear-panel slide switches used to do the job on some other receivers. Antenna 1 on the R-5000 must be 50 ohms; Antenna 2 can be 50 or 500 ohms. (The 500-ohm input is the best choice for a random wire antenna unless you know that the wire is closer to 50 ohms at your frequency of interest.) The NRD-525's **HI-Z** (600-ohm) and **LOW-Z** (50-ohm) antenna inputs are selected by means of a rear-panel-mounted slide switch. Pretty classy for a $1500 receiver, no? The R-5000 wins hands down in this category!

Selectivity. For the purposes of this NRD-525/R-5000 comparison, I'm out of the endless wearisome discussion of third-party selectivity modifications and filters. *So* many people buy "better" filters without ever having heard the standard ones that I'll deal myself out this time around. In fact, what I'm about to say will probably sound like a cop-out. As I mentioned earlier, my NRD-525 contains the stock "SSB" and "AM" filters; I've added JRC's 0.5- and 1.0-kHz filters to fill all of the receiver's selecitivity slots. The results sound fine to me. Sure, I can hear 5-kHz heterodynes with the 525's "AM" filter, but I did not buy the '525 as a program-listening set, and -- in my opinion -- anyone who expects to do serious SWBC DXing with envelope (rectification) detection and a wide filter isn't going to do any serious SWBC DXing! (In fact, there's only so much DX work possible with envelope detection and *any* filter.) So, I use the 525's "AM" filter for listening to very strong signals -- BBC, Japan via Sackville, RCI, Radio Netherlands and so on -- and switch to the "SSB" filter and heterodyne reception for SWBC DX reception. SSB reception is fine, of course, as is CW reception, with the '525.

As other commentators -- *Larry Magne*, for instance -- have mentioned, the NRD-525 suffers filter leakage ("blowby.") This is especially noticeable during CW reception with the 0.5-kHz filter. You know what? I don't care! If Sherwood Engineering -- or me, come to think of it -- can come up with a reasonably effective and hassle-free fix for this, that's fine. If not, I don't mind. I have already built receivers with ultimate selectivity better than even the military tends to buy, and, if I thought it necessary, I could build another such receiver, or modify my '525 to be as good. But the fact is that the '525's performance is good enough for me. I've learned it the hard way, after having listened to everything from crystal sets to Racals: If I want *really* good selectivity, I'll probably have to build the radio myself!

Selectivity in the R-5000 is pretty good. I strongly recommend that SWBC listeners who purchase the R-5000 also purchase Kenwood's optional YK-88A-1 AM filter, though. Although it has the same -6 dB selectivity as does the stock filter, its shape factor and stopband attenuation are what you *intended* to buy if you've already paid so much for a radio.

Generalizations aside, here's what I *don't* like about the R-5000's method of achieving high filter stopband attenuation. ICOM, Kenwood, Yaesu and JRC have all proven themselves to be incapable of achieving high filter stopband ("ultimate") attenuation without somehow putting two filters in series. ICOM receivers and transceivers, and previous Kenwood receivers and transceivers, have used filters at both of two IFs to do this. (All the Japanese

receivers and transceivers I've heard that *don't* use such seriesed filters suffer from obvious filter blowby -- the NRD-525, too.) The reason is twofold: cheap filters and cramming everything too closely together on poorly-designed circuit boards.

Kenwood's cheaper ham transceivers suffer such blowby, too. The more-expensive Kenwood transceivers (TS-830, -930 and -940, and now -440), use seriesed ("cascaded," some ads say) filters to do away with the blowby. In all of these, blowby is done away with by using seriesed filters at 8.83 MHz and 455 kHz.

Well, with the R-5000, Kenwood at last brings similar techniques to an SWL receiver. The difference is that all of the "cascading" is done at 8.83 MHz. The system is simple: The narrower the bandwidth you select, the more filters there are in series! Example: Assuming that you have installed the necessary optional filter, selection of 0.5 kHz selectivity actually entails the use of 6-, 2.4- and 0.5-kHz filters in series, in that order. Neat and clever, huh? Clever, yes. Neat? Not necessarily. The filters aren't wired *directly* in series; there are "buffer amplifiers" between them. I anticipate that putting the narrowest filter farthest down the amplifier chain will result in some pretty strange within-the-passband IMD effects under some reception-of-a-weak-signal-right-alongside-a-strong-one conditions. (For instance, during reception with the 0.5-kHz filter, it's possible for signals just outside the passband of the 0.5-kHz filter to get through the 6- and 2.4-kHz filters without attenuation. Such signals could cause generation of third-order IMD products at much lower levels than they'd have to be to produce IMD in the receiver's front end.) Also, I've already noticed with the R-5000 that Kenwood's method of filter cascading results in stopband asymmetry. For instance, I can hear some blowby on one side of the R-5000's 0.5-kHz passband and none on the other. That figures; its passband isn't centered in the passbands of the 6- and 2.4-kHz filters. Bottom line: I hope that this method of filter switching doesn't catch on with other manufacturers. The best method of filter cascading is to use two filters with more or less identical passbands, one at the head of the IF amplifier and the other at the end, *after* the last IF stage and before the detector. *That* kind of selectivity has to be heard to be appreciated!

Tuning feel. I like the mechanical feel of the 525's tuning over that of the R-5000, even though the '5000's dial-tuning drag is adjustable; the '525's is not. The 525's tuning knob has a finger hole; the '5000's does not -- a silly oversight.

Initially, the NRD-525 did not allow choice of tuning steps. Later, JRC modified the radio's computer program to allow choice of tuning step by means of the receiver's **RUN** button. The choices are 10 Hz and 100 Hz; the **RUN** button also switches the steps taken by pressing the 525's **UP** and **DOWN** buttons from 1 kHz to 10 kHz. Between these choices and the radio's keypad, you can get to where you're going with reasonable ease.

The R-5000's tuning steps are somewhat tied with receiving mode, and the radio's **STEP** control modifies this relationship somewhat. Also, the R-5000's tuning speed varies with how fast you spin the tuning dial; this is not so with the NRD-525. Between these choices and the radio's ridiculous nonstandard and invisibly numbered keypad, you can get to where you're going.

Tuning in 10-Hz steps, the NRD-525's synthesizer clicks every kilohertz on the 0.1 kHz. The 525's synth doesn't move between 10-Hz steps as near-seamlessly as the R-5000; it sounds more raucous. Also, the '525's synthesizer sort of, well, fishtails onto frequency after you stop tuning (you must tune in a carrier in SSB or CW mode to hear this). Does this mean that the design of the NRD-525's synth is inferior to that of the '5000? Quite the contrary. Almost certainly, the NRD-525's synthesizer is considerably phase-noise quieter than that of the R-5000. **As a general rule, the faster the synthesizer settling time, the phase-noisier it is.** The NRD-525's synth is noticeably clicky during rapid tuning, and it overshoots ("fishtails" -- my term -- because of long setting time) noticeably no matter how fast you tune. **These indicate a synthesizer design in which phase-noise performance takes precedence over tuning smoothness.** That's fine with me, although I agree with commentators who point out that random-search, weak-signal reception may be hampered by these clicks. By contrast, if you prefer a synth that more nearly approaches an LC-tuned-VFO sound during 10-Hz-step tuning, you'll prefer the R-5000. As for commentators who continue to complain about the audibility of *100-Hz* steps in *any* radio, well...

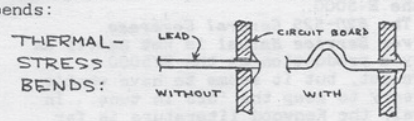
Ah, I should mention that the NRD-525 has a RIT (receiver incremental tuning) mode. Pressing the '525's **RIT** button switches the tuning dial to tune just ±5 kHz from the center frequency indicated on the display before **RIT** was pushed. The display reads only the offset, from +5.00 to -5.00 kHz. For a while, I used this function only when I used the NRD-525 in conjunction with a transmitter for amateur-radio work. Because the '525 remembers the last-used RIT offset independent of memory channel or tuned frequency, however, I've recently realized that the '525's RIT function is quite useful for playing "Has the carrier dropped yet?" during SWBC DX sessions. (Example: You've tuned in a weak Radio Beijing shortwave outlet as single sideband; the carrier's too weak to register on the '525's S-meter. [It'd have to be darned strong to do so; in tuning the signal as SSB, you've put the carrier almost 20 dB down on the IF-filter slope.] Yet, you'd like to check on the presence and quality of the carrier at intervals. Because the S-meter's of no help, you'll need to *listen* to the carrier. You could retune the receiver, but then you'll have to retune to zero beat for the demodulated signal audio to sound right. Solution: Keep the NRD-525's RIT set for a few hundred Hz of offset. Tap **RIT** to listen to the carrier, and tap **RIT** again to return to zero-beat tuning. Neat! [There's no RIT on the R-5000; but you can do the same thing with adjacent memory channels, or with the '5000's **VFO A/B** control.] I think that this technique will also work with the ICOM IC-R71A, among other receivers.) A further hint: use negative RIT shift if you're listening in USB; positive shift for LSB.

Heat. There's been a bit of controversy over the relative warmth of these two receivers. Let's get it straight: The R-5000 runs warm to *hot*; the NRD-525 runs only warm. For the first week after I began using the R-5000, Oak Floor House smelled like, well, hot artificial bananas. I attribute this to further curing of the lacquer (or whatever) used to seal the power transformer. The '5000 runs so warm that even its tuning knob is warm to the touch after the radio has been on for more than an hour! Curiously, however, the R-5000 seemed to run cooler after about a month of operation that it did at first -- *you* figure it out!

Simply put, the R-5000's thermal design is poor. There *are* louvers on the top and bottom covers of the receiver, but a gander inside the box shows that these communicate poorly, and that no ventilation holes have been provided in the metal divider that cuts the interior of the box into upper and lower sections. What convection occurs has to move along vertically along the sides of this divider, and through a few access holes in the radio's boards and modules. (In particular, good thermal design would've placed a ring of ventilation holes around the power transformer -- but the holes aren't there.)

Further, several of the R-5000's heat-generating components really should be connected to *external heat sinks* -- external, that is, to the R-5000 cabinet. I'm talking about the set's various voltage regulators, and especially about its full-wave rectifier module. The rectifier is bolted to, or very near to, a spot near the bottom of the rear panel of the set. (I can't remember its precise position because I no longer have the set here.) I fully believe that people with uncalloused fingers may be able to achieve a first-degree burn if they hold one of those fingers on that particular rear-panel spot for a minute or so. That's improper heat-sinking, Kenwood!

Further in relation to the R-5000's poor thermal design, I predict heat-cycling failures for R-5000s within, oh, three years. Why? Well, several heat-producing parts in the R-5000 are bolted to heat sinks while having their leads through-hole soldered to circuit boards. Their leads do *not* contain thermal-stress bends:



It was thermal "engineering" like this that led to those mysterious "my frequency display goes crazy" failures in the R-1000. (In the '1000, the leads of three-terminal regulators, through-hole soldered to a circuit board while the devices themselves were bolted to an off-board heat sink, finally broke their solder connections to the board as a result of thermal cycling. The regulator leads had no thermal-stress bends; the stress was absorbed by breakage of the connections. The fix: resolder the leads. The comment: This repair will have to be done periodically because the leads on the R-1000's regulators don't have thermal-stress bends.) Well, the R-5000 has even more such sleazily-mounted devices, the leads of none of which have thermal-stress bends! Some R-5000 owners will almost certainly experience receiver failures for the same reason some R-1000s -- including one of my two; how's 50% sound to *you*? -- failed. You heard it here first.

The NRD-525, on the other hand, runs only as warm as I'd expect a modern, adequately-ventilated receiver to run. **If I owned an R-5000, I'd at least take steps to cool it better** -- steps including moving its power supply, transformer and all, to another, well-ventilated box. Note: The clear-plastic window over the NRD-525's fluorescent display is warm to the touch because of the filaments in the the display. (Filaments? Sure! Every fluorescent display has 'em.)

Mechanical construction. The R-5000 is the better of the two; the NRD-525 is little more than a card cage in a flimsy box. The 525's front panel is just plastic sprayed on the inside with a conductive coating. (This is *shielding*? Barely, I'm sure.) Almost every part on the '525's front panel is actually soldered to a circuit board mounted about a half inch or so behind, and parallel to, the front panel. (If you remove the '525's top and bottom covers, and loosen another six or so screws, *the entire front panel* comes off in your hands. Umbilical cables make the electrical connections.) Most of the 525's circuitry is contained in cards mounted vertically in a cage behind that front-panel circuit board; the caged cards plug into a large motherboard, which does away with most of the intermodule wiring you see in other receivers, including the R-5000. The front panel's umbilical cables plug into the motherboard, too. There's another board-based module or two between the rear panel and the back of the card cage; the power supply, including the power transformer, is back there. If this construction technique sounds rather lightweight and flimsy to you, you're darned right! If you ever drop your NRD-525 from desk-top height to the floor, *expect that it'll be "totalled."*

The R-5000 is not as well made as it is *predictably* made in a thin, steel shell. Sure, its front panel is plastic, but there's a steel subpanel behind this. (Anyone out there hoping for a return to the days of cast-aluminum front panels? Forget it! Think of it: Would such expense add to shielding or mechanical stability in a radio in which no oscillator is mechanically tuned?! Nope. The dollar/yen hassle has these boxes costing enough, thanks.)

Odd bits. Another NRD-525 feature that really pays off during amateur-radio work is its monitor feature. The 525's **MONI** button switches in an auxiliary RF gain control that comes into play when the receiver is muted. This **MONITOR LEVEL** control is screwdriver-adjustable from the bottom of the receiver. Once you've set **MONITOR LEVEL** properly, you can monitor your transmitted signal by pressing **MONI**. *Very* useful!

I find the NRD-525's **TONE** control quite useful for reducing wideband IF hiss during heterodyne reception with the '525's "inter" and narrower filters. Although the R-5000 doesn't have a **TONE** control, it doesn't seem to need one.

The R-5000 Service Manual indicates that the '5000 includes "tailored-to-the-mode" audio filtering; maybe this is the reason I don't miss a **TONE** control with this receiver.

The clock/timer functions of both receivers work adequately. I prefer to be able to leave a radio on during timer cycling, but neither the R-5000 nor the NRD-525 allows this. A note on clocks: Just as the R-5000 does *not* really have two VFOs, so does neither of these receivers actually have two separate clocks. Rather, the two-clock effect is achieved by having two *displays* for one clock. I like the R-5000's ability to display time and frequency simultaneously; on the NRD-525, you have to hit the **CLOCK/TIMER** button to see the time. Not only does this change the frequency display to indicate time, it also locks all frequency/mode/AGC/channel functions of the receiver until you touch **FREQ** or **CHANNEL**! Oh, well, that's okay with me. Neither radio's clock displays seconds; when will these manufacturers learn that we want to *see* the seconds?

The NRD-525's display-dimming circuitry is superior to that of the R-5000 because it adjusts the brightness of every light transmitter on the front panel. The R-5000's **DIM** switch adjusts the intensity only of the display and S meter. (Think this is unimportant? *You* sit in a dark room and stare at a dimmed frequency display directly over several undimmed function-indicator LEDs and see how your eyes like it!) The NRD-525's **DIMMER** button allows you to step through choices of off, dim, medium and bright. The only rub with this system is that receiver doesn't remember your dimmer choice when you turn it off; at "power up," the radio defaults to the **BRIGHT** setting. Big deal, huh?

I consider scanning an "odd bit" right now -- wait until I get the 525's VHF/UHF converter -- so I'll talk about scanning here. Except for the lack of a scanning-speed control, I consider the R-5000's scanning features to be superior to that of the '525. Two facts swing my decision in favor of the '5000: (1) The R-5000 allows you lock a channel out of memory scan (no such facility in the '525) and (2) the R-5000 can scan between two frequency limits in 10-Hz steps (1-kHz steps in the NRD-525). Each scanner manufacturer has a different idea of what features a scanner must have, of course; to make matters worse, a receiver like the R-5000 and NRD-525 has already devoted so much panel space to basic radio features that "something's got to give" when the time comes to add scanning. The '525's designers neglected to add channel lockout; the R-5000's designers do not allow user control of scanning speed above that achievable with the radio's **STEP** switch. When scanning between two frequency limits, the '5000 can do it in 10-Hz steps -- a neat facility, since it's just like bandscanning by hand. (I estimate that it would take the R-5000 the better part of a day to scan from 30 kHz to 30 MHz in this mode. Next time I have an R-5000 in my clutches, I'll give this a try!) The NRD-525 can't "frequency scan" in anything less than 1 kHz. During heterodyne reception, this is useless unless the scanning speed is quite slow.

A selling point for both of these receivers is the fact that they are computer controllable. Trouble is, neither manufacturer goes into detail on this selling point. For instance, which receiver parameters are controllable by computer? You know as much as I do, and I've got service and owner's manuals on both radios! Is any sort of AGC-line-level or S-meter information available in either receiver's data stream? (This is an important point for anyone considering computerized spectrum surveys.) Right now, your guess is as good as mine. I do intend to buy the RS-232-C interface for the '525; I'll let you know. Sometime.

Despite its quantized readout, the NRD-525's S meter is better implemented than the R-5000's for one important reason: The R-5000's meter jumps all over the place during "AM" reception, and that shouldn't happen. Don't you believe the voltage levels printed below the S units on the '5000's meter scale; those numbers *do not* hold across the R-5000's tuning range!

Documentation. ***The R-5000 Owner's Manual*** covers operation of the receiver very well, although it needs an index. It also needs *one* diagram showing the pinout for its **ACC** jack and another for its **REMOTE** jack. Technical information? As I said earlier, *forget it.* You've got to buy (for about $20), ***The R-5000 Service Manual*** if you want to know anything about the receiver's circuitry and how to align it. As ***Don Moman*** discovered right away, one of the important things missing from the ***Owner's Manual*** is information on how to defeat or turn down the R-5000's keyboard beeper. (You have to adjust VR8 on the IF UNIT board to do this. *Hold it!* Are you Qualified Service Personnel? Let's see some ID....) The ***Service Manual*** is impressive, but it really doesn't tell you how the radio works, circuit by circuit. Judging by what coverage there is of circuit function, Kenwood doesn't prove that it knows, either.

The NRD-525's ***Instruction Manual*** does the job, but it's more bookish, and looks much "lower budget," than the R-5000 equivalent. Again, an index would be helpful. Its description of the receiver's circuitry is limited to *one page*! Oh, well, at least JRC provides us with a block diagram, schematics and installation-of-options information for the '525. Again, you have to buy the ***Service Manual*** to get any of these things for the R-5000.

The ***NRD-525 General Coverage Receiver Service Manual*** is not nearly as classy a production as the R-5000 equivalent, but it seems to have what's necessary to keep the '525 in tune. In general, the Kenwood literature is far slicker than JRC's. Comparing their manuals, you'd think the R-5000 was the more expensive radio of the two!

Concluding comments. **In my opinion, most shortwave listeners considering the purchase of one of these two receivers would be better off with the R-5000.** Reasons: The NRD-525 costs *much* more than the R-5000, and most SWLs will not use the NRD-525 in situations where its edge over the R-5000 will be noticeable. The panel appearance and control functions of the R-5000 are more "pop" and less forbidding that those of the NRD-525. The Kenwood manuals are more friendly, also.

The '525 particularly shines for CW

reception; most SWLs do not listen to CW. With a 0.5-kHz filter in line, the R-5000 suffers severe audio IMD during CW reception.

Many SWLs seem to be stuck with doing their SWBC DXing in "the AM mode" at an SSB bandwidth; might as well not pay extra money for the NRD-525 if you insist on staying in the Stone Age. If you're a progressive soul who tunes for SWBC DX in the SSB mode, you'll find that the R-5000's nonsynchronous heterodyne reception is so good that the NRD-525 offers little or no improvement in this regard. Beware, however: If you buy the '5000, you'll miss out on a good *IF* notch filter.

The R-5000's deceptively smoother-sounding tuning *may* hide a phase-noisier (than the '525's) synthesizer, but many SWLs may be unable to pinpoint phase noise as a problem even as it screws up reception for them. As receivers become less overloadable, phase noise will be more apparent -- never fear!

The R-5000 is a smaller radio than the NRD-525; this makes the '5000 the better choice for DXpeditionary use. Also, as I hinted earlier, I suspect that the R-5000 will take more physical abuse than the NRD-525. I'd rather not take a $1500+ radio "on the road," myself -- I'd take the cheaper one!

I don't think that many people will be bothered by the R-5000's sleazy thermal design, for one reason: They'll probably buy another "latest and greatest" receiver before thermal failures occur in the R-5000 they're so excited about now. (For example, a prediction: ICOM will supersede the IC-R71A within a year or two; it'll have more [or different] bells and whistles than the R-5000. Equipment "feeding frenzy" will set in again, and many R-5000s will end up in the classified ads. NRD-525 owners, however, having bought a seemingly more spartan radio than the R-5000 for considerably more money, will be more and more certain of the quality of their purchase with each passing week, and turnover in other manufacturers' cheaper receivers will be of only mild interest to them.)

NRD-525 owners will continue to be annoyed by filter blowby, however, and they'll seek solutions to this problem. (One solution to this may already be available, as I'll mention after this article!) Different filters *aren't* the solution: the blowby occurs on the filter (and/or mother) board(s), not as a result of poor filter performance.

Make no mistake, the R-5000 and the NRD-525 are *excellent* receivers. When I took the R-5000 out of its box, installed a pair of optional filters and began to compare the '5000 with the NRD-525, I wondered if I'd discover that I'd bought the more expensive receiver to no avail. I now see the differences between the two receivers clearly. There's much in the R-5000 that I'd consider "musts" to modify out. My original reasons for choosing the NRD-525 over the R-5000 were enough to allow me to decide between the two; by chance, however, additional and unforeseen weaknesses in the R-5000 have strengthened my feeling that my decision was sound.

Closing Notes on the NRD-525

In the R-5000/NRD-525 comparison, I mentioned that a means may soon be available to reduce the filter blowby in the NRD-525. ***Don Moman*** has sent me a preliminary fact sheet about four NRD-525 enhancement boards soon to be available from ESKAB, Malmoe, Sweden. The CFLB EV is "an optional IF-board that eliminates the -white noise and cross talk- [hyphens by ESKAB] in the IF-stage and improves the overall IF selectivity." The CFLB PV does the same thing, with the addition of optional filters (for "cascading" or "tail ending," I suppose) to "provide high-class IF-selectivity." The remaining two boards, the CFLB EV P L A M and the CFLB PV P L A M, duplicate the first two boards and add phase-locked AM detection. You use one out of the four; whichever you choose, it uses up the space allocated by JRC for installation of the NRD-525's optional VHF/UHF converter. Well, I guess I'll let you know. (My first question: When will ESKAB discover model *numbers*?)

Finally, an answer to a question from ***Jay Mathisrud***: There seem to be conflicting reports as to which of JRC's optional filters are mechanical and which are crystal-based. The 525's optional 500-Hz filter sounds fine to me; I can't tell from the sound whether it's mechanical or crystal, which means that it doesn't matter. If you like an optional filter's specifications, and the filter you purchase lives up to those specs, the filter mechanism matters little. (I *do* think that voice-bandwidth mechanical filters may introduce transients under some conditions because of the nearly rectangular shape of their response curves, but this effect would proabably be hard to detect with narrower filters used for other than voice and music reception. You may recall that the 400-Hz Collins filter long available from Radio West and others as an add-on to various radios has drawn my fire in the past because of its crummy shape factor -- something like 5 or 7 to 1. The JRC 500-Hz filter is considerably tighter than this.)

No, I don't know if other manufacturers' filters are suitable for the NRD-525. (A good technician can work miracles, of course.) My opinion is that the value of third-party filter options for the '525 will be limited because of the noticeable filter blowby -- an effect caused by board layout, not filter leakage. Perhaps the ESKAB PV boards will solve this problem.

Finally, Jay, yes: An extender board (the CMH-365) *is* necessary for *in situ* service work on the NRD-525 boards.