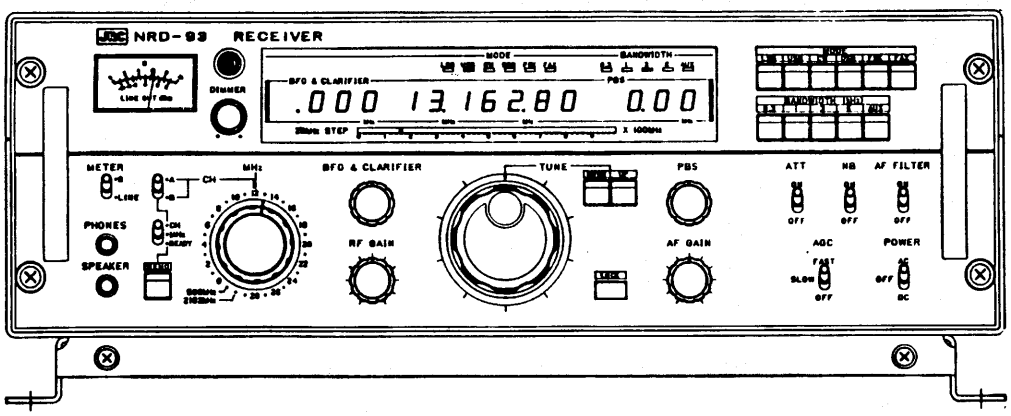
JAPAN RADIO COMPANY NRD-93 COMMERCIAL/MARINE RECEIVER

Mark Seiden



INTRODUCTION

Like Sir Gawaine searching for the Holy Grail, serious DX'ers search for the perfect radio. While I don't know whether Sir Gawaine ever found the Holy Grail, I do know that I have not found the perfect radio. That's because it doesn't exist. Any electrical or mechanical device is a series of compromises. Technology, design limitations, intended use, intended market, and most importantly, cost, govern every device that we use in our daily lives. Just as no one has designed the perfect writing instrument, no one has designed the perfect radio. But, since this is not the best of all possible worlds, we must make use of what is available, and evaluate things in a relative sense. That's what I attempt to do with this review. While I could easily come up with a wish list for the ultimate receiver, no doubt your wish list would be slightly different. In this particular case, when the new radio bug bit, I wanted to supplement my listening post with the best of whatever was available. After much soul searching and one or two conversations with a very understanding wife, I decided that for my purposes, the best available receiver on the market, regardless of price, was the Japan Radio Company NRD-93. What follows is the result of operating this radio on an almost daily basis for ten months. While I did have a IBS White Paper on the NRD-93 before I took the plunge, I did not have the benefit of an in depth user review. My non-technical observations are meant to assist those contemplating the purchase of a high end receiver, and to provide information to readers interested in the NRD-93 receiver.

DESCRIPTION

The NRD-93 is a solid state, double conversion, superheterodyne receiver, which was designed for both commercial and marine use. It was meant for serious monitoring by government and commercial agencies, as well as for employment at coastal stations and on board ship. The retail price, with accessories, is $8,605.

The radio is physically large, measuring (with the NDH-93 scanning unit mounted on top of it) 19" wide, 9 5/8" tall, and 11 7/8" deep. The depth is important. It is no deeper than an R-7, or an NRD-535D. This means that when you place the radio on top of your desk, you still have plenty of room for writing, looking at your atlas, and consulting reference books. By comparison, the Watkins-Johnson HF 1000 is almost 21" deep and leaves little space for anything else on the average desk.

The radio is no lightweight. The receiver itself, with cabinet, weighs 33 pounds. The NDH-93 scanning unit adds another 12 pounds, for a total of 45. While this is about half the weight of an R-390A, it should pose no extraordinary problems.

Both the receiver and scanning unit are designed for a 19" rack mount. There is an optional cabinet for both the receiver and scanning unit, which is a necessity unless the units are rack mounted. The cabinets are built like an M1A1 Abrams tank. They are solid, heavy gauge riveted steel, and are obviously, like the '93 itself, designed to withstand hard use. They are eminently stackable. Both the receiver and scanning unit cabinets come with metal feet, which are

designed to be bolted to an operating desk in a ship's radio room. The previous owner of my NRD-93 replaced those metal feet with large rubber ones. Unless the NRD-93 is actually intended for marine use, the rubber feet make a lot more sense. Presently, an Icom R-7100 and KIWA MAP unit sit atop my radio and scanning unit, and I have no doubt that in time, other accessories will find their way on top of the '93 as well.

The face of the radio is finished in a light gray. The cabinet is a light aquamarine green. While this is very untraditional and takes a bit of getting used to, it is actually quite attractive. The paint finish on the cabinet surpasses the finest automotive finish that one might expect on a ultra-expensive luxury car. In short, it is superb.

The radio, which has no internal speaker, comes with a non-matching outboard speaker, designated as the NVA-92. The face of the speaker cabinet is a traditional dark military gray. The remaining cabinet is the matching aquamarine green. On my particular radio, the previous owner had Electronic Equipment Bank in Vienna, Virginia, replace the actual speaker in the NVA-92 cabinet with a high quality 4 Ohm unit, which gives excellent audio fidelity. At the same time, EEB added a grounded three-prong plug to the radio's power supply, and installed a JRC 1.8 kHz filter (CFL-218A) in the auxiliary bandwidth position. The second I.F. is 455 kHz, which allows the installation of accessory filters by JRC, KIWA, or Collins.

OPERATING CONTROLS AND TUNING

Those of you who are familiar with the NRD-515 will be right at home with the NRD-93. The tuning scheme on both radios is almost identical. In fact, as can be seen from the line drawing, the control layout for both radios is very similar as well. Like the NRD-515, the '93 uses a megahertz knob to select any one megahertz range between 0 and 30. There is a main tuning dial that covers 10 kHz per revolution, and to the right of that there are up/down slewing buttons that change frequency at several hundred kHz per second. The digital readout on the main display contains orange LED characters that are approximately 1/2" high. The main display reads to the .01 definition level, and the display is electrically quiet.

To the left of the main display is a BFO & clarifier which functions as an RIT control. The LED readout here is also 1/2" in height, though it is in green and most important, reads out to the .001 level. In other words, it is possible to visually fine tune the radio down to the individual hertz.

To the right of the main display is another green 3-digit 1/2" digital LED that gives a readout of the passband offset in 10-hertz increments. To the right of the display is a series of push buttons for mode (LSB, USB, CW, DSB, FSK, and FAX), with a series of five push buttons for IF filter selection below that. The radio comes with four high quality filters with excellent shape factors (1:1.5 per Magne's White Paper) as standard. The wide filter is 6 kHz at -6 dB. The intermediate is 2.5 kHz, the narrow is 1.0 kHz, and the CW filter is .3 kHz.

Additionally, there is a -20 Db attenuator, a noise blanker, a dial lock, manual controls for RF and AF gain, as well as a knob to control the brightness of the readouts. There is also an extremely useful audio filter that works well at reducing noise, a switch to select either the fast, slow, or off modes for the AGC, and several other switches relating to both the memory function and the S meter. The S meter does not read in the standard S units that we are accustomed to. Rather, the top part of the scale is calibrated from 0 to 10, and the bottom part of the scale is calibrated in line out dBm. Either reading is user selectable from the front panel. Strangely enough, the S meter is not lighted. At first I thought that this would be annoying, but it has not proved to be so.

There are two 1/4" front panel jacks. One is for a set of 600 Ohm headphones, and the other is for the 4 Ohm speaker. Inserting the headphone into the headphone jack does not mute the speaker audio circuit. If you want to mute the speaker audio circuit, you must physically disconnect the speaker jack from the front panel, which is easy enough to do.

All JRC radio controls have excellent feel. Those of you who have had the pleasure of operating an NRD-535 or an NRD-515 appreciate their quality. The NRD-93 is even better. The control feel, especially the main tuning knob, is superb. The buttons and switches work like you would imagine the controls of the space shuttle to feel, and every aspect of the radio has a solid, built-to-last touch about it that one would expect in an expensive commercial receiver.

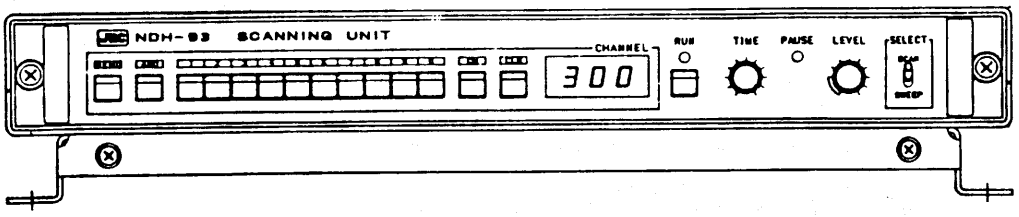
One of the big problems with the NRD-515 was the touchy RIT. It is very difficult to zero beat the '515 because of that. Not to worry in the NRD-93. The '93's RIT not only reads out to the individual hertz, but also can be easily tuned to select that individual hertz, even when wearing gloves. I'm sure they designed it that way.

With the exception of the megahertz selection knob (which also serves double duty as a 60-channel memory), all of the controls on the radio are single function-single purpose. There are no concentric knobs, and all of the controls, knobs and switches are pleasingly large.

Those of you who haven't fallen asleep by now have probably noted that I haven't mentioned a keypad. That's because the NRD-93 doesn't have one. This is real shame, because each frequency must either be tuned in individually, or selected from one of the 360 available memory channels. While the radio is not as cumbersome to tune as is, say, a

Drake R-7, it is certainly not as quick to tune as one of the push button radios of the '90's. Often, I find myself punching up frequencies on my NRD-535D to see what's available. When I find something I really want to listen to, I then tune it in on the NRD-93. For slow bandscanning, however, such as a trip across 60 meters, the '93 is a real joy.

According to the date on the chassis, my radio was built in 1983. Despite that, JRC designers had apparently decided not to employ the user friendly tuning technology that they used in the earlier '515 and later '525 and '535 hobby radios. What this means is that assuming that you were listening to WWV on 15 megahertz, in AM (DSB), when you select upper side band, the radio fails to select the offset automatically and detunes itself to 14.998.50 MHz. Conversely, going from AM to LSB, causes the frequency to shift to 15.001.50 MHz. This, like the Icom R-71A, requires that you retune the radio every time you change mode. Since the radio is such a pleasure to tune, this is really no big deal; but it is a bit of yestertech.



MEMORIES

While the NRD-93 may be a little antique in its tuning scheme, it more than makes up for this in the memory department. The NDH-93 scanner, which came with my radio, has a retail of $1,125 all by itself. It's almost worth it. The NDH-93 scanning unit has a provision for 300 memories. Unlike the 96-channel scanning unit that was an option with the '515, all 300 of the NDH-93's memories are tunable. All of the memories can be selected individually, or they can be selected by bank. If you prefer to scan memories number 1, 6, 89, 95, 252, and 298, while excluding all the others, that can be done as well. You can also sweep frequencies once you set upper and lower frequency parameters and mode.

The scan delay is selectable, as is the level. The level selection is both important and interesting. If you enjoy monitoring the BBC, you can program a number of BBC frequencies into the memory, setting what you consider an acceptable signal level with the level control. When the level for the frequency that you are listening to drops below what you have predesignated as being acceptable, the radio will then search out the next strongest BBC frequency and lock on to it. This is a neat feature.

Since I spend a lot of time monitoring pirates, I merely program 10 to 12 of the most active pirate frequencies, set the level fairly low, and allow the radio to scan among the preselected frequencies until somebody comes on the air. This saves a lot of knob twiddling when pirate activity is slow on any given night. It's also possible to program in your favorite PNG or Indo frequencies and rapidly scan through them each morning. Someone who spends a lot of time DXing on the broadcast band can also program in all of the available frequencies between 530 kHz and 1700 kHz, rapidly switching from frequency to frequency much faster than they could with a keypad setup.

There are also 60 available memory positions accessible through the MHz knob, which are also tunable. While these 60 memories cannot be automatically scanned, they can be manually selected, and are very handy as well. All in all, 360 readily accessible, tunable memories minimize the inconvenience of the lack of a keypad, though they do not eliminate it.

HOW DOES IT WORK?

How a radio really performs is actually the proof of the pudding. In this case, the pudding is very good. Simply put, the NRD-93 is the best radio I have ever used. Besides being generally user friendly and a pleasure to operate, it performs better than anything that I've ever sat in front of before. At the time of its purchase, I placed it alongside a full house NRD-535D (with an extra filter, a high stability oscillator, and all of the upgrades available), a beautiful example of a Drake R-7 (with a full set of filters), a Gilfer modified NRD-515 (with the NDH-518 scanning unit), and an EEB modified Icom R-71A (HPXF option, plus a few extra goodies). It simply outshone all of them.

First of all, the receiver is dead quiet. Its noise floor is -141 dBm, and its local oscillator noise is rated by Sherwood at 133 dBc. There is no other solid state receiver that I am aware of that approaches these figures. In addition to being extremely sensitive and selective, the radio is blessed with a Tracking Preselector that is rated by Sherwood as an "A+." The only other Tracking Preselector that he rates as an A+ is that of the Collins R-390A. This means that the radio's front end is pretty much bullet proof. The audio is also superb. If you close your eyes, you would think you were listening to a hollow state radio. This is more obvious when the '93 is used with a good speaker. The favorite speaker in my shack is a Drake MS-4. The combination of the NRD-93, and the MS-4 produces sound that actually makes program listening and speaker DXing a pleasure. The AGC action is also excellent, with no over-shoot and very appropriate time constants.

When the extremely low noise floor, excellent audio quality, superb front end, very appropriate AGC, precise tuning, and professional quality filters are combined in one package, the result is the ability, on occasion, to dig usable, even enjoyable audio out of the mud that is unlistenable on a lesser radio. While there were no actual signals that were heard on the NRD-93 that could not be detected on the other radios, the difference was that at times, the '93 provided usable audio on marginal signals when the other radios couldn't. In all fairness, this didn't happen all the time. Once in a while, the NRD 535D or R-7 would hear something better than the '93 did. But those occasions were rare. And under no circumstances did the R-71A or '515 perform as well as the '93. They weren't in the same league when DXing tough signals.

BCB DX'ers will be interested to know that there was no perceived degradation of performance between 530 kHz and 1700 kHz on the '93 either.

As is expected in a radio of this price class and quality, the stability of the set is rock solid. Simply turn it on, select a frequency, and walk away. I verified it will still be at that exact same frequency, within one or two hertz, days later.

BUILD QUALITY

The NRD-93 was designed to last a long time, and in difficult environments. In addition to standard AC, the radio can be used with 24 volt ships' current. Each control was obviously designed to withstand many thousands of operating cycles. The radio utilizes JRC's concept of slide-in, printed circuit boards attaching to a motherboard. The printed circuit boards are thick, of very high quality, and are all waterproof. The filters, according to my ear, are symmetrical. The cabinet, as stated, is designed for heavy duty use. The components are all well shielded. The radio runs extremely cool, which means that the high quality components should last a long time. A comprehensive operator's manual comes with the set, and the receiver can be repaired by a knowledgeable technician, the Japan Radio Company, or Raytheon, who services JRC equipment in the United States. Strangely, however, there is no service manual available for the '93 from JRC. The NRD-93 is ruggedly designed and built with components selected for long life and operational stability. It is built to exacting standards with workmanship and parts far above the quality of the best hobby receivers.

DEFICIENCIES

All, however, is not perfect. It never is. There are a few flies in the ointment, though they are small flies. First, the radio has no notch filter (neither did the NRD-515). This has not proved to be a problem for me since I use the radio with the superb JPS NIR-10 digital audio filter. The NIR-10 is an excellent accessory for the '93. In addition to being the most advanced audio filter on today's market, it is a het killer par excellence. Merely activate the automatic notch filter on the NIR-10, and it searches out hets, even multiple ones, and kills them without a trace. Therefore, I do not consider the absence of a notch filter a serious drawback.

Since this radio was designed for commercial rather than hobby use, ease of use for commercial radiotelephone operators was paramount. As a result, if you are listening to a signal in the AM (DSB) mode using the 6 kHz filter, when you select USB or LSB, the radio automatically selects the 2.5 kHz filter. If you want to listen to USB or LSB with a 6 kHz filter, you must then manually reselect that filter after you've changed mode. It doesn't work the other way, though. In other words, if you're listening in the USB mode with a 2.5 kHz filter, going up to AM (DSB), doesn't automatically invoke the 6 kHz filter. All it takes to select a filter is a simple button push. You don't have to carousel through all the filters to get the one you want.

The passband tuning on the radio is excellent. It really does help manipulate a signal in order to obtain the maximum usable audio. However, the width of the passband shift varies according to the filter that is selected. In the 6 kHz filter position, there is a range of + or - 2.0 kHzs of passband shift available. With the 2.5 kHz filter, the range is + or - 1.2 kHz. All of these ranges are appropriate for ECSS tuning with the various filters that come installed in the radio, with the exception of the auxiliary position. Unfortunately, JRC decided that a very narrow CW filter was what the operator was likely to install in that slot, as they only allow 80 hertz of passband shift while in the auxiliary position. This very much reduces the usefulness of that position.

For the type of monitoring that I do, I wanted to retain the 1.8 kHz filter, but increase the available range of the passband shift while using that filter. At the same time, I wanted a narrow AM/wide SSB filter, which the radio lacked. Russ Scotka, DX South Florida's resident electronic genius, performed some minor surgery on the radio that allowed these two aims to be achieved. First, Russ removed the 1.0 kHz JRC filter and inserted the 1.8 filter in its place. This is a drop-in fit. Next, he installed one of KIWA's premium 3.5 kHz filters in the auxiliary slot. This was not a drop-in fit. In order to get the KIWA filter to work, Russ had to fabricate a pair of 4.7 Mh chokes to match the filter to the IF board. Once this was accomplished, the 1.8 kHz filter had 500 hertz of passband shift, and there was an additional level of selectivity between the 2.5 kHz and 6.0 kHz choices that were previously available. The 3.5 kHz filter in the auxiliary slot only has 80 hertz of passband shift, but since it is primarily used for narrow AM and wide SSB use, this has not proved to be a serious problem. Still, I would like to increase the range of the passband shift in the auxiliary position, though to my knowledge, there is no way to correct that deficiency. If anybody out there has discovered a way, please let me know.

The NRD-93 does not have a synchronous detector the way the '535-D and the Drake R-8 do. The technology wasn't available when the radio was designed. Since the audio on the radio is excellent, even a mismatch of one or two hertz can be detected. This makes tuning to within one or two hertz critical when monitoring in the ECSS mode with a wide filter. Once this is done, the audio remains excellent. I had the good fortune of obtaining a KIWA MAP unit on the used market not too long after I obtained the NRD-93 (see Guy Atkins' excellent review of the MAP in *Proceedings 1989*. Russ Scotka installed direct pickups in both the NRD 535D and the NRD-93. The MAP unit allows instant audio comparisons between receiver audio and MAP-processed audio. There was a tremendous improvement noted when the 535D's signal was fed through the MAP unit. However, the audio on the NRD-93 was so good that often the unprocessed audio from the NRD-93 actually sounded better than the same NRD-93 signal fed through the MAP unit! In other words, while the radio does not have a synchronous detector, it is not really missed. What actually is missed is the presence of an effective noise blanker. The NRD-93 does have a noise blanker switch on the front panel. To say that it is less than effective would be an understatement. I have yet to be able to determine one single situation where activation of the '93's noise blanker had any effect on the audio. That is why an external noise blanker, with a notch filter, such as the JPS NIR-10 or the JPS NTR-1, is a required accessory with this radio.

OTHERS CONSIDERED

There are, of course, other radios available in the same price range as an NRD-93. The Icom R-9000 is one example. I thought about the R-9000, and decided against it. I was concerned about reports from George Zeller and Larry Magne that indicated the AM filters were inappropriate and that the radio ran very hot. Since I was interested in a radio that only tuned through the shortwave spectrum, I thought that my money would be best directed in some other area.

To complicate things further, Watkins-Johnson announced their HF-1000 at the same time I learned that there was a mint NRD-93 available for purchase. This was a real dilemma. I spent many hours on the phone talking with radio enthusiasts about this quandary, particularly Dallas Lankford, who is one of the most knowledgeable radio enthusiasts in the United States when it comes to receiver design. Dallas, from a review of the specifications, told me that the NRD-93 was really the only way to go. He pointed out that the local oscillator phase noise on the HF-1000 was worse than the local oscillator phase noise in the NRD-525! He also pointed out to me that the HF-1000 did not have a Tracking Preselector, and further, that its digital filters seemed to "blow out" at about 75 dB. He also questioned whether a radio with a rated AM sensitivity of 1.58 microvolts (which was the spec on the HF-1000) was really suitable for DX work.

On my own, I discovered that not only did the HF-1000 have an unusually deep footprint, but there was no cabinet available for it, and most important, the passband shift apparently only worked in the CW mode. Fifty-six digital filters or not, I simply could not imagine operating a radio without a passband shift operable in all modes. All of this, coupled with the fact that while HF-1000's were more or less readily available, my chance of finding another mint NRD-93 was rather rare, convinced me to opt for the '93. I'm not sorry that I did.

In all fairness to Watkins-Johnson, I have not had the opportunity to test their radio. Dallas' comments were made from a review of published specifications and not a hands-on test. I wrote their project engineer and asked for a test sample about ten months ago, hoping that I could compare it side by side with the '93. Unfortunately, the radio never came.

THE BOTTOM LINE

Okay, the reader may ask -- what does it cost? Well, that depends whether you buy new or used. Personally, I have had excellent luck over the years purchasing used radios. This one was no exception. When I decided that I wanted a used '93, I mentioned it to Gilfer Shortwave's Paul Lannuier, then employed at JRC's New York office. A few months later, Paul called me and told me that one of his customers was selling one. He said the customer was a reputable

collector, who was very fussy about his gear. I telephoned the seller and got a description of the radio, which he rated as "9.8 out of 10." He also gave me a few references as to people he had previously done business with. I checked the references out, and he did, in fact, appear to be perfectly reputable. We agreed on a price of $3,750, with shipping to be paid by me and packing to be paid by him. I took a big gulp and mailed him a cashier's check. Within about three days, my radio arrived. It was, in fact, "a 9.8 out of 10." Perhaps it was even a little better than it had been described. In any event, I was very happy with the purchase and would not hesitate to do it over again the same way.

According to list prices, the radio, with scanning unit and cabinet, has a retail price of approximately $8,600. Unfortunately, the radio is no longer in production. There is, however, an inventory of radios available through the Japan Radio Corporation which have not yet been sold. It is my understanding that these radios are available for $7,000, with scanning unit, speaker and cabinet, new.

As far as the used market goes, I would expect to pay somewhere between $3,000 and $4,000 for the radio, depending upon condition and accessories. A radio without the scanning unit, cabinet and speaker might sell for as low as $3,000. A mint set with all the goodies might go for as much as $4,000. There are not many NRD-93's in hobbyists' hands around (it has been estimated there are only about 50 in the United States), and they do command something of a premium when you find one. In my opinion, they're worth it. Paul Lannuier is extremely knowledgeable about JRC radios, and seems to be a clearinghouse for information relating to Japan Radio Company equipment. He would be a good place to start your search for a '93.

SUMMARY

There is no magic radio out there that will allow you to hear PNG's in Kansas City at high noon. As far as I am concerned, once you get into the R-7/NRD-535D/NRD-515/NRD-525/Drake R-8 class, any improvements from there on will be in small increments. There is a ceiling, somewhere around $1,500 or $1,600, where the law of diminishing returns kicks into high gear. But to the serious radio enthusiast, small increments can be very important. If you are one of those people and you especially enjoy operating a very high quality piece of equipment, then you should consider the NRD-93. While there is some competition with the radio by others in the same price range, it really is in a class by itself. And, if you are interested in buying one, mine isn't for sale.