THE DRAKE R-8 RECEIVER

THROUGH DXERS' EYES AND EARS

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The introduction of a major new communications receiver is always a happy event. But to have one brought to market by an American company with a reputation for building solid and innovative equipment makes it something special.

The re-entry of the R.L. Drake Co. into the shortwave marketplace was just such an event, and the receiver they produced has become a welcome addition to many a DXer's shack.

This review gives DXers the opportunity to tell, in their own words, what they like and dislike about the new Drake R8, the first new American DX machine in many a year, hopefully the harbinger of great things to come.

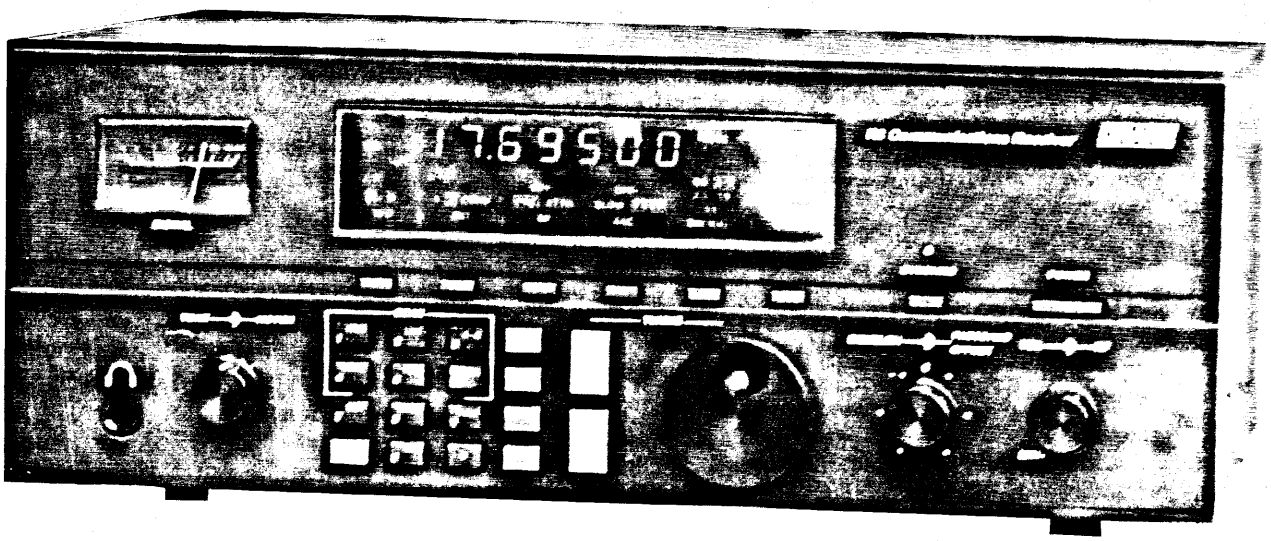
INTRODUCTION

From the late 1950s until the early 1980s radio receivers built by the R.L. Drake Co. were highly prized by DXers, SWLs, and hams alike. Many of the Ohio company's radios were acknowledged classics of receiver design and performance, with the final units in the series, the R7A and its commercial cousin the R-4245, thought by many to be the best DXing receivers ever built.

The Drake Co. left the shortwave radio field in the early 1980s to concentrate on the emerging market for satellite television equipment, eventually becoming a leader in that burgeoning industry.

But, even as the company's name slowly faded from the memories of shortwave aficionados, a core of Drake employees harbored a desire to return to the high frequency bands. By the end of the 1980s Drake's engineers and marketers were well on the way to building a receiver they hoped would compete head to head with the sophisticated radios from Japan that were then flooding the North American market. Could Drake pull it off?

Indeed they could, and proved it by launching the R8 communications receiver at the Dayton HamVention in April, 1991.



The new receiver introduced at Dayton sure doesn't look like a Drake. Its appearance has been described variously as "austere" and "high-tech;" some say it looks like a high-end stereo receiver and "would be right at home in my living room." It's generally accepted that one thing the Drake R8 does ***not*** look like is a serious shortwave receiver. Drake's years in the satellite receiver business are very evident in the looks of the new radio.

"Some may find the front panel design too stark, but I like the R8's aesthetics just as it is. I guess I like the 'stealth' look." -- Guy Atkins

"It's clean and well laid out -- you don't have indicators and colors all over the place, meaningless controls, etc. You get the sense that you are really operating this thing, not just pushing buttons." -- Jerry Berg

Looks are deceptive, for behind that sleek black panel is the heart of a fine DX receiver.

FEW CONTROLS, MANY FUNCTIONS

The front panel measures 13 1/8" (334 mm) wide by 4 11/16" (119 mm) high. There are seven rotary controls, 26 pushbuttons, and a mono/stereo headphone jack on the lower half of the panel. The upper half contains a green LED to show that the radio's synchronous detector is in use, an S-meter, and an LCD display that measures 5 3/8" (137 mm) by 1 3/8" (35 mm.)

Besides a rather small tuning knob (1 9/16", 39 mm), the rotary controls are small concentric knobs for volume/RF gain, squelch/passband offset, and tone/notch tuning.

"One of my dislikes about the radio is the stock tuning knob. I replaced the knob on my R8 with the stock knob from an Icom R-72A. It cost me $18 directly from Icom America." -- Guy Atkins

Drake's use of concentric knobs for other analogue functions has come in for criticism, as well:

"The center concentric knobs are of adequate size and feel, but the rear knobs are terribly under-proportioned -- they're practically hidden behind the center knobs, making them unnecessarily awkward to operate. With all the spare room on the R8's front panel, it's a shame Drake didn't spread things out a bit. I also wish the tone control were behind the notch, rather than the other way 'round. It would make it much easier to operate. The same thing applies to the rarely used squelch control and the often used passband offset." -- David Clark

When you turn the receiver on, the LCD tells you virtually everything about the radio's conditions: VFO in use, frequency, bandwidth, mode, RF preamp or attenuator, AGC time constants, which of the two selectable antennas is in use. It also tells you if the notch filter or noise blanker is turned on, or if the radio's timer is set.

The LCD also shows whether the receiver's in the memory or scan mode, and tells you what type of scanning it's set up to do. It even tells you if you've poked the wrong button.

A major gripe with the R8's LCD display is that there's no indication of the sub-kilohertz digits. Frequencies are displayed as XX.XXXXX, when they could more easily be read as XX.XXX:XX. The colon (:) for the radio's clock is in exactly the right spot and, I think, Drake could easily turn it on with a PROM change. If tuning isn't too critical, the display can be set to read fewer digits, to three or four decimal places: XX.XXX or XX.XXXX.

Along the bottom edge of the LCD are six labels that match up with the six small black pushbuttons directly below. Pressing the **F** (function) key changes the labels and the functions the buttons perform.

When the R8 is off, the LCD gives local or UTC time in 24-hour format, but there's no leading zero for times before 10:00 hours.

MULTI-PURPOSE KEYPAD

Just as the radio's LCD gives you a lot of information and the concentric knobs give the receiver a less cluttered look, so the radio's pushbuttons perform multiple functions.

Each button in the keypad has its secondary function labeled in orange. These functions are accessed by pressing the **F** key, followed by the appropriate button. If you make a mistake while entering a frequency, pressing the **F** key and the **dot (.)** will clear the error.

"Some have complained about the feel of the keypad buttons and the six under-the-display pushbuttons, but I kind of like them. The former have a good, solid feel, and the latter respond quickly, 'on the fly.' However, the on-off switch has a strange, soft feel to it, which I don't like." -- Jerry Berg

AUDIO PERFORMANCE

Here's an area where everybody agrees: The R8 sounds ***GREAT!***

This radio puts the lie to the old wives tale that a shortwave radio -- especially a solid-state one -- must sound miserable. The audio it produces is smooth and ample, and it puts one in mind of the great tube receivers of the past.

I use mine side-by-side with a National HRO-50T1 and they sound remarkably alike, even though the HRO puts out more than 8 watts -- more than twice the R8's audio power. (Neither the R8 nor the HRO can match the superb audio of my Lowe HF-225, though. That radio is as close to hi-fi as an AM set can get.)

"Let it be said that the R8 sounds great! The intelligibility and crispness of its audio is by far the best I've heard from any solid-state communications receiver. The absence of muddy lows typical of 'Japanese audio' is very refreshing.

"This is a receiver that can make DXing in AM mode enjoyable again. The clean, low distortion and relatively wideband audio with the 4 kHz filter is amazingly good, and even at 2.3 kHz, voice response in AM is not nearly as muddied as we have learned to tolerate over the last ten years." -- David Clark

"The R8's audio is very good, even with the built-in speaker. But if you're a real 'speaker DXer,' as I am, you should use an outboard speaker for maximum performance." -- Jerry Berg

"The audio on the R8 is easily the best I've heard from any solid-state receiver. It's remarkably similar to the audio I've come to expect from a good tube-type radio." -- Dallas Lankford

Drake offers an optional outboard loudspeaker for the R8, called the MS8. David Clark says it works very well. I usually use a Minimus-7 speaker from Radio Shack, but occationally hook my R8 to the superb MS-4 that matches my old R-4B. The speaker accentuates voice frequencies.

"This receiver sounds so good I have found myself becoming more of a program listener than I used to be. And when it comes to DXing, every little bit of intelligibility helps." -- Guy Atkins

Several users have maligned the R8's tone control, saying it does next to nothing. Drake's **Steve Whitefield** replies: **"I wanted to call it a bass-boost control rather than a tone control, but the marketing boys wouldn't let me!"**

The R8's tone control really works -- and the radio's audio amplifier has the power to back it up.

My only gripe with Drake's design is that the tone control also affects the line-level outputs, so it can really tax your stereo amplifier, tape recorder, or RTTY decoder.

If you use the line-level outputs for taping, be sure that the tone control is NOT turned to the "morning" side of its travel. Keep it at 1 or 2 o'clock, otherwise you're likely to overload your tape recorder, amplifier, or speakers with excessive bass. This is *especially* true in ECSS tuning or when using the synchro mode!

Drake's putting two line-level outputs on the R8 was very thoughtful and is very welcome, especially for those of us who use RTTY decoders and do a lot of taping. It also makes hooking up an external audio filter a snap.

SYNCHRONOUS (PLL) DETECTOR

The R8's PLL synchronous detector is a marvel. It'll lock on to most very weak signals and does an excellent job of reducing audio distortion.

"It can make a big difference even on DX-level signals. Sometimes it locks on instaneously, other times it takes a little while. But I have noticed that it tends to go out of phase momentarily on strong signals with broad fade characteristics." -- Jerry Berg

Returning from a short DXpedition to the Washington State coast, **Guy Atkins** reported:

"The R8's synchronous detector successfully locked onto perhaps 90 percent of all signals, weak or strong, and improved the audio quality and readability of the signal in most cases. Tuning for MW DX signals was best accomplished in LSB/USB [ECSS] modes, however. On the stronger medium wave catches, I switched to the synchronous AM mode with good results."

Guy had his receiver examined by his friend and associate **Craig Siegenthaler,** developer of the Kiwa MAP. He says, *"Craig fell in love with the performance of the R8's synchronous detector. He says it's very nearly a perfect PLL type. Craig was VERY impressed with its response on DX signals in particular. Only when there's another carrier in the passband does the detector [understandably] get confused."*

I've noticed the same thing Jerry Berg mentioned -- that the PLL tends to lose lock on a broadly fading signal. This proves disconcerting, especially when listening to music. The music seems to "bend" in pitch when the PLL unlocks.

My Lowe HF-225 doesn't do this as readily as does the R8, and I think it's a function of the time constants used in the PLLs of the two receivers' detectors. When the PLL loses lock on the HF-225, the oscillator it controls tends to remain on frequency; the one in the R8 seems to try to snap back to its center frequency, waiting for the PLL to re-acquire the carrier.

"Another quirk of the R8's PLL detector shows up when the receiver is switched from a sideband mode into the AM mode and the 'synchro' button is pressed: the radio emits a piercing HOWL, that descends in frequency as the PLL's oscillator 'homes in' on the received carrier. Sometimes the frequency of this heterodyne is so high it's inaudible -- there's no audio at all. Pressing the synchro button a couple of times clears it up, but it's still annoying. This only happens when you switch from SSB to AM-synchro; if you're tuning around in AM mode and switch on the synchro detector it locks right in." -- Guy Atkins

"The R8's 'synchro' detector is extremely effective when it stays in lock. But I can't help feeling Drake should take another look at the design to make it less likely to lose lock." -- Dallas Lankford

PASSBAND OFFSET

The R8's **passband offset** system shifts the receiver's 50 kHz IF carrier to one side or the other of the IF filters' passband. This is done by varying the frequency of the 2nd local oscillator, which provides input to the 45 MHz to 50 kHz mixer. This is simple and effective, but there's a potential problem with this system:

If you're using a relatively wide filter and shift the carrier out to its edge in order to eliminate interference from an adjacent frequency, then switch to a narrower filter, the carrier of the station you were tuned to may then lie completely outside the receiver's passband. The result is a drop in audio level and an increase in audio distortion. To cure it, you'll have to readjust the passband offset control to bring the carrier back into the filter's passband. David Clark points out that the R8 isn't alone in requiring the operator to readjust the passband offset when going to a narrower filter. He comments that the R7's PBT does the same thing.

"I really like the performance of the R8's passband offset control. It can make a dramatic difference in signal intelligibility. In my opinion it is at least equal and likely superior to the R7's vaunted PBT, except that the R7 allows the user to 'slide' easily from one sideband to the other. It takes the mode key to accomplish this on the R8.

"The notch filter and passband offset are very helpful for extracting useful audio from 'messy' frequencies. I've been surprised more than once by the results achieved on what appeared to be a hopelessly buried signal." -- Guy Atkins

"Using passband offset with ECSS is powerful. When you find a station and go into USB or LSB, then move the PBT right or left, you are really getting a lot out of the signal. Only rarely must I go to a 2.3 kHz bandwidth; 4 kHz in USB/LSB usually does the job nicely. When I do use 2.3, however, audio remains usable as long as I don't tune too far off center." -- Jerry Berg

Bob Brown commented that he was displeased when he went from a wider filter to a narrower one, mainly because the audio level dropped. He said he was annoyed that he had to re-center the PBT control in these cases. I concur with Bob's observation, but I don't feel it's a real design fault.

IF BANDWIDTH FILTERS

Unlike most other communications receivers, the R8 is supplied with a full range of IF filters in widths of 6.0, 4.0, 2.3, 1.8, and 0.5 kHz. They are remarkably effective and their widths are well chosen for shortwave or mediumwave use.

"When the receiver was first announced, I was puzzled as to how it could possibly provide a range of five selectable bandwidths, nominally the same as for the [$2,000] R7, with reasonably good shape factors ... for a price of less than $1,000. Once the details of the receiver became known, the answer became clear. Drake has cleverly dusted off the L/C [inductance/capacitance] tuned circuit technique and has used it in the low (50 kHz) second IF.

"These are the same 'electrical' bandwidth filters that were used in the 1950s and 1960s to provide excellent selectivity characteristics, combined with inherently superior audio -- especially voice reproduction -- in the top-grade tube receivers such as the Hallicrafters SX-88 and the Hammarlund HQ-180 series, not to mention Drake's own R4 line.

"L/C tuned circuitry is obviously an idea whose time has come again -- providing very good, if not razor-sharp, selectivity for a small fraction of the cost of crystal or mechanical filters.

"However, I feel that 2.3 kHz is too close to 1.8 kHz -- I would haven preferred 2.8 or 3.0 kHz between the 1.8 and 4 kHz steps. The 3 kHz Sherwood filters in my R7s proved that to me." -- David Clark

"Some receiver users claim that L/C filters provide better audio response for listening to broadcast stations [than do mechanical or crystal filters.] From a performance standpoint, I wouldn't have known the R8 had L/C filters if I hadn't read about them in the Owner's Manual." -- Jim Kearman, writing in ***QST***, March 1992.

"The Drake's 1.8 kHz filter is good, but it doesn't come close to the ultimate selectivity of the Collins 1.8 filter I had installed in an NRD-525 (my previous main DX rig.) Many times while MW DXing I noticed audio from a nearby (1 to 3 kHz away) domestic MW channel bleeding through to a split frequency I was DXing. The excellent passband tuning helped, but it could not provide the results that the Collins 1.8 can give." -- Guy Atkins

Of course, Guy should have mentioned that that Collins mechanical filter costs upwards of $150.

Peter Hart, G3SJX, gives the following chart in **Radio Communications**, the journal of the Radio Society of Great Britain:

Filter	Bandwidth		Shape Factor
	-6 dB	-60dB	
6.0 kHz	6070 Hz	10800 Hz	1:1.8
4.0	4260	7450	1:1.7
2.3	2510	4860	1:1.9
1.8	1970	3970	1:2.0
0.5	550	1170	1:2.1

AGC CHARACTERISTICS

Here's one of those facets of shortwave reception that has as many answers as there are listeners. This wrangling's been going on since the early 1930s, when AGC was called "automatic ***volume*** control."

Most DXers like their AGC fast; program listeners generally like it to work at a more leisurely pace. Both groups are likely to find the time constants used in the R8 to their liking. This is something just short of a miracle.

Drake has specified the R8's AGC attack time as 1 mS; release times are said to be 300 mS for fast, 2 seconds for slow. The AGC threshold is specified to be 0.8 microvolt, although Larry Magne found his receiver's to be 0.6 uv, and the one tested by Peter Hart in Radio Communications measured an astounding 0.25 uv.

"I think the R8's AGC characteristics are the best available on any receiver today. If you're willing to experiment, the JRC NRD-525's AGC can be made to be just as good, but it takes a lot of work." -- Dallas Lankford

Suffice it to say the R8 is not "deafened" by loud static bursts -- a major gripe with the NRD-525. The AGC can also be defeated, which is especially helpful when listening in the tropical bands during the summer.

"One thing worthy of note is that the R8 has a minor AGC attack problem that's most pronounced with strong CW signals and fast AGC. The AGC pops at the onset of each keyed element, making copying such signals fatiguing. Slow AGC and weaker signals help, but the true fix would be improved AGC attack characteristics." -- Jim Kearman, in *QST*

When the R8 was introduced the AGC time constants were chosen by defaults set at the factory and DXers hollered. Drake's current PROM chip takes care of that gripe by allowing the user to select his favorite AGC timing for the mode in use. It makes a big difference!

Through the aforementioned miracle, everybody who responded to my questionnaire said the AGC was "just about right."

THE CAROUSELS FROM HELL!

Having reached a consensus on the R8's audio and AGC, I decided to press my luck, and promptly stepped into quicksand. There's consensus here, too, but it seems to be that the R8's method of selecting modes and bandwidths was devised by Stephen King while in the throes of a particularly nasty hangover.

Whatever the motivation, which I'm sure was well intentioned, the R8's mode and bandwidth selectors are, to be kind, frustrating.

"Let's say that your favorite LSB bandwidth is 2.3 kHz, day in and day out. However, Voice of the Mangoes from Haiti (4697.5 kHz) is hemmed in tightly by a FEMA CW station on 4699.8 kHz. To combat the tough interference, you switch the bandwidth to the 1.8 kHz setting. Great! Perfect copy for a reception report.

"Some time later, you change the receiver to AM mode and seek other juicy DX to conquer. Aha! Just in time to catch the full ID of that new clandestine, Voice of the Confused Ayatollahs, broadcasting in Special Farsi. You quickly change to LSB, fully expecting to use your 'preprogrammed,' favorite 2.3 kHz bandwidth for that mode. But wait, there's MORE!!

"The PROM 'remembers' what setting you used THE VERY LAST TIME you were in LSB, so it switches to that narrower 1.8 kHz bandwidth. Arrrgh! In this DXing instance, Voice of the Confused Ayatollahs sounds too muffled in the 1.8 kHz bandwidth, and you just missed an ominous reading of your name on their new Hit List of North American Traitor/DXers.

"Unfazed, you go about your life blissfully ignorant of your danger in the days ahead -- and all because of a poorly implemented PROM chip from the R.L. Drake Co." -- Guy Atkins

Most DXers would prefer to be able to change modes and bandwidths independently, without having the radio decide its other settings for them. They'd also prefer to be able to cycle through the selections in both directions, perhaps by using the large UP/DOWN slewing buttons.

The R8 is not alone in having a "carousel" arrangement for choosing bandwidths. The Lowe receivers from England do the same thing. It's less annoying with the Lowe HF-225 because it uses a rotary knob to select its modes, rather than another "carousel." The Lowe HF-150 isn't likely to be used for real DXing, so mode switching is less of a problem, and besides, the HF-150's carousel works in both directions.

Drake's **Steve Whitefield** explained the company's reasoning with a simple statement: **"We never expected real DXers to *BUY* the R8!"**

Guess we fooled them, eh?

Fortunately, since the R8's operating system is contained in a replaceable PROM, nothing about the radio's operation is "graven in stone." When asked about the possibility of Drake's compiling a special "DXer's PROM" for the R8 and selling it as an option, Steve Whitefield said he thought the company might go for it.

But the "stock" R8 will remain as it now is, quirks and all. Drake feels it's easier for newcomers to the hobby to have the radio make some of the more arcane decisions for them. Maybe so, but it sure is frustrating for the rest of us.

As it is, the current PROM is a vast improvement over the original version, which *always* forced a factory-chosen bandwidth when changing modes.

NOTCH FILTER

The R8 has a tunable notch filter, but it acts in the audio frequency range, rather than at the IF. The low frequency allows the notch to be very narrow and quite deep, but many users have remarked that it's difficult to adjust, as a result.

One other problem with an audio-based notch is that the interfering heterodyne you're trying to remove has already affected the receiver's AGC by the time you've squashed it with the notch filter.

Most users say they'd have preferred an IF-based notch, and a couple said that one reason for using a low-frequency IF, like the R8's, is that a notch filter can easily be built for the 50 kHz range. One user stated that he felt it was inexcusable for Drake to have failed to build the notch filter at IF.

Dallas Lankford disagrees: *"When a het that's gotten through the receiver's IF is strong enough to affect the radio's AGC it's already as strong or stronger than the signal you're trying to hear. Slicing it out at that point could cause an overload in the RF-IF amplifier chain, leading to an increase in intermod."*

The bottom line is performance, and the R8's notch filter is superbly capable of slicing out a bothersome whistle.

NOISE BLANKERS

The R8 has two noise blankers, called wide and narrow, but there's no threshold control for adjusting their action. The wide one is designed to be effective against the old Soviet "Woodpecker" over-the-horizon radar. I say "old" because the Woodpecker was shut down several years ago and, with the dissolution of the USSR, it isn't likely to reappear.

The narrow noise blanker works well, especially if your neighbors drive Model Ts. A comparison with another receiver proves its effectiveness. It's designed to remove ignition noise, but most of us would prefer that its threshold level were adjustable.

"Some users have complained that the R8's noise blanker seems to operate intermittently. The reason is that the blanker samples the noise in the 1st IF stage, at 45 MHz, which is before the selective, 50 kHz IF. The bandwidth there is 12.5 kHz at -6 dB, and any signal within that passband that's stronger than the noise will desense the blanker. When it isn't inhibited in this way, the blanker works very well indeed." -- Dallas Lankford

BFO OFFSETS FOR CW AND RTTY

The R8 reads the correct frequency of a CW signal only when the radio's set for zero beat. The trouble here is that you cannot hear a CW signal when you tune for zero beat. This is a major pain, and it affects the R8's performance on RTTY, too.

"On the NRD-525, you have a BFO control. When you set the radio up, you set the BFO to neutral position. Set the mode to CW. Tune to a CW signal, for example, CFH on 10945. When the BFO is in neutral position, the CW tone will be zero beat. Adjust the BFO control 1.5 divisions clockwise and now you hear the 800 Hz tone of the CW note. Once set up, you no longer have to touch it. Now when you tune CW, you tune to the 800 Hz CW note and you have the exact frequency of the station on the readout.

"On the R8, there is no way to do this. To copy CFH on 10945 properly, that is by listening to the 800 Hz tone, you must tune the receiver to 10944.2. If you are sitting on 10945 you will be zero beat, but I don't know anyone who copies CW by listening to zero beat.

"This is ESPECIALLY annoying when trying to DX CW beacons on longwave. You will have many CW stations occupying the same bandwidth, and trying to identify them when the frequency readout is correct is tough enough, much less when the offset isn't accounted for.

"All the above applies to RTTY as well." -- Bob Brown

MEMORIES

Having a microprocessor in the guts of your receiver is a mixed blessing. If they're not well shielded they can cause you headaches, because the beasts generate a lot of RF noise which can wipe out weak DX signals. But the chips also allow your radio to store frequencies in memories, and the R8 gives you 100 to play with.

The R8's memories can be partitioned into blocks of ten, called lists, numbered 0 through 9. You can page through them in various ways, too, by using the large UP and DOWN buttons, the keypad itself, or by turning the main tuning knob.

"Being able to page through the memory channels with the main tuning knob is one of my favorite features. Sometimes I'll enter a station's parallel frequencies into contiguous memories, then just dial back and forth among them to determine which is best. There's no switching noise as you go from one to another, just the change in signal quality itself." -- Jerry Berg

The receiver's memories store not only frequencies, but also all the receiver's other settings, except for the adjustments to analogue controls such as passband offset, notch tuning, and volume.

"In the course of checking for mediumwave hets and audio, I discovered that I very much like the R8's method of memory channel entry. If an interesting signal or het is present and I want the radio to remember it for a future check, a single press of the V>M (VFO to MEMORY) button, followed by a two-digit number is all that's needed to do the trick. The receiver automatically reverts to VFO mode for continued manual tuning. This is VERY handy and quick when doing a bandscan." -- Guy Atkins.

As with any memory scheme, there are compromises. What Jerry Berg and I find especially useful -- the ability to "spin" through the stored frequencies with the main tuning knob -- makes the receiver's memories a nuisance to others, because the memories are not directly tunable. You must first transfer the contents from a memory to a VFO in order to adjust its frequency to compensate for a "variable" transmitter.

"I think the R8's memories are a nuisance, compared to those in the NRD-525 and R-71A, especially for DXers who want to program for DX signals in the tropical bands, which are often somewhat unstable in frequency. It's a pain to have to get out of memory mode, re-tune, then re-store when you find the station has shifted frequency slightly. I think Guy's comments tend to understate this consideration." -- David Clark

This is one of those no-win situations for the folks at Drake. Some of us like having a "channelized" radio that works like the R8; others would prefer a receiver with 100 "VFOs." But you can't have it both ways!

"Unlike most radios, the R8 stores all control settings and memory locations in non-volatile EEPROM (electronically erasable PROM) which has the major advantage over a battery-backed memory system [in] that there is no battery which needs replacing in the future." -- Peter Hart, in *Radio Communications.*

SCANNING

I have yet to find a receiver that does a good job of scanning a shortwave band. There's simply not a high enough signal-to-noise ratio on the HF bands to do what you want. The R8 is better than most, but it's still inadequate. It's the nature of the beast, I suppose.

For those who find scanning useful, the R8 offers several choices of both "mode" and "method."

Under the "mode" heading are three choices: scan all memories, scan all memories within a block or blocks, or scan upwards from the frequency in VFO-A to the frequency in VFO-B.

The "methods" are: stop scanning at the first carrier detected, stop at each carrier for five seconds, or stop at a carrier and remain there until the carrier drops, then move on.

Drake's excellent Owner's Manual gives helpful pointers on how properly to set the squelch and other controls to get the radio to scan as you want, but the scan *rates* are somewhat arbitrary.

"I tried using the scanning abilities on MW, to 'look' between the domestic 10 kHz-spaced frequencies for international MW DX. When scanning this way in a sideband mode, the R8 scanned either too slow or way too fast for my tastes. The scanning rate is adjustable by a change of the STEP rate, but neither speed was suitable for me. The NRD-525 with its fully variable scanning speed is better, but I've yet to find a receiver with scanning that was useful for serious DX when scanning from frequency to frequency." -- Guy Atkins.

As are most HF receivers, the R8 is fighting a losing battle in its valiant attempt to scan from one frequency to another. Scanning memories, however, can work quite well, as several users pointed out.

SENSITIVITY AND OVERLOAD CHARACTERISTICS

In this day of 500-kilowatt shortwave transmitters, a receiver's sensitivity isn't the problem it once was. But a radio's ability to hear weak stations sandwiched between these powerhouses becomes more of a problem every day.

The R8 has more than enough sensitivity to hear the weakest signals on the air, yet its ability to dig through the megawatts to pull out a flea-powered beanshooter from Indonesia or Africa is outstanding. This is quite an accomplishment, as we shall see.

Following the modern practice, Drake has dispensed with a tunable preselector in the R8 and has used nine, diode-switched bandpass filters in the radio's front end. Once it knows the frequency you want to tune to, the set's microprocessor selects the appropriate filter for that band segment. The system is simple and effective.

RF from the front end filters is applied either to the switchable preamplifier or directly to the first mixer, if the preamp's switched out. The first mixer is the key to the R8's RF performance, and Drake has struck a good compromise between sensitivity and interference rejection.

The following chart is taken from a review of the R8 by **Peter Hart,** G3SJX, that appeared in the RSGB's **Radio Communications** for February, 1992. Measurements below 1.8 MHz were taken on my own receiver. International convention calls for an S-meter reading of S9 for a potential difference (a voltage) of 50 uv across 50 ohms, so the R8's S-meter reads high.

Frequency	Sensitivity (SSB 10dB s+n:n)		Input for S9	
	Preamp IN	OUT	Preamp IN	OUT
0.1 MHz	---	0.35 uv	--	47 uv
0.5	---	0.32	--	45
1.0	---	0.28	--	45
1.8	0.18 uv	0.28	11 uv	35
3.5	0.18	0.28	11	35
7.0	0.18	0.28	11	35
10.0	0.18	0.28	11	40
14.0	0.20	0.32	13	45
18.0	0.20	0.32	11	45
21.0	0.22	0.35	13	45
24.0	0.25	0.35	14	45
28.0	0.22	0.32	14	40

As you can see, the R8 has sensitivity to spare. But the hottest radio in the world is useless if its dynamic range and image rejection fall flat. The R8 is no slouch in this department, either.

Larry Magne's *RDI White Paper* gives the receiver's dynamic range as 71 dB for a signal that's 5 kHz away and 90 dB for a signal that's 20 kHz away from the one you're tuned to. The ARRL Lab measured the blocking dynamic range at 20 kHz spacing as 123 dB (3.5 MHz) and 118 dB (14 MHz) with the preamp off; 112 dB (3.5 MHz) and 114 dB (14 MHz) with the preamp on. (The discrepancies between the two lab's readings are due to the method used in making the tests. Both indicate essentially the same result.)

The third-order intercept point at 20 kHz was measured by ARRL at 6 dBm at 3.5 and 14 MHz with the preamp off, and 0.5 dBm (3.5 MHz) and -8.5 dBm (14 MHz) with the preamp on. With this measurement, the higher the figure the better. Drake's specs claim 5.0 dBm or greater at 20 kHz spacing. For reference, the NRD-525 has a claimed 3rd-order IP of 13.0 dBm.

"Rejection of the 45 MHz IF was around 90 dB with the primary image rejection well over 100 dB. The second mixer image occurs 100 kHz below the on-tune frequency and rejection of this signal was close to 80 dB on all bands. This is remarkably good ... The receiver was also remarkably clear of other responses and particularly good close-in, where many rigs tend to show up problems. No other [spurious] response was worse than about 100 dB down. -- Peter Hart, in *Radio Communications*

Here are some reports from the "real world:"

"I don't know how it stacks up in laboratory tests, but I have the sense that 'if it's there,' this set will pull it out, especially in ECSS with the PBT." -- Jerry Berg

"I was impressed with its strong-signal handling capacity and the ability to pull a weaker, adjacent channel out of the slop. It's BETTER than my race-prepared Icom!" -- Werner Funkenhauser, who used the R8 on mediumwave.

"I'm very impressed with the R8's dynamic range. The radio is exceptionally quiet, yet it handles extremely strong signals with ease. I measured the noise floor on my receiver at 0.125 microvolts for AM and 0.025 microvolts for CW/SSB (using the 6 kHz filter.) It's somewhat quieter than my R-390A, and I keep that radio in top condition." -- Dallas Lankford, whose measurements were taken on the MW band.

I can attest to the R8's ability to handle strong local signals, because I live only about a quarter mile from a 50kW AM broadcast transmitter (WQXR-1560 kHz) and in the station's antenna's major lobe. The RF floating around my apartment doesn't bother the R8 in the least, except on mediumwave when using a long wire. This is no problem, because I always use a loop antenna on the MW band.

A PEEK INSIDE -- WHAT MAKES THE R8 TICK?

The Drake R8 contains four major circuit boards, interconnected by multi-conductor cables and miniature coax. All the cables plug into sockets for easy circuit board removal, and Drake's left enough slack in the cables so that the receiver can be operated with the boards pulled out for servicing.

"Particularly impressive is the extensive ground-plane grid that helps the receiver achieve such a low noise floor. A fine grid of metallic traces can be found going under and around nearly all components on all circuit boards in the R8." -- Guy Atkins

The four main boards are divided as to their functions, with the RF front end board on top. This board also contains the first IF stage at 45 MHz and the second mixer that converts it to the second IF at 50 kHz.

Directly below that is the second IF board, which holds the selectivity producing L/C filters, the demodulators, the audio stages, and part of the power supply.

The front panel components are attached to a third circuit board, which mounts vertically.

The R8's frequency synthesizer and microprocessor circuitry is mounted on a fourth circuit board. This one, mounted above the radio's bottom cover, is isolated from the R8's other components by a hefty aluminum chassis, effectively shielding the radio from internally generated computer noise.

"I'm impressed by how quiet the R8 is from an RF standpoint. I was able to use the radio for MW DX using a McKay-Dymek amplified loop antenna that was only inches from the receiver's front panel. My Icom R-71A makes the use of a loop anywhere near the receiver impossible." -- Werner Funkenhauser

"The R8's LCD's quietness makes it ideal for use with a nearby loop antenna. For the MW DXer, the R8 is THE receiver to own." -- Dallas Lankford

I use my loops in the same way as Werner and Dallas and have had the same results. MW DXing is impossible when my NRD-525 is turned on -- there's simply too much RF hash radiated from the radio.

"We designed the R8 to minimize RF leakage from the radio's microprocessor and display. Indeed that's one of the main reasons we opted for an LCD display over a fluorescent." -- Steve Whitefield

Nearly everyone who owns an R8 has remarked that the receiver runs warm. It even stays warm when it's turned off. There are good reasons for this:

First, even when it's off, many of the R8's circuits continue to work, including the internal clock/timer and the LEDs that illuminate the LCD display. As a result, the power supply must be operating as well.

Because the radio's front panel is made of heavy extruded aluminum, Drake uses it as a heat sink for an LM317 voltage regulator IC that controls the voltage for the front panel LEDs. That voltage regulator seems to be the major source of heat. Since there are 52 LEDs for the main display, they draw quite a bit of current. And they're always ***on***, even when the set's turned off.

If you turn the LEDs off and rely on ambient light for viewing the LCD, the R8 runs cool.

INNOVATIVE CIRCUITRY

The Drake R8 contains a number of surprising, innovative circuits that enhance the receiver's performance. These include the use of a *synchrophase AM detector*, similar to that used in the Drake R7 and the Kiwa MAP, for "normal" AM reception, and an intriguing image-reject mixer, which converts the 45 MHz first IF to the low, 50 kHz IF used in the selectivity stages.

Images, the appearance of radio signals at points on the dial far from where they belong, have plagued designers of superheterodyne receivers since the day Major Armstrong built the first one, during World War One. The engineers at Drake have incorporated in the R8 an elegant solution to the image problem, called an *image-reject mixer.*

This innovative circuit takes the 45 MHz signal from the receiver's 1st IF amplifier and splits it two ways. One of the split signals is fed directly to a diode-ring mixer in the traditional way. The other half of the signal, however, is fed through a *90-degree phase-shifting network*, then on to a second diode-ring mixer.

Now it gets interesting! The local oscillator signal, necessary for converting the 45 MHz IF signal to 50 kHz for the R8's 2nd IF strip, is fed *in phase* to both mixers. Then, the outputs of the two mixers are re-combined through a second phase-shifting network, this time at 50 kHz.

In this way, any frequency other than the wanted signal gets shifted more or less than 90 degrees, and gets routed away from the 2nd IF strip, into a loading resistor.

Thus, the images wind up in a 47k resistor, instead of in your loudspeaker!

One problem that has plagued DXers and program listeners forever is the audio distortion produced by a traditional AM envelope detector when the received carrier fades.

When a distant radio signal passes through the ionosphere, portions of the signal are delayed more than others, so they arrive at your receiving antenna out of phase with one another. This produces fading, sometimes called QSB. When an AM station's carrier wave arrives at your receiver at a lower level than the modulation-carrying sidebands, distortion results. It's directly analogous to overmodulating the transmitter.

The R8 attacks this problem by using two separate types of synchronous AM detection. The radio's "normal" AM detector is an adaptation of the *synchrophase* detector Drake developed for the R7 series receivers. And the R8 contains a *phase-locked synchronous detector* that replaces the received carrier completely, eliminating many of the effects of fading completely.

The receiver's PLL synchronous detector is a key to its excellent audio performance. When the detector stays in "lock," which is most of the time, the R8's audio distortion is exceptionally low. When it falls out of "lock," ECSS techniques can make listening a very pleasurable experience.

A full discussion of synchronous AM detection is beyond the scope of this article, but the subject is covered thoroughly in Craig Siegenthaler's excellent piece in *Proceedings 1990.*

PLEASURES AND PAINS

Anything as complex as a communications receiver is bound to have features that one user likes and another finds annoying. The R8 is no exception.

When the receiver was first released, Drake took a lot of heat about the way the radio would choose such things as bandwidth, AGC time constants, tuning steps, etc., depending on the mode switch setting. After several strong complaints the company saw the light and recompiled the radio's operating system, retrofitting older receivers with a new PROM.

There are still some features of the radio that are irksome, some of which cannot be fixed by replacing a chip. One of these is the receiver's clock. The R8's clock will keep accurate time for two time zones, but when the radio's turned on you can't see either one, except for a fleeting glimpse when you press a couple of buttons.

This is a real mistake, I think, and one that's not easily corrected, because the LCD has no means of displaying the time and the frequency simultaneously.

Another annoyance, especially for those who like to drag their radios along on DXpeditions, is that the power cord is not detachable. Several users have griped about this one.

I, for one, feel that the terminal block supplied for connection to a DC source is too flimsy for the job. I don't relish the idea of a pair of wires, carrying a couple of amps of DC at 12 or more volts, coming in contact with one another. Better it were a Molex connector of some sort, with a ***fused*** cable supplied.

Many others have complained about the relatively small tuning knob used on the receiver, but the knob options Guy Atkins outlined got around that problem for me and a few others. The trouble here is there's just not enough room between the encoder shaft and the small mode and bandwidth selection buttons to allow fitting a larger knob. As it is, it's far too easy to bump the tuning knob when you go for one of those buttons.

And, speaking of tuning, the R8's synthesizer produces a moderate amount of "chuffing," which sounds like muffled clicks whenever the kilohertz digit changes. It's not loud enough to be obnoxious, but it's there, nonetheless.

Dallas Lankford has discovered a number of "birdies" and other spurious responses in the R8, but he says they are no more numerous or bothersome than on any other synthesized receiver he's used. He has compared notes with other R8 owners to be certain that the artifacts are not unique to his radio.

Drake provides for complete software control of the R8 via a computer port on the radio's rear apron. Besides being available directly from Drake, others have produced software packages for the radio. A check of DX hobby magazines and telephone bulletin board systems reveals several control programs for the radio. Jim Frimmel has adapted his WRTH Award-winning *Shortwave Navigator* for the Apple Macintosh to the R8, and programs for IBM computers, some using Microsoft *Windows*, are widely available.

But everybody's biggest gripe is still those damned mode and bandwidth selection "carousels." It's an issue that just won't go away, and it'll continue to rankle for as long as the R8 exists, I guess.

To be frank, I now find it almost automatic to do a lot of poking when changing modes. The revised PROM really helps, but it's still a nuisance.

And, when it comes to *real DXing*, this is not a small matter. Those two buttons can mean the difference between getting an elusive ID and missing it.

A LOT OF RADIO FOR THE MONEY

Despite its quirks and small annoyances, Drake did so much ***right*** in designing and building the R8 that ***we users want it all!***

"In today's marketplace, I feel that the R8 is the best value around in a communications receiver. Performance is the bottom line, isn't it? This receiver is a well-balanced machine that has no glaring faults in any area. The three S's of Stability, Sensitivity, and Selectivity are all found to a high degree in the R8. Add to these the quality audio and flexibility the radio provides, and you have a very useful receiver." -- Guy Atkins

Guy's statement about sums up the consensus I found among R8 owners, myself included. Other receivers may exceed the R8's performance in certain areas, but the folks in Miamisburg have produced a radio of which they, and all Americans, can be proud.

ACKNOWLEDGEMENTS and THANKS!

I want to thank all those DXers who took time away from their radios to respond to my questions.

But first, I want to extend a special note of thanks to **Steve Whitefield, WA3OJX,** of Drake, for giving freely of his time during the Winter SWL Festival to answer the questions Dave Clark and I fired at him. His help was invaluable and I'm looking forward to the next Drake receiver!

ANARC's North American Shortwave Broadcast DXer of the Year, Jerry Berg, was especially helpful. His wonderful article for the *NASWA Journal,* **"Rip Van Winkle Meets the Drake R8"** (Dec. '91), was a real treat, and his personal correspondence was above and beyond the call.

Guy Atkins took time out to give me a West Coast perspective, and set me to dreaming about long, l-o-n-g wire antennas.

ODXA President David Clark, a DXer who has at least one copy of every radio built in the last 50 years, supplied a Canadian view of the R8. Does wonders for Free Trade, eh?

A mediumwave view from Canada was supplied by **DX Ontario's MW editor, Werner Funkenhauser,** who confesses he's unable to purchase an R8 right away because he's planning a trip to Europe this summer. He'll have one before next DX season, though.

Although primarily a mediumwave DXer, **Dallas Lankford** is well versed in all aspects of receiver design. Dallas is currently working on a number of enhancements for the R8.

NASWA's Executive Director Bob Brown, KW3F, was not only a great host at the Winter SWL Fest last March, but contributed some very cogent commentary about the new receiver.

My friend and associate, **Mike Musielski,** worked many hours developing a computer program to run the R8 and passed on a lot of valuable comments. Fortunately for this review and for the **R8TUNER** program, the weather during a northeast winter isn't conducive to flying an open-cockpit biplane.

And thanks to **Jim Frimmel** for telling me about his great **Shortwave Navigator** program for the R8 and other receivers. If I ever buy a Macintosh, his program will be the first software I install.

FURTHER READING

In the year since it was released, the Drake R8 has been reviewed in virtually all the hobby publications. It's impossible for me to provide a fully comprehensive list simply because I haven't seen all the reviews. With that in mind, here's a list of the domestic reviews I *have* read:

Both *Passport to World Band Radio* and the *World Radio TV Handbook* covered the R8 in their 1992 editions. The reviewers, **Larry Magne** for *PWBR* and **Jonathan Marks** for *WRTH*, present divergent views of the receiver that reflect the suitability of the radio for use in different locales. Magne, writing from the Philadelphia area, liked the receiver; Marks, whose base is in northwestern Europe where signal strengths tend to be very high, thought the receiver was overpriced in Europe. It should be noted that both of these reviews were prepared before the current PROM was released by Drake. The *PWBR* review was published in September 1991; the *WRTH* review, in January 1992. The *WRTH* review is a virtual transcript of a review broadcast on **Radio Nederland's** *Media Network* on September 19, 1991.

Larry Magne's *RDI White Paper* on the Drake R8 was released in January 1992 and contains extensive test data, as well as a complete revision of the review that appeared in *PWBR*, to reflect the most recent PROM changes. It costs $6.95 postpaid from: **Passport RDI White Papers, Box 300, Penn's Park, PA 18943.**

Other reviews appeared in *QST,* March 1992; *CQ,* February 1992; *Monitoring Times,* October 1991; and *Popular Communications,* October 1991. Of these, the *CQ* and *QST* reviews are most thorough.