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R. L. Drake SW8 General-Coverage Receiver

Timewave Technology DSP-9+ and DSP-59+ Digital Signal Processors

Conducted by Mark Wilson, AA2Z
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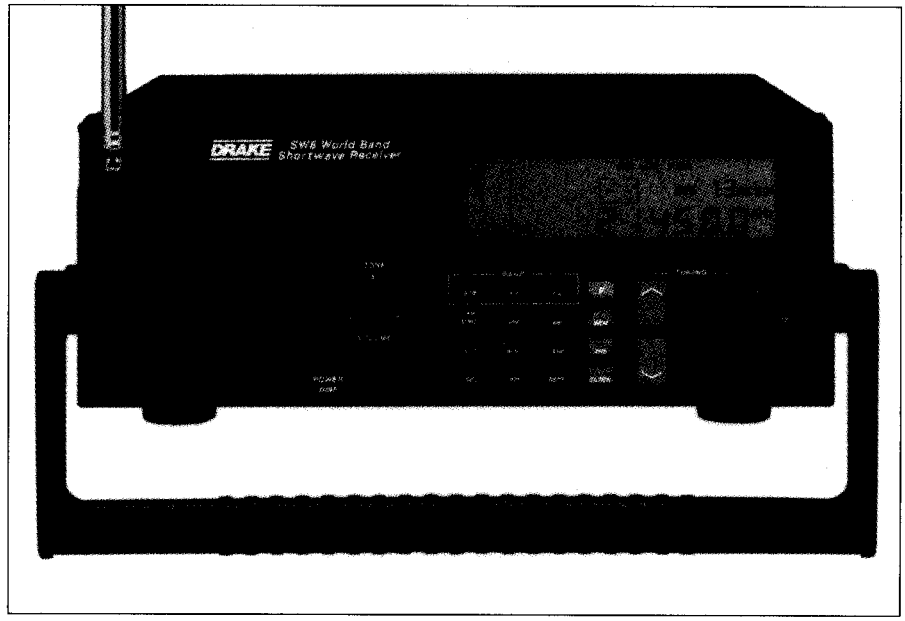
The R. L. Drake SW8 General-Coverage Receiver

Reviewed by Jim Kearman, KR1S



When, after a hiatus of several years, the R. L. Drake Company released the R8 receiver, it rocketed to the top of nearly every reviewer's list of the best consumer-grade general-coverage receivers (see the review in March 1992 *QST*). Such quality comes at a price, however, and some shortwave listeners asked Drake for a more-affordable receiver. The $600 SW8 is the result. While it shares a family resemblance and certain features with the R8, the SW8 is not a stripped-down R8; it is a completely different receiver. As if to leave no doubt, even the display color has been changed, from green to orange.

Drake's new radio covers 500 kHz to 30 MHz (AM, USB and LSB), plus the FM broadcast band (87 to 108 MHz) and the aircraft band (118 to 137 MHz, AM only). You can listen to stereo FM broadcasts with headphones, a feature the R8 doesn't offer. Like the R8, the SW8 comes with a detailed 32-page manual that is clear, complete, and exceptionally well illustrated.

The SW8 is sold as a portable receiver. Battery power is optional, and it has a handle (which also serves to prop up the front of the receiver if you desire), so you can carry it about. It's about twice as thick as a notebook computer and weighs about the same. The 41-inch whip antenna extends from the front panel, which faces up while in transit, making it possible to operate the set while in motion, but I don't think that's what the designers had in mind. I think they intended that you'd carry the SW8 to wherever you intended to use it, set it up and listen.

You wouldn't necessarily expect to find ac power at a remote location. You can usually scare up a car or boat battery, though. You might even like to plug the SW8 directly into the cigarette lighter on your car or boat, but you can't unless you buy an adapter. You see, the SW8 operates from 9 V dc, not 12 V. I think the receiver should have had the provision for 12-V power built in.

You can install half a dozen D cells inside. The batteries are easy enough to change by loosening a knurled screw and removing an aluminum plate from the bottom panel. Current consumption with the display backlight off runs about 600 mA.

Most users will probably never use the receiver with anything but the supplied wall-plug power supply. Careful headphone listening reveals a 120-Hz hum floor while using the SW8 with its standard ac supply, though. If you use headphones for listening, consider a better external supply or use batteries.

Front Panel

The SW8 uses an array of pushbuttons to select mode, bandwidth and frequency. The feel is a little rubbery and they take some getting used to. I liked being able to punch in MF/HF frequencies in kHz, instead of MHz as on the R8. Although you don't have to type in the decimal point on MF/HF, you must first hit the **F** (function) key before entering a frequency from the keypad, so the number of keystrokes is the same. You can also enter the "meter" band designation of the common shortwave-broadcast (SWBC) bands and then use the tuning knob or up/down buttons to tune around within the band.

IF bandwidth, AGC speed (fast or slow; the AGC cannot be disabled) and operating mode are selected by the same pushbutton arrangement used on the R8. You keep punching the button until the desired selection is indicated on the display. The SW8 uses a bar-graph S meter, a sensible feature in a portable receiver. The display is an attractive backlit LCD, and the lamp can be turned off to reduce power consumption by about 100 mA, or for use in a darkened room.

Bandwidth choices on the SW8 are 2.3, 4 and 6 kHz for the AM and SSB modes. There is no provision for additional filters, nor for substitution of existing filters. IF bandwidth is obtained by means of a first IF crystal filter with 8 kHz bandwidth and ceramic filters at the second IF (2.3, 4 and 6 kHz bandwidths). The IF filters do a good job, with a bit of strong-signal blowby with the 2.3-kHz filter in line. Each of the SW8's filters sounds and acts like I expect a filter with that selectivity to do. The 6-kHz filter is a lot better than the standard AM filter typically included in ham transceivers with general-coverage receivers.

The SW8 has 70 programmable memories, which allow you to specify mode, AGC, attenuator on/off, bandwidth, synchronous detector on/off and frequency. The 70 memories are partitioned into blocks of 10. You can scan the contents of a memory block.

Two 24-hour clocks are included, so you can set one to local time and one to UTC. The built-in two-event timer is handy, and the back panel has an audio line output for use with a tape recorder. The manual devotes a couple of pages to timer functions and talks about setting up the SW8 to record

The Bottom Line

Drake's SW8 is a take-it-anywhere general-coverage receiver with good RF performance. It's more than enough radio for the casual listener and adequate for a number of serious applications as well.

programs, but there's no provision to control an external recorder. If you plan to use the SW8's timer to record late-night programs, you'll need a recorder with a VOX feature. Clock/timer settings and memory contents are retained for about 30 minutes after the SW8 is unplugged or the batteries are removed.

The built-in whip antenna tilts up from the front panel and snaps into a notch on the panel. The 1/8-inch headphone jack is on the left side of the panel. The receiver includes a front-panel speaker, which sounds about as good as you'd expect from a small speaker mounted in a metal cabinet. You can connect an external speaker, but be careful not to ground either side of the external-speaker line to the chassis. (The SW8 uses a bridged audio amplifier to generate sufficient power from the 9-V supply. Grounding either speaker line to the chassis could damage the amplifier.) Warnings are clearly stated on the panel and in the manual.

Synchronous Detector

Another feature of the SW8, synchronous detection, can be a great help when receiving fading AM stations. (By "AM," I mean double-sideband signals with full carrier.) A phenomenon known as *selective fading* can wipe out one sideband and the carrier of a station, resulting in severe distortion. A good synchronous detector supplies its own carrier, phase locked to the incoming signal. As long as one sideband is reasonably intact, the signal remains quite readable.

Anyone who listens to shortwave broadcast stations will appreciate synchronous detection. If the signal fades deeply enough, though, the synchronous detector can lose phase lock. The SW8's synchronous detector loses lock relatively often on fades, even on strong (S7 and above) signals. (Switching to fast AGC minimizes this by giving the detector's phase detector a more uniform signal during fades, but lock loss still occurs annoyingly often.)

In addition, bearing in mind that a true synchronous detector is supposed to be a *heterodyne* detector that supplants the signal carrier with a phase-locked, locally generated carrier at reasonably high level, the SW8's synchronous detector sometimes exhibits two envelope-detector traits: occasional distortion on signal peaks, and a noise-fuzzed threshold effect on fading signals at levels close to the band-noise floor. Fading aside, the SW8's AM-receive audio can be quite good with its 6-kHz filter in line.

Table 1

R. L. Drake SW8 General-Coverage Receiver, serial no. 4E12950033

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: 0.5-30 MHz, 87-108 MHz and 118-137 MHz.	As specified.
Modes of operation: AM, LSB, USB (0.5-30 MHz); FM (87-108 MHz); AM (118-137 MHz).	As specified.
Power requirement: 7-10 V dc from supplied ac wall adapter, or 5.7-9 V dc from 6 internally mounted D cells. Current requirement at 9 V dc, 440-730 mA.	670 mA at 9 V dc with backlight on, USB mode, no signal.
SSB receiver sensitivity (bandwidth not specified, 10 dB S+N/N): Less than 0.5 μV (–113 dBm).	Minimum discernible signal (noise floor) with 2.3-kHz IF filter: 1 MHz, –125 dBm 3.5 MHz, –126 dBm 14 MHz, –125 dBm
AM receiver sensitivity (bandwidth not specified, 10 dB S+N/N): Less than 2 μV, 0.5-30 MHz and less than 4 μV, 118-137 MHz.	10 dB S+N/N (signal 30% modulated with a 1-kHz tone, 6-kHz filter): 1 MHz, 2 μV 3.8 MHz, 1.7 μV 120 MHz, 7.9 μV
FM receiver sensitivity (bandwidth not specified, 20 dB S/N): Less than 4 μV, 87-108 MHz.	12 dB SINAD with FM filter: 100 MHz, 5.2 μV
Blocking dynamic range: Not specified.	Blocking dynamic range with 2.3-kHz IF filter:* 1 MHz, 98 dB 3.5 MHz, 99 dB 14 MHz, 109 dB
Two-tone, third-order IMD dynamic range: greater than 95 dB, 0.5-30 MHz at 20 kHz spacing with 2.3 kHz filter.	Two-tone, third-order IMD dynamic range with 2.3-kHz IF filter:* 1 MHz, 91 dB 3.5 MHz, 92 dB 14 MHz, 91 dB
Third-order input intercept: greater than +10 dBm @ 20 kHz spacing at 50-Ω antenna input, attenuator off.	1 MHz, +11.3 dBm 3.5 MHz, +11.9 dBm 14 MHz, +11.3 dBm
S-meter sensitivity: Not specified.	S9 signal at 14 MHz: 85 μV
Squelch sensitivity: Not specified.	AM, 120 MHz: 1.5 μV
Receiver audio output: 2 W into 4 Ω with less than 5% THD with a 9-V dc supply.	2.1 W at 5% THD into 4 Ω
IF/audio response: Not specified.	At 6 dB: USB, 88-2786 Hz (2698 Hz); LSB, 78-2790 Hz (2712 Hz); AM, 30-4000 Hz (3970 Hz).
Image rejection: Greater than 60 dB, 0.5-30 and 118-137 MHz; greater than 50 dB, 87-108 MHz.	65 dB at 14 and 120 MHz; 50 dB at 100 MHz.
IF rejection: greater than 80 dB at 55.845-MHz and 455-kHz IFs.	55.845 MHz, 78 dB; 455 kHz, 105 dB.

Size (height, width, depth): 5.25×11.5×13 inches; weight, 10 lb with ac adapter but without batteries.

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the value shown. AGC could not be disabled.

Tuning

Tuning is by means of two frequency up/down pushbuttons, keypad entry or a rotary knob. You can tune quickly by placing a finger in a depression in the knob and spinning. The receiver has none of the synthesizer chuffing that is common with some other portable SW receivers. (Chuffing is a series of noise pulses heard while tuning, a result of the receiver muting and unmuting with each synthesizer step.)

Operating at its finest resolution, the SW8 tunes in 50-Hz steps during SSB/CW reception. Because the radio does not include an RIT or clarifier function, this leads to tuning errors of up to 25 Hz in these modes—acceptable for CW, but (because of the audio unnaturalness off-tuning can cause) just tolerable for SSB voice reception.

That the SW8 can tune SSB in steps no finer than 50 Hz is frustrating if you want to tune medium- or shortwave broadcasters as

SSB, however, because frequency-fidelity errors on the order of 25 Hz are intolerable in music reception. Why tune AM broadcast stations in SSB mode, when the set includes a synchronous detector? That's because there's no provision for selecting upper or lower sideband with the synchronous detector engaged. A strong adjacent signal can play havoc with the synchronous detector. (The R8 doesn't allow sideband selection in the traditional sense during sync-detector operation, but you can accomplish the same thing by using the passband tuner, a feature missing on the SW8.)

Assuming that the radio's coarse tuning steps let you tune in an incoming signal closely enough, the SW8 can provide high-fidelity SSB voice reception. (If band conditions warrant, you can improve on this further by selecting the radio's 4- or 6-kHz filter for SSB—a neat thing to be able to do for SSB or CW reception anyway.) This is due in no small degree to the radio's good AGC performance: In both fast and slow modes, its AGC attack is the best I've heard in a battery-operable portable. The AGC's attack somewhat hardens the element onsets of strong CW signals, but its performance on voice and code is entirely acceptable, and distinctly better than that of the R8.

External Antennas

Although the receiver is plenty sensitive and the built-in whip antenna offers plenty of HF listening enjoyment, there will come a time when you want to hook up an outdoor antenna to hunt some weak, obscure station. Unlike most portable receivers, the SW8 thrives on an external antenna. Here on the East Coast, the European SW broadcasters are a nightly test of a receiver's ability to withstand a band full of strong signals. The SW8 handles the chore well, thanks to its good dynamic range. I noticed some spurious responses on the low end of 40 meters, but they weren't strong enough to cause reception problems. A selectable 20-dB front-end attenuator helps with strong signals. Even tuning at night in the 21 to 22-MHz range for second-order IMD products (9.5 MHz SWBC + 11.7 MHz SWBC) revealed no spurs—a stiff test with a 40-meter dipole connected. The SW8's front end easily outshines the other consumer general-coverage portables I've used.

The SW8 would benefit from the addition of a ferrite rod antenna for medium-wave reception. The radio hears considerably less well on the AM broadcast band with its whip antenna than, for example, a 1977-vintage Panasonic RF-2200 with its rotatable ferrite rod.

The rear panel has several antenna connectors. For 500 kHz through 30 MHz, you can connect a nominal 50-Ω coax-fed antenna. Or you can connect a 50- or 500-Ω wire antenna to a terminal strip. A rear-panel switch allows you to select the whip antenna, coax connector or terminal strip.

The external antenna connections for air-band and FM broadcast reception are for 300-Ω balanced transmission line or for 75-Ω coaxial cable. The illustration in the manual seems to suggest the use of an external TV or FM broadcast antenna for air-band reception as well. I don't recommend using a horizontally polarized FM BC antenna for air-band reception, though, as aircraft and ground stations use vertically polarized antennas.

Summing Up

When compared with other receivers in its class, the take-it-anywhere SW8 offers excellent RF performance on the medium- and shortwave bands. Its strong front end, good IF filtering and good AGC performance make it easy to listen to. An improved synchronous detector would make SWBC listening more enjoyable, though. The SW8 is more than enough radio for the casual listener and certainly adequate for number of serious applications. I think that Drake could work on the ergonomics and ease of use a bit more, but overall the SW8 is a worthy, more-affordable counterpart to the popular R8.

Thanks to Dave Newkirk, WJ1Z, for his contributions to this review.

Manufacturer's suggested retail price: $599. Manufacturer: R. L. Drake Company, PO Box 3006, Miamisburg, OH 45343; tel 513-866-2421.

Timewave Technology DSP-9+ and DSP-59+ Digital Signal Processors

Reviewed by Rus Healy, NJ2L
ARRL Technical Advisor

In the hot market for high-quality DSP audio filters, Timewave Technology is making its mark with two new models targeted at mainstream and more specialized amateurs. Both are significantly improved and upgraded versions of popular earlier models—the DSP-9 and DSP-59. Although both filters are designed around the same Analog Devices DSP hardware, the two offer significant differences in features and performance. Both feature high-quality construction with rugged cabinets and attractive, high-contrast Lexan front- and rear-panel labels.

How do they Differ?

The DSP-9+ is aimed at the operator who doesn't need elaborate adjustable filtering. This model offers a relatively limited—but very useful—selection of bandpass filters, as well as the specialized modes that have become staples of DSP audio filters: adaptive noise reduction and tone notching. The DSP-9+ also introduces AGC into the realm of external DSP filters.

Up the ladder of complexity is the DSP-59+, which caters to the needs of those who demand maximum flexibility. It offers considerably more bandwidth choices in SSB, CW and data modes than the DSP-9+, as well as selectable adaptive filtering aggressiveness.

With relatively few controls, the DSP-9+ is easy to learn and use; the DSP-59+ is significantly more involved. Both can drive a low-impedance speaker and stereo headphones.

The Bottom Line

These high-quality DSP audio processors are useful additions to your ham shack. The DSP-9+ serves SSB, CW and digital operators well with relatively straightforward operation. The more complex DSP-59+ supports the operator who's looking for finely tailored filter response with useful noise-reduction modes close at hand.

DSP-9+ Features

In addition to its adaptive random-noise filtering and tone notching capabilities, the DSP-9+ provides three selectable filter bandwidths in its voice and CW modes. For CW, bandwidths of 100, 200 and 500 Hz are available at center frequencies of 400, 500, 600 or 800 Hz (you select any two with an internal jumper). In voice modes, you have bandwidth choices of 1.8, 2.4 and 3.1 kHz or 1.6, 2.0 and 2.4 kHz. You select which three bandwidths you want via another internal jumper setting. In each case, the low-cutoff frequency of the voice

filters is 300 Hz. Performance-minded operators like DXers and contesters will get the most benefit from the narrower bandwidths, and more casual operators are most likely to be satisfied by the wider, default bandwidth choices.

Digital enthusiasts will be pleased to find filters for RTTY, AMTOR, PacTOR and HF packet. (The PacTOR filter is also useable for G-TOR.) The RTTY filter features a 250-Hz bandwidth. The bandwidth increases to 340 Hz for AMTOR, 440 Hz for PacTOR/G-TOR and 540 Hz for HF packet. Four center frequencies are available through an internal jumper; 2210 Hz (default) and 1360, 1700 and 2125 Hz. You can also order a European model with center frequencies of 2210, 1360, 1300 and 1530 Hz.

The DSP-9+ operates by means of seven push-button switches and one knob. The switches select bandwidth and adaptive-filter modes and combinations of modes. Each button is color coded by mode: blue for CW, green for voice and red for data. This makes a simple matter of selecting the filter mode you want at a particular time.

In the DSP-9+, Timewave included an automatic gain control feature. Its intended function is to keep signals at the desired output level under fading conditions, and it does a good job of that.

The DSP-9+ includes provisions for filter bypassing (for CW operation) or audio muting (for voice operation) during transmitting. An active-low input or a contact closure can be used to operate this function, depending on what your rig provides. This capability is particularly useful if you use a transceiver that supports monitoring transmit audio (or a CW sidetone) and you want to listen to that audio without manually bypassing the filter while you're transmitting.

By another jumper setting, the DSP-9+ can provide a high- or low-impedance load to your transceiver or receiver. Most modern radios operate best with the low-impedance termination (22 Ω), as opposed to the 2-kΩ option.

DSP-59+ Features

By giving you a staggering total of 225 possible high- and low-pass filter combinations as well as 330 bandpass filter combinations, Timewave has made the DSP-59+ one of the most flexible filters on the market. Depending on your needs, you can set the high-pass filter cutoff frequency in 15 increments between 200 Hz and 1.6 kHz, and the low-pass filter cutoff in 15 steps between 1.7 and 4.2 kHz. This version also supports a CW bandpass with 15 bandwidth choices between 25 Hz and 600 Hz. You can also select one of 13 CW center frequencies between 400 Hz and 1 kHz.

For data modes, you can select 15 bandwidths from 25 Hz to 600 Hz with a center frequency of 2210 Hz. You can also select optional center frequencies of 1300, 1360, 1530, 1700 or 2125 Hz. At a given time, some combination of these bandwidths and center frequencies is right for just about everyone.

The DSP-59+ has several operating modes, with different combinations of high- and low-pass filtering, noise reduction, tone removal and bandpass filtering. In each mode-switch position, the controls that select bandwidths, cutoff frequencies

Table 2
Timewave Technology DSP-9+ DSP filter, serial no. 62461

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Power requirements: 12-16 V dc, 1 A.	12 V at 410 mA (full audio output) and 160 mA with no input signal.
Input impedance: 22 Ω or 2 kΩ.	Not measured.
Input-to-output delay: Voice filters, 10 ms max; CW filters, 30 ms max; data filters, 18 ms max.	Voice filters, 9 ms max; CW filters, 30 ms max; data filters, 18 ms max.
Voice filter bandwidths: 300 Hz to 3.4, 2.7 and 2.1 kHz or (jumper selectable) 300 Hz to 2.7, 2.3 and 1.9 kHz.	At –6 dB points: Factory default medium, 246 to 2760 Hz; narrow, 246 Hz to 1960 Hz.
Voice filter shape factor: Not specified.	At –6 and –60 dB points: 2.4 kHz filter, 1.08; 1.6 kHz filter, 1.11.
Data filter bandwidth: RTTY, 250 Hz; AMTOR, 340 Hz; PacTOR, G-TOR, 440 Hz; HF packet, 540 Hz. Selectable mark/space frequency pairs.	At –6 dB points: RTTY, 350 Hz; AMTOR, 450 Hz; PacTOR, G-TOR, 530 Hz; HF packet, 640 Hz.
Data filter shape factor: Not specified.	At –6 and –60 dB points: RTTY, 1.49; AMTOR, 1.31; PacTOR, G-TOR, 1.3; HF packet, 1.23.
CW filter bandwidth: 100 Hz, 200 Hz and 500 Hz.	At –6 dB points: Wide, 538 Hz; narrow, 136 Hz.
CW filter shape factor: Not specified.	At –6 and –60 dB points: 500-Hz filter, 1.11; 100-Hz filter, 1.47.
CW filter center frequency: 400, 500, 600 or 800 Hz (select any two with internal jumpers).	As specified.
Random noise reduction: Up to 20 dB.	As specified.
Automatic notch filter depth: Up to 50 dB.	50 dB with a single 1-kHz tone.
Time to notch: Not specified.	Undesired signal is notched by approximately 50% after 4 ms.
Speaker output: At 13.8 V dc, less than1% distortion, 1.6 W into 8 Ω and 3.2 W into 4 Ω.	At 1% THD: 1.6 W into 8 Ω and 2.7 W into 4 Ω.
Line output: –6 dB referenced to input level into 10 kΩ.	As specified.
Size (height, width, depth): 1.75×6×6 inches; weight, 2 lb.	

and other key operating parameters use color-coded labels to help you find the right settings. This is a helpful way to label the panel, because if all the labels were the same color, this filter's many combinations of settings would make it really hard to operate!

Like the DSP-9+, the DSP-59+ provides switchable filter bypassing or audio muting during transmitting. An active-low input or a contact closure can be used to operate this function, depending on what your rig provides. By selecting the proper jumper setting, the DSP-59+ can provide a high- or low-impedance load to your transceiver or receiver.

The DSP-59+ includes a handy audio-signal generator mode, which has a variety of uses. The generator mode is selectable from the front panel. It produces sine wave test signals at the frequency of *each* bandpass, high-pass and low-pass filter. The test signals include single sine waves, two-tone signals for SSB testing and mark/space tones for TNC or communications processor testing.

Interfacing

Both filters require 12 to 16 V dc via a Timewave-provided coaxial connector. Any clean supply that can source at least 1 A is sufficient. Timewave doesn't recommend switching power supplies because they're sometimes inadequately filtered, but if you use a high-quality supply, this shouldn't cause any problem. I used the DSP-9+ and -59+ with two switching power supplies with no ill effects. Audio inputs and speaker outputs use rear-panel phono jacks, and both units provide 1/8-inch stereo headphone jacks. The audio amplifiers in these filters can drive 4- or 8-ohm speakers to room-filling levels. Both units provide line-level outputs for driving TNCs, terminal units or other external modems, as well as key-line interfaces to control audio muting or bypassing, as mentioned earlier. The DSP-9+ and the DSP-59+ are equipped with phono jacks for all audio connections on their respective rear panels.

Performance

Both filters provide the expected benefits of no-ringing, steep-skirted filters. Deep notch filtering is also a given, when that mode is selected. These filters act fast enough take out even relatively fast CW, which helps to quickly eliminate carriers during SSB operation with intermittent interference.

On CW, the DSP-9+ and -59+ work just as well in comparable situations (bandwidths and center frequencies). It's mainly the DSP-59+'s multitude of choices that set it apart from the DSP-9+. For almost all operation, however, I found three bandwidth choices to be enough, even with a rig that provides only one IF bandwidth on CW. Especially useful with both models is the ability to perform random-noise reduction in conjunction with bandpass filtering.

Random-noise filtering is something Timewave does well. These filters remove most line noise, which is traditionally hard to filter out. However, they also both impose a reverb-like quality during random-noise reduction—especially when the tone-removal filtering is enabled. This effect is best likened to listening to a speaker at the opposite end of a rather long hallway. Although it's fairly easy to mentally tune out, this effect gives desired signals an artificial quality. In its defense, however, I must

Table 3
Timewave Technology DSP-59+ DSP filter, serial no. 46426

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Power requirements: 12-16 V dc, 1 A.	12 V at 410 mA (full audio output) and 160 mA with no input signal.
Input impedance: 22 Ω or 2 kΩ.	Not measured.
Input-to-output delay: Voice filters, 10 ms max; CW filters, 30 ms max; data filters, 18 ms max.	Voice filters, 9 ms max; CW filters, 28 ms max; data filters, 16 ms max.
High-pass and low-pass filters: High-pass corner frequencies, 200 Hz to 1.6 kHz in 100-Hz steps. Low-pass corner frequencies, 1.7 to 3.4 kHz in 100-Hz steps.	Tested in HP/LP mode at recommended voice setting of 300 Hz to 2.7 kHz. At –6 dB points, 253 Hz to 2.76 kHz.
Data filter bandwidth: 25 to 600 Hz in 15 steps.	Tested 250, 450 and 550 Hz bandwidths. At –6 dB points: 331, 540 and 650 Hz.
Data filter center frequency: 2210 Hz, 1700 (default),1360, 1300, 1530 or 2125 Hz.	As specified.
Data filter shape factor: Not specified.	At –6 and –60 dB points: 250 Hz filter, 1.78; 450-Hz filter, 1.33; 550-Hz filter, 1.29.
CW filter bandwidth: 25 to 600 Hz in 15 steps.	Tested 250 and 500 Hz bandwidths. At –6 dB points: 288 and 538 Hz.
CW filter center frequency: 400 to 1000 Hz in 50-Hz steps.	As specified.
CW filter shape factor: Not specified.	250-Hz filter, 1.22; 500-Hz filter, 1.13.
Random noise reduction: Up to 20 dB.	As specified.
Automatic notch filter depth: Up to 50 dB.	50 dB with a single 1-kHz tone.
Time to notch: Not specified.	Undesired signal is notched by approximately 50% after 4 ms.
Speaker output: At 13.8 V dc, less than1% distortion, 1.6 W into 8 Ω and 3.2 W into 4 Ω.	At 1% THD: 1.6 W into 8 Ω and 2.7 W into 4 Ω.
Line output: –6dB referenced to input level into 10 kΩ.	As specified.
Size (height, width, depth): 1.9×7.6×8.5 inches; weight, 2 lb.	

say that the random-noise reduction, in conjunction with an appropriately chosen bandwidth, makes weak signals on noisy bands literally jump out of the noise. And I'll trade intelligibility for completely natural-sounding audio any time!

The DSP-59+ lets you choose the filter algorithm's *correlation* to optimize filter performance over a wide range of band conditions. Correlation is a signal characteristic that describes its spectral and time-changing content; a carrier is highly correlated, and noise is just the opposite. Voice signals are somewhere between these extremes. By moving an internal jumper, you can choose from among four correlation settings, which correspond to how aggressively the filter removes noise. Lower correlation settings remove less noise while preserving high audio quality. Higher settings treat more of the input audio as noise, which causes the filter's DSP algorithms to remove more undesired noise while having a somewhat more intrusive effect on the desired signal. In practice, I found that the noise-reduction mode works best with relatively low correlation settings (more aggressive noise reduction). You can't increase correlation so much that it makes desired signals unintelligible, so why not go for the best noise reduction you can get?

I particularly like the DSP-59+'s ability to select from 13 CW center frequencies between 400 and 1000 Hz. It's nice to be able to adjust this from the front panel, for the times when I use the filter with my high-offset (700 Hz) radio. The DSP-9+, on the other hand, gives enough flexibility for most single-radio users with its four center-frequency choices.

Although the inclusion of AGC in both filters isn't a substitute for good receiver AGC, it does keep fading SSB signals at a relatively constant level in your headphones. You barely notice it in regular operation, but it's a subtle help in hearing the weak ones.

The DSP-9+ and DSP-59+ both turned in excellent performances in the data modes. A Sunday afternoon spent on the jam-packed 20-meter digital subband proved their worth. Without resorting to narrow IF filtering, I was able to separate and copy signals with ease. The filter skirts are extremely sharp, so careful tuning and a stable transceiver are critical. If I tuned too rapidly, I'd sweep right through several signals without knowing it. The better approach is to do your initial hunting in the "wider" modes, then select narrower filters after you've located a signal.

I found that switching in the DSP-9+'s tone filter significantly increases the noise level in any of the filter's voice modes, especially when the input signal level is fairly weak and the band noise is high. With stronger signals, this isn't as noticeable. At first, I thought something was wrong with the review unit, but after using the filter for a while, I have to conclude that this is related to the filter's AGC attempting to raise the audio-output level, as receiver AGC does under weak- or no-signal conditions.

With no input signal, the DSP-9+ and DSP-59+ generate significant audio noise in high-quality stereo headphones. This is barely audible when the audio **GAIN** control is set for normal listening levels, but when you turn up the knob, significant high-frequency hiss and what sound like clock-related repetitive sounds, which change with the selected mode, are clearly audible. It seems that a high-quality audio filtering product should be free of any such behavior, but in fairness, it seems to have little effect on the DSP-9+ and -59+ operation.

Documentation

Photocopied and stapled instructions accompanied each filter. These manuals include concise instructions, complete specifications, and even schematics for all the parts of both filters that any ham is likely to ever need to repair. Although there are several tables, the documentation would benefit from the inclusion of more graphics. Of value to new users: Clear instructions showing how to wire the DSP-9+ input and output connectors, complete with Radio Shack part numbers. Like most US-based companies, Timewave offers telephone and fax technical support. Customer support can be an important factor in making a buying decision.

Conclusions

Timewave Technology has brought a couple of useful and high-quality products to today's increasingly crowded audio-processing arena. Both filters have a place in the ham market. The DSP-9+ should serve the majority of SSB, CW and digital operators well, and it does so with relatively straightforward operation and interfacing requirements. The DSP-59+, more complex on both fronts, does a solid job of supporting the operator who's looking for tailored filter response with useful noise-reduction modes close at hand.

Thanks for Steve Ford, WB8IMY, for his contributions to this review.

Manufacturer's suggested retail price: Prices: DSP-9+, $219; DSP-59+, $299. Manufacturer: Timewave Technology, Inc, 2401 Pilot Knob Rd, St Paul, MN 55120; tel 612-452-5939, fax 612-452-4571.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns. —*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

AEA PK-96 1200/9600 bit/s packet TNC (see Product Review, September 1994 *QST*). Minimum bid: $135.

Kenwood TS-60S 6-meter transceiver with YK-107C CW filter (sold as a package only; see Product Review, September 1994 *QST*). Minimum bid: $716.

PacComm TNC/NB-96 1200/9600 bit/s packet TNC (see Product Review, September 1994 *QST*). Minimum bid: $202.

Sealed bids must be submitted by mail and must be postmarked on or before October 27, 1994. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

New Products

PC AUDIO ANALYZER

◊ It's easy to display complex audio signals on a computer monitor with *Spectra Plus*, a new software package that works on an IBM-compatible PC running Windows 3.1 and any 8- or 16-bit sound card. It provides four display formats: times-series, spectrum, color spectrogram and 3-D surface plots, all of which can be displayed concurrently. *Spectra Plus* supports recording and playback, post-processing and real-time analysis. Features include Smoothing Windows, triggering, overlap processing and more. It's easy to import a .WAV file, for example, to provide fascinating and useful color graphic displays for educational or practical applications.The retail price is $179. Pioneer Hill Software, 24460 Mason Rd, Poulsbo, WA 98370; tel 800-401-4372, fax 206-697-3472. QST