Product Review and Short Takes from *QST* Magazine

March 2006
Product Reviews:

Yaesu FTDX9000 Contest HF and 6 Meter Transceiver
Alinco DR-635T Dual-Band FM Transceiver

Short Takes:

Advanced Receiver Research SP144VDA Preamplifier

PRODUCT REVIEW

Yaesu FTDX9000 Contest HF and 6 Meter Transceiver

Reviewed by Rick Lindquist, N1RL
ARRL Senior News Editor

Make no mistake: The FTDX9000 Contest is *not* the economy-sized model of its more-expensive brethren. It's still a Hummer, with fewer frills but comparable muscle when push comes to shove. Carrying a typical price tag that's slightly less than half that of the FTDX9000D we reviewed last summer (see "Product Review," *QST*, Aug 2005), it's much more than half the top-of-the-line model in terms of functionality. We'd highly recommend reading the earlier review. This one will complement it by concentrating on issues the earlier review did not raise or which are unique to the Contest.

As the earlier review noted, the FTDX9000 radios are "full-figured." This is truly "professional" Amateur Radio gear, oozing quality both in performance and fit and finish. There's nothing lightweight about this model line in either tonnage—each weighs in at around 70 pounds—or capability. The Contest (or its higher-end siblings) also will take up *considerably* more space in your shack. Depending on how much you can easily bench press, you might want to ask someone to help you heft the Contest from its box onto the desk.

Major Physical Differences

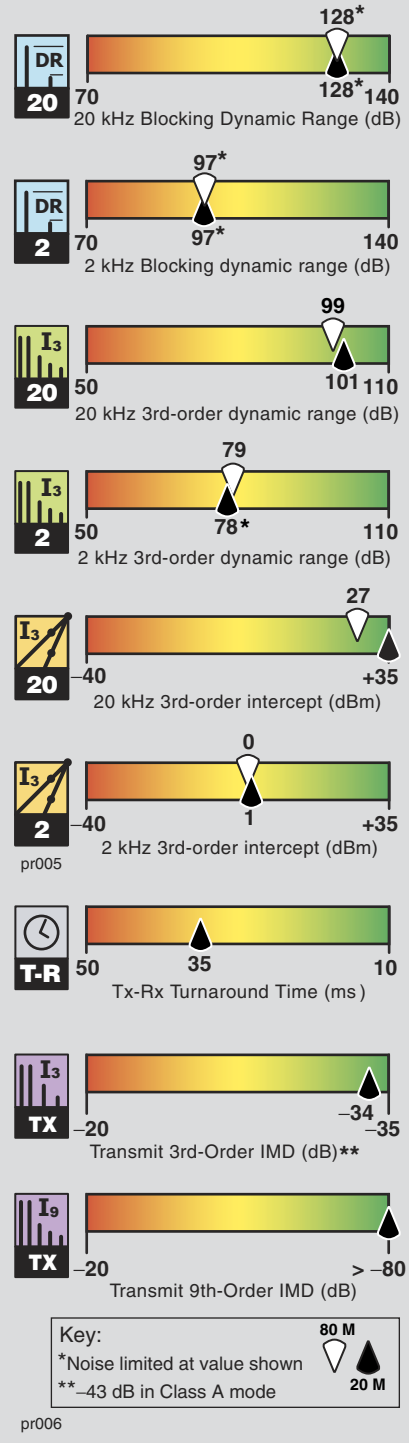
At first glance, the Contest appears to be an FTDX9000D without the TFT display. True, but only partly. A mammoth tuning knob with a rubberized no-slip grip, the easy-to-read color VFD (fluorescent) frequency/clarifier display and the various controls arrayed down both sides of the dial escutcheon are the centerpiece of both models (Figure 1). Beyond this familial resemblance (FT-1000MP users will feel at home), much of the remaining front panel is identical to the 'D's, with primary controls in the same locations.

Filling the space occupied by the 'D's TFT display are two additional, smaller analog D'Arsonval meters (one measures either drain or bias voltage on the MOSFET finals; the other measures the heat sink temperature or SWR) and a tiny LCD display (it measures about 1.25 × 1.3 inches). In addition to duplicating (perhaps unnecessarily) the frequency readout for the selected VFO, the LCD window shows selected VFO mode, antenna, roofing filter and bandwidth settings for both VFOs plus graphical representations of current roofing filter, bandwidth and shift settings.

Accessorizing the Contest

We purchased the *basic* Contest model ($5700), but buyers can accessorize their transceivers *only* at the time of purchase. These are *not* add-ons. Integrated custom options include the RXU-9000 dual-receive unit ($1950 installed), which, essentially, adds a second receiver; VRF (variable RF filter) preselector for the RXU-9000 ($220 installed); up to three RF μ-Tune preselector units ($530 apiece installed), which can further enhance the Contest's already

Key Measurements Summary



Bottom Line

The FTDX9000 Contest lives up to its name, offering superior performance without some of the bells and whistles (and without the associated price tag) of the high-end D version.

Mark J. Wilson, K1RO ♦ Product Review Editor ♦ k1ro@arrl.org

superior selectivity (more on that later); the DMU-9000 data management unit ($1575 installed) and its optional TFT-9000 TFT display ($1100 or $1600 for the TFT-9000A installed). If you don't want to spring for the TFT-9000, the DMU-9000 lets you hook up your own external display.

Do the math. A loaded Contest will run you $12,135 ($12,635 with the "A" model TFT display). That's more than the cost of the 'D model while still lacking some its features, such as the flash memory card slot. [Prices are typical and approximate. — *Ed.*]

The key fact to keep in mind is that with this arrangement a user can have a "custom built" high-end radio with features optimized for a particular application. This is a radical change in the way amateur gear is marketed.

Having these options installed will change the Contest's front-panel configuration. For example, the DMU-9000 requires a third tier of front-panel controls (without the DMU-9000, our unit had extra KEY and PHONES jacks). The RF μ-Tune units add more controls and scrunch the roofing filter setting/display to the right. Add the TFT-9000 display, and the Contest will look pretty much like the FTDX9000D.

On the Air

The 200 W output Contest got uniformly positive reviews from stations I worked during casual operation. While getting the right mic level and IF DSP processor settings took a little bit of tinkering, it sounds terrific on SSB by all accounts. One station sent me a recording of an on-air audio comparison between the Contest and my IC-756PROIII (same mic in both cases — a Heil Pro-Set *Plus!*). The Contest clearly had the edge in audio quality, processor on or off. By the way, the *minimum* compression level for the processor is about 10 dB, which is the maximum the manual says you should apply. Often less is more when it comes to compressors, however.

As do its pricier siblings, the Contest offers a three-band parametric equalizer to tailor transmit audio to suit the user's voice and microphone choice. Briefly, parametric equalization lets you specify a center frequency for either boosting or cutting and a bandwidth for each of the three ranges across the transmitted audio passband. While more difficult to use than the bass and treble controls on some radios, the parametric equalizer provides a professional approach appropriate to the XLR mic connector on the front panel. It's unfortunate that the manual does not go into further detail about how to get the most out of this particular feature. Yaesu indicates that that their Web site will provide all manual updates as they become available.

The CW keying is excellent (see Figure 2), and you can tinker with menu settings to customize weighting as well as rise time (shape).

Table 1
Yaesu FTDX9000 Contest, serial number 5G020107

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.33, 5.35, 5.37, 5.40, 7-7.3, 10.1-10.15,14-14.35,18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power requirement: 90-264 V ac; receive, 100 VA (no signal); transmit, 720 VA (200 W out).	As specified.
Operating modes: SSB, CW, AM, FM, FSK, AFSK.	As specified.
Receiver	***Receiver Dynamic Testing***
SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S+N/N: 1.8-30 MHz, 0.2 μV; 50-54 MHz, 0.13 μV.	Noise Floor (MDS), 500 Hz filter: *Preamp off* / *Preamp on* 1.0 MHz –114 dBm / –120 dBm 3.5 MHz –124 dBm / –134 dBm 14 MHz –123 dBm / –133 dBm 50 MHz –117 dBm / –136 dBm
AM sensitivity, 6 kHz bandwidth, 10 dB S+N/N: 0.1-1.8 MHz, 3.2 μV; 1.8-30 MHz, 2 μV; 50-54 MHz, 1 μV.	10 dB (S+N)/N, 1-kHz tone, 30% mod: *Preamp off* / *Preamp on* 1.0 MHz 8.9 μV / 4.2 μV 3.8 MHz 2.2 μV / 0.89 μV 50 MHz 5.4 μV / 0.80 μV
FM sensitivity, 12 dB SINAD: 28-30 MHz, 0.5 μV; 50-54 MHz, 0.35 μV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 29 MHz 1.6 μV / 0.46 μV 52 MHz 2.3 μV / 0.29 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: *20 kHz Preamp off/on* / *5 kHz/2 kHz Preamp off* 3.5 MHz 128*/134* dB / 118*/97 dB 14 MHz 128*/133* dB / 119*/97 dB 50 MHz 114*/130* dB / 106*/96 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500 Hz filter: *20 kHz Preamp off/on* / *5 kHz/2 kHz Preamp off* 3.5 MHz 99/94 dB / 99/79 dB 14 MHz 101/100 dB / 98*/78 dB 50 MHz 97/95 dB / 91/78 dB
Third-order intercept: Not specified.	*20 kHz Preamp off/on* / *5 kHz/2 kHz Preamp off* 3.5 MHz +27/+10 dBm / +27/+0 dBm 14 MHz +35/+20 dBm / +32/+1 dBm 50 MHz +33/+8 dBm / +27/+6 dBm
Second-order intercept: Not specified.	Preamp off/on, +65/+65 dBm.
FM adjacent channel rejection: Not specified.	20 kHz offset, preamp on: 29 MHz, 85 dB; 52 MHz, 83 dB.

Figure 1 — The main tuning knob, display and the nerve center of the FTDX9000 Contest. The small display to the right shows the frequency of the selected VFO, as well as antenna, roofing filter and bandwidth settings for both VFOs and graphical representations of current roofing filter, bandwidth and shift settings.

Manufacturer's Specifications	Measured in the ARRL Lab
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp on: 29 MHz, 85 dB*; 52 MHz, 83 dB.* 10 MHz offset: 52 MHz, 103 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 56 μV; preamp on, 14 μV.
Squelch sensitivity: Not specified.	At threshold, preamp on: SSB, 1.1 μV; FM, 29 MHz, 0.08 μV; 52 MHz, 0.08 μV.
Receiver audio output: 2.5 W into 4 Ω at 10% THD.	3.6 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW: 325-977 Hz (652 Hz)**; USB: 111-2825 Hz (2714 Hz); LSB: 110-2900 Hz (2790 Hz); AM: 73-2766 Hz (2693 Hz).
Spurious and image rejection: HF: 70 dB; 50 MHz, Not specified.	First IF rejection, 14 MHz, 119 dB; 50 MHz, 97 dB; image rejection, 14 MHz, 102 dB; 50 MHz, 77 dB.

Transmitter	Transmitter Dynamic Testing
Power output: HF and 50 MHz: SSB, CW, FM, 200 W (high), 5 W (low); AM, 75 W (high), 5 W (low); Class A mode, SSB, 75 W (high), 5 W (low).	HF: CW, SSB, FM, typically 208 W high, <2 W low; AM, typ 66 W high, <2 W low; 50 MHz: CW, SSB, FM, typ 185 W high, <2 W low; AM, typ 80 W high, <2 W low.
Spurious and harmonic suppression: Harmonics ≥60 dB on HF, ≥70 dB on 50 MHz.	HF, 56 dB; 50 MHz, 62 dB. Meets FCC requirements.
SSB carrier suppression: ≥70 dB.	>80 dB.
Undesired sideband suppression: ≥80 dB.	74 dB.
Third-order intermodulation distortion (IMD) products: –35 dB (200 W PEP); Class A mode, –50 dB (75 W PEP).	3rd/5th/7th/9th order (worst case): 200 W, –34/–47/–50/*** dB PEP Class A (75 W), –43/*** dB PEP
CW keyer speed range: Not specified.	4 to 56 WPM.
CW keying characteristics: Not specified.	See Figures 2 and 3.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 35 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 38 ms; FM, 38 ms. Unit is not suitable for use on ARQ modes.
Composite transmitted noise: Not specified.	See Figure 4.

Size (height, width, depth): 6.5 × 20.4 × 17.3 inches; weight, 66 pounds.

*Measurement was noise-limited at the value indicated.
**Measured with 500 Hz filter. Varies with PITCH control settings.
***The 9th order products at 200 W and 5th, 7th and 9th order products in Class A were below measurable level.

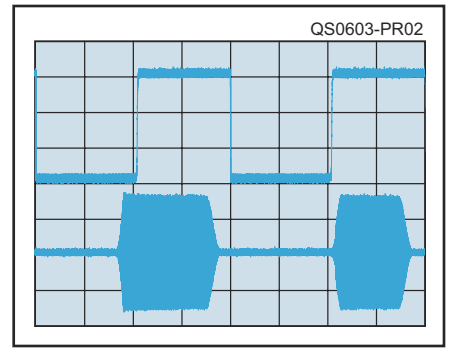


Figure 2 — CW keying waveform for the FTDX9000 Contest showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure (starting at left edge of plot); the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at

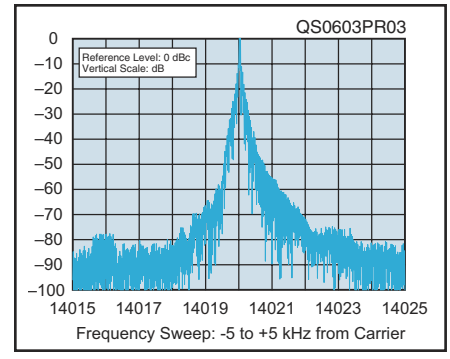


Figure 3 — Worst-case spectral display of the FTDX9000 Contest transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output at 14.2 MHz.

The built-in keyer operates smoothly in semi and full break-in modes, although I did alter the weighting slightly.

I used the Contest during the CQ World Wide CW DX Contest and the ARRL 160-Meter Contest, also a CW event. Once I got the hang of it, even the weakest signals became copiable with the Contest. It's *truly* a superior performer. It seemed there was nary a signal I could not copy. For example, the CONTOUR, VRF, NR (noise reduction) and NOTCH features all came in handy while trying to pull TF3CW out of the mud during the CQ WW.

While the VRF and NR help keep down noise, the unique CONTOUR feature (menu adjustable) lets you notch or boost within the passband, although you must go to the menu to switch to or adjust either function. (This feature may be a good choice to program into the C.S "custom switch" button, which gives quick access to a single menu item.) In addition to zapping unwanted signals or heterodynes, the conventional NOTCH permits additional filter shaping. The D.NOTCH is an auto-notch. On SSB, engaging one or more of these functions will affect audio quality to a greater or lesser degree.

Of course, it doesn't hurt to be able to wind the bandwidth down to 200 Hz (it will go as low as 25), or to be able to shift the IF passband as needed, all thanks to the 32-bit floating point DSP.

In addition to being able to customize a raft of automatic gain control (AGC) settings,

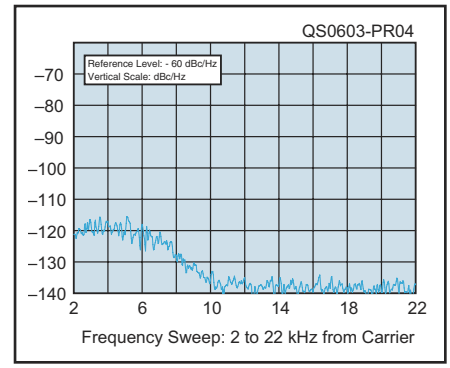


Figure 4 — Worst-case spectral display of the FTDX9000 Contest transmitter output during composite-noise testing. Power output is 200 W at 14.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

ARRL Lab Data Presentation Changes

In the January 2006 Product Review column, we introduced the new Key Measurements Summary—color charts showing different test parameters relative to the range of typical values. This month, we introduce two additional changes to the test data prepared by the ARRL Lab for HF transceivers.

Close-In Dynamic Range

The first change is subtle in appearance but quite significant in impact — additional receiver dynamic range measurements at 2 kHz spacing. For several decades, *QST* Product Reviews have included measurements for IMD dynamic range and blocking dynamic range at a signal spacing of 20 kHz.[1] In July 2001, we added measurements taken at 5 kHz spacing to better represent receiver performance on a crowded band.[2] The appearance of transceivers with narrow bandwidth roofing filters and upconverting first IFs has spurred interest in dynamic range even closer in.

The ARRL Lab has tested dynamic range at offsets as low as 1 kHz since 1996, publishing this data in Expanded Test Result Reports.[3] Members have expressed interest in seeing the 2 kHz spacing data in the column, so starting this month we will publish dynamic range measurements at 20 kHz spacing with the preamp on and off, and at 5 kHz and 2 kHz spacing with the preamp off.

As always, no one parameter (such as close-in dynamic range) should be considered as *the* measure of a transceiver's performance. Look at all performance parameters and obtain as much information as possible when making a purchase decision. It's especially important to keep in mind that variations of several dB are not significant and are to be expected between any two units of the same model number.

CW Keying Sidebands

The other new item this month is a plot of the transmitter CW keying sidebands measured on a spectrum analyzer (Figure 3) in addition to the traditional CW waveform measured on an oscilloscope (Figure 2). These plots show different aspects of a transmitter's CW output, and together they can be used to evaluate CW keying quality.

QST Product Reviews have regularly reported on SSB transmitter intermodulation distortion (IMD) products that can cause interference to nearby stations. Previously published as a spectrum analyzer plot, the level of the 3rd through 9th order IMD products are now listed in the transceiver data table. CW fans are also concerned about the cleanliness of their transmitted signal, especially with regard to "splatter" that interferes with operators on nearby frequencies.

The ARRL Handbook recommends an ideal CW wave shape with rise and fall times of about 5 ms to minimize key clicks and keep the signal within a 150 Hz occupied bandwidth.[4] While many rigs come close to this figure, some have much shorter transition times, often resulting in a "clicky" output. Waveforms with sharp edges (square corners or any rapid shape change) can also be a problem, even if the rise and fall times meet the theoretical ideal.

The traditional oscilloscope plot (Figure 2) shows the transmitter output with the transmitter keyed at 60 WPM. The top trace shows the key closure (first closure at left edge), while the bottom trace is the actual RF output of the radio. In addition to showing the general wave shape, this test shows whether there is any shortening of the first dit in semi-break-in operation or sometimes of all dits in full-break-in (QSK) operation. It also indicates the keying delay (the time between key closure and RF output). The absolute values of the on and off delay are not critical, but they should be approximately the same so that CW weighting will not be affected.

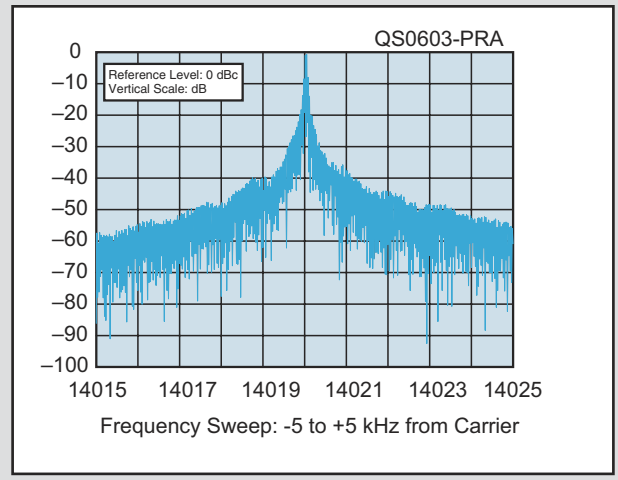


Figure 5 — Here's an example of a radio with poor keying sideband performance. Note how wide the shape of the signal is compared with the FTDX9000 Contest (Figure 3). This means that the transmitted energy is still fairly strong for several kHz above and below the carrier, with the potential for interference to nearby stations.

Figure 3 shows the transmitter CW output, again with a string of 60 WPM dits, as measured on a spectrum analyzer. The plot shows the carrier at the center of the screen and the energy at frequencies up to ±5 kHz from the carrier ("keying sidebands"). The measurements use a resolution bandwidth of 10 Hz and are not instantaneous, but rather indicate the average energy produced over 30 seconds. This slow sweep technique makes it easier to read the level of unwanted energy produced. In an ideal transmitter, the level of keying sidebands drops off very quickly, producing little energy on adjacent frequencies. (In other words, the narrower the signal trace, the better.) An example of poor keying sideband performance is shown in Figure 5.

We hope that you find these changes to the data presentation helpful. We will continue to review our test procedures and presentation and introduce additional changes as warranted. — *Michael Tracy, KC1SX, ARRL Test Engineer*

[1]M. Tracy, "*QST* Product Reviews—In Depth, In English," *QST*, Aug 2004, pp 32-36.
[2]M. Tracy, "ARRL Lab Data Table Change," *QST*, July 2001, p 80.
[3]Available online at **www.arrl.org/members-only/prodrev/reports.html**.
[4]R. D. Straw, Ed., *The 2006 ARRL Handbook for Radio Communications* (Newington: 2005), pp 9.7-9.8.

another great feature is the ability to "slope" the AGC response. Once the AGC comes into play, the additional slope provides just a little "play" in its AGC and can also reduce overall noise. For example, a weak signal next to a fairly strong one will be a bit harder copy at the normal AGC setting than with the sloped setting, even though the desired signal may not sound *quite* as loud. It can make the difference between copying a weak one or not, however.

Astounding Numbers

The numbers resulting from ARRL Laboratory testing do not suggest a "basic" model and are among the very best we've measured. In fact, in terms of two-tone, third-order IMD dynamic range, the Contest hit 101 dB on 14 MHz at 20 kHz spacing (outside of the maximum 15 kHz roofing filter setting). At the more critical 5 kHz spacing, the dynamic range only dropped by 3 dB, although the reading was noise-limited.

In terms of third-order intercept (IP3), a popular benchmark that takes into account a receiver's sensitivity and its dynamic range, the difference was more stark. On 14 MHz at 5 kHz spacing, preamp off, the Contest beat out its bigger brother +32 dBm to +20 dBm. With its μ-Tune feature enabled, the FTDX9000D barely topped the Contest on the same band and spacing by a mere 2 dBm.

Front Panel Overload

Perhaps befitting a radio of this stature, its front panel is *extremely* busy. While most of the controls tend to be of industrial proportions, I found some of the legends difficult to read without first "front lighting" the radio. Before I got acquainted with the extensive layout, I sometimes found myself peering closely and squinting or moving the desk lamp around to get a good look. Even then, with the radio at desk level, some of the controls and/or the panel's topography tend to obscure the legends. This is particularly true of some lower-tier controls.

Yaesu apparently tried to compensate by providing some top lighting for the controls on either side. While noteworthy, this doesn't quite succeed because (1) the light is amber and quite dim, and (2) the four sizeable knobs on the top right hand row totally block the amber light from reaching the lower-tier controls.

The legends for the tightly spaced buttons, arrayed like parentheses around the CLAR/VFO B knob, are minuscule (secondary functions are orange) and difficult to decipher even in adequate auxiliary lighting. The close grouping also makes it simple to punch the wrong button, assuming you can *see* the button and, if necessary, determine if the dull-amber LED in some of them is lighted or not. Speaking of the CLAR/VFO B knob, I found it was very, very easy to nudge it inadvertently, either while pressing one of the adjacent buttons or when adjusting the VRF or NOTCH controls immediately above it.

Unlike FTDX9000 units with the TFT display installed, the Contest presents the user with a row of buttons just below the LCD screen and the two smaller analog meters mentioned earlier. These little buttons double as band keys (with triple-stacking registers) and frequency entry keys. Because they serve dual functions, they're labeled 1/1.8 through 0/28 plus ./50, GENeral coverage and the ENTer buttons. The dual labels can be confusing. Oh! I meant to enter 7 but I hit the 4/7 key instead.

Automatic Antenna Tuner

The automatic antenna tuner (ATU) offers 100 memory points — at least one for each band is set at the factory, and it works on receive as well as transmit (on HF and 6 meters), helping to keep strong out-of-band RF out of the passband. The *Operation Manual* says the unit can match impedances between 16.5 and 150 Ω — an SWR of 3:1 or less. It also allows that the impedance of certain antennas "may not be within the impedance matching range of the ATU" on all bands.

The Contest's ATU frequently can take a relatively long time to find a match — 30 seconds or more in some cases, the transmitter all the while putting out a 100 W carrier (the manual does advise checking the frequency before firing up the ATU).

Miscellaneous Pluses and Minuses

Operating split is simple, and you can program a preset split, such as 2 kHz, and the TXW key lets you listen on your transmit frequency (no matter how you got into split mode). However, if you hit SPLIT and, say, you've been using the CLAR/VFO B knob for RIT/XIT, it clears that. Pressing SPLIT again doesn't return you to clarifier mode, however. You have to also press the A/B key next to the CLAR/VFO B knob.

The August 2005 review praised the quiet fan, but our Contest's cooling fan had a distinctive rattle. Yaesu offered that this was not typical and could have resulted from latent shipping damage.

The tuning offset indicator, praised in the earlier review for making CW tuning easy, has additional functionality. You can set it to display the relative offset of the clarifier or the manual notch filter (the manual doesn't mention the latter) or the peak position of the VRF or μ-Tune filter. The first three work great; I couldn't get it to display the VRF peak, however.

The FH-2 Remote Control Keypad is a

CQ SS DE FTDX9000 CONTEST

I used the FTDX9000 Contest in the CW Sweepstakes on the first weekend of November, in "single operator two radio" (SO2R) configuration alongside my usual transceiver.

The colorful front panel display effectively communicates what you need to know, and then some: Separate meters permit simultaneous monitoring of four parameters, including heat sink temperature. The knobs that see the heaviest use during a contest are big, are comfortable to use and operate very smoothly. The main tuning knob is *huge* but the AF and RF GAIN, bandWIDTH and SHIFT, and CLARifier/VFO B knobs are also generously proportioned and grouped conveniently at the lower right.

There is a learning curve for any new equipment, and with a transceiver as complex as the '9000 it is advisable to spend a few hours becoming familiar with the controls and menu options. It is well worth taking the time to familiarize yourself with the receiver AGC, contour and DSP shape/slope settings. You can tailor the sound of the '9000 to suit your ears and to help you dig the weakest signals out of the noise. Don't overlook AGC SLOPE, menu #075, which gives you access to two options for the gain curve of the AGC amplifier. You may prefer the "slope" setting, which increases audio by 1 dB for each 10 dB increase in received signal strength, to the "normal" (flat) setting.

A very nice feature is the Custom Switch (C.S), which allows instant access to the most-used menu selection. For example, let's say that you want to set your maximum output power to 50 or 100 W because that's all the drive your amplifier requires, but you want access to the full 200 W output when you're bypassing the amplifier. You can use the Custom Switch as a shortcut to TX MAX POWER (menu item #154).

There is probably no greater test of receiver performance than 40 meters on a contest weekend. Hooked to a two element Yagi at 94 feet, the '9000 had no trouble coping with the many loud signals contending for band space. I never had to resort to the full 18 dB of front end attenuation that was available. The limiting factor over the CW Sweepstakes weekend was atmospheric noise, which was unusually high for November.

In short, the FTDX9000 Contest is aptly named. It can take everything a contest can dish out. — *David Sumner, K1ZZ, ARRL Chief Executive Officer*

mouse-like outboard accessory keypad (it comes standard with the radio) that plugs into the rear apron. It worked fine to program voice and CW memories. As heard in the monitor in VOX mode, the voice playback seems to "skip," but it sounds fine over the air. You have to be very quick in ending a recording or it will leave a noticeable "tail" of noise.

The audio limiter feature (AFL), which limits AF output, offers a wonderful way to conserve your hearing, especially during long periods of contesting.

Programming the digital voice recorder requires activating PTT. Unless you have a push-to-talk mic (the Contest doesn't come with a mic), however, you'll have to improvise (I used a straight key). Pressing MOX won't cut it.

The P.BACK button lets you record and play back a segment of received audio, which is a cool feature. The manual says 30 seconds, but it's more like 15. You apparently cannot play back the recorded audio over the air, however.

The MOX and DIM buttons have no embedded LEDs to let you know they're enabled. The VOX button does have one, however.

The NAR button is a convenient feature that swaps in a preset narrow filter, but you can't then override that setting using the WIDTH control.

I noticed a few issues with the receiver audio. With the DSP NR enabled, over time the audio developed a crackling sound if I left the receiver controls alone. Adjusting the NR level or turning it off and on returned the audio to normal for a while. Also, I noticed some distortion on CW signals with the sloped AGC enabled. The manual suggests using this feature only when you need it. And finally, the detent-type controls such as NOTCH and VRF made crackling sounds in the audio when rotated.

Programming memories — which hold gobs of information — was less than intuitive. Pressing the V/M button doesn't entirely take you out of memory mode either. You still must press the MCH/GRP key (and, if you want RIT/XIT, the appropriate buttons to enable that function too).

The ACS (automatic character spacing) mode on CW is great, but it does take a bit of getting used to as it tries to "adjust" your character spacing while you're sending.

The 164 page *Operating Manual* was disappointing, riven with typographical and even a few substantive errors. For example, it tells you to select "OFF" in the appropriate menu item to include a particular band in the "My Bands" feature. It's just the opposite, however. Also, for a radio in this category, the manual is fairly insubstantial.

Adjusting the bandwidth or IF shift affects both VFOs, no matter what mode they're in (except AM).

The Contest uses a male serial connector to interface with a PC for external control. USB would be a nice option as many PCs don't even have serial ports anymore.

So How Does It All Add Up?

In the Contest you have a performance-oriented transceiver that will appeal to a certain segment of the Amateur Radio community. The Contest is less cutting-edge innovation than solid application of proven technology in a mostly comfortable and classically styled radio package.

It's a bit like a performance oriented high-end vehicle: It's not for everyone — and especially if you've gotten accustomed to having a display screen and other niceties. (But hey, if you're serious about a high performance sports car, you want one that goes, stops and turns and don't care about cup holders or a DVD entertainment system.) For those who value performance over baubles, the Contest — with or without some of its custom options — could be their next transceiver investment.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; **www.vxstdusa.com**. *Price*: $5700 (see text for discussion of options and prices).

Alinco DR-635T Dual-Band FM Transceiver

Reviewed by Dan Henderson, N1ND
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If you are looking to add or replace a dual-band (2 meter/70 cm) mobile or home radio, then you will want to take a look at the Alinco DR-635T. The '635T is a relatively compact transceiver that packs a maximum output of 50 W on 2 m and 35 W on 70 cm — enough to provide an adequate signal to any repeater within your range.

The DR-635T offers 200 memory channels, three transmitter power settings, a removable control head for remote mounting, expanded receive coverage, an alphanumeric display with a choice of colors, and tone access with continuous tone coded squelch system (CTCSS) and digital coded squelch (DCS).[5] In addition to the standard features, you can add optional modules for 1200 and 9600 bps packet operation and for Alinco's digital voice system.[6]

Figure 6 — The DR-635T is a compact radio with a clear display and large push buttons that make it easy to use.

Initial Impressions

I found the '635T to be very straightforward to use in a home station. After taking the radio out of the box, I attached the substantial microphone. Unlike many of the newer radios that have reduced-size microphones, the EMS-57 that came with the radio fills up the palm of your hand. After plugging in a dual-band antenna and attaching the fused leads to the power supply, I was ready to go.

The first thing that caught my attention was what happened to the display when I turned on the power. The front panel changed from off, to a violet color, and then to blue. Control your emotions — this is normal and highlights a feature of this radio. The '635T has three different color options for its displays — amber, violet and blue. The defaults are blue in the receiving mode, amber in transmit and violet in standby. You can change these settings to suit your personal taste.

After figuring out that the color change

[5]J. Hallas, "Getting to Know Your Radio — VHF Squelch Modes," *QST*, Aug 2005, pp 46-47.
[6]For more information on digital voice in Amateur Radio, see **www.arrl.org/tis/info/digivoice.html**.

is normal, I was ready to dial up the local repeater and make a contact. The largest knob on the front panel acts as the control for the VFO. It's also used for changing memories in memory mode and for changing various settings in the parameter setting mode (SET MODE). In the VFO mode, you can either tune in the frequency using the main VFO knob or punch in the desired frequency from the 16-button keypad on the microphone. That part was simple.

Unlike several other radios I have reviewed recently, the DR-635T does not automatically use repeater offsets that track the usual band plans. It is quite easy to use the function buttons to set the correct offset, but it is not done for you automatically. I discovered this when I attempted to access a repeater with a +600 kHz offset and found the offset display showing a minus offset. You can easily store the information (including frequency, offset and tone access) for frequently used repeaters in one of the ample available memory channels.

When using the VFO mode, however, you need to pay attention and make sure that the correct offset is selected. The manual describes how to use the VFO AUTO-PROGRAM function to call up automatic settings — including repeater offset and CTCSS tones — while you are tuning a specific frequency range set by programming upper and lower limits into the AH and AL memories. The problem with this arrangement is that you can set only one band segment at a time.

After setting the proper offset, I was ready to go. I threw my call out on the frequency, and a friend answered. So with a few exceptions, the '635T handily passed the N1ND "how quickly can I get it on the air" test.

Installation and Some Features

The '635T comes with a detachable front panel that can be flipped to allow the speaker to fire out the top or bottom — useful during mobile operation with limited interior space. Using the EDS-9 separation kit (not reviewed), you can mount the main unit remotely, up to 16.5 feet away.

After the initial smoke test to make sure everything was working properly, it was time to start exploring the DR-635T's many options and features. I first spent some time with the manual to familiarize myself with the 12 buttons and dials on the front panel. Most buttons control more than one function. Some I had learned during the initial setup of the radio. Some would take a little more study.

One important element that I look for when purchasing a radio is the quality and ease of use of the instruction manual. While I think the manual accompanying the DR-635T handles many elements well, it could use an alphabetical index to make specific operations easier to find. The manual covers both the USA (DR-635T) and European (DR-635E) versions and in most cases does a good job of differentiating between the two. Cross-band repeater operation is available only on the US version and is covered on an insert sheet. These instructions are sketchy, and I would have liked more information on using this feature.[7]

I ended up classifying the radio controls in two groups — basic operation or advanced features. The basic operations included PWR on/off, MAIN VOL and SUB VOL (separate volume knobs for the main and sub bands), V/M (VFO/memory) switch and dial, VHF/UHF BAND switch, H/L (high/medium/low) power level, SQL (squelch), TS/DCS (tone squelch/DCS) and CALL mode (to return the radio to a programmed primary call frequency, one each for VHF and UHF). All of these controls are accessed from the front panel without the need to press the FUNC (function) key or put the radio into the SET MODE.

Plenty of Memories

Back in the "good old days" you needed a good memory in your head to remember the correct CTCSS tone or unusual offset for your local repeater. The '635T handles these details by providing 200 memory channels — 80 channels each for VHF and UHF and 40 more channels that can be used for either band. Each band — 2 meters and 70 cm — has a user-designated CALL (priority) channel. To manage the 200 memory channels, you can include an alphanumeric label for each repeater stored in memory.

Programming the memory channels is relatively straightforward. Use the V/M button to put the radio into memory mode and select the parameters you wish to store. Next, press FUNC and the various memory channel numbers will be displayed on the readout. Use the main tuning dial to select the channel memory number you wish to store the information in. If the selected memory is empty, its number will flash. Press the V/M key again while the function icon is displayed on the main readout, and the repeater information is stored in the '635T's memory bank for future use.

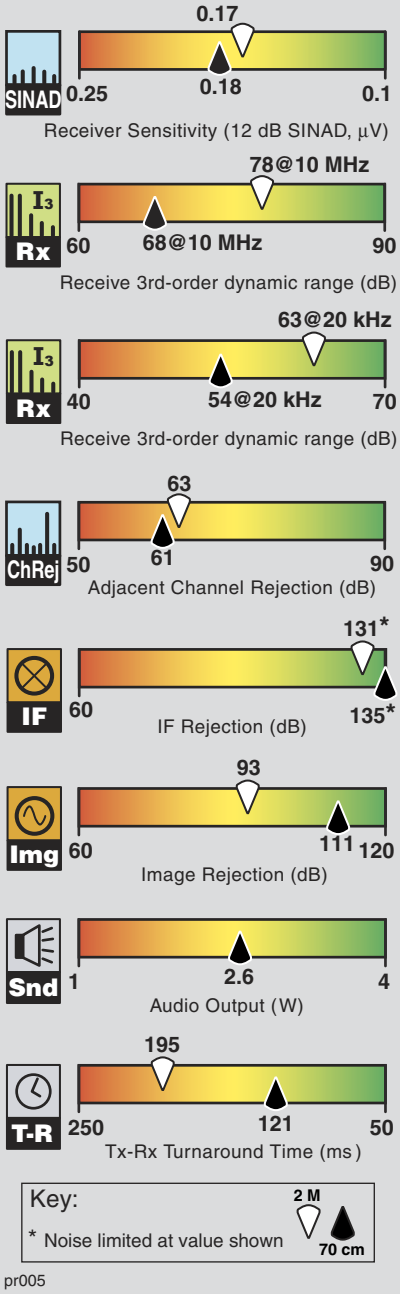
It's likely you will run out of repeaters before you run out of channels in which to store them. Although the memory features worked flawlessly, some way of further grouping similar memory channels (for example, ARES channels or repeaters used while traveling) would have made operation even more convenient.

More Choices for Your Listening Pleasure

In addition to amateur FM operation, the '635T can receive a broad range of frequencies including the FM broadcast band, AM aircraft band and NOAA weather channels. So if you get bored listening to amateur chatter, you can tune in your favorite oldies station or the local weather. I was disappointed that the '635T does not include the

[7]It's a good idea to review the rules and regulations regarding crossband repeaters and remote base operation in *The ARRL FCC Rule Book* or online at **www.arrl.org/FandES/field/regulations/faq-aux.html**.

Key Measurements Summary



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Bottom Line

The Alinco DR-635T is a durable, attractive and easy to use mobile transceiver that offers flexible mounting options.

Table 2

Alinco DR-635T, serial number M000586

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 87.5-174,* 335-480 MHz; transmit, 144-148, 430-450 MHz.	Receive and transmit, as specified.
Power requirements: Receive, 0.7 A (max audio); transmit, 11 A (high power).	Receive, 0.7 A; transmit, 9.2 A. Tested at 13.8 V.
Modes of operation: FM, AM (receive only).	As specified.
Receiver	**Receiver Dynamic Testing**
AM sensitivity: Not specified.	For 10 dB S+N/N: 120 MHz, 1.9 μV.
FM sensitivity, 12 dB SINAD: 0.2 μV.	For 12 dB SINAD: 144 MHz, 0.17 μV; 430 MHz, 0.18 μV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 63 dB; 440 MHz, 54 dB. 10 MHz offset: 146 MHz, 78 dB; 440 MHz, 68 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	76 dB.
FM adjacent-channel rejection: Not specified.	20 kHz offset: 146 MHz, 63 dB; 440 MHz, 61 dB.
Spurious and image rejection: 70 dB.	First IF rejection, 146 MHz, 131 dB**; 440 MHz, >135 dB.** Image rejection, 146 MHz, 93 dB; 440 MHz, 111 dB.
S-meter sensitivity: Not specified.	S9 indication: 146 MHz, 1.7 μV; 440 MHz, 2.1 μV.
Squelch sensitivity: 0.13 μV.	At threshold: 146 MHz and 440 MHz, 0.11 μV.
Audio output: 2 W at 10% THD into 8 Ω.	2.6 W at 10% THD into 8 Ω.
Transmitter	**Transmitter Dynamic Testing**
Power output (H/M/L): 144 MHz, 50/20/5 W; 430 MHz, 35/20/5 W.	146 MHz, 48/18/4.2 W; 440 MHz, 33/19/5 W.
Spurious and harmonic suppression: 60 dB.	VHF, 67 dB; UHF, 72 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 146 MHz, 195 ms; 440 MHz, 121 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	146 and 440 MHz, 157 ms.
Size (height, width, depth): main unit, 1.6×5.5×7.3 inches; weight, 2.2 pounds.	
Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.	

*WFM only for 87.5-108 MHz and AM only for 108-136 MHz.
**Measurement was noise-limited.

special NOAA weather alert feature that is incorporated into some other FM mobile/base transceivers.

The '635T has a wide range of variable settings that allows the owner to set up the radio to best suit his or her needs. For example, you can install the radio so that it turns on and off with the ignition switch in your vehicle. Or you can enable the APO (automatic power off) mode to turn the radio off after 30 minutes of inactivity. If your radio is programmed to open the receiver only when a special tone is transmitted (a popular feature similar to a paging function), this transceiver can be set to sound an alert bell to beckon you to the radio. One special function worth noting is a unique anti-theft alarm that sounds a tone if an alarm cable is removed or cut.

With the addition of an optional digital unit (EJ-47U) it is possible to use the '635T for digital voice communication. APRS is also possible with this transceiver if the optional TNC (EJ-50U) unit and an external GPS unit are installed. The review transceiver did not include these options.

On the Air

Once programmed with my favorite frequencies, the DR-635T was easy to use. It has all of the basic features I need for VHF/UHF FM operation. In response to a query to the ARRL Lab, I paid some special attention to the transmit and receive audio. On receive, it seemed a bit restricted at the low end of the bass range, but this did not distract from the readability of received stations. I also asked several friends who know my voice for a critical evaluation of the transmit audio. Their response was positive, though one friend noted what seemed to be a little distortion when I spoke in low tones. Overall the audio quality seemed fine to my ear.

The EMS-57 mic provides a comfortable alternative to using the front panel control buttons. On the top of the microphone are UP/DOWN buttons that duplicate the functions of the main dial on the front panel. The microphone includes a 16 button keypad for direct frequency entry and DTMF functions. Some of the buttons have secondary functions to change bands, access the call channel, change between VFO and memory mode and change power level.

Overall I found the Alinco DR-635T to be durable, attractive and easy to use. Its compact size and detachable faceplate make it appealing to someone with limited space in the car for mounting the radio. It has features that appeal to the newcomer or the experienced operator looking to replace an older radio or add a new toy to the collection.

Manufacturer: Distributed in the US by Ham Distribution Inc, 15 South Trade Center Pkwy #B5, Conroe, TX 77385; tel 936-271-3366; **www.alinco.com**. Price: DR-635T, $369; EDS-9 separation kit, $45; EJ-47U digital voice module, $179; EJ-50U TNC module, $129.

W4RRY ELECTRONIC BATTERY BOOSTER AVAILABLE AGAIN

We have been informed by Leo Lehner, W4RRY, that his Battery Booster, reviewed in the October 2005 issue of *QST*, is again available. Leo has contracted with a manufacturing concern reportedly capable of meeting demand. Per Leo, the new price is $115 plus $5 for shipping. To order, send a check to Leo Lehner, 5811 E Crocus Dr, Scottsdale, AZ 85254.

Going Once, Going Twice...

The ARRL-purchased equipment listed below is for sale to the highest bidder. Prices quoted on the Web page are the minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty except as noted.

Details of equipment offered and bidding instructions can be found on the ARRL members' Web page at **www.arrl.org/prauction**. The following items are available for bid in the March auction: Kuranishi BR-210 SWR analyzer. Hy-Gain HAM-V antenna rotator and DCU-1 digital controller. MFJ-860 wattmeter. Vectronics LP-30 low-pass filter. Icom ID-800 digital VHF/UHF mobile FM transceiver. Yaesu VX-6R multiband handheld transceiver.

Advanced Receiver Research SP144VDA Preamplifier

When most hams think of RF loss in transmission lines, their obsession is focused on loss of output power. It's galling to realize that even a single milliwatt of precious RF is lost on the way to the antenna, much less 10s of watts or more. What many hams don't understand, however, is that this loss problem also works "in reverse." RF is RF is RF, regardless of whether it comes from your transceiver or is snagged from the space-time continuum by your antenna. In other words, not only do you lose transmitted power in your cables, you lose *received* signal energy as well.

The loss problem is particularly acute when you venture into the VHF, UHF and microwave bands. Depending on the frequency, matching conditions and the length and quality of your coax, losses can be horrendous. Until the day arrives when scientists develop room-temperature superconducting transmission lines, these losses will continue to vex us. On the transmit side, you can compensate for loss to a certain extent by boosting your output. To minimize received signal loss, you need a receive *preamplifier*.

Introducing the SP144VDA

Advanced Receiver Research (ARR) is well-known in the "weak signal" VHF/UHF community. The company has a reputation for producing high-quality commercial and amateur products. For my particular application, I needed something to give 2 meter satellite signals a kick. I was using an omnidirectional antenna for VuSAT-OSCAR 52 and the International Space Station reception. Since I was also occasionally transmitting on the same antenna, I needed a preamp that could automatically switch itself out of the circuit.

Interior view of the SP144VDA.

The ARR model SP144VDA seemed well suited for the job. This 2 meter preamplifier is *RF switched*, which means that it automatically bypasses itself whenever it senses RF above a certain threshold. You simply supply the necessary power and the SP144VDA does the rest. The SP144VDA handles up to 25 W, which was fine for my purposes.

In terms of gain, the SP144VDA delivers 15 dB with its dual-gate MOSFET design. Unfortunately, gain isn't everything when it comes to boosting receive signals. The real trick is to increase gain without adding excessive extraneous noise. There will always be noise to one degree or another, but less is definitely better. The SP144VDA specifies a noise figure of 1.1 dB. Our ARRL Lab tests determined that the preamp we purchased met its gain spec at an even better noise figure of 0.85 dB.

Installation and Use

The SP144VDA is quite small at only 4½ × ½ × 2 inches with a total weight of 5 ounces. The rugged black enclosure offers BNC RF ports, a ground terminal and a feedthrough capacitor tap for the "hot" side of the dc power source (10 to 16 V). A tiny toggle switch controls the ON/OFF state and a red LED serves as the indicator.

Note that the SP144VDA is *not* designed for outdoor use (ARR offers weatherproof mast-mounted preamps for that purpose). I have a short coax run to the 2 meter antenna, so there was no need to have the preamp on the mast. For longer transmission lines, however, mast mounting is the preferred choice. You want to raise the received signal level *before* the coaxial cable converts most of it to heat, not after.

My SP144VDA fit nicely under my operating desk, out of sight and out of mind. Performance was outstanding. VO-52 signals that were almost inaudible with my omni antenna popped right out of the noise to crystal clarity. Best of all, the increase in signal level didn't come with a noticeable increase in noise — it was just pure, clean amplification. This was in stark contrast to the preamp built into my transceiver. Yes, it boosted the signal levels, but it also added a noticeable amount of noise. Not so with the SP144VDA.

Whenever I transmitted, I could hear a muffled *click* as the SP144VDA's relay switched the preamp out of the circuit. There is about a ½ second delay before the relay returns the SP144VDA to the circuit after you stop transmitting. For voice communication, this isn't an issue, but it might present problems for data exchanges or high-speed CW.

Although the preamp is rated for 25 W of RF, I accidentally blasted it with about 60 W with no ill effects. This isn't something I'd recommend doing on a regular basis, though!

The SP144VDA is a worthy addition to any terrestrial or satellite station. The quality is obvious in its construction and performance. The price is right on target, too.

Manufacturer: Advanced Receiver Research, Box 1242, Burlington CT 06013; tel 860-485-0310; fax 860-485-0311; e-mail **info@advancedreceiver.com**; **www.advancedreceiver.com/index1.html**. *$77.95*

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