Product Review & Short Takes Columns from *QST* Magazine

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Product Reviews

Short Takes

A *QST* Roundup: 2-Meter Handheld FM Transceivers

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Well over a year has passed since two of the three transceivers in this "roundup" were released into the US ham radio marketplace.

While I've got to admit that we've corralled somewhat of a "mixed bag" this time around, in the interest of getting a closer look at them before they grow even longer in the tooth, let's gather round, take up a perch on the top fence rail and give due consideration to these unlikely stable mates.

It's important to point out that each of these radios has particular attributes that make them worthy choices for specific applications. Also have a look back at our previous 2-meter handheld reviews, such as those that appeared in the May 1996, December 1997 and October 1998 issues of *QST*. Nearly all of the radios covered in these earlier reviews are still available. Be sure to select the one that best fits your personal operating requirements.

The Alinco DJ-195T

The DJ-195T caused quite a buzz at last year's Dayton Hamvention. Included in the usual list of capabilities touted on the glossy advertising handouts were a couple of eyebrow raisers—a built-in theft alarm and an "experimental mosquito repelling" system.

Additional highlights include 40 memory channels with 6-character alphanumeric naming capability, a dedicated "call" channel, independent CTCSS encode and decode, digital code squelch (DCS) encode/decode, tone burst, 135 to 174 MHz extended receive, 5 W or 800 mW of RF power output with the included battery, nine 16-digit DTMF autodial memories and direct frequency entry from the keypad.

The DJ-195T is noticeably larger—especially in height—than most of the recent handhelds, but these more generous dimensions result in some distinct advantages. The size and spacing of the buttons on the keypad, the readability of the information shown in the display and the audio quality of the built-in speaker all benefit from this added elbowroom.

The LCD window is located at the midpoint of the front panel. Information appears as black segments on a gray field. The frequency digits (or alphanumeric characters), the memory channel number and the various icons are some of the largest—and consequently easiest to read—currently available on an H-T. A comparatively small 6-segment S/RF power meter resides in the lower right-hand corner of the window. Display backlighting is available—the keypad however, is not backlit.

The speaker is mounted above the display and **POWER**, **FUNC**tion/**SET**, and 16 DTMF/frequency input buttons are located below.

Several of the keypad buttons also perform control functions. The labels that appear above these keys—**STEP**, **TSQ**, **SHIFT**, **PO**, for example—make it simple to locate the desired operation.

A set mode menu—accessed by pressing and holding the **FUNC**tion/**SET** key, is used to control 13 of the less often varied operating parameters. These include settings for the battery saver mode, the key beep, the tone burst, the busy channel lockout, the time-out-timer penalty, the theft alarm, the mosquito repelling system and additional choices related to the DTMF autodialer.

A single rotary encoder on the top panel controls several operations. As with most transceivers, the encoder is used to step between the programmed memories in the

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Table 1—Alinco DJ-195T, serial number T000799

Manufacturer's Specifications	Measured in ARRL Lab
Frequency Coverage: Receive, 135-175 MHz, transmit,144-148 MHz.	Receive, 135-174 MHz; transmit, as specified.
Power requirements: 6.0-16.0 V dc; receive, 50 mA (squelched); transmit, 1.2 A (maximum, high power).	Receive, 0.15 A (maximum volume, no signal); transmit, 1.1 A (with EBP-48N battery pack).
Size (hwd): 4.9×2.2×1.6 inches; weight, 13.2 ounces.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, 0.2 μV.	For 12 dB SINAD: 0.17 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 58 dB*, 10 MHz offset from 146 MHz, 82 dB.
Two-tone, second-order IMD dynamic range: Not specified.	77 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 58 dB.
Spurious response: Not specified.	IF rejection, 102 dB; image rejection, 92 dB.
Squelch sensitivity: Not specified.	0.07 μV at threshold.
Audio output: 200 mW at 10% THD into 8 Ω.	195 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H / L): 5 / 0.8 W.	5.4 / 0.8 W.
Spurious signal and harmonic suppression: 60 dB.	63 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 180 ms.
Receive-transmit turnaround time ("tx delay"): 96 ms. Not specified.	

*Measurement was noise limited at the value indicated.

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memory mode, to vary the frequency when in the VFO mode and to change the settings of the various parameters during programming. With the DJ-195T though, this knob also controls the volume and squelch.

This is achieved by pressing the */**VOL** or the #/**SQL** key first and then rotating the encoder. A two-digit indicator pops up in the lower left-hand corner of the display window and reports the relative setting of the levels as a value between 0 and 20. Approximately 5 seconds after you first hit the key or stop turning the knob, the level indicator will disappear and the encoder will revert back to frequency control.

This arrangement works nicely and virtually eliminates the possibility of accidentally upsetting the volume or squelch levels—a common problem with dedicated rotary controls. It does make it more difficult to adjust these settings when the unit is clipped to your belt though.

A BNC antenna connector and a pair of speaker/microphone jacks are also located on the top panel. A **DC IN** jack, for connecting the included wall transformer battery charger or an external 12 V dc power source is positioned on the right side of the transceiver.

The 9.6 V 700 mAh NiCd battery pack attaches clamshell style to the back of the chassis. A large plastic belt clip snaps into a track on the battery.

Some Unusual Talents

The theft alarm function in the DJ-195T works in conjunction with the dc power jack. Once set, if the dc supply from an external power supply or the wall transformer charger is interrupted, the radio will emit a loud high-pitched squeal. While the level of the alarm tone isn't exactly ear shattering, it will certainly attract attention.

The "experimental mosquito repelling" function is based on the premise that mosquitoes are bothered enough by a very high frequency sound that they will choose to look for their dinner some distance away. I had hoped to experiment with it out on my deck, but was unable to recruit a sufficient number of mosquitoes to formulate any supportable conclusions. I tried to convince the folks in the ARRL Lab to set up one of the exposed-arm-in-the-glass-box-full-of-mosquitoes tests, but they respectfully declined. I'll leave further investigation to others. I did find that when the feature was switched on the sound was annoying enough to *me* that I would choose not to be subjected to it for very long.

An especially interesting feature is an "external control function." When this is enabled, any receive audio that breaks the squelch (or CTCSS or DCS tone squelch) will result in a 5 V output at the ring connector of the microphone jack. This voltage could be used to control an external relay. You could wire the relay so that it switches

on a connected tape recorder or activates sounders or lights to indicate an incoming call, for example.

The DJ-195T includes basic memory and VFO scanning capabilities. Selected memory channels can be locked out of a scan and there are two scan resume modes.

VFO scan will search through all frequencies between 135 and 174 MHz—no scan frequency limit settings are available.

The 8×6-inch 38-page *Instruction Manual* is loaded with illustrations, making it especially easy to follow the programming steps.

The operation of this radio seems very intuitive—primarily due to the clearly labeled control assignments for the keypad buttons. Moderately experienced operators should be able to program and operate this transceiver without spending more than a few minutes paging through the written instructions.

The manual includes a wiring diagram for connecting the radio to a packet TNC. A schematic diagram of the transceiver is also provided.

On The Air

Requests for on-the-air signal reports consistently garnered high praise for the quality of the transmitted audio. The level and clarity of receive audio from the built in speaker is more than adequate for handheld applications and is sufficiently loud for all but the noisiest of environments.

ARRL Lab tests (see Table 1) revealed some pretty impressive performance characteristics. Two-tone third-order IMD dynamic range at 10 MHz offset, typically a good indicator of a transceiver's ability to fight off interference from nearby commercial services operating on either side of the 2-meter amateur band, measured 82 dB. This is just 1-dB off the highest figure that we've recorded for a 2-meter H-T. (The Kenwood TH-22A set the high water mark back in '96.)

The IF rejection numbers are quite good—scoring above average for this class. Image rejection performance, while not quite as stellar, still came in considerably better than the running average for similar units.

The Alinco DJ-195T is a good choice for those willing to trade off some of the carry convenience of the smaller H-Ts for an easier to view display, improved control accessibility and intuitive operation.

Manufacturer: USA Alinco Branch, 438 Amapola Ave, Suite 130, Torrance, CA 90501; 310-618-8616; fax 310-618-8758; **http://www.alinco.com**.

Manufacturer's suggested retail price: $289.95. Typical current street price: $160.

The RadioShack HTX-200

The HTX-200 was also initially rolled out at the 1999 Dayton Hamvention. A 70-cm

version, the HTX-400 was released shortly afterward.

These very compact low power handhelds (the RF output is specified at 200 mW with two AA alkaline cells installed) are just the ticket for monitoring the action on local repeaters, communicating through the close ones, and for short distance simplex operation—such as at a hamfest or Field Day site.

Granted, 200 mW of RF power won't cover a tremendous amount of real estate over typical terrain, but if shirt pocket carry convenience is what you're looking for, the tiny HTX-200 certainly fits the bill.

This radio also has a hidden talent, however—feed it 9 V dc from an external source and the RF output increases to 2 W (1 W with the 70-cm version)—a level that's suitable for mid-range repeater operation. You can use an optional cigarette lighter cable with a built in dc-to-dc (12 V-to-9 V) adapter to draw power from a 13.8 V dc power supply or a vehicle's electrical system.

The HTX-200 offers a good variety of the basic features—30 memory channels; a "call" channel; CTCSS encode and decode; CTCSS paging capability; extended receive from 136 to 174 MHz; band and memory scan modes with memory channel lockout; and a multistage battery charge indicator.

The front panel sports a small LCD window that shows information as black segments on a gray background. Display backlighting is available. A 10-section S/RF power meter is located along the lower edge of the display. The frequency digits, memory channel numbers and various function icons are very small.

As is the case with the alternative sub-mini 2-meter H-Ts presently on the market, the familiar 16-button DTMF/frequency entry keypad is absent. Seven rubberized buttons on the front panel, **FUNC**tion and **PTT** buttons on the left side panel and concentric rotary **VOL**ume/**OFF** and **SQ**uelch knobs on top control most operations. No arrangements for generating DTMF tones for autopatch or repeater control are provided.

The operating frequency is selected using combinations of the **FUNC**tion button and ▲/**T.SET** and ▼/▶ keys. Frequencies are entered by pressing and holding the **FUNC**tion button, selecting the desired digit with the ▼/▶ key, and then pressing the ▲/**T.SET** or ▼/▶ keys to step up or down through the numbers. In the VFO mode, you can also use the ▲/**T.SET** or ▼/▶ keys to change the frequency by the tuning step. In the memory mode, these same keys are used to step through the memory channels. Although it may seem a little awkward at first, with a little practice you'll soon find that this tuning scheme works quite nicely for moving quickly around the band.

Commonly required operations—such as toggling between the memory and VFO

modes, tuning, changing the duplex setting, programming VFO information into memories, entering the scan mode, accessing the call channel, switching on the backlighting, locking the keys and temporarily opening the squelch—are performed using the front panel buttons or combinations of the **FUNC**tion key and those buttons.

Two menus are used for controlling the more advanced settings. There's a "Main Menu" with items for adjusting the tuning step size, the repeater offset frequency, the time-out-timer, the busy channel lock out, the power save feature and the scan hold delay time. A separate "Tone Set Menu" is used for selecting and activating the CTCSS tones for tone and tone squelch operation. Forty-seven CTCSS tones are available and different tones can be set for transmit and receive.

The provided antenna is about $3^3/_4$ inches long and attaches to a female SMA connector. Conventional 2-pin speaker/microphone jacks are located on the top panel. The external power jack is positioned on the right side.

The radio does not include built-in battery charging circuitry. If you decide to employ rechargeable batteries, you'll need to purchase a separate charging system for them.

The $4^1/_2 \times 7$-inch 47-page *Owner's Manual* provides clear step-by-step instructions and includes lots of diagrams. Tables listing the menu items, with columns for the available settings, brief text explanations and page number references for more detailed information, are provided.

An extremely handy *A Quick Look at the Controls* table proved very helpful on a number of occasions. This would be a good section to photocopy and laminate for field reference.

Operational Aspects

On the air, the HTX-200 received compliments for its natural sounding transmit audio. Receive audio from the internal speaker is sufficient for most handheld applications, but those pressing this unit into mobile service will definitely want to consider connecting an amplified external speaker.

With just 200 mW of specified RF output power and a stock antenna that measures under 4 inches, I was initially skeptical about how well the HTX-200 would fit my typical operating needs.

Our local club repeater is located on a ridge about 3 miles from my home. While communicating from my basement shack

Table 2—RadioShack HTX-200, serial number 99080659

Manufacturer's Specifications	Measured in ARRL Lab
Frequency Coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.	Receive and transmit, as specified.
Power requirements: 3.0-9.0 V dc; receive, unspecified; transmit, 0.9 A.	Receive, 0.05 A (maximum volume, no signal); transmit, 0.8 A, tested at 9 V.
Size (hwd): 2.3×3.4×1.1 inches; weight, 6.0 ounces.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, 0.22 µV.	For 12 dB SINAD: 0.22 µV.
Two-tone, third-order IMD dynamic range: 60 dB, (spacing not specified).	20 kHz offset from 146 MHz, 57 dB, 10 MHz offset from 146 MHz, 71 dB.
Two-tone, second-order IMD dynamic range: Not specified.	80 dB.
Adjacent-channel rejection: 50 dB.	20 kHz offset from 146 MHz, 58 dB.
Spurious response: 60 dB.	IF rejection, 93 dB; image rejection, 47 dB.
Squelch sensitivity: Not specified.	0.15 µV at threshold.
Audio output: 90 mW at 10% THD into 16 Ω.	83 mW at 10% THD into 16 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output: 200 mW with batteries, 2 W with 9 V dc.	450 mW with batteries, 2.6 W with 9 V dc.
Spurious signal and harmonic suppression: Not specified.	57 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 180 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	6 ms.

proved to be pushing the limits a bit, nearly any location on the ground or second floor resulted in sufficient signal levels for solid two way communications through the repeater. Handheld use around our small town also provided reasonably good results (the usual RF holes did seem a little "deeper" though). It should be noted however, that our product review unit put out nearly $^1/_2$-W of RF energy with a fresh set of AA alkalines. Your results—of course—may vary.

Looking over the ARRL Lab data in Table 2 and comparing the numbers posted by the HTX-200 with those of the other subcompact shirt pocket 2-meter handhelds that we've reviewed (Alinco's DJ-S11T and DJ-C1T, and Standard's C108A) reveals an overall level of performance that stacks up nicely against the competition. In several instances, the '200's performance even compares favorably with some of the more deluxe 2-meter handhelds.

We did run into a problem with the original HTX-200 that we purchased for this review. While the unit was still in the very early stages of lab testing the receive audio output disappeared. RadioShack has a 90-day return policy on equipment. They cheerfully (really—*cheerfully*—no kidding!) replaced our defective unit with a new transceiver. We encountered no difficulties with the replacement unit.

The carry convenience of an H-T this small can make it a valuable addition to your communications arsenal. If walking around with a bulkier transceiver hanging off your belt cramps your style, or if it just seems to attract a little too much attention at work or school, perhaps the pocket sized HTX-200 is just what you need to keep 2-meter Amateur Radio communications capabilities close at hand.

Manufacturer: RadioShack Corp, Fort Worth, TX 76102; 800-842-7422; fax 718-415-2303; **http://www.radioshack.com**.

Manufacturer's suggested retail price, $179.99. Typical current street price, $150.

Yaesu's Vertex VX-150

With little (if any) fanfare, the Vertex Standard VX-150, along with a similar but less deluxe version—the VX-110, quietly joined the ranks of Yaesu's usual handheld lineup in one of their ads in the May 2000 issue of *QST*.

These unfortunate little transceivers were robbed of the usual full-page debut bestowed on nearly all of the new Yaesu ham equipment that has made it to market over the last few decades. Perhaps they deserve better.

These two handhelds have managed to slip the surly bonds of Yaesu's Vertex Standard commercial equipment division and escaped into their amateur division without sacrificing their nameplates. Let's have a closer look at the VX-150.

The VX-150 features 199 regular memory channels with 7-character alphanumeric naming capability; a "home" (or call) channel; extended receive from 140 to 174 MHz; dual VFOs; 5 pairs of programmable upper and lower scan or VFO limits; CTCSS and DCS encode and decode with tone scan and page capabilities; automatic repeater shift; and

5 W, 2 W and 0.5 W power output settings with the included battery pack. Also included are two user programmable keys; dual watch; nine 16-digit DTMF autodial memories; and Yaesu's exclusive Smart Search and automatic range transponder (ARTS) systems.

The transceiver's slim enclosure consists of a front cover section made of thick black plastic fastened to a chassis/framework of cast aluminum. A flat 7.2 V 700 mAh NiCd battery pack inserts into the back and is secured in place with a pivoting latch. An aggressive spring loaded belt clip is fastened directly to the aluminum framework—not to the battery pack. A rough texture covering the enclosure makes it easy to grip.

The position of the LCD window is unique—it faces upward at about a 45 degree angle. This makes it easier to read the display when the H-T is standing upright on a desktop or when it's clipped to your belt (albeit in this position the view of the window is inverted!).

The LCD is small, but the frequency digits (or alphanumeric characters) and the function icons are large enough for reasonably good legibility. A 7-segment S/RF power output meter is located along the bottom edge of the display.

A female SMA antenna connector, a volume control knob with an integral on/off switch, concentric squelch and encoder knobs and a red/green busy/transmit LED are located on the top panel. A single pin 4-section 1/8-inch speaker/microphone jack

and a coaxial-style external dc input jack are located on the right side. Rubberized PTT, monitor and lamp control buttons are positioned towards the top of the left side panel.

The 16-digit DTMF/frequency entry keypad is located in the lower part of the front panel. The number digits, the **MR**, **VFO**, ▲, ▼, **REV** and **F** keys have their labels printed directly on the surface of translucent buttons. Orange-colored illumination for both the display and the keypad can be activated, and is extremely handy for nighttime operation.

Above each key—printed in yellow letters—are their secondary control assignments.

In order to control the wide range of available features, the VX-150 relies heavily on a 38-item "Set Mode" menu. The menu items are identified by a number and alphanumeric titles up to seven characters long—"SHIFT," "SQL TYP," "DCS SET," "SKIP," are some examples. Once you've dialed up the desired feature, a quick press of the **F**unction key and a twist of the encoder will step you through the available settings. While some of the titles may seem a bit cryptic on the first encounter, they soon become familiar.

Loaded

The VX-150 offers virtually every capability—with the exception of extreme wide receive range—that we've seen up 'til now in a handheld Amateur Radio transceiver.

Yaesu has included their exclusive Smart Search and ARTS (automatic range transponder system) features. These have been avail-

able in the vast majority of VHF/UHF equipment that they've released over the last couple of years.

The Smart Search system is useful for quickly searching through the band for activity. The system will scan above and below the selected frequency and load up to 31 dedicated memories. A single pass mode sweeps the range once in each direction. A continuous pass mode will search up and down the band until all 31 memories are filled.

While the feature is definitely handy, it does tend to collect a disproportionate number of false signals, and will load strong signals into multiple positions.

The ARTS system works with other ARTS equipped (read "Yaesu") transceivers. This feature automatically transmits and listens for DCS pings. If two radios with this feature enabled move outside of communications range for more than approximately one minute, three beeps will sound and an "OUT RNG" message will appear in the VX-150's display. This capability might be useful in public service or search and rescue operations. A CW ID setting that transmits your call sign at 10-minute intervals identifies these automatic transmissions.

An additional interesting feature is a transmit battery save mode. When this is activated, the transceiver will automatically reduce the RF power output level when the last received signal was very strong.

Yaesu has earned a reputation for providing well-written documentation with their recent transceivers, and the VX-150's *Operating Manual* is no exception. The 41-page 6×8-inch booklet features several diagrams and tables, and clear, concise step-by-step guidelines for programming the various functions. A wiring diagram for connecting the radio to a packet TNC is provided, and a separate foldout sheet with a block diagram and schematic is also included.

Those who have owned and operated other contemporary Yaesu handheld transceivers will find the control arrangements on the VX-150 extremely familiar. Newcomers should have little trouble "learning the ropes" by carefully following the information included in the manual.

With the long list of features available in this transceiver, a "pocket guide" for reference in the field would have been a welcome addition.

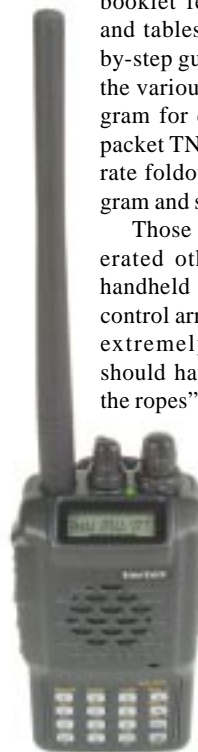The VX-150 has musical talents that should make it a popu-

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Table 3—Vertex VX-150, serial number 0C031732

Manufacturer's Specifications	Measured in ARRL Lab
Frequency Coverage: Receive and transmit, 144-148 MHz.	Receive, 140-174 MHz; transmit, as specified.
Power requirements: 6.0-16.0 V dc; receive, 130 mA (no signal); transmit, 1.3 A (maximum, high power).	Receive, 0.18 A (maximum volume), transmit, 1.3 A, tested at 13.8 V.
Size (hwd): 4.3×2.3×1.0 inches; weight, 11.5 ounces.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, 0.16 µV.	For 12 dB SINAD: 0.16 µV.
Two-tone, third-order IMD dynamic range: 70 dB, (spacing not specified).	20 kHz offset from 146 MHz, 65 dB*, 10 MHz offset from 146 MHz, 76 dB.
Two-tone, second-order IMD dynamic range: Not specified.	81 dB.
Adjacent-channel rejection: (specified at 25 kHz offset) 70 dB.	20 kHz offset from 146 MHz, 65 dB.
Spurious response: Not specified.	IF rejection, 122 dB; image rejection, 80 dB.
Squelch sensitivity: Not specified.	0.05 µV at threshold.
Audio output: 400 mW at 10% THD into 8 Ω.	450 mW at 10% THD into 8Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output: 5 W high, medium and low not specified.	4.8 / 1.7 / 0.46 W.
Spurious signal and harmonic suppression: 60 dB.	70 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 140 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	116 ms.

*Measurement was noise limited at the value indicated.

lar choice for the vision impaired. Each of the 16 keys on the front panel emits a unique note when pressed. This "key beep" function can be disabled in a menu setting if desired.

Operating Impressions

Both the receive and transmit audio clarity of the VX-150 are excellent. Stations contacted reported clear, natural sounding transmissions.

The level and quality of the receive audio are *very* impressive for a handheld unit—and are actually better than that of

several of the mobile transceivers that we've looked at recently.

This may be attributable to the VX-150's commercial heritage. Commercial handhelds often find use in industrial and construction environments where competing with background noise can be a major problem.

ARRL Lab test results (see Table 3) reveal a respectable overall level of performance. The 10 MHz offset two-tone third-order IMD dynamic range measurement scores slightly above the running average for similar units. The 122 dB IF rejection fig-

ure is the highest we've measured to date in a 2-meter H-T. (The previous holder of this title was Yaesu's FT-10R.)

If 2-meters is your primary band of interest and you need a feature-packed, compact, rugged handheld transceiver, the Vertex Standard VX-150 is worthy of serious consideration.

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703; 562-404-2700; **http://www.yaesu.com**.

Manufacturer's suggested retail price: $239. Typical current street price: $170.

AlphaMax and AlphaRemote for the Alpha 87A

Reviewed by Dick Green, WC1M

For the first few years that I owned my Alpha 87A, I rarely thought about how it could be improved. It's always been a quiet, reliable and versatile workhorse in my station. But about a year ago, Alpha/Power introduced two significant upgrades for the 87A: AlphaMax and AlphaRemote. The former is firmware that transforms the no-tune 87A into a true autotune amplifier. The latter is *Windows*-compatible software for operating the 87A remotely. Both products are now standard features in new 87A amplifiers and are also available as an inexpensive field upgrade for all existing 87A amplifiers. (The Alpha 87A was reviewed in the June 1992 issue of *QST.—Ed.*)

What's the difference between "no-tune" and "autotune?" As the term has come to be used in Amateur Radio, a no-tune amplifier uses preset tuning values that can be rapidly selected, either manually or automatically. The venerable Alpha 78 is a good example of a no-tune amplifier that offered manually selected presets: banks of variable capacitors that could be pretuned with a screwdriver to match the output circuit to the antenna impedance in a particular band segment. The main drawbacks were that you still had to remember to change the band switch, and the small variable capacitors had limited bandwidth and limited ability to handle the high values of reflected power that result from a mismatch.

The original Alpha 87A solved these problems with computer-selected presets. Instead of using small tuning capacitors, all tuning is done using the large main tune and load capacitors. At installation, you simply tune up on five frequency segments in each band and store the settings in the 87A's non-volatile memory. After that, you seldom have to touch anything except the on and off switches. The 87A automatically detects the transmit frequency and activates computer-controlled stepper motors to set the bandswitch and variable capacitors to the values stored for that band segment. The re-

tuning only takes a second or two.

Combine this rapid band change capability with computerized logging software, a computer-controlled rig and band decoders for automatic antenna selection, and you set the stage for high contest scores and some serious fun. For example, while casually operating in the last CQ WPX SSB contest, I worked 327 packet spots on five bands and my hands never left the keyboard!

The biggest drawback to the original 87A design was that you could only store the settings for one antenna in each segment. This was particularly nettlesome when I built an automated single operator two radio (*SO2R*) contest station that has multiple antennas for each band that can be switched between the two radios. This meant that the original 87A's output network could be presented with several different impedance values on a given frequency, but only one could be properly matched.

Operators of stacked antennas are sometimes faced with a similar problem. There can be impedance variations between different configurations of the stack, especially when stacks for multiple bands are mixed on the same tower.

Bottom Line

Available standard in new Alpha 87As and as an upgrade for earlier versions, AlphaMax adds true autotune operation to these popular amplifiers. Updated control software—AlphaRemote—allows computer control of these units in a Windows operating environment.

You can run into mismatch problems even if you have only one antenna for each band. The 87A's band segments are relatively wide: 40 kHz on 160 meters, 100 kHz on 80 through 15 meters and 400 kHz on 10 meters. Normally, you tune up at the center of each segment, and if the antenna's bandwidth is limited, the amp can be somewhat off the correct tuning when operated at either edge of the segment. Sometimes you can compensate for this by redefining the center frequency, but you have to be careful not to allow segments to overlap (otherwise the firmware gets confused).

Here's another common source of single-antenna mismatches: during bad weather many of us have experienced antenna impedance variations resulting from rain, snow or ice accumulation.

In all of these cases, the result of a mismatch is usually a drop in output power and an increase in grid and/or plate current. The 87A has elaborate self-protection circuits, so the tubes are not in danger, but it's annoying when the amp trips in the middle of a QSO. Also, improper tuning can cause distortion, flat-topping and splatter on SSB.

Autotune with AlphaMax

The AlphaMax upgrade solves the multiple antenna matching problem once and for all. Autotune amplifiers traditionally use a phase detector, but this would have significantly increased the cost of the 87A and would have made a field upgrade either impossible or very expensive. Instead, the Alpha/Power engineers came up with an ingenious method for tuning the amplifier in software. Using "fuzzy logic," the AlphaMax firmware simulates what a human operator would do with the tune and load variable capacitors. After doing that, a well-trained human operator would increase the loading a little to prevent clipping, using about a 5% reduction in output power as a guideline. AlphaMax doesn't have to guess—since it has all of the 87A's operating parameters instantly available, it tunes

for the optimum gain point, which results in the greatest efficiency and the least distortion.

How well does it work? Extremely well at my station. On the high bands, I run a Hy-Gain TH7, a Force 12 C3E and sometimes a GAP Titan. In the heat of battle, I parallel the TH7 and the C3E for a bigger footprint (eg, to work Europe and Japan at the same time.) Each of these options presents a different impedance to the amplifier on any given band. What's more, I use switchable bandpass stub filters that can affect the impedance on some frequencies. During the past year, AlphaMax has been able to match all of the antenna and filter combinations on each band almost immediately. When I switch antennas, I usually hear the stepper motors pulse rapidly for a second or two, and the match is complete. Occasionally it takes five seconds or so to find a match, but that's rare.

Of course, there's one variable that AlphaMax can't control, and that's the input power. After AlphaMax finishes tuning, it's not uncommon for me to reach over and either increase or decrease the transceiver's output power to achieve 1500 W output on the 87A (which sometimes causes a brief flurry of retuning by AlphaMax.) The power adjustment is always very small—with my antennas, the power doesn't change by more than a couple of hundred watts.

Because input power is one of the tuning variables, AlphaMax typically takes a little longer to work on SSB. That's because the peak power of the SSB waveform varies more rapidly than CW, and the shifting input power makes it more difficult for AlphaMax to optimize the settings. This has not been an inconvenience for me during SSB contests (perhaps due to my SHOUTING into the microphone…).

AlphaMax begins with the tuning parameters that it finds for the band segment in non-volatile memory. That can be either the factory default (optimized for a non-reactive 50-Ω load) or whatever settings you have stored. I found that AlphaMax was able to tune any of my antennas quite easily when starting from the default values. However, it tuned faster and the match was better when starting from manual settings that I had stored for that antenna. Alpha/Power says that the firmware algorithm has to make certain compromises, so the manual tuning procedure can result in a slightly better match and provides the best starting point for AlphaMax.

AlphaMax will attempt to tune the amp 80 times before giving up. So far, I have never seen it make anywhere near 80 tries and it has never given up. This is no accident. The 87A protection circuits are well-known for tripping at around 2:1 SWR. This is to protect the pin diodes, which are vulnerable to high levels of reflected power. 87A users are therefore forced to have antennas with impedances close to 50 Ω, and then AlphaMax will have a pretty easy time of it.

Installation

Installation of the upgrade kit is straightforward. Alpha/Power provides excellent documentation with step-by-step instructions and a detailed photograph. All you have to do is unplug the amplifier, remove the top cover, remove the screws holding the front panel, unplug a couple of connectors and replace two chips on the motherboard. Be sure to follow the safety instructions in the manual—LETHAL VOLTAGES CAN BE PRESENT INSIDE ANY HF AMPLIFIER. Also, be very careful not to bend the pins when you replace the chips. Finally, carefully record the position of the circuit board connectors that you unplug, and replace them exactly as you found them.

I saw a post on one of the Internet reflectors from a ham who replaced a connector incorrectly and shorted some components on the CPU board. That amp required a trip back to Alpha/Power. The installation is easy, but take it very, very slowly.

Remote Control with AlphaRemote

In addition to AlphaMax, the upgrade includes a copy of the AlphaRemote software. This *Windows*-compatible software lets you control virtually all of the 87A's features from your computer. AlphaRemote is especially useful for those who operate one or more 87A amplifiers remotely (yes, you can do it over a telephone line with modems), or for those who would like to locate the 87A away from the operating desk. With an RS232 cable, you can put the 87A 100 feet or more away from your operating position. Personally, I still have my 87A on the operating desk. It's so darned quiet I'm not motivated to move it!

The 87A has always had a text-based status and command interface accessible via RS232. AlphaRemote provides a much friendlier graphical user interface under *Windows*, while using the text-based interface behind the scenes (ie, it's a "front-end" for the 87A.). Most of the 87A's LED meters are reproduced on the screen as green bar graphs that turn yellow or red when values get close to or exceed maximums. Most of the front panel switches are reproduced as well, allowing you to perform just about any operation that you could do manually, including tune up.

Since my amp is right on the operating desk, I didn't think I would use AlphaRemote very much. But now that I've switched to the *WriteLog Windows*-based contest logging program, I find it very convenient to have status and control of the 87A available right on the screen and accessible with a click of the mouse.

A "Wish List"

There are a few things missing from AlphaRemote. One is that it does not reproduce the LED tuning scale mounted on the front panel of the 87A. This means you can't use the tuning procedure documented in the 87A manual when operating the amp remotely, and must rely on standard procedures for tuning an amplifier. There's nothing wrong with that, but I've come to like the 87A's front panel tuning indicator and find it somewhat quicker and safer to use than the standard method. I think this would be a great feature for people who need to tune the amp remotely, especially over phone lines.

Another shortcoming is that there is no equivalent of the GPIO ON/OFF text command, which gives a continuous display of grid current, plate current, input power and output power. I've found the precise numbers very useful for testing and would like to see them on the AlphaRemote screen. Finally, there's no online help for AlphaRemote.

Installation of AlphaRemote software is straightforward as well, although it does not use the latest *Windows* installation techniques. The first time I installed the software, I got a couple of error messages and the installation did not complete properly. However, reinstalling the software solved the problem.

As one of the first customers for the upgrade, I received a draft copy of the manual. I found some shortcomings in it that I reported to Alpha/Power. A few weeks later I was delighted to receive an unsolicited revised copy of the manual with many of my suggestions implemented. In my experience, the service at Alpha/Power has always been excellent, and this was no exception.

Alpha/Power has created an affordable upgrade for the 87A that significantly extends the useful life of the product line, protecting each owner's substantial investment in this state-of-the-art amplifier. We can only hope that other manufacturers of computer-based gear will follow suit.

If you have an 87A, you owe it to yourself to get the AlphaMax and AlphaRemote upgrade. The AlphaMax and AlphaRemote upgrade package for existing 87A amplifiers sells for $99.

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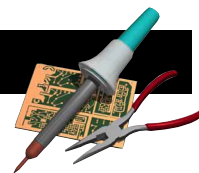
Arcron Zeit "Chrono" Wristwatch

A few years ago we reviewed a desktop alarm clock from German manufacturer Arcron Zeit that calibrated itself by monitoring and decoding time signals broadcast by National Institute of Science and Technology station WWVB at 60 kHz. The clock represented what was then relatively new consumer technology—clocks with built-in WWVB receivers. Each night, usually in the wee hours when WWVB's signal was loud and clear, these ingenious clocks automatically adjusted their time to match WWVB.

Well, "time" marches on. Now the same products that were desk and tabletop units several years ago have morphed into durable water-resistant timepieces that you can wear on your wrist.

Enter the Arcron Chrono

At first glance the Arcron Chrono looks like your run-of-the-mill sports watch—large buttons and all. A closer look at the three-section display gives you a hint that this device is a little different. You have to marvel at how they can squeeze seven functions into a normal-sized watch and have room for a 60-kHz receiver. Where do they put the antenna, you ask? No, it isn't part of the wrist strap (I checked). An internal inspection of the watch didn't provide obvious clues, but my guess is that it is a very small circular loop. I didn't want to disassemble the Chrono further and risk not being able to put it back together again! At any rate, you don't need much of an antenna to pick up WWVB. Its powerful signal blankets North America and could probably be received on the proverbial wet string.
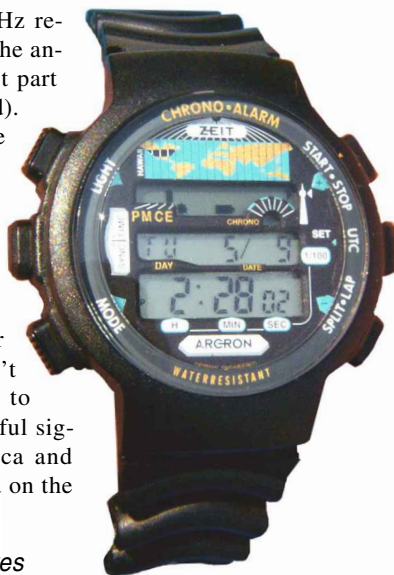
Chrono Time/Date Features

The watch displays local time in easy-to-read numerals in the main window. Just above, in the auxiliary window, you can set the Chrono to display either the date or UTC time. (I was pleased to discover that the Chrono displayed UTC in 24 format.)

This wouldn't be a multifunction watch without an alarm, and the Chrono offers two of them. Your typical "beep" alarm is there to warn you of specific appointments. The second alarm is a little out of the ordinary. It's a "date alarm" that reminds you of important dates by flashing the display continuously to get your attention. Of course, it's up to you to remember *why* the display is flashing (a sked, contest, operating event?).

The stopwatch function includes elapsed time, split time (when you are timing two events simultaneously) and a lap time. The stopwatch readout appears in the main display.

Finally, there is a light. Pressing the **LIGHT** button provides three seconds of soft blue background glow. My 45-year-old eyes can read the local and UTC time displays easily enough, but I squint at the other information. The light does a good job of bringing the displays into sharper contrast under low-illumination conditions.

And What about WWVB?

The Chrono watch is programmed to begin monitoring WWVB at 0100 local time. It will continue to monitor until it receives enough data for a valid time synchronization.

One interesting feature included in the Chrono is manual reception. This means that you can force the Chrono to activate its receiver at any time by pressing and holding a single button. If you are within daytime VLF propagation range of WWVB (most of Colorado and parts of adjacent states), the Chrono will attempt to sync right away. For the rest of us…well, I must confess that I didn't attempt to stay up past 1 AM and manually synchronize the Chrono, but I did give it a shot at about 9 PM local time. Although the Chrono manual doesn't mention this per se, the WWVB sync indicator in the "multifunction display" (the upper third of the watch face) is actually a signal-strength meter. I watched as WWVB's signal rose and fell while the Chrono attempted to decode the data. It was no-go at 9 PM, but an interesting little exercise nonetheless.

The Real World Test

My approach to using the Chrono was to deliberately set it to the incorrect time, then let it sit on my station desk overnight. I live in an aluminum-sided home; it's a virtual RF cage. In my station the nearest window is 12 feet from the desk.

Each morning I was greeted with a tiny triangle on the display next to the radio tower symbol (this is the same area where the signal-strength indicator appears in the manual mode). The appearance of the triangle confirmed that the Chrono had indeed synchronized itself during the night. One evening I accidentally left the Chrono buried deep in a coat pocket in a downstairs closet. Not a problem. The Chrono still heard WWVB's persistent pulses and synchronized as usual.

For practical Amateur Radio applications I found the Chrono very handy for remembering on-air schedules and nets. I was also able to use it very successfully in my satellite operating where precise timing is of particular importance.

Yes, the Chrono costs substantially more than the average sport watch, but how many watches have you seen with built-in 60-kHz receivers that automatically calibrate themselves to atomic clocks? The Chrono is an uncommon and remarkable piece of timekeeping technology.