

Product Review Column from *QST* Magazine

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Alinco DX-70T Transceiver

QST Compares: Pocket Morse Code Trainers

(MFJ Pocket Morse Tutor; Morsix Codeman MT-5; Computer Aided Technology "Standard" and "Ultimate")

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Alinco DX-70T Transceiver

Reviewed by Rick Lindquist, KX4V
Product Review Editor

The availability of compact HF transceivers has fueled a resurgence in the popularity of mobile operation the past several years that really took off when rigs like the Kenwood TS-50S and the Ten-Tec Scout 555 left the starting gate. Full-featured transceivers for HF that are smaller than the 2-meter FM rigs of just a few years ago have captured the imagination of the ham on the go. Despite precious little room in today's vehicles to install *any* radio gear, these tiny radios have opened up the world of HF mobiling to practically everyone. Pop one of the many low-cost HF mobile antenna systems on your trunk lip, bumper or roof and you're on the air!

Now, Alinco has weighed into the fray with its DX-70T compact transceiver, an attractive package that offers not only 100 W on HF but 10 W on 6 meters! It's a multimode rig, too: SSB, CW, AM and FM are available at the touch of a front-panel button. The radio also can be used for digital modes (RTTY, AFSK, FAX and SSTV) via connections to the microphone jack. The DX-70T is Alinco's first outing in the HF transceiver arena.

This is a radio for those who take their hobby on the fly, and we reviewed it primarily in that context: Our DX-70T spent a *lot* of time on the road! The radio accompanied one of our reviewers on a more than 5,300-mile road trip from Connecticut to Texas and back, including a tour along the Blue Ridge Parkway in North Carolina and Virginia. He worked more than 250 stations on the DX-70T—all but a handful while mobile and most on SSB or FM—and he particularly enjoyed the rig's portability.

What It's Got

The ability to separate the front panel from the radio "body" makes it easier to mount than one-piece models and sets the DX-70T apart from compact competitors like the TS-50 and the Scout. To install the "control head" and the radio in separate locations requires the optional EDS-4 accessory cable, which we did not have for this review. Depending on how far away you mount the radio



itself, you also might need the optional EDS-5 microphone extension cable, since the jack is on the radio proper, not on the front panel. Given this adaptability, you should be able to find space in nearly any vehicle to install this radio, a real plus for those cars where the driver's seat more closely resembles a cockpit. The rig's size also makes it convenient to move from one vehicle to another, a real plus if you operate mobile from more than one vehicle, or if you travel a lot and frequently use rental vehicles.

Some reviewers expressed concern about the seeming "fragility" of the small-gauge wiring harness between the "control head" and the radio. Even if you don't plan to mount them apart, you still need to detach the face to connect or disconnect the microphone. While no one encountered any problems with the wiring, a couple of reviewers complained about the cramped quarters available to unscrew the mike connector, which is slightly recessed. The microphone itself is lightweight and comfortable to handle. It includes **UP** and **DOWN** buttons to control tuning and other modes, including some scanning functions.

For added fun, 6 meters is standard on the DX-70T. While conditions on that band during the review period were not spectacular, one reviewer did fire it up on SSB from his home (in FN31), feeding a six-element Yagi at 30 feet to work stations in the Greater New York City area with good reports. Later, mobiling in Texas, the same reviewer managed to snag two more stations during the September VHF QSO Party using a bumper-mounted quarter-wave antenna. Another reviewer who made several local and regional contacts on 6-meter SSB said he got excellent audio reports using the speech proces-

sor and the stock hand-held microphone. Their only wish was for more power on 6 meters.

Besides the other expected features—like general coverage receive, two VFOs, lots of memories and IF shift—the DX-70T includes some nice touches. In addition to your operating frequency, the busy but still easy-to-read backlit display window displays mode, noise-blanker, AGC, RF attenuation/preamp, VFO and filter status, RIT offset, memory channel and S reading or RF output. Major front-panel controls are prominent enough that you don't have to divert your attention from road to radio every time you tune or make adjustments, a definite driving advantage. The main tuning dial and the audio, squelch, RIT and IF shift controls flank the display window; just below are the **MODE** switches and dual-function buttons for RF and noise blanker, filter choice and AGC, and high or low-power selection and tune. The DX-70T also includes—standard—the EJ-26U CTCSS tone encoder to access 10-meter and 6-meter repeaters. The user selects the desired CTCSS tones using DIP switches on the bottom of the rig. A convenient chart is permanently affixed to the bottom plate, so you don't need to refer to the instruction manual for the proper DIP switch settings unless, of course, you install the set under the seat.

Also standard on this little radio: narrow filters for CW, SSB and AM; the ability to receive CW from either the upper or lower side; full break-in on CW and separate antenna ports for HF and 6 meters. Additional niceties include a preamplifier, memory scanning and adjustable CW sidetone and offset. A top-firing speaker provides plenty of audio at reasonable quality—especially

The Bottom Line

The DX-70T, Alinco's first HF transceiver, is a welcome mobile traveling companion or second rig at home. It covers HF and 6 meters and offers loads of standard features, including a detachable front panel, narrow CW and SSB filters, a preamplifier and a CTCSS tone encoder.

Table 1**Alinco DX-70, serial no. T00-765****Manufacturer's Claimed Specifications**

Frequency coverage: Transmit, 1.8-2; 3.5-4; 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, 0.15-30 and 50-54 MHz.

Size (width, height, depth): 7.1x2.8x9.1 inches; weight: just under 6 pounds.

Modes of operation: LSB, USB, CW, AM and FM

Power requirements: Receive, 1.0 A max; transmit, 20 A max.

Receiver

SSB/CW sensitivity (bandwidth not specified, 10 dB S/N):
0.5-1.8 MHz, 1 μ V (-107 dBm); 1.8-30 MHz,
0.25 μ V (-119 dBm); 50-54 MHz, 0.15 μ V (-123 dBm).

AM sensitivity (10 dB S/N): 0.5-1.8 MHz, 10 μ V;
1.8-30 and 50-54 MHz, 2 μ V.

FM sensitivity: Not specified.

Blocking dynamic range: Not specified.

Two-tone, third-order IMD dynamic range:
Not specified.

Third-order input intercept: Not specified.

Second-order intercept point: Not specified.

FM adjacent channel rejection: Not specified.

FM two-tone, third-order IMD dynamic range:
Not specified.

S-meter sensitivity: Not specified.

Squelch sensitivity: Not specified.

Receiver audio output: >2 W at 10% THD into 8 Ω .

IF/audio response: Not specified.

Spurious and image rejection: >70 dB.

Transmitter

Power output: HF SSB, CW, FM: 100 W, high; \approx 10 W, low.
AM, 40 W, high; \approx 4 W, low. 50 MHz SSB, CW,
FM: 10 W, high; \approx 1 W, low. 50 MHz AM: 4 W, high; \approx 0.4 W, low.

Spurious-signal and harmonic suppression: HF: 50 dB or more
(except 45 dB on 10 MHz band). 6 meters: 60 dB or more.

SSB carrier suppression: 40 dB or more.

Undesired sideband suppression: >50 dB.

Third-order intermodulation distortion products:
Not specified.

CW keying characteristics: Not specified.

Transmit-receive turnaround time (PTT release to 50%
audio output):

Composite transmitted noise: Not specified

*Blocking dynamic-range measurements were made using 100 kHz spacing instead of the ARRL Lab standard signal spacing of 20 kHz because of AGC effects. Two-tone, third-order IMD dynamic range measurements were made at 20 kHz spacing. Blocking dynamic range measurements and some two-tone third-order dynamic range measurements were noise limited at the values shown.

**Noise-limited at the value shown.

Measured in the ARRL Lab

As specified.

As specified.

Receive, 0.7 A; transmit, 14.7 A; tested at 13.8 V dc.

Receiver Dynamic Testing

Minimum discernible signal (noise floor) with 500-Hz IF filter:

	Preamp off	Preamp on
1.0 MHz	-126 dBm	-130 dBm
3.5 MHz	-131 dBm	-138 dBm
14 MHz	-129 dBm	-136 dBm
50 MHz	-138 dBm	-140 dBm

10 dB (S+N)/N (signal 30% modulated with a 1-kHz tone,
9-kHz [wide] filter):

	Preamp off	Preamp on
1.0 MHz	2.6 μ V	1.6 μ V
3.8 MHz	1.6 μ V	0.6 μ V
50 MHz	0.7 μ V	0.5 μ V

For 12 dB SINAD:

	Preamp off	Preamp on
29 MHz	0.8 μ V	0.26 μ V
50 MHz	0.23 μ V	0.16 μ V

Blocking dynamic range with 500-Hz IF filter:*

	Preamp off	Preamp on
1.0 MHz	123 dB	125 dB
3.5 MHz	127 dB	129 dB
14 MHz	123 dB	126 dB
50 MHz	126 dB	125 dB

Two-tone, third-order IMD dynamic range with 500-Hz IF filter:

	Preamp off	Preamp on
1.0 MHz	88 dB**	88 dB**
3.5 MHz	93 dB	90 dB
14 MHz	84 dB	92 dB
50 MHz	91 dB	86 dB

	Preamp off	Preamp on
1.0 MHz	+5.8 dBm**	+2.0 dBm**
3.5 MHz	+8.4 dBm	-2.9 dBm
14 MHz	-2.9 dBm	+1.9 dBm
50 MHz	-1.6 dBm	-10.8 dBm

+55 dBm, preamp off; +52 dBm, preamp on.

\geq 75 dB at 20 kHz channel spacing.

\geq 73 dB at 20 kHz channel spacing.**

S9 signal at 14 MHz: preamp off, 146 μ V; preamp on, 50 μ V.

At threshold, preamp on: FM, 29 MHz, 1.2 μ V or less; 52 MHz,
0.3 μ V or less; SSB, HF, 2.5 μ V or less; 52 MHz, 0.6 μ V or less.
2.5 W at 10% THD into 8 Ω

Range at -6 dB points, (bandwidth)

CW-W: 227-1401 Hz (1174 Hz); CW-N: 475-1100 Hz (625 Hz)

USB-W: 301-2566 Hz (2265); USB N: 727-2175 Hz (1448 Hz)

LSB W: 251-2375 Hz (2124); LSB N: 502-2000 Hz (1498 Hz)

AM W: 210-2820 Hz (2610 Hz); AM N: 206-1430 Hz (1224 Hz).

IF rejection \geq 72 dB; image rejection, \geq 81 dB.

Transmitter Dynamic Testing

HF SSB, CW, FM power output: Typically 114 W, high; 13 W,
low (varies slightly from band to band). HF AM power output:
Typically 48 W, high; 9 W, low. 50 MHz SSB, CW, FM power
output: 11 W, high; 1 W, low. 50 MHz AM: 5 W, high; 0.7 W, low.

Worst case, 56 dB at 3.5 and 10.1 MHz. Meets FCC specifications
for equipment in its power output class and frequency range.

As specified. >60 dB for HF.

>60 dB.

See Figures 1 and 2.

See Figure 3.

S9 signal, \approx 8 ms.

See Figures 4 and 5.

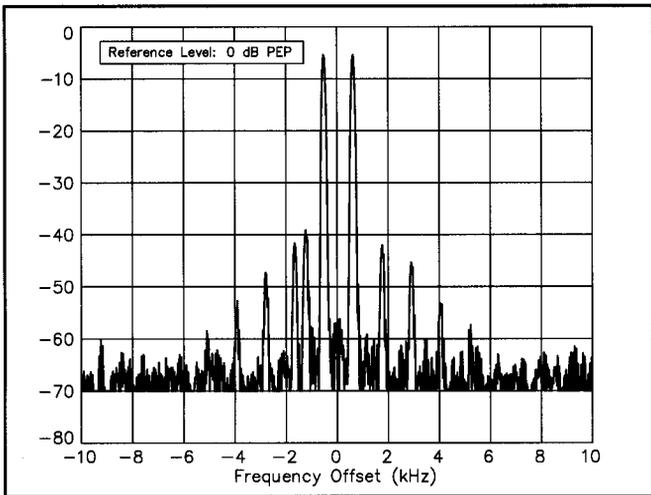


Figure 1—Typical VHF spectral display of the DX-70T transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 42 dB below PEP output. The fifth-order product is approximately 46 dB down. The transceiver was being operated at 10 W PEP output at 52 MHz.

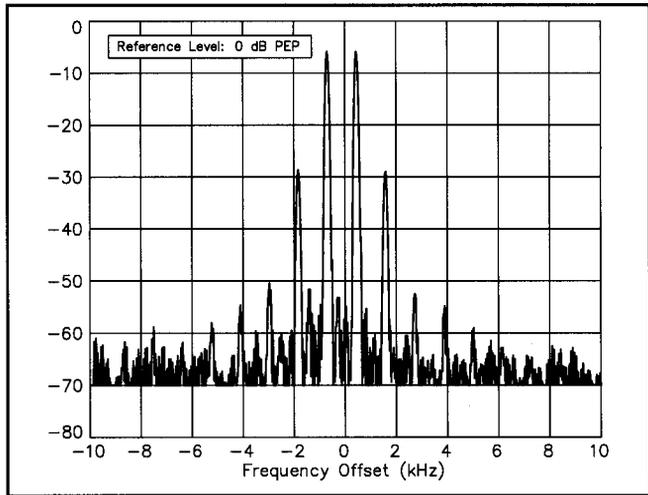


Figure 2—Worst-case HF spectral display of the Alinco DX-70T transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 29 dB below PEP output. The fifth-order product is approximately 51 dB down. The transceiver was being operated at 100 W PEP output at 14.2 MHz.

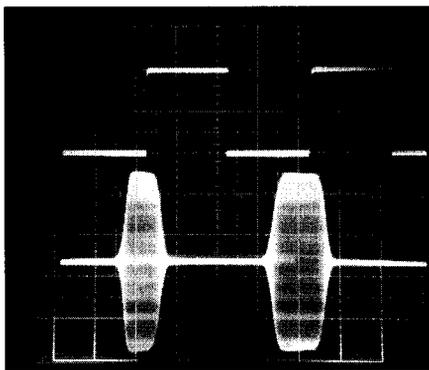


Figure 3—CW keying waveform for the DX-70T in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz.

for a small radio—even in a noisy vehicle. A rear-apron external-speaker jack doubles as a headphone jack, but you need to use an attenuator adapter with headphones to keep from blowing out your 'phones or your hearing! (One reviewer lamented the lack of a separate headphone jack as “very inconvenient for home use, and just about impossible for mobile.”) The cooling fan is efficient and quiet, so much so that one reviewer at first didn't even realize it had one.

Using the DX-70T

As with most new rigs, the level of sophistication has risen to the point that you really can't get away without reading the instruction manual at some point. (I found I needed it immediately, to determine how to go from semi-break-in CW to full-break-in.) Overlooking for the most part the “rough

spots” in the translation to English from Japanese, the reviewers rated the manual as adequate. It's compact enough to carry along with the rig, and it even includes some tutorial-style “exercises.” The manual starts out with the basics in each area, then directs the reader to related, advanced features. But even with the best manual, operators should expect a learning curve, and the reviewers found themselves quickly becoming familiar with routine functions on the DX-70T.

A front-panel **MULTI FUNCTION** knob—about half the size of the main tuning knob—is just below and to the left of the display window. It stands out enough to be vulnerable to clumsy fingers, a pitfall common during mobile operation when you're trying to keep the vehicle on the road. A tiny, white **MF SEL** button determines the **MULTIFUNCTION** knob's purpose in life, but most of the

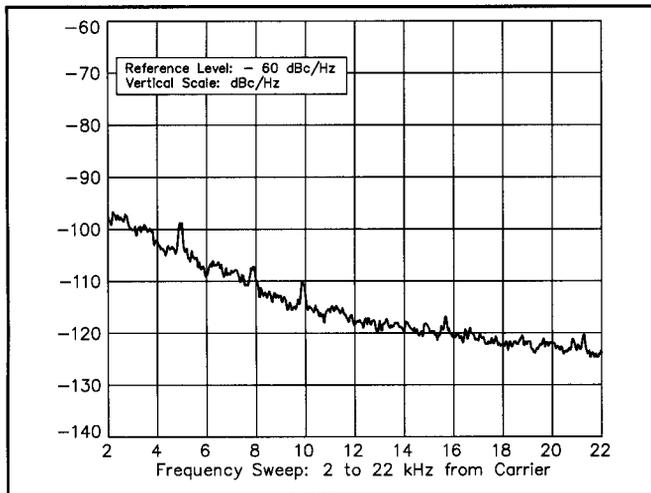


Figure 4—Spectral display of the DX-70T transmitter output during composite-noise testing. Power output is 10 W at 50.2 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

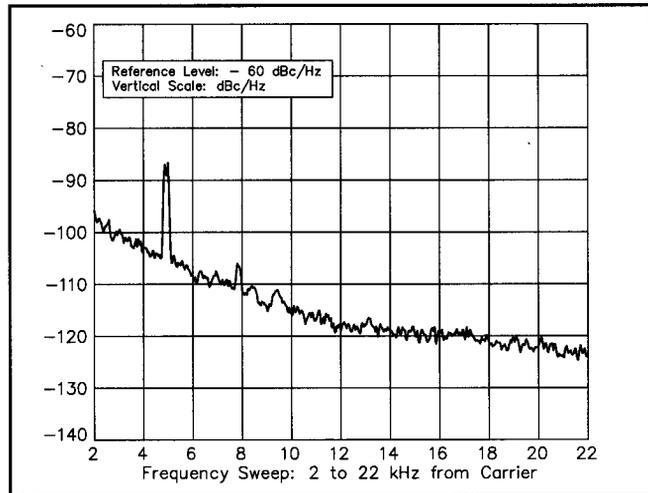


Figure 5—Spectral display of the DX-70T transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

time, you'll use it change frequencies or bands quickly. You also use this control to select one of the 100 memories.

The RIT is easy to engage and *almost* handy—if you don't mind toggling through several other functions (including transmit offset) on the **RIT** button to turn it off and don't care if the RIT only offers maximum excursions of just ± 1.4 kHz. The DX-70T offers a quick offset mode. Press and hold the **SPLIT** button above the main tuning knob, dial in your split (eg, 5 kHz) and presto, you're there!

One front-panel control you'll use repeatedly on the DX-70T is the **FUNC** button, just below the concentric **AF** and **SQL** controls. This button accesses the second tier of the dual-function buttons and proved to be both a blessing and a curse for the review team. Several reviewers griped that the AGC, noise blanker and speech processor should have been primary functions. One team member noted the light blue panel lettering for the second-tier functions was hard to read. (Primary function lettering is white.)

As it is, you first push the **FUNC** button, then the button for the specific function. For example, you push the **FUNC** button, then the **FILTER/AGC** button to change the AGC action from fast to slow. (However, you cannot disable the AGC on the DX-70T). Similarly, you push the **FUNC** button, then the **RF/NB** button to turn the noise blanker on or off. However, *that* proved to be a mere academic exercise for most review team members, who felt the noise blanker worked almost as well *off* as it did *on*! Since a solid noise blanker is essential for HF mobile work, we investigated further.

A check in the ARRL Lab seemed to confirm suspicions that the noise blanker on the DX-70T was pretty ineffectual, so we obtained another DX-70T from a local supplier to see how it performed. After its noise blanker checked out the same as the first, we called Alinco, who asked us to return the transceiver for servicing. Alinco said it "updated" the noise blanker in our unit by replacing some components to increase the attack time. The "improved" noise blanker did work somewhat better against ignition noise, but, as one reviewer put it, "not as effectively as I would like...I can still lose weak signals in the noise." He also said the noise blanker now seemed to introduce some distortion on signal peaks. However, another reviewer said the noise blanker "worked well" and removed all the ignition noise from his vehicle.

This experience conforms with the manufacturer's somewhat cryptic explanation. Alinco said the noise blanker "may not work effectively when the radio is installed in certain vehicle models"—suggesting that

ignition noise may be vehicle-specific—and that the noise blanker "may not work for all kinds of noise." The company offered to take care of DX-70T noise-blanker problems case by case.

While most reviewers agreed the noise blanker left a bit to be desired, opinions were more divided on how well the available selectivity enhancers worked on the DX-70T. Although most testers found the wide and narrow filters a real plus, one felt there was little difference between the 1 kHz and 500 Hz positions in CW and that the IF shift didn't do much. Another felt the 1 kHz "narrow" position in SSB was "way too narrow" for optimum intelligibility, while a third thought the same filter cut back the audio level too much. These discrepancies might have a lot to do with what you're used to in the home shack. If you're accustomed to the filter performance common in upper-end radios, the DX-70T might disappoint you.

The receiver seemed plenty sensitive, even using typical mobile HF antennas. If you're trying to pull out a weak one, a preamplifier is available via the **RF/NB** button to augment sensitivity. The same button also toggles through a 'zero' position (preamp off) and two levels of attenuation, down to -20 dB. Help is available on SSB transmit, too, in the form of a speech compressor. On-air reports indicated the compressor gives a needed boost without sounding obnoxious. You use a setup menu to turn on the speech processor (and to adjust several other modes and functions). One reviewer who put the DX-70T on 20-meter SSB found the radio performed admirably in the face of strong signals, even with the preamp on. Another tester even used the DX-70T for a downlink receiver for the RS-10/11 satellites and reported it worked very well.

For mobile CW operators like me, the DX-70T's standard narrow filter and full break-in are welcome amenities, but the rig does not have a built-in keyer. On-air reports and Lab testing indicated clean keying both in QSK and in the default semi-break-in modes (see Figure 3). The rig's keying relay in QSK was judged excessively noisy and distracting by the CW operators on the team, but "road noise" might cover it up in some vehicles. You can pick one of three semi-break-in delay settings or an "auto" delay setting which is supposed to track sending speed. It works, but the initially exorbitant delay could be disconcerting. Once the rig "figures out" how fast you're sending, though, it adjusts accordingly.

Some radios are finicky, but the DX-70T seemed to handle a couple of common adversities with aplomb. I ran the set from a marine battery that hadn't been topped off for

awhile. Despite the fact that the key-down voltage soon dropped off to around 11.5 V, my CW signal still sounded OK on the other end—no "chirp"—although the display flickered perceptibly and the power output waned. Another reviewer found the set was less fussy than most solid-state rigs about getting an exact 50- Ω match at the antenna terminal: it put out full power where some rigs would start throttling back as the SWR climbed. By the way, if you're into QRP or want to conserve power during battery operation, the front-panel **H/L** switch lets you drop the output power to approximately 10 W on HF and approximately 1 W on 6 meters. Using an internal switch, you can limit high power on HF to 50 W.

The DX-70T works with its own matching, optional EDX-1 manual antenna tuner or one of the competitors' automatic ones, according to the manual. The mobile mounting bracket is an optional accessory. The DX-70T does have a flip-down bale to tilt it up for desktop use.

OK, But Would We Buy One?

Everyone enjoyed using the DX-70T, but the mediocre noise blanker in the DX-70T kept us from giving this little radio higher marks overall. As one team member saw it, "The rig always worked as expected and didn't exhibit any unusual quirks." Another found it "easy to use, once I got used to the layout of the controls and the display." (As I stated earlier, every radio has a learning curve.) A third called it "a great little rig" and "very user friendly." Noted deficiencies aside, the DX-70T offers some real advantages for mobile HF operating—size, detachable front panel, standard filters—with all modes on 6 meters thrown in as a bonus! (One reviewer said his wife liked the fact that the DX-70T took up far less room on the passenger side than his regular mobile rig.) Considering it's in the same price class as radios offering fewer features, the DX-70T certainly warrants a close look for all who enjoy taking their hobby along for the ride.

The suggested retail price for the DX-70T is \$1439, but recent specials and coupons have brought the street price down to the \$1000 range. As usual, check with your favorite dealer for current pricing. The optional EDS-4 accessory cable extender kit is \$44. *Manufacturer:* Alinco Electronics Inc, 438 Amapola Ave, Unit 130, Torrance, CA 90501; call 310-618-8616; fax, 310-618-8758.

Thanks to Glenn Swanson, KB1GW; Clem Paskus, K1EM; Norm Bliss, WA1CCQ, and Pete Budnik, KB1HY for their help in preparing this review by putting the DX-70T through its paces.

QST Compares: Pocket Morse Code Trainers

By Glenn Swanson, KB1GW
Educational Programs Coordinator

Every so often, people call who claim to have "memorized" all of the code on their code-training tapes and usually want to know if there is another source of practice. Of course, there's WIAW or actual CW QSOs, but these folks often are new to Amateur Radio and don't have short-wave receivers. Morse tutoring programs are nice, but not everyone owns a personal computer either.

The answer could be a pocket Morse code trainer! Because these microprocessor-based trainers are dedicated to a single task, are portable, and use little power, they fit the bill for those who find themselves looking for an alternative way to learn or practice CW. Best of all, you can practice code *anywhere*.

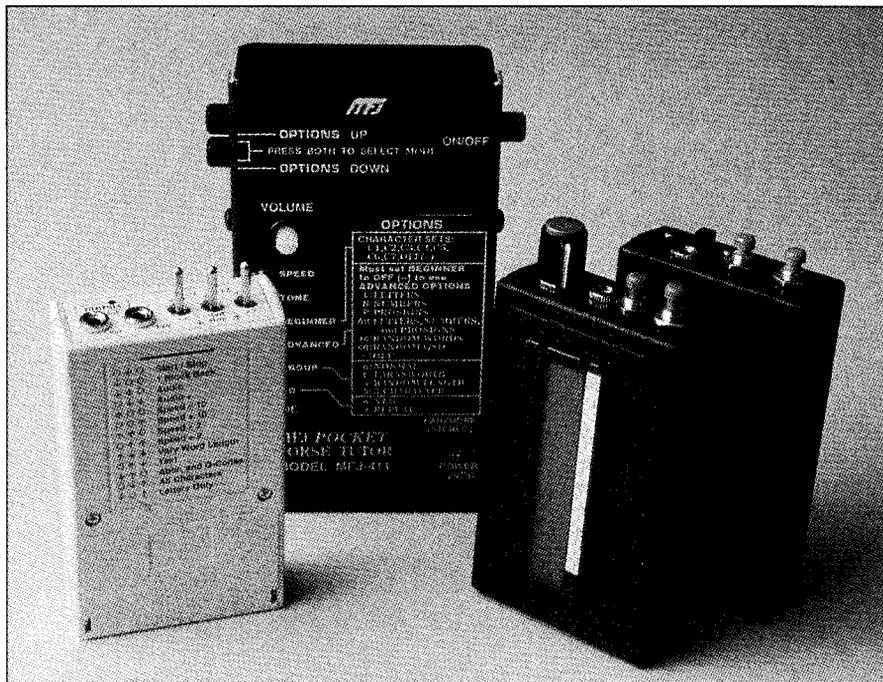
The pocket, or portable, Morse code trainers we reviewed include the MFJ Pocket Code Tutor, the morsix Codeman mt-5, and two units from Computer Aided Technology: the Standard and Ultimate models. This review incorporates the observations of active CW operators including Larry Wolfgang, WR1B, Senior Technical Editor; Harry White, N1QVE, Educational Assistant; Mike Gruber, WA1SVF, Laboratory Engineer; Rick Lindquist, KX4V, Assistant Technical Editor; and myself.

MFJ POCKET MORSE TUTOR

The MFJ Pocket Morse Tutor—the largest and heaviest unit in this group—probably pushes the outer limits of its "pocket" designation. A red **ON/OFF** push button is on the right-hand side of its sturdy, black metal case. Two black push buttons on the left side (**OPTIONS UP** and **OPTIONS DOWN**) select various functions. The Pocket Morse Tutor has a downward-firing speaker, a top-panel-mounted **VOLUME** control and adjustable sidetone pitch. It provides enough audio to fill a small room. For private listening, you can connect a stereo headset via a mini-jack on the side. An internal 9-V battery or an external 12-V dc power supply (not included) can power the unit. Unfortunately, you must remove four screws to replace the battery.

As you step through each function via the **OPTIONS** buttons, a row of red **MODE** LEDs associated with a printed menu on the unit's front show which mode (**BEGINNER**, **ADVANCED**, and so on) you're in. A separate, two-digit red LED readout indicates **OPTIONS** within each mode, such as code speed, random words mode, or random QSO. Press both **OPTIONS** buttons to set the mode, then press **OPTIONS UP** or **OPTIONS DOWN** to make your choices within the available menus.

The Pocket Morse Tutor is easy to use, and the LED displays give you plenty of feedback. However, the unit doesn't save the last-used settings. Every time you turn it on, you must step through the menus to set it up for the kind of practice you want. In the **BEGINNER** mode, it sends code groups (listed in the manual) three times, then goes into random



The MFJ-411 Pocket Code Tutor, center, is flanked by the morsix Codeman mt-5, left, and the CAT Ultimate (with the LCD screen) and CAT Standard, right.

practice using that group. During the first three practice transmissions, it sends the groups in the order given in the manual, and character spacing appears to equal a word space. But when the Pocket Morse Tutor sends the same group as random practice, it puts a letter space between each character and a word space between each group. This has the effect of making the random practice sound much faster than the first three passes.

MFJ's Pocket Morse Tutor also offers a variety of **ADVANCED** code practice choices. Once you master the basics, you can concentrate on letters, numbers or prosigns only; all characters combined; random words; or random QSOs. The random QSOs follow the format the ARRL/VEC and others use for actual code examinations. The QSOs generates valid US call-sign configurations (with a bias for 5-land call signs perhaps reflecting the MFJ-411's Mississippi heritage) but includes some you're not likely to actually hear for a few years (like NJ5HRW or NV3TFW).

The menu allows you to choose normal character speed or Farnsworth speed (see sidebar "Farnsworth Technique"), and random word length (1 to 8 characters) or fixed word length (5 characters). Also, you have a choice to either start a new practice group or replay a group—perhaps at a slower speed—to check your copy. ARRL Lab data (Table 2) show the MFJ unit's code-speed and character-speed accuracy to be very good, with the exception of 13-wpm Farnsworth, which we measured at 11 wpm. The MFJ-411 has the widest sidetone frequency range of the bunch, but if you plan to use your new code skills on the air, tones

between 300 and 800 Hz are most realistic.

One ham who used the Pocket Morse Tutor felt rank beginners would find it more useful if it could send at speeds less than 5 wpm. Aside from some minor snags, the MFJ Personal Morse Code Tutor is, in the words of one of our testers, "a nifty little unit." *Manufacturer:* MFJ Enterprises Inc, PO Box 494, Mississippi State, MS 39762; 601-323-5869. *Suggested Retail Price:* \$79.95.

MORSIX CODEMAN MT-5

The morsix Codeman mt-5 is intriguing but a bit pricey. The unit's manual says the Codeman was "first developed by the Swiss ILT Radio School, that specializes in all aspects of Amateur Radio and electronics and 'ham' radio licensing." Of the three units, the Codeman is the only one that provides for *sending* practice by letting you hook up a key. In one practice mode, the mt-5 sends code, then you tap out the same characters and try to make them sound the same. It's also the only trainer that allows you to change sending speed on the fly and that retains its settings after you turn it off.

The Codeman is very light, and its small plastic case easily tucks into a shirt pocket. It uses two AAA-size alkaline batteries. (The manufacturer claims you'll have your license long before you'll ever need to replace batteries.) Three toggle switches along one end of the case turn it on or off, adjust listening volume and speed and activate different modes. Controls are clearly labeled, and a small but handy menu on the case (and continued inside the battery cover) tells which

Table 2
Pocket Morse Code Trainers

	MFJ MFJ-411	morsix Codeman mt-5	CAT Standard	CAT Ultimate
Specified CW Speed range (wpm)	5 to 60	4 to 60	3 to 29	3 to 29
Measured Standard CW Speeds (5, 13, 20 wpm/Character speed)	5/5 13/13 19/19	5/12* 13/13* 20/21*	5/13 15/16 19/23	4/12 11/12 14/21
Specified Farnsworth Speed	18 wpm	N/A	Not specified	Not specified
Measured Farnsworth Speeds (5, 13, 20 wpm/Character speed)	4/17 11/17 20/19	N/A N/A N/A	6/18 14/18 17/18	3/19 9/19 20/19
Dot/Dash Ratio (5, 13, 20 wpm)	1/3 1/3 1/3	1/3 1/3 1/3	1/3 1/3 1/3	1/3 1/3 1/3
Sidetone Frequency Range (Hz)	305-3335	600-1300	N/A	N/A
Default Sidetone Freq. (Hz)	690	592	806	770
Supply voltage	9-12 V dc	3 V dc	9 V dc	9 V dc
Size (HxWxD)	1x3x5.3 in.	1x2x3.6 in.	1x2x3.6 in.	1x2x3.6 in.
Built-in Display (type)	Yes (LED)	No	No	Yes (LCD)
Built-in Speaker	Yes	No	No	Yes
Approximate weight (oz)	10	4	4	4
Manufacturer's Suggested Retail Price	\$79.95	\$149.95	\$29	\$99

*The mt-5 measurements were performed at settings of 26, 66 and 100 cpm, which correspond to approximately 5, 13 and 20 wpm for 5-character word groups.

N/A: Not applicable

switch combinations activate which modes. An **EAR** (headphone) jack (it has no speaker) and a **KEY** jack are next to the toggle switches. It takes a few minutes to get the hang of the switches, but the manual is helpful. A "Walkman" type stereo headset (not supplied) works fine with the Codeman.

The Codeman generates impressive amounts of random code (five-letter code groups, variable-length code groups or "text" with punctuation) plus common on-air words and abbreviations (ant, agn, hr, rig, etc.) and Q-signals. But that's *all* it generates. (This may owe to its European origins, but it also makes the Codeman useful to speakers of any language.) If you're simply trying to enhance your code speed or practice for the commercial radiotelegraph ticket code test, this could be a plus. For anyone wishing to use this unit to learn Morse code from scratch—especially to pass the typical QSO-oriented Amateur Radio exam—this could pose a roadblock. To make optimal use of the Codeman, you'd need to first become at least fairly familiar with Morse code characters, since the slowest speed is approximately 4 wpm and no "beginner" groups are available. The Codeman lets you practice with text groups corresponding to normal language or with all characters (letter, numbers and punctuation) showing up with equal frequency. Or you can narrow your focus to "difficult" characters (morsix includes 4, 6, 7, g, x and z on the list), alpha characters or long characters (eg, numbers, punctuation, and symbols). Using various switch combinations, you can "replay" the previous code group or a single word, slowing it down or speeding it up if you like.

One problem: The manual expresses its code speed in *characters per minute* (cpm), rather than the more familiar words-per-minute (wpm) format. Adjusting speeds ac-

ording to *characters* per minute was quite difficult! In Lab tests (see Table 2), basing our results on 5 characters per "word," speed accuracy was excellent. At speeds above 60 cpm (ie, 12 wpm), you can twiddle the switches on the Codeman to match character and word speed or to increase *character*

Farnsworth Technique

In the Farnsworth technique of sending CW, *character speed* is faster than *word speed* (wpm), but this makes it an excellent tool for learning the code or for boosting your speed. All ARRL Morse code training tapes and W1AW code practice (up to 15 wpm) employ the Farnsworth technique.

Let's use 5 wpm code as an example. In this case, each *character* is sent at 18 wpm, but the spacing *between* the characters is increased to make the overall *word speed* 5 wpm. In other words, students hear 18-wpm characters, but exaggerated spacing makes the overall speed 5 wpm. The longer spacing provides sufficient time for beginners to recognize the rhythm of each character and avoid the habit of counting individual dits and dahs. Once students master the sound of every character at 18 wpm, the spacing is gradually reduced until the sending speed reaches 18 wpm. (The ARRL does not use Farnsworth at or above 18 wpm. Instead, the code is sent at "normal" speeds and spacing. For a detailed description of the Farnsworth method, see "A Standard for Morse Timing Using the Farnsworth Technique" by Jon Bloom, KE3Z, in the April 1990 QEX.

speed (what morsix calls "keying speed") in relation to *word* speed (what morsix calls "code speed"); at word speeds less than 60 cpm, *character* speed can't drop below 60 cpm while *word* speed varies according to user preference. The manual is less than clear about this, and customizing a practice session is less than convenient. To get the character and code speed you want means counting the number of times you click various switch combinations. However, it's possible, for example, to set up a practice session at 10 or maybe 13 wpm but have the characters sent at 20 wpm. So, while it's not specifically Farnsworth, it's a workable emulation.

It's not possible to manually adjust the CW pitch. Instead, the pitch varies automatically with each code group (which morsix calls a "QSO"), a "feature" one tester termed "annoying at best." As the manual explains it, this is "to reflect actual operating conditions and to insure optimal learning success." The available tones are between 600 and 1300 Hz.

Despite its otherwise fine features, the Codeman's most serious drawback for the prospective radio amateur is its reliance on random groups. Before we could recommend the Codeman to anyone learning the code to get an entry-level ham ticket, we'd like to see a programmed series of typical QSOs and random word groups. It's most appropriate for someone who already knows the code and is trying to increase their proficiency. *US Distributor*: SSB Electronic, 124 Cherrywood Drive, Mountaintop, PA 18707; call 717-868-5643; fax 717-868-6917. *Suggested retail price*: \$149.95.

COMPUTER AIDED TECHNOLOGY "STANDARD" AND "ULTIMATE"

Each of these units is housed in a black plastic enclosure that, except for its color, is identical to the Morsix Codeman mt-5 case. The similarity ends there, however. The workmanship has a homebrew look: like a project put together in a hurry, the units—and the manual—lack professional polish. For example, no one deburred the rectangular LCD display opening on the "Ultimate" model, and the opening's edges look slightly uneven, as though the saw blade "wandered" just a bit. I also was dismayed to discover someone left out a foam insulating pad to prevent the metal case of the required 9-V battery from directly contacting the microprocessor inside.

CAT's customer service wasn't impressive either. We ordered one model from the top of their line (the Ultimate), and one from the low end (the Standard), leaving out the Deluxe model in between. It took just under a month for the Standard and Ultimate units to arrive, along with a manual for the Deluxe model that we *didn't* order. In a vain attempt to obtain the correct manuals, two HQ staffers made several telephone calls to the manufacturer. Each call elicited a promise that the manuals would be sent right away. Though it's been several months, we have yet to receive them. Since these units all are *some-what* similar, we attempted to forge ahead

with the only manual we had, which wasn't much. On an illustration, the numerals for **BUTTON 1** and **BUTTON 2** have been written over by hand and are impossible to decipher (They *both* look like "2.") Practice text print-outs in the manual were incomplete and contained mistakes.

The Standard unit has an **ON/OFF** switch along with a headphone jack (a single earphone is supplied; this unit has no speaker) and a recessed **VOLUME** control you need a small screwdriver to adjust. On the Ultimate model, a **VOLUME** control with a full-sized knob also serves as the on/off switch. This model has a built-in speaker which provides ample volume for a single user or small group. The pitch on either unit is not adjustable. Both trainers feature top-mounted push buttons, which let you choose mode and CW speed. The Ultimate is easier to use, since its large, backlit LCD display and a tiny printed menu indicate where you are as you step through the choices. Better yet: it reads out the code as it's being sent (16 characters at a time), the only unit of the group offering that slick feature! The Standard unit has no display, so it's harder to use. Instead, you have to count and remember how many times you've pushed the button. Even then, we weren't sure. Both units can produce Farnsworth technique code.

So how did they work? Again, there were some rough edges. The QSO mode in the Ultimate was supposed to be "similar to actual code tests," but let's hope you never run into call signs like KD4AMSE, KS47IW or K27R4M, as we did on the Ultimate. The "signal reports" were even worse. Ever get an RST 784? We did on the Ultimate. This is *not* good practice for beginners, who should hear *realistic* call signs and reports similar to those used on the air or for exams. While the "interactive" and random word group modes were most useful, these units just have too many other drawbacks. In addition, measured code speeds varied widely from specifications (see Table 2). All things considered, we could not recommend either of them. *Manufacturer:* Computer Aided Technology, 10132 Monroe Dr, Dallas, TX 75229; call 214-350-0888. *Suggested Retail Price:* Standard, \$29.95; Ultimate, \$99.95.

Summary

The MFJ Personal Morse Code Tutor is larger than the other units we reviewed, but its size allows for a good-sounding speaker and sufficient buttons and LEDs to make it very easy to use. Of the three trainers, the MFJ-411 comes closest to teaching the code the way ARRL recommends. It sends code groups and realistic practice QSOs. All things considered, the MFJ unit is the clear choice for beginners.

The Morsix mt-5 Codeman is a capable performer, offers a reasonable user interface and it can play back groups and individual groups. The addition of word groups and "realistic" QSO practice would be a major advantage for the prospective ham. (The Morsix mt-7, which just became available, offers that and much more, including an RS-232 inter-

face, but at a much higher price, \$299). On the other hand, the mt-5 is well suited to those seeking to advance their code-copying capabilities in any language. If you already know the code, the Codeman makes for a handy, very portable code trainer. The ability to adjust the wandering sidetone frequency would be a plus as well.

Perhaps with a little effort by the manufacturer, the CAT Ultimate and Standard could be brought up to snuff. Both are true pocket-sized trainers, and the display and the speaker on the Ultimate model are nice touches. For real beginners, the "interactive" mode, where the student decides when to play the next character, also is commendable. But these features don't outweigh the deficiencies, from inaccurate code speeds to a poor program and questionable customer service.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

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

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

AEA PK-12 GPS compatible TNC (see Product Review, October 1995 *QST*). Minimum bid: \$82.

Alinco DR-610T dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$416.

HAL P38 HF communication modem (see Product Review, August 1995 *QST*). Minimum bid: \$261.

ICOM IC-2340H dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$390.

ICOM IC-2700H dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$505.

Japan Radio Corp. JST-245 MF/HF/6-meter transceiver, with the following optional filters: CFL-317, CFL-218A, CFL-316, CFL-232, CFL-231 (sold as a package only; see Product Review, September 1995 *QST*). Minimum bid: \$2145.

Kantronics KPC-3 GPS compatible TNC (see Product Review, October 1995 *QST*). Minimum bid: \$76.

Kenwood TM-733A dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$416.

Kenwood TM-742A multiband FM transceiver with UT-50S 6-meter module (sold as a package only; see Product Review, November 1995 *QST*). Minimum bid: \$670.

PacComm Tiny-2 Mk-2 TNC with GPS receiver (see Product Review, October

1995 *QST*). Minimum bid: \$415.

Standard C5718DA dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$455.

Yaesu FT-5200 dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$416.

Yaesu FT-8500 dual-band FM transceiver (see Product Review, November 1995 *QST*). Minimum bid: \$429.

Sealed bids must be submitted by mail and must be postmarked on or before December 27, 1995. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

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

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

New Products

WILDERNESS RADIO OFFERS TINY KEYSER/FREQUENCY COUNTER

◇ Wilderness Radio has announced the KC-1 Universal Keyer/Frequency Counter kit that features small size (0.8x2.5 in.) and low current drain (< 4 mA), making it ideal for installation in portable gear. Instead of a display, the frequency counter reports the operating frequency as three digits (±1 kHz) in Morse code. A search mode lets the user enter a target frequency using the keyer paddle, then tune the VFO until the target is reported. Up to four VFO offsets can be programmed, and it works with both direct and pre-mixed VFOs as high as 25 MHz.

The keyer provides two iambic modes, multi-partition message memory, plus programmable weighting and break-in delay. CW messages—as well as all keyer and counter parameters—are entered using the keyer paddle and stored in nonvolatile memory.

The KC-1 is available as a partial kit (\$24.50) or full kit (\$44.50). For more information, call 415-494-3806, or write Wilderness Radio, PO Box 734, Los Altos, CA 94023-0734. 