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QST Compares: Economy and No-Frills 2-Meter FM Hand-Held Transceivers
(ADI-201; Alinco DJ-190T; Alinco DJ-S11T; ICOM IC-T2A; Kenwood TH-235A; Midland 73-030; Standard C156)

Product Review

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QST Compares: Economy and No-Frills 2-Meter FM Hand-Held Transceivers

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With 2-meter H-Ts as popular as ever, the time seems right to compare the features and performance of a new generation of "economy" and "no-frills" models now on the market. Frequently we hear from readers that they're willing to sacrifice gobs of features for ease of use and simplicity in an H-T. Moreover, they don't want to pay for features they don't use. The units in this selection tend to adopt a "most-for-least" philosophy. Although all can be described as small and light, some are decidedly smaller and lighter than others. Some have quite a few features, but others are so basic that they lack even a tone pad. The *most* basic in the group has a fixed telescoping antenna and dry battery pack that uses three AA cells (NiCds are optional).

But the best news may be the prices. The

Table 1 2-Meter H-T Features

	ADI AT-201	*Alinco DJ-190T*	*Alinco DJ-S11T*	*ICOM IC-T2A*	*Kenwood TH-235A*	*Midland 73-030*	*Standard C156*
Expanded VHF reception	M	Y	M	Y	M	Y	Y
Memory channels (#)	40 + CALL	40	20 + CALL	40 + CALL	60	73	100
Memory cloning	N	Y	Y (see text)	Y	Y	N	N
Memory names	N	N	N	N	N	N	Y
Programmed range scanning	N	N	N	Y	N	Y	Y
Power output choices	H/M/L	H/L	H/L	H/L	H/L	H/M/L	H/M/L
Standard battery type	NiCd	NiCd	3×AA	8×AA	NiCd	NiCd	4×AA
Standard battery (mAH)	7.2 V (650)	4.8 V (700)	4.5 V (N/A)	9.6 (N/A)	7.2 V (950)	6 V (600)	6 V (N/A)
12 V ready?	Y	Y	O	N	Y	Y	Y
Low-battery indicator	N	Y	Y	Y	N	Y	Y
Auto power off	Y	Y	Y	N	Y	Y	Y
Automatic repeater offset	Y	N	N	Y	Y	Y	Y
Paging (code or tone squelch)	Y	N	N	Y	Y	Y	Y
Priority channel monitoring	Y	N	N	N	N	Y	Y
Keypad	Y	N	N	Y	Y	Y	Y
DTMF autodial memories (#)	N	N	N	Y (5)	Y (5)	Y (8)	Y (10)
CTCSS encoder	Y	Y	Y	Y	Y	Y	Y
CTCSS decoder	Y	O	N	Y	Y	Y	Y
Antenna connector type	BNC	BNC	N/A	BNC	BNC	BNC	BNC
Time-out timer	N	Y	N	N	Y	N	Y
Suggested retail price	$215	$219	$149	$227	$230	$370	$289
Typical selling price as of 10/97†	$170	$173	$120	$170	$173	$215	$200

Key

Y = Standard
O = Optional
N = Not available
N/A = Not applicable
M = With hardware or keypad modification. Details available from manufacturer (may require proof of MARS or CAP license).

†Typical selling prices represent an average of street prices obtained from three equipment retailers, exclusive of any sales, coupons or rebates.We were able to locate only one retailer that carried the Midland 73-030, however.

average street price for our seven H-Ts comes in at just under $175—the kind of money you once expected to hand over for a *used* H-T! Despite our "no frills" and "economy" designations, many of these units still offer a wide range of features, from CTCSS encoding to extended receive, multifunction scanning and paging. Table 1 provides a quick comparison of features and prices.

All models have a variety of optional accessories that extend the usefulness of the basic transceiver. Those of us who have used the larger and heavier H-Ts of years past found that we missed the comparable speaker size and audio output on these units. Another tradeoff was display size and clarity. Most of these radios have small displays that can't do justice to the "flags" (or icons) that designate various functions. All displays can be illuminated for nighttime viewing, and some feature a backlit keypad as well. Power output is in the 1.5 to 2.5 W range for most in the group, although optional battery packs or a 13.8 V supply can raise the ante to as high as 5 W.

In the recent past, we've looked at the Alinco DJ-191, the ICOM T22A, the Kenwood TH-22AT, the Standard C108A, the Standard C178A, and the Yaesu FT-10R and FT-11R (see "Product Review," *QST*, May 1996). All of these were still on the market as this review went to press.

Our review team, all members of the Headquarters staff, put each radio through its paces for several days apiece. This allowed us to get a good feel for each radio, and to develop our individual lists of features we liked and those we didn't. The testers were selected for their attention to detail and varying amounts of experience with H-Ts. Thanks to Pete Budnik, KB1HY; Steve Ford, WB8IMY; Jean Wolfgang, WB3IOS; Martin Cook, N1FOC; Dan Miller, K3UFG, Paul Danzer, N1II; and Mike Tracy, KC1SX, and Ed Hare, W1RFI, of the ARRL Lab for their contributions to this review.

ADI AT-201

ADI/Premier is a relative newcomer to the ham radio market. The company offers radios for VHF and UHF, including a 2-meter mobile and a dual-band H-T. A traditionally designed H-T, the ADI AT-201 feels and looks pretty solid. Ruggedness and general polish (what's sometimes called "fit and finish") were judged as average. The ADI AT-201 has a husky frame (one user called it "too bulky for me"). ADI says some of its customers say they prefer a full-sized H-T as an alternative to what it called "small radios with tiny buttons." The nice-sized keypad can be illuminated for nighttime use. Most of the unit's better features are accessible via the keypad.

Reviewers were unimpressed by the smallish display, however. Frequency and memory channel numbers are large and clear, but some of the other display flags were too small to be seen easily, particularly in less than optimal lighting conditions. The display can be illuminated also.

Audio output was good except at the highest volume. On transmit, audio was judged to be above average for an H-T. One user got reports indicating very natural audio that compared nicely with his regular mobile radio. "Excellent reports received from all contacts!" commented one user. "Some people who know my voice well said I sounded better than on my own H-T." Users reported that the supplied 7.2-V, 700 mAH NiCd battery pack held its charge well, particularly with the battery save feature enabled.

Our user team's initial programming woes and confusion over how to use the AT-201 were traced to one problem—the *User's Manual*. The one supplied with our radio was for the earlier AT-200. Fortunately, the *very* handy *Quick Reference Guide* did match our unit, and it was sufficient for most users to figure out the radio. Subsequently, we were able to get the correct manual from ADI—which deserves high marks for its prompt response to our various customer service inquiries. Armed with the correct instructions, we found programming to be fairly simple. It takes four basic steps to put a frequency into a memory, and when you seek an empty memory slot, the AT-201 displays each memory's contents—or a blinking **M** if it's

ADI AT-201, serial number 7S40030019

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 138-174 MHz; transmit, 144-148 MHz.	As specified.
Power requirements: 5.0-16 V dc. Receive, ≈35 mA; transmit (max, high power), ≈950 mA at 13.8 V dc.	As specified.
Size (HWD); 5.5×2×1.25 in; weight 13.1 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.32 μV.	For 12 dB SINAD: 0.15 μV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 60 dB;* 10 MHz offset, 82 dB.
Adjacent channel rejection: Not specified.	61 dB.
First IF and image rejection: Not specified.	IF rejection, 97 dB; image rejection, 77 dB.
Squelch sensitivity: 0.10 μV.	At threshold, 0.09 μV.
S-meter sensitivity: Not specified.	S9=2.7 μV.
Audio output: 250 mW at 10% THD into 8 Ω.	245 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/M/L): 2 W / 2.5 W / 0.35 W , with RBP072 7.2 V battery pack; with external supply, not specified.	2.4 W / 2.4 W / 0.4 W with RBP072 7.2 V battery pack; 5.5 W / 2.7 W / 0.4 W at 13.8 V dc.
Spurious signal and harmonic suppression: 60 dB.	63 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 175 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	46 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at the value shown.

empty—as you scroll through.

Less intuitive was the use of a steady **M** on the display while accessing special functions using the **SET** button, and the use of the **MR/ENT** key to switch between VFO and memory mode. Also, keypad frequency entry is limited. Unlike the other units we looked at (the ones with keypads, that is), to move to 146.685 MHz, for example, you can only enter "4-6-8" from the keypad. You have to give the **CHANNEL** (tuning) knob a twist to add the "5." Once users got the hang of it, though, they had no problems.

Aside from matching the unit, the AT-201 *User's Manual* was a *huge* improvement over the AT-200 book. The manual is peppered with illustrations that employ little directional arrows to graphically depict step-by-step instructions. This is a good concept that works for most people. While users could find most needed information about the AT-201 in either the *Quick Reference Guide* or the *User's Manual*, neither contained battery charging instructions. A schematic diagram accompanies the manual.

You'll need to refer to the *User's Manual* or the *Quick Reference Pocket Guide* to master the use of the **FUNCTION** button and other controls. One odd feature was the prominent button on the front panel labeled **SQL**. Surprise! This isn't the squelch control at all; it's the "squelch off" button, which most manufacturers typically call "monitor." This allows you to momentarily disable the squelch to listen for a weak signal or to set the volume level in the absence of an actual signal. The *real*, unlabeled squelch control is a nearly invisible knob that sits practically flush atop the unit and that you turn with your fingertip—pretty awkward. On the other hand, most users don't have to adjust the squelch that often.

Much better were the sizable, rubberized top-mounted **VOLUME** and **CHANNEL** knobs. Even the most "ham-handed" user will find these easy to manipulate. The **VOLUME** knob is calibrated with a 0-10 scale, so you can reset it for comfortable listening without having to listen first. This knob also serves as the power switch.

The AT-201 has a variety of useful features, and the new manual makes it easier to figure them out. Most users considered the AT-201 at least an average performer. One called it "a good meat-and-potatoes radio."

Manufacturer: Premier Communications, 20277 Valley Blvd, No J, Walnut, CA 91789; tel 909-869-5711; fax 909-869-5710; e-mail **premier@adi-radio.com**; **http://www.adi-radio.com/**. Manufacturer's suggested retail price, $215.

ALINCO DJ-190T

Despite having only three knobs on the front panel and no keypad, it might not be fair to categorize the Alinco DJ-190T as a "no frills" H-T. This rugged, slim unit includes many of the bells and whistles now available on more expensive H-Ts.

Its readout is large and clear with bold numbers and characters—one reviewer called it "outstanding!" Its display is the biggest of the bunch and reminiscent of the display on the big brother DJ-191T. You can light the display by pressing the **LAMP** button on the side. This was the only H-T in the group that included a drop-in charger stand. Our radio came with a 4.8 V, 700 mAH battery, which provides 1.5 W in the high-power setting. Most, but not all, users got several days of use from a single charge. Most considered battery life above average.

Indicative of the quality built in to this H-T is the metal belt clip. Although it's a minor point, one reviewer commented, "I especially like it because the radio is secure on my purse, too." Another called the controls "very solid." The rubber dust covers for the speaker/mike and dc jacks stayed in place, too—not the case with all the radios we looked at.

Programming a memory channel on this radio involves five steps but was judged to be relatively simple. One user called it "a snap." Setting the various functions takes a bit of getting used to, but the manual is generally clear and well organized. One reviewer called the DJ-190T "very easy to use" once it's set up. Several others shared that senti-

Alinco DJ-190T, serial number T001221

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.	Receive, 130-174 MHz; transmit, as specified.
Power requirements: 4.8-13.8 V dc. Receive, ≈50 mA; transmit (max, high power), ≈1.5 A at 13.8 V dc.	As specified.
Size (HWD); 5.75×2.25×1 in; weight 11.4 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.16 μV.	For 12 dB SINAD: 0.15 μV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 58 dB;* 10 MHz offset, 68 dB.
Adjacent channel rejection: Not specified.	59 dB.
First IF and image rejection: Not specified.	IF rejection, 114 dB, image rejection, 67 dB.
Squelch sensitivity: Not specified.	At threshold, 0.19 μV.
S-meter sensitivity: Not specified.	Max indication=3.8 μV.
Audio output: 200 mW at 10% THD into 8 Ω.	245 mW at 15% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/L): Power levels with EBP37N 4.8 V battery pack, not specified; ≈5 W / ≈0.6 W at 13.8 V dc.	2.0 W / 1.0 W with EBP37N, 4.8 V battery pack; 6.5 W / 1.0 W at 13.8 V dc.
Spurious signal and harmonic suppression: 70 dB.	72 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 40 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	75 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at the value shown.

ment. Still, there were some rough spots. Adjusting the squelch involves holding down two buttons on the left side while rotating the single control knob. This takes a bit of practice and dexterity. The labels on these three critical side buttons are difficult to read, which can lead to some initial programming confusion.

Users got good reports on transmitted audio—most stations contacted reported it was loud and clean. Received audio is ample, with just some distortion at the highest volume setting. As Alinco has done on some earlier models, including the DJ-191, this H-T uses up and down pushbuttons to adjust the volume. These buttons double in brass for other functions. The volume control is the default, so setting it just right is simple. The display reads out the relative level (0-31).

The 28-page *Instruction Manual* is well-illustrated and nicely designed, but some reviewers thought it could have been *written* more clearly. It contains a detailed table of contents and a quick reference section, both helpful in finding specific information quickly. The manufacturer included a schematic diagram.

One noteworthy feature is what Alinco calls cable cloning. To transfer the entire memory contents from one DJ-190T to another, you just need a couple of mini stereo plugs and some cable. The few easy steps are described clearly in the manual.

Alinco says the DJ-190T also provides for PC cloning/programming, which requires optional third-party software. RT Systems (800-723-6922) offers the software and cable, item code APK-1, for $35. (This also works with the DJ-191T.)

Nearly everyone on the review team expressed disappointment at the lack of a keypad, but no one missed the paging function (available on most of the other radios in the test group). The absence of the tone pad also seemed to be why most major dealers were not regularly stocking the DJ-190T, but they might want to rethink that philosophy. Our users *liked* the back-to-basics design with a minimum of bells and whistles. "Everything the average user would want," one tester said. As it stands now, you'll very likely have to shop around to locate a DJ-190T, and even then it might have to be a special order item.

The lack of the keypad aside, those looking for basic communication might find the DJ-190T just what they need in an H-T.

Manufacturer: Alinco Electronics, 438 Amapola Ave, No 130, Torrance, CA 90501; tel 310-618-8616; fax 310-618-8758; e-mail **alinco@alinco.com**; **http://www.alinco.com**. Manufacturer's suggested retail price, $219.

ALINCO DJ-S11T

At first blush, the Alinco DJ-S11T "mini power transceiver" almost seems *too* small and *too* simple. But the DJ-S11T is no mere novelty. It's the smallest radio in the pack, has a small, fixed telescoping antenna, uses three AA cells (you can use NiCds too), has no keypad, not much of a manual (it barely qualifies as a *brochure*), and puts out about 300 mW. Yes, this is the "most basic" model referred to earlier! It's also the least expensive. I'm not sure if I can explain why, but given a chance to prove itself, this radio grows on you. In any event, it keeps a low profile and weighs in at just over 7 ounces.

Some of the features packed into this tiny frame include an external power jack, external mike and speaker jacks, monitor function, simple change between VFO and memory modes, lamp, auto power off, high and low power (yes, 50 mW!), scan, shift and call functions, alarm, courtesy beep, keystroke beep, CTCSS encoder, offset shift indicator and channel display mode.

Reviewers gave the display good marks, considering its small size. It can be illuminated. They especially liked the fact that you can run the DJ-S11T for quite a while on a fresh set of AA cells (it has an automatic battery saver function). Audio output was deemed to be on the low side, leading several reviewers to suggest an external speaker mike for mobile use or in a noisy environment. Users noted a fair amount of distortion at the highest volume setting.

For such a small, light radio, overall quality is very good. On the downside, the built-in "fold-out" nine-inch telescoping antenna can flop over on occasion when fully extended. There's no way to connect the unit to an external antenna either, which complicated testing somewhat and will likely con-

Alinco DJ-S11T, serial number T003447C

Manufacturer's Specifications	***Measured in the ARRL Lab***
Frequency coverage: 144-148 MHz, receive and transmit.	As specified.
Power requirements: 3.6-5.5 V dc. Receive, ≈33 mA; transmit, ≈260 mA at 4.5 V dc.	As specified.
Size (HWD); 3.9×2.1×1 in; weight 7.1 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.18 μV.	For 12 dB SINAD: 0.19 μV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 56 dB; 10 MHz offset, 55 dB.
Adjacent channel rejection: Not specified.	59 dB.
First IF and image rejection: Not specified.	IF rejection, 88 dB, image rejection, 57 dB.
Squelch sensitivity: Not specified.	At threshold, 0.15 μV.
S-meter sensitivity: Not specified.	Max indication=1.5 μV.
Audio output: 100 mW at 10% THD into 8 Ω.	101 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/L): 0.34 W at 4.5 V dc (3×AA batteries); low power, 0.05 W; with external supply, not specified.	0.3 W / 0.1 W with 3×AA batteries; 0.3 W / 0.1 W at 5.5 V dc.
Spurious signal and harmonic suppression: Not specified.	54 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 300 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	108 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.

tribute to mixed success on the air. Alinco says it's looking into this issue.

Programming this radio was more of a chore than with some of the others, but most users found it got much easier with practice. The instruction sheet, which can charitably be called sketchy, was one contributing factor. The word "squelch" does not appear on the sheet, for example; if there's a way to set the squelch level, Alinco is keeping it to themselves. (No one complained that the squelch didn't work, however; Alinco confirms that it's not user-settable.) Entering a frequency into memory involves just three steps. To access a function, a key may be pressed either alone or at the same time the **FUNCTION** key is pressed. You can access other functions by holding down a key while turning on the power. Other programming functions were judged to be a bit more complicated than on some other radios in the group.

The relatively low power output of the DJ-S11T—coupled with the minimal antenna—made it difficult to impossible to hit some repeaters in this region. Most users felt a better antenna would have compensated for the flea-power transmitter. Once we'd "made the machine," reports varied. For example, one station would report that I was breaking up a bit, while another time I'd be solid copy. Transmit audio was reported to be good. At the low output power setting, it was difficult to hit repeaters more than a mile or so away. Use of a more efficient external antenna would help, of course, but there's no way to do it.

One somewhat unusual feature is the telephone-style "alerting ring" on transmit that sounds for all the world like an electronic telephone ring. You can use it to get the attention of another station. Just press the **UP** or **DOWN** key (this can be switched to the 1750-Hz tone burst used in Europe). You can enable an alarm that sounds when a signal is received, too. Some found the alerting tones tended to confuse—and sometimes annoy—both users and those they contacted. They can be disabled, however.

Despite its insubstantial nature, the instruction sheet even includes a schematic diagram, a couple of illustrations, a quick reference chart, and instructions in four other languages besides English. The type is small, though, and some reviewers had difficulty reading it.

Alinco says cable cloning is available for the DJ-S11T, something our manual didn't mention. Alinco says the manual has been revised to reflect this change. The manufacturer also says it plans to offer PC cloning for the DJ-S11T. This will require optional software that was not available when this review went to press.

Overall, reviewers especially liked the small size of this radio. With the antenna folded down, it fits easily into a shirt pocket, in a purse, or on a belt (with the supplied clip). On the other hand, reviewers missed a "real" manual, the ability to connect to an external antenna, and more power output.

The DJ-S11T might be more useful as a backup H-T, particularly if you do most of your operating either near a repeater with good "ears" or on simplex—at Field Day, while hiking, or talking across the hamfest, for example. Those who primarily operate mobile or routinely need to hit a distant repeater would probably want to look elsewhere.

Manufacturer: Alinco Electronics, 438 Amapola Ave, No 130, Torrance, CA 90501; tel 310-618-8616; fax 310-618-8758; e-mail **alinco@alinco.com**; **http://www.alinco.com**. Manufacturer's suggested retail price, $149.

ICOM IC-T2A

The IC-T2A is a sturdy and well designed radio that has a lot to offer—but you may need help getting it up and running because there are few labels on the controls. That's because the IC-T2A is user programmable. If you don't like the default controls, you can, as one user put it, "roll your own."

The display is one of the smallest in the group. The frequency and memory channel are prominent, but the other flags aren't, particularly in bright sunlight or at an angle. The display is lighted for nighttime use, but the tone pad isn't. One handy feature: the lamp stays on for 5 seconds after the radio is turned on.

The comparatively high audio power paid dividends in the IC-T2A. Reviewers were uniformly positive about the received sound quality, even at highest volume setting. Transmitted audio reports received were good to excellent.

ICOM IC-T2A, serial number 01215

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 136-174 MHz; transmit, 140-150 MHz.	As specified.
Power requirements: 9.6 V dc. Receive, standby ≈65 mA; transmit (max, high power), ≈1.4 A.	As specified.
Size (HWD); 5.5×2.25×1.4 in; weight 14.4 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.18 μV.	For 12 dB SINAD: 0.15 μV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 53 dB; 10 MHz offset, 73 dB.
Adjacent channel rejection: Not specified.	51 dB.
First IF and image rejection: Not specified.	IF rejection, 94 dB, image rejection, 116 dB.
Squelch sensitivity: 0.18 μV	At threshold, 0.13 μV.
S-meter sensitivity: Not specified.	S9=0.8 μV.
Audio output: 350 mW at 10% THD into 8 Ω.	361 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/L): 4.5 W / 1 W with BP194 battery tray; with external supply, not specified.	4.2 W / 0.8 W with BP194 battery tray (8×AA NiCds); 4.2 W / 0.8 W at 9.6 V dc.
Spurious signal and harmonic suppression: 60 dB.	67 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 175 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	144 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.

The supplied BP-194 battery case contains eight individual AA NiCd cells instead of the typical monolithic battery pack. ICOM says it should last 3.5 hours between charges, but there is a battery saver function to help extend that. You can replace the NiCds with alkalines for a bit more power output if you want—not that you'll necessarily need it. At more than 4 W, the output power of our IC-T2A was the highest of the seven units we looked at while running off the internal batteries.

As for ruggedness, the radio got high marks. While one reviewer thought it was a bit on the heavy side (at just over 14 ounces, it's the heaviest of the bunch), everyone liked how it felt in the hand. A couple of users compared it to a commercial radio in look and feel.

Figuring out the default button functions requires reading the *Instruction Manual* or knowing how to use the built-in Guide—which is like the "Help" file on a PC program. This is how I learned that the default setting for **P1** is the scan button, and that the default **A** button toggles between VFO and memory modes. The Guide system is contextual. Pressing a key after pressing the # key provides a description of that key's function as "crawl text" on the full display. ICOM says it now offers a free pocket guide "to simplify customizing." IC-T2A owners can write ICOM for a copy.

Once you get the hang of programming, the radio provides lots of flexibility. If you like to program, you'll have fun with this one. The neat thing about it is that you can customize eight buttons, P0 through P4 and A through D, to handle functions you use a lot. Once you've customized a button, the radio's Guide function is there to remind you what you've programmed. Very nice! Programming a frequency into a memory requires five steps.

The 40-page manual sports nice looking drawings and tables that make it easy to follow. There is no schematic diagram.

Although you don't want to activate a push-to-talk button accidentally, this one requires more pressure than the others. As with a stick shift in heavy traffic, operating the PTT when you're having a lengthy conversation with short segments can be tiring.

One reviewer experienced an anomaly that others didn't. The transceiver locked up twice, and nothing short of resetting everything could get it out of the locked-up condition.

One potentially useful feature is cloning. With optional software and a cloning cable (CS-T2 software; OPC-474 or OPC-478 cable from ICOM), the programmed contents of one IC-T2A can be transferred to another, as well as from a PC to the IC-T2A. This also enables use of the ANI (automatic number identification) mode, a selective calling system that's similar to paging. The IC-T2A is the only transceiver in this group to offer tone scan capability.

If you're not satisfied with "cookie cutter" H-Ts but enjoy programming and learning to use advanced functions, this radio might very well cut the mustard for you.

Manufacturer: ICOM America Inc, 2380 116th Ave NE, Box C-90029, Bellevue, WA 98004; tel 425-454-8155; fax 425-454-1509; e-mail **75540.525@compuserve.com** (tech support); **http://www.icomamerica.com**. Manufacturer's suggested retail price, $227.

KENWOOD TH-235A

This definitely no-frills H-T includes a tone pad, but it offers a minimum of buttons and controls for ease of operation. It's the tallest unit of the group (not counting the rubber ducky).

The display is small, which means some display symbols and icons are too small to be seen easily. The important stuff—the frequency and memory address—is sufficiently large and clear if viewed straight on. Viewing the small stuff at an angle is a challenge under all lighting conditions. The display can be illuminated for nighttime viewing.

Our unit came with a 7.2 V, 950 mAH NiCd battery pack—pretty generous for an economy model H-T. Most users considered battery life good to excellent. At a full charge, our review radio cranked out 1 W more than its 1.5 W specified output. That's a healthy bonus.

Because this radio is so devoid of the controls that bristle from most other H-Ts, it almost looks generic. Okay, so maybe it's not exciting to look at, but apparently Kenwood's thinking here was that most hams prefer useful features and good quality to head-turning looks. Fit and finish are good, with one exception: The review radio's tuning control

Kenwood TH-235A, serial number 80905312

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: 144-148 MHz, receive and transmit.	Receive, 136-174 MHz; transmit, 144-148 MHz.
Power requirements: 7.5-16 V dc. Receive, ≈50 mA; transmit (max, high power), ≈1.3 A at 12 V dc.	As specified.
Size (HWD); 6×2.25×1.25 in; weight 12.9 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.2 μV.	For 12 dB SINAD: 0.14 μV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 63 dB;* 10 MHz offset, 80 dB.
Adjacent channel rejection: Not specified.	61 dB.
First IF and image rejection: Not specified.	IF rejection, 98 dB, image rejection, 133 dB.*
Squelch sensitivity: 0.13 μV	At threshold, 0.10 μV.
S-meter sensitivity: Not specified.	No signal strength indicator.
Audio output: 280 mW at 10% THD into 8 Ω.	451 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/L): 1.5 W / 1 W with PB36, 7.2 V battery pack; 5 W / 1 W at 13.8 V dc.	2.5 W / 1.0 W with PB36, 7.2 V battery pack; 4.7 W / 1.0 W at 13.8 V dc.
Spurious signal and harmonic suppression: 60 dB.	64 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time to 50% of full audio output): Not specified.	Squelch off, S9 signal, 105 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	38 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value shown.

knob could easily be pulled off (and perhaps lost if it should be removed by a youngster). The secondary labels present on most other radios in this group are nearly absent, which means you'll need to keep the manual nearby until you memorize the functions.

The review team found that programming the TH-235A was a pleasure. It involves just three steps. This was deemed the simplest of all the radios in this review group to program. As one user enthused, "I was on the repeater within 60 seconds of removing it from the box." Other functions (the ones that use keys with labels, that is) are intuitive. Once programmed, the radio works very well indeed. "Can't be any easier," one user declared.

Reports on transmitted audio were a mixed bag. Some of those contacted reported strong, clear signals, while a few reported low or less-than-natural sounding voice quality. This radio supplies more than 400 mW of audio to its little speaker, so there's lots of receive audio, but the unit can distort at high volume.

The nicely illustrated *Instruction Manual* has a great quick start section plus an index but no separate quick reference guide, which some users missed. Kenwood says a quick reference adhesive label for the TH-235A is available upon request. Drawings are professionally rendered, making it simple to follow the instructions. Tables are likewise clear and straightforward. One user called it the best manual of the group. There is no schematic diagram, but Kenwood says the optional TH-235A *Service Manual* includes one.

Overall, reviewers liked this radio for its simplicity. "As basic as I have seen and no problem to use," summed up one user. The memory-to-VFO transfer capability is impressive. Simply pressing the **F** and **VFO** buttons transfers the complete contents of the memory channel to the VFO. As the manual points out, this is useful while searching for other stations or for a clear frequency near the selected memory channel.

Manufacturer: Kenwood Communications Corp, 2201 E Dominguez St, Box 22745, Long Beach, CA 90801-5745; tel 310-639-5300; fax 310-631-3913; **http://www.kenwood.net**. Manufacturer's suggested retail price, $230.

MIDLAND 73-030

Back in the early days of VHF repeaters, Midland offered some crystal-controlled and synthesized mobile transceivers (the company still has a following among CBers). Now, Midland is back in the amateur market with (among other products) this 2-meter H-T, which the manual touts as a "palm size FM paging transceiver." And that it is. This comfortably compact unit will also fit in a shirt pocket, although it's heavy enough to remind you it's there.

Midland says this transceiver has been available in Europe for some time now, but it's not well known in the US. In fact, we had trouble finding a dealer that regularly stocks the 73-030. Even the dealer that sold us our unit has since discontinued carrying it, so you could have trouble getting your hands on one. Midland says it's working to change this situation.

The 73-030 has a traditional **PWR/VOL** knob at the top, next to the not-so-traditional **ENC/SQL** (tuning and squelch) dial. This H-T also has a tone pad with small but well separated buttons. A bit puzzling is the tone key labeled **FM** (the #7 key on the keypad) that allows the various controls to be set. When **FM** is pushed, a tiny F (for "function," one can assume) appears in the display.

Reviewers found the display small but legible; it has good-sized numbers, but some "over 40" reviewers had difficulty reading the smaller legends. The tone pad is backlit for clear visibility at night.

On transmit, most stations gave very good or excellent reports on transmitted audio, but a couple of testers got reports that audio was "muffled" when close-talked, and others got reports that audio was "a bit low." Audio output on receive was judged to be above average, particularly for a small speaker. "Output was great, even at full volume in a noisy environment" raved one reviewer.

Battery life was likewise excellent—one reviewer used it for an hour a day for a week and didn't need to charge the battery pack. The supplied NiCd battery pack is rated at 6 V at 600 mAH.

The H-T has a solid feel to it and strongly resembles the Kenwood TH-22AT we reviewed last year. Controls and buttons are

Midland 73-030, serial number 550059

Manufacturer's Specifications	***Measured in the ARRL Lab***
Frequency coverage: 144-148 MHz, receive and transmit.	Receive, 136-174 MHz; transmit, 144-148 MHz.
Power requirements: 5.0-13.8 V dc. Receive (squelched), ≈42 mA; transmit (max, high power), ≈1.5 A at 13.8 V dc.	As specified.
Size (HWD); 4.5×2.1×1 in; weight 10.4 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, 0.16 μV.	For 12 dB SINAD: 0.16 μV.
Two-tone, third-order dynamic range: 60 dB.	20 kHz offset, 58 dB;* 10 MHz offset, 68 dB.
Adjacent channel rejection: 64 dB.	59 dB.
First IF and image rejection: Not specified.	IF rejection, 76 dB, image rejection, >146 dB.
Squelch sensitivity: Not specified.	At threshold, 0.04 μV.
S-meter sensitivity: Not specified.	Max indication=4.4 μV.
Audio output: 200 mW at 10% THD into 8 Ω.	245 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/M/L): With RNB127 6-V battery pack, not specified; 5 W / 0.6 W / 0.18 W at 11 V dc.	2.8 W / 0.6 W / 0.2 W with RNB127, 6 V battery pack; 5.6 W / 0.6 W / 0.2 W at 11 V dc.
Spurious signal and harmonic suppression: 60 dB.	66 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 42 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	84 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value shown.

well placed and work easily. The speaker mike and dc jack dust covers stayed put when closed, and the radio provides a sturdy metal belt clip. On our review unit, the small plate surrounding the dc jack (it's glued in place) came loose. Otherwise, fit and finish were excellent.

Programming also got high marks from the reviewers. One quirk was the use of the letter **A** in the display to indicate VFO mode. There's no explanation of what **A** stands for. Programming a memory channel involves four steps. After you're done, the H-T automatically returns to VFO mode. Once programmed, the radio was deemed easy to use.

Owing to the H-T's many features and functions, the 56-page manual is larger than most. A *Quick Reference Guide* is printed on heavy card stock, which is helpful. The manual itself contained a few annoying typographical errors, but it's easy to figure out the intent of the words. There is no schematic diagram.

Of special note is the automatic battery saver function. The radio "sleeps" but awakens every 250 ms to check for activity. One reviewer with large hands reported that his pinkie tended to wrap all the way around to the front **MR** button, which activates the memory mode. Those with smaller hands had no such problems. One commented, "I took it out walking each night, and I found it comfortable in hand."

One reviewer found that an incorrect frequency occasionally appeared on the display. "When working a local repeater, the radio was set to 147.39 on receive and 147.99 on transmit. Sometimes, after transmitting, the display would stay at 147.99, even though it was receiving perfectly fine on 147.39." A low battery could have been the culprit here.

Another reviewer reported that when the radio was in memory mode, he could inadvertently change the memory without realizing it. The Midland 73-030 offers expanded receive coverage right out of the box.

Considering the largely positive impression the unit made on our users, more retailers should seriously consider putting the 73-030 on their shelves. By the way, Midland also makes the larger Model 73-005A, which offers a different variety of features.

Manufacturer: Midland Consumer Radio, 1670 North Topping, Kansas City, MO 64120; tel 816-241-8500; fax 816-241-5713. Manufacturer's suggested retail price, $370.

STANDARD C156A

Standard has a history of making some small H-Ts. In the past, we've looked at the diminutive C108 2-meter H-T and, more recently, the C508 dualbander. A palm size radio with a tone pad, two knobs on top and three on the side, including a function button, the little C156A is both simple and fun to use and has lots of nice features. This is a very well-built, handsome radio with the excellent fit and finish that Standard owners have come to expect. The only minor gripe in that regard was that the rubber dust covers over the jacks didn't stay put once they'd been opened. Standard says it's fixed this problem in current production models.

In general, this H-T feels rugged and fits well in the hand. The display panel is easy to read in all but the brightest sunlight. The lamp lights the display but not the keypad buttons.

Audio output was quite good, even at high volume. "There were no distortion, rattles or vibration," one reviewer reported. Transmitted audio quality got mixed reviews from stations the reviewers contacted. Although some noted "clear and strong" reports, several others got "does not sound like your usual voice" and "very low in pitch and a little muffled." One user cured the "muffled" audio by backing away from the mike a bit.

The battery pack, which holds four AA alkaline cells, held up well over the course of our testing. This could vary from one battery brand to another, however.

The radio is a good fit in a shirt or pants pocket, even with the antenna attached. One drawback is the small size of the **F**unction button on the side. Considering that it's used fairly often, users felt that a larger button would have been more convenient. There were some complaints about the lack of a squelch knob—but the C156A has an automatic squelch system, so the control is superfluous. There is a **MONI**tor button, however.

Ease of programming this radio got mixed reviews. One experienced H-T user called it

Standard C156A, serial number 66U020176

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive and transmit, 144-148 MHz.	Receive, 100-196 MHz; with reduced sensitivity below 137 MHz and above 174 MHz; transmit, as specified.
Power requirements: 4.0-15 V dc. Receive, ≈30 mA; transmit (max, high power), ≈1.3 A at 13.8 V dc.	As specified.
Size (HWD); 5×2.1×1 in; weight 10.6 oz.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity, 12 dB SINAD: 0.16 µV.	For 12 dB SINAD: 0.13 µV.
Two-tone, third-order dynamic range: Not specified.	20 kHz offset, 59 dB;* 10 MHz offset, 66 dB.
Adjacent channel rejection: Not specified.	58 dB.
First IF and image rejection: Not specified.	IF rejection, 89 dB, image rejection, 66 dB.
Squelch sensitivity: 0.10 µV	At threshold, 0.09 µV.
S-meter sensitivity: Not specified.	S9=2.8 µV.
Audio output: 250 mW at 10% THD into 8 Ω.	281 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (H/M/L): 1.8 W / 0.35 W with CBT156, 6 V battery tray; 5 W / 2.5 W / 0.35 W at 13.8 V dc.	1.8 W / N/A / 0.4 W with CBT156, 6 V battery tray; 5.0 W / 2.2 W / 0.4 W at 13.8 V dc.
Spurious signal and harmonic suppression: 60 dB.	65 dB. Meets FCC requirements for spectral purity for equipment in its power output class and frequency range.
Transmit-receive turn-around time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, 27 ms.
Receive-transmit turn-around time ("tx delay"): Not specified.	76 ms.

Note: All dynamic range measurements were made at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value shown.

"worse than average." Most agreed it was no better than average and they needed to refer frequently to the manual. "Much use of the function button," another user remarked. To program a frequency into memory involves four steps. Switching between memory and VFO mode is easy—the large **V/M ENT** button on the front panel toggles between them.

This is the only unit in the group that has memory naming—and it has the most memories to name, too. You can apply up to seven character names or titles to the unit's 100 memory channels.

The well-organized manual covers 80 pages and includes an index. A couple of experienced H-T users felt it lacked some necessary details (such as information about extended receive coverage), however, and one lambasted the awkward translated English. The first section covers Basic Operations, and the remainder Advanced Operations. "This one tells how to get into a function *and* how to get out of it," one reviewer commented. Another reviewer became puzzled at first by the musical tones at the end of some transmissions; it turned out to be a low-battery indicator that's undocumented in the manual. The manual includes a troubleshooting section. Illustrations are large enough to show necessary detail. There is no separate quick reference guide or schematic diagram.

This radio seems rugged enough to stand up to repeated use, and our reviewers really appreciated the size and feel of this H-T.

Manufacturer: Standard Amateur Radio Products, Box 48480, Niles, IL 60714; tel 773-763-0081; fax 773-763-3377; **http://www.stdradio.com**. Manufacturer's suggested retail price, $289.

Summary

If I had to provide one piece of advice based on a close look at these seven H-Ts, it would be this: Don't be seduced by the number of features and functions a particular model offers. Instead, look at the capabilities of each model, and decide which has the features you're likely to use. More bells and whistles *do not* necessarily equate to more operating enjoyment if you don't use them!

A couple of comments are worth noting here. Except for the Kenwood TH-235A, there was nothing in the manuals about using these radios for packet operation. And there's nothing on the boxes—or even in the manuals in most cases—about ham radio! The radios are described as "VHF FM transceivers," or some variant thereof, but there is no indication that they are to be used in the Amateur Radio Service, or that a license is required to transmit on the ham bands.

Overall, these radios represent a terrific cross-section of features and operating convenience, and at a cost that won't bust your budget. Some manufacturers have clearly succeeded better than others, but these seven H-Ts, each with its own personality, are marvels of engineering and electronics. While I was using these radios, I found that I didn't miss my old, heavy and very, very basic H-T. In fact, I'm not even sure where I put it. I may just have to replace it…

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