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QST Compares: 2-Meter Mobile Transceivers
   (ADI AR-146; Alinco DR-150T; ICOM IC-2000H; Kenwood TM-261A; Radio Shack HTX-242;
   Ten-Tec T-kit 1220; Yaesu FT-3000M)

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QST Compares: 2-Meter Mobile Transceivers

For a moment, let's go back 10 years (those of you who haven't been in the hobby that long, please indulge us for a moment) and look at the 2-meter mobile gear available in the fall of 1986. Have we come a long way? This current crop of radios offers power up to 70 W. Although the first 70-W mobile came out about a decade ago, many others topped out at 25 W or so. Today, 45 or 50 W is commonplace. Memories? A decade ago, 5 or 10 might have been considered sufficient (so was 640 kB of computer memory!). Now, having 40, 50 or even 100 memories is routine. DTMF autodialing capability was considered cutting edge in 1986. Many mobile transceivers—and even some H-Ts—offer that now.

What you're more likely to find these days that you *couldn't* buy a decade ago are extended VHF, aviation band and UHF reception; alphanumeric memory display; standard CTCSS encoding (and even decoding, in some cases); and easier-to-read displays. Today's transceivers sometimes also offer some kind of dual-watch capability—to monitor two separate frequencies simultaneously. And you might find full-duplex and cross-band repeat, a spectral display that shows you the other signals on the band, automatic memory storage, 9600-bit/s packet capability, and an automatic power-off timer. Some radios have made many functions available remotely via the microphone.

Today's microprocessor-driven menus also have lowered the knob and button count on the typical 2-meter mobile while increasing functionality with additional features (how many of them are actually needed or even used is another matter).

The use of "modular" telephone-type plugs for microphone connectors appears to be a new industry trend, but there's no particular standard, either in terms of the type of modular plug or the pin connections. One *big* advantage is that they don't require solder-ing. These connectors are becoming widely available, too. Of this group, four used modular plugs, while three used more traditional connectors.

Another trend is the use of "pigtail" antenna and power connections. As one reviewer put it, the pigtails "just beg to be chopped off." We felt the pigtail-type antenna connectors in particular might be less durable than a bulkhead-type SO-239 on the rear panel, which only two radios (the Ten-Tec T-kit 1220 and the ICOM IC-2000H) offered. On the other hand, as another op

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Two-meter Mobile Superlatives (See individual tables for ARRL Lab test results.)
- Lowest street price: ADI AR-146 ($240).
- Best 2-meter receive sensitivity: ADI AR-146 (0.13 uV)
- Highest transmit power: Yaesu FT-3000M (70 W)
- Best adjacent channel rejection: ADI AR-146 (88 dB)
- Best two-tone, third-order IMD Dynamic Range (VHF) at 20 kHz spacing: Radio Shack HTX-242 (77 dB; noise-limited).
- Best two-tone, third-order IMD Dynamic Range (VHF) at 10 MHz spacing: Yaesu FT-3000M (101 dB). This number indicates how well your transceiver will do when exposed to the local "intermod alley" (see *QST*, Aug 96, p 40).
- Best IF rejection (VHF): ADI AR-146 (121 dB)
- Best image rejection (VHF): Kenwood TM-261A (>121 dB)
- Most memories: Alinco DR-150T (100)
- Highest audio output power: Kenwood TM-261A (3.2 W)
- Fewest front panel knobs and buttons: Ten-Tec T-kit 1220 (8)
- Widest receiver range: Yaesu FT-3000M (110-180; 300-520; 800-999 MHz except cellular)
- Best display (by acclamation): ICOM IC-2000H

2-Meter FM Mobile Transceiver Features

	ADI AR-146	Alinco DR-150T	ICOM IC-2000H	Kenwood TM-261A	Radio Shack HTX-242	Ten-Tec T-kit 1220	Yaesu FT-3000M
Extended VHF reception (FM)	S	S	S	S	S	X	S
UHF reception (FM)	X	S	X	X	X	X	S
Aviation band reception (AM)	X	S	S	S	X	X	S
Specified output-power levels (W)	50/25/5	50/25/10	50/10/5	50/10/5	45/10	30/5	70/50/25/10
Memory channels	40+CALL	100	50+CALL	60+CALL	40+CALL	15	80+CALL
Band, memory and programmed scan	S	S	S	S	S	X	S
Alphanumeric memory naming	X	X	S	S	X	X	S
Automatic repeater offset	X	S	S	S	S	X	S
CTCSS encoder	S	S	S	S	S	S	S
CTCSS decoder	S	O	O	O	S	X	O
DTMF decoder	S	O	O	S	S	X	S
DTMF autodialer	X	S	O	S	S	X	S
9600-bit/s packet capability	X	S	X	X	X	X	S
Dedicated TNC jack	X	S	X	X	X	S	S
Display dimmer	S	S	S	X	S	X	S
Manufacturer's suggested retail price	$280	$315	$329	$430	$300	$259*	$599
Typical selling price as of 9/96†	$240	$285	$277	$277	$300‡	$259‡	$481

Key
S = Standard
O = Optional
X = Not available
*Basic T-kit 1220 is $195; Model 1222 30-W amplifier is $64.
†Typical selling prices represent an average of street prices obtained from three equipment retailers, exclusive of any sales, coupons or rebates.
‡These transceivers are only available from the manufacturer.

observed, on an under-dash radio, it's easier to connect an antenna to a pigtail than to a protruding rear-apron connector, which could also interfere with mounting.

In 1996, we also have some new faces among the manufacturers. This roundup includes the first transceiver by ADI to be reviewed by *QST*, as well as an entry from Radio Shack—a decade ago not even a contender in the FM mobile arena and today a force to be reckoned with, especially given their vast number of retail outlets. In addition, we've included the first-ever 2-meter FM mobile transceiver by Ten-Tec, which happens to be a kit (see sidebar, Building the Ten-Tec T-kit 1220). We'll look at the ADI AR-146, the Alinco DR-150T, the ICOM IC-2000H, the Kenwood TM-261A, the Radio Shack HTX-242, the Ten-Tec T-kit 1220 and the Yaesu FT-3000M.

Our review team consisted of Glenn Swanson, KB1GW, Educational Activities Coordinator; Peter Budnik, KB1HY, Educational Assistant; Rick Lindquist, KX4V, Assistant Technical Editor; Norman Bliss, WA1CCQ, former manager, Regulatory Information Branch; and Mike Gruber, WA1SVF, ARRL Lab Test Engineer.

ADI AR-146

The ADI AR-146 is the Taiwan firm's first entry into the burgeoning 2-meter mobile market. It's a handsome radio that's compact and sensibly laid out. The ADI AR-146 also was a terrific performer (it topped four of the eight categories in our Superlatives list, including lowest price of the lot). While it doesn't come with "everything" (no alphanumeric memories and no audialer, for example) it does offer 50-W output and 40 memories plus a *Call* channel. It also has standard CTCSS decode, although the manual indicates this is an option.

Like those on some of its review cohorts, the left-mounted tuning knob is surrounded by a lighted "halo" for easy visibility in the dark. But the knob itself is small and smooth. The green **PWR** button is easy to spot; barriers separate neighboring buttons. The radio is fairly simple to use, and we figured out how to store data in memories without resorting to the manual. It's *very* easy! While the AR-146 does not offer alphanumeric memory naming, it does let you display memories solely by channel number.

You won't find layers of features buried in various menus, because the AR-146 has no menus. All functions are accessed by pressing buttons. The radio also does not offer automatic repeater offset, a fairly common feature these days. Strangely, the time-out timer (**TOT**) only offers a 30-minute setting. Now, *that's* one long-winded transmission!

We got good audio reports, and the tiny, top-firing speaker handled audio adequately. The **VOL**ume and **SQ**uelch controls are oval and tapered, which should make them a bit easier than smooth, round controls to grip and position without looking. Some ops found them awkward at first and felt they could be bigger. The **SQ** control on our unit seemed to bind slightly at one point, while the **VOL** control moved smoothly.

Unlike many radios, the AR-146 doesn't scan when you press and hold the **UP** or **DN** buttons. You have to push and hold **VFO** instead. The **UP** and **DN** buttons then change scan direction.

We found that the display was hard to read at wide horizontal viewing angles, but it's okay vertically. A front-panel dimmer controls four levels of display brightness. The combination LCD S meter/power-output meter is easy to read and interpret. The front panel itself was another matter. While the white main legends were easy to see, the red sublegends were hard to make out (both are tiny). The red, lighted subfunctions above the **SHFT** and **TONE** buttons were a bit easier to see, but still quite small.

The supplied hand mike has an indent for your thumb, most comfortable if you hold the mike in your right hand. It also has a locking switch and a hook on top to hang it up. Besides the DTMF keypad, the mike has **CALL**, **VFO**, **MR** and **MHZ** buttons plus the recessed **UP/DN** buttons on the top. You cannot enter your frequency directly from the keypad, however.

The AR-146 should not have any trouble with its hearing. The transceiver's receiver sensitivity (0.13 µV for 12 dB SINAD) was the best of the lot and topped its own 0.18-µV spec! Other than that, the ARRL Lab numbers put this radio in the average to above-average category, depending on the numbers you look at (see table). The AR146 compared favorably with other radios in terms of its two-tone, third-order IMD dynamic range (73 dB), and it had very good adjacent-channel rejection numbers (88 dB). In terms of "intermod" immunity, the majority of the radios in our review group had better numbers, but not that much better in most cases.

The AR-146 has limited receiving capability outside the 2-meter band. While the manual indicates otherwise, the unit does cover 138 to 174 MHz, FM only.

The six-foot power cable might be too short for some installations. The radio also became *quite* warm after several minutes of continuous use.

The AR-146 package includes a mobile mounting bracket and hardware and a spare fuse. The antenna connects via a coaxial cable pigtail with a UHF connector on the end. The power connection is also on a pigtail.

The compact, 41-page *User's Manual* was well-organized and easy to follow. While the booklet contained a few typographical (and a couple of minor factual) errors, these did not greatly detract from its usefulness.

All told, the ADI AR-146 appears to be an excellent value.

Manufacturer: Distributed by Premier Communications Corp, 20277 Valley Blvd, Unit J, Walnut, CA 91789; tel 909-869-5711; fax 909-869-5710. Manufacturer's suggested retail price, $280.

ADI AR-146, serial no. 6520060005

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 144-148 MHz; transmit, 144-148 MHz.	Receive, 138-174 MHz; transmit, 144-148 MHz.
Power requirements: At 13.8 V dc: Receive, <0.6 A; transmit, <11 A.	At 13.8 V dc: Receive, ≤0.7 A (max); transmit, 8.2 A (max).
Size (height, width, depth): 1.6×5.6×6.9 inches; weight, 2.7 lb.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: 0.18 µV or less for 12-dB SINAD.	0.13 µV for 12-dB SINAD.
Two-tone, third-order IMD dynamic range: Not specified	20-kHz offset from 146 MHz, 73 dB. 10-MHz offset from 146 MHz, 86 dB.
Adjacent-channel rejection: Not specified	20-kHz offset from 146 MHz, 88 dB
IF rejection: Not specified.	121 dB.
Image rejection: Not specified.	62 dB.
Squelch sensitivity: <0.1 µV.	0.05 µV, at threshold.
Audio output: >2 W at 5% THD into 8 Ω.	2.8 W at 5% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/medium/low): 50 / ≈25 / ≈5 W	51 / 25 / 8 W.
Spurious signal and harmonic suppression: –60 dBc or better.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 48 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	75 ms.

Alinco DR-150T

In contrast to the DR-130T included in our last comparative review of 2-meter mobiles (*QST*, Jan 95), Alinco has packed a *lot* of features into the DR-150T while still keeping the radio fairly simple and the price reasonable. Just for starters, the DR-130T—which continues to be available—offers just 20 memories (expandable to 100). As this review went to press, Alinco announced its mid-price DR-140T. The '150T has 100 standard memories, topping the pack! Another thing: Reviewers complained about the DR-130T's "skimpy" manual. This time, Alinco provided a full-sized 64-page *Instruction Manual* that covers every detail of the transceiver's operation. The manual includes a handy, wallet-sized *Reference Key* and a schematic. The Alinco DR-150T was one of two transceivers in this lineup (the other was the Yaesu FT-3000M) that's equipped for 9600-bit/s packet operation—it offers a separate TNC port—and which can receive on UHF. The manual did a particularly good job of explaining how to hook up the radio for 1200-bit/s or 9600-bit/s packet use.

Our reviewers felt the front panel was neatly laid out, and a couple of them really liked the row of dual-function buttons (tilted up for better viewing) just below the display window. They could be a little too close together for those with big fingers, however. One such reviewer complained he often hit two buttons at once.

The radio has a lot of front-panel controls to contend with, however—14 in all—and some of them probably could have been relegated to menus. Separate **SQL** and **VOL** controls are on the right. The tuning knob is on the left. The review team also liked the lighted "halos" around the front-panel control knobs, but the halo around the main tuning knob was only visible at an angle, not a problem in most mobile installations. Alinco displays tend to be easy to see and with bold numbers and characters. This was no exception. Visibility of the lime-green display was rated good. It offers two brightness levels. One reviewer called it "a pleasure to look at." It's visible from various viewing angles, including from below. The display can be set to read out frequency or channel numbers only. The bar-type S meter/RF output meter, which is above the frequency readout, was also judged easy to see and decipher.

This is the only radio that offers an RF attenuator. Alinco says it helps to prevent interference from strong adjacent signals

Alinco DR150T, serial no. T00-4269

Manufacturer's Specifications	Measured in ARRL Lab

Frequency coverage:
    Receive, 108-174, 440-450 MHz;
    transmit, 144-148 MHz.
	As specified.

Power requirements: At 13.8 V dc:
    Receive, 0.6 A; transmit, 10 A (max).
	At 13.8 V dc: Receive, 0.5 A (max);
	    transmit, 9.3 A (max).

Size (height, width, depth): 1.6×5.6×5.2 inches; weight, 1.8 lb.	

Receiver	*Receiver Dynamic Testing*

Sensitivity: For 12 dB SINAD: 146 MHz,
    −16 dBµ (0.16 µV) or less; 440 MHz,
    −10 dBµ (0.32 µV) or less; AM (120 MHz),
    not specified.
	For 12-dB SINAD: 146 MHz, 0.17 µV;
	    440 MHz, 0.3 µV; AM (120 MHz): 0.47 µV
	    for 10-dB (S+N)/N.

Two-tone, third-order IMD dynamic range:
    Not specified.
	20-kHz offset from 146 MHz, 61 dB.*
	    20-kHz offset from 440 MHz, 49 dB.*
	    10-MHz offset from 146 MHz, 86 dB.

Adjacent-channel rejection: Not specified	20-kHz offset from 146 MHz, 61 dB 20-kHz offset from 440 MHz, 49 dB
IF rejection: Not specified.	146 MHz, 67 dB; 440 MHz, 77 dB.
Image rejection: Not specified.	146 MHz, 94 dB; 440 MHz, 23 dB.
Squelch sensitivity: −20 dBu (0.1 µV) or better.	0.09 µV, at threshold.
Audio output: 1.5 W into 8 Ω (THD not specified).	3 W at 6% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/medium/low): 50 / 25 / 10 W.	52 / 22 / 10 W.

Spurious signal and harmonic suppression:
    −60 dBc or better.
	As specified. Meets FCC requirements for
	    spectral purity.

Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 110 ms; data mode, 100 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	165 ms.

Bit-error rate (BER), 9600 baud: Not specified.	Receiver: BER @ 12-dB SINAD, $2.7×10^{-4}$;
	    BER @ 16-dB SINAD, $<1.0×10^{-5}$; BER @
	    −50 dBm, $<1.0×10^{-5}$. Transmitter: BER @
	    12-dB SINAD, $6.5×10^{-3}$; BER @ 12-dB
	    SINAD + 30 dB, $1.6×10^{-3}$.

*Measurement was noise-limited at value indicated.

"during crowded band conditions." The ARRL Lab measured the radio's dynamic range and adjacent-channel rejection at a modest, noise-limited 61 dB (a tie with Ten-Tec for the worst of the bunch in this regard). ARRL Lab tests showed only minimal improvement using the RF attenuator.

Despite the numerous features, we found that we didn't need to refer to the manual to get up and running. But we *did* need to consult the book to find out how to program memories. One user suggested first setting up the radio at home or while parked before heading out on the road. All suggested first reading the manual thoroughly.

On-the-air audio reports were mixed. Readability of transmitted audio was fine, but one user got reports that suggested that audio might be rolled off a bit too much on the bass side of the scale. Receive audio was judged adequate.

The comfortable-to-use microphone includes a DTMF pad, plus **UP/DOWN** keys (to change frequency or to activate scanning), an **UP/DOWN** lock switch and a **REMOTE/DTMF** switch. This last item unlocks the capability to control the radio's receiver entirely from the microphone by using the DTMF keypad buttons. Of course, you can't use the DTMF keys in this operating mode, and you have to

remember which keys do what on the keypad. While in remote mode, you can use the DTMF keypad to enter a frequency directly from the microphone. If you're on 2 meters and want to monitor a UHF repeater, the radio will automatically switch to UHF when you enter the repeater's frequency.

Users liked the UHF receive capability, although the only way to monitor UHF and VHF at the same time is to use the radio's scanning features. The radio also has extended VHF receive capability, including AM receive on aircraft frequencies.

Among other "slick" features this radio offers is its *Channel Scope*, which visually displays band (or memory) activity. Once the novelty wears off, though, we're not sure how much you'll use it. Of this current crop of 2-meter mobiles, only the much-higher-priced Yaesu FT-3000M offered a similar capability. The Alinco DR-150T also has an S-meter squelch, which lets you set a minimum S-meter reading that's required to break the radio's squelch. That's handy to keep distant repeaters you hear but can't hit from breaking your squelch. Alinco also offers a *wireless* cloning feature. This lets you send memory and setting information to another DR-150T over the air, great for families or groups. Like other Alinco radios,

the DR-150T supports the *LiTZ* (long-tone zero) emergency alerting signal (DTMF 0 sent for three seconds or longer).

The Alinco DR-150T is a very functional transceiver that greatly expands on the features offered by the DR-130T. Expect to spend some time with the excellent *Instruction Manual* if you want to avail yourself of all of those features. The DR-150T package includes a 9-foot power cord, mike bracket, mobile mount plus hardware, two spare fuses and a wrench.

Manufacturer: Alinco Electronics Inc, 438 Amapola Ave, Suite 130, Torrance, CA 90501; tel 310-618-8616. Manufacturer's suggested retail price, $315. EJ-20U tone decoder, $41 (provides tone squelch and tone scan).

ICOM IC-2000H

With the IC-2000H, ICOM offers an unpretentious 2-meter mobile transceiver at a competitive price and leaves it for you to decide if you want to spring for more bells and whistles. Features aside, this is a great radio with plenty to offer, but ICOM's "one-piece construction" is *mostly* unpainted aluminum heat sink, which might be what prompted one reviewer to call it "very solid." The attractive front-panel assembly is bolted right onto the heat sink, which proved sizable enough to head off any problems with overheating.

The ICOM IC-2000H features a *big* backlighted LCD display with very easy-to-see, easy-to-read numbers. "One of the best I've seen" is how one user rated it. Reviewers voted it the best of the bunch. The IC-2000H tuning knob is to the right of the display.

We found the radio quite easy to program and figured it out without first resorting to the manual. "No tricky procedures," one reviewer commented. It does not have the memory recall/VFO button typical of many radios. Instead, it has an **M/CALL** button (for memory and call channel) and a **V/MHZ/PRIO** button to select the VFO and for tuning by 1-MHz increments and to start or stop a priority-channel watch, another handy feature. The radio has no "function" button either. With ICOM's one-touch button operation, you press and hold multi-function buttons to access secondary functions. Even so, the front panel has many buttons and controls—11 in all—including separate buttons for **SCAN** and **PG/CS** (for pager and code squelch), which are options. Buttons have

ICOM IC-2000, serial no. 33246

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 118-174 MHz; transmit, 144-148 MHz.	Receive, 118-174 MHz; transmit, 140-150 MHz.
Power requirements: At 13.8 V dc: Receive, 1.0 A (max); transmit, 10.5 A (max).	At 13.8 V dc: Receive, <0.5 A (max); transmit, 10 A (max).
Size (height, width, depth): 2×6×6 inches; weight, 2.6 lb.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 0.18 µV or less for 12-dB SINAD.	For 12-dB SINAD: 146 MHz, 0.19 µV; AM (120 MHz): 0.7 µV for 10-dB (S+N)/N.
Two-tone, third-order IMD dynamic range: Not specified.	20-kHz offset from 146 MHz, 69 dB.* 10-MHz offset from 146 MHz, 97 dB.
Adjacent-channel rejection: Not specified	20-kHz offset from 146 MHz, 69 dB.
Spurious response: >60 dB.	IF rejection: 109 dB. Image rejection: 63 dB.
Squelch sensitivity: 0.13 µV at threshold.	0.1 µV, at threshold.
Audio output: >2.4 W at 10% THD into 8 Ω.	2.8 W at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output (high/medium/low): 50 / 10 / 5 W.	56 / 9.8 / 4.5 W.
Spurious signal and harmonic suppression: –60 dBc or better.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 170 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	125 ms.

*Measurement was noise-limited at value indicated.

Braille-like raised patterns on them, apparently to make them easy to identify by touch while under way. The coined edges on the three controls—**SQL**, **VOL** and the tuning knob—are easy to grip.

In its advertising, ICOM has been promoting the IC-2000H as "highly intermod resistant." While not at the top of this particular heap, the numbers we measured were quite good (see table); it should perform very well in an RF-active environment.

The supplied HM-95 mike feels solid. It has **UP/DN** buttons, a switch to lock out the **UP/DN** buttons, and DTMF keys, but no function buttons. However, you can assign a function to the **UP** button. DTMF keys are not lighted, and they're recessed on the *back* of the mike, so it's possible to inadvertently press them while you're talking into the other side. You can change frequency or step through memories via the microphone, but you need an optional UT-101 DTMF unit for *direct keypad entry* of frequency.

On the air, the radio brought reports of "clean, crisp audio." The receive audio also was quite good. It cranks out nearly 3 W, which turned out to be plenty. This radio was the only one of the crop with a downward-firing speaker, a plus if you still have a dashboard to mount a radio beneath, but not so good if you plan to just set the radio in the passenger seat.

The IC-2000H offers a *repeater lockout* feature to prevent you from "doubling." When it's activated, you cannot transmit until the squelch tail drops, which makes it highly unlikely you'll start talking out of turn.

We liked the six-character alphanumeric memory naming feature. This is enough letters to put up a meaningful message. For additional entertainment, enable the *demonstration display*, which visually "introduces" the radio's various function display indicators. It's quite a show!

For the most part, we found the compact, 42-page IC-2000H *Instruction Manual* quite thorough and complete, except that it ignored packet altogether. But it does diagram the connections to the 8-pin modular telephone-type front-panel microphone jack.

What features does the IC-2000H *not* offer? As we mentioned, pager and code squelch are options on the IC-2000H. You need the UT-101 DTMF unit, which also gives you alphanumeric messaging capability as well as DTMF remote (with the DTMF microphone). For CTCSS decoding, (tone squelch) and pocket beep function, you need the optional UT-85 tone squelch unit. If you want autodialing (DTMF memory) capability, you can get the HM-77 mike that provides 14 DTMF memories of up to 22 digits each.

The IC-2000H package includes a mobile mounting bracket and hardware, a spare 20-A fuse, and a 10-foot DC power cable.

If you value performance and solid quality over features, this could be the radio for you.

Manufacturer: ICOM America Inc, 2380 116th Ave NE, Bellevue WA 98004; tel 206-454-7619. Manufacturer's suggested retail price: $329; the UT-85 tone squelch unit is $61; UT-101 DTMF unit is $22; HM-77 microphone with DTMF memories, $121.

Kenwood TM-261A

The Kenwood TM-261A is a step up from the discontinued TM-241A and a step down from the feature-packed TM-251A (see *QST*, Jan 95). It appears to be a very well-made unit that, like its predecessors, complies with military environmental standards MIL-STD 810C and 810D for vibration and physical shock (Kenwood makes a nearly identical UHF transceiver, the TM-461A, for 70 cm). The TM-461A tuning knob is on the left. While not surrounded by lighted halos, the front-panel knobs are easy to grip since they have a raised coined-edge. The TM-261A display is easy to read and visible from *all* angles, including very acute angles looking downward, something you could experience in certain mobile installations. There is no display dimmer.

The four front-panel buttons below the display are multi-functional. The **F**unction button has a Braille-like raised dot on it, for quick tactile identification, The **TONE** button has two raised dots. Conveniently, the buttons' labels appear on the LCD display window, so they always indicate the correct function or subfunction, which eliminates guesswork. Another convenience we liked was the memory name function. You can apply six-character alphanumeric names to all 62 memory channels—or you can just display a channel number for each memory.

The supplied MC-53DM microphone is big and has an especially solid feel in either hand; it also features nice, *large*, lighted TTP buttons plus a row of four function buttons above the keypad. The mike connects to a front-panel modular telephone-type plug. The MC-53DM was not a hit with all users. One of them called it "clunky," but others found its substantial size made it more convenient to use (and see). You can program the mike's **VFO** and **MR** and **PF** keys as one-touch function buttons, a great convenience. They'll even handle some menu functions. The **PF** key defaults to the **MHZ** function, but to set the radio up for direct frequency entry from the microphone keypad, you must first reprogram the **PF** button, so its utility value is limited.

The TM-261A has a menu system to access various functions and subfunctions. Making choices within menus on this radio is *not* especially intuitive, however, depending on which menu function you select. The radio is fairly easy to program, provided you first read the manual. To program a repeater split, you can't set up the offset in advance, then simply store it. Instead, you must select the offset as part of the programming operation. This means more button pushing. Once you get the hang of it, though, the TM-261A is pretty easy to run from the mike alone. The radio offers packet at 1200 bit/s. It does not have a separate data port, however, so you'll need an adapter cable with a connector that fits the 8-pin mike jack (Kenwood offers a mike plug adapter, MJ-88, but we didn't see an accessory cable listed among the optional accessories in the manual). The TM-261A also can tune the AM aircraft band, but it's not especially sensitive there. At 120 MHz, we measured 22.9 µV for 10-dB (S+N)/N.

To scan, you push and hold the **VFO** button to start scanning. Pushing the **UP** and **DWN** buttons then changes the scan direction.

On-the-air reports suggested that transmitted audio was fine. The received audio was clean from the very small top-firing speaker. ARRL Lab tests showed the Kenwood as the audio-output winner at 3.2 W; it should easily drive a larger, external speaker.

The TM-261A includes CTCSS encoding, although you'll need the optional TSU-8 CTCSS board that provides tone decoding *plus* tone identification—sometimes called tone scan—provided the tone is audible on the received signal.

The 57-page *Instruction Manual* appeared to be thorough and, for the most part, well-organized. (Kenwood includes a separate *Manual de Instrucciones* for Spanish-speaking users.) Information on the radio's CTCSS tone capabilities was a little misleading and inexplicably spread among several sections of the manual. The TM-261A package includes a 6-foot power cable, mobile mounting bracket, mounting hardware, a spare 15-A fuse, and a little wrench, apparently for the mounting hardware, although the *Instruction Manual* never makes that clear.

Overall, the TM-261A is a capable, quality radio that should serve the average mobile operator well.

Manufacturer: Kenwood Communications Corp, 2201 E Dominguez St, Box 22745, Long Beach, CA 90801-5745; tel 310-639-4200. Manufacturer's suggested retail price, $429; TSU-8 CTCSS board, $60.

Radio Shack HTX-242

Radio Shack says it's *serious* about Amateur Radio, and the HTX-242 is a serious contender in the mobile transceiver market. The HTX-212, Radio Shack's first 2-meter mobile offering, now has been discontinued, in favor of the HTX-242 (although some Radio Shack stores still have the '212 available). As this review went to press, Radio Shack slashed $70 off the price of the HTX-242, making it an even better value than its predecessor. Among other things, the HTX-242 offers out-of-band memory storage (the HTX-212 only let you save frequencies with-in the 2-meter band), more memories (40) and CTCSS decoding (but not tone scan)—a nice standard bonus.

Kenwood TM-261A, serial no. 71200011

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive and transmit, 144-148 MHz.	Receive, 118-174 MHz; transmit, 144-148 MHz.
Power requirements: At 13.8 V dc: Receive, 0.6 A or less; transmit, 11 A or less.	At 13.8 V dc: Receive, 0.67 A (max); transmit, 8.7 A (max).
Size (height, width, depth): 1.6×5.6×6.4 inches; weight, 2.2 lb.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: 0.16 µV or less for 12-dB SINAD.	For 12-dB SINAD: 146 MHz, 0.17 µV; AM (120 MHz): 22.9 µV for 10-dB (S+N)/N.
Two-tone, third-order IMD dynamic range: Not specified.	20-kHz offset from 146 MHz, 74 dB. 10-MHz offset from 146 MHz, 91 dB.
Adjacent-channel rejection: Not specified.	20-kHz offset from 146 MHz, 71 dB
IF rejection: Not specified.	96 dB.
Image rejection: Not specified.	>120 dB.
Squelch sensitivity: 0.1 µV or less.	0.04 µV, at threshold.
Audio output: ≥2 W at 5% THD into 8 Ω.	3.2 W at 5% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/medium/low): 50 / 10 / ≈5 W.	51 / 11 / 6 W.
Spurious signal and harmonic suppression: −60 dBc or better.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 200 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	83 ms.

*Measurement was noise-limited at value indicated.

Radio Shack HTX-242, serial no. 0000663

Manufacturer's Specifications	**Measured in ARRL Lab**
Frequency coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.	As specified.
Power requirements: At 13.8 V dc: Receive, 0.5 A (standby); transmit, <8 A (max).	At 13.8 V dc: Receive, 0.6 A (max volume, no signal, lights at default); transmit 7.8 A (max).
Size (height, width, depth): 1.7×5.7×6.4 inches; weight, 2.9 lb.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: 0.25 µV for 12-dB SINAD.	For 12-dB SINAD: 146 MHz, 0.2 µV.
Two-tone, third-order IMD dynamic range: Not specified.	20-kHz offset from 146 MHz, 77 dB.* 10-MHz offset from 146 MHz, 91 dB.
Adjacent-channel rejection: 70 dB or better.	20-kHz offset from 146 MHz, 79 dB.
IF rejection: Not specified.	81 dB.
Image rejection: Not specified.	72 dB.
Squelch sensitivity: 0.1 µV, at threshold.	0.08 µV, at threshold.
Audio output: >2 W at 10% THD into 8 Ω.	2 W at 1.1% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/low): 45 / 10 W.	50 / 14 W.
Spurious signal and harmonic suppression: −60 dBc or better.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 120 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	67 ms.

*Measurement was noise-limited at value indicated.

The HTX-242 is an attractive radio with a sensible, but busy, front panel. The tuning knob is to the left of the display window. The radio has lots of controls (14; it tied with the Alinco DR-150T for the most), but we experienced no difficulties using those controls on the road. The lighted "halos" around the **TUNE/M-CH**, **VOLUME** and **SQUELCH** controls were a nice touch. Knobs have coined edges for sure grip. A row of buttons below the display provides access to some common functions (**SHIFT/REV**, **MHZ/STEP** and **CALL/ LOCK**) and some not-so-common ones (**T-SQL** and **DTMF**), and includes a function (**F**) button to access second-tier functions. We found it hard to read the legends for the secondary functions. The **CALL** button thoughtfully defaulted to 146.52 MHz. Another set of three smaller pushbuttons above the **TUNE/M-CH** control accesses yet other functions (including **VFO**, **MR** and **DUP)** and let you page through menu selections. Radio Shack easily could have relegated some of the lesser-used functions to the menu and kept down the front-panel clutter.

The tuning dial has detents, but as you tune, the display seems to lag a few milliseconds behind, which we found annoying. Because of this, you'd sometimes find yourself tuning further than one "step" unless you turned the knob carefully and deliberately through each click.

The radio's display is fine, as long as you don't need to view it from below. Then, it all but disappears. Users actually found the display was a bit sharper and clearer when viewed from slightly *above* (as it would be in a typical mobile installation) than straight on. There are two levels of display brightness available.

We got favorable audio reports with the HTX-242 (which Radio Shack says uses "true FM"), and a couple of ops commented that it was very natural-sounding. Receive audio from the top-firing speaker also was decent, but one op said he would have liked more of it.

The mike is lightweight with lots of buttons: **UP/DOWN**, **VFO**, **MR**, **MHZ**, **LOCK ON** and **CALL** plus a DTMF pad. It's comfortable and easy to hold. You can enter your frequency directly from the DTMF pad. One quirk: The **UP** button is on the *left-hand* side, while the **DN** button is on the right, just the opposite of what you'd expect. A modular telephone-type plug connects the mike to a front-panel jack. The radio is capable of 1200-bit/s packet, and you can purchase the needed 8-pin microphone plug (catalog number 279-440) at Radio Shack.

The programming directions in the *Owner's Manual* were very easy to follow and got you on the air in short order. We found it was easy to store data in memories.

One of the major new features in the HTX-242—and one which Radio Shack has touted—is *Auto Memory Store. AMS* scans the band and automatically stores active frequencies in memories, including any applicable repeater offsets. When we tried it, however, we found it recorded each signal it heard in at least three separate memories, because strong signals spill over at least 5 kHz on either side. A local 147.000-MHz repeater showed up in the first memory at 146.995 MHz, then at 147.000 MHz and again at 147.005 MHz. Tightening up the squelch helped reduce this effect, but it didn't go away altogether. AMS needs more work to make it bulletproof.

Better was the HTX-242's immunity to "intermod." It topped the field at 77 dB in tests for two-tone, third-order IMD dynamic range at a 20-kHz offset, and the radio posted a respectable 91 dB at a 10-MHz offset. Adjacent channel rejection at 79 dB was second only to the ADI AR-146. This kind of performance can make a difference in "busy" VHF environments.

The HTX-242 also has a variable transmit time-out timer (shortest time is one minute), and a menu option that lets you skip certain frequencies while scanning. You can expand the radio's transmit frequency range for MARS or CAP to cover 142.5 to 149.5 MHz.

The 47-page *Owner's Manual* was a treat. In addition to thorough but concise instructions, it contains a complete schematic diagram. Better yet, it includes a very handy plastic-laminated *Quick Reference* card for your visor or glove box.

The HTX-242 is user friendly, and its considerable functionality should satisfy most 2-meter ops. The package includes a eight-foot power cable, mike bracket, mobile mounting bracket and hardware.

Manufacturer: Radio Shack, a division of Tandy Corporation, Fort Worth, Texas 76102. Manufacturer's suggested retail price, $300.

Ten-Tec T-kit 1220

The Ten-Tec T-kit 1220 is a very basic, economically priced 2-meter transceiver you can build yourself (see sidebar, Building the T-kit 1220) which should appeal to those who prefer to buy American. Judging from the calls we'd had from other owners, the T-kit 1220 is plenty popular (Ten-Tec also kits up a similar radios for 6-meter and 220-MHz FM). It's a fun project, and—thanks to the detailed information in the combination construction and operating manual—a great learning experience. Because the T-kit 1220 has few bells and whistles, this radio was probably the easiest of our review crop to program and use. Most ops won't need the manual to figure it out. The standard '1220 runs approximately 5 W. We got the optional 1222 30-W amplifier, which attaches to the back.

We found the radio has adequate performance for typical, everyday operation. In particular, we received very favorable comments about the rig's transmit audio quality. Receive quality was quite good from the built-in, top-firing speaker, which was larger than most. We had no trouble hearing or raising repeaters in fringe areas; the 30 W was more than enough power. Kit builder Norman Bliss, WA1CCQ, reports having a problem with ignition noise from his Isuzu Trooper. We didn't notice this with an otherwise noisy

Ford Explorer, and you might not have this problem with your vehicle.

The complete package includes a mobile mounting bracket. Ten-Tec chintzed a bit on the power cord; it's only about 5 feet long. It's hardwired to the unit, and if you want a connector in the line, you will have to put one there yourself. The only control on the microphone is the PTT button; there is no DTMF pad, but Ten-Tec plans to offer a DTMF mike in the future. The mike uses a widely available 4-pin connector, making it easy to adapt another mike to the unit. The rig has a five-pin DIN plug on the back for interconnection with a packet TNC. The backup battery is the popular 9-V type you can buy anywhere.

The display window is very simple, but the green LED frequency readout washes out in strong daylight. The front-panel control legends—white against the black panel—are easy to read. The least functional front-panel control is the **PWR** switch, a combination dc-power and output-power control. It's a toggle switch with a center-off position. For high-power operation, you move the switch up; for low-power operation, you move the switch down. Switching from one output-power level to the other turns the unit off momentarily, which we found annoying. The right-hand tuning control is detented, but it doesn't seem to be quite as well-supported as the **VOLUME** and **SQUELCH** controls, so it feels a little "wobbly."

Setting CTCSS tones for repeater access was simple, but not intuitive. You have to press the **SHIFT** button until it displays the tone frequency, then use the tuning knob to change it. Pressing **SHIFT** again returns you to VFO or memory mode (whichever you were in previously), but you might have to press it again a time or two to reset the desired offset. Then, you press the **TONE** button (an LED lights) to turn the PL tone on or off as needed.

Ten-Tec said the average builder should be able to align the T-kit "by ear" and by using a VOM or VTVM. We had Ten-Tec take a look at the completed unit to make sure it was aligned correctly. We uncovered one major (and a few minor) discrepancies during ARRL Lab testing. The major problem was that the transmitter of our unit did not meet FCC requirements for spectral purity (–60 dBc or greater) when using the optional 30-W amplifier. It's okay "barefoot." Ten-Tec provided us with one radio built by a staff member there that did meet spectral purity requirements at high power. This suggests that getting a kit that meets spectral purity requirements is a hit-or-miss proposition. If you build one of these kits with the optional amplifier, we'd suggest an additional band-pass filter. Many such units are available. Again, this is *not* a problem if you only build the basic 5-W unit. Our unit also failed to meet its –70 dB adjacent channel rejection specification.

While this radio lacks many features you'll find on higher priced transceivers, many ops will find this is a positive, rather than negative. The Ten-Tec T-kit 1220 does everything you normally need to do with a 2-meter transceiver, and you don't have to pore over the manual for several hours (or keep the manual at hand) to be able to use it. Building it was an enjoyable, educational experience.

Manufacturer: Ten-Tec, 1185 Dolly Parton Pkwy, Sevierville, TN 37862-3710; tel 423-453-7172; 800-833-7373 (orders only). Manufacturer's suggested retail price, $195; Model 1222 30-W amplifier kit, $64.

Ten-Tec T-kit 1220

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive and transmit, 143.5-148.5 MHz.	Receive and transmit, 143.495-148.6 MHz
Power requirements: At 13.5 V dc: Receive, 0.2 A (no signal); transmit, 5 A (max).	At 13.8 V dc: Receive, 0.33 A (max volume, no signal); transmit 4.9 A (max).
Size (height, width, depth): 2.25×6.5×7 inches; weight, 3.2 lb.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: For 12-dB SINAD, 0.2 μV or less.	For 12-dB SINAD, 0.23 μV.
Two-tone, third-order IMD dynamic range: 70 dB at 20-kHz offset from 146 MHz.	20-kHz offset from 146 MHz, 61 dB.* 10-MHz offset from 146 MHz, 90 dB.
Adjacent-channel rejection: 70 dB at 20 kHz offset from 146 MHz.	20-kHz offset from 146 MHz, 61 dB.
IF rejection: Not specified.	76 dB.
Image rejection: Not specified.	64 dB.
Squelch sensitivity: Not specified.	0.08 μV, at threshold.
Audio output: Not specified.	1.9 W at 10% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/low): 30 / 5 W.	37 / 2 W.
Spurious signal and harmonic suppression: –60 dBc or better.	–55 dBc. Does *not* meet FCC requirements for spectral purity (see text).
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 55 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	25 ms.

*Measurement was noise-limited at value indicated.

Building the Ten-Tec T-kit 1220

This kit was surprisingly easy to build. The manual comes with a separate layout/ schematic sheet, which I found very useful. I would have liked to have seen more photos of the rig—at least top and bottom views—as finished. You might want to photocopy the Component Reference Index in the Service section of the manual, since you'll almost certainly want to consult it while the book is open to another section. If you plan to install the 1222 30-W amplifier, it's easier to do it when building the transceiver (unless you have a special affection for *de*soldering circuit boards).

The manual is comprehensive and clear. The biggest challenge (common to most kits) is locating where a component goes, and occasionally, what side of the board it goes on, or how leads are run relative to other components. Ten-Tec refers to the top, or component side of the board, and the bottom, or trace (solder) side. Part locations are silk-screened on the top (component) side, and most parts mount there, with their leads soldered on the bottom side. When the board is mounted in the transceiver, however, the trace side is up, and the component side is down! This can be confusing (at least it was for me).

The basic kit has three circuit boards (display, transmit/receive, and main), and just about everything mounts on them. The optional 30-W amplifier has its own circuit board. The tools needed should be in any amateur's toolbox. Required test equipment is a DC voltmeter, 2-meter signal source (a low power H-T and a dummy load will do), and either a digital frequency counter or a digitally accurate HF receiver to set the 4.0 MHz oscillator.

Alignment is simple; the only real problem I had was reducing the strength of the 2-meter signal for receiver alignment. Too strong a signal will cause the receive circuitry to limit, making it difficult or impossible to properly align the receive circuit. The manual gives some suggestions about how you can lower the test signal level, if necessary. A couple of additional caveats: be very careful when permanently mounting the display board to the main board; the volume and squelch controls are very fragile, and it doesn't take much to break them. Also, the power plug and the optical encoder plugs are identical except for wire color, so be very careful not to mix them up; you must connect them several times during construction. Of course, I didn't make any of these mistakes (just don't ask Ten-Tec why they had to send me a new volume control and several ICs).

The final product is somewhat larger than most typical transceivers having similar features; factory-built rigs make great use of surface-mount technology to achieve their small size. Surface-mount technology is not something that can be easily applied to kits intended for construction by the average amateur, however. Unlike such rigs, you will know what's in the radio and what each part of the circuit does. And if you need help, Ten-Tec's excellent support is always available.—*Norman Bliss, WA1CCQ*

Yaesu FT-3000M

Featuring 70 W output, the FT-3000M is the high-powered sports model of this review ensemble, and, as you'd expect, carries the biggest price tag. Put this rugged (MIL-STD 810) radio on the air and you're suddenly King of the Road among the FM and repeater set! In addition to lots of power (it has three *lower* power levels), transmit and receive audio are fine, and the FT-3000M offers top-notch "intermod" immunity on 2 meters and just about any standard feature you could ask for in a 2-meter mobile, with the notable exception of CTCSS decoding (it does have a *digital code squelch* feature that Yaesu says offers more privacy than CTCSS). Its expanded receive coverage includes 70 cm, and the unit can be configured for crossband split. Its 80 memories plus a call (Yaesu calls it *Home*) channel puts it in second place in that category, but that's more memories than most ops will ever need.

You can tell that some thought to ergonomics went into the design of the FT-3000M. The radio features a prominent, easy-to-grip tuning knob (Yaesu calls it a *rotary selector*) on the right-hand side of the large LCD display window. The **S&PO** (signal strength and power output) meter segments swoop in an upward arc. The display can show two frequencies at once and is visible at all angles except from below at an extreme angle. It has pleasant "orangey" backlighting. Oh, and there's an *eight*-step dimmer.

The tuning knob tunes the default tuning step or chooses individual memories. Surrounding the base of the tuning knob is an outer ring that lets you either tune in 1-MHz steps or select different memory *banks*. You press the tuning knob to swap the band and subband displays; you press and hold it to enter the menu. There are 57 individual menu items.

We absolutely *loved* the *interactive menu programming*, a "crawl text" feature that explains the purpose of each menu item and how to use it. Crawl text is what TV stations often broadcast along the bottom of the screen to impart school closing or storm information during a program. Yaesu extended the crawl text concept to other aspects of the FT-3000M. One mode automatically displays crawl text that tells you how the function keys are programmed!

Flanking the tuning knob both to the right and above are two pairs of function buttons. One pair is user-programmable (but with defaults to recall the *Home* channel and to activate the reverse function). The other pair

Yaesu FT-3000M, serial no.5N010245

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 110~180; 300~520 800-999 MHz (cellular blocked); transmit, 144-148 MHz.	As specified.
Power requirements: At 13.8 V dc: Receive, <0.8 A (signal); transmit, 15 A (max).	At 13.8 V dc: Receive, 0.4 A (max volume, no signal, lights at default); transmit, 10.5 A (max).
Size (height, width, depth): 1.6×5.6×7.2 inches; weight, 2.8 lb.	

Receiver	*Receiver Dynamic Testing*
Sensitivity: VHF, <0.2 µV; UHF, <0.25 µV, for 12 dB SINAD.	For 12-dB SINAD: 146 MHz, 0.18 µV; AM (120 MHz): 1.1 µV for 10-dB (S+N)/N; UHF: 440 MHz, 0.18 µV; 800 MHz, 0.43 µV.
Two-tone, third-order IMD dynamic range: Not specified.	20-kHz offset from 146 MHz, 70 dB*. 10-MHz offset from 146 MHz, 101 dB. 20-kHz offset from 440 MHz, 60 dB*. 10-MHz offset from 440 MHz, 69 dB.
Adjacent-channel rejection: Not specified.	20-kHz offset from 146 MHz, 70 dB. 20-kHz offset from 440 MHz, 60 dB.
IF rejection: Not specified.	VHF, 81 dB; UHF, 86 dB; 800 MHz, 85 dB.
Image rejection: VHF, >70 dB; UHF not specified.	VHF, 85 dB; UHF, 31 dB; 800 MHz, 3 dB.
Squelch sensitivity: VHF, >0.12 µV; UHF, >0.16 µV.	VHF, 0.1 µV; UHF, 0.1 µV at threshold.
Audio output: 2 W at 10% THD into 8 Ω.	2.3 W at 10% THD into 8 Ω.

Transmitter	*Transmitter Dynamic Testing*
Power output (high/low3/low2/low1): 70 / 50 / 25 / 10 W.	68 / 56 / 26 / 11 W.
Spurious signal and harmonic suppression: −60 dBc or better.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio): Not specified.	Squelch on, 60 ms; data mode, 50 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	80 ms; data mode, 75 ms.
Bit-error rate (BER), 9600 baud: Not specified.	Receiver: BER @ 12-dB SINAD, 1.8×10^{-3}; BER @ 16-dB SINAD, 1.1×10^{-4}; BER @ −50 dBm, 2.3×10^{-5}. Transmitter: BER @ 12-dB SINAD, 6.6×10^{-3}; BER @ 12-dB SINAD +30 dB, 4.7×10^{-4}.

*Measurement was noise-limited at value indicated.

let you toggle between VFO and memory, power the unit on or off and activate the auto-record mode for the optional digital voice synthesizer. A fifth button, **SRCH**, is on the rotary selector escutcheon. Pressing it starts an automatic search-and-store mode (more on that later). All five function buttons are easy to find without looking, since they surround the protruding tuning knob (uhhh, *rotary selector*). The rotary **VOL** and **SQL** controls are left of the display window.

The mike plugs into the left-hand side of the radio, right next to the edge of the mounting bracket. This puts it out of the way, certainly, but it also could complicate mounting. In addition to the DTMF pad (buttons are recessed and lighted, if desired, and an LED lights as you press a key), the mike also has **DWN** and **UP** keys, a **VFO/MR** button, **LAMP** and **LOCK** switches, two user-programmable function buttons, and an **ACC** button that lets you monitor stations below the squelch threshold.

We enjoyed trying out full duplex on this transceiver. It might not be something you'd use a lot, but it works great, just like using a telephone. Of course, the other transceiver must also be capable of simultaneous 70-cm transmit and 2-meter receive. The FT-3000M also can be set up as a crossband repeater. The transceiver can retransmit a 440-MHz

signal on 2-meters—great for those times when you're away from the car (fishing or camping, for example) and need to access a distant 2-meter repeater that your H-T can *hear* but not hit. The 70-cm coverage includes the satellite subband (435-438 MHz), and the unit supports 9600-bit/s packet with a dedicated **DATA** jack. However, the smallest tuning step is 5 kHz, which makes it problematic to track Doppler shift for satellite work.

You can apply alphanumeric names (up to five characters) to each memory. You also can protect memories from overwriting. The FT-3000M's *Smart Search* feature scans and stores active channels in 20 memory channels. It worked flawlessly. *Smart Search* overwrites filled memories once it's used the 20 allocated to it.

Yaesu's *Spectrum Scope* visually displays band or memory activity. The radio also has *twin* cooling fans on the rear apron; automatic power off; a transmit time-out timer (TOT) that can be set from 1 to 60 minutes; and (this could be a first) variable key-push timing (normally a half-second for primary functions). A remote function lets you enter frequencies via the DTMF keypad and control most other transceiver functions from the mike. But Yaesu took this one step further: You also can use DTMF tones to control the FT-3000M from *another* radio! Like some

other Yaesu transceivers, it also offers the *Auto Range Transpond System* (*ARTS*), which lets you know when you and another *ARTS*-equipped transceiver are within communication range. And you can clone the settings and memories of your FT-3000M to another FT-3000M. Unlike the Alinco DR-150T, however, cloning the FT-3000M requires a user-constructed cable.

The manual doesn't mention it, but you can use Yaesu's ADMS-2C software to program the transceiver with your PC. Otherwise, the FT-3000M manual is comprehensive, but it needs an index, not just a table of contents. The manual includes a complete schematic. The FT-3000M in package includes an 8-foot power cable, mounting bracket, spare fuses and a mike bracket.

Overall, this is a complex radio that you probably won't figure out without spending some time with the manual. But it offers lots of features and flexibility in a quality package.

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703. Manufacturer's suggested retail price, $599; DVS-4 digital voice recorder, $61; FTS-17A tone squelch unit, $62.

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.

ADI AR-146 2-meter FM transceiver (see "Product Review," *QST*, Nov 1996). Minimum bid: $158.

Alinco DR-150T 2-meter FM transceiver (see "Product Review," *QST*, Nov 1996). Minimum bid: $191.

Alinco DR-M06 6-meter FM transceiver (see "Product Review," *QST*, Aug 1996). Minimum bid: $218.

Azden PCS-7500H 6-meter FM transceiver (see "Product Review," *QST*, Aug 1996). Minimum bid: $254.

ICOM IC-2000H 2-meter FM transceiver (see "Product Review," *QST*, Nov 1996). Minimum bid: $175.

Index New QRP Plus HF transceiver (see "Product Review," *QST*, Sep 1996). Minimum bid: $462.

JPS NIR-12 DSP audio filter (see "Product Review," *QST,* Jul 1996). Minimum bid: $231.

Kenwood TM-261A 2-meter FM transceiver (see "Product Review," *QST*, Nov 1996). Minimum bid: $234.

Kenwood TS-870S DSP MF/HF transceiver (see "Product Review," *QST,* Feb 1996). Minimum bid: $1716.

MFJ 9406X 6-meter transceiver with MFJ-4110 power supply and MFJ-417 cw adapter (see "Product Review," *QST,* Oct 1996). Minimum bid: $224.

Mirage B5016G 2-meter amplifier (see "Product Review," *QST*, Oct 1996). Minimum bid: $178.

Radio Shack HTX-242 2-meter FM transceiver (see "Product Review," *QST,* Nov 1996). Minimum bid: $198.

RF Concepts 2-417 2-meter amplifier (not reviewed). Minimum bid: $182.

Sigmatech DX Peeper DX packet decoder (see "Product Review," *QST,* Sep 1996). Minimum bid: $98.

TE Systems 1412G 2-meter amplifier (see "Product Review," *QST*, Oct 1996). Minimum bid: $182.

Teletec DXP-V175 2-meter amplifier (see "Product Review," *QST*, Oct 1996). Minimum bid: $196.

Tucker V-100W 2-meter amplifier (see "Product Review," *QST*, Oct 1996). Minimum bid: $131.

Yaesu FT-3000M 2-meter FM transceiver (see "Product Review," *QST,* Nov 1996). Minimum bid: $304.

Sealed bids must be submitted by mail and must be postmarked on or before December 1, 1996. 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.

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