PRODUCT REVIEW

Patcomm PC-16000A HF Transceiver

Reviewed by Joe Bottiglieri, AA1GW
Assistant Technical Editor

Nearly three years have passed since we completed our evaluation of the previous version of this HF transceiver—the PC-16000—and reported our impressions, experiences and ARRL Lab measurement data in these pages (see *Product Review*, February 1998).

At that time, Patcomm Corporation of St James, New York was a new player in the Amateur Radio market.

Patcomm no doubt recognized from the onset that competing head-to-head with the big manufacturers was going to be tough sledding.

Certainly, the cachet of being an *American* Amateur Radio equipment manufacturer wouldn't hurt. The company's heritage might possibly generate a twinge of "Made in the USA" patriotism on their home turf, and could perhaps help their products attract attention in the crowded world market.

One thing was for sure—their equipment would have to be unique. It would need to offer something that clearly set it apart from the competition.

An Interesting Concept

The product concept they came up with was pretty ingenious, and maybe a little too far ahead of its time!

Patcomm's PC-16000 (initially released as a PC-1610) was—and, with their new "A" version, I should add—*still is*—the world's only amateur HF transceiver that includes a fully integrated digital mode terminal for RTTY (Baudot or ASCII) and CW operation *built right in*. Plug in the included IBM keyboard and switch the transceiver into either of these modes, press a "decode" button, properly tune in a RTTY or CW signal, and *voilá*—the received message text begins scrolling along the top line of the main display window.

When it's your turn to make the call (in RTTY *or* CW), it's a simple matter of engaging the transmit mode with a couple of keyboard strokes and away you go. Message text typed into the 16-character transmit buffer begins marching across the bottom line of the main display and gets sent out.

Patcomm also took advantage of the keyboard hookup to implement a radio-control-from-the-keyboard feature. Nearly all of the control operations accessible from the keys on the front panel of the radio (and even a couple that aren't) can be remotely accessed using keys or key combinations on the IBM keyboard.

Of course, conventional phone and CW operation is also supported.

Are You Calling My Baby Ugly?

The original PC-16000 seemed very promising but, as those of you who read our earlier review might recall, Patcomm initially struggled with some hardware and firmware problems.

In what some might consider "adding insult to injury," our reviewers didn't pull any punches when it came to expressing their opinions on the look, the feel and the layout of the controls.

Fast forward to Dayton Hamvention '99. A prototype of a new model of the '16000—the PC-16000A—made its debut at the show.

In the process of its transformation into the "A" version, the PC-16000 had received a radical facelift, and the results were nothing short of remarkable.

Some of the highlights? The LCD display window, shamelessly ridiculed for being "too small" in the text of our original write-up, had doubled in size—and so had the "tiny" S meter. The main tuning knob had been replaced with a larger and considerably more attractive alternative.

What had once been a single, confusing mass of 31 buttons tagged with difficult-to-read legends had been divvied up into subgroups of related keys and herded off to separate regions of the front panel. Silk-screened borders marked off their individual territories and the legends for all of the controls were larger and much easier to read.

Six machined-aluminum knobs, bunched close together in a tight pack on the original model, were also paired up and shuffled off to the suburbs.

Both aesthetically and ergonomically, the prototype PC-16000A appeared to be worlds apart from the original '16000. We eagerly anticipated the availability of regular production units so that we could purchase one to see how the changes would affect operation.

Bottom Line

With tremendous improvements in both aesthetics and ergonomics over the original radios of this series, Patcomm has once again captured our attention with this unique, and distinctly American, HF transceiver.

PC-16000A Particulars

Electronically, the new version of the transceiver is very similar to the previous model, but a recap is in order.

The PC-16000A covers all of the amateur bands from 160 through 10 meters and is capable of SSB, CW, AM and FSK operation. (An optional FM board is *still* not yet available. Patcomm reports that customer demand for this accessory has been virtually nonexistent). General coverage receive stretches continuously from about 100 kHz up to 30 MHz.

The transmitter harnesses the power of

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Table 1—Patcomm PC-16000A, serial number 25070D0047

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Receive, 0.1-29.9 MHz; transmit, 1.8-2.0, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89- 24.99, 28-29 MHz.	Receive 0.2-30 MHz[1]; transmit, 1.77-3.0, 3.37-4.59, 6.98-7.32, 10.08-10.17, 13.98-14.37, 18.04-18.19, 20.98-21.47, 24.87-25.01, 27.98-29.72 MHz.
Power requirement: Receive, not specified; transmit, 22 A.	Receive, 3.3 A; transmit, 21.3 A. Tested at 13.8 V.
Modes of operation: SSB, CW, AM, RTTY.	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW noise floor: –128 dBm.	Noise floor (MDS), 500 Hz filter: 1.0 MHz –127 dBm 3.5 MHz –123 dBm 14 MHz –127 dBm
AM sensitivity: Not specified.	1.0 MHz 4.8 µV 3.9 MHz 5.8 µV
Blocking dynamic range: 111 dB, spacing not specified.	Blocking dynamic range, 500 Hz filter: 3.5 MHz 112 dB* 14 MHz 118 dB*
Two-tone, third-order IMD dynamic range, 20 kHz spacing, 93 dB.	Two-tone, third-order IMD dynamic range, 500 Hz filter: 3.5 MHz 92 dB 14 MHz 94 dB
Third-order intercept: Not specified.	3.5 MHz +24.1 dBm 14 MHz +17.6 dBm
Second-order intercept: Not specified.	+54.1 dBm.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: 31 µV.
Receiver audio output: 2.5 W at 10% into 8 Ω.	2.5 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth)[2]: CW-N (500 Hz filter): 533-975 Hz (442 Hz); CW-W: 286-1111 Hz (825 Hz); USB-W: 286-1000 Hz (714 Hz); LSB-W: 286-1111 Hz (825 Hz); AM: 102-1020 Hz (918 Hz).
Spurious and image rejection: Not specified.	First IF rejection, 14 MHz, 59 dB; image rejection, 14 MHz, 45 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, 100 W (high), AM, 40 W carrier (high)	CW and SSB, typically 107 W high[3], <1 W low, AM: typically 40 W high, <1 W low.
Spurious-signal suppression: 45 dB; harmonic suppression, 50 dB.	42 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: 40 dB[4].	28 dB.
Undesired sideband suppression: 45 dB with a 1 kHz tone.	40 dB.
Third-order intermodulation distortion (IMD) products: 28 dB.	See Figure 1.
CW keyer speed range: Not specified.	5 to 67 WPM.
CW keying characteristics: Not specified.	See Figure 3.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 120 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 40 ms. Unit is not suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figure 2.
Size (hwd): 3.5×13×12 inches; weight, 12 pounds.	

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value indicated.
Third-order intercept points were determined using S5 reference.
[1]Sensitivity reduced below 500 kHz.
[2]See text.
[3]Maximum output on 160 meters was 85 W. Output decreases moderately above 29.0 MHz.
[4]Patcomm specifies this measurement relative to 100 W with no audio input. Their specification was met when tested using this method.
An expanded test result report for this transceiver is available to our members on our Web site. Printed copies are also available for those without Web access.

a pair of bipolar RF transistors, rated for up to 100-W *each*, to deliver 100 W for SSB and CW operation, 75 W for RTTY and 40 W (carrier) for AM.

The small rear-mounted heatsink and the rather massive aluminum chassis are said to supply sufficient heat dissipation to allow the lightly loaded finals to keep their cool. No one will be grumbling about the level of the cooling fan noise emanating from this radio—*there is no cooling fan*.

Fixed-level VOGAD (voice-operated gain-adjusting device) RF speech processing; multiple antenna connectors; variable RF power output (down to under 1-W) and the ability to display the RF power and SWR numerically in the LCD window are all included. The PC-16000A does not contain VOX features or a built-in automatic antenna tuner, however.

The receiver is dual conversion with IF stages at 45 MHz and 455 kHz. The radio employs 2.4 kHz and 500-Hz Rockwell Collins mechanical filters at the second IF. A 6-kHz ceramic filter is used for the AM mode. An optional 1.8 kHz Rockwell Collins SSB filter is also available.

The '16000A makes use of digital signal processing to effectively bracket the passband of the mechanical filters and to generate additional audio level DSP-based filter bandwidths of 1.8 kHz, 250 Hz and 200 Hz. The 200-Hz DSP

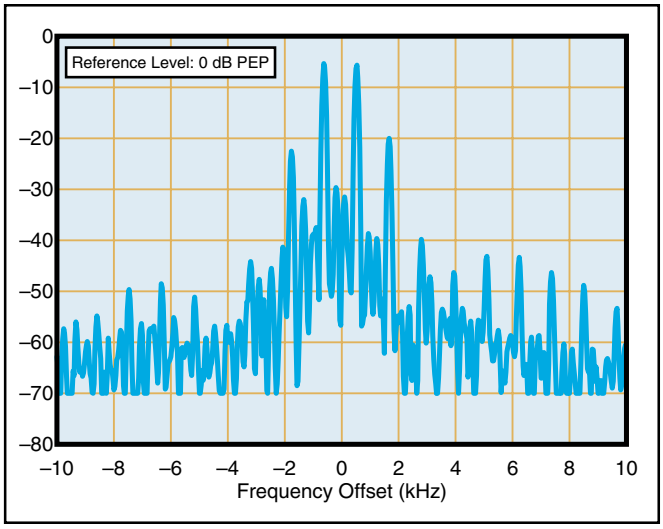

Figure 1—Worst-case spectral display of the Patcomm PC-16000A transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 22 dB below PEP output, and the worst-case fifth-order product is approximately 42 dB down. The transmitter was being operated at 100 W output at 21.250 MHz.

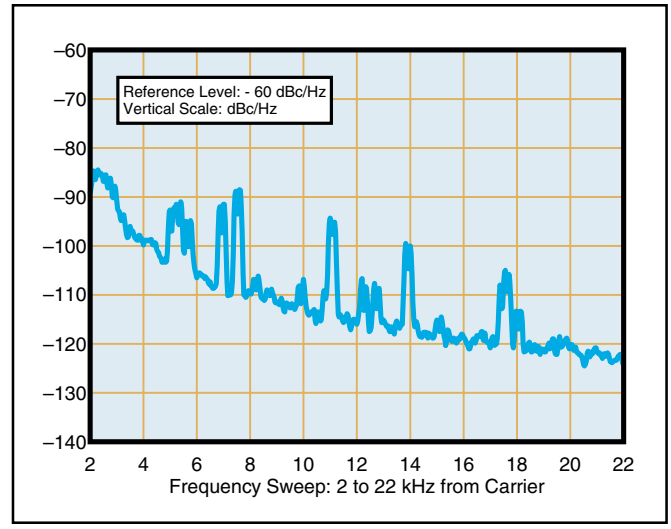

Figure 2—Worst-case spectral display of the Patcomm PC-16000A transmitter during composite-noise testing at 3.520 MHz. Power output is 100 W. The carrier, off the left edge of the plot, is not shown. The plot shows composite transmitted noise 2 to 22 MHz from the carrier. Composite noise is higher than other HF transceivers we've test recently.

filter, available only in the RTTY modes, works in conjunction with the 2.4 kHz and 500 Hz mechanical filters.

In addition to expanding and enhancing the filter capabilities, the DSP also delivers "de-noiser" and "auto-notch" features.

The de-noiser is designed to reduce the level of the background noise. The automatic notch filter, available only when using the 2.4 or 1.8 kHz filter settings, can track and notch up to four constant tones, such as tuning stations and other types of interfering carriers, that appear within the passband of the selected filter. Both features, however, can not be activated simultaneously and are only available in the SSB modes.

Other notables include a manual AF notch filter, an IF shift control, a pulse-type noise blanker, a receive attenuator, selectable AGC, a clock and a 10-minute ID timer.

Easy Now, Big Fella...

The changes that were made in the positions and labeling of the front panel controls makes the PC-16000A much more intuitive to operate.

All of the original 31 control buttons, with the exception of the **MOX/CLR** key, now enjoy exclusive membership in one of six key clubs.

Twelve of them, set up in a 4-row/3-column standard keypad configuration, have taken up residence on the far left-hand side of the front panel. Most of these keys perform three different functions.

The label printed above each indicates its primary assignment. These keys are used to control the split frequency, RIT,

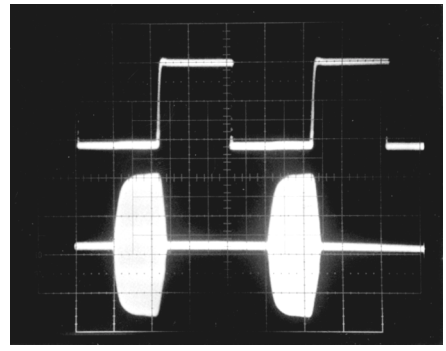

Figure 3—CW keying waveform for the Patcomm PC-16000A showing the first two dits in full-break-in (QSK) mode. The equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14.2 MHz.

QSK, CW spot and RF power/SWR metering features. Most have small red LEDs positioned next to them that indicate the current state of their associated feature.

The button located in the lower left corner of this group, **DIR FREQ/E**, is used to evoke the keypad's secondary control capability, direct frequency input. The corresponding digit assignments appear in yellow just to the right of each key.

The button in the lower right, labeled **BAND/•**, enables the keypad's tertiary function—band selection. Touch this key first and the keypad buttons become band keys. The band legends are printed below each key.

Just to the right of this group is a second 7-button set collectively titled **MODE/FILTER**. Here you'll find the keys used for mode and filter (mechanical/DSP and DSP-generated) selection, and a button that activates the RTTY/CW decode system.

The primary assignment for these keys is mode selection. Press the **BPF** button (in the 12-button keypad) first though, and five of them will also perform filter selection duties. Vertically oriented pairs of LEDs, located to the right of each key, indicate the present mode and filter setting.

The remaining four less-populated key groups control antenna, memory, tuning and noise reduction related operations.

The first contains just two buttons—**ANT** and **ATTEN**. The **ANT** button is used for antenna connector selection. The PC-16000A provides *three* SO-239 antenna jacks, and you can even program the radio to use separate ones on transmit and receive. Unfortunately, this capability is not available when in the QSK mode. The receive attenuator is specified at 20 dB.

The next group, labeled **MEMORY** and conveniently located just to the left of the main tuning knob, includes **STORE, DIR RCL, SCROLL DN** and **SCROLL UP** keys. The memory arrangement in this radio is unlike any other I've previously encountered. I'll provide details later.

The **TUNING** group, positioned just to the right of the VFO knob, consists of a **LOCK** and a **VST** button. The **LOCK** key disables VFO tuning.

When **VST** (variable speed tuning) is activated, the tuning step size is dependent on the speed of rotation of the VFO knob. The system automatically selects among five different step sizes ranging from 1 Hz for slow rotation up to 10 kHz for rapid spinning. It works *very* well.

The final group, with **AGC**, **NB** and **DSP** keys, is located on the far right hand

side of the front panel. These control the automatic gain control (fast or slow—off is not an option); the noise blanker; and a single key that can activate either the DSP de-noiser or the DSP auto-notch systems.

If anyone should ever doubt the importance of "human engineering" in product development, comparisons made between the ease of operation of the PC-16000A and the PC-16000 would rapidly dispel that suspicion. The PC-16000A is much easier to operate than the PC-16000.

One area that could still stand improvement is documentation. The 27-page manual (in a nice 3-ring binder) is well indexed and thorough, but tables or quick reference cards detailing front panel and keyboard control assignments would be a tremendous asset. A schematic diagram should also be provided.

Motivation for Memorization

The 90 "regular" memories are divided into 9 band-specific groups of 10. Each memory will retain the settings of the operating frequencies (including splits if desired), the mode, the filters, the antenna selector, the tuning speed, the VFO lock, the AGC, the noise blanker, the DSP and the attenuator.

The PC-16000A does not offer band-stacking registers. When you switch bands, the frequency that initially pops up will be the frequency stored in the first of that band's 10 memory slots. This took some getting used too.

With this rig, it's worth the effort to load up the first few positions of each band's memory bank with some strategic "starting" points.

As an example, for the 20-meter memories I programmed in 14.000 MHz (CW), 14.090 MHz (FSK), 14.150 MHz (USB), 14.195 MHz (USB) and 14.350 MHz (USB). Now, when I enter the band by way of the band key, I land on 14.000 MHz (CW) and can immediately begin cranking up through the band. If I want to begin tuning in another part of 20 meters, I use the **SCROLL UP** and **SCROLL DN** buttons to select the memorized frequency that's closest to my target.

In addition to the regular memories, there's also a single "scratchpad" memory. Shortwave and utility listeners should be forewarned that this is the *only* memory that will retain a frequency that's outside the limits of the US amateur bands.

Keyboard Control

For typical phone and conventional CW operation, it's not necessary to attach the included keyboard. I found that operating this radio seemed much easier from the transceiver's front panel controls.

It's conceivable that one might eventually warm up to the idea of using the computer keyboard to control the rig. This would require memorization of the numerous keystrokes and key combinations involved. The keyboard Patcomm provides carries only generic computer keyboard labeling. A keyboard overlay template with radio control assignments printed on it—a suggestion that we offered in our earlier review—sure would help.

Keyboard control however, may offer some advantages to the vision-impaired. They may find it more convenient to key in the radio control sequences on a familiar computer keyboard. One keyboard command that they will undoubtedly appreciate is **Alt**-**F**. This will initiate an announcement of the transmit and receive frequencies in Morse code. This feature can *only* be accessed from the keyboard.

Computer Connection

The PC-16000A offers keyboard control, but it does not include provisions for controlling the radio via a computer interface for remote control or station automation applications. Cabling the transceiver to your shack computer (or a "dumb" terminal—remember those?) can still offer some advantages though.

There's a 7-pin DIN connector on the back panel that can be connected to your computer's COM port. Make up an interconnect cable, fire up some terminal software and this will allow RTTY and CW text that's being decoded and encoded inside the transceiver to be displayed on the monitor. This can come in very handy.

When I was using the transceiver as a stand-alone digital mode terminal, on a number of occasions I found myself wishing for a way to scroll back through the received text—once it disappears off the left edge of the 16-character LCD screen, it's gone for good. If you forget the other operator's name or call sign, for example, it can't be recovered. With the radio operating in stand-alone mode, you'll definitely want to keep a pad or logbook close at hand for jotting down notes as the text flows by.

With a terminal "buffering" the incoming text, you'll also have an extended opportunity to play "Wheel of Fortune" with text that may have been corrupted by interference or variations in propagation. While the fairly consistent decoding that typically occurs in the RTTY mode doesn't result in too much garbled text, decoding CW by electronic means—particularly under poor conditions—often leads to a need for significant amounts of "text interpretation."

Snakebit

In the early stages of our evaluation of the original version (back in '97), it became apparent that Patcomm was still in the process of ironing out several problems related to the design and manufacture of the transceiver. To their credit, by the time we were ready to publish that review, nearly all of the performance shortcomings that we had encountered and reported to them had been resolved.

Although our criticisms concerning the man/machine interface aspects of the transceiver's design still remained, the underlying performance of the last of several we tested—a transceiver with all the factory updates installed—had been elevated to a respectable level. Most of their claimed specifications were met.

Along the way, Patcomm had managed to improve the CW keying waveform; reduce the phase noise; and increase the spurious signal and harmonic suppression, the blocking dynamic range and the two-tone third-order dynamic range.

This time around, when we initially received our PC-16000A and began our lab tests, we immediately ran into problems with sideband carrier suppression and spot checks of some of the other important performance characteristics turned up several that fell well short of their current published specifications. The transceiver went back to Patcomm for further investigation.

Their service department tracked the difficulties to a couple of cracked surface mount capacitors. Apparently a subcontractor that provides SMD circuit board subassemblies had encountered a bad batch of caps. Patcomm replaced the defective components and sent the radio back to us.

Back to the Bench

Our second series of tests confirmed that the performance of the PC-16000A was as good as—and in some cases, better than—the best of the PC-16000's we looked at back in '97.

The CW keying waveform (see Figure 3) indicated significant improvement. The best keying we observed in the previous model still showed signs of first-dit shortening and very "soft" rise times—not so this time around.

The two-tone third-order IMD dynamic range on 80 and 20 meters scored in the low- to mid-90s and neither measurement was noise-limited. The blocking dynamic range, although noise-limited, topped their 111 dB spec.

Oddly, the IF/audio response measurements for SSB and AM recorded during testing were much narrower than those we observed in any of the earlier units. The Lab investigated further and found that there was a notable frequency roll-off in the audio response that resulted in a decrease in the −6 dB bandwidths. This

made the filters seem—on paper anyway—way too narrow to pass intelligible audio.

On upper and lower sideband, the –6 dB bandwidths measured in the neighborhood of 700 Hz, but a second check at –30 dB revealed that the bandwidths at that lower level were closer to 1850 Hz. For AM, the –6 dB points indicated a mere 900 Hz of bandwidth, but the bandwidth at –30 dB measured 4 kHz. Although a poor IF filter shape factor can lead to this effect, a less than flat audio response (as was the case here) can also produce similar results.

While our Lab data pointed toward receiver audio that would sound seriously constricted, our field observations didn't bear that out. The audio delivered by this radio actually sounds very nice.

Closing Considerations

The PC-16000A exhibits a level of overall performance that's reasonable for a HF transceiver in this price range with basic DSP, built-in Rockwell Collins filters, RF speech processing, keyboard control and an integrated full-featured RTTY and CW digital mode terminal built in.

If you are presently shopping for a conventional HF transceiver and have a particular interest in RTTY and keyboard CW operation, the PC-16000A provides everything you'll need. Simply pull the radio out of the box; plug in the keyboard; lash it up to a suitable power supply and an antenna; and you are in business. No external TNC, no custom-built cabling and *no* personal computer are required.

Thanks to Michael Tracy, KC1SX, and the ARRL Lab for their assistance with this review.

Manufacturer: Patcomm Corp, 7 Flowerfield Suite M100, St James, NY 11780; 631-862-6512; fax 631-862-6529; **patcomm1@aol.com**; **www.patcomm.net/**.

Manufacturer's suggested retail price, $1350.

RadioShack HTX-252 2-Meter FM Mobile Transceiver

Reviewed by Rich Arland, K7SZ
QST *Contributing Editor*

When I contacted *QST* Product Review Editor Joe Bottiglieri, AA1GW, with an offer to do this review, his immediate response was: "How did you manage to get your hands on an HTX-252? RadioShack hasn't even begun *advertising* them yet!"

I had been searching for a 2-meter mobile to install in the very limited space available in my Subaru Outback. When I caught my first glimpse of this radio at the RadioShack booth at the Murgas Amateur Radio Club hamfest back in July, I quickly began to suspect that my quest was nearing an end.

Barry Brutko, the manager of the RadioShack in Wilkes-Barre, Pennsylvania, along with his sales associate Walt Gouse (N3BSX), were manning the booth. Their store had received one of the earliest shipments of HTX-252s. They brought along a few to sell at the show.

I chatted with them, perused the *Owner's Manual*, looked over the list of features and decided to give this little rig a try. Believe me, Barry and Walt didn't have to resort to too much arm-twisting. (We purchased a second HTX-252 to put through ARRL Lab testing and to try out for ourselves. The measurement data presented in Table 2 is from this second unit.—*Ed.*)

Bucking the Trend

Perhaps what is most immediately striking about this transceiver is its diminutive size. The overall dimensions are about $1^{5}/_{16} \times 5^{1}/_{8} \times 4^{7}/_{8}$ inches. This is one *tiny* radio! The weight is well under 2 lbs. I've owned some 2-meter H-Ts that were heavier than this mobile transceiver.

With their introduction of the HTX-252, it appears as if the folks in Fort Worth have decided to carve themselves a niche in the highly-competitive

2-meter FM mobile market by offering an extremely compact, moderately-featured, easy-to-operate transceiver.

This radio represents a refreshing departure from a current trend within the Amateur Radio industry—cram every conceivable bell and whistle into ever-smaller enclosures. Although the resulting products score high on the "Gee Whiz" scale, a significant—and growing—number of hams have voiced their displeasure with the difficulties they encounter programming and operating some of these "fully-loaded" models.

The '252 offers a blend of features that has been distilled down to just a tad more than the bare essentials. You'll find 10 memory channels (11 if you count the "Call" channel); 10 and 25 W RF power output settings; CTCSS encode and decode; extended receive coverage; priority watch, basic memory and VFO scan; and DTMF (for autopatch and repeater control)—and that's about it.

Bottom Line

RadioShack's HTX-252 provides just a smidgen more than the basic requirements for contemporary amateur 2-meter FM communications. What it may lack in "bells and whistles" however, it compensates for with its subcompact dimensions, ease of programming and simplicity of operation.

Some examples of the things that you *won't* find are high RF power output (50 W seems to be typical for VHF mobiles these days), an abundance of memories with alphanumeric tagging, direct frequency input from the microphone keypad and autodial memories. For my requirements, I consider these omissions to be reasonable tradeoffs. We'll revisit this topic shortly, but first let's take a closer look.

Face Front

The front panel of the '252 is remarkably—but somewhat deceivingly—uncluttered. Three rubberized pushbuttons; a volume, squelch and tuning knob; a conventional 8-pin microphone jack and the $^{3}/_{4} \times 1^{3}/_{4}$-inch display window are all you'll find. The "deception" lies in the fact that some of the control operations that are commonly accessed from front panel buttons on other VHF mobile transceivers have been relegated to four control buttons located on the HTX-252's hand mike.

The LCD window displays black segments on an amber background. Icons that show the state of the various settings pop up along the top edge of the window; a 4-section S/RF meter is located in the lower portion. The displayed frequency digits, the memory channel numbers and the icons are large enough for easy viewing. The display illumination level is fixed. Readability is good over a wide range of angles and lighting conditions.

The three chassis-mounted buttons, located just below the display, are labeled **REV**, **VFO/T-SQL** and **MR/MS**. A brief press of the **REV**erse button (when the transceiver is set up for repeater operation) will swap the transmit and receive frequen-